Virginia Institute of Marine Science
Wetland Condition Assessment Tool

The Virginia Wetland Condition Assessment Tool (WetCAT), developed through a collaborative partnership between the Virginia Institute of Marine Science (VIMS) and the Virginia Department of Environmental Quality-Office of Wetlands & Stream Protection (VDEQ), is designed for use in multiple conservation and resource management contexts. The WetCAT can inform efforts to prioritize wetland restoration and conservation by helping users understand individual or cumulative impacts at wetland sites. A primary use of the tool is to help regulators develop mitigation/compensation requirements for permitted wetland impacts. One unique aspect of the WetCAT is its online interactive user interface, which allows users to overlay data such as previously permitted impacts and impaired waters and run various geoprocessing tools to visualizing cumulative impacts, downstream flow, and upgradient catchments. While the simple method used to create the landscape prioritization tool is readily transferable to other areas, adoption of the supporting rapid assessment and intensive analyses and development of the online interactive tool would require some funding and expertise.

OVERVIEW

Lead developer(s): Kirk Havens, Virginia Institute of Marine Science (VIMS), College of William and Mary.

Year developed: 2007.[1]

Geographic area: Currently used in only the coastal plain of Virginia, but the tool is soon to be extended to the entire state (Fig. 1).[2]

Resource types: Nontidal wetlands.[1]

Restoration/conservation: Restoration (reestablishment and rehabilitation), creation, enhancement, preservation/protection, and acquisition without preservation/protection.[2]

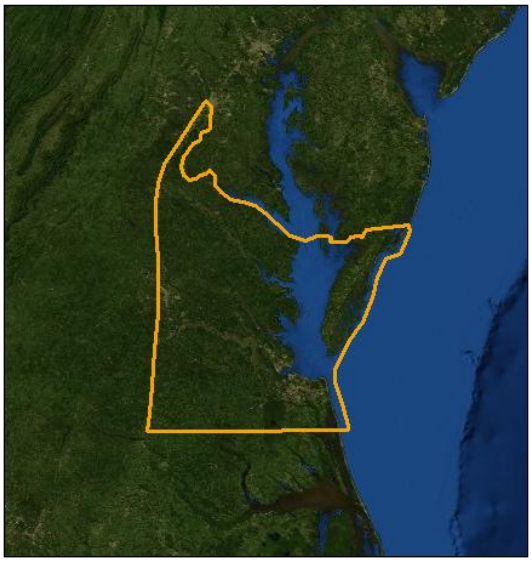

Figure 1. Wetland impacts are assessed in the Virginia coastal plain using VIMS's Wetland Condition Assessment Tool. Used with permission from the Virginia Institute of Marine Science.

Stakeholders: Virginia Department of Environmental Quality; U.S. Army Corps of Engineers; U.S. Environmental Protection Agency; the general public.[3]

Current status: WetCAT is currently under development but is nearing completion. VDEQ plans to use the tool for regulatory purposes and the Virginia Department of Transportation (VDOT) has expressed interest in using it to assess cumulative impacts of transportation corridors.[2]

PRIORITIZATION ANALYSIS

Landscape prioritization tool(s):

Wetland condition assessment tool: This tool scores palustrine emergent, scrub/shrub, and forested wetland polygons based on the habitat and water quality stressors present within buffer regions surrounding each. Factors/data used to assess these functions/values are provided in Table 1.[1]

Prioritization objectives assessed:

- Wetland condition

Table 1. Factors and associated data sources used to prioritize for water quality and habitat quality.[1]

Factor used in analysis	Data source(s)
Watersheds around each wetland	USGS National Elevation Dataset
Wetlands	NWI
Density of roads within 200m of each wetland	US Census TIGER/Line roads (2000)
Land cover data	NLCD

NLCD = National Land Cover Dataset; NWI = United States Fish and Wildlife Service National Wetlands Inventory; USGS = United States Geological Survey

