

Annual Monitoring Report

Monitoring Year 2 of 5

FINAL

Project Name: Junes Branch Stream Restoration

NCDMS Contract No.: 003979

NCDMS Project No.: 95027

Jackson County, NC

Data Collected: July 2015 - November 2015

Date Submitted: January 2016



Submitted to:

North Carolina Division of Mitigation Services

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1.0 PROJECT SUMMARY

1.1. Goals

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 complex 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

1.2. Success Criteria

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 profile and/or 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 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).

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 2 (MY2) data was collected from July through November 2015. Monitoring included the following activities: visual assessment of all reaches and the surrounding easement, collection of photos at fourteen permanent photo stations, documentation of vegetation at five permanent monitoring plots, surveying of 3,050 feet of longitudinal profile, fifteen 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 two small bare areas, 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. No indication of instability was observed (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, two bare areas totaling 0.07 acre were noted along the Junes Branch reach (Table 6, Figure 2). The one small area of encroachment (mowing) noted at the private driveway crossing during MY1 has been corrected and vegetation is becoming re-established.

Monitoring of permanent vegetation monitoring plots ($n = 5$) was completed during September 2015. Summary tables and photographs associated with MY2 monitoring can be found in Appendix C. Vegetation data for MY2 indicate that all vegetation monitoring plots are on track to meet the MY3 interim success criteria of 320 stems per acre. Stem densities ranged from 364 to 688 stems per acre with a mean of 526 stems per acre across all plots. A total of 12 species were documented within the monitoring plots. When volunteer stems are included, densities ranged between 728 and 2,064 stems per acre with a mean of 1,392 stems per acre across all plots.

Geomorphic data for MY2 was collected from October through November 2015. Summary tables, cross-section plots, and longitudinal profiles related to stream morphology are located in Appendix D. Changes in the cross-section data between MY1 and MY2 were limited to Cross-Sections 3 and 13 (Appendix B, Table 11a). Riffle cross-section 3, where downcutting of the channel was evident in MY1 has begun to stabilize, however the max depth still increased by 0.2 feet from MY1 to MY2. Deposits of finer material in pools led to a decrease of 0.1 feet to 0.6 feet in maximum pool depth in cross-section 13.

Generally, longitudinal profile data (Appendix B, Table 11b) indicated relatively little change in riffle and pool dimensions between MY1 and MY2. All reaches showed a decrease in riffle length of between 0.2 feet and 1.6 feet, however these numbers are now falling closer to the baseline conditions. Each reach, with the exception of Doris Branch, also showed a decrease in average maximum pool depth between 0.1 feet and 0.2 feet.

Substrate monitoring was also performed during MY2. Riffle D_{50} has decreased between MY1 and MY2. The average D_{50} fell into the coarse sand size class for Bumgarner I, fine gravel for Bumgarner II, medium sand for Junes Branch, fine sand for Higdon Branch, and silt to fine sand for Doris Branch. The shift towards finer particle size classes throughout the project is likely due to fine sediment being transported into the project area from upstream and dropping out of the water column during the falling limb of high flow events. Additionally, the dense herbaceous vegetation throughout all reaches increases entrapment of fine material during high flows. As woody vegetation continues to establish, herbaceous vegetation density in and near the channel will decrease, allowing more efficient transport of finer particle size classes during high flows. A gravel and cobble layer is still present under a layer of finer silts and

sand at all riffles assessed during pebble counts. Substrate will be monitored in future years for shifts in size composition.

Overall, documented shifts in stream morphology do not exceed expectations between MY1 and MY2 as the constructed stream adjusts to conditions at the site. The project is meeting success criteria regarding stable dimension, pattern, and profile as well as substrate and sediment transport.

A bankfull event was recorded on the crest gauge at Bumgarner Branch II on a July site visit, at 0.1 feet above the bankfull elevation (Appendix E, Table 12).

Summary information/data related to the occurrence of items such as beaver or 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 Mitigation Plan) and in the Mitigation Plan (formerly Restoration Plan) documents available on DMS's website. All raw data supporting the tables and figures in the appendices is available from DMS upon request.

2.0 METHODS

Visual assessment of the stream 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 Nikon® NPR 332 Total Station. Three-dimensional coordinates associated with cross-section and profile data were collected in the field and geo-referenced (NAD83 State Plane feet FIPS 3200). Morphological data was limited to 15 cross-sections, and 3,050 feet of longitudinal profile. Survey data was 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 5 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 is processed using the CVS data entry tool. In the field, the four corners of each plot were permanently marked with rebar and photos of each plot are taken from the origin each monitoring year.

Precipitation data was 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

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>

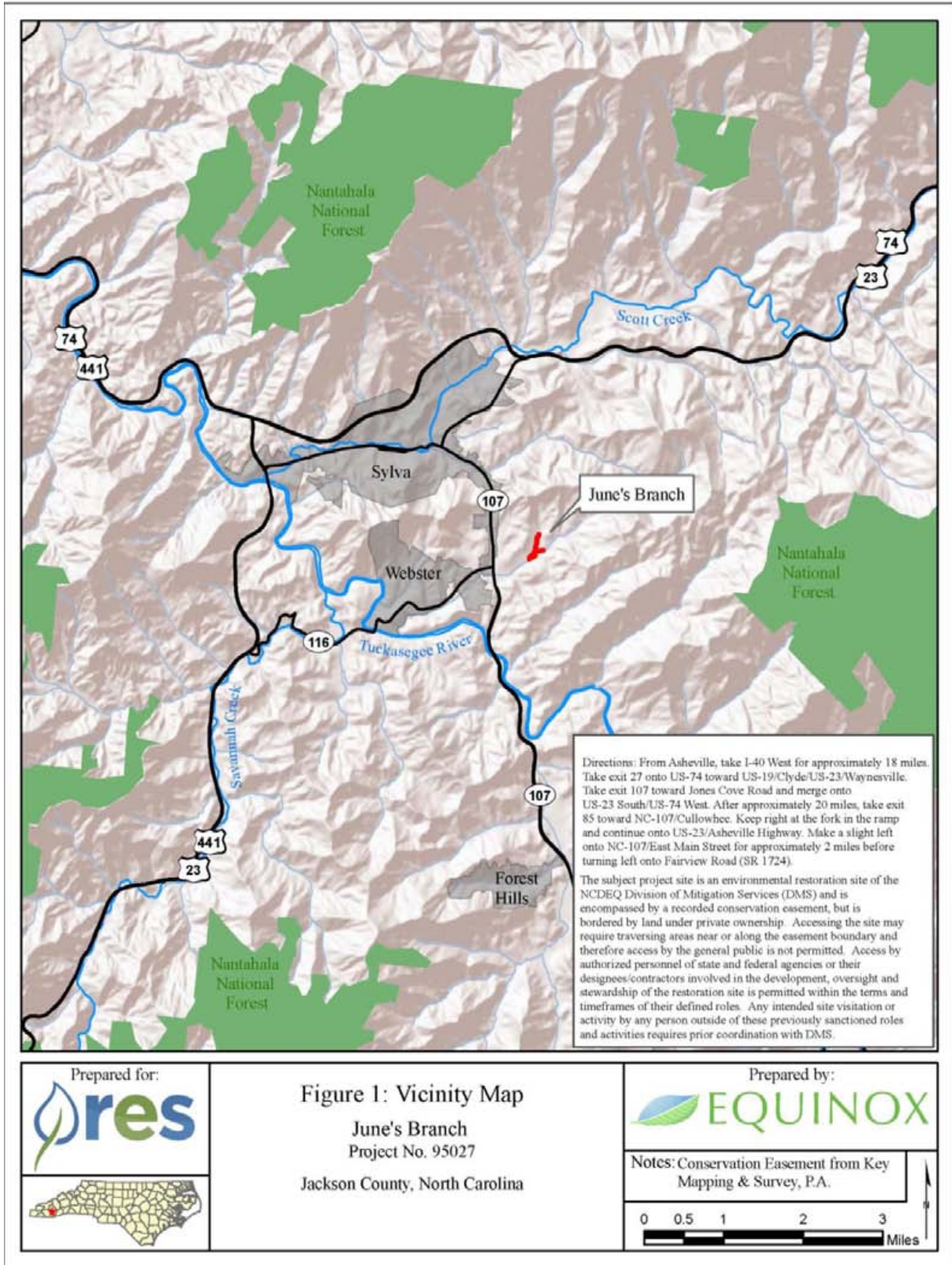
Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, Colorado.

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.

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Appendix A
General Tables and Figures

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Prepared for:




Figure 1: Vicinity Map
June's Branch
Project No. 95027
Jackson County, North Carolina

Prepared by:



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




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	3,162	-	-	-	-	-	-	-	-
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 1	100+21 - 107+49		610		PI	R	631	1:1	
Bumgarner Branch 2	107+49 - 112+92		550		PI	R	501	1:1	
June's Branch	200+97 - 215+77		1,311		PI	R	1,374	1:1	
Higdun Branch	300+45 - 304+27		530		PI	R	376	1:1	
Doris Branch	400+00 - 402+88		260		PI	R	280	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	3,162	-	-	-	-	-			
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

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	April-2013
Final Design - Construction Plans	N/A	April-2013
Construction	N/A	June-2014
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)	July-2014	July-2014
Year 1 Monitoring	Jan - 2015	Feb - 2015
Year 2 Monitoring	Nov - 2015	Nov - 2015
Year 3 Monitoring		
Year 4 Monitoring		
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-MY2) 2014 - 2015	Equinox 37 Haywood St. Asheville, North Carolina 28801 Hunter Terrell (828) 253-6856

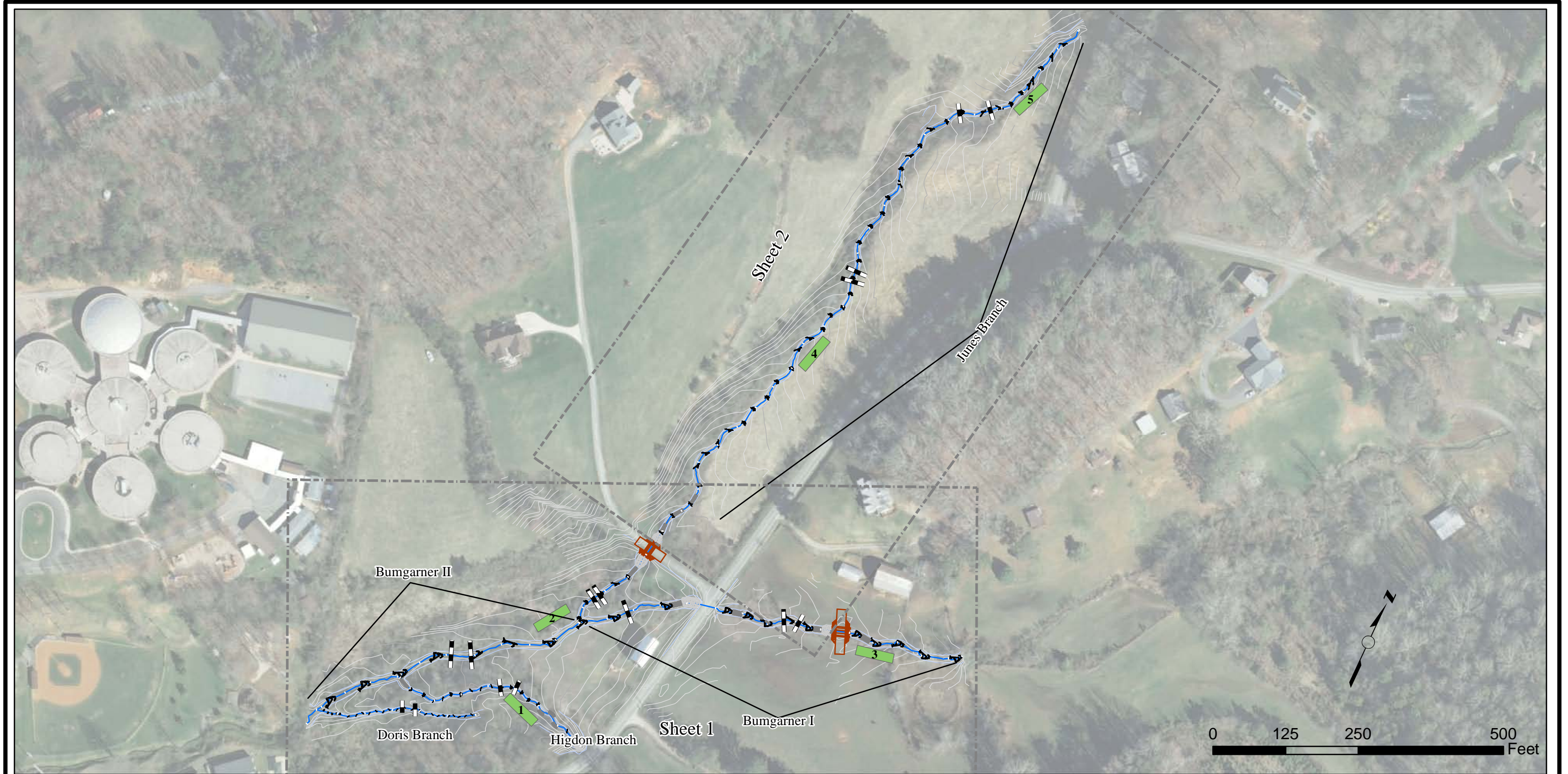
Table 4. Project Baseline Information and Attributes					
Junes Branch Stream Restoration Site – Project # 95027					
Project Information					
Project Name	Junes Branch				
County	Jackson County				
Project Area (acres)	5.8 ac.				
Project Coordinates (latitude and longitude)	35.357378° N and longitude 83.191391° W				
Project Watershed Summary Information					
Physiographic Province	Blue Ridge				
River Basin	Little Tennessee				
USGS Hydrologic Unit 8-digit	6010203	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	1311	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			

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Appendix B
Visual Assessment Data

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Figure 2. Integrated Current Condition Plan View Draft



Prepared for	Junes Branch Stream Restoration Project Monitoring Year 2 Sylva, Jackson County, NC NCDMS Contract No. 003979 NCDMS Project No.: 95027 November 2015 Overview	<table border="0"> <tr> <td></td> <td>Cross-Section</td> <td></td> <td>Hook-Log Run</td> <td></td> <td>Log Vane with Hook</td> </tr> <tr> <td></td> <td>Thalweg</td> <td></td> <td>Hook Run</td> <td></td> <td>Log Sill</td> </tr> <tr> <td></td> <td>Top of Bank</td> <td></td> <td>Boulder-Arch</td> <td></td> <td>Log Sill no Baffle</td> </tr> <tr> <td></td> <td>Contour- Major</td> <td></td> <td>Boulder-Arch with Log</td> <td></td> <td>Brush Toe</td> </tr> <tr> <td></td> <td>Contour- Minor</td> <td></td> <td>Armored Riffle</td> <td></td> <td></td> </tr> <tr> <td></td> <td>Vegetation Plot</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Sheet Boundary</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>		Cross-Section		Hook-Log Run		Log Vane with Hook		Thalweg		Hook Run		Log Sill		Top of Bank		Boulder-Arch		Log Sill no Baffle		Contour- Major		Boulder-Arch with Log		Brush Toe		Contour- Minor		Armored Riffle				Vegetation Plot						Sheet Boundary					Notes: 1) Baseline Data Provided by Kee Mapping 2) Orthoimagery provided by NCOneMap (2010)	Prepared by
	Cross-Section		Hook-Log Run		Log Vane with Hook																																									
	Thalweg		Hook Run		Log Sill																																									
	Top of Bank		Boulder-Arch		Log Sill no Baffle																																									
	Contour- Major		Boulder-Arch with Log		Brush Toe																																									
	Contour- Minor		Armored Riffle																																											
	Vegetation Plot																																													
	Sheet Boundary																																													



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Monitoring Year 2

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NCDMS Contract No. 003979

NCDMS Project No.: 95027

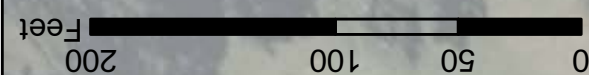
November 2015

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Notes:
 1) Baseline Data Provided by Kee Mapping
 2) Orthomagey provided by NConMap (2010)

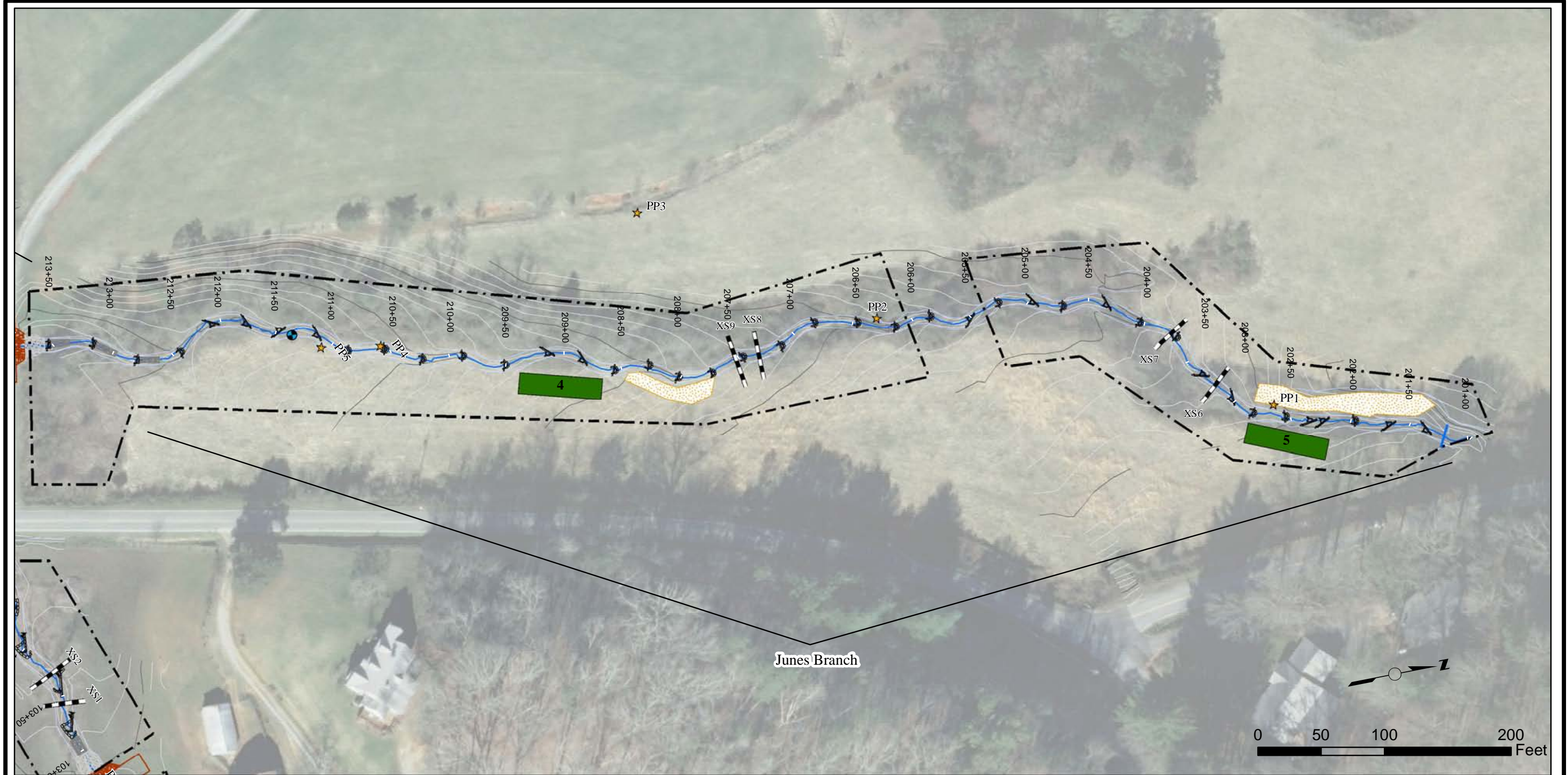



	Rain Gauge
	Crest Gauge
	Photo Point
	Control Point
	Cross-Section
	Thalweg
	Top of Bank
	Contour-Major
	Contour-Minor

	Easement
	Bare Area
	Encroachment
	Hook-Log Run
	Hook Run
	Boulder-Arch
	Boulder-Arch with Log
	Armored Rifle

	Vegetation Plot Success
	Criteria Met
	Criteria Unmet
	Log Vane with Hook
	Log Sill
	Log Sill no Baffle
	Brush Toe

Figure 2. Integrated Current Condition Plan View



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Junes Branch Stream Restoration Project
 Monitoring Year 2
 Sylva, Jackson County, NC
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 Sheet 2 of 2

Rain Gauge	Cross-Section	Easement	Hook-Log Run	Log Vane with Hook
Crest Gauge	Long Pro Begin/End	Bare Area	Hook Run	Log Sill
Photo Point	Thalweg	Encroachment	Boulder-Arch	Log Sill no Baffle
Control Point	Top of Bank	Low Stem Density	Boulder-Arch with Log	Brush Toe
Contour- Major	Contour- Minor	Vegetation Plot Success		
		Criteria Met	Armored Riffle	
		Criteria Unmet		

Notes:
 1) Baseline Data Provided by Kee Mapping
 2) Orthoimagery provided by NCOneMap (2010)

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**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> gradation - 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.			0	0	100%				
	2. Riffle Condition	1. <u>T</u> exture/Substrate - Riffle maintains coarser substrate.	13	13				100%			
		1. <u>D</u> epth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	13	13				100%			
	3. Meander Pool Condition	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			
		1. Thalweg centering at upstream of meander bend (Run).	13	13				100%			
	4. Thalweg Position	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	100%	0	0	100%
			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
			Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
	3. Engineered Structures	1. Overall Integrity	Totals			0	0	100%	N/A	N/A	N/A
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%			
		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%			
		Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	14	14				100%			

N/A - Item does not apply.

