Pennsylvania Wetland Condition Level 2 Rapid Assessment Protocol

Version 2.0

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Waterways Engineering and Wetlands
Division of Wetlands, Encroachments and Training

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DOCUMENT NUMBER: 310-2137-002

TITLE: Pennsylvania Wetland Condition Level 2 Rapid Assessment

EFFECTIVE DATE: Upon publication of notice as final in the *Pennsylvania Bulletin*

AUTHORITY: The Dam Safety and Encroachments Act, Act of November 26, 1978, P.L. 1375, No. 325, as amended, 32 P.S. §§ 693.1 *et seq*.

POLICY: This document provides guidance for assessing the condition of wetland aquatic resources for use in applicable requirements under 25 Pa. Code Chapter 105 regulations.

PURPOSE: To provide standard guidelines for evaluating the condition of palustrine wetland aquatic resources for the purposes of meeting regulatory requirements contained in 25 Pa. Code Chapter 105. The guidance outlines how to conduct assessments, the factors to consider when doing so and establishes a scoring system based upon condition categories.

APPLICABILITY: The guidance document applies to persons performing wetland condition assessments for planning, permitting, compliance, compensation and other applicable requirements under 25 Pa. Code Chapter 105 regulations.

DISCLAIMER: The policies and procedures outlined in this guidance document are intended to supplement existing requirements. Nothing in the policies or procedures will affect regulatory requirements.

The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of the Department to give these rules that weight or deference. This document establishes the framework, within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

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Introduction

The Dam Safety and Encroachments Act requires a person to obtain a permit from the Department of Environmental Protection (DEP or Department) to construct, operate, maintain, modify, enlarge or abandon a dam, water obstruction or encroachment. 32 P.S. § 693.6(a). Regulations related to the dam safety and waterway management permitting process have been promulgated in Chapter 105 of Title 25 of the *Pennsylvania Code*. When impacts are proposed to a resource in connection with a proposed dam, water obstruction or encroachment, an applicant is required to, among other things, submit a mitigation plan with the application for an individual permit or the registration for a general permit in accordance with the definition of mitigation in Chapter 105. 25 Pa. Code § 105.13. The Department has developed this technical guidance to provide a methodology acceptable to the Department for the assessment of existing wetland resource conditions proposed to be impacted as part of a permit application.

This assessment protocol is neither a regulation, nor is intended to alter existing regulatory requirements. To the extent that restrictive language is used in this technical guidance, the restrictive language is intended to make sure that the assessment protocol is performed to assess the resources condition in a manner that the Department has determined is acceptable to attain the regulatory standard.

The Department recommends the use of this technical guidance to perform resource condition assessments. The Department may approve an alternative resource condition assessment (separate from and not contained in this technical guidance) if that methodology is determined by the Department to adequately identify and assess resource conditions for the purposes of meeting regulatory requirements under Chapter 105. Complete and legally defensible supporting documentation (justifications, calculations; etc.) must be included with the application to allow the Department to make an informed decision regarding the use of an alternative assessment protocol methodology. Additional application processing time may be necessary when using an alternative methodology because the methodology will require review and approval by the Director of the Bureau of Waterways Engineering and Wetlands prior to use in a final permit action.

The Department may require additional information necessary to adequately review a resource condition assessment or may require other information deemed necessary to review a proposed alternative resource condition assessment.

Background

This protocol is part of a comprehensive effort to ensure consistency in conducting aquatic resource condition assessments, impact assessments and compensation determinations. It was developed to provide information regarding the condition of natural wetlands for permit impact evaluation and compensatory mitigation purposes. This methodology is not intended to be used for water quality designation purposes. While this method was developed for establishing the condition of natural wetlands, it can also be used to evaluate restored and constructed wetlands as well as proposed projects seeking to restore or create wetlands based upon those plans and existing site conditions.

This protocol was developed by adapting the approach and scoring of previously developed and tested rapid assessment protocols (Brooks, 2002, 2007-11 and 2009). Little to no equipment is needed to use this protocol and a wetlands professional generally should be able to employ the protocol in less than one day not including preparation time, to ascertain the condition of a palustrine wetland after proficiency is developed.

This rapid condition assessment through the use of condition indices considers the condition of the zone of influence; the presence of roadbeds; wetland vegetation; and presence of vegetation, hydrologic, sediment and water quality stressors. These condition indices do not consider the abundance or types of fauna present, nor do they consider the water quality of the palustrine wetland resource. Therefore, this protocol seeks to assess wetland resources through evaluating the assessment area and surrounding lands based upon the departure from "reference standard" resource conditions.

This protocol can be used to satisfy certain Chapter 105 application requirements as described in the Department's permit application and environmental assessment forms and instructions available in its Online Library found at www.dep.pa.gov. This qualitative rapid assessment is designed to limit subjectivity and provide a representation of the resource condition associated with an established assessment area. The resulting palustrine wetland condition index may be used by applicants seeking Chapter 105 authorizations from the Department or by the Department when evaluating proposed project impacts and determining compensatory mitigation requirements.

Assessors should follow general professional standards and collect or utilize supporting information such as photographic documentation as appropriate or reference such materials contained in the application that support observations, professional judgments or other circumstances as deemed necessary to provide an accurate and true representation of the resource conditions.

1.0 Assessment Area

Prior to conducting the wetland condition assessment, the assessment area (AA) must be established. The utilization of aerial or satellite imagery is highly recommended for establishing the AA boundaries with follow-up field verification. The imagery should substantially assist the assessor in establishing and evaluating the wetland zone of influence area as discussed in **Section 2.0.** The AA is comprised of wetland area only and adjoining uplands are not included in the AA. However, adjoining uplands may comprise all or part of the wetland zone of influence as discussed in **Section 2.0**.

1.1 Determining Impact Area

Unless performing an assessment of an entire wetland as described in the first bullet under **1.2 Establishing the AA**, the area of wetland impact(s) must be determined for each discrete wetland. Impact acreage is calculated to the nearest one hundredth of an acre (0.00). Wetland impacts may be comprised of both temporary and permanent direct and indirect project effects. Generally, direct impacts have both acreage and functional losses in a given area, whereas indirect impacts result in a change in function without the loss of acreage in any given area.

- Direct impacts consist of filling, draining or conversion of a resource to another type such as a wetland to an open body of water. Examples include placement of fill in a wetland, placement of a box culvert in a stream, placement of fill in the floodplain, building a dam where the impoundment area will flood wetlands with a sufficient depth as to change the existing aquatic resource to another type of aquatic resource.

- Indirect impacts consist of altering the chemical, physical or biological components of an aquatic resource to the extent that changes to the functions of the resource results. However, indirect impacts do not result in a loss of resource acreage. Changes include such things as 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; altered hydrologic conditions (increases or decreases) such as stormwater discharges or water withdrawals that alter the chemical, physical or biological functions of the resource, etc.

In many instances, the project may affect more than one wetland area and AAs will need to be established for each wetland proposed to be affected. In rarer cases, a project may propose to affect a large wetland in multiple locations and depending upon case specific circumstances establishing the AA(s) may significantly differ. In unusual circumstances, the Department should be consulted prior to performing the assessment for advice.

1.2 Establishing the AA

When establishing the AA utilizing this assessment protocol to assess the condition of an entire wetland or large contiguous wetland area that is not part of a proposal to directly and/or indirectly affect a wetland, apply the following:

- The identified (delineated or mapped) wetland boundary will comprise the AA.

When establishing the AA utilizing this assessment protocol to assess the condition of a wetland area proposed to be effected directly and/or indirectly (impact area), apply the following, as appropriate:

- If the entire wetland proposed to be affected is less than or equal to 1.0 acre in size, then the entire wetland will comprise the AA regardless of the proposed impact size area; or

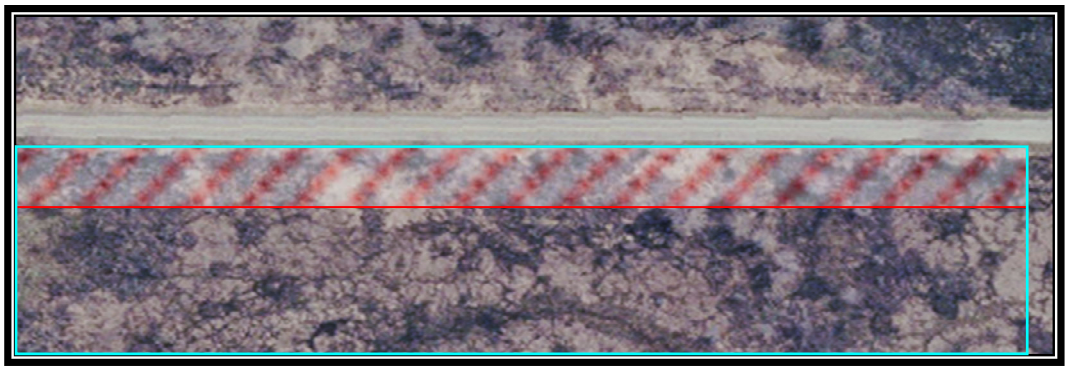
- If the impact is less than 1.0 acre in size and the wetland is greater than 1.0 acre, the AA is established around the proposed impact area until 1.0 acre in size is reached and the area provides a representative sampling of the wetland while still fully encompassing the proposed impact area; or

- If the proposed impact area is greater than 1.0 acre in size, then the AA is comprised entirely of the proposed wetland impact area.

