



Bureau of Waterways Engineering and Wetlands



Restoration Targeting

2023 Mid-Atlantic Wetland Workgroup Meeting

November 14-16, 2023

Dave Goerman

Bureau of Waterways Engineering and Wetlands

Josh Shapiro, Governor

Jessica Shirley, Interim Secretary

Targeting for What?????

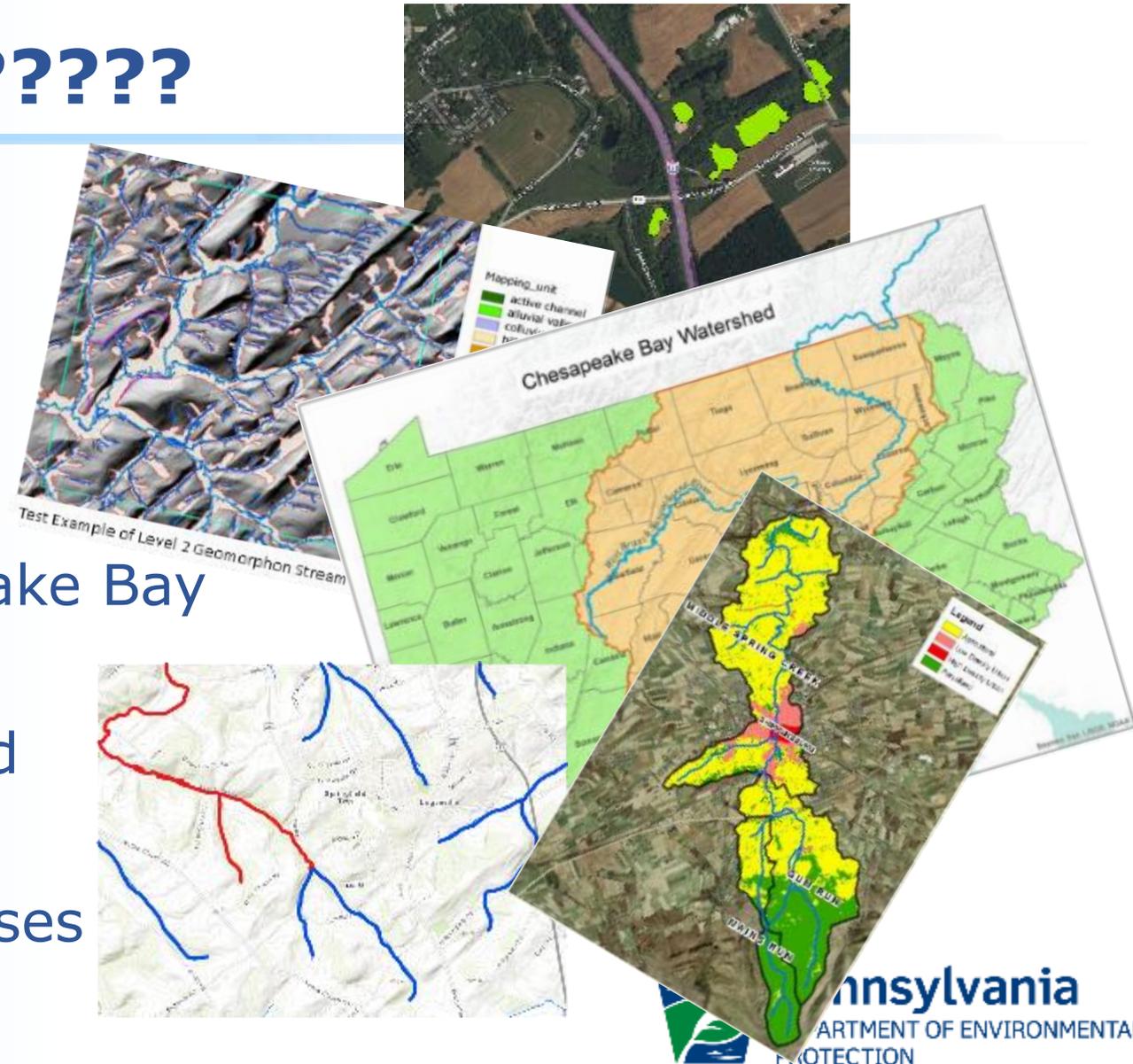
Regulatory vs Voluntary

Watershed vs Discrete Areas

Jurisdiction Wide vs Chesapeake Bay

Altered/Degraded vs Impaired

Legacy Losses vs Modern Losses



Waterways and Wetlands Regulatory Program Perspective

Charged with considering a broader perspective of the resource

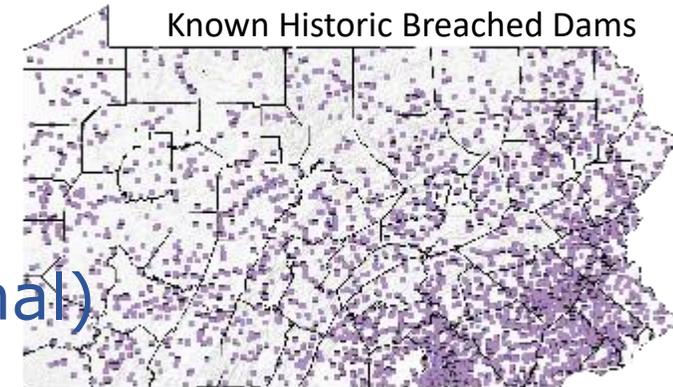
- **§ 105.2. Purposes....**(4) Protect the natural resources, environmental rights and values secured by PA. CONST. art. I, § 27 and conserve and protect the water quality, natural regime and carrying capacity of watercourses.
- **Regulated waters of this Commonwealth**—Watercourses, streams or bodies of water and their floodways wholly or partly within or forming part of the boundary of this Commonwealth.

Existing Data and Developed Tools

- Habitat Models
- Palustrine and Floodplain Plant Community Classification
- Plant Community Fact Sheets/Profiles
- Wetland Reference Data
- HGM Classifications
- HGM Level 3 Models
- Level 2 RAPs
- Modeled Wetland Data– Existing Wetland and Restorable Lands
- TWI Statewide Coverage
- Watershed Resource Registry
- Level 1 Geomorphon Landform Statewide Coverage
- Restoration Community Predictor Tool

Data and Tools Under Development

- Level 2 Geomorphon Valley/Channel Mapping Statewide Coverage
- Watershed Legacy Alteration Index
- Dam Related Legacy Sediment Mapping (regional)
- Breached Dam Database Statewide Mapping ($\approx 4,000$ from circa 1917-present) Another 8,000 unknown breached dams likely!
- Pennsylvania Aquatic Resource Compensation Determination Process



Targeting Factors

Evidence-Based Approach

