

# Virginia's Updated Wetland Monitoring and Assessment Strategy



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## **Introduction**

Virginia has approximately 1 million acres of wetlands. An estimated 75% of these acres are palustrine vegetated wetlands, and the remaining 25% of these acres are estuarine wetlands. Virginia is believed to have lost about 40 percent of its original complement of pre-colonial wetlands (National Water Summary on Wetland Resources, *United States Geological Survey Water Supply Paper 2425*).

A study of wetland trends in Southeastern Virginia for 1994-2000 showed a net loss of 2,100 acres (1.3%). The actual loss of vegetated wetlands was even higher, but offset by a gain in pond and open water area. The loss of palustrine wetlands was primarily due to conversion to uplands, while estuarine wetlands were lost through conversion to open water (Tiner *et al.*, 2005). Several major causes of wetland loss in Virginia include conversion to other land cover types, ecosystem service modifications associated with climate change, hydrologic alterations, invasive species, fragmentation by development, crop fields, roads, fences, berms, or elimination of ecosystem services, notably habitat and water quality.

A monitoring and assessment program is defined as the establishment and operation of appropriate devices, methods, systems and procedures necessary to monitor, compile, and analyze data on the condition of wetlands (adapted from *Elements of a State Water Monitoring and Assessment Program*, USEPA, March 2003). Monitoring is the systematic observation and recording of current and changing conditions, while assessment is the use of that data to evaluate or appraise wetlands to support decision-making and planning processes. Wetlands can be characterized both by their condition and by functions. Wetland condition is the current state as compared to reference standards for physical, chemical, and biological characteristics, while functions represent the processes that characterize wetland ecosystems.

The overarching goal of Virginia's wetland monitoring and assessment strategy is to develop a long-term implementation plan for a wetland monitoring and assessment program that protects the physical, chemical, and biological integrity of the Commonwealth's water resources, including wetlands. In order to accomplish this goal, it is critical to first know the status of wetland resources in Virginia, in terms of location and extent of wetlands in each watershed, and have a general knowledge of the quality of these wetland resources. Secondly, the functions of wetland resources affected through the Virginia Water Protection (VWP) permitting program must be accurately evaluated to determine those functions to be replaced through compensatory mitigation. It is also important to assess the degree to which the required compensatory mitigation is performing in relation to those affected functions.

## **Wetland Monitoring Background**

Since 2003, the overall wetland monitoring and assessment strategy has been to establish baseline conditions in various broad contexts, such as land use, watershed, and wetland type. This information can then be used to guide management decisions regarding wetland restoration efforts, programmatic compensatory mitigation, and integration with overall Water Quality Standards (WQS). This strategy provides the ultimate framework for an ongoing assessment of the status of the Commonwealth's wetland resources and the success of both wetland regulatory and voluntary programs. The wetlands monitoring strategy will be coordinated with Virginia's comprehensive water quality monitoring program strategy. The monitoring objectives are designed to support regulatory decision-making, allow reporting of wetland conditions, and provide information for policy development.

The wetland monitoring program will also meet the Clean Water Act objectives for water monitoring programs by addressing the quality of the Commonwealth's wetlands and their condition as part of the overall condition assessment of state waters.

The monitoring and assessment strategy follows the "Elements of a Wetland Monitoring and Assessment Program Checklist" developed by the United States Environmental Protection Agency (EPA) in October 2002, as well as the Elements of a State Water Monitoring and Assessment Program (EPA 841-B-03-003, March 2003) and Application of Elements of a State Water Monitoring and Assessment Program for Wetlands (unpublished draft, July 2005).

The Virginia Department of Environmental Quality (VDEQ) and the Virginia Institute for Marine Science (VIMS) have developed a robust, science based Wetland Monitoring and Assessment strategy for evaluating the condition of wetlands in the Commonwealth. The overarching goal of Virginia's wetland monitoring and assessment strategy is to develop a long-term implementation plan for a wetland monitoring and assessment program that protects the physical, chemical, and biological integrity of the Commonwealth's water resources, including wetlands. In order to accomplish this goal, it is critical to first know the status of wetland resources in Virginia, in terms of location and extent of wetlands in each watershed, and have a general knowledge of the quality of these wetland resources. Secondly, the functions of wetland resources impacted through our permitting program must be accurately evaluated to determine those functions to be replaced through compensatory mitigation. It is also important to assess the degree to which the required compensatory mitigation is performing in relation to those impacted functions.

The assessment method is a multi-service model that involves three levels of data collection. The level II and level III sampling are intended to calibrate and validate the model that is applied at the level I (model development) stage. The data collections are not designed to operate independently. The method characterizes the capacity of the wetland to provide water quality and habitat services using remotely sensed data. The underlying models are based on existing research. They specify the combination of landscape level parameters that are most likely predictive of these capacities. The model application produces a relative numeric score for each wetland for each service. The scores are then refined and calibrated by site visits to randomly selected wetlands. The relationship between structure and function is validated by intensive study of ecological service endpoints. A critical part of the overall monitoring and assessment strategy is effective validation and calibration of the underlying models. The level III assessments are designed to specifically evaluate performance of functions in wetlands under varying degrees of stress, as indicated by the Levels I and II protocols.

Virginia's wetland monitoring and assessment program is being implemented through a cooperative agreement between VDEQ and the Center for Coastal Resources Management (CCRM) at the Virginia Institute of Marine Science (VIMS) using funds awarded through EPA's Wetland Program Development

Grants to continue these efforts. VDEQ has received nine grant awards from EPA for this initiative, and Virginia is recognized as one of five states leading this initiative nationally. Parameters used in the assessment reflect information from published literature, with consideration of on-going work being conducted through the Mid-Atlantic Wetland Workgroup (MAWWG), regarding each parameter's validity, usefulness, and utility for field data collection.

A level I assessment based on type and surrounding landscape has been completed for all wetlands in Virginia. Each wetland area is given a separate score for habitat and for water quality. The assessment was done using existing data sets from the National Wetlands Inventory (NWI), Landsat Thematic Mapper (TM) satellite, protocols developed by the Coastal Change Analysis Program (CCAP) of the National Oceanic and Atmospheric Administration (NOAA), U.S. Geologic Survey National Elevation Dataset (NED), and Digital OrthoPhoto Quads. The parameters chosen for Virginia's Level I assessment wetland condition score include: (i) wetland size, (ii) wetland type, (iii) proximity to other wetlands; (iv) proximity to roads and highways, (v) density of roads and highways; and (vi) percent land cover (immediately adjacent to the study wetland, at a 200 meter radius from the study wetland, and at 200meters within the contributing drainage to the study wetland). The data set will be updated periodically, when resources allow, as revised land cover and NWI maps are updated.

Level II and III assessments have proceeded by physiographic province from the coastal plain to piedmont to the ridge and valley with a sampling effort succeeded by model validation. This phase of the assessment and monitoring effort is complete. The current phase is the re-calibration of the stressors by landcover to verify the correlation of stressor type to landcover and validate the use of landcover for condition assessment scoring. Recalibration is conducted on a 3-5 year cycle by physiographic province

The data collected has been compiled into an online GIS-based viewer identified as the Wetland Condition Assessment Tool (WetCAT). One aspect of WetCAT is its interactive user interface, which allows users to overlay data such as permitted impacts and impaired waters and run various geoprocessing tools to visualize cumulative impacts, downstream flow, and upgradient drainage areas.

The goal of WetCAT is to support VDEQ's regulatory decision-making, allow reporting of wetland condition, and provide information for policy development. Information derived from monitoring will be used to:

1. Report ambient wetland conditions in Virginia's Clean Water Act (CWA) Integrated 305(b)/303(d) report;
2. Assist in the evaluation of environmental impacts to wetlands of proposed projects during permit review as part of Virginia's regulatory program, including an assessment of cumulative impacts to wetlands and water quality within a given watershed;
3. Evaluate the performance of wetland restoration and other compensatory wetland mitigation in replacing wetland acreage and function, including changes in wetland condition over time based upon surrounding landscape changes and maturity of the mitigation site; and
4. Evaluate the cumulative impacts of wetland loss and restoration in watersheds relative to ambient ecological conditions and water quality management needs.

