National Fish and Wildlife Foundation – Native Plant Conservation Initiative

Fall 2009, Full Proposal Organization: University of Wisconsin - Madison

Title: **Plant monitoring network for forest and wildlife managers**

Grant Request Information
Total Amount Requested $ 99,174.20
Matching Contributions Proposed $ 146,895.00
Proposed Grant Period 12/15/2009 - 06/30/2011

Project Description
Managers need timely input on shifts in plant distribution & abundance to guide policy. We will design & test a regional long-term monitoring system to provide key data on trends, drivers, & impacts.

Project Abstract
Land and wildlife managers often lack accurate and relevant field data on the broad trends that affect the resources they oversee and how management influences and responds to, these trends. Our goal here is to use research and adaptive monitoring approaches to construct a research and adaptive monitoring network -'RAMNet'- to provide timely and reliable information to land and wildlife managers who confront an increasingly complex and contentious set of issues. Such information is essential for pursuing adaptive management – the use of monitoring data and management experiments to inform management decisions. The project would jump-start a consortium that has already started to coalesce around the need for more regular and sustained monitoring of plant communities and impacts. This consortium includes academic researchers; state, federal, and private land and wildlife managers; and various conservation groups, providing an immediate base of support and audience for the project. This interest and support will also be essential for translating the results of this initial project into the long-term adaptive monitoring program we envision.

Organization and Primary Contact Information

Organization	University of Wisconsin - Madison
Organization Type	Higher Education Institution
Organization Web Address:	www.wisc.edu/
Tax Status Non-profit,	Tax ID 396006492

Primary Contact Dr. Donald M. Waller
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Keywords Conservation Action; Conservation Threat; Land Ownership
Sub-keywords Action - External Capacity Building; Action - Education & Awareness;

Project Location Information

Project Location Description	Upper Midwest / Lake States Region, starting with Wisconsin and Michigan, later extending to Illinois, Iowa, Minnesota, Indiana, & Ohio.
Project Country(ies)	North America - United States
Project State(s)	Wisconsin; Michigan

Project Congressional District(s) All Districts (WI); All Districts (MI)

Full proposal Narrative:

1. **Long-Term Conservation Outcome(s):** Elaborate on the long-term conservation outcome(s) summarized previously in the application; discuss what makes this outcome(s) achievable and important.

   Land and wildlife managers often lack accurate and relevant field data on the broad trends that affect the resources they oversee and how management influences and responds to, these trends. Our goal here is to use research and adaptive monitoring approaches [1] to construct a research and adaptive monitoring network -'RAMNet'- to provide timely and reliable information to land and wildlife managers who confront an increasingly complex and contentious set of issues. Such information is essential for pursuing adaptive management – the use of monitoring data and management experiments to inform management decisions. The project would jump-start a consortium that has already started to coalesce around the need for more regular and sustained monitoring of plant communities and impacts. This consortium includes academic researchers; state, federal, and private land and wildlife managers; and various conservation groups, providing an immediate base of support and audience for the project. This interest and support will also be essential for translating the results of this initial project into the long-term adaptive monitoring program we envision.

   We particularly propose to compare and evaluate several methods used to monitor plant communities and how they are responding to the simultaneous and interacting impacts of **climate change**, pervasive **habitat modification,** shifts in **forest and land management**, and correlated surges in **deer abundance**. These ultimately also affect forest production and related recreational activities.. All of these forces have strong effects on native plant communities, making it essential to evaluate their relative and combined effects *together* within and among land-cover types and regions. This requires both an *extensive* network and *intensive* analyses and comparisons of methods to ensure that the data being collected serve the needs that exist (as we still lack the detailed knowledge needed to chose the best and most efficient monitoring tools). We therefore propose to do a nested series of pilot studies to compare and evaluate techniques and the quality and relevance of data they produce. These results will then be used to design the large-scale integrated plant monitoring network based on methods that will be modular, extendable, and efficient in their use of limited resources. By including students, naturalists, and other 'citizen scientists' in these efforts and by creating simple metrics that can be widely disseminated and understood, we will also broaden public understanding of threats to native plants and the habitats that sustain them. This helps generate interest in the solutions needed to mitigate threats to landscapes that sustain local economies.

