Holly Grove Stream Restoration Site

Guilford County, North Carolina
Cataloging Unit: 03030002
EEP Contract #: D06028-B
November 11, 2010

MONITORING REPORT 2010 (YEAR 2)

Submitted to:
North Carolina Department of Environment and Natural Resources
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Submitted by:
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MONITORING REPORT 2010 (YEAR 2)

Prepared for:

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Prepared by:

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EXECUTIVE SUMMARY

The Holly Grove Site is located in Guilford County, North Carolina within the Cape Fear River Basin, Cataloging Unit 03030002. The project consisted of restoring, enhancing, and preserving approximately 21,000 linear feet of stream, restoring approximately 42 acres of riparian buffers, and preserving approximately 1.11 acres of wetlands. The Site is in a rural setting in the Southern Outer Piedmont hydrophysiographic ecoregion and was previously used to grow row crops 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. Restoration practices on this project were implemented with the intent of minimizing unnecessary disturbance to adjacent land and to protect mature riparian vegetation where it existed. The constructed stream profile has restored stable bed morphology including appropriate riffle-pool sequencing. 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. Biodegradable fiber matting was used to provide temporary stabilization on 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 completion of the construction in October of 2008, the Site has been subjected to one greater-than-bankfull event and at least three bankfull or near-bankfull events. It should be noted that, prior to completion of construction, Tropical Storm Fay (August 2008) produced a high-flow event in which floodwaters crested 2.5 feet above bankfull. Approximately seventy percent (70%) of the project was complete at that time and subjected to this high water event. In late September, 2010, Tropical Storm Nicole resulted in 3 and 4.5 inches of rain on the site and over-bankfull flows.

Stream
The restored stream reaches have successfully managed the high-flow events of the first two years. Visual inspection of the Site following the greater-than-bankfull event in August of 2008, the bankfull event in June of 2009, and the near-bankfull event in September of 2010 revealed no noticeable adjustments in the bed or banks. The overall grade of the channel has been maintained and the banks of the channels are intact throughout the Site.

Vegetation
Native woody and herbaceous species were used to establish, at minimum, a fifty-foot riparian buffer on each side of the restored reach. Herbaceous species have successfully established throughout the entire site. The riparian buffer bare-root planting had an overall survival rate of 67% through the second year and showed significant evidence of additional volunteer species becoming established. In general, herbaceous planting resulted in vigorous growth throughout the site.

Planned Action

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

1.0 PROJECT GOALS, BACKGROUND, AND ATTRIBUTES

The purpose of the Holly Grove Stream Restoration Site (Site) was to restore degraded sections of Buckhorn Creek and several of its tributaries located in Guilford 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

Buckhorn Creek is located approximately 15 miles northeast of the City of Greensboro in rural Guilford County, North Carolina (Figure 1: Vicinity Map). The site consists of approximately 42 acres of floodplain, approximately 21,000 linear feet of stream designated as Buckhorn Creek and its tributaries, and 1.11 acres of existing wetlands (Figure 2: Project Map). The stream reaches consist of perennial, 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 row crops. The site is located within moderately sloping colluvial valleys and elevations range from approximately 615 to 720 feet above sea level. Past land management activities have consisted of timber harvesting with subsequent land clearing for agricultural uses including cattle and row crop farming. 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 Haw River watershed of the Cape Fear River Basin (United States Geological Survey (USGS) 14-digit Hydrologic Unit 03030002020070) within North Carolina Division of Water Quality (NCDWQ) sub-basin 03-06-02. This sub-basin is primarily rural agriculture, although residential land use accounts for a significant portion. Buckhorn Creek drains into Reedy Fork Creek approximately ¾ miles downstream of the Site, which in turn flows to the Haw River eight miles downstream.

1.1.2 NCDWQ Surface Water Classification

Reedy Fork Creek in the vicinity of the Site is assigned a best usage classification of C, NSW 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. The supplemental classification, NSW (Nutrient Sensitive Waters) includes areas with water quality problems associated with excessive plant growth resulting from nutrient enrichment.

The portion of Reedy Fork Creek to which Buckhorn Creek drains and the portion of the Haw River that is approximately two miles east of the Site are listed on the DWQ final

2004 and draft 2006 303(d) lists. Streams which are included in the 303(d) list do not meet water quality standards or have impaired uses.

1.2 Project Goals and Objectives

The primary goals of the Holly Grove Stream Restoration Project are to:

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

These goals will be accomplished through the following objectives:

- Restoration of approximately forty-two acres of Mesic Mixed Hardwood Forest along both sides of Buckhorn Creek and its tributaries.
- Removing nonpoint sources of pollution associated with agricultural activities including the establishment of a native woody riparian buffer (at least 50' wide) adjacent to streams and wetlands to treat surface runoff which may be laden with sediment and/or agricultural pollutants from the adjacent landscape.
- Reestablishing stream stability and the capacity to transport watershed flows and sediment loads by restoring a stable dimension, pattern, and profile supported by natural in-stream habitat and grade/bank stabilization structures.
- Promoting floodwater attenuation through a) conveying bankfull stream flows through construction of bankfull bench, b) restoring secondary, entrenched tributaries thereby reducing floodwater velocities, and c) 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 fringe and forest edge.

These accomplishments will result in:

- Restoration and enhancement of **15,822** Stream Mitigation Units.
- Protecting the Site with a perpetual conservation easement.

1.3 Project Structure

The project is composed of seven distinct reaches; the main channel, Buckhorn Creek, and each of its tributaries, Middle Branch, West Branch, East Branch, Lower East Branch, Southeast Creek, and Southwest Creek. The project structure is tabulated in the corresponding Table 1 (See Below).

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,

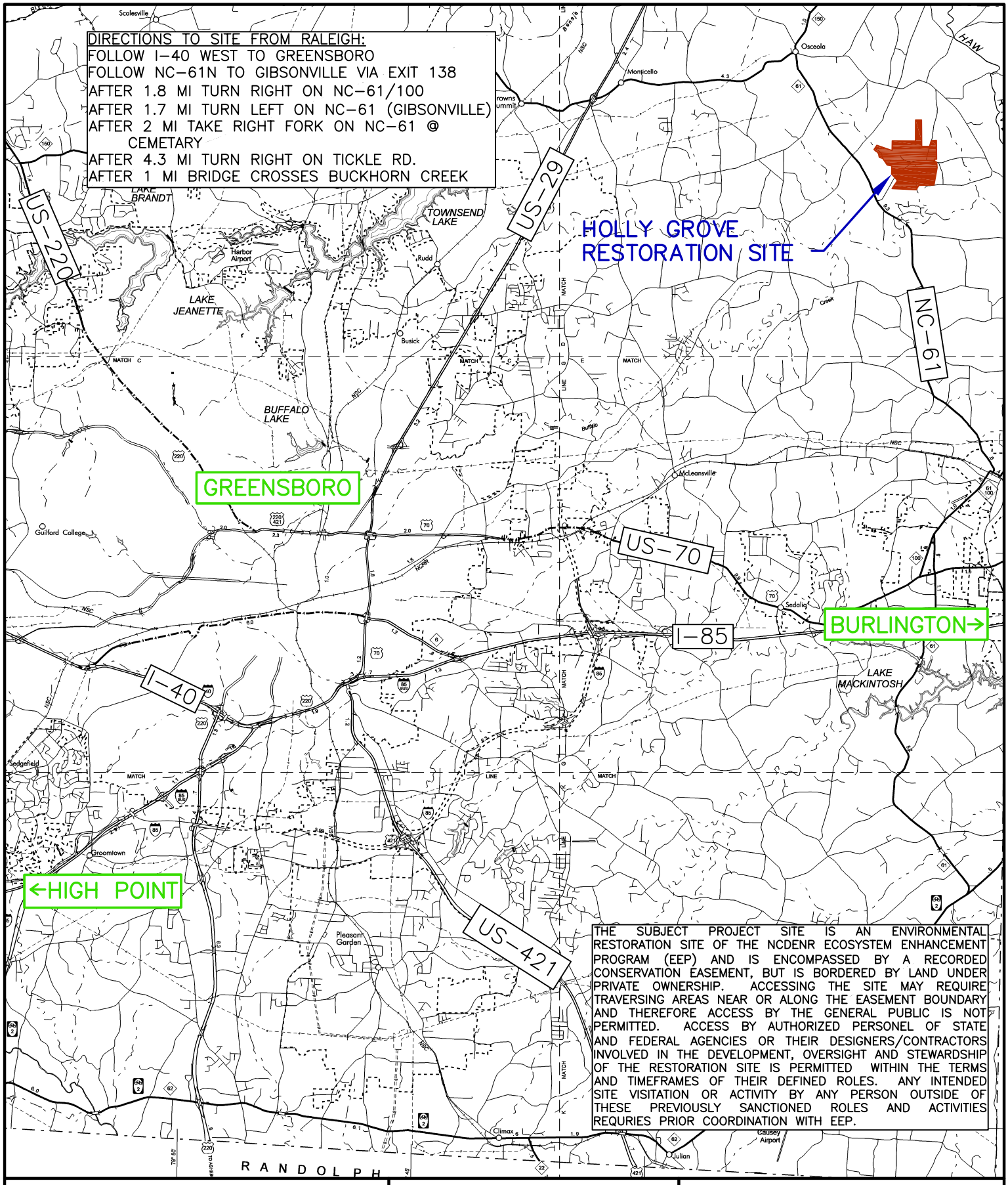
consideration was given to which reaches could best be served by maintaining as much of the existing channel pattern as possible.

The proposed channels of Buckhorn Creek and its tributaries were designed as Type B4c streams with the exception of the lower reach of Middle Branch. This channel configuration provides the most stable and natural form in the moderately sloping colluvial valleys that are found throughout the Site. Not only does it effectively convey bankfull discharge and sediment load but also conforms to the natural conveyance of flood flows. Additionally, since broad alluvial valleys are generally not found within the Site, the lower sinuosity of the Type B4c streams allowed for minimization grading and earthwork activities. The constructed channel dimensions, patterns, and profiles were based on hydraulic relationships and morphologic dimensionless ratios of the reference reaches.

Restoration activities included restoring stable channel morphology supported by natural in-stream habitat and grade/bank stabilization structures, the elimination of accelerated bank erosion, and reestablishment of native riparian buffers at least 50 feet in width. Exotic riparian vegetation was removed in areas of the project to allow for replanting of native riparian species. In-stream structures were installed to provide for enhanced aquatic habitat, protection of the newly constructed stream banks, and grade control for the newly constructed channel.

1.5 Project History, Contacts and Attribute Data

The summary of the project history, contacts, and attribute data is tabulated in Tables II, III, and IV (See Below).



PREPARED FOR: Ecosystem Enhancement Program

PREPARED BY: Restoration Systems, LLC

AND BY: Wolf Creek Engineering

SCALE

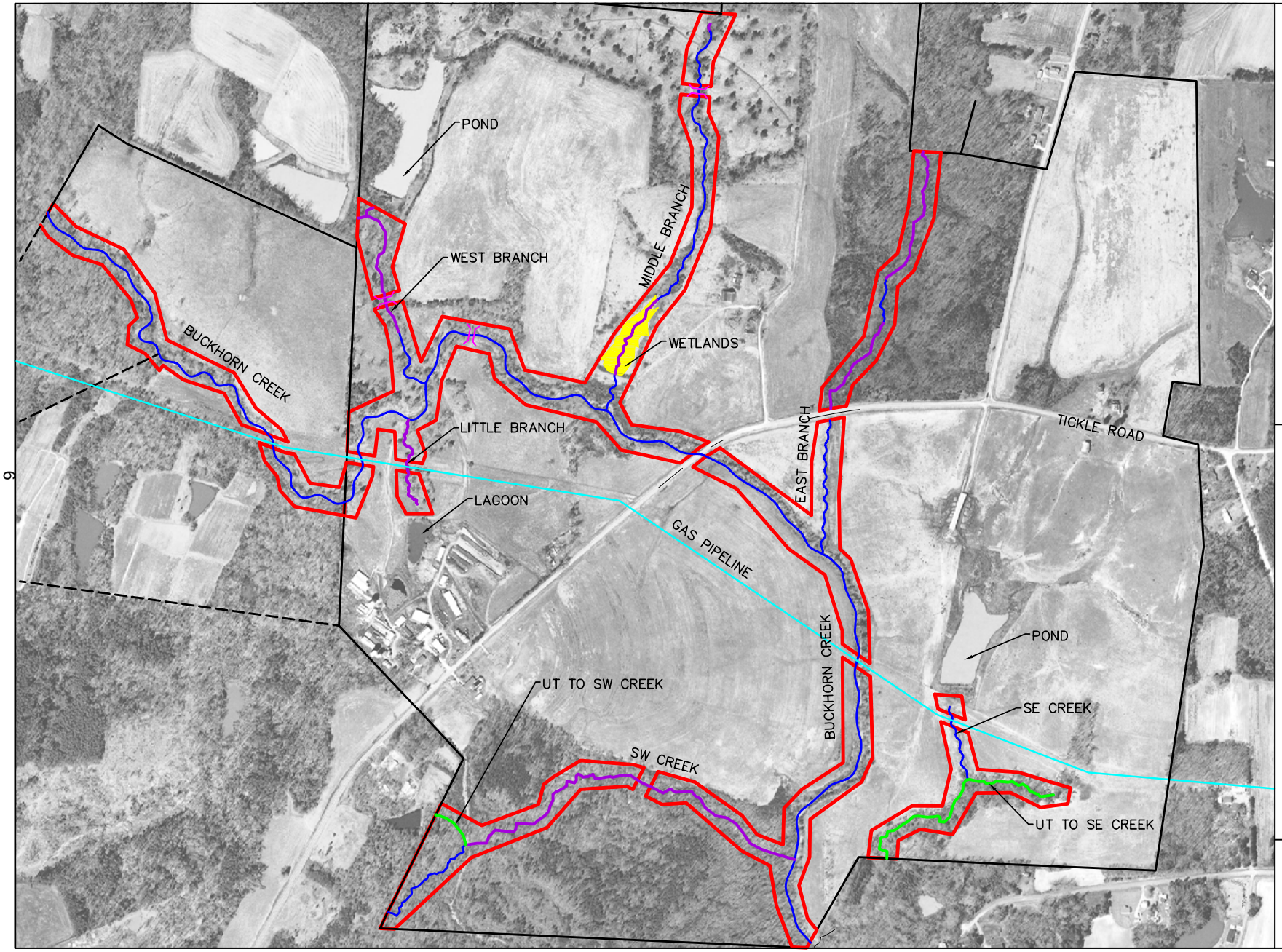
1/2 0 1 3

MILES

SITE VICINITY MAP

HOLLY GROVE RESTORATION SITE
GUILFORD COUNTY, NORTH CAROLINA
EEP Contract #: D06028-B

FIGURE 1



PREPARED FOR:

Ecosystem Enhancement

PREPARED BY:

RESTORATION SYSTEMS, LLC

AND BY:

Wolf Creek ENGINEERING

LEGEND

- STREAM RESTORATION
- STREAM PRESERVATION
- STREAM ENHANCEMENT
- WETLANDS
- FORD
- CONSERVATION EASEMENT
- PROPERTY BOUNDARY
- GAS PIPELINE

SCALE

200 0 200 400 600 800

FEET

SITE MAP

HOLLY GROVE RESTORATION SITE
GUILFORD COUNTY, NORTH CAROLINA
EEP Contract #: D06028-B

FIGURE 2

9

Table I Project Components
Holly Grove Stream Restoration Site / EEP Contact #D06028-B

Restoration Reach/Area	Restoration Level	Approach	Pre-Restoration LF or AC	Post-Restoration LF or AC	Station Range/Location	Comments
Buckhorn Creek	R	P2	8,757	8,848	100+00 - 194+50	
West Branch	E2	E2	870	870	300+00 - 308+00	
West Branch	R	P2	390	391	300+00 - 303+91	
Middle Branch	E2	E2	240	240	398+91 - 401+31	
Middle Branch	R	P1	1,549	1,561	401+31 - 417+37	
Middle Branch	E2	E2	472	472	417+37 - 422+09	
Middle Branch	R	P1	90	194	423+00 - 425+40	
East Branch	P	-	960	960	480+00 - 498+80	
East Branch	E2	E2	920	920	480+00 - 498+80	
East Branch	R	P1	300	329	490+00 - 493+29	
East Branch	R	P1	739	761	500+00 - 507+61	
Little Branch	E2	E2	553	553	19+945 - 205+54	
SW Creek	R	P1	723	723	600+00 - 607+34	
SW Creek	E2	E2	2,229	2,229	608+26 - 630+55	
UT to SW Creek	P	-	325	325	650+00 - 653+50	
SE Creek	R	P1	342	363	700+00 - 704+36	
SE Creek	P	-	881	881	706+25 - 715+06	
UT to SE Creek	P	-	528	528	750+00 - 755+28	
Wetland A	E	-	1.11	1.11	Middle Branch	

Component Summation							
Restoration Level	Stream (LF)	Riparian Wetland (Ac)		Non-Riparian (Ac	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	13,170						
Enhancement		1.11					
Enhancement I							
Enhancement II	5,284						
Creation							
Preservation	2,694						
HQ Preservation							
		1.11					
Totals	**21,148**	**1.11**				**42**	**BMP Count**

= Non-Applicable

Table II Project Activity and Reporting History Holly Grove Restoration Project		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Restoration Plan	Apr 2007	Jun 2007
Final Design - Construction Plans	N/A	Oct 2007
Construction	N/A	Oct 2008
Temporary S&E mix applied to entire project area	N/A	Sep 2008
Permanent seed mix applied to entire site	N/A	Sep 2008
Bare-root plantings for floodplain and uplands	N/A	Dec 2008
Mitigation Plan / As-Built (Year 0 Monitoring - baseline)	Oct 2008	Dec 2008
Year 1 Monitoring	Oct 2009	Dec 2009
Year 2 Monitoring	Oct 2010	Nov 2010
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

Table III Project Contact Table Holly Grove Restoration Project		
Designer		
Wolf Creek Engineering, pllc	51 North Knob Lane Weaverville NC, 28787	
S. Grant Ginn	828-658-3649	
Construction Contractor		
North State Environmental, Inc	2889 Lowery St. Winston-Salem, NC 27101	
Darrell Westmoreland	336-725-2010	
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	828-658-3649
Vegetation Monitoring - Catena Group	Mike Wood	919-732-1300

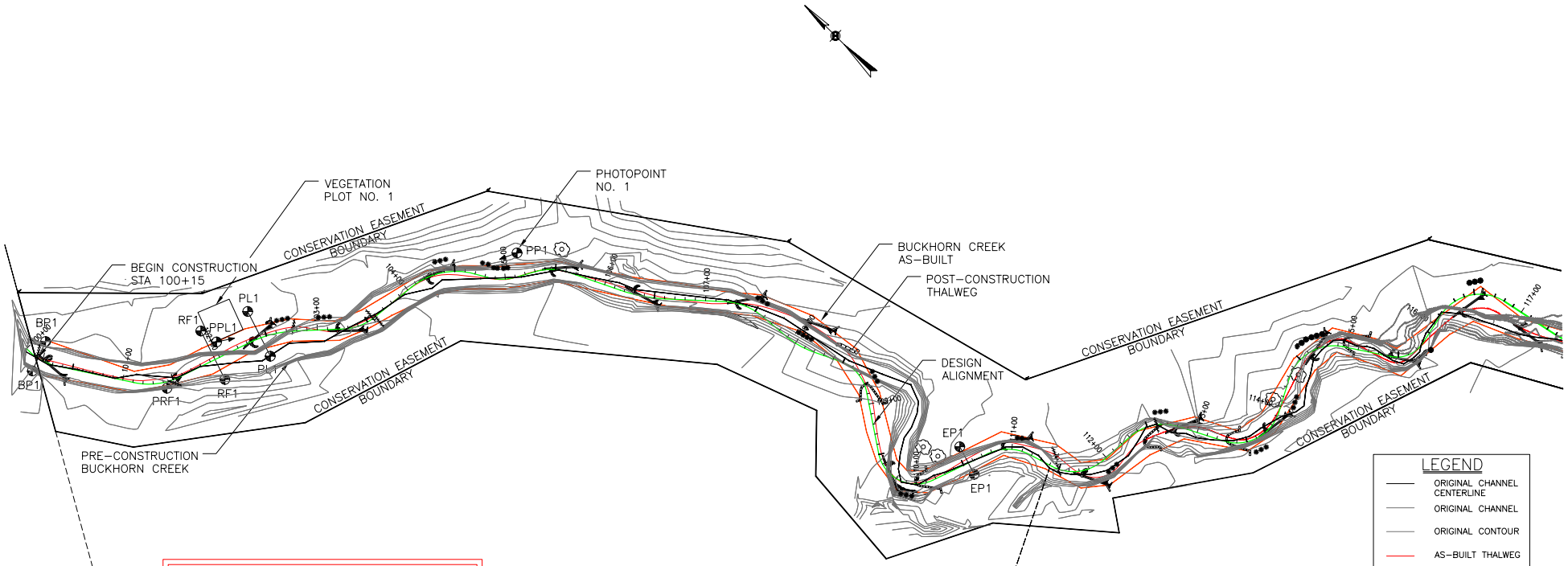
Table IV Project Attribute Table Holly Grove Restoration Project						
Project County	Guilford					
Physiographic Region	Piedmont					
Ecoregion	Southern Outer Piedmont					
Project River Basin	Cape Fear River Basin					
USGS HUC for Project (14 digit)	03030002020070					
NCDWQ Sub-basin for Project	03-06-02					
Within extent of EEP Watershed Plan?						
WRC Class (Warm, Cool, Cold)						
% of project esaement fenced or demarcated	100% Demarcated Easement Corners					
Beaver activity observed during design phase?	Yes, on Buckhorn Creek upstream of bridge					
Restoration Component Attribute Table						
	Buckhorn	West	Middle	East	Southeast	Southwest
Drainage area (mi^2)	4.27	0.2	0.2	0.2	0.14	0.19
Stream order	Second	First	First	First	First	First
Restored length (feet)	8757	390	1639	1039	342	723
Perennial or Intermittent	Perennial	Perennial	Perennial	Perennial	Perennial	Perennial
Watershed type	Rural	Rural	Rural	Rural	Rural	Rural
Watershed LULC Distribution (e.g.)						
Residential	20%	10%	5%	10%	5%	10%
Ag-Row Crop	40%	60%	50%	10%	90%	10%
Ag-Livestock	10%	5%	10%	0%	0%	0%
Forested	30%	25%	35%	80%	5%	80%
Watershed impervious cover (%)	10	5	5	5	2	2
NCDWQ AU/Index number	16-(1)a					
NCDWQ classification	C, NSW	C, NSW	C, NSW	C, NSW	C, NSW	C, NSW
303d listed?	No					
Upstream of a 303d listed segment?	Yes					
Reasons for 303d listing or stressor	non-point urban and agricultural runoff					
Total acreage of easement	64.87					
Total vegetated acreage within easement	47.06					
Total planted acreage as part of the restoration	45.3					
Rosgen classification of pre-existing	F, G	G	G	G	G	G
Rosgen classification of As-Built	B4c	B4c	B4c	B4c	B4c	B4c
Valley type	II	II	II	II	II	II
Valley slope	0.0051	0.0239	0.0165	0.0119	0.0159	0.0169
Valley side slope range	4% - 40%					
Valley toe slope range	0.4% - 2%					
Cowardin classification	N/A					
Trout waters designation	N/A					
Species of concern, endangered?	Yes, Bald Eagle & Carolina Darter					
Dominant soil series and characteristics	Ch , Co	CcD	Ch	CcD , Ch	CcD	CcD
Series	Congaree	Cecil	Chewacla	Chewacla	Cecil	Cecil
Depth (in)	0-80	0-80	0-70	0-70	0-80	0-80
Clay %	5-35	5-70	5-35	5-35	5-70	5-70
K	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
T	-	-	-	-	-	-

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

PROJECT: HOLLY GROVE STREAM RESTORATION SITE
OWNER: RESTORATION SYSTEMS, LLC
TITLE: MONITORING PLANS

SCALE	AS NOTED	DRWN. BY	CDSE	PROJECT NO.	SHEET NUMBER
DATE	10/29/2010	CHKD. BY	SGG	1024	MP-1

DATE	BY	REV.	DESCRIPTION



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RF1 RT	RIFFLE X.S.	892047.92	1827214.63	98.00
RF1 LT	RIFFLE X.S.	892097.66	1827231.6	98.66
PPL1	PHOTO PT. POOL	892079.26	1827234.84	97.28
PL1 RT	POOL X.S.	892032.47	1827261.68	97.34
PL1 LT	POOL X.S.	892078.62	1827277.13	98.46
EP1 RT	END PROFILE	891450.75	1827684.19	94.53
EP1 LT	END PROFILE	891490.02	1827699.27	95.11
PP1	PHOTO POINT NO. 1	891932.76	1827501.67	–

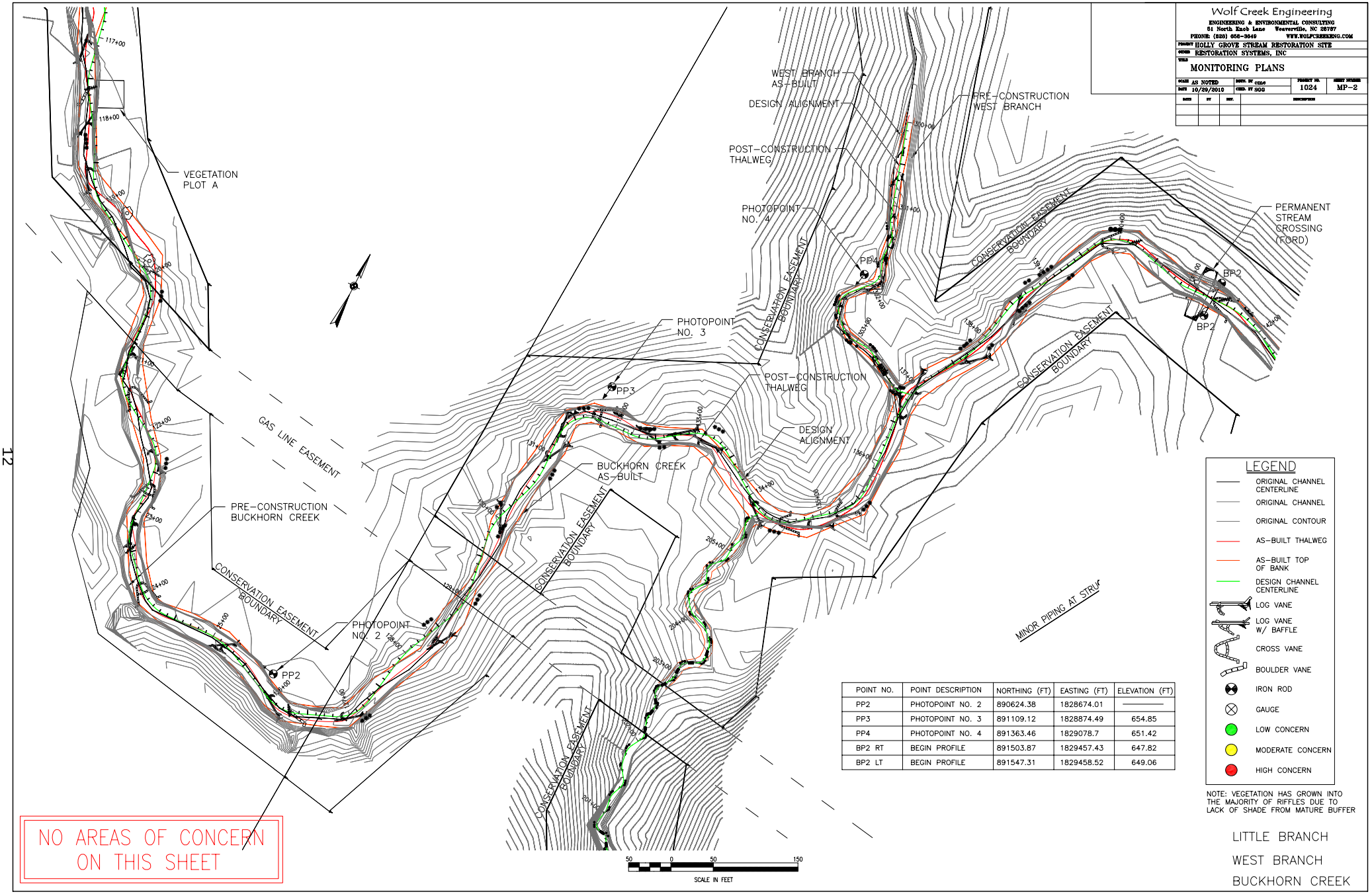
50 0 50 150
SCALE IN FEET

LEGEND
- ORIGINAL CHANNEL CENTERLINE
- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS-BUILT THALWEG
- AS-BUILT TOP OF BANK
- DESIGN CHANNEL CENTERLINE
- LOG VANE
- LOG VANE W/ BAFFLE
- CROSS VANE
- BOULDER VANE
- IRON ROD
- GAUGE
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

NOTE: VEGETATION HAS GROWN INTO THE MAJORITY OF RIFFLES DUE TO LACK OF SHADE FROM MATURE BUFFER

BUCKHORN CREEK

11



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PP4	PHOTOPOINT NO. 4	891363.46	1829078.7	651.42
BP2 RT	BEGIN PROFILE	891503.87	1829457.43	647.82
BP2 LT	BEGIN PROFILE	891547.31	1829458.52	649.06

LEGEND

- ORIGINAL CHANNEL CENTERLINE
- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS-BUILT THALWEG
- AS-BUILT TOP OF BANK
- DESIGN CHANNEL CENTERLINE
- LOG VANE
- LOG VANE W/ BAFFLE
- CROSS VANE
- BOULDER VANE
- IRON ROD
- GAUGE
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

NOTE: VEGETATION HAS GROWN INTO THE MAJORITY OF RIFFLES DUE TO LACK OF SHADE FROM MATURE BUFFER

LITTLE BRANCH
WEST BRANCH
BUCKHORN CREEK

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SCALE	AS NOTED	DRWN. BY	CDSE	PROJECT NO.	SHEET NUMBER
DATE	10/29/2010	CHKD. BY	SGG	1024	MP-2

