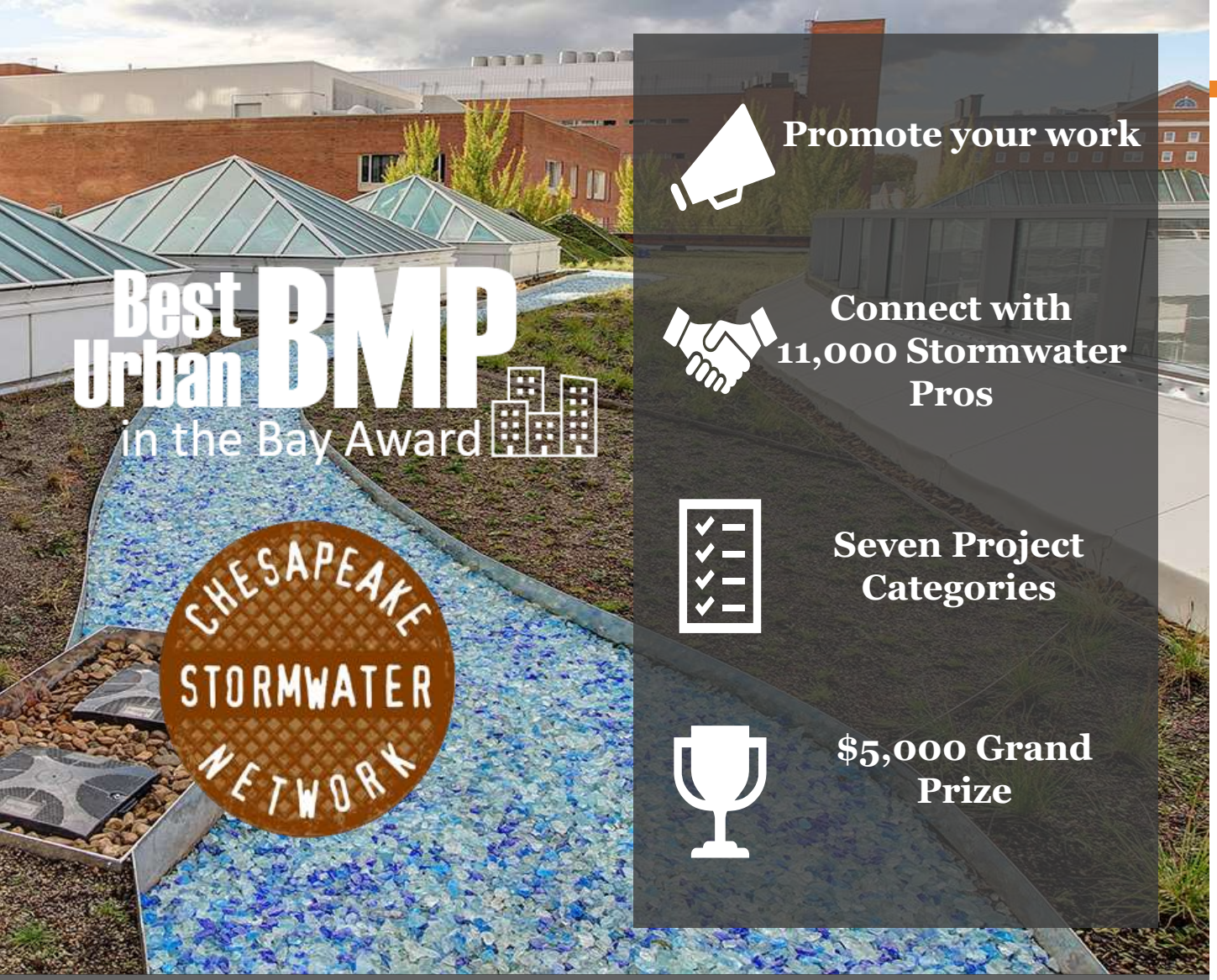
# NEW CHESAPEAKE BAY BMPS

## WEST VIRGINIA STORMWATER WORKSHOP

## JANUARY 12, 2021




**Contest Closes February 5, 2021**

**www.chesapeakestormwater.net/the-bubbas**

## What's New This Year?

**New Category:**
Innovations in Stormwater Permit Implementation

**New Grand Prize Category:**
"Small but Mighty"

# WHAT WE'LL COVER

- Conservation Landscaping
- 3 Flavors of Tree BMPs
- Outfall and Gully Stabilization Protocol
- New Stream and Floodplain Guidance

