Morgan Creek Stream Restoration Site

Haywood County, North Carolina
Cataloging Unit: 06010106
EEP Contract #: D06035-A
February 24, 2014

MONITORING REPORT 2013 (YEAR 5)

Submitted to:
North Carolina Department of Environment and Natural Resources
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
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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 4,269 linear feet of stream, restoring approximately 9.8 acres of riparian buffers, and restoring and enhancing approximately 1.06 acres of wetlands. The Site is in a rural setting in the Blue Ridge hydrophysiographic ecoregion and was previously used to pasture cattle with woody vegetation confined to isolated areas. Prior to restoration, the channels were highly degraded due to unrestricted livestock access, channelization activities, and lack of riparian vegetation. The restoration design was based on a Priority Level 1 and 2 approach to restore proper channel dimension and allow for appropriate sediment transport. Cross-vanes, J-Hook vanes, and in-stream log structures have been integrated into the channel to provide grade control, maintain stable streambanks while the riparian vegetation establishes, and provide in-stream habitat. Sod mats were harvested on-site and were used to stabilize the newly graded streambanks. Excavated materials from the existing channel were used to backfill around in-stream structures and to build riffles with a natural substrate and function.

Hydrology
Following the completion of construction in January of 2009, the Site has been subjected to at least five bankfull or greater events. The portions of the southwest region of the state experienced rainfall well above normal during the spring of 2009. In July of 2009 a high rainfall event resulted in high water at 0.8 ft. above bankfull or 1.6 times maximum channel depth. No bankfull or greater-than-bankfull flows were recorded during the second year of monitoring (2010). One greater-than-bankfull flow was recorded during the third year of monitoring (2011). No greater-than-bankfull events were recorded during the fourth year of monitoring (2012). One greater-than-bankfull flow was recorded during the fifth year of monitoring (2013).

Stream
The stream reaches have managed the high-flow events of the first five years. Visual inspection of the Site following the bankfull event in June of 2009 revealed no noticeable adjustments in the bed or bank. The overbank event in July of 2009 resulted in noticeable adjustments in many of the riffles. The overall grade of the channel has been maintained, while there are numerous local adjustments in the riffles and pools. These adjustments appear to be consistent with the channel form and have generally not affected structure stability or function. The Year 5 monitoring visit showed that the bed has remained stable since the Year 4 monitoring visit.

Vegetation
Native woody and herbaceous species were used to establish, at minimum, a thirty-foot riparian buffer on each side of the restored reach. Herbaceous species have successfully established throughout the entire site. On-site sod transplants used to reconstruct the channel banks are well established and show evidence of vigorous growth. Riparian buffer planting exhibits a high survival rate, with an average density for planted living stems at the end of Monitoring Year 5 of 425 stems per acre.

Wetland

Wetland hydrology criteria was met on two of three groundwater gauges in the first year of monitoring, one of the three gauges in the second year, three out of three the third year and fourth year. The newly installed groundwater gauge (GW4) was installed in the spring of 2011. Although a maintenance site visit was conducted to service the groundwater gauge during Year 4, no data was recovered due to gauge failure. During the fifth year of monitoring, groundwater gauge four was replaced and two new gauges were installed (See Appendix A for gauge locations). Five out of six gauges met criteria during the fifth year of monitoring. Overall, the Site has met wetland hydrology criteria.

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.

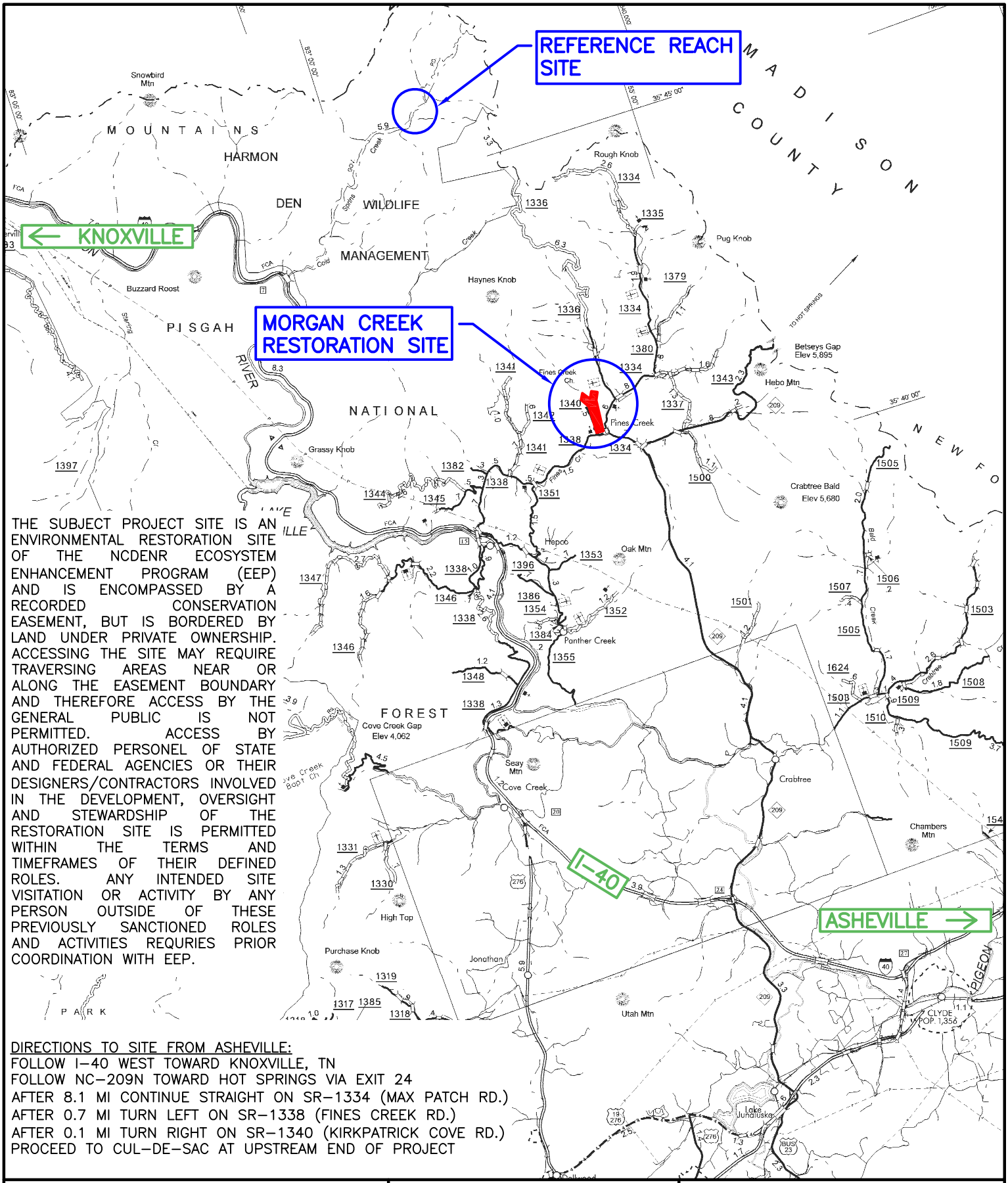
1.1.1 USGS and NCDWQ River Basin Designations

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 30' wide) adjacent to streams and wetlands to treat surface runoff which may be laden with sediment and/or agricultural pollutants from the adjacent landscape.
- Reestablishing stream stability and the capacity to transport watershed flows and sediment loads by restoring a stable dimension, pattern, and profile supported by natural in-stream habitat and grade/bank stabilization structures.
- Promoting floodwater attenuation through a) reconnecting bankfull stream flows to the abandoned floodplain terrace, b) restoring secondary, entrenched tributaries thereby reducing floodwater velocities, c) restoring floodplain wetlands, thereby increasing the storage capacity for floodwaters within the Site, and d) re-vegetating floodplains to increase frictional resistance on floodwaters crossing the Site.
- Improving aquatic habitat by enhancing stream bed variability and the use of in-stream structures.
- Providing wildlife habitat including seepage slope wetlands.

These accomplishments will result in:

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

1.3 Project Structure

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

Table 1. Project Components					
Restoration Reach/Area	Restoration Level	Approach	Pre-Restoration LF or AC	Post-Restoration LF or AC	Station Range/Location
Morgan Creek	R	P2	892	900	100+00 – 109+73
Morgan Creek	R	P1	340	340	108+73 – 112+00
Morgan Creek	R	P2	1402	1438	112+00 – 126+36
Morgan Creek	E1	E1	141	141	126+36 – 127+77
Morgan Creek	R	P2	213	212	127+77 – 129+72
North Branch	R	R2	288	296	200+00 – 202+96
North Branch	R	P2	63	66	203+38 – 204+02
Lower North Branch	R	P1	2	254	500+00 – 502+46
Middle Branch	E1	E1	148	148	300+00 – 301+48
Middle Branch	E1	E1	154	154	301+48 – 303+02
South Branch	R	P1	197	205	400+00 – 402+05
South Branch	E1	E1	115	115	402+05 – 403+20
A, C, D, E, F, G, H, I, J, K	E		0.46	0.46	
R1, R2, R3, R4, R5, R6, R7	R		0.6	0.6	

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

Applicable	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	Oct 2010	Nov 2010
Year 3 Monitoring	Sept 2011	Sept 2011
Year 4 Monitoring	Sept 2012	Nov 2012
Year 5 Monitoring	Sept 2013	Oct 2013

Table III. Project Contact Table Morgan Creek Restoration Project / EEP Contract# D06035-A		
Full Delivery Provider		
Restoration Systems, Inc	1101 Haynes St., Suite 211 Raleigh, NC 27604	
Travis Hamrick	919-755-9490	
Designer		
Wolf Creek Engineering, pllc	7 Florida Ave Asheville, NC 28787	
S. Grant Ginn, P.E.	828-658-3649	
Construction Contractor		
North State Environmental, Inc	2889 Lowery St. Winston-Salem, NC 27101	
Darrell Westmoreland	336-725-2010	
Project Manager		
American Wetlands	2310 Valley Carline Court Ruston, VA 20191	
Lamar Beasley	703-860-0045	
Planting & Seeding Contractor		
North State Environmental, Inc	2889 Lowery St. Winston-Salem, NC 27101	
Stephen Joyce	336-725-2010	
Monitoring Performers		
Stream Monitoring - Wolf Creek Engineering, pllc	S. Grant Ginn, P.E.	828-658-3649
Vegetation Monitoring - Axiom Environmental, Inc	Grant Lewis	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 4.2* (Lee et al. 2008) (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 5 (2013) vegetation monitoring for the Site occurred on October 3, 2013. Vegetation sampling across the Site was above the required average density with 425 planted stems per acre (excluding livestakes). In addition, each individual plot met success criteria of 260 stems per acre. Dense native herbaceous cover has established throughout the Site.

2.1.2 Vegetative Problems

Stem loss, which occurred following baseline monitoring, was attributed to several factors, including livestock encroachment in Plots 2 and 4, and mowing within Plot 5. Supplemental planting occurred during the Year 1 (2009) monitoring season within areas that had experienced stem loss. Average overall vigor of planted stems through Year 5 (2013) was noted as good to excellent.

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	10/3/2013	12	1	0	12	486	8
2	10/3/2013	15	2	4	19	769	8
3	10/3/2013	9	2	0	9	364	5
4	10/3/2013	7	3	0	7	283	6
5	10/3/2013	10	2	0	10	405	6
6	10/3/2013	10	0	0	10	405	6

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, Year 1, Year 2, Year 3, Year 4 and Year 5 summary data are provided in Tables VI and VII below).

Most of the stream reaches have managed the extreme flow events of the first five years reasonably well. The overall bed profile of Morgan Creek has been maintained; however, there are numerous local adjustments to riffle and pool features. These adjustments appear to have remained stable during Monitoring Year 5 (2013), and exhibit no additional degradation. Most of the in-stream structures are intact and functional. The few structures that were partially compromised appear to have stabilized.

2.2.1 Hydrology

Since completion of construction in January of 2009, the site has been subjected to at least five bankfull or greater events. In July of 2009, a weather system crossed western North Carolina resulting in four inches of rainfall on-site and water elevations 0.8 feet above bankfull on Morgan Creek. It is estimated that this storm was between a twenty-five and fifty-year event. Heavy rainfall in the late summer of 2009 again resulted in water elevations above bankfull. No bankfull event was recorded during Monitoring Year 2 (2010). One greater-than-bankfull event occurred during the summer of 2011. No bankfull event was recorded during Monitoring Year 4 (2012). At least one greater-than-bankfull event occurred during the summer of 2013.

Table VIII. Verification of Bankfull Events

Date of Data Collection	Date of Occurrence of Bankfull Event	Height Above Bankfull (ft)	Method of Data Collection
6/16/09	Spring 2009	At Bankfull	Debris evidence at bankfull
7/9/09	7/8/09	0.8	Crest Gauge
10/6/09	Summer 2009	0.6	Crest Gauge
9/7/11	Summer 2011	0.3	Crest Gauge and Debris evidence
9/18/13	Summer 2013	0.8	Crest Gauge and Debris evidence

2.2.2 Geomorphology

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

Table VI. - Baseline Morphology and Hydraulic Summary

Morgan Creek Restoration Site - Morgan Creek (3031 ft)

Parameter	Gauge	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			As-Built / Baseline					
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 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 VII. Morphology 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	13	14.2	12.4			14.0	13.9	15.1	15.2								
Floodprone Width (ft)	63	63	63	63			-	-	-	-								
Bkf Cross Sectional Area (ft^2)	11.4	11.6	8.7	6			13.4	12.5	10.8	11.6								
Bkf Mean Depth (ft)	0.9	0.9	0.6	0.5			1.0	0.9	0.7	0.8								
Bkf Max Depth (ft)	1.3	1.3	1.4	1.2			1.5	1.4	1.7	1.7								
Width/Depth Ratio	14.6	14.6	23.3	25.9			-	-	-	-								
Entrenchment Ratio	4.9	4.9	4.4	5.1			-	-	-	-								
Bank Height Ratio	1.0	1.0	1.0	1			-	-	-	-								
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	94	17.6	6.7	0.1														
D_{84} (mm)	207	122	81	1														

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	18	24	21	18	24	21	18	24	21						
Radius of Curvature (ft)	28	87	36	28	87	36	28	87	36	28	87	36						
Meander Wavelength (ft)	61	84	72	61	84	72	61	84	72	61	84	72						
Meander Width Ratio	1.4	1.9	1.6	1.4	1.9	1.6	1.4	1.9	1.6	1.4	1.9	1.6						
Profile																		
Riffle Length (ft)	8.5	25.5	12	5.5	22.9	16	7.5	41.5	14.8	7.8	22	17.9						
Riffle Slope (ft/ft)	0.0156	0.0864	0.0342	0.0195	0.0657	0.0422	0.0117	0.1233	0.0354	0.0138	0.1073	0.0346						
Pool length (ft)	3.3	16.5	9	-	-	-	7	16.5	10.5	5.8	46	11.7						
Pool Spacing (ft)	15	46	37	15	137.5	43	16	59	41.2	22.5	77	44.6						
Additional Reach Parameters																		
Valley Length (ft)	-	-	740	-	-	740	-	-	740	-	-	740						
Channel Length (ft)	-	-	773	-	-	773	-	-	773	-	-	773						
Sinuosity	-	-	1.04	-	-	1.04	-	-	1.04	-	-	1.04						
Water Surface Slope (ft/ft)	0.036	0.080	0.048	0.0355	0.0471	-	0.03	0.0678	0.0472	-	-	-						
Bkf Slope (ft/ft)	0.036	0.080	0.048	-	-	0.0444	0.0238	0.066	0.0457	0.0238	0.0660	0.0457						
Rosgen Classification	-	-	B3a	-	-	B3a	-	-	B3a	-	-	B3a						
Habitat Index																		
Macrobenthos																		

Table VII. Morphology 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	14.1	13.6	13.9			15.2	16.3	15.6	16.3								
Floodprone Width (ft)	33	33	33	33			-	-	-	-								
Bkf Cross Sectional Area (ft^2)	12	10.6	9.8	11.2			21.8	20.2	19.9	18.5								
Bkf Mean Depth (ft)	0.9	0.7	0.7	0.8			1.4	1.2	1.3	1.1								
Bkf Max Depth (ft)	1.6	1.5	1.6	1.7			2.2	2.1	2.7	2.7								
Width/Depth Ratio	14.8	18.8	18.9	17.2			-	-	-	-								
Entrenchment Ratio	2.5	2.5	2.4	2.4			-	-	-	-								
Bank Height Ratio	1.0	1.0	1.0	1.0			-	-	-	-								
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	51	26	20	12.7														
D_{84} (mm)	139	109	104	151														

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	16	30	24	16	30	24	16	30	24						
Radius of Curvature (ft)	30	88	40	30	88	40	30	88	40	30	88	40						
Meander Wavelength (ft)	73	93	88	73	93	88	73	93	88	73	93	88						
Meander Width Ratio	1.2	2.3	1.8	1.2	2.3	1.8	1.2	2.3	1.8	1.2	2.3	1.8						
Profile																		
Riffle Length (ft)	14	29	21	8.5	84	44.5	12	37	23	3.8	23	19						
Riffle Slope (ft)	0.0261	0.0542	0.0332	0.0218	0.033	0.0275	0.0117	0.0372	0.0281	0.0165	0.0247	0.0171						
Pool length (ft)	8	15	9.5	-	-	-	7	89	9	3.9	14.4	8.6						
Pool Spacing (ft)	33	67	45	34	107	48	36.5	115	46.5	10	91	53						
Additional Reach Parameters																		
Valley Length (ft)	-	-	541	-	-	541	-	-	541	-	-	541						
Channel Length (ft)	-	-	573	-	-	573	-	-	573	-	-	573						
Sinuosity	-	-	1.1	-	-	1.06	-	-	1.06	-	-	1.06						
Water Surface Slope (ft/ft)	0.037	0.043	0.037	0.0334	0.0404	-	0.0307	0.0444	0.0411	-	-	-						
Bkf Slope (ft/ft)	0.037	0.043	0.037	-	-	0.0337	-	0.1236	0.0347	-	0.1236	0.0347						
Rosgen Classification	-	-	B4	-	-	B4	-	-	B4	-	-	B4						
Habitat Index																		
Macrobenthos																		

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

Parameter	Cross Section RF3 Riffle						Cross Section PL3 Pool						Cross Section					
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	14.9	17.1			14.9	13.4	14.5	15.6								
Floodprone Width (ft)	36	36	36	36			-	-	-	-								
Bkf Cross Sectional Area (ft^2)	15.3	12.3	12.4	12.8			11.8	10	9.5	9.7								
Bkf Mean Depth (ft)	1	0.8	0.8	0.7			0.8	0.7	0.7	0.6								
Bkf Max Depth (ft)	1.9	1.7	1.8	1.9			1.2	1.1	1.5	1.5								
Width/Depth Ratio	14	18	18	22.8			-	-	-	-								
Entrenchment Ratio	2.5	2.5	2.4	2.1			-	-	-	-								
Bank Height Ratio	1.0	1.0	1.0	1.0			-	-	-	-								
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	44	39.1	18.3	1.7														
D_{84} (mm)	132	104	98	100														

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	22	28	26	22	28	26	22	28	26						
Radius of Curvature (ft)	33	80	52	33	80	52	33	80	52	33	80	52						
Meander Wavelength (ft)	73	122	101	73	122	101	73	122	101	73	122	101						
Meander Width Ratio	1.5	1.9	1.8	1.5	1.9	1.8	1.5	1.9	1.8	1.5	1.9	1.8						
Profile																		
Riffle Length (ft)	4	30	17	12	68	18.6	6	41	17.5	13.9	23	22.9						
Riffle Slope (ft)	0.0135	0.0600	0.0359	0.0119	0.0615	0.0318	0.0138	0.1233	0.029	0.0044	0.0516	0.028						
Pool length (ft)	5.5	21	13	-	-	-	5.5	28	11.5	9.3	28.8	16.1						
Pool Spacing (ft)	35	76	53	3	76	48	33	67	48	44	75	50						
Additional Reach Parameters																		
Valley Length (ft)	-	-	328	-	-	328	-	-	328	-	-	328						
Channel Length (ft)	-	-	344	-	-	344	-	-	344	-	-	344						
Sinuosity	-	-	1.05	-	-	1.05	-	-	1.05	-	-	1.05						
Water Surface Slope (ft/ft)	0.030	0.037	0.030	0.0279	0.0347	-	0.0221	0.0619	0.0332	-	-	-						
Bkf Slope (ft/ft)	0.030	0.037	0.030	-	-	0.0313	0.018	0.0555	0.0348	0.0180	0.0555	0.0348						
Rosgen Classification	-	-	B4	-	-	B4	-	-	B4	-	-	B4						
Habitat Index																		
Macrobenthos																		

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

Parameter	Cross Section RF4 Riffle						Cross Section PL4 Pool						Cross Section					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Bkf Width (ft)	15.7	15.7	15.3	16.1			15.4	16.9	16.9	17								
Floodprone Width (ft)	44	44	44	44			-	-	-	-								
Bkf Cross Sectional Area (ft^2)	19.1	18.2	18.3	17.5			18.3	20.8	21.8	19.2								
Bkf Mean Depth (ft)	1.2	1.2	1.2	1.1			1.2	1.2	1.3	1.1								
Bkf Max Depth (ft)	2.0	1.9	2	1.8			2.1	2.4	2.6	2.3								
Width/Depth Ratio	12.9	13.5	12.8	14.8			-	-	-	-								
Entrenchment Ratio	2.8	2.8	2.9	2.7			-	-	-	-								
Bank Height Ratio	1.0	1.0	1.0	1.0			-	-	-	-								
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	50	49.9	13.7	0.6														
D_{84} (mm)	144	103	63	75														

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	21	30	23	21	30	23	21	30	23						
Radius of Curvature (ft)	33	92	47	33	92	47	33	92	47	33	92	47						
Meander Wavelength (ft)	82	108	91	82	108	91	82	108	91	82	108	91						
Meander Width Ratio	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5						
Profile																		
Riffle Length (ft)	5.2	28	18.2	14	77	18.5	11.5	53	24.5	2.7	49.4	23.3						
Riffle Slope (ft)	0.0169	0.0700	0.0322	0.0181	0.0736	0.0275	0.0127	0.062	0.0282	0.0088	0.0665	0.0255						
Pool length (ft)	4	35	13.5	-	-	-	4	53	15	11	29	18						
Pool Spacing (ft)	19	52	32	19	99	37	31	116	52	39	156	64						
Additional Reach Parameters																		
Valley Length (ft)	-	-	717	-	-	717	-	-	717	-	-	717						
Channel Length (ft)	-	-	741	-	-	741	-	-	741	-	-	741						
Sinuosity	-	-	1.03	-	-	1.03	-	-	1.03	-	-	1.03						
Water Surface Slope (ft/ft)	0.020	0.032	0.031	0.03	0.0316	-	0.0173	0.0388	0.027	-	-	-						
Bkf Slope (ft/ft)	0.020	0.032	0.031	-	-	0.03	0.0091	0.0379	0.0275	0.009	0.038	0.027						
Rosgen Classification	-	-	B4	-	-	B4	-	-	B4	-	-	B4						
Habitat Index																		
Macrobenthos																		

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

Parameter	Cross Section RF5 Riffle						Cross Section PL5 Pool						Cross Section					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Bkf Width (ft)	8.6	7.1	7.5	9.5			8.4	7.9	8.2	10								
Floodprone Width (ft)	22	22	22	22			-	-	-	-								
Bkf Cross Sectional Area (ft^2)	4.5	3.9	3.7	4.1			8.7	6.7	7.8	4.2								
Bkf Mean Depth (ft)	0.5	0.6	0.5	0.4			1.0	0.9	1	0.6								
Bkf Max Depth (ft)	1.0	0.9	1.1	1.1			1.9	1.4	8.6	1.1								
Width/Depth Ratio	16.5	12.9	15.2	22.1			-	-	-	-								
Entrenchment Ratio	2.6	2.6	2.9	2.2			-	-	-	-								
Bank Height Ratio	1.0	1.0	1.0	1.0			-	-	-	-								
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	31	51	22.8	0.1														
D_{84} (mm)	177	160	108	4														

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	11	16	13	11	16	13	11	16	13						
Radius of Curvature (ft)	16	30	18	16	30	18	16	30	18	16	30	18						
Meander Wavelength (ft)	34	41	39	34	41	39	34	41	39	34	41	39						
Meander Width Ratio	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5	1.3	1.9	1.5						
Profile																		
Riffle Length (ft)	3	10.2	4.5	1.2	27	9.4	3	25.7	6	4.5	18.2	8.2						
Riffle Slope (ft)	0.0267	0.1171	0.0667	0.024	0.0976	0.0664	0.03	0.14	0.0733	0.0355	0.0616	0.0456						
Pool length (ft)	3.2	10.5	4.2	-	-	-	3	22.2	6	3	8.8	5						
Pool Spacing (ft)	8.5	33	20.3	14.1	37	21.3	11.5	36.3	19.8	10	41	23						
Additional Reach Parameters																		
Valley Length (ft)	-	-	246	-	-	246	-	-	246	-	-	246						
Channel Length (ft)	-	-	266	-	-	266	-	-	266	-	-	266						
Sinuosity	-	-	1.08	-	-	1.08	-	-	1.08	-	-	1.08						
Water Surface Slope (ft/ft)	0.045	0.06	0.054	0.0508	0.0664	-	0.0136	0.0959	0.0535	-	-	-						
Bkf Slope (ft/ft)	0.045	0.06	0.054	-	-	0.0527	0.0218	0.0808	0.0474	0.022	0.081	0.047						
Rosgen Classification	-	-	B4a	-	-	B4a	-	-	B4a	-	-	B4a						
Habitat Index																		
Macrobenthos																		

Re-survey of the permanent cross sections and profile reaches have shown a few minor alterations in local bed elevations with the bed form and the channel pattern remains consistent with the Year 4 condition. On Morgan Creek, the four riffle sections that were taken showed variation from the Year 4 condition in that they are continuing to experience slight deposition of material along the banks. This may be due to the continued growth of vegetation along the riffles. Changes between Year 4 and Year 5 riffle sections were minor and none suggest a systemic problem at the Site. The four pool sections that were taken show slight adjustments, but are fairly consistent with conditions present in Year 4. None of the adjustments are cause for concern regarding performance of the stream.

The riffle and pool sections that were taken on North Branch indicate minor change from the Year 4 survey. The riffle section has experienced slight deposition of material along the banks. The pool section appears to be aggrading and returning to the condition prior to Year 4. Overall, the channel is generally consistent with the Year 4 survey.

Pebble counts were conducted at each cross-section, as well as across the overall study reach. Pebble count data was plotted by size distribution in order to assess the D_{50} and D_{84} size class. On Morgan Creek and North Branch, the material size increased from the Year 4 condition. This overall increase in particle size is likely related to the greater-than-bankfull event during the previous year that moved silt and smaller sediment through the system.

TABLE IX. BEHI AND SEDIMENT EXPORT ESTIMATES

Exhibit Table IX. BEHI and Sediment Export Estimates Morgan Creek Stream Restoration															
Time Point	Segment/ Reach	Linear Footage	Extreme		Very High		High		Moderate		Low		Very Low		Sediment Export
			ft	%	ft	%	ft	%	ft	%	ft	%	ft	%	tons/yr
YEAR 5	MRGN-R1	900 LF							10	1	890	99			1.5
	MRGN-R2	340 LF							40	12	300	88			1.3
	MRGN-R3	1438 LF							150	10	1288	90			4.9
	MRGN-R4	141 LF									141	100			0.2
	MRGN-R5	212 LF									212	100			0.2
	NB-R1	296 LF									296	100			0.2
Project Total		3327 LF							200	6	3127	94			8.3

2.2.3 Problem Areas

Structure drops or nick points that were identified in previous years appear to be stable and show no further evidence of degradation.

2.2.4 Photo Point Stations

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

2.2.5 Stability Assessment

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

Table X. Categorical Stream Feature Visual Stability Assessment

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

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

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

2.3 Wetland Assessment

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

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

2.3.1 Hydrology

Five of the six gauges installed met wetland hydrology criteria during the 2013 growing season (Table III). Gauge GW1 had groundwater present within 12 inches for the entire growing season. Gauge GW2 had groundwater present within 12 inches for a total of 130 days with a peak of 17 consecutive days. Gauge GW3 had groundwater present within 12 inches for a total of 162 days with a peak of 86 consecutive days. Gauge GW4 had groundwater present within 12 inches for a total of 61 days with a peak of 33 consecutive days. Gauge GW6 had groundwater present within 12 inches for a total of 65 days with a peak of 15 consecutive days. The newly installed gauge GW5 was the only gauge that did not meet wetland hydrology criteria, with no groundwater present within 12 inches during the Year 5 growing season. Plots of the gauge data can be found in Appendix C.

Exhibit Table XI. Wetland Criteria Attainment

Tract	Well ID	Well Hydrology Threshold Met?	Consecutive Days of Hydrology Met	% of Growing Season Met	Tract Mean	Vegetation Plot ID	Veg Survival Threshold Met?	Tract Mean
1	GW1	Yes	175	100	57%	-	-	100%
	GW2	Yes	17	74				
	GW3	Yes	86	93				
	GW4	Yes	33	35				
	GW5	No	0	0				
	GW6	Yes	15	37				

Wetland hydrology criteria was met on two out of three groundwater gauges in the first year of monitoring, one of the three gauges in the second year, three out of three the third year and fourth year. During the fifth year, five out of six gauges met wetland hydrology criteria.

Exhibit Table XII. Summary of Wetland Criteria Attainment

	Well Hydrology Threshold Met?				
WELL ID	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
GW1	Yes	Yes	Yes	Yes	Yes
GW2	No	No	Yes	Yes	Yes
GW3	Yes	No	Yes	Yes	Yes
GW4	-	-	-	-	Yes
GW5	-	-	-	-	No
GW6	-	-	-	-	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. Plots 2 and 4 were above the minimum 260 stems per acre required to be surviving after five years of monitoring with 607 and 283 planted stems per acre (excluding livestakes). 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

Lee, Michael T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2. (online). Available: http://cvs.bio.unc.edu/methods.htm

Weakley, Alan S. 2008. Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas (working draft) (online). Available: http://www.herbarium.unc.edu/WeakleyFlora_2008-Apr.pdf. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, North Carolina.