Calibration of the landscape prioritization tool(s): VIMS researchers developed input factors for the landscape prioritization model based on expert judgment and calibrated the model using data obtained from field surveys. In these field surveys, VIMS counted the number of anthropogenic stressors within 30m and 100m of the center of 1928 randomly-sampled coastal plain and piedmont wetlands. Counts for the four most frequently observed stressors in the coastal plain (roads, modification of vegetation through mowing, brush cutting, and timber harvesting) and piedmont (roads, moving, brush cutting, and unfenced livestock) were then correlated with the landscape prioritization scores. VIMS used changepoint analysis to account for nonlinear thresholds in these relationships to establish a final scoring protocol for calculating habitat and water quality functions based on land cover metrics.[1]

Validation of the landscape prioritization tool(s): VIMS obtained acoustic signatures of wetland wildlife (captured by sound recording devices) to directly sample habitat provision at 27 sites throughout the coastal plain. These measurements served as the basis of an 'analysis of similarity' that was used to validate the ability of landscape prioritization land cover scores and rapid assessment stressor counts to predict habitat quality (Fig. 2). In addition, VIMS used Pearson correlation to demonstrate the relationship between land use metrics (e.g., percent pasture, percent rowcrops) and water quality measures (total dissolved nitrogen, total suspended sediment, incision ratio).[1]

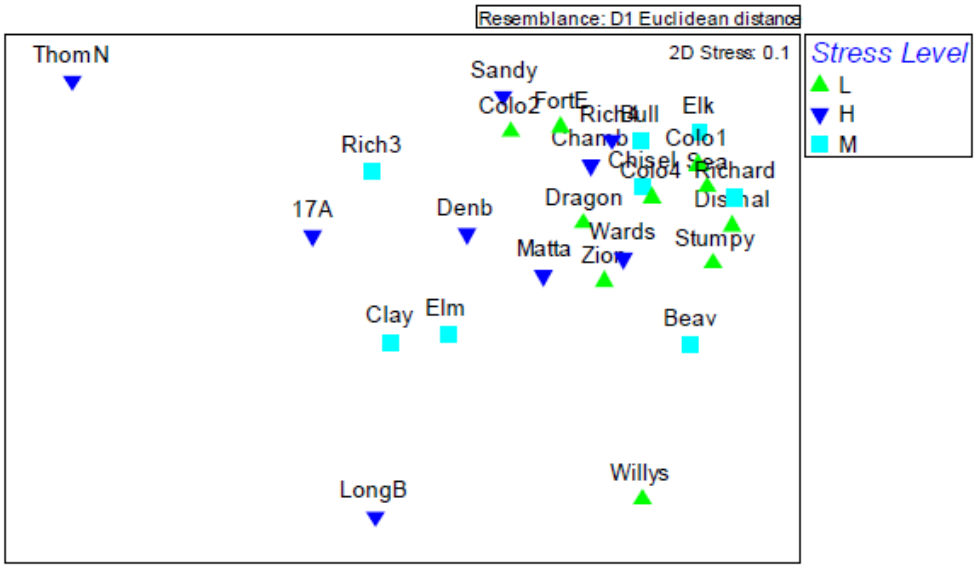

Figure 2. VIMS validates rapid assessment stressor results with intensive amphibian and bird sound signature data using an analysis of similarity. The results from this analysis (shown above) demonstrate a pattern between magnitude of stress level and magnitude of habitat function.[1] Used with permission from the Virginia Institute of Marine Science.

Prioritization products: VIMS will make results from its Wetland Condition Assessment Tool available as part of its Nontidal Wetlands Viewer web tool (Fig. 3), which will allow users to study individual wetlands throughout Virginia using a variety of map overlay and geoprocessing tools. For instance, users will be able to overlay impaired waters, priority conservation areas, sites that have received VDEQ permits, and other features over NWI wetland maps. In addition, one geoprocessing tool will allow users to select a point on the landscape and observe cumulative effects to wetland habitat and water quality within 1 kilometer of that point. Another geoprocessing tool will allow users to trace the downstream flow path from a point and visualize the contributing watershed to a point (Fig. 4).

