

Annual Monitoring Report

Monitoring Year 4 of 5

FINAL

Project Name: Junes Branch Stream Restoration

NCDMS Contract No.: 003979

NCDMS Project No.: 95027

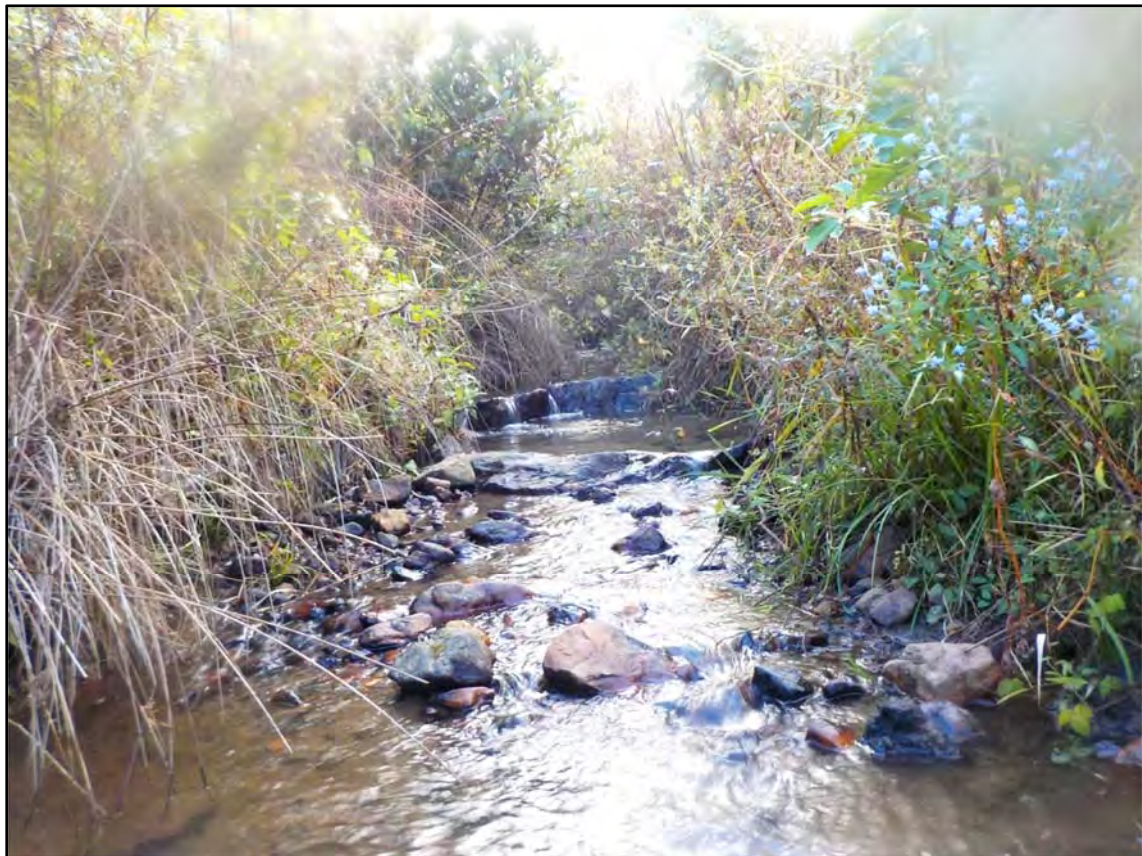
USACE Permit Action ID: 2012-01101

DWR Project No.: 20120748

Jackson County, NC

Data Collected: January 2017 - December 2017

Date Submitted: January 2018



Submitted to:

North Carolina Division of Mitigation Services

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January 31, 2018

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RE: Junes Branch Stream Restoration Site: MY4 Monitoring Report (NCDMS ID 95027)

Listed below are comments provided by DMS on January 11, 2018 regarding the Junes Branch Stream Restoration Site: Year 4 Monitoring Report and RES' responses.

General: The MY4 cross section and longitudinal profile data shows significant aggradation on Higdon Branch and Doris Branch. This aggradation has increased on both reaches since MY3. Junes Branch also shows areas of increased aggradation in MY4. In the report text, please add additional discussion regarding the aggradation on these reaches.

[Additional discussion has been added to the report text in Section 1.5.](#)

Based on review of the MY4 data and past experience with the IRT, DMS believes that both Higdon Branch (422 SMUs) and Doris Branch (282 SMUs) are "at risk" and may receive no mitigation credit at project closeout with the IRT.

DMS will be withholding payment for these 704 "at risk" stream credits until the April 24-25, 2018 IRT Credit Release meeting.

Cover: Please include the USACE Permit Action ID and the DWR Project Number on the report cover page.

[Done.](#)

General: As noted in the report text, Junes Branch is one of the projects that the IRT has requested be reverted to the Mitigation Plan asset totals prior to the 2018 credit release. Total stream assets will be reduced to 3,093 SMUs per the approved mitigation plan.

Section 1.1 - Goals and Objectives: Please include the full goals and objectives from the approved mitigation plan. Currently, the "objectives" section and associated bullets are missing.

[Done.](#)

General: One the project objectives from the approved mitigation plan is; "*Provide riparian buffer restoration by establishing a native forested and herbaceous riparian buffer plant community with a minimum width of 30 feet from the edge of the restored channels. This new community will be established in conjunction with the eradication of any existing exotic or undesirable plant species.*" Please be sure to closely monitor and treat invasive species along



the entire conservation easement through project closeout. At project closeout, the regulatory agencies may expect no living exotic invasive species within the project conservation easement based on the approved mitigation plan objective.

Section 1.5. Project Performance: Monitoring Year 3 (MY4) should be updated to Monitoring Year 4 (MY4).

Done.

Section 1.5.1 - Vegetation: Invasive species were prevalent on this site prior to construction. No invasive species are reported in the text, CCPV sheets or Table 6. Please confirm and add report verbiage to this section noting that no invasive species were observed on the site in MY4 (2017).

This statement is correct and verbiage has been added to the report.

Table 1: Please revert Table 1 back to the totals found in the Mitigation Plan. Add a note at bottom of table to acknowledge communications with IRT regarding the change. Suggested table note: “* Stream credit calculations were originally calculated along the as-built thalweg. Based on the April 3, 2017 IRT Credit Release Meeting, these stream credits have been reverted back to the amounts in the IRT approved mitigation plan.”

Done.

Table 2: Please list all invasive-exotic treatments in Table 2. If none have been completed, please disregard the comment.

Invasive treatments were done in October 2014. This has been added to Table 2.

Table 2: The data collection complete column for MY3 is incorrect. Based on the final MY3 report, MY3 data was collected in Dec. 2016. Additionally, The MY1 data collection date is entered as Jan. 2015. Please QA/QC the table update accordingly. This was an IRT concern at the 2017 credit release meeting.

The MY3 data collection dates have been corrected. According to the MY1 report, data collection was done in January 2015.

Table 2: For MY4 please report the data collection complete dates for vegetation and geomorphology as they appear to have been collected at different times. This update should be made in MY5 as well.

Done.

Table 3: Please add a row for the MY4 monitoring performers. It is currently missing.

Done.

Cross Sections / Cross Section Tables – A couple of methods are currently being utilized to calculate the BHR from year to year. To compare subsequent monitoring years to the As-built condition one can hold the bankfull depth static (denominator) while allowing the Low TOB max depth (numerator) to vary. Another method that has been proposed and is being evaluated is to hold the As-built cross sectional area static within each year’s new cross section and allow that to determine the max bankfull depth for each year. However; if there are large changes in the W/D ratio either method can make for somewhat distorted BHR values depending upon the direction and magnitude of the change in the W/D ratio. Please update the calculations to reflect changes observed in the overlays and explain in detail as a table footnote how the calculations were made. Be prepared to defend the method used for the 2018 credit release and justify through context whether or not any changes observed in a cross section represent an issue.



Starting in MY4, BHR 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. None of the riffle cross sections exceeded a 1.2 BHR. This has been added to the text and as a footnote to Table 11a.

Longitudinal Profiles – Per the approved mitigation plan, longitudinal profiles are required annually as part of the project monitoring. The project longitudinal profiles were not included in the draft report; however, they were included in the digital support files. Please include the MY4 longitudinal profiles in the FINAL MY4 report and QA/QC the associated data and tables.
[Done.](#)

Prepared by:



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1.0 PROJECT SUMMARY

1.1. Goals and Objectives

The project goals address stressors identified in the Targeted Local Watershed (TLW) and include the following:

- Improve water quality within the restored channel reaches and downstream watercourses through:
 - reducing turbidity by stabilizing existing stream banks and altering stream channel dimension, pattern and profile
 - reducing nutrient loads and fecal coliform bacteria from adjacent agricultural fields by fencing the riparian area to keep livestock out of the stream and restoring a wooded riparian buffer
- Improve local aquatic and terrestrial habitat and diversity within the restored channels and their vicinity through:
 - reducing water temperatures by planting native vegetation in the riparian zone and creating shade
 - improving habitat complexity by restoring the stream profile to stable riffle/pool and step/pool complexes
 - improving terrestrial habitat by excluding livestock and creating a riparian buffer comprised of native plant species
 - improving aquatic habitat by establishing tree canopy to provide organic material such as woody debris and leaf packs to stream
 - removing invasive exotic species and planting native vegetation in the riparian buffer
- Improve flood flow attenuation on-site and downstream through:
 - raising the bed or creating bankfull benches to allow for overbank flows every 1-2 years and improve the connection to the active floodplain.

The project goals will be addressed through the following project objectives:

- Restore stable channel morphology and proper sediment transport capacity.
- Create and improve stream bed form and improve aquatic and benthic macroinvertebrate habitat.
- Reconnect the stream to the historic floodplain or construct a floodplain bench that is accessible at the proposed bankfull channel elevation.
- Improve channel and stream bank stabilization by integrating in-stream structures and native bank vegetation.
- Provide riparian buffer restoration by establishing a native forested and herbaceous riparian buffer plant community with a minimum width of 30 feet from the edge of the restored channels. This new community will be established in conjunction with the eradication of any existing exotic or undesirable plant species.

1.2. Success Criteria

The success criteria for the Junes Branch Stream Restoration Site follows accepted and approved success criteria presented in the USACE Stream Mitigation Guidelines and subsequent NCDMS and agency guidance. Specific success criteria components are presented below.

1.2.1. Morphological Parameters and Channel Stability

Restored and enhanced streams shall be in compliance with the standards set forth in the USACE 2003 Stream Mitigation Guidelines and should demonstrate morphologic stability to be considered successful. Stability does not equate to an absence of change, but rather to sustainable rates of change or stable patterns of variation. Restored streams often demonstrate some level of initial adjustment in the several months that follow construction and some change/variation subsequent to that is also to be expected. However, the observed change should not be unidirectional such that it represents a robust trend. If some trend is evident, it should be very modest or indicate migration to a stable form.

Dimension - Cross-section measurements should indicate little change from the as-built cross-sections. If changes do occur, they will be evaluated to determine whether the adjustments are associated with increased stability or whether they indicate movement towards an unstable condition.

Pattern and Profile - Measurements and calculated values should indicate stability with little deviation from as-built conditions and established morphological ranges for the restored stream type. Pool depths may vary from year to year, but the majority should maintain depths sufficient to be observed as distinct features in the profile. The pools should maintain their depth with flatter water surface slopes, while the riffles should remain shallower and steeper. Pattern measurements will not be collected unless conditions seem to indicate that a detectable change appears to have occurred based on channel profile and/or cross-section dimension measurements.

Substrate - Calculated D_{50} and D_{84} values should indicate coarser size class distribution of bed materials in riffles and finer size class distribution in pools. The majority of riffle pebble counts should indicate maintenance or coarsening of substrate distributions. Generally, it is anticipated that the bed material will coarsen over time.

Sediment Transport - Depositional features should be consistent with a stable stream that is effectively managing its sediment load. Point bar and inner berm features, if present, should develop without excessive encroachment of the channel. Isolated development of robust (i.e. comprised of coarse material and/or vegetation actively diverting flow) mid-channel or lateral bars will be acceptable. Likewise, development of a higher number of mid-channel or lateral bars that are minor in terms of their permanency such that profile measurements do not indicate systemic aggradation will be acceptable, but trends in the development of robust mid-channel or alternating bar features will be considered a destabilizing condition and may require intervention or have success implications.

Surface Water Hydrology - Monitoring of stream surface water stages should indicate recurrence of a bankfull flow on average every 1 to 2 years. At a minimum, throughout the monitoring period, the surface water stage should achieve bankfull or greater elevations at least twice. The bankfull events must occur during separate monitoring years.

1.2.2. Vegetation

Riparian vegetation monitoring shall be conducted for a minimum of five years to ensure that success criteria are met per USACE (2003) guidelines. Accordingly, success criteria will consist of a minimum survival of 320 stems per acre by the end of the Year 3 monitoring period and a minimum of 260 stems per acre at the end of Year 5. If monitoring indicates either that the specified survival rate is not being met or the development of detrimental conditions (i.e., invasive species, diseased vegetation), appropriate corrective actions will be developed and implemented.

1.3. Project Setting and Background

The Junes Branch Restoration Site (Site) is located in central Jackson County approximately 2 miles east of Sylva, NC (**Figure 1**). The site encompasses 5.8 acres of formerly agricultural land and includes portions of Bumgarner Branch and three unnamed tributaries that, for purposes of the project, are referred to as Junes Branch, Higdon Branch, and Doris Branch. The Site is located within the Little Tennessee River Basin, United States Geological Survey (USGS) 14-digit Hydrologic Unit 06010203020010, and the North Carolina Division of Environmental Quality (NCDEQ) sub basin 04-04-02. The site watershed is characteristic of the Blue Ridge region with moderate rainfall with annual precipitation averaging 52.9 inches. Elevation within the site ranges from 2,200 feet at the northwestern extent, to 2,150 feet along Junes Branch. The drainage area of Bumgarner Branch at the downstream end of the Site is 1.03 square miles (668 acres). Land use within the watershed is predominately forested (68%) with the remaining land use composed of low-density residential (21%) and agricultural (11%). Additional information regarding project setting and background is found in the Final Mitigation Plan (EBX 2013).

Following 2016 monitoring the NCIRT requested a review of the differential between the Approved Mitigation Plan and Baseline Monitoring Report. The table below details the discrepancies by reach. The cause of increased baseline SMUs is construction field adjustments and survey methodology (thalweg vs. centerline). The Mitigation Plan lengths were based on centerline.

Reach	Mitigation Type*	Proposed Length (LF)	Mitigation Ratio	Proposed SMUs	Baseline SMUs
Bumgarner Branch 1	P1 Restoration	594	1:1	594	631
Bumgarner Branch 2	P1 Restoration	476	1:1	476	501
June's Branch	P1 Restoration	1,319	1:1	1,319	1,374
Higdon Branch	P1 Restoration	422	1:1	422	376
Doris Branch	P1 Restoration	282	1:1	282	280
Total		3,093		3,093	3,162

*P1=Priority 1

**The contracted amount of credits for this Site is 3,000 SMUs

1.4. Project Approach

Channel restoration involving improved pattern, dimension, and longitudinal profile was completed on all four stream reaches. A Priority I approach was applied to all four reaches of the project (Rosgen 1996; NCSRI 2004).

1.5. Project Performance

Monitoring Year 4 (MY4) data was collected from January 2017 to December 2017. Monitoring included the following activities: visual assessment of all reaches and the surrounding easement, collection of photos at 14 permanent photo stations, documentation of eight permanent vegetation monitoring plots, surveying of 3,050 feet of longitudinal profile and 15 cross-sections, and conducting pebble counts at eight riffles.

Generally, visual assessment of the project as a whole indicates that the streams are performing as desired and, with the exception of one small bare area, vegetation is well established throughout the easement. Summary tables and photos taken at the permanent photo stations associated with the visual assessment are presented in **Appendix B**. Visual assessment of the stream was performed to document signs of instability, such as eroding banks, in-stream structural instability, or excessive sedimentation. One small area of degradation was observed on Bumgarner I (**Table 5 and Figure 2**). Structures are intact and

performing as designed. Herbaceous vegetation has become well established in both the wetland fringes along the stream as well as upland areas. Planted stems are becoming well established; however, one bare areas totaling 0.03 acres was noted along Junes Branch (**Table 6, Figure 2**). This area is improving and will be monitored in future site visits for woody recruitment and the establishment of herbaceous vegetation.

In April of 2017, RES and the IRT met to discuss the sediment aggradation noted on Doris Branch and Higdon Branch. On Higdon Branch, the IRT agreed there was sediment aggradation but a defined channel was present. No maintenance, remedial actions or credit deductions were requested. On Doris Branch, however, the sedimentation had diminished the distinct channel features. The IRT requested no specific maintenance and recommended a final decision on crediting be made after additional monitoring. The IRT also noticed that overall Junes Branch has a high sediment load but concluded that it appeared to be maintaining appropriate geomorphology. The meeting summary is documented in **Appendix F**.

Summary information and data related to the occurrence of items such as beaver activity or 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 Baseline Monitoring Report (formerly the Mitigation Plan) and in the Mitigation Plan (formerly the Restoration Plan) documents available on NCDMS' website (<http://deq.nc.gov/about/divisions/mitigation-services>). All raw data supporting the tables and figures in the appendices is available from NCDMS upon request.

1.5.1. Vegetation

Monitoring of eight permanent vegetation plots was completed during October 2017. Summary tables and photographs associated with MY4 monitoring can be found in **Appendix C**. With the exception of Plot 2, MY4 monitoring data indicates that all vegetation monitoring plots met the MY4 interim success criteria of 260 planted stems per acre. Low planted stem densities at Plot 2 can be attributed to thick herbaceous vegetation and a large density of recruited black willows (*Salix nigra*) outcompeting the planted stems. While vegetation Plot 2 is not meeting success criteria for planted stems, with recruits, the stem density 8,498 stems/ acre, far exceeding the MY4 interim success criteria of 260 stems per acre. Eleven species were documented in the plots as volunteers: red maple (*Acer rubrum*), hazel alder (*Alnus serrulata*), river birch (*Betula nigra*), shagbark hickory (*Carya ovata*), silky dogwood (*Cornus amomum*), flowering dogwood (*Cornus florida*), green ash (*Fraxinus pennsylvanica*), tulip poplar (*Liriodendron tulipifera*), sycamore *Platanus occidentalis*), black cherry (*Prunus serotina*), and black willow (*Salix nigra*). Planted stem densities among the plots ranged from 162 to 1,012 planted stems per acre with a mean of 622 stems per acre across all plots. When volunteer stems are included, densities ranged between 688 and 8,498 total stems per acre with a mean of 2,327 stems per acre across all plots. The estimated average plot tree height was 223 cm (7.3 ft). No invasive species were observed in the easement in MY4. RES will continue to monitor for invasive species and will treat them as needed in the upcoming monitoring year.

1.5.2. Stream Geomorphology

Geomorphic data for MY4 was collected in December 2017. Cross-section plots, longitudinal profiles, and summary tables related to stream morphology are located in **Appendix D**. The MY4 stream morphology data indicate that, in general, streams are stable. Cross-section and longitudinal profile data suggests that Higdon Branch and Doris Branch continue to display aggradation; however, Higdon Branch still has an obvious, defined channel with regular baseflow. As for Bumgarner Branch and Junes Branch, several small changes were noted in the cross-section dimensions and longitudinal profile; however, these

are minor and do not exceed expected adjustments in channel form. Starting in MY4, BHR 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. None of the riffle cross sections exceeded a 1.2 BHR.

MY4 substrate monitoring was performed in December 2017 (**Table 12 & Charts 1-6**). The pebble counts fell into the coarse gravel range for Bumgarner I and II, and Junes Branch and remained in the silt/clay range for both the Higdon and Doris Branches. The channel substrate will be monitored in future years for shifts in particle size distributions.

Overall, documented shifts in stream morphology do not exceed expectations between MY3 and MY4 as the newly reconstructed streams adjust to conditions at the site. The project is meeting success criteria regarding stable dimension and profile as well as substrate and sediment transport with the exception of Doris Branch. As for Doris Branch, the IRT requested no specific maintenance and recommended a final decision on crediting be made after additional monitoring.

1.5.3. Stream Hydrology

Stream hydrology is documented utilizing manual crest gauges to record bankfull events (**Table 13**). Manual crest gauge readings were collected in April, October, and December of MY4. There were two bankfull events recorded in MY4 on Junes Branch, documented in December 2017. Based on the precipitation data, the highest bankfull event most likely occurred in October. Junes Branch has had three bankfull events since construction was completed in June 2014. There were no bankfull events recorded on the Bumgarner II Branch in MY4 but this reach has had three total events since construction. Both crest gauges had to be maintained in October of MY4, to clear the bottom of the gauge of sediment. Additionally, the Bumgarner II Branch crest gauge had to be elevated, since the bottom of the gauge had been buried in the bank, likely from high flow events.

2.0 METHODS

Visual assessment of the Junes Branch restoration site was performed at the beginning of the monitoring period. Permanent photo station photos were collected during the initial visual assessment. Vegetation or stream problem areas occurring outside of the monitoring stations were documented with additional photographs.

Geomorphic measurements were taken during low flow conditions using a Topcon GTS-312 Total Station. Three-dimensional coordinates associated with cross-sections and longitudinal profiles were collected in the field and geo-referenced (NAD83 State Plane feet FIPS 3200). Morphological data was limited to 15 cross-sections, and 3,050 feet of longitudinal profile. Survey data were imported into CAD, ArcGIS®, and Microsoft 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 at eight permanent monitoring plots. Vegetation monitoring follows the CVS-EEP Level 2 Protocol for Recording Vegetation, Version 4.2 (Lee et al. 2008) and includes analysis of composition and density of planted species. Data are 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 were collected using an Onset® HOBO® Data Logging Rain Gauge. Bankfull events were documented with crest gauges. 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

EBX (Environmental Banc and Exchange). 2013. Junes Branch Stream Restoration, Final Mitigation Plan, Jackson County, North Carolina. NCEEP Project No. 95027.

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. <http://cvs.bio.unc.edu/methods.htm>.

