

RECOMMENDED BEST MANAGEMENT PRACTICES FOR
RESTORATION OF WETLANDS AFTER TEMPORARY IMPACTS

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EFFECTIVENESS OF BEST MANAGEMENT PRACTICES IN RESTORING
TEMPORARY IMPACTS IN
NONTIDAL WETLANDS

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INTRODUCTION

Since 1991, the Maryland Department of the Environment (MDE) has regulated activities in nontidal wetlands with the goal of achieving a “no net loss” of wetland acreage and function. Permanent impacts are subject to compensatory mitigation requirements. Temporary impacts are presumed to result in retention of wetland acreage and ultimately wetland function, provided that best management practices and authorization conditions are followed. There is no compensatory mitigation requirement for temporary impacts. MDE typically conducts expedited review of these activities, primarily utility lines and temporary access roads, and does not record them as wetland losses. However, MDE has never systematically visited and evaluated these sites to determine how successful the BMPs have been in restoring/rectifying the disturbed wetlands to their previous condition and functional performance.

There are certain standards in regulations for how activities should be conducted in nontidal wetlands to minimize adverse impacts and restore temporary impacts. “Best Management Practices” are defined in the Code of Maryland Regulations (COMAR) 26.23.01 B(12) as

“conservation practices or systems of practices and management measures that:

- (a) Control soil loss and reduce water quality degradation caused by nutrients, animal waste, toxics, and sediment; and
- (b) Minimize adverse impacts to the surface water, ground water flow, and circulation patterns, and to the chemical, physical, and biological characteristics of nontidal wetlands.”

Specific BMPs that would apply are also described in COMAR 26.23.03.02A:

- (a) Maintain the hydrologic regime of the nontidal wetlands upstream, downstream, or adjacent to the exempted activity;
- (b) Remove excess fill or construction material or debris to an upland disposal area;
- (c) Place materials in a location and manner which does not adversely impact surface or subsurface water flow into or out of the nontidal wetland;
- (d) If backfill is obtained from sources other than the originally excavated material, use clean material free of waste metal products, unsightly debris, toxic material, or any other deleterious substance;
- (e) Place heavy equipment on mats or suitably design the equipment to prevent damage to the nontidal wetlands;
- (f) Rectify any nontidal wetlands temporarily impacted by any proposed repair and maintenance activity;
- (g) Repair and maintain any serviceable structure or fill so there is no permanent loss of nontidal wetlands in excess of nontidal wetlands lost under the original construction or fill;

- (h) Conduct the activity so as not to cause or contribute to a degradation of water quality as determined by the Department;
- (i) For installation of utility lines, make postconstruction grades and elevations of nontidal wetlands the same as the original grades and elevations.

MDE evaluated 65 sites with a rapid assessment, and collected data at 8 sites for a 12-month period of repeated sampling, to determine if the wetlands were restored as required. Authorization conditions, application review, plans, record management, compliance and Best Management Practices (BMPs) were evaluated and modified based on assessment results.

The sites visited for the rapid assessment were: sewer lines (21); water lines (8); outfalls/storm drains (10); bridge/culvert repairs (4); road or driveway repair or temporary access (9); other temporary construction (8); stream restoration (3); gas line (1); and marsh creation (1). Sites were located two different physiographic regions: Coastal Plain (9) and Piedmont (56).

Sites of successful restoration were: sewer lines (14/21 67%); water lines (5/8 62%); outfall storm drains/outfalls (2/10, 20%); bridge/culvert repair (3/5, 60%) road/driveway (4/9 44%); temporary construction (3/6 50%) and stream restoration (2/3 67%) Six additional sites (1 sewer, 3 water lines, 1 road) were partially successful, in that a wetland was restored, but vegetation unacceptable due to high amounts of invasive or upland species.

Despite receiving an authorization for wetland impacts, there were four successfully restored sites which were not believed by the investigators to have been mistakenly characterized as being wetlands.

The most common cause of complete failure was improper backfill material over trenches or soil compaction.

Recommended Practices for MDE Permit Reviewers

1) Site identification

Rationale: Personnel have found it difficult to locate small temporary impact sites along linear projects. Better information and depictions of authorized temporary impact sites should be readily available.

