Maryland Wetland Monitoring Strategy

Background and Discussions Years 1-3

Deliverable

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INTRODUCTION

This report is the first deliverable of a multi-year effort to develop a comprehensive strategy for monitoring wetlands in Maryland. The report contains background information on goals and objectives, discussions and decisions made to date; pilot project summaries that may guide strategy development, and other related monitoring efforts. While wetland monitoring and assessment is undertaken in Maryland to meet various objectives, the impetus for this project is the requirement to monitor wetlands to meet Clean Water Act requirements.

The Clean Water Act was authorized in 1972 with the goal of protecting the chemical, physical, and biological integrity of the Nation's waters. Among the provisions and programs required under the Act, Section 305(b) requires that the States conduct biannual monitoring to provide essential data for water quality protection. Maryland has extensive programs for conducting chemical and biological monitoring in surface and ground waters to meet these requirements. However, within Maryland's monitoring programs, there is not a complementary effort underway for wetlands, despite their dual status as "waters of the United States" and "waters of the State."

RECOMMENDED ELEMENTS OF A COMPREHENSIVE MONITORING STRATEGY

In April 2006, EPA released a document, Application of Elements of a State Water Monitoring and Assessment Program For Wetlands, to assist States in developing their wetland monitoring programs. The document lists ten recommended elements for a comprehensive program, which are summarized below.

1) A Comprehensive Water Monitoring Strategy. Maryland does have a strategy in place for monitoring "traditional" waters. The wetland monitoring strategy is under development and will be included with Maryland's overall strategy.
2) Monitoring Objectives. The objectives are listed in the section PROJECT PURPOSE AND OBJECTIVES in the next section.
3) Monitoring Design. The strategy development process will include consideration of the various study designs (comprehensive census, probability-based regional assessment, and targeted sampling using best professional judgment) in meeting strategy objectives. Establishment of a reference network of sites, representing a range of disturbance, is encouraged for verifying indicators of wetland condition and function, and for measuring variability over time.
4) Core and Supplemental Indicators and Methods. The strategy development process will consider various indicators and methods from pilot projects in Maryland, literature, other States, guidance, and other methods. General methods will include:

a) Level 1 Assessment. This type of assessment is typically based on Geographic Information System (GIS) analysis using existing wetland and soil maps, land use and hydrology information. Level 1 assessments may be repeated over time, can sample entire populations, and require fewer resources, but yield less reliable information. These assessments are useful for providing basic information for status and trend analyses and setting management priorities for restoration and preservation. Level 1 assessments are often verified by field methods.

b) Level 2 Assessment. This type of assessment involves data collection from rapid, easily observable field indicators. They require greater effort and time, and are usually used to sample subsets of populations. A Level 2 assessment of a single sample unit usually lasts less than four hours. Level 2 assessments would be used most often in permit review and watershed assessments. Level 2 Assessments should be validated by Level 3 field methods.

c) Level 3 Assessment. This type of comprehensive assessment involves collection of data from direct measurements and fewer indicators. As it is more time consuming and expensive, it is usually applied to smaller subsets of populations to validate Level 1 and Level 2 assessments and development of water quality standards. Note: While not specified in the EPA guidance, the duration and intensity of Level 3 assessments has been highly variable to date. Level 3 assessments may last several years in duration, with repeated sampling and analysis.

5) Quality Assurance. Quality Assurance Project Plans are used to prevent errors in data collection and analysis.

6) Data Management. States should have in place a system to store data for analysis and use in GIS applications.

7) Data Analysis/Assessment. This element includes design of data entry and field forms and methods of analysis and will be evaluated in more detail in strategy development and implementation.

8) Reporting. Data collected to meet Clean Water Act requirements must be reported to EPA in an appropriate format. Information from all aspects of monitoring will be disseminated to the target audience for informational and management purposes.

9) Programmatic Evaluation. States conduct periodic review with EPA on implementation of the State water monitoring strategy. Monitoring may also be used to evaluate State regulatory program progress in meeting “no net loss” of wetland acreage and function and success of voluntary restoration projects.

10) General Support and Infrastructure Planning. This element considers the resources necessary to implement a monitoring strategy.

PROJECT PURPOSE AND OBJECTIVES

The purpose of this project is to develop a comprehensive strategy to monitor and assess the condition of wetlands in Maryland and to initiate its implementation. At present, Maryland does not have a strategy in place that will guide development of a statewide wetland monitoring and assessment program. Maryland has made some strides in the development of tools for the assessment of landscapes, including wetlands, for condition of the habitats these landscapes provide. These tools may have a place in the development of wetland condition monitoring. There are multiple objectives for Maryland's wetland monitoring and assessment program, which will be related to other regulatory and non-regulatory wetland management programs:

1) Meet 305(b) reporting requirements;
2) Improve existing wetland and waterway regulatory programs;
3) Provide additional information for targeting wetland/waterway restoration and protection efforts;
4) Comply with TMDL requirements, if applicable;
5) Develop use designations and water quality standards for wetlands;
6) Assist in evaluating the effectiveness of compensatory mitigation and voluntary restoration projects;
7) Improve our ability to comprehensively assess landscape and watershed function;
8) Develop the capability to study and assess the status of wetland condition over time; and
9) Make wetland condition and functional value information available for use in federal, State, local and citizen group-driven natural resource conservation and restoration efforts (examples include Tributary Strategies, TMDL implementation plans, Green Infrastructure Assessment, Strategic Forest Lands Assessment, etc.).

Regardless of the final approach to the assessment effort, there are certain common elements, which must be in place to meet the objectives of all the participants. These include:

a) Identification of direct and indirect indicators for the biological, chemical, and physical condition of wetlands and waterways. Maryland Biological Stream Survey (MBSS) is currently used to provide indicators of the biological condition of nontidal waterways, but a wetland component is still needed;
b) Identification of reference wetlands for a variety of wetland classes throughout the state's various physiographic provinces;
c) Creation of a step-by-step strategy to develop and implement a wetland monitoring program;
d) Compilation of indicator/wetland assessment information into a database with:
    i) extensive and flexible reporting capabilities;

ii) ease of display using GIS software;
iii) integration of regulatory permit databases and supporting databases with information used in permit application screening; and

e) Incorporation of monitoring and assessment results into regulatory and non-regulatory wetland decision making.

Maryland's wetland management activities are diverse and spread among numerous State agencies, and in different programs within those agencies. Due to the extent of information and diverse management efforts, the development of a detailed, multi-agency strategy will likely be a complicated process. The number of potential information sources, their suitability, limitations, format, and location, has not been determined but is believed to be extensive. Various references and studies of Maryland's wetlands have been recorded over the decades by various agencies and other researchers. More recently, geographic information systems (GIS) have been used to identify wetlands and manipulate electronic data layers to aid in the development of management recommendations. However, the State has limited existing resources to conduct the necessary investigations of potential information within each agency, and between other agencies and partners. A comprehensive wetland assessment strategy requires that all of these entities participate in wetland monitoring and assessment and provide information in a format usable to stakeholders. It is, therefore, essential that the strategy contains a detailed work plan based on investigation of existing information and future study to avoid duplication, eliminate unnecessary tasks, and meet the needs of various partners. The need exists to also minimize the additional burden placed on participating partners in the strategy.

Information is currently found in various electronic and hard copy sources among agencies. Key agencies and their activities are:

1) Maryland Department Of the Environment (MDE - State lead for Clean Water Act requirements): 1) Prepares 303(d) list of impaired waters and prepares and adopts Total Maximum Daily Loads (TMDLs) for pollutants; 2) Prepares and adopts water quality standards and use designations. Requires and approves watershed plans in certain local jurisdictions and conducts other watershed planning efforts; and 3) Implements regulatory programs for air, waste, water, etc. (water programs include wetlands and waterways, sediment and stormwater, point and nonpoint source discharges, surface and ground water supply, and water quality infrastructure improvements and restoration). MDE information that will be evaluated as part of the assessment strategy includes:
   a) Wetland delineation, impact, mitigation, restoration, preservation and assessment information;
   b) Stream stabilization and monitoring information;
   c) Watershed or similar plan assessments;
   d) Flood study information; and
   e) Water quality monitoring results.

2) Maryland Department of Natural Resources (DNR - State lead for natural resource assessment, planning and management (including habitat, fisheries, wildlife, and biodiversity), land conservation and protection, and management of State lands): 1) Implements and oversees land management, protection and restoration programs such as the Critical Areas Program, Forest Conservation Act, Program Open Space, Rural Legacy, Tributary Strategies, and State forests and parks; 2) Prepares 305(b) biannual report of condition of State waters; 3) Conducts MBSS, natural heritage and biodiversity assessments, stream corridor assessments, surface and ground water quality monitoring, watershed and landscape assessment and planning; and 4) wetland and riparian restoration. DNR information that will be evaluated as part of the monitoring strategy includes:

a) Wetland restoration, preservation, assessment information;
b) Stream corridor surveys, water quality and aquatic species synoptic surveys, and MBSS results;
c) Landscape and watershed assessments (such as Green Infrastructure Assessment, restoration targeting);
d) Shoreline surveys; and
e) Biodiversity, wildlife, fisheries and vegetative community sampling.

3) Maryland State Highway Administration (SHA - State lead for highway transportation projects): Conducts numerous wetland and waterways assessments, environmental impact analyses, and mitigation in association with highway projects. SHA information that will be evaluated as part of the monitoring strategy includes:
a) Wetland classification, functional assessment, and mitigation information;
b) Fish, wildlife, and other habitat assessments; and
c) Stream classification and assessments.

Coordination will also take place with other State agencies, such as the Department of Agriculture (MDA). MDA supports numerous conservation, wetland, and riparian restoration projects. Coordination will take place with the U.S. Army Corps of Engineers, Environmental Protection Agency, U.S. Fish and Wildlife Service, and National Oceanic and Atmospheric Administration. These agencies also have information on resource assessments and/or restoration projects. Local governments will also be contacted for pertinent information.

IMPROVEMENTS TO EXISTING PROGRAMS

The comprehensive strategy will integrate wetland monitoring and assessment into other aspects of wetland management. Uses of monitoring and assessment information and its implications for other programs include:

1) Regulatory program - Wetland permit reviewers will have a better understanding of condition and function of wetlands proposed for impacts

by regulated activities. This will allow the review and best management practices to be more tailored to the particular wetland type. Mitigation projects will also be designed, constructed, and monitored more effectively.

2) Wetland restoration - As will be the case for mitigation projects, voluntary wetland restoration projects will also be designed, constructed, and monitored more effectively. Restoration sites can be better prioritized to meet needs of the water quality, habitat, recharge, and flood attenuation needs of a particular watershed. The context of potential restoration sites within the larger landscape or watershed can be determined and help with site location and design.

3) Wetland preservation – The highest quality wetlands of various types can be made priorities for protection, again considering these areas within the larger landscape or watershed context. Adjacent land uses which are found to cause significant degradation of wetland condition can be addressed with regulation or public education.

4) Watershed planning – The information on wetland condition and function can be incorporated into watershed management or restoration plans, along with stream corridor and stream bioassessment results. The predominant stressors of wetland condition can be identified and addressed through public education.

