Guidance for Verifying Wetland Restoration and Creation Projects

I. The need for wetlands BMP verification

Restoration, creation, and enhancement of wetlands provide a range of benefits for wildlife, fish, and other aquatic species. Wetlands also filter nitrogen, phosphorus, and sediment from overland flow, thereby providing quantifiable water quality benefits. As such, wetland restoration and creation are recognized best management practices (BMPs) in the Chesapeake Bay Program's (CBP) Watershed Model. This document provides guidance on verifying wetland projects to ensure that their pollutant removal performance is appropriately credited toward Chesapeake Bay watershed jurisdictions' two year milestone commitments and their Watershed Implementation Plans.

The Wetlands Workgroup (WWG) was charged with developing principles/guidance for verifying wetland BMP projects in order for such projects to continue receiving nutrient and sediment load reduction credit. Workgroup members first received a background document and were asked to describe their monitoring efforts, what level of project verification would be reasonable given existing resources, and what could be accomplished if more resources were available. Personal solicitation by the WWG co-chair was also made to certain practitioners. Responses were received from the Maryland Department of the Environment (MDE), Natural Resources Conservation Service (NRCS), U.S. Fish and Wildlife Service (USFWS), Ducks Unlimited, U.S. Environmental Protection Agency (USEPA), New York State Department of Environmental Conservation, Maryland Department of Natural Resources (MD DNR), the National Association of Home Builders, and U.S. Army Corps of Engineers (USACE).

The draft principles were revised and further developed based on feedback received from the CBP Partnership's BMP Verification Review Panel on December 6, 2012 and the Comparison Matrix of source sector and habitat workgroup BMP verification protocols. The wetland principles were then reformatted and enhanced based on comments received in May 2013 during the Habitat GIT's review and comment process. Based on feedback received from the BMP Verification Review Panel in November 2013 and additional verbal feedback from practitioners in December 2013 and January 2014, the wetlands BMP verification principles were restructured into guidance to support the seven watershed jurisdictions in developing their own jurisdiction-specific protocols for wetland BMP verification.

Wetland restoration, creation, and enhancement projects are primarily driven by either: (1) financial assistance incentive programs (Federal and/or state or (2) regulatory requirements for mitigation of impacts to existing wetlands.

Financial assistance programs (Voluntary)

Implementation of wetland projects is incentivized by a variety of federal and state financial assistance programs. Some of these programs may be more focused on water quality benefits while others may be more focused on wildlife habitat conservation. Wetland projects implemented under these programs have differing goals that are very site specific and dependent on what is appropriate for the landowner's situation and objectives.

The major federal financial assistance programs for wetland projects include:

- **Wetland Reserve Easements** (WRE: formerly the Wetlands Reserve Program, to be implemented under the 2014 Farm Bill under the Agricultural Conservation Easement Program): Under WRE, the NRCS provides technical and financial assistance to landowners for voluntary wetland protection, restoration, and enhancement projects on privately owned property. WRE projects require a specific monitoring regime throughout the lifespan of the project, as discussed in more detail in a later section. WRE projects are either maintained in perpetuity or under a thirty-year easement contract depending on the selected enrollment option.
- **Conservation Reserve Program** (CRP): The CRP is administered by the Farm Service Agency (FSA) and is a private lands conservation program. Under the CRP, farmers who enroll in the program agree to take environmentally sensitive land out of agricultural production and plant species that support improvement of environmental health and quality. The contracts for agricultural land enrolled in CRP are ten to fifteen years in length with the long-term goal of re-establishing valuable land cover to assist in water quality improvement, soil erosion prevention, and reduction of wildlife habitat loss. Wetland buffers and wetland restoration are practices included in the CRP.
- **Conservation Reserve Enhancement Program** (CREP): CREP is also administered by the FSA and is a state-federal partnership implemented under the authority of the CRP. As such, the CREP serves a similar purpose and contract length as described for CRP above. Under CREP, high-priority conservation issues identified by state, local, or tribal governments are targeted with incentive payments and participation by landowners is voluntary.
- **Environmental Quality Incentives Program** (EQIP): EQIP is a voluntary program providing technical and financial assistance to agricultural producers for planning and implementing conservation practices. This assistance is administered via contracts with a maximum ten year term. The purpose of EQIP differs from other financial assistance programs in that it is typically focused on wildlife habitat benefits.

