Environment and Natural Resources Trust Fund
2011-2012 Request for Proposals (RFP)

Subd: 03n

Project Title: Strengthening Natural Resource Management with LiDAR Training

Category: A2. Natural Resource Data and Information: Distribution, Application, and Training

Total Project Budget: $ $180,000

Proposed Project Time Period for the Funding Requested: 2 yrs, July 2011 - June 2013

Other Non-State Funds (secured): $ 0

Summary:

Natural resource managers will be provided workshops and web-based training and information to enable them to effectively use LiDAR elevation data in planning and management of natural resources.

Name: Leslie   Everett

Sponsoring Organization: U of MN

Address: Water Resources Center, 173 McNeal Hall, 1985 Buford Ave

Saint Paul   MN   55108

Telephone Number: 612-625-6751

Email   evere003@umn.edu

Web Ad   http://wrc.umn.edu

Location:

Region: Statewide

Ecological Section: Lake Agassiz, Aspen Parklands (223N), Red River Valley (251A), North Central Glaciated Plains (251B)

County Name: Statewide

City / Township: Statewide

2011-2012 MAIN PROPOSAL
TITLE: Strengthening Natural Resource Management with LiDAR Training

I. PROJECT STATEMENT
The **goal** of this project is to enable natural resource managers to effectively use LiDAR data in restoring, protecting, and managing natural resources, including soil, water, vegetation, and habitat structure. The **target audience** is natural resource managers who use Geographic Information Systems (GIS) and need training to fully incorporate LiDAR data in their work. The **outcomes** will be:
- Natural resource managers and engineers who have been trained in preparing and employing LiDAR data in natural resource applications,
- Web-based assistance for resource managers in preparing and employing LiDAR data,
- Improved restoration, protection, and management of natural resources.

Background/Justification: The State of Minnesota is procuring statewide coverage of high resolution digital elevation data via LiDAR (Light Detection and Ranging). Data will be available for most of the state by February 2012 and likely for all of the state by February 2013. Precision, efficacy and cost efficiency of natural resource management will be greatly increased by use of these data. Examples include wetland and restorable wetland mapping, siting and installation of soil and water conservation structures, mapping and prediction of soil erosion, hydrologic modeling for water quality and quantity, plant community mapping by terrain characteristics, forest and biomass volume estimates, geologic mapping, and many other applications. Integration of LiDAR data with Minnesota's rich set of other data layers (soil survey, geological atlas, wetlands inventories, biological surveys, etc.) will add precision to their interpretation and use. For example, the current soil survey provides slope classes. LiDAR data allow calculation of precise slope, slope length, and aspect anywhere in the field, enabling prediction of soil erosion and areas of concentrated flow, as well as rapid pre-design of management practices and structures. Other examples include rapid identification of depressional areas in landscapes suitable for wetland restoration or hydrologic storage, and identification of specific micro-terrain where rare species may be located and mapped. However, in order to fully utilize this new tool, natural resource managers require training and information on how to import, process, and employ the very large LiDAR data sets, using the computer software applications currently and potentially available to them. We have surveyed a subset of resource managers to determine their training and information requirements, and designed this project to meet those needs.

Methods: The project will achieve its goal by:
- Developing training modules for basic LiDAR data management and five application areas,
- Providing web-based training and reference information,
- Providing hands-on workshops at computer laboratories around the state to deliver the training modules to natural resource managers, including staff of soil and water conservation districts, NRCS, and watershed organizations; natural resource engineers; and public and private forestry and ecosystem services staff.

II. DESCRIPTION OF PROJECT ACTIVITIES
Activity 1: Prepare Training Modules and Website   **Budget:** $ 122,399
Six training modules will be developed for natural resource managers using GIS and CAD (Computer Aided Design) applications: 1. basic LiDAR data management, 2. terrain analysis and soil conservation, 3. engineering, 4. hydrologic applications, 5. wetland mapping, and 6. forestry and ecological applications. Modules will be tested with target audiences and refined for wider delivery. Components of the training modules as well as reference information will be

prepared for and maintained on the Web for open use. The host sites will initially be at the University of Minnesota, with links from MnGeo, MnDNR, BWSR, and NRCS. Interagency coordination will be provided through the State Digital Elevation Committee.

