Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2016 Work Plan

Date of Report: February 9, 2016

Date of Next Status Update Report: Jan. 1, 2017

Date of Work Plan Approval:

Project Completion Date: June 30, 2018

Does this submission include an amendment request? No

PROJECT TITLE: Minnesota Vegetative Buffer Assessment and Prioritization

Project Manager: David Mulla

Organization: University of Minnesota

Mailing Address: Dept. Soil, Water & Climate; 1991 Upper Buford Circle; University of Minnesota

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Location: 70 agriculturally important counties of Minnesota

Total ENRTF Project Budget:		**ENRTF Appropriation:**	**$170,000**
		Amount Spent:	**$0**
		Balance:	**$170,000**

Legal Citation: M.L. 2016, Chp. xx, Sec. xx, Subd. xx

Appropriation Language:

I. PROJECT TITLE: Minnesota Vegetative Buffer Assessment and Prioritization

II. PROJECT STATEMENT:

This project aims to work collaboratively with MN DNR via the Governor's Buffer Initiative data-creation effort to assist in cataloging topographic features on the landscape which may require a buffer. With our group at the U of MN having the longest tenure of experience with LiDAR data and Hydro-Terrain Analysis in the state, we recognize current efforts already underway, yet seek to provide critical advisement, consultation, and Quality Assurance/Quality Control to final products. By utilizing high resolution aerial imagery acquired during the spring non-crop growing period, a more robust analysis of riparian areas will be produced than currently exists. Additionally, once unprotected waterways have been identified, a prioritization will then be employed to rank the vulnerability of each reach to water quality degradation. This will act as a valuable guideline for resource conservation planners and will ultimately result in increased protection for our susceptible surface waters and associated improvements in water quality.

The Governor's recent proposed buffer initiative has brought much attention to the status of Minnesota's waterways and the vegetative buffers that are needed to protect them. There is a strong need for not only identifying where surface waters lack proper protection, but also prioritizing these susceptible areas. A large portion of Minnesota waters in the prairie pothole region lack proper vegetative (buffers; the Minnesota DNR currently reports that half of the shorelines in this region remain unprotected. Various reports identify buffer locations and areal coverage; however, detailed analysis is limited to the southern portion of the state and is lacking elsewhere. Furthermore, analysis in southern Minnesota is limited to merely buffer presence or absence. A prioritization of currently unprotected waters is needed as the Governor's buffer initiative evolves and waterway protection is mandated.

State of the art Digital Globe satellite areal imagery (1 m resolution at 1-3 day revisit frequencies) will provide unprecedented spatial and temporal detail for this assessment. The project will be focused in agriculturally important portions of the state and will include regions not analyzed in previous efforts. Once locations of unprotected waterways are identified, a terrain-based approach utilizing LiDAR data will then identify the areas where overland flow paths cross unprotected shorelines and pose an increased threat to waterways.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of January 1, 2017:

Project Status as of July 1, 2017:

Project Status as of January 1, 2018:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Buffer Features Assessment
Description: University of Minnesota and MN DNR staff will work collaboratively to satisfy the data requirements of the Governor's Buffer Initiative, with each providing crucial yet varied experiences to the process. Regardless of funding mechanism, both entities will work together to ensure a final cohesive product that satisfies all needs. For the University portion, the most recent and highest resolution streams data layer will be acquired from MN DNR to create a 50 - 200 foot riparian corridor layer (using GIS) on either side of ditches, perennial streams and rivers. All definitions of buffers, perennial streams, and any applicable terms will be matched to Buffer Initiative terminology for consistency. Vegetative indices (e.g.. Normalized Difference

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Vegetative Index) will be applied to high resolution aerial photography to assess the extent of perennial vegetation within the riparian corridor. Digital Globe aerial imagery is available to the University of Minnesota, which will allow a very high level of spatial and temporal detail for this analysis. The analysis will be concentrated in 70 counties where agricultural landuse is 30% or greater. Minnesota's prairie pothole region covers a majority of these counties, and includes most of the non-buffered waters in the state. More than 20,000 miles of perennial streams and rivers will be assessed in this analysis. Data regarding vegetative buffer coverage will be validated using high resolution aerial photography.