1.3 Project AA Examples

In the example below, the wetland boundary is colored light blue; the red shaded area represents the proposed impact area. In this example, the proposed impact area is greater than 1.0 acre in size and therefore the AA is comprised of the proposed impact area only.

In the second example below, the wetland boundary is colored light blue; the red shaded area represents the proposed impact area. In this example, the proposed impact area is greater than 1.0 acre in size and therefore the AA will be comprised of the entire proposed impact area only.



In the third example below, the light blue line is the wetland boundary, the orange shaded area is the proposed impact area and the AA is the red shaded area. The proposed impact area is smaller than 1.0 acre in size and therefore the AA was adjusted around the proposed impact area to provide an AA that is equal to or greater than 1.0 acre in size.

Linear wetland features that are common in floodplains along streams may require a reduced AA if the linear wetland feature is less than 100 feet in width. In these instances, the assessor(s) may justify a smaller AA but under no circumstances should the AA be reduced below 0.5 acres in size for linear wetland features unless the entire linear wetland is less than 0.5 acres in size, in which case the entire wetland would comprise the AA.

2.0 Wetland Zone of Influence (ZOI) Condition Index

This condition index is not intended to be a detailed vegetative cover survey, but instead, a qualitative evaluation of the land cover types that make up the wetland ZOI surrounding the AA. The Wetland ZOI is determined by evaluating the percentage of total area of the wetlands ZOI that is occupied by each condition category. The wetland ZOI area is comprised of the lands extending 300 feet from the AA perimeter. This area may be comprised of uplands, wetlands or other aquatic resources such as waterways. The evaluation and scoring of the wetland ZOI condition is based upon visual observations of the area. The use of aerial photography is strongly recommended for initial condition category mapping prior to performing the assessment in the field. The initial condition category mapping combined with a visual observation of the ZOI is sufficient to provide adequate information to determine this condition index.

The optimal wetland ZOI vegetation would include land cover areas comprised of hardwood/conifer trees, wetlands, waterways and/or lacustrine resources (≥ 10 acres). All Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are categorized as optimal. It is highly likely that the ZOI area will contain land covers that meet multiple condition categories. If the land cover composite is heterogeneous (example: 33% forested, 33% cropland, and 34% pavement), each condition category present within the ZOI is scored and weighted based on the percentage of the total area it occupies within the ZOI. A percentage estimate of the total area that each cover type occupies is determined by using visual estimates of each different area to obtain its percentage of cover. The assessor will categorize and score the observed cover types accordingly, based upon the condition category descriptions. The assessor records the percentages on the form in decimal format (**0.00**).

The following equation is used for the Wetland ZOI Condition Index:

EQUATION: $$\text{WZOI CI} = \frac{\sum (\%\text{ZOI Areas} \times \text{Scores})}{20}$$

2.1 Wetland ZOI Condition Categories

The Wetland ZOI condition is assessed using the following four Condition Categories. The Wetland ZOI is the land extending 300 feet from the perimeter of the AA previously established in **Section 1.0**. The Wetland ZOI may be comprised of wetlands, uplands, waterways and/or floodplains.

1. Wetland Zone of Influence Condition Index

	Condition Category																			
Wetland Zone of Influence (300 foot area around AA perimeter)	**Optimal**					**Suboptimal**					**Marginal**					**Poor**				
	ZOI area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal.					**High Suboptimal:** ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.		**Low Suboptimal:** ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.			**High Marginal:** ZOI area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.		**Low Marginal:** ZOI area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.		**High Poor:** ZOI area vegetation consists of lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition.	**Low Poor:** ZOI area vegetation consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions.	**CI = Total Score/20**
SCORE ___	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**

1. Identify all applicable Condition Category areas within the wetland zone of influence using the descriptors above.
2. Estimate the % area within each condition category. Calculators are provided for you below.
3. Enter the % ZOI Area in decimal form (0.00) and Score for each category in the blocks below.

Total Score = SUM(%Areas*Scores)

	Condition Category:								**Total Score:**	
Scoring:	% ZOI Area:									**CI**
	Score:									
	Total Sub-score:									

Comments:

Optimal 20 - 16

ZOI area vegetation consists of a tree stratum (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal.

Suboptimal 15 - 11

High Suboptimal (15 - 13): ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.

Low Suboptimal (13 - 11): ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.

Marginal 10 - 6

High Marginal (10 - 8): ZOI area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover.

Low Marginal (8 - 6): ZOI area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.

Poor 5 - 1

High Poor (5 - 3): ZOI area vegetation consists of lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition.

Low Poor (3 - 1): ZOI area vegetation consists of impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions.

3.0 Roadbed Presence Condition Index

The presence of roadbeds is assessed in the same area established for the wetland ZOI. However, roadbeds are assessed in two distinct areas within the wetland ZOI. The first area is 100 feet in width (0-100 ft.) from the AA perimeter outward and the second area extends an additional 200 feet (100-300 ft.) to the outside perimeter of the wetland ZOI. Distances are measured outward from the AA perimeter. Roadbed proximity has been shown to be highly correlated to a decrease in wetland function due to factors such as an increase in invasive species, altering surface and subsurface water flow and source of pollutants.

The data used to evaluate roadbed presence uses the Roadbed Presence Worksheet to determine the scoring for each distance category. These scores are then used to assign a condition category for each of the distance categories. The condition category scores are established for each distance category independently since the resulting scores are weighted in the index. More emphasis is placed on the potential effect that roadbeds within 0-100 feet from the AA perimeter would have on the wetland. The two distance categories are weighted to reflect this in the Roadbed Presence Condition Index.

The Roadbed Presence Worksheet includes six roadbed types and two non-road options for scoring. The roadbed types are: 4 Lane Paved (or larger), 2 Lane Paved, 1 Lane Paved, Gravel Road, Dirt Road, and Railroad. A No Roadbeds and an Other Roadbeds option are also included in the worksheet. Examples of Other Roadbeds include parking lots, truck facilities, loading docks, trails, etc. The assessor(s) assigns the weighting factor for the Other Roadbeds category based upon best professional judgment (BPJ) of the effect the Other Roadbed is having on the wetland itself or the Wetland ZOI. The assessor will note why the weighting factor was selected in the comments section of the worksheet. The size of the roadbed, frequency of usage, and presence of stormwater management should all factor into assigning a weighting factor.

Pennsylvania Wetland Condition Level 2 Rapid Assessment Version 2.0 Roadbed Worksheet								
Project Name / Identifier			Date	Name(s) of Evaluator(s)				
Resource Identifier	AA #	Lat (dd)	Long (dd)	Notes:				
Roadbeds: Record the number of occurrences by roadbed type and distance category. Multiply the number of occurrences by the weighting factors for each roadbed type and distance category then sum the total score for each distance category. The total scores for each distance category are then compared to the condition category descriptions.								
Roadbed Type	Distance	Occurrences	Weighting Factor	Score	Distance	Occurrences	Weighting Factor	Score
>= 4 Lane Paved	0-100 ft.		4		100-300 ft.		4	
2 Lane Paved	0-100 ft.		2		100-300 ft.		2	
1 Lane Paved	0-100 ft.		1		100-300 ft.		1	
Gravel Road	0-100 ft.		1		100-300 ft.		1	
Dirt Road	0-100 ft.		2		100-300 ft.		2	
Railroad	0-100 ft.		2		100-300 ft.		2	
Other Roadbeds	0-100 ft.		1, 2 or 4		100-300 ft.		1, 2 or 4	
Total Scores:	0-100 ft.				100-300 ft.			

