



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2015 Work Plan

Date of Report: June 24, 2015

Date of Next Status Update Report: January 15, 2016

Date of Work Plan Approval:

Project Completion Date: August 15, 2022

Does this submission include an amendment request? No

PROJECT TITLE: Minnesota Invasive Terrestrial Plants and Pests Center

Project Manager: Robert Venette

Organization: Regents of the University of Minnesota

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Location: Statewide

Total ENRTF Project Budget:

ENRTF Appropriation: \$5,000,000

Amount Spent: \$0

Balance: \$5,000,000

Legal Citation: M.L. 2015, Chp.76, Sec. 2, Subd. 6a

Appropriation Language:

\$5,000,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota for the Invasive Terrestrial Plants and Pests Center established in Laws 2014, chapter 312, article 13, section 44, to conduct research to prevent, minimize, and mitigate the threats and impacts posed by invasive plants, pathogens, and pests to the state's prairies, forests, wetlands, and agricultural resources. This appropriation is available until June 30, 2023, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Minnesota Invasive Terrestrial Plants and Pests Center

II. PROJECT STATEMENT:

The Minnesota Invasive Terrestrial Plants and Pests Center (MITPPC) will serve a lead role in terrestrial invasive species research – coordinating initiatives on prevention of establishment; early detection and rapid response; development of new control methods and technology; integrated pest management; and minimizing non-target impacts of control. The MITPPC mission is to offer science-based solutions to pest invasions that ensure the protection of Minnesota’s healthy prairies, forests, wetlands and agricultural resources. The goal is to eliminate, reduce, mitigate and prevent the introduction, expansion, or damage caused by terrestrial invasive species in Minnesota.

The array of terrestrial invasive species (TIS) of high concern for Minnesota are numerous and diverse, and include invasive grasses, trees, shrubs, insects, earthworms, mammals, fungal pathogens, and other microbes. TIS impact every citizen in the State: emerald ash borer damages our forests and urban landscapes; weeds diminish the biodiversity of our prairies and wetlands; and pests and pathogens destroy fruit and grain harvests resulting in significant economic costs. The annual, combined economic impact of plant, animal, and microbial invasives in the U.S. is estimated at \$134 billion (Agricultural and Resource Economic Review, 2006). Minnesota’s share of this loss is estimated at \$3 billion annually, which is typical of the 50 states.

The MITPPC will support priority research on TIS that pose the greatest threats to Minnesota and take a comprehensive, planned, multi-disciplinary approach to addressing risk. The MITPPC research prioritization process and subsequent lines of research will involve researchers from multiple disciplines, and will address invasives affecting our prairies, forests, agricultural landscapes and wetlands in urban, developing and rural contexts. The Center will identify research priorities for TIS already established in Minnesota and for those that appear likely to arrive and do harm, and develop control methods, management strategies, and policy to achieve effective outcomes. The expert panel working group will establish priorities and present requests for proposals and work-plans to conduct research to address identified priority invasive species. Proposals will be sent out for peer review to ad hoc scientific reviewers in the field of research, which will allow for rapid turnaround of proposals to expedite work to be completed. The ad hoc scientific reviewers will make award recommendations. These specific initiatives selected and their budgets will be provided to LCCMR for review as the selections are made and the work progresses.

The Center will prioritize and support multiple projects by research teams comprised of faculty, students, and staff from one of 10 participating departments. UMN faculty will work with both graduate students and post-doctoral associates on any given project. The scope of each research project will likely vary by species addressed. With this funding, it is expected that over a six-year period the Center will conduct an estimated seven projects and train roughly 14 graduate students and postdocs.

