

Trust Fund 2009 Work Program

Date of Report: May 7, 2009

Date of Next Progress Report: December 30, 2009

Date of Work Program Approval:

Project Completion Date: June 30, 2012

I. PROJECT TITLE: Prevention and Early Detection of Asian Earthworms and Reducing the Spread of European Earthworms

Project Manager: Cindy Hale
Affiliation: Natural Resources Research Institute, University of Minnesota Duluth
Mailing Address: 5013 Miller Trunk Hwy
City / State / Zip: Duluth MN 55811
Telephone Number: 218/720-4364
E-mail Address: cmhale@d.umn.edu
Fax Number: 218/720-4328
Web Page address: <http://www.nrri.umn.edu/staff/chale.asp>

Location: Statewide

Total Trust Fund Project Budget:	Trust Fund Appropriation	\$	150,000
	Minus Amount Spent:	\$	0
	Equal Balance:	\$	150,000

Legal Citation: M.L. 2009, Chp. 143, Sec. 2, Subd. 6e

Appropriation Language:

\$150,000 is from the trust fund to the Board of Regents of the University of Minnesota Natural Resources Research Institute for a risk assessment of the methods of spreading, testing of management recommendations, and identification of key areas for action in the state to reduce the impacts of invasive earthworms on hardwood forest productivity. This appropriation is available until June 30, 2012, at which time the project must be completed and final products delivered, unless an earlier date is specified in the work program.

II. PROJECT SUMMARY AND RESULTS:

The goal of this 3 year project is to use a multi-pronged approach to greatly reduce the introduction and spread of invasive earthworms through rigorous quantification of the relative importance of different vectors of introduction for earthworm species (result1), development and testing the effectiveness of management recommendations for resource managers to limit the spread and introduction of earthworms (result 2), and through a comprehensive effort involving research and educational institutions, governmental agencies, non-governmental organizations and citizen science to inform and actively engage diverse stakeholders in efforts to accumulate distributional data on invasive earthworm and their relative impacts across the state/region and to identify earthworm-free and minimally impacted areas worthy of protection (result 4). Results 1,2 & 4 will provide key information and evidence for the development of regulation recommendations/policies to respond to early detection of incipient invasions of new invasive

earthworm species that have begun to appear in adjacent states but are not yet detected or established in the state (result 3). Anticipated results and outcomes include a publication summarizing the in-state and interstate risk assessment of the vectors of invasive earthworms spread; a publication of the results of the testing of the effectiveness of management recommendations; a plan for regulatory response by various governmental agencies for early detection of non-established invasive earthworms in the state; public education and conference presentations of our research and results; All distributional data will be summarized in a map (GIS layers) showing the know earthworm distributions and levels of impacts for the state.

III. PROGRESS SUMMARY AS OF

IV. OUTLINE OF PROJECT RESULTS:

Result 1: Risk-Assessment of Vectors of Earthworm Introduction

Description:

In contrast to the traditional approach of species-based risk assessments, we propose to identify, describe and quantify the potential vectors of in-state spread of established earthworm species and of interstate transport and introduction of non-established earthworm species (i.e. intentional and unintentional transport of earthworms through compost, mulch, soils and fishing bait), including field-based measures of earthworm species and relative abundance present in each vector.

This will be done in a 2 step process beginning in 2009 and completed in 2010. Preliminary sampling of various in-state and interstate vectors will be conducted in summer and fall 2009 to provide an initial indication of the relative importance of different vectors and to identify any obstacles that need to be overcome in order to adequately assess their level of risk. From the preliminary sampling and analysis in 2009, more comprehensive and/or targeted sampling of the most important vectors of earthworms spread will be conducted in spring, summer & fall 2010.

A manuscript will be submitted for publication in a peer-reviewed professional journal, such as Biological Invasions, summarizing and reporting the research conducted under result 1 of this project. The delay between the 4th update and final report of this result provides adequate time for the peer-review process to be completed and final publication of the submitted manuscript.