Jurisdictional partners within the watershed provide additional financial assistance incentives for wetland projects in each state. Specific state financial assistance programs are listed below:

- Virginia's Agricultural Cost-Share program - provides a 25 percent state tax credit of costs up to $17,500 per year for constructed wetland and wetland restoration BMPs. http://www.dcr.virginia.gov/water_quality/costshar.shtml
- The Maryland Agricultural Water Quality Cost-Share (MACS) Program administered by the Maryland Department of Agriculture provides grants covering up to 87.5 percent of BMP installation costs for various practices implemented on agricultural land, which include wetland restoration BMPs. Wetland restoration projects implemented via the MACS program must be maintained for a minimum of fifteen years. http://mda.maryland.gov/resource_conservation/Pages/macs.aspx

Mitigation

Some wetland restoration projects are built to offset, compensate or otherwise mitigate for impacts caused by development elsewhere in the watershed. This includes projects implemented in accordance with the compensatory mitigation regulations under Section 404 of the Clean Water Act, as amended, as well as applicable state wetland mitigation regulations. States reporting wetland acreage gains to the Chesapeake Bay Program are asked to distinguish between wetland increases due to voluntary projects versus those constructed as compensation from regulated losses.

Department of Army permits include:

- Nationwide Permit (NWP): The NWP provides federal authorization on a nationwide basis for commonly recurring activities that have minimal individual and cumulative adverse impacts to the environment. Many NWPs are suspended in MD since they are duplicated by the Maryland State Programmatic General Permit-4 (MDSPGP-4) and some NWPs are retained.
- Individual Permit (IP): The IP applies to large/complex projects exceeding thresholds and conditions of nationwide and general permits. This applies to projects with the potential for more than minimal impacts.
- MSPGP-4: The MSPGP-4 is issued by the USACE Baltimore District, providing federal authorization and expedited permitting for activities with minimal impacts. The majority of projects authorized are verified by MDE without the need for USACE's review of the application.

II. Definitions

Restoration, creation, and enhancement

Wetland restoration, creation, and enhancement projects, while having differing definitions, will undergo similar verification processes. These projects are defined as follows (STAC, 2008):

- **Created wetlands** - manipulation of the physical, chemical, or biological characteristics present to develop a wetland that did not previously exist on an upland or deepwater site; results in a gain of wetland acres.
- **Restored wetlands** - manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former wetland; results in a gain of wetland acres.
- **Enhanced/rehabilitated wetlands** - manipulation of the physical, chemical, or biological characteristics of an existing wetland (undisturbed or degraded) site to heighten, intensify, or improve specific function(s) or for a purpose such as water quality improvement, flood water retention, or wildlife habitat; results in gain of wetland function, not acres. The significant difference between rehabilitate and enhance is rehabilitation usually refers to a site that currently has hydrology degradation, while enhancement is usually more about invasive species control.

Projects authorized under a permitting authority as well as those implemented under WRE are subject to specific monitoring requirements, which constitute a built-in level of verification.

The existing wetland restoration BMP efficiencies for nutrient and sediment removal apply to restoration and creation projects; wetland enhancement projects do not yet have approved BMP efficiencies.

Stream restoration (floodplain reconnections)

Some overlap exists with regard to stream restoration projects and wetland projects, specifically in hydrologically reconnecting a stream to its floodplain as part of a stream restoration project. In this scenario, the floodplain reconnection allows overflow from the stream during storm events to spread out onto the floodplain, which may include wetland areas. In addition, these floodplain reconnection projects may increase groundwater levels also influencing floodplain wetlands.