   How is this project achievable and important? Our goals are practical, the time is right, and the needs are clear.
   - ✓ Forests in the (upper) Midwest are threatened by climate change, conversion, management activities, deer abundance and interactions among them.
   - ✓ We have already assembled a broad base of public agency, NGO, and academic partners for the project who share a sense of common purpose and appreciate the importance of this project.
   - ✓ Our previous research into the drivers of long-term changes in native plant communities provides a critical and unique foundation for interpreting plant responses to multiple stresses and thus this project.

- ✓ Most of the methods to be compared have been developed already and are simple and practical, yet they have not been applied and compared in a systematic way.
- ✓ Few other projects attempt to grapple with multiple drivers and their interactions.
- ✓ Few efforts are made to assemble and interpret results from multiple studies across a broad geographic scale.
- ✓ The results gained will be of immediate and obvious use to forest and wildlife managers as well as of intrinsic interest to scientists and the public.
- ✓ These results will strengthen the role of science and data in resource management decisions, potentially reducing public controversy.
- ✓ We are seeking to develop and test methods that are efficient, effective, and extendable, providing pilot studies and examples that can quickly propagate to other regions.

2. **Threats and/or Opportunities:** Elaborate on the relationship of threats and/or opportunities to the long-term conservation outcome(s) and describe which of these threats and/or opportunities will be addressed in the project.

Native plant populations are shifting in distribution and abundance in response to multiple factors including **climate change, habitat loss** and **fragmentation,** reductions in **pollinator** populations**,** atmospheric **nitrogen** inputs**,** shifts in forest and land **management, invasions** of exotic plants and earthworms, and **herbivory** by introduced insects and overabundant white-tailed **deer**. Our research for the last 10 years has focused on describing changes in forest understory communities and inferring their probable causes, a project made possible by a uniquely detailed set of baseline data dating back 60 years. These long-term studies reveal strong **declines in native species diversity**, **invasions** of exotic plants and earthworms, and **homogenization** in community composition [2-7]. These declines in plant diversity are ironically most dramatic in two protected state parks. Assessing the relative importance of these stresses and possible interactions among them remains a topic of intense interest and research. [e.g. 3, 4, 6]. We pay particular attention to characterizing the 'signatures' of different kinds of ecological change including both shifts in overall community composition and responses of individual species sensitive to particular kinds of impact [7, 8].

Climates are changing in ways that will boost extinction rates [9]. These changes will occur quickly in north temperate habitats. In the upper Midwest, several of the warmest winters on record occurred in recent years. Aspen trees in the region (the basis for much of the paper pulp industry in the region) have increased their rates of growth by more than 50% over the past 70 years in apparent response to **increased CO_2 levels** [10]. At the same time, several important forest tree species (especially certain conifers) are experiencing widespread **regeneration failures**, with controversy over the cause(s) of these failures [11-19].

At a time when these challenges are growing, forest and wildlife managers are increasingly subject to public criticism and pressure to serve particular constituencies [20-24]. Such outcry and pressures often constrain the decisions they can make and the degree to which they can use their professional expertise and scientific information in their jobs. For example, political pressure from hunting groups has handicapped Wisconsin's DNR Wildlife in its efforts to reduce the state's deer herd. These constraints are particularly troubling in that many forestry and wildlife decisions made now will have impacts for decades, or even centuries, to come. I also participated in a recent review and comparison of forest monitoring methods for the Pennsylvania Game Commission and Bureau of Forestry [25]. An interesting outcome of the Pennsylvania review was the recommendation to start basing deer management decisions on direct measures of impacts on vegetation instead of on estimates of deer density which tend to be controversial, expensive, geographically coarse, and sometimes unrelated to local regeneration failures or other impacts. Under contract with the National Park Service 'Vital Signs' program, we also compared field methods for monitoring long-term shifts in the composition and dynamics of forest plant communities, making recommendations on how to make this program as efficient and informative as possible [26, 27]. A parallel effort in the Northeast recommends including similar key components when monitoring forest ecosystem integrity [28].