NCSRI (North Carolina Stream Restoration Institute). 2004. Stream Restoration: A Natural Channel Design Handbook. North Carolina Stream Restoration Institute and North Carolina Sea Grant. Raleigh. <http://www.bae.ncsu.edu/programs/extension/wqg/srp/guidebook.html>

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology. 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

General Tables and Figures

Table 1. Project Components and Mitigation Credits

Table 2. Project Activity and Reporting History

Table 3. Project Contacts

Table 4. Project Information

Figure 1. Vicinity Map

**Table 1. Project Components and Mitigation Credits
Junes Branch / Project Number 95027**

Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	3,093	-	-	-	-	-	-	-	-
Project Components									
Project Component -or- Reach ID	Stationing/Location		Existing Footage/Acreage		Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	Restoration Footage or Acreage		Mitigation Ratio
Bumgarner Branch I	100+37 - 107+27		610		PI	R	594		1:1
Bumgarner Branch II	107+27 - 112+50		550		PI	R	476		1:1
June's Branch	200+97 - 215+15		1,311		PI	R	1,319		1:1
Higdon Branch	300+46 - 304+08		530		PI	R	422		1:1
Doris Branch	400+00 - 402+37		260		PI	R	282		1:1
Component Summation									
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)	Upland (acres)			
		Riverine	Non-Riverine						
Restoration	3,093	-	-	-	-	-			
Enhancement	-	-	-	-	-	-			
Enhancement I	-	-	-	-	-	-			
Enhancement II	-	-	-	-	-	-			
Creation	-	-	-	-	-	-			
Preservation	-	-	-	-	-	-			
High Quality Preservation	-	-	-	-	-	-			
BMP Elements									
Element	Location		Purpose/Function			Notes			
FB	Entire Site		Protect Stream						

¹BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer

Note: Stream credit calculations were originally calculated along the as-built thalweg. Based on the April 3, 2017 IRT Credit Release Meeting, these stream credits have been reverted back to the amounts in the IRT approved mitigation plan

Table 2. Project Activity and Reporting History**Junes Branch / Project Number 95027**

Activity or Report	Data Collection Complete	Completion or Delivery
Mitigation Plan	Aug-12	Apr-13
Final Design - Construction Plans	-	Apr-13
Construction	-	Jun-14
Temporary S&E Mix Applied to Entire Project Area		May-14
Permanent Seed Mix Applied		May-14
Containerized and B&B Plantings		May-14
Baseline Monitoring Document (Year 0 Monitoring - Baseline)	Jul-14	Jul-14
Year 1 Invasive Species Treatment	-	Oct-14
Year 1 Monitoring	Jan-15	Feb-15
Year 2 Monitoring	Nov-15	Nov-15
Year 3 Monitoring	Dec-16	Dec-16
Year 4 Monitoring	Vegetation: Oct-17 Stream: Nov-17	Jan-18
Year 5 Monitoring		

Table 3. Project Contacts	
Junes Branch Stream Restoration Site – Project # 95027	
Prime Contractor	Resource Environmental Solutions, LLC 302 Jefferson St., Suite 110 Raleigh, North Carolina 27605 Brian Hockett (919) 209-1061
Designer	Wolf Creek Engineering 12-1/2 Wall St., Suite C Asheville, North Carolina 28801 Grant Ginn (828) 449-1930 ext 102
Construction Contractor	Northstate Environmental 2889 Lowery Street Winston Salem, North Carolina 27101 Darrell Westmoreland (336) 725-2010
Planting Contractor	Northstate Environmental 2889 Lowery Street Winston Salem, North Carolina 27101 Darrell Westmoreland (336) 725-2010
As-built Surveys	Kee Mapping and Surveying PO Box 2566 Asheville, North Carolina 28802 Phillip B. Key (828) 575-9021
Seeding Mix Source	Green Resource 5204 Highgreen Court Colfax, North Carolina 27235 (336) 855-6363
Bare Root Seedlings	Dykes & Son Nursery 825 Maude Etter Road McMinnville, Tennessee (931) 668-8833
Live Stakes	Foggy Mountain Nursery 797 Helton Creek Road Lansing, North Carolina 28643 (336) 384-5323
Monitoring Performers (Y0-MY3) 2014 - 2016	Equinox 37 Haywood St. Asheville, North Carolina 28801 Drew Alderman (828) 253-6856
Monitoring Performers (Y4-MY5) 2017-2018	Resource Environmental Solutions, LLC 302 Jefferson St., Suite 110 Raleigh, North Carolina 27605 Ryan Medric (919) 741-6268

Table 4. Project Baseline Information and Attributes

Junes Branch Stream Restoration Site – Project # 95027

Project Information

Project Name	Junes Branch
County	Jackson County
Project Area (acres)	5.8 ac.
Project Coordinates (latitude and longitude)	35.357378° N; 83.191391° W

Project Watershed Summary Information

Physiographic Province	Blue Ridge		
River Basin	Little Tennessee		
USGS Hydrologic Unit 8-digit	06010203	USGS Hydrologic Unit 14-digit	6010203020010
DWQ Sub-basin	4/4/2002		
Project Drainage Area (acres)	668		
Project Drainage Area Percentage of Impervious Area	<5%		
CGIA Land Use Classification	2.01.03 Hay and Pasture Land		

Reach Summary Information

Parameters	Bumgarner Br. I	Bumgarner Br. II	Junes Br.	Higdon Br.	Doris Br.
Length of reach (linear feet)	610	550	1,311	530	260
Valley classification (Rosgen)	II	II	II	II	II
Drainage area	0.93	1.03	0.23	0.08	0.01
NCDWQ stream identification score	40	40	38	38	29.5
NCDWQ Water Quality Classification	C	C	-	-	-
Morphological Description (stream type) (Rosgen)	E	G	G	E	G
Evolutionary trend (Rosgen)	C	F	F	E	G
Underlying mapped soils	CwA, WtB	CwA, WtB	WtB	CwA	CwA
Drainage class	Somewhat Poorly Drained- Mod. Well Drained	Somewhat Poorly Drained- Mod. Well Drained	Mod. Well Drained	Somewhat Poorly Drained	Somewhat Poorly Drained
Soil Hydric status	Non-Hydric	Non-Hydric	Non-Hydric	Non-Hydric	Non-Hydric
Slope	2.20%	2.20%	2.30%		
FEMA classification	N/A	N/A	N/A	N/A	N/A
Native vegetation community	Agricultural	Agricultural	Agricultural	Agricultural	Agricultural
Percent composition of exotic invasive vegetation	30%	30%	30%	40%	40%

Wetland Summary Information

Parameters	Wetland 1	Wetland 2
Size of Wetland (acres)	0.03	0.13
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Riparian	Riparian
	Non-Riverine	Non-Riverine
Mapped Soil Series	CwA	CwA
Drainage class	Somewhat Poorly Drained	Somewhat Poorly Drained
Soil Hydric Status	Hydric	Hydric
Source of Hydrology	Seep	Seep
Hydrologic Impairment	None	Dredging/Ditching
Native vegetation community	Scrub-Shrub	Forested
Percent composition of exotic invasive vegetation	2%	42%

Regulatory Considerations

Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States – Section 404	Yes	Resolved	Action ID #2012-01101
Waters of the United States – Section 401	Yes	Resolved	NCDWR Project # 20120748
Endangered Species Act	No	Yes	ERTR
Historic Preservation Act	No	Yes	ERTR
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	
FEMA Floodplain Compliance	N/A	N/A	
Essential Fisheries Habitat	N/A	N/A	

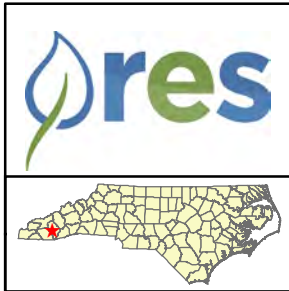
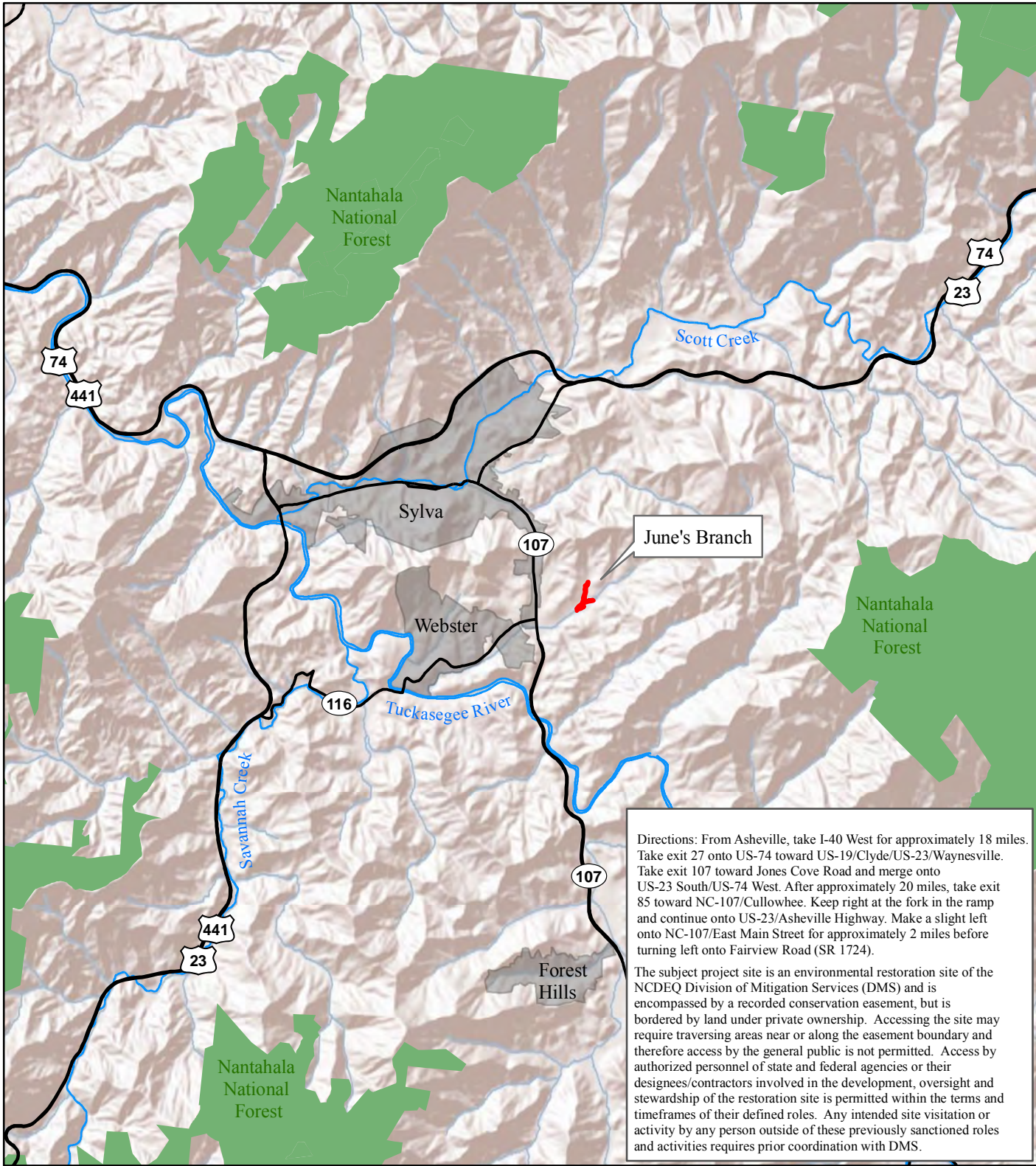
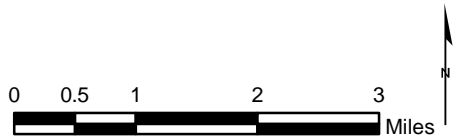


Figure 1: Vicinity Map

June's Branch
Project No. 95027

Jackson County, North Carolina

Notes: Conservation Easement from Key Mapping & Survey, P.A.



Appendix B

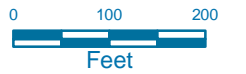
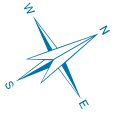
Visual Assessment Data

Figures 2a-c. Current Conditions Plan View Maps

Table 5. Visual Stream Morphology Stability Assessment

Table 6. Vegetation Condition Assessment

Figure 7. 2017 Photo Station Photos



1 inch = 200 feet

Figure 2a.
Junes Branch Stream
Restoration Project
MY4 2017
Current Conditions
Overview Map

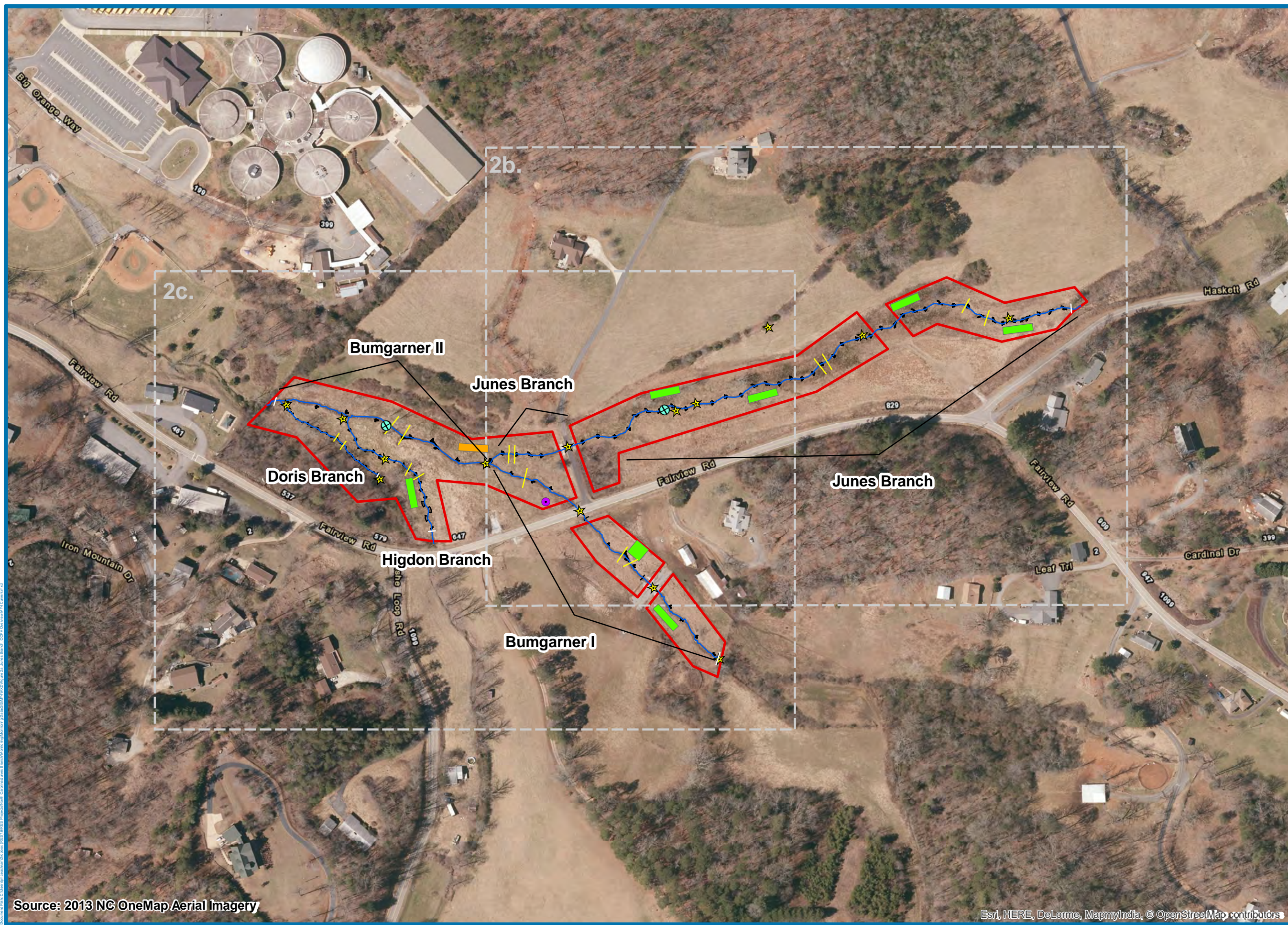
Date: 12/20/2017 | Drawn by: MDE

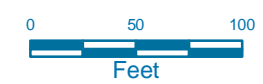
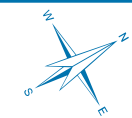
LEGEND

- Conservation Easement
- Stream Restoration
- Rain Gauge
- Photo Station
- Crest Gauge
- Cross Section
- Structure
- Long Pro Begin/End
- Vegetation Plot**
- > 260 stems/acre
- < 260 stems/acre

Riparian Buffer Conditions

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





1 inch = 90 feet

Figure 2c. Junes Branch Stream Restoration Project MY4 2017

Current Conditions Plan View

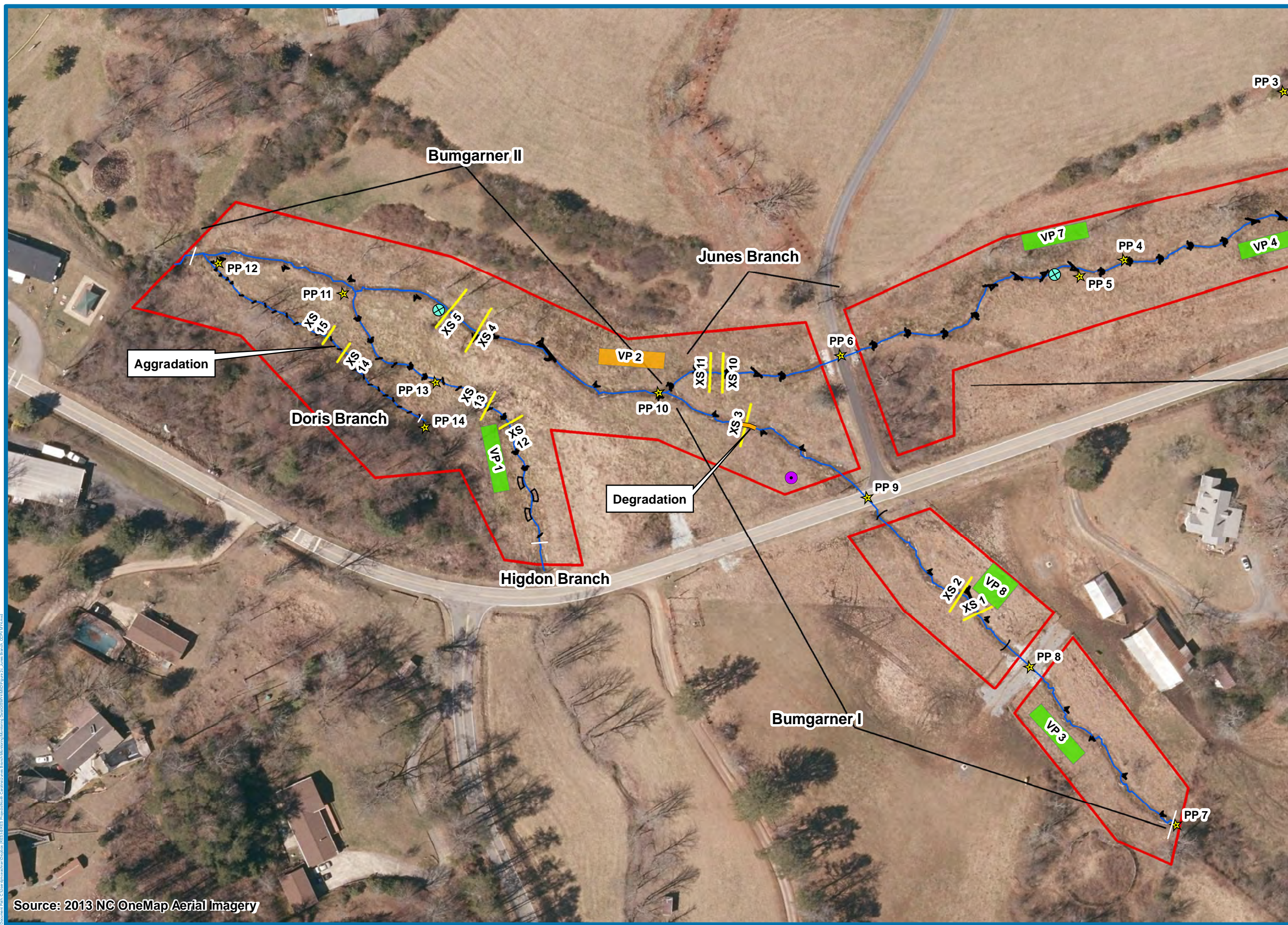
Date: 12/21/2017 Drawn by: MDE

LEGEND

- Conservation Easement
 - Stream Restoration
 - Rain Gauge
 - Photo Station
 - Crest Gauge
 - Cross Section
 - Stream Problem Areas
 - Structure
 - Long Pro Begin/End
- Vegetation Plot
- > 260 stems/acre
 - < 260 stems/acre

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

Table 5. Visual Stream Morphology Stability Assessment Junes Branch / Project No. 95027 - Bumgarner Branch I Assessed Length 631 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>A</u> egradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. <u>D</u> egradation - Evidence of downcutting.			1	20	97%			
	2. Riffle Condition	1. <u>T</u> exture/Substrate - Riffle maintains coarser substrate.	13	13		100%				
	3. Meander Pool Condition	1. <u>D</u> epth Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6).	13	13		100%				
		2. <u>L</u> ength appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	N/A	N/A		N/A				
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	13	13		100%				
		2. Thalweg centering at downstream of meander bend (Glide).	12	12		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.	14	14		100%				
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	14	14		100%				
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	14	14		100%				
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	14	14		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.	14	14		100%				

Table 5 con'td. Visual Stream Morphology Stability Assessment

Junes Branch / Project No. 95027 - Bumgarner Branch II												
Assessed Length 543 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.					100%					
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	7	7			100%					
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6).	8	8			100%					
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	2	2			100%					
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	8	8			100%					
		2. Thalweg centering at downstream of meander bend (Glide).	8	8			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.	7	7			100%					
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	7	7			100%					
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	7	7			100%					
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	7	7			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.	7	7			100%					

N/A - Item does not apply.

Table 5 con'td. Visual Stream Morphology Stability Assessment

Junes Branch / Project No. 95027 - Junes Branch Assessed Length 1,375 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.					100%							
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	45	45			100%							
		3. Meander Pool Condition	1. <u>Depth Sufficient</u> (Max Pool Depth : Mean Bankfull Depth \geq 1.6).	45			45				100%			
	2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).		N/A	N/A			N/A							
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	45	45			100%							
		2. Thalweg centering at downstream of meander bend (Glide).	45	45			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	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.	45	45			100%							
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	45	45			100%							
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	45	45			100%							
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	45	45			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.	45	45			100%							

N/A - Item does not apply.

