

# Morgan Creek Stream Restoration Site

Haywood County, North Carolina

Cataloging Unit: 06010106

EEP Contract #: D06035-A

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## MONITORING REPORT 2011 (YEAR 3)



**Submitted to:**

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North Carolina Ecosystem Enhancement Program

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## EXECUTIVE SUMMARY

The Morgan Creek Site is located in Haywood County, North Carolina within the French Broad River Basin, Cataloging Unit 06010106, specifically within the targeted local watershed 06010106020040. The project consisted of restoring and enhancing approximately 3,900 linear feet of stream, restoring approximately 9.8 acres of riparian buffers, and restoring and enhancing approximately 1.11 acres of wetlands. The Site is in a rural setting in the Blue Ridge hydrophysiographic ecoregion and was previously used to pasture cattle with woody vegetation confined to isolated areas. Prior to restoration, the channels were highly degraded due to unrestricted livestock access, channelization activities, and lack of riparian vegetation. The restoration design was based on a Priority Level 1 and 2 approach to restore proper channel dimension and allow for appropriate sediment transport. Cross-vanes, J-Hook vanes, and in-stream log structures have been integrated into the channel to provide grade control, maintain stable streambanks while the riparian vegetation establishes, and provide in-stream habitat. Sod mats were harvested on-site and were used to stabilize the newly graded streambanks. Excavated materials from the existing channel were used to backfill around in-stream structures and to build riffles with a natural substrate and function.

### Hydrology

Following the completion of construction in January of 2009, the Site has been subjected to at least one bankfull event and three greater-than-bankfull events. The portions of the southwest region of the state experienced rainfall well above normal during the spring of 2009. In July of 2009 a high rainfall event resulted in high water at 0.8 ft. above bankfull or 1.6 times maximum channel depth. No bankfull or greater-than-bankfull flows were recorded during the second year of monitoring (2010). One greater-than-bankfull flow was recorded during the third year of monitoring (2011).

### Stream

The stream reaches have managed the high-flow events of the first three years. Visual inspection of the Site following the bankfull event in June of 2009 revealed no noticeable adjustments in the bed or bank. The overbank event in July of 2009 resulted in noticeable adjustments in many of the riffles. The overall grade of the channel has been maintained, while there are numerous local adjustments in the riffles and pools. These adjustments appear to be consistent with the channel form and have generally not affected structure stability or function. Visual observations during the performance of Year 3 monitoring indicate that most adjustments to the bed have remained stable and there has been no further degradation during that year. One occurrence of bank failure was observed along Morgan Creek which appears to be a local issue and has not affected the stability or function of the project reach.

### Vegetation

Native woody and herbaceous species were used to establish, at minimum, a thirty-foot riparian buffer on each side of the restored reach. Herbaceous species have successfully established throughout the entire site. On-site sod transplants used to reconstruct the channel banks are well established and show evidence of vigorous growth. Riparian buffer planting exhibits a high survival rate, with an average density for planted living stems at the end of Monitoring Year 3 of 486 stems per acre.

**Wetland**

Wetland hydrology criteria was met on two out of three groundwater gauges in the first year of monitoring, one of the three gauges in the second year and three out of four the third year. The newly installed groundwater gauge (GW4) was installed in the spring of 2011. However no data was recovered due to gauge failure. Overall, Site wetland hydrology appears to have improved during Monitoring Year 3.

**Planned Action**

The riparian buffer bare-root planting has remained successfully established through the third year. In general, herbaceous planting resulted in vigorous growth throughout the site, and no remedial action with respect to vegetation is necessary.

Continued visual monitoring is planned for stream areas that have been identified as “Areas of Concern”. No repair work is required at this time for any reaches of the channel.

A Site visit will be conducted to service the new groundwater gauge (GW4) prior to the Year 4 growing season.

## **1.0 PROJECT GOALS, BACKGROUND, AND ATTRIBUTES**

The purpose of the Morgan Creek Stream Restoration Site (Site) was to restore degraded sections of Morgan Creek and three of its tributaries located in Haywood County, North Carolina. This monitoring report presents information regarding the site and watershed conditions, the restoration approach for the project, the monitoring results, remedial action plan and detailed monitoring drawings of the site.

### **1.1 General Project Description**

The site is located approximately 10 miles northeast of the City of Waynesville in rural Haywood County, North Carolina (Figure 1: Vicinity Map). The site consists of approximately 9.8 acres of floodplain, approximately 3,900 linear feet of stream designated as Morgan Creek and its tributaries, and 0.51 acres of existing wetlands. The stream reaches consist of perennial and intermittent, first and second order streams that have historically been impacted by riparian and bank vegetation removal, channel straightening, unrestricted livestock access, and agricultural land-use practices. Existing land use within the site consists of forested areas and pasture land. The site is located within moderate to steep, sloping colluvial valleys and elevations range from approximately 2500 ft. to 2625 ft. (NGVD). Past land management activities have consisted of timber harvesting with subsequent land clearing for agricultural uses including cattle grazing. The land outside of the conservation easement remains in active agricultural production.

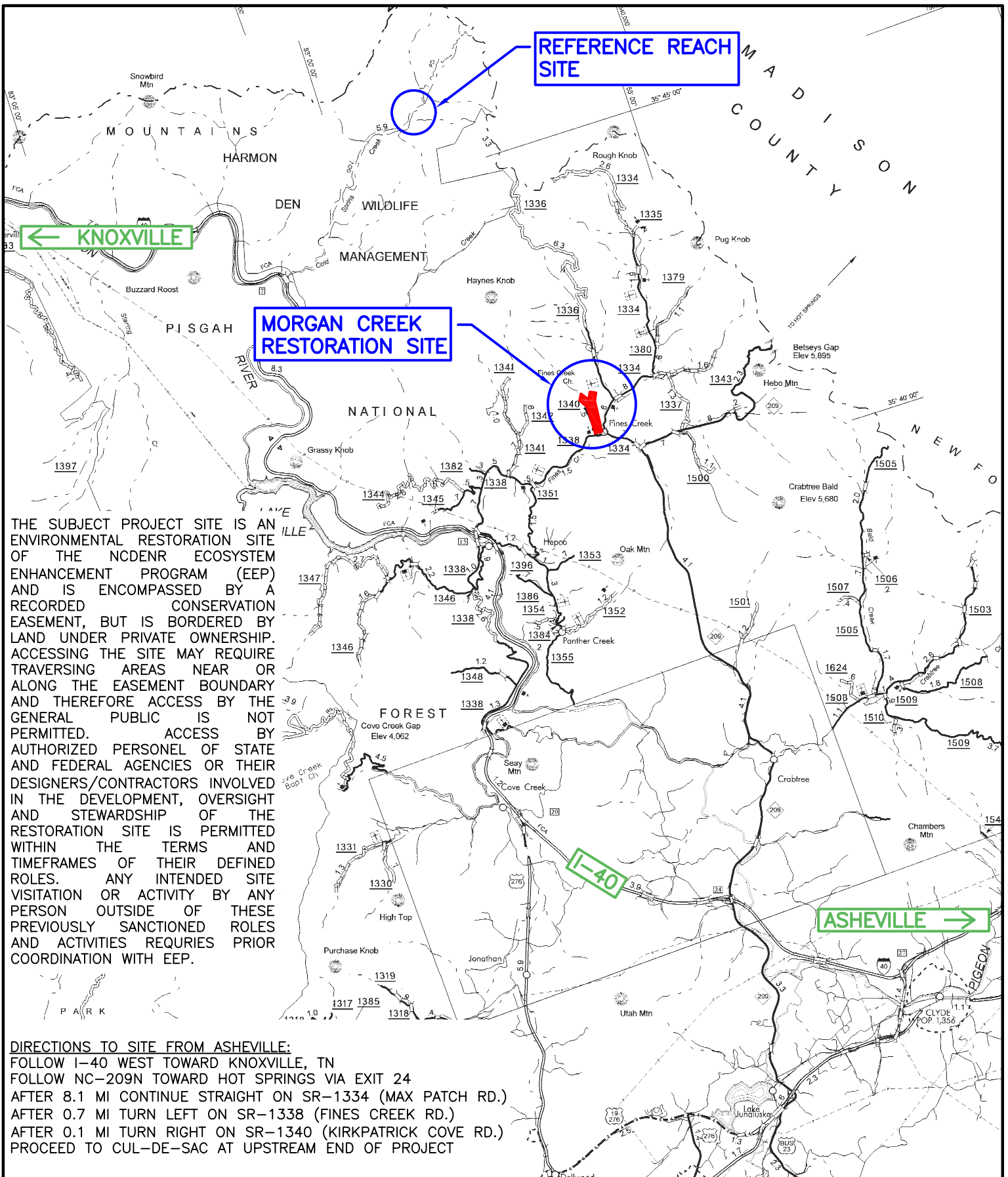
#### **1.1.1 USGS and NCDWQ River Basin Designations**

The project reach is located in the Pigeon River watershed of the French Broad River Basin (United States Geological Survey (USGS) 14-digit Hydrologic Unit 06010106020040) within North Carolina Division of Water Quality (NCDWQ) sub-basin 04-03-05. This sub-basin is primarily forested, although agriculture accounts for a significant portion of the land-use. Morgan Creek drains into Fines Creek at the downstream end of the Site, which in turn flows to the Pigeon River five miles farther downstream.

#### **1.1.2 NCDWQ Surface Water Classification**

Morgan Creek, in the vicinity of the Site, is assigned a best usage classification of C by the NCDWQ and as such there are no restrictions on watershed development or types of discharge. These waters are suitable for aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture. Secondary recreation includes wading, boating, and other uses not involving human body contact with water on an organized or frequent basis.

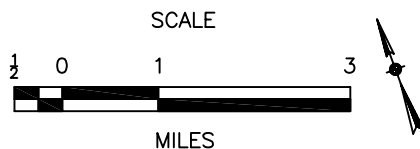
Fines Creek, from its source to the Pigeon River, as well as the portion of the Pigeon River located approximately 5 miles south of the Site, are listed on the DWQ final 2006 303(d) list. Streams which are included in the 303(d) list either do not meet water quality standards or have impaired uses. Listing of these streams likely results from non-point agriculture and urban runoff, and potentially from industrial point source discharges. Specifically, the reason given for the listing of Fines Creek and the Pigeon River is "Impaired Biological Integrity."



THE SUBJECT PROJECT SITE IS AN ENVIRONMENTAL RESTORATION SITE OF THE NCDENR ECOSYSTEM ENHANCEMENT PROGRAM (EEP) AND IS ENCOMPASSED BY A RECORDED CONSERVATION EASEMENT, BUT IS BORDERED BY LAND UNDER PRIVATE OWNERSHIP. ACCESSING THE SITE MAY REQUIRE TRAVERSING AREAS NEAR OR ALONG THE EASEMENT BOUNDARY AND THEREFORE ACCESS BY THE GENERAL PUBLIC IS NOT PERMITTED. ACCESS BY AUTHORIZED PERSONEL OF STATE AND FEDERAL AGENCIES OR THEIR DESIGNERS/CONTRACTORS INVOLVED IN THE DEVELOPMENT, OVERSIGHT AND STEWARDSHIP OF THE RESTORATION SITE IS PERMITTED WITHIN THE TERMS AND TIMEFRAMES OF THEIR DEFINED ROLES. ANY INTENDED SITE VISITATION OR ACTIVITY BY ANY PERSON OUTSIDE OF THESE PREVIOUSLY SANCTIONED ROLES AND ACTIVITIES REQUIRES PRIOR COORDINATION WITH EEP.

**DIRECTIONS TO SITE FROM ASHEVILLE:**  
 FOLLOW I-40 WEST TOWARD KNOXVILLE, TN  
 FOLLOW NC-209N TOWARD HOT SPRINGS VIA EXIT 24  
 AFTER 8.1 MI CONTINUE STRAIGHT ON SR-1334 (MAX PATCH RD.)  
 AFTER 0.7 MI TURN LEFT ON SR-1338 (FINES CREEK RD.)  
 AFTER 0.1 MI TURN RIGHT ON SR-1340 (KIRKPATRICK COVE RD.)  
 PROCEED TO CUL-DE-SAC AT UPSTREAM END OF PROJECT

PREPARED FOR: PREPARED BY: AND BY:



**SITE VICINITY MAP**  
 MORGAN CREEK RESTORATION SITE  
 HAYWOOD COUNTY, NORTH CAROLINA  
 FIGURE 1



## 1.2 Project Goals and Objectives

The primary goals of the Morgan Creek Stream Restoration Project are to:

- Restore aquatic and riparian habitat within portions of the Morgan Creek watershed.
- Restore geomorphic stability to the subject stream reaches.

These goals will be accomplished through the following objectives:

- Restoration of approximately ten acres of Montane Alluvial Forest along both sides of Morgan Creek.
- Removing nonpoint sources of pollution associated with cattle raising and agricultural activities including the exclusion of livestock from Morgan Creek and adjacent floodplain and establishing a native woody riparian buffer (at least 30' wide) adjacent to streams and wetlands to treat surface runoff which may be laden with sediment and/or agricultural pollutants from the adjacent landscape.
- Reestablishing stream stability and the capacity to transport watershed flows and sediment loads by restoring a stable dimension, pattern, and profile supported by natural in-stream habitat and grade/bank stabilization structures.
- Promoting floodwater attenuation through a) reconnecting bankfull stream flows to the abandoned floodplain terrace, b) restoring secondary, entrenched tributaries thereby reducing floodwater velocities, c) restoring floodplain wetlands, thereby increasing the storage capacity for floodwaters within the Site, and d) re-vegetating floodplains to increase frictional resistance on floodwaters crossing the Site.
- Improving aquatic habitat by enhancing stream bed variability and the use of in-stream structures.
- Providing wildlife habitat including seepage slope wetlands.

These accomplishments will result in:

- Restoration and enhancement of 4083 Stream Mitigation Units.
- Providing 0.83 Wetland Mitigation Units.
- Protecting the Site with a perpetual conservation easement.

## 1.3 Project Structure

The project is composed of four distinct stream reaches; the main channel, Morgan Creek, and its three tributaries, North Branch, Middle Branch, and South Branch. The project structure is tabulated in Table I (See Below).

Restoration Reach/Area	Restoration Level	Approach	Pre-Restoration LF or AC	Post-Restoration LF or AC	Station Range/Location
Morgan Creek	R	P2	892	900	100+00 – 109+73
Morgan Creek	R	P1	340	340	108+73 – 112+00
Morgan Creek	R	P2	1402	1438	112+00 – 126+36
Morgan Creek	E1	E1	141	141	126+36 – 127+77
Morgan Creek	R	P2	213	212	127+77 – 129+72
North Branch	R	R2	288	296	200+00 – 202+96
North Branch	R	P2	63	66	203+38 – 204+02
Lower North Branch	R	P1	2	254	500+00 – 502+46
Middle Branch	E1	E1	148	148	300+00 – 301+48
Middle Branch	E1	E1	154	154	301+48 – 303+02
South Branch	R	P1	197	205	400+00 – 402+05
South Branch	E1	E1	115	115	402+05 – 403+20
A, C, D, E, F, G, H, I, J, K	E		0.46	0.46	
R1, R2, R3, R4, R5, R6, R7	R		0.6	0.6	

Restoration Level	Stream (LF)	Riparian Wetland (Ac)		Non-Riparian (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	3,711		0.6				
Enhancement			0.46				
Enhancement I	558						
Enhancement II							
Creation							
Preservation							
HQ Preservation							
			1.06				
<b>Totals</b>	<b>4,269</b>		<b>1.06</b>				

Applicable	Non-Applicable
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## **1.4 Restoration Type and Approach**

Restoration and enhancement practices implemented on this project were designed to minimize unnecessary disturbance to adjacent land and to protect mature riparian vegetation where it exists. Consideration was given to the potential functional lift provided by restoration activities in comparison to the functional lift that could be realized through the natural process of channel evolution. Included in this consideration was an attempt to determine the disturbance and sedimentation that could occur as a result of this natural process. Where restoration was determined to be warranted, consideration was given to which reaches could best be served by maintaining as much of the existing channel pattern as possible.

The proposed reaches of Morgan Creek and its tributaries are designed as Type B4 and Type B4a streams. This channel configuration provides the most stable and natural form in the moderately sloping colluvial valleys that are found throughout the Site. Additionally, since broad alluvial valleys are not found within the Site, the lower sinuosity of the Type B4 streams will result in minimizing grading and earthwork activities. The proposed channel dimensions, patterns, and profiles are based on hydraulic relationships and morphologic dimensionless ratios of the reference reaches. The installation of rock and wood structures was utilized throughout the restored reaches of the Site. Rock and log structures were installed in runs for grade control to prevent headcut formation. Log vanes with rootwads were installed in meander bends to direct the flow away from the outside of the bend and provide toe and bank protection. Sod transplants were used extensively throughout the project to stabilize newly constructed channel banks. On-site material including sod, bed material, boulders, and logs were used to the maximum extent possible.

Proposed wetland areas are underlain by hydric soils but are non-jurisdictional due to insufficient hydrology. Channel restoration reestablished a connection between the floodplain and the channel. Overbank flooding and better utilization of nearby seepage hydrology will provide the needed hydrology to sustain these hydric soil zones as jurisdictional wetlands. Areas where jurisdictional wetlands existed have been enhanced by the planting of appropriate woody and herbaceous species. Each wetland restoration and enhancement area has been planted with species appropriate to the ecoregion and will promote the functionality of the wetlands as integral parts of the riparian corridor.

## **1.5 Project History, Contacts and Attribute Data**

Tables II and III (below) provide an overview of the project implementation timeline as well as the individual companies responsible for managing and completing various project milestones. Information defining current land use within the watershed, Rosgen classification of the stream reaches within the site, and various other data attributes for the site are provided in Table IV (below).

<b>Table II. Project Activity and Reporting History</b> <b>Morgan Creek Restoration Project / EEP Contract# D06035-A</b>		
<b>Activity or Report</b>	<b>Data Collection Complete</b>	<b>Completion or Delivery</b>
Restoration Plan	Nov 2007	Jan 2008
Final Design - Construction Plans	N/A	Jul 2008
Construction	N/A	Jan 2009
Temporary S&E mix applied to entire project area	N/A	Dec 2008
Permanent seed mix applied to entire site	N/A	Dec 2008
Bare-root plantings for floodplain and uplands	N/A	Jan 2009
Mitigation Plan / As-Built (Year 0 Monitoring - baseline)	Jan 2009	Feb 2009
Year 1 Monitoring	Oct 2009	Dec 2009
Year 2 Monitoring	Oct 2010	Nov 2010
Year 3 Monitoring	Sept 2011	Sept 2011
Year 4 Monitoring		
Year 5 Monitoring		

<b>Table III. Project Contact Table</b> <b>Morgan Creek Restoration Project / EEP Contract# D06035-A</b>		
<b>Full Delivery Provider</b> Restoration Systems, Inc Travis Hamrick	1101 Haynes St., Suite 211 Raleigh, NC 27604 919-755-9490	
<b>Designer</b> Wolf Creek Engineering, pllc S. Grant Ginn, P.E.	7 Florida Ave Asheville, NC 28787 828-658-3649	
<b>Construction Contractor</b> North State Environmental, Inc Darrell Westmoreland	2889 Lowery St. Winston-Salem, NC 27101 336-725-2010	
<b>Project Manager</b> American Wetlands Lamar Beasley	2310 Valley Carline Court Ruston, VA 20191 703-860-0045	
<b>Planting &amp; Seeding Contractor</b> North State Environmental, Inc Stephen Joyce	2889 Lowery St. Winston-Salem, NC 27101 336-725-2010	
<b>Monitoring Performers</b> Stream Monitoring - Wolf Creek Engineering, pllc Vegetation Monitoring - Axiom Environmental, Inc	S. Grant Ginn, P.E. Grant Lewis	828-658-3649 919-215-1693

Table IV. Project Attribute Table					
Morgan Creek Restoration Project / EEP Contract# D06035-A					
Project County	Haywood				
Physiographic Region	Blue Ridge				
Ecoregion	Southern Crystalline Ridges and Mountains				
Project River Basin	French Broad River Basin				
USGS HUC for Project (14 digit)	06010106020040				
NCDWQ Sub-basin for Project	04-03-05				
Within extent of EEP Watershed Plan?					
WRC Class (Warm, Cool, Cold)					
% of project easement fenced or demarcated	100% Demarcated Easement Corners				
Beaver activity observed during design phase?	None within project site				
Restoration Component Attribute Table					
	Morgan	North	Lower North	Middle	South
Drainage area (mi <sup>2</sup> )	0.71	0.12	0.18	0.004	0.006
Stream order	Second	First	First	First	First
Restored length (feet)	2890	362.5	254	-	250
Perennial or Intermittent	Perennial	Perennial	Perennial	Intermittent	Perennial
Watershed type	Rural	Rural	Rural	Rural	Rural
Watershed LULC Distribution (e.g.)					
Residential	15%	30%	35%	0%	0%
Ag-Row Crop	0%	0%	0%	0%	0%
Ag-Livestock	35%	0%	0%	65%	55%
Forested	50%	70%	65%	35%	45%
Watershed impervious cover (%)	5	5	5	0	0
NCDWQ AU/Index number	5-32-7				
NCDWQ classification	C	C	C	C	C
303d listed?	No				
Upstream of a 303d listed segment?	Yes				
Reasons for 303d listing or stressor	non-point urban and agricultural runoff, agricultural activities				
Total acreage of easement	10.25				
Total vegetated acreage within easement	9.8				
Total planted acreage as part of the restoration	9.5				
Rosgen classification of pre-existing	C4b, G4	A4	A4	G4	F4
Rosgen classification of As-Built	B4	B4a	B4	B4a	B4a
Valley type	II	II	II	II	II
Valley slope	0.0376	0.0515	0.0365	0.118	0.1271
Valley side slope range	4% - 44%				
Valley toe slope range	4.5% - 8%				
Cowardin classification	N/A				
Trout waters designation	N/A				
Species of concern, endangered?	small whorled pagonia, Indiana and Gray bat				
Dominant soil series and characteristics	CxA	EvE, SdD, CxA	CxA	HaD2	FnE2, HaD2
Series	Cullowhee-Nikwasi	Evard-Cowee, Saunook	Cullowhee-Nikwasi	Hayesville Clay Loam	Fannin Loam
Depth (in)	0-65	0-72, 0-65	0-65	0-60	0-61
Clay %	-	-	-	-	0-35
K	mod. rapid - rapid	moderate - mod. rapid	moderately rapid	moderate	moderate
T	-	-	-	-	-

## 2.0 PROJECT CONDITION AND MONITORING RESULTS

### 2.1 Vegetation Assessment

Sampling was conducted as outlined in the *CVS-EEP Protocol for Recording Vegetation, Version 4.0* (Lee et al. 2006) (<http://cvs.bio.unc.edu/methods.htm>) to determine the planting pattern of woody stems with respect to species, spacing, and density as well as to forecast survivability and growth of planted stems in subsequent monitoring years. The taxonomic standard for vegetation used for this document was *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas* (Weakley 2011). Following Site construction six vegetative sampling plots (five standard [10m x 10m] plots and one [5m x 20m] plot) were established, monumented at each corner with metal fence posts and PVC pipes, and recorded during baseline surveys. All planted stems and plot corners were marked with orange flagging tape to facilitate relocation during subsequent monitoring years. Four plots were established in stream restoration areas and two within wetland areas (one within a wetland enhancement area and one within a wetland restoration area). Plots were placed within the applicable planting zones to capture the heterogeneity of the designed vegetative communities.

#### 2.1.1 Stem Counts

Year 3 vegetation monitoring for the Site occurred in early August 2011. Vegetation sampling across the Site was above the required average density with 486 planted stems per acre. Native herbaceous cover has successfully established throughout the Site. Volunteer woody species were documented within three of the six the monitoring plots (Plots 1, 2, and 6) during Year 3.

**Table V: Vegetation Summary**

Plot	Date Sampled	Planted Living Stems	Dead or Missing Stems	Volunteer Stems	Total Living Stems	Average Stems Per Acre	# Species
1	8/3/2011	12	3	1	13	526	7
2	8/3/2011	16	4	5	21	850	8
3	8/3/2011	11	7	0	11	445	6
4	8/3/2011	11	1	0	11	445	8
5	8/3/2011	11	4	0	11	445	6
6	8/3/2011	11	0	1	12	486	7

#### 2.1.2 Vegetative Problems

Stem loss which occurred at the Site following baseline monitoring may be due to several factors, including livestock encroachment in Plots 2 and 4, and mowing within Plot 5. Supplemental planting occurred during the Year 1 (2009) monitoring season within areas that had experienced stem loss. During Year 3 (2011) monitoring, average overall vigor of planted stems was noted as good to excellent; however, planted stems should continue to be monitored closely in subsequent monitoring years.

### 2.1.3 Vegetation Plot Photos

A photo point was established in each vegetation plot. Photo points are positioned for each plot at the origin looking diagonally across the plot to the opposite corner. The photographs were captured on the same day as the vegetation plot surveys (Appendix B).

## 2.2 Stream Assessment

Monitoring protocol follows that outlined within the EEP Site Specific Mitigation Plan and detailed in the U.S. Army Corps of Engineers (USACE) Stream Mitigation Guidelines for Monitoring Level I. Stream monitoring included measurements of stream dimension, profile, pattern, bed materials, photo documentation, and stream bankfull return interval. (Baseline, Year 1, Year 2 and Year 3 summary data are provided in Tables VI and VII below).

Most of the stream reaches have managed the extreme flow events of the first three years reasonably well. The overall bed profile of Morgan Creek has been maintained; however, there are numerous local adjustments to riffle and pool features. These adjustments appear to have remained stable during Monitoring Year 3 (2011), and exhibit no additional degradation. One bank failure approximately 8 ft. in length was evident within Reach 4, but all other channel banks are stable and fully vegetated throughout the project. Most of the in-stream structures are intact and functional. The few structures that were partially compromised appear to have stabilized and are not presently in need of repair. No repairs or remediation is called for at this time.

### 2.2.1 Hydrology

Since completion of construction in January of 2009, the site has been subjected to at least four bankfull or greater events. In July of 2009, a weather system crossed western North Carolina resulting in four inches of rainfall on-site and water elevations 0.8 feet above bankfull on Morgan Creek. It is estimated that this storm was between a twenty-five and fifty-year event. Heavy rainfall in the late summer of 2009 again resulted in water elevations above bankfull. No bankfull event was recorded during Monitoring Year 2 (2010). One greater-than-bankfull event occurred during the summer of 2011.

**Table VIII. Verification of Bankfull Events**

Date of Data Collection	Date of Occurrence of Bankfull Event	Height Above Bankfull (ft)	Method of Data Collection
6/16/09	Spring 2009	At Bankfull	Debris evidence at bankfull
7/9/09	7/8/09	0.8	Crest Gauge
10/6/09	Summer 2009	0.6	Crest Gauge
9/7/11	Summer 2011	0.3	Crest Gauge and Debris evidence

### 2.2.2 Geomorphology

Following the procedures established in the USDA Forest Service Manual (Harrelson et al 1994) and the methodologies utilized in the Rosgen stream assessment and classification system (Rosgen 1994, 1996), data collected consisted of detailed dimension and pattern measurements, longitudinal profiles, and bed materials sampling.

Table VI - Baseline Morphology and Hydraulic Summary  
Morgan Creek Restoration Site - Morgan Creek (3031 ft)

Parameter	Gauge			Regional Curve			Pre-Existing Condition					Reference Reach(es) Data					Design					As-Built / Baseline					
	LL	UL	Eq.	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 and Substrate - Rifle																											
Bankfull Width (ft)																											
Floodprone Width (ft)																											
Bankfull Mean Depth (ft)																											
Bankfull Max Depth (ft)																											
Bankfull Cross-Sectional Area (ft <sup>2</sup> )																											
Width/Depth Ratio																											
Entrenchment Ratio																											
Bank Height Ratio																											
d50 (mm)																											
Profile																											
Rifle Length (ft)																											
Rifle Slope (ft/ft)																											
Pool Length (ft)																											
Pool Max Depth (ft)																											
Pool Spacing (ft)																											
Pool Volume (ft <sup>3</sup> )																											
Channel Beltwidth (ft)																											
Radius of Curvature (ft)																											
Radius of Curvature Ratio (ft/ft)																											
Meander Wavelength (ft)																											
Meander Width Ratio (ft/ft)																											
Substrate, bed and transport parameters																											
<sup>4</sup> R% / Ru% / P% / G% / S%																											
<sup>5</sup> Sc% / Ss% / G% / C% / B% / Be%																											
<sup>6</sup> d16 / d35 / d50 / d84 / d95 / dip / disp (mm)																											
Reach Shear Stress (competency) lb/ft <sup>2</sup>																											
Max part size (mm) mobilized at bankfull																											
Stream Power (transport capacity) W/m <sup>2</sup>																											
Additional Reach Parameters																											
Drainage Area (sq mi)																											
Impervious cover estimate (%)																											
Rosgen Classification																											
Bankfull Velocity (fps)																											
Bankfull discharge (cfs)																											
Valley length (ft)																											
Channel Thalweg length (ft)																											
Sinuosity (ft)																											
Water Surface Slope (channel) (ft/ft)																											
BF slope (ft/ft)																											
<sup>8</sup> Bankfull Floodplain Area (acres)																											
<sup>9</sup> Proportion Overwide (%)																											
<sup>7</sup> Entrenchment Class (ER Range)																											
<sup>8</sup> Incision Class (BHR Ranch)																											
BEHI VL% / L% / MP% / H% / V% / E%																											
Channel Stability or Habitat Metric																											
Biological or Other																											



Table VI - Baseline Morphology and Hydraulic Summary  
Morgan Creek Restoration Site - North Branch (#15 ft)

Parameter	Gauge		Regional Curve		Pre-Existing Condition				Reference Reach(es) Data				Design				As-Built / Baseline				
	LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Rifle																					
Bankfull Width (ft)					7.1					8					8.5			9.4			
Floodprone Width (ft)					14					11.6					18.5			21			
Bankfull Mean Depth (ft)					1					0.52					0.53			0.5			
Bankfull Max Depth (ft)					1.5					0.77					0.72			0.9			
Bankfull Cross-Sectional Area (ft <sup>2</sup> )					6.9					4.2					4.48			5			
Width/Depth Ratio					7.1					15.4					16.1			17.7			
Entrenchment Ratio					2					1.45					2.2			2.23			
Bank Height Ratio					1.5					1					1			1			
d50 (mm)					27					27											
Profile																					
Rifle Length (ft)															7			7			12.5
Rifle Slope (ft/ft)					0.078					0.142					0.0444			0.056			0.09
Pool Length (ft)														3			6.5			9	
Pool Max Depth (ft)					1.5					0.95					1.1			1.9			
Pool Spacing (ft)					95					68					17			22			25
Pool Volume (ft <sup>3</sup> )																					
Pattern																					
Channel Beltwidth (ft)					23					17					13			13			13
Radius of Curvature (ft)					5		14			13					17			22			26
Radius of Curvature Ratio (ft/ft)					0.7		2			1.6					2			2.3			2.8
Meander Wavelength (ft)					41					29					36			41			42
Meander Width Ratio (ft/ft)					3.2					2.1					1.5			4.4			4.5
Substrate, bed and transport parameters																					
<sup>4</sup> R% / Ru% / P% / G% / S%																					
<sup>5</sup> Sc% / Ss% / G% / C% / B% / Be%					5	26	51	17	0	1	1	10	48	41	0	1					
<sup>6</sup> d16 / d35 / d50 / d84 / d95 / dip / disp (mm)					0.32	5.37	16.7	69	119	5.2	22	45	130	190							
Reach Shear Stress (competency) lb/ft <sup>2</sup>															1.69						
Max part size (mm) mobilized at bankfull															500						
Stream Power (transport capacity) W/m <sup>2</sup>																					
Additional Reach Parameters																					
Drainage Area (sq mi)																					
Impervious cover estimate (%)										0.12											
Rosgen Classification										A4								B4a			
Bankfull Velocity (fps)										3.8					4.5						
Bankfull discharge (cfs)										26											
Valley length (ft)																					
Channel Thalweg length (ft)																					
Sinuosity (ft)										1.05					368			362.5			
Water Surface Slope (channel) (ft/ft)										0.078					1.02			1.06			
BF slope (ft/ft)										0.051					0.0538			0.0528			
<sup>8</sup> Bankfull Floodplain Area (acres)										0.35					0.051			0.0524			
<sup>9</sup> Proportion Overwide (%)																					
<sup>7</sup> Entrenchment Class (ER Range)																					
<sup>8</sup> Incision Class (BHR Ranch)																					
BEHI VL% / L% / M% / H% / V% / E%																					
Channel Stability or Habitat Metric																					
Biological or Other																					

**Table VII. Morphology and Hydraulic Monitoring Summary  
Morgan Creek Stream Restoration Site (D06035-A)  
Reach 1: Morgan Creek**

Parameter	Cross Section RFI Riffle						Cross Section PL1 Pool						Cross Section					
	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
<b>Dimension</b>																		
Bkf Width (ft)	12.9	13	14.2				14.0	13.9	15.1									
Floodprone Width (ft)	63	63	63				-	-	-									
Bkf Cross Sectional Area (ft <sup>2</sup> )	11.4	11.6	8.7				13.4	12.5	10.8									
Bkf Mean Depth (ft)	0.9	0.9	0.6				1.0	0.9	0.7									
Bkf Max Depth (ft)	1.3	1.3	1.4				1.5	1.4	1.7									
Width/Depth Ratio	14.6	14.6	23.3				-	-	-									
Entrenchment Ratio	4.9	4.9	4.4				-	-	-									
Bank Height Ratio	1.0	1.0	1.0				-	-	-									
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
<b>Substrate</b>																		
D <sub>50</sub> (mm)	94	17.6	6.7															
D <sub>84</sub> (mm)	207	122	81															

Parameter	MY-1 (2009)						MY-2 (2010)						MY-3 (2011)						MY-4 (2012)						MY-5 (2013)						MY+ (2014)					
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med						
<b>Pattern</b>																																				
Beltwidth (ft)	18	24	21	18	24	21	18	24	21	18	24	21	18	24	21	18	24	21	18	24	21	18	24	21	18	24	21	18	24	21						
Radius of Curvature (ft)	28	87	36	28	87	36	28	87	36	28	87	36	28	87	36	28	87	36	28	87	36	28	87	36	28	87	36	28	87	36						
Meander Wavelength (ft)	61	84	72	61	84	72	61	84	72	61	84	72	61	84	72	61	84	72	61	84	72	61	84	72	61	84	72	61	84	72						
Meander Width Ratio	1.4	1.9	1.6	1.4	1.9	1.6	1.4	1.9	1.6	1.4	1.9	1.6	1.4	1.9	1.6	1.4	1.9	1.6	1.4	1.9	1.6	1.4	1.9	1.6	1.4	1.9	1.6	1.4	1.9	1.6						
<b>Profile</b>																																				
Riffle Length (ft)	8.5	25.5	12	5.5	22.9	16	5.5	22.9	16	7.5	41.5	14.8	7.5	41.5	14.8	7.5	41.5	14.8	7.5	41.5	14.8	7.5	41.5	14.8	7.5	41.5	14.8	7.5	41.5	14.8						
Riffle Slope (ft/ft)	0.0156	0.0864	0.0342	0.0195	0.0657	0.0422	0.0195	0.0657	0.0422	0.0117	0.1233	0.0354	0.0117	0.1233	0.0354	0.0117	0.1233	0.0354	0.0117	0.1233	0.0354	0.0117	0.1233	0.0354	0.0117	0.1233	0.0354	0.0117	0.1233	0.0354						
Pool length (ft)	3.3	16.5	9	-	-	-	-	-	-	7	16.5	10.5	7	16.5	10.5	7	16.5	10.5	7	16.5	10.5	7	16.5	10.5	7	16.5	10.5	7	16.5	10.5						
Pool Spacing (ft)	15	46	37	15	137.5	43	15	137.5	43	16	59	41.2	16	59	41.2	16	59	41.2	16	59	41.2	16	59	41.2	16	59	41.2	16	59	41.2						
<b>Additional Reach Parameters</b>																																				
Valley Length (ft)	-	-	740	-	-	740	-	-	740	-	-	740	-	-	740	-	-	740	-	-	740	-	-	740	-	-	740	-	-	740						
Channel Length (ft)	-	-	773	-	-	773	-	-	773	-	-	773	-	-	773	-	-	773	-	-	773	-	-	773	-	-	773	-	-	773						
Sinuosity	-	-	1.04	-	-	1.04	-	-	1.04	-	-	1.04	-	-	1.04	-	-	1.04	-	-	1.04	-	-	1.04	-	-	1.04	-	-	1.04						
Water Surface Slope (ft/ft)	0.036	0.080	0.048	0.0355	0.0471	-	0.0355	0.0471	-	0.03	0.0678	0.0472	0.03	0.0678	0.0472	0.03	0.0678	0.0472	0.03	0.0678	0.0472	0.03	0.0678	0.0472	0.03	0.0678	0.0472	0.03	0.0678	0.0472						
Bkf Slope (ft/ft)	0.036	0.080	0.048	-	-	0.0444	-	-	0.0444	0.0238	0.066	0.0457	0.0238	0.066	0.0457	0.0238	0.066	0.0457	0.0238	0.066	0.0457	0.0238	0.066	0.0457	0.0238	0.066	0.0457	0.0238	0.066	0.0457						
Rosgen Classification	-	-	B3a	-	-	B3a	-	-	B3a	-	-	B3a	-	-	B3a	-	-	B3a	-	-	B3a	-	-	B3a	-	-	B3a	-	-	B3a						
Habitat Index																																				
Macrobenthos																																				



