

A Proposal to Develop a Web-Based

**VOLUNTEER STREAM MONITORING
INTERACTIVE VERIFICATION PROGRAM
(VSM-IVP)**

Submitted to the

2005 TEL GRANTS PROGRAM

by

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VOLUNTEER STREAM MONITORING INTERACTIVE VERIFICATION PROGRAM (VSM-IVP)

Project Description

Background: In the past 10 years federal and state programs have been designed to encourage citizen volunteers to participate in environmental monitoring programs. These programs, spearheaded nationally by the U. S. Environmental Protection Agency, have met with varied successes at state and regional levels. In Minnesota the Metropolitan Council and Minnesota Pollution Control Agency have provided monetary and organizational support. The Water Resources Program (University of Minnesota) has coordinated training and technical evaluation.

In terms of local participation, public enthusiasm and programmatic acceptance, the volunteer stream monitoring program (VSMP) in Minnesota is one of the most successful programs in the Midwest. Effective monitoring of water quality conditions can be achieved by determining the kinds and abundances of aquatic invertebrates that occur in lakes, rivers and streams, and Minnesotans state-wide have embraced the opportunity to assist state agencies in evaluating our manifold aquatic systems. Stakeholder buy-in to the program is especially strong in urban areas, where more than 1,900 volunteers monitored fifty-one stream sites in six counties that form the Minneapolis/Saint Paul metropolitan area during 2004 (VSMP 2004, Annual Report, on-line at <http://wrc.coafes.unm.edu/VSMP/index.html>).

More than 2,000 species of aquatic invertebrates are likely to occur in Minnesota. Individual species exhibit a wide variety of tolerances to differing classes of environmental pollutants. Accurate assessments of water quality, therefore, require accurate identifications of organisms collected in streams. I have been involved in providing verifications of identifications done by metro-area volunteers, and have checked more than 3,000 identifications. Initially the rate of correct identifications by volunteers was very poor, in many cases less than 50% correct. Consequently, we have written an identification guide to assist citizen volunteers. More than 1,800 copies of the guide have been disseminated, and it is available for access and downloading on line at <http://wrc.coafes.unm.edu/VSMP/education.htm>. The guide relies on dichotomous, but non-technical identification keys, supplemented with more than 200 original *habitus* line drawings of invertebrates. Since publication and distribution of our guide the accuracy of identifications by volunteers has improved, hovering around 80% correct during 2004 (Ferrington, unpublished data). Although this represents a marked improvement, we feel that 90-95% correct identification is an essential programmatic goal.

Many local VSMP groups consist of high school biology teachers and their students. Feedback received from them has indicated that they would like additional resources to check a tentative identification that has been achieved using our guide, especially color photographs of species to complement the line drawings. In this document we propose to develop web-based interactive identification software to provide an additional resource for use by citizen volunteers which will be accessible from our existing web page at <http://www.entomolo.gy.urn.n.edu/midge/index.htm>.

The interactive web products will consist of photographs of representatives of 125 the most common families of aquatic invertebrates, including primitive Isopoda, aquatic insects, leeches, snails, fingernail clams, scuds, fairy shrimp and aquatic worms. Each photographic page will

have a link to a data page that summarizes the localities of aquatic habitats where the species has been collected by VSMP participants. Another link from the photographic page will be to other photographic pages of species that have commonly been mistaken for the species being identified, along with a summary of characters to check in order to confirm identifications. Another button on the photographs page will link to text on pollution tolerances and natural history of the species.

This project conforms to all three of the Themes described in the Call for Proposals.

Programmatic Potential: Courses dealing with aquatic sciences are distributed through several colleges and programs within the University. Below is a list of courses with lecture and/or lab components that touch on water quality monitoring or aquatic pollution assessment. The web pages will have sufficient technical content to supplement topics included in the following courses: COAFES--- ENT 3005, Insect Biology; ENT 3925, Insects, Aquatic Habitats and Pollution; ENT 5021, Insect Taxonomy and Phylogeny; ENT 5081, Insects, Aquatic Habitats and Pollution; ENT 5361, Aquatic Insects; CNR--- FW 4132, Invertebrate Diversity; FW 8459, Stream and River Ecology; NRES 4061, Water Quality and Natural Resource Management; NRES 4601, Water Quality: The International Dimension; CBS--- EEB 4601, Limnology.

