

MTRI has developed a Wetlands Mitigation Site Suitability Tool (WMSST) that uses satellite imagery, GIS data analysis, and customized geospatial software to create a user-friendly method of rapidly assessing large watersheds for suitable locations of wetlands mitigation projects needed due to transportation projects. By being able to assess entire watersheds and other priority areas at one go, the WMSST reduces the need for expensive field time and makes the finding of suitable mitigation sites more efficient because less time in the field is required. The tool captures key priority characteristics of wetlands mitigation sites used by transportation agencies, and creates results in industry standard GIS formats for interpretation and use in the field.

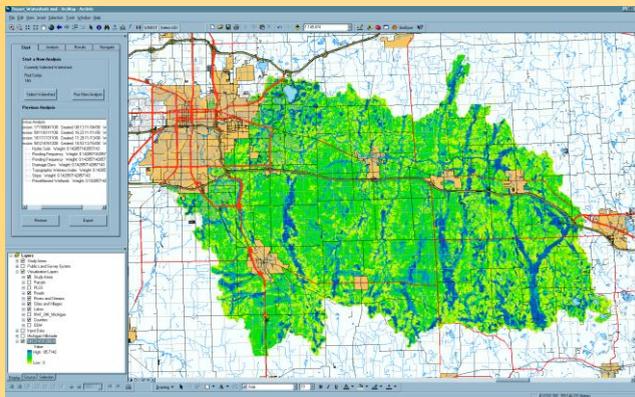


Figure 1: The WMSST tool has been used to create an analysis of suitability for potential wetlands mitigation for an entire 294,000 acre watershed. The tool is docked on the left within an ArcGIS interface; blue areas have the highest suitability.

The tool operates within a Desktop ESRI ArcGIS environment, and includes an open source viewer application built around MapWindow so that results can be used in the field without the need for additional expensive software. The tool can be used for planning and site selection in the office, but also includes the demonstrated ability to operate on a field laptop while integrated with GPS for real-time assessment and suitability mapping. In addition to a set of default values tested in collaboration with the Michigan

Department of Transportation (MDOT), the tool includes the capability for users to alter the weights for each input data source to interactively map user priorities for wetland mitigation site suitability. Input data layers for assessing site suitability include high-resolution digital soils data, topographic information, historical land cover, and two MTRI-derived indices of relative soil moisture. Suitability results can be compared to visualization data sources, such as watershed boundaries, roads, hydrology, ecoregions, Public Land Survey System (PLSS) sections, National Wetlands Inventory data, current land cover, and high resolution imagery.

The user-friendly GIS interface includes the ability to save suitability assessments and re-use them at later periods for additional assessment. Also included is a navigation toolbar that enables users to rapidly focus on high priority areas by zooming in via PLSS sections, latitude/longitude, watershed, and address. The tool has a comprehensive user manual to help with integrating the tool into agency workflows.

