Wilmington District Stream and Wetland Compensatory Mitigation Update

North Carolina Interagency Review Team – October 24, 2016

I. Purpose

The U.S. Army Corps of Engineers (USACE), Wilmington District, has prepared this guidance document in coordination with the North Carolina Interagency Review Team (NCIRT) to provide updates to existing District guidance for compensatory mitigation. The NCIRT is a joint interagency team chaired by the USACE, which includes representation from the US Fish and Wildlife Service, US Environmental Protection Agency, National Marine Fisheries Service, NC Division of Water Resources (NCDWR), NC Wildlife Resources Commission, NC Division of Coastal Management, and the NC State Historic Preservation Office. This guidance is applicable to stream and wetland mitigation projects that are used to satisfy the requirements of Department of the Army (DA) permits issued in accordance with Section 404 of the Clean Water Act (CWA) and Sections 9 and 10 of the Rivers and Harbors Act of 1899. In particular, these updates are intended to bring District monitoring requirements up to the standards established in 33 CFR part 332 – Compensatory Mitigation for Losses of Aquatic Resources (Mitigation Rule), issued in April, 2008, and Regulatory Guidance Letter (RGL) 08-03, issued in October, 2008, which establishes minimum monitoring requirements for compensatory mitigation projects.

Compensatory mitigation is intended to replace functions of stream and wetland systems lost through Department of the Army (DA) permit actions. The goal of mitigation projects is to take degraded stream and wetland systems and return them to a stable condition, but fully replacing lost functions may take much more time, perhaps decades. Because of this, monitoring is required to demonstrate that a site is trending towards success and is on target to meet the goals and objectives outlined in the Mitigation Plan. It is critical that all Mitigation Plans are developed with appropriate and attainable goals and objectives. The fundamental purpose of a monitoring program is to provide reliable data upon which valid conclusions can be reached regarding the success or failure of a mitigation site and to demonstrate whether the goals and objectives of the Mitigation Plan are being met. Success is documented through the use of performance standards, which are defined in the Mitigation Rule as “observable or measurable physical (including hydrological),

chemical, and/or biological attributes that are used to determine if a compensatory mitigation project meets its objectives". Other aspects of monitoring that aren't captured in the performance standards, such as visual observations, can also help demonstrate that desired site conditions are being attained. Another goal of having consistent performance standards is the ability to compare data across the state of North Carolina and evaluate whether current practices are working or if changes are needed.

In order to assist with determining the initial baseline for all mitigation sites, a jurisdictional determination must be conducted to establish the preexisting extent of streams, wetlands, or other jurisdictional features on the site. This should be done shortly after the initial review of the mitigation site by the USACE and NCIRT. The determination will be approved by the USACE county Project Manager. Additionally, mitigation proposals (prospectuses for new banks and proposals to add umbrella bank or ILF sites) should always include results from the NC Stream Assessment Method (NC SAM) and NC Wetland Assessment Method (NC WAM) for all streams and wetlands proposed for credit. These rapid assessment methods have been adopted by the District, and are valuable as a mitigation site screening tool and for establishing the baseline functional condition of proposed sites (e.g., preservation sites should generally have results that indicate a current high functional condition, while enhancement and restoration sites should have results that indicate an impaired functional condition). These tools may also help demonstrate the specific areas where functional improvements may be made. Results from these assessment methods will not be used in determining mitigation success. The use of NC SAM and NC WAM do not replace the need to conduct more thorough assessments and measurements of existing conditions on proposed stream and wetland mitigation sites.

II. Applicability

This update is intended to compile several District documents and draft procedures into one document, and also to provide a predictable and consistent approach to monitoring mitigation sites The District intends this guidance to be a living document, which will be routinely updated with new information and methods. The most recent version of this document will be available on the Wilmington District Regulatory In-lieu Fee and Bank Information Tracking System (RIBITS) website, at https://ribits.usace.army.mil. This guidance applies to all sources of stream and wetland compensatory mitigation, including permittee-responsible mitigation (PRM) sites, mitigation banks (public, private, and single-client), and In-Lieu Fee (ILF) projects, which includes all projects implemented by the North Carolina Division of Mitigation Services (NCDMS). While this document establishes the basic expectations for developing and monitoring compensatory mitigation sites, we acknowledge that there are sites where unique circumstances may call for alternative monitoring approaches. Accordingly, any provision within this guidance may be modified on a case-by-case basis for a specific project if the conditions or circumstances justify such a change. All modifications to the provisions contained in this document must be approved in advance by the USACE in consultation with the NCIRT. Where modifications are approved, the Mitigation Plan should explicitly identify those changes and provide a detailed explanation for the proposed changes.

As stated earlier, the intent of monitoring is to demonstrate that a site is trending towards meeting the overall goals and objectives of the Mitigation Plan. Failure to meet any particular performance standard will not necessarily result in a determination that the goals and objectives of the Mitigation Plan have not been met. The final decision regarding the applicability of any provision contained in this guidance document, including the success of specific performance standards, the suitability of

a site to be used as compensatory mitigation for authorized impacts, or the amount of credit generated by a specific site shall be made by the District Engineer in consultation with the NCIRT. For PRM, the roles and responsibilities of the NCIRT referenced in this document are carried out by the USACE Project Manager (PM), through coordination with the other resource agencies in the NCIRT.

For DA permits with impacts that are compensated through PRM, the mitigation sites are typically much smaller than the typical bank or in-lieu fee site. The Mitigation Rule states that "the submission of monitoring reports to assess the development and condition of the compensatory mitigation project is required, but the content and level of detail for those monitoring reports must be commensurate with the scale and scope of the compensatory mitigation project, as well as the compensatory mitigation project type". Because of this, the requirements established in this document may be reduced on a case-by-case basis by the PM to account for the reduced scope of the mitigation. For example, mitigation associated with projects that are within the nationwide permit thresholds (½ acre and/or 300 linear feet of stream channel) may have reduced mitigation requirements if it is determined to be appropriate by the District PM.

This guidance is applicable to both stream and wetland mitigation. Individual sections within this document specifically identify what type of mitigation they apply to (i.e., preservation, restoration, enhancement, and Creation) and whether they apply to stream sites and/or wetland sites. The requirements of this document do not apply to mitigation sites that were initiated prior to the date of this guidance, regardless of whether they are umbrella bank sites, ILF mitigation sites, or PRM sites. This document applies to all modifications of existing bank and ILF instruments that are initiated after the date of this guidance where additional sites are added to the instrument as part of the modification. The term "initiated" is defined as the date when the District is in receipt of a complete prospectus for new mitigation bank, a complete proposal to modify an existing mitigation bank, or a complete DA permit application that includes a proposal for PRM. For NCDMS, the term "instituted" is the same as the date a project is "instituted", as defined in the NCDMS Instrument, approved on July 28, 2010, and also includes any projects submitted for any Requests for Proposals advertised after the date of these guidelines.

Piedmont, Coastal Plain and Mountain Counties – Any reference to mountain counties in this document applies to the following twenty-five North Carolina counties: Alleghany, Ashe, Avery, Buncombe, Burke, Caldwell, Cherokee, Clay, Graham, Haywood, Henderson, Jackson, Macon, Madison, McDowell, Mitchell, Polk, Rutherford, Stokes, Surry, Swain, Transylvania, Watauga, Wilkes and Yancey. All other seventy-five North Carolina counties are considered either piedmont or coastal plain counties.

III. Relationship to Other District Guidance Documents

These guidelines have been prepared in accordance with the Mitigation Rule. The requirements provided in this guidance document are intended to replace the monitoring requirements found in existing District mitigation guidance, including Section 11 of the 2003 Stream Mitigation Guidelines (SMGs). Where conflicts exist between the requirements of this document and previous District guidance, the requirements of this document will supersede those of other documents (not to include Federal regulations or RGLs).

IV. General Monitoring Requirements

This section deals with general monitoring requirements for all compensatory mitigation sites, with the exception of preservation sites and non-forested coastal marsh wetland sites. As a rule, all monitoring of mitigation sites must adhere to the minimum standards provided in RGL 08-03, which is available on the Wilmington District RIBITS website.

A. Site monitoring for all stream and wetland compensatory mitigation projects must occur for seven years post-construction, unless the District, in consultation with the IRT, agrees that monitoring may be terminated early. If performance standards have not been met by year seven, or if remedial actions are required, additional monitoring may be required to ensure that a site is stable and that the target community is established on the site, otherwise the project, or portions of the project, may be deemed to have failed.

B. Unless otherwise specified in the Mitigation Plan or banking instrument, monitoring reports must be completed for all seven years and provided to the Corps of Engineers for review no later than April 1 of the year following the monitoring. Failure to provide monitoring reports by this deadline may result in additional monitoring, withholding the release of credits, and/or suspension of credit sales. If the monitoring reports indicate that replanting is necessary, additional monitoring may be required depending on the extent of replanting, the timing of the replanting, and the type of stock used. Supplemental plantings that cover more than 20% of a site, use small stock, or are conducted toward the end of the 7-year monitoring period are more likely to require additional monitoring. Bank or structure repair, invasive control, beaver management, conservation easement encroachments, or other remedial actions may also require additional monitoring, depending on the extent of the problem.