5) The ability to develop watershed wetland profiles can be improved through the development of additional skills, (in particular HGM classification and spatially random sampling procedures for wetland selection,).

6) Water quality monitoring and restoration – The wetland information will be incorporated, as appropriate, into Clean Water Act 305(b) and 303(d) reporting. Considerable work remains to be done in terms of developing designated uses for wetlands of various classes before wetlands can be assessed as meeting or not meeting their specific designates uses. This information will, as appropriate, become part of TMDL and implementation plan development to remove waters from the impaired waters list.

The tasks in this report span six federal fiscal years, with some tasks occurring concurrently and some tasks dependent on the successful completion of previous tasks. The provision for periodic review and comment by outside experts in the field is essential to refine the process and ensure that all potential users of the data can present needs to be addressed and to understand the parameters and constraints of the assessment and monitoring procedures. Periodic reports to the EPA grants officer will advise of progress and of potential problem areas to be addressed in a timely fashion.

WORK PLAN FOR STRATEGY DEVELOPMENT

1) Attend MAWWG meetings and review reference materials. Identify issues and pertinent information for use in Maryland.

2) Identify MDE/DNR personnel to participate in discussions and work group.

3) Begin identification of other pertinent reference materials.

4) Submit status reports for the semi annual periods ending March 31 and September 30.

5) Form a work group with representatives of various State agencies with expertise. MDE will coordinate the effort to collect, manage, and catalog studies and data sets from the various state agencies, to produce minutes and final documents.

6) Agencies identified various needs, additional tools, and uses of wetland monitoring information. These include needs to meet statutory requirements, improve regulatory programs, and implement non-regulatory management activities such as restoration, preservation, and watershed planning.

7) Agencies agreed to consider wetland function, as well as condition, in evaluating various existing procedures and assessments.

8) Complete draft classification system(s) to be used for various monitoring purposes. System will allow for data collection to be used for various assessment methods.

9) Begin evaluation of existing data and data collection, in progress or planned, and how they fit into the Level 1, 2, and 3 assessment framework. Agencies will begin by evaluating their own information and other information to meet their needs. This will be followed by review of evaluations and compilations done by other representatives of the work group. Representatives will also coordinate to answer questions about limitations and strengths of other information sources. It will be determined whether information sharing MOU's are necessary or whether information sharing is covered by current Maryland State Government Geographic Coordinating Committee agreements. Regular meetings of the work group will be held.

10) Finalize an interagency agreement between MDE and the Maryland Department of Natural Resources. DNR will evaluate the advantages and disadvantages of various rapid assessment methods for presentation to the interagency work group.

11) Develop template for comprehensive wetland assessment and procedures for using results from comprehensive data collection to predict function and condition using Level 1 (GIS), Level 2 (rapid field) and Level 3 (intensive field) assessments.

12) Expand the work group of stakeholders and experts to include representatives from other federal and local governments, advisory groups, and academic institutions. Present background information, goals, and objectives of monitoring strategy and seek consensus on draft wetland classification system.

13) Prepare background materials for work group on potential designated uses for wetlands, to meet Clean Water Act requirements.

14) Evaluation of the potential reference sites selected for the pilot study. Reference sites already selected will continue to be used as reference sites. Where new reference sites need to be added because of the inclusion of additional wetland subclasses and the need to represent a disturbance gradient, new reference sites will be added using input from regional wetland experts from MD and DE, the NRCS, Smithsonian and universities.

15) Training of field teams -- Using the logistics protocols previously developed, field teams will be designated from the participating agencies. Training schedules will be established and training materials produced to cover the rapid and comprehensive assessment protocols and wetland delineation. Training will be conducted for all field teams.

16) Hire temporary coordinator to provide public information and point of contact with private landowners to secure permission to sample randomly selected sites. Coordinator will be based on whichever agency has lead on field sampling. Coordinator will also assist with field equipment inventory and control, instrument calibration and data QA/QC.

17) Coordinator will contact all landowners and secure necessary permissions to visit the sites.

18) Field teams will;

    a. Verify that the site meets the criteria of a wetland according to the 1987 Corps of Engineers Wetland Delineation Manual.
    b. Field verify sites to confirm or correct the GIS generated HGM classification, and to provide location and access information.
    c. Visit sites selected for Level 2 rapid and Level 3 intensive assessment methods and collect data.
    d. Enter all field data into database and verify entries.

19) Designated QA/QC officer will check all field datasheets and database for accuracy and completeness.

20) Modify wetland monitoring strategy, as appropriate and based on new information.

21) Attend the following meetings:

a. one or two meetings annually of the Mid-Atlantic Wetlands Workgroup - 2 day meetings with one overnight;
b. one EPA Region lII Wetland Meeting (traditionally held in Atlantic City, NJ. for 3 days);
c. the National Meeting of the Society of Wetland Scientists, wherever it is to be held, to make a formal presentation on the results of the development of wetland condition assessments from this grant.

22) Submit status reports for the semi annual periods ending March 31 and September 30.

23) Visit sites selected for Level 3 and Level 2 assessment data collection. Collect all field data for the wetlands of the selected classes.

24) Attend the following meetings:

a. one or two meetings annually of the Mid-Atlantic Wetlands Workgroup - 2 day meetings with one overnight;
b. one EPA Region lII Wetland Meeting (traditionally held in Atlantic City, NJ. for 3 days); and
c. the National Meeting of the Society of Wetland Scientists, where ever it is to be held, to make a formal presentation on the results of the development of wetland condition assessments from this grant.

25) Submit status reports for the semi annual periods ending March 31 and September 30.

26) Continue second year of field sampling.

27) Training of field teams -- Using the logistics protocols developed in step five of year two, field teams will be designated from the participating agencies. Training schedules will be established and training materials produced to cover the Level 2 and 3 assessment protocols and wetland delineation. Training will be conducted for all field teams.

28) Hire temporary coordinator to provide public information and point of contact with private landowners to secure permission to sample randomly selected sites. Coordinator will be based on whichever agency has lead on field sampling. Coordinator will also assist with field equipment inventory and control, instrument calibration and data QA/QC.

29) Coordinator will contact all landowners and secure necessary permissions to visit the sites.

30) Field teams will;

a. Verify that the site meets the criteria of a wetland according to the 1987 Corps of Engineers Wetland Delineation Manual.
b. Field verify sites to confirm or correct the GIS generated HGM classification, and to provide location and access information.
e. Visit sites and conduct Level 2 rapid and Level 3 intensive assessment method data collection.
f. Enter all field data into database and verify entries.

31) Designated QA/QC officer will check all field datasheets and database for accuracy and completeness.

32) Modify wetland monitoring strategy, as appropriate and based on new information.

33) Attend the following meetings:

a. one or two meetings annually of the Mid-Atlantic Wetlands Workgroup - 2 day meetings with one overnight;
b. one EPA Region lII Wetland Meeting (traditionally held in Atlantic City, NJ. for 3 days); and
c. the National Meeting of the Society of Wetland Scientists, where ever it is to be held, to make a formal presentation on the results of the development of wetland condition assessments from this grant.

34) Record the data in the condition assessment database.

35) Scale the responses to reference conditions as appropriate, calculate Functional Capacity Indices (FCI's) and other scores for sampled wetlands. Compare scores for Levels 1,2, and 3. Use Level 3 data for validation and calibration of Level 1 and Level 2 data.

36) Convene workshop of wetland professionals to critique results and suggest alternative

37) Transmit the results to STORET.

38) Finalize results and field study and prepare report. Produce final report on the condition of wetlands of the sampled HGM classes for the pilot study, including a discussion of the utility of the information.

39) Prepare draft report of overall monitoring strategy.

40) Finalize report.

PUBLIC PARTICIPATION

A work group with representatives of various agencies and other entities with expertise will be formed. The provision for periodic review and comment by outside experts in the field is essential to refine the process and ensure that all potential users of the data can present needs to be addressed and to understand the parameters and constraints of the assessment and monitoring procedures.

There will also be outreach and education made to landowners for field monitoring of the pilot study. The coordinator will provide public information and serve as the point of contact with private landowners to secure permission to sample randomly selected sites.

Strategy development is expected to consider role of volunteers in wetland monitoring. The final strategy will also be posted on Department of the Environment and Natural Resources web sites.

DELIVERABLES

1) Year three: The deliverable is background information for Maryland's wetland monitoring strategy to date. The strategy will be described in semi annual progress reports that will also include background information, literature citations, deliberations, detailed work plan, and task assignments.

2) Year four: A report on the results of:

   a. Development of the HGM classification decision rules, the development of the spatially random sampling selection method and the limits of accuracy of these tools in properly classifying all the wetlands in the study region; and

   b. Field team activities, number of property owners contacted, percentage of permission granted, training conducted, number of sites visited and sampled, and the difficulties encountered and methods for dealing with them.

   c. Maryland's wetland monitoring strategy to date.

3) Year five: A report on the results of:

   a. Field team activities, number of property owners contacted, percentage of permission granted, training conducted, number of sites visited and sampled, and the difficulties encountered and methods for dealing with them.

b. Draft final wetland monitoring strategy.

4) Year six:

a. Document containing final Maryland Wetland Monitoring Strategy, including background information, literature citations, deliberations, detailed work plan, and task assignments. The work plan will include a discussion of Statewide implementation of the monitoring strategy and associated resources needs for implementation.

b. Report on the overall condition of wetlands in the pilot watershed in accordance with the comprehensive strategy including suggestions for improving the strategy for future watershed monitoring.

c. Presentation materials for pilot study and wetland monitoring strategy from wetland conferences.

INTERAGENCY WORK GROUP MEETINGS AND DISCUSSIONS

This project seeks consensus from a variety of stakeholders in wetland management. Consensus will be sought through discussions and exchanges of written materials between stakeholders. The first meetings were held with representatives from State agencies only. After some a basic consensus is reached, the work group will expand to include representatives from federal and local agencies, academic institutions, and other advisory groups. Meetings were held on August 29, 2006; September 19, 2006; and October 19, 2006. Attendees at one or all of the meetings were:

Matthew Rowe	MDE-TARSA
Adam Rettig	MDE-TARSA
Gwen Brewer	DNR
Ron Klauda	DNR
Helen Stewart	DNR
Christine Conn	DNR
Joseph Beaman	DNR
Lee Anne Chandler	CAC
Charles Poukish	MDE-TARSA
Elder Ghigiarelli	MDE-WMA
Tim Larney	DNR-FWH
Sherm Garrison	DNR
Todd Nichols	SHA
George Harman	MDE-TARSA
Denise Clearwater	MDE-WMA
John Backus	MDE-TARSA
Erin McLaughlin	DNR

The following are summaries of presentations of the work group meetings:

August 29, 2006

Introduction

Denise Clearwater opened the meeting with an introduction of the project to develop a wetland monitoring strategy and expected outcomes from the work group. The Environmental Protection Agency grant (EPA) to fund the project will end in 2008. By the end of 2006, MDE and DNR will produce a draft strategy. This is behind schedule by several months. The discussions will be reflected in official minutes that will be part of the deliverable to EPA. Work group members were asked to consider what their program goals are for monitoring, what they hope to accomplish through monitoring, and what their need are in regard to monitoring. Goals as listed in the grant application from DNR and MDE are:

Meet requirements of Clean Water Act. This would include development of use classes, water quality standards, 305(b), 303(d), and possibly TMDLs.

