PROPOSED FIX TO STREAM RESTORATION PROTOCOL 3

USWG – August 15, 2023

OVERVIEW

- Protocol 3 Memo approved by WQGIT in October 2020
- Early last year, issue was identified by group members
- Series of 4 calls and many emails to discuss potential solution
- Draft memo produced with a proposed solution

PROTOCOL 3 BACKGROUND

THE STREAM RESTORATION PROTOCOLS

1. Prevented sediment

2. In-stream denitrification

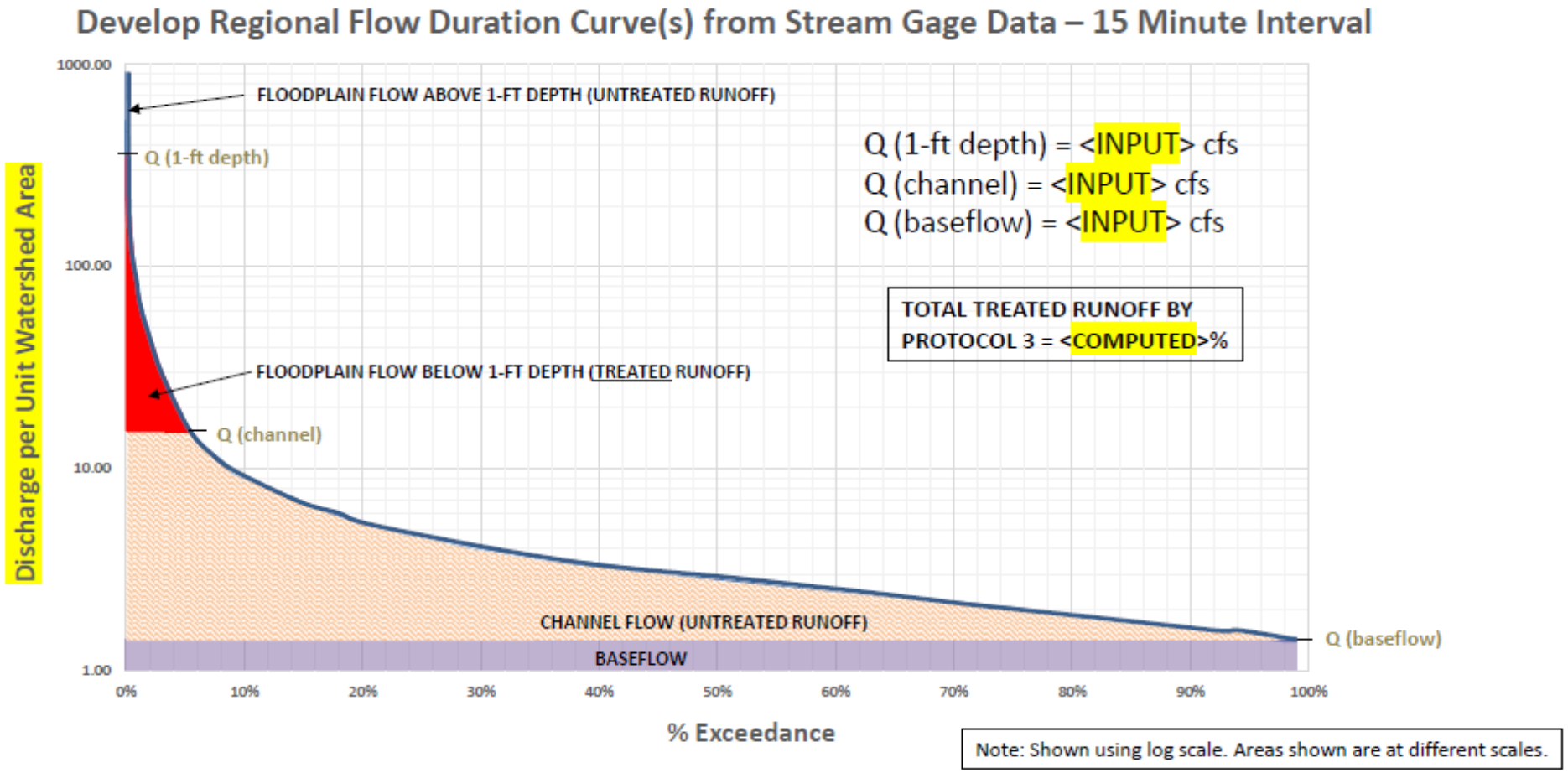
3. Floodplain reconnection

4. The "tweener" Dry Channel RSC

Summary of Areas of Consensus for P-3 (2020)

- **The credit should be based on the difference in load reduction based on a before and after application of P-3 to individual projects.**
- **Hydraulic modeling defines the extent of reconnection boundaries for the FTZ, based on critical floodplain flow velocities where sediment trapping and filtering can be expected.**
- **Retain the one-foot max elevation above the floodplain as the upper limit for effective runoff treatment in the FTZ, unless a higher elevation is justified by floodplain H&H modeling.**
- **Multiply the FTZ by the appropriate wetland removal rate established for floodplain wetland restoration projects, as defined by NTW EPR to determine project load reduction.**