The Center is administratively located in the College of Food, Agricultural and Natural Resource Sciences (CFANS) in coordination with the College of Biological Sciences (CBS). Participating departments within CFANS include Entomology, Plant Pathology, Forest Resources, Agronomy & Plant Genetics, Horticultural Science, Applied Economics, Fisheries, Wildlife and Conservation Biology, and Bioproducts and Biosystems Engineering. Participating departments within CBS include Plant Biology and Ecology, Evolution and Behavior. Additionally, research will be possible on CFANS’ eight research and outreach centers located in diverse agro-ecological areas of the State.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of *January 31, 2016:*

Project Status as of *July 31, 2016:*

Project Status as of January 31, 2017:

Project Status as of July 31, 2017:

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:

Project Status as of January 31, 2022:

Overall Project Outcomes and Results:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Launch research on high priority, established terrestrial invasive species and rapid response for the prevention of establishment of new threats.

Description: By using funds from the 2014 General Fund appropriation, the MITPPC conducted a rapid prioritization in the spring of 2015 to identify immediate research needs among state agencies with primary responsibility for the management of terrestrial invasive plants and pests on public and private lands. Initial priority plants are species on the eradicate list, the control list, or the restricted noxious weed list as designated under Minnesota’s noxious weed law, and initial priority pests were the brown marmorated stink bug (*Halyomorpha halys*) and oak wilt (caused by the fungal pathogen *Ceratocystis fagacearum*). Initial priority themes for research are:

- invasive species detection and distribution;
- invasive species response to climate change; and
- new approaches to management of invasive species.

These priorities were identified through a consultative process with eight representatives from the Minnesota Board of Water and Soil Resources, Minnesota Department of Agriculture, Minnesota Department of Natural Resources, and Minnesota Department of Transportation. Each agency had generated a list of several dozen potential research themes and topics. From these lists each agency self-selected their top four research priorities. MITPPC advised that a research topic should be considered a priority if it (i) would help the agency achieve its mission more effectively, (ii) would be of benefit to another agency (iii) could be supported by the agency financially or through in-kind contributions, and (iv) could be completed with the capacity at the University of Minnesota. Agency priorities were vetted during a joint meeting on March 26, 2015. The initial prioritization was complete by April 15, 2015. The prioritization provided the basis for MITPPC’s first request for proposals (RFP). After review by LCCMR staff, the RFP was issued on April 30, 2015. The complete request for

proposals, including descriptions of priorities and the process by which projects will be selected, is attached as Appendix A to this work plan. The rapid prioritization and associated request for proposals will be used to allocate up to \$1.2 million awarded to MITPPC through the M.L. 2014 ENRTF appropriation.

Eight pre-proposals were received on May 22, 2015. Those pre-proposals are currently being reviewed by a five member panel of University faculty who do not have a conflict of interest with the proposals submitted. Their evaluations will be used to determine which research teams will be invited to submit full proposals with the proposed or a modified scope of work. Full proposals will be reviewed by three experts outside of the University for scientific novelty and rigor. Funding recommendations will be reviewed by the Center Advisory Board. The intent is for initial projects funded under the M.L. 2014 ENRTF appropriation to begin by August 15, 2015.

A more expansive research prioritization was initiated in May 2015 to systematically evaluate threats posed by a wider array of terrestrial invasive plants, pathogens, and insects/arthropods. The more expansive prioritization will be used to allocate the remaining research funds from the M.L. 2014 ENRTF appropriation and in this work plan. Twelve panelists were identified, six from the faculty at the University of Minnesota and six program managers with advanced degrees from partner agencies. In total, these panelists will identify 120 significant invasive plants, pathogens, or insects that threaten Minnesota's agriculture, forests, wetlands, or prairies. An Analytical Hierarchy Process (AHP) will be used to rank these threats. AHP is a form of multi-criteria decision analysis that makes the process of selecting the highest priority threats consistent and transparent. AHP has been used by many agencies and organizations to facilitate complex decision making. In brief, the twelve member panel will engage in a facilitated discussion about criteria by which terrestrial invasive plants and pests should be considered a high threat and the relative importance of each criterion. National experts will be consulted to identify the greatest research needs for these priority taxa.