DATE	BY	REV.	DESCRIPTION

Wolf Creek Engineering
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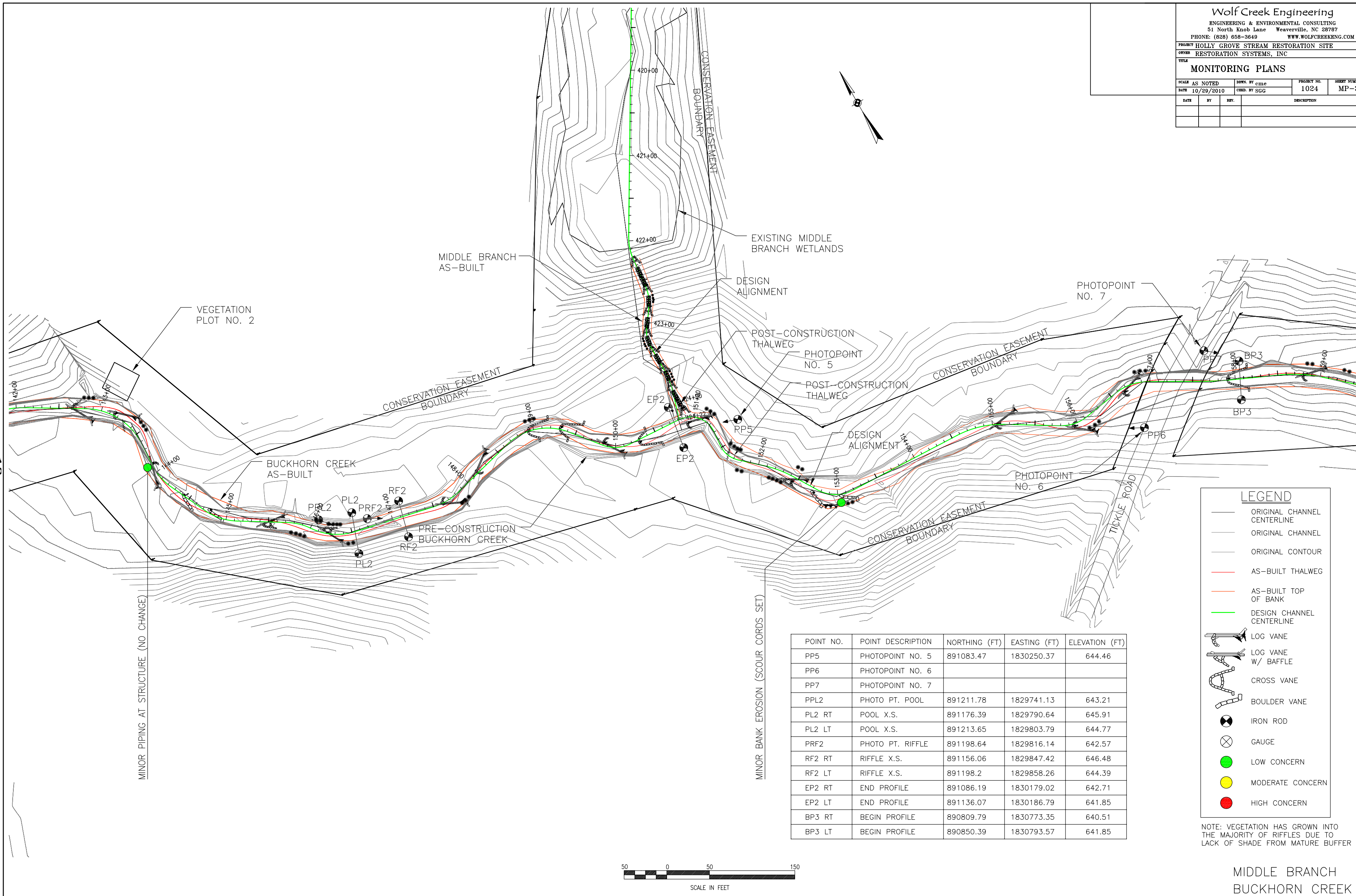
PROJECT HOLLY GROVE STREAM RESTORATION SITE
OWNER RESTORATION SYSTEMS, INC
TITLE MONITORING PLANS

SCALE	AS NOTED	DRWN. BY	cme	PROJECT NO.	SHEET NUMBER
DATE	10/29/2010	CHKD. BY	SGG	1024	MP-3

DATE	BY	REV.	DESCRIPTION



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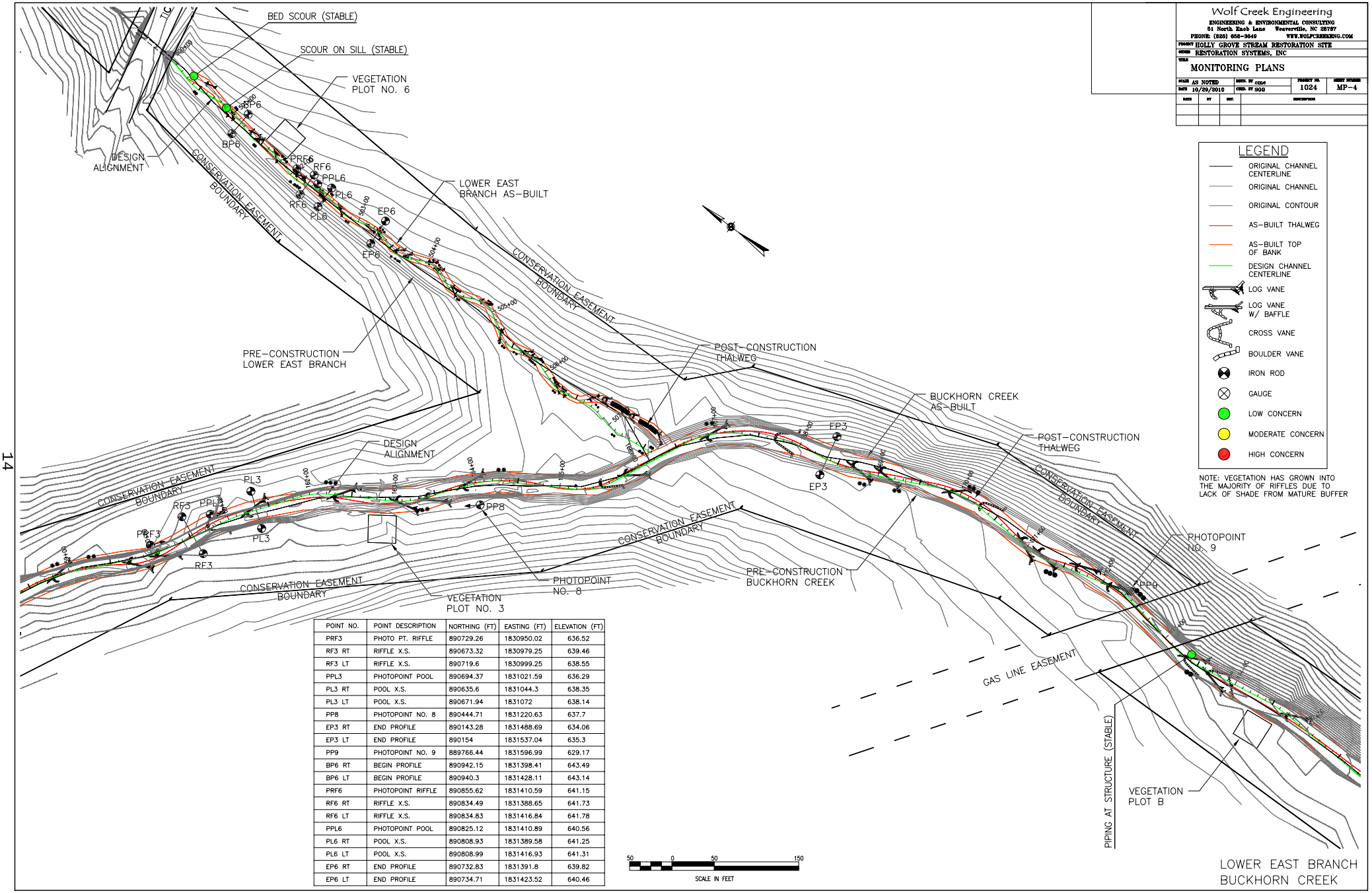
PP6	PHOTOPOINT NO. 6			
PP7	PHOTOPOINT NO. 7			
PPL2	PHOTO PT. POOL	891211.78	1829741.13	643.21
PL2 RT	POOL X.S.	891176.39	1829790.64	645.91
PL2 LT	POOL X.S.	891213.65	1829803.79	644.77
PRF2	PHOTO PT. RIFFLE	891198.64	1829816.14	642.57
RF2 RT	RIFFLE X.S.	891156.06	1829847.42	646.48
RF2 LT	RIFFLE X.S.	891198.2	1829858.26	644.39
EP2 RT	END PROFILE	891086.19	1830179.02	642.71
EP2 LT	END PROFILE	891136.07	1830186.79	641.85
BP3 RT	BEGIN PROFILE	890809.79	1830773.35	640.51
BP3 LT	BEGIN PROFILE	890850.39	1830793.57	641.85

NOTE: VEGETATION HAS GROWN INTO THE MAJORITY OF RIFFLES DUE TO LACK OF SHADE FROM MATURE BUFFER

MIDDLE BRANCH
BUCKHORN CREEK



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RF3 LT	RIFFLE X.S.	890719.6	1830999.25	638.55
PPL3	PHOTOPOINT POOL	890694.37	1831021.59	636.29
PL3 RT	POOL X.S.	890635.6	1831044.3	638.35
PL3 LT	POOL X.S.	890671.94	1831072	638.14
PP8	PHOTOPOINT NO. 8	890444.71	1831220.63	637.7
EP3 RT	END PROFILE	890143.28	1831488.69	634.06
EP3 LT	END PROFILE	890154	1831537.04	635.3
PP9	PHOTOPOINT NO. 9	889766.44	1831596.99	629.17
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BP6 LT	BEGIN PROFILE	890940.3	1831428.11	643.14
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RF6 LT	RIFFLE X.S.	890834.83	1831416.84	641.78
PPL6	PHOTOPOINT POOL	890825.12	1831410.89	640.56
PL6 RT	POOL X.S.	890808.93	1831389.58	641.25
PL6 LT	POOL X.S.	890808.99	1831416.93	641.31
EP6 RT	END PROFILE	890732.83	1831391.8	639.82
EP6 LT	END PROFILE	890734.71	1831423.52	640.46

LEGEND

- ORIGINAL CHANNEL CENTERLINE
- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS-BUILT THALWEG
- AS-BUILT TOP OF BANK
- DESIGN CHANNEL CENTERLINE
- LOG VANE
- LOG VANE W/ BAFFLE
- CROSS VANE
- BOULDER VANE
- IRON ROD
- GAUGE
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

NOTE: VEGETATION HAS GROWN INTO THE MAJORITY OF RIFFLES DUE TO LACK OF SHADE FROM MATURE BUFFER

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PROJECT: HOLLY GROVE STREAM RESTORATION SITE
OWNER: RESTORATION SYSTEMS, INC
TITLE: MONITORING PLANS

SCALE: AS NOTED | DRWN. BY: CDSE | PROJECT NO.: 1024 | SHEET NUMBER: MP-4
DATE: 10/29/2010 | CHKD. BY: SGG

DATE	BY	REV.	DESCRIPTION

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PROJECT: HOLLY GROVE STREAM RESTORATION SITE
OWNER: RESTORATION SYSTEMS, INC
TITLE: MONITORING PLANS

SCALE	DRWN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CDSE	1024	MP-5
DATE 10/29/2010	CHKD. BY SGG		

DATE	BY	REV.	DESCRIPTION

GAS LINE EASEMENT

CONSERVATION EASEMENT BOUNDARY

DESIGN ALIGNMENT

POST-CONSTRUCTION THALWEG

BUCKHORN CREEK AS-BUILT

PRE-CONSTRUCTION BUCKHORN CREEK

VEGETATION PLOT C

END CONSTRUCTION STA 190+50

MINOR PIPING AT STRUCTURE (NO CHANGE)

PHOTOPOINT NO. 10

PP10

MINOR BANK SCOUR

MINOR BANK SCOUR

LEGEND

- ORIGINAL CHANNEL CENTERLINE
- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS-BUILT THALWEG
- AS-BUILT TOP OF BANK
- DESIGN CHANNEL CENTERLINE
- LOG VANE
- LOG VANE W/ BAFFLE
- CROSS VANE
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- IRON ROD
- GAUGE
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

NOTE: VEGETATION HAS GROWN INTO THE MAJORITY OF RIFFLES DUE TO LACK OF SHADE FROM MATURE BUFFER

POINT NO.	POINT DESCRIPTION	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
PP10	PHOTOPOINT NO. 10	888863.77	1831225.83	622.37

50 0 50 150
SCALE IN FEET

BUCKHORN CREEK

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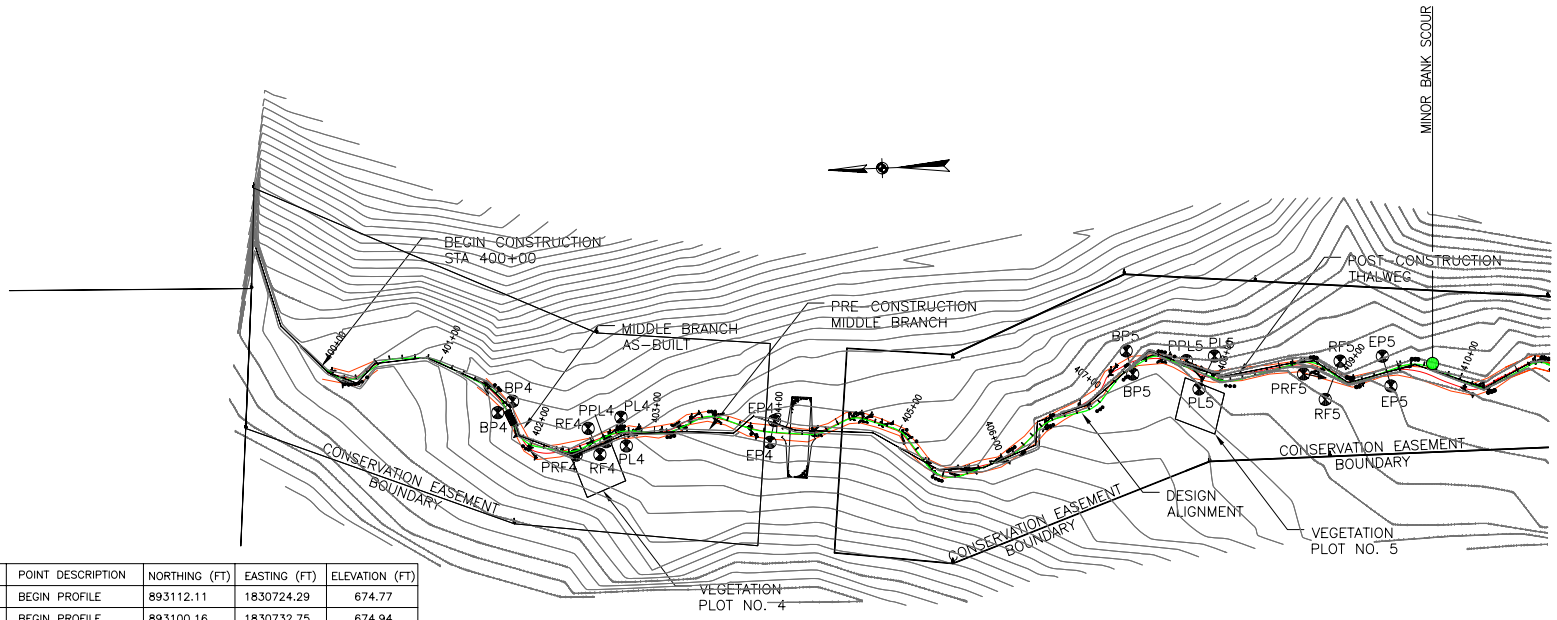
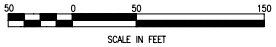
PROJECT HOLLY GROVE STREAM RESTORATION SITE
OWNER RESTORATION SYSTEMS, INC
TITLE MONITORING PLANS

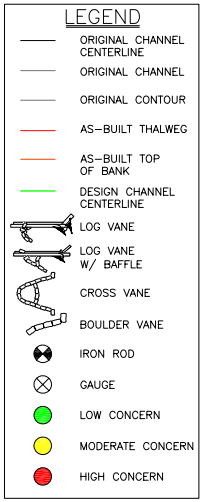
SCALE	AS NOTED	DRWN. BY	CDSE	PROJECT NO.	SHEET NUMBER
DATE	10/29/2010	CHKD. BY	SGG	1024	MP-6

DATE	BY	REV.	DESCRIPTION



POINT NO.	POINT DESCRIPTION	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
BP4 RT	BEGIN PROFILE	893112.11	1830724.29	674.77
BP4 LT	BEGIN PROFILE	893100.16	1830732.75	674.94
PRF 4	PHOTOPOINT RIFFLE	893052.14	1830688.91	672.84
RF4 RT	RIFFLE X.S.	893033.61	1830688.71	672.97
RF4 LT	RIFFLE X.S.	893041.95	1830709.35	673.1
PPL4	PHOTOPOINT POOL	893028.41	1830698.43	672.27
PL4 RT	POOL X.S.	893012.69	1830694.5	672.34
PL4 LT	POOL X.S.	893016.06	1830717.08	672.37
EP4 RT	END PROFILE	892900.43	1830693.07	670.12
EP4 LT	END PROFILE	892896.35	1830710.01	670.19
BP5 RT	BEGIN PROFILE	892615.37	1830735.78	665.53
BP5 LT	BEGIN PROFILE	892619.77	1830754.12	665.59
PRF 5	PHOTOPOINT RIFFLE	892481.99	1830730.82	662.8
RF5 RT	RIFFLE X.S.	892465.75	1830710.28	663.37
RF5 LT	RIFFLE X.S.	892453.05	1830739.76	662.65
PPL5	PHOTOPOINT POOL	892573.02	1830744.67	663.74
PL5 RT	POOL X.S.	892563.99	1830722.2	664.33
PL5 LT	POOL X.S.	892551	1830747.44	664.4
EP5 RT	END PROFILE	892414.15	1830718.87	661.96
EP5 LT	END PROFILE	892419.91	1830742.4	661.71





NOTE: VEGETATION HAS GROWN INTO THE MAJORITY OF RIFFLES DUE TO LACK OF SHADE FROM MATURE BUFFER

MIDDLE BRANCH

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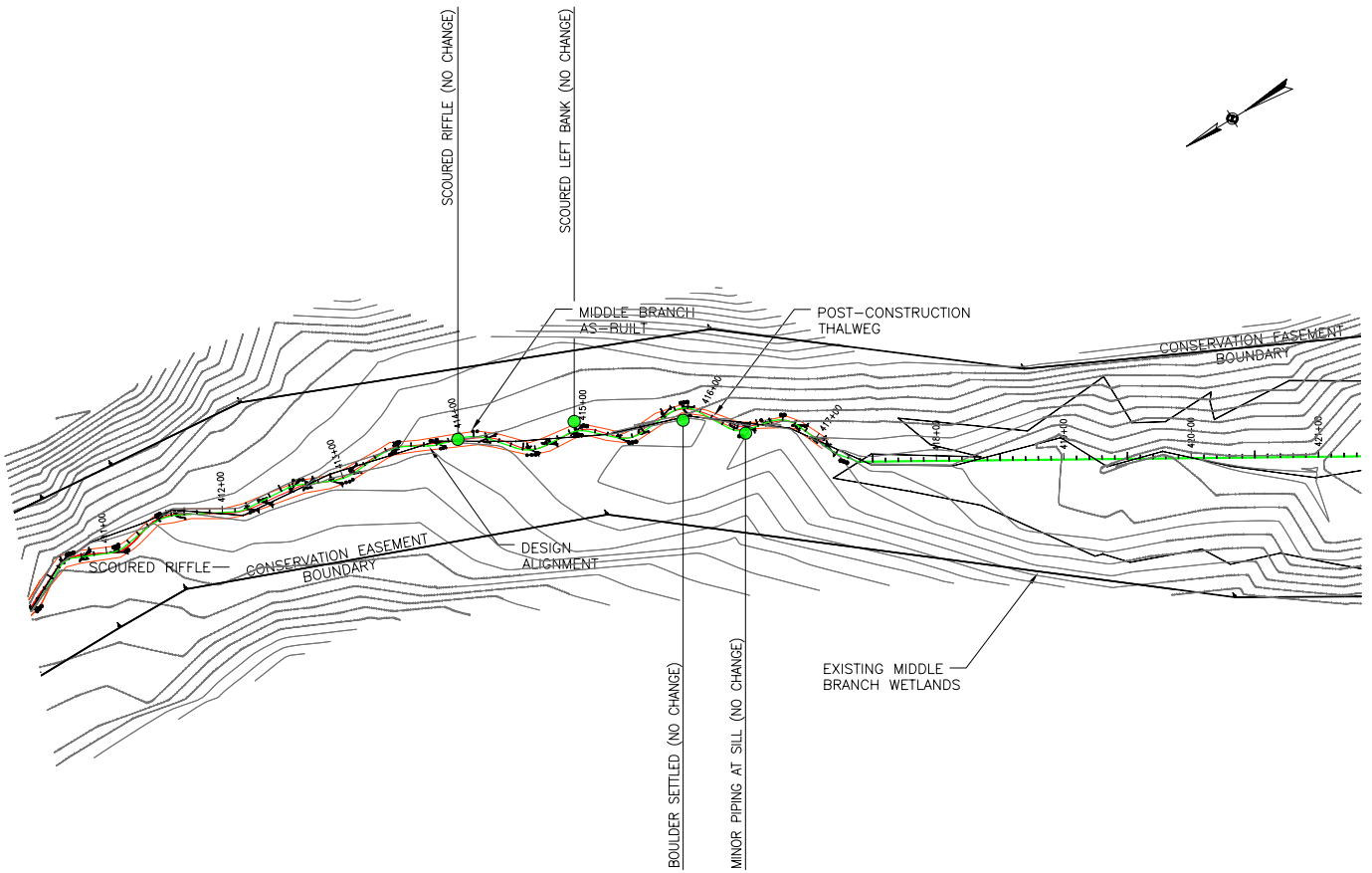
PROJECT: HOLLY GROVE STREAM RESTORATION SITE
OWNER: RESTORATION SYSTEMS, INC
TITLE: MONITORING PLANS

SCALE	AS NOTED	DRWN. BY	CDSS	PROJECT NO.	SHEET NUMBER
DATE	10/29/2010	CHKD. BY	SGG	1024	MP-7

DATE	BY	REV.	DESCRIPTION



LEGEND

- ORIGINAL CHANNEL CENTERLINE
- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS-BUILT THALWEG
- AS-BUILT TOP OF BANK
- DESIGN CHANNEL CENTERLINE
- LOG VANE
- LOG VANE W/ BAFFLE
- CROSS VANE
- BOULDER VANE
- IRON ROD
- GAUGE
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

NOTE: VEGETATION HAS GROWN INTO THE MAJORITY OF RIFFLES DUE TO LACK OF SHADE FROM MATURE BUFFER

MIDDLE BRANCH

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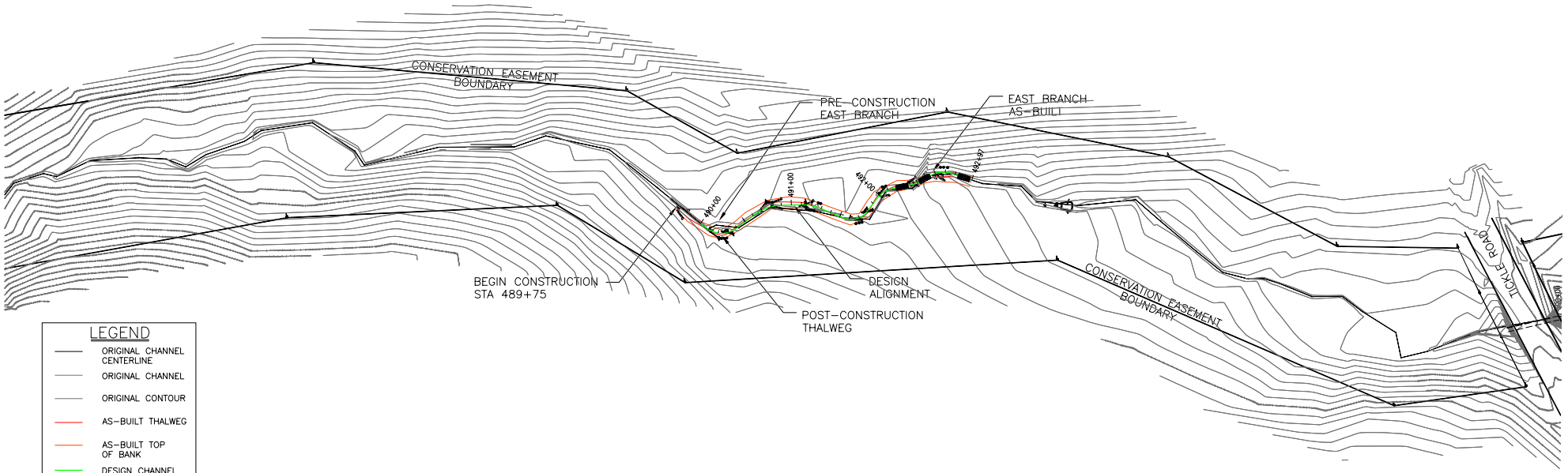
SCALE	DSGN. BY	PROJECT NO.	SHEET NUMBER
AS NOTED	CDS	1024	MP-8
DATE	CHKD. BY		
10/29/2010	SGG		

DATE	BY	REV.	DESCRIPTION



LEGEND

- ORIGINAL CHANNEL CENTERLINE
- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS-BUILT THALWEG
- AS-BUILT TOP OF BANK
- DESIGN CHANNEL CENTERLINE
- LOG VANE
- LOG VANE W/ BAFFLE
- CROSS VANE
- BOULDER VANE
- IRON ROD
- GAUGE
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

NOTE: VEGETATION HAS GROWN INTO THE MAJORITY OF RIFFLES DUE TO LACK OF SHADE FROM MATURE BUFFER

NO AREAS OF CONCERN ON THIS SHEET

50 0 50 150
SCALE IN FEET

EAST BRANCH

18

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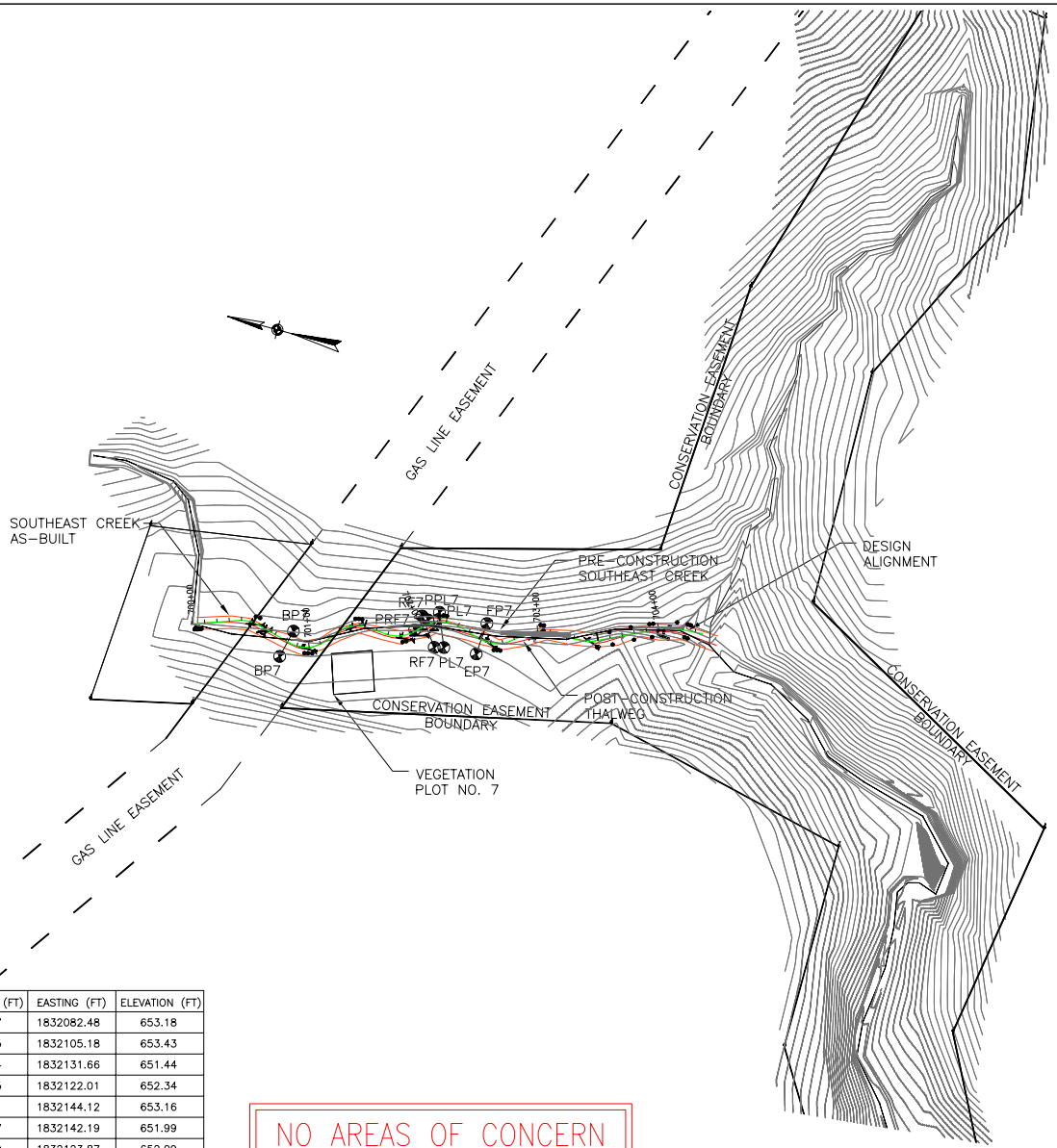
OWNER: RESTORATION SYSTEMS, INC
TITLE: MONITORING PLANS

SCALE	AS NOTED	DRWN. BY	CDSE	PROJECT NO.	SHEET NUMBER
DATE	10/29/2010	CHKD. BY	SGG	1024	mp-9

DATE	BY	REV.	DESCRIPTION



POINT NO.	POINT DESCRIPTION	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
BP7 RT	BEGIN PROFILE	889394.27	1832082.48	653.18
BP7 LT	BEGIN PROFILE	889388.85	1832105.18	653.43
PRF 7	PHOTOPOINT RIFFLE	889294.04	1832131.66	651.44
RF7 RT	RIFFLE X.S.	889275.05	1832122.01	652.34
RF7 LT	RIFFLE X.S.	889291.11	1832144.12	653.16
PPL7	PHOTOPOINT POOL	889285.67	1832142.19	651.99
PL7 RT	POOL X.S.	889267.49	1832123.87	652.09
PL7 LT	POOL X.S.	889278.35	1832150.58	653.53
EP7 RT	END PROFILE	889240.74	1832125.74	651.43
EP7 LT	END PROFILE	889238.74	1832151.82	653.54

NO AREAS OF CONCERN ON THIS SHEET

50 0 50 150
SCALE IN FEET

LEGEND
- ORIGINAL CHANNEL CENTERLINE
- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS-BUILT THALWEG
- AS-BUILT TOP OF BANK
- DESIGN CHANNEL CENTERLINE
- LOG VANE
- LOG VANE W/ BAFFLE
- CROSS VANE
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- GAUGE
- LOW CONCERN
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- HIGH CONCERN