C. Monitoring reports should be prepared in accordance with RGL 08-03, which identifies specific contents and formatting of the report. Monitoring reports should include the data collected for all applicable sections of this guidance; however, not all monitoring reports will include the same information (e.g., monitoring reports submitted in years four and six will not typically include vegetation plot data). Monitoring reports should include an executive summary that state the overall monitoring results, to include stream and wetland hydrologic monitoring, vegetation monitoring, water quality, fish and macroinvertebrate monitoring (if applicable), and areas of concern (such as beaver activity, exotic/invasive vegetation, stream instability, supplemental planting, etc.). Performance standards, as provided in the Mitigation Plan or in the permit conditions, must be restated verbatim in the monitoring report. Where graphs or tabular data are provided, they should be overlaid with as-built data and data from preceding monitoring years (e.g., hydrology gauge data, stream cross-sections, etc.).

D. A final as-built survey must be submitted following the completion of all physical and biological improvements, including planting, for every mitigation project to document baseline conditions. As-built surveys should include photo documentation at all cross-sections and monitoring instruments (hydrology gauges, crest gauges, etc.), a plan view diagram, a copy of the recorded easement, verification of the installation of conservation easement boundary markers, a longitudinal profile, and vegetation information (type and number of species planted, and, if applicable, planting zones for targeted communities). Stream lengths (and associated credits) should be calculated using the stream centerline, not the thalweg, as this can be more easily verified in the project plans. As-built surveys should

also indicate the locations of all monitoring activities (permanent vegetation plots, groundwater and surface water gauges, crest gauges, cross-sections, bank pins, photo points, water quality and aquatic biota sampling points, etc.). Any change to the projected wetland acreage or stream linear footage and associated credit amounts stated in the mitigation plan must be documented and explained in the as-built report. As-built reports must be provided to the USACE within 90 days of completion of physical and biological improvements. As-built surveys are not required for preservation-only projects.

V. Planted Vegetation Monitoring

The following requirements apply to all stream and wetland mitigation projects that include planting of woody vegetation. Alternative vegetation planting and monitoring plans may be approved by the NCIRT or PM on a case-by-case basis as necessary to accommodate non-standard techniques.

A. Vegetation Planting and Monitoring Requirements

1. Vegetation plots must be monitored for 7 years, with monitoring events occurring on years 1, 2, 3, 5, and 7. If the Sponsor/Permittee chooses to conduct supplemental monitoring, results may be considered toward meeting performance standards.

2. Vegetation planting/replanting should be conducted between November 15 and March 15, unless otherwise noted in the approved Mitigation Plan or remedial action plan.

3. Vegetation monitoring should be conducted between July 1st and leaf drop. It is strongly recommended to monitor later in the growing season to capture any effects of climatic or other conditions that may adversely affect vegetation survival. Failure to identify these effects may result in additional monitoring.

4. Vegetation must be planted and plots established at least 180 days prior to the initiation of the first year of monitoring (Year 1).

5. A combination of permanent fixed plots and random plots should be used to demonstrate vegetation coverage. Random plots should not make up more than 50% of the total required plots. Random plots may be a different plot type (e.g., circular, transect, etc.), but should be the same size as the fixed plots. Additionally, the location (GPS coordinates and orientation) of random plots for every year of monitoring must be identified in the monitoring report, and the plots must be marked so the plots may be evaluated in the field.

6. Permanent plots to sample vegetation should be randomly located in each of the target communities. Plot sizes for the determination of stem density and vigor (height) should be a minimum of 0.02 acre in size, and should typically be square or rectangular. For projects that include stream channels, fixed plots should not overlap the stream (top-of-bank to top-of-bank) to ensure that vegetation data does not include stream bank live stakes.

7. Vegetation monitoring plots should be located across the site to provide a random sampling of all the vegetation community types reestablished on the site. For projects

that include both streams and wetland, the plots should be located to cover both the stream buffers and wetlands if possible. The monitoring plots must make up a minimum of 2% of the planted portion of the site with a minimum of 4 plots. Exceptions to this requirement may be provided on a case-by-case basis for very small sites or for large, uniform sites. All exceptions to this requirement shall be specifically noted in the approved Mitigation Plan.

8. Upon initial establishment of fixed vegetation plots (as-built baseline/year 0), the plot corners must be identified in the field with markers. The plot should be divided into a grid pattern so that each planted stem can be identified for future monitoring according to its grid location within the plot.

9. Plot vegetation data collected must include:
   - Within each fixed plot: species, height, grid location, planted versus volunteer, and age (based on the year the stem was planted, or first observed for volunteers)
   - Within each random plot: species and height
   - For both fixed and random plots, all woody stems, including exotic and invasive species, should be counted (exotic/invasive species will not count toward success of performance standards)

10. Individual plot data for planted and volunteer species must be provided separately. Plot data cannot be averaged across plots over the entire site to obtain a single figure for stem density for the purposes of demonstrating success in meeting performance standards. Averages will be considered by the NCIRT, on a case-by-case basis.

11. Supplemental plantings and volunteer plants must be present for at least two growing seasons before counting toward meeting performance standards for monitoring year five and seven.

12. Monitoring events should be used to evaluate the site for the presence of invasive species, which should be noted in the monitoring report. (Implementation of invasive species control measures should be conducted in accordance with the Adaptive Management Plan, and may be required on a case-by-case basis as determined by the NCIRT.)

13. Planting in rows to facilitate mowing between planted species is acceptable. Mowing may be conducted once annually by the mitigation sponsor between monitoring years one and five to reduce the competition by nuisance volunteer species or to treat exotic/invasive plants, but no mowing activities can be conducted between March 1st and June 30th. (Note that mowed volunteer trees should not be counted in plot data presented in the monitoring report.)

14. Application of fertilizers may be conducted once at the time of planting only, unless approved on a case-by-case basis as part of a remedial action plan. Herbicides may be used to control nuisance volunteer, exotic and invasive vegetation, but they must be applied in accordance with product labeling by a licensed applicator and any herbicides used near streams must be approved for aquatic use. Aerial application of herbicides must not be conducted.

B. Planted Vegetation Performance Standards

1. Within planted portions of the site, a minimum of 320 stems per acre must be present at year three; a minimum of 260 stems per acre must be present at year five; and a minimum of 210 stems per acre must be present at year seven.

2. For projects located in the coastal plain and piedmont counties, trees in each plot must average 7 feet in height at year five and 10 feet in height at year seven. For projects located in the mountain counties, trees in each plot must average 6 feet in height at year five and 8 feet in height at year seven. Alternative performance standards for vegetation vigor or density may be proposed in the Mitigation Plan for sites proposed to be revegetated with slow growing species, woody shrub species, or primarily with understory species (e.g., shrubs in currently forested areas, bogs, pine savannahs, wetland mosaics with open spring ponds, etc.).

3. For any tree stem to count toward success for standard 1 or 2, it may be either planted or volunteer, but it must be a species from the approved planting list included in the Mitigation Plan. Other species not included on the planting list may be considered by the IRT on a case-by-case basis. Additionally, any single species can only account for up to 50% of the required number of stems within any vegetation plot. (Stems in excess of 50% should still be shown on the monitoring table, but cannot be used to demonstrate success.) In cases where plots are dominated by volunteer species, remedial action as specified in the Adaptive Management Plan or as directed by the NCIRT may be required. Exceptions to this requirement may be provided on a case-by-case basis for sites with conditions that limit the planting list. All exceptions to this requirement must be specifically noted in the approved Mitigation Plan.

VI. Stream Channel Stability and Stream Hydrology Monitoring

The purpose of the monitoring requirements and performance standards included in this section is to demonstrate that the proposed in-stream work has effectively corrected channel bed and bank instability when it is identified as a primary objective in the Mitigation Plan. Accordingly, the requirements in this section apply to all stream mitigation reaches that utilize a restoration or enhancement level I approach, and also to all enhancement level II reaches where in-stream work is conducted that alters the channel dimensions below the bankfull elevation (e.g., laying back the stream banks below bankfull elevation or raising/lowering the bed elevation). For the purposes of this guidance document, a "reach" is defined as a continuous section of an individual tributary where a similar design approach is applied (e.g., priority 1 restoration, priority 2 restoration, enhancement level I, enhancement level II, or preservation). A reach is limited to a single tributary. These performance standards do not apply to wetland mitigation or channels constructed in accordance with the Headwater Stream Guidance (Section VIII).

A. Stream Channel Stability and Stream Hydrology Monitoring Requirements

1. Channel stability must be monitored for 7 years, with monitoring events occurring on years 1, 2, 3, 5, and 7. If the Sponsor/Permittee chooses to conduct supplemental monitoring, results may be considered towards meeting performance standards. It is recommended that stream surveys for both project construction and project

monitoring generally follow the methodology contained in the *USDA Forest Service Manual, Stream Channel Reference Sites* (Harrelson, et.al, 1994 - available on the Wilmington District RIBITS website at http://ribits.usace.army.mil).

2. A longitudinal profile of the thalweg, water surface, bankfull, and top of bank, must be collected during the as-built survey of the constructed channel to compare with future geomorphological data. Additional longitudinal profiles are not required during routine channel stability monitoring (years 1 through 7) unless the monitoring efforts demonstrate channel bank or bed instability, in which case additional longitudinal profiles may be required by the NCIRT along channel reaches of concern to track changes in the channel and demonstrate stability.

