Inaccurate Cover Classification Leads to Unnecessary Loss of Pennsylvania Palustrine Wetland Forest Structure and Functions

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ABSTRACT

Regulators and consultants have an obligation to insure accurate identification and reporting when inventorying vegetation, delineating wetlands, and assessing impacts on land proposed for development projects. This includes the proper characterization of internal and external cover of vegetation in wetlands proposed for destruction, as well as the species of plants present. Otherwise, environmental impacts will not be minimized, functions will be lost, and post-disturbance wetland ecosystem recovery will be unlikely, even where compensatory mitigation is attempted. Palustrine forested wetlands in Pennsylvania are being identified as emergent herbaceous wetlands in projects affecting thousands of hectares of land and many hundreds of individual wetlands. Not only are the forest functions being lost for indefinitely long periods of time, but "required" compensatory mitigation for the loss of forest is being ignored.

During project impact assessments, Cowardin Classes ("external cover" – percent cover by the tallest life-form of plants) have been erroneously recorded recently in Pennsylvania, resulting in palustrine forested wetlands mischaracterized, impacts not avoided or minimized, and compensatory mitigation not provided. Such basic scientific error can be avoided by careful attention to technical terms on the part of consultants and regulators, accurate reporting of what exists on the ground, and thorough inspection of jurisdictional boundaries and cover types on project sites prior to disturbance. Lacking accurate inventory and site restoration design, compensatory mitigation in compliance with regulatory directives can offer no prospect of wetland forest restoration to benefit future generations.

INTRODUCTION

For at least a decade the U.S. Army Corps of Engineers (Corps) has directed that the Cowardin classification (Cowardin et al. 1979), especially "Class," be reported for the wetland polygons identified in applications for permits and jurisdictional determinations (Riley 2008). That classification system, based on the common sense visual inspection of the uppermost layer of vegetation, was designed to communicate scientific and resource management information and for use in National Wetlands Inventory (NWI) mapping based on airphotos. The "Class" level of the hierarchical classification addresses overall vegetation structure, not species composition.

Forest structure typically is more complex than herbaceous vegetation, and forested wetland functions are not replaced by wetlands where succession is arrested at an herbaceous stage (Schmid & Co., Inc. 2014a). The Corps and the US Environmental Protection Agency observed in 2008 rulemaking regarding compensatory mitigation for losses of aquatic resources:

> *We understand that different functions often develop at different rates after aquatic resource restoration, establishment, or enhancement activities are implemented, because of the ecosystem development processes that occur. ... It is important to understand that temporary impacts may result in permanent changes to, or losses of, specific functions. As an incentive for timely mitigation, district engineers may determine that additional compensation for temporal losses is not necessary if the mitigation project is initiated prior to or concurrent with the permitted impacts, except in the case of resources with long development times, (e.g., forested wetlands). [33 CFR 325 and 332, 40 CFR 230; 73 FR70:19638]*

Little is known about the restoration of forest soils after human changes in wetland and non-wetland ecosystems (Lovett et al. 2018). Even beneath restored herbaceous wetlands, soil development requires decades to centuries to approximately recover functions such as the denitrification performed under undisturbed reference conditions nearby (Ballantine and Schneider 2009; Hossler et al. 2011; Moreno-Mateos et al. 2012, 2015) or the capture of human-produced carbon dioxide (Griscom et al. 2017).

No supplemental guidance has been provided suggesting any modification of the Cowardin classification when using it for Corps regulatory purposes that typically demand greater precision than regional NWI mapping. Corps three-parameter wetland identification and delineation

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methodology itself is specifically described as not having been designed for wetland classification. Users of the 1987 Corps of Engineers Wetlands Delineation Manual are advised to become familiar with the older Cowardin system as a means for classifying wetlands (EL 1987, p.7).[2]

The Pennsylvania Department of Environmental Protection (PADEP) by regulation has adopted Corps methodology for wetland identification and assessment.[3] PADEP would specifically adopt the Cowardin Class designations for use when designing compensation for wetlands damaged in Pennsylvania (PADEP 2014a). Impacts requiring mitigation include "conversion of a forested wetland system to a non-forested state through chemical, mechanical or hydrologic manipulation that results in a maintained state of vegetation" (PADEP 2017b). Such changes are most common along electric power lines and pipelines, where a permanent right-of-way is kept open to facilitate inspection and maintenance.