Summary Budget Information for Activity 1:	**ENRTF Budget:**	**$ 87,192**
	Amount Spent:	**$ 0**
	Balance:	**$ 87,192**

Outcome	Completion Date
1. *Acquire appropriate data layers for riparian corridor assessment*	July, 2016
2. *Develop a methodology for assessing presence or absence of perennial vegetation on MN waterways*	October, 2016
3. *Validate methodology with aerial imagery and field visits*	March, 2017
4. *Create a spatial data layer identifying non-protected waterways in 70 Minnesota counties*	June, 2017

Activity Status as of January 1, 2017:

Activity Status as of July 1, 2017:

Activity Status as of January 1, 2018:

Final Report Summary:

ACTIVITY 2: Prioritization of Unprotected Watercourses
Description: Once areas are identified as unprotected, they will be ranked and prioritized based on a LiDAR terrain analysis coupled with the previously developed Ecological Benefits Index (EBI). A new stream corridor layer will be created for unprotected waters that will stretch past the Governor's proposed 50 foot corridor (e.g. 300 feet) on either side of the stream to properly analyze near stream flow paths; this new corridor width will be determined during analysis based on data processing feasibilities and wildlife restoration goals. A LiDAR-based terrain index that measures erosivity of overland flow (Stream Power Index) will be calculated for this corridor along with other terrain attributes in order to rank the risk of erosion and pollutant (sediment, phosphorus, pesticide) transport near unprotected waters. Categorical risk values will be analyzed at multiple scales, and data can be aggregated to DNR Subwatersheds or HUC 12 hydrologic unit boundaries to guide regional conservation planning. Data can also be made available at a finer-scale, such as individual unprotected stream reaches. Based on slope, soil, SPI and EBI characteristics, we will use these data to identify what types of practices are needed to best protect riparian areas and provide multiple benefits. These practices could include vegetative buffers of various widths, water and sediment basins, and saturated buffers, for example.

Summary Budget Information for Activity 1:	**ENRTF Budget:**	**$ 82,808**
	Amount Spent:	**$ 0**
	Balance:	**$ 82,808**

Outcome	Completion Date
1. *Determine an appropriate LiDAR corridor width based on the extent of unprotected waters and data processing considerations*	July, 2017

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2. *Acquire and calculate appropriate terrain attributes*	November, 2017
3. *Develop a methodology for prioritizing unprotected waters based on terrain analysis*	March, 2018
4. *Create a spatial data layer for vulnerability ranking of unprotected waters in 70 Minnesota counties*	June, 2018

Activity Status as of January 1, 2017:

Activity Status as of July 1, 2017:

Activity Status as of January 1, 2018:

Final Report Summary:

V. DISSEMINATION:
Description: A statewide dataset of vegetative buffer coverage as well as their priority rankings will be hosted on Minnesota Geospatial Commons, a data hosting website supported by the Minnesota DNR. These data will be made available to conservation agencies in order to assess the statewide condition of near-stream vegetative buffers on a scale never before achieved. These data will be used by DNR and BWSR to develop goals and strategies for protecting riparian areas of the state, and will have positive impacts on the protection of Minnesota's surface waters for decades to come.

Activity Status as of January 1, 2017:

Activity Status as of July 1, 2017:

Status as of January 1, 2018:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:
A. ENRTF Budget Overview:

Budget Category	$ Amount	Overview Explanation
Personnel:	$ 143,200	1FTE Remote sensing and terrain analysis expert for two years and 0.25 FTE GIS expert for two years
Equipment/Tools/Supplies:	$6,500	Two high memory, high CPU computers, with large external storage disks @ $3250 each. Data analyzed requires the ability to process terrabytes of Lidar and remote sensing data.
Travel Expenses in MN:	$2,300	Travel @0.575/mi x 200 mi/trip x 10 trips/yr
Other:	$18,000	Remote sensing imagery ($10,000) and fees ($8,000) for using GIS lab facilities at the UofM for two years. TBD: Remote sensing imagery to be purchased or acquired from a government entity.
TOTAL ENRTF BUDGET:	**$170,000**	

Explanation of Use of Classified Staff: None

Explanation of Capital Expenditures Greater Than $5,000: None

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Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 2.5 FTE.