## **Coordination Efforts**

Several meetings have been held with Virginia Department of Transportation (VDOT), Corps of Engineers (Corps), EPA, VIMS, and VDEQ to discuss the types of information needed for reference materials and online tools for WetCAT. WetCAT has been modified based on VDOT and Corps

recommendations, as of Winter 2015. Those requests have been incorporated, where feasible, including the ability to conduct cumulative impact analysis along linear corridors and the ability to import a single arc or polygon as a zipped file and use the buffer and/or the cumulative results tool. In addition, a tab was added to allow searching by decimal degrees and VDEQ permits were updated as well as Conservation Lands and Mitigation Banks. In order to increase processing times, geoprocessing and map services were moved from ArcGIS server 10.0 to ArcGIS server 10.3. Online training modules have been created on YouTube and are currently available on the WetCAT website that is provided on VDEQ's website.

VDEQ Leadership Team supports the use of WetCAT and the roll-out to staff. Testing for the VWP staff was conducted and training was been provided in 2014 and 2015. WetCAT has been presented to the public at several public environmental workshops and conferences and is currently available on VDEQ's website (<https://www.deq.virginia.gov/our-programs/water/wetlands-streams/monitoring-assessment-strategy>).

Tablets have replaced the old PDAs to collect level II data through the additional money awarded by EPA in October of 2013. The new equipment has been purchased and the training of VDEQ's field staff is complete. Development and testing of new protocols for VDEQ field staff that provides for integrated data collection and quality assurance in support of the recalibration effort and non-mapped NWI wetland identification is ongoing. By continuing the model recalibration and developing additional datasets for WetCAT, the online interactive assessment tool will become a more useful and robust tool for use by VDEQ wetland permit staff, other state and federal agencies, and the public. Supplementary equipment will be purchased for additional VDEQ field staff to use to collect data. Data supplied by VDEQ field staff (level II assessments) has been added to the WetCAT database. Presentations and training for the public have occurred in the winter of 2015 and again in the spring of 2016.

## **VDEQ's Accomplishments**

The strategy continues to develop a complete wetland monitoring and condition assessment in Virginia's Coastal Plain, Piedmont, and Ridge and Valley physiographic provinces in Virginia. The strategy developed in Phase 1 (see Table 1 in Appendix A) provides the framework for the ongoing assessment of the status of the Commonwealth's wetland resources and performance measures for both the wetland regulatory and voluntary programs. VDEQ's monitoring objectives are designed to support regulatory decision-making, allow reporting of wetland conditions, and provide information for policy development. Products from the wetlands monitoring and assessment strategy directly support Goal 4 of EPA's Strategic Plan to provide "...*additional focus on assessment of wetland condition*" and the National Priority of "*wetlands monitoring and assessment*". Table 1 in Appendix A provides an overview of the strategy's milestones and the status of each.

The level I (model development) analysis, combined with validation and calibration from the level II and level III assessments, provides an evaluation of the condition of wetlands based on their position in the landscape. This information is directly applicable to status and trends reporting under Clean Water Act Section 305(b), and can be utilized in permitting programs to assess cumulative impacts to wetlands within watersheds.

Resampling of NWI mapped wetlands is conducted to investigate possible changes between surrounding land use and wetland stressors. This information is critical in the Virginia assessment protocol as the foundation of the stressor prediction algorithm in the Level I assessment model. It is essential to revisit the relationship between land use practices and stressors impacting wetlands as the pattern of development changes. Evolving best management practices in agriculture, and changing



stormwater and site development regulations in suburban communities may alter the probable occurrence of selected stressors. Since the Level I protocol uses remotely sensed land cover information to predict stressor occurrence, it is critical to periodically reassess the prediction algorithms. The periodic resampling has shown that the major stressors found within wetlands remained similar between sample periods with mowing, brush cutting, roads, eroding banks, and unfenced livestock. A critical part of the overall monitoring and assessment strategy is effective validation and calibration of the underlying models. The level III assessments are designed to specifically evaluate performance of functions in wetlands under varying degrees of stress, as indicated by the level I and level II protocols.

One of the potential advantages of the Virginia protocol for monitoring and assessment of nontidal wetlands is the opportunity to develop a comprehensive assessment of the functional condition of all mapped wetlands whenever there is updated land cover information. This information is particularly useful for evaluating the performance of the regulatory program. It is also useful for indicating cumulative impacts to wetland resources arising from adjacent activities that do not directly impact wetlands. This information can help to raise awareness of consequences and motivate essential change in general land use management and planning that affects lands outside wetland jurisdictional boundaries. Linking decisions in these areas to wetlands policy will be essential to attainment of the no net loss goal.

One of the tasks of the grant projects took advantage of updated coastal plain assessment protocol, and the newly available land cover information from the NOAA Coastal Change Analysis Program. The recent update of the land cover classification for the coastal plain of Virginia provides a 2006 land cover that can be used in conjunction with the 1996 and 2001 land cover data set to assess change. All three land cover data sets were analyzed using the Level 1 assessment model. CCRM then summarized the changes in wetland condition output by the model. This represents the first comprehensive assessment of trends in wetland condition over a relatively modern time interval. Analysis of wetland water quality condition and habitat condition scores by 12-digit hydrologic unit code showed some changes in average water quality and average habitat condition over time.

Using the analysis of wetland condition change, the water quality data was analyzed for Virginia's coastal plain. By developing catchment areas for the various water quality monitoring stations, the primary objective of this task was to search for relationships between water quality condition recorded at VDEQ water quality stations and the condition of wetlands in the contributing drainage.