The hierarchical Cowardin descriptive classification of wetland habitats requires that vegetation be assigned to categories based on the Class (i.e., the aggregate external cover) of their tallest plants.[4]

> *"If living vegetation (except pioneer species) covers 30 percent or more of the substrate, we distinguish Classes on the basis of the life form of the plants that constitute the uppermost layer of vegetation and that possess an areal coverage 30 percent or greater. For example, an area with 50 percent areal coverage of trees over a shrub layer with a 60 percent areal coverage would be classified as Forested Wetland; an area with 20 percent areal coverage of trees over the same (60 percent) shrub layer would be classified as Scrub-Shrub Wetland. When trees or shrubs alone cover less than 30 percent of an area but in combination cover 30 percent or more, the wetland is assigned to the Class Scrub-Shrub. When trees and shrubs cover less than 30 percent of the area but the total cover of vegetation (except pioneer species) is 30 percent or greater, the wetland is assigned to the appropriate Class for the predominant life form below the shrub layer." [FGDC 2013, p. 19-20, emphasis added]*

Total aggregate external cover of the ground or water surface by plants must be at least 30% for a wetland to be placed in any Cowardin vegetation cover Class (or "vegetated" Subclass), by definition. Subclasses and modifiers can be identified, depending on the level of detail needed. More than 7,500 distinct Cowardin classification codes have been used for NWI mapping (Dahl et al. 2015). Bare ground, open water, shrubs, herbaceous plants, lichens, and/or mosses may be found beneath the tree canopy in a forested wetland.

The term "cover" also is used for other regulatory purposes, notably when quantifying the "internal cover" of each named species formed by the individuals growing within each layer of a wetland plant community. This "internal" cover metric (i.e., cover within a plot) routinely is used to determine dominant species for the three-parameter methodology identifying federally regulated wetlands in accordance with the 1987 Corps Manual and its regional supplements (e.g., USACE 2012). Internal and external measures of cover and the recorded data (from which they are derived) may differ for an individual wetland sample plot. Both are meaningful, but if these distinct measures of cover are muddled, the result can be misclassification, lack of required regulation, and inappropriate mitigation of impacts—especially for small wetlands. That leads to loss of wetland functions and values (Schmid & Co., Inc. 2014).

WETLAND MAPPING IN PENNSYLVANIA

Pennsylvania lies within the deciduous forest biome of eastern North America (Braun 1950). The great majority of its mapped wetlands are forested (Tiner 1990). National Wetlands Inventory and Geological Survey topographic mapping typically omit the small headwater wetlands and streams not recognizable on high-altitude aerial photographs because of overhanging forest cover. Such features are usually discovered during on-ground inspection. Furthermore, plant succession, beavers, forest fires, hurricanes, and human activities often lead to changes in actual vegetation subsequent to the taking of aerial photographs, and thus warrant on-ground confirmation. During a recent field investigation of more than 350 selected wetlands in Kentucky, Guidugli-Cook et al. (2017) found that more than 50% of their wetlands mapped as emergent herbaceous by NWI in fact exhibited forest cover, while more than 20% of NWI-mapped forested wetlands were dominated by herbaceous cover at the time of field inspection. For Pennsylvania, PADEP (2017b) directs that analysis of aerial photographs be followed by field inspection when assessing wetlands, so on-the-ground classification is the ultimate step.

The misapplication of the Cowardin classification for wetland cover is significant in Pennsylvania permit applications seeking approval to destroy wetlands, where compensatory mitigation requirements on paper are more

2. The current version of the Cowardin system is that of the Federal Geographic Data Committee (FGCD 2013).

3. 25 Pa. Code 105.451(c).

4. Plant names are not relevant for basic Cowardin classification.

stringent for forested wetlands than for emergent herbaceous wetlands (PADEP 2017b). This creates an incentive for applicants to mischaracterize small wetlands as herbaceous rather than forested and thus underreport the actual qualitative extent of proposed damage. Making a mistake in classification can occur if a field investigator forgets to look around and supplement a Corps data form, which does not allocate space for data identifying Cowardin cover.[5] In Pennsylvania, wetlands shown on permit drawings subsequently are not carefully reviewed for consistency with collateral information or field conditions. Such mistakes could be corrected when brought to the attention of applicants and regulators.[6] Too often, however, they are not corrected.

For pipelines, power lines, and high-extraction underground coal mining projects, for example, where hundreds of wetlands and streams are proposed for damage on a single project site that encompasses hundreds or thousands of hectares of land, cumulative impacts become important (Schmid & Co., Inc. 2000, 2015; Helbing and Szybist 2014). Failure to identify and properly classify wetlands in the field precludes avoidance and minimization of those impacts. This problem is typical for streams and wetlands in Pennsylvania that are: 1) not mapped by the National Wetlands Inventory, 2) not depicted on U.S. Geological Survey topographic quadrangles, or 3) not shown in the National Map hydrography database[7]. Unless properly disclosed during the permit process, such resources remain unknown and unprotected. Misclassification in the field also makes it: 1) impossible to consider avoiding forested wetlands, 2) understates the need for forest replanting in temporarily disturbed wetlands or riparian areas, and 3) precludes compensation for the permanent conversion of forested wetlands to herbaceous cover in rights-of-way to be maintained permanently as treeless. Federal regulations declaring each stream or wetland crossing typically to be an individual project approvable in isolation via general permits[8] appear to have deflected attention from accurate analysis of individual wetland impacts as well as from the cumulative effects of major linear projects.

