

**Environment and Natural Resources Trust Fund
2015 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 081-D

Minnesota Terrestrial Invasive Species Research Center

Category: D. Aquatic and Terrestrial Invasive Species

Total Project Budget: \$ 10,350,375

Proposed Project Time Period for the Funding Requested: 8 years, July 2015 – July 2023

Summary:

Conduct research to prevent new establishment of terrestrial invasive species and mitigation of existing invasives. Diagram shows stages of invasion, control or prevention actions, costs and example images with departments.

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Web Address _____

Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

n/a

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____ %



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PROJECT TITLE: Minnesota Invasive Terrestrial Plants and Pests Center

I. PROJECT STATEMENT

The Minnesota Invasive Terrestrial Plants and Pests Center (MITPPC), is requested to be established at the University of Minnesota by Minnesota's 88th Legislature (Chapter 312, Article 13, Section 44). 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 mission of the Center will be to offer science-based solutions to pest invasions that ensure the protection of the state's healthy prairies, forests, wetlands and agricultural resources. The research and educational programs of the Center will be pursued in collaboration with state, local, tribal and federal governments, nongovernmental agencies, the private sector, Extension, and other colleges and universities.

The Center will be administratively located in the College of Food, Agricultural and Natural Resource Science (CFANS) in coordination with the College of Biological Sciences (CBS). CFANS and CBS have the intellectual and physical capacity in place to effectively address the multidisciplinary challenges posed by invasive species. This includes Departments of Entomology (insect invasives e.g., emerald ash borer, western pine bark beetles, spotted wing drosophila), Plant Pathology (microbial invasives e.g., oak wilt, soybean rust), Forest Resources (e.g., forest pests & diseases, earth worms), Agronomy & Plant Genetics (plant bio-control such as cover plants and establishment of native prairies), Horticultural Science (invasive ornamentals, fruit and vegetable plant protection), Applied Economics (risk assessment and policy strategies for intervention and investment in effective controls), Fisheries Wildlife and Conservation Biology (e.g., invasive wildlife species, non-target impacts in prairies and wetlands), and Bioproducts and Biosystems Engineering (technology for detection and bio-physical control), and Plant Biology and Ecology, Evolution and Behavior Departments in CBS. In addition, CFANS oversees eight research and outreach centers located in diverse agro-ecological areas of the state allowing research to be conducted across Minnesota's rich and varied landscapes. Together these departments and research centers will address invasives in prairies, forests, agricultural landscapes and wetlands in urban, developing and rural contexts and develop control methods, management strategies and policy to achieve effective outcomes.

A significant share of research funding will be directed toward graduate student and post-doctoral research assistantships. At the funding levels proposed here (ENRTF 2015 - \$10.1 million), the Minnesota State appropriated general funds (\$3.4 million) and the ENRTF 2014 funds (\$1.46 million), and there is sufficient investment to fully support 10 graduate students assuming 4 years of funding each. This is a total of \$1,897,048 invested in graduate students over the 8 years (5 grads/year * 8 years * \$47,426 salary, benefits and tuition = \$1,897,048). In addition it will support approximately 8 post-doctoral research associates also assuming 4 years of funding each for a total of another \$1,783,216 (4 post-docs/year * 8 years * \$55,725 salary and benefits = \$1,783,216.) We expect the graduate students and post docs to work with one faculty advisor each, resulting in roughly 9 projects in progress each year. It is difficult to determine how many years will be spent on each project which depends on the scope of research that likely varies by species addressed, but if we use the 4 years of and average graduate student or post-doc we should expect 18-25 species or projects to be initiated because of this investment. However, we expect that the center is likely to train 25 graduate students and postdocs because these funds will be leveraged with other sources and some projects will train MS students (which are shorter-term than PhDs). We believe building professional capacity related to terrestrial invasive species is critical because we consistently hear from government agencies, industries, and other non-governmental organizations that there are not enough well-trained professionals to address their workforce needs. This program will assist with workforce development along with research outcomes.



