

**Environment and Natural Resources Trust Fund  
2010 Request for Proposals (RFP)**

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**LCCMR ID: 116-D**

**Project Title:**

Integrated Management Systems for Invasive Herbaceous Plants

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**LCCMR 2010 Funding Priority:**

D. Invasive Species

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**Total Project Budget: \$** \$500,000

**Proposed Project Time Period for the Funding Requested:** 3 years, 2010 - 2013

**Other Non-State Funds: \$** \$0

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**Summary:**

We will develop long-term management for Canada thistle on MnDOT lands through integrated research on biofuel production, weed seed banks, and native plants resistance to reinvasion by Canada thistle.

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**Name:** Roger Becker

**Sponsoring Organization:** U of MN

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St. Paul MN 55108

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**Fax:** (612) 625-1268

**Web Address:** \_\_\_\_\_

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**Location:**

**Region:** Statewide

**County Name:** Pope, Redwood, Renville, Rock, Sibley, Stearns, Stevens, Swift, Todd, Traverse, Wadena, Watonwan, Wilkin, Yellow Medicine

**City / Township:**

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|                      |                  |                  |
|----------------------|------------------|------------------|
| _____ Knowledge Base | _____ Broad App. | _____ Innovation |
| _____ Leverage       | _____ Outcomes   |                  |
| _____ Partnerships   | _____ Urgency    | _____ TOTAL      |

## MAIN PROPOSAL

### PROJECT TITLE: Integrated Management Systems for Invasive Herbaceous Plants

#### I. PROJECT STATEMENT.

##### 2010 LCCMR Funding Priority D. 3 and 4.

**Why?** The need exists to improve current management strategies for invasive plant species on MnDOT managed lands. For example, although substantial MnDOT resources have been expended over the last 50 years to manage Canada thistle (*Cirsium arvense* [L.] Scop), this primary noxious weed remains the most problematic invasive plant species on Minnesota roadsides and threatens to invade associated agricultural, native, and other lands. In a recent survey of Canada thistle populations on the road rights-of-way (ROWs) of MnDOT District 4, we found approximately 4.0 acres infested with Canada thistle per mile of roadway for a total of about 5,000 acres that required management each year with expensive mowing and herbicide treatments. Previous MnDOT supported work on wind dispersal of seed clarified the need to control existing populations and localized seed banks. We propose to develop a new, integrated systems approach to management of Canada thistle on MnDOT managed land. **Goals.** The goal of this project is to design, develop and evaluate a unique systems approach to the management herbaceous invasive plants using Canada thistle as the model system. **How?** We will accomplish this by determining 1.) what roadside vegetation management will optimize biofuel production and suppression of Canada thistle, 2.) the role of seed banks in reinvasion of Canada thistle, and 3.) the ability of native plant functional group mixtures to resist reinvasion of Canada thistle.

#### II. DESCRIPTION OF PROJECT RESULTS

##### Result 1. Design roadside vegetation management systems for the control of Canada thistle and the production of biomass for renewable energy. **Budget: \$ 166,400**

We will establish roadway research sites to measure biomass productivity and to evaluate the impact of biomass harvesting on the efficacy of Canada non-chemical and chemical management. We hypothesize that combinations of repeated biomass harvesting integrated with spring or fall herbicide treatments will dramatically improve long-term Canada thistle control. Experiments will be initiated in 2010 and repeated in 2011.

##### Result 1 Deliverables

1. Measure biomass production on road rights-of-way at 15 sites in each of the four eco-zones of a MnDOT District.
2. Measure the impact of biomass harvests alone on Canada thistle infestations.
3. Measure the impact of biomass harvests on the efficacy of additional Canada thistle management.

##### Completion Date

Interim report completed  
December 2010 and  
December 2011.  
Project completed  
June 30, 2012.

##### Result 2. Design and evaluate non-chemical and chemical methods to reduce invasion of Canada thistle from the soil seed bank. **Budget: \$ 165,650**

We will determine the role that the soil seed bank plays in the redevelopment of Canada thistle patches following mowing and the application of post emergence herbicide treatments. We hypothesize that Canada thistle seed plays an important role in the redevelopment of Canada thistle patches following any management treatment. We will evaluate high temperature burn treatments and a series of preemergence and post emergence herbicide treatments designed to reduce the reinvasion of Canada thistle from the soil seed bank. These treatments will be applied to Canada thistle patches previously mowed or treated with initial post emergence herbicides to control the existing stands. Canada thistle reinvasion control treatments will be initiated in 2010 and repeated in 2011 with follow-up evaluations required after the initial funding cycle in 2012.