I recently have examined drawings, text assertions, and data forms in applications for new linear projects that currently are being built across hundreds, if not thousands, of wetlands and streams in Pennsylvania to see how vegetation cover is being characterized and impacts addressed. I frequently encountered inconsistencies which were not discussed in agency permit reviews. Consequently, I went into the field and checked about two dozen sites where the wetlands proposed for impact were on public lands or adjacent to public roads (most affected wetlands are on private lands where there is no public access) and am disturbed by what I found.

EXAMPLES FROM ONE PROJECT

My examples here were drawn from one major pipeline project that has disturbed about 1,200 hectares (3,000 acres) of land and for which extensive information is available online (https://www.dep.pa.gov/Business/ProgramIntegration/Pennsylvania-Pipeline-Portal/Pages/Mariner-East-II.aspx).[9] This applicant acknowledged its intent to disturb 15 ha (37 acres) within the 562 wetlands crossed by the new pipeline corridor and 5 ha (13 acres) within the 883 streambeds crossed. For the project discussed here, construction on the roughly 500-km long right-of-way was claimed to require the permanent conversion of only 0.2 ha (0.405 ac) of palustrine forest (PFO) to herbaceous (PEM) within a total of 19 wetlands. Natural reforestation of the land in the active right-of-way above the new pipelines is to be prevented long-term to facilitate inspection and maintenance. The applicant also acknowledged a project total of only 0.12 ha (0.288 ac) in PFO wetlands to be damaged temporarily during construction, which it proposed to replant with young trees. This minimal acknowledged total of wetland forest conversion and of temporary wetland forest construction disturbance with replanting suggests that an extraordinary effort was apparently made to minimize wetland forest impacts along 500 km of right-of-way. The applicant claimed to have minimized impacts by collocating the proposed pipelines near existing pipeline rights-of-way as much as possible. In most cases the existing cleared pipeline corridor is too narrow to accommodate the new pipelines, so new construction encroached into adjacent forest even where it did not strike out across new alignments. The proposed pipelines entailed the clearing of a new permanent right-of-way generally 23 m (75 ft) wide, reduced to 15 m (50 ft) in wetlands where "possible" and widened for additional temporary work space wherever "necessary." Rather than avoiding forested wetlands, how-

5. The current forms do have a small blank for reporting NWI classification, which typically is recorded as "none" for headwater wetlands not identified on NWI maps (as in Figure 3 below). No supporting data are prompted for recording wetland classification in the field. Field recording of Cowardin cover might help reduce the frequency of gross documentation errors such as those discussed in this article.

6. Pennsylvania regulations state that a permit application will not be approved unless the applicant demonstrates that the application is complete and accurate [25 Pa. Code 105.21(a)(1)]. Actual permit files suggest otherwise, and questions from agency reviewers often remain unaddressed.

7. All of these products are derived from remote sensing and therefore have recognized limitations and are not intended to identify all wetlands and streams, hence the focus on on-the-ground determinations for permit applications.

8. Definition of "Single and Complete Linear Project" (USACE 2016:12).

9. Similar errors are not confined to the specific project I discuss here or to linear projects in Pennsylvania (Schmid & Co., Inc. 2000, 2014a, 2014b, 2015, 2016a, 2016b, 2017a, 2017b; Helbing and Szybist 2014).

ever, this applicant appears often to have minimized instead the wetlands it characterized as forested.

The actual extent of forested wetland damage appears to be significantly greater than acknowledged, because: 1) the wetlands inventoried were not field flagged by the applicant, and 2) few wetland boundaries and cover types were field checked by agency staff. I found numerous errors during my spot inspections of accessible sites where application documents presented contradictory information. Careful examination of the project drawings, confirmed by field inspection, suggests that the consultant's claimed "streamlining" of aquatic resource inventory led to recurrent errors which regulators then failed to address. The figures here excerpted from this immense permit application warrant close scrutiny. In most cases, the contradictory information led to a significant cumulative underestimate of the actual damage proposed to forested wetlands and riparian forests when the sites were examined directly in the field. At two small locations where wetlands were mischaracterized as discussed below, the actual permanent conversion increases the acknowledged total conversion of PFO to PEM for this entire project by 38%.