Areas of the floodplain may include existing wetlands, or agricultural wetlands, or wetlands that have been converted as a result of stream channelization and drainage. In many cases where the floodplain is currently forested, the reconnection to the stream results in a rehabilitation of the wetlands, but not an acreage gain. This particular rehabilitation may be more significant in terms of water quality than some wetland re-establishment projects, because of the potential to receive and treat high levels of nutrient and sediment loadings. Stream restoration including floodplain reconnection where the floodplain is currently in agricultural use may include wetland restoration, which would result in acreage gains and significant increases in function, including water quality functions, baseflow support, flood storage, and fish and wildlife habitat.

Under the stream restoration BMP, a floodplain is defined as follows: "For flood hazard management purposes, floodplains have traditionally been defined as the extent of inundation associated with the 100-year flood, which is a flooding event that has a one-percent probability of being equaled or exceeded in any one year. However, in the context of this document, floodplains are defined as relatively flat areas of land between the stream channel and the valley wall that will receive excess storm flows when the channel capacity is exceeded. Therefore, water access to the floodplain is defined much more frequently than what is typically considered a flooding event." (Schueler and Stack, 2013)

Stream restoration can consist of stabilizing eroded banks with vegetation, raising channel bed grade in incised channels, reintroducing meanders in channelized streams, and complete realignment of a stream channel to circumvent a blockage or provide capacity for current flows. Floodplain reconnection is typically combined with all of these stream restoration activities, except perhaps when only stabilizing eroded banks.

In regard to wetland projects as part of the floodplain reconnection, the following are defined:

- **Stream restoration BMP** – under Protocol 3 of the stream restoration BMP, efficiencies are provided for nutrient and sediment load reductions as a result of floodplain reconnection implemented as part of a stream restoration project (Schueler and Stack, 2013); this includes reconnection to floodplain wetlands.
- **Floodplain reconnection** – Restoring the hydrologic connection between the stream channel and its floodplain to allow overflow from the stream to contact the adjacent floodplain area, including floodplain wetlands. This usually involves one or more of the following: removal of historical spoil levees created by the placement of dredge spoil on stream banks; raising of the channel bed grade on incised stream channels to promote overbank flow; or creation of floodplains within channelized streams when the channel grade cannot be raised.

III. Project design and siting

Project information obtained prior to and immediately after implementation provides a baseline level of data. This baseline information can then be used for comparison against monitoring/inspection data to determine if the project is still in existence and functioning as intended. Enabling this comparison is a key part of verification so that the project can continue receiving credit for nutrient and sediment load reductions. Thus the baseline information needed is discussed here in order to set up the project to succeed and to elucidate what initial information is required to enable comparison to monitoring/inspection data, thus facilitating the verification process.

Pre-construction

A wetland project, if designed properly, will continue to function indefinitely, so it is important to focus on the quality of design as well as the siting of the project. Planning and site selection criteria have a great influence on the success of projects. Projects should be located in areas suitable for wetland creation or restoration and to meet clear project objectives. This includes siting projects at locations capable of supporting suitable hydrology, hydrophytic vegetation, and hydric soils.

Hydrology. Hydrology is the most critical factor in most wetland restoration projects. Hydrology analysis can be simple or complicated. In farm fields that have been ditched and contain hydric soils (which is usually where there are ditches), hydrologic analysis is usually minimal because we know the ditch is there to allow crop production. The typical commodity crops planted in Maryland cannot grow well in areas with wetland hydrology. Ditches were often designed and installed based on rating curves that are based on providing sufficient drainage to allow crop production for corn and soybeans. In many cases, in implementation, the ditches were constructed to larger dimensions than were recommended by the rating curves.

For many wetland projects in agricultural fields, in addition to restoration of baseline hydrology, the hydrology is enhanced somewhat from what it may have been historically. This is done to enhance functions for wildlife habitat, as well as to overcome the limits of effects on drainage of adjacent lands. Usually this involves installing a berm adjacent to or across a ditch to prevent drainage. A control structure is installed at a specific elevation, which only allows water to drain off the site when that elevation is reached.