Practice:

Require applicants to show:

- a) Individual impact locations with georeferenced coordinates on plans and as an attachment to the application form. Each impact site should be accompanied with pre-construction photographs and field delineation forms;
- b) A description and photograph of the soil profile to the depth of installation should be included, with depth of topsoil measured and photographed, to ensure its proper placement as the last layer to be backfilled over the trench;
- c) A description of how to best access the impact site should be included.

Hard copy and digital information should be requested and provided. Plans should be at engineering scale, and color coded over aerial imagery to be folded into an 8 ½ x 11 folder.

Digital photographs and delineation forms should be attached as documents within TEMPO as part of the master record and authorization.

MDE created an application that allows storage and display of impact site information as part of the existing initial screening application in a GIS format. Links will be created back to MDE TEMPO enterprise database via the master identification number. The application has the capability of expansion into a new data layer of verified wetland polygons that record case history of mapped wetland, verified field extents and classification, authorized impact, and acreage changes. Information on impacts to a specific wetland would then be accessible from the regulatory database of applications and authorizations as well as an updated map layer to be used for broader resource management purposes.

Hard copies of individual impact locations and sites should be retained in the file for compliance use.

2) Oversight of sensitive areas

Rationale: Some resources are so sensitive to certain disturbances that only very specific and precisely executed construction techniques will allow for restoration of the wetland to its previous condition.

Practice:

MDE may use its discretion to require that an environmental manager be present during construction to ensure that required construction techniques, equipment, and stabilization practices are followed.

3) Construction Specifications

Rationale: During the course of this project, MDE determined that construction specifications used by some utility entities were in conflict with MDE's BMPs for restoring wetlands after temporary disturbances. The conflicts observed involved maintaining vegetation through mowing and compaction of soil to support vehicles that may be used in maintenance and repair activities.

Practice:

MDE can use different options for resolving the conflict. For entities that are repeat applicants for authorizations:

- a) MDE may obtain copies of the standards and specifications used by the entities and request that certain specification be amended or replaced by practices that do not result in unauthorized maintenance or soil compaction; or
- b) Another option would be to specifically request information on the specifications to be given to the contractors on each application, and require appropriate changes for constructions on each case. Alternatively, MDE find that the impacts are not temporary, and inform the applicant of any mitigation requirements.

MDE will provide training opportunities to utility entities, their contractors, and environmental consultants on resolving inconsistencies with authorization requirements and construction

specifications, how inconsistencies may affect the type of authorization, notice, and mitigation requirements.

4) Training to MDE Staff

Rationale: Staff should be aware of all new requirements for consistent implementation across the State. Potential for inconsistent implementation may occur through information requirements, permit best management practices and conditions, differences between temporary vs. permanent impacts, and mitigation requirements.

Compliance personnel have closed cases in which restoration did not successfully occur after completion of the project.

Practice:

MDE shall establish operating procedures for reviewing temporary impacts, designed to verify that the impact is actually temporary with adequate restoration. This will include comparison of restoration practices shown in plans vs. the standards and specifications provided by the utility entity, as well as erosion and sediment control plans where applicable. The standard procedure will help ensure that the required practices match; impacts and conditions are clearly described in the permit and plans.

Staff will be given direction to determine whether impacts are in fact temporary or are permanent. This will include queries to the applicant on the following:

- a) Need and schedule for maintenance, and required successional stage of vegetation in the right-of-way. If forested wetlands were lost, and the applicant can justify the permanent alteration of the vegetation to emergent or shrub stage, then the change may be considered a permanent conversion, depending on the width of the right-of-way and extent of conversion. Permanent conversions over a certain threshold are considered a form of wetland loss and would be subject to a full permit and mitigation requirement;
- b) Need to grade and compact the right-of-way to support vehicles for maintenance. If the applicant can justify the need to maintain compacted soils to support equipment, then the impact would not be considered restorable and the loss of wetland would be permanent;

- c) Equipment to be used during construction. A current BMP is to operate high flotation equipment to avoid compaction. Reviewers should determine if this BMP is practicable before imposing it; and
- d) Schedule and time needed for completion of the project. The schedule will be used to set the timing and phases of construction and stabilization. See also section 6 below under construction practices, for timing of restoration.

When impacts are found to result in a permanent nontidal wetland loss of acreage or a permanent conversion to another wetland type, the MDE reviewer will consult with the mitigation section to determine if mitigation is required of the applicant. Permanent losses that are not subject to mitigation requirements by permittees will be mitigated by MDE as programmatic mitigation.