Integrate results into the wetland regulatory programs for permit review and mitigation.

Improve voluntary wetland restoration

Integrate results with other planning, water monitoring, and water/natural resources management.

Copies of the work plan from the grant and EPA's document Application of Elements of a State Water Monitoring and Assessment Program for Wetlands were distributed.

Denise Clearwater noted that EPA expects States to begin wetland monitoring by 2012. Joe Beaman observed that designated uses and a pass/fail threshold must be set by 2010 to be in the plan approval cycle for 2012. Sherm Garrison suggested that the strategy could outline the information needed to do standards and monitoring. It was clarified that the strategies due by 2006 and 2008 do not need to answer all questions related to how monitoring would be accomplished, but should identify the steps to be undertaken, questions answered, and information gathered in order to implement Clean Water Act monitoring.

George Harman and Elder Ghigiarelli both expressed concern about project cost, and the ability to implement a strategy with limited resources. Both favored a minimal or more temperate approach, since the State otherwise could be forced to deal with more complicated regulatory issues arising from a complicated monitoring strategy, as well as having to address impairments. Denise Clearwater responded that EPA had confirmed that no additional money was allocated for wetland monitoring. Current work related to monitoring has been funded through competitive wetland program development grants from EPA. These previously ranged from $700,000 -$1million, but the money will be reduced over the next several years due to funding implementation grants. The question of a no action alternative was raised, but Joe Beaman and Christine Conn noted that EPA could promulgate uses and standards if the State did not. It agreed that the State should proceed with wetland monitoring rather than be forced to implement an EPA-developed approach and risk future EPA funding. Joe Beaman encouraged use of as much existing information as possible, and was concerned about doing standards for water quality treatment wetlands in the same manner as natural wetlands.

Another source of existing information will be a future field study by EPA for Region III. The study will take place over the next couple of years and will include field sampling in all physiographic regions. States involved have expressed concern that EPA's results and models may not be consistent with State methods and findings. It was suggested that this study be conducted in a manner that would yield useful results for multiple parties.

There was also discussion on monitoring for condition vs. function. Wetland assessments have typically focused on a wetland's ability to provide functions such as wildlife habitat and water quality improvement. Most wetland assessments under the Clean Water Act are making comparison to a reference standard, and deviations from a pristine condition. An example of the conflict would be a wetland receiving inputs of nutrient or sediment, and receiving a high score for

providing a water quality benefit, while another assessment would rank the wetland lower due to being degraded. A suggestion was to develop a use designation for a limited use wetland, such as those providing water quality benefits though degraded. These wetlands could still be protected, but they would not be managed to attain a reference standard condition. There was general interest among participants in monitoring both condition and function.

EPA Guidelines

EPA's guidelines were presented. These are:

1) Have a monitoring strategy. Maryland currently has an approved monitoring strategy for other waters and a wetland element would be included in the future.
2) Goals and Objectives. These are shown in the work plan that was previously presented.
3) Monitoring Design. Sampling may occur for all units (e.g., GIS State wide assessment, all wetlands in a smaller area,), probability sampling, such as done by the Maryland Biological Survey (MBSS), or using best professional judgment to ensure that wetlands are sampled across all land use gradients.
4) Core and Supplemental Indicators and Methods. Denise Clearwater noted that many indicators are similar for various assessment methods, but the interpretation and models vary. The work plan includes evaluation of 3 tiers of assessment: Level 1 (GIS), Level 2 (rapid), and Level 3 (intensive). EPA offers assistance in study design.
5) Data Analysis/Assessment
6) Reporting
7) Programmatic Evaluation
8) General support and Infrastructure Planning

Numerous monitoring activities are currently taking place. MDE applies a cursory approach using best professional judgment about habitat, water quality, etc. in regulatory review. The State Highway Administration (SHA) conducts more formal assessments. Mitigation sites are monitored for vegetation, soils, hydrology but little work is being done to measure function. Voluntary restoration projects have some monitoring to determine if projects were built to design. Assessments are also done for potential State land acquisitions. Monitoring to meet Clean Water Act requirements is the major new impetus and is the result of lawsuit settlements in Pennsylvania and Delaware that confirmed that like other waters, wetlands must be monitored. The Clean Water Act requirement is to "restore and maintain chemical, physical, and biological integrity of the Nation's waters."

Clean Water Act requirements will include designated uses, narrative criteria, possible numeric criteria after time and enough data have been collected, and potentially TMDLs. Approximately 10-12 states have wetland designated uses that Maryland can use for comparison, some have narrative criteria, a few have numeric and anti-degradation criteria, and one state (Minnesota) has all of these elements.

Designated uses have included many of the same elements listed in Maryland's laws. Aquatic life, wildlife, rare, threatened and endangered species, aesthetics, water supply, recreation, education, flood storage, water quality, hydrology functions, and shoreline protection are included as designated uses in other States. Discussion of developing designated uses in the mid-Atlantic Wetland Group (MAWWG), of which MDE and DNR are members, has lagged behind discussions of methods. Discussion has begun on using tiered aquatic life uses (TALUS) for wetlands. These include the biological condition gradient from pristine to pollution tolerant species. Ohio has done much work on TALUS and they will be evaluated later by the work group to determine their applicability for Maryland. MDE will not follow Ohio's use of monitoring and point systems to classify wetlands into different protection level categories, as there have been concerns in the past and it would add another contentious layer to permit review, after wetland identification and delineation. Pennsylvania may develop wetland quality standards rather than water quality standards for wetlands. EPA representatives have told MDE and DNR that it would be acceptable to develop narrative criteria and follow up later, as data collections efforts allow, with numeric criteria. EPA has given mixed messages on the need for TMDLs, but most recently EPA-HQ representatives have confirmed that if wetlands are monitored under 305(b) requirements, then there is potential for designated impairments and developing TMDLs in response.

Discussions have also taken place on the question of reference standard wetlands, and whether or not they should represent the most pristine wetland, and average condition, or a hypothetical composite. DNR recommends that the reference standard represent the most pristine wetlands in the study area and the issue will be further discussed

Both Joe Beaman and Sherm Garrison emphasized the need to address designated uses for wetlands early in workgroup’s work plan. Clearly defined designated uses are a fundamental and precursor element that should be in place before criteria and indicators for water quality standards, in addition to monitoring and assessment sampling designs are developed. Joe Beaman recommended using the TALUS concept in order to develop water quality standards that are appropriate to the desired performance level expected out of a variety of wetland types in different settings (i.e. urbanized reference standards vs. others).

An early step will be to determine a system to classify wetlands for monitoring. EPA favors the Hydrogeomorphic (HGM) approach, which considers hydrology source, landscape position, physiographic region to classify wetlands. At a joint meeting of MAWWG and New England States, the New England states indicated that they would not use HGM. The National Wetlands Inventory is the existing classification used on base maps, and incorporates hydrology, salinity, vegetation, and duration of inundation. Ohio uses HGM with an additional vegetation modifier, so Maryland may consider adapting an existing assessment method for its own purposes. Maryland also uses its own classification system for

tidal wetlands and shows these on its regulatory maps. DNR's Natural Heritage Program uses a plant community classification system.

Work Plan

Christine Conn presented the work plan from the grant. The grant term is from 2004-2008. This meeting represents the first step with the formation and meeting of a work group. In addition to the State agencies present or invited, other entities will be asked to share experience, information, expertise and advice from federal agencies such as EPA, the Corps of Engineers, other federal agencies, local governments, volunteer groups, universities, and other States with monitoring efforts. Various maps, assessments, planning products, and regulatory data will be evaluated. The work plan also includes goals and objectives, which were described in a previous section. A current time line was presented, with a draft goal due at the end of the year. Other tasks that will be undertaken by the end of the year are evaluations of function and condition measures, reference wetlands, and recent work on Level 1, 2, and 3 assessments. During the third year of the grant from October 2006 – September 2007, a pilot field study will be initiated. This was originally proposed as a test case of the protocols of the Nanticoke River watershed study in the Chester River watershed. DNR and MDE are discussing possible modifications but have not yet reached agreement on the scope of work. The field study will be initiated in early 2008. A grant extension has been requested to allow for 2 years of field study. the scope is flexible. The draft strategy may also be modified. During the final year from October 2007 through June 2008, the field study will be completed and the monitoring strategy will be finalized. A workshop is also planned.

There has been great concern in Maryland and other states about the extent of resources needed to implement a monitoring program. Some States may not pursue monitoring unless they are forced by legal action. Pennsylvania will use 6 full-time equivalent positions from the spring through November in one test watershed to sample 250 wetlands. Ohio uses 3-4 full time staff annually, with another 3-4 seasonal staff. Entities conducting assessment efforts have also noted that it may often be easier for personnel from academic institutions to gain access to sites. Access in general appears to be becoming more difficult, even for stream sampling.

Goals/Needs

Participants presented goals and needs from a wetland monitoring effort that would support or are required for agency programs:

Goals and needs are presented in the attached spreadsheet which will be used as a planning template to refine goals/needs and to develop monitoring and assessment strategies appropriate to meeting those needs. Some, but not all, of the agencies responses to this question are presented below. Please refer to the spreadsheet for the most comprehensive overview.

MDE: MDE management encompasses all aspects of regulatory and non-regulatory activities, including permit review and assessments, mitigation, planning, mapping, voluntary restoration and preservation, Clean Water Act reporting, TMDLs, and development of water quality standards. It was suggested that the group be expanded in future meeting to involve the Maryland Water Monitoring Council (MWMC), and give a presentation at the next board meeting and summary presentation at the State Water Quality Advisory Committee meeting, both to be held in October. Federal and local entities will be included in future meetings.

MDE also suggested that future water quality standards be considered at all times when developing the strategy. If standards are simple, then simple monitoring may be appropriate. Tiered aquatic life uses may be the most flexible approach. A Use Attainability Analysis may also help determine how standards are developed.

New data management will be required. The selected custodian, information sharing, and privacy issues will all have to be addressed.

There is a need to reconcile the seeming clash between condition/integrity in wetlands and wetland functions. A legally defensible classification system is also needed.

Data collection will be a great burden. The possibility of requiring permittees /applicants to collect information was suggested and MDE will consider this option so the State will not bear the entire burden of data collection.However, the State must also consider that permittee assessment may be biased to favor the permittee's interests over the importance of the wetland.

DNR: The Natural Heritage Program views monitoring as an opportunity for more data collection and more effective restoration and restoration targeting. The information would be integrated into water quality, cumulative impact, and functional reviews. Consistent mapping is also needed.