3. Permanent, monumented cross-sections must be installed at an approximate frequency of one per 20 bankfull-widths, measured along the centerline of the channel. In general, the locations should be selected to represent approximately 50% pools and 50% riffle areas. Flexibility in the location and frequency is allowed for cross-sections and should be based on best professional judgment. The selection of locations should always include areas that may be predisposed to potential problems, such as particularly tight meanders, meanders just downstream from channel confluence points, or areas where in-channel work corrected existing bank failures. In the case of very narrow streams, two cross-sections per 1,000 linear feet will generally be sufficient. All channel cross-sections within riffles must include measurements of Bank Height Ratio (BHR) and Entrenchment Ratio (ER), which must be documented in monitoring reports.

4. When stream reaches show accelerated instability the NCIRT will generally require some form of measured documentation to assess stability over time. Two acceptable methods include the installation of a bank pin arrays or the addition of cross sections. This will generally be required whenever annual monitoring demonstrates an increase of greater than 15% in cross-sectional area, or when visual monitoring indicates potential bank instability. Bank pins are not required where the size of the channel makes it impractical to use them (e.g., channels that are too narrow to allow installation) – these areas should be monitored through photo points instead. Bank pins may consist of chain, rebar, or wire driven horizontally into the bank face, and should be a minimum of 3 feet long. A minimum of one pin per 2 feet of bank height should be installed at each location, with the lowest pin installed just above the normal water line and additional pins installed vertically above the first pins to the top of the bank. Vertical series of pins should be installed in at least three locations along the bank, centered on the area of potential instability. For instance, where erosion is located within a stream meander, the pins should be installed at middle of the meander bend, the upstream third of the meander bend, and downstream third of the meander bend. The pins should be installed perpendicular and flush to the face of the stream bank if rebar is used, and the length of exposed pin should be measured and reported during each cross-section monitoring event. Once the exposure has been measured, rebar pins should be hammered flush with the bank face. Lateral movement of the stream banks as indicated by pin exposure must be reported in all monitoring reports.

5. Crest gauges must be installed to document the occurrence of bankfull events. A minimum of one gauge must be installed on each tributary that is greater than 1000

feet in length, with one gauge required for every 5000 feet of length on each tributary, and a maximum of 5 gauges per tributary. For all Priority 1 projects and any project that is designed to reconnect the stream to its floodplain, gauges should also be capable of tracking the frequency and duration of overbank events (e.g., pressure transducer gauges or other gauges that continually monitor events). Automated photo loggers may also be used to document channel hydrology in lieu of crest gauges.

6. Where restoration or enhancement activities are proposed for intermittent streams, monitoring gauges should be installed to track the frequency and duration of stream flow events.

B. Stream Channel Stability and Stream Hydrology Performance Standards

1. All stream channels must receive sufficient flow throughout the monitoring period to maintain an Ordinary High Water Mark (OHWM) in accordance with the requirements of RGL 05-05, dated December 7, 2005, which establishes the extent of USACE jurisdiction for non-tidal waters for CWA Section 404. Channels that are determined to be non-jurisdictional will not be eligible to receive credit.

2. Continuous surface water flow within the tributaries must be documented to occur every year for at least 30 consecutive days during the prescribed monitoring period. This 30-day period can occur at any point during the year. Additional monitoring may be required if surface water flow cannot be documented due to abnormally dry conditions.

3. BHR must not exceed 1.2 at any measured riffle cross-section. This standard only applies to reaches of the channel where BHR is adjusted to reference condition through design and construction. Exceptions to this requirement may be approved on a case-by-case basis, but all exceptions must be included in the final approved Mitigation Plan.

4. ER must be no less than 1.4 at any measured riffle cross-section. This standard only applies to reaches of the channel where ER is altered to reference condition through design and construction. Exceptions to this requirement may be approved on a case-by-case basis, but all exceptions must be included in the final approved Mitigation Plan.

5. BHR and ER at any measured riffle cross-section should not change by more than 10% from the baseline condition during any given monitoring interval (e.g., no more than 10% between years 1 and 2, 2 and 3, 3 and 5, or 5 and 7).

6. When bank pin arrays are required, average bank pin measurements at each cross section (i.e., length of pin exposed due to lateral movement of the bank) cannot exceed 10% of as-built bankfull width during any given monitoring interval (e.g., no more than 10% between years 1 and 2, 2 and 3, 3 and 5, or 5 and 7), and individual bank pin measurements must not exceed 20% of as-built bankfull width over the duration of monitoring. When cross sections are added to document bank movement in certain areas, bankfull cross sectional area must not increase by more than 15% over the duration of monitoring.

7. The stream project shall remain stable and all other performance standards shall be met through four (4) separate bankfull events, occurring in separate years, during the monitoring years 1 through 7.

VII. Stream Water Quality, Macroinvertebrate, and Fish Monitoring

The objective of the monitoring protocols included in this section is to directly measure physical, chemical and biological metrics within restored and enhanced reaches of stream channels with the intent of linking stream mitigation and functional uplift. Water quality, macroinvertebrate, and fish community monitoring included in this section is not required, but is encouraged. For those projects where this monitoring is conducted, additional credit of up to 2% may be generated for each tributary to be monitored in accordance with the protocols specified below. (The additional credit will be calculated based on the credit generated by the tributary before applying any additional credit resulting from wider buffers, BMPs or other measures.) At a minimum, water quality and macroinvertebrate sampling must be conducted to receive the additional credit. If fish sampling is also conducted, the additional credit ratio may be adjusted upward to account for the added sampling. Generally, this monitoring should be conducted on reaches where a restoration or enhancement approach is used. In some cases, monitoring of preservation reaches for additional credit may also be approved (e.g., where it is anticipated that habitat uplift may occur due to upstream enhancements or where on-site preservation is used as a reference). Additional credits generated by this monitoring will be added to the total credit amount for the project and released according to the standard release schedule. All proposals to monitor water quality, macroinvertebrates and fish must be reviewed and approved by the USACE in consultation with the NCIRT.

These water quality and macroinvertebrate indicators are inherently sensitive to changes that occur anywhere within the watershed draining to the mitigation project, such as land use changes, meteorological changes (droughts, storms, etc.), or pollution entering the watershed (e.g., herbicide use, fertilizer application, road runoff, etc.). Improvements may also occur slowly since they develop in response to other modifications, such as buffer replanting or in-stream habitat improvements. For macroinvertebrates, there may also be a lag period for re-colonization by the desired species. For these reasons, Mitigation Plans that propose water quality and macroinvertebrate monitoring should always include a narrative that describes the proposed monitoring activities and those land uses within the watershed(s) draining to the project that may affect water quality or macroinvertebrate communities. It is possible that results may not always demonstrate a measurable improvement over pre-construction conditions through the seven-year monitoring timeframe, and consequently, project success will not be tied to these metrics. Performance standards associated with water quality, macroinvertebrate and fish data have not been developed at this time. These monitoring protocols have been added in part to provide the NCIRT with data that may be used to support future guidance, including making these protocols mandatory or tying functional uplift to credit production.

A. Water Quality Monitoring Protocol

1. Water quality sampling should be conducted prior to construction and during the monitoring period using a continuous recording sampling device. (Alternative monitoring protocols using single event sampling instead of continuous recorders may

be approved on case-by-case basis; however, credit adjustments may be different depending the on the monitoring protocol proposed.)

2. Water quality sampling should at a minimum include measurements of acidity (pH), temperature, dissolved oxygen, and conductivity. Additional sampling of other water quality parameters may be proposed on a project-by-project basis, particularly if they support specific goals identified in the Mitigation Plan, such as a reduction in fecal coliform or nutrient levels.

3. At a minimum, each project tributary longer than 1000 feet should be sampled at two locations, though shorter tributary reaches may also be monitored (and allotted additional credit). Sampling points should be located as close as possible to the upper and lower end of the tributary in order to detect any change. If possible, the upstream sampling points should be located just upstream from the start of restoration or enhancement activities. Sampling points should be located where water is freely flowing and with sufficient depth to allow sampling to be conducted without disturbance to streambed sediments.

4. Water quality sampling equipment and reference solutions must be maintained and calibrated in accordance with manufacturer specifications. Personnel installing and conducting the monitoring must be adequately trained.

5. Results should be presented annually in the monitoring report, and include a summary of the current results and all past monitoring events in tabular format.

B. Macroinvertebrate Monitoring Requirements

1. Macroinvertebrate sampling should be conducted prior to construction and once a year during monitoring years 3, 5, and 7.

2. A sampling point should be conducted on every perennial tributary greater than 1000 feet in length. Additional sampling points are required per additional 2000 feet of length on each tributary (1000' = 1 point, 3000' = 2 points, 5000' = 3 points, etc.). Sampling points should be located on riffles, with the first sampling point located on the most downstream riffle on the tributary. The appropriate sampling location should be based on riffle condition and best professional judgment. Pre-construction sampling points may be located in different locations than during the monitoring period sampling to ensure that appropriate habitat is included in the sample (e.g., riffles, leaf packs, undercut banks, woody debris, etc.); however, sampling conducted during the monitoring period should occur within the same riffle year-to-year, if possible.

3. A reference location should also be sampled for comparison purposes. The reference point should be located on a relatively stable reach in an undisturbed setting, located as close to the mitigation site as possible, and within the same watershed. The reference sampling point should be on a stream with similar watershed characteristics (drainage size, ecoregion, imperviousness, etc.). The reference location may be located within an on-site preservation reach, or upstream of the mitigation site if stream

conditions are appropriate, but should not be located downstream of mitigation activities, regardless of whether it is on-site.

