

**Environment and Natural Resources Trust Fund
2017 Request for Proposals (RFP)**

Project Title:

ENRTF ID: 005-A

Enhancing Targeted and Measureable Watershed Restoration and Protection

Category: A. Foundational Natural Resource Data and Information

Total Project Budget: \$ 2,802,000

Proposed Project Time Period for the Funding Requested: 1.5 years, July 2017 - December 2018

Summary:

Enhancing comprehensive watershed planning and implementation by creating data that accurately shows how water flows from one point on the land to another such as a lake, stream or ditch.

Name: Doug Thomas

Sponsoring Organization: Board of Water and Soil Resources

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Web Address bwsr.state.mn.us

Location

Region: Statewide

County Name: Statewide

City / Township:

Alternate Text for Visual:

Why Accurate Digital Elevation Data Matters

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____ %



PROJECT TITLE: Enhancing targeted and measureable watershed restoration and protection

I. PROJECT STATEMENT

Watershed models and tools used by state agencies and local government for comprehensive watershed management planning and implementation rely on accurately knowing how water flows from one point on the land to another such as a lake, stream or watershed outlet. Our current topographic data (LiDAR/DEM) cannot accurately give us this information due to a phenomenon called digital dams. Accurate topographic data is critical to 1) understanding where and how much sediment, phosphorus, and nitrogen is coming from in a watershed, 2) knowing how it moves through the watershed, 3) how much is actually getting to a water resource of concern, and 4) being able to target implementation to those areas that are contributing the most pollutants. Removing these digital dams (DEM hydro-modification) in our current state-wide data and creating new data that indicates how long it takes a drop of water at any point on the landscape to travel to the watershed outlet will overcome this barrier when developing prioritized, targeted, and measureable watershed implementation plans.

These data layers are best derived systematically and authoritatively at a state level from the current LiDAR-derived DEM data that the State has already invested in. BWSR views these new products as foundational natural resources/hydrologic data that are needed at this time to support and guide future state and local investments into watershed non-point source pollution restoration and protection projects. These products will also support many other natural resource studies, research projects, plans and projects that rely on corrected digital elevation models (DEMs) with proper landscape hydrologic representation.

Overall goals of the project – 1) Sustain healthy watersheds and ground water supplies to provide clean abundant water and flood protection essential to supporting aquatic life, industry, agriculture, community growth and development by providing enhanced foundational data for watershed models and tools used by local governments for comprehensive watershed management planning, One Watershed One Plan, and subsequent implementation of prioritized, targeted, and measurable multiple-benefit restoration and protection programs and projects, 2) improve data management and science-based decisions by ensuring that elevation and hydrologic data are reliable, usable and accessible to state and local staff and the public, and 3) develop new state-wide foundational data for hydro-modified DEMs and hydrologic time of travel grids.

The project will result in 1) a state-wide authoritative hydro-modified DEM layer and hydrologic time of travel grids by major watershed which will fill out the suite of required input data layers necessary to support and make available state-wide the use of a suite watershed planning and targeting tools such as BWSR’s Prioritize, Target, and Measure application, USDA Agricultural Research Service’s Agricultural Conservation Planning Framework, and numerous hydrology and hydraulic models, and 2) creation of a Digital Dam Breachline and Culvert Web Database which will allow for continuous collection and distribution of known digital dams and updating of a state-wide hydro-modified DEM.

II. PROJECT ACTIVITIES AND OUTCOMES

Activity 1 – Create a state level project to take the existing statewide, LiDAR-derived, 3-meter DEM and create a level 2+ hydro-modified DEM for major watersheds in Minnesota. **Budget: \$2,500,000**

Outcome	Completion Date
1. Statewide automated hydro-modified DEM (AhDEM) and automated breachlines organized by HUC8 work units.	December 31, 2017



Environment and Natural Resources Trust Fund (ENRTF)

2017 Main Proposal

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2. Statewide Level-2+ hydro-modified DEM (h2DEM+) and manual breachlines organized by HUC8 work units.	December 31, 2018
3. Statewide authoritative Level-2+ hydro-modified DEM is published for public consumption.	December 31, 2019

Activity 1 – Create a state level project to develop time of travel grids for major watersheds in Minnesota. These products are necessary layers to run non-point pollution targeting tools such as PTMApp. They are also required layers in may hydrology and hydraulic models.

Budget: \$252,000

Outcome	Completion Date
1. State-wide time of travel grids	December 31, 2017

Activity 3 – Create a state-wide digital dam breachline and culvert database

Budget: \$50,000

This activity will make the digital dam breachlines from Activity 1 as well as existing breachlines available in a web application allowing for continuous on-the-fly updating.