Table 5 con'td. Visual Stream Morphology Stability Assessment

Junes Branch / Project No. 95027 - Higdon Branch											
Assessed Length 376 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.					100%				
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	18	18		100%					
		3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6).	18		18	100%				
	2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).		3	3		100%					
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	18	18		100%					
		2. Thalweg centering at downstream of meander bend (Glide).	18	18		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 NOT 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.	15	15			100%				
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	15	15			100%				
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	15	15			100%				
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	15	15			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.	15	15			100%				

N/A - Item does not apply.

Table 5 con'td. Visual Stream Morphology Stability Assessment

Table 5 cont'd. Visual Stream Morphology Stability Assessment										
Junee Branch / Project No. 95027 - Doris Branch										
Assessed Length 288 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).			1	288	0%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	23	23			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6).	23	23			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	N/A	N/A			N/A			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	23	23			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	23	23			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.	23	23			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	23	23			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	23	23			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	23	23			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.	23	23			100%			

Table 6. Vegetation Condition Assessment

Table 6. Vegetation Condition Assessment Junes Branch / Project No. 95027								
Planted Acreage: 5.81								
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.				Vertical Red Lines	1	0.03	<1%
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						1	0.03	<1%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.				N/A	0	0.00	0%
Cumulative Totals						1	0.03	<1%
Easement Acreage: 5.81								
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).				N/A	0	0.00	0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).				N/A	0	0.00	0%

N/A - Item does not apply.

Figure 7. 2017 Photo Station Photos



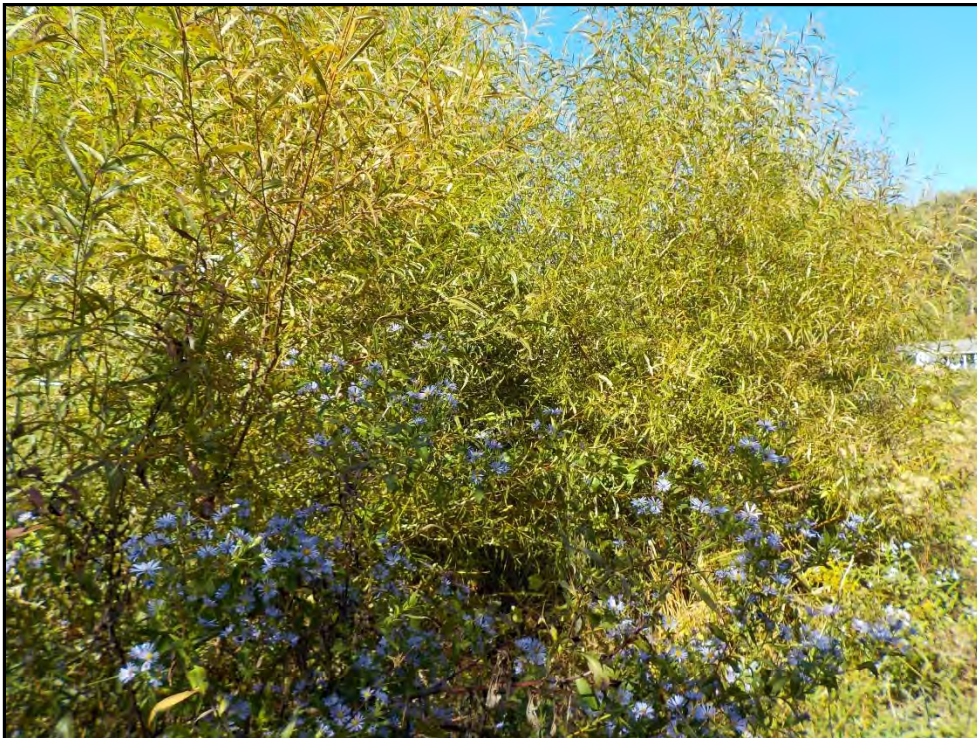
Junes Branch – Permanent Photo Station 1
Station 202+60 – Downstream
October 4, 2017



Junes Branch – Permanent Photo Station 1
Station 202+60 – Upstream
October 4, 2017



Junes Branch – Permanent Photo Station 2
Station 206+30 – Downstream
October 4, 2017



Junes Branch – Permanent Photo Station 2
Station 206+30 – Upstream
October 4, 2017



Junes Branch – Permanent Photo Station 3
Looking South/Downstream Junes Branch
October 4, 2017



Junes Branch – Permanent Photo Station 3
Looking North/Upstream – Upstream
October 4, 2017



Junes Branch – Permanent Photo Station 4
Station 210+60 – Downstream
October 4, 2017



Junes Branch – Permanent Photo Station 4
Station 210+60 – Upstream
October 4, 2017



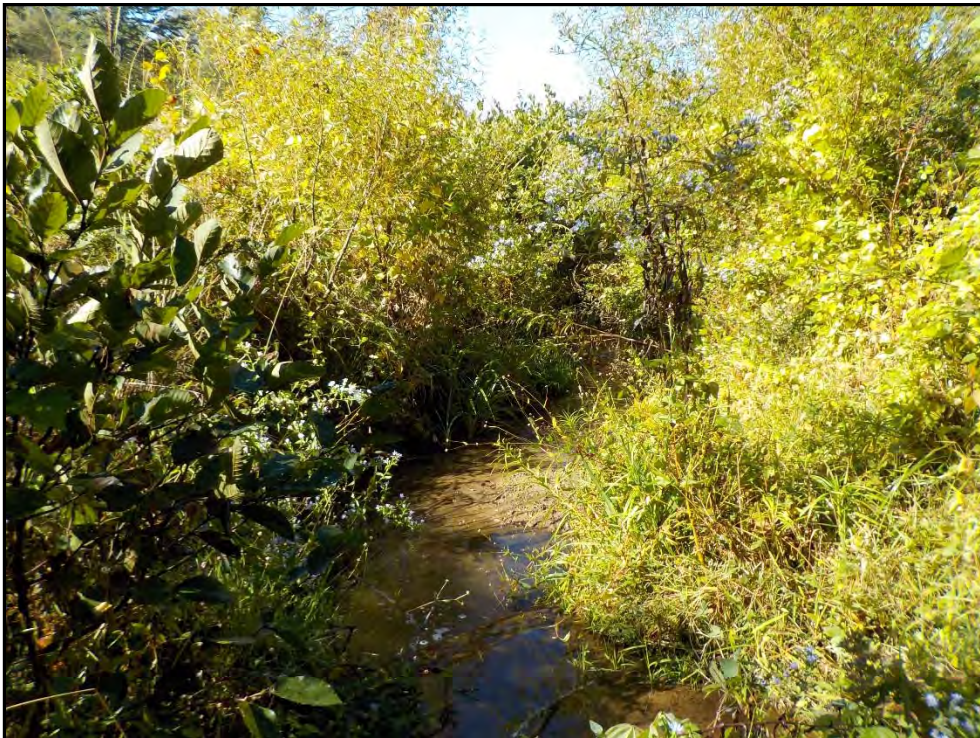
Junes Branch – Permanent Photo Station 5
Station 211+10 – Upstream
October 4, 2017



Junes Branch – Permanent Photo Station 6
Station 214+00 – Downstream
October 4, 2017



Junes Branch – Permanent Photo Station 6
Station 214+00 – Upstream
October 4, 2017



Bumgarner Branch I – Permanent Photo Station 7
Station 100+21 – Downstream
October 5, 2017



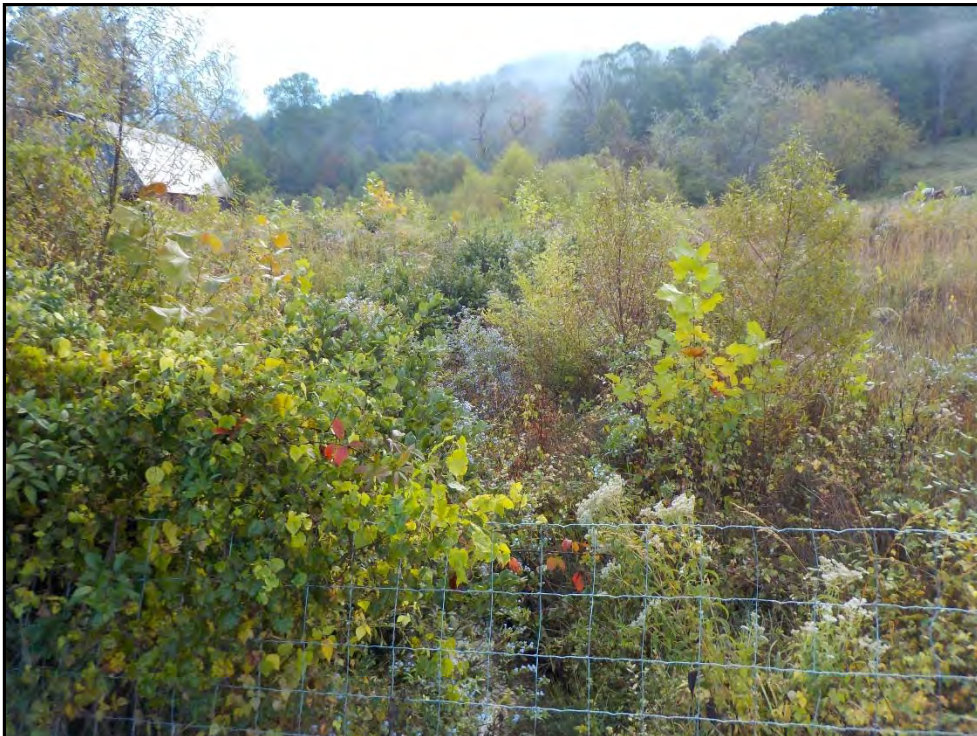
Bumgarner Branch I – Permanent Photo Station 8
Station 102+70 – Downstream
October 5, 2017



Bumgarner Branch I – Permanent Photo Station 8
Station 102+70- Upstream
October 5, 2017



Bumgarner Branch I – Permanent Photo Station 9
Station 105+25 – Downstream
October 5, 2017



Bumgarner Branch I – Permanent Photo Station 9
Station 105+25 – Upstream
October 5, 2017



Bumgarner Branch I – Permanent Photo Station 10
Looking Upstream from Confluence with Junes Branch
October 5, 2017



Junes Branch – Permanent Photo Station 10
Looking Upstream from Confluence with Bumgarner Branch
October 5, 2017



Bumgarner Branch II – Permanent Photo Station 11
Looking Upstream from Confluence with Higdon Branch
October 5, 2017



Higdon Branch – Permanent Photo Station 11
Looking Upstream from Confluence with Bumgarner Branch II
October 5, 2017



Bumgarner Branch II – Permanent Photo Station 12
Looking Upstream from Confluence with Doris Branch
October 5, 2017



Doris Branch – Permanent Photo Station 12
Looking Upstream from Confluence with Bumgarner Branch II
October 5, 2017



Higdon Branch – Permanent Photo Station 13
Station 302+80 – Downstream
October 5, 2017



Higdon Branch – Permanent Photo Station 13
Station 302+80 – Upstream
October 5, 2017



Doris Branch – Permanent Photo Station 14
Station 400+00 – Downstream
October 5, 2017

Appendix C

Vegetation Plot Data

Table 7. Vegetation Plot Mitigation Success Summary

Table 8. CVS Vegetation Metadata

Table 9. Total Planted Stem Counts

Figure 8. Vegetation Plot Photos

Table 7. Vegetation Plot Criteria Attainment

Plot #	Planted Stems/Acre	Volunteer Stems/Acre	Total Stems/Acre	Success Criteria Met?	Average Tree Height (cm)*
01	688	688	1376	Yes	186
02	162	8337	8498	No	166
03	364	2995	3359	Yes	309
04	607	364	971	Yes	150
05	486	202	688	Yes	144
6	1012	445	1457	Yes	216
7	850	526	1376	Yes	316
8	809	81	890	Yes	296
Project Avg	622	1705	2327	Yes	223

*The tallest seven trees were averaged, as this represents 260 stems/acre.

Table 8: CVS Vegetation Plot Metadata

Junes Branch Stream and Wetland Restoration Site	
Report Prepared By	Eric Teitsworth
Date Prepared	10/23/2017 9:48
database name	Junes Branch_MY4_2017.mdb
database location	C:\Users\eteitsworth\Dropbox (RES)\@RES Projects\North Carolina\Junes Branch\Monitoring\Monitoring Data\MY4_2017\Vegetation Data
computer name	D4V0KGH2
file size	61837312
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	95027
project Name	Junes Branch
Description	
River Basin	Little Tennessee
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	8

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

Junes Branch Stream Restoration Site																													
Scientific Name	Common Name	Species Type	Current Plot Data (MY4 2017)																										
			95027-01-0001			95027-01-0002			95027-01-0003			95027-01-0004			95027-01-0005			95027-01-0006			95027-01-0007			95027-01-0008					
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T			
<i>Acer rubrum</i>	Red Maple	Tree			5																								
<i>Alnus serrulata</i>	Hazel Alder	Shrub					1						1					8	8	8	5	5	5	1	1	1			
<i>Betula nigra</i>	River Birch	Tree	4	4	4						4	1	1	2	2	2	3	1	1	3	3	3	3						
<i>Carpinus caroliniana</i> var. <i>ca.</i>	Coastal American Hornbeam	Tree											3	3	3														
<i>Carya ovata</i>	Shagbark Hickory	Tree					1																						
<i>Cornus amomum</i>	Silky Dogwood	Shrub			1															8			11						
<i>Cornus florida</i>	Flowering Dogwood	Tree					1					2	2	2															
<i>Diospyros virginiana</i>	Common Persimmon	Tree														1	1	1						2	2	2			
<i>Fraxinus pennsylvanica</i>	Green Ash	Tree	9	9	9				2	2	2	5	5	8	4	4	5	1	1	1				2	2	2			
<i>Hamamelis virginiana</i> var. <i>v.</i>	American Witchhazel	Tree	1	1	1										1	1	1				1	1	1						
<i>Juglans nigra</i>	Black Walnut	Tree																											
<i>Liriodendron tulipifera</i>	Tuliptree	Tree																											
<i>Liriodendron tulipifera</i> var. <i>t.</i>	Tulip-tree, Yellow Poplar, Whitewood	Tree					1			6	1	1	4	2	2	2	7	7	8	5	5	6							
<i>Platanus occidentalis</i>	American Sycamore	Tree																											
<i>Platanus occidentalis</i> var. <i>oc.</i>	Sycamore, Plane-tree	Tree	1	1	1	4	4	4	7	7	17	2	2	2			2	6	6	6	7	7	8	15	15	15			
<i>Prunus cerasus</i>	Sour Cherry	Exotic																											
<i>Prunus serotina</i>	Black Cherry	Tree			1																								
<i>Prunus serotina</i> var. <i>serotina</i>	Black Cherry	Tree													2	2	2												
<i>Quercus</i>	Oak	Tree	1	1	1																								
<i>Quercus michauxii</i>	Swamp Chestnut Oak	Tree	1	1	1																								
<i>Quercus phellos</i>	Willow Oak	Tree															2	2	2										
<i>Quercus rubra</i>	Northern Red Oak	Tree										1	1	1															
<i>Quercus rubra</i> var. <i>rubra</i>	Northern Red Oak	Tree																											
<i>Salix nigra</i>	Black Willow	Tree			10			202			54			1			1									2			
<i>Sambucus canadensis</i>	Common Elderberry	Shrub																											
Unknown		Shrub or Tree																											
<i>Vitis aestivalis</i>	Summer Grape	Vine																											
<i>Vitis rotundifolia</i>	Muscadine	Vine																											
Stem count			17	17	34	4	4	210	9	9	83	15	15	24	12	12	17	25	25	36	21	21	34	20	20	22			
size (ares)			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		
Species count			6	6	10	1	1	6	2	2	5	7	7	9	6	6	8	6	6	7	5	5	6	4	4	5			
Stems per ACRE			688	688	1376	162	162	8498	364	364	3359	607	607	971	486	486	688	1012	1012	1457	850	850	1376	809	809	890			

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

Color Key

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Recruit Stems

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

Junes Branch Stream Restoration Site																	
Scientific Name	Common Name	Species Type	Annual Means														
			MY4 (2017)			MY3 (2016)			MY2 (2015)			MY1 (2015)			MY0 (2014)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	Red Maple	Tree			5												
<i>Alnus serrulata</i>	Hazel Alder	Shrub	14	14	16	13	13	15			5						
<i>Betula nigra</i>	River Birch	Tree	11	11	19	9	9	13	5	5	20	6	6	6	11	11	11
<i>Carpinus caroliniana</i> var. <i>co</i>	Coastal American Hornbeam	Tree	3	3	3	4	4	4	5	5	5	5	5	5	4	4	4
<i>Carya ovata</i>	Shagbark Hickory	Tree			1												
<i>Cornus amomum</i>	Silky Dogwood	Shrub			20			50			3						
<i>Cornus florida</i>	Flowering Dogwood	Tree	2	2	3	2	2	2	3	3	3	3	3	3	3	3	3
<i>Diospyros virginiana</i>	Common Persimmon	Tree	3	3	3	3	3	6			4						
<i>Fraxinus pennsylvanica</i>	Green Ash	Tree	23	23	27	25	25	28	20	20	28	20	20	20	21	21	21
<i>Hamamelis virginiana</i> var. <i>v</i>	American Witchhazel	Tree	3	3	3	3	3	3	3	3	3	5	5	5	5	5	5
<i>Juglans nigra</i>	Black Walnut	Tree				1	1	6	1	1	5	1	1	1	1	1	1
<i>Liriodendron tulipifera</i>	Tuliptree	Tree									5						
<i>Liriodendron tulipifera</i> var. <i>var.</i>	Tulip-tree, Yellow Poplar, Whitewood	Tree	15	15	27	17	17	17	4	4	4	6	6	6	7	7	7
<i>Platanus occidentalis</i>	American Sycamore	Tree									24						
<i>Platanus occidentalis</i> var. <i>o</i>	Sycamore, Plane-tree	Tree	42	42	55	43	43	53	16	16	16	17	17	17	17	17	17
<i>Prunus cerasus</i>	Sour Cherry	Exotic						3									
<i>Prunus serotina</i>	Black Cherry	Tree			1												
<i>Prunus serotina</i> var. <i>serotin</i>	Black Cherry	Tree	2	2	2	2	2	2	2	2	2	1	1	1	3	3	3
<i>Quercus</i>	Oak	Tree	1	1	1	2	2	2	4	4	4	6	6	6	6	6	6
<i>Quercus michauxii</i>	Swamp Chestnut Oak	Tree	1	1	1	1	1	1									
<i>Quercus phellos</i>	Willow Oak	Tree	2	2	2	2	2	2			2						
<i>Quercus rubra</i>	Northern Red Oak	Tree	1	1	1												
<i>Quercus rubra</i> var. <i>rubra</i>	Northern Red Oak	Tree				1	1	1	3	3	3	6	6	6	5	5	5
<i>Salix nigra</i>	Black Willow	Tree			270			77			53			81			
<i>Sambucus canadensis</i>	Common Elderberry	Shrub									3						
Unknown	Shrub or Tree														4	4	4
<i>Vitis aestivalis</i>	Summer Grape	Vine									2						
<i>Vitis rotundifolia</i>	Muscadine	Vine									2						
Stem count			123	123	460	128	128	285	66	66	196	76	76	157	87	87	87
size (ares)			8			8			5			5			5		
size (ACRES)			0.20			0.20			0.12			0.12			0.12		
Species count			14	14	19	15	15	18	11	11	21	11	11	12	12	12	12
Stems per ACRE			622	622	2327	647	647	1442	534	534	1586	615	615	1271	704	704	704

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

Color Key

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Recruit Stems

Figure 8. Vegetation Plot Photos



Junes Branch - Vegetation Monitoring Plot 1
October 5, 2017



Junes Branch - Vegetation Monitoring Plot 2
October 5, 2017



Junes Branch - Vegetation Monitoring Plot 3
October 5, 2017



Junes Branch - Vegetation Monitoring Plot 4
October 4, 2017



Junes Branch - Vegetation Monitoring Plot 5
October 4, 2017



Junes Branch - Vegetation Monitoring Plot 6
October 4, 2017



Junes Branch - Vegetation Monitoring Plot 7
October 4, 2017



Junes Branch - Vegetation Monitoring Plot 8
October 5, 2017

Appendix D

Stream Geomorphology Data

Table 11a. Dimensional Morphology Summary

Table 11b. Stream Reach Data Summary

Figure 9. Cross Section Plots

Longitudinal Profile with Annual Overlay

Figure 10. Pebble Count Data

Table 12. Pebble Count Data Summary

Charts 1-11. MY4 Stream Reach Substrate Composition Charts

**Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Sections)
Junes Branch / Project No. 95027 - Bumgarner I (631 feet)**

	Cross-Section 1 Riffle						Cross-Section 2 Pool						Cross-Section 3 Riffle					
Dimension	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record Elevation (datum) Used	2,153.11	2,153.11	2,153.11	2,153.11	2,153.11		2,152.68	2,152.68	2,152.68	2,152.68	2,152.68		2,145.60	2,145.60	2,145.60	2,145.60	2,145.60	
Bankfull Width (ft)	13.3	13.4	12.7	12.9	13.2		13.4	13.1	13.2	12.7	13.4		15.8	16.8	16.3	18.0	18.3	
Floodprone Width (ft)	>79	>79	>79	>79	>33		>124	>124	>124	124	>39		>42	>42	>42	>42	>42	
Bankfull Mean Depth (ft)	0.9	0.8	0.8	0.7	0.7		1.5	1.1	0.9	0.9	0.9		0.8	0.9	0.9	0.9	1.0	
Bankfull Max Depth (ft)	1.5	1.3	1.3	1.4	1.5		2.9	1.9	2.1	2.0	2.3		1.2	1.7	1.9	2.1	2.2	
Bankfull Cross Sectional Area (ft ²)	11.7	11.3	10.2	9.6	8.6		20.6	14.0	12.2	11.3	12.2		12.2	14.5	14.8	15.8	17.5	
Bankfull Width/Depth Ratio	15.2	15.8	15.8	17.2	20.2		8.7	12.3	14.3	14.4	14.6		20.4	19.4	18.0	20.5	19.1	
Bankfull Entrenchment Ratio	>5.9	>5.9	>6.2	6.1	>2.5		>9.3	>9.5	>9.4	>9.7	N/A		>2.7	>2.5	>2.6	>2.3	>2.3	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.1	1.1		1.0	1.0	1.0	1.0	N/A		1.0	1.0	1.0	1.0	0.9	
d50 (mm)	N/A	27	0.67	1.5	15		N/A	N/A	N/A	N/A	N/A		N/A	16	0.68	0.24	14	

N/A - Item does not apply.