Topographic information informs practitioners as to the areal extent of the water surface at the control elevation. In Maryland, maximum water levels in wetlands usually occur in late winter and early spring when precipitation is high and evapotranspiration is low, which is concurrent with the start of the growing season. Unlike with a deep water pond, the shallow water surface of a wetland does not require a large contributing drainage area to maintain ponded conditions into the growing season. In fact, in the humid east climate, precipitation alone can provide sufficient water to create an inundated wetland so long as the water is prevented from draining off the surface. Practitioners therefore can safely assume that the areal extent of the water surface at the control elevation is the minimum wetland acreage that will be achieved. In most cases, the full wetland area is not limited to the areal extent of the water surface, or normal pool, because saturation of the soil extends some distance beyond the extent of the water surface.

Hydric soils. The soils on these sites, in addition to being hydric, typically are silt loams or clay loams. These soils contain sufficient silt and clay content to severely restrict water infiltration and subsequent losses through shallow subsurface flow and groundwater to drainage features. In some cases, sandy soils may be present at the surface, but a clayey horizon exists within a couple feet of the soil surface. Water may also be impounded on these soils by installing a cut-off trench below the berm. The cut-off trench is excavated down to the clayey horizon and filled with a clayey soil to inhibit seepage under the berm.

Success of wetland rehabilitation projects can be slightly more difficult to evaluate because they typically occur in areas that are currently wetlands. However, the same concepts that apply to the examples described above also apply to most wetland rehabilitation: where ditches were installed, they were installed and maintained for a reason – to provide sufficient drainage to support production of food and/or fiber. On heavy soils, they often result in the reduction of surface ponding or the reduction in the duration of surface ponding. This occurs because the drainage features, when in sufficient quantity, significantly reduce the travel time of water moving across the surface, thus reducing the effects of the high precipitation to evapotranspiration ratio in the winter and early growing season.

Thus the keys to site assessment for many wetland rehabilitation projects are the presence of drainage features and hydric soils. Manmade drainage features in hydric soils equals a loss of wetland functions. Mitigation of the drainage features equals rehabilitation of those functions. On heavy soils, the area of influence can be determined by the topography, from which acreage can be easily calculated. On sandy soils, the area of influence is more difficult to determine, because much of the effects may be occurring just below or at the surface. The primary available and legally recognized methods are the groundwater flow equations (e.g. ellipse equation), from which the distance of influence perpendicular to drainage ditches can be calculated. Normally, a combination of groundwater flow equations and site visits to look for changes in surface ponding are used to determine the areal extent of rehabilitation. However, the NRCS and USFWS in cooperation with the Agricultural Research Service, the U.S. Forest Service, and the EPA, are evaluating methods using remote sensing technologies to more accurately determine the area of effect.

For rehabilitation projects where the primary form of rehabilitation is reconnection of a stream to its floodplain, hydraulic models of stream flow (e.g. HEC-RAS) are used in combination with topographic data for design and to determine the area of effect. Validation of the model is conducted through site visits during storm flows for visual confirmation of water movement into the floodplain from the stream.

Field indicators providing evidence of the periodic occurrence of inundation or soil saturation can include (per USACE):

- Standing or flowing water
- Waterlogged soil
- Water marks on trees
- Drift lines (piles of debris oriented in direction of water movement
- Debris lodged in trees
- Thin layers of sediment deposited on leaves or other objects

Presence of hydric indicators can be determined by examining the soil for:

- Predominance of decomposed plant material (e.g. peat, muck)
- Bluish gray or gray in color at 10 to 12 inches below the ground surface
- Dark and dull (brownish black or black) soil and hydrogen sulfide odor
- could be sandy with dark stains or streaks of organic material in the upper layer, which is 3 to 12 inches below the ground surface

Post-construction

Sites should be visited after construction and planting to ensure that the project was completed as designed; that structures (e.g. berms, water control structures) are operating properly; that there is a predominance of native wetland vegetation; and hydrology is as planned. For wetland restoration projects, it will also be noted that the project is on hydric soil. Invasive species should be managed to maintain desired plant species composition and abundance. However, the WWG does believe that presence of certain invasive species (e.g., cattail, Phragmites) should not disqualify a project from receiving credit as a BMP. The installing agency should provide a post-construction certification that the wetland restoration project was installed properly, prior to submitting the project for credit in the state tracking database. Wetland practices reported by the various agencies and organizations are compiled by a state-designated data steward and cross-checked for duplication.