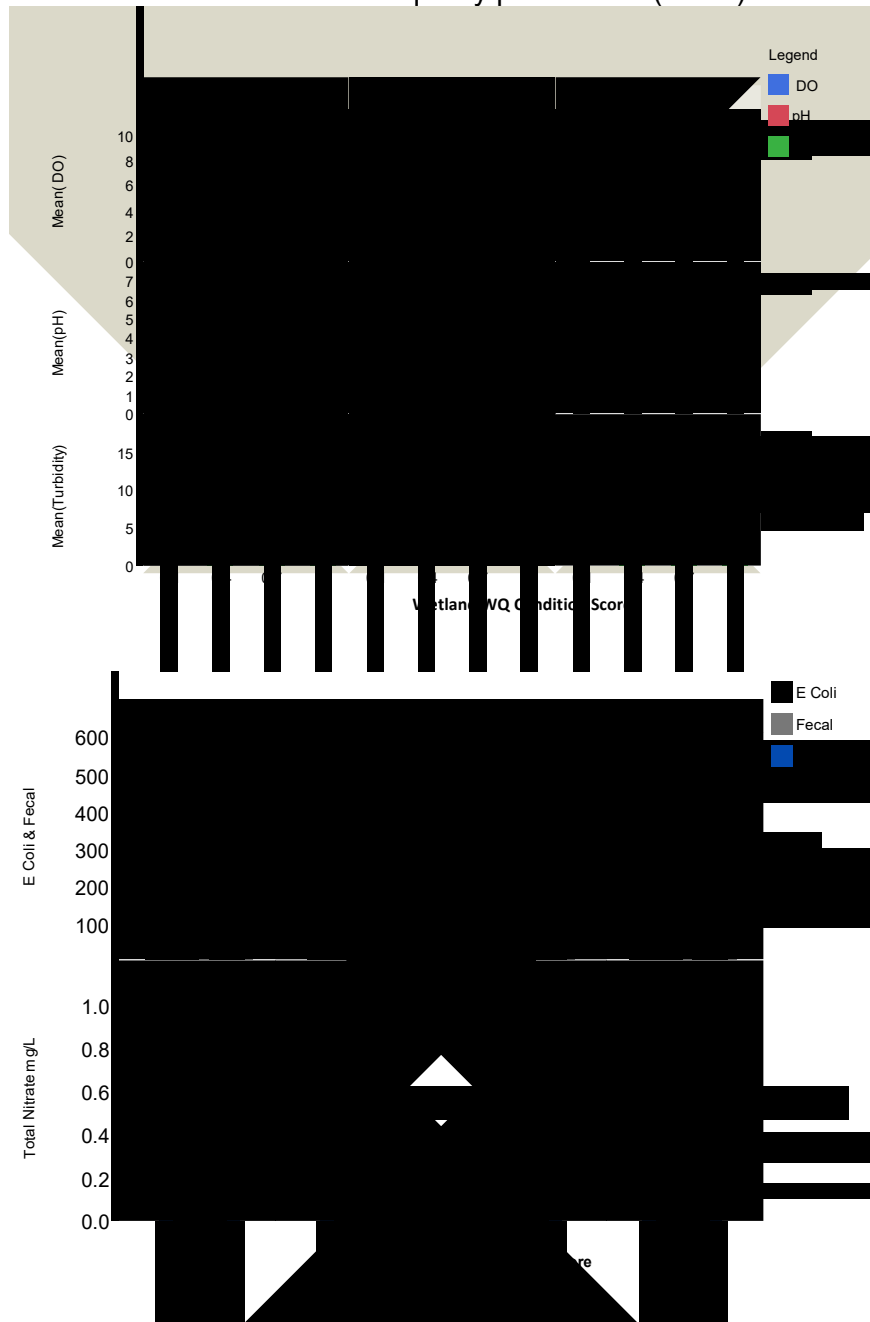
To test wetland water quality condition scores, VDEQ coastal plain water quality stations (n=99) were used to determine possible trends between wetland water quality condition scores and in-stream water quality metrics (E. coli, fecal coliform, total nitrate nitrogen, DO, pH, and turbidity). Contributing drainage areas were developed for water quality stations using the same protocol for development of individual wetland drainage areas (Figure 1). Water quality station data was compared to contributing drainage wetland water quality condition scores for multiple years (1996, 2001, and 2006).

Figure 1. Wetland water quality stress condition within the contributing drainage to a VDEQ water quality station.



While there were no obvious trends between wetland water quality condition score and average DO, pH, and turbidity, there were trends in total nitrate nitrogen, fecal coliform levels, and E. coli levels. As shown in Figure 2, the higher the wetland water quality condition score in the contributing drainage the lower the levels of nitrate, fecal coliforms, and E. coli suggesting a relationship between those water quality parameters and wetland condition.

Figure 2. Comparison of wetland water quality condition scores (mode) and in-stream water quality parameters (mean).



### GIS Wetland Data Viewer

Coordination with CCRM-VIMS and VDEQ staff to design and implement procedures to facilitate the routine application of inventory and monitoring data for regulatory decisions on wetland permits is ongoing. The data collected has been compiled into a wetland data viewer created by CCRM-VIMS with substantial input from VDEQ. The goal is to automate the processing of database information through GIS necessary to support VDEQ's regulatory decision-making, allow reporting of wetland condition, and provide information for policy development.



The additions of data sets and GIS layers will allow Virginia to continue to develop a GIS-based wetland data viewer for use by regulatory agencies and the general public (see Figure 6). Our success will be measured by an increasing trend in the statistically-reliable Level I protocol and a decreasing trend in cumulative wetland impacts. By having a statistically-validated tool that measures wetland quality as a function of habitat and water quality parameters, our permit staff will be able to make better permit decisions relative to potential cumulative impacts. Further, we will also be able to measure how well we are protecting the function of our more vulnerable wetlands (i.e. isolated wetlands, vernal pools, Atlantic white cedar swamps), by comparing the condition of wetland habitat and water quality parameters, as a function of the assessment scoring over time.

## **Task Related Results**

### **Grant Title: REFINEMENT OF THE WETLAND MONITORING AND ASSESSMENT STRATEGY FOR VIRGINIA – TRACK ONE (Project 51415, Task 11)**

VDEQ continues to make significant progress in the continued refinement of our wetland monitoring and assessment tools for use in management decision-making; integration within our water quality programs; and coordinated effort to provide other agencies the opportunity to use our assessment tools for land use planning and permitting review. This project carried out the following actions (identified in Wetland Comprehensive Program Plan (WPP)): 1) modify the Wetland Dataviewer to incorporate linear projects for NEPA review and permitting; 2) incorporate Virginia's approved mitigation banks into the Wetland Dataviewer; 3) continue re-calibration of the wetland assessment models; and 4) update the 2005 Monitoring and Assessment Strategy along with development of online reference manuals/training modules for the Wetland Dataviewer website. This grant built on previous funded work, and specifically addresses EPA's national wetland program priorities and Goal 4 of EPA's strategic plan. In addition, this work included a collaborated effort with VDOT to support and improve their NEPA review and permitting decisions.

#### ***Task 1: Modify Wetland Dataviewer for Linear Projects***

The interactive Wetland Dataviewer, also identified as the Wetland Condition Assessment Tool (WetCAT), allows users to access wetland condition in designated buffers or by HUC unit, but was not designed for long, linear projects with multiple crossings of state waters. This task involved coordination with VDOT and VDEQ personnel to modify the reporting mechanism to meet the specific needs of VDOT for NEPA review, mitigation requirements, and analyzing linear corridors for cumulative wetland impacts. Several meetings were conducted with VDOT and VDEQ to discuss modification of WetCAT for use in reviewing linear transportation projects and suggestions regarding the functionality of WetCAT for linear projects were discussed. Suggested modifications to WetCAT were incorporated such as analysis by linear corridor and the ability to input user generated polygons (Figure 3), culminating in WetCAT being used by VDOT in the Hampton Roads Crossing Study SEIC [http://www.hamptonroadscrossingstudy.org/learn\\_more/hracs\\_draft\\_seis.asp](http://www.hamptonroadscrossingstudy.org/learn_more/hracs_draft_seis.asp) (Figure 4).