Working with these agencies has taught us that geographically dispersed quantitative data on native plant abundance and condition have extraordinary value for land and wildlife managers charged with sustaining the diversity and condition of the natural resources they oversee. Data from the many understory species at many sites over longer periods of time provide a much more complete picture of the nature and extent of ecological change, allowing us to distinguish local patterns and temporary trends from more consistent, long-term trends of greater concern to managers. Such data are particularly valuable for assessing impacts to rarer species, responses to regional trends involving climate change and habitat modifications, and increasing threats posed by weedy plant invasions and deer herbivory. To assess the impacts of these multiple drivers and possible interactions, we propose to monitor plants and these impacts via an integrated network across multiple species and sites. Although the existing national Forest Inventory and Analysis (FIA) system (http://www.fia.fs.fed.us/) provides data on a national grid for forest lands, its focus on trees provides few data to track more diverse (and responsive) understory plants [27].

To serve multiple needs of land and wildlife managers faced with uncertainty and controversies over management, we propose to erect a Research and Adaptive Monitoring Network ('RAMNet'), a cooperative venture to develop and apply a consistent set of plant monitoring methods and protocols across a wide region. The very challenges that create the need for this network also provide a special opportunity to build this consortium at a time when shared needs and a sense of common purpose are bringing us together. RAMNet will join a diverse group of agency, NGO, and academic researchers together to build an active and sustained adaptive monitoring program (see 3. below). This network serves several purposes, namely to:

- Monitor shifts in the distribution and abundance of particular species;
- Infer probable causes of these shifts including climate change, losses of suitable habitat, displacement by invading exotic species, or impacts from pests, pathogens, or herbivory;
- Assess the relative significance of these threats for different plant species and communities;
- Build the capacity for collecting and sharing data among a dispersed group of users;
- Evaluate the relative utility of data derived via different methods and at different scales for tracking various trends and for making management recommendations;
- Provide opportunities for education and outreach on important natural resource issues by encouraging citizen science participation, devising simple metrics of impacts, and providing ways to share data;
- Serve as a pilot or demonstration project for other states and regions across the U.S. by providing modular, extendable, and inexpensive methods for generating and sharing data;

3. **Activities:** Elaborate on the primary activities that will be employed through the grant. Explain how these activities address the threats, opportunities and/or conservation outcome(s) described above. How do these activities relate to established plans (management, conservation, recovery, etc.)?

Background / context. A coalition of public and private partners (see 5.) has coalesced around the shared goal of building an effective and sustained plant monitoring network to serve the multiple needs outlined above. This coalition met in July 2009 to discuss common interests, identify partners, and explore the feasibility of various projects and funding sources. We identified this NFWF program as an ideal enabling grant and endorsed this proposal. We want to use this project to initiate pilot projects, compare and test field methods, and build an effective information and data-sharing network. At the conclusion of this project, we will have the protocols and experience in hand to design and implement the expanded adaptive monitoring network. With demonstrated feasibility, efficiency, and utility, we also expect to attract solid and sustained funding from the agencies and NGO's in need of these data to launch the 'production' version of RAMNet. The following steps lead toward this ultimate goal.

Organization and communication. We will soon convene a second meeting of the consortium that met in July 2009. Our goals at this meeting will be to review our needs and objectives, share concerns, agree on an overall

approach, and focus on how to implement the research and monitoring projects. As the group continues to evolve, we will strive to devise effective ways to share ideas and concerns regularly and openly. To ensure reliability, utility, and trustworthiness of the results, we will insist on regular internal and external review of the research protocols, data, and the interpretations and uses being made of the data. We consider this the essence of adaptive monitoring.

Monitoring. We will first take stock of existing plant inventory and monitoring programs in Wisconsin and the UP of Michigan including the location and condition of plant / vegetation study plots and exclosures and the nature and condition of the data associated with them. This survey will include obvious broad-scale and on-going projects like the USFS's FIA program (http://www.fia.fs.fed.us/) and our own UW-Plant Ecology Laboratory studies (http://www.botany.wisc.edu/waller/Researchpages/50yearsofchange.html). It will also include local intensive plant monitoring activities like the UW-Green Bay long term forest dynamics plot in the Chequamegon-Nicolet National Forest near Wabikon Lake (see Wolf & Howe letter of support). Finally, we will seek information on many of the smaller-scale and more scattered plant monitoring projects that exist, often in association with nature reserves, state natural areas, or biological field stations. For each such study or program, we will enumerate the scale and focus of the study, its location, results and publication to date, the availability and location of the data, and its relevance to this project. We will then enter these data into a shared **database** for our own and others' use.

