Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2013 Work Plan

Date of Status Update Report: February 10, 2014

Date of Next Status Update Report: August 31, 2014

Date of Work Plan Approval: June 25, 2013

Project Completion Date: June 30, 2019 **Is this an amendment request?** No

Project Title: Aquatic Invasive Species Research Center

Project Manager: Susan Galatowitsch

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Location:

Counties Impacted: Statewide

Ecological Section Impacted: Lake Agassiz Aspen Parklands (223N), Minnesota and Northeast Iowa Morainal (222M), North Central Glaciated Plains (251B), Northern Minnesota and Ontario Peatlands (212M), Northern Minnesota Drift and lake Plains (212N), Northern Superior Uplands (212L), Paleozoic Plateau (222L), Red River Valley (251A), Southern Superior Uplands (212J), Western Superior Uplands (212K)

Total ENRTF Project Budget:	**ENRTF Appropriation $:**	8,700,000
	Amount Spent $:	0
	Balance $:	8,700,000

Legal Citation: M.L. 2013, Chp. 52, Sec. 2, Subd. 06a

Appropriation Language:
$4,350,000 the first year and $4,350,000 the second year are from the trust fund to the Board of Regents of the University of Minnesota to develop and support an aquatic invasive species (AIS) research center at the University of Minnesota that will develop new techniques to control aquatic invasive species including Asian carp, zebra mussels, and plant species. This appropriation is available until June 30, 2019, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Aquatic Invasive Species Research Center

II. PROJECT SUMMARY: Aquatic invasive species (AIS) are causing irreparable damage to Minnesota's fisheries and wildlife and their habitats, as well as to our outdoor heritage. This threat is expanding as new exotic species arrive, most of which are poorly understood. New ideas and approaches are needed to develop real solutions. The Minnesota state legislature awarded the University of Minnesota $3,800,000 in 2012 to create an Aquatic Invasive Species (AIS) Research Center. The goal of the Research Center (Laws of 2012, Chapter 264, article 2, section 4 and article 4, section 3) is to develop and implement solutions to control aquatic invasive species. It will do this by developing scientific expertise in variety of disciplines so that new solutions can be devised and extant ones improved while educating management agencies and the public. The Center will function in collaboration with the Minnesota Department of Natural Resources as well as other federal and state governmental agencies and private citizens groups. Initial funding was allocated to establish the administrative structure for this center, renovate University facilities, and start studies of zebra mussels and Asian carp. The present project will provide operating funds so that the scope of research can be extended to include common carp, pathogens designed to control invasive fishes, risk analysis of AIS, as well as establish as an extension and education component. This new funding will also establish an administrative structure for the Center which will both administer funds and reporting and coordinate collaborations with the DNR and other groups with an advisory board as well was as a board of technical experts. The Center will coordinate anonymous peer-reviews of center projects to insure high quality research. The new funding will give the center a life through 2019 and the opportunity to create to raise supplemental funding from other sources.

The work supported by this new proposal will initially include 11 sub-projects:

1. Coordinating, synergizing and promoting expertise: Establishing the administrative structure;
2. Delaying the spread of AIS: Monitoring the abundance and distribution of AIS using new molecular tools so techniques to delay their spread can be implemented;
3. Reducing and controlling AIS: Developing effective tools to attract and locate aggregations of invasive carp;
4. Reducing and controlling AIS: Developing effective bio-control techniques to control common and/or Asian carp;
5. Reducing and controlling AIS: Developing and evaluating new techniques to selectively control invasive plants;
6. Reducing and controlling AIS: Simulation modeling to identify and evaluate AIS control methods;
7. Developing eradication tools: Exploring whether native pathogens can be used to control AIS;
8. Implementing findings: An applied ecologist - extension specialist position and program;
9. Implementing Findings: Implementing new tools for zebra mussel control;
10. Implementing findings: An extension educator or outreach position; and
11. Reducing and controlling AIS: Risk analysis to identify AIS control priorities and methods**.**

These sub-projects will all be evaluated at 2 -3 year intervals through a peer-review process at which time detailed budgets will be assigned. Sub-projects may be added or eliminated depending upon progress and needs for AIS control in the state. Evaluation of results and implementation of changes (if necessary) will be evaluated by a Center Advisory Board (CAB) which will provide recommendations to the Director who would then suggest project amendments. Final approval of plans and changes to them must come from an internal Center Administrative Review Board and then ultimately from the LCCMR as an amendment to the work plan. This first work plan has been written following advice provided by the DNR and LCCMR staff using knowledge available as of June 2013.

III. PROJECT STATUS UPDATES:

Project Status as of August 30, 2013*:*

Revisions and corrections have been made to the budget to resolve issues such as formula errors, updating fringe rates to reflect current university policy, and rebalancing travel and supplies allocations for consistency

among similar projects. This has resulted in a change in each subproject budget and a shift in the reserve amounts accordingly:

Subproject 1: $2,083,419 to $2,034,394; reserve from $1,668,657 to $1,445,927
Subproject 2: $953,014 to $978,220; reserve from $953,014 to $978,220
Subproject 3: $674,917 to $666,335; reserve from $674,917 to $666,335
Subproject 5: $630,776 to $650,280; reserve from $470,758 to $426,998
Subproject 6: $331,628 to $352,790; reserve from $246,917 to $230,116
Subproject 7: $864,888 to $806,535; reserve from $569,401 to $471,308
Subproject 8: $1,056,222 to $1,037,134; reserve from $785,223 to $758,341
Subproject 10: $395,416 to $390,196; reserve from $319,711 to $283,694
Subproject 11: In addition to the corrections mentioned above, an error was fixed so that this project has a duration of two years (the original intent) rather than of 3.5 years. Budget shifted from $282,988 to $171,932; reserve from $168,797 to $0

Additionally, Attachment A now shows allocations for the entire 2-year duration of the first round of subprojects (#s 1,5,6,7,and 11), which will extend over three fiscal years. This also explains the change in the reserve amounts listed above for those subprojects.

Amendment Request as of August 30, 2013:

In addition to the type of corrections mentioned above, programmatic changes were made to three subprojects. We hereby request an amendment for the following changes:

Subproject 4: We have increased the fish ecologist time from 50% to 75% in the first year to allow for a possible earlier start. Together with the corrections mentioned above, this results in the budget for this subproject changing from $943,058 to $990,584; the reserve from $849,072 to $842,358.

Subproject 8: Change in job title. Conversations with the Extension service (Dr. M . Schmitt) have revealed that we cannot presently ask for formal status within Extension Service for this position (they lack space and funding, and have their own hiring procedures) so we have dropped this term from the position description. Nevertheless, there is a good possibility that this individual may work with an extension specialist (which we will pursue) and language to that effects is now in the subproject description.

Subproject 9: We have increased the zebra mussel program by half a year and included some expenses to reflect a more updated understanding of the needs of this program. Together with the corrections mentioned above, this results in the budget for this project changing from $483,674 to $621,600; the reserve from $483,674 to $621,600.

Subproject 10: We slightly increased the salary based on updated information on this type of position. We also delayed the start and reduced it to a 75% position because of inadequate funds. We are seeking non ENRTF matching funds to make this a full time position. The job title of this position has also changed because conversations with the Extension service (Dr. M . Schmitt) have revealed that we cannot ask for formal status within extension service for this position (they lack space and funding, and have their own hiring procedures) so we have dropped the 'extension' designation. Nevertheless, there is a good possibility that this individual may work with extension educators (which we will pursue) and language to that effect is now in the subproject description as well as the fact this individual will assist with communications. Together with the corrections mentioned above, this results in the budget for this project changing from $395,416 to $390,196; reserve from $319,711 to $283,694.

Further adjustments to these projects will be needed as project proposals are received. We will submit to LCCMR updates and/or further amendment requests as needed at those times.

Amendment Request approved contingent on revision of Attachment A format: September 23, 2013

Project Status as of *February 10, 2014*
As planned, the Center's administration and care of shared resources, as well as the Center's initial research, continues to be funded through its 2012 ENRTF appropriation. Please see the 2012 workplan and budget for progress reports on these activities.

No funds have been drawn down from the 2013 ENRTF award as SUB-PROJECT 1 continues to be paid from 2012 ENRTF Funds and SUB-PROJECTS 2, 3, 4, 6, 8, and 10 are not slated to begin yet. SUB-PROJECT 9 is initially being paid for with other funds, as described below.

Three research subprojects proposed with 2013 funds (SUB-PROJECTS 5, 7, and 11) have now completed the proposal and peer review process for their first phase of work, have been recommended for funding by the Scientific Director, and have now been approved by the Center Administrative Review committee. Detailed work plans and budgets for these subprojects will soon be submitted by these researchers to LCCMR.