# CONSERVATION LANDSCAPING AS A BAY BMP

APPROVED: AUGUST 2018

REPORT: HTTPS://CHESAPEAKESTORMWATER.NET/DOWNLOAD/8886/

# BACKGROUND: CREDITING HOMEOWNER BMPS

- 2014 Report ties homeowner practices to existing approved BMPs
- Allows aggregated homeowner BMP reporting
- Shorter credit but streamlined verification

**Table 1 Link Between Expert Panel Reports and Homeowner BMPs Credits**

| *Individual BMP* | *Status* | *Notes* |
|---|---|---|
| Rain Garden | Approved | Define DA and rainfall depth treated by each individual practice and then use the retrofit adjustor curves of expert panel for on-site retrofits |
| Rain Barrel | Approved | |
| Permeable Pavement | Approved | |
| Downspout Disconnection | Approved | |
| UNM Pledge [1] | Approved | Define turf area (TA) and associated removal rates based on risk factor for each individual urban nutrient management plan or pledge, as specified in expert panel report |
| UNM Plan, Hi Risk [2] | Approved | |
| Conservation Landscaping [3] | None | Convert turf to meadow |
| Tree Planting | Interim/ Pending | Interim rate exists for sf of tree canopy, but an expert panel is expected to modify rate in 2104 |
| Impervious Cover Removal [4] | N/A | Impervious cover converted to pervious cover |

# WHY CONSERVATION LANDSCAPING?

- Pervious lands comprise nearly 10% of the total watershed area of the Chesapeake Bay, of which about 80% is specifically devoted to home lawns
- Compared to managed turf, conservation landscapes:
  - Have no fertilizer inputs
  - Help decompact the urban soils
  - Provide native habitat and wildlife corridors
  - Reduce long term maintenance compared to mowing
  - Look great!

# CONSERVATION LANDSCAPING BMP

**Conservation Landscapes:**

- Convert turf to perennial meadow (native landscaping)
- The landscaping areas are slightly depressed so they can hold rainfall
- Are designed to provide habitat for birds and pollinators
- Has a maintenance plan to arrest succession

# POLLUTANT REMOVAL

**Table 1. Summary of Pollutant Load Reductions from Conservation Landscapes.**

| | TN | TP | TSS |
|---|---|---|---|
| **Removal Rate** | 39% | 25% | 0% |

**Option 1**: Credit for the converted area only

**Option 2**: Credit for converted area + Impervious run-on (w/ 2 x CL area cap)

# REPORTING/VERIFYING

- Individual conservation landscapes can be aggregated
- Inspect every 5 years
- Can be self-reported photos from homeowners of key indicators
- Can be inspect randomized subset (10%) at county-scale

# URBAN TREE PLANTING BMPS

APPROVED: SEPTEMBER 2016

CANOPY AND FORESTRY REPORT: HTTP://CHESAPEAKESTORMWATER.NET/DOWNLOAD/7222/

RIPARIAN BUFFER REPORT: HTTPS://CHESAPEAKESTORMWATER.NET/DOWNLOAD/9065/

*Through the* Chesapeake Bay Watershed Agreement, *the Chesapeake Bay Program has committed to…*

## Vital Habitats Goal

**Tree Canopy Outcome:** Continually increase urban tree canopy capacity to provide air quality, water quality and habitat benefits throughout the watershed. **Expand urban tree canopy by 2,400 acres by 2025.**