NOTE: VEGETATION HAS GROWN INTO THE MAJORITY OF RIFFLES DUE TO LACK OF SHADE FROM MATURE BUFFER

SOUTHEAST CREEK

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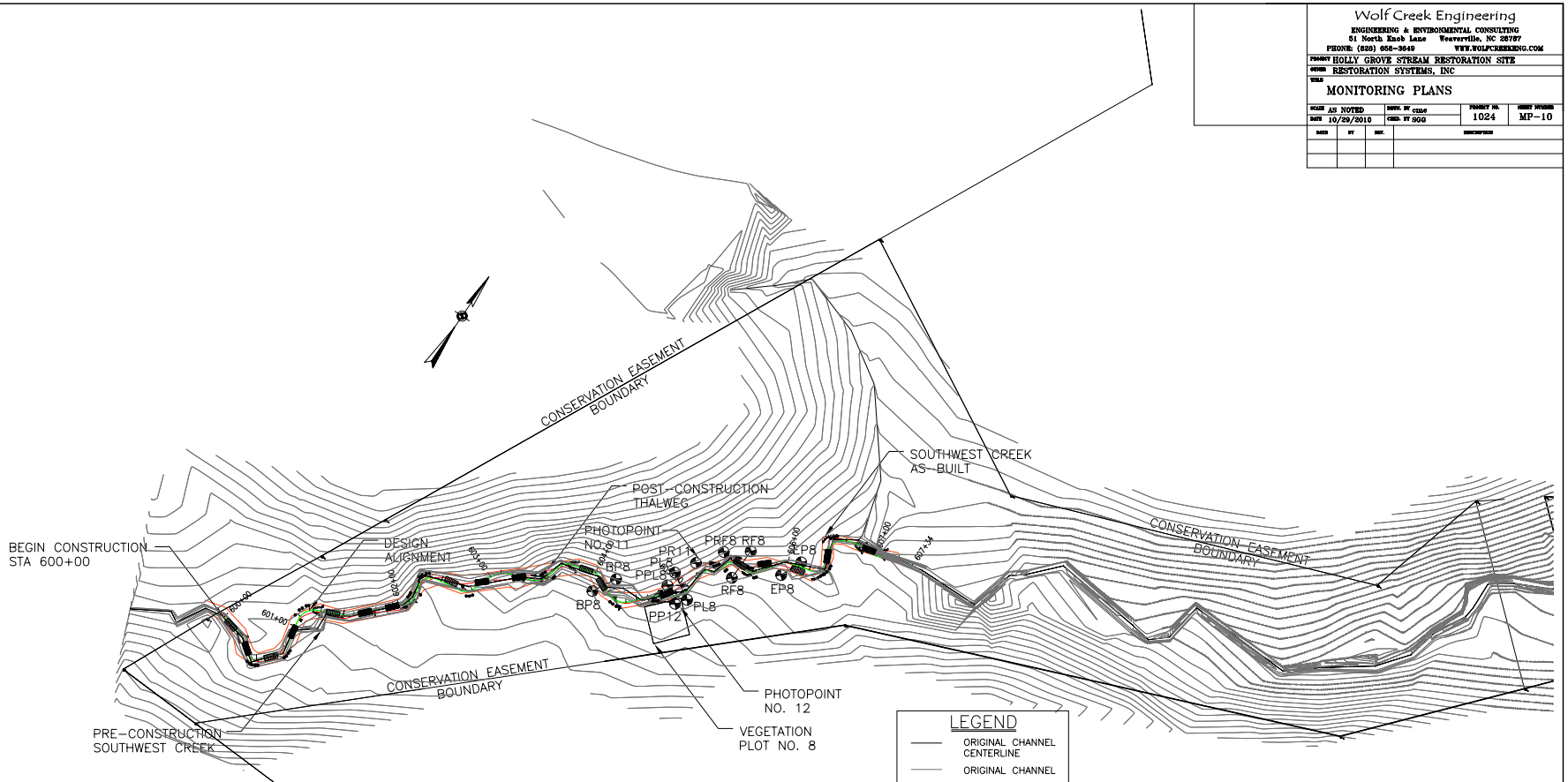
PROJECT HOLLY GROVE STREAM RESTORATION SITE
OWNER RESTORATION SYSTEMS, INC
TITLE MONITORING PLANS

SCALE	AS NOTED	DESN. BY	CDS	PROJECT NO.	SHEET NUMBER
DATE	10/29/2010	CHKD. BY	SGG	1024	MP-10

DATE	BY	REV.	DESCRIPTION



NO AREAS OF CONCERN ON THIS SHEET

POINT NO.	POINT DESCRIPTION	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
BP8 RT	BEGIN PROFILE	888530.2	1829244.79	
BP8 LT	BEGIN PROFILE	888550.58	1829256.28	
PR8 5	PHOTOPOINT RIFFLE	888624.26	1829321.4	
RF8 RT	RIFFLE X.S.	888609.33	1829340.21	
RF8 LT	RIFFLE X.S.	888638.13	1829340.74	
PPL8	PHOTOPOINT POOL	888571.69	1829296.89	
PL8 RT	POOL X.S.	888570.92	1829318.35	
PL8 LT	POOL X.S.	888584.77	1829295.99	
EP8 RT	END PROFILE	888635.95	1829374.79	
EP8 LT	END PROFILE	888655.17	1829383.15	
PP11	PHOTOPOINT NO. 11	888602.23	1829306.57	
PP12	PHOTOPOINT NO. 12	888562.04	1829311.53	

50 0 50 150
SCALE IN FEET

LEGEND
- ORIGINAL CHANNEL CENTERLINE
- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS-BUILT THALWEG
- AS-BUILT TOP OF BANK
- DESIGN CHANNEL CENTERLINE
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- BOULDER VANE
- IRON ROD
- GAUGE
- LOW CONCERN
- MODERATE CONCERN
- HIGH CONCERN

NOTE: VEGETATION HAS GROWN INTO THE MAJORITY OF RIFFLES DUE TO LACK OF SHADE FROM MATURE BUFFER

SOUTHWEST CREEK

2.0 PROJECT CONDITION AND MONITORING RESULTS

2.1 Vegetation Assessment

The Carolina Vegetation Survey – Ecosystem Enhancement Program (CVS-EEP) 2008 protocol for recording vegetation (Lee et. al 2008) was used 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. Eleven (11) randomly placed 10 meter by 10 meter vegetative sampling plots were established within the project easement area. The corners of each monitoring plot have been marked in the field and their position documented by GPS survey. Plots were placed within the applicable planting zones to capture the heterogeneity of the designed vegetative communities. Plot corners were permanently marked with rebar and recorded during the baseline survey. All planted stems and plot corners were marked with orange flagging tape to facilitate relocation during subsequent monitoring years. A reference photograph was taken for each plot at the origin looking diagonally across the plot to the opposite corner.

Year 2 vegetation for the Site occurred on September 13-14, 2010. The project has an average of 320 planted stems per acre. The interim success criterion is 320 steams per acre at the end of the Year 3 monitoring period. The riparian buffer planting had an overall survival rate of 67% but showed significant evidence of additional volunteer species taking root.

2.1.1 Stem Counts

Across all vegetation monitoring plots (VP), Year 2 monitoring documented a moderate survivability range of 121 to 526 planted stems per acre. VP7 had the lowest average stem density whereas VPC had the highest. VP2, 5, & 8 did not meet the interim success criterion. Approximately 31% of total planted stems were missing and 2% were dead. Of these, eastern redbud, silky willow, and common witchhazel had the highest mortality rates. Twenty-one (21) species were documented among the vegetation plots, a 19.2% reduction in the total species planted. Several species such as sugarberry, American beech, possum haw, willow oak, and black gum were represented by only one individual.

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	9/13/2010	8	13	32	40	323.75	7
2	9/13/2010	4	2	70	74	161.87	3
3	9/13/2010	8	2	38	46	323.75	6
4	9/13/2010	10	2	51	61	404.69	9
5	9/13/2010	7	4	19	26	283.28	6
6	9/14/2010	11	2	2	13	445.15	5

7	9/14/2010	3	0	1	4	121.41	2
8	9/14/2010	6	0	56	62	242.81	3
A	9/13/2010	12	3	33	45	364.22	6
B	9/13/2010	8	13	31	39	323.75	7
C	9/14/2010	13	3	35	48	526.09	5

Approximately 62% of planted stems had a vigor code of good or excellent. High numbers of natural stems were found in seven of the eleven vegetation monitoring plots. Volunteer stems were also found in vegetation plots VP5, 6, & 7 but in significantly lower numbers. It is expected that recruitment will continue to contribute to the total stem density for the restoration site.

2.1.2 Vegetative Problem

No significant vegetation problem areas were noted within the vegetation monitoring plots on-site although some damage and mortality was recorded. Of all damaged, missing, or dead stems within the vegetation monitoring plots 42.5% of the damage has been attributed to insects. Expansion of invasive exotic plant populations should be monitored both within the vegetation plots in which they occur and within the larger restoration area.

2.1.3 Vegetation Plot Photos

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

2.2 Stream Assessment

Monitoring protocol follows that outlined within the EEP Site Specific Mitigation Plan and detailed in the U.S. Army Corps of Engineers (USACE) Stream Mitigation Guidelines for Monitoring Level I. Specifically, stream monitoring included measurements of stream dimension, profile, pattern, bed materials, photo documentation, and stream bankfull return interval.

The restored stream reaches have managed the extreme flow events of the first year. Streambanks remain intact and stable and fully vegetated throughout the site. Vegetation has grown into many riffles on the main channel due to a lack of shade and mature buffer. This has limited the mobility of bed material but has not had noticeable effects on overall stability. All in-stream structures remain intact and fully functional with the exception of a few minor piping issues.

2.2.1 Hydrology

Since completion of construction in October of 2008, the site has been subjected to at least one greater-than-bankfull event and several bankfull or near-bankfull events. In August of 2008, Tropical Storm Fay crossed central North Carolina resulting in eight (8) inches of rainfall on-site and water elevations 2.5 feet above bankfull on Buckhorn Creek. Approximately seventy percent (70%) of the project was complete at that time

and subjected to this estimated fifty-year storm event. In October of 2008, locally heavy rainfall produced a bankfull event at the Site during the final stages of construction. In June of 2009, heavy rainfall resulted in water elevations 0.2 to 0.3 feet above bankfull. Heavy rainfall associated with remnants of Hurricane Ida produced one additional event in November of 2009, after Year 1 monitoring was completed which again resulted in an elevated flow event. In late September of 2010, Tropical Storm Nicole moved north across central and eastern North Carolina and produced approximately 4.5 inches of rain over 48 hours resulting in flood waters which crested 0.4 feet above bankfull.

Table VI Verification of Bankfull Events – Lick Creek Stream Restoration Site (D04013-1)

Date of Data Collection	Date of Occurrence of Bankfull Event	Height above Bankfull (ft)	Method of Data Collection
9/3/08	8/27/08	2.5	Debris Evidence
8/13/09	June 2009	0.2	Crest Gauge
10/11/10	September 2010	0.4	Crest Gauge

2.2.2 Geomorphology

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

Re-survey of the permanent cross sections and profile reaches have shown only minimal alterations in local bed elevations with the bed form and the channel pattern remaining consistent with the As-built condition. All eight riffle cross sections exhibit consistent maximum depth while six of the eight retain nearly the same cross-sectional area as documented in the baseline monitoring. Six of the eight pool cross-sections have maintained their depth and cross-sectional area and two show only slight adjustments relative to the As-built condition. Location of bed features relative to the pattern is consistent with the As-built survey.

Pebble counts were conducted at each riffle cross-section, as well as across the overall study reaches. Pebble count data was plotted by size distribution in order to assess the D_{50} and D_{84} size class. On Buckhorn Creek the material size generally decreased from the Year 1 condition with the D_{50} on Reaches 2 and 3 decreasing from 67mm to 49mm and from 61mm to 32mm. The D_{84} on Reaches 2 and 3 decreased from 184mm to 144mm and from 118mm to 101mm. The D_{50} and D_{84} remained approximately the same on Reach 1 at 28mm and 68mm. This may be due in part to significant growth of vegetation in the riffles that may be trapping finer particles in the bed.

All of the tributaries, with the exception of Southeast Creek, showed a decrease in the D_{50} over the Year 1 condition, although generally the decreases were not appreciable. The D_{50} on Middle Branch decreased from 21mm to 11mm and from 15mm to 9mm. On Lower East Branch the D_{50} decreased from 10mm to 0.5mm and Southwest Creek

decreased from 7mm to 5mm. The D_{50} on Southeast Creek increased from 0.1mm to 5mm.

Table VII. BEHI and Sediment Export Estimates – (Only Required in Year 5)

2.2.3 Problem Areas

In the year following construction of the Holly Grove Stream Restoration Site, a few minor problem areas have been documented.

1.) Several riffles on Buckhorn Creek and Southeast Branch exhibit excessive vegetation in the channel bed.
2.) There were four (4) locations of minor piping identified at log vanes.
3.) There were five (5) areas of local bank scour identified.
4.) There were two (2) areas of minor riffle scour identified.

Inadequate shade due to lack of mature riparian buffer has allowed vegetation to take root in the bed matrix. It is anticipated that this vegetation will die back during the winter but will reestablish during each growing season until sufficient shading is provided by the canopy of the buffer. This has affected bedload transport by limiting bed mobility, but it is not expected to have any significant impact on the overall stability or integrity of the channel bed.

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

2.2.4 Photo Reference Stations

Photograph reference Stations (PRSs) 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 As-built plans to allow for consistent repetition. A total of twenty-eight (28) PRSs have been established along the restored stream (Appendix B). Sixteen (16) of these PRSs 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 Table

Table VIII. Categorical Stream Feature Visual Stability Assessment

Feature	Performance Percentage Buckhorn Creek (8,848 ft)					
	Initial	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	100%	100%			
Pools	100%	100%	100%			
Thalweg	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	100%	100%			
Vanes / J Hooks etc.	100%	99%	100%			
Wads and Boulders	100%	100%	100%			

Feature	Performance Percentage Middle Branch (1,755 ft)					
	Initial	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	97%	99%			
Pools	100%	100%	100%			
Thalweg	100%	100%	100%			
Meanders	100%	100%	99%			
Bed General	100%	100%	100%			
Vanes / J Hooks etc.	100%	98%	99%			
Wads and Boulders	100%	83%	83%			

Feature	Performance Percentage East Branch (1,090 ft)					
	Initial	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	100%	99%			
Pools	100%	100%	100%			
Thalweg	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	100%	100%			
Vanes / J Hooks etc.	100%	100%	99%			
Wads and Boulders	100%	100%	100%			

Feature	Performance Percentage Southeast Creek (363 ft)					
	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
Riffles	100%	96%	100%			
Pools	100%	100%	100%			
Thalweg	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	100%	100%			
Vanes / J Hooks etc.	100%	100%	100%			
Wads and Boulders	100%	100%	100%			

Feature	Performance Percentage Southwest Creek (723 ft)					
	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
Riffles	100%	100%	100%			
Pools	100%	100%	100%			
Thalweg	100%	100%	100%			
Meanders	100%	100%	100%			
Bed General	100%	100%	100%			
Vanes / J Hooks etc.	100%	100%	100%			
Wads and Boulders	100%	100%	100%			

Table IX-a Baseline Stream Data Summary

Holly Grove Restoration Site - Buckhorn Creek (8848 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)					24			26					20.1				22	23	25	23.4		23.4	25.4		
Floodprone Width (ft)					32			32					63				30	52.5	75	50		50	70		
Bankfull Mean Depth (ft)					1.6			2.3					1.73				1.69	1.78	1.91	1.3		1.5	1.9		
[1]Bankfull Max Depth (ft)					2.3			3					2				2.3	2.4	2.6	1.9		2.1	2.6		
Bankfull Cross-Sectional Area (ft2)					42			55					34.8				37	40.9	48	30.3		34.3	48.3		
Width/Depth Ratio					10			16					12					13		13.4		16	18.1		
Entrenchment Ratio					1.2			1.3			2.7		2.9	3.1			1.4	2.28	3			2.5			
[1]Bank Height Ratio					2			2.3					1.2					1							
d50 (mm)					14			14					28												
Profile																									
Riffle Length (ft)																	23	40	64	38		58	74		
Riffle Slope (ft/ft)					0.006		0.007	0.008					0.013				0.004	0.005	0.006	0.0026		0.0069	0.017		
Pool Length (ft)																	21	25	54	55		67	87		
Pool Max Depth (ft)					2.8		3.35	3.9					2.6				3.4	3.6	3.8	1.08		2.89	3.51		
Pool Spacing (ft)					60		110	160			71		102.5	134			88	119	150	56		119	136		
[2]Pool Volume (ft3)																									
Pattern																									
Channel Beltwidth (ft)					40		80	120			33		36.5	40			33	54	75	183		217	250		
Radius of Curvature (ft)					50		145	240			47		182.5	318			44	59.5	75	41		87	167		
Radius of Curvature Ratio (ft/ft)					1.9		5.95	10			2.3		9.15	16			2	2.5	3	1.7		3.72	7		
Meander Wavelength (ft)					110		225	340			37		104.5	172			44	134.5	225	140		221	380		
Meander Width Ratio (ft/ft)					1.7		3.15	4.6			1.6		1.8	2			1.5	2.25	3	7.82		9.27	10.7		
Substrate, bed and transport parameters																									
[4]Ri% / Ru% / P% / G% / S%																				35	18	29		17	
[4]SC% / Sa% / G% / C% / B% / Be%																									
[4]d16 / d35 / d50 / d84 / d95 / dip / disp (mm)																									
Reach Shear Stress (competency) lb/ft2																		0.66							
Max part size (mm) mobilized at bankfull																		144							
Stream Power (transport capacity) W/m2																									
Additional Reach Parameters																									
Drainage Area (sq mi)					3.76						2.2														
Impervious cover estimate (%)																									
Rosgen Classification					F4 & G4						B4c						B4c					B4c			
Bankfull Velocity (fps)					3.3												4.5								
Bankfull discharge (cfs)					186																				
Valley length (ft)																									
Channel Thalweg length (ft)					8756												8777					8848			
Sinuosity (ft)					1.17						1.05						1.2					1.17			
Water Surface Slope (channel) (ft/ft)					0.0054						0.0079						0.005			0.0042			0.0051		
BF slope (ft/ft)					0.005						0.006						0.006					0.0047			
[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 IX-b Baseline Stream Data Summary

Holly Grove Restoration Site - West Branch (391 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)							6.3						20.1					9		9		10.5	12		
Floodprone Width (ft)							7.5						63				12	19.5	27						
Bankfull Mean Depth (ft)							0.9						1.73					0.7							
[1]Bankfull Max Depth (ft)							1.2						2					0.95							
Bankfull Cross-Sectional Area (ft2)							5.5						34.8					6.3							
Width/Depth Ratio							7						12					13							
Entrenchment Ratio							1.2				2.7		2.9	3.1			1.4	1.7	3						
[1]Bank Height Ratio							1.7						1.2					1							
d50 (mm)							28						28												
Profile																									
Riffle Length (ft)																	13	16	19						
Riffle Slope (ft/ft)							0.02						0.013					0.013							
Pool Length (ft)																	7	14	20						
Pool Max Depth (ft)							1.4						2.6					1.4							
Pool Spacing (ft)					30		65	100			33		36.5	40			36	45	54	40		46	52		
[2]Pool Volume (ft3)																									
Pattern																									
Channel Beltwidth (ft)					40		50	60			33		36.5	40			13	20	27			80			
Radius of Curvature (ft)					45		97.5	150			47		182.5	318			18	22.5	27	23		41.5	60		
Radius of Curvature Ratio (ft/ft)					7		15	23			2.3		9.15	16			2	2.5	3	2.3		4.2	6		
Meander Wavelength (ft)					55		77.5	100			37		104.5	172			18	49.5	81			89			
Meander Width Ratio (ft/ft)					6		8	10			1.6		1.8	2			1.5	2.25	3						
Substrate, bed and transport parameters																									
[4]Ri% / Ru% / P% / G% / S%																									
[4]SC% / Sa% / G% / C% / B% / Be%																									
[4]d16 / d35 / d50 / d84 / d95 / dip / disp (mm)																									
Reach Shear Stress (competency) lb/ft2																		0.53							
Max part size (mm) mobilized at bankfull																		96							
Stream Power (transport capacity) W/m2																									
Additional Reach Parameters																									
Drainage Area (sq mi)							0.2						2.2												
Impervious cover estimate (%)																									
Rosgen Classification							G4						B4c					B4c				B4c			
Bankfull Velocity (fps)							3.9											4.5							
Bankfull discharge (cfs)							28																		
Valley length (ft)																									
Channel Thalweg length (ft)							400											386				391			
Sinuosity (ft)							1.06						1.05					1.2				1.17			
Water Surface Slope (channel) (ft/ft)							0.014						0.0079					0.013							
BF slope (ft/ft)							0.015						-					0.015							
[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 IX-c Baseline Stream Data Summary

Holly Grove Restoration Site - Middle Branch (1796 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)							6.3						20.1					9		6.2			7.2		
Floodprone Width (ft)							7.5						63				12	19.5	27	55			80		
Bankfull Mean Depth (ft)							0.9						1.73					0.7		0.6			0.7		
[1]Bankfull Max Depth (ft)							1.2						2					0.95		1			1.1		
Bankfull Cross-Sectional Area (ft2)							5.5						34.8					6.3		3.7			5.2		
Width/Depth Ratio							7						12					13		10			10.4		
Entrenchment Ratio							1.2				2.7		2.9	3.1			1.4	1.7	3	7.6			13		
[1]Bank Height Ratio							1.7						1.2					1							
d50 (mm)							28						28												
Profile																									
Riffle Length (ft)																	10	15	32	17			38		
Riffle Slope (ft/ft)							0.02						0.013					0.013		0.0148			0.0184		
Pool Length (ft)																	6	13	16	17			29		
Pool Max Depth (ft)							1.4						2.6					1.4		0.9			1.32		
Pool Spacing (ft)					30		65	100			33		36.5	40			36	45	54	44			75		
[2]Pool Volume (ft3)																									
Pattern																									
Channel Beltwidth (ft)					40		50	60			33		36.5	40			13	20	27	30			88		
Radius of Curvature (ft)					45		97.5	150			47		182.5	318			18	22.5	27	16			130		
Radius of Curvature Ratio (ft/ft)					7		15	23			2.3		9.15	16			2	2.5	3	2.4			19.4		
Meander Wavelength (ft)					55		77.5	100			37		104.5	172			18	49.5	81	60			105		
Meander Width Ratio (ft/ft)					6		8	10			1.6		1.8	2			1.5	2.25	3	3			8.8		
Substrate, bed and transport parameters																									
[4]Ri% / Ru% / P% / G% / S%																				34	25	29		12	
[4]SC% / Sa% / G% / C% / B% / Be%																									
[4]d16 / d35 / d50 / d84 / d95 / dip / disp (mm)																									
Reach Shear Stress (competency) lb/ft2																		0.58							
Max part size (mm) mobilized at bankfull																		115							
Stream Power (transport capacity) W/m2																									
Additional Reach Parameters																									
Drainage Area (sq mi)							0.2						2.2												
Impervious cover estimate (%)																									
Rosgen Classification							G4						B4c					B4c				B4c			
Bankfull Velocity (fps)							3.9											4.5							
Bankfull discharge (cfs)							28																		
Valley length (ft)																									
Channel Thalweg length (ft)							1778											1790				1796			
Sinuosity (ft)							1.06						1.05					1.2				1.07			
Water Surface Slope (channel) (ft/ft)							0.014						0.0079					0.013		0.0164			0.0187		
BF slope (ft/ft)							0.015						-					0.015		0.016			0.019		
[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 IX-d Baseline Stream Data Summary

Holly Grove Restoration Site - East Branch (1073 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)							6.3						20.1					9				8.6			
Floodprone Width (ft)							7.5						63				12	19.5	27			18			
Bankfull Mean Depth (ft)							0.9						1.73					0.7				0.8			
[1]Bankfull Max Depth (ft)							1.2						2					0.95				1			
Bankfull Cross-Sectional Area (ft2)							5.5						34.8					6.3				6.5			
Width/Depth Ratio							7						12					13				11.4			
Entrenchment Ratio							1.2				2.7		2.9	3.1			1.4	1.7	3			2.1			
[1]Bank Height Ratio							1.7						1.2					1							
d50 (mm)							28						28												
Profile																									
Riffle Length (ft)																	12	17	21	22		23	26		
Riffle Slope (ft/ft)							0.02						0.013					0.013		0.0071		0.0104	0.0132		
Pool Length (ft)																	12	15	18	13		14	17		
Pool Max Depth (ft)							1.4						2.6					1.4		0.5		0.8	0.9		
Pool Spacing (ft)					30		65	100			33		36.5	40			36	45	54	34		35	44		
[2]Pool Volume (ft3)																									
Pattern																									
Channel Beltwidth (ft)					40		50	60			33		36.5	40			13	20	27	28		36	45		
Radius of Curvature (ft)					45		97.5	150			47		182.5	318			18	22.5	27	33		44	60		
Radius of Curvature Ratio (ft/ft)					7		15	23			2.3		9.15	16			2	2.5	3	3.8		5.1	7		
Meander Wavelength (ft)					55		77.5	100			37		104.5	172			18	49.5	81	76		81	91		
Meander Width Ratio (ft/ft)					6		8	10			1.6		1.8	2			1.5	2.25	3	3.25		9.4	5.25		
Substrate, bed and transport parameters																									
[4]Ri% / Ru% / P% / G% / S%																				41	16	24		19	
[4]SC% / Sa% / G% / C% / B% / Be%																									
[4]d16 / d35 / d50 / d84 / d95 / dip / disp (mm)																									
Reach Shear Stress (competency) lb/ft2																		0.54							
Max part size (mm) mobilized at bankfull																		102							
Stream Power (transport capacity) W/m2																									
Additional Reach Parameters																									
Drainage Area (sq mi)							0.2						2.2												
Impervious cover estimate (%)																									
Rosgen Classification							G4						B4c					B4c				B4c			
Bankfull Velocity (fps)							3.9											4.5							
Bankfull discharge (cfs)							28																		
Valley length (ft)																									
Channel Thalweg length (ft)							1039											1058				1073			
Sinuosity (ft)							1.06						1.05					1.2				1.04			
Water Surface Slope (channel) (ft/ft)							0.014						0.0079					0.013				0.011			
BF slope (ft/ft)							0.015						-					0.015				0.011			
[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 IX-e Baseline Stream Data Summary

Holly Grove Restoration Site - Southeast Creek (363 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)							6.3						20.1					7.5				8			
Floodprone Width (ft)							7.5						63				10	16.5	23			25			
Bankfull Mean Depth (ft)							0.9						1.73					0.6				0.5			
[1]Bankfull Max Depth (ft)							1.2						2					0.75				0.8			
Bankfull Cross-Sectional Area (ft2)							5.5						34.8					4.2				4.3			
Width/Depth Ratio							7						12					13				15			
Entrenchment Ratio							1.2				2.7		2.9	3.1			1.4	2.2	3			3.1			
[1]Bank Height Ratio							1.7						1.2					1							
d50 (mm)							28						28												
Profile																									
Riffle Length (ft)																	10	12	19	14		15	18		
Riffle Slope (ft/ft)							0.02						0.013					0.016				0.0067			
Pool Length (ft)																	10	13	20	18		19	21		
Pool Max Depth (ft)							1.4						2.6					1.1		0.49		0.52	1.4		
Pool Spacing (ft)					30		65	100			33		36.5	40			30	37.5	45	20		22	40		
[2]Pool Volume (ft3)																									
Pattern																									
Channel Beltwidth (ft)					40		50	60			33		36.5	40			11	17	23	27		30.5	34		
Radius of Curvature (ft)					45		97.5	150			47		182.5	318			15	19	23	40		64	88		
Radius of Curvature Ratio (ft/ft)					7		15	23			2.3		9.15	16			2	2.5	3	5		8	11		
Meander Wavelength (ft)					55		77.5	100			37		104.5	172			15	41.5	68	81		86	91		
Meander Width Ratio (ft/ft)					6		8	10			1.6		1.8	2			1.5	2.25	3	3.4		38.5	4.3		
Substrate, bed and transport parameters																									
[4]Ri% / Ru% / P% / G% / S%																				40	15	30		15	
[4]SC% / Sa% / G% / C% / B% / Be%																									
[4]d16 / d35 / d50 / d84 / d95 / dip / disp (mm)																									
Reach Shear Stress (competency) lb/ft2																		0.53							
Max part size (mm) mobilized at bankfull																		96							
Stream Power (transport capacity) W/m2																									
Additional Reach Parameters																									
Drainage Area (sq mi)							0.2						2.2												
Impervious cover estimate (%)																									
Rosgen Classification							G4						B4c					B4c				B4c			
Bankfull Velocity (fps)							3.9											4.5							
Bankfull discharge (cfs)							28																		
Valley length (ft)																									
Channel Thalweg length (ft)							342											359				363			
Sinuosity (ft)							1.06						1.05					1.2				1.05			
Water Surface Slope (channel) (ft/ft)							0.014						0.0079					0.016				0.0106			
BF slope (ft/ft)							0.015						-					0.019				0.0106			
[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 IX-f Baseline Stream Data Summary

Holly Grove Restoration Site - Southwest Creek (723 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)							6.3						20.1					8				8			
Floodprone Width (ft)							7.5						63				11	17.5	24			15.6			
Bankfull Mean Depth (ft)							0.9						1.73					0.6				0.4			
[1]Bankfull Max Depth (ft)							1.2						2					0.85				0.7			
Bankfull Cross-Sectional Area (ft2)							5.5						34.8					4.9				3.4			
Width/Depth Ratio							7						12					13				18.6			
Entrenchment Ratio							1.2				2.7		2.9	3.1			1.4	2.2	3			1.95			
[1]Bank Height Ratio							1.7						1.2					1							
d50 (mm)							28						28												
Profile																									
Riffle Length (ft)																	10	14	19	9		11	18		
Riffle Slope (ft/ft)							0.02						0.013					0.007		0.0012		0.0018	0.032		
Pool Length (ft)																	6	10	13	5		8	12		
Pool Max Depth (ft)							1.4						2.6					1.3		1.15		1.45	1.65		
Pool Spacing (ft)					30		65	100			33		36.5	40			32	40	48	19		25	32		
[2]Pool Volume (ft3)																									
Pattern																									
Channel Beltwidth (ft)					40		50	60			33		36.5	40			12	18	24	50		55	60		
Radius of Curvature (ft)					45		97.5	150			47		182.5	318			16	20	24	20		28.5	37		
Radius of Curvature Ratio (ft/ft)					7		15	23			2.3		9.15	16			2	2.5	3	2.5		3.55	4.6		
Meander Wavelength (ft)					55		77.5	100			37		104.5	172			16	44	72	60		93	126		
Meander Width Ratio (ft/ft)					6		8	10			1.6		1.8	2			1.5	2.25	3	6.25		6.88	7.5		
Substrate, bed and transport parameters																									
[4]Ri% / Ru% / P% / G% / S%																				33	19	30		18	
[4]SC% / Sa% / G% / C% / B% / Be%																									
[4]d16 / d35 / d50 / d84 / d95 / dip / disp (mm)																									
Reach Shear Stress (competency) lb/ft2																		0.25							
Max part size (mm) mobilized at bankfull																		50							
Stream Power (transport capacity) W/m2																									
Additional Reach Parameters																									
Drainage Area (sq mi)							0.2						2.2												
Impervious cover estimate (%)																									
Rosgen Classification							G4						B4c					B4c				B4c			
Bankfull Velocity (fps)							3.9											4.5							
Bankfull discharge (cfs)							28																		
Valley length (ft)																									
Channel Thalweg length (ft)																						723			
Sinuosity (ft)							1.06						1.05					1.2				1.17			
Water Surface Slope (channel) (ft/ft)							0.014						0.0079					0.007				0.0122			
BF slope (ft/ft)							0.015						-					0.008				0.0122			
[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 X-a Morphology and Hydraulic Monitoring Summary
Holly Grove Stream Restoration Site (D06028-B)
Reach 1: Buckhorn Creek

Parameter	Cross Section 1 Riffle						Cross Section 2 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)	20	23.7					22	23.4										
Floodprone Width (ft)	70	82					-	-										
Bkf Cross Sectional Area (ft^2)	35.4	35.3					48	46.8										
Bkf Mean Depth (ft)	1.5	1.5					2.2	2										
Bkf Max Depth (ft)	2.1	2.6					3.9	4.2										
Width/Depth Ratio	15.3	15.9					-	-										
Entrenchment Ratio	>3	>3					-	-										
Bank Height Ratio	1	1					-	-										
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	26.5	4.7																
D_{84} (mm)	64	55																

Parameter	MY-1 (2006)			MY-2 (2007)			MY-3 (2008)			MY-4 (2009)			MY-5 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	40	115	65	40	115	65												
Radius of Curvature (ft)	29	371	105	29	371	105												
Meander Wavelength (ft)	125	320	180	125	320	180												
Meander Width Ratio	2	5.75	3.25	2	5.75	3.25												
Profile																		
Riffle Length (ft)	28	81	47	20.5	80.2	37.5												
Riffle Slope (ft/ft)	0.0024	0.0126	0.0094	0	0.0212	0.0071												
Pool length (ft)	24.4	38	29.5	-	-	-												
Pool Spacing (ft)	37	130	82	59.5	164	93												
Additional Reach Parameters																		
Valley Length (ft)	-	-	967	-	-	967												
Channel Length (ft)	-	-	1085	-	-	1085												
Sinuosity	-	-	1.1	-	-	1.1												
Water Surface Slope (ft/ft)	0.0024	0.0126	0.0094	0.0039	0.0081	-												
Bkf Slope (ft/ft)	-	-	0.006	-	-	0.0056												
Rosgen Classification	-	-	B4c	-	-	B4c												
Habitat Index																		
Macrobenthos																		

