BMP Expert Panel for Nontidal Wetland Rehabilitation, Creation and Enhancement

Wednesday, July 31, 2019

Welcome to the webcast! Everyone is currently muted. We will begin at 1:00pm.

Chesapeake Bay Program
Science. Restoration. Partnership.

VIRGINIA TECH

CENTER FOR WATERSHED PROTECTION

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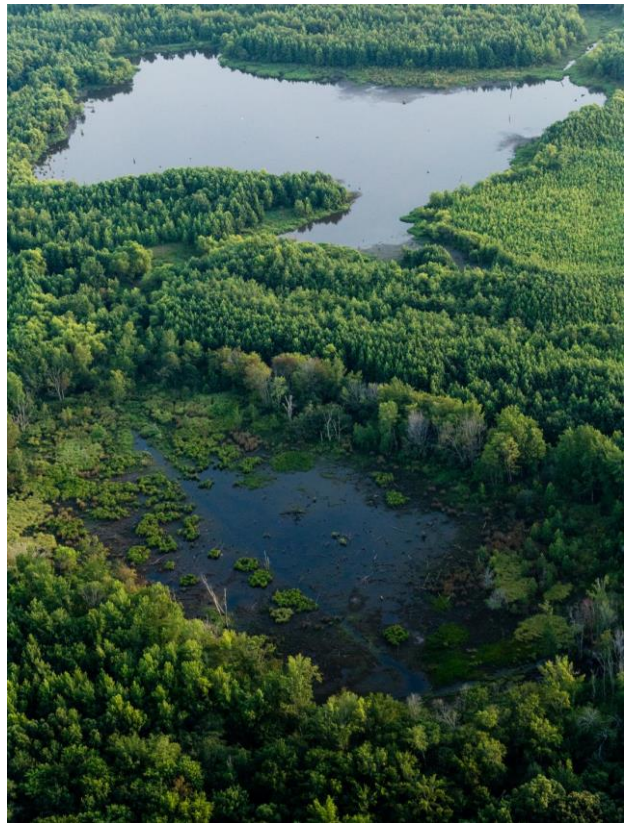
Getting started

- **If you can't hear me right now, please double-check your audio!**
- Click the "start audio" button in your Zoom control panel and follow the prompts to connect audio through either your computer or conference line
  - If Zoom control panel is hidden, hover your mouse over the minimized control panel at the bottom or top of your screen; "start audio" is on left-hand side of panel
- Participants are muted automatically to avoid disruptions.
- Please enter your questions for the speakers into the chat box throughout the webinar.
  - We will note your questions and pose them later in the webcast, or at pauses as able. Therefore please provide a slide number if your question refers to a specific slide.
- We are recording this session and will post the link to the CBP event calendar entry: https://bit.ly/30xdk2K

Jeremy Hanson
Virginia Tech, Panel Coordinator



Webcast Agenda

- Introduction and Overview of the Panel Process
- Background on Nontidal Wetlands, Watershed Model and Previous Wetland Expert Panel
- Summary of Panel Recommendations
- Current Panel's Logic Framework & Recommendations
- General Q&A (30 mins)

What is a BMP Expert Panel?

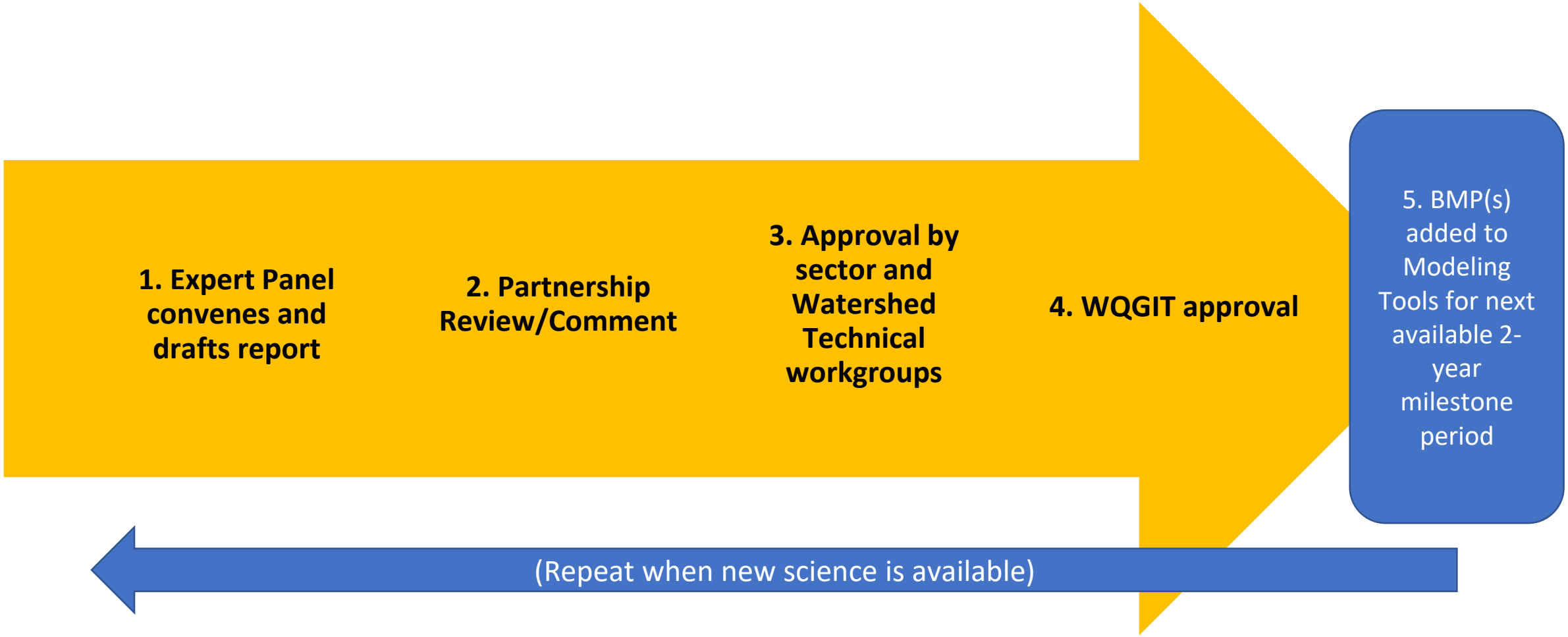
Best Management Practices (BMPs) are practices or technologies that reduce pollution loads when implemented or installed (can be structural, non-structural, programmatic)

Expert panels use the best available science and best professional judgment to inform the Chesapeake Bay Program partnership how much a BMP reduces pollution

- The panel writes a report with a lot of information in it
- They follow the BMP Protocol

Expert panels focus on the water quality benefits – specifically, the nitrogen, phosphorus and sediment reductions – associated with BMPs. They consider ancillary effects, too.

The “BMP Protocol” process (simplified)



Panel Charge and Membership

Panel Charge

- Formed to evaluate nitrogen, phosphorus and sediment reduction benefits of three nontidal wetland BMPs:
  - Rehabilitation
  - Enhancement
  - Creation
- Wetland Workgroup approved Charge for the panel, May 2017
- Charge and Scope of Work confirmed in September 2017 when panel membership was approved by the Wetland Workgroup