Upon the completion of the expansive research prioritization, the expert panel working group will establish priorities and present requests for proposals and work-plans to conduct research to address identified priority invasive species. Proposals will be sent out for peer review to ad hoc scientific reviewers in the field of research, which will allow for rapid turnaround of proposals to expedite work to be completed. The ad hoc scientific reviewers will make final award recommendations. The MITPPC will coordinate with successful applicant to submit for review sub-award workplans and budgets to the LCCMR for review and make the necessary amendments to the overall work plan and budgets.

The Center will initiate and/or accelerate coordinated, applied research according to the prioritized list of pest and plant species that threaten Minnesota's prairies, urban and rural forests, wetlands, and agricultural resources as identified through this assessment process. Depending on the net impacts associated with each species, research may include new control methods including bio-control and technology, development of integrated pest management tools that minimize non-target impacts of control, early detection of and/or rapid response to new threats, and establishment prevention. The Center infrastructure is vital to improving Minnesota's capacity and response time to preventing and limiting introduction of new terrestrial invasive species. All research projects will include an analysis of any consequences related to the management of prioritized species to the State's non-target flora, fauna or our soils, water and climate.

Workforce development and training experts in invasive species management is also critical. A core component of each project will be funding of graduate students and postdoctoral associates to work with existing faculty.

Since University faculty are expected to acquire grants that cover their research salary, existing faculty are accounted for in the budget at 25% time in their role as the project leader. Providing salary through these awards will secure faculty time and intellectual effort in the projects, assuring that we are attracting the resources to

provide project design, effort, and mentoring of the graduate students and post-docs in their research development. We do not anticipate hiring any new faculty for the projects.

The Center will support multiple projects by research teams, each comprised of a UMN faculty member from one of the participating departments, one graduate student and one postdoctoral associate. Estimated funding per project will be \$180,000-210,000 per year, for three to four years. We expect this to result approximately seven projects in two separate phases, depending upon the priority identified by the annual risk assessment planning. It is expected that per project expenses for established invasive species will be higher as compared to prevention strategies.

Research projects funded by MITPPC will be treated administratively as sub-projects under this work plan. As research sub-projects are identified for funding, new sub-project work plans and budgets will be submitted to LCCMR by the new investigators for review and consent. Regular activity updates and budget updates will be provided by sub-project leaders directly to LCCMR and to MITPPC. This overarching work plan and budget will be updated accordingly to include general progress of the Center and a synopsis of activities completed by each sub-project. The budget updates for this overall work plan will provide summaries of expenditures (by budget line item) for each sub-project. Details on expenditures will be found in sub-project reports.

Summary Budget Information for Activity 1:

ENRTF Budget: \$5,000,000
Amount Spent: \$ 0
Balance: \$5,000,000

Activity Completion Date:

Outcome	Completion Date
1. RFP released for first phase of projects	Dec 15, 2015
2. First phase research projects selected and launched (est. 4 projects, ranging from 3-4 years each)	May 15, 2016
3. Second phase research projects selected and launched (est. 3 projects, ranging from 3-4 years each)	May 15, 2017
4. Research findings for first phase of projects	May 15, 2020
5. Research findings for second phase of projects	May 15, 2021

Activity Status as of January 31, 2016:

Activity Status as of July 31, 2016:

Activity Status as of January 31, 2017:

Activity Status as of July 31, 2017:

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:*

Activity Status as of *January 31, 2022:*

Final Report Summary:

V. DISSEMINATION:

Description: Findings will be shared with agencies and citizen groups so that public information and decision making is based on the best available science. Updates on progress and research results will be disseminated through University of Minnesota, College of Food, Agricultural, and Natural Resource Sciences, and College of Biological Sciences via websites, social media, and publications. Media releases will also be used when warranted. Additionally, findings will be presented at local and national conferences and via peer-reviewed publication and student theses.