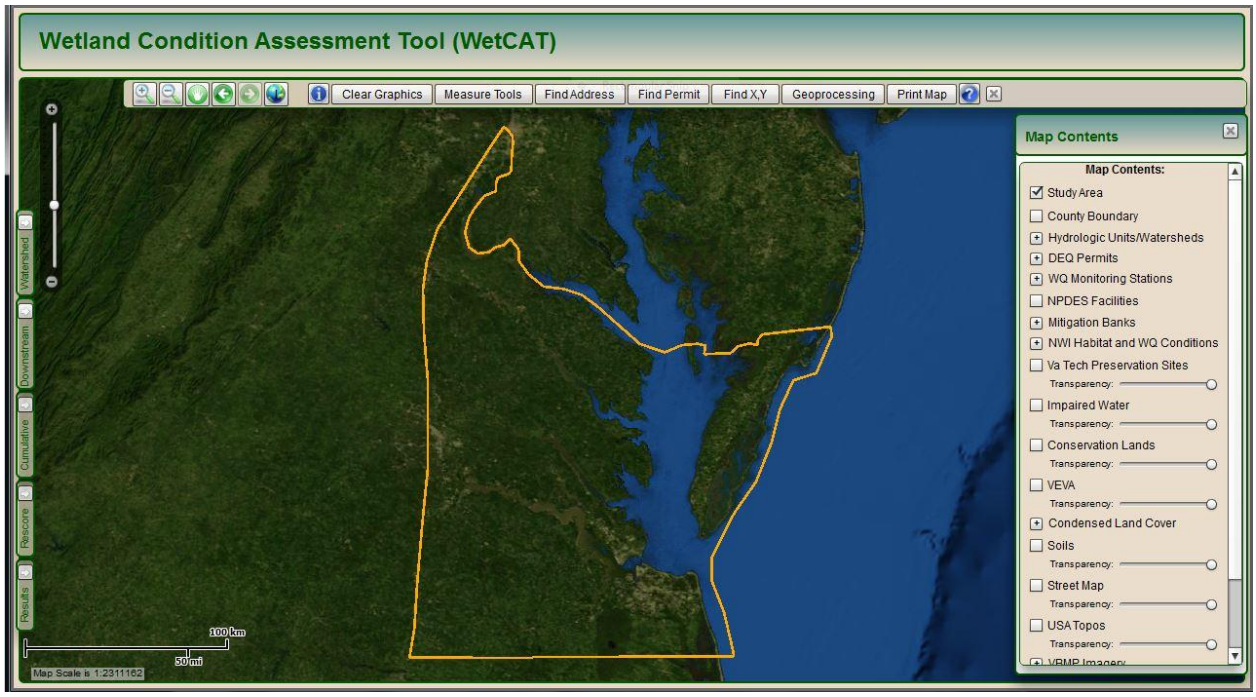

Figure 3. Using the Nontidal Wetlands Viewer web tool, users can overlay impaired waters, priority conservation areas, and sites that have received VDEQ permits, among other features, over NWI wetland maps. Used with permission from the Virginia Institute of Marine Science.