**Table 11a cont'd. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Sections)
Junes Branch / Project No. 95027 - Bumgarner II (543 feet)**

	Cross-Section 4 Pool						Cross-Section 5 Riffle					
Dimension	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record Elevation (datum) Used	2,140.17	2,140.17	2,140.17	2,140.17	2,140.17		2,139.81	2,139.81	2,139.81	2,139.81	2,139.81	
Bankfull Width (ft)	16.5	16.1	16.5	15.2	13.8		16.3	15.7	16.2	16.0	15.1	
Floodprone Width (ft)	>50	>50	>50	>50	>49		>48	>48	>48	>48	>47	
Bankfull Mean Depth (ft)	1.4	1.2	1.1	1.2	1.2		0.7	0.9	0.8	0.9	0.6	
Bankfull Max Depth (ft)	2.6	2.4	2.5	2.3	2.3		1.2	1.3	1.3	1.4	1.4	
Bankfull Cross Sectional Area (ft ²)	23.0	18.9	18.5	17.9	16.6		11.9	13.4	12.6	13.7	9.4	
Bankfull Width/Depth Ratio	11.9	13.7	14.8	12.8	11.5		22.2	18.4	20.8	18.6	24.3	
Bankfull Entrenchment Ratio	>3.0	>3.1	>3.0	>3.3	N/A		>3.0	>3.1	>3	>3.0	>3.1	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	N/A		1.0	1.0	1.0	1.0	1.1	
d50 (mm)	N/A	N/A	N/A	N/A	N/A		N/A	25	4.9	4.3	57	

N/A - Item does not apply.

Note: Starting in MY4, 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 11a cont'd. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Sections)
Junes Branch / Project No. 95027 - Junes (1,375 feet)**

	Cross-Section 6 Riffle						Cross-Section 7 Pool						Cross-Section 8 Riffle					
Dimension	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record Elevation (datum) Used	2,172.66	2,172.66	2,172.66	2,172.66	2,172.66		2,171.35	2,171.35	2,171.35	2,171.35	2,171.35		2,163.28	2,163.28	2,163.28	2,163.28	2,163.28	
Bankfull Width (ft)	8.6	8.8	8.0	6.3	3.9		8.2	8.8	7.8	8.3	6.8		9.6	10.8	10.6	10.6	10.1	
Floodprone Width (ft)	>94	>94	>94	>94	>23		>111	>111	>111	>111	>32		>53	>53	>53	>53	>36	
Bankfull Mean Depth (ft)	0.4	0.5	0.4	0.3	0.2		1.0	0.7	0.6	0.4	0.4		0.7	0.6	0.5	0.5	0.4	
Bankfull Max Depth (ft)	0.7	0.9	0.7	0.5	0.5		2.1	1.6	1.3	1.0	1.3		1.2	1.1	1.0	1.2	1.1	
Bankfull Cross Sectional Area (ft ²)	3.7	4.1	3.0	1.7	0.8		8.6	6.1	4.8	3.7	2.7		6.4	6.4	5.7	5.6	3.6	
Bankfull Width/Depth Ratio	19.7	18.9	21.7	23.0	19.4		7.9	12.7	12.7	18.8	17.0		14.3	18.2	19.8	20.0	28.3	
Bankfull Entrenchment Ratio	>11.0	>10.7	>11.7	>14.8	>5.8		>13.5	>12.6	>14.2	>13.4	N/A		>5.5	>4.9	>5.0	>5.0	>3.6	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.1		1.0	1.0	1.0	1.0	N/A		1.0	1.0	1.0	1.0	1.0	
d50 (mm)	N/A	1.4	0.13	0.062	2.8		N/A	N/A	N/A	N/A	N/A		N/A	4.7	0.65	0.062	1.9	

N/A - Item does not apply.

**Table 11a cont'd. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Sections)
Junes Branch / Project No. 95027 - Junes (1,375 feet)**

	Cross-Section 9 Pool						Cross-Section 10 Pool						Cross-Section 11 Riffle					
Dimension	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record Elevation (datum) Used	2,162.64	2,162.64	2,162.64	2,162.64	2,162.64		2,144.35	2,144.35	2,144.35	2,144.35	2,144.35		2,143.99	2,143.99	2,143.99	2,143.99	2,143.99	
Bankfull Width (ft)	10.5	11.1	10.1	9.8	7.3		11.0	10.9	11.0	10.3	10.7		9.8	9.0	8.6	9.2	10	
Floodprone Width (ft)	>56	>56	>56	>56	>36		>39	>39	>39	>39	>39		>38	>38	>38	>38	>38	
Bankfull Mean Depth (ft)	1.0	0.8	0.7	0.9	0.4		0.8	0.7	0.7	0.7	0.7		0.6	0.6	0.6	0.6	0.6	
Bankfull Max Depth (ft)	2.0	1.8	1.6	2.0	0.9		1.7	1.5	1.5	1.5	1.6		1.2	1.0	1.2	1.3	1.4	
Bankfull Cross Sectional Area (ft ²)	10.5	8.4	7.5	8.4	3.3		9.0	7.9	7.6	7.6	7.9		5.8	5.2	5.2	5.7	5.7	
Bankfull Width/Depth Ratio	10.4	14.7	13.7	11.5	16.3		13.4	15.0	16.1	14.1	14.3		16.5	15.9	14.1	14.7	17.6	
Bankfull Entrenchment Ratio	>5.3	>5	>5.5	>5.7	N/A		>3.5	>3.5	>3.5	>3.8	N/A		>3.9	>4.2	>4.4	>4.1	>3.8	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	N/A		1.0	1.0	1.0	1.0	N/A		1.0	1.0	1.0	1.1	1.0	
d50 (mm)	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		N/A	12	0.21	4.3	27	

N/A - Item does not apply.

Note: Starting in MY4, 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 11a. cont'd. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Sections)
Junec Branch / Project No. 95027 -Higdon Branch (376 feet)**

Dimension	Cross-Section 12 Riffle						Cross-Section 13 Pool					
	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record Elevation (datum) Used	2,140.85	2,140.85	2,140.85	2,140.85	2,140.85		2,140.14	2,140.14	2,140.14	2,140.14	2,140.14	
Bankfull Width (ft)	6.6	8.1	7.0	7.7	5.4		8.0	7.2	7.0	7.0	5.6	
Floodprone Width (ft)	>40	>40	>40	>40	>21		>30	>30	>30	>30	>8	
Bankfull Mean Depth (ft)	0.4	0.3	0.3	0.3	0.2		0.7	0.6	0.3	0.3	0.1	
Bankfull Max Depth (ft)	0.7	0.7	0.9	0.7	0.6		1.7	1.1	0.5	0.4	0.1	
Bankfull Cross Sectional Area (ft ²)	2.5	2.6	2.4	2.1	1.2		5.9	4.0	2.1	1.9	0.5	
Bankfull Width/Depth Ratio	17.6	24.7	20.6	28.8	23.3		10.8	13.0	23.9	25.5	62.5	
Bankfull Entrenchment Ratio	>6.0	>4.9	>5.6	>5.2	>3.9		>3.7	>4.1	>4.2	>4.3	N/A	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.1		1.0	1.0	1.0	1.1	N/A	
d50 (mm)	N/A	15	0.13	0.062	0.062		N/A	N/A	N/A	N/A	N/A	

N/A - Item does not apply.

Note: Starting in MY4, 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 11a. cont'd Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Sections)
Junes Branch / Project No. 95027 -Doris Branch (288 feet)**

Dimension	Cross-Section 14 Riffle						Cross-Section 15 Pool					
	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record Elevation (datum) Used	2,138.93	2,138.93	2,138.93	2,138.93	2,138.93		2,138.74	2,138.74	2,138.74	2,138.74	2,138.74	
Bankfull Width (ft)	6.2	6.6	6.9	7.3	3.5		11.6	11.7	11.9	12.4	9.5	
Floodprone Width (ft)	>23	>23	>23	>23	>20		>21	>21	>21	>21	>21	
Bankfull Mean Depth (ft)	0.4	0.4	0.3	0.3	0.3		0.8	0.7	0.6	0.5	0.3	
Bankfull Max Depth (ft)	0.7	0.7	0.7	0.7	0.5		2.3	1.7	1.4	1.2	0.8	
Bankfull Cross Sectional Area (ft ²)	2.3	2.4	1.9	2.1	0.9		9.4	8.3	7.4	6.5	2.8	
Bankfull Width/Depth Ratio	16.7	18.2	25.7	25.9	13.3		14.3	16.5	19.1	23.6	32.1	
Bankfull Entrenchment Ratio	>3.8	>3.5	>3.4	>3.2	>5.6		>1.8	>1.8	>1.8	>1.7	N/A	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	N/A	
d50 (mm)	N/A	0.062	0.062	0.062	0.062		N/A	N/A	N/A	N/A	N/A	

N/A - Item does not apply.

Note: Starting in MY4, 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. Monitoring Data - Stream Reach Data Summary
Junes Branch / Project No. 95027 - Bumgarner I (631 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)	13.3	14.6	14.6	15.8	N/A	2	13.4	15.5	15.5	17.6	3.0	2	12.7	14.5	14.5	16.3	2.5	2	12.9	15.4	15.4	18.0	3.6	2	13.2	15.8	15.8	18.3	3.6	2						
Floodprone Width (ft)	>42	>61	>61	>79	N/A	2	>42	>61	>61	>79	26.2	2	>42	>61	>61	>79	26.2	2	>42	>60	>60	>79	26.2	2	>33	>37.5	>37.5	>42	6.4	2						
Bankfull Mean Depth (ft)	0.8	0.9	0.9	0.9	N/A	2	0.8	0.8	0.8	0.8	0	2	0.8	0.9	0.9	0.9	0.1	2	0.7	0.8	0.8	0.9	0.1	2	0.7	0.9	0.9	1.0	0.2	2						
Bankfull Max Depth (ft)	1.2	1.4	1.4	1.5	N/A	2	1.3	1.5	1.5	1.7	0.3	2	1.3	1.6	1.6	1.9	0.4	2	1.4	1.7	1.7	2.1	0.5	2	1.5	1.9	1.9	2.2	0.5	2						
Bankfull Cross-Sectional Area (ft ²)	11.7	12.0	12.0	12.2	N/A	2	11.3	16.4	16.4	21.4	7.1	2	10.2	12.5	12.5	14.8	3.3	2	9.6	12.7	12.7	15.8	4.3	2	8.6	13.1	13.1	17.5	6.3	2						
Width/Depth Ratio	15.2	17.8	17.8	20.4	N/A	2	15.8	18.6	18.6	21.4	4.0	2	15.8	16.9	16.9	18.0	1.6	2	17.2	18.9	18.9	20.5	2.3	2	19.1	19.7	19.7	20.2	0.8	2						
Entrenchment Ratio	>2.7	>4.3	>4.3	>5.9	N/A	2	>2.4	>4.15	>4.15	>5.9	2.5	2	>2.6	>4.4	>4.4	>6.2	2.5	2	>2.3	>4.2	>4.2	>6.1	2.7	2	>2.3	>2.4	>2.4	>2.5	0.1	2						
Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	0.0	2	1.0	1.0	1.0	1.0	0.0	2	1.0	1.1	1.0	1.1	0.1	2	0.9	1.0	1.0	1.1	0.1	2						
Profile																																				
Riffle Length (ft)	0.5	13.7	14.4	23.0	7.4	14	10.5	17.0	14.5	25.6	5.7	11	11.4	17.5	14.9	26.6	6.1	11	9.4	15.5	12.4	27.3	6.3	11	3.3	15.2	14.2	37.2	8.1	13						
Riffle Slope (ft/ft)	0.016	0.061	0.039	0.251	0.063	14	0.019	0.030	0.027	0.055	0.010	11	0.017	0.028	0.025	0.040	0.009	11	0.007	0.022	0.021	0.042	0.012	11	0.001	0.023	0.015	0.061	0.020	13						
Pool Length (ft)	5.2	10.2	9.2	22.5	4.3	12	5.0	7.6	7.3	13.4	2.2	12	5.4	7.7	7.0	12.9	2.1	12	4.9	9.2	8.1	19.1	3.7	12	6.1	12.1	9.6	24.8	5.9	14						
Pool Max Depth (ft)	2.1	2.8	2.8	3.6	0.5	14	1.9	2.5	2.4	3.7	0.5	14	1.9	2.3	2.2	2.7	0.3	14	1.5	1.9	1.9	2.6	0.3	14	2.1	2.6	2.6	3.4	0.3	14						
Pool Spacing (ft)	24.2	45.2	44.1	60.3	10.3	11	25.3	41.8	41.1	59.9	11.9	11	28.8	41.4	37.6	57.5	10.3	11	23.6	41.3	36.3	56.6	10.9	11	25.9	51.7	45.6	106.3	24.1	13						
Pattern																																				
Channel Belt Width (ft)	24.5	25.3	25.3	26.2	N/A	2																														
Radius of Curvature (ft)	41.6	48.3	41.6	60.1	10.3	3																														
Rc: Bankfull Width (ft/ft)	2.8	3.3	2.9	4.1	0.7	3																														
Meander Wavelength (ft)	69.8	81.7	75.9	105.4	16.6	4																														
Meander Width Ratio	1.9	2.0	2.0	2.1	N/A	2																														
Additional Reach Parameters																																				
Rosgen Classification	Bc						B						B						B						B4c											
Channel Thalweg Length (ft)	728						713						704						703						693											
Sinuosity (ft)	1.09						1.09						1.07						1.06						1.06											
Water Surface Slope (Channel) (ft/ft)	0.0233						0.0243						0.0247						0.0247						0.0253											
Bankfull Slope (ft/ft)	0.0235						0.0245						0.0250						0.0254						0.0248											
Ri% / Ru% / P% / G% / S%	37%	32%	24%	7%	0%		38%	34%	19%	9%	0%		40%	35%	19%	7%	0%		35%	36%	23%	6%	0%		29%	33%	24%	14%	0%							
SC% / SA% / G% / C% / B% / Be%*																																				
d16 / d35 / d50 / d84 / d95 (mm)																																				
% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

N/A - Information does not apply.
 Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step
 SC = Silt-Clay / SA = Sand / G = Gravel / C = Cobble / B = Boulder / Be = Bedrock

**Table 11b. Monitoring Data - Stream Reach Data Summary
Junès Branch / Project No. 95027 - Junès Branch (1,375 feet)**

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5					
	Min	Mean	Med	Max	SD	n 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
Bankfull Width (ft)	8.6	9.3	9.6	9.8	0.6	3	8.8	9.6	9.0	10.8	1.1	3	8.0	9.1	8.6	10.6	1.4	3	6.3	8.7	9.2	10.6	2.17	3	3.9	8.0	10.0	10.1	3.6	3						
Floodprone Width (ft)	>38	>62	>53	>94	29,204	3	>38	>62	>53	>94	29.0	3	>38	>62	>53	>94	29.0	3	>38	>62	>53	>94	29	3	>23	>32.3	>36	>38	8.1	3						
Bankfull Mean Depth (ft)	0.4	0.6	0.6	0.7	0.2	3	0.5	0.5	0.6	0.6	0.1	3	0.4	0.5	0.5	0.6	0.1	3	0.3	0.5	0.5	0.6	0.2	3	0.2	0.4	0.4	0.6	0.2	3						
Bankfull Max Depth (ft)	0.7	1.0	1.2	1.2	0.3	3	0.9	1.0	1.0	1.1	0.1	3	0.7	1.0	1.0	1.2	0.3	3	0.5	1.0	1.2	1.3	0.4	3	0.5	1.0	1.1	1.4	0.5	3						
Bankfull Cross-Sectional Area (ft ²)	3.7	5.3	5.8	6.4	1.4	3	4.1	5.2	5.2	6.4	1.2	3	3.0	4.6	5.2	5.7	1.4	3	1.7	4.4	5.6	5.7	2.3	3	0.8	3.4	3.6	5.7	2.5	3						
Width/Depth Ratio	14.3	16.8	16.5	19.7	2.7	3	15.9	17.7	18.2	18.9	1.6	3	14.1	18.5	19.8	21.7	4.0	3	14.7	19.2	20.0	23.0	4.2	3	17.6	21.8	19.4	28.3	5.7	3						
Entrenchment Ratio	>3.9	>6.8	>5.5	>11	3.7	3	>4.2	>6.6	>4.9	>10.7	3.6	3	>4.4	>7.0	>5.0	>11.7	4.1	3	>4.1	>8.0	>5.0	>14.8	5.9	3	>3.6	>4.4	>3.8	>5.8	1.2	3						
Bank Height Ratio	1.0	1.0	1.0	1.0	0	3	1.0	1.0	1.0	1.0	0.0	3	1.0	1.0	1.0	1.0	0.0	3	1.0	1.0	1.0	1.1	0.1	3	1.0	1.0	1.0	1.1	0.1	3						
Riffle Length (ft)	7.8	14.9	14.4	33.7	4.1	44	4.9	13.8	14.1	20.5	3.5	43	5.6	13.6	13.8	20.9	3.4	43	6.2	16.2	16.2	26.9	5.0	43	3.2	16.0	11.6	39.5	8.8	39						
Riffle Slope (ft/ft)	0.007	0.029	0.030	0.052	0.010	44	0.007	0.030	0.032	0.049	0.010	43	0.014	0.034	0.031	0.093	0.014	43	0.004	0.031	0.028	0.081	0.016	43	0.000	0.021	0.021	0.075	0.019	39						
Pool Length (ft)	4.7	10.7	10.4	19.5	3.0	42	1.6	7.8	7.6	14.8	2.9	43	3.7	9.7	9.7	14.5	2.7	43	3.1	8.8	9.0	13.8	2.3	43	4.1	14.0	11.0	27.9	6.4	43						
Pool Max Depth (ft)	1.3	1.9	1.9	3.2	0.4	44	1.0	2.1	2.0	3.8	0.6	43	0.8	2.0	2.0	3.6	0.6	44	0.9	2.0	1.9	3.5	0.6	45	0.6	1.6	1.6	2.8	0.6	43						
Pool Spacing (ft)	12.3	30.0	30.5	42.1	6.2	41	19.7	29.8	31.5	38.2	5.4	40	11.9	29.0	30.0	38.6	6.4	41	9.1	29.1	28.9	40.7	7.4	41	4.1	32.4	26.4	94.8	13.5	42						
Pattern																																				
Channel Belt Width (ft)	18.5	19.7	20.1	21.0	1.5	3																														
Radius of Curvature (ft)	31.9	35.8	36.7	38.9	3.6	3																														
Rc: Bankfull Width (ft/ft)	3.3	3.7	3.8	4.0	0.4	3																														
Meander Wavelength (ft)	53.7	67.1	61.4	88.3	12.5	6																														
Meander Width Ratio	1.9	2.1	2.1	2.2	0.2	3																														
Additional Reach Parameters																																				
Rosgen Classification	Bc						B						B						B						B4c											
Channel Thalweg Length (ft)	1,480						1,427 ²						1,414						1,424						1,405											
Sinuosity (ft)	1.1						1.1						1.1						1.1						1.1											
Water Surface Slope (Channel) (ft/ft)	0.0231						0.0245						0.0271						0.0261						0.0259											
Bankfull Slope (ft/ft)	0.0246						0.0248						0.0272						0.0263						0.0256											
Ri% / Ru% / P% / G% / S%	50%	0%	34%	9%	7%		47%	0%	26%	18%	9%		46%	0%	33%	13%	8%		55%	0%	30%	8%	7%		44%	0%	43%	10%	3%							
SC% / SA% / G% / C% / B% / Be%*																																				
d16 / d35 / d50 / d84 / d95 (mm)																																				
% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

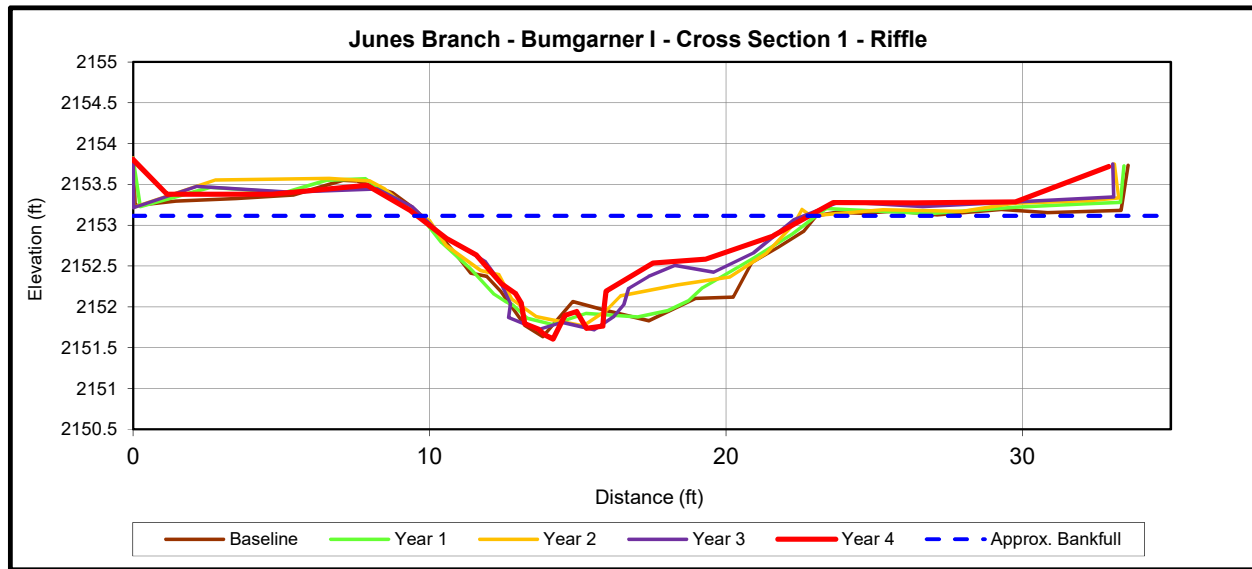
N/A - Information does not apply.
 Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step
 SC = Silt-Clay / SA = Sand / G = Gravel / C = Cobble / B = Boulder / Be = Bedrock