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: None

B. Other Funds: N/A

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state			
	$0	$	
State			
	$0	$	
TOTAL OTHER FUNDS:	**$0**	**$**	

VII. PROJECT STRATEGY:

A. Project Partners: This is a partnership between the Minnesota Department of Natural Resources (DNR – not receiving funds) and the University of Minnesota (receiving funds). David Mulla is the project manager, and he will oversee the compilation and analysis of data (University of Minnesota) while Sean Vaughn (MN DNR) acts as a Quality Assurance/Quality Control analyst for the finished products for this proposal. MN DNR has also agreed to provide high-resolution streams data, as well as advice on utilizing the Hydrographic Position Index (HPI) to identify hydrographic areas of interest. The University of Minnesota will also carry out LiDAR data downloading and processing, and develop methodologies used for prioritization. The DNR will maintain an advisory role throughout this analysis.

B. Project Impact and Long-term Strategy: A statewide dataset of vegetative buffer coverage as well as their priority rankings will be hosted on Minnesota Geospatial Commons, a data hosting website supported by the Minnesota DNR. These data will be made available to conservation agencies in order to assess the statewide condition of near-stream vegetative buffers on a scale never before achieved. Vegetative buffer installation will inevitably increase as the Buffer Initiative evolves, and these data can be utilized to target the most effective placement and width of buffers and other practices to achieve multiple water quality and habitat benefits. These data will be used by DNR and BWSR to develop goals and strategies for protecting riparian areas of the state, and will have positive impacts on the protection of Minnesota's surface waters for decades to come.

C. Funding History: *N/A*

Funding Source and Use of Funds	Funding Timeframe	$ Amount
		$
		$
		$

VIII. CONSERVATION EASEMENT: N/A

IX. VISUAL COMPONENT or MAP(S):

Agricultural Landuse

Miles
0 15 30   60   90   120
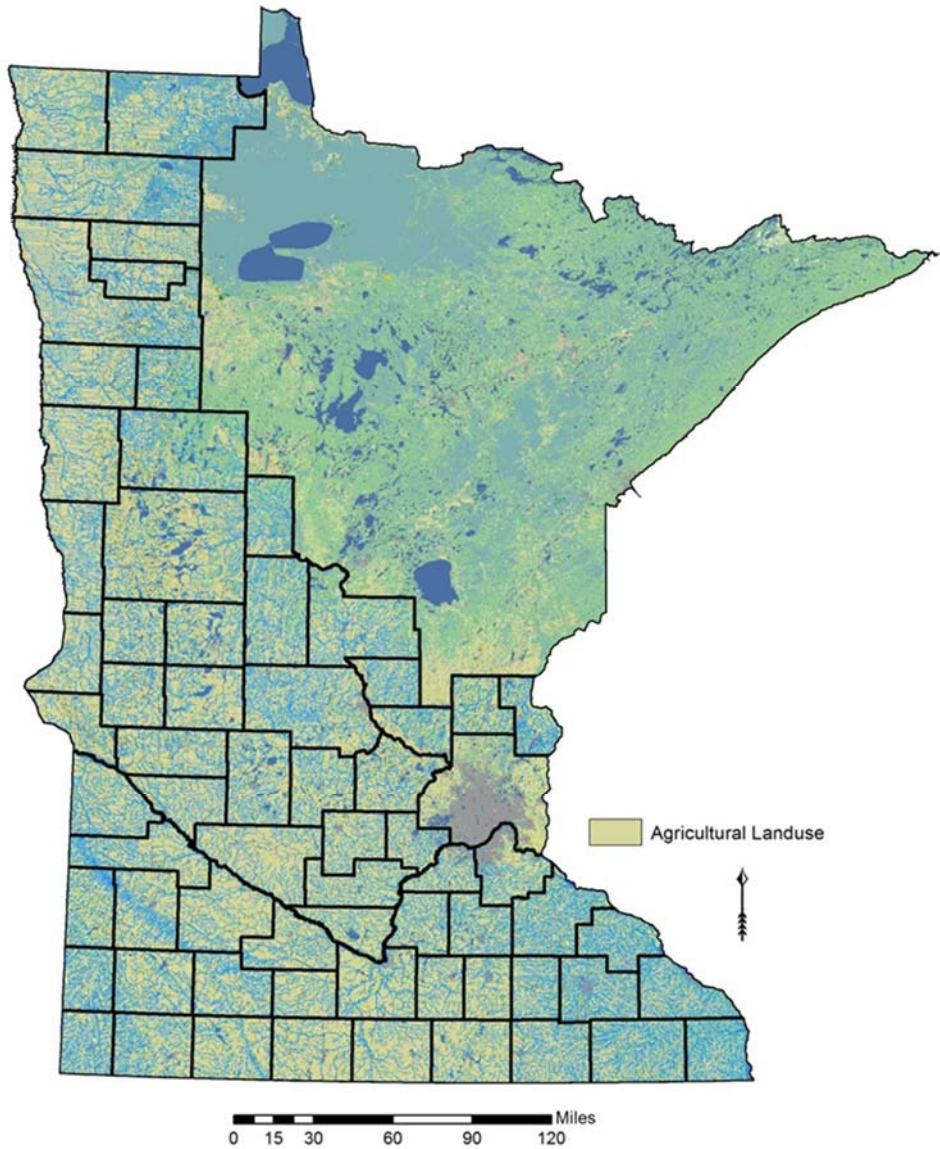
X. RESEARCH ADDENDUM: N/A

