

Stream Mitigation Options and Associated Macrobenthos Monitoring Interim, Internal DWQ Policies on Stream Mitigation Options and Associated Macrobenthos Monitoring

As of: May 10, 2000

The following interim, internal policies for stream mitigation and associated macrobenthos monitoring in addition to stream restoration were developed by DWQ staff (401/Wetlands and Wetland Restoration Program) at a meeting on January 24, 2000 and then revised at meetings of a review group (DOT, City of Charlotte staff and consultants, WRP, WRC and 401/Wetlands) on February 24 and 14 March 2000. The following interim, internal options for stream mitigation are meant to present additional options to satisfy the stream mitigation requirements in 15A NCAC 2H .0506 (b)(6) for the 401 Water Quality Certification Program. DWQ staff anticipate that these interim, internal options will be presented to a larger multi-agency group including the U.S. Army Corps of Engineers during the summer of 2000 once that group is established. This interim, internal policy may then be modified by DWQ following the work of this larger group and public comment. Until that time, this interim, internal policy is effective as of May 10, 2000. The general guidelines in this interim, internal policy are subject to modification by the Director of DWQ if a particular proposed stream mitigation plan does not show an overall water quality and aquatic life benefit which offsets the loss of water quality and aquatic life uses from a particular project.

Watershed Management

A. Watershed Restoration/Enhancement

Entire watershed ? Applicants must model the entire watershed for hydraulics, erosive forces and pollutant sources and then select/locate BMPs. DWQ staff will review the modeling and BMPs to verify the accuracy of the models as well as the selection, size and location of BMPs.

Watershed size ? Should be larger than ? square mile (i.e. focus on perennial streams).

Targeting watershed ? Should be 303(d) list, HQW/ORW, Trout, Water Supply, etc. Mitigation should occur with same general type of watershed (i.e., urban watershed (defined as within an ETJ) versus rural watershed)

Ratios ? 2:1.

Accounting ? Count stream length below BMPs to the downstream end of improvement. BMPs must be designed and installed properly according to DWQ (and other) BMP Design Manuals. Restoration (1:1 ratio) and preservation (10:1 ratio) will be counted for separately. Long-term protection of the riparian corridor is encouraged and may receive preservation credits.

Up-front, pre-release of credits ? 15% pre; 10% for each of the 1st and 2nd years; 15% for each of the 3rd, 4th, and 5th years; with 20% held for release at end. This release schedule assumes that there is a showing of a trend of success. Crediting will begin

upon completion of the initial BMP. Preservation and restoration lengths to be released immediately upon plan approval.

Success criteria ? Pre-agreed upon goal to demonstrate improvement. The specific success criteria will be developed on a case-by-case basis by DWQ and the applicant. Pre and post monitoring, within and below watershed. Annual monitoring is required.

Monitoring ? Required within and below watershed. Monitoring will include analysis of tree survival to meet 320 trees per acre or other ecologically appropriate goal using permanent quadrats, herbaceous cover evaluated with photos, geomorphology including bank stability, macrobenthos and fish (see attached "Technical Guide Summary ? Benthic Macroinvertebrate Monitoring Protocols For Stream Restoration Projects "), and a habitat assessment form. Water chemistry will be limited in scope and focused on pollutants of concern in that watershed.

Reporting ? Annual reporting on BMP success, monitoring, credit balances and any corrective measures will be sent to DWQ for written concurrence.

B. Watershed Preservation

Protect forested, naturally vegetated or able to be naturally vegetated, and presently unprotected watershed from development, mining and logging. Protection for the watershed shall be through fee simple purchase and/or conservation easement.

Preservation provides long term protection for a stream segment or watershed and therefore has a role in stream mitigation. However DWQ's other major goal is water quality improvement and replacement of aquatic life uses which are unavoidably lost. Therefore DWQ may limit the use of preservation in the context of stream mitigation since aquatic life uses are not being replaced with preservation.

Ratio ? 10:1. DWQ will consider other ratios for streams with unusual flora or fauna (i.e., rare or endangered species) or highly valuable water quality.

Accounting ? Total stream length (perennial and intermittent).

Monitoring ? Not needed.

Reporting ? A final report with copies of the protection mechanism and description of the protected area will be sent to DWQ for written concurrence.

Stream Restoration

Definition ? Stream restoration is defined as "the process of converting an unstable, altered or degraded stream corridor, including adjacent riparian zone and floodprone areas to its natural or referenced, stable conditions considering recent and future watershed conditions. This process also includes restoring the geomorphic dimension, pattern and profile as well as biological and chemical integrity, including transport of water and sediment produced by the stream's watershed in order to achieve dynamic equilibrium".

Buffer (wooded) widths ? Goal of 50 feet in piedmont/coastal plain and 25 feet in mountains on each side measured from the top of bank. Smaller buffers may be possible under unique situations. Conservation easements or similar mechanisms are required to provide long term protection.

Ratio ? 1:1. DWQ will consider other ratios in unusual situations.