The following equation is used for the Roadbed Presence Condition Index:

EQUATION: $$\text{Roadbed Presence CI} = \frac{\sum(\text{a.categoryScore}*0.66)+(\text{b.categoryScore}*0.33)}{20}$$

3.1 Roadbed Presence Condition Categories

The presence and type of roadbeds occurring within wetland ZOI affects the overall performance of the Wetland ZOI. The Wetland ZOI is the land extending 300 feet from the AA perimeter (see establishing the Wetland ZOI in Section 2.0). The presence of roadbeds is measured in two different distance categories which include 0-100 feet and 100-300 feet. The distance categories are measured from the perimeter of the AA outward and the outside boundary of 300 feet coincides with the Wetland ZOI boundary.

The Roadbed Presence Worksheet as described above is used to establish the scores for each of the distance categories a) 0-100 ft. and b) 100-300 ft. The distance category score is then used to assign the condition category and the assessor then uses BPJ to select from the score from within the range for that condition category.

2. Roadbed Presence Index

	Condition Categories																			
a. Roadbed Presence (within 0 - 100 foot Wetland ZOI distance)	Optimal					Suboptimal					Marginal					Poor				
	High Optimal: No roadbeds present within 100 feet of the AA boundary			**Low Optimal:** Roadbed presence score within 0-100 feet of the AA boundary equal to or less than 2.		**High Suboptimal:** Roadbed presence score within 0-100 foot distance of the AA boundary is greater than to 2 but equal to or less than 4.			**Low Suboptimal:** Roadbed presence score within 0-100 foot distance of the AA boundary is greater than to 4 but less than or equal to 6.		**High Marginal:** Roadbed presence score within 0-100 foot distance of the AA boundary is greater than to 6 but less than or equal to 8.			**Low Marginal:** Roadbed presence score within 0-100 foot distance of the AA boundary is greater than to 8 but less than or equal to 10.		**High Poor:** Roadbed presence score within 0-100 foot distance of the AA boundary is greater than 10 but less than or equal to 12.			**Low Poor:** Roadbed presence score within 0-100 foot distance of the AA boundary is greater than 12.	
SCORE ___	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Comments:

	Condition Categories																				
b. Roadbed Presence (within 100 - 300 foot Wetland ZOI distance)	Optimal					Suboptimal					Marginal					Poor					CI = Total Score/20
	High Optimal: No roadbeds present within 100 - 300 feet of the AA boundary			**Low Optimal:** Roadbed presence score within 100 - 300 feet of the AA boundary equal to or less than 2.		**High Suboptimal:** Roadbed presence score within 100 - 300 feet of the AA boundary is greater than to 2 but equal to or less than 4.			**Low Suboptimal:** Roadbed presence score within 100 - 300 feet AA boundary is greater than to 4 but less than or equal to 6.		**High Marginal:** Roadbed presence score within 100 - 300 feet of the AA boundary is greater than to 6 but less than or equal to 8.			**Low Marginal:** Roadbed presence score within 100 - 300 feet of the AA boundary is greater than to 8 but less than or equal to 10.		**High Poor:** Roadbed presence score within 100 - 300 feet of the AA boundary is greater than to 10 but less than or equal to 12.			**Low Poor:** Roadbed presence score within 100 - 300 feet of the AA boundary is greater than 12.	
SCORE ___	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	

	Condition Score	Weighting	Sub-Scores
a. Roadbed 0-100:		* (0.67)	
b. Roadbed 100-300:		* (0.33)	
		Total Score:	

Comments:

Distance Category a (0-100 ft.) or b (100-300 ft.):

Optimal 20 - 16

High Optimal (20 - 18): No roadbeds present.

Low Optimal (18 - 16): Roadbeds may be present; score is equal to or less than 2.

Suboptimal 15 - 11

High Suboptimal (15 - 13): Roadbeds may be present; score is greater than 2 but less than or equal to 4.

Low Suboptimal (13 - 11): Roadbeds may be present; the score is greater than 4 but less than or equal to 6.

Marginal 10 - 6

High Marginal (10 - 8): Roadbeds may be present the score is greater than 6 but less than or equal to 8.

Low Marginal (8 - 6): Roadbeds may be present; the score is greater than 8 but less than or equal to 10.

Poor 5 - 1

High Poor (5 - 3): Roadbeds may be present; the score is greater than 10 but less than or equal to 12.

Low Poor (3 - 1): Roadbeds may be present; the score is greater than 12.

4.0 Vegetation Condition Index

The Vegetation Condition Index is comprised of two sub-indices that represent the overall vegetation condition of the wetland assessment area. The two sub-indices are Invasive Species Presence and Vegetation Stressor Presence. The scores from these two sub-indices are combined

and then divided by 40 the maximum potential score to determine the overall Vegetation Condition Index. The presence of invasive species has a great influence on the overall ecological health of a wetland and can affect biogeochemical processing and habitat functions. In many instances, the presence of vegetation stressors may provide opportunities for invasive species colonization.

The following equation is used to calculate the Vegetation Condition Index:

EQUATION: $$\text{Vegetation CI} = \frac{\sum(\text{Invasive Species} + \text{Vegetation Stressor Presence scores})}{40}$$

3. Vegetation Condition Index

	Condition Category																				
a. Invasive Species Presence	Optimal					Suboptimal					Marginal					Poor					
	High Optimal: No invasives present.		**Low Optimal:** <5% of the total AA contains invasive species.			**High Suboptimal:** >5% but less than 10% of the total AA contains invasive species.		**Low Suboptimal:** >10% but less than 20% of the total AA contains invasive species.			**High Marginal:** >20% but less than 30% of the total AA contains invasive species.		**Low Marginal:** >30% but less than 50% of the total AA contains invasive species.			> 50% of the total AA contains invasive species.				
SCORE ___	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
Comments:																					

	Condition Category																				
b. Vegetation Stressor Presence	Optimal					Suboptimal					Marginal					Poor					**CI = Total Score/40**
	High Optimal: No vegetation stressors present within the AA boundary.		**Low Optimal:** One vegetation stressor present within the AA boundary.			**High Suboptimal:** Two vegetation stressors present within the AA boundary.		**Low Suboptimal:** Three vegetation stressors present within the AA boundary.			**High Marginal:** Four vegetation stressors present within the AA boundary.		**Low Marginal:** Five vegetation stressors present within the AA boundary.			Greater than five vegetation stressors present within the AA boundary.					
SCORE ___	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
Comments:											**a. Invasive Sub-Score:**							**Total Score:**			
											b. Vegetation Sub-Score:										

4.1 Invasive Species Presence Sub Index

A list of the more common invasive and aggressive plants known to occur in Pennsylvania is provided in the Invasive Species Presence Worksheet. Many of these plants have wetland plant indicator statuses, but some are still undetermined. Others may list upland indicators, but they have been observed to occur in wetlands or otherwise effect wetlands. This list was derived from a variety of sources including, but not limited to, the PA Department of Conservation of Natural Resources, the U.S. National Park Service and The Alliance for the Chesapeake Bay.

This is a visual estimation of the presence of invasive species and percentage of areal coverage, but is not intended to be a detailed vegetative survey. If species listed on the Invasive Species Presence Worksheet are found within the AA, the aerial coverage percentage of each species is estimated and recorded on the worksheet under the appropriate percentage group heading. After this has been completed the percentage of relative coverage for all invasive species is estimated and entered on the row titled ***Total % relative cover of all invasives, collectively on site***. The Invasive Species Presence Worksheet is shown below to depict the format in which this information is collected and organized. After these data are collected and summarized, the assessor(s) can assign the correct condition category and score for this subindex.

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Invasive Species Presence Worksheet

Are invasive species (from list) present at the site in any layer? YES NO

If listed species present, enter the percent areal coverage for each species below:

Species Code	<5%	≥ 5-20%	≥ 20 - 50%	≥ 50%	*Species Code*	<5%	5-20%	20 - 50%	≥ 50%

Total % relative cover of all invasives, collectively on site: _____%

Comments:

Listed below are some of the more common invasive and aggressive species of concern in wetland areas. Species that are not listed below may be observed in the AA and can be recorded on the worksheet. Please provide the common and species name (if known) on the worksheet in lieu of the species code in such cases.