**Table 5 cont'd. Visual Stream Morphology Stability Assessment
Junes Branch / Project No. 95027 - Bumgarner 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>A</u> gradation - 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.			0	0	100%				
	2. Riffle Condition	1. <u>T</u> exture/Substrate - Riffle maintains coarser substrate.	7	7				100%			
		1. <u>D</u> epth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	8	8				100%			
	3. Meander Pool Condition	2. <u>L</u> ength appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	2	2				100%			
		1. Thalweg centering at upstream of meander bend (Run).	8	8				100%			
	4. Thalweg Position	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	100%	0	0	100%
			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
			Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
	3. Engineered Structures	Totals			0	0	0	100%	N/A	N/A	N/A
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 ≥ 1.6. Rootwads/logs providing some cover at base-flow.	7	7			100%					

N/A - Item does not apply.

Table 5 cont'd. Visual Stream Morphology Stability Assessment
Junes Branch / Project No. 95027 - Junes
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>A</u> gradation - 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.			0	0	100%				
	2. Riffle Condition	1. <u>T</u> exture/Substrate - Riffle maintains coarser substrate.	45	45			100%				
		1. <u>D</u> epth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	45	45			100%				
	3. Meander Pool Condition	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				
		1. Thalweg centering at upstream of meander bend (Run).	45	45			100%				
	4. Thalweg Position	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	0	100%
			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
			Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
	3. Engineered Structures	1. Overall Integrity		Totals			0	0	100%	N/A	N/A
Structures physically intact with no dislodged boulders or logs.			45	45			100%				
Grade control structures exhibiting maintenance of grade across the sill.			45	45			100%				
Structures lacking any substantial flow underneath sills or arms.			45	45			100%				
Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.			45	45			100%				
Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.			45	45			100%				

N/A - Item does not apply.

Table 5 cont'd. Visual Stream Morphology Stability Assessment
Junes Branch / Project No. 95027 - Higdon
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>A</u> gradation - 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.			0	0	100%				
	2. Riffle Condition	1. <u>T</u> exture/Substrate - Riffle maintains coarser substrate.	18	18			100%				
		1. <u>D</u> epth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	18	18			100%				
	3. Meander Pool Condition	2. <u>L</u> ength appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	3	3			100%				
		1. Thalweg centering at upstream of meander bend (Run).	18	18			100%				
	4. Thalweg Position	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	100%	0	0	100%
			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
			Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
	3. Engineered Structures	1. Overall Integrity		Totals			0	0	100%	N/A	N/A
Structures physically intact with no dislodged boulders or logs.			15	15			100%				
Grade control structures exhibiting maintenance of grade across the sill.			15	15			100%				
Structures lacking any substantial flow underneath sills or arms.			15	15			100%				
Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.			15	15			100%				
Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.			15	15			100%				

N/A - Item does not apply.

Table 5 cont'd. Visual Stream Morphology Stability Assessment
Junes Branch / Project No. 95027 - Doris
 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>A</u> gradation - 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.			0	0	100%				
	2. Riffle Condition	1. <u>T</u> exture/Substrate - Riffle maintains coarser substrate.	23	23				100%			
		1. <u>D</u> epth Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6).	23	23				100%			
	3. Meander Pool Condition	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			
		1. Thalweg centering at upstream of meander bend (Run).	23	23				100%			
	4. Thalweg Position	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	100%	0	0	100%
			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
			Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
	3. Engineered Structures	1. Overall Integrity		Totals			0	0	100%	N/A	N/A
Structures physically intact with no dislodged boulders or logs.			23	23				100%			
Grade control structures exhibiting maintenance of grade across the sill.			23	23					100%		
Structures lacking any substantial flow underneath sills or arms.			23	23					100%		
Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.			23	23					100%		
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%		

N/A - Item does not apply.

**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.	N/A	2	0.07	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						
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						
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).	Cross Hatch (Red - Dense/Yellow - Present)	0	0.00	0%	
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	N/A	1	0.02	<1%	

N/A - Item does not apply.



Junes Branch – Permanent Photo Station 1
Station 202+60 - Downstream



Junes Branch – Permanent Photo Station 1
Station 202+60 - Upstream



Junes Branch – Permanent Photo Station 2
Station 206+30 - Downstream



Junes Branch – Permanent Photo Station 2
Station 206+30 - Upstream



Junes Branch – Permanent Photo Station 3
Looking South/Downstream Junes Branch



Junes Branch – Permanent Photo Station 3
Looking North/Upstream - Upstream



Junes Branch – Permanent Photo Station 4
Station 210+60 - Downstream



Junes Branch – Permanent Photo Station 4
Station 210+60 - Upstream



Junes Branch – Permanent Photo Station 5
Station 211+10 - Upstream



Junes Branch – Permanent Photo Station 6
Station 214+00 - Downstream



Junes Branch – Permanent Photo Station 6
Station 214+00 - Upstream



Bumgarner Branch I – Permanent Photo Station 7
Station 100+21 - Downstream



Bumgarner Branch I – Permanent Photo Station 8
Station 102+70 - Downstream



Bumgarner Branch I – Permanent Photo Station 8
Station 102+70- Upstream



Bumgarner Branch I – Permanent Photo Station 9
Station 105+25 - Downstream



Bumgarner Branch I – Permanent Photo Station 9
Station 105+25 – Upstream



Bumgarner Branch I – Permanent Photo Station 10
Looking Upstream from Confluence with Junes Branch



Junes Branch – Permanent Photo Station 10
Looking Upstream from Confluence with Bumgarner Branch



Bumgarner Branch II – Permanent Photo Station 11
Looking Upstream from Confluence with Higdon Branch



Higdon Branch – Permanent Photo Station 11
Looking Upstream from Confluence with Bumgarner Branch II



Bumgarner Branch II – Permanent Photo Station 12
Looking Upstream from Confluence with Doris Branch



Doris Branch – Permanent Photo Station 12
Looking Upstream from Confluence with Bumgarner Branch II



Higdon Branch – Permanent Photo Station 13
Station 302+80 - Downstream



Higdon Branch – Permanent Photo Station 13
Station 302+80 - Upstream



Doris Branch – Permanent Photo Station 14
Station 400+00 - Downstream

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Appendix C
Vegetation Plot Data

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Table 7. Vegetation Plot Criteria Attainment		
Junes Branch / Project No. 95027		
Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	100%
2	Yes	
3	Yes	
4	Yes	
5	Yes	



Junes Branch - Vegetation Monitoring Plot 1
September 11, 2015



Junes Branch - Vegetation Monitoring Plot 2
September 11, 2015



Junes Branch - Vegetation Monitoring Plot 3
September 11, 2015



Junes Branch - Vegetation Monitoring Plot 4
September 11, 2015



Junes Branch - Vegetation Monitoring Plot 5
September 11, 2015

Table 8. CVS Vegetation Plot Metadata Junes Branch / Project No. 95027	
Report Prepared By	Drew Alderman
Date Prepared	9/11/2015 13:23
database name	Equinox_2015_A_Junes.mdb
database location	Z:\ES\NRI&M\EBX Monitoring\Junes\MY2-2015\Data\Veg
computer name	FIELD-PC
file size	61181952
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	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	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	5

Table 9. Planted and Total Stem Counts (Species by Plot with Annual Means)
Junes Branch/Project No. 95027

Scientific Name	Common Name	Species Type	Current Plot Data (MY2 2015)												Annual Means									
			Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		MY2 (2015)		MY1 (2015)		MY0 (2014)							
			P-noLS	T	P-noLS	T	P-noLS	T	P-noLS	T	P-noLS	T	P-noLS	T	P-noLS	T	P-noLS	T						
<i>Alnus serrulata</i>	Hazel alder	Shrub																						
<i>Betula nigra</i>	River birch	Tree	4	4																				
<i>Carpinus caroliniana</i>	Coastal American Hornbeam	Tree			1	1																		
<i>Cornus amomum</i>	Silky dogwood	Shrub				2																		
<i>Cornus florida</i>	Flowering dogwood	Tree																						
<i>Diospyros virginiana</i>	Common persimmon	Tree																						
<i>Fraxinus pennsylvanica</i>	Green ash	Tree	9	9																				
<i>Hamamelis virginiana</i>	American witchhazel	Tree	1	1	1	1																		
<i>Juglans nigra</i>	Black walnut	Tree																						
<i>Liriodendron tulipifera</i>	Tuliptree	Tree											4											
<i>Liriodendron tulipifera</i>	Tulip-tree, Yellow Poplar, White wood	Tree																						
<i>Platanus occidentalis</i>	American sycamore	Tree												1										
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree	1	1	5	5	9	9	9	1	1	1												
<i>Prunus serotina</i>	Black cherry	Tree																						
<i>Quercus</i>	Oak	Tree	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Quercus phellos</i>	Willow oak	Tree																						
<i>Quercus rubra</i>	Northern red oak	Tree	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>Salix nigra</i>	Black willow	Tree																						
<i>Sambucus canadensis</i>	Common Elderberry	Shrub																						
<i>Unknown</i>	Shrub or Tree																							
<i>Vitis aestivalis</i>	Summer grape	Vine																						
<i>Vitis rotundifolia</i>	Muscadine	Vine																						
	Stem count		17	17	18	18	18	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
	size (ares)		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	size (ACRES)		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	Species count		6	6	7	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	Stems per ACRE		688	688	728	364	364	1700	445	2064	567	567	1133	567	567	1335	526	526	1392	615	615	1246	704	704

*P-noLS: No livestock 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

Appendix D
Stream Geomorphology Data

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Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Sections) Junes Branch / Project No. 95027 - Bumgarner I (631 feet)																		
Dimension	Cross-Section 1 Riffle					Cross-Section 2 Pool					Cross-Section 3 Riffle							
	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				2,152.68	2,152.68	2,152.68				2,145.60	2,145.60	2,145.60			
Bankfull Width (ft)	13.3	13.4	12.7				13.4	13.1	13.2				15.8	16.8	16.3			
Floodprone Width (ft)	>79	>79	>79				>124	>124	>124				>42	>42	>42			
Bankfull Mean Depth (ft)	0.9	0.8	0.8				1.5	1.1	0.9				0.8	0.9	0.9			
Bankfull Max Depth (ft)	1.5	1.3	1.3				2.9	1.9	2.1				1.2	1.7	1.9			
Bankfull Cross Sectional Area (ft ²)	11.7	11.3	10.2				20.6	14.0	12.2				12.2	14.5	14.8			
Bankfull Width/Depth Ratio	15.2	15.8	15.8				8.7	12.3	14.3				20.4	19.4	18.0			
Bankfull Entrenchment Ratio	>5.9	>5.9	>6.2				>9.3	>9.5	>9.4				>2.7	>2.5	>2.6			
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0	1.0			
Cross Sectional Area between End Pins (ft ²)	33.8	27.9	26.7				43.1	35.6	32.6				28.4	31.0	32.2			
d50 (mm)	N/A	27	0.67				N/A	N/A	N/A				N/A	16	0.68			

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)																		
Dimension	Cross-Section 4 Pool					Cross-Section 5 Riffle												
	Base	MY1	MY2	MY3	MY4	MY5	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				2,139.81	2,139.81	2,139.81				2,139.81	2,139.81	2,139.81			
Bankfull Width (ft)	16.5	16.1	16.5				16.3	15.7	16.2				>48	>48	>48			
Floodprone Width (ft)	>50	>50	>50				>48	>48	>48				>48	>48	>48			
Bankfull Mean Depth (ft)	1.4	1.2	1.1				0.7	0.9	0.8				0.7	0.9	0.8			
Bankfull Max Depth (ft)	2.6	2.4	2.5				1.2	1.3	1.3				1.2	1.3	1.3			
Bankfull Cross Sectional Area (ft ²)	23.0	18.9	18.5				11.9	13.4	12.6				11.9	13.4	12.6			
Bankfull Width/Depth Ratio	11.9	13.7	14.8				22.2	18.4	20.8				22.2	18.4	20.8			
Bankfull Entrenchment Ratio	>3.0	>3.1	>3.0				>3.0	>3.1	>3.1				>3.0	>3.1	>3.1			
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0	1.0			
Cross Sectional Area between End Pins (ft ²)	31.9	26.1	25.2				28.0	27.6	26.8				28.0	27.6	26.8			
d50 (mm)	N/A	N/A	N/A				N/A	N/A	4.9				N/A	25	4.9			

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 (1375 feet)																		
Dimension	Cross-Section 6					Cross-Section 7					Cross-Section 8							
	Riffle					Pool					Riffle							
	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				2,171.35	2,171.35	2,171.35				2,163.28	2,163.28	2,163.28			
Bankfull Width (ft)	8.6	8.8	8.0				8.2	8.8	7.8				9.6	10.8	10.6			
Floodprone Width (ft)	>94	>94	>94				>111	>111	>111				>53	>53	>53			
Bankfull Mean Depth (ft)	0.4	0.5	0.4				1.0	0.7	0.6				0.7	0.6	0.5			
Bankfull Max Depth (ft)	0.7	0.9	0.7				2.1	1.6	1.3				1.2	1.1	1.0			
Bankfull Cross Sectional Area (ft ²)	3.7	4.1	3.0				8.6	6.1	4.8				6.4	6.4	5.7			
Bankfull Width/Depth Ratio	19.7	18.9	21.7				7.9	12.7	12.7				14.3	18.2	19.8			
Bankfull Entrenchment Ratio	>11.0	>10.7	>11.7				>13.5	>12.6	>14.2				>5.5	>4.9	>5			
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0	1.0			
Cross Sectional Area between End Pins (ft ²)	24.9	17.8	16.2				25.8	24.4	22.7				38.6	39.6	38.4			
d50 (mm)	N/A	1.4	0.13				N/A	N/A	N/A				N/A	4.7	0.65			

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 (1375 feet)																		
Dimension	Cross-Section 9					Cross-Section 10					Cross-Section 11							
	Pool					Pool					Riffle							
	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				2,144.35	2,144.35	2,144.35				2,143.99	2,143.99	2,143.99			
Bankfull Width (ft)	10.5	11.1	10.1				11.0	10.9	11.0				9.8	9.0	8.6			
Floodprone Width (ft)	>56	>56	>56				>39	>39	>39				>38	>38	>38			
Bankfull Mean Depth (ft)	1.0	0.8	0.7				0.8	0.7	0.7				0.6	0.6	0.6			
Bankfull Max Depth (ft)	2.0	1.8	1.6				1.7	1.5	1.5				1.2	1.0	1.2			
Bankfull Cross Sectional Area (ft ²)	10.5	8.4	7.5				9.0	7.9	7.6				5.8	5.2	5.2			
Bankfull Width/Depth Ratio	10.4	14.7	13.7				13.4	15.0	16.1				16.5	15.9	14.1			
Bankfull Entrenchment Ratio	>5.3	>5	>5.5				>3.5	>3.5	>3.5				>3.9	>4.2	>4.4			
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0	1.0			
Cross Sectional Area between End Pins (ft ²)	46.1	44.3	42.9				32.4	31.0	30.0				23.7	23.2	22.8			
d50 (mm)	N/A	N/A	N/A				N/A	N/A	N/A				N/A	12	0.21			

N/A - Item does not apply.

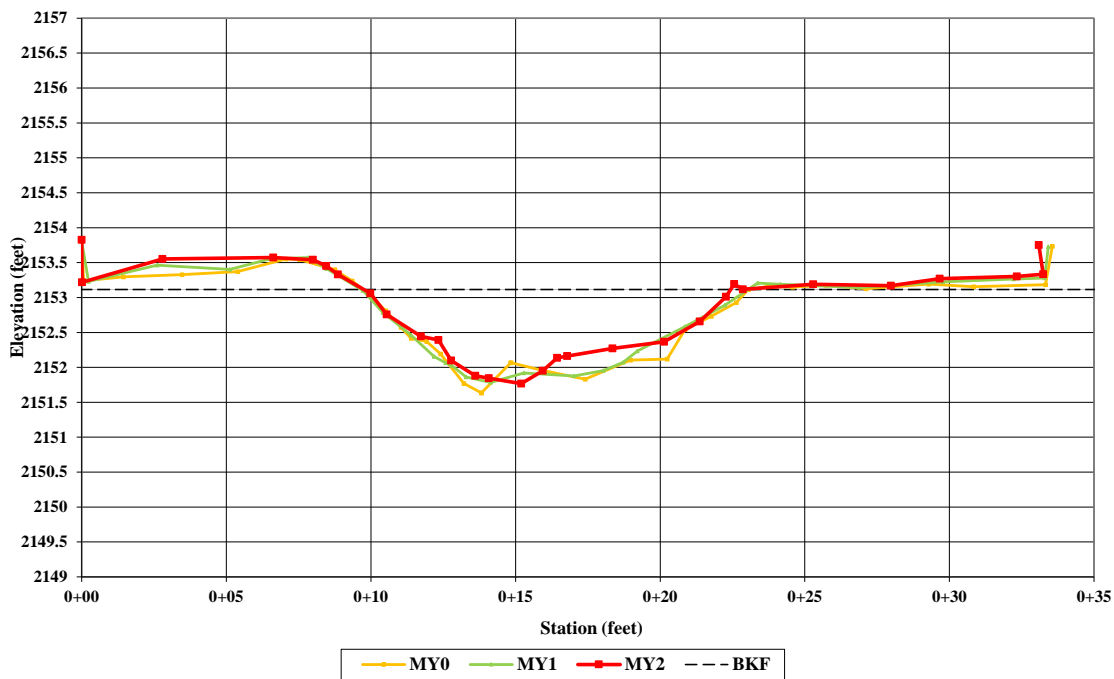
Table 11a. cont'd. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Sections) Junes Branch / Project No. 95027 -Higdon Branch (376 feet)												
Dimension	Cross-Section 12 Riffle					Cross-Section 13 Pool						
	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record Elevation (datum) Used	2,140.85	2,140.85	2,140.85				2,140.14	2,140.14	2,140.14	2,140.14		
Bankfull Width (ft)	6.6	8.1	7.0				8.0	7.2	7.0			
Floodprone Width (ft)	>40	>40	>39				>30	>30	>30			
Bankfull Mean Depth (ft)	0.4	0.3	0.3				0.7	0.6	0.3			
Bankfull Max Depth (ft)	0.7	0.7	0.9				1.7	1.1	0.5			
Bankfull Cross Sectional Area (ft ²)	2.5	2.6	2.4				5.9	4.0	2.1			
Bankfull Width/Depth Ratio	17.6	24.7	20.6				10.8	13.0	23.9			
Bankfull Entrenchment Ratio	>6.0	>4.9	>5.6				>3.7	>4.1	>4.2			
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0			
Cross Sectional Area between End Pins (ft ²)	15.9	15.3	14.9				20.0	16.8	12.9			
d50 (mm)	N/A	15	0.13				N/A	N/A	N/A			

N/A - Item does not apply.

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				2,138.74	2,138.74	2,138.74			
Bankfull Width (ft)	6.2	6.6	6.9				11.6	11.7	11.9			
Floodprone Width (ft)	>23	>23	>23				>21	>21	>21			
Bankfull Mean Depth (ft)	0.4	0.4	0.3				0.8	0.7	0.6			
Bankfull Max Depth (ft)	0.7	0.7	0.7				2.3	1.7	1.4			
Bankfull Cross Sectional Area (ft ²)	2.3	2.4	1.9				9.4	8.3	7.4			
Bankfull Width/Depth Ratio	16.7	18.2	25.7				14.3	16.5	19.1			
Bankfull Entrenchment Ratio	>3.8	>3.5	>3.4				>1.8	>1.8	>1.8			
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0			
Cross Sectional Area between End Pins (ft ²)	11.5	10.7	9.9				18.7	16.3	15.3			
d50 (mm)	N/A	0.062	0.062				N/A	N/A	N/A			

N/A - Item does not apply.