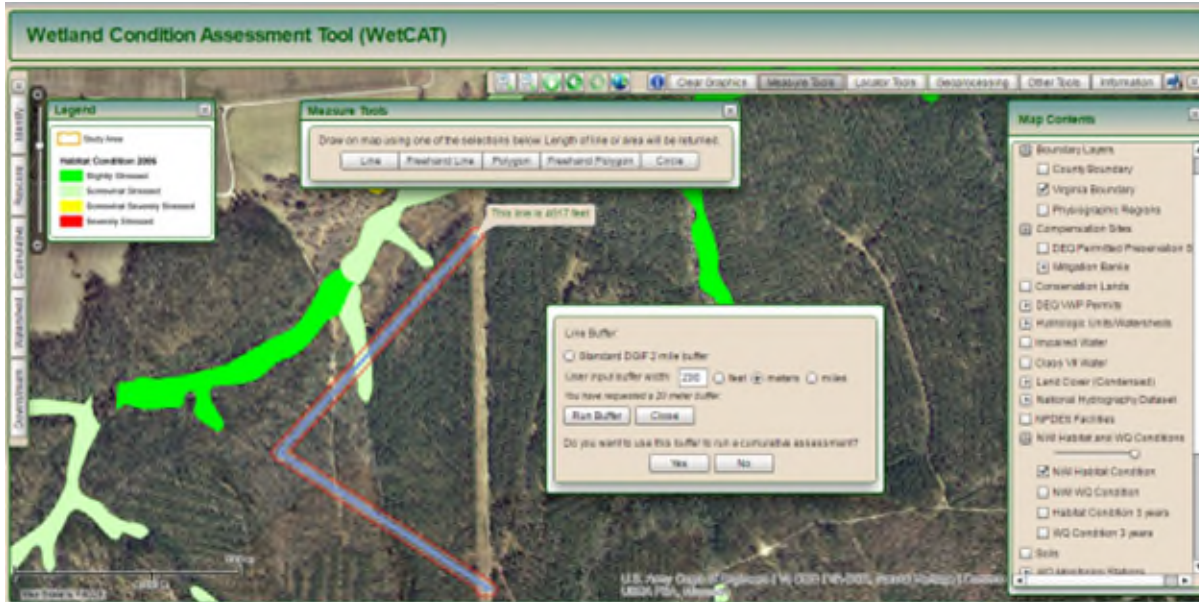
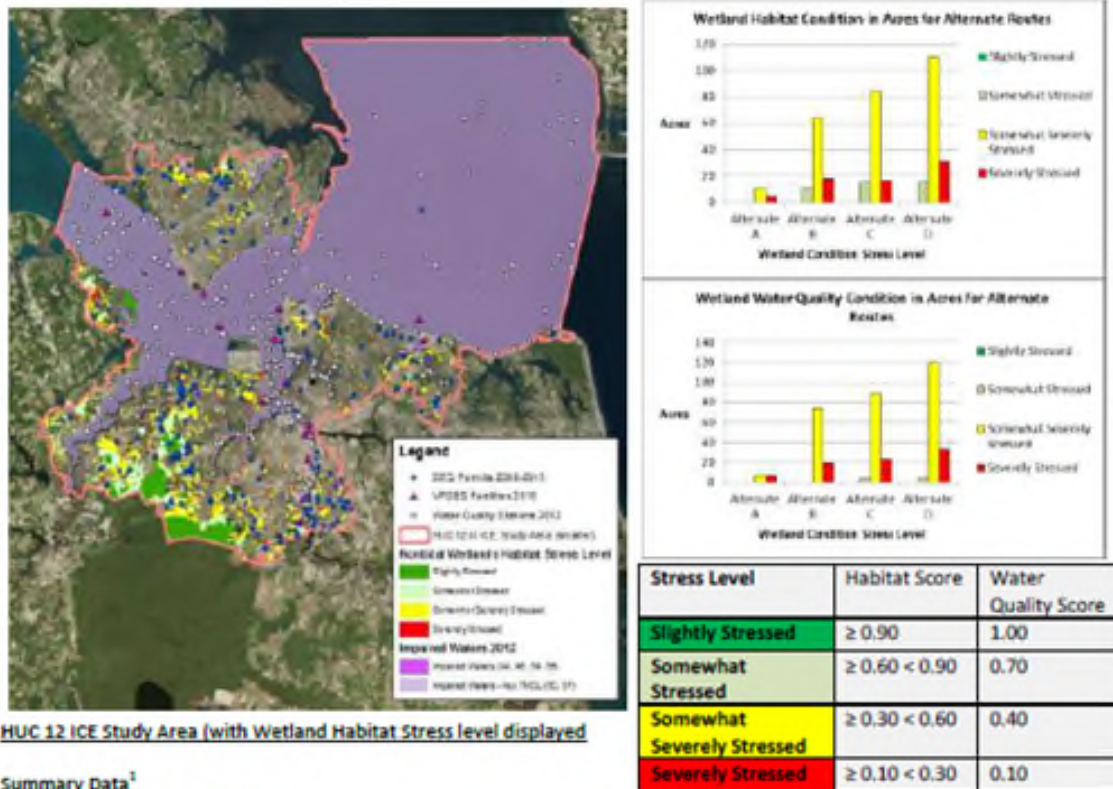


Figure 3. Incorporation of linear corridor analysis for cumulative assessment of transportation projects.

## VDOT Hampton Roads Crossing Study SEIS: Virginia Wetland Condition Assessment Tool (WetCAT) Analysis



HUC 12 ICE Study Area (with Wetland Habitat Stress level displayed)

**Summary Data<sup>1</sup>**

HUC 12 Study Area: 24,450 acres  
 Mean Wetland Habitat Condition Score = 0.57  
 Water Quality Condition Score (Mode) = 0.10

Overall Condition Category = **Somewhat Severely Stressed**  
 Overall Condition Category = **Severely Stressed**

Alternate A direct wetland impacts: 15.2 acres  
 Mean Habitat Condition Score = 0.35  
 Water Quality Condition Score (Mode) = 0.10

Overall Condition Category = **Somewhat Severely Stressed**  
 Overall Condition Category = **Severely Stressed**

Alternate B direct wetlands impacts: 364.7 acres  
 Mean Habitat Condition Score = 0.40  
 Water Quality Condition Score (Mode) = 0.10

Overall Condition Category = **Somewhat Severely Stressed**  
 Overall Condition Category = **Severely Stressed**

Alternate C direct wetlands impacts: 637.9 acres  
 Mean Habitat Condition Score = 0.43  
 Water Quality Condition Score (Mode) = 0.40

Overall Condition Category = **Somewhat Severely Stressed**  
 Overall Condition Category = **Somewhat Severely Stressed**

Alternate D direct wetlands impacts: 811.8 acres  
 Mean Habitat Condition Score = 0.41  
 Water Quality Condition Score (Mode) = 0.10

Overall Condition Category = **Somewhat Severely Stressed**  
 Overall Condition Category = **Severely Stressed**

Figure 4. Summary output for cumulative analysis of transportation projects.



## Task 2: Incorporate mitigation banks into the WetCAT

The provision and enhancement of tools to assist in the analysis of compensatory mitigation is an ongoing need. This task involved obtaining, checking, and, in some cases, digitizing maps for wetland banks, and linking the records in a searchable format to establish a geo-data base for approved wetland mitigation banks in Virginia in the WetCAT. The Corps mitigation bank data located in RIBITS (Regulatory In lieu fee and Bank Information Tracking System) was converted to shape files and included in the WetCAT (Figure 5). In addition, current stream and wetland credit levels per bank (Figure 6) and the mitigation bank service areas (Figure 7) have been incorporated as part of the data table for each bank.

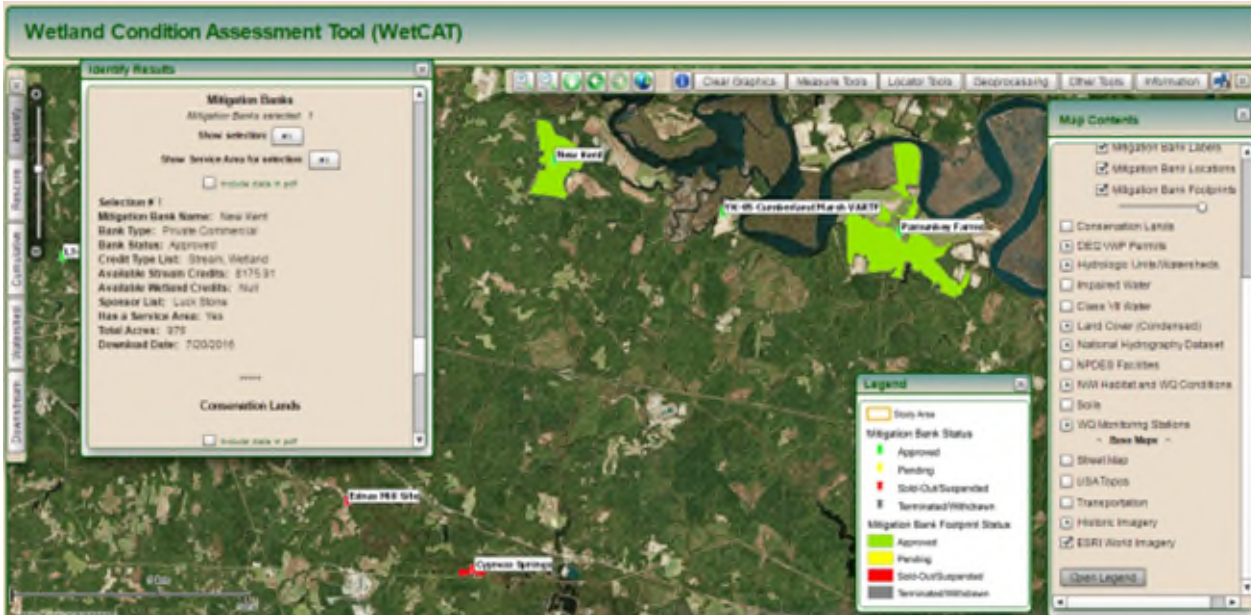


Figure 5. Incorporation of mitigation bank location and footprint.