- **Rely on downstream flow methods to estimate annual volume of storm runoff diverted into the floodplain for treatment**
- **Recommend standard methods for defining baseflow channels, separating baseflow from storm flows and processing appropriate USGS flow gage data**

Figure E-1. *Flow Duration Curve for calculating floodplain treatment (Altland 2019).*



NON-TIDAL WETLAND REMOVAL RATES

Table 13. Floodplain Wetland Removal Rates in Prior CBP Expert Panel Reports			
Wetland BMP Category	Pollutant Removal Rate (compared to pre-restoration)		
	Total N	Total P	TSS
NTW Restoration	42%	40%	31%
NTW Creation	30%	33%	27%
NTW Rehabilitation	16%	22%	19%
[1] as outlined in expanded lit review and recently approved EPR (NTW EP, 2020)			

- Restoration: Wetland absent or degraded. Hydric soils present
- Rehabilitation: Wetland present w/ degraded function
- Creation: No wetland present, no hydric soils present

THE ISSUES

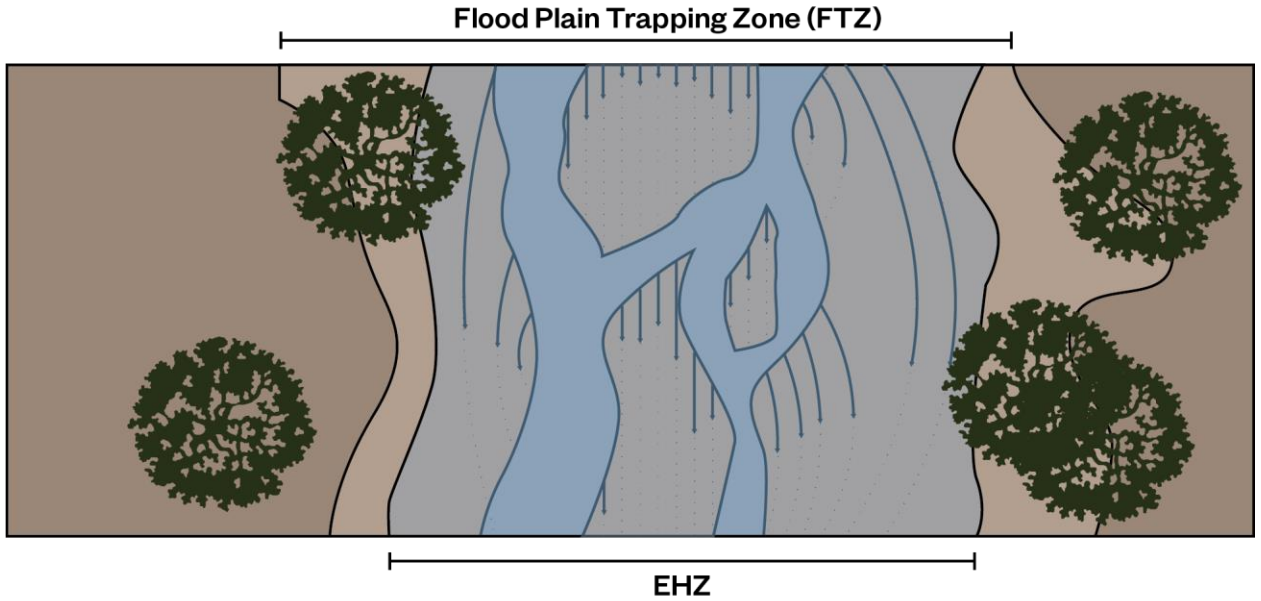
- New Protocol 3 may not properly "scale" the credit to account for more or less extensive floodplain restoration projects (whether by length or acres of reconnected floodplain).