Monitoring ? Monitoring will include analysis of tree survival to meet 320 trees per acre or an other ecologically appropriate goal using permanent quadrats, herbaceous cover evaluated with photos, geomorphology including bank stability, macrobenthos and fish (see "Interim, Internal Technical Guide Summary ? Benthic Macroinvertebrate Monitoring Protocols For Compensatory Stream Restoration Projects, dated May 10, 2000", and the "Internal Technical Guide for Stream Work in North Carolina, Version 1.0, dated May 2000"), and a habitat assessment form.

Reporting ? Annual reporting with an as-built plan, monitoring and any corrective measures will be sent to DWQ for written concurrence.

Examples ? Add stable pattern, dimension and profile to a channelized stream; add pools and riffles with in-stream structures.

Stream Enhancement

Definition ? Stream enhancement is the process of implementing certain stream rehabilitation practices in order to improve water quality and/or ecological function. These practices are typically conducted on the stream bank or in the flood prone area. Enhancement activities may also include the placement of in-stream habitat structures.

Buffer (wooded) widths - Goal of 50 feet in piedmont/coastal plain and 25 feet in mountains on each side measured from the top of bank. Smaller buffers may be possible under unique situations.

Ratios ? These will vary since there are various degrees of enhancement. The following are guidelines ? vegetation planting only, 5:1; vegetation planting plus in-stream structures and/or livestock exclusion, 4:1; vegetation planting plus changes to two of the following - pattern, dimension and profile, 3:1. A conservation easement or similar mechanism is needed to provide long term protection.

Monitoring ? Monitoring will include analysis of tree survival to meet 320 trees per acre or another ecologically appropriate goal using permanent quadrats, herbaceous cover evaluated with photos, geomorphology including bank stability and a habitat assessment form.

Reporting ? Annual reporting with an as-built plan, monitoring and any corrective measures will be sent to DWQ for written concurrence.

Examples ? Fencing out livestock; plant wooded buffer without stream or streambank modifications; install habitat structures; daylighting channel without altering pattern, dimension and profile with planted buffer and instream structures.

Streambank Stabilization

Definition ? Streambank stabilization is defined as the in-place stabilization of a severely eroding streambank. Stream stabilization measures that consist primarily of "hard" engineering, such as concrete lined channels, rip rap, or gabions will not be considered as restoration or enhancement in most cases.

Buffer (wooded) widths ? Irrelevant.

Ratios ? Zero except streambank stabilization would count as mitigation when it is necessary to protect the remainder of the project. Streambank stabilization can be no more than 5% of the project and then will be counted at a 5:1 ratio. Also riprap shall be installed only at bankfull stage unless the need for more riprap is convincingly shown.

Monitoring ? None.

Reporting ? Annual reporting with an as-built plan, monitoring and any corrective measures will be sent to DWQ along with the report for the larger project.

Examples ? Add riprap, gabions and/or concrete to streambank.

Stream/Buffer Preservation

Definition - Stream/buffer preservation is defined as the protection of a relatively undisturbed stream and its associated buffer through purchase and/or conservation easement beyond that presently required by a regulatory program. Also preservation should be 1) only a small percentage of project (< 10%) and part of a larger project, or 2) as identified by NHP, WRC, WRP, TNC, etc. as needing preservation. Preservation provides long term protection for a stream segment or watershed and therefore has a role in stream mitigation. However DWQ's other major goal is water quality improvement and replacement of aquatic life uses which are unavoidably lost. Therefore DWQ may limit the use of preservation in the context of stream mitigation since aquatic life uses are not being replaced with preservation.

Buffers ? In basins with buffer rules, buffers should be at least 300 feet on each side of the stream. In non-buffered basins, buffers should be at least 50 feet on each side of the stream.

Ratios: 10:1. DWQ will consider other ratios in unusual situations.

Monitoring ? None.

Reporting ? A final report with copies of the protection mechanism and description of the protected area will be sent to DWQ for written concurrence.

Other options

Other actions which result in demonstrable stream improvements may also be eligible for stream mitigation crediting on a case by case basis. These options would have to be beyond those measures required by regulations and should be part of a local watershed

restoration plan. These other options can provide long term protection for a stream segment or watershed and therefore have a role in stream mitigation. However DWQ's other major goal is water quality improvement and replacement of aquatic life uses which are unavoidably lost. Therefore DWQ may limit the use of these other options in the context of stream mitigation since DWQ needs to ensure that aquatic life uses are being replaced. These options must receive case-by-case approval from the Director of DWQ and must include monitoring which demonstrates the water quality and aquatic life benefit of the project. As such, DWQ is most interested in projects that target waters with impaired water quality.

INTERIM, INTERNAL TECHNICAL GUIDE SUMMARY

BENTHIC MACROINVERTEBRATE MONITORING PROTOCOLS

FOR COMPENSATORY STREAM RESTORATION AND

ENHANCEMENT LEVEL 1 PROJECTS

(Updated 16 March, 2001)

The 401 Certification process is a verification by the Division of Water Quality that a given project will not degrade Waters of the State or otherwise violate water quality standards. Specific monitoring requirements for stream restoration can be written into each 401 Certification and can be used by regulatory agencies to determine the ecological functions or recovery of stream reaches being disturbed. This interim, internal guidance describes the basic principles of benthic macroinvertebrate (or aquatic insects) ecology as a monitoring tool and how this tool will be used in compensatory stream restoration projects. At this point, these data will not be used to determine the regulatory success or failure of a particular project. However DWQ believes that these data are essential to demonstrate the biological benefit of stream restoration. These data will address the following information needs:

These data will be collected to demonstrate whether the mitigation has successfully replaced the ecological function of the stream reach being restored.