These subprojects are:

SUB-PROJECT 5: Reducing and controlling AIS: Developing and evaluating new techniques to selectively control invasive plants. Phase I: Manipulating sunfish to enhance milfoil weevils and factors influencing selective herbicide control of curlyleaf pondweed.
Project Manager: Ray Newman
Phase 1 Budget: $214,995
Estimated Start Date: June 2014
This work will be guided by Professor Ray Newman over the next two and a half years and will have a phase 1 budget of $214,995.

SUB-PROJECT 7. Developing eradication tools: Developing eradication tools for invasive carp species Phase 1: Understanding the virome of carp species in the Upper Midwest.
Project Manager: Nick Phelps
Phase 1 Budget: $335,225
Estimated Start Date: May 2014
This work will be conducted under the guidance of Professor Nick Phelps over the next two years and will have a phase 1 budget of $335,225.

SUB-PROJECT 11: Reducing and controlling AIS: Risk analysis to identify AIS control priorities and methods. Phase 1: Problem formulation for invasive Asian carp.
Project Manager: David Andow
Phase 1 Budget: $110,185
Estimated Start Date: May 2014
This first phase in a two- phase Ecological Risk Assessment effort will be guided by Professor David Andow and will have a phase 1 budget of $110,185.

The first phase of SUB-PROJECT 1: Coordinating, synergizing and promoting expertise: Establishing an administrative structure has also now been approved by the Center Administrative Review Committee. This work will be completed over two and a half years and will have a phase 1 budget of $913,893**.** A detailed subproject 1 budget is attached.

The Center has hired its first new Research Assistant Professor, Dr. Michael McCartney, who will be committed to studying zebra and quagga mussels. The first phase of this work will be funded through the Clean Water Fund.

Subsequent work is anticipated to be funded as part of SUB-PROJECT 9. Implementing Findings: Applying new methods to control zebra mussels under this 2013 work plan.

Changes to the projected budgets on several of the subprojects have been made since the August 30, 2013 update. Explanations for these changes follow:

SUBPROJECT 1: Coordinating, synergizing and promoting expertise: Establishing an administrative structure.
Project Manager: Susan Galatowitsch
Phase 1 Budget: $913,893
Estimated Start Date: April/May 2014
An administrative and communications assistant has been added, and a technician has been converted to a lab manager for the Engineering and Fisheries Laboratory, which was recently designated for the Minnesota Aquatic Invasive Species Research Center's use as a central holding and research facility. Additional funds were also included in supplies, capital equipment, and repairs in anticipation of MAISRC's increased responsibility for upkeep of this facility.

SUBPROJECT 2: Delaying the spread of AIS: Monitoring the abundance and distribution of AIS using new molecular tools and metagenomics to delay their spread.
Project Manager: Michael Sadowsky
Phase 1 Budget: $365,756.00
Estimated Start Date: December 2014
University of Minnesota Professor and Director of the Biotechnology Institute, Mike Sadowsky, will now alone guide this subproject rather than the Center hiring a new research assistant professor to do so. This will allow the MAISRC to collaborate with a renowned expert in the field of metagenomics and also to get this research started sooner than previously planned.

SUBPROJECT 3: Reducing and controlling AIS: Developing effective tools to attract and locate aggregations of invasive carp.
Project Manager: Peter Sorensen
Phase 1 Budget: TBD
Estimated Start Date: July 2015
Additional funds for supplies, travel, and services were added to the budget.

SUBPROJECT 4: Reducing and controlling AIS: Developing effective bio-control techniques to control common and/or Asian carp.
Project Manager: TBD
Phase 1 Budget: TBD
Estimated Start Date: October 2014
No progress to report at this time as the project is not anticipated to start until early 2015

SUB-PROJECT 6: Reducing and controlling AIS: Simulation modeling to identify and evaluate AIS control methods.
Project Manager: Paul Venturelli
Phase 1 Budget: TBD
Estimated Start Date: July 2015
This sub-project has been delayed to more appropriately sequence it after additional empirical data has been gathered by the Center. It is anticipated that this project will move ahead with a project proposal and start sometime after July 1, 2015. The budget has been reduced accordingly.

SUBPROJECT 8: Implementing findings: An applied ecologist position and program.

Project Manager: TBD
Phase 1 Budget: TBD
Estimated Start Date: Workplan date July 2014; realistic date January 2015
Funds have been added to this project in anticipated need of additional boat(s) and or a vehicle (the specifics would be proposed to LCCMR as part of the subproject workplan and budget)

SUBPROJECT 9: Implementing Findings: Applying new methods to control zebra mussels.
Project Manager: Michael McCartney
Phase 1 Budget: TBD
Estimated Start Date: July 2016 (currently being funded through Clean Water Funds)
The budget for half a year of this project has been added to this workplan.

SUBPROJECT 10: Implementing Findings: An educator-outreach position.
Project Manager: TBD
Phase 1 Budget: TBD
Estimated Start Date: Workplan date July 2014; realistic date March 2015
The educator-outreach position has been made full time for the first two years (years 3-6 continue to be 75%) and additional funds have been provided for field supplies (nets and boat gas) and printing services in anticipation of this person generating informational brochures and other educational materials.

SUBPROJECT 11: Reducing and controlling AIS: Risk analysis to identify AIS control priorities and methods:
Project Manager: David Andow
Phase 1 Budget: $110,185
Estimated Start Date: May 2014
Following the project proposal process, this project has been extended and the budget has been adjusted accordingly. Additionally, based on peer review of this project, it will now be two phases, with the design and implementation of the second phase being conditioned on the results of phase 1.

Modifications to the total project budgets and reserves on the remaining projects (SUB-PROJECTS 4, 5, and 7), which have not yet begun, were made to accommodate the above changes. The net result of these budget changes are as follows:

Subproject 1: from $2,034,394 to $2,307,760; reserve from $1,445,927 to $1,393,867
Subproject 2: from $978,220 to $729,512; reserve from $978,220 to $729,512
Subproject 3: from $666,335 to $702,736; reserve from $666,335 to $702,736
Subproject 4: from $990,585 to $920,521; reserve from $842,358 to $920,521
Subproject 5: from $650,280 to $643,394; reserve from $426,998 to $428,399
Subproject 6: from $352,790 to $248,261; reserve from $230,116 to $248,261
Subproject 7: from $806,535 to $780,434; reserve from $471,308 to $445,210
Subproject 8: from $1,037,134 to $987,253; reserve from $758,341 to $987,253
Subproject 9: from $621,600 to $712,438; reserve from $621,600 to $712,438
Subproject 10: from $390,196 to $434,378; reserve from $283,694 to $434,378
Subproject 11: from $171,932 to $233,313; reserve from $0 to $123,128

These new budgets are reported on a new Overall Budget spreadsheet agreed to by LCCMR and MAISRC. The Subproject 1 revised budget is reported on a similarly approved new Subproject Budget spreadsheet. These changes have all been approved by the Center Administrative Review committee as the final initial budget of the 2013 appropriation. Any future budget changes will follow the processes set forth in the Center's MOU and the "Summary of LCCMR reporting and process 120213 final with attachment" document that are both on hand with LCCMR staff.

Project Status as of *August 31, 2014*

Project Status as of *February 28, 2015*

Project Status as of *August 31,2015*

Project Status as of *February 29, 2016*

Project Status as of *August 31, 2016*

Project Status as of *February 28, 2017*

Project Status as of *August 31,2017*

Project Status as of *February 28, 2018*

Project Status as of *August 31,2018*

Project Status as of *February 28, 2019*

IV. PROJECT ACTIVITIES (SUB-PROJECTS), AND OUTCOMES:

SUB-PROJECT 1: Coordinating, synergizing and promoting expertise: Establishing an administrative structure.
Project Manager: Susan Galatowitsch
Description: The promise of the center lies in its ability to promote synergies, share facilities, and disseminate information. These activities require scientific and administrative leadership that can organize meetings of center participants in the form of an advisory group as well as a technical group and faculty, while running peer-review, sponsoring symposia, raising funds, and both creating and disseminating reports to the legislature. Sub-Project 1 consolidates the framework for this leadership. As it becomes fully operational (an outcome of this work plan), the Center will be called 'The Minnesota Aquatic Invasive Species Research Center '(MAISRC) and it will be based in the College of Food, Agricultural and Natural Resource Sciences (CFANS) at the University of Minnesota. The MAISRC's Director is Dr. Susan Galatowitsch and she will devote approximately 30% of her time to administering the Center and providing overall leadership and direction. Dr. Galatowitsch will be assisted by a fulltime Associate Director (1.0 FTE for 5 years) who will be fully funded by this activity after startup funding ends in 2014. The Associate Director will continue to work with the Director to run an advisory board (Center Advisory Board [CAB], that includes the DNR (see below), establish and coordinate a technical board (MTC), organize peer-reviews, organize working groups, compile and produce reports and budgets, track spending, produce media releases, and organize peer reviews. Working with the Director and Extension specialist, the Associate Director will also organize regular meetings of Center faculty and staff and a symposium on campus each year, and keep a website up to date. An annual report for the Center will also be produced and biannual reports to the LCCMR.