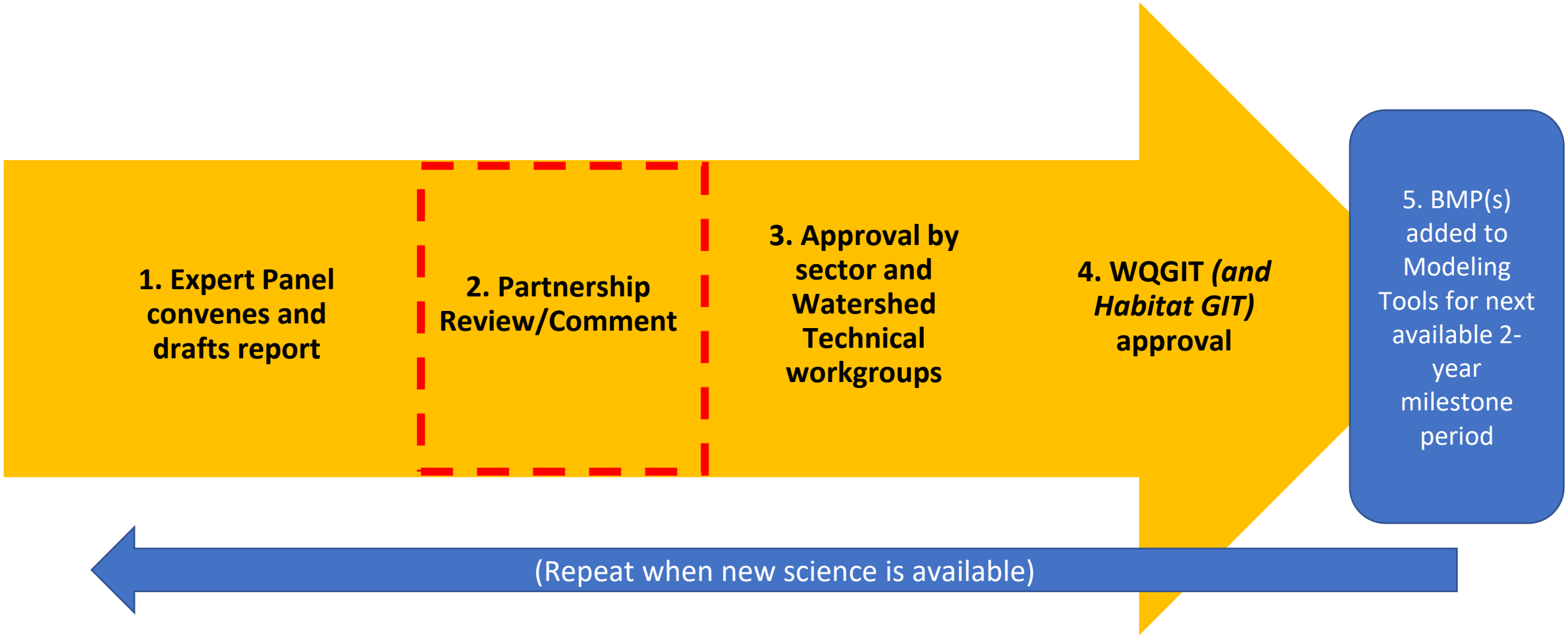
Panel membership and support roster

Name	Affiliation	Role
Neely L. Law, PhD	**The Center for Watershed Protection (CWP)**	**Panel Chair**
Kathleen Boomer, PhD	**Foundation for Food and Agriculture Research**	**Panel Member**
Jeanne Christie	**Christie Consulting Services LLC**	**Panel Member**
Greg Noe, PhD	**U.S. Geological Survey**	**Panel Member**
Erin McLaughlin	**Maryland DNR**	**Panel Member**
Solange Filoso, PhD	**Chesapeake Biological Lab**	**Panel Member**
Denice Wardrop, PhD, PE	**Penn State**	**Panel Member**
Scott Jackson	**University of Massachusetts**	**Panel Member**
Steve Strano	**NRCS-Maryland**	**Panel Member**
Rob Roseen, PhD, PE, D.WRE	**Waterstone Engineering**	**Panel Member**
Ralph Spagnolo	**EPA Region 3**	**Panel Member**
Jeremy Hanson	*Virginia Tech*	*Panel Coordinator*
Brian Benham	*Virginia Tech*	*VT Principal Investigator*
Lisa Fraley-McNeal	*CWP*	*Support*
Bill Stack	*CWP*	*Support*
Deb Caraco	*CWP*	*Support*
Jeff Sweeney	*EPA CBPO*	*CBPO Modeling Team and Watershed Technical Workgroup rep*
Carrie Traver	*EPA Region 3*	*EPA Region 3 rep*

Panel Timeline

- Membership approved by Wetland Workgroup in September 2017
- Convened for first call in November 2017
- Open stakeholder session: February 28, 2018 (https://bit.ly/2YlWHcI)
- 14 Panel meetings from November 2017 to June 2019
- Report posted and distributed: July 10-15, 2019
- **Feedback requested by COB August 15, 2019**
- Tentative timeline for decision/approval:
  - Wetland WG: Early September
  - Presentations to Urban Stormwater WG and Agriculture WG
  - Watershed Technical WG: Early October
  - WQGIT & HGIT: October or November

The “BMP Protocol” process (simplified)



Today's speakers

Neely Law, PhD

Panel Chair

Center for Watershed Protection

Kathy Boomer, PhD

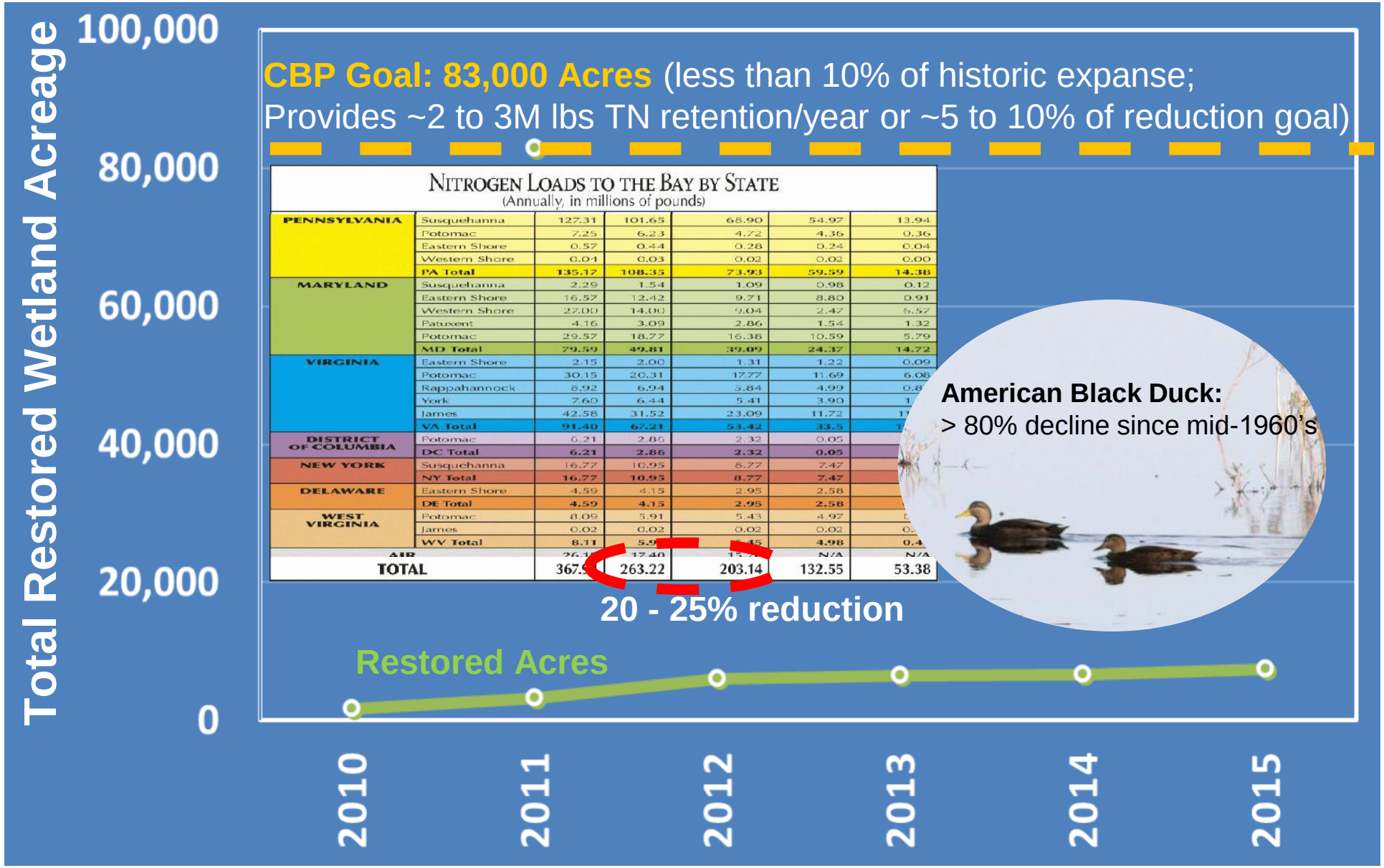
Panel member

Foundation for Food and Agriculture Research

Background: Wetlands and the Chesapeake Bay Watershed (Model)

Overview of the significance of wetlands in the Chesapeake Bay Watershed and Agreement

CBP 2014 Agreement: Wetland Restoration Goal



NITROGEN LOADS TO THE BAY BY STATE
(Annually, in millions of pounds)