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Most importantly this investment will result in a comprehensive, planned and multi-disciplinary approach to addressing terrestrial invasive species. Individual faculty typically initiate grants on specific topics, such as an entomologist working on bio-control of emerald ash borer. However, to address this most effectively also requires assessment of the forest health, trees species diversity and ecology which very likely impacts the potential for infestation and impacts as well. Investment in a comprehensive center approach across several departments helps assure the coordination of the research projects, focusing on the identified priorities from the over 100 potential invasives.

Legislative appropriations for MITPPC are provided in Chapter 312, HF 3172, Article 12, Section 8 of the 2014 Legislative Record. A total of \$4,860,000 is appropriated from the following funds:

General Fund	\$3,400,000
ENRTF 2014	\$1,460,000

These funds are designated to include a director, graduate students and necessary supplies to conduct the research and are available until June 30, 2022 (eight years).

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1: Catalyzing research & education: establishing administrative structure **Budget: \$0 ENRTF**

Success will depend on the ability to marshal multi-disciplinary teams in timely and prioritized ways to deliver results. The best way to approach this is to have a collegiate-level center directed by a faculty researcher who reports to the dean of CFANS (similar to the existing Water Resources Center). The Center Director would be primarily responsible for prioritizing the research agenda of the MITPPC, for overseeing the implementation and completion of the research projects and to coordinate faculty, student and staff resources to complete projects. Administrative oversight would be provided by existing collegiate and departmental staff and administration and one administrative assistant in an effort to ensure that funding goes to mission-specific investments. This is completely funded by the 2014 Legislative Appropriation (Chapter 132 – H. F. 3172, Sec. 8) from general legislative funds, and is not a part of the request in this proposal. This totals \$2,417,196 of the general funds provided by the legislature and as such is not part of this request.

A key foundational principle of the center will be to develop its research activities and portfolio based on net impact assessment of various invasive species and expected outcomes of intervention strategies. This approach would include consideration of pressing need, opportunity and practicality. This will allow for strategic management of the research portfolio to address existing invasive species or developing preventative strategies for rapidly spreading species that have not yet entered the state but could. To accomplish this, the Center will convene expert panels to create risk assessment frameworks and to conduct an initial assessment that can prioritize investments in highest priority invasive species. This is also completely funded by the 2014 legislative appropriation, and is not part of this proposal. It totals \$113,537 of the general funds provide by the legislature and as such is not part of this request.

Outcome	Completion Date
1. Recruit the Center Director and establish administrative structure for research	<i>Aug 15, 2015</i>
2. Establish a council of internal and external expertise to provide input on strategic direction and funding priorities (to be supported by preliminary net impact assessment).	<i>Sept 15, 2015</i>
3. Convene expert panels to begin creating frameworks for assessing net impacts of invasive species and control responses, revisit per needs assessments.	<i>Oct 15, 2015</i>



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Activity 2: Launch research on high priority, established terrestrial invasive species Budget: \$4,647,264

The Center will initiate or accelerate applied research on high risk invasive species already present in Minnesota. This will include creating a prioritized list of pest and plant species that threaten the state’s prairies, forests, wetlands, and agricultural resources. Depending on the net impacts associated with each species, this research may include new control methods including bio-control and technology, and development of integrated pest management tools that minimize non-target impacts of control. This will include an analysis of any consequences related to the management of prioritized species to the state’s water, pollinators, and native prairies or other native species. In addition to this ENRTF 2015 budget request of \$4,647,264, legislatively appropriated general funds of \$470,352 will be designated to Activity 2 and \$1,460,000 will be used from the 2014 ENRTF Funding. The 2015 ENRTF request will enable the multi-disciplinary coordination missing in one-by-one identification of TIS research projects by individual researchers. While led by faculty researchers, its emphasis on graduate student and post-doctoral researchers will expand the available long run intellectual research capital to address the ongoing multi-faceted challenges posed by terrestrial invasive species. Over an 8-year period, the Center will support approximately 5 team projects dedicated to established, high-risk species (e.g., funding \$100,000-200,000+/yr, for 3-5 years). Training experts in invasive species is also critical so a core component of these projects will be funding of graduate students to work with existing faculty. The total use of 2014 funds for this activity is \$1,460,000.