A Memorandum of Understanding (effective 12/2/2013) between the MAISRC, the College of Food, Agricultural, and Natural Resource Sciences, and the Department of Fisheries, Wildlife, and Conservation Biology memorializes the policies guiding MAISRC. A document entitled "Summary of LCCMR reporting and process 120213 final with attachments" guides the procedures for seeking approvals from and reporting to LCCMR. These documents are on hand with LCCMR staff. Key policies and procedures from those documents are highlighted here.

The Scientific Director will be advised by CAB. This board will meet at least twice per year to review and provide feedback on center activities, new developments on AIS in the state, provide advice to the Director on overall research directions, new funding sources, and new collaborations. This board will also review any proposed changes in research (sub-project) direction or scope (i.e. identified outcomes) and provide recommendations to the Director for implementation according to the parameters of funding agencies (LCCMR and potential future funding contributors). The Director may add or eliminate sub-projects depending on progress and needs according to the processes set out in the Center's MOU with the department and college. All proposed changes to the Center's work plan must ultimately be approved by the LCCMR which would have to approve an amendment to the work plan. The Commissioner of the DNR (or designee) will initially lead CAB. In addition, the Board will include the Dean of CFANS (or designee; ex officio), two federal representative; 2 representatives from state government; 2 representatives from local government; and 2 representatives that do not represent any particular entity. The Director (*ex officio* and non-voting) and Commissioner of the DNR may appoint work groups to address special issues of mutual concern such as how the Center can address key AIS challenges facing the DNR. Work groups would report to CAB and have a limited life.

A Center Administrative Review Board ("CAR") will provide administrative oversight for MAISRC. This includes: approval of faculty positions; approval of work plans and budgets; approval of changes to research directions including to work plans, budgets, and faculty and administrative positions; and resolution of scientific and budget conflicts. Members of CAR are the CFANS Dean or Designee, Heads of all Departments with MAISRC Faculty (both inside and outside of CFANS), and the Director. Meetings are organized by MAISRC's Associate Director.

The Director will also lead, and be advised by, Technical Committee (MTC). This group of scientific experts will include at least three members from DNR, three from MAISRC, and the possibility of two others outside the University. MTC will provide technical guidance and advice. The Center will also have a Center Peer Review Committee (CPRC) whose primary responsibility will be to implement peer-reviews of proposed research and report this to the Director. This committee will be comprised of 2 MAISRC faculty and one outside member. Ad-hoc reviewers from outside the University will be solicited for each project. Following the peer review process, the Director will make recommendations for subproject funding. These recommendations will need to be approved by the CAR prior to being submitted to LCCMR.

Initially there will be 11 Center sub-projects, each of which is described in this work plan. All will be peer-reviewed within the first year of initiation when new staff will be asked to develop roughly two year sub-project proposals with budgets based on the outline provided herein. Staff will administer their own budgets and sub-project work plans which will be shared (for approval) with the LCCMR staff after being approved by the Center Administrative Review Board. . Subsequent sub-projects and sub-budgets will then be reviewed at least at three-year intervals depending on what the Director deems appropriate. It is expected that sub-projects will generally follow the outline of outcomes proposed in this work plan; however, changes may be proposed in activity scope, direction (specified outcome), FTE allocation, and budget. New sub-projects or activities may be created or old ones terminated by the Director according to process laid out in the Center's MOU with the department and college. Changes will be managed and implemented as described above.

The Scientific and Administrative Director will administer the facilities and activities of MAISRC. This includes a lab manager, a technician, the AIS holding facilities, a truck and boats. Faculty meetings will be held at least four times a year and a peer review (CPRC) as needed (at least once a year). The technical committee will also meet at least twice a year with the DNR (MTC). There will be a yearly workshop or symposium.

Summary Budget Information for Sub-Project 1:

ENRTF Budget*: **~~$2,034,394~~ $2,307,760**

Amount Spent: **$0**

Balance: **~~$2,034,394~~**

2,307,760

This value is projected; it may be adjusted during the course of the project pending progress and input from peer-review of this particular sub-project.

Outcome	Completion Date
Advisory group meeting, workshop, LCCMR reports, press releases, etc.	2013
Advisory group meeting, workshop, LCCMR reports, press releases, etc.	2014
Advisory group meeting, workshop, LCCMR reports, press releases, etc.	2015
Advisory group meeting, workshop, LCCMR reports, press releases, etc.	2016
Advisory group meeting, workshop, LCCMR reports, press releases, etc.	2017
Advisory group meeting, workshop, LCCMR reports, press releases, etc.	2018
Advisory group meeting, workshop, LCCMR reports, press releases, etc.	2019

Sub-Project Status as of *February 10, 2014*
SUBPROJECT 1: An administrative and communications assistant has been added and a technician position has been converted to a lab manager for the Engineering and Fisheries Laboratory, which was recently designated for the Minnesota Aquatic Invasive Species Research Center's use as a central holding and research facility. Additional funds were also included in supplies, capital equipment, and repairs in anticipation of MAISRC's increased responsibility for upkeep of this facility. A Subproject Budget is attached.

Sub-Project Status as of *August 31, 2014*

Sub-Project Status as of *February 28, 2015*

Sub-Project Status as of *August 31, 2015*

Sub-Project Status as of *February 29, 2016*

Sub-Project Status as of *August 31, 2016*

Sub-Project Status as of *February 28, 2017*

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Sub-Project Status as of *February 28, 2018*

Sub-Project Status as of *August 31, 2018*

Sub-Project Status as of *February 28, 2019*

Final Report Summary:

SUB-PROJECT 2: Delaying the spread of AIS: Monitoring the abundance and distribution of AIS using new molecular tools and metagenomics to delay their spread.
Project Manager: Michael Sadowsky
Description: No good options presently exist to quantify the distribution of aquatic organisms making control of AIS nearly impossible. This is particularly true for zebra (*Dreissena polymorpha*) and quagga (*D. rostriformis*) mussels, two highly invasive filter-feeding bivalve mollusks that were first found in the Duluth/Superior Harbor

in 1989. While the former has now spread into approximately 100 inland lakes, where its sharp shells and feeding habits are causing great consternation and ecological harm, the latter species threatens to follow a similar fate. Because there is presently limited options to reduce the number of these invasive mussels, natural resource managers (the DNR in Minnesota) currently focus their efforts on preventing mussel spread by isolating infected lakes which they identify by performing hand counts. They also check boats to make sure there is no spread from one infested lake into another. This is a very slow, expensive, and difficult process. The MAISRC is presently examining the possibility that environmental DNA ('eDNA') in larval mussels might be used to census invasive mussels, but the metagenomics approach proposed herein, is another equally viable option. In metagenomic approaches all the DNA in a mussel, or a particular environment, is examined. This provides a "fingerprint" of microbes in the mussels that can be extremely distinctive. The distribution of rare and abundant microbes in mussels will be examined in this subproject. In phase 1 we will develop metagenomic, quantitative PCR, and sequencing approaches to create tools to ascertain the presence/absence of zebra and then quagga mussels, via their distinct bacterial composition, in waterways. Using this approach we can understand the microbiota associated with these AIS and may be able to identify and quantify their abundance in lakes. Characterization of AIS microbiota could allow us to eventually develop effective and perhaps selective microbiological control agents for invasive mussel management. Our ultimate goal is to develop a standard set of protocols and data acquisition methods to systematically evaluate the distribution, spread, and ecological effects of zebra and quagga mussels in Minnesota waterways across time and space. This approach should ultimately be of use for conservation practices of native mussels. These studies will be conducted in a collaborative manner with the eDNA work done at the MAISRC and the MN DNR. Pending results of Phase 2, and if our methods are established, we will apply this approach to other aquatic invasive species, such as Eurasian milfoil (*Myriophyllum spicatumas*) as needed by MAISRC and the state.

Summary Budget Information for Sub-Project 2:

ENRTF Budget*: ~~$978,220~~,$729,512
Amount Spent: $0
Balance: ~~$978,220~~,$729,512

Outcome (Tentative, pending Center peer-review)	Tentative Completion Date
1. Molecular markers for key microbes associated with zebra mussel will be developed	2015
2. The utility of development of similar markers for quagga mussels	2016
3. Markers tested in lab and field experiments	2017
4. Eurasian Milfoil examined	2018
5. Analysis of possible sampling matrix for all species completed	2019

Sub-Project Status as of *February 10, 2014*
No progress to report as project is not anticipated to start until December 2014

Sub-Project Status as of *August 31, 2014*

Sub-Project Status as of *February 28, 2015*

Sub-Project Status as of *August 31, 2015*

Sub-Project Status as of *February 29, 2016*

Sub-Project Status as of *August 31, 2016*

Sub-Project Status as of *February 28, 2017*

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Sub-Project Status as of *February 28, 2018*

Sub-Project Status as of *August 31, 2018*

Sub-Project Status as of *February 28, 2019*

Final Report Summary:

SUB-PROJECT 3. Reducing and controlling AIS: Developing effective tools to attract and locate aggregations of invasive carp.