PENNSYLVANIA	Susquehanna	127.31	101.65	68.90	54.97	13.94
	Potomac	7.25	6.23	4.72	4.36	0.36
	Eastern Shore	0.57	0.44	0.28	0.24	0.04
	Western Shore	0.04	0.03	0.02	0.02	0.00
	PA Total	**135.17**	**108.35**	**73.93**	**59.59**	**14.38**
MARYLAND	Susquehanna	2.29	1.54	1.09	0.98	0.12
	Eastern Shore	16.57	12.42	9.71	8.80	0.91
	Western Shore	27.00	14.00	9.04	2.47	6.57
	Patuxent	4.16	3.09	2.86	1.54	1.32
	Potomac	29.57	18.77	16.38	10.59	5.79
	MD Total	**79.59**	**49.81**	**39.09**	**24.37**	**14.72**
VIRGINIA	Eastern Shore	2.15	2.00	1.31	1.22	0.09
	Potomac	30.15	20.31	17.77	11.69	6.08
	Rappahannock	8.92	6.94	5.84	4.99	0.8
	York	7.60	6.44	5.41	3.90	1
	James	42.58	31.52	23.09	11.72	11
	VA Total	**91.40**	**67.21**	**53.42**	**33.5**	**1**
DISTRICT OF COLUMBIA	Potomac	6.21	2.86	2.32	0.05	
	DC Total	**6.21**	**2.86**	**2.32**	**0.05**	
NEW YORK	Susquehanna	16.77	10.95	8.77	7.47	
	NY Total	**16.77**	**10.95**	**8.77**	**7.47**	
DELAWARE	Eastern Shore	4.59	4.15	2.95	2.58	
	DE Total	**4.59**	**4.15**	**2.95**	**2.58**	
WEST VIRGINIA	Potomac	8.09	5.91	5.43	4.97	
	James	0.02	0.02	0.02	0.02	0.
	WV Total	**8.11**	**5.9**	**5.45**	**4.98**	**0.4**
AIR		26.1	17.40	15.[illegible]	N/A	N/A
TOTAL		367.5	263.22	203.14	132.55	53.38

http://www.chesapeakebay.net/

Wetlands and the Phase 6 Model

Recommendations from the 2016 Wetlands Expert Panel and their implementation in the Phase 6 Model

I. Key Definitions

The Starting Point – Frame of Reference

BMP Category /Applicable NRCS Practice Standard	**CBP Definition (for Phase 6 CBWM)**	**CBP will count the BMP acres as...**	**Operational Definitions**
Restoration Applicable NRCS Practice 657	Re-establish The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former wetland.	Acreage gain *(toward Watershed Agreement outcome of 85,000 acre wetland gain and in Phase 6 annual progress runs)*	• No wetland currently exists • Hydric soils present • "Prior converted" • **Result**: Wetland acreage and functional gain
Creation Applicable NRCS Practice 658	Establish (or Create) The manipulation of the physical, chemical, or biological characteristics present to develop a wetland that did not previously exist at a site.	Acreage gain *(toward Watershed Agreement outcome of 85,000 acre wetland gain and in Phase 6 progress runs)*	• No wetland currently exists • Hydric soils not present • **Result**: Wetland acreage and functional gain

I. Key Definitions

The Starting Point – Frame of Reference

BMP Category /Applicable NRCS Practice Standard	**CBP Definition (for Phase 6 CBWM)**	**CBP will count the BMP acres as...**	**Operational Definitions**
Enhancement Applicable NRCS Practice 659	Enhance The manipulation of the physical, chemical, or biological characteristics of a wetland to heighten, intensify, or improve a specific function(s).	Function gain *(toward 150,000 acre outcome and Phase 6 annual progress runs)*	• Wetland present • Some functions may be suboptimal • **Result**: Gain in wetland function
Rehabilitation May include some NRCS Code 657 practices.[1]	Rehabilitate The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded wetland.	Function gain *(toward 150,000 acre outcome and Phase 6 annual progress runs)*	• Wetland present • Wetland conditions/functions degraded • **Result**: Gain in wetland function

First Wetland Expert Panel (WEP2016; convened 2014 to 2016)

- Full report approved December 2016
  - https://www.chesapeakebay.net/documents/Wetland_Expert_Panel_Report_WQGIT_approved_December_2016.pdf
- Two land uses for nontidal wetlands in Phase 6, lowest loading rates, equal to pristine Forest
  - Floodplain
  - Other
- Described four BMP categories:
  - Restoration
  - Creation*
  - Enhancement*
  - Rehabilitation*
- Defined reductions for Restoration BMP based on framework described in report; other 3 categories (*) required another panel

Sediment Retention Capacity:

Retention ~ f (input concentration, reaction rate)

Initial concentration~ Input Loads

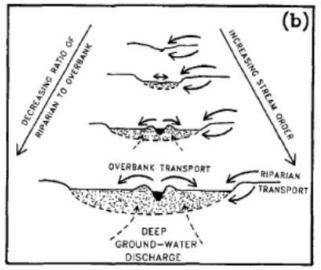
- Amount/rate of contamination in inflow (surface- and ground-waters)
- Portion of contaminated water that actually intersects carbon-rich substrate rather than by-passing wetland system

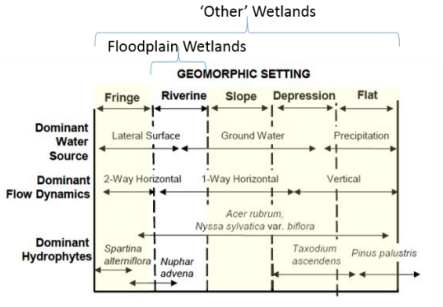
Retention Efficiency ~ Reaction Rate ~ Retention Potential

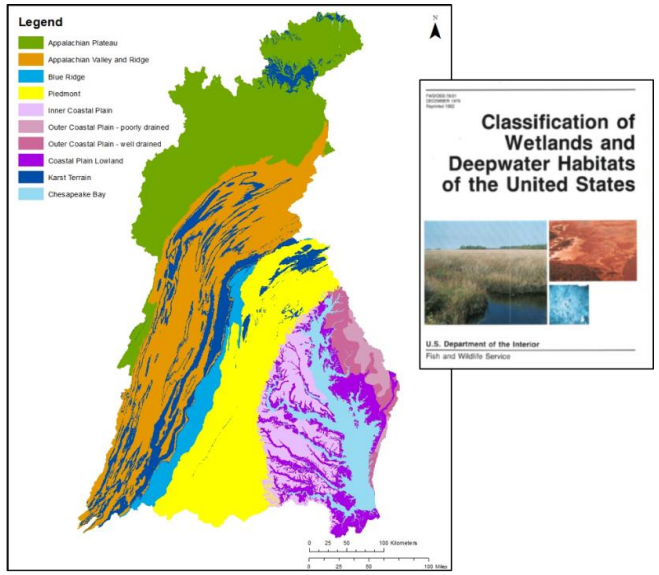
- Soil carbon availability
- Water chemistry
- Temperature

First Wetland Expert Panel (WEP2016; convened 2014 to 2016)

Logic Framework: Wetland Forms and Distributions across the Chesapeake Bay Watershed







Physiographic Province	Other Wetlands			Floodplain Wetlands
	Flats	Depressional Wetlands	Sloping Wetlands	
Appalachian Plateau		-moraine depressions	- Aquifer outcrops - Small tributary riparia	-valley floors, above bedrock outcrops
Appalachian Ridge & Valley		- Aquifer outcrops - Fractured rock springs	- Small tributary riparia - Slope breaks	- Medium to large waterways
Blue Ridge		- Ridgetops	- Fractured bedrock outcrops - Riparia	- Tributary confluences - Medium to large waterways
Piedmont			- Fractured bedrock outcrops - riparia	Eroded stream/river terraces
Inner Coastal Plain			- Small streams, floodplain edges	Small to large waterways
Outer Coastal Plain - Poorly drained uplands	Watershed divides	Watershed divides	- Small (natural and artificial) tributary riparia	Small to large waterways
Outer Coastal Plain - - Well drained uplands			- Small tributary riparia	Small to large waterways
Coastal Plain Lowlands	Watershed divides		- Small (natural and artificial) tributary riparia	Bottom lands
Karst terrain - Appalachian Plateau - Appalachian Ridge & Valley - Piedmont		Tubular springs	Outcrops, slope breaks, springs	

Wetland land uses in the Phase 6 Watershed Model

- Two land uses for nontidal wetlands
  - Floodplain (light green land cover)
  - Other or Headwater/Depressional (dark blue)
- Tidal wetlands (light blue) are simulated in the estuarine model, not the watershed model
- Approx. 1.32M acres of nontidal wetlands within Watershed (2018 Progress base conditions from CAST)
  - Nearly 700k in Floodplain; remaining ~620k in Other