Research. Our research will first compare a range of field methods and metrics for tracking and identifying the impacts of climate change, invading exotics, and deer impacts on native plant communities. Our goal here is to assess their **efficiency** (the time and effort required to sample a site), the **accuracy** and reliability of the data collected (including statistical power tests to estimate the number of plots / sites required to gain given levels of accuracy), and their **utility** – the information that each response variable is providing and the degree of independence (or correlation) among variables. Less reliable variables or those that are highly correlated with other, less expensive variables will be dropped from further consideration. We will also explore how best to combine data from among the individual sites to draw inferences at larger spatial scales. Knowing the utility, independence, and reliability of individual variables will then allow us to combine these variables into composite metrics that can serve as more integrated, meaningful, and reliable tools for tracking plant community responses to climate change, invasions, and deer impacts. Our ultimate goal will be to devise a set of simple indexes that forest and wildlife managers and the general public can use to track and understand these impacts in an intuitive way.

To attain these goals, we will construct our initial research network using a **hierarchical nested design** with three or more tiers of sampling extent and intensity. That is, sampling and monitoring at the lowest tier will involve the fewest variables and require the least time and expertise to collect data. In fact, protocols at this tier will be designed for 'citizen scientists' – students and teachers, amateur naturalists, and outdoors people – to encourage wide participation and the accompanying savings on costs and opportunities for public education that such programs provide. For example, we might simply score the presence or absence of a few easily identified species or ask observers to track the growth and survival of tree seedlings or herbaceous plants they plant into specific locations. Sampling sites at this tier will be simple and cheap, allowing us to collect data from a great number of sites (and thus opportunities to track spatial variation in plant responses). Sampling at the upper tiers will be more intensive and require more time and greater expertise, but will yield a broader set of potential response variables. Such sampling will likely include more complete and refined quantitative surveys of plant community composition, shifts in tree seedling numbers and size distributions, soil and light conditions, and measures of plant height and reproductive condition. At the top tier, we plan to sample bird and mammal communities at 2-3 sites, including in and near three large (2 ha) exclosures we plan to build in Upper Michigan. Our more intensive sampling may extend to include estimates of plant growth rates and invertebrate and mammal density or activity. We might also plant tree seedlings or herbaceous species of known (and perhaps identical) genetic stock at some sites to monitor the growth and survival over time of these 'phytometers.'

Such an experiment would allow sensitive assays of how forest types and regions may differ in habitat suitability. Analyses of patterns of growth and survival across sites could give clues regarding the causes driving this variation.

Subsequent **analyses of the data** generated will then allow us to evaluate how adequate and suitable each type of data is for our purposes and thus the suitability of different monitoring programs. The nested nature of our design will allow us to explore how inter-correlated the different variables are and whether simpler, easier-to-collect data can be substituted for more involved and thus expensive sampling. We will also use our data to assess how well existing data sets like those assembled routinely by the USFS's FIA program can be used to track the key variables we identify as important. We will also explore how the data can be combined across variables and across sites to devise more reliable or informative composite variables. For example, it may be that a sparse network of intensively sampled sites could add significant value to the overall monitoring program by adding precision or by correcting for geographic variation in some key parameter. Finally, we will be in a position to validate the quality and utility of the data collected by citizen scientists relative to that collected by professional biologists.

This information will be crucial for providing a firm **scientific foundation** for the expanded, more permanent **RAM Network** which we envision designing as the last stage of this project (in 1.5–2 years). The results we obtain from our research activities will allow us to design an efficient overall network with a minimal, but sufficient, number of sites and a suitable intensity of sampling. If differences among habitat types and regions are strong, we may recommend establishing a stratified set of monitoring sites. We will also be able to devise an efficient set of protocols capable of generating reliable field data for the variables with the most value. Of course, any such design and results will be provisional, subject to further revision based on new research, additional monitoring results, and feedback from managers. This is the essence of the **adaptive monitoring** cycle. That is, we will work to design future phases of the RAMNetwork even more capable of tracking native plant responses and the relative degree of threat posed by climate change, deer impacts, habitat conditions, and other threats to native plants across the region. We will also have a proven template for propagating this type of network to other states and regions.