4. The sampling should be conducted in accordance with the NCDWR Qual 4 macroinvertebrate sampling protocol, which is described in the most current version of the *Standard Operating Procedures for Collection and Analysis of Benthic Macroinvertebrates*, February 2016 (Version 5.0). If the stream is large (greater than a 3 square mile watershed), a mix of Qual 4 and the Standard Qualitative (Full Scale) methods may be appropriate. Samples should be collected by someone trained in and experienced with the method. In general, sampling should be conducted during the same time of year to minimize seasonal differences in the data from year-to-year. Additionally, sampling should be conducted at the same time as water quality monitoring, and within the index period referenced in the North Carolina Division of Water Resources (NCDWR) document entitled Small Streams Biocriteria Development, dated May 29, 2009. Both documents referenced above are available on the NCDWR Biological Assessment Unit homepage (https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/biological-assessment-branch) under the Benthos Links section. The number of samples collected should be based on the size and complexity of the site. Macroinvertebrate samples should be identified to the lowest practical taxonomic level (usually Genus) by a qualified taxonomist (this qualification can be demonstrated by being a NCDWR certified laboratory for macroinvertebrates).

5. Results should be presented in the current monitoring report and include, at a minimum, a list of taxa collected at each site for each sampling event, as well as an enumeration of the Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa and a Biotic Index (see the NCDWR Standard Operating Procedures for Collection and Analysis of Benthic Macroinvertebrates). Each report should include a summary of the current results and all past monitoring events in tabular format. Other summary or comparison statistics may also be acceptable on a case-by-case basis.

C. Fish Sampling

1. Fish sampling may also be conducted where the project goals include the restoration or enhancement of fish habitat. In general, fish sampling should be conducted prior to construction and once a year during monitoring years 3, 5, and 7; however, the specific protocol for fish sampling will likely vary depending on the site and species sampled, and must be included in the mitigation plan for approval by the USACE in consultation with the NCIRT.

VIII. Headwater Stream Monitoring

This section is applicable to projects developed in accordance with the document entitled Information Regarding Stream Restoration With Emphasis on the Coastal Plain, Version 2, dated April 4, 2007, referred to here as the Headwater Stream Guidance (available on the Wilmington District RIBITS website). The Headwater Stream Guidance allows for restoration of streams that do not typically require construction of pattern, dimension, and/or profile. Restoration of the streams in these systems should be achieved through the reestablishment of appropriate hydrology and

hydraulics, which leads to the passive development of headwaters stream geomorphology over time. Site construction may include some less invasive construction measures such as ditch filling, field crown removal, planting bed/crop row leveling, and the return of hydrology to historic braids or channels (if still present). The requirements in this section apply to all stream mitigation reaches that utilize the Headwaters Stream Guidance. The protocols for constructed channels included in Section VI (Stream Channel Stability and Stream Hydrology Monitoring) and Section VII (Stream Water Quality, Macroinvertebrate, and Fish Monitoring) are not applicable to Headwater Streams. Instead, these systems will be subject to the monitoring and performance standards identified below:

A. Headwater Stream Monitoring Requirements

1. Proposals to use the Headwaters Stream Guidance must include justification within the Mitigation Plan that documents the site conditions and supports the use of this approach. This should include catchment size, slope, soil type, and valley length for all channels. In general, catchments of less than 25 acres may not be appropriate for stream credit using this approach. Credit must be calculated using valley length, not stream centerline (thalweg) measurements. Wetland credit, if proposed in conjunction with the stream project, cannot be generated within the 100-foot corridor where the stream is expected to develop.

2. Headwater stream monitoring must be conducted for 7 years, with monitoring events occurring every year as described below.

3. Surface water flow should be documented using gauges (flow meters, pressure transducers, etc.), or automated photo loggers. Gauge stations should be located within the anticipated primary path of flow within the low point of the valley to ensure all flow events are captured. Gauge stations should also be placed along the topographic low point of the valley as necessary to document the upstream end of channel forming flows. The number of gauge stations to be installed should be based on relevant factors, including pre and post-construction site conditions, valley slope and length, watershed size, adjacent wetlands, etc., and should be sufficient to document the upper end of stream formation when considered with the required field indicators listed in the performance standards (see Section VIII(B) below).

4. Channel formation within the valley or crenulation must be documented through the identification of field indicators consistent with those listed in RGL 05-05. Identified field indicators (listed in the performance standards below) must be documented using data sheets and photographs, and their location must be shown on a plan view of the site to be included with the annual monitoring report. Additional monitoring and/or analysis may be necessary in the event of abnormal climactic conditions.

B. Headwater Stream Performance Standards

1. Continuous surface water flow within the valley or crenulation must be documented to occur every year for at least 30 consecutive days during the prescribed monitoring period. Additional monitoring may be required if surface water flow cannot be documented due to abnormally dry conditions.

2. Channel formation must be documented using indicators consistent with RGL 05-05 in accordance with the following schedule:
    a. During monitoring years 1 through 4, the preponderance of evidence must demonstrate a concentration of flow indicative of channel formation within the topographic low-point of the valley or crenulation as documented by the following indicators:
        - Scour (indicating sediment transport by flowing water)
        - Sediment deposition (accumulations of sediment and/or formation of ripples)
        - Sediment sorting (sediment sorting indicated by grain-size distribution within the primary path of flow)
        - Multiple observed flow events (must be documented by gauge data and/or photographs)
        - Destruction of terrestrial vegetation
        - Presence of litter and debris
        - Wracking (deposits of drift material indicating surface water flow)
        - Vegetation matted down, bent, or absent (herbaceous or otherwise)
        - Leaf litter disturbed or washed away

    b. During monitoring years 5 through 7, the stream must successfully meet the requirements of standard 2(a) above and the preponderance of evidence must demonstrate the development of stream bed and banks (i.e., an ordinary high water mark) as documented by the following indicators:
        - Bed and banks (may include the formation of stream bed and banks, development of channel pattern such as meander bends and/or braiding at natural topographic breaks, woody debris, or plant root systems)
        - Natural line impressed on the bank (visible high water mark)
        - Shelving (shelving of sediment depositions indicating transport)
        - Water staining (staining of rooted vegetation)
        - Change in plant community (transition to species adapted for flow or inundation for a long duration, including hydrophytes)
        - Changes in character of soil (texture and/or chroma changes when compared to the soils abutting the primary path of flow)

IX. Wetland Hydrology Monitoring

The purpose of this section is to provide guidance and requirements for a number of aspects of wetland hydrology monitoring and performance criteria. The fundamental goal of a monitoring program is to provide reliable data upon which valid conclusions can be reached regarding the success or failure of a mitigation site. While wetland hydrologic performance criteria will be discussed in this section, other related aspects of wetland hydrology will be covered, such as issues related to growing season and the proper installation and placement of groundwater monitoring gauges. Some concepts that are important to the discussion about wetland hydrology are included below:

- Hydrologic regime - The distribution and circulation of water in an area on average during a given period including normal fluctuations and periodicity
- Hydrologic performance standards - The criteria set forth within a compensatory mitigation plan that describes the specific hydrologic regime that will exist on a site and the subsequent achievement of that specific goal.

A. Requirements for Monitoring Hydrology and Reporting Hydrologic Data

1. Wetland hydrology monitoring must be conducted for 7 years, with monitoring events occurring every year as described below. For non-forested coastal marsh wetlands, monitoring will generally only be required for 5 years.

2. Water table depths beneath the soil surface should be recorded at least once per day. Two or more measurements per day may be required if the data will be used to calibrate hydrologic models.

3. Detailed soil profile descriptions should be recorded for each boring where a gauge is installed. These profile descriptions should be a record of the soil horizons present, and the color, texture, and redoximorphic features present should be described following standard procedures as specified by the USDA-NRCS (Schoeneberger et al., 2002).

4. Wetland groundwater gauges must be installed in accordance with the techniques and standards described in the USACE document entitled "Technical Standard for Water-Table Monitoring of Potential Wetland Sites" (ERDC TN-WRAP-05-2, June 2005) available on the Wilmington District's Regulatory In-lieu Fee and Bank Information Tracking System (RIBITS) website. In particular, bentonite seals must be installed and properly maintained on all wells. Deeper well depths (4'-5') are also recommended to help interpret fluctuations in the water table, provided that wells do not penetrate any restrictive soil horizons. Routine well maintenance should be documented in annual monitoring reports.

5. A sufficient number of gauges must be installed to adequately characterize the different soils, vegetation communities, and surface topographic variations that are found across the site. Areas in the center of the wetland and at the edge must be monitored. It may be most efficient to install gauges in transects that extend from the wetland center to edge. Gauges must not be installed in localized depressions that are not representative of surrounding site conditions.

6. Each gauge location should have recorded GPS coordinates and elevation at ground level (msl), which should match the calibration level of the gauge. If there is an offset, it must be reported in the monitoring report. If the offset changes over the course of monitoring, the change and reason should be documented in the mitigation plan (e.g., floodplain sediment accumulation).

7. In order to minimize the risk of credit loss during close-outs, gauges must be installed in transects extending away from any perimeter drainage features that may remain after the site is constructed.

8. When hydrology data is reported it should include a summary table that includes all the gauges and the number of days of saturation and percent hydroperiod. In addition, each monitoring year should include data from all previous monitoring years.

9. Every gauge in each monitoring report should have a representative graph showing the water table levels with a reference line at 12 inches below the surface.

10. In each monitoring report (where hydrologic data is required) there should be an explanation or graphical representation that explains/portrays whether the site had an above, below, or normal precipitation year.