## Result 2 Deliverables

1. Measure the efficacy of high temperature burn treatments on the reinvasion of Canada thistle from the soil seed bank following both non-chemical and chemical treatments.
2. Measure the efficacy of preemergence and post emergence herbicides treatments on the reinvasion of Canada thistle from the soil seed bank following both non-chemical and chemical treatments.

## Completion Date

Interim report completed December 2010 and December 2011. Project completed June 30, 2012.

## Result 3. Determine the ability of native prairie plant functional group mixtures to resist invasion by Canada thistle.

**Budget: \$ 167,950**

We will determine the role of native plant competition on the reinvasion of Canada thistle populations following management treatments. We will evaluate native plant functional group mixtures for effectiveness in reducing the reestablishment of Canada thistle from seed and root buds following biomass harvest, and other chemical and non-chemical treatments. We hypothesize that different native prairie grass, forb, and legume functional groups differentially suppress Canada thistle regrowth when integrated with non-chemical and chemical control treatments. We will also determine the effect harvesting for biofuel may have on native community resistance to invasion.

### Result 3 Deliverables

1. Measure impact of native prairie plant functional group mixtures on the regrowth of Canada thistle following chemical and non-chemical treatments at three roadside sites in each of the eco-zones of a MnDOT District.
2. Measure the impact of biomass harvests on the efficacy of native functional group mixtures ability to resist invasion by Canada thistle.

## Completion Date

Interim report completed December 2010 and December 2011. Project completed June 30, 2012.

## III. PROJECT STRATEGY

### A. Project Team/Partners

**Roger Becker**, Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN will be project manager and provide leadership for herbicide and native plant treatments. **Donald Wyse**, Agronomy and Plant Genetics, University of Minnesota, St. Paul, MN will provide leadership in biofuel production and invasive species management. **John Nieber**, Bioproducts and Biosystems Engineering, University of Minnesota, St. Paul, MN will provide hydrology information to guide treatment decisions. **Roger Moon**, Entomology, University of Minnesota, St. Paul, MN will provide leadership for landscape sampling. **Paul Walvatne**, MnDOT Roadside Vegetation Management Unit Supervisor, St. Paul, MN will coordinate the project in the MnDOT system. **Gary Dirlam**, P.E., D3A Area Maintenance Engineer MnDOT, Baxter, MN will coordinate roadside project activities.

### B. Timeline Requirements

The project will be initiated during the summer of 2010 with the first set of experiments initiated by fall 2010 and then repeated by fall 2011. The follow up treatments will be completed in the 2010 studies by 2011 and by 2012 in the studies initiated in 2011. Since the project is designed to develop treatments that will provide long term control of Canada thistle we will need to evaluate control 1, 2, 3, 5, 7 and 10 years after the treatments have been completed. The costs of the evaluations will be less than the cost of establishing the experiments.

### C. Long-Term Strategy

This project will require additional future investment to evaluate the results of the management systems in years 2, 3, 5, 7 and 10 after completion of the Canada thistle management treatments in this proposal, and to apply sequential treatments for select management strategies if needed. We will submit proposals to the appropriate granting opportunities in MnDOT to support future evaluations of management strategies and to sequentially apply key management treatments if needed.

