Morgan Creek Stream Restoration Site

Haywood County, North Carolina
Cataloging Unit: 06010106
EEP Contract #: D06035-A
December 30, 2009

MONITORING REPORT 2009 (YEAR 1)

Submitted to:
North Carolina Department of Environment and Natural Resources
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 onsite 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 two 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.

Stream
Most of the stream reaches have managed the high flow events of the first year. 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. The banks of the channels are intact throughout the Site.

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 had a good survival rate although minor issues with encroachment did occur in 2009. These issues have been addressed and will no longer be a factor moving forward. There is little evidence of additional volunteer species taking root which is normal for a first year mitigation project.

Wetland
Wetland hydrology criteria was met on two of the three groundwater gauges in the first year of monitoring. The gauge that did not meet minimum wetland hydrology suggests that restoration efforts may not be successful in areas that are the farthest removed from the seep sources and/or the location of the gauge was inappropriate. Herbaceous wetland vegetation was documented in the vegetation plots located in the wetland restoration areas.

Planned Action
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. In areas where minor encroachment into the easement has occurred, additional planting of bare root stock species consistent with the original planting plan will take place this winter.

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.

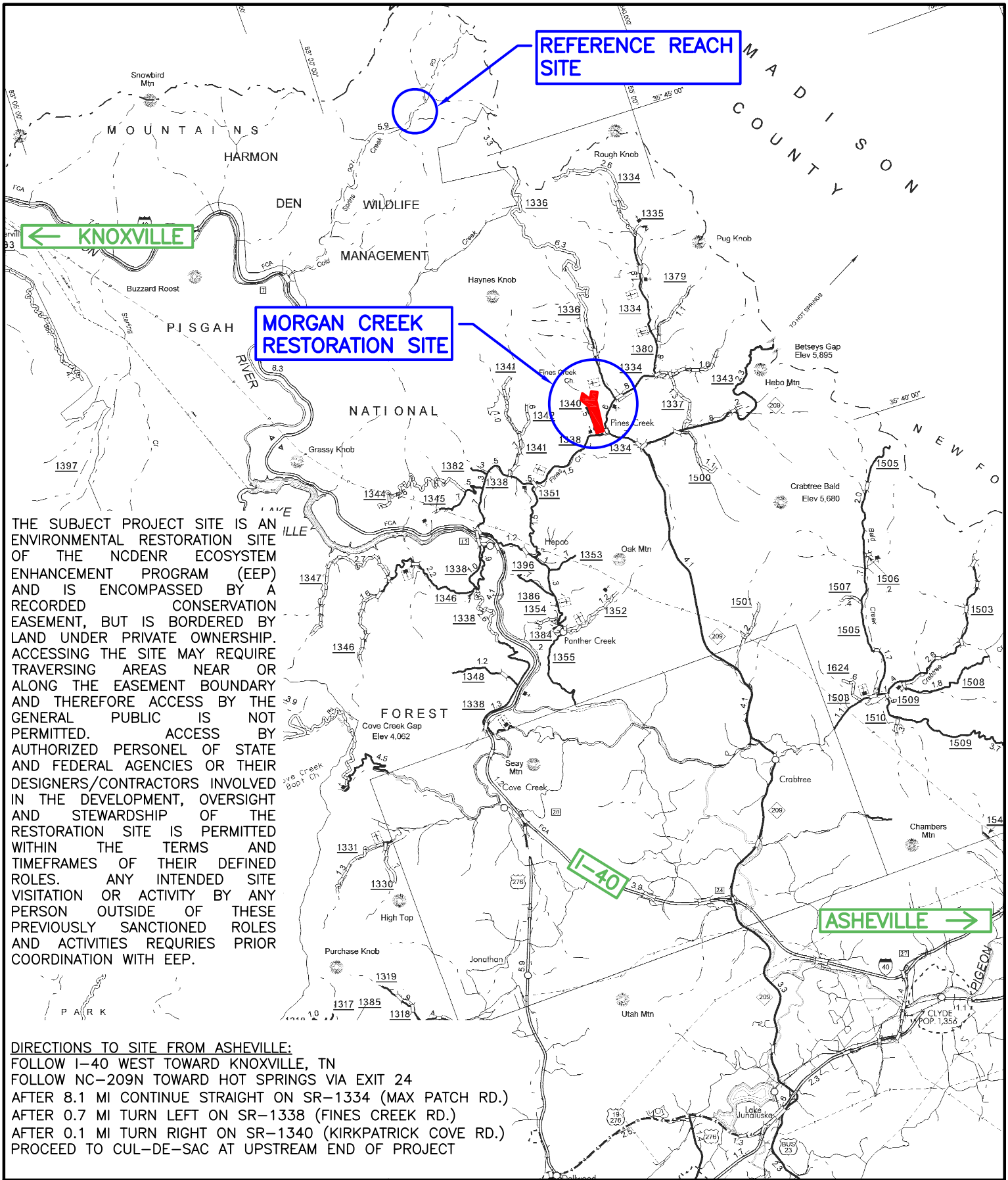
1.1.1 USGS and NCDWQ River Basin Designations

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 REQURIES 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:

Ecosystem Enhancement Program | Restoration Systems, LLC | Wolf Creek Engineering

SCALE
1/2 0 1 3
MILES

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 50' 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) revegetating 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).

Table I. Project Components
Morgan Creek Stream Restoration Site / EEP Contact #D06035-A

Restoration Reach/Area	Restoration Level	Approach	Pre-Restoration LF or AC	Post-Restoration LF or AC	Station Range/Location	Comments
Morgan Creek	R	P2	892	900	100+00 - 108+73	
Morgan Creek	R	P1	340	340	108+73 - 112+00	
Morgan Creek	R	P2	1,402	1,438	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		0.60	0.60		

Component Summation							
Restoration Level	Stream (LF)	Riparian Wetland (Ac)		Non-Riparian (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	3,711		0.60				
Enhancement			0.46				
Enhancement I	558						
Enhancement II							
Creation							
Preservation							
HQ Preservation							
			1.06				
Totals	**4,269**	**1.06**					**BMP Count**

	= Non-Applicable

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).

Table II. Project Activity and Reporting History Morgan Creek Restoration Project / EEP Contract# D06035-A		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
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		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

Table III. Project Activity and Reporting History Morgan Creek Restoration Project / EEP Contract# D06035-A			
Provider	Company	Lead Contact	Address
Full Delivery Provider	Restoration Systems	Travis Hamrick	1101 Haynes St. Suite 211 Raleigh, NC 27604 919.755.9490
Designer	Wolf Creek Engineering	Grant Ginn, P.E.	51 North Knob Lane Asheville, NC 28787 828-658-3649
Construction	North State Environmental	Darrell Westmoreland	2889 Lowery St. Winston-Salem, NC 27101 336-725-2010
Project Manager	American Wetlands	Lamar Beasley	2310 Valley Carline Court Ruston, VA 20191 703-860-0045
Planting & Seeding	North State Environmental	Stephen Joyce	2889 Lowery St. Winston-Salem, NC 27101 336-725-2010
Monitoring (Stream)	Wolf Creek Engineering	Grant Ginn, P.E.	51 North Knob Lane Asheville, NC 28787 828-658-3649
Monitoring (Vegetation)	Axiom Environmental	Grant Lewis	20 Enterprise St. Suite 7 Raleigh, NC 27606 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^2)	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 2008). 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 1 vegetation monitoring for the Site occurred in early December 2009. Vegetation sampling across the Site was above the required average density with 586 planted stems per acre. Native herbaceous cover has successfully established throughout the Site although volunteer woody species were not documented within the monitoring plots during Year 1.

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	12/9/2009	19	0	0	19	768.90	11
2	12/9/2009	15	0	0	15	607.03	10
3	12/9/2009	16	0	0	16	647.50	9
4	12/9/2009	12	0	0	12	485.62	10
5	12/9/2009	15	0	0	15	607.03	5
6	12/9/2009	10	0	0	10	404.69	6

2.1.2 Vegetative Problems

Stem loss which occurred at the Site since baseline monitoring are due to two factors- livestock encroachment in Plots 2 and 4, and mowing within Plot 5. Livestock entered the site after fencing along the easement was compromised. Monthly monitoring efforts revealed this and the fencing was repaired immediately. Cattle had access to the area for approximately 2-3 weeks and this resulted in minor damage to the riparian zone. In addition, a small section of Plot 5 was cleared. This plot is on the edge of the easement area and as a result, better easement boundary markers were installed and the landowner was notified. Supplemental planting occurred during the Year 1 monitoring season within areas that had experienced stem loss.

During Year 1 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. Even though success criteria for vegetation has been met for Year 1, additional planting of bare root stock species consistent with the original planting plan will take place this winter.

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 A).

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. Steam monitoring included measurements of stream dimension, profile, pattern, bed materials, photo documentation, and stream bankfull return interval. (Baseline and Year 1 summary data are provided in Tables VI and VII below).

Most of the stream reaches have managed the extreme flow events of the first year reasonably well. The overall bed profile of Morgan Creek has been maintained, however, there are numerous local adjustments to riffle and pool features. The channel banks are stable and fully vegetated throughout the project. Most of the in-stream structures are intact and functional. The few structures that have been 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 three 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.

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

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 - North Branch (415 ft)

Parameter	Gauge	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			As-Built / Baseline					
Simension and Substrate - Riffle		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
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			
[1]Bankfull Max Depth (ft)							1.5						0.77					0.72				0.9			
Bankfull Cross-Sectional Area (ft2)							6.9						4.2					4.48				5			
Width/Depth Ratio							7.1						15.4					16.1				17.7			
Entrenchment Ratio							2						1.45				1.4	2.2	3			2.23			
[1]Bank Height Ratio							1.5						1					1				1			
d50 (mm)							27						27												
Profile																									
Riffle Length (ft)																	7	9	12	4		7	12.5		
Riffle Slope (ft/ft)							0.078						0.142				0.0444	0.0482	0.0619	0.036		0.056	0.09		
Pool Length (ft)																	3	4	7	5.2		6.5	9		
Pool Max Depth (ft)							1.5						0.95					1.1				1.9			
Pool Spacing (ft)							95						68				17		26	17		22	25		
[2]Pool Volume (ft3)																									
Pattern																									
Channel Beltwidth (ft)							23						17				13	17	19	11		13	13		
Radius of Curvature (ft)					5			14					13				17		26	17		22	26		
Radius of Curvature Ratio (ft/ft)					0.7			2					1.6				2		3	1.8		2.3	2.8		
Meander Wavelength (ft)							41						29				36	41	42	36		41	42		
Meander Width Ratio (ft/ft)							3.2						2.1				1.5		3	2.8		4.4	4.5		
Substrate, bed and transport parameters																									
[4]Ri% / Ru% / P% / G% / S%																				31	29	26		14	
[4]SC% / Sa% / G% / C% / B% / Be%					5	26	51	17	0	1	1	10	48	41	0	1									
[4]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/ft2																		1.69							
Max part size (mm) mobilized at bankfull																		500							
Stream Power (transport capacity) W/m2																									
Additional Reach Parameters																									
Drainage Area (sq mi)							0.12						0.1												
Impervious cover estimate (%)																									
Rosgen Classification							A4						B4a					B4a				B4a			
Bankfull Velocity (fps)							3.8											4.5							
Bankfull discharge (cfs)							26																		
Valley length (ft)																									
Channel Thalweg length (ft)																		368				362.5			
Sinuosity (ft)							1.05						1.07					1.02				1.06			
Water Surface Slope (channel) (ft/ft)							0.078						0.126					0.0538				0.0528			
BF slope (ft/ft)							0.051						0.135					0.051				0.0524			
[5]Bankfull Floodplain Area (acres)																									
[6]Proportion Overwide (%)																									
[7]Entrenchment Class (ER Range)																									
[8]Incision Class (BHR Ranch)																									
BEHI VL% / L% / M% / H% / VH% / E%																									
Channel Stability or Habitat Metric																									
Biological or Other																									

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					
Simension and Substrate - Riffle		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)							15.2						23.4				13.4	15.2	15.4	13.8		15	16.5		
Floodprone Width (ft)							50				43		48	52			28	30	32	33		36	63		
Bankfull Mean Depth (ft)							0.64				1.3		1.48	1.5			0.84	0.95	0.96	0.8		0.9	1.1		
[1]Bankfull Max Depth (ft)							1.2						2.2				1.15	1.28	1.3	1.1		1.3	1.7		
Bankfull Cross-Sectional Area (ft2)							9.5						34.6				11.3	14.4	14.8	10.2		13.3	18.7		
Width/Depth Ratio							23.7						15.8					16		14.5		16.9	17.9		
Entrenchment Ratio							3.3						2.2				1.4		3	2.2		2.4	4.2		
[1]Bank Height Ratio							1.8						1.5					1				1			
d50 (mm)							58						45												
Profile																									
Riffle Length (ft)											20		28	40			14	17	21	12		19	31		
Riffle Slope (ft/ft)							0.0312				0.015		0.025	0.043			0.027	0.038	0.043	0.0245		0.0375	0.0588		
Pool Length (ft)											6		18	42			4	6	11	7		11.7	20		
Pool Max Depth (ft)							1.2						2.3				1.7	1.9	2	2.5		2.6	3		
Pool Spacing (ft)					52			485			51		87	113			26.8	45.6	77	36		51	77		
[2]Pool Volume (ft3)																									
Pattern																									
Channel Beltwidth (ft)					80			190					43				17	23	32	25		28	35		
Radius of Curvature (ft)					32			75			44		75	103			28	36	68	28		36	68		
Radius of Curvature Ratio (ft/ft)					2.1			4.9					3.2				2.08	2.36	4.28	1.87		2.4	4.53		
Meander Wavelength (ft)							200						100				69	86	120	69		86	120		
Meander Width Ratio (ft/ft)					5			13					1.8				1.1	1.5	2.1	4.6		5.73	8		
Substrate, bed and transport parameters																									
[4]Ri% / Ru% / P% / G% / S%											29		29		21	21				36	25	26		13	
[4]SC% / Sa% / G% / C% / B% / Be%					5	26	51	17	0	1	1	10	48	41	0	1									
[4]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/ft2																	1.52	2.08	2.1						
Max part size (mm) mobilized at bankfull																		650							
Stream Power (transport capacity) W/m2																									
Additional Reach Parameters																									
Drainage Area (sq mi)							0.47						2.77												
Impervious cover estimate (%)																									
Rosgen Classification							C4b						B4					B4		B4		B4	B4a		
Bankfull Velocity (fps)							7.2											4.5							
Bankfull discharge (cfs)							68																		
Valley length (ft)																									
Channel Thalweg length (ft)																		2912				2890			
Sinuosity (ft)							1.12						1.05				1.01	1.02	1.07			1.05			
Water Surface Slope (channel) (ft/ft)							0.036						0.0238				0.027	0.038	0.043	0.0253		0.0297	0.0528		
BF slope (ft/ft)							0.037						0.024				0.028	0.038	0.043	0.0236		0.0297	0.0527		
[5]Bankfull Floodplain Area (acres)																									
[6]Proportion Overwide (%)																									
[7]Entrenchment Class (ER Range)																									
[8]Incision Class (BHR Ranch)																									
BEHI VL% / L% / M% / H% / VH% / E%																									
Channel Stability or Habitat Metric																									
Biological or Other																									

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

Parameter	Cross Section RF1 Riffle						Cross Section PL1 Pool						Cross Section					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Bkf Width (ft)	12.9						14.0											
Floodprone Width (ft)	63						-											
Bkf Cross Sectional Area (ft^2)	11.4						13.4											
Bkf Mean Depth (ft)	0.9						1.0											
Bkf Max Depth (ft)	1.3						1.5											
Width/Depth Ratio	14.6						-											
Entrenchment Ratio	4.9						-											
Bank Height Ratio	1.0						-											
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	94																	
D_{84} (mm)	207																	

Parameter	MY-1 (2009)			MY-2 (2010)			MY-3 (2011)			MY-4 (2012)			MY-5 (2013)			MY+ (2014)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	18	24	21															
Radius of Curvature (ft)	28	87	36															
Meander Wavelength (ft)	61	84	72															
Meander Width Ratio	1.4	1.9	1.6															
Profile																		
Riffle Length (ft)	8.5	25.5	12															
Riffle Slope (ft/ft)	0.0156	0.0864	0.0342															
Pool length (ft)	3.3	16.5	9															
Pool Spacing (ft)	15	46	37															
Additional Reach Parameters																		
Valley Length (ft)	-	-	740															
Channel Length (ft)	-	-	773															
Sinuosity	-	-	1.04															
Water Surface Slope (ft/ft)	0.036	0.080	0.048															
Bkf Slope (ft/ft)	0.036	0.080	0.048															
Rosgen Classification	-	-	B3a															
Habitat Index																		
Macrobenthos																		

Table VII. Morphoology and Hydraulic Monitoring Summary
Morgan Creek Stream Restoration Site (D06035-A)
Reach 2: Morgan Creek

Parameter	Cross Section RF2 Riffle						Cross Section PL2 Pool						Cross Section					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Bkf Width (ft)	13.3						15.2											
Floodprone Width (ft)	33						-											
Bkf Cross Sectional Area (ft^2)	12						21.8											
Bkf Mean Depth (ft)	0.9						1.4											
Bkf Max Depth (ft)	1.6						2.2											
Width/Depth Ratio	14.8						-											
Entrenchment Ratio	2.5						-											
Bank Height Ratio	1.0						-											
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	51																	
D_{84} (mm)	139																	

Parameter	MY-1 (2009)			MY-2 (2010)			MY-3 (2011)			MY-4 (2012)			MY-5 (2013)			MY+ (2014)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	16	30	24															
Radius of Curvature (ft)	30	88	40															
Meander Wavelength (ft)	73	93	88															
Meander Width Ratio	1.2	2.3	1.8															
Profile																		
Riffle Length (ft)	14	29	21															
Riffle Slope (ft)	0.0261	0.0542	0.0332															
Pool length (ft)	8	15	9.5															
Pool Spacing (ft)	33	67	45															
Additional Reach Parameters																		
Valley Length (ft)	-	-	541															
Channel Length (ft)	-	-	573															
Sinuosity	-	-	1.1															
Water Surface Slope (ft/ft)	0.037	0.043	0.037															
Bkf Slope (ft/ft)	0.037	0.043	0.037															
Rosgen Classification	-	-	B4															
Habitat Index																		
Macrobenthos																		

Table VII. Morphoology 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					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Bkf Width (ft)	14.6						14.9											
Floodprone Width (ft)	36						-											
Bkf Cross Sectional Area (ft^2)	15.3						11.8											
Bkf Mean Depth (ft)	1						0.8											
Bkf Max Depth (ft)	1.9						1.2											
Width/Depth Ratio	14						-											
Entrenchment Ratio	2.5						-											
Bank Height Ratio	1.0						-											
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	44																	
D_{84} (mm)	132																	

Parameter	MY-1 (2009)			MY-2 (2010)			MY-3 (2011)			MY-4 (2012)			MY-5 (2013)			MY+ (2014)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	22	28	26															
Radius of Curvature (ft)	33	80	52															
Meander Wavelength (ft)	73	122	101															
Meander Width Ratio	1.5	1.9	1.8															
Profile																		
Riffle Length (ft)	4	30	17															
Riffle Slope (ft)	0.0135	0.0600	0.0359															
Pool length (ft)	5.5	21	13															
Pool Spacing (ft)	35	76	53															
Additional Reach Parameters																		
Valley Length (ft)	-	-	328															
Channel Length (ft)	-	-	344															
Sinuosity	-	-	1.05															
Water Surface Slope (ft/ft)	0.030	0.037	0.030															
Bkf Slope (ft/ft)	0.030	0.037	0.030															
Rosgen Classification	-	-	B4															
Habitat Index																		
Macrobenthos																		

Table VII. Morphoology 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					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Bkf Width (ft)	15.7						15.4											
Floodprone Width (ft)	44						-											
Bkf Cross Sectional Area (ft^2)	19.1						18.3											
Bkf Mean Depth (ft)	1.2						1.2											
Bkf Max Depth (ft)	2.0						2.1											
Width/Depth Ratio	12.9						-											
Entrenchment Ratio	2.8						-											
Bank Height Ratio	1.0						-											
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	50																	
D_{84} (mm)	144																	

Parameter	MY-1 (2009)			MY-2 (2010)			MY-3 (2011)			MY-4 (2012)			MY-5 (2013)			MY+ (2014)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	21	30	23															
Radius of Curvature (ft)	33	92	47															
Meander Wavelength (ft)	82	108	91															
Meander Width Ratio	1.3	1.9	1.5															
Profile																		
Riffle Length (ft)	5.2	28	18.2															
Riffle Slope (ft)	0.0169	0.0700	0.0322															
Pool length (ft)	4	35	13.5															
Pool Spacing (ft)	19	52	32															
Additional Reach Parameters																		
Valley Length (ft)	-	-	717															
Channel Length (ft)	-	-	741															
Sinuosity	-	-	1.03															
Water Surface Slope (ft/ft)	0.020	0.032	0.031															
Bkf Slope (ft/ft)	0.020	0.032	0.031															
Rosgen Classification	-	-	B4															
Habitat Index																		
Macrobenthos																		

Table VII. Morphoology 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					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Bkf Width (ft)	8.6						8.4											
Floodprone Width (ft)	22						-											
Bkf Cross Sectional Area (ft^2)	4.5						8.7											
Bkf Mean Depth (ft)	0.5						1.0											
Bkf Max Depth (ft)	1.0						1.9											
Width/Depth Ratio	16.5						-											
Entrenchment Ratio	2.6						-											
Bank Height Ratio	1.0						-											
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	31																	
D_{84} (mm)	177																	

Parameter	MY-1 (2009)			MY-2 (2010)			MY-3 (2011)			MY-4 (2012)			MY-5 (2013)			MY+ (2014)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	11	16	13															
Radius of Curvature (ft)	16	30	18															
Meander Wavelength (ft)	34	41	39															
Meander Width Ratio	1.3	1.9	1.5															
Profile																		
Riffle Length (ft)	3	10.2	4.5															
Riffle Slope (ft)	0.0267	0.1171	0.0667															
Pool length (ft)	3.2	10.5	4.2															
Pool Spacing (ft)	8.5	33	20.3															
Additional Reach Parameters																		
Valley Length (ft)	-	-	246															
Channel Length (ft)	-	-	266															
Sinuosity	-	-	1.08															
Water Surface Slope (ft/ft)	0.045	0.06	0.054															
Bkf Slope (ft/ft)	0.045	0.06	0.054															
Rosgen Classification	-	-	B4a															
Habitat Index																		
Macrobenthos																		

Re-survey of the permanent cross sections and profile reaches have shown some alterations in local bed elevations with the bed form and the channel pattern remaining consistent with the As-built condition. On Morgan Creek, of the four riffle sections that were taken, two sections (RF2 & RF3) down-cut 0.5 to 0.6 ft and two sections (RF1 & RF4) had thalwegs that were 0.1 to 0.3 ft lower than the As-built survey. In each case, inspection of the profile reveals that grade downstream of each section was consistent with the As-built survey and that the grade adjustments occurred primarily on the upper end of each riffle. This situation can be found elsewhere on the Morgan Creek where adjustments have occurred in the profile. Of the four pool sections that were taken, one pool (PL3) was almost completely filled in and the other three each had some amount of aggradation although they appear to have been over-excavated during construction and have returned to a depth consistent with the design depth. These adjustments, along with similar adjustments in other locations along the profile, appear to have occurred primarily during the July 2009 storm event that resulted in the greater-than-bankfull flows.

The riffle and pool sections that were taken on North Branch indicate no significant change from the As-built survey. Inspection of the profile indicates that two of the pools have filled in but the channel is generally consistent with the As-built 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 D50 and D84 size class. On Morgan Creek, the material size generally increased from the As-built condition with the D50 increasing from 36 mm to 56 mm on the upper reach and from 13mm to 30mm on the middle and lower reaches. Likewise the D84 increased from 117mm to 311mm on the upper reach and from 67mm to 160mm on the middle and lower reaches. On North Branch the D50 decreased slightly from 25mm to 14mm while the D84 increased from 76mm to 154mm. This may have resulted from an expected coarsening or armoring of the bed producing the increase in the large caliber material along with the input of finer material from bank erosion upstream of the site.

2.2.3 Problem Areas

There are several areas of concern that should be monitored but that presently appear to have stabilized. These areas have been identified on the monitoring plan sheets and generally consist of two scenarios. First, where adjustments have occurred to the grade of the upstream end of the riffle, it has exaggerated the drop on the structure immediately upstream (Appendix B, Problem Area Photos 2 and 3). Second, where adjustments have occurred to the grade of the lower end of the riffle, the existing bed material has limited the extent of the adjustment by forming cobble nick points (Appendix B, Problem Area Photos 1, 4, and 8).

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.

2.5.5 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

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

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

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

Feature	Performance Percentage - South Branch (320 ft)					
	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
Riffles	100%	100%				
Pools	100%	100%				
Thalweg	100%	100%				
Meanders	100%	100%				
Bed General	100%	100%				
Vanes / J Hooks etc.	100%	97%				
Wads and Boulders	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. Three 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 22nd and ending on October 14th.

2.3.1 Hydrology

Two of the three gauges met wetland hydrology criteria during the 2009 growing season (Table III). Gauge GW1 had groundwater present within twelve (12) inches of the surface throughout the entire growing season. Gauge GW3 had groundwater present within 12 inches for a total of 69 days with a peak of 21 consecutive days. Gauge GW2 did not have any days during the growing season with groundwater present within 12 inches of the surface. Plots of the gauge data can be found in Appendix C

Exhibit Table X. Wetland Criteria Attainment

Tract	Well ID	Well Hydrology Threshold Met?	Tract Mean	Vegetation Plot ID	Veg Survival Threshold Met?	Tract Mean
1	GW1	Yes	67%	-	-	100%
	GW2	No		4	Yes	
	GW3	Yes		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 607 and 486 planted stems per plot, respectively (Table V). 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+.

3.0 REFRENCES

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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. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, North Carolina.