Summary Budget Information for Result 1: Trust Fund Budget: \$ 43,268
Amount Spent: \$ 0
Balance: \$ 43,268

Deliverable	Completion Date	Budget
1. Preliminary descriptions and risk assessment of in-state and interstate vectors of earthworm spread	December 30, 2009	Staff \$7972 Data storage \$300 Supplies \$400 Travel \$2656 Total: \$11,328
2. Final descriptions and risk assessment of vectors of earthworm spread	December 30, 2010	Staff \$19,457 Supplies \$400 Travel \$5391 Total: \$25,248
3. Analysis of data and preparation of a report submitted to MDA, DNR and other governmental agencies charged with managing or regulation invasive species to help	June 30, 2011	Staff \$ 6,692 Total: \$6,692

<i>promote the health of our forests. This will also be submitted for publication in a professional peer-reviewed journal (i.e. Biological Invasions)</i>		
---	--	--

Result Completion Date: June 30, 2011

Result Status as of: December 30, 2009

Result Status as of : July 30, 2010

Result Status as of: December 30, 2010

Result Status as of: July 30, 2011

Final Report Summary: June 30, 2012

Result 2: Testing Effectiveness of Management Recommendations

Description:

Management recommendations resulting from previous work in 2008 and further developed through the information provided by Result 1 of this project (i.e. equipment hygiene, public land-use restrictions, bait labeling or restrictions, etc.) will be field tested to determine the cost-benefit and relative effectiveness of different recommendations to actually limit the spread/introduction of different earthworm species.

Rebecca Knowles of the Leech lake Band of Ojibwe Department of Resource Management will provide primary coordination and management these activities including, recruitment, training and supervision of undergraduate interns from the UMD, State colleges and Tribal colleges. Informed by a previous project in 2008 and our preliminary result in 2009 from Result 1, the project partners will collaborate to identify, describe and prioritize a list of management recommendations they want to explicitly test. Sampling methods and protocols will be developed for each and field testing/sampling will be conducted in 2010. For example, if we want to test the effectiveness of logging equipment hygiene on limiting the spread of earthworms; we may collect samples of soil from equipment treads and underbodies and inspect them for earthworms and earthworm egg cocoons before and after implementation of hygiene protocols. This will allow us to quantify the cost vs. benefit based on the actual effects of the management recommendation on earthworm and egg cocoon presence, absence and relative abundance.

A manuscript will be submitted for publication as a General Technical Report summarizing and reporting the research conducted under result 2 of this project. The delay between the 4th update and final report of this result provides adequate time for the peer-review process to be completed and final publication of the submitted manuscript.

Summary Budget Information for Result 2: Trust Fund Budget: \$ 44,046
Amount Spent: \$ 0
Balance: \$ 44,046

Deliverable	Completion Date	Budget
1. <i>Identify & describe the specific management recommendations we will field test for effectiveness</i>	February 30, 2010	Staff \$ 5,351 Total: 5,351
2. <i>Develop sampling protocols for each management recommendation to be tested</i>	June 30, 2010	Staff \$ 8,107 Total: 8,107
3. <i>Conduct field testing/sampling for each</i>	December 30,	Staff \$ 11,378

<i>management recommendation to be tested</i>	2010	Undergraduates \$ 6,867 Data storage \$300 Supplies \$ 800 Travel \$8,047 Total: 27,392
4. General Technical Report: results of testing regional management recommendations	June 30, 2011	Staff \$ 2,946 Publication \$ 250 Total: 3,196

Result Completion Date: *June 30, 2011*

Result Status as of: December 30, 2009

Result Status as of: July 30, 2010

Result Status as of: December 30, 2010

Result Status as of: July 30, 2011

Final Report Summary: June 30, 2012

Result 3: Regulatory Responses to Early Detection of Asian Earthworms

Description:

In cooperation with governmental agencies (including but not limited to DNR, and USFS) and based on results 1 & 2, a plan for regulatory responses will be developed to respond to early detection of earthworm species not already established in the state (i.e. *Amyntas* species) including possible control or eradication measures and monitoring for incipient invasions of new species. These will be summarized in a General Technical Report. The delay between the 4th update and final report of this result provides adequate time for the agency-review and adoption to be completed before the final report.