Common Invasives/Aggressives List

Code	Common Name	*Scientific*	Status	Code	Common Name	*Scientific*	Status
aggi2	Redtop	*Agrostis gigantea*	FACW	luhe	Water primrose	*Ludwigia hexapetala*	OBLW
algl2	European Alder	*Alnus glutinosa*	FACW	lyvu	Garden loosestrife	*Lysimachia vulgaris*	OBLW
arhi3	Carpetgrass	*Arthraxon hispidus*	FAC-	lysa2	Purple loosestrife	*Lythrum salicaria*	FACW
beth	Japanese barberry	*Berberis thunbergii*	FACW	maqu	European waterclover	*Marsilea quadrifolia*	OBLW
bevu	European barberry	*Berberis vulgaris*	FACW	mivi	Japanese stiltgrass	*Microstegium vimineu*	FAC
butom	Flowering Rush	*Butomus umbellatus*	OBLW	nami2	Water cress	*Nasturtium officinale*	OBLW
calli6	Pond water-starwort	*Callitriche stagnalis*	OBLW	pelo	Low smartweed	*Persicaria longiseta*	FACW
egde	Brazilian waterweed	*Egeria densa*	OBLW	phar	Reed canary grass	*Phalaris arundinacea*	FACW
elan	Russian olive	*Elaeagnus angustifolia*	FACU	phau7	Common Reed	*Phragmites australis*	OBLW
elum	Autumn olive	*Elaeagnus umbellata*	FACU	potr	Rough bluegrass	*Poa trivialis*	FACW
ephi	Hairy willow-herb	*Epilobium hirsutum*	FACW	pocu6	Japanese knotweed	*Polygonum (Faloia) cus*	FAC-
eppa5	Willow-herb	*Epilobium parviflorum*	FACW	pgpf	Mile-a-minute	*Polygonum perfoliatum*	FAC-
fasa	Giant knotweed	*Fallopia sachalinensis*	OBLW	puera	Kudzu-vine	*Pueraria lobata*	FAC-
gldi	Mudmats	*Glossostigma diandrum*	OBLW	pysp1	Apple/crabapple/pear	*Pyrus sp.*	FAC?
hola	Velvetgrass	*Holcus lanatus*	FAC	rhfr	Glossy Buckthorn	*Rhamnus frangula*	FAC-
huja	Japanese Hops	*Humulus japonicus*	FACU	romu	Multiflora rose	*Rosa multiflora*	FACU
loja	Japanese honeysuckle	*Lonicera japonica*	FAC-	tyan	Cattail (hybrid)	*Typha angustifolia*	OBLW
lomo	Morrow's honeysuckle	*Lonicera morrowii*	NI	tygl	Hybrid cattail	*Typha x glauca*	OBLW
lota	Tartarian honeysuckle	*Lonicera tatarica*	NI				

4.2 Invasive Species Presence Condition Categories

3. Vegetation Condition Index																				
	Condition Category																			
a. Invasive Species Prescence	Optimal					Suboptimal					Marginal					Poor				
	High Optimal: No invasives present.		**Low Optimal:** <5% of the total AA contains invasive species.			**High Suboptimal:** >5% but less than 10% of the total AA contains invasive species.		**Low Suboptimal:** >10% but less than 20% of the total AA contains invasive species.			**High Marginal:** >20% but less than 30% of the total AA contains invasive species.		**Low Marginal:** >30% but less than 50% of the total AA contains invasive species.			> 50% of the total AA contains invasive species.				
SCORE ___	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comments:																				

Optimal 20 - 16

High Optimal (20 - 18): No invasive species present within the AA perimeter.
Low Optimal (18 - 16): Less than or equal to 5% of the AA contains invasive species.

Suboptimal 15 - 11

High Suboptimal (15 - 13): Greater than 5% but less than or equal to 10% of the AA contains invasive species.
Low Suboptimal (13 - 11): Greater than 10% but less than or equal to 20% of the AA contains invasive species.

Marginal 10 - 6

High Marginal (10 - 8): Greater than 20% but less than or equal to 30% of the AA contains invasive species.
Low Marginal (8 - 6): Greater than 30% but less than or equal to 50% of the AA contains invasive species.

Poor 5 - 1

Greater than 50% of the AA contains invasive species.

4.3 Vegetation Stressor Presence Sub Index

The data used to evaluate vegetation stressor presence are obtained from the Stressor Worksheet. The eleven potential vegetation stressors related to this category include: mowing, moderate livestock grazing (within one year), selective tree harvesting/cutting (>50% removal within 5 years), right of way clearing (mechanical or chemical), clear cutting or brush cutting (mechanized removal of shrubs or tress), removal of woody debris, aquatic weed control (mechanical or chemical), excessive herbivory (wildlife related), plantations (conversion from natural tress species, including orchards) and other (provided as an option to capture any unusual stressors not provided on the worksheet). A description of the stressor identified as other must be provided on the worksheet.

When performing this assessment, the assessor(s) checks the Y box if the identified stressor is present within the AA, but if it is not present, then the N box is checked. If more than one right-of-way clearing stressor is present, then the total number of occurrences is recorded in the space provided. The number of stressor types present and the number of occurrences (when applicable) for each section is totaled and entered into the Total Number field(s) on the Stressor Worksheet. The total number of stressors

present for the Vegetation section of the Stressor Worksheet is then used to assign the condition category according to the descriptions listed below.

4.4 Vegetation Stressor Condition Categories

The extent to which a stressor is affecting the wetland AA may be qualified by the individual or team conducting the assessment by adjusting the score up or down after the condition category has been determined. This qualification is based upon the assessor's BPJ and the basis documented in the comments section.

3. Vegetation Condition Index																					
	Condition Category																				CI = Total Score/40
b. Vegetation Stressor Presence	Optimal					Suboptimal					Marginal					Poor					
	High Optimal: No vegetation stressors present within the AA boundary.			**Low Optimal:** One vegetation stressor present within the AA boundary.		**High Suboptimal:** Two vegetation stressors present within the AA boundary.			**Low Suboptimal:** Three vegetation stressors present within the AA boundary.		**High Marginal:** Four vegetation stressors present within the AA boundary.			**Low Marginal:** Five vegetation stressors present within the AA boundary.		Greater than five vegetation stressors present within the AA boundary.					
SCORE__	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
Comments:											a. Invasive Sub-Score:							Total Score:			
											b. Vegetation Sub-Score:										

Optimal 20 - 16

High Optimal (20 - 18): No vegetation stressors present within the AA perimeter.

Low Optimal (18 - 16): One vegetation stressor present within the AA perimeter.

Suboptimal 15 - 11

High Suboptimal (15 - 13): Two vegetation stressors present within the AA perimeter.

Low Suboptimal (13 - 11): Three vegetation stressors present within the AA perimeter.

Marginal 10 - 6

High Marginal (10 - 8): Four vegetation stressors present within the AA perimeter.

Low Marginal (8 - 6): Five vegetation stressors present within the AA perimeter.

Poor 5 - 1

Greater than five vegetation stressors present within the AA perimeter.

5.0 Hydrologic Modification Stressor Index

The data used to evaluate the hydrologic modification stressor presence are obtained from the Stressor Worksheet. The potential stressors related to this category include: ditching, tile draining or other dewatering methods; dike, weir or dam; filling or grading; dredging or excavation; stormwater inputs, microtopographic alterations (e.g., plowing, forestry bedding, skidder/ATV tracks), dead or dying trees (still standing); adjacent stream alteration (channelization or incision) and other (provided as an option to capture any unusual stressors not provided on the worksheet). A description of the stressor identified as other must be provided on the worksheet.

Note: Dead or dying trees attributed to beaver activity or emerald ash borer (or other identifiable insect infestation) should not be recorded as a stressor present. The assessor is responsible for recording observations in the comment section concerning presence of these conditions.

When performing this assessment, the assessor(s) checks the Y box if the identified stressor is present within the AA, but if it is not present, then the N box is checked. If a stressor related to ditching, tile draining or other dewatering methods; or stormwater inputs occurs more than once, then the total number of occurrences is recorded in the space provided. The number of stressor types present and the number of occurrences (when applicable) for each section is totaled and entered into the Total Number field(s) on the Stressor Worksheet. The total number of stressors present for the Hydrologic Modification section of the Stressor Worksheet is then used to assign the condition category according to the descriptions listed below.

The following equation is used for the Hydrologic Modification Stressor Index:

EQUATION: $$\text{Hydrologic Modification SI} = \frac{\text{Condition Category Score}}{20}$$

5.1 Hydrologic Modification Stressor Condition Categories

The extent to which a stressor is affecting the wetland AA may be qualified by the individual or team conducting the assessment by adjusting the score up or down once the condition category has been determined. This qualification is based upon the assessors BPJ and the basis documented in the comments section.