IV. Existing inspection, maintenance, monitoring frameworks

Inspection and maintenance frameworks routinely performed as part of state and federal agricultural financial assistance programs in the Bay watershed should serve as the foundation of each of the jurisdictions' wetland restoration verification protocols. If a state designs its wetland BMP verification protocols around existing inspection and monitoring frameworks associated with a financial assistance program or a permit, then those protocols or procedures are fully consistent with this guidance.

The monitoring requirements for financial assistance programs are possible options for verification and are as follows:

- WRE projects are monitored annually for three years, followed by an ownership review in the fourth year, and then three years of remote sensing review. Onsite monitoring should occur every five years after that. Monitoring may be more frequent if there are violations or if compatible uses of the wetland (e.g. prescribed grazing, habitat management) have been approved. However, many WRE projects occur in existing wetlands and count as rehabilitation, which does not have BMP efficiencies for nutrient and sediment removal.
- CRP/CREP projects are verified for correct installation. Annual monitoring is required for 10% of contracts. A fully implemented project is not subject to further status reviews, but a project that is not successful or has a problem may be monitored for two more years. All of these projects are implemented on private lands where landowners typically inspect the sites a few times throughout the year. Landowners contact NRCS regarding any problems noted during these inspections (e.g., structural failure or invasive species).
- Except for WRE, all other projects implemented under U.S. Department of Agriculture and Maryland Department of Agriculture financial assistance programs would be monitored the same as CRP/CREP projects.

Monitoring requirements under federal/state permits are as follows:

- Permits issued by USACE require background information as part of the permit application process including: location, waterway, detailed project description, wetland delineation, impacts, baseline data on resource, proposed improvements, concept plans, onsite and aerial photos, description/documentation for net increases in aquatic resources functions and services, maintenance plan, monitoring plan. Projects requiring a Department of the Army authorization may have additional monitoring and maintenance requirements.
- MDE has specific requirements for nontidal wetland creation, restoration, and enhancement projects implemented for mitigation of development and agricultural activities. These requirements include project monitoring for five years, submission of annual monitoring reports, and performance of maintenance activities. The mitigation site must also be protected in perpetuity.

V. Verification guidance

Field assessments are used to identify which projects are still in place and functioning as intended and which ones require preventative or corrective maintenance. In addition, field verification enables local governments to analyze their historical inventory of private and public wetland restoration projects to identify which individual projects present the best opportunities to retrofit for additional sediment and nutrient reduction. The assessment tools used in

verification may also be adapted to allow local governments to determine if other wetland restoration objectives (e.g., habitat) are being achieved.

The verification process must be simple, preferably following a short checklist that can be completed with minimal examination. The WWG recommends the following checklist for verifying wetland BMP projects; these criteria match the requirements for onsite monitoring of WRE easements, which has also been accepted by the Corps for monitoring projects authorized through NWP27. On small project sites, verification should take no more than twenty minutes and on larger sites, no longer than one to two hours.