The project manager and projects partners will also collaborate to present the outcomes of results 1, 2 & 3 at national ecological and/or land managers conferences. Our results will serve as a model for others across the country who are also facing the threat of invasive earthworms.

Summary Budget Information for Result 3: Trust Fund Budget: \$ 2,462
Amount Spent: \$ 0
Balance: \$ 2,462

Deliverable	Completion Date	Budget
1. Technical Report: cooperative regulatory response procedures	October 30, 2011	\$ 1470
2. Meet with 2-3 regulatory agencies in the development of the technical report.	December 30, 2011	\$ 992

Result Completion Date: *December 30, 2011*

Result Status as of: December 30, 2009

Result Status as of (*Insert Date of Second Update Report*): July 30, 2010

Result Status as of (*Insert Date of Third Update Report*): December 30, 2010

Result Status as of (*Insert Date of Fourth Update Report*): July 30, 2011

Final Report Summary: June 30, 2012

Result 4: Identify Priority Areas for Protection

Description:

A comprehensive and coordinated 3 year effort involving research and educational institutions, governmental agencies, non-governmental organizations and citizen science will inform and involve diverse stakeholders to identify earthworm-free and minimally invaded areas of the state/region in order to prioritize protection efforts and provide rapid detection and response for new species introductions. This component is critical for agencies and project partners to effectively move forward with actions recommended in Results 1-3.

Summary Budget Information for Result 4: Trust Fund Budget: \$ 60,224
Amount Spent: \$ 0
Balance: \$ 60,224

Deliverable	Completion Date	Budget
1. <i>Updates of Great Lakes Worm Watch and National Institute for Invasive Species Science earthworm survey protocols and online data collection system customized for various potential users/stakeholders.</i>	November 30, 2009	Staff \$ 21,050 Total: \$21,050
2. <i>Host a minimum of 36 training workshops (10-14 annually) and regular web casts with collaborators and stakeholder groups to actively support citizen-based earthworm survey activities throughout the state</i>	December 30, 2011	Staff \$ 23,250 Undergraduates \$ 6,891 Data storage \$300 Supplies \$ 150 Travel \$2,169 Express mail \$150 Total: \$ 32,910
3.a. <i>GIS data layer indicating earthworm-free, minimally invaded, moderately invaded and heavily invaded areas of the state</i> 3.b. <i>GIS data layer of the known/estimated distributions of all earthworm species documented in the state</i>	June 30, 2012	Staff \$ 4,547 Lab fees \$ 800 Total: \$ 5,347
4. <i>peer-review publication</i>	June 30, 2012	Staff \$ 667 Publication \$ 250 Total: \$917

Result Completion Date: June 30, 2012

Result Status as of: December 30, 2009

Result Status as of: July 30, 2010

Result Status as of: December 30, 2010

Result Status as of: July 30, 2011

Final Report Summary: June 30, 2012

V. TOTAL TRUST FUND PROJECT BUDGET:

Personnel: \$ 107,510

Contracts: \$ 19,135

Equipment/Tools/Supplies: \$ 2,650

Acquisition, including easements: \$ 0

Travel: \$ 19,255

Other: \$ 1,450

TOTAL TRUST FUND PROJECT BUDGET: \$ 150,000

Explanation of Capital Expenditures Greater Than \$3,500: none

VI. PROJECT STRATEGY:

A. Project Partners:

Partners who will receive funds through this project include:

- 1) Rebecca Knowles **Leech Lake Band of Ojibwe Division of Resource Management**, Ecologist – will receive \$19,135
- 2) George Host, **The Natural Resources Research Institute, University of Minnesota Duluth GIS lab**, Senior Research Scientist and GIS lab coordinator – will receive \$3,889

Partners who will NOT receive funds include:

- 1) Andy Holdsworth, **MN Department of Natural Resources**, Science Policy Division
- 2) Ann Pierce, **MN Department of Natural Resources**, Terrestrial invasive species coordinator
- 3) Jim Barott, **Chippewa National Forest**, Soil Ecologist
- 4) David Andow, **University of Minnesota**, Distinguished McKnight University Professor, Department of Entomology
- 5) Jim Graham, **The National Institute of Invasive Species Science, U.S.G.S. & Colorado State University**, Fort Collins Colorado –Research Scientist;
- 6) Catherine Jarnevich, **The National Institute of Invasive Species Science, U.S.G.S. & Colorado State University**, programmer
- 7)

B. Project Impact and Long-term Strategy:

The results of this project will fill large gaps in knowledge about 1) the risks associated with different vectors of spread for invasive earthworms such as fishing bait, vermicomposting and the movement of soils, mulch and compost; 2) what different management practices, regulatory responses and educational efforts can do to prevent further spread, 3) and what areas of the state should have the highest priority for protection. With the risk assessments in hand we can readily move towards developing highly effective strategies for limiting the spread of established earthworms and preventing introductions of species not yet present in the state, thereby protecting native forests resources from future aesthetic, biologic and economic impacts. Specifically, native plant populations, tree seedling regeneration, habitat for forest birds, amphibians and small mammals will be protected. We also expect to help limit the spread of many of the most destructive invasive plant species such as buckthorn and garlic mustard which appear to be facilitated by earthworm invasions. The results will be applicable to the state as a whole, since earthworm invasions are occurring statewide, and specifically to the hardwood forested ecosystems where large impacts have already been documented. In addition, we will provide the first coordinated data collection effort in the prairie regions and conifer dominated forests of MN. These results will be broadly applicable to the previously earthworm-free, cold-temperate regions of North America and the Eastern Deciduous Forest Biome of North America, where invasive earthworm invasions are occurring. The technology and information infrastructure created with the National Institute for Invasive Species Science (NISS) will be available for use by others continent-wide and lays the foundation for the development of an accessible and

comprehensive system to involve professionals and citizens in long-term monitoring and rapid response to invasive species invasions (see www.citsci.org).

C. Other Funds Proposed to be Spent during the Project Period:

1) MN Coastal Program Grant – “Exotic earthworm invasions: integrated research and education to achieve natural resource protection in North Shore State parks”, grant award \$46,065. (see “AttachmentB.xls”)

2) University of Minnesota - Undergraduate Research Opportunities Grant – “Testing Educational Effectiveness of an “*Invasive Earthworm Disposal*” Message in our North Shore, State Parks”, student - Nicole Vander Heiden, grant award \$1,700 (see “AttachmentC.doc”)

Potential: USDA – CREES Invasive Species grant program, grant proposal has been cleared for submission, funding request for 3 year project is expected to be ~ \$500,000

D. Spending History:

National Forest Foundation - “**Regional Assessment And Proposed Actions To Address Non-Native Earthworm Invasion Threats To Northern Forests Of The Great Lakes Region.**”, award amount \$4,999

No previous trust fund dollars have been spent on this project.

VII. DISSEMINATION:

The project will enhance and expand the existing web sites of Great Lakes Worm Watch < <http://www.greatlakeswormwatch.org> > and the Citizen Science website of the National Institute of Invasive Species Science < <http://www.citsci.org> >, providing access to information and all results of this project.

We plan on presenting our results at a minimum of 3 national meetings and producing 4 peer-reviewed publications through the project. that will provide during and after the project period. A book may be published at the end of the six-year project.