APPENDIX A

MONITORING PLANS

Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
7 Florida Avenue Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PROJECT	MORGAN CREEK RESTORATION PROJECT
OWNER	RESTORATION SYSTEMS, INC.
TITLE	**MONITORING PLANS – YEAR 5**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1026	MP-1
DATE 10/10/13	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

MONITORING REACH 1

MONITORING REACH 2

STABLE NICK POINT
STABLE NICK POINT
STABLE DROP AT END OF STRUCT
STABLE GAP IN STRUCT
STABLE DROP AT END OF STRUCT
LOG PIPING (STABLE)
STABLE DROP AT END OF STRUCT
DEPOSITION IN RIFFLE (STABLE)
STABLE BED CUT OR NICK POINT
STABLE BED CUT OR NICK POINT

PHOTOPOINT NO. 1
PP1
GW5
R1
MORGAN CREEK AS-BUILT
DESIGN ALIGNMENT
VEG PLOT 6
CONSERVATION EASEMENT BOUNDARY
BEGIN CONSTRUCTION STA 100+00
PHOTOPOINT NO. 7
PRE-CONSTRUCTION MORGAN CREEK
POST-CONSTRUCTION THALWEG
A
C
D
R2
GW1
RF1
PRF1
RF1
PPL1
PL1
PL1
CONSERVATION EASEMENT BOUNDARY
CONSERVATION EASEMENT BOUNDARY

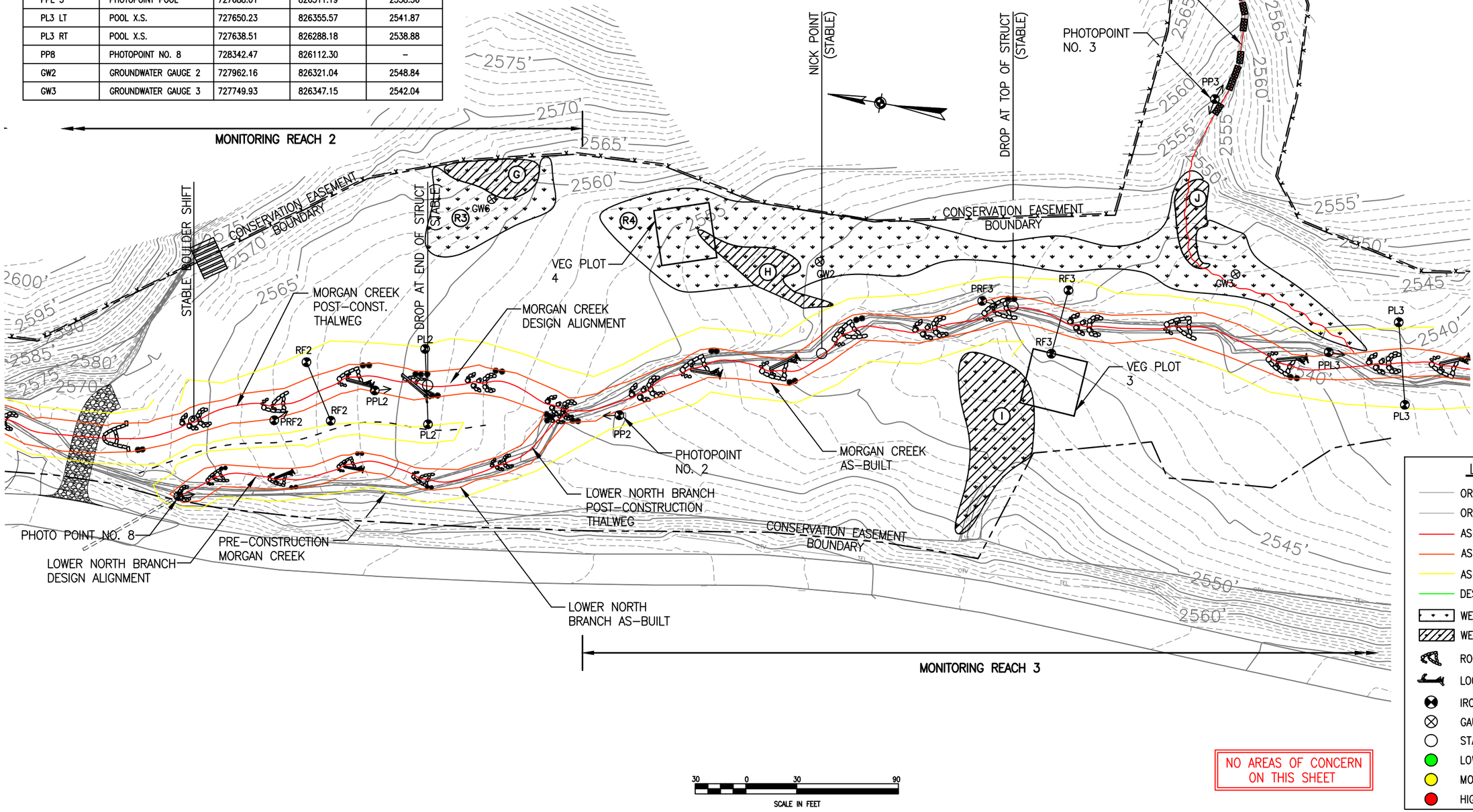
POINT NO.	POINT DESCRIPTION	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
PP1	PHOTOPOINT NO. 1	729156.17	826117.25	2605.55
PRF 1	PHOTOPOINT RIFFLE	728807.03	826071.48	2583.49
RF1 LT	RIFFLE X.S.	728789.03	826110.51	2584.66
RF1 RT	RIFFLE X.S.	728764.74	826075.17	2581.69
PPL 1	PHOTOPOINT POOL	728713.94	826121.16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

NO AREAS OF CONCERN ON THIS SHEET

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

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



LEGEND

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

NO AREAS OF CONCERN ON THIS SHEET

30 0 30 90
SCALE IN FEET

Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
7 Florida Avenue Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PROJECT: MORGAN CREEK RESTORATION PROJECT
OWNER: RESTORATION SYSTEMS, INC.
TITLE: **MONITORING PLANS – YEAR 5**

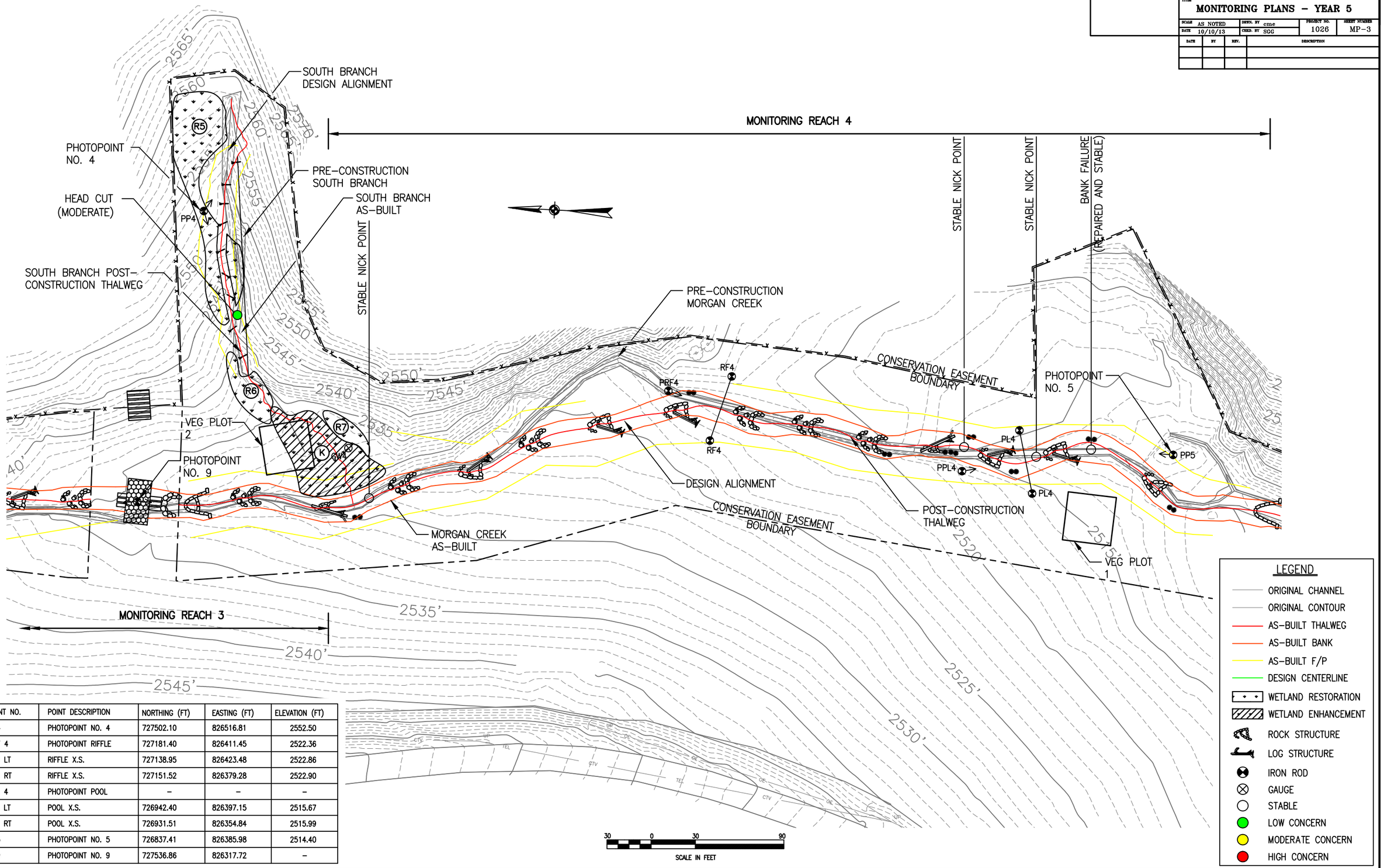
SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1026	MP-2
DATE 10/10/13	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
7 Florida Avenue Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PROJECT	MORGAN CREEK RESTORATION PROJECT
OWNER	RESTORATION SYSTEMS, INC.
TITLE	**MONITORING PLANS – YEAR 5**
SCALE	AS NOTED
DATE	10/10/13
DRWN. BY	cme
CHKD. BY	SGG
PROJECT NO.	1026
SHEET NUMBER	MP-3

DATE	BY	REV.	DESCRIPTION



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

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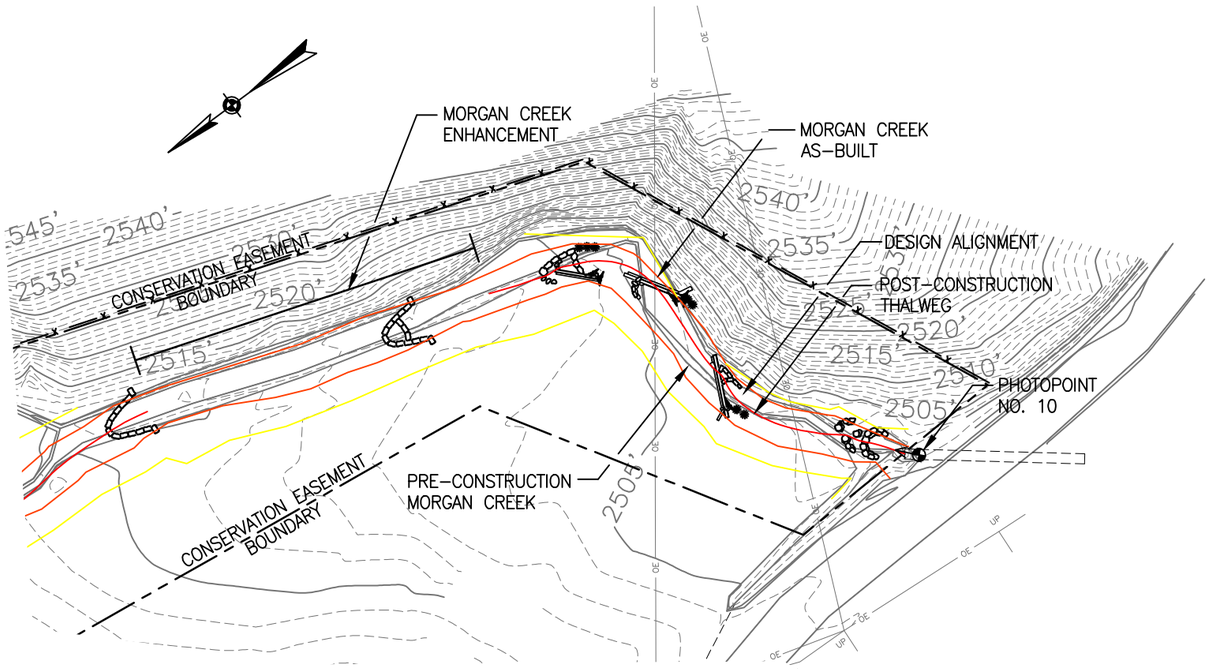
PROJECT	MORGAN CREEK RESTORATION PROJECT
OWNER	RESTORATION SYSTEMS, INC.
TITLE	**MONITORING PLANS – YEAR 5**

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1026	MP-4
DATE 10/10/13	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION



PP10	PHOTOPOINT NO. 10	726527.45	826153.34	–

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SCALE IN FEET

NO AREAS OF CONCERN ON THIS SHEET

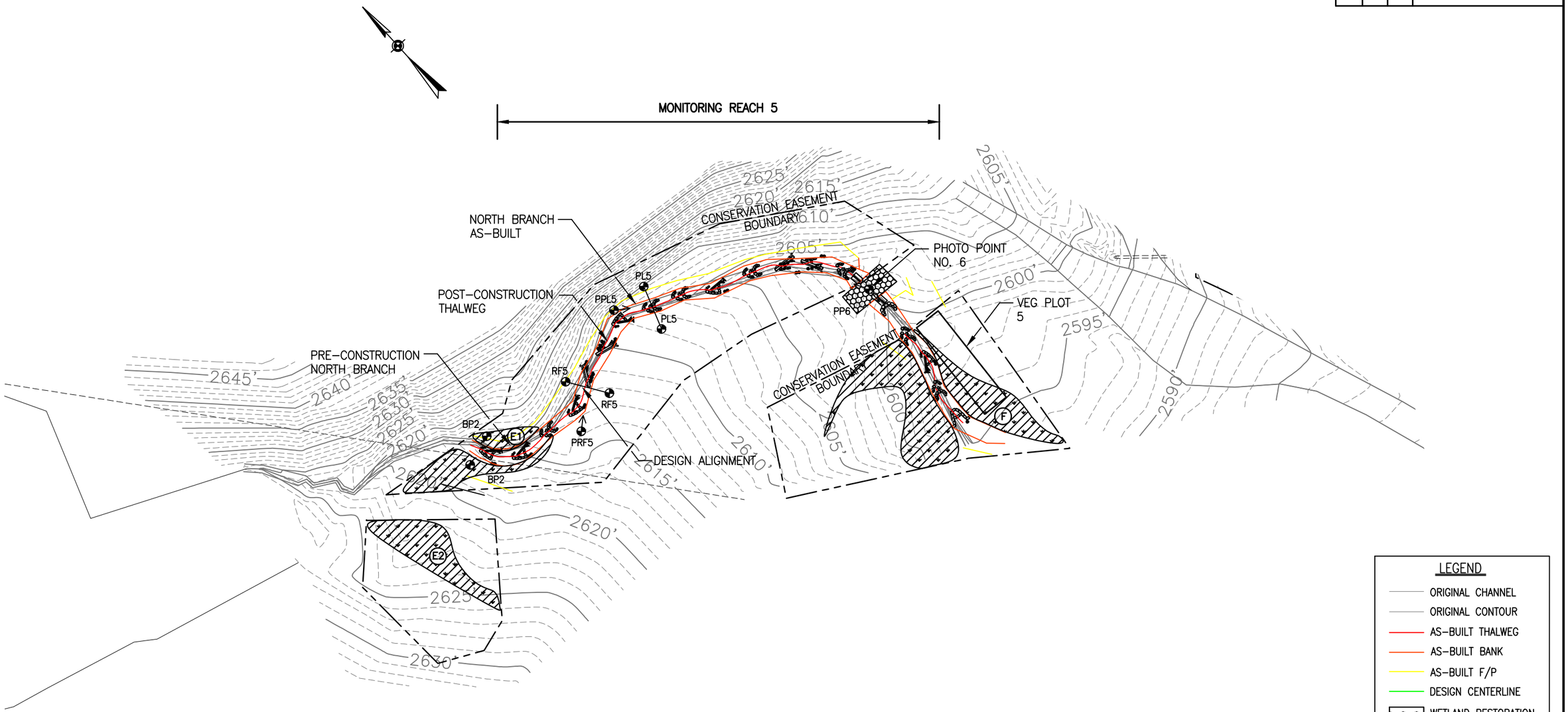
LEGEND
- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS-BUILT THALWEG
- AS-BUILT BANK
- AS-BUILT F/P
- DESIGN CENTERLINE
- WETLAND RESTORATION
- WETLAND ENHANCEMENT
- ROCK STRUCTURE
- LOG STRUCTURE
- IRON ROD
- GAUGE
- STABLE
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

Wolf Creek Engineering
ENGINEERING & ENVIRONMENTAL CONSULTING
7 Florida Avenue Weaverville, NC 28787
PHONE: (828) 658-3649 WWW.WOLFCREEKENG.COM

PROJECT	MORGAN CREEK RESTORATION PROJECT
OWNER	RESTORATION SYSTEMS, INC.
TITLE	**MONITORING PLANS – YEAR 5**

SCALE	DWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	cme	1026	MP-5
DATE 10/10/13	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

NO AREAS OF CONCERN ON THIS SHEET

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

APPENDIX B

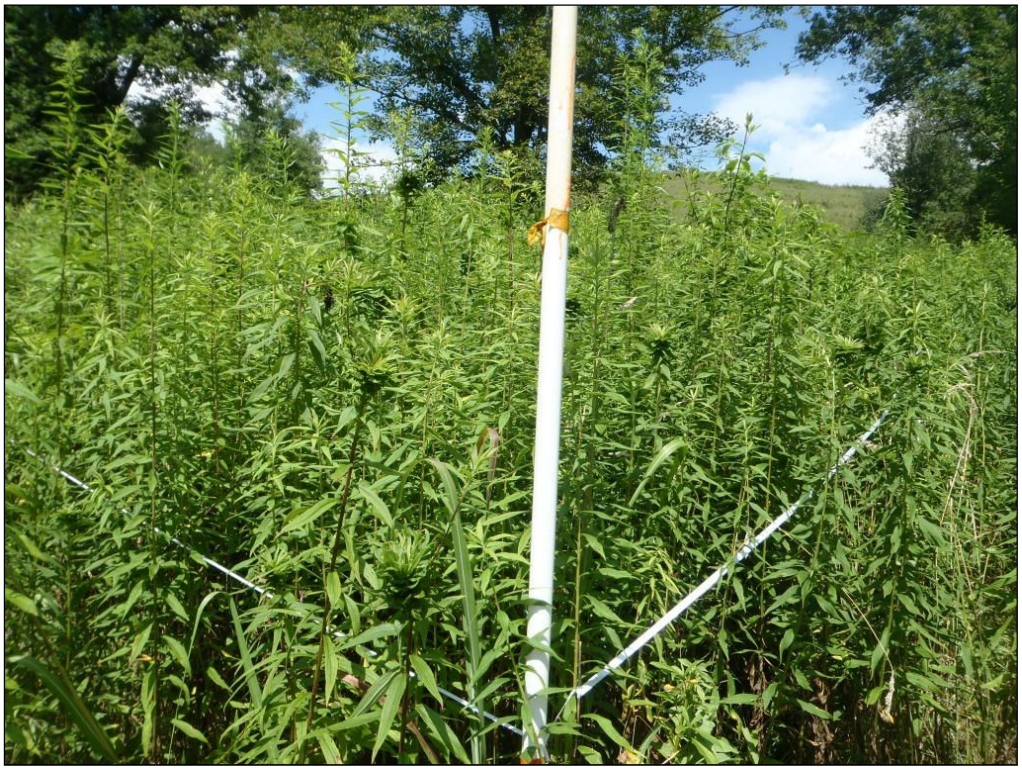
VEGETATION RAW DATA

Vegetation Plot No. 1

Year 4 Photo No. 1

Year 5 Photo No.2

Vegetation Plot No. 2



Year 4 Photo No. 3

Year 5 Photo No.4

Vegetation Plot No. 3

Year 4 Photo No. 5

Year 5 Photo No. 6

Vegetation Plot No. 4

Year 4 Photo No. 7

Year 5 Photo No. 8

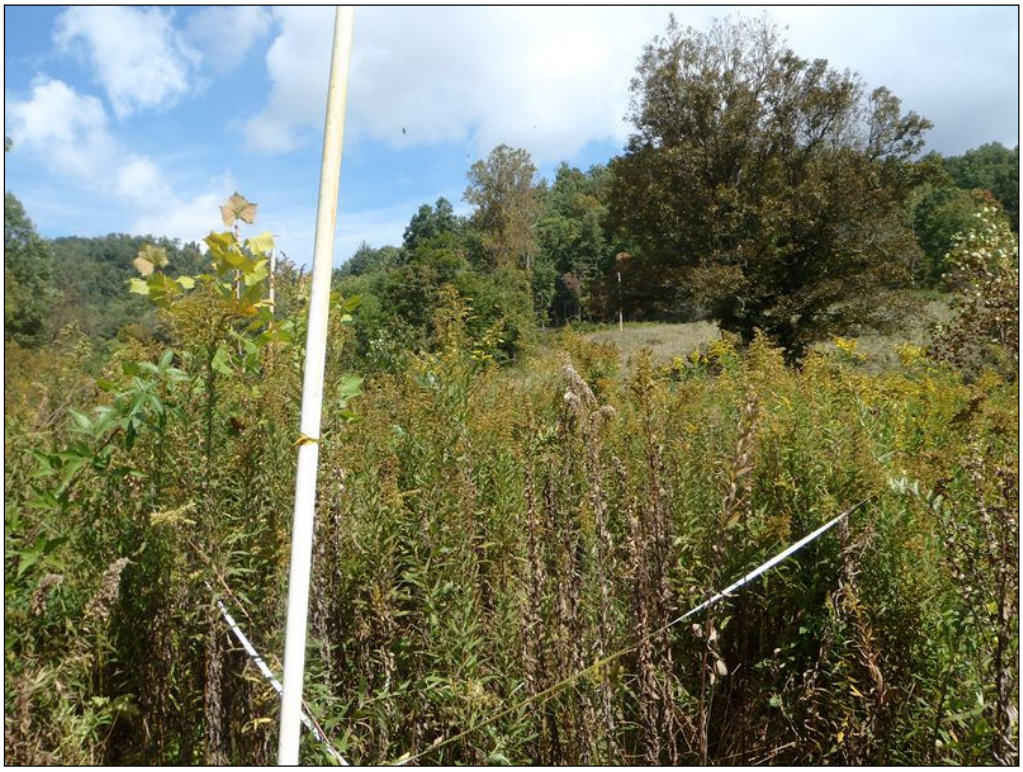
Vegetation Plot No. 5

Year 4 Photo No. 9

Year 5 Photo No. 10

Vegetation Plot No. 6

Year 4 Photo No. 11



Year 5 Photo No. 12

Vegetation Monitoring Data (VMD) Datasheet **Please fill in any missing data and correct any errors.**

Plot Morgan-AXE-0001

VMD Year (1-5): 5 Date: 10/3/1 - / /

Taxonomic Standard: Vegetation

Taxonomic Standard DATE: 2010

Latitude or UTM-N: 35.68300 Datum: NAD83/WGS84

(dec.deg. or m)

Longitude or UTM-E: -82.95331 UTM Zone:

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

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

Party:	Role:
Perkins	PI
[illegible]	A

Date last planted:

New planting date m/yy?

☐ Check box if plot was not sampled, specify reason below

Notes: Photo - 6

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Jul 2012 Data Height 1cm*	Jul 2012 Data DBH 1 cm	THIS YEAR'S DATA Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
2492	Cornus amomum	ⓑ	R	1.8	3.3	170.0	0.4	210	0.7	☐	4		
2493	Liriodendron tulipifera	ⓓ	R	3.0	4.0	110.0	*DBH?*			☐	0		
2496	Cornus amomum	ⓕ	R	5.1	0.0	190.0	0.9	220	1	☐	4		
2497	Betula nigra	ⓖ	R	6.1	3.2	240.0	1.3			☐	0		
2499	Cornus amomum	ⓛ	R	9.4	0.8	220.0	1.1	240	1.5	☐	4		
2502	Salix purpurea	ⓙ	R	7.8	4.9	310.0	1.4	370	2.3	☐	4		
2503	Hamamelis virginiana	ⓜ	R	9.7	8.4	60.0		68	–	☐	3		
hornets nest													
2504	Cornus amomum	ⓚ	R	9.0	9.9	200.0	0.3	250	2	☐	4		
resprout													
2505	Quercus rubra	ⓘ	R	7.2	7.6	190.0	0.5	310	2	☐	4		
2506	Amelanchier laevis	ⓗ	R	6.6	6.4	190.0	0.4	250	1.7	☐	4		
2507	Betula nigra	ⓒ	R	2.6	5.6	120.0	*DBH?*	130	–	☐	4		
no identifible features, went with previous id													
2509	Quercus rubra	ⓐ	R	0.7	6.7	90.0		90		☐	4		
16901	~~Liriodendron tulipifera~~	ⓔ	R	4.7	5.0	150.0	0.3	170	.5	☐	4		

 # stems: 13 New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

Species Name	Source*	X (m)	Y (m)	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes
Platanus occidentalis		2.9	2.6	140	0.2	4		

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

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

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

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

Plot (continued): **Morgan-AXE-0001**						Jul 2012 Data			THIS YEAR'S DATA						
ID	Species	map char	source	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*	Notes

Natural Woody Stems - tallied by species

Explanation of cut-off & subsampling**:

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

Species Name	☑ c	SEEDLINGS — HEIGHT CLASSES				SAPLINGS — DBH			TREES — DBH		
		Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Sub-Sapl	0-1 cm	1-2.5	2.5-	5-	=10 (write DBH)
Platanus occidentalis		___				___					
		___				___					
		___				___					
		___				___					
		___				___					
		___				___					
		___				___					

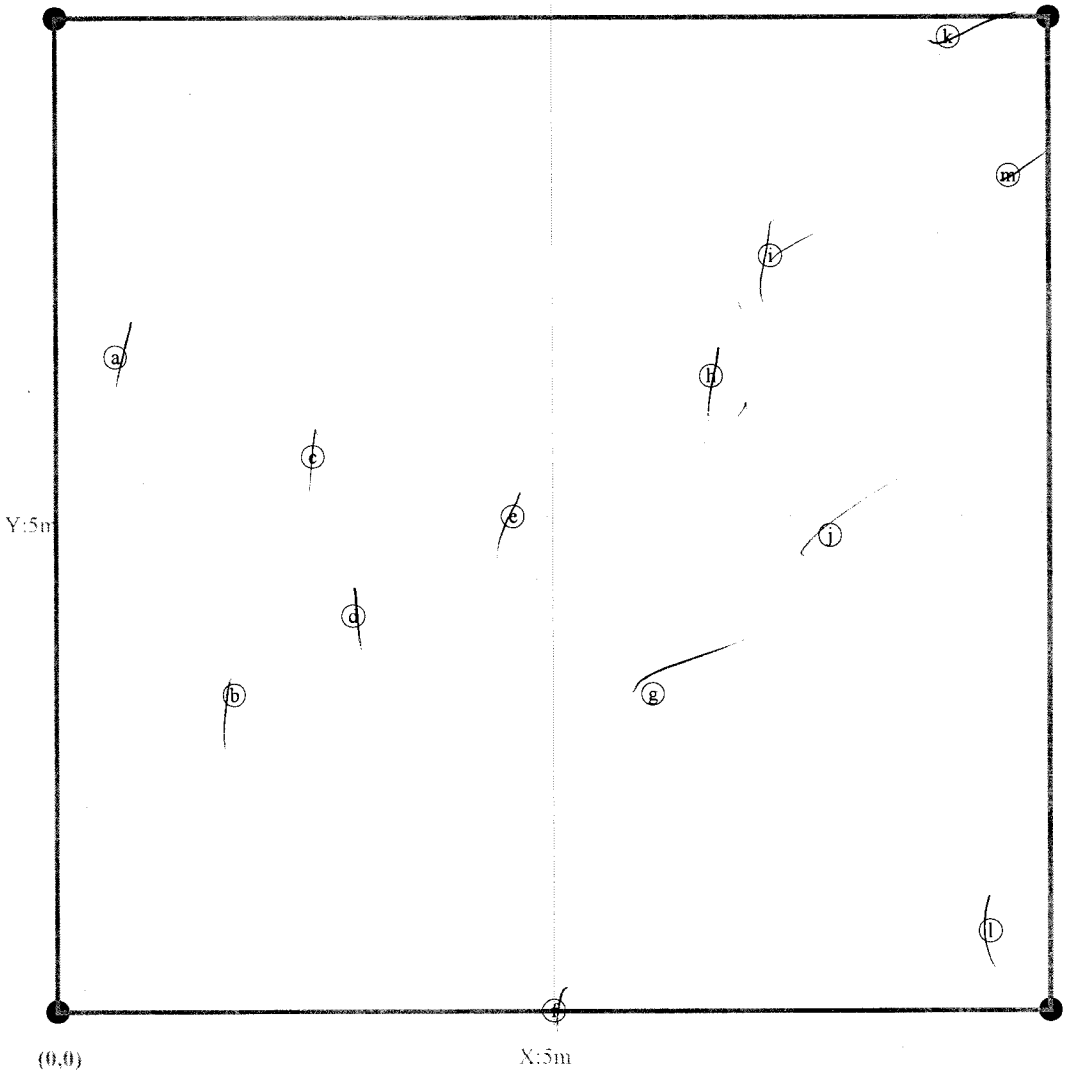
**Required if cut-off >10cm or subsample ? 100%. 1 2 3 4 5 6 7 8 9 10 Form WS2, ver 9.1

Map of stems on plot Morgan-AXE-0001

X-axis: 94 °

N

 # stems: 13
map size: Medium



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

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

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

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

Vegetation Monitoring Data (VMD) Datasheet **Please fill in any missing data and correct any errors.**

Plot Morgan-AXE-0002

VMD Year (1-5): 5 Date: 10/3/13 - / /

Taxonomic Standard: Weakley

Taxonomic Standard DATE: 2010

Latitude or UTM-N: (dec.deg. or m) 35.68458 Datum: NAD83/WGS84

Longitude or UTM-E: -82.95334 UTM Zone:

Coordinate Accuracy (m): X-Axis bearing (deg): 78

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

Party:	Role:
Perkinson	Or
Vo...	

Date last planted:

New planting date m/yy? /

☐ Check box if plot was not sampled, specify reason below

Notes: P-6

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Jul 2012 Data Height 1cm*	Jul 2012 Data DBH 1 cm	THIS YEAR'S DATA Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
2520	Platanus occidentalis	b	R	0.9	2.2	160.0	0.3	200	1.1	☐	4		
2522	Cornus amomum	h	R	4.9	2.3	160.0	0.7	230	1.0	☐	4		
2523	~~Lindera benzoin~~ ✓	o	R	7.1	3.5	40.0		48		☐	3		
2524	Quercus rubra	q	R	8.8	1.9	130.0	DBH?	141	.2	☐	4		
2527	Betula nigra	p	R	7.7	8.8	280.0	1.6	380	4.2	☐	4		
2528	Quercus rubra	l	R	6.3	9.1	90.0		173	0.6	☐	4		
2529	Amelanchier laevis	n	R	6.8	6.7	200.0	0.7	270	1.5	☐	4		
2530	Hamamelis virginiana	i	R	5.0	6.7	160.0	0.4	210	1.0	☐	4		
2531	Hamamelis virginiana	g	R	3.7	9.4	10.0				☐	0		
2532	Quercus rubra	f	R	3.0	8.7	300.0	1.5	380	3.3	☐	4		
2533	Hamamelis virginiana	d	R	2.1	6.6	120.0	DBH?	200	0.5	☐	4		
2534	Quercus rubra	c	R	0.9	9.2	180.0	0.6	250	2.2	☐	4		
5910	Platanus occidentalis	a	R	0.5	7.0	170.0	0.4	260	1.4	☐	4		
5911	Acer saccharum	e	R	2.1	8.1	80.0				☐	0		
12458	Platanus occidentalis	j	R	5.2	6.9	110.0	DBH?	160	.6	☐	4		
12459	Platanus occidentalis	k	R	6.3	7.0	70.0		135		☐	4		
16902	Liriodendron tulipifera	m	R	6.6	1.3	100.0		175	0.6	☐	4		

 # stems: *17* New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

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

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

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

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

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

Printed in the CVS-EEP Entry Tool ver. 2.3.0

Plot (continued): Morgan-AXE-0002					Jul 2012 Data				THIS YEAR'S DATA						
ID	Species	map char	source	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*	Notes

Natural Woody Stems - tallied by species

Explanation of cut-off & subsampling:**

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

Species Name	☑ c	SEEDLINGS — HEIGHT CLASSES				SAPLINGS — DBH			TREES — DBH		
		Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Sub-Sapl	0-1 cm	1-2.5	2.5-	5-	=10 (write DBH)
Acer Saccharum		—		0	0	—					
Prunus Serotina		—		1		—	1				
		—				—					
		—				—					
		—				—					
		—				—					
		—				—					

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

●1 ●2 ●3 ●●4 ●●5 ●●6 ●●7 ●●8 ●●9 ●●10

Form WS2, ver 9.1

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

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

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

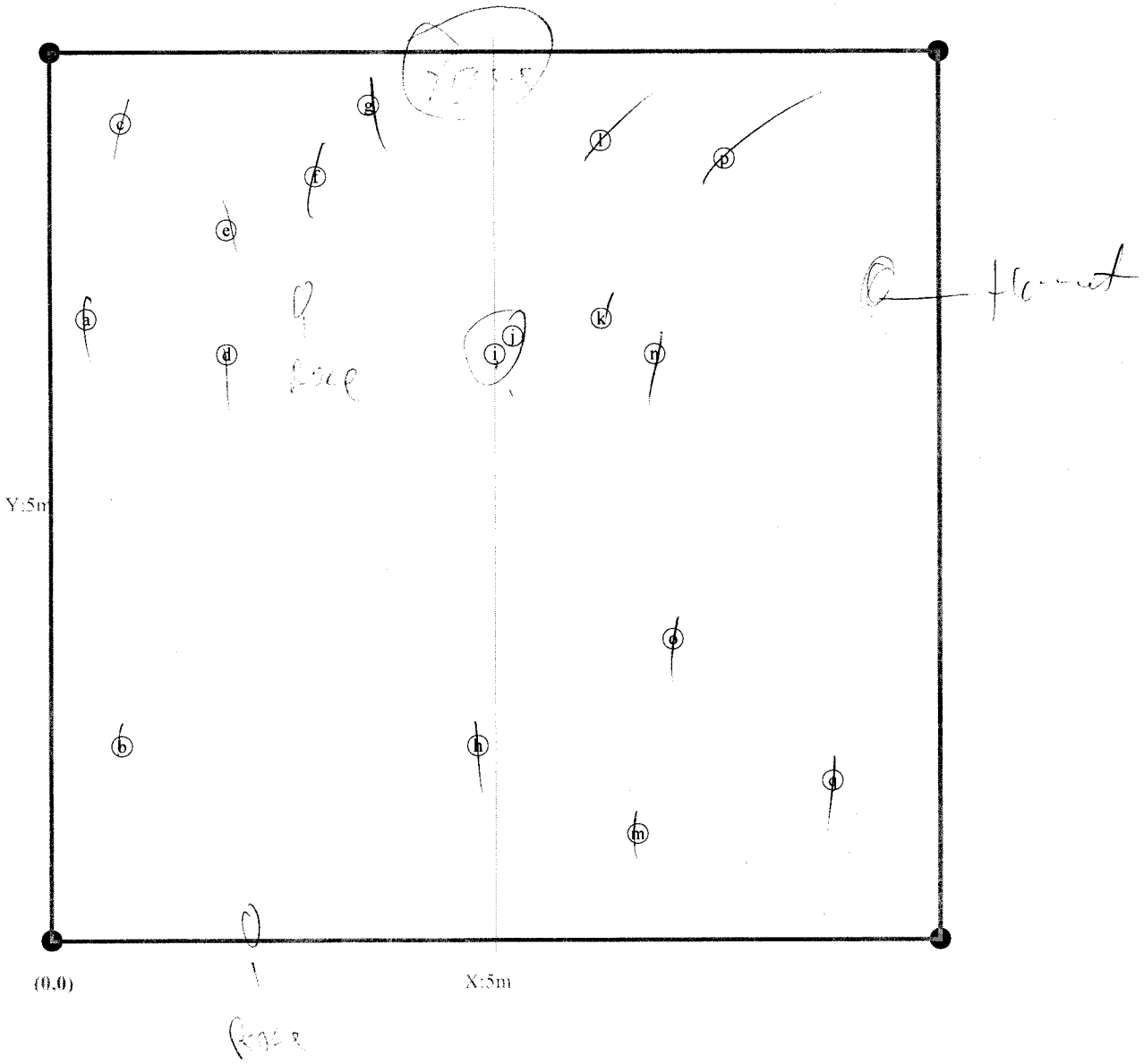
*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Map of stems on plot Morgan-AXE-0002

X-axis: 78 °

N

 # stems: 17
map size: Medium



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

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

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

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

Vegetation Monitoring Data (VMD) Datasheet **Please fill in any missing data and correct any errors.**

Plot Morgan-AXE-0003

Party: Perkinson, Verrill — Role: PI

Date last planted:

New planting date m/yy?