11. The growing season should be stated (start date, end date, and number of days) and the method used to determine the extent should be explained (see Section IX(B) below).

B. Target Wetland Hydrology Related to Precipitation and Growing Season

1. Precipitation

Hydrological data should be placed in the context of normal, wetter than normal, and drier than normal, precipitation based on the most recent 30-year period of record. The WETS table from the weather station closest to the compensation site can be used for this purpose (Eggers, 2012). The USACE has summarized the principle methods for assessing normal rainfall conditions at (Sprecher and Warne, 2000), which is available on Wilmington District's RIBITS website. Rainfall should be measured on-site to determine whether the water table requirements for wetland hydrology have been met during periods of normal or drier than normal rainfall. Other recommendations from Wetland Hydrology Assessment, Vepraskas, et al., 2013:

- Rainfall should be measured on-site using at least one recording rain gauge.
- Rainfall from the nearest available weather station can be used to supplement data collected on-site, or may be utilized in place of collecting on site if the station is located close to the project.
- Normal rainfall conditions may be assessed for the 3 month period that comes prior to the time when the water table rises above the 12 inch depth during the growing season (Sumner, et al., 2009).

2. Growing Season

For compensatory mitigation, the hydrology present during the growing season is the general standard for wetland hydrologic monitoring. The growing season information can be derived from County Soil Survey data and/or the USACE Regional Supplements (Atlantic and Gulf Coastal Plain Region, 2012, Eastern Mountains and Piedmont Region, 2012). In addition, the growing season will occur for the period identified on the WETS data tables for a probability of 50% and an air temperature of 28 °F. These growing season dates are available for all counties in NC. While other definitions of growing

season are in use, this definition has, until recently, been used by the US Army Corps of Engineers to assess wetland hydrology nationwide.

The USACE Regional Supplements that apply in North Carolina allow for the two different methods to determine growing season, one is soil temperature, and the other is vegetative indicators. While the Regional Supplement supports soil temperature as a growing season determinant, the NCIRT cautions any provider which lengthens the growing season due to soil temperatures. The fundamental purpose of the growing season is related to the hydrology being present during the time of year the soil microbes are most active. Based on evidence in the literature (Skaggs, 2012), the longer a growing season is extended, even out to 365 days, the more marginal wetlands fail to obtain basic wetland hydrologic requirements. If soil temperature monitoring is proposed as the method to determined growing season, justification must be provided in the mitigation plan. Soil temperatures should also be measured using a continuous measurement device, if possible. Additionally, this method should also be corroborated with vegetative indicators, including bud burst and leaf drop. In general, growing seasons that start earlier than March 1st or end later than November 20th may not be approved, depending upon project location.

C. Establishment of Wetland Hydrologic Performance Criteria

1. Percent Saturation/Hydroperiod Thresholds for Common Wetland Soil Series in North Carolina

The NCIRT has established saturation/hydroperiod thresholds for wetland restoration performance criteria in North Carolina. These thresholds/ranges are provided in Table 1, below. The Wetland Saturation Threshold Table lists many common soil series in each major physiographic region of North Carolina and their requisite percent saturation range for the growing season. If data is available to support a reduced hydroperiod, that data must be provided in the mitigation plan.

2. Hydrologic Variance for Extensively Managed Hydric Soils

Much of a site's ability to reach and maintain its appropriate saturation period is dependent upon the soil conditions, most notably; organic matter, clay content, and soil structure. If the site has been extensively managed, the NCIRT may consider a short-term wetland hydrologic variance for the site.

The NCIRT will consider shortening the saturation period for soils on extensively managed sites for up to 2% for the first two years of monitoring (for example, a Rains soil series calls for a range of hydrology of 10-12% in the Wetland Saturation Threshold Table, then the NCIRT may allow for an 8% target saturation period for Monitoring years 1 and 2). However, at Monitoring Year 3 the NCIRT will expect the minimum target of the hydrology range to be achieved. Generally, a variance may only be approved when supporting documentation justifies the extensive management of a site in the mitigation plan (site history, existing condition photographs, etc.).

3. Some common Hydric Soil Series and their taxonomic subgroups are provided in this document; if a series you are looking for is not provided, it can be accessed on the Natural Resources Conservation Service Official Soil Series Descriptions webpage. If the required saturation range for a soil series is not listed in the Wetland Saturation Threshold Table, the following procedure should be used:

   a. Look up the taxonomic subgroup of the Soil Series at the link above.
   b. If the series has the same taxonomic subgroup name as another series that is listed, then that which is listed is the required hydrology range. (For example, if you have a site with soils mapped as Woodington, you will notice it is not listed in Table 1; however, if you go to the link above, you will find that it has the same taxonomic name as a Rains which is listed, therefore the required hydroperiod range would be 10-12% of the growing season.)
   c. If the soil series is neither in Table 1, nor has a taxonomic name which matches any other listed, the District, in consultation with the NCIRT, must approve the proposed wetland saturation range.

D. Reference Data - Modeling Wetland Hydrology

If a Provider believes a different hydrology standard is appropriate for their site, they may utilize several/different data sources to support their position. This could include reference data and/or wetland hydrology models. Reference data may be utilized to support, but not take the place of, wetland performance criteria. It is likely that as more data is collected, the ranges that appear in the Wetland Saturation Threshold Table will change. Firms that monitor a large number of wetland mitigation sites for mitigation banks or the NCDMS have a considerable amount of data or historical knowledge of wetland hydroperiods. Both the NCDMS and North Carolina State University are working on wetland hydrology databases, which in the near future, should inform the mitigation community further with regard to wetland hydroperiod performance criteria.

Groundwater models may be utilized for predicting future hydro periods of a wetland restoration site. However, modeling data alone will not be used as the primary information source for determining hydrologic success. Any model data must be corroborated with groundwater wells. "The best use of simulation models for evaluating success of a restored site is to use them in combination with water table data" (Vepraskas, et. al., 2013).

E. Chewacla Soils

Chewacla is a non-hydric soil series that appears on many floodplains in the upper Coastal Plain and Piedmont of North Carolina, and depending on site characteristics has been considered for many wetland restoration projects. This series, as evidenced by its taxonomic subgroup (Fluvaquentic Dystrudepts), has inclusions of hydric soils. The NCIRT would like to stress that although these sites may yield wetland credit, often the project success is due to particular site conditions (for example, extensive ditching, or toe-or-slope geomorphic landscape position) that actually result in more of a hydric localized soil condition or series (such as Wehadkee-Typic Fluvaquent). The NCIRT emphasizes that it is imperative that all soil mapping be verified by a North Carolina Licensed Soil Scientist.

Table 1 - Wetland Saturation Threshold Table

Common Coastal Plain Soil Series (associated with wetlands)		
Series Name	**Taxonomic Subgroup**	**Wetland Saturation Range**
Altavista*	Fine-Loamy, Mixed, Semiactive, Thermic Aquic Hapludults	6-8%
Arapahoe	Coarse-Loamy, Mixed, Semiactive, Nonacid, Thermic Typic Humaquepts	12-16-%
Augusta	Fine-Loamy, Mixed, Semiactive, Thermic Aeric Endoaquults	7-9%
Belhaven	Loamy, Mixed, Dysic, Thermic Terric Haplosaprists	20%
Bibb	Coarse-Loamy, Siliceous, Active, Acid, Thermic Typic Fluvaquents	12-16-%
Chastain	Fine, Mixed, Semiactive, Acid, Thermic Fluvaquentic Endoaquepts	12-16-%
Craven*	Fine, Mixed, Subactive, Thermic Aquic Hapludults	6-8%
Croatan	Loamy, Siliceous, Dysic, Thermic Terric Haplosaprists	20%
Dare	Dysic, Thermic Typic Haplosaprists	25%
Grifton	Fine-Loamy, Siliceous, Semiactive, Thermic Typic Endoaqualfs	10-12%
Hyde	Fine-Silty, Mixed, Active, Thermic Typic Umbraquults	12-16-%
Johnston	Coarse-Loamy, Siliceous, Active, Acid, Thermic Cumulic Humaquepts	12-16-%
Leaf	Fine, Mixed, Active, Thermic Typic Albaquults	10-12%
Lenoir	Fine, Mixed, Semiactive, Thermic Aeric Paleaquults	7-9%
Leon	Sandy, Siliceous, Thermic Aeric Alaquods	7-9%
Lynn Haven	Sandy, Siliceous, Thermic Typic Alaquods	10-12%
Masontown	Coarse-Loamy, Siliceous, Active, Nonacid, Thermic Cumulic Humaquepts	12-16-%
Meggett	Fine, Mixed, Active, Thermic Typic Albaqualfs	10-12%
Murville	Sandy, Siliceous, Thermic Umbric Endoaquods	12-16-%
Pactolus*	Thermic, Coated Aquic Quartzipsamments	6-8%
Pantego	Fine-Loamy, Siliceous, Semiactive, Thermic Umbric Paleaquults	12-16-%
Portsmouth	Fine-Loamy Over Sandy Or Sandy-Skeletal, Mixed, Semiactive, Thermic Typic Umbraquults	12-16-%
Rains	Fine-Loamy, Siliceous, Semiactive, Thermic Typic Paleaquults	10-12%
Roanoke	Fine, Mixed, Semiactive, Thermic Typic Endoaquults	9-12%
Tomotley	Fine-Loamy, Mixed, Semiactive, Thermic Typic Endoaquults	10-12%
Torhunta	Coarse-Loamy, Siliceous, Active, Acid, Thermic Typic Humaquepts	12-16-%