- **Legacy sediments are everywhere – depths vary by alteration profile (2-20 feet)**
- **Historic unaltered conditions persisted from 6,000 – 300 yrs. bp**
- Pre-Alteration Resource(s) - evidence indicates most unconfined valleys were comprised of stream/floodplain wetland conditions.
 - Both Mineral and Organic hydric soils
- Hydrologic Disconnection(s) resulting from historic alterations greatest driver of degradation and constraint on resource recovery

Go Big or Go Home Approach

- Small discreet projects have limited effect, are rife with resiliency problems, and have high per unit and long-term costs
- Focus is on larger voluntary mill dam legacy sediment projects
 - Easy Targeting – locate historic dams, mills or easily observed legacy sediment deposits (*they really are everywhere!*)
 - Relatively large projects – 1,000-5,000 feet in length
- Compensatory Bank and ILF Mitigation
 - Credit Demand Component
 - Large to extensive in size – 2,000 – 100,000 feet in length
 - Economic Drivers

Compensation Value

Table 8. Project Approach Values

Project Approach	C _{VPA}
Reestablishment	3
Rehabilitation	2
Enhancement	1
Preservation	0

Table 10. Riverine Resource Factor

Class	Watershed Size Description	Drainage Area		C _{VRF}
		>0	≤2 mi ²	
1	Headwater	>2	≤10 mi ²	3.0
2	Small Stream	>10	≤100 mi ²	2.0
3	Mid-reach Stream	>100 mi ²	>100 mi ²	1.0
4	Large Stream/River	>100 mi ²	>100 mi ²	0.5

Compensation Value Factor = (Project Approach + Resource Factor)/2

- Headwater – Small Stream portion of watersheds
 - Incentivize through credit yields
- Legacy Sediment/Headcut Depth
 - < 4 feet of depth – Rehabilitation
 - ≥ 4 feet of depth – Reestablishment
- L2 Condition Depth Scaled Reduction
- Hydrodynamic reconnection provides basis for increasing Rehabilitation and Enhancement Project Approach Value (0.25 increments)

% Riverine Condition Index Baseline Reduction = 25 x (max depth)