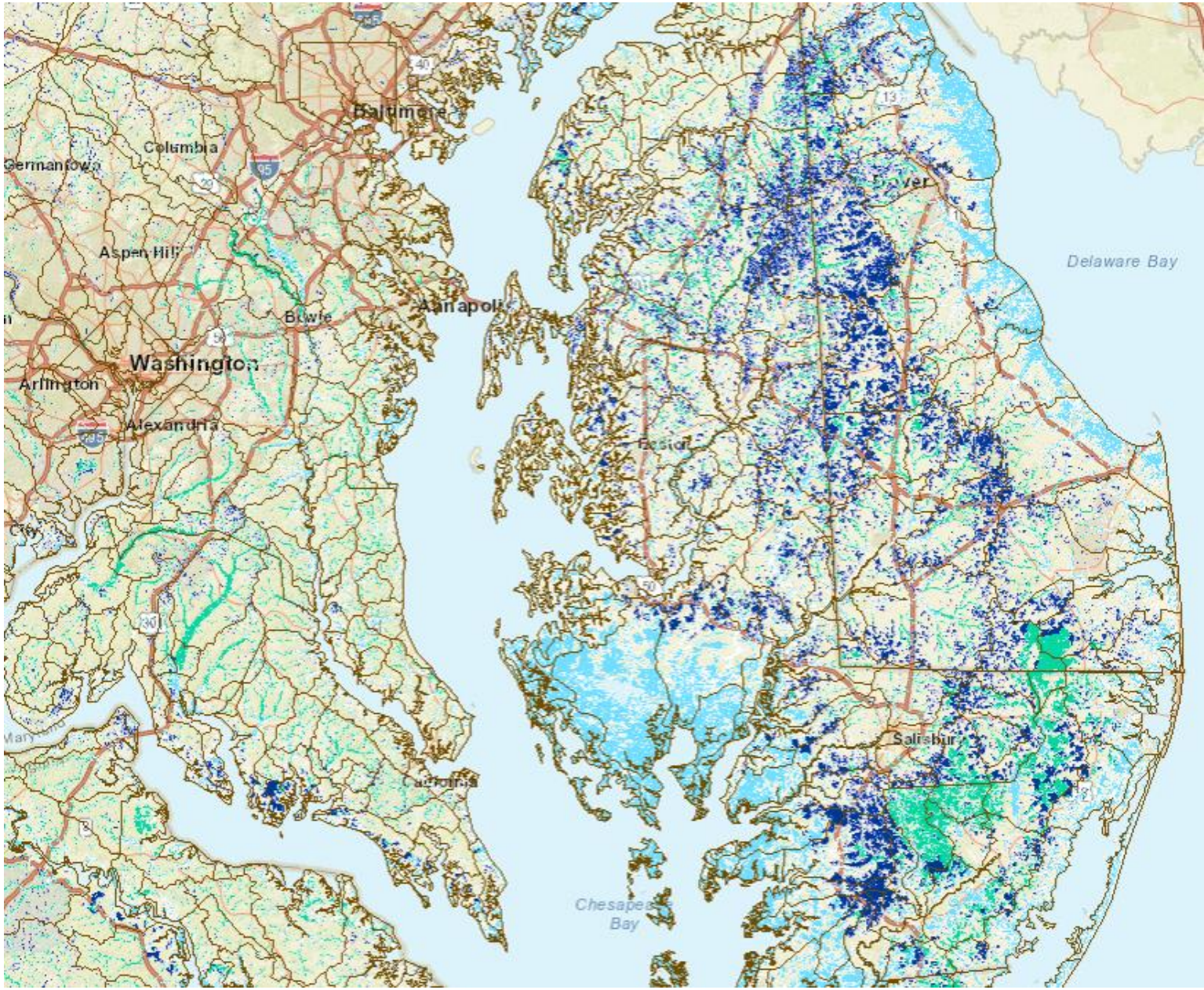
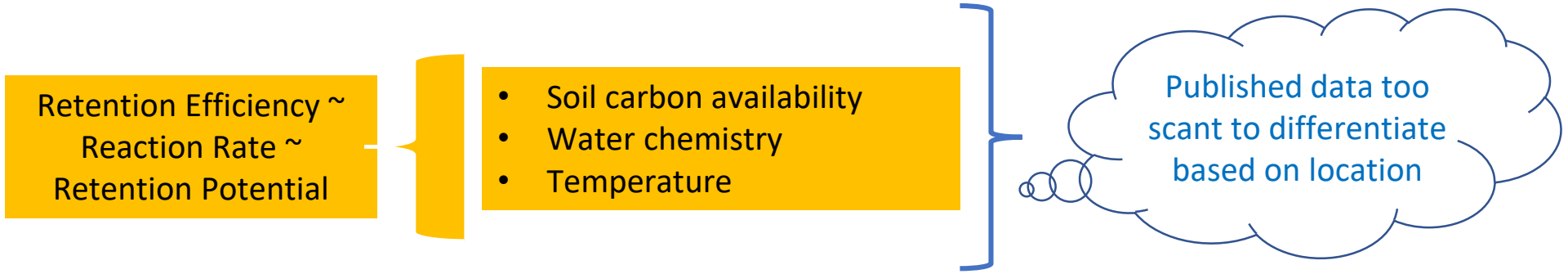


Image from Chesapeake Bay Phase 6 Land Use Viewer, 7/23/19: https://chesapeake.usgs.gov/phase6/map/
Image is for illustrative purposes only. Only layers for nontidal and tidal wetlands are shown.

Literature Review: Wetland Retention Efficiencies



- WEP2016 recommendation for wetland restoration BMP retention efficiencies

		TN	TP	TSS
All wetlands, except constructed	Mean	42%	40%	31%
	Range	-8-97	-47-100	-30-95
	Median	39%	41%	27%
	N	(36)	(64)	(15)

Summary of P6 Wetland Restoration BMP Function across the CB Watershed

	% Efficiency			Upland Acres Treated	
Physiographic Province	**TN**	**TP**	**TSS**	**Other Wetlands**	**Floodplain Wetlands**
Appalachian Plateau	**42**	**40**	**31**	**1**	**2**
Appalachian Ridge and Valley				**1**	**2**
Blue Ridge				**2**	**3**
Piedmont				**2**	**3**
Inner Coastal Plain				**4**	**6**
Outer Coastal Plain- Poorly Drained				**1**	**2**
Outer Coastal Plain- Well Drained				**2**	**3**
Coastal Plain Lowland				**2**	**3**
Karst Terrain				**2**	**3**

Efficiency values currently in Phase 6 CBWM

- Placeholder efficiencies were adopted for the Rehabilitation, Creation and Enhancement BMP categories in 2016. The efficiency rate was an average of the Phase 5.3.2 Watershed Model efficiency for "wetland restoration" BMP. Creation had additional reduction associated with land use change.

	TN removal (%)	TP removal (%)	TSS removal (%)	Upland acres treated per acre of BMP
Restoration	42	40	31	Varies by HGMR
Creation	**16.75**	**32.18**	**9.82**	**1**
Rehabilitation	**16.75**	**32.18**	**9.82**	**1**
Enhancement	**16.75**	**32.18**	**9.82**	**1**

Average from CBP5.3 retention efficiencies by region

WEP2016 Key Concerns:

- **WEP2016 Panel did not adequately address differences in retention capacity due to bmp type (i.e., restored vs created, enhanced or rehabilitated.***
- Representation of natural wetland retention benefits averaged across land use types through CBP Phase 6 calibration and may not adequately capture the unique benefits provided by natural (i.e., currently mapped) wetlands.
- Lack of data to describe how wetland nutrient and sediment retention efficiencies vary based on hydrogeologic setting, watershed position, and climate conditions.

*** Current WEP (2019) Charge**

Wetland Creation, Rehabilitation and Enhancement Expert Panel

Outline: Wetland Creation, Rehabilitation and Enhancement

I. Summary of Recommendations
II. Key Definitions
III. Methods, Results and Key Findings
IV. Recommendations
V. Qualifying conditions
VI. Accountability Mechanisms
VII. Unintended Consequences

Summary of Recommendations of the Current Wetland Expert Panel (WEP2019)

I. Summary of Recommendations

- Revised efficiency values for Wetland Creation and Wetland Rehabilitation BMPs, based on panel's multiple methods and best understanding of water quality "uplift"
- Panel agreed that wetland enhancement could not be supported as a BMP for water quality
- Recommended efficiency values and upland treated acres:

	TN removal (%)	TP removal (%)	TSS removal (%)	Upland acres treated per acre of BMP
Restoration*	*42*	*40*	*31*	*Varies by HGMR*
Creation	30	33	27	Report drainage area; if not, 1:1 for "other wetlands; 1.5:1 for floodplain wetlands
Rehabilitation	16	22	19	Report drainage area; if not, 1:1 for "other wetlands; 1.5:1 for floodplain wetlands
Enhancement	Not recommended			

**No change to WEP2016 values for Wetland Restoration. The information is provided for reference.*

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II. Key Definitions

- **Degraded wetland:** Refers to a wetland area where impacts to hydrology, soils, or vegetation impede the wetland's ability to function. Assessment methods can be used to determine whether a particular resource is degraded, based on the chosen threshold(s). Best professional judgment may also be used to identify degraded resources in situations where appropriate assessment methods are not available.
- **Efficiency:** A net efficiency, or "lift" is defined to express the percent improvement in nutrient and sediment reduction provided by a wetland BMP. The net efficiency is defined by the difference in the output nutrient and sediment loads pre- and post-treatment and expressed as a percentage.