Project Manager: Peter Sorensen

Description: To remove highly mobile and invasive fish such as carp, we must know where they are. Ideally we would also be able to stimulate them to aggregate in specific locations using attractants. Common carp and Asian carp are social animals that tend aggregate so this approach has great promise. Further, initial work with radio-tagged common carp has already demonstrated that these fish will quickly locate aggregating groups of conspecifics in the winter when the entire group can be located and removed by seining. The approach is using one marked and motivated fish to locate others is known as the 'Judas Fish technique' and we will develop it for use in the Asian carps. We will also develop food and /or sex pheromone attractants (that could even be released by Judas fish) to stimulate aggregations outside of the winter months in ways we can also control. Initial work on Judas fish and feeding attractants is presently supported by startup funding provided by ML 2012 ENRTF funds but ends in 2015. This sub-project will continue and apply this work starting in 2015 with a new postdoctoral research ad graduate student. Although the precise details of this sub-project will be determined by progress with ML 2012 ENRTF funds, tentatively two activities are proposed: (3a) developing ways to apply sensory cues to attract carp (i.e. stimulating aggregation); and (3b) developing techniques to locate aggregating carp using sterile, sexually-active Judas fish. The Center will provide a fish care technician and access to central AIS holding facility. Activity 3a will develop an understanding of how to optimize either food or sex pheromone function in the lab, then test the most promising of these in the field, and then apply this technology. Activity 3b will first determine if sterilized carp can be rendered sexually-active with hormone implants, and then perform proof-of-concept work in ponds, and the apply in the field. If and as needed new sensory tools (ex. sound playback) will be developed to control the behavior and distribution of adults. This work will be directed by Dr. Peter Sorensen (1 mo/yr; 0.08 FTE for 4 years). The project likely will proceed using common carp and Asian carp with tentative outcomes listed below. Specific details will be determined in a proposal he will write in 2015 and which will be peer-reviewed and improved. This description and the outcomes below will be updated following approval of a more detailed subproject work plan and budget.

Summary Budget Information for Sub-Project 3:

ENRTF Budget*: **~~$666,335~~ 702,736**
Amount Spent: **$0**
Balance: **~~$666,335~~ 702,736**

This value is projected; it may be adjusted during the course of the project pending progress and input from peer-review of this particular sub-project.

Outcome (tentative, pending peer-review by Center)	Completion date
1. 3a Decision made on whether to develop feeding stimulants or attractants	2015
2. 3b. Decision on whether to develop pheromones or sexually active Judas fish	2015
3. 3a. Means to optimally apply poisoned food and/or food odors developed (lab)	2016
4. 3b.Ability to induce attraction with pheromones or sexual activity in sterile	2016

Judas fish established (lab)	
5. 3a. Means to optimally apply either food and sex odors in ponds established	2017
6. 3b**.**Ability to deploy pheromones and .or Judas fish in ponds established	2017
7. 3a. Means to optimally apply food or food odors to wild fish in the open rivers established	2018
8. 3b**.** Ability to deploy Judas in open rivers established	2018
9. 3a and 3b. Judas fish and behavioral attractant developed and used in carp control	2019

Sub-Project Status as of *February 10, 2014*

No progress to report as initial work is being funded with 2012 ENRTF funds through June 2015

Sub-Project Status as of *August 31, 2014*

Sub-Project Status as of *February 28, 2015*

Sub-Project Status as of *August 31, 2015*

Sub-Project Status as of *February 29, 2016*

Sub-Project Status as of *August 31, 2016*

Sub-Project Status as of *February 28, 2017*

Sub-Project Status as of *August 31, 2017*

Sub-Project Status as of *February 28, 2018*

Sub-Project Status as of *August 31, 2018*

Sub-Project Status as of *February 28, 2019*

Final Report Summary:

SUB-PROJECT 4: Reducing and controlling AIS: Developing effective bio-control techniques to control common and/or Asian carp.
Project Manager: TBD
Description: Initial work will extend and perfect ongoing research into integrated pest management (IPM) strategies previously funded by watershed districts and ML 2008 ENRTF funded efforts to control invasive common carp in Minnesota lakes by managing native fish that prey on carp eggs, larvae. This sub-project is slated to start in FY2015 and co-ordinate closely with an extension specialist (Sub-Project 8) who will be hired slightly in advance of this position. We propose to develop, test, and apply these concepts in wetlands where carp damage is extremely detrimental to waterfowl populations and which we presently are not able to control. Simultaneously, we will determine if Asian carp eggs, larvae, and/or young are also consumed by any native fishes as a first step in determining how bio-control might eventually be implemented. This field work will likely be conducted in Missouri where Asian carp are abundant and chances of success high. Findings will then be tested in ponds to identify the species and densities of native fish needed in Minnesota. Results will be used to create explicit protocols to control silver and common carp and this will be shared with the Extension specialist

(Sub-project 8) to be implemented. This work will be spearheaded by a new assistant research professor (1.0 FTE per year for 4.75 years) who will also collaborate with the fish aggregation (Sub-Project 3) and modeling (Sub-Project 5) teams. The research assistant professor will have a graduate student for the entire project (0.5 FTE for 4.75 years). In addition, the Center will provide access to a shared truck and boat. Specific details (which may vary depending on recent developments with Asian carp research and their invasion into Minnesota waters) will be determined by a proposal that will be written, reviewed and improved by a Center-led peer-review process. This description and the outcomes below will be updated following approval of a more detailed subproject work plan and budget.

Summary Budget Information for Sub-project 4:

ENRTF Budget*: ~~$990,584~~ 920,521
Amount Spent: $0
Balance: $ ~~990,584~~ 920,521

This value is projected; it may be adjusted during the course of the project pending progress and input from peer-review of this particular sub-project.

Outcome (tentative, pending peer-review by Center)	Completion date
1. Age structure of carp in wetlands and insights into recruitment established	2015
2. Recruitment dynamics of common carp in waterfowl wetlands established	2016
3. IPM scheme for carp in wetlands established	2017
4. Native fish species that might prey on Asian carp eggs and young identified-project evaluation	2017
5. The species and density of native fish needed to control either silver or common carp in ponds established	2018
6. IPM scheme for Asian carp in riverine flood plains established (if appropriate)	2019

Sub-Project Status as of *February 10, 2014*

No progress to report as project is not anticipated to start until approximately March 2015

Sub-Project Status as of *August 31, 2014*

Sub-Project Status as of *February 28, 2015*

Sub-Project Status as of *August 31, 2015*

Sub-Project Status as of *February 29, 2016*

Sub-Project Status as of *August 31, 2016*

Sub-Project Status as of *February 28, 2017*

Sub-Project Status as of *August 31, 2017*

Sub-Project Status as of *February 28, 2018*

Sub-Project Status as of *August 31, 2018*

Sub-Project Status as of *February 28, 2019*

Final Report Summary:

SUB-PROJECT 5: Reducing and controlling AIS: Developing and evaluating new techniques to selectively control invasive plants.

Project Manager: Ray Newman

Description: University of Minnesota professor and invasive plant expert, Dr. Ray Newman (0.08 FTE for 5.5 years), will work with the DNR to evaluate extant and new strategies to control submersed invasive plants selectively in ways that will also restore native plant communities. This work can start as soon as peer-review is complete (2013) because Dr. Newman is on staff. A full time postdoctoral fellow (1.0 FTE for 5.5 years) or equivalent will be hired to assist with this sub-project along with part-time undergraduate student(s) (0.25 FTE for 5 years). The Center truck and boat will also be available. Strategies proposed for invasive plant control will include use of native herbivorous insects, integrated management with selective chemical or mechanical controls, and techniques to enhance native plant communities. Working with the DNR, at least one chemical treatment to control a species of invasive plant will also be examined and ecological effects will be evaluated. The focus will be a large-scale, multi-lake manipulation to determine if altering fish community structure can be accomplished to enhance the biological control of Eurasian water milfoil with milfoil weevils, a species of native herbivorous insect. Previous research funded by ENRTF has shown weevils can control water milfoil if sunfish do not consume the weevils. Our bio-control experiment will determine if we can reduce sunfish populations and enhance herbivore populations to control milfoil. The sub-project will proceed in several steps, with tentative outcomes listed below. Specific details will be determined by Center-led peer-review process. This description and the outcomes below will be updated following approval of a more detailed subproject work plan and budget.