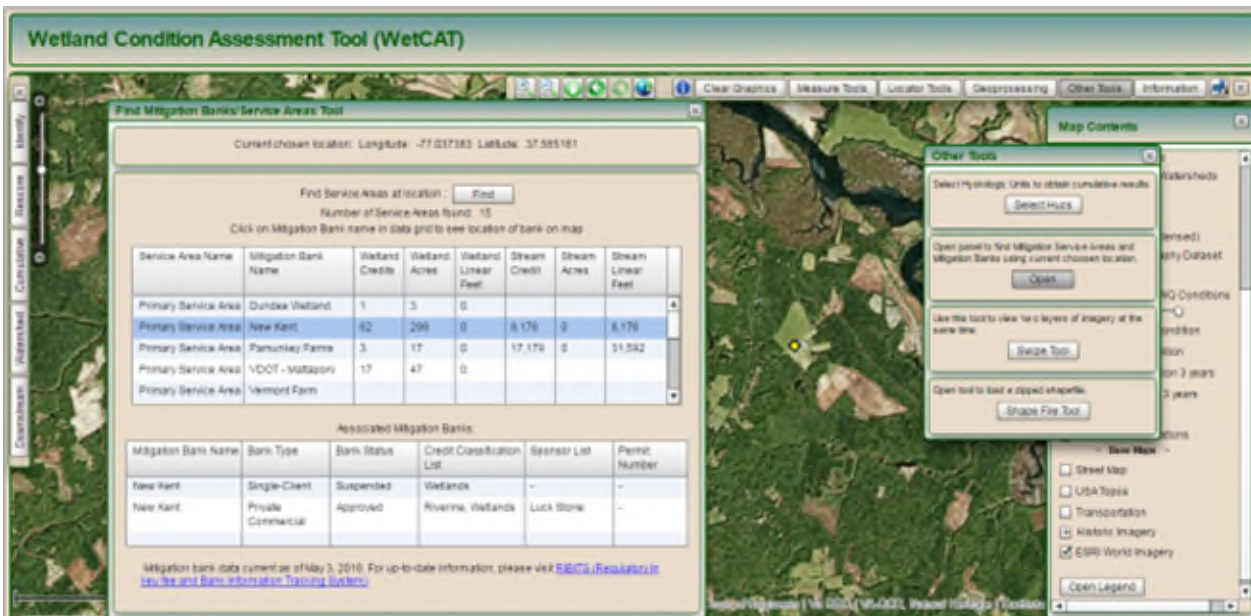


Figure 6. Wetland and stream credit availability.

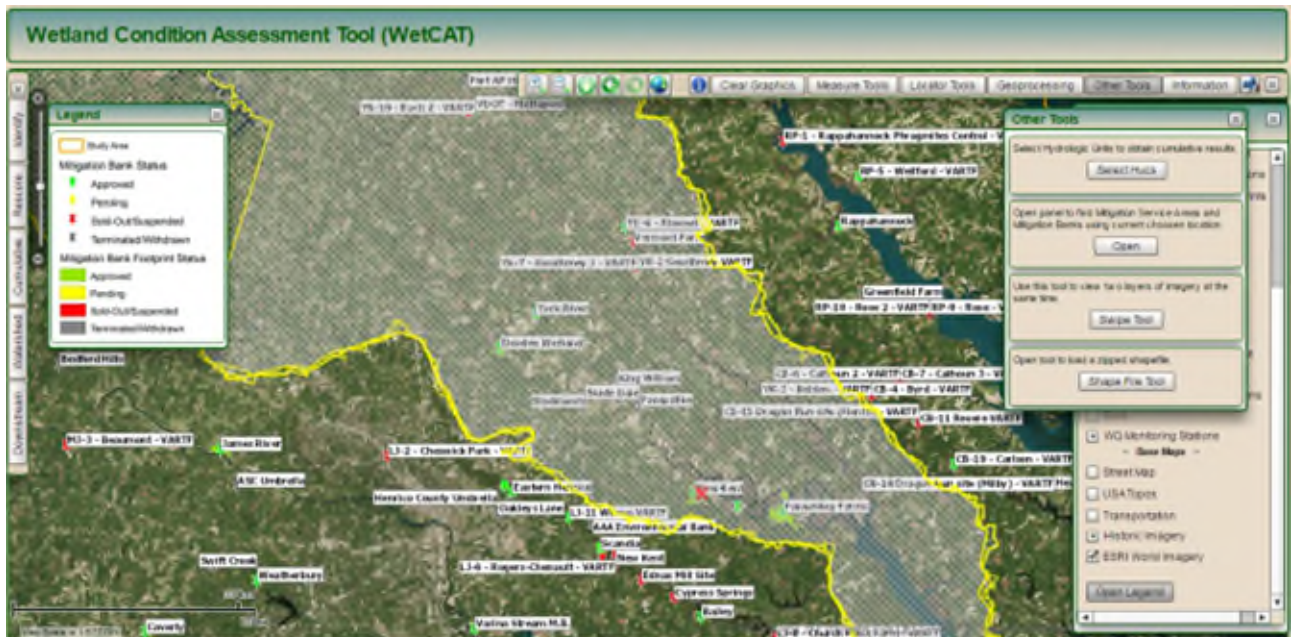


Figure 7. Mitigation bank service areas.

### Task 3: Continued re-calibration of the assessment model

To investigate the possible changes between surrounding landuse and wetland stressors, the Ridge & Valley and Appalachian Plateau NWI mapped wetlands and Coastal Plain NWI mapped wetlands were resampled. The purpose of the recalibration effort is to capture changes in surrounding landcover – stressor relationships at 5 year intervals to ensure the model for wetland condition assessment remains statistically valid.

In a comparison between stressors sampled in wetlands in coastal plain over time the relative levels of stress remain similar with the exception of a notable increase in brush cutting (Figure 8). However, for stressors identified specifically in coastal plain headwater wetlands systems, there is a notable decrease in stressors associated with dikes, weirs, dams, dredging, excavation, invasive species, and other road beds (generally parking lots and driveways) relative to the general population of wetlands. Conversely, there appears to be an increase in filling, grading, and brush cutting in wetlands associated with headwaters as opposed to the general wetland population in the coastal plain. For wetlands systems in the Ridge & Valley, Blue Ridge, and Appalachian Plateau the main stressors are similar overtime with a slight increase in eroding banks and slopes (Figure 9) which differs for headwater wetlands systems where there is a decrease in stressors associated with eroding banks and slopes and an increase in stressors associated with gravel roads and utility easement maintenance relative to the general population of wetlands (CCRM-VIMS, *Development of Strategies to Improve Protection of Wetlands and Headwater Resources in Virginia*, Final Report to EPA, 2016).

