Streams BMP Verification Protocols

submitted by the Habitat GIT's Streams workgroup

In order to verify that a stream has been restored and is continuing to functionally support water quality benefits and biological populations, practices must be implemented to monitor specific ecosystem functions. The Habitat GIT advocates that stream habitat BMP restoration verification protocols be based upon the Stream Functions Pyramid.

The Stream Functions Framework (Harman, W., et al. 2012) is a tool that organizes stream ecosystem functions in a hierarchical structure and illustrates how physical functions support chemical and biological functions. The Stream Functions Framework consists of four components that increase in detail. First, the broad-level view shows the five functional categories with underlying controlling variables of geology and climate. Second, function-based parameters are provided for each functional category. Third, measurement methods are provided for each function-based parameter. And fourth, where possible, performance standards are provided for the measurement methods.

This hierarchical representation of stream functions has five levels, starting from bottom to top:

1-Hydrology: transport of water from the watershed to the channel

2-Hydraulics: transport of water in the channel, on the floodplain, and through sediments

3-Geomorphology: transport of wood and sediment to create diverse bed forms and dynamic equilibrium

4-Physicochemical: temperature and oxygen regulation; processing of organic matter and nutrients

5-Biology: biodiversity and the life histories of aquatic and riparian life

Verifying that the functions in Levels 1 through 4 are present enables achievement of functional improvements in biology. Detailed information on the Stream Functions Framework can be accessed here: http://water.epa.gov/lawsregs/guidance/wetlands/upload/A_Function-Based_Framework.pdf. Chapter Four describes the framework and Chapter Eleven outlines potential applications.

The following stream restoration BMP verification protocols are based on use of the Stream Functions Pyramid to determine the continued function of a restored stream:

- The measurement methods are typically performed at a reach scale using function-based parameters (includes structural and function parameters)

- The Streams workgroup will determine the level of assessment (rapid or moderate) appropriate for BMP verification while keeping in mind staff availability and budget limitations.
- The Streams workgroup will develop a standard stream verification protocol SOP.

References

Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. 2012. *A Function-Based Framework for Stream Assessment and Restoration Projects.* US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, DC EPA 843-K-12-006.