# THE MANY TREE BMPS:

1. Urban Tree Canopy
2. Urban Forest Planting
3. Riparian Buffer Planting

# Urban Tree BMPs approved for Chesapeake TMDL

## 1. Urban Tree Planting - Canopy

| | |
|---|---|
| **Definition** | • Trees planted on developed land (turf grass or impervious) that result in an increase in tree canopy<br>• Not intended to result in forest-like conditions/understory<br>• For reporting, 300 trees planted is equivalent to 1 acre |
| **Efficiency Credited** | Land use change to Tree Canopy over Turf or Tree Canopy over Impervious |
| **Credit Expiration** | 10 years, then it is picked up in land cover data |

# Urban Tree BMPs approved for Chesapeake TMDL

## 2. Urban Forest Planting

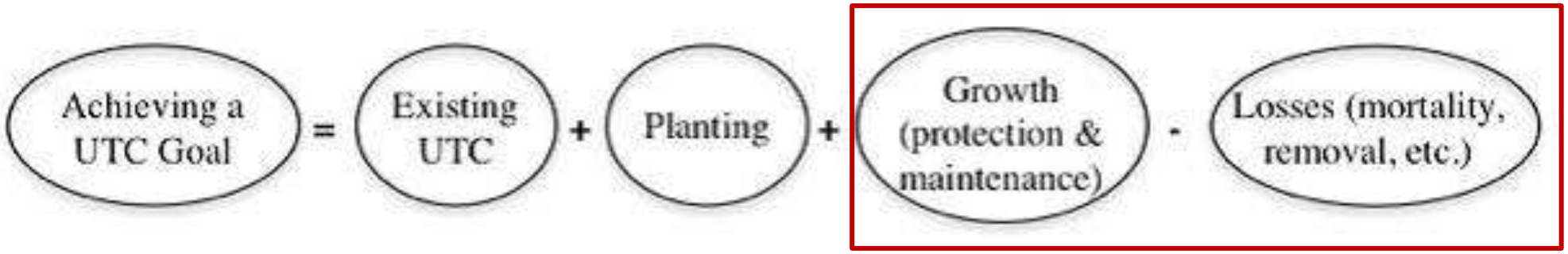
| | |
|---|---|
| **Definition** | • Trees planted in a contiguous area to establish forest-like conditions (no minimum size)<br>• No fertilization and minimal mowing to aid tree and understory establishment<br>• Required planting and maintenance plan that meets any State or District standards for forest establishment |
| **Efficiency Credited** | Land use change to Forest (lowest loading land use) |
| **Credit Expiration** | 15 years, then it is picked up in land cover data |

# Urban Tree BMPs approved for Chesapeake TMDL

## 3. Urban Forest Buffer

| | |
|---|---|
| **Definition** | • Forest buffers are linear wooded areas along waterbodies that help filter nutrients, sediments and other pollutants<br>• Recommended buffer width is 100 feet, with a 35 feet minimum width |
| **Efficiency Credited** | Land use change to Forest, plus each acre reported receives a load reduction/efficiency credit on one upland acre: TN: 25%, TP 50%, TSS: 50% |
| **Credit Expiration** | 10 years, then practice must be verified to maintain the efficiency credit |

# *It's not just about planting…*



# OUTFALL AND GULLY STABILIZATION

APPROVED: OCTOBER 2019

FULL REPORT: HTTPS://CHESAPEAKESTORMWATER.NET/DOWNLOAD/9714/

# HISTORY OF CBP STREAM RESTORATION CREDITING

- Expert Panel Report approved in 2013
- Report was revised after a “test-drive” period in 2014
- Changes in how streams and sediment are simulated in Phase 6 watershed model in 2017
- USWG approves SR Protocol FAQ document in early 2018
- 5 Groups formed to revisit Protocols in mid-2018