APPENDIX A

MONITORING PLAN

Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
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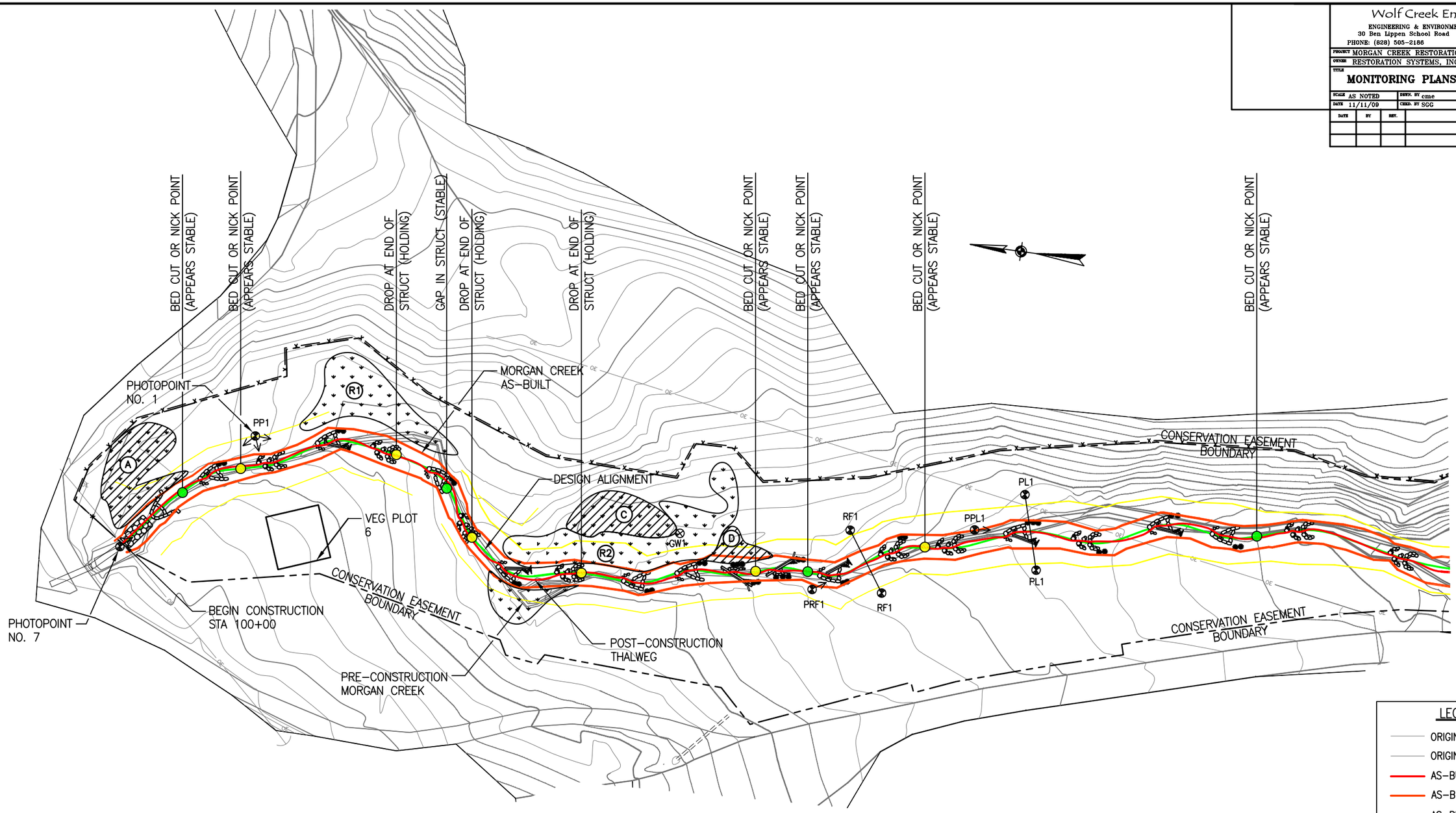
PHONE: (828) 505-2186 WWW.WOLFCREEKENG.COM

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

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1026	MP-1
DATE 11/11/09	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

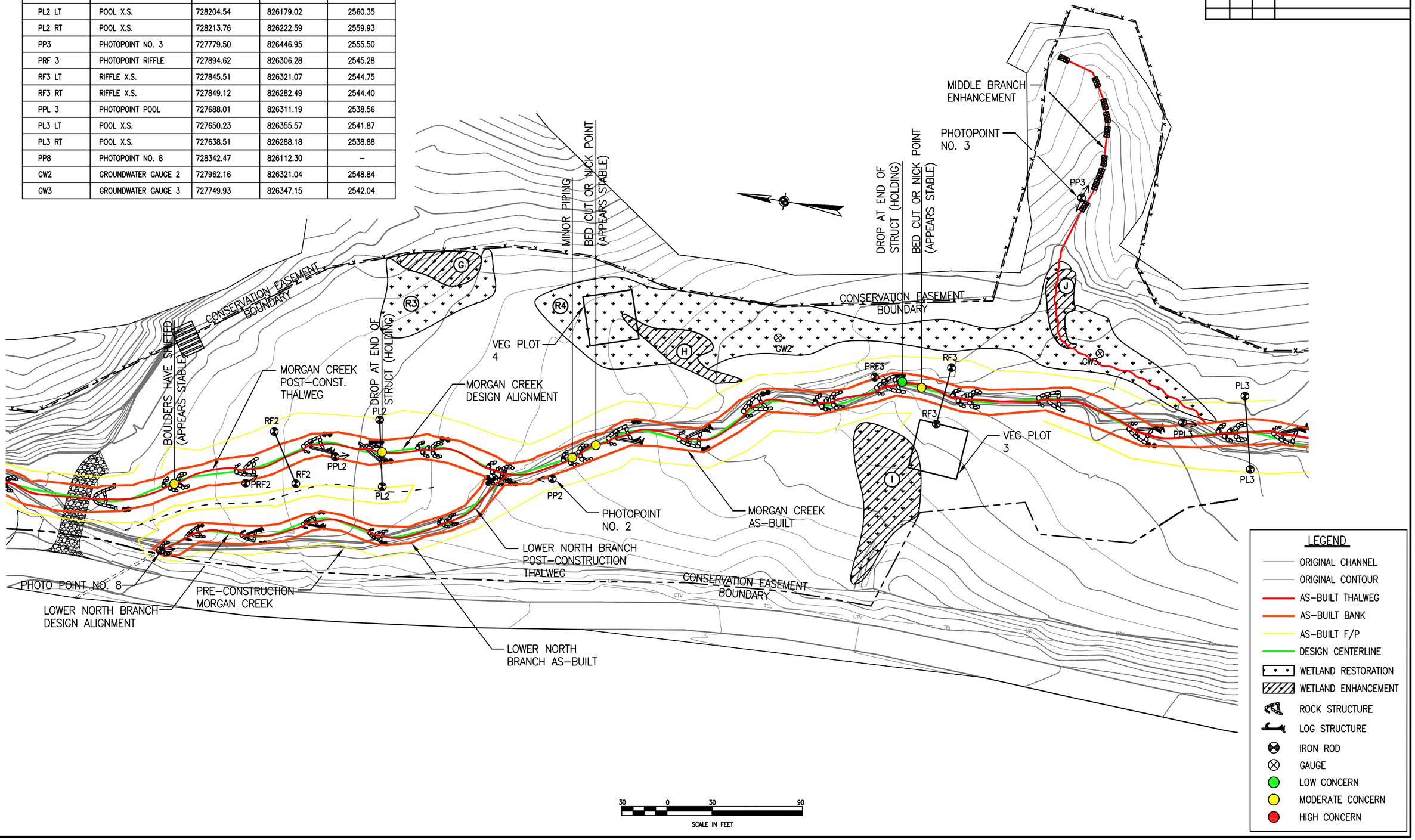


POINT NO.	POINT DESCRIPTION	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
PP1	PHOTOPOINT NO. 1	729156.17	826117.25	2605.55
PRF 1	PHOTOPOINT RIFFLE	728807.03	826071.48	2583.49
RF1 LT	RIFFLE X.S.	728789.03	826110.51	2584.66
RF1 RT	RIFFLE X.S.	728764.74	826075.17	2581.69
PPL 1	PHOTOPOINT POOL	728713.94	826121.16	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

30 0 30 90
SCALE IN FEET

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
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

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



Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
30 Ben Lippen School Road Asheville, NC 28806
PHONE: (828) 505-2186 WWW.WOLFCREEKENG.COM

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

SCALE	AS NOTED	DRWN. BY	cme	PROJECT NO.	SHEET NUMBER
DATE	11/11/09	CHKD. BY	SGG	1026	MP-2

DATE	BY	REV.	DESCRIPTION

Wolf Creek Engineering
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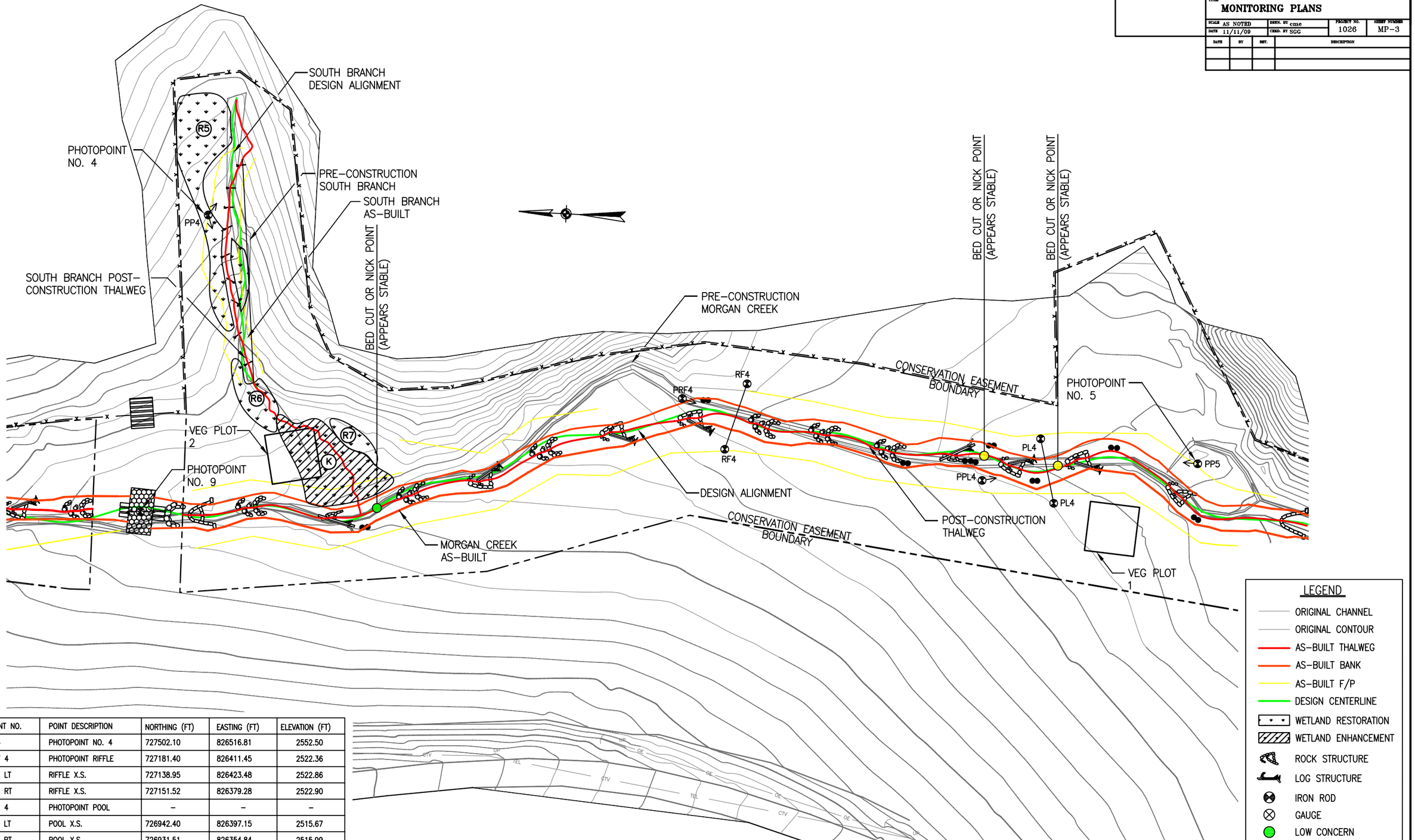
30 Ben Lippen School Road Asheville, NC 28806
PHONE: (828) 505-2186 WWW.WOLFCREEKENG.COM

PROJECT: MORGAN CREEK RESTORATION PROJECT
OWNER: RESTORATION SYSTEMS, INC.
TITLE: **MONITORING PLANS**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1026	MP-3
DATE 11/11/09	CHKD. BY SGG		

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
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

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30 Ben Lippen School Road Asheville, NC 28806
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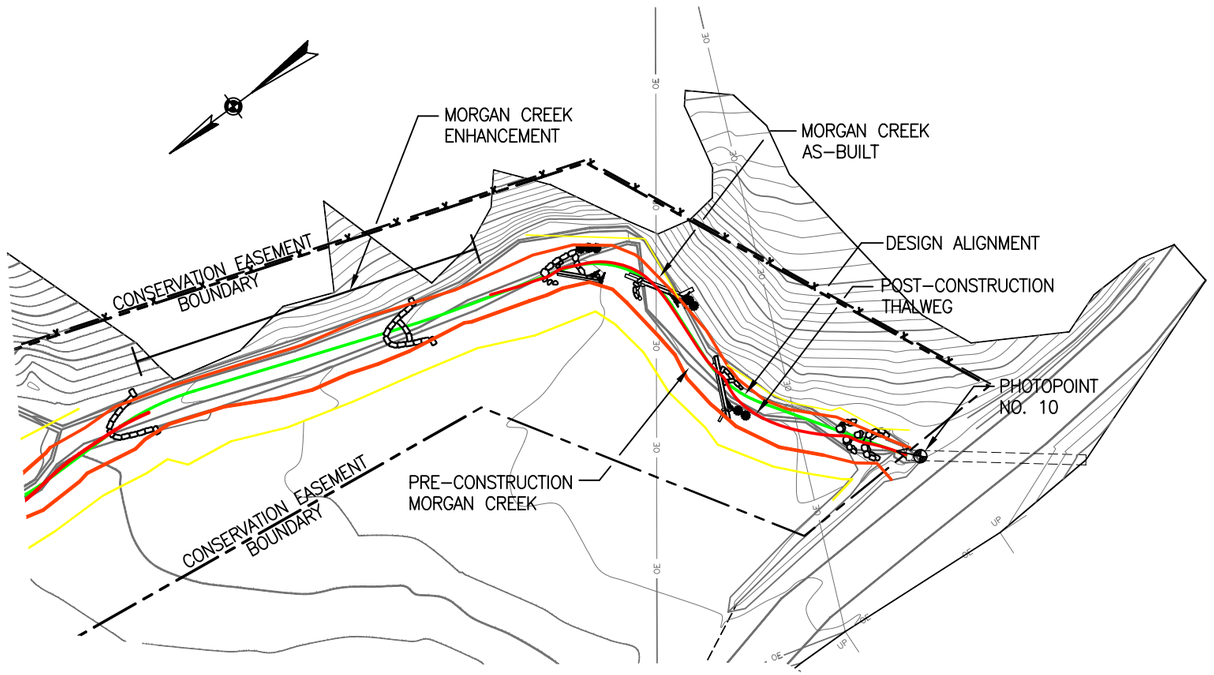
PROJECT MORGAN CREEK RESTORATION PROJECT
OWNER RESTORATION SYSTEMS, INC.
TITLE **MONITORING PLANS**

SCALE	AS NOTED	DRWN. BY	cme	PROJECT NO.	SHEET NUMBER
DATE	11/11/09	CHKD. BY	SGG	1026	MP-4

DATE	BY	REV.	DESCRIPTION



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
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

PP10	PHOTOPOINT NO. 10	726527.45	826153.34	–

30 0 30 90
SCALE IN FEET

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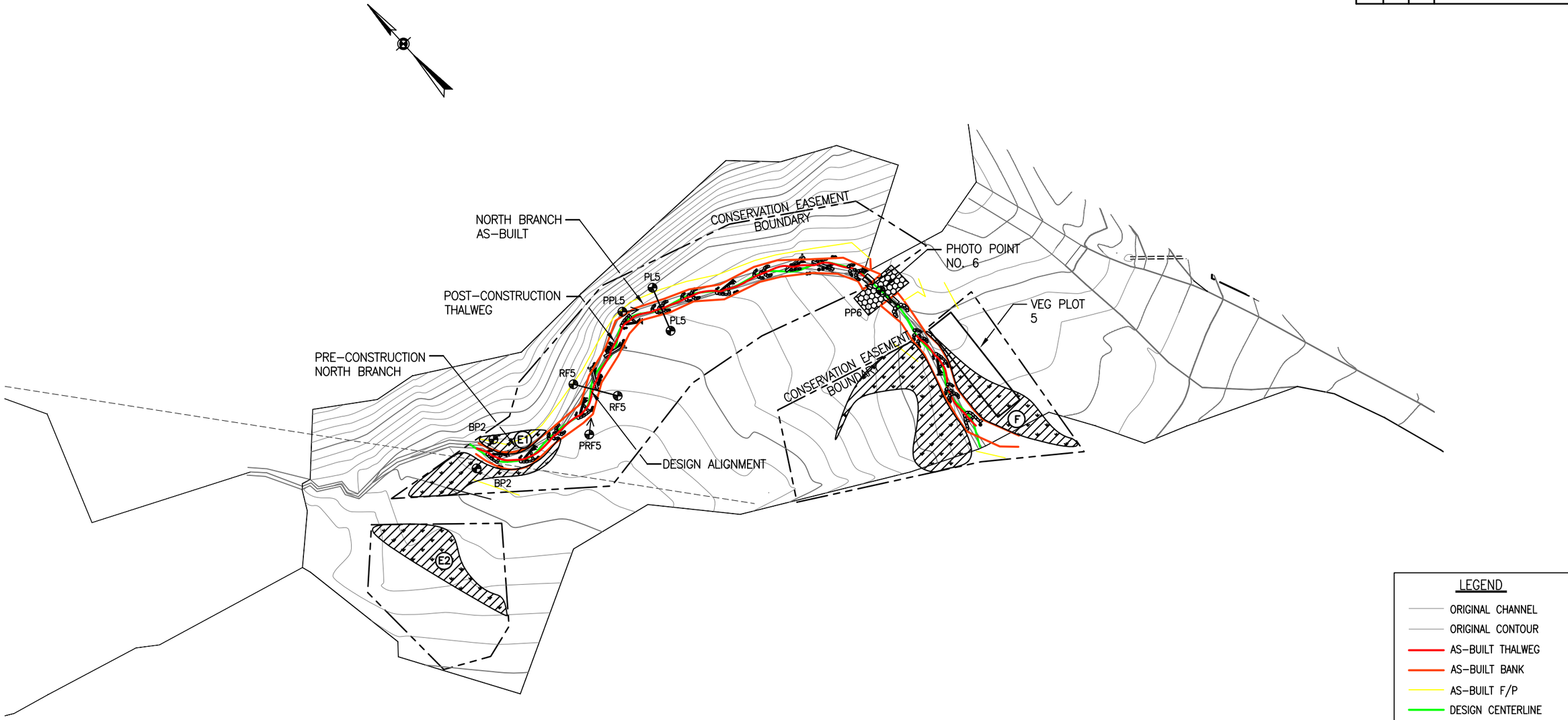
ENGINEERING & ENVIRONMENTAL CONSULTING
30 Ben Lippen School Road Asheville, NC 28806
PHONE: (828) 505-2186 WWW.WOLFCREEKENG.COM

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

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1026	MP-5
DATE 11/11/09	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



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	–

30 0 30 90
SCALE IN FEET

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
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

APPENDIX B

VEGETATION RAW DATA

Vegetation Monitoring Plot 1

Vegetation Monitoring Plot 2

Vegetation Monitoring Plot 3

Vegetation Monitoring Plot 4

Vegetation Monitoring Plot 5

Vegetation Monitoring Plot 6

Plot Data: CVS Levels 1 & 2

General Information

Project Label: Morgan Ck

Project Name:

Team: AXE

Plot: 1

☐ Level 1 (planted stems only)
☒ Level 2 (planted and natural stems)

Start Date: 12 / 9 / 09
dd/mmm/yyyy e.g. 15 / JAN / 2007

End Date (if different): / /

Party	Role**
Ferguson	Plot Leader
Thelyns	

**Roles: Co-leader, Assistant, Guide, Land owner, Taxonomist, Other

Soil Drainage*

☐ Excessively drained
☐ Somewhat excessively drained
☒ Well drained
☐ Moderately well drained
☐ Somewhat poorly drained
☐ Poorly drained
☐ Very poorly drained

Water

Percent of Plot Submerged: 0 %

Mean Water Depth: — cm

Location

General:

State: NC County: Haywood

Quadrangle:

Place Names: 1)

2) 3)

EEP Reach:

Land Owner:

⊗ **GPS Receiver Location** (m):
x= y=

Coordinate System: ☒ Lat/Long ☐ UTM ☐ State Plane ☐ Other (*specify*):

Coord. Units: ☒ deg. ☐ deg. min. ☐ deg. min. sec. ☐ m ☐ ft ☐ ____

Datum: ☒ NAD83/WGS84 ☐ NAD27

Zone: (if applicable)

Lat: 35.68300 **(or Northing)**

Long: -82.75331 **(or Easting)**

Coordinate Accuracy (m radius):
e.g. 30

GPS File Name:

Site Characteristics

Elevation: ± ☐m ☐ft.

Slope (degrees):

Aspect (degrees):

Compass Type: ☐ magnetic ☒ true

Plot Placement (check 1 or more)

☒ Representative
☐ Random
☐ Stratified
☐ Transect component
☐ Systematic (grid)
☐ Capture specific feature

Further details of placement can be recorded in Plot Rationale.

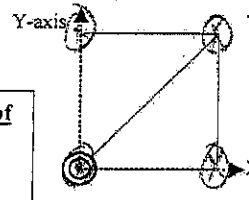
Taxonomic Standard Used for Plant Identification

Authority: Weakley, **Publ. Date:** ____

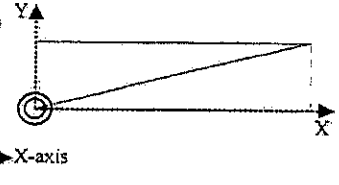
Plot Diagram

Fill in *ONE* of the templates below, using the key to draw GPS location, photos and posts. Edit shape if plot doesn't match one of the templates. Draw any landmarks, such as streams, banks, fences, etc.

Standard 10m x 10m (14.142m diagonal):



Non-standard 5m x 20m (20.616m diagonal):



●Posts (x,y) (meters)
(0,0)
(0,10)
(10,0)
(10,10)
(,)
(,)

Key
- ◎ Plot origin (0,0) point
- ⊗ GPS location point
- ○→ photo taken, with direction
- ● posts

Bearing of Plot X-Axis: 90°

Plot Size (ares, default=1): 1
(An "are" is 100 m²)

○→ Photo Identifier(s): 1091-1035 → 10350

Notes

If more space is needed, check the box and use back of datasheets.

Layout: (anything unusual about plot layout and shape) ☐ more...

Plot Location: (directions to plot, landscape content) ☐ more...

Plot Rationale: (why location was chosen for the plot) ☐ more...

Other Notes: (invasive species, erosion, disturbances, etc.)

No natural recruits. ☐ more...

Planted Woody Stem Data: CVS Level 1

Leader: Faquin/Thomas **Project:** Morgan Ck **Team:** AXE **Plot:** 1 **Date:** 12 / 9 / 09 Page 1 of 1

Species Name	Source	Coordinates X (m)	Coordinates Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor	Damage
Fagus grandifolia	BR	0,4	1,2	4,7	50	—	3	
Cornus amomum	BR	1,8	3,3	6.2	50	—	3	
Liriodendron tulip.	BR	3.0	4,0	9,6	90	—	4	
Platanus occident.	BR	4.5	4,0	15.5	130	—	4	
Platanus occident.	BR	3,0	1,80	10,5	115	—	4	
Cornus amomum	BR	5,1	0,0	7,4	55	—	3	
Betula nigra	BR	3,2	6,1	12,6	150	0.4	4	
Amelanchier laevis	BR	9.1	5,0	8,6	125	—	4	
Cornus amomum	BR.	9,4	0,80	12,80	145	0.3	4	
Acer saccharum	BR	10.0	3,0	4,3	40	—	1	unk.
Acer saccharum	BR	8,7	0,6	2.7	25	—	2	Resprout
Acer saccharum	BR	7,80	4,9	7,1	100	—	3	
Hamamelis virg.	BR	9,7	8,4	8,9	110	—	4	
Cornus amomum	BR	9.0	9.9	6,3	40	—	2	Resprout
Quercus rubra	BR	7,2	7,6	11,1	50	—	3	
Amelanchier laevis.	BR	6,6	6,4	10,4	110	—	4	
Carpinus carol.	BR	2,6	5,6	5.0	40	—	2	no term. leader
Lindera benzoin	BR	1.2	9.3	7,3	50	—	4	
Platanus occident.	BR	0.7	6.7	10.1	75	—	4	

No Natural Recruits

Source: Transplant, Live stake, Ball and burlap, Pot, Tubling, Bare Root, Mechanically planted, Unknown

Vigor: 4=excellent, 3=good, 2=weak, 1=unlikely to survive year, 0=Dead, 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.

Plot Data: CVS Levels 1 & 2

General Information

Project Label: Morgan crk.

Project Name:

Team: AXE

Plot: 2

☐ Level 1 (planted stems only)
☒ Level 2 (planted and natural stems)

Start Date: 12 / 9 / 09
e.g.: JAN / 15 / 2006

End Date (if different): / /

Party	Role**
Fay in	Plot Leader
Thomas	

**Roles: Co-leader, Assistant, Guide, Land owner, Taxonomist, Other

Soil Drainage*

☐ Excessively drained
☐ Somewhat excessively drained
☐ Well drained
☐ Moderately well drained
☒ Somewhat poorly drained
☐ Poorly drained
☐ Very poorly drained

Water

Percent of Plot Submerged: 75 %

Mean Water Depth: 2-4 cm

Location

General:

State: NC County: Haywood

Quadrangle:

Place Names: 1)

2) 3)

Land Owner:

GPS Receiver Location (m): x= y=

Datum: ☒ NAD83/WGS84 ☐ NAD27

UTM Zone: if UTMs used

Lat: decimal deg. 35.68458 (or UTM-N) meters
e.g. 35.16623 e.g. 3962248

Long: -82.95334 (or UTM-E) e.g. 710524
e.g. -125.12413

Coordinate Accuracy (m radius):
e.g. 30

GPS File Name:

Site Characteristics

Elevation: ± ☐m ☐ft.

Slope (deg):

Aspect (deg):

Compass Type: ☐ magnetic ☒ true

Plot Placement

☒ Representative
☐ Random
☐ Stratified random
☐ Transect component
☐ Systematic (grid)
☐ Capture specific feature

Further details of placement can be mentioned in Plot Rationale.

Taxonomic Standard Used for Plant Identification

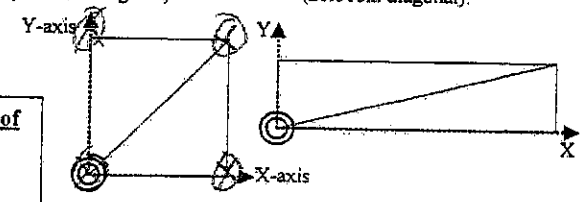
Authority: Weakley, **Publ. Date:**

Plot Diagram

Fill in *ONE* of the templates below, using the key to draw GPS location, photos and posts. Edit shape if plot doesn't match one of the templates. Draw any landmarks, such as streams, banks, fences, etc.

Standard 10m x 10m (14.142m diagonal):

Non-standard 5m x 20m (20.616m diagonal):



Bearing of Plot X-Axis: 18 °

●Posts (x,y) (meters)
(0,0)
(0,10)
(10,0)
(10,10)
(,)

Key
- Plot origin (0,0) point
- GPS location point
- photo taken, with direction
- posts

Plot Size (ares, default=1): 1
(An "are" is 100 m²)

Photo Identifier(s): 101 – 1021 → 1024

Notes

If more space is needed, check the box and use back of datasheets.

Layout: (anything unusual about plot layout and shape)

☐ more...

Plot Location: (directions to plot, landscape content)

☐ more...

Plot Rationale: (why location was chosen for the plot)

☐ more...

Other Notes: (invasive species, erosion, disturbances, etc.)

No natural recruits.

☐ more...

Required Fields in Bold and Underlined. *Definitions and/or values are in the Definitions section of the CVS Field Guide.

Woody Stem Data: CVS Level 2

Planted Woody Stems - individual stems measured

Leader: Faquin/Thomas Project: Morgan Creek Team: AXE Plot: 2 Date: 12/9/09

Species Name	Source	Coordinates X (0.1 m)	Coordinates Y (0.1 m)	ddh (1 mm)	Height (1* cm)	DBH (1 cm)	Vigor	Damage
Platanus occidentl.	BR	0.9	2.2	13.2	140	0.3	4	
Hydrangea arbor.	BR	3.0	3.6	4.4	55	—	2	
Cornus amomum	BR	4.9	2.3	13.7	150	0.4	4	
Lindera benzoin.	BR	7.1	6.5	6.1	50	—	4	
Quercus sp.	BR	8.8	1.9	10.7	55	—	4	
Acer saccharum	BR	9.7	0.5	0.9	10	—	2	Resprout
Hydrangea arbor.	BR	9.8	3.1	2.9	10	—	2	
Betula nigra.	BR	7.7	8.8	12.9	120	—	4	
Quercus rubra	BR	6.3	9.1	5.6	50	—	3	
Amelanchier laev's.	BR	6.8	6.7	9.7	115	—	4	
Hamamelis vrg	BR	5.0	6.7	7.3	60	—	4	
Hamamelis vrg.	BR	3.7	9.4	11.8	90	—	4	
Quercus rubra	BR	3.0	8.7	4.7	40	—	3	
Hamamelis vrg.	BR	2.1	6.6	9.2	70	—	4	
Quercus sp.	BR	0.9	9.2	10.3	50	—	4	

Source: Transplant, Live stake, Ball and burlap, Pot, Tubling, Bare Root, Mechanically planted, Unknown

Vigor: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=Dead, Missing.

*Height precision drops to 10cm if >2.5m and 50cm if >4m.

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.

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: Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Saplings — DBH: Sub-Sapl	0-1 cm	1-2.5	Trees — DBH: 2.5-	5-	≥10 (write DBH)
NO NATURAL RECRUITS											

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

Plot Data: CVS Levels 1 & 2

General Information

Project Label: Morgan ark.