FIGURE 1. Obvious misclassification of forested wetland (pale blue stripes) along a partially identified perennial headwater stream (dark blue) in this excerpt from a July 2015 applicant aerial site plan drawing. Pale blue striped wetland polygon was recorded as palustrine emergent (PEM). Yellow lines show project study area limits; red lines are proposed new pipelines through the mature forest. Yellow box is applicant's wetland data log location for W-L24, where data in Figures 3 and 4 were recorded. The applicant's photobase, other aerial photos, and onsite observations (Figure 2) confirm the applicant's failure to record trees present at the sampling location. This airphoto apparently was taken circa autumn 2013.

Since no field flagging of wetland limits was provided by this applicant, boundary locations had to be reconstructed in the field from application graphics using global positioning system (GPS) and geographic information system (GIS) technology. When questioned regarding the apparent wetland misclassification identified in Figure 1, the consultant's response was that no rooted trees had been found in these "herbaceous" wetlands because no trees were listed on the Corps wetland data form completed at the sampling location (applicant's yellow box), and there was no need to check further[10].

Actual conditions at this sampling location are shown in Figure 2. The basic error was misrecording the plants present, and that became the "justification" for erroneous cover classification. The mapped location of this sampling station differed from its reported latitude and longitude coordinates by 21 m (68 feet), although agency reviewers did not notice the misrepresentation or that any alternative sampling location in this wetland was similarly forested. The applicant's accompanying stream data sheet S-L41 representing the proposed pipeline crossing of the stream within wetland W-L24 records the stream channel itself as having 50% tree cover (presumably external cover determined following the conventions of Barbour et al. 1999). Corrections were not made by the applicant or required by regulators, despite landowner protest. Because of misclassification, the intended permanent conversion of 0.027 ha (0.066 acre) of forested wetlands to herbaceous wetlands here was not acknowledged. That omission alone is 42% greater than the acknowledged conversion in the surrounding county and 16% of the entire acknowledged project total. No applicant plans show any proposed replanting of the riparian forest to be "temporarily" destroyed here during construction.

Figures 5 through 8 likewise warrant close examination that was never done by regulators. They show Pennsylvania "Exceptional Value" riparian wetlands along two designated High Quality ("Special Protection") headwater streams tributary to a reproducing wild trout stream.[11] PADEP regulations specify among other things that no permit can be issued that has an "adverse impact" on Exceptional Value wetlands [25

10. Overhanging trees should be included in plot data wherever the trees are rooted in the plot and thereby part of the plant community. Furthermore, it is common knowledge that roots extend well beyond the canopy of individual trees.

11. Pennsylvania-designated Exceptional Value wetlands are Tier 3 Outstanding National Resource Waters in the terminology of the federal Clean Water Act (CWA) of 1948, with major amendments in 1972, 1977, and 1981 (33 USC §1251 et seq.)

Pa. Code 105.18a (1)]. As in the prior example, the actual forested nature of much of these Exceptional Value wetlands was not recognized, and it is clear that no effort was made to minimize wetland impacts here, despite repeated claims of impact minimization throughout the permit application documents for this project.

In Figure 6, forest tree canopy edge lines (black scalloped lines that I highlight in green) are shown along the existing pipeline right-of-way (compare base photo in Figure 5), contradicting PEM designation north of the existing mowed pipeline. The applicant again did not provide accurate information in its application text and drawings. This is not simply misclassification of Cowardin cover, but actual gross misrepresentation of the geographical extent of purported documentation represented by the Corps data form. The construction corridor was not inspected by regulators, and corrected drawings were not required prior to permit approvals or construction. Pennsylvania regulators clearly are not prepared to review large projects to this level of detail, but approve permits for them nonetheless.[12]

The western segment of this alignment, beginning just east of the public road was shifted to the south of the existing pipeline in late 2016 (Figure 5). Within the mowed, existing pipeline corridor new construction disturbance in PEM wetland is minimized by the southern alignment, but the workspace to the north caused unnecessary, easily avoided clearing of the Exceptional Value forested wetland mislabeled as herbaceous (Figure 6). The actual permanent conversion of 0.036 ha (0.09 ac) of forested wetland to herbaceous cover here above the pipelines was never acknowledged on drawings and was not included in proposed offsite mitigation. This single omission is more than 2.5 times the total area of permanent PFO to PEM conversion in this entire county that was identified in the state's record of decision (0.014 ha, 0.034 ac; PADEP 2017e) and 22% of the acknowledged total for the entire project. The recently added jog in the new pipelines could have been started 122 m (400 feet) further east to avoid the forest in Wetland Q63 entirely (Figures 5 and 7), or the temporary construction workspace could have been run through the mowed right-of-way along the south side of the new pipeline trenches, thus reducing wetland and non-wetland riparian forest impact significantly. The temporary timber mats for heavy equipment traversing these in-fact forested wetlands could have been shifted southward to cross the already disturbed cover of herbaceous wetland above the existing pipeline (as done elsewhere).

