

## **Mobile District Guidance for Development of Stream Mitigation Performance Standards**

Performance standards are defined in the 2008 Mitigation Rule as: observable or measurable physical, chemical, and/or biological attributes that are used to determine if a compensatory mitigation project meets its objectives. The Rule goes on to say that performance standards must be tied to the objectives (see Appendix B-Restoration Objectives) of the project, and must be objective and verifiable and based on the best available science. All stream mitigation methodologies, assessments, and performance standards must be practicable, repeatable, and appropriate for implementation in the Regulatory Program and support other agency needs. Protocols and methodologies for obtaining measurable attributes must be verified and approved by the Corps.

The most notable stream system attributes associated with stream restoration projects are stream geomorphology (pattern, profile, and dimension), hydrology (magnitude, duration, and frequency), hydraulic (energy), and indirect surrogate metrics for chemistry (riparian buffer), and biology (stream habitats). While some of these parameters lend themselves to efficient measurement (e.g. geomorphology and habitat), others are more complicated. Measuring changes in chemical and biological attributes of stream ecosystems is significantly more complicated because of natural stochastic variability, regional variability, and quick responsiveness to changing development influences outside the project area. In these cases, the Mobile District supports the use of surrogate metrics within the control of the stream restoration project that are practicable, repeatable, and appropriate for implementation in the Regulatory Program. There are too many variables that must be addressed for a one-size fits all approach to stream channel restoration. The Mobile District endorses the use of natural stream channel design concepts where the development of project specific performance standards are based on clearly defined objectives and the ability to correlate the appropriate stream restoration metrics between the stream restoration project and approved reference reaches.

Reference reaches are streams of the same type (sometimes order), and position within the watershed that exhibit stable stream pattern, profile, and dimension, appropriate benthic substrates, and representative stream habitats. Reference reaches do not have to be pristine “totally undisturbed” streams, but should represent the least altered stable stream available for a watershed. While the reference reach can provide reference stream metrics for the stable stream at a single point in time, it is important to monitor these systems during the life of the project since upstream land use changes can also alter the condition of the reference system. Any changes within the upstream watershed may require adaptive management when developing the final stream restoration design.

### **Stream Mitigation Performance Standards**

- Establishment and acceptance of Reference Stream Reach for target stream pattern, profile, and dimension using data required by Appendix B Summary Data Worksheet. The Reference Reach Stream should be evaluated for appropriate benthic substrates and aquatic habitats.
- Identification of stream attributes requiring stream restoration actions. Restore stream

channel to a stable pattern, profile, and dimension (as appropriate based on impacts), appropriate benthic substrates, and appropriate aquatic habitats based upon reference stream parameters.

- Maintaining stable stream parameters, substrates, and habitats for at least two bankfull events, preferably two larger events (i.e., 2-yr, 5-yr, 10-yr, 25yr, etc. events). Exact calculation of the bankfull return and discharge will be addressed with the information required in a completed Appendix B Summary Data Worksheet. Bankfull events typically occur on a return interval of 1.5 or less. The second bankfull event should be no sooner than 1.5 years after the first event to demonstrate long-term stability of the restored stream channel. One flow must inundate the floodplain.
- Riparian buffers: Except for urban streams, the minimum riparian buffer that can be placed on a stream is 50 feet. Riparian buffer restoration and enhancement actions and target ecological performance standards should be based upon success criteria developed by Mobile District. The Mobile District wetland success criteria are listed on Regional Internet Banking Information Tracking System (RIBITS) site on Mobile District Regulatory Division web site (<http://www.sam.usace.army.mil/RD/reg/>).
- Wetland riparian buffers: Site hydrology and vegetation mimics Corps approved wetland reference site or wetlands performance standards/success criteria (and associated credit release schedule if a mitigation bank) developed by Mobile District. Riparian enhancement projects require vegetative improvements. Riparian restoration projects require monitoring and demonstrating both vegetative and hydrologic improvements. For hydrology, monitoring wells should be placed in both the project site and the target reference site for measuring and demonstrating hydrologic improvements.
- Upland riparian buffers: An upland reference site is required that is within the same watershed. Riparian buffer restoration and enhancement ecological performance standards will be based upon the same attributes (target species composition, density, and diversity) as reflected in the Mobile District bottomland hardwood performance standards. All reference sites and proposed performance standards must be approved.

