Recommendations for Stream Restoration Protocols 2 & 3

WATER QUALITY GIT

OCTOBER 26, 2020

Agenda

- Quick Refresher
- Comparing LSR and RSB
- Summary of Protocol Adjustments
- Environmental Considerations
- Comments Received

The Stream Restoration Protocols

1. Prevented sediment

2. In-stream denitrification

3. Floodplain reconnection

4. The “tweener” Dry Channel RSC

Revisiting Stream Restoration

The USWG formed 5 groups to revisit the stream restoration expert panel report:

Group 1: Verifying Stream Restoration Practices (Approved June 2019)

Group 2: Outfall and Gully Stabilization Practices (Approved Sep. 2019)

Group 3: Establishing Standards for Applying Protocol 1 (Approved Feb. 2020)

Group 4: Adjusting Protocol 2/3 to Capture Floodplain Restoration

"Team" 5: Floodplain Reconnection with Legacy Sediment Removal (Advisory to Group 4)

Name	Affiliation
Joe Berg	Biohabitats
Drew Altland	RK&K
Bill Stack	CWP
Scott Lowe	McCormick Taylor
John Hottenstein	Bayland Consultants
Jeremy Hanson	Virginia Tech
Sujay Kaushal	University of Maryland
Jens Geratz	Anne Arundel County DPW
Sean Crawford	Bayland Consultants
Josh Burch	DOEE
Jeff Hartranft	PADEP BWEW
Denise Clearwater	MDE Wetlands and Waterways
Paul Mayer	EPA Region ORD
Durelle Scott	Virginia Tech
Greg Noe	USGS
Chris Becraft	Underwood and Assoc
Barbara Doll	North Carolina State University

Thank you to our Group Members!

Name	Affiliation
Jason Coleman	RK&K
Joe Sweeney	Water Science Institute
Benjamin Ehrhart Ward Oberholtzer	Land Studies
Art Parola	Stream Institute, U. of Louisville
Ted Brown	Biohabitats
Jeff White	MDE

Guiding Principles

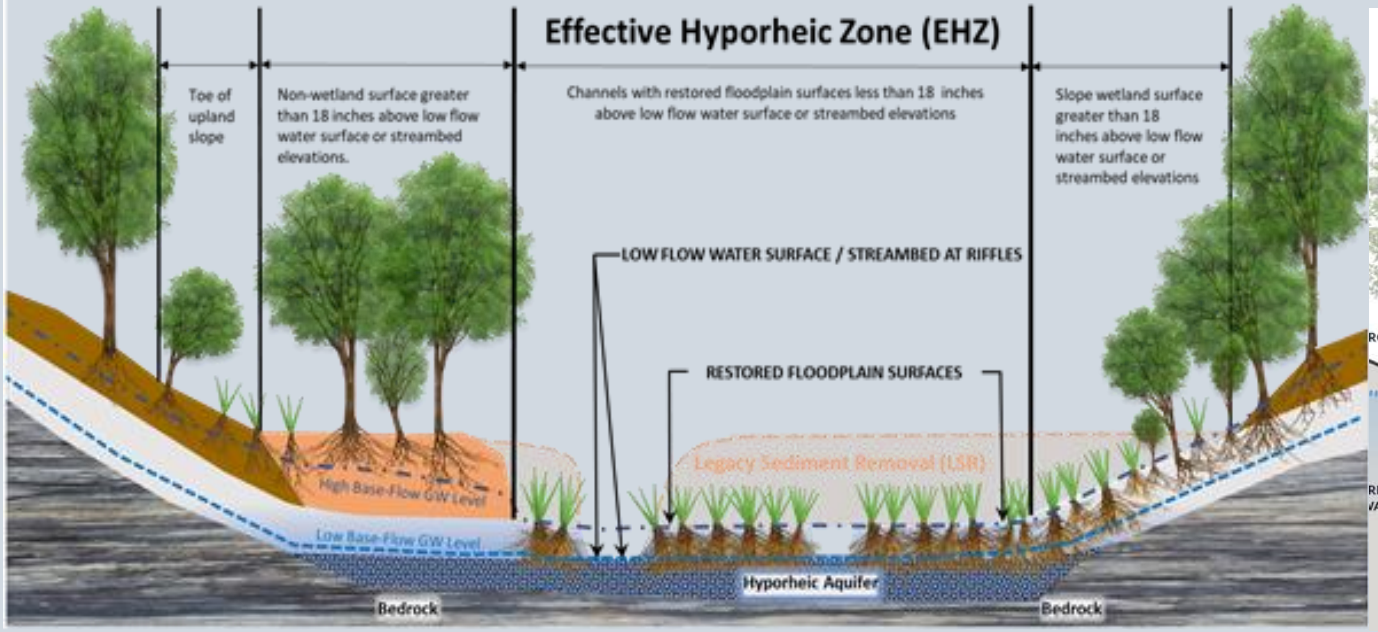
Ensure tweaks are Phase 6 watershed model compatible (e.g., delivery, new stream source)