**Bumgarner I
Cross Section 1 - Riffle
Station 103+31**



Left Descending Bank



Right Descending Bank

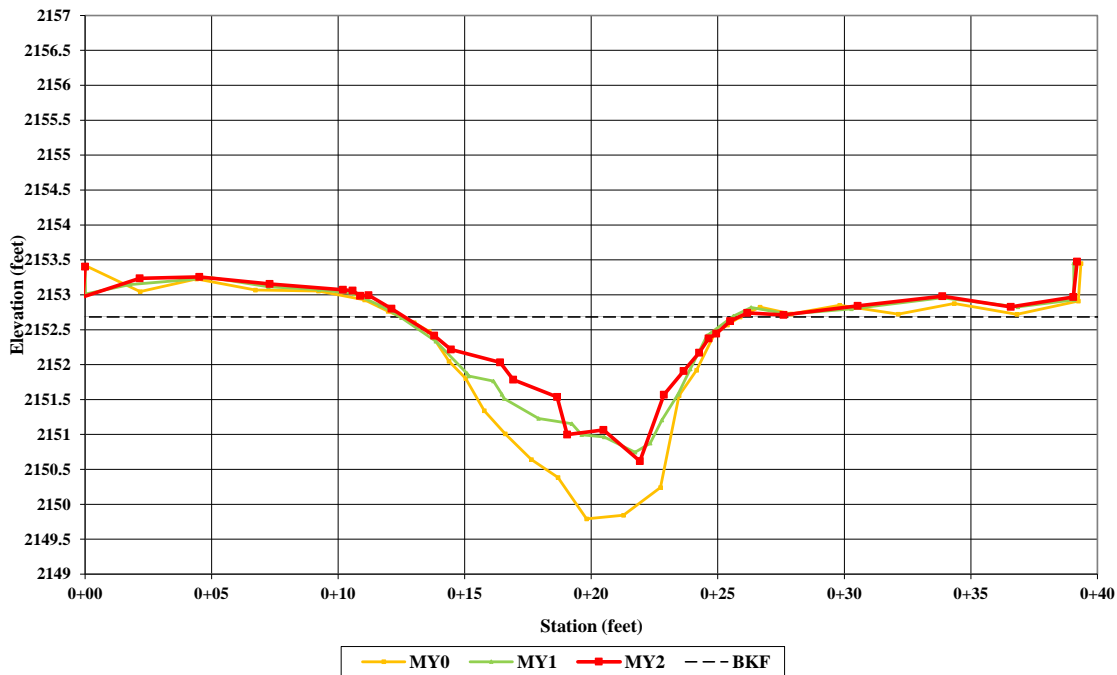


Upstream



Downstream

**Bumgarner I
Cross Section 2 - Pool
Station 103+56**



Left Descending Bank



Right Descending Bank

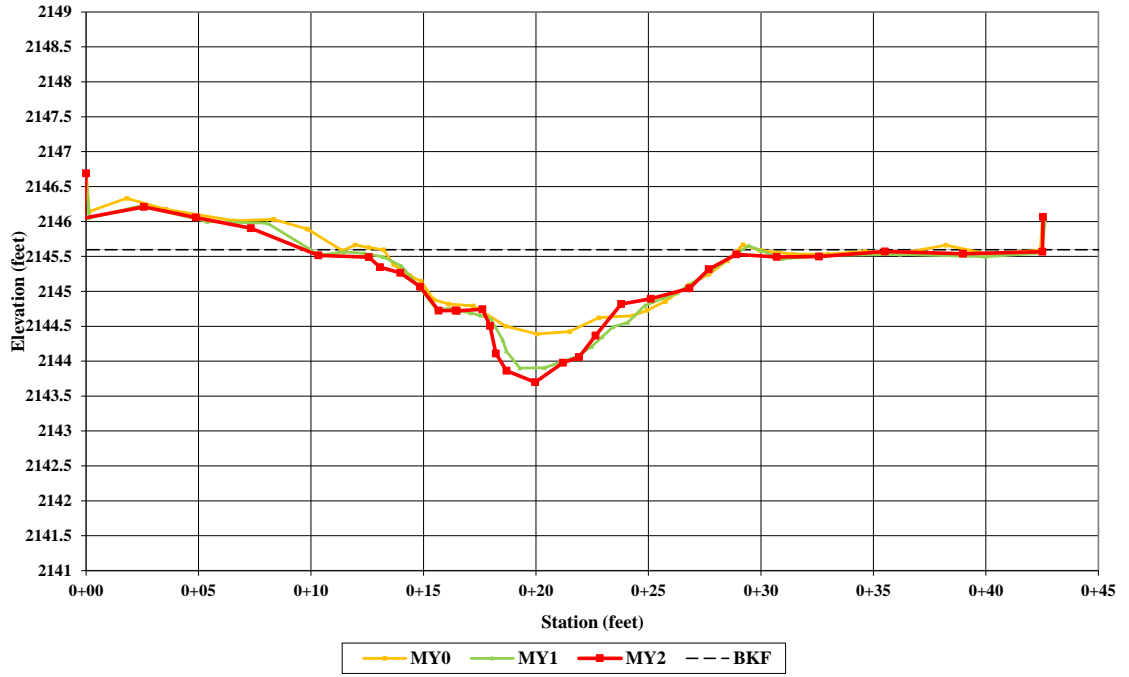


Upstream



Downstream

**Bumgarner I
Cross Section 3 - Riffle
Station 106+36**



Left Descending Bank



Right Descending Bank

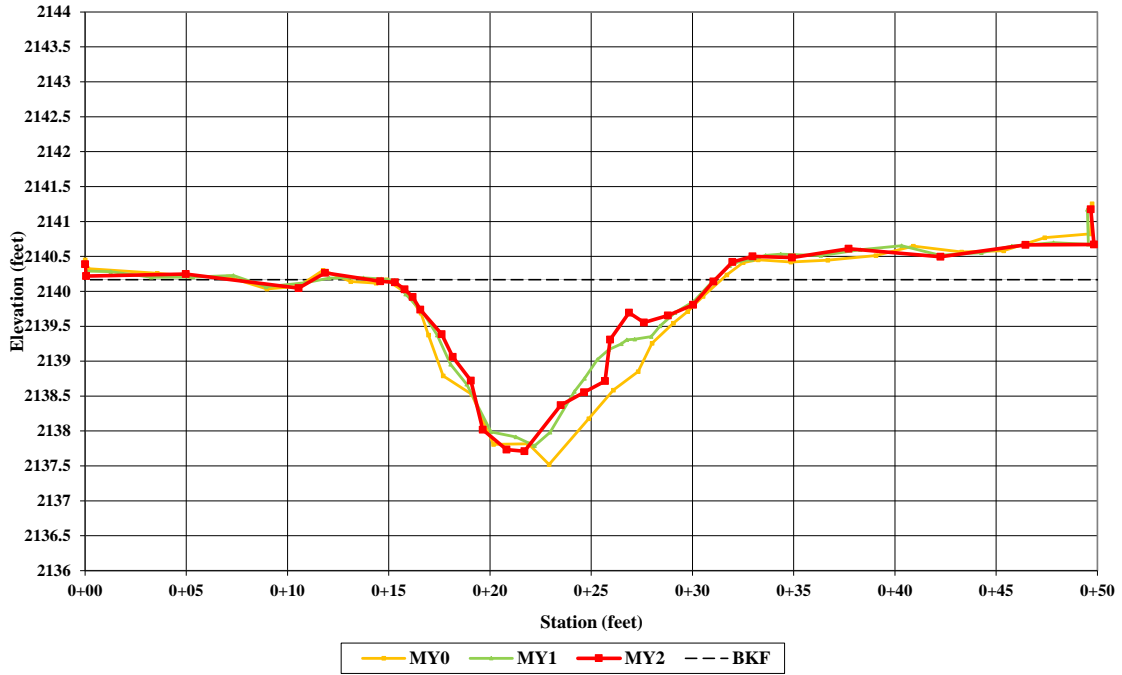


Upstream



Downstream

**Bumgarner II
Cross Section 4 - Pool
Station 109+24**



Left Descending Bank



Right Descending Bank

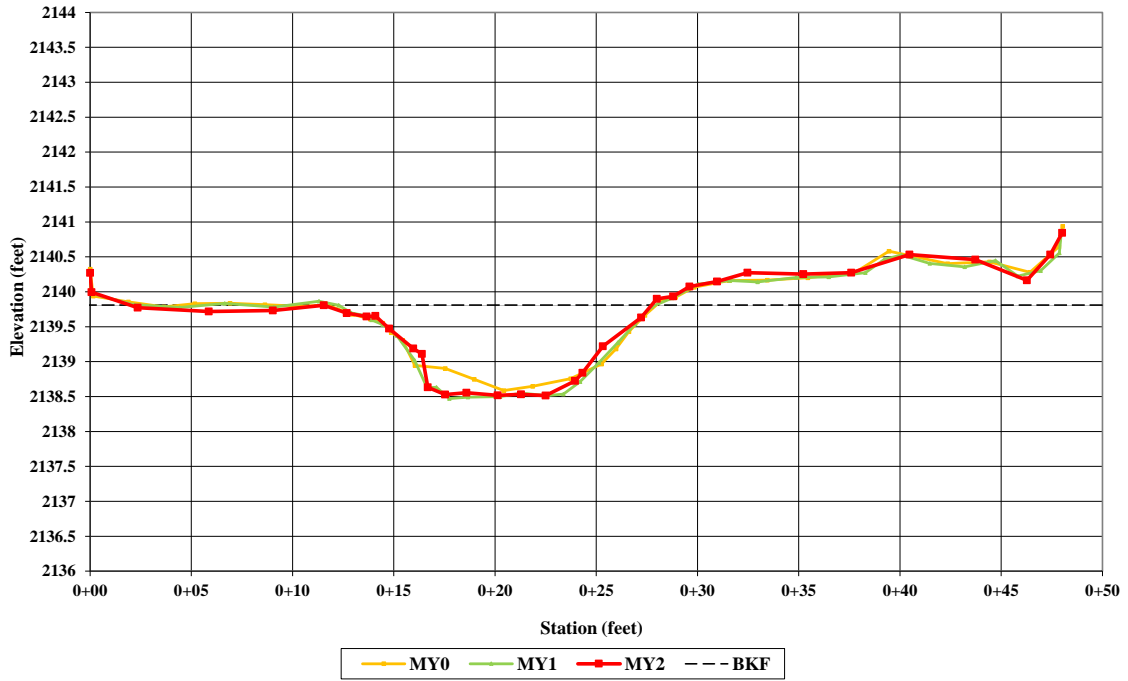


Upstream



Downstream

**Bumgarner II
Cross Section 5 - Riffle
Station 109+58**



Left Descending Bank



Right Descending Bank

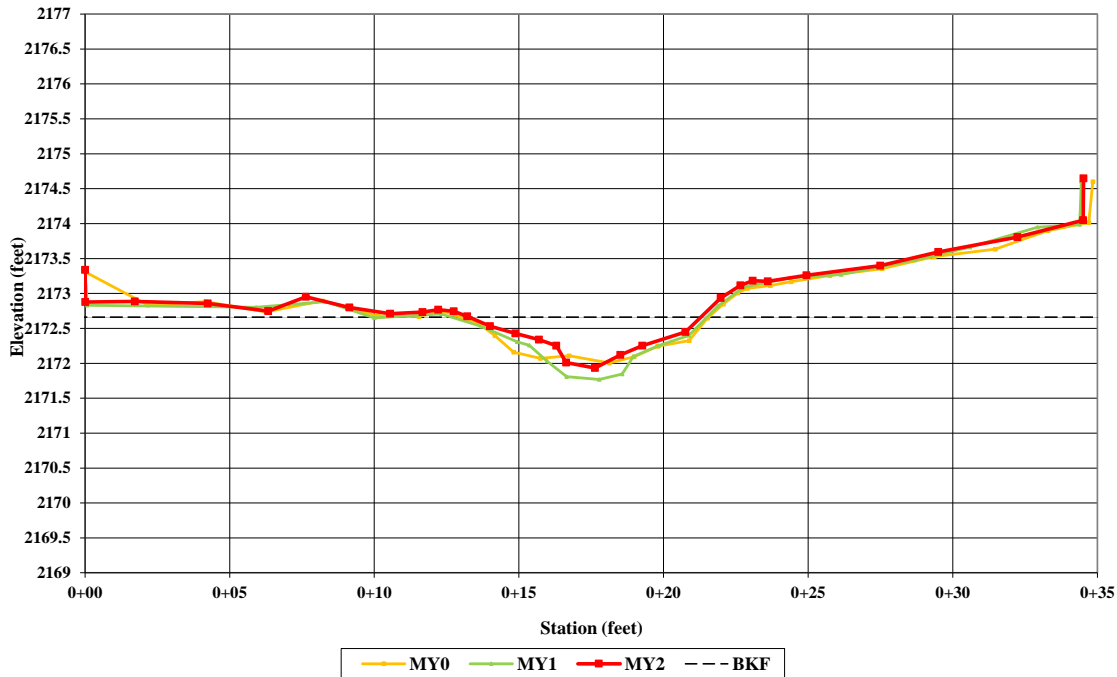


Upstream



Downstream

**Junes Branch
Cross Section 6 - Riffle
Station 202+94**



Left Descending Bank



Right Descending Bank

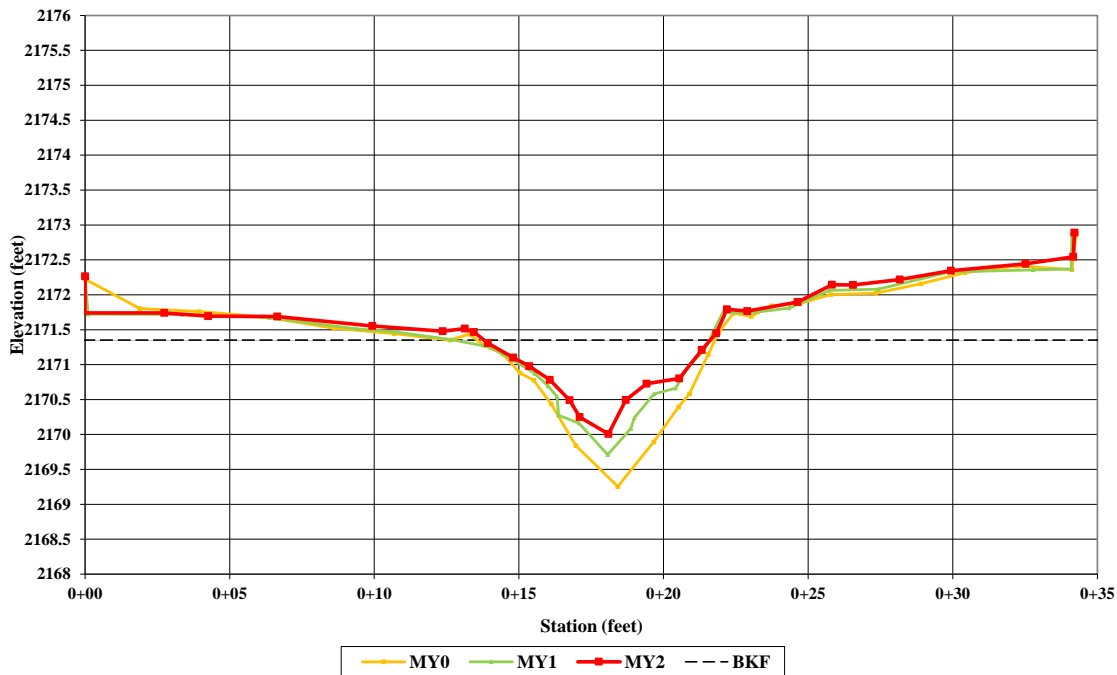


Upstream



Downstream

**Junes Branch
Cross Section 7 - Pool
Station 203+50**



Left Descending Bank



Right Descending Bank

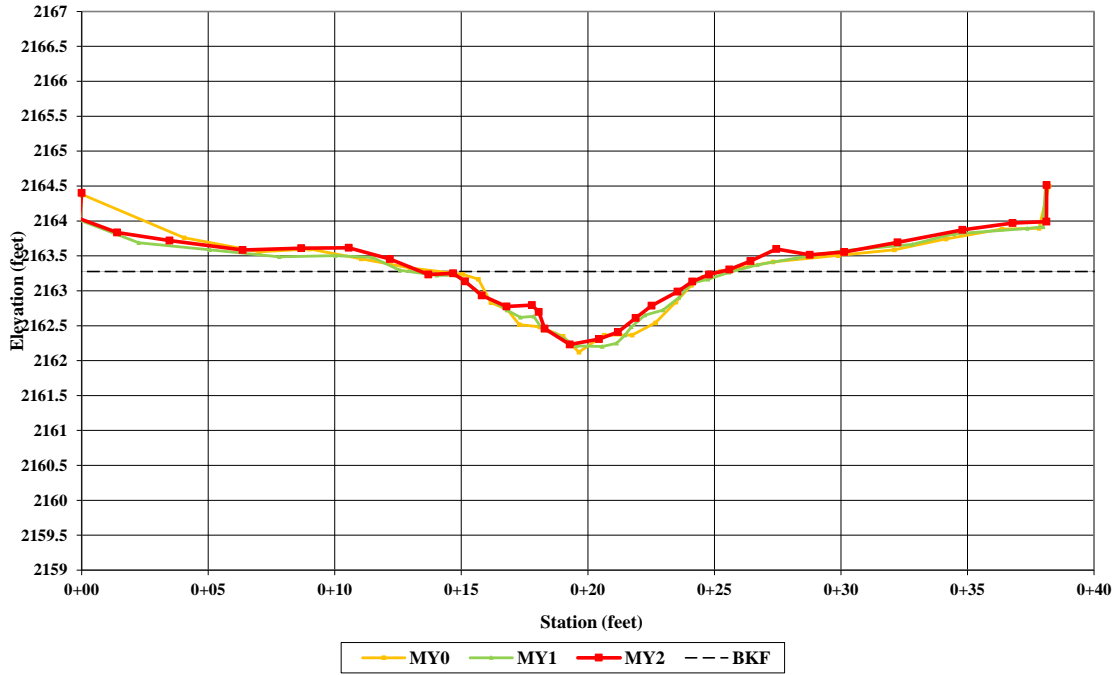


Upstream



Downstream

**Junes Branch
Cross Section 8 - Riffle
Station 20+99**



Left Descending Bank



Right Descending Bank

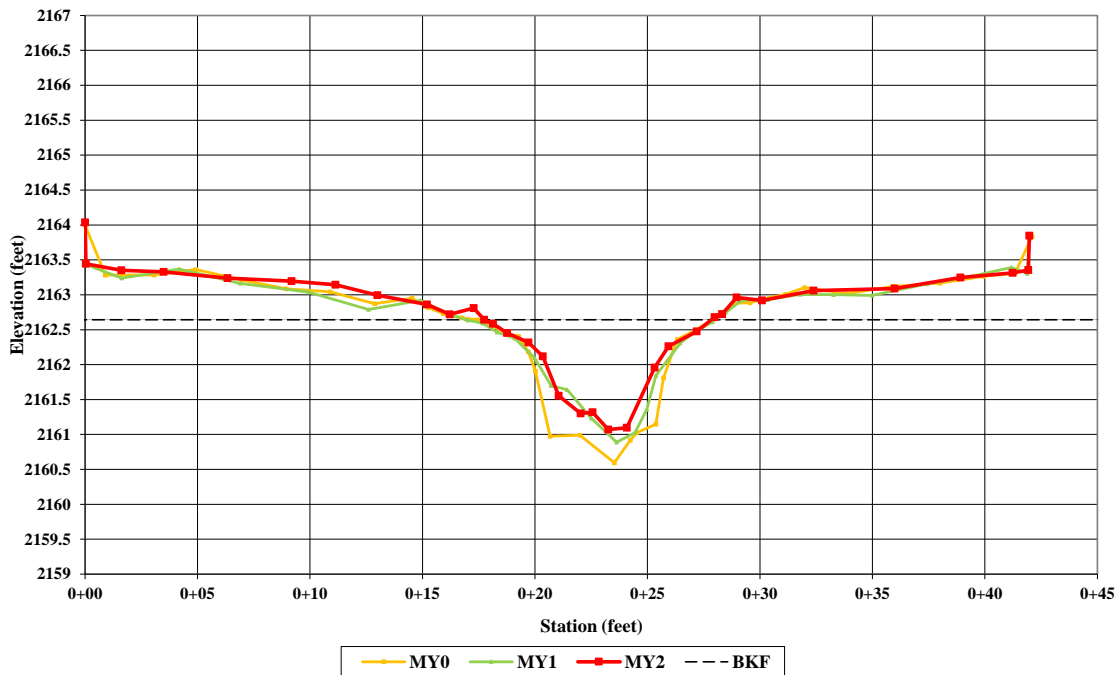


Upstream



Downstream

**Junes Branch
Cross Section 9 - Pool
Station 207+18**



Left Descending Bank



Right Descending Bank

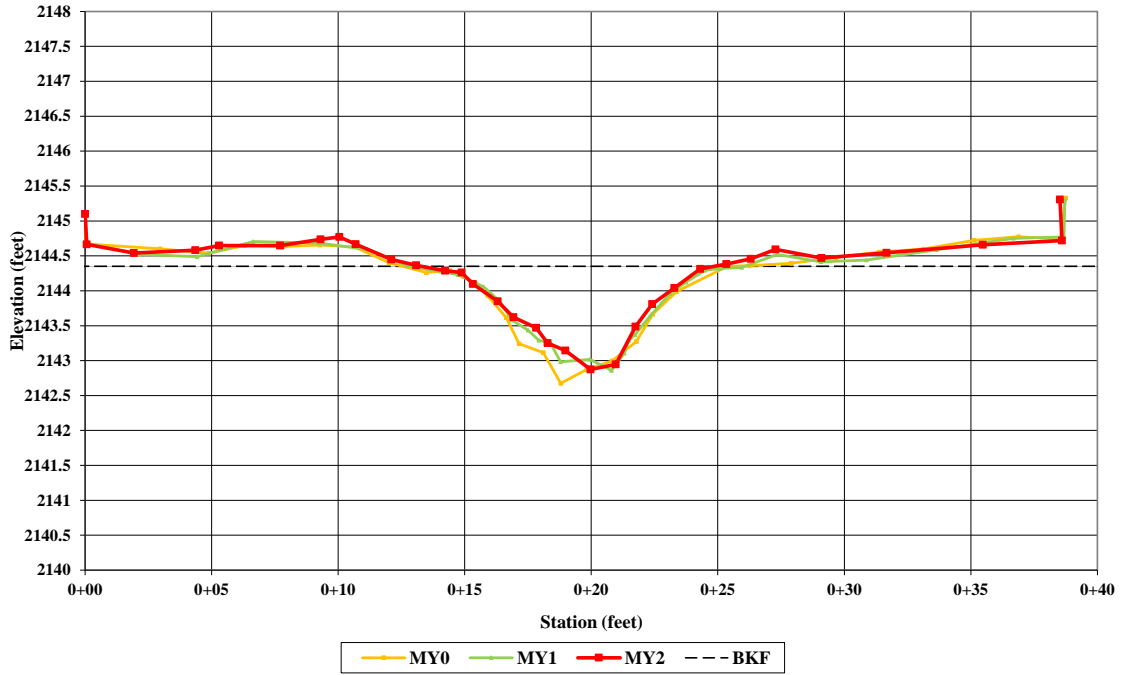


Upstream



Downstream

**Junes Branch
Cross Section 10 - Pool
Station 214+53**



Left Descending Bank



Right Descending Bank

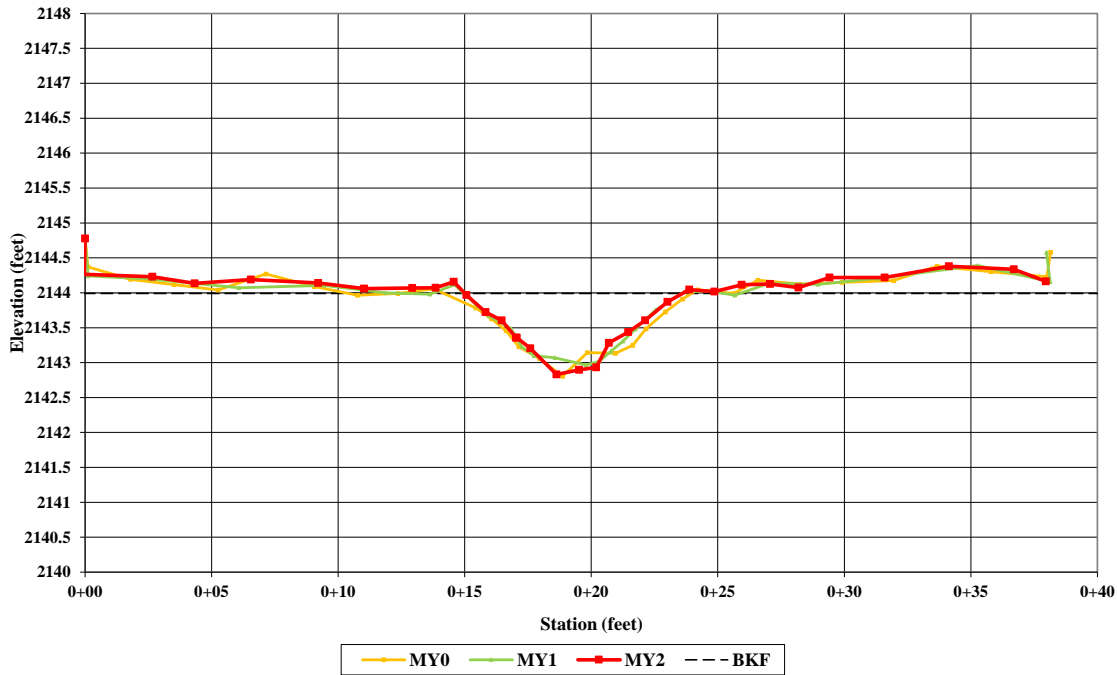


Upstream



Downstream

Junes Branch
 Cross Section 11 - Riffle
 Station 214+65



Left Descending Bank



Right Descending Bank

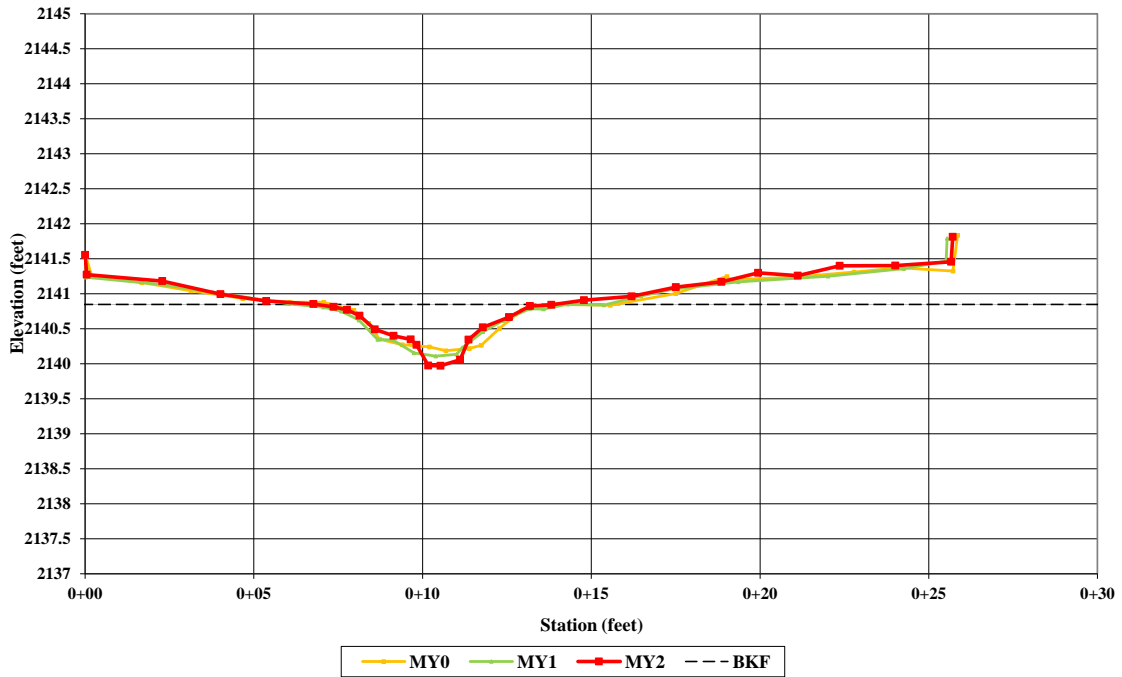


Upstream



Downstream

Higdon Branch
 Cross Section 12 - Riffle
 Station 301+99



Left Descending Bank



Right Descending Bank

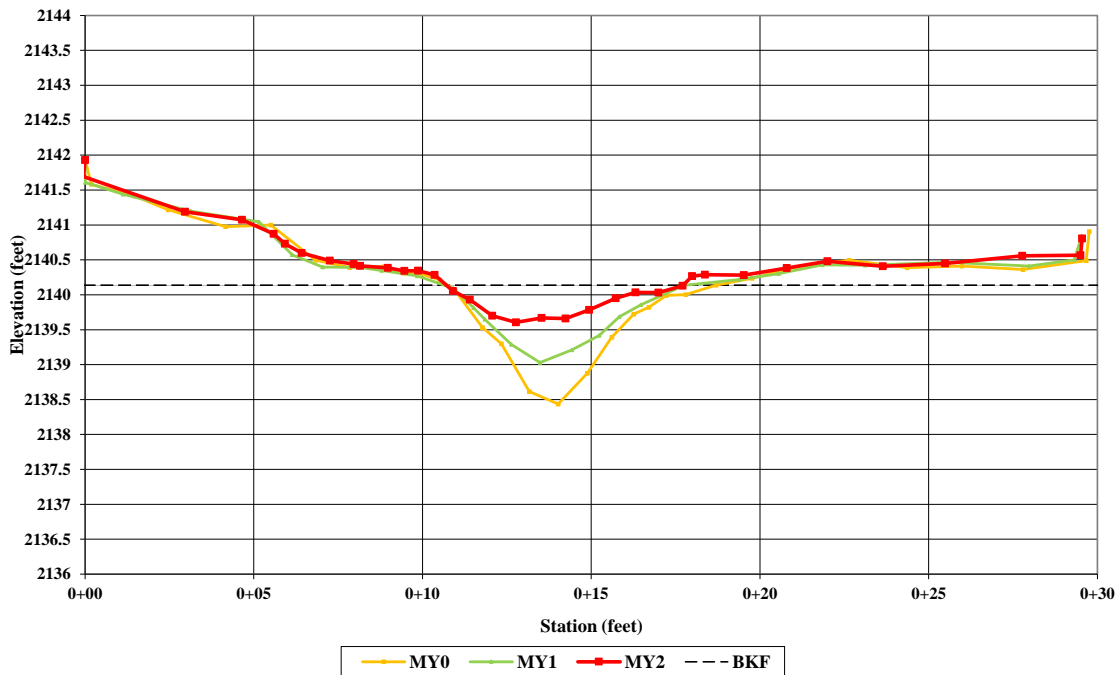


Upstream



Downstream

Higdon Branch
 Cross Section 13 - Pool
 Station 302+26



Left Descending Bank



Right Descending Bank

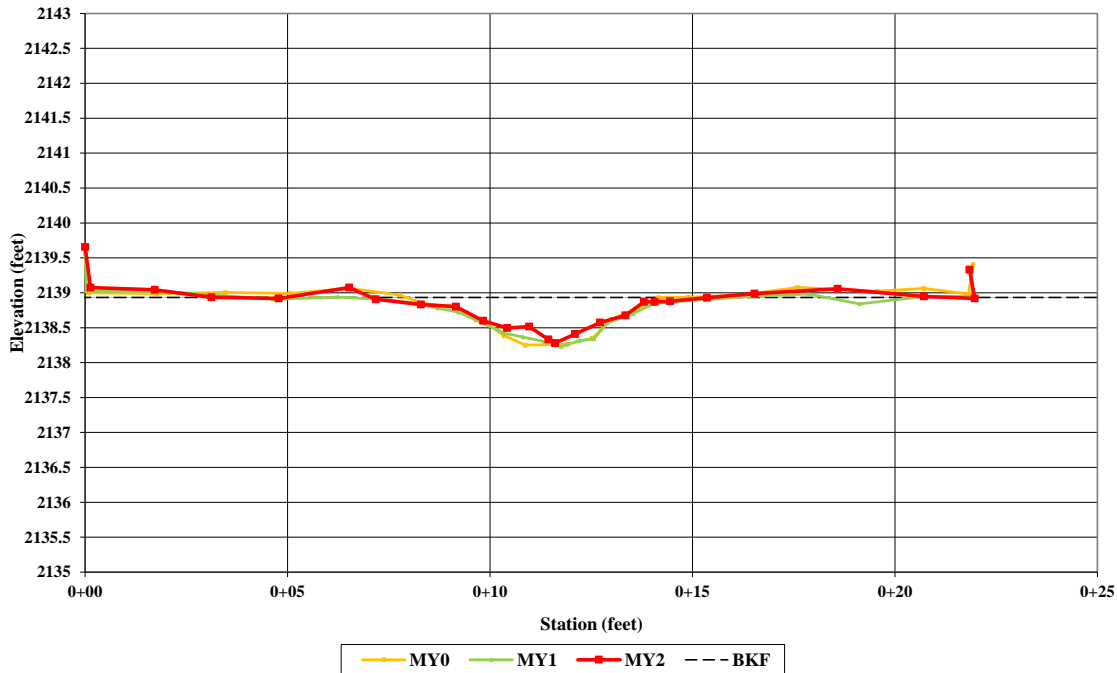


Upstream



Downstream

Doris Branch
Cross Section 14 - Riffle
Station 401+12



Left Descending Bank



Right Descending Bank

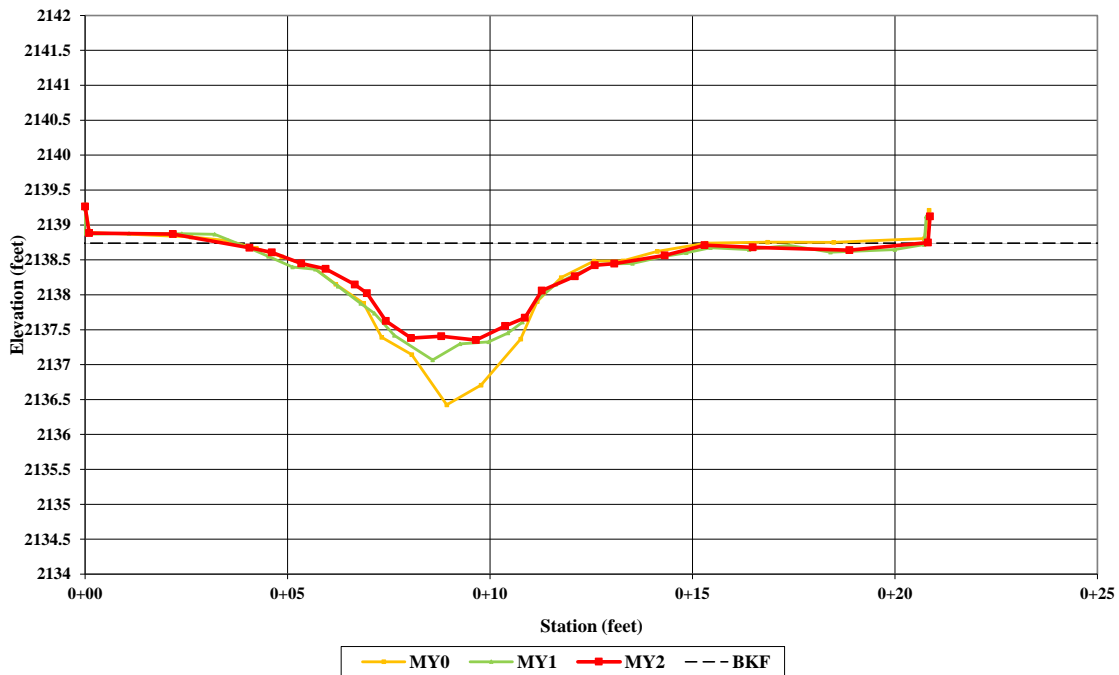


Upstream



Downstream

Doris Branch
 Cross Section 15 - Pool
 Station 401+35



Left Descending Bank



Right Descending Bank



Upstream



Downstream

**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
Dimension & Substrate - Riffle																																				
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																		
Floodprone Width (ft)	>42	>61	>61	>79	N/A	2	>42	>61	>61	>79	26.2	2	>42	>61	>61	>79	26.2	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																		
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																		
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																		
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																		
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																		
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																		
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																		
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																		
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																		
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																		
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																		
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																							
Channel Thalweg Length (ft)	728						713						704																							
Sinuosity (ft)	1.09						1.09						1.07																							
Water Surface Slope (Channel) (ft/ft)	0.0233						0.0243						0.0247																							
Bankfull Slope (ft/ft)	0.0235						0.0245						0.0250																							
Ri% / Ru% / P% / G% / S%	37%	32%	24%	7%	0%		38%	34%	19%	9%	0%		40%	35%	19%	7%	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
 - Information unavailable

Table 11b. Monitoring Data - Stream Reach Data Summary Junes Branch / Project No. 95027 - Bumgarner II (543 feet)																																																											
Parameter	Baseline							MX - 1							MX - 2							MX - 3							MX - 4							MX - 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																		
Dimension & Substrate - Riffle	16.3	-	-	-	-	1	N/A	-	-	-	-	1	15.7	-	-	-	-	1	N/A	-	-	-	-	1	16.2	-	-	-	-	1	N/A	-	-	-	-	1	N/A	-	-	-	-	1	N/A	-	-	-	-	1											
