Protocol 2 DESIGN EXAMPLE

Simplified design examples to show how the revised P2 works for LSR and RSB projects

Design Example[1]

A 1,000 linear ft FR project is completed. It meets all qualifying criteria outlined in Sections 3.3 and 3.4. The resulting stream-wetland complex has the following characteristics:

- Single-threaded meandering channel with perennial baseflow.
- The post-restoration floodplain surface is 6" above the riffle crest for an area that extends an average of 100 ft laterally, for the entire length of the restoration. The channel itself is 5 ft wide. (These dimensions are later confirmed by groundwater monitoring).
- The predominant post-restoration soil type is a silty-sand.

Step 1. Define the Extent of the EHZ.

Calculate the area of the restored floodplain. It is helpful to separate out the channel area to make the following steps simpler:

- Floodplain: 1,000 ft x 95 ft = 95,000 sq ft
- Channel: 1,000 ft x 5 ft = 5,000 sq ft

Step 2. Apply the Denitrification Rate to the EHZ

- Floodplain: 95,000 sq ft x 0.00269 lbs/sq ft/year = 256 lbs NO_3/year
- Channel: 5,000 sq ft x 0.00269 lbs/sq ft/year = 13 lbs NO_3/year

Step 3. Apply the Site Specific Discount Factors

The site has perennial baseflow, 6" floodplain height and a silty-sand aquifer throughout the restored floodplain. Use Table 10 to identify the appropriate adjustments.

- Floodplain: 256 lbs/year x 1.0 x 1.0 x 0.6 = 154 lbs NO_3/year
- Channel: 13 lbs/year x 1.0 x 1.0 x 1.0 = 13 lbs NO_3/year

Step 4. Calculate the Total Nitrate Removed[2]

In this example, the pre-restoration condition was an incised, highly degraded channel. Fine grained legacy sediments in the floodplain and the lack of contact between the hyporheic aquifer and the root zone meant that there was assumed to be negligible denitrification in the hyporheic zone during baseflow conditions[3]. Therefore, the sum of the post-restoration denitrification rate in the channel and floodplain represents the total nitrate removal under Protocol 2.

- 154 + 13 = **167 lbs NO3/year**

[1]Design example represents a simplified hypothetical project site to demonstrate how the nutrient reductions are calculated.

[2] Protocol 2 is based on nitrate (NO_3) removal due to denitrification. The Chesapeake Bay Program only accepts total nitrogen (TN) as a reportable unit. The value calculated in Step 4 should be reported as TN, without further adjustment. This is the most accurate way to report the removal efficiency as calculated in Protocol 2, while also serving as a conservative estimate of the TN removed in the hyporheic zone during baseflow.

[3] If the pre-restoration floodplain area includes existing wetlands or areas that are within 18" of the low flow water elevation, practitioners and reviewers should check to ensure that the project meets the qualifying condition that the stream is highly degraded and actively degrading. If the qualifying conditions are met, the Protocol should be run on both the pre- and post-restoration conditions, and credit is earned for the difference.