# Virginia Institute of Marine Science
# Wetland Mitigation Targeting Tool

The Virginia Institute of Marine Science (VIMS) Wetland Mitigation Targeting Tool (WMTT) applies five criteria related to wetland restorability in sequence to assess suitability for created or restored wetland habitats to develop and persist over time. To date, the tool has been used most widely to guide the selection of wetland compensatory mitigation sites. Because the tool relies on freely-available national or regional datasets, it is readily transferable to other states.

## OVERVIEW

**Lead developer:** Marcia Berman, VIMS Center for Coastal Resources Management (CCRM).[1]

**Year developed:** 2002 and subsequently updated. The interactive website was last updated in 2007.[2]

**Geographic area:** The coastal area of Virginia (Fig. 1).[2]

**Resource types:** Wetlands.[2]

**Restoration/conservation:** The tool targets wetland restoration (reestablishment and rehabilitation), creation, and enhancement.[2]

**Current status:** The project to develop the tool is complete and the output is available as an interactive map on the CCRM website. Developers, consultants, and possibly the Virginia Department of Transportation are currently using this interactive map to identify mitigation sites.[2]

## PRIORITIZATION ANALYSIS

**Input data QA/QC:** High-resolution digital orthophotography was used to validate that results of the GIS analysis met the land use, hydrology, and wetland-adjacency criteria used in the WMTT prioritization. Orthophotography, however, could not be used to evaluate soils criteria. During this QA/QC process, misclassifications of National Land Cover Dataset (NLCD) data that affected results were discovered (e.g., many areas ranked as "good" were actually developed). Where possible, replacing 1992 NLCD data with more accurate 1997 land cover data reduced error from 50% to less than 15%.[1]

**Landscape prioritization tool(s):**

Wetland Mitigation Targeting Tool: The WMTT applies a hierarchical approach in which GIS layers representing different criteria for wetland restoration/creation are applied successively, in order of importance. As an area on the landscape satisfies more of these spatial criteria its suitability rank for the development and persistence of wetlands increases. This process begins with a raster land cover dataset, from which forested and agricultural land use types – considered to have a high probability of successful conversion to wetlands – are identified for further consideration as potential sites for wetland restoration or creation.[1]

Within these areas, areas containing hydric soils larger than 0.25 acres are ranked as "potential" restoration sites. Potential restoration sites that intersect with streams – an indicator of hydrologic connectivity – are ranked as "moderate." Of these "moderate" areas, those adjacent to wetlands, an indicator of the likelihood that restoration will be successful, are ranked as "good" if they are forested and "high" if they are agricultural. The higher preference for agricultural lands over forested lands reflects the higher ecological values of maintaining forest buffers rather than converting forests to wetlands. Agricultural lands meeting hydrology and hydric soil criteria are also likely to be prior converted wetlands and are therefore better suited for conversion to wetlands than other land cover types (e.g., forest). Sites that were ranked "good" and are adjacent to conservation areas are elevated to "high," while those that were ranked as "high" and are adjacent to conservation areas are elevated to "excellent." Data used in this process and their sources are provided in Table 1.[1]

There was no formal collaboration with stakeholders during development of the tool – CCRM staff members were centrally responsible for developing the criteria and scoring system upon which the tool was based. However, because VIMS staff members are actively involved in wetland restoration and creation projects with area non-profits (e.g., the Elizabeth River Project) and government agencies (e.g., Department of Defense wetland restoration and creation), input from area stakeholders may have informally influenced the tool's development.[1]

*Prioritization objectives assessed:*

- Feasibility of restoration

**Table 1. Data factors and sources used by the WMTT tool to prioritize suitable sites for restoration.[1]**

| **Factor used in analysis** | **Data source(s)** |
|---|---|
| Forested and agricultural land cover | NLCD |
| Hydric soils | Virginia Tech GIS (VIRGIS);<br>SSURGO |
| Hydrologic connectivity | DLG hydrography |
| Wetland polygons | NWI |
| Conservation Lands 2000s | Virginia Department of Conservation/Natural Heritage Division |

SSURGO = Natural Resource Conservation Service Soil Survey Geographic Database; DLG = United States Geological Survey Digital Line Graph; VIRGIS = Virginia GIS Project; NLCD = National Land Cover Dataset; NWI = National Wetlands Inventory.

**Prioritization products:** The final restoration suitability output map is available as an interactive map at: http://ccrmgis.wetlan.vims.edu/wetmit_coastalplain/viewer.htm. Users can specify criteria including wetland size, locality (city or county), watershed, and suitability class (potential – excellent) to identify sites for potential wetland compensatory mitigation projects (Fig. 2).