Table X-b Morphology and Hydraulic Monitoring Summary
Holly Grove Stream Restoration Site (D06028-B)
Reach 2: Buckhorn Creek

Parameter	Cross Section 3 Riffle						Cross Section 4 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)	20.4	20.2					22.2	22										
Floodprone Width (ft)	34	34					-	-										
Bkf Cross Sectional Area (ft^2)	25.4	27.6					45.1	49.1										
Bkf Mean Depth (ft)	1.2	1.4					2	2.2										
Bkf Max Depth (ft)	1.7	1.9					3	3.1										
Width/Depth Ratio	16.4	14.8					-	-										
Entrenchment Ratio	1.6	1.6					-	-										
Bank Height Ratio	1.7	1.7					-	-										
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	67.2	32																
D_{84} (mm)	184	116																

Parameter	MY-1 (2006)			MY-2 (2007)			MY-3 (2008)			MY-4 (2009)			MY-5 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	55	162	60	55	162	60												
Radius of Curvature (ft)	61	245	130	61	245	130												
Meander Wavelength (ft)	182	225	195	182	225	195												
Meander Width Ratio	2.5	7.5	2.8	2.5	7.5	2.8												
Profile																		
Riffle Length (ft)	25	87	34	39	90	50.3												
Riffle Slope (ft)	0.0012	0.0228	0.0099	0.0023	0.0172	0.0083												
Pool length (ft)	16.2	36.8	31.8	-	-	-												
Pool Spacing (ft)	26	151	56	39	159	68												
Additional Reach Parameters																		
Valley Length (ft)	-	-	882	-	-	882												
Channel Length (ft)	-	-	968	-	-	968												
Sinuosity	-	-	1.18	-	-	1.18												
Water Surface Slope (ft/ft)	0.0012	0.0228	0.0099	0.0015	0.0046	0.0069												
Bkf Slope (ft/ft)	-	-	0.0057	-	-	0.0055												
Rosgen Classification	-	-	B4c	-	-	B4c												
Habitat Index																		
Macrobenthos																		

Table X-c Morphology and Hydraulic Monitoring Summary
Holly Grove Stream Restoration Site (D06028-B)
Reach 3: Buckhorn Creek

Parameter	Cross Section 5 Riffle						Cross Section 6 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)	25.5	27.5					22.5	22.8										
Floodprone Width (ft)	65	65					-	-										
Bkf Cross Sectional Area (ft^2)	48	47.7					62.8	66.2										
Bkf Mean Depth (ft)	1.9	1.7					2.8	2.9										
Bkf Max Depth (ft)	2.6	2.8					4.7	4.9										
Width/Depth Ratio	13.5	15.9					-	-										
Entrenchment Ratio	2.5	2.5					-	-										
Bank Height Ratio	1	1					-	-										
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	60.6	15.4																
D_{84} (mm)	118	109																

Parameter	MY-1 (2006)			MY-2 (2007)			MY-3 (2008)			MY-4 (2009)			MY-5 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	45	87	50	45	87	50												
Radius of Curvature (ft)	177	284	222	177	284	222												
Meander Wavelength (ft)	243	288	274	243	288	274												
Meander Width Ratio	1.8	3.4	2	1.8	3.4	2												
Profile																		
Riffle Length (ft)	17	103	49	18	85	51.6												
Riffle Slope (ft)	0.0032	0.014	0.007	0.0029	0.0217	0.0076												
Pool length (ft)	19.9	49.6	24.7	-	-	-												
Pool Spacing (ft)	31	167	75	19.5	164	78												
Additional Reach Parameters																		
Valley Length (ft)	-	-	1009	-	-	1009												
Channel Length (ft)	-	-	1040	-	-	1040												
Sinuosity	-	-	1.03	-	-	1.03												
Water Surface Slope (ft/ft)	0.0032	0.014	0.0066	-	-	0.0044												
Bkf Slope (ft/ft)	-	-	0.0047	-	-	0.0051												
Rosgen Classification	-	-	B4c	-	-	B4c												
Habitat Index																		
Macrobenthos																		

Table X-d Morphology and Hydraulic Monitoring Summary
Holly Grove Stream Restoration Site (D06028-B)
Reach 4: Middle Branch

Parameter	Cross Section 1 Riffle						Cross Section 2 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)	6.4	6.9					17	17.7										
Floodprone Width (ft)	40	40					-	-										
Bkf Cross Sectional Area (ft^2)	3.5	3.8					17	18.2										
Bkf Mean Depth (ft)	0.6	0.5					1	1										
Bkf Max Depth (ft)	1	1					2.5	2.8										
Width/Depth Ratio	11.8	12.6					-	-										
Entrenchment Ratio	>3	>3					-	-										
Bank Height Ratio	1.45	1.45					-	-										
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	20.6	2.2																
D_{84} (mm)	58	53																

Parameter	MY-1 (2006)			MY-2 (2007)			MY-3 (2008)			MY-4 (2009)			MY-5 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	14	21	18	14	21	18												
Radius of Curvature (ft)	25	59	40	25	59	40												
Meander Wavelength (ft)	66	100	88	66	100	88												
Meander Width Ratio	2.8	4.2	3.6	2.8	4.2	3.6												
Profile																		
Riffle Length (ft)	9	23	15.8	8.3	18.1	14.5												
Riffle Slope (ft/ft)	0.0155	0.0409	0.0271	0	0.0348	0.0348												
Pool length (ft)	5	11.9	8.7	-	-	-												
Pool Spacing (ft)	20	41	23	12	52	35												
Additional Reach Parameters																		
Valley Length (ft)	-	-	220	-	-	220												
Channel Length (ft)	-	-	236	-	-	236												
Sinuosity	-	-	1.1	-	-	1.07												
Water Surface Slope (ft/ft)	-	-	-	-	-	-												
Bkf Slope (ft/ft)	-	-	0.0205	-	-	0.0197												
Rosgen Classification	-	-	B4c	-	-	B4c												
Habitat Index																		
Macrobenthos																		

Table X-e Morphology and Hydraulic Monitoring Summary
Holly Grove Stream Restoration Site (D06028-B)
Reach 5: Middle Branch

Parameter	Cross Section 3 Riffle						Cross Section 4 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)	8.2	7.9					8.6	8.4										
Floodprone Width (ft)	40	40					-	-										
Bkf Cross Sectional Area (ft^2)	5.9	5.6					9.7	10.1										
Bkf Mean Depth (ft)	0.7	0.7					1.1	1.2										
Bkf Max Depth (ft)	1.2	1.2					2	1.9										
Width/Depth Ratio	11.5	11.1					-	-										
Entrenchment Ratio	>3	>3					-	-										
Bank Height Ratio	1.3	1.3					-	-										
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	15.3	10.8																
D_{84} (mm)	44	49																

Parameter	MY-1 (2006)			MY-2 (2007)			MY-3 (2008)			MY-4 (2009)			MY-5 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	22	24	23	22	24	23												
Radius of Curvature (ft)	52	71	62	52	71	62												
Meander Wavelength (ft)	91	133	108	91	133	108												
Meander Width Ratio	237	2.9	2.8	237	2.9	2.8												
Profile																		
Riffle Length (ft)	16	43	18	13.5	41.5	22												
Riffle Slope (ft)	0.009	0.0093	0.0092	0.0044	0.0123	0.0064												
Pool length (ft)	11.7	16.2	16.2	-	-	-												
Pool Spacing (ft)	44	74.6	48.5	13.5	61	43												
Additional Reach Parameters																		
Valley Length (ft)	-	-	197	-	-	197												
Channel Length (ft)	-	-	211	-	-	211												
Sinuosity	-	-	1.1	-	-	1.07												
Water Surface Slope (ft/ft)	-	-	-	-	-	-												
Bkf Slope (ft/ft)	-	-	0.0117	-	-	0.0166												
Rosgen Classification	-	-	B4c	-	-	B4c												
Habitat Index																		
Macrobenthos																		

Table X-f Morphology and Hydraulic Monitoring Summary
Holly Grove Stream Restoration Site (D06028-B)
Reach 6: Lower East Branch

Parameter	Cross Section 5 Riffle						Cross Section 6 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)	7.1	8					12.1	9.2										
Floodprone Width (ft)	30	30					-	-										
Bkf Cross Sectional Area (ft^2)	2.7	3					11.5	10.2										
Bkf Mean Depth (ft)	0.4	0.4					1	1.1										
Bkf Max Depth (ft)	0.6	0.7					2.5	2										
Width/Depth Ratio	18.6	21.6					-	-										
Entrenchment Ratio	>3	>3					-	-										
Bank Height Ratio	1.6	1.6					-	-										
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	9.8	0.1																
D_{84} (mm)	29	23																

Parameter	MY-1 (2006)			MY-2 (2007)			MY-3 (2008)			MY-4 (2009)			MY-5 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	16	17	16	16	17	16												
Radius of Curvature (ft)	-	-	193	-	-	193												
Meander Wavelength (ft)	-	-	87	-	-	87												
Meander Width Ratio	2.3	2.4	2.3	2.3	2.4	2.3												
Profile																		
Riffle Length (ft)	17.5	27	18.8	11.7	22.5	16.9												
Riffle Slope (ft)	0.0037	0.0176	0.012	0.0107	0.0222	0.0107												
Pool length (ft)	6.5	12.5	9.5	-	-	-												
Pool Spacing (ft)	30	44	38.4	28.6	39.5	33.6												
Additional Reach Parameters																		
Valley Length (ft)	-	-	207.4	-	-	207.4												
Channel Length (ft)	-	-	209.7	-	-	209.7												
Sinuosity	-	-	1.0	-	-	1.01												
Water Surface Slope (ft/ft)	-	-	-	-	-	-												
Bkf Slope (ft/ft)	-	-	0.0104	-	-	0.0141												
Rosgen Classification	-	-	B4c	-	-	B4c												
Habitat Index																		
Macrobenthos																		

Table X-g Morphology and Hydraulic Monitoring Summary
Holly Grove Stream Restoration Site (D06028-B)
Reach 7: Southeast Creek

Parameter	Cross Section 1 Riffle						Cross Section 2 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	14.5					10.5	9.8										
Floodprone Width (ft)	35	35					-	-										
Bkf Cross Sectional Area (ft^2)	9.5	7.6					9.7	9.6										
Bkf Mean Depth (ft)	0.6	0.05					0.9	1										
Bkf Max Depth (ft)	1.2	1.2					1.8	1.9										
Width/Depth Ratio	23.8	27.7					-	-										
Entrenchment Ratio	2.3	2.3					-	-										
Bank Height Ratio	2.1	2.1					-	-										
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	0.1	2.4																
D_{84} (mm)	43	21																

Parameter	MY-1 (2006)			MY-2 (2007)			MY-3 (2008)			MY-4 (2009)			MY-5 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	21	26	23	21	26	23												
Radius of Curvature (ft)	37	48	44	37	48	44												
Meander Wavelength (ft)	70	80	77	70	80	77												
Meander Width Ratio	1.4	1.7	1.5	1.4	1.7	1.5												
Profile																		
Riffle Length (ft)	12	20.5	19	12.6	24.9	18.8												
Riffle Slope (ft/ft)	0.0017	0.0052	0.0029	0.0024	0.004	0.0032												
Pool length (ft)	5	8.1	6	-	-	-												
Pool Spacing (ft)	29.6	43.5	40.5	29.3	44.2	36.8												
Additional Reach Parameters																		
Valley Length (ft)	-	-	157.6	-	-	157.6												
Channel Length (ft)	-	-	167	-	-	167												
Sinuosity	-	-	1.1	-	-	1.06												
Water Surface Slope (ft/ft)	-	-	-	-	-	-												
Bkf Slope (ft/ft)	-	-	0.0106	-	-	0.0096												
Rosgen Classification	-	-	B4c	-	-	B4c												
Habitat Index																		
Macrobenthos																		

Table X-h Morphology and Hydraulic Monitoring Summary
Holly Grove Stream Restoration Site (D06028-B)
Reach 8: Southwest Creek

Parameter	Cross Section 3 Riffle						Cross Section 4 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)	8.2	8.4					6.6	7.2										
Floodprone Width (ft)	15	15					-	-										
Bkf Cross Sectional Area (ft^2)	4.4	4.9					7.4	9.1										
Bkf Mean Depth (ft)	0.5	0.6					1.1	1.3										
Bkf Max Depth (ft)	0.7	0.8					1.7	1.8										
Width/Depth Ratio	15.2	14.5					-	-										
Entrenchment Ratio	1.83	1.83					-	-										
Bank Height Ratio	2.3	2.3					-	-										
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D_{50} (mm)	7.3	13.3																
D_{84} (mm)	56	42																

Parameter	MY-1 (2006)			MY-2 (2007)			MY-3 (2008)			MY-4 (2009)			MY-5 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Beltwidth (ft)	19	42	25	19	42	25												
Radius of Curvature (ft)	19	26	25	19	26	25												
Meander Wavelength (ft)	59	99	66	59	99	66												
Meander Width Ratio	2.3	5.1	3	2.3	5.1	3												
Profile																		
Riffle Length (ft)	4	15	9	5.1	14.3	8.5												
Riffle Slope (ft)	0.002	0.0092	0.0056	0	0.0373	0.0056												
Pool length (ft)	7	19.5	11.4	-	-	-												
Pool Spacing (ft)	21	38.5	27.5	9.9	32.6	23.9												
Additional Reach Parameters																		
Valley Length (ft)	-	-	174.4	-	-	174.4												
Channel Length (ft)	-	-	198.2	-	-	198.2												
Sinuosity	-	-	1.1	-	-	1.14												
Water Surface Slope (ft/ft)	-	-	-	-	-	-												
Bkf Slope (ft/ft)	-	-	0.0123	-	-	0.0128												
Rosgen Classification	-	-	B4c	-	-	B4c												
Habitat Index																		
Macrobenthos																		

APPENDIX A

VEGETATION RAW DATA

828-545-1041

Vegetation Monitoring Data (VMD) Datasheet. This is the beginning of plot **HGV-01-VP1**

VMD Year (1-5): 2 Date: 9/13/10 - / /

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m) 36.19963 Datum: NAD83/WGS84

Longitude or UTM-E: -79.58552 UTM Zone:

Coordinate Accuracy (m): 5.7 X-Axis bearing (deg): ~~25~~ ~~116~~

Party:	Role:
CMS	
ICK	

Notes on plot: Picture # 1941

Flagged w/ pink tape

Plot: HGV-01-VP1

ID	Species	map char	X (m)	Y (m)	Oct 2009 Data ddh (mm)	Oct 2009 Data Height (cm)	Oct 2009 Data DBH (cm)	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage+	Notes
323	Quercus sp.	m	5.5	0.1		*Missing*					☐			missing
324	Unknown sp.	c	1.7	2.9		*Missing*					☐			missing
325	Salix sp. Nigra	h	2.8	5.4	5	39.0		7	116		☐	3	ins	
326	Quercus sp. michilii	f	2.3	7.8	10	50.0		10	54		☐	4	ins	
327	Carya cordiformis	r	8.0	0.7		*Missing*					☐			missing
329	Cercis canadensis	l	5.2	7.8	4	22.0					☐			missing
330	Juglans nigra	q	7.9	8.2	9	30.0					☐			missing
332	Celtis laevigata	k	3.2	4.7	3	41.0					☐			missing
333	Quercus sp.	g	2.8	3.5	5	45.0		4	42		☐	3	ins	
334	Unknown sp.	n	7.1	3.3		*Missing*					☐			missing
335	Unknown sp.	j	3.1	8.8		*Missing*					☐			
336	Cercis canadensis	i	2.9	9.5		*Missing*					☐			
337	Quercus sp.	b	1.3	9.8	4	41.0					☐			missing
338	Ulmus sp.	o	7.2	0.1		*Missing*					☐			Missing
339	Corylus americana	p	7.5	0.0	7	62.0		7	116		☐	4	ins	
340	Ulmus alata	s	8.2	4.9	5	58.0		7	106		☐	4	ins	
341	Cercis canadensis	e	10.0	7.9		*Missing*					☐			missing
342	Unknown sp.	a	0.2	5.5		*Missing*					☐			
351	~~Cercis canadensis~~ Diospyrus Virginian a	d	1.9	5.2	5	25.0		4	54		☐	3	ins	

*VIGOR: 4=excellent, 3=good, 2=weak, 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.

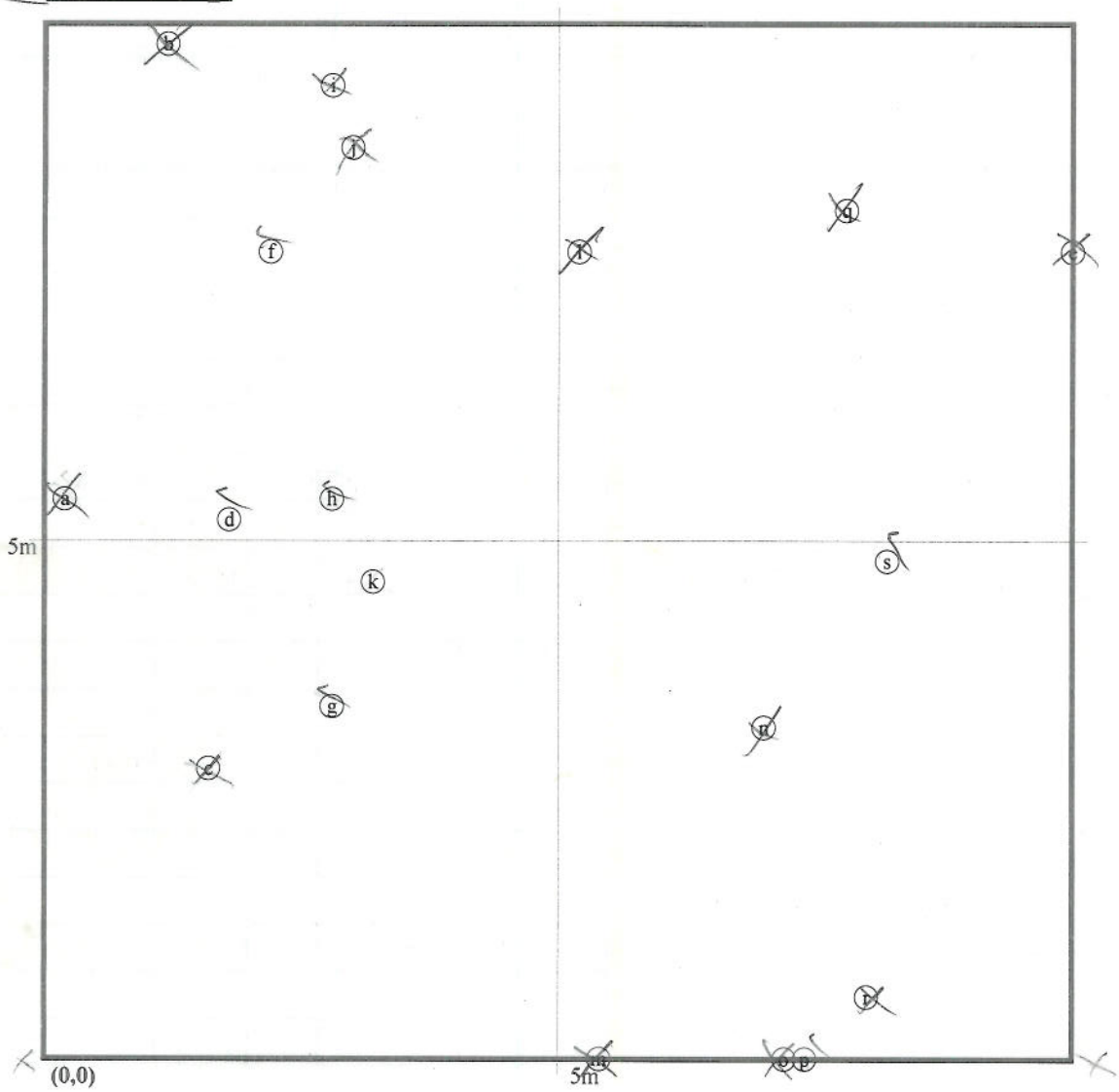
Printed in the CVS-EEP Entry Tool ver. 2.2.5

Number of stems on this plot: 19

N

Plot Map

X-axis: ~~116°~~ 25°



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

Species	source**	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor*	Damage+	Notes
Plantus accidentalis		0.0	2.7		163	2.5	4		
Corylus americana		6	1.5	5	18		2	ins	

---END PLOT.-- **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=weak, 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.

Natural Woody Stem Data: CVS Levels 2 & 3

Leader: CMS **Project:** Holly Grove **Team:** ___ **Plot:** VP1 **Date:** 9/13/10 **Ares** (=100m²): ___

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

Explanation of cut-off & subsampling*: ☐ more..

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 cm	Trees — DBH: 2.5-	5-	10-	15-	20-	25-	30-	35-	≥40 (write dbh)
Salix nigra (black willow)	___			••	••	___			••								
Acer rubrum (red maple)	___		••	•		___											
Liriodendra tulipifera	___		••	••	•	___			•								
Fraxinus pennsylvanica (Green Ash)	___		••			___											
Juglans nigra	___		•			___											
Liquidambar (sweet gum)	___		•	•		___											
Cercis canadensis	___		•			___											
Ulmus alata	___			•		___											
Elantis optisima	___			•		___											
Diospyrus virginiana	___			•		___			•								
Ulmus rubra	___			•		___											
Plantus occidentalis	___					___			•								
Rosa multiflora	___			•		___											
	___					___											
	___					___											
	___					___						•					
	___					___											
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	___					___											
	___					___											
	___					___											

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

Vegetation Monitoring Data (VMD) Datasheet. This is the beginning of plot HGV-01-VP2

VMD Year (1-5): 2 Date: 9/13/10 - / /

Taxonomic Standard:

Taxonomic Standard DATE:

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

Longitude or UTM-E: UTM Zone:

Coordinate Accuracy (m): X-Axis bearing (deg): 147

Party: Cms, ICK Role:

Notes on plot: picture # 1945; Flagged w/ pink tape

Plot: HGV-01-VP2

ID	Species	map char	X (m)	Y (m)	Oct 2009 Data ddh (mm)	Oct 2009 Data Height (cm)	Oct 2009 Data DBH (cm)	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage+	Notes
352	Cornus amomum	a	2.2	3.4	5	38.0		5	86		☐	4	None	
355	Salix sericea	b	3.9	9.0	*Missing*						☐			missing
357	Fraxinus pennsylvanica	d	7.5	3.6	7	71.0		6	77		☐	3	Disease	
358	Unknown sp. Diospyrus virginiana	f	9.4	0.6	4	45.0		2	37		☑	2	Smother	
359	Cornus amomum	e	9.1	6.4	*Missing*						☐			missing
360	Fraxinus pennsylvanica	c	7.2	9.0	5	59.0		5	57		☐	3	Deer	

Herbacious: Wing Stem, Stiltweed, Pokeweed

Multiflora Rose - invasive

Poison Ivy abundant

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

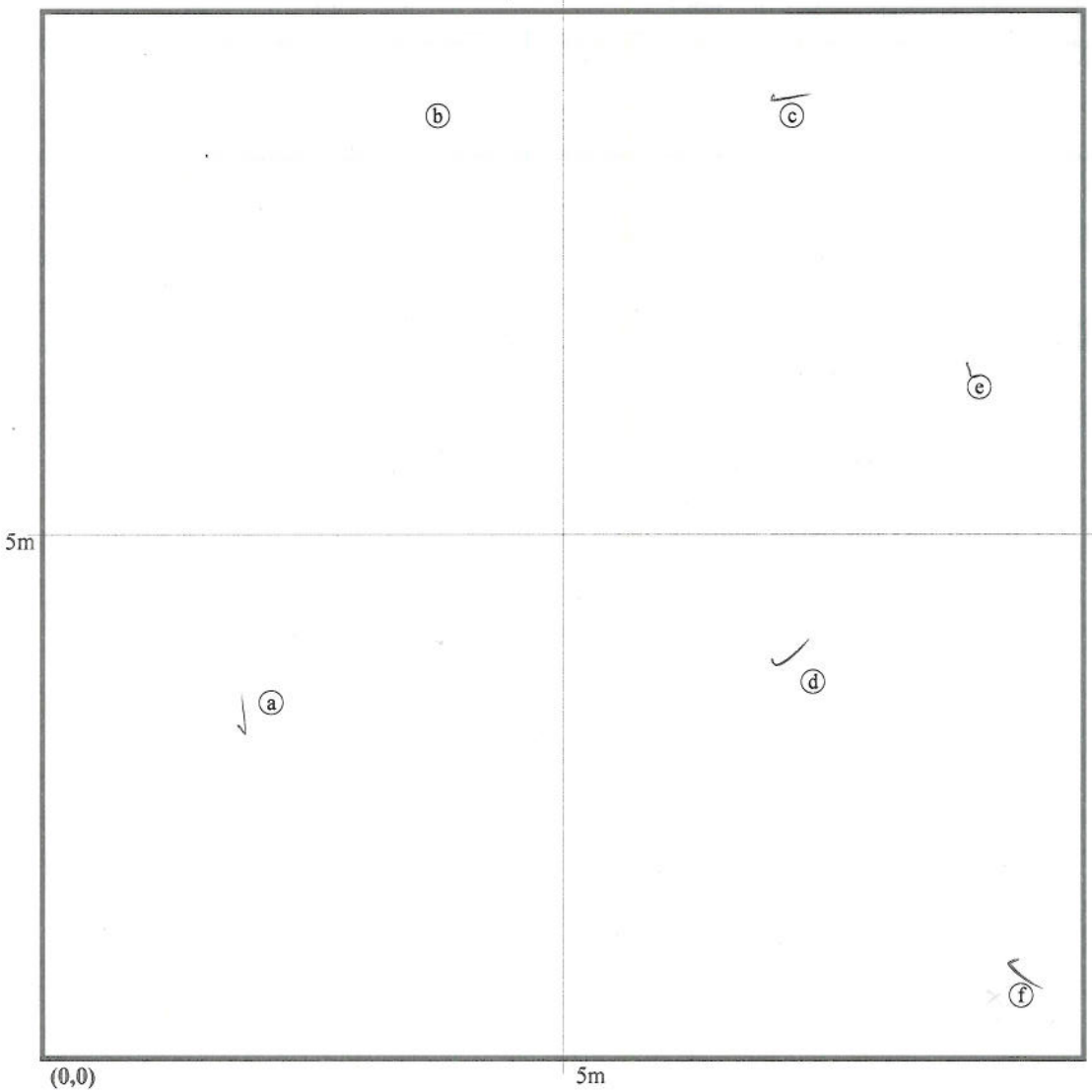
+DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

Number of stems on this plot: 6

N

Plot Map

X-axis: 147°



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

Species	source**	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor*	Damage+	Notes

---END PLOT.-- **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=weak, 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.

Natural Woody Stem Data: CVS Levels 2 & 3

Leader: CMS **Project:** Holly Grove **Team:** ____ **Plot:** VP2 **Date:** 9 / 13 / 10 **Ares** (=100m²): ____

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

Explanation of cut-off & subsampling*: ☐ more..

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 cm	Trees — DBH: 2.5-	5-	10-	15-	20-	25-	30-	35-	≥40 (write dbh)
Liquid ambar		___	⊠⊠	⊠⊠		___											
Leriodendra tulipifera		___		·		___											
Plantus accidentalis sp		___	:	□	:1	___											
Fraxinus pennsylvanica		___		::	·	___											
Acer nagundo		___		·		___											
		___				___											
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*Required if cut-off >10cm or any subsample ≠100%. ●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ●10

EntryTool2.2.6

Form NWS23, ver 8.3

Vegetation Monitoring Data (VMD) Datasheet. This is the beginning of plot **HGV-01-VP3**

VMD Year (1-5): 2 Date: 9/14/10 - / /

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m) 36.19547 Datum:

Longitude or UTM-E: -79.57227 UTM Zone:

Coordinate Accuracy (m): 5 X-Axis bearing (deg): 236

Party:	Role:
CMS	
ICK	

Notes on plot: Photo # 1951; Flagged w/ Pink

Plot: HGV-01-VP3

ID	Species	map char	X (m)	Y (m)	Oct 2009 Data ddh (mm)	Oct 2009 Data Height (cm)	Oct 2009 Data DBH (cm)	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage+	Notes
368	Quercus sp.	a	1.5	0.7	4	38.0					☐			missing
369	Fraxinus pennsylvanica	b	1.7	3.0	5	39.0		8	86		☐	4	ins	
370	Cornus amomum	c	1.8	5.3	4	42.0		3	88		☑	4	None	
371	Quercus sp. ~~macheli~~	d	2.2	9.8	6	52.0		6	63		☐	4	None	
372	Cornus amomum	f	4.5	8.0	3	38.0		3	54		☐	3	Smothered	
375	Corylus americana	h	6.5	4.3	5	53.0		3	42		☑	3	ins	
376	~~Fagus grandifolia~~ Viburnum dentatum	g	6.3	0.1	1	71.0		4	68		☐	4	None	
377	Cornus amomum	i	8.8	1.9	4	42.0					☐			missing
379	Quercus sp. ~~macheli~~	j	9.3	7.0	5	31.0		3	41		☐	3	ins	
381	Cercis canadensis	e	4.5	6.0	7	74.0		8	76		☐	4	None	

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

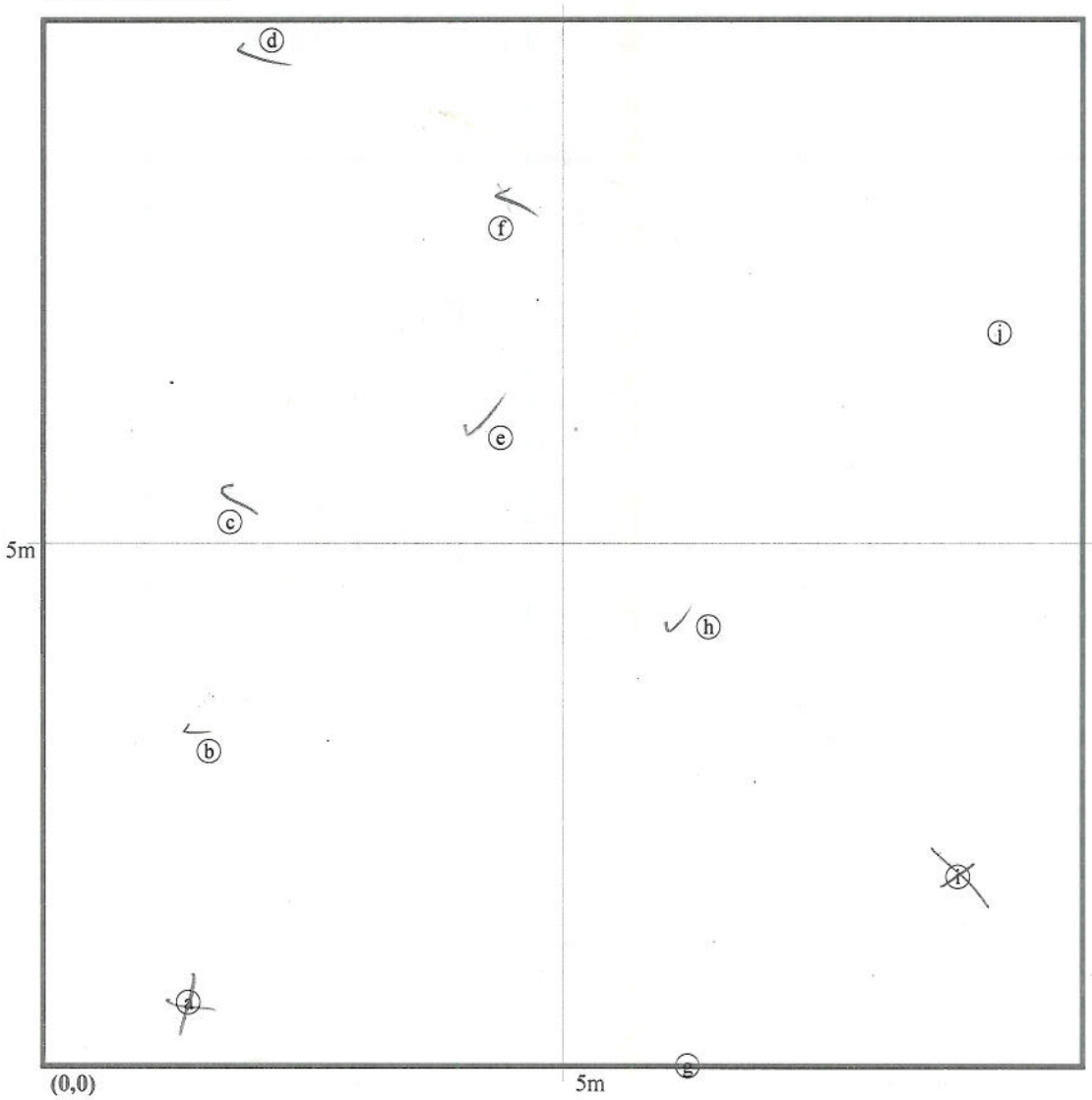
+DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

Number of stems on this plot: 10

Plot Map

N

X-axis: 236°



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

Species	source**	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor*	Damage+	Notes

---END PLOT.-- **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=weak, 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.