Bankfull Width (ft)	>47	-	-	-	-	1	N/A	>48	-	-	-	1	>48	-	-	-	-	1	>48	-	-	-	-	1	>48	-	-	-	-	1	>48	-	-	-	-	1	>48	-	-	-	-	1	>48	-	-	-	-	1											
Floodprone Width (ft)	0.7	-	-	-	-	1	N/A	0.9	-	-	-	1	0.9	-	-	-	-	1	0.8	-	-	-	-	1	0.8	-	-	-	-	1	0.8	-	-	-	-	1	0.8	-	-	-	-	1	0.8	-	-	-	-	1											
Bankfull Mean Depth (ft)	1.2	-	-	-	-	1	N/A	1.3	-	-	-	1	1.3	-	-	-	-	1	1.3	-	-	-	-	1	1.3	-	-	-	-	1	1.3	-	-	-	-	1	1.3	-	-	-	-	1	1.3	-	-	-	-	1											
Bankfull Max Depth (ft)	11.9	-	-	-	-	1	N/A	13.4	-	-	-	1	13.4	-	-	-	-	1	12.6	-	-	-	-	1	12.6	-	-	-	-	1	12.6	-	-	-	-	1	12.6	-	-	-	-	1	12.6	-	-	-	-	1											
Bankfull Cross-Sectional Area (ft ²)	22.2	-	-	-	-	1	N/A	18.4	-	-	-	1	18.4	-	-	-	-	1	20.8	-	-	-	-	1	20.8	-	-	-	-	1	20.8	-	-	-	-	1	20.8	-	-	-	-	1	20.8	-	-	-	-	1											
Width/Depth Ratio	>3	-	-	-	-	1	N/A	>3.1	-	-	-	1	>3.1	-	-	-	-	1	>3.0	-	-	-	-	1	>3.0	-	-	-	-	1	>3.0	-	-	-	-	1	>3.0	-	-	-	-	1	>3.0	-	-	-	-	1											
Entrenchment Ratio	1.0	-	-	-	-	1	N/A	1.0	-	-	-	1	1.0	-	-	-	-	1	1.0	-	-	-	-	1	1.0	-	-	-	-	1	1.0	-	-	-	-	1	1.0	-	-	-	-	1	1.0	-	-	-	-	1											
Bank Height Ratio	3.1	32.3	38.6	12	7	27.2	34.5	34.5	42.0	5.5	6	26.5	32.9	32.9	32.3	42.0	5.9	6	0.016	0.026	0.020	0.064	0.017	7	0.015	0.017	0.015	0.015	0.024	0.005	6	0.016	0.026	0.020	0.064	0.017	7	0.015	0.017	0.015	0.015	0.024	0.005	6															
Riffle Length (ft)	2.3	2.9	3.1	3.4	0.4	7	2.2	2.7	2.7	3.2	0.4	7	2.1	2.6	2.6	2.7	3.0	0.3	7	12.1	17.8	19.2	22.4	4	7	12.1	14.6	14.6	14.0	20.1	4.1	7	12.1	17.8	19.2	22.4	4	7	12.1	14.6	14.6	14.0	20.1	4.1	7	12.1	17.8	19.2	22.4	4	7	12.1	14.6	14.6	14.0	20.1	4.1	7	
Riffle Slope (ft/ft)	61.5	70.2	69.9	80.2	6	6	60.7	66.7	66.7	66.4	74.5	5.1	6	59.0	67.6	67.6	67.7	75.8	5.7	6	0.016	0.026	0.020	0.064	0.017	7	0.015	0.017	0.015	0.015	0.024	0.005	6	0.016	0.026	0.020	0.064	0.017	7	0.015	0.017	0.015	0.015	0.024	0.005	6	0.016	0.026	0.020	0.064	0.017	7	0.015	0.017	0.015	0.015	0.024	0.005	6
Pool Max Depth (ft)	25.4	28.0	26.2	26.2	3.8	3	25.4	28.0	26.2	26.2	3.8	3	25.4	28.0	26.2	26.2	3.8	3	25.4	28.0	26.2	26.2	3.8	3	25.4	28.0	26.2	26.2	3.8	3	25.4	28.0	26.2	26.2	3.8	3	25.4	28.0	26.2	26.2	3.8	3	25.4	28.0	26.2	26.2	3.8	3	25.4	28.0	26.2	26.2	3.8	3					
Channel Belt Width (ft)	39.5	54.4	54.4	54.4	69.3	N/A	2	39.5	54.4	54.4	54.4	69.3	N/A	2	39.5	54.4	54.4	54.4	69.3	N/A	2	39.5	54.4	54.4	54.4	69.3	N/A	2	39.5	54.4	54.4	54.4	69.3	N/A	2	39.5	54.4	54.4	54.4	69.3	N/A	2	39.5	54.4	54.4	54.4	69.3	N/A	2	39.5	54.4	54.4	54.4	69.3	N/A	2			
Radius of Curvature (ft)	3.1	4.3	4.3	4.3	5.5	N/A	2	3.1	4.3	4.3	4.3	5.5	N/A	2	3.1	4.3	4.3	4.3	5.5	N/A	2	3.1	4.3	4.3	4.3	5.5	N/A	2	3.1	4.3	4.3	4.3	5.5	N/A	2	3.1	4.3	4.3	4.3	5.5	N/A	2	3.1	4.3	4.3	4.3	5.5	N/A	2	3.1	4.3	4.3	4.3	5.5	N/A	2			
Rc: Bankfull Width (ft/ft)	109.3	123.2	65.2	134.6	12.8	3	109.3	123.2	65.2	134.6	12.8	3	109.3	123.2	65.2	134.6	12.8	3	109.3	123.2	65.2	134.6	12.8	3	109.3	123.2	65.2	134.6	12.8	3	109.3	123.2	65.2	134.6	12.8	3	109.3	123.2	65.2	134.6	12.8	3	109.3	123.2	65.2	134.6	12.8	3											
Mander Wavelength (ft)	2.0	2.2	2.1	2.6	0.3	3	2.0	2.2	2.1	2.6	0.3	3	2.0	2.2	2.1	2.6	0.3	3	2.0	2.2	2.1	2.6	0.3	3	2.0	2.2	2.1	2.6	0.3	3	2.0	2.2	2.1	2.6	0.3	3	2.0	2.2	2.1	2.6	0.3	3	2.0	2.2	2.1	2.6	0.3	3											
Mander Width Ratio	0.0152	0.0140	0.0151	0.0154	0.0145		0.0152	0.0140	0.0151	0.0154	0.0145		0.0152	0.0140	0.0151	0.0154	0.0145		0.0152	0.0140	0.0151	0.0154	0.0145		0.0152	0.0140	0.0151	0.0154	0.0145		0.0152	0.0140	0.0151	0.0154	0.0145		0.0152	0.0140	0.0151	0.0154	0.0145		0.0152	0.0140	0.0151	0.0154	0.0145												
Channel Belt Width (ft)	543	522	526	Bc		543	522	526	Bc		543	522	526	Bc		543	522	526	Bc		543	522	526	Bc		543	522	526	Bc		543	522	526	Bc		543	522	526	Bc		543	522	526	Bc															
Channel Thalweg Length (ft)	1.07	1.06	1.07			1.07	1.06	1.07			1.07	1.06	1.07			1.07	1.06	1.07			1.07	1.06	1.07			1.07	1.06	1.07			1.07	1.06	1.07			1.07	1.06	1.07			1.07	1.06	1.07																
Simosity (ft)	0.0140	0.0151	0.0166			0.0140	0.0151	0.0166			0.0140	0.0151	0.0166			0.0140	0.0151	0.0166			0.0140	0.0151	0.0166			0.0140	0.0151	0.0166			0.0140	0.0151	0.0166			0.0140	0.0151	0.0166			0.0140	0.0151	0.0166																
Water Surface Slope (Channel) (ft/ft)	45%	18%	28%	8%	0%		50%	16%	24%	10%	0%		48%	18%	25%	10%	0%		45%	18%	28%	8%	0%		45%	18%	25%	10%	0%		45%	18%	28%	8%	0%		45%	18%	25%	10%	0%		45%	18%	28%	8%	0%												
Rf% / Ru% / P% / G% / S%	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 = Gravel / C = Cobble / B = Boulder / Be = Bedrock
 SC = Silt-Clay / SA = Sand / G = Gravel / C = Cobble / B = Boulder / Be = Bedrock
 - Information unavailable