Procedures for maintenance of the hard copy file and documents to be saved in the TEMPO enterprise database and new screening database will be prepared. Site location information and directions to the impact sites along linear projects will be clearly shown. Pre-construction photographs to indicate the desired condition of the wetland after restoration will be included.

Compliance personnel will be given training to reinforce what is considered successful restoration.

- e) Photographs will be produced to indicate successful and unsuccessful restoration and stabilization, including soils investigations, compaction, microtopography, and desired post-construction elevations.
- f) “Refusal” of soil probe, auger, or shovel will be considered a failure to adequately restore a hydric soil. Compliance personnel will be requested to perform this investigation.

5) Construction Plans

Rationale: Contractors and inspectors rely on plans for detailed information more than language in permits. Plans must accurately show designs and practices to accomplish goal of restoring wetlands.

Practice:

- a) Show stockpile and heavy use areas. These areas should not be located in wetlands. Erosion and sediment control

practices for stockpile and heavy use areas require placement of gravel, which has been found in this study to be left in sites and impede processes in soils associated with nutrient transformation.

- b) Show how compaction is to be prevented or corrected. Check plans and other specifications for other requirements of soil compaction in the wetland or buffer. If required and authorized, the impact may not be considered temporary and mitigation may be required.
- c) Verify stabilization mix as being appropriate for wetlands. A wetland-specific mix should be used.
- d) Show limits of disturbance, right-of-way, and maintained right-of-way.
- e) Include on the plan details the procedures to be used to remove all timber riprap, specific measures (including the import of additional fill material) to restore preconstruction surface contours, and specific measures (including planting of herbaceous and shrub species) to ensure successful revegetation of the construction right-of-way with native wetland plant species;
- f) Show that all timber pads, prefabricated equipment pads and geotextile fabric overlain with gravel fill upon completion of construction.

6) Construction Practices

Rationale: Practices that limit full removal of vegetation have been recommended by FERC (1994) to improve successful wetland restoration.

Vegetation Removal

Rationale: Practices that limit full removal of vegetation have been recommended by FERC (1994) to improve successful wetland restoration.

Practice:

- a) Cut vegetation off only at ground level, leaving existing root systems intact, and remove from wetland for disposal; and
- b) Limit pulling of tree stumps and grading activities to directly over the trench. Do not remove stumps or root

systems from the rest of the right-of-way in wetlands unless required for safety-related construction constraints. Constraints shall be discussed with MDE during the application review process.

Timing of Stabilization

Rationale: Projects under construction were not stabilized and contained exposed soil in the wetland for extended periods of time until the utility line was installed. The failure to stabilize areas as soon as practicable left areas adjacent to streams subject to flooding and transport of sediment into waters of the State.

Practice:

- a) Ensure that plans and specifications require stabilization within three days, or apply phased construction and accelerated stabilization within 24 hours after each day that new construction commences according to “*2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control*” *Maryland Department of the Environment in Association with Natural Resources Conservation Service and Maryland Association of Soil Conservation Districts*. Where feasible, specify that only the amount of soil may be disturbed which can be stabilized at the end of the same working day.
- b) Ensure that timing and method of stabilization should match construction plans submitted by the applicant plus erosion and sediment control plans.

Topsoil and Backfilling

Rationale: Sites that were unsuccessfully restored to wetlands often failed due to soil compaction, placement of aggregate to the surface, and elevations above grade. The long term study funded through this grant noted that contractors may not be able to distinguish topsoil from subsoil, and specifying soil excavated to a certain depth to be replaced may result in subsoil being placed as the topsoil layer.

Practice:

- a) Sort excavated material into topsoil and subsoil. The permit reviewer shall specify the depth of material, which is considered topsoil, on a case-by-case basis.
- b) Stockpile topsoil separately from subsoil.

- c) Set aside topsoil on a sheet for later placement back into the wetland. A minimum 4" depth of topsoil is recommended.
- d) Cover the stockpile with a sheet to prevent escape of material before replacing it back in the wetland.
- e) For restoration, place subsoil in trench over utility, with deepest original material placed first. Place topsoil in its original position as the last layer over the trench.
- f) Unless required to protect the underground line, any aggregate used during construction shall be removed.
- g) Soil shall be tested for compaction. Soil probe, auger, or shovel should be able to retrieve samples of post-restoration profile. Refusal of equipment shall be considered a failure of restoration.
- h) Compacted soil shall be restored through subsoiling or ripping. Equipment used shall be described to MDE for approval.