| Group 1 (Verification) | |
|---|---|
| **Name** | Affiliation |
| **Rich Starr** | Ecosystem Planning and Restoration |
| **Kathy Hoverman** | KCI |
| **Tim Schueler** | Hazen and Sawyer |
| **Kip Mumaw** | Ecosystem Services |
| **Neely Law** | Center for Watershed Protection |
| **Meghan Fellows** | Fairfax County, DPWES |
| **Sandra Davis** | US Fish and Wildlife Service |
| **Jennifer Rauhofer** | Stormwater Management Consulting |
| **Josh Burch** | DOEE |
| **Scott Cox** | PADEP |

| Table 1: Outfall Restoration Crediting Team | |
|---|---|
| **Name** | Affiliation |
| **Ray Bahr** | MDE |
| **Stephen Reiling** | DOEE |
| **Tracey Harmon** | VDOT |
| **Brock Reggi** | VADEQ |
| **Karen Coffman** | MDOT SHA |
| **Ryan Cole** | MDOT SHA (alternate) |
| **Elizabeth Ottinger** | US EPA Region 3 |
| **Carrie Traver/Aaron Blair** | US EPA Region 3 |
| **Alison Santoro** | MD DNR |
| **Ted Brown** | Biohabitats |
| **Chris Stone** | Loudoun County, VA |
| **Erik Michelsen** | Anne Arundel County |
| **Neil Weinstein** | LID Center |
| **Nick Noss** | PA Turnpike Commission |

| Table 1. Membership for Group 3 | |
|---|---|
| **Name** | Affiliation |
| **Drew Altland** | RKK |
| **Lisa Fraley-McNeal** | Center for Watershed Protection |
| **Joe Berg** | Biohabitats |
| **Rich Starr** | Ecosystem Planning and Restoration |
| **Josh Running** | Stantec |
| **Matt Meyers** | Fairfax County, VA DPWES |
| **Bill Brown** | PADEP |
| **Jeff White** | MDE |
| **Josh Burch** | DOEE |
| **Reid Cook** | RES Consultants |
| **Aaron Blair** | EPA |
| **Tess Thompson** | Virginia Tech |
| **Joe Sweeney** | Water Science Institute |

| Table 1. Roster for Group 4 | |
|---|---|
| **Name** | Affiliation |
| **Joe Berg** | Biohabitats |
| **Drew Altland** | RKK |
| **Bill Stack** | CWP |
| **Scott Lowe** | McCormick Taylor |
| **John Hottenstein** | Bayland Consultants |
| **Jeremy Hanson** | Virginia Tech |
| **Sujay Kaushal** | University of Maryland |
| **Joel Moore** | Towson University |
| **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 |

# THE STREAM RESTORATION PROTOCOLS

1. Prevented sediment

2. In-stream denitrification

3. Floodplain reconnection

4. The "tweener" Dry Channel RSC

# PRIMARY PURPOSE

Addressing erosion driven by vertical incision.

Often caused by:

- Uncontrolled runoff upstream,
- Migrating nick points,
- Poor slope stabilization or energy dissipation structures.

**Figure 2. Examples of Severe Outfall Erosion in the Headwater Transition Zone**

**1.**


**2.**


**3.**


**4.**

# WHAT IS THE OUTFALL AND GULLY STABILIZATION PROTOCOL?

- Is a new way of calculating prevented sediment for restoration projects addressing channel erosion driven by vertical incision
- Is NOT a new design approach
- Creates a new "Protocol 5"
- Cannot be combined with Protocol 1
- Can be combined with Protocols 2, 3 and 4.

# USING THE OGSP PROTOCOLS IN PERENNIAL/INTERMITTENT STREAMS

- Protocol should primarily be applied in the Headwater Transition Zone, not the perennial or intermittent stream network

In channels degrading primarily due to vertical headcut incision, stricter qualifying conditions apply:

- The project MUST meet the more stringent QCs
- The project MUST NOT introduce barriers or challenges to aquatic organism passage or degrade instream habitat
- No drop structures, or hard armoring