Table 1 - Wetland Saturation Threshold Table, Continued

Common Piedmont Soil Series		
Series Name	**Taxonomic Subgroup**	**Wetland Saturation Range**
Chewacla**	Fine-Loamy, Mixed, Active, Thermic Fluvaquentic Dystrudepts	10-12%
Wehadkee	Fine-Loamy, Mixed, Active, Nonacid, Thermic Fluvaquentic Endoaquepts	12-16-%
Iredell*	Fine, Mixed, Active, Thermic Oxyaquic Vertic Hapludalfs	6-8%
Kinkora	Fine, Mixed, Semiactive, Mesic Typic Endoaquults	10-12%
Riverview*	Fine-Loamy, Mixed, Active, Thermic Fluventic Dystrudepts	7-9%
Hatboro	Fine-Loamy, Mixed, Active, Nonacid, Mesic Fluvaquentic Endoaquepts	12-16-%
Worsham	Fine, Mixed, Active, Thermic Typic Endoaquults	10-12%
Helena*	Fine, Mixed, Semiactive, Thermic Aquic Hapludults	6-8%
Congaree*	Fine-Loamy, Mixed, Active, Nonacid, Thermic Oxyaquic Udifluvents	7-9%
Meggett	Fine, Mixed, Active, Thermic Typic Albaqualfs	10-12%
Coxville	Fine, Kaolinitic, Thermic Typic Paleaquults	10-12%
Dorian*	Fine, Mixed, Semiactive, Thermic Aquic Hapludults	6-8%
Oakboro**	Fine-Loamy, Mixed, Active, Thermic Fluvaquentic Dystrudepts	10-12%
Cordorus**	Fine-Loamy, Mixed, Active, Mesic Fluvaquentic Dystrudepts	7-9%
Common Mountain Soil Series		
Alarka	Fine-Loamy Over Sandy Or Sandy-Skeletal, Mixed, Active, Mesic Aeric Epiaquults	7-9%
Nikwasi	Coarse-Loamy Over Sandy Or Sandy-Skeletal, Mixed, Superactive, Nonacid, Mesic Cumulic Humaquepts	12-16-%
Rosman*	Coarse-Loamy, Mixed, Superactive, Mesic Fluventic Humudepts	10-12%
Toxaway	Fine-Loamy, Mixed, Superactive, Nonacid, Mesic Cumulic Humaquepts	12-16-%
Ela	Coarse-Loamy, Siliceous, Superactive, Acid, Mesic Fluvaquentic Humaquepts	12-16-%
Reddies*	Coarse-Loamy Over Sandy Or Sandy-Skeletal, Mixed, Superactive, Mesic Oxyaquic Humudepts	10-12%
Arkaqua**	Fine-Loamy, Mixed, Active, Mesic Fluvaquentic Dystrudepts	7-9%
Wesser	Sandy-Skeletal, Mixed, Mesic Humaqueptic Fluvaquents	12-16%
Biltmore*	Mixed, Mesic Typic Udipsamments	7-9%

*These soil series are non-hydric soils that may appear in close association with other soil series that are hydric.

**These soil series are all non-hydric soils that are similar taxonomically to the Chewacla soil series.

It should be noted that the presence of non-hydric series in this Table does not mean the NCIRT endorses pursuing sites with these soils series for wetland mitigation. The soils identified with asterisks are non-hydric soils. These soils often appear in association with other soils which are hydric. To determine whether the soil on site is in fact the mapped soil series, you should consult a North Carolina Licensed Soil Scientist.

X. Visual Monitoring

The following requirements apply to all wetland and stream mitigation projects, including preservation areas as noted below. The goal of visual monitoring is to provide a method that rapidly identifies any concerns on a mitigation project that may not be picked up by other routine monitoring activities. These include encroachments, areas with poor vegetation growth, beaver activity, excessively or inadequately drained areas, stream bank instability, etc. Visual monitoring is intended to cover the entire mitigation site in an efficient manner. This information should be presented as a current conditions plan view that identifies all problems with the site. The following requirements apply to visual monitoring:

A. Visual monitoring of all portions of the mitigation project should be conducted annually and be provided in the monitoring report in a plan view format. Visual monitoring should be conducted by traversing the entire mitigation site to identify and document areas of low stem density or poor plant vigor, areas dominated by undesirable volunteer species, prolonged inundation, native and exotic invasive species, beaver activity, herbivory, encroachments, indicators of livestock access, or other areas of concern.

B. The results of visual assessments must be included in the Annual Monitoring Report, and should identify the date(s) that the assessment was conducted. In general, it is preferable for the visual assessment of the site to be performed toward the end of the monitoring year. A narrative of the results should be included in the Annual Monitoring Report to describe any areas of concern, and should be represented on the current conditions plan view of the site with GPS coordinates provided in decimal degrees. Photographs showing the features of concern are helpful. Once a feature of concern has been identified, that same feature must be reassessed on all subsequent visual assessments until the issue has been corrected. Photographs should be taken from the same location year-to-year to document the current condition of the concern. The Monitoring Report should identify all recommended courses of action, which may include continued monitoring, repair or other remedial action to alleviate the concerns.

C. For stream projects, visual monitoring within the channel corridor should be conducted along the entire length of each reach to identify and document movement of the channel pattern, dimension or profile (e.g., lateral bank migration, bank instability, instability/failure of in-stream structures, structure piping, headcuts, aggradation/excessive sediment deposition, etc.), beaver activity, excessive live stake mortality, invasive species, or other potential problems with the channel. As discussed earlier, stream bank instability identified through visual monitoring should be followed up with installation of bank pins, unless it is not possible to do so. Visual monitoring of streams should be conducted only by individuals that have the appropriate training and/or expertise to assess the stability of streams and the condition of in-stream structures.

D. Within preservation areas, visual monitoring should be conducted annually until project closeout for the purpose of ensuring that no activities are occurring that are in violation of the restrictions included in the preservation mechanism prior to the site being transferred to the long-term steward.

XI. Stream Buffers

Vegetated buffers are a critical component of all stream mitigation projects. In 2003, the District established a standard buffer width of 30 feet in the mountain counties, and 50 feet in all other counties. This guidance provides additional clarification regarding these requirements, and also establishes a methodology for assessing credit adjustments for streams that have buffers that are wider or narrower than the standard width. This guidance builds on the most recent draft guidance that was released for public comment in July, 2010.

A. Required Minimum Buffer Widths

1. The riparian buffer requirement for stream and stream/wetland mitigation projects is a minimum of 30 feet for the mountain counties and 50 feet for all other counties.

2. This distance is measured horizontally from the normal wetted perimeter of the stream channel to the nearest edge of the wooded buffer on the same side of the channel. The wooded buffer is defined as the edge of the contiguous riparian zone along a stream that is vegetated with appropriate species, whether planted or preexisting, and located within the boundary of the preservation mechanism. In cases where an approved mitigation plan includes non-tree species in the planting plan, the wooded buffer would include areas planted with these species as well. For multi-thread channels, the wetted perimeter includes all channels and is measured from the outer-most edge of the channel on each side of the valley. Where utility corridors run parallel with stream channels, the buffer may continue across the utility corridor if the corridor is fully vegetated (i.e., no paved or other impervious trails or structures - maintained herbaceous cover and unpaved foot paths are acceptable), there are no berms, ditches or other features that prevent sheet flow of water from one side of the easement to the other, and the inner edge of the utility corridor is located at least 15 feet from the wetted perimeter of the stream and no more than 15 feet in total width. In these cases, the width of the utility corridor cannot be included in the measurement of the overall wooded buffer width. Utility corridor width is measured by the width of the utility easement or the area that has historically been maintained in cases where there is no utility easement.

3. While the minimum acceptable width is measured from the normal wetted perimeter, it is preferred that buffers are established that meet these same widths as measured from the edge of the meander belt to ensure that streams have adequate space to migrate within the buffer. This also allows for a straighter edge along the buffer, which is preferred to a project boundary that meanders with the channel.

4. Depending on project limitations, buffers that are less than the minimum width stated above may be approved on a case-by-case basis by the District, in consultation with the NCIRT. In these cases, the mitigation plan must clearly show where the buffers will not meet this standard and explain why the minimum width cannot be met (e.g., limited property availability, existing utility easements, etc.). The credit generated by reaches with less than the minimum buffer width will generally be reduced in accordance with

the procedures outlined in Section XI(C). Exceptions to this may be approved on a case-by-case basis in urban areas or other situations where it is not practicable to obtain sufficient land; however, the mitigation plan must demonstrate how these project will provide optimal functional uplift to targeted stream functions despite the presence of reduced buffers. The addition of stormwater controls or other BMPs to control and/or treat runoff from contributing watersheds with high percentages of impervious cover is an example of an action that may justify full credit in urban systems.

5. Where streams intersect with project boundaries (e.g., property lines, farm crossings, utility easements, etc.), it may not be possible for buffers to meet the minimum standard width all the way to the end of the channel where the intersection occurs at an acute angle. Because of this, exceptions to the minimum width are allowable without credit reduction when no more than 5% of the total project stream length, measured cumulatively, is located in these areas. Efforts should be made to acquire the necessary property rights to ensure minimum acceptable buffers are established in as short a distance as possible.