Outcome	Completion Date
Six training modules ready for delivery in workshops	January 2012
Training and reference information for application of LiDAR data in natural resource management available on the Web to all users	June 2013 final (Jan. 2012 initial)
Natural resource managers using web training and reference information to enable effective use of LiDAR data	Ongoing

Activity 2: Deliver hands-on training workshops   **Budget:** $ 57,601
Each of the six training modules will be delivered through day-long hands-on workshops at computer laboratories selected to best serve the target audience around the state. We will deliver approximately seven basic module workshops and an average of five workshops for each of the five application modules, depending on specific audience demand, with an average of 15 participants per workshop. Pre and post-workshop surveys of participants will assist in adjustment of training format and content.

Outcome	Completion Date
Natural resource managers who have received hands-on training in use of LiDAR for resource management activities: 480 participant-training-days.	March 2013
Additional resource managers coached by workshop attendees in use of LiDAR data.	Ongoing

III. PROJECT STRATEGY
A. Project Team/Partners
Project Manager: Leslie Everett, UM Water Resources Center;
Training module development, web development, and workshop delivery: Paul Bolstad, Joseph Knight, and Andrew Jenks, UM Dept. Forest Resources; Joel Nelson, UM Dept. Soil, Water & Climate; Ann Lewandowski, UM WRC; Ann Johnson, UM Dept Civil Engineering; Lea Holter, Sonia Jacobsen, NRCS; Karen Bonde, BWSR; Sean Vaughn, DNR.
Advisory: Susan Galatowitsch, members of the State Digital Elevation Committee, and leadership of the Minnesota GIS/LIS Consortium.
Partial Support by Trust Fund: Knight, Jenks, Nelson, Johnson, Lewandowski and grad student. All others are contributing their time (including part of Knight's time).

B. Timeline Requirements
Project total time: 24 months.
July 2011-January 2012: Training module and web information development.
January 2012-March 2013: Workshop delivery and evaluation, and continued web development.
March-June 2013: Final evaluation and transition to long term web management.

C. Long-Term Strategy and Future Funding Needs
Because LiDAR data have not been previously available for most of the state, the largest demand for training will occur as the data are delivered through 2013. Training materials from this project will be migrated to the MnGeo website and content supervised by the State Digital Elevation Committee for continued use after the project period. New natural resource applications of LiDAR data will continue to be developed in agencies and the private sector. Guides to their use will be posted as they become available.

2011-2012 Detailed Project Budget
Project Title: Strengthening Natural Resource Management with LiDAR Training

IV. TOTAL TRUST FUND REQUEST BUDGET Two years

| BUDGET ITEM	AMOUNT	
Personnel:		$159,546
1 Faculty, wetland module development 3% time, 1 year, fringe 25%	$	3,000
1 Professional staff, forestry module dev. & delivery, 25% time, 1 year, fringe 25%	$	17,849
1 Instructor, engineer module dev & delivery, 139 hr, fringe 25%	$	9,231
1 Civil Svc staff, 3 modules dev. & delivery, 25% time, 22 months, fringe 28.6%	$	37,330
1 Professional staff, principal organizer, coordinate and assist with all modules, web, publications, and workshops, 66% time, 22 months, fringe 25%	$	78,114
1 Graduate student, wetland module, 25% time, 1 yr, fringe including tuition 43.5%	$	9,152
Services:		$6,800
Design of training documents and web pages	$	3,000
Video editing software	$	200
Outstate training room rental, 12 workshops @$300	$	3,600
Supplies:		$5,400
Workshop handouts for 480 participants @$10	$	4,800
Portable hard drives to store and take 6 training modules to computer training laboratories, 6 @$100	$	600
Travel:		$13,124
Mileage: 26 outstate workshops x 300 mi/wkshp x $0.5/mi	$	3,900
Mileage: 6 planning meetings x 2 people x 300 mi/person x $0.5/mi	$	1,800
Lodging/meals: 2 trainers x 26 outstate workshops x $116/trainer	$	6,032
Lodging/meals: 2 people x 6 planning meetings x $116/person	$	1,392
TOTAL ENVIRONMENT & NATURAL RESOURCES TRUST FUND $ REQUEST	$	180,000