Illustration of how the term ‘efficiency’ - *the difference in the output loads pre- and post-treatment*

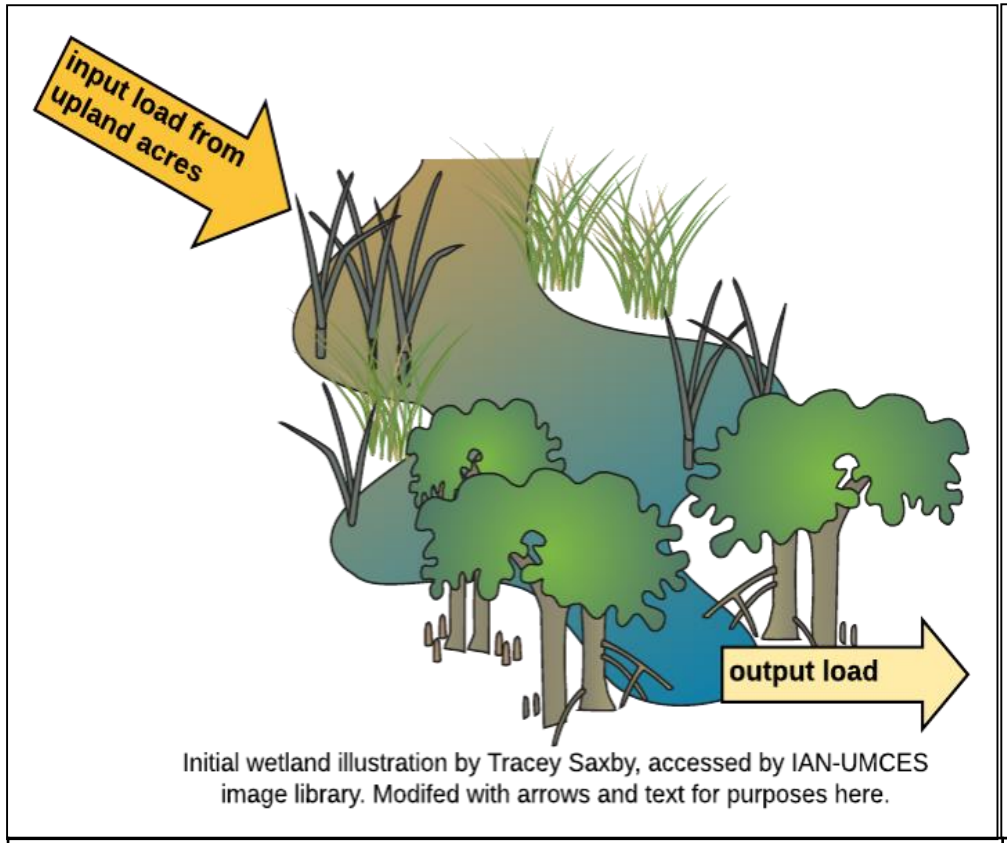

Figure D-1. Baseline or pre-treatment condition, with wetland present but conditions are degraded.

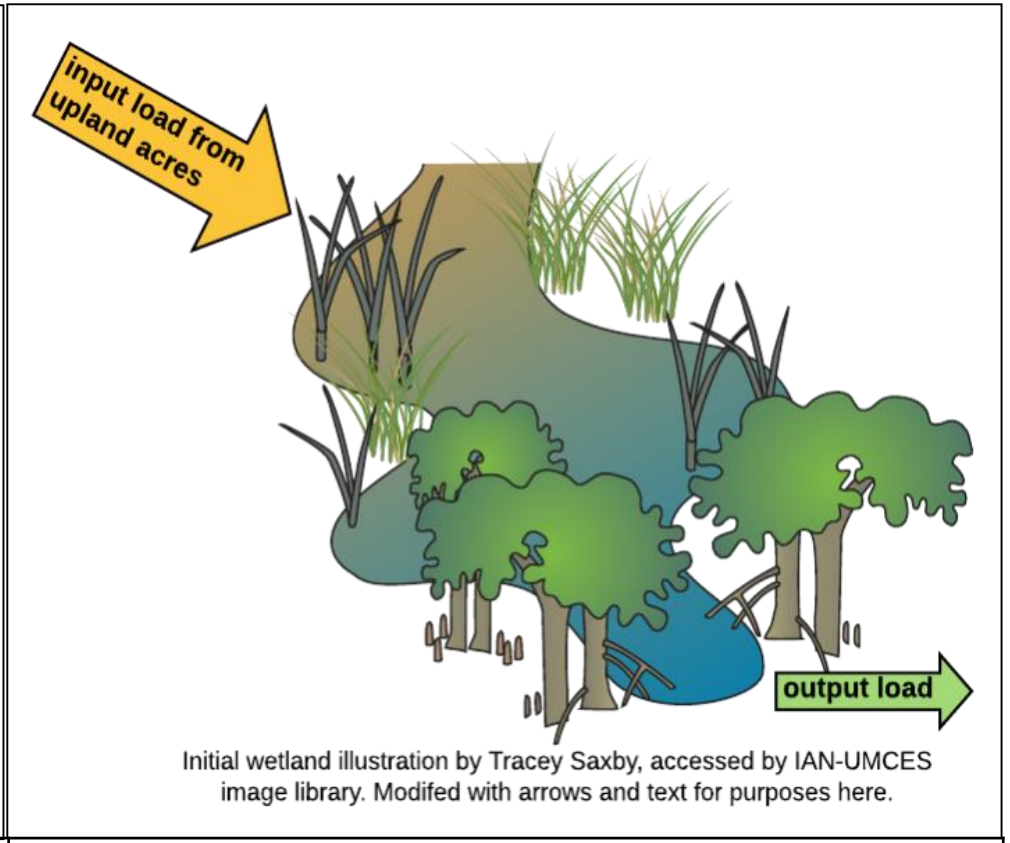

Figure D-2. Post-treatment, or desired outcome for a degraded wetland to repair functions to natural or historic functions (e.g. rehabilitated).

II. Key Definitions

- **Practice**: A general reference to a management action or conservation practice (i.e., not CBP-specific)
- **Technique**: Design strategies used to restore, create, rehabilitate, or enhance wetland conditions, typically as an intervention or action that alters the hydrology, vegetation or soils.
- Panel discussions noted that one or more techniques may be applied as part of a single BMP. While techniques may be implemented individually as a basic approach to address a singular component of a wetland for enhancement, more frequently they will be implemented collectively as a more comprehensive approach to restore wetland structure and functions.
- Section 6 of the report provides more detail discussion of techniques used to implement wetland BMPs.

Outline: Wetland Creation, Rehabilitation and Enhancement

I. Summary of Recommendations
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III. Methods, Results and Key Findings to inform the development of recommendations

- Multiple lines of evidence approach
  - Conceptual Model Elicitation
  - Literature Review
  - Expert Elicitation (Modified Delta Approach)
  - Riparia Database Analysis

Conceptual Models

Method 1

Conceptual Model Elicitation – Key Findings

- The performance of natural wetlands should be considered as the benchmark for evaluating wetland BMPs.
- Wetland BMP's water quality benefits vary systematically:
  - Available information, however, was insufficient to reach consensus on ranking
  - Natural, high-functioning wetlands provide greater water quality benefits than wetland BMPs
  - Wetland enhancement was identified as the BMP to provide least *net water quality benefit*
- Key factors controlling wetland water quality benefits remain challenging to translate into a relevant crediting framework
- Evaluation of wetland BMP benefits complicated by a wide range of ecosystem service provisions beyond water quality benefits (e.g., plant species diversity, carbon sequestration, water storage, flood protection, and wildlife habitat).

Literature Review

Method 2

Literature Review – Key Findings

(Update of WEP2016 Literature Review)

- Reported practices and practice implementation (i.e., techniques) difficult to classify according to NRCS/CBP system of definitions.
  - Highlighted inconsistency in language and lack of standard definitions amongst the BMP types and associated techniques
- Often specific techniques were reported without adequate description of pre-existing conditions or surrounding watershed conditions.
- Given the wide variety of monitoring methods and site settings, panel members expressed concerns about consistency across reported numbers.
- Comprehensive (i.e., holistic) wetland restorations that address the full range of hydrologic impacts and enhance hydric soil and vegetation composition provide benefits more similar to natural wetlands than do simple or singular restoration techniques.

Literature Review – Key Findings

Average Retention Efficiencies (%) for Natural and Wetland BMPs from the Literature Review, (n= number of studies).