Summary Budget Information for Sub-Project 5:

ENRTF Budget*: $643,394 ~~650,280~~
Amount Spent: $0
Balance: $643,394 ~~650,280~~

This value is projected; it may be adjusted during the course of the project pending progress and input from peer-review of this particular sub-project.

Outcome (tentative, pending peer-review by Center)	Completion Date
1. Consult with DNR and lake stakeholders and choose potential study lakes	2014
2. Biological control study lakes selected and monitoring initiated	2015
3. At least one new chemical weed-control strategy identified (with DNR)	2016
4. Pre-manipulation assessment completed and sunfish manipulation started	2017
5. Assessment of fish, herbivore, and plant response to manipulations complete	2018
6. Recommendations on approaches for effective control of aquatic weeds made	2019

Sub-Project Status as of *February 10, 2014*

A project proposal has been written, peer reviewed, and recommended for funding by the Scientific Director. After Center Administrative Review committee approval is granted, a subproject work plan and budget will be submitted to LCCMR.

Sub-Project Status as of *August 31,, 2014*

Sub-Project Status as of *February 28, 2015*

Sub-Project Status as of *August 31, 2015*

Sub-Project Status as of *February 29, 2016*

Sub-Project Status as of *August 31, 2016*

Sub-Project Status as of *February 28, 2017*

Sub-Project Status as of *August 31, 2017*

Sub-Project Status as of *February 28, 2018*

Sub-Project Status as of *August 31, 2018*

Sub-Project Status as of *February 28, 2019*

Final Report Summary:

SUB-PROJECT 6: Reducing and controlling AIS: Simulation modeling to identify and evaluate AIS control methods.

Project Manager: Paul Venturelli

Description: Simulation models are an efficient and low-cost means of developing and evaluating control scenarios for AIS and predicting outcomes that are prohibitively expensive and risky to determine in the field. We will use models to identify potential control measures, predict the impact of a given control measure (or a combination thereof), and determine how often and how much control we will need for it to be effective. Initial work will be done using common carp because data for these are in hand and this species is extremely damaging. Likely, we will then extrapolate to zebra mussels before tackling threats posed by silver carp (the most damaging species of Asian carp). This activity will be led by Dr. Paul Venturelli (modeling expert [0.08 FTE for 4 years]) who will have funds for a graduate student for 4 years (0.5 FTE per year). This work can start as soon as peer-review is complete (2015) because Dr. Venturelli is on staff. Specific details of this sub-project will be determined by the Center-led peer-review. This description and the outcomes below will be updated following approval of a more detailed subproject work plan and budget.

Summary Budget Information for Sub-Project 6:

ENRTF Budget*: **$~~352,790~~ 248,261**

Amount Spent: **$0**

Balance: **$~~352,790~~ 248,261**

This value is projected; it may be adjusted during the course of the project pending progress and input from peer-review of this particular sub-project.

Outcome (tentative, pending peer-review by Center)	Completion date
1. Model developed for common carp management in MN lakes	2014
2. Population viability model to determine impact or degree of control required to ensure probability of eradicating common carp and zebra mussel from lakes completed	2015
3. Evaluation of induced nest failure as a mechanism for controlling invasive bass Risk assessment models of Asian carp management options completed	2016
4. Age-structured matrix population of silver to estimate rates of population increase and identify facets of life history that can be controlled in MN completed	2017
5. Age-structured matrix population of bighead carp to estimate rates of population increase and identify facets of life history that can be controlled in MN completed	2018
6. A user-friendly point-and-click model to control common carp in lakes and	2019

wetlands completed	

Sub-Project Status as of *February 10, 2014*

This sub-project has been delayed to more appropriately sequence it after additional empirical data has been gathered by the Center. It is anticipated that this project will move ahead with a project proposal and start after July 1, 2015.

Sub-Project Status as of *August 31, 2014*

Sub-Project Status as of *February 28, 2015*

Sub-Project Status as of *August 31, 2015*

Sub-Project Status as of *February 29, 2016*

Sub-Project Status as of *August 31, 2016*

Sub-Project Status as of *February 28, 2017*

Sub-Project Status as of *August 31, 2017*

Sub-Project Status as of *February 28, 2018*

Sub-Project Status as of *August 31, 2018*

Sub-Project Status as of *February 28, 2019*

Final Report Summary:

SUB-PROJECT 7. Developing eradication tools: Exploring whether native pathogens can be used to control AIS
Project Manager: Nick Phelps
Description: Although ambitious, eradication is our ultimate goal. Only three techniques presently appear capable of achieving it: 1) introduction of exotic predators, 2) introduction or promotion of species-specific pathogens, 3) genetic-engineering and release of AIS with lethal genes. We presently believe the second option has the most promise in Minnesota and also poses the least risk. However, using infectious agents to target specific species is still a high-risk, high-reward approach that must be evaluated carefully. Viruses threaten native populations as well and have not been well characterized. This activity will initially be led by a part-time assistant professor (Dr. Nick Phelps [0.08 FTE for 5 years]) who will initially focus on the first step of this evaluation: identifying native pathogens of both native fishes and the carps. Focus is placed on two native virus *(Picornavirus*, *Orthomyzovirus)*. A postdoctoral fellow (1.0 FTE per year for 5.5 years), or equivalent, will provide assistance. This work can start as soon as peer-review is complete (2013) because Dr. Phelps is on staff. Because there has been little research on infectious agents that control, or even might control fishes in Minnesota, we must first perform a survey to identify endogenous infectious agents of native fish and carps. Specific details of this sub-project will be determined by Center-led peer-review. If successful, new funding would be requested from the LCCMR and other agencies to develop the technology to apply identified pathogens to AIS control (i.e. we do not ask for that here). This description and the outcomes below will be updated following approval of a more detailed subproject work plan and budget.

Summary Budget Information for Sub-Project 7: **ENRTF Budget*: $~~806,535~~ 780,434**
Amount Spent: $0
Balance: $~~806,535~~ 780,434

This value is projected; it may be adjusted during the course of the project pending progress and input from peer-review of this particular sub-project.

Outcome (Tentative, pending peer-review by Center)	Completion Date
1. Initial characterization of novel *Picornavirus* and a diagnostic assay for it	2013
2. Complete characterization of novel *Picornavirus*, its pathogenesis to a range of fishes including invasive carps	2014
3. Characterization of novel *Orthomyxovirus, its* pathogenesis, a diagnostic assay for it	2015
4. Characterization of another virus	2016
5. If one of the aforementioned virus has potential for bio-control, test it in lab	2017
6. Field test in experimental facility	2018
7. Proposal to develop application in field	2019

Sub-Project Status as of *February 10, 2014*
A project proposal has been written, peer reviewed, and recommended for funding by the Scientific Director. After Center Administrative Review committee approval is granted, a subproject work plan and budget will be submitted to LCCMR.

Sub-Project Status as of *August 31, 2014*

Sub-Project Status as of *February 28, 2015*

Sub-Project Status as of *August 31, 2015*

Sub-Project Status as of *February 29, 2016*

Sub-Project Status as of *August 31, 2016*

Sub-Project Status as of *February 28, 2017*

Sub-Project Status as of *August 31, 2017*

Sub-Project Status as of *February 28, 2018*

Sub-Project Status as of *August 31, 2018*

Sub-Project Status as of *February 28, 2019*

Final Report Summary:

SUB-PROJECT 8. Implementing findings: An applied ecologist position and program.
Project Manager: TBD
Description: A new assistant research professor (1.0 FTE per year for 5.5 years) will link the scientific advances being made on AIS to the application of knowledge and practices of AIS control throughout Minnesota by working directly with those struggling with AIS control. A likely focus will be invasive plants and carp in shallow

lakes in wetlands because these are highly impacted and we have already developed tools; however, this will be to some extent determined by who applies and is hired for this position. Specifically, this individual will develop and implement engagement opportunities that will involve state (DNR) and local agencies and organizations (ex. watershed districts). They will work directly with Center scientists (Sub-projects 3, 4,5 and 6 in particular) to implement new monitoring and control strategies for specific AIS. While conducting this applied ecological research they will seek to educate and inform groups that are responsible for AIS control while interacting with the University's Extension Service and a new educator (Sub-Project 10) and DNR to disseminate information to the general public. A graduate student (0.5 FTE) will be available to assist this position as will the center truck and boat. It will start in early 2014. The overall goal is to create an applied research and application program that results in a change in condition (management or elimination of AIS). The project will proceed in several steps with tentative outcomes listed below. Specific details will be determined by Center-led peer-review process. This description and the outcomes below will be updated following approval of a more detailed subproject work plan and budget.