☐ Check box if plot was not sampled, specify reason below

Notes: P-4

VMD Year (1-5): 5 Date: 10/3/1 - / /

Taxonomic Standard: Weakley

Taxonomic Standard DATE: 2010

Latitude or UTM-N: (dec.deg. or m) 35.68568 Datum: NAD83/WGS84

Longitude or UTM-E: -82.95381 UTM Zone:

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

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

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Jul 2012 Data Height 1cm*	Jul 2012 Data DBH 1 cm	THIS YEAR'S DATA Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
2535	Cornus amomum	c	R	1.3	1.9	180.0	0.5	230	1.0	☐	4		
2536	Betula nigra	f	R	4.1	2.0	270.0	1.3	280	2	☐	4		
2539	Cornus amomum	b	R	0.4	2.9	200.0	1.0	226	1.0	☐	4		
2540	Lindera benzoin	h	R	7.2	1.0	*Missing*				☐	M		
2541	Quercus rubra	k	R	9.3	0.4	20.0				☐	M		
2542	Amelanchier laevis	i	R	8.7	3.7	230.0	0.8	282	1.5	☐	4		
2546	Quercus rubra	g	R	6.8	7.8	70.0		90	-	☐	4		
2548	Quercus rubra	e	R	3.4	8.8	90.0		105		☐	4		
2549	Platanus occidentalis	a	R	0.3	8.7	210.0	1.0	270	2.0	☐	4		
5914	Platanus occidentalis	d	R	3.4	7.2	140.0	0.3	165	1.0	☐	4		
5915	Platanus occidentalis	j	R	8.8	6.2	30.0		80		☐	4		

 # stems: 11

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

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

Purple Virgin)

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

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

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

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

Printed in the CVS-EEP Entry Tool ver. 2.3.0

Plot (continued): Morgan-AXE-0003					Jul 2012 Data				THIS YEAR'S DATA						
ID	Species	map char	source	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*	Notes

Natural Woody Stems - tallied by species

Explanation of cut-off & subsampling**:

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

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

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

●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ●10

Form WS2, ver 9.1

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

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

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

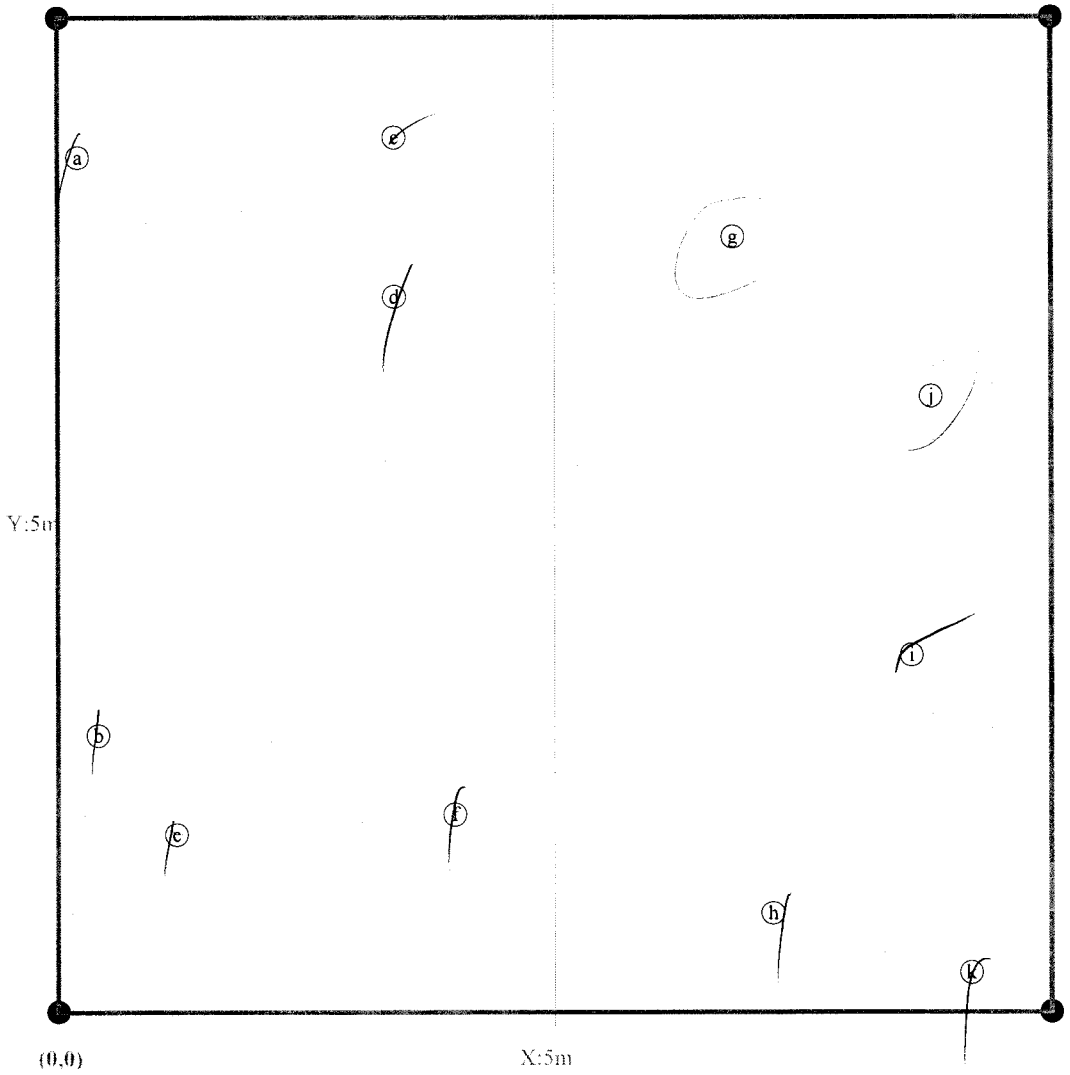
*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Map of stems on plot Morgan-AXE-0003

X-axis: 94 °

N

 # stems: 11
map size: Medium



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

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

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

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

Printed in the CVS-EEP Entry Tool ver. 2.3.0

Vegetation Monitoring Data (VMD) Datasheet **Please fill in any missing data and correct any errors.**

Plot Morgan-AXE-0004

Party:	Role:
Po-kinson	PL
Veg-1	

Date last planted:
New planting date m/yy?
☐ Check box if plot was not sampled, specify reason below
Notes: Plot 3

VMD Year (1-5): 5 Date: 10/3/1 - / /
Taxonomic Standard: Veg-Met
Taxonomic Standard DATE: 2010
Latitude or UTM-N: (dec.deg. or m) 35.68624 Datum: NAD83/WGS84
Longitude or UTM-E: -82.95360 UTM Zone:
Coordinate Accuracy (m): X-Axis bearing (deg): 72
Plot Dimensions: X: 10 Y: 10 ☐ Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Jul 2012 Data Height 1cm*	Jul 2012 Data DBH 1 cm	THIS YEAR'S DATA Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
2551	Platanus occidentalis	a	R	1.4	0.3	310.0	2.7	400	5.0	☐	4		
2552	Betula nigra	c	R	2.0	2.2	320.0	1.9	380	4	☐	4		
2553	Amelanchier laevis	f	R	4.9	3.7	190.0	1.2			☐	0		
2554	Liriodendron tulipifera	g	R	6.2	1.0	50.0				☐	M		
2555	Aronia arbutifolia	k	R	9.5	2.5	130.0	*DBH?*	135	~	☐	2		
2556	~~Liriodendron tulipifera~~ Platanus occ.	i	R	7.3	5.1	60.0		350	4.6	☐	4		
2558	Hamamelis virginiana	h	R	7.0	8.7	120.0	*DBH?*			☐	M		
2559	Quercus rubra	e	R	4.1	8.6	100.0		115		☐	3		
2560	Aronia arbutifolia	d	R	2.4	5.2	50.0		170	0.2	☐	2		
2561	Cornus amomum	b	R	1.7	8.2	250.0	1.1	260	1	☐	4		
5916	Platanus occidentalis	j	R	8.2	1.0	170.0	0.5	250	2.5	☐	4		

 # stems: 11

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

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

poorly drained

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

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

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

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

Printed in the CVS-EEP Entry Tool ver. 2.3.0

Plot (continued): Morgan-AXE-0004

ID	Species	map char	source	X (m)	Y (m)	Jul 2012 Data: ddh (mm)	Height (cm)	DBH (cm)	THIS YEAR'S DATA: ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*	Notes

Natural Woody Stems - tallied by species

Explanation of cut-off & subsampling:**

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

Species Name	☑ 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)
		___				___					
		___				___					
		___				___					
		___				___					
		___				___					
		___				___					
		___				___					

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

●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ●10

Form WS2, ver 9.1

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

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

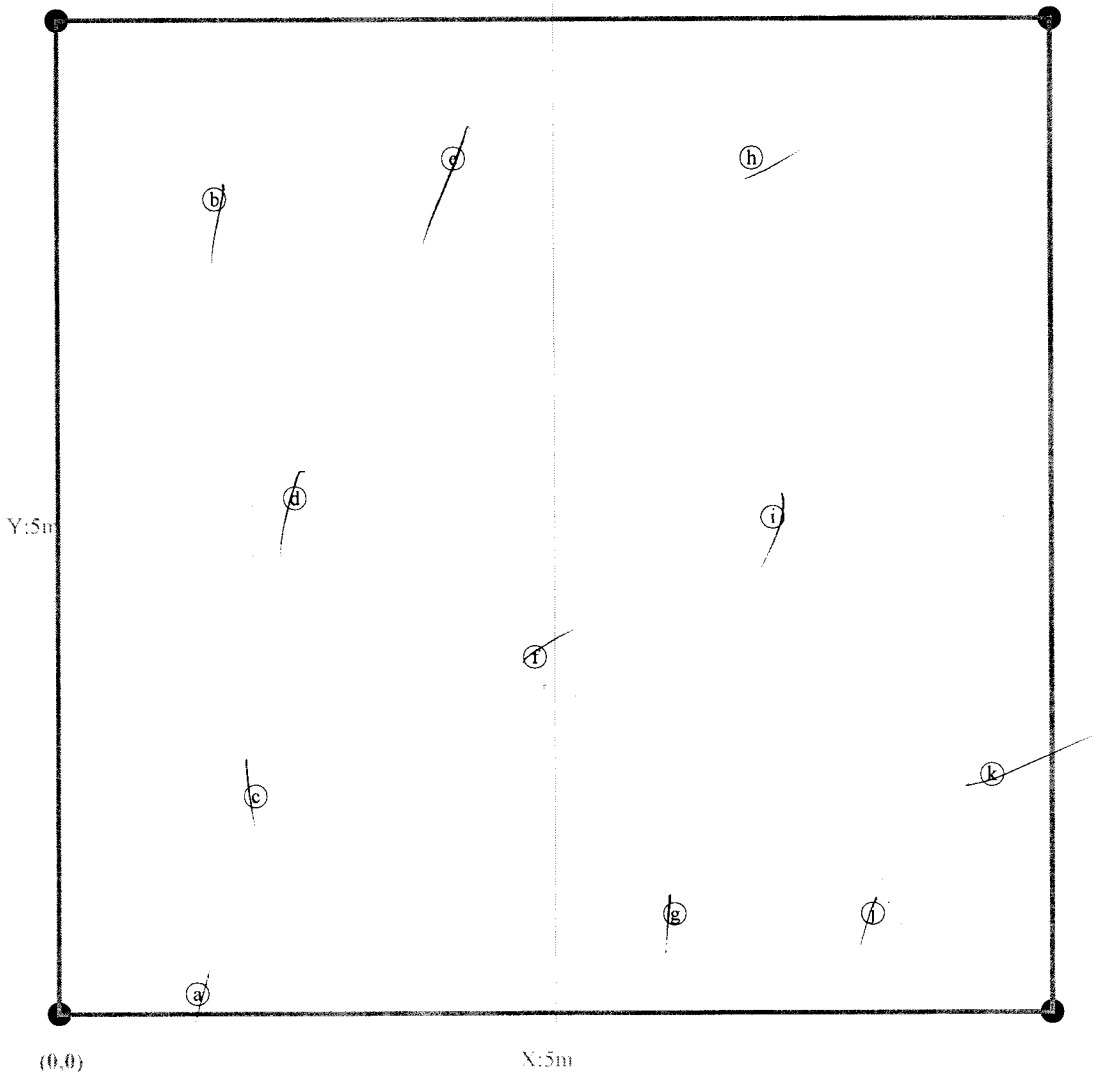
*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

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

Map of stems on plot Morgan-AXE-0004

X-axis: 72 ° N

 # stems: 11
map size: Medium



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

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

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

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

Vegetation Monitoring Data (VMD) Datasheet **Please fill in any missing data and correct any errors.**

Plot Morgan-AXE-0005

VMD Year (1-5): 5 Date: 10/3/ - / /

Taxonomic Standard: Weakley

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m) 35.68836 Datum: NAD83/WGS84

Longitude or UTM-E: -82.95519 UTM Zone:

Coordinate Accuracy (m): X-Axis bearing (deg): 4

Plot Dimensions: X: 20 Y: 5 ☐ Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X

Party:	Role:
Peterson	
Verrill	

Date last planted:

New planting date m/yy? /

☐ Check box if plot was not sampled, specify reason below

Notes: photo 1

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Jul 2012 Data Height 1cm*	Jul 2012 Data DBH 1 cm	This Year's Data Height 1cm*	This Year's Data DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
2563	Platanus occidentalis	(h)	R	2.0	3.4	330.0	1.1	190	.3	X	3		
2564	Aronia arbutifolia	(i)	R	2.8	1.0	80.0		83		☐	2	Vine-trum	
2565	Platanus occidentalis	(k)	R	5.9	1.0	340.0	2.1	500	5.0	☐	4		
2567	Cornus amomum	(b)	R	13.6	1.5	230.0	0.5	270	1.3	☐	4		
2568.	Platanus occidentalis	(e)	R	16.6	0.0	370.0	3.5	550	9.0	☐	4		
2569	Liriodendron tulipifera	(g)	R	19.3	2.7	130.0	DBH?	195	0.7	☐	4		
2570	Betula nigra	(f)	R	17.8	4.5	240.0	1.3	290	3	☐	4		
2571	Liriodendron tulipifera	(d)	R	16.4	3.0	*Missing*		—	—	☐	M		
trampled													
2572	Platanus occidentalis	(c)	R	15.3	4.7	230.0	1.1	450	6.0	☐	4		
2573	Platanus occidentalis	(a)	R	12.4	3.5	360.0	2.2	450	5.0	☐	4		
2575	Salix purpurea	(l)	R	5.9	4.0	340.0	2.2	290	0.2	☐	3	Vine	
2577	Aronia arbutifolia	(j)	R	3.5	3.2	100.0				☐	M		

 # stems: 12

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

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

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

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

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

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

Printed in the CVS-EEP Entry Tool ver. 2.3.0

Plot (continued): Morgan-AXE-0005					Jul 2012 Data				THIS YEAR'S DATA						
ID	Species	map char	source	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*	Notes

Natural Woody Stems - tallied by species

Explanation of cut-off & subsampling**:

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

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

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

●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ●10

Form WS2, ver 9.1

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

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

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

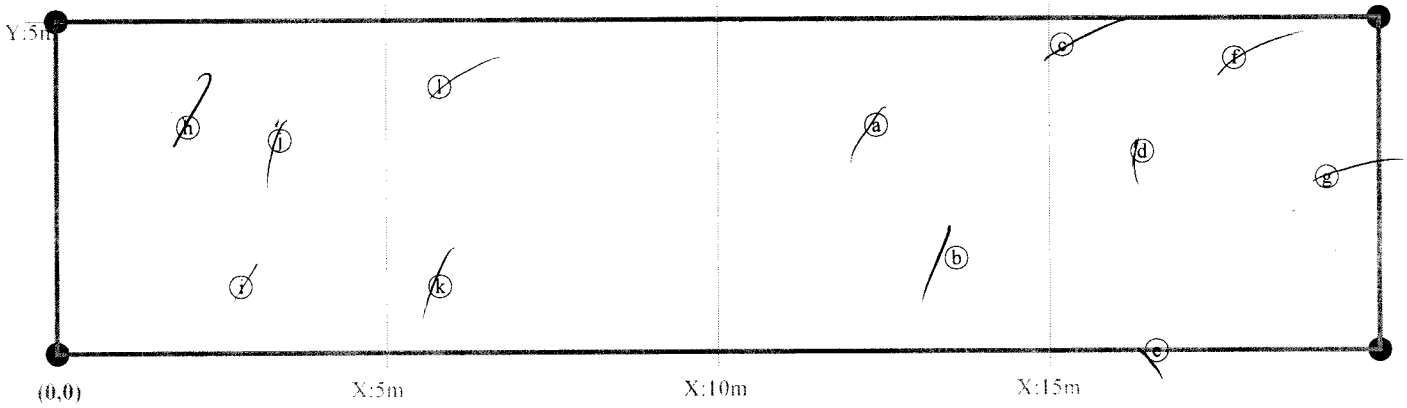
*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Map of stems on plot Morgan-AXE-0005

X-axis: 4 °

 # stems: 12
map size: Medium

N



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

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

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

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

Vegetation Monitoring Data (VMD) Datasheet — **Please fill in any missing data and correct any errors.**

Plot Morgan-AXE-0006

VMD Year (1-5): 5	Date: 10/3/ - / /	Party:	Role:
Taxonomic Standard:	Weakley	Perkinson	
Taxonomic Standard DATE:	2010	Jernig	
Latitude or UTM-N: (dec.deg. or m)	35.68910	Datum: NAD83/WGS84	
Longitude or UTM-E:	-82.95452	UTM Zone:	
Coordinate Accuracy (m):	3	X-Axis bearing (deg): 69	
Plot Dimensions: X: 10	Y: 10	☐ Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X	

Date last planted:
New planting date m/yy? /
☐ Check box if plot was not sampled, specify reason below
Notes: Photo 2

							Jul 2012 Data		THIS YEAR'S DATA					
ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m		Height 1cm*	DBH 1 cm	Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
2510	Quercus rubra	(c)	R	1.7	2.2		120.0	*DBH?*	170	/	☐	4		
2511	Acer saccharum	(f)	R	4.1	3.9		70.0		155	.5	☐	4		
2512	Liriodendron tulipifera	(e)	R	3.9	0.8		140.0	0.3	177	0.4	☐	4		
2514 resprout	Viburnum opulus	(i)	R	8.4	0.5		70.0		140	.6	☐	4		
2515	Viburnum opulus	(i)	R	6.6	5.0		160.0	0.3	240	0.8	☐	4		
2516	Liriodendron tulipifera	(h)	R	6.0	7.3		120.0	*DBH?*	155	1.1	☐	4		
2519	Amelanchier laevis	(a)	R	0.5	5.8		150.0	0.7	205	/	☐	4		
5918	Platanus occidentalis	(b)	R	0.8	3.3		170.0	0.5	255	2	☐	4		
5919	Quercus rubra	(d)	R	3.5	6.0		160.0	0.3	245	.8	☐	4		
16906	Acer saccharum	(g)	R	5.9	7.3		70.0		95	—	☐	3		

 # stems: 10 New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

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

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

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

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

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

Printed in the CVS-EEP Entry Tool ver. 2.3.0

Plot (continued): Morgan-AXE-0006

ID	Species	map char	source	X (m)	Y (m)	Jul 2012 Data: ddh (mm)	Height (cm)	DBH (cm)	THIS YEAR'S DATA: ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*	Notes

Natural Woody Stems - tallied by species

Explanation of cut-off & subsampling:**

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

Species Name	☑ 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)
		___				___					
		___				___					
		___				___					
		___				___					
		___				___					
		___				___					
		___				___					

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

●1 ●2 ● 3 ●● 4 ●● 5 ●● 6 ●● 7 ●● 8 ●● 9 ●● 10

Form WS2, ver 9.1

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

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

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

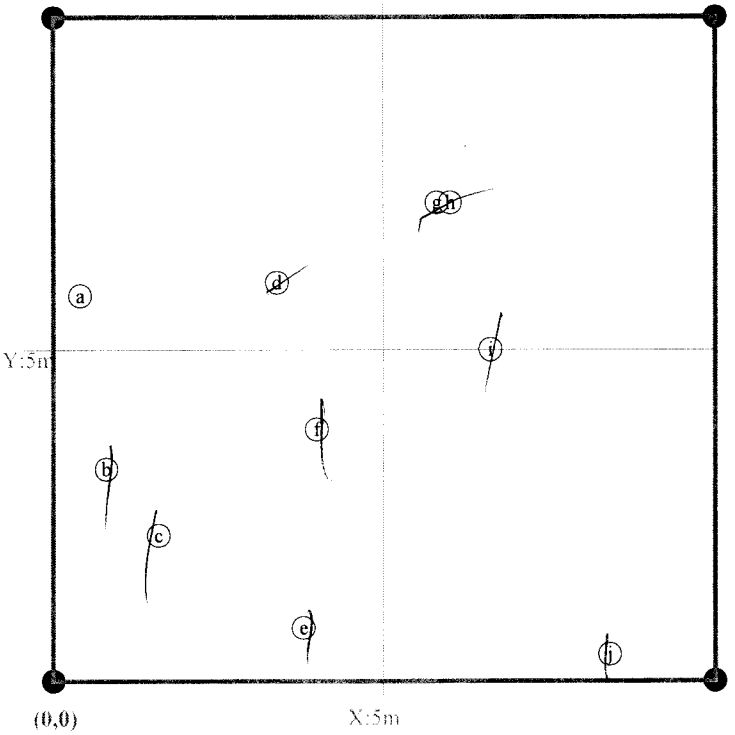
*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Map of stems on plot Morgan-AXE-0006

X-axis: 69 °

N

 # stems: 10
map size: small



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

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

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

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

Printed in the CVS-EEP Entry Tool ver. 2.3.0

APPENDIX C

GEOMORPHIC RAW DATA

PHOTO POINTS

Photo Point 1

Morgan Creek facing upstream

As-Built Photo No. 13 2/3/09

Year 3 Photo No. 16 9/14/11

Year 1 Photo No. 14 10/30/09

Year 4 Photo No. 17 9/4/12

Year 2 Photo No. 15 10/02/10

Year 5 Photo No. 18 9/18/13

Photo Point 2

Morgan Creek perpendicular to stream

As-Built Photo No. 19 2/3/09

Year 3 Photo No. 22 9/14/11

Year 1 Photo No. 20 10/30/09

Year 4 Photo No. 23 9/4/12

Year 2 Photo No. 21 10/02/10

Year 5 Photo No. 24 9/18/13

Photo Point 2

Morgan Cr. / Lower North Br. confluence facing upstream

As-Built Photo No. 25 2/3/09

Year 3 Photo No. 28 9/14/11

Year 1 Photo No. 26 10/30/09

Year 4 Photo No.29 9/4/12

Year 2 Photo No. 27 10/02/10

Year 5 Photo No. 30 9/18/13

Photo Point 3

Middle Branch facing upstream

As-Built Photo No. 31 2/3/09

Year 3 Photo No. 34 9/14/11

Year 1 Photo No. 32 10/30/09

Year 4 Photo No.35 9/4/12

Year 2 Photo No. 33 10/02/10

Year 5 Photo No.36 9/18/13

Photo Point 3

Middle Branch facing downstream

As-Built Photo No. 37 2/3/09

Year 3 Photo No. 40 9/14/11

Year 1 Photo No. 38 10/30/09

Year 4 Photo No. 41 9/4/12

Year 2 Photo No. 39 10/02/10

Year 5 Photo No. 42 9/18/13

Photo Point 4

South Branch facing upstream

As-Built Photo No. 43 2/3/09

Year 3 Photo No. 46 9/14/11

Year 1 Photo No. 44 10/30/09

Year 4 Photo No.47 9/4/12

Year 2 Photo No. 45 10/02/10

Year 5 Photo No.48 9/18/13

Photo Point 4

South Branch facing downstream

As-Built Photo No. 49 2/3/09

Year 3 Photo No. 52 9/14/11

Year 1 Photo No. 50 10/30/09

Year 4 Photo No. 53 9/4/12

Year 2 Photo No. 51 10/02/10

Year 5 Photo No. 54 9/18/13

Photo Point 5

Morgan Creek facing upstream

As-Built Photo No. 55 2/3/09

Year 3 Photo No. 58 9/14/11

Year 1 Photo No.56 10/30/09

Year 4 Photo No.59 9/4/12

Year 2 Photo No. 57 10/02/10

Year 5 Photo No.60 9/18/13

Photo Point 6

North Branch from piped crossing, facing upstream

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

Year 3 Photo No. 64 9/14/11

Year 1 Photo No. 62 10/30/09

Year 4 Photo No. 65 9/4/12

Year 2 Photo No. 63 10/02/10

Year 5 Photo No. 66 9/18/13

Photo Point 6

North Branch from piped crossing, facing downstream

As-Built Photo No. 67 2/3/09

Year 3 Photo No. 70 9/14/11

Year 1 Photo No. 68 10/30/09

Year 4 Photo No. 71 9/4/12

Year 2 Photo No. 69 10/02/10

Year 5 Photo No. 72 9/18/13

Photo Point 7

Morgan Creek from U/S pipe outfall, facing downstream

As-Built Photo No. 73 2/3/09

Year 3 Photo No. 76 9/14/11

Year 1 Photo No. 74 10/30/09

Year 4 Photo No. 77 9/4/12

Year 2 Photo No. 75 10/02/10

Year 5 Photo No. 78 9/18/13

Photo Point 8

Lower North Branch from pipe outfall, facing downstream

As-Built Photo No. 79 2/3/09

Year 2 Photo No. 82 10/02/10

Year 1 Photo No. 80 10/30/09

Year 4 Photo No. 83 9/4/12

Year 2 Photo No.81 10/02/10

Year 5 Photo No. 84 9/18/13

Photo Point 9

Piped crossing at easement break, facing upstream

As-Built Photo No. 85 2/3/09

Year 3 Photo No. 88 9/14/11

Year 1 Photo No. 86 10/30/09

Year 4 Photo No. 89 9/4/12

Year 2 Photo No. 87 10/02/10

Year 5 Photo No.90 9/18/13

Photo Point 9

Piped crossing at easement break, facing downstream

As-Built Photo No. 91 2/3/09

Year 3 Photo No. 94 9/14/11

Year 1 Photo No. 92 10/30/09

Year 4 Photo No. 95 9/4/12

Year 2 Photo No. 93 10/02/10

Year 5 Photo No. 96 9/18/13

Photo Point 10

Morgan Creek from D/S pipe inlet, facing upstream

As-Built Photo No. 97 2/3/09

Year 3 Photo No. 100 9/14/11

Year 1 Photo No.98 10/30/09

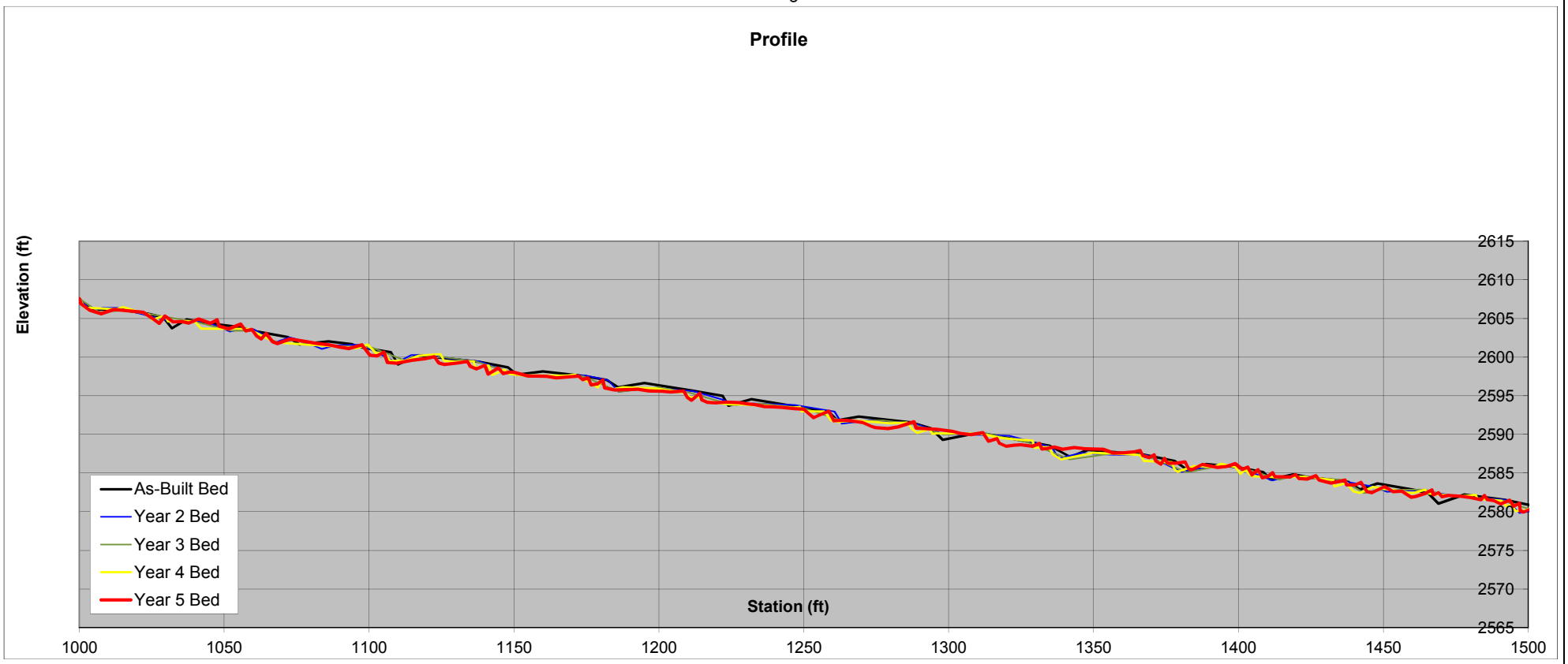
Year 4 Photo No. 101 9/4/12

Year 2 Photo No. 99 10/02/10

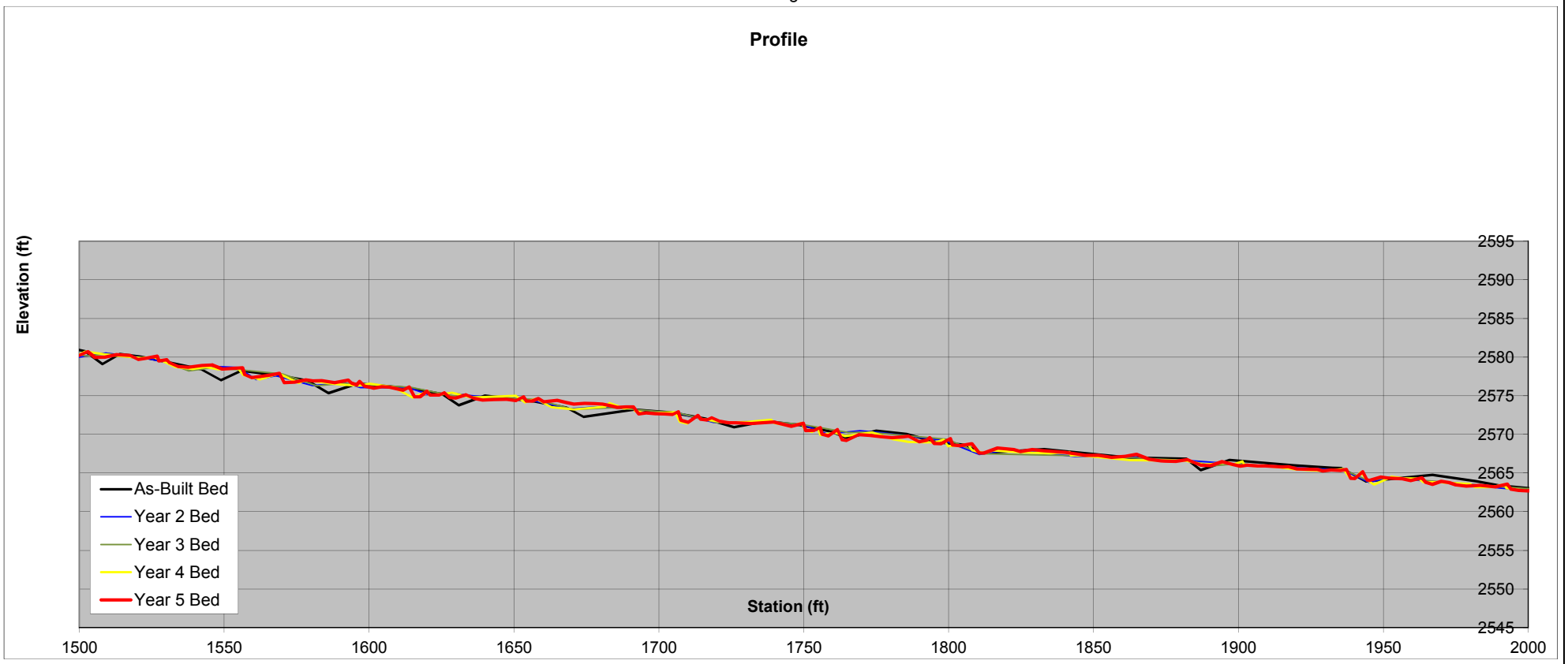
Year 5 Photo No. 102 9/18/13

GEOMORPHIC DATA

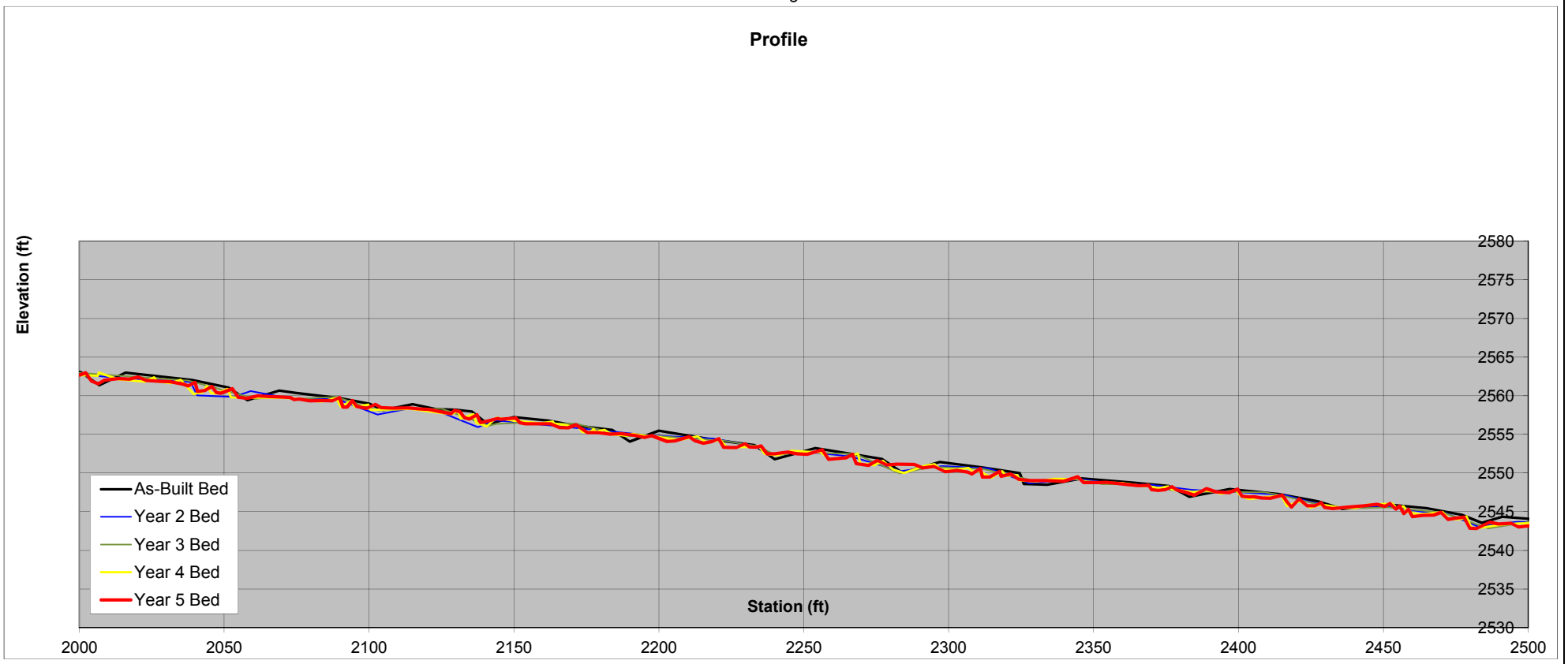
Morgan Creek Stream Restoration Site
Haywood County, NC
Profile - Morgan Creek