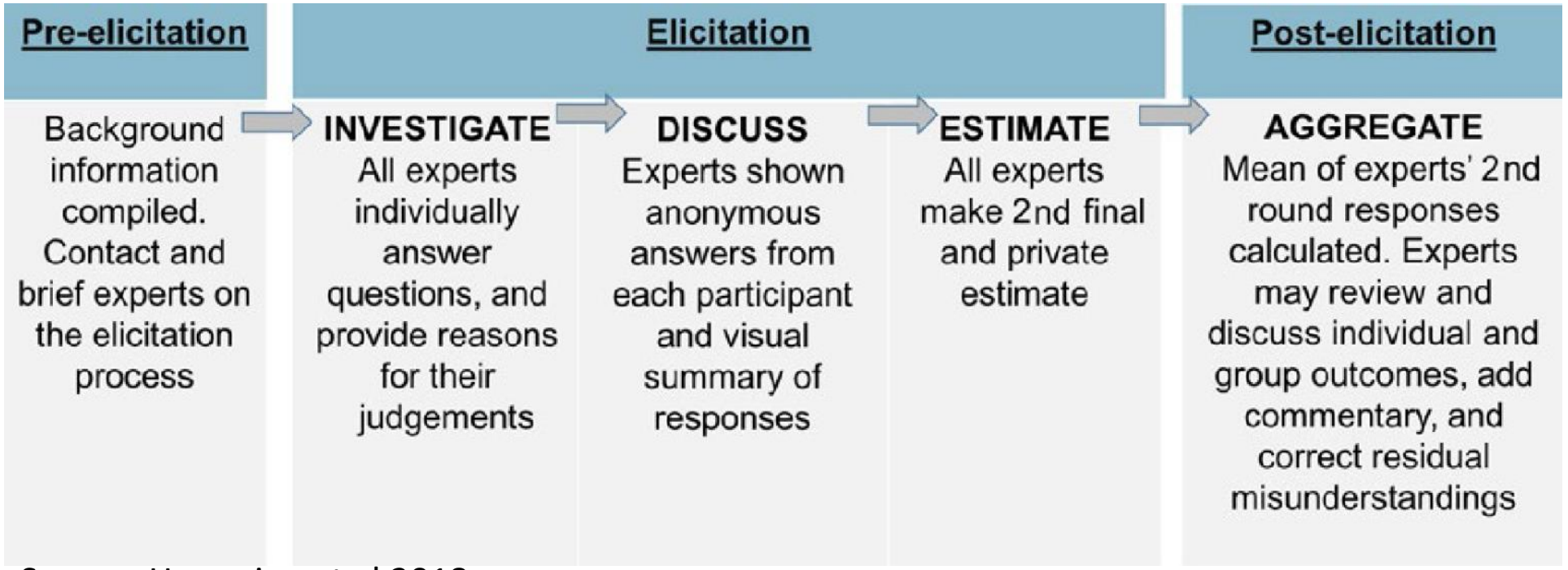
Wetland Type	TN % (n)	TP % (n)	TSS %(n)
Natural wetlands	45 (15)	42 (17)	n/a
Wetland BMPs	39 (21)	42 (46)	43 (12)
Existing Wetland Restoration Efficiency	42	40	31

Expert Elicitation

Method 3

An Expert Elicitation Approach

- Used when insufficient information available to evaluate specific topic of interest (see Hemming et al 2018, Spiers-Bridge et al 2010)
- Solicit expert judgement to quantify the relative, average annual efficiencies



Source: Hemming et al 2018

Results

- Provided a quantitative value for all 4 wetland BMP types
- “Loose” relative ranking generally consistent with Panel expectations for TN and TSS
  - Restoration and Creation provide greater retention benefits compared to Rehabilitation and Enhancement
- Panel members assumed wetland enhancement results in water quality benefits
- Wide range in individual responses attributed to uncertainty about baseline or pre-treatment conditions (i.e., retention efficiencies for degraded wetland conditions)

		Efficiency (%), expressed as a net improvement or “lift”		
Parameter	**BMP Type[1]**	**Mean (%)**	**COV[2]**	**Adapted Range[3] (%)**
TN	Restoration	32	0.48	0.9 – 57.6
	Creation	29.8	0.64	9.1 – 59.9
	Rehabilitation	21.0	0.55	-5.5 – 50.7
	Enhancement	17.5	0.85	-14.5 – 47.1
TP	Restoration	23.5	0.64	-11.0 – 49.0
	Creation	27.0	0.63	0.6 – 56.0
	Rehabilitation	22.8	0.50	-12.8 – 50.5
	Enhancement	25.6	0.80	-18.4 – 49.5
Sediment	Restoration	34.5	0.68	-3.6 – 49.0
	Creation	32.5	0.69	0.9 – 54.4
	Rehabilitation	20.8	0.63	-2.3 – 45.8
	Enhancement	17.3	0.93	-10.5 – 45.6

[1] The values for the wetland restoration BMP are the existing efficiencies as recommended by WEP(2016) and provided for context.

[2] COV is the coefficient of variation is used to describe the relative measure of variation amongst the individual responses

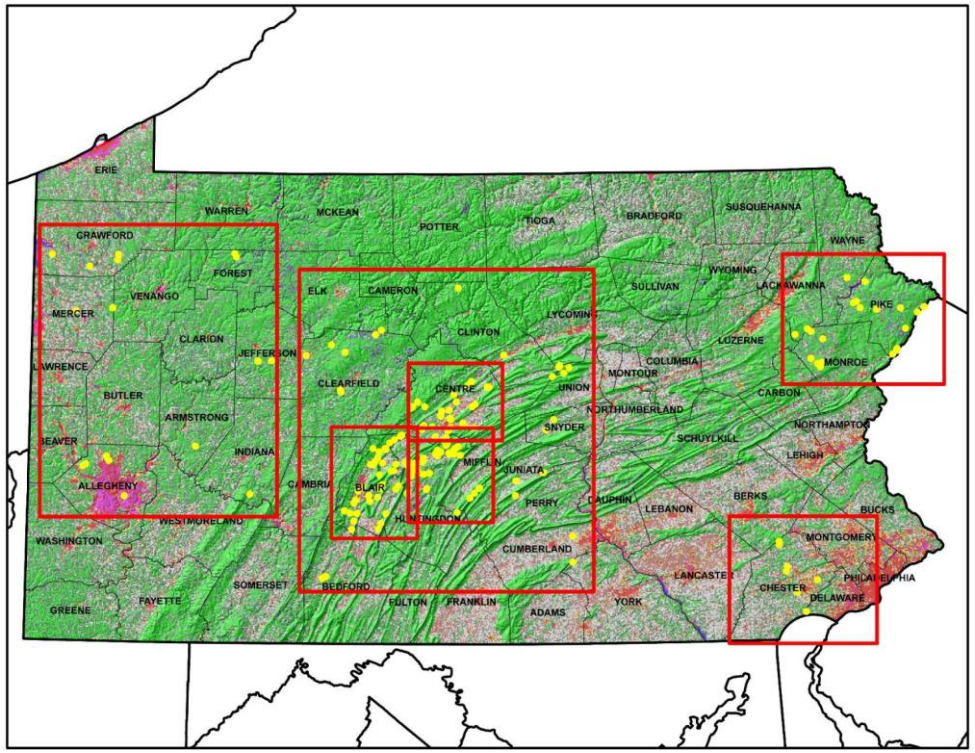
3 The adapted range takes into account the confidence associated with individual responses

Riparia Database Analysis

Method 4

Riparia Database Analysis - Method

- Riparia Reference Wetland Database (Riparia) includes 222 natural wetland sites surveyed across PA, including the Ridge & Valley and Piedmont regions (Brooks et al., 2016)
- Pennsylvania Created Wetlands Dataset includes 107 wetlands surveyed (Gebo and Brooks, 2012)
- The WEP2019 analysis focused on Riverine, Headwater and Isolated Depressions wetlands (HGM classification)
  - Used subset of data that described the water quality functions of wetlands
  - Efficiency values were calculated using the relative value or score from these databases along with literature review results.
  - Assumptions applied to approximate other wetland BMP types (i.e., restoration, rehabilitation)



Map image, Riparia website, 7/30/19: https://riparia.psu.edu/files/2018/04/cwc_pa_extent-17fqori.jpg

Riparia Database Analysis - Method

Mean Scores from the HGM Functional Assessment Models for Headwater Wetlands for Each Wetland Type

Wetland Type	Wetland BMP State Represented	Scores (Headwater Wetlands)		
		F5. Inorganic Nitrogen	F6. Solute Adsorption	F7. Inorganic Particulates
Reference	Post-BMP for Rehabilitation and Restoration	0.56	0.51	0.50
Created	Created	0.42	0.41	0.38
10th percentile for Reference Wetlands[1]	Pre-BMP Condition for Rehabilitation	0.41	0.24	0.24

[1] This value is estimated assuming a normal distribution, and the mean and standard deviation provided for each score.