Project Name:

Team: AXE

Plot: 3

☐ Level 1 (planted stems only)
☒ Level 2 (planted and natural stems)

Start Date: 12 / 9 / 09
e.g.: JAN / 15 / 2006

End Date (if different): / /

Party	Role**
Feiglin	Plot Leader
Thomas	

**Roles: Co-leader, Assistant, Guide, Land owner, Taxonomist, Other

Soil Drainage*

- ☐ Excessively drained
- ☐ Somewhat excessively drained
- ☒ Well drained
- ☐ Moderately well drained
- ☐ Somewhat poorly drained
- ☐ Poorly drained
- ☐ Very poorly drained

Water

Percent of Plot Submerged: 0 %

Mean Water Depth: _ cm

Location

General:

State: NC County: Haywood

Quadrangle:

Place Names: 1)

2) 3)

Land Owner:

GPS Receiver Location (m): x= y=

Datum: ☒ NAD83/WGS84 ☐ NAD27

UTM Zone: if UTMs used

Lat: decimal deg. e.g. 35.16623 — 35.68568 (or **UTM-N** meters e.g. 3962248)

Long: e.g. -125.12413 — -82.95381 (or **UTM-E** e.g. 710524)

Coordinate Accuracy (m radius): e.g. 30

GPS File Name:

Site Characteristics

Elevation: ± ☐m ☐ft.

Slope (deg):

Aspect (deg):

Compass Type: ☐ magnetic ☒ true

Plot Placement

- ☒ Representative
- ☐ Random
- ☐ Stratified random
- ☐ Transect component
- ☐ Systematic (grid)
- ☐ Capture specific feature

Further details of placement can be mentioned in Plot Rationale.

Taxonomic Standard Used for Plant Identification

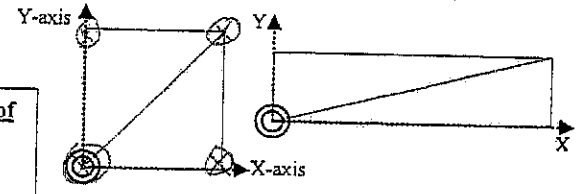
Authority: WEAKLEY, **Publ. Date:**

Plot Diagram

Fill in *ONE* of the templates below, using the key to draw GPS location, photos and posts. Edit shape if plot doesn't match one of the templates. Draw any landmarks, such as streams, banks, fences, etc.

Standard 10m x 10m (14.142m diagonal):

Non-standard 5m x 20m (20.616m diagonal):



Bearing of Plot X-Axis: 94 °

Posts (x,y) (meters)
(0 , 0)
(0 , 10)
(10 , 0)
(10 , 10)
(,)

Key

- Plot origin (0,0) point
- GPS location point
- photo taken, with direction
- posts

Plot Size (ares, default=1): 1
(An "are" is 100 m²)

Photo Identifier(s): 1017 → 1020

Notes

If more space is needed, check the box and use back of datasheets.

Layout: (anything unusual about plot layout and shape) ☐ more...

Plot Location: (directions to plot, landscape content) ☐ more...

Plot Rationale: (why location was chosen for the plot) ☐ more...

Other Notes: (invasive species, erosion, disturbances, etc.)

No natural reproduction. ☐ more...

Required Fields in Bold and Underlined. *Definitions and/or values are in the Definitions section of the CVS Field Guide.

Woody Stem Data: CVS Level 2

Planted Woody Stems - individual stems measured

Leader: Faglin/Thomas Project: Morgan Team: AKt Plot: 3 Date: 12/9/09

Species Name	Source	Coordinates X (0.1 m)	Coordinates Y (0.1 m)	ddh (1 mm)	Height (1* cm)	DBH (1 cm)	Vigor	Damage
Cornus amomum	BR	1.3	1.9	13.7	150	0.3	4	
Betula nigra	BR	4.1	2.0	13.7	180	0.5	4	
unknown	BR	4.1	3.0	4.5	30	—	1	No buds or intact features
Lindera benzoin	BR	3.6	5.0	9.0	40	—	3	
Cornus amomum	BR	0.4	2.9	8.3	150	0.4	4	
Lindera benzoin	BR	7.2	1.0	6.9	60	—	3	
Quercus sp.	BR	9.3	0.4	7.6	60	—	4	
Amelanchier laevis	BR	8.7	3.7	11.4	110	—	4	
Hamamelis virgin.	BR	7.1	5.1	4.0	55	—	3	
Hamamelis virgin	BR	9.9	7.5	4.2	40	—	3	
Lindera benzoin	BR	8.8	9.2	9.2	80	—	4	
Quercus rubra	BR	6.8	7.8	6.9	50	—	3	
Hamamelis vig.	BR	5.1	9.9	6.6	20	—	1	dieback.
Quercus rubra.	BR	3.4	8.8	4.7	40	—	2	
Platanus occident.	BR	0.3	8.7	15.1	110	—	4	
unknown	BR	3.8	6.1	6.0	10	—	1	Tramp. No buds/ intact features

Source: Transplant, Live stake, Ball and burlap, Pot, Tubling, Bare Root, Mechanically planted, Unknown

Vigor: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=Dead, Missing.

*Height precision drops to 10cm if >2.5m and 50cm if >4m.

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.

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: Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Saplings — DBH: Sub-Sapl	0-1 cm	1-2.5	Trees — DBH: 2.5-	5-	≥10 (write DBH)
NO NATURAL RECRUITS.											

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

General Information

Project Label: morgan crk

Project Name:

Team: AXE

Plot: 4

☐ Level 1 (planted stems only)
☒ Level 2 (planted and natural stems)

Start Date: 12 / 9 / 09
e.g.: JAN / 15 / 2006

End Date (if different): / /

Party	Role**
Fagan	Plot Leader
Thomas	

**Roles: Co-leader, Assistant, Guide, Land owner, Taxonomist, Other

Soil Drainage*

- ☐ Excessively drained
- ☐ Somewhat excessively drained
- ☐ Well drained
- ☐ Moderately well drained
- ☒ Somewhat poorly drained
- ☐ Poorly drained
- ☐ Very poorly drained

Water

Percent of Plot Submerged: 15 %

Mean Water Depth: 2-4 cm

Location

General:

State: NC County: Haywood

Quadrangle:

Place Names: 1)

2) 3)

Land Owner:

GPS Receiver Location (m): x= y=

Datum: ☒ NAD83/WGS84 ☐ NAD27

UTM Zone: if UTMs used

Lat: decimal deg. e.g. 35.16623 — 35.686629 (or **UTM-N** meters e.g. 3962248)

Long: e.g. -125.12413 — -82.95360 (or **UTM-E** e.g. 710524)

Coordinate Accuracy (m radius): e.g. 30

GPS File Name:

Site Characteristics

Elevation: ± ☐m ☐ft.

Slope (deg):

Aspect (deg):

Compass Type: ☐ magnetic ☒ true

Plot Placement

- ☒ Representative
- ☐ Random
- ☐ Stratified random
- ☐ Transect component
- ☐ Systematic (grid)
- ☐ Capture specific feature

Further details of placement can be mentioned in Plot Rationale.

Taxonomic Standard Used for Plant Identification

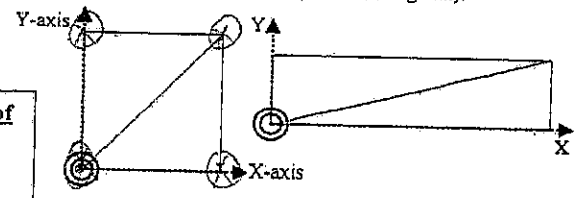
Authority: Weakley, **Publ. Date:**

Plot Diagram

Fill in *ONE* of the templates below, using the key to draw GPS location, photos and posts. Edit shape if plot doesn't match one of the templates. Draw any landmarks, such as streams, banks, fences, etc.

Standard 10m x 10m (14.142m diagonal):

Non-standard 5m x 20m (20.616m diagonal):



Posts (x,y) (meters)
(0,0)
(0,10)
(10,0)
(10,10)
(,)

Key
- Plot origin (0,0) point
- GPS location point
- photo taken, with direction
- posts

Bearing of Plot X-Axis: 72°

Plot Size (ares, default=1): 1
(An "are" is 100 m²)

Photo Identifier(s): frame 101-1010 → 1013

Notes

If more space is needed, check the box and use back of datasheets.

Layout: (anything unusual about plot layout and shape) ☐ more...

Plot Location: (directions to plot, landscape content) ☐ more...

Plot Rationale: (why location was chosen for the plot) ☐ more...

Other Notes: (invasive species, erosion, disturbances, etc.)

No natural recruits.

☐ more...

Required Fields in Bold and Underlined. *Definitions and/or values are in the Definitions section of the CVS Field Guide.

Woody Stem Data: CVS Level 2

Planted Woody Stems - individual stems measured

Leader: Fulvin/Thomas **Project:** Morgan 90 **Team:** AXE **Plot:** 4 **Date:** 12 / 9 / 09

Species Name	**Source**	**Coordinates** X (0.1 m)	Y (0.1 m)	ddh (1 mm)	**Height** (1* cm)	DBH (1 cm)	**Vigor**	Damage
Platanus occidentalis	BR	1.4	0.3	7.0	80	—	4	
Betula nigra	BR	2.0	2.2	10.1	150	0.4	4	
Carpinus caroliniana	BR	4.9	3.7	10.7	120	—	4	
Liriodendron tulip.	BR	6.2	1.0	10.7	90	—	4	
Salix nigra	BR	9.5	2.5	7.0	80	—	4	
Liriodendron tulip.	BR.	7.3	5.1	8.0	55	—	3	
Aronia arbutifolia	BR	5.0	6.9	5.7	60	—	2	
Hamamelis virginiana	BR	7.0	8.7	10.1	90	—	4	
Quercus rubra	BR	4.1	8.6	10.1	60	—	4	
Salix nigra	BR	2.4	5.2	4.5	60	—	3	
Cornus amomum	BR	1.7	8.2	11.9	130	—	4	
Sassafras albidum	BR	1.4	9.6	2.7	5	—	1	dieback, too wet, unk.

Source: Transplant, Live stake, Ball and burlap, Pot, Tubling, Bare Root, Mechanically planted, Unknown

Vigor: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=Dead, Missing.

↓

*Height precision drops to 10cm if >2.5m and 50cm if >4m.

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.

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** Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	**Saplings — DBH** Sub-Sapl	0-1 cm	1-2.5	**Trees — DBH** 2.5-	5-	≥10 (write DBH)
		—				—					
		—				—					
		—				—					
		—				—					
		—				—					
		—				—					
		—				—					

NO NATURAL RECRUITS

Plot Data: CVS Levels 1 & 2

General Information

Project Label: Morgan Ck

Project Name:

Team: AXE

Plot: 5

☐ Level 1 (planted stems only)
☒ Level 2 (planted and natural stems)

Start Date: 12 / 9 / 09
e.g.: JAN / 15 / 2006

End Date (if different): / /

Party	Role**
Faquin	Plot Leader
Thomas	

**Roles: Co-leader, Assistant, Guide, Land owner, Taxonomist, Other

Soil Drainage*

- ☐ Excessively drained
- ☐ Somewhat excessively drained
- ☒ Well drained
- ☐ Moderately well drained
- ☐ Somewhat poorly drained
- ☐ Poorly drained
- ☐ Very poorly drained

Water

Percent of Plot Submerged: 0 %

Mean Water Depth: — cm

Location

General:

State: NC County: Haywood

Quadrangle:

Place Names: 1)

2) 3)

Land Owner:

GPS Receiver Location (m):
x= y=

Datum: ☒ NAD83/WGS84 ☐ NAD27

UTM Zone: if UTMs used

Lat: decimal deg. e.g. 35.16623 — 35.688836 (or UTM-N) meters e.g. 3962248

Long: e.g. -125.12413 — -82.95519 (or UTM-E) e.g. 710524

Coordinate Accuracy (m radius): e.g. 30

GPS File Name:

Site Characteristics

Elevation: ± ☐m ☐ft.

Slope (deg):

Aspect (deg):

Compass Type: ☐ magnetic ☒ true

Plot Placement

- ☒ Representative
- ☐ Random
- ☐ Stratified random
- ☐ Transect component
- ☐ Systematic (grid)
- ☐ Capture specific feature

Further details of placement can be mentioned in Plot Rationale.

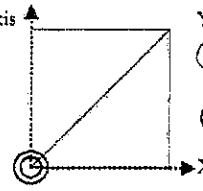
Taxonomic Standard Used for Plant Identification

Authority: Weakley, **Publ Date:**

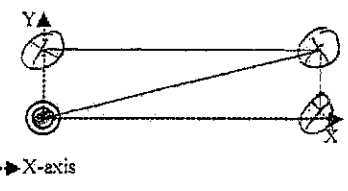
Plot Diagram

Fill in *ONE* of the templates below, using the key to draw GPS location, photos and posts. Edit shape if plot doesn't match one of the templates. Draw any landmarks, such as streams, banks, fences, etc.

Standard 10m x 10m (14.142m diagonal):



Non-standard 5m x 20m (20.616m diagonal):



Bearing of Plot X-Axis: 4 °

Posts (x,y) (meters)
(0,0)
(0,20)
(5,0)
(5,20)
(,)

Key
- Plot origin (0,0) point
- GPS location point
- photo taken, with direction
- posts

Plot Size (ares, default=1): 1 (An "are" is 100 m²)

Photo Identifier(s): frames 101-0996 → 0999

Notes

If more space is needed, check the box and use back of datasheets.

Layout: (anything unusual about plot layout and shape)

at edge of easement

☐ more...

Plot Location: (directions to plot, landscape content)

☐ more...

Plot Rationale: (why location was chosen for the plot)

☐ more...

Other Notes: (invasive species, erosion, disturbances, etc.)

No natural vegetation

☐ more...

Required Fields in Bold and Underlined. *Definitions and/or values are in the Definitions section of the CVS Field Guide.

Woody Stem Data: CVS Level 2

Planted Woody Stems - individual stems measured

Leader: Faquith Thomas Project: _____ Team: _____ Plot: 5 Date: 12/9/09

Species Name	Source	Coordinates X (0.1 m)	Coordinates Y (0.1 m)	ddh (1 mm)	Height (1* cm)	DBH (1 cm)	Vigor	Damage
Platanus occidentalis	BR	2.0	3.4	4.8	60	—	3	
Salix nigra	BR	2.8	1.0	5.1	55	—	3	
Platanus occidentalis	BR	5.9	1.0	11.6	140	0.3	4	
Liriodendron tulip.	BR	9.7	1.1	7.7	80	—	4	
Cornus amomum	BR	13.6	1.5	12.5	160	0.5	4	
Platanus occidentalis	BR	16.6	0.0	16.0	120	—	4	
Liriodendron tulipifera	BR	19.3	2.7	3.6	50	—	3	
Betula nigra	BR	17.8	4.5	11.0	135	—	4	
Liriodendron tulipifera	BR	16.4	3.0	3.6	30	—	3	
Platanus occidentalis	BR	15.3	4.7	8.0	55	—	3	
Platanus occidentalis	BR	12.4	3.5	7.5	75	—	4	
Salix nigra	BR	7.0	3.3	8.8	100	—	4	
Cornus amomum	BR	5.9	4.0	7.0	105	—	4	
Liriodendron tulipifera	BR	5.9	5.0	7.8	90	—	3	
Salix nigra	BR	3.1	2.5	7.5	70	—	4	

Source: Transplant, Live stake, Ball and burlap, Pot, Tubling, Bare Root, Mechanically planted, Unknown

Vigor: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=Dead, Missing.

*Height precision drops to 10cm if >2.5m and 50cm if >4m.

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.

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: Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Saplings — DBH: Sub-Sapl	0-1 cm	1-2.5	Trees — DBH: 2.5-	5-	≥10 (write DBH)
No Natural Recruits.											

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

Plot Data: CVS Levels 1 & 2

General Information

Project Label: Morgan cfr

Project Name:

Team: AXE

Plot: 6

☐ Level 1 (planted stems only)
☒ Level 2 (planted and natural stems)

Start Date: 12 / 9 / 09
e.g.: JAN / 15 / 2006

End Date (if different): / /

Party	Role**
Faquin	Plot Leader
Thomas	

**Roles: Co-leader, Assistant, Guide, Land owner, Taxonomist, Other

Soil Drainage*

☐ Excessively drained
☐ Somewhat excessively drained
☒ Well drained
☐ Moderately well drained
☐ Somewhat poorly drained
☐ Poorly drained
☐ Very poorly drained

Water

Percent of Plot Submerged: 0 %

Mean Water Depth: — cm

Location

General:

State: County: Haywood

Quadrangle:

Place Names: 1)

2) 3)

Land Owner:

GPS Receiver Location (m):
x= y=

Datum: ☒ NAD83/WGS84 ☐ NAD27

UTM Zone: if UTMs used

Lat: decimal deg. e.g. 35.16623 — 35.68910 — **(or UTM-N)** meters e.g. 3962248

Long: e.g. -125.12413 — -82.95452 — **(or UTM-E)** e.g. 710524

Coordinate Accuracy (m radius): e.g. 30

GPS File Name:

Site Characteristics

Elevation: ± ☐m ☐ft.

Slope (deg):

Aspect (deg):

Compass Type: ☐ magnetic ☒ true

Plot Placement

☒ Representative
☐ Random
☐ Stratified random
☐ Transect component
☐ Systematic (grid)
☐ Capture specific feature

Further details of placement can be mentioned in Plot Rationale.

Taxonomic Standard Used for Plant Identification

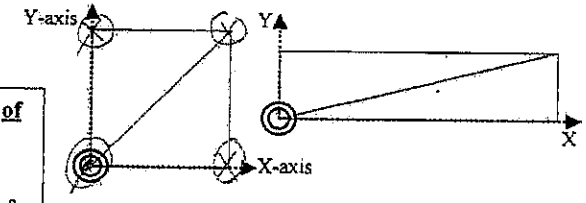
Authority: Weakley, **Publ. Date:**

Plot Diagram

Fill in *ONE* of the templates below, using the key to draw GPS location, photos and posts. Edit shape if plot doesn't match one of the templates. Draw any landmarks, such as streams, banks, fences, etc.

Standard 10m x 10m (14.142m diagonal):

Non-standard 5m x 20m (20.616m diagonal):



Bearing of Plot X-Axis: 69 °

Posts (x,y) (meters)
(0,0)
(0,10)
(10,0)
90,10)
(,)

Key
- Plot origin (0,0) point
- GPS location point
- photo taken, with direction
- posts

Plot Size (ares, default=1): (An "are" is 100 m²) 1

Photo Identifier(s): Frame 101-1003 → 1006

Notes

If more space is needed, check the box and use back of datasheets.

Layout: (anything unusual about plot layout and shape) ☐ more...

Plot Location: (directions to plot, landscape content) ☐ more...

Plot Rationale: (why location was chosen for the plot) ☐ more...

Other Notes: (invasive species, erosion, disturbances, etc.)

No natural recruits. ☐ more...

Required Fields in Bold and Underlined. *Definitions and/or values are in the Definitions section of the CVS Field Guide.

Woody Stem Data: CVS Level 2

Planted Woody Stems - individual stems measured

Leader: Faquin/Thomas **Project:** Morganton **Team:** AXE **Plot:** 6 **Date:** 12 / 9 / 09

Species Name	Source	Coordinates X (0.1 m)	Coordinates Y (0.1 m)	ddh (1 mm)	Height (1* cm)	DBH (1 cm)	Vigor	Damage
Quercus rubra	BR	1.7	2.2	3.7	35	—	3	
Acer saccharum	BR	4.1	3.9	7.1	50	—	3	
Liriodendron tulipifera	BR	3.9	0.8	9.9	80	—	4	
Acer saccharum	BR	7.6	2.7	8.0	20	—	3	Resprout
Acer saccharum	BR	8.4	0.5	3.3	10	—	3	Resprout
Cornus amomum	BR.	6.6	5.0	5.4	75	—	3	
Liriodendron tulip.	BR.	6.0	7.3	10.1	75	—	4	
Betula nigra	BR	5.3	9.9	5.5	85	—	3	
Betula nigra	BR	2.1	9.3	15.4	160	0.5	4	
Amelanchier laevis	BR.	0.5	5.8	10.9	110	—	3	

Source: Transplant, Live stake, Ball and burlap, Pot, Tubling, Bare Root, Mechanically planted, Unknown

Vigor: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=Dead, Missing.

*Height precision drops to 10cm if >2.5m and 50cm if >4m.

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.

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: Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Saplings — DBH: Sub-Sapl	0-1 cm	1-2.5	Trees — DBH: 2.5-	5-	≥10 (write DBH)

NO NATURAL RECRUITS

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

APPENDIX C

GEOMORPHIC RAW DATA

REPRESENTATIVE PROBLEM AREA PHOTOS

Stabilized Nick Point in Riffle on Morgan Cr, Sta 100+50

Year 1 10/30/09 Photo No. 1

Gap in Structure Baffle, Morgan Cr, Sta 102+06 (Appears Stable)

Year 1 10/30/09 Photo No. 2

Excessive Drop on Boulder Run Arch, Morgan Cr, Sta 102+47 (Appears to be holding)
Year 1 10/30/09 Photo No. 3

Nick Point in Riffle, Morgan Cr, Sta 107+60 (Larger boulders presently holding nick)
Year 1 10/30/09 Photo No. 4

Material scoured out of Boulder Run Structure, Morgan Cr, Sta 112+30
(Grade is being held by upper portion of structure)

Year 1 10/30/09 Photo No. 5

Deposition in Pool, Morgan Cr, Sta 113+20

Year 1 10/30/09 Photo No. 6

Deposition caused by pipe blockage, Morgan Cr, Sta 118+05

Year 1 10/30/09 Photo No. 7

Nick point formations in Riffle, Morgan Cr, Sta 124+20

Year 1 10/30/09 Photo No. 8

PHOTO POINTS

Photo Point 1
Morgan Creek facing upstream

As-Built 2/3/09

Year 1 10/30/09

Photo Point 1
Morgan Creek perpendicular to stream

As-Built 2/3/09

Year 1 10/30/09

Photo Point 1
Morgan Creek facing downstream

As-Built 2/3/09

Year 1 10/30/09

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

As-Built 2/3/09

Year 1 10/30/09

Photo Point 3
Middle Branch facing upstream

As-Built 2/3/09

Year 1 10/30/09

Photo Point 3
Middle Branch facing downstream

As-Built 2/3/09

Year 1 10/30/09

Photo Point 4
South Branch facing upstream

As-Built 2/3/09

Year 1 10/30/09

Photo Point 4
South Branch facing downstream

As-Built 2/3/09

Year 1 10/30/09

Photo Point 5
Morgan Creek facing upstream

As-Built 2/3/09

Year 1 10/30/09

Photo Point 6
North Branch from piped crossing, facing upstream

As-Built 2/3/09

Year 1 10/30/09

Photo Point 6
North Branch from piped crossing, facing downstream

As-Built 2/3/09

Year 1 10/30/09

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

As-Built 2/3/09

Year 1 10/30/09

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

As-Built 2/3/09

Year 1 10/30/09

Photo Point 9
Piped crossing at easement break, facing upstream

As-Built 2/3/09

Year 1 10/30/09

Photo Point 9
Piped crossing at easement break, facing downstream

As-Built 2/3/09

Year 1 10/30/09

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

As-Built 2/3/09

Year 1 10/30/09

GEOMORPHIC DATA

Table B2. Visual Morphological Stability Assessment

Morgan Creek Stream Restoration Site (D06035-A)

Morgan Creek 3,031 ft

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	58	62	N/A	94%	
	2. Armor stable	58	62	N/A	94%	
	3. Facet grade appears stable	58	62	N/A	94%	
	4. Minimal evidence of embedding/fining	62	62	N/A	100%	
	5. Length appropriate	60	62	N/A	97%	**95%**
B. Pools	1. Present	53	62	N/A	85%	
	2. Sufficently deep	53	62	N/A	85%	
	3. Length appropriate	53	62	N/A	85%	**85%**
C. Thalweg	1. Upstream of meander bend centered	62	62	N/A	100%	
	2. Downstream of meander bend centered	62	62	N/A	100%	**100%**
D. Meanders	1. Outer bend in state of limited erosion	62	62	N/A	100%	
	2. Of those eroding, # w/ concomitant point bar formation	0	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%	**98%**
E. Bed General	1. General channel bed agradation areas	N/A	N/A	0/0	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting	N/A	N/A	16/200	98%	**93%**
F. Vanes	1. Free of back or arm scour	62	62	N/A	100%	
	2. Height appropriate	57	62	N/A	92%	
	3. Angle and geometry appear appropriate	62	62	N/A	100%	
	4. Free of piping or other structural failures	60	62	N/A	97%	**97%**
G. Wads/Boulders	1. Free of scour	4	4	N/A	100%	
	2. Footing stable	4	4	N/A	100%	**100%**

Table B2. Visual Morphological Stability Assessment

Morgan Creek Stream Restoration Site (D06035-A)

North Branch 616 ft

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%	**100%**
B. Pools	1. Present	25	25	N/A	100%	
	2. Sufficently deep	24	25	N/A	96%	
	3. Length appropriate	24	25	N/A	96%	**97%**
C. Thalweg	1. Upstream of meander bend centered	23	23	N/A	100%	
	2. Downstream of meander bend centered	23	23	N/A	100%	**100%**
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%	**100%**
E. Bed General	1. General channel bed agradation 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%	**100%**
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%	**100%**
G. Wads/Boulders	1. Free of scour	2	2	N/A	100%	
	2. Footing stable	2	2	N/A	100%	**100%**

Table B2. Visual Morphological Stability Assessment

Morgan Creek Stream Restoration Site (D06035-A)

Middle Branch 302 ft

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%	**100%**
B. Pools	1. Present	6	6	N/A	100%	
	2. Sufficently deep	6	6	N/A	100%	
	3. Length appropriate	6	6	N/A	100%	**100%**
C. Thalweg	1. Upstream of meander bend centered	9	9	N/A	100%	
	2. Downstream of meander bend centered	9	9	N/A	100%	**100%**
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%	**100%**
E. Bed General	1. General channel bed agradation 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%	**100%**
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%	**100%**
G. Wads/Boulders	1. Free of scour	6	6	N/A	100%	
	2. Footing stable	6	6	N/A	100%	**100%**

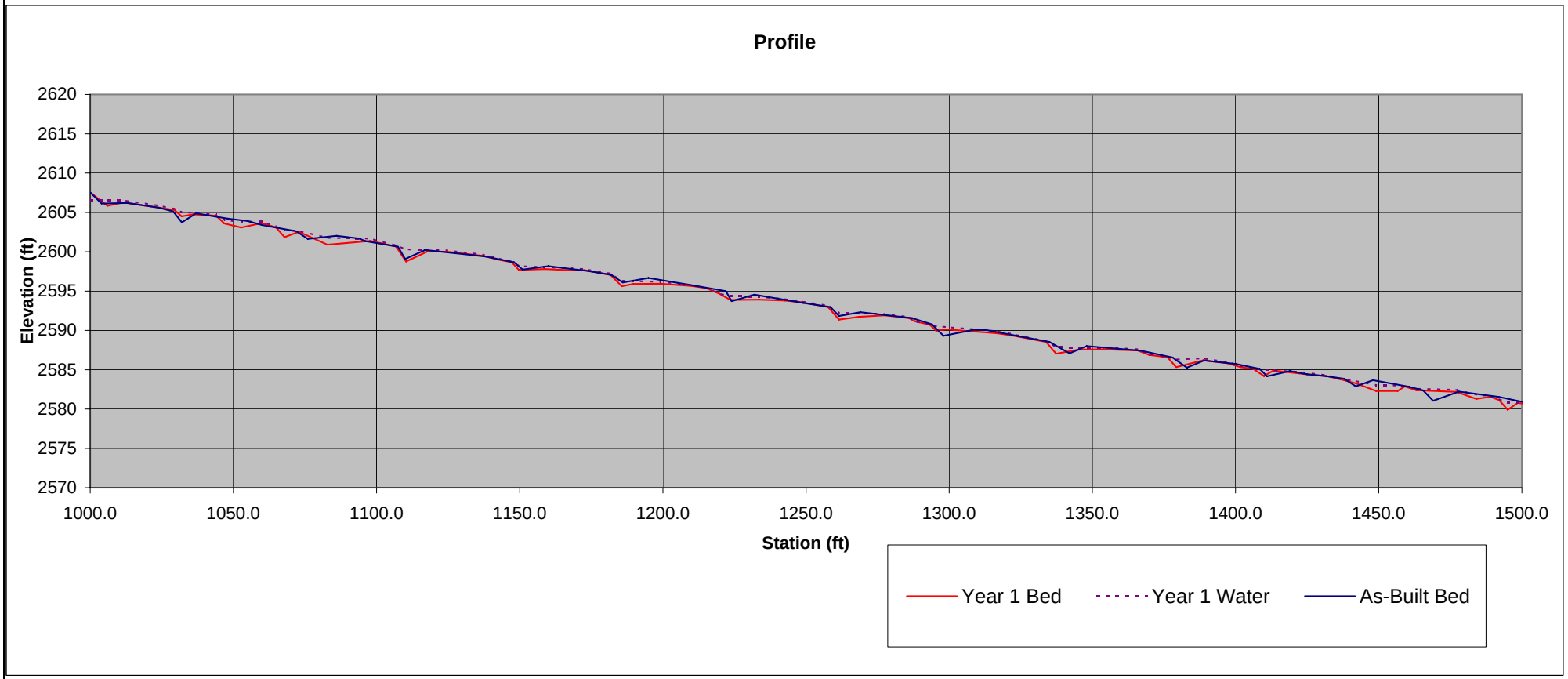
Table B2. Visual Morphological Stability Assessment