- Estimated acreage of restored, created, or enhanced wetland(s)
- Wetland hydrology
- Predominance of hydrophytic vegetation
- Is vegetation primarily herbaceous, trees, or shrubs
- Presence of wetland wildlife; note species observed
- Water control structures and/or berms or ditch plugs functioning properly (note if repairs are needed)
- Planned buffers being maintained
- Meets plan objectives
- Presence of invasive or non-native plants (if so, briefly note species, density, and acreage covered)
- Measures to address threatened and endangered species functioning are being implemented
- Stability/instability/erosive areas
- Compatible uses, if authorized, being implemented in compliance with management plan (Any authorized uses that remove vegetation, other than maintenance of trails as identified in the plan, will be monitored annually for all years for which they are authorized.)
- Conflicting uses (e.g., ATVs, livestock)
- Encroachment of unauthorized activities (e.g. cropping, roads, unallowed mowing, structures other than those allowed)
- Land ownership changes (if so, has new landowner been provided copy of management plan)
- Document areas of concern, required maintenance, recommendations for enhancement

The WWG feels that it would not be appropriate to consider the project's success or failure in meeting other functional objectives through the BMP process since the verification is about properly crediting the project as a water quality BMP. Wetland projects should not be rejected

as water quality BMPs due to a failure to meet standards not related to the water quality objective (i.e. habitat-based objectives).

State oversight of local wetland restoration reporting

The installing agency should submit basic documentation to the appropriate state agency for each individual wetland restoration/creation project installed. Localities should check with their state agency on the specific data to report for individual projects. In addition, it is recommended that the installing agency maintain a project file for each wetland restoration project installed (i.e., construction drawings, as-build survey, digital photos, post construction monitoring, inspection records, and maintenance agreement). This file should be maintained for the lifetime for which the load reduction will be claimed. This information would be used as a basis for comparison to long-term monitoring/verification information per the above checklist to determine if the project is still functioning as designed.

Inspection, maintenance, monitoring

Monitoring is the actual part of verification which can be used to determine if the project is functioning as designed. Field experience has shown that if a wetland project is functioning adequately approximately three years following completion of construction, then it will likely continue to function indefinitely. Therefore, onsite monitoring within the three years following construction is recommended. For any long-term monitoring, use of aerial imagery for remote observations is highly recommended for verification of wetland BMPs; remote observations can indicate encroachment of agricultural activities, clearing, and tree removal. Any issues or concerns with projects implemented on private lands are typically reported by the landowner to the installing agency and addressed as needed.

Most wetland projects are designed to minimize long-term maintenance and, therefore, should remain effective indefinitely. Wetland restoration practices implemented under CRP/CREP have a fifteen year contract; however, in most cases, the wetland continues to exist and function beyond the contract period. Wetland projects enrolled in the WRE must be maintained in perpetuity.

Appropriate Verification Guidance to Follow for Multi-BMP Projects

Tracking, reporting, and verification of wetland projects presents a challenge for the partnership in that these projects cross various pollutant source sector and habitat restoration and protection groups. Verification for wetlands falls under different sets of guidance developed by the CBP Partnership's workgroups including those for wetland restoration projects, stream restoration projects (as related to floodplain reconnection), the agriculture sector (as a structural BMP), and the urban stormwater sector. In addition, various types of

wetlands are covered under different BMPs approved by the Partnership and ongoing/upcoming BMP expert review panels convened by different workgroups.

Urban wet ponds are not equivalent to a wetland project implemented in an agricultural setting. Therefore, jurisdictions should verify any urban wet pond projects following the Urban Stormwater Workgroup's BMP verification guidance. In the case of wetland restoration, creation, and enhancement projects, the jurisdictions should follow the guidance provided in this document by the Wetlands Workgroup.

Any wetland projects that are defined as reconnecting a stream to the floodplain are credited according to the revised stream restoration BMP efficiencies adopted by the Partnership (Schueler and Stack, 2013). Therefore, projects of this nature should be verified for their continued existence and proper functioning by jurisdictions following the Streams Workgroup's stream restoration BMP verification guidance. In cases where floodplain reconnection also involves wetland restoration within the floodplain, the wetland BMP verification guidance should be followed for verifying the wetland portion of the project.

References

Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC) (November, 2008). Quantifying the role of wetlands in achieving nutrient and sediment reductions in Chesapeake Bay. *Chesapeake Bay Program STAC Responsive Workshop.* STAC publication 08-006. Retrieved from http://www.chesapeake.org/pubs/238_2008.pdf

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