V. OTHER FUNDS

| SOURCE OF FUNDS, In-kind Services	AMOUNT	Status
1 UM Faculty (module development) salary & fringe, 5% time, 9 months	$3,716	
1 UM Faculty (module development/delivery) salary & fringe, 100% time, 1 month	$11,087	
1 UM Professional staff (project manager) salary & fringe, 5% time, 2 years	$8,192	
3 NRCS staff (module development), 1.5% time, 1 year	$4,200	
1 BWSR staff (module development), 2% time, 1 year	$2,000	
1 DNR staff (module development), 5 days	$1,600	
Advisors (Digital Elevation Committee members and others) not estimated		
Total	$30,795	

LiDAR Applications
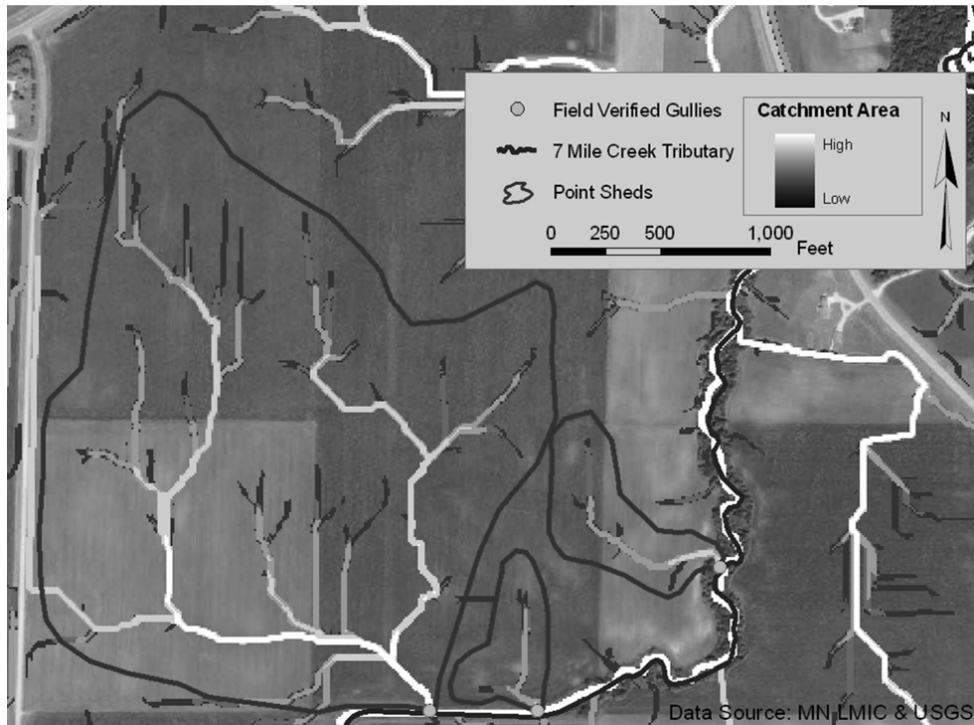
Predicting concentrated flow and gully erosion ←