## Project Budget

Project Budget

### IV. TOTAL PROJECT REQUEST BUDGET (3 Years)

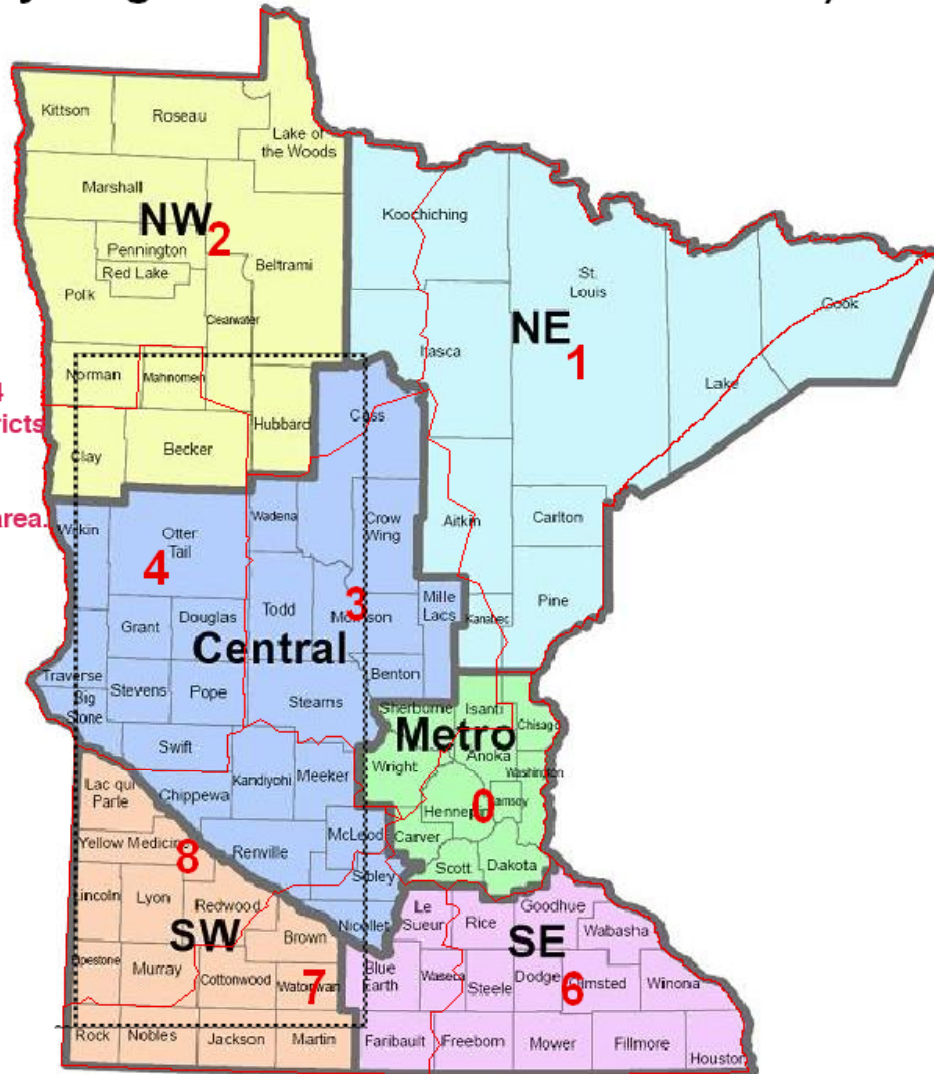
| BUDGET ITEM   | AMOUNT            |
|---|-------------------|
| <b>Personnel: Professional/technical - U of M</b>   | \$482,250         |
| 1 post doc 100% time; \$49,131 salary; \$15,869 [32.3%] fringe x 3 years =                            |                   |
| \$195,000   |                   |
| 1 technician 75% time; \$35,584 salary; \$13,166 [37%] fringe x 3 years =                             |                   |
| \$146,250   |                   |
| 1 graduate student 50% time; \$20,311 salary; \$18,689 fringe x 3 years =                             |                   |
| \$117,000   |                   |
| Student labor; \$10/hr. x 800/hrs.x 3 years = \$24,000  |                   |
| <b>Contracts: /</b>   | \$1,000           |
| Burn crew [to be determined] \$1,000  |                   |
| <b>Equipment/Tools/Supplies:</b>  | \$8,650           |
| No-till specialty drill 16.40/A \$300   |                   |
| Mower 12.75/A \$600   |                   |
| Mow + Chopper/Harvester 12.75 + 56.18/A \$1,000   |                   |
| Certified native plant seed \$3,000   |                   |
| Plot scale \$300  |                   |
| Harvest tools (clippers, blade capable weed wackers, hand scythe, harvest bags, flags, stakes \$3,450 |                   |
| <b>Acquisition (Fee Title or Permanent Easements): /</b>  | N/A               |
| <b>Travel:</b>  | \$8,100           |
| Travel expenses in Minnesota \$8,100  |                   |
| <b>Additional Budget Items:</b>   | N/A               |
| <b>TOTAL PROJECT BUDGET REQUEST TO LCCMR</b>  | <b>\$ 500,000</b> |