Table 11b. Monitoring Data - Stream Reach Data Summary
Junes Branch / Project No. 95027 - Junes 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																		
Floodprone Width (ft)	>38	>62	>53	>94	29.2	3	>38	>62	>53	>94	29.0	3	>38	>61.7	>53	>94	29.0	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																		
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																		
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																		
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																		
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																		
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																		
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																		
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																		
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																		
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																		
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																		
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																							
Channel Thalweg Length (ft)	1,480						1,427 ²						1,414																							
Sinuosity (ft)	1.1						1.1						1.1																							
Water Surface Slope (Channel) (ft/ft)	0.0231						0.0245						0.0271																							
Bankfull Slope (ft/ft)	0.0246						0.0248						0.0272																							
Ri% / Ru% / P% / G% / S%	50%	0%	34%	9%	7%		47%	0%	26%	18%	9%		46%	0%	33%	13%	8%																			
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

- Information unavailable

¹Number of riffle cross-sections mis-reported in baseline; Corrected value included here.

²Variation in channel thalweg length due to differences in length of monitored longitudinal profile from as-built.

Table 11b. Monitoring Data - Stream Reach Data Summary Junes Branch / Project No. 95027 - Higdon Branch (376 feet)																																									
Parameter																																									
Dimension & Substrate - Riffle																																									
Min	Mean ¹	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												
8.0	-	-	-	-	1	>40	-	-	-	-	1	>40	-	-	-	-	1	>40	-	-	-	-	1	>40	-	-	-	-	1												
Bankfull Width (ft)	Bankfull Mean Depth (ft)	Bankfull Max Depth (ft)	Bankfull Cross-Sectional Area (ft ²)	Width/Depth Ratio	Entrenchment Ratio	Bank Height Ratio	2.5	7.7	7.6	15	2.9	13	6.5	9.8	9.1	15.6	2.9	13	4.9	8.9	8.4	14.8	2.8	13	Riffle Length (ft)	Riffle Slope (ft/ft)	Pool Length (ft)	Pool Max Depth (ft)	Pool Spacing (ft)												
9.1	10.6	10.6	12.1	2.1	2	Channel Belt Width (ft)	16.2	19.7	20.1	22.9	3.4	3	Radius of Curvature (ft)	2.0	2.5	2.5	2.9	0.4	3	Rc: Bankfull Width (ft/ft)	11.8	31.1	31.5	39.5	9.3	7	Meander Wavelength (ft)	1.1	1.3	1.3	1.5	N/A	2	Meander Width Ratio							
Additional Reach Parameters																																									
Rosgen Classification																																									
Bc																																									
Bc																																									
Channel Thalweg Length (ft)																																									
382																																									
370																																									
Bc																																									
Channel Classification																																									
Bc																																									
Sinuosity (ft)																																									
1.06																																									
Water Surface Slope (Channel) (ft/ft)																																									
0.020																																									
Bankfull Slope (ft/ft)																																									
0.018																																									
Rf% / Ru% / P% / G% / S%																																									
42%																												1%	47%	7%	2%	51%	5%	34%	11%	0%	46%	6%	31%	15%	2%
SC% / SA% / G% / 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.
 Rf = Riffle / Ru = Run / P = Pool / G = Glide / S = Step
 SC = Silt-Clay / SA = Sand / G = Gravel / C = Cobble / B = Boulder / Be = Bedrock
 Corrected Values
 * - Information unavailable

Bumgarner Branch I
 Longitudinal Profile
 Stationing 100+37 to 107+27

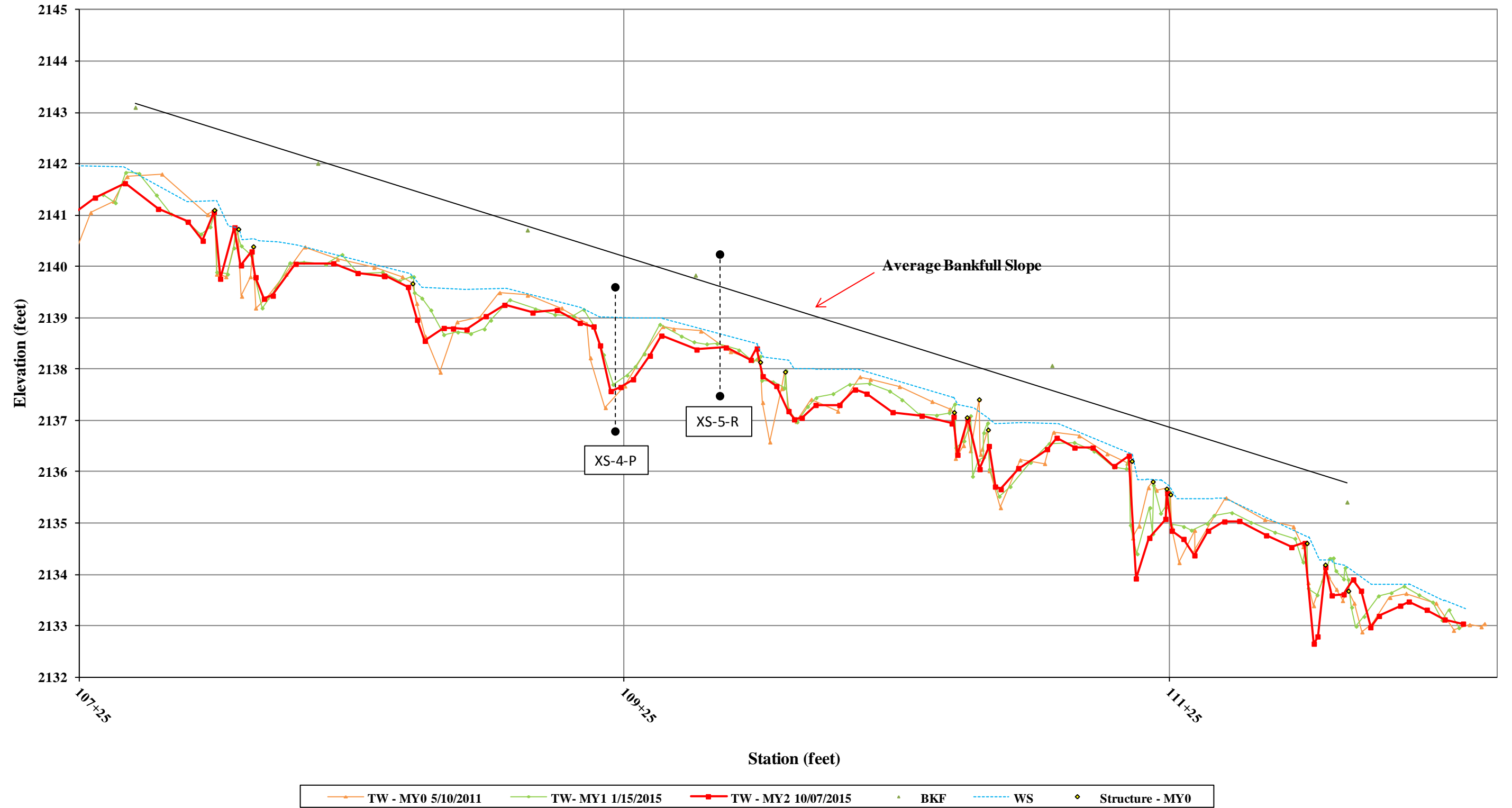


▲ TW - M/Y0 5/10/2011
 ■ TW - M/Y1 1/15/2015
 ● TW - M/Y2 7/07/2015
 ◆ Structure - M/Y0
 ▼ BKF
 - - - WS

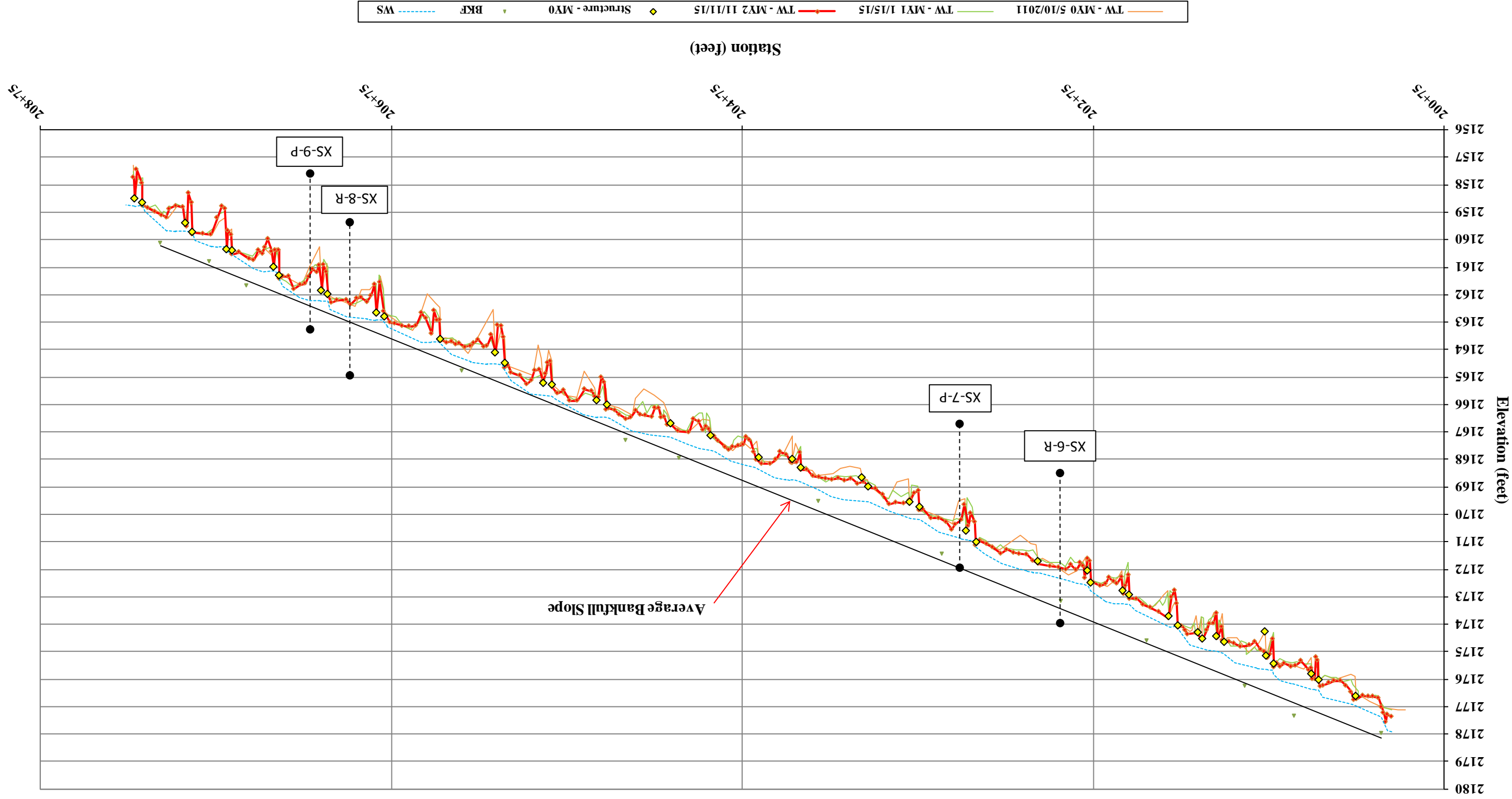
Station (feet)

Elevation (feet)

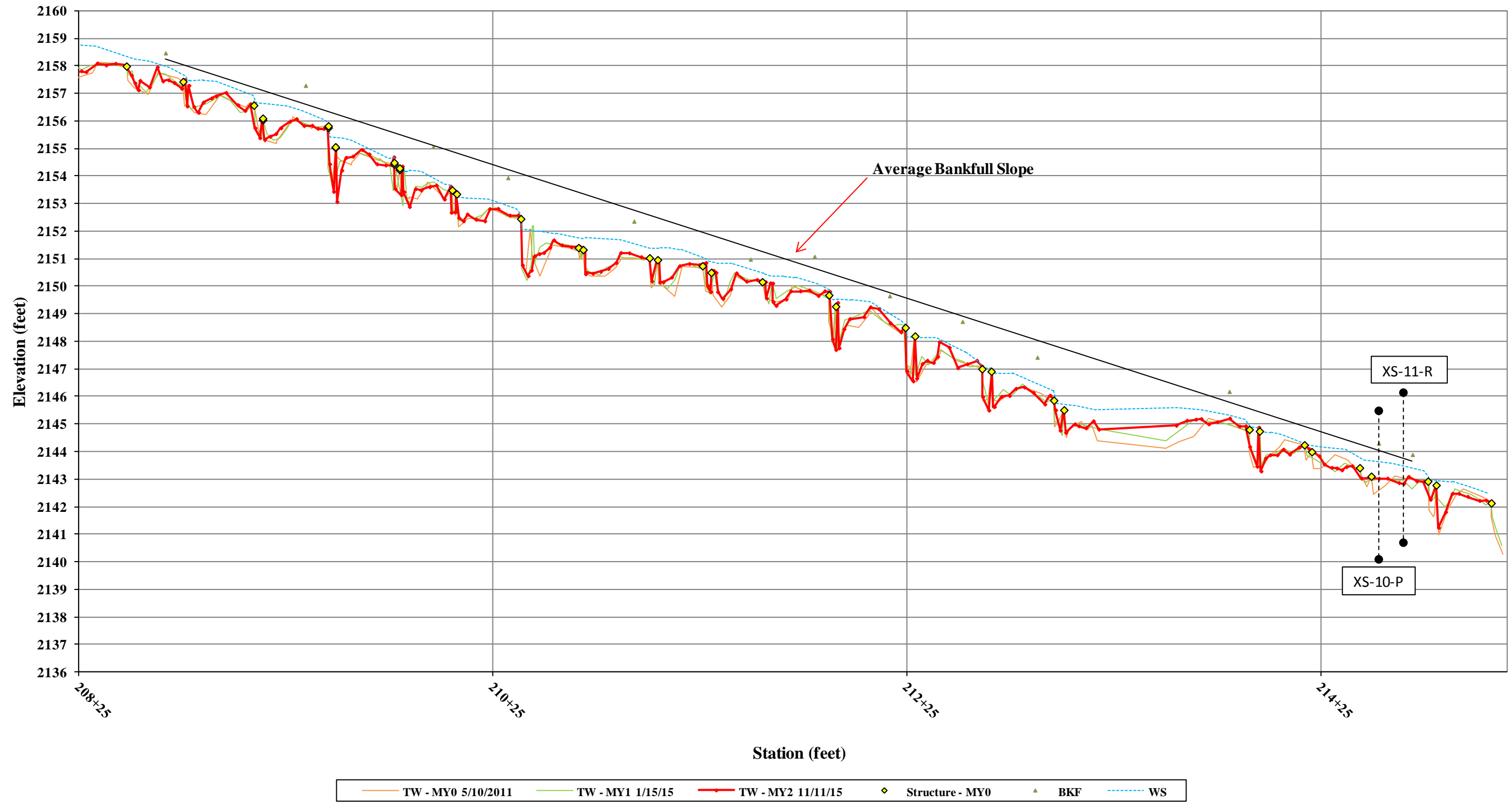
**Bumgarner Branch II
Longitudinal Profile
Staioning 107+27 to 112+35**



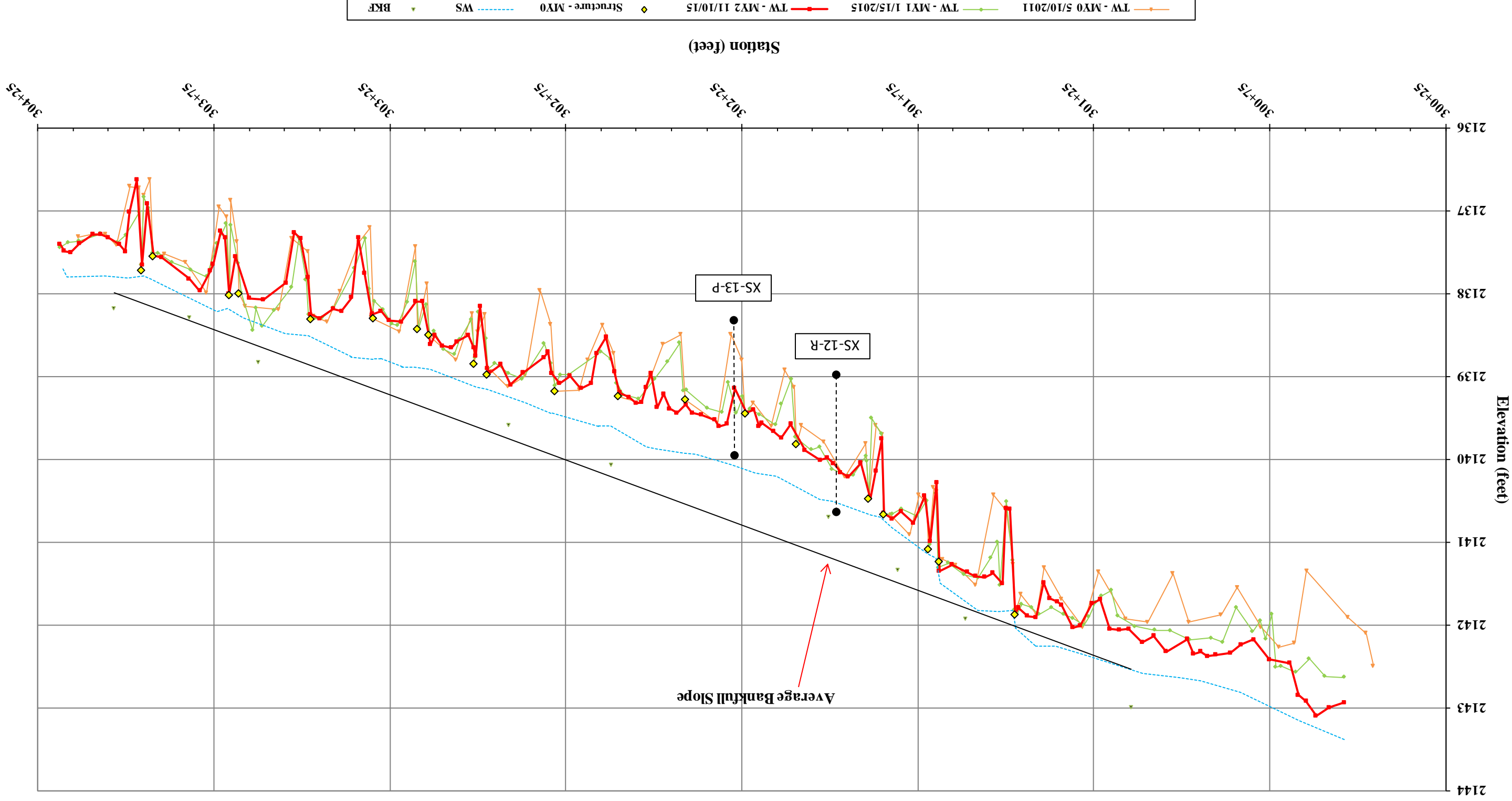
June Branch - Sheet 1
 Longitudinal Profile
 Stationing 200+97 to 215+15