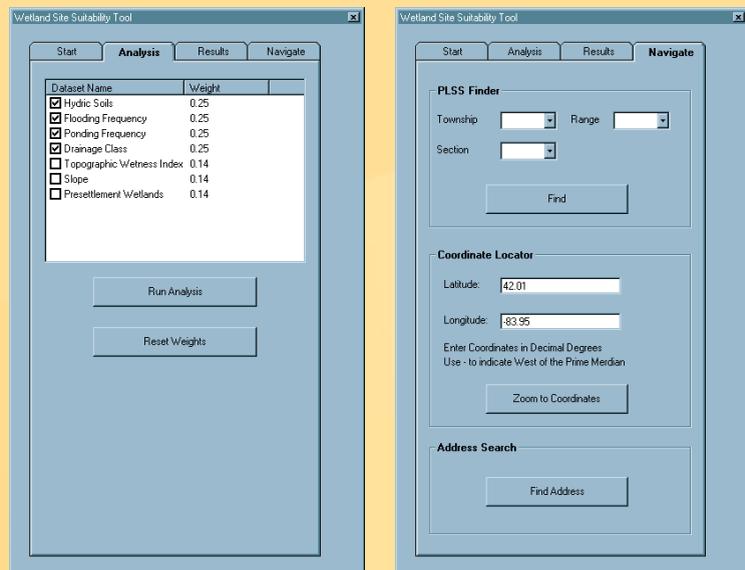


Figure 2(a) and 2(b): Tool components showing (a) the interactive weighting interface that enables the tool to produce results focused on user priorities and (b) the navigation toolbar that enables users to rapidly access locations of high priority wetlands mitigation sites.

Advanced analysis included in the Michigan version of the tool includes a Soil Moisture Index (SMI), calculated by using established relationships between amounts of vegetation in agricultural fields and surface temperature values interpreted using Landsat satellite imagery. MTRI also calculated a Topographic Wetness Index using USGS topographic data to enable complete moisture index coverage of states where analyzed satellite data are not readily available.

In extended testing in a variety of ecological regions in Michigan, the WMSST correctly identified the suitability of wetlands mitigation sites 95% of the time. The ability for the user to interactively select their priorities for suitability increases the applicability for different areas and states. The tool can be operated by staff who are not GIS or remote sensing experts, and MTRI can provide training and customization for different areas of the country. With a tool that integrates existing GIS data sources, new advanced analysis, user selected weighting of priorities, MTRI has developed a resource that rapidly and accurately assesses the suitability of large areas for potential wetlands mitigation sites.

TABLE 1

List of primary data sources used to evaluate wetland mitigation site suitability, which can be customized:

Data sources

- USDA SSURGO Hydric Soils
- USDA SSURGO Drainage Class
- USDA SSURGO Ponding Frequency
- USDA SSURGO Flooding Frequency
- MTRI Topographic Wetness Index
- MTRI Soil Moisture Index
- USGS Slope
- Presettlement Wetland Land Cover

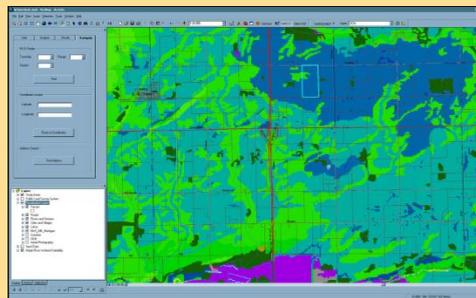


Figure 3: The watershed selection interface (displayed) enables users to rapidly focus on their priority area of interest.

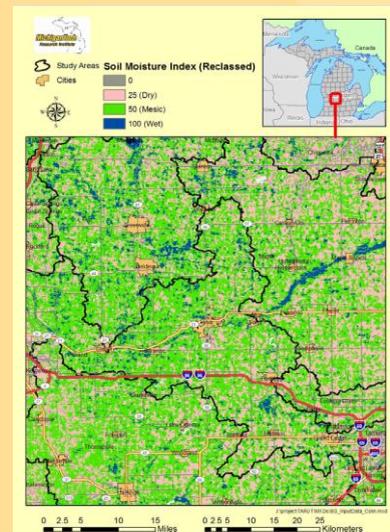


Figure 5: An example of the MTRI derived Soil Moisture Index, which helps assess a key characteristic of mitigation site suitability.

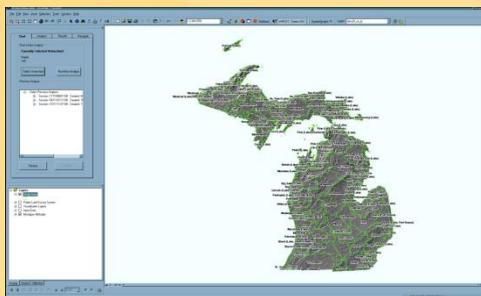


Figure 4: A zoomed-in example of the suitability results showing visualization data such as roads and parcels that can help assess individual sites.

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