Morgan Creek Stream Restoration Site (D06035-A)

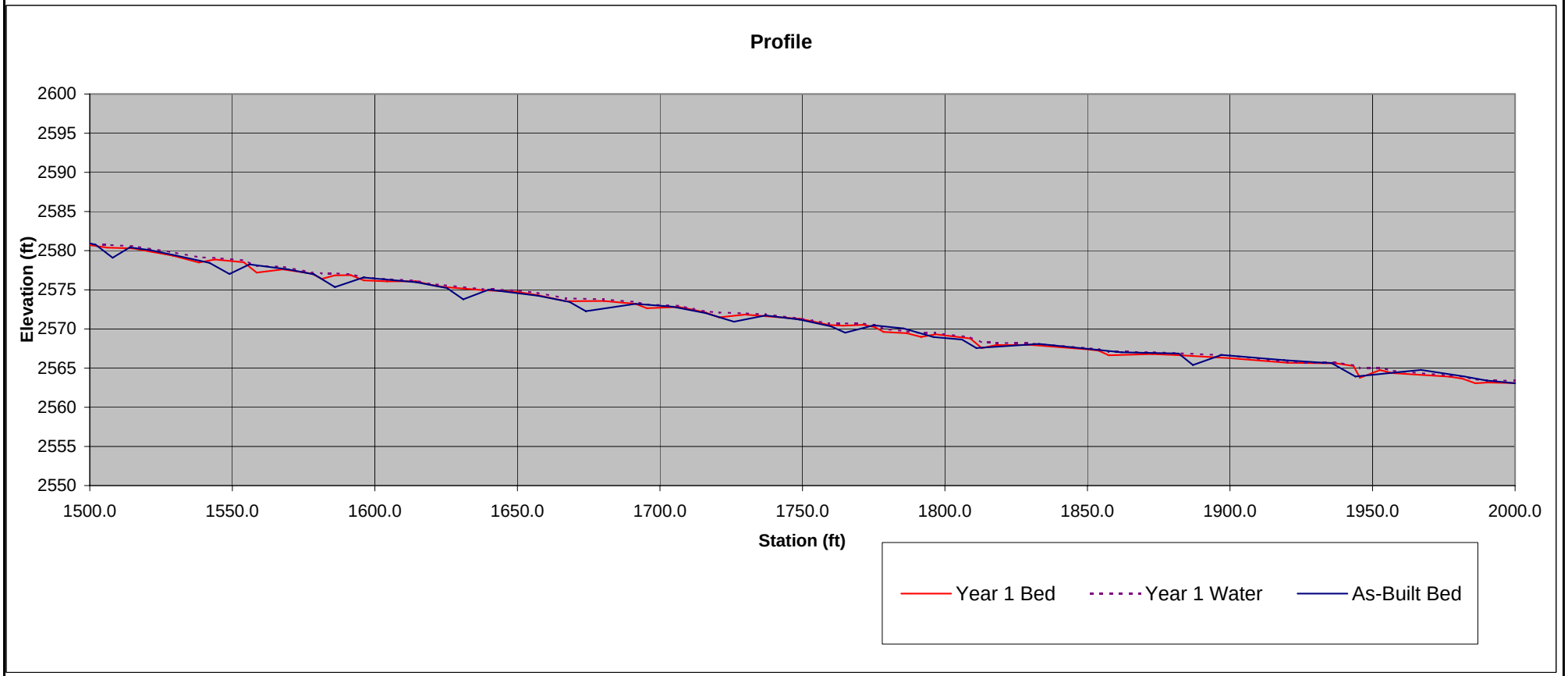
South Branch 320 ft

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	12	12	N/A	100%	
	4. Minimal evidence of embedding/fining	12	12	N/A	100%	
	5. Length appropriate	12	12	N/A	100%	**100%**
B. Pools	1. Present	9	9	N/A	100%	
	2. Sufficently deep	9	9	N/A	100%	
	3. Length appropriate	9	9	N/A	100%	**100%**
C. Thalweg	1. Upstream of meander bend centered	12	12	N/A	100%	
	2. Downstream of meander bend centered	12	12	N/A	100%	**100%**
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%	**100%**
E. Bed General	1. General channel bed agradation 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%	**100%**
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	8	9	N/A	89%	**97%**
G. Wads/Boulders	1. Free of scour	2	2	N/A	100%	
	2. Footing stable	2	2	N/A	100%	**100%**

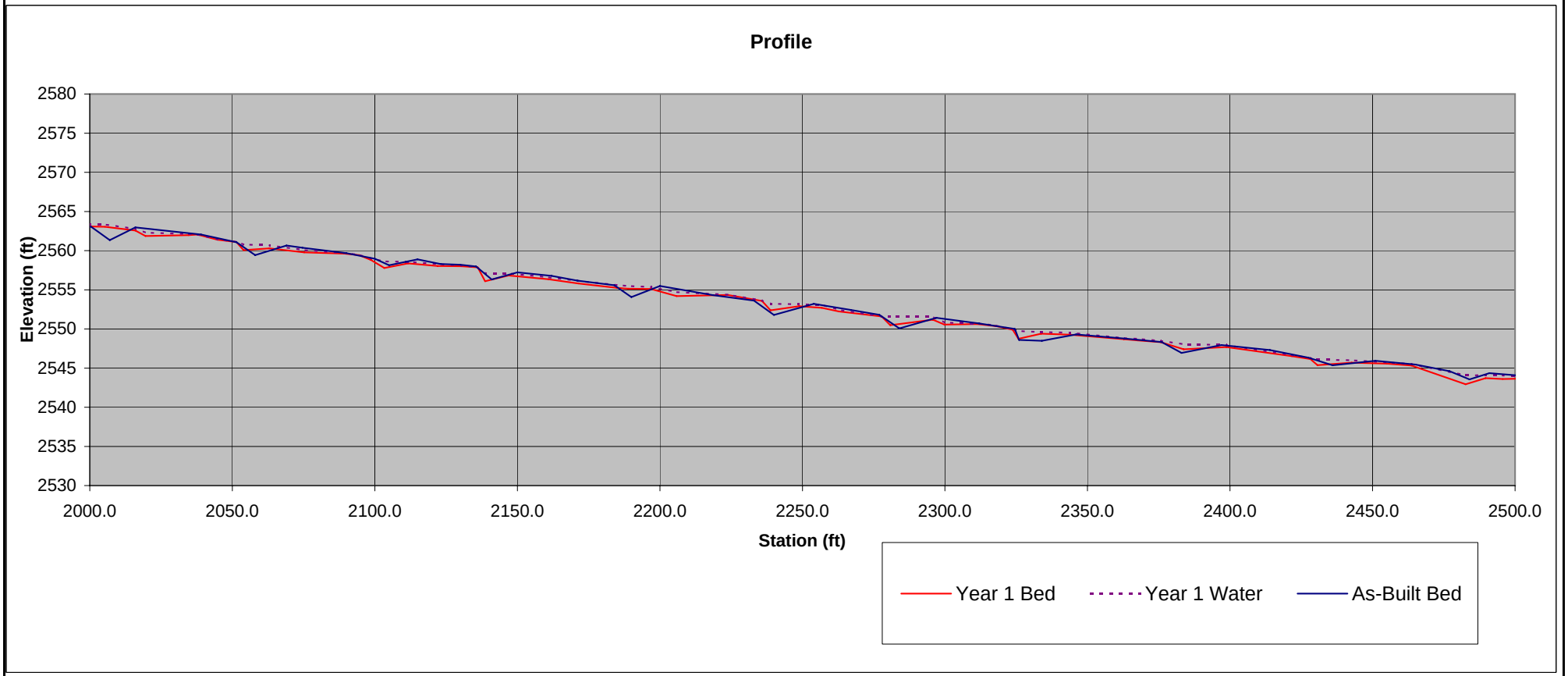
Morgan Creek Stream Restoration Site
Haywood County, NC
Profile Reach 1 - Morgan Creek



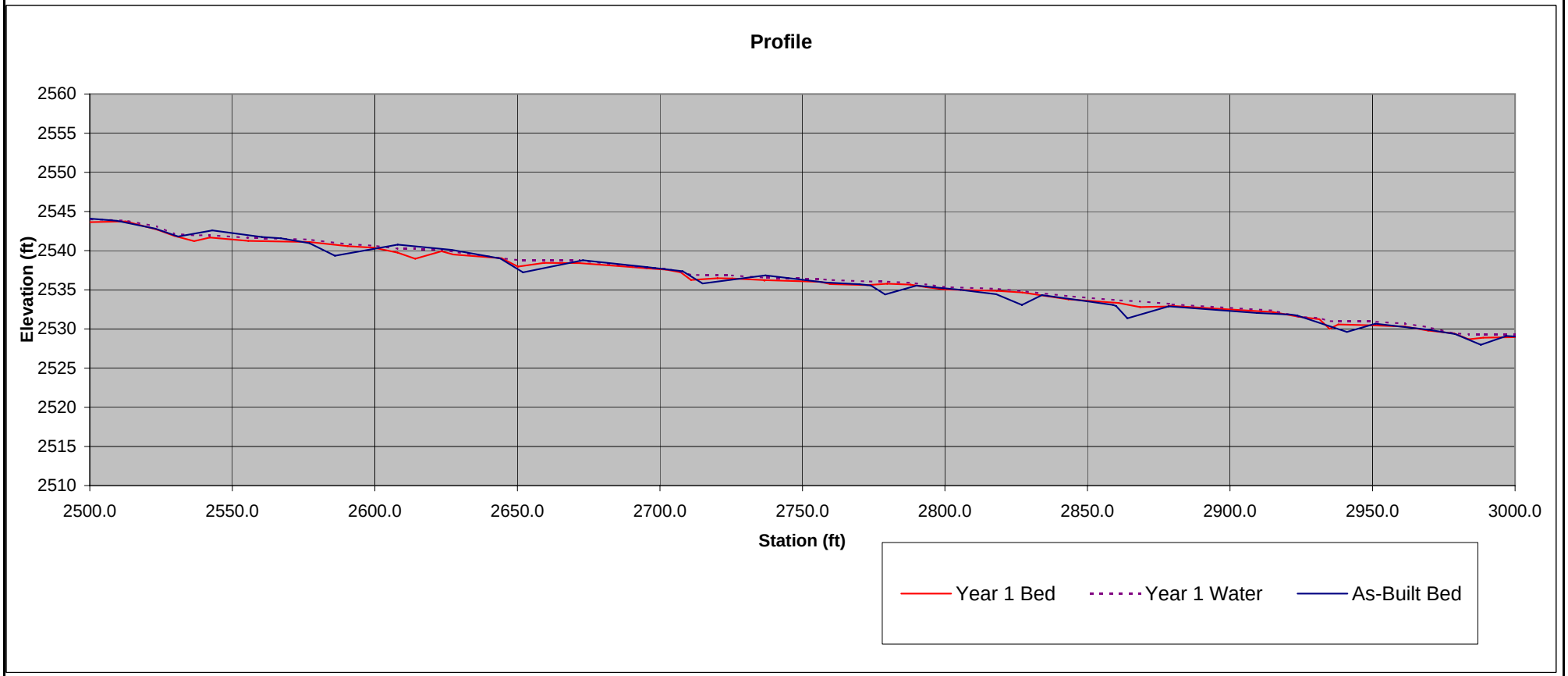
Morgan Creek Stream Restoration Site
Haywood County, NC
Profile Reach 1 - Morgan Creek



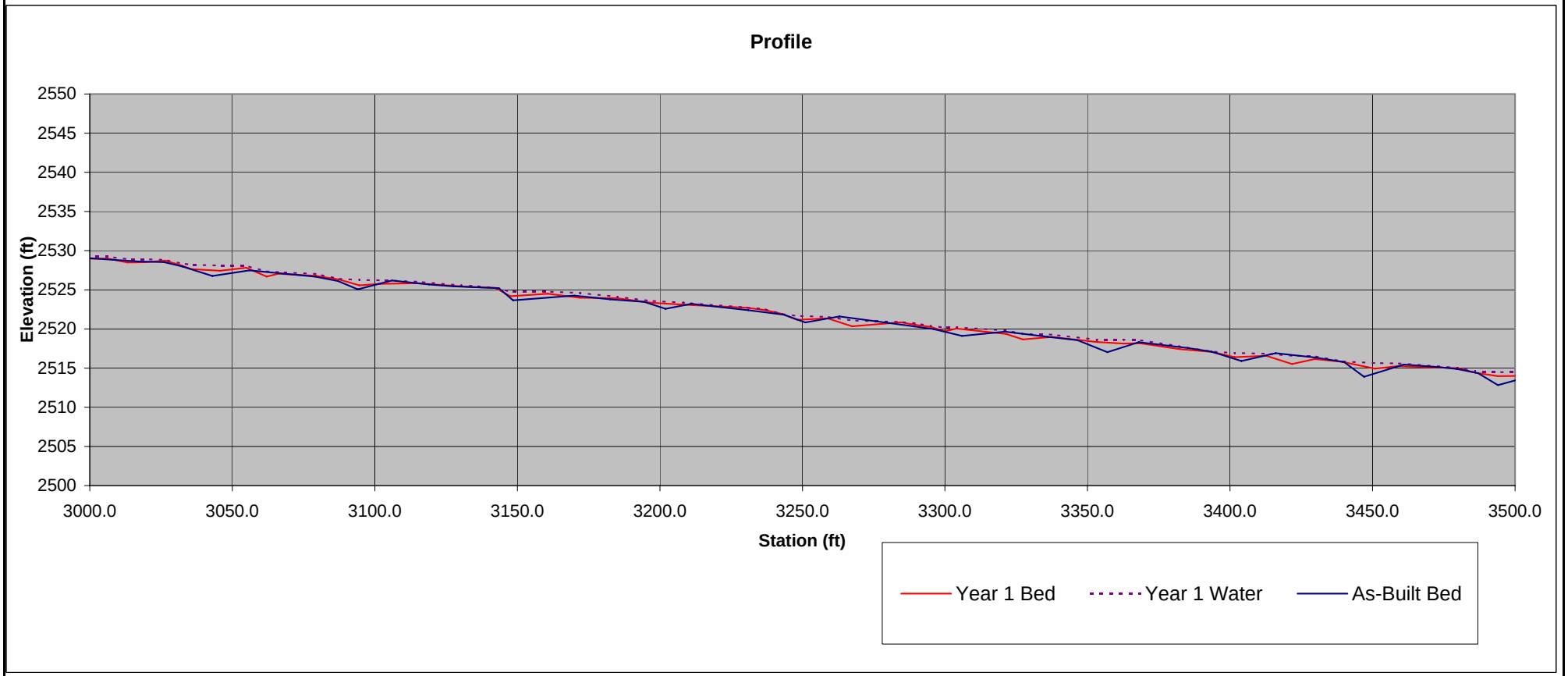
Morgan Creek Stream Restoration Site
Haywood County, NC
Profile Reach 1 - Morgan Creek



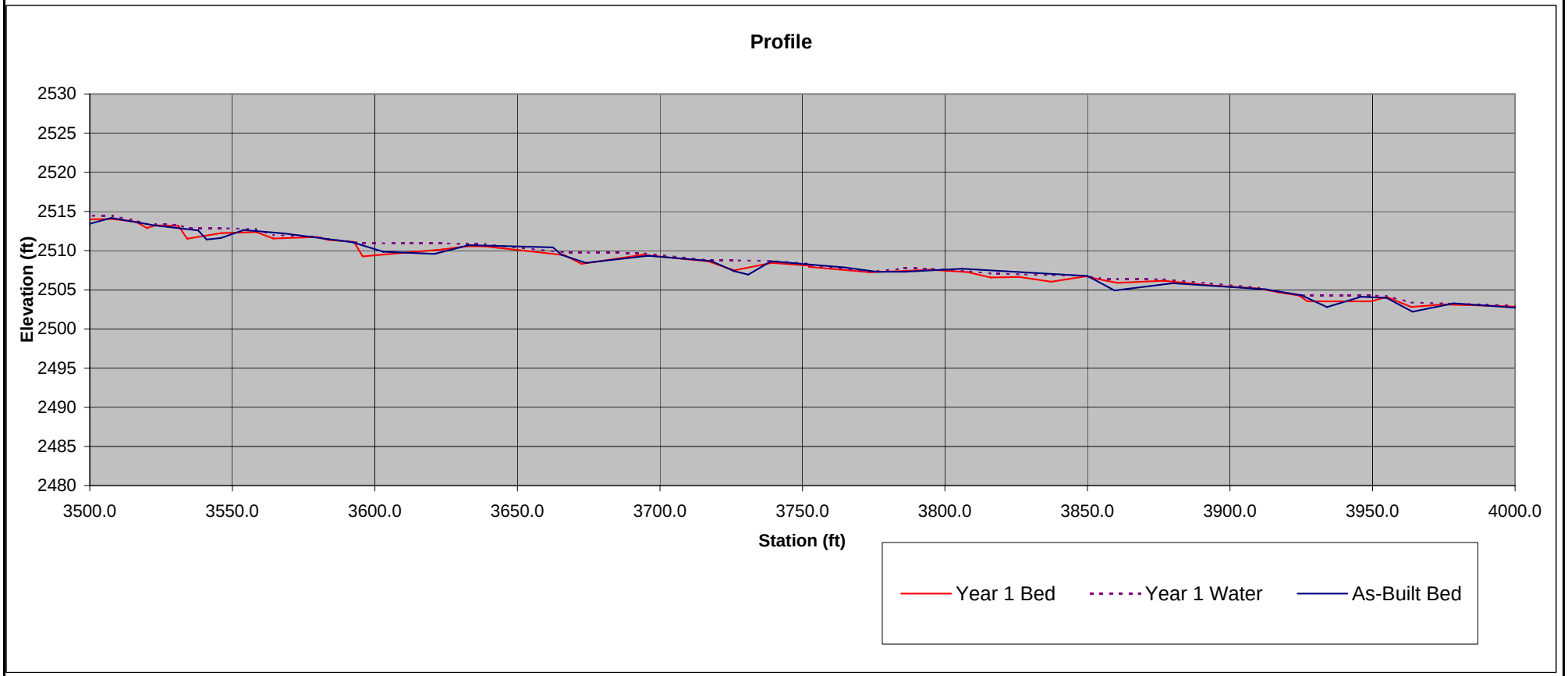
Morgan Creek Stream Restoration Site
Haywood County, NC
Profile Reach 1 - Morgan Creek



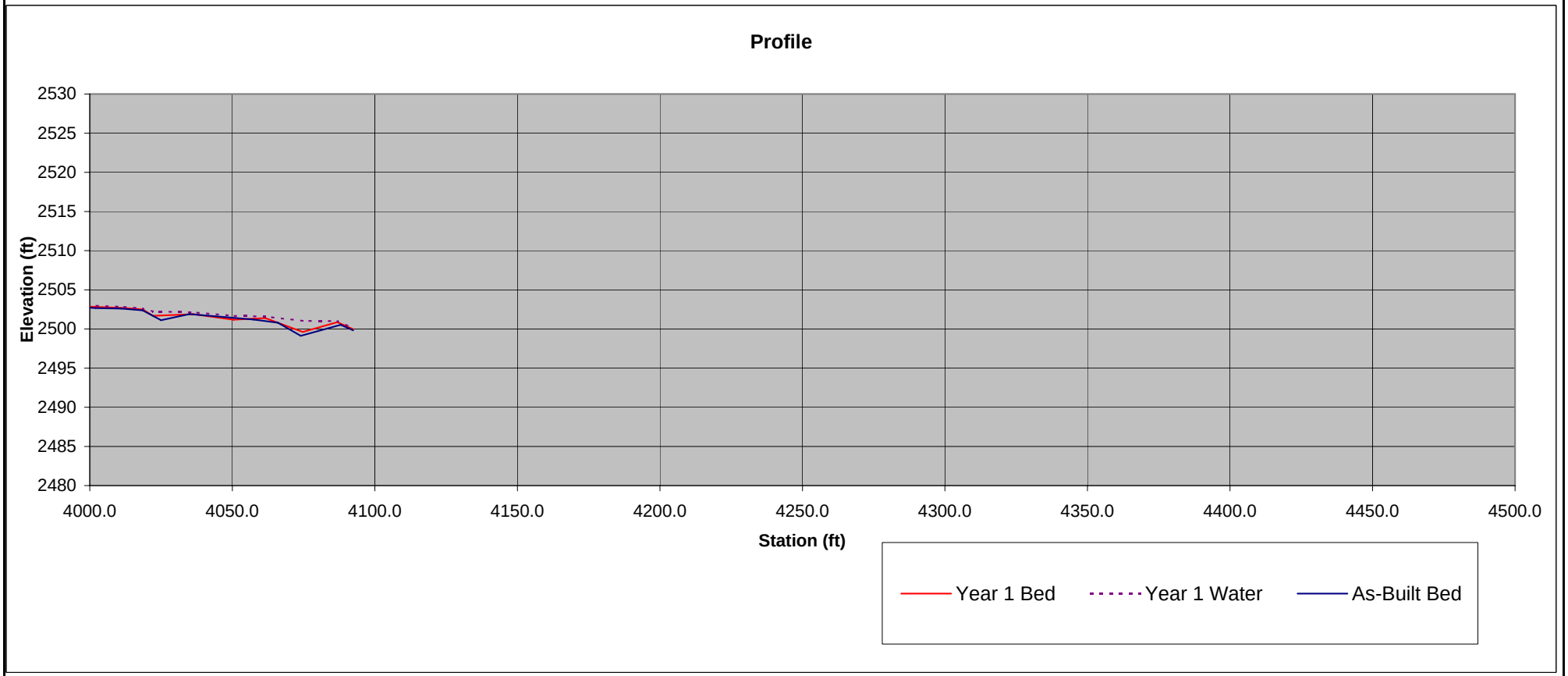
Morgan Creek Stream Restoration Site
Haywood County, NC
Profile Reach 1 - Morgan Creek



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



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



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

Year 1

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
2611.45	1000	3.90			INV CMP	2607.55	2606.56	
2611.45	1006	5.62				2605.83	2606.56	
2611.45	1011.5	5.18	0.29		HOR	2606.27	2606.56	
2611.45	1024.5	5.87	0.25	5.05	RCV	2605.58	2605.83	2606.40
2611.45	1029.5	6.14	0.14			2605.31	2605.45	
2611.45	1032	6.96	0.54			2604.49	2605.03	
2611.45	1036	6.70	0.21		HOR	2604.75	2604.96	
2611.45	1044	6.87	0.13	5.92		2604.58	2604.71	2605.53
2611.45	1047	7.86	0.42			2603.59	2604.01	
2611.45	1052.8	8.37	0.76			2603.08	2603.84	
2611.45	1060	7.82	0.20		DHR	2603.63	2603.83	
2611.45	1065	8.35	0.15			2603.10	2603.25	
2611.45	1068	9.60	0.90			2601.85	2602.75	
2611.45	1073	8.91	0.12	7.85	HOR	2602.54	2602.66	2603.60
2611.45	1083	10.56	0.88			2600.89	2601.77	
2611.45	1093	10.24	0.50			2601.21	2601.71	
2611.45	1098	10.08	0.30	8.95		2601.37	2601.67	2602.50
2611.45	1107	10.78	0.12		BR ARCH	2600.67	2600.79	
2611.45	1110.5	12.70	1.55			2598.75	2600.30	
2611.45	1118	11.42	0.22		HOR	2600.03	2600.25	
2611.45	1125	11.45	0.18	10.32		2600.00	2600.18	2601.13
2611.45	1137.5	11.97	0.15		LHR	2599.48	2599.63	
2611.45	1142.8	12.45	0.17			2599.00	2599.17	
2611.45	1147.5	12.79	0.05			2598.66	2598.71	
2611.45	1150	13.77	0.50			2597.68	2598.18	
2611.45	1159	13.65	0.25		HOR	2597.80	2598.05	
2611.45	1168.5	13.81	0.25			2597.64	2597.89	
2611.45	1173	13.80	0.15	12.75	BR	2597.65	2597.80	2598.70
2611.45	1182	14.38	0.16		BR ARCH	2597.07	2597.23	
2600.90	1186	5.29	0.70			2595.61	2596.31	
2600.90	1190	5.00	0.36			2595.90	2596.26	
2600.90	1199.5	4.97	0.26	3.51	HOR	2595.93	2596.19	2597.39
2600.90	1210.5	5.25	0.12		DHR	2595.65	2595.77	
2600.90	1215.5	5.53	0.02			2595.37	2595.39	
2600.90	1220	6.21	0.00			2594.69	2594.69	
2600.90	1224	7.03	0.50			2593.87	2594.37	
2600.90	1234	7.00	0.38		HOR	2593.90	2594.28	
2600.90	1243	7.11	0.20	5.89		2593.79	2593.99	2595.01
2600.90	1249	7.32	0.10		BR	2593.58	2593.68	
2600.90	1258.2	7.94	0.18			2592.96	2593.14	
2600.90	1262	9.53	0.85			2591.37	2592.22	
2600.90	1269	9.17	0.49			2591.73	2592.22	
2600.90	1278	8.99	0.16			2591.91	2592.07	
2600.90	1286.5	9.34	0.14		LHR	2591.56	2591.70	
2600.90	1288.5	9.74	0.00			2591.16	2591.16	
2600.90	1293.8	10.19	0.05			2590.71	2590.76	
2600.90	1296	10.93	0.55			2589.97	2590.52	
2600.90	1299.5	10.77	0.32		HOR	2590.13	2590.45	
2600.90	1317	11.25	0.25	10.13		2589.65	2589.90	2590.77
2600.90	1322.5	11.54	0.20		BR	2589.36	2589.56	
2600.90	1334.5	12.37	0.10			2588.53	2588.63	
2600.90	1338	13.87	0.83			2587.03	2587.86	
2600.90	1346	13.34	0.28			2587.56	2587.84	
2600.90	1354.5	13.31	0.25	11.73	HOR	2587.59	2587.84	2589.17
2600.90	1366.5	13.45	0.16		LHR	2587.45	2587.61	
2600.90	1370.5	14.01	0.10			2586.89	2586.99	
2600.90	1377	14.33	0.05			2586.57	2586.62	
2600.90	1380	15.58	1.00			2585.32	2586.32	
2600.90	1389.5	14.70	0.25		HOR	2586.20	2586.45	
2600.90	1398	15.08	0.15		DHR	2585.82	2585.97	
2591.06	1402.5	5.73	0.20			2585.33	2585.53	
2591.06	1407	5.95	0.01			2585.11	2585.12	
2591.06	1410.7	6.86	0.80			2584.20	2585.00	
2591.06	1414	6.16	0.05		HOR	2584.90	2584.95	
2591.06	1425	6.61	0.21			2584.45	2584.66	
2591.06	1433	6.89	0.10		XLOG	2584.17	2584.27	
2591.06	1437	7.23	0.05			2583.83	2583.88	