Data tools and sharing. Key elements of this project depend on having a dedicated website that will serve a range of functions. First, we need to provide up-to-date protocols and educational materials to a wide set of field observers, including citizen scientists. Second, we need a way for observers to upload and check the data they collect. Third, researchers and managers need to be able to compare and share data across the web among multiple sites. Finally, to be maximally useful and to provide a template for the eventual 'production' RAMNet, we need to synthesize and share the results of these monitoring activities with managers in a timely and maximally informative manner. Fortunately, the PI's Department's IT staffperson has strong skills for this project and has expressed enthusiasm and support for the project. He will dedicate significant time to the project (not shown in the match).

Education and outreach. As noted above, education and outreach activities are built into the core of this project. We see 'citizen scientists' including school teachers, their students, and school forests as key partners in our activities, both for the volunteer labor they will contribute to this project and for the opportunities they present for sharing the concerns and results of this project with a large and important audience. The protocols, results, and accompanying educational materials we develop will be widely distributed via the web site, increasing the visibility of the program to other parties and regions. In addition, the UW Extension Wildlife Specialists will incorporate results into landowner education/stewardship programs such as the Coverts Project, Master Woodland Stewards, Woodland School, and others as appropriate.

4. **Outcomes and Indicators:** Describe the general monitoring approach that will be used to assess progress on one or more of the indicators presented previously in the application. Please note any challenges or limitations you anticipate in conducting this monitoring or the interpretation of anticipated results.

We have several complementary objectives with distinct indicators of success. In terms of **science**, our success will be measured in the quality and quantity of data generated and the insights that these data provide over time, measured in terms of papers and their impact. For **managers**, the project's success will be measured in terms of how the consortium comes together, their ability to identify common goals and data needs, the rate at which the network expands, and the relevance of the data generated for management and restoration. In terms of **information sharing**, the project's success can be assessed in terms of the website we will build to share protocols, data, maps, and results, and how the shared data are used. The **educational** value of the project can be assessed in terms of increases in public participation and awareness, news stories about the project, and possible policy impacts.

5. **Project Team:** List key individuals and describe their qualifications relevant for project implementation.

We have organized a highly qualified team of individuals to achieve these objectives. Heading up the research efforts will be *PI* **Donald Waller** (Professor or Botany and Environmental Studies at UW-Madison), *co-PI* **David Ewert** (The Nature Conservancy's Director of Conservation Science in the Great Lakes region), *post doctoral Research Associate* **Sarah Johnson** (Ph.D. candidate, UW-Madison), and a *graduate Research Assistant* that will be selected upon receiving funds. RAMnet has already received written and verbal commitments of time and money from many consortium members, including professors **Robert Howe** and **Amy Wolf** (UW-Green Bay). Academic members from UW-Madison's Forest & Wildlife Ecology Department include **Tim Van Deelen** and **Scott Craven** (also a UW-Extension Wildlife Specialist). Participants from federal agencies include **Jeanne Higgins** (supervisor of Chequamegon-Nicolet National Forest) along with her very knowledgeable staff. The Chequamegon-Nicolet National Forest has just been identified as a model forest for climate change research into adaptation and mitigation strategies and has thus initiated a new "Climate Change Response Network" project. **Jonathan Gilbert** (wildlife biologist) is working with us (BIA-Great Lakes Indian Fisheries and Wildlife Commision), as well as ecologists from the National Park Service's Great Lakes Inventory & Montitoring Network. Wisconsin's **Department of Natural Resources** is well-represented in our consortium with participation from their Forestry, Wildlife, Parks, Endangered Resources, and Science Support Services branches. Participants also include **John Schwarzmann** (Forest Supervisor) of Wisconsin's Board of Commissioners of Public Lands and **Jane Severt** (Executive Director) of Wisconsin County Forests Association.