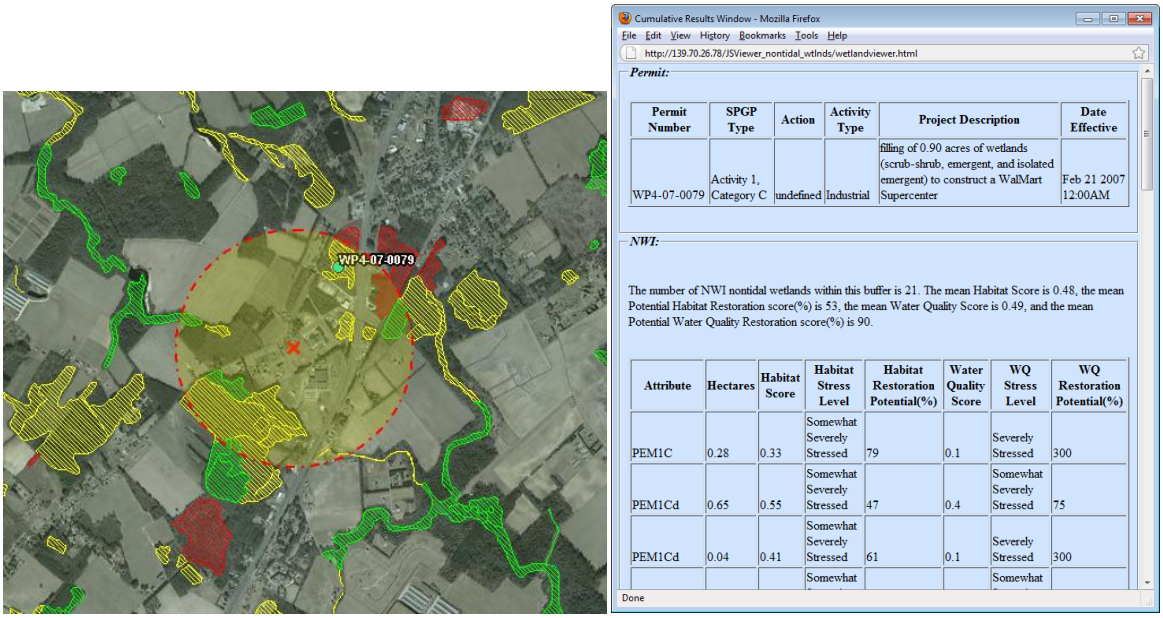

Figure 4. The Nontidal Wetlands Viewer Tool includes geoprocessing tools, such as this cumulative effects analysis, which report stress levels for wetland habitat and water quality within a 1km radius. The tools also report point source impairments, such as DEQ General Permit location (blue dot). Used with permission from the Virginia Institute of Marine Science.

IMPLEMENTATION

Regulatory/non-regulatory programs:

- Section 404 wetland compensatory mitigation: By allowing users to estimate individual or cumulative effects of wetland impacts (e.g., by incorporating the habitat stress level of surrounding wetlands, locations of DEQ general permits, etc.) the tool supports efforts to determine wetland permitting requirements.[2]
- VDEQ wetland regulatory program: VDEQ can use the tool to assess wetland impacts (including cumulative effects), which can help determine appropriate mitigation ratios. The tool's assessment of habitat and water quality impacts may be useful for deciding the size of required compensatory mitigation.[2]
- VDOT NEPA cumulative effects analysis: VDOT has expressed interest in using the tool to assess cumulative effects of planned transportation corridors.[2]

Transferability:

- WetCAT is a good model for any wetland permitting program that must target wetland conservation and restoration based on an assessment of individual or cumulative effects of a wetland impact.[2]
- The basic method underlying the tool is readily transferable to any state with NWI and land cover data. In fact, VIMS has already helped to transfer the basic method to the mid-Atlantic region. However, transfer of the entire method, including the rapid assessment and intensive steps and web-based interactive tool, would require substantial funding and expertise.[2]

Data gaps:

- Easement data: VDEQ would like to have a layer for conservation easements. Easement data are available but need to be transferred to GIS.[2]
- LiDAR data: would be useful for fine-tuning their DEM.[2]

Barriers:

- Funding.[2]
- Obtaining regular updates of land cover data, so that the model can work its best, will be the largest obstacle.[2]

Future goals:

- Expand use of the tool to other areas of the country over the next five years. However, obstacles to achieving this include:[2]
  - Funding, particularly for calibration/validation
  - A lack of high-quality NWI data
  - Comprehensive, regularly updated land cover data.
- Increased training, data, and funding could help VIMS achieve this goal.[2]

[1] Center for Coastal Resources Management, Virginia Institute of Marine Science, College of William and Mary. 2007. Development of a nontidal inventory and monitoring strategy for Virginia – completion of phase II (coastal plain and piedmont physiographic provinces): Final report to the Environmental Protection Agency Region III.
[2] Interview on 7/29/2011 with Kirk Havens, Assistant Director, Center for Coastal Resources Management, Virginia Institute of Marine Science, College of William and Mary.
[3] Feedback received 3/8/2012 from Kirk Havens, Assistant Director, Center for Coastal Resources Management, Virginia Institute of Marine Science, College of William and Mary.