Table 1: Comparison of Floodplain Treatment Volume for Two Hypothetical Project Sites Using Protocol 3*

	Site 1	Site 2
Length of Restoration Site (miles)	1.5	3.0
Restored FTZ Area	14.0	24.0
Upstream Contributing Stream Length (Miles)	4.0	4.0
Bulk Density (lb/cf)	55	55
Proposed increase in treatable flow	39%	39%
% Wetland Restoration	80%	80%
% Wetland Rehabilitation	20%	20%
TSS Removed per year (tons)	**256.5**	**256.5**
TN Removed per year (lbs)	**201.0**	**201.0**
TP Removed per year (lbs)	**56.8**	**56.8**
*See Appendix B for calculation details		

THE ISSUES

- Lack of support for relaxing the crediting cap that limited nutrient and sediment reductions to the first one foot of water on the floodplain in certain circumstances for projects that otherwise meet the qualifying conditions.



THE TEAM

Name	Affiliation	Name	Affiliation
Drew Altland	Ecotone	Jeff Hartranft	PA DEP
Joe Berg	Biohabitats	Amy Hruska	Underwood and Associates
Keith Binstead	Underwood and Associates	Scott Lowe	McCormick Taylor
Ted Brown	Biohabitats	Paul Mayer	EPA
Denise Clearwater	MDE	Greg Noe	USGS
Jason Coleman	Ecotone	Ward Oberholzer	LandStudies
Barbara Doll	NC State University	Josh Smalley	McCormick Taylor
Ben Erhardt	LandStudies	Bill Stack	CWP
Jens Geratz	Anne Arundel Co.	Joe Sweeney	Water Science Institute

David Wood, CSN compiled the memo
Memo was approved via consensus with Denise Clearwater (MDE) abstaining

PROPOSED SOLUTION #1 (FLOODPLAIN ELEVATION CAP)

MDE conducted a literature review to assess the relaxation of the floodplain elevation crediting cap, and did not find support for the recommendation

Solution: The group unanimously supported the conclusion of this literature review and recommends reverting to the original language from the 2014 Expert Panel Report, which states:

"The maximum ponded volume in the floodplain that receives credit should be 1.0 foot to ensure interaction between runoff and wetland plants." (USR EP, 2014)

PROPOSED SOLUTION #2 (SCALING)

Establish the volume of sediment delivered to the site.

- The fix would use CAST to establish the sediment load delivered to the project site, divided by the average bulk density of floodplain sediments from the CDFN sites, 55 lb/cf.

Establish the sediment storage capacity of the floodplain.

- The floodplain storage capacity is based on the mean vertical accretion rate from McMillan and Noe (2017) of 0.33 in/year. This depth is multiplied by the restored floodplain acreage to determine the storage capacity.

Determine the pollutant removal credit using the floodplain storage efficiency.