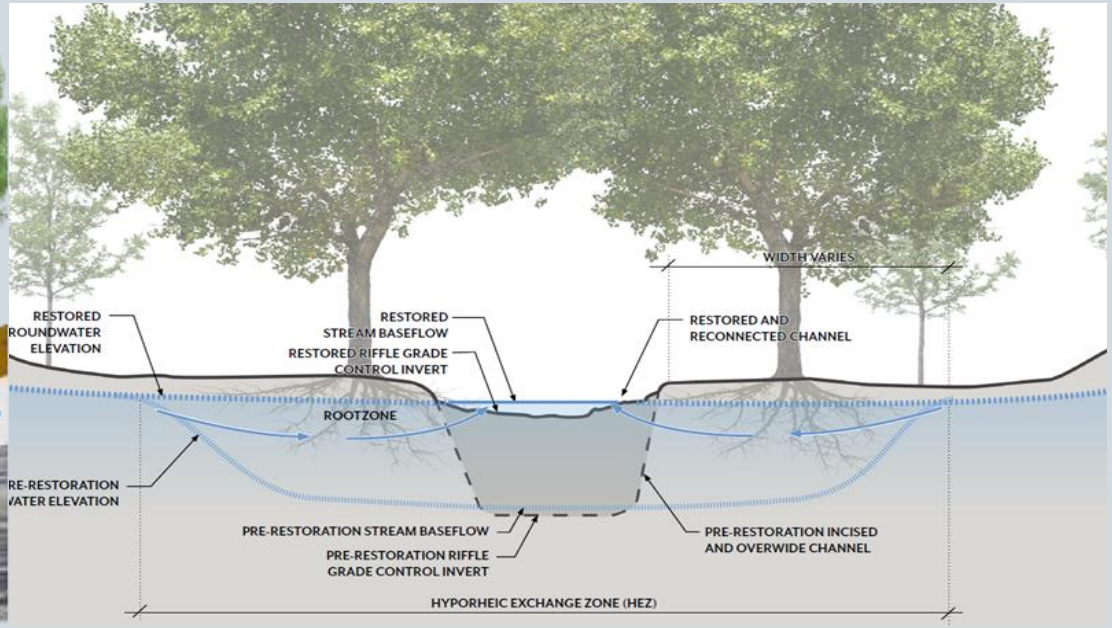
Retain the integrity of the pollutant removal protocols, but tweak based on:

- Better science to define removal parameters (e.g., unit denitrification rate)
- Field testing of most sensitive parameters in load calculations
- More defensible methods to define boundaries over which the removal processes operate

The Recommendations

- Definitions and qualifying conditions for two flavors of floodplain restoration: LSR and RSB





New Qualifying Conditions

Keep all the original qualifying conditions from the Expert Panel report (2014)

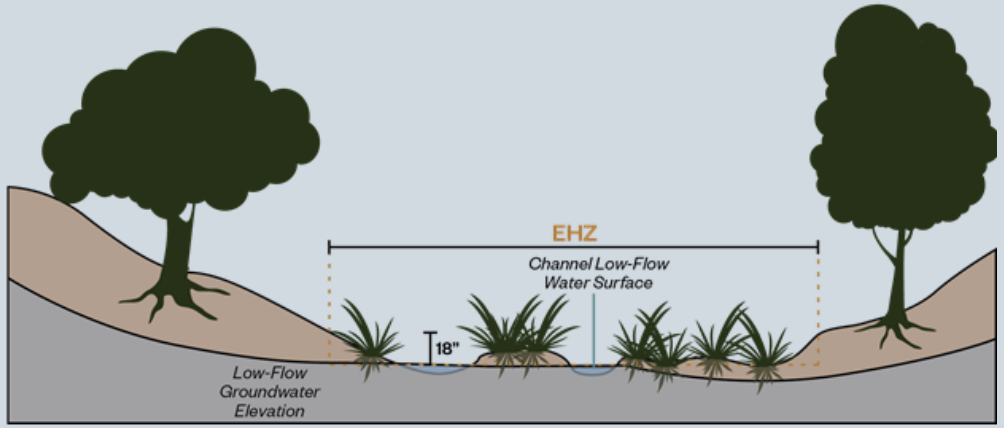
For LSR and RSB:

1. Project must meet applicable floodplain management requirements in the stream corridor
2. Project must evaluate the duration of floodplain ponding in the context of the restoration goals
3. Project must demonstrate consideration of potential unintended consequences of the restoration (Outlined in Section 7).