In terms of Chesapeake Bay restoration, monitoring results could be used to quantify benefits of restoration, refine restoration goals, and target the location of BMPs, wetland restoration and wetland conservation. Watershed-level and site specific information is needed. Better wetland information will also improve Maryland's Green Infrastructure Assessment which provide a framework for conserving and restoring the State's most ecologically valuable lands.

For Clean Water Act reporting, the monitoring must determine if wetlands meet, fail, of can't determine if they meet, use designations. Causes and sources of pollutants must be identified.

Chesapeake and Coastal Bays Critical Areas Program needs to document how their regulations improve resources. The Program is interested in what

monitoring results will mean for on-the-ground decisions, and effects of those decisions. Results would be used for targeting restoration projects, especially for use of in-lieu fee money. Standardized assessments could be made part of the typical development review packet.

Monitoring could provide a better understanding of ambient conditions, which would be used in planning, restoration, and Clean Water Act efforts. Monitoring needs to be done at various scales. Results could be used to establish performance measures for restoration and mitigation. Functional assessments are also needed.

State Highway Administration (SHA): Monitoring is needed for mitigation and permitting. This includes delineations, assessments, mitigation monitoring (watershed and site specific) and strategic planning. SHA currently has a large amount of data and assessment results. SHA recommends that classification categories be broad and they need a rapid assessment method.

Agency Roles

Work group participants were asked if they wanted to continue attending all related meetings in the future, of if they would prefer to attend meetings discussing only certain topics. At this time, all participants will continue with the work group.

Current Status

MDE: Uses a cursory approach using best professional judgment about habitat, water quality, etc. in regulatory review. Mitigation sites are monitored for vegetation, soils and hydrology, but little work is being done to measure function. Efforts are underway to better evaluate functional success sites by attempting to determine if the mitigation site is on the proper trajectory for meeting the long-term goals of the mitigation project. MDE is also working with the University of Maryland to do some intensive, one-time data collection, including chemical data, at some MDE programmatic and SHA mitigation sites. A literature search is also being prepared on nutrient sampling in wetlands.

SHA: SHA conducts wetland delineations and assessments of impact and mitigation sites. Impact sites are assessed using the New Hampshire method if the wetland is greater than 1 acre in size or if the impact exceeds 5000 square feet. SHA prefers that HGM is not selected as an assessment method as it is very time intensive. They also monitor stream restoration and fish passage sites. SHA has extensive data from past monitoring reports, site location, and mitigation records, and is interested in developing a database to store this information. SHA has had some discussions with MDE about cooperative project to develop a shared database. SHA formerly used Interagency Mitigation Guidance for assessing mitigation projects, but has since developed a more streamlined procedure, since the detailed information was not being used. SHA takes aerial photographs of mitigation sites annually and has found this to be very important.

DNR: DNR was part of a three-tier assessment of nontidal wetlands in the Nanticoke River watershed. The HGM classification system was used. They are interested in evaluating the transferability of the methods to other areas in Maryland. DNR is also working with the State of Delaware and the Virginia Institute of Marine Science (VIMS) to assess tidal wetlands in the Nanticoke watershed. A shoreline survey with georeferenced data points that was recently completed is used as part of the assessment. A Statewide Level 1 assessment of nontidal wetlands focusing on habitat and condition measures is being adapted by VIMS for Maryland, but it needs field calibration. A rapid Level 2 assessment in the Patuxent River watershed was conducted using the Ohio Rapid Assessment Method and the Delaware Rapid Assessment Procedure, which was the method used for the Nanticoke River watershed project.

DNR's Natural Heritage Program inventories and assesses occurrences of living resources, targeted species, conducted environmental reviews, and assesses stressors and current condition on Nontidal Wetlands of Special State Concern. A community classification system has been developed and used Statewide with reference sites, plot data, and vegetative descriptions. Reports on certain community types, such as tidal emergent, shrub, and forested wetlands have been completed. The Program conducts ongoing inventories of communities of interest and landowner contacts and has restored and monitored Delmarva Bays. Rare amphibian surveys have also been conducted. Tim Larney distributed the executive summary of Maryland's Wildlife Diversity Conservation Plan identifies key habitat categories and correlates these types to National Wetland inventory classes. Ten of the key habitats are wetlands. The Plan also has monitoring requirements.

DNR's Chesapeake and Coastal Bays Critical Areas Program requires and conducts some monitoring of wetlands related to specific projects under review. Monitoring has been required for some restoration projects.

Other States: Pennsylvania has completed models for wetlands across the State's physiographic regions with the possible exception of the Coastal Plain. An HGM assessment was used. There is a great deal of documentation and literature citations that accompany the Pennsylvania studies, which may also be applicable for Maryland. Virginia also has a completed strategy and is pursuing a three-tier approach, and intensive proposed for a two-year period. Ohio has done extensive model and assessment method development and implements a monitoring program.

Copies of monitoring strategies for other States will be made available to the Work Group.

Next Steps

Participants were asked to identify and collect any information that would be useful during strategy development. Information could include published literature, other assessments, case studies from other States, and similar materials.

Christine Conn presented a table of monitoring objectives and assessment questions for each agency and other topics such as sampling approach, design scale, population/region of interest, classification system, methods, indicators, and wetland maps. The table will be filled in over time as decisions are made on the various monitoring issues.

September 19, 2006

The main topic of this meeting was to discuss existing classification methods.

Maryland Coastal (Tidal) Wetland System

Denise Clearwater began with a presentation of the oldest and simplest classification systems in use in Maryland and distributed a handout. The oldest system is the classification used for tidal wetlands regulated under State law. The system classifies wetland by vegetation and community type, and also includes unvegetated wetlands. Classified wetlands are shown on over 2000 maps at a scale of 1" = 200 feet.

There are three ranges of salinity and two ranges of tidal inundation, representing regularly flooded areas and higher, less frequently flooded wetlands. Seven general types include:

1) shrub swamps;
2) swamp forests;
3) fresh marshes;
4) brackish high marshes;
5) brackish low marshes;
6) saline high marshes; and
7) saline low marshes.

There are 2-10 dominant plant communities for each vegetated wetland type shown above.

Extensive supporting documentation for the system, and associated functions and values of the wetland types, is provided in the report Coastal Wetlands of Maryland.. The 1982 report is available online at MDE's web page.

Advantages of this system are the existing maps, the extensive background, and its future availability as a GIS layer. Disadvantages include lack of information from recent studies, age of maps (1972), and limited updates. Maps are currently not widely distributed.

U.S. Fish and Wildlife Classification System (National Wetlands Inventory)

Denise Clearwater discussed this system and presented a copy of a key to its

use. The system developed by Cowardin et al. (1979) classifies wetlands and other aquatic areas by system, subsystem, class, subclass, and a variety of modifiers. The sorting is by general characteristics of the water body and salinity (marine, estuarine, palustrine) or confinement in a topographic depression or dammed river channel (lacustrine) or flowing water in a channel (riverine). Many of the areas are currently already monitored under Maryland's current approved strategy.

For tidal wetlands, the USFWS classification sorts wetlands by salinity and frequency and duration of inundation through system, subsystem, and water regime codes. Dominant vegetation type (emergent, scrub-shrub, forested) is also determined, though in nontidal wetlands the vegetation is often progressing though successional change more than tidal wetlands. Water regime modifiers in nontidal wetlands offer useful information about extent of duration, which influences soils, organic matter, and processes associated with water quality and hydrology functions. This is a consideration not often used in hydrogeomorphic (HGM) classifications. Changes in wetland type and loss have occurred since maps were originally produced by the USFWS, and updated by the State. Digital maps make it possible to analyze wetlands in conjunction with data layers available for land use, floodplains, topography, and infrastructure, all of which influence wetland condition and function. Wetland boundaries are approximate, and there are often errors in wetland extent. These maps will be the foundation for identifying wetlands and selecting sample sites.

Advantages of USFWS system:

1) Available Statewide
2) Long history, basics are well understood
3) Rapid field verification
4) Can be further sorted or refined using other GIS layers

Disadvantages:

1) Requires additional analysis of topography, soils, hydrology, and landscape to predict functions

<u>Hydrogeomorphic Classification</u>

Christine Conn gave a presentation on the Hydrogeomorphic (HGM) Wetland classification systems. HGM was developed by the U.S. Army Corps of Engineers to evaluate impacts on wetland functions as part of Clean Water Act-Section 404 permit reviews (Note: it is not currently used for the purpose of Section 404 reviews in Maryland.) The classification is based on the following factors: landscape position, water source, and flow and fluctuation of water in wetland. Landscape positions include riverine, interfluve, depressional, slope, mineral and organic flats, and tidal fringe. Dominant water sources are precipitation, overbank

flooding, and groundwater. Water fluctuation may be horizontal or vertical, and one-way or in both directions (in and out of the wetland).

Results in the Nanticoke study were presented as a set of scores representing an index of wetland condition and a functional capacity index for various functions which included hydrology, biogeochemistry, habitat, plant community, and buffer integrity. NWI maps have been used to identify sites.

Advantages of HGM are that it includes abiotic factors important for evaluating wetland function, such as water quality, flood protection, sediment retention, and nutrient processing. Ability to perform certain functions varies by wetland type. HGM is the selected classification system in Pennsylvania, New Jersey, Delaware, and Virginia, coupled with biological metrics. Pilot studies in Maryland have included an assessment in the Nanticoke River watershed and in Piedmont slope wetlands. EPA will also use the system in a 2007 regional wetland assessment.

Disadvantages are as follows:

1) Models are lacking for some wetland types and physiographic regions;
2) Development of new models is expensive and labor intensive. However, many studies and research projects among neighboring states and across the nation are developing models which will be investigated for applicability in Maryland;
3) The emphasis is on wetland condition rather than function in regional case studies, but HGM is not a bioassessment procedure.

Denise Clearwater distributed a key to the HGM system used by Pennsylvania. Pennsylvania has compiled extensive background information and references to document the models and indicators used in their assessment. Classes include riverine (headwater and mainstem) floodplain wetlands, headwater impoundments, slope wetlands, headwater depressions, riparian depressions, headwater or mainstem impoundments, organic or surface water depressions, isolated depressions, mainstem depressions, and man- or beaver made impoundments.

Key Wildlife Habitats

Gwen Brewer presented the Key Wildlife Habitats classification used by DNR for its Wildlife Diversity Conservation Plan. The system is used for conservation of 500 Maryland species of greatest conservation need, plus other wildlife in those same habitats. The system uses NWI, HGM considerations, ecoregion and vegetative classification systems, and uses NWI information. Key wildlife habitats that are wetlands are: floodplain forests, forested seepage wetlands, Carolina Bays, vernal pools, upland depressional swamps, nontidal shrub

wetlands, tidal shrub wetlands, nontidal emergent wetlands, tidal wetlands, and bog and fen wetland complexes. Sites have been mapped from field data and predictive models. The Wildlife Diversity Conservation Plan shows these maps and describes each habitat type. Reference site and vegetative plot data is available.

Advantages are:

1) Existing information is available;
2) System can "crosswalk" with regional and national systems;
3) Allows for comparisons between wetlands across physiographic regions;
4) Can meet various monitoring objectives; and
5) Can accommodate various physical, chemical, and biological integrity/indicator measures at various assessment levels.