# FLOODPLAIN RECONNECTION (PROTOCOLS 2 & 3)

APPROVED: OCTOBER 2020

FULL REPORT: HTTPS://CHESAPEAKESTORMWATER.NET/DOWNLOAD/10032/

# THE STREAM RESTORATION PROTOCOLS

1. Prevented sediment

2. In-stream denitrification

3. Floodplain reconnection

4. The "tweener" Dry Channel RSC

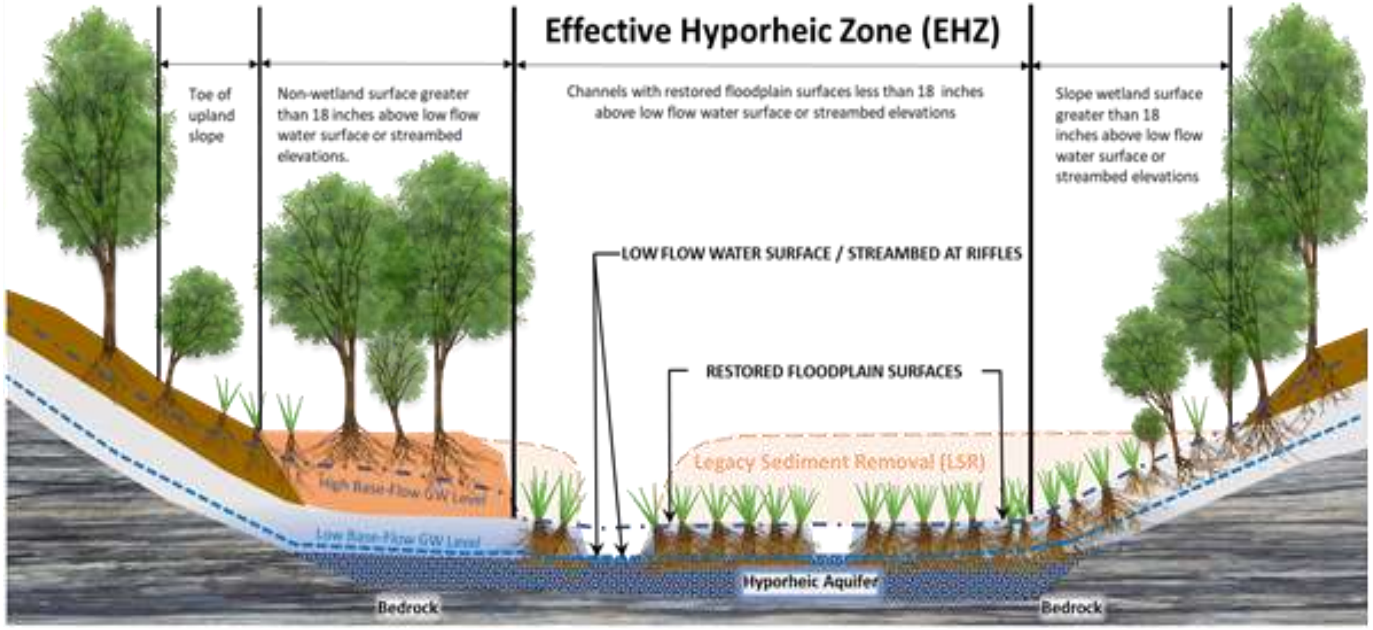
# GUIDING PRINCIPLES

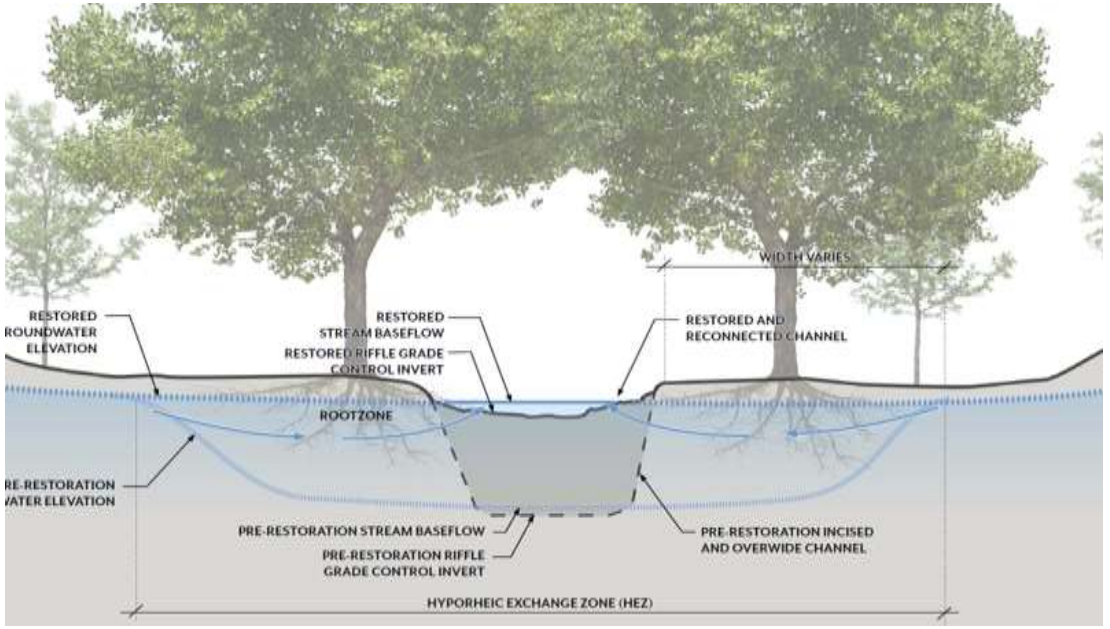
