Surface Water Models and Tools for Minnesota's Water Management Framework

CLEAN WATER LAND & LEGACY AMENDMENT

In February 2016, the Minnesota Department of Agriculture (MDA) hosted a two-day symposium for state agency employees involved in managing Minnesota's water resources. Participants shared knowledge about surface water quality models and tools currently used, supported, or funded by state agencies. These models and tools allow the prioritization and targeting of conservation practices and measurement of water quality impacts. The goal is to estimate the potential benefit of conservation practices at varying scales for the purpose of meeting MN's water quality goals through the Water Restoration and Protection Strategy (WRAPS) process.

Videos of the presentations are available at www.mda.state.mn.us/modelsandtools.

This fact sheet highlights tools that can be used to link model data from steps 1-3 into local planning.

There are a number of applicable models and tools, each with a specific use, strength, or limitation, all which defines its placement within the 10-year monitoring and assessment cycle. Steps 1-3 of the WRAPS process are conducted with state agency oversight and coordination, while Step 4 and Ongoing Implementation are lead by the local government units.

STEP 4
Conduct Restoration and Protection Projects in the Watershed

- Civic engagement and public participation
- **Prioritize, target and measure** implementation of restoration and protection projects

Reporting

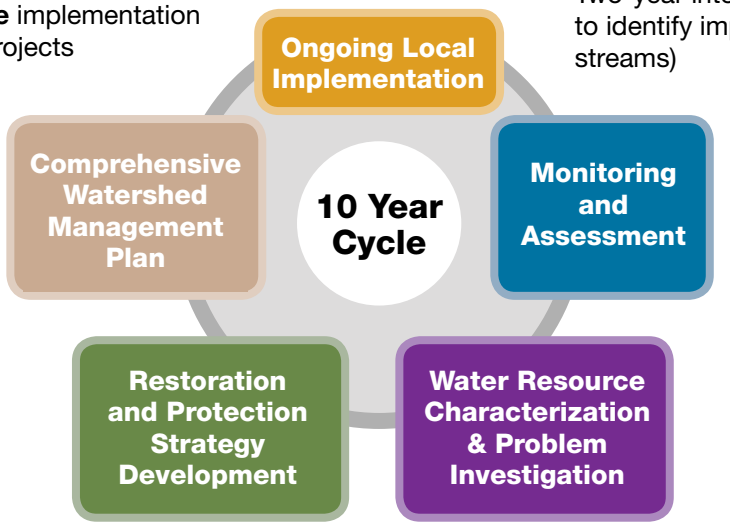
- Local Water Plan
- One Watershed One Plan

STEP 1
Monitor Water Bodies and Collect Data

- Two-year intensive water monitoring to identify impairments (lakes & streams)

Reporting

- Monitoring & Assessment Report
- Stressor Identification Report



Applicable Models/Tools

- ACPF
- HSPF-SAM
- N&P-BMP
- PTMApp
- WHAF
- Zonation

STEP 3
Develop Strategies to Restore and Protect the Watershed's Water Bodies

- Summarize details on water quality issues
- Determine reduction goals for impaired or protected water bodies

Reporting

- Total Maximum Daily Load (TMDL)
- WRAPS Report

Applicable Models

- BATHTUB
- GSSHA
- HSPF
- SWAT

STEP 2
Assess the Data

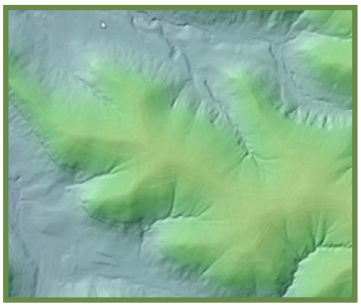
- Identify impaired waters
- Identify stressors affecting aquatic life
- Analyze data with water quality models and maps

Minnesota Department of Agriculture
Minnesota Pollution Control Agency
Minnesota Board of Water & Soil Resources
MNDNR
MDH Minnesota Department of Health
METROPOLITAN COUNCIL

LiDAR: Light Detection and Ranging

Many of the tools used to prioritize or target the implementation of Best Management Practices (BMPs) within a watershed use LiDAR remote sensing data, or derived products, to identify landscape topographic features. LiDAR data are often the Geographic Information System (GIS) base layer of information used by watershed models and tools to route surface water flow.

LiDAR technology creates a seamless, high-accuracy digital elevation map (DEM) of Earth's surface using radio waves.



Through the Clean Water Fund, an elevation model, collected using LiDAR technology, became available for the entire state of Minnesota.

MnTOPO is a state web application for viewing, printing and downloading this high-resolution elevation data. It is located at the following website: www.dnr.state.mn.us/maps/mntopo/index.html

Acronym Summary List

ACPF: Agriculture Conservation Planning Framework
HSPF: Hydrological Simulation Program – Fortran
HSPF-SAM: Scenario Application Manager
HUC: Hydrologic Unit Code
PTMApp: Prioritize, Target, and Measure Application
WHAF: Watershed Health Assessment Framework

Models and Tools for Informing Local Watershed Planning

Model Name (Developer)	Description	Considerations
ACPF (USDA, ARS)	GIS conservation planning toolbox for identifying topographic landscape characteristics suitable for agricultural BMP placement (field or subfield) scale.	Modest GIS knowledge required, but toolbox is a simple, user-friendly application. Includes a built-in geospatial tool to hydro-condition LiDAR data. Addresses tile drainage and runoff pathways, while stressing soil health. Requires soil and land use data; uses an internal crop cover database, which includes rotations (available for agricultural areas of Minnesota).
HSPF-SAM (MPCA, RESPEC Consulting & Services)	Extension to the HSPF model, used to view HSPF output data for BMP senario building.	Requires use of HSPF data files, without full HSPF knowledge; although understanding HSPF terminology is valuable. Designed for watershed managers or conservation planners. Users can develop conservation scenarios and generate nutrient and sediment reduction quantities, based on tabulated review data.
N&P-BMP (Univ. of MN and MPCA)	Spreadsheet model to estimate nitrogen (N) and phosphorus (P) runoff reductions achieved from BMP adoption.	Simple agricultural nutrient reduction spreadsheet estimation tool. Not a geospatial based tool; therefore, does not incorporate flow path, sediment, or in-stream attenuation of nutrients.
PTMApp (Houston Engineering Inc., International Water Institute, and BWSR)	Desktop and Web-based GIS tool to estimate water quality impacts of conservation practice placement.	Complete with pre-packaged geodatabase of required inputs; hydro-conditioned DEM is required. Allows user to specify combinations of BMPs and determine applicable landscape locations. Quantifies conservation practice efficiencies based on tabulated review data.
WHAF (MNDNR)	Comprehensive ecological health score mapping tools for user defined watershed scales.	Web-interface allows user to view available GIS data layers simultaneously to define areas that may have disproportionate impact to water quality problems. Available on MNDNR website with training videos. No experience necessary.
Zonation (Univ. of Helsinki)	Systematic, objective spatial mapping tool for conservation priority identification.	Allows regional social input to weight value of conservation features (i.e. waters of concern, reduce erosion, enhance wildlife, implementation of BMPs) to identify priority areas.

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