The Recommendations

Protocol 2:

- Replace the existing Hyporheic Box with an area-based “Effective Hyporheic Zone”.
- Replace the existing denitrification rate (1.95 x 10^{-4} lbs/ton/day) with a new rate (2.69 x 10^{-3} lbs NO_3/sq ft/year) and adjust it based on site factors, such as seasonal streamflow, floodplain height and the underlying materials in the hyporheic aquifer (i.e., the Parola Equation).
- Eliminate the bank height ratio (≤1) requirement, since these don’t typically apply to most low-bank FR projects.



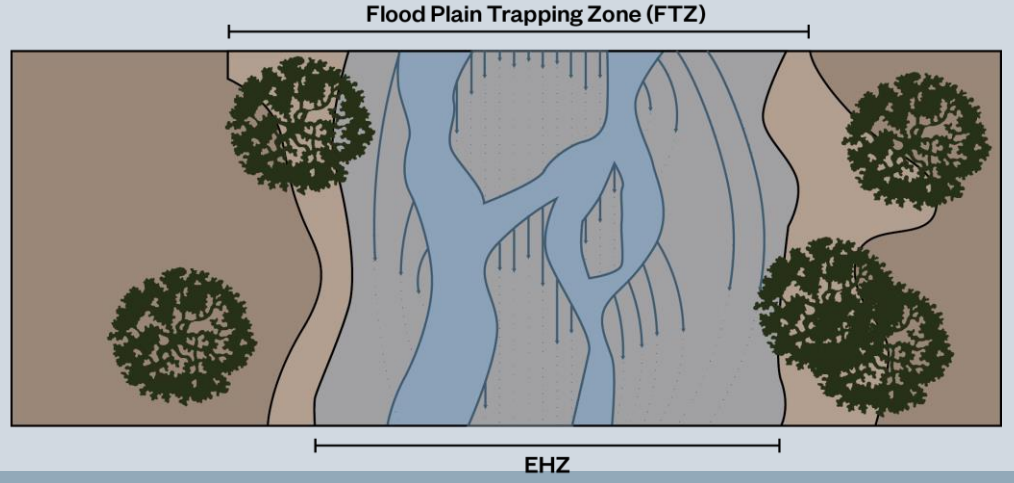


Table 10: Site Specific Discount Factors for Adjusting the Denitrification Rate (Parola et al, 2019)					
Effective Hyporheic Zone N credit = (Base Rate) (EHZ) (B_f) (H_f) (A_f)					
Baseflow Reduction Factor (B_f)		Floodplain Height Factor [1] (H_f)		Aquifer Conductivity Reduction Factor [2] (A_f)	
Perennial baseflow	1.0	0-0.75 ft	1.0	cobbly gravel, gravel, gravelly sand, sand and peat	1.0
Baseflow in all but late summer/fall	0.75	0.76 ft – 1.00 ft	0.75	gravelly silt, silty sand, or loamy sand, sandy loam, and organic silt with no coarse material layer connected to the streambed	0.60
Baseflow in winter/spring	0.50	1.01 ft – 1.25 ft	0.50	clayey gravel, sandy silt, or sandy clay loam, loam, silt loam, and silt with no coarse material layer connected to the streambed	0.40
Baseflow only during wet seasons	0.25	1.26 ft – 1.50 ft	0.10	sandy clay, clay loam, silty clay loam, organic clay with no coarse material layer connected to the streambed	0.10
Flow only during runoff events	0.10	>1.50 ft	0.00	silty clay and clay with no coarse material layer connected to the streambed	0.01

[1] The floodplain height factor is determined by the restored floodplain height (Hf) above the streambed riffle elevations or low flow water surface elevations. Additional streambed feature elevations, like those at a run in sand bed channels or streambeds comprised of silty clay, also may be used to determine the restored floodplain height. Low base-flow (lowest 10% of flows) could also be used as a suitable alternative.

[2] This refers to an aquifer capacity factor based on the dominant materials within the streambed and below the floodplain soil of the EHZ (Figure 4). Where coarse grain aquifer layers are not directly connected to the channel, the factor should be determined based on the soil texture at the elevation of the streambed using NRCS standard texture classifications (Schoeneberger, et al., 2012).

“Base Rate” is the mean areal floodplain denitrification rate (lbs/sq foot/yr), as recommended by Group 4.

The Recommendations

Protocol 3

- Replace the “upstream” method of using rainfall-runoff models to determine the amount of stream flow that is diverted into the floodplain, with a “downstream” method that uses scaled, representative USGS gauge stations to calculate overbank flow.
- Use updated non-tidal wetland BMP removal rates to determine % efficiency
- Remove the upstream watershed to floodplain surface area ratio reduction.