Resulting BMP efficiencies for wetland creation and rehabilitation

Wetland BMP	TN (%)	TP (%)	TSS (%)
Creation	30	33	35
Rehabilitation	16	22	23

Comparison of all methods to quantify wetland BMP retention efficiencies

Results

Wetland BMP Type	TN (%)	TP (%)	TSS (%)	Source	Notes
All Wetland BMPs	39	32	43, 36[1]	Updated Literature Review	Unable to differentiate amongst the different BMP types (see Table 4 in report)
Creation	29.8	27	32.5	Expert Elicitation	Results from EE survey (see Table 5 in report)
Rehabilitation	21	22.8	20.8		
Creation	30	33	35, 27[1]	Riparia database analyses	See Table 10 in report
Rehabilitation	16	22	23, 19[1]		

[1] **The average TSS percent reduction from all studies in the literature review database is 36%. The Riparia database analyses was repeated using this value to adjust the TSS retention efficiency values.**

Outline: Wetland Creation, Rehabilitation and Enhancement

I. Summary of Recommendations
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IV. Recommendations

- Wetland Enhancement
- Pollutant Removal Efficiencies for Wetland Creation and Rehabilitation
- Upland Treated Acres

Wetland Enhancement

- Panel recommends that wetland enhancement is not an eligible BMP for water quality
- Panel recognizes the value of wetland enhancement to achieve other Agreement outcomes where the benefit of enhancement supports wildlife and improved habitat
- Recommendation is based on three key factors:
  - Definition of enhancement does not guarantee a focus on water quality and its improvement
  - Typical techniques associated with enhancement may result in the increase in nutrient loads, or a change in resource
  - Relatively small, if any (net) water quality improvement
  - ➢ Results in large uncertainty on the outcome of this BMP

Pollutant Removal Efficiencies for Wetland Creation and Rehabilitation

- Panel consideration of the results from the literature review, expert elicitation survey and Riparia database analysis provide the following pollutant removal efficiencies (Table 11 in report)

Wetland BMP Type	TN (%)	TP (%)	TSS (%)
Restoration[1]	42	40	31
Creation	30	33	27
Rehabilitation	16	22	19
Enhancement	Not recommended		

[1] The wetland restoration efficiencies are provided for reference and the values are from WEP (2016).

Upland Treated Acres

- Recommend to report the drainage area of the wetland BMP as part of the water quality benefit (credit).
- If a drainage area for the wetland creation or rehabilitation BMP is not reported to the State agency, a default ratio will be applied for reporting to the Chesapeake Bay Program.
  - A default 1:1 ratio will be applied to non-floodplain wetland creation and rehabilitation BMPs
  - A default 1.5:1 ratio for floodplain wetland creation and rehabilitation BMPs in acknowledgement of the influence of landscape position (flatter topography, lower in drainage area) and hydrological connectivity to upland sources on retention efficiency of a wetland.
- The Panel further recommends an upper limit for reported upland acres treated of 4:1 for non-floodplain wetland creation and rehabilitation and 6:1 for these wetland BMPs in the floodplain, using the same ratios recommended for the restoration BMP by WEP 2016.

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V. Qualifying Conditions

The Basics:

- The intended outcome for all wetlands BMPs should result in a sustainable, functioning wetland that requires minimal, long-term intervention.

- The statements and procedures are intended to supplement existing jurisdictional requirements, where established and do not affect any jurisdictional regulatory and other legal requirements.

    - Wetland BMPs should adhere to all federal, state, and local permit requirements and regulations pertaining to jurisdictional wetlands.

V. Qualifying Conditions

Location is key:

- Implemented at appropriate sites which improve the ecological function of a wetland or a non-wetland site where a created wetland BMP is implemented.
- All BMPs should avoid adverse impacts to watercourses or wetlands.
- BMP locations should be chosen to ensure hydrology is sufficient for long-term sustainability of the wetland.
- Wetland BMPs in agricultural areas should be designed to promote nutrient and sediment retention to the extent practical.

V. Qualifying Conditions

Conditions and Functions Assessment:

- Each project should be assessed based on federal, state, and local regulatory requirements, according to best professional judgment in the field, and supported by benchmarks presented in state and federal guidance documents.
  - E.g., USACE 1987 Wetland Delineation Manual (USACE, 1987) and applicable Regional Supplements for all potential Restoration or Rehabilitation projects is an example of the type of information that may used for a conditions assessment (with modifications needed)
- An assessment of pre- and post BMP conditions
- Negatively impacting the functions and/or values of existing wetland systems and high-quality or rare non-wetland ecosystems should not be pursued.
- Changing the functions of existing high-quality wetlands should not be pursued.

Example Wetlands Conditions Assessment

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: _____ City/County: _____ Sampling Date: _____

Applicant/Owner: _____ State: _____ Sampling Point: _____

Investigator(s): _____ Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): ___

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

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, e

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:

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 require

- ___ 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): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ____

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

Remarks:

VEGETATION (Five Strata) – Use scientific names of plants. Sampling Point: _____

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata:

Percent of Dominant Species That Are OBL, FACW, or FAC:

Prevalence Index worksheet:

Total % Cover of:

OBL species _____ x 1

FACW species _____ x 2

FAC species _____ x 3

FACU species _____ x 4

UPL species _____ x 5

Column Totals: _____ (A)

Prevalence Index = B/A = _

Hydrophytic Vegetation Indicat

___ 1 - Rapid Test for Hydrophyti

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptation data in Remarks or on a s

___ Problematic Hydrophytic Veg

[1]Indicators of hydric soil and wetl be present, unless disturbed or p

Definitions of Five Vegetation S

Tree – Woody plants, excluding v approximately 20 ft (6 m) or more (7.6 cm) or larger in diameter at b

Sapling – Woody plants, excludi approximately 20 ft (6 m) or more than 3 in. (7.6 cm) DBH.

Shrub – Woody plants, excluding approximately 3 to 20 ft (1 to 6 m

Herb – All herbaceous (non-wood herbaceous vines, regardless of s plants, except woody vines, less t ft (1 m) in height.

Woody vine – All woody vines, r

Hydrophytic Vegetation Present? Yes _____

Remarks: (Include photo numbers here or on a separate sheet.)

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SOIL Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

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Regional Supplements for all potential Restoration or Rehabilitation projects (https://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/reg_supp/).

Elements of a Wetland Conditions Assessment

- Purpose to determine eligibility for the three wetland BMPs
- Evaluate hydrologic, vegetation and soils of the site
  - All have an effect on water quality benefits, singularly or in combination
- General guidance where the number of components addressed will guide the selection and eligibility of the most appropriate wetland BMP type

Wetland Techniques Matrix (Table 13 in report)

BMP type	Number of Components Typically Addressed	Wetland Components					
		Hydrology		Vegetation		Soils	
		Goal	Typical Techniques	Goal	Typical Techniques	Goal	Typical Techniques
Restoration	2-3	Reestablish wetland hydrology	· Ditch Fills · Ditch Plugs · Tile Drain Plugs or Breaking Tile Drains · Berm Creation or Modification · Addition of Microtopography	Reestablish a functioning native plant community	· Planting · Seeding · Invasive Species Management · Manage Excessive Wildlife Browse · Livestock Fencing	Reestablish functioning hydric soils	· Fill Removal · Excavation · Decompaction · Organic Matter Addition
Creation	All 3	Establish and maintain wetland hydrology	· Berm Creation or Modification · Excavation · Water Control Structures*4 · Creation of Microtopography	Establish and maintain a wetland plant community	· Planting · Seeding · Invasive Species Management · Manage Excessive Wildlife Browse · Livestock Fencing	Establish wetland soils conditions	· Decompaction · Addition of soil · Organic Matter Addition · Soil Amendment
Rehabilitation	1-2	Modify current hydrology to repair degraded hydrologic conditions.	· Ditch Fills and Ditch Plugs · Regrading Ditch or Watercourse Banks · Levee Breach · Berm Creation or Modification · Addition or Enhancement of Microtopography	Supplement and improve existing plant community to reflect a reference community	· Planting · Seeding · Invasive Species Management · Manage Excessive Wildlife Browse · Livestock Fencing · Forest Management	Amend soils to support a functioning wetland	· Decompaction · Organic Matter Addition · Soil Amendment
Enhancement[3]	1	Improve Hydrologic Function	· Berm Modification · Microtopography/ Addition of Pools and/or Hummocks	Supplement and improve existing plant community to reflect a reference community	· Planting · Seeding · Invasive Species Management · Manage Excessive Wildlife Browse · Livestock Fencing	Enhance existing wetland soils	· Organic Matter Addition · Soil Amendment