Because of inaccurate and uncorrected inventory information, neither the design engineer nor regulators were informed that forested wetland was being converted permanently at Wetland Q63. No riparian forest restoration (either wetland or non-wetland) is shown on drawings wherever temporary forest disturbance occurs within 150 feet of these Special Protection streams (as required to achieve 60% uniform canopy cover at maturation by special verbal condition of the applicable PADEP permit).

Drawings that show some of the applicant's proposed post-construction restoration measures along the new pipelines nowhere illustrate where the state's verbal permit conditions to replant forested wetlands and non-wetland riparian forest trees will be implemented. Many regulated preconstruction riparian forests were never accurately displayed on the permit inventory drawings along these proposed pipelines.

Given the absence of drawings showing the post-construction replanting of trees for riparian forest restoration called for by verbal permit condition in temporary construction areas previously forested (within 46 m [150 ft] of Special Protection streams, 30 m [100 ft] of Cold Water Fisheries streams, and 15 m [50 ft] of Trout Stocking and Warm Water Fishery streams), construction personnel may find compliance difficult. No forest restoration is required in any non-wetland forests clearcut outside riparian zones.

FIGURE 2. Man stands in the center of the applicant's recorded wetland sampling location, the yellow box for W-L24 shown in Figure 1. View northeast, April 2018. Recent clearing in background at right surrounds the area of red lines (proposed new pipelines) in Figure 1. Facultative hydrophytic trees (chiefly red maples, Acer rubrum) in fact are obviously rooted in this wetland. No trees were listed on the vegetation data form allegedly recorded here (Figure 4). Hence this wetland was erroneously reported as PEM and defended merely by reference to the erroneous data form.

12. "The Department has not received and continues not to receive complete permit applications that provide environmental assessments that adequately comply with the regulatory requirements when a project involves stream and wetland crossings in multiple counties" (PADEP 2017c). Despite this admission, the permits are approved.

Inventory errors were not limited to wetlands, but also extended to streams in this permit application. Stream S-Q64, for example, is represented on Figure 6 as about 7.6 m (25 ft) wide, although it was recorded on the applicant's stream data form as 1.2 m (4 ft) wide, which notation describes actual preconstruction field conditions more accurately than the Figure 6 drawing. In a 2017 addendum to the permit application, the designation of Stream S-Q64 was changed by the applicant to ephemeral rather than intermittent, but the drawing from which Figure 6 was taken was not revised. Potential impact to this stream thus is overstated by Figure 6. Such inconsistencies characterize many among the many hundreds of drawings and other documents in the applications for this project.

As the Pennsylvania Independent Oil and Gas Association has stated, "applicants should be encouraged to construct projects in areas that have been previously impacted" (PADEP 2017c), and this applicant claimed maximum collocation of its proposed new pipelines with existing development. Mere approximate collocation adjacent to an existing pipeline, of course, is not the same as conscientiously minimizing wetland or forest impacts, as illustrated in Figures 5 through 8. Regulators hardly began to review these applications and request corrections before approving the permits, and their review questions and comments largely went unaddressed.[13]

FIGURE 3. First page of applicant's Corps data form for wetland W-L24 (Figures 1 and 2). NWI classification is properly noted as "None". Reported latitude and longitude of sampling point contradict Figure 1. No data support the erroneous summary conclusion of Cowardin PEM herbaceous cover, which is contradicted also by the applicant's ground-level photos, stream cover classification, and tree lines on drawings.

Project/Site: PPP City/County: Huntingdon County Sampling Date: 06/24/2014
Applicant/Owner: Sunoco State: PA Sampling Point: W-L24
Investigator(s): A. Grech, A. Stott Section, Township, Range:
Landform (hillslope, terrace, etc.): Valley bottom Local relief (concave, convex, none): concave Slope (%): 0-4%
Subregion (LRR or MLRA): LRRS Lat: 40.358046 Long: -78.006565 Datum: NAD 83
Soil Map Unit Name: Andover extremely stony loam, 0-8 percent slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✔ No ____
Hydric Soil Present? Yes ✔ No ____
Wetland Hydrology Present? Yes ✔ No ____
Is the Sampled Area within a Wetland? Yes ✔ No ____

Remarks:
Cowardin Code: PEM
HGM: Riverine
WT: RPWWD

HYDROLOGY

Wetland Hydrology Indicators:
Primary Indicators (minimum of one is required; check all that apply)
___ Surface Water (A1)
✔ High Water Table (A2)
✔ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)
___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
✔ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
✔ FAC-Neutral Test (D5)

