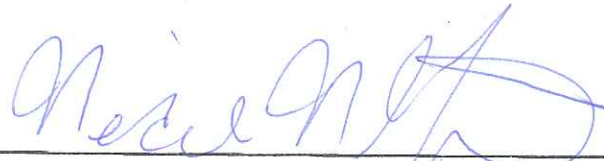Accelerating Outcome-Based Ag Conservation in Saginaw Bay

Great Lakes Restoration Initiative Grant # 00E01448
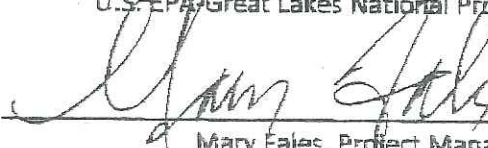
July 15, 2015

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Nicole Singleton, Project Officer
U.S. EPA-Great Lakes National Program Office

_____ 8/20/15

Louis Blume, Quality Assurance Officer
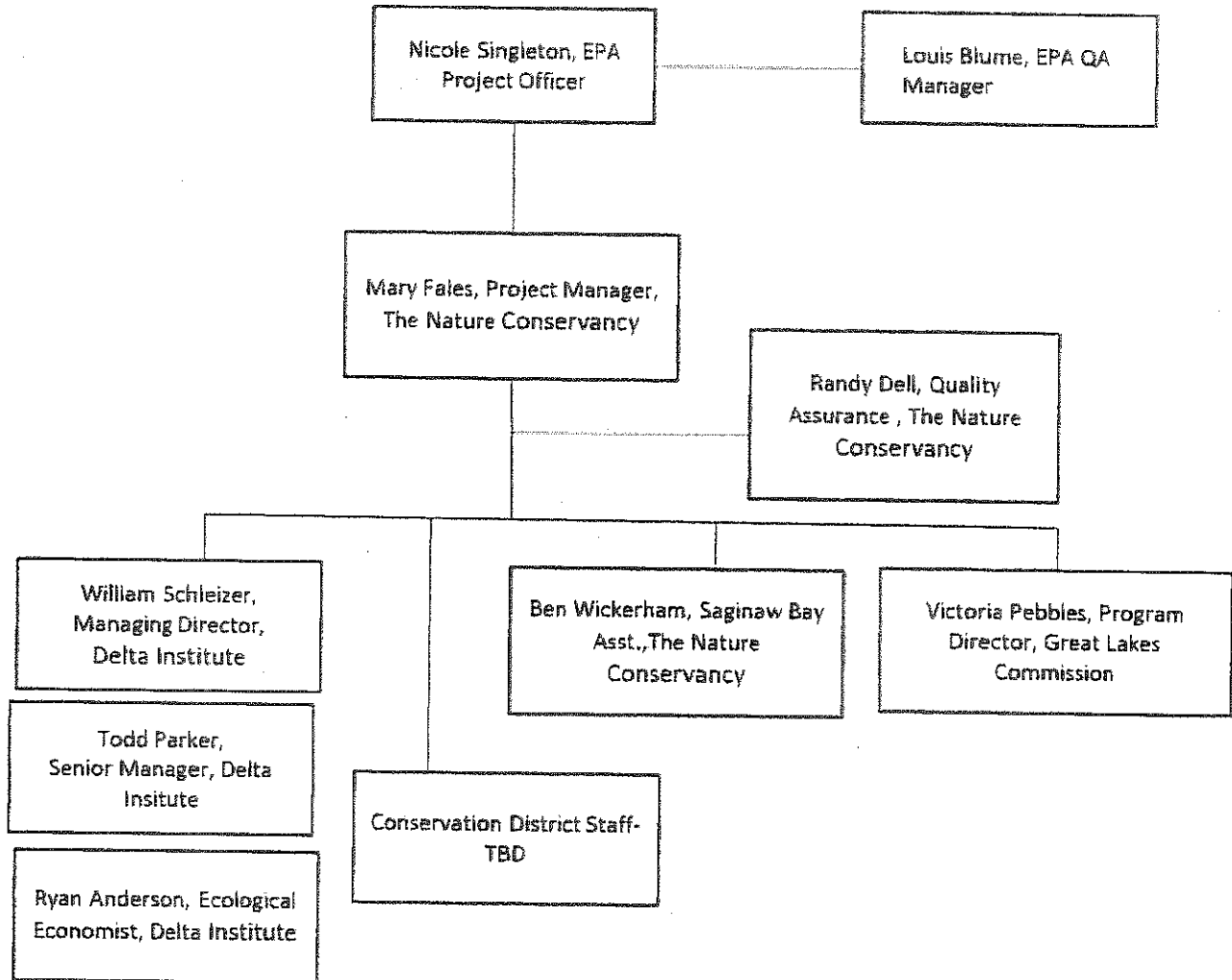U.S. EPA-Great Lakes National Program Office

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Mary Fales, Project Manager
The Nature Conservancy

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Randy Dell, Quality Assurance Manager
The Nature Conservancy

Figure 1 Project Team Organization


Figure 1 Project Team Organization

Problem Definition/Background

This project aims to reduce the impact of non-point source pollution from agricultural land-uses and improve the health of aquatic resources within four targeted watersheds within the Saginaw Bay region. The project intends to address this problem by increasing the adoption and scale of conservation practices to retain sediment and phosphorus and prevent runoff to local waterways through a Pay for Performance program. The funding and practices will be targeted to sub-watersheds that have aquatic ecosystems identified as impaired (Sowa et al. 2011) and where agricultural BMPs are expected to have a positive effect on local aquatic ecosystem conditions (Sowa et al. 2013). A key aspect of this project is that it is performance-based, meaning that dollars and practices will be allocated in order to maximize environmental outcomes (i.e. pounds of sediment retained from waterways).

