

**601 North II
Stream Restoration Site**

FINAL

Annual Monitoring Report
NCDMS Project Number: 95025
Monitoring Contract Number: 003991
Monitoring Year 5 2017



Prepared By:
Resource Environmental Solutions



302 Jefferson Street, Suite 110
Raleigh, North Carolina 27605

Submitted to:
NCDEQ – Division of Mitigation Services

1652 Mail Service Center
Raleigh, NC 27699



302 Jefferson Street, Suite 110
Raleigh, NC 27605

Corporate Headquarters
5020 Montrose Blvd. Suite 650
Houston, TX 77006
Main: 713.520.5400

February 1, 2018

Matthew Reid
NC DEQ Division of Mitigation Services
5 Ravenscroft Drive, Suite 102
Asheville, NC 28801

RE: 601 North II Stream Restoration Site: MY5 Monitoring Report (NCDMS ID 95025)

Listed below are comments provided by DMS on January 16, 2018 regarding the 601 North II Stream Restoration Site: Year 5 Monitoring Report and RES' responses.

General:

601NII is scheduled to close out in 2018. Please solve encroachment issues and treat invasives as necessary to prevent any possible contingency items.

As RES has done in the past, please include a response to the comment letter and how/where the comments were addressed. Please insert this letter directly behind the cover page in the final deliverables including the electronic deliverable. The IRT has requested that we include this letter with the final deliverables. The response letter will need to be included with all future monitoring deliverables.

Executive Summary:

An encroachment is discussed on Reach 4 between sta: 0+00 and 1+50. This encroachment has occurred more than once during the life of the project. No solution or corrective measure is discussed regarding the encroachment. What has RES done to prevent further encroachment? Please update section to discuss corrective measure. If the encroachment cannot be resolved, please inform DMS for assistance. Please be aware that historic encroachments may prevent the project from being accepted by stewardship thereby preventing closeout.

RES plans to lock the gate that is being used to access the easement. Then RES will install a new gate outside the of easement to allow the farmer access to the other field without having to cut through the easement.

Table 2:

Please add beaver dam removal from early 2016 to Table 2.

Beavers were removed in May 2017, and water is freely flowing through the remnant beaver dams. The gap in the beaver dams, however, needs to be widened to a typical cross section dimension. This will be done in early 2018. The report has been corrected and this has been added to Table 2.



Table 7:

Plot numbers 8 and 12 are meeting the MY5 success criteria. Suggest editing these two plot rows to match other plots (green fill and Yes for criteria met).

Done.

Cross Sections and Table 11:

The IRT has expressed concern with having a BHR of 1.0 for all monitoring years. The IRT has requested that Bank Height Ratios be calculated. Please calculate BHR for cross sections and update Table 11. If BHR has been calculated, consider increasing the significant digits to show changes throughout monitoring years (example: 1.06). Also, be prepared to discuss with the IRT how RES calculates BHR at the Credit Release meeting.

BHR for MY5 riffle cross sections has been calculated using the bankfull elevation from baseline. This method was used because the dimension of the channels has not changed enough to alter the bankfull elevation. BHR from previous years was not calculated therefore it is not included. This has been added to the report and as a footnote to Table 11a.

**601 North II
Stream Restoration Site
2017 Monitoring Report (MY5)**

Table of Contents

1.0 Executive Summary/Project Abstract 1
2.0 Methodology 2
3.0 References..... 3

Appendices

Appendix A. Project Vicinity Map and Background Tables

- Figure 1. Vicinity Map and Directions
- Table 1. Project Components and Component Summations
- Table 2. Project Activity and Reporting History
- Table 3. Project Contacts
- Table 4. Project Attributes

Appendix B. Visual Assessment Data

- Figure 2. Integrated Current Condition Plan View
- Table 5. Visual Stream Morphology Stability Assessment
- Table 6. Vegetation Condition Assessment
- Figure 3. Permanent Photo Station Photos

Appendix C. Vegetation Plot Data

- Table 7. Vegetation Plot Criteria Attainment
- Figure 4. Vegetation Monitoring Plot Photos
- Table 8. CVS Vegetation Plot Metadata
- Table 9. Planted and Total Stem Counts (Species by Plot with Annual Means)

Appendix D. Stream Geomorphology Data

- Figure 5. Cross-Section Plots with Annual Overlays and Photos
- Figure 6. Longitudinal Profile with Annual Overlays
- Table 10. Baseline Stream Data Summary
- Table 11a. Baseline Morphology & Hydraulic Monitoring Summary
- Table 11b. Monitoring Data – Stream Reach Data Summary
- Table 12. Pebble Count Data Summary
- Figure 7. MY5 Stream Reach Substrate Composition Charts

Appendix E. Hydrology Data

- Table 13. Verification of Bankfull Events
- Chart 7. Daily Precipitation Data for Monroe, NC
- Table 14. Monroe, NC Rainfall Summary 2017

1.0 Executive Summary/Project Abstract

The goals and objectives stated in the 601 North II Restoration Plan (EBX 2013) are as follows:

Project Goals

- Re-establish the capacity to store and transport watershed flows and sediment loads by restoring stable dimension, pattern, and profile
- Reduce sediment within on-site and downstream receiving waters through the stabilization of eroding stream banks, introduction of livestock exclusion fencing and responsible grazing techniques, and restoration of a forested riparian buffer
- Elevate the water table and introduce surface water flood hydrodynamics within the floodplain by re-establishing characteristic bankfull dimensions and flood frequency
- Remove non-point sources of pollution associated with pesticides, herbicides, fertilizer, and livestock waste by filtering sheet flow through a restored riparian buffer and installed Riparian Best Management Practice (RBMP) detention devices
- Improve aquatic habitat by reducing sedimentation, removing in-stream culverts, enhancing stream bed variability, and introducing shading, woody debris, and detritus from riparian planting
- Enhance terrestrial wildlife habitat by extending a terrestrial wildlife corridor and refuge to connect with the existing and adjacent 601 North Site, as well as to the downstream reaches of Wicker Branch and Lanes Creek
- Improve water quality for two populations of freshwater mussels documented to occur in Lanes Creek (Savannah Lilliput (*Toxolasma pullus*) and Carolina creekshell (*Villosa vaughniana*), both state listed and Federal Species of Concern
- Expand on and integrate the restoration and enhancement work with the adjacently positioned, companion 601 North Restoration Site

Project Objectives

- Restoration (Priority 1 and 2) of approximately 3,354 linear feet of perennial stream channel (3,169 linear feet of credited stream) to reconnect the floodplain and restore stable channel dimension, pattern, and profile
- Enhancement (Level I) of approximately 225 linear feet of perennial stream channel by stream bank grading, and slight adjustments to either stream pattern or dimension
- Enhancement (Level II) of approximately 615 linear feet of perennial stream channel by restoring a minimum 50 foot planted buffer
- Removal of an existing culvert on Wicker Branch
- Installation of Riparian Best Management Practice (RBMP) detention devices, and livestock exclusion fencing to prohibit grazing on the floodplain and hoof shear on stream banks
- Re-vegetating floodplains adjacent to streams
- Providing a permanent conservation easement on approximately 12.3 acres of riparian buffer along approximately 4,194 feet of restored and enhanced stream channels

The following presents the results from data collection performed during the Year 5 monitoring period (MY5). Data was collected between January and November of 2017.

Visual assessment of the easement indicates that herbaceous vegetation has become well established throughout the project. Limited areas of poor growth rates were noted during MY5 (**Figure 2**). These areas were greatly reduced in comparison to MY4. During MY5, a previously identified easement encroachment was observed on Reach 4, between station 0+00 and 1+50 on the LDB. This area consists

of clearing a path along the fence line using mowing and the application of herbicides. RES plans to lock the gate that is being used to access the easement. Then RES will install a new gate outside of the easement to allow the farmer access to the other field without having to cut through the easement. Invasive exotic vegetation (Chinese privet) was noted in two locations totaling 0.26 acres, or 2% of the easement area (**Figure 2 and Table 6**). Previously noted areas of invasive exotic vegetation that was comprised of Japanese honeysuckle was not included in MY5 as the vine was not hindering the growth of any of the planted stems. The Chinese privet will be treated during the upcoming growing season.

The MY5 vegetation plot data was collected during October 2017. All monitoring plots met the Year 5 success criteria of 260 stems per acre. Stem densities ranged from 283 to 647 stems per acre with an annual mean of 401 stems per acre (**Table 7**). A total of 12 plant species were documented within the vegetation monitoring plots. When volunteer stems are included, densities ranged from 405 to 971 stems per acre with a mean of 587 stems per acre across all plots (**Table 9**).

Visual assessment of the entire project indicates that the stream is stable. Areas of bank erosion noted in previous years were not included in MY5 as the vegetation on the banks along all reaches have become well established. Beavers were removed in May 2017, and water is freely flowing through the remnant beaver dams (**Figure 2**). The gap in the beaver dams, however, needs to be widened to a typical cross section dimension. This will be done in early 2018.

A field visit was conducted in the end of November 2017 to collect stream morphological data. Stream longitudinal profiles, in general, have remained stable from MY4 to MY5 (**Figure 6 and Table 11b**). MY5 cross-section data also showed little change between MY4 and MY5 (**Figure 5 and Table 11a**). BHR for MY5 riffle cross sections has been calculated using the bankfull elevation from baseline. This method was used because the dimension of the channels has not changed enough to alter the bankfull elevation. Pebble counts were conducted at all 10 cross-sections and continue to display removal of fine sediment in the channel, resulting in a larger, more coarse stream bed substrate (**Table 12; Figure 7**).

Bankfull events were documented on Reach 2 and Reach 5 in the form of wrack lines (**Table 13**). Both reaches have recorded multiple bankfull events throughout the monitoring period.

Summary information and data related to the occurrence of items such as easement encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the restoration plan on NCDMS's website. All raw data supporting tables and figures in the appendices are available from NCDMS upon request.

2.0 Methodology

Visual assessment of the stream was performed at the beginning and end of the monitoring year. Permanent photo station photos were collected during the initial visual assessment during leaf-off conditions to ensure visibility of in-channel structures and stream banks. Additional photos of vegetation or stream problem areas were documented with photographs throughout the project area.

Geomorphic measurements were taken using standard guidance (Rosgen 1996; USACE 2003) during low flow conditions using a Topcon GTS-312 Total Station. Three-dimensional coordinates associated with cross-section and profile data were collected in the field and geo-referenced (NAD83 State Plane feet FIPS 3200). Morphological data was limited to 10 cross-sections. Survey data was imported into CAD,

ArcGIS, and Excel for data processing and analysis. Channel substrate was characterized using a Wolman Pebble Count outlined in the Harrelson et al. (1994) and processed using Microsoft Excel.

Vegetation success is being monitored using 12 permanent monitoring plots. Vegetation monitoring follows the CVS-EEP Level 1 Protocol for MY1 and will follow Level 2 Protocol for monitoring years 2-5 for Recording Vegetation, version 4.2 (Lee et al. 2008) and includes analysis of composition and density of planted species. Data is processed using the CVS data entry tool. In the field, the four corners of each plot were permanently marked with rebar and photos of each plot are taken from the origin each monitoring year.

Precipitation data was reported from the NCCRONOS station number 315771 two miles South East of Monroe, NC. Two crest gauges were installed—one on the mainstem Reach 2 at XS-10, and the other on Reach 5 at XS-3. During quarterly visits to the site, the height of the corkline was recorded and cross-referenced with known bankfull elevations at each crest gauge.

3.0 References

- Harrelson, Cheryl, C. Rawlins and J. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Gen. Tech. Rep. RM-245. Rocky Mountain Forest and Range Experiment Station. USDA Forest Service. Fort Collins, Colorado
- Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2. The University of North Carolina at Chapel Hill, Department of Biology.
- EBX (Environmental Banc and Exchange). 2013. 601 North II Restoration Site Baseline Monitoring Document and As-Build Baseline Report. NCEEP Project No. 95025/Contract No. 003991. Raleigh.
- Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology Books, Pagosa Springs, Colorado.
- USACE (U.S. Army Corps of Engineers). 2003. Stream Mitigation Guidelines. U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, North Carolina Wildlife Resources Commission, North Carolina Department of Environment and Natural Resources-Division of Water Quality. Wilmington District.