Page 1 of 1

Natural Woody Stem Data: CVS Levels 2 & 3

Leader: CMS **Project:** Holly Grove **Team:** ____ **Plot:** VR3 **Date:** 9 / 14 / 10 **Ares** (=100m²): ____ →

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

Explanation of cut-off & subsampling*:

☐ more..

		Seedlings — Height Classes				Saplings — DBH			Trees — DBH							
Species Name	☑ c	Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Sub-Sapl	0-1 cm	1-2.5 cm	2.5-	5-	10-	15-	20-	25-	30-	35-	≥40 (write dbh)
Fraxinus pennsylvanica		___		⁘	··	___			·								
Acer Negundo (Box elder)		___	··	☒ ⁘	:7	___			⊐								
Corylus americana		___		·		___											
Cercis canadensis		___		·		___											
		___				___											
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*Required if cut-off >10cm or any subsample ≠100%.

EntryTool2.2.6

Vegetation Monitoring Data (VMD) Datasheet. This is the beginning of plot HGV-01-VP4

VMD Year (1-5): 2 Date: 9 / 13 / 10 - / /

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m) 36.20236 Datum:

Longitude or UTM-E: -79.57381 UTM Zone:

Coordinate Accuracy (m): X-Axis bearing (deg): 252

Party:	Role:
CMS	
ICK	

Notes on plot: Picture # 1948

Flagged w/ Pink tape

Plot: HGV-01-VP4

ID	Species	map char	X (m)	Y (m)	Oct 2009 Data ddh (mm)	Oct 2009 Data Height (cm)	Oct 2009 Data DBH (cm)	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage+	Notes
387	Diospyros virginiana	a	1.5	0.1	7	52.0					☐			missing
388	Quercus phellos	b	2.3	2.9	6	51.0		5	48		☐	3	Deer	
390	~~Celtis laevigata~~ misID Diospyros virginiana	c	5.5	7.6	5	52.0		6	35		☐	3	Disease	
391	Quercus sp.	d	5.4	5.4	3	39.0		2	35		☐	2	ins	
392	Hamamelis virginiana? (unknown)	f	6.2	4.4	3	26.0		3	17		☐	1		
393	Betula nigra	c	5.3	1.7	7	56.0		8	91		☐	4	some ins	
394	Ilex decidua	g	7.0	1.4	4	43.0		5	47		☐	3	Disease	
395	Hamamelis virginiana	h	7.2	3.9	*Missing*						☐			missing
396	Fraxinus pennsylvanica	j	9.7	8.2	8	58.0		15	64		☐	3	Disease	
397	Diospyros virginiana	i	8.3	8.4	2	18.0		2	16		☑	3	Disease	

Switchgrass, Indian grass, Dog fennel

Pagoda Oak

*VIGOR: 4=excellent, 3=good, 2=weak, 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.

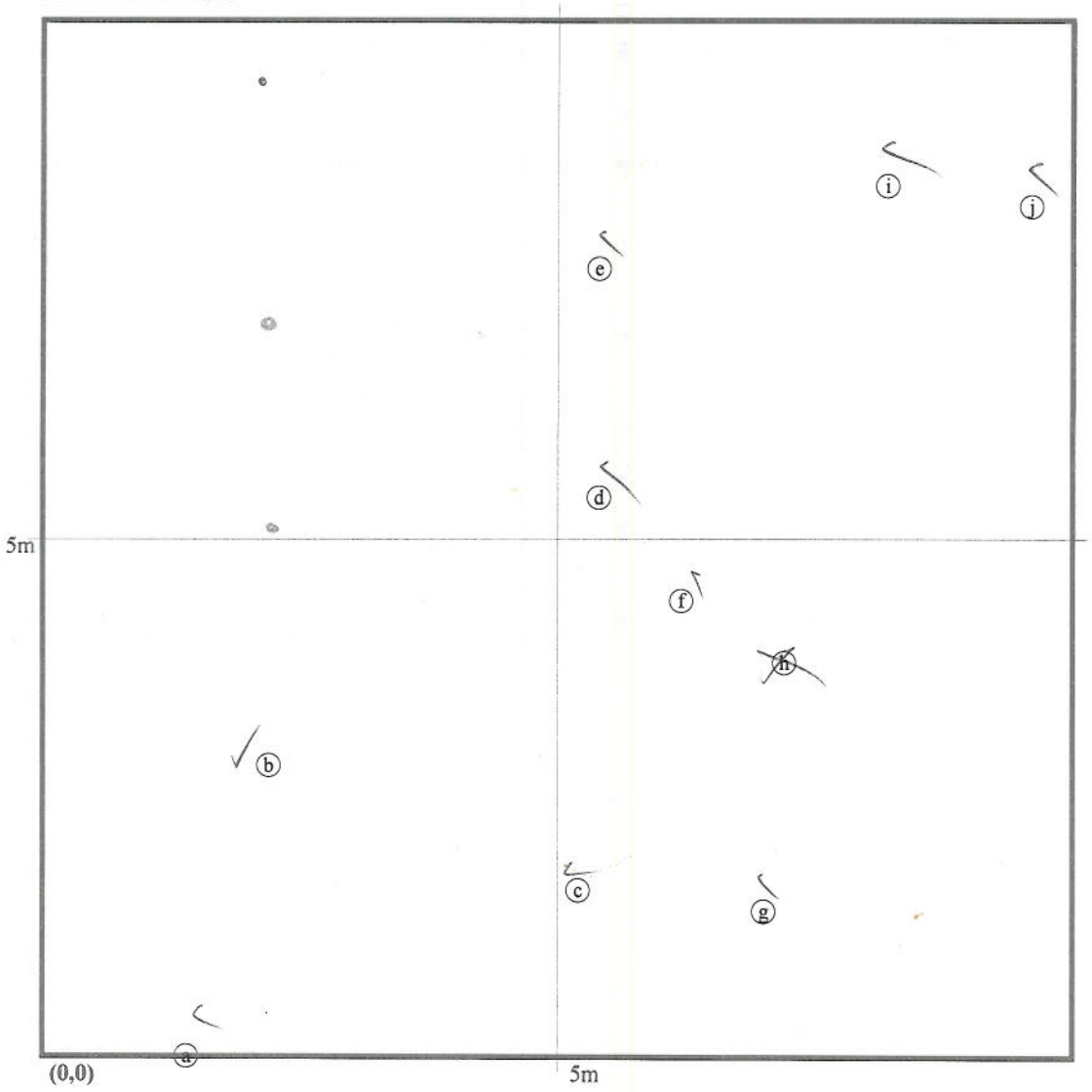
Printed in the CVS-EEP Entry Tool ver. 2.2.5

Number of stems on this plot: 10

Plot Map

N

X-axis: 252°



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

Species	source**	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor*	Damage+	Notes
Quarelis americana		1.9	4.4	3	46		3	ins	
Cercis canadensis		6.5	2.1	2	38		3	Disease	Resprout

---END PLOT.-- **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=weak, 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.

Natural Woody Stem Data: CVS Levels 2 & 3

Leader: Chris **Project:** Holly Grove **Team:** ___ **Plot:** VP4 **Date:** 9/13/10 **Ares** (=100m²): ___ → **Explanation of cut-off & subsampling***: ☐ more..

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 cm	Trees — DBH: 2.5-	5-	10-	15-	20-	25-	30-	35-	≥40 (write dbh)
Diospyros Virginianus		___	1			___											
Quercus Sp		___	1			___											
Quercus Sp (michelii alba)		___		1		___											
Fraxinus Pennsylvanica		___	2	1		___			1								
Liquidambar		___	2	1	2	___			1								
Quercus Phellos		___		1		___											
Bacarus amorapholia		___		1		___											
Corylus americana		___	1			___											
		___				___											
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*Required if cut-off >10cm or any subsample ≠100%. ●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ●10

Vegetation Monitoring Data (VMD) Datasheet. This is the beginning of plot **HGV-01-VP5**

VMD Year (1-5): 2 Date: 9 / 13 / 10 - / /

Party: CMS, ICK Role:

Notes on plot: Photo #1950; Flagged w/ Pink tape

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m) 36.20105 Datum:

Longitude or UTM-E: -79.57369 UTM Zone:

Coordinate Accuracy (m): 4.5 X-Axis bearing (deg): 286

Plot: HGV-01-VP5

ID	Species	map char	X (m)	Y (m)	Oct 2009 Data ddh (mm)	Oct 2009 Data Height (cm)	Oct 2009 Data DBH (cm)	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage+	Notes
404	Unknown sp. ~~Diospyros virginiana~~	d	4.4	2.5		Missing		4	57		☑	2	Smothered insects	
405	Celtis laevigata	h	7.5	0.2	5	55.0		7	87		☐	3	ins	
406	Cercis canadensis	j	8.0	0.9	5	68.0		5	80		☐	3	Smothered ins	
407	Cercis canadensis	k	8.4	3.5	7	81.0		8	149		☐	4	Smothered ins	
408	Cornus amomum	g	6.5	4.2		Missing					☐			DEAD
409	Hamamelis virginiana	f	6.2	6.7		Missing					☐			DEAD
410	Quercus sp.	e	5.3	9.2	4	43.0		6	50		☐	3	Smothered ins	
411	Fagus grandifolia	c	3.4	7.5	4	56.0		4	56		☐	3	Smothered	
412	Unknown sp.	b	0.9	8.1		Missing					☐			missing
413	Cornus amomum	a	0.6	9.7	6	78.0		8	107		☐	3	Smothered	
414	Cercis canadensis	i	7.7	9.0	6	42.0					☐			DEAD

Goldenrod * very abundant
muskedine grape
johnson grass
multiflora Rose
Ragweed
Poison Ivy

*VIGOR: 4=excellent, 3=good, 2=weak, 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.

Printed in the CVS-EEP Entry Tool ver. 2.2.5

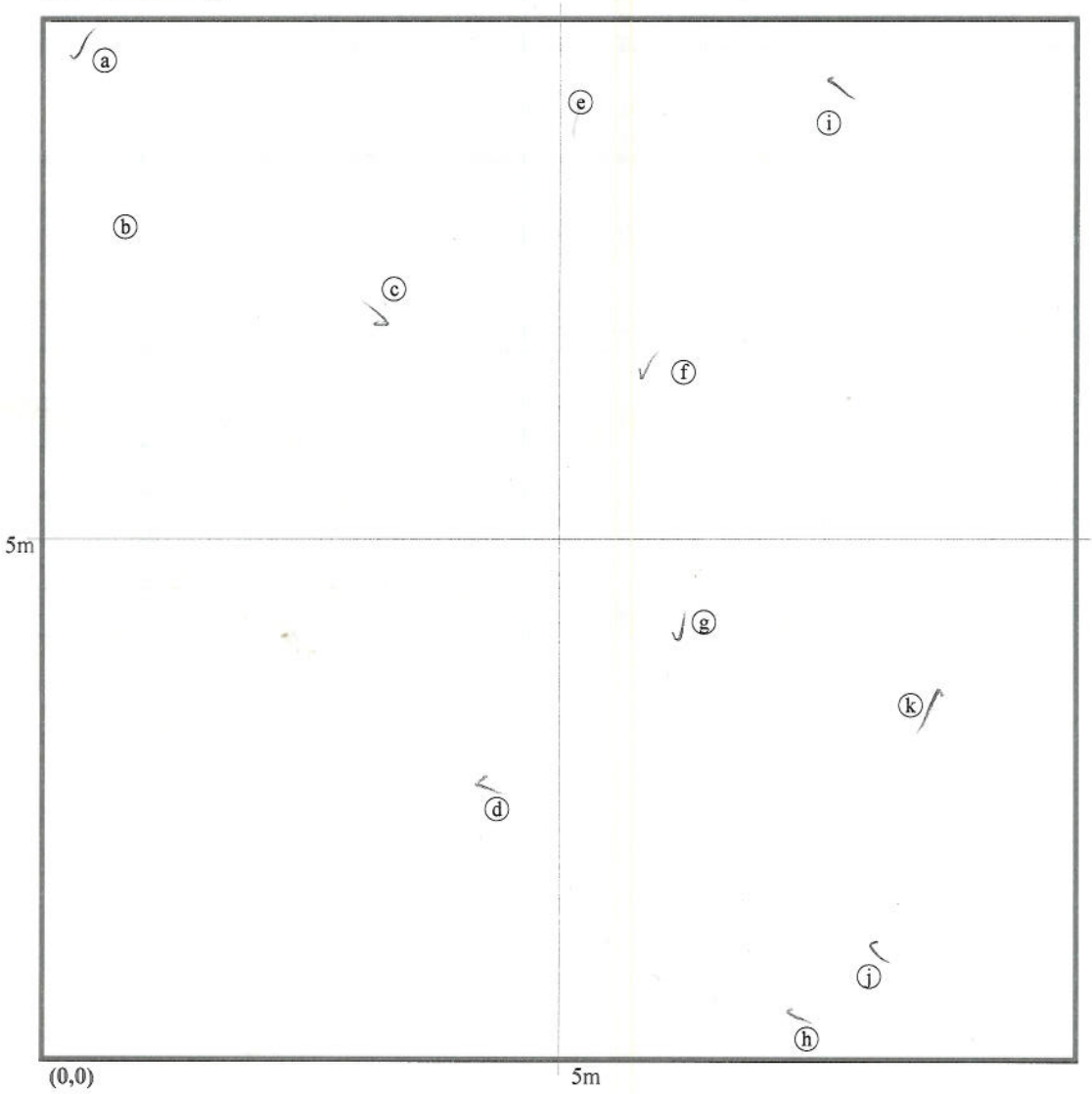
Duncan Parnell

Number of stems on this plot: 11

Plot Map

N

X-axis: 286°



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

Species	source**	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor*	Damage+	Notes

---END PLOT.-- **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=weak, 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.

Natural Woody Stem Data: CVS Levels 2 & 3

Leader: CMS **Project:** Holly Grove **Team:** ___ **Plot:** VP4 **Date:** 9/13/10 **Ares** (=100m²): ___

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

Explanation of cut-off & subsampling*: ☐ more..

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 cm	Trees — DBH: 2.5-	5-	10-	15-	20-	25-	30-	35-	≥40 (write dbh)
Cercis canadensis		___		·		___			·								
Juglans nigra		___		·	·	___			·								
Fraxinus pennsylvanica		___	1	1		___											
Plantus occidentalis		___				___			·								
		___				___											
		___				___											
		___				___											
		___				___											
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*Required if cut-off >10cm or any subsample ≠100%.

●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ●10

EntryTool2.2.6

Form NWS23, ver 8.3

Vegetation Monitoring Data (VMD) Datasheet. This is the beginning of plot **HGV-01-VP6**

VMD Year (1-5): 2 Date: 9/14/10 - / /

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m) 36.19648 Datum:

Longitude or UTM-E: -79.57130 UTM Zone:

Coordinate Accuracy (m): 5 X-Axis bearing (deg): 184

Party:	Role:
CMS	
ICK	

Notes on plot: photo# 1959 Flagged w/ pink tape

Plot: HGV-01-VP6

ID	Species	map char	X (m)	Y (m)	Oct 2009 Data ddh (mm)	Oct 2009 Data Height (cm)	Oct 2009 Data DBH (cm)	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage+	Notes
419	Quercus sp. lyrata	c	1.7	1.6	4	35.0		4	49		☐	3	Ins	
420	Liriodendron tulipifera	g	4.1	1.2	2	14.0		3	21		☐	2	Ins	
422	Quercus sp. lyrata	l	8.7	1.3	5	44.0		3	28		☐	3	Ins	
423	Fraxinus pennsylvanica	k	7.7	4.3	6	50.0		6	52		☐	3	Disease	
424	Liriodendron tulipifera	i	5.2	4.3	5	49.0		5	58		☐	3	Ins	
425	Betula nigra	e	2.8	4.3	2	38.0		3	63		☑	3	Ins	
426	Platanus occidentalis	a	0.7	4.4	4	31.0		2	26		☑	3	Disease	
427	Platanus occidentalis	b	1.3	7.1		*Missing*		6	51		☑	3	Ins	
428	Quercus sp. lyrata	f	3.6	7.2	4	41.0		4	43		☐	3	Ins	
430	Fraxinus pennsylvanica	j	7.5	9.9	4	41.0		4	50		☐	3	Ins	
431	Unknown sp.	h	4.9	9.7		*Missing*					☐			missing
432	Liriodendron tulipifera	d	2.4	9.9		*Missing*					☐			missing

*VIGOR: 4=excellent, 3=good, 2=weak, 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.

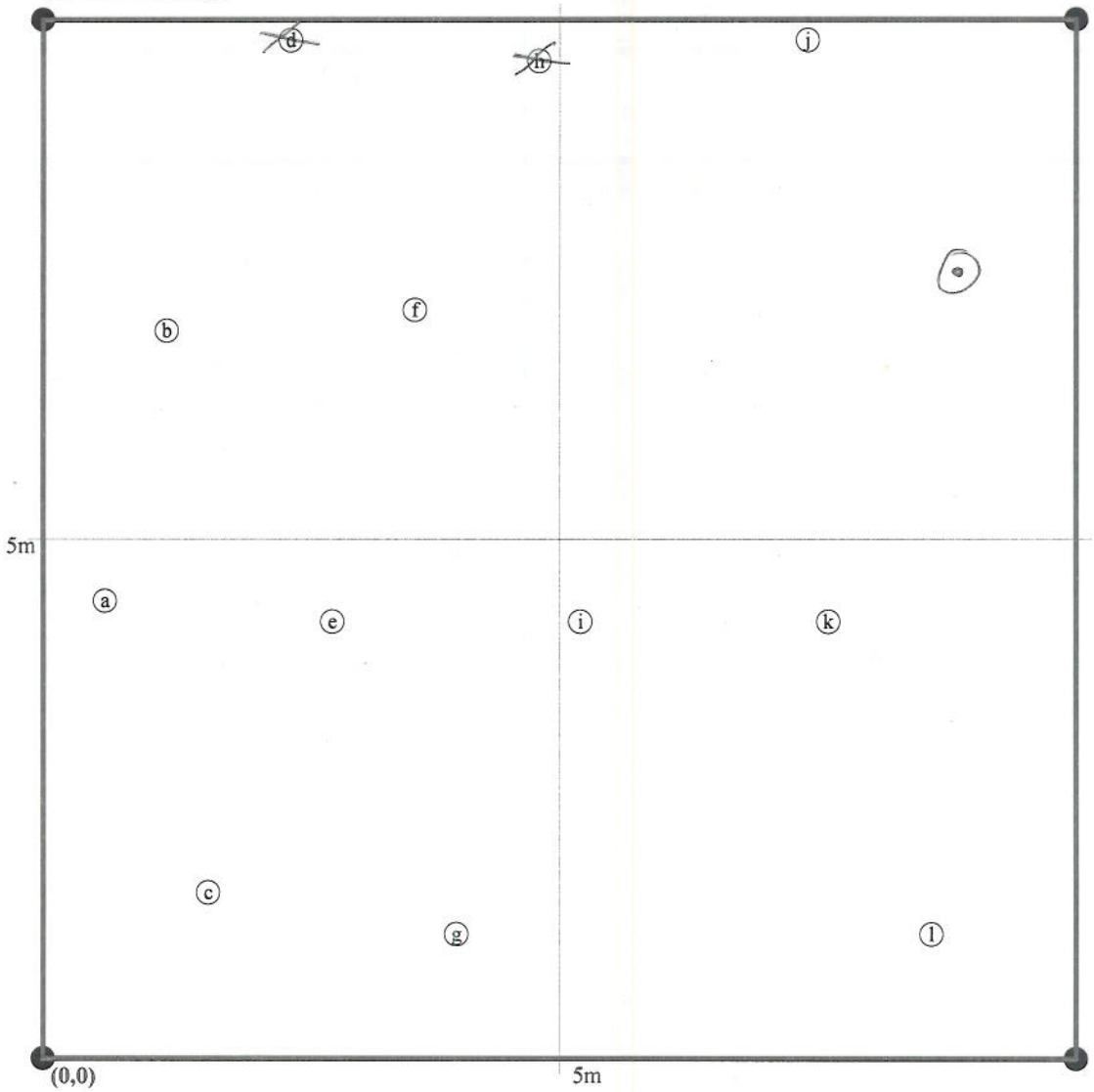
Printed in the CVS-EEP Entry Tool ver. 2.2.5

Number of stems on this plot: 12

N

Plot Map

X-axis: 184°



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

Species	source**	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor*	Damage+	Notes
Quercus lyrata		8.6	8	4	42		3	Ins	

---END PLOT.-- **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=weak, 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.

Page 1 of 1

Natural Woody Stem Data: CVS Levels 2 & 3

Leader: CMS **Project:** Holly Grove **Team:** ___ **Plot:** VP6 **Date:** 9/14/10 **Ares** (=100m²): ___ → **Explanation of cut-off & subsampling***: ☐ more..

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

		Seedlings — Height Classes				Saplings — DBH			Trees — DBH								
Species Name	☑ c	Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Sub-Sapl	0-1 cm	1-2.5 cm	2.5-	5-	10-	15-	20-	25-	30-	35-	≥40 (write dbh)
Planatus occidentalis		___		●		___											
Salix nigra		___			●	___											
		___				___											
		___				___											
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*Required if cut-off >10cm or any subsample ≠100%.

●1 ●●2 ●●●3 ●●●●4 5 6 7 8 9 10

EntryTool2.2.6

Form NWS23, ver 8.3

Vegetation Monitoring Data (VMD) Datasheet. This is the beginning of plot HGV-01-VP7

VMD Year (1-5): 2 Date: 9 / 14 / 10 - / /

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m) 36.19223 Datum:

Longitude or UTM-E: -79.56899 UTM Zone:

Coordinate Accuracy (m): 12 X-Axis bearing (deg): 250 → 260

Party:	Role:
CMS	
ICK	

Notes on plot: Picture # 1960

Flagged w/ Pink tape

Plot: HGV-01-VP7

ID	Species	map char	X (m)	Y (m)	Oct 2009 Data ddh (mm)	Oct 2009 Data Height (cm)	Oct 2009 Data DBH (cm)	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage+	Notes
436	Liriodendron tulipifera	ⓓ	1.6	1.0	5	40.0					☐			
437	Fraxinus pennsylvanica	ⓑ	1.4	3.6	6	61.0					☐			
438	Liriodendron tulipifera	ⓒ	1.5	5.7	2	12.0					☐			
439	Platanus occidentalis	ⓐ	1.2	8.6	9	103.0					☐			
442	Platanus occidentalis	ⓔ	4.1	5.2	5	57.0					☐			
445	Betula nigra	ⓗ	7.3	1.3	1	41.0					☐			
446	Quercus sp.	ⓕ	7.1	3.9	4	23.0					☐			
447	Fraxinus pennsylvanica	ⓖ	7.0	6.4	*Missing*						☐			
448	Platanus occidentalis	ⓘ	7.2	9.0	4	39.0					☐			
449	Fraxinus pennsylvanica	ⓚ	9.5	8.5	6	60.0					☐			
450	Quercus sp.	ⓙ	8.1	5.5	*Missing*						☐			

* Moved plot out of gas-line corridor *

New origin: 36.192138
79.568957

HAE 550

Johnson grass, Goldenrod abundant
morning glory, Sal thistle
tearthumb

* Picture

*VIGOR: 4=excellent, 3=good, 2=weak, 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.

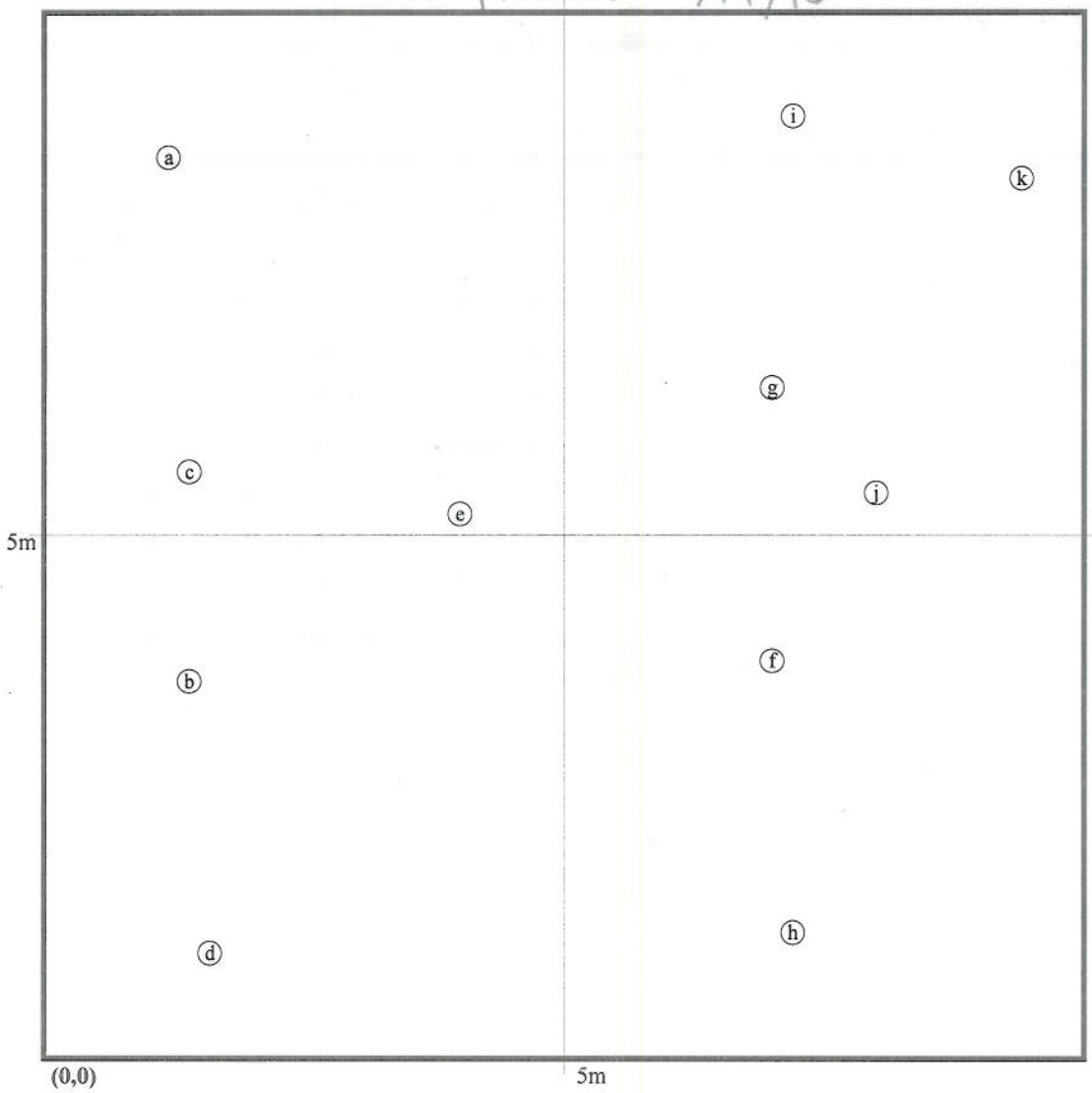
Number of stems on this plot: 11

Plot Map

Re-plotted 9/14/10

N

X-axis: 250°



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

Species	source**	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor*	Damage+	Notes
Platanus occidentalis		10	0.1	20	200	2	4	No	
Platanus occidentalis		8.7	2.3	12	147		4	Ins	
Nyssis sylvatica		7.7	6	4	72		3	Ins	

---END PLOT.-- **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=weak, 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.

Natural Woody Stem Data: CVS Levels 2 & 3

Page 1 of 1

Leader: cms **Project:** Holly Grove **Team:** ____ **Plot:** VP7 **Date:** 9 / 14 / 10 **Ares** (=100m²): ____ → **Explanation of cut-off & subsampling***: ☐ more..

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

		Seedlings — Height Classes				Saplings — DBH			Trees — DBH									
Species Name	☑ c	Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Sub-Sapl	0-1 cm	1-2.5 cm	2.5-	5-	10-	15-	20-	25-	30-	35-	≥40 (write dbh)
Planatus occidentalis		—		○		—											
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*Required if cut-off >10cm or any subsample ≠100%.