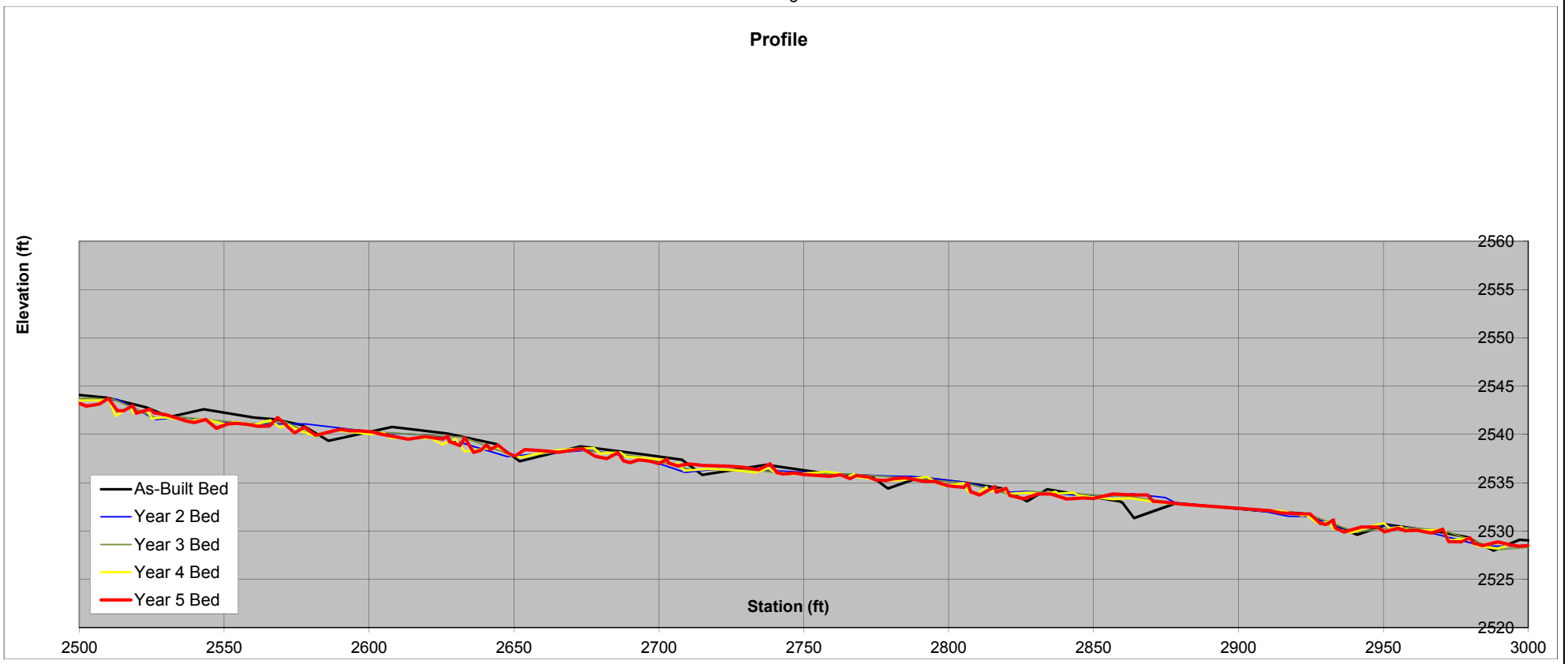
Morgan Creek Stream Restoration Site
Haywood County, NC
Profile - Morgan Creek



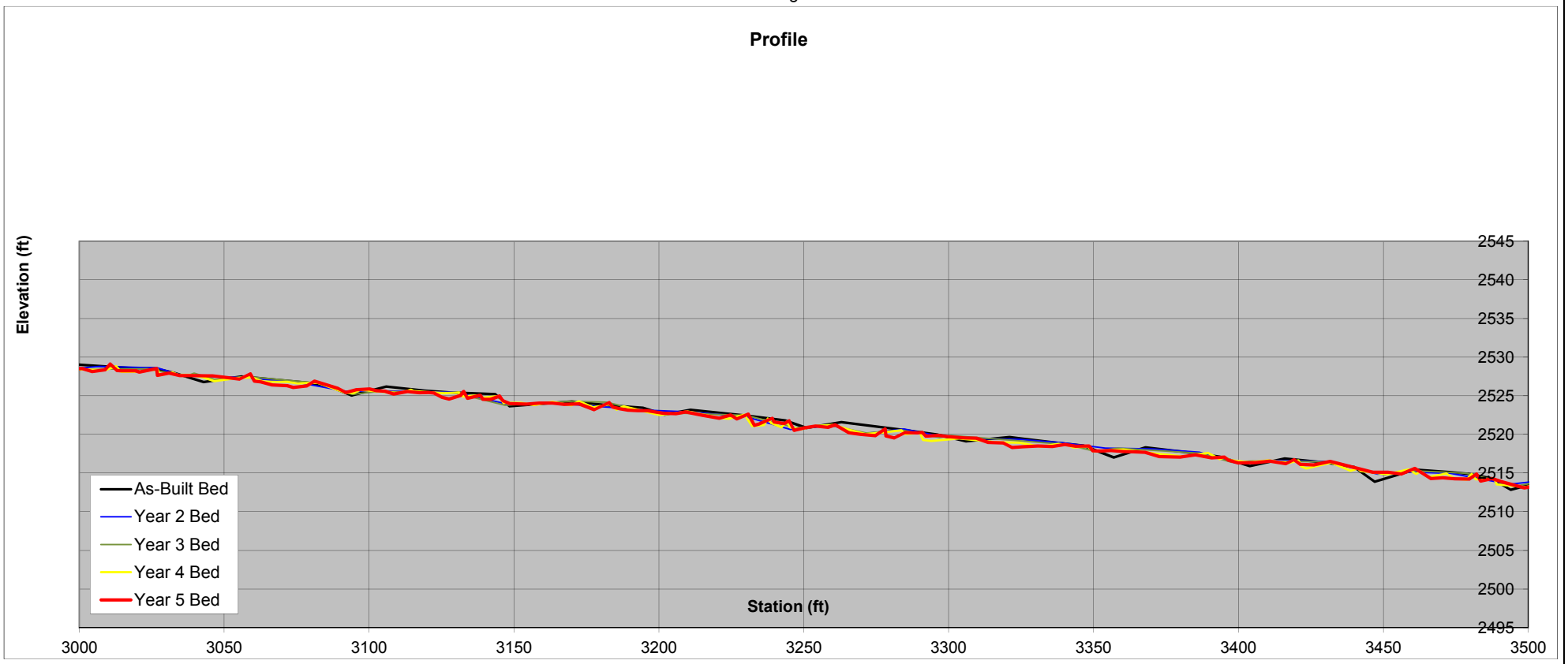
Morgan Creek Stream Restoration Site
Haywood County, NC
Profile - Morgan Creek



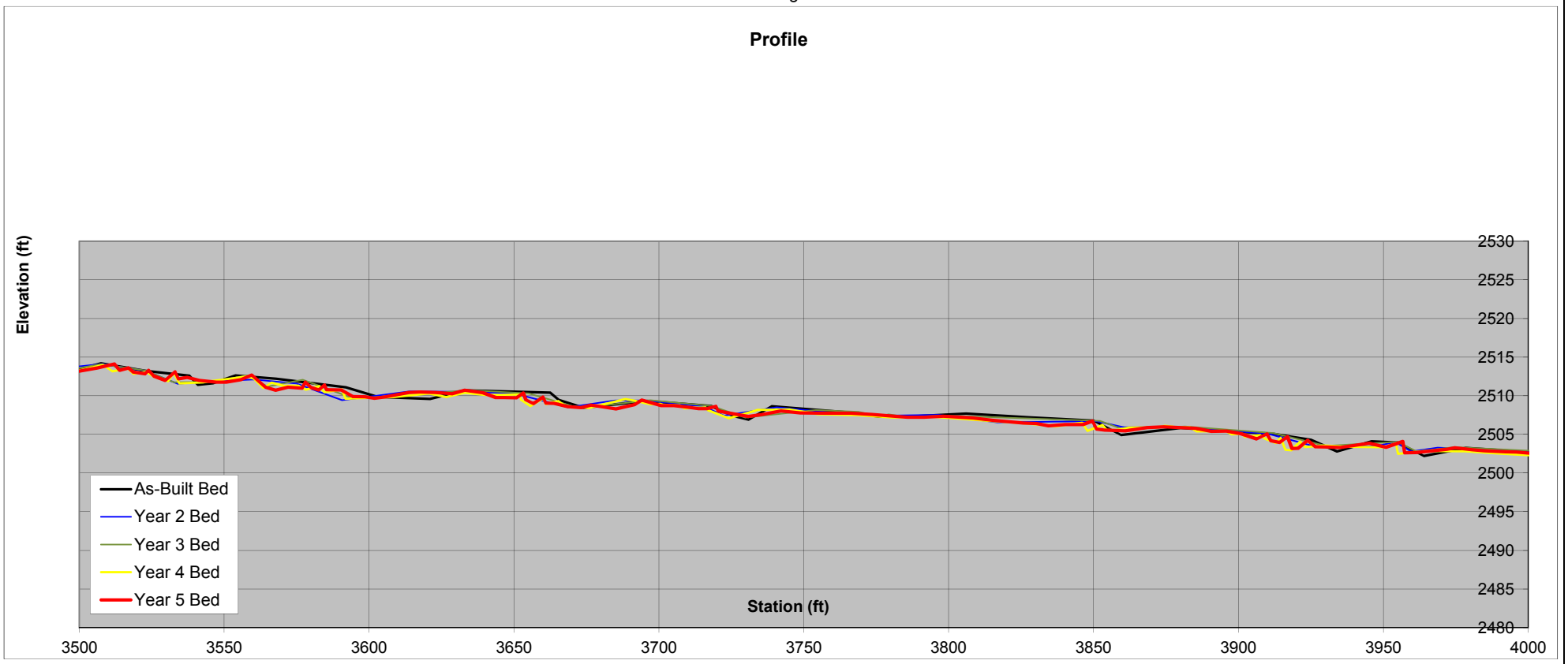
Morgan Creek Stream Restoration Site
Haywood County, NC
Profile - Morgan Creek



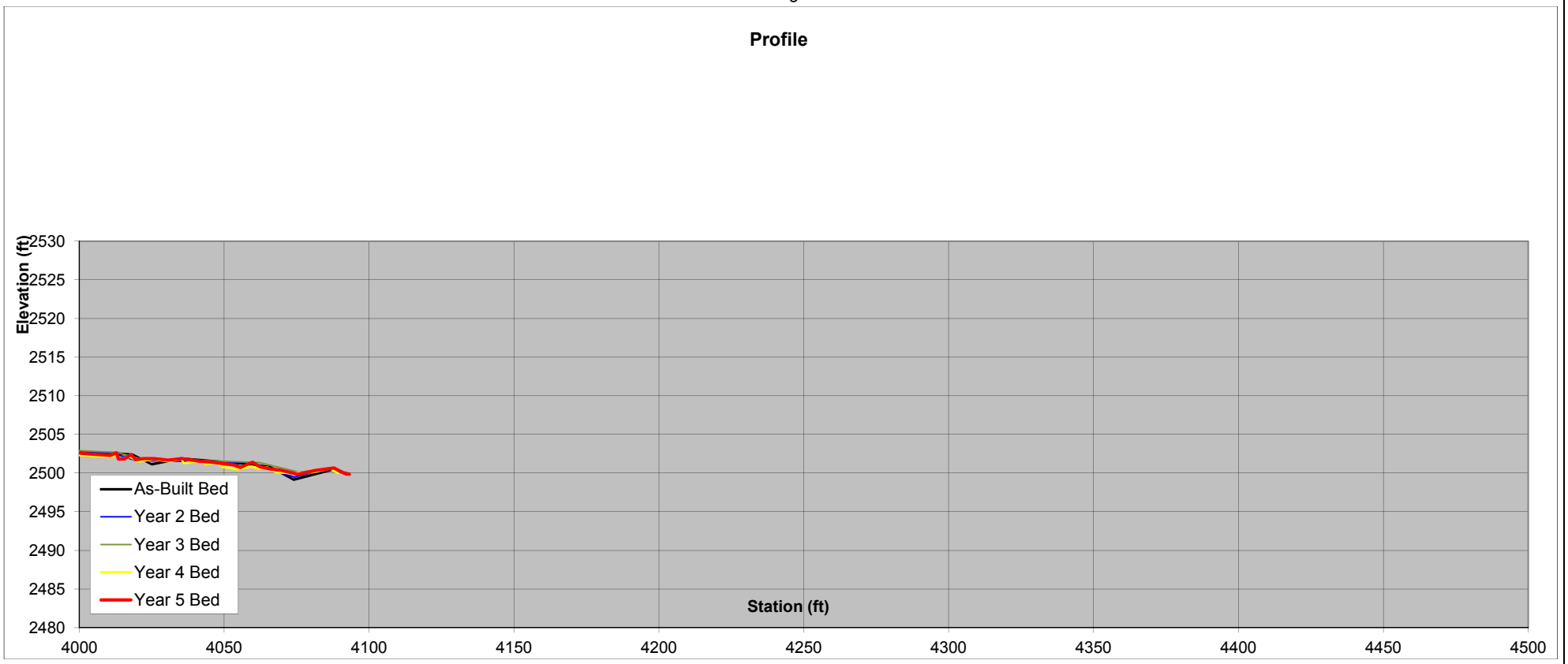
Morgan Creek Stream Restoration Site
Haywood County, NC
Profile - Morgan Creek



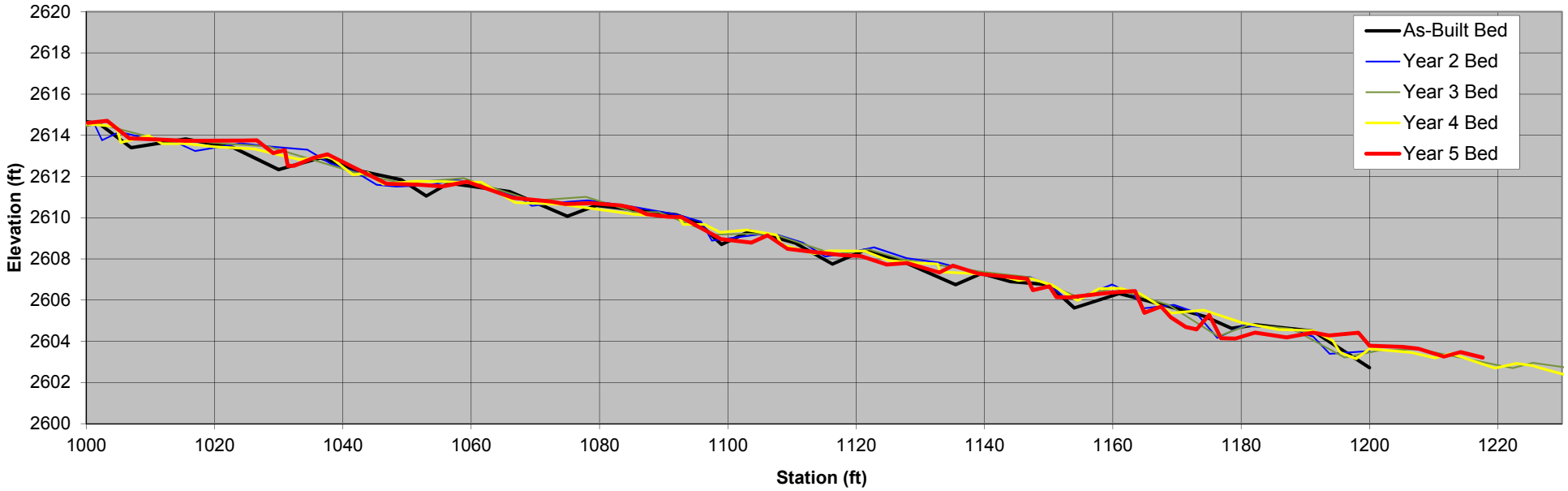
Morgan Creek Stream Restoration Site
Haywood County, NC
Profile - Morgan Creek



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



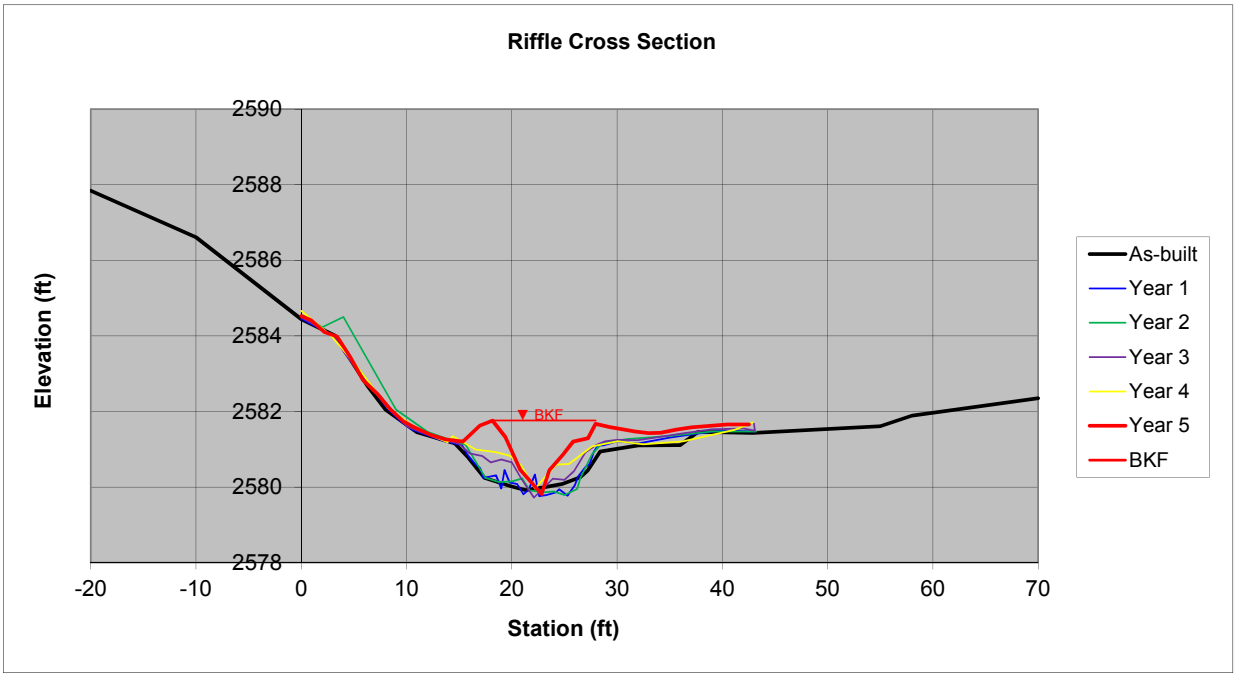
Morgan Creek Stream Restoration Site
Haywood County, NC
Profile Reach 2 - North Branch



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

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/29/10	Date	9/7/11	Date	9/4/12	Date	9/15/13
Area	12.2	Area	11.4	Area	11.6	Area	8.7	Area	5.9	Area	9.1
Bkf W	13.8	Bkf W	12.9	Bkf W	13	Bkf W	14.2	Bkf W	12.23	Bkf W	9.8
Dmean	0.9	Dmean	0.9	Dmean	0.9	Dmean	0.6	Dmean	0.5	Dmean	0.9
Dmax	1.2	Dmax	1.3	Dmax	1.3	Dmax	1.4	Dmax	1.2	Dmax	1.9
W/d	15.6	W/d	14.6	W/d	14.6	W/d	23.3	W/d	25.3	W/d	10.6

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

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	5.11	2581.69	IR Rt
HI		2586.80	
0.2	2.26	2584.54	GRND
2	2.57	2584.23	GRND
4	2.30	2584.50	GRND
9	4.75	2582.05	GRND
12	5.34	2581.46	GRND
15	5.64	2581.16	GRND
15.6	5.68	2581.12	BKF
17.5	6.56	2580.24	TOE
18.8	6.67	2580.13	EOW
20	6.65	2580.15	BED
21	6.57	2580.23	BED
21.7	6.89	2579.91	BED
23	6.94	2579.86	BED
24	6.92	2579.88	BED
25	7.01	2579.79	BED
26.2	6.85	2579.95	BED
26.5	6.57	2580.23	EOW
27.6	5.94	2580.86	BNK
28.6	5.63	2581.17	BKF
31	5.53	2581.27	GRND
35	5.45	2581.35	GRND
39	5.33	2581.47	GRND
43.2	5.33	2581.47	GRND

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

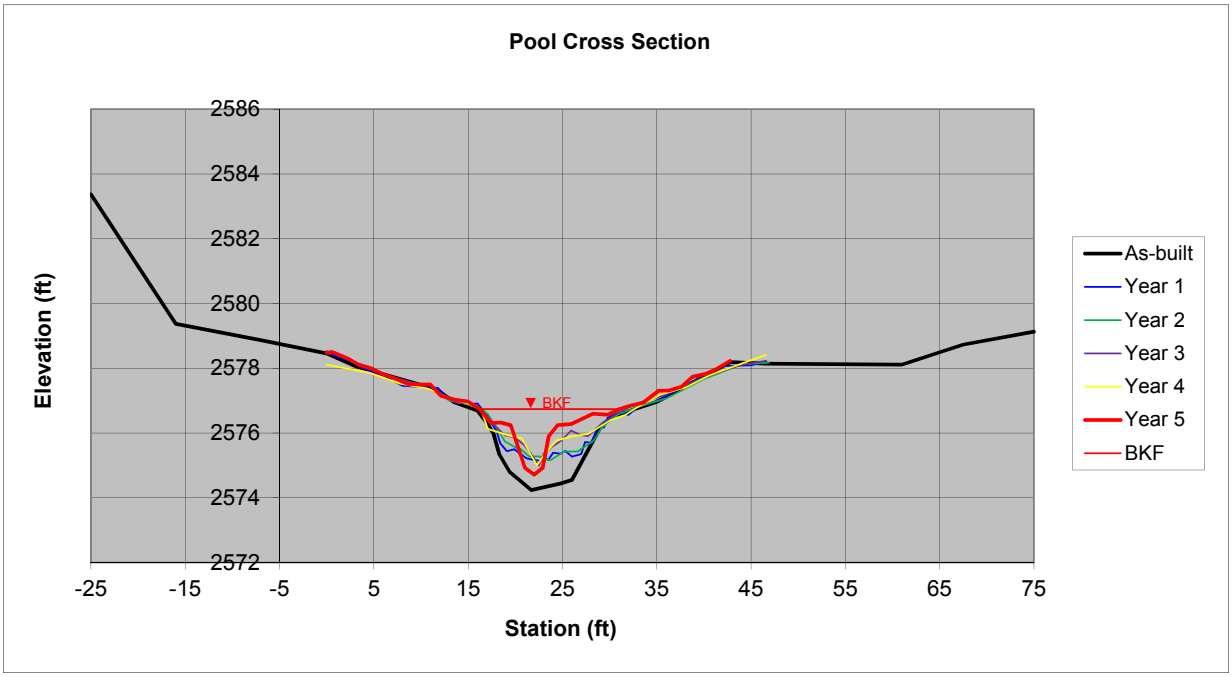
Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00		IR Lt
HI		0.00	
0		2584.66	
2.86		2584.00	
5.1		2583.26	
8.27		2582.08	
11.09		2581.52	
13.89		2581.19	BKF
14.38		2581.35	
16.59		2580.99	
18.41		2580.93	
19.84		2580.83	
20.91		2580.57	
22.2		2579.96	
24.22		2580.59	
25.42		2580.61	
27.63		2581.08	
30.06		2581.21	BKF
32.52		2581.13	
36.23		2581.21	
41.19		2581.52	
42.89		2581.71	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	0.00	IR Lt
HI		0.00	
0		2584.53	
0.95		2584.41	
2.21		2584.10	
3.4		2583.98	
4.66		2583.44	
5.85		2582.84	
7.28		2582.45	
8.46		2582.06	
9.68		2581.74	
10.64		2581.59	
12.35		2581.37	
13.67		2581.26	
15.36		2581.20	bkf
16.96		2581.63	
18.16		2581.76	
19.39		2581.32	
20.8		2580.46	
22.83		2579.81	
23.57		2580.44	
24.84		2580.85	
25.83		2581.20	
27.24		2581.29	bkf
27.96		2581.67	
29.28		2581.59	
31.73		2581.47	
32.99		2581.43	
34.14		2581.43	
35.55		2581.515	
37.05		2581.581	
40.47		2581.656	
41.35		2581.657	

Morgan Creek Stream Restoration Site
Haywood County, NC
Pool Cross Section PL1
Reach 1 - Morgan Creek - Sta 16+16.4

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/28/10	Date	9/13/11	Date	9/4/12	Date	9/15/13
Area	22.5	Area	13.4	Area	12.5	Area	10.8	Area	11.6	Area	9.8
Bkf W	14.4	Bkf W	14	Bkf W	13.9	Bkf W	15.1	Bkf W	15.18	Bkf W	14.68
Dmean	1.6	Dmean	1.0	Dmean	0.9	Dmean	0.7	Dmean	0.8	Dmean	0.7
Dmax	2.5	Dmax	1.5	Dmax	1.4	Dmax	1.7	Dmax	1.7	Dmax	2.0
W/d	9.2	W/d	14.6	W/d	15.4	W/d	21.2	W/d	19.9	W/d	22.1

Morgan Creek Stream Restoration Site
Haywood County, NC
Pool Cross Section PL1
Reach 1 - Morgan Creek - Sta 16+16.4

As-Built			
Station	FS/BS	Elev.	Desc.
BM	5.53	2584.66	RF1 IR Rt
HI		2590.19	
-25	6.82	2583.37	
-16	10.82	2579.37	
-7	11.32	2578.87	
0	11.73	2578.46	GRND
3.1	12.13	2578.06	
11.7	12.85	2577.34	
13.5	13.24	2576.95	
16	13.50	2576.69	BKF LT
17	13.88	2576.31	
17.7	14.21	2575.98	
18.3	14.85	2575.34	EOW
19.4	15.39	2574.80	
21.7	15.95	2574.24	
24.8	15.75	2574.44	
26	15.64	2574.55	
27.6	14.78	2575.41	EOW
29.1	13.97	2576.22	
30.4	13.67	2576.52	BKF RT
35	13.23	2576.96	
42.8	12.00	2578.19	
46.6	12.05	2578.14	GRND
61	12.08	2578.11	
67.5	11.46	2578.73	
75	11.06	2579.13	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	5.64	2581.69	PRF1 IR Rt
HI		2587.33	
0	8.84	2578.49	GRND
1	8.95	2578.38	GRND
3	9.16	2578.17	GRND
4	9.36	2577.97	GRND
6	9.56	2577.77	GRND
8	9.87	2577.46	GRND
11.8	9.94	2577.39	GRND
13	10.31	2577.02	GRND
15	10.44	2576.89	GRND
16	10.42	2576.91	GRND
17	10.78	2576.55	BKF
17.5	11.05	2576.28	BNK
18	11.26	2576.07	BNK
18.4	11.65	2575.68	BNK
19.1	11.89	2575.44	BNK
19.9	11.83	2575.5	BNK
20.4	11.94	2575.39	EOW
21.2	12.11	2575.22	BED
22	12.16	2575.17	BED
22.7	12.19	2575.14	BED
23.1	12.08	2575.25	BED
23.5	12.16	2575.17	BED
24	11.94	2575.39	BED
24.8	11.97	2575.36	EOW
25.3	11.88	2575.45	BED
26	12.06	2575.27	BED
27	11.98	2575.35	BNK
27.4	11.61	2575.72	BNK
28.1	11.63	2575.7	BNK
28.7	11.17	2576.16	BNK
29.4	11.16	2576.17	BNK
29.8	10.86	2576.47	BNK
31	10.69	2576.64	BKF
32	10.77	2576.56	GRND
33	10.52	2576.81	GRND
34.6	10.39	2576.94	GRND
36	10.18	2577.15	GRND
38.4	9.83	2577.5	GRND
40	9.56	2577.77	GRND
42	9.26	2578.07	GRND
45	9.24	2578.09	GRND
46.6	9.12	2578.21	GRND

Year 2			
Station	FS/BS	Elev.	Desc.
BM	6.02	2578.35	IR Rt
HI		2584.37	
0.4	5.83	2578.54	GRND
4	6.31	2578.06	GRND
8	6.79	2577.58	GRND
11	6.89	2577.48	GRND
13	7.37	2577.00	GRND
16	7.54	2576.83	GRND
17.1	7.79	2576.58	BKF
18.9	8.63	2575.74	BED
20	8.81	2575.56	BED
20.6	8.87	2575.50	EOW
21.5	9.10	2575.27	BED
22.5	9.09	2575.28	BED
23.7	9.21	2575.16	BED
25.2	8.94	2575.43	EOW
26.6	8.94	2575.43	BED
28.3	8.61	2575.76	BED
29.1	8.23	2576.14	BNK
30	7.99	2576.38	BKF
31	7.78	2576.59	GRND
33	7.56	2576.81	GRND
36	7.30	2577.07	GRND
40	6.70	2577.67	GRND
44	6.25	2578.12	GRND
46.9	6.20	2578.17	GRND