Pre-existing elevations.

Rationale: Restoration to pre-existing elevations is necessary to ensure that the previous depth to groundwater and surface flow patterns are maintained. Sites in this study have failed due to excess filling above pre-existing elevations, which resulted in the site no longer meeting the wetland definition.

Practice:

- a) There will be excess material from the excavation that cannot be placed back into the trench, due to displacement from the line. Only sufficient subsoil and all topsoil should be replaced to restore the ground surface of the wetland to pre-existing elevations. Some natural settling will occur. Consult with MDE on final elevations and if elevations above the previously existing elevation will be acceptable, given predicted amount of settling.
- b) Excess material shall be removed from the construction area and placed where it does not affect surface flow patterns.

Access roads

Rationale: Access roads may represent an additional wetland impact beyond the utility line impacts. As a construction impact, the location, construction, and removal of the road are subject to avoidance and minimization requirements.

Practice:

- a) Determine whether or not the access road is temporary and will be removed after utility line installation or maintenance. Permanent roads, if justified by the applicant, may be authorized but would be considered a permanent impact and may require mitigation.
- b) Existing roads should be used where practicable for access and operation of heavy equipment. Mats and high flotation equipment should be the second preference if equipment must be operated from the wetland area.
- c) Retain natural root mat, stumps, and mounds of herbaceous vegetation as a base for temporary access roads. Avoid use of fill where practicable.
- d) Use shear-blade technique rather than grubbing to remove tree stumps. If fill is necessary, place it over geotextile fabric that can be removed after construction.
- e) After construction and stabilization, aggregate and geotextile placed for temporary access shall be removed.
- f) Access areas shall be re-graded to pre-existing elevations in regulated wetlands, buffers, and floodplains unless otherwise authorized.
- g) Test for soil compaction, Soil probe, auger, or shovel should be able to retrieve samples of post-restoration profile. Refusal of equipment shall be considered a failure of restoration.
- h) Compacted soil shall be restored through subsoiling or ripping. Equipment used shall be described to MDE for approval.
- i) Apply techniques to restore soils after compaction.

Heavy Use Areas

Rationale: The 2011 Erosion and Sediment Control specifications allow for placement of a minimum of 4 inches of crushed stone or other material. Placement of crushed stone or other material results in refusal of probe, shovel, or auger to determine hydric soil characteristics, and impedes soil processes and re-establishment of desirable wetland plant species. If not removed, successful restoration is not possible.

Practice:

- a) Use mats for access and equipment operation (1st preference).
- b) Remove all material emplaced in heavy use area, and restore with topsoil. Apply practices to restore compacted soil.

Time of Installation and Restoration

Rationale: Disturbance and operation of equipment during wet periods or high groundwater result in greater soil disturbance, resulting in ruts and compaction. Restoration of compacted soils is also more successful when soils are drier. Restoration is more successful when soil disturbance is minimized.

Practice:

- a) Test for depth of compacted soil. Use techniques of disking, subsoiling, or disking based on depth of compacted layer.
- b) Conduct activity during dry season when water levels are lowest, when practicable.

Seed/stabilization mixes

Rationale: An appropriate wetland-specific seed/stabilization mix for the region will support the return of natural wetland vegetation. Other mixes may contain upland or non-native species, which will result in an area failing to meet the wetland definition or being dominated by non-native or invasive species.

Practice:

- a) A wetland-specific mix suitable for the region should be used. Request that the applicant provide a label or details of the proposed mix to MDE for approval.

7) Management of Vegetation for New Linear Utilities

Rationale: Restoration of forested or shrub wetlands will be more successful when a minimum area is maintained in an emergent (herbaceous) wetland stage. Some conversion may be necessary for ease of periodic inspection and maintenance. Permanent conversion exceeding minimal widths may be considered a permanent wetland conversion and may require mitigation.

Practice:

- a) For periodic inspection and maintenance, maintain a corridor centered on the pipeline up to 10 ft. in width in an herbaceous wetland state.
- b) Request a consultation with MDE for selective removal of trees that are located within 15 ft. of the pipeline and are greater than 15 ft. in height.
- c) Consult with the Mitigation Section on determining if the conversion requires mitigation.