Outcome	Completion Date
1. Assembled statewide database of digital dam breachlines comprised of digital dam deliverables from Activity-1 vendors, existing projects and culvert inventories.	June 30, 2018
2. Web-based viewable interface of the statewide database developed in Outcome 1.	June 30, 2018

III. PROJECT STRATEGY

A. Project Team/Partners

BWSR- will serve as lead project sponsor and provide overall project management and reporting. Project staff - Project Manager will be Doug Thomas, Assistant Director Regional Operations, BWSR Reporting and Outcomes Coordinator, and BWSR MNIT Manager.

Project Partners Receiving Funds:

DNR, MNIT Sean Vaughn (\$50,000) – Digital Dam Breachline and Culvert Web Viewable Database. DNR will also be providing approximately 1900 hours of in-kind support to the project through the assignment of various staff serving as technical experts to the project. Project staff- Sean Vaughn, DNR MNIT

Iowa State University Dr. Brian Gelder (\$400,000) - contract with ISU to produce automated hydro-modified DEM (AhDEM) and automated breach lines.

Contractors (TBD) (\$2,200,000) - create a level 2+ hydro-modified DEM for major watersheds

B. Project Impact and Long-Term Strategy

The project will advance the purposes of One Watershed, One Plan (M.S. 103B.801) and the goal of having the transition from largely geo-political water plan boundaries to watershed based plan boundaries by 2025 as well as making the required data necessary to implement watershed implementation targeting tools and hydrologic and hydraulic models available state-wide.

C. Timeline Requirements

The project is expected to be completed by December 31, 2019 or 2 ½ years. There are not any particular conditions or field season requirements which are anticipate and which could cause this timeline not to be met.

2017 Detailed Project Budget

Project Title: Enhancing targeted and measurable watershed restoration and protection

IV. TOTAL ENRTF REQUEST BUDGET 2.5 years

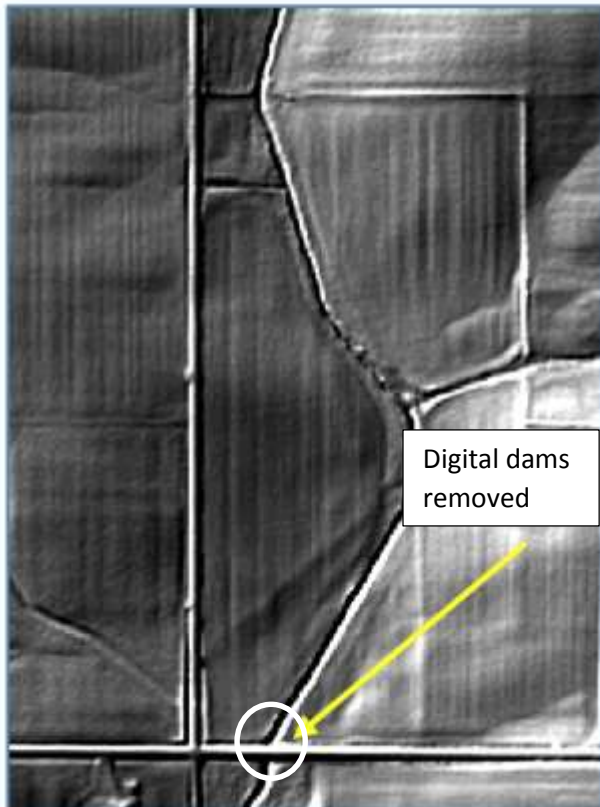
BUDGET ITEM <i>(See "Guidance on Allowable Expenses", p. 13)</i>	AMOUNT
Personnel:	
BWSR Project Manager - (75% salary, 25% benefits); 50% FTE for 2.5 years	152,000
Profession/Technical/Service Contracts	
MN Department of Natural Resources - interagency agreement to develop breachline/culvert database	50,000
Iowa State University - contract to develop automated level 2 hydro-modification by watershed	400,000
University of Minnesota - professional services contract to develop level 2+ hydro-modification by watershed and time of travel grids	2,200,000
TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =	\$ 2,802,000

V. OTHER FUNDS *(This entire section must be filled out. Do not delete rows. Indicate "N/A" if row is not applicable.)*

SOURCE OF FUNDS	AMOUNT	Status
In-kind services To Be Applied To Project During Project Period		
BWSR employee in-kind time. Doug Thomas and Agency Soil Scientist, 5% time each, fringe and benefits total \$30,000.	30,000	secured
DNR MNIT - 1900 hours @ \$45,00 hr.	85,000	secured
Funding History: N/A	\$ -	
Remaining \$ From Current ENRTF Appropriation: N/A	\$ -	<i>Indicate: Unspent? Legally Obligated? Other?</i>