Additional Discussion

There was additional discussion among attendees about what monitoring should accomplish. Recommendations included:

1) The classification system should meet multiple objectives;
2) Do not apply standards that are unachievable. For example, wetlands created for stormwater management purposes might be listed in a separate class;
3) While resources are currently very limited, the monitoring approach should allow for improvement if additional funds become available;
4) Monitoring results should be able to identify areas that support significant habitat, rare threatened and endangered species, and restoration areas. A special modifier could be used for this, and may be useful for disturbed areas that support rare species, such as bog turtle habitat or powerline bogs; and
5) Monitoring should consider condition, function (especially water quality), and habitat.

Next Steps:

Work groups members have the assignment of preparing a system to group wetlands and a monitoring framework.

October 19, 2006

The purpose of this meeting was to discuss and decide on a classification system for wetlands and discuss visions of a monitoring framework. Denise Clearwater and Christine Conn presented draft use classes for MDE and DNR.

MDE Draft Classification

The MDE system was developed with consideration of wetland hydrology, current definitions, and management needs. Potential corresponding HGM and key

wildlife habitats were included. A list of potential modifiers was also presented. There should be an initial sorting by physiographic regions, which would account for natural variation among wetlands due to topography and geology.

Classes were: 1) tidal - this would possibly be separated in to freshwater and estuarine subcategories for assessment. The separation of tidal from nontidal systems would parallel to reporting of traditional waters in the 305(b) report;

2) nontidal riparian headwater wetland - means a wetland hydrologically connected to streams of a third order or less, that are primarily supported by groundwater, often as spring or seepage discharges, and occasionally by some surface runoff. This category is found in Pennsylvania's classification system but differs from some HGM models due to the inclusion of other HGM classes such as slope and depression wetlands, provided that they are in the floodplain or connected to it. Headwater wetlands are attracting greater interest for management as they are very significant for nutrient processing and transformation, and perform differently from larger stream systems more dominated by overbank flooding;

3) nontidal riparian mainstem - means a wetland hydrologically connected to streams or rivers of a fourth order or higher, that are supported by a combination of groundwater, surface runoff, and overbank flooding when in a reference standard condition. These are wetlands associated larger stream systems, that also may contain slope and depression wetlands.

4) isolated wetlands - means a nontidal wetland not hydrologically connected by surface or subsurface flow to streams, tidal or nontidal wetlands, or tidal waters. Isolated wetlands may occur in an apparent depression or on a slope with no connection to another surface water body. The isolation of these wetlands may be natural or caused by human influence.

It may not be required to report on the condition of these wetlands as part of 305(b) requirements as isolated wetlands are generally no longer recognized as waters of the U.S. under the Clean Water Act. Sherm Garrison noted that similar situation occur for some lakes and reservoirs. Maryland may wish to monitor isolated wetlands for its own purposes.

5) seasonal flat wetlands - means a nontidal wetland with hydrology supported by slow infiltration of surface water, high groundwater, and level topography. These wetlands may contain stream systems but are not significantly influenced by flooding and are located in the other regions. Seasonal flat wetlands often appear similar to adjacent upland areas.

These wetlands include some of the larger areas on the lower Eastern Shore, but may also be found in the western part of the State.

6) peatland wetlands – means a nontidal wetland characterized by a sphagnous mat, organic soils, or accumulated peat, and soils saturated to the surface throughout the year with minimal fluctuations in water level.

This language is from an Anne Arundel County definition, that in turn was based on a State nontidal wetland definition of "bogs."

7) Altered, Constructed, or Incidental Wetland – means wetlands actively managed or established due to human activity. These wetlands have disturbed conditions that are not comparable to natural reference wetlands, and have increased or decreased functional performance and benefits as a result of human actions. Wetlands may become comparable to natural reference wetlands over time, and may then be assigned to other use classes.

This class was proposed in response to concerns from TARSA about establishing a future standard to wetlands deliberately designed and constructed for water quality improvement, such as stormwater ponds. These wetlands would never have water quality comparable to natural reference wetlands, but in a separate class the benefits provided by the created wetland would be recognized. The class would also include mitigation wetlands, at least for a time, when in their early development they reflect a disturbed condition after recent construction.

The class would also recognize wetlands with improved functions as a result of human activity. Examples are wetlands providing habitat for bog turtles, as a result of grazing, or bogs maintained under powerlines. After discussion, the group agreed that wetlands in which the human activity mimicked a natural process would not be placed in this class. For example, tree removal in Delmarva Bays to simulate fire and early succession would not be considered a stressor.

There were conflicting opinions about comparing constructed wetlands to natural systems, with some in favor of comparisons and others opposed. Arguments included observations that these sites would always fall short for a number of years after construction and that their inclusion would skew data toward a lower end of the scale. Other points of view were that they could be compared to natural wetlands, but not penalized, and it would be necessary to know when the wetlands were performing as well as they could be. DNR continues to be concerned over this classification, and, most importantly, the potentially different assessment methods and grading scales, applied to these wetlands.

A list of modifiers was also suggested that would give a higher ranking for wetlands with certain characteristics. These included presence of rare, threatened or endangered species, Nontidal Wetlands of Special State Concern, Delmarva Bays, vernal pools and supporting drinking water sources.

Another suggestion was to establish a functional class with Nontidal Wetlands of Special State Concern or wetlands having significant plant or wildlife value, excluding trout streams. MDE proposed excluding a blanket designation for trout streams due to their prevalence in western Maryland and the belief that many will never, and/or never did, actually support trout. It would still be possible to select indicators that would reflect a wetland's support of a stream with significant aquatic habitat, but the wetland need not be in a separate class.

There was general agreement about presenting monitoring results as meeting certain uses (habitat), and some meeting functional uses such as water quality improvement. This would recognize that less pristine wetlands still provide important functions.

MDE's monitoring framework proposed to monitor both condition and function, distinguish between natural and man-made wetlands, and use intensive sampling to calibrate both a rapid and GIS assessment. A GIS-based sample should be used as the initial report to meet Clean Water Act requirements, unless adequate funding is provided for additional field work.

DNR Draft Classifications

Christine Conn from DNR's Ecosystem Analysis Center and Gwen Brewer from the Wildlife and Heritage Service each presented a classification system.

Christine Conn presented a HGM classification system with an additional class for man-made wetlands. Classes were riverine, depressional, slope, mineral soil flats, organic soil flats, estuarine fringe, and lacustrine fringe. Key wildlife habitats were matched to the HGM classes, with a description of the dominant water source, hydrodynamics, and pertinent physiographic province.

An initial suggestion was to use Nontidal Wetlands of Special State Concern as reference wetlands. Joe Beaman cautioned against using these as reference, since it wouldn't be appropriate if the wetlands are unique areas, in which case other wetlands would not be expected to be comparable. An alternative could be to pristine areas as reference, and then evaluating wetlands according to a percentile. Another suggestion was to recognize that all wetlands would be subject to direct or indirect disturbance, and thus evaluating wetlands to a lower standard.

Another suggestion was to supplement information by using out-of-State data, but that was not recommended data was similar after matching for appropriate parameters, such as ecoregion, wetland type, elevation, underlying geology, and surrounding land use.

DNR has a contract with the Virginia Institute of Marine Science to do a GIS-based assessment. For Level 2 rapid assessments, DNR proposes to use HGM and Key Wildlife Habitat classes, compare various assessment approaches in a test

field study in 2007. For Level 3, DNR proposed to use Nontidal Wetlands of Special State concern and other high quality, pristine wetlands as reference sites and use data to calibrate Level 1 and 2 assessments. A targeted survey was recommended.

Gwen Brewer presented a classification for key wildlife habitats. These were developed to meet requirements of a State Wildlife Action Plan. The Plan focuses conservation for approximately 500 species of greatest conservation need as entire assemblages. The classification system incorporates various elements from the National Wetlands Inventory, U.S. Natural Vegetative communities, and Maryland Ecological Community groups. Key Wildlife Habitats that are wetlands are: floodplain forests, forested seepage wetlands, Carolina Bays, vernal pools, upland depressional swamps, nontidal shrub wetlands, tidal shrub wetlands, nontidal emergent wetlands, tidal marshes, and bog and fen complexes. Extensive information is available across the State for the habitat types, from field inventories and existing maps and predictive models. Reference site and vegetative plot data is available.

Participants agreed that it would be possible to derive key wildlife habitat information from either classification.

Next Steps:

A small number of work group members would meet separately to resolve differences over the classification system.

DRAFT CLASSIFICATION SYSTEM

After several meetings, MDE and DNR developed a draft classification system in 2007 to present to the Work Group. The classification is a modified version of the HGM classification, that can also be translated into the classification system used for wildlife habitats. A unique addition is the designation of a separate class for wetlands that are constructed, whether for mitigation, restoration, or water quality improvement. The class is under consideration to recognize that newly established wetlands are often built for a specific purpose, are built in a disturbed area, and are in an early successional stage. Comparison of these wetlands with a more mature natural system, at least for an initial period, may incorrectly indicate that these wetlands are in poor condition or not performing desired functions. A separate class prevents this problem but will continue to be discussed.

The system is shown in the table below:

LEVEL 1					LEVEL 2	
MD Wetland Class	HGM Class	NWI class	Brief Description	Hydrology 1) source, 2) hydrodynamics 3) hydroperiod	Key Wildlife Habitat	Physiographic Province of Occurrence[2]
Tidal Freshwater	Fringe	PFO PSS PEM	0 – 0.5 ppt Salinity and head of tide	1) Overbank flow from channel 2)Bidirectional, horizontal, vertical 3)Diurnal	Tidal Shrub Wetlands Tidal Marshes Floodplain Forest	UCP, LCP
Tidal Estuarine	Fringe	E2SS E2EM E2FO	> 0.5 ppt Salinity	1) Overbank flow from channel 2)Bidirectional, horizontal, vertical 3)Diurnal		UCP, LCP
Non-tidal Riparian Headwater Complex	Riverine, slopes, depression	PFO, PSS, PEM	Riparian zone of waterway, floodplain, and transitional upland fringe <or = 3rd order mosaic of low/high gradient streams, depressions, toe-slopes	1) Overbank, groundwater, surface runoff 2) Bidirectional, horizontal, vertical 3) Variable	Floodplain Forest Nontidal Shrub Wetlands Nontidal Emergent Wetlands Forested Seepage Wetlands Bog and Fen Wetland Complexes Vernal Pools	AP, RV, PD, UCP, LCP
Non-tidal Riparian Mainstem Complex	Riverine	PFO, PSS, PEM	Riparian zone of waterway, floodplain, and transitional upland fringe > 3rd order mosaic of low/high gradient streams, depressions, toe-slopes	1) Overbank, groundwater, surface runoff 2) Bidirectional, horizontal, vertical 3) Variable	Floodplain Forest Nontidal Shrub Wetlands Nontidal Emergent Wetlands Vernal Pools	AP, RV, PD, UCP, LCP
Seasonal Flat (mineral soil) • Connected • Isolated	Mineral Flat	PFO, PSS, PEM	Broad, flat areas with poor drainage	1) Precipitation, groundwater, overbank 2) Vertical 3) Temporarily to semi-permanently flooded		AP, RV, PD, UCP, LCP
Peatland • Connected • Isolated	Organic Flats + Depressions	PFO, PSS, PEM	Broad, flat areas or depressions with sustained saturation and deep peat	1) Precipitation, groundwater 2) Vertical 3) Saturated,semi-permanently flooded	Bogs and Fens	AP, RV,PD, UCP
Isolated Depressional	Depression	PFO, PSS, PEM	Topographic low area lacking hydrologic connection to riparian tidal waters	1) Precipitation, Groundwater, surface run-off 2) Vertical 3) Temporarily, seasonally, to semipermanently flooded	Upland Depressional Swamps Vernal Pools	AP, PD, UCP, LCP
Isolated Seepage Slope	Slope	PFO, PSS, PEM	Discharge area lacking observable surface connection to riparian or tidal waters	1) Groundwater 2) Unidirectional, horizontal 3) Saturated most or all of the year	Upland Depressional Swamps Carolina Bays Vernal Pools Nontidal Shrub Wetlands Nontidal Emergent Wetlands	AP, RV, PD, UCP, LCP
Constructed or Incidental	Any class	PFO, PSS,, PEM	May become any of above classes after wetland matures	Any of above sources	Forested Seepage Wetlands Bog and Fen Wetland Complexes, stormwater, mitigation, mining, highway and other incidentals, lake and pond fringes, voluntary	AP, RV, PD, UCP, LCP