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

Year 1

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
2591.06	1443	7.80	0.30			2583.26	2583.56	
2591.06	1450	8.77	0.76			2582.29	2583.05	
2591.06	1457.5	8.77	0.71			2582.29	2583.00	
2591.06	1460	8.19	0.05		XLOG	2582.87	2582.92	
2591.06	1464	8.67	0.20			2582.39	2582.59	
2591.06	1478	8.88	0.27	7.84		2582.18	2582.45	2583.22
2591.06	1485	9.77	0.55			2581.29	2581.84	
2591.06	1490	9.50	0.10		LHR	2581.56	2581.66	
2591.06	1493	9.93	0.15			2581.13	2581.28	
2591.06	1496	11.16	0.95			2579.90	2580.85	
2591.06	1499.5	10.28	0.05			2580.78	2580.83	
2591.06	1507	10.68	0.35			2580.38	2580.73	
2591.06	1516	10.77	0.30	9.60	HOR	2580.29	2580.59	2581.46
2591.06	1530	11.69	0.43		BR	2579.37	2579.80	
2591.06	1539	12.58	0.69			2578.48	2579.17	
2591.06	1544.5	12.19	0.20	11.03	HOR	2578.87	2579.07	2580.03
2591.06	1554.5	12.54	0.25			2578.52	2578.77	
2591.06	1559	13.86	0.85			2577.20	2578.05	
2591.06	1568	13.45	0.35		BR	2577.61	2577.96	
2591.06	1578	13.99	0.15			2577.07	2577.22	
2591.06	1581.5	14.67	0.72			2576.39	2577.11	
2591.06	1586	14.21	0.27			2576.85	2577.12	
2591.06	1591.5	14.18	0.10	13.31		2576.88	2576.98	2577.75
2591.06	1596	14.86	0.40			2576.20	2576.60	
2591.06	1604	14.99	0.30			2576.07	2576.37	
2591.06	1614	14.97	0.10		LHR	2576.09	2576.19	
2591.06	1619	15.42	0.10			2575.64	2575.74	
2591.06	1623.5	15.70	0.25	14.40	HOR	2575.36	2575.61	2576.66
2577.96	1637	3.00	0.13			2574.96	2575.09	
2577.96	1649	3.23	0.20		BR	2574.73	2574.93	
2577.96	1656	3.63	0.28			2574.33	2574.61	
2577.96	1666	4.42	0.39			2573.54	2573.93	
2577.96	1679	4.38	0.20	3.00	HOR	2573.58	2573.78	2574.96
2577.96	1690	4.75	0.25			2573.21	2573.46	
2577.96	1694	5.31	0.48			2572.65	2573.13	
2577.96	1705	5.15	0.15		LHR	2572.81	2572.96	
2577.96	1710	5.50	0.10			2572.46	2572.56	
2577.96	1714.5	5.88	0.15			2572.08	2572.23	
2577.96	1719	6.48	0.62			2571.48	2572.10	
2577.96	1728	6.12	0.15		HOR	2571.84	2571.99	
2577.96	1735	6.33	0.25	5.34		2571.63	2571.88	2572.62
2577.96	1747	6.67	0.05			2571.29	2571.34	
2577.96	1751.5	7.01	0.10		DHR	2570.95	2571.05	
2577.96	1757	7.45	0.23			2570.51	2570.74	
2577.96	1762	7.54	0.30			2570.42	2570.72	
2577.96	1769	7.43	0.15		HOR	2570.53	2570.68	
2577.96	1773	7.73	0.30			2570.23	2570.53	
2577.96	1776	8.35	0.40			2569.61	2570.01	
2577.96	1784	8.51	0.25			2569.45	2569.70	
2577.96	1789	8.98	0.50			2568.98	2569.48	
2577.96	1794	8.64	0.15	7.74	BR	2569.32	2569.47	2570.22
2577.96	1806	9.18	0.17			2568.78	2568.95	
2577.96	1810	10.40	0.74			2567.56	2568.30	
2577.96	1815	10.01	0.28		HOR	2567.95	2568.23	
2577.96	1827	10.00	0.19	8.98		2567.96	2568.15	2568.98
2577.96	1847	10.57	0.15			2567.39	2567.54	
2577.96	1850.5	10.73	0.20			2567.23	2567.43	
2577.96	1854	11.32	0.45			2566.64	2567.09	
2577.96	1869	11.17	0.25	9.90	HOR	2566.79	2567.04	2568.06
2577.96	1879	11.33	0.26		RIFF BEDROCK	2566.63	2566.89	
2577.96	1896	11.69	0.35		RIFF	2566.27	2566.62	
2578.02	1916	12.34	0.10		U/S EDGE FORD	2565.68	2565.78	
2578.02	1933	12.42	0.13		RCV INV	2565.60	2565.73	
2578.02	1938.8	12.76	0.10		RCV BAFF	2565.26	2565.36	
2578.02	1941	14.25	1.25		POOL	2563.77	2565.02	
2578.02	1948	13.27	0.30		DAM	2564.75	2565.05	
2578.02	1952	13.65	0.30		HOR	2564.37	2564.67	

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

Year 1

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
2578.02	1972	14.12	0.15		RIFF	2563.90	2564.05	
2578.02	1976.5	14.36	0.26		THL	2563.66	2563.92	
2578.02	1981	14.95	0.49		THL	2563.07	2563.56	
2578.02	1985	14.87	0.30		BR INV?	2563.15	2563.45	
2578.02	2000	14.97	0.30		THL	2563.05	2563.35	
2564.88	2010.5	2.32	0.23		0	2562.56	2562.79	
2564.88	2014	3.01	0.44		0	2561.87	2562.31	
2564.88	2029	2.91	0.15		0	2561.97	2562.12	
2564.88	2032	2.82	0.02		DHR INV	2562.06	2562.08	
2564.88	2039	3.49	0.04		DHR ARM	2561.39	2561.43	
2564.88	2045.5	3.78	0.04		DHR BAFF	2561.10	2561.14	
2564.88	2048	4.82	0.72		POOL	2560.06	2560.78	
2564.88	2057	4.60	0.40		HOR	2560.28	2560.68	
2564.88	2069	5.10	0.30		RIFF	2559.78	2560.08	
2564.88	2082.5	5.27	0.08		LHR INV	2559.61	2559.69	
2564.88	2087.5	5.45	0.04		LHR ARM	2559.43	2559.47	
2564.88	2091.5	6.07	0.20		LHR BAFF	2558.81	2559.01	
2564.88	2096	7.10	0.85		POOL	2557.78	2558.63	
2564.88	2104	6.50	0.20		HOR	2558.38	2558.58	
2564.88	2114	6.84	0.26		RIFF	2558.04	2558.30	
2564.88	2122	6.87	0.10		X-LOG	2558.01	2558.11	
2564.88	2127.5	7.01	0.01		BAFF	2557.87	2557.88	
2564.88	2130	8.78	1.00		POOL	2556.10	2557.10	
2564.88	2138	8.06	0.28		HOR	2556.82	2557.10	
2564.88	2152	8.53	0.25		Thl	2556.35	2556.60	
2564.94	2162.5	9.14	0.34		BR Inv	2555.80	2556.14	
2564.94	2176	9.69	0.37		BR Arch	2555.25	2555.62	
2564.94	2180	9.80	0.34		THL	2555.14	2555.48	
2564.94	2188	9.84	0.26		HOR	2555.10	2555.36	
2564.94	2197	10.74	0.50		THL	2554.20	2554.70	
2564.94	2215	10.60	0.04		BR INV @ CONF	2554.34	2554.38	
2564.94	2227	11.37	0.08		BR ARCH @ CONF	2553.57	2553.65	
2564.94	2230	12.57	0.85		POOL	2552.37	2553.22	
2564.94	2240	12.04	0.26		HOR	2552.90	2553.16	
2564.94	2248	12.24	0.40		THL	2552.70	2553.10	
2564.94	2254	12.70	0.22		BR INV	2552.24	2552.46	
2564.94	2269	13.34	0.00		BR ARCH	2551.60	2551.60	
2564.94	2272	14.46	1.10		POOL	2550.48	2551.58	
2564.94	2287	13.76	0.38		HOR	2551.18	2551.56	
2564.94	2291	14.38	0.26		RIFF	2550.56	2550.82	
2564.94	2302.5	14.32	0.10		LHR INV	2550.62	2550.72	
2564.94	2309	14.58	0.10		LHR ARM	2550.36	2550.46	
2564.94	2315	15.03	0.06		LHR BAFF	2549.91	2549.97	
2554.01	2317	5.27	1.00		POOL	2548.74	2549.74	
2554.01	2325	4.61	0.20		HOR	2549.40	2549.60	
2554.01	2335	4.74	0.26		THL	2549.27	2549.53	
2554.04	2354	5.34	0.13		DHR INV	2548.70	2548.83	
2554.04	2359	5.51	0.21		DHR ARM	2548.53	2548.74	
2554.04	2367	5.73	0.18		DHR BAFF	2548.31	2548.49	
2554.04	2375	6.64	0.66		THL	2547.40	2548.06	
2554.04	2390	6.36	0.28		THL	2547.68	2547.96	
2554.04	2413	7.52	0.15		DHR ARM	2546.52	2546.67	
2554.04	2419.5	7.89	0.15		DHR BAFF	2546.15	2546.30	
2554.04	2422	8.67	0.70		POOL	2545.37	2546.07	
2554.04	2434	8.35	0.32		HOR	2545.69	2546.01	
2554.04	2446.5	8.48	0.16		RIFF	2545.56	2545.72	
2554.04	2455	8.71	0.20		BR INV	2545.33	2545.53	
2554.04	2474	11.11	1.16		POOL	2542.93	2544.09	
2554.04	2481	10.33	0.39		THL	2543.71	2544.10	
2554.04	2487	10.43	0.46		HOR	2543.61	2544.07	
2554.07	2504	10.33	0.10		DHR INV	2543.74	2543.84	
2554.07	2515	11.39	0.40		DHR BAFF	2542.68	2543.08	
2554.07	2521	12.19	0.27		HOR	2541.88	2542.15	
2554.07	2528	12.86	0.75		THL	2541.21	2541.96	
2554.07	2533.5	12.39	0.30		HOR	2541.68	2541.98	
2554.07	2547	12.83	0.40		THL	2541.24	2541.64	
2554.07	2568	12.97	0.32		HOR	2541.10	2541.42	

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

Year 1

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
2554.10	2581	13.53	0.26		THAL	2540.57	2540.83	
2554.10	2590	13.74	0.27		THAL	2540.36	2540.63	
2554.10	2598	14.35	0.50		THAL	2539.75	2540.25	
2543.90	2604	4.93	1.25		POOL	2538.97	2540.22	
2543.90	2613	3.98	0.20		HOR	2539.92	2540.12	
2543.90	2617	4.40	0.38		BR INV	2539.50	2539.88	
2543.90	2633.5	4.88	0.01		BR ARCH	2539.02	2539.03	
2543.90	2639	5.94	0.85		POOL	2537.96	2538.81	
2543.90	2648	5.46	0.35		THAL	2538.44	2538.79	
2543.90	2660	5.50	0.32		HOR	2538.40	2538.72	
2543.90	2678	6.01	0.13		THAL	2537.89	2538.02	
2543.90	2683	6.16	0.05		LHR INV	2537.74	2537.79	
2543.90	2689.5	6.33	0.14		LHR LOG	2537.57	2537.71	
2543.90	2694.5	6.67	0.06		LHR RIFF	2537.23	2537.29	
2543.90	2698	7.65	0.65		POOL	2536.25	2536.90	
2543.90	2707	7.43	0.40		THAL	2536.47	2536.87	
2543.90	2712	7.45	0.40		HOR	2536.45	2536.85	
2543.90	2712	7.45	0.40		HOR	2536.45	2536.85	
2543.90	2723	7.66	0.32		THAL	2536.24	2536.56	
2543.90	2723	7.66	0.32		THAL	2536.24	2536.56	
2543.90	2742	7.89	0.35		THAL	2536.01	2536.36	
2543.90	2745.5	8.18	0.55		BR INV	2535.72	2536.27	
2543.90	2758	8.30	0.48		0	2535.60	2536.08	
2543.90	2764.8	8.13	0.27		PL3 THAL	2535.77	2536.04	
2543.90	2773	8.24	0.24		THAL	2535.66	2535.90	
2543.90	2778.5	8.57	0.35		THAL	2535.33	2535.68	
2543.90	2785	8.86	0.32		THAL	2535.04	2535.36	
2543.90	2803	9.03	0.27		THAL	2534.87	2535.14	
2543.90	2812	9.25	0.19		THAL	2534.65	2534.84	
2543.90	2828	10.12	0.41		THAL	2533.78	2534.19	
2543.90	2845.5	10.58	0.35		THAL	2533.32	2533.67	
2543.90	2853	11.11	0.73		POOL	2532.79	2533.52	
2543.90	2863	11.03	0.35		XPIPE LT INV	2532.87	2533.22	
2543.90	2863	11.00	0.29		XPIPE MID INV	2532.90	2533.19	
2543.90	2863	10.93	0.20		XPIPE RT INV	2532.97	2533.17	
2543.90	2899.5	11.74	0.20		THAL	2532.16	2532.36	
2543.90	2908.5	12.35	0.00		RCP INV	2531.55	2531.55	
2543.90	2915.5	12.66	0.17		RCP BAFF	2531.24	2531.41	
2543.90	2919	13.89	0.99		POOL	2530.01	2531.00	
2543.90	2922	13.33	0.40		THL	2530.57	2530.97	
2543.90	2933.5	13.43	0.49		HOR	2530.47	2530.96	
2543.90	2945	13.60	0.38		THAL	2530.30	2530.68	
2543.90	2953	14.10	0.44		BR INV	2529.80	2530.24	
2543.90	2962	14.47	0.00		BR ARCH	2529.43	2529.43	
2543.90	2967	15.23	0.68		POOL	2528.67	2529.35	
2543.90	2972	15.01	0.41		0	2528.89	2529.30	
2543.90	2989	14.90	0.25		HOR	2529.00	2529.25	
2543.90	2996	15.41	0.42		THL	2528.49	2528.91	
2532.31	3002	3.79	0.39		THL	2528.52	2528.91	
2532.31	3009	3.59	0.10		X-LOG	2528.72	2528.82	
2532.31	3014.5	4.19	0.25		X-LOG BAFF	2528.12	2528.37	
2532.31	3018	4.67	0.55		POOL	2527.64	2528.19	
2532.31	3028	4.88	0.68		POOL	2527.43	2528.11	
2532.31	3037	4.49	0.25		HOR	2527.82	2528.07	
2532.31	3044	5.63	0.68		THL	2526.68	2527.36	
2532.31	3048	5.26	0.20		HOR	2527.05	2527.25	
2532.31	3061	5.53	0.25		BR THROAT	2526.78	2527.03	
2532.31	3069	6.00	0.10		BR ARCH	2526.31	2526.41	
2532.31	3076	6.74	0.70		POOL	2525.57	2526.27	
2532.31	3083	6.55	0.46		HOR	2525.76	2526.22	
2532.31	3096	6.47	0.20		THL	2525.84	2526.04	
2532.31	3111	6.87	0.13		LHR INV	2525.44	2525.57	
2532.31	3116.5	6.99	0.15		LHR ARM	2525.32	2525.47	
2532.31	3123	7.08	0.01		LHR BAFF	2525.23	2525.24	
2532.31	3128	8.13	0.59		POOL	2524.18	2524.77	
2532.31	3141	7.82	0.28		HOR	2524.49	2524.77	
2532.31	3152	8.33	0.63		RIF	2523.98	2524.61	

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

Year 1

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
2532.31	3165	8.38	0.18		BR	2523.93	2524.11	
2532.31	3176	8.95	0.25		BR BED ROCK	2523.36	2523.61	
2532.31	3188	9.21	0.25		BED ROCK	2523.10	2523.35	
2532.31	3209.5	9.60	0.04		LHR INV	2522.71	2522.75	
2532.31	3216	9.90	0.12		LHR ARM	2522.41	2522.53	
2532.31	3222	10.42	0.00		LHR BAFF	2521.89	2521.89	
2532.31	3227	11.14	0.50		THL	2521.17	2521.67	
2532.31	3237.5	10.96	0.20		BED ROCK	2521.35	2521.55	
2532.31	3246	11.98	0.75		POOL	2520.33	2521.08	
2532.31	3262.8	11.47	0.06		LHR INV	2520.84	2520.90	
2532.31	3268	11.80	0.20		LHR ARM	2520.51	2520.71	
2532.31	3273	12.04	0.13		LHR BAFF	2520.27	2520.40	
2532.31	3278	12.62	0.50		POOL	2519.69	2520.19	
2532.31	3282	12.26	0.15		HOR	2520.05	2520.20	
2532.31	3299	12.95	0.46		RIF	2519.36	2519.82	
2532.31	3305	13.65	0.70		0	2518.66	2519.36	
2532.31	3315	13.33	0.30		BR INV	2518.98	2519.28	
2523.54	3331	5.21	0.30		POOL	2518.33	2518.63	
2523.54	3340	5.41	0.51		POOL	2518.13	2518.64	
2523.54	3346	5.37	0.39		HOR	2518.17	2518.56	
2523.54	3359.5	6.10	0.36		BKF INV	2517.44	2517.80	
2523.54	3371	6.48	0.05		BR ARCH	2517.06	2517.11	
2523.54	3379	7.14	0.53		POOL	2516.40	2516.93	
2523.54	3390	6.97	0.28		HOR	2516.57	2516.85	
2523.54	3399	8.02	1.06		THAL	2515.52	2516.58	
2523.54	3407	7.39	0.38		BR INV	2516.15	2516.53	
2523.54	3416.5	7.73	0.06		BR ARCH	2515.81	2515.87	
2523.54	3428	8.61	0.72		POOL	2514.93	2515.65	
2523.54	3436	8.30	0.38		HOR	2515.24	2515.62	
2523.54	3457	8.55	0.05		XLOG	2514.99	2515.04	
2523.54	3463	9.13	0.16		XL BAFF	2514.41	2514.57	
2523.54	3471	9.57	0.52		POOL	2513.97	2514.49	
2523.54	3485	9.51	0.39		HOR	2514.03	2514.42	
2523.54	3493	9.86	0.18		THAL	2513.68	2513.86	
2523.54	3497	10.66	0.53		THAL	2512.88	2513.41	
2523.54	3500	10.30	0.13		LHR INV	2513.24	2513.37	
2523.54	3508	10.39	0.14		LHR ARM	2513.15	2513.29	
2523.54	3511	12.02	1.38		POOL	2511.52	2512.90	
2523.54	3522.8	11.31	0.65		PL4 THAL	2512.23	2512.88	
2523.54	3535	11.16	0.35		HOR	2512.38	2512.73	
2523.54	3541	12.00	0.45		THAL	2511.54	2511.99	
2523.54	3556	11.80	0.05		LHR INV	2511.74	2511.79	
2523.54	3560	12.17	0.09		LHR ARM	2511.37	2511.46	
2523.54	3569	12.43	0.00		LHR BAFF	2511.11	2511.11	
2523.54	3572	14.28	1.70		POOL	2509.26	2510.96	
2523.54	3587	13.80	1.20		POOL	2509.74	2510.94	
2523.54	3600	13.38	0.79		POOL	2510.16	2510.95	
2519.49	3608	8.93	0.25		GLIDE	2510.56	2510.81	
2519.49	3614.5	8.95	0.27		HOR	2510.54	2510.81	
2519.49	3642	10.07	0.35		DHR BAFF	2509.42	2509.77	
2519.49	3648	11.18	1.45		POOL	2508.31	2509.76	
2519.49	3669	10.04	0.25		HOR	2509.45	2509.70	
2519.49	3692	10.86	0.15		RCV INV	2508.63	2508.78	
2519.49	3701	12.01	1.28		POOL	2507.48	2508.76	
2519.49	3714	11.05	0.26		HOR	2508.44	2508.70	
2514.02	3727	5.94	0.25		RIF	2508.08	2508.33	
2514.02	3727	6.09	0.22		TOR	2507.93	2508.15	
2514.02	3748	6.78	0.06		POOL	2507.24	2507.30	
2514.02	3760	6.62	0.33		THL	2507.40	2507.73	
2514.02	3769	6.46	0.16		HOR	2507.56	2507.72	
2514.02	3782	6.77	0.13		TOR	2507.25	2507.38	
2514.02	3790	7.45	0.52		POOL	2506.57	2507.09	
2514.02	3800	7.39	0.35		THL	2506.63	2506.98	
2514.02	3811	7.99	0.85		THL	2506.03	2506.88	
2514.02	3823	7.31	0.10		RCV INV	2506.71	2506.81	
2514.02	3828	7.70	0.10		RCV BAFF	2506.32	2506.42	
2514.02	3834	8.13	0.50		POOL	2505.89	2506.39	

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

Year 1

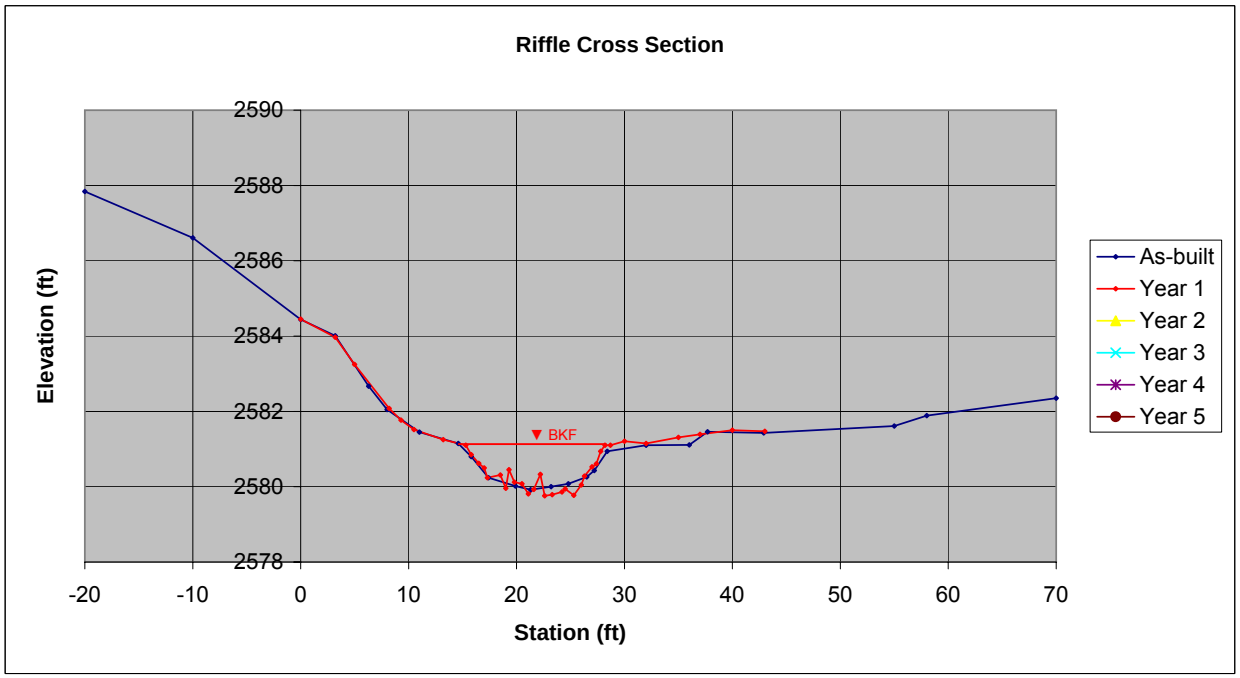
HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
2514.02	3850	7.87	0.20		HOR*	2506.15	2506.35	
2514.02	3865	8.42	0.25		RIF	2505.60	2505.85	
2514.02	3883	8.86	0.12		LHR INV	2505.16	2505.28	
2514.02	3890	9.35	0.05		LHR ARM	2504.67	2504.72	
2514.02	3897	9.74	0.05		LHR BAFF	2504.28	2504.33	
2514.02	3900	10.50	0.75		POOL	2503.52	2504.27	
2514.02	3912	10.50	0.75		POOL	2503.52	2504.27	
2514.02	3922	10.50	0.75		POOL	2503.52	2504.27	
2514.02	3927.5	9.93	0.12		LV	2504.09	2504.21	
2514.02	3936	11.22	0.58		POOL	2502.80	2503.38	
2514.02	3947	10.90	0.15		HR*	2503.12	2503.27	
2514.02	3962	11.04	0.15		RIF	2502.98	2503.13	
2514.02	3984	11.34	0.15		X-LOG INV	2502.68	2502.83	
2514.02	3990.5	11.53	0.12		X-LOG BAFF	2502.49	2502.61	
2514.02	3994	12.34	0.55		POOL	2501.68	2502.23	
2514.02	4008	12.14	0.25		HOR	2501.88	2502.13	
2514.02	4022	12.84	0.50		RIF	2501.18	2501.68	
2514.02	4033	12.63	0.20		ROCK ARCH?	2501.39	2501.59	
2508.69	4046	9.08	1.42		POOL	2499.61	2501.03	
2508.69	4058	7.83	0.15		HOR	2500.86	2501.01	
2508.69	4063.5	8.72	0.15		48" CMP INV	2499.97	2500.12	

Morgan Creek Stream Restoration Site
Haywood County, NC
Riffle Cross Section RF1
Reach 1 - Morgan Creek - Sta 15+21.4

As-Built

Year 1

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	0/0/0	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	12.2	Area	11.4	Area	0.0	Area	0.0	Area	0.0	Area	0.0
Bkf W	13.8	Bkf W	12.9	Bkf W	10	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	0.9	Dmean	0.9	Dmean	0.0	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	1.2	Dmax	1.3	Dmax	0.0	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	15.6	W/d	14.6	W/d	0.0	W/d	0.0	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+21.4

As-Built			
Station	FS/BS	Elev.	Desc.
BM	5.53	2584.66	RF1 IR Lt
HI		2590.19	
-20	2.35	2587.84	
-10	3.58	2586.61	
0	5.75	2584.44	GRND
3.2	6.18	2584.01	
6.3	7.52	2582.67	
8	8.14	2582.05	
11	8.74	2581.45	
14.6	9.04	2581.15	BKF LT
15.8	9.39	2580.80	
17.4	9.95	2580.24	EOW LT
19.9	10.17	2580.02	
21.3	10.27	2579.92	
23.2	10.19	2580.00	
24.8	10.11	2580.08	
26.5	9.93	2580.26	EOW RT
27.2	9.76	2580.43	
28.4	9.25	2580.94	BKF RT
32	9.09	2581.10	
36	9.08	2581.11	
37.7	8.73	2581.46	
42.9	8.76	2581.43	GRND
55	8.58	2581.61	
58	8.30	2581.89	
70	7.84	2582.35	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	5.64	2581.69	IR Lt
HI		2587.33	
0	2.88	2584.45	GRND
3.2	3.36	2583.97	"
5	4.08	2583.25	"
8.2	5.25	2582.08	"
9.3	5.56	2581.77	"
10.5	5.81	2581.52	"
13.2	6.08	2581.25	"
15.3	6.23	2581.10	BKF
15.8	6.48	2580.85	BNK
16.5	6.71	2580.62	BNK
17	6.83	2580.50	BNK
17.3	7.09	2580.24	BED
18.5	7.02	2580.31	BED
19	7.37	2579.96	"
19.3	6.88	2580.45	"(ROCK)
19.8	7.21	2580.12	"(ROCK)
20.5	7.25	2580.08	EOW
21.1	7.52	2579.81	BED
21.6	7.40	2579.93	"
22.2	7.00	2580.33	"(ROCK)
22.6	7.57	2579.76	"
23.3	7.54	2579.79	"
24.2	7.47	2579.86	"
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 2			
Station	FS/BS	Elev.	Desc.
BM			IR Lt
HI		0.00	