Delineating watersheds →
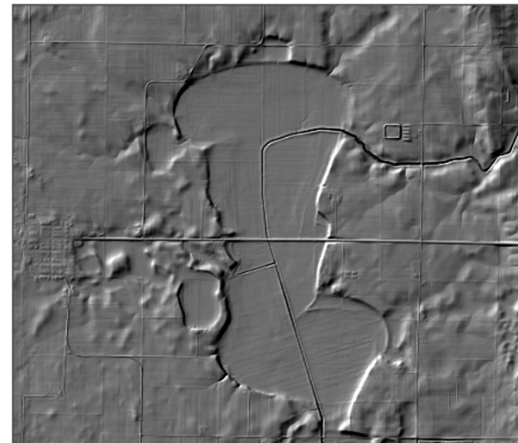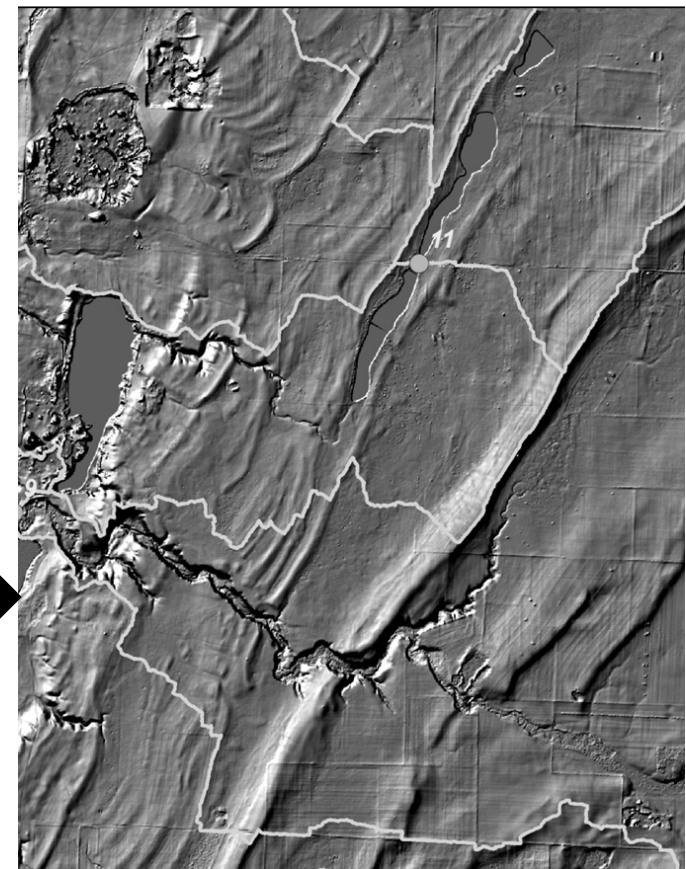
Identifying restorable features (drained lake) ←