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



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

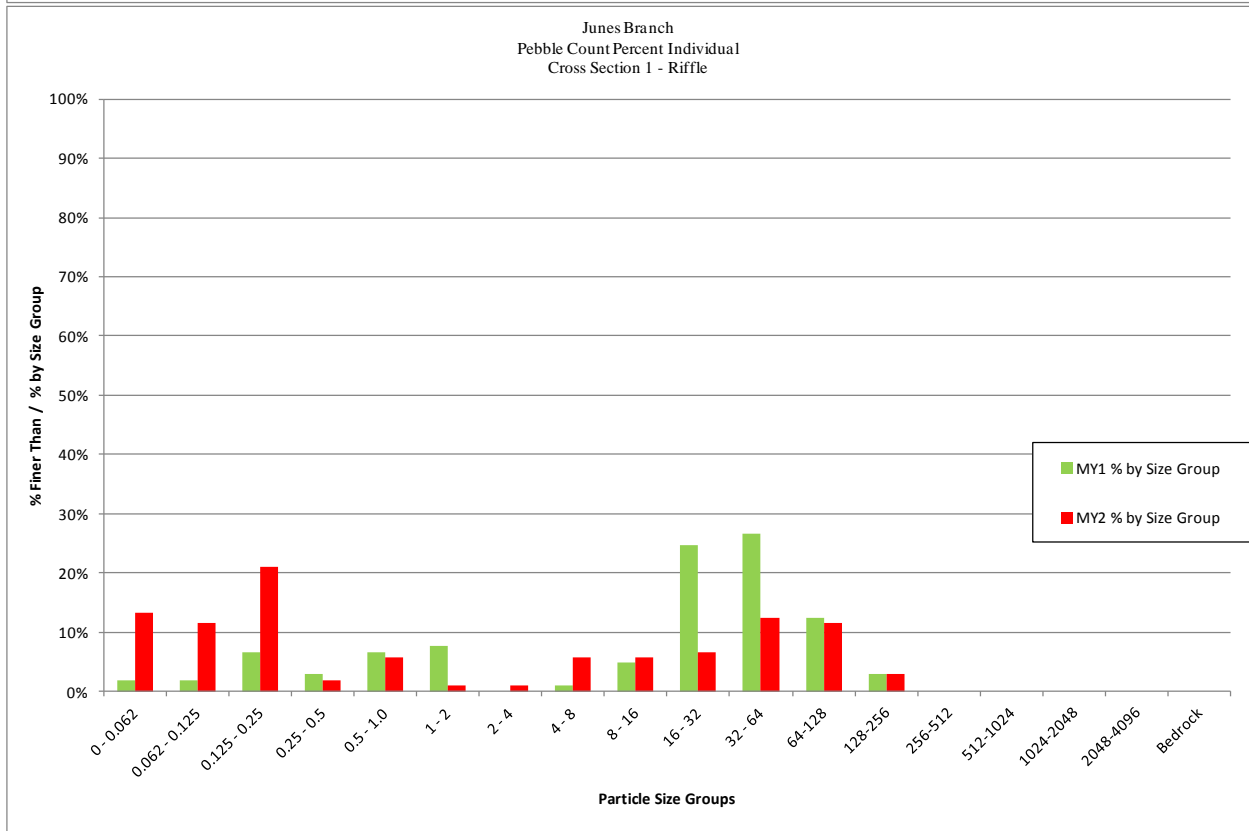
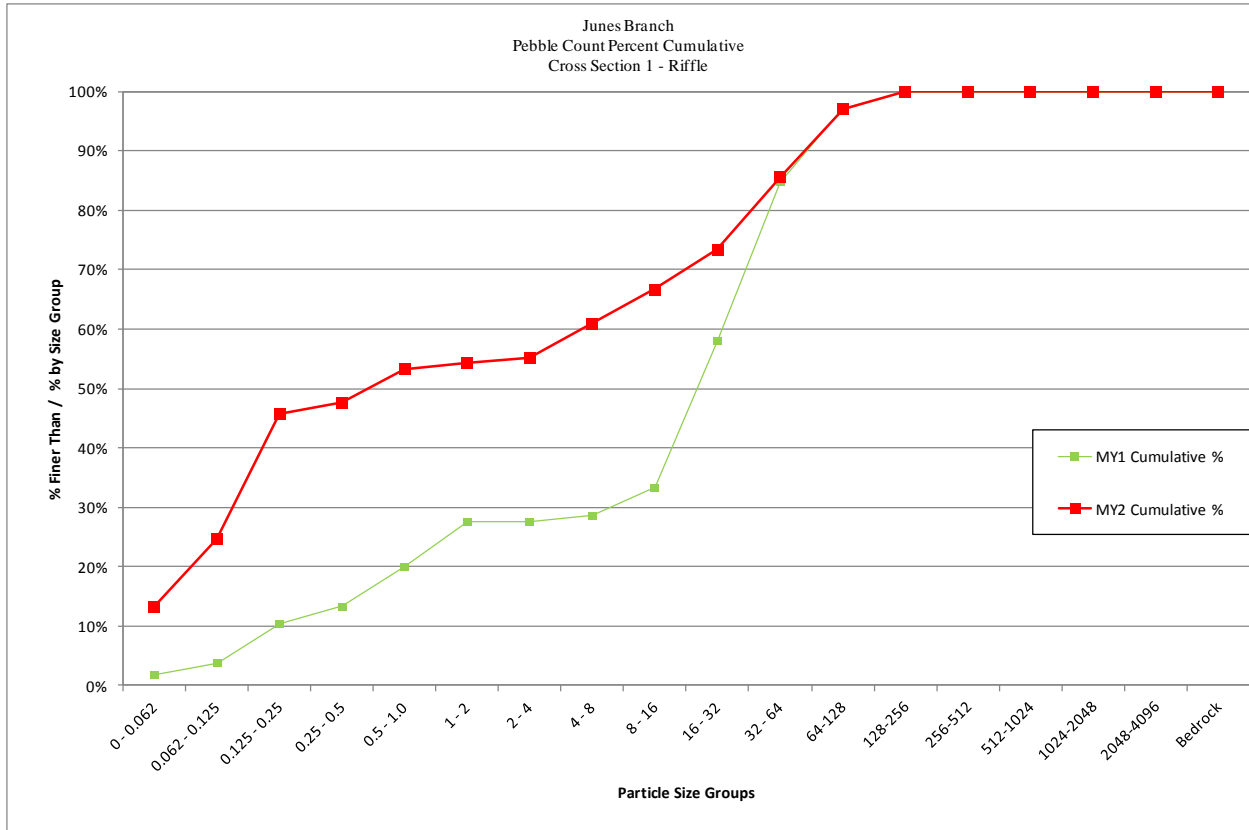


**Doris Branch
Longitudinal Profile
Staioning 400+00 to 402+82**

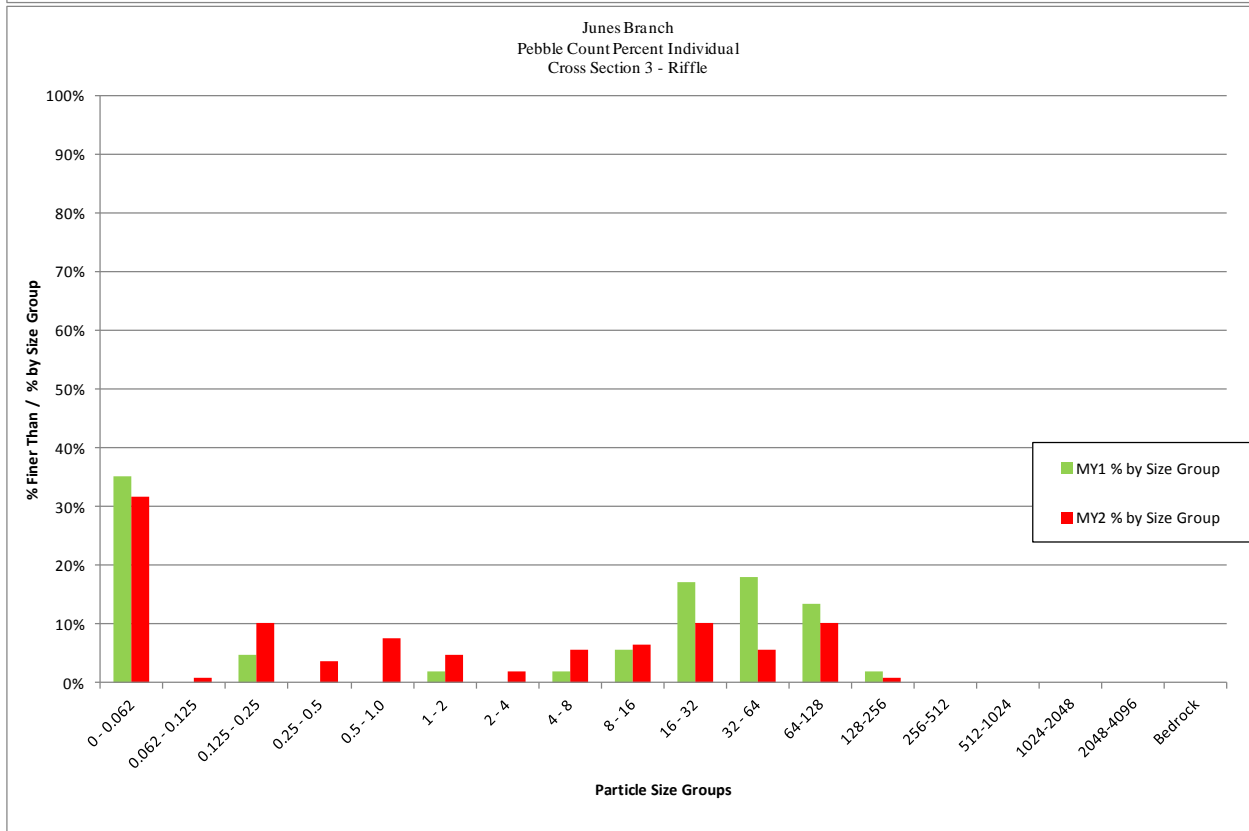
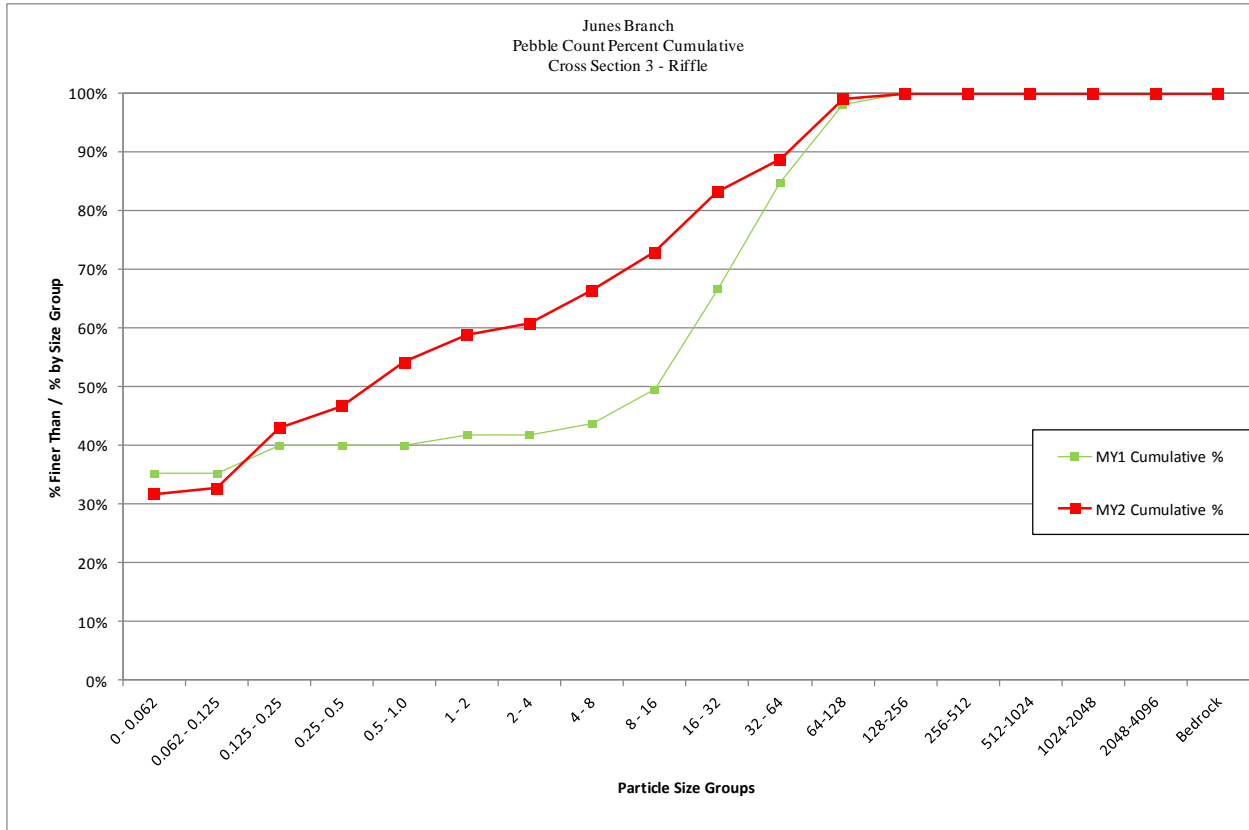


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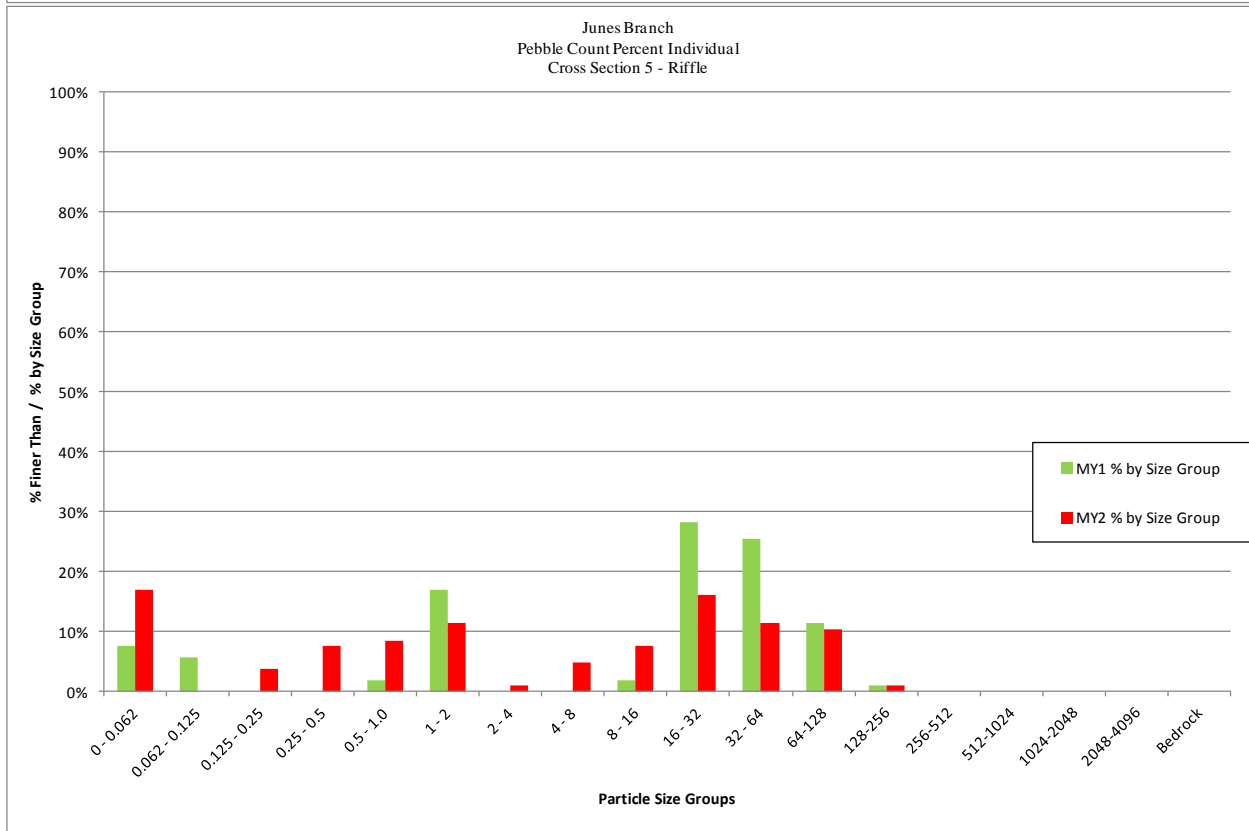
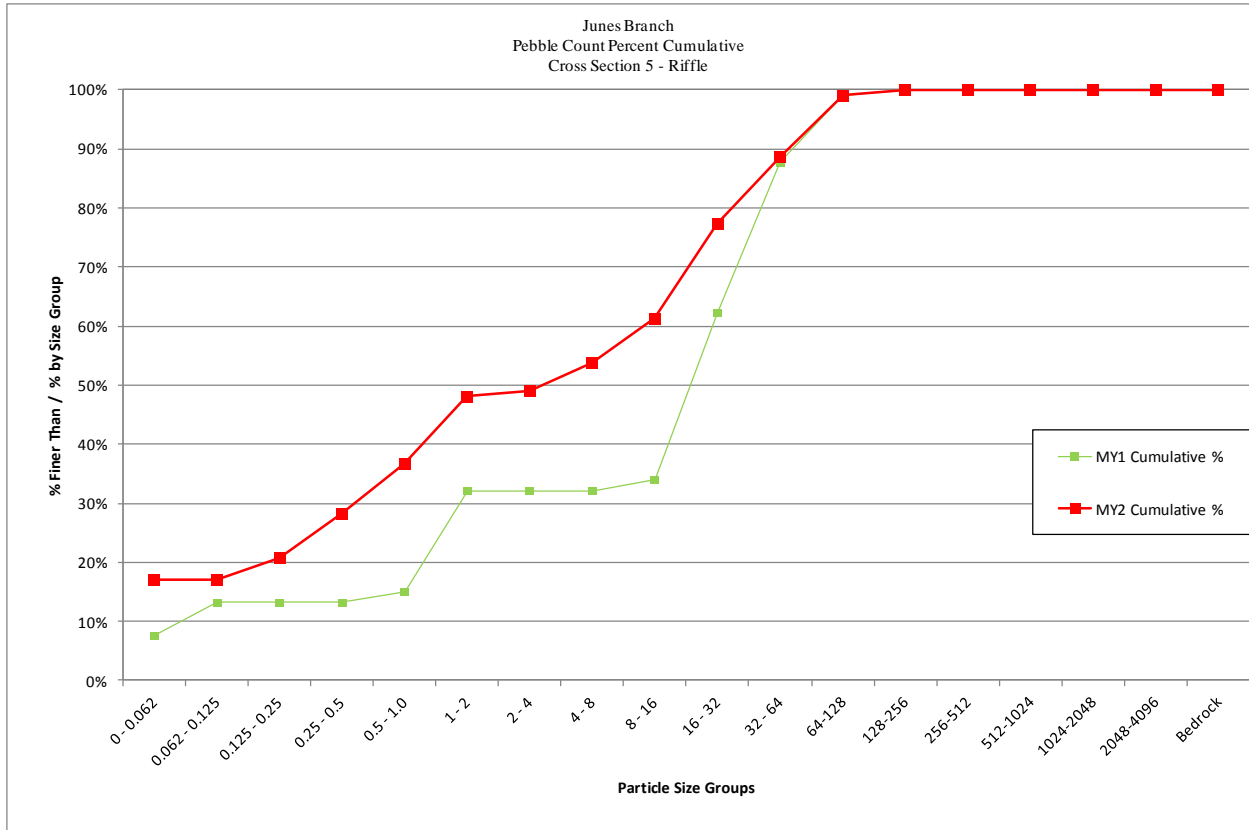
Junes Branch			
Cross Section 1 - Riffle			
Monitoring Year - 2015; MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	14	13.3%	13%
0.062 - 0.125	12	11.4%	25%
0.125 - 0.25	22	21.0%	46%
0.25 - 0.5	2	1.9%	48%
0.5 - 1.0	6	5.7%	53%
1 - 2	1	1.0%	54%
2 - 4	1	1.0%	55%
4 - 8	6	5.7%	61%
8 - 16	6	5.7%	67%
16 - 32	7	6.7%	73%
32 - 64	13	12.4%	86%
64-128	12	11.4%	97%
128-256	3	2.9%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	105	100%	100%
Summary Data			
		D50	0.67
		D84	60
		D95	110