Why Accurate Digital Elevation Data Matters

Hydro-modified DEM



Non hydro-modified DEM

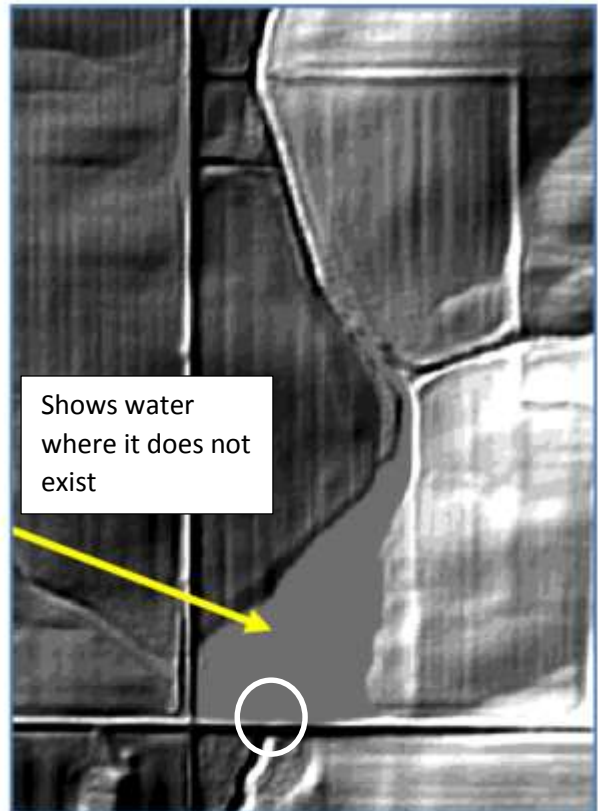


Image 7 – (left) Hillshaded DEM. Digital Dam at Intersection of Road and Ditch, (right) Filled, raised DEM above Digital Dam

Hydro-modified DEMs removes these digital dams and results in:

- Connects streams & ditches
- Accurate representation of how water flows across the land
- Accurate creation of watershed areas
- Ability to route pollutants thru the watershed
- Better model results for water volume and peak flows
- Required to run new GIS targeting tools

Non hydro-modified DEMs result in:

- Water ponded on the landscape where it does not belong
- Computer thinks it's a lake or wetland
- Bad model results for water volume and downstream peak flows
- Water flowing the wrong direction
- Inaccurate creation of contributing watersheds to lakes, streams, and watershed outlets
- Limited use for new GIS targeting tools

DEMs are a digital elevation models of the bare earth surface (buildings and vegetation removed) created for use in computer software. Basically an electronic version of a topographic map.

Digital Dams are features on earth's landscape captured by LiDAR that 1) exist perpendicular to the gradient flow of water, 2) disrupt hydrologic connectivity, and 3) impede the ability to route water through a watershed. Digital dams most commonly are roads, water control structures (e.g., dams), and bridges.

DEM hydro-modification is the process of breaching or the taking out of digital dams in a digital elevation model so that water actually flows through it.

DOUGLAS J. THOMAS

PROFESSIONAL EXPERIENCE

Present – Assistant Director of Regional Operations, MN board of Water and soil Resources. Major responsibility is overseeing field operations of the agency, local water management authorities, and the development and roll out of agency’s One Watershed One Plan program. Directly oversees all aspects of the agencies Clean Water Fund and General Fund grant programs along with agency reporting and outcomes activities.

2007 – 2013 Rice Creek Watershed and Comfort Lake Forest Lake Watershed Districts. Served as District Administrator with responsibility for public drainage ditches, wetlands, stormwater permitting, flood control, and water quality restoration and protection programs. Also oversaw the Districts monitoring and geographic information system including its local LIDAR collect, hydro-modification and waterway crossing database.

1989 – 2007 MN Board of Water and Soil Resources (BWSR). Held a number of positions with the last position being the Assistant Director for Policy and Program Development. During career at BWSR rolled out the State’s new Comprehensive Local water Planning Program and worked in a number of program areas including watershed district planning and operations, wetland conservation act, MN Reinvest in MN – RIM Reserve program, and the Clean Water Legacy Act.

1978 – 1989 USDA, Soil Conservation Service and the Washington County Soil and Water Conservations District.

EDUCATION

SOIL SCIENCE - EMPHASIS IN SOIL AND WATER RESOURCE MANAGEMENT (BACHELOR OF SCIENCE)

University of Minnesota
St. Paul, Minnesota

YEARS ATTENDED (1974 - 78)

AGRONOMY (BACHELOR OF SCIENCE)

University of Minnesota
St. Paul, Minnesota

YEARS ATTENDED (1974 - 78)

MN BOARD OF WATER AND SOIL RESOURCES

The board is the state's administrative agency for 90 soil and water conservation districts, 46 watershed districts, 23 metropolitan watershed management organizations, and 80 county water managers.

The BWSR mission is to improve and protect Minnesota's water and soil resources by working in partnership with local organizations and private landowners. Core functions include implementing the state's soil and water conservation policy, comprehensive local water management, and the Wetland Conservation Act as it relates to the 41.7 million acres of private land in Minnesota.