- Ensure tweaks are Phase 6 watershed model compatible (e.g., delivery, new stream source)

- 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)

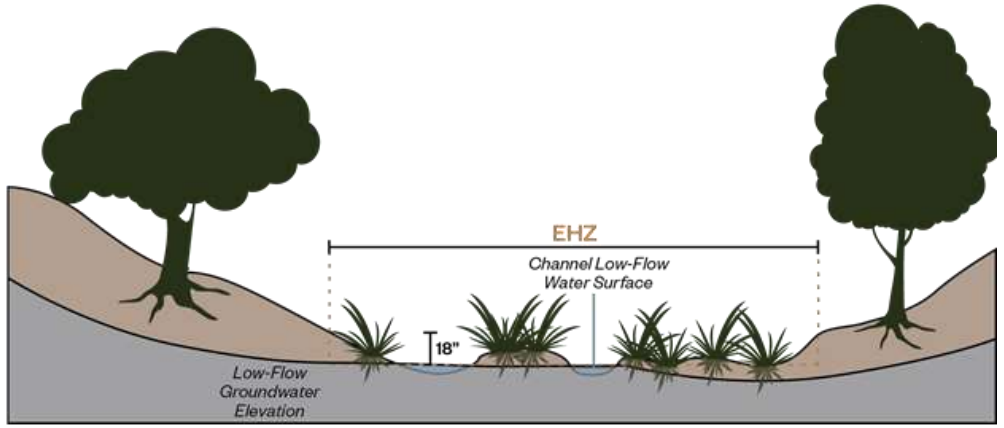
- For LSR and RSB:

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
- Eliminate the bank height ratio (≤1) requirement, since these don't typically apply to most low-bank FR projects.