VIII. REPORTING REQUIREMENTS: Periodic work program progress reports will be submitted not later than December 30, 2009. A final work program report and associated products will be submitted between June 30 and August 1, 2012 as requested by the LCCMR.

See the intended reporting dates under each result above.

IX. RESEARCH PROJECTS:

Attachment A: Budget Detail for 2009 Projects - Summary and a Budget page for each partner (if applicable)																	
Project Title: <i>Prevention and Early Detection of Asian Earthworms and Reducing the Spread of European Earthworms.</i>																	
Project Manager Name: <i>Cindy Hale</i>																	
Trust Fund Appropriation: \$ 150,000																	
1) See list of non-eligible expenses, do not include any of these items in your budget sheet																	
2) Remove any budget item lines not applicable																	
2009 Trust Fund Budget - Result 1	Result 1 Budget:	Amount Spent (date)	Balance (date)	2009 Trust Fund Budget-Result 2	Result 2 Budget:	Amount Spent (date)	Balance (date)	2009 Trust Fund Budget-Result 3	Result 3 Budget:	Amount Spent (date)	Balance (date)	2009 Trust Fund Budget - Result 4	Result 4 Budget:	Amount Spent (date)	Balance (date)	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	Risk-Assessment of Vectors of Earthworm Introduction			BUDGET ITEM	Testing Effectiveness of Management Recommendations			BUDGET ITEM	Regulatory Responses to Early Detection of Asian Earthworms			BUDGET ITEM	Identify Priority Areas for Protection				
PERSONNEL: wages and benefits				PERSONNEL: wages and benefits <i>(List individual names, amount budgeted and)</i>				PERSONNEL: wages and benefits <i>(List individual names, amount budgeted and)</i>				PERSONNEL: wages and benefits <i>(List individual names, amount budgeted and)</i>					
Cindy Hale, project manager- years 1&2 @ 5% annual salary & fringe (project total \$26,574)	6,933	0	6,933	Cindy Hale, project manager- years 2 &3 @ 5% annual salary & fringe	7,351	0	7,351	Cindy Hale, project manager- years 3 @ 2% annual salary & fringe	1,470	0	1,470	Cindy Hale, project manager- all 3 years - 5% annual salary & fringe	10,820	0	10,820	26,574	26,574
George Host - total of year 1 support @ 1% over 2 year period - experimental design and GIS support (project total \$3,889)	1,258	0	1,258	George Host - total of year 1 support @ 1% over 2nd & 3rd years of project - experimental design and GIS support	1,296	0	1,296	George Host	0	0	0	George Host - year 3 @ 1% consulting, GIS support, manuscript preparation	1,335	0	1,335	3,889	3,889
Gerry Sjerven (project total \$6,777)	0	0	0	Gerry Sjerven	0	0	0	Gerry Sjerven	0	0	0	Gerry Sjerven - GIS specialist, 3% for entire grant period (3 years)	6777	0	6777	6,777	6,777
Jane Reed (project total \$1,871)	0	0	0	Jane Reed	0	0	0	Jane Reed	0	0	0	Jane Reed - Website development, 2% for 2 years	1871	0	1871	1,871	1,871
NRRI Junior Scientist (to be named) - 2 years @ 25% annual salary & fringe of \$28,000/year + 32.7 fringe (project total \$47,289)	18,578	0	18,578	NRRI Junior Scientist (this effort and \$ moved to contract - professional services)	0	0	0	NRRI Junior Scientist	0	0	0	NRRI Junior Scientist (to be named) - 2 years @ 25% annual salary & fringe of \$28,000/year + 32.7 fringe	28,711	0	28,711	47,289	47,289