Improved Educational Access: The web products to be developed will also have sufficient technical content to provide a public-access of non-credit resources for biology teachers at Junior and senior high school levels, and also potential for continuing educational skills-development for practicing environmental scientists at local consulting firms and regional government.

Enhancement of Community: Continued improvement in the technical support of the VSMP will have both direct and indirect implications to enhancing the connections between University experts and community groups focused on water quality, environmental management and conservation. The VSMP, with a large participation at metro area high schools, has the potential to serve as a direct and efficient conduit to inform high school students of the University's strong research focus in environmental areas, and will complement or enhance undergraduate student recruitment efforts by COAFES, CNR and CBS. Two additional segments of our local public that have strong presences in the VSMP are retired persons and those that are interested in preserving the recreational aspects of rivers and lakes. Linking the web-page to our existing web site will reinforce in the public eye the support that the University has committed to VSMP.

Learning Outcomes: Learning outcomes consist of interactive use of electronic resources that are coupled to our standard text guide, providing a mechanism of "check-back" of user decisions. A longer-term goal is to expand the reserve of citizen volunteers with state-of-the-art technical skills in invertebrate identification.

Specific Activities: In addition to the interactive pages, I will continue to provide verifications of identifications by VSMP personnel. Specific activities will include monitoring and evaluating the accuracy of identifications. Prototypes of the interactive pages will be presented during the Annual River Summit, held annually in November. Last November the venue of the Summit was the Minnesota Science Museum, and the emcee was once again KARE 11 meteorologist Belinda Jensen. Unveiling a prototype at the Summit will be an opportunity to coordinate with 200+ high school students and 30+ high school science teachers with known interest in volunteer

monitoring. I have discussed with Barbara Luikkonen, program organizer for the 2005 Summit, the possibility of have a session devoted to "improved, web-based resources" being developed to supplement our identification guide. Barbara supports the concept at this stage and I will coordinate with her if this proposal is successful to have 25 prototype pages ready for demonstration at the River Summit in November 2005.

Timetable and Budget

This project will be initiated in August 2005, at the onset of Fall Semester. Prototype web pages (-25) will be finished by November 2005, and final pages completed by May 2006. I will hire a graduate student Research Assistant quarter-time (10 hrs/week) for the Fall 2005 and Winter 2006 semesters to work on development of the pages. Tasks and timetable are outlined below.

TASKS	Aug-Sep	Oct-Nov	Dec-Feb	Mar-Apr	Mid-May
Produce digital photographs of 125 invertebrate species	XXX				
Arrange photographs into 25 web pages by family or genus	XX	X			
Write text for 25 pages on natural history of family/genus	X	XX			
Assemble and format 25 pages for prototype display		XXX			
Adjust format and/or content based on Summit feedback			XXX		
Write text for remaining 100 families or genera			XX	XXX	
Final formatting, proofing and web posting					XX

Evidence of Departmental Support: I am requesting \$ 9,000 salary for a quarter-time RA at standard rates presently in effect for the Department of Entomology.

Matching support from the Department will include:

2.5% of my non-teaching time and fringe benefits (Amount = \$2031 + \$667).

Fringe benefits (health insurance and tuition) for the RA = \$5808 (1543-377-3418)

Disposable supplies of \$ 500 (1543-377-3418)

Connection with Strategic Initiatives: COAFES has both an undergraduate major and a newly approved minor in Environmental Sciences. This project will strengthen the curriculum of both of these educational programs. Recent COAFES research initiatives include "Improving Environmental Quality." Recruitment and training of both undergraduate and graduate students related to this initiative will be enhanced by this project. The University Initiative for Renewable Energy & Environment will also be enhanced through the improved educational aspects and community interaction elements of this project described in earlier sections.

Sustainability: Longer-term sustainability of a broader (state-wide or regional) program for VSM-IVP will be possible through developing and marketing CD-based versions of our original web pages plus subsequent up-grades and improved coverage of additional invertebrate species.

Roles and Responsibilities: Professor Leonard C. Ferrington Jr. will supervise technical development of web page content and species coverage. Ms. Moriya Rufer (grad student in Entomology and our present web master) will be responsible for preparing digital photographs of invertebrates, web page formatting and development.