8) Training to Contractors/applicants

Rationale: Regulated entities will need to be informed of new requirements.

Practice:

- a) Prepare training materials (attached as a separate deliverable), including identification of topsoil.
- b) Ensure that bid notices include provisions for wetland BMPs, including proper seeding; specific segregation of topsoil; no compaction; proper backfill w/o aggregate, unless approved.
- c) Provide information on appropriate stabilization mixes for wetlands.

8) Record Keeping

Assessments

Rationale: Records were previously kept on paper forms, with checks for losses of wetland functions. A box was frequently checked for “temporary impacts” to indicate no functional losses. Except for cases in which a separate functional assessment was made by the applicant, or other records were in the file, there is often not a record of existing wetland functions existing at the site prior to the authorized activity. A determination of successful functional replacement is not possible unless pre-disturbance records are kept.

Practice:

- a) Modify database to create new fields for documenting existing functions of wetlands prior to authorization, distinguishing between permanent and temporary losses. Database design should allow for multiple entries with minimal reviewer effort.
- b) Revise data sheet to require assessment for temporary impacts.

Correspondence

Rationale: Files examined in this study sometimes showed differences in the type of wetland being impacted, the amount of acreage, and information on plans between the original submissions and the final authorization. It was unclear whether or not there were errors in the authorization, that there was an inaccurate wetland delineation, or a verified change in the original impact. In addition, specific BMPs were not always shown on plans.

Practice:

- a) Reviewers should retain correspondence in the file confirming the type and extent of wetland impact. Notes or additional correspondence in the file should be included to state when standard or specific BMPs were not required, and what measures were deemed sufficient to restore the wetland by other methods.

Recommended Practices for MDE Compliance Personnel

1) Inspection checklist

Rationale: Compliance personnel use a simple checklist for visiting sites that were under nontidal wetland authorizations. Questions answered are:

- Is site authorized under nontidal wetland permit or letter of authorization?
- Are impacts in compliance with MDE-approved plans?
- If an agricultural activity or forest harvest, is the activity in compliance with soil conservation district plans?
- Has the permittee notified the Department at least 5 days prior to commencing work?
- Does the site have an approved erosion and sediment control plan?
- Has water quality certification been obtained?
- Has excess fill, spoil, debris and construction materials been removed from the wetland, nontidal wetland buffer, and 100-year floodplain?
- Is instream work occurring outside the closure period?
- Has the permittee received written approval for instream blasting?
- Has the permittee successfully implemented the mitigation plan?

These items do not fully address the need to verify that wetlands have been restored after temporary impacts.

Practice:

The Wetlands and Waterways Program will work with the Compliance Program to develop a new checklist with simple items that would evaluate restoration. Items to be discussed will include:

- a) The matching of pre-existing elevations;
- b) A test for resistance of a probe, shovel or other tool;
- c) Simple assessment of vegetation will also be considered;
- d) Scheduling of inspections;
- e) Soil evaluations;
- f) Evidence of surface hydrology;
- g) Depth to ground water

An assessment is provided as a separate deliverable. See also Appendix A.

Recommended Practices for Applicants and Authorized Persons

1) Administrative

Standards and Specifications

Rationale: Applicant standards and specification sometimes conflict with practices necessary to restore wetlands after temporary disturbances.

Practice:

- a) Ensure that bid notices and internal standards and specifications include provisions for wetland BMPs, including proper seeding; identification and specific segregation of topsoil; no compaction; proper backfill w/o aggregate, unless otherwise approved by MDE.
- b) Require that bidders and construction personnel document capability of implementing wetland BMPs.

Location of Wetland Impacts

Rationale: Application review and access to proposed impacts is more efficient when impacts and impact sites are clearly described. MDE personnel have had difficulty in identifying impact sites along linear projects.

Practice:

Applicants should provide the following:

- a) Individual impact locations with georeferenced coordinates on plans and as an attachment to the application form. Each impact site should be accompanied with pre-construction photographs and field delineation forms;
- b) A description and photograph of the soil profile to the depth of installation should be included, with depth of topsoil measured and photographed, to ensure its proper placement as the last layer to be backfilled over the trench;
- c) A description of how to best access the impact site should be included, with a description of adverse impacts were avoided or minimized; and
- d) A description of measures taken to restore the wetland.