### Relative Frequency of Coastal Plain Stressors

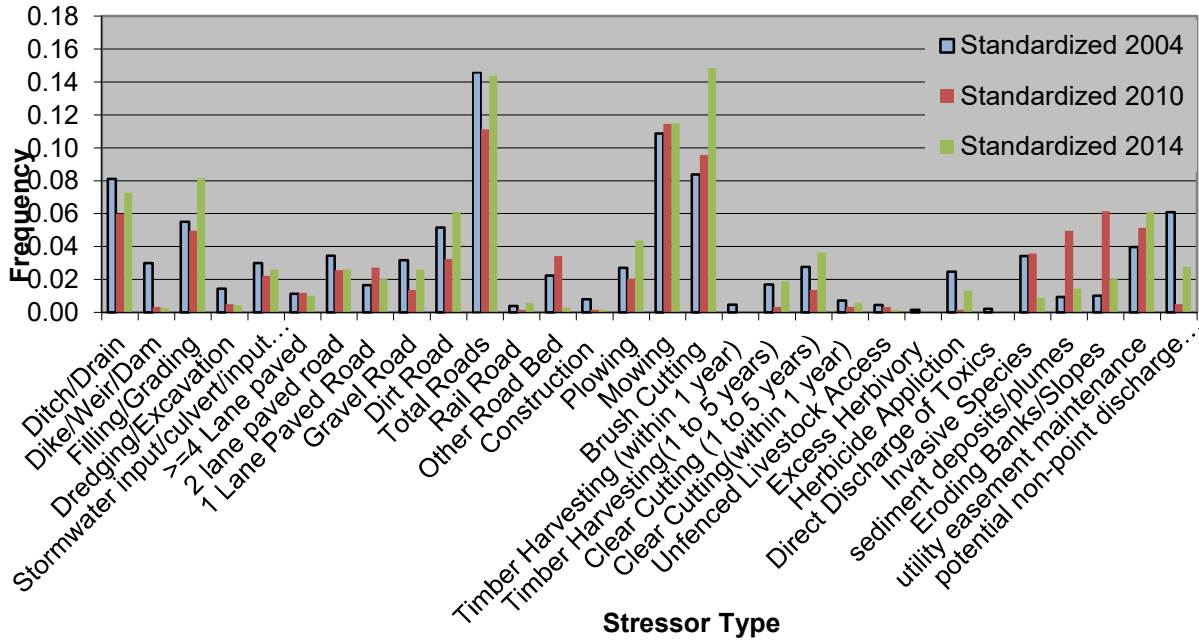


Figure 8. Relative frequency of stressor in Coastal Plain wetlands sampled in 2004 (n = 1,326), 2010 (n = 122), 2014 (n = 127).

### Relative Frequency of Ridge & Valley, Blue Ridge, & Appalachian Plateau Stressors

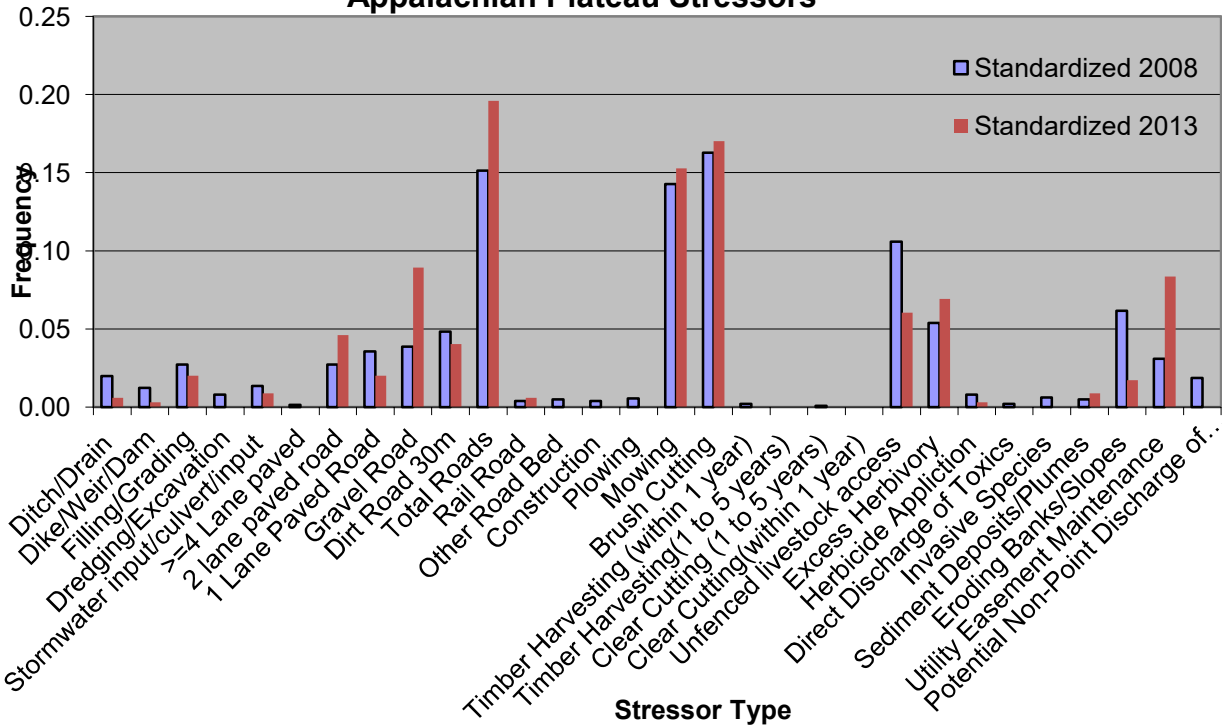


Figure 9. Relative frequency of stressor in Ridge & Valley, Blue Ridge, & Appalachian Plateau wetlands sampled in 2008 (n = 198) and 2013 (n = 42).



***Task 4: Update M&A Strategy including development of reference modules***

This information and all other accomplishments completed since 2005 was incorporated into an updated Monitoring and Assessment Strategy. Several meetings were held with VDOT, Corps, EPA, VIMS, and VDEQ to discuss the types of information needed for reference materials and online tools for WetCAT. The results of the meetings were incorporated in the updated M & A strategy report. The Corps and VDOT provided a list of items that would be useful to them for possible inclusion in WetCAT. Those requests were incorporated where feasible such as including a linear measurement tool for use on assessing linear impacts and the ability to input user generated polygons for WetCAT analysis. Additional meetings have been conducted with the Corps regarding the use of WetCAT in Corps functional assessment analysis. The request for the ability to incorporate the Corps ORMS database into WetCAT will be explored in a subsequent project.

An additional supplemental funding was awarded by EPA in October of 2013 to replace the old PDAs with tablets. Supplementary equipment has been purchased for additional VDEQ field staff to use to collect data (Figures 10, 11. Development and testing of new protocols for VDEQ field staff provided for integrated data collection and quality assurance in support of the recalibration effort and non-mapped NWI wetland identification was conducted and is ongoing. By continuing the model recalibration and developing additional datasets for WetCAT, the online interactive assessment tool will become a more useful and robust tool for use by VDEQ wetland permit staff, other state and federal agencies, and the public.

To enhance the use of WetCAT a series of training modules that are self-paced and web-accessible were developed. Online training modules have been created on YouTube and are currently available on the WetCAT site that is provided on VDEQ's Wetland and Stream Protection website. Tutorials include 1) "Getting Started", 2) "Adding Layers", 3) "Using Measuring Tools", 4) "Using Geoprocessing Tools", and 5) "Assessing a Wetland" (Figure 12).