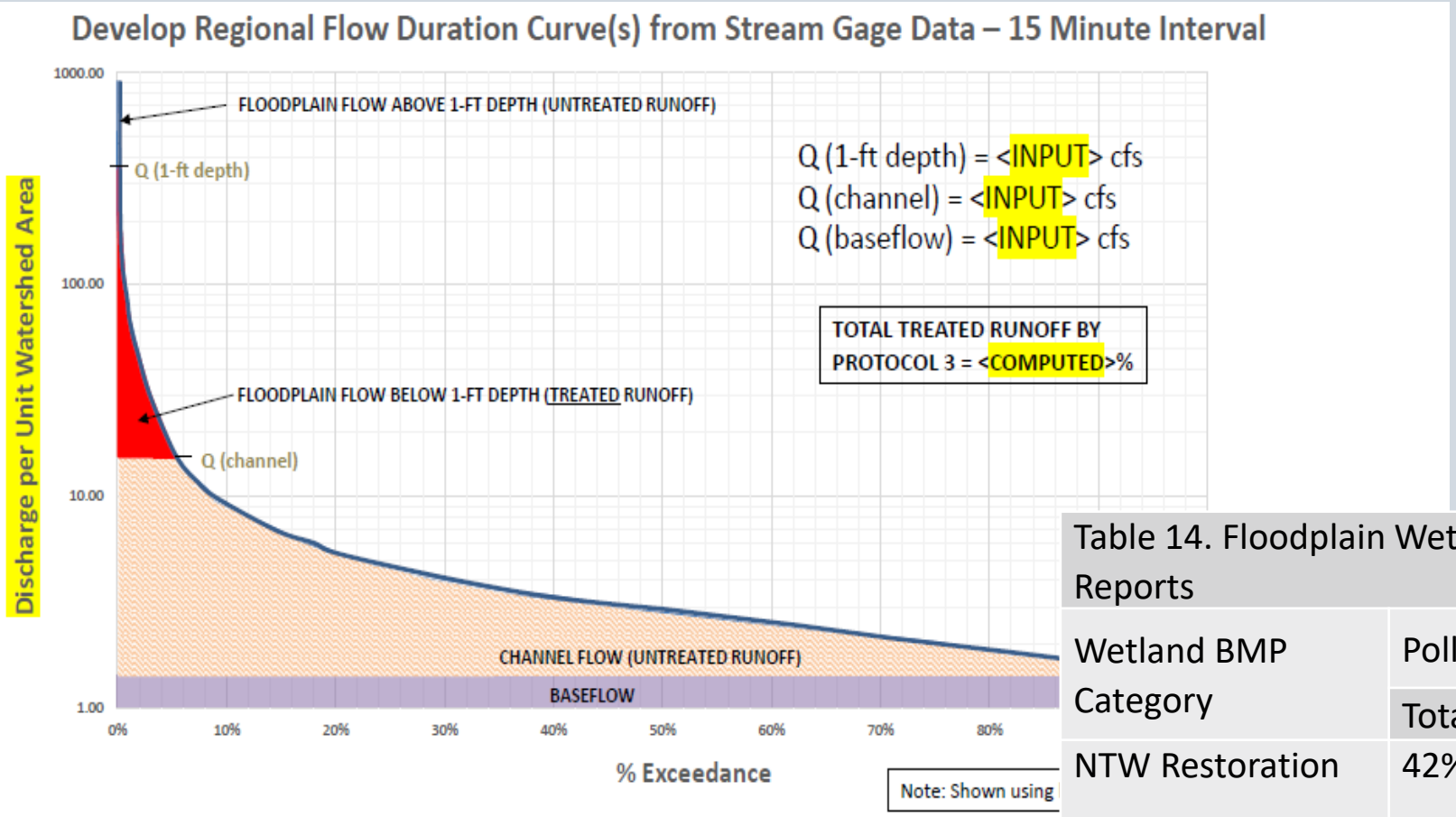


Table 14. Floodplain Wetland Removal Rates in Prior CBP Expert Panel Reports

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 Expert Panel Report(NTW EP, 2020)

[2] rates are applied to the stream bed and bank load delivered to the project reach (see Table 16 and Appendix H for example). The “upland acres treated” factors from the NTW EP do not apply for Protocol 3.

Environmental Considerations

- Advisory in nature – intended to promote best practices
- Review of research on potential unintended consequences
- Outlines best practices for:
  - Design and Siting
  - Construction
  - Post-Construction

Tracking/Reporting/Verification

- No changes to how practice is reported to CBPO
- Guidance provided on some addition records helpful for verification
- New appendix on using CAST to help with Protocol 3 calculation
- Verification based on Group 1 memo (2019)

Response to Comments

- New Appendix K: MDE Addendum on P3 use in Maryland
- New Appendix J: Dissenting Opinion on Protocol 2 adjustments
- Pending WQGIT decision on use of new Protocols in Urban and Non-urban streams

Questions?