Achievement of performance standards will be determined for each stream reaches through a comparative analysis of the initial baseline data on physical parameters in the reference stream and project stream before mitigation is implemented, and monitoring of these physical parameters annually, for at least 5 years or the life of the mitigation project, and after mitigation is completed (mitigation banks). Physical parameters that must be measured include and documenting stream specific stability parameters for pattern, profile, and dimension, benthic substrates, habitats, as well as deviations from stable stream conditions using, at minimum, data required by Appendix B and the monitoring data requirements identified in Appendix D. Although not required, water chemistry parameters such as water temperature, DO, turbidity, and water pH may be provided above, below, and within the restored stream reach to demonstrate no short-term adverse impacts resulting from the project. The presence of various aquatic habitats must be measured which serves as a surrogate to measuring stream biological productivity metrics such as fish and aquatic insect population metrics. While not required, aquatic species diversity and abundance may be measured above, below, and within the restored stream reach to demonstrate no short-term adverse impacts resulting from the project.

**MITIGATION BANKS:** Prior to requesting a credit release, mitigation banks are required to provide stream measurement data sheets (appendix B worksheet) for each stream reach to demonstrate achievement of required performance standards, including assessment of stable stream conditions, appropriate substrates, and appropriate aquatic habitats. Selected cross-sectional areas should be located at riffle and pool locations that are representative of typical pattern, profile, and dimension for the entire stream reach. The appropriate number of measurements will be determined on a project-by-project basis.

When monitoring stream restoration success criteria, information is required for evaluating hydrologic, geomorphologic, and aquatic habitat attributes of the restored stream ecosystem. Hydraulic data may be required on a case-by-case basis. The components listed in Appendices B are important to assessing the baseline condition and restored condition of a restored reach. The current performance standards for a stream restoration project are reflective of current lateral and vertical stream channel stability (pattern, profile, and dimension), hydrology and bed form diversity, channel substrate, aquatic habitat diversity, establishment of the riparian zone, and floodplain connectivity. Table 1 refers to general performance criteria categories that will be assessed:

Table 1. General performance criteria categories used to evaluate the success or failure of activities at stream mitigation project.

Mitigation Component (Item)	Success (Required on action)	Failure
1. Floodplain Connectivity	Stream has access to the floodplain or floodprone area. No signs of headcutting.	Loss of access to floodplain, stream begins to incise (bed lowering) as shown by headcuts, stream bank and stream bed erosion and scour leading to inappropriate stream profile and dimension.
2. Stream Channel Stability	Vegetated stream banks, limited erosion that does not represent a trend towards further lateral instability, stable stream channel morphology that is sustaining reference stream attributes.	Streambank erosion and avulsion is prevalent on both adjacent stream banks and has the potential to cause large (reach) scale adjustment and destabilization of stream channel pattern, profile, dimension, e.g. down-valley meander bend migration. Unnatural bank erosion is predicted to worsen over time.
3. Bed Form Diversity	Riffle/pool and depth variation meets reference conditions. Appropriate stream channel substrates.	Bed form frequency and variation does not meet reference conditions, and the loss of natural benthic substrates

4. Riparian Vegetation and Hydrology	Riparian vegetation and hydrology reflect or are trending towards achieving target success criteria (invasive species are not present, hydrology similar to reference site, tree and plant species density, diversity, and composition meet target approved by Mobile District).	Riparian vegetation and hydrology not appropriate or indicate a trend towards failure and not achieving the target success criteria.
5. Biological Indicators  Aquatic Habitats  *Invertebrate populations *Fish populations  *Not required as a success criteria metric	Target aquatic habitat reflects appropriate composition, density, and diversity present and is demonstrating sustainability. Though not required, supporting data that reflects no short-term project related impacts to endemic aquatic species populations.	Aquatic habitat composition and diversity not present or not being sustained. If collected, data that reflects project causing negative impacts to endemic aquatic species populations.

#### **Adaptive Management:**

**Contingency Plans/Remedial Actions:** In the event the mitigation fails to achieve interim or final success criteria as specified in the mitigation plan, sponsor shall develop necessary contingency plans and implement appropriate remedial actions for that phase. In the event the sponsor fails to implement necessary remedial actions or demonstrate meaningful progress towards achieving the target success criteria within an appropriate amount of time determined by the Corps, the Corps will notify sponsor and the appropriate authorizing agencies and require appropriate corrective actions that may include providing alternative compensation by purchasing mitigation credits from an approved mitigation bank. The Corps reserves the right to take enforcement actions on all permit non-compliance issues.