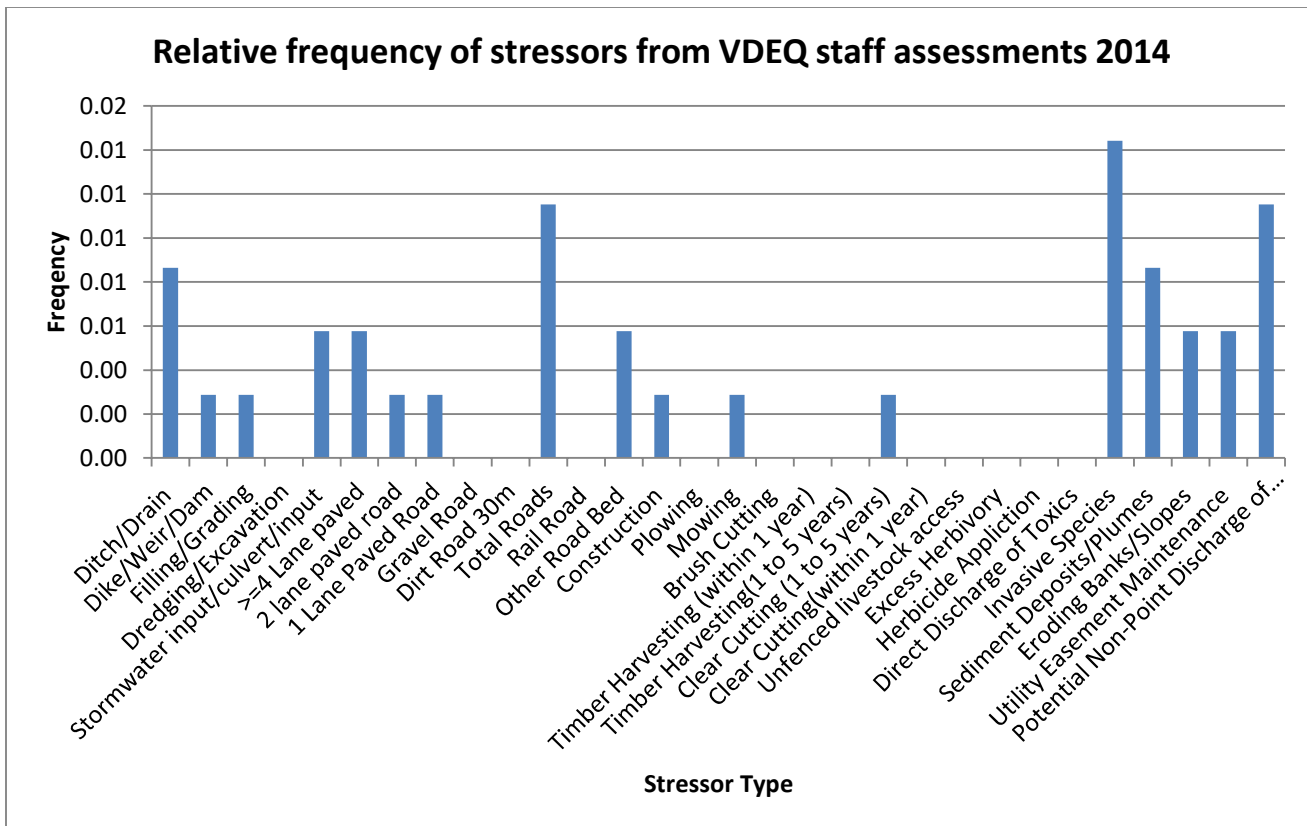


Figure 10. Data collected by VADEQ Aquatic Biologist staff.

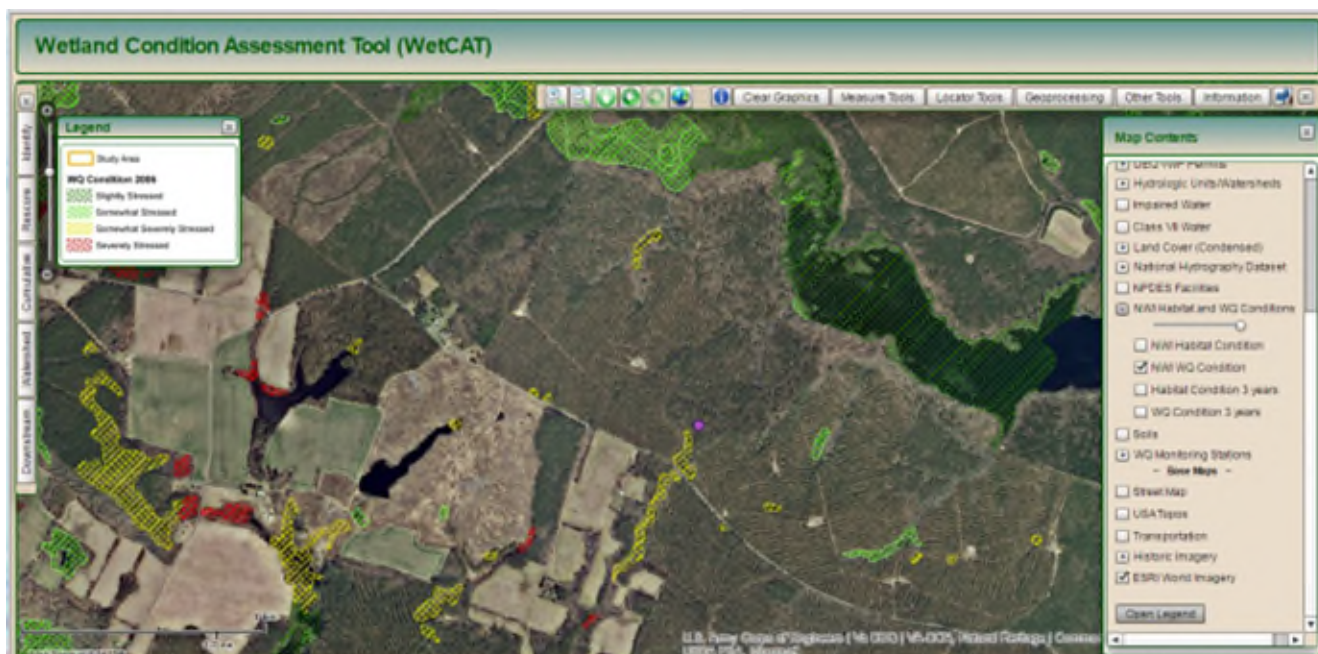


Figure 11. Example of a sample point from VADEQ Aquatic Biologist staff data collection.

## Tutorials:

Tutorial videos describing how to use WetCAT. Each YouTube video is approximately 3 minutes in length.

Getting Started

Adding Layers

Using Measuring Tools

Using Geoprocessing Tools

Assessing a Wetland



Search



Getting Started

Figure 12. Instructional tutorials for WetCAT.

**Grant Title: TRAINING FOR THE VIRGINIA WETLAND CONDITION ASSESSMENT TOOL (Project 51415, Task 13)**

The Virginia Department of Environmental Quality (VDEQ) and the Virginia Institute for Marine Science (VIMS) has developed a robust, science based strategy for evaluating the condition of wetlands in the Commonwealth. Virginia continues to enhance the Wetland Monitoring and Assessment Strategy by developing and updating the Wetland Condition Assessment Tool (WetCAT) to evaluate wetland condition over time; to make better permitting decisions relative to cumulative impacts, avoid and minimize wetland loss; evaluate performance of compensatory wetland mitigation in replacing wetland acreage and function; and evaluate the effectiveness of our regulatory program. As WetCAT use increases within both VDEQ and the public, we anticipate increased need for training and/or tutorials or help tabs for effective use of the tool. The goal is to provide additional training for both the public and VDEQ staff as WetCAT is more widely used upon public dissemination.

***Task 1: Training***

VDEQ will provide in-house training on the use of WetCAT to both our VWP staff and VDEQ staff in other Water Division programs such as staff in our Water Quality Monitoring and Assessment Program and Total Maximum Daily Loads (TMDLs). VDEQ will work with VIMS to conduct an educational needs assessment for both the general public and staff by collating the public and staff comments regarding the efficiency in using WetCAT. In addition, VDEQ will provide approximately four (4) workshops for the general public to include consultants, localities, and other interested stakeholders.

Summary of Activities

Meetings have been conducted with VWP, Corps and VDOT staff. Significant improvements have been made based on input and feedback from these meetings. A presentation was provided to VDEQ's Leadership Team (LT) explaining that WetCAT is now ready to go live for staff and public use. The Virginia Monitoring Strategy presentation that has been presented at several national conferences on the functionality and proposed use of WetCAT was provided to the VWP staff to better understand the Wetland Condition Tool (WetCAT) as part of the final testing phase.