Summary Budget Information for Sub-Project 8:

ENRTF Budget*: **~~$1,037,134~~ 987,253**
Amount Spent: **$0**
Balance: **~~$1,037,134~~ 987,253**

This value is projected; it may be adjusted during the course of the project pending progress and input from peer-review of this particular sub-project.

Outcome (Tentative, pending peer-review by Center)	Completion Date
1. Identification of project and partners	2014
2. Application of AIS protocols developed by the Center at a test site #1	2015
3. Application of perfected AIS protocols developed by the Center at test site #2	2016
4. Progress assessed; IPM implemented	2017
5. Application of a second set of AIS protocols developed by the Center to another set of AIS problems	2018
6. Program literature prepared/ distributed, workshops conducted	2019

Sub-Project Status as of *February 10, 2014*

No progress to report at this time as the project is not anticipated to start until approximately January 2015

Sub-Project Status as of *August 31,, 2014*

Sub-Project Status as of *February 28, 2015*

Sub-Project Status as of *August 31, 2015*

Sub-Project Status as of *February 29, 2016*

Sub-Project Status as of *August 31, 2016*

Sub-Project Status as of *February 28, 2017*

Sub-Project Status as of *August 31, 2017*

Sub-Project Status as of *February 28, 2018*

Sub-Project Status as of *August 31, 2018*

Sub-Project Status as of *February 28, 2019*

Final Report Summary:

SUB-PROJECT 9. Implementing Findings: Applying new methods to control zebra mussels
Project Manager: Michael McCartney
Description: Techniques are urgently needed to control zebra mussels. Although a research assistant professor specializing in the zebra mussel biology and control will have already been hired by MAISRC using Clean Water Funds in 2013-2014, this startup funding will run out in 2017. Here, we propose to extend this extremely important work another two years so that it can be tested and implemented. The specific focus of this position will likely be a specific ecological, genetic and/or physiological mechanism that might be targeted for use in bio-control. Although it is not yet clear what this research focus will be, this individual (1.0 FTE for 3 years) will need a research associate (1.0 FTE for 3 years) and funds for in-state travel and collaboration with the DNR and other groups. Full details will be established through a proposal and the Center peer-review process. This description and the outcomes below will be updated following approval of a more detailed subproject work plan and budget.

Summary Budget Information for Sub-Project 9:

ENRTF Budget*: $712,438 ~~621,600~~
Amount Spent: $0
Balance: $712,438 ~~621,600~~

This value is projected; it may be adjusted during the course of the project pending progress and input from peer-review of this particular sub-project.

Outcome (Tentative, pending peer-review by Center)	Completion Date
1. Application of a control technique in experimental ponds	2017
2. Application of control technique in the field	2018
3. Application of control technique in the field	2019

Sub-Project Status as of *February 10, 2014*

Project is currently being peer reviewed and will be funded with Clean Water Funds through June 2016.

Sub-Project Status as of *August 31, 2014*

Sub-Project Status as of *February 28, 2015*

Sub-Project Status as of *August 31, 2015*

Sub-Project Status as of *February 29, 2016*

Sub-Project Status as of *August 31, 2016*

Sub-Project Status as of *February 28, 2017*

Sub-Project Status as of *August 31, 2017*

Sub-Project Status as of *February 28, 2018*

Sub-Project Status as of *August 31, 2018*

Sub-Project Status as of *February 28, 2019*

Final Report Summary:

SUB-PROJECT 10. Implementing Findings: An educator-outreach position.
Project Manager: TBD
Description: A new Educator (1.0 FTE for 2 years, 0.75 FTE for 3 years) will develop, implement, and communicate engagement opportunities and educational programs that will target state and local agencies and organizations (ex. watershed districts). The overall goal is to create a state-of-the-art program that results in a change in condition (management or elimination of AIS) due to a change in behavior and expectation through increased understanding of AIS environmental impacts and threats. This individual would work very closely with the DNR, Sea Grant, the University Extension Service, as well as our applied ecologist (Sub-Project 8) and other MAISRC scientists as well was MAISRC administration to convey and communicate the most up-to-date information out to interested citizens and semi-governmental groups. This sub-project will start as soon as practical in 2014 and this description and the outcomes below will be updated accordingly.

Summary Budget Information for Sub-Project 10:

ENRTF Budget*: $~~106,503~~ 434,378
Amount Spent: $0
Balance: $~~106,503~~ 434,378

This value is projected; it may be adjusted during the course of the project pending progress and input from peer-review of this particular sub-project.

Outcome (Tentative, pending peer-review by Center)	Completion Date
1. Ongoing startup education efforts expanded and consolidated, annual state-wide workshops on zebra mussel, invasive plants, carp other AIS	2014
2. Workshops on AIS; educational materials	2015
3. Workshops on AIS; educational materials	2016
4. Workshops on AIS; educational materials developed and distributed	2017
5. Workshops on AIS; educational materials	2018
6. Workshops on AIS; educational materials	2019

Sub-Project Status as of *February 10, 2014*
No progress to report as project is not anticipated to start until approximately March, 2015

Sub-Project Status as of *August 31, 2014*

Sub-Project Status as of *February 28, 2015*

Sub-Project Status as of *August 31, 2015*

Sub-Project Status as of *February 29, 2016*

Sub-Project Status as of *August 31, 2016*

Sub-Project Status as of *February 28, 2017*

Sub-Project Status as of *August 31, 2017*

Sub-Project Status as of *February 28, 2018*

Sub-Project Status as of *August 31, 2018*

Sub-Project Status as of *February 28, 2019*

Final Report Summary:

SUB-PROJECT 11: Reducing and controlling AIS: Risk analysis to identify AIS control priorities and methods.
Project Manager: Dave Andow
Description: Simulation models are an efficient and low-cost means of developing and evaluating control Working with the DNR, we will also use risk analysis to prioritize management actions based on cost/benefit trade-offs. This activity will be led by Professor David Andow (head of the University of Minnesota's NSF risk assessment training program [0.8 FTE for3 years]) who will have a postdoctoral fellow (1.0 FTE for 3 years), or equivalent. He is prepared to start immediately and expected to work with the DNR on evaluating the relative risks of Asian carp invading different Minnesota rivers so that systems can be selected for possible barrier construction. Specific details and costs of this project will be determined by Center-led peer-review. This description and the outcomes below will be updated following approval of a more detailed subproject work plan and budget.

Summary Budget Information for Sub-Project 11:

ENRTF Budget*: ~~$171,932~~ 233,313
Amount Spent: $0
Balance: ~~$171,932~~ 233,313

This value is projected; it may be adjusted during the course of the project pending progress and input from peer-review of this particular sub-project.

Outcome (tentative, pending peer-review by Center)	Completion date
1. Risk assessment models of Silver carp management options completed	2014
2. Risk assessment models of Bighead carp management options completed	2015

Sub-Project Status as of *February 10, 2014*
A project proposal has been written, peer reviewed, and recommended for funding by the Scientific Director. After Center Administrative Review committee approval is granted, a subproject work plan and budget will be submitted to LCCMR.

Sub-Project Status as of *August 31, 2014*

Sub-Project Status as of *February 28, 2015*

Sub-Project Status as of *August 31, 2015*

Sub-Project Status as of *February 29, 2016*

Final Report Summary:

V. DISSEMINATION:

Description: Findings will be disseminated by annual public workshops organized by the Center, the Center's web site, collaborative meetings with our advisory boards, peer-reviewed publications and student theses.

Sub-Project Status as of *February 28, 2015*

Sub-Project Status as of *August 31, 2015*

Sub-Project Status as of *February 29, 2016*

Sub-Project Status as of *August 31, 2016*

Sub-Project Status as of *February 28, 2017*

Sub-Project Status as of *August 31, 2017*

Sub-Project Status as of *February 28, 2018*

Sub-Project Status as of *August 31, 2018*

Sub-Project Status as of *February 28, 2019*

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget:

1. SUB-PROJECT #1

Budget Category	$ Amount	Explanation
Personnel:	$809,588	Director – 2FTE Associate Director – 5 FTE Admin & Communications Assistant- 4.125 Aquatic technician- 5 FTE Lab Manager- 5 FTE Undergraduate Assistant : 1.25 FTE
Professional /Technical Services and Contracts	$35,240	Services- office & gen oper. (printing/duplication, mailing, etc.); Services- lab & medical (data storage, sequencing, biochemistry, microscopy); Professional Services & contracts- (fees or honoraria for guest lecturer and speakers, etc); Repairs- lab & field (vehicle, EFL holding facility, or

		other shared equipment)
Equipment/Tools/Supplies:	$34,525	Supplies- office & gen oper. (paper, computer, software, printer, folders, brochures, displays); Supplies- lab & field (piping, glue, etc for facilities, gas); Equipment- non capital lab & field (primarily equipment for central holding facilities if needed for repair or replacement, etc)
Capital Equipment over $5,000:	$16,000	Cap expenditures over $5,000: (new well pump if needed- $16,000)
Other:	$1,000	Telecommunications (voicemail service for MAISRC researchers and staff)
Travel Expenses:	$17,540	Travel - MN (mileage, meetings, conferences, etc. Field tech mileage will be paid from specific subprojects); Travel - Domestic (mileage, conferences, mtgs for Center coordination)
Budget Reserves (pending progress)	$1,393,867	SUB-PROJECT #1
TOTAL ENRTF BUDGET:	$2,307,760	SUB-PROJECT #1