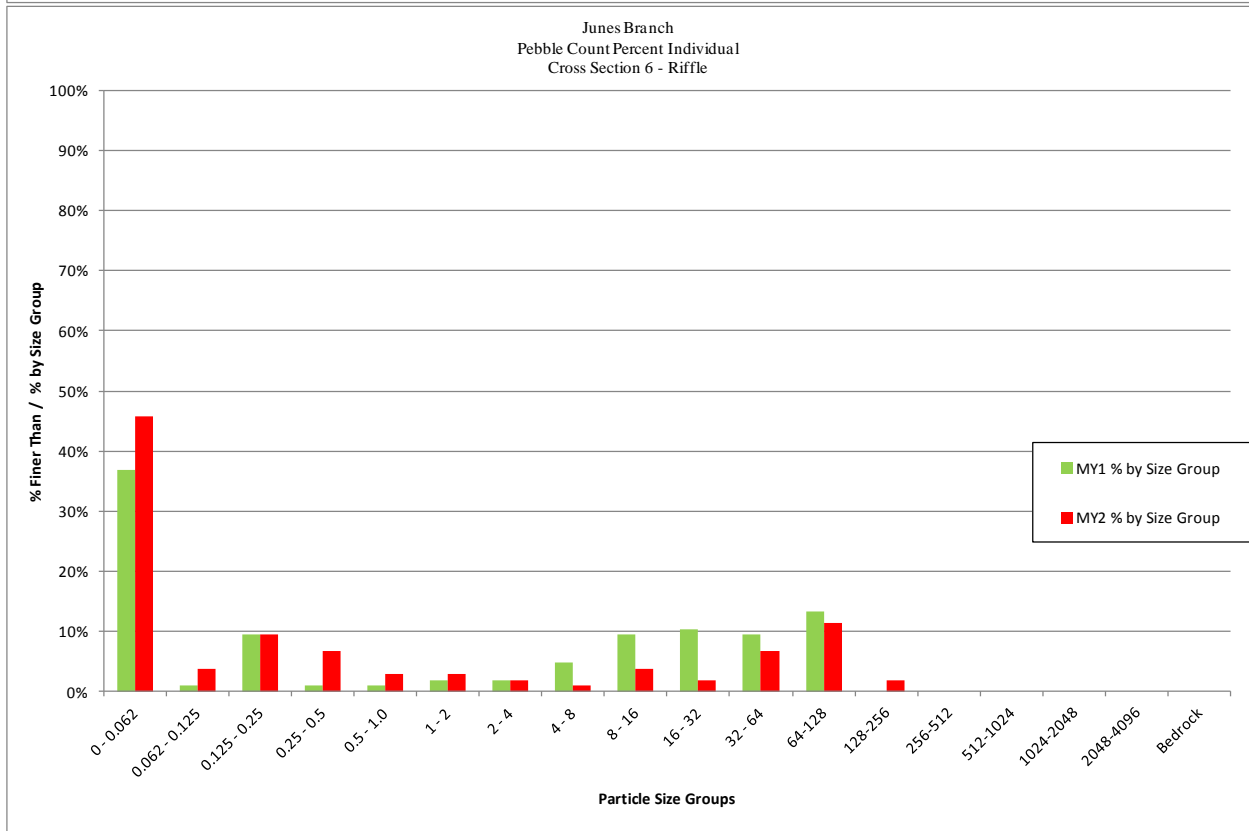
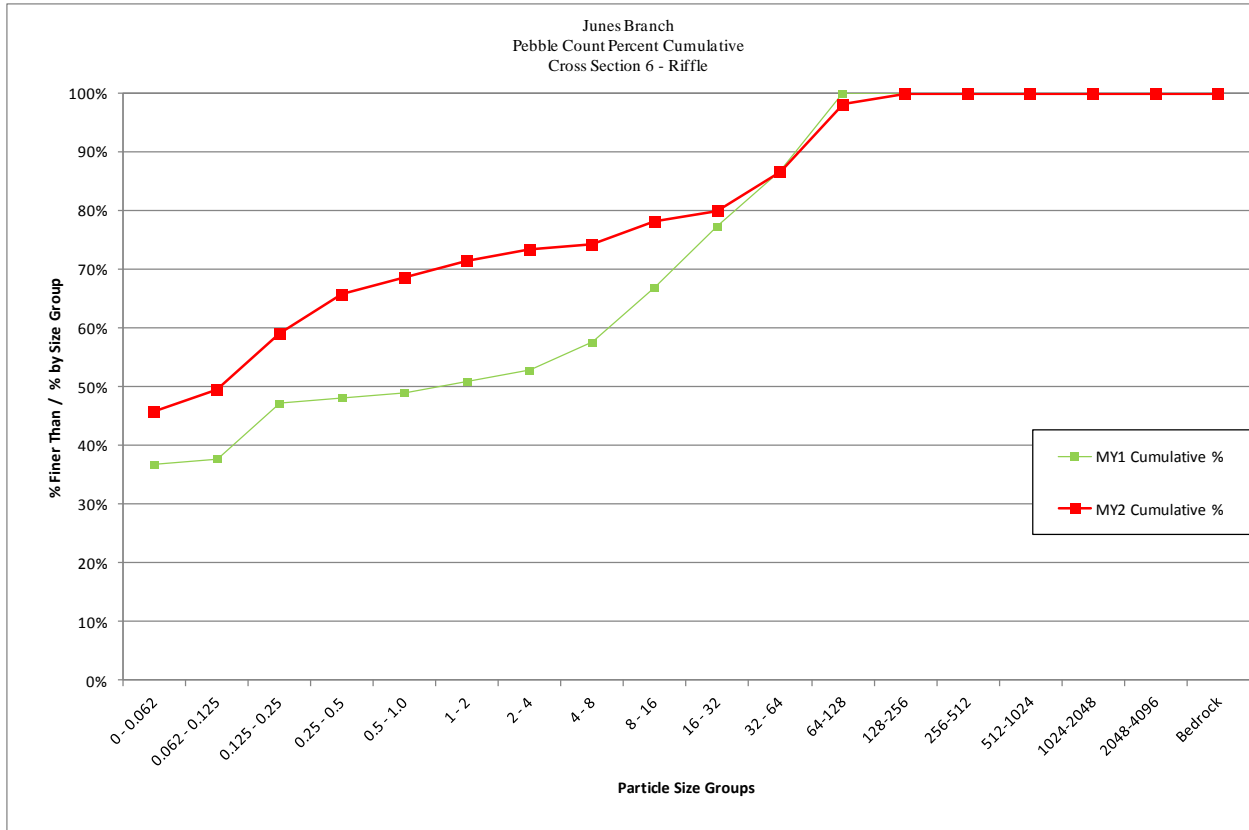
Junes Branch			
Cross Section 3 - Riffle			
Monitoring Year - 2015; MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	34	31.8%	32%
0.062 - 0.125	1	0.9%	33%
0.125 - 0.25	11	10.3%	43%
0.25 - 0.5	4	3.7%	47%
0.5 - 1.0	8	7.5%	54%
1 - 2	5	4.7%	59%
2 - 4	2	1.9%	61%
4 - 8	6	5.6%	66%
8 - 16	7	6.5%	73%
16 - 32	11	10.3%	83%
32 - 64	6	5.6%	89%
64-128	11	10.3%	99%
128-256	1	0.9%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	107	100%	100%
		Summary Data	
		D50	0.68
		D84	43
		D95	99



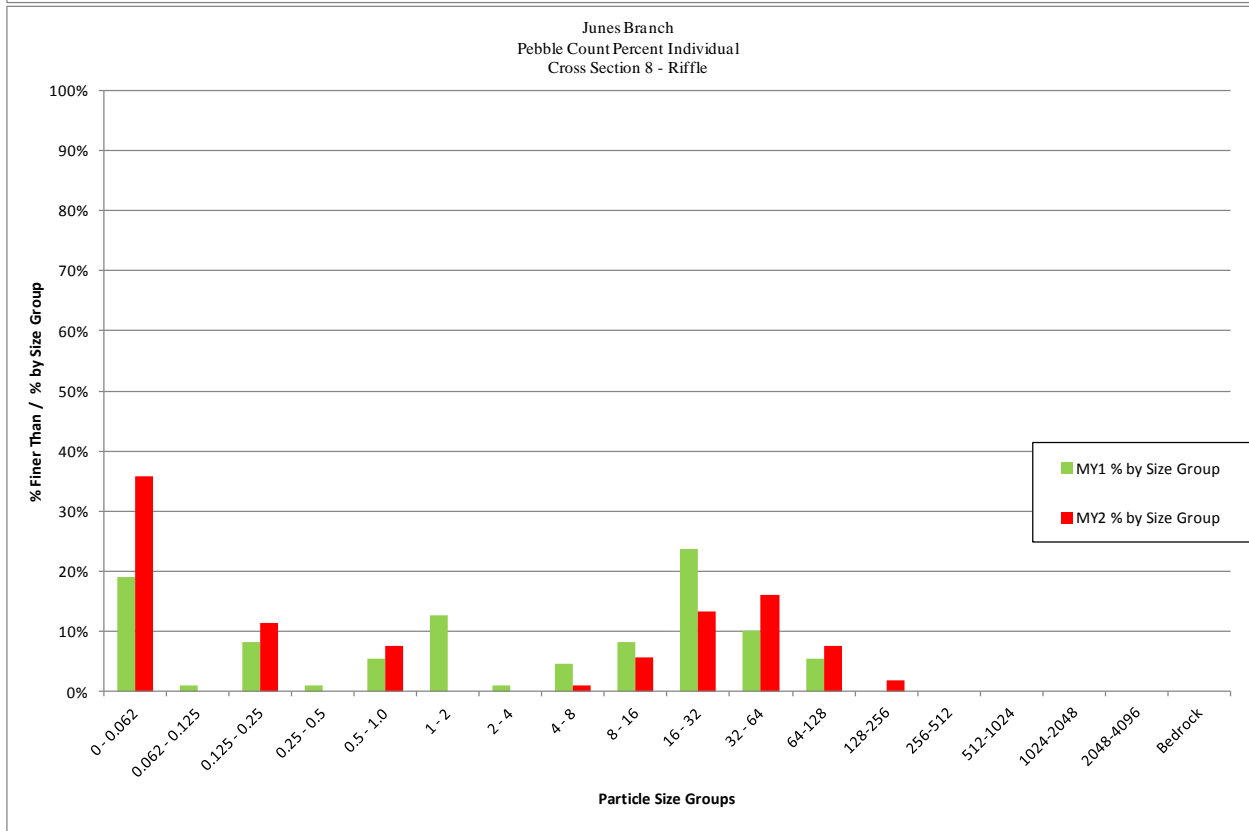
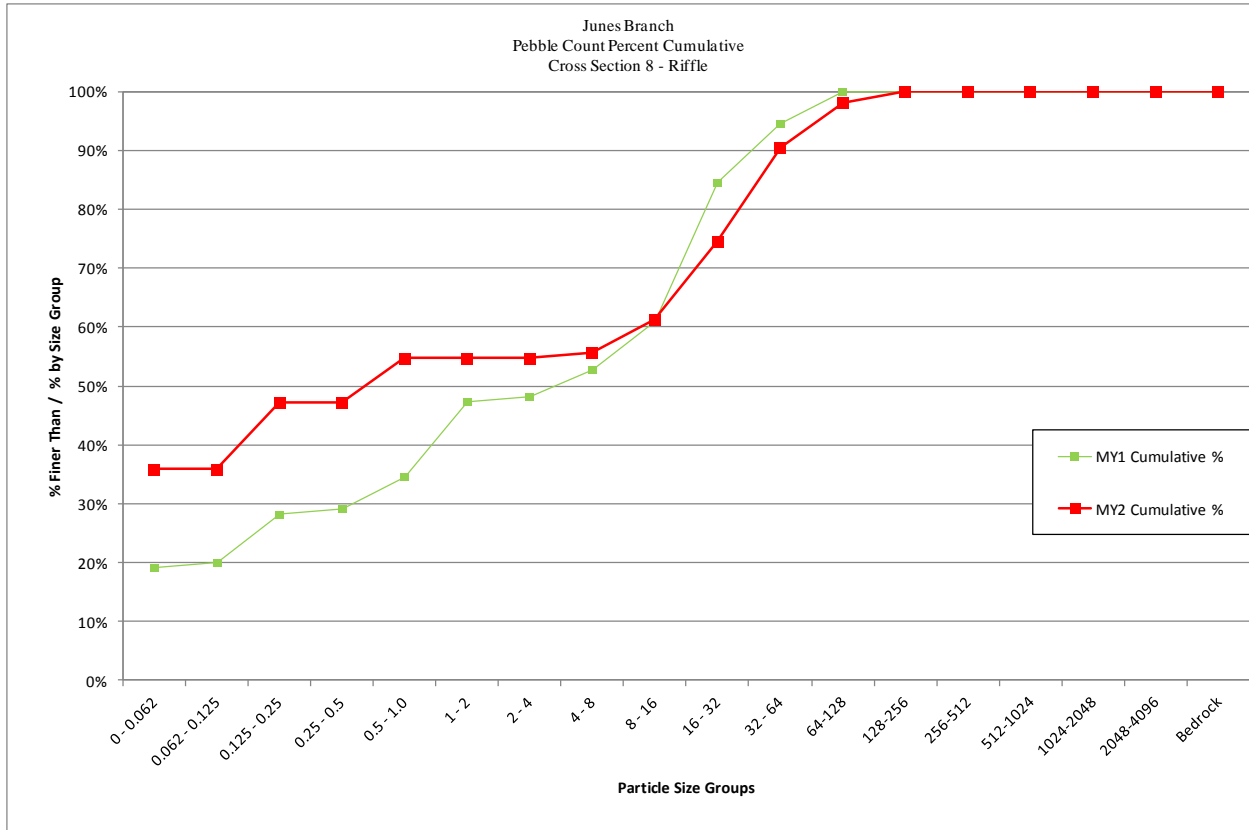
Junes Branch			
Cross Section 5 - Riffle			
Monitoring Year - 2015; MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	18	17.0%	17%
0.062 - 0.125	0	0.0%	17%
0.125 - 0.25	4	3.8%	21%
0.25 - 0.5	8	7.5%	28%
0.5 - 1.0	9	8.5%	37%
1 - 2	12	11.3%	48%
2 - 4	1	0.9%	49%
4 - 8	5	4.7%	54%
8 - 16	8	7.5%	61%
16 - 32	17	16.0%	77%
32 - 64	12	11.3%	89%
64-128	11	10.4%	99%
128-256	1	0.9%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	106	100%	100%
		Summary Data	
		D50	4.9
		D84	50
		D95	100



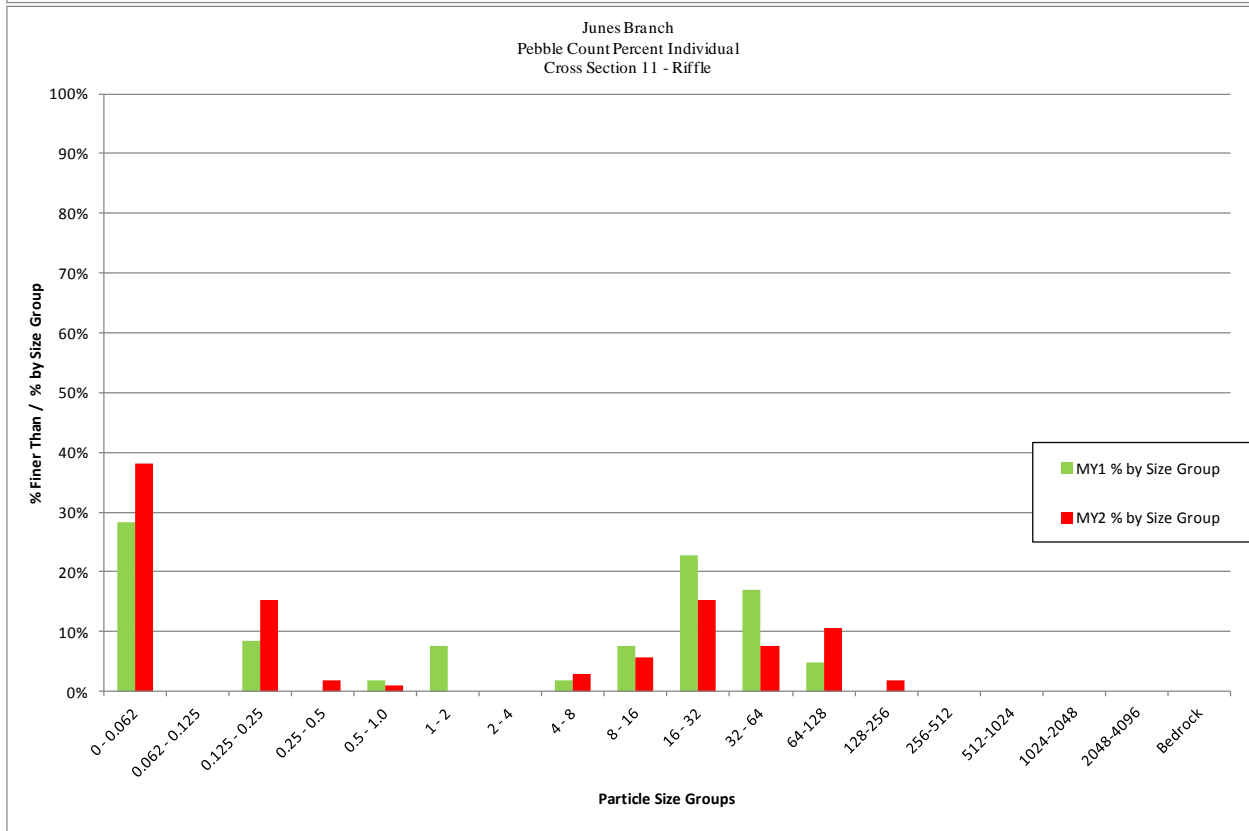
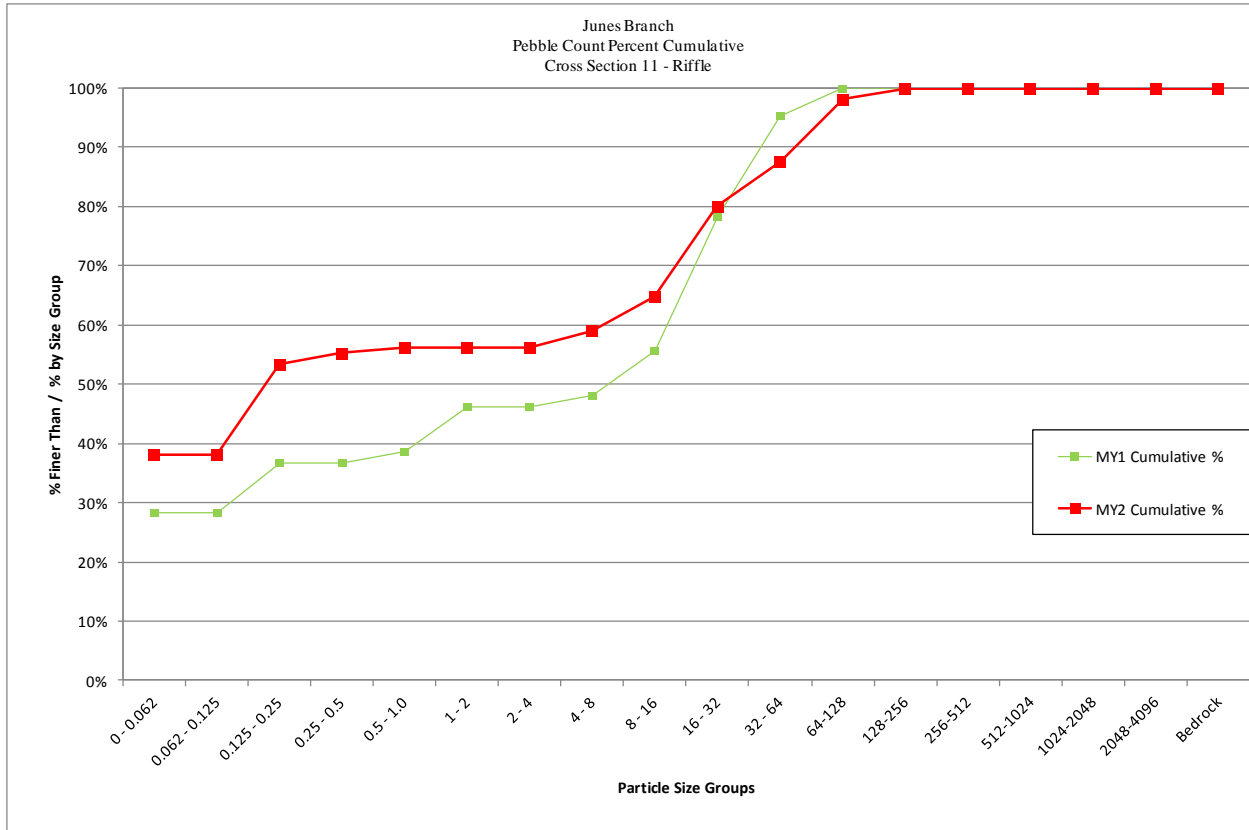
Junes Branch			
Cross Section 6 - Riffle			
Monitoring Year - 2015; MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	48	45.7%	46%
0.062 - 0.125	4	3.8%	50%
0.125 - 0.25	10	9.5%	59%
0.25 - 0.5	7	6.7%	66%
0.5 - 1.0	3	2.9%	69%
1 - 2	3	2.9%	71%
2 - 4	2	1.9%	73%
4 - 8	1	1.0%	74%
8 - 16	4	3.8%	78%
16 - 32	2	1.9%	80%
32 - 64	7	6.7%	87%
64-128	12	11.4%	98%
128-256	2	1.9%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	105	100%	100%
Summary Data			
	D50	0.13	
	D84	53	
	D95	86	