Status as of *January 31, 2016:*

Status as of *July 31, 2016:*

Status as of *January 31, 2017:*

Status as of *July 31, 2017:*

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:*

Status as of *January 31, 2022:*

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$ 3,350,000	3 x 0.25 x 4 years = 3 FTE Research Faculty 4 x 0.25 x 3 years = 3 FTE Research Faculty 3 x 0.5 x 4 years = 6 FTE Graduate Research Assistants 4 x 0.5 x years = 6 FTE Graduate Research Assistants 3 x 1 x 4 years = 12 FTE Post-Doctoral Associates 4 x 1 x 3 years = 12 FTE Post-Doctoral Associates ~42 total FTE. More detail to be provided as specific research projects are proposed.
Professional/Technical/Service Contracts:	\$1	More detail to be provided as specific research projects are proposed (if applicable).
Equipment/Tools/Supplies:	\$1,590,000	Consumable lab materials, specimens and other expenses directly related to research. More detail to be provided as specific research projects are proposed.
Printing	\$1	More detail to be provided as specific research projects are proposed (if applicable.)
Capital Expenditures over \$5,000:	\$1	More detail to be provided as specific research projects are proposed (if applicable).
Travel Expenses:	\$59,996	Travel directly related to research (app. \$2,500/year per project) More detail to be provided as specific research projects are proposed. All travel expenses will follow U of MN policy allowances.
Other:	\$1	More detail to be provided as specific research projects are proposed (if applicable).
TOTAL ENRTF BUDGET:	\$5,000,000	

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than \$5,000: More detail to be provided as specific research projects are proposed (if applicable)

Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 42

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: None

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
State			
General Fund Appropriation ML 2014, Chapter 312, Article 12, Section 8	\$3,400,000	\$9,038	Funds will be used to support the core operations and leadership of the Minnesota Invasive Terrestrial Plants and

			Pests Center by a Center Director and administrative support for the 8-year project period. This includes funding for est. 2 additional research projects, personnel costs (faculty, graduate students, postdoctoral associates), equipment, materials and supplies necessary for research. Each project is estimated at \$180-210K/year for 3-4 years.
ML 2014, Chapter 312, Article 12, Section 8	\$1,460,000	\$0	Funds will be used to convene expert panel to create a framework and conduct initial assessment to establish highest priority species; convene expert panel annually in years 2 and 3 to assess net impacts of invasive species and control responses; and support 2-3 research projects (at \$180-\$210K/year for 3-5 years).
TOTAL OTHER FUNDS:	\$4,860,000	\$9,038	

VII. PROJECT STRATEGY:

A. Project Partners:

Project Partners (not receiving funds):

- USDA Forest Service Northern Research Station
- Minnesota Department of Agriculture
- Minnesota Department of Natural Resources
- Minnesota Forest Resource Council
- Agencies and organizations involved in invasive species outreach programs so public information is based on the best available science.
- Networks of citizen scientists could be an important part of implementing early detection programs and monitoring the effectiveness of control efforts.

This will be updated in more detail once the priorities for research are established.

B. Project Impact and Long-term Strategy:

The Center’s ultimate goal is to eliminate, reduce, mitigate or prevent the introduction, expansion or damage done by terrestrial invasive species in Minnesota. Metrics of success include: threat awareness, response efficiency, control effectiveness, non-target species protection, and mitigation strategies. Ancillary goals include: workforce development, citizen engagement, focused research strategies, improved response time to emerging threats, and improved coordination of efforts.

Success will depend on the ability to marshal multi-disciplinary teams in timely and prioritized ways to deliver results. While M.L. 2014 ENRTF and General Fund dollars will be used to conduct a risk assessment and launch initial research or prioritized species, funding is being sought through the M.L 2015 ENRTF request to support additional multi-disciplinary research teams. With adequate funding, the Center’s efforts are expected to result in numerous, effective prevention and control methods within an eight year time frame for a significant portion of the 15-20 species upon which we will focus.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	\$ Amount
General Fund Appropriation ML 2014 Chapter 312, Article 12, Section 8	6/30/22	\$3,400,000
M.L. 2014, Chapter 312, Article 12, Section 8 (from ENRTF)	6/30/22	\$1,460,000

VIII. FEE TITLE ACQUISITION/CONSERVATION EASEMENT/RESTORATION REQUIREMENTS:

A. Parcel List: N/A

B. Acquisition/Restoration Information: N/A

IX. VISUAL COMPONENT or MAP(S): see attached

X. RESEARCH ADDENDUM: Peer review will be conducted by internal U of MN process and documentation will be provided to LCCMR.