**Table VII. Morphology and Hydraulic Monitoring Summary  
Morgan Creek Stream Restoration Site (D06035-A)  
Reach 3: Morgan Creek**

Parameter	Cross Section RF3 Riffle						Cross Section PL3 Pool						Cross Section					
	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
<b>Dimension</b>																		
Bkf Width (ft)	14.6	14.9	14.9				14.9	13.4	14.5									
Floodprone Width (ft)	36	36	36				-	-	-									
Bkf Cross Sectional Area (ft <sup>2</sup> )	15.3	12.3	12.4				11.8	10	9.5									
Bkf Mean Depth (ft)	1	0.8	0.8				0.8	0.7	0.7									
Bkf Max Depth (ft)	1.9	1.7	1.8				1.2	1.1	1.5									
Width/Depth Ratio	14	18	18				-	-	-									
Entrenchment Ratio	2.5	2.5	2.4				-	-	-									
Bank Height Ratio	1.0	1.0	1.0				-	-	-									
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
<b>Substrate</b>																		
D <sub>50</sub> (mm)	44	39.1	18.3															
D <sub>84</sub> (mm)	132	1607	98															

Parameter	MY-1 (2009)			MY-2 (2010)			MY-3 (2011)			MY-4 (2012)			MY-5 (2013)			MY+ (2014)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
<b>Pattern</b>																		
Beltwidth (ft)	22	28	26	22	28	26	22	28	26	22	28	26	22	28	26	22	28	26
Radius of Curvature (ft)	33	80	52	33	80	52	33	80	52	33	80	52	33	80	52	33	80	52
Meander Wavelength (ft)	73	122	101	73	122	101	73	122	101	73	122	101	73	122	101	73	122	101
Meander Width Ratio	1.5	1.9	1.8	1.5	1.9	1.8	1.5	1.9	1.8	1.5	1.9	1.8	1.5	1.9	1.8	1.5	1.9	1.8
<b>Profile</b>																		
Riffle Length (ft)	4	30	17	12	68	18.6	6	41	17.5									
Riffle Slope (ft)	0.0135	0.0600	0.0359	0.0119	0.0615	0.0318	0.0138	0.1233	0.029									
Pool length (ft)	5.5	21	13	-	-	-	5.5	28	11.5									
Pool Spacing (ft)	35	76	53	3	76	48	33	67	48									
<b>Additional Reach Parameters</b>																		
Valley Length (ft)	-	-	328	-	-	328	-	-	328									
Channel Length (ft)	-	-	344	-	-	344	-	-	344									
Sinuosity	-	-	1.05	-	-	1.05	-	-	1.05									
Water Surface Slope (ft/ft)	0.030	0.037	0.030	0.0279	0.0347	-	0.0221	0.0619	0.0332									
Bkf Slope (ft/ft)	0.030	0.037	0.030	-	-	0.0313	0.018	0.0555	0.0348									
Rosgen Classification	-	-	B4	-	-	B4	-	-	B4									
Habitat Index																		
Macrobenthos																		

**Table VII. Morphology and Hydraulic Monitoring Summary  
Morgan Creek Stream Restoration Site (D06035-A)  
Reach 4: Morgan Creek**

Parameter	Cross Section RF4 Riffle						Cross Section PL4 Pool						Cross Section					
	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
<b>Dimension</b>																		
Bkf Width (ft)	15.7	15.7	15.3				15.4	16.9	16.9									
Floodprone Width (ft)	44	44	44				-	-	-									
Bkf Cross Sectional Area (ft <sup>2</sup> )	19.1	18.2	18.3				18.3	20.8	21.8									
Bkf Mean Depth (ft)	1.2	1.2	1.2				1.2	1.2	1.3									
Bkf Max Depth (ft)	2.0	1.9	2				2.1	2.4	2.6									
Width/Depth Ratio	12.9	13.5	12.8				-	-	-									
Entrenchment Ratio	2.8	2.8	2.9				-	-	-									
Bank Height Ratio	1.0	1.0	1.0				-	-	-									
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
<b>Substrate</b>																		
D <sub>50</sub> (mm)	50	49.9	13.7															
D <sub>84</sub> (mm)	144	103	63															

Parameter	MY-1 (2009)						MY-2 (2010)						MY-3 (2011)						MY-4 (2012)						MY-5 (2013)						MY+ (2014)					
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med						
<b>Pattern</b>																																				
Beltwidth (ft)	21	30	23	21	30	23	21	30	23	21	30	23	21	30	23	21	30	23	21	30	23	21	30	23	21	30	23	21	30	23						
Radius of Curvature (ft)	33	92	47	33	92	47	33	92	47	33	92	47	33	92	47	33	92	47	33	92	47	33	92	47	33	92	47	33	92	47						
Meander Wavelength (ft)	82	108	91	82	108	91	82	108	91	82	108	91	82	108	91	82	108	91	82	108	91	82	108	91	82	108	91	82	108	91						
Meander Width Ratio	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5						
<b>Profile</b>																																				
Riffle Length (ft)	5.2	28	18.2	14	77	18.5	14	77	18.5	11.5	53	24.5																								
Riffle Slope (ft)	0.0169	0.0700	0.0322	0.0181	0.0736	0.0275	0.0127	0.062	0.0282																											
Pool length (ft)	4	35	13.5	-	-	-	4	53	15																											
Pool Spacing (ft)	19	52	32	19	99	37	31	116	52																											
<b>Additional Reach Parameters</b>																																				
Valley Length (ft)	-	-	717	-	-	717	-	-	717	-	-	717	-	-	717	-	-	717	-	-	717	-	-	717	-	-	717	-	-	717						
Channel Length (ft)	-	-	741	-	-	741	-	-	741	-	-	741	-	-	741	-	-	741	-	-	741	-	-	741	-	-	741	-	-	741						
Sinuosity	-	-	1.03	-	-	1.03	-	-	1.03	-	-	1.03	-	-	1.03	-	-	1.03	-	-	1.03	-	-	1.03	-	-	1.03	-	-	1.03						
Water Surface Slope (ft/ft)	0.020	0.032	0.031	0.03	0.0316	-	0.0173	0.0388	0.027																											
Bkf Slope (ft/ft)	0.020	0.032	0.031	-	-	0.03	0.0091	0.0379	0.0275																											
Rosgen Classification	-	-	B4	-	-	B4	-	-	B4	-	-	B4	-	-	B4	-	-	B4	-	-	B4	-	-	B4	-	-	B4	-	-	B4						
Habitat Index																																				
Macrobenthos																																				

**Table VII. Morphology and Hydraulic Monitoring Summary  
Morgan Creek Stream Restoration Site (D06035-A)  
Reach 5: North Branch**

Parameter	Cross Section RF5 Riffle					Cross Section PL5 Pool					Cross Section								
	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	
<b>Dimension</b>																			
Bkf Width (ft)	8.6	7.1	7.5				8.4	7.9	8.2										
Floodprone Width (ft)	22	22	22				-	-	-										
Bkf Cross Sectional Area (ft <sup>2</sup> )	4.5	3.9	3.7				8.7	6.7	7.8										
Bkf Mean Depth (ft)	0.5	0.6	0.5				1.0	0.9	1										
Bkf Max Depth (ft)	1.0	0.9	1.1				1.9	1.4	8.6										
Width/Depth Ratio	16.5	12.9	15.2				-	-	-										
Entrenchment Ratio	2.6	2.6	2.9				-	-	-										
Bank Height Ratio	1.0	1	1				-	-	-										
Wetted Perimeter (ft)																			
Hydraulic Radius (ft)																			
<b>Substrate</b>																			
D <sub>50</sub> (mm)	31	51	22.8																
D <sub>84</sub> (mm)	177	160	108																

Parameter	MY-1 (2009)			MY-2 (2010)			MY-3 (2011)			MY-4 (2012)			MY-5 (2013)			MY+ (2014)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
<b>Pattern</b>																		
Beltwidth (ft)	11	16	13	11	16	13	11	16	13	11	16	13						
Radius of Curvature (ft)	16	30	18	16	30	18	16	30	18	16	30	18						
Meander Wavelength (ft)	34	41	39	34	41	39	34	41	39	34	41	39						
Meander Width Ratio	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5						
<b>Profile</b>																		
Riffle Length (ft)	3	10.2	4.5	1.2	27	9.4	3	25.7	6									
Riffle Slope (ft)	0.0267	0.1171	0.0667	0.024	0.0976	0.0664	0.03	0.14	0.0733									
Pool length (ft)	3.2	10.5	4.2	-	-	-	3	22.2	6									
Pool Spacing (ft)	8.5	33	20.3	14.1	37	21.3	11.5	36.3	19.8									
<b>Additional Reach Parameters</b>																		
Valley Length (ft)	-	-	246	-	-	246	-	-	246	-	-	246						
Channel Length (ft)	-	-	266	-	-	266	-	-	266	-	-	266						
Sinuosity	-	-	1.08	-	-	1.08	-	-	1.08	-	-	1.08						
Water Surface Slope (ft/ft)	0.045	0.06	0.054	0.0508	0.0664	-	0.0136	0.0959	0.0535									
Bkf Slope (ft/ft)	0.045	0.06	0.054	-	-	0.0527	0.0218	0.0808	0.0474									
Rosgen Classification	-	-	B4a	-	-	B4a	-	-	B4a									
Habitat Index																		
Macrobenthos																		

Re-survey of the permanent cross sections and profile reaches have shown a few minor alterations in local bed elevations with the bed form and the channel pattern remains consistent with the Year 2 condition. On Morgan Creek, the four riffle sections that were taken showed slight variation from the Year 2 condition in that they are experiencing deposition of material along the banks. This may be due to an increase in vegetation along the riffles where water depth is shallow and vegetation growth has occurred. As vegetation increases in these areas, lower flow velocities result in deposition of finer sediment. An increase in finer material is evident in the pebble count data described below. Any changes to the riffle sections between Year 2 and Year 3 were minor and none suggest a systemic problem at the Site. The four pool sections that were taken indicated some slight deposition, but overall are fairly consistent with conditions present in Year 2. None of the adjustments are cause for concern regarding performance of the stream.

The riffle and pool sections that were taken on North Branch indicate minor change from the Year 2 survey. The riffle section remains consistent with Year 2 conditions. There are indications from the cross sections and the profile that the material that was previously deposited in the pools has re-mobilized and pool depths have partially returned. Overall, the channel is generally consistent with the Year 2 survey.

Pebble counts were conducted at each cross-section, as well as across the overall study reach. Pebble count data was plotted by size distribution in order to assess the  $D_{50}$  and  $D_{84}$  size class. On Morgan Creek, the material size generally decreased from the Year 2 condition with the  $D_{50}$  decreasing from 19 mm to 5 mm on the upper reach, from 25 mm to 7 mm on the second reach, from 49 mm to 33mm on the third, and 25 mm to 10 mm on the fourth reach. Likewise the  $D_{84}$  decreased from 122 mm to 68 mm on the upper reach, from 112 mm to 86 mm on the second reach, 119 mm to 106 mm on the third reach. A bimodal distribution of material is evident throughout all four reaches of Morgan Creek. For instance in reach 3, when finer particles ( $< 2$  mm) are removed from the data set of the riffle section, the  $D_{50}$  increases from 32.5 mm to 51.3 mm. This value is comparable to the Year 2  $D_{50}$  of 49.1 mm. This similarity in size distribution in the riffles indicates that the gravel and cobble fractions have not changed in composition, but remain in the channel embedded in a layer of finer material. This may be caused by the increase in vegetation along the riffles as indicated by the cross sections.

On North Branch the material size decreased, with the  $D_{50}$  decreasing from 50 mm to 0.5 mm and the  $D_{84}$  decreasing from 145 mm to 43 mm. Similarly, the collected data from North Branch suggests that the gravel and cobble fractions have not changed in composition, but finer sediment has settled along the channel.

### 2.2.3 Problem Areas

There are some minor areas of concern that should be monitored but that presently appear to be stable. These areas have been identified on the monitoring plan sheets. Some of the adjustments that occurred during Year 1 and Year 2 have appeared to have healed themselves. Others, such as structure drops or nick points, did not heal themselves during Year 3 but appear to be stable and show no further evidence of degradation.

One bank failure occurred at STA 125+00 is approximately 8 ft. in length. This appears to be a localized problem that should not affect the adjacent areas. Sod from the bank failure may act to protect the toe from future erosion. Additional monitoring of the area is the only action required at this time.

#### 2.2.4 Photo Point Stations

Photo Point Stations (PPSs) have been established to assist in characterizing the site and to allow qualitative evaluation of the site conditions. The location of each photo station has been permanently marked in the field and the bearing/orientation of the photograph is indicated on the monitoring plans to allow for consistent repetition. A total of ten (10) PPSs have been established along the restored stream (Appendix B). An additional ten (10) photo stations have been located upstream of the permanent monitoring cross sections. These photographs are taken facing downstream looking at the section, and show as much of the banks and channel as possible.

#### 2.2.5 Stability Assessment

The following three tables provide a summary of the stream stability assessment and the morphologic parameters of the Site. The Stability Assessment Table is a semi-quantitative summary of the results from the visual inspection conducted of each reach using Table B2 (Appendix B). The Baseline Morphology and Hydraulic Summary Table and the Morphology and Hydraulic Monitoring Summary Table provide the quantitative summary of data from the cross sectional and longitudinal surveys for the As-built condition and for each subsequent monitoring year.

**Table IX. Categorical Stream Feature Visual Stability Assessment**

Feature	Performance Percentage – Morgan Creek (Reach 1-4) (3,031 ft)					
	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
Riffles	100%	95%	96%	97%		
Pools	100%	85%	82%	84%		
Thalweg	100%	100%	100%	100%		
Meanders	100%	98%	98%	98%		
Bed General	100%	93%	100%	99%		
Vanes / J Hooks etc.	100%	97%	98%	98%		
Wads and Boulders	100%	100%	100%	100%		

Feature	Performance Percentage - North Branch (Reach 5) (616 ft)					
	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
Riffles	100%	100%	100%	100%		
Pools	100%	97%	95%	95%		
Thalweg	100%	100%	100%	100%		
Meanders	100%	100%	100%	100%		
Bed General	100%	100%	100%	100%		
Vanes / J Hooks etc.	100%	100%	100%	100%		
Wads and Boulders	100%	100%	100%	100%		



Performance Percentage - Middle Branch (302 ft)						
Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
Riffles	100%	100%	100%	100%		
Pools	100%	100%	100%	100%		
Thalweg	100%	100%	100%	100%		
Meanders	100%	100%	100%	100%		
Bed General	100%	100%	100%	100%		
Vanes / J Hooks etc.	100%	100%	100%	100%		
Wads and Boulders	100%	100%	100%	100%		
Performance Percentage - South Branch (320 ft)						
Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
Riffles	100%	100%	100%	97%		
Pools	100%	100%	100%	100%		
Thalweg	100%	100%	100%	100%		
Meanders	100%	100%	100%	100%		
Bed General	100%	100%	100%	99%		
Vanes / J Hooks etc.	100%	97%	100%	100%		
Wads and Boulders	100%	100%	100%	100%		

## 2.3 Wetland Assessment

Evaluation of the success of restored wetland areas consists of monitoring groundwater hydrology and vegetation survival. Continuously-recording groundwater monitoring gauges were installed in accordance with specifications in *Installing Monitoring Wells/Piezometers in Wetlands* (NCWRP 1993). Monitoring gauges were set to a depth of approximately 24 inches below the soil surface. Screened portions of each gauge were surrounded by filter fabric, buried in screened well sand, and sealed with a bentonite cap to prevent siltation and surface flow infiltration. Four groundwater gauges were installed in wetland restoration areas to provide representative coverage of the Site. Hydrological sampling was performed in restoration areas during the growing season at intervals necessary to satisfy the hydrology success criteria within each physiographic landscape area (USEPA 1990).

Groundwater hydrology success criteria for the five-year monitoring period will include a minimum regulatory criterion, comprising saturation (free water) within one foot of the soil surface for 5 percent of the growing season or nine (9) consecutive days. The growing season in Haywood County has a duration of 175 days, beginning on April 22<sup>nd</sup> and ending on October 14<sup>th</sup>.

### 2.3.1 Hydrology

Three of the gauges installed met wetland hydrology criteria during the 2011 growing season (Table III). Gauge GW1 had groundwater present within twelve (12) inches of the surface throughout the entire growing season. Gauge GW2 had groundwater present within 12 inches for a total of 96 days with a peak of 60 consecutive days. Gauge GW3 had groundwater present

within 12 inches for a total of 25 days with a peak of 9 consecutive days. Plots of the gauge data can be found in Appendix C. Gauge GW4, which was installed in Spring 2011, did not provide any data during this monitoring season due to gauge malfunction.

**Exhibit Table X. Wetland Criteria Attainment**

Tract	Well ID	Well Hydrology Threshold Met?	Consecutive Days of Hydrology Met	% of Growing Season Met	Tract Mean	Vegetation Plot ID	Veg Survival Threshold Met?	Tract Mean
1	GW1	Yes	146	83	41%	-	-	100%
	GW2	Yes	60	34		4	Yes	
	GW3	Yes	9	5		2	Yes	

### 2.3.2 Vegetation

Vegetation plots 2 and 4 are located in wetland enhancement/restoration areas in order to represent wetland vegetation survival rates. Each of these plots was well-above the minimum 320 stems per acre required to be surviving after three years of monitoring with 647 and 445 planted stems per plot, respectively. In addition, herbaceous vegetation establishing within these areas included soft rush (*Juncus effusus*), tearthumb (*Persicaria sagittata*), hollow joe-pye-weed (*Eutrochium fistulosum*), and ironweed (*Vernonia noveboracensis*), all of which are FACW, OBL, or FAC+.

## 2.4 Conclusions

The vegetation appears to be surviving at an acceptable rate and is expected to meet success criteria in Monitoring Year 4. Continued visual observation is planned; however, no action is recommended at this time.

The wetland areas appear to have had stable hydrology during Monitoring Year 3 due to the end of the drought conditions during the previous year. Issues with gauge GW4 will be resolved prior to the Year 4 growing season.

Continued visual monitoring is planned for stream areas that have been identified as “Areas of Concern”. Repair work is not warranted at this time on any of the areas. This is based on the judgment that these issues have not risen to the level of posing a threat to channel or structure stability and are not resulting in excessive erosion. It is recommended that natural stream processes and natural re-vegetation be allowed the opportunity to mend these areas and then re-assess their condition in the next monitoring cycle.

### 3.0 REFERENCES

- Lee, Michael T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation, Version 4.0. (online). Available: <http://cvs.bio.unc.edu/methods.htm>
- Weakley, Alan S. 2008. Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas (working draft) (online). Available: [http://www.herbarium.unc.edu/WeakleyFlora\\_2008-Apr.pdf](http://www.herbarium.unc.edu/WeakleyFlora_2008-Apr.pdf). University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, North Carolina.



**APPENDIX A**  
**MONITORING PLANS**



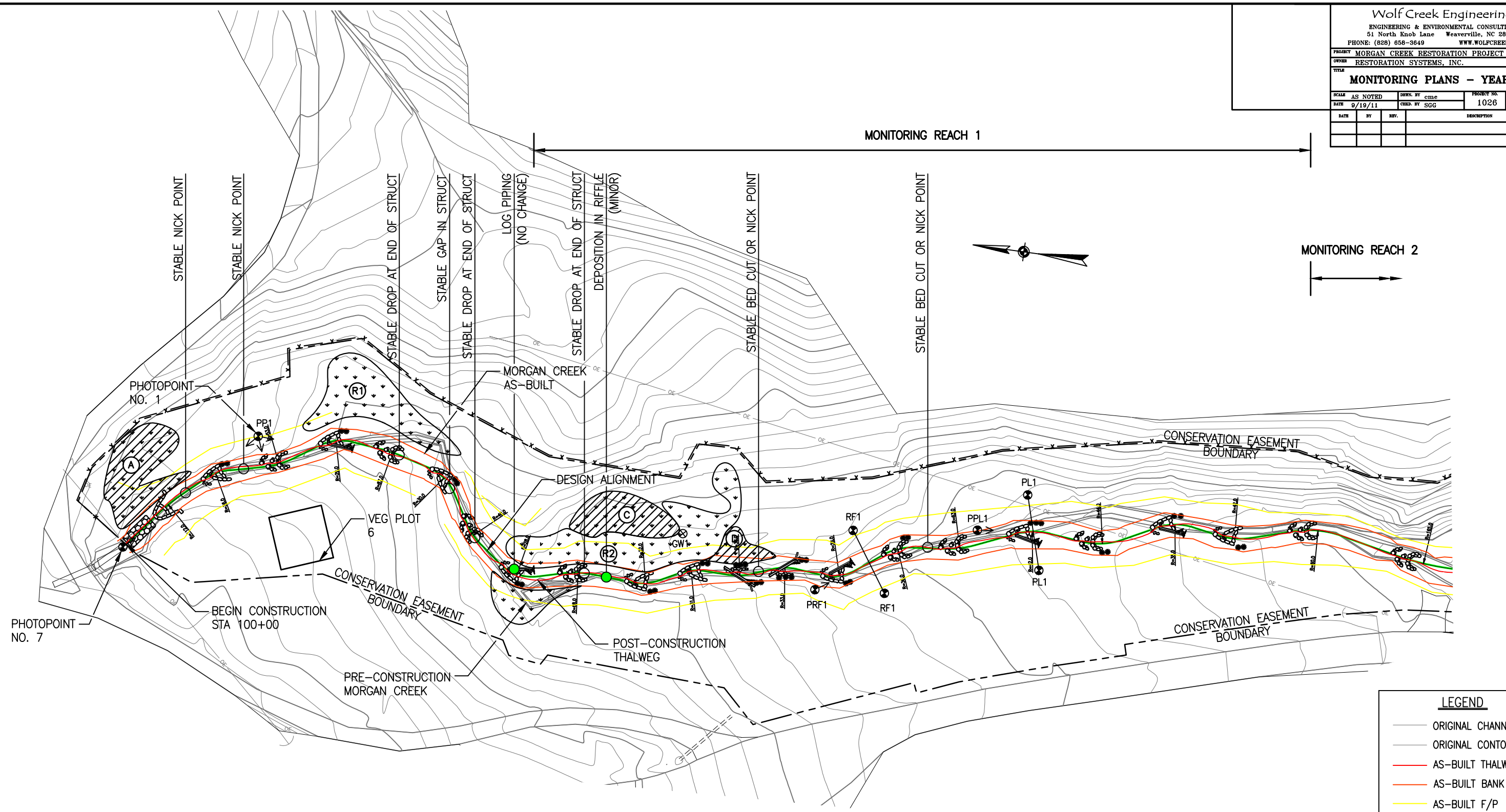
Wolf Creek Engineering  
 ENGINEERING & ENVIRONMENTAL CONSULTING  
 51 North Knob Lane Weaverville, NC 28787  
 PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PROJECT MORGAN CREEK RESTORATION PROJECT  
 OWNER RESTORATION SYSTEMS, INC.  
 TITLE **MONITORING PLANS - YEAR 3**

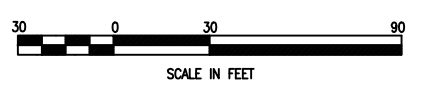
SCALE AS NOTED	DEVL. BY cime	PROJECT NO. 1026	SHEET NUMBER MP-1
DATE 9/19/11	CHEK. BY SGG		
DATE	BY	REV.	DESCRIPTION

MONITORING REACH 1

MONITORING REACH 2



POINT NO.	POINT DESCRIPTION	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
PP1	PHOTOPOINT NO. 1	729156.17	826117.25	2605.55
PRF 1	PHOTOPOINT RIFFLE	728807.03	826071.48	2583.49
RF1 LT	RIFFLE X.S.	728789.03	826110.51	2584.66
RF1 RT	RIFFLE X.S.	728764.74	826075.17	2581.69
PPL 1	PHOTOPOINT POOL	728713.94	826121.16	2578.04
PL1 LT	POOL X.S.	728686.50	826146.71	2578.57
PL1 RT	POOL X.S.	728673.40	826102.02	2578.35
PP7	PHOTOPOINT NO. 7	729228.60	826039.00	2587.80
GW1	GROUNDWATER GAUGE 1	728891.56	826094.25	2587.80

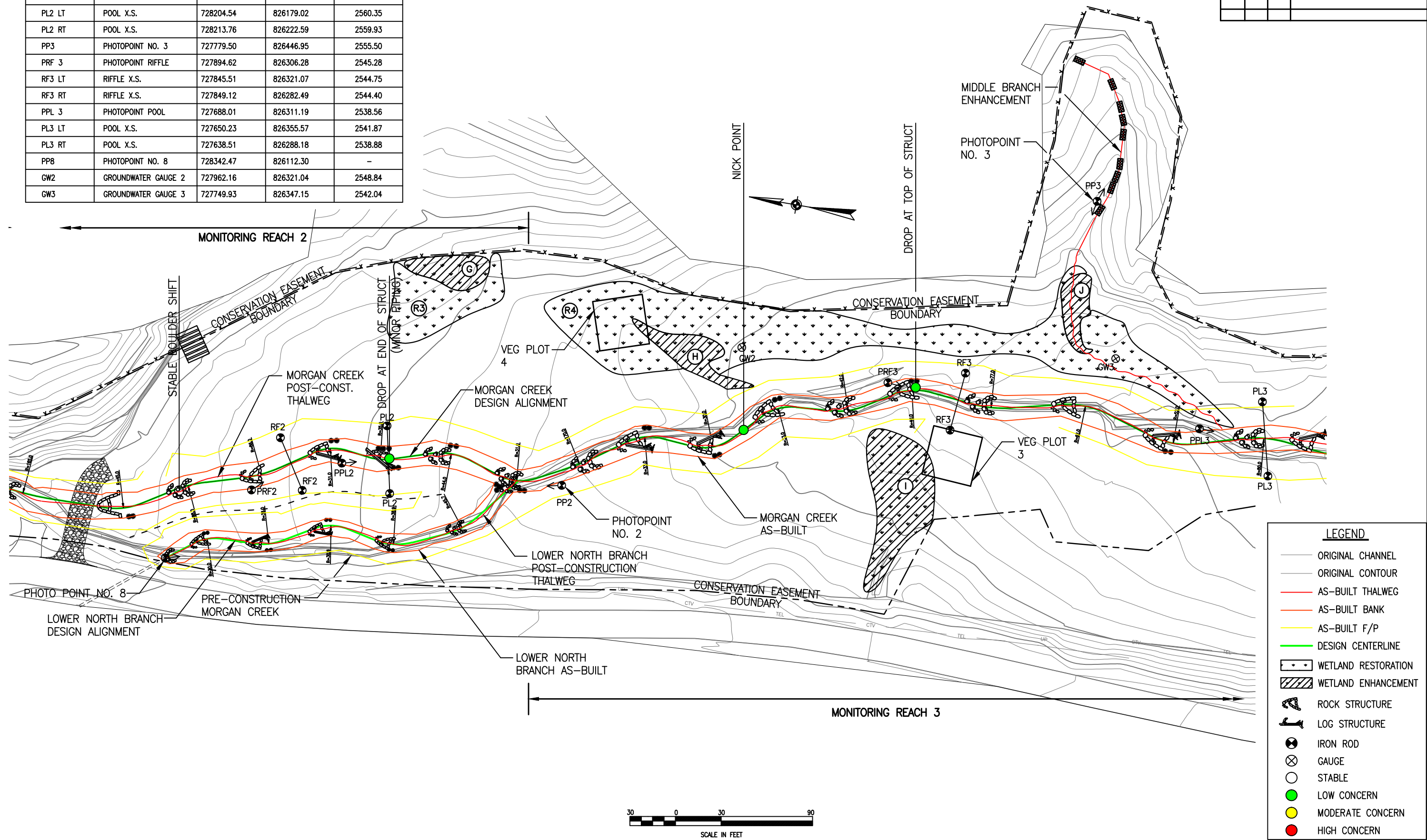


**LEGEND**

- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS-BUILT THALWEG
- AS-BUILT BANK
- AS-BUILT F/P
- DESIGN CENTERLINE
- WETLAND RESTORATION
- ▨ WETLAND ENHANCEMENT
- ⊠ ROCK STRUCTURE
- ⊠ LOG STRUCTURE
- ⊗ IRON ROD
- ⊗ GAUGE
- STABLE
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

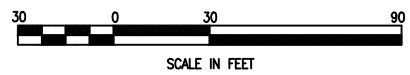
DATE	BY	REV.	DESCRIPTION

POINT NO.	POINT DESCRIPTION	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
PP2	PHOTOPOINT NO. 2	728094.17	826203.48	2554.37
PRF 2	PHOTOPOINT RIFFLE	728294.27	826165.96	2563.21
RF2 LT	RIFFLE X.S.	728281.42	826202.97	2562.65
RF2 RT	RIFFLE X.S.	728261.46	826171.32	2562.41
PPL 2	PHOTOPOINT POOL	728238.80	826193.37	2560.66
PL2 LT	POOL X.S.	728204.54	826179.02	2560.35
PL2 RT	POOL X.S.	728213.76	826222.59	2559.93
PP3	PHOTOPOINT NO. 3	727779.50	826446.95	2555.50
PRF 3	PHOTOPOINT RIFFLE	727894.62	826306.28	2545.28
RF3 LT	RIFFLE X.S.	727845.51	826321.07	2544.75
RF3 RT	RIFFLE X.S.	727849.12	826282.49	2544.40
PPL 3	PHOTOPOINT POOL	727688.01	826311.19	2538.56
PL3 LT	POOL X.S.	727650.23	826355.57	2541.87
PL3 RT	POOL X.S.	727638.51	826288.18	2538.88
PP8	PHOTOPOINT NO. 8	728342.47	826112.30	-
GW2	GROUNDWATER GAUGE 2	727962.16	826321.04	2548.84
GW3	GROUNDWATER GAUGE 3	727749.93	826347.15	2542.04



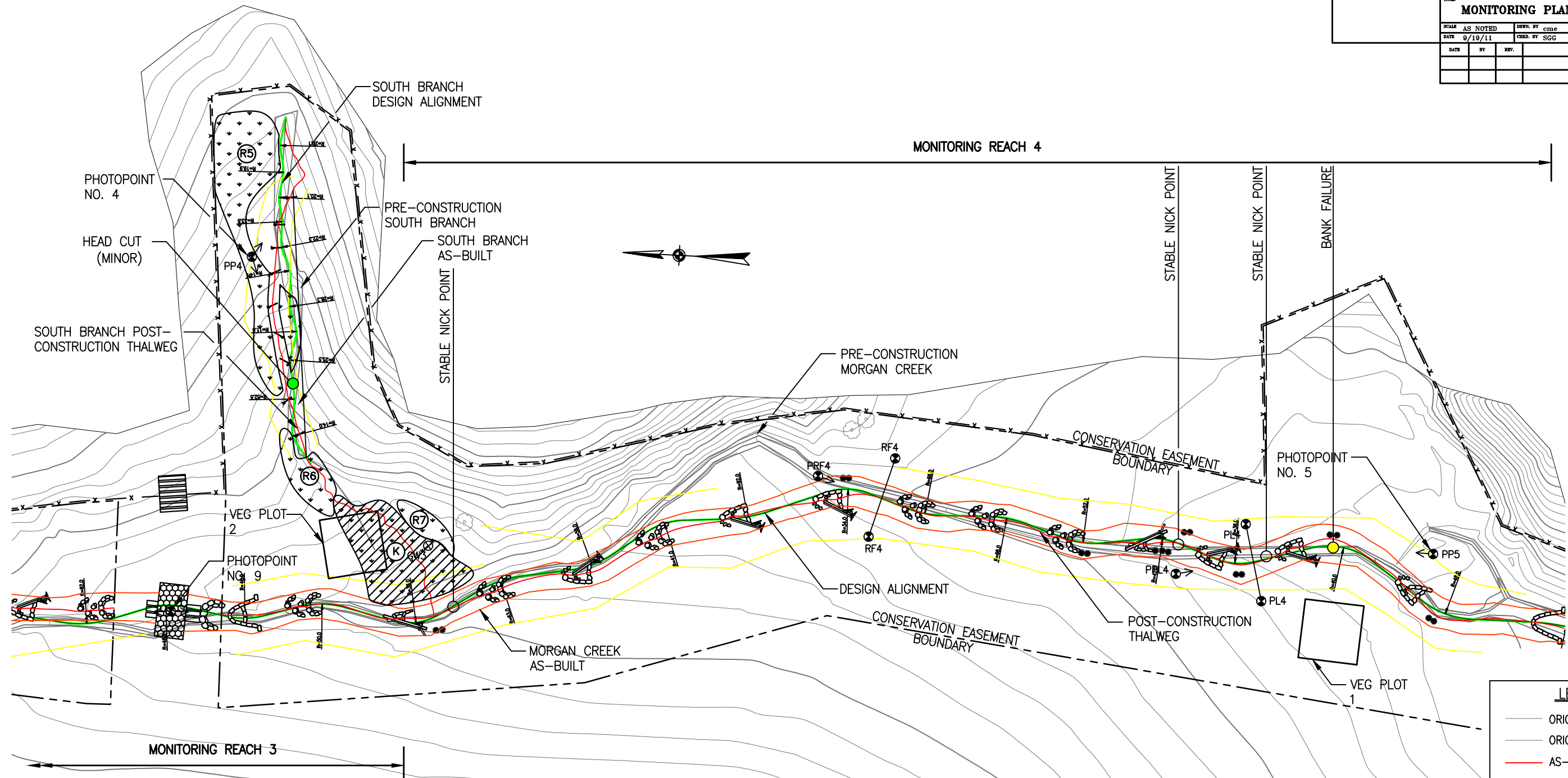
**LEGEND**

- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS-BUILT THALWEG
- AS-BUILT BANK
- AS-BUILT F/P
- DESIGN CENTERLINE
- WETLAND RESTORATION
- ▨ WETLAND ENHANCEMENT
- ⊠ ROCK STRUCTURE
- ⊠ LOG STRUCTURE
- ⊗ IRON ROD
- ⊗ GAUGE
- STABLE
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN



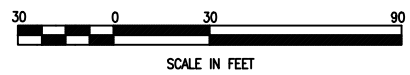


PROJECT	MORGAN CREEK RESTORATION PROJECT		
OWNER	RESTORATION SYSTEMS, INC.		
TITLE	MONITORING PLANS - YEAR 3		
SCALE	AS NOTED	DEVL. BY	OTM
DATE	9/19/11	CHEK. BY	SGG
PROJECT NO.	1026	SHEET NUMBER	MP-3
DATE	BY	REV.	DESCRIPTION

