

## **Monitoring Wetlands in Pennsylvania 2004**

### **Executive Summary**

#### BACKGROUND

The protection and management of wetland resources to support a healthy environment has been recognized as a national priority for several decades. While the initial regulatory programs implemented by federal and state agencies have served the nation well in bringing attention to these valuable resources, and have slowed the losses significantly, we have come to recognize that regulatory programs alone do not provide the comprehensive protection and management necessary to ensure long term sustainability of these resources.

We now recognize that all types of wetlands are not qualitatively the same, nor do they function identically. We have learned also that the impacts of activities not covered by traditional federal and state permitting programs are affecting the quality and vitality of wetland resources and the services that they provide. Wetlands have not been managed with the same vigor or attention provided to other aquatic habitats. Clearly, there is a need to assess, monitor, protect, and restore wetland resources in ways similar to how management programs have been applied to streams, lakes, and estuaries.

Under the Federal Clean Water Act (CWA), protection of streams and lakes has relied on the establishment of Water Quality Standards (WQS). When degradation places these waters out of compliance with their criteria and/or designated uses – a condition referred to as “impairment”- identification of the impairment and a plan to restore attainment within WQS is initiated through various provisions including Section 303(d) for the CWA, also known as the Total Maximum Daily Loads (TMDL) process. Wetlands have been protected often outside the WQS process through Section 404 of the Clean Water Act and relevant state statutes, but that may soon change as we learn how to better evaluate their condition and functions. Ultimately, wetlands should be included into any watershed-wide assessment and restoration process that links the health of all waters together.

In 1998, the Penn State Cooperative Wetlands Center (CWC) and the U.S. Environmental Protection Agency’s Office of Wetlands, Oceans, and Watersheds (OWOW) entered into a Cooperative Agreement to develop tools using biological data for assessing and managing aquatic resources in an effort to improve the protection of the waters of the Commonwealth of

Pennsylvania and the Nation. The CWC working through this Cooperative Agreement with the U.S. Environmental Protection Agency and the Pennsylvania Department of Environmental Protection, developed a three-level protocol appropriate for monitoring and assessing wetlands. This protocol will assist agencies, local governments, and others to: 1) determine wetland condition within the context of a watershed management approach; 2) determine impacts to wetland functions within a watershed due to non-point sources and non-regulated land use practices; and 3) evaluate the results of restoration and remediation efforts. The three levels involve the use of remote-sensing data (such as satellite imagery), a rapid site visit to observe impacts or stressors at a wetland, and an intensive investigation of the ecological integrity and functions of a wetland.

The objectives of the Cooperative Agreement have been shaped by requirements of the 1997 litigation settlement agreement between the U.S. Environmental Protection Agency (USEPA), the American Littoral Society, and the Pennsylvania Public Interest Research Group. The relevant statement from the settlement agreement is paragraph 18 that states - "Within seven years of the effective date of this Settlement Agreement, EPA agrees to develop a protocol for assessing water quality in emergent, shrub and forested wetlands." The completion date is 9 April 2004.

Over the life of the Cooperative Agreement, the original objectives and products evolved in response to the needs of federal and state agencies engaged in wetlands protection and management. Although the CWC had a vision for using data from a set of reference wetlands to enhance assessment, monitoring, and mitigation activities, that vision was shaped substantially by interactions with personnel from OWOW and other parts of USEPA, including USEPA Region 3, ORD Laboratories, the STAR Grants Program, as well as personnel from the Pennsylvania Department of Environmental Protection and other state agencies and universities from across the nation. Their collective contributions toward this work are greatly appreciated.

## APPROACH

The set of modular protocols, tools, and reports presented here, explains and illustrates the application of these methods, referred to as a Wetlands Monitoring Matrix, for inventorying, assessing, and restoring wetlands. Of key importance is the use of a consistent set of monitoring protocols for conducting condition assessments, restoration and creation designs, and

performance evaluations for mitigation projects; the same variables are measured regardless of the intended use of the data. This approach meets the national priorities of the U.S. Environmental Protection Agency for wetlands, and can be tailored to any state, tribal lands, or region by establishing a reference set of wetlands organized by hydrogeomorphic (HGM) subclasses, prioritizing watersheds and individual wetlands, and implementing consistent monitoring protocols.

The same set of tools can be used to begin the process of refining Water Quality Standards (WQS) specifically for wetlands, report on the condition of wetland resources for 305(b) and 303(d) lists, enhance wetland restoration and creation efforts, and provide wetland mitigation guidance within the traditional regulatory programs implemented by the U.S. Army Corps of Engineers and state agencies. By assessing wetlands and other waters with a rotating watershed approach, over time, assessment can eventually be integrated into existing Water Quality Management programs. This approach will help to maximize staff resources and efforts to develop a more complete picture of the health of aquatic resources in a watershed context.