We have also begun to work with private partners from the Wisconsin Woodland Owners Association, the Wisc Native Plant Society, TNC, Wisconsin Wetlands Association (Becky Abel**,** Executive Director), and wildlife societies such as Whitetails Unlimited. We also work closely with scientific partners like the National Center for Invasive Species Science (Fort Collins), UW's Center for Restoration Ecology, and educational partners including the Midwest Invasive Plants Network and (on climate change) the National Phenology Network (based in Milwaukee). We held an initial meeting in July, and are now requesting formal support and matching funding from these partners for this project. Our project also fits well with projects currently being pursued by other agencies.

6. **Other (Optional):** Provide any further information important for the review of this proposal.

In soliciting the Sand County Foundation for interest in and support for this proposal, I got this reply: "We wish the initiative success. . . Unquestionably over-abundant deer are one of the great perils to native plant diversity and population integrity in the Great Lakes states. . . <but> I would have to be convinced that a sea change had taken place among the interests that really call the shots on Wisconsin deer management to be willing to commit SCF resources of time or money in this state." Achieving this sea change – injecting more science into management – represents, of course, a fundamental goal of this project.

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Budget: Easygrants ID: 19483

National Fish and Wildlife Foundation – Native Plant Conservation Initiative Fall 2009, Full Proposal (Abbreviated)
Title: Plant monitoring network for forest and wildlife managers
Organization: University of Wisconsin - Madison

	Units	Cost Per Unit	Total
Salaries and Benefits			
Post-doctoral Research Associate	1	$54,458.00	$54,458.00
Graduate Reseach Assistant	1	$7,721.00	$7,721.00
student hourly assistance	1360	$9.32	$12,675.20
Total Salaries and Benefits			$74854.20
Post-doc:82% of $35,000/year for 18 months + 26.5% fringe rate Grad RA: 3 mos x $2019/mo + 27.5% fringe benefits Student Hourly: 1360 hrs x $9/hr + 3.5% fringe			
Equipment			
Total Equipment			$0
Contractual Services			
co-PI Ewert salary	5	$2,234.00	$11,170.00
Total Contractual Services			$11170.00
Ewert salary: $1596 / wk x 5 weeks + 40% fringe			
Supplies and Materials			
Fencing and supplies	1	$5,050.00	$5,050.00
Tree and herb seedlings	1	$900.00	$900.00
Total Supplies and Materials			$5950.00
Fencing for deer exclosures; field survey supplies (flags, tapes, frames, etc.); xerox & computer supplies; Seedlings are for transplant experiments			
Printing			
Total Printing			$0
Travel			
Vehicle rental	60	$40.00	$2,400.00
Per diem	80	$60.00	$4,800.00
Total Travel			$7200.00
Car rental: 60 days @ $40/day Per diem: 80 person-days x $60/day (extensive field work)			
Other			
Total Other			$0
Budget Grand Total			$99174.20

Matching Contributions

Amount:	$20,585.00
Type:	In-kind
Status:	Received
Source:	The PI + the institution (Univ. of Wisconsin)
Source Type:	Non-Federal
Description:	The PI & UW commit 10% of Waller's time for 9 mos to this project + $3853 fringe (38.5%) + 48.5% foregone indirect costs on this.

Amount:	$3,000.00
Type:	Cash
Status:	Pledged
Source:	Univ. of Wisconsin - Green Bay
Source Type:	Non-Federal
Description:	Undergraduate student hourly assistance, via Drs. Howe & Wolf.

Amount:	$3,410.00
Type:	In-kind
Status:	Pledged
Source:	Univ. of Wisconsin - Green Bay
Source Type:	Non-Federal
Description:	Salary + fringe for Dr. R. Howe for 1.5 weeks committed to project.

Amount:	$19,302.00
Type:	Cash
Status:	Pledged
Source:	Univ. of Wisconsin - Graduate School + College (L&S)
Source Type:	Non-Federal
Description:	9 mos. of graduate research assistant: $15,139 salary + $4163 fringe

Amount:	$2,000.00
Type:	In-kind
Status:	Pledged
Source:	Univ. of Wisconsin - Green Bay
Source Type:	Non-Federal
Description:	Support for web resource development - staff time.