Figure 4. Percent RCI Reduction by Legacy Sediment/Headcut Depth

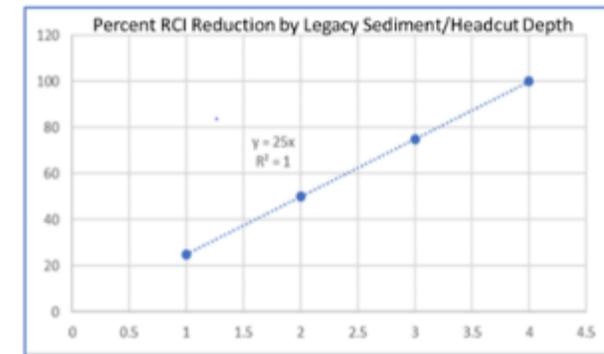


Table 9. Wetland/Lacustrine Resource Factor

Description	Size of Area		C _{VRF}
	Acreage		
Extensive	>15		3.0
Large	>10	≤15	2.5
Med-Large	>7.5	≤10	2.0
Medium	>5	≤7.5	1.5
Small-Medium	>2	≤5	1.0
Small	≤2		0.5

Compensation Value

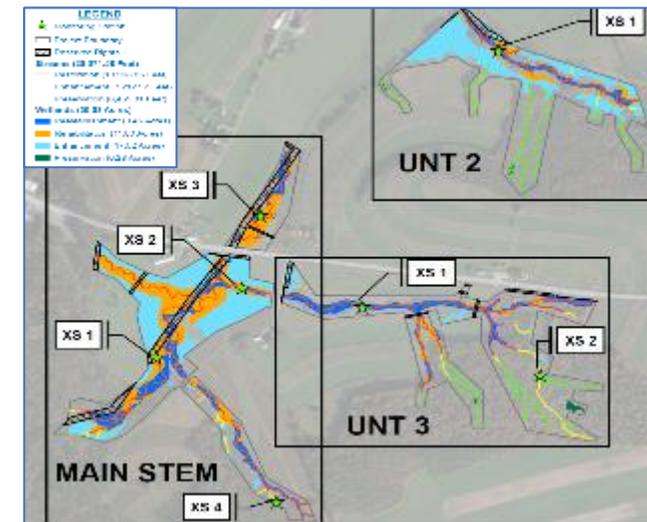
Table 10. Riverine Resource Factor

Watershed Size				C _{VRF}
Class	Description	Drainage Area		
1	Headwater	>0	≤2 mi ²	3.0
2	Small Stream	>2	≤10 mi ²	2.0
3	Mid-reach Stream	>10	≤100 mi ²	1.0
4	Large Stream/River	>100 mi ²		0.5

Comprehensive Project Compensation Value Adjustment

The riverine factor can be modified if more than one watershed size classes are integrated into the overall project. If a larger class project area also has a lower class draining to it and the lower class is also undergoing work that has a CVPA value of a 2 or 3, the CVRF value is adjusted upward by 0.5 for each WSC included.

If a rehabilitation or reestablishment project on a WSC 2 watercourse has a WSC 1 stream draining to it and that stream is being rehabilitated or reestablished the CVRF factor for the WSC 2 stream could be adjusted upward 0.5, from 2.0 to a value of 2.5.



Introduction to Guiding Principles of Aquatic Ecosystem Restoration



Pennsylvania Clean Water Academy You are currently using guest access [Log in](#)

[HOME](#) [FIND LEARNING](#) [SEO REPORT](#)

[Courses](#) / [Chap. 105 - Dam Safety & Waterway Mgmt](#) / [Guiding Principles - 2](#)

WELCOME

Guiding Principles of Aquatic Resource Restoration

The Division of Wetlands, Encroachments, and Training (DWET) in the Bureau of Waterways Engineering and Wetlands developed the Introduction to Guiding Principles of Aquatic Ecosystem Restoration training. Please note that this multi-part training is intended to be an introduction or overview presentation and DWET is developing additional more intensive content to cover many of the topics that are introduced. For example, a more in-depth or Deep Dive discussion on Legacy Sediments will be available in several forms (i.e., Oil Creek Case Study). This is intended to be an introduction to a series of trainings addressing issues related to aquatic resource restoration that will be developed over the next few years.

This introductory training will cover several important aspects of the guiding principles that are important to the execution of highly successful restoration projects. The training is presented in four parts: Introduction, Basic Watershed and Ecosystem Functions, Watershed Alterations and Effects, and finally Project Considerations. Completion of this training will provide a good foundation for future trainings that will dive deeper into the topics, research, and DWET program development efforts.

Over the past 15 years this approach has been applied to restore numerous aquatic ecosystems buried by legacy sediment. The mitigation banking industry in PA has successfully applied these principles to other causes of resource degradation successfully. This approach has wide applicability to understanding and responding to a variety of watershed alterations, not just legacy sediment.

Completion of this course is worth 2.5 PDH credit hours