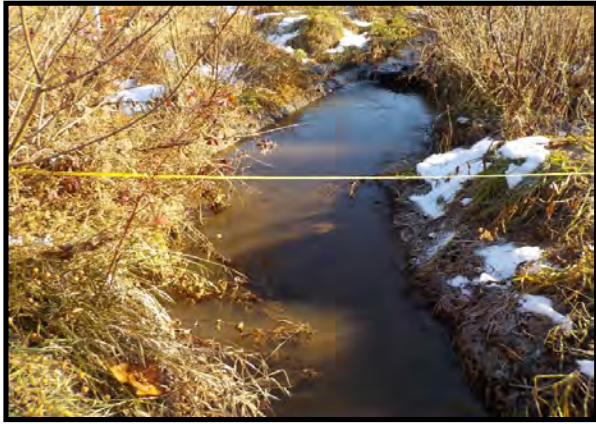
Upstream



Downstream



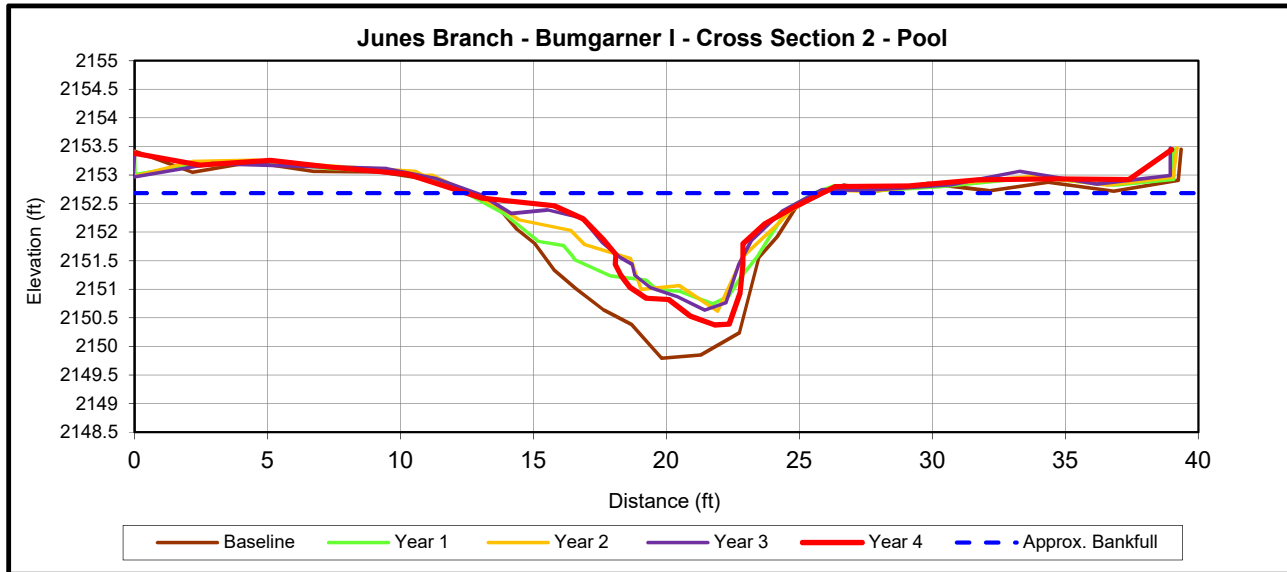
	Cross Section 1 (Riffle)					
Based on fixed baseline bankfull elevation	Base	MY1	MY2	MY3	MY4	MY5
Record elevation (datum) used	2153.1	2153.1	2153.1	2153.1	2153.1	
Bankfull Width (ft)	13.3	13.4	12.7	12.9	13.2	
Floodprone Width (ft)	>79	>79	>79	>79	>33	
Bankfull Mean Depth (ft)	0.9	0.8	0.8	0.7	0.7	
Bankfull Max Depth (ft)	1.5	1.3	1.3	1.4	1.5	
Bankfull Cross Sectional Area (ft ²)	11.7	11.3	10.2	9.6	8.6	
Bankfull Width/Depth Ratio	15.2	15.8	15.8	17.2	20.2	
Bankfull Entrenchment Ratio	>5.9	>5.9	>6.2	6.1	>2.5	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.1	1.1	



Upstream



Downstream



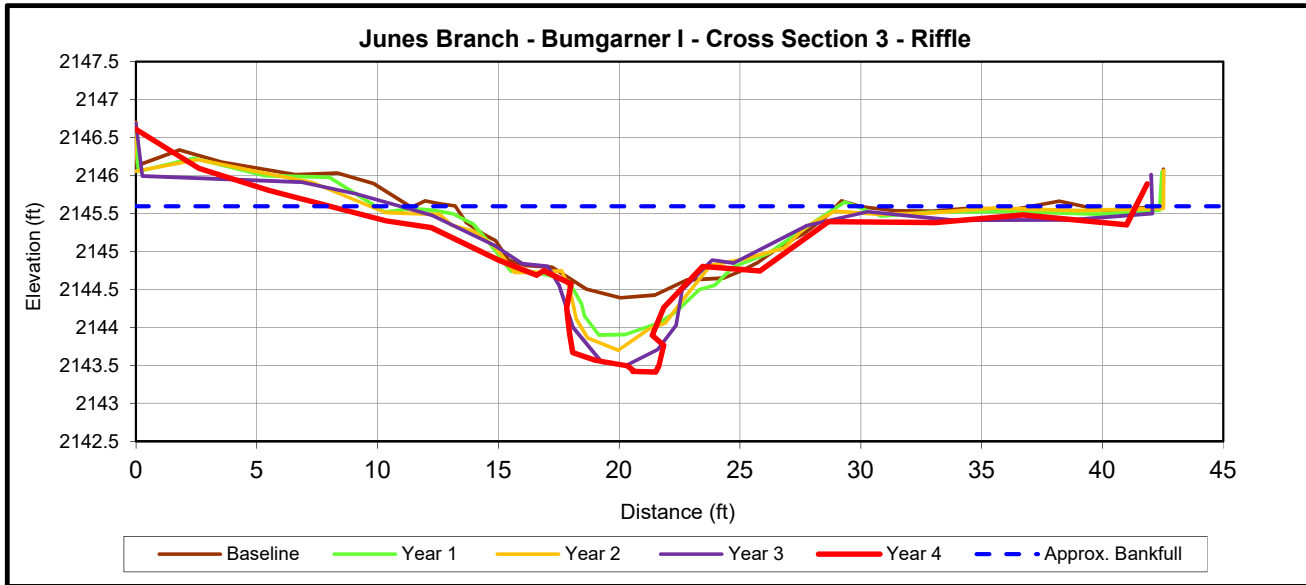
	Cross Section 2 (Pool)					
Based on fixed baseline bankfull elevation	Base	MY1	MY2	MY3	MY4	MY5
Record elevation (datum) used	2152.7	2152.7	2152.7	2152.7	2152.7	
Bankfull Width (ft)	13.4	13.1	13.2	12.7	13.4	
Floodprone Width (ft)	>124	>124	>124	124.0	>39	
Bankfull Mean Depth (ft)	1.5	1.1	0.9	0.9	0.9	
Bankfull Max Depth (ft)	2.9	1.9	2.1	2.0	2.3	
Bankfull Cross Sectional Area (ft ²)	20.6	14.0	12.2	11.3	12.2	
Bankfull Width/Depth Ratio	8.7	12.3	14.3	14.4	14.6	
Bankfull Entrenchment Ratio	>9.3	>9.5	>9.4	>9.7	N/A	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	



Upstream



Downstream



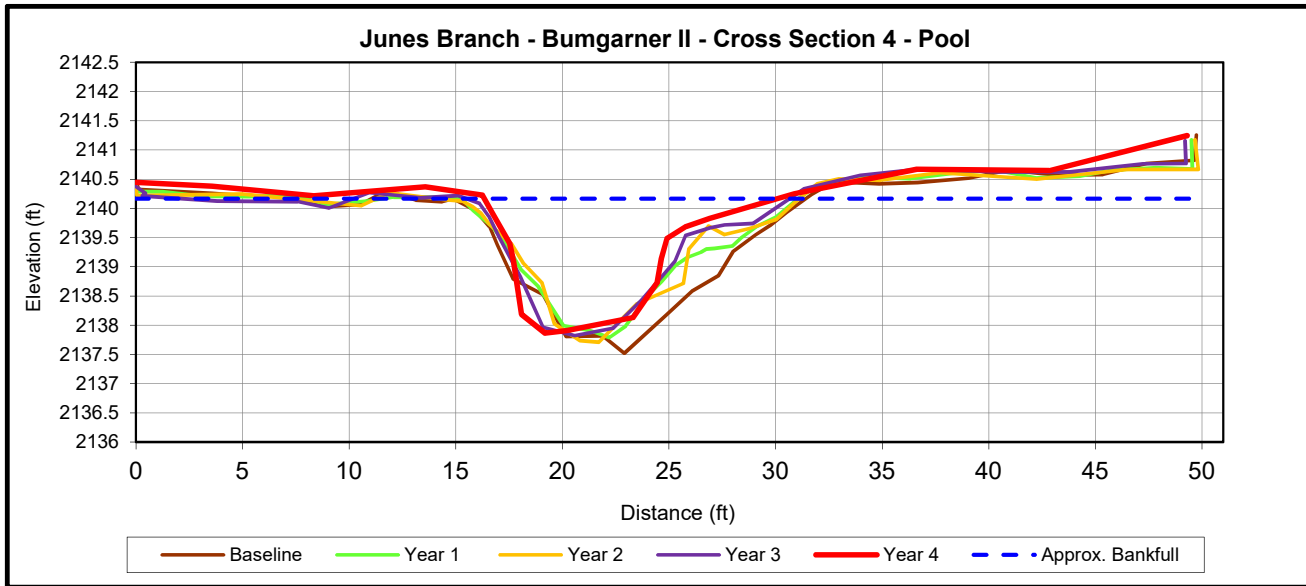
	Cross Section 3 (Riffle)					
	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation						
Record elevation (datum) used	2145.6	2145.6	2145.6	2145.6	2145.6	
Bankfull Width (ft)	15.8	16.8	16.3	18.0	18.3	
Floodprone Width (ft)	>42	>42	>42	>42	>42	
Bankfull Mean Depth (ft)	0.8	0.9	0.9	0.9	1.0	
Bankfull Max Depth (ft)	1.2	1.7	1.9	2.1	2.2	
Bankfull Cross Sectional Area (ft ²)	12.2	14.5	14.8	15.8	17.5	
Bankfull Width/Depth Ratio	20.4	19.4	18.0	20.5	19.1	
Bankfull Entrenchment Ratio	>2.7	>2.5	>2.6	>2.3	>2.3	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	0.9	



Upstream



Downstream



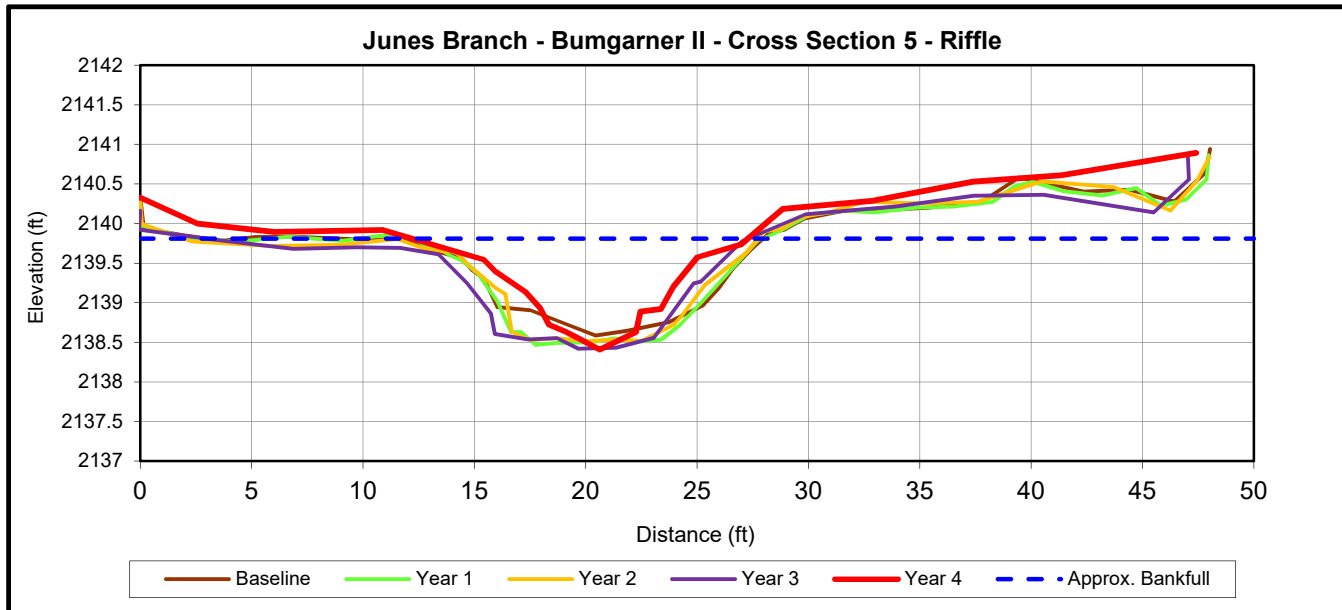
	Cross Section 4 (Pool)					
Based on fixed baseline bankfull elevation	Base	MY1	MY2	MY3	MY4	MY5
Record elevation (datum) used	2140.2	2140.2	2140.2	2140.2	2140.2	
Bankfull Width (ft)	16.5	16.1	16.5	15.2	13.8	
Floodprone Width (ft)	>50	>50	>50	>50	>49	
Bankfull Mean Depth (ft)	1.4	1.2	1.1	1.2	1.2	
Bankfull Max Depth (ft)	2.6	2.4	2.5	2.3	2.3	
Bankfull Cross Sectional Area (ft ²)	23.0	18.9	18.5	17.9	16.6	
Bankfull Width/Depth Ratio	11.9	13.7	14.8	12.8	11.5	
Bankfull Entrenchment Ratio	>3.0	>3.1	>3.0	>3.3	N/A	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	



Upstream



Downstream



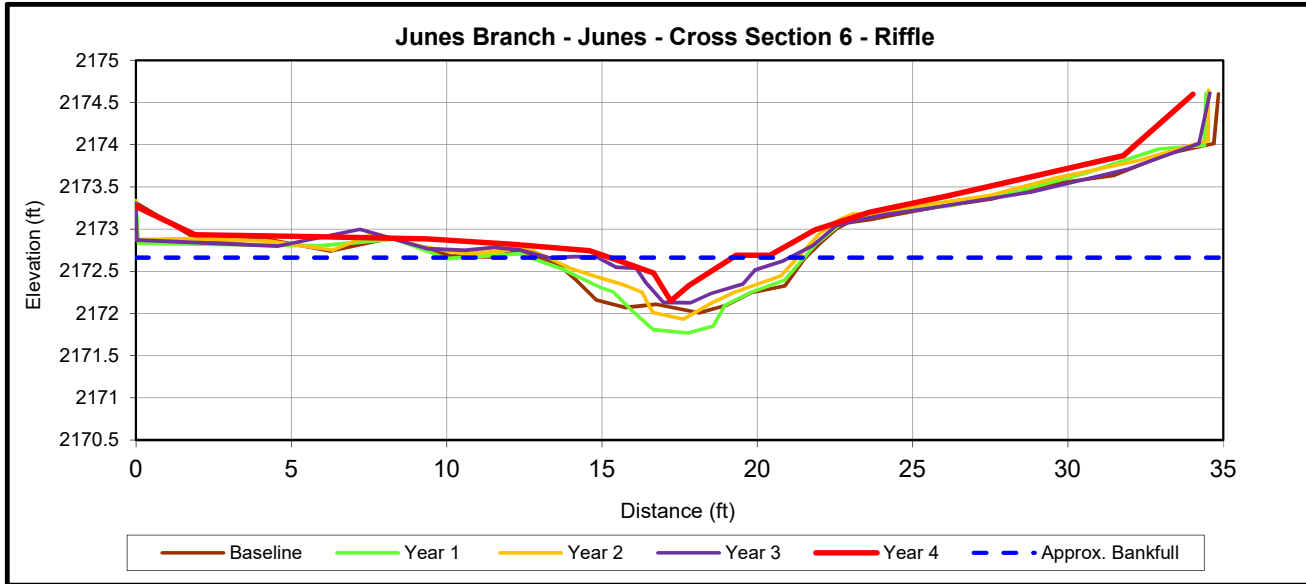
	Cross Section 5 (Riffle)					
	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation						
Record elevation (datum) used	2139.8	2139.8	2139.8	2139.8	2139.8	
Bankfull Width (ft)	16.3	15.7	16.2	16.0	15.1	
Floodprone Width (ft)	>48	>48	>48	>48	>47	
Bankfull Mean Depth (ft)	0.7	0.9	0.8	0.9	0.6	
Bankfull Max Depth (ft)	1.2	1.3	1.3	1.4	1.4	
Bankfull Cross Sectional Area (ft ²)	11.9	13.4	12.6	13.7	9.4	
Bankfull Width/Depth Ratio	22.2	18.4	20.8	18.6	24.3	
Bankfull Entrenchment Ratio	>3.0	>3.1	>3	>3.0	>3.1	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.1	



Upstream



Downstream



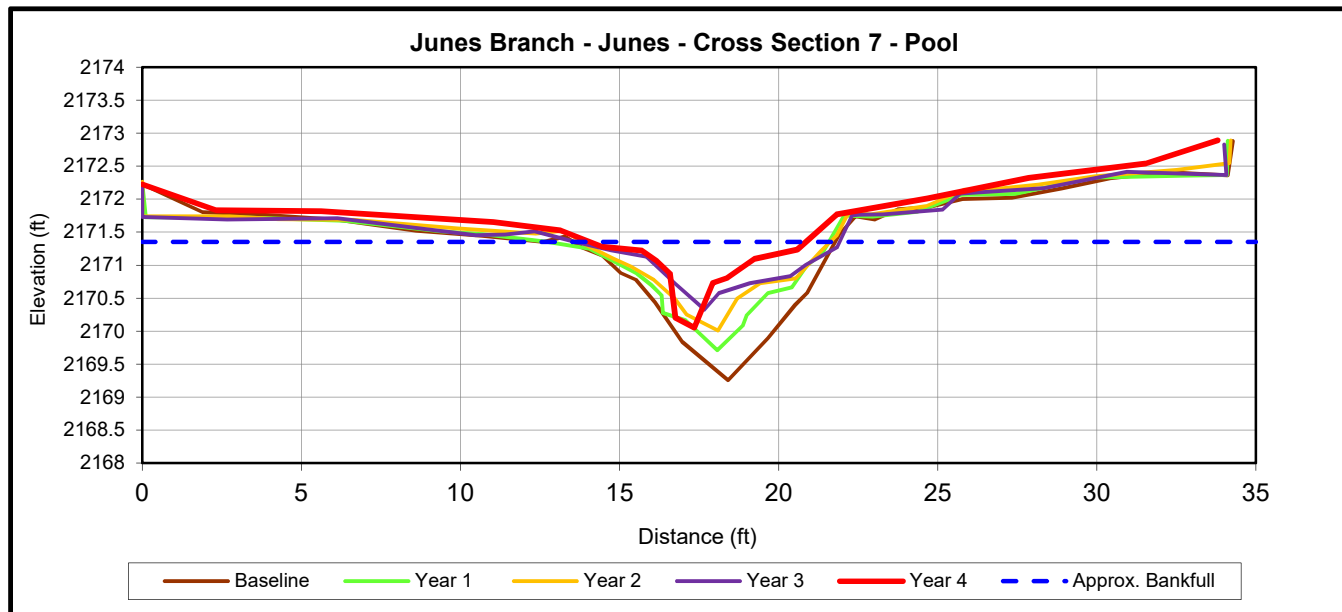
	Cross Section 6 (Riffle)					
	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation						
Record elevation (datum) used	2172.7	2172.7	2172.7	2172.7	2172.7	
Bankfull Width (ft)	8.6	8.8	8.0	6.3	3.9	
Floodprone Width (ft)	>94	>94	>94	>94	>23	
Bankfull Mean Depth (ft)	0.4	0.5	0.4	0.3	0.2	
Bankfull Max Depth (ft)	0.7	0.9	0.7	0.5	0.5	
Bankfull Cross Sectional Area (ft ²)	3.7	4.1	3.0	1.7	0.8	
Bankfull Width/Depth Ratio	19.7	18.9	21.7	23.0	19.4	
Bankfull Entrenchment Ratio	>11.0	>10.7	>11.7	>14.8	>5.8	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.1	



Upstream



Downstream



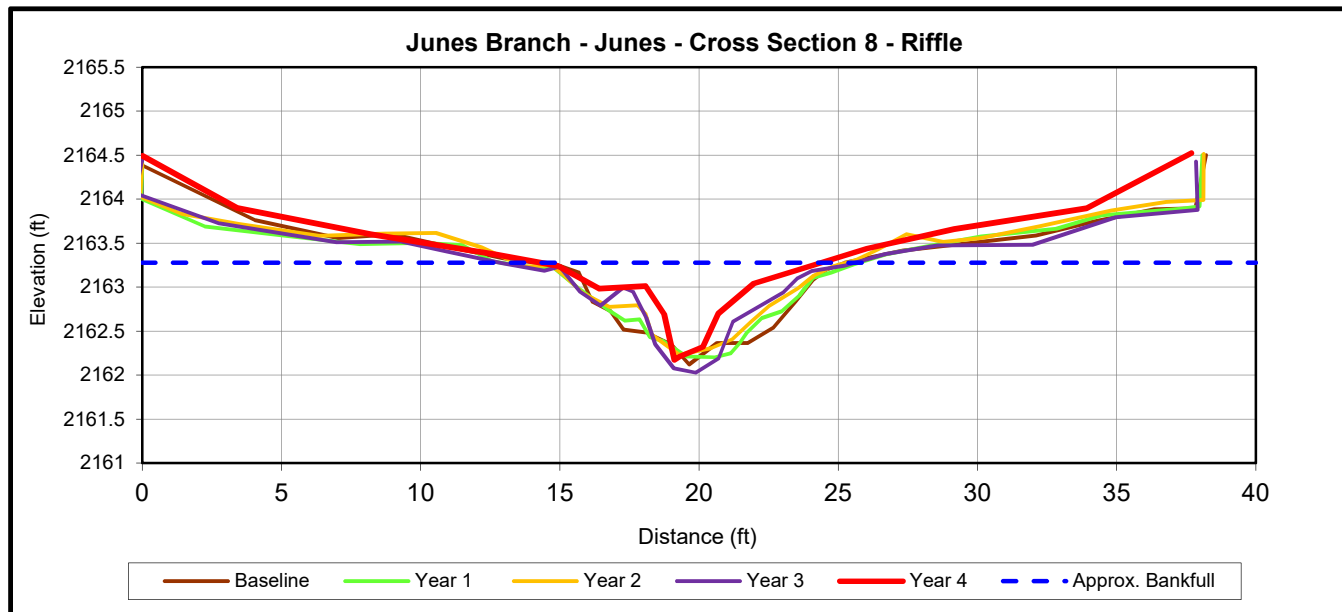
	Cross Section 7 (Pool)					
	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation						
Record elevation (datum) used	2171.4	2171.4	2171.4	2171.4	2171.4	
Bankfull Width (ft)	8.2	8.8	7.8	8.3	6.8	
Floodprone Width (ft)	>111	>111	>111	>111	>32	
Bankfull Mean Depth (ft)	1.0	0.7	0.6	0.4	0.4	
Bankfull Max Depth (ft)	2.1	1.6	1.3	1.0	1.3	
Bankfull Cross Sectional Area (ft ²)	8.6	6.1	4.8	3.7	2.7	
Bankfull Width/Depth Ratio	7.9	12.7	12.7	18.8	17.0	
Bankfull Entrenchment Ratio	>13.5	>12.6	>14.2	>13.4	N/A	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	