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

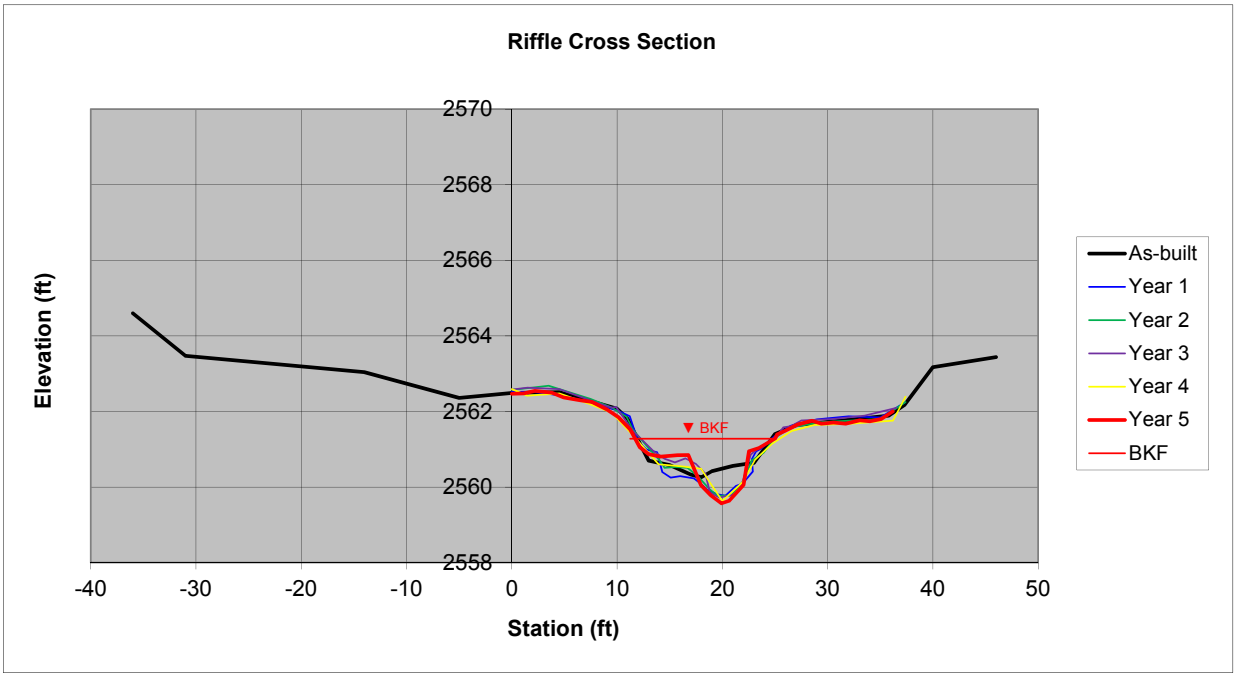
Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00		IR Lt
HI		0.00	
0		2578.11	
4.55		2577.86	
7.68		2577.53	
10.76		2577.37	
12.8		2577.10	
15.45		2576.87	
16.42		2576.68	BKF
17.08		2576.13	
19.24		2575.93	
20.69		2575.84	
21.54		2575.39	
22.29		2575.01	
23.26		2575.41	
24.39		2575.77	
25.97		2575.89	
27.77		2575.98	
30.07		2576.39	
31.6		2576.55	BKF
32.83		2576.78	
35.42		2577.19	
38.09		2577.41	
40.61		2577.79	
43.74		2578.12	
46.57		2578.41	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	
0		2578.48	
0.68		2578.49	
2.34		2578.29	
3.35		2578.11	
4.72		2578.00	
5.89		2577.82	
7.04		2577.71	
8.6		2577.51	
9.78		2577.50	
10.99		2577.50	
12.09		2577.16	
13.55		2577.03	
14.96		2576.97	
16.26		2576.74	bkf
17.37		2576.31	
18.49		2576.32	
19.53		2576.24	
21.02		2574.92	
22		2574.71	
22.9		2574.92	
23.54		2575.90	
24.49		2576.24	
25.94		2576.28	
28.23		2576.59	
29.83		2576.56	
30.94		2576.73	bkf
32.21		2576.84	
33.56		2576.939	
35.2		2577.309	
36.3		2577.31	
37.62		2577.424	
38.78		2577.736	
40.21		2577.833	
41.33		2577.973	
42.79		2578.231	

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

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/28/10	Date	9/7/11	Date	9/4/12	Date	9/15/13
Area	10.2	Area	12.0	Area	10.8	Area	9.8	Area	11.2	Area	9.9
Bkf W	13.5	Bkf W	13.3	Bkf W	13.5	Bkf W	13.6	Bkf W	13.89	Bkf W	13.76
Dmean	0.8	Dmean	0.9	Dmean	0.8	Dmean	0.7	Dmean	0.8	Dmean	0.7
Dmax	1.1	Dmax	1.6	Dmax	1.5	Dmax	1.6	Dmax	1.7	Dmax	1.7
W/d	17.9	W/d	14.8	W/d	16.9	W/d	18.9	W/d	17.2	W/d	19.1

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

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	5.05	2562.41	IR Rt
HI		2567.46	
0	4.89	2562.57	GRND
3.5	4.78	2562.68	GRND
7.5	5.13	2562.33	GRND
9.5	5.36	2562.10	GRND
10.5	5.53	2561.93	GRND
10.9	5.60	2561.86	BKF
11.5	5.94	2561.52	BNK
13	6.43	2561.03	BNK
14	6.74	2560.72	BNK
14.5	6.95	2560.51	BED
15.5	6.93	2560.53	BED
16.7	6.95	2560.51	BED
17.7	7.18	2560.28	BED
18	7.28	2560.18	EOW
18.8	7.52	2559.94	BED
19.5	7.69	2559.77	BED
20.8	7.69	2559.77	BED
22	7.30	2560.16	EOW
22.8	6.75	2560.71	BNK
23.9	6.56	2560.90	BNK
25	6.16	2561.30	BKF
26.5	5.88	2561.58	GRND
29.5	5.74	2561.72	GRND
35	5.66	2561.80	GRND
37.4	5.21	2562.25	GRND

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

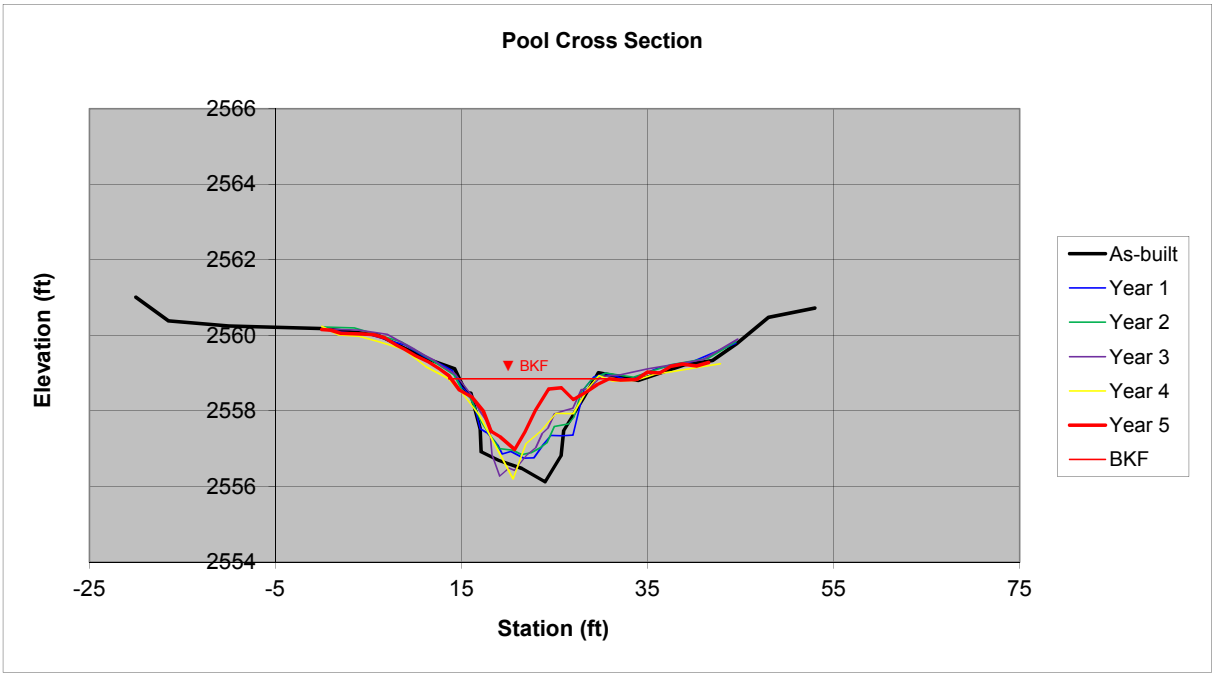
Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00		IR Lt
HI		0.00	
0		2562.59	
1.48		2562.42	
4.51		2562.48	
7.34		2562.20	
9.48		2561.98	
11.61		2561.34	BKF
13.94		2560.60	
16.32		2560.54	
17.99		2560.48	
18.72		2560.16	
20.01		2559.63	
21.94		2560.13	
23.09		2560.72	
24.78		2561.16	
26.6		2561.49	BKF
28.75		2561.64	
31.74		2561.67	
36.21		2561.76	
37.39		2562.39	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	0.00	IR Lt
HI		0.00	
0		2562.47	
1.13		2562.48	
2.2		2562.55	
3.79		2562.50	
4.91		2562.37	
6.51		2562.29	
7.6		2562.25	
9.03		2562.05	
10.11		2561.85	
11.25		2561.52	bkf
12.16		2561.05	
12.97		2560.87	
14.13		2560.80	
15.73		2560.84	
16.77		2560.85	
17.97		2560.05	
18.87		2559.79	
19.91		2559.57	
20.65		2559.64	
22.01		2560.05	
22.53		2560.95	
23.47		2561.04	
25.01		2561.28	bkf
25.2		2561.39	
25.98		2561.49	
27.16		2561.66	
28.5		2561.75	
29.39		2561.676	
30.55		2561.705	
31.71		2561.675	
33.05		2561.767	
34		2561.738	
35.09		2561.801	
36.19		2562.003	

Morgan Creek Stream Restoration Site
Haywood County, NC
Pool Cross Section PL2
Reach 1 - Morgan Creek - Sta 21+17.8

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/28/10	Date	9/7/11	Date	9/4/12	Date	9/15/13
Area	26.5	Area	21.8	Area	20.2	Area	19.9	Area	18.5	Area	12.2
Bkf W	15.4	Bkf W	15.2	Bkf W	16.3	Bkf W	15.6	Bkf W	16.28	Bkf W	17.22
Dmean	1.7	Dmean	1.4	Dmean	1.2	Dmean	1.3	Dmean	1.1	Dmean	0.7
Dmax	2.9	Dmax	2.2	Dmax	2.1	Dmax	2.7	Dmax	2.7	Dmax	1.9
W/d	9.0	W/d	10.6	W/d	13.2	W/d	12.2	W/d	14.3	W/d	24.3

Morgan Creek Stream Restoration Site
Haywood County, NC
Pool Cross Section PL2
Reach 1 - Morgan Creek - Sta 21+17.8

As-Built			
Station	FS/BS	Elev.	Desc.
BM	7.72	2562.65	RF2 IR Lt
HI		2570.37	
-20	9.36	2561.01	
-16.5	9.99	2560.38	
-10	10.12	2560.25	
0	10.19	2560.18	GRND
6	10.36	2560.01	
11	10.96	2559.41	
14.3	11.26	2559.11	BKF LT
15.5	11.88	2558.49	
16	11.90	2558.47	
17	12.84	2557.53	EOW
17.1	13.45	2556.92	
19	13.68	2556.69	
21.5	13.89	2556.48	
24	14.25	2556.12	
25.7	13.55	2556.82	
26	12.89	2557.48	EOW
28.2	12.00	2558.37	
29.7	11.36	2559.01	BKF RT
34	11.56	2558.81	
39	11.15	2559.22	
42	11.04	2559.33	
44.6	10.59	2559.78	GRND
48	9.89	2560.48	
53	9.65	2560.72	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	5.21	2562.41	RF2 IR RT
HI		2567.62	
0	7.39	2560.23	GRND
2	7.53	2560.09	GRND
5	7.59	2560.03	GRND
9	7.88	2559.74	GRND
11	8.18	2559.44	GRND
13	8.41	2559.21	GRND
14	8.55	2559.07	GRND
15	8.97	2558.65	BKF
15.4	9.07	2558.55	BNK
16	9.25	2558.37	BNK
16.5	9.57	2558.05	BNK
17	10.09	2557.53	BNK
17.7	10.19	2557.43	BNK
18.6	10.42	2557.2	BNK
18.9	10.52	2557.1	EOW
19.4	10.76	2556.86	BED
20.3	10.69	2556.93	BED
21.7	10.87	2556.75	BED
22.8	10.86	2556.76	BED
23.8	10.51	2557.11	EOW
24.6	10.27	2557.35	BNK
25.8	10.28	2557.34	BNK
27	10.26	2557.36	BNK
28.2	9.03	2558.59	BNK
29.2	8.73	2558.89	BKF
30.5	8.63	2558.99	GRND
33	8.80	2558.82	GRND
36	8.5	2559.12	GRND
40	8.3	2559.32	GRND
44.5	7.83	2559.79	GRND

Year 2			
Station	FS/BS	Elev.	Desc.
BM	7.52	2559.93	IR Lt
HI		2567.45	
0	7.23	2560.22	GRND
3.5	7.25	2560.20	GRND
8.5	7.62	2559.83	GRND
11.5	8.06	2559.39	GRND
13.5	8.38	2559.07	GRND
14.2	8.49	2558.96	BKF
15	8.85	2558.60	BNK
16	9.13	2558.32	BNK
17.1	9.73	2557.72	BNK
18.2	10.13	2557.32	BED
18.6	10.28	2557.17	EOW
19	10.45	2557.00	BED
20.5	10.49	2556.96	BED
21.5	10.61	2556.84	BED
22.5	10.56	2556.89	BED
23.5	10.42	2557.03	BED
24.2	10.29	2557.16	EOW
25	9.86	2557.59	BNK
26.5	9.79	2557.66	BNK
27.1	9.62	2557.83	BNK
27.9	8.95	2558.50	BNK
28.9	8.64	2558.81	BKF
30.5	8.45	2559.00	GRND
33.5	8.56	2558.89	GRND
37.5	8.23	2559.22	GRND
41.5	8.06	2559.39	GRND
44.5	7.62	2559.83	GRND

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

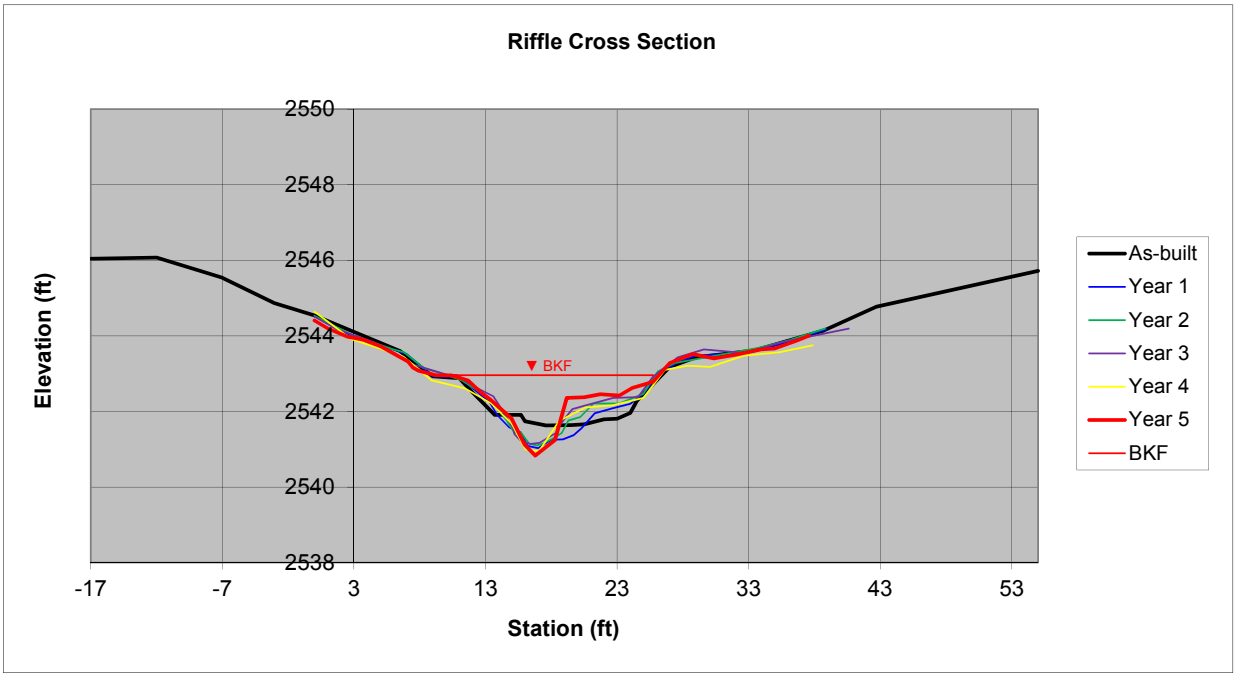
Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00		IR Lt
HI		0.00	
0		2560.24	
1.81		2560.01	
3.96		2559.98	
6.12		2559.84	
8.78		2559.63	
11.15		2559.17	
13.5		2558.87	BKF
15.14		2558.45	
16.92		2557.90	
20.56		2556.20	
21.94		2557.13	
23.5		2557.46	
25.16		2557.94	
27.03		2557.93	
28.64		2558.61	BKF
29.78		2558.94	
31.23		2558.79	
33.68		2558.81	
35.76		2558.97	
37.78		2559.04	
40.22		2559.15	
42.84		2559.25	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	0.00	IR Lt
HI		0.00	
0		2560.16	
0.96		2560.14	
2.06		2560.05	
3.09		2560.04	
4.45		2560.04	
5.52		2560.02	
6.78		2559.94	
7.96		2559.75	
8.91		2559.63	
10.06		2559.46	
11.44		2559.30	
12.64		2559.11	
13.64		2558.93	bkf
14.78		2558.55	
16.13		2558.37	
17.36		2557.99	
18.17		2557.46	
19.16		2557.32	
20.73		2556.98	
21.82		2557.44	
22.95		2558.02	
24.39		2558.58	
25.76		2558.61	
27.01		2558.30	
28.5		2558.51	
29.59		2558.70	
30.86		2558.85	bkf
32.13		2558.82	
33.85		2558.83	
35.01		2559.027	
36.31		2559.002	
37.53		2559.179	
38.76		2559.237	
40.26		2559.19	
41.57		2559.281	

Morgan Creek Stream Restoration Site
Haywood County, NC
Riffle Cross Section RF3
Reach 1 - Morgan Creek - Sta 25+19.6

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/28/10	Date	9/8/11	Date	9/4/12	Date	9/15/13
Area	13.3	Area	15.3	Area	12.3	Area	12.4	Area	12.8	Area	12.3
Bkf W	15	Bkf W	14.6	Bkf W	14.9	Bkf W	14.9	Bkf W	17.1	Bkf W	16.53
Dmean	0.9	Dmean	1.0	Dmean	0.8	Dmean	0.8	Dmean	0.7	Dmean	0.7
Dmax	1.3	Dmax	1.9	Dmax	1.7	Dmax	1.8	Dmax	1.9	Dmax	2.1
W/d	16.9	W/d	14.0	W/d	18.0	W/d	18.0	W/d	22.8	W/d	22.3

Morgan Creek Stream Restoration Site
Haywood County, NC
Riffle Cross Section RF3
Reach 1 - Morgan Creek - Sta 25+19.6

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	1.90	2546.72	IR Lt
HI		2548.62	
0	4.09	2544.53	GRND
3	4.62	2544.00	GRND
6	4.98	2543.64	GRND
6.8	5.05	2543.57	GRND
8.3	5.47	2543.15	GRND
10.1	5.66	2542.96	GRND
11.2	5.80	2542.82	BKF
13.1	6.22	2542.40	BNK
13.8	6.51	2542.11	BNK
14.6	6.85	2541.77	EOW
15.2	7.19	2541.43	BED
15.7	7.18	2541.44	BED
16.3	7.47	2541.15	BED
16.9	7.52	2541.10	THL
17.4	7.47	2541.15	BED
18.3	7.30	2541.32	BED
18.8	7.19	2541.43	BED
19.3	6.86	2541.76	EOW
20.2	6.77	2541.85	BNK
21.2	6.41	2542.21	BNK
23.2	6.41	2542.21	BNK
25	6.15	2542.47	BNK
26.1	5.56	2543.06	BKF
27.4	5.34	2543.28	GRND
30.2	5.16	2543.46	GRND
33.7	4.94	2543.68	GRND
36	4.74	2543.88	GRND
38.8	4.43	2544.19	GRND

Year 3

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

Year 4

Station	FS/BS	Elev.	Desc.
BM	0.00		IR Lt
HI		0.00	
0		2544.64	
2.81		2543.91	
4.74		2543.69	
6.77		2543.45	
8.9		2542.83	
11.45		2542.61	
13.42		2542.21	
14.98		2541.68	
16.04		2541.00	
17.07		2540.95	
18.6		2541.75	
20.58		2542.11	
22.68		2542.16	
25		2542.36	
26.63		2543.10	BKF
28.35		2543.21	
30.07		2543.18	
32.64		2543.48	
35.31		2543.57	
37.88		2543.75	

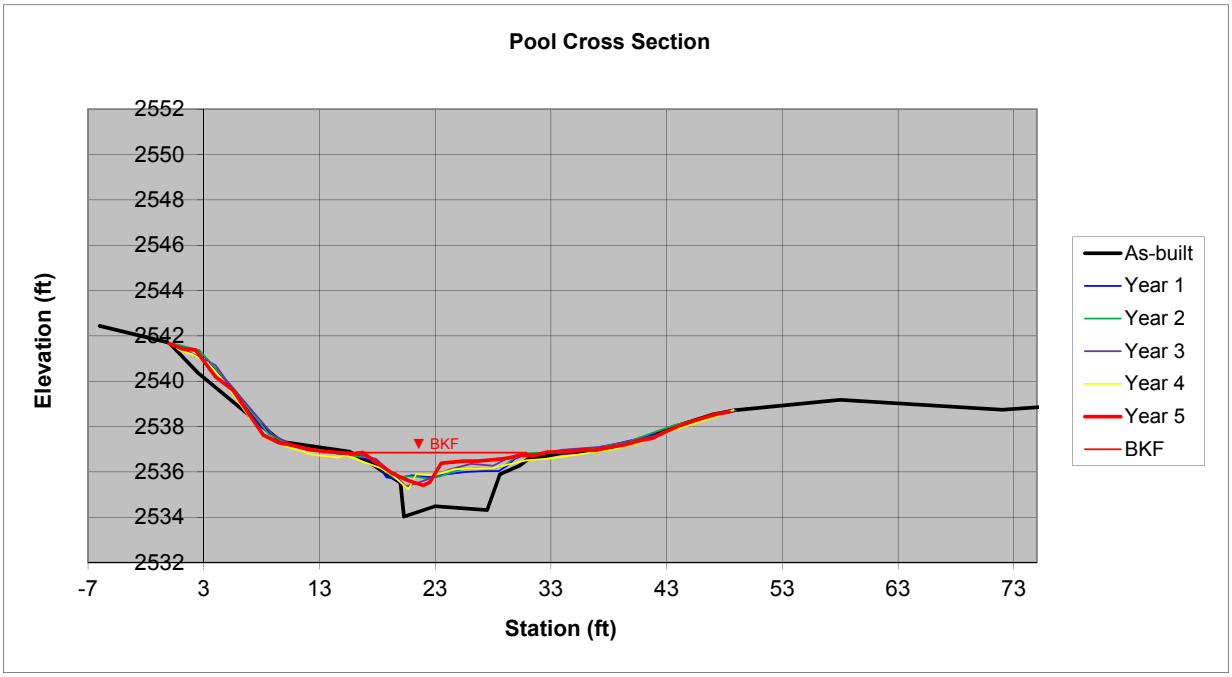
Year 5

Station	FS/BS	Elev.	Desc.
BM	0.00	0.00	IR Lt
HI		0.00	
0		2544.41	
1.05		2544.19	
2.51		2543.98	
3.66		2543.90	
5.07		2543.72	
7.1		2543.32	
7.48		2543.16	
7.91		2543.08	
9.22		2542.96	bkf
10.39		2542.96	
11.7		2542.81	
12.6		2542.52	
13.41		2542.30	
14.97		2541.82	
15.99		2541.12	
16.78		2540.83	
18.28		2541.24	
19.17		2542.36	
20.5		2542.37	
21.73		2542.46	
23.17		2542.42	
24.12		2542.62	
25.64		2542.77	
25.75		2542.79	bkf
27.01		2543.28	
28.75		2543.52	
30.36		2543.40	
32.09		2543.507	
33.91		2543.643	
34.99		2543.667	
36.66		2543.873	
37.59		2544.006	

Morgan Creek Stream Restoration Site
Haywood County, NC
Pool Cross Section PL3
Reach 1 - Morgan Creek - Sta 27+30.4

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/28/10	Date	9/8/11	Date	9/4/12	Date	9/15/13
Area	25.5	Area	11.8	Area	10.0	Area	9.5	Area	9.7	Area	8.4
Bkf W	15.4	Bkf W	14.9	Bkf W	13.4	Bkf W	14.5	Bkf W	15.61	Bkf W	14.66
Dmean	1.7	Dmean	0.8	Dmean	0.7	Dmean	0.7	Dmean	0.6	Dmean	0.6
Dmax	2.9	Dmax	1.2	Dmax	1.1	Dmax	1.5	Dmax	1.5	Dmax	1.4
W/d	9.3	W/d	18.7	W/d	18.0	W/d	22.0	W/d	25.0	W/d	25.7

Morgan Creek Stream Restoration Site
Haywood County, NC
Pool Cross Section PL3
Reach 1 - Morgan Creek - Sta 27+30.4

As-Built			
Station	FS/BS	Elev.	Desc.
BM	4.30	2541.87	PL3 IR Lt
		2546.17	
-6	3.73	2542.44	
0	4.47	2541.70	GRND
2.5	5.80	2540.37	
9.7	8.84	2537.33	
15.6	9.28	2536.89	BKF LT
17.6	9.85	2536.32	
18.8	10.26	2535.91	EOW
20	10.64	2535.53	
20.3	12.14	2534.03	
23	11.68	2534.49	
27.5	11.85	2534.32	
28.6	10.27	2535.90	EOW
30.3	9.89	2536.28	BKF RT
31	9.61	2536.56	
34	9.33	2536.84	
36.5	9.26	2536.91	
40.4	8.84	2537.33	
43.5	8.20	2537.97	
47	7.63	2538.54	
48.9	7.45	2538.72	GRND
58	6.99	2539.18	
72	7.43	2538.74	
86	6.93	2539.24	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	2.14	2541.87	PL3 IR Lt
HI		2544.01	
0	2.35	2541.66	GRND
2.6	2.65	2541.36	GRND
5	4.03	2539.98	GRND
8	6.05	2537.96	GRND
10	6.75	2537.26	GRND
12	7.05	2536.96	GRND
14	7.13	2536.88	GRND
15.6	7.13	2536.88	BKF
16.7	7.37	2536.64	BNK
17.7	7.56	2536.45	BNK
18.2	7.76	2536.25	BNK
18.5	8.04	2535.97	EOW
18.8	8.25	2535.76	BED
19.6	8.30	2535.71	BED
21	8.16	2535.85	BED
22.5	8.24	2535.77	BED
24	8.11	2535.9	BED
25.6	8.01	2536	EOW
27	7.98	2536.03	BED
28.5	7.97	2536.04	BED
29.3	7.72	2536.29	BNK
29.9	7.43	2536.58	BNK
30.5	7.30	2536.71	BKF
31.5	7.24	2536.77	GRND
32.5	7.19	2536.82	GRND
34	7.11	2536.9	GRND
36	7.04	2536.97	GRND
39	6.73	2537.28	GRND
42	6.37	2537.64	GRND
46	5.66	2538.35	GRND
48.9	5.31	2538.7	GRND

Year 2			
Station	FS/BS	Elev.	Desc.
BM	6.83	2538.88	IR Lt
HI		2545.71	
0	4.00	2541.71	GRND
1.6	4.21	2541.50	GRND
2.6	4.34	2541.37	GRND
5.6	6.04	2539.67	GRND
8.6	8.04	2537.67	GRND
10.6	8.58	2537.13	GRND
14.6	8.89	2536.82	GRND
16.6	9.04	2536.67	GRND
17.4	9.09	2536.62	GRND
17.8	9.18	2536.53	BKF
18.7	9.71	2536.00	EOW
19.6	10.01	2535.70	BED
20.6	9.90	2535.81	BED
21.6	9.94	2535.77	BED
22.3	10.02	2535.69	BED
23.4	9.91	2535.80	BED
24.5	9.71	2536.00	EOW
25.3	9.60	2536.11	BED
26.6	9.55	2536.16	BED
27.6	9.59	2536.12	BED
29	9.44	2536.27	BED
29.9	9.06	2536.65	BNK
30.8	8.89	2536.82	BKF
32.6	8.86	2536.85	GRND
35.6	8.77	2536.94	GRND
39.6	8.39	2537.32	GRND
43.6	7.66	2538.05	GRND
48.8	6.99	2538.72	GRND

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

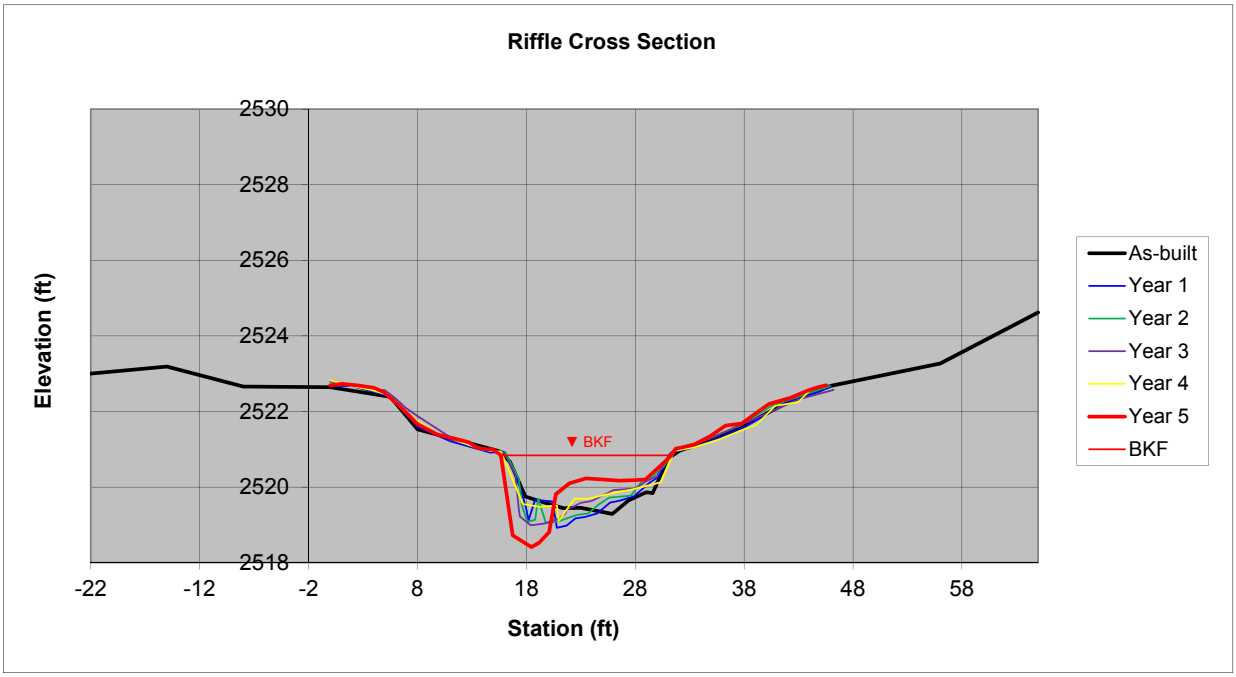
Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00		IR Lt
HI		0.00	
0		2541.77	
0.88		2541.37	
2.06		2541.17	
3.34		2540.81	
4.97		2539.83	
6.67		2538.62	
8.27		2537.54	
10.24		2537.10	
12.48		2536.75	
14.55		2536.64	
15.29		2536.73	BKF
16.39		2536.52	
18.19		2536.19	
19.29		2535.86	
20.71		2535.23	
21.36		2535.90	
22.95		2535.86	
24.65		2536.11	
25.91		2536.14	
27.78		2536.15	
30.9		2536.51	BKF
32.84		2536.58	
35.63		2536.78	
38.29		2536.98	
40.7		2537.28	
42.98		2537.76	
44.92		2538.05	
47.3		2538.45	
48.79		2538.74	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	0.00	IR Lt
HI		0.00	
0		2541.67	
1.17		2541.42	
2.29		2541.38	
4.02		2540.20	
5.52		2539.61	
6.76		2538.67	
8.15		2537.63	
9.49		2537.29	
10.64		2537.18	
12.08		2537.00	
13.44		2536.90	
14.79		2536.85	
15.83		2536.79	
16.71		2536.85	bkf
19.3		2535.93	
20.7		2535.62	
21.96		2535.40	
22.55		2535.54	
23.52		2536.39	
25.46		2536.48	
26.68		2536.47	
27.78		2536.52	
29.04		2536.59	
30.49		2536.73	bkf
31.48		2536.71	
32.73		2536.88	
34.08		2536.87	
35.79		2536.971	
36.85		2536.959	
38.1		2537.089	
39.45		2537.206	
40.77		2537.391	
41.73		2537.479	
42.72		2537.728	
44		2538.013	