4. Hydrologic Modification Index

	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					CI = Total Score/20
Hydrologic Modification Stressor Presence	**High Optimal:** No hydrologic stressors present within the AA boundary.			**Low Optimal:** One hydrologic stressor present within the AA boundary.		**High Suboptimal:** Two hydrologic stressors present within the AA boundary.			**Low Suboptimal:** Three hydrologic stressors present within the AA boundary.		**High Marginal:** Four hydrologic stressors present within the AA boundary.			**Low Marginal:** Five hydrologic stressors present within the AA boundary.		Greater than five hydrologic stressors present within the AA boundary.					
SCORE___	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	

Comments:

Optimal 20 - 16

High Optimal (20 - 18): No hydrologic modification stressors present within the AA perimeter.

Low Optimal (18 - 16): One hydrologic modification stressor present within the AA perimeter.

Suboptimal 15 - 11

High Suboptimal (15 - 13): Two hydrologic modification stressors present within the AA perimeter.

Low Suboptimal (13 - 11): Three hydrologic modification stressors present within the AA perimeter.

Marginal 10 - 6

High Marginal (10 - 8): Four hydrologic modification stressors present within the AA perimeter.

Low Marginal (8 - 6): Five hydrologic modification stressors present within the AA perimeter.

Poor 5 - 1

Greater than five hydrologic modification stressors present within the AA perimeter.

6.0 Sediment Stressor Index

The data used to evaluate sediment stressor presence are obtained from the Stressor Worksheet. The ten identified potential stressors related to this category include: sediment deposits/plumes; eroding banks or slopes; active construction (earth disturbance for development), active plowing (plowing for crop planting in past year), intensive livestock grazing (in one year, ground is >50% bare), active selective forestry harvesting (within one year); active forest harvesting (within two years, includes roads, borrow areas, pads, etc.), turbidity (moderate concentration of suspended solids in the water column, obvious sediment discharges) and other (provided as an option to capture any unusual stressors not provided on the worksheet). A description of the stressor identified as other must be provided on the worksheet.

When performing this assessment, the assessor(s) checks the Y box if the identified stressor is present within the AA, but if it is not present, then the N box is checked. The number of stressor types present and the number of occurrences (when applicable) for each section is totaled and entered into the Total Number field(s) on the Stressor Worksheet. The total number of stressors present for the Sediment section of the Stressor Worksheet is then used to assign the condition category according to the descriptions listed below.

The following equation is used for the Sediment Stressor Index:

EQUATION: $$\text{Sediment SI} = \frac{\text{Condition Category Score}}{20}$$

6.1 Sediment Stressor Condition Categories

The extent to which a stressor is affecting the wetland AA may be qualified by the individual or team conducting the assessment by adjusting the score up or down once the condition category has been determined. This qualification is based upon the assessor's BPJ and the basis documented in the comments section.

5. Sediment Stressor Index																					
	Condition Category																				CI = Total Score/20
Sediment Stressor Presence	Optimal					Suboptimal					Marginal					Poor					
	High Optimal: No sediment stressors present within the AA boundary.		**Low Optimal:** One sediment stressor present within the AA boundary.			**High Suboptimal:** Two sediment stressors present within the AA boundary.		**Low Suboptimal:** Three sediment stressors present within the AA boundary.			**High Marginal:** Four sediment stressors present within the AA boundary.		**Low Marginal:** Five sediment stressors present within the AA boundary.			Greater than five sediment stressors present within the AA boundary.					
SCORE ___	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
Comments:																					

Optimal 20 - 16

High Optimal (20 - 18): No sediment stressors present within the AA perimeter.
Low Optimal (18 - 16): One sediment stressor present within the AA perimeter.

Suboptimal 15 - 11

High Suboptimal (15 - 13): Two sediment stressors present within the AA perimeter.
Low Suboptimal (13 - 11): Three sediment stressors present within the AA perimeter.

Marginal 10 - 6

High Marginal (10 - 8): Four sediment stressors present within the AA perimeter.
Low Marginal (8 - 6): Five sediment stressors present within the AA perimeter.

Poor 5 - 1

Greater than five sediment stressors present within the AA perimeter.

7.0 Water Quality Stressor Index

The Water Quality Stressor Index is comprised of two sub-indices that represent the overall water quality condition of the wetland assessment area. The two sub-indices are Eutrophication Stressor Presence and Contaminant Toxicity Stressor Presence. The scores from these two sub-indices are combined and then divided by 40 to determine the overall Water Quality Stressor Index.

The following equation is used for the Water Quality Stressor Index:

EQUATION: $$\text{Water Quality SI} = \frac{\sum(\text{Eutrophication} + \text{Contaminant/Toxicity subscores})}{40}$$

6. Water Quality Stressor Index

	Condition Category																			
a. Eutrophication Stressor Presence	Optimal					Suboptimal					Marginal					Poor				
	No eutrophication stressors present within the AA boundary.					One eutrophication stressors present within the AA boundary.					Two eutrophication stressors present within the AA boundary.					Three eutrophication stressors present within the AA boundary.				
SCORE ___	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Comments:

	Condition Category																				CI = Total Score/40
b. Contaminant / Toxicity Stressor Presence	Optimal					Suboptimal					Marginal					Poor					
	No contaminant / toxicity stressors present within the AA boundary.					One contaminant / toxicitystressors present within the AA boundary.					Two contaminant / toxicity stressors present within the AA boundary.					Three contaminant / toxicity stressors present within the AA boundary.					
SCORE ___	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	

Comments:

a. Eutrophication Score		**Total Score:**	
b. Contaminant Score			

7.1 Eutrophication Stressor Presence Sub Index

The data used to evaluate eutrophication stressor presence are obtained from the Stressor Worksheet. The four identified potential stressors related to this category include: direct discharges from agriculture feed lots, manure pits, aquaculture etc.; direct discharges from septic or sewage treatment systems; heavy or moderately heavy formation of algal mats and other (provided as an option to capture any unusual stressors not provided on the worksheet). A description of the stressor identified as other must be provided on the worksheet.

When performing this assessment, the assessor(s) checks the Y box if the identified stressor is present within the AA, but if it is not present, then the N box is checked. If a stressor related to direct discharges from agriculture feed lots, manure pits, aquaculture etc.; or direct discharges from septic or sewage treatment systems occurs more than once, then the total number of occurrences is recorded in the space provided. The number of stressor types present and the number of occurrences (when applicable) for each section are totaled and entered into the Total Number field(s) on the Stressor Worksheet. The total number of stressors present for the Eutrophication section of the Stressor Worksheet is then used to assign the condition category according to the descriptions listed below.

7.2 Eutrophication Stressor Condition Categories

The extent to which a stressor is affecting the wetland AA may be qualified by the individual or team conducting the assessment by adjusting the score up or down after the condition category has been determined. This qualification is based upon the assessor's BPJ and the basis documented in the comments section.

6. Water Quality Stressor Index																				
	Condition Category																			
a. Eutro-phication Stressor Prescence	Optimal					Suboptimal					Marginal					Poor				
	No eutrophication stressors present within the AA boundary.					One eutrophication stressors present within the AA boundary.					Two eutrophication stressors present within the AA boundary.					Three eutrophication stressors present within the AA boundary.				
SCORE ___	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Comments:																				

Optimal 20 - 16

No eutrophication stressors present within the AA perimeter.

Suboptimal 15 - 11

One eutrophication stressor present within the AA perimeter.

Marginal 10 - 6

Two eutrophication stressors present within the AA perimeter.

Poor 5 - 1

Three eutrophication stressors present within the AA perimeter.