Year 3			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

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

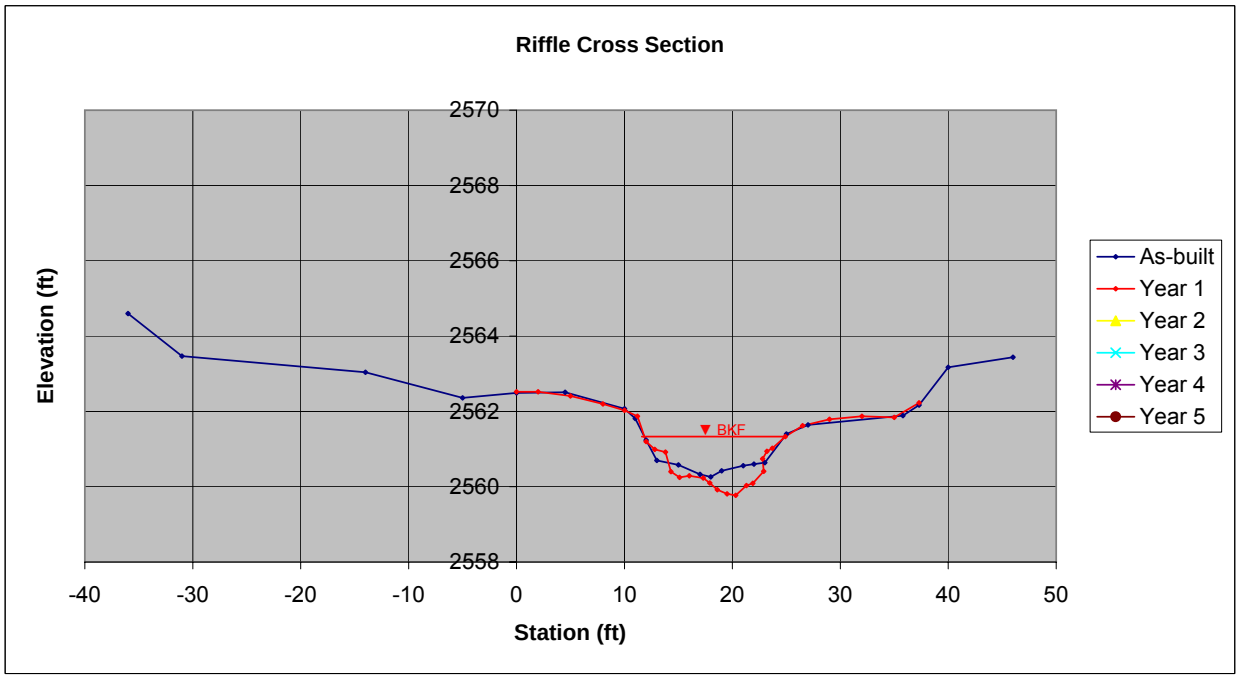
Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

Morgan Creek Stream Restoration Site
Haywood County, NC
Riffle Cross Section RF2
Reach 1 - Morgan Creek - Sta 20+74.6

As-Built

Year 1

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	0/0/0	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	10.2	Area	12.0	Area	0.0	Area	0.0	Area	0.0	Area	0.0
Bkf W	13.5	Bkf W	13.3	Bkf W	10	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	0.8	Dmean	0.9	Dmean	0.0	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	1.1	Dmax	1.6	Dmax	0.0	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	17.9	W/d	14.8	W/d	0.0	W/d	0.0	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+74.6

As-Built

Station	FS/BS	Elev.	Desc.
BM	7.72	2562.65	RF2 IR Lt
HI		2570.37	
-36	5.77	2564.60	
-31	6.90	2563.47	
-14	7.33	2563.04	
-5	8.01	2562.36	
0	7.88	2562.49	GRND
4.5	7.86	2562.51	
10	8.30	2562.07	BKF LT
11	8.56	2561.81	
12	9.13	2561.24	
13	9.67	2560.70	
15	9.79	2560.58	EOW LT
17	10.04	2560.33	
18	10.11	2560.26	
19	9.95	2560.42	
21	9.81	2560.56	EOW RT
22	9.77	2560.60	
23	9.73	2560.64	
25	8.97	2561.40	BKF RT
27	8.73	2561.64	
35.8	8.48	2561.89	
37.3	8.20	2562.17	GRND
40	7.20	2563.17	
46	6.93	2563.44	

Year 1

Station	FS/BS	Elev.	Desc.
BM	5.21	2562.41	RF2 IR Lt
HI		2567.62	
0	5.10	2562.52	GRND
2	5.10	2562.52	GRND
5	5.21	2562.41	GRND
8	5.42	2562.20	GRND
10	5.59	2562.03	GRND
11.2	5.75	2561.87	BKF
12	6.42	2561.20	BNK
12.8	6.63	2560.99	BNK
13.8	6.70	2560.92	BNK
14.3	7.22	2560.40	BED
15.1	7.37	2560.25	BED
16	7.33	2560.29	BED
17.3	7.39	2560.23	BED
17.9	7.52	2560.10	EOW
18.6	7.70	2559.92	BED
19.5	7.81	2559.81	BED
20.3	7.85	2559.77	BED
21.3	7.59	2560.03	BED
21.9	7.53	2560.09	EOW
22.9	7.21	2560.41	BANK
22.8	6.88	2560.74	BANK
23.2	6.68	2560.94	BANK
23.7	6.60	2561.02	BANK
24.9	6.29	2561.33	BKF
26.5	6.00	2561.62	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 2

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

Year 3

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

Year 4

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

Year 5

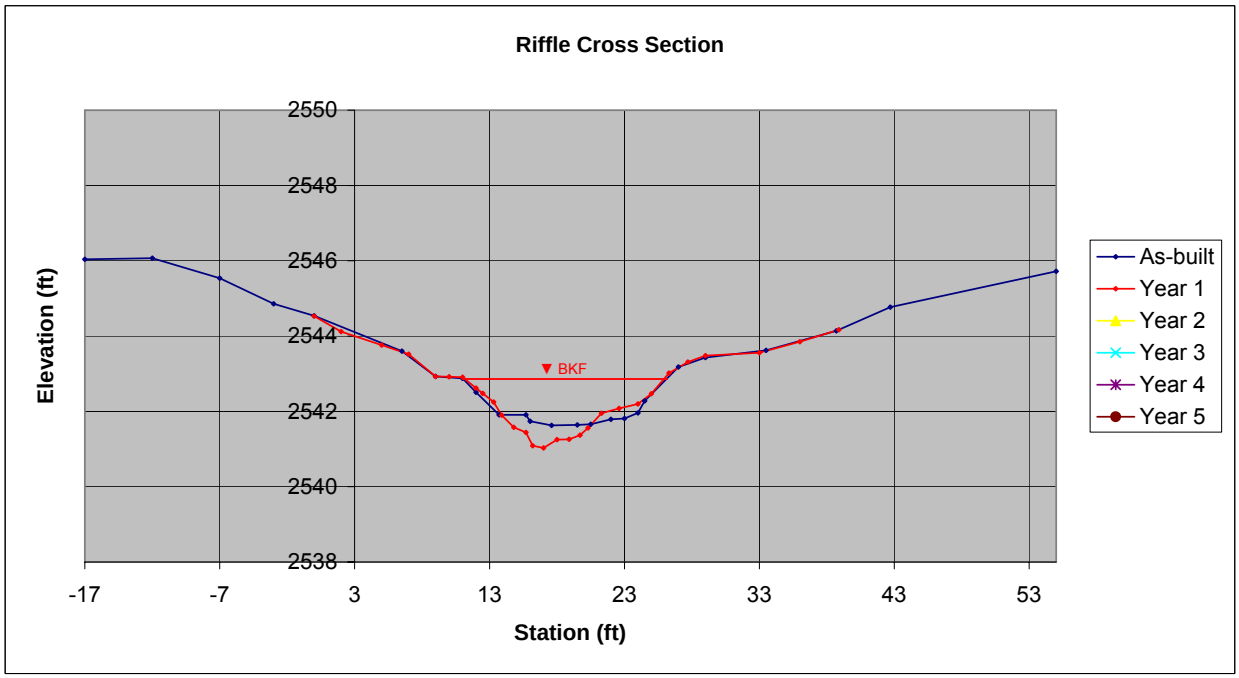
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

Morgan Creek Stream Restoration Site
Haywood County, NC
Riffle Cross Section RF3
Reach 1 - Morgan Creek - Sta 25+60.4

As-Built

Year 1

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	0/0/0	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	13.3	Area	15.3	Area	0.0	Area	0.0	Area	0.0	Area	0.0
Bkf W	15	Bkf W	14.6	Bkf W	10	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	0.9	Dmean	1.0	Dmean	0.0	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	1.3	Dmax	1.9	Dmax	0.0	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	16.9	W/d	14.0	W/d	0.0	W/d	0.0	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+60.4

As-Built			
Station	FS/BS	Elev.	Desc.
BM	6.04	2544.75	RF3 IR Lt
HI		2550.79	
-17	4.75	2546.04	
-12	4.72	2546.07	
-7	5.25	2545.54	
-3	5.93	2544.86	
0	6.25	2544.54	GRND
6.5	7.19	2543.60	
9	7.86	2542.93	
11	7.91	2542.88	BKF LT
12	8.28	2542.51	
13.7	8.88	2541.91	
15.7	8.88	2541.91	EOW LT
16	9.05	2541.74	
17.6	9.16	2541.63	
19.5	9.15	2541.64	
20.5	9.13	2541.66	
22	9.00	2541.79	
23	8.98	2541.81	EOW RT
24	8.83	2541.96	
24.5	8.51	2542.28	
27	7.61	2543.18	BKF RT
29	7.36	2543.43	
33.5	7.17	2543.62	
38.7	6.65	2544.14	GRND
42.7	6.02	2544.77	
55	5.07	2545.72	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	4.45	2544.75	RF3 IR Lt
HI		2549.20	
0	4.67	2544.53	GRND
2	5.08	2544.12	GRND
5	5.44	2543.76	GRND
7	5.68	2543.52	GRND
9	6.27	2542.93	GRND
10	6.28	2542.92	GRND
11	6.29	2542.91	BKF
12	6.58	2542.62	BNK
12.5	6.72	2542.48	BNK
13.3	6.95	2542.25	BNK
13.9	7.30	2541.90	BED
14.8	7.62	2541.58	EOW
15.7	7.76	2541.44	BED
16.2	8.11	2541.09	BED
17	8.17	2541.03	BED
18	7.95	2541.25	BED
18.9	7.94	2541.26	BED
19.7	7.83	2541.37	BED
20.3	7.64	2541.56	EOW
21.3	7.25	2541.95	BANK
22.6	7.12	2542.08	BANK
24	7.00	2542.20	BANK
25	6.73	2542.47	BANK
26.3	6.18	2543.02	BANK
27.7	5.89	2543.31	GRND
29	5.72	2543.48	GRND
33	5.64	2543.56	GRND
36	5.35	2543.85	GRND
38.9	5.03	2544.17	GRND

Year 2			
Station	FS/BS	Elev.	Desc.
BM			IR Lt
HI		0.00	

Year 3			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

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

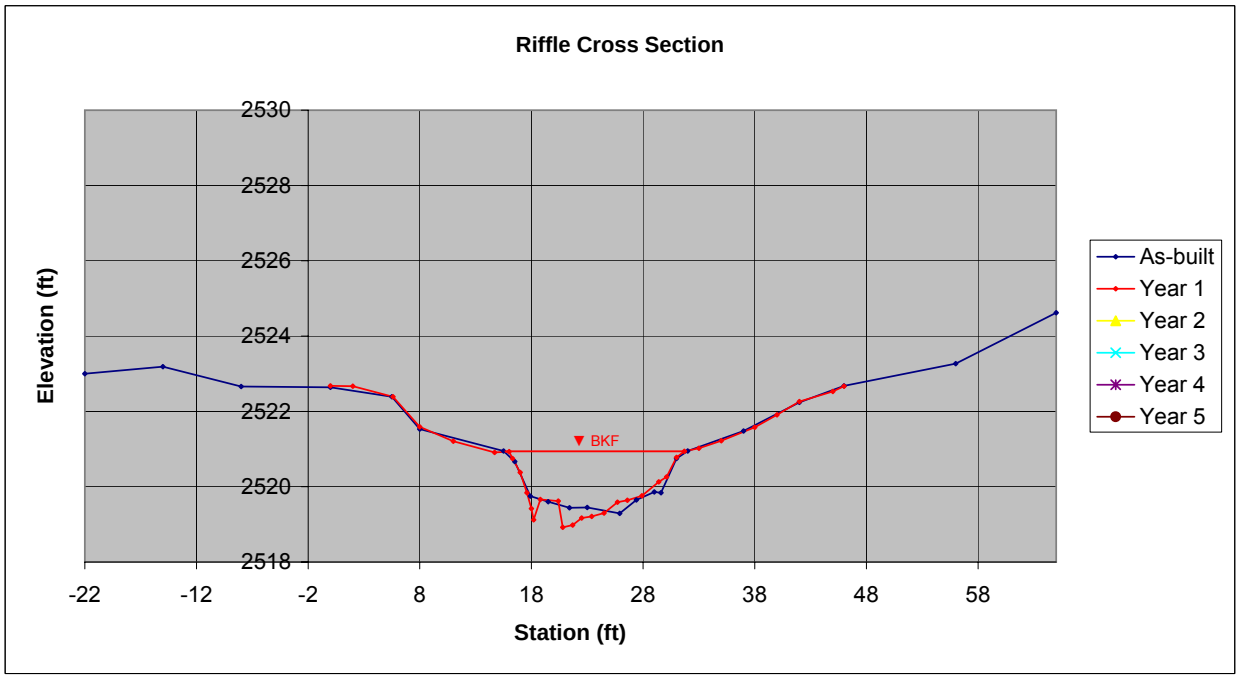
Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

Morgan Creek Stream Restoration Site
Haywood County, NC
Riffle Cross Section RF4
Reach 4 - Morgan Creek - Sta 33+24.4

As-Built

Year 1

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	0/0/0	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	18.7	Area	19.1	Area	0.0	Area	0.0	Area	0.0	Area	0.0
Bkf W	16.5	Bkf W	15.7	Bkf W	10	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	1.1	Dmean	1.2	Dmean	0.0	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	1.7	Dmax	2.0	Dmax	0.0	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	14.5	W/d	12.9	W/d	0.0	W/d	0.0	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 33+24.4

As-Built

Station	FS/BS	Elev.	Desc.
BM	6.32	2522.86	RF4 IR Lt
HI		2529.18	
-22	6.18	2523.00	
-15	5.99	2523.19	
-8	6.52	2522.66	
0	6.54	2522.64	GRND
5.5	6.79	2522.39	
8	7.65	2521.53	
15.5	8.23	2520.95	BKF LT
16.5	8.51	2520.67	
17.9	9.43	2519.75	EOW LT
19.5	9.58	2519.60	
21.4	9.74	2519.44	
23	9.73	2519.45	
25.9	9.89	2519.29	
27.4	9.53	2519.65	EOW RT
29	9.32	2519.86	
29.6	9.34	2519.84	
31	8.43	2520.75	
32	8.23	2520.95	BKF RT
37	7.70	2521.48	
42	6.94	2522.24	
46	6.50	2522.68	GRND
56	5.91	2523.27	
65	4.56	2524.62	

Year 1

Station	FS/BS	Elev.	Desc.
BM	4.19	2522.86	RF4 IR Lt
HI		2527.05	
0	4.37	2522.68	GRND
2	4.38	2522.67	GRND
5.6	4.66	2522.39	GRND
8	5.46	2521.59	GRND
11	5.84	2521.21	GRND
14.7	6.14	2520.91	GRND
16	6.12	2520.93	BKF
16.3	6.30	2520.75	BNK
17	6.67	2520.38	BNK
17.6	7.21	2519.84	BNK
18	7.63	2519.42	EOW
18.2	7.93	2519.12	BED
18.8	7.39	2519.66	BED
20.4	7.43	2519.62	BED
20.8	8.13	2518.92	BED
21.7	8.07	2518.98	BED
22.5	7.88	2519.17	BED
23.4	7.84	2519.21	BED
24.5	7.75	2519.30	EOW
25.7	7.46	2519.59	BED
26.6	7.41	2519.64	BED
27.9	7.29	2519.76	BED
29.4	6.92	2520.13	BNK
30.1	6.79	2520.26	BNK
31	6.27	2520.78	BNK
31.7	6.11	2520.94	BKF
33	6.03	2521.02	GRND
35	5.83	2521.22	GRND
38	5.47	2521.58	GRND
40	5.14	2521.91	GRND
42	4.79	2522.26	GRND
45	4.52	2522.53	GRND
46	4.38	2522.67	GRND

Year 2

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

Year 3

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

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

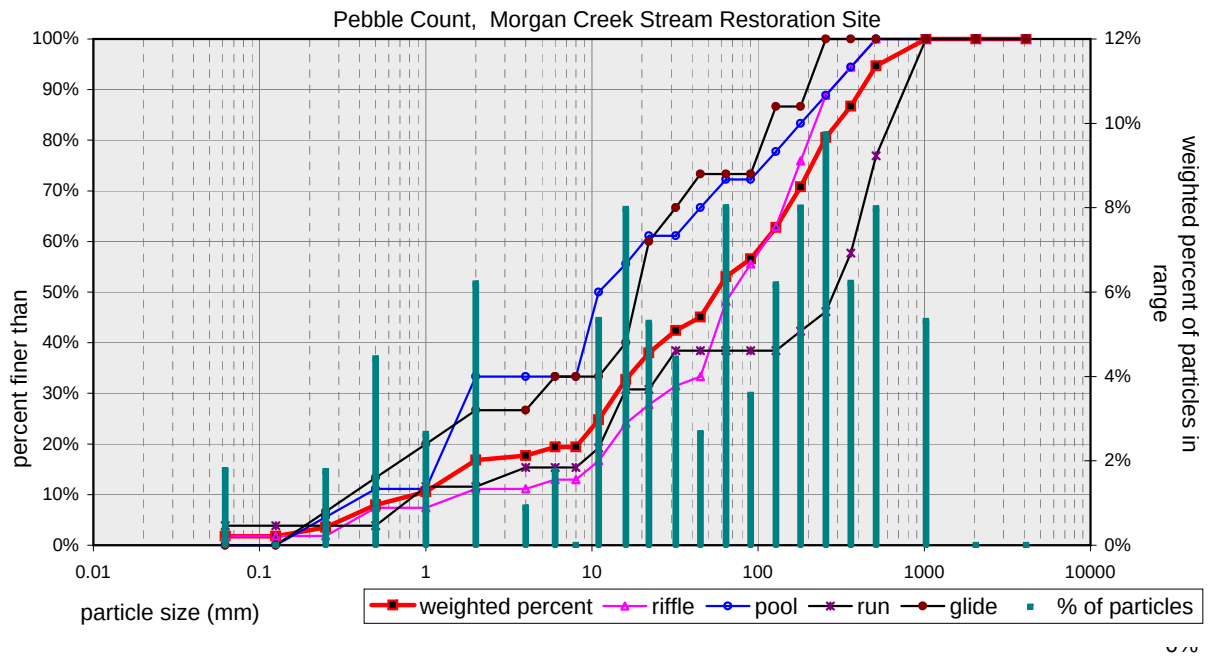
Percent Riffle:	**48**	Percent Run:	**23**
Percent Pool:	**16**	Percent Glide:	**13**

Pebble Count,

Morgan Creek Stream Restoration Site
Haywood County, NC
Morgan Creek: Reach 1
Note: **Reach Data 1** 2%

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	1.8	#
very fine sand	0.062	0.13	0.0	#
fine sand	0.13	0.25	1.8	#
medium sand	0.25	0.5	4.4	#
coarse sand	0.5	1	2.6	#
very coarse sand	1	2	6.2	#
very fine gravel	2	4	0.9	#
fine gravel	4	6	1.8	#
fine gravel	6	8	0.0	#
medium gravel	8	11	5.3	#
medium gravel	11	16	8.0	#
coarse gravel	16	22	5.3	#
coarse gravel	22	32	4.4	#
very coarse gravel	32	45	2.6	#
very coarse gravel	45	64	8.0	#
small cobble	64	90	3.6	#
medium cobble	90	128	6.2	#
large cobble	128	180	8.0	#
very large cobble	180	256	9.7	#
small boulder	256	362	6.2	#
small boulder	362	512	8.0	#
medium boulder	512	1024	5.3	#
large boulder	1024	2048	0.0	#
very large boulder	2048	4096	0.0	#
weighted particle count:			100.0	

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



based on	size percent less than (mm)						particle size distribution		
sediment	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
particles only	1.832	18.36	56.0	141	311	533	18.1	23.9	13.0

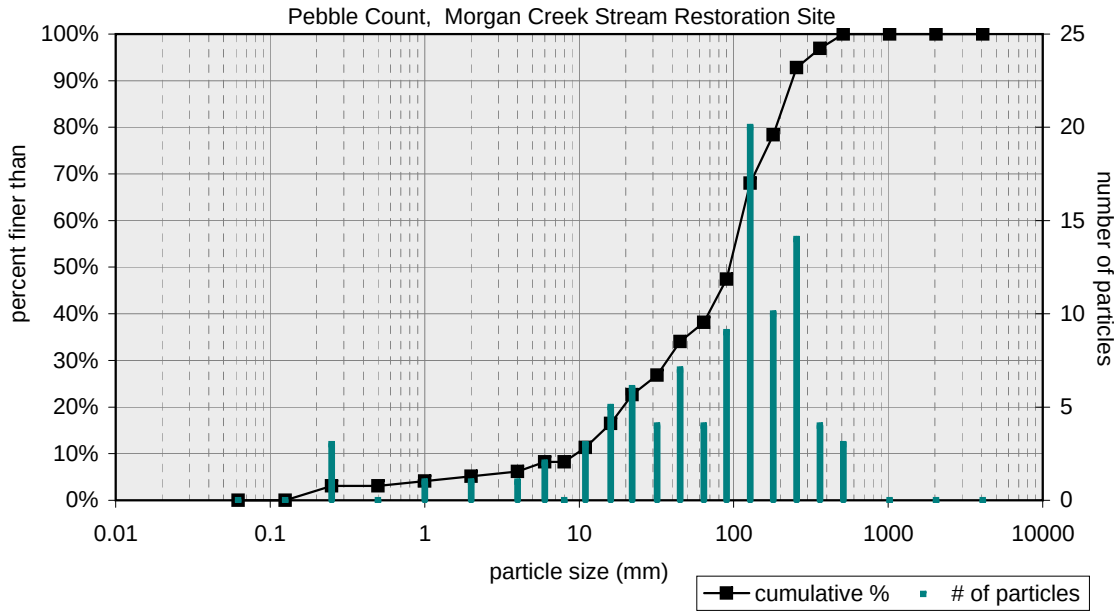
based on	percent by substrate type								
total count	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	2%	15%	36%	27%	19%	0%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count	
silt/clay	0	0.062	**0**	##
very fine sand	0.062	0.13	**0**	##
fine sand	0.13	0.25	**3**	##
medium sand	0.25	0.5	**0**	##
coarse sand	0.5	1	**1**	##
very coarse sand	1	2	**1**	##
very fine gravel	2	4	**1**	##
fine gravel	4	6	**2**	##
fine gravel	6	8	**0**	##
medium gravel	8	11	**3**	##
medium gravel	11	16	**5**	##
coarse gravel	16	22	**6**	##
coarse gravel	22	32	**4**	##
very coarse gravel	32	45	**7**	##
very coarse gravel	45	64	**4**	##
small cobble	64	90	**9**	##
medium cobble	90	128	**20**	##
large cobble	128	180	**10**	##
very large cobble	180	256	**14**	##
small boulder	256	362	**4**	##
small boulder	362	512	**3**	##
medium boulder	512	1024	**0**	##
large boulder	1024	2048	**0**	##
very large boulder	2048	4096	**0**	##
	total particle count:		97	

bedrock			**2**
clay hardpan			
detritus/wood			
artificial			
	total count:		99

Pebble Count,
Morgan Creek Stream Restoration Site
Haywood County, NC
Morgan Creek: Reach 1
Note: **Riffle RF1**



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	15.435	48.93	94.1	122	207	308	4.1	56.5	3.7

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	5%	32%	54%	7%	2%	0%	0%	0%

Pebble Count Weighted by Channel Feature

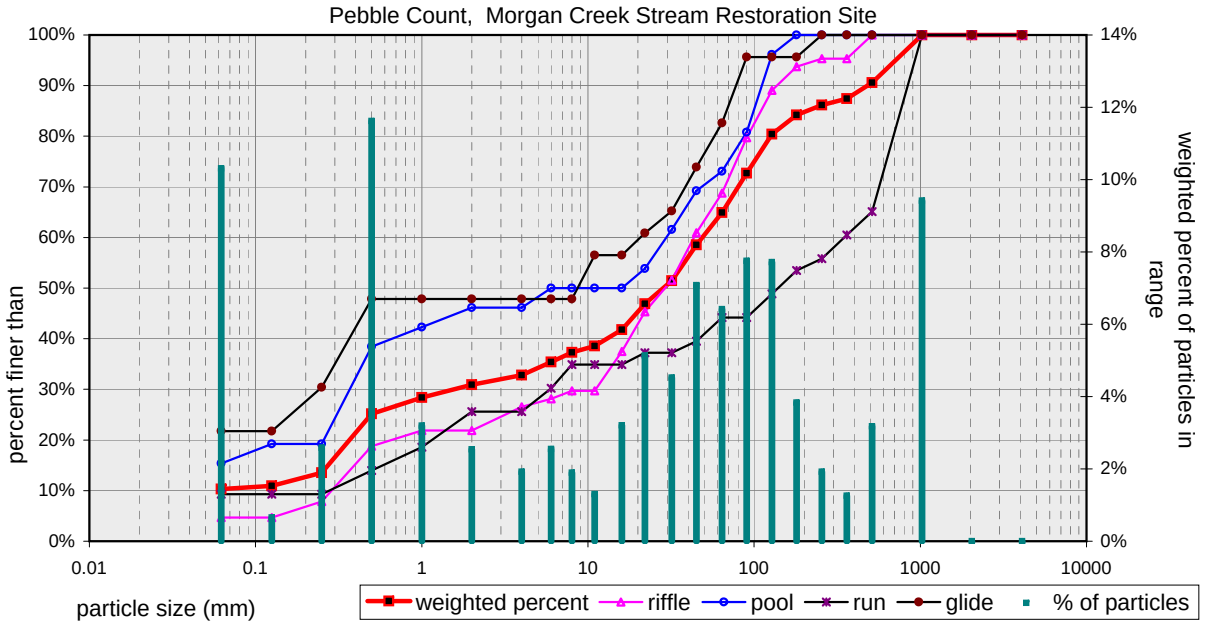
Percent Riffle:	41	Percent Run:	27
Percent Pool:	17	Percent Glide:	15

Pebble Count,

Morgan Creek Stream Restoration Site
Haywood County, NC
Morgan Creek: Reach 1
Note: **Reach Data 2** 10%

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	10.3	#
very fine sand	0.062	0.13	0.7	#
fine sand	0.13	0.25	2.6	#
medium sand	0.25	0.5	11.6	#
coarse sand	0.5	1	3.2	#
very coarse sand	1	2	2.5	#
very fine gravel	2	4	1.9	#
fine gravel	4	6	2.6	#
fine gravel	6	8	1.9	#
medium gravel	8	11	1.3	#
medium gravel	11	16	3.2	#
coarse gravel	16	22	5.1	#
coarse gravel	22	32	4.5	#
very coarse gravel	32	45	7.1	#
very coarse gravel	45	64	6.4	#
small cobble	64	90	7.7	#
medium cobble	90	128	7.7	#
large cobble	128	180	3.8	#
very large cobble	180	256	1.9	#
small boulder	256	362	1.3	#
small boulder	362	512	3.2	#
medium boulder	512	1024	9.4	#
large boulder	1024	2048	0.0	#
very large boulder	2048	4096	0.0	#
weighted particle count:			100.0	

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



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.289	5.66	28.4	64	176	709	52.2	7.1	24.7