Outcome	Completion Date
1. Risk focused research on invasive species, new control methods and technology	July 1, 2023
2. Research on integrated pest management approaches and strategies	July 1, 2023
3. Research on minimizing non-target impacts of control	July 1, 2023

Activity 3: Research on prevention of establishment of new threats: Rapid Response Budget: \$5,703,111

The Center will emphasize “Prevention and Early Detection” capabilities for responding to new threats to include projects focused on establishment prevention, early detection and rapid response. In addition to the ENRTF budget request of \$5,703,111, legislatively appropriated general funds of \$398,915 will be designated to Activity 3. The 2015 ENRTF will fund an expected four post-doc students and two graduate students and over an 8-year period, the Center will support approximately 6 projects, generally 1-3 years in duration. The 2015 ENRTF is particularly important in this case because it provides the underlying infrastructure of support and coordination to be able to respond quickly rather than the typical nearly one year lag between identification of a potential new TIS and the funding being released, and only then being able to hire graduate students or post-docs which requires additional time. Given that the greatest impact that we can have on any potential invasive species is the time before it becomes established or even enters the state, this is a vital investment that will improve our capacity and our response time to preventing and limiting introduction of new terrestrial invasive species.

Outcome	Completion Date
1. Research findings providing for early detection	July 1, 2023
2. Research results for preventing establishment, mitigating impacts, restoration and fostering ecosystem resilience at diverse scales from very local to large landscape levels.	July 1, 2023

III. PROJECT STRATEGY

A. Project Team/Partners

The project teams will be comprised of faculty members and staff from eight departments of CFANS with potential for other collaborations was necessary upon identified priority species, as well as administrative



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staff of the Center and the Center Director established by the legislature. The Director will report to the dean of the College of Food, Agricultural and Natural Resource Sciences. Partnering organizations include the USDA Forest Service Northern Research Station, the Minnesota Department of Agriculture, Minnesota Department of Natural Resources and the Minnesota Forest Resource Council as well as the College of Biological Sciences at the University of Minnesota.

B. Project Impact and Long-Term Strategy

Terrestrial invasive species impact every citizen in Minnesota: from the damage the emerald ash borer does to forests and urban landscapes, to weeds that diminish the biodiversity of prairies and wetlands and to economic costs to grain and fruit producers from harvests destroyed by pests and pathogens. A study published in the journal *Agricultural and Resource Economic Review* in 2006 estimates the combined economic impact of plant, animal, and microbial invasives in the U.S. to be \$134 billion annually. If Minnesota's share of this loss is typical of the 50 states, the loss is roughly \$3 billion annually.

The array of terrestrial invasive species of high concern for Minnesota are numerous and diverse. They include invasive grasses, trees, shrubs, insects, earthworms, mammals, fungal pathogens, and other microbes. Because there has been no comprehensive assessment of terrestrial invasive species risks to Minnesota, it is impossible to know how many species should be considered high risk. The initial assessment we propose will screen at least 100 species to arrive at scientifically-defensible research priorities. We will identify research priorities for species already established in Minnesota and for those that appear likely to arrive and do harm. After the impact assessment working group meets to begin to establish priorities, these will be presented to research in the form of requests for proposals and work-plans to conduct research to address these invasive species. These will be reviewed by the impact assessment teams which will allow for rapid turnaround of proposals to expedite work to be completed.

Although not part of this proposal, it will be important to incorporate public outreach and citizen science. One of the greatest factors causing introduction and spread of invasive species is human transport. It will be crucial for the center to work with 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.

C. Timeline Requirements

Spread of invasive species, is by definition nearly impossible to prevent or reverse. There are dozens of examples worldwide (including several in Minnesota) where effective methods have been devised that result in long-term control with limited non-target impacts. All have required many years to develop the method, followed by additional time to verify results and secure permits needed for widespread use. By providing adequate funding to support multi-disciplinary teams, it is realistic to expect the center to develop effective prevention and control methods within an 8 year time frame for a significant portion of the 15-20 species we would focus on.