- The volume of sediment storage capacity divided by the volume of sediment volume delivered to the site. Floodplain soil nutrient concentration data is used to determine the TN and TP load reductions.

PROPOSED SOLUTION #2 (SCALING)

The floodplain storage capacity method eliminates the need for the wetland treatment efficiencies, as it produces a direct measurement of floodplain trapping.

3-years of post-construction monitoring can be used to replace the 0.33in/yr accretion rate with site-specific monitoring data. Methods are outlined in Thomas and Ridd (2014), and detailed in the memo.

EXAMPLE

A **3.0-mile-long** restoration site will create **14.0 acres** of restored FTZ area, compared to **2.0 acres** in existing. The upstream contributing stream length was computed as 4 miles delivering 350, 100, and 1,150,000 lb/mi/year of TN, TP, and sediment, respectively from CAST. The bulk density is 55 lb/cf

Steps 1-4 – Determine the percent treatable flow and floodplain area
Percent treatable flow (using previously approved methods)
• 6% in existing and 45% in proposed.

Step 5 – Determine the yearly loads delivered to the project
1,150,000 lb TSS/mi/year * 4 miles = 4,600,000 lbs/year

Step 6a – Determine the annual sediment volume delivered
4,600,000 lbs/year / 55 lb/cf bulk density = 83,600 cf (1.9 ac-ft)

Step 6b - Determine floodplain sediment storage at 0.33 inches per year
Existing **2.0 acres** * 0.33 in = 0.06 ac-ft sediment storage
Proposed **14.0 acres** * 0.33 in = 0.39 ac-ft sediment storage

Step 6c – Determine sediment storage (trapping) effectiveness
Existing 0.06 ac-ft / 1.9 ac-ft = 3%
Proposed 0.39 ac-ft / 1.9 ac-ft = 21%

Step 6d – Determine the weighted P3 credits as a function of FTZ effectiveness
CAST loading x floodplain sediment storage effectiveness x percent treatable flow
Existing 4,600,000 lbs/yr x 0.03 x 0.06 = 7,906 lbs/yr or 3.9 tons
Proposed 4,600,000 lbs/yr x 0.21 x 0.45 = 415,072 lbs/yr or 207.5 tons

Step 6e -Determine credit as the difference between existing and proposed
207.5 tons -3.9 tons = 203.6 tons

Step 6e – Multiply by soil nutrient concentrations
203.6 tons x 4.82 lb/ton TN = 981 lb/yr TN
203.6 tons x 1.13 lb/ton TP = 230 lb/yr TP

407,166 lb/yr TSS credit (9% reduction)
981 lb/yr TN credit (70% reduction)
244 lb/yr TP credit (58% reduction)

COMPARING SCALE

A **3.0-mile-long** restoration site will create **14.0 acres** of restored FTZ area, compared to **2.0 acres** in existing. The upstream contributing stream length was computed as 4 miles delivering 350, 100, and 1,150,000 lb/mi/year of TN, TP, and sediment, respectively from CAST. The bulk density is 55 lb/cf

407,166 lb/yr TSS credit (9% reduction)
981 lb/yr TN credit (70% reduction)
244 lb/yr TP credit (58% reduction)

A **3.0-mile-long** restoration site will create **28.0 acres** of restored FTZ area, compared to **2 acres of existing**.

830,444 lb/yr TSS credit (18% reduction)
1,400 lb/yr TN credit (100% reduction – capped at delivered load)
400 lb/yr TP credit (100% reduction – capped at delivered load)

A **0.5-mile-long** restoration site will create **2.0 acres** of restored FTZ area, compared to **0.5 acres of existing**.

61,962 lb/yr TSS credit (1.3% reduction)
147 lb/yr TN credit (10.5% reduction)
34 lb/yr TP credit (8.5% reduction)

NEXT STEPS

Review Period:

- Provide Comments and Concerns by Friday, September 15th

Decision Requested:

- September 19th USWG Meeting