6. Where farm crossings, utility lines, or other stream crossings are proposed in mitigation plans, they should be minimized to the maximum extent practicable. Crossings should be co-located whenever possible, and situated at the beginning or end of a stream reach rather than in the middle. Additionally, they should cross perpendicular to the stream channel. All stream crossings, to include aerial and buried utility lines, are not eligible to generate stream credit within the limits of the crossings (as defined by the utility easements for utility crossings). Stream reaches immediately adjacent to crossings that intersect at acute angles may also be subject to credit reduction due to narrow buffers that result, except as allowed in parts 2 and 5 above.

7. Other than the exceptions noted in part 4 and 5 above, stream channels with buffers less than 15 feet in total width on either side are not eligible to receive mitigation credit (on either side of the channel).

B. Additional Credit for Buffers Exceeding Minimum Standard Widths

1. To provide an incentive for buffers that exceed the minimum standard width, additional credit may be awarded using the procedures outlined in Section XI(C) below. Additional credit is not provided until buffer widths exceed 50 feet from the normal wetted perimeter for mountain streams and 75 feet from the normal wetted perimeter for piedmont and coastal plain streams.

2. The following guidelines apply to the addition of credit due to wider buffers:

    a. Buffer measurements for additional credit must be made horizontally, beginning from the edge of the wetted perimeter and extending to the nearest edge of the wooded buffer (as defined in XI(A)(2)) in any direction. Buffers must also be located within the watershed draining to the stream. An average stream width may be applied to a surveyed stream centerline to estimate the normal wetted perimeter. Measurements may not cross over any breaks within the buffer, such as utility lines, other streams, roads, greenways, or other easement breaks, even

if located within the project boundary, except as specified in Section XI(A)(2). For constructed multi-thread streams, the buffer should be measured from the edge of the wetted perimeter of the outer-most thread. (This does not refer to channels restored using the Headwater Stream Guidance discussed in Section VIII, which are not eligible to generate additional credit for wider buffers.)

b. The inclusion of any buffer for additional credit is dependent upon the success of vegetation plantings - areas that are bare or dominated by invasive species may be eliminated from additional credit calculations.

c. Any area within a buffer may only be used to provide additional credit for one stream (i.e., where wide buffers exist between two project streams, or leading up to the confluence of two streams, these areas may only be used to provide additional credit for one of the streams).

d. Due to the minimum required widths, additional credit cannot be generated until a stream is at least 75 feet inside the edge of the buffer (50 feet for mountain counties). This distance assumes the stream intersects the buffer at a perpendicular angle, and will increase where the intersection is at an acute angle. Where a stream origin is located within a project, that origin must be at least 75 feet inside the edge of the buffer (50 feet for mountain counties).

e. To qualify for additional credit, channels must be jurisdictional. Additional credit may be awarded for both perennial and intermittent reaches, and also for restoration or enhancement reaches, but not for any preservation reach (buffer width is already considered when determining the acceptability and appropriate mitigation ratios for preservation reaches).

f. Areas within mitigation projects that are used to generate additional credit must be used exclusively for the generation of stream mitigation credits, and cannot be used for the generation of any other credit type (i.e., the same square foot of buffer cannot be used to generate wetland credit, or credits associated with other federal, state, or local requirements, including nutrient offset credits or state buffer credits).

g. Where additional credit is proposed for wider buffer widths, the mitigation plan must include a plan view that details the individual reaches associated with each buffer width category shown in the tables in part C. The plan view should identify the normal wetted perimeter and the edge of the wooded buffer, and should be to scale so that the measurements can be verified. Additionally, the calculations must be presented in a table that shows the length of each reach and the associated credit increase resulting from the wider buffers.

C. Procedures to Calculate Credits for Non-standard Buffer Widths

1. In order to calculate credit adjustments due to non-standard buffer widths, each side of the stream must be evaluated separately. The two sides of each stream should be broken down into reaches that fall within the buffer width categories shown in Table 2

below. Measurements are made using the nearest point method described in Section XI(B)(2) above (the nearest buffer edge may be in any direction, not necessarily perpendicular from the centerline of the stream). Measurements may be calculated using any method (e.g., GIS, CAD, by hand using a scale, etc.), provided that the plan view and calculations are provided. The lengths of individual reaches should then be multiplied by the mitigation ratio to yield stream credits, and the results should then be adjusted by the increase or decrease percentage indicated in Table 2. Finally, the resulting credit amounts should be totaled for each side of the stream. The sum of both sides of the stream is then divided by two to yield the final number of credits.

Table 2 - Stream Mitigation Credit Adjustments for Non-standard Buffer Widths

Mountain Counties		Piedmont and Coastal Plain Counties	
Buffer Width	**Adjustment to Stream Credit**	**Buffer Width**	**Adjustment to Stream Credit**
Less than 15 feet	-100 %	Less than 15 feet	-100%
15 to < 20 feet	-50 %	15 to < 20 feet	- 50%
20 to < 25 feet	-30 %	20 to < 25 feet	-40%
25 to < 30 feet	-15 %	25 to < 30 feet	- 30%
30 to < 50 feet	0 %	30 to < 35 feet	-20%
50 to < 75 feet	+9 %	35 to < 40 feet	-15%
75 to < 100 feet	+16 %	40 to < 45 feet	-10%
100 to < 125 feet	+22 %	45 to < 50 feet	-5%
125 to < 150 feet	+27 %	50 to < 75 feet	0 %
150 feet or Greater	+30 %	75 to < 100 feet	+7%
		100 to < 125 feet	+12%
		125 to < 150 feet	+16%
		150 feet or greater	+20%

XII. Remedial Actions

Mitigation Plans are required to include an Adaptive Management Plan, which should address how problems on sites will be resolved. In addition, if monitoring results indicate that all or some portions of the site will fail to meet one or more of the required performance standards, the monitoring report must provide a remedial action plan (based on the Adaptive Management Plan) to address the deficiency and the USACE mitigation contact shall be notified as soon as possible if a situation is discovered that will require remedial action. The remedial action plan, at a minimum, must describe the failure, the source or reason for the failure, a concise description of the corrective measures that are proposed, and a time frame for the implementation of the corrective measures. Additional monitoring, as prescribed by this guidance, may also be required.

A. Vegetation

If monitoring indicates that portions of the site are not going to meet required vegetation performance standards, replanting of all or part of the site may be required. If supplemental plantings are required by the NCIRT that exceed 20% of the total planted area of the site (measured cumulatively), additional monitoring may be required within these areas to demonstrate success in accordance with the vegetation performance standards. Remedial action plans should take into

account reasons for failure and provide for corrective measures if applicable. For instance, if inundation is determined to be a cause for poor vegetation performance, the replanted species may be adjusted to include species more tolerant to inundation.

In the event that a site is not meeting the vegetation vigor standards, the remedial action plan should seek to identify the cause of the problem and remediate the problem if possible. This may include one or more of several options, such as deep ripping portions of the site and replanting, mowing, herbicide use or other treatment of competitive and/or invasive vegetation to release the desirable species, fertilization, beaver control, or replanting with species less subject to herbivory. In certain instances, it may be determined that it is not practicable to perform remedial actions to address the factors limiting the vigor of planted vegetation, and that no further work will improve the conditions. In this situation, the NCIRT will determine what level of credit may be generated by portions of the site that are not meeting performance standards.

B. Stream Stability

Stream stability may be identified as a concern with stream mitigation projects even though all performance standards may be met at monitored cross-sections. Visual monitoring of the channel is intended to identify potential problems that are not captured by cross-sections and allow them to be tracked and addressed, if necessary. The use of bank pins may be prescribed to help track bank stability. In general, repairs should be undertaken when stream stability issues are identified that continue to worsen, pose a threat to other portions of the stream (headcuts), or are systemic and symptomatic of more serious issues with the design and/or construction of the project. Moreover, the NCIRT recommends that if a reach has greater than 10% bank or bed instability, then it is likely the reach may be a candidate for repair. If this number exceeds 15%, it is highly likely that the stream reach will need repair or it may be a threat to other portions of the project if not addressed. If problems continue to persist, repairs may be discontinued and mitigation credits will be adjusted accordingly. These decisions will be made on a case-by-case basis by the NCIRT.

C. Invasive Species

As more stream and wetland mitigation projects have been established, problems with native and exotic invasive vegetation or otherwise undesirable plant species have become more prevalent. A list of these species is available as an appendix to the NC SAM User's Manual available on the Wilmington District RIBITS website. The current approach used by the District is to manage invasive species during the monitoring phase of mitigation projects, with the understanding that long-term management of invasive species in perpetuity is not practicable. The District also expects that invasive species management will always be a routine maintenance task for compensatory mitigation sites; however, removal of invasive species should not typically be identified as a primary source of functional improvement in the Mitigation Plan. In rare cases, credit may be provided for invasive species management activities, but in these cases, the functional uplift from the management activities should be explained in the mitigation plan and a long-term management plan and appropriate funding may be required.

No specific performance standards have been established in this guidance for controlling invasive species, although sites should be routinely monitored for the presence of invasive species during both the visual assessments of the channel and vegetation plot monitoring events. In general, when an invasive species impacts the functional integrity of the target vegetative community, adaptive

management aimed at controlling the species should be conducted. In certain cases, credit releases may be withheld or modified until the problem is addressed.