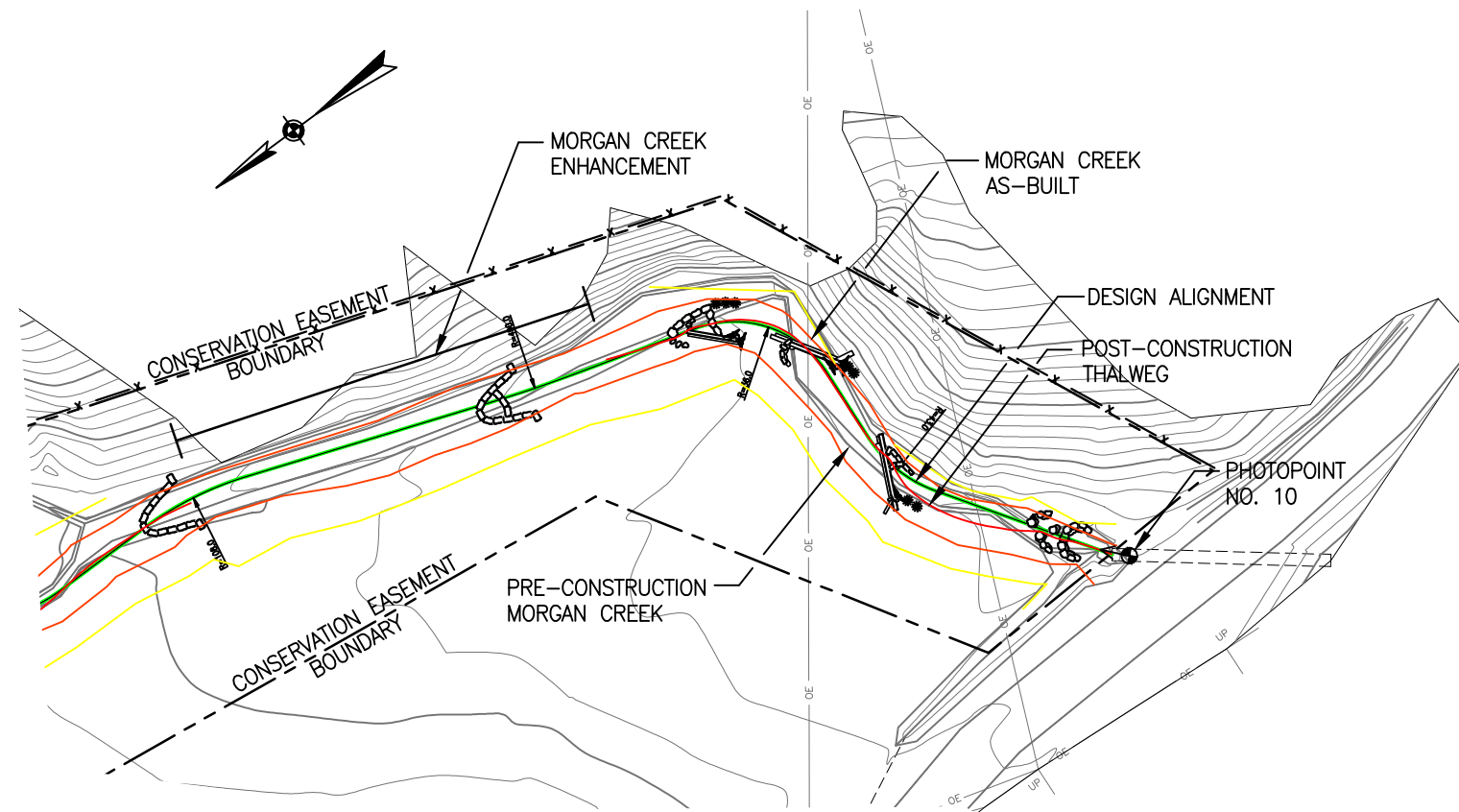


POINT NO.	POINT DESCRIPTION	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
PP4	PHOTOPOINT NO. 4	727502.10	826516.81	2552.50
PRF 4	PHOTOPOINT RIFFLE	727181.40	826411.45	2522.36
RF4 LT	RIFFLE X.S.	727138.95	826423.48	2522.86
RF4 RT	RIFFLE X.S.	727151.52	826379.28	2522.90
PPL 4	PHOTOPOINT POOL	-	-	-
PL4 LT	POOL X.S.	726942.40	826397.15	2515.67
PL4 RT	POOL X.S.	726931.51	826354.84	2515.99
PP5	PHOTOPOINT NO. 5	726837.41	826385.98	2514.40
PP9	PHOTOPOINT NO. 9	727536.86	826317.72	-

LEGEND	
	ORIGINAL CHANNEL
	ORIGINAL CONTOUR
	AS-BUILT THALWEG
	AS-BUILT BANK
	AS-BUILT F/P
	DESIGN CENTERLINE
	WETLAND RESTORATION
	WETLAND ENHANCEMENT
	ROCK STRUCTURE
	LOG STRUCTURE
	IRON ROD
	GAUGE
	STABLE
	LOW CONCERN
	MODERATE CONCERN
	HIGH CONCERN



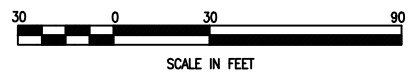
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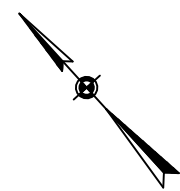
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- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS-BUILT THALWEG
- AS-BUILT BANK
- AS-BUILT F/P
- DESIGN CENTERLINE
- ◻ ◻ ◻ WETLAND RESTORATION
- ▨▨▨ WETLAND ENHANCEMENT
- ⊠ ROCK STRUCTURE
- ⊠ LOG STRUCTURE
- ⊗ IRON ROD
- ⊗ GAUGE
- STABLE
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

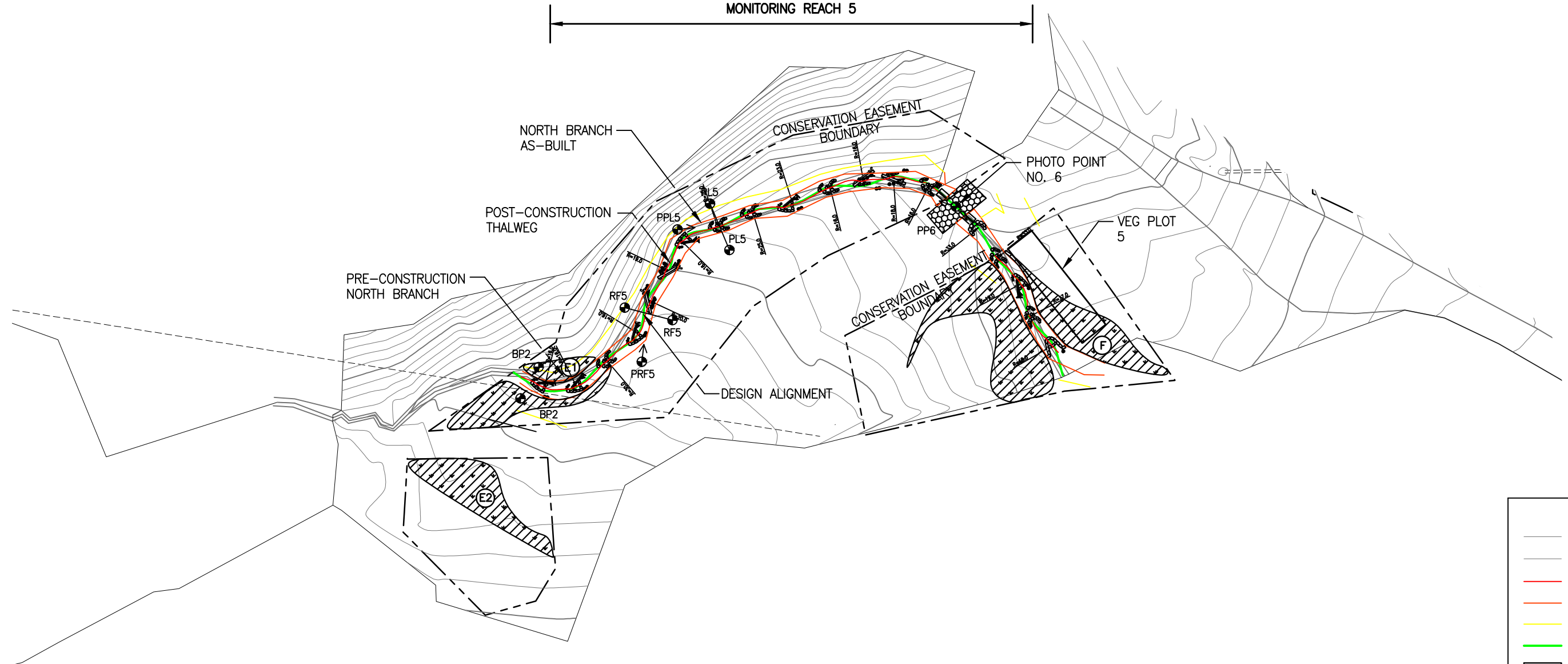
PP10	PHOTOPOINT NO. 10	726527.45	826153.34	-
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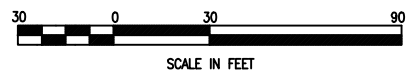
PROJECT	MORGAN CREEK RESTORATION PROJECT		
OWNER	RESTORATION SYSTEMS, INC.		
TITLE	<b>MONITORING PLANS - YEAR 3</b>		
SCALE	AS NOTED	DEVL. BY	cmc
DATE	9/19/11	CHEK. BY	SGG
PROJECT NO.	1026	SHEET NUMBER	MP-5
DATE	BY	REV.	DESCRIPTION



MONITORING REACH 5



POINT NO.	POINT DESCRIPTION	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
BP2 LT	BEGIN PROFILE	729047.60	825608.04	2616.10
BP2 RT	BEGIN PROFILE	729041.62	825589.22	2617.00
PRF 5	PHOTOPOINT RIFFLE	729011.82	825651.74	2614.40
RF5 LT	RIFFLE X.S.	729039.97	825664.74	2612.59
RF5 RT	RIFFLE X.S.	729017.39	825679.44	2613.46
PPL 5	PHOTOPOINT POOL	729052.16	825714.81	2609.26
PL5 LT	POOL X.S.	729050.69	825737.44	2609.77
PL5 RT	POOL X.S.	729024.76	825728.27	2610.39
PP6	PHOTOPOINT NO. 6	728956.37	825836.00	-



LEGEND	
	ORIGINAL CHANNEL
	ORIGINAL CONTOUR
	AS-BUILT THALWEG
	AS-BUILT BANK
	AS-BUILT F/P
	DESIGN CENTERLINE
	WETLAND RESTORATION
	WETLAND ENHANCEMENT
	ROCK STRUCTURE
	LOG STRUCTURE
	IRON ROD
	GAUGE
	STABLE
	LOW CONCERN
	MODERATE CONCERN
	HIGH CONCERN



**APPENDIX B**  
**VEGETATION RAW DATA**



Vegetation Plot No. 1



Year 2

Photo No. 1



Year 3

Photo No. 2

Vegetation Plot No. 2



Year 2

Photo No. 3



Year 3

Photo No. 4



Vegetation Plot No. 3



Year 2

Photo No. 5



Year 3

Photo No. 6

Vegetation Plot No. 4



Year 2

Photo No. 7



Year 3

Photo No. 8

Vegetation Plot No. 5



Year 2

Photo No. 9



Year 3

Photo No. 10

Vegetation Plot No. 6



Year 2

Photo No. 11



Year 3

Photo No. 12

**Plot (continued): Morgan-AXE-0001**

ID	Species	map char	source	X (m)	Y (m)	Jul 2010 Data			THIS YEAR'S DATA				
						ddh (mm)	Height (cm)	DBH (cm)	ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*

**Plot Morgan-AXE-0001**

Please fill in any missing data and fix incorrect data.

Vegetation Monitoring Data (VMD) Datasheet

VMD Year (1-5):  Date:  -  Party:  Role:  Notes on plot:

Taxonomic Standard:  Taxonomic Standard DATE:

Latitude or UTM-N:  Datum:  Longitude or UTM-E:  UTM Zone:  Coordinate Accuracy (m):  X-Axis bearing (deg):

Plot Dimensions: X:  Y:   Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X)

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Jul 2010 Data			THIS YEAR'S DATA				
						ddh 1 mm	Height 1cm*	DBH 1 cm	ddh 1mm	Height 1cm*	DBH 1 cm	Re-sprout	Vigor*

2492	Cornus amomum	(b)	R	1.8	3.3	6	80.0		11	140	.3	<input type="checkbox"/>	4		
2493	Liriodendron tulipifera	(c)	R	3.0	4.0	9	90.0		10	110		<input type="checkbox"/>	4		
2496	Cornus amomum	(f)	R	5.1	0.0	7	70.0		12	140	.2	<input type="checkbox"/>	4		
2497	Betula nigra	(g)	R	6.1	3.2	13	170.0	0.4	20	210	1.1	<input type="checkbox"/>	4		
2498	Amelanchier laevis	(l)	R	9.1	5.0	9	140.0	0.2				<input type="checkbox"/>	M		
2499	Cornus amomum	(n)	R	9.4	0.8	14	150.0	0.3	22	170	.7	<input type="checkbox"/>	4		
2500	Acer saccharum	(c)	R	10.0	3.0	Missing						<input type="checkbox"/>	M		
2501	Acer saccharum	(k)	R	8.7	0.6	Missing						<input type="checkbox"/>	M		
resprout															
2502	Salix purpurea	(j)	R	7.8	4.9	16	180.0	0.3	31	260	1.2	<input type="checkbox"/>	4		
2503	Hamamelis virginiana	(o)	R	9.7	8.4	10	110.0	DBH?	10	130		<input type="checkbox"/>	4		
hornets nest															
2504	Cornus amomum	(m)	R	9.0	9.9	6	90.0		10	140	.3	<input type="checkbox"/>	4		
resprout															
2505	Quercus rubra	(i)	R	7.2	7.6	6	60.0		10	130		<input type="checkbox"/>	4		
2506	Amelanchier laevis	(h)	R	6.6	6.4	11	120.0	DBH?	14	160	.3	<input type="checkbox"/>	4		
2507	<del>Carpinus caroliniana</del> <i>Betula N.</i>	(d)	R	2.6	5.6	4	30.0		4	60		<input type="checkbox"/>	4		
no identifiable features, went with previous id															
2509	Quercus rubra	(a)	R	0.7	6.7	7	90.0		8	90		<input type="checkbox"/>	3		

# stems: 15 New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

Species Name	Source*	X (m)	Y (m)	ddh 1 mm	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes

\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubing, R=bare Root, M=Mechanically, U=Unknown  
 \*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing  
 \*DAMAGE: REMOval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown ANIMAL, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRICane, DISeased, VINE Strangulation, UNKNown, specify other.  
 \*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Plot (continued): **Morgan-AXE-0001**

Jul 2010 Data

THIS YEAR'S DATA

ID	Species	map	source	X	Y	ddh	Height	DBH	ddh	Height	DBH	Re-	Vigor*	Damage*	Notes
		char		(m)	(m)	(mm)	(cm)	(cm)	(mm)	(cm)	(cm)	sprout			

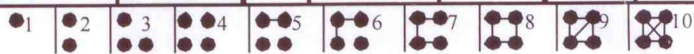
**Natural Woody Stems - tallied by species**

Explanation of cut-off & subsampling\*\*:

Height Cut-Off (All stems shorter than this are ignored. If >10cm, explain why to the right.):  10cm  50cm  100cm  137cm

Species Name	<input checked="" type="checkbox"/> Sub-Seed	SEEDLINGS — HEIGHT CLASSES			SAPLINGS — DBH			TREES — DBH		
		10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Sub-Sapl	0-1 cm	1-2.5	2.5-	5-	=10 (write DBH)
Platanus										

\*\*Required if cut-off >10cm or subsample ? 100%.



Form WS2, ver 9.1

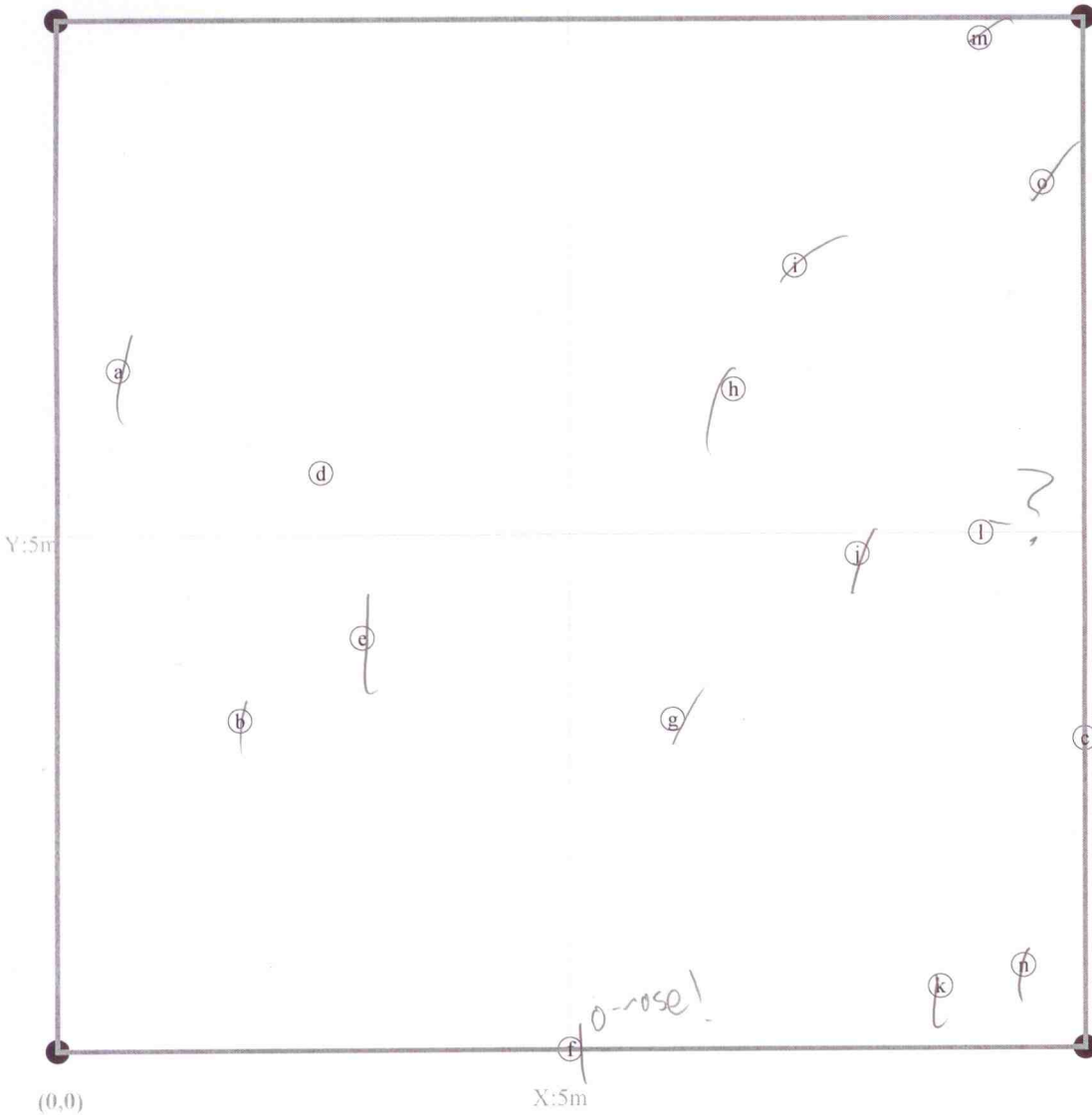
\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown p. 2  
 \*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing.  
 \*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown ANIMAL, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRICane, DISeased, VINE Strangulation, UNKNOwn, specify other.  
 \*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.  
 Printed in the CVS-EEP Entry To

Map of stems on plot Morgan-AXE-0001

X-axis: 94°



# stems: 15  
map size:  
Medium



\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown

p. 3

\*VIGOR: 4=excellent, 3=good, 2=fair,  
1=unlikely to survive year, 0=dead,  
M=missing.

\*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown  
ANIMAL, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRIcane, DISeased, VINE  
Strangulation, UNKNown, specify other.

\*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Printed in the CVS-EEP Entry Tool ver. 2.7

**Plot Morgan-AXE-0002**

Please fill in any missing data and fix incorrect data.

Vegetation Monitoring Data (VMD) Datasheet

VMD Year (1-5):  Date: 8/3/11 - / /

Taxonomic Standard: Wright et al

Taxonomic Standard DATE: 2006

Latitude or UTM-N: 35.68458 Datum: NAD83/WGS84

Longitude or UTM-E: -82.95334 UTM Zone:

Coordinate Accuracy (m):  X-Axis bearing (deg):

Plot Dimensions: X:  Y:   Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X)

Party: Thomas Perkins Role: PL A

Notes on plot: Plot 11

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Jul 2010 Data			THIS YEAR'S DATA						
						ddh 1 mm	Height 1 cm*	DBH 1 cm	ddh 1mm	Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
2520	Platanus occidentalis	(b)	R	0.9	2.2	6	70.0		<u>18</u>	<u>110</u>		<input type="checkbox"/>	<u>4</u>		
2521	Hydrangea arborescens	(g)	R	3.0	3.6	5	90.0					<input type="checkbox"/>	<u>0</u>		
2522	Cornus amomum	(j)	R	4.9	2.3	12	160.0	0.4	<u>20</u>	<u>130</u>	<u>.5</u>	<input type="checkbox"/>	<u>4</u>		
2523	Lindera benzoin	(n)	R	7.1	3.5	6	50.0		<u>6</u>	<u>60</u>		<input type="checkbox"/>	<u>3</u>		
2524	Quercus rubra	(p)	R	8.8	1.9	9	70.0		<u>12</u>	<u>90</u>		<input type="checkbox"/>	<u>4</u>		
2525	Viburnum opulus	(q)	R	9.7	0.5	3	30.0					<input type="checkbox"/>	<u>M</u>		
resprout															
2526	Hydrangea arborescens	(r)	R	9.8	3.1	2	30.0					<input type="checkbox"/>	<u>M</u>		
2527	Betula nigra	(o)	R	7.7	8.8	14	130.0	DBH?	<u>20</u>	<u>200</u>	<u>.5</u>	<input type="checkbox"/>	<u>4</u>		
2528	Quercus rubra	(l)	R	6.3	9.1	4	40.0		<u>5</u>	<u>60</u>		<input type="checkbox"/>	<u>3</u>	<u>1 cm</u>	
2529	Amelanchier laevis	(m)	R	6.8	6.7	10	150.0	0.3	<u>12</u>	<u>180</u>	<u>.5</u>	<input type="checkbox"/>	<u>4</u>		
2530	Hamamelis virginiana	(k)	R	5.0	6.7	7	70.0		<del>12</del>	<u>190</u>	<u>.5</u>	<input type="checkbox"/>	<u>4</u>		
2531	Hamamelis virginiana	(i)	R	3.7	9.4	10	80.0		<u>11</u>	<u>120</u>		<input type="checkbox"/>	<u>4</u>		
2532	Quercus rubra	(h)	R	3.0	8.7	5	70.0		<u>12</u>	<u>140</u>	<u>.5</u>	<input type="checkbox"/>	<u>4</u>		
2533	Hamamelis virginiana	(d)	R	2.1	6.6	9	80.0		<u>20</u>	<u>110</u>		<input type="checkbox"/>	<u>4</u>		
2534	Quercus rubra	(e)	R	0.9	9.2	10	80.0		<u>13</u>	<u>120</u>		<input type="checkbox"/>	<u>4</u>		
5909	Hydrangea arborescens	(f)	R	3.1	1.2	3	50.0					<input type="checkbox"/>	<u>M</u>		
5910	Platanus occidentalis	(a)	R	0.5	7.0	4	70.0		<u>10</u>	<u>110</u>		<input type="checkbox"/>	<u>3</u>	<u>10's</u>	
5911	<del>Betula nigra</del> <b>ALER S.</b>	(c)	R	2.1	8.1	5	60.0		<u>5</u>	<u>100</u>		<input type="checkbox"/>	<u>4</u>		

# stems: 18 New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

Species Name	Source*	X (m)	Y (m)	ddh 1 mm	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes
<u>Platanus occ</u>	<u>R</u>	<u>5.2</u>	<u>6.9</u>	<u>5</u>	<u>90</u>		<u>4</u>		
<u>Platanus occ</u>	<u>R</u>	<u>6.3</u>	<u>7</u>	<u>5</u>	<u>50</u>		<u>3</u>	<u>resprout</u>	

\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown p. 4  
 \*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing.  
 \*DAMAGE: REMOval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown ANIMAL, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRricane, DISeased, VINE Strangulation, UNKNOwn, specify other.  
 \*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.



ID Species map source X Y ddh Height DBH ddh Height DBH Re- Vigor\* Damage\* Notes  
char (m) (m) (mm) (cm) (cm) (mm) (cm) (cm) sprout

**Natural Woody Stems - tallied by species** Explanation of cut-off & subsampling\*\*:

Height Cut-Off (All stems shorter than this are ignored. If >10cm, explain why to the right.):  10cm  50cm  100cm  137cm

Species Name	☑ c	SEEDLINGS — HEIGHT CLASSES				SAPLINGS — DBH			TREES — DBH		
		Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Sub-Sapl	0-1 cm	1-2.5	2.5-	5-	=10 (write DBH)
<i>Cratogeomys T.</i>			••								
<i>Prunus S.</i>				•							
<i>Acer S.</i>				•							

\*\*Required if cut-off >10cm or subsample ? 100% ●1 ●●2 ●●●3 ●●●●4 ●●●●●5 ●●●●●●6 ●●●●●●●7 ●●●●●●●●8 ●●●●●●●●●9 ●●●●●●●●●●10 Form WS2, ver 9.1

\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown p. 5  
 \*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing  
 \*DAMAGE: REMOval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown ANIMAl, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUGHT, STORM, HURRICane, DISeased, VINE Strangulation, UNKNown, specify other.  
 \*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m. Printed in the CVS-EEP Entry Tool ver. 2.2.7

Map of stems on plot Morgan-AXE-0002

X-axis: 78°



# stems: 18  
map size:  
Medium

Rosebush



\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown p. 6  
 \*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing.  
 \*DAMAGE: REMOval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown ANIMAL, Human TRAMPled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRICane, DISeased, VINE Strangulation, UNKNOwn, specify other.  
 \*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

**Plot Morgan-AXE-0003**

Please fill in any missing data and fix incorrect data.

Vegetation Monitoring Data (VMD) Datasheet

VMD Year (1-5):  Date: 8/3/11 -      /      /     

Taxonomic Standard: weibler

Taxonomic Standard DATE: 2009

Latitude or UTM-N: 35.68568 Datum: NAD83/WGS84

Longitude or UTM-E: -82.95381 UTM Zone:     

Coordinate Accuracy (m):      X-Axis bearing (deg): 94

Plot Dimensions: X: 10 Y: 10  Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X)

Party: Thomas Role: PL

Perkins A

Notes on plot:

Monte 9

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Jul 2010 Data			THIS YEAR'S DATA						
						ddh 1 mm	Height 1cm*	DBH 1 cm	ddh 1mm	Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
2535	Cornus amomum	(c)	R	1.3	1.9	16	180.0	0.5	14	170	.4	<input type="checkbox"/>	3	1mm	
2536	Betula nigra	(h)	R	4.1	2.0	16	200.0	0.7		250	1	<input type="checkbox"/>	4		
2537	Unknown sp.	(i)	R	4.1	3.0	Missing						<input type="checkbox"/>	M		
no buds or identifiable features															
2538	Lindera benzoin	(f)	R	3.6	5.0	6	30.0					<input type="checkbox"/>	0		
2539	Cornus amomum	(b)	R	0.4	2.9	12	160.0	0.4	12	200	.6	<input type="checkbox"/>	4		
2540	Lindera benzoin	(m)	R	7.2	1.0	6	30.0		9	180		<input type="checkbox"/>	24		
2541	Quercus rubra	(q)	R	9.3	0.4	6	80.0		10	80		<input type="checkbox"/>	4		
2542	Amelanchier laevis	(n)	R	8.7	3.7	12	130.0	DBH?	16	170	.4	<input type="checkbox"/>	4		
2543	Hamamelis virginiana	(l)	R	7.1	5.1	4	60.0					<input type="checkbox"/>	0		
2544	Hamamelis virginiana	(r)	R	9.9	7.5	Missing						<input type="checkbox"/>	M		
2545	Lindera benzoin	(p)	R	8.8	9.2	8	90.0					<input type="checkbox"/>	M		
2546	Quercus rubra	(k)	R	6.8	7.8	6	60.0		8	80		<input type="checkbox"/>	3		
2547	Hamamelis virginiana	(j)	R	5.1	9.9	Missing						<input type="checkbox"/>	M		
2548	Quercus rubra	(e)	R	3.4	8.8	3	70.0		4	80		<input type="checkbox"/>	4		
2549	Platanus occidentalis	(a)	R	0.3	8.7	16	100.0		24	160	.5	<input type="checkbox"/>	4		
2550	Unknown sp.	(g)	R	3.8	6.1	Missing						<input type="checkbox"/>	M		
no buds or identifiable features															
5914	Platanus occidentalis	(d)	R	3.4	7.2	4	70.0		7	100		<input type="checkbox"/>	4		
5915	Platanus occidentalis	(o)	R	8.8	6.2	5	80.0		7	110		<input type="checkbox"/>	4		

# stems: 18 New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

Species Name	Source*	X (m)	Y (m)	ddh 1 mm	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes

*large no-recruitment*

\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown  
 \*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing  
 \*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown  
 ANIMAL, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUGHT, STORM, HURRICane, DISeased, VINE Strangulation, UNKNOwn, specify other.  
 \*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

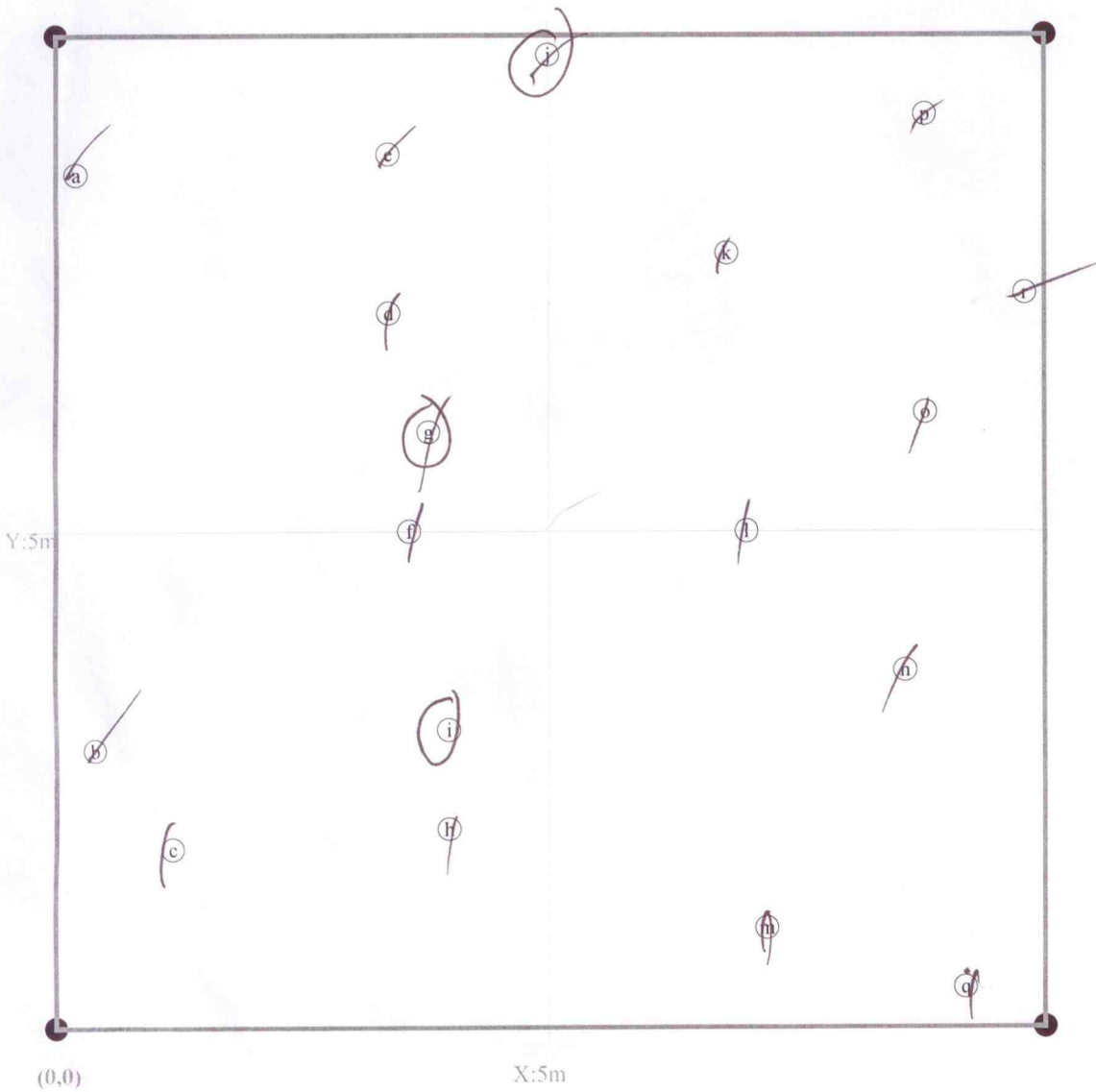


Map of stems on plot Morgan-AXE-0003

X-axis: 94°



# stems: 18  
map size:  
Medium



\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown

\*VIGOR: 4=excellent, 3=good, 2=fair,  
1=unlikely to survive year, 0=dead,  
M=missing.

\*DAMAGE: REMOval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown  
ANIMAl, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRICane, DISeased, VINE  
Strangulation, UNKNOwn, specify other.

\*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

**Plot Morgan-AXE-0004**

Please fill in any missing data and fix incorrect data.

Vegetation Monitoring Data (VMD) Datasheet

VMD Year (1-5):  Date:  -  /  /

Taxonomic Standard:  Party:  Role:   
 Taxonomic Standard DATE:

Latitude or UTM-N:  Datum:  (dec.deg. or m)  
 Longitude or UTM-E:  UTM Zone:

Coordinate Accuracy (m):  X-Axis bearing (deg):

Plot Dimensions: X:  Y:   Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X)

Notes on plot:

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Jul 2010 Data			THIS YEAR'S DATA						
						ddh 1 mm	Height 1 cm*	DBH 1 cm	ddh 1mm	Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
2551	Platanus occidentalis	(a)	R	1.4	0.3	15	150.0	0.4		250	1.6	<input type="checkbox"/>	4		
2552	Betula nigra	(c)	R	2.0	2.2	18	190.0	0.5		290	1.5	<input type="checkbox"/>	4		
2553	Amelanchier laevis	(f)	R	4.9	3.7	11	150.0	0.2	14	180	1	<input type="checkbox"/>	4		
2554	Liriodendron tulipifera	(h)	R	6.2	1.0	11	100.0		12	120		<input type="checkbox"/>	2	WET	
2555	Aronia arbutifolia	(i)	R	9.5	2.5	6	90.0		5	130		<input type="checkbox"/>	3	WET	
2556	Liriodendron tulipifera	(j)	R	7.3	5.1	8	70.0		10	80		<input type="checkbox"/>	3		
2557	Aronia arbutifolia	(g)	R	5.0	6.9	Missing						<input type="checkbox"/>	M		
2558	Hamamelis virginiana	(i)	R	7.0	8.7	9	120.0	DBH?	11	150	.1	<input type="checkbox"/>	3	WET	
2559	Quercus rubra	(e)	R	4.1	8.6	10	100.0		11	120		<input type="checkbox"/>	4		
2560	Aronia arbutifolia	(d)	R	2.4	5.2	5	80.0		5	90		<input type="checkbox"/>	2	WET	
2561	Cornus amomum	(b)	R	1.7	8.2	13	160.0	0.3	20	200	.6	<input type="checkbox"/>	4		
5916	Platanus occidentalis	(k)	R	8.2	1.0	4	60.0		10	110		<input type="checkbox"/>	4		

# stems: 12 New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

Species Name	Source*	X (m)	Y (m)	ddh 1 mm	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes

\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown p. 10  
 \*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing  
 \*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown ANIMAL, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUGHT, STORM, HURRICane, DISeased, VINE Strangulation, UNKNown, specify other.  
 \*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.  
 Printed in the CVS-EEP Entry Tool ver. 2.2.7

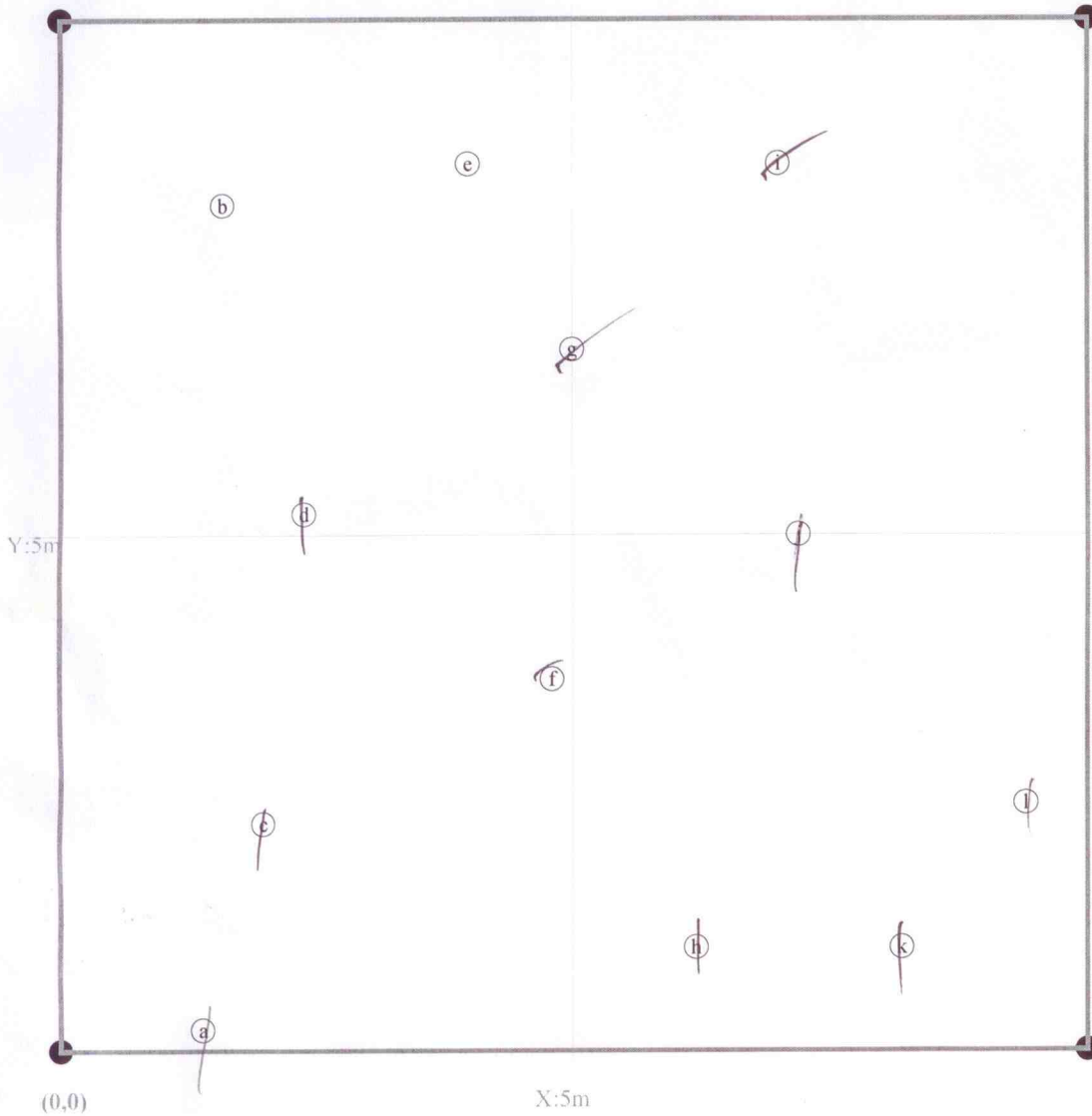


Map of stems on plot Morgan-AXE-0004

→ X-axis: 72°



# stems: 12  
map size:  
Medium



\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown

p. 12

\*VIGOR: 4=excellent, 3=good, 2=fair,  
1=unlikely to survive year, 0=dead,  
M=missing.