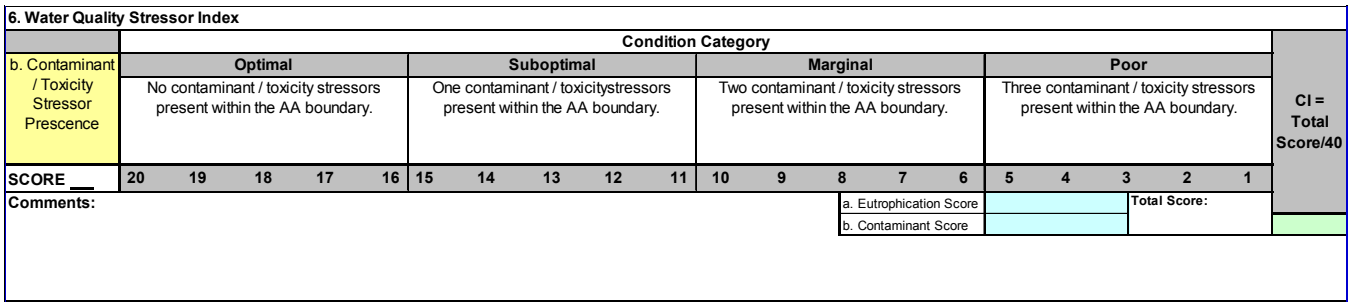
7.3 Contaminant/Toxicity Stressor Presence Sub Index

The data used to evaluate contaminant/toxicity stressor presence are obtained from the Stressor Worksheet. The seven identified potential stressors related to this category include: severe vegetation stress; obvious spills, discharges, plumes, and odors; acidic drainages (mined sites, quarries, road cuts); point source discharges from adjacent industrial facilities, landfills, railroad yards, or comparable sites; chemical defoliation (majority of herbaceous and woody plants affected (within one year), fish or wildlife kills or obvious disease or abnormalities observed; excessive garbage dumping/dumping; and other (provided as an option to capture any unusual stressors not provided on the worksheet). A description of the stressor identified as other must be provided on the worksheet.

When performing this assessment, the assessor(s) checks the Y box if the identified stressor is present within the AA, but if it is not present, then the N box is checked. If a stressor related to obvious spills, discharges, plumes, and odors; acidic drainages (mined sites, quarries, road cuts); or point source discharges from adjacent industrial facilities occurs more than once, then the total number of occurrences is recorded in the space provided. The number of stressor types present and the number of occurrences (when applicable) for each section are totaled and entered into the Total Number field(s) on the Stressor Worksheet. The total number of stressors present for the Contaminant/Toxicity section of the Stressor Worksheet is then used to assign the condition category according to the descriptions listed below.

7.4 Contaminant/Toxicity Stressor Condition Categories

The extent to which a stressor is affecting the wetland AA may be qualified by the individual or team conducting the assessment by adjusting the score up or down after the condition category has been determined. This qualification is based upon the assessor's BPJ and the basis documented in the comments section.



6. Water Quality Stressor Index																					
	Condition Category																				CI = Total Score/40
b. Contaminant / Toxicity Stressor Prescence	Optimal					Suboptimal					Marginal					Poor					
	No contaminant / toxicity stressors present within the AA boundary.					One contaminant / toxicitystressors present within the AA boundary.					Two contaminant / toxicity stressors present within the AA boundary.					Three contaminant / toxicity stressors present within the AA boundary.					
SCORE __	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
Comments:													a. Eutrophication Score					Total Score:			
													b. Contaminant Score								

Optimal 20 - 16

No contaminant/toxicity stressors present within the AA perimeter.

Suboptimal 15 - 11

One contaminant/toxicity stressor present within the AA perimeter.

Marginal 10 - 6

Two contaminant/toxicity stressors present within the AA perimeter.

Poor 5 - 1

Three contaminant/toxicity stressors present within the AA perimeter.

8.0 Overall Wetland Condition Index

The overall wetland condition index score is calculated by adding all of the previously calculated condition indices and dividing by 6, the total number of condition indices. Each condition index score should result in a value from 0.05 - 1.0. The overall wetland condition score should also result in a score from 0.05 - 1.0. If values greater than 1.0 result, then it is likely that the individual scores or the sub-indices were used and not the calculated condition indices. Space is provided on the Wetland Condition Assessment Form to perform this calculation.

The following equation is used to calculate the overall Wetland Condition Index:

EQUATION: $$WCI = \frac{\sum(\text{condition index scores})}{6}$$

NOTE: The Department may revise the WCI scores reported as part of an application for determining applicable compensatory requirements if the assessment submitted by the applicant does not adequately represent the resource condition.

Bibliography

Brinson, Mark M. 1993. USACOE Technical Report WRP-DE-4 *A Hydrogeomorphic Classification for Wetlands*.

Brooks, R. P., C. A. Cole, L. Bishel, D. H. Wardrop, D. J. Prosser, D. E. Arnold., and G. W. Petersen. 1995. Evaluating and implementing watershed approaches for protecting Pennsylvania's wetlands**.** Volumes 1 and 2. Final Report to PA Dep. Environ. Resour. and USEPA Region 3, ERRI Rep. No. 9506. Penn State Coop. Wetl. Ctr. Rep. No. 95-5. (See 96-2)

Brooks, R. P., C. A. Cole, D. H. Wardrop, L. Bishel-Machung, D. J. Prosser, D. A. Campbell, M. T. Gaudette. 1996. Wetlands, wildlife, and watershed assessment techniques for evaluation and restoration (W3ATER). Vol. 1, 2A, and 2B, Penn State Coop. Wetl. Ctr. Rep. No. 96-2, University Park. 782pp.

Brooks, R. P., D. H. Wardrop, and J. K. Perot. 1999. Development and application of assessment protocols for determining the ecological condition of wetlands in the Juniata River Watershed. U.S. Environ. Prot. Agency, Corvallis, OR. EPA/600/R-98-181. 30pp. (Project Description).

Brooks, R. P., D. H. Wardrop, and J. A. Bishop. 2002. Watershed-based protection for wetlands in Pennsylvania: Levels 1 & 2 - Synoptic maps and rapid field assessments. Final Report to Pennsylvania Dep. Environ. Prot. Report No. 2002-2, Penn State Coop. Wetl. Ctr,, University Park, PA. 66pp.

Brooks, R. P., D. H. Wardrop, and J. A. Bishop. 2004. Assessing wetland condition on a watershed basis in the Mid-Atlantic region using synoptic land cover maps. *Environmental Monitoring and Assessment;* 94(1):9-22.

Brooks, R. P. (ed.) 2004. Monitoring and Assessing Pennsylvania Wetlands. Final Report for Cooperative Agreement No. X-827157-01, between Penn State Cooperative Wetlands Center, Pennsylvania State University, University Park, PA and U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, D.C.

Brooks, R. P., G. P. Patil, S. Fei, A. I. Gitelman, W. L. Myers, and E. D. Reavie. 2007. Next generation of ecological indicators of wetland condition. *EcoHealth* 4(2):176-178.

Brooks, Robert, P. and D. H. Wardrop, with C. Hershner and K. Havens (VA Institute of Marine Science) Mid-Atlantic States Wetlands Assessment; 2007 – 2011. U.S. Environmental Protection Agency - ORD/NHEERL/MED (Unpublished, 2008. *Pennsylvania Rapid Assessment Protocol (PA-RAP) for Mid-Atlantic States Regional Wetlands Assessment.*)

Brooks R, McKenney-Easterling M, Brinson M, Rheinhardt R, Havens K, et al. (2009) A Stream-Wetland-Riparian (SWR) index for assessing condition of aquatic ecosystems in small watersheds along the Atlantic slope of the eastern U.S. Environmental Monitoring and Assessment 150: 101–117

Brooks, R. P., M. M. Brinson, K. J. Havens, C. S. Hershner, R. D. Rheinhardt, D. H. Wardrop, D. F. Whigham, A. D. Jacobs, and J. M. Rubbo. 2011. Proposed hydrogeomorphic classification for wetlands of the Mid-Atlantic Region, USA. Wetlands 31(2):207-219.

Eichelberger, B., E. Zimmerman, G. Podniesinski, T. Davis, M. Furedi, and J. McPherson. 2011. Pennsylvania Wetland Plant Community Rarity and Identification. Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy, Pittsburgh, PA.

Mid-Atlantic Tidal Wetland Rapid Assessment Method Version 1.0. Delaware Department of Natural Resources and Environmental Control; Division of Water Resources; 820 Silver Lake Blvd., Suite 220, Dover, DE 19904.

Mack, John and Kentula, Mary; EPA/600/R-10/140, Metric Similarity in Vegetation-Based Wetland Assessment Methods.

Rheinhardt, Richard, Mark Brinson, Robert Brooks, Mary McKenney-Easterling, Jennifer Masina Rubbo, Jeremy Hite, Brian Armstrong, 2007. Development of a reference-based method for identifying and scoring indicators of condition for coastal plain riparian reaches, Ecological Indicators, Volume 7, Issue 2, April 2007, Pages 339-361, ISSN 1470-160X, http://dx.doi.org/10.1016/j.ecolind.2006.02.007 .