Field Observations:
Surface Water Present? Yes ____ No ✔ Depth (inches): ____
Water Table Present? Yes ✔ No ____ Depth (inches): 4"
Saturation Present? (includes capillary fringe) Yes ✔ No ____ Depth (inches): 0"
Wetland Hydrology Present? Yes ✔ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

US Army Corps of Engineers Eastern Mountains and Piedmont – Version 2.0

WHAT REGULATORS SHOULD DO

Clearly large linear projects like pipelines are a challenge for regulators to evaluate given the length of the projects and funding/time constraints for regulatory review. In order to implement applicable statutes and regulations protecting aquatic resources in Pennsylvania,

13. The kinds of misrepresentation discussed above are not confined to major or linear projects in Pennsylvania. While completing this paper I became aware of a nearby 47-acre tract of mature, mostly non-wetland forest on steep slopes proposed as part of a suburban residential development adjacent to a water supply reservoir. The land was described accurately by this applicant's environmental consultant as consisting "entirely of woods," consistent with aerial photographs and field documentation. The applicant's engineer claimed in the permit application, however, that all onsite wetlands here to be destroyed permanently by roads and utilities were PEM, contradicting the attached consultant delineation report. State reviewers never noticed the contradictory information when authorizing permanent damage to wetlands and streams. Moreover, they issued federal CWA approval, despite the fact that the applicant did not commit to placing a permanent conservation easement on the 0.207 ha (0.512 ac) of acknowledged wetlands that could remain undisturbed onsite. Lacking such commitment, a stream and wetland fill application is "required" to undergo federal agency review and coordination pursuant to Pennsylvania Statewide Programmatic General Permit-5 prior to Corps approval (PADEP Instructions 3150-PM-BWEW0051, March 2018, p. 2), but this one did not. Sedimentation of the reservoir resulted from severe thunderstorms during clearcutting.

certain changes are necessary on the part of permit applicants and by federal and state regulators. I offer a few suggestions for improvement. Immediate practical changes are needed for permits affecting water resources: 1) require and provide accurate delineation and classification of potentially affected resources; 2) require and provide visible, in-field flagging of wetland boundaries to correspond with surveyed drawings that meet Corps accuracy requirements; 3) require and provide accurate identification and acknowledgment of actually minimized temporary and permanent damage to streams, wetlands, and buffers; 4) require and provide drawings that show planned post-construction site restoration in compliance with permit conditions and enabling compliance inspection; and 5) withhold permit approvals until complete, accurate, and consistent applications and drawings are submitted and reviewed by regulators on behalf of the public. Approved Corps Jurisdictional Determinations, supported by thorough agency field inspections, should be secured for all projects. PADEP should post all applications for 25 Pa. Code Chapter 102 and 105 permits online, so that the public can review such documents; considerable transparency can be easily achieved by such posting. Regulators should seriously consider comments received from the public, and there should be consequences for systematic misrepresentation of resources inventoried in permit applications.

Regulatory guidance needs clarification and updating by PADEP and by the Corps. There is no mention of the Cowardin classification in the ten regional supplements that update the 1987 Corps Manual.[14]

The minimum regulatory parcel size for reporting discrete cover classes on project sites should be specified, because it appears to be quite different from that used for National Wetlands Inventory purposes.[15] The definition of single and complete linear projects should be reconsidered, because it has the effect of deflecting attention from impact minimization and avoidance.

15. Agencies in Pennsylvania direct that wetland boundaries be drawn to +/- 15 cm (0.5 foot) horizontal accuracy (http://www.nab.usace.army.mil/Portals/63/docs/Regulatory/Pubs/checklist.pdf) and that tallies of wetland area be reported to the accuracy of 40 square meters (a 21-foot square or 0.01 acre) for permit applications (PADEP 2017d). Applicants have little incentive to comply.

FIGURE 4. Second page of applicant's Corps data form for wetland W-L24. No trees are recorded. Page 3 correctly records a hydric soil meeting "depleted matrix" (F3) criteria.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: W-L24

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		
Herb Stratum (Plot size: 5')			
1. Impatiens capensis	40	✔	FACW
2. Osmundastrum cinnamomeum	40	✔	FACW
3. Galium aparine	10		FACU
4. Onoclea sensibilis	5		FACW
5. Poa species	5		ND
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:
__ 1 - Rapid Test for Hydrophytic Vegetation
✔ 2 - Dominance Test is >50%
__ 3 - Prevalence Index is ≤3.0[1]
__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✔ No __

Remarks: (Include photo numbers here or on a separate sheet.)
ND- species not determined

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14. The undated online Army Corps Baltimore District "Regulatory Sourcebook" defines wetland types (a) with woody vegetation covering at least 20% of the ground as forest (trees >5 m or 16.4 ft tall) or scrub-shrub (shrubs <5 m tall) rather than the Cowardin 30% Class threshold and Cowardin 6 m (20 ft) break between trees and shrubs, and (b) as persistent emergent vegetation only when exhibiting 80% minimum total cover atop the soil or water (http://www.nab.usace.army.mil/Portals/63/docs/Regulatory/Pubs/sourcebook.pdf). Those definitions would yield more forest than the Cowardin definitions used in this paper, but apparently are not used by the District or PADEP.