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2015 Detailed Project Budget

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IV. ENRTF PROPOSAL REQUEST BUDGET 8 years

<u>BUDGET ITEM</u> (See "Guidance on Allowable Expenses", p. 13)	<u>AMOUNT</u>
Personnel: Established TIS - Two Post-Doctoral researchers (100%) \$45.9K/yr salary + \$9,860/yr benefits for eight years = \$891,608. Four Faculty Principal Investigators (25%) \$27.3K/yr salary + \$9,251/yr benefits for eight years = \$1,169,766.	\$ 2,061,374
Personnel: Rapid Response TIS - One Graduate Research Assistants (50%) \$24K/yr salary + \$23,402/yr tuition and benefits for eight years = \$758,819. Two Post-Doctoral researchers (100%) \$45.9K/yr salary + \$9,860/yr benefits for eight years = \$891,608. Four Faculty Principal Investigators (25%) \$27.3K/yr salary + \$9,251/yr benefits for eight years = \$1,169,766.	\$ 2,820,193
Equipment/Tools/Supplies: Established TIS - Direct research expenses include only expenses related directly to research including consumable lab materials, specimens, field trial related expenses. \$80.8K/yr for four Investigators for eight years = \$2,585,600.	\$ 2,585,890
Equipment/Tools/Supplies: Rapid Response TIS - Similar expenses as established TIS although less research intensity than established TIS is assumed as Rapid Response personnel (faculty PI, Post-docs and Grad RAs) are able to handle two projects. \$55K/yr for six Investigators for eight years = \$2,685,502.	\$ 2,882,918
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 10,350,375

V. ENRTF 2014 Fund Allocation

<u>AMOUNT</u>	<u>ENRTF 2014 Appropriation</u>
\$ 1,460,000	Revenue: Other State \$ To Be Applied To Project During Project Period: Legislative appropriations for MITPPC are provided in Chapter 312, HF 3172, Article 12, Section 8 of the 2014 Legislative Record. ENRTF FUNDS IDENTIFIED.
\$ 758,819	Expense: Personnel Graduate Students- Established TIS Two Graduate Research Assistants (50%) \$22K/yr salary + \$21,430/yr tuition and benefits for eight years = \$758,819. Expected four total students funded over 8 years (4 year graduate PhD).
\$ 646,473	Expense: Equipment/Tools/Supplies: Established TIS - Direct research expenses include only expenses related directly to research including consumable lab materials, specimens, field trial related expenses. \$74K/yr for one project for eight years = \$646,473
\$ 54,708	Expense: - Established TIS - Direct research expenses include only expenses related directly to research including consumable lab materials, specimens, field trial related expenses.