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

EntryTool2.2.6

Form NWS23, ver 8.3

Vegetation Monitoring Data (VMD) Datasheet. This is the beginning of plot **HGV-01-VP8**

VMD Year (1-5): 2 Date: 9/14/10 - / /

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m) 36.18998 Datum:

Longitude or UTM-E: -79.57815 UTM Zone:

Coordinate Accuracy (m): 18 X-Axis bearing (deg): 132

Party:	Role:
CMS	
ICK	

Notes on plot: Photo # Flagged w/ pink tape

Plot: HGV-01-VP8

ID	Species	map char	X (m)	Y (m)	Oct 2009 Data ddh (mm)	Oct 2009 Data Height (cm)	Oct 2009 Data DBH (cm)	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage+	Notes
455	Fraxinus pennsylvanica	a	2.3	1.5	4	45.0		7	99		☐	4	Ins	
456	Liriodendron tulipifera	d	6.3	2.5	7	40.0		11	103		☐	3	Ins	
457	Fraxinus pennsylvanica	f	9.0	3.7	7	86.0		11	151		☐	3	Ins	
458	Liriodendron tulipifera	e	8.0	6.2	3	37.0		8	120		☐	3	Disease	
459	Quercus sp. lyrata	c	5.6	7.9	4	57.0		4	53		☐	3	Ins	
460	Liriodendron tulipifera	b	4.2	0.0 / 10.0	6	57.0		8	98		☐	3	Ins Disease	

Tree of Heaven
Mycrostegium

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

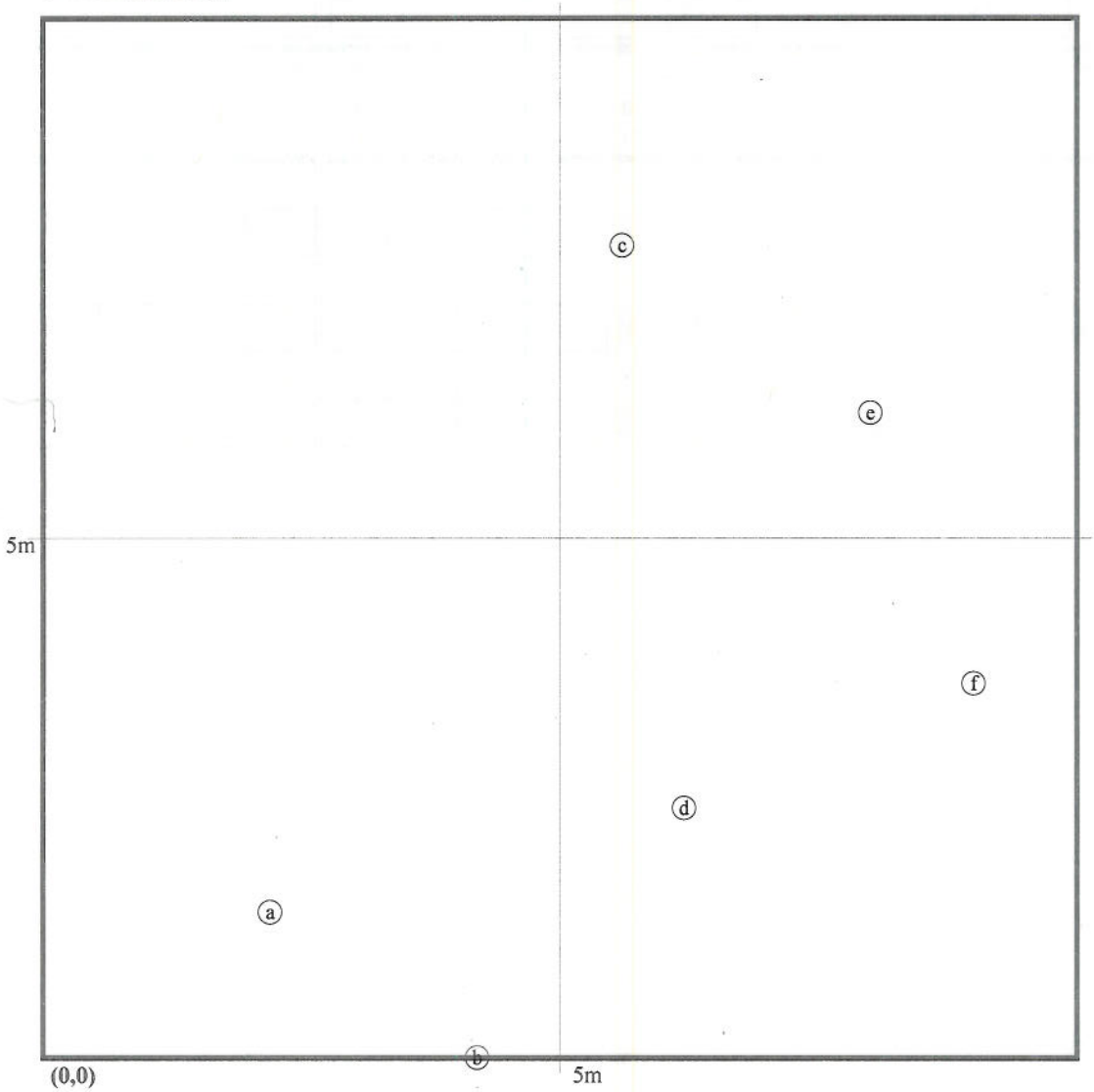
+DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

Number of stems on this plot: 6

N

Plot Map

X-axis: 132°



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

Species	source**	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor*	Damage+	Notes

---END PLOT.-- **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=weak, 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.

Natural Woody Stem Data: CVS Levels 2 & 3

Leader: CMS **Project:** Holly Grove **Team:** ___ **Plot:** VP8 **Date:** 9/14/10 **Ares** (=100m²): ⟶

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

Explanation of cut-off & subsampling*: ☐ more..

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 cm	Trees — DBH: 2.5-	5-	10-	15-	20-	25-	30-	35-	≥40 (write dbh)
Fraxinus pennsylvanica		___	⁵			___			•								
Leriodendron tulipifera		___	⁵	²⁰		___		²	•								
Liquidambar		___	⁴⁰	⁷	•	___			³		²	•					
Ilex opaca		___			²⁰	___			•								
Juniperus virginiana		___				___											
Caria alba		___	³			___			•	•							
Quercas Sp. 1		___	⁴	•		___											
Quercas Sp. 2		___	²			___											
Elantis optisima (tree of H.)		___	•		•	___											
Acer rubrum		___				___			³								
Quercus alba		___				___		•									
Nissas Savatica		___				___			•								
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*Required if cut-off >10cm or any subsample ≠100%. ●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ●10

Vegetation Monitoring Data (VMD) Datasheet. This is the beginning of plot HGV-01-VPA

VMD Year (1-5): 2 Date: 9/13/10 - / /

Taxonomic Standard:

Taxonomic Standard DATE:

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

Longitude or UTM-E: UTM Zone:

Coordinate Accuracy (m): X-Axis bearing (deg): 152

Party: CMS, ICK Role:

Notes on plot: Picture # 1943, 1944. Flagged w/ Pink tape

Plot: HGV-01-VPA

ID	Species	map char	X (m)	Y (m)	Oct 2009 Data ddh (mm)	Oct 2009 Data Height (cm)	Oct 2009 Data DBH (cm)	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage+	Notes
478	Fagus grandifolia	h	3.5	7.7		*Missing*					☐			missing
480	Quercus sp.	n	8.7	8.0	3	26.0		4	38		☐	3	Smothered ins	
481	Diospyros virginiana	m	8.4	9.1	4	37.0		5	58		☐	3	ins	
482	Cercis canadensis	k	7.2	5.7	7	58.0		8	132		☐	3	Deer ins	
483	Viburnum dentatum	i	4.3	5.2	5	74.0		7	108		☐	4	Deer	
484	Fraxinus pennsylvanica	c	1.7	5.3	4	36.0		3.5	44		☐	4	ins	
485	Hamamelis virginiana	g	3.0	0.4		*Missing*					☐			missing
487	Sambucus canadensis	f	3.1	0.1	10	118.0		n/a	163	4	☐	3	ins	
488	Sambucus canadensis	e	2.1	0.1		138.0	1.0	n/a	191	.8	☐	3	ins	
489	Sambucus canadensis	b	1.7	0.1		137.0	1.0	n/a 18	166	.7	☐	3	ins	
490	Diospyros virginiana	d	1.9	0.4	3	53.0					☐			missing
491	Sambucus canadensis	a	~~0.4~~ Ø.5	~~0.1~~ Ø.3		141.0	1.0	n/a 22	156	.7	☐	3	ins	
493	Fraxinus pennsylvanica	j	6.0	3.6	8	59.0		7	69		☐	3	ins	
495	Fraxinus pennsylvanica	l	8.1	3.5	5	52.0		6	59		☐	3	ins	
496	Viburnum dentatum (Arrowood)	o	9.7	0.6	3	42.0		3.5	48		☐	3	Smothering	flooding

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

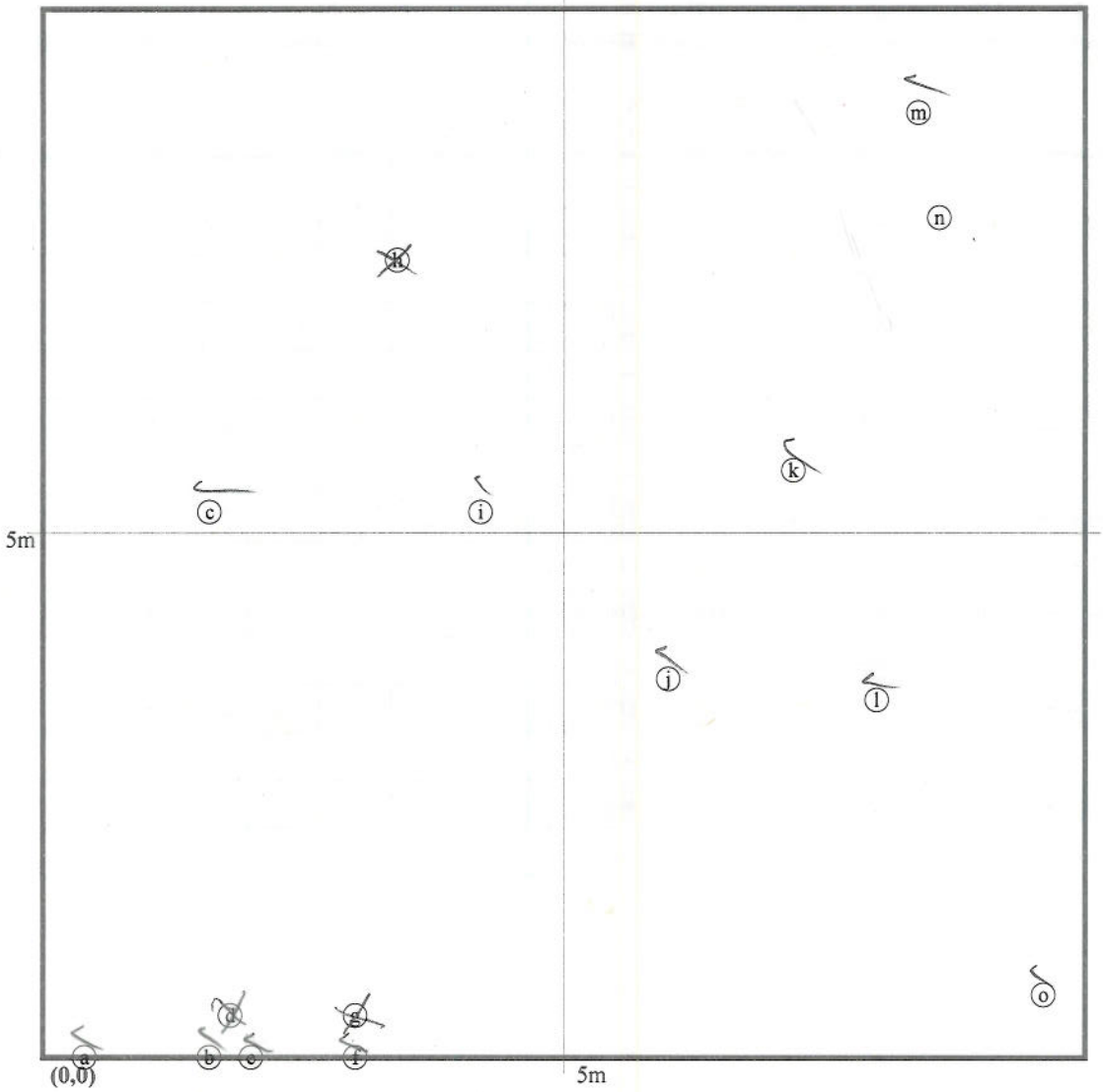
+DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

Number of stems on this plot: 15

N

Plot Map

X-axis: 152°



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

Species	source**	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor*	Damage+	Notes

---END PLOT.-- **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=weak, 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.

Natural Woody Stem Data: CVS Levels 2 & 3

Leader: CMS **Project:** Holly Grove **Team:** ____ **Plot:** VPA **Date:** 9 / 13 / 10 **Ares** (=100m²): ⟶

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

Explanation of cut-off & subsampling*: ☐ more..

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 cm	Trees — DBH: 2.5-	5-	10-	15-	20-	25-	30-	35-	≥40 (write dbh)
Plantus accidentalis sp		___	⊠ ::	·		___											
Quercus fellows		___	·			___											
Viburnum dentatum		___		:·		___											
Fraxinus pennsylvanica		___	·			___											
Carpinus caroliniana		___	:·	·		___											
Liquidambar		___	:·	:·		___											
Leodendrum tulipifera		___	·			___											
Dyospyros Virginiana		___		·		___											
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*Required if cut-off >10cm or any subsample ≠100%.

●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ●10

Vegetation Monitoring Data (VMD) Datasheet. This is the beginning of plot **HGV-01-VPB**

VMD Year (1-5): 2 Date: 9/14/10 - / /

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m) 36.19282 Datum:

Longitude or UTM-E: -79.57080 UTM Zone:

Coordinate Accuracy (m): 5 X-Axis bearing (deg): 266

Party:	Role:
CMJ	
ICK	

Notes on plot: Photo # 1951; Flagged w/ Pink tape

Plot: HGV-01-VPB

ID	Species	map char	X (m)	Y (m)	Oct 2009 Data ddh (mm)	Oct 2009 Data Height (cm)	Oct 2009 Data DBH (cm)	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage+	Notes
501	Fraxinus pennsylvanica	a	1.8	1.7	4	46.0		5	52		☐	3	Ins	
502	Fraxinus pennsylvanica	b	1.8	4.3	4	39.0		6	50		☐	3	Ins	
503	Fraxinus pennsylvanica	c	1.9	6.7	7	57.0		10	96		☐	4	Ins	
504	Unknown sp.	h	4.7	9.2		*Missing*					☐			missing
505	Unknown sp.	g	4.4	7.1		*Missing*					☐			missing
506	Unknown sp.	f	4.4	4.7		*Missing*					☐			missing
507	Nyssa sylvatica	e	4.4	2.6	2	31.0					☐			missing
508	Nyssa sylvatica	d	4.4	0.3	3	36.0		4	51		☐	3	Disease	
510	Fraxinus pennsylvanica	i	6.8	4.2	5	52.0		10	101		☑	4		
511	Nyssa sylvatica	j	6.8	6.7	2	45.0		7	86		☐	4	Disease	
513	Viburnum dentatum	n	9.0	9.9	3	46.0					☐		Smothered	DEAD
514	Fraxinus pennsylvanica	m	9.0	7.6	5	51.0		7	73		☐	3	Disease	
516	Corylus americana	l	9.0	3.1	4	48.0		5	91		☐	3		
517	Corylus americana	k	9.0	0.9	2	27.0		3	44		☐	3	Ins	

measured resprout

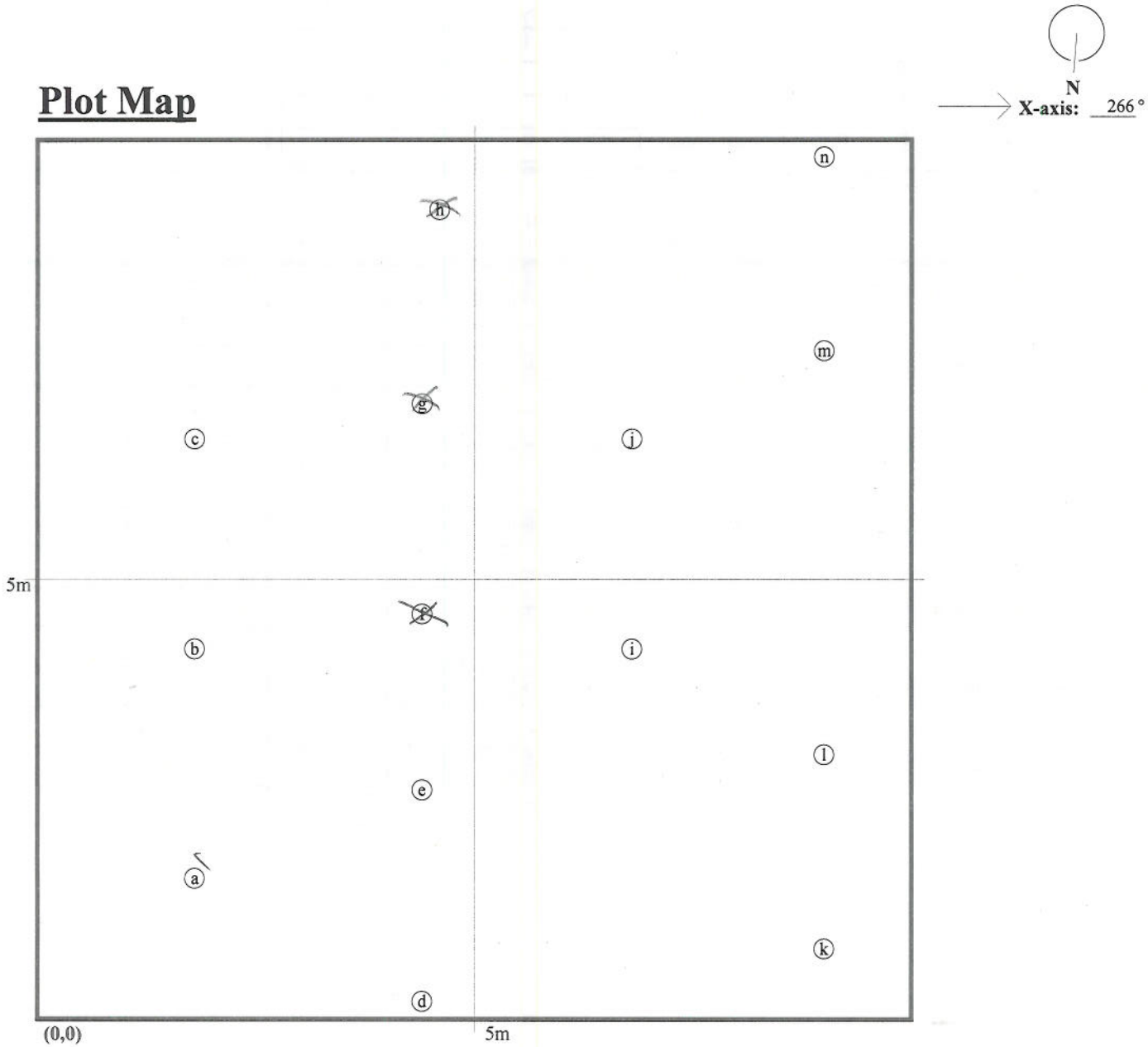
Morning Glory, goldenrod, wing stem, junkus. Carex (sedge)
Cockleburr

*VIGOR: 4=excellent, 3=good, 2=weak, 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.

Number of stems on this plot: 14

Plot Map



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

Species	source**	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor*	Damage+	Notes

---END PLOT.-- **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=weak, 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.

Natural Woody Stem Data: CVS Levels 2 & 3

Leader: CMS **Project:** Holly Grove **Team:** ___ **Plot:** VPB **Date:** 9/14/10 **Ares** (=100m²): ___

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

Explanation of cut-off & subsampling*: ☐ more..

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 cm	Trees — DBH: 2.5-	5-	10-	15-	20-	25-	30-	35-	≥40 (write dbh)
Fraxinus pennsylvanica		___	•	•	••	___											
Acer negundo (Box elder)		___	••	••		___			•								
Diospyros virginiana		___				___			•								
Salix nigra		___				___			••								
Platanus occidentalis		___		•		___											
Carpinus caroliniana		___	•	••		___											
Corylus americana		___		•		___											
		___				___											
		___				___											
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		___				___											

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

●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ●10

Vegetation Monitoring Data (VMD) Datasheet. This is the beginning of plot **HGV-01-VPC**

VMD Year (1-5): 2 Date: 9/14/10 - / /

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m) 36.19075 Datum:

Longitude or UTM-E: -79.57179 UTM Zone:

Coordinate Accuracy (m): X-Axis bearing (deg): 168

Party: Cms, ICK Role:

Notes on plot: Picture# 1957 1958

Plot: HGV-01-VPC

ID	Species	map char	X (m)	Y (m)	Oct 2009 Data ddh (mm)	Oct 2009 Data Height (cm)	Oct 2009 Data DBH (cm)	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage+	Notes
522	Betula nigra	d	3.0	0.2	4	72.0					☐			
523	Quercus sp. lyrata	h	5.6	0.4	6	63.0		10	138	.25	☐	4	None	
524	Platanus occidentalis	l	8.3	0.4	7	62.0		9	103		☐	3	Ins	
525	Liriodendron tulipifera	o	9.4	1.6	6	61.0		8	87		☐	3	Ins	
526	Quercus sp. lyrata	j	6.8	2.1	4	54.0		8	133		☐	4	Ins	
527	Fraxinus pennsylvanica	f	4.0	2.2	7	97.0		13	223	1	☐	4	disease	
528	Betula nigra (river birch)	a	0.2	4.9	5	73.0		8	182	.5	☐	4	Ins	
529	Quercus sp. lyrata	c	2.6	4.9	10	78.0		20	233	1	☐	4	Ins	
531	Fraxinus pennsylvanica	m	8.3	4.4	8	74.0		12	115		☐	4	Ins	
532	Platanus occidentalis	p	9.6	7.1		*Missing*					☐			missing
533	Liriodendron tulipifera	k	6.8	7.2	1	13.0		4	71		☐	3	Smothered	
534	Quercus sp. lyrata	g	4.1	7.2	6	49.0		9	85		☐	4	Ins	
535	Betula nigra	b	1.4	7.2	4	67.0		12	199	.5	☐	4	Ins	
536	Unknown sp.	e	3.0	9.8		*Missing*					☐			missing
537	Fraxinus pennsylvanica	i	5.8	9.7	12	84.0		21	223		☐	4	Ins	
538	Quercus sp. lyrata	n	8.5	9.7	5	48.0		9	94		☐	4	Ins	

tree of Heaven

* Picture

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

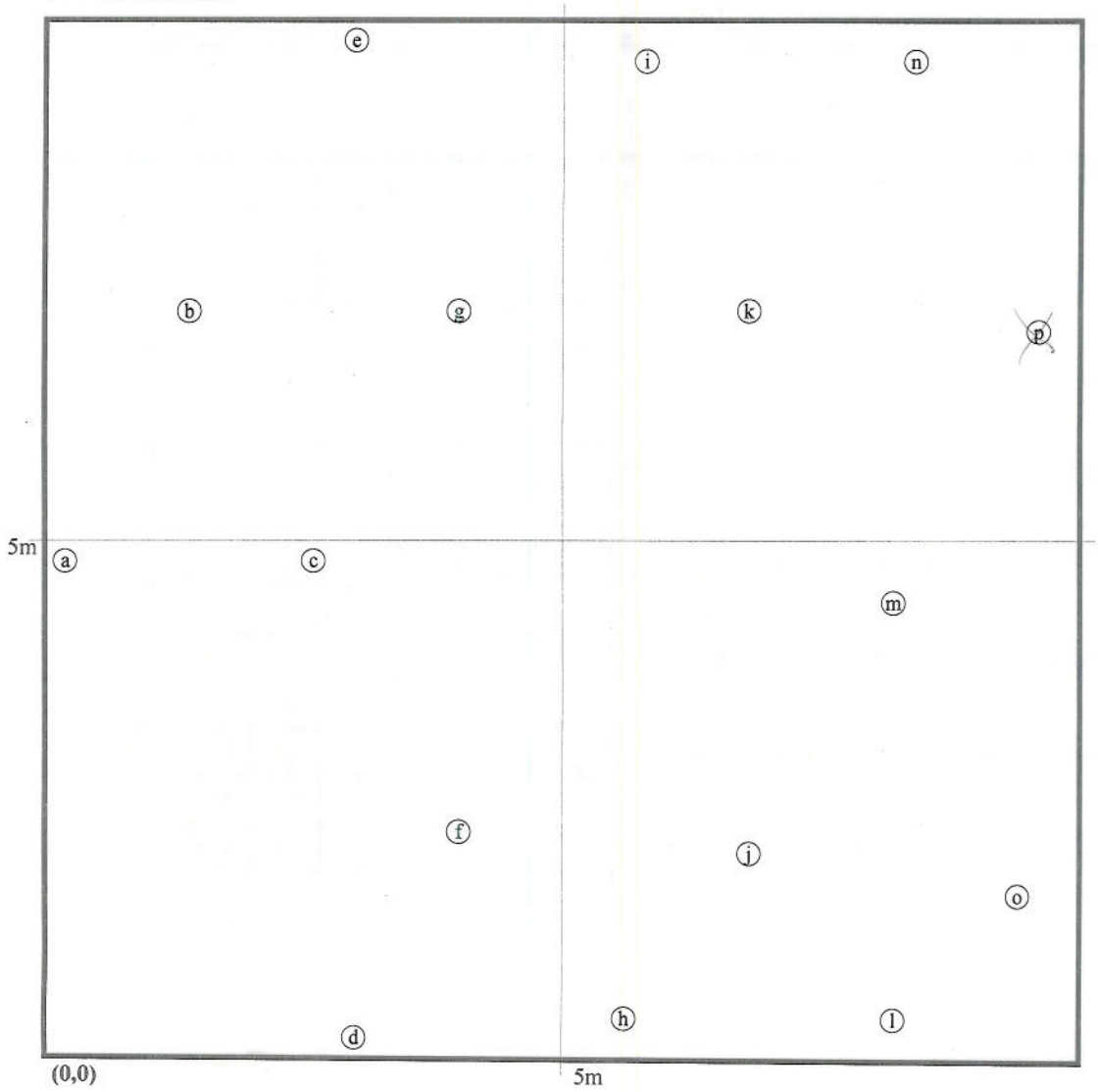
+DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

Number of stems on this plot: 16

N

X-axis: 168°

Plot Map



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

Species	source**	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	Vigor*	Damage+	Notes

---END PLOT.-- **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=weak, 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.

Natural Woody Stem Data: CVS Levels 2 & 3

Leader: CMS **Project:** Holly Grove **Team:** ___ **Plot:** VPC **Date:** 9/14/10 **Ares** (=100m²): →

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

Explanation of cut-off & subsampling*: ☐ more..

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 cm	Trees — DBH: 2.5-	5-	10-	15-	20-	25-	30-	35-	≥40 (write dbh)
Platanus occidentalis		___	7	☒☐		___			•								
Cercis canadensis		___		•		___											
Corylus americana		___		• •		___			•								
Acer negundo		___			•	___											
Fraxinus pennsylvanica		___				___			•								
Betula nigra		___		•		___											
Diospyros virginiana		___		•		___											
		___				___											
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		___				___											

*Required if cut-off >10cm or any subsample ≠100%. ●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ●10

Vegetation Monitoring Plot 1 – 10/28/09

Vegetation Monitoring Plot 1 – 9/13/10

Vegetation Monitoring Plot 2 – 10/28/09

Vegetation Monitoring Plot 2 – 9/13/10

Vegetation Monitoring Plot 3 – 10/28/09

Vegetation Monitoring Plot 3 – 9/13/10

Vegetation Monitoring Plot 4 – 10/28/09

Vegetation Monitoring Plot 4 – 9/13/10

Vegetation Monitoring Plot 5 – 10/28/09

Vegetation Monitoring Plot 5 – 9/13/10

Vegetation Monitoring Plot 6 – 10/28/09

Vegetation Monitoring Plot 6 – 9/14/10

Vegetation Monitoring Plot 7 – 10/28/09

Vegetation Monitoring Plot 7 – 9/14/10

Vegetation Monitoring Plot 8 – 10/28/09

Vegetation Monitoring Plot 8 – 9/14/10

Vegetation Monitoring Plot A – 10/28/09

Vegetation Monitoring Plot A – 9/13/10

Vegetation Monitoring Plot B – 10/28/09

Vegetation Monitoring Plot B – 9/13/10

Vegetation Monitoring Plot C – 10/28/09

Vegetation Monitoring Plot C – 9/14/10

APPENDIX B

GEOMORPHIC RAW DATA

Photo Point 1

Buckhorn Creek facing upstream – Year 0 Photo No. 1

Buckhorn Creek facing upstream – Year 1 Photo No. 2

Buckhorn Creek facing upstream – Year 2 Photo No. 3

Photo Point 2

Buckhorn Creek facing upstream – Year 0 Photo No. 4

Buckhorn Creek facing upstream – Year 1 Photo No. 5

Buckhorn Creek facing upstream – Year 2 Photo No. 6

Photo Point 3

Buckhorn Creek facing upstream – Year 0 Photo No. 7

Buckhorn Creek facing upstream – Year 1 Photo No. 8

Buckhorn Creek facing upstream – Year 2 Photo No. 9

Photo Point 4

West Branch facing downstream – Year 0 Photo No. 10

West Branch facing downstream – Year 1 Photo No. 11

West Branch facing downstream – Year 2 Photo No. 12

Photo Point 5

Buckhorn Creek facing upstream – Year 0 Photo No. 13

Buckhorn Creek facing upstream – Year 1 Photo No. 14

Buckhorn Creek facing upstream – Year 2 Photo No. 15

Photo Point 6

Buckhorn Creek at bridge, facing upstream – Year 0 Photo No. 16

Buckhorn Creek at bridge, facing upstream – Year 1 Photo No. 17

Buckhorn Creek at bridge, facing upstream – Year 2 Photo No. 18

Photo Point 7

Buckhorn Creek at bridge, facing downstream – Year 0 Photo No. 19

Buckhorn Creek at bridge, facing downstream – Year 1 Photo No. 20

Buckhorn Creek at bridge, facing downstream – Year 2 Photo No. 21

Photo Point 8

Buckhorn Creek facing upstream – Year 0 Photo No. 22

Buckhorn Creek facing upstream – Year 1 Photo No. 23

Buckhorn Creek facing upstream – Year 2 Photo No. 24

Photo Point 9

Buckhorn Creek facing upstream – Year 0 Photo No. 25

Buckhorn Creek facing upstream – Year 1 Photo No. 26

Buckhorn Creek facing upstream – Year 2 Photo No. 27

Photo Point 10

Buckhorn Creek facing upstream – Year 0 Photo No. 28

Buckhorn Creek facing upstream – Year 1 Photo No. 29

Buckhorn Creek facing upstream – Year 2 Photo No. 30

Photo Point 11

Southwest Creek facing downstream – Year 0 Photo No. 31

Southwest Creek facing downstream - Year 1 Photo No. 32

Southwest Creek facing downstream - Year 2 Photo No. 33

Photo Point 12

Southwest Creek facing upstream – Year 0 Photo No. 34

Southwest Creek facing upstream – Year 1 Photo No. 35

Southwest Creek facing upstream – Year 2 Photo No. 36

Table B2. Visual Morphological Stability Assessment

Holly Grove Stream Restoration Site (D06028-B)

Buckhorn Creek 8,848 ft

Feature Category	Metric	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performing Mean or Total
A. Riffles	1. Present	86	86	N/A	100%	
	2. Armor stable	86	86	N/A	100%	
	3. Facet grade appears stable	86	86	N/A	100%	
	4. Minimal evidence of embedding/fining	86	86	N/A	100%	
	5. Length appropriate	86	86	N/A	100%	**100%**
B. Pools	1. Present	88	88	0	100%	
	2. Sufficently deep	88	88	N/A	100%	
	3. Length appropriate	88	88	N/A	100%	**100%**
C. Thalweg	1. Upstream of meander bend centered	86	86	N/A	100%	
	2. Downstream of meander bend centered	86	86	N/A	100%	**100%**
D. Meanders	1. Outer bend in state of limited erosion	85	88	N/A	97%	
	2. Of those eroding, # w/ concomitant point bar formation	0	N/A	N/A	100%	
	3. Apparent Rc within specification	88	88	N/A	100%	
	4. Sufficient floodplain access and relief	88	88	N/A	100%	**100%**
E. Bed General	1. General channel bed agradation areas	N/A	N/A	0/0	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting	N/A	N/A	0/200	100%	**100%**
F. Vanes	1. Free of back or arm scour	108	108	N/A	100%	
	2. Height appropriate	108	108	N/A	100%	
	3. Angle and geometry appear appropriate	108	108	N/A	100%	
	4. Free of piping or other structural failures	106	108	N/A	98%	**100%**
G. Wads/Boulders	1. Free of scour	23	23	N/A	100%	
	2. Footing stable	23	23	N/A	100%	**100%**

Table B2. Visual Morphological Stability Assessment

Holly Grove Stream Restoration Site (D06028-B)