1. **SUB-PROJECTS #1- #11 (COMBINED)**

Budget Category	$ Amount	Explanation
Personnel:	$809,588	SUB-PROJECT #1: Director – 2FTE Associate Director – 5 FTE Admin & Communications Assistant- 4.125 Aquatic technician- 5 FTE Lab Manager- 5 FTE Undergraduate Assistant : 1.25 FTE
Professional /Technical Services and Contracts	$35,240	SUB-PROJECT #1: Services- office & gen oper. (printing/duplication, mailing, etc.); Services- lab & medical (data storage, sequencing, biochemistry, microscopy); Professional Services & contracts- (fees or honoraria for guest lecturer and speakers, etc); Repairs- lab & field (vehicle, EFL holding facility, or other shared equipment)
Equipment/Tools/Supplies:	$34,525	SUB-PROJECT #1: Supplies- office & gen oper. (paper, computer, software, printer, folders, brochures, displays); Supplies- lab & field (piping, glue, etc for facilities, gas); Equipment- non capital lab & field (primarily equipment for central holding facilities if

		needed for repair or replacement, etc)
Capital Equipment over $5,000:	$16,000	SUB-PROJECT #1: Cap expenditures over $5,000: (new well pump if needed- $16,000)
Other:	$1,000	SUB-PROJECT #1: Telecommunications (voicemail service for MAISRC researchers and staff)
Travel Expenses:	$17,540	SUB-PROJECT #1: Travel - MN (mileage, meetings, conferences, etc. Field tech mileage will be paid from specific subprojects); Travel - Domestic (mileage, conferences, mtgs for Center coordination)
Budget Reserves (pending progress and peer review)	$7,786,107	SUB-PROJECTS #1- #11
TOTAL ENRTF BUDGET	$8,700,000	SUB-PROJECTS #1- #11

Explanation of Use of Classified Staff: *n.a.*

Explanation of Capital Expenditures Greater Than $5,000:
Sub-Project 1: A new well pump for the centralized holding and research facility, if current pump fails: $16,000

Number of Full-time Equivalent (FTE) funded with this ENRTF appropriation:

SUB-PROJECT #1: 22.875
SUB-PROJECTS #1- #11(estimate): 85.65

Number of Full-time Equivalent (FTE) estimated to be funded through contracts with this ENRTF appropriation:
0

B. Other Funds (related projects that can synergize this one):

Source of Funds	$ Amount Proposed	$ Amount Spent (1/31/14)	Use of Other Funds
Non-state			
National Science Foundation	$234,000	$84,058	Radio-tags for Judas fish
USGS	$97,646	$93,000	Preliminary work with Asian carp
Riley Purgatory Bluff Watershed District	$2,728,771	$1,776,934	Preliminary work on Judas carp
State			
ENRTF –M.L. 2012, chp 264, art4. Sec 3- Aquatic Invasive species (AIS) Cooperative research center	$2,000,000	$604,410	Startup funds for Center (eDNA work, facility repair, Judas carp study, administrative costs)
Clean Water Legacy Funds	$1,800,000	$ $311,256	Startup for Center (Zebra mussel position, facility repair, administrative costs)
TOTAL OTHER FUNDS:	$4,8649,817	$$2,558,402	

VII. PROJECT STRATEGY:

A. Project Partners:
DNR (a full partner and co-lead on CAB with whom the University will have a memoradum of understanding), USGS (LaCrosse WI; and Columbia, MI; former with a memorandum of understanding), Riley Purgatory Bluff Watershed District (Chanhassen, MN), Ramsey Washington Metro Watershed District (Maplewood, MN), Minnehaha Watershed District (Minnetonka, MN)

B. Project Impact and Long-term Strategy: This project will establish a new national center of excellence for AIS in Minnesota that will develop and disseminate new infornation and useful techniques for their control to public agencies and the private sector.

C. Spending History:

Funding Source	**M.L. 2005 or FY 2006-07**	**M.L. 2007 or FY 2008**	**M.L. 2008 or FY 2009**	**M.L. 2009 or FY 2010**	**M.L. 2010 or FY 2011**
ENRTF – M.L. 2008 Chp 367, Sec 2, Subd. 04b - Accelerating plans for integrated control of common carp		550,000			
ENRTF –M.,L. 2005, First Special Session, Chp.1, Art 2, Sec 11, Subd. 05g – Integrated and pheromonal control of the common carp	550,000				

VIII. ACQUISITION/RESTORATION LIST: n.a.

IX. MAP(S): Entire state of Minnesota

X. RESEARCH ADDENDUM: *not applicable (peer review of all activities will completed by the Center)*

XI. REPORTING REQUIREMENTS: Periodic work plan status update reports will be submitted not later than February 28 and August 31 each from February 10, 2014 through February 28, 2019. A final report and associated products will be submitted between June 30 and August 15, 2019 as requested by the LCCMR.

Environment and Natural Resources Trust Fund

M.L. 2013 Sub-Project Budget of M.L. 2013-06a: Aquatic Invasive Species Research Center

Project Title: Aquatic Invasive Species Research Center Sub-Project 1: Coordinating, Synergizing, and Promoting Expertise: establishing an Administrative Structure

Legal Citation: M.L. 2013, Chp. 52, Sec. 2, Subd. 06a

Project Manager: *Susan Galatowitsch*

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

Sub-Project Budget: $ *2,307,761*

Sub-Project Phase 1 Length and Completion Date: *3 years, June 30, 2016*

Project Length and Completion Date: 6 Years, June 30, 2019

Date of Report: *February 10, 2014*

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	***Activity 1: Coordinating, Synergizing, and Promoting Expertise: establishing an Administrative Structure (Phase 1)***			***Activity 2: Fill in your activity title here.***			***Activity 3: Fill in your activity title here.***						
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 REVISED BUDGET**	**TOTAL SPENT**	**TOTAL BALANCE**
Personnel (Wages and Benefits) - Total	**$809,588**		**$809,588**			**$0**			**$0**	**$809,588**	**$809,588**	**$0**	**$809,588**
Associate Director Professional & Admin: $83,000 Salary (66.4%Salary, 33.6% benefits, 1 FTE)													
Scientific Director Professional & Admin: $79,000 (66.4%Salary, 33.6% benefits, 0.5 FTE)													
Name- Post Doctoral Fellow: $Salary; (79.25% Salary, 20.75% benefits) 1.0 FTE													
Undergraduate Student: $6000 (93% salary, 7% benefits) 0.25 FTE													
Admin and Communications Assistant: $28,000 (63.2% salary, 36.8% benefits) 0.75 FTE													
Field Technician (Civil Service): $42,000; (63.2% salary, 36.8% benefits) 1.0 FTE													
Lab Manager (Civil Service): $49,000; (63.2% salary, 36.8% benefits) 1.0 FTE													
Professional/Technical Services and Contracts - Total	**$35,240**	**$0**	**$35,240**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$35,240**	**$35,240**	**$0**	**$35,240**
Services- office & gen oper. (printing/duplication, mailing, etc.)	$9,000		$9,000			$0			$0	$9,000	$9,000	$0	$9,000
Services- lab & medical (data storage, sequencing, biochemistry, microscopy)	$1,000		$1,000			$0			$0	$1,000	$1,000	$0	$1,000
Professional Services & contracts- (fees or honoraria for guest lecturer and speakers, etc)	$2,000		$2,000			$0			$0	$2,000	$2,000	$0	$2,000
Repairs- lab & field (vehicle, EFL holding facility, or other shared equipment)	$23,240		$23,240			$0			$0	$23,240	$23,240	$0	$23,240
Equipment/Tools/Supplies - Total	**$34,525**	**$0**	**$34,525**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$34,525**	**$34,525**	**$0**	**$34,525**
Supplies- office & gen oper. (paper, computer, software, printer, folders, brochures, displays)	$10,525		$10,525			$0			$0	$10,525	$10,525	$0	$10,525
Supplies- lab & field (piping, glue, etc for facilties, gas)	$20,000		$20,000			$0			$0	$20,000	$20,000	$0	$20,000
Equipment- non capital lab & field (primarily equipment for central holding facilities if needed for repair or replacement, etc)	$4,000		$4,000			$0			$0	$4,000	$4,000	$0	$4,000
Capital Expenditures Over $5,000 - Total	**$16,000**	**$0**	**$16,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$16,000**	**$16,000**	**$0**	**$16,000**
Cap expenditures over $5,000: (new well pump if needed- $16,000)	$16,000		$16,000			$0			$0	$16,000	$16,000	$0	$16,000
Travel - Total	**$17,540**	**$0**	**$17,540**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$17,540**	**$17,540**	**$0**	**$17,540**
Travel - MN (mileage, meetings, conferences, etc. Field tech mileage will be paid from specific subprojects)	$9,540		$9,540			$0			$0	$9,540	$9,540	$0	$9,540
Travel - Domestic (mileage, conferences, mtgs for Center coordination)	$8,000		$8,000			$0			$0	$8,000	$8,000	$0	$8,000
Other - Total	**$1,000**	**$0**	**$1,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$1,000**	**$1,000**	**$0**	**$1,000**
Telecommunications (voicemail service for MAISRC researchers and staff)	$1,000		$1,000			$0			$0	$1,000	$1,000	$0	$1,000
Budget Reserve Pending Progress and Peer Review - Total	**$0**	**$0**	**$0**	**$1,393,867**	**$0**	**$1,393,867**	**$0**	**$0**	**$0**	**$1,393,867**	**$1,393,867**	**$0**	**$1,393,867**
Funds for future phases to be allocated to specific budget categories at a future date pending sub-project progress			$0	$1,393,867		$1,393,867			$0	$1,393,867	$1,393,867	$0	$1,393,867
COLUMN TOTAL	**$913,893**	**$0**	**$913,893**	**$1,393,867**	**$0**	**$1,393,867**	**$0**	**$0**	**$0**	**$2,307,760**	**$2,307,760**	**$0**	**$2,307,760**