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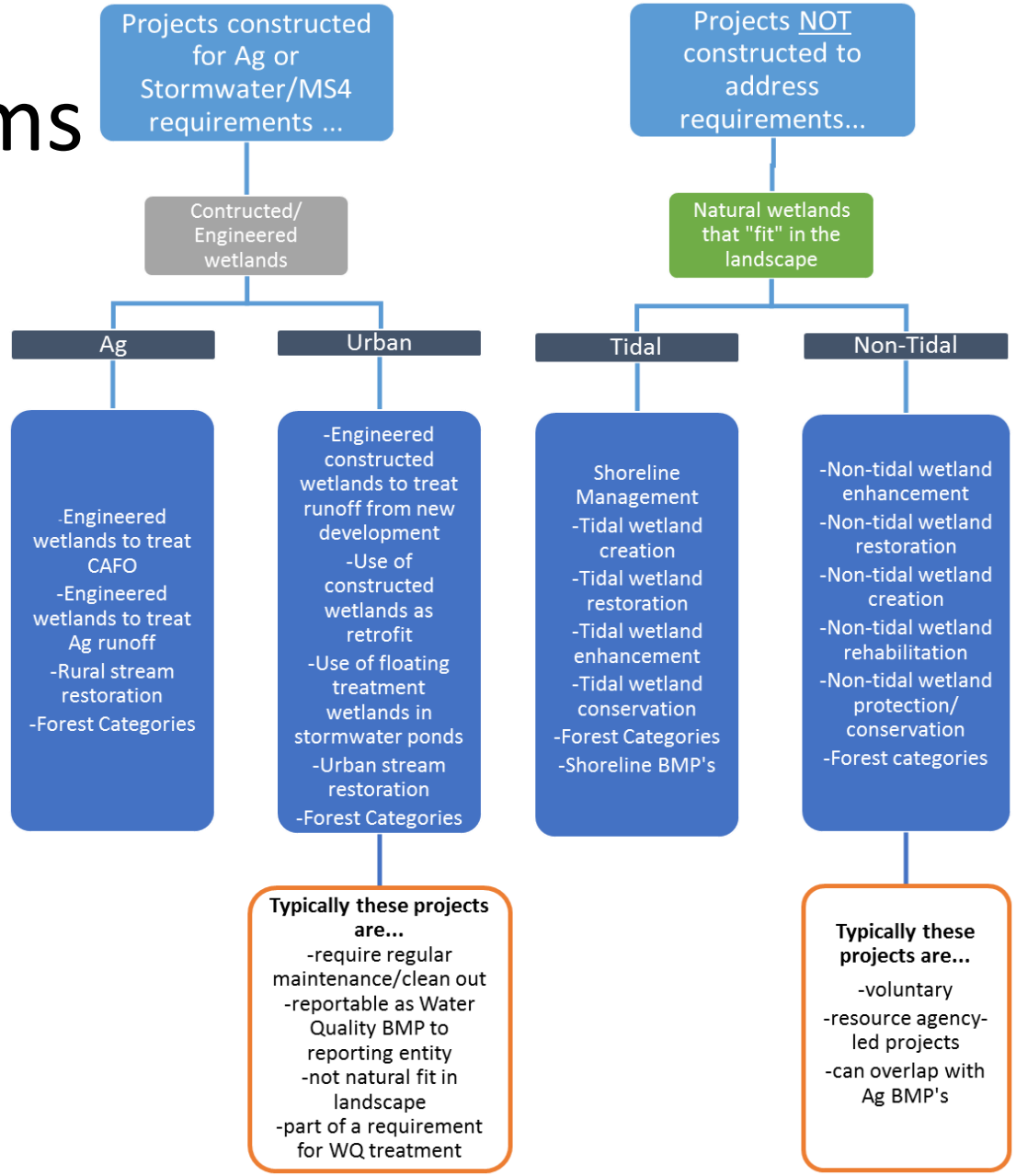
VI. Accountability Mechanisms

- Same as for WEP 2016
- Existing partnership BMP Verification Framework includes guidance for Wetland Verification
  - E.g., as-built survey; monitoring for first 3-5 years; annual observations after that to document continued continued success
- Each jurisdiction documents their programs and methods in their BMP verification plan submitted to EPA-CBP (part of QAPP)



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VII. Unintended Consequences

- Underscore importance stated by WEP (2016) for the need to identify appropriate sites for wetland BMPs
  - Avoid impact to or alteration of high-quality wetlands. Changing the structure and function of existing high-quality or rare wetland systems should be avoided due to potential unintended adverse impacts and tradeoffs.
  - By removing enhancement as a potential BMP, the potential for unintended consequences of impacting fully functioning and high quality wetlands should be somewhat reduced.
- The potential to improve nutrient and sediment function of wetland should not overlook or take priority over other functions provided by the wetland; tradeoffs of functions should generally be avoided. Mindful consideration and evaluation by wetland professionals/practitioners is needed
- The location of management actions to implement wetland BMPs should be targeted where the need for water quality may be most beneficial; areas of high pollutant loadings/export.
- Avoid double counting of wetlands created in the floodplain for water quality credit from the implementation of stream restoration projects that reconnect streams to the floodplain.
  - It is recommended that the acreage of wetland created from such stream restoration effort be tracked and reported to the relevant State agency, and subsequently the Chesapeake Bay Program as part of the Agreement Outcomes.

Q&A

Please enter your questions in the chat box.

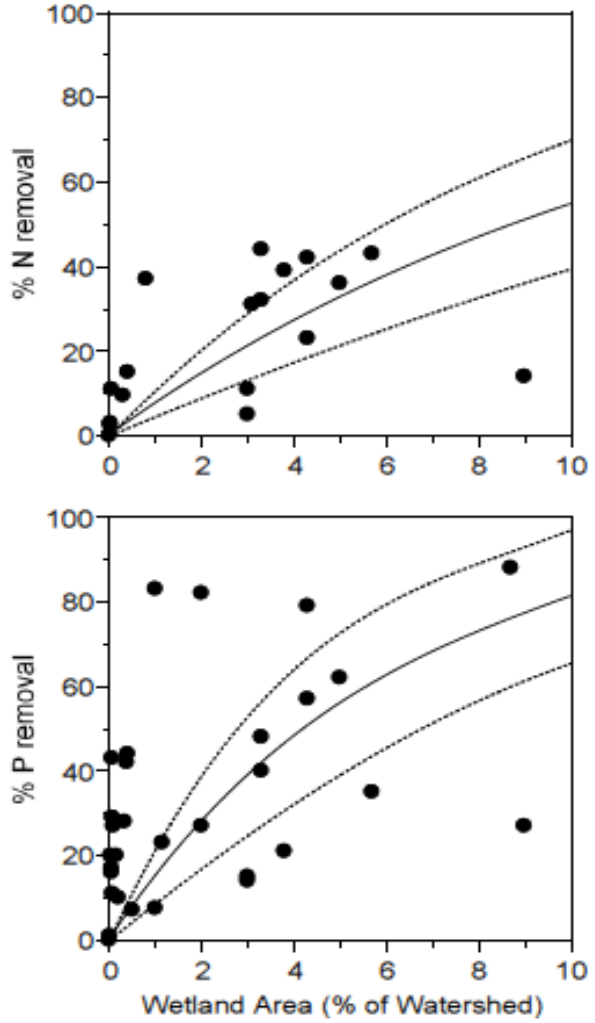
If you are familiar with Zoom and wish to ask your question verbally, please use the “raise hand” feature and wait to be called on. Un-mute and ask your question when prompted and re-mute when done speaking.

Next steps

- Reminder: the full report, appendices and this recorded webcast are available on the CBP calendar page: https://bit.ly/30xdk2K
- **Feedback requested by COB August 15**
  - Send written feedback about the report to Jeremy Hanson, Panel Coordinator (jchanson@vt.edu)
  - Call or email with questions or requests (410-267-5753)

Extra Slides

Review of Wetland Retention Efficiencies: Phase 5 Wetland Restoration BMP



Geomorphic Province	TN Removal Efficiency	TP Removal Efficiency	TSS Removal Efficiency
Appalachian	7%	12%	4%
Piedmont and Valley	14%	26%	8%
Coastal Plain	25%	50%	15%
Average	16.75%	32.18%	9.82%

- Reduction efficiencies based on kinetic equation for TN and TP; fit to literature data. 15% rate set for sediment on CP, adjusted based on TP rate.
- 1%, 2% and 4% wetland area is assumed for each respective HGMR

Figure 2. Literature review data points for wetland nutrient removal efficiency based on the wetland area as a proportion of the watershed. (STAC 2008).

Comparison of WEP16 Adopted Efficiencies and Current WEP Recommendations

WEP2016, CBP Adopted Retention Efficiencies:

	TN removal (%)	TP removal (%)	TSS removal (%)	Upland acres treated per acre of BMP
Restoration	42	40	31	Varies by HGMR
Creation	**16.75**	**32.18**	**9.82**	**1**
Rehabilitation	**16.75**	**32.18**	**9.82**	**1**
Enhancement	**16.75**	**32.18**	**9.82**	**1**

WEP2019, Proposed Retention Efficiencies:

	TN removal (%)	TP removal (%)	TSS removal (%)	Upland acres treated per acre of BMP
Restoration	42	40	31	Varies by HGMR
Creation	**30**	**33**	**27**	**Report drainage area; if not, 1:1**
Rehabilitation	**16**	**22**	**19**	**Report drainage area; if not, 1:1**
Enhancement	**Not recommended**			

Basic Approach

$E = E_{base} \times F$

Where:

- E = Efficiency for a particular wetland state and pollutant
- E_{base} = "Base" efficiency represented as the mean value for wetland BMPs (from Table 2)
- F = Factor used to scale the efficiency (derived from HGM Scores)

- F, a scaling factor is defined using the scores or values from the databases and multiplied by a retention efficiency from the literature review

As an example calculation, the scaling factor, (F) Ratio for Inorganic Nitrogen Retention for Created wetlands is calculated as:

$F_{F5\text{-}Created}$ = (F5 HGM Score for Created) /(F5 HGM Score for Reference)

= 0.42 /0.56

= 0.75

- The mean TN efficiency from the literature review for wetland BMPs is 39%

0.75 X 39

= 29.25% (use 30%)