Upstream



Downstream



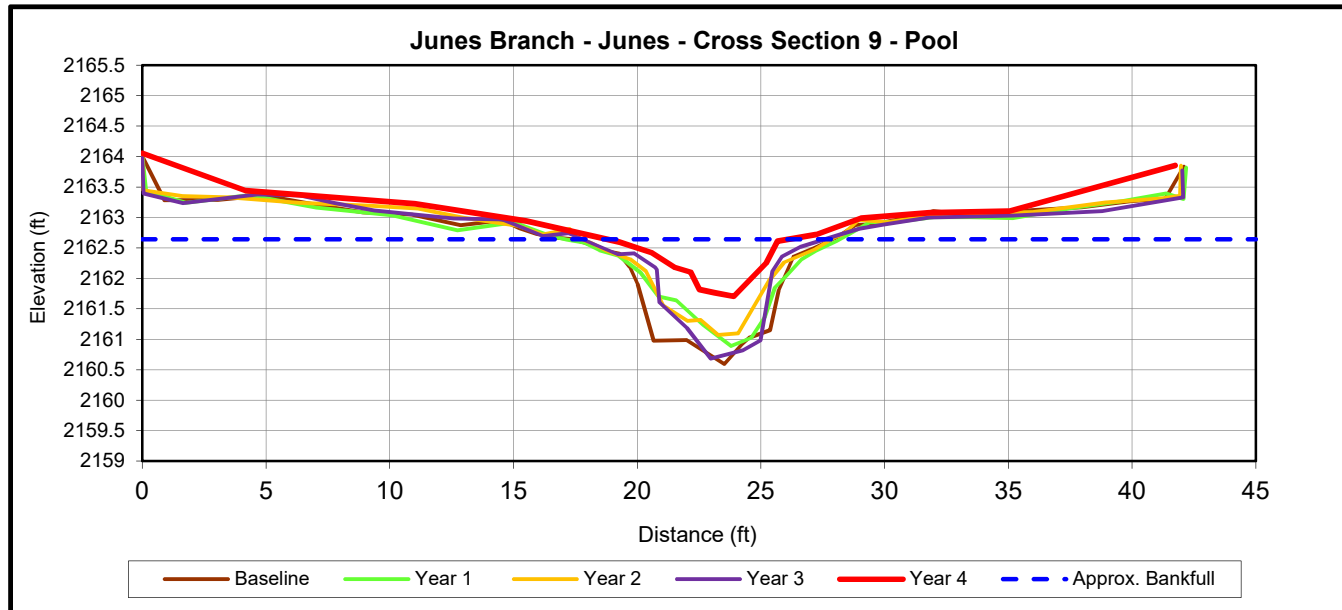
	Cross Section 8 (Riffle)					
Based on fixed baseline bankfull elevation	Base	MY1	MY2	MY3	MY4	MY5
Record elevation (datum) used	2163.3	2163.3	2163.3	2163.3	2163.3	
Bankfull Width (ft)	9.6	10.8	10.6	10.6	10.1	
Floodprone Width (ft)	>53	>53	>53	>53	>36	
Bankfull Mean Depth (ft)	0.7	0.6	0.5	0.5	0.4	
Bankfull Max Depth (ft)	1.2	1.1	1.0	1.2	1.1	
Bankfull Cross Sectional Area (ft ²)	6.4	6.4	5.7	5.6	3.6	
Bankfull Width/Depth Ratio	14.3	18.2	19.8	20.0	28.3	
Bankfull Entrenchment Ratio	>5.5	>4.9	>5.0	>5.0	>3.6	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	



Upstream



Downstream



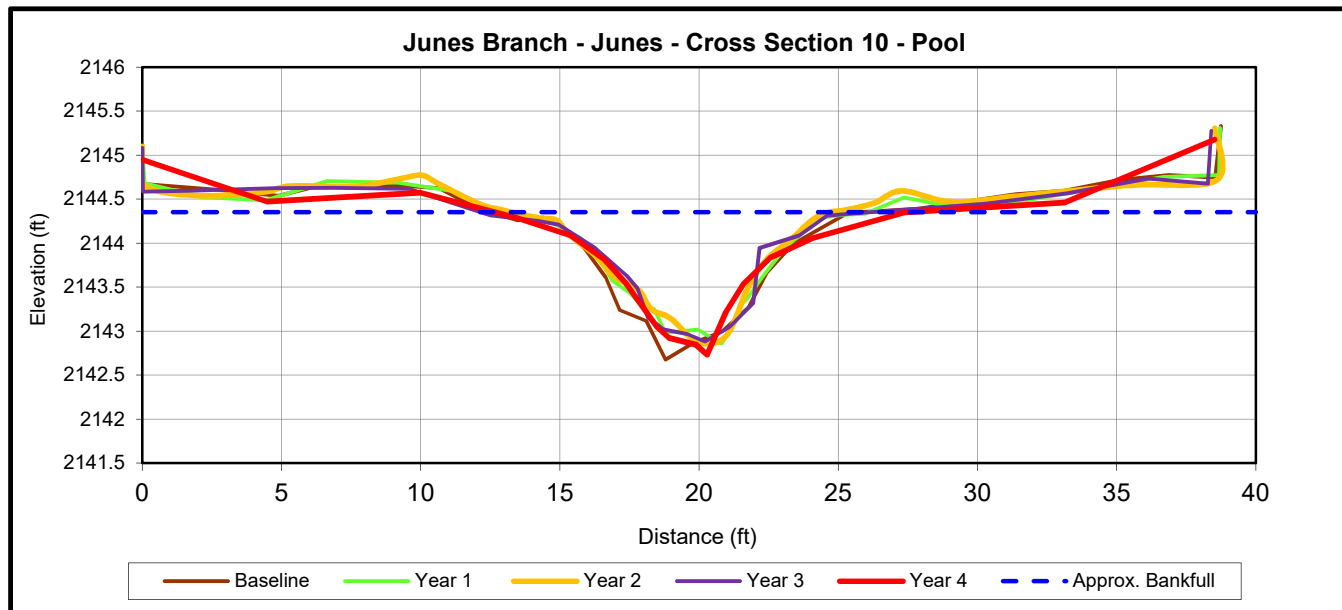
	Cross Section 9 (Pool)					
	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation						
Record elevation (datum) used	2162.6	2162.6	2162.6	2162.6	2162.6	
Bankfull Width (ft)	10.5	11.1	10.1	9.8	7.3	
Floodprone Width (ft)	>56	>56	>56	>56	>36	
Bankfull Mean Depth (ft)	1.0	0.8	0.7	0.9	0.4	
Bankfull Max Depth (ft)	2.0	1.8	1.6	2.0	0.9	
Bankfull Cross Sectional Area (ft ²)	10.5	8.4	7.5	8.4	3.3	
Bankfull Width/Depth Ratio	10.4	14.7	13.7	11.5	16.3	
Bankfull Entrenchment Ratio	>5.3	>5	>5.5	>5.7	N/A	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	



Upstream



Downstream



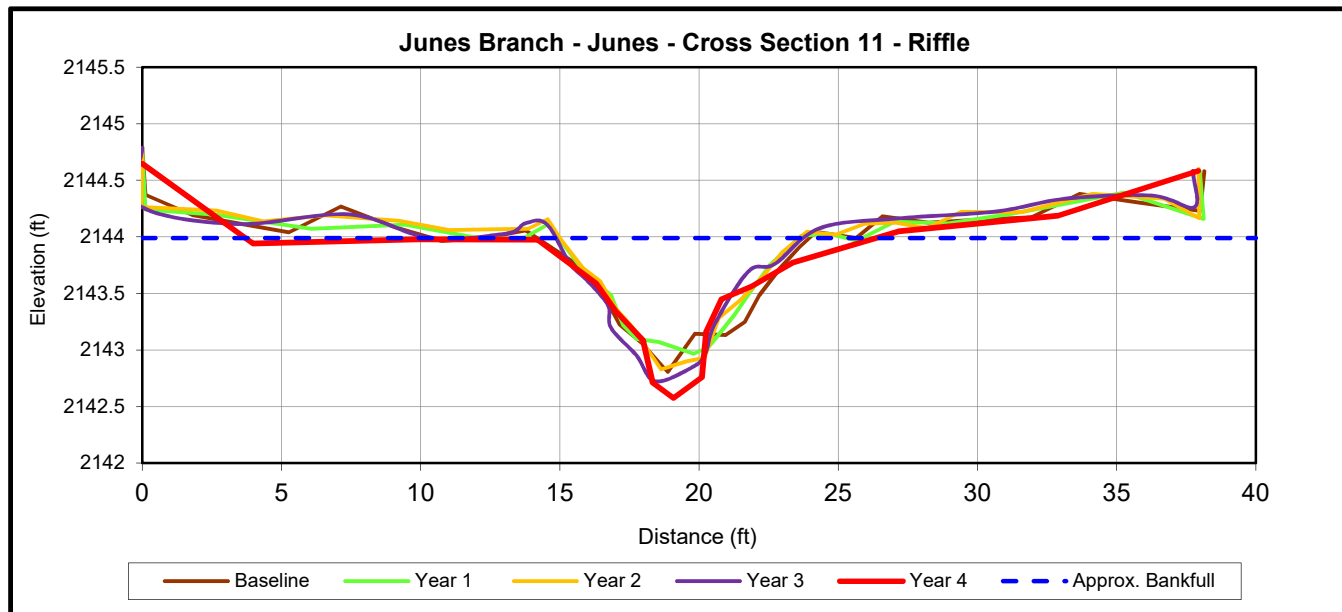
	Cross Section 10 (Pool)					
	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation						
Record elevation (datum) used	2144.4	2144.4	2144.4	2144.4	2144.4	
Bankfull Width (ft)	11.0	10.9	11.0	10.3	10.7	
Floodprone Width (ft)	>39	>39	>39	>39	>39	
Bankfull Mean Depth (ft)	0.8	0.7	0.7	0.7	0.7	
Bankfull Max Depth (ft)	1.7	1.5	1.5	1.5	1.6	
Bankfull Cross Sectional Area (ft ²)	9.0	7.9	7.6	7.6	7.9	
Bankfull Width/Depth Ratio	13.4	15.0	16.1	14.1	14.3	
Bankfull Entrenchment Ratio	>3.5	>3.5	>3.5	>3.8	N/A	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	



Upstream



Downstream



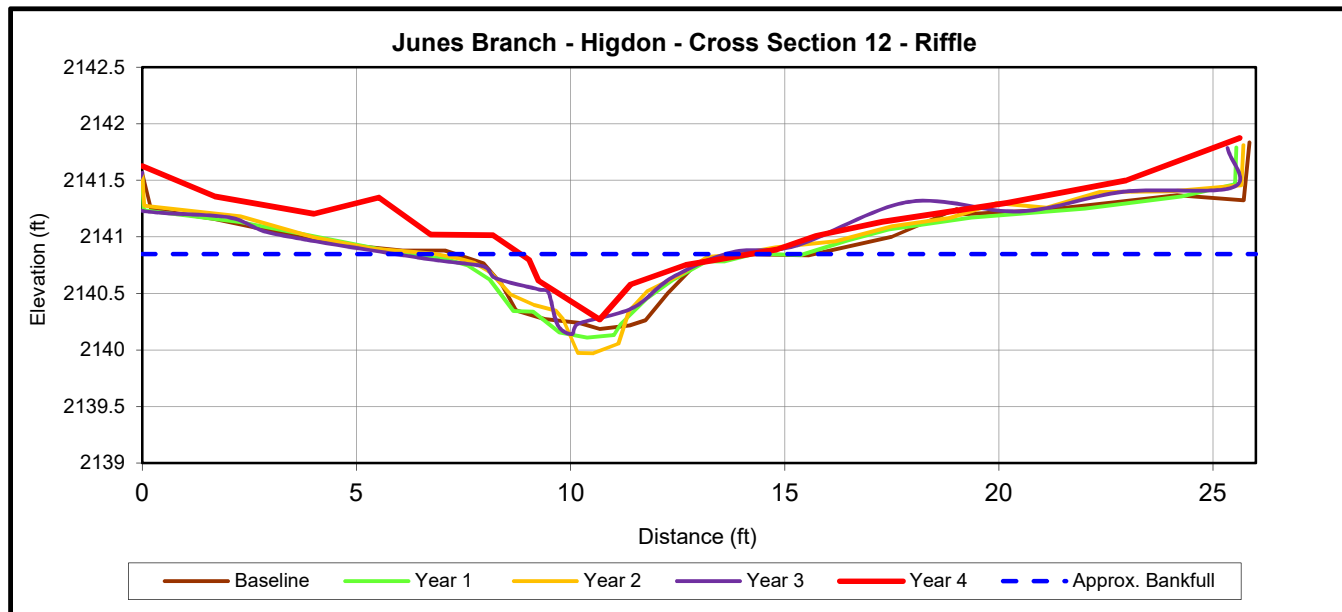
	Cross Section 11 (Riffle)					
	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation						
Record elevation (datum) used	2144.0	2144.0	2144.0	2144.0	2144.0	
Bankfull Width (ft)	9.8	9.0	8.6	9.2	10.0	
Floodprone Width (ft)	>38	>38	>38	>38	>38	
Bankfull Mean Depth (ft)	0.6	0.6	0.6	0.6	0.6	
Bankfull Max Depth (ft)	1.2	1.0	1.2	1.3	1.4	
Bankfull Cross Sectional Area (ft ²)	5.8	5.2	5.2	5.7	5.7	
Bankfull Width/Depth Ratio	16.5	15.9	14.1	14.7	17.6	
Bankfull Entrenchment Ratio	>3.9	>4.2	>4.4	>4.1	>3.8	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.1	1.0	



Upstream



Downstream



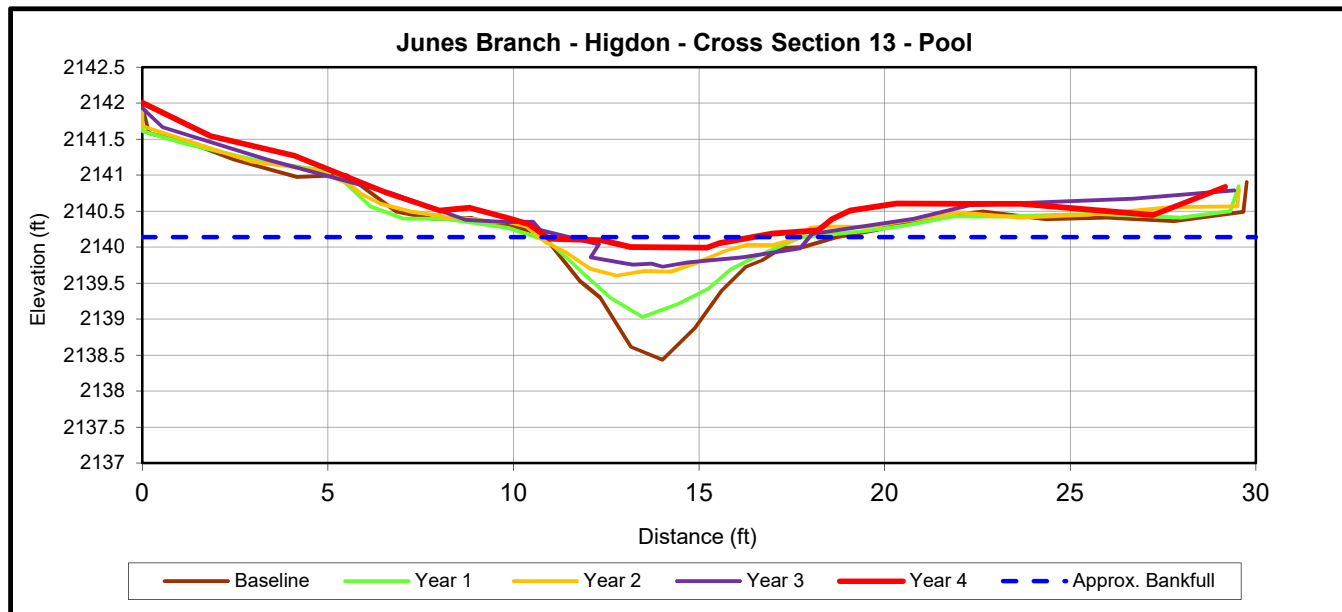
	Cross Section 12 (Riffle)					
	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation						
Record elevation (datum) used	2140.9	2140.9	2140.9	2140.9	2140.9	
Bankfull Width (ft)	6.6	8.1	7.0	7.7	5.4	
Floodprone Width (ft)	>40	>40	>40	>40	>21	
Bankfull Mean Depth (ft)	0.4	0.3	0.3	0.3	0.2	
Bankfull Max Depth (ft)	0.7	0.7	0.9	0.7	0.6	
Bankfull Cross Sectional Area (ft ²)	2.5	2.6	2.4	2.1	1.2	
Bankfull Width/Depth Ratio	17.6	24.7	20.6	28.8	23.3	
Bankfull Entrenchment Ratio	>6.0	>4.9	>5.6	>5.2	>3.9	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.1	



Upstream



Downstream



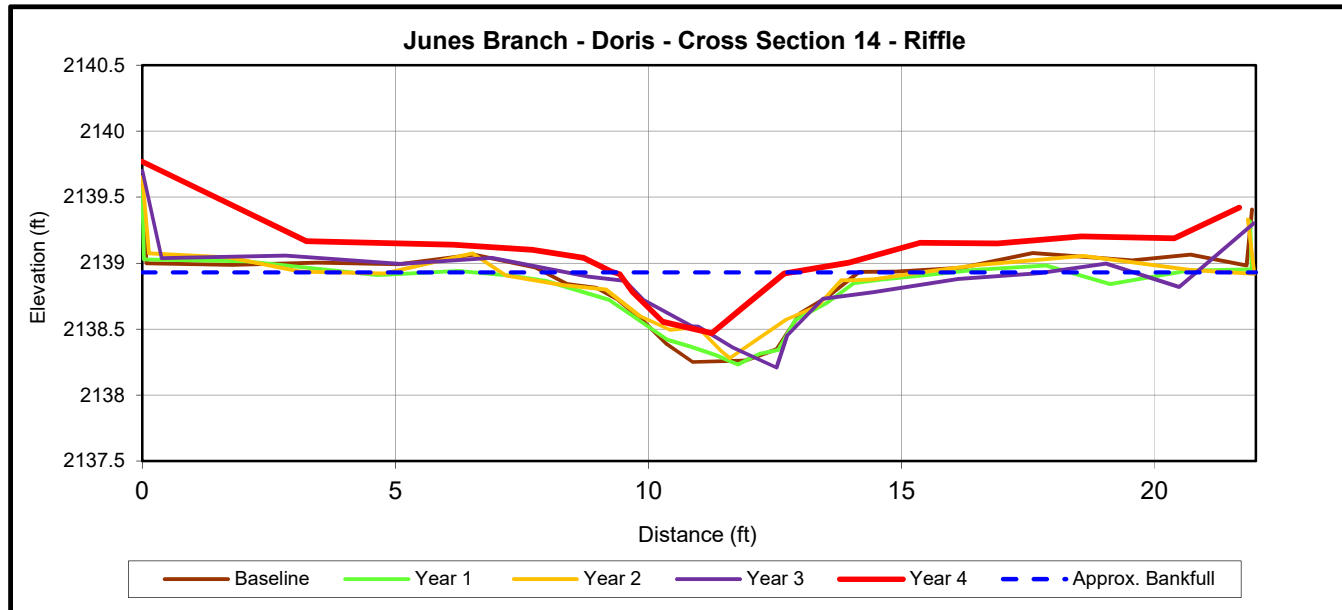
	Cross Section 13 (Pool)					
	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation						
Record elevation (datum) used	2140.1	2140.1	2140.1	2140.1	2140.1	
Bankfull Width (ft)	8.0	7.2	7.0	7.0	5.6	
Floodprone Width (ft)	>30	>30	>30	>30	>8	
Bankfull Mean Depth (ft)	0.7	0.6	0.3	0.3	0.1	
Bankfull Max Depth (ft)	1.7	1.1	0.5	0.4	0.1	
Bankfull Cross Sectional Area (ft ²)	5.9	4.0	2.1	1.9	0.5	
Bankfull Width/Depth Ratio	10.8	13.0	23.9	25.5	62.5	
Bankfull Entrenchment Ratio	>3.7	>4.1	>4.2	>4.3	N/A	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.1	N/A	