\*DAMAGE: REMOval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown  
ANIMAl, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUGHT, STORM, HURRICane, DISeased, VINE  
Strangulation, UNKNown, specify other.

\*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Printed in the CVS-EEP Entry Tool ver. 2.2.7



**Plot Morgan-AXE-0005**

Please fill in any missing data and fix incorrect data.

Vegetation Monitoring Data (VMD) Datasheet

VMD Year (1-5):  Date: 8/3/11 -     /     /     Party: Thomas Role: PL  
 Taxonomic Standard: Weakley 2006 Party: Perkinson Role: A Notes on plot: none  
 Taxonomic Standard DATE: 2006  
 Latitude or UTM-N: 35.68836 Datum: NAD83/W  
 (dec.deg. or m)     CSG  
 Longitude or UTM-E: -82.95519 UTM Zone:      
 Coordinate Accuracy (m):     X-Axis bearing (deg):     4  
 Plot Dimensions: X: 20 Y: 5  Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X)

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Jul 2010 Data			THIS YEAR'S DATA						
						ddh 1 mm	Height 1cm*	DBH 1 cm	ddh 1mm	Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
2563	Platanus occidentalis	(h)	R	2.0	3.4	9	100.0		<u>21</u>	<u>220</u>	<u>.8</u>	<input type="checkbox"/>	<u>3</u>	<u>VINE</u>	
2564	Aronia arbutifolia	(i)	R	2.8	1.0	5	60.0		<u>5</u>	<u>70</u>		<input type="checkbox"/>	<u>3</u>	<u>VINE</u>	
2565	Platanus occidentalis	(k)	R	5.9	1.0	14	150.0	0.4	<u>18</u>	<u>220</u>	<u>.6</u>	<input type="checkbox"/>	<u>3</u>	<u>VINE</u>	
2566	Liriodendron tulipifera	(o)	R	9.7	1.1	7	20.0					<input type="checkbox"/>	<u>M</u>		
just a stump															
2567	Cornus amomum	(b)	R	13.6	1.5	9	170.0	0.5	<u>23</u>	<u>230</u>	<u>.4</u>	<input type="checkbox"/>	<u>4</u>	<u>VINE</u>	
2568	Platanus occidentalis	(c)	R	16.6	0.0	18	150.0	0.4	<u>30</u>	<u>240</u>	<u>1.7</u>	<input type="checkbox"/>	<u>3</u>	<u>VINE/TWNS</u>	
2569	Liriodendron tulipifera	D (d)	R	19.3	2.7	4	70.0					<input type="checkbox"/>	<u>M</u>		
2570	Betula nigra	(f)	R	17.8	4.5	15	150.0	0.3	<u>24</u>	<u>210</u>	<u>1.1</u>	<input type="checkbox"/>	<u>4</u>		
2571	Liriodendron tulipifera	G (g)	R	16.4	3.0	5	50.0		<u>7</u>	<u>100</u>		<input type="checkbox"/>	<u>3</u>	<u>VINE Broken/trace</u>	
2572	Platanus occidentalis	(c)	R	15.3	4.7	10	90.0		<u>15</u>	<u>170</u>	<u>.5</u>	<input type="checkbox"/>	<u>3</u>	<u>VINE</u>	
2573	Platanus occidentalis	(a)	R	12.4	3.5	10	130.0	DBH?		<u>260</u>	<u>1.4</u>	<input type="checkbox"/>	<u>3</u>		
2574	Aronia arbutifolia	(n)	R	7.0	3.3	9	120.0	DBH?				<input type="checkbox"/>	<u>M</u>		
2575	Salix purpurea	(l)	R	5.9	4.0	13	230.0	0.5		<u>240</u>	<u>1.2</u>	<input type="checkbox"/>	<u>4</u>		
2576	Liriodendron tulipifera	(m)	R	5.9	5.0		Missing					<input type="checkbox"/>	<u>M</u>		
2577	Aronia arbutifolia	(i)	R	3.5	3.2	5	90.0		<u>6</u>	<u>100</u>		<input type="checkbox"/>	<u>3</u>		

# stems: 15 New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

Species Name	Source*	X (m)	Y (m)	ddh 1 mm	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes
<u>Platanus</u>	<u>R</u>	<u>11.2</u>	<u>3.7</u>						

Very dense herbaceous vegetation, vine throughout

\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown p. 13  
 \*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing  
 \*DAMAGE: REMOVAL, CUT, MOWING, BEAVER, DEER, RODENTS, INSECTS, GAME, LIVESTOCK, Other/Unknown ANIMAL, Human TRAMPLED, Site Too WET, Site Too DRY, FLOOD, DROUGHT, STORM, HURRICANE, DISEASED, VINE Strangulation, UNKNOW, specify other.  
 \*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m. Printed in the CVS-EEP Entry Tool ver. 2.2.7



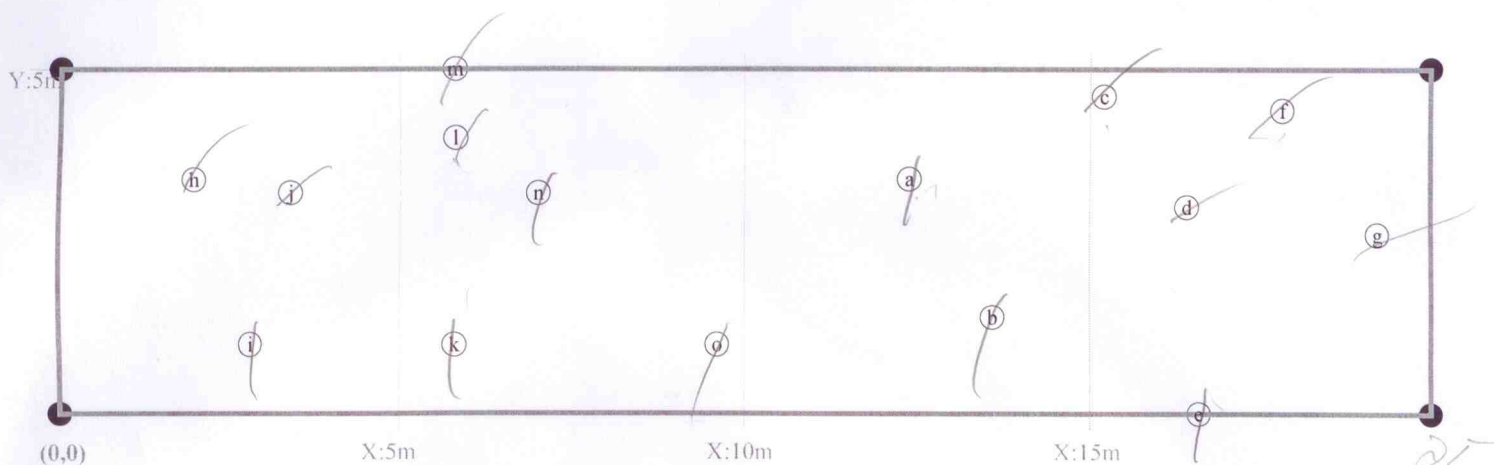
Map of stems on plot Morgan-AXE-0005

→ X-axis: 4°

# stems: 15

map size:

Medium



\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown p. 15  
 \*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing.  
 \*DAMAGE: REMOval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown  
 ANIMAL, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRICane, DISeased, VINE  
 Strangulation, UNKNown, specify other.  
 \*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

**Plot Morgan-AXE-0006**

Please fill in any missing data and fix incorrect data.

Vegetation Monitoring Data (VMD) Datasheet

VMD Year (1-5):  Date: 6/3/11 - 8/3/11 Party: Thomas Role: PL Notes on plot: P-3  
 Taxonomic Standard: Wentley DeKorsan A  
 Taxonomic Standard DATE: 2006  
 Latitude or UTM-N: 35.68910 Datum: NAD83/WGS84  
 Longitude or UTM-E: -82.95452 UTM Zone:    
 Coordinate Accuracy (m):  X-Axis bearing (deg):   
 Plot Dimensions: X:  Y:   Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X)

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Jul 2010 Data			THIS YEAR'S DATA						
						ddh 1 mm	Height 1cm*	DBH 1 cm	ddh 1mm	Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
2510	Quercus rubra	(c)	R	1.7	2.2	3	50.0		4	70		<input type="checkbox"/>	3		
2511	Acer saccharum	(g)	R	4.1	3.9	5	50.0		3	60		<input checked="" type="checkbox"/>	3		
2512	Liriodendron tulipifera	(f)	R	3.9	0.8	10	90.0		13	130		<input type="checkbox"/>	4		
2514	Viburnum opulus	(k)	R	8.4	0.5	4	60.0		6	70		<input type="checkbox"/>	4		
resprout															
2515	Viburnum opulus	(j)	R	6.6	5.0	8	110.0	DBH?	11	110		<input type="checkbox"/>	4		
2516	Liriodendron tulipifera	(i)	R	6.0	7.3	10	90.0		12	100		<input type="checkbox"/>	4		
2517	Betula nigra	(h)	R	5.3	9.9	6	80.0		10	100		<input type="checkbox"/>	4		
2518	Betula nigra	(d)	R	2.1	9.3	19	170.0	0.5	30	250	1	<input type="checkbox"/>	4		
2519	Amelanchier laevis	(a)	R	0.5	5.8	10	120.0	DBH?	15	140	.5	<input type="checkbox"/>	4		
5918	Platanus occidentalis	(b)	R	0.8	3.3	5	60.0		7	110		<input type="checkbox"/>	4		
5919	Quercus rubra	(e)	R	3.5	6.0	6	40.0		10	110		<input type="checkbox"/>	4		

# stems: 11 New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

Species Name	Source*	X (m)	Y (m)	ddh 1 mm	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes

\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown p. 16  
 \*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing  
 \*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRricane, DISeased, VINE Strangulation, UNKNown, specify other.  
 \*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m. Printed in the CVS-EEP Entry Tool ver. 2.2.7

Plot (continued): **Morgan-AXE-0006**

Jul 2010 Data

THIS YEAR'S DATA

ID	Species	map char	source	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*	Notes
----	---------	----------	--------	-------	-------	----------	-------------	----------	----------	-------------	----------	-----------	--------	---------	-------

**Natural Woody Stems - tallied by species**

Explanation of cut-off & subsampling\*\*:

Height Cut-Off (All stems shorter than this are ignored. If >10cm, explain why to the right.):  10cm  50cm  100cm  137cm

Species Name	Sub-Seed	SEEDLINGS — HEIGHT CLASSES			SAPLINGS — DBH			TREES — DBH		
		10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Sub-Sapl	0-1 cm	1-2.5	2.5-	5-	=10 (write DBH)
ACER R.										

\*\*Required if cut-off >10cm or subsample ? 100%.



Form WS2, ver 9.1

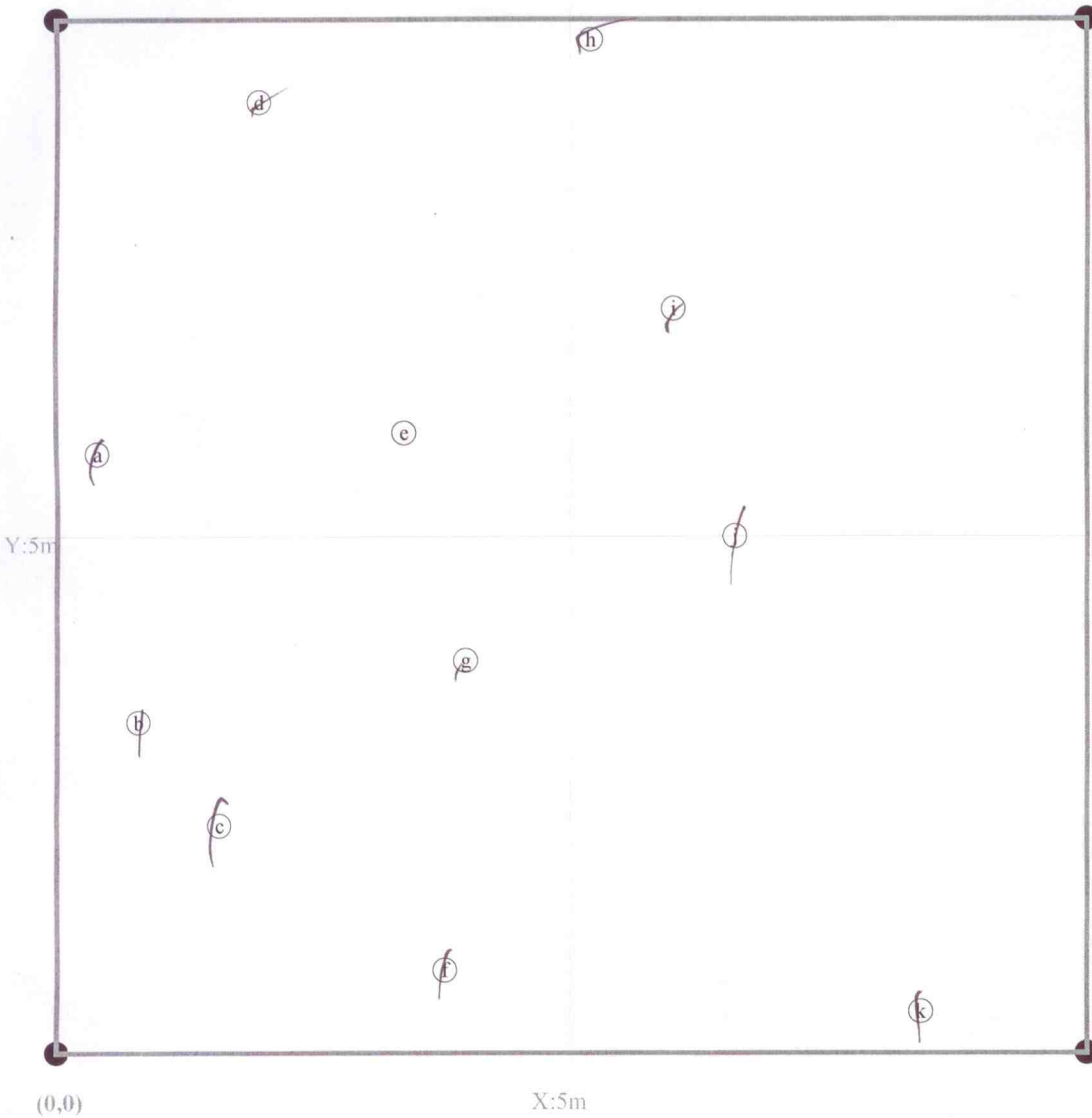
\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown p. 17  
 \*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing.  
 \*DAMAGE: REMOval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRICane, DISeased, VINE Strangulation, UNKNown, specify other.  
 \*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.  
 Printed in the CVS-EEP Entry Tool ver. 2.2.7

Map of stems on plot Morgan-AXE-0006

→ X-axis: 69°



# stems: 11  
map size:  
Medium



\*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown p. 18  
 \*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing. \*DAMAGE: REMOval, CUT, MOWing, BEAVer, DEER, RODents, INSEcts, GAME, LIVESTock, Other/Unknown ANIMAL, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUGHT, STORM, HURRricane, DISeased, VINE Strangulation, UNKNown, specify other.  
 \*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m. Printed in the CVS-EEP Entry Tool ver. 2.2.7

**APPENDIX C**  
**GEOMORPHIC RAW DATA**





**REPRESENTATIVE PROBLEM AREA PHOTOS**





Stable Nick Point, Morgan Cr, Sta 105+50

Year 3

9/14/11

Photo No. 13



Stable Nick Point, Morgan Cr, Sta 124+50

Year 3

9/14/11

Photo No. 14



## **PHOTO POINTS**



Photo Point 1  
Morgan Creek facing upstream



As-Built Photo No. 17 2/3/09



Year 2 Photo No. 19 10/02/10



Year 1 Photo No. 18 10/30/09



Year 3 Photo No. 20 9/14/11

Photo Point 1  
Morgan Creek perpendicular to stream



As-Built

Photo No. 21

2/3/09



Year 2

Photo No. 23

10/02/10



Year 1

Photo No. 22

10/30/09



Year 3

Photo No. 24

9/14/11



Photo Point 1  
Morgan Creek facing downstream



As-Built

Photo No. 25

2/3/09



Year 2

Photo No. 27

10/02/10



Year 1

Photo No. 26

10/30/09



Year 3

Photo No. 28

9/14/11

Photo Point 2  
Morgan Cr. / Lower North Br. confluence facing upstream



As-Built

Photo No. 29

2/3/09



Year 2

Photo No. 31

10/02/10



Year 1

Photo No. 30

10/30/09



Year 3

Photo No. 32

9/14/11

Photo Point 3  
Middle Branch facing upstream



As-Built

Photo No. 33

2/3/09



Year 2

Photo No. 35

10/02/10



Year 1

Photo No. 34

10/30/09



Year 3

Photo No. 36

9/14/11

Photo Point 3  
Middle Branch facing downstream



As-Built

Photo No. 37

2/3/09



Year 2

Photo No. 39

10/02/10



Year 1

Photo No. 38

10/30/09



Year 3

Photo No. 40

9/14/11

Photo Point 4  
South Branch facing upstream



As-Built

Photo No. 41

2/3/09



Year 2

Photo No. 43

10/02/10



Year 1

Photo No. 42

10/30/09



Year 3

Photo No. 44

9/14/11

Photo Point 4  
South Branch facing downstream



As-Built

Photo No. 45

2/3/09



Year 2

Photo No. 47

10/02/10



Year 1

Photo No. 46

10/30/09



Year 3

Photo No. 48

9/14/11

Photo Point 5  
Morgan Creek facing upstream



As-Built

Photo No. 49

2/3/09



Year 2

Photo No. 51

10/02/10



Year 1

Photo No. 50

10/30/09



Year 3

Photo No. 52

9/14/11

Photo Point 6  
North Branch from piped crossing, facing upstream



As-Built

Photo No. 53

2/3/09



Year 2

Photo No. 55

10/02/10



Year 1

Photo No. 54

10/30/09



Year 3

Photo No. 56

9/14/11



Photo Point 6  
North Branch from piped crossing, facing downstream



As-Built

Photo No. 57

2/3/09



Year 2

Photo No. 59

10/02/10



Year 1

Photo No. 58

10/30/09



Year 3

Photo No. 60

9/14/11

Photo Point 7  
Morgan Creek from U/S pipe outfall, facing downstream



As-Built Photo No. 61 2/3/09



Year 2 Photo No. 63 10/02/10



Year 1 Photo No. 62 10/30/09



Year 3 Photo No. 64 9/14/11

Photo Point 8  
Lower North Branch from pipe outfall, facing downstream



As-Built Photo No. 65 2/3/09



Year 2 Photo No. 67 10/02/10



Year 1 Photo No. 66 10/30/09



Year 3 Photo No. 68 9/14/11

Photo Point 9  
Piped crossing at easement break, facing upstream



As-Built Photo No. 69 2/3/09



Year 2 Photo No. 71 10/02/10



Year 1 Photo No. 70 10/30/09



Year 3 Photo No. 72 9/14/11

Photo Point 9  
Piped crossing at easement break, facing downstream



As-Built

Photo No. 73

2/3/09



Year 2

Photo No. 75

10/02/10



Year 1

Photo No. 74

10/30/09



Year 3

Photo No. 76

9/14/11

Photo Point 10  
Morgan Creek from D/S pipe inlet, facing upstream



As-Built Photo No. 77 2/3/09



Year 2 Photo No. 79 10/02/10



Year 1 Photo No. 78 10/30/09



Year 3 Photo No. 80 9/14/11

## **GEOMORPHIC DATA**

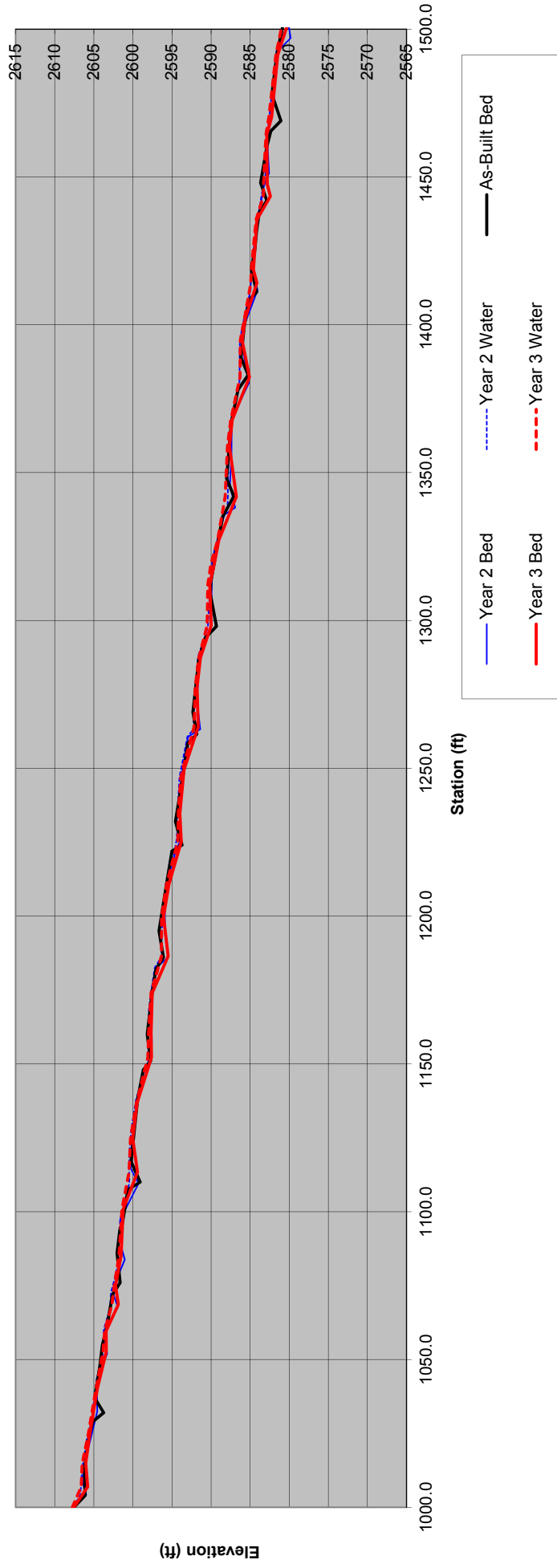




### Morgan Creek Stream Restoration Site

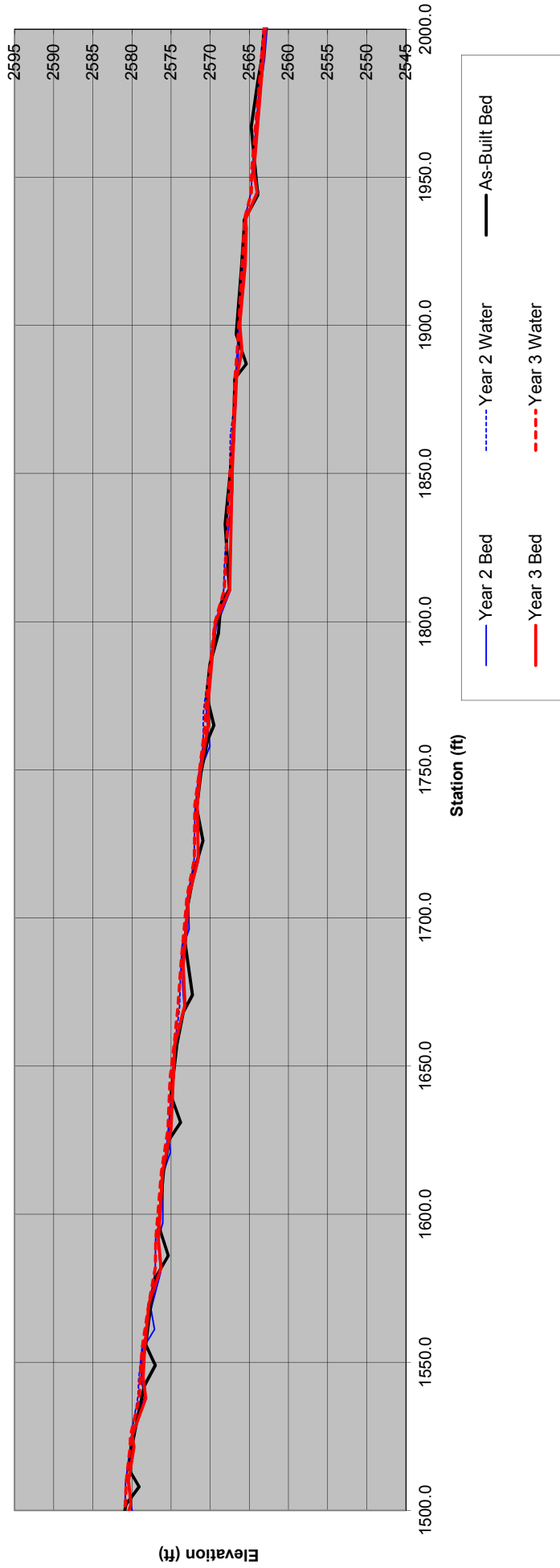
Haywood County, NC  
Profile Reach 1 - Morgan Creek

#### Profile



**Morgan Creek Stream Restoration Site**  
Haywood County, NC  
Profile Reach 1 - Morgan Creek

**Profile**

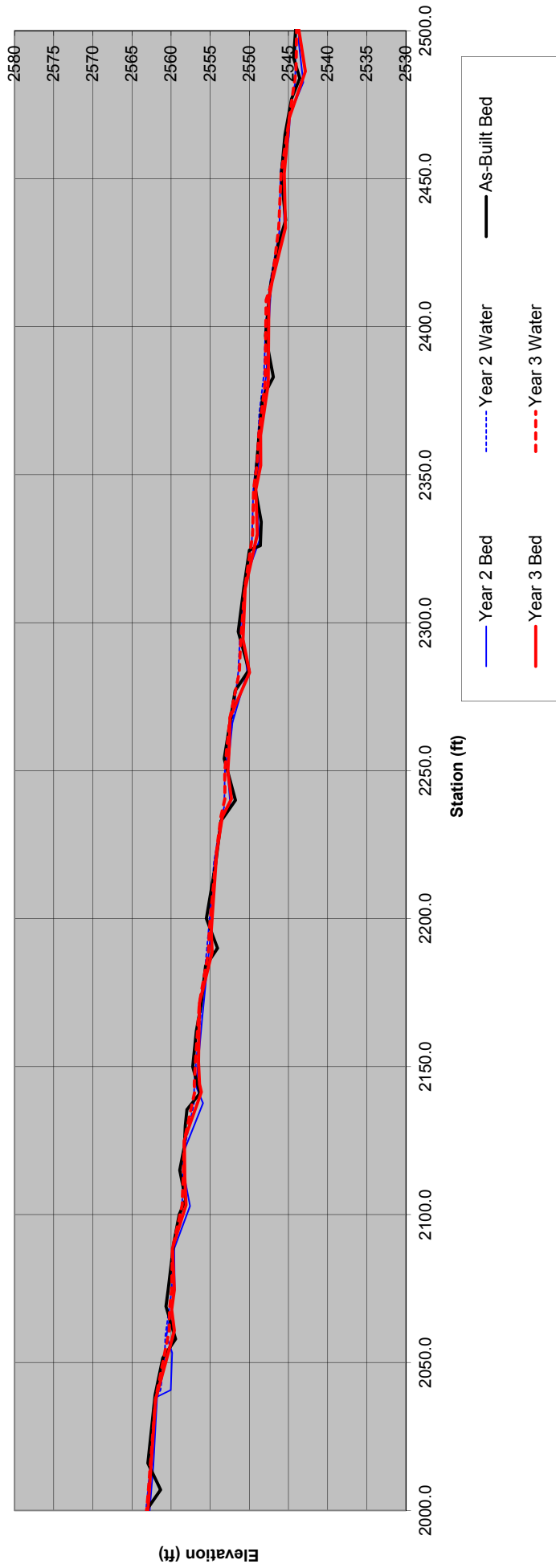


### Morgan Creek Stream Restoration Site

Haywood County, NC

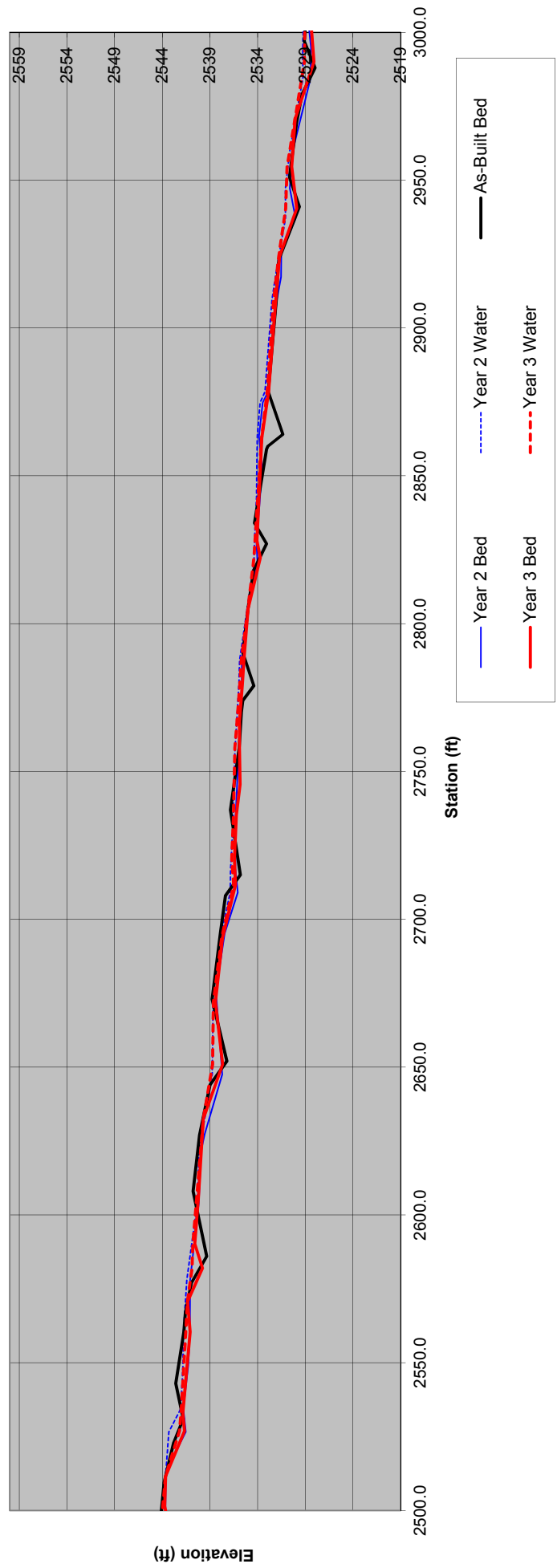
Profile Reach 1 - Morgan Creek

#### Profile



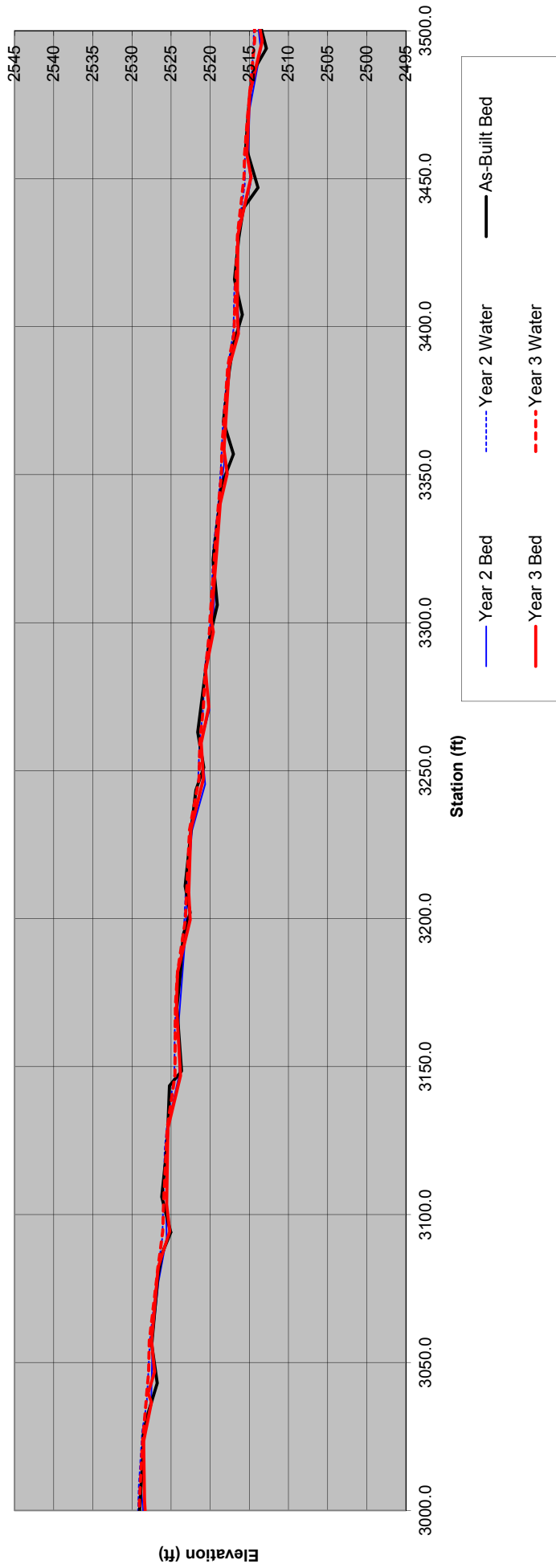
**Morgan Creek Stream Restoration Site**  
Haywood County, NC  
Profile Reach 1 - Morgan Creek