Mapping depressions for water storage and restorable wetlands →
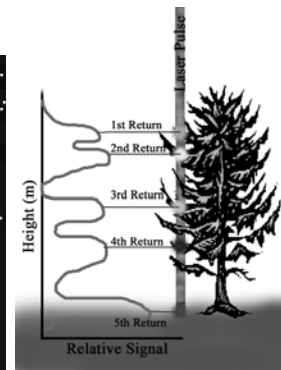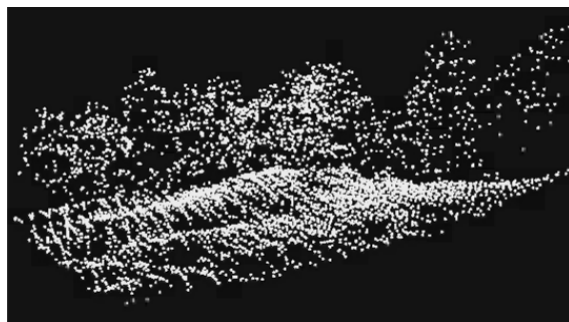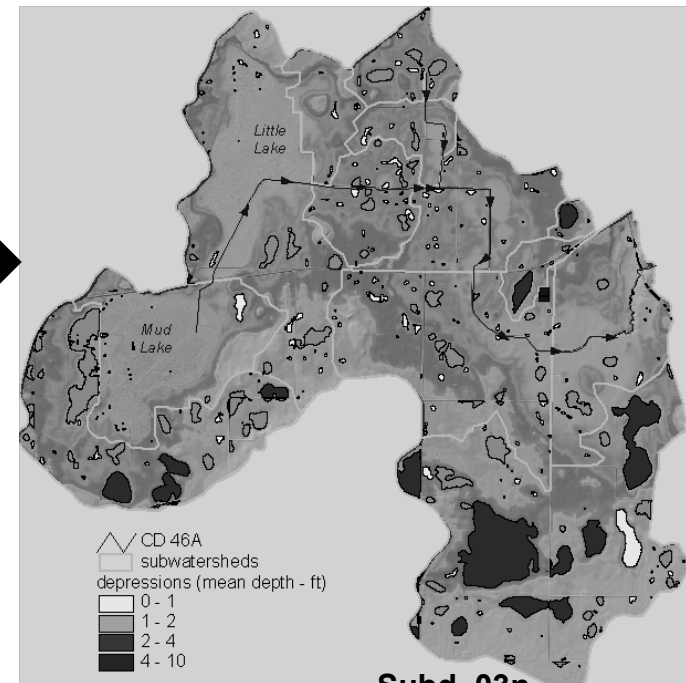
Measuring forest biomass ←

Project Manager Qualifications and Organization Description

Project Title: Strengthening Natural Resource Management with LiDAR Training

Project Manager:

Les Everett, Ph.D., Agronomist and program coordinator for the University of Minnesota Water Resources Center. Prepares and manages state and federal grant-funded projects providing outreach and on-farm research focusing on water quality and agriculture. Projects have included training for conservation technical service providers and agency staff. Co-chair of the Land Use Practices Team for the LCCMR Statewide Conservation and Preservation Plan. Member, State Digital Elevation Committee. Presented the need for statewide LiDAR data to the State Legislature.

Principal Technical Leads:

Paul Bolstad, Ph.D., Professor, UM Dept. Forest Resources. Emphasis in geographic information systems (GIS) in natural resource analysis, forest ecology and spatial data analysis. Teaches GIS and author of a GIS textbook.

Joseph Knight, Ph.D., Asst. Professor of Remote Sensing, UM Dept. Forest Resources. Uses geospatial science methods including remote sensing, image processing, and GIS in wetlands mapping and characterization, and applications such as identifying and characterizing natural and anthropogenic landscape change to assess impacts on natural resources.

Joel Nelson, M.S., Information Technology Specialist – GIS, UM Dept. Soil, Water, and Climate. Research and instruction using GIS, including terrain analysis and other applications. Member of the State Digital Elevation Committee.

Ann Johnson, M.S., P.E., Instructor, UM Dept. Civil Engineering. Develops curricula and teaches surveying, geometric design of highways, and Computer Aided Design (Auto-CAD and Civil 3D, the design software used by soil and water engineers).

Organization Description:

The University of Minnesota Water Resources Center (WRC) facilitates interdisciplinary research, education, and outreach on water resources. It hosts the interdepartmental Water Resources Science graduate program with faculty affiliates across many UM Departments. In collaboration with UM Extension as well as state and federal agency partners, it develops and delivers outreach and professional education programs in water-related fields including agricultural practices, sewage treatment, and stormwater, shoreland, and watershed management. The WRC was a lead in developing the Statewide Conservation and Preservation Plan for the LCCMR and is preparing the Statewide Water Framework for the State Legislature.

Faculty of the University of Minnesota conduct research using GIS and LiDAR data in natural resource management applications including techniques of terrain analysis, wetland mapping, measurement and mapping of vegetation, streambank and bluff erosion measurement, and many others.