2) Construction Specifications

Rationale: During the course of this project, MDE determined that construction specifications used by some utility entities were in conflict with MDE's BMPs for restoring wetlands after temporary disturbances. The conflicts observed involved maintaining vegetation through mowing and compaction of soil to support vehicles that may be used in maintenance and repair activities.

Practice:

For instances when the intent is to restore the wetland and claim a temporary impact:

- a) Provide copies of the standards and specifications upon request and amend specifications or replace practices that do not result in unauthorized maintenance or soil compaction; or
- b) Propose appropriate changes for constructions on each case.

For instances when activities prevent restoration of wetlands:

- c) Clearly indicate any require permanent maintenance, soil compaction, or aggregate as part of the application information; and
- d) Present the impact as a wetland loss.

3) Construction Plans

Rationale: Contractors and inspectors rely on plans for detailed information more than language in permits. Plans must accurately show designs and practices to accomplish goal of restoring wetlands.

Practice:

- a) Show stockpile and heavy use areas. These areas should not be located in wetlands. Erosion and sediment control practices for stockpile and heavy use areas require placement of gravel, which has been found in this study to be left in sites and impede processes in soils associated with nutrient transformation.

- b) Show how compaction is to be prevented or corrected. If required and authorized, the impact may not be considered temporary and mitigation may be required.
- c) Verify stabilization mix as being appropriate for wetlands.
- d) Show limits of disturbance, right-of-way, and maintained right-of-way;
- e) Include on the plan details the procedures to be used to remove all timber riprap, specific measures (including the import of additional fill material) to restore preconstruction surface contours, and specific measures (including planting of herbaceous and shrub species) to ensure successful revegetation of the construction right-of-way with native wetland plant species;
- f) Show that all timber pads, prefabricated equipment pads and geotextile fabric overlain with gravel fill upon completion of construction.

4) Construction Practices

Vegetation Removal

Rationale: Practices that limit full removal of vegetation have been recommended by FERC (1994) to improve successful wetland restoration.

Practice:

- a) Cut vegetation off only at ground level, leaving existing root systems intact, and remove from wetland for disposal; and
- b) Limit pulling of tree stumps and grading activities to directly over the trench. Do not remove stumps or root systems from the rest of the right-of-way in wetlands unless required for safety-related construction constraints. Constraints shall be discussed with MDE during the application review process.

Timing of Stabilization

Rationale: Projects under construction were not stabilized and contained exposed soil in the wetland for extended periods of time until the utility line was installed. The failure to stabilize areas as soon as practicable left areas

adjacent to streams subject to flooding and transport of sediment into waters of the State.

Practice:

- a) Ensure that plans and specifications require stabilization within three days, or apply phased construction and accelerated stabilization within 24 hours after each day that new construction commences according to “*2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control*” *Maryland Department of the Environment in Association with Natural Resources Conservation Service and Maryland Association of Soil Conservation Districts*. Where feasible, specify that only the amount of soil may be disturbed which can be stabilized at the end of the same working day.
- b) Ensure that timing and method of stabilization should match construction plans submitted by the applicant plus erosion and sediment control plans.

Topsoil and Backfilling

Rationale: Sites that were unsuccessfully restored to wetlands often failed due to soil compaction, placement of aggregate to the surface, and elevations above grade. The long term study funded through this grant noted that contractors may not be able to distinguish topsoil from subsoil, and specifying soil excavated to a certain depth to be replaced may result in subsoil being placed as the topsoil layer.

Practice:

- a) Sort excavated material into topsoil and subsoil. The permit reviewer shall specify the depth of material, which is considered topsoil, on a case-by-case basis.
- c) Stockpile topsoil separately from subsoil.
- c) Set aside topsoil on a sheet for later placement back into the wetland. A minimum 4” depth of topsoil is recommended.
- d) Cover the stockpile with a sheet to prevent escape of material before replacing it back in the wetland.

- e) For restoration, place subsoil in trench over utility, with deepest original material placed first. Place topsoil in its original position as the last layer over the trench.
- f) Unless required to protect the underground line, any aggregate used during construction shall be removed.
- g) Soil shall be tested for compaction. Soil probe, auger, or shovel should be able to retrieve samples of post-restoration profile. Refusal of equipment shall be considered a failure of restoration.
- h) Compacted soil shall be restored through subsoiling or ripping. Equipment used shall be described to MDE for approval.

Pre-existing elevations.