**Profile**



**Morgan Creek Stream Restoration Site**  
Haywood County, NC  
Profile Reach 1 - Morgan Creek

**Profile**

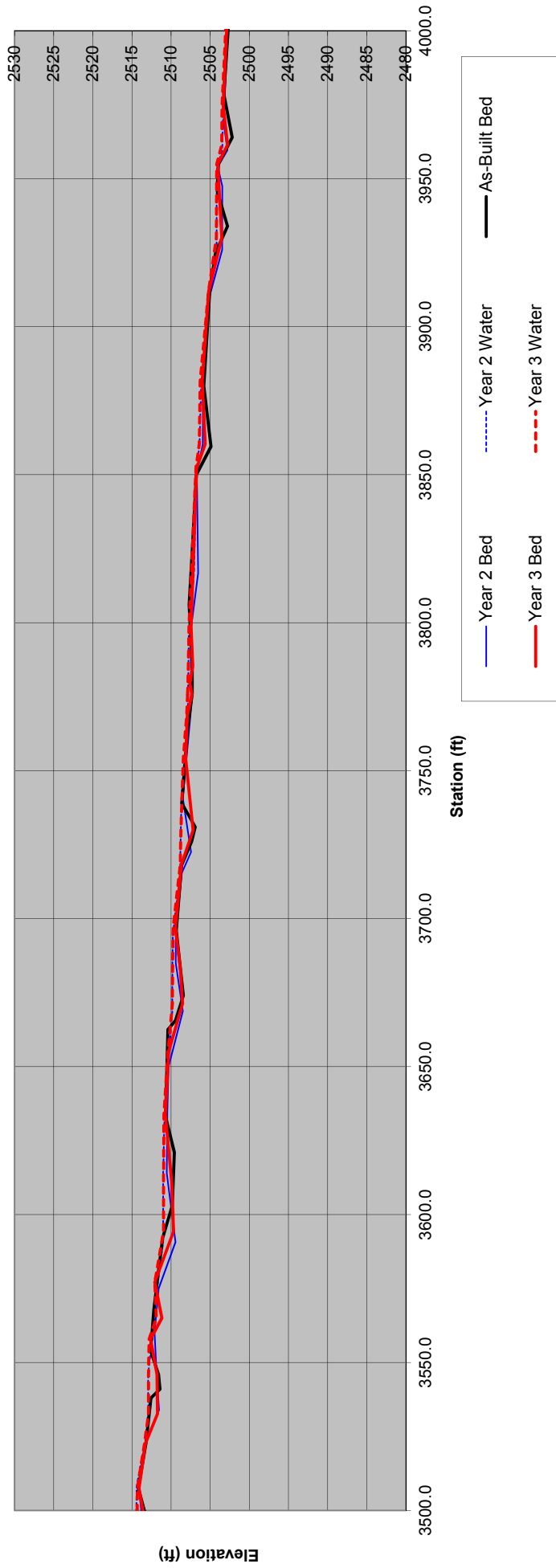


### Morgan Creek Stream Restoration Site

Haywood County, NC

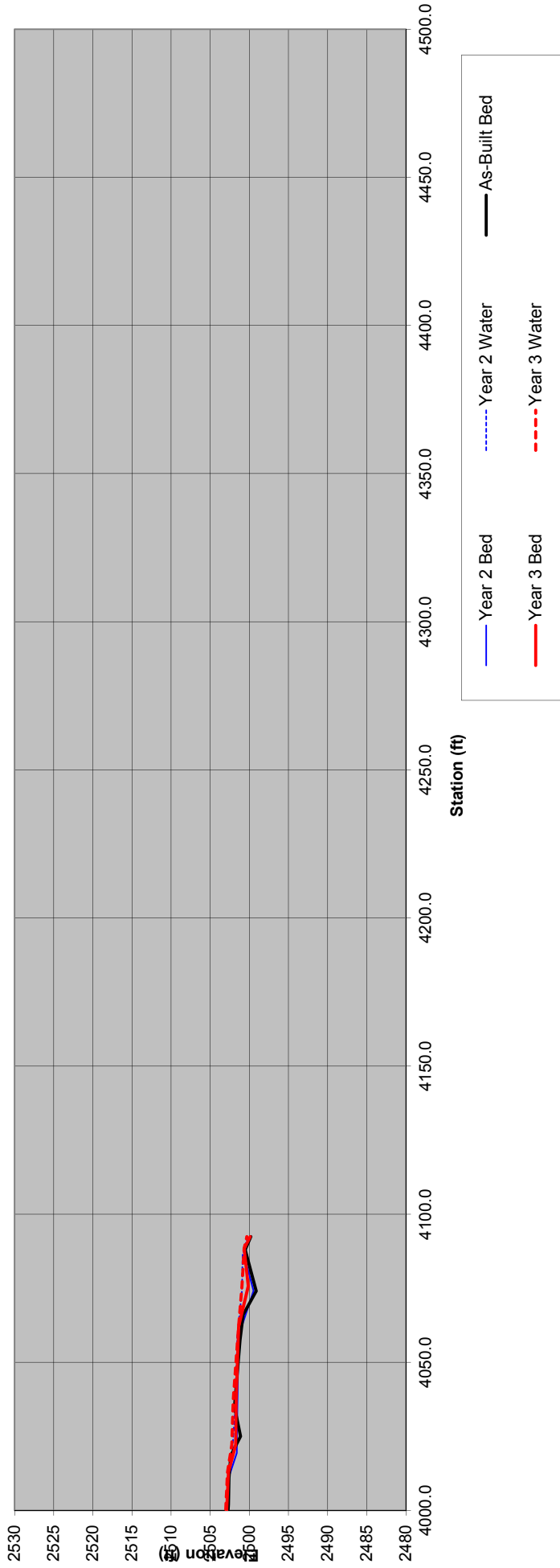
Profile Reach 1 - Morgan Creek

#### Profile



**Morgan Creek Stream Restoration Site**  
 Haywood County, NC  
 Profile Reach 1 - Morgan Creek

**Profile**



## Morgan Creek Stream Restoration Site

Haywood County, NC

Profile Reach 1 - Morgan Creek

Year 3

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.
2614.16	1000	6.61	0.2			2607.55	2607.75
2614.16	1007	8.37	0.82			2605.79	2606.61
2614.16	1015	8.13	0.45	6.96		2606.03	2606.48
2614.16	1024	8.58	0.19			2605.58	2605.77
2614.16	1040.5	9.62	0.16			2604.54	2604.70
2614.16	1053	10.76	0.41			2603.40	2603.81
2614.16	1060	10.74	0.18			2603.42	2603.60
2614.16	1069	12.29	0.81			2601.87	2602.68
2614.16	1075.5	11.93	0.15	10.58		2602.23	2602.38
2614.16	1085.5	12.64	0.26	10.97		2601.52	2601.78
2614.16	1101.5	12.92	0.14			2601.24	2601.38
2614.16	1114	14.75	1.09			2599.41	2600.50
2607.67	1125.5	7.64	0.28	6.23		2600.03	2600.31
2607.67	1137.5	8.21	0.08			2599.46	2599.54
2607.67	1153	10.05	0.46			2597.62	2598.08
2607.67	1161.5	10	0.31			2597.67	2597.98
2607.67	1175	10.14	0.15			2597.53	2597.68
2607.67	1187.5	12.18	0.86			2595.49	2596.35
2607.67	1201	11.59	0.24	10.19		2596.08	2596.32
2607.67	1211.8	12.27	0.3			2595.40	2595.70
2607.67	1226.5	13.85	0.44			2593.82	2594.26
2600.67	1236	6.67	0.19			2594.00	2594.19
2600.67	1248	7.11	0.32			2593.56	2593.88
2600.67	1250.8	7.2	0.18			2593.47	2593.65
2600.67	1265.5	9.03	0.53			2591.64	2592.17
2600.67	1279	8.87	0.22	7.34		2591.80	2592.02
2600.67	1289	9.3	0.19			2591.37	2591.56
2600.67	1300	10.68	0.5			2589.99	2590.49
2600.67	1314	10.5	0.24			2590.17	2590.41
2600.67	1321	11.07	0.4	10.11		2589.60	2590.00
2600.67	1329	11.66	0.16			2589.01	2589.17
2600.67	1343.8	13.9	1.42			2586.77	2588.19
2600.67	1361	13.01	0.24	11.47		2587.66	2587.90
2593.93	1370	6.64	0.19			2587.29	2587.48
2593.93	1384.5	8.84	1.2			2585.09	2586.29
2593.93	1397	7.91	0.23	6.57		2586.02	2586.25
2593.93	1404.5	8.31	0.1			2585.62	2585.72
2593.93	1416.5	9.79	0.77			2584.14	2584.91
2593.93	1421	9.35	0.28			2584.58	2584.86
2593.93	1438	9.79	0.1			2584.14	2584.24
2593.93	1446	11.51	0.9			2582.42	2583.32
2593.93	1450	11.12	0.48	9.09	9.8- bkf rt	2582.81	2583.29
2593.93	1467	11.06	0.11			2582.87	2582.98
2593.93	1473	11.68	0.35	10.03		2582.25	2582.60
2593.93	1494	12.46	0.24			2581.47	2581.71
2587.29	1505	7.15	0.71			2580.14	2580.85
2587.29	1513	6.85	0.29	5.62		2580.44	2580.73
2587.29	1524.4	7.55	0.5			2579.74	2580.24
2587.29	1528.2	7.32	0.21			2579.97	2580.18
2587.29	1540.5	9.06	0.84			2578.23	2579.07
2587.29	1547.5	8.72	0.39	7.72	7.52 -bkf rt	2578.57	2578.96
2587.29	1557.3	8.92	0.32			2578.37	2578.69



## Morgan Creek Stream Restoration Site

Haywood County, NC

Profile Reach 1 - Morgan Creek

Year 3

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.
2587.29	1572	9.47	0.01			2577.82	2577.83
2587.29	1583.6	11.01	0.73			2576.28	2577.01
2587.29	1592.8	10.67	0.35			2576.62	2576.97
2587.29	1615.5	11.21	0.15			2576.08	2576.23
2587.29	1629.3	12.27	0.39			2575.02	2575.41
2581.26	1646.5	6.54	0.4	4.97		2574.72	2575.12
2581.26	1658	6.74	0.09			2574.52	2574.61
2581.26	1671	8.03	0.88			2573.23	2574.11
2581.26	1684	7.8	0.31	6.25		2573.46	2573.77
2581.26	1707	8.49	0.2			2572.77	2572.97
2581.26	1720	9.73	0.49			2571.53	2572.02
2581.26	1738	9.59	0.3	8.44		2571.67	2571.97
2581.26	1749	9.97	0.11			2571.29	2571.40
2581.26	1765	11.02	0.38			2570.24	2570.62
2581.26	1772	10.99	0.28	9.25		2570.27	2570.55
2581.26	1799	11.9	0.05			2569.36	2569.41
2574.81	1810	7.3	0.68			2567.51	2568.19
2574.81	1848	7.6	0.28			2567.21	2567.49
2574.81	1864	7.86	0.13			2566.95	2567.08
2574.81	1881	8.17	0.19	6.72		2566.64	2566.83
2574.81	1890	8.86	0.6			2565.95	2566.55
2574.81	1899	8.59	0.14			2566.22	2566.36
2574.81	1919	9.29	0.39			2565.52	2565.91
2574.81	1931	9.43	0.28			2565.38	2565.66
2574.81	1934	9.3	0.12			2565.51	2565.63
2574.81	1943	10.81	0.75			2564.00	2564.75
2574.81	1950	10.37	0.27	8.21		2564.44	2564.71
2569.59	1987	6.32	0.22			2563.27	2563.49
2569.59	2003	6.76	0.13	0.13		2562.83	2562.96
2569.59	2035	7.61	0			2561.98	2561.98
2569.59	2058	10.01	0.66			2559.58	2560.24
2569.59	2065	9.66	0.28	7.79		2559.93	2560.21
2569.59	2071.7	10	0.34			2559.59	2559.93
2569.59	2085	9.75	0			2559.84	2559.84
2569.59	2099	11.5	0.5			2558.09	2558.59
2569.59	2108	11.34	0.2	10.43		2558.25	2558.45
2569.59	2120	11.28	0			2558.31	2558.31
2569.59	2135.5	13.45	0.85			2556.14	2556.99
2569.59	2138	13.23	0.68			2556.36	2557.04
2562.62	2145.5	6.12	0.39	4.71		2556.50	2556.89
2562.62	2165	6.23	0			2556.39	2556.39
2562.62	2182	7.87	0.48			2554.75	2555.23
2562.62	2189	7.74	0.25			2554.88	2555.13
2562.62	2215	8.43	0.02			2554.19	2554.21
2562.62	2227	9.16	0.18			2553.46	2553.64
2562.62	2233	10.33	0.84			2552.29	2553.13
2562.62	2242	9.86	0.39			2552.76	2553.15
2562.62	2250	10.04	0.31			2552.58	2552.89
2562.62	2260	10.14	0			2552.48	2552.48
2557.57	2275	7.6	1.32			2549.97	2551.29
2557.57	2286	6.75	0.28	5.16		2550.82	2551.10
2557.57	2303	7.03	0.05			2550.54	2550.59

## Morgan Creek Stream Restoration Site

Haywood County, NC

Profile Reach 1 - Morgan Creek

Year 3

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.
2557.57	2321	8.58	0.6			2548.99	2549.59
2557.57	2336	8.4	0.29	7.05		2549.17	2549.46
2557.57	2344	9.02	0.48			2548.55	2549.03
2557.57	2354	9	0.24			2548.57	2548.81
2557.57	2371	9.97	0.39			2547.60	2547.99
2557.57	2399	10.05	0.33			2547.52	2547.85
2557.57	2405	10.47	0.01			2547.10	2547.11
2557.57	2423	12.18	0.85			2545.39	2546.24
2557.57	2441	12.02	0.38	10.55		2545.55	2545.93
2549.89	2459.5	4.99	0			2544.90	2544.90
2549.89	2475	7.04	1.2			2542.85	2544.05
2549.89	2490	6.14	0.2	4.92		2543.75	2543.95
2549.89	2500	6.24	0.02			2543.65	2543.67
2549.89	2515	8.22	0.52			2541.67	2542.19
2549.89	2521	8.05	0.19	6.64		2541.84	2542.03
2549.89	2548	8.81	0.45			2541.08	2541.53
2549.89	2558	8.54	0.01			2541.35	2541.36
2549.89	2569	10.11	1.1			2539.78	2540.88
2549.89	2577	9.29	0.19	7.65		2540.60	2540.79
2549.89	2592	9.68	0.18			2540.21	2540.39
2547.53	2618	7.83	0			2539.70	2539.70
2547.53	2636	9.86	1.05			2537.67	2538.72
2547.53	2656.5	9.1	0.21	7.16		2538.43	2538.64
2547.53	2677.5	9.85	0.1			2537.68	2537.78
2547.53	2695	11.21	0.19			2536.32	2536.51
2547.53	2703.5	11.1	0.29			2536.43	2536.72
2547.53	2718	11.3	0.29			2536.23	2536.52
2547.53	2728	11.69	0.63			2535.84	2536.47
2547.53	2740	11.62	0.48	10.18		2535.91	2536.39
2547.53	2748.5	11.63	0.26			2535.90	2536.16
2547.53	2761.1	11.93	0.26			2535.60	2535.86
2542.33	2769	6.9	0.28	5.72		2535.43	2535.71
2542.33	2785.5	7.33	0.02			2535.00	2535.02
2542.33	2802	8.6	0.65			2533.73	2534.38
2542.33	2807.5	8.25	0.19	6.85		2534.08	2534.27
2542.33	2841	8.77	0.02			2533.56	2533.58
2542.33	2856	9.48	0.15			2532.85	2533.00
							2532.33
							2532.33
2542.33	2887.5	10.24	0.24			2532.09	2532.33
2542.33	2902	10.63	0.09			2531.70	2531.79
2542.33	2918	12.43	1.16			2529.90	2531.06
2542.33	2932	11.91	0.49	10.27		2530.42	2530.91
2542.33	2948	12.27	0.01			2530.06	2530.07
2542.33	2967	14.24	1			2528.09	2529.09
2535.98	2980	7.58	0.65	5.74		2528.40	2529.05
2535.98	3000	7.47	0.14			2528.51	2528.65
2535.98	3013	8.47	0.69			2527.51	2528.20
2535.98	3016	8.05	0.18			2527.93	2528.11
2535.98	3023	8.87	0.76			2527.11	2527.87
2535.98	3033.5	8.48	0.29			2527.50	2527.79
2535.98	3058	9.32	0.02			2526.66	2526.68

## Morgan Creek Stream Restoration Site

Haywood County, NC

Profile Reach 1 - Morgan Creek

Year 3

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.
2535.98	3070	10.81	0.89			2525.17	2526.06
2535.98	3079	10.41	0.39	8.69		2525.57	2525.96
2535.98	3104.5	10.58	0.1			2525.40	2525.50
2535.98	3122	12.19	0.71			2523.79	2524.50
2529.90	3145	5.6	0.15	4.3		2524.30	2524.45
2529.90	3156.5	5.72	0			2524.18	2524.18
2529.90	3174	7.34	0.61			2522.56	2523.17
2529.90	3183	7.16	0.29	5.43		2522.74	2523.03
2529.90	3204	7.42	0.16			2522.48	2522.64
2529.90	3221	9.03	0.57			2520.87	2521.44
2529.90	3233	8.74	0.18			2521.16	2521.34
2529.90	3245	9.72	0.69			2520.18	2520.87
2529.90	3257	9.31	0.05			2520.59	2520.64
2529.90	3270	10.29	0.5			2519.61	2520.11
2529.90	3274	10.03	0.16			2519.87	2520.03
2526.03	3297.2	6.86	0.24			2519.17	2519.41
2526.03	3313	7.3	0.2			2518.73	2518.93
2526.03	3323	8.19	0.71			2517.84	2518.55
2526.03	3331	7.79	0.28			2518.24	2518.52
2526.03	3359	8.46	0.19			2517.57	2517.76
2526.03	3370	9.63	0.57			2516.40	2516.97
2525.59	3377	9.03	0.32	7.37		2516.56	2516.88
2525.59	3403	9.12	0.05			2516.47	2516.52
2525.59	3422.5	10.81	0.9			2514.78	2515.68
2525.59	3430	10.27	0.29			2515.32	2515.61
2525.59	3443	10.48	0.11			2515.11	2515.22
2525.59	3450.5	10.63	0			2514.96	2514.96
2525.59	3468	12.23	0.98			2513.36	2514.34
2525.59	3479	11.49	0.22			2514.10	2514.32
2525.59	3494	12.3	0.1			2513.29	2513.39
2525.59	3504	13.86	1.16			2511.73	2512.89
							2512.89
2525.59	3517.2	13.79	1.09			2511.80	2512.89
2519.02	3529	6.4	0.19	4.95		2512.62	2512.81
2519.02	3536	7.84	0.71			2511.18	2511.89
2519.02	3548	6.94	0			2512.08	2512.08
2519.02	3565	9.33	1.27			2509.69	2510.96
2519.02	3581	9.1	1.05			2509.92	2510.97
2519.02	3604	8.29	0.19	7.56		2510.73	2510.92
2519.02	3625	8.71	0.1			2510.31	2510.41
2519.02	3641	10.49	1.3			2508.53	2509.83
2519.02	3652	10.22	1.01			2508.80	2509.81
2519.02	3666.5	9.58	0.3	8.13		2509.44	2509.74
2513.52	3687.5	4.84	0.15			2508.68	2508.83
2513.52	3699	6.34	1.57			2507.18	2508.75
2513.52	3723	5.38	0.3			2508.14	2508.44
2513.52	3737.5	5.6	0.09			2507.92	2508.01
2513.52	3744.5	6.17	0.54			2507.35	2507.89
2513.52	3748	5.92	0.25			2507.60	2507.85
2513.52	3754	6.28	0.56			2507.24	2507.80
2513.52	3767	6.07	0.26	4.58		2507.45	2507.71
2513.52	3820	6.77	0.07			2506.75	2506.82

### Morgan Creek Stream Restoration Site

Haywood County, NC

Profile Reach 1 - Morgan Creek

Year 3

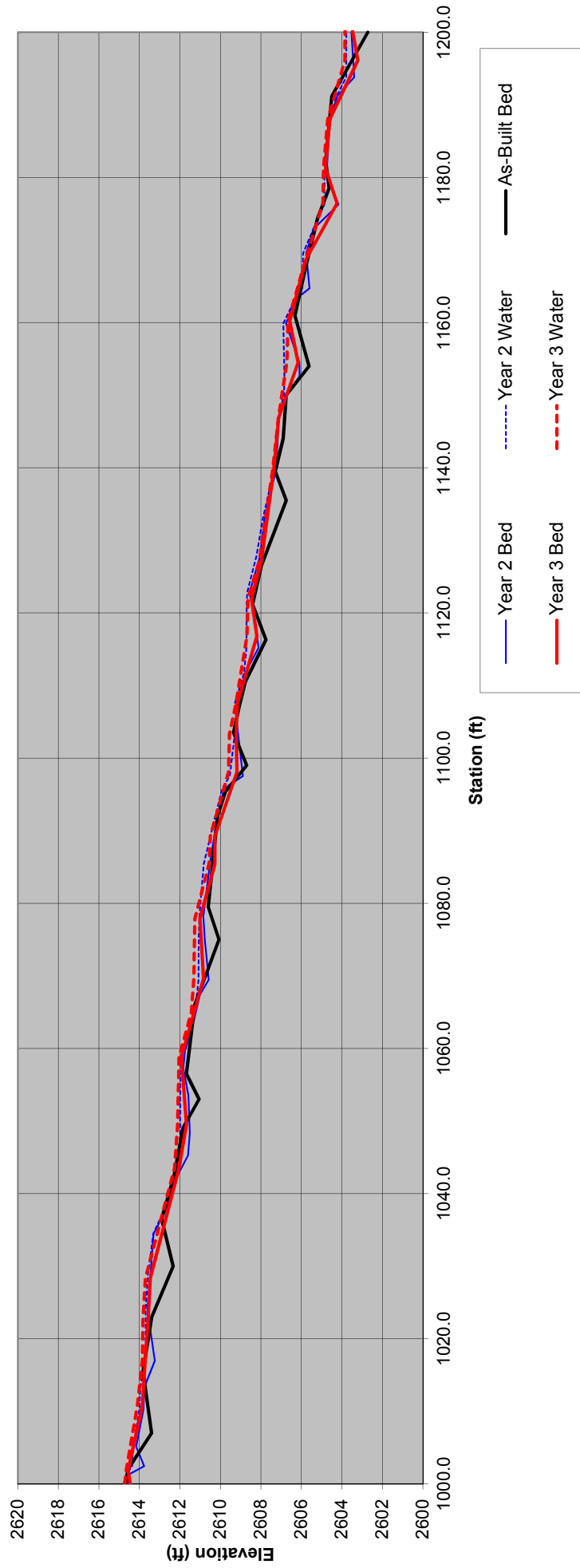
HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.
2513.52	3828	7.87	0.75			2505.65	2506.40
2511.58	3849	5.56	0.27	4.39		2506.02	2506.29
2511.58	3879	6.38	0.02			2505.20	2505.22
2511.58	3897	8.05	0.68			2503.53	2504.21
2511.58	3921.5	7.54	0.12			2504.04	2504.16
2511.58	3928	8.79	0.73			2502.79	2503.52
2511.58	3941	8.23	0.15	6.22		2503.35	2503.50
2511.58	3979	8.91	0.12			2502.67	2502.79
2511.58	3988	9.83	0.49			2501.75	2502.24
2511.58	4003	9.89	0.37			2501.69	2502.06
2511.58	4027.5	10.21	0			2501.37	2501.37
2511.58	4041	11.44	0.81			2500.14	2500.95
2511.58	4053.5	10.92	0			2500.66	2500.66
2511.58	4057.5	11.69	0.44			2499.89	2500.33

### Morgan Creek Stream Restoration Site

Haywood County, NC

Profile Reach 2 - North Branch

#### Profile



**Morgan Creek Stream Restoration Site**

Haywood County, NC

Profile Reach 2 - North Branch

**Year 2**

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
2620.08	1000	5.63	0.28			2614.45	2614.73	
2620.08	1001.8	5.52	0.09			2614.56	2614.65	
2620.08	1010.5	6.23	0.25			2613.85	2614.10	
2620.08	1016.5	6.37	0.14	5.74		2613.71	2613.85	2614.34
2620.08	1022	6.51	0.25			2613.57	2613.82	
2620.08	1027.5	6.62	0.24	5.98		2613.46	2613.70	2614.10
2620.08	1042.2	8.04	0.22			2612.04	2612.26	
2620.08	1048	8.4	0.43			2611.68	2612.11	
2620.08	1057	8.16	0.12			2611.92	2612.04	
2620.08	1063	8.79	0.14			2611.29	2611.43	
2620.08	1067.5	9.25	0.48			2610.83	2611.31	
2620.08	1075.5	9.07	0.25	8.24		2611.01	2611.26	2611.84
2620.08	1082.8	9.81	0.29	8.69		2610.27	2610.56	2611.39
2620.08	1086.5	9.81	0.23			2610.27	2610.50	
2620.08	1095	10.9	0.42			2609.18	2609.60	
2620.08	1100	10.86	0.33	10.08		2609.22	2609.55	2610.00
2620.08	1104	10.91	0.07			2609.17	2609.24	
2620.08	1113	11.88	0.49			2608.20	2608.69	
2620.08	1118	11.62	0.18			2608.46	2608.64	
2620.08	1123	12.1	0.1			2607.98	2608.08	
2612.69	1135.2	5.33	0.05	4.4		2607.36	2607.41	2608.29
2612.69	1142	5.57	0.01			2607.12	2607.13	
2612.69	1149.3	6.53	0.56			2606.16	2606.72	
2612.69	1155.2	6.11	0.08	5.3		2606.58	2606.66	2607.39
2612.69	1164	6.92	0.02			2605.77	2605.79	
2612.69	1172	8.45	0.7			2604.24	2604.94	
2612.69	1177	7.88	0.1	6.99		2604.81	2604.91	2605.70
2612.69	1184	8.09	0.1			2604.60	2604.70	
2612.69	1192	9.48	0.64			2603.21	2603.85	
2612.69	1197	9.14	0.29	7.86		2603.55	2603.84	2604.83
2612.69	1203	9.07	0.02			2603.62	2603.64	
2612.69	1217	9.99	0.51			2602.70	2603.21	
2612.69	1220	9.73	0.17	8.95		2602.96	2603.13	2603.74
2612.69	1229	10.15	0.1			2602.54	2602.64	
2612.69	1235	10.91	0.44			2601.78	2602.22	
2612.69	1241	10.65	0.08			2602.04	2602.12	
2612.69	1244	11.1	0.11			2601.59	2601.70	
2612.69	1251.5	12.81	1.4			2599.88	2601.28	
2612.69	1259	12.03	0.13			2600.66	2600.79	
2612.69	1267	12.75	0.21			2599.94	2600.15	
2612.69	1270	13	0.41			2599.69	2600.10	
2612.69	1277.2	13.09	0.28			2599.60	2599.88	

<b>Table B2. Visual Morphological Stability Assessment</b>						
<b>Morgan Creek Stream Restoration Site (D06035-A)</b>						
<b>Morgan Creek 3,031 ft</b>						
Feature Category	Metric	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performing Mean or Total
A. Riffles	1. Present	62	62	N/A	100%	
	2. Armor stable	62	62	N/A	100%	
	3. Facet grade appears stable	55	62	N/A	89%	
	4. Minimal evidence of embedding/fining	62	62	N/A	100%	
	5. Length appropriate	60	62	N/A	97%	<b>97%</b>
B. Pools	1. Present	52	62	N/A	84%	
	2. Sufficiently deep	52	62	N/A	84%	
	3. Length appropriate	52	62	N/A	84%	<b>84%</b>
C. Thalweg	1. Upstream of meander bend centered	62	62	N/A	100%	
	2. Downstream of meander bend centered	62	62	N/A	100%	<b>100%</b>
D. Meanders	1. Outer bend in state of limited erosion	61	62	N/A	98%	
	2. Of those eroding, # w/ concomitant point bar formation	1	N/A	N/A	100%	
	3. Apparent Rc within specification	62	62	N/A	100%	
	4. Sufficient floodplain access and relief	58	62	N/A	94%	<b>98%</b>
E. Bed General	1. General channel bed aggradation areas	N/A	N/A	0/0	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting	N/A	N/A	3/80	98%	<b>99%</b>
F. Vanes	1. Free of back or arm scour	62	62	N/A	100%	
	2. Height appropriate	59	62	N/A	95%	
	3. Angle and geometry appear appropriate	62	62	N/A	100%	
	4. Free of piping or other structural failures	61	62	N/A	98%	<b>98%</b>
G. Wads/Boulders	1. Free of scour	4	4	N/A	100%	
	2. Footing stable	4	4	N/A	100%	<b>100%</b>

<b>Table B2. Visual Morphological Stability Assessment</b>						
<b>Morgan Creek Stream Restoration Site (D06035-A)</b>						
<b>North Branch 616 ft</b>						
Feature Category	Metric	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performing Mean or Total
A. Riffles	1. Present	23	23	N/A	100%	
	2. Armor stable	23	23	N/A	100%	
	3. Facet grade appears stable	23	23	N/A	100%	
	4. Minimal evidence of embedding/fining	23	23	N/A	100%	
	5. Length appropriate	23	23	N/A	100%	<b>100%</b>
B. Pools	1. Present	25	25	N/A	100%	
	2. Sufficiently deep	21	25	N/A	84%	
	3. Length appropriate	25	25	N/A	100%	<b>95%</b>
C. Thalweg	1. Upstream of meander bend centered	23	23	N/A	100%	
	2. Downstream of meander bend centered	23	23	N/A	100%	<b>100%</b>
D. Meanders	1. Outer bend in state of limited erosion	22	22	N/A	100%	
	2. Of those eroding, # w/ concomitant point bar formation	0	N/A	N/A	100%	
	3. Apparent Rc within specification	22	22	N/A	100%	
	4. Sufficient floodplain access and relief	22	22	N/A	100%	<b>100%</b>
E. Bed General	1. General channel bed aggradation areas	N/A	N/A	0/0	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting	N/A	N/A	0/0	100%	<b>100%</b>
F. Vanes	1. Free of back or arm scour	25	25	N/A	100%	
	2. Height appropriate	25	25	N/A	100%	
	3. Angle and geometry appear appropriate	25	25	N/A	100%	
	4. Free of piping or other structural failures	25	25	N/A	100%	<b>100%</b>
G. Wads/Boulders	1. Free of scour	2	2	N/A	100%	
	2. Footing stable	2	2	N/A	100%	<b>100%</b>

<b>Table B2. Visual Morphological Stability Assessment</b>						
<b>Morgan Creek Stream Restoration Site (D06035-A)</b>						
<b>Middle Branch 302 ft</b>						
Feature Category	Metric	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performing Mean or Total
A. Riffles	1. Present	9	9	N/A	100%	
	2. Armor stable	9	9	N/A	100%	
	3. Facet grade appears stable	9	9	N/A	100%	
	4. Minimal evidence of embedding/fining	9	9	N/A	100%	
	5. Length appropriate	9	9	N/A	100%	<b>100%</b>
B. Pools	1. Present	6	6	N/A	100%	
	2. Sufficiently deep	6	6	N/A	100%	
	3. Length appropriate	6	6	N/A	100%	<b>100%</b>
C. Thalweg	1. Upstream of meander bend centered	9	9	N/A	100%	
	2. Downstream of meander bend centered	9	9	N/A	100%	<b>100%</b>
D. Meanders	1. Outer bend in state of limited erosion	6	6	N/A	100%	
	2. Of those eroding, # w/ concomitant point bar formation	0	N/A	N/A	100%	
	3. Apparent Rc within specification	6	6	N/A	100%	
	4. Sufficient floodplain access and relief	6	6	N/A	100%	<b>100%</b>
E. Bed General	1. General channel bed aggradation areas	N/A	N/A	0/0	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting	N/A	N/A	0/0	100%	<b>100%</b>
F. Vanes	1. Free of back or arm scour	5	5	N/A	100%	
	2. Height appropriate	5	5	N/A	100%	
	3. Angle and geometry appear appropriate	5	5	N/A	100%	
	4. Free of piping or other structural failures	5	5	N/A	100%	<b>100%</b>
G. Wads/Boulders	1. Free of scour	6	6	N/A	100%	
	2. Footing stable	6	6	N/A	100%	<b>100%</b>

<b>Table B2. Visual Morphological Stability Assessment</b>						
<b>Morgan Creek Stream Restoration Site (D06035-A)</b>						
<b>South Branch 320 ft</b>						
Feature Category	Metric	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performing Mean or Total
A. Riffles	1. Present	12	12	N/A	100%	
	2. Armor stable	12	12	N/A	100%	
	3. Facet grade appears stable	11	12	N/A	92%	
	4. Minimal evidence of embedding/fining	12	12	N/A	100%	
	5. Length appropriate	11	12	N/A	92%	<b>97%</b>
B. Pools	1. Present	9	9	N/A	100%	
	2. Sufficiently deep	9	9	N/A	100%	
	3. Length appropriate	9	9	N/A	100%	<b>100%</b>
C. Thalweg	1. Upstream of meander bend centered	12	12	N/A	100%	
	2. Downstream of meander bend centered	12	12	N/A	100%	<b>100%</b>
D. Meanders	1. Outer bend in state of limited erosion	9	9	N/A	100%	
	2. Of those eroding, # w/ concomitant point bar formation	0	N/A	N/A	100%	
	3. Apparent Rc within specification	9	9	N/A	100%	
	4. Sufficient floodplain access and relief	9	9	N/A	100%	<b>100%</b>
E. Bed General	1. General channel bed aggradation areas	N/A	N/A	0/0	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting	N/A	N/A	1/10	97%	<b>99%</b>
F. Vanes	1. Free of back or arm scour	9	9	N/A	100%	
	2. Height appropriate	9	9	N/A	100%	
	3. Angle and geometry appear appropriate	9	9	N/A	100%	
	4. Free of piping or other structural failures	9	9	N/A	100%	<b>100%</b>
G. Wads/Boulders	1. Free of scour	2	2	N/A	100%	
	2. Footing stable	2	2	N/A	100%	<b>100%</b>



### Morgan Creek Stream Restoration Site

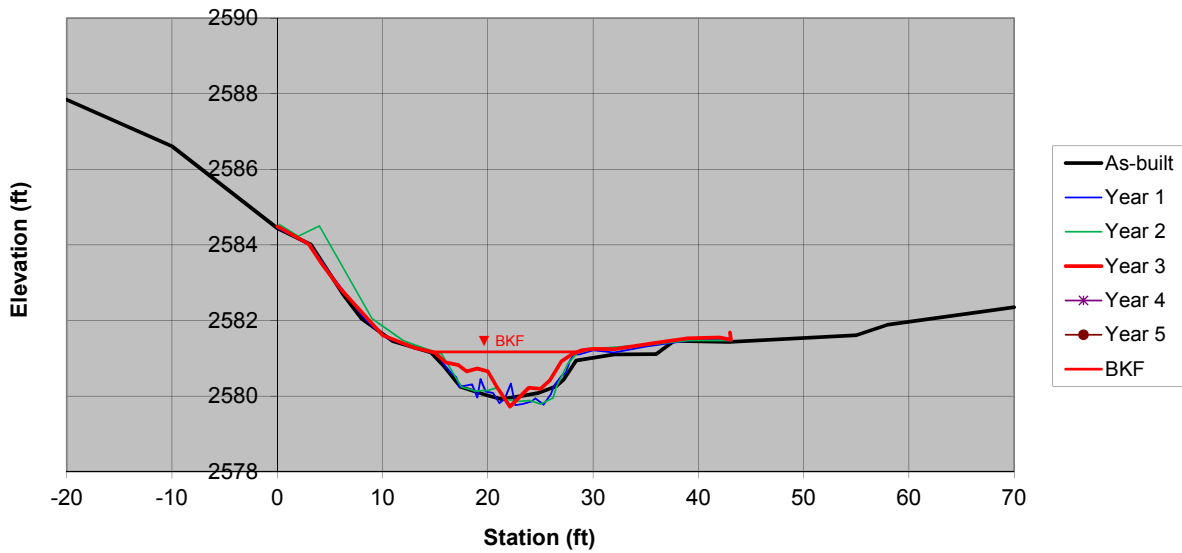
Haywood County, NC  
 Riffle Cross Section RF1  
 Reach 1 - Morgan Creek - Sta 15+14.1



Year 3

Facing Downstream

#### Riffle Cross Section



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/29/10	Date	9/7/11	Date	0/0/0	Date	0/0/0
Area	12.2	Area	11.4	Area	11.6	Area	8.7	Area	0.0	Area	0.0
Bkf W	13.8	Bkf W	12.9	Bkf W	13	Bkf W	14.2	Bkf W	10	Bkf W	10
Dmean	0.9	Dmean	0.9	Dmean	0.9	Dmean	0.6	Dmean	0.0	Dmean	0.0
Dmax	1.2	Dmax	1.3	Dmax	1.3	Dmax	1.4	Dmax	0.0	Dmax	0.0
W/d	15.6	W/d	14.6	W/d	14.6	W/d	23.3	W/d	0.0	W/d	0.0