XI. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than January 31 and July 31 each year (every 6 months). A final report and associated products will be submitted between June 30 and August 15, 2022.

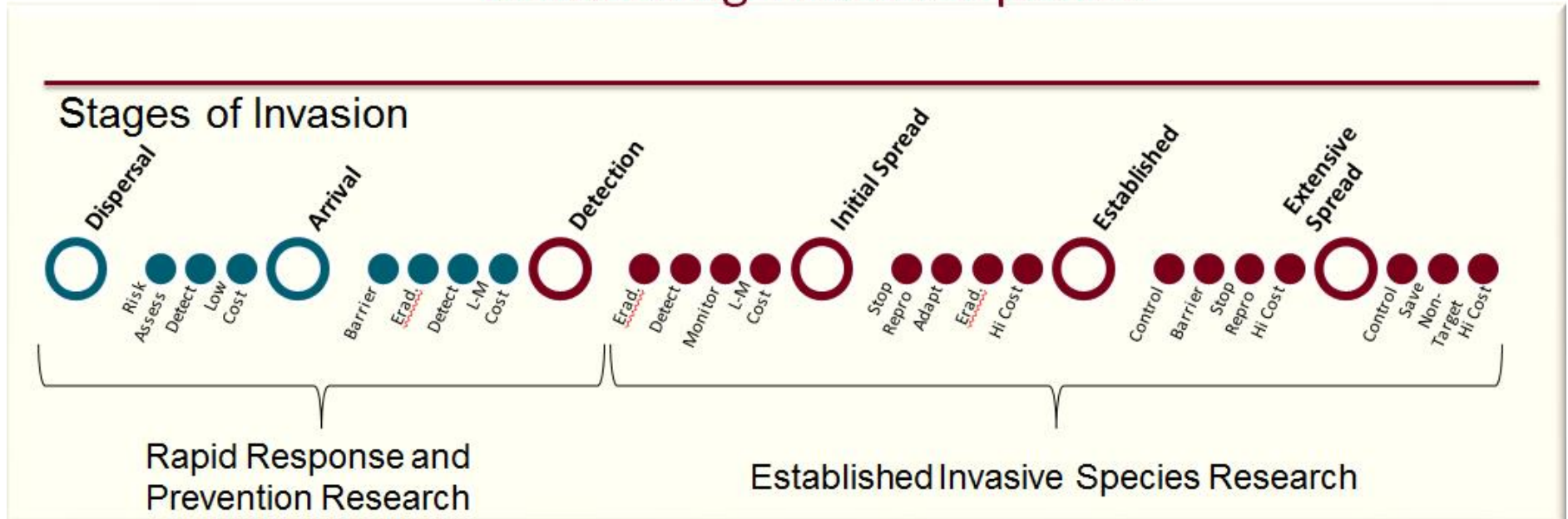
Environment and Natural Resources Trust Fund
 M.L. 2015 Project Budget

Legal Citation: M.L. 2015, Chp. 76, Sec. 2, Subd. 06a
 Project Title: Minnesota Invasive Terrestrial Plants and Pests Center
 Project Manager: Rob Venette
 M.L. 2015 ENRTF Appropriation: \$5,000,000
 Organization: University of Minnesota
 Project Length and Completion Date: 8 Years, June 30, 2022
 Date of Report: June 24, 2015