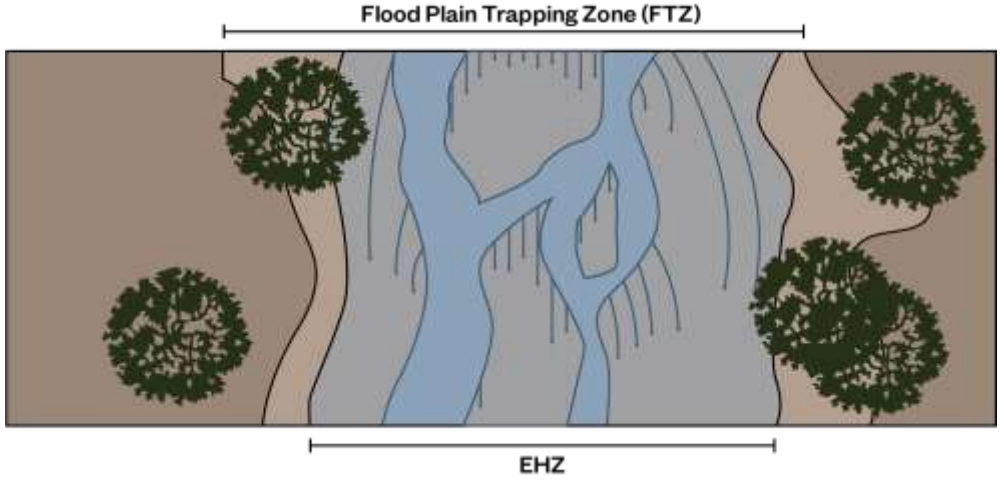



**Table 10**: Site Specific Discount Factors for Adjusting the Denitrification Rate (Parola et al, 2019)

*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 |

# THE RECOMMENDATIONS

## Protocol 3

- Replace the “upstream” method of using rainfall-runoff models to determine the annual 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.