**Morgan Creek Stream Restoration Site**

Haywood County, NC

Riffle Cross Section RF1

Reach 1 - Morgan Creek - Sta 15+14.1

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM HI	5.53	2584.66	RF1 IR Lt	BM HI	5.64	2581.69	IR Lt	BM HI	5.11	2581.69	IR Rt
		2590.19				2587.33				2586.80	
-20	2.35	2587.84		0	2.88	2584.45	GRND	0.2	2.26	2584.54	GRND
-10	3.58	2586.61		3.2	3.36	2583.97	"	2	2.57	2584.23	GRND
0	5.75	2584.44	GRND	5	4.08	2583.25	"	4	2.30	2584.50	GRND
3.2	6.18	2584.01		8.2	5.25	2582.08	"	9	4.75	2582.05	GRND
6.3	7.52	2582.67		9.3	5.56	2581.77	"	12	5.34	2581.46	GRND
8	8.14	2582.05		10.5	5.81	2581.52	"	15	5.64	2581.16	GRND
11	8.74	2581.45		13.2	6.08	2581.25	"	15.6	5.68	2581.12	BKF
14.6	9.04	2581.15	BKF LT	15.3	6.23	2581.10	BKF	17.5	6.56	2580.24	TOE
15.8	9.39	2580.80		15.8	6.48	2580.85	BNK	18.8	6.67	2580.13	EOW
17.4	9.95	2580.24	EOW LT	16.5	6.71	2580.62	BNK	20	6.65	2580.15	BED
19.9	10.17	2580.02		17	6.83	2580.50	BNK	21	6.57	2580.23	BED
21.3	10.27	2579.92		17.3	7.09	2580.24	BED	21.7	6.89	2579.91	BED
23.2	10.19	2580.00		18.5	7.02	2580.31	BED	23	6.94	2579.86	BED
24.8	10.11	2580.08		19	7.37	2579.96	"	24	6.92	2579.88	BED
26.5	9.93	2580.26	EOW RT	19.3	6.88	2580.45	"(ROCK)	25	7.01	2579.79	BED
27.2	9.76	2580.43		19.8	7.21	2580.12	"(ROCK)	26.2	6.85	2579.95	BED
28.4	9.25	2580.94	BKF RT	20.5	7.25	2580.08	EOW	26.5	6.57	2580.23	EOW
32	9.09	2581.10		21.1	7.52	2579.81	BED	27.6	5.94	2580.86	BNK
36	9.08	2581.11		21.6	7.40	2579.93	"	28.6	5.63	2581.17	BKF
37.7	8.73	2581.46		22.2	7.00	2580.33	"(ROCK)	31	5.53	2581.27	GRND
42.9	8.76	2581.43	GRND	22.6	7.57	2579.76	"	35	5.45	2581.35	GRND
55	8.58	2581.61		23.3	7.54	2579.79	"	39	5.33	2581.47	GRND
58	8.30	2581.89		24.2	7.47	2579.86	"	43.2	5.33	2581.47	GRND
70	7.84	2582.35		24.5	7.39	2579.94	"				
				25.3	7.56	2579.77	"				
				26	7.28	2580.05	EOW				
				26.3	7.05	2580.28	BNK				
				27	6.8	2580.53	"				
				27.4	6.72	2580.61	"				
				27.8	6.39	2580.94	"				
				28.2	6.23	2581.1	BKF				
				28.7	6.23	2581.1	GRND				
				30	6.12	2581.21	"				
				32	6.18	2581.15	"				
				35	6.02	2581.31	"				
				37	5.94	2581.39	"				
				40	5.83	2581.5	"				
				43	5.86	2581.47	"				

Year 3			
Station	FS/BS	Elev.	Desc.
BM HI	2.28	2584.66	IR Lt
		2586.94	
0	2.45	2584.49	GRND
3	2.92	2584.02	GRND
4.2	3.43	2583.51	GRND
6	4.10	2582.84	GRND
10	5.33	2581.61	GRND
13	5.66	2581.28	GRND
14.7	5.77	2581.17	BKF
15	5.80	2581.14	BNK
16	6.05	2580.89	BNK
17.2	6.12	2580.82	
18	6.29	2580.65	BED
19	6.21	2580.73	BED
20	6.29	2580.65	BED
20.9	6.72	2580.22	EOW
22.1	7.22	2579.72	THAL
23.9	6.72	2580.22	EOW
25	6.75	2580.19	
25.9	6.52	2580.42	BNK
27	6.02	2580.92	BNK
28	5.83	2581.11	BNK
28.9	5.73	2581.21	BKF
30	5.69	2581.25	GRND
32	5.70	2581.24	GRND
36	5.53	2581.41	GRND
39	5.41	2581.53	GRND
42	5.39	2581.55	GRND
43.1	5.45	2581.49	GRND
43	5.26	2581.68	

Year 4			
Station	FS/BS	Elev.	Desc.
BM HI	0.00	100.00	IR Lt
		100.00	

Year 5			
Station	FS/BS	Elev.	Desc.
BM HI	0.00	100.00	IR Lt
		100.00	

### Morgan Creek Stream Restoration Site

Haywood County, NC

Pool Cross Section PL1

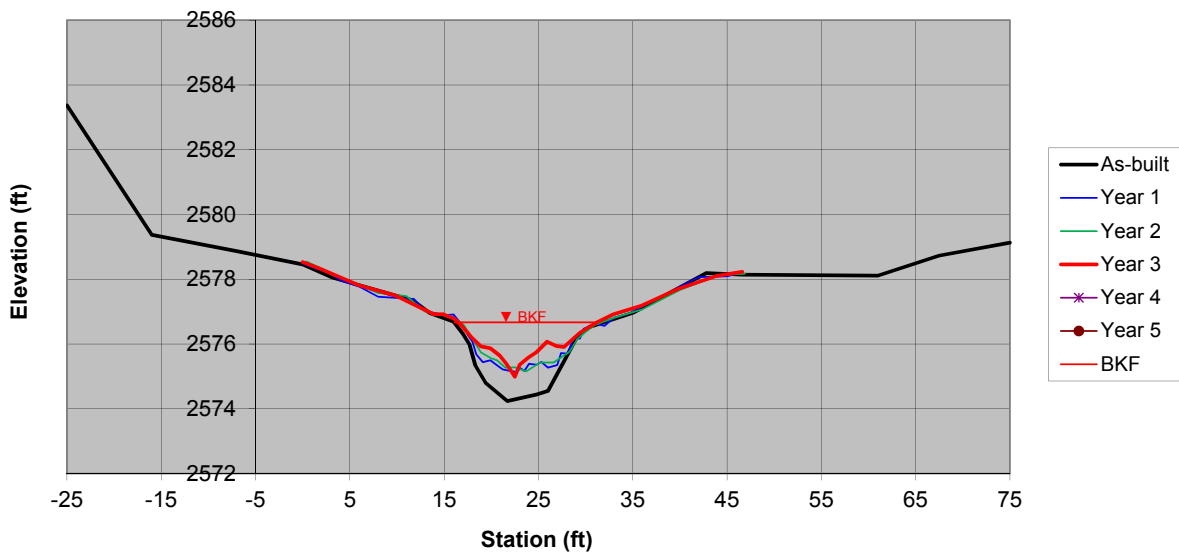
Reach 1 - Morgan Creek - Sta 16+16.4



Year 3

Facing Downstream

#### Pool Cross Section



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/28/10	Date	9/13/11	Date	0/0/0	Date	0/0/0
Area	22.5	Area	13.4	Area	12.5	Area	10.8	Area	0.0	Area	0.0
Bkf W	14.4	Bkf W	14	Bkf W	13.9	Bkf W	15.1	Bkf W	10	Bkf W	10
Dmean	1.6	Dmean	1.0	Dmean	0.9	Dmean	0.7	Dmean	0.0	Dmean	0.0
Dmax	2.5	Dmax	1.5	Dmax	1.4	Dmax	1.7	Dmax	0.0	Dmax	0.0
W/d	9.2	W/d	14.6	W/d	15.4	W/d	21.2	W/d	0.0	W/d	0.0

**Morgan Creek Stream Restoration Site**

Haywood County, NC

Pool Cross Section PL1

Reach 1 - Morgan Creek - Sta 16+16.4

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM	5.53	2584.66	RF1 IR Rt	BM	5.64	2581.69	PRF1 IR Rt	BM	6.02	2578.35	IR Rt
HI		2590.19		HI		2587.33		HI		2584.37	
-25	6.82	2583.37		0	8.84	2578.49	GRND	0.4	5.83	2578.54	GRND
-16	10.82	2579.37		1	8.95	2578.38	GRND	4	6.31	2578.06	GRND
-7	11.32	2578.87		3	9.16	2578.17	GRND	8	6.79	2577.58	GRND
0	11.73	2578.46	GRND	4	9.36	2577.97	GRND	11	6.89	2577.48	GRND
3.1	12.13	2578.06		6	9.56	2577.77	GRND	13	7.37	2577.00	GRND
11.7	12.85	2577.34		8	9.87	2577.46	GRND	16	7.54	2576.83	GRND
13.5	13.24	2576.95		11.8	9.94	2577.39	GRND	17.1	7.79	2576.58	BKF
16	13.50	2576.69	BKF LT	13	10.31	2577.02	GRND	18.9	8.63	2575.74	BED
17	13.88	2576.31		15	10.44	2576.89	GRND	20	8.81	2575.56	BED
17.7	14.21	2575.98		16	10.42	2576.91	GRND	20.6	8.87	2575.50	EOW
18.3	14.85	2575.34	EOW	17	10.78	2576.55	BKF	21.5	9.10	2575.27	BED
19.4	15.39	2574.80		17.5	11.05	2576.28	BNK	22.5	9.09	2575.28	BED
21.7	15.95	2574.24		18	11.26	2576.07	BNK	23.7	9.21	2575.16	BED
24.8	15.75	2574.44		18.4	11.65	2575.68	BNK	25.2	8.94	2575.43	EOW
26	15.64	2574.55		19.1	11.89	2575.44	BNK	26.6	8.94	2575.43	BED
27.6	14.78	2575.41	EOW	19.9	11.83	2575.5	BNK	28.3	8.61	2575.76	BED
29.1	13.97	2576.22		20.4	11.94	2575.39	EOW	29.1	8.23	2576.14	BNK
30.4	13.67	2576.52	BKF RT	21.2	12.11	2575.22	BED	30	7.99	2576.38	BKF
35	13.23	2576.96		22	12.16	2575.17	BED	31	7.78	2576.59	GRND
42.8	12.00	2578.19		22.7	12.19	2575.14	BED	33	7.56	2576.81	GRND
46.6	12.05	2578.14	GRND	23.1	12.08	2575.25	BED	36	7.30	2577.07	GRND
61	12.08	2578.11		23.5	12.16	2575.17	BED	40	6.70	2577.67	GRND
67.5	11.46	2578.73		24	11.94	2575.39	BED	44	6.25	2578.12	GRND
75	11.06	2579.13		24.8	11.97	2575.36	EOW	46.9	6.20	2578.17	GRND
				25.3	11.88	2575.45	BED				
				26	12.06	2575.27	BED				
				27	11.98	2575.35	BNK				
				27.4	11.61	2575.72	BNK				
				28.1	11.63	2575.7	BNK				
				28.7	11.17	2576.16	BNK				
				29.4	11.16	2576.17	BNK				
				29.8	10.86	2576.47	BNK				
				31	10.69	2576.64	BKF				
				32	10.77	2576.56	GRND				
				33	10.52	2576.81	GRND				
				34.6	10.39	2576.94	GRND				
				36	10.18	2577.15	GRND				
				38.4	9.83	2577.5	GRND				
				40	9.56	2577.77	GRND				
				42	9.26	2578.07	GRND				
				45	9.24	2578.09	GRND				
				46.6	9.12	2578.21	GRND				

Year 3			
Station	FS/BS	Elev.	Desc.
BM	4.67	2578.57	IR Lt
HI		2583.24	
0	4.71	2578.53	GRND
1.9	4.92	2578.32	GRND
5.9	5.42	2577.82	GRND
9.9	5.75	2577.49	GRND
13.9	6.32	2576.92	GRND
14.9	6.32	2576.92	GRND
16.1	6.46	2576.78	BKF
16.9	6.69	2576.55	BNK
17.9	7.03	2576.21	
18.9	7.31	2575.93	
19.9	7.37	2575.87	
20.9	7.60	2575.64	
21.6	7.85	2575.39	EOW
22.5	8.25	2574.99	THAL
23	7.88	2575.36	EOW
23.9	7.66	2575.58	
24.8	7.49	2575.75	
25.9	7.17	2576.07	
26.9	7.30	2575.94	
27.7	7.33	2575.91	BNK
29.4	6.89	2576.35	BNK
31.2	6.57	2576.67	BKF
32.9	6.33	2576.91	GRND
35.9	6.06	2577.18	GRND
39.9	5.53	2577.71	GRND
43.9	5.14	2578.10	GRND
46.6	5.01	2578.23	GRND

Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

**Morgan Creek Stream Restoration Site**

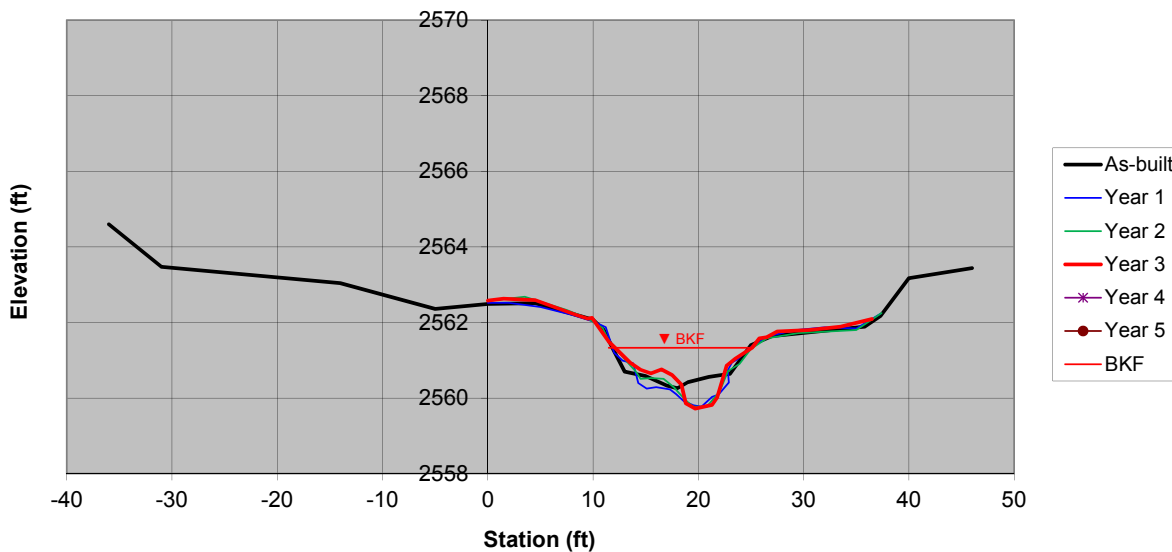
Haywood County, NC  
 Riffle Cross Section RF2  
 Reach 1 - Morgan Creek - Sta 20+49.1



Year 3

Facing Downstream

**Riffle Cross Section**



As-Built	Year 1	Year 2	Year 3	Year 4	Year 5
Date 1/8/09	Date 10/6/09	Date 9/28/10	Date 9/7/11	Date 0/0/0	Date 0/0/0
Area 10.2	Area 12.0	Area 10.8	Area 9.8	Area 0.0	Area 0.0
Bkf W 13.5	Bkf W 13.3	Bkf W 13.5	Bkf W 13.6	Bkf W 10	Bkf W 10
Dmean 0.8	Dmean 0.9	Dmean 0.8	Dmean 0.7	Dmean 0.0	Dmean 0.0
Dmax 1.1	Dmax 1.6	Dmax 1.5	Dmax 1.6	Dmax 0.0	Dmax 0.0
W/d 17.9	W/d 14.8	W/d 16.9	W/d 18.9	W/d 0.0	W/d 0.0

**Morgan Creek Stream Restoration Site**

Haywood County, NC

Riffle Cross Section RF2

Reach 1 - Morgan Creek - Sta 20+49.1

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM	7.72	2562.65	RF2 IR Lt	BM	5.21	2562.41	RF2 IR Lt	BM	5.05	2562.41	IR Rt
HI		2570.37		HI		2567.62		HI		2567.46	
-36	5.77	2564.60		0	5.10	2562.52	GRND	0	4.89	2562.57	GRND
-31	6.90	2563.47		2	5.10	2562.52	GRND	3.5	4.78	2562.68	GRND
-14	7.33	2563.04		5	5.21	2562.41	GRND	7.5	5.13	2562.33	GRND
-5	8.01	2562.36		8	5.42	2562.20	GRND	9.5	5.36	2562.10	GRND
0	7.88	2562.49	GRND	10	5.59	2562.03	GRND	10.5	5.53	2561.93	GRND
4.5	7.86	2562.51		11.2	5.75	2561.87	BKF	10.9	5.60	2561.86	BKF
10	8.30	2562.07	BKF LT	12	6.42	2561.20	BNK	11.5	5.94	2561.52	BNK
11	8.56	2561.81		12.8	6.63	2560.99	BNK	13	6.43	2561.03	BNK
12	9.13	2561.24		13.8	6.70	2560.92	BNK	14	6.74	2560.72	BNK
13	9.67	2560.70		14.3	7.22	2560.40	BED	14.5	6.95	2560.51	BED
15	9.79	2560.58	EOW LT	15.1	7.37	2560.25	BED	15.5	6.93	2560.53	BED
17	10.04	2560.33		16	7.33	2560.29	BED	16.7	6.95	2560.51	BED
18	10.11	2560.26		17.3	7.39	2560.23	BED	17.7	7.18	2560.28	BED
19	9.95	2560.42		17.9	7.52	2560.10	EOW	18	7.28	2560.18	EOW
21	9.81	2560.56	EOW RT	18.6	7.70	2559.92	BED	18.8	7.52	2559.94	BED
22	9.77	2560.60		19.5	7.81	2559.81	BED	19.5	7.69	2559.77	BED
23	9.73	2560.64		20.3	7.85	2559.77	BED	20.8	7.69	2559.77	BED
25	8.97	2561.40	BKF RT	21.3	7.59	2560.03	BED	22	7.30	2560.16	EOW
27	8.73	2561.64		21.9	7.53	2560.09	EOW	22.8	6.75	2560.71	BNK
35.8	8.48	2561.89		22.9	7.21	2560.41	BANK	23.9	6.56	2560.90	BNK
37.3	8.20	2562.17	GRND	22.8	6.88	2560.74	BANK	25	6.16	2561.30	BKF
40	7.20	2563.17		23.2	6.68	2560.94	BANK	26.5	5.88	2561.58	GRND
46	6.93	2563.44		23.7	6.60	2561.02	BANK	29.5	5.74	2561.72	GRND
				24.9	6.29	2561.33	BKF	35	5.66	2561.80	GRND
				26.5	6.00	2561.62	GRND	37.4	5.21	2562.25	GRND
				29	5.83	2561.79	GRND				
				32	5.75	2561.87	GRND				
				35	5.78	2561.84	GRND				
				37.3	5.39	2562.23	GRND				

Year 3			
Station	FS/BS	Elev.	Desc.
BM	5.70	2562.65	IR Lt
HI		2568.35	
0	5.77	2562.58	GRND
1.5	5.72	2562.63	GRND
4.5	5.76	2562.59	GRND
8.5	6.16	2562.19	GRND
9.5	6.25	2562.10	GRND
9.9	6.23	2562.12	BKF
11.5	6.86	2561.49	BNK
13.5	7.41	2560.94	BNK
14.5	7.60	2560.75	BNK
15.5	7.70	2560.65	BED
16.5	7.59	2560.76	BED
17.5	7.74	2560.61	BED
18.4	8.00	2560.35	BED
18.8	8.49	2559.86	THL
19.7	8.63	2559.72	
21.3	8.53	2559.82	EOW
21.8	8.33	2560.02	
22.7	7.49	2560.86	
23.5	7.31	2561.04	BNK
25.1	7.02	2561.33	BNK
25.8	6.77	2561.58	BKF
26.5	6.74	2561.61	GRND
27.5	6.59	2561.76	GRND
30.5	6.55	2561.80	GRND
33.5	6.46	2561.89	GRND
36.5	6.26	2562.09	GRND

Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

### Morgan Creek Stream Restoration Site

Haywood County, NC  
Pool Cross Section PL2

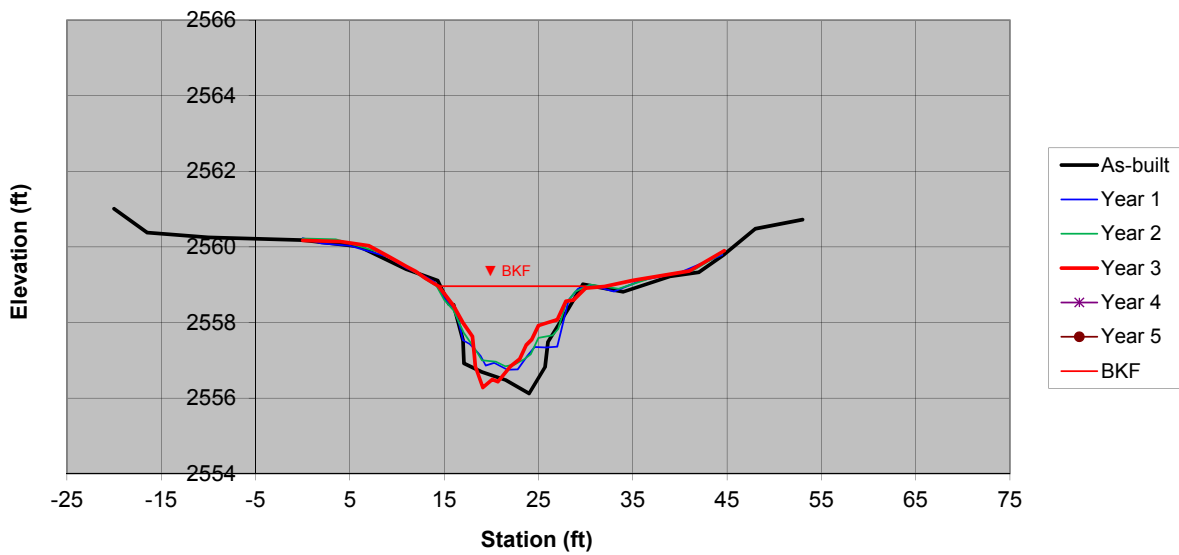
Reach 1 - Morgan Creek - Sta 21+17.8



Year 3

Facing Downstream

#### Pool Cross Section



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/28/10	Date	9/7/11	Date	0/0/0	Date	0/0/0
Area	26.5	Area	21.8	Area	20.2	Area	19.9	Area	0.0	Area	0.0
Bkf W	15.4	Bkf W	15.2	Bkf W	16.3	Bkf W	15.6	Bkf W	10	Bkf W	10
Dmean	1.7	Dmean	1.4	Dmean	1.2	Dmean	1.3	Dmean	0.0	Dmean	0.0
Dmax	2.9	Dmax	2.2	Dmax	2.1	Dmax	2.7	Dmax	0.0	Dmax	0.0
W/d	9.0	W/d	10.6	W/d	13.2	W/d	12.2	W/d	0.0	W/d	0.0

**Morgan Creek Stream Restoration Site**

Haywood County, NC

Pool Cross Section PL2

Reach 1 - Morgan Creek - Sta 21+17.8

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM HI	7.72	2562.65	RF2 IR Lt	BM HI	5.21	2562.41	RF2 IR RT	BM HI	7.52	2559.93	IR Lt
		2570.37				2567.62				2567.45	
-20	9.36	2561.01		0	7.39	2560.23	GRND	0	7.23	2560.22	GRND
-16.5	9.99	2560.38		2	7.53	2560.09	GRND	3.5	7.25	2560.20	GRND
-10	10.12	2560.25		5	7.59	2560.03	GRND	8.5	7.62	2559.83	GRND
0	10.19	2560.18	GRND	9	7.88	2559.74	GRND	11.5	8.06	2559.39	GRND
6	10.36	2560.01		11	8.18	2559.44	GRND	13.5	8.38	2559.07	GRND
11	10.96	2559.41		13	8.41	2559.21	GRND	14.2	8.49	2558.96	BKF
14.3	11.26	2559.11	BKF LT	14	8.55	2559.07	GRND	15	8.85	2558.60	BNK
15.5	11.88	2558.49		15	8.97	2558.65	BKF	16	9.13	2558.32	BNK
16	11.90	2558.47		15.4	9.07	2558.55	BNK	17.1	9.73	2557.72	BNK
17	12.84	2557.53	EOW	16	9.25	2558.37	BNK	18.2	10.13	2557.32	BED
17.1	13.45	2556.92		16.5	9.57	2558.05	BNK	18.6	10.28	2557.17	EOW
19	13.68	2556.69		17	10.09	2557.53	BNK	19	10.45	2557.00	BED
21.5	13.89	2556.48		17.7	10.19	2557.43	BNK	20.5	10.49	2556.96	BED
24	14.25	2556.12		18.6	10.42	2557.2	BNK	21.5	10.61	2556.84	BED
25.7	13.55	2556.82		18.9	10.52	2557.1	EOW	22.5	10.56	2556.89	BED
26	12.89	2557.48	EOW	19.4	10.76	2556.86	BED	23.5	10.42	2557.03	BED
28.2	12.00	2558.37		20.3	10.69	2556.93	BED	24.2	10.29	2557.16	EOW
29.7	11.36	2559.01	BKF RT	21.7	10.87	2556.75	BED	25	9.86	2557.59	BNK
34	11.56	2558.81		22.8	10.86	2556.76	BED	26.5	9.79	2557.66	BNK
39	11.15	2559.22		23.8	10.51	2557.11	EOW	27.1	9.62	2557.83	BNK
42	11.04	2559.33		24.6	10.27	2557.35	BNK	27.9	8.95	2558.50	BNK
44.6	10.59	2559.78	GRND	25.8	10.28	2557.34	BNK	28.9	8.64	2558.81	BKF
48	9.89	2560.48		27	10.26	2557.36	BNK	30.5	8.45	2559.00	GRND
53	9.65	2560.72		28.2	9.03	2558.59	BNK	33.5	8.56	2558.89	GRND
				29.2	8.73	2558.89	BKF	37.5	8.23	2559.22	GRND
				30.5	8.63	2558.99	GRND	41.5	8.06	2559.39	GRND
				33	8.80	2558.82	GRND	44.5	7.62	2559.83	GRND
				36	8.5	2559.12	GRND				
				40	8.3	2559.32	GRND				
				44.5	7.83	2559.79	GRND				

Year 3			
Station	FS/BS	Elev.	Desc.
BM HI	4.07	2560.35	IR Lt
		2564.42	
0	4.25	2560.17	GRND
4	4.28	2560.14	GRND
7	4.39	2560.03	GRND
9	4.66	2559.76	GRND
10	4.80	2559.62	GRND
11	4.94	2559.48	GRND
12	5.07	2559.35	GRND
13	5.25	2559.17	GRND
14.4	5.46	2558.96	BKF
16	5.98	2558.44	BNK
17	6.43	2557.99	BNK
18	6.79	2557.63	BED
18.2	7.29	2557.13	EOW
18.3	7.58	2556.84	
19.1	8.14	2556.28	
20.1	7.93	2556.49	
20.7	7.99	2556.43	
22	7.59	2556.83	
23	7.39	2557.03	
23.7	7.02	2557.40	
24.3	6.87	2557.55	
25	6.50	2557.92	
26	6.42	2558.00	
27	6.35	2558.07	BNK
27.9	5.86	2558.56	BNK
28.7	5.83	2558.59	BKF
30	5.51	2558.91	GRND
32	5.47	2558.95	GRND
35	5.31	2559.11	GRND
41	5.06	2559.36	GRND
44.7	4.52	2559.9	GRND

Year 4			
Station	FS/BS	Elev.	Desc.
BM HI	0.00	100.00	IR Lt
		100.00	

Year 5			
Station	FS/BS	Elev.	Desc.
BM HI	0.00	100.00	IR Lt
		100.00	



### Morgan Creek Stream Restoration Site

Haywood County, NC

Riffle Cross Section RF3

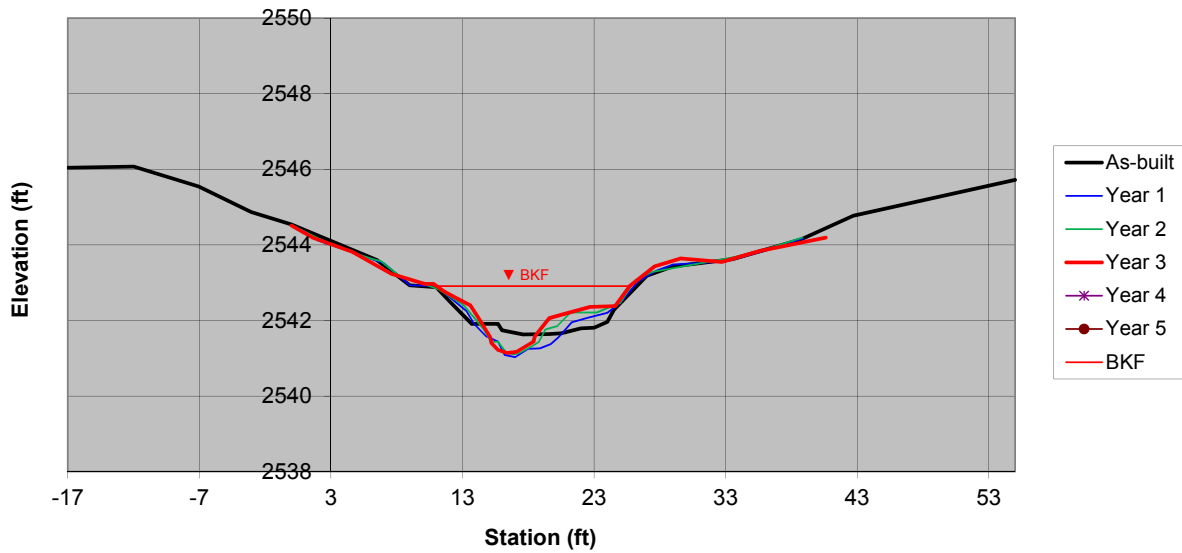
Reach 1 - Morgan Creek - Sta 25+19.6



Year 3

Facing Downstream

#### Riffle Cross Section



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/28/10	Date	9/8/11	Date	0/0/0	Date	0/0/0
Area	13.3	Area	15.3	Area	12.3	Area	12.4	Area	0.0	Area	0.0
Bkf W	15	Bkf W	14.6	Bkf W	14.9	Bkf W	14.9	Bkf W	10	Bkf W	10
Dmean	0.9	Dmean	1.0	Dmean	0.8	Dmean	0.8	Dmean	0.0	Dmean	0.0
Dmax	1.3	Dmax	1.9	Dmax	1.7	Dmax	1.8	Dmax	0.0	Dmax	0.0
W/d	16.9	W/d	14.0	W/d	18.0	W/d	18.0	W/d	0.0	W/d	0.0

**Morgan Creek Stream Restoration Site**

Haywood County, NC

Riffle Cross Section RF3

Reach 1 - Morgan Creek - Sta 25+19.6

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM	6.04	2544.75	RF3 IR Lt	BM	4.45	2544.75	RF3 IR Lt	BM	1.90	2546.72	IR Lt
HI		2550.79		HI		2549.20		HI		2548.62	
-17	4.75	2546.04		0	4.67	2544.53	GRND	0	4.09	2544.53	GRND
-12	4.72	2546.07		2	5.08	2544.12	GRND	3	4.62	2544.00	GRND
-7	5.25	2545.54		5	5.44	2543.76	GRND	6	4.98	2543.64	GRND
-3	5.93	2544.86		7	5.68	2543.52	GRND	6.8	5.05	2543.57	GRND
0	6.25	2544.54	GRND	9	6.27	2542.93	GRND	8.3	5.47	2543.15	GRND
6.5	7.19	2543.60		10	6.28	2542.92	GRND	10.1	5.66	2542.96	GRND
9	7.86	2542.93		11	6.29	2542.91	BKF	11.2	5.80	2542.82	BKF
11	7.91	2542.88	BKF LT	12	6.58	2542.62	BNK	13.1	6.22	2542.40	BNK
12	8.28	2542.51		12.5	6.72	2542.48	BNK	13.8	6.51	2542.11	BNK
13.7	8.88	2541.91		13.3	6.95	2542.25	BNK	14.6	6.85	2541.77	EOW
15.7	8.88	2541.91	EOW LT	13.9	7.30	2541.90	BED	15.2	7.19	2541.43	BED
16	9.05	2541.74		14.8	7.62	2541.58	EOW	15.7	7.18	2541.44	BED
17.6	9.16	2541.63		15.7	7.76	2541.44	BED	16.3	7.47	2541.15	BED
19.5	9.15	2541.64		16.2	8.11	2541.09	BED	16.9	7.52	2541.10	THL
20.5	9.13	2541.66		17	8.17	2541.03	BED	17.4	7.47	2541.15	BED
22	9.00	2541.79		18	7.95	2541.25	BED	18.3	7.30	2541.32	BED
23	8.98	2541.81	EOW RT	18.9	7.94	2541.26	BED	18.8	7.19	2541.43	BED
24	8.83	2541.96		19.7	7.83	2541.37	BED	19.3	6.86	2541.76	EOW
24.5	8.51	2542.28		20.3	7.64	2541.56	EOW	20.2	6.77	2541.85	BNK
27	7.61	2543.18	BKF RT	21.3	7.25	2541.95	BANK	21.2	6.41	2542.21	BNK
29	7.36	2543.43		22.6	7.12	2542.08	BANK	23.2	6.41	2542.21	BNK
33.5	7.17	2543.62		24	7.00	2542.20	BANK	25	6.15	2542.47	BNK
38.7	6.65	2544.14	GRND	25	6.73	2542.47	BANK	26.1	5.56	2543.06	BKF
42.7	6.02	2544.77		26.3	6.18	2543.02	BANK	27.4	5.34	2543.28	GRND
55	5.07	2545.72		27.7	5.89	2543.31	GRND	30.2	5.16	2543.46	GRND
				29	5.72	2543.48	GRND	33.7	4.94	2543.68	GRND
				33	5.64	2543.56	GRND	36	4.74	2543.88	GRND
				36	5.35	2543.85	GRND	38.8	4.43	2544.19	GRND
				38.9	5.03	2544.17	GRND				

Year 3			
Station	FS/BS	Elev.	Desc.
BM	5.14	2544.75	IR Lt
HI		2549.89	
0	5.38	2544.51	GRND
1.6	5.70	2544.19	GRND
4.6	6.07	2543.82	GRND
7.6	6.66	2543.23	GRND
10.1	6.92	2542.97	GRND
10.8	6.92	2542.97	BKF
11.6	7.12	2542.77	BNK
12.6	7.31	2542.58	BNK
13.6	7.49	2542.40	BNK
14.3	7.87	2542.02	BED
14.8	8.16	2541.73	BED
15.1	8.33	2541.56	EOW
15.2	8.49	2541.40	BED
15.7	8.67	2541.22	BED
16.4	8.75	2541.14	THL
17.1	8.72	2541.17	
18.4	8.45	2541.44	
18.5	8.31	2541.58	EOW
19.6	7.83	2542.06	
20.6	7.73	2542.16	
22.7	7.53	2542.36	
24.6	7.51	2542.38	
25.7	6.98	2542.91	BKF
27.6	6.46	2543.43	GRND
29.6	6.25	2543.64	GRND
32.7	6.34	2543.55	GRND
35.6	6.05	2543.84	GRND
37.6	5.91	2543.98	GRND
40.6	5.7	2544.19	GRND

Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

### Morgan Creek Stream Restoration Site

Haywood County, NC  
Pool Cross Section PL3

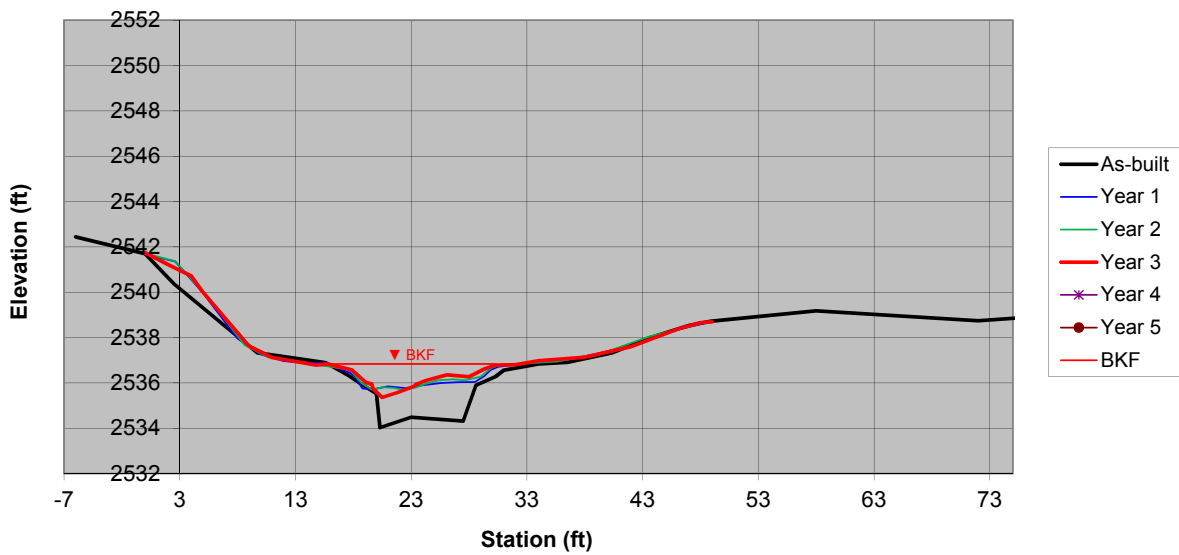
Reach 1 - Morgan Creek - Sta 27+30.4



Year 3

Facing Downstream

#### Pool Cross Section



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/28/10	Date	9/8/11	Date	0/0/0	Date	0/0/0
Area	25.5	Area	11.8	Area	10.0	Area	9.5	Area	0.0	Area	0.0
Bkf W	15.4	Bkf W	14.9	Bkf W	13.4	Bkf W	14.5	Bkf W	10	Bkf W	10
Dmean	1.7	Dmean	0.8	Dmean	0.7	Dmean	0.7	Dmean	0.0	Dmean	0.0
Dmax	2.9	Dmax	1.2	Dmax	1.1	Dmax	1.5	Dmax	0.0	Dmax	0.0
W/d	9.3	W/d	18.7	W/d	18.0	W/d	22.0	W/d	0.0	W/d	0.0