XI. REPORTING REQUIREMENTS:
Periodic work plan status update reports will be submitted no later than January 1, 2017, July 1, 2017, and January 1, 2018. A final report and associated products will be submitted between June 30 and August 15, 2018.

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Environment and Natural Resources Trust Fund

M.L. 2016 Project Budget

Project Title: *Minnesota Vegetative Buffer Assessment and Prioritization*

Legal Citation: *M.L. 2016, Chp. xx, Sec. xx, Subd. Xx*

Project Manager: *David Mulla*

Organization: University of Minnesota

M.L. 2016 ENRTF Appropriation: $*170,000*

Project Length and Completion Date: *# Years 2, June 30, 2018*

Date of Report: *February 9, 2016*

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	TOTAL BUDGET	TOTAL BALANCE
BUDGET ITEM	*Buffer Features Assessment*			*Prioritization of Unprotected Watercourses*				
Personnel (Wages and Benefits)								
Jake Galzki, Remote Sensing expert, $51,226.60 (67% salary, 33% benefits); 100% FTE for two years plus 3% inflation. Joel Nelson, GIS expert, $19315.27 (67% salary, 33% benefits); 25% FTE for two years plus 3% inflation.	$70,542	$0	$70,542	$72,658	$0	$72,658	$143,200	$143,200
Equipment/Tools/Supplies								
Two high memory, high CPU computers, with large external storage disks each $3250. Data analyzed requires the ability to process terrabytes of Lidar and remote sensing data.	$6,500	$0	$6,500	$0	$0	$0	$6,500	$6,500
Travel expenses in Minnesota								
Travel to ground truth remote sensing data in Minnesota @0.575/mi x 200 mi/trip x 10 trips/yr	$1,150	$0	$1,150	$1,150	$0	$1,150	$2,300	$2,300
Other								
Remote sensing imagery (TBD: purchased or acquired from governmen	$5,000			$5,000			$10,000	$10,000
Fees for using GIS facilities at the UofM @$4,000/yr for two years.	$4,000	$0	$4,000	$4,000	$0	$4,000	$8,000	$8,000
COLUMN TOTAL	**$87,192**	**$0**	**$82,192**	**$82,808**	**$0**	**$77,808**	**$170,000**	**$170,000**