Unified Stream Methodology (USM); January 2007. U.S. Army Corps of Engineers, Norfolk District and Virginia Department of Environmental Quality.

USDA-NRCS Technical Note No. 190-8-76. *Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service*. February 2008.

U.S. EPA. 2002. Methods for Evaluating Wetland Condition: Using Vegetation To Assess Environmental Conditions in Wetlands. Office of Water, U.S. Environmental Protection Agency, Washington, D.C. EPA-822-R-02-020.

Wardrop, D. H., J. K. Perot, and R. P. Brooks. 1999. Watershed modeling for water quality effects on wetlands. Final Rep. for PA Dept. of Environ. Prot., Div. Waterways, Wetlands, and Erosion Control. Penn State Coop. Wetl. Ctr. Rep. No. 99-2, University Park. 52pp.+appendices.

Wardrop, D. H., R. P. Brooks, L. Bishel-Machung, and C. A. Cole. 1998. Hydrogeomorphic (HGM) functional assessment models for Pennsylvania wetlands. Penn State Coop. Wetl. Ctr. Rep. No. 98--6, University Park. 50pp.

APPENDIX A

WETLAND CONDITION LEVEL 2 RAPID ASSESSMENT

WORKSHEETS AND ASSESSMENT SCORING FORM

Pennsylvania Wetland Condition Level 2 Rapid Assessment Version 2.0
Roadbed Worksheet

Project Name / Identifier			Date	Name(s) of Evaluator(s)
Resource Identifier	**AA #**	**Lat (dd)**	**Long (dd)**	**Notes:**

Roadbeds: Record the number of occurrences by roadbed type and distance category. Multiply the number of occurrences by the weighting factors for each roadbed type and distance category then sum the total score for each distance category. The total scores for each distance category are then compared to the condition category descriptions.

Roadbed Type	Distance	Occurrences	Weighting Factor	Score	Distance	Occurrences	Weighting Factor	Score
>= 4 Lane Paved	0-100 ft.		4		100-300 ft.		4	
2 Lane Paved	0-100 ft.		2		100-300 ft.		2	
1 Lane Paved	0-100 ft.		1		100-300 ft.		1	
Gravel Road	0-100 ft.		1		100-300 ft.		1	
Dirt Road	0-100 ft.		2		100-300 ft.		2	
Railroad	0-100 ft.		2		100-300 ft.		2	
Other Roadbeds	0-100 ft.		1, 2 or 4		100-300 ft.		1, 2 or 4	
Total Scores:	0-100 ft.				100-300 ft.			

Road Comments:

Pennsylvania Wetland Condition Level 2 Rapid Assessment
Version 2.0
Invasive Species Presence Worksheet

Are invasive species (from list) present at the site in any layer? YES NO

If listed species present, enter the percent areal coverage for each species below:

Species Code	<5%	≥ 5-20%	≥ 20 - 50%	≥ 50%	*Species Code*	<5%	≥ 5-20%	≥ 20 - 50%	≥ 50%

Total % relative cover of all invasives, collectively on site: _____%

Comments:

Common Invasives/Aggressives List

Code	Common Name	*Scientific*	Status	Code	Common Name	*Scientific*	Status
aggi2	Redtop	*Agrostis gigantea*	FACW	luhe	Water primrose	*Ludwigia hexapetala*	OBLW
algl2	European Alder	*Alnus glutinosa*	FACW	lyvu	Garden loosestrife	*Lysimachia vulgaris*	OBLW
arhi3	Carpetgrass	*Arthraxon hispidus*	FAC-	lysa2	Purple loosestrife	*Lythrum salicaria*	FACW
beth	Japanese barberry	*Berberis thunbergii*	FACW	maqu	European waterclover	*Marsilea quadrifolia*	OBLW
bevu	European barberry	*Berberis vulgaris*	FACW	mivi	Japanese stiltgrass	*Microstegium vimineum*	FAC
butom	Flowering Rush	*Butomus umbellatus*	OBLW	nami2	Water cress	*Nasturtium officinale*	OBLW
calli6	Pond water-starwort	*Callitriche stagnalis*	OBLW	pelo	Low smartweed	*Persicaria longiseta*	FACW
egde	Brazilian waterweed	*Egeria densa*	OBLW	phar	Reed canary grass	*Phalaris arundinacea*	FACW
elan	Russian olive	*Elaeagnus angustifolia*	FACU	phau7	Common Reed	*Phragmites australis*	OBLW
elum	Autumn olive	*Elaeagnus umbellata*	FACU	potr	Rough bluegrass	*Poa trivialis*	FACW
ephi	Hairy willow-herb	*Epilobium hirsutum*	FACW	pocu6	Japanese knotweed	*Polygonum (Faloia) cuspidatum*	FAC-
eppa5	Willow-herb	*Epilobium parviflorum*	FACW	pgpf	Mile-a-minute	*Polygonum perfoliatum*	FAC-
fasa	Giant knotweed	*Fallopia sachalinensis*	OBLW	puera	Kudzu-vine	*Pueraria lobata*	FAC-
gldi	Mudmats	*Glossostigma diandrum*	OBLW	pysp1	Apple/crabapple/pear	*Pyrus sp.*	FAC?
hola	Velvetgrass	*Holcus lanatus*	FAC	rhfr	Glossy Buckthorn	*Rhamnus frangula*	FAC-
huja	Japanese Hops	*Humulus japonicus*	FACU	romu	Multiflora rose	*Rosa multiflora*	FACU
loja	Japanese honeysuckle	*Lonicera japonica*	FAC-	tyan	Cattail (hybrid)	*Typha angustifolia*	OBLW
lomo	Morrow's honeysuckle	*Lonicera morrowii*	NI	tygl	Hybrid cattail	*Typha x glauca*	OBLW
lota	Tartarian honeysuckle	*Lonicera tatarica*	NI				

Pennsylvania Wetland Condition Level 2 Rapid Assessment Version 2.0 STRESSOR WORKSHEET	Occurrence in AA		
	Y	#'s	N
Vegetation Alteration			
Mowing			
Moderate livestock grazing (within one year)			
Crops (annual row crops, within one year)			
Selective tree harvesting/cutting (>50% removal, within 5 years)			
Right-of-way clearing (mechanical or chemical)			
Clear cutting or Brush cutting (mechanized removal of shrubs and saplings)			
Removal of woody debris			
Aquatic weed control (mechanical or herbicide)			
Excessive herbivory (deer, muskrat, nutria, carp, insects, etc.)			
Plantation (conversion from typical natural tree species, including orchards)			
Other:			
Total Number:			
Hydrologic Modification			
Ditching, tile draining, or other dewatering methods			
Dike/weir/dam			
Filling/grading			
Dredging/excavation			
Stormwater inputs (culvert or similar concentrated urban runoff)			
Microtopographic alterations (e.g., plowing, forestry bedding, skidder/ATV tracks)			
Dead or dying trees (trunks still standing)*			
Stream alteration (channelization or incision)			
Other:			
Total Number:			
Sedimentation			
Sediment deposits/plumes			
Eroding banks/slopes			
Active construction (earth disturbance for development)			
Active plowing (plowing for crop planting in past year)			
Intensive livestock grazing (in one year, ground is >50% bare)			
Active selective forestry harvesting (within one year)			
Active forest harvesting (within two years, includes roads, borrow areas, pads, etc.)			
Turbidity (moderate concentration of suspended solids in the water column, obvious sediment discharges)			
Other:			
Total Number:			
Eutrophication			
Direct discharges from agricultural feedlots, manure pits, etc.			
Direct discharges from septic or sewage treatment plants, fish hatcheries, etc.			
Heavy or moderately heavy formation of algal mats			
Other:			
Total Number:			
Contaminant/Toxicity			
Severe vegetation stress (source unknown or suspected)			
Obvious spills, discharges, plumes, odors, etc.			
Acidic drainages (mined sites, quarries, road cuts)			
Point discharges from adjacent industrial facilities, landfills, railroad yards, or comparable sites			
Chemical defoliation (majority of herbaceous and woody plants affected, within one year)			
Fish or wildlife kills or obvious disease or abnormalities observed			
Excessive garbage/dumping			
Other:			
Total Number:			

**** Dead or dying trees attributed to beaver activity or emerald ash borer (or other identifiable insect infestation) should not be recorded as a stressor present. The assessor is responsible for recording observations in the comment section concerning presence of these conditions.***

Wetland Condition Assessment Form

Pennsylvania Wetland Condition Level 2 Rapid Assessment Version 2.0

For use in all wetland classifications found within Pennsyvlania except those found within the banks of a watercourse.