To guide the reader through the modules of this report, a simulated application of the monitoring process, including a series of graphics (Figures 1-1, 1-2, and 1-3), is provided. Also, the Table of Contents of this modular report is sufficiently detailed to help guide the user to the appropriate document or tool to accomplish a desired task. We believe the application of the protocols associated with this wetlands monitoring protocol provides the basis for objective and defensible practices and decisions regarding the protection of wetlands on a watershed basis.

#### Simulated application of the wetlands monitoring process – 5-Year Cycle

The following simulation is designed to guide the user through the anticipated sequence of activities that a state or tribe would conduct to generate monitoring data on wetlands on a continuing basis. After each year, a report based on the nested assessments conducted through Levels 1, 2, and 3 could be compiled for approximately 20% of the watersheds. This approach ensures coverage for the entire area every 5 years on a continuing basis. To keep this simulation relatively simple, the process for conducting condition assessments only are presented. Monitoring inventory and restoration aspects would follow similar paths through the three levels of effort. The wetlands monitoring protocols would become operational following formal adoption by the relevant state agency and training of staff. Notes in [brackets] refer to the

appropriate protocol or tool in the modules of the CWC's 2004 report to USEPA and the Pennsylvania Department of Environmental Protection. With the narrative description of each Level, we present an illustrative graphic that is designed to show the relationship between the monitoring protocols and the various tasks required of wetland protection and management programs. The respective tasks are accumulated in the boxes of each graphic, such that by the time Level 3 Intensive Assessments are conducted, the full monitoring process is completed. The actual chronology of implementing this proposed monitoring process will depend on the availability of resources and input received during formal adoption of these protocols by a state or tribe.

#### Year 1

1. The Level 1 remote-sensing assessment protocol is used to identify the top 20% of priority watersheds in Pennsylvania for further monitoring. The criteria for setting priorities are flexible (e.g., watershed scale, land use proportions, permitting activities, non-regulatory restoration projects, integration with assessment of other waters, etc.). Priority watersheds may also be assigned on a regional basis depending on staff resources and other factors.

[II.A.Reference, II.B.1.a.Level 1]

#### Products:

Provides status of wetland condition into at least 3 categories of ecological integrity (i.e., high, moderate, and low) by watershed for 305(b) report.

Trends in wetlands condition within a watershed will be documented over time (5-year rotation).

Focuses attention on selected watersheds for regulatory and non-regulatory activities for wetlands protection.

2. The Level 2 rapid assessment process is applied to a minimum of 20 wetlands in each of the selected priority watersheds in each region. In the CWC's experience, we estimate that about one to two weeks of fieldwork is needed to assess a 14- to 11-digit watershed (hundreds of km<sup>2</sup>) at Level 2, thus, when fully operational, "dozens" of watersheds could be assessed per year depending on needs and available resources. Sampling would be coordinated by PADEP's Central Office with assistance from CWC. [II.A.,Reference, II.B.2.b.Level 2]

Products:

Proper classification of wetlands is confirmed through ground reconnaissance.  
Dominant stressors to wetlands are identified by wetland type and spatial location.  
Reporting for 305(b) report.  
Initial integration into the watershed-based 303(d) TMDL planning process.  
Provides initial set of data for evaluating performance of non-regulatory and regulatory programs.

3. Level 3 intensive assessments are conducted on a subset of wetlands in a selected set of the priority watersheds. Data for use in HGM functional assessment models and IBIs are collected for a variety of reasons (e.g., calibration of Level 1 and 2 assessments, expansion of assessment protocols to include other wetlands types or taxonomic groups, development of design and performance criteria for wetland restoration projects, and providing support for the regulatory program through wetland design and mitigation standards). Each individual wetland assessment using HGM or IBI protocols takes about one day, thus, we would anticipate that “dozens” of wetlands would be assessed per year by PADEP staff at Level 3 depending on the need and the availability of resources. Sampling would be coordinated by PADEP’s Central Office with assistance from CWC. [II.A.Reference, II.B.3.Level 3]

Products:

Scientifically defensible condition assessments in support of 305(b) reports.  
Wetland-specific functional assessments for regulatory and non-regulatory wetland restoration, enhancement, and protection projects.  
Specific design criteria for regulatory and non-regulatory restoration projects by wetland type, including integration with watershed-based TMDL plans.  
Increases knowledge of wetland functions and ecology.  
Provides confirming set of data for evaluating performance of programs.