Upstream



Downstream



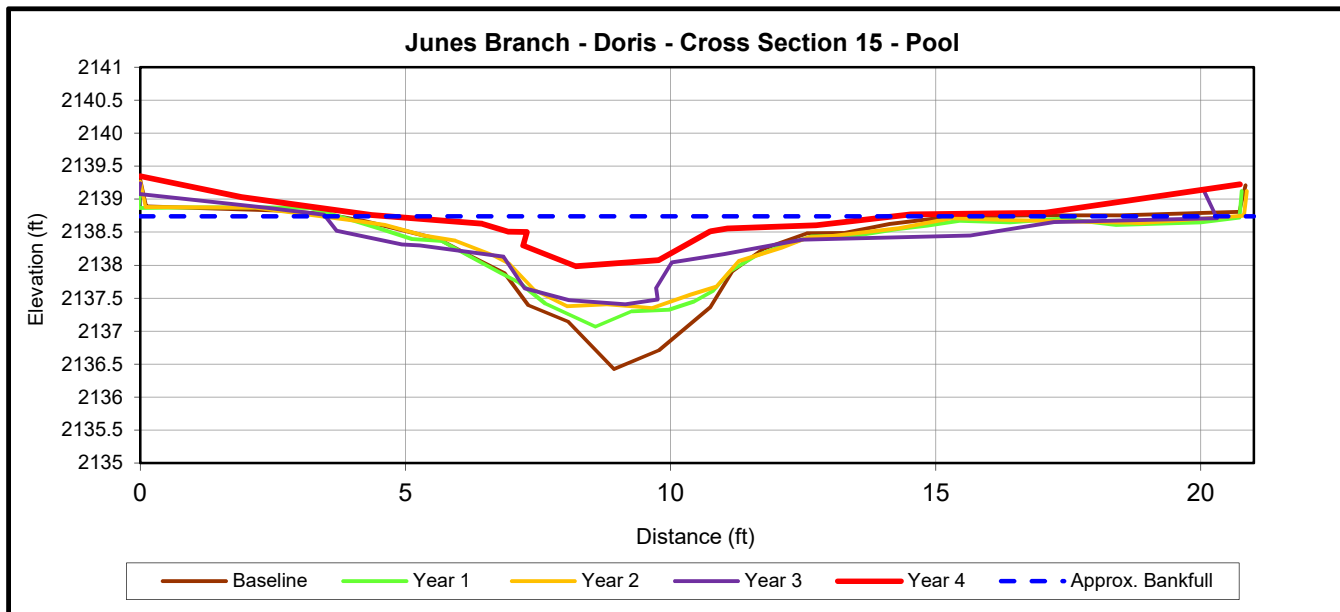
	Cross Section 14 (Riffle)					
	Base	MY1	MY2	MY3	MY4	MY5
Based on fixed baseline bankfull elevation						
Record elevation (datum) used	2138.9	2138.9	2138.9	2138.9	2138.9	
Bankfull Width (ft)	6.2	6.6	6.9	7.3	3.5	
Floodprone Width (ft)	>23	>23	>23	>23	>20	
Bankfull Mean Depth (ft)	0.4	0.4	0.3	0.3	0.3	
Bankfull Max Depth (ft)	0.7	0.7	0.7	0.7	0.5	
Bankfull Cross Sectional Area (ft ²)	2.3	2.4	1.9	2.1	0.9	
Bankfull Width/Depth Ratio	16.7	18.2	25.7	25.9	13.3	
Bankfull Entrenchment Ratio	>3.8	>3.5	>3.4	>3.2	>5.6	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	



Upstream



Downstream



	Cross Section 15 (Pool)					
Based on fixed baseline bankfull elevation	Base	MY1	MY2	MY3	MY4	MY5
Record elevation (datum) used	2138.7	2138.7	2138.7	2138.7	2138.7	
Bankfull Width (ft)	11.6	11.7	11.9	12.4	9.5	
Floodprone Width (ft)	>21	>21	>21	>21	>21	
Bankfull Mean Depth (ft)	0.8	0.7	0.6	0.5	0.3	
Bankfull Max Depth (ft)	2.3	1.7	1.4	1.2	0.8	
Bankfull Cross Sectional Area (ft ²)	9.4	8.3	7.4	6.5	2.8	
Bankfull Width/Depth Ratio	14.3	16.5	19.1	23.6	32.1	
Bankfull Entrenchment Ratio	>1.8	>1.8	>1.8	>1.7	N/A	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	

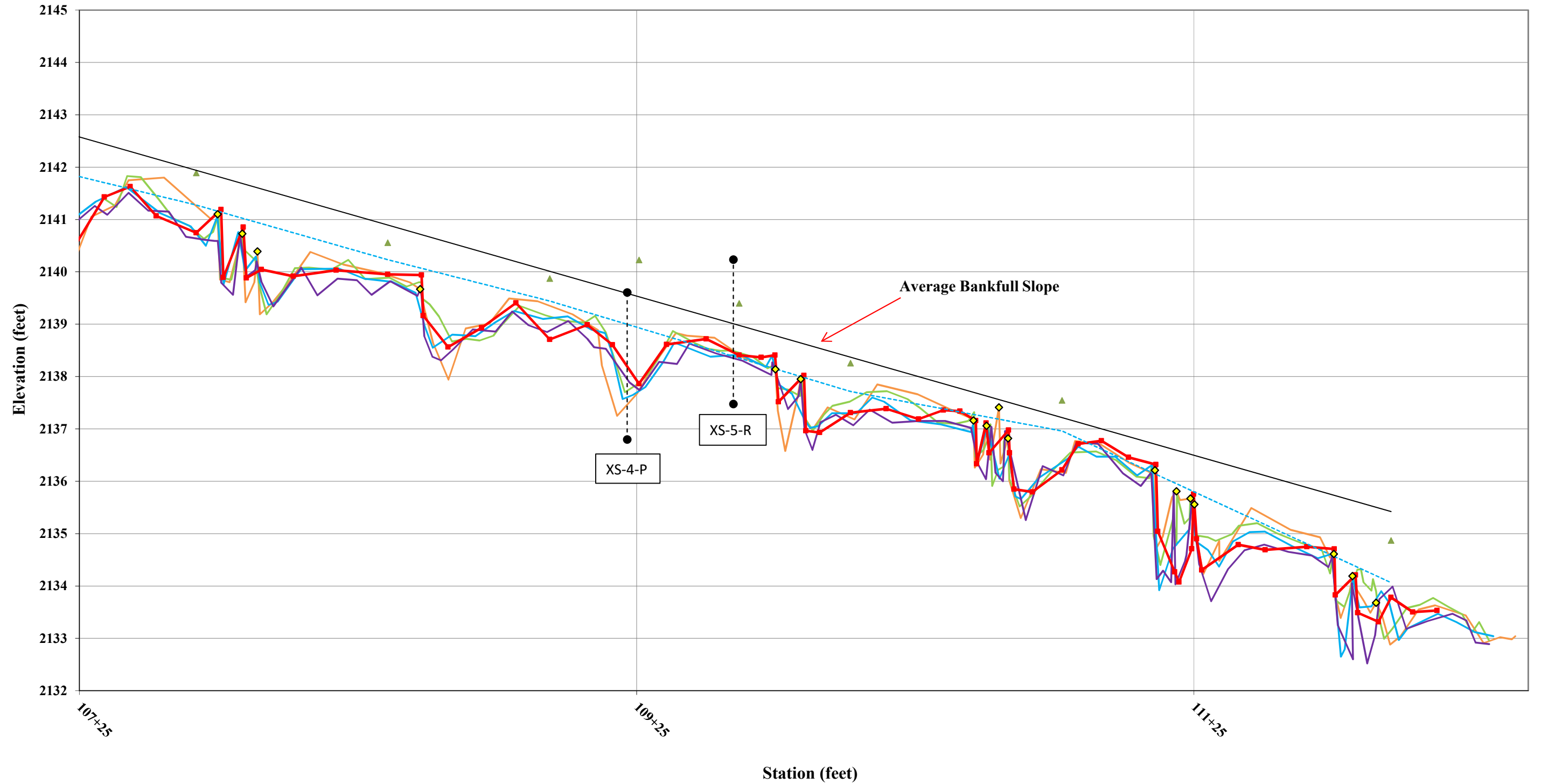
Junes Branch - Sheet 2
Longitudinal Profile
Staioning 200+97 to 215+15



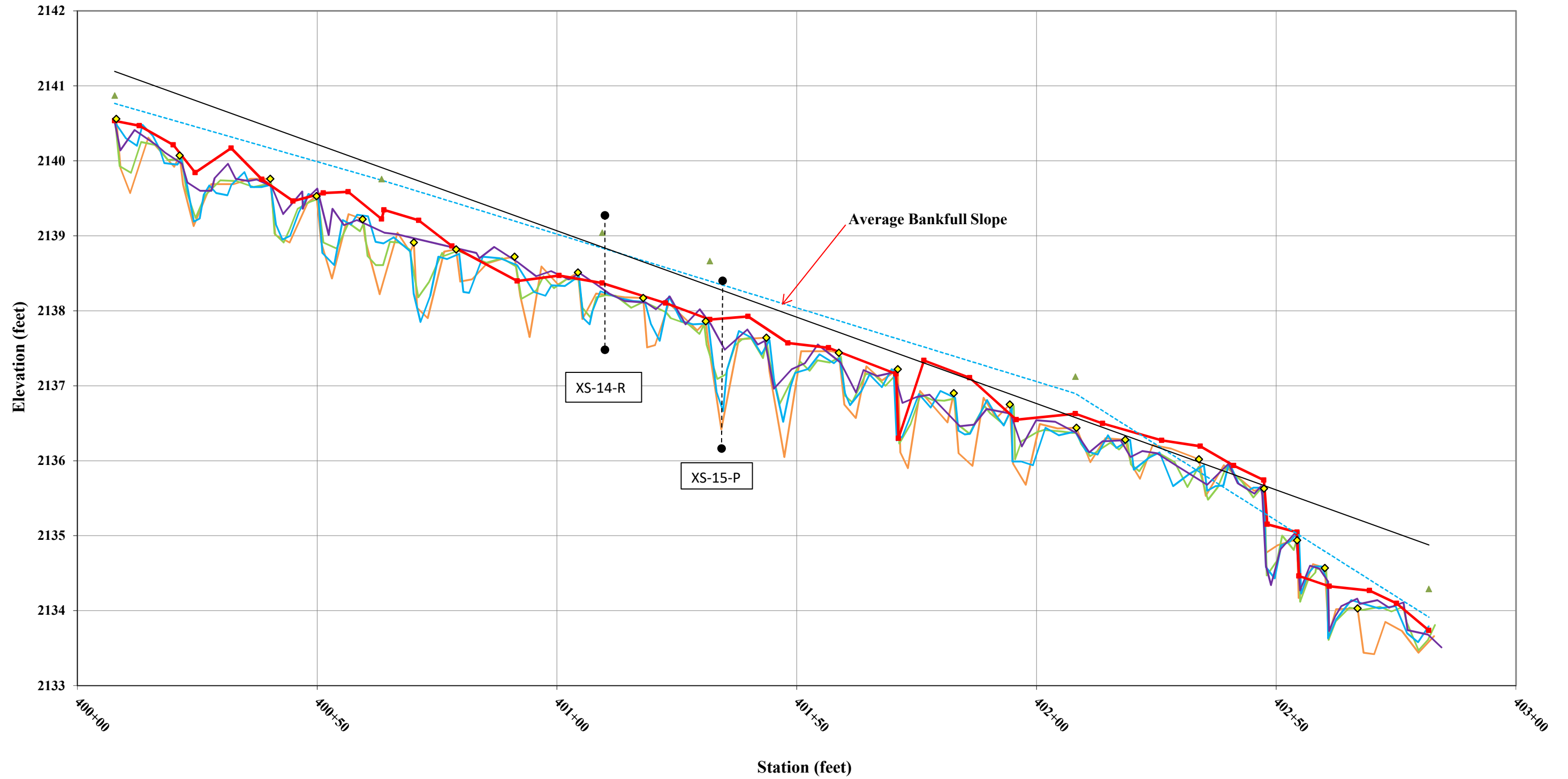
**Bumgarner Branch I
Longitudinal Profile
Staioning 100+37 to 107+27**



**Bumgarner Branch II
Longitudinal Profile
Staioning 107+27 to 112+35**



**Doris Branch
Longitudinal Profile
Staioning 400+00 to 402+82**



**Hidgon Branch
Longitudinal Profile
Staioning 300+46 to 304+22**

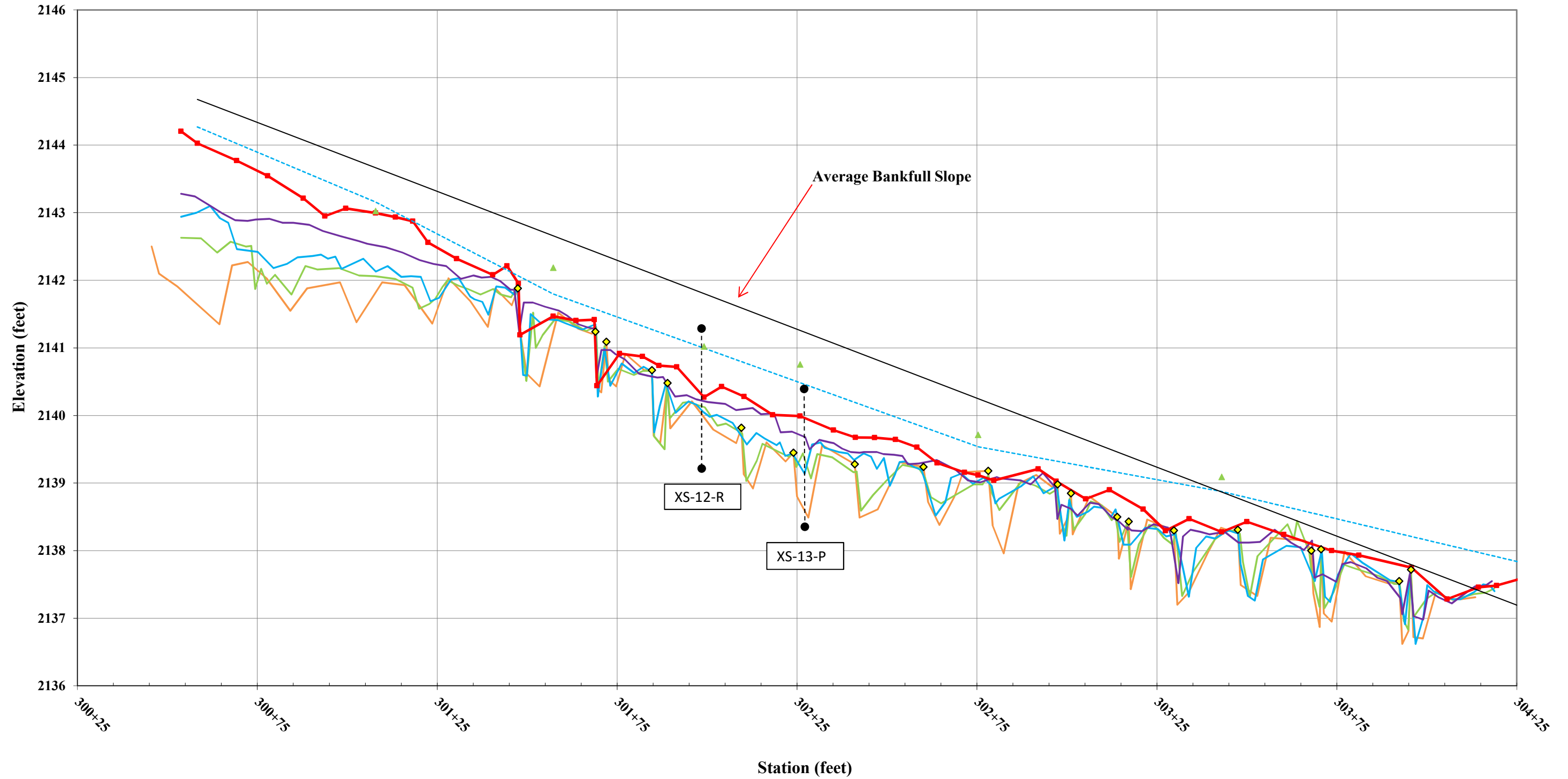


Table 12. Pebble Count Data Summary

Table 12. Pebble Count Data Summary														
Junes Branch														
Stream Reach	MY1 - 2014		MY2 - 2015		MY3 - 2016		MY4 - 2017		MY5 - 2018		MY6 - 2019		MY7 - 2020	
	Pebble Count		Pebble Count		Pebble Count		Pebble Count		Pebble Count		Pebble Count		Pebble Count	
	D ₅₀ (mm)	D ₈₄ (mm)	D ₅₀ (mm)	D ₈₄ (mm)	D ₅₀ (mm)	D ₈₄ (mm)	D ₅₀ (mm)	D ₈₄ (mm)	D ₅₀ (mm)	D ₈₄ (mm)	D ₅₀ (mm)	D ₈₄ (mm)	D ₅₀ (mm)	D ₈₄ (mm)
Bumgarner I	25	63	0.675	54	0.9	27.0	14.5	75						
Bumgarner II	27	61	6.4	55	6.1	54	57	81						
Junes Branch	6.7	47	0.33	55	2.108	18	10.567	56						
Higdon Branch	15	50	0.13	55	0.062	0.062	0.062	0.062						
Doris Branch	0.062	32	0.062	7.9	0.062	0.062	0.062	0.062						

MY4 Stream Reach Substrate Composition Charts 1-6

Chart 1.

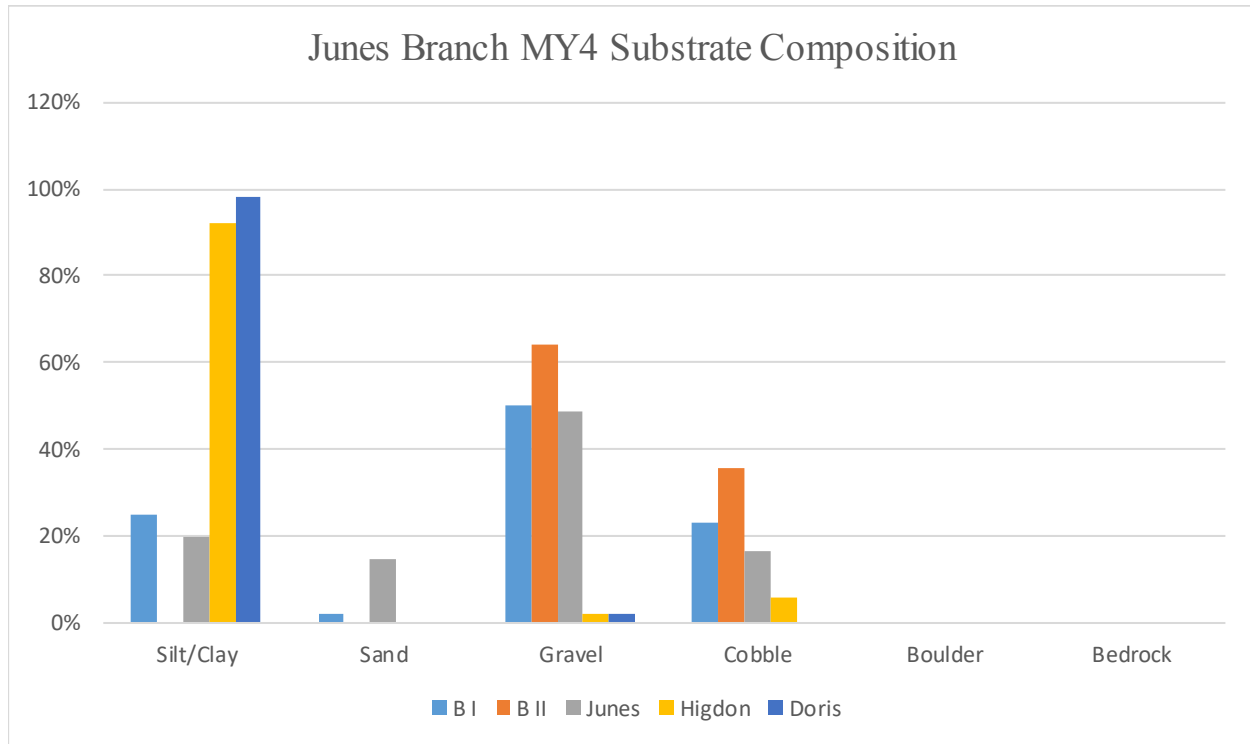


Chart 2.

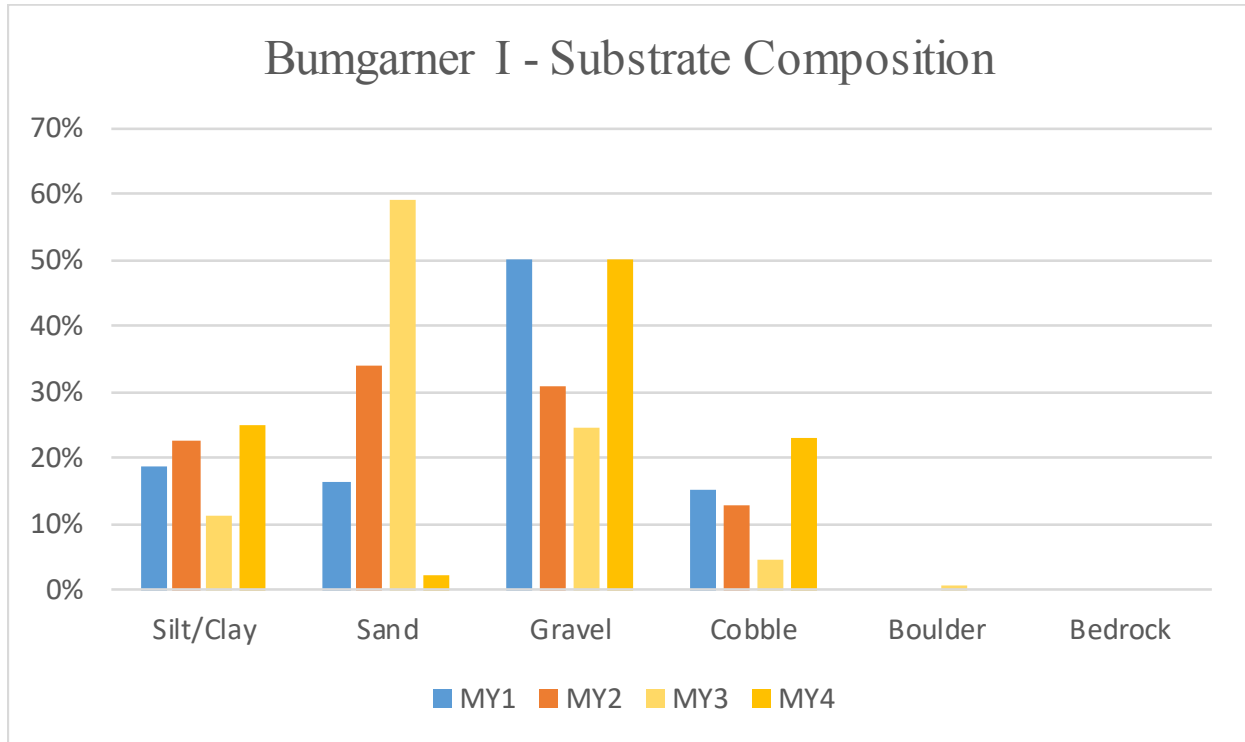


Chart 3.