Project #	Project Name	Date	Proposed Impact Size (acres)	AA #	AA Size (acres)	

Name(s) of Evaluator(s)	Lat (dd)	Long (dd)	Notes:

1. Wetland Zone of Influence Condition Index

	Condition Category					
	Optimal	Suboptimal		Marginal		Poor		CI = Total Score/20
Wetland Zone of Influence (300 foot area around AA perimeter)	ZOI area vegetation consists of a tree stratum present (diameter at breast height (dbh) > 3 inches) with greater than or equal to 60% tree canopy cover. Areas comprised of stream channels, wetlands (regardless of classification or condition) and lacustrine resources ≥ 10 acres are scored as optimal.	**High Suboptimal:** ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** ZOI area vegetation consists of a tree stratum (dbh > 3 inches) present, with greater than or equal to 30% and less than 60% tree canopy cover with a maintained understory.	**High Marginal:** ZOI area vegetation consists of non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with less than 30% tree canopy cover.	**Low Marginal:** ZOI area vegetation consists of non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, areas of hay production, and ponds or open water areas (< 10 acres). If trees are present, tree stratum (dbh > 3 inches) present, with less than 30% tree canopy cover with maintained understory.	**High Poor:** ZOI area vegetation consists of lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, pervious trails, recently seeded and stabilized, or other comparable condition.	**Low Poor:** ZOI area vegetation consists of impervious surfaces; mine spoil lands, denuded surfaces, row crops, active feed lots, impervious trails, or other comparable conditions.	
SCORE ___	20 19 18 17 16	15 14 13 12 11		10 9 8 7 6		5 4 3 2 1		

1. Identify all applicable Condition Category areas within the wetland zone of influence using the descriptors above.
2. Estimate the % area within each condition category. Calculators are provided for you below.
3. Enter the % ZOI Area in decimal form (0.00) and Score for each category in the blocks below.

Total Score = SUM(%Areas*Scores)

	Condition Category:							**Total Score:**	
Scoring:	% ZOI Area:								**CI**
	Score:								
	Total Sub-score:								

Comments:

2. Roadbed Presence Index

	Condition Categories					
	Optimal		Suboptimal		Marginal		Poor		
a. Roadbed Presence (within 0 - 100 foot Wetland ZOI distance)	**High Optimal:** No roadbeds present within 100 feet of the AA boundary	**Low Optimal:** Roadbed presence score within 0-100 feet of the AA boundary equal to or less than 2.	**High Suboptimal:** Roadbed presence score within 0-100 foot distance of the AA boundary is greater than to 2 but equal to or less than 4.	**Low Suboptimal:** Roadbed presence score within 0-100 foot distance of the AA boundary is greater than to 4 but less than or equal to 6.	**High Marginal:** Roadbed presence score within 0-100 foot distance of the AA boundary is greater than to 6 but less than or equal to 8.	**Low Marginal:** Roadbed presence score within 0-100 foot distance of the AA boundary is greater than to 8 but less than or equal to 10.	**High Poor:** Roadbed presence score within 0-100 foot distance of the AA boundary is greater than 10 but less than or equal to 12.	**Low Poor:** Roadbed presence score within 0-100 foot distance of the AA boundary is greater than 12.	
SCORE ___	20 19 18 17 16		15 14 13 12 11		10 9 8 7 6		5 4 3 2 1		

Comments:

	Condition Categories					
	Optimal		Suboptimal		Marginal		Poor		CI = Total Score/20
b. Roadbed Presence (within 100 - 300 foot Wetland ZOI distance)	**High Optimal:** No roadbeds present within 100 - 300 feet of the AA boundary	**Low Optimal:** Roadbed presence score within 100 - 300 feet of the AA boundary equal to or less than 2.	**High Suboptimal:** Roadbed presence score within 100 - 300 feet of the AA boundary is greater than to 2 but equal to or less than 4.	**Low Suboptimal:** Roadbed presence score within 100 - 300 feet AA boundary is greater than to 4 but less than or equal to 6.	**High Marginal:** Roadbed presence score within 100 - 300 feet of the AA boundary is greater than to 6 but less than or equal to 8.	**Low Marginal:** Roadbed presence score within 100 - 300 feet of the AA boundary is greater than to 8 but less than or equal to 10.	**High Poor:** Roadbed presence score within 100 - 300 feet of the AA boundary is greater than to 10 but less than or equal to 12.	**Low Poor:** Roadbed presence score within 100 - 300 feet of the AA boundary is greater than 12.	
SCORE ___	20 19 18 17 16		15 14 13 12 11		10 9 8 7 6		5 4 3 2 1		

	Condition Score	Weighting	Sub-Scores
a. Roadbed 0-100:		* (0.67)	
b. Roadbed 100-300:		* (0.33)	
		Total Score:	

Comments:

Wetland Condition Assessment Form

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Project #	Project Name	Date	Proposed Impact Size (acres)	AA #	AA Size (acres)	

3. Vegetation Condition Index

	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	
a. Invasive Species Presence	**High Optimal:** No invasives present. **Low Optimal:** <5% of the total AA contains invasive species.	**High Suboptimal:** >5% but less than 10% of the total AA contains invasive species. **Low Suboptimal:** >10% but less than 20% of the total AA contains invasive species.	**High Marginal:** >20% but less than 30% of the total AA contains invasive species. **Low Marginal:** >30% but less than 50% of the total AA contains invasive species.	> 50% of the total AA contains invasive species.	
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

Comments:

	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	
b. Vegetation Stressor Presence	**High Optimal:** No vegetation stressors present within the AA boundary. **Low Optimal:** One vegetation stressor present within the AA boundary.	**High Suboptimal:** Two vegetation stressors present within the AA boundary. **Low Suboptimal:** Three vegetation stressors present within the AA boundary.	**High Marginal:** Four vegetation stressors present within the AA boundary. **Low Marginal:** Five vegetation stressors present within the AA boundary.	Greater than five vegetation stressors present within the AA boundary.	**CI = Total Score/40**
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

Comments:

a. Invasive Sub-Score:		**Total Score:**
b. Vegetation Sub-Score:		

4. Hydrologic Modification Index

	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	
Hydrologic Modification Stressor Presence	**High Optimal:** No hydrologic stressors present within the AA boundary. **Low Optimal:** One hydrologic stressor present within the AA boundary.	**High Suboptimal:** Two hydrologic stressors present within the AA boundary. **Low Suboptimal:** Three hydrologic stressors present within the AA boundary.	**High Marginal:** Four hydrologic stressors present within the AA boundary. **Low Marginal:** Five hydrologic stressors present within the AA boundary.	Greater than five hydrologic stressors present within the AA boundary.	**CI = Total Score/20**
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

Comments:

5. Sediment Stressor Index

	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	
Sediment Stressor Presence	**High Optimal:** No sediment stressors present within the AA boundary. **Low Optimal:** One sediment stressor present within the AA boundary.	**High Suboptimal:** Two sediment stressors present within the AA boundary. **Low Suboptimal:** Three sediment stressors present within the AA boundary.	**High Marginal:** Four sediment stressors present within the AA boundary. **Low Marginal:** Five sediment stressors present within the AA boundary.	Greater than five sediment stressors present within the AA boundary.	**CI = Total Score/20**
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

Comments:

6. Water Quality Stressor Index

	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	
a. Eutro-phication Stressor Presence	No eutrophication stressors present within the AA boundary.	One eutrophication stressors present within the AA boundary.	Two eutrophication stressors present within the AA boundary.	Three eutrophication stressors present within the AA boundary.	
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

Comments:

	Condition Category				
	Optimal	Suboptimal	Marginal	Poor	
b. Contaminant / Toxicity Stressor Presence	No contaminant / toxicity stressors present within the AA boundary.	One contaminant / toxicitystressors present within the AA boundary.	Two contaminant / toxicity stressors present within the AA boundary.	Three contaminant / toxicity stressors present within the AA boundary.	**CI = Total Score/40**
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

Comments:

a. Eutrophication Score		**Total Score:**
b. Contaminant Score		

Overall Wetland Level 2 Condition Score: Sum all six of the Condition Indexes and divide by 6 to calculate the overall condition score.	**Index Score Totals:**
	Overall Condition Index:

General Comments: