

601 North II Stream Restoration Site

FINAL

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



Prepared By:
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February 1, 2018

Matthew Reid
NC DEQ Division of Mitigation Services
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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)**

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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.

Appendix A

Project Background History and Maps

Figure 1. Project Vicinity Map

Table 1. Project Components and Mitigation Credits

Table 2. Project Activity and Reporting History

Table 3. Project Contacts

Table 4. Project Information and Attributes

Driving Directions: From Monroe drive south on Hwy. 601. Turn right on McManus Circle at the southern intersection with Hwy. 601. Site is on left and is accessed by a farm path located on the west side of McManus Circle just before the road ends.

The subject project site is an environmental restoration site of the NCDEQ DMS and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easment boundary and therefore access by the general public is not permitted. Access by authorized personel of state and federal agencies or their designee/contractors involved in the development, oversight, and stewardship of the restoration site is permitted within the terms and timeframes of their defined role. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with DMS.

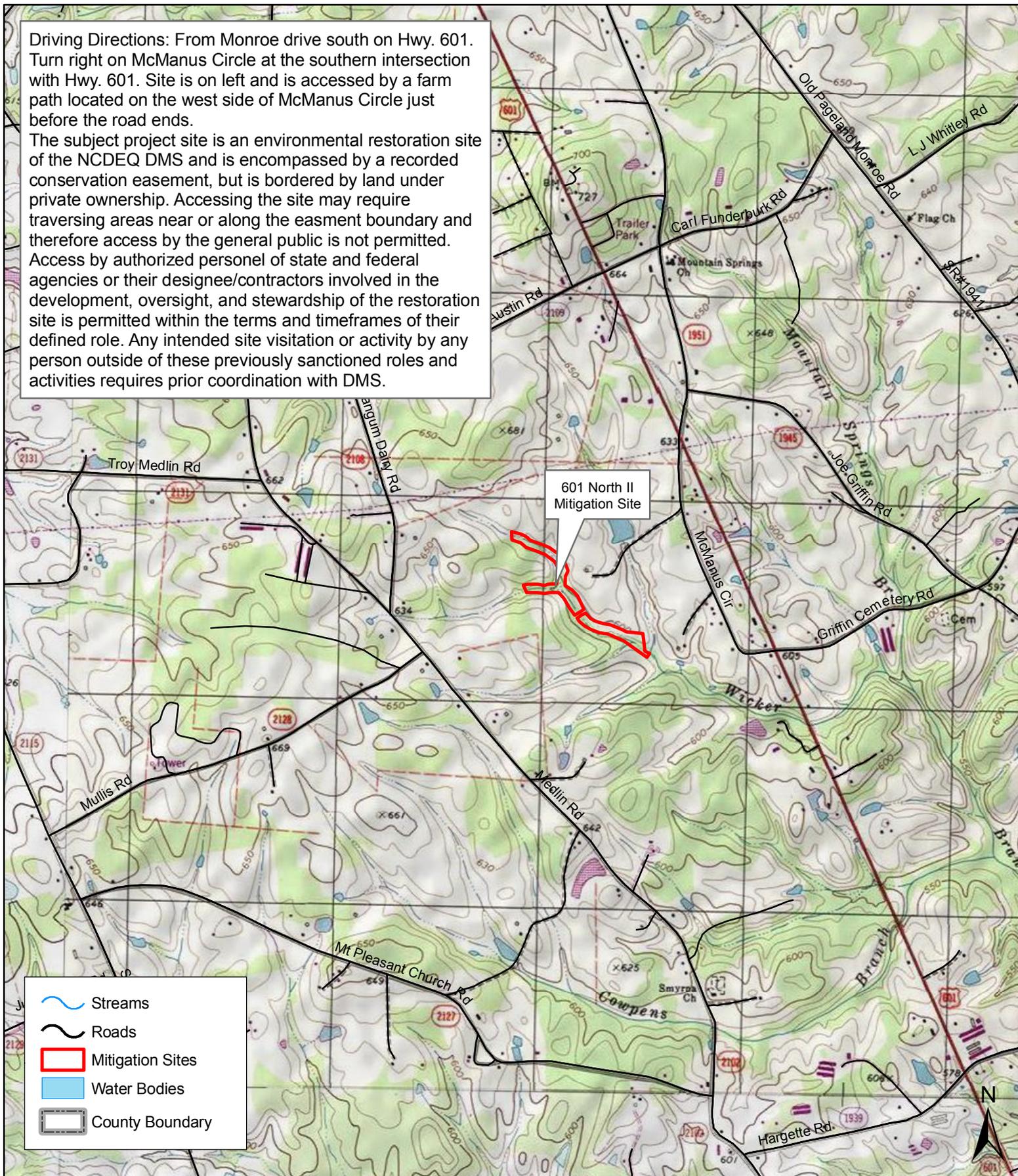


Figure 1
601 North II Mitigation Site
Project Vicinity Map

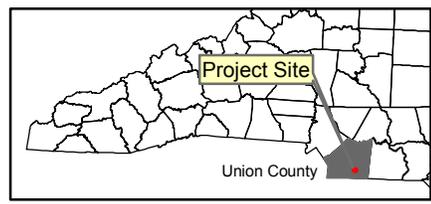
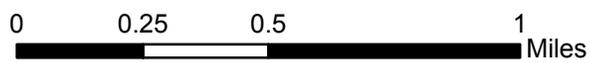


Table 1. Project Components and Mitigation Credits

| Table 1. Project Components and Mitigation Credits 601 North II Stream Restoration Site – Project No. 95025 | | | | | | | |
|--|------------------------------------|---|---------------------|---------------------------------|---|---|--------------------------------|
| Mitigation Credits | | | | | | | |
| | Stream | | Riparian Wetland | Non-riparian Wetland | Buffer | Nitrogen Nutrient Offset | Phosphorous Nutrient Offset |
| Type | R | RE | | | | | |
| Totals | 3,169 | 396 | | | | | |
| Project Components | | | | | | | |
| Project Component -or- Reach ID | Stationing /Location | | Existing Footage | Approach | Restoration -or- Restoration Equivalent | Restoration Footage | Mitigation Ratio |
| Wicker Branch (Reach 1) | 00+00-06+60 | | 630 ¹ | P1 | Restoration | 660 | 1:01 |
| Wicker Branch (Reach 2) | 06+60-24+35 | | 1,356 | P1, P2 | Restoration | 1,713 ² | 1:01 |
| Wicker Branch (Reach 3) | 24+35-27+08 | | 414 | P2 | Restoration | 150 ³ | 1:01 |
| UT to Wicker Branch (Reach 4) | 00+00-02+25 | | 218 | EI | Restoration Equivalent | 225 | 01:01.5 |
| | 02+25-08+40 | | 608 | EII | Restoration Equivalent | 615 | 01:02.5 |
| UT to Wicker Branch (Reach 5) | 08+40-14+86 | | 534 | P1 | Restoration | 646 | 1:01 |
| Component Summation | | | | | | | |
| Restoration Level | Stream (linear feet) | Riparian Wetland (acres) | | Non-riparian Wetland (acres) | Buffer (square feet) | Upland (acres) | |
| | | Riverine | Non-Riverine | | | | |
| Restoration | 3,169 | -- | -- | -- | -- | 12.3 | |
| Enhancement I | 225 | -- | -- | -- | -- | | |
| Enhancement II | 615 | -- | -- | -- | -- | | |
| BMP Elements | | | | | | | |
| Element | Location | Purpose/Function | | | | Notes | |
| Vernal Pools (12) | See as-built plans | Treat on-site storm water from adjacent agricultural fields. Remove suspended solids, help infiltration of water and remove excess nutrients prior to entering stream. Will reduce livestock waste in on-site streams | | | | Target at base of drainages coming from adjacent agricultural fields. | |
| Farm Crossing Improvements | See as-built plans | Two off-site farm crossings located above the restored streams will be improved at their existing location and incorporated into the restoration design. | | | | | |
| Cattle Exclusion Fencing | Along the western site boundary | Will eliminate hoof shear on banks and livestock waste into on-site streams | | | | To be installed in 2013 | |

¹Includes 169 feet of hydrologic connectivity through a linear wetland persisting in the location of the relic channel.

²Does not include the restored portion of Wicker Branch located outside of the conservation easement (Station 11+63-12+25).

³Does not include the restored portion of Wicker Branch located outside of the conservation easement (Station 25+85-27+08).

Table 2. Project Activity and Reporting History

| Table 2. Project Activity and Reporting History 601 North II Stream Restoration Site - Project No. 95025 | | |
|---|---------------------------------|-------------------------------|
| Activity Report | Data Collection Complete | Completion or Delivery |
| Final Mitigation Plan | N/A | Oct-12 |
| Final Design (90 percent) | N/A | Nov-12 |
| Construction | N/A | Apr-13 |
| Temporary S&E mix applied to entire project area | N/A | Feb-Apr 2013 |
| Permanent seed mix applied to reach/egments | N/A | Apr-13 |
| Bare Root Seedling Installation | N/A | Apr-13 |
| Installation of permanent cross-sections and vegetation plots | N/A | May-13 |
| Baseline Monitoring Report | Jun-13 | Jun-13 |
| Year 1 Vegetation Monitoring | Dec-13 | Dec-13 |
| Year 1 Stream Monitoring | Nov-13 | Dec-13 |
| Beaver Dam Removal | - | Mar-14 |
| Additional Boundary Marking/Signage | - | Apr-14 |
| Year 2 Vegetation Monitoring | Sep-14 | Nov-14 |
| Year 2 Stream Monitoring | Jun-14 | Nov-14 |
| Supplemental Planting | - | Jan-15 |
| Year 3 Vegetation Monitoring | Sep-15 | Nov-15 |
| Year 3 Stream Monitoring | May-15 | Nov-15 |
| Year 4 Vegetation Monitoring | Jun-16 | Oct-16 |
| Year 4 Stream Monitoring | May-16 | Oct-16 |
| Beaver Management | - | May-17 |
| Year 5 Vegetation Monitoring | Oct-17 | Feb-18 |
| Year 5 Stream Monitoring | Nov-17 | Feb-18 |

*NA - Activities and reporting history for these items are not applicable to this restoration project

Table 3. Project Contacts

| Table 3. Project Contacts 601 North II Stream Restoration Site – Project No. 95025 | |
|---|---|
| Prime Contractor | Resource Environmental Solutions 302 Jefferson Street, Suite 110 Raleigh NC 27605 Phone: (919) 209-1061 Contact: Brian Hockett |
| Designer | Atkins North America, Inc. 1616 East Millbrook Road, Suite 310 Raleigh, NC 27609 (919) 876-6888 Contact: Jens Geratz or Michael Gloden |
| Construction Contractor | Wright Contracting PO Box 545 Siler City, NC 27344 (919) 663-0810 Contact: Stephen James |
| Planting Contractor | KBS Earthworks 5616 Cable Church Road Julian, NC 27283 (336) 314-2935 Contact: Keneth Strader |
| As-built Surveys | Kee Mapping and Surveying PO Box 2566 Ashville, NC 28802 Contact: Phillip Kee |
| Seeding Mix Source | Evergreen Seed Fuquay Varina, NC (919) 567-1333 Contact: Wistar Taylor |
| Nursery Stock Suppliers | Arbor Gen Super Tree Nursery (800) 222-1290 Contact: Polly Creech |
| Monitoring Performers (MY0) - 2013 | Atkins North America, Inc. 1616 East Millbrook Road, Suite 310 Raleigh, NC 27609 (919) 876-6888 Contact: Jim Cooper |
| Monitoring Performers (MY1-MY5) 2013-2016 | Resource Environmental Solutions, LLC. 302 Jefferson Street, Suite 110 Raleigh NC 27605 |
| Stream Monitoring POC | Ryan Medric (703) 424-6313 |
| Vegetation Monitoring POC | Ryan Medric (703) 424-6313 |

Table 4. Project Information and Attributes

| Table 4. Project Baseline Information and Attributes 601 North II Stream Restoration Site – Project No. 95025 | | | | | |
|--|--|------------------------------|---|---|---|
| Project Information | | | | | |
| Project Name | 601 North II Stream Restoration Site | | | | |
| County | Union County | | | | |
| Project Area (acres) | 12.3 | | | | |
| Project Coordinates (latitude and longitude) | 34.897274, -80.473416 | | | | |
| Project Watershed Summary Information | | | | | |
| Physiographic Province | Piedmont | | | | |
| River Basin | Yadkin | | | | |
| USGS Hydrologic Unit 8-digit | 3040105 | | | | |
| USGS Hydrologic Unit 14-digit | 3040105081010 | | | | |
| DWQ Sub-basin | 3/7/2014 | | | | |
| Project Drainage Area (acres) | 453 | | | | |
| Project Drainage Area Percent Impervious Area | <1% | | | | |
| CGIA Land Use Classification | Cultivated, Managed Herbaceous Cover, Mixed Hardwood | | | | |
| Reach Summary Information | | | | | |
| Parameters | Wicker Branch (Reach 1) | Wicker Branch (Reach 2) | Wicker Branch (Reach 3) | UT to Wicker Branch (Reach 4) | UT Wicker Branch (Reach 5) |
| Length of reach (linear feet) | 630 | 1,356 | 414 | 826 | 534 |
| Valley classification | VIII | VIII | VIII | VIII | VIII |
| Drainage area (acres) | 169 | 286 | 365 | 85 | 88 |
| NCDWQ stream identification score | 23.5 | 35 | 35 | 23 | 23 |
| NCDWQ Water Quality Classification | WS-V | WS-V | WS-V | WS-V | WS-V |
| Morphological Description (stream type) | F6 | E1/C1 | G4 | B4 | B4 |
| Evolutionary trend | E-G-F | E-G-C-E | E-G | E-G-B | E-G-B |
| Underlying mapped soils | Cid channery silt loam (CmB) | Cid channery silt loam (CmB) | Cid channery silt loam (CmB) | Badin channery silty clay loam (BdB2), Cid channery silt loam (CmB) | Badin channery silty clay loam (BdB2), Cid channery silt loam (CmB) |
| Drainage class | Moderately well drained | Moderately well drained | Moderately well drained | BdB2: Well drained, CmB: Moderately well drained | BdB2: Well drained, CmB: Moderately well drained |
| Soil Hydric status | Not hydric | Not hydric | Not hydric | Not hydric | Not hydric |
| Valley Slope | 0.0095 | 0.0098 | 0.0165 | 0.013 | 0.0124 |
| FEMA classification | Project streams are not located within a FEMA regulated area | | | | |
| Native vegetation community | N/A (cultivated land) | N/A (cultivated land) | Mesic Mixed Hardwood Forest | N/A (cultivated land) | N/A (cultivated land) |
| Percent composition of exotic invasive vegetation | 0% | 0% | 60% (Chinese privet) | 0% | 0% |
| Wetland Summary Information | | | | | |
| Parameters | Wetland 1 | | | | |
| Size of Wetland (acres) | 0.05 | | | | |
| Wetland Type | Palustrine emergent | | | | |
| Mapped Soil Series | Cid channery silt loam (CmB) | | | | |
| Drainage class | Moderately well drained | | | | |
| Soil Hydric Status | Not hydric | | | | |
| Source of Hydrology | Groundwater | | | | |
| Hydrologic Impairment | NA | | | | |
| Native vegetation community | N/A (cultivated land) | | | | |
| Percent composition exotic invasive vegetation | 0% | | | | |
| Regulatory Considerations | | | | | |
| Regulation | Applicable? | Resolved? | Documentation | | |
| Waters of the United States – Section 404 | Yes | Yes | JD Notification / NWP27 | | |
| Waters of the United States – Section 401 | Yes | Yes | 401 Water Quality Certification | | |
| Endangered Species Act | Yes | Yes | CE Documentation (Mitigation Plan, Appendix B) | | |
| Historic Preservation Act | No | N/A | CE Documentation (Mitigation Plan, Appendix B) | | |
| Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA) | No | N/A | N/A | | |
| FEMA Floodplain Compliance | No | N/A | FEMA Floodplain Checklist (Mitigation Plan, Appendix B) | | |
| Essential Fisheries Habitat | No | N/A | N/A | | |

Appendix B

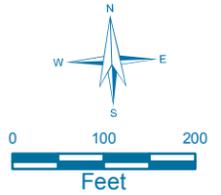
Visual Assessment Data

Figure 2. Integrated Current Conditions Plan View

Table 5. Visual Stream Morphology Stability Assessment

Table 6. Vegetation Condition Assessment

Figure 3. Permanent Photo Station Photos



1 inch = 200 feet

Figure 2
601 North II Stream
Restoration Project
MY5 2017

Current Conditions
Plan View

Date: 12/8/2017

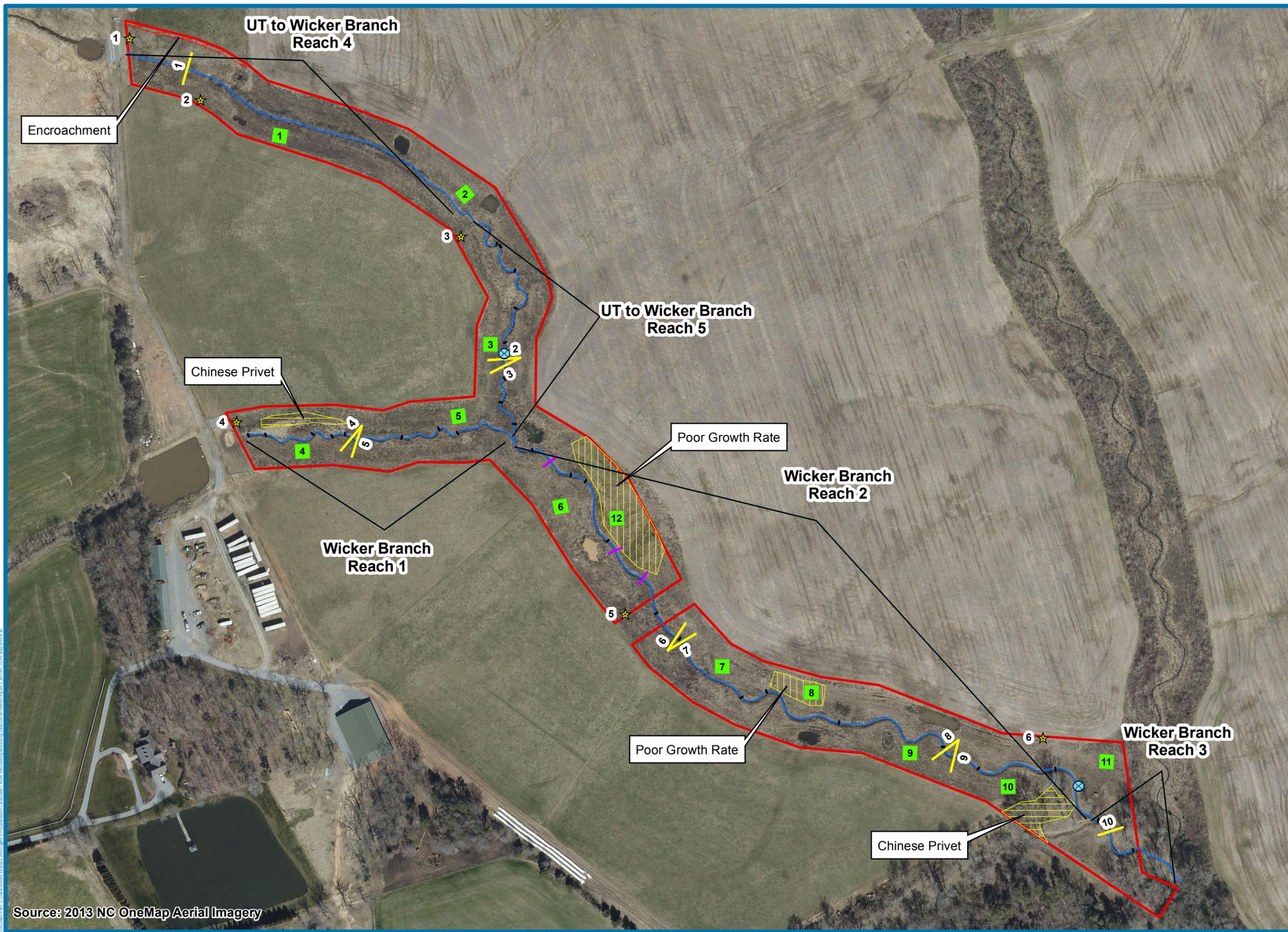
Drawn by: RTM

LEGEND

- ▭ Conservation Easement
- ★ Photo Stations
- ⊗ Crest Gauge
- Cross Section
- Stream Centerline
- Structures
- Breached Beaver Dams
- Vegetation Plots**
- ▭ Successful

Riparian Buffer Conditions

| Invasive Species | Target Community | | |
|------------------|------------------|----------|--------|
| | Present | Marginal | Absent |
| Absent | No Fill | | |
| Present | | | |
| Common | | | |



Source: 2013 NC OneMap Aerial Imagery

| Table 5. Visual Stream Morphology Stability Assessment 601 North II / Project No. 95025 - Wicker Branch Reach 1 Assessed Length 660 feet | | | | | | | | | | |
|--|---|---|---|--------------------------|-----------------------------|----------------------------|----------------------------------|--|---|---|
| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | Adjusted % for Stabilizing Woody Vegetation |
| 1. Bed | 1. Vertical Stability (Rifle and Run Units) | 1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars). | | | 0 | 0 | 100% | | | |
| | | 2. <u>Degradation</u> - Evidence of downcutting. | | | 0 | 0 | 100% | | | |
| | 2. Rifle Condition | 1. <u>Texture/Substrate</u> - Rifle maintains coarser substrate. | 22 | 22 | | | 100% | | | |
| | | 3. Meander Pool Condition | 1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6). | 19 | 19 | | | | | |
| | 4. Thalweg Position | 2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle). | 19 | 19 | | | 100% | | | |
| | | 1. Thalweg centering at upstream of meander bend (Run). | 21 | 21 | | | 100% | | | |
| | | 2. Thalweg centering at downstream of meander bend (Glide). | 21 | 21 | | | 100% | | | |
| | 2. Bank | 1. Scoured / Eroding | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion. | | | 0 | 0 | | | |
| 2. Undercut | | Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 0 | 100% | N/A | N/A | N/A |
| 3. Mass Wasting | | Bank slumping, calving, or collapse. | | | 0 | 0 | 100% | N/A | N/A | N/A |
| Totals | | | | | 0 | 0 | 100% | N/A | N/A | N/A |
| 3. Engineered Structures | 1. Overall Integrity | Structures physically intact with no dislodged boulders or logs. | 8 | 8 | | | 100% | | | |
| | 2. Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 8 | 8 | | | 100% | | | |
| | 2a. Piping | Structures lacking any substantial flow underneath sills or arms. | 8 | 8 | | | 100% | | | |
| | 3. Bank Protection | Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%. | 8 | 8 | | | 100% | | | |
| | 4. Habitat | Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio \geq 1.6. Rootwads/logs providing some cover at base-flow. | 8 | 8 | | | 100% | | | |

N/A - Item does not apply.

| Table 5 cont'd. Visual Stream Morphology Stability Assessment 601 North II / Project No. 95025 - Wicker Branch Reach 2 Assessed Length 1,775 feet | | | | | | | | | | |
|---|---|---|---|--------------------------|-----------------------------|----------------------------|----------------------------------|--|---|---|
| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | Adjusted % for Stabilizing Woody Vegetation |
| 1. Bed | 1. Vertical Stability (Riffle and Run Units) | 1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars). | | | 0 | 0 | 100% | | | |
| | | 2. <u>Degradation</u> - Evidence of downcutting. | | | 0 | 0 | 100% | | | |
| | 2. Riffle Condition | 1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate. | 33 | 33 | | | 100% | | | |
| | | 3. Meander Pool Condition | 1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6). | 33 | 33 | | | | | |
| | 2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle). | | 33 | 33 | | | 100% | | | |
| | 4. Thalweg Position | 1. Thalweg centering at upstream of meander bend (Run). | 33 | 33 | | | 100% | | | |
| | | 2. Thalweg centering at downstream of meander bend (Glide). | 33 | 33 | | | 100% | | | |
| 2. Bank | 1. Scoured / Eroding | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion. | | | 0 | 0 | 100% | 0 | 0 | 100% |
| | 2. Undercut | Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 0 | 100% | N/A | N/A | N/A |
| | 3. Mass Wasting | Bank slumping, calving, or collapse. | | | 0 | 0 | 100% | N/A | N/A | N/A |
| Totals | | | | | 0 | 0 | 100% | N/A | N/A | N/A |
| 3. Engineered Structures | 1. Overall Integrity | Structures physically intact with no dislodged boulders or logs. | 13 | 13 | | | 100% | | | |
| | 2. Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 13 | 13 | | | 100% | | | |
| | 2a. Piping | Structures lacking any substantial flow underneath sills or arms. | 13 | 13 | | | 100% | | | |
| | 3. Bank Protection | Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%. | 13 | 13 | | | 100% | | | |
| | 4. Habitat | Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio \geq 1.6. Rootwads/logs providing some cover at base-flow. | 13 | 13 | | | 100% | | | |

N/A - Item does not apply.

| Table 5 cont'd. Visual Stream Morphology Stability Assessment | | | | | | | | | | | | | | |
|--|---|---|---|--------------------------|-----------------------------|----------------------------|----------------------------------|--|---|---|------|---|------|-----|
| 601 North II / Project No. 95025 - Unnamed Tributary - Wicker Branch Reach 3 | | | | | | | | | | | | | | |
| Assessed Length 273 feet | | | | | | | | | | | | | | |
| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | Adjusted % for Stabilizing Woody Vegetation | | | | |
| 1. Bed | 1. Vertical Stability (Rifle and Run Units) | 1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars). | | | 0 | 0 | 100% | | | | | | | |
| | | 2. <u>Degradation</u> - Evidence of downcutting. | | | | | 100% | | | | | | | |
| | 2. Rifle Condition | 1. <u>Texture/Substrate</u> - Rifle maintains coarser substrate. | 5 | 5 | | | 100% | | | | | | | |
| | | 3. Meander Pool Condition | 1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6). | 5 | | | 5 | | | | 100% | | | |
| | 2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle). | | 5 | 5 | | | 100% | | | | | | | |
| | 4. Thalweg Position | 1. Thalweg centering at upstream of meander bend (Run). | 5 | 5 | | | 100% | | | | | | | |
| | | 2. Thalweg centering at downstream of meander bend (Glide). | 5 | 5 | | | 100% | | | | | | | |
| | 2. Bank | 1. Scoured / Eroding | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion. | | | | | | | | 0 | 0 | 100% | 0 |
| 2. Undercut | | | Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | | | 0 | 0 | 100% | | | N/A | N/A |
| 3. Mass Wasting | | Bank slumping, calving, or collapse. | 0 | | | | | 0 | 100% | N/A | | | N/A | N/A |
| | | Totals | | | 0 | 0 | | 100% | N/A | N/A | | | N/A | |
| 3. Engineered Structures | 1. Overall Integrity | Structures physically intact with no dislodged boulders or logs. | 2 | 2 | | | 100% | | | | | | | |
| | 2. Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 2 | 2 | | | 100% | | | | | | | |
| | 2a. Piping | Structures lacking any substantial flow underneath sills or arms. | 2 | 2 | | | 100% | | | | | | | |
| | 3. Bank Protection | Bank erosion within the structures extent of influence does NOT exceed 15%. | 2 | 2 | | | 100% | | | | | | | |
| | 4. Habitat | Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio \geq 1.6. Rootwads/logs providing some cover at base-flow. | 2 | 2 | | | 100% | | | | | | | |

N/A - Item does not apply.

| Table 5 cont'd. Visual Stream Morphology Stability Assessment | | | | | | | | | | | | | |
|--|---|---|---|--------------------------|-----------------------------|----------------------------|----------------------------------|--|---|---|---|------|-----|
| 601 North II / Project No. 95025 - Unnamed Tributary - Wicker Branch Reach 5 | | | | | | | | | | | | | |
| Assessed Length 646 feet | | | | | | | | | | | | | |
| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | Adjusted % for Stabilizing Woody Vegetation | | | |
| 1. Bed | 1. Vertical Stability (Rifle and Run Units) | 1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars). | | | 0 | 0 | 100% | | | | | | |
| | | 2. <u>Degradation</u> - Evidence of downcutting. | | | | | 100% | | | | | | |
| | 2. Rifle Condition | 1. <u>Texture/Substrate</u> - Rifle maintains coarser substrate. | 18 | 18 | | 100% | | | | | | | |
| | | 3. Meander Pool Condition | 1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6). | 19 | | 19 | 100% | | | | | | |
| | 2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle). | | 19 | 19 | | 100% | | | | | | | |
| | 4. Thalweg Position | 1. Thalweg centering at upstream of meander bend (Run). | 19 | 19 | | 100% | | | | | | | |
| | | 2. Thalweg centering at downstream of meander bend (Glide). | 19 | 19 | | 100% | | | | | | | |
| | 2. Bank | 1. Scoured / Eroding | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion. | | | | 0 | | | | 0 | 100% | 0 |
| 2. Undercut | | | Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | | | 0 | 0 | 100% | | N/A | N/A |
| 3. Mass Wasting | | Bank slumping, calving, or collapse. | 0 | | | | | 0 | 100% | N/A | | N/A | N/A |
| | | Totals | | | | | | 0 | 0 | 100% | | N/A | N/A |
| 3. Engineered Structures | 1. Overall Integrity | Structures physically intact with no dislodged boulders or logs. | 9 | 9 | | | 100% | | | | | | |
| | 2. Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 9 | 9 | | | 100% | | | | | | |
| | 2a. Piping | Structures lacking any substantial flow underneath sills or arms. | 9 | 9 | | | 100% | | | | | | |
| | 3. Bank Protection | Bank erosion within the structures extent of influence does NOT exceed 15%. | 9 | 9 | | | 100% | | | | | | |
| | 4. Habitat | Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio \geq 1.6. Rootwads/logs providing some cover at base-flow. | 9 | 9 | | | 100% | | | | | | |

N/A - Item does not apply.

| Table 6. Vegetation Condition Assessment 601 North II / Project No. 95025 Planted Acreage 12.3 | | | | | |
|---|---|--|--------------------|------------------|-----------------------|
| Vegetation Category | Definitions | CCPV Depiction | Number of Polygons | Combined Acreage | % of Planted Acreage |
| 1. Bare Areas | Very limited cover of both woody and herbaceous material. | N/A | 0 | 0.00 | 0% |
| 2. Low Stem Density Areas | Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria. | N/A | 0 | 0.00 | 0% |
| Totals | | | 0 | 0.00 | 0% |
| 3. Areas of Poor Growth Rates or Vigor | Areas with woody stems of a size class that are obviously small given the monitoring year. | Yellow Vertical Lines | 2 | 0.64 | 5% |
| Cumulative Totals | | | 2 | 0.64 | 5% |
| Easement Acreage 12.3 | | | | | |
| Vegetation Category | Definitions | CCPV Depiction | Number of Polygons | Combined Acreage | % of Easement Acreage |
| 4. Invasive Areas of Concern | Areas or points (if too small to render as polygons at map scale). | Horizontal Lines (Red - Dense/Yellow - Present) | 2 | 0.26 | 2% |
| 5. Easement Encroachment Areas | Areas or points (if too small to render as polygons at map scale). | Red Vertical Lines | 1 | 0.06 | 0% |

N/A - Item does not apply.

Figure 3. MY5 – Permanent Photo Station Photos



Tributary to Wicker Branch – Permanent Photo Station 1
Downstream
November 30, 2017



Tributary to Wicker Branch – Permanent Photo Station 2
Upstream
November 30, 2017



Tributary to Wicker Branch – Permanent Photo Station 2
Downstream
November 30, 2017



Tributary to Wicker Branch – Permanent Photo Station 3
Upstream
November 28, 2017



Tributary to Wicker Branch – Permanent Photo Station 3
Downstream
November 28, 2017



Wicker Branch – Permanent Photo Station 4
Downstream
November 29, 2017



Wicker Branch – Permanent Photo Station 5
Upstream
November 28, 2017



Wicker Branch – Permanent Photo Station 5
Downstream
November 28, 2017



Wicker Branch – Permanent Photo Station 6
Upstream
November 29, 2017



Wicker Branch – Permanent Photo Station 6
Downstream
November 29, 2017

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)

Table 7. Vegetation Plot Criteria Attainment

| Table 7. Vegetation Plot Criteria Attainment 601 North II / Project No. 95025 | | | | | |
|--|-------------------------------|---------------------------------|-----------------------------|---------------------------------------|--|
| Plot # | Planted Stems/Acre | Volunteer Stems/Acre | Total Stems/Acre | Survival Criteria Met? | Average Tree Height (cm)* |
| 1 | 405 | 0 | 405 | Yes | 377 |
| 2 | 324 | 121 | 445 | Yes | 559 |
| 3 | 445 | 162 | 607 | Yes | 406 |
| 4 | 445 | 81 | 526 | Yes | 300 |
| 5 | 647 | 81 | 728 | Yes | 505 |
| 6 | 607 | 121 | 728 | Yes | 461 |
| 7 | 405 | 121 | 526 | Yes | 471 |
| 8 | 283 | 121 | 405 | Yes, | 199 |
| 9 | 324 | 243 | 567 | Yes | 464 |
| 10 | 324 | 202 | 526 | Yes | 464 |
| 11 | 324 | 647 | 971 | Yes | 288 |
| 12 | 283 | 324 | 607 | Yes | 236 |
| Project Avg | 401 | 185 | 587 | Yes | 394 |

MY5 – Vegetation Plot Photos



601 North II - Vegetation Monitoring Plot 1
October 18, 2017



601 North II - Vegetation Monitoring Plot 2
October 18, 2017



601 North II - Vegetation Monitoring Plot 3
October 18, 2017



601 North II - Vegetation Monitoring Plot 4
October 18, 2017



601 North II - Vegetation Monitoring Plot 5
October 18, 2017



601 North II - Vegetation Monitoring Plot 6
October 18, 2017



601 North II - Vegetation Monitoring Plot 7
October 18, 2017



601 North II - Vegetation Monitoring Plot 8
October 18, 2017



601 North II - Vegetation Monitoring Plot 9
October 18, 2017



601 North II - Vegetation Monitoring Plot 10
October 18, 2017



601 North II - Vegetation Monitoring Plot 11
October 18, 2017



601 North II - Vegetation Monitoring Plot 12
October 18, 2017

Table 8. CVS Vegetation Plot Metadata

| Table 8: CVS Vegetation Plot Metadata 601 North II Stream and Wetland Restoration Site | |
|---|---|
| Report Prepared By | Eric Teitsworth |
| Date Prepared | 10/20/2017 15:44 |
| | |
| database name | 601_N_II_MY5_2017.mdb |
| database location | C:\Users\eteitsworth\Dropbox (RES)\@RES Projects\North Carolina\601 North II\Monitoring\Monitoring Data\MY5_2017\Vegetation Data |
| computer name | D4V0KGH2 |
| file size | 47288320 |
| | |
| DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT | |
| Metadata | Description of database file, the report worksheets, and a summary of project(s) and project data. |
| Proj, planted | Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes. |
| Proj, total stems | Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems. |
| Plots | List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.). |
| Vigor | Frequency distribution of vigor classes for stems for all plots. |
| Vigor by Spp | Frequency distribution of vigor classes listed by species. |
| Damage | List of most frequent damage classes with number of occurrences and percent of total stems impacted by each. |
| Damage by Spp | Damage values tallied by type for each species. |
| Damage by Plot | Damage values tallied by type for each plot. |
| Planted Stems by Plot and Spp | A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded. |
| ALL Stems by Plot and spp | A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded. |
| | |
| PROJECT SUMMARY | |
| Project Code | 95925 |
| project Name | 601 North II Stream Restoration Site |
| Description | Stream Restoration Site |
| River Basin | Yadkin-Pee Dee |
| length(ft) | 4248 |
| stream-to-edge width (ft) | 350 |
| area (sq m) | 47348.22 |
| Required Plots (calculated) | 12 |
| Sampled Plots | 12 |

Table 9. Planted Total Stem Counts (Species by Plot)

| Table 9. Planted Total Stem Counts (Species by Plot) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----------------------|--------------|--------|-------|-----|--------|-------|-----|--------|-------|-----|--------|-------|-----|--------|-------|-----|--------|-------|-----|--------|-------|-----|--------|-------|-----|--------|-------|-----|---------|-------|-----|---------|-------|-----|---------|-----|-----|---|--|
| 601NII Stream Restoration Site | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Current Plot Data (MY5 2017) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Scientific Name | Common Name | Species Type | Plot 1 | | | Plot 2 | | | Plot 3 | | | Plot 4 | | | Plot 5 | | | Plot 6 | | | Plot 7 | | | Plot 8 | | | Plot 9 | | | Plot 10 | | | Plot 11 | | | Plot 12 | | | | |
| | | | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | | | | | |
| Betula nigra | River Birch | Tree | 1 | 1 | 1 | 3 | 3 | 3 | 2 | 2 | 3 | 1 | 1 | 2 | 4 | 4 | 4 | 4 | 4 | 5 | | | | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 2 | 2 | 2 | | |
| Campsis radicans | Trumpet Creeper | Vine | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Celtis laevigata | Sugarberry | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Celtis occidentalis | Common Hackberry | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cercis canadensis | Eastern Redbud | Tree | | | | | | | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | |
| Diospyros virginiana | Common Persimmon | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fraxinus pennsylvanica | Green Ash | Tree | 1 | 1 | 1 | | | 1 | 1 | 1 | 1 | | | | | | 1 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 1 | 3 | 2 | 2 | 3 | | | | | 1 | 2 | 2 | 2 | | | |
| Liquidambar styraciflua | Sweetgum | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nyssa sylvatica | Blackgum | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Platanus occidentalis | American Sycamore | Tree | 1 | 1 | 1 | 4 | 4 | 5 | 2 | 2 | 2 | | | 1 | 5 | 5 | 5 | | | | | | 5 | 5 | 5 | | | | | | | | | | | 1 | 2 | 2 | 2 | |
| Platanus occidentalis var. c | Sycamore, Plane-tree | Tree | 1 | 1 | 1 | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Quercus michauxii | Swamp Chestnut Oak | Tree | 3 | 3 | 3 | 1 | 1 | 1 | 3 | 3 | 5 | 6 | 6 | 6 | 4 | 4 | 4 | 3 | 3 | 3 | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 2 | | | | | | 1 | |
| Quercus phellos | Willow Oak | Tree | 1 | 1 | 1 | | | 1 | | | | 2 | 2 | 2 | | | | 5 | 5 | 6 | 2 | 2 | 2 | 2 | 2 | 2 | | | | | | | | | | | | | | |
| Quercus rubra | Northern Red Oak | Tree | 1 | 1 | 1 | | | | 1 | 1 | 1 | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | |
| Quercus velutina | Black Oak | Tree | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Salix nigra | Black Willow | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sambucus canadensis | Common Elderberry | Shrub | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stem count | | | 10 | 10 | 10 | 8 | 8 | 11 | 11 | 11 | 15 | 11 | 11 | 13 | 16 | 16 | 18 | 15 | 15 | 18 | 10 | 10 | 13 | 7 | 7 | 10 | 8 | 8 | 14 | 8 | 8 | 13 | 8 | 8 | 24 | 7 | 7 | 15 | | |
| size (ares) | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | | |
| size (ACRES) | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | | |
| Species count | | | 8 | 8 | 8 | 3 | 3 | 5 | 7 | 7 | 8 | 4 | 4 | 5 | 5 | 5 | 7 | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 5 | 6 | 4 | 4 | 7 | 5 | 5 | 6 | 2 | 2 | 5 | 4 | 4 | 7 | | |
| Stems per ACRE | | | 405 | 405 | 405 | 324 | 324 | 445 | 445 | 445 | 607 | 445 | 445 | 526 | 647 | 647 | 728 | 607 | 607 | 728 | 405 | 405 | 526 | 283 | 283 | 405 | 324 | 324 | 567 | 324 | 324 | 526 | 324 | 324 | 971 | 283 | 283 | 607 | | |

¹PnoLS: No livestakes included in tally; P-all: All planted stems included in tally; T: Total stems including recruitment.

Table 9 con't. Planted Total Stem Counts (Annual Means)

| Table 9 Con't. Planted Total Stem Count (Annual Means) | | | | | | | | | | | | | | | | | | | | |
|--|----------------------|--------------|------------|-------|-----|------------|-------|-----|------------|-------|-----|------------|-------|-----|------------|-------|-----|------------|-------|-----|
| 601NII Stream Restoration Site | | | | | | | | | | | | | | | | | | | | |
| | | Annual Means | | | | | | | | | | | | | | | | | | |
| Scientific Name | Common Name | Species Type | MY5 (2017) | | | MY4 (2016) | | | MY3 (2015) | | | MY2 (2014) | | | MY1 (2013) | | | MY0 (2013) | | |
| | | | PnoLS | P-all | T |
| <i>Betula nigra</i> | River Birch | Tree | 29 | 29 | 33 | 29 | 29 | 35 | 29 | 29 | 29 | 29 | 29 | 29 | 31 | 31 | 31 | 51 | 51 | 51 |
| <i>Campsis radicans</i> | Trumpet Creeper | Vine | | | | | | | | | | | | 2 | | | | | | |
| <i>Celtis laevigata</i> | Sugarberry | Tree | | | | | | | | | | | | | | | | | | 4 |
| <i>Celtis occidentalis</i> | Common Hackberry | Tree | | | | | | 2 | | | | | | | | | | | | |
| <i>Cercis canadensis</i> | Eastern Redbud | Tree | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 7 | 7 | 7 | 11 | 11 | 11 | 19 | 19 | 19 |
| <i>Diospyros virginiana</i> | Common Persimmon | Tree | | | | | | 6 | | | | | | | | | | | | |
| <i>Fraxinus pennsylvanica</i> | Green Ash | Tree | 11 | 11 | 18 | 11 | 11 | 20 | 11 | 11 | 15 | 10 | 10 | 14 | 9 | 9 | 9 | 10 | 10 | 10 |
| <i>Liquidambar styraciflua</i> | Sweetgum | Tree | | | 24 | | | 35 | | | 2 | | | 10 | | | | | | |
| <i>Nyssa sylvatica</i> | Blackgum | Tree | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 7 | 7 | 7 |
| <i>Platanus occidentalis</i> | American Sycamore | Tree | 21 | 21 | 25 | 21 | 21 | 21 | 21 | 21 | 26 | 21 | 21 | 21 | 22 | 22 | 22 | 19 | 19 | 19 |
| <i>Platanus occidentalis var. o</i> | Sycamore, Plane-tree | Tree | 2 | 2 | 2 | 2 | 2 | 6 | 2 | 2 | 2 | 2 | 2 | 8 | | | | | | |
| <i>Quercus michauxii</i> | Swamp Chestnut Oak | Tree | 22 | 22 | 26 | 23 | 23 | 25 | 23 | 23 | 23 | 23 | 23 | 23 | 31 | 31 | 31 | 44 | 44 | 44 |
| <i>Quercus phellos</i> | Willow Oak | Tree | 18 | 18 | 21 | 18 | 18 | 20 | 17 | 17 | 17 | 18 | 18 | 18 | 19 | 19 | 19 | 27 | 27 | 27 |
| <i>Quercus rubra</i> | Northern Red Oak | Tree | 7 | 7 | 7 | 11 | 11 | 11 | 11 | 11 | 11 | 9 | 9 | 9 | 13 | 13 | 13 | 14 | 14 | 14 |
| <i>Quercus velutina</i> | Black Oak | Tree | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | |
| <i>Salix nigra</i> | Black Willow | Tree | | | 6 | | | 10 | | | 3 | | | 3 | | | | | | |
| <i>Sambucus canadensis</i> | Common Elderberry | Shrub | | | 2 | | | 2 | | | | | | | | | | | | |
| Stem count | | | 119 | 119 | 174 | 124 | 124 | 202 | 124 | 124 | 138 | 121 | 121 | 146 | 139 | 139 | 139 | 191 | 191 | 195 |
| size (ares) | | | 12 | | | 12 | | | 12 | | | 12 | | | 12 | | | 12 | | |
| size (ACRES) | | | 0.30 | | | 0.30 | | | 0.30 | | | 0.30 | | | 0.30 | | | 0.30 | | |
| Species count | | | 10 | 10 | 13 | 10 | 10 | 15 | 10 | 10 | 12 | 10 | 10 | 13 | 8 | 8 | 8 | 8 | 8 | 9 |
| Stems per ACRE | | | 401 | 401 | 587 | 418 | 418 | 681 | 418 | 418 | 465 | 408 | 408 | 492 | 469 | 469 | 469 | 644 | 644 | 658 |

¹PnoLS: No livestakes included in tally; P-all: All planted stems included in tally; T: Total stems including recruitment.

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

Figure 5. Cross Section Plots and Photos

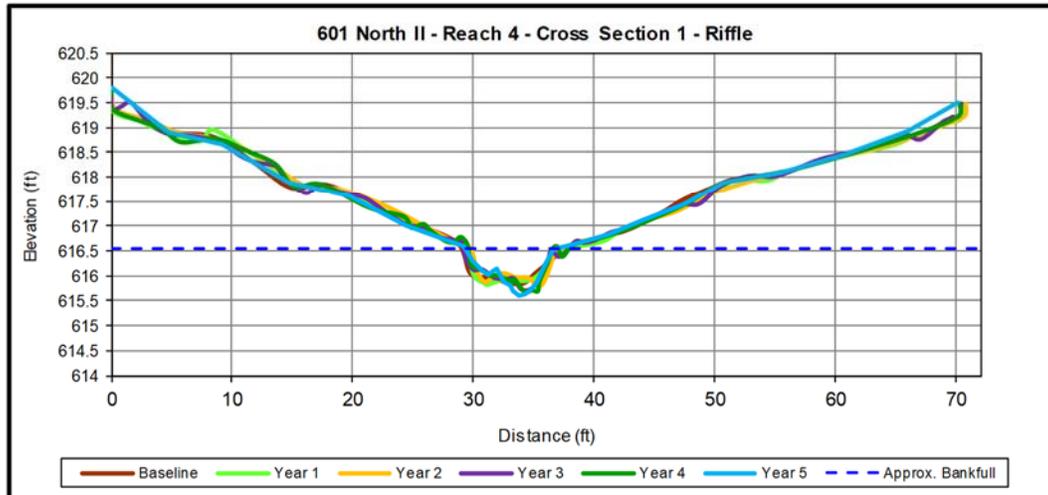
Cross Section 1



Upstream



Downstream



| Cross Section 1 (Riffle) | | | | | | |
|--|-------|-------|-------|-------|-------|-------|
| Based on fixed baseline bankfull elevation | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| Record elevation (datum) used | 616.5 | 616.5 | 616.5 | 616.5 | 616.5 | 616.5 |
| Bankfull Width (ft) | 8.9 | 8.3 | 8.0 | 8.6 | 7.9 | 6.3 |
| Floodprone Width (ft) | 23.1 | >23 | >23 | >23 | >23 | 27.4 |
| Bankfull Mean Depth (ft) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.4 |
| Bankfull Max Depth (ft) | 0.7 | 0.7 | 0.8 | 0.8 | 0.9 | 1.0 |
| Bankfull Cross Sectional Area (ft ²) | 4.2 | 4.1 | 3.9 | 3.9 | 4.0 | 2.7 |
| Bankfull Width/Depth Ratio | 18.5 | 16.9 | 16.4 | 19.0 | 15.6 | 14.9 |
| Bankfull Entrenchment Ratio | 2.6 | >2.8 | >2.9 | >2.7 | >2.9 | 4.3 |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

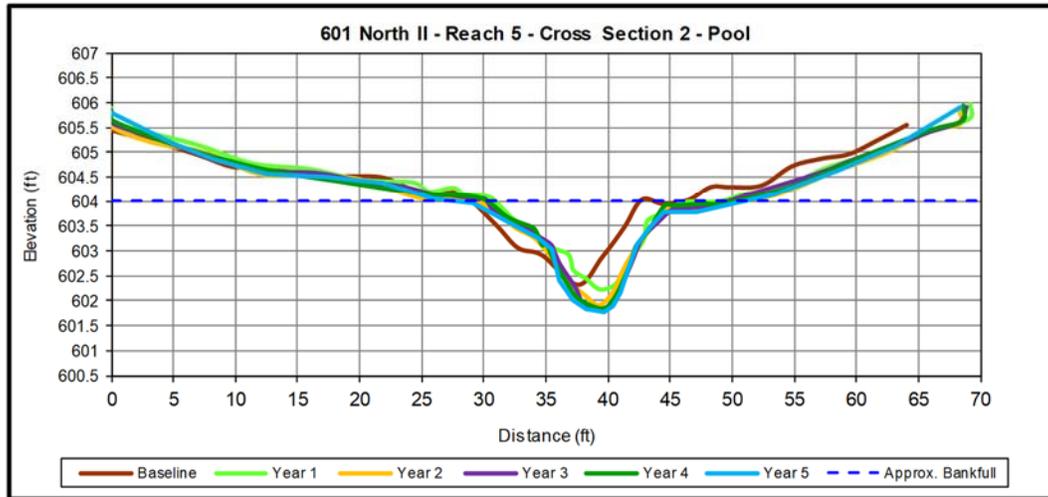
Cross Section 2



Upstream



Downstream



| Cross Section 2 (Pool) | | | | | | |
|--|-------|-------|-------|-------|-------|-------|
| Based on fixed baseline bankfull elevation | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| Record elevation (datum) used | 604.0 | 604.0 | 604.0 | 604.0 | 604.0 | 604.0 |
| Bankfull Width (ft) | 17.6 | 15.4 | 17.1 | 18.6 | 17.6 | 16.5 |
| Floodprone Width (ft) | 64.1 | >100 | >100 | >100 | >100 | >68.3 |
| Bankfull Mean Depth (ft) | 0.7 | 0.9 | 1.0 | 0.9 | 0.9 | 0.8 |
| Bankfull Max Depth (ft) | 1.7 | 1.8 | 2.1 | 2.2 | 2.2 | 2.2 |
| Bankfull Cross Sectional Area (ft ²) | 12.8 | 13.6 | 16.4 | 16.7 | 16.0 | 17.8 |
| Bankfull Width/Depth Ratio | 24.5 | 17.5 | 17.8 | 20.8 | 19.2 | 16.2 |
| Bankfull Entrenchment Ratio | 3.6 | >6.5 | >5.9 | >5.4 | >5.7 | N/A |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | N/A |

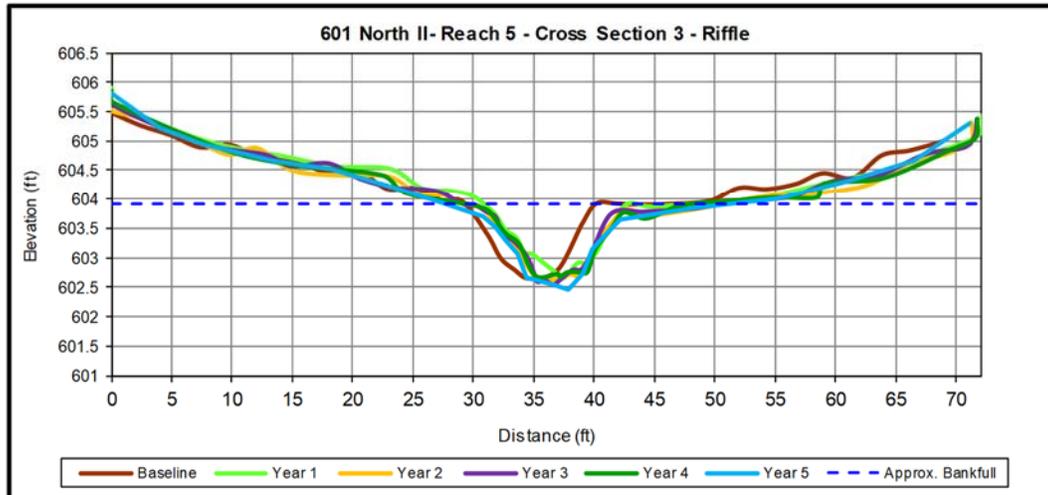
Cross Section 3



Upstream



Downstream



| Cross Section 3 (Riffle) | | | | | | |
|--|-------|-------|-------|-------|-------|-------|
| Based on fixed baseline bankfull elevation | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| Record elevation (datum) used | 603.9 | 603.9 | 603.9 | 603.9 | 603.9 | 603.9 |
| Bankfull Width (ft) | 11.0 | 10.8 | 10.8 | 11.9 | 11.7 | 12.4 |
| Floodprone Width (ft) | 65.5 | >100 | >100 | >100 | >100 | >68.2 |
| Bankfull Mean Depth (ft) | 0.8 | 0.9 | 0.9 | 0.8 | 0.8 | 0.8 |
| Bankfull Max Depth (ft) | 1.3 | 1.3 | 1.3 | 1.4 | 1.3 | 1.5 |
| Bankfull Cross Sectional Area (ft ²) | 8.5 | 8.5 | 9.5 | 9.1 | 8.6 | 9.7 |
| Bankfull Width/Depth Ratio | 14.1 | 14.6 | 12.3 | 15.6 | 14.6 | 15.9 |
| Bankfull Entrenchment Ratio | 6.0 | >9 | >9.2 | >8.4 | >8.6 | >5.5 |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.8 |

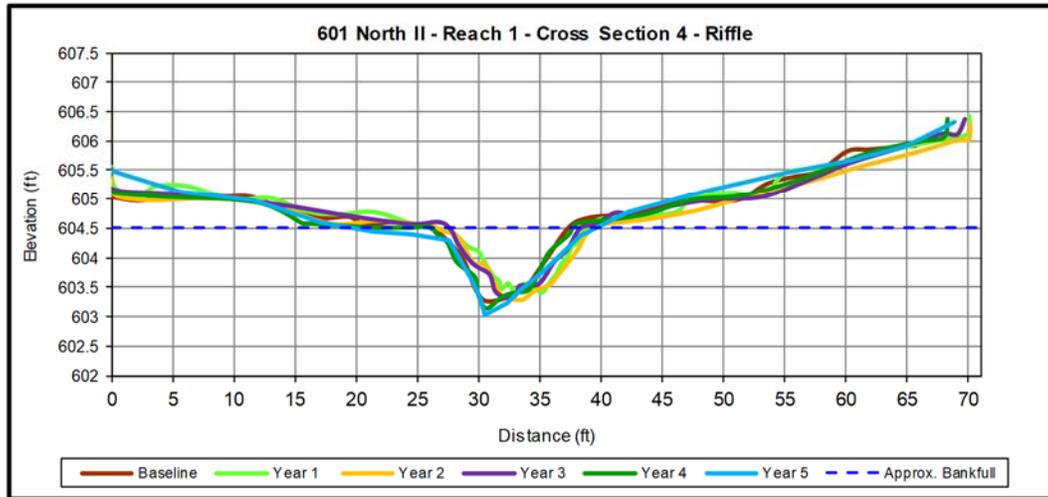
Cross Section 4



Upstream



Downstream



| Cross Section 4 (Riffle) | | | | | | |
|--|-------|-------|-------|-------|-------|-------|
| Based on fixed baseline bankfull elevation | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| Record elevation (datum) used | 604.5 | 604.5 | 604.5 | 604.5 | 604.5 | 604.5 |
| Bankfull Width (ft) | 11.4 | 12.5 | 12.3 | 11.0 | 11.2 | 12.0 |
| Floodprone Width (ft) | 59.7 | >100 | >100 | >100 | >100 | >65.6 |
| Bankfull Mean Depth (ft) | 0.7 | 0.6 | 0.8 | 0.7 | 0.7 | 0.8 |
| Bankfull Max Depth (ft) | 1.3 | 1.1 | 1.2 | 1.2 | 1.4 | 1.5 |
| Bankfull Cross Sectional Area (ft ²) | 7.9 | 7.2 | 8.2 | 7.5 | 8.4 | 9.0 |
| Bankfull Width/Depth Ratio | 16.6 | 21.7 | 18.1 | 16.1 | 14.9 | 16.0 |
| Bankfull Entrenchment Ratio | 5.2 | >8 | >8.1 | >9.1 | >8.9 | >5.5 |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 |

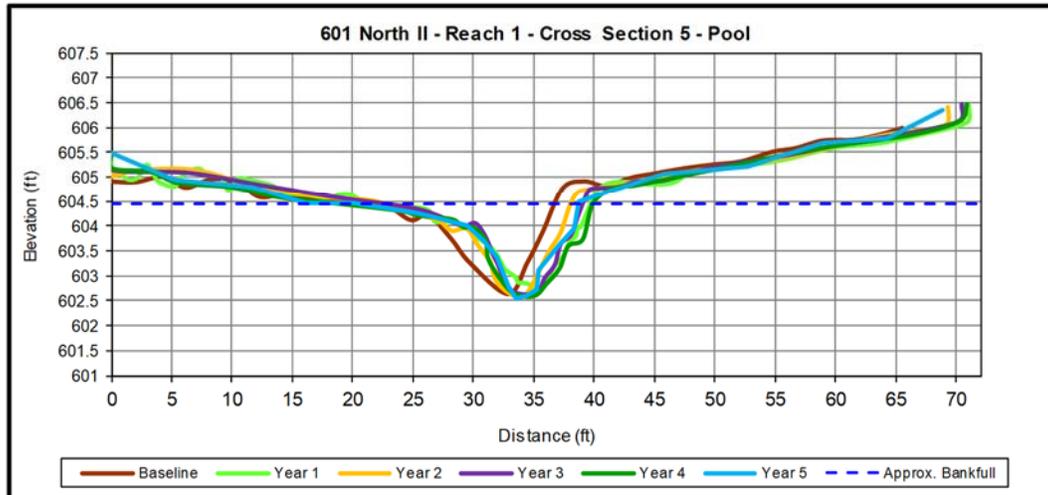
Cross Section 5



Upstream



Downstream



| | | Cross Section 5 (Pool) | | | | | |
|--|--|------------------------|-------|-------|-------|-------|-------|
| Based on fixed baseline bankfull elevation | | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| Record elevation (datum) used | | 604.4 | 604.4 | 604.4 | 604.4 | 604.4 | 604.4 |
| Bankfull Width (ft) | | 14.2 | 15.4 | 15.5 | 16.1 | 20.0 | 18.1 |
| Floodprone Width (ft) | | 65.6 | >100 | >100 | >100 | >100 | >68.8 |
| Bankfull Mean Depth (ft) | | 0.8 | 0.8 | 0.8 | 0.7 | 0.7 | 0.7 |
| Bankfull Max Depth (ft) | | 1.8 | 1.7 | 1.8 | 1.8 | 1.8 | 1.9 |
| Bankfull Cross Sectional Area (ft ²) | | 11.5 | 6.1 | 9.4 | 11.8 | 14.1 | 12.0 |
| Bankfull Width/Depth Ratio | | 17.6 | 19.3 | 19.9 | 21.9 | 28.4 | 27.3 |
| Bankfull Entrenchment Ratio | | 4.6 | >6.5 | >6.5 | >6.2 | >5.0 | N/A |
| Bankfull Bank Height Ratio | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | N/A |

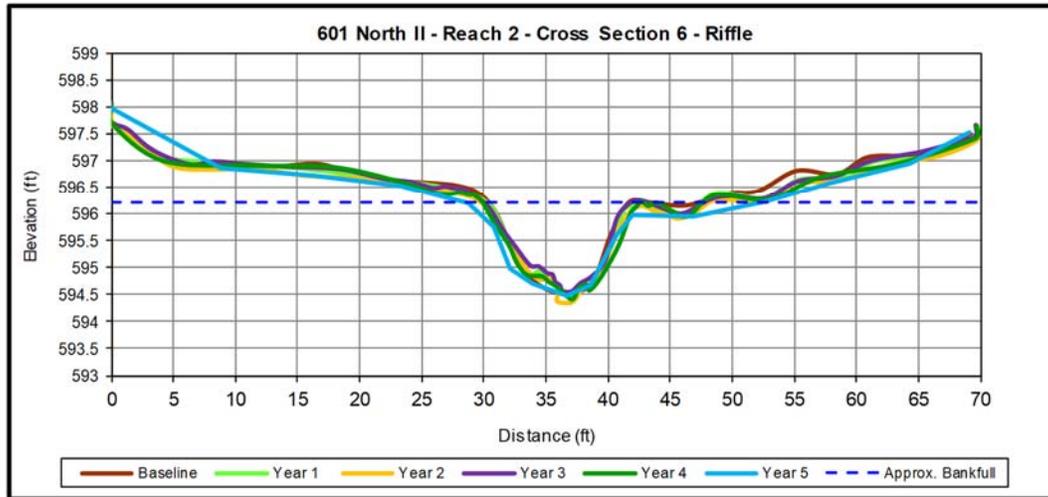
Cross Section 6



Upstream



Downstream



| Cross Section 6 (Riffle) | | | | | | |
|--|-------|-------|-------|-------|-------|-------|
| Based on fixed baseline bankfull elevation | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| Record elevation (datum) used | 596.2 | 596.2 | 596.2 | 596.2 | 596.2 | 596.2 |
| Bankfull Width (ft) | 11.5 | 11.9 | 11.8 | 11.9 | 12.7 | 13.2 |
| Floodprone Width (ft) | 69.2 | >90 | >90 | >90 | >90 | >68.8 |
| Bankfull Mean Depth (ft) | 1.1 | 1.0 | 1.1 | 0.9 | 1.1 | 1.1 |
| Bankfull Max Depth (ft) | 1.7 | 1.7 | 1.9 | 1.6 | 1.8 | 1.7 |
| Bankfull Cross Sectional Area (ft ²) | 12.1 | 12.0 | 12.9 | 11.2 | 13.6 | 14.2 |
| Bankfull Width/Depth Ratio | 10.8 | 11.8 | 10.8 | 12.7 | 11.8 | 12.2 |
| Bankfull Entrenchment Ratio | 6.0 | >7.5 | >7.6 | >7.5 | >7.1 | >5.2 |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

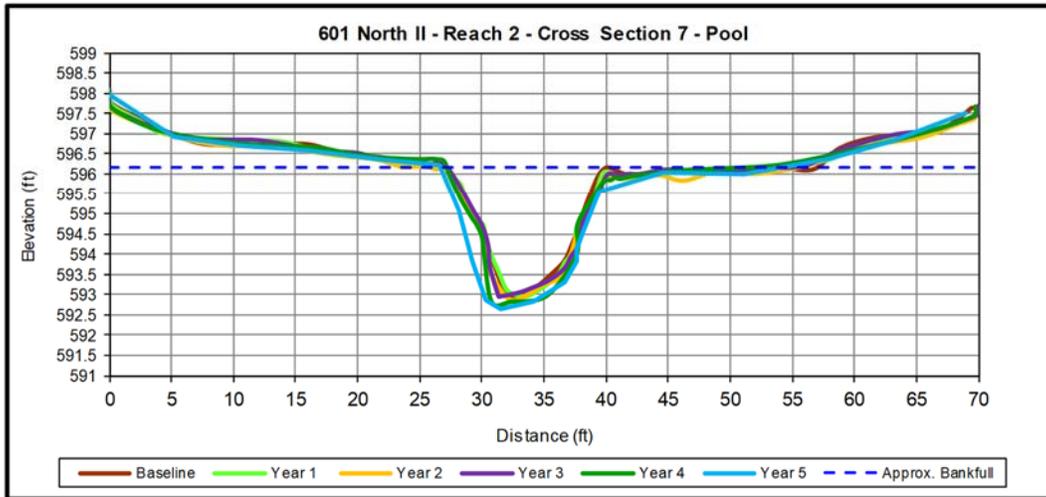
Cross Section 7



Upstream



Downstream



| Cross Section 7 (Pool) | | | | | | |
|--|-------|-------|-------|-------|-------|-------|
| Based on fixed baseline bankfull elevation | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| Record elevation (datum) used | 596.1 | 596.1 | 596.1 | 591.6 | 591.6 | 591.6 |
| Bankfull Width (ft) | 12.8 | 12.8 | 12.9 | 12.9 | 12.7 | 13.8 |
| Floodprone Width (ft) | 69.5 | >125 | >125 | >125 | >125 | >69 |
| Bankfull Mean Depth (ft) | 1.8 | 1.9 | 2.0 | 2.0 | 2.2 | 2.1 |
| Bankfull Max Depth (ft) | 3.2 | 3.2 | 3.2 | 3.2 | 3.3 | 3.5 |
| Bankfull Cross Sectional Area (ft ²) | 23.2 | 24.2 | 25.5 | 25.2 | 27.6 | 29.1 |
| Bankfull Width/Depth Ratio | 7.0 | 6.8 | 6.5 | 6.6 | 5.8 | 6.5 |
| Bankfull Entrenchment Ratio | 5.4 | >9.8 | >9.7 | >9.7 | >9.9 | N/A |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | N/A |

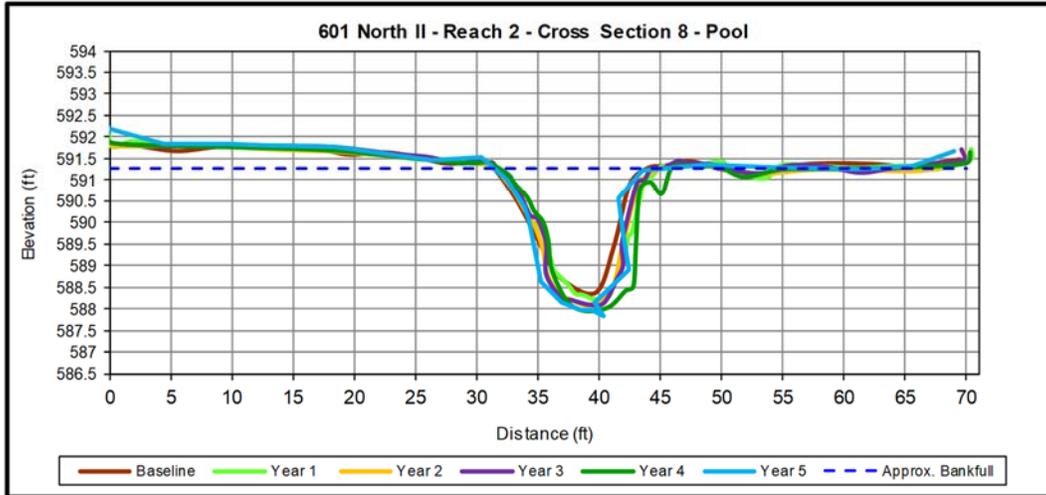
Cross Section 8



Upstream



Downstream



| Cross Section 8 (Pool) | | | | | | |
|--|-------|-------|-------|-------|-------|-------|
| Based on fixed baseline bankfull elevation | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| Record elevation (datum) used | 591.3 | 591.3 | 591.3 | 591.3 | 591.3 | 591.3 |
| Bankfull Width (ft) | 12.7 | 13.3 | 13.4 | 13.6 | 14.1 | 12.2 |
| Floodprone Width (ft) | 69.5 | >200 | >200 | >200 | >200 | >69 |
| Bankfull Mean Depth (ft) | 1.6 | 1.7 | 1.8 | 1.7 | 1.8 | 2.0 |
| Bankfull Max Depth (ft) | 2.9 | 3.1 | 3.2 | 3.2 | 3.3 | 3.4 |
| Bankfull Cross Sectional Area (ft ²) | 19.9 | 22.9 | 23.5 | 22.9 | 25.7 | 24.2 |
| Bankfull Width/Depth Ratio | 8.1 | 7.8 | 7.6 | 8.1 | 7.8 | 6.1 |
| Bankfull Entrenchment Ratio | 5.5 | >15 | >14.9 | >14.7 | >14.2 | N/A |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | N/A |

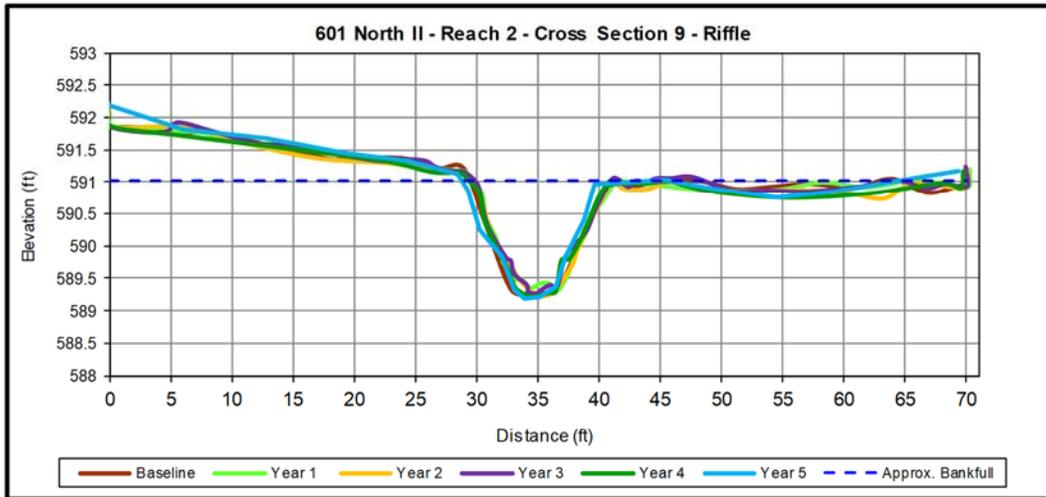
Cross Section 9



Upstream



Downstream



| Cross Section 9 (Riffle) | | | | | | |
|--|-------|-------|-------|-------|-------|-------|
| Based on fixed baseline bankfull elevation | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| Record elevation (datum) used | 591.0 | 591.0 | 591.0 | 591.0 | 591.0 | 591.0 |
| Bankfull Width (ft) | 11.6 | 11.5 | 11.3 | 11.1 | 11.6 | 10.9 |
| Floodprone Width (ft) | 69.7 | >200 | >200 | >200 | >200 | >69.3 |
| Bankfull Mean Depth (ft) | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 |
| Bankfull Max Depth (ft) | 1.8 | 1.7 | 1.8 | 1.7 | 1.8 | 1.8 |
| Bankfull Cross Sectional Area (ft ²) | 13.0 | 12.3 | 12.4 | 11.7 | 12.5 | 12.5 |
| Bankfull Width/Depth Ratio | 10.4 | 10.7 | 10.2 | 10.6 | 10.8 | 9.5 |
| Bankfull Entrenchment Ratio | 6.0 | >17.5 | >17.8 | >17.9 | >17.2 | >6.3 |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

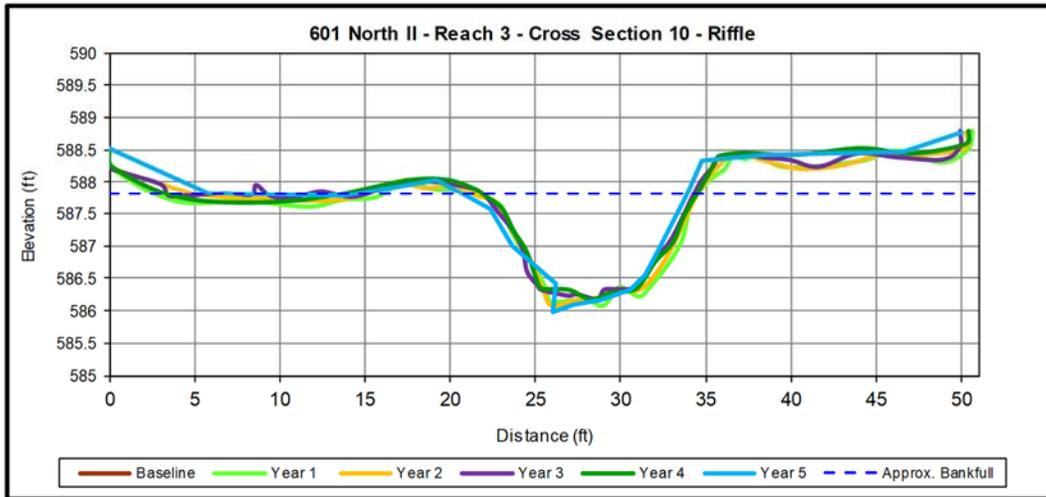
Cross Section 10



Upstream

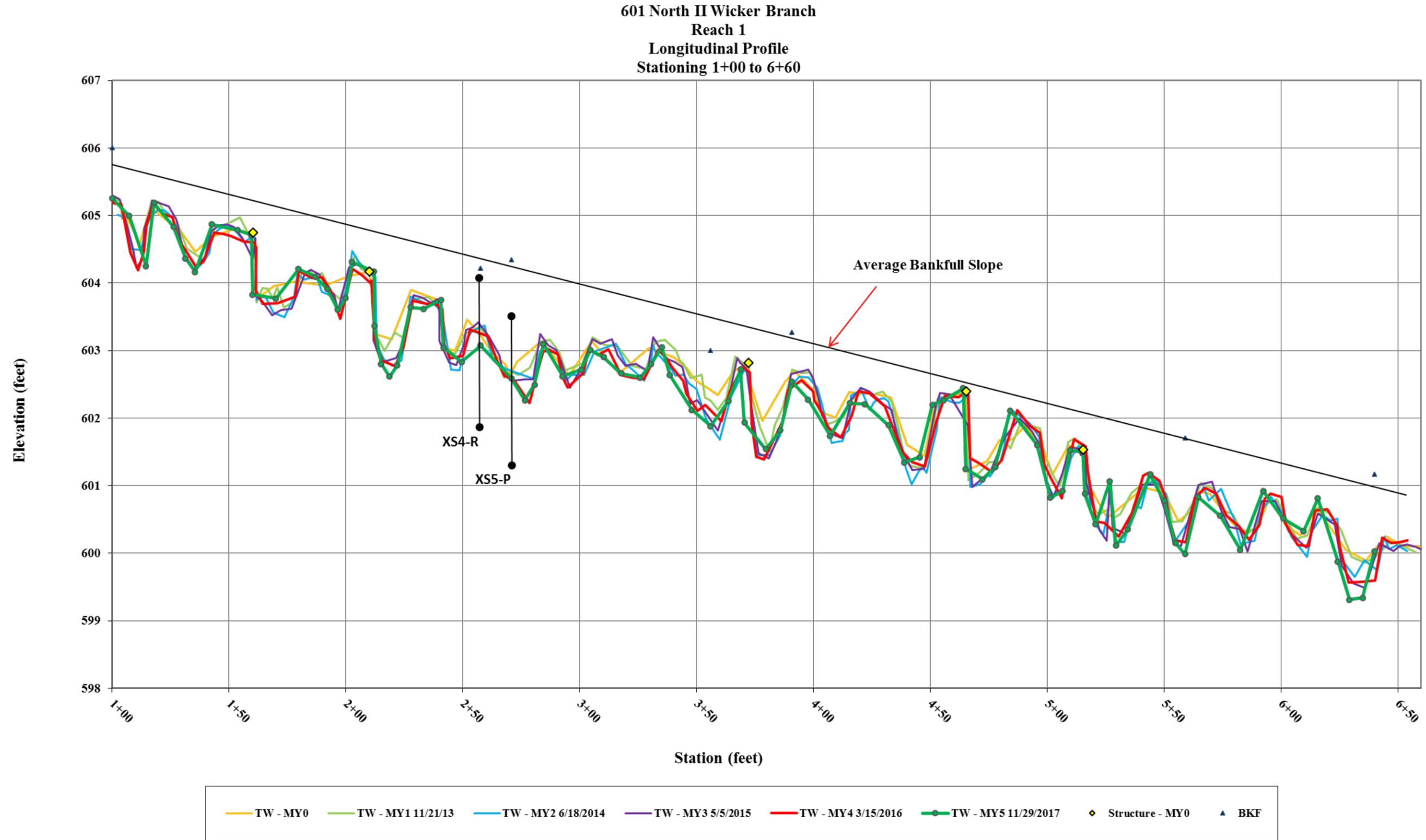


Downstream

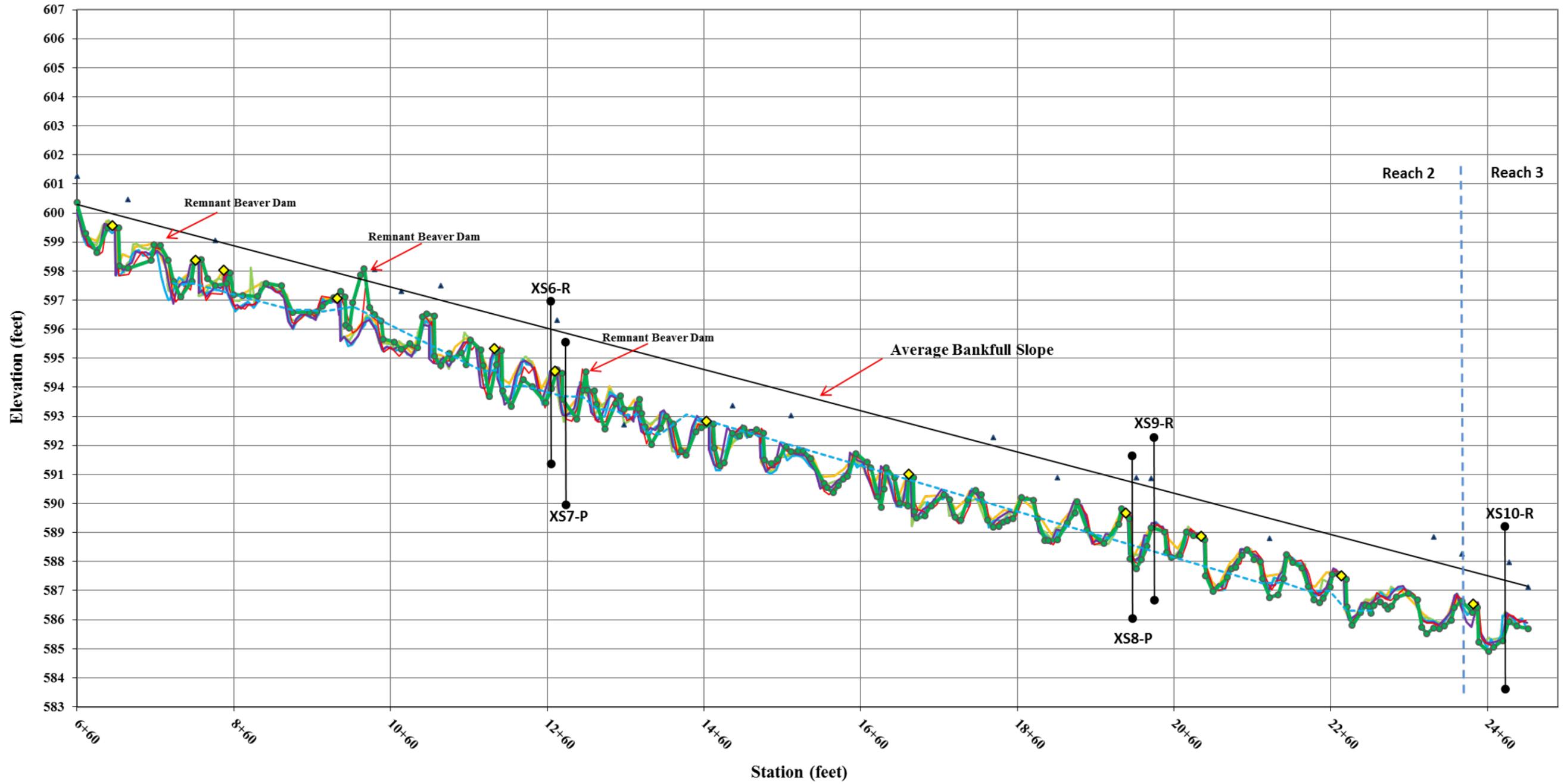


| Cross Section 10 (Riffle) | | | | | | |
|--|------|-------|-------|-------|-------|-------|
| Based on fixed baseline bankfull elevation | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| Record elevation (datum) used | - | 587.8 | 587.8 | 587.8 | 587.8 | 587.8 |
| Bankfull Width (ft) | - | 12.0 | 11.8 | 12.4 | 12.6 | 20.6 |
| Floodprone Width (ft) | - | >200 | >200 | >200 | >200 | >50.0 |
| Bankfull Mean Depth (ft) | - | 1.2 | 1.2 | 1.1 | 1.1 | 0.7 |
| Bankfull Max Depth (ft) | - | 1.7 | 1.7 | 1.6 | 1.6 | 1.8 |
| Bankfull Cross Sectional Area (ft ²) | - | 14.4 | 14.0 | 13.5 | 13.3 | 14.0 |
| Bankfull Width/Depth Ratio | - | 9.9 | 9.9 | 11.3 | 11.9 | 30.3 |
| Bankfull Entrenchment Ratio | - | >16.7 | >17 | >16.2 | >15.9 | >2.4 |
| Bankfull Bank Height Ratio | - | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 |

Figure 6. Longitudinal Profile with Annual Overlays



601 North II Reach 2/3
 Longitudinal Profile
 Reach 2 - Stationing 6+60 to 24+35
 Reach 3 - Stationing 24+35 to 25+08



601 North II UT-Wicker Branch
 Reach 5
 Longitudinal Profile
 Stationing 8+86 to 14+84

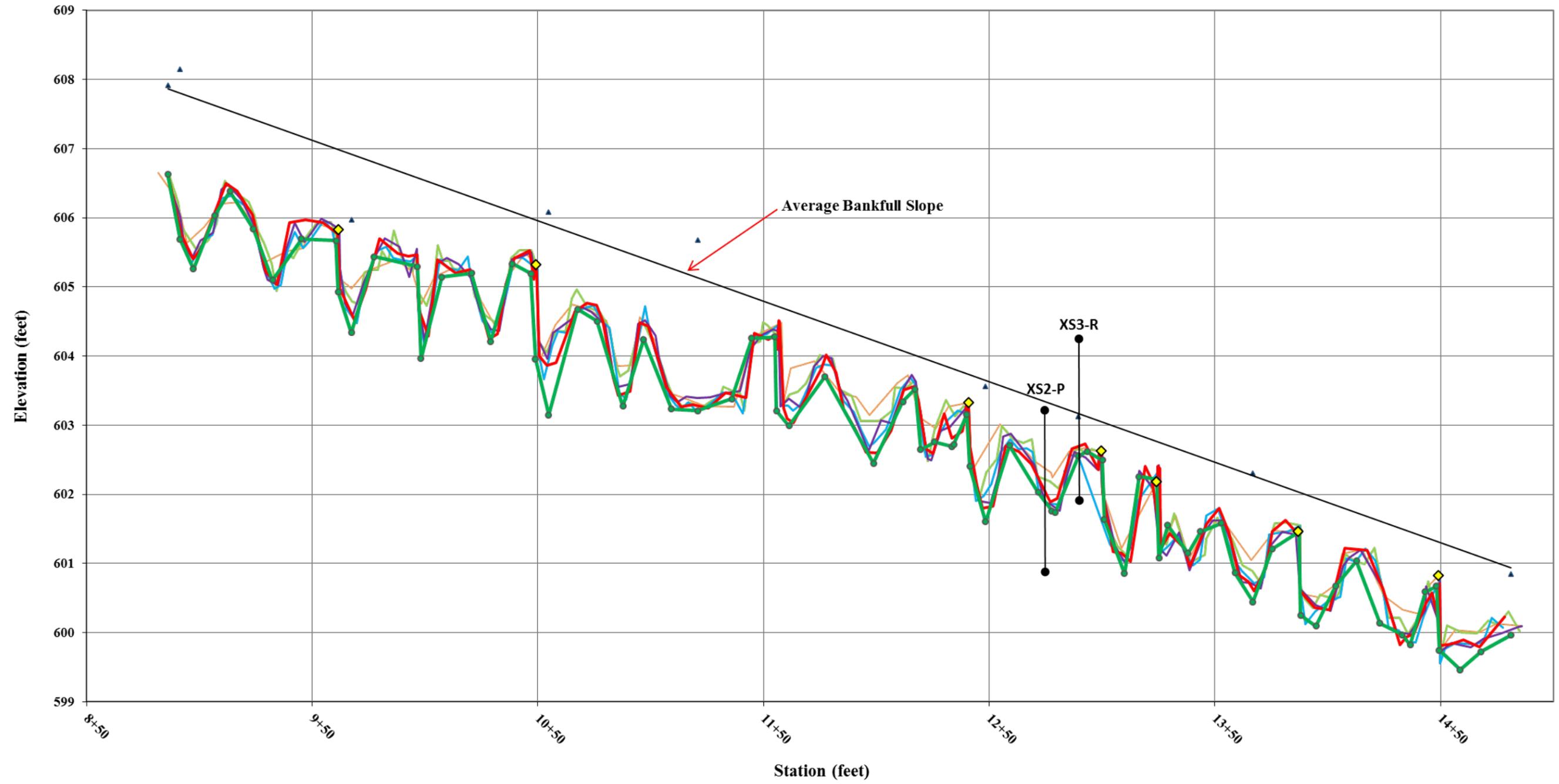


Table 11a. Baseline Morphology & Hydraulic Monitoring Summary

| Table 11a. Baseline Morphology & Hydraulic Monitoring Summary 601 North II / Project No. 95025 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|-------|-------|-------|-------|-------|--|-------|-------|-------|-------|-------|--|-------|-------|-------|-------|-------|---|-------|-------|-------|-------|-------|---|-------|-------|------------------|-------|-------|
| | Cross-Section 1 (Riffle) UT to Wicker (Reach 4) | | | | | | Cross-Section 2 (Pool) UT to Wicker (Reach 5) | | | | | | Cross-Section 3 (Riffle) UT to Wicker (Reach 5) | | | | | | Cross-Section 4 ¹ (Riffle) Wicker (Reach 1) | | | | | | Cross-Section 5 ¹ (Pool) Wicker (Reach 1) | | | | | |
| Dimension | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 |
| Record Elevation (datum) Used | 616.5 | 616.5 | 616.5 | 616.5 | 616.5 | 616.5 | 604.0 | 604.0 | 604.0 | 604.0 | 604.0 | 604.0 | 603.9 | 603.9 | 603.9 | 603.9 | 603.9 | 603.9 | 604.5 | 604.5 | 604.5 | 604.5 | 604.5 | 604.5 | 604.4 | 604.4 | 604.4 | 604.4 | 604.4 | 604.4 |
| Bankfull Width (ft) | 8.9 | 8.3 | 8.0 | 8.6 | 7.9 | 6.3 | 17.6 | 15.4 | 17.1 | 18.6 | 17.6 | 16.5 | 11.0 | 10.8 | 10.8 | 11.9 | 11.7 | 12.4 | 11.4 | 12.5 | 12.3 | 11.0 | 11.2 | 12.0 | 14.2 | 15.4 | 15.5 | 16.1 | 20.0 | 18.1 |
| Floodprone Width (ft) | 23.1 | >23 | >23 | >23 | >23 | 27.4 | 64.1 | >100 | >100 | >100 | >100 | >68.3 | 65.5 | >100 | >100 | >100 | >100 | >68.2 | 59.7 | >100 | >100 | >100 | >100 | >65.6 | 65.6 | >100 | >100 | >100 | >100 | >68.8 |
| Bankfull Mean Depth (ft) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.4 | 0.7 | 0.9 | 1.0 | 0.9 | 0.9 | 0.8 | 0.8 | 0.9 | 0.9 | 0.8 | 0.8 | 0.8 | 0.7 | 0.6 | 0.8 | 0.7 | 0.7 | 0.8 | 0.8 | 0.8 | 0.8 | 0.7 | 0.7 | 0.7 |
| Bankfull Max Depth (ft) | 0.7 | 0.7 | 0.8 | 0.8 | 0.9 | 1.0 | 1.7 | 1.8 | 2.1 | 2.2 | 2.2 | 2.2 | 1.3 | 1.3 | 1.3 | 1.4 | 1.3 | 1.5 | 1.3 | 1.1 | 1.2 | 1.2 | 1.4 | 1.5 | 1.8 | 1.7 | 1.8 | 1.8 | 1.8 | 1.9 |
| Bankfull Cross Sectional Area (ft ²) | 4.2 | 4.1 | 3.9 | 3.9 | 4.0 | 2.7 | 12.8 | 13.6 | 16.4 | 16.7 | 16.0 | 17.8 | 8.5 | 8.5 | 9.5 | 9.1 | 8.6 | 9.7 | 7.9 | 7.2 | 8.2 | 7.5 | 8.4 | 9.0 | 11.5 | 6.1 | 9.4 | 11.8 | 14.1 | 12.0 |
| Bankfull Width/Depth Ratio | 18.5 | 16.9 | 16.4 | 19.0 | 15.6 | 14.9 | 24.5 | 17.5 | 17.8 | 20.8 | 19.2 | 16.2 | 14.1 | 14.6 | 12.3 | 15.6 | 14.6 | 15.9 | 16.6 | 21.7 | 18.1 | 16.1 | 14.9 | 16.0 | 17.6 | 19.3 | 19.9 | 21.9 | 28.4 | 27.3 |
| Bankfull Entrenchment Ratio | 2.6 | >2.8 | >2.9 | >2.7 | >2.9 | 4.3 | 3.6 | >6.5 | >5.9 | >5.4 | >5.7 | N/A | 6.0 | >9 | >9.2 | >8.4 | >8.6 | >5.5 | 5.2 | >8 | >8.1 | >9.1 | >8.9 | >5.5 | 4.6 | >6.5 | >6.5 | >6.2 | >5.0 | N/A |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | N/A | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.8 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | N/A |
| d50 (mm) | - | 0.062 | 0.062 | 1.1 | 0.062 | 16.0 | - | 0.062 | 0.062 | 0.062 | 0.062 | 3.5 | - | 4.9 | 6.9 | 40 | 1.6 | 66.0 | - | 0.06 | 0.062 | 0.062 | 6.9 | 27.0 | - | 0.062 | 0.062 | 0.062 | 0.062 | 6.1 |
| | Cross-Section 6 (Riffle) Wicker (Reach 2) | | | | | | Cross-Section 7 (Pool) Wicker (Reach 2) | | | | | | Cross-Section 8 (Pool) Wicker (Reach 2) | | | | | | Cross-Section 9 (Riffle) Wicker (Reach 2) | | | | | | Cross-Section 10 (Riffle) Wicker (Reach 3) | | | | | |
| Dimension | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 | MY4 | MY5 | Base | MY1 | MY2 | MY3 ² | MY4 | MY5 |
| Record Elevation (datum) Used | 596.2 | 596.2 | 596.2 | 596.2 | 596.2 | 596.2 | 596.1 | 596.1 | 596.1 | 591.6 | 591.6 | 591.6 | 591.3 | 591.3 | 591.3 | 591.3 | 591.3 | 591.3 | 591.0 | 591.0 | 591.0 | 591.0 | 591.0 | 591.0 | - | 587.8 | 587.8 | 587.8 | 587.8 | 587.8 |
| Bankfull Width (ft) | 11.5 | 11.9 | 11.8 | 11.9 | 12.7 | 13.2 | 12.8 | 12.8 | 12.9 | 12.9 | 12.7 | 13.8 | 12.7 | 13.3 | 13.4 | 13.6 | 14.1 | 12.2 | 11.6 | 11.5 | 11.3 | 11.1 | 11.6 | 10.9 | - | 12.0 | 11.8 | 12.4 | 12.6 | 20.6 |
| Floodprone Width (ft) | 69.2 | >90 | >90 | >90 | >90 | >68.8 | 69.5 | >125 | >125 | >125 | >125 | >69 | 69.5 | >200 | >200 | >200 | >200 | >69 | 69.7 | >200 | >200 | >200 | >200 | >69.3 | - | >200 | >200 | >200 | >200 | >50.0 |
| Bankfull Mean Depth (ft) | 1.1 | 1.0 | 1.1 | 0.9 | 1.1 | 1.1 | 1.8 | 1.9 | 2.0 | 2.0 | 2.2 | 2.1 | 1.6 | 1.7 | 1.8 | 1.7 | 1.8 | 2.0 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | - | 1.2 | 1.2 | 1.1 | 1.1 | 0.7 |
| Bankfull Max Depth (ft) | 1.7 | 1.7 | 1.9 | 1.6 | 1.8 | 1.7 | 3.2 | 3.2 | 3.2 | 3.2 | 3.3 | 3.5 | 2.9 | 3.1 | 3.2 | 3.2 | 3.3 | 3.4 | 1.8 | 1.7 | 1.8 | 1.7 | 1.8 | 1.8 | - | 1.7 | 1.7 | 1.6 | 1.6 | 1.8 |
| Bankfull Cross Sectional Area (ft ²) | 12.1 | 12.0 | 12.9 | 11.2 | 13.6 | 14.2 | 23.2 | 24.2 | 25.5 | 25.2 | 27.6 | 29.1 | 19.9 | 22.9 | 23.5 | 22.9 | 25.7 | 24.2 | 13.0 | 12.3 | 12.4 | 11.7 | 12.5 | 12.5 | - | 14.4 | 14.0 | 13.5 | 13.3 | 14.0 |
| Bankfull Width/Depth Ratio | 10.8 | 11.8 | 10.8 | 12.7 | 11.8 | 12.2 | 7.0 | 6.8 | 6.5 | 6.6 | 5.8 | 6.5 | 8.1 | 7.8 | 7.6 | 8.1 | 7.8 | 6.1 | 10.4 | 10.7 | 10.2 | 10.6 | 10.8 | 9.5 | - | 9.9 | 9.9 | 11.3 | 11.9 | 30.3 |
| Bankfull Entrenchment Ratio | 6.0 | >7.5 | >7.6 | >7.5 | >7.1 | >5.2 | 5.4 | >9.8 | >9.7 | >9.7 | >9.9 | N/A | 5.5 | >15 | >14.9 | >14.7 | >14.2 | N/A | 6.0 | >17.5 | >17.8 | >17.9 | >17.2 | >6.3 | - | >16.7 | >17 | >16.2 | >15.9 | >2.4 |
| Bankfull Bank Height Ratio | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | N/A | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | N/A | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | - | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 |
| d50 (mm) | - | 0.062 | 15 | 11 | 2.6 | 48.0 | - | 0.062 | 1.7 | 1.2 | 1.9 | 25.0 | - | 0.062 | 0.062 | 0.062 | 0.16 | 0.062 | - | 0.06 | 1.4 | 0.062 | 0.63 | 48.0 | - | 24 | 24 | 6.7 | 11 | 56.0 |

N/A - Item does not apply.

¹MY1 data updated to show corrected bankfull width, W/D ratio, and entrenchment ratio calculations.

²Data updated to show corrected calculations.

Note: In MY5, Bankfull Bank Height Ratio was calculated on riffles using the baseline bankfull elevation. This method was used because the dimension of the channels has not changed enough to alter the bankfull elevation.

Table 11b. Stream Reach Data Summary

| Table 11b. Monitoring Data - Stream Reach Data Summary 601 North II - Wicker Branch Reach 1 (630 feet) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|----------|-------|-------|-------|-------|------|-----------------------|------|------|------|-----|----|--------------------|------|------|------|-----|----|--------|-------|-------|-------|-------|----|--------|-------|-------|-------|-------|----|--------------------|-------|-------|-------|-------|----|
| Parameter | Baseline | | | | | | MY- 1 ^{1, ^} | | | | | | MY- 2 ¹ | | | | | | MY- 3 | | | | | | MY- 4 | | | | | | MY- 5 ¹ | | | | | |
| Dimension & Substrate - Riffle | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n |
| Bankfull Width (ft) | - | 11.4 | - | - | - | 1 | - | 12.5 | - | - | - | 1 | - | 12.3 | - | - | - | 1 | - | 11.0 | - | - | - | 1 | - | 11.0 | - | - | - | 1 | - | 12.0 | - | - | - | 1 |
| Floodprone Width (ft) | - | 59.7 | - | - | - | 1 | - | >100 | - | - | - | 1 | - | >100 | - | - | - | 1 | - | >100 | - | - | - | 1 | - | >100 | - | - | - | 1 | - | >65.6 | - | - | - | 1 |
| Bankfull Mean Depth (ft) | - | 0.7 | - | - | - | 1 | - | 0.6 | - | - | - | 1 | - | 0.8 | - | - | - | 1 | - | 0.7 | - | - | - | 1 | - | 0.7 | - | - | - | 1 | - | 0.8 | - | - | - | 1 |
| Bankfull Max Depth (ft) | - | 1.3 | - | - | - | 1 | - | 1.1 | - | - | - | 1 | - | 1.2 | - | - | - | 1 | - | 1.2 | - | - | - | 1 | - | 1.2 | - | - | - | 1 | - | 1.5 | - | - | - | 1 |
| Bankfull Cross-Sectional Area (ft ²) | - | 7.9 | - | - | - | 1 | - | 7.2 | - | - | - | 1 | - | 8.2 | - | - | - | 1 | - | 7.5 | - | - | - | 1 | - | 7.5 | - | - | - | 1 | - | 9.0 | - | - | - | 1 |
| Width/Depth Ratio | - | 16.6 | - | - | - | 1 | - | 21.7 | - | - | - | 1 | - | 18.1 | - | - | - | 1 | - | 16.1 | - | - | - | 1 | - | 16.1 | - | - | - | 1 | - | 16.0 | - | - | - | 1 |
| Entrenchment Ratio | - | 5.2 | - | - | - | 1 | - | >8 | - | - | - | 1 | - | >8.1 | - | - | - | 1 | - | >6.2 | - | - | - | 1 | - | >9.1 | - | - | - | 1 | - | >5.5 | - | - | - | 1 |
| Bank Height Ratio | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 0.9 | - | - | - | 1 |
| Profile | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 4.2 | 12.3 | 11.5 | 33.3 | 6.0 | 22.0 | 3.3 | 6.9 | 6.3 | 11.0 | 2.1 | 18 | 1.9 | 7.8 | 7.3 | 12.9 | 3.3 | 19 | 4.8 | 8.5 | 7.6 | 15.5 | 3.1 | 19 | 4.7 | 8.7 | 8.8 | 17.4 | 3.2 | 19 | 4.5 | 8.9 | 8.2 | 16.9 | 3.4 | 17 |
| Riffle Slope (ft/ft) | 0.001 | 0.017 | 0.017 | 0.043 | 0.0 | 22 | - | - | - | - | - | - | - | - | - | - | - | - | 0.000 | 0.016 | 0.015 | 0.035 | 0.010 | 19 | 0.000 | 0.019 | 0.016 | 0.059 | 0.015 | 19 | 0.000 | 0.017 | 0.016 | 0.065 | 0.031 | 17 |
| Pool Length (ft) | 4.7 | 10.8 | 10.4 | 20.0 | 4.2 | 20 | 7.3 | 14.1 | 12.0 | 37.6 | 6.8 | 19 | 6.9 | 12.3 | 12.0 | 19.0 | 3.5 | 20 | 8.0 | 13.5 | 14.5 | 17.4 | 2.9 | 21 | 7.4 | 13.5 | 13.4 | 18.7 | 3.6 | 20 | 3.4 | 10.8 | 10.0 | 16.0 | 3.9 | 21 |
| Pool Max Depth (ft) | 1.4 | 1.9 | 1.9 | 2.2 | 0.2 | 20 | 1.1 | 1.6 | 1.6 | 2.0 | 0.3 | 19 | 1.3 | 1.7 | 1.7 | 2.2 | 0.2 | 21 | 1.7 | 2.2 | 2.2 | 2.5 | 0.2 | 21 | 1.5 | 1.9 | 1.8 | 2.3 | 0.2 | 20 | 0.9 | 1.5 | 1.4 | 2.1 | 0.3 | 21 |
| Pool Spacing (ft) | 13.4 | 30.7 | 26.9 | 57.8 | 10.0 | 19 | 16.4 | 27.7 | 26.9 | 41.8 | 7.0 | 19 | 8.9 | 26.0 | 25.8 | 38.0 | 7.2 | 20 | 7.7 | 26.2 | 25.4 | 34.3 | 6.1 | 20 | 16.6 | 27.3 | 28.6 | 36.3 | 5.8 | 19 | 7.7 | 25.4 | 25.2 | 36.7 | 7.6 | 20 |
| Pattern | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Belt Width (ft) | 13.4 | 20.1 | 20.2 | 29.7 | 4.00 | 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | 14.4 | 17.9 | 16.4 | 27.7 | 3.90 | 23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rc: Bankfull Width (ft/ft) | 1.30 | 1.60 | 1.40 | 2.40 | 0.3 | 23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Wavelength (ft) | 13.7 | 51.5 | 51.8 | 87.9 | 15.30 | 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Width Ratio | 1.2 | 4.5 | 4.5 | 7.7 | 1.30 | 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Additional Reach Parameters | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | C4 | | | | | | C4 | | | | | | C4 | | | | | | C4 | | | | | | C4 | | | | | | | | | | | |
| Channel Thalweg Length (ft) | 660 | | | | | | 557 | | | | | | 562 | | | | | | 562 | | | | | | 558 | | | | | | 552 | | | | | |
| Sinuosity (ft) | 1.1 | | | | | | 1.1 | | | | | | 1.1 | | | | | | 1.1 | | | | | | 1.1 | | | | | | | | | | | |
| Water Surface Slope (Channel) (ft/ft) | - | | | | | | - | | | | | | - | | | | | | 0.0090 | | | | | | 0.0089 | | | | | | - | | | | | |
| Bankfull Slope (ft/ft) | 0.0090 | | | | | | 0.0094 | | | | | | 0.0093 | | | | | | 0.0083 | | | | | | 0.0083 | | | | | | 0.0088 | | | | | |
| Ri% / Ru% / P% / G% / S% | - | - | - | - | - | | 24% | 10% | 52% | 14% | 0% | | 28% | 8% | 46% | 18% | 1% | | 30% | 7% | 53% | 9% | 0% | | 31% | 7% | 51% | 11% | 0% | | 27% | 23% | 41% | 8% | 0% | |

N/A - Information does not apply.

Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step

*Percentages based on riffle and pool pebble counts.

¹No water present at time of survey; MY1 and MY2 profile values based on bedform only.

[^]Mean bankfull width, W/D ratio, entrenchment ratio updated to reflect accurate calculations.

| Table 11b. Monitoring Data - Stream Reach Data Summary 601 North II - Wicker Branch Reach 2 (1356 feet) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----------|-------|-------|-------|-------|----|---------------------|------|------|-------|------|----|---------------------|------|------|-------|------|----|--------|-------|-------|-------|------|----|--------|-------|-------|-------|-------|----|--------|-------|-------|-------|-------|----|--|
| Parameter | Baseline | | | | | | MY - 1 ¹ | | | | | | MY - 2 ¹ | | | | | | MY - 3 | | | | | | MY - 4 | | | | | | MY - 5 | | | | | | |
| Dimension & Substrate - Riffle | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | |
| Bankfull Width (ft) | 11.5 | 11.6 | 11.6 | 11.6 | 0.1 | 2 | 11.5 | 11.7 | 11.7 | 11.9 | 0.28 | 2 | 11.3 | 11.6 | 11.6 | 11.8 | 0.4 | 2 | 11.1 | 11.5 | 11.5 | 11.9 | 0.6 | 2 | 11.6 | 12.2 | 12.2 | 12.7 | 0.8 | 2 | 10.9 | 12.1 | 12.1 | 13.2 | 1.6 | 2 | |
| Floodprone Width (ft) | 69.2 | 69.5 | 69.5 | 69.7 | 0.4 | 2 | 90 | 145 | 145 | 200 | 77.8 | 2 | 90 | 145 | 145 | 200 | 77.8 | 2 | 90.0 | 145.0 | 145.0 | 200.0 | 77.8 | 2 | 90.0 | 145.0 | 145.0 | 200.0 | 77.8 | 2 | 68.8 | 69.1 | 69.1 | 69.3 | 0.4 | 2 | |
| Bankfull Mean Depth (ft) | 1.1 | 1.1 | 1.1 | 1.1 | 0 | 2 | 1.0 | 1.0 | 1.0 | 1.1 | 0.04 | 2 | 1.1 | 1.1 | 1.1 | 1.1 | 0 | 2 | 0.9 | 1.0 | 1.0 | 1.1 | 0.1 | 2 | 1.1 | 1.1 | 1.1 | 1.1 | 0.0 | 2 | 1.1 | 1.1 | 1.1 | 1.1 | 0.0 | 2 | |
| Bankfull Max Depth (ft) | 1.7 | 1.8 | 1.8 | 1.8 | 0.1 | 2 | 1.7 | 1.7 | 1.7 | 1.7 | 0.02 | 2 | 1.8 | 1.9 | 1.9 | 1.9 | 0.07 | 2 | 1.6 | 1.7 | 1.7 | 1.7 | 0.1 | 2 | 1.8 | 1.8 | 1.8 | 1.8 | 0.0 | 2 | 1.7 | 1.8 | 1.8 | 1.8 | 0.1 | 2 | |
| Bankfull Cross-Sectional Area (ft ²) | 12.1 | 12.6 | 12.6 | 13.0 | 0.6 | 2 | 12.0 | 12.2 | 12.2 | 12.3 | 0.21 | 2 | 12.4 | 12.7 | 12.7 | 12.9 | 0.35 | 2 | 11.2 | 11.5 | 11.5 | 11.7 | 0.4 | 2 | 12.5 | 13.1 | 13.1 | 13.6 | 0.8 | 2 | 12.5 | 13.4 | 13.4 | 14.2 | 1.2 | 2 | |
| Width/Depth Ratio | 10.4 | 10.6 | 10.6 | 10.8 | 0.3 | 2 | 10.7 | 11.3 | 11.3 | 11.8 | 0.78 | 2 | 10.2 | 10.5 | 10.5 | 10.8 | 0.42 | 2 | 10.6 | 11.7 | 11.7 | 12.7 | 1.5 | 2 | 10.8 | 11.3 | 11.3 | 11.8 | 0.7 | 2 | 9.5 | 10.9 | 10.9 | 12.2 | 1.9 | 2 | |
| Entrenchment Ratio | 6.0 | 6.0 | 6.0 | 6.0 | 0 | 2 | 7.5 | 12.5 | 12.5 | 17.5 | 7.07 | 2 | 7.6 | 12.7 | 12.7 | 17.8 | 7.2 | 2 | 7.5 | 12.7 | 12.7 | 17.9 | 7.4 | 2 | 7.1 | 12.2 | 12.2 | 17.2 | 7.1 | 2 | 5.2 | 5.8 | 5.8 | 6.3 | 0.8 | 2 | |
| Bank Height Ratio | 19.3 | 21.4 | 21.4 | 23.5 | 3 | 2 | 1.0 | 1.0 | 1.0 | 1.0 | 0 | 2 | 1.0 | 1.0 | 1.0 | 1.0 | 0 | 2 | 1.0 | 1.0 | 1.0 | 1.0 | 0 | 2 | 1.0 | 1.0 | 1.0 | 1.0 | 0.0 | 2 | 0.9 | 1.0 | 1.0 | 1.0 | 0.1 | 2 | |
| Profile | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 6.3 | 17.3 | 18.1 | 38.7 | 7.5 | 33 | 8.1 | 17.1 | 15.7 | 32.9 | 7.0 | 31 | 6.8 | 16.1 | 15.2 | 30.7 | 6.8 | 31 | 4.4 | 15.2 | 14.1 | 36.6 | 7.6 | 31 | 2.2 | 16.7 | 16.3 | 34.5 | 8.1 | 31 | 4.2 | 15.6 | 11.9 | 39.1 | 8.9 | 33 | |
| Riffle Slope (ft/ft) | 0.001 | 0.017 | 0.013 | 0.062 | 0.013 | 33 | - | - | - | - | - | - | - | - | - | - | - | - | 0.008 | 0.019 | 0.016 | 0.050 | 0.01 | 31 | 0.000 | 0.026 | 0.016 | 0.110 | 0.028 | 31 | -0.048 | 0.017 | 0.005 | 0.178 | 0.047 | 33 | |
| Pool Length (ft) | 6.1 | 24.2 | 23.7 | 62.0 | 11.9 | 33 | 12.6 | 29.2 | 26.2 | 57.3 | 11.3 | 33 | 13.7 | 29.4 | 25.4 | 65.0 | 11.7 | 33 | 17.5 | 32.7 | 29.1 | 66.2 | 11.2 | 33 | 15.4 | 27.3 | 24.1 | 55.5 | 9.6 | 34 | 4.5 | 22.7 | 16.5 | 43.8 | 13.1 | 33 | |
| Pool Max Depth (ft) | 1.7 | 2.9 | 2.8 | 3.8 | 0.4 | 33 | 1.4 | 2.8 | 2.8 | 3.8 | 0.5 | 33 | 1.7 | 3.0 | 3.0 | 3.7 | 0.4 | 33 | 2.1 | 3.2 | 3.3 | 3.9 | 0.4 | 33 | 1.9 | 2.9 | 3.0 | 3.5 | 0.4 | 34 | 1.5 | 2.5 | 2.6 | 3.1 | 0.5 | 33 | |
| Pool Spacing (ft) | 25.5 | 53.6 | 53.2 | 103.3 | 19.5 | 33 | 24.4 | 54.0 | 52.2 | 112.6 | 18.3 | 32 | 20.1 | 53.1 | 48.1 | 113.5 | 20.0 | 32 | 14.6 | 53.4 | 48.1 | 114.2 | 19.8 | 32 | 24.7 | 52.3 | 51.3 | 113.4 | 19.1 | 34 | 23.5 | 54.0 | 53.0 | 95.9 | 17.2 | 32 | |
| Pattern | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Belt Width (ft) | 18.3 | 31.1 | 30.6 | 49.5 | 8.8 | 24 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | 28.3 | 40.2 | 37.8 | 61.8 | 10.1 | 28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rc: Bankfull Width (ft/ft) | 2.40 | 3.50 | 3.30 | 5.30 | 0.9 | 28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Wavelength (ft) | 13.7 | 114.4 | 113.3 | 226.5 | 46.9 | 24 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Width Ratio | 1.2 | 9.9 | 9.8 | 19.5 | 4.0 | 24 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Additional Reach Parameters | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | E4 | | | | | | E4 | | | | | | E4 | | | | | | E5 | | | | | | E5 | | | | | | E4 | | | | | | |
| Channel Thalweg Length (ft) | 1,775 | | | | | | 1,777 | | | | | | 1,779 | | | | | | 1,775 | | | | | | 1,774 | | | | | | 1,786 | | | | | | |
| Sinuosity (ft) | 1.2 | | | | | | 1.2 | | | | | | 1.2 | | | | | | 1.2 | | | | | | 1.2 | | | | | | 1.2 | | | | | | |
| Water Surface Slope (Channel) (ft/ft) | - | | | | | | - | | | | | | - | | | | | | 0.0072 | | | | | | 0.0067 | | | | | | 0.0075 | | | | | | |
| Bankfull Slope (ft/ft) | 0.0070 | | | | | | 0.0071 | | | | | | 0.0070 | | | | | | 0.0071 | | | | | | 0.0071 | | | | | | 0.0072 | | | | | | |
| Ri% / Ru% / P% / G% / S% | - | - | - | - | - | | 31% | 2% | 57% | 9% | 0% | | 28% | 3% | 55% | 13% | 0% | | 27% | 3% | 61% | 9% | 1% | | 29% | 5% | 52% | 12% | 1% | | 28% | 14% | 42% | 16% | 0% | | |

N/A - Information does not apply.

Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step

*Percentages based on riffle and pool pebble counts.

¹No water present at time of survey; MY1 and MY2 profile values based on bedform only.

**Table 11b. Monitoring Data - Stream Reach Data Summary
601 North II- Wicker Branch Reach 3 (414 feet)**

| Parameter | Baseline ² | | | | | | MY - 1 ¹ | | | | | | MY - 2 ¹ | | | | | | MY - 3 ^{1,2} | | | | | | MY - 4 | | | | | | MY - 5 ¹ | | | | | |
|--|-----------------------|------|-----|-----|----|---|---------------------|-------|-----|-----|----|---|---------------------|------|-----|-----|----|---|-----------------------|-------|-----|-----|----|---|--------|-------|-----|-----|----|---|---------------------|-------|-----|-----|----|---|
| | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n |
| Dimension & Substrate - Riffle | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | - | - | - | - | - | - | - | 12.0 | - | - | - | 1 | - | 11.8 | - | - | - | 1 | - | 12.4 | - | - | - | 1 | - | 12.6 | - | - | - | 1 | - | 20.6 | - | - | - | 1 |
| Floodprone Width (ft) | - | - | - | - | - | - | - | >200 | - | - | - | 1 | - | >200 | - | - | - | 1 | - | >200 | - | - | - | 1 | - | >200 | - | - | - | 1 | - | >50.0 | - | - | - | 1 |
| Bankfull Mean Depth (ft) | - | - | - | - | - | - | - | 1.2 | - | - | - | 1 | - | 1.2 | - | - | - | 1 | - | 1.1 | - | - | - | 1 | - | 1.1 | - | - | - | 1 | - | 0.7 | - | - | - | 1 |
| Bankfull Max Depth (ft) | - | - | - | - | - | - | - | 1.7 | - | - | - | 1 | - | 1.7 | - | - | - | 1 | - | 1.6 | - | - | - | 1 | - | 1.6 | - | - | - | 1 | - | 1.8 | - | - | - | 1 |
| Bankfull Cross-Sectional Area (ft ²) | - | - | - | - | - | - | - | 14.4 | - | - | - | 1 | - | 14.0 | - | - | - | 1 | - | 13.5 | - | - | - | 1 | - | 13.3 | - | - | - | 1 | - | 14.0 | - | - | - | 1 |
| Width/Depth Ratio | - | - | - | - | - | - | - | 9.9 | - | - | - | 1 | - | 9.9 | - | - | - | 1 | - | 11.3 | - | - | - | 1 | - | 11.9 | - | - | - | 1 | - | 30.3 | - | - | - | 1 |
| Entrenchment Ratio | - | - | - | - | - | - | - | >16.7 | - | - | - | 1 | - | >17 | - | - | - | 1 | - | >16.2 | - | - | - | 1 | - | >15.9 | - | - | - | 1 | - | >2.4 | - | - | - | 1 |
| Bank Height Ratio | - | - | - | - | - | - | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 1.1 | - | - | - | 1 |
| Profile | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | - | - | - | - | - | - | - | 27.6 | - | - | - | 1 | - | 31.7 | - | - | - | 1 | - | 25.6 | - | - | - | 1 | - | 24.9 | - | - | - | 1 | - | 24.2 | - | - | - | 1 |
| Riffle Slope (ft/ft) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.011 | - | - | - | 1 | - | 0.010 | - | - | - | 1 |
| Pool Length (ft) | - | - | - | - | - | - | - | 29.0 | - | - | - | 1 | - | 25.7 | - | - | - | 1 | - | 29.0 | - | - | - | 1 | - | 28.1 | - | - | - | 1 | - | 30.70 | - | - | - | 1 |
| Pool Max Depth (ft) | - | - | - | - | - | - | - | 2.7 | - | - | - | 1 | - | 3.0 | - | - | - | 1 | - | 3.1 | - | - | - | 1 | - | 2.5 | - | - | - | 1 | - | 2.9 | - | - | - | 1 |
| Pool Spacing (ft) | - | - | - | - | - | - | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | 0 | - | - | - | - | - | - | - | - | - | - | - | - |
| Pattern | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Belt Width (ft) | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rc: Bankfull Width (ft/ft) | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Wavelength (ft) | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Width Ratio | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Additional Reach Parameters | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | - | | | | | | E4 | | | | | | E4 | | | | | | E4 | | | | | | E4 | | | | | | | | | | | |
| Channel Thalweg Length (ft) | - | | | | | | 80 | | | | | | 79 | | | | | | 81 | | | | | | 81 | | | | | | 84 | | | | | |
| Sinuosity (ft) | - | | | | | | 1.17 | | | | | | 1.18 | | | | | | 1.17 | | | | | | 1.17 | | | | | | 1.15 | | | | | |
| Water Surface Slope (Channel) (ft/ft) | - | | | | | | NA | | | | | | N/A | | | | | | N/A | | | | | | 0.0067 | | | | | | N/A | | | | | |
| Bankfull Slope (ft/ft) | - | | | | | | 0.0073 | | | | | | 0.0070 | | | | | | 0.0100 | | | | | | 0.0071 | | | | | | 0.0118 | | | | | |
| Ri% / Ru% / P% / G% / S% | - | - | - | - | - | - | 44% | - | 46% | 10% | - | - | 51% | - | 41% | 8% | - | - | 42% | - | 48% | 9% | - | - | 42% | - | 47% | 11% | - | - | 29% | 25% | 36% | 10% | 0% | - |

N/A - Information does not apply.

Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step

*Percentages based on riffle and pool pebble counts.

¹No water present at time of survey; MY1, MY2, and MY3 profile values based on bedform only.

²Reach 3 cross-section was added during MY1; no data available for MY0

³Data updated to show corrected calculations.

**Table 11b. Monitoring Data - Stream Reach Data Summary
601 North II - UT to Wicker Branch Reach 4 (826 feet)**

| Parameter | Baseline | | | | | | MY - 1 | | | | | | MY - 2 | | | | | | MY - 3 | | | | | | MY - 4 | | | | | | MY - 5 | | | | | | | |
|--|----------|------|-----|-----|----|---|--------|------|-----|-----|----|---|--------|------|-----|-----|----|---|--------|------|-----|-----|----|---|--------|------|-----|-----|----|---|--------|------|-----|-----|----|---|---|---|
| | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | | |
| Bankfull Width (ft) | - | 8.9 | - | - | - | 1 | - | 8.3 | - | - | - | 1 | - | 8.0 | - | - | - | 1 | - | 8.6 | - | - | - | 1 | - | 7.9 | - | - | - | 1 | - | 6.3 | - | - | - | 1 | | |
| Floodprone Width (ft) | - | 23.1 | - | - | - | 1 | - | >23 | - | - | - | 1 | - | >23 | - | - | - | 1 | - | >23 | - | - | - | 1 | - | >23 | - | - | - | 1 | - | 27.4 | - | - | - | 1 | | |
| Bankfull Mean Depth (ft) | - | 0.5 | - | - | - | 1 | - | 0.5 | - | - | - | 1 | - | 0.5 | - | - | - | 1 | - | 0.5 | - | - | - | 1 | - | 0.5 | - | - | - | 1 | - | 0.4 | - | - | - | 1 | | |
| Bankfull Max Depth (ft) | - | 0.7 | - | - | - | 1 | - | 0.7 | - | - | - | 1 | - | 0.8 | - | - | - | 1 | - | 0.8 | - | - | - | 1 | - | 0.9 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | | |
| Bankfull Cross-Sectional Area (ft ²) | - | 4.2 | - | - | - | 1 | - | 4.1 | - | - | - | 1 | - | 3.9 | - | - | - | 1 | - | 3.9 | - | - | - | 1 | - | 4.0 | - | - | - | 1 | - | 2.7 | - | - | - | 1 | | |
| Width/Depth Ratio | - | 18.5 | - | - | - | 1 | - | 16.9 | - | - | - | 1 | - | 16.4 | - | - | - | 1 | - | 19.0 | - | - | - | 1 | - | 15.6 | - | - | - | 1 | - | 14.9 | - | - | - | 1 | | |
| Entrenchment Ratio | - | 2.6 | - | - | - | 1 | - | >2.8 | - | - | - | 1 | - | >2.9 | - | - | - | 1 | - | >2.7 | - | - | - | 1 | - | >2.9 | - | - | - | 1 | - | 4.3 | - | - | - | 1 | | |
| Bank Height Ratio | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | | |
| Profile | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Riffle Slope (ft/ft) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pool Length (ft) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pool Max Depth (ft) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pool Spacing (ft) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pattern | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Belt Width (ft) | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rc: Bankfull Width (ft/ft) | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Wavelength (ft) | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Width Ratio | - | - | - | - | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Additional Reach Parameters | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Thalweg Length (ft) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sinuosity (ft) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Surface Slope (Channel) (ft/ft) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Slope (ft/ft) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ri% / Ru% / P% / G% / S% | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

N/A - Information does not apply.
 Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step
 *Percentages based on riffle and pool pebble counts.

| Table 11b. Monitoring Data - Stream Reach Data Summary 601 North II -UT to Wicker Branch Reach 5 (534 feet) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----------|-------|-------|-------|-------|----|-----------------------|------|------|------|-----|----|---------------------|------|------|------|-----|----|--------|-------|-------|-------|-------|----|--------|-------|-------|-------|-------|----|---------------------|-------|-------|-------|-------|----|--|
| Parameter | Baseline | | | | | | MY - 1 ^{1,^} | | | | | | MY - 2 ¹ | | | | | | MY - 3 | | | | | | MY - 4 | | | | | | MY - 5 ¹ | | | | | | |
| | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | Min | Mean | Med | Max | SD | n | |
| Bankfull Width (ft) | - | 11.0 | - | - | - | - | - | 11.1 | - | - | - | 1 | - | 10.8 | - | - | - | 1 | - | 11.9 | - | - | - | 1 | - | 11.7 | - | - | - | 1 | - | 12.4 | - | - | - | 1 | |
| Floodprone Width (ft) | - | 65.5 | - | - | - | - | - | >100 | - | - | - | 1 | - | >100 | - | - | - | 1 | - | >100 | - | - | - | 1 | - | >100 | - | - | - | 1 | - | >68.2 | - | - | - | 1 | |
| Bankfull Mean Depth (ft) | - | 0.8 | - | - | - | - | - | 0.8 | - | - | - | 1 | - | 0.9 | - | - | - | 1 | - | 0.8 | - | - | - | 1 | - | 0.8 | - | - | - | 1 | - | 0.8 | - | - | - | 1 | |
| Bankfull Max Depth (ft) | - | 1.3 | - | - | - | - | - | 1.3 | - | - | - | 1 | - | 1.3 | - | - | - | 1 | - | 1.4 | - | - | - | 1 | - | 1.3 | - | - | - | 1 | - | 1.5 | - | - | - | 1 | |
| Bankfull Cross-Sectional Area (ft ²) | - | 8.5 | - | - | - | - | - | 8.5 | - | - | - | 1 | - | 9.5 | - | - | - | 1 | - | 9.1 | - | - | - | 1 | - | 8.6 | - | - | - | 1 | - | 9.7 | - | - | - | 1 | |
| Width/Depth Ratio | - | 14.1 | - | - | - | - | - | 14.6 | - | - | - | 1 | - | 12.3 | - | - | - | 1 | - | 15.6 | - | - | - | 1 | - | 14.6 | - | - | - | 1 | - | 15.9 | - | - | - | 1 | |
| Entrenchment Ratio | - | 6.0 | - | - | - | - | - | >9 | - | - | - | 1 | - | >9.2 | - | - | - | 1 | - | >8.4 | - | - | - | 1 | - | >8.6 | - | - | - | 1 | - | >5.5 | - | - | - | 1 | |
| Bank Height Ratio | - | 1.0 | - | - | - | - | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 1.0 | - | - | - | 1 | - | 0.8 | - | - | - | 1 | |
| Profile | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 5.1 | 12.8 | 12.4 | 23.2 | 4.5 | 16 | 3.1 | 9.7 | 9.3 | 18.5 | 3.9 | 17 | 3.2 | 7.7 | 6.9 | 14.5 | 3.5 | 17 | 2.2 | 9.0 | 8.3 | 14.8 | 3.1 | 17 | 4.9 | 10.1 | 10.9 | 16.9 | 4.0 | 17 | 4.9 | 11.3 | 10.3 | 21.4 | 4.3 | 17 | |
| Riffle Slope (ft/ft) | 0.001 | 0.016 | 0.016 | 0.035 | 0.010 | 16 | - | - | - | - | - | - | - | - | - | - | - | - | 0.001 | 0.018 | 0.014 | 0.053 | 0.013 | 17 | 0.003 | 0.021 | 0.016 | 0.057 | 0.014 | 17 | 0.000 | 0.018 | 0.006 | 0.088 | 0.036 | 17 | |
| Pool Length (ft) | 3.2 | 12.4 | 12.3 | 29.5 | 6.3 | 18 | 6.0 | 16.0 | 14.5 | 38.3 | 7.3 | 19 | 7.4 | 17.0 | 15.8 | 28.8 | 5.7 | 19 | 8.6 | 16.7 | 16.3 | 37.6 | 6.9 | 18 | 5.5 | 15.4 | 14.6 | 36.8 | 6.5 | 18 | 3.9 | 14.1 | 14.7 | 26.7 | 5.16 | 19 | |
| Pool Max Depth (ft) | 1.6 | 2.2 | 2.3 | 2.6 | 0.3 | 18 | 1.5 | 2.0 | 2.0 | 2.6 | 0.3 | 19 | 1.8 | 2.2 | 2.2 | 2.7 | 0.3 | 19 | 1.9 | 2.3 | 2.4 | 2.6 | 0.2 | 18 | 1.8 | 2.3 | 2.3 | 2.8 | 0.3 | 18 | 1.4 | 2.0 | 2.0 | 2.8 | 0.4 | 19 | |
| Pool Spacing (ft) | 14.5 | 30.2 | 31.7 | 42.2 | 6.9 | 17 | 10.8 | 28.7 | 30.8 | 42.0 | 8.8 | 19 | 10.5 | 29.1 | 30.4 | 48.7 | 9.9 | 19 | 13.9 | 30.7 | 30.8 | 54.3 | 7.9 | 18 | 21.7 | 31.7 | 32.3 | 39.8 | 5.1 | 18 | 19.7 | 30.6 | 29.5 | 46.6 | 7.4 | 18 | |
| Pattern | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Belt Width (ft) | 15.7 | 24.3 | 25.6 | 29.8 | 4.7 | 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | 12.3 | 19.9 | 18.8 | 31.4 | 5.8 | 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rc: Bankfull Width (ft/ft) | 1.10 | 1.80 | 1.70 | 2.90 | 0.5 | 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Wavelength (ft) | 23.3 | 54.3 | 52.3 | 88.5 | 15.6 | 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Width Ratio | 2.1 | 4.9 | 4.8 | 8.0 | 1.4 | 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Additional Reach Parameters | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | C4 | | | | | | C4 | | | | | | C4 | | | | | | C4 | | | | | | C4 | | | | | | | | | | | | |
| Channel Thalweg Length (ft) | 646 | | | | | | 600 | | | | | | 591 | | | | | | 589 | | | | | | 595 | | | | | | 588 | | | | | | |
| Sinuosity (ft) | 1.2 | | | | | | 1.25 | | | | | | 1.27 | | | | | | 1.25 | | | | | | 1.28 | | | | | | 1.25 | | | | | | |
| Water Surface Slope (Channel) (ft/ft) | - | | | | | | - | | | | | | - | | | | | | 0.0103 | | | | | | 0.0108 | | | | | | - | | | | | | |
| Bankfull Slope (ft/ft) | 0.0110 | | | | | | 0.0114 | | | | | | 0.0113 | | | | | | 0.0102 | | | | | | 0.0112 | | | | | | 0.0116 | | | | | | |
| Ri% / Ru% / P% / G% / S% | - | - | - | - | - | | 30% | 5% | 56% | 8% | - | | 24% | 5% | 58% | 14% | 0% | | 28% | 3% | 56% | 13% | 0% | | 31% | 5% | 51% | 11% | 2% | | 33% | 9% | 46% | 13% | 0% | | |

N/A - Information does not apply.

Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step

*Percentages based on riffle and pool pebble counts.

¹No water present at time of survey; MY1 and MY2 profile values based on bedform only.

[^]MY1 data misreported, numbers updated to reflect accurate riffle length calculations

Table 12. Pebble Count Data Summary

| Stream Reach | MY1 - 2013 | | MY2 - 2014 | | MY3 - 2015 | | MY4 - 2016 | | MY5 - 2017 | |
|--------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | Pebble Count | | Pebble Count | | Pebble Count | | Pebble Count | | Pebble Count | |
| | D ₅₀ (mm) | D ₈₄ (mm) |
| Reach 1 | 0.062 | 16.031 | 0.062 | 24.031 | 0.062 | 23.2 | 3.531 | 27.031 | 16.55 | 64 |
| Reach 2 | 0.062 | 19.5405 | 4.7405 | 57.2655 | 3.831 | 26.7655 | 1.3225 | 31.35 | 30.2655 | 51.0155 |
| Reach 3 | 26 | 93 | 27 | 110 | 7.2 | 100 | 13 | 110 | 56 | 150 |
| Reach 4 | 0.062 | 0.062 | 0.062 | 0.062 | 1.1 | 29 | 0.062 | 11 | 16 | 56 |
| Reach 5 | 3.231 | 52.55 | 3.481 | 28.25 | 0.631 | 37 | 0.831 | 31.2 | 34.75 | 62.5 |

Figure 7. MY5 Stream Reach Substrate Composition Charts

Chart 1.

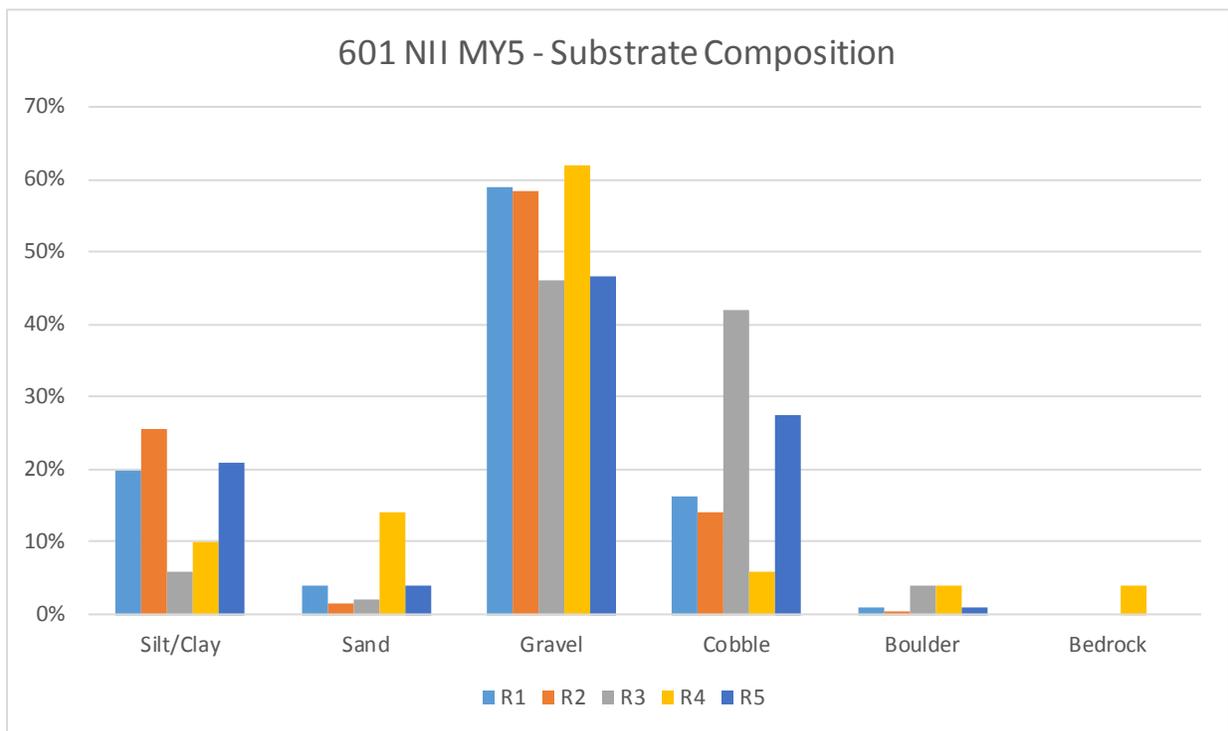


Chart 2.

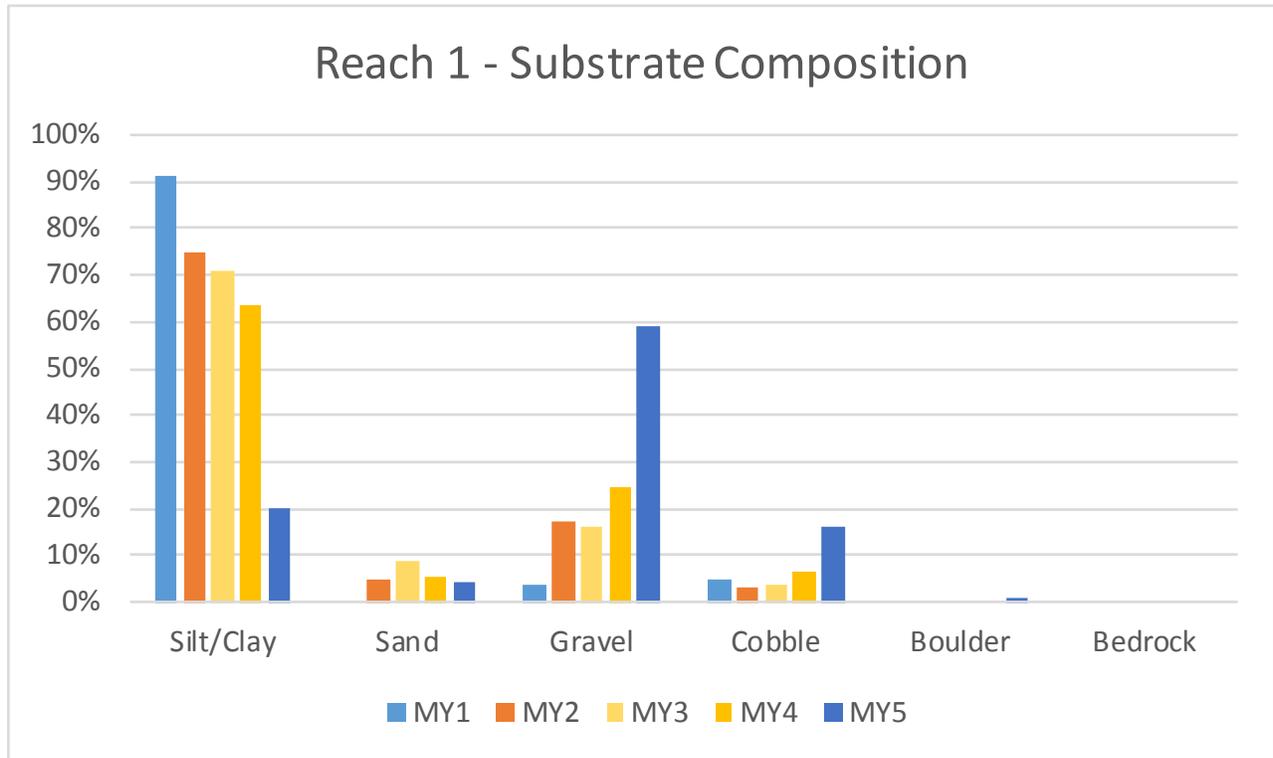


Chart 3.

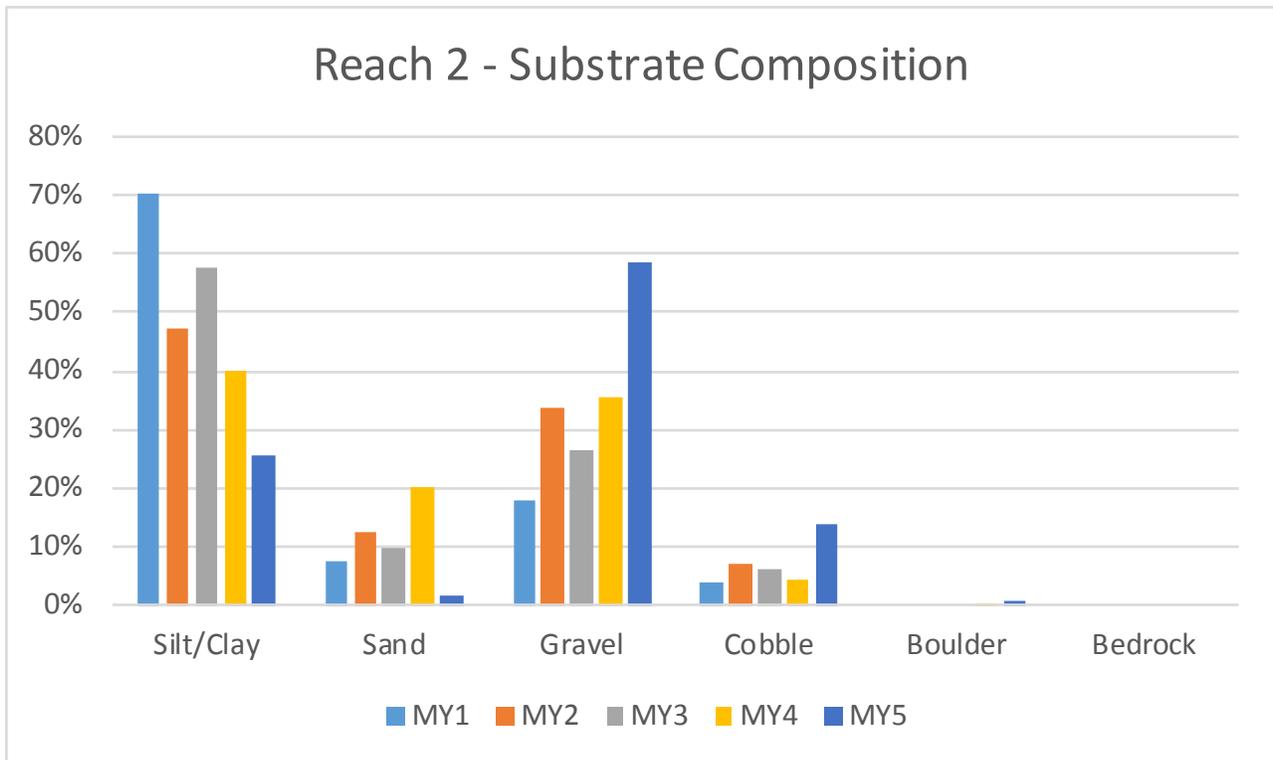


Chart 4.

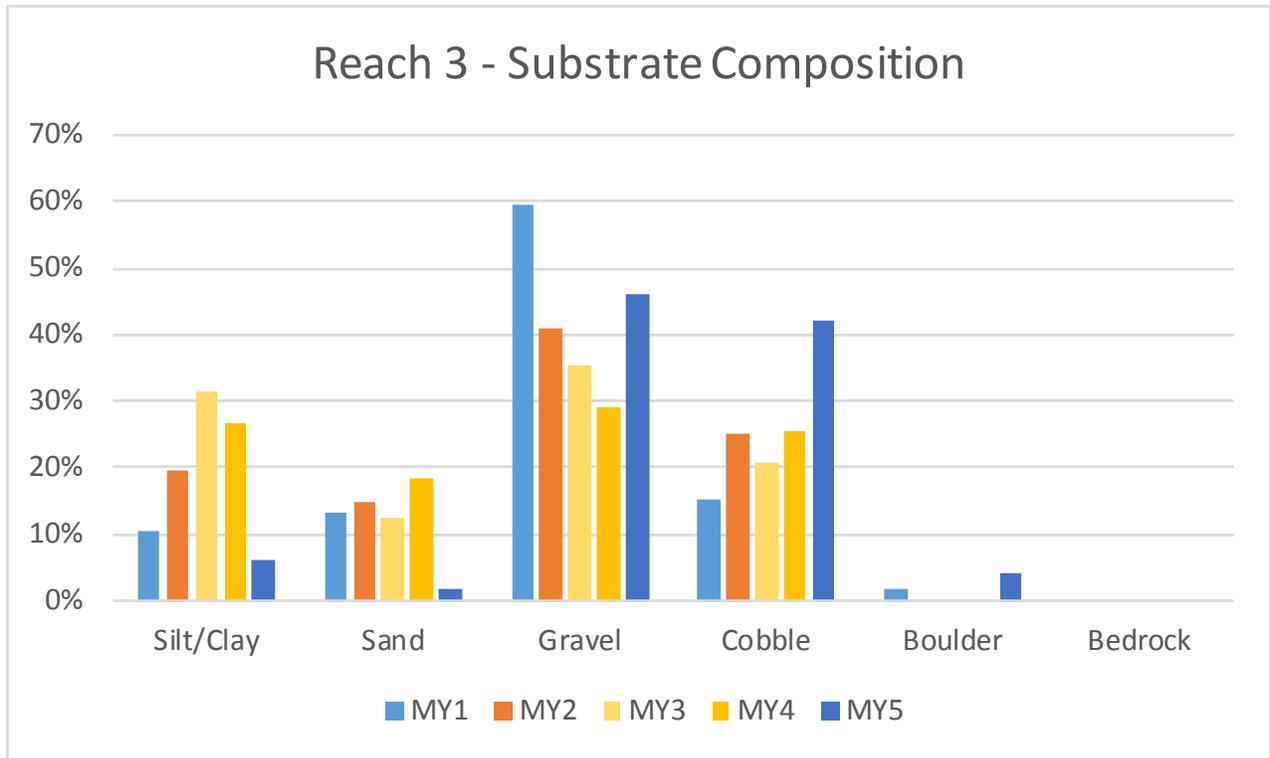


Chart 5.

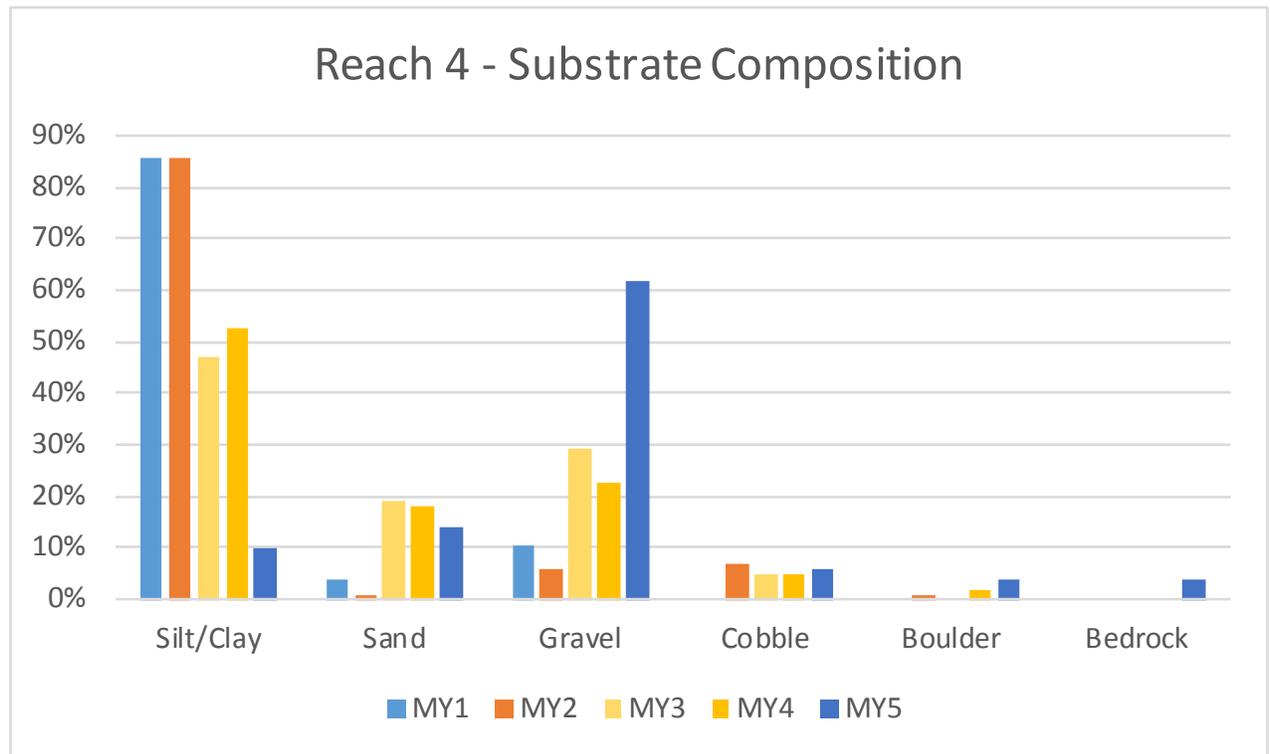
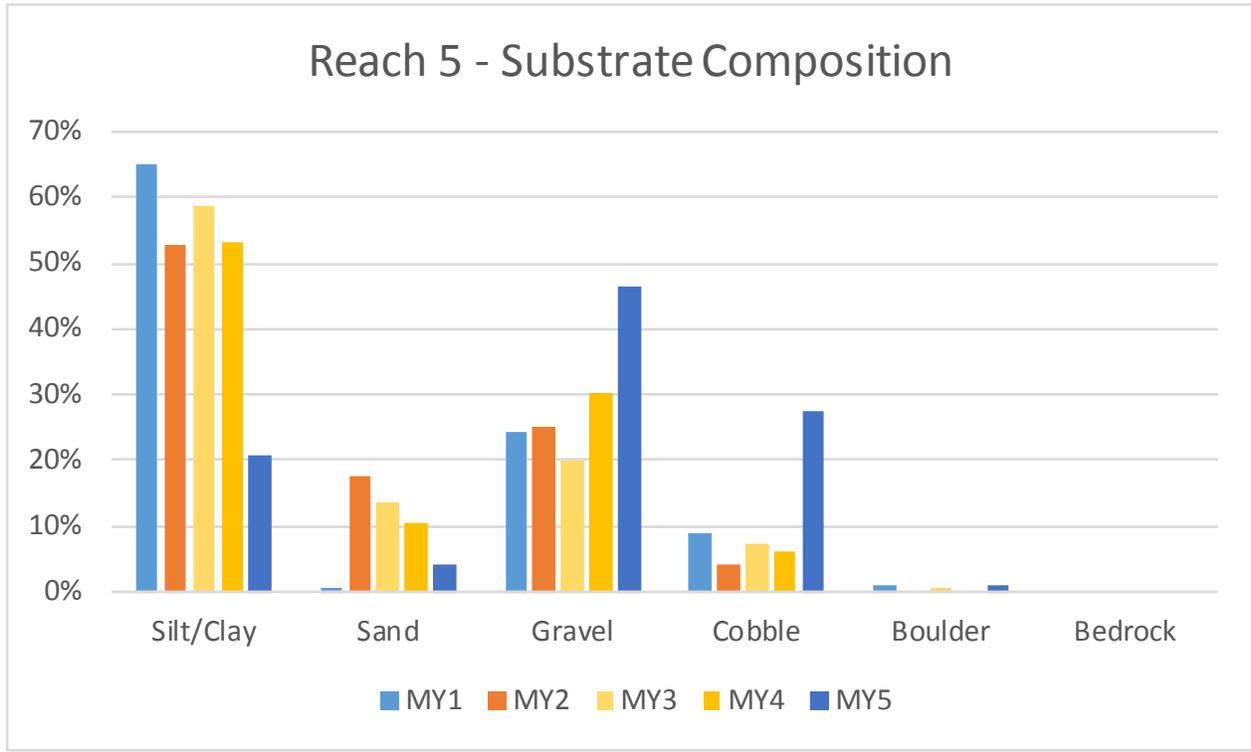


Chart 6.



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

| Table 13. Verification of Bankfull Events- Reach 2 | | | |
|---|---------------|--------------------------------------|-------------------------------|
| Date of Data Collection | Method | Feet Above Bankfull Elevation | Photo # (if available) |
| November - 2013 | Wrack Lines | | |
| September - 2014 | Crest Gauge | 1.5 | |
| February - 2015 | Crest Gauge | 0.7 | |
| May - 2015 | Crest Gauge | 0.4 | |
| November - 2015 | Crest Gauge | 1.0 | |
| January - 2016 | Crest Gauge | 1.1 | |
| March - 2016 | Crest Gauge | 0.5 | |
| October - 2017 | Wrack Lines | | 1 |

| Table 13. Verification of Bankfull Events - Reach 5 | | | |
|--|---------------|--------------------------------------|-------------------------------|
| Date of Data Collection | Method | Feet Above Bankfull Elevation | Photo # (if available) |
| November - 2013 | Wrack Lines | | |
| September - 2014 | Crest Gauge | 1.2 | |
| February - 2015 | Crest Gauge | 0.2 | |
| May - 2015 | Crest Gauge | 0.1 | |
| November - 2015 | Wrack Lines | | |
| January - 2016 | Crest Gauge | 0.1 | |
| December - 2017 | Wrack Lines | | 2 |



Photo 1: Wrack line on Reach 2
(10/18/2017)



Photo 2: Wrack line on Reach 5
(11/28/2017)

Figure 9. Daily Precipitation Data for Monroe, NC

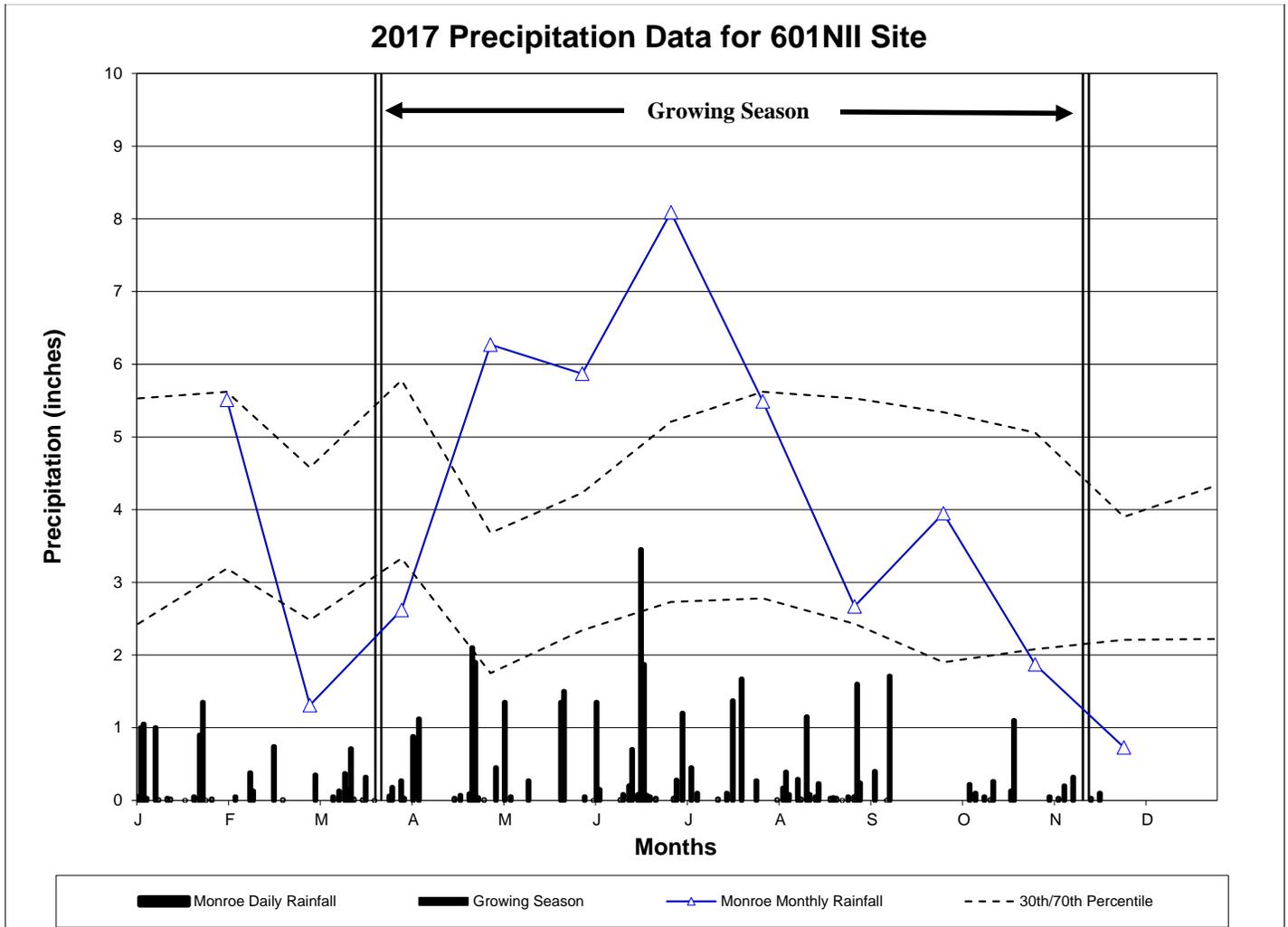


Table 14. Monroe, NC Rainfall Summary 2017

| Month | Average | Normal Limits | | Monroe, NC Coop Station |
|-----------|---------|---------------|------------|----------------------------|
| | | 30 Percent | 70 Percent | |
| January | 4.71 | 3.19 | 5.62 | 5.51 |
| February | 3.81 | 2.48 | 4.58 | 1.31 |
| March | 4.85 | 3.33 | 5.78 | 2.62 |
| April | 3.02 | 1.75 | 3.68 | 6.27 |
| May | 3.53 | 2.34 | 4.23 | 5.87 |
| June | 4.32 | 2.73 | 5.21 | 8.08 |
| July | 4.63 | 2.78 | 5.62 | 5.49 |
| August | 4.53 | 2.43 | 5.53 | 2.67 |
| September | 4.38 | 1.9 | 5.34 | 3.95 |
| October | 4.04 | 2.08 | 5.06 | 1.87 |
| November | 3.33 | 2.21 | 3.9 | 0.73 |
| December | 3.58 | 2.22 | 4.33 | -- |
| Total | 48.73 | 29.44 | 58.88 | 44.37 |