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

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/29/10	Date	9/8/11	Date	9/4/12	Date	9/15/13
Area	18.7	Area	19.1	Area	18.2	Area	18.3	Area	17.5	Area	16.1
Bkf W	16.5	Bkf W	15.7	Bkf W	15.7	Bkf W	15.3	Bkf W	16.1	Bkf W	15.56
Dmean	1.1	Dmean	1.2	Dmean	1.2	Dmean	1.2	Dmean	1.1	Dmean	1.0
Dmax	1.7	Dmax	2.0	Dmax	1.9	Dmax	2.0	Dmax	1.8	Dmax	2.4
W/d	14.5	W/d	12.9	W/d	13.5	W/d	12.8	W/d	14.8	W/d	15.0

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

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	6.46	2522.90	IR Lt
HI		2529.36	
0	6.58	2522.78	GRND
2.6	6.71	2522.65	GRND
5.6	6.95	2522.41	GRND
7.6	7.60	2521.76	GRND
9.6	7.93	2521.43	GRND
12.6	8.18	2521.18	GRND
14.6	8.41	2520.95	GRND
15.6	8.40	2520.96	GRND
16.1	8.46	2520.90	BKF
17.3	9.13	2520.23	BNK
17.6	9.85	2519.51	EOW
18.1	10.28	2519.08	BED
18.8	10.23	2519.13	BED
19.1	9.67	2519.69	ROCK
19.8	10.32	2519.04	BED
21	10.26	2519.10	BED
22.6	10.10	2519.26	BED
23.7	10.06	2519.30	EOW
24.6	9.83	2519.53	BED
25.6	9.64	2519.72	BED
27.6	9.59	2519.77	BED
28.6	9.21	2520.15	BNK
29.6	9.09	2520.27	BNK
30.6	8.82	2520.54	BNK
31.8	8.35	2521.01	BKF
32.6	8.29	2521.07	GRND
34.6	8.09	2521.27	GRND
37.6	7.74	2521.62	GRND
40.6	7.20	2522.16	GRND
45.9	6.69	2522.67	GRND

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

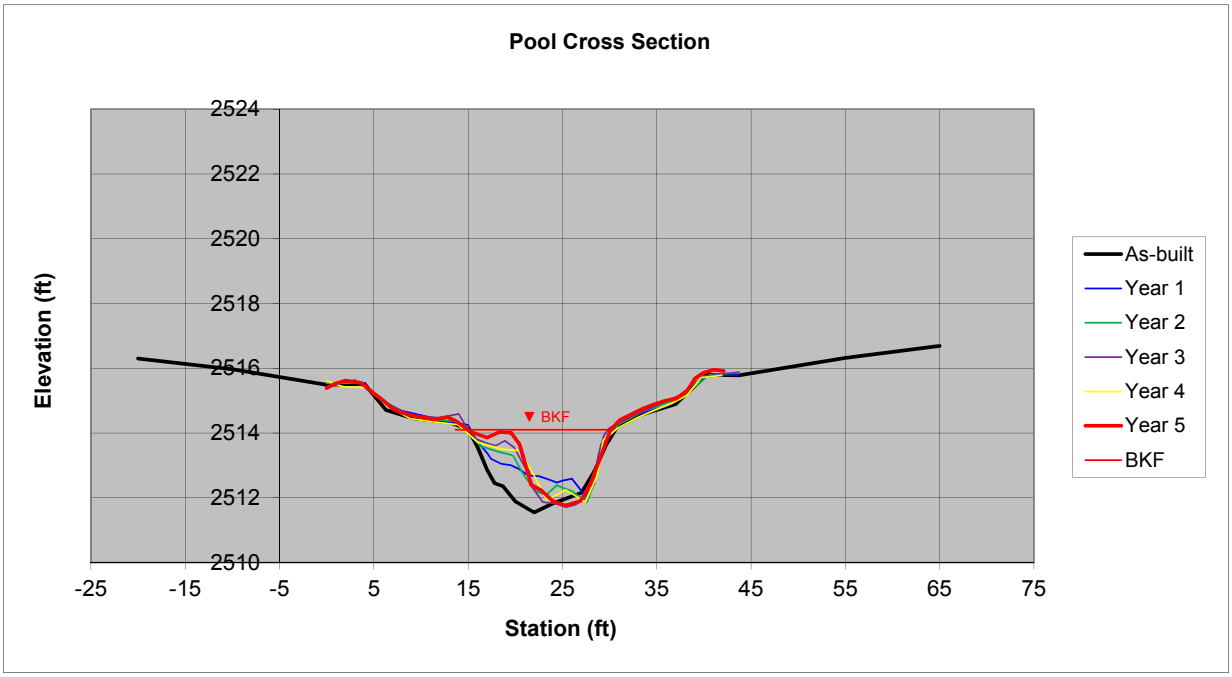
Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	
0		2522.82	
1.75		2522.69	
3.82		2522.57	
5.31		2522.44	
7.2		2521.91	
9.53		2521.46	
11.63		2521.23	
13.74		2521.01	
15.13		2520.95	BKF
15.68		2520.93	
17.68		2519.55	
19.25		2519.48	
20.81		2519.51	
20.98		2519.10	
22.42		2519.69	
23.67		2519.69	
25.92		2519.84	
27.73		2519.94	
30.33		2520.12	
31.59		2520.95	BKF
33.41		2521.05	
35.73		2521.26	
37.64		2521.49	
39.11		2521.64	
40.85		2522.15	
42.99		2522.25	
43.88		2522.51	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	0.00	IR Lt
HI		0.00	
0		2522.69	
1.08		2522.73	
2.53		2522.69	
4.02		2522.63	
4.9		2522.51	
6.41		2522.13	
7.98		2521.67	
9.8		2521.39	
11.32		2521.29	
12.76		2521.18	
13.36		2521.05	
14.01		2521.01	
14.91		2521.00	
15.66		2520.84	bkf
16.74		2518.72	
18.47		2518.41	
19.16		2518.52	
20.09		2518.81	
20.72		2519.81	
21.96		2520.10	
23.51		2520.23	
24.81		2520.20	
26.55		2520.17	
27.91		2520.18	
28.94		2520.20	
31.22		2520.81	bkf
31.71		2521.02	
32		2521.031	
33.41		2521.123	
34.86		2521.341	
36.3		2521.627	
37.78		2521.679	
38.79		2521.891	
40.28		2522.196	
42.19		2522.354	

Morgan Creek Stream Restoration Site
Haywood County, NC
Pool Cross Section PL4
Reach 1 - Morgan Creek - Sta 34+76.9

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/29/10	Date	9/8/11	Date	9/4/12	Date	9/15/13
Area	26.1	Area	18.3	Area	20.8	Area	21.8	Area	19.2	Area	16.9
Bkf W	15.8	Bkf W	15.4	Bkf W	16.9	Bkf W	16.9	Bkf W	17	Bkf W	16.43
Dmean	1.7	Dmean	1.2	Dmean	1.2	Dmean	1.3	Dmean	1.1	Dmean	1.0
Dmax	2.6	Dmax	2.1	Dmax	2.4	Dmax	2.6	Dmax	2.3	Dmax	2.3
W/d	9.5	W/d	13.0	W/d	13.7	W/d	13.1	W/d	15.1	W/d	16.0

Morgan Creek Stream Restoration Site
Haywood County, NC
Pool Cross Section PL4
Reach 1 - Morgan Creek - Sta 34+76.9

As-Built			
Station	FS/BS	Elev.	Desc.
BM	6.05	2515.67	PL4 IR Lt
HI		2521.72	
-20	5.42	2516.30	
-10	5.75	2515.97	
0	6.23	2515.49	GRND
4	6.20	2515.52	
6.3	7.01	2514.71	
9	7.26	2514.46	
13	7.39	2514.33	
15	7.60	2514.12	BKF LT
16	8.15	2513.57	
17	8.85	2512.87	EOW
17.8	9.27	2512.45	
18.7	9.36	2512.36	
20	9.83	2511.89	
22	10.17	2511.55	
24	9.89	2511.83	
27	9.57	2512.15	
28.4	8.89	2512.83	EOW
29.6	8.10	2513.62	
30.8	7.54	2514.18	BKF RT
33	7.19	2514.53	
37	6.83	2514.89	
40.3	5.92	2515.80	
43.7	5.94	2515.78	GRND
55	5.40	2516.32	
65	5.03	2516.69	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	5.40	2515.67	PL4 IR Lt
HI		2521.07	
0	5.63	2515.44	GRND
1	5.53	2515.54	GRND
3	5.44	2515.63	GRND
5	5.86	2515.21	GRND
7	6.32	2514.75	GRND
10	6.52	2514.55	GRND
13	6.73	2514.34	GRND
15	6.82	2514.25	GRND
15.3	6.98	2514.09	BKF
16	7.35	2513.72	BNK
17	7.68	2513.39	BNK
17.4	7.86	2513.21	BED
18.5	8.02	2513.05	BED
19.5	8.06	2513.01	BED
20.5	8.20	2512.87	BED
21.1	8.33	2512.74	EOW
21.8	8.39	2512.68	BED
22.5	8.40	2512.67	BED
23.6	8.51	2512.56	BED
24.4	8.60	2512.47	BED
25	8.54	2512.53	BED
26	8.48	2512.59	BED
27.4	9.00	2512.07	BED
28.1	8.77	2512.3	BED
28.4	8.32	2512.75	EOW
29.1	7.58	2513.49	BNK
29.2	7.45	2513.62	BNK
30	7.18	2513.89	BNK
30.7	6.89	2514.18	BKF
31.3	6.73	2514.34	GRND
33	6.49	2514.58	GRND
35	6.33	2514.74	GRND
36.3	6.22	2514.85	GRND
38	5.88	2515.19	GRND
40	5.34	2515.73	GRND
42	5.29	2515.78	GRND
43.7	5.28	2515.79	GRND

Year 2			
Station	FS/BS	Elev.	Desc.
BM	7.79	2515.99	IR Lt
HI		2523.78	
0	8.24	2515.54	GRND
3.6	8.24	2515.54	GRND
7.6	9.09	2514.69	GRND
10.6	9.34	2514.44	GRND
13.6	9.42	2514.36	GRND
16.4	10.19	2513.59	GRND
18.1	10.35	2513.43	GRND
19.6	10.46	2513.32	GRND
19.8	10.49	2513.29	BKF
20.5	10.87	2512.91	EOW
21.1	11.17	2512.61	BED
22.2	11.58	2512.20	BED
23.3	11.69	2512.09	BED
24.4	11.39	2512.39	BED
26.1	11.59	2512.19	BED
27.6	11.91	2511.87	BED
28.3	11.36	2512.42	BED
28.6	10.83	2512.95	EOW
29.1	10.12	2513.66	BNK
30.5	9.71	2514.07	BNK
30.9	9.52	2514.26	BKF
31.6	9.42	2514.36	GRND
33.6	9.11	2514.67	GRND
37.6	8.69	2515.09	GRND
40.6	7.98	2515.80	GRND
43.7	7.92	2515.86	GRND

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

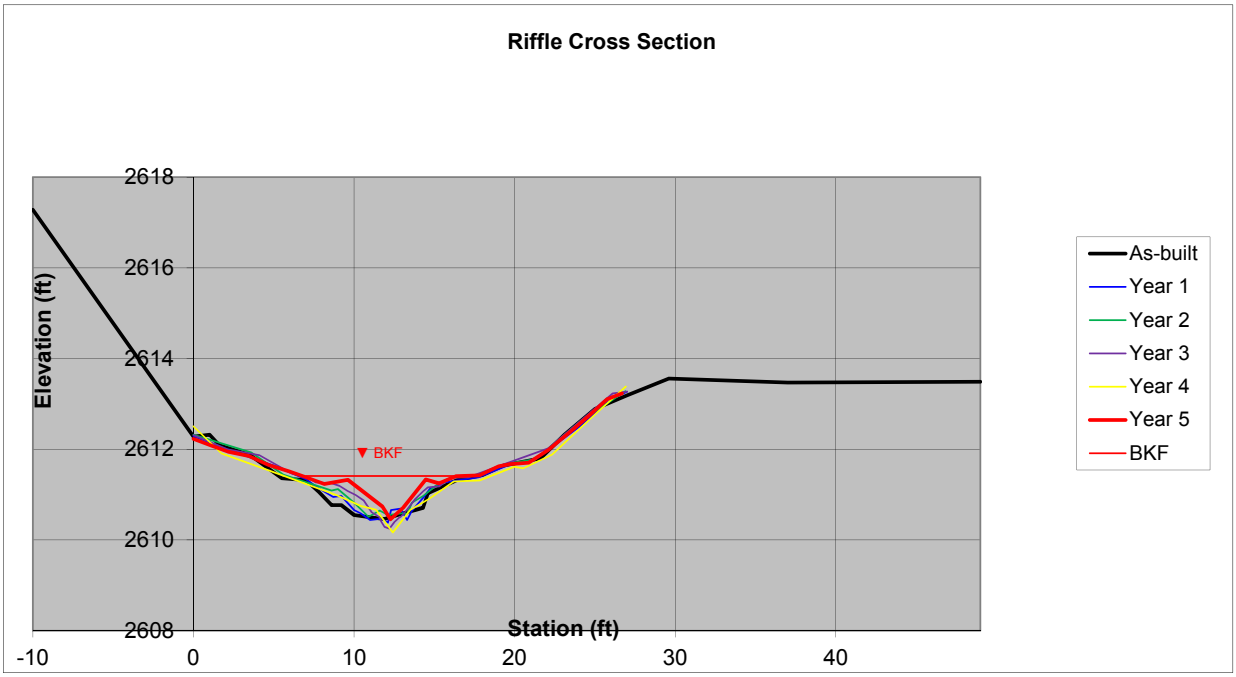
Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	
0		2515.61	
1.73		2515.43	
4.38		2515.40	
6.5		2514.85	
8.81		2514.45	
11.19		2514.36	
13.93		2514.26	
16.07		2513.71	
18.61		2513.51	
20.51		2513.45	
22.03		2512.66	
23.33		2511.94	
25.37		2512.24	
27.43		2511.87	
28.7		2512.70	
29.32		2513.77	
30.93		2514.17	BKF
32.94		2514.48	
34.89		2514.72	
36.59		2514.92	
38.19		2515.16	
39.72		2515.71	
41.9		2515.78	
43.62			

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	0.00	IR Lt
HI		0.00	
0		2515.39	
0.93		2515.52	
2.01		2515.62	
3.64		2515.55	
4.9		2515.25	
5.95		2515.02	
7.13		2514.72	
8.67		2514.56	
11.44		2514.42	
12.81		2514.49	
13.67		2514.38	
15.31		2514.03	bkf
17.01		2513.86	
18.32		2514.03	
19.56		2514.01	
20.44		2513.66	
21.69		2512.40	
22.73		2512.24	
24.03		2511.89	
25.36		2511.76	
26.91		2511.90	
27.96		2512.41	
30.1		2514.10	bkf
31.07		2514.40	
32.24		2514.56	
33.58		2514.76	
34.68		2514.88	
35.94		2515.002	
37.1		2515.07	
38.21		2515.298	
39.05		2515.688	
39.9		2515.852	
41.08		2515.956	

Morgan Creek Stream Restoration Site
Haywood County, NC
Riffle Cross Section RF5
Reach 2 - North Branch - Sta 10+83.0

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/29/10	Date	9/8/11	Date	9/4/12	Date	9/15/13
Area	5.0	Area	4.5	Area	3.9	Area	3.7	Area	4.1	Area	2.9
Bkf W	9.4	Bkf W	8.6	Bkf W	7.1	Bkf W	7.5	Bkf W	9.5	Bkf W	9.34
Dmean	0.5	Dmean	0.5	Dmean	0.6	Dmean	0.5	Dmean	0.4	Dmean	0.3
Dmax	0.9	Dmax	1.0	Dmax	0.9	Dmax	1.1	Dmax	1.1	Dmax	1.0
W/d	17.7	W/d	16.5	W/d	12.9	W/d	15.2	W/d	22.1	W/d	29.9

Morgan Creek Stream Restoration Site
Haywood County, NC
Riffle Cross Section RF5
Reach 2 - North Branch - Sta 10+83.0

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	2.70	2617.00	IR Lt
HI		2619.70	
0	7.38	2612.32	GRND
3.6	7.77	2611.93	GRND
5.6	8.26	2611.44	GRND
8.6	8.61	2611.09	GRND
9	8.58	2611.12	BKF
10	8.88	2610.82	EOW
10.9	9.19	2610.51	BED
11.6	9.05	2610.65	BED
12.1	9.15	2610.55	BED
13	9.11	2610.59	BED
13.3	9.13	2610.57	BED
13.6	8.88	2610.82	EOW
14.3	8.73	2610.97	BNK
15.3	8.45	2611.25	BNK
16.1	8.31	2611.39	BKF
17.6	8.29	2611.41	GRND
19.6	8.01	2611.69	GRND
21.3	7.92	2611.78	GRND
24.1	7.08	2612.62	GRND
26.9	6.42	2613.28	GRND

Year 3

Station	FS/BS	Elev.	Desc.
BM	6.00	2612.59	IR Lt
HI		2618.59	
0	6.28	2612.31	GRND
2.1	6.59	2612.00	GRND
4.1	6.72	2611.87	GRND
6.1	7.12	2611.47	GRND
7.1	7.21	2611.38	GRND
7.6	7.32	2611.27	GRND
8.6	7.34	2611.25	BKF
9.1	7.40	2611.19	BNK
9.6	7.51	2611.08	BNK
10.1	7.60	2610.99	
10.6	7.72	2610.87	
11.1	7.98	2610.61	
11.6	8.09	2610.50	EOW
11.7	8.19	2610.40	BED
11.9	8.30	2610.29	BED
12.2	8.34	2610.25	THL
12.5	8.20	2610.39	BED
12.8	8.10	2610.49	BED
12.9	8.08	2610.51	EOW
13.1	8.01	2610.58	
13.8	7.69	2610.90	
14.3	7.52	2611.07	BNK
14.6	7.43	2611.16	BNK
15.3	7.41	2611.18	BNK
15.7	7.30	2611.29	BKF
16.1	7.22	2611.37	GRND
17.1	7.21	2611.38	GRND
19.1	6.95	2611.64	GRND
22.1	6.57	2612.02	GRND
26.1	5.36	2613.23	GRND
27	5.32	2613.27	GRND

Year 4

Station	FS/BS	Elev.	Desc.
BM	0.00		IR Lt
HI		0.00	
0		2612.51	
1.74		2611.91	
4.63		2611.54	BKF
6.63		2611.28	
8.89		2610.99	
10.4		2610.75	
11.37		2610.67	
12.41		2610.16	
13.49		2610.66	
14.71		2610.92	
16.21		2611.29	
17.81		2611.31	
19.99		2611.62	BKF
20.53		2611.58	
22.34		2611.88	
24.97		2612.75	
26.92		2613.38	

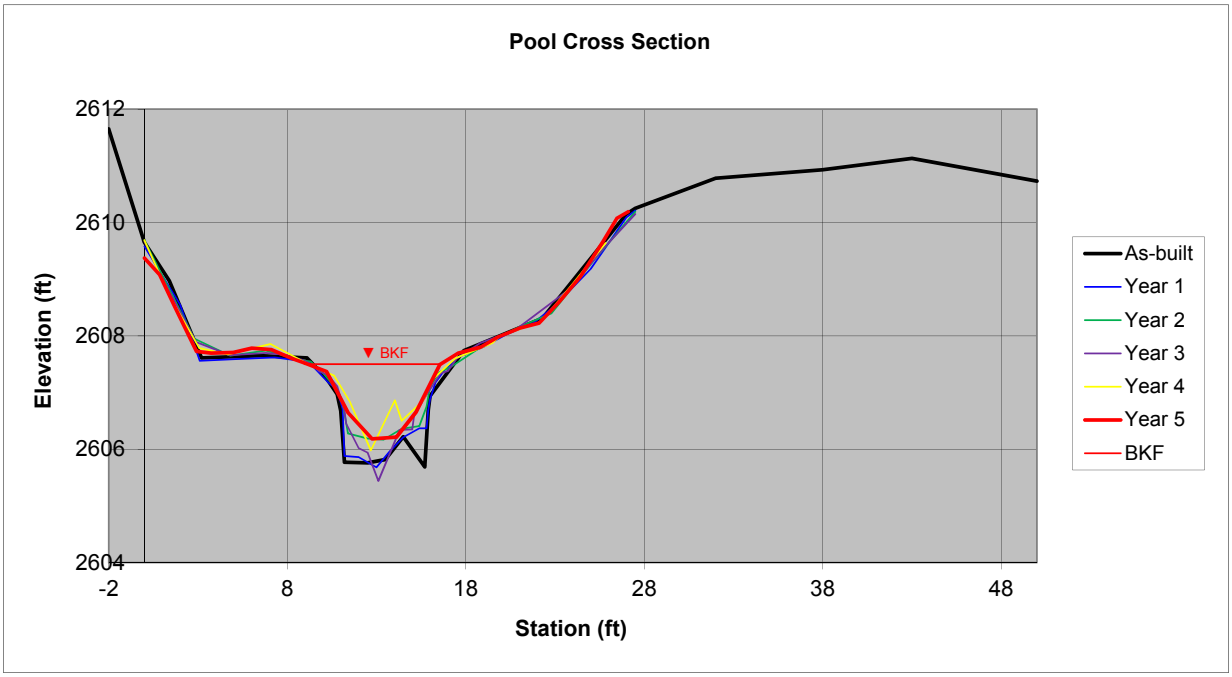
Year 5

Station	FS/BS	Elev.	Desc.
BM	0.00	0.00	IR Lt
HI		0.00	
0		2612.23	
1.05		2612.09	
2.15		2611.95	
3.45		2611.85	
4.67		2611.65	
5.94		2611.51	
7.01		2611.38	bkf
8.15		2611.23	
9.61		2611.32	
11.77		2610.74	
12.26		2610.46	
13.08		2610.72	
14.47		2611.33	
15.28		2611.25	
16.35		2611.41	bkf
17.8		2611.42	
18.99		2611.62	
19.7		2611.67	
20.87		2611.70	
22.1		2611.98	
23.73		2612.47	
24.73		2612.77	
25.75		2613.11	
26.68		2613.23	

Morgan Creek Stream Restoration Site
Haywood County, NC
Pool Cross Section PL5
Reach 2 -North Branch - Sta 11+51.4

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/6/09	Date	9/29/10	Date	9/8/11	Date	9/4/12	Date	9/15/13
Area	9.6	Area	8.7	Area	6.7	Area	7.8	Area	3.0	Area	5.6
Bkf W	8.8	Bkf W	8.4	Bkf W	7.9	Bkf W	8.2	Bkf W	6.74	Bkf W	7.58
Dmean	1.1	Dmean	1.0	Dmean	0.9	Dmean	1.0	Dmean	0.5	Dmean	0.7
Dmax	1.9	Dmax	1.9	Dmax	1.4	Dmax	2.2	Dmax	1.3	Dmax	1.3
W/d	8.1	W/d	8.1	W/d	9.3	W/d	8.6	W/d	14.9	W/d	10.3

Morgan Creek Stream Restoration Site
Haywood County, NC
Pool Cross Section PL5
Reach 2 -North Branch - Sta 11+51.4

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	2.70	2617.00	IR Lt
HI		2619.70	
0	10.01	2609.69	GRND
2.8	11.75	2607.95	GRND
4.8	12.05	2607.65	GRND
6.8	11.96	2607.74	GRND
8.8	12.13	2607.57	GRND
9.3	12.15	2607.55	BKF
10	12.36	2607.34	BNK
10.8	12.65	2607.05	BNK
11.1	12.88	2606.82	EOW
11.4	13.42	2606.28	BED
12.5	13.51	2606.19	BED
13.4	13.53	2606.17	BED
14.4	13.34	2606.36	BED
15.4	13.29	2606.41	BED
15.8	12.95	2606.75	EOW
16	12.60	2607.10	BNK
16.5	12.35	2607.35	BKF
17.2	12.24	2607.46	GRND
18.8	11.91	2607.79	GRND
20.8	11.57	2608.13	GRND
22.8	11.30	2608.40	GRND
25.3	10.32	2609.38	GRND
27.5	9.51	2610.19	GRND

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

Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	0.00	IR Lt
HI		0.00	
0		2609.69	
1.36		2608.73	
3.07		2607.78	
4.67		2607.67	
7.06		2607.86	
9.41		2607.46	bkf
10.63		2607.30	
11.5		2606.84	
12.68		2605.98	
14.03		2606.86	
14.41		2606.50	
15.61		2606.85	
16.15		2607.24	bkf
17.42		2607.61	
19.49		2607.87	
19.94		2608.00	
22.23		2608.25	
23.95		2608.90	
25.83		2609.64	

Year 5			
Station	FS/BS	Elev.	Desc.
BM	0.00	0.00	IR Lt
HI		0.00	
0		2609.37	
0.85		2609.08	
1.68		2608.52	
2.91		2607.73	
3.74		2607.70	
4.98		2607.71	
6.01		2607.78	
7.11		2607.76	
8.27		2607.60	
8.97		2607.52	bkf
10.2		2607.37	
11.41		2606.64	
12.75		2606.18	
14.12		2606.21	
15.22		2606.66	
16.55		2607.49	bkf
17.57		2607.69	
18.83		2607.80	
19.8		2607.98	
21.02		2608.14	
22.11		2608.23	
23.24		2608.60	
24.42		2609.04	
25.69		2609.66	
26.47		2610.07	
27.11		2610.19	

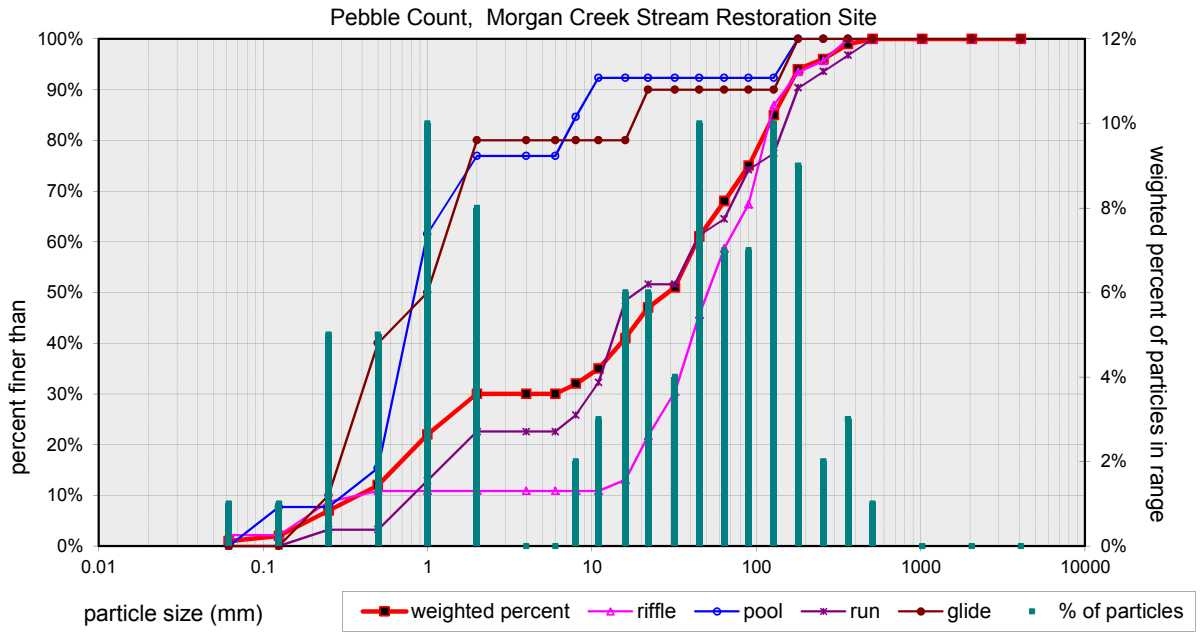
Pebble Count Weighted by Channel Feature

Percent Riffle:	46	Percent Run:	31
Percent Pool:	13	Percent Glide:	10

Material	Size Range (mm)		weighted
silt/clay	0	0.062	1.0
very fine sand	0.062	0.13	1.0
fine sand	0.13	0.25	5.0
medium sand	0.25	0.5	5.0
coarse sand	0.5	1	10.0
very coarse sand	1	2	8.0
very fine gravel	2	4	0.0
fine gravel	4	6	0.0
fine gravel	6	8	2.0
medium gravel	8	11	3.0
medium gravel	11	16	6.0
coarse gravel	16	22	6.0
coarse gravel	22	32	4.0
very coarse gravel	32	45	10.0
very coarse gravel	45	64	7.0
small cobble	64	90	7.0
medium cobble	90	128	10.0
large cobble	128	180	9.0
very large cobble	180	256	2.0
small boulder	256	362	3.0
small boulder	362	512	1.0
medium boulder	512	1024	0.0
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 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
	0.660	11.00	29.1	55	124	215	24.2	9.0	13.7

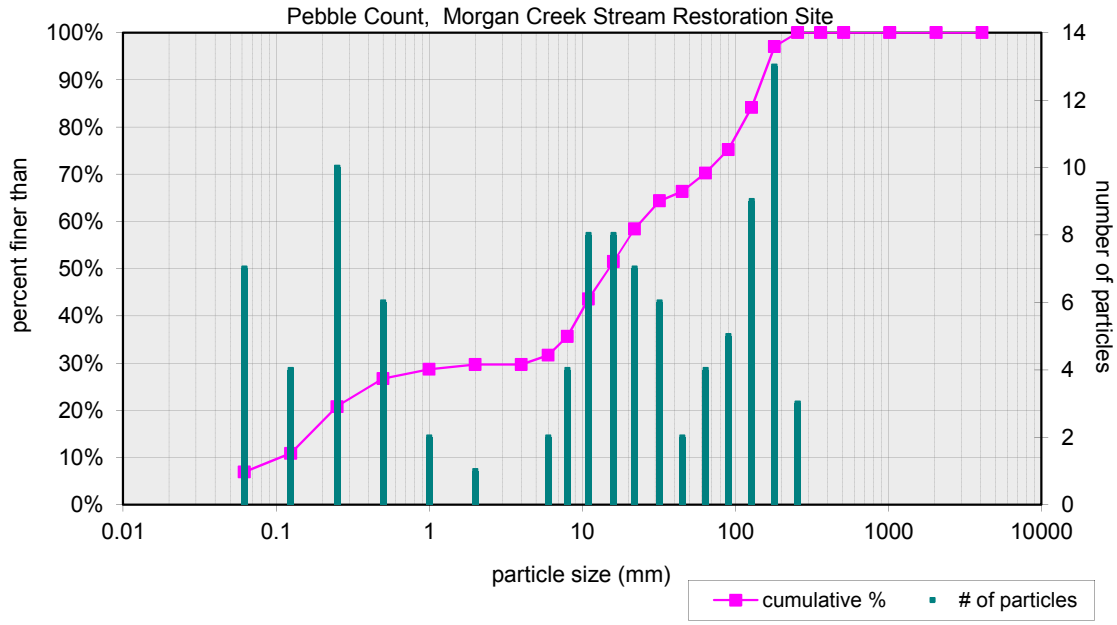
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	1%	29%	38%	28%	4%	0%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count
silt/clay	0	0.062	7
very fine sand	0.062	0.13	4
fine sand	0.13	0.25	10
medium sand	0.25	0.5	6
coarse sand	0.5	1	2
very coarse sand	1	2	1
very fine gravel	2	4	
fine gravel	4	6	2
fine gravel	6	8	4
medium gravel	8	11	8
medium gravel	11	16	8
coarse gravel	16	22	7
coarse gravel	22	32	6
very coarse gravel	32	45	2
very coarse gravel	45	64	4
small cobble	64	90	5
medium cobble	90	128	9
large cobble	128	180	13
very large cobble	180	256	3
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
		total particle count:	101

bedrock		
clay hardpan		
detritus/wood		
artificial		
	total count:	101

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
	0.179	7.63	14.9	36	127	171	46.0	4.8	26.7