**Morgan Creek Stream Restoration Site**

Haywood County, NC

Pool Cross Section PL3

Reach 1 - Morgan Creek - Sta 27+30.4

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM	4.30	2541.87	PL3 IR Lt	BM	2.14	2541.87	PL3 IR Lt	BM	6.83	2538.88	IR Lt
		2546.17		HI		2544.01		HI		2545.71	
-6	3.73	2542.44		0	2.35	2541.66	GRND	0	4.00	2541.71	GRND
0	4.47	2541.70	GRND	2.6	2.65	2541.36	GRND	1.6	4.21	2541.50	GRND
2.5	5.80	2540.37		5	4.03	2539.98	GRND	2.6	4.34	2541.37	GRND
9.7	8.84	2537.33		8	6.05	2537.96	GRND	5.6	6.04	2539.67	GRND
15.6	9.28	2536.89	BKF LT	10	6.75	2537.26	GRND	8.6	8.04	2537.67	GRND
17.6	9.85	2536.32		12	7.05	2536.96	GRND	10.6	8.58	2537.13	GRND
18.8	10.26	2535.91	EOW	14	7.13	2536.88	GRND	14.6	8.89	2536.82	GRND
20	10.64	2535.53		15.6	7.13	2536.88	BKF	16.6	9.04	2536.67	GRND
20.3	12.14	2534.03		16.7	7.37	2536.64	BNK	17.4	9.09	2536.62	GRND
23	11.68	2534.49		17.7	7.56	2536.45	BNK	17.8	9.18	2536.53	BKF
27.5	11.85	2534.32		18.2	7.76	2536.25	BNK	18.7	9.71	2536.00	EOW
28.6	10.27	2535.90	EOW	18.5	8.04	2535.97	EOW	19.6	10.01	2535.70	BED
30.3	9.89	2536.28	BKF RT	18.8	8.25	2535.76	BED	20.6	9.90	2535.81	BED
31	9.61	2536.56		19.6	8.30	2535.71	BED	21.6	9.94	2535.77	BED
34	9.33	2536.84		21	8.16	2535.85	BED	22.3	10.02	2535.69	BED
36.5	9.26	2536.91		22.5	8.24	2535.77	BED	23.4	9.91	2535.80	BED
40.4	8.84	2537.33		24	8.11	2535.9	BED	24.5	9.71	2536.00	EOW
43.5	8.20	2537.97		25.6	8.01	2536	EOW	25.3	9.60	2536.11	BED
47	7.63	2538.54		27	7.98	2536.03	BED	26.6	9.55	2536.16	BED
48.9	7.45	2538.72	GRND	28.5	7.97	2536.04	BED	27.6	9.59	2536.12	BED
58	6.99	2539.18		29.3	7.72	2536.29	BNK	29	9.44	2536.27	BED
72	7.43	2538.74		29.9	7.43	2536.58	BNK	29.9	9.06	2536.65	BNK
86	6.93	2539.24		30.5	7.30	2536.71	BKF	30.8	8.89	2536.82	BKF
				31.5	7.24	2536.77	GRND	32.6	8.86	2536.85	GRND
				32.5	7.19	2536.82	GRND	35.6	8.77	2536.94	GRND
				34	7.11	2536.9	GRND	39.6	8.39	2537.32	GRND
				36	7.04	2536.97	GRND	43.6	7.66	2538.05	GRND
				39	6.73	2537.28	GRND	48.8	6.99	2538.72	GRND
				42	6.37	2537.64	GRND				
				46	5.66	2538.35	GRND				
				48.9	5.31	2538.7	GRND				

Year 3			
Station	FS/BS	Elev.	Desc.
BM	5.15	2541.87	IR Lt
HI		2547.02	
0	5.28	2541.74	GRND
2	5.80	2541.22	GRND
4	6.30	2540.72	GRND
5	7.01	2540.01	GRND
9	9.39	2537.63	GRND
11	9.90	2537.12	GRND
14.8	10.23	2536.79	GRND
15.8	10.18	2536.84	BKF
17.9	10.45	2536.57	BNK
19.1	11.00	2536.02	BNK
19.6	11.07	2535.95	EOW
19.7	11.26	2535.76	BED
20.5	11.66	2535.36	BED
21.9	11.43	2535.59	THL
23.3	11.16	2535.86	BED
23.4	11.09	2535.93	EOW
24.3	10.91	2536.11	BED
26.1	10.66	2536.36	
28	10.75	2536.27	
29.3	10.41	2536.61	BNK
30.3	10.23	2536.79	BKF
32	10.22	2536.80	GRND
34	10.04	2536.98	GRND
38	9.89	2537.13	GRND
42	9.42	2537.60	GRND
46	8.65	2538.37	GRND
48	8.36	2538.66	GRND
49	8.33	2538.69	GRND

Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

**Morgan Creek Stream Restoration Site**

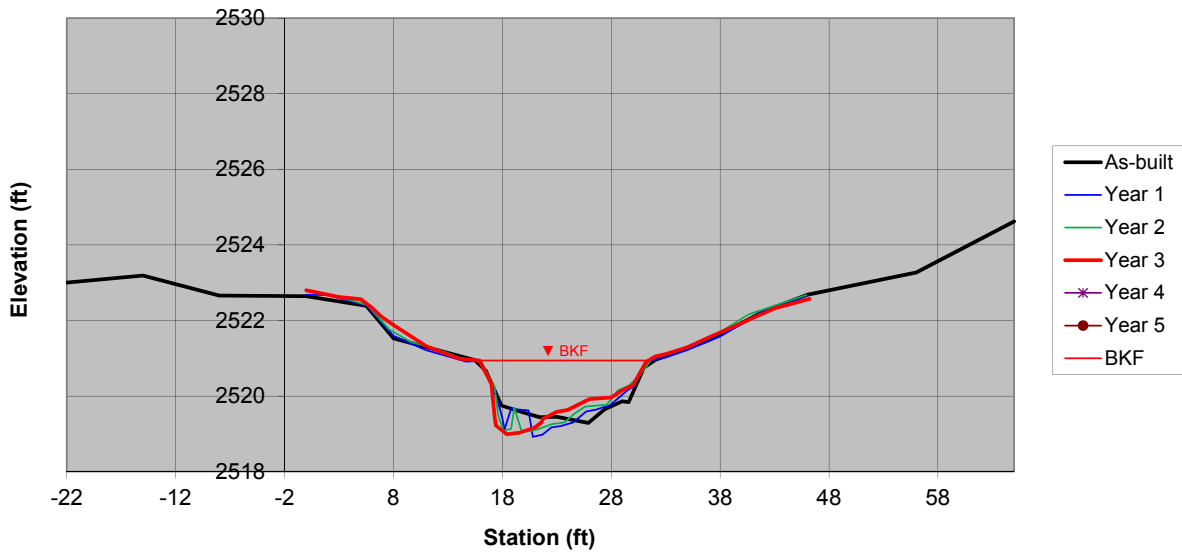
Haywood County, NC  
 Riffle Cross Section RF4  
 Reach 4 - Morgan Creek - Sta 32+57.6



Year 3

Facing Downstream

**Riffle Cross Section**



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/29/10	Date	9/8/11	Date	0/0/0	Date	0/0/0
Area	18.7	Area	19.1	Area	18.2	Area	18.3	Area	0.0	Area	0.0
Bkf W	16.5	Bkf W	15.7	Bkf W	15.7	Bkf W	15.3	Bkf W	10	Bkf W	10
Dmean	1.1	Dmean	1.2	Dmean	1.2	Dmean	1.2	Dmean	0.0	Dmean	0.0
Dmax	1.7	Dmax	2.0	Dmax	1.9	Dmax	2.0	Dmax	0.0	Dmax	0.0
W/d	14.5	W/d	12.9	W/d	13.5	W/d	12.8	W/d	0.0	W/d	0.0

**Morgan Creek Stream Restoration Site**

Haywood County, NC

Riffle Cross Section RF4

Reach 4 - Morgan Creek - Sta 32+57.6

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM	6.32	2522.86	RF4 IR Lt	BM	4.19	2522.86	RF4 IR Lt	BM	6.46	2522.90	IR Lt
HI		2529.18		HI		2527.05		HI		2529.36	
-22	6.18	2523.00		0	4.37	2522.68	GRND	0	6.58	2522.78	GRND
-15	5.99	2523.19		2	4.38	2522.67	GRND	2.6	6.71	2522.65	GRND
-8	6.52	2522.66		5.6	4.66	2522.39	GRND	5.6	6.95	2522.41	GRND
0	6.54	2522.64	GRND	8	5.46	2521.59	GRND	7.6	7.60	2521.76	GRND
5.5	6.79	2522.39		11	5.84	2521.21	GRND	9.6	7.93	2521.43	GRND
8	7.65	2521.53		14.7	6.14	2520.91	GRND	12.6	8.18	2521.18	GRND
15.5	8.23	2520.95	BKF LT	16	6.12	2520.93	BKF	14.6	8.41	2520.95	GRND
16.5	8.51	2520.67		16.3	6.30	2520.75	BNK	15.6	8.40	2520.96	GRND
17.9	9.43	2519.75	EOW LT	17	6.67	2520.38	BNK	16.1	8.46	2520.90	BKF
19.5	9.58	2519.60		17.6	7.21	2519.84	BNK	17.3	9.13	2520.23	BNK
21.4	9.74	2519.44		18	7.63	2519.42	EOW	17.6	9.85	2519.51	EOW
23	9.73	2519.45		18.2	7.93	2519.12	BED	18.1	10.28	2519.08	BED
25.9	9.89	2519.29		18.8	7.39	2519.66	BED	18.8	10.23	2519.13	BED
27.4	9.53	2519.65	EOW RT	20.4	7.43	2519.62	BED	19.1	9.67	2519.69	ROCK
29	9.32	2519.86		20.8	8.13	2518.92	BED	19.8	10.32	2519.04	BED
29.6	9.34	2519.84		21.7	8.07	2518.98	BED	21	10.26	2519.10	BED
31	8.43	2520.75		22.5	7.88	2519.17	BED	22.6	10.10	2519.26	BED
32	8.23	2520.95	BKF RT	23.4	7.84	2519.21	BED	23.7	10.06	2519.30	EOW
37	7.70	2521.48		24.5	7.75	2519.30	EOW	24.6	9.83	2519.53	BED
42	6.94	2522.24		25.7	7.46	2519.59	BED	25.6	9.64	2519.72	BED
46	6.50	2522.68	GRND	26.6	7.41	2519.64	BED	27.6	9.59	2519.77	BED
56	5.91	2523.27		27.9	7.29	2519.76	BED	28.6	9.21	2520.15	BNK
65	4.56	2524.62		29.4	6.92	2520.13	BNK	29.6	9.09	2520.27	BNK
				30.1	6.79	2520.26	BNK	30.6	8.82	2520.54	BNK
				31	6.27	2520.78	BNK	31.8	8.35	2521.01	BKF
				31.7	6.11	2520.94	BKF	32.6	8.29	2521.07	GRND
				33	6.03	2521.02	GRND	34.6	8.09	2521.27	GRND
				35	5.83	2521.22	GRND	37.6	7.74	2521.62	GRND
				38	5.47	2521.58	GRND	40.6	7.20	2522.16	GRND
				40	5.14	2521.91	GRND	45.9	6.69	2522.67	GRND
				42	4.79	2522.26	GRND				
				45	4.52	2522.53	GRND				
				46	4.38	2522.67	GRND				

Year 3			
Station	FS/BS	Elev.	Desc.
BM	4.89	2522.86	IR Lt
HI		2527.75	
0	4.95	2522.80	GRND
3	5.13	2522.62	GRND
5	5.19	2522.56	GRND
6	5.41	2522.34	GRND
6.9	5.65	2522.10	GRND
8	5.87	2521.88	GRND
11	6.43	2521.32	GRND
14	6.76	2520.99	GRND
15.9	6.81	2520.94	BKF
17	7.43	2520.32	BNK
17.3	8.33	2519.42	EOW
17.4	8.53	2519.22	BED
18.4	8.76	2518.99	BED
19.6	8.72	2519.03	THL
21	8.58	2519.17	BED
21.6	8.45	2519.30	BED
21.7	8.36	2519.39	EOW
23	8.17	2519.58	BED
24	8.12	2519.63	BED
26	7.83	2519.92	
28	7.79	2519.96	
29	7.60	2520.15	
30	7.46	2520.29	
31.2	6.85	2520.90	BKF
32	6.71	2521.04	
33	6.64	2521.11	GRND
35	6.46	2521.29	GRND
37	6.19	2521.56	GRND
39	5.94	2521.81	GRND
43	5.43	2522.32	GRND
46.2	5.18	2522.57	GRND

Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

**Morgan Creek Stream Restoration Site**

Haywood County, NC  
Pool Cross Section PL4

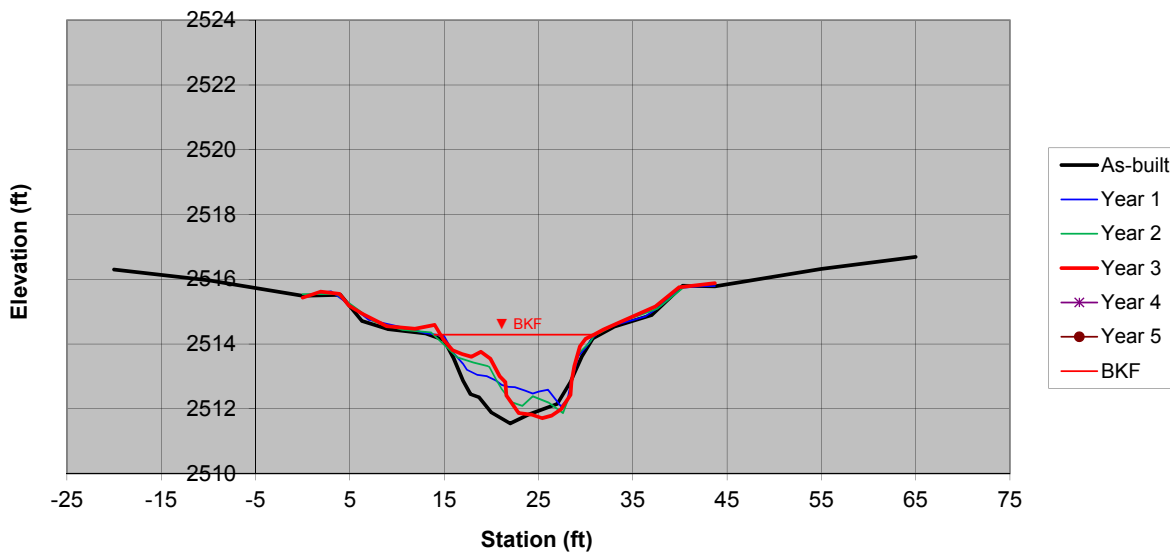
Reach 1 - Morgan Creek - Sta 34+76.9



Year 3

Facing Downstream

**Pool Cross Section**



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/29/10	Date	9/8/11	Date	0/0/0	Date	0/0/0
Area	26.1	Area	18.3	Area	20.8	Area	21.8	Area	0.0	Area	0.0
Bkf W	15.8	Bkf W	15.4	Bkf W	16.9	Bkf W	16.9	Bkf W	10	Bkf W	10
Dmean	1.7	Dmean	1.2	Dmean	1.2	Dmean	1.3	Dmean	0.0	Dmean	0.0
Dmax	2.6	Dmax	2.1	Dmax	2.4	Dmax	2.6	Dmax	0.0	Dmax	0.0
W/d	9.5	W/d	13.0	W/d	13.7	W/d	13.1	W/d	0.0	W/d	0.0

**Morgan Creek Stream Restoration Site**

Haywood County, NC

Pool Cross Section PL4

Reach 1 - Morgan Creek - Sta 34+76.9

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM HI	6.05	2515.67	PL4 IR Lt	BM HI	5.40	2515.67	PL4 IR Lt	BM HI	7.79	2515.99	IR Lt
		2521.72				2521.07				2523.78	
-20	5.42	2516.30		0	5.63	2515.44	GRND	0	8.24	2515.54	GRND
-10	5.75	2515.97		1	5.53	2515.54	GRND	3.6	8.24	2515.54	GRND
0	6.23	2515.49	GRND	3	5.44	2515.63	GRND	7.6	9.09	2514.69	GRND
4	6.20	2515.52		5	5.86	2515.21	GRND	10.6	9.34	2514.44	GRND
6.3	7.01	2514.71		7	6.32	2514.75	GRND	13.6	9.42	2514.36	GRND
9	7.26	2514.46		10	6.52	2514.55	GRND	16.4	10.19	2513.59	GRND
13	7.39	2514.33		13	6.73	2514.34	GRND	18.1	10.35	2513.43	GRND
15	7.60	2514.12	BKF LT	15	6.82	2514.25	GRND	19.6	10.46	2513.32	GRND
16	8.15	2513.57		15.3	6.98	2514.09	BKF	19.8	10.49	2513.29	BKF
17	8.85	2512.87	EOW	16	7.35	2513.72	BNK	20.5	10.87	2512.91	EOW
17.8	9.27	2512.45		17	7.68	2513.39	BNK	21.1	11.17	2512.61	BED
18.7	9.36	2512.36		17.4	7.86	2513.21	BED	22.2	11.58	2512.20	BED
20	9.83	2511.89		18.5	8.02	2513.05	BED	23.3	11.69	2512.09	BED
22	10.17	2511.55		19.5	8.06	2513.01	BED	24.4	11.39	2512.39	BED
24	9.89	2511.83		20.5	8.20	2512.87	BED	26.1	11.59	2512.19	BED
27	9.57	2512.15		21.1	8.33	2512.74	EOW	27.6	11.91	2511.87	BED
28.4	8.89	2512.83	EOW	21.8	8.39	2512.68	BED	28.3	11.36	2512.42	BED
29.6	8.10	2513.62		22.5	8.40	2512.67	BED	28.6	10.83	2512.95	EOW
30.8	7.54	2514.18	BKF RT	23.6	8.51	2512.56	BED	29.1	10.12	2513.66	BNK
33	7.19	2514.53		24.4	8.60	2512.47	BED	30.5	9.71	2514.07	BNK
37	6.83	2514.89		25	8.54	2512.53	BED	30.9	9.52	2514.26	BKF
40.3	5.92	2515.80		26	8.48	2512.59	BED	31.6	9.42	2514.36	GRND
43.7	5.94	2515.78	GRND	27.4	9.00	2512.07	BED	33.6	9.11	2514.67	GRND
55	5.40	2516.32		28.1	8.77	2512.3	BED	37.6	8.69	2515.09	GRND
65	5.03	2516.69		28.4	8.32	2512.75	EOW	40.6	7.98	2515.80	GRND
				29.1	7.58	2513.49	BNK	43.7	7.92	2515.86	GRND
				29.2	7.45	2513.62	BNK				
				30	7.18	2513.89	BNK				
				30.7	6.89	2514.18	BKF				
				31.3	6.73	2514.34	GRND				
				33	6.49	2514.58	GRND				
				35	6.33	2514.74	GRND				
				36.3	6.22	2514.85	GRND				
				38	5.88	2515.19	GRND				
				40	5.34	2515.73	GRND				
				42	5.29	2515.78	GRND				
				43.7	5.28	2515.79	GRND				

Year 3			
Station	FS/BS	Elev.	Desc.
BM HI	5.10	2515.67	IR Lt
		2520.77	
0	5.34	2515.43	GRND
1.9	5.15	2515.62	GRND
3.9	5.22	2515.55	GRND
4.9	5.58	2515.19	GRND
6.3	5.83	2514.94	GRND
8.9	6.22	2514.55	GRND
11.9	6.30	2514.47	GRND
14	6.18	2514.59	BKF
14.9	6.62	2514.15	BNK
15.9	6.96	2513.81	BNK
16.9	7.08	2513.69	BED
17.9	7.16	2513.61	BED
18.9	7.01	2513.76	BED
19.9	7.22	2513.55	BED
20.9	7.77	2513.00	BED
21.5	7.95	2512.82	EOW
21.6	8.36	2512.41	BED
22.9	8.90	2511.87	
24.3	8.95	2511.82	
25.4	9.06	2511.71	THL
26.4	8.98	2511.79	BED
27.4	8.78	2511.99	BED
28.4	8.34	2512.43	BED
28.5	7.94	2512.83	EOW
28.8	7.45	2513.32	BNK
29.4	6.84	2513.93	BNK
30	6.61	2514.16	BKF
30.9	6.48	2514.29	BNK
31.9	6.32	2514.45	GRND
33.9	6.06	2514.71	GRND
37.4	5.61	2515.16	GRND
39.9	5.02	2515.75	GRND
43.7	4.89	2515.88	GRND

Year 4			
Station	FS/BS	Elev.	Desc.
BM HI	0.00	100.00	IR Lt
		100.00	

Year 5			
Station	FS/BS	Elev.	Desc.
BM HI	0.00	100.00	IR Lt
		100.00	



**Morgan Creek Stream Restoration Site**

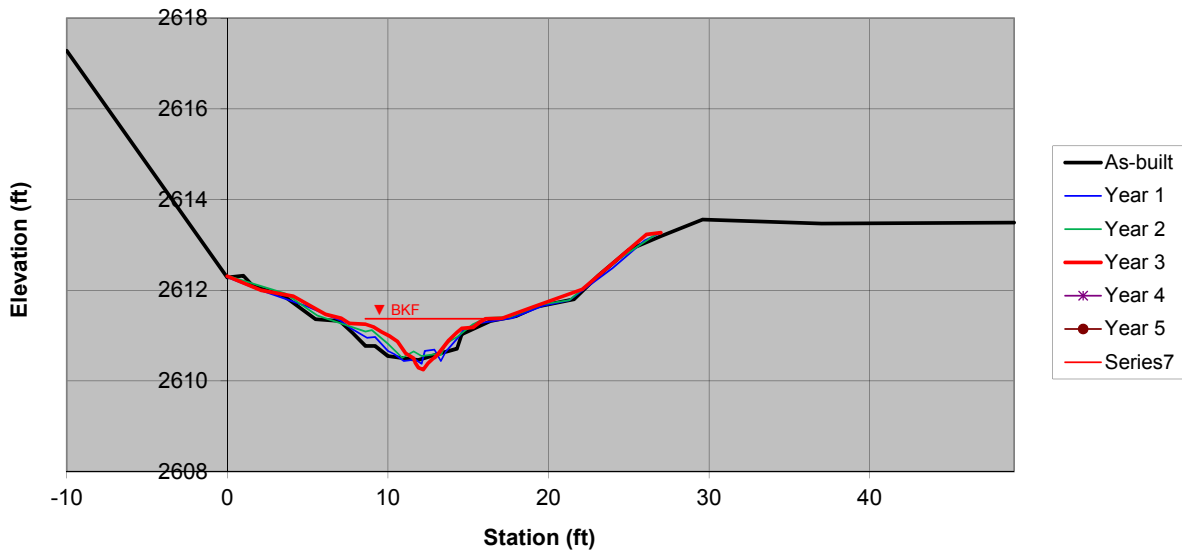
Haywood County, NC  
 Riffle Cross Section RF5  
 Reach 2 - North Branch - Sta 10+83.0



Year 3

Facing Downstream

**Riffle Cross Section**



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/29/10	Date	9/8/11	Date	0/0/0	Date	0/0/0
Area	5.0	Area	4.5	Area	3.9	Area	3.7	Area	0.0	Area	0.0
Bkf W	9.4	Bkf W	8.6	Bkf W	7.1	Bkf W	7.5	Bkf W	10	Bkf W	10
Dmean	0.5	Dmean	0.5	Dmean	0.6	Dmean	0.5	Dmean	0.0	Dmean	0.0
Dmax	0.9	Dmax	1.0	Dmax	0.9	Dmax	1.1	Dmax	0.0	Dmax	0.0
W/d	17.7	W/d	16.5	W/d	12.9	W/d	15.2	W/d	0.0	W/d	0.0



**Morgan Creek Stream Restoration Site**

Haywood County, NC

Pool Cross Section PL5

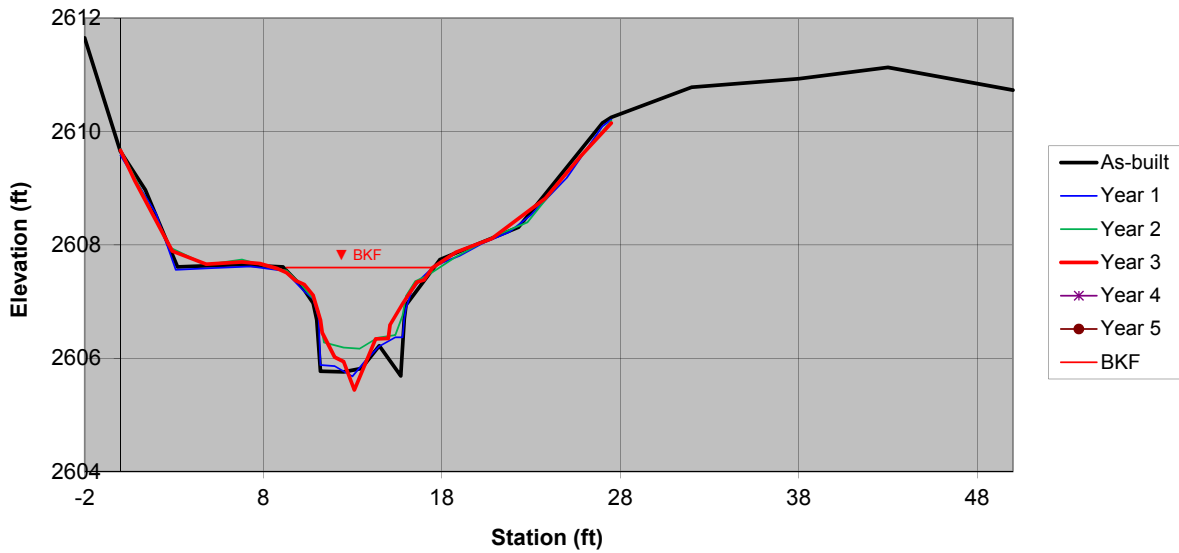
Reach 2 -North Branch - Sta 11+51.4



Year 3

Facing Downstream

**Pool Cross Section**



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/29/10	Date	9/8/11	Date	0/0/0	Date	0/0/0
Area	9.6	Area	8.7	Area	6.7	Area	7.8	Area	0.0	Area	0.0
Bkf W	8.8	Bkf W	8.4	Bkf W	7.9	Bkf W	8.2	Bkf W	10	Bkf W	10
Dmean	1.1	Dmean	1.0	Dmean	0.9	Dmean	1.0	Dmean	0.0	Dmean	0.0
Dmax	1.9	Dmax	1.9	Dmax	1.4	Dmax	2.2	Dmax	0.0	Dmax	0.0
W/d	8.1	W/d	8.1	W/d	9.3	W/d	8.6	W/d	0.0	W/d	0.0

**Morgan Creek Stream Restoration Site**

Haywood County, NC

Pool Cross Section PL5

Reach 2 -North Branch - Sta 11+51.4

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM	7.55	2612.59	RF5 IR Lt	BM	2.31	2617.00	BP IR Rt	BM	2.70	2617.00	IR Lt
HI		2620.14		HI		2619.31		HI		2619.70	
-2	8.49	2611.65		0	9.73	2609.58	GRND	0	10.01	2609.69	GRND
0	10.49	2609.65	GRND	2	10.76	2608.55	"	2.8	11.75	2607.95	GRND
1.4	11.17	2608.97		3.1	11.75	2607.56	"	4.8	12.05	2607.65	GRND
3.2	12.53	2607.61		5	11.72	2607.59	"	6.8	11.96	2607.74	GRND
6.5	12.49	2607.65		7.3	11.69	2607.62	"	8.8	12.13	2607.57	GRND
9.1	12.53	2607.61	BKF LT	9.2	11.77	2607.54	BKF	9.3	12.15	2607.55	BKF
10.2	12.89	2607.25		10.3	12.13	2607.18	BNK	10	12.36	2607.34	BNK
10.8	13.17	2606.97		10.8	12.26	2607.05	BNK	10.8	12.65	2607.05	BNK
11	13.46	2606.68	EOW	11.1	12.60	2606.71	EOW	11.1	12.88	2606.82	EOW
11.2	14.37	2605.77		11.2	13.43	2605.88	BED	11.4	13.42	2606.28	BED
12.5	14.38	2605.76		12	13.45	2605.86	"	12.5	13.51	2606.19	BED
13.5	14.32	2605.82		13	13.63	2605.68	"	13.4	13.53	2606.17	BED
14.5	13.92	2606.22		13.7	13.36	2605.95	"	14.4	13.34	2606.36	BED
15.7	14.45	2605.69		14.5	13.10	2606.21	"	15.4	13.29	2606.41	BED
15.9	13.45	2606.69	EOW	15.4	12.94	2606.37	"	15.8	12.95	2606.75	EOW
16	13.20	2606.94		15.8	12.94	2606.37	"	16	12.60	2607.10	BNK
17.9	12.40	2607.74	BKF RT	15.9	12.61	2606.7	EOW	16.5	12.35	2607.35	BKF
22.3	11.83	2608.31		16	12.43	2606.88	BNK	17.2	12.24	2607.46	GRND
27	9.99	2610.15		16.3	12.13	2607.18	BNK	18.8	11.91	2607.79	GRND
27.5	9.89	2610.25	GRND	16.8	11.92	2607.39	BNK	20.8	11.57	2608.13	GRND
32	9.36	2610.78		17.6	11.68	2607.63	BKF	22.8	11.30	2608.40	GRND
38	9.21	2610.93		19	11.50	2607.81	GRND	25.3	10.32	2609.38	GRND
43	9.01	2611.13		20.3	11.28	2608.03	"	27.5	9.51	2610.19	GRND
50	9.41	2610.73		21.8	11.08	2608.23	"				
				23	10.78	2608.53	"				
				25	10.13	2609.18	"				
				27	9.22	2610.09	"				
				27.5	9.1	2610.21	"				

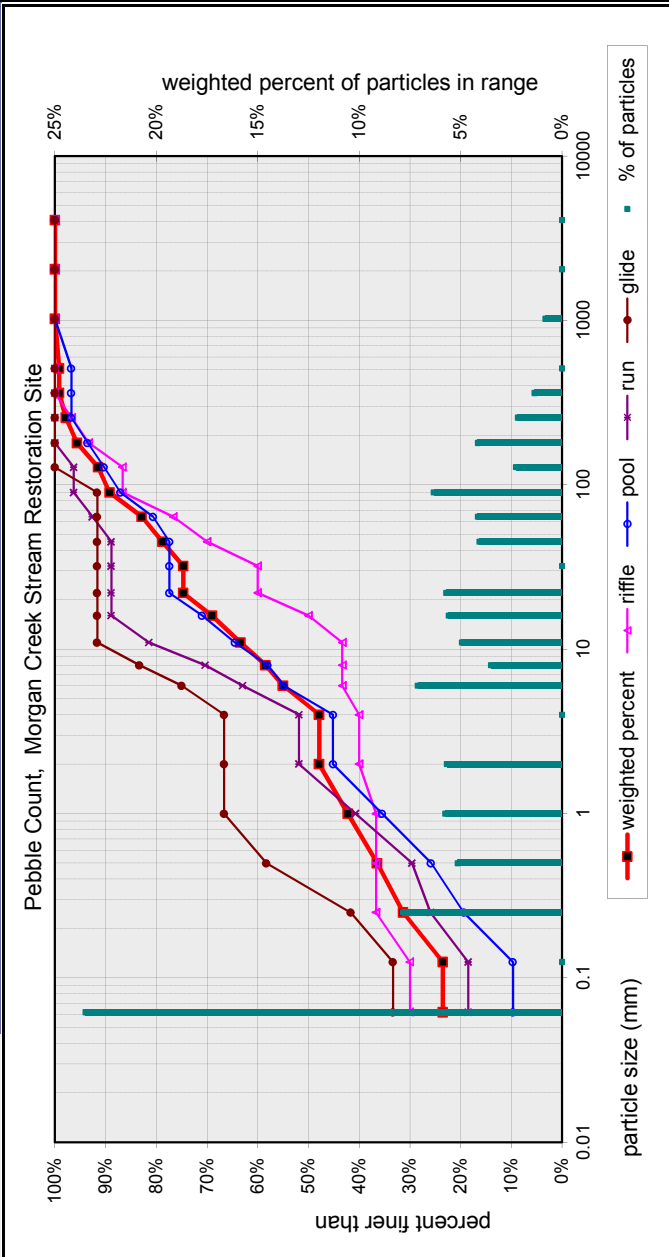
Year 3			
Station	FS/BS	Elev.	Desc.
BM	6.48	2609.77	IR Lt
HI		2616.25	
0	6.58	2609.67	GRND
0.8	7.12	2609.13	GRND
2.9	8.36	2607.89	GRND
4.8	8.59	2607.66	GRND
6.8	8.55	2607.70	GRND
7.8	8.58	2607.67	GRND
8.8	8.67	2607.58	GRND
9.3	8.74	2607.51	BKF
9.8	8.88	2607.37	BNK
10.3	8.95	2607.30	BNK
10.8	9.14	2607.11	BNK
11.2	9.57	2606.68	EOW
11.3	9.80	2606.45	BED
12	10.23	2606.02	BED
12.5	10.31	2605.94	BED
13.1	10.81	2605.44	THL
14.3	9.91	2606.34	BED
15	9.90	2606.35	BED
15.1	9.66	2606.59	EOW
15.8	9.29	2606.96	BNK
16.6	8.91	2607.34	BNK
17	8.87	2607.38	BNK
17.5	8.65	2607.60	BKF
18.8	8.38	2607.87	GRND
20.8	8.14	2608.11	GRND
23.8	7.43	2608.82	GRND
25.8	6.68	2609.57	GRND
27.5	6.1	2610.15	GRND

Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

Pebble Count Weighted by Channel Feature			
Percent Riffle:	40.4	Percent Run:	17.2
Percent Pool:	25.3	Percent Glide:	17.2

Material		Size Range (mm)	weighted
silt/clay		0	0.062
very fine sand		0.062	0.13
fine sand		0.13	0.25
medium sand		0.25	0.5
coarse sand		0.5	1
very coarse sand		1	2
very fine gravel		2	4
fine gravel		4	6
fine gravel		6	8
medium gravel		8	11
medium gravel		11	16
coarse gravel		16	22
coarse gravel		22	32
very coarse gravel		32	45
very coarse gravel		45	64
small cobble		64	90
medium cobble		90	128
large cobble		128	180
very large cobble		180	256
small boulder		256	362
small boulder		362	512
medium boulder		512	1024
large boulder		1024	2048
very large boulder		2048	4096



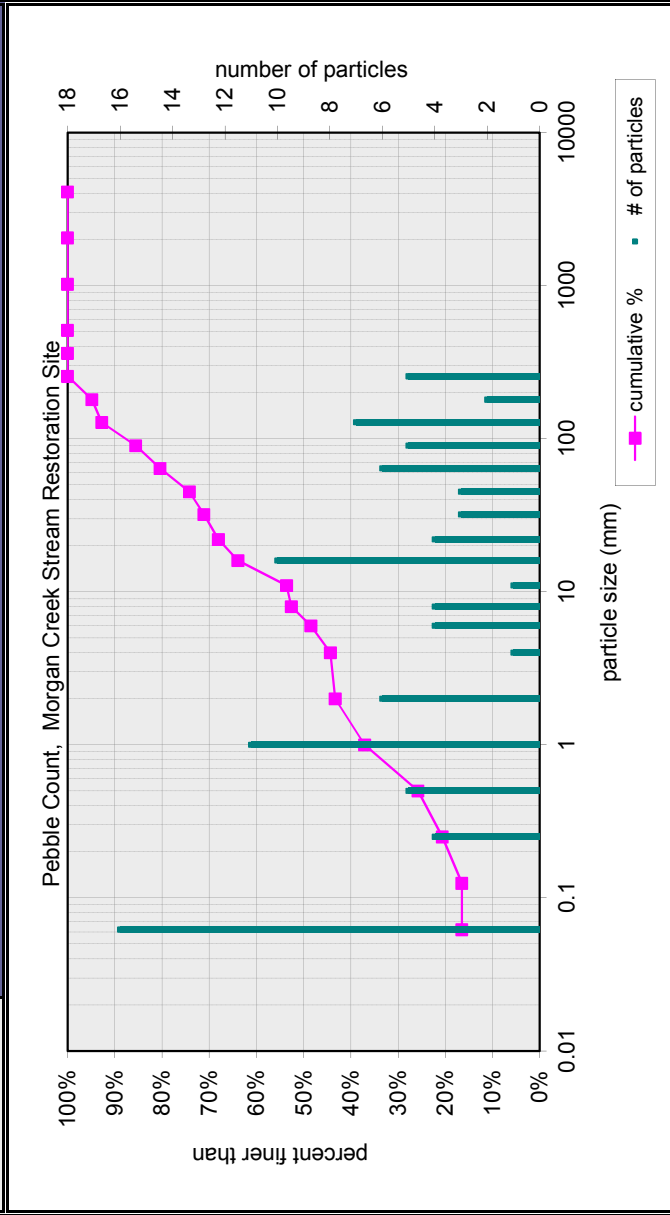
based on sediment particles only	size percent less than (mm)					particle size distribution						
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev			
based on total count	0.062	0.41	4.5	12	68	171	43.9	2.1	33.1			
	percent by substrate type					bedrock		wood/det		artificial		
					silt/clay	sand	gravel	cobble	boulder	hardpan	wood/det	artificial
					23%	24%	35%	15%	2%	0%	0%	0%

weighted particle count:		99.5
bedrock		0.6
clay hardpan		0.0
detritus/wood		0.0
artificial		0.0
weighted total count:		100.1