Middle Branch 1,755 ft

Feature Category	Metric	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performing Mean or Total
A. Riffles	1. Present	44	44	N/A	100%	
	2. Armor stable	43	44	N/A	98%	
	3. Facet grade appears stable	43	44	N/A	98%	
	4. Minimal evidence of embedding/fining	44	44	N/A	100%	
	5. Length appropriate	44	44	N/A	100%	**99%**
B. Pools	1. Present	46	46	N/A	100%	
	2. Sufficently deep	46	46	N/A	100%	
	3. Length appropriate	46	46	N/A	100%	**100%**
C. Thalweg	1. Upstream of meander bend centered	44	44	N/A	100%	
	2. Downstream of meander bend centered	44	44	N/A	100%	**100%**
D. Meanders	1. Outer bend in state of limited erosion	44	46	N/A	96%	
	2. Of those eroding, # w/ concomitant point bar formation	0	N/A	N/A	100%	
	3. Apparent Rc within specification	46	46	N/A	100%	
	4. Sufficient floodplain access and relief	46	46	N/A	100%	**99%**
E. Bed General	1. General channel bed agradation areas	N/A	N/A	0/0	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting	N/A	N/A	0/0	100%	**100%**
F. Vanes	1. Free of back or arm scour	68	69	N/A	99%	
	2. Height appropriate	69	69	N/A	100%	
	3. Angle and geometry appear appropriate	69	69	N/A	100%	
	4. Free of piping or other structural failures	68	69	N/A	99%	**99%**
G. Wads/Boulders	1. Free of scour	3	3	N/A	100%	
	2. Footing stable	2	3	N/A	67%	**83%**

Table B2. Visual Morphological Stability Assessment

Holly Grove Stream Restoration Site (D06028-B)

East Branch 1,090 ft

Feature Category	Metric	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performing Mean or Total
A. Riffles	1. Present	25	25	N/A	100%	
	2. Armor stable	24	25	N/A	96%	
	3. Facet grade appears stable	25	25	N/A	100%	
	4. Minimal evidence of embedding/fining	25	25	N/A	100%	
	5. Length appropriate	25	25	N/A	100%	**99%**
B. Pools	1. Present	25	25	N/A	100%	
	2. Sufficently deep	25	25	N/A	100%	
	3. Length appropriate	25	25	N/A	100%	**100%**
C. Thalweg	1. Upstream of meander bend centered	25	25	N/A	100%	
	2. Downstream of meander bend centered	25	25	N/A	100%	**100%**
D. Meanders	1. Outer bend in state of limited erosion	25	25	N/A	100%	
	2. Of those eroding, # w/ concomitant point bar formation	0	N/A	N/A	100%	
	3. Apparent Rc within specification	25	25	N/A	100%	
	4. Sufficient floodplain access and relief	25	25	N/A	100%	**100%**
E. Bed General	1. General channel bed agradation areas	N/A	N/A	0/0	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting	N/A	N/A	0/0	100%	**100%**
F. Vanes	1. Free of back or arm scour	37	38	N/A	97%	
	2. Height appropriate	38	38	N/A	100%	
	3. Angle and geometry appear appropriate	38	38	N/A	100%	
	4. Free of piping or other structural failures	37	38	N/A	97%	**99%**
G. Wads/Boulders	1. Free of scour	1	1	N/A	100%	
	2. Footing stable	1	1	N/A	100%	**100%**

Table B2. Visual Morphological Stability Assessment

Holly Grove Stream Restoration Site (D06028-B)

Southeast Creek 363 ft

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

Table B2. Visual Morphological Stability Assessment

Holly Grove Stream Restoration Site (D06028-B)

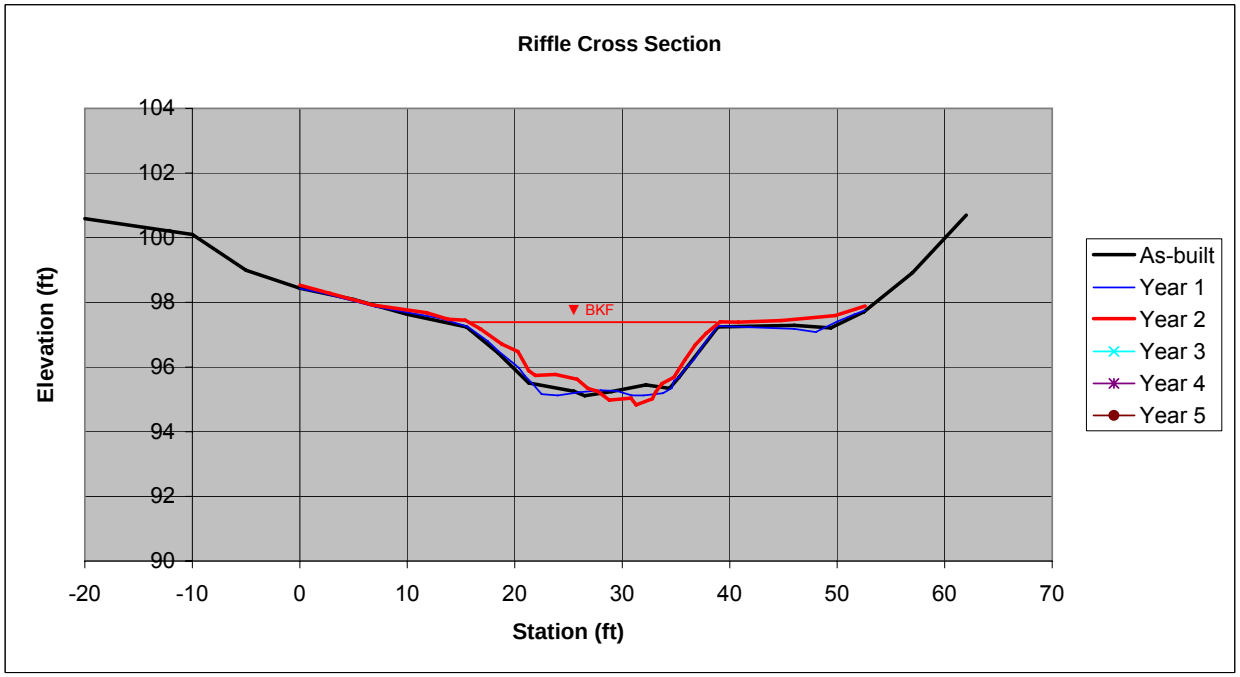
Southwest Creek 723 ft

Feature Category	Metric	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performing Mean or Total
A. Riffles	1. Present	23	23	N/A	100%	
	2. Armor stable	23	23	N/A	100%	
	3. Facet grade appears stable	23	23	N/A	100%	
	4. Minimal evidence of embedding/fining	23	23	N/A	100%	
	5. Length appropriate	23	23	N/A	100%	**100%**
B. Pools	1. Present	25	25	N/A	100%	
	2. Sufficently deep	25	25	N/A	100%	
	3. Length appropriate	25	25	N/A	100%	**100%**
C. Thalweg	1. Upstream of meander bend centered	23	23	N/A	100%	
	2. Downstream of meander bend centered	23	23	N/A	100%	**100%**
D. Meanders	1. Outer bend in state of limited erosion	25	25	N/A	100%	
	2. Of those eroding, # w/ concomitant point bar formation	0	N/A	N/A	100%	
	3. Apparent Rc within specification	25	25	N/A	100%	
	4. Sufficient floodplain access and relief	25	25	N/A	100%	**100%**
E. Bed General	1. General channel bed agradation areas	N/A	N/A	0/0	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting	N/A	N/A	0/0	100%	**100%**
F. Vanes	1. Free of back or arm scour	9	9	N/A	100%	
	2. Height appropriate	9	9	N/A	100%	
	3. Angle and geometry appear appropriate	9	9	N/A	100%	
	4. Free of piping or other structural failures	9	9	N/A	100%	**100%**
G. Wads/Boulders	1. Free of scour	34	34	N/A	100%	
	2. Footing stable	34	34	N/A	100%	**100%**

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF1
Reach 1 - Buckhorn Creek - Sta 11+78.6

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/11/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	34.3	Area	35.4	Area	35.3	Area	0.0	Area	0.0	Area	0.0
Bkf W	23.4	Bkf W	23.3	Bkf W	23.7	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	1.5	Dmean	1.5	Dmean	1.5	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	2.1	Dmax	2.1	Dmax	2.6	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	16.0	W/d	15.3	W/d	15.9	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF1
Reach 1 - Buckhorn Creek - Sta 11+78.6

As-Built

Station	FS/BS	Elev.	Desc.
BM	6.36	97.34	PL1 IR Lt
HI		103.70	
-20	3.11	100.59	GRND
-10	3.60	100.10	
-5	4.71	98.99	
0	5.26	98.44	GRND
5	5.61	98.09	
10	6.07	97.63	
15.5	6.46	97.24	BKF
18.4	7.25	96.45	
21.3	8.19	95.51	TOE
25.5	8.45	95.25	EOW
26.5	8.59	95.11	THL
29	8.46	95.24	
32.2	8.25	95.45	
34.4	8.36	95.34	EOW
35.3	8.01	95.69	TOE
38.9	6.46	97.24	BKF
46	6.41	97.29	
49.4	6.49	97.21	
52.5	5.99	97.71	GRND
57	4.78	98.92	
62	3.00	100.70	

Year 1

Station	FS/BS	Elev.	Desc.
BM	3.78	98.67	RF1 IR Lt
HI		102.45	
0	4.02	98.43	GRND
2	4.15	98.30	GRND
7	4.58	97.87	GRND
13	4.94	97.51	GRND
15.6	5.20	97.25	GRND
17.5	5.65	96.80	BKF LT
18.5	5.96	96.49	BNK
20	6.37	96.08	BNK
20.4	6.48	95.97	BNK
20.9	6.71	95.74	BNK
21.7	6.98	95.47	EOW
22.5	7.29	95.16	BED
24	7.33	95.12	BED
26	7.23	95.22	BED
28	7.17	95.28	BED
29.5	7.19	95.26	BED
30.9	7.33	95.12	BED
32	7.33	95.12	BED
33.8	7.26	95.19	BED
34.6	7.10	95.35	BED
34.8	6.89	95.56	EOW
35.3	6.75	95.70	BNK
36	6.45	96.00	BNK
36.7	6.21	96.24	BNK
37.4	5.83	96.62	BKF RT
38.9	5.18	97.27	GRND
42	5.22	97.23	GRND
46	5.27	97.18	GRND
48	5.37	97.08	GRND
50	5.04	97.41	GRND
51.6	4.82	97.63	GRND
52.6	4.7	97.75	GRND
25		97.14	

Year 2

Station	FS/BS	Elev.	Desc.
BM	4.81	98.73	IR Lt
HI		103.54	
0	5.01	98.53	GRND
2.8	5.26	98.28	GRND
6.8	5.62	97.92	GRND
11.8	5.86	97.68	GRND
13.8	6.06	97.48	GRND
15.4	6.09	97.45	BKF
16.8	6.36	97.18	BNK
18.8	6.83	96.71	BNK
20.3	7.06	96.48	BNK
21.3	7.65	95.89	BNK
21.9	7.80	95.74	BED
23.8	7.77	95.77	BED
25.8	7.92	95.62	BED
26.8	8.20	95.34	BED
27.7	8.29	95.25	EOW
28.8	8.56	94.98	BED
30.8	8.50	95.04	BED
31.3	8.71	94.83	THL
32.8	8.52	95.02	BED
33.1	8.32	95.22	EOW
33.7	8.05	95.49	BED
34.8	7.86	95.68	BED
35.8	7.33	96.21	BNK
36.8	6.85	96.69	BNK
37.8	6.50	97.04	BNK
39.1	6.14	97.40	BKF
40.8	6.15	97.39	GRND
44.8	6.10	97.44	GRND
49.8	5.95	97.59	GRND
52.6	5.65	97.89	GRND

Year 3

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

Year 4

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

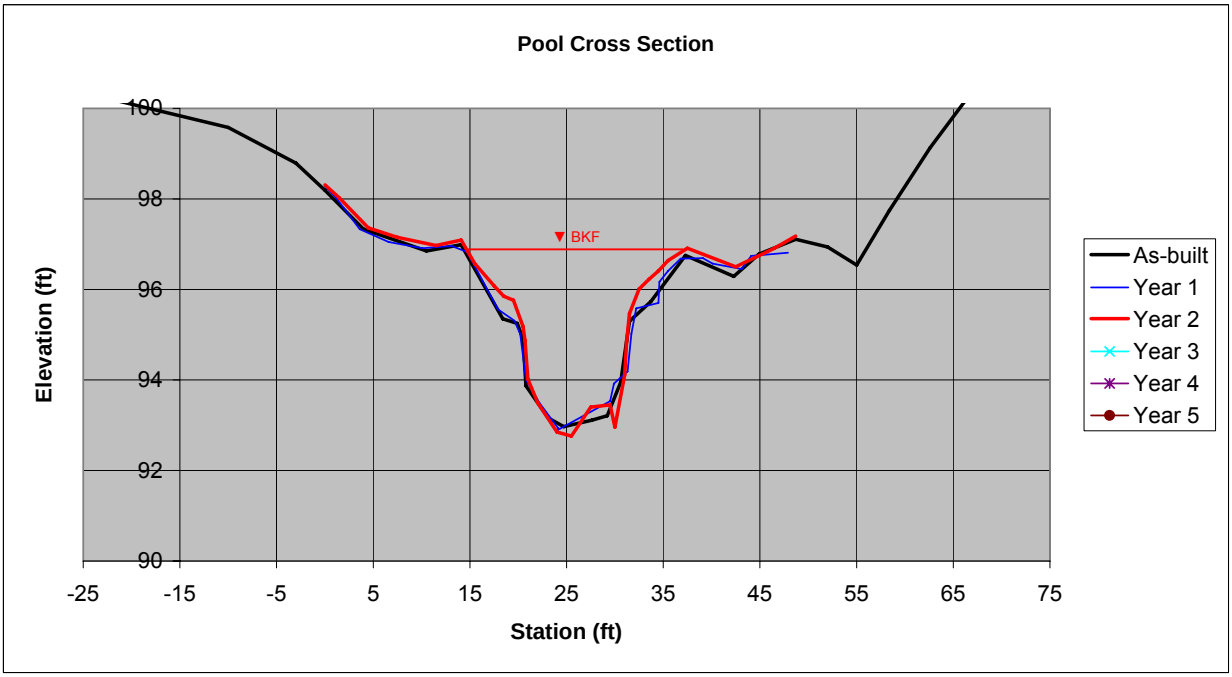
Year 5

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

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL1
Reach 1 - Buckhorn Creek - Sta 12+28.7

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/11/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	52.7	Area	48.0	Area	46.8	Area	0.0	Area	0.0	Area	0.0
Bkf W	23.2	Bkf W	22.1	Bkf W	23.4	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	2.3	Dmean	2.2	Dmean	2.0	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	4.0	Dmax	3.9	Dmax	4.2	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	10.2	W/d	10.2	W/d	11.7	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL1
Reach 1 - Buckhorn Creek - Sta 12+28.7

As-Built			
Station	FS/BS	Elev.	Desc.
BM	6.36	97.34	PL1 IR Rt
HI		103.70	
-25	3.35	100.35	
-10	4.12	99.58	
-3	4.91	98.79	
0	5.51	98.19	GRND
4	6.37	97.33	
10.5	6.85	96.85	
14.1	6.71	96.99	BKF
18.4	8.35	95.35	
19.9	8.45	95.25	
20.5	8.80	94.90	EOW
20.8	9.83	93.87	
23.1	10.54	93.16	
24.7	10.73	92.97	
27.6	10.59	93.11	
29.2	10.49	93.21	
30.6	9.75	93.95	
31.2	8.84	94.86	EOW
31.5	8.40	95.30	
33.7	7.97	95.73	
37.3	6.95	96.75	BKF
42.3	7.41	96.29	
44.9	6.92	96.78	
48.7	6.59	97.11	
52	6.76	96.94	
55	7.16	96.54	
58.4	5.95	97.75	
62.6	4.57	99.13	
67.5	3.17	100.53	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	3.78	98.67	RF1 IR Lt
HI		102.45	
0	4.17	98.28	GRND
1.1	4.41	98.04	GRND
3.6	5.12	97.33	GRND
6.6	5.40	97.05	GRND
10.1	5.54	96.91	GRND
13.1	5.49	96.96	GRND
14.7	5.62	96.83	GRND
16.8	6.46	95.99	GRND
17.9	6.89	95.56	BKF LT
19.6	7.14	95.31	BNK
20.2	7.43	95.02	LOG
20.8	8.44	94.01	EOW
22.2	8.96	93.49	BED
24.1	9.51	92.94	BED
24.1	9.55	92.9	BED
28.7	9.01	93.44	BED
29.5	8.92	93.53	BED
29.9	8.53	93.92	BED
31.3	8.26	94.19	BED
31.7	7.43	95.02	BED
32.2	6.87	95.58	EOW
34.5	6.75	95.7	BNK
34.6	6.28	96.17	BNK
35.5	6.04	96.41	BNK
36.8	5.77	96.68	BKF RT
39.1	5.76	96.69	GRND
40.1	5.88	96.57	GRND
43.1	6	96.45	GRND
44.1	5.71	96.74	GRND
47.9	5.64	96.81	GRND
25		97.14	

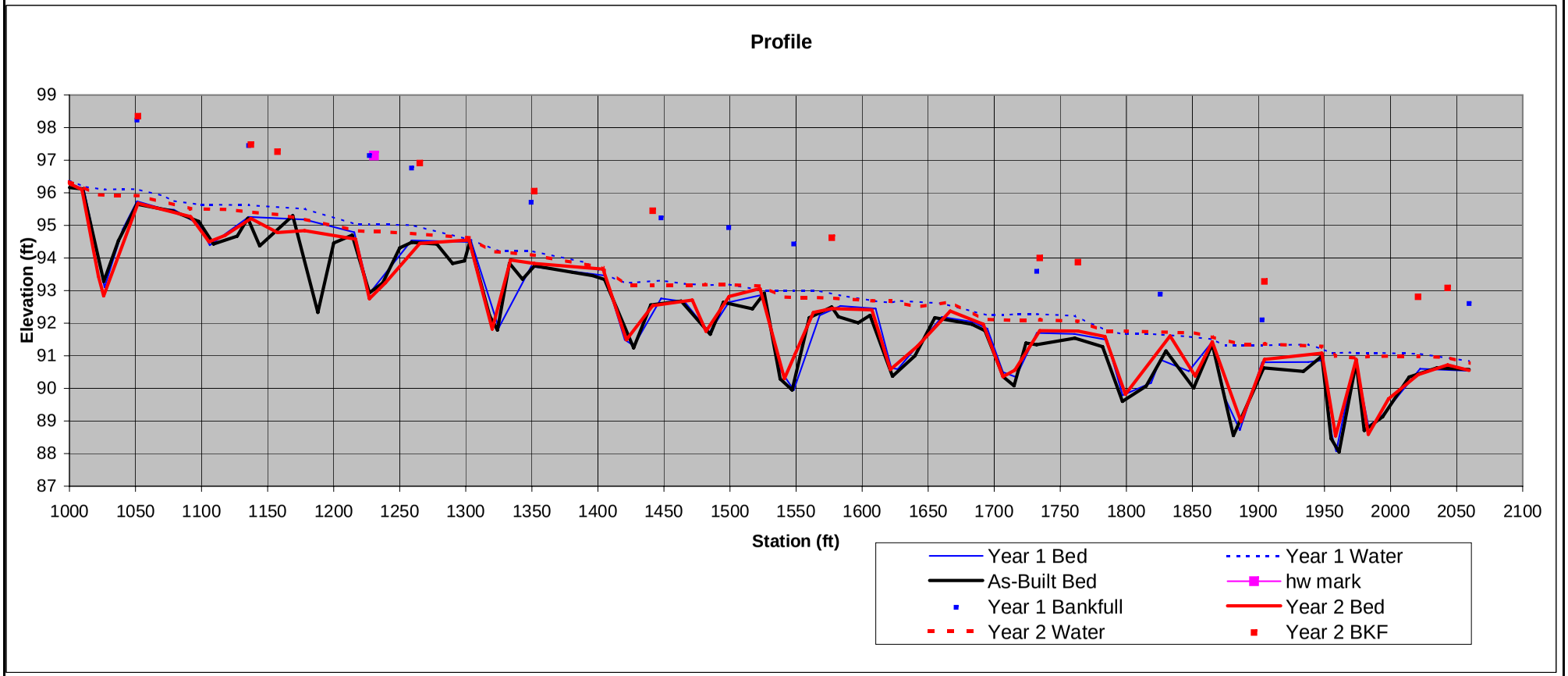
Year 2			
Station	FS/BS	Elev.	Desc.
BM	5.91	98.55	IR Lt
HI		104.46	
0	6.15	98.31	GRND
1.5	6.44	98.02	GRND
4.5	7.10	97.36	GRND
7.5	7.31	97.15	GRND
11.5	7.49	96.97	GRND
14.1	7.37	97.09	BKF
15.5	7.89	96.57	BNK
17.5	8.38	96.08	BNK
18.5	8.61	95.85	BNK
19.5	8.70	95.76	BNK
20.5	9.28	95.18	BNK
20.7	9.59	94.87	EOW
21	10.44	94.02	BED
22	10.96	93.50	BED
24	11.61	92.85	BED
25.5	11.70	92.76	BED
27.5	11.06	93.40	BED
29.5	11.01	93.45	BED
30	11.50	92.96	BED
31	10.35	94.11	BED
31.2	9.62	94.84	EOW
31.5	8.99	95.47	BNK
32.5	8.45	96.01	BNK
33.5	8.24	96.22	BNK
34.5	8.05	96.41	BNK
35.5	7.82	96.64	BKF
37.5	7.55	96.91	GRND
42.5	7.96	96.50	GRND
46.5	7.55	96.91	GRND
48.7	7.28	97.18	GRND

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

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

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

Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 1 - Buckhorn Creek



Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 1 - Buckhorn Creek

Year 1

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
102.95	1000	6.67	0.06			96.28	96.34	
102.95	1009.5	6.85	0.09			96.10	96.19	
102.95	1022	9.51	2.50			93.44	95.94	
102.95	1026	10.11	3.09			92.84	95.93	
102.95	1052	7.27	0.23	4.60	5.22 alt bkf HOR	95.68	95.91	98.35
102.95	1092	7.68	0.24			95.27	95.51	
102.95	1106	8.45	1.00			94.50	95.50	
102.95	1118	8.26	0.80			94.69	95.49	
102.95	1137.8	7.74	0.20	5.47	6.05 alt bkf HOR	95.21	95.41	97.48
102.95	1158	8.17	0.55	5.69	THL	94.78	95.33	97.26
102.95	1178.6	8.11	0.35			94.84	95.19	
102.95	1218	8.37	0.26			94.58	94.84	
102.95	1228.7	10.20	2.06			92.75	94.81	
102.95	1241	9.71	1.56			93.24	94.80	
102.95	1267	8.50	0.28	6.04	6.43 alt bkf HOR	94.45	94.73	96.91
102.95	1304.5	8.40	0.07			94.55	94.62	
102.95	1322	11.13	2.38			91.82	94.20	
102.95	1336	9.01	0.22			93.94	94.16	
102.95	1354	9.12	0.25	6.90	7.02 alt bkf HOR	93.83	94.08	96.05
102.95	1406.2	9.29	0.04			93.66	93.70	
100.04	1424	8.55	1.68			91.49	93.17	
100.04	1444	7.50	0.63	4.59	THL	92.54	93.17	95.45
100.04	1474	7.33	0.46			92.71	93.17	
100.04	1484.5	8.29	1.43			91.75	93.18	
100.04	1502	7.22	0.36			92.82	93.18	
100.04	1525.5	6.98	0.08			93.06	93.14	
100.04	1544	9.74	2.50			90.30	92.80	
100.04	1552	9.00	1.75			91.04	92.79	
100.04	1566	7.71	0.46			92.33	92.79	
100.04	1580	7.59	0.32	5.42	5.89 alt bkf HOR	92.45	92.77	94.62
100.04	1610.5	7.63	0.28			92.41	92.69	
100.04	1624.5	9.46	2.10			90.58	92.68	
100.04	1645	8.75	1.21			91.29	92.50	
100.04	1670	7.67	0.28			92.37	92.65	
100.04	1695	8.07	0.15			91.97	92.12	
100.04	1710	9.68	1.74			90.36	92.10	
100.04	1719	9.48	1.53			90.56	92.09	
100.04	1738	8.27	0.33	6.04	THL	91.77	92.10	94.00
99.31	1767	7.55	0.30	5.44	HOR	91.76	92.06	93.87
99.31	1787.5	7.72	0.17			91.59	91.76	
99.31	1803	9.49	1.94			89.82	91.76	
99.31	1837	7.70	0.11			91.61	91.72	
99.31	1856	8.93	1.32			90.38	91.70	
99.31	1869	7.88	0.15			91.43	91.58	
99.31	1891	10.33	2.37			88.98	91.35	
99.31	1909	8.42	0.47	6.03	HOR	90.89	91.36	93.28
99.31	1953	8.23	0.21			91.08	91.29	
102.09	1967	13.55	2.45			88.54	90.99	
102.09	1988	11.20	0.04			90.89	90.93	
102.09	1997	13.50	2.39			88.59	90.98	
102.09	2012	12.41	1.31			89.68	90.99	
102.09	2034	11.67	0.56	9.28	THL	90.42	90.98	92.81
102.09	2056	11.37	0.23	9.01	HOR	90.72	90.95	93.08
102.09	2072	11.54	0.22			90.55	90.77	

Pebble Count Weighted by Channel Feature

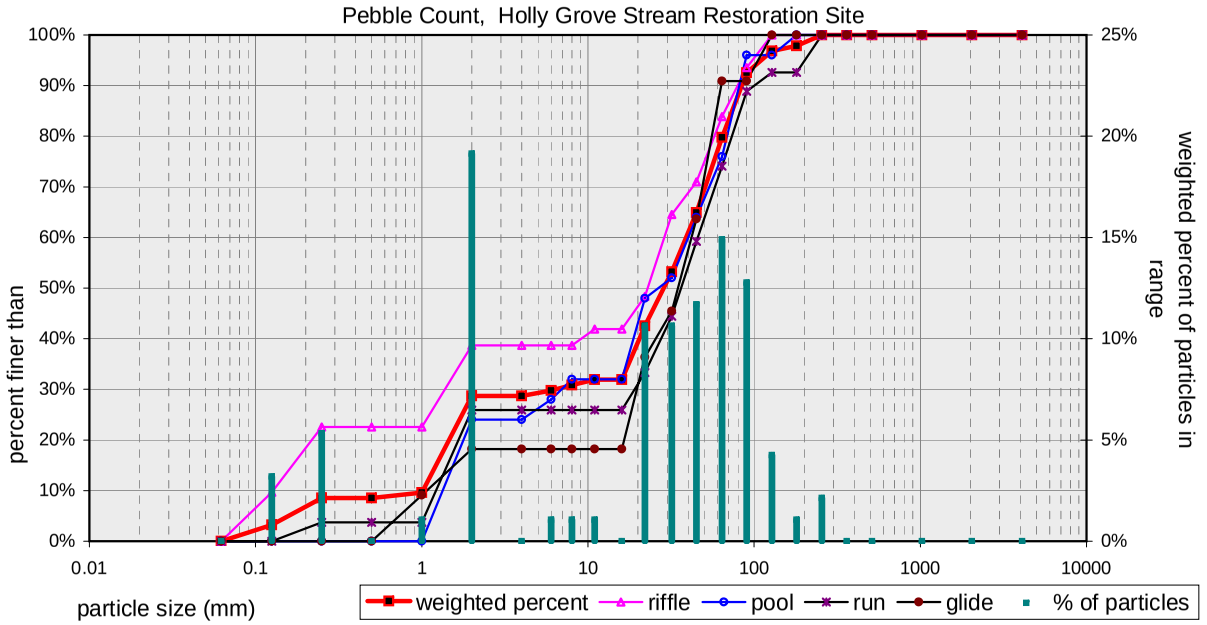
Percent Riffle:	**33.7**	Percent Run:	**28.7**
Percent Pool:	**26.7**	Percent Glide:	**10.9**

Pebble Count,

Holly Grove Stream Restoration Site
Guilford County, NC
Buckhorn Creek: Reach 1
Note: **Reach Data 1** 0%

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	0.0	#
very fine sand	0.062	0.13	3.0	#
fine sand	0.13	0.25	5.0	#
medium sand	0.25	0.5	0.0	#
coarse sand	0.5	1	1.0	#
very coarse sand	1	2	17.8	#
very fine gravel	2	4	0.0	#
fine gravel	4	6	1.0	#
fine gravel	6	8	1.0	#
medium gravel	8	11	1.0	#
medium gravel	11	16	0.0	#
coarse gravel	16	22	9.9	#
coarse gravel	22	32	9.9	#
very coarse gravel	32	45	10.9	#
very coarse gravel	45	64	13.9	#
small cobble	64	90	11.9	#
medium cobble	90	128	4.0	#
large cobble	128	180	1.0	#
very large cobble	180	256	2.0	#
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:			93.1	

bedrock		6.9
clay hardpan		0.0
detritus/wood		0.0
artificial		0.0
weighted total count:		100



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	1.262	17.55	28.6	45	72	110	12.6	9.5	7.5

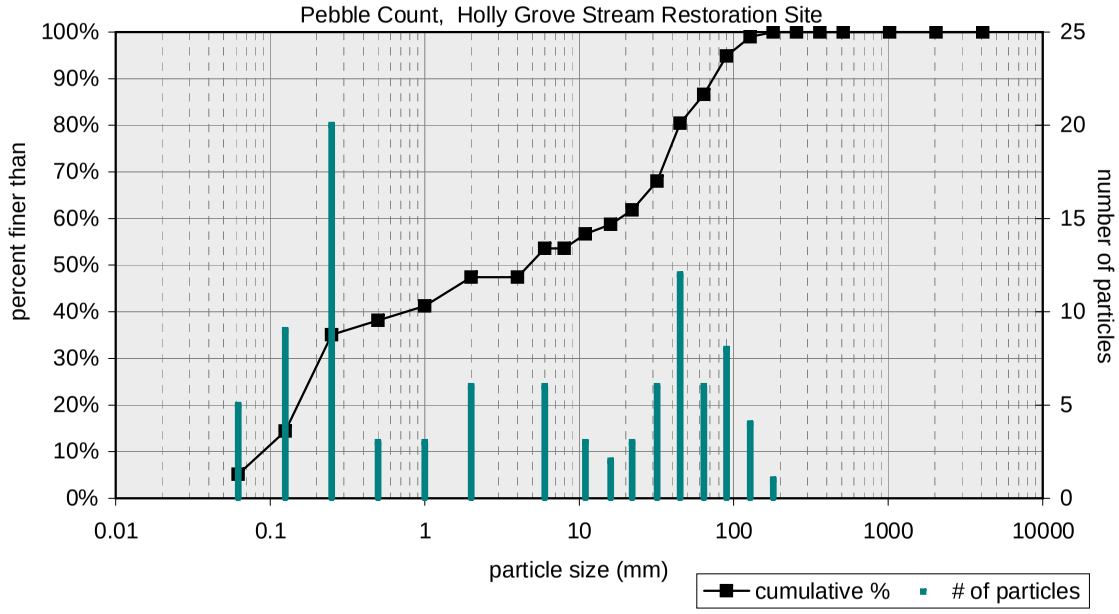
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	0%	27%	48%	19%	0%	7%	0%	0%	0%

Pebble Count of Channel Reach

Pebble Count,
Holly Grove Stream Restoration Site
Guilford County, NC
Buckhorn Creek: Reach 1
Note: **Riffle RF1**

Material	Size Range (mm)		Count	
silt/clay	0	0.062	**5**	##
very fine sand	0.062	0.13	**9**	##
fine sand	0.13	0.25	**20**	##
medium sand	0.25	0.5	**3**	##
coarse sand	0.5	1	**3**	##
very coarse sand	1	2	**6**	##
very fine gravel	2	4		##
fine gravel	4	6	**6**	##
fine gravel	6	8		##
medium gravel	8	11	**3**	##
medium gravel	11	16	**2**	##
coarse gravel	16	22	**3**	##
coarse gravel	22	32	**6**	##
very coarse gravel	32	45	**12**	##
very coarse gravel	45	64	**6**	##
small cobble	64	90	**8**	##
medium cobble	90	128	**4**	##
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:		97	

bedrock			**9**
clay hardpan			
detritus/wood			
artificial			
	total count:		106