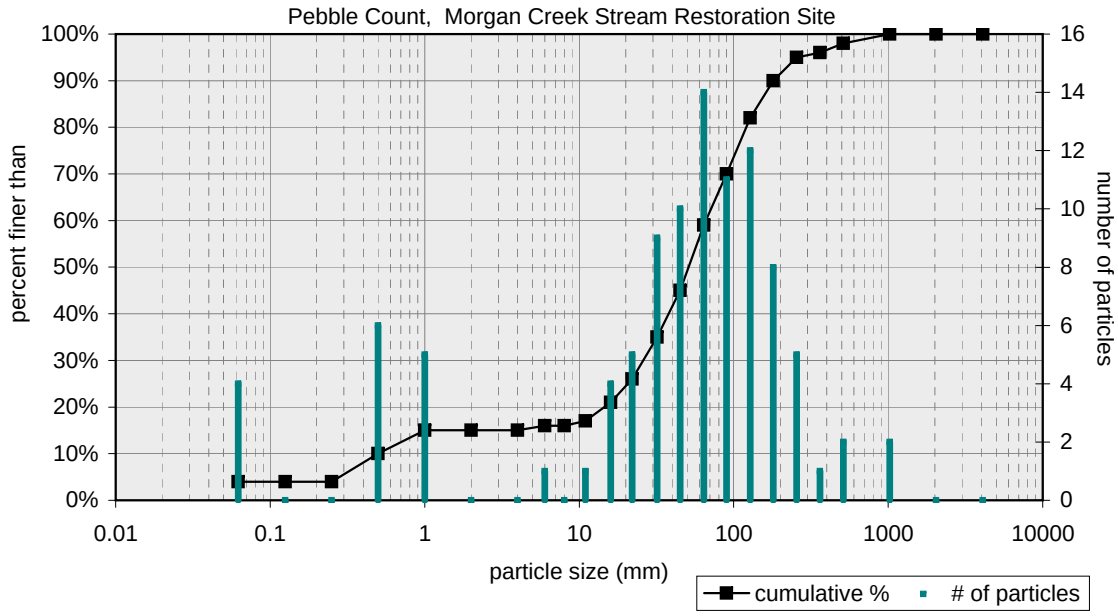
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	10%	21%	34%	21%	14%	0%	0%	0%	0%

Pebble Count of Channel Reach

Pebble Count,
Morgan Creek Stream Restoration Site
Haywood County, NC
Morgan Creek: Reach 1
Note: **Riffle RF2**

Material	Size Range (mm)		Count	
silt/clay	0	0.062	**4**	##
very fine sand	0.062	0.13	**0**	##
fine sand	0.13	0.25	**0**	##
medium sand	0.25	0.5	**6**	##
coarse sand	0.5	1	**5**	##
very coarse sand	1	2	**0**	##
very fine gravel	2	4	**0**	##
fine gravel	4	6	**1**	##
fine gravel	6	8	**0**	##
medium gravel	8	11	**1**	##
medium gravel	11	16	**4**	##
coarse gravel	16	22	**5**	##
coarse gravel	22	32	**9**	##
very coarse gravel	32	45	**10**	##
very coarse gravel	45	64	**14**	##
small cobble	64	90	**11**	##
medium cobble	90	128	**12**	##
large cobble	128	180	**8**	##
very large cobble	180	256	**5**	##
small boulder	256	362	**1**	##
small boulder	362	512	**2**	##
medium boulder	512	1024	**2**	##
large boulder	1024	2048	**0**	##
very large boulder	2048	4096	**0**	##
	total particle count:		100	

bedrock			**0**
clay hardpan			
detritus/wood			
artificial			
	total count:		100



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	6.000	32.00	51.0	77	139	256	5.6	28.9	4.8

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	4%	11%	44%	36%	5%	0%	0%	0%	0%

Pebble Count Weighted by Channel Feature

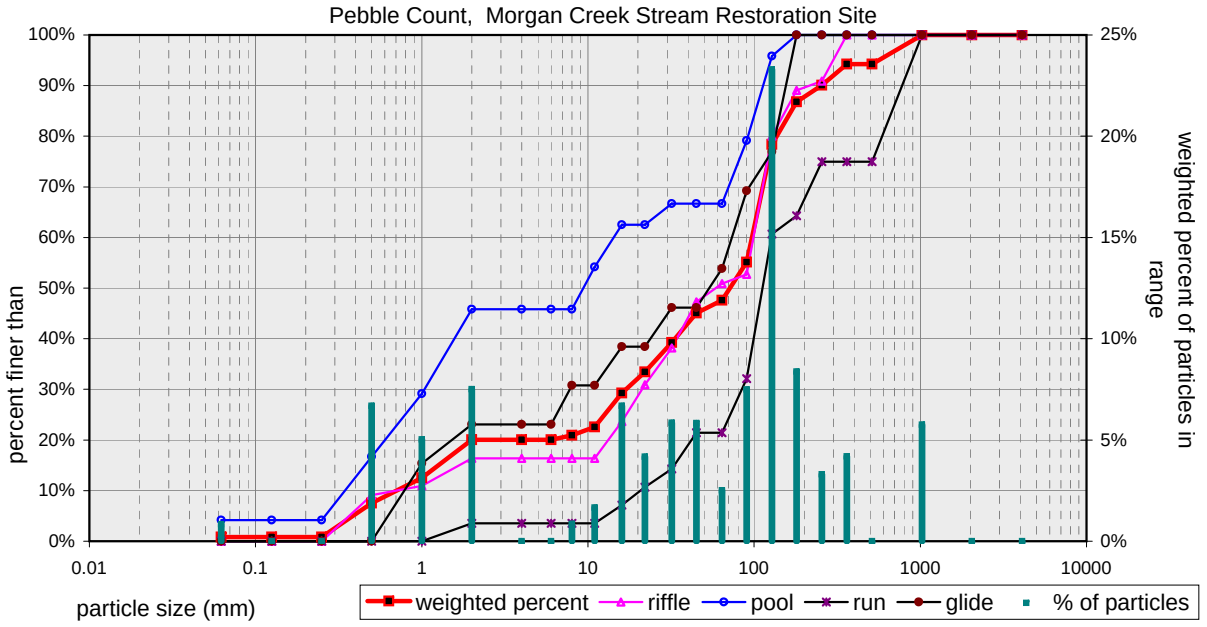
Percent Riffle:	**46**	Percent Run:	**23**
Percent Pool:	**20**	Percent Glide:	**11**

Pebble Count,

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	0.8	#
very fine sand	0.062	0.13	0.0	#
fine sand	0.13	0.25	0.0	#
medium sand	0.25	0.5	6.7	#
coarse sand	0.5	1	5.0	#
very coarse sand	1	2	7.5	#
very fine gravel	2	4	0.0	#
fine gravel	4	6	0.0	#
fine gravel	6	8	0.8	#
medium gravel	8	11	1.7	#
medium gravel	11	16	6.7	#
coarse gravel	16	22	4.2	#
coarse gravel	22	32	5.8	#
very coarse gravel	32	45	5.8	#
very coarse gravel	45	64	2.5	#
small cobble	64	90	7.5	#
medium cobble	90	128	23.3	#
large cobble	128	180	8.4	#
very large cobble	180	256	3.3	#
small boulder	256	362	4.2	#
small boulder	362	512	0.0	#
medium boulder	512	1024	5.8	#
large boulder	1024	2048	0.0	#
very large boulder	2048	4096	0.0	#
weighted particle count:			100.0	

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

Morgan Creek Stream Restoration Site
Haywood County, NC
Morgan Creek: Reach 1
Note: **Reach Data 3** 1%



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	1.376	24.36	71.4	105	161	560	27.1	14.9	10.8

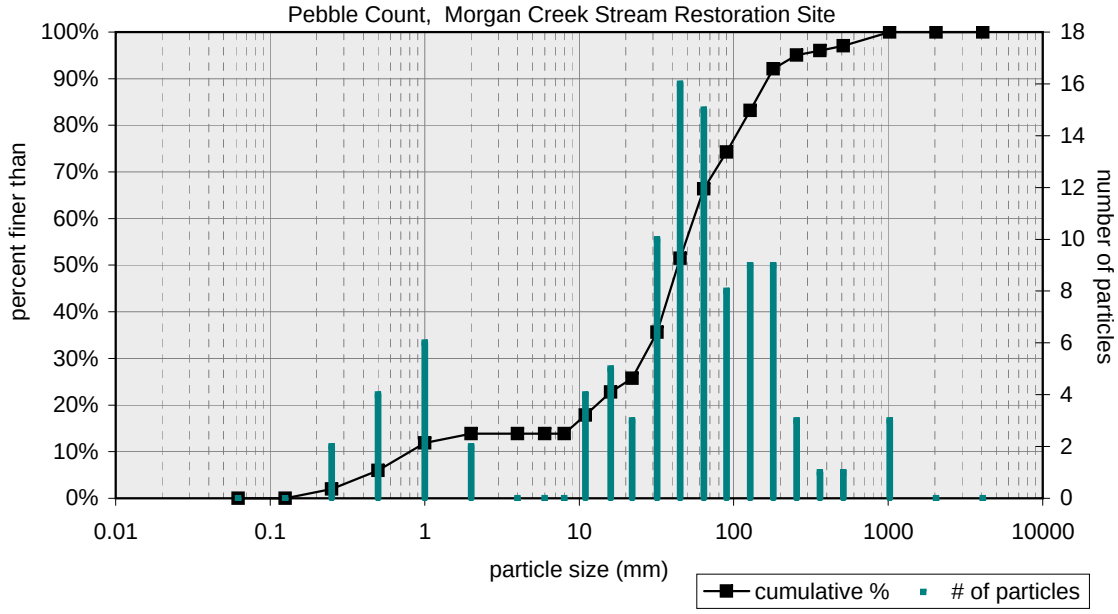
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	1%	19%	28%	42%	10%	0%	0%	0%	0%

Pebble Count of Channel Reach

Pebble Count,
Morgan Creek Stream Restoration Site
Haywood County, NC
Morgan Creek: Reach 1
Note: **Riffle RF3**

Material	Size Range (mm)		Count	
silt/clay	0	0.062	**0**	##
very fine sand	0.062	0.13	**0**	##
fine sand	0.13	0.25	**2**	##
medium sand	0.25	0.5	**4**	##
coarse sand	0.5	1	**6**	##
very coarse sand	1	2	**2**	##
very fine gravel	2	4	**0**	##
fine gravel	4	6	**0**	##
fine gravel	6	8	**0**	##
medium gravel	8	11	**4**	##
medium gravel	11	16	**5**	##
coarse gravel	16	22	**3**	##
coarse gravel	22	32	**10**	##
very coarse gravel	32	45	**16**	##
very coarse gravel	45	64	**15**	##
small cobble	64	90	**8**	##
medium cobble	90	128	**9**	##
large cobble	128	180	**9**	##
very large cobble	180	256	**3**	##
small boulder	256	362	**1**	##
small boulder	362	512	**1**	##
medium boulder	512	1024	**3**	##
large boulder	1024	2048	**0**	##
very large boulder	2048	4096	**0**	##
		total particle count:	101	

bedrock		**0**
clay hardpan		
detritus/wood		
artificial		
	total count:	101



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	9.501	31.23	43.6	62	132	255	3.8	35.4	3.7

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	14%	52%	29%	5%	0%	0%	0%	0%

Pebble Count Weighted by Channel Feature

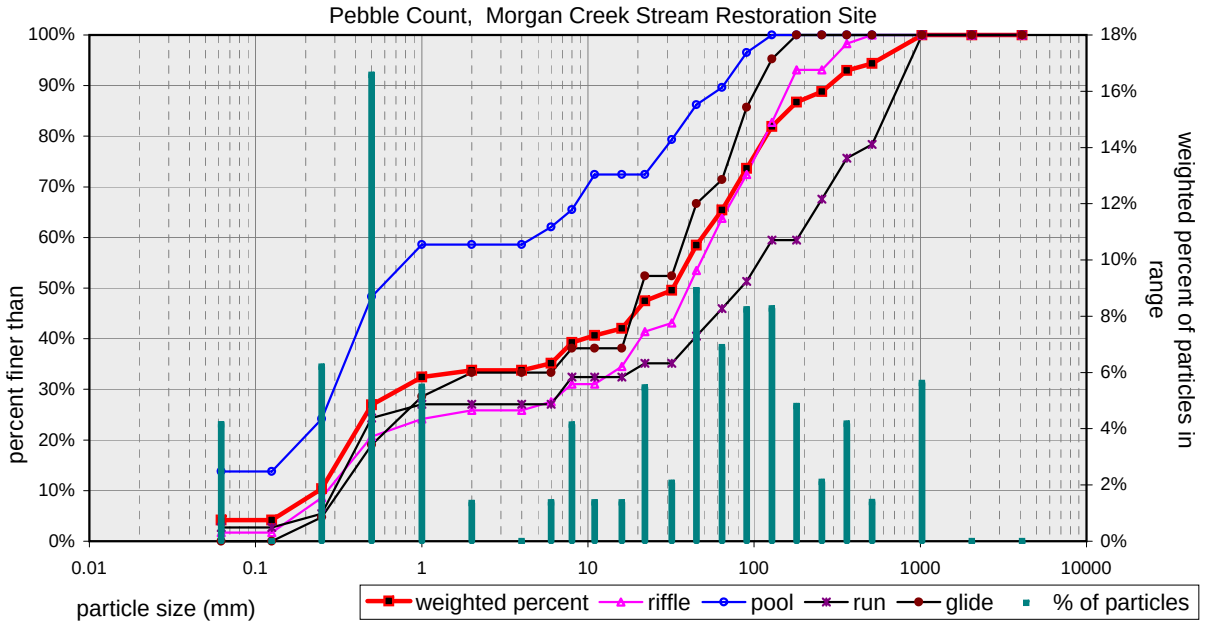
Percent Riffle:	**40**	Percent Run:	**26**
Percent Pool:	**20**	Percent Glide:	**14**

Pebble Count,

Morgan Creek Stream Restoration Site
Haywood County, NC
Morgan Creek: Reach 1
Note: **Reach Data 4** 4%

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	4.2	#
very fine sand	0.062	0.13	0.0	#
fine sand	0.13	0.25	6.2	#
medium sand	0.25	0.5	16.6	#
coarse sand	0.5	1	5.5	#
very coarse sand	1	2	1.4	#
very fine gravel	2	4	0.0	#
fine gravel	4	6	1.4	#
fine gravel	6	8	4.1	#
medium gravel	8	11	1.4	#
medium gravel	11	16	1.4	#
coarse gravel	16	22	5.5	#
coarse gravel	22	32	2.1	#
very coarse gravel	32	45	8.9	#
very coarse gravel	45	64	6.9	#
small cobble	64	90	8.2	#
medium cobble	90	128	8.3	#
large cobble	128	180	4.8	#
very large cobble	180	256	2.1	#
small boulder	256	362	4.2	#
small boulder	362	512	1.4	#
medium boulder	512	1024	5.6	#
large boulder	1024	2048	0.0	#
very large boulder	2048	4096	0.0	#
weighted particle count:			100.0	

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



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.317	5.75	32.5	63	149	553	53.6	6.9	21.7

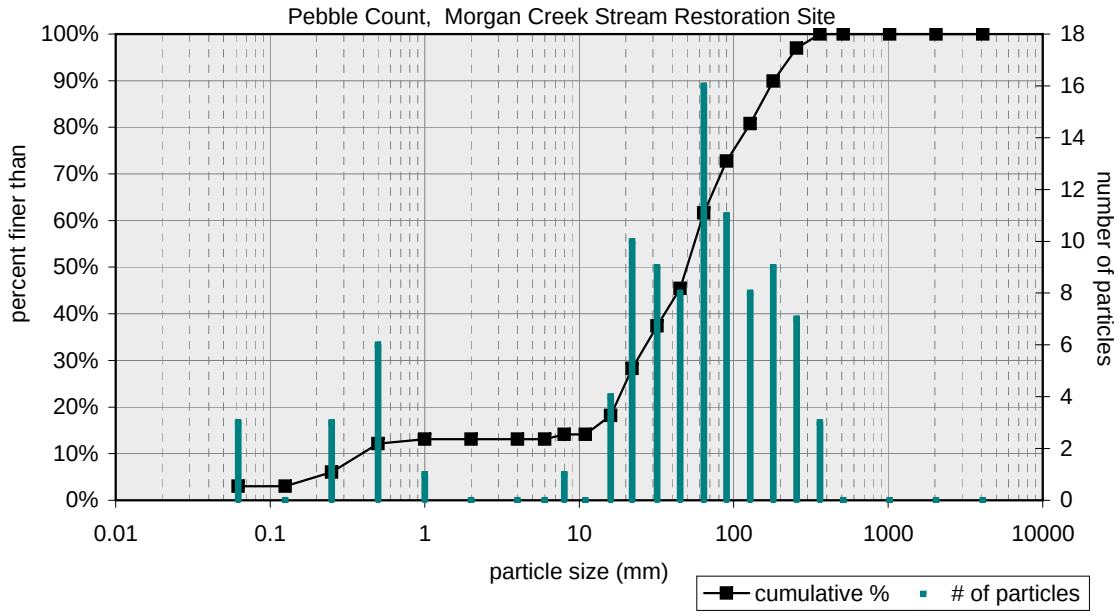
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	4%	30%	32%	23%	11%	0%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count	
silt/clay	0	0.062	**3**	##
very fine sand	0.062	0.13	**0**	##
fine sand	0.13	0.25	**3**	##
medium sand	0.25	0.5	**6**	##
coarse sand	0.5	1	**1**	##
very coarse sand	1	2	**0**	##
very fine gravel	2	4	**0**	##
fine gravel	4	6	**0**	##
fine gravel	6	8	**1**	##
medium gravel	8	11	**0**	##
medium gravel	11	16	**4**	##
coarse gravel	16	22	**10**	##
coarse gravel	22	32	**9**	##
very coarse gravel	32	45	**8**	##
very coarse gravel	45	64	**16**	##
small cobble	64	90	**11**	##
medium cobble	90	128	**8**	##
large cobble	128	180	**9**	##
very large cobble	180	256	**7**	##
small boulder	256	362	**3**	##
small boulder	362	512	**0**	##
medium boulder	512	1024	**0**	##
large boulder	1024	2048	**0**	##
very large boulder	2048	4096	**0**	##
	total particle count:		99	

bedrock		**0**
clay hardpan		
detritus/wood		
artificial		
	total count:	99

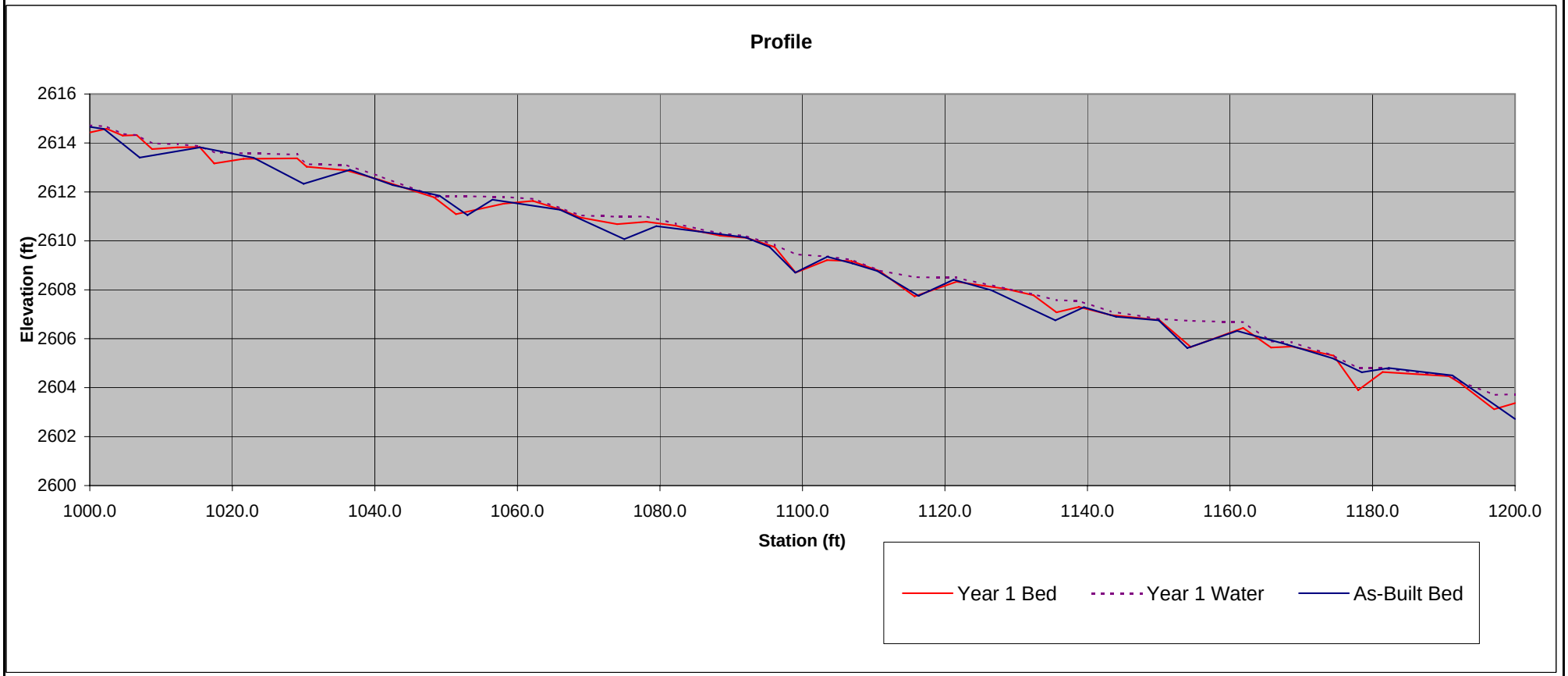
Pebble Count,
Morgan Creek Stream Restoration Site
Haywood County, NC
Morgan Creek: Reach 1
Note: **Riffle RF4**



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	13.069	29.02	49.7	71	144	232	3.4	43.4	3.3

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	3%	10%	48%	35%	3%	0%	0%	0%	0%

Morgan Creek Stream Restoration Site
Haywood County, NC
Profile Reach 2 - North Branch



Morgan Creek Stream Restoration Site
Haywood County, NC
Profile Reach 2 - North Branch

Year 1

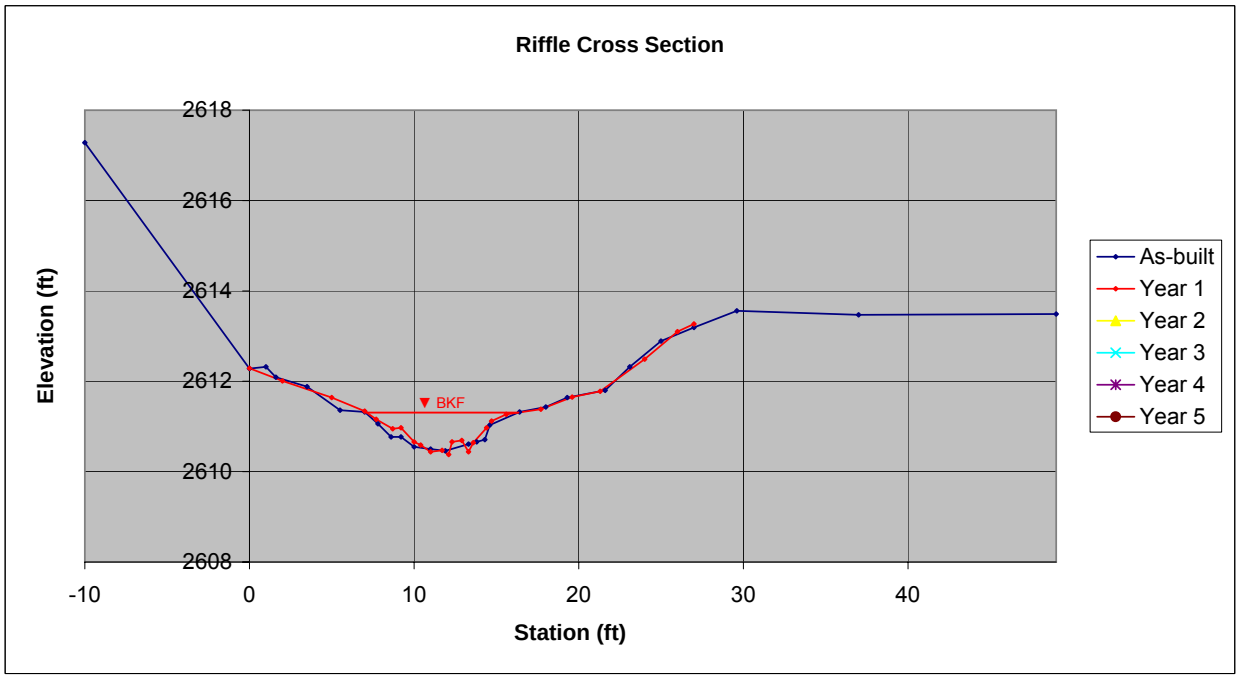
HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
2619.31	1000	4.88	0.29	3.21	THL	2614.43	2614.72	2616.10
2619.31	1002.3	4.73	0.10		LHR INV	2614.58	2614.68	
2619.31	1004.5	5.01	0.07		LHR LOG	2614.30	2614.37	
2619.31	1006.4	4.99	0.00		LHR BAFF	2614.32	2614.32	
2619.31	1008.5	5.56	0.24		POOL	2613.75	2613.99	
2619.31	1012	5.49	0.13		HOR	2613.82	2613.95	
2619.31	1015	5.48	0.04		ROCK	2613.83	2613.87	
2619.31	1017	6.15	0.45		POOL	2613.16	2613.61	
2619.31	1021	5.96	0.23	5.22	THL	2613.35	2613.58	2614.09
2619.31	1028.3	5.94	0.16		THAL	2613.37	2613.53	
2619.31	1029.6	6.28	0.10		THAL	2613.03	2613.13	
2619.31	1035	6.43	0.22	5.95	HOR	2612.88	2613.10	2613.36
2619.31	1039.5	6.81	0.15		THAL	2612.50	2612.65	
2619.31	1047	7.53	0.05		ROCK ARCH	2611.78	2611.83	
2619.31	1050	8.22	0.74		POOL	2611.09	2611.83	
2619.31	1056.5	7.79	0.28	7.10	THAL	2611.52	2611.80	2612.21
2619.31	1060.5	7.68	0.09		HOR	2611.63	2611.72	
2619.31	1064.5	8.05	0.06		LHR INV	2611.26	2611.32	
2619.31	1067	8.36	0.09		LHR LOG	2610.95	2611.04	
2619.31	1072	8.63	0.31		POOL	2610.68	2610.99	
2619.31	1076	8.53	0.22	7.93	HOR	2610.78	2611.00	2611.38
2619.31	1080	8.69	0.09		RIFF	2610.62	2610.71	
2619.31	1083.1	8.92	0.10	8.19	XS FR 5	2610.39	2610.49	2611.12
2619.31	1086.2	9.10	0.11		LHR INV	2610.21	2610.32	
2619.31	1090	9.19	0.07		LHR LOG	2610.12	2610.19	
2619.31	1094	9.56	0.09		LHR BAFF	2609.75	2609.84	
2619.31	1097	10.61	0.75		POOL	2608.70	2609.45	
2619.31	1101.5	10.10	0.15	9.51	HOR	2609.21	2609.36	2609.80
2619.31	1105	10.14	0.06		BR INV	2609.17	2609.23	
2619.31	1109	10.54	0.02		BR ARCH	2608.77	2608.79	
2619.31	1114	11.58	0.79		POOL	2607.73	2608.52	
2619.31	1120	10.98	0.16		HOR	2608.33	2608.49	
2619.31	1127	11.27	0.02		LHR INV	2608.04	2608.06	
2619.31	1131	11.53	0.04		LHR LOG	2607.78	2607.82	
2619.31	1134.3	12.23	0.50		POOL	2607.08	2607.58	
2619.31	1137.5	12.01	0.25		HOR	2607.30	2607.55	
2619.31	1142	12.34	0.15		BR INV	2606.97	2607.12	
2619.31	1149	12.55	0.05		BR ARCH	2606.76	2606.81	
2619.31	1153.5	13.65	1.07		XS PL 5	2605.66	2606.73	
2619.31	1161	12.87	0.24	12.37	THAL	2606.44	2606.68	2606.94
2619.31	1165	13.67	0.25		THL	2605.64	2605.89	
2619.31	1168	13.63	0.18		BR INV	2605.68	2605.86	
2619.31	1174	14.00	0.00		BR ARCH	2605.31	2605.31	
2619.31	1177.5	15.41	0.90		POOL	2603.90	2604.80	
2619.31	1181	14.67	0.15		HOR	2604.64	2604.79	
2619.31	1190.5	14.84	0.02		LHR INV	2604.47	2604.49	
2619.31	1192	15.10	0.06		LHR LOG	2604.21	2604.27	
2619.31	1197	16.19	0.59		POOL	2603.12	2603.71	
2619.31	1200	15.94	0.36		THAL	2603.37	2603.73	

Morgan Creek Stream Restoration Site
Haywood County, NC
Riffle Cross Section RF5
Reach 2 - North Branch - Sta 10+85.4

As-Built

Year 1

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	0/0/0	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	5.0	Area	4.5	Area	0.0	Area	0.0	Area	0.0	Area	0.0
Bkf W	9.4	Bkf W	8.6	Bkf W	10	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	0.5	Dmean	0.5	Dmean	0.0	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	0.9	Dmax	1.0	Dmax	0.0	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	17.7	W/d	16.5	W/d	0.0	W/d	0.0	W/d	0.0	W/d	0.0