[1]from Cowardin (1979)
[2]AP=Allegheny Plateau; RV=Ridge and Valley; PD=Piedmont; UCP=Upper Coastal Plain; LCP=Lower Coastal Plain

Table 1. Draft Classification System and Existing Classifications

PILOT STUDIES, PAST STUDIES, AND RELATED SOURCE INFORMATION

The following studies, projects, and products have been conducted or are in progress by MDE and DNR. These studies provide new mapping information and various wetland assessments methods that will be presented to the interagency wetland monitoring workgroup for consideration as components of the Statewide Wetland Monitoring Strategy.

1. Maryland Department of the Environment. 1995. A Method for the Assessment of Wetland Function. Prepared by Fugro East, Inc. for MDE and funded by U.S. Environmental Protection Agency State Wetland Program Development Grant CD 003617-01-2.

   The deliverable was a field and/or desk top approach for assessing wetland functions in a landscape setting, particularly for watershed planning purposes. Basic principles and indicators used in HGM assessments are included, though not with additional validation. Detailed descriptions on interpreting indicators are included. Comparisons may be made between wetlands on relative functional performance. The model has been adapted for use in Montgomery County, Maryland for environmental inventories. The document also was used as a reference for evaluating functional success of wetland mitigation sites. An evaluation of assessment methods commonly in use at the time is also included.

2. Maryland Department of the Environment. 1998. Comprehensive Nontidal Wetland Watershed Management Plan: A Guide for Local Governments. Funded by U.S. Environmental Protection Agency State Wetland Program Development Grant.

   This document contains a chapter with basic information on functional assessments and a summary of watershed plan case studies with functional assessments.

3. Tiner, R., M. Starr, H. Bergquist, and J. Swords. 2000. Watershed-based wetland characterization for Maryland's Nanticoke River and Coastal Bays Watersheds: A preliminary assessment report. U.S. Fish and Wildlife Service, National Wetlands Inventory (NWI) Program, Northeast Region, Hadley, MA. Prepared for the Maryland Department of Natural Resources, Coastal Zone Management Program.

   Project purpose was to produce updated wetland maps and a characterization of wetland function, condition, stressors and restoration opportunities in the Nanticoke River and Coastal Bays watersheds. This information will assist Maryland wetland managers in wetland planning and evaluation at the watershed level. Early 1980s NWI maps were enhanced using Maryland wetland data (1989 aerial photographs) to improve the delineation of wetlands in the NWI database. The database was also expanded to include hydrogeomorphic-type attributes for all mapped wetlands and waterbodies, an inventory of ditches, an inventory of potential wetland restoration sites and geospatial data on land use and land cover

in both watersheds. Wetland characterization based on the database development included

4. Tiner, R.W. and H.C. Bergquist. 2003. Historical Analysis of Wetlands and Their Functions for the Nanticoke River Watershed: A Comparison Between Pre-settlement and 1998 Conditions. U.S. Fish and Wildlife Service, National Wetlands Inventory (NWI) Program. Funded by Kent County and Eastern Shore Resource Conservation District and prepared for the Maryland Department of Natural Resources.

   The analysis provides a historical perspective of wetland extent and function in the Nanticoke, as a companion study to the Tiner et al. 2000 report which revised NWI maps to include hydrogeomorphic descriptors (landscape position, landform, and water flow path) and a preliminary assessment of wetland functions. This information will assist wetland managers in wetland planning and evaluation at the watershed level.

5. MDNR. 2004. Wetland Profile of the Nanticoke River Watershed. Wetland Program Development Grant CD-98337701. David Bleil, Project Manager.

   Maryland's report for the interagency (MDNR/DNREC) Nanticoke River watershed study. Three major wetland classes (flats, riverine and depressions) were identified and assessed for condition. Wetland condition was compared with reference condition and scores were developed. Three levels of analysis were evaluated. A landscape level (level 1), which relied on mapping data and aerial photography, a rapid assessment procedure (level 2) looking for known stressors at the site, and a detailed data collection protocol (level 3) needed for verifying and calibrating level 1 and 2 assessments and to develop reference condition.

6. MDNR. 2005. Using the Landscape Development Intensity Index as a predictor of wetland condition along a gradient of wetland impacts in Maryland. EPA Cooperative Agreement AW-83435801. David Bleil, Program Manager. Revised as Nanticoke River Tidal Fringe Wetlands Assessment.

   This project was originally intended to investigate the use of an Landscape Development Intensity (LDI) Index to predict wetland condition. The LDI is a GIS based landscape (level 1) assessment tool that can estimate the amount of human influence in watersheds and coefficients of land use types within a region as an indicator of wetland condition. Riverine wetlands were selected along a gradient of land use, from rural to urban, within the Patuxent River basin. Field data were collected for about 30 wetlands using two rapid assessment methods (level 2), developed by Delaware (DERAP) and Ohio (ORAM). EPA Office of Research and Development staff had committed technical assistance, but were unable to contribute. The LDI Patuxent project was discontinued and the grant money was redirected to a level 1, 2 and 3 tidal wetland assessment in the

Nanticoke River watershed. This dataset could be used to verify and refine level 1 scores generated for non-tidal wetlands through the VIMS subcontract.

7. MDNR. 2006. Building Maryland's capacity to perform statewide landscape level wetland condition assessments for current and future conservation and restoration applications. EPA Region 3 Wetland Program Development Grant, ongoing. Erin McLaughlin, Project Manager.

   Produces a landscape level assessment (level 1) of all mapped non-tidal wetlands in Maryland. Each wetland will be scored for both habitat and water quality condition. The Virginia Institute of Marine Science (VIMS) has been subcontracted to do the work and will use the methods developed for Virginia's wetland monitoring strategy. This project will provide Maryland with the capacity to conduct the landscape level analysis in the future covering any region of the state to track changes in non-tidal wetland condition resulting from land use changes. Wetland scores will be integrated with the updated Green Infrastructure Analysis. Fieldwork completed in the Nanticoke and in progress elsewhere will validate or refine the landscape condition indices. Continued refinement of landscape level assessments will provide a means to rapidly report on statewide wetland condition for very little cost. Project will be completed in March 2008.

8. VIMS. 2006. Development of an Inventory and Multi-Level Assessment Method for Mid-Atlantic Tidal Wetlands. EPA funded award to Virginia Institute of Marine Sciences. DNR provided $10,000 match as in-kind services through David Bleil.

   DNR provided statistical analysis support to develop and test multi-level (level 1, 2, 3) assessment methods for tidal wetlands in Virginia, Maryland and Delaware. DNR continued to refine tidal assessment methods under another EPA grant during the summer of 2007.

9. MDNR. 2007. Nanticoke River Tidal Fringe Wetlands Assessment. EPA Cooperative Agreement AW-83435801. Erin McLaughlin, Program Manager.

   Rapid assessment (level 2) methods, developed in California (CRAM) and New England (NERAM), and detailed field assessment (level 3) methods were tested on tidal wetlands in the Nanticoke River watershed. This project was one piece of a larger collaborative effort between MDNR, Delaware Department of Natural Resources and Environmental Control (DNREC) and Virginia Institute of Marine Science (VIMS) under the "Development of an Inventory and Multi-Level Assessment Method for Mid-Atlantic Tidal Wetlands" grant. The grant was concluded in September 2007, and a final report has been submitted to EPA ORD.

It is recommended that follow-up work include calibrating the level I assessments (conducted by VIMS) with the level 2 and 3 datasets collected through this study.

10. MDNR. 2007. US 301 Waldorf Area Transportation Improvements Project. MD State Highways Administration contract to DNR. Ongoing. Christine Conn, Program Manager. Erin McLaughlin, Project Manager.

    DNR is developing assessment protocols to score the ecological values of wetland environmental stewardship opportunities to include creation, restoration, conservation and management projects. A subset of the projects will be funded by SHA as part of the US 301 transportation improvement plan. DNR will also be developing wetland monitoring and restoration cost protocols. DNR has tested several existing rapid assessment methods on 23 individual wetlands to date, and will evaluate the results to recommend an appropriate method. Beyond SHA needs, the results from this study will provide an additional dataset that evaluates the utility of 4 different rapid assessment methods (Ohio Rapid Assessment Method, Delaware Rapid Assessment Method, Montana Department of Environmental Quality, and Pennsylvania State University method) and can also be compared with level 1 assessment scores generated through the VIMS level 1 study.

11. Maryland Department of the Environment. Effectiveness of Maryland Compensatory Wetland Program. 2007 (In progress). Funded by U.S. Environmental Protection Agency State Wetland Program Development Grant.

    This project includes a literature review of methods for measuring success of mitigation sites. In addition, a functional assessment protocol was developed and tested at 96 wetland mitigation sites. The protocol uses a checklist and best professional judgment. Use of IRIS tubes for evaluating soil processes and hydric soil development is under consideration as a predictor of future wetland function. A GIS protocol for evaluating functional services, based on MDE's wetland assessment method will also be tested.

12. Maryland Department of the Environment. 2007 (In progress.) Under preparation by University of Delaware. Monitoring and Assessing the Nutrient Status and Overall Health of Fresh Water Wetlands. Funded by U.S. Environmental Protection Agency State Wetland Program Development Grant.

    This project is developing monitoring protocols for wetlands for purposes of evaluating nitrogen and phosphorous enrichment for compliance with water quality standards. More specifically, the project addresses the temporal variables of monitoring with respect to frequency and season. Also, traditional monitoring procedures for water quality can be time consuming and expensive. Therefore, the project addresses the feasibility of using rapid assessment procedures in lieu of monitoring. This project will enhance the wetland monitoring and assessment

efforts in the region by integrating the results into the decision-making processes be completed in 2007.