Year 2 - Process is repeated for next quintile (20-40%) of priority watersheds

Year 3 - Process is repeated for next quintile (40-60%) of priority watersheds

Year 4 - Process is repeated for next quintile (60-80%) of priority watersheds

Year 5 - Process is repeated for final quintile (80-100%) of priority watersheds;

5-year summary report compiled.

Years 6-10 - Process is repeated beginning with the “new” list of priority watersheds.

## SUMMARY OF ACCOMPLISHMENTS

Accomplishments are summarized based on the objectives of the Cooperative Agreement.

### OBJECTIVES:

- 1) Participated in BAWWG activities and provide technical assistance (62 meetings);
  - a) 9 Cooperative Agreement meetings in Washington, DC
  - b) 9 BAWWG or National Wetlands Monitoring workshops
  - c) 4 MAWWG workshops (CWC hosted)
  - d) 3 NEBAWWG workshops
  - e) 3 PADEP meetings, Harrisburg
  - f) 2 EPA Region 3 meetings, Philadelphia
  - g) 2 Tiered Aquatic Life Use workshops
  - h) Kenyon National Wetlands Workshop, Ohio
  - i) Woodward National Wetlands Workshop, PA (CWC hosted)
  - j) 28 regional, national, international conferences (47 presentations)
  - k) reviewed numerous USEPA documents, reports, and papers
  - l) provided information and reprints for numerous requests.
  
- 2) Work toward the development and testing of assessment protocols and ecological indicators for determining wetland condition (ecological integrity);
  - a) Hydrogeomorphic (HGM) functional assessment models completed for 6 subclasses in various ecoregions of Pennsylvania and adjacent states
  - b) Wetland Macroinvertebrate Indices of Biological Integrity (IBI) (3 master's theses)
    - Ridge and Valley headwaters, slopes, and riparian depressions (Bennett 12/99)
    - Ridge and Valley isolated and riparian depressions & Pocono riparian depressions (Conklin 5/03)
    - Ridge and Valley, Pocono, and Piedmont floodplains and slopes (Laubscher 8/04)
    - Summary report on Macroinvertebrate IBIs
  - c) Wetland Plant IBI
    - Completed for 6 HGM subclasses in multiple ecoregions
  - d) Amphibian IBI (master's thesis)
    - Ridge and Valley headwaters, slopes, and riparian depressions (Farr 8/03)
  - e) Wetland Bird IBI
    - Developing for multiple avian taxa, wetland types, and ecoregions, target date 12/04
  - f) Wetland-Riparian Wildlife Landscape Study (continuing staff project)
    - Mining existing databases to develop landscape indicators (2004/2005).
  
- 3) Continue effort to link wetland assessment methods to a comprehensive watershed assessment system (W<sup>3</sup>ATER);
  - a) Completed report on synoptic mapping and assessment of watersheds
  - b) Developed Wetlands Monitoring Matrix for Inventory, Condition Assessment, and Restoration at 3 levels of effort.

- 4) Use the assessment protocols from items (2) and (3) to develop measures of impairment for wetlands that can be reported on a watershed basis;
  - a) Developed standard calibration format for HGM and IBI (0-1 scale)
  - b) Exploring options for determining thresholds (TALU, statistical, graphical)
  - c) Training sessions for PADEP completed or scheduled from 5/03-10/04.
  
- 5) Establish a system of reference wetlands in Pennsylvania based on ecoregions and standard classification systems, and a sampling protocol that can be used reliably to collect data on wetland condition (ecological integrity) on a periodic basis by watershed, to report on degradation (impairment);
  - a) Completed data collection on 222 reference wetlands (5 ecoregions)
  - b) Completed standard sampling protocols for wetland inventory, condition assessment, and restoration (Levels 1, 2, & 3).

In summary, work conducted under this Cooperative Agreement produced:

- a) A wetlands monitoring protocol operational at 3 levels of effort for Pennsylvania with relevance to other states and tribes
- b) A system of reference wetlands (n=222) in 5 ecoregions of Pennsylvania
- c) Standard sampling protocols for use in wetland inventories, condition assessments, and restorations
- d) HGM functional assessment models for 6 wetland subclasses in multiple ecoregions
- e) IBIs for wetland plants, macroinvertebrates, amphibians, and birds in multiple ecoregions.
- f) Numerous papers and presentations communicating results to multiple audiences
- g) A modular final report providing concepts, protocols, models and multiple data sets for the inventory, assessment, and restoration of wetlands on a watershed basis.