Rationale: Restoration to pre-existing elevations is necessary to ensure that the previous depth to groundwater and surface flow patterns are maintained. Sites in this study have failed due to excess filling above pre-existing elevations, which resulted in the site no longer meeting the wetland definition.

Practice:

- a) There will be excess material from the excavation that cannot be placed back into the trench, due to displacement from the line. Only sufficient subsoil and all topsoil should be replaced to restore the ground surface of the wetland to pre-existing elevations. Some natural settling will occur. Consult with MDE on final elevations and if elevations above the previously existing elevation will be acceptable, given predicted amount of settling.
- b) Excess material shall be removed from the construction area and placed where it does not affect surface flow patterns.

Access roads

Rationale: Access roads may represent an additional wetland impact beyond the utility line impacts. As a construction impact, the location, construction, and removal of the road are subject to avoidance and minimization requirements.

Practice:

- a) Determine whether or not the access road is temporary and will be removed after utility line installation or maintenance. Permanent roads, if justified by the applicant, may be authorized but would be considered a permanent impact and may require mitigation.
- b) Existing roads should be used where practicable for access and operation of heavy equipment. Mats and high flotation equipment should be the second preference if equipment must be operated from the wetland area.
- c) Retain natural root mat, stumps, and mounds of herbaceous vegetation as a base for temporary access roads. Avoid use of fill where practicable.
- d) Use shear-blade technique rather than grubbing to remove tree stumps. If fill is necessary, place it over geotextile fabric that can be removed after construction.
- e) After construction and stabilization, aggregate and geotextile placed for temporary access shall be removed.
- f) Access areas shall be re-graded to pre-existing elevations in regulated wetlands, buffers, and floodplains unless otherwise authorized.
- g) Test for soil compaction, Soil probe, auger, or shovel should be able to retrieve samples of post-restoration profile. Refusal of equipment shall be considered a failure of restoration.
- h) Compacted soil shall be restored through subsoiling or ripping. Equipment used shall be described to MDE for approval.
- i) Apply techniques to restore soils after compaction.

Heavy Use Areas

Rationale: The 2011 Erosion and Sediment Control specifications allow for placement of a minimum of 4 inches of crushed stone or other material. Placement of crushed stone or other material results in refusal of probe, shovel, or auger to determine hydric soil characteristics, and impedes soil processes and re-

establishment of desirable wetland plant species. If not removed, successful restoration is not possible.

Practice:

- a) Use mats for access and equipment operation (1st preference).
- b) Remove all material emplaced in heavy use area, and restore with topsoil. Apply practices to restore compacted soil.

Time of Installation and Restoration

Rationale: Disturbance and operation of equipment during wet periods or high groundwater result in greater soil disturbance, resulting in ruts and compaction. Restoration of compacted soils is also more successful when soils are drier. Restoration is more successful when soil disturbance is minimized.

Practice:

- c) Test for depth of compacted soil. Use techniques of disking, subsoiling, or disking based on depth of compacted layer.
- d) Conduct activity during dry season when water levels are lowest, when practicable.

Seed/stabilization mixes

Rationale: An appropriate wetland-specific seed/stabilization mix for the region will support the return of natural wetland vegetation. Other mixes may contain upland or non-native species, which will result in an area failing to meet the wetland definition or being dominated by non-native or invasive species.

Practice:

- a) A wetland-specific mix suitable for the region should be used. Submit the proposed mix to MDE for approval.

8) Management of Vegetation for New Linear Utilities

Rationale: Restoration of forested or shrub wetlands will be more successful when a minimum area is maintained in an emergent (herbaceous) wetland stage. Some conversion may be necessary for ease of periodic inspection and

maintenance. Permanent conversion exceeding minimal widths may be considered a permanent wetland conversion and may require mitigation.

Practice:

- a) For periodic inspection and maintenance, maintain a corridor centered on the pipeline up to 10 ft. in width in an herbaceous wetland state.
- b) Consult with MDE for selective removal of trees that are located within 15 ft. of the pipeline and are greater than 15 ft. in height.