13. Maryland Department of the Environment. 2007 (In progress.) Under preparation by University of Delaware. Improved Identification, Delineation, and Functional Assessment of Piedmont Wetlands. Funded by U.S. Environmental Protection Agency State Wetland Program Development Grant.

    This is an active grant awarded in 2001, and will close in 2007. Deliverables will include additional guidance on hydric soil indicators for floodplain and slope wetlands in the Piedmont physiographic province. In addition, a hydrogeomorphic model for slope wetlands in the Piedmont will be developed.

14. Maryland Department of the Environment and University of Maryland. (In progress). Formation of New Redoximorphic Features under Hydric Soil Conditions. Funded by U.S. Environmental Protection Agency State Wetland Program Development Grant.

    The purpose of this project is to look at the development of redoximorphic features in recently deposited soil material and ask the question which is often asked when trying to interpret soil morphology in such problem settings is "How long does it take for various redoximorphic features to form?" In determining this time frame and an understanding of organic soil amendments, the development of a performance standard, which can be applied during the monitoring phase of compensatory mitigation will greatly assist in determining if mitigation sites are successful in providing the functions for which they are established. This Grant will be completed in early 2008.

15. University of Maryland. Baseline Assessment of Water Quality in Maryland's Wetlands. 2008. Prepared as student honors thesis and for Maryland Department of the Environment. (In progress).

    Under the guidance of Dr. David Tilley, a team of undergraduate students (Team C.R.A.B.S) in the University of Maryland Gemstone program conducted an assessment of the water quality, soil characteristics, landuse and vegetation of 13 non-tidal, constructed wetlands in 2006 in an effort to provide baseline data to MDE to help them form their strategy for meeting future wetland assessment requirements. CRABS collected data on each wetland's surrounding landuse based on the latest landuse/landcover surveys completed in 2001. CRABS also assessed *Eschericia coli* and total coliform concentrations and the resistance of *E. coli* to commonly used pharmaceutical and agricultural antibiotics. This project will also result in a literature search of techniques to monitor nutrient levels in wetlands.

Other States or Projects Identified to Date for Evaluation

Ohio Rapid Assessment Method
Delaware Rapid Assessment Method
Delaware Comprehensive Assessment Method
Pennsylvania State University method
Virginia Institute of Marine Science method
Virginia Department of Environmental Quality Floristic Quality Index
West Virginia Fish and Game Department
Virginia Polytechnic Institute and State University methods
Washington State Assessment method
Maryland State Highway Assessment method
Conservation Effects Assessment Project methods
Wetland Assessment Technique II
NatureServe
U.S. Fish and Wildlife Services documents
U.S. Environmental Protection Agency documents
    Nutrient Criteria Guidelines for Wetlands
Association of State Wetland Managers documents
Wetlands
J. American Water Resources Association
J. of Environmental Quality
J. of Environmental Restoration
J. Forestry

RELATED EFFORTS

National Wetland Monitoring and Assessment Work Group

MDE and DNR are members of the National Wetland Monitoring and Assessment Work Group (NWMAWG). NWMAWG is working with States and tribes to coordinate the first National Wetland Condition Assessment of the nation's wetlands. Similar efforts are in progress for other types of waters. Research and protocol development are underway.

MDE participated in conference calls and a September 11-12, 2007 meeting for the National Wetland Condition Assessment in Kansas City. Much of the discussion centered on how results would be reported and the elements to monitor. Many attendees, including MDE, urged monitoring for wetland function as well as condition. Monitoring for function would recognize the benefits provided by wetlands that are degraded by providing water quality services, such as retaining or transforming nutrients. It was announced that that the 1000 sample sites for the 2011 field study would be taken from 2 x 2 mile plots currently used by the U.S. Fish and Wildlife Service for status and trend inventories.

Rapid field protocols (Ohio, California, Delaware) were reviewed and tested during a field portion at the meeting. These methods will be analyzed in greater detail for applicability toward Maryland's Wetland Monitoring Strategy objectives.

Site selection is expected to take place in 2009.

Participants are currently reviewing pertinent definitions of wetland health and conditions. Smaller sub-groups are working on "reference condition."

Mid-Atlantic Wetland Work Group

Maryland has been a member of the Mid-Atlantic Wetland Work Group (MAWWG), an organization of federal and State agencies and academic institutions that exchanges information on various aspects of wetland monitoring. MAWWG has held semi-annual meetings since 2002.

From Mid-Atlantic Wetland work Group web site:

> "Primary objective:
>
> The primary objective of the Mid-Atlantic Wetland Workgroup is to support a forum in which to facilitate the development and implementation of wetland monitoring strategies, including elements of a comprehensive wetland monitoring program, that meet the needs of the mid-Atlantic states (i.e., wetland monitoring programs to be implemented at the state level)
>
> Primary goals for the workgroup include:
>
> 1. "The technical preparation necessary for improved coordination of surface water and wetland monitoring programs, with the eventual long-term incorporation of wetlands into traditional water quality monitoring programs (e.g., CWA sections 305(b), 303(d), 319, and 106)

2. Regionalization of existing monitoring and assessment tools for wetlands, such as HGM classification, functional assessment and biological assessment

3. Use of monitoring and assessment tools for improved restoration and mitigation

4. Provision of training for regulatory personnel in monitoring and assessment methods

5. Source of information on monitoring and assessment tools, through a workgroup web site."

Participants typically exchange progress reports and case studies to share information.

Mid-Atlantic Regional Assessment

The U.S. Environmental Protection Agency are sponsoring a mid-Atlantic Regional Assessment. Researchers from Pennsylvania State University and Virginia Institute of Marine Science are developing the protocols. There will be 400 total data points, or 100 points per State. Nontidal wetlands in four ecoregions will be sampled. Field sampling will begin in 2008 and continue in 2009. Results will be final in 2011.

ADDITIONAL PRESENTATIONS

Wetland Monitoring Strategy Development in Maryland. 9th Wetlands and Watersheds Workshop. Atlantic City, New Jersey. October 23, 2006. Maryland Department of the Environment.

Vernal Pool: Monitoring and Management in Maryland. Maryland Water Monitoring Council. Patuxent Research Refuge, Laurel, Maryland. March 23, 2007. Maryland Department of Natural Resources and Maryland Department of the Environment.

STRATEGY COMPONENTS

Clean Water Act Requirements

As "waters of the United States," wetlands must be managed to protect, restore, and maintain the chemical, physical, and biological integrity of the Nation's waters. States must now implement a monitoring program to report on how their waters meet the chemical, physical, and biological integrity. This is accomplished by the formal adoption of State water quality standards and structuring the monitoring program to measure water parameters against the established standards. Water quality standards consist of three components: include use designations, narrative or numeric criteria, and an anti-degradation policy. States now report bi-annually on waters, and list those that fail to meet designated uses (impaired waters). Impaired waters are placed on the Clean Water Act Section 303(d) list, and may require development of a total maximum daily load (TMDL) for the impairing pollutant. TMDLS, in turn are used for implementation to bring the water body into compliance with water quality standards.

MDE assumes that all three elements of water quality standards for wetlands must be developed. While Maryland has conducted monitoring on many aspects of wetlands for various purposes, monitoring to meet Clean Water Act requirements is an entirely new effort. Monitoring of wetlands to meet Clean Water Act requirements must begin in 2012. One-fifth of the State will be sampled and reported on each year, as is done for other waters. Results would be shown in the bi-annual Integrated Assessment report.

Many of the early meetings of MAWWG and pilot efforts to date have focused on the monitoring of wetlands in terms of conditions, as a deviation from a least disturbed state. This monitoring does not necessarily meet all aspects of Clean Water Act requirements, which requires monitoring to determine if certain designated uses, as defined by a State, have been met. For traditional waters, uses have such designation in Maryland as natural trout waters, recreation trout waters, and shellfish waters. Minimum standards at the federal level are for waters that "fishable" and "swimmable," which would not often be reasonable criteria for a wetland.

The first detailed discussions of any type of designated use through MAWWG was in April 2005. Presentations from representatives from Pennsylvania State University, Maine, and Ohio presented their approaches to date for tiered aquatic life uses (TALU) for wetlands. It is anticipated that Maryland will have some sort of designated use for habitat or aquatic life. Some protocols developed to date or that are in progress are of plants and macroinvertebrates. Within a TALU, the ranking system has levels that denote living communities that change in response to certain stressors. At a minimally disturbed level, the living resource would support balanced indigenous species populations. As disturbance increases, species that are known to be more tolerant of pollution would begin to predominate and species diversity would decline.

MDE has collected information from 11 other States that have, at a minimum, formally adopted designated uses for wetlands. Some States also have narrative and numeric criteria and antidegradation policies. State language under review is from Massachusetts, Pennsylvania, North Carolina, Minnesota, Ohio, Wisconsin, Iowa, Nebraska, Wyoming, California, and

Washington. Maryland participated in extensive discussions with EPA and other States at the annual State/Tribal/Federal Coordination Workshop on March 1-2, 2006 in Washington, D.C. The workshop was sponsored by EPA and the USDA Natural Resources Conservation Service. Useful contacts were made that will aid Maryland in producing its strategy. MDE has shared this information with DNR and will provide the informationin the future to the interagency workgroup to allow consideration of this information and information from other states not currently included.

MDE, DNR, and EPA and other stakeholders met on May 21, 2007 in Ocean City, Maryland for a Wetland Monitoring and Assessment Management meeting. The meeting was part of a larger water quality monitoring meeting, and brought together wetland and other water monitoring personnel to discuss issues involved with monitoring wetlands to meet Clean Water Act requirements, particularly designated uses, reporting, and TMDLS.

MDE also provided comments on EPA's 2007 guidance on wetlands and TMDLs. Concerns and questions were raised about some language suggesting that designated uses, 303(d) listings, and TMDLs may not have to be prepared for wetlands. This is not MDE's understanding, although DNR accepts the guidance as presented in the memo. EPA and Maryland representatives will meet, probably in 2008, to resolve concerns. Maryland is supportive of an alternative approach for addressing impaired wetlands, such as through watershed-based restoration, preservation, and enhancements, which may acceptable for meeting Clean Water Act requirements.

Monitoring and Assessment for Wetland Permits

Assessment of wetlands during permit reviews has been, for the majority of projects, very abbreviated. Reviewers use best professional judgment and a checklist to note whether or not the wetland provides certain functions. Functions listed are biological, water quality, hydrologic, human values, low functional loss, no functional loss, and functions not determined. Biological functions have sub-categories of (rare, threatened or endangered wildlife or plants; forest interior dwelling birds; other non-wetland dependent wildlife; reptiles and amphibians; other wetland dependent wildlife; fish and other aquatic wildlife; and furnishing organic matter to the aquatic food web. Water quality functions have sub-categories for headwater wetlands, floodplain wetlands, discharging groundwater, and recharging groundwater. Human values have sub-categories for providing recreational opportunities, providing harvestable natural resources, educational opportunities, aesthetic qualities, representing a rare ecotype, and having historic properties. Wetlands considered to have a low functional loss would be highly disturbed or degraded; isolated with no significant plant or wildlife value according to regulation; farmed wetlands' landscape management areas; located only on streambanks, natural swales; ditches, stormwater basins, sediment basins, and other. Little or no formal guidance exists to ensure that functions are ranked consistently among reviewers.