Environment and Natural Resources Trust Fund

M.L. 2013 Project Budget - Overall Budget of Aquatic Invasive Species Research Center

Project Title: Aquatic Invasive Species Research Center
Legal Citation: M.L. 2013, Chp. 52, Sec. 2, Subd. 06a
Project Manager: *Susan Galatowitsch*
Organization: University of Minnesota
M.L. 2014 ENRTF Appropriation: $8,700,000
Project Length and Completion Date: 6 Years, June 30, 2019

Date of Report: February 10, 2014

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	SUB-PROJECT 1 - Coordinating, synergizing and promoting expertise: Establishing an administrative structure			SUB-PROJECT 2 - Delaying the spread of AIS: Monitoring the abundance and distribution of AIS using new molecular tools so techniques to delay their spread can be implemented			SUB-PROJECT 3 - Reducing and controlling AIS: Developing effective tools to attract and locate aggregations of invasive carp			SUB-PROJECT 4 - Reducing and controlling AIS: Developing effective bio-control techniques to control common and/or Asian carp		
BUDGET ITEM	**Sub-Project 1 Budget**	**Amount Spent**	**Sub-Project 1 Balance**	**Sub-Project 2 Budget**	**Amount Spent**	**Sub-Project 2 Balance**	**Sub-Project 3 Budget**	**Amount Spent**	**Sub-Project 3 Balance**	**Sub-Project 4 Budget**	**Amount Spent**	**Sub-Project 4 Balance**
Personnel (Wages and Benefits) - Overall Total	$809,588		$809,588			$0			$0			$0
Professional/Technical Services and Contracts - Overall Total	$35,240		$35,240			$0			$0			$0
Equipment/Tools/Supplies - Overall Total	$34,525		$34,525			$0			$0			$0
Capital Expenditures Over $5,000 - Overall Total	$16,000		$16,000			$0			$0			$0
Travel - Overall Total	$17,540		$17,540			$0			$0			$0
Other - Overall Total	$1,000		$1,000			$0			$0			$0
Budget Reserve Pending Progress and Peer Review - Overall Total	$1,393,867		$1,393,867	$729,512		$729,512	$702,736		$702,736	$920,521		$920,521
COLUMN TOTAL	**$2,307,760**	**$0**	**$2,307,760**	**$729,512**	**$0**	**$729,512**	**$702,736**	**$0**	**$702,736**	**$920,521**	**$0**	**$920,521**

Environment and Natural Resources Trust Fund

M.L. 2013 Project Budget - Overall Budget of Aquatic Invasive Species Research Center

Project Title: Aquatic Invasive Species Research Center
Legal Citation: M.L. 2013, Chp. 52, Sec. 2, Subd. 06a
Project Manager: *Susan Galatowitsch*
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M.L. 2014 ENRTF Appropriation: $8,700,000
Project Length and Completion Date: 6 Years, June 30, 2019

Date of Report: February 10, 2014

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	SUB-PROJECT 5 - Reducing and controlling AIS: Developing and evaluating new techniques to selectively control invasive plants			SUB-PROJECT 6 - educing and controlling AIS: Simulation modeling to identify and evaluate AIS control methods			SUB-PROJECT 7 - Developing eradication tools: Exploring whether native pathogens can be used to control AIS			SUB-PROJECT 8 - Implementing findings: An applied ecologist - extension specialist position and program		
BUDGET ITEM	**Sub-Project 5 Budget**	**Amount Spent**	**Sub-Project 5 Balance**	**Sub-Project 6 Budget**	**Amount Spent**	**Sub-Project 6 Balance**	**Sub-Project 7 Budget**	**Amount Spent**	**Sub-Project 7 Balance**	**Sub-Project 8 Budget**	**Amount Spent**	**Sub-Project 8 Balance**
Personnel (Wages and Benefits) - Overall Total	$183,107		$183,107			$0	$131,494		$131,494			$0
Professional/Technical Services and Contracts - Overall Total	$4,863		$4,863			$0	$55,230		$55,230			$0
Equipment/Tools/Supplies - Overall Total	$17,800		$17,800			$0	$92,500		$92,500			$0
Capital Expenditures Over $5,000 - Overall Total	$0		$0			$0	$40,000		$40,000			$0
Travel - Overall Total	$9,225		$9,225			$0	$16,000		$16,000			$0
Other - Overall Total	$0		$0			$0	$0		$0			$0
Budget Reserve Pending Progress and Peer Review - Overall Total	$428,399		$428,399	$248,261		$248,261	$445,210		$445,210	$987,253		$987,253
COLUMN TOTAL	**$643,394**	**$0**	**$643,394**	**$248,261**	**$0**	**$248,261**	**$780,434**	**$0**	**$780,434**	**$987,253**	**$0**	**$987,253**

Environment and Natural Resources Trust Fund

M.L. 2013 Project Budget - Overall Budget of Aquatic Invasive Species Research Center

Project Title: Aquatic Invasive Species Research Center
Legal Citation: M.L. 2013, Chp. 52, Sec. 2, Subd. 06a
Project Manager: *Susan Galatowitsch*
Organization: University of Minnesota
M.L. 2014 ENRTF Appropriation: $8,700,000
Project Length and Completion Date: 6 Years, June 30, 2019

Date of Report: February 10, 2014

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	SUB-PROJECT 9 - Implementing Findings: Applying new methods to control zebra mussels			SUB-PROJECT 10 - Implementing Findings: An educator position			SUB-PROJECT 11 - Reducing and controlling AIS: Risk analysis to identify AIS control priorities and methods					
BUDGET ITEM	**Sub-Project 9 Budget**	**Amount Spent**	**Sub-Project 9 Balance**	**Sub-Project 10 Budget**	**Amount Spent**	**Sub-Project 10 Balance**	**Sub-Project 11 Budget**	**Amount Spent**	**Sub-Project 11 Balance**	**TOTAL BUDGET**	**TOTAL SPENT**	**TOTAL BALANCE**
Personnel (Wages and Benefits) - Overall Total			$0			$0	$85,485		$85,485	$1,209,674	$0	$1,209,674
Professional/Technical Services and Contracts - Overall Total			$0			$0	$2,000		$2,000	$97,333	$0	$97,333
Equipment/Tools/Supplies - Overall Total			$0			$0	$5,700		$5,700	$150,525	$0	$150,525
Capital Expenditures Over $5,000 - Overall Total			$0			$0	$0		$0	$56,000	$0	$56,000
Travel - Overall Total			$0			$0	$17,000		$17,000	$59,765	$0	$59,765
Other - Overall Total			$0			$0	$0		$0	$1,000	$0	$1,000
Budget Reserve Pending Progress and Peer Review - Overall Total	$712,438		$712,438	$434,378		$434,378	$123,128		$123,128	$7,125,703	$0	$7,125,703
COLUMN TOTAL	**$712,438**	**$0**	**$712,438**	**$434,378**	**$0**	**$434,378**	**$233,313**	**$0**	**$233,313**	**$8,700,000**	**$0**	**$8,700,000**