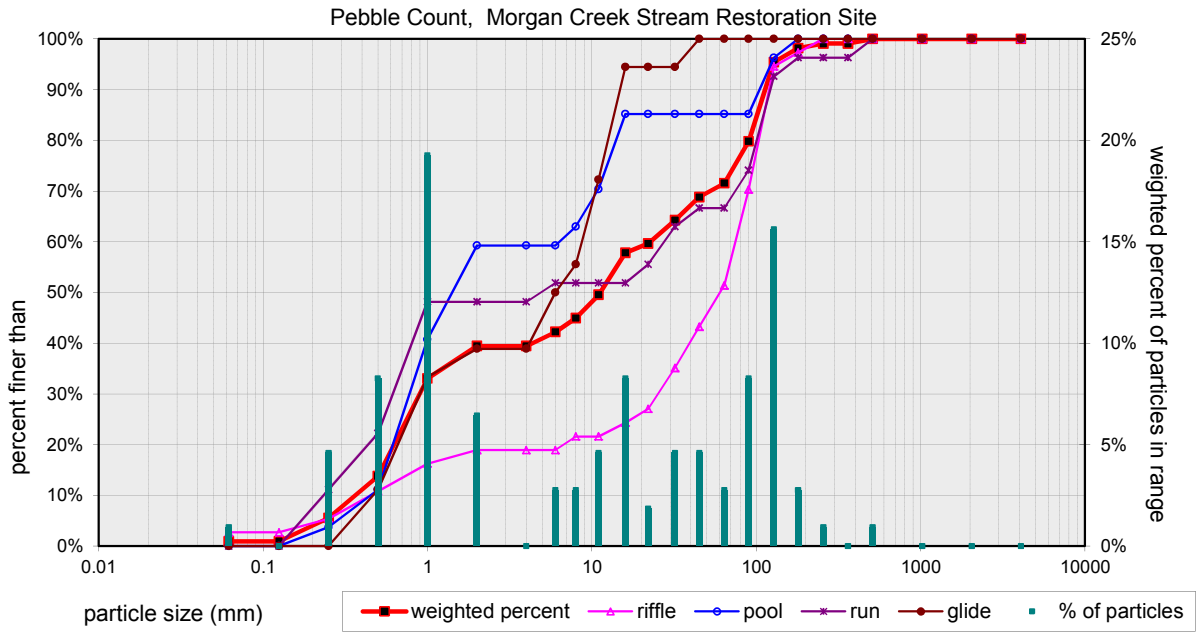
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	7%	23%	41%	30%	0%	0%	0%	0%	0%

Pebble Count Weighted by Channel Feature

Percent Riffle:	37	Percent Run:	27
Percent Pool:	27	Percent Glide:	18

Material	Size Range (mm)		weighted
silt/clay	0	0.062	1.0
very fine sand	0.062	0.13	0.0
fine sand	0.13	0.25	5.0
medium sand	0.25	0.5	9.0
coarse sand	0.5	1	21.0
very coarse sand	1	2	7.0
very fine gravel	2	4	0.0
fine gravel	4	6	3.0
fine gravel	6	8	3.0
medium gravel	8	11	5.0
medium gravel	11	16	9.0
coarse gravel	16	22	2.0
coarse gravel	22	32	5.0
very coarse gravel	32	45	5.0
very coarse gravel	45	64	3.0
small cobble	64	90	9.0
medium cobble	90	128	17.0
large cobble	128	180	3.0
very large cobble	180	256	1.0
small boulder	256	362	0.0
small boulder	362	512	1.0
medium boulder	512	1024	0.0
large boulder	1024	2048	0.0
very large boulder	2048	4096	0.0
weighted particle count:			109.0
bedrock			0.0
clay hardpan			0.0
detritus/wood			0.0
artificial			0.0
weighted total count:			109

Morgan Creek Stream Restoration Site
Haywood County, NC
Morgan Creek: Reach 2
Note: **Reach Data 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
	0.542	1.24	11.2	34	99	127	14.8	7.3	13.5

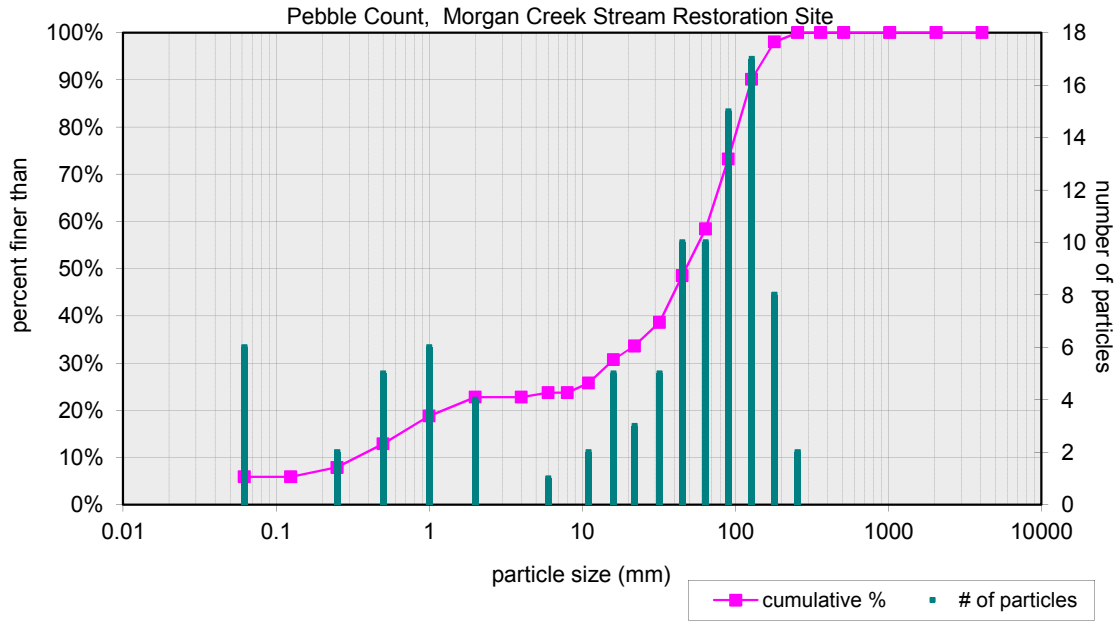
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	1%	39%	32%	28%	1%	0%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count
silt/clay	0	0.062	6
very fine sand	0.062	0.13	
fine sand	0.13	0.25	2
medium sand	0.25	0.5	5
coarse sand	0.5	1	6
very coarse sand	1	2	4
very fine gravel	2	4	
fine gravel	4	6	1
fine gravel	6	8	
medium gravel	8	11	2
medium gravel	11	16	5
coarse gravel	16	22	3
coarse gravel	22	32	5
very coarse gravel	32	45	10
very coarse gravel	45	64	10
small cobble	64	90	15
medium cobble	90	128	17
large cobble	128	180	8
very large cobble	180	256	2
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
		total particle count:	101

bedrock		
clay hardpan		
detritus/wood		
artificial		
	total count:	101

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



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.720	24.34	47.4	74	113	158	34.1	9.0	12.5

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	6%	17%	36%	42%	0%	0%	0%	0%	0%

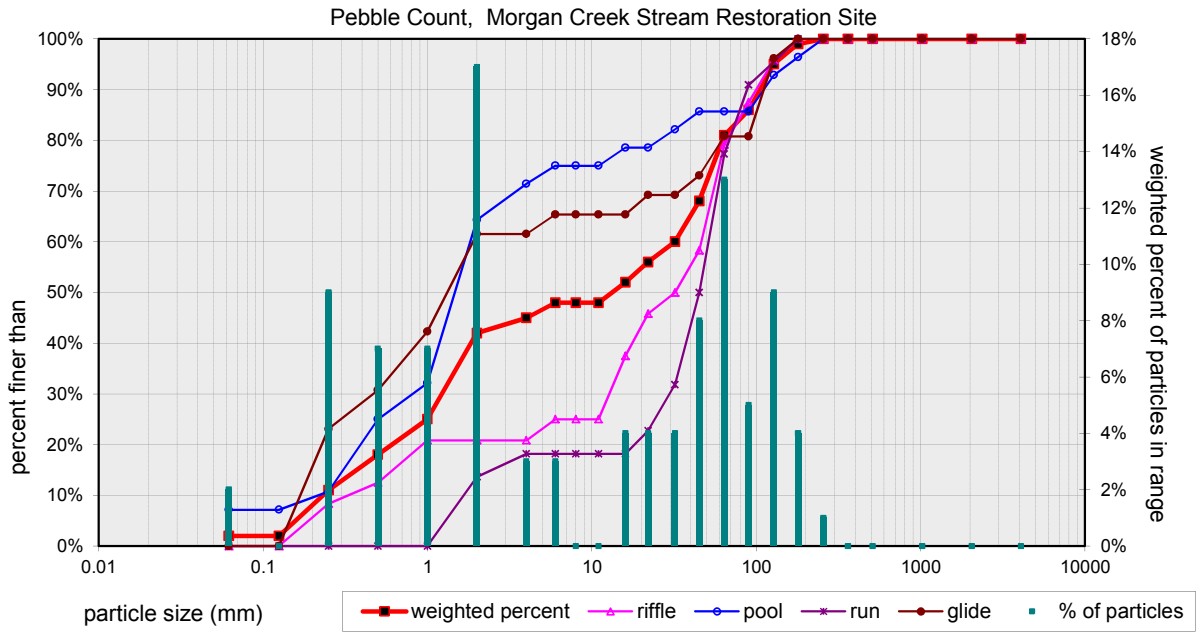
Pebble Count Weighted by Channel Feature

Percent Riffle:	24	Percent Run:	22
Percent Pool:	28	Percent Glide:	26

Material	Size Range (mm)		weighted
silt/clay	0	0.062	2.0
very fine sand	0.062	0.13	0.0
fine sand	0.13	0.25	9.0
medium sand	0.25	0.5	7.0
coarse sand	0.5	1	7.0
very coarse sand	1	2	17.0
very fine gravel	2	4	3.0
fine gravel	4	6	3.0
fine gravel	6	8	0.0
medium gravel	8	11	0.0
medium gravel	11	16	4.0
coarse gravel	16	22	4.0
coarse gravel	22	32	4.0
very coarse gravel	32	45	8.0
very coarse gravel	45	64	13.0
small cobble	64	90	5.0
medium cobble	90	128	9.0
large cobble	128	180	4.0
very large cobble	180	256	1.0
small boulder	256	362	0.0
small boulder	362	512	0.0
medium boulder	512	1024	0.0
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 3
Note: **Reach Data 3**



based on sediment particles only	size percent less than (mm) D16	D35	D50	D65	D84	D95	particle size distribution gradation	geo mean	std dev
	0.410	1.50	13.3	40	79	128	19.1	5.7	13.8

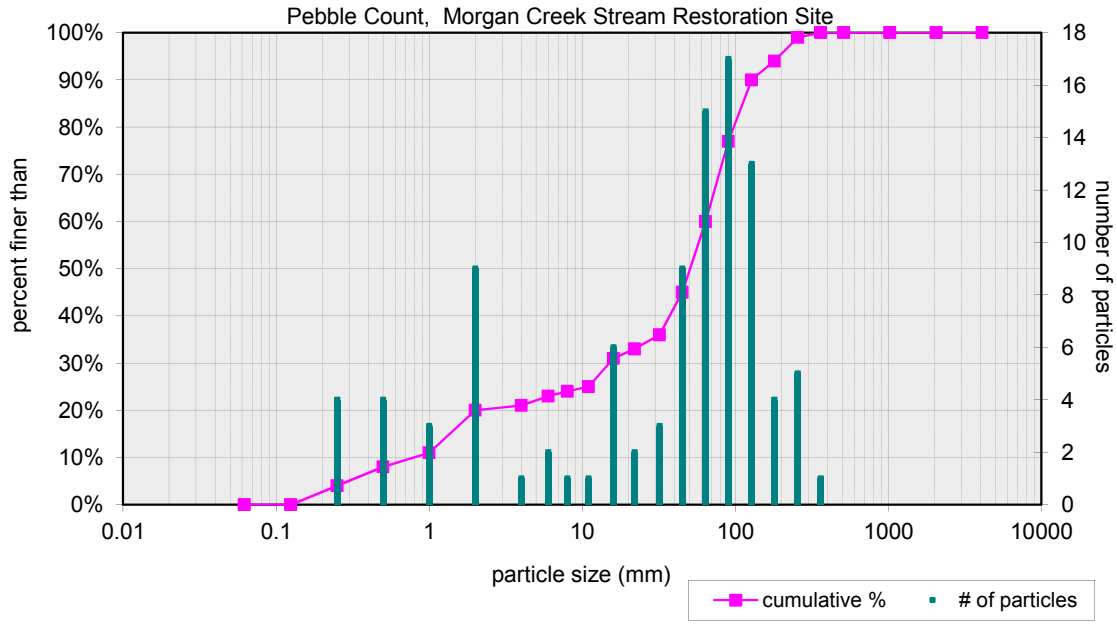
based on total count	percent by substrate type silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	2%	40%	39%	19%	0%	0%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count
silt/clay	0	0.062	
very fine sand	0.062	0.13	
fine sand	0.13	0.25	4
medium sand	0.25	0.5	4
coarse sand	0.5	1	3
very coarse sand	1	2	9
very fine gravel	2	4	1
fine gravel	4	6	2
fine gravel	6	8	1
medium gravel	8	11	1
medium gravel	11	16	6
coarse gravel	16	22	2
coarse gravel	22	32	3
very coarse gravel	32	45	9
very coarse gravel	45	64	15
small cobble	64	90	17
medium cobble	90	128	13
large cobble	128	180	4
very large cobble	180	256	5
small boulder	256	362	1
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
	total particle count:		100

bedrock			
clay hardpan			
detritus/wood			
artificial			
	total count:		100

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



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	1.470	28.24	50.6	71	109	193	18.3	12.6	8.6

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	20%	40%	39%	1%	0%	0%	0%	0%

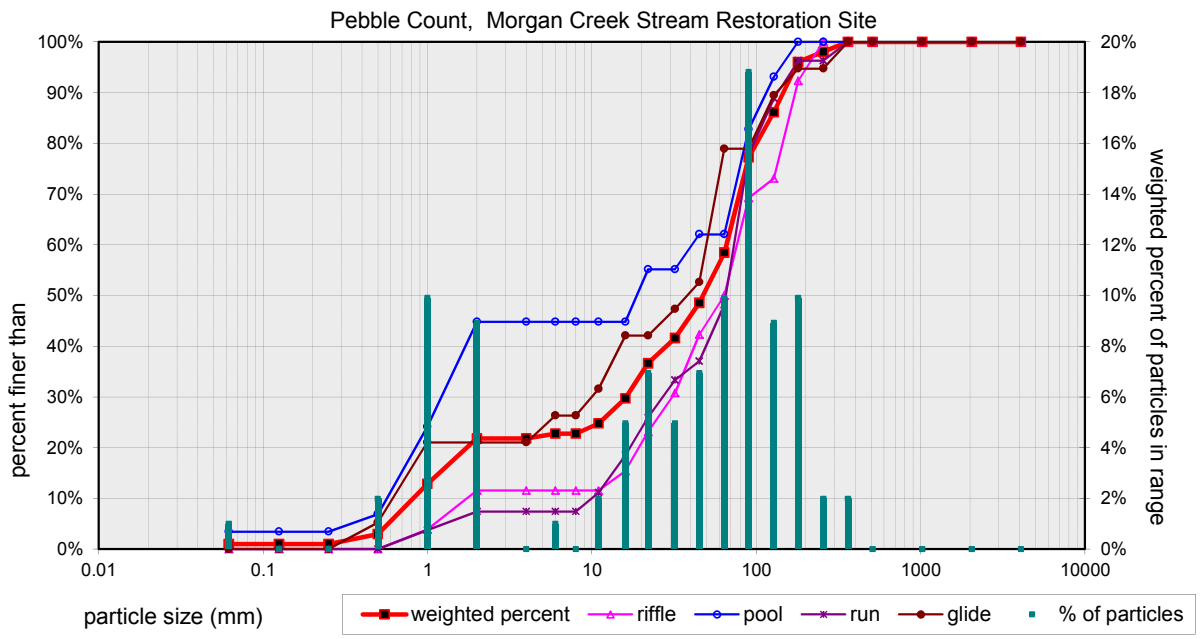
Pebble Count Weighted by Channel Feature

Percent Riffle:	26	Percent Run:	27
Percent Pool:	29	Percent Glide:	19

Material	Size Range (mm)		weighted
silt/clay	0	0.062	1.0
very fine sand	0.062	0.13	0.0
fine sand	0.13	0.25	0.0
medium sand	0.25	0.5	2.0
coarse sand	0.5	1	10.0
very coarse sand	1	2	9.0
very fine gravel	2	4	0.0
fine gravel	4	6	1.0
fine gravel	6	8	0.0
medium gravel	8	11	2.0
medium gravel	11	16	5.0
coarse gravel	16	22	7.0
coarse gravel	22	32	5.0
very coarse gravel	32	45	7.0
very coarse gravel	45	64	10.0
small cobble	64	90	19.0
medium cobble	90	128	9.0
large cobble	128	180	10.0
very large cobble	180	256	2.0
small boulder	256	362	2.0
small boulder	362	512	0.0
medium boulder	512	1024	0.0
large boulder	1024	2048	0.0
very large boulder	2048	4096	0.0
weighted particle count:			101.0

bedrock		0.0
clay hardpan		0.0
detritus/wood		0.0
artificial		0.0
weighted total count:		101

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



based on sediment particles only	size percent less than (mm) D16	D35	D50	D65	D84	D95	particle size distribution gradation	geo mean	std dev
	1.276	20.41	47.4	72	118	174	19.8	12.2	9.6

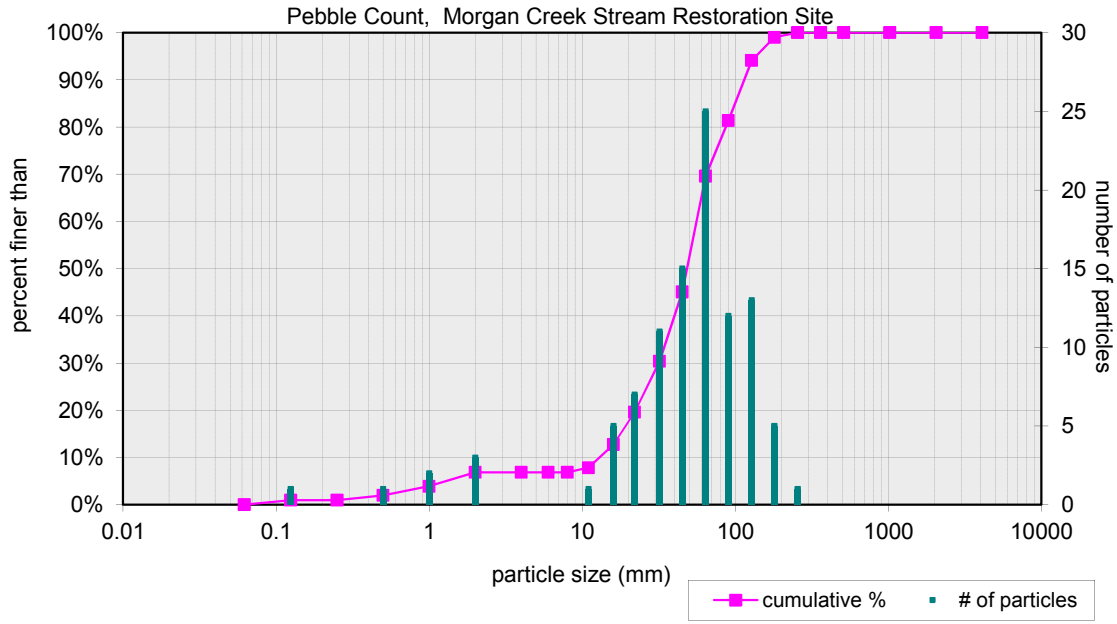
based on total count	percent by substrate type silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	1%	21%	37%	40%	2%	0%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count
silt/clay	0	0.062	
very fine sand	0.062	0.13	1
fine sand	0.13	0.25	
medium sand	0.25	0.5	1
coarse sand	0.5	1	2
very coarse sand	1	2	3
very fine gravel	2	4	
fine gravel	4	6	
fine gravel	6	8	
medium gravel	8	11	1
medium gravel	11	16	5
coarse gravel	16	22	7
coarse gravel	22	32	11
very coarse gravel	32	45	15
very coarse gravel	45	64	25
small cobble	64	90	12
medium cobble	90	128	13
large cobble	128	180	5
very large cobble	180	256	1
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
		total particle count:	102

bedrock		
clay hardpan		
detritus/wood		
artificial		
	total count:	102

Morgan Creek Stream Restoration Site
Haywood County, NC
Morgan Creek: Reach 4
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
	18.609	35.61	48.3	60	97	136	2.3	42.4	2.3

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	7%	63%	30%	0%	0%	0%	0%	0%

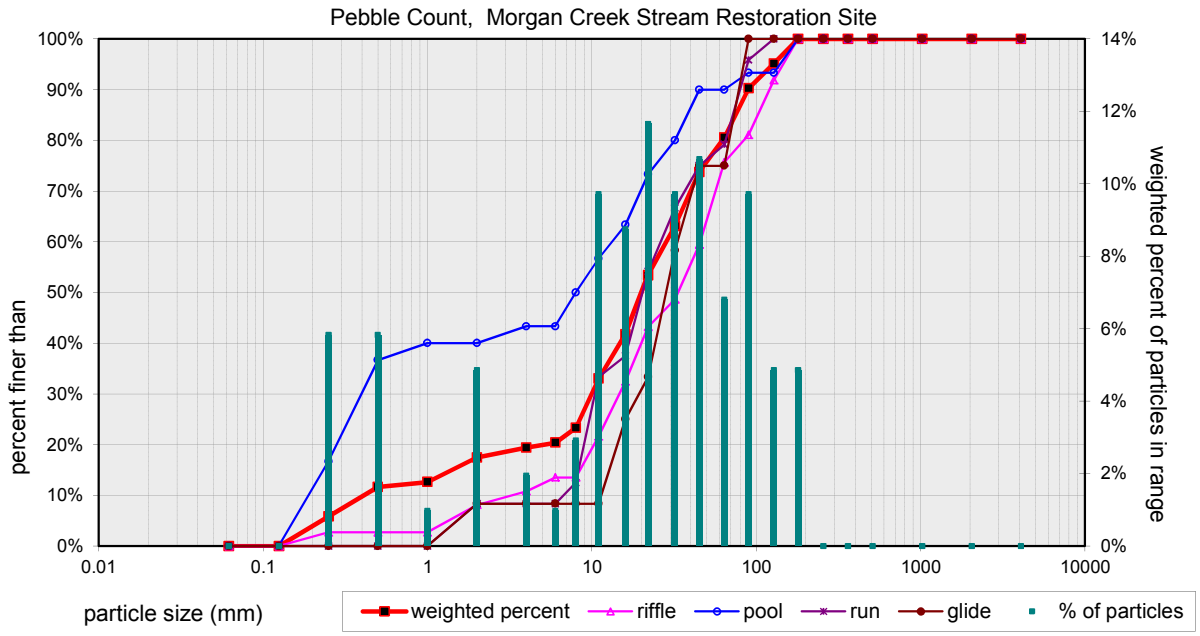
Pebble Count Weighted by Channel Feature

Percent Riffle:	37	Percent Run:	24
Percent Pool:	30	Percent Glide:	12

Material	Size Range (mm)		weighted
silt/clay	0	0.062	0.0
very fine sand	0.062	0.13	0.0
fine sand	0.13	0.25	6.0
medium sand	0.25	0.5	6.0
coarse sand	0.5	1	1.0
very coarse sand	1	2	5.0
very fine gravel	2	4	2.0
fine gravel	4	6	1.0
fine gravel	6	8	3.0
medium gravel	8	11	10.0
medium gravel	11	16	9.0
coarse gravel	16	22	12.0
coarse gravel	22	32	10.0
very coarse gravel	32	45	11.0
very coarse gravel	45	64	7.0
small cobble	64	90	10.0
medium cobble	90	128	5.0
large cobble	128	180	5.0
very large cobble	180	256	0.0
small boulder	256	362	0.0
small boulder	362	512	0.0
medium boulder	512	1024	0.0
large boulder	1024	2048	0.0
very large boulder	2048	4096	0.0
weighted particle count:			103.0

bedrock		0.0
clay hardpan		0.0
detritus/wood		0.0
artificial		0.0
weighted total count:		103

Morgan Creek Stream Restoration Site
Haywood County, NC
North Branch: Reach 1
Note: **Reach Data 5**



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	1.620	11.98	20.0	34	72	127	8.0	10.8	6.7

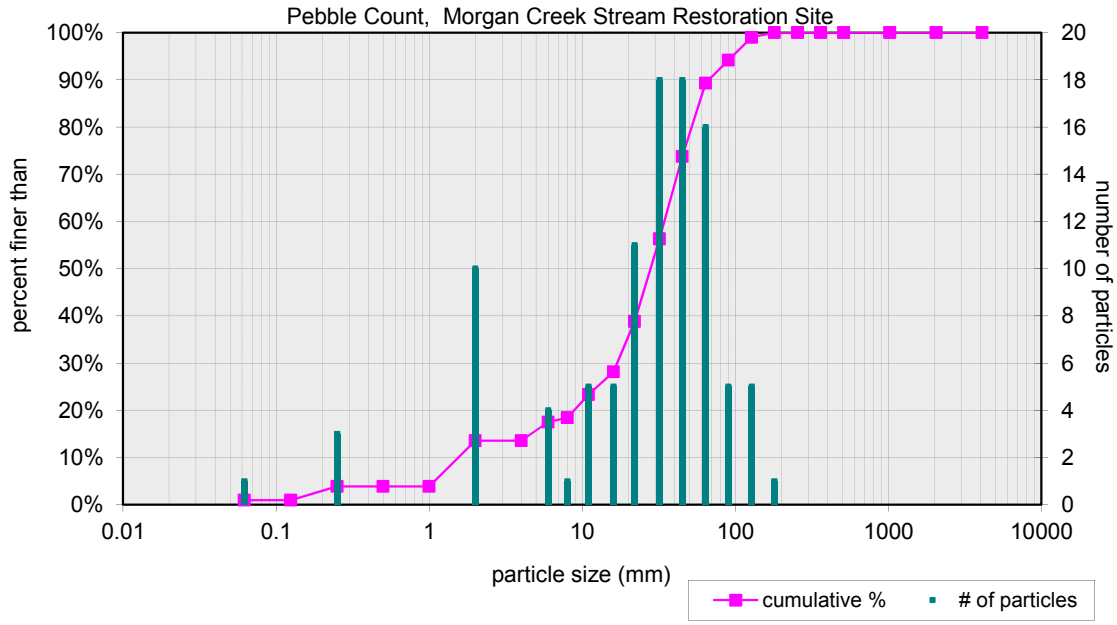
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	17%	63%	19%	0%	0%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count
silt/clay	0	0.062	1
very fine sand	0.062	0.13	
fine sand	0.13	0.25	3
medium sand	0.25	0.5	
coarse sand	0.5	1	
very coarse sand	1	2	10
very fine gravel	2	4	
fine gravel	4	6	4
fine gravel	6	8	1
medium gravel	8	11	5
medium gravel	11	16	5
coarse gravel	16	22	11
coarse gravel	22	32	18
very coarse gravel	32	45	18
very coarse gravel	45	64	16
small cobble	64	90	5
medium cobble	90	128	5
large cobble	128	180	1
very large cobble	180	256	
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
		total particle count:	103

bedrock		
clay hardpan		
detritus/wood		
artificial		
	total count:	103

	Morgan Creek Stream Restoration Site
	Haywood County, NC
	North Branch: Reach 1
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
	5.143	19.62	28.0	38	57	96	3.7	17.1	3.3

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	1%	13%	76%	11%	0%	0%	0%	0%	0%

Erosion Rate Calculations

Project:	1026-MRGN	Date:	9/18/2013
Stream:	Morgan Creek	Crew:	MM,CE,GG
Reach/Description:	1	Page: 1	Of: 8

Feature	Units							
Reach Name		1	2	3	4	5	6	
Station/Location		R1	R1	R1	R1	R1	R1	
Photo No.								
Reach Length	ft	100	100	10	100	100	100	
Bank	RT-LT-Both	Both	Both	RT	Both	Both	Both	
Bank Height	ft	1.2	1.2	1.2	1.2	1.2	1.2	
Bankfull Height	ft	1.2	1.2	1.2	1.2	1.2	1.2	
Root Depth	ft	0.4	0.4	0.4	0.5	0.5	0.5	
Root Density	%	90%	90%	80%	90%	90%	90%	
Bank Angle	Degrees	30	30	80	40	40	40	
Surface Protection	%	90%	80%	80%	90%	90%	90%	
Bank Material	C-G-S-SC	SC	SC	SC	SC	SC	SC	
Stratification	N-M-E	N	N	N	N	N	N	
Thalweg Position	C-OC-Toe	C	C	OC	C	C	C	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	No	No	No	No	No	No	
BEHI Calculation								
Bnk Ht / Bkf Ht		1.00	1.00	1.00	1.00	1.00	1.00	
BEHI Score		1.00	1.00	1.00	1.00	1.00	1.00	
Root Depth / Bnk Ht		0.33	0.33	0.33	0.42	0.42	0.42	
BEHI Score		6.00	6.00	6.00	5.00	5.00	5.00	
Bank Angle		30	30	80	40	40	40	
BEHI Score		2.50	2.50	6.00	3.00	3.00	3.00	
Surface Protection		90%	80%	80%	90%	90%	90%	
BEHI Score		0.86	1.71	1.71	0.86	0.86	0.86	
Bank Material Adjustment		0	0	0	0	0	0	
Stratification Adjustment		0	0	0	0	0	0	
Total BEHI Score		16.36	17.21	21.16	15.21	15.21	15.21	
Rating		Low	Low	Moderate	Low	Low	Low	
NBS Calculation								
Thalweg Position Score		1	1	1.5	1	1	1	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		0	0	0	0	0	0	
Total NBS Rating		1	1	1.5	1	1	1	
WARSS NBS Rating		1	1	2	1	1	1	
Rating		Very Low	Very Low	Low	Very Low	Very Low	Very Low	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.0	0.0	0.0	0.0	0.0	**Sheet Total**
Erosion Total (ft^3/yr)		0.1	0.1	0.4	0.1	0.1	0.1	1.0

Erosion Rate Calculations

Project:	1026-MRGN	Date:	9/18/2013
Stream:	Morgan Creek	Crew:	MM,CE,GG
Reach/Description:	1	Page: 2	Of: 8

Feature	Units							
Reach Name		7	8	9	10			
Station/Location		R1	R1 u/s xing	R1 d/s xing	R1			
Photo No.								
Reach Length	ft	100	100	100	100			
Bank	RT-LT-Both	Both	Both	Both	Both			
Bank Height	ft	1.2	1.2	1.2	1.2			
Bankfull Height	ft	1.2	1.2	1.2	1.2			
Root Depth	ft	0.5	0.5	0.4	0.4			
Root Density	%	80%	90%	80%	80%			
Bank Angle	Degrees	40	40	45	30			
Surface Protection	%	80%	90%	80%	80%			
Bank Material	C-G-S-SC	SC	SC	SC	SC			
Stratification	N-M-E	N	N	N	N			
Thalweg Position	C-OC-Toe	C	C	C	C			
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1			
Local Slope > Avg	Yes-No	No	No	No	No			
BEHI Calculation								
Bnk Ht / Bkf Ht		1.00	1.00	1.00	1.00			
BEHI Score		1.00	1.00	1.00	1.00			
Root Depth / Bnk Ht		0.42	0.42	0.33	0.33			
BEHI Score		5.00	5.00	6.00	6.00			
Bank Angle		40	40	45	30			
BEHI Score		3.00	3.00	3.25	2.50			
Surface Protection		80%	90%	80%	80%			
BEHI Score		1.71	0.86	1.71	1.71			
Bank Material Adjustment		0	0	0	0			
Stratification Adjustment		0	0	0	0			
Total BEHI Score		16.43	15.21	18.41	17.66			
Rating		Low	Low	Low	Low			
NBS Calculation								
Thalweg Position Score		1	1	1	1			
Toe Depth Ratio Score		0	0	0	0			
Local Slope Score		0	0	0	0			
Total NBS Rating		1	1	1	1	0	0	
WARSS NBS Rating		1	1	1	1			
Rating		Very Low	Very Low	Very Low	Very Low			
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.0	0.0	0.0			**Sheet Total**
Erosion Total (ft^3/yr)		0.1	0.1	0.1	0.1			0.5

Erosion Rate Calculations

Project:	1026-MRGN	Date:	9/18/2013
Stream:	Morgan Creek	Crew:	MM,CE,GG
Reach/Description:	2	Page: 3	Of: 8

Feature	Units							
Reach Name		11	12	13	14			
Station/Location		R2 d/s N br	R2	R2	R2			
Photo No.								
Reach Length	ft	100	100	100	40			
Bank	RT-LT-Both	Both	Both	Both	Both			
Bank Height	ft	1.3	1.3	1.3	1.3			
Bankfull Height	ft	1.3	1.3	1.3	1.3			
Root Depth	ft	0.5	0.5	0.5	0.3			
Root Density	%	80%	80%	80%	75%			
Bank Angle	Degrees	40	40	40	30			
Surface Protection	%	80%	80%	80%	75%			
Bank Material	C-G-S-SC	SC	SC	SC	SC			
Stratification	N-M-E	N	N	N	N			
Thalweg Position	C-OC-Toe	C	C	C	C			
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1			
Local Slope > Avg	Yes-No	No	No	No	No			
BEHI Calculation								
Bnk Ht / Bkf Ht		1.00	1.00	1.00	1.00			
BEHI Score		1.00	1.00	1.00	1.00			
Root Depth / Bnk Ht		0.38	0.38	0.38	0.23			
BEHI Score		5.38	5.38	5.38	7.23			
Bank Angle		40	40	40	30			
BEHI Score		3.00	3.00	3.00	2.50			
Surface Protection		80%	80%	80%	75%			
BEHI Score		1.71	1.71	1.71	2.14			
Bank Material Adjustment		0	0	0	0			
Stratification Adjustment		0	0	0	0			
Total BEHI Score		17.03	17.03	17.03	20.57			
Rating		Low	Low	Low	Moderate			
NBS Calculation								
Thalweg Position Score		1	1	1	1			
Toe Depth Ratio Score		0	0	0	0			
Local Slope Score		0	0	0	0			
Total NBS Rating		1	1	1	1	0	0	
WARSS NBS Rating		1	1	1	1			
Rating		Very Low	Very Low	Very Low	Very Low			
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.0	0.0	0.0			**Sheet Total**
Erosion Total (ft^3/yr)		0.1	0.1	0.1	0.9			1.3