Morgan Creek Stream Restoration Site
Haywood County, NC
Riffle Cross Section RF5
Reach 2 - North Branch - Sta 10+85.4

As-Built			
Station	FS/BS	Elev.	Desc.
BM	7.55	2612.59	RF5 IR Lt
HI		2620.14	
-10	2.86	2617.28	
0	7.86	2612.28	GRND
1	7.82	2612.32	
1.6	8.05	2612.09	
3.5	8.26	2611.88	
5.5	8.78	2611.36	
7	8.82	2611.32	BKF LT
7.8	9.08	2611.06	
8.6	9.37	2610.77	
9.2	9.37	2610.77	
10	9.59	2610.55	EOW LT
11	9.64	2610.50	
11.9	9.68	2610.46	
13.3	9.53	2610.61	
13.8	9.48	2610.66	EOW RT
14.3	9.43	2610.71	
14.6	9.11	2611.03	
16.4	8.82	2611.32	BKF RT
18	8.71	2611.43	
19.3	8.50	2611.64	
21.6	8.34	2611.80	
23.1	7.82	2612.32	
25	7.25	2612.89	
27	6.95	2613.19	GRND
29.6	6.58	2613.56	
37	6.67	2613.47	
49	6.65	2613.49	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	2.31	2617.00	BP IR Rt
HI		2619.31	
0	7.02	2612.29	GRND
2	7.30	2612.01	"
5	7.67	2611.64	"
7	7.97	2611.34	BKF
7.7	8.15	2611.16	BANK
8.7	8.36	2610.95	BANK
9.2	8.34	2610.97	BANK
10	8.65	2610.66	BANK
10.4	8.72	2610.59	EOW
11	8.87	2610.44	BED
11.7	8.84	2610.47	"
12.1	8.93	2610.38	"
12.3	8.65	2610.66	"
12.9	8.62	2610.69	"
13.3	8.87	2610.44	"
13.6	8.67	2610.64	EOW
14.4	8.34	2610.97	BANK
14.7	8.19	2611.12	BANK
15.6	8.04	2611.27	BKF
17.7	7.93	2611.38	GRND
19.6	7.66	2611.65	GRND
21.3	7.53	2611.78	GRND
24	6.82	2612.49	GRND
26	6.21	2613.10	GRND
27	6.04	2613.27	GRND

Year 2			
Station	FS/BS	Elev.	Desc.
BM			IR Lt
HI		0.00	

Year 3			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

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

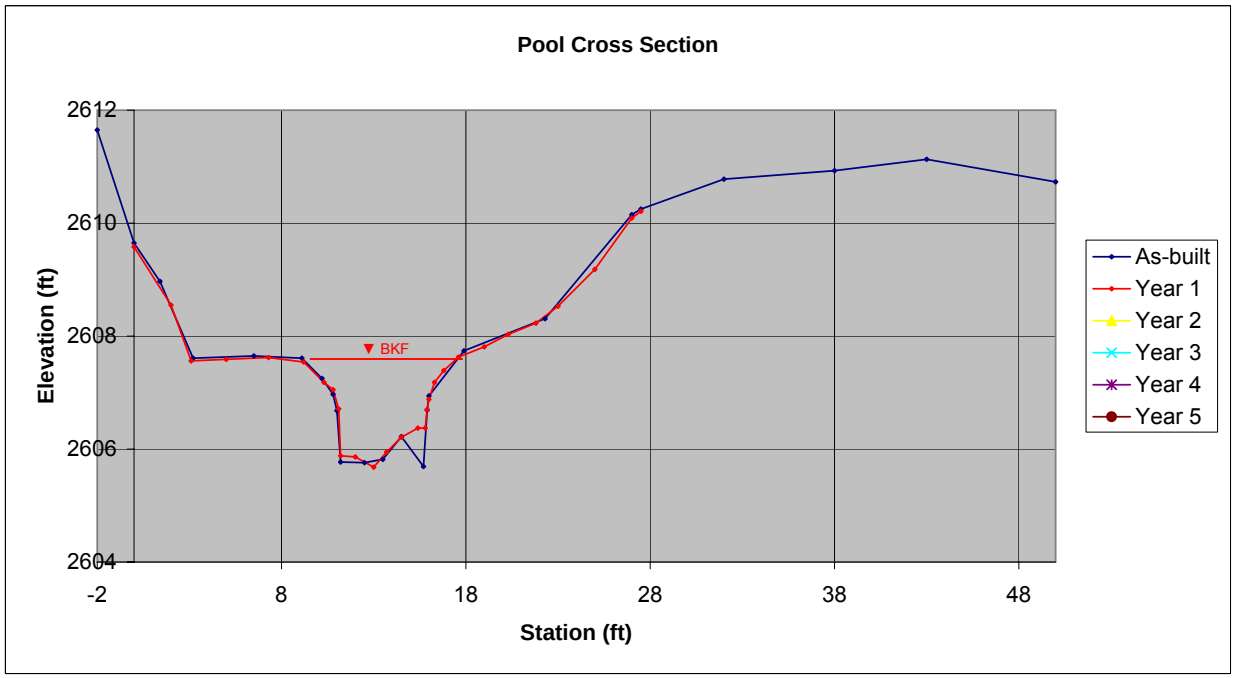
Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

Morgan Creek Stream Restoration Site
Haywood County, NC
Pool Cross Section PL5
Reach 2 -North Branch - Sta 11+54.5

As-Built

Year 1

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	0/0/0	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	9.6	Area	8.7	Area	0.0	Area	0.0	Area	0.0	Area	0.0
Bkf W	8.8	Bkf W	8.4	Bkf W	10	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	1.1	Dmean	1.0	Dmean	0.0	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	1.9	Dmax	1.9	Dmax	0.0	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	8.1	W/d	8.1	W/d	0.0	W/d	0.0	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+54.5

As-Built			
Station	FS/BS	Elev.	Desc.
BM	7.55	2612.59	RF5 IR Lt
HI		2620.14	
-2	8.49	2611.65	
0	10.49	2609.65	GRND
1.4	11.17	2608.97	
3.2	12.53	2607.61	
6.5	12.49	2607.65	
9.1	12.53	2607.61	BKF LT
10.2	12.89	2607.25	
10.8	13.17	2606.97	
11	13.46	2606.68	EOW
11.2	14.37	2605.77	
12.5	14.38	2605.76	
13.5	14.32	2605.82	
14.5	13.92	2606.22	
15.7	14.45	2605.69	
15.9	13.45	2606.69	EOW
16	13.20	2606.94	
17.9	12.40	2607.74	BKF RT
22.3	11.83	2608.31	
27	9.99	2610.15	
27.5	9.89	2610.25	GRND
32	9.36	2610.78	
38	9.21	2610.93	
43	9.01	2611.13	
50	9.41	2610.73	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	2.31	2617.00	BP IR Rt
HI		2619.31	
0	9.73	2609.58	GRND
2	10.76	2608.55	"
3.1	11.75	2607.56	"
5	11.72	2607.59	"
7.3	11.69	2607.62	"
9.2	11.77	2607.54	BKF
10.3	12.13	2607.18	BNK
10.8	12.26	2607.05	BNK
11.1	12.60	2606.71	EOW
11.2	13.43	2605.88	BED
12	13.45	2605.86	"
13	13.63	2605.68	"
13.7	13.36	2605.95	"
14.5	13.10	2606.21	"
15.4	12.94	2606.37	"
15.8	12.94	2606.37	"
15.9	12.61	2606.7	EOW
16	12.43	2606.88	BNK
16.3	12.13	2607.18	BNK
16.8	11.92	2607.39	BNK
17.6	11.68	2607.63	BKF
19	11.50	2607.81	GRND
20.3	11.28	2608.03	"
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 2			
Station	FS/BS	Elev.	Desc.
BM			IR Lt
HI		0.00	

Year 3			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

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	

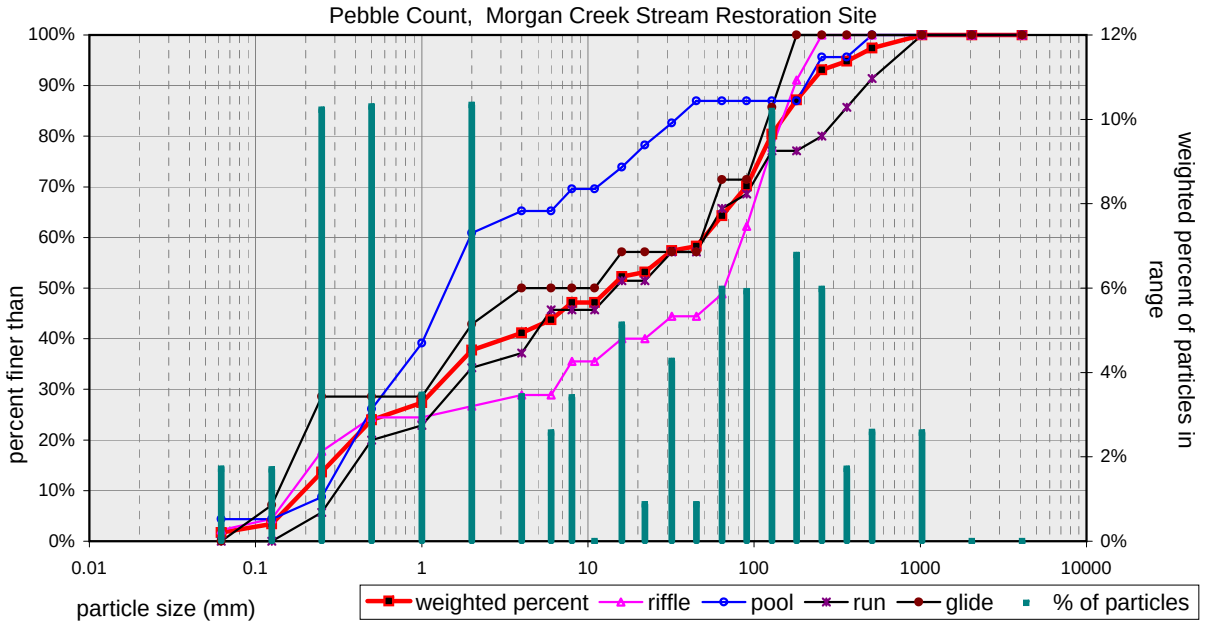
Pebble Count Weighted by Channel Feature

Percent Riffle:	**38**	Percent Run:	**30**	
Percent Pool:	**20**	Percent Glide:	**12**	Pebble Count,

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	1.7	#
very fine sand	0.062	0.13	1.7	#
fine sand	0.13	0.25	10.2	#
medium sand	0.25	0.5	10.3	#
coarse sand	0.5	1	3.5	#
very coarse sand	1	2	10.3	#
very fine gravel	2	4	3.4	#
fine gravel	4	6	2.6	#
fine gravel	6	8	3.4	#
medium gravel	8	11	0.0	#
medium gravel	11	16	5.1	#
coarse gravel	16	22	0.9	#
coarse gravel	22	32	4.3	#
very coarse gravel	32	45	0.9	#
very coarse gravel	45	64	6.0	#
small cobble	64	90	5.9	#
medium cobble	90	128	10.2	#
large cobble	128	180	6.8	#
very large cobble	180	256	6.0	#
small boulder	256	362	1.7	#
small boulder	362	512	2.6	#
medium boulder	512	1024	2.6	#
large boulder	1024	2048	0.0	#
very large boulder	2048	4096	0.0	#
weighted particle count:			100.0	

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

	Morgan Creek Stream Restoration Site
	Haywood County, NC
	Morgan Creek: North Branch
Note:	**Reach Data 5** 2%



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.293	1.66	13.6	67	154	370	28.8	6.7	22.9

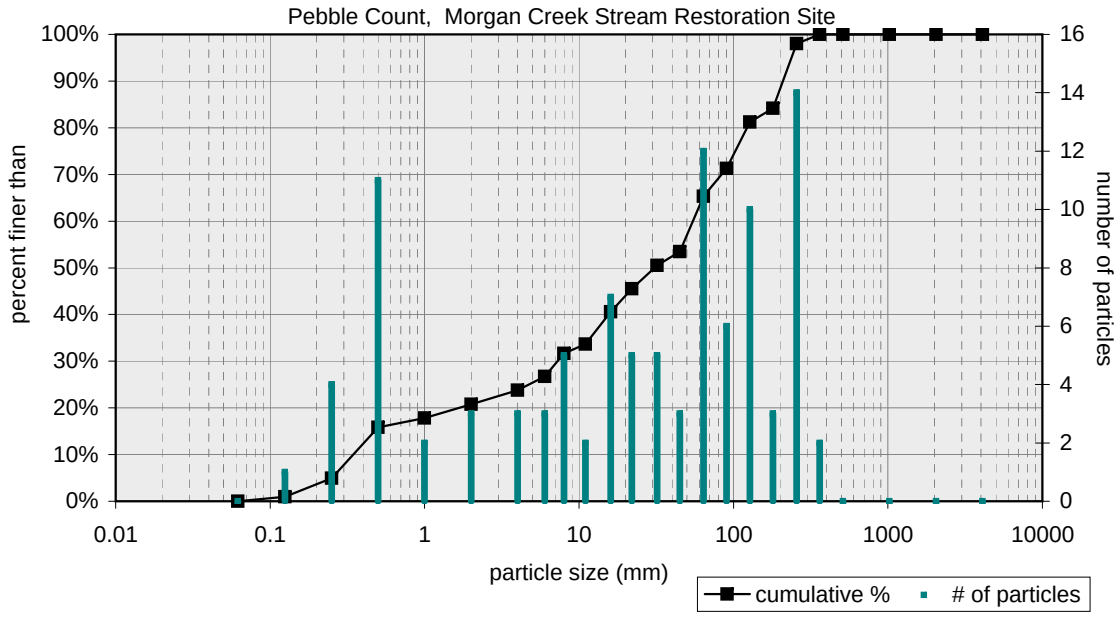
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	2%	36%	27%	29%	7%	0%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count	
silt/clay	0	0.062	**0**	##
very fine sand	0.062	0.13	**1**	##
fine sand	0.13	0.25	**4**	##
medium sand	0.25	0.5	**11**	##
coarse sand	0.5	1	**2**	##
very coarse sand	1	2	**3**	##
very fine gravel	2	4	**3**	##
fine gravel	4	6	**3**	##
fine gravel	6	8	**5**	##
medium gravel	8	11	**2**	##
medium gravel	11	16	**7**	##
coarse gravel	16	22	**5**	##
coarse gravel	22	32	**5**	##
very coarse gravel	32	45	**3**	##
very coarse gravel	45	64	**12**	##
small cobble	64	90	**6**	##
medium cobble	90	128	**10**	##
large cobble	128	180	**3**	##
very large cobble	180	256	**14**	##
small boulder	256	362	**2**	##
small boulder	362	512	**0**	##
medium boulder	512	1024	**0**	##
large boulder	1024	2048	**0**	##
very large boulder	2048	4096	**0**	##
		total particle count:	101	

bedrock		**0**
clay hardpan		
detritus/wood		
artificial		
	total count:	101

Pebble Count,
Morgan Creek Stream Restoration Site
Haywood County, NC
Morgan Creek: North Branch
Note: **Riffle RF5**

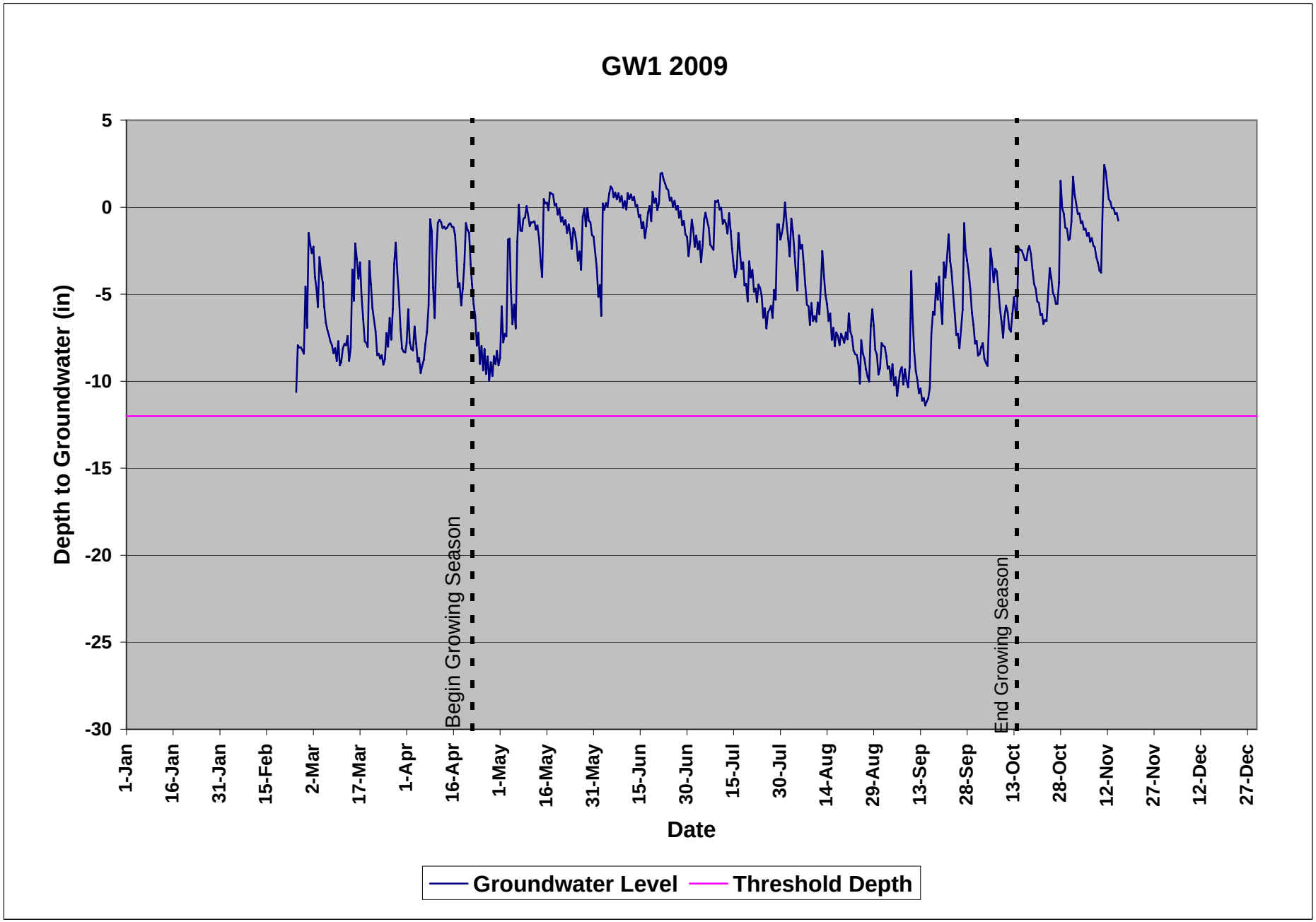


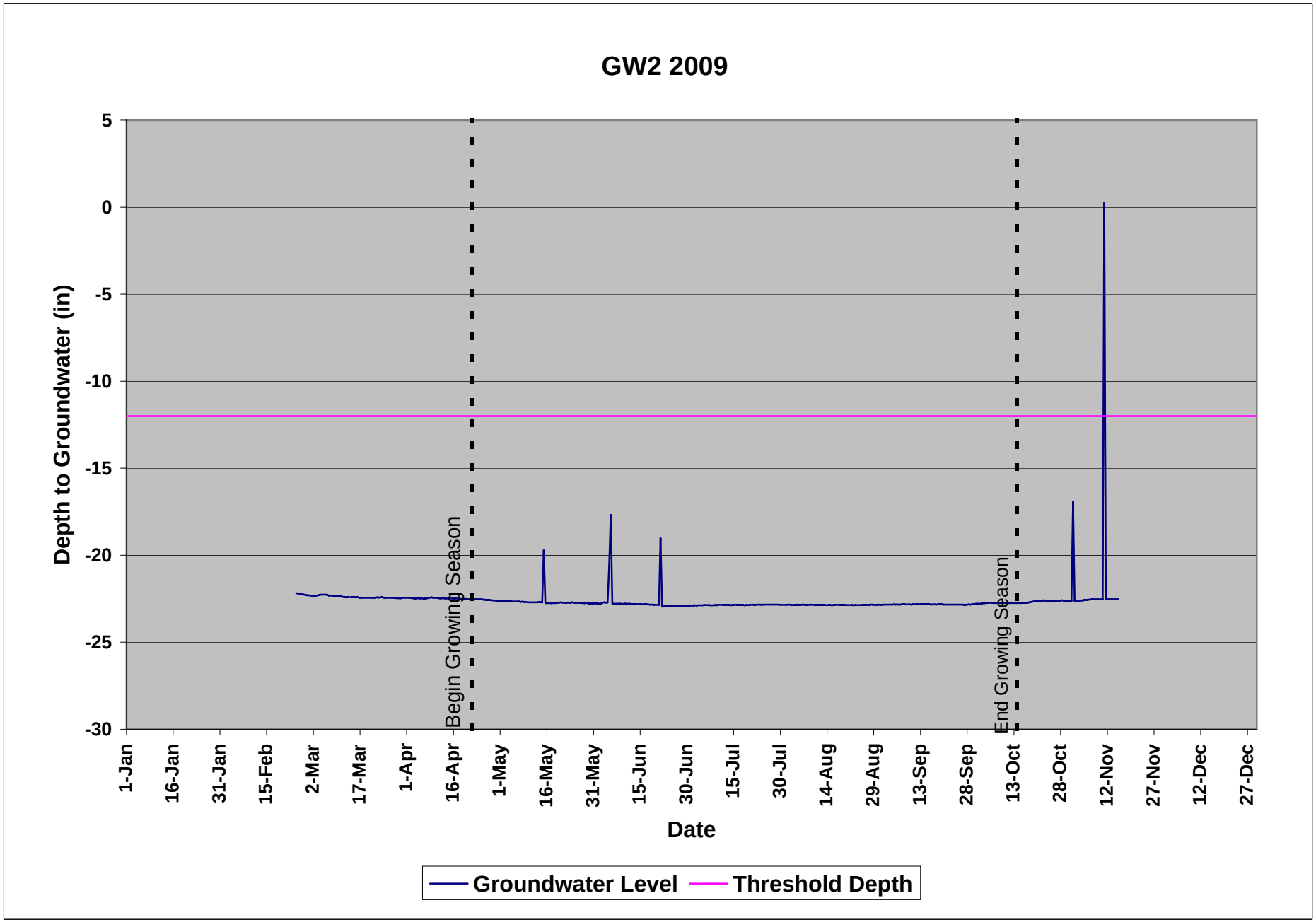
based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.529	11.82	30.8	63	177	237	32.0	9.7	18.3

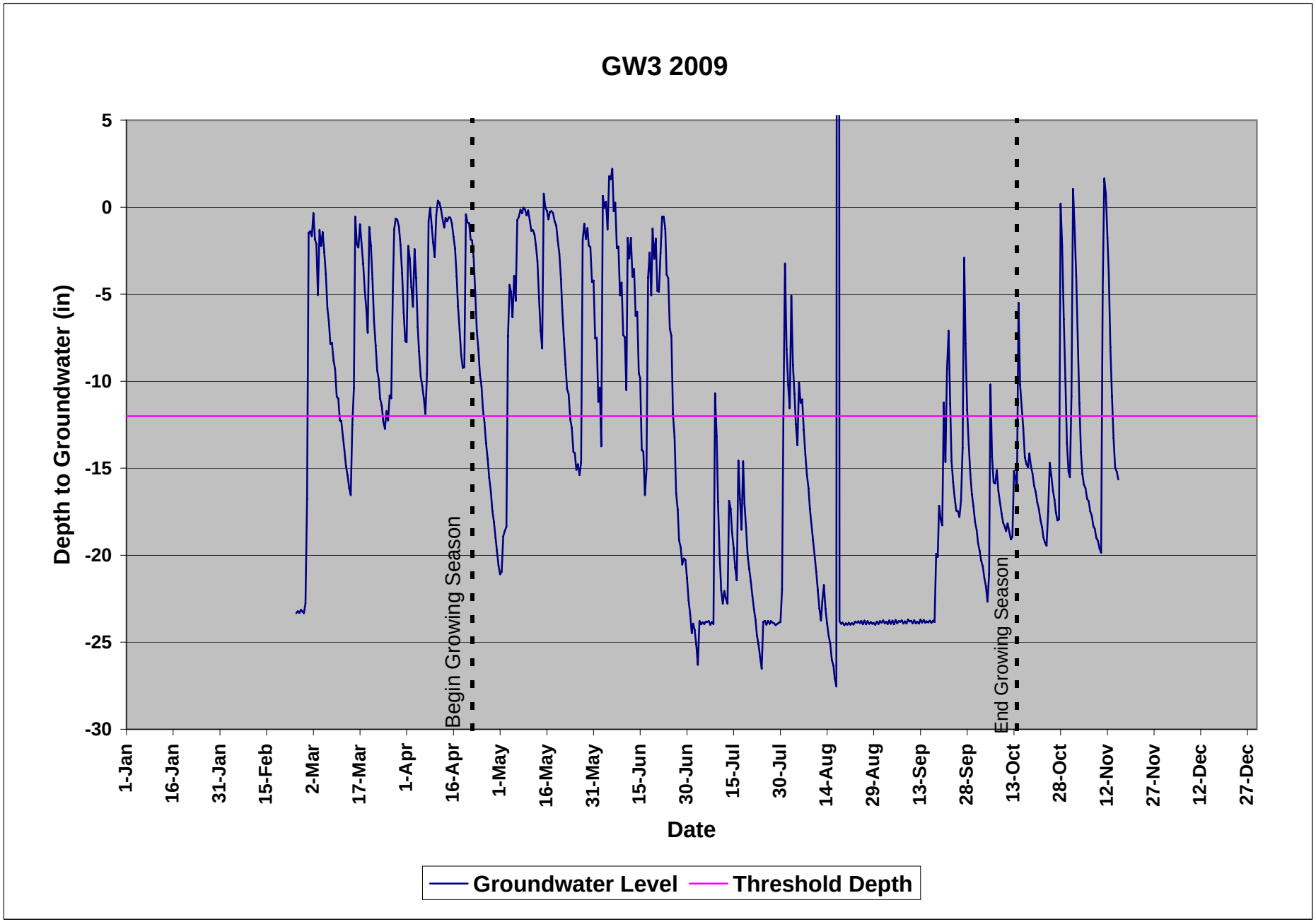
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	21%	45%	33%	2%	0%	0%	0%	0%

APPENDIX D

WETLAND RAW DATA


GW1 2009
Depth to Groundwater (in)
5
0
-5
-10
-15
-20
-25
-30
Begin Growing Season
End Growing Season
1-Jan
16-Jan
31-Jan
15-Feb
2-Mar
17-Mar
1-Apr
16-Apr
1-May
16-May
31-May
15-Jun
30-Jun
15-Jul
30-Jul
14-Aug
29-Aug
13-Sep
28-Sep
13-Oct
28-Oct
12-Nov
27-Nov
12-Dec
27-Dec
Date
Groundwater Level
Threshold Depth


GW2 2009
Depth to Groundwater (in)
5
0
-5
-10
-15
-20
-25
-30
Begin Growing Season
End Growing Season
1-Jan
16-Jan
31-Jan
15-Feb
2-Mar
17-Mar
1-Apr
16-Apr
1-May
16-May
31-May
15-Jun
30-Jun
15-Jul
30-Jul
14-Aug
29-Aug
13-Sep
28-Sep
13-Oct
28-Oct
12-Nov
27-Nov
12-Dec
27-Dec
Date
Groundwater Level
Threshold Depth


GW3 2009
Depth to Groundwater (in)
5
0
-5
-10
-15
-20
-25
-30
Begin Growing Season
End Growing Season
1-Jan
16-Jan
31-Jan
15-Feb
2-Mar
17-Mar
1-Apr
16-Apr
1-May
16-May
31-May
15-Jun
30-Jun
15-Jul
30-Jul
14-Aug
29-Aug
13-Sep
28-Sep
13-Oct
28-Oct
12-Nov
27-Nov
12-Dec
27-Dec
Date
Groundwater Level
Threshold Depth