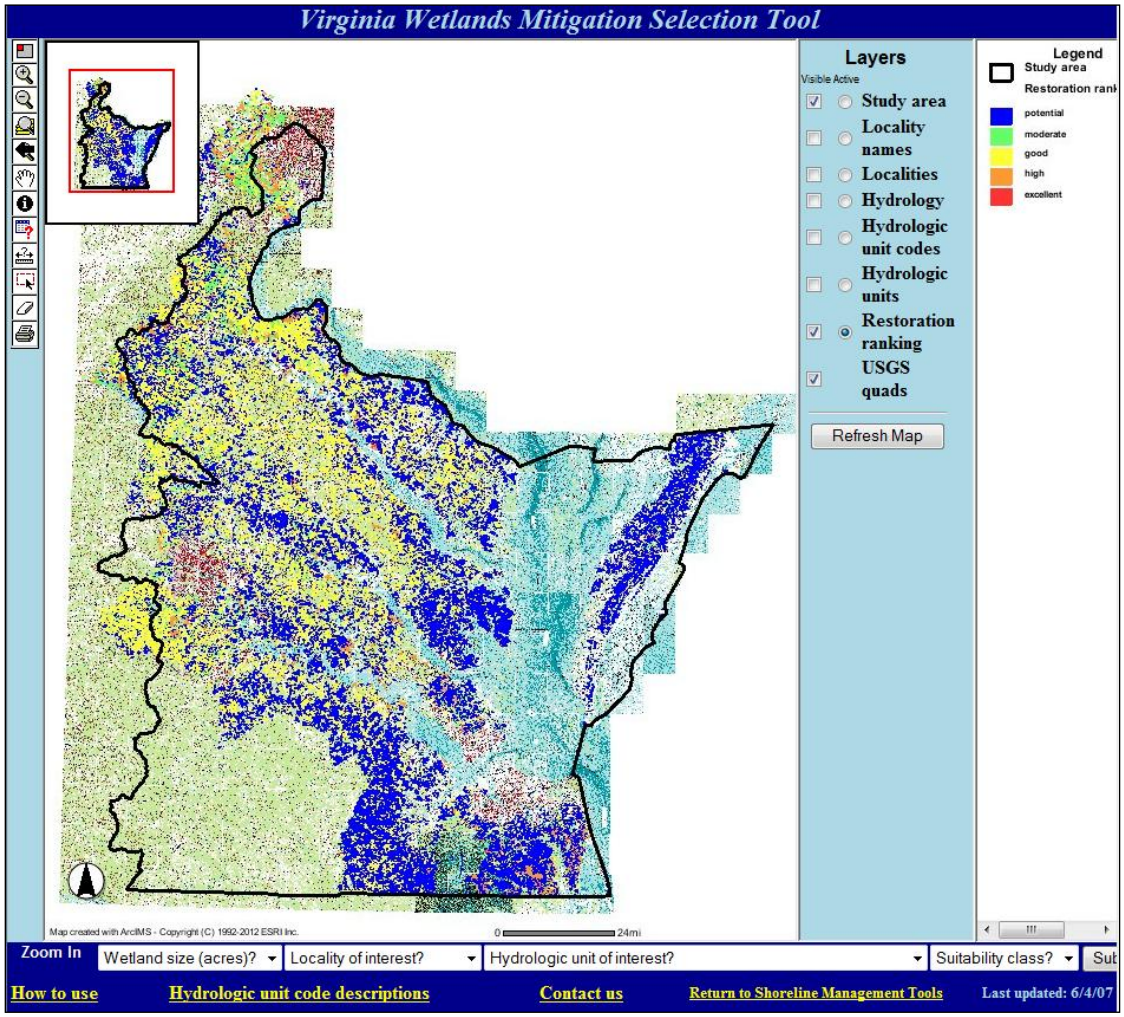


**Figure 1. Output map from the VIMS WMTT as displayed on its interactive website (http://ccrmgis.wetlan.vims.edu/wetmit_coastalplain/viewer.htm). The colors indicate the rank of each area of the map as a location for wetland compensatory mitigation: "potential" = blue, "moderate" = green, "good" = yellow, "high" = orange, and "excellent" = red. Used with permission from Marcia Berman, VIMS Center for Coastal Resources Management (CCRM).**

## IMPLEMENTATION

### Regulatory/non-regulatory programs:

- Section 404 wetland compensatory mitigation: The tool is used by developers and consultants seeking to fulfill compensatory mitigation obligations under Section 404 of the Clean Water Act.[2]

- State/local wetland compensatory mitigation: The tool is used by developers and consultants seeking to fulfill state/local compensatory mitigation obligations under the Virginia Tidal Wetlands Act.[2]
- The tool is used by non-regulatory agencies seeking wetland restoration or conservation opportunities.[2]

**Transferability:**

- One feature that makes the WMTT unique is that it considers whether the opportunity exists for conversion to wetlands across land cover types while other tools often assume that all land uses are potential wetland restoration or creation areas. This feature may make the WMTT approach appealing to those seeking to develop their own prioritization method.[2]
- The WMTT is readily transferable because it uses national and regional datasets – states would just need to replace certain input datasets to apply it themselves.[2]

**Data gaps:**

- High-resolution digital elevation model (DEM) data: VIMS is aware of higher resolution DEM data that are available, although they sparsely cover the study area. Finer-scale datasets are needed, since the data they currently use are regional but the target area for the assessments is very local.[2]
- Prior converted wetlands (PCWs) data: PCW data would have been the most important additional layer to incorporate for improving the WMTT prioritization results; VIMS was unable to create PCW data because of budget limitations.[2]
- Property ownership and value data: This information is widely available in local community databases; however, the data are often not very GIS friendly.[2]
- High-resolution aerial imagery: High-resolution aerial imagery could be used to create land cover datasets that have higher resolution than the NLCD data that are currently used in the model.[2]

**Barriers:**

- Time and money: Funding would need to be acquired before the tool could be updated to address data limitations/gaps that currently exist.[2]
- The sites identified in the output map may not be available for groundtruthing because they are located on private property.[2]

**Future goals:**

- In the next five years, VIMS would like to see the tool undergo revision and, during the process, gain an increased level of exposure to stakeholders. The most significant obstacle to achieving this goal would be convincing funding agencies that revision of the model should be a funding priority.[2]

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[1] Berman MR, Rudnicky T, Berquist H, and Hershner C. 2002. Protocols for implementation of a GIS-based model for the selection of potential wetlands restoration sites in southeastern Virginia. Center for Coastal Resources Management, Virginia Institute of Marine Science, College of William and Mary. Gloucester Point, Virginia.
[2] Interview on 8/17/2011 with Marcia Berman, Program Manager, Virginia Institute of Marine Science.