Although a site may rapidly be dominated by one or more invasive species, the desirable or planted species may have survived and exhibited sufficient growth to suggest that they will continue to survive. Efforts should be taken immediately upon the identification of invasive species on the site to eradicate or at least control their recurrence, and may include chemical or physical eradication methods. In cases where invasive species located on an adjacent property threaten a mitigation site, it is recommended that the control measures be extended to the adjacent property if the landowner is willing. Extreme care must be exercised such that the desirable species are not adversely impacted. Efforts taken to control invasive species must always be noted in the monitoring reports.

D. Beaver

The occurrence of beavers on stream and wetland mitigation projects has become prevalent throughout NC, but this is a natural and expected occurrence within these communities. Beaver management is a topic that should be addressed in the Adaptive Management Plan portion of all Mitigation Plans. When beaver activity is discovered on a mitigation site, the monitoring report should document the location of dams in the current conditions plan view. The report should also include an estimate of the potential impact of the beaver and dams to the site (e.g., LF of stream impounded, acres of wetlands flooded).

When management is prescribed, it may entail trapping or otherwise removing beavers from mitigation sites and completely removing any beaver dams. All management activities should be tracked and included in the monitoring reports. This should include dates of trapping, number of beavers removed, and the number and location of dams that are removed. Generally, dams should be removed by hand whenever possible. Depending on the method of dam removal (e.g., mechanical, explosives, etc.), it may be necessary to obtain a DA permit from the USACE county Project Manager prior to conducting the work.

XIII. Monitoring Schedule

Table 3 lists the monitoring requirements for each year. Monitoring events conducted after year 7 will be specified on a case-by-case basis by the NCIRT. Stream mitigation conducted in accordance with the Headwater Stream Guidance will be monitored following the schedule outlined in Section VIII. Wetland hydrology monitoring activities listed below should be conducted in accordance with the approved Mitigation Plan. Please note that the table below is a general list of monitoring requirements, and is not meant to be a comprehensive list of monitoring requirements. Individual Mitigation Plans may specify different monitoring activities and/or schedules.

Table 3 – Schedule of Monitoring Events

Monitoring Event	Monitoring Activities Required	
	Streams	**Wetlands**
Pre-Construction	• Water Quality (Section VII(A)) • Macroinvertebrate & Fish (Section VII(B-C))*	• Per Mitigation Plan
Year 0 (As-Built)	• As-built Survey (includes longitudinal profile and sampling point locations)	• As-built Survey
Year 1	• Vegetation (Section V) • Stream Channel Stability/Hydrology (Section VI) • Water Quality (Section VII(A))* • Visual, two times (Section X)	• Vegetation (Section V) • Wetland Hydrology (Section IX) • Visual, two times (Section X)
Year 2	• Vegetation (Section V) • Stream Channel Stability/Hydrology (Section VI) • Water Quality (Section VII(A))* • Visual, two times (Section X)	• Vegetation (Section V) • Wetland Hydrology (Section IX) • Visual, two times (Section X)
Year 3	• Vegetation (Section V) • Stream Channel Stability/Hydrology (Section VI) • Water Quality (Section VII(A))* • Macroinvertebrate & Fish (Section VII(B-C))* • Visual, two times (Section X)	• Vegetation (Section V) • Wetland Hydrology (Section IX) • Visual, two times (Section X)
Year 4	• Water Quality (Section VII(A)) * • Visual, two times (Section X)	• Visual (Section X) • Wetland Hydrology (Section IX)
Year 5	• Vegetation (Section V) • Stream Channel Stability/Hydrology (Section VI) • Water Quality (Section VII(A)) * • Macroinvertebrate & Fish (Section VII(B-C)) * • Visual, two times (Section X)	• Vegetation (Section V) • Wetland Hydrology (Section IX) • Visual, two times (Section X)
Year 6	• Water Quality (Section VII(A)) * • Visual, two times (Section X)	• Wetland Hydrology (Section IX) • Visual, two times (Section X)
Year 7	• Vegetation (Section V) • Stream Channel Stability/Hydrology (Section VI) • Water Quality (Section VII(A)) * • Macroinvertebrate & Fish (Section VII(B-C)) * • Visual, two times (Section X)	• Vegetation (Section V) • Wetland Hydrology (Section IX) • Visual, two times (Section X)

*Indicates optional monitoring activities

XIV. Credit Release Schedules

The standard release schedule for mitigation bank and ILF credits generated through stream and wetland mitigation projects has been modified to meet the new standards for the monitoring timeframes provided in this guidance document. For mitigation banks, the first credit release (15% of the bank's total stream restoration and/or enhancement credits) will occur upon establishment of the mitigation bank, and upon completion following criteria:

1) Execution of the MBI or UMBI by the Sponsor and the USACE
2) Approval of the final Mitigation Plan

3) The mitigation bank site must be secured
4) Delivery of the financial assurances described in the Mitigation Plan
5) Recordation of the long-term protection mechanism and title opinion acceptable to the USACE
6) Issuance of the 404 permit verification for construction of the site, if required.

For mitigation sites that include preservation-only credits, 100% of the preservation credits will be released with the completion of the six criteria stated above.

For ILF sites (including all NCDMS projects), no initial release of credits (Milestone 1) is provided because ILF programs utilized advance credits, so no initial release is necessary to help fund site construction. To account for this, the 15% credit release associated with the first milestone (bank establishment) is held until the second milestone, so that the total credits release at the second milestone is 30%. In order for NCDMS to receive the 30% release (shown in the schedules as Milestone 2), they must comply with the credit release requirements stated in Section IV(I)(3) of the approved NCDMS Instrument.

The following conditions apply to the credit release schedules:

A. A reserve of 10% of a site's total stream credits will be released after four bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than four bankfull events occur during the monitoring period, release of these reserve credits is at the discretion of the NCIRT.

B. For mitigation banks, implementation of the approved Mitigation Plan must be initiated no later than the first full growing season after the date of the first credit transaction (credit sale).

C. After the second milestone, the credit releases are scheduled to occur on an annual basis, assuming that the annual monitoring report has been provided to the USACE in accordance with Section IV (General Monitoring Requirements) of this document, and that the monitoring report demonstrates that interim performance standards are being met and that no other concerns have been identified on-site during the visual monitoring. All credit releases require written approval from the USACE.

D. The credits associated with the final credit release milestone will be released only upon a determination by the USACE, in consultation with the NCIRT, of functional success as defined in the Mitigation Plan.

The schedules below list the updated credit release schedules for stream and wetland mitigation projects developed by bank and ILF sites in North Carolina:

Credit Release Schedule and Milestones for Wetlands					
Credit Release Milestone	**Release Activity**	**Banks**		**ILF/NCDMS**	
		Interim Release	**Total Released**	**Interim Release**	**Total Released**
1	Site Establishment (includes all required criteria stated above)	15%	15%	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	15%	30%	30%	30%
3	Year 1 monitoring report demonstrates that interim performance standards have been met	10%	40%	10%	40%
4	Year 2 monitoring report demonstrates that interim performance standards have been met	10%	50%	10%	50%
5	Year 3 monitoring report demonstrates that interim performance standards have been met	15%	65%	15%	65%
6*	Year 4 monitoring report demonstrates that interim performance standards have been met	5%	70%	5%	70%
7	Year 5 monitoring report demonstrates that interim performance standards have been met	15%	85%	15%	85%
8*	Year 6 monitoring report demonstrates that interim performance standards have been met	5%	90%	5%	90%
9	Year 7 monitoring report demonstrates that performance standards have been met	10%	100%	10%	100%

*Please note that vegetation plot data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the NCIRT.

Credit Release Schedule and Milestones for Coastal Marsh Wetlands					
Credit Release Milestone	**Release Activity**	**Banks**		**ILF/NCDMS**	
		Interim Release	**Total Released**	**Interim Release**	**Total Released**
1	Site Establishment (includes all required criteria stated above)	15%	15%	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	15%	30%	30%	30%
3	Year 1 monitoring report demonstrates that interim performance standards have been met	10%	40%	10%	40%
4	Year 2 monitoring report demonstrates that interim performance standards have been met	15%	55%	15%	55%
5	Year 3 monitoring report demonstrates that interim performance standards have been met	20%	75%	20%	75%
6	Year 4 monitoring report demonstrates that interim performance standards have been met	10%	85%	10%	85%
7	Year 5 monitoring report demonstrates that performance standards have been met	15%	100%	15%	100%

Credit Release Schedule and Milestones for Streams					
Credit Release Milestone	**Release Activity**	**Banks**		**ILF/NCDMS**	
		Interim Release	**Total Released**	**Interim Release**	**Total Released**
1	Site Establishment (includes all required criteria stated above)	15%	15%	0%	0%
2	Completion of all initial physical and biological improvements made pursuant to the Mitigation Plan	15%	30%	30%	30%
3	Year 1 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	40%	10%	40%
4	Year 2 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	50%	10%	50%
5	Year 3 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	60%	10%	60%
6*	Year 4 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	65% (75%**)	5%	65% (75%**)
7	Year 5 monitoring report demonstrates that channels are stable and interim performance standards have been met	10%	75% (85%**)	10%	75% (85%**)
8*	Year 6 monitoring report demonstrates that channels are stable and interim performance standards have been met	5%	80% (90%**)	5%	80% (90%**)
9	Year 7 monitoring report demonstrates that channels are stable, performance standards have been met	10%	90% (100%**)	10%	90% (100%**)

*Please note that vegetation data may not be required with monitoring reports submitted during these monitoring years unless otherwise required by the Mitigation Plan or directed by the NCIRT.

**10% reserve of credits to be held back until the bankfull event performance standard has been met.

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