Undergraduate field/lab staff - 25% for academic year 09-10 and 50% for summer 2010, based on \$16,640 annual salary (\$8/hr x 2080 hrs), no fringe (project total \$21,100)	7,352	0	7,352	Undergraduate field/lab staff - 25% for academic year 09-10 and 50% for summer 2010, based on \$16,640 annual salary (\$8/hr x 2080 hrs), no fringe	6,867	0	6,867	Undergraduate field/lab staff	0	0	0	Undergraduate field/lab staff - 25% for academic year 09-10 and 50% for summer 2010, based on \$16,640 annual salary (\$8/hr x 2080 hrs), no fringe	6,891	0	6,891	21,110	21,110
Contracts				Contracts				Contracts				Contracts					
Professional/technical (project total \$19,135)	0	0	0	Professional/technical - Rebecca Knowles, Leech Lake Band of Ojibwe Department of Resource Management, 30% time (salary & fringe) for 1 year	19,135	0	19,135	Professional/technical	0	0	0	Professional/technical (with whom?, for what?)	0	0	0	19,135	19,135
Office equipment & computers - project specific data storage (project total \$ 900)	300	0	300	Office equipment & computers - project specific data storage	300	0	300	Office equipment & computers	0	0	0	Office equipment & computers - project specific data storage	300	0	300	900	900
Supplies: sampling supplies: mustard for earthworm sampling, baggies, vials, preservation fluids, coolers, ice, misc. (project total \$1,700)	800	0	800	Supplies: sampling supplies: mustard for earthworm sampling, baggies, vials, preservation fluids, coolers, ice, misc.	800	0	800	Supplies (list specific categories):	0	0	0	Supplies (list specific categories): sampling supplies: mustard for earthworm sampling, baggies, vials, preservation fluids, coolers, ice, misc.	150	0	150	1,750	1,750
Travel expenses in Minnesota: (project total \$19,255) 1) Field staff will be reimbursed at actual costs since they will be traveling extensively, lodging and meals may be provided in some locations by collaborators and they may be camping in remote locations. Estimated need for 38 days travel at per diem rates (lodging \$70/day + M&IE \$39/day = \$109/day) 2) 55 days of NRRI vehicle use (\$10/day) and 6100 miles @ \$0.55/mile	8,047	0	8,047	Travel expenses in Minnesota: 1) Field staff will be reimbursed at actual costs since they will be traveling extensively, lodging and meals may be provided in some locations by collaborators and they may be camping in remote locations. Estimated need for 38 days travel at per diem rates (lodging \$70/day + M&IE \$39/day = \$109/day) 2) 55 days of NRRI vehicle use (\$10/day) and 6100 miles @ \$0.55/mile	8,047	0	8,047	Travel expenses in Minnesota: 1) mileage for meetings: 5 days of NRRI vehicle use (\$10/day) and 721 miles @ \$0.55/mile 2) lodging & meals for meetings: estimated 5 days travel (lodging \$70/day + M&IE \$39/day = \$109/day)	992	0	992	Travel expenses in Minnesota: 1) Program staff will be reimbursed at actual costs since they will be traveling extensively, lodging and meals will be provided in many locations by workshop hosts, etc. - Estimated need for 10 days travel at per diem rates (lodging \$70/day + M&IE \$39/day = \$109/day) 2) 10 days of NRRI vehicle use (\$10/day) and 6100 miles @ \$0.55/mile	2,169	0	2,169	19,255	19,255
Other (project total \$1,450)	0	0	0	Other: publication costs associated with General Technical Report	250	0	250	Other: publication costs associated with General Technical Report	0	0	0	Other: 1) lab fees -NRRI GIS lab user fees (yrs 1&2 \$300 each and yr 3 \$200) 2) express mail (\$50 in each year) 3) publication costs for peer-reviewed journal article (\$250)	1,200	0	1,200	1,450	1,450
COLUMN TOTAL	\$43,268	\$0	\$43,268	COLUMN TOTAL	\$44,046	\$0	\$44,046	COLUMN TOTAL	\$2,462	\$0	\$2,462	COLUMN TOTAL	\$60,224	\$0	\$60,224	\$150,000	\$150,000