Amount:	$8,640.00
Type:	In-kind
Status:	Application Submitted
Source:	various state agencies and regional NGOs
Source Type:	Non-Federal
Description:	To support paid and unpaid student interns working with state agencies and local and NGO's on this project.

Amount:	$1,000.00
Type:	Cash
Status:	Received
Source:	Diversity Inventory Group

Source Type:	Non-Federal
Description:	Grant for travel, materials and supplies associated with this project. DIG is a small non-profit charity.
Amount:	$1,500.00
Type:	Cash
Status:	Intend to Apply
Source:	vendors, schools, nature centers, etc.
Source Type:	Non-Federal
Description:	to purchase materials for field surveys and deer exclosures.
Amount:	$1,500.00
Type:	In-kind
Status:	Intend to Apply
Source:	vendors, schools, nature centers, etc.
Source Type:	Non-Federal
Description:	for labor and materials to support field surveys & fenced exclosures.
Amount:	$2,000.00
Type:	Cash
Status:	Application Submitted
Source:	Wisconsin DNR &/or Bur Commissionor Public
Source Type:	Lands &/or County Forests
Description:	Non-Federal To support field surveys and construction of deer exclosures.
Amount:	$12,500.00
Type:	Cash
Status:	Pledged
Source:	The Nature Conservancy (Michigan)
Source Type:	Non-Federal
Description:	Key contribution to support construction & maintenance of 3 large (2 ha) fenced deer exclosures on private land. Size necessary to allow effects on birds & mammals to be evaluated.
Amount:	$48,097.00
Type:	In-kind
Status:	Received
Source:	Univ. of Wisconsin - Madison
Source Type:	Non-Federal
Description:	Unrecovered indirect costs incurred in association with this project (48.5% of $99,169)
Amount:	$2,000.00
Type:	In-kind
Status:	Application Submitted
Source:	Wisconsin DNR &/or Bur Commissionor Public
Source Type:	Lands &/or County Forests
Description:	Non-Federal Tree seedlings to use as phytometers and in conjunction with exclosures.

Amount:	$4,000.00
Type:	Cash
Status:	Application Submitted
Source:	US Forest Service &/or BLM &/or GLIFWC
Source Type:	Federal
Description:	For field supplies and fencing materials and maintenance for exclosures.

Amount:	$17,361.00
Type:	In-kind
Status:	Received
Source:	Univ. of Wisconsin - Madison
Source Type:	Non-Federal
Description:	Unrecovered indirect costs for Research Assistant salary + fringe (48.5%) + $8000 tuition remission.

Total Amount of Matching Contributions	$146,895.00

Letters of Support received from:

Person:	Representing:	Affiliation
Dave Ewert, Director of Conservation Science, Great Lakes Program, TNC	collaborator	The Nature Conservancy
Tim Van Deelen Asst. Professor	collaborator	Univ. of Wisconsin – Madison, Department of Forest & Wildlife Ecology
Robert Howe & Amy Wolf Prof. & Assoc. Prof.	collaborator	Univ. of Wisconsin – Green Bay Department of Natural and Applied Sciences
Scott Craven Professor and Extension Wildlife Specialist	collaborator	Univ. of Wisconsin – Madison, Department of Forest & Wildlife Ecology
David Siebert Division Administrator, Enforcement and Science, Wisconsin DNR	consortium partner	Wisconsin Department of Natural Resources (DNR) – Science Division
Signe Holtz Director, Bureau of Endangered Resources, DNR	consortium partner	Wisconsin DNR - Bureau of Endangered Resources
Keith Warnke Big Game Biologist	consortium partner	Wisconsin DNR – Bureau of Wildlife Management
Jeanne Higgins Supervisor, CNNF	consortium partner	Chequamegon-Nicolet National Forest, USDA Forest Service
Jonathan Gilbert, Wildlife Section Leader, GLIFWC	consortium partner	Great Lakes Indian Fish and Wildlife Commission (GLIFWC)
Tia Nelson, Executive Secretary, BCPL	consortium partner	Wisconsin Board of Commissioner of Public Lands (BCPL)
Donna Paulnock Assoc. Dean, Graduate School	Funding source	Univ. of Wisconsin – Madison Graduate School

(letters available on request)