Appendix A

Assessment Checklist for Restoration (Rectification) of Temporary Disturbances in Wetlands

For Use by Wetlands and Waterways Program

Date_____

Name of Person completing Data Sheet_____

Authorization Number_____ Date of Authorization_____

County_____ Watershed_____

Permittee_____ Contact:_____

Wetland Description Prior to Disturbance

_____Data sheets available (attach)

_____Photographs available (attach)

_____Wetland classification

_____Functional assessment (attach)

Hydrology source (choose all that apply):

- Perennial watercourse
- Intermittent watercourse
- Floodwater
- Pond/lake

- Surface Runoff
- Groundwater/Perched water table
- Not determined

_____Depth to water table

Soil
Description_____

Other
comments _____

Post-construction Assessment

Vegetation

Is site predominantly vegetated? _____y/n

Are observed species acceptable? _____y/n /unk Note: Acceptable species must be native, non-invasive wetland plants.

Is r.o.w mowed or maintained? _____y/n

Vegetation parameter satisfied _____y/n

Soils

Compaction y/n _____

Note: Refusal of probe, auger, or shovel shall be considered a failure to satisfy soils parameter, unless refusal existed prior to disturbance, such as in a wetland with perched water table.

Backfill with original material y/n/unk _____

Excavated Material Properly Replaced _____y/n

Note: Excavated must be replaced in to match original profile, with topsoil as top layer.

Restoration to previous
elevations/contours _____

Comments _____

Soil parameter satisfied _____y/n

Hydrology source (choose all that apply):

- | | |
|---|--|
| <input type="checkbox"/> Perennial watercourse | <input type="checkbox"/> Surface Runoff |
| <input type="checkbox"/> Intermittent watercourse | <input type="checkbox"/> Groundwater/Perched water table |
| <input type="checkbox"/> Floodwater | <input type="checkbox"/> Not determined |
| <input type="checkbox"/> Pond/lake | |

_____ Depth to water table

Comments _____

Hydrology parameter satisfied _____ y/n

If the site is not restored to previous conditions, are there enhancements that have resulted?

Yes _____ No _____ Describe _____

Comments _____

Wetland Functions:

Check all that apply:

Biological functions

- Providing habitat
 - Rare, threatened, or endangered wildlife
 - Rare, threatened, or endangered plants
 - Forest interior dwelling birds
 - Other non-wetland dependent wildlife
 - Reptiles and amphibians
 - Other wetland dependent wildlife
 - Fish and other aquatic wildlife

Furnishing organic material to the aquatic food webs

Water quality functions

- Filtering sediments, pollutants, and excess nutrients
- Reducing erosion (e.g., streambanks and drainageways)

Hydrologic functions

- Headwater wetland – storing, slowing, or reducing floodwater flow
- Floodwater wetland – storing, slowing, or reducing floodwater flow
- Discharging groundwater
- Recharging groundwater

Human Values

- Providing recreational opportunities
- Providing harvestable natural resources (e.g., timber, fish, furbearing mammals)
- Providing educational opportunities
- Providing aesthetic qualities
- Representing a rare ecosystem

Have functions changed from original assessment? _____y/n

_____Functions not originally assessed

How have functions changed? _____gain of new function _____(name)

loss of function _____(name) _____increase in previously recorded function (name)

_____decrease in previously recorded function (name)

Describe additional functional observations:_____

Assessment Checklist for Restoration (Rectification) of Temporary Disturbances in Wetlands

For Use by MDE Compliance Program

Date_____

Name of Person completing Data Sheet_____

Authorization Number_____ Date of Authorization_____

County_____

Permittee_____ Contact:_____

Is site predominantly vegetated? _____y/n

If no, restoration may not successful. Contact Wetlands and Waterways Program

Is r.o.w mowed or maintained?_____y/n

If yes, restoration may not successful. Contact Wetlands and Waterways Program

Were excavated areas backfilled with original material?_____y/n/unk

Note: Excavated must be replaced in to match original profile, with topsoil as top layer.

Note: Refusal of probe, auger, or shovel shall be considered a failure to satisfy soils parameter, unless refusal existed prior to disturbance, such as in a wetland with perched water table. Contact Wetlands and Waterways Program.

Restoration to previous elevations/contours_____y/n

If no, consult with Wetlands and Waterways Program

References

Maryland Department of the Environment. 2011. 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control.

Vasilas, Bruce, and D. Clearwater (ed.). 2013. Evaluation of Best Management Practices for Underground Utility Line Installation and Restoration in Wetlands. Final Report to Maryland Department of the Environment. Prepared in partial fulfillment of a U.S. Environmental Protection Agency State Wetland Program Development Grant BG 97027-3.