FIGURE 5. Pipelines proposed as of November 2016 (red lines) adjacent to an existing mowed, treeless pipeline right-of-way in the forest matrix. Black arrows indicate the camera location of ground-level views in Figures 7 and 8. Applicant's proffered classifications for Wetland Q63 (toothed lines) in the study corridor are white for PEM, green for PSS. South of the proposed pipelines PEM designation is accurate, but not for the PFO north of them. Earlier site plans showed the new pipelines continuing westward across the public road along the north side of the existing pipeline corridor. Leaf-off airphoto is from online ESRI World Imagery, date not specified.

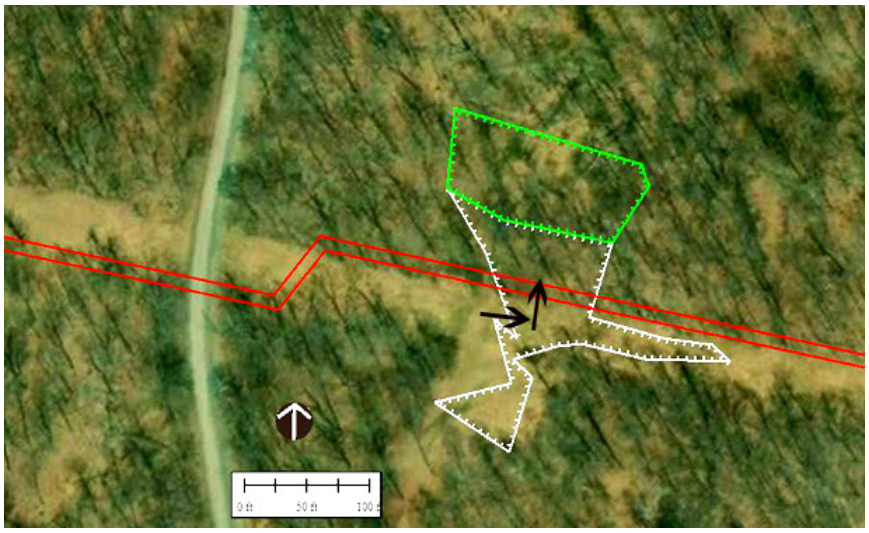
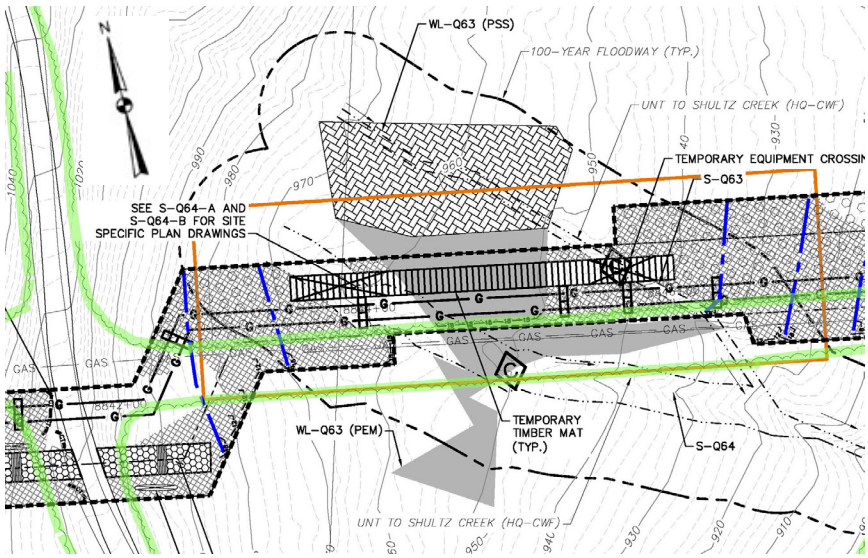