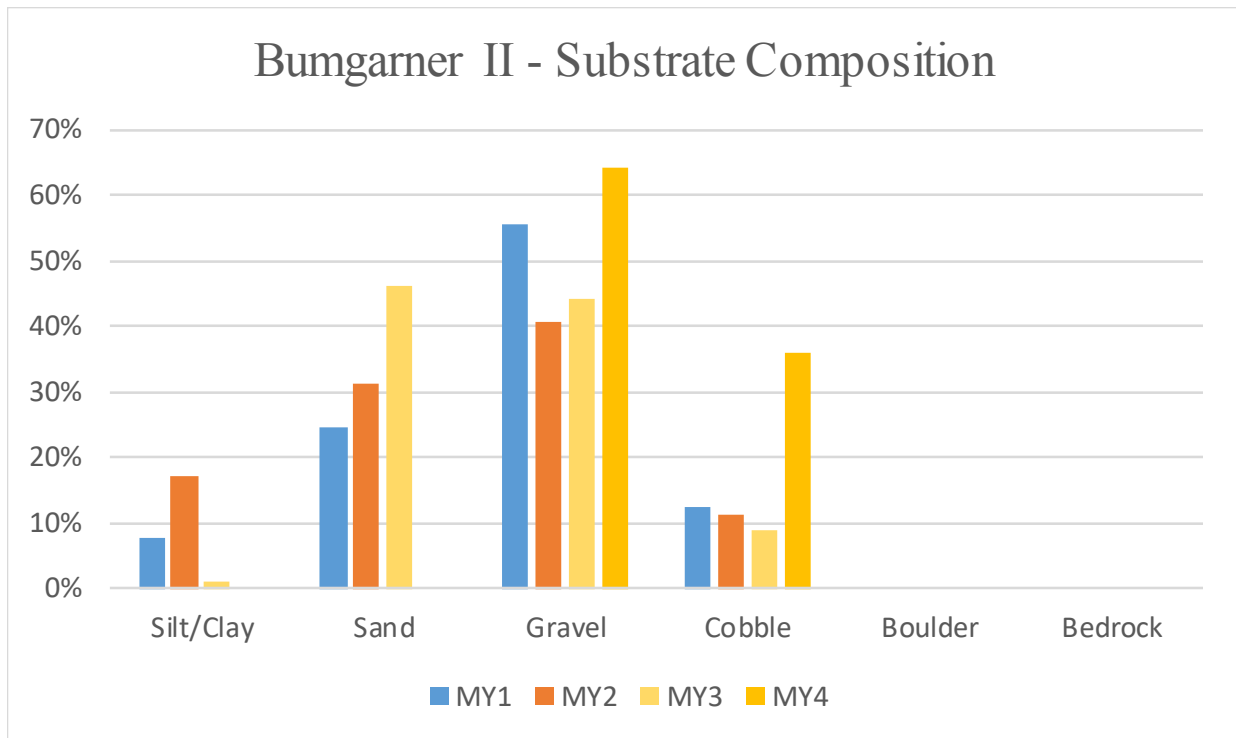


Chart 4.

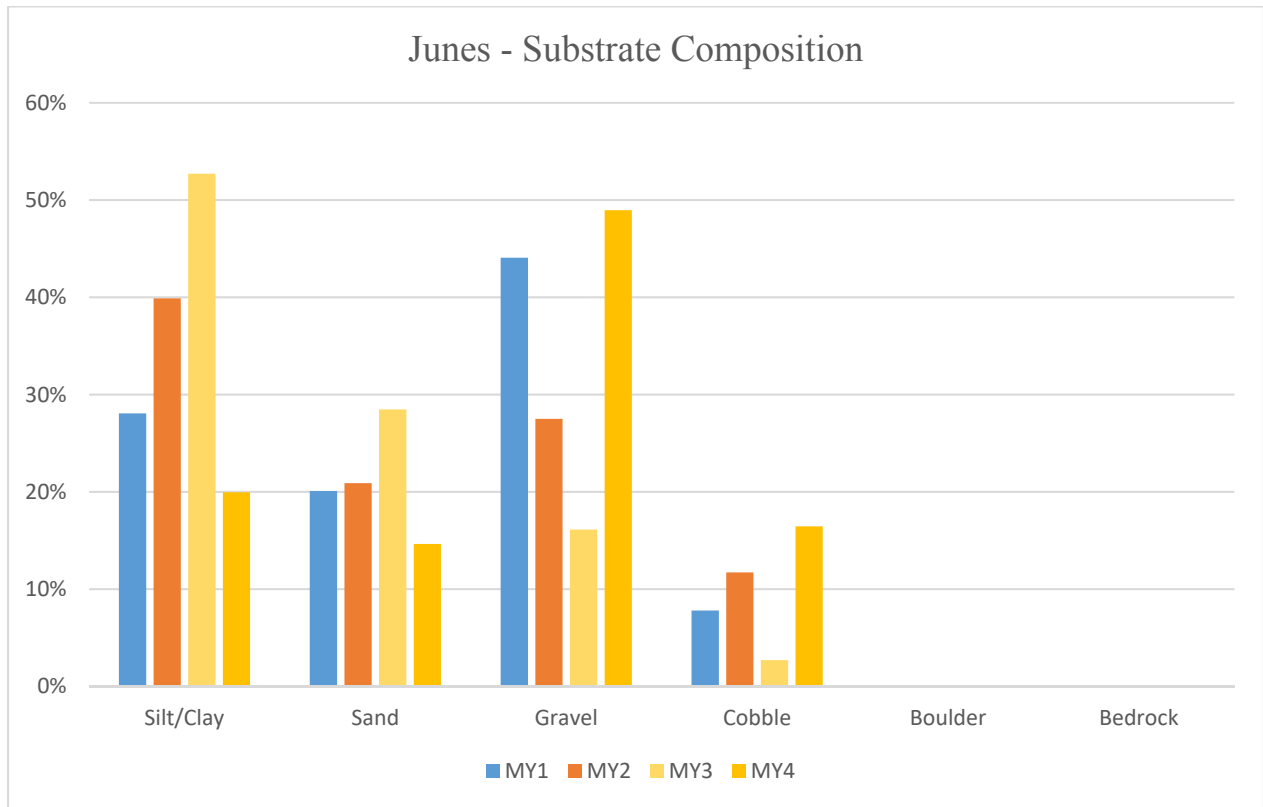


Chart 5.

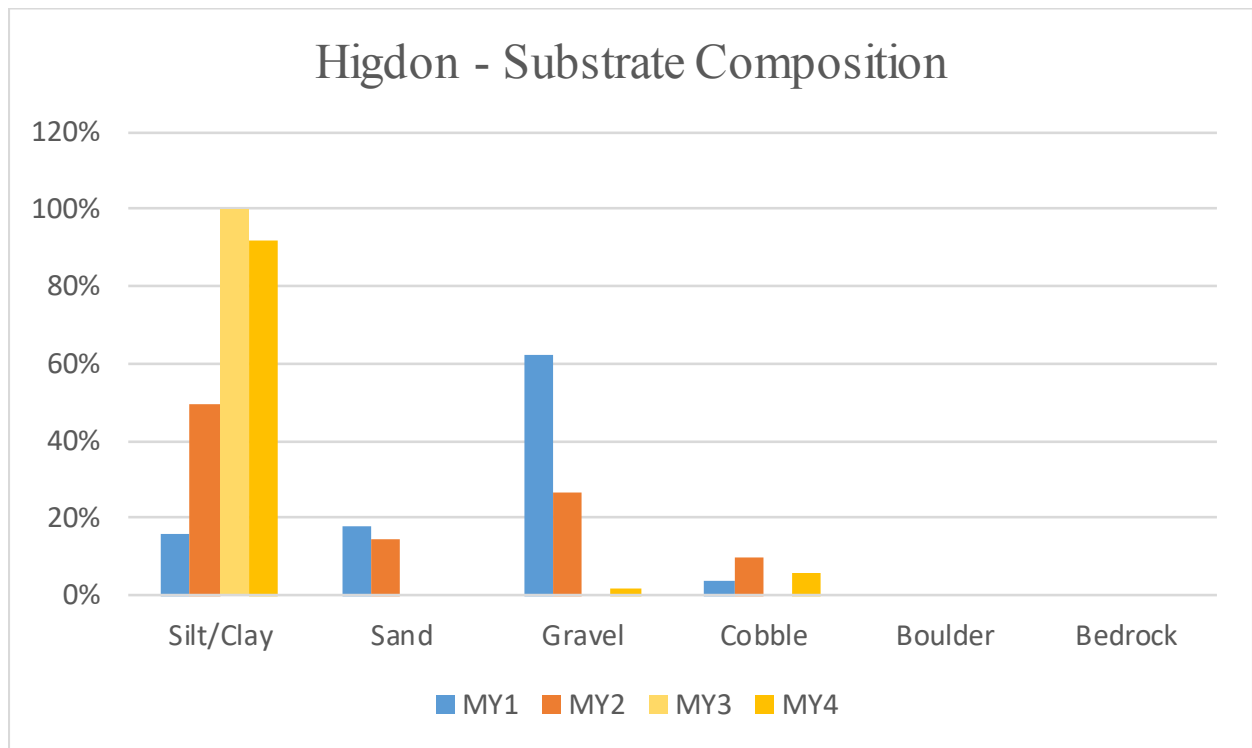
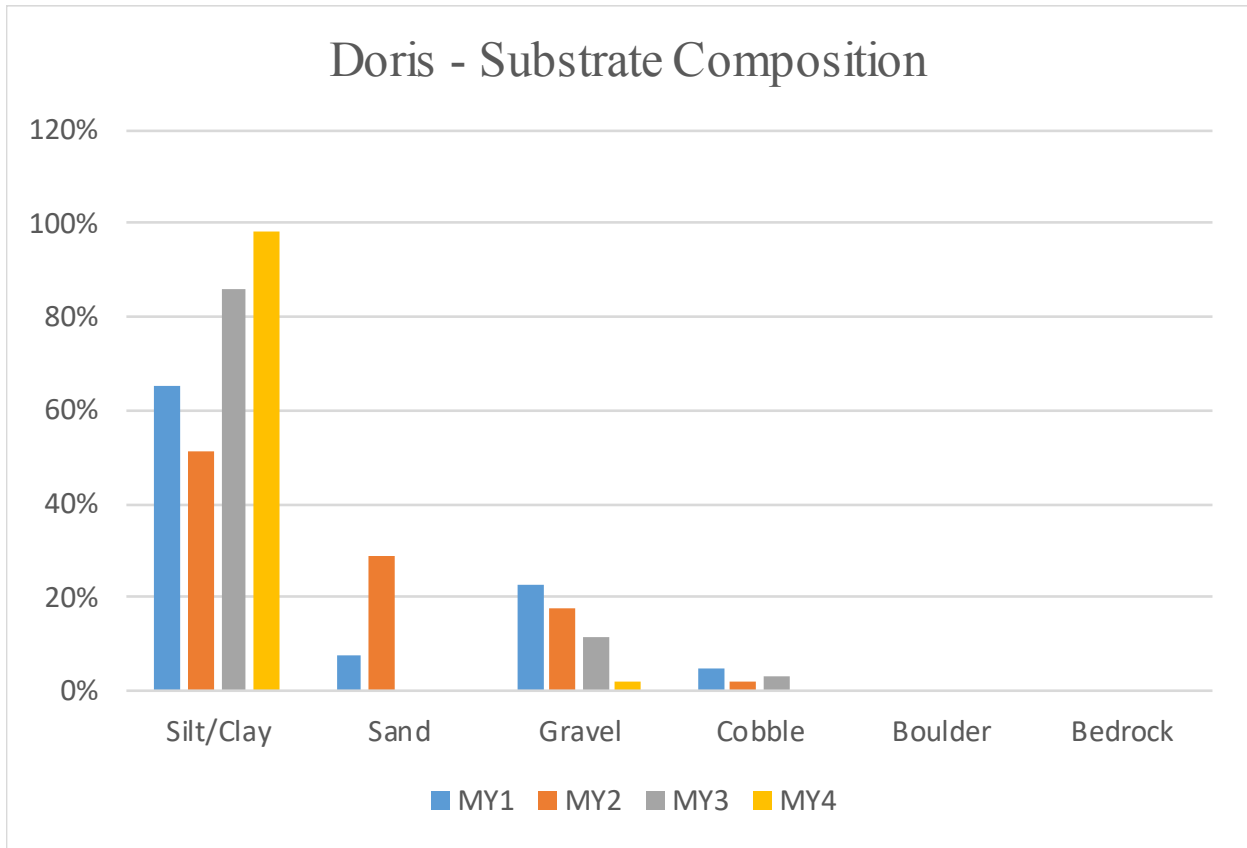


Chart 6.



Appendix E

Hydrology Data

Table 12. Verification of Bankfull Events

Figure 11. Photo Verification of Bankfull Events

Table 13. 2017 Rainfall Summary

Chart 10. 2017 Junes Branch Site Precipitation Data

Table 12. Verification of Bankfull Events

Crest Gauge	Stream Reach	Number of Bankfull Events	Date of Highest Bankfull Event	Maximum Bankfull Height (ft.)	Photo Number
Crest Gauge 1	Junes	2	October 2017	0.6	1
Crest Gauge 2	Bum II	0	NA	NA	NA

Figure 11. Photo Verification of Bankfull Events**Photo 1: Crest Gauge 1 - Junes Branch**

Data collected on 12/12/2017

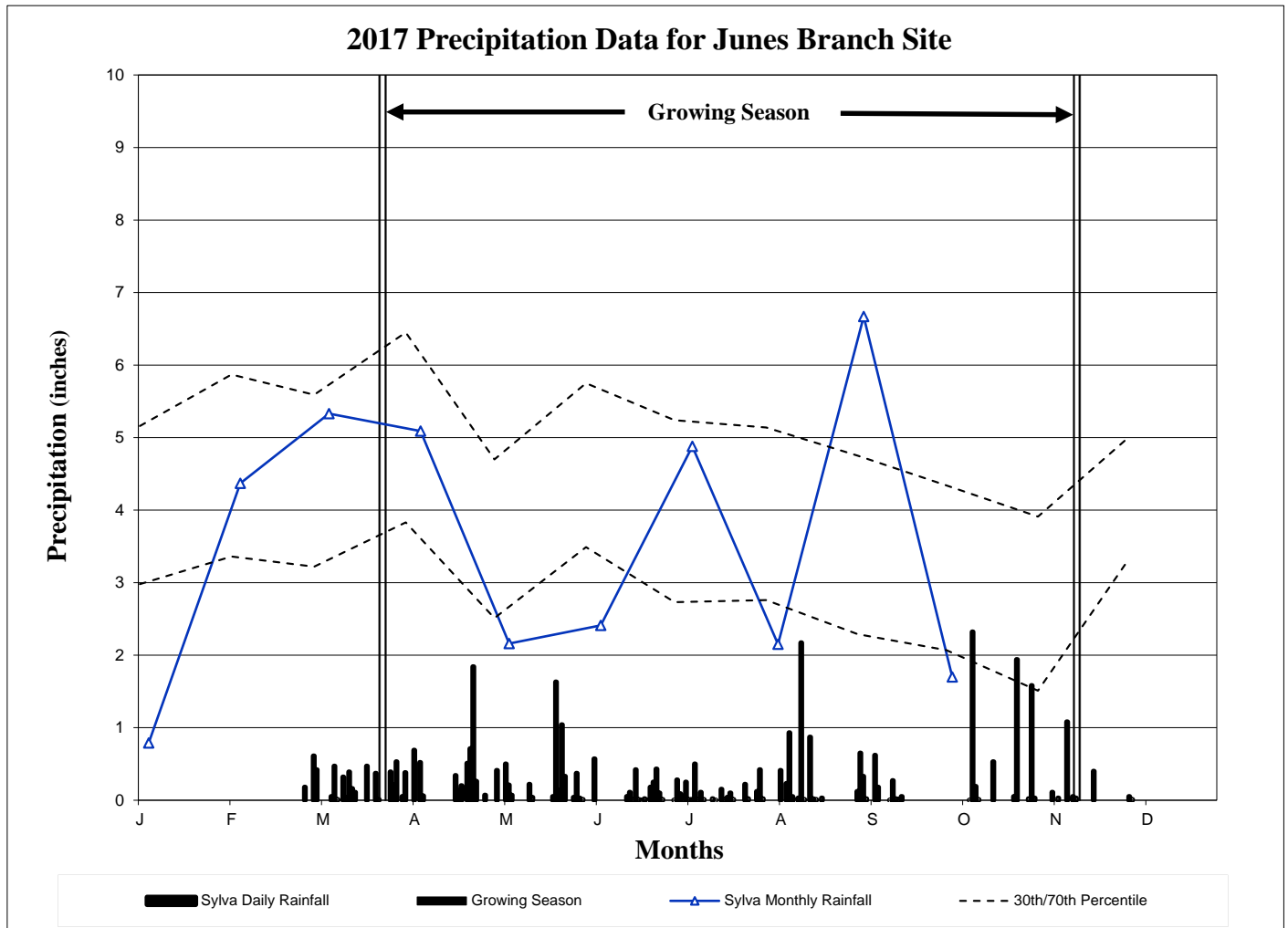
Table 13. Sylva, NC Rainfall Summary 2017

Month	Average	Normal Limits		Sylva, NC CoCoRaHS Station
		30 Percent	70 Percent	
January	4.92	3.36	5.87	--
February	4.69	3.22	5.59	0.79
March	5.43	3.83	6.45	4.37
April	3.91	2.51	4.7	5.33
May	4.86	3.49	5.75	5.09
June	4.34	2.73	5.24	2.16
July	4.27	2.76	5.14	2.41
August	3.91	2.29	4.75	4.88
September	3.57	2.07	4.34	2.15
October	3.20	1.51	3.91	6.67
November	4.28	3.28	4.98	1.7
December	4.33	2.98	5.16	--
Totals	51.71	34.03	61.88	35.55

*January Data missing from Station

**Switched from NJCY RAWs Station to NC-JC-17 CoCoTaHS Station on June 1, 2017

Chart 10. MY4 Precipitation Data



*Daily rainfall data not reported by Station until Feb. 25, 2017

Appendix F

Memorandum

Junes Branch IRT Site Visit on 4/18/2017 Meeting Summary



MEMORANDUM

To: Paul Wiesner, NCDMS

From: Daniel Ingram, RES

Re: Junes Branch IRT Site Visit on 4/18/2017, DMS project #(95027), FD contract #(003979)

Date: 4/24/2017

Meeting Summary

Date: 4/18/2017, 8:30am to 11:00am

Location: Junes Branch Site, Jackson County

Attendees: Todd Tugwell, Kim Browning, David Brown, and Steve Kichefski (USACE); Mac Haupt (NCDWR); Paul Wiesner and Matthew Reid (NCDMS), Daniel Ingram and Brian Hockett (RES)

RES and NCDMS requested a site visit at Junes Branch during the 2017 Credit Release IRT meeting. Specific items to review were two reaches with sediment aggradation (Doris Branch and Higdon Branch). IRT members also wanted to discuss the monitoring schedule over the previous three years. Junes Branch is entering into Monitoring Year 4 of 5. The IRT intends to revamp the close-out process by providing increased review of monitoring reports and providing feedback in advance of close-out. In light of that approach, the IRT members wanted to walk the entire project area to review all project components. Their comments are presented below by reach. At the outset of the meeting RES presented a detailed monitoring schedule to the IRT and DMS staff (see below). IRT feedback on the schedule was they do not want to see two monitoring events in the same calendar year. RES explained the reasoning behind the schedule, noted that over six months had elapsed between each monitoring event, and noted the lack of clear guidance and interpretation of the mitigation guidelines. Paul W. stated that he approved the compressed monitoring schedule. RES asked what remedy the IRT proposed and was answered that we just shouldn't do it again on other sites, but no specific remedy or consequence for Junes Branch was proposed. RES and DMS noted the clear direction from the IRT and will incorporate these comments into future project activities.

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Odenton, MD 21113

10055 Red Run Blvd. #130
Owings Mills, MD 21117

302 Jefferson St. #110
Raleigh, NC 27605

33 Terminal Way #431
Pittsburgh, PA 15219

701 E. Bay St. #306
Charleston, SC 29403

5020 Montrose Blvd. #650
Houston, TX 77006

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Fairfax, VA 22031

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Richmond, VA 23233

3751 Westerre Pkwy. #A
Richmond, VA 23220

5367 Telephone Rd.
Warrenton, VA 20187

137½ East Main St. #210
Oak Hill, WV 25901



Activity	Date of Data Collection	Notes
Earthwork Complete	May 2014	
Planting Complete	May 2014	
As-Built Veg	June 2014	
As-Built Survey	June 2004	
Year 1 Veg	Jan 2015	7 months from As-Built
Year 1 Survey	Jan 2015	7 months from As-Built
Year 2 Veg	Sep 2015	8 months from Year 1
Year 2 Survey	Oct-Nov 2015	9 months from Year 1
Year 3 Veg	June 2016	9 months from Year 2
Year 3 Survey	Aug-Dec 2016	10 months from Year 2

Junes Branch

- No specific problem areas or concerns were noted on Junes Branch.
- Overall the system has a high sediment load but appears to be maintaining appropriate geomorphology.

Bumgarner I and II

- No problems or concerns were noted on Bumgarner I and II.

Higdon Branch

- Sediment accumulation was noted in Higdon Branch, but a defined channel was present.
- No maintenance, remedial actions, or credit deductions were requested by the IRT.

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Doris Branch

- Sediment accumulation was observed in Doris Branch and distinct channel features are absent along much of the reach.
- No specific maintenance was requested by the IRT.
- Todd T. stated the system appeared to be more of a linear wetland seep.
- Mac H. and David B. both observed that some aquatic function was still provided by the restoration.
- Mac H. commented that a reduced credit ratio, such as 2:1, may be warranted.
- David B. and Paul W. both stated the pre-construction condition was a shallow ditch/swale through a disturbed old field with groundwater flow.
- Based on monitoring data the reach appears to have spring fed perennial flow, but limited watershed size and is lacking channel-forming flow events.
- IRT members did not request any specific remedial actions and recommended a final decision on crediting be made after additional monitoring.

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