Prior to public use, VDEQ's Office of Wetland and Stream Protection (OWSP) conducted a final testing phase for the each VWP permit writer to use the online interactive GIS tool (WetCAT) with at least one issued VWP permit (using either an Individual Permit or General Permit). A questionnaire was also provided to obtain input during the testing phase (that ended in Feb 2015) to capture the results for both technical issues and usefulness. Additional meetings with staff in VDEQ's Water Quality Monitoring and Assessment Program and Total Maximum Daily Loads (TMDLs) were conducted with input provided on potential additions for WetCAT. A public presentation at the Virginia Association of Wetland Professionals spring 2015 workshop was conducted in preparation for WetCAT's public release. In June of 2015 WetCAT went live and is available on the VVDEQ website

<https://www.deq.virginia.gov/our-programs/water/wetlands-streams/monitoring-assessment-strategy>

Michelle Henicheck and Dave Davis presented WetCAT at the Virginia Association of Wetland Professionals in June 2015, and also at the Delaware Wetlands Conference in February 2016 and WetCAT was presented at the American Planners Association (Virginia Chapter) Annual Conference in July 2016. The Delaware Wetland Conference was attended by over 320 scientists, engineers, consultants, land managers, regulators, students, educators, elected officials and members of the public. The APA Conference had an attendance of over 350 with over 70 counties, cities, and towns represented <https://2016apavirginia.sched.org/>. Michelle Henicheck presented an update on WetCAT enhancements to VDEQ wetland permitting staff in September 2016. Additional WetCAT trainings being planned for late 2016 or early 2017 include: (1) an update on WetCAT enhancements to Corps of

Engineers-Norfolk District Regulatory Branch management, (2) VDEQ executive management and (3) the Federal Highway Administration (FHWA) .

**Task 2: Tutorials**

This task involved development of additional tutorials, help tabs, and/or instructional workshops as identified in the needs assessment conducted with VDEQ in Task 1. Additional instructional material was tailored to address the issues raised in the educational needs assessment (i.e. more instruction on using specific tools, more guidance on using the stressor condition scores). Additional definitions have been added to WetCAT as a result of continued user input. Online training modules have been created on Youtube and are currently available on the WetCAT site that is provided on VDEQ’s Wetland and Stream Protection website. See Figure 12 above.

Summary of Activities

Continue efforts to provide presentations to explain the use of WetCAT. Conducted a public presentation to report the release of WetCAT in June 2015 at the Virginia Association of Wetland Professionals spring workshop held at VIMS. Information was provided to the public regarding the link to the new online WetCAT tool. Additional definitions have been added to WetCAT as a result of continued user input.

A completed schedule for Task 13 is provided below in Table 2.

**Table 2.  
Schedule**

Grant period: 2015-2016						
Tasks	Summer 2015	Fall 2015	Winter 2016	Spring 2016	Summer 2016	Fall 2016
Task 1. Determine additional WetCAT training needs.	Complete	Complete				
Task 2. Provide additional tutorials, help tabs, and/or workshops as identified in need assessment.			Complete	Complete	Complete	Completed and On-going



## **Virginia's Wetland Program Plan**

At the direction of the Environmental Protection Agency (EPA), Virginia has an approved Wetland Program Plan (WPP) that summarizes (1) the multiple existing regulatory and voluntary wetland program elements in Virginia, (2) identifies opportunities for improvements in current program objectives and operations, and (3) prioritizes program development to achieve an effective and comprehensive program strategy. The WPP provides a framework to improve its wetland programs over the next five years (2015-2020) with incorporation of action items to address wetland management issues.

Virginia's WPP describes efforts in four core element areas, plus three additional areas identified by Virginia as critical to the achievement of wetland no-net-loss and net resources gain. The EPA has identified these four core elements as 1) monitoring and assessment, 2) regulation, 3) voluntary restoration, and 4) water quality standards for wetlands. However, long term sustainability of wetland resources in Virginia necessitates actions in other areas. Virginia has added 3 additional element areas: Planning and sustainability, Information Acquisition and Outreach/Education. Inclusion of these elements, along with the EPA core elements, creates a comprehensive perspective on Virginia's wetland resources and facilitates a plan to address those resources. The following pages identify milestones and future action items for the core elements and objectives within the WPP. Only items pertinent to the updated wetland strategy are provided in this report. To view the full WPP report, click the following link at <https://www.deq.virginia.gov/our-programs/water/wetlands-streams/monitoring-assessment-strategy>

See Appendix B for *Milestones and Future Action Items for Core Elements and Objectives* associated with Virginia's Wetland Program Plan.



## **Future Plans**

The EPA-grant funded studies and initiatives commissioned by the VDEQ Office of Wetlands and Stream Protection have resulted in comprehensible and significant environmental benefits. Listed below are proposed future action items that will continue efforts to advance our wetland monitoring and assessment program that will strengthen and develop incentives for protection of our wetland resources in Virginia.

### **Goal 1: Strengthen and Establish Wetland Partnerships**

- Build stronger relationship with Virginia Department of Transportation (VDOT) to further define the use of WetCAT for their NEPA and permitting review process. Develop ability to share data to provide more accurate and definitive regulatory decision making to improve the process of wetland protection.
- Establish wetland partnerships with local and state entities to maximize wetland stewardship through the use of WetCAT to provide local and state comprehensive planning opportunities to protect wetland resources.
- Establish a partnership with Federal Highways Administration (FHWA) to use their Ecological process in coordination with WetCAT to provide opportunities for VDOT to reduce habitat fragmentation and protection of multi-resource ecosystems.
- Continue coordination with the Army Corps of Engineers to obtain permit data and confirmed wetland delineations from their ORMS database to incorporate into WetCAT.

### **Goal 2: Improve wetland mapping in Virginia**

- Seek funding to advance the effort to provide accurate and timely data on wetland losses/gains in the regulatory program for multiple stakeholders by developing wetland mapping for Virginia's wetlands. Seek the most up-to-date wetland mapping technologies to better interpret wetland areas in Virginia that can be updated on a regular basis. Manually digitizing wetland boundaries can be subjective, time-consuming, expensive and difficult to update.
- Work with other water programs within VDEQ to determine Class Seven Waters in the Commonwealth of Virginia which are waters that are removed from the impaired waters list due to the fact that they are naturally-occurring wetlands.

### **Goal 3: Complete Virginia's Floristic Quality Assessment Index (FQAI)**

- VDEQ developed a Floristic Quality Assessment Index (FQAI) to be used as a qualitative indicator of a wetland's relative condition. Development of a FQAI specific to Virginia involved determining Coefficient of Conservatism values (C-values) for vascular plants frequently encountered in tidal and nontidal wetlands in Virginia. Coefficient of Conservatism values need to be developed for all wetland plants located in Virginia. The assignment of C-values for common wetland plants in Virginia was the first phase of developing a FQAI to help assess relative wetland function and quality as part of VDEQ's on-going wetland monitoring and assessment efforts.

### **Goal 4: Maintain updates for databases and computer software**

- Update computer software technology in order to maintain programs such as WetCAT that are capable of assessing impacts to Virginia's wetland resources. WetCAT will continue to evolve to inform the public, local, state and federal entities to conditionally assess wetland resources in Virginia.

### **Goal 5: Collaborate on Coastal Wetland Resilience**

- Participate in efforts on the assessment of, and management for, coastal wetlands vulnerability to anthropogenic and climate risks.
- Incorporate consideration of the CBP BMPs for tidal (living shorelines) and nontidal wetlands restoration into permit decision.

## **Appendix A**

### **Milestones**

## **Appendix B**

### ***Milestones and Future Action Items for Core Elements and Objectives***