FIGURE 6. Excerpt from applicant's November 2016 erosion and sediment control plan for the area shown in Figure 5. Construction disturbance corridor width has been reduced to 15 m (50 ft) in the center of this crossing. The existing pipeline is labeled "-GAS-"; proposed new pipelines, "-G-". Stream channels are shown by thin dashed black lines with two dots inside regulated floodway limits marked by thick black lines with three dashes. The forest edge tree line along rights-of-way is shown by scalloped black lines highlighted here in green; black freestanding hexagons within the limits of disturbance denote existing riparian forest (hidden from view here beneath the erroneous PEM shading north of the existing pipeline).[16] Conterminous hexagons denote proposed rock construction entrances; square cross-hatch pattern, proposed erosion control blankets on steep slopes. Dashed blue lines are applicant's proposed permanent water bars. The "site specific plan drawings" referenced by the orange-boxed area show no replanting of riparian forest within temporary construction right-of-way, although such replanting is "required" by verbal permit condition to extend 150 feet from disturbed, previously forested streambanks of all Special Protection streams such as these.



16. Freestanding hexagons identifying preconstruction riparian forests are often hidden by this applicant's wetland patterns on erosion and sediment control plans.

CONCLUSION

The structural and functional losses in wetlands damaged by human activities worldwide are incurring "recovery debt" (Moreno-Mateos et al. 2015, 2017) that rarely is recovered completely despite human efforts at mitigation (Jones et al. 2018). This problem appears to be occurring in Pennsylvania, where forested wetlands go unrecognized and unmitigated, and their biological structure and especially their biogeochemical functions require many decades or centuries to recover, even where post-construction restoration is attempted (Ballantine and Schneider 2009; Moreno-Mateos et al. 2012; Jones et al. 2018).

From my field review of several projects, it appears that state and federal regulators of proposed impacts on aquatic resources in Pennsylvania too often remain oblivious to errors of cover classification (i.e., wetland type identification), wetland boundary delineation, and other aspects of environmental inventory, and fail to: a) require wetland boundary point flagging that is visible in the field, b) inspect and verify applicant-delineated wetland boundaries on construction sites, and c) demand complete, accurate, and consistent data in permit applications to damage streams and wetlands prior to granting permit approvals. Permit conditions for restoration and compensatory mitigation that on paper might appear protective of resources in fact are not.[17] Mistakes in reporting what might be thought simple, basic Cowardin Classes of wetlands in Pennsylvania, as well as appropriate acknowledgment of proposed damages, onsite restorations, and proposed offsite compensatory mitigation entered on project drawings and application summary tables, are now commonplace.

17. Pennsylvania also chooses not to require compensatory mitigation for impacts it broadly defines as "temporary" (viz., "those that are avoided or minimized, rectified by repairing, rehabilitating or restoring the impacted environment, or reducing or eliminating the impact over time by preservation or maintenance operations, and [thus] do not require compensatory mitigation…" [PADEP 2017c]). It further adds that "only permanent impacts must be assessed for meeting the applicable regulatory requirements pertaining to cumulative impacts for wetlands … and antidegradation impacts for streams …" (Ibid.). But in fact these are not assessed during actual permit reviews.

Moreover, consultants cannot assist the public, affected landowners, or regulators by verifying site inventories where site access is unavailable and where regulators do not follow up to resolve issues raised in comments provided during permit review. When consistent, accurate wetland inventory information is not required of applicants by regulators on behalf of the public prior to permit approval, compliance with regulatory "requirements" is precluded (Schmid & Co., Inc. 2000, 2014b, 2015, 2016a, 2016b; Helbing and Szybist 2014). Based on my observations, existing regulatory procedures need to be revised to promote the objectives of the wetland regulations. ■

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FIGURE 7. View east toward Schultz Ridge about 1.8 km (1.1 mile) distant, February 2017. PEM wetland (foreground at right) is in cleared right-of-way of existing pipeline with PFO wetland to north (left) mislabeled as PEM. The distribution of trees shown in the aerial photo (Figure 5) and by the applicant's treeline in Figure 6 is confirmed as accurate by field inspection. Several applicant drawings claim that PEM extends for 15 m (50 feet) to the north (left of the man in photo), in contradiction to the applicant's accurate tree canopy line on the north side of the existing pipeline corridor in Figure 6. Photo location is shown by horizontal arrow in Figure 5. Man stands in the same place along the tree line in Figures 7 and 8.

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FIGURE 8. View north directly into mislabeled, red maple-dominated PFO wetland across foreground PEM wetland in the cleared right-of way of the existing pipeline, February 2017. PFO extends northward through the alleged PEM and PSS wetlands here. All these trees subsequently were cut unnecessarily, and no proposed replanting of trees in "temporarily" disturbed sections of riparian forest is shown on applicant drawings. Photo location is depicted by the vertical black arrow in Figure 5. Man stands at same location as in Figure 7.

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