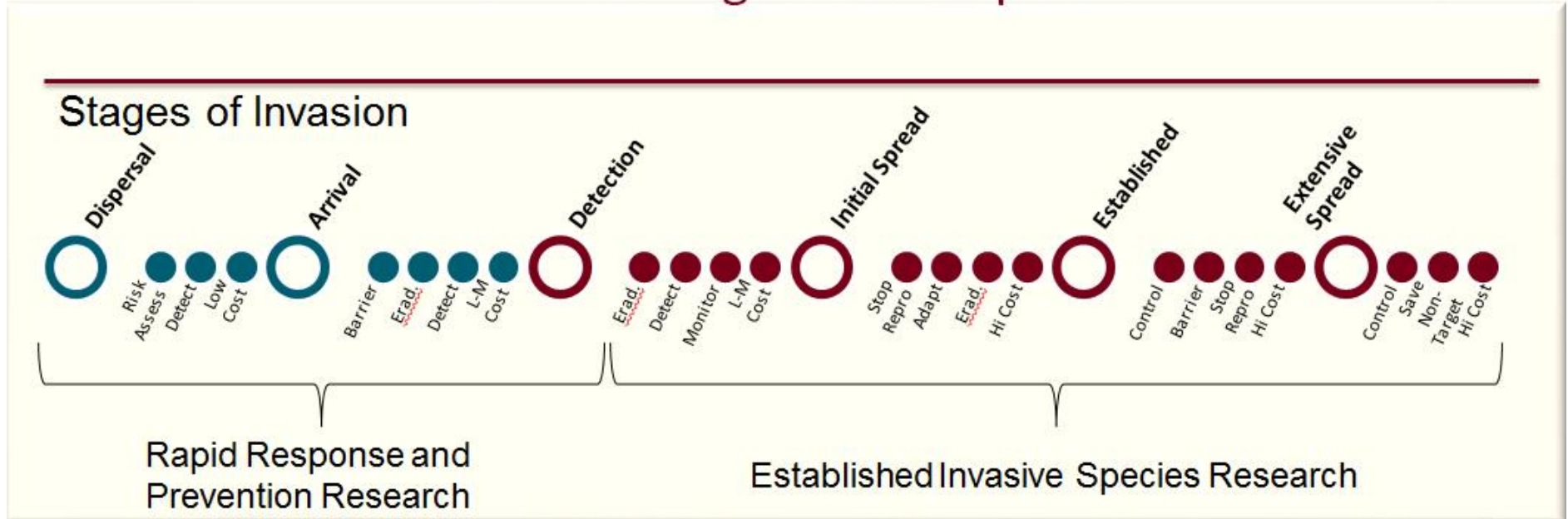
VI. OTHER FUNDS

<u>AMOUNT</u>	<u>General Fund Appropriation MN Legislature</u>
\$3,400,000	Other State \$ To Be Applied To Project During Project Period: Legislative appropriations for MITPPC are provided in Chapter 312, HF 3172, Article 12, Section 8 of the 2014 Legislative Record. General Funds Only.
\$2,417,196	Personnel: Administrative - Faculty Research Director (100%) average \$164K/yr salary + \$55,529/yr benefits for eight years = \$1,754,609. Administrative Assistant (100%) \$66K/yr salary + \$17,298/yr benefits for eight years = \$662,547.
\$113,537	Travel and Expert Priority: Expert Panel Net Impact Assessment expenses include coordination and meetings of experts to identify priority TIS for both existing and rapid response. Two meetings for two days at \$210/day for 12 people each year for five years = \$50,461 Honorarium to be paid for time contributed by participants. 12 participants at \$1,050 honorarium for five years = \$63,076.
\$671,851	Personnel: Graduate Student and Faculty Researcher: 1 graduate student 1/2 time, salary \$22,000/year and Benefits \$21,430/year. 1 Faculty Investigator/advisor, 1/4 time, salary \$100,000/year and benefits \$33,900/year.
\$197,416	Supplies and Equipment/Tools/Supplies: Up to 2 established TIS projects supplies or 1 established and 1 rapid response funds.



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Multi-disciplinary and Two Pronged Approach for Controlling Invasive Species



Forestry Resources



Entomology/
Horticulture



Weed Science/
Agronomy/ FWCB



Plant Pathology





Project Manager Qualifications: Minnesota Invasive Terrestrial Plants and Pests Center

The Minnesota Terrestrial Invasive Species Research Center (MTISRC) is conceived as a collegiate level initiative in the College of Food, Agricultural and Natural Resource Sciences (CFANS) at the University of Minnesota. The research by its nature is multi-disciplinary (FWCB, Entomology, Horticulture, Agronomy, Forestry, Plant Pathology, Bio-Engineering and Applied Economics) all have a role to play. As such the overall project management will reside with the Dean of CFANS as with all academic programs. Currently that position is held by Professor Brian Buhr as Dean and Director of the Minnesota Agricultural Experiment Station. Based on 2014 legislation, the MITPPC will eventually be led by a Faculty Director as described in the legislation and to be determined.

Dr. Buhr received his PhD in Economics from Iowa State University in 1992 and was appointed as Assistant Professor in Applied Economics at the University of Minnesota in September 1992. Dr. Buhr’s research is primarily in the area of commodity marketing and risk management and has extensive experience in quantitative modeling of markets and bio-physical processes in agriculture. In 2004, Dr. Buhr was appointed the E. Fred Koller Chair in Applied Economics, and in 2008 was appointed head of Applied Economics, a position he held until assuming his current role as Interim Dean of CFANS. Dr. Buhr successfully led the Applied Economics with 34 faculties, over 140 graduate students and 230 undergraduate students and budget of over \$5 million for five years, expanding their research funding, improving facilities, and enhancing the quality of their graduate and undergraduate programs while securing new sources of funding for both graduate funding and research projects. As such Dr. Buhr has the qualifications to manage joint and interdisciplinary projects such as MITPPC and has demonstrated success in doing so throughout his career. This includes managerial, personnel and financial skills necessary to successfully implement a diverse project of this scale.