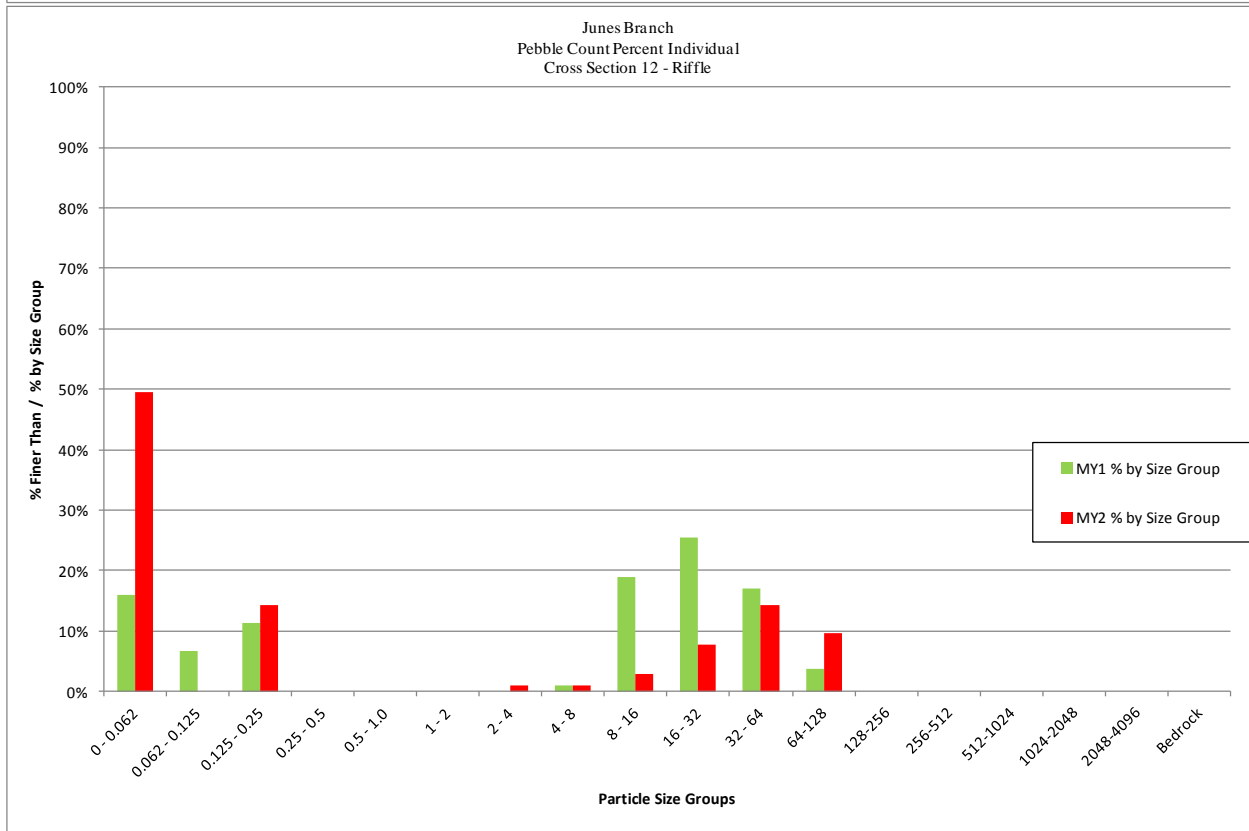
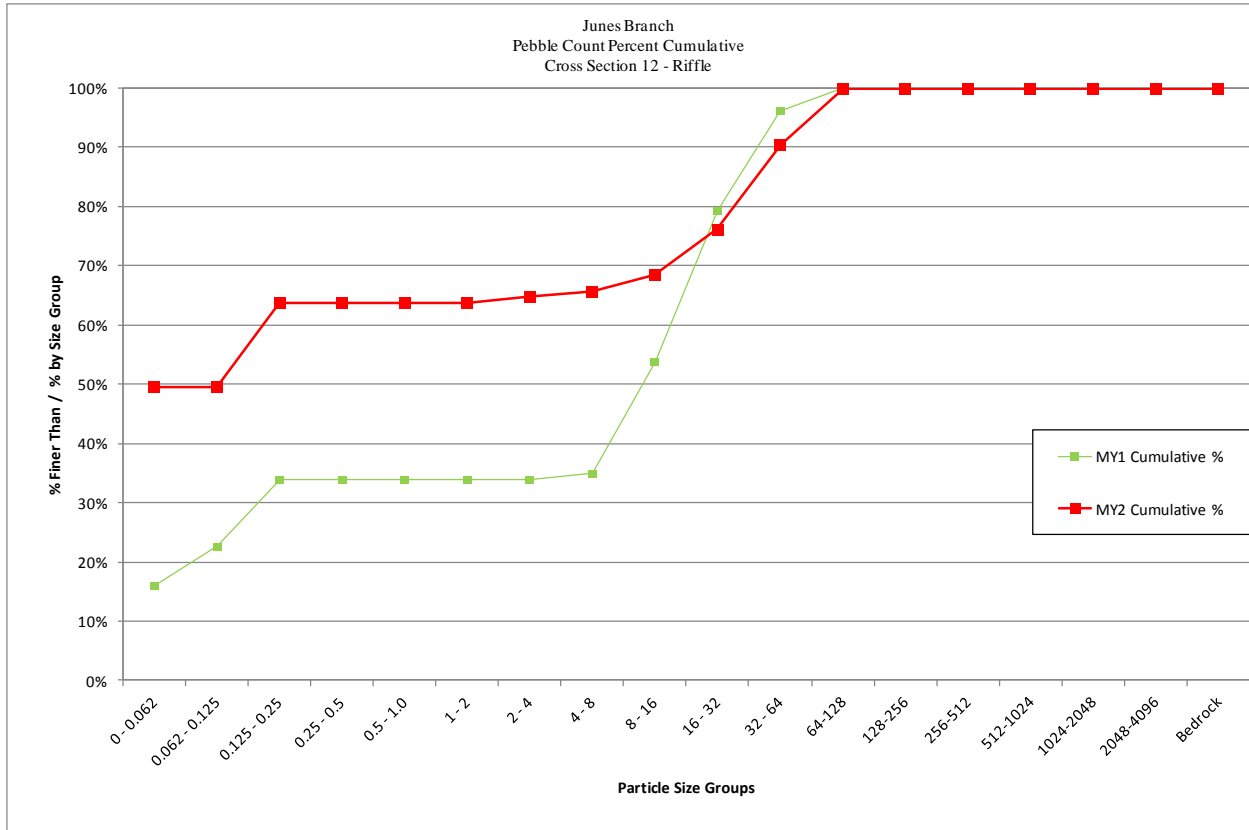
Junes Branch			
Cross Section 8 - Riffle			
Monitoring Year - 2015; MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	38	35.8%	36%
0.062 - 0.125	0	0.0%	36%
0.125 - 0.25	12	11.3%	47%
0.25 - 0.5	0	0.0%	47%
0.5 - 1.0	8	7.5%	55%
1 - 2	0	0.0%	55%
2 - 4	0	0.0%	55%
4 - 8	1	0.9%	56%
8 - 16	6	5.7%	61%
16 - 32	14	13.2%	75%
32 - 64	17	16.0%	91%
64-128	8	7.5%	98%
128-256	2	1.9%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	106	100%	100%
Summary Data			
D50		0.65	
D84		50	
D95		84	



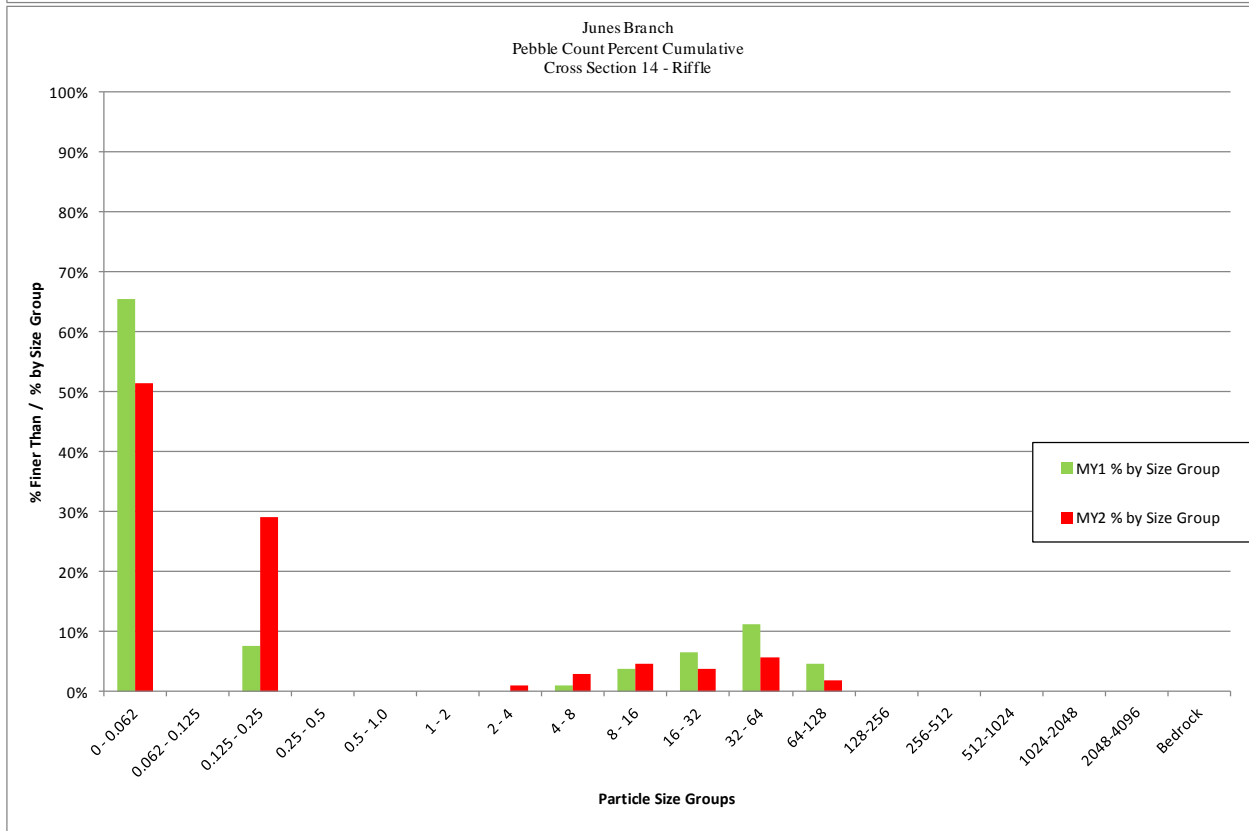
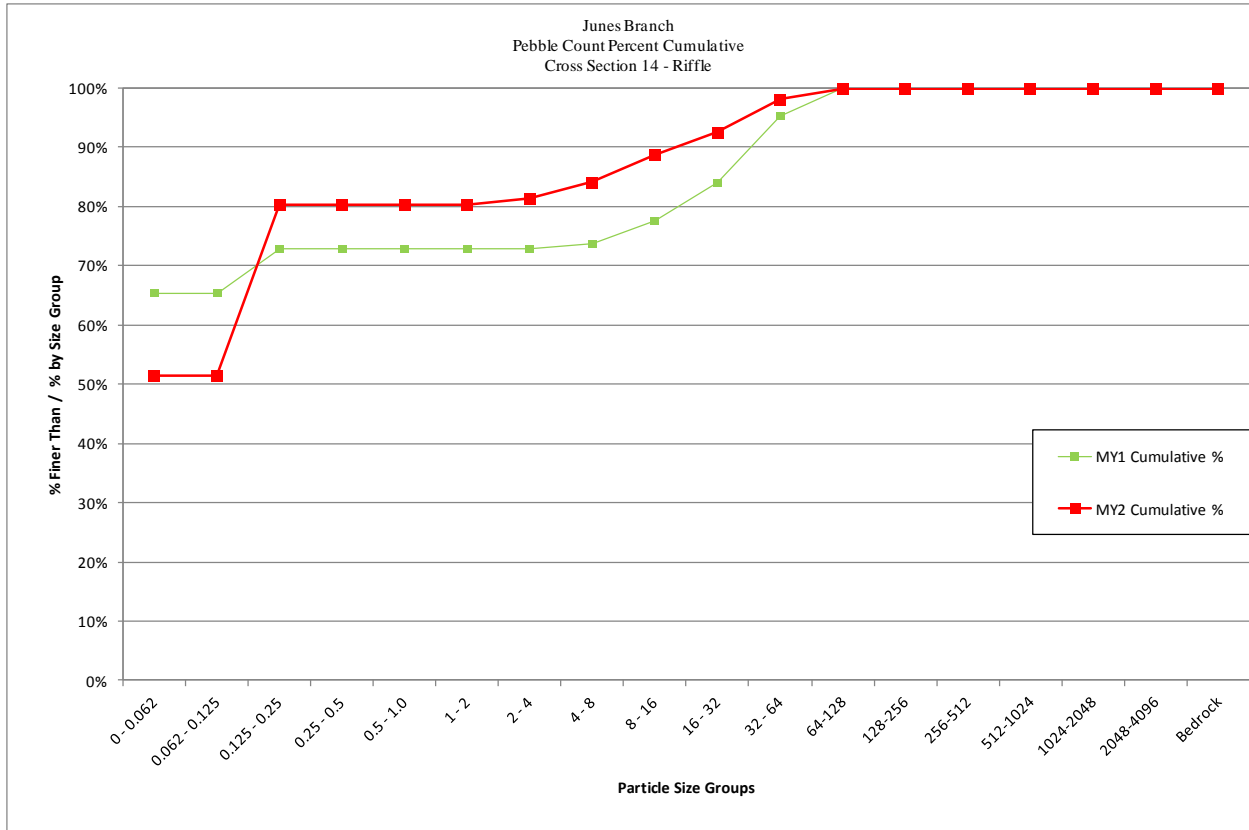
Junes Branch			
Cross Section 11 - Riffle			
Monitoring Year - 2015; MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	40	38.1%	38%
0.062 - 0.125	0	0.0%	38%
0.125 - 0.25	16	15.2%	53%
0.25 - 0.5	2	1.9%	55%
0.5 - 1.0	1	1.0%	56%
1 - 2	0	0.0%	56%
2 - 4	0	0.0%	56%
4 - 8	3	2.9%	59%
8 - 16	6	5.7%	65%
16 - 32	16	15.2%	80%
32 - 64	8	7.6%	88%
64-128	11	10.5%	98%
128-256	2	1.9%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	105	100%	100%
		Summary Data	
		D50	0.21
		D84	49
		D95	86



Junes Branch			
Cross Section 12 - Riffle			
Monitoring Year - 2015; MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	52	49.5%	50%
0.062 - 0.125	0	0.0%	50%
0.125 - 0.25	15	14.3%	64%
0.25 - 0.5	0	0.0%	64%
0.5 - 1.0	0	0.0%	64%
1 - 2	0	0.0%	64%
2 - 4	1	1.0%	65%
4 - 8	1	1.0%	66%
8 - 16	3	2.9%	69%
16 - 32	8	7.6%	76%
32 - 64	15	14.3%	90%
64-128	10	9.5%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	105	100%	100%
		Summary Data	
		D50	0.13
		D84	45
		D95	77



Junes Branch			
Cross Section 14 - Riffle			
Monitoring Year - 2015; MY2			
Bed Surface Material Particle Size Class (mm)	Number	% Individual	% Cumulative
0 - 0.062	55	51.4%	51%
0.062 - 0.125	0	0.0%	51%
0.125 - 0.25	31	29.0%	80%
0.25 - 0.5	0	0.0%	80%
0.5 - 1.0	0	0.0%	80%
1 - 2	0	0.0%	80%
2 - 4	1	0.9%	81%
4 - 8	3	2.8%	84%
8 - 16	5	4.7%	89%
16 - 32	4	3.7%	93%
32 - 64	6	5.6%	98%
64-128	2	1.9%	100%
128-256	0	0.0%	100%
256-512	0	0.0%	100%
512-1024	0	0.0%	100%
1024-2048	0	0.0%	100%
2048-4096	0	0.0%	100%
Bedrock	0	0.0%	100%
Total	107	100%	100%
		Summary Data	
		D50	0.062
		D84	7.7
		D95	51



Appendix E

Hydrologic Data

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Table 12. Verification of Bankfull Events Junes Branch / Project No. 95027					
Reach	Date of Data Collection	Date of Occurrence	Method	Feet Above Bankfull Elevation	Photo # (if available)
Bungamer II	7/28/2015	Unkown	Crest Gauge	0.1	E-files

Figure 3. Daily Precipitation Totals for the Junes Branch Restoration Project

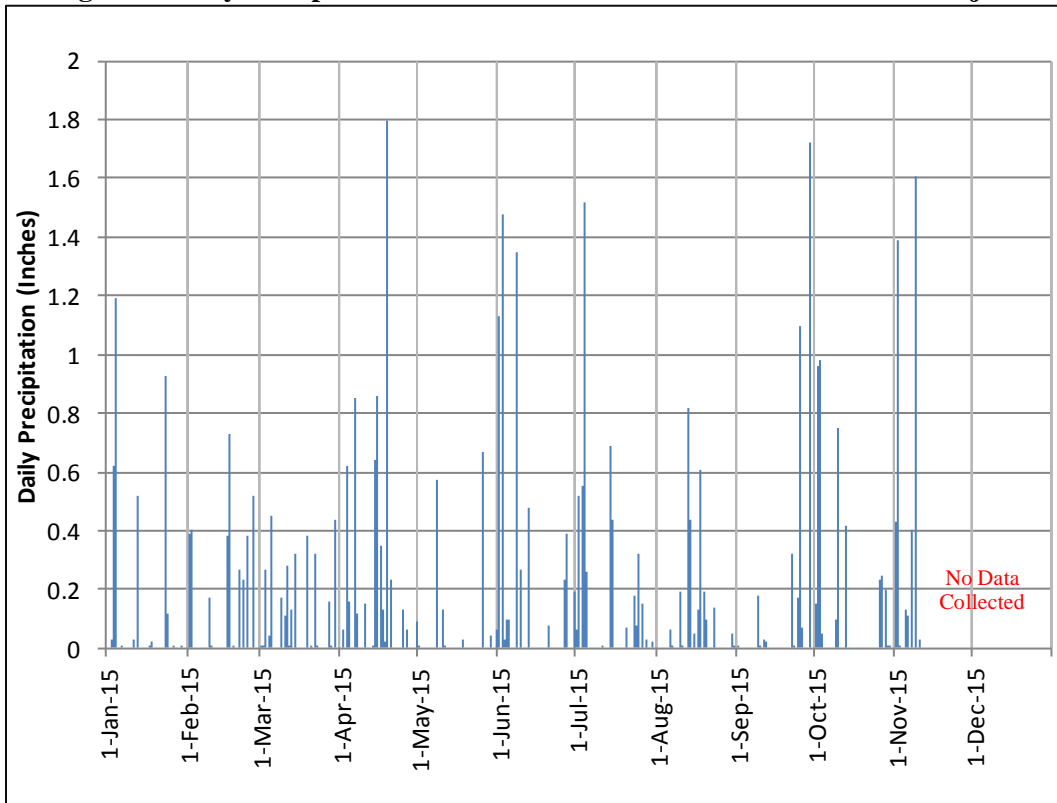


Figure 4. Monthly Precipitation Data Compared to Average, 30th, and 70th Percentiles for Jackson County