Monitoring a wide variety of projects should reveal which stream restoration and enhancement techniques result in biological benefit.

These data will help DWQ and local water pollution control staff to identify any watershed-scale problems in the stream and thereby aid in stream restoration.

These data may eventually aid in the development of numeric success criteria for stream restoration and enhancement projects statewide.

The need for macrobenthos monitoring for stream restoration in the future will be assessed by DWQ based on these data. If stream restoration data are found to not yield useful information, the DWQ will reassess this policy to determine whether continued macrobenthos monitoring is needed.

I. Regulatory Requirements.

Biological monitoring will be required for all projects (except as noted below) that have more than 1000 linear feet of compensatory stream restoration or enhancement level 1. Biological monitoring requirements will be recommended on a case-by-case basis for projects having linear feet measurements of greater than 500 and less than 1000 feet. High priority will be given to sensitive watersheds, such as HQW, ORW, water supply watersheds and those watersheds that contain rare or endangered aquatic species. Monitoring plans will not be a mandatory requirement for compensatory stream restoration projects affecting 500 or less linear feet.

An analysis of a subset of up to 80 restoration and enhancement level 1 projects will be conducted. These analyses will be conducted by ecoregion and stream size.

Specifically, up to five surveys will be conducted within 8 ecoregions [Mountain (western mountains and blue ridge), Central Appalachians (essentially the New River Basin), Western Piedmont (inner piedmont and Charlotte Belt), Slate Belt, Triassic Basin, Eastern Piedmont (inner coastal plain and eastern piedmont), Sand Hills, and Coastal Plain (outer coastal plain and tidewater)] and two stream sizes (small first and second order systems, and larger streams). The required macrobenthos monitoring on these 80 sites will be supplemented with monitoring including that for tree survival, vegetation cover, geomorphology including bank stability, and habitat assessment on all restoration projects. DWQ will select these projects to monitor in order to get a representative sample within these ecoregions.

Monitoring plans will include station descriptions; however, data typically will be collected from stations above the restoration reach and within the restoration reach. A monitoring location below the restoration reach is a DWQ option. Data from within the restoration reach should be collected from the existing channel prior to disturbance (or at a regional reference location if impractical to collect prior to disturbance) and must be collected within the relocated channel during all subsequent surveys.

Benthic macroinvertebrate surveys should be conducted prior to restoration or enhancement followed by at least three years after restoration or enhancement excluding the year immediately following restoration. All data need to be collected during similar seasonal periods for each year of analysis.

The Qual-4 collection method should be used to collect samples from small mountain or piedmont streams which have a catchment size of less than one square mile and are 1st or 2nd order systems.

Data analysis and choice of metrics should be consistent with protocols developed by the Biological Assessment Unit of the Division of Water Quality. These protocols are described in the Standard Operating Procedures manual for the Unit.

Protocols for the collection and analyses of fish population structures to assess stream restoration projects will be developed cooperatively by the Wildlife Resources Commission and the Division of Water Quality.

Reports summarizing survey results should be submitted to the Division of Water Quality /Wetlands Unit within 60 days following survey completion.

II. Regulatory Recommendations.

This Technical Guidance suggests that the applicants locate a regional reference location in addition to an upstream reference location. It is assumed that a regional reference location can be applied to several restoration projects within a specific ecoregion. Data from these locations are intended to help applicants with the analysis of seasonal trends in biological information.

The Division of Water Quality is currently collecting Qualitative, or semi-quantitative samples to assess water quality perturbations. This guidance promotes the use of these collection methods; however, quantitative methods of collection also may provide accurate estimates of ecosystem function and recovery. At the current time, DWQ cannot require quantitative collection methods; however, DWQ does recognize the utility of these collection methods.

It is recommended that benthic macroinvertebrate samples be collected from mountain and piedmont streams during the summer months (June-September) and from coastal plain swamp streams during the winter/spring (January-March).

An assessment of channel materials is essential to understanding the biological function of streams. The practical use of pebble count information has been described in the literature and is listed DWQ Stream Restoration Manual as an assessment tool. DWQ recommends that pebble counts be conducted at each of the biological monitoring locations. These data will then be correlated to benthic macroinvertebrate data.

DWQ recommends that applicants implement a QA/QC program to insure the quality of biological data.

Funding of Monitoring Projects.

The North Carolina Wetlands Restoration Program is considering the establishment of a monitoring fund whereby applicants could contribute a set fee for monitoring for stream restoration projects. This fee would then be used to conduct all of the required monitoring at a number of sites. Alternatively, monitoring could be done by trained in-house staff or trained consultants following the protocols outlined earlier.