This approach is being implemented because existing agricultural conservation programs, namely the United State Department of Agriculture's conservation programs, have not proven sufficient on their

The tasks described above will primarily be conducted in the Saginaw River and tributaries of the Saginaw River, including the Saginaw River (04080206), Cass River (04080205), the Shiawassee River (04080203) and the Pine/Chippewa Rivers (04080202) as shown below.
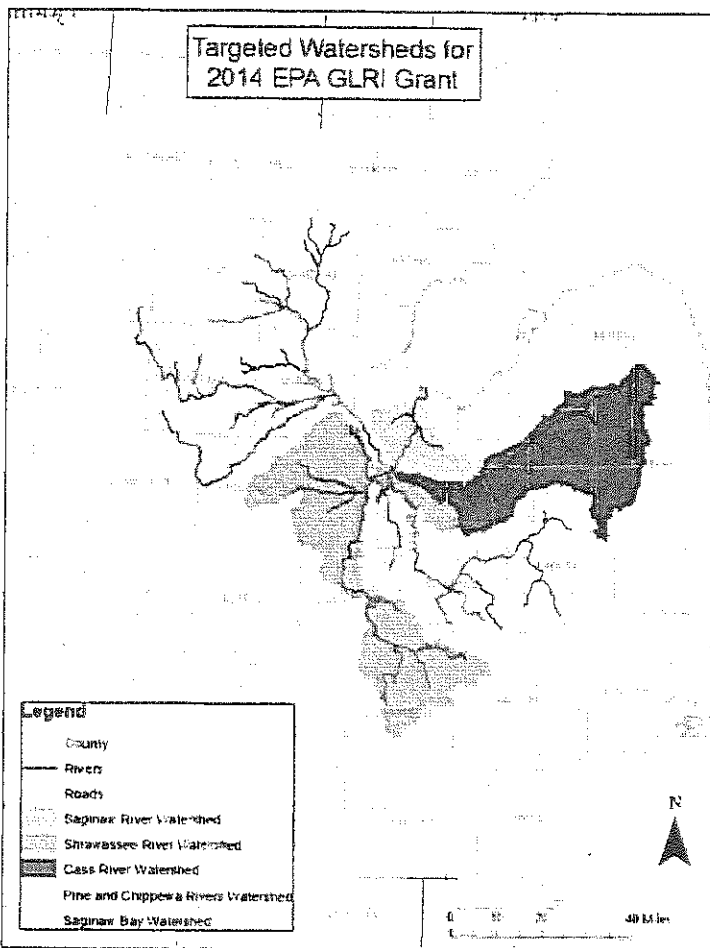
Data Quality Objectives and Measurement Data

Project objectives include use of the GLWMS to provide accurate field-scale estimates of sediment and/or nutrients retained from the implementation of BMPs, and the use of those payments to provide a performance-based payment ($/ton of sediment) to improve and scale conservation delivery. The project will ultimately measure success not only by achieving substantial implementation of conservation practices and modeled pollutant load data but also by examining long term trends in fish community health measured by the Index of Biotic Integrity. This is a long-term goal of the project and monitoring activities are not included in this project. Most, if not all conservation practices will be implemented on private property and tracked at the field and watershed level via the Great Lakes Watershed Management System. Three primary forms of data will be generated through this project and entered and collected in the GLWMS, representing the project's pollutant load reductions, project activities and project area.

The erosion and sediment calculations of GLWMS are based on the Revised Universal Soil Loss Equation (RUSLE) to estimate annual erosion caused by rainfall and SEDMOD to estimate the proportion of eroded soil that reaches a stream network. These tools are combined in the High Impact Targeting tool, or HIT, which estimates sediment and erosion at the scale of 100 square-meters. A description of how the HIT tool interacts with GLWMS can be found here: http://35.8.121.111/glwms/docs/background.pdf

One limitation of this approach is that the HIT model within the GLWMS can only estimate sheet erosion, and is not capable of accounting for stream-bank, wind, or ephemeral gully erosion. Despite the potential uncertainty in model outputs, HIT still provides a quick and easy means for estimating erosion and sediment loading in a specified area, prioritizing conservation areas, and evaluating relative changes resulting from land cover change or BMPs.

GLWMS nutrient loading estimates (total N and total P) are derived from L-THIA, or the Long Term Hydrologic Impact Analysis (https://engineering.purdue.edu/~lthia/). L-THIA was developed and is maintained by the Agricultural Biological Engineering Department at Purdue University.

Use of Existing Data

The project team will not acquire additional data, but will instead utilize the public data sets already incorporated into the GLWMS. The data sets are either publicly available and/or peer reviewed.

For example, the erosion and sediment estimates generated by the High Impact Targeting tool are based on inputs from the following datasets:

- *USDA's Cropland Data Layer to simulate land cover and crop rotations,*
- *USDA's SSURGO soil surveys to estimate soil texture and erodibility,*
- *USGS digital elevation models to estimate surface slope and run-off paths,*
- *USGS' National Hydrography Dataset for stream locations,*
- *Purdue's Conservation Technology Information Center (CTIC) county-scale surveys to estimate tillage practices, and*
- *Oregon State University's PRISM dataset for precipitation.*

Information on the management, versions, and processing of the data used to populate HIT can be found at the following links:

- Summary of Erosion Metadata: http://35.8.121.111/glwms/docs/erosion.html
- Summary of Sediment metadata: http://35.8.121.111/glwms/docs/sediment.html

As the GLWMS is an already assembled tool, the project team will not have the ability to utilize alternative data sets during the project duration, unless the GLWMS is modified by Michigan State University's Institute of Water Research. If inconsistencies or unexpected results are produced, the project team will inform the model developer about potential issues with data quality.