ENVIRONMENT AND NATURAL RESOURCES TRUST FUND			Activity 1 Balance	TOTAL BUDGET	TOTAL SPENT	TOTAL BALANCE
BUDGET ITEM	Activity 1 Budget	Amount Spent				
BUDGET						
<i>Activity 1: Launch research on high priority, established terrestrial invasive species and rapid response for the prevention of establishment of new threats.</i>						
Personnel (Wages and Benefits) - Total	\$3,350,000	\$0	\$3,350,000	\$3,350,000	\$0	\$3,350,000
To be named: 3 research faculty PI, 25% FTE for 4 years: -\$37,400 (66% salary, 33.8% benefits);						
To be named: 4 research faculty PI, 25% FTE for 3 years: -\$37,400 (66% salary, 33.8% benefits)						
To be named: 3 graduate research assistant, 50% FTE for 4 years: -\$40,000 (56% salary 35% tuition 9% benefits)						
To be named: 4 graduate research assistant, 50% FTE for 3 years: -\$40,000 (56% salary 35% tuition 9% benefits)						
To be named: 3 postdoctoral associate, 100% FTE for 4 years: -\$57,000 (79% salary, 21.4% benefits)						
To be named: 4 postdoctoral associate, 100% FTE for 3 years: -\$57,000 (79% salary, 21.4% benefits)						
Professional/Technical/Service Contracts - Total	\$1	\$0	\$1	\$1	\$0	\$1
This may include items within the below categories. More detail to be provided as specific research projects are proposed (if applicable).						
Services - Lab (e.g., data storage, sequencing, biochemistry, microscopy, etc.)	\$0	\$0	\$0	\$0	\$0	\$0
Professional Services and Contracts (e.g., biocontainment facility storage, technical and engineering contracts, fees or honoraria for guest lecturer and speakers, etc.)	\$0	\$0	\$0	\$0	\$0	\$0
Printing - Total	\$1	\$0	\$1	\$1	\$0	\$1
More detail to be provided as specific research projects are proposed (if applicable).						
Equipment/Tools/Supplies - Total	\$1,590,000	\$0	\$1,590,000	\$1,590,000	\$0	\$1,590,000
Consumable lab materials, specimens and other expenses directly related to research. This may include items within the below categories. More detail to be provided as specific research projects are proposed.						
Supplies - Lab and/or Field (e.g., polymerase chain reaction chemicals; pots, soil, fertilizer for plant propagation; ingredients for insect diet; confinement cages for insect rearing) More detail to be provided as specific research projects are proposed.	\$0	\$0	\$0	\$0	\$0	\$0
Equipment - Non-Capital Lab and/or Field (e.g., pipettes, balances, laboratory glassware, laptop to operate, heat block, vortex, mini centrifuge, etc.) More detail to be provided as specific research projects are proposed.	\$0	\$0	\$0	\$0	\$0	\$0
Capital Expenditures Over \$5,000 - Total	\$1	\$0	\$1	\$1	\$0	\$1
More detail to be provided as specific research projects are proposed (if applicable). Examples may include growth chambers, DNA sequencers, microscopes, etc.						
Travel - Total	\$59,996	\$0	\$59,996	\$59,996	\$0	\$59,996
Travel directly related to research for mileage, lodging, and meals (app. \$2,500/year per project). This may include items in the below categories. More detail to be provided as specific research projects are proposed. All travel expenses will follow U of MN policy allowances.						
Travel - MN (e.g., mileage, conferences, meetings, etc.) All travel will follow U of MN policy allowances.	\$0	\$0	\$0	\$0	\$0	\$0
Travel - Domestic (e.g., mileage, conferences, meetings, etc.) All travel will follow U of MN policy allowances.	\$0	\$0	\$0	\$0	\$0	\$0
Other - Total	\$1	\$0	\$1	\$1	\$0	\$1
More detail to be provided as specific research projects are proposed (if applicable).						
COLUMN TOTAL	\$5,000,000	\$0	\$5,000,000	\$5,000,000	\$0	\$5,000,000

Multi-disciplinary and Two Pronged Approach for Controlling Invasive Species



Forestry Resources



Entomology/ Horticulture



Weed Science/ Agronomy/ FWCB



Plant Pathology