Formal assessments are conducted by the Maryland State Highway Administration, using an approach modified from the New Hampshire method (Amman,1991).

Mitigation Monitoring and Assessment

Maryland has used regulatory performance standards in its nontidal wetland program since 1991. The standards are simple, requiring that a mitigation site meet the definition of a wetland, with criteria described in the 1987 Corps of Engineers Wetland Delineation Manual. In 1994, MDE, DNR, MD-SHA, the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Federal Highway Administration, and National Marine Fisheries Services produced Maryland Compensatory Mitigation Guidance to improve success of mitigation projects. The emphasis again was on meeting the wetland definition, with additional design and performance standards. Performance standards focused on plant survival, without functional assessment. In 2002, Maryland began an evaluation of the effectiveness of its nontidal wetland mitigation program, funded by an EPA State Wetland Program Development Grant. Development of a functional assessment protocol was included among the grant tasks and deliverables. The tool, which uses best professional judgment and a checklist, indicators from MDE's wetland assessment method (see item #1 in the preceding section), and other indicators of certain functions. A scoring system has also been developed. Most sites evaluated were found to meet the wetland definition and contained features associated with wetland functions. This is the first effort to monitor wetlands for anything other than wetland parameters, and it will evolve over time. MDE's progress and future developments of the scoring system will be included in the monitoring strategy.

The Mid –Atlantic Wetland Work Group held its first discussions on monitoring of mitigation and other restoration sites in October 2007. There was no consensus on a consistent approach, with some entities favoring comparison with natural reference wetlands, and other entities objected to the comparison of young, newly established systems with mature communities. A sub-group of members will hold additional discussions on mitigation monitoring.

Within the Chesapeake Bay Program, an organization of federal agencies, other stakeholders, and Maryland, Pennsylvania, Virginia, and District of Columbia signatories, a strategic implementation plan is under development. Tasks under consideration include developing consistent minimum requirements for mitigation success.

Watershed Planning

Watershed plans for wetland management, or which contain a wetland element, have been completed for numerous areas by local, federal, and/or State agencies. Plans have been done to improve wetland inventories, assess wetland condition, guide permit decision-making, and local land use decisions. No standard assessment protocol exists. Given the varying objectives of watershed plans, it may not be possible to use a single assessment approach. A functional assessment is a required element under a comprehensive watershed management plan under the Nontidal Wetland Regulations that is used in making permit decisions, though there is only one plan (Big Annemessex River in Somerset County) that has ever been approved under the regulations.

The Maryland-National Capital Park and Planning Commission, in consultation

with MDE, adapted the MDE Landscape Level Functional Assessment to use in the environmental inventories. MDE's Comprehensive Nontidal Wetland Watershed Management Plan: A Guide for Local Governments (1998) contains some general guidance on elements to consider in a functional assessment, but does not specify a method. Case studies in this report use various methods, including variations of Wetland Assessment Technique (WET) II and the New Hampshire method. Special Area Management Plans have been conducted in two watersheds in Baltimore County, also using a variation of the New Hampshire method and WET II.

CURRENT STATUS OF STRATEGY

Progress on internal meeting and decisions for the Maryland Wetland Monitoring Strategy slowed. No large-scale meetings were held. In developing a scope of work for a pilot project to be conducted by the Department of Natural Resources, plans to test a previously used protocol for wetlands in the Nanticoke River watershed in another part of Maryland, for review by the monitoring Work Group, were modified. A new proposal to develop a protocol that would serve as a final assessment method is under development. While consistent with the goals, objectives, and tasks of the approved grant, the development of a preferred protocol is a substantial change that would advance ultimate implementation of Maryland's monitoring strategy more than previously envisioned. It has been necessary to investigate whether or not any tasks under the new subcontract are already being done under other contracts between other agencies. The importance of properly designing the subcontract to achieve this has further delayed progress in the short term, but will result in a more advanced final product.DNR and MDE are still negotiating the details of the scope.

TASKS (Years 1-3, completed)

1. Attend MAWWG meetings and review reference materials. Identify issues and pertinent information for use in Maryland.
2. Identify MDE/DNR personnel to participate in discussions and work group.
3. Begin identification of other pertinent reference materials.
4. Submit status reports for the semi annual periods ending March 31 and September 30.
5. Form a work group with representatives of various State agencies with expertise. MDE will coordinate the effort to collect, manage, and catalog studies and data sets from the various state agencies, to produce minutes and final documents.
6. Agencies identified various needs, additional tools, and uses of wetland monitoring information. These include needs to meet statutory requirements, improve regulatory programs, and implement non-regulatory management activities such as restoration, preservation, and watershed planning.
7. Agencies agreed to consider wetland function, as well as condition, in evaluating various existing procedures and assessments.
8. Complete draft classification system(s) to be used for various monitoring purposes. System will allow for data collection to be used for various assessment methods.

TASKS (Years 1-3, ongoing)

1) Begin evaluation of existing data and data collection, in progress or planned, and how they fit into the Level 1, 2, and 3 assessment framework. Agencies will begin by evaluating their own information and other information to meet their needs. This will be followed by review of evaluations and compilations done by other representatives of the work group. Representatives will also coordinate to answer questions about limitations and strengths of other information sources. It

will be determined whether information sharing MOU's are necessary or whether information sharing is covered by current Maryland State Government Geographic Coordinating Committee agreements. Regular meetings of the work group will be held.

TASKS (Year four) October 2007 – June 2008

1) Finalize an interagency agreement between MDE and the Maryland Department of Natural Resources. DNR will evaluate the advantages and disadvantages of various rapid assessment methods for presentation to the interagency work group.

2) Develop template for comprehensive wetland assessment and procedures for using results from comprehensive data collection to predict function and condition using Level 1 (GIS) and Level 2 (rapid field) assessments.

3) Expand the work group of stakeholders and experts to include representatives from other federal and local governments, advisory groups, and academic institutions. Present background information, goals, and objectives of monitoring strategy and seek consensus on draft wetland classification system.

4) Prepare background materials for work group on potential designated uses for wetlands, to meet Clean Water Act requirements.

5) Evaluation of the potential reference sites selected for the pilot study. Reference sites already selected will continue to be used as reference sites. Where new reference sites need to be added because of the inclusion of additional wetland subclasses and the need to represent a disturbance gradient, new reference sites will be added using input from regional wetland experts from MD and DE, the NRCS, Smithsonian and universities.

6) Training of field teams -- Using the logistics protocols previously developed, field teams will be designated from the participating agencies. Training schedules will be established and training materials produced to cover the rapid and comprehensive assessment protocols and wetland delineation. Training will be conducted for all field teams.

7) Hire temporary coordinator to provide public information and point of contact with private landowners to secure permission to sample randomly selected sites. Coordinator will be based on whichever agency has lead on field sampling. Coordinator will also assist with field equipment inventory and control, instrument calibration and data QA/QC.

8) Coordinator will contact all landowners and secure necessary permissions to visit the sites.

9) Field teams will:

a. Verify that the site meets the criteria of a wetland according to the 1987 Corps of Engineers Wetland Delineation Manual.
b. Field verify sites to confirm or correct the GIS generated HGM classification, and to provide location and access information.
   i. Visit sites and conduct Level 2 rapid assessment method data collection.
   ii. Enter all field data into database and verify entries.

10) Designated QA/QC officer will check all field datasheets and database for accuracy and completeness.

11) Modify wetland monitoring strategy, as appropriate and based on new information.

12) Attend the following meetings:

a. one or two meetings annually of the Mid-Atlantic Wetlands Workgroup - 2 day meetings with one overnight;
b. one EPA Region lII Wetland Meeting (traditionally held in Atlantic City, NJ. for 3 days);
c. the National Meeting of the Society of Wetland Scientists, wherever it is to be held, to make a formal presentation on the results of the development of wetland condition assessments from this grant.

13) Submit status reports for the semi annual periods ending March 31 and September 30.

14) Visit sites selected for Level 3 and Level 2 assessment data collection. Collect all field data for the wetlands of the selected classes.

15) Attend the following meetings:

a. one or two meetings annually of the Mid-Atlantic Wetlands Workgroup - 2 day meetings with one overnight;
b. one EPA Region lII Wetland Meeting (traditionally held in Atlantic City, NJ. for 3 days); and
c. the National Meeting of the Society of Wetland Scientists, where ever it is to be held, to make a formal presentation on the results of the development of wetland condition assessments from this grant.

16) Submit status reports for the semi annual periods ending March 31 and September 30.

TASKS (Year five) October 2008 – September 2009

1) Continue second year of field sampling.

2) Training of field teams -- Using the logistics protocols developed in step five of year two, field teams will be designated from the participating agencies. Training schedules will be established and training materials produced to cover the Level 2 and 3 assessment protocols and wetland delineation. Training will be conducted for all field teams.

3) Hire temporary coordinator to provide public information and point of contact with private landowners to secure permission to sample randomly selected sites. Coordinator will be based on whichever agency has lead on field sampling. Coordinator will also assist with field equipment inventory and control, instrument calibration and data QA/QC.

4) Coordinator will contact all landowners and secure necessary permissions to visit the sites.

5) Field teams will;

a. Verify that the site meets the criteria of a wetland according to the 1987 Corps of Engineers Wetland Delineation Manual.
b. Field verify sites to confirm or correct the GIS generated HGM classification, and to provide location and access information.
c. Visit sites and conduct Level 2 rapid assessment method data collection.
d. Enter all field data into database and verify entries.

6) Designated QA/QC officer will check all field datasheets and database for accuracy and completeness.

7) Modify wetland monitoring strategy, as appropriate and based on new information.

8) Attend the following meetings:

a. one or two meetings annually of the Mid-Atlantic Wetlands Workgroup - 2 day meetings with one overnight;
b. one EPA Region lII Wetland Meeting (traditionally held in Atlantic City, NJ. for 3 days); and
c. the National Meeting of the Society of Wetland Scientists, where ever it is to be held, to make a formal presentation on the results of the development of wetland condition assessments from this grant.

9) Record the data in the condition assessment database.

10) Scale the responses to reference conditions as appropriate, calculate Functional Capacity Indices (FCI's) and other scores for sampled wetlands. Compare scores for Levels 1,2, and 3. Use Level 3 data for validation and calibration of Level 1 and Level 2 data.

11) Convene workshop of wetland professionals to critique results and suggest alternative

12) Transmit the results to STORET.

<u>TASKS (Year six)</u> October 2008 – December 2009

1) Finalize results and field study and prepare report. Produce final report on the condition of wetlands of the sampled HGM classes for the pilot study, including a discussion of the utility of the information.

2) Prepare draft report of overall monitoring strategy.

3) Finalize report.

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