Erosion Rate Calculations

Project:	1026-MRGN	Date:	9/18/2013
Stream:	Morgan Creek	Crew:	MM,CE,GG
Reach/Description:	3	Page: 4	Of: 8

Feature	Units							
Reach Name		15	16	17	18	19	20	
Station/Location		R3	R3	R3	R3	R3	R3	
Photo No.								
Reach Length	ft	150	150	100	100	100	150	
Bank	RT-LT-Both	Both	Both	Both	Both	Both	Both	
Bank Height	ft	1.3	1.3	1.3	1.3	1.3	1.3	
Bankfull Height	ft	1.3	1.3	1.3	1.3	1.3	1.3	
Root Depth	ft	0.5	0.4	0.5	0.5	0.5	0.4	
Root Density	%	80%	80%	80%	80%	80%	75%	
Bank Angle	Degrees	40	30	45	45	45	45	
Surface Protection	%	80%	80%	80%	80%	80%	75%	
Bank Material	C-G-S-SC	SC	SC	SC	SC	SC	SC	
Stratification	N-M-E	N	N	N	N	N	N	
Thalweg Position	C-OC-Toe	C	C	C	C	C	C	
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1	<1	<1	<1	
Local Slope > Avg	Yes-No	No	No	No	No	No	No	
BEHI Calculation								
Bnk Ht / Bkf Ht		1.00	1.00	1.00	1.00	1.00	1.00	
BEHI Score		1.00	1.00	1.00	1.00	1.00	1.00	
Root Depth / Bnk Ht		0.38	0.31	0.38	0.38	0.38	0.31	
BEHI Score		5.38	6.31	5.38	5.38	5.38	6.31	
Bank Angle		40	30	45	45	45	45	
BEHI Score		3.00	2.50	3.25	3.25	3.25	3.25	
Surface Protection		80%	80%	80%	80%	80%	75%	
BEHI Score		1.71	1.71	1.71	1.71	1.71	2.14	
Bank Material Adjustment		0	0	0	0	0	0	
Stratification Adjustment		0	0	0	0	0	0	
Total BEHI Score		17.03	18.24	17.28	17.28	17.28	19.62	
Rating		Low	Low	Low	Low	Low	Moderate	
NBS Calculation								
Thalweg Position Score		1	1	1	1	1	1	
Toe Depth Ratio Score		0	0	0	0	0	0	
Local Slope Score		0	0	0	0	0	0	
Total NBS Rating		1	1	1	1	1	1	
WARSS NBS Rating		1	1	1	1	1	1	
Rating		Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.0	0.0	0.0	0.0	0.0	**Sheet Total**
Erosion Total (ft^3/yr)		0.2	0.2	0.1	0.1	0.1	3.3	4.1

Erosion Rate Calculations

Project:	1026-MRGN	Date:	9/18/2013
Stream:	Morgan Creek	Crew:	MM,CE,GG
Reach/Description:	3	Page: 5	Of: 8

Feature	Units							
Reach Name		21	22	23				
Station/Location		R3	R3	R3				
Photo No.								
Reach Length	ft	200	200	200				
Bank	RT-LT-Both	Both	Both	Both				
Bank Height	ft	1.3	1.3	1.3				
Bankfull Height	ft	1.3	1.3	1.3				
Root Depth	ft	0.5	0.5	0.5				
Root Density	%	80%	80%	80%				
Bank Angle	Degrees	45	45	35				
Surface Protection	%	80%	80%	80%				
Bank Material	C-G-S-SC	SC	SC	SC				
Stratification	N-M-E	N	N	N				
Thalweg Position	C-OC-Toe	C	C	C				
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1				
Local Slope > Avg	Yes-No	No	No	No				
BEHI Calculation								
Bnk Ht / Bkf Ht		1.00	1.00	1.00				
BEHI Score		1.00	1.00	1.00				
Root Depth / Bnk Ht		0.38	0.38	0.38				
BEHI Score		5.38	5.38	5.38				
Bank Angle		45	45	35				
BEHI Score		3.25	3.25	2.75				
Surface Protection		80%	80%	80%				
BEHI Score		1.71	1.71	1.71				
Bank Material Adjustment		0	0	0				
Stratification Adjustment		0	0	0				
Total BEHI Score		17.28	17.28	16.78				
Rating		Low	Low	Low				
NBS Calculation								
Thalweg Position Score		1	1	1				
Toe Depth Ratio Score		0	0	0				
Local Slope Score		0	0	0				
Total NBS Rating		1	1	1	0	0	0	
WARSS NBS Rating		1	1	1				
Rating		Very Low	Very Low	Very Low				
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.0	0.0				**Sheet Total**
Erosion Total (ft^3/yr)		0.3	0.3	0.3				0.8

Erosion Rate Calculations

Project:	1026-MRGN	Date:	9/18/2013
Stream:	Morgan Creek	Crew:	MM,CE,GG
Reach/Description:	4	Page: 6	Of: 8

Feature	Units							
Reach Name		24						
Station/Location		R4						
Photo No.								
Reach Length	ft	140						
Bank	RT-LT-Both	Both						
Bank Height	ft	1.3						
Bankfull Height	ft	1.3						
Root Depth	ft	0.5						
Root Density	%	80%						
Bank Angle	Degrees	35						
Surface Protection	%	80%						
Bank Material	C-G-S-SC	SC						
Stratification	N-M-E	N						
Thalweg Position	C-OC-Toe	C						
D_{TOE}/D_{MEAN}	<1 or >1	<1						
Local Slope > Avg	Yes-No	No						
BEHI Calculation								
Bnk Ht / Bkf Ht		1.00						
BEHI Score		1.00						
Root Depth / Bnk Ht		0.38						
BEHI Score		5.38						
Bank Angle		35						
BEHI Score		2.75						
Surface Protection		80%						
BEHI Score		1.71						
Bank Material Adjustment		0						
Stratification Adjustment		0						
Total BEHI Score		16.78						
Rating		Low						
NBS Calculation								
Thalweg Position Score		1						
Toe Depth Ratio Score		0						
Local Slope Score		0						
Total NBS Rating		1	0	0	0	0	0	
WARSS NBS Rating		1						
Rating		Very Low						
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0						**Sheet Total**
Erosion Total (ft^3/yr)		0.2						0.2

Erosion Rate Calculations

Project:	1026-MRGN	Date:	9/18/2013
Stream:	Morgan Creek	Crew:	MM,CE,GG
Reach/Description:	5	Page: 7	Of: 8

Feature	Units							
Reach Name		25						
Station/Location		R5						
Photo No.								
Reach Length	ft	150						
Bank	RT-LT-Both	Both						
Bank Height	ft	1.3						
Bankfull Height	ft	1.3						
Root Depth	ft	0.5						
Root Density	%	80%						
Bank Angle	Degrees	35						
Surface Protection	%	80%						
Bank Material	C-G-S-SC	SC						
Stratification	N-M-E	N						
Thalweg Position	C-OC-Toe	C						
D_{TOE}/D_{MEAN}	<1 or >1	<1						
Local Slope > Avg	Yes-No	No						
BEHI Calculation								
Bnk Ht / Bkf Ht		1.00						
BEHI Score		1.00						
Root Depth / Bnk Ht		0.38						
BEHI Score		5.38						
Bank Angle		35						
BEHI Score		2.75						
Surface Protection		80%						
BEHI Score		1.71						
Bank Material Adjustment		0						
Stratification Adjustment		0						
Total BEHI Score		16.78						
Rating		Low						
NBS Calculation								
Thalweg Position Score		1						
Toe Depth Ratio Score		0						
Local Slope Score		0						
Total NBS Rating		1	0	0	0	0	0	
WARSS NBS Rating		1						
Rating		Very Low						
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0						**Sheet Total**
Erosion Total (ft^3/yr)		0.2						0.2

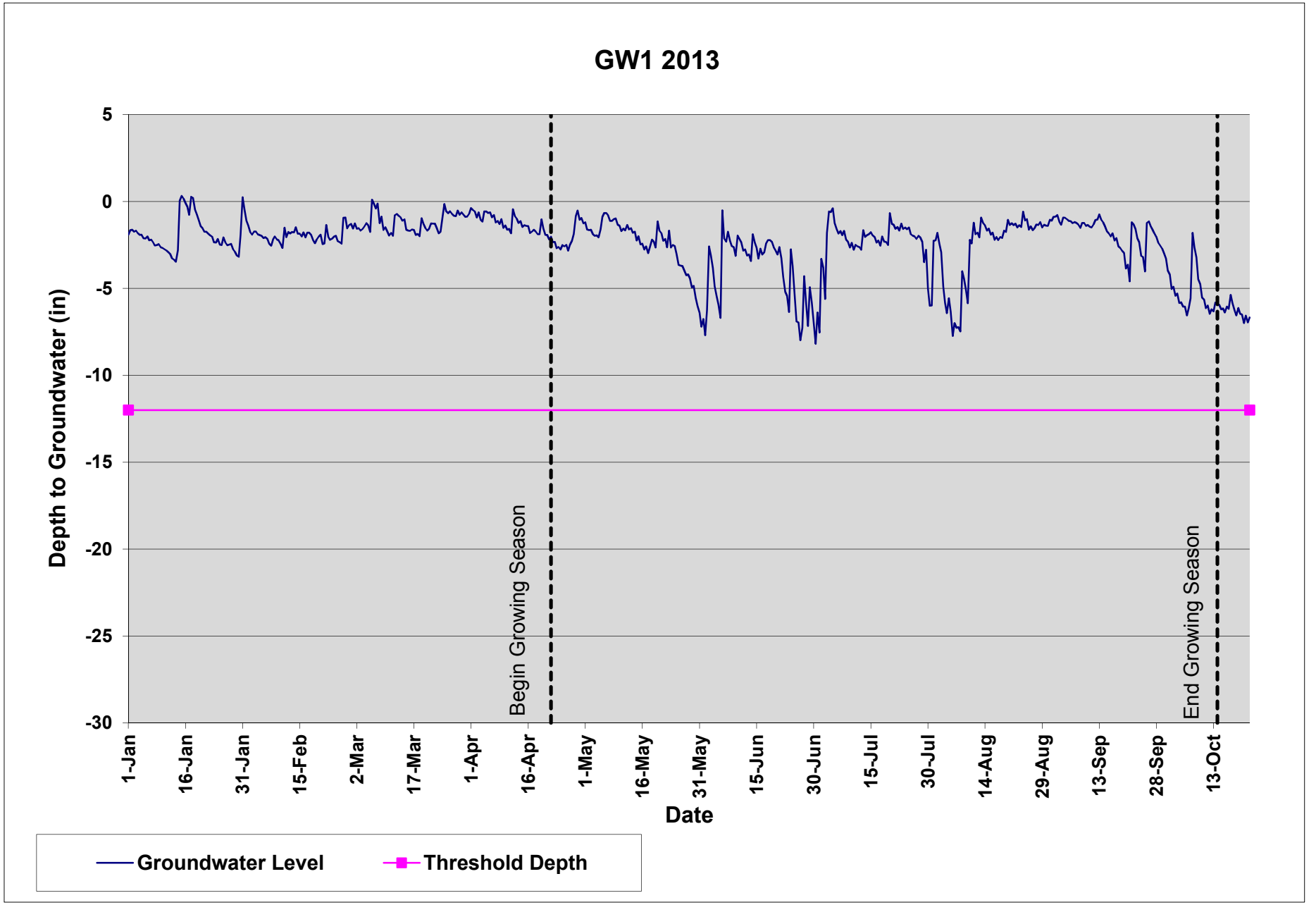
Erosion Rate Calculations

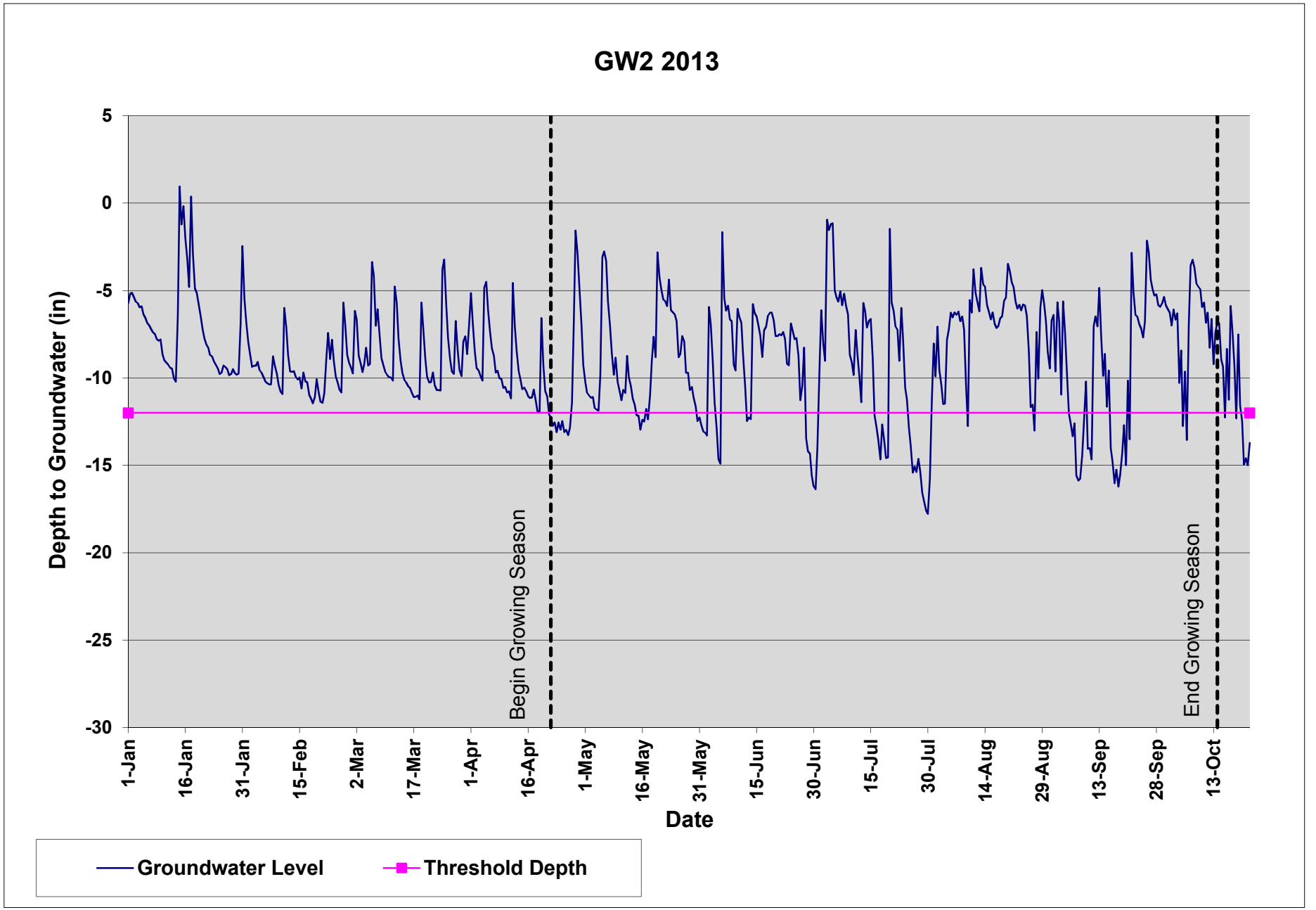
Project:	1026-MRGN	Date:	9/18/2013
Stream:	N.Branch	Crew:	MM,CE,GG
Reach/Description:		Page: 8	Of: 8

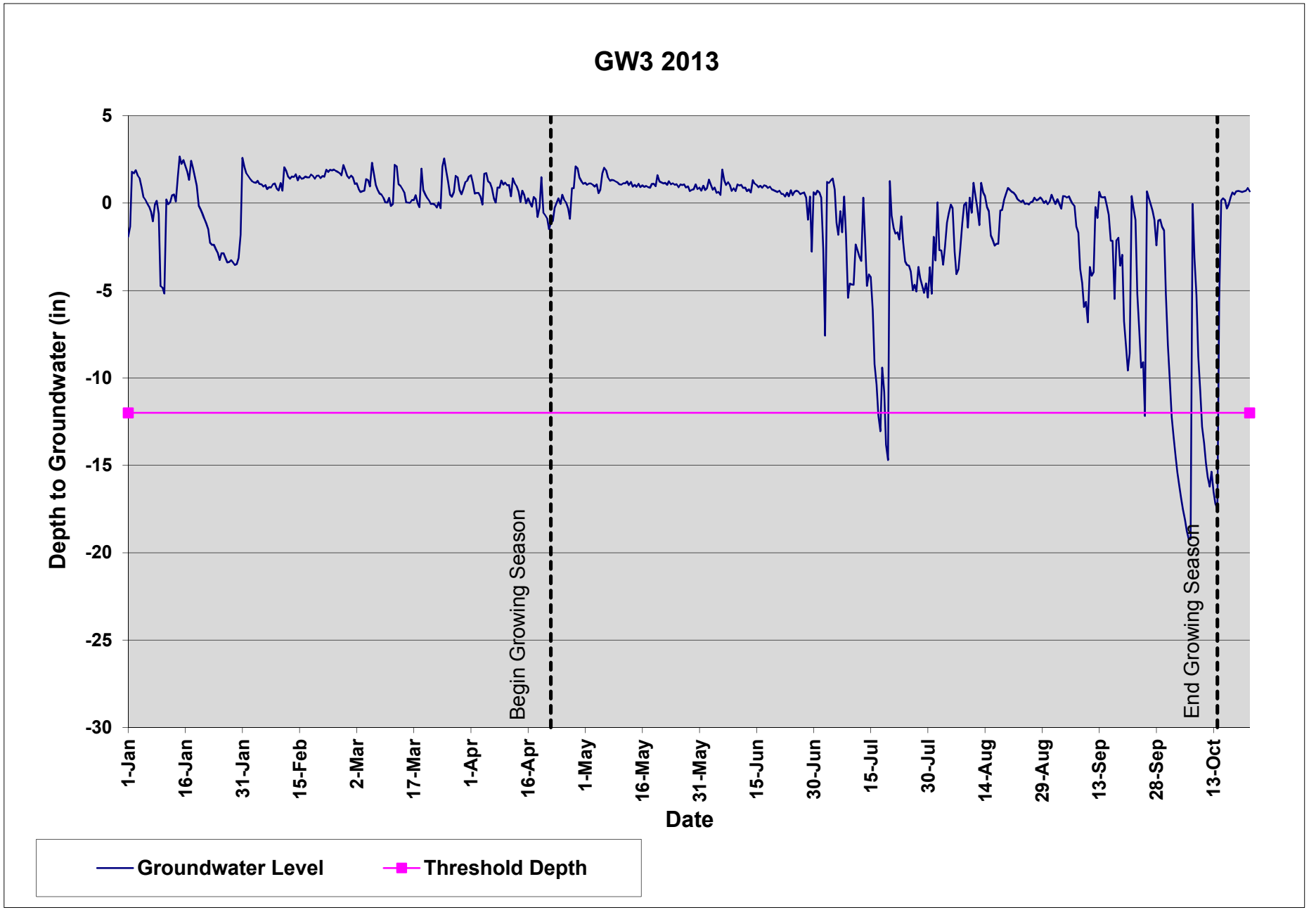
Feature	Units							
Reach Name		26	27	28				
Station/Location		N Branch	N Branch	N Branch				
Photo No.								
Reach Length	ft	100	100	100				
Bank	RT-LT-Both	Both	Both	Both				
Bank Height	ft	0.7	0.7	0.7				
Bankfull Height	ft	0.7	0.7	0.7				
Root Depth	ft	0.5	0.5	0.5				
Root Density	%	80%	80%	80%				
Bank Angle	Degrees	35	35	35				
Surface Protection	%	80%	80%	80%				
Bank Material	C-G-S-SC	SC	SC	SC				
Stratification	N-M-E	N	N	N				
Thalweg Position	C-OC-Toe	C	C	C				
D_{TOE}/D_{MEAN}	<1 or >1	<1	<1	<1				
Local Slope > Avg	Yes-No	No	No	No				
BEHI Calculation								
Bnk Ht / Bkf Ht		1.00	1.00	1.00				
BEHI Score		1.00	1.00	1.00				
Root Depth / Bnk Ht		0.71	0.71	0.71				
BEHI Score		2.93	2.93	2.93				
Bank Angle		35	35	35				
BEHI Score		2.75	2.75	2.75				
Surface Protection		80%	80%	80%				
BEHI Score		1.71	1.71	1.71				
Bank Material Adjustment		0	0	0				
Stratification Adjustment		0	0	0				
Total BEHI Score		12.06	12.06	12.06				
Rating		Low	Low	Low				
NBS Calculation								
Thalweg Position Score		1	1	1				
Toe Depth Ratio Score		0	0	0				
Local Slope Score		0	0	0				
Total NBS Rating		1	1	1	0	0	0	
WARSS NBS Rating		1	1	1				
Rating		Very Low	Very Low	Very Low				
Erosion Rate Prediction								
NC or CO		NC						
Erosion Rate (ft/yr)		0.0	0.0	0.0				**Sheet Total**
Erosion Total (ft^3/yr)		0.1	0.1	0.1				0.2

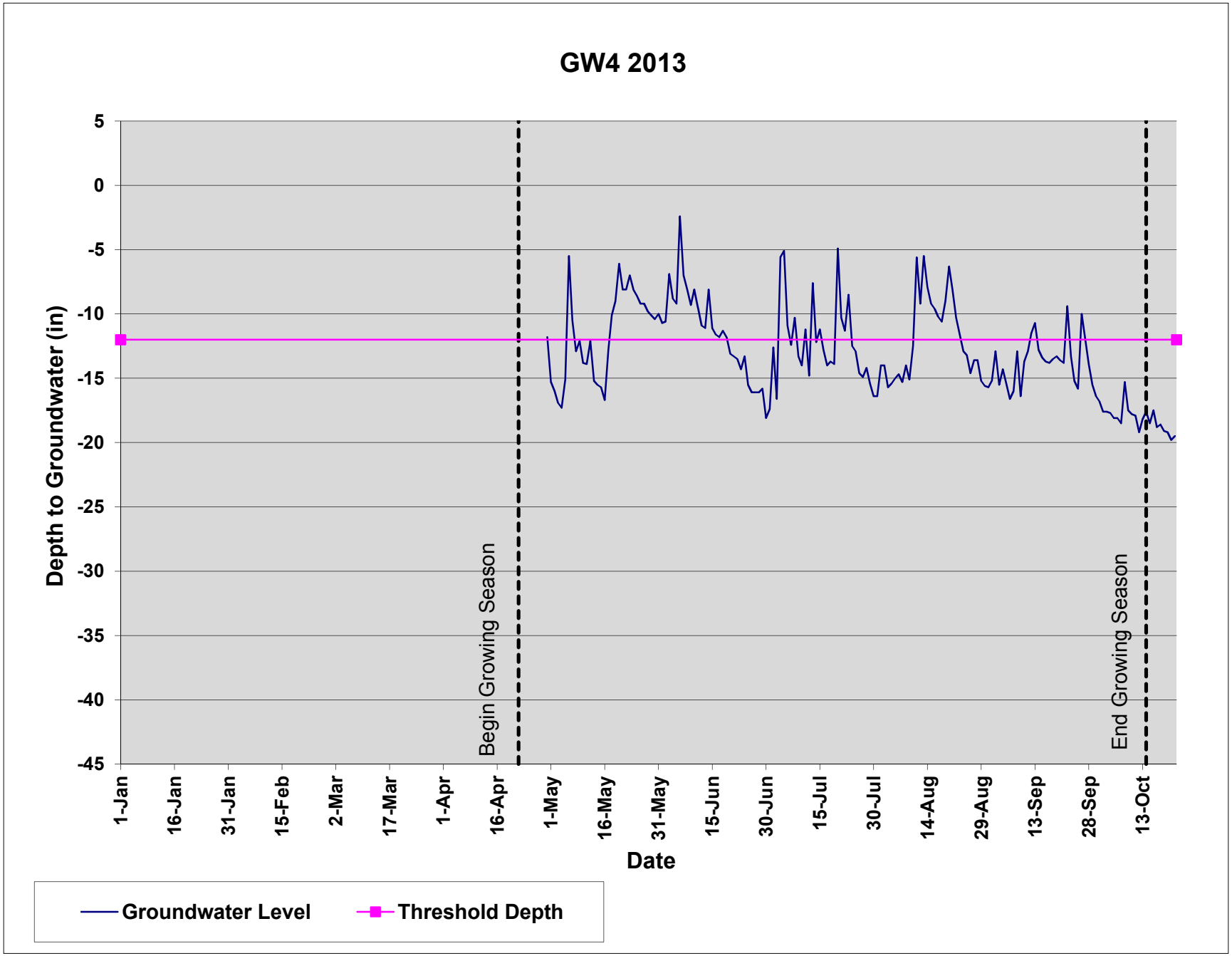
APPENDIX D

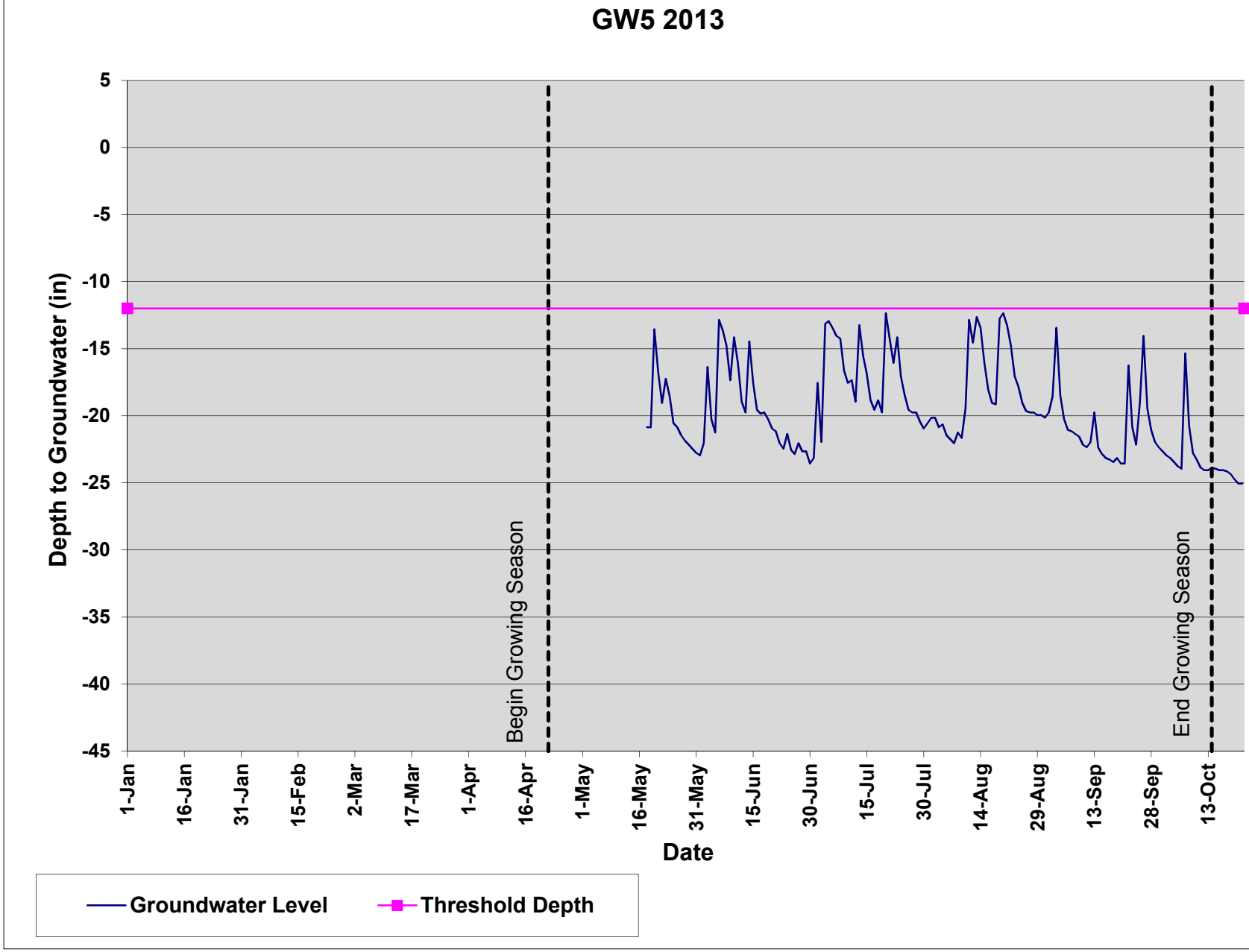
WETLAND RAW DATA

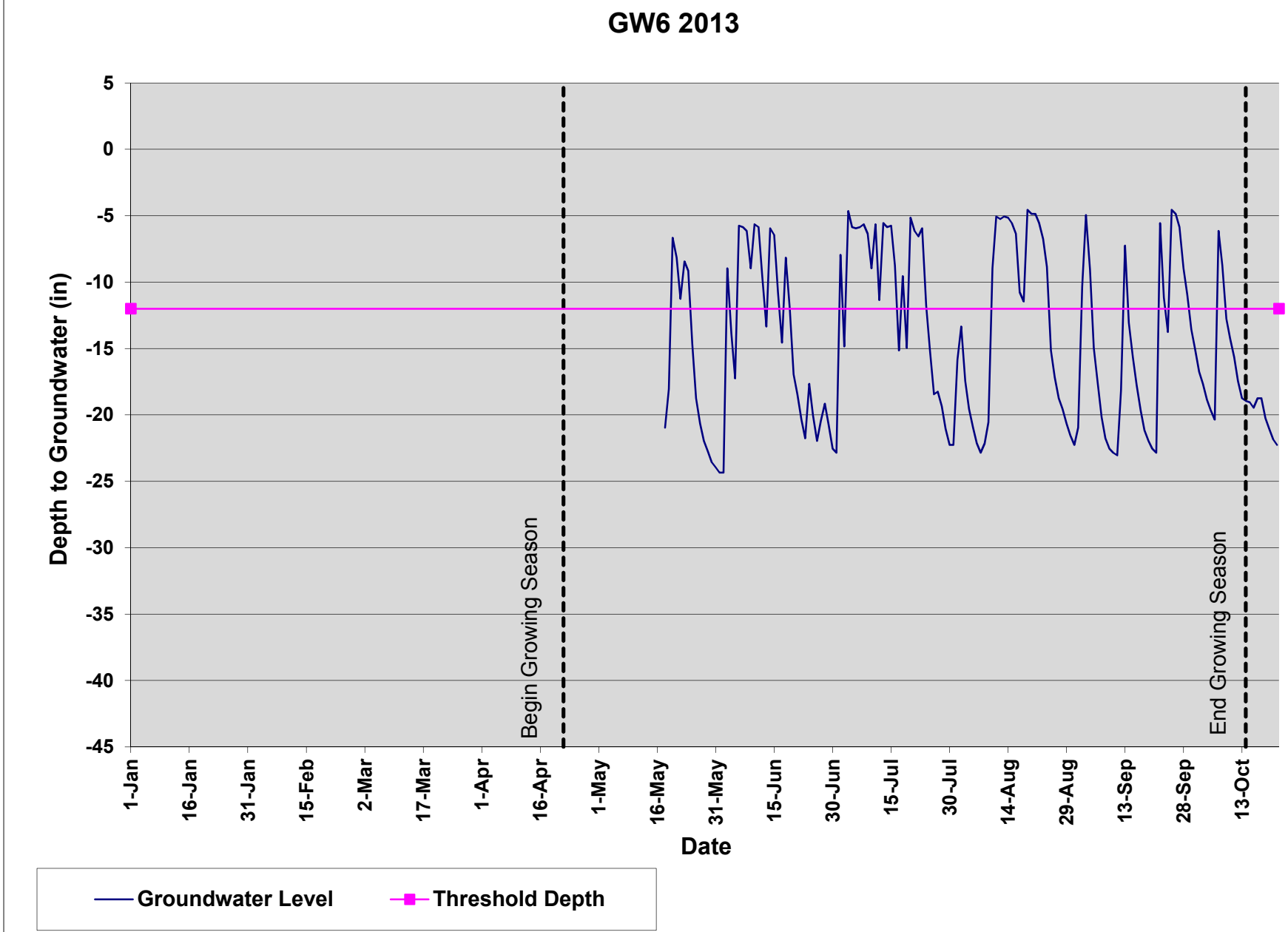

GW1 2013
Depth to Groundwater (in)
5
0
-5
-10
-15
-20
-25
-30
Begin Growing Season
End Growing Season
1-Jan
16-Jan
31-Jan
15-Feb
2-Mar
17-Mar
1-Apr
16-Apr
1-May
16-May
31-May
15-Jun
30-Jun
15-Jul
30-Jul
14-Aug
29-Aug
13-Sep
28-Sep
13-Oct
Date
Groundwater Level
Threshold Depth


GW2 2013
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
Date
Groundwater Level
Threshold Depth


GW3 2013
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
Date
Groundwater Level
Threshold Depth


GW4 2013
Depth to Groundwater (in)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
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
Date
Groundwater Level
Threshold Depth


GW5 2013
Depth to Groundwater (in)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
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
Date
Groundwater Level
Threshold Depth


GW6 2013
Depth to Groundwater (in)
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
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
Begin Growing Season
End Growing Season
Date
Groundwater Level
Threshold Depth