**Pebble Count of Channel Reach**

Material	Size Range (mm)	Count
silt/clay	0	16
very fine sand	0.062	4
fine sand	0.13	5
medium sand	0.25	11
coarse sand	0.5	6
very coarse sand	1	1
very fine gravel	2	4
fine gravel	4	4
fine gravel	6	4
medium gravel	8	1
medium gravel	11	10
coarse gravel	16	4
coarse gravel	22	3
coarse gravel	32	3
very coarse gravel	45	6
very coarse gravel	64	5
small cobble	90	7
medium cobble	128	2
large cobble	180	5
very large cobble	256	
small boulder	362	
small boulder	512	
medium boulder	1024	
large boulder	2048	
very large boulder	4096	
total particle count:		97

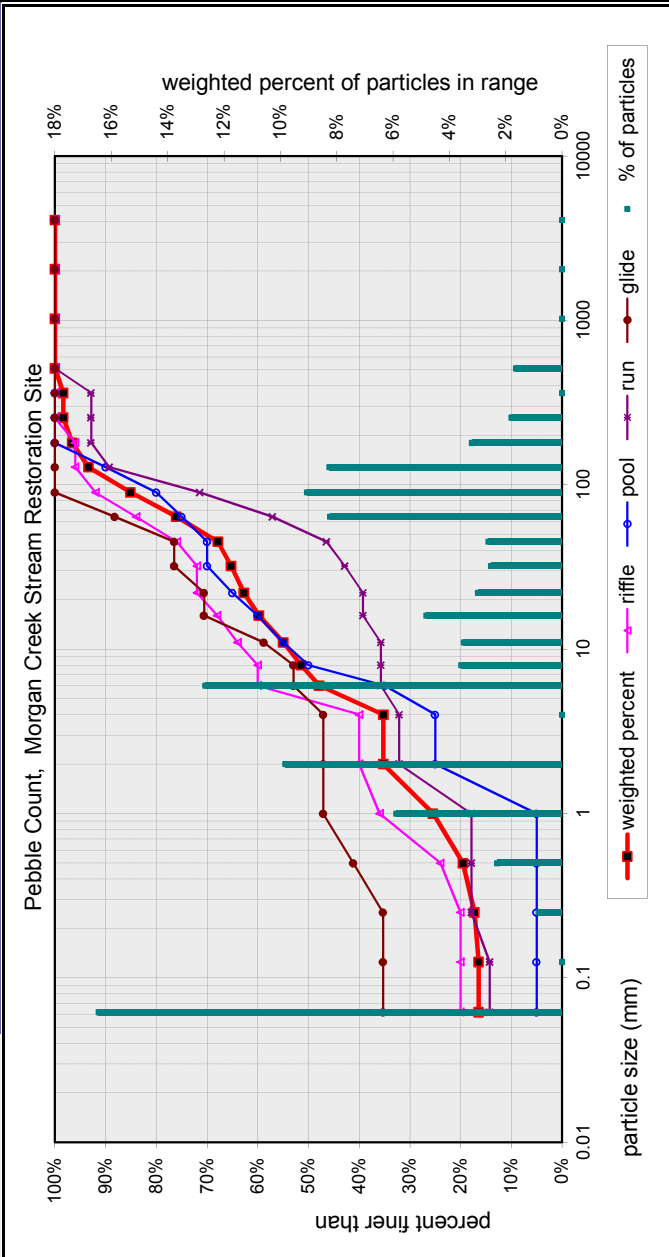
Morgan Creek Stream Restoration Site  
 Haywood County, NC  
 Morgan Creek: Reach 1  
 Note: Riffle RF-1



based on sediment particles only	size percent less than (mm)					particle size distribution gradation			std dev
	D16	D35	D50	D65	D84	D95	geo mean	std dev	
	0.062	0.88	6.7	17	81	182	60.0	2.2	36.2
based on total count	percent by substrate type					hardpan	wood/det	artificial	
	silt/clay	sand	gravel	cobble	boulder	bedrock			
	16%	27%	37%	20%	0%	0%	0%	0%	0%

Pebble Count Weighted by Channel Feature			
Percent Riffle:	44.8	Percent Run:	22.9
Percent Pool:	23.8	Percent Glide:	8.6

Material	Size Range (mm)	weighted
silt/clay	0 - 0.062	16.5
very fine sand	0.062 - 0.13	0.0
fine sand	0.13 - 0.25	0.8
medium sand	0.25 - 0.5	2.3
coarse sand	0.5 - 1	5.9
very coarse sand	1 - 2	9.8
very fine gravel	2 - 4	0.0
fine gravel	4 - 6	12.7
fine gravel	6 - 8	3.6
medium gravel	8 - 11	3.5
medium gravel	11 - 16	4.8
coarse gravel	16 - 22	3.0
coarse gravel	22 - 32	2.5
very coarse gravel	32 - 45	2.6
very coarse gravel	45 - 64	8.2
small cobble	64 - 90	9.1
medium cobble	90 - 128	8.3
large cobble	128 - 180	3.2
very large cobble	180 - 256	1.8
small boulder	256 - 362	0.0
small boulder	362 - 512	1.6
medium boulder	512 - 1024	0.0
large boulder	1024 - 2048	0.0
very large boulder	2048 - 4096	0.0



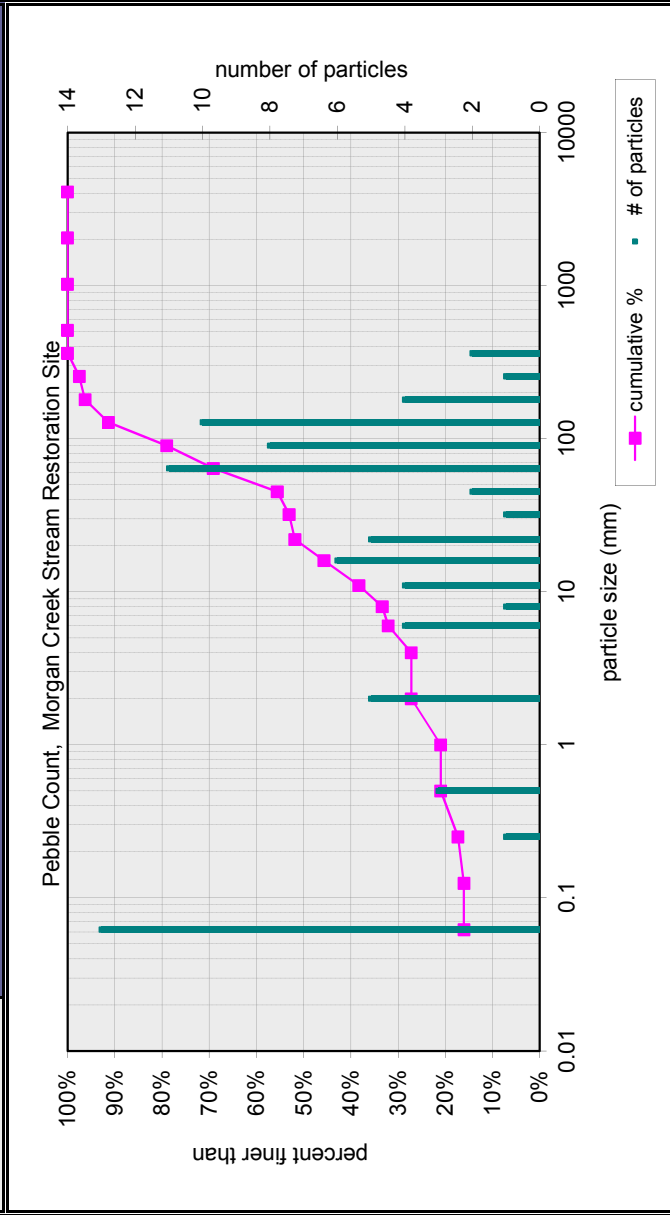
based on sediment particles only	D16	D35	D50	D65	D84	D95	particle size distribution gradation geo mean	std dev
	0.062	1.97	7.1	31	86	152	63.4	2.3
based on total count	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det
	16%	19%	41%	22%	2%	0%	0%	0%
								artificial
								0%
								37.3

bedrock	0.0
clay hardpan	0.0
detritus/wood	0.0
artificial	0.0
weighted total count:	100.1

**Pebble Count of Channel Reach**

Material	Size Range (mm)	Count
silt/clay	0	13
very fine sand	0.062	1
fine sand	0.13	3
medium sand	0.25	5
coarse sand	0.5	4
very coarse sand	1	1
very fine gravel	2	6
fine gravel	4	1
fine gravel	6	4
medium gravel	8	11
medium gravel	11	6
medium gravel	16	5
coarse gravel	22	1
coarse gravel	32	2
coarse gravel	45	11
very coarse gravel	64	8
small cobble	90	10
medium cobble	128	4
large cobble	180	1
very large cobble	256	2
small boulder	362	
small boulder	512	
medium boulder	1024	
large boulder	2048	
very large boulder	4096	
total particle count:		81

Morgan Creek Stream Restoration Site  
 Haywood County, NC  
 Morgan Creek: Reach 2  
 Note: Riffle RF2



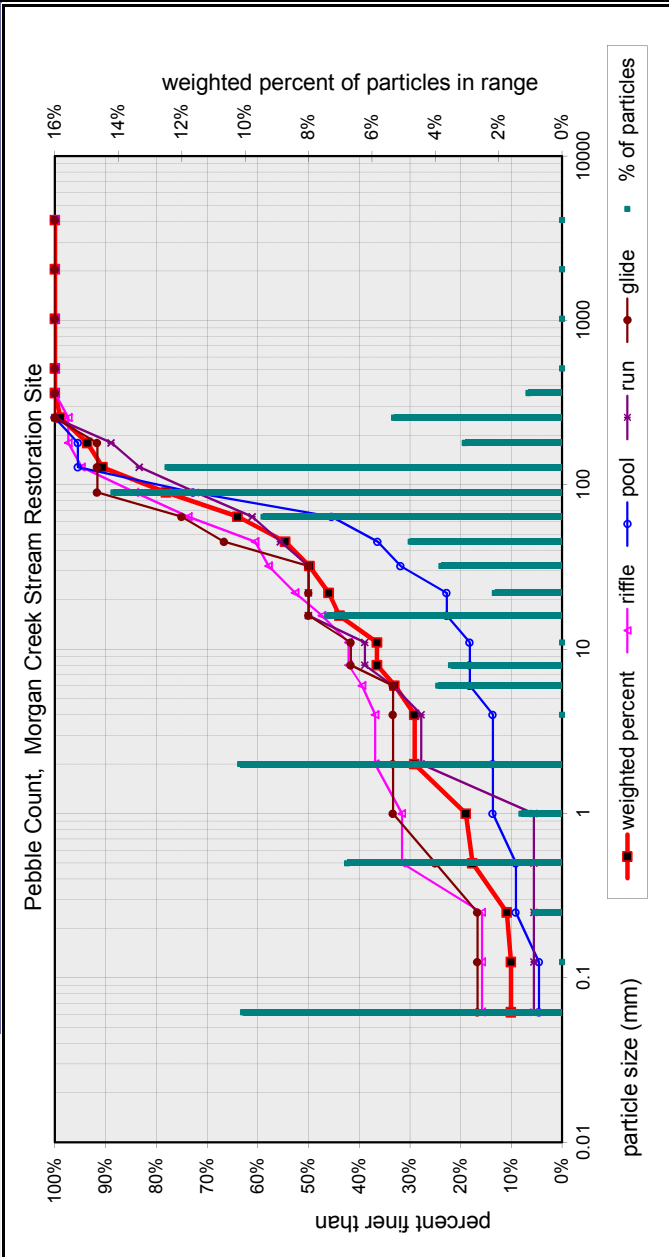
based on sediment particles only	D16	D35	D50	D65	D84	D95	particle size distribution gradation geo mean	std dev
	0.062	8.91	20.0	57	104	165	163.8	40.9
based on total count	percent by substrate type		cobble		boulder		artificial	
	silt/clay	sand	gravel	28%	2%	0%	0%	0%
	16%	11%	42%					

bedrock	
clay hardpan	
detritus/wood	
artificial	
total count:	81



Pebble Count Weighted by Channel Feature			
Percent Riffle:	38.6	Percent Run:	38.6
Percent Pool:	17.8	Percent Glide:	5

Material	Size Range (mm)	weighted
silt/clay	0	0.062
very fine sand	0.062	0.13
fine sand	0.13	0.25
medium sand	0.25	0.5
coarse sand	0.5	1
very coarse sand	1	2
very fine gravel	2	4
fine gravel	4	6
fine gravel	6	8
medium gravel	8	11
medium gravel	11	16
coarse gravel	16	22
coarse gravel	22	32
very coarse gravel	32	45
very coarse gravel	45	64
small cobble	64	90
medium cobble	90	128
large cobble	128	180
very large cobble	180	256
small boulder	256	362
small boulder	362	512
medium boulder	512	1024
large boulder	1024	2048
very large boulder	2048	4096



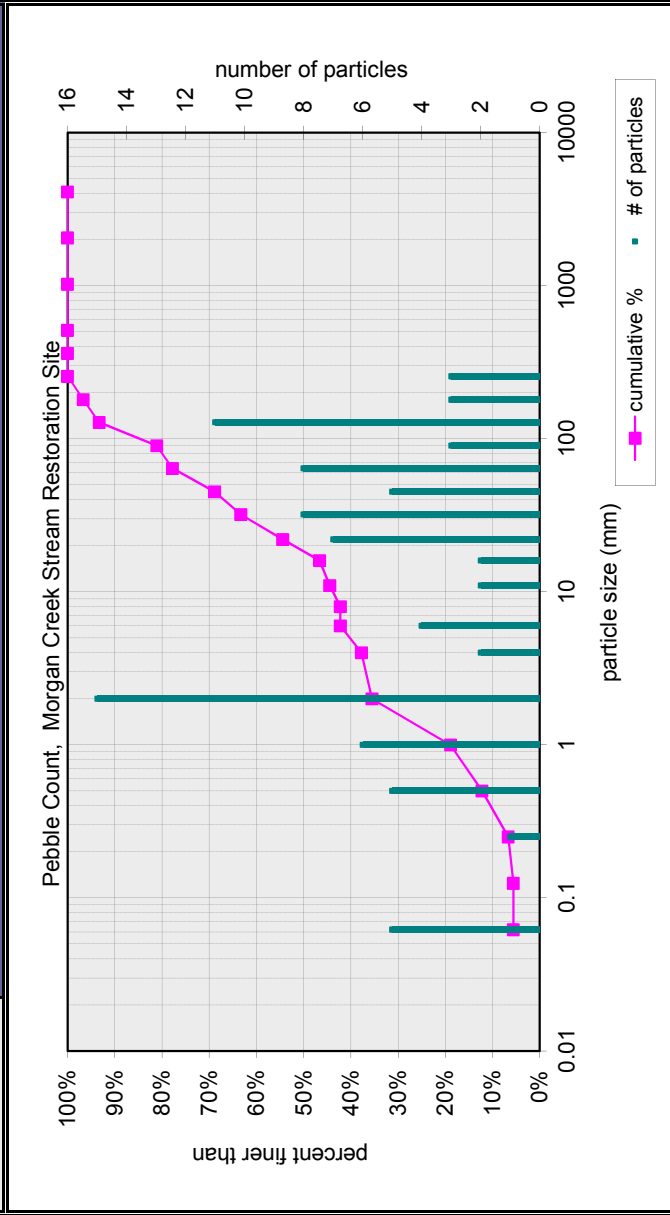
based on sediment particles only	D16	D35	D50	D65	D84	D95	particle size distribution gradation geo mean	std dev	
based on total count	0.421	7.08	32.5	66	106	197	40.1	6.7	
percent by substrate type									
silt/clay	10%	sand	18%	gravel	34%	cobble	34%	boulder	1%
bedrock	0%	hardpan	0%	wood/det	0%	artificial	0%	0%	

bedrock	3.9
clay hardpan	0.0
detritus/wood	0.0
artificial	0.0
weighted total count:	100

**Pebble Count of Channel Reach**

Material	Size Range (mm)	Count
silt/clay	0	5
very fine sand	0.062	1
fine sand	0.13	5
medium sand	0.25	6
coarse sand	0.5	15
very coarse sand	1	2
very fine gravel	2	4
fine gravel	4	6
fine gravel	6	8
medium gravel	8	11
medium gravel	11	2
medium gravel	16	2
coarse gravel	16	7
coarse gravel	22	8
coarse gravel	32	8
very coarse gravel	32	5
very coarse gravel	45	8
very coarse gravel	64	8
small cobble	64	90
medium cobble	90	3
large cobble	128	11
very large cobble	180	3
very large cobble	180	3
small boulder	256	3
small boulder	256	362
medium boulder	362	512
medium boulder	512	1024
large boulder	1024	2048
very large boulder	2048	4096
total particle count:		90

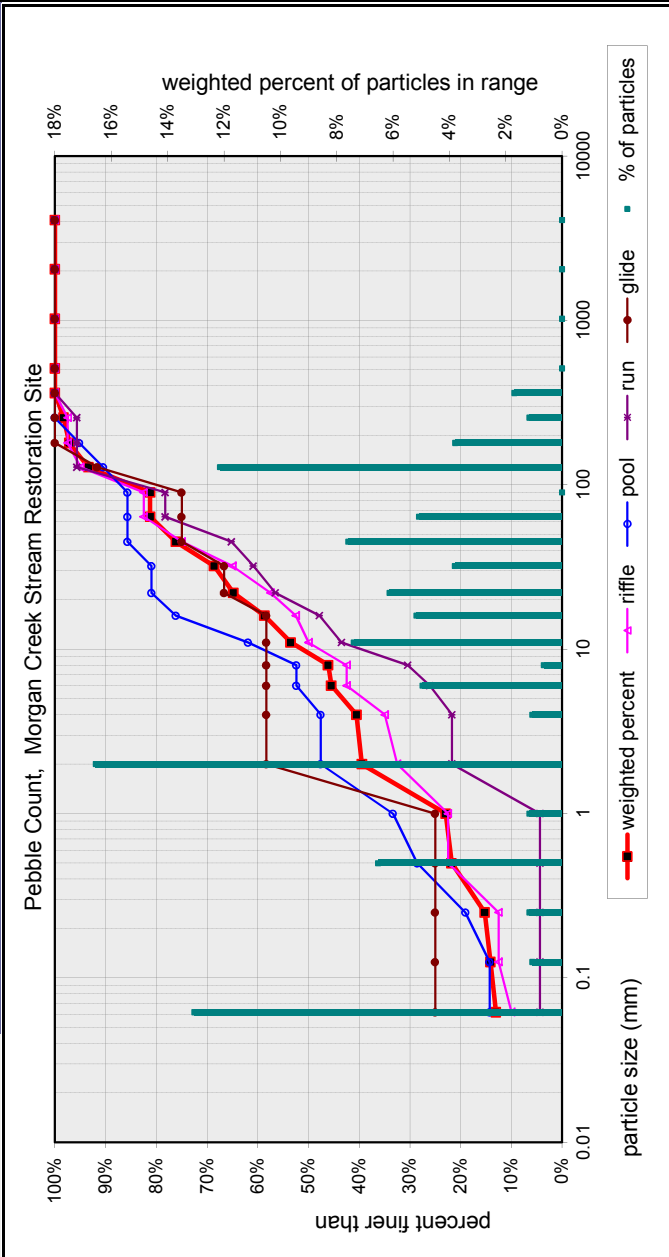
Morgan Creek Stream Restoration Site  
 Haywood County, NC  
 Morgan Creek: Reach 3  
 Note: Riffle RF3



based on sediment particles only	D16	D35	D50	D65	D84	D95	particle size distribution gradation geo mean	std dev	
	0.741	1.95	18.3	35	98	152	15.0	11.5	
based on total count	percent by substrate type		percent by substrate type		percent by substrate type		hardpan	wood/det	artificial
	silt/clay	sand	gravel	cobble	boulder	bedrock	0%	0%	0%
	6%	30%	42%	22%	0%	0%	0%	0%	0%

Pebble Count Weighted by Channel Feature			
Percent Riffle:	43.9	Percent Run:	14.3
Percent Pool:	23.6	Percent Glide:	18.4

Material	Size Range (mm)	weighted
silt/clay	0	0.062
very fine sand	0.062	0.13
fine sand	0.13	0.25
medium sand	0.25	0.5
coarse sand	0.5	1
very coarse sand	1	2
very fine gravel	2	4
fine gravel	4	6
fine gravel	6	8
medium gravel	8	11
medium gravel	11	16
coarse gravel	16	22
coarse gravel	22	32
very coarse gravel	32	45
very coarse gravel	45	64
small cobble	64	90
medium cobble	90	128
large cobble	128	180
very large cobble	180	256
small boulder	256	362
small boulder	362	512
medium boulder	512	1024
large boulder	1024	2048
very large boulder	2048	4096



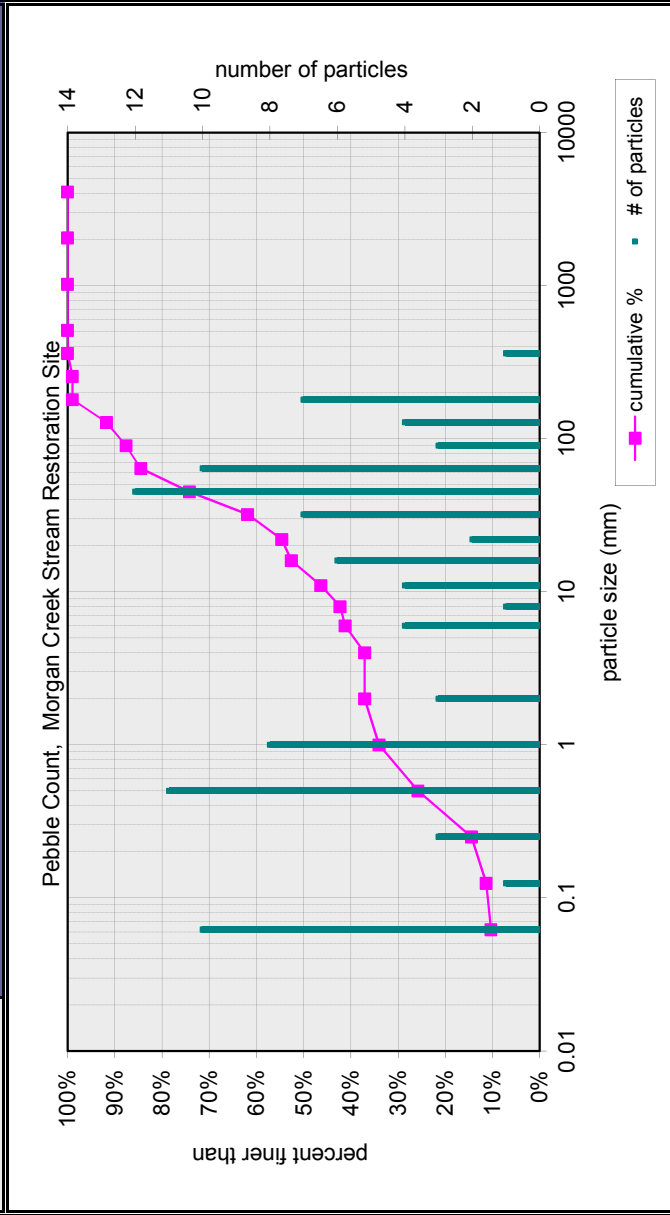
based on sediment particles only	D16	D35	D50	D65	D84	D95	particle size distribution gradation geo mean	19.0
based on total count	0.271	1.66	9.5	22	98	148	22.6	5.1

weighted particle count:	97.1
bedrock	3.1
clay hardpan	0.0
detritus/wood	0.0
artificial	0.0
weighted total count:	100.2

**Pebble Count of Channel Reach**

Material	Size Range (mm)	Count
silt/clay	0	10
very fine sand	0.062	1
fine sand	0.13	3
medium sand	0.25	11
coarse sand	0.5	8
very coarse sand	1	3
very fine gravel	2	4
fine gravel	4	6
fine gravel	6	1
medium gravel	8	4
medium gravel	11	6
medium gravel	16	2
coarse gravel	22	7
coarse gravel	32	12
very coarse gravel	45	10
very coarse gravel	64	3
small cobble	90	4
medium cobble	128	7
large cobble	180	1
very large cobble	256	1
small boulder	362	1
small boulder	512	1
medium boulder	1024	1
large boulder	2048	1
very large boulder	4096	1
total particle count:		97

Morgan Creek Stream Restoration Site  
 Haywood County, NC  
 Morgan Creek: Reach 4  
 Note: Riffle RF-4



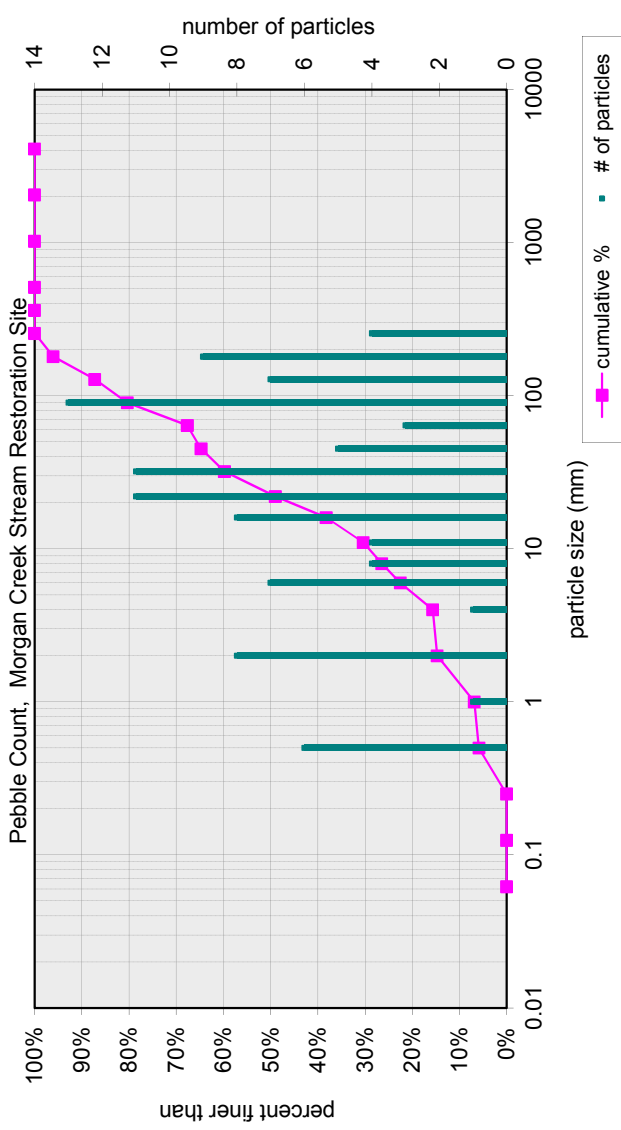
based on sediment particles only	size percent less than (mm)					particle size distribution gradation			std dev
based on total count	D16	D35	D50	D65	D84	D95	geo mean	wood/det	artificial
	0.275	1.25	13.7	35	63	149	4.2	0%	0%
	percent by substrate type					bedrock	hardpan	wood/det	artificial
	silt/clay	sand	gravel	cobble	boulder	0%	0%	0%	0%
	10%	27%	47%	14%	1%	0%	0%	0%	0%



**Pebble Count of Channel Reach**

Material	Size Range (mm)	Count
silt/clay	0	0
very fine sand	0.062	0
fine sand	0.13	0
medium sand	0.25	6
coarse sand	0.5	1
very coarse sand	1	8
very fine gravel	2	4
fine gravel	4	7
fine gravel	6	4
medium gravel	8	11
medium gravel	11	8
coarse gravel	16	11
coarse gravel	22	11
very coarse gravel	32	5
very coarse gravel	45	3
small cobble	64	13
medium cobble	90	7
large cobble	128	9
very large cobble	180	4
small boulder	256	4
small boulder	362	0
medium boulder	512	0
large boulder	1024	0
very large boulder	2048	0
	4096	0
total particle count:		102

Morgan Creek Stream Restoration Site  
 Haywood County, NC  
 Morgan Creek: North Branch  
 Note: Riffle RF-5



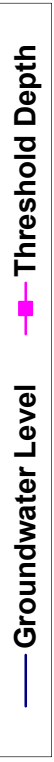
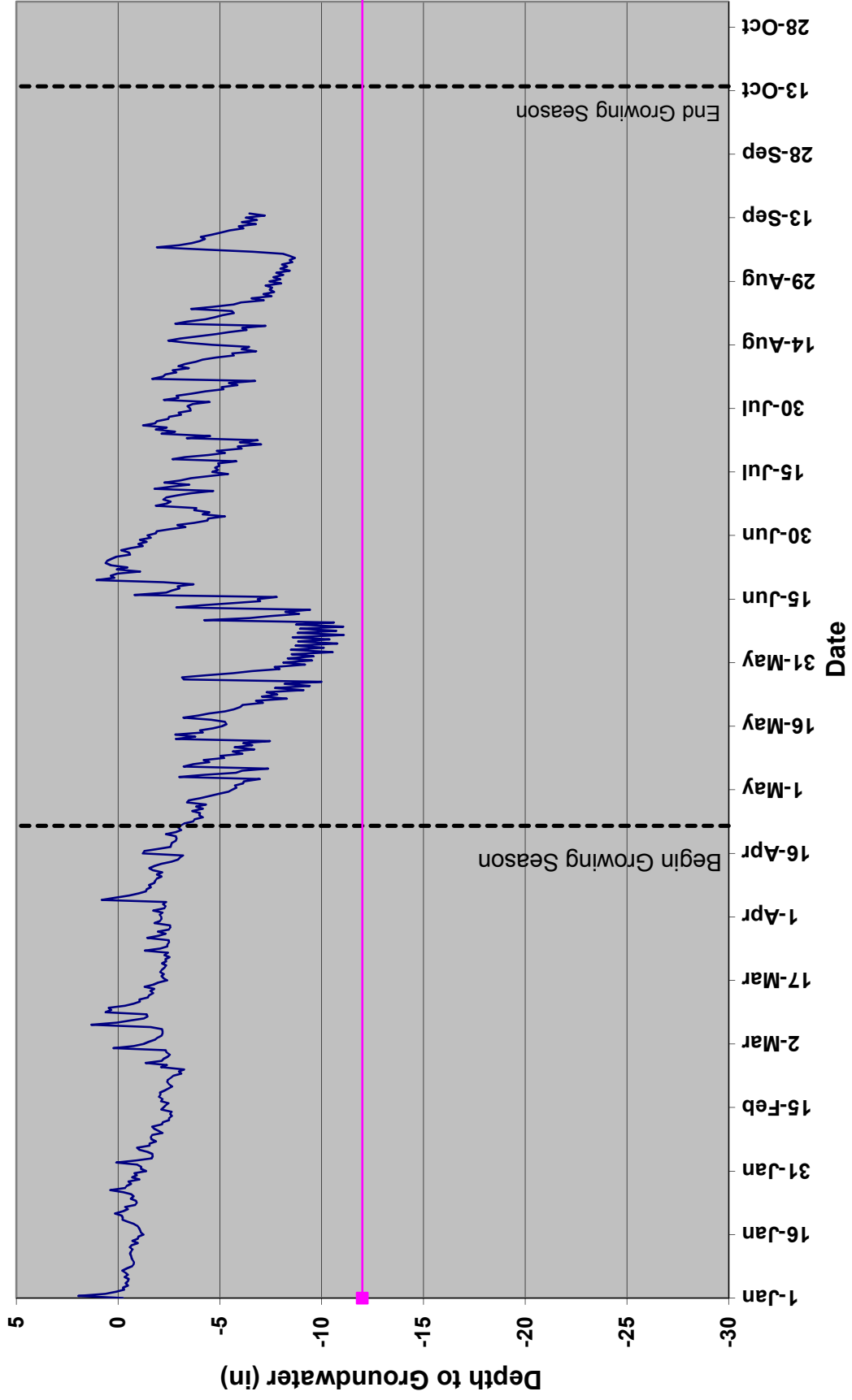
based on sediment particles only	D16	D35	D50	D65	D84	D95	particle size distribution gradation	geo mean	std dev
	4.075	13.71	22.8	47	108	173	5.2	21.0	5.2
based on total count	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	15%	53%	32%	0%	0%	0%	0%	0%
total count:		102							

**APPENDIX D**  
**WETLAND RAW DATA**

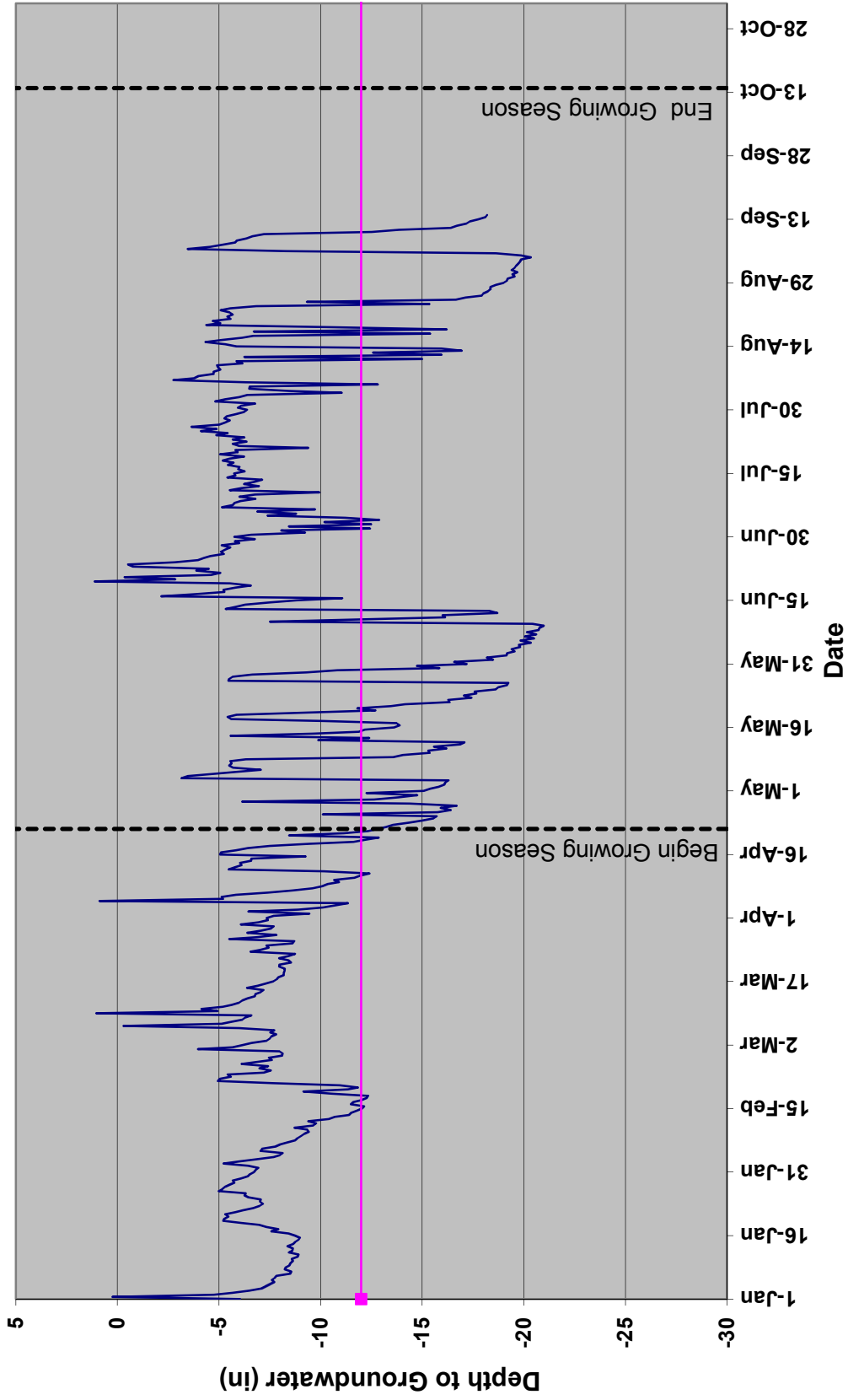




# GW1 2011



# GW2 2010



# GW3 2011