## Develop Regional Flow Duration Curve(s) from Stream Gage Data – 15 Minute Interval

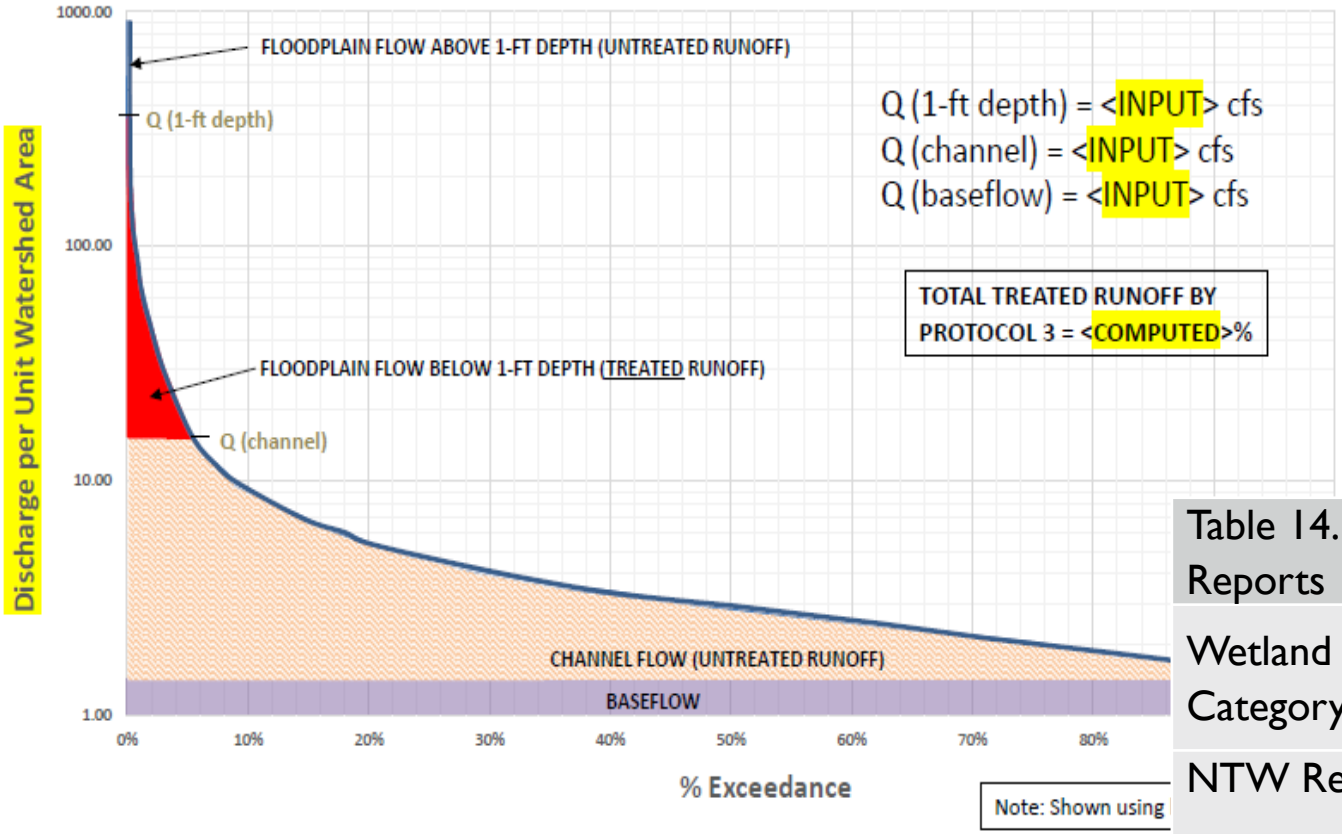



Table 14. Floodplain Wetland Removal Rates in Prior CBP Expert Panel Reports

| 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)

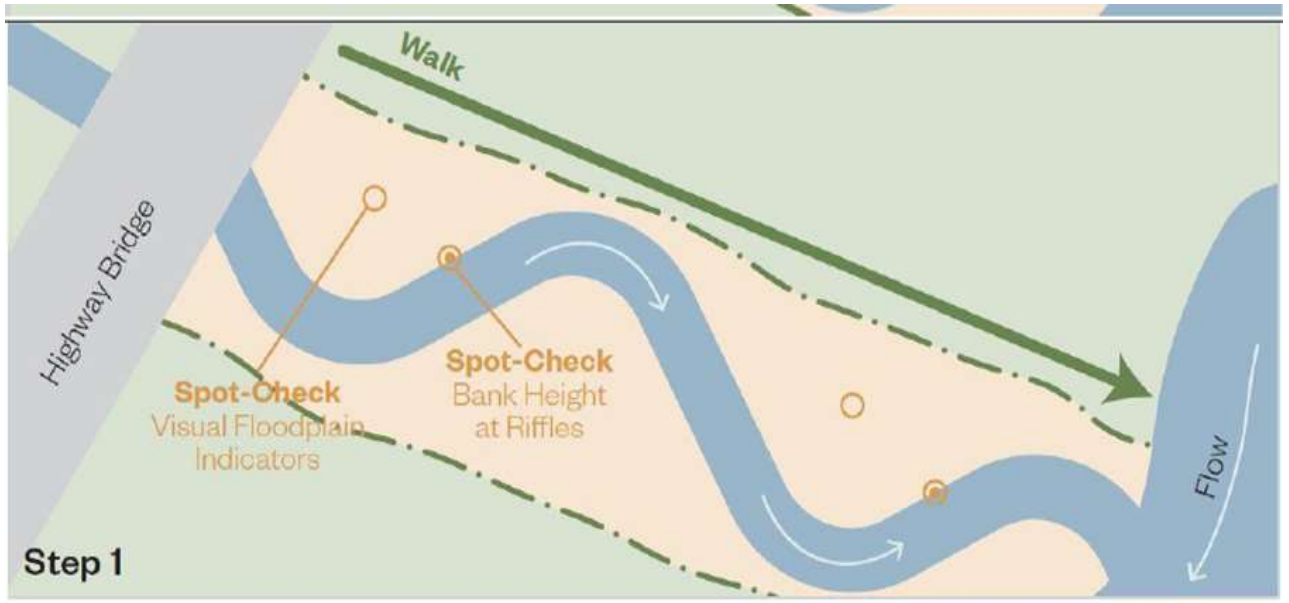
[2] rates are applied to the stream bed and bank load delivered to the project reach (see Table 16 and Appendix H for example). The "upland acres treated" factors from the NTW EP do not apply for Protocol 3.

# 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)



# QUESTIONS?