### V. OTHER FUNDS

| SOURCE OF FUNDS  | AMOUNT   | Status |
|--|----------|--------|
| <b>Other Non-State \$ Being Applied to Project During Project Period:</b>  | N/A      |        |
| <b>Other State \$ Being Applied to Project During Project Period:</b>      | N/A      |        |
| <b>In-kind Services During Project Period:</b>                             | \$ 9,176 |        |
| 1 % Effort - Roger Becker \$4,119 [salary & fringe @32.2%] over 3 years    |          |        |
| 1% Effort - Donald Wyse \$5,057 [salary and fringe @32.3%] over 3 years    |          |        |
| <b>Remaining \$ from Current Trust Fund Appropriation (if applicable):</b> | N/A      |        |
| <b>Funding History:</b>  | N/A      |        |

# Minnesota (By Region and MnDOT Districts 0-8)

Mn DOT District 4 and parts of Districts 2, 3, 7 and 8 are included in the proposed study area.



## Legend

### ALL-MNDOT\_DISTRICTS\_MN

- BEMIDJI, 2
- BRAINERD, 3
- DETROIT LAKES, 4
- DULUTH, 1
- MANKATO, 7
- METRO, 0
- ROCHESTER, 6
- WILLMAR, 8

### Vita for Roger Becker

**Title:** Extension Agronomist - Weed Scientist  
**Department:** Agronomy and Plant Genetics  
**Address:** University of Minnesota  
411 Borlaug Hall  
1991 Buford Circle  
St. Paul, MN 55108  
**Telephone:** (612) 625-5753 **E mail:** becke003@umn.edu  
**Appointment:** Extension 75% / Research 25%

#### Specific Areas of Responsibility:

Weed management strategies in annual and perennial systems in disturbed and undisturbed habitats. Current projects include management of purple loosestrife in wetlands; garlic mustard and buckthorn in woodlands; and Canada thistle in native prairies. Also prairie establishment, weed management in forages and in processing vegetables, and the environmental impacts of herbicide and non-herbicide weed management systems.

#### Education:

| <u>Degree</u> | <u>Major</u>                               | <u>College/University</u> | <u>Years</u> |
|---------------|--|---------------------------|--------------|
| B.S.          | Agronomy                                   | Iowa State University     | 1972 - 1976  |
| M.S.          | Botany-Plant Physiology                    | Iowa State University     | 1976 - 1978  |
| Ph.D.         | Agronomy-Crop Production<br>and Physiology | Iowa State University     | 1978 - 1982  |

#### Professional Positions:

| <u>Employer</u>         | <u>Dates</u>  | <u>Position</u>                    |
|-------------------------|---------------|------------------------------------|
| Iowa State University   | 1978-1982     | Extension Associate                |
| Monsanto Company        | 1982-1985     | Product Development Representative |
| Monsanto Company        | 1985-1987     | Product Development Associate      |
| University of Minnesota | 1987-1993     | Assistant Professor                |
| University of Minnesota | 1993-1999     | Associate Professor                |
| University of Minnesota | 1999- present | Professor                          |

#### Recent Referred Publications:

- Jordan, N., H. Niemi, S. Simmons, R. Becker, J. Gunsolus, and S. White. 2006. Learning Groups for Implementation of Integrated Weed Management: Principles and Practical Guidelines. Chpt. 25 *In: Handbook of sustainable weed management.* H.P. Singh, D.R. Batish, and R.K. Kohli, eds. The Haworth Press, Inc. ISBN: 978-1-56022-957-5 Hard cover, ISBN: 978-1-56022-956-8 Soft cover. 892 p.
- Jordan, N. H. Niemi-Blissett, S. Simmons, S. White, J. Gunsolus, R. Becker, and S. Damme. 2006. Building a Knowledge Network for Sustainable Weed Management: An Experiment in Public Scholarship. Chpt. 6 *In: Engaging campus and community. The practice of public scholarship in the state and Land-Grant University system.* S.J. Peters, N.R. Jordan, M. Adamek, and T.R. Alter, eds. Kettering Foundation Press. Dayton OH. ISBN: 0923993150. 499 p.
- Katovich, E.J.S., R.L. Becker, and J.L. Bryon. 2003. Winter survival of late emerging purple loosestrife (*Lythrum salicaria*) seedlings. *Weed Sci.* 51:565-568.
- Katovich E.J.S., R.L. Becker, D.W. Ragsdale, and L.C. Skinner. 2008. Growth and Phenology of Three Lythraceae Species in Relation to Feeding by *Galerucella californiensis* and *Galerucella pusilla*: Predicting Ecological Host Range from Laboratory Host Range Testing. *Inv. Plant Sci Management.* 1(2):207-215.