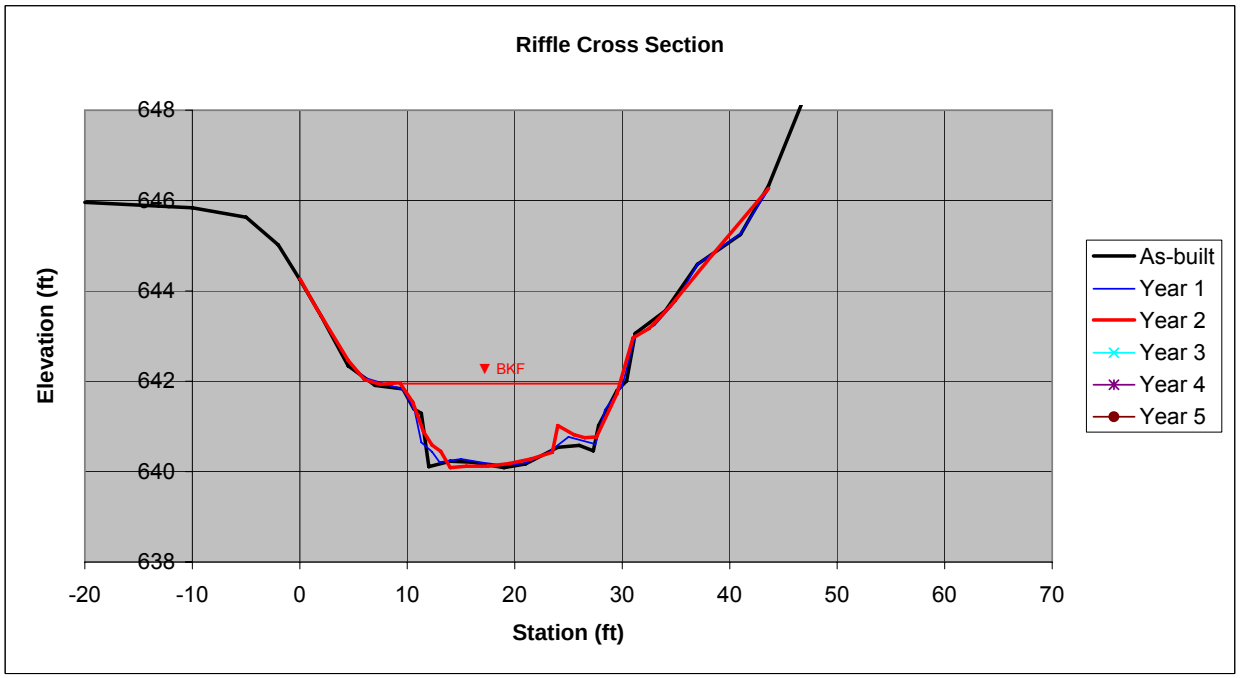
based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.132	0.25	4.7	27	55	91	23.8	2.7	20.5

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	5%	39%	36%	12%	0%	8%	0%	0%	0%

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF2
Reach 2 - Buckhorn Creek - Sta 15+89.6

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/12/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	26.3	Area	25.4	Area	27.6	Area	0.0	Area	0.0	Area	0.0
Bkf W	19.9	Bkf W	20.4	Bkf W	20.2	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	1.3	Dmean	1.2	Dmean	1.4	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	1.7	Dmax	1.7	Dmax	1.9	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	15.1	W/d	16.4	W/d	14.8	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF2
Reach 2 - Buckhorn Creek - Sta 15+89.6

As-Built			
Station	FS/BS	Elev.	Desc.
BM	6.90	644.39	RF2 IR Lt
HI		651.29	
-20	5.33	645.96	
-10	5.45	645.84	
-5	5.66	645.63	
-2	6.27	645.02	
0	7.04	644.25	GRND
2	7.85	643.44	
4.5	8.95	642.34	
7	9.38	641.91	
9.6	9.46	641.83	BKF
10.6	9.90	641.39	
11.3	10.00	641.29	EOW
12	11.18	640.11	
14	11.06	640.23	
16	11.08	640.21	
19	11.20	640.09	
21	11.12	640.17	
24	10.75	640.54	
26	10.71	640.58	
27.3	10.83	640.46	EOW
27.8	10.27	641.02	
29.5	9.50	641.79	
30.4	9.28	642.01	
31.2	8.23	643.06	BKF
34	7.73	643.56	
37	6.70	644.59	
41	6.04	645.25	
43.6	4.96	646.33	GRND
48	2.38	648.91	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	6.55	644.77	PL2 IR Lt
HI		651.32	
0	7.06	644.26	GRND
4.5	8.89	642.43	GRND
6	9.24	642.08	GRND
8.5	9.42	641.90	GRND
9.6	9.50	641.82	BKF LT
10.7	9.98	641.34	BNK
11.3	10.67	640.65	BNK
12.3	10.88	640.44	EOW
13	11.11	640.21	BED
15	11.04	640.28	BED
17	11.12	640.20	BED
19	11.18	640.14	BED
21	11.13	640.19	BED
23.1	10.90	640.42	EOW
25	10.55	640.77	BED
27.5	10.71	640.61	BED
28.4	9.95	641.37	BANK
30	9.42	641.90	BANK
31.2	8.31	643.01	BKF RT
33	8.08	643.24	GRND
35	7.54	643.78	GRND
37	6.73	644.59	GRND
41	6.05	645.27	GRND
43.7	5.04	646.28	GRND

Year 2			
Station	FS/BS	Elev.	Desc.
BM	6.50	644.77	IR Lt
HI		651.27	
0	7.00	644.27	GRND
1.5	7.63	643.64	GRND
4.5	8.81	642.46	GRND
6	9.23	642.04	GRND
7.5	9.34	641.93	GRND
9.3	9.30	641.97	BKF
10.5	9.73	641.54	BNK
11.5	10.38	640.89	BNK
12.3	10.68	640.59	BNK
13.1	10.82	640.45	EOW
14	11.18	640.09	BED
15.5	11.15	640.12	BED
17.5	11.15	640.12	BED
19.5	11.09	640.18	BED
21.5	10.99	640.28	BED
23.5	10.84	640.43	EOW
24	10.25	641.02	BED
25.5	10.45	640.82	BED
26.5	10.52	640.75	BED
27.6	10.50	640.77	BED
29.5	9.55	641.72	BNK
31	8.31	642.96	BKF
32.5	8.10	643.17	GRND
34.5	7.60	643.67	GRND
38.5	6.44	644.83	GRND
43.6	5.00	646.27	GRND

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

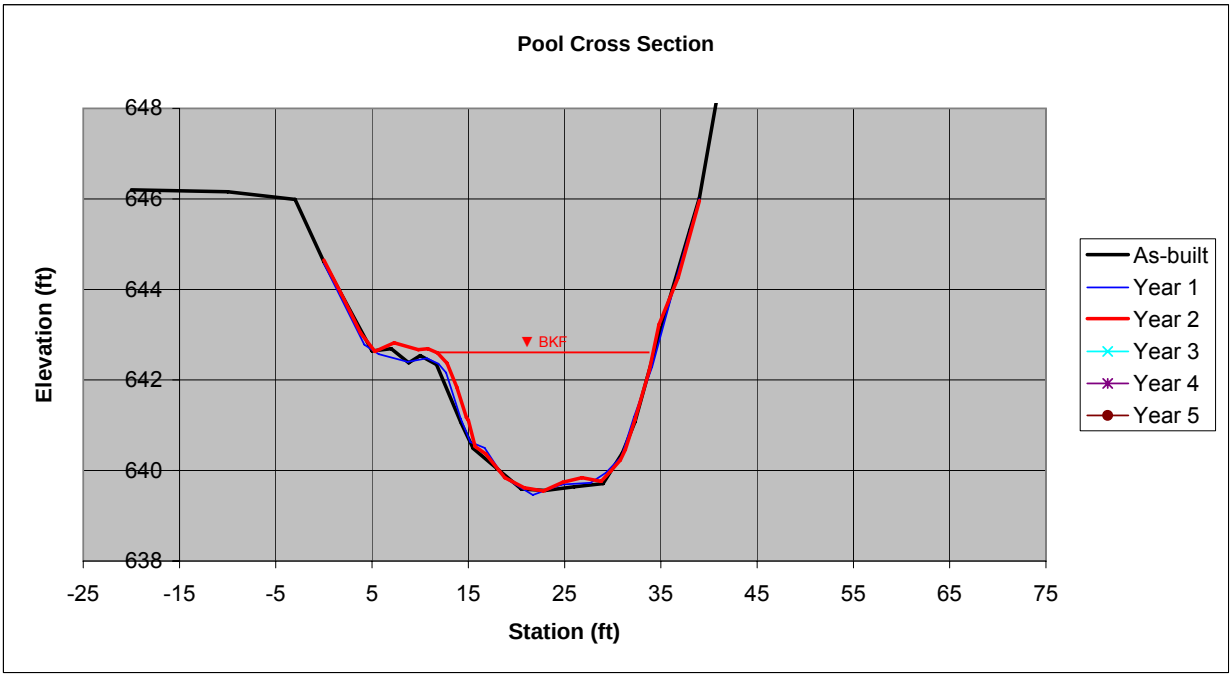
Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

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

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL2
Reach 2 - Buckhorn Creek - Sta 15+30.7

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/12/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	45.6	Area	43.8	Area	49.1	Area	0.0	Area	0.0	Area	0.0
Bkf W	23.3	Bkf W	22.2	Bkf W	22	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	2.0	Dmean	2.0	Dmean	2.2	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	2.8	Dmax	2.9	Dmax	3.1	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	11.9	W/d	11.2	W/d	9.9	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL2
Reach 2 - Buckhorn Creek - Sta 15+30.7

As-Built

Station	FS/BS	Elev.	Desc.
BM	6.90	644.39	RF2 IR Lt
HI		651.29	
-20	5.09	646.20	
-10	5.13	646.16	
-3	5.30	645.99	
0	6.68	644.61	GRND
5	8.65	642.64	
7	8.60	642.69	
8.8	8.91	642.38	
10	8.75	642.54	
11.7	8.95	642.34	BKF
14.2	10.22	641.07	
15.5	10.80	640.49	
18	11.25	640.04	
20.5	11.70	639.59	
23	11.73	639.56	BR
26	11.65	639.64	BR
29	11.58	639.71	
31	10.90	640.39	
32.3	10.22	641.07	EOW
35	8.15	643.14	
38	5.98	645.31	
39	5.27	646.02	
40.8	3.10	648.19	

Year 1

Station	FS/BS	Elev.	Desc.
BM	6.55	644.77	PL2 IT Lt
HI		651.32	
0	6.75	644.57	GRND
4.2	8.54	642.78	GRND
5.7	8.75	642.57	GRND
8.7	8.92	642.4	GRND
10.7	8.84	642.48	GRND
11.9	8.96	642.36	BKF LT
12.7	9.16	642.16	BNK
14.2	10.17	641.15	EOW
15.2	10.69	640.63	BED
16.7	10.82	640.5	BED
18.7	11.47	639.85	BED
21.7	11.86	639.46	BED
24.7	11.63	639.69	BED
27.7	11.59	639.73	BED
29.3	11.37	639.95	BED
30.9	11.01	640.31	BED
32.2	10.14	641.18	EOW
34.1	9.03	642.29	BNK
36.7	7.01	644.31	BNK
39	5.32	646	GRND

Year 2

Station	FS/BS	Elev.	Desc.
BM	6.50	644.77	IR Lt
HI		651.27	
0	6.62	644.65	GRND
1.8	7.37	643.90	GRND
3.8	8.23	643.04	GRND
5.3	8.64	642.63	GRND
7.3	8.45	642.82	GRND
9.8	8.60	642.67	GRND
10.8	8.58	642.69	GRND
11.8	8.67	642.60	BKF
12.8	8.90	642.37	BNK
13.8	9.43	641.84	BNK
14.8	10.10	641.17	BNK
15	10.16	641.11	EOW
15.7	10.74	640.53	BED
16.8	10.90	640.37	BED
18.8	11.43	639.84	BED
20.8	11.65	639.62	BED
22.8	11.72	639.55	BED
24.8	11.53	639.74	BED
26.8	11.43	639.84	BED
28.8	11.51	639.76	BED
29.8	11.28	639.99	BED
30.8	11.04	640.23	BED
31.3	10.81	640.46	BED
32.3	10.15	641.12	EOW
33.8	9.06	642.21	BNK
34.8	8.05	643.22	BNK
36.8	7.00	644.27	BNK
39	5.31	645.96	GRND

Year 3

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

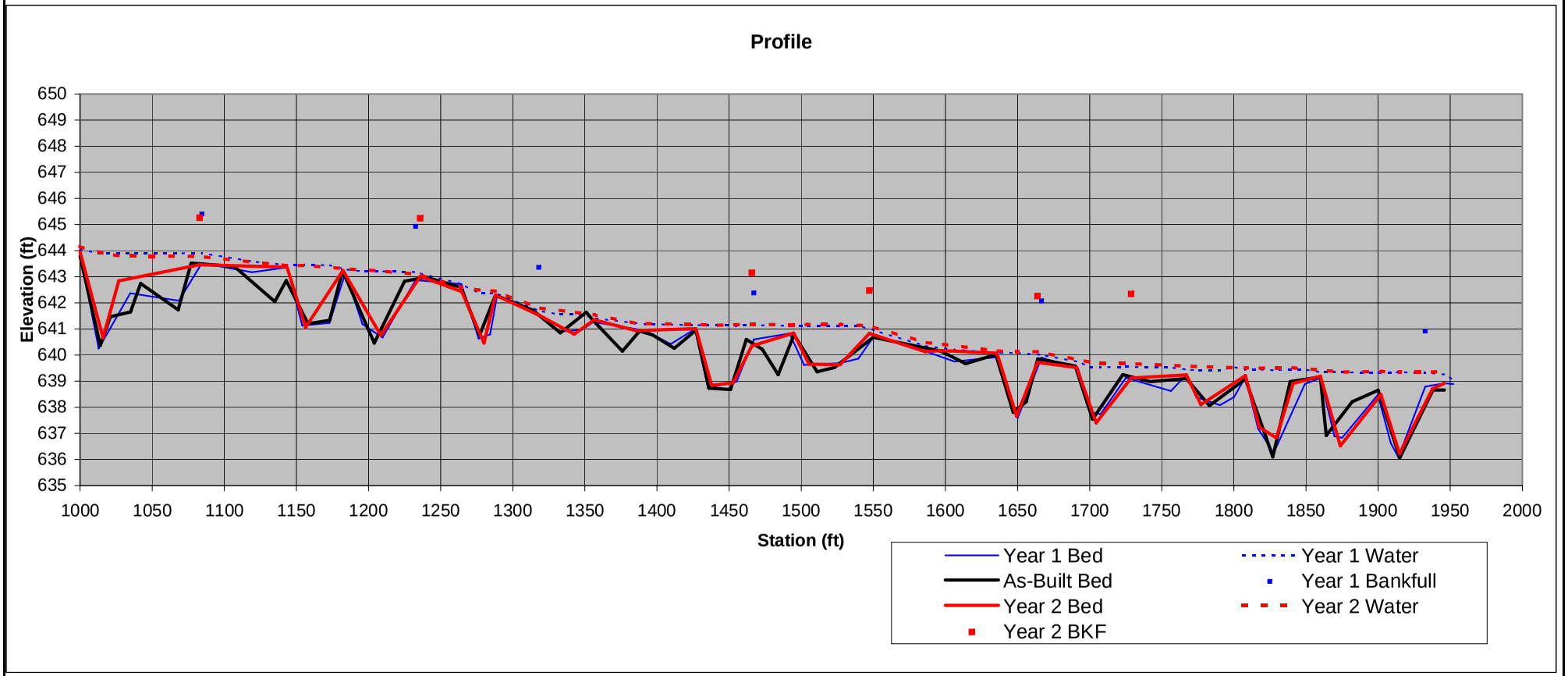
Year 4

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

Year 5

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

Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 2 - Buckhorn Creek



Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 2 - Buckhorn Creek

Year 1

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
653.56	1000	9.61	0.21			643.95	644.16	
653.56	1016	12.90	3.23			640.66	643.89	
653.56	1027	10.72	0.96			642.84	643.80	
653.56	1083.5	10.10	0.32	8.30		643.46	643.78	645.26
653.56	1144.5	10.19	0.05			643.37	643.42	
653.56	1157.5	12.50	2.37			641.06	643.43	
653.56	1183.5	10.32	0.07			643.24	643.31	
653.56	1210	12.81	2.47			640.75	643.22	
653.56	1237.5	10.55	0.07	8.32		643.01	643.08	645.24
653.56	1266.5	11.13	0.15			642.43	642.58	
653.56	1282	13.10	2.01			640.46	642.47	
653.56	1290	11.27	0.16			642.29	642.45	
653.56	1320	12.02	0.27			641.54	641.81	
653.56	1345	12.76	0.84			640.80	641.64	
653.56	1359	12.21	0.20			641.35	641.55	
651.03	1388	10.09	0.27			640.94	641.21	
651.03	1430	10.02	0.17			641.01	641.18	
651.03	1441	12.19	2.30			638.84	641.14	
651.03	1456	12.09	2.22			638.94	641.16	
651.03	1469	10.68	0.82	7.88	8.53 alt bkf THL	640.35	641.17	643.15
651.03	1498.2	10.19	0.32			640.84	641.16	
651.03	1509	11.38	1.52			639.65	641.17	
651.03	1530.7	11.40	1.54			639.63	641.17	
651.03	1551	10.20	0.29	8.56		640.83	641.12	642.47
651.03	1589.6	10.90	0.35			640.13	640.48	
651.03	1601	10.86	0.25			640.17	640.42	
647.52	1641	7.45	0.09			640.07	640.16	
647.52	1655	9.86	2.46			637.66	640.12	
647.52	1670	7.80	0.41	5.26		639.72	640.13	642.26
647.52	1698	8.00	0.31			639.52	639.83	
647.52	1712	10.12	2.29			637.40	639.69	
647.52	1737	8.40	0.55	5.18	6.1 alt bkf HOR	639.12	639.67	642.34
647.52	1776.5	8.28	0.34			639.24	639.58	
647.52	1786	9.42	1.45			638.10	639.55	
647.52	1815	8.31	0.30			639.21	639.51	
647.52	1825	10.29	2.27			637.23	639.50	
647.52	1837	10.69	2.68			636.83	639.51	
647.52	1849	8.61	0.60			638.91	639.51	
647.52	1868.5	8.33	0.24			639.19	639.43	
647.52	1883	11.00	2.83			636.52	639.35	
647.52	1912.5	9.03	0.88			638.49	639.37	
647.52	1926	11.30	3.14			636.22	639.36	
648.41	1950	9.71	0.65			638.70	639.35	
648.41	1958.7	9.49	0.46			638.92	639.38	

Pebble Count Weighted by Channel Feature

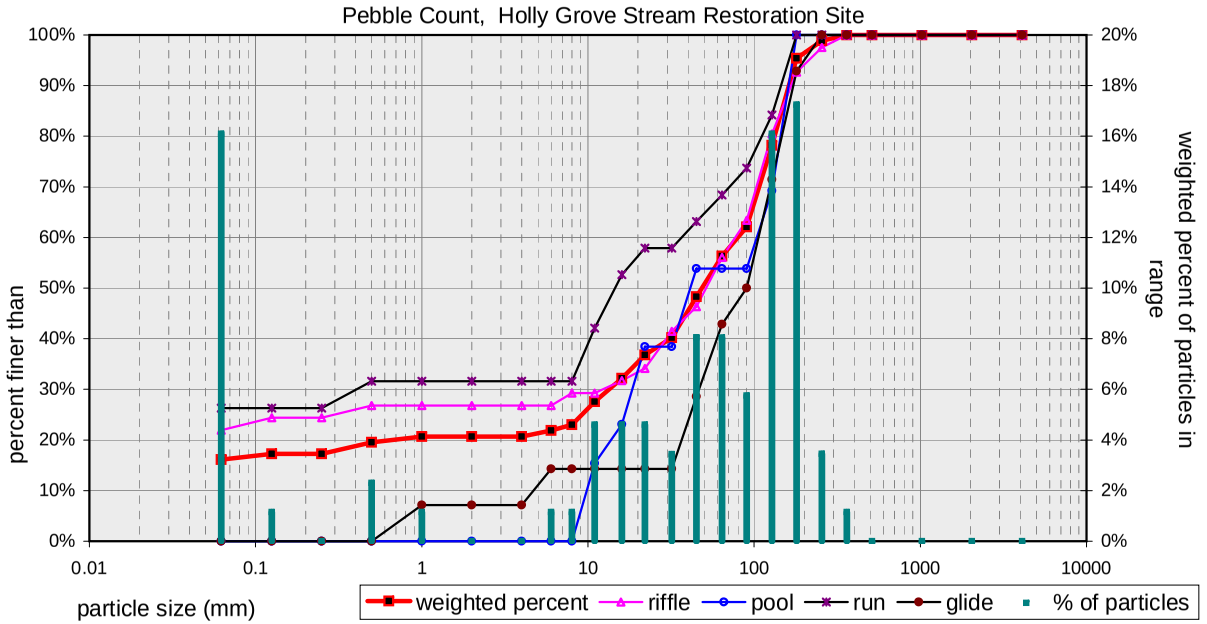
Percent Riffle:	**41.7**	Percent Run:	**21.4**
Percent Pool:	**19.4**	Percent Glide:	**17.5**

Pebble Count,

Holly Grove Stream Restoration Site
Guilford County, NC
Buckhorn Creek: Reach 2
Note: **Reach Data 2** 16%

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	13.6	#
very fine sand	0.062	0.13	1.0	#
fine sand	0.13	0.25	0.0	#
medium sand	0.25	0.5	1.9	#
coarse sand	0.5	1	1.0	#
very coarse sand	1	2	0.0	#
very fine gravel	2	4	0.0	#
fine gravel	4	6	1.0	#
fine gravel	6	8	1.0	#
medium gravel	8	11	3.9	#
medium gravel	11	16	3.9	#
coarse gravel	16	22	3.9	#
coarse gravel	22	32	2.9	#
very coarse gravel	32	45	6.8	#
very coarse gravel	45	64	6.8	#
small cobble	64	90	4.9	#
medium cobble	90	128	13.6	#
large cobble	128	180	14.6	#
very large cobble	180	256	2.9	#
small boulder	256	362	1.0	#
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:			84.5	

bedrock		15.5
clay hardpan		0.0
detritus/wood		0.0
artificial		0.0
weighted total count:		100



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	19.44	48.5	96	144	179	392.8	3.0	48.1

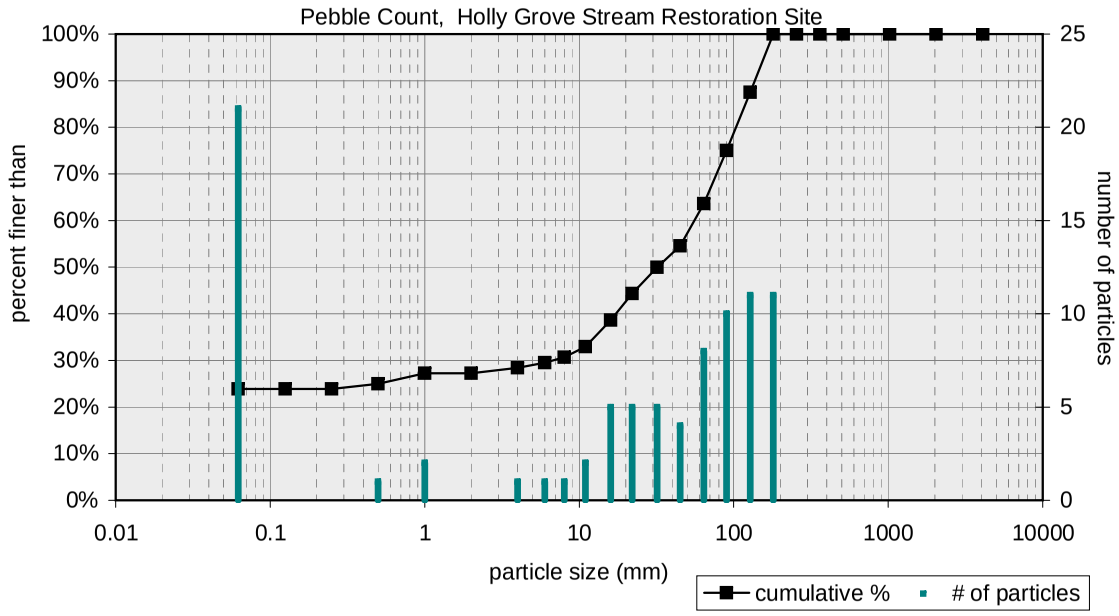
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	14%	4%	30%	36%	1%	16%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count
silt/clay	0	0.062	**21**
very fine sand	0.062	0.13	
fine sand	0.13	0.25	
medium sand	0.25	0.5	**1**
coarse sand	0.5	1	**2**
very coarse sand	1	2	
very fine gravel	2	4	**1**
fine gravel	4	6	**1**
fine gravel	6	8	**1**
medium gravel	8	11	**2**
medium gravel	11	16	**5**
coarse gravel	16	22	**5**
coarse gravel	22	32	**5**
very coarse gravel	32	45	**4**
very coarse gravel	45	64	**8**
small cobble	64	90	**10**
medium cobble	90	128	**11**
large cobble	128	180	**11**
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:		88

bedrock			**14**
clay hardpan			
detritus/wood			
artificial			
	total count:		102

Pebble Count,
Holly Grove Stream Restoration Site
Guilford County, NC
Buckhorn Creek: Reach 2
Note: **Riffle RF2**



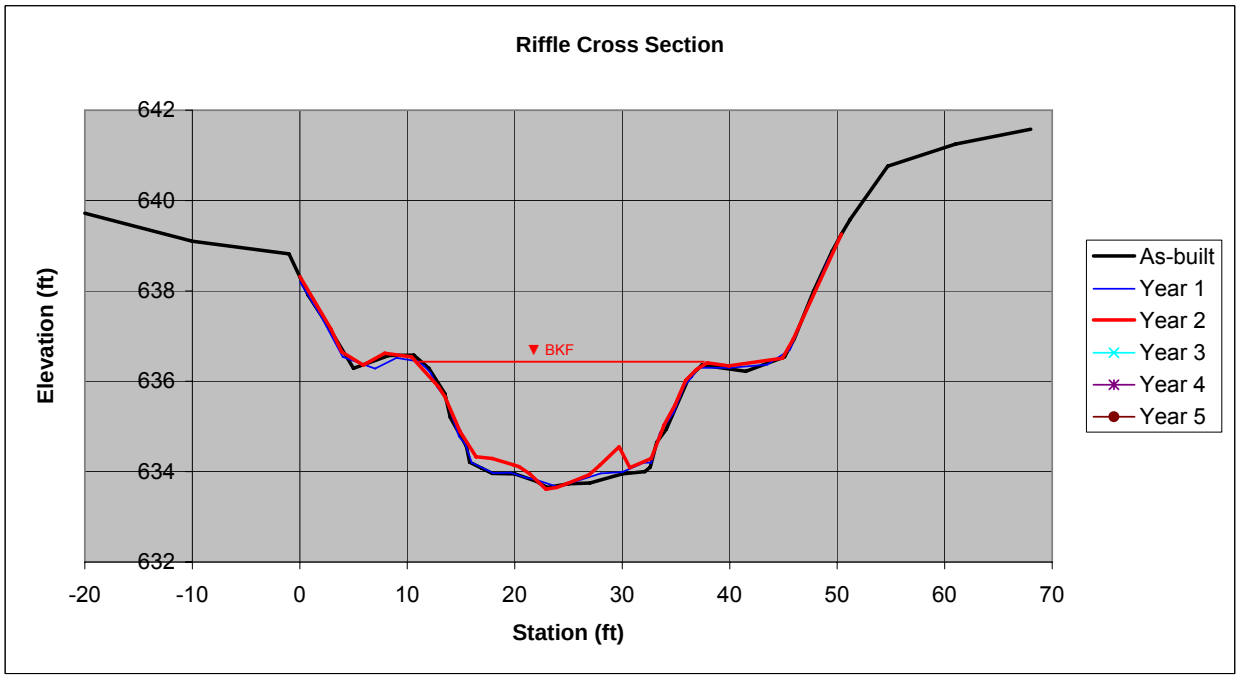
based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	12.59	32.0	67	116	157	259.9	2.7	43.3

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	21%	3%	31%	31%	0%	14%	0%	0%	0%

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF3
Reach 3 - Buckhorn Creek - Sta 12+50.7

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/12/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	48.3	Area	47.5	Area	47.7	Area	0.0	Area	0.0	Area	0.0
Bkf W	25.4	Bkf W	25.5	Bkf W	27.5	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	1.9	Dmean	1.9	Dmean	1.7	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	2.6	Dmax	2.6	Dmax	2.8	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	13.4	W/d	13.7	W/d	15.9	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF3
Reach 3 - Buckhorn Creek - Sta 12+50.7

As-Built			
Station	FS/BS	Elev.	Desc.
BM	5.88	638.55	RF3 IR Lt
HI		644.43	
-20	4.71	639.72	
-10	5.33	639.10	
-1	5.61	638.82	
0	6.12	638.31	GRND
0.8	6.53	637.90	
2.3	7.08	637.35	
5	8.14	636.29	
8.3	7.86	636.57	
10.6	7.85	636.58	
12	8.14	636.29	BKF
13.5	8.70	635.73	
14	9.23	635.20	
15.5	9.87	634.56	
15.8	10.22	634.21	
16.9	10.35	634.08	
17.9	10.47	633.96	EOW
20	10.48	633.95	
22	10.64	633.79	
23	10.78	633.65	
25	10.70	633.73	
27	10.68	633.75	
30	10.48	633.95	
32.1	10.43	634.00	EOW
32.6	10.33	634.10	
33.2	9.78	634.65	
34.1	9.49	634.94	
36.2	8.35	636.08	
37.4	8.07	636.36	BKF
41.5	8.21	636.22	
45.1	7.89	636.54	
46	7.49	636.94	
47.8	6.43	638.00	
49.5	5.56	638.87	
50.4	5.17	639.26	GRND
51.2	4.85	639.58	
54.7	3.67	640.76	
61	3.18	641.25	
68	2.85	641.58	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	3.92	638.55	RF3 IR Lt
HI		642.47	
0	4.27	638.20	GRND
2	5.04	637.43	GRND
4	5.93	636.54	GRND
7	6.19	636.28	GRND
9	5.95	636.52	GRND
11	6.03	636.44	BKF LT?
11.6	6.14	636.33	BKF LT
12.2	6.29	636.18	BKF LT
12.8	6.60	635.87	BANK
13.6	6.85	635.62	BANK
14.8	7.69	634.78	BANK
15.4	7.86	634.61	BANK
16	8.27	634.20	EOW
18	8.50	633.97	BED
19.6	8.49	633.98	BED
21	8.60	633.87	BED
22	8.65	633.82	BED
24	8.81	633.66	BED
26	8.66	633.81	BED
28	8.51	633.96	BED
30	8.48	633.99	BED
32	8.27	634.20	BED
32.7	8.27	634.20	TOE
33.5	7.61	634.86	BNK
34.8	7.16	635.31	BNK
35.8	6.56	635.91	BNK
36.5	6.37	636.10	BNK
37.1	6.17	636.30	BKF
40	6.17	636.30	GRND
43.5	6.1	636.37	GRND
45.6	5.77	636.70	GRND
47	4.97	637.50	GRND
49	3.87	638.60	GRND
50.4	3.22	639.25	GRND

Year 2			
Station	FS/BS	Elev.	Desc.
BM	3.11	638.55	IR Lt
HI		641.66	
0	3.34	638.32	GRND
2.9	4.50	637.16	GRND
3.9	5.01	636.65	GRND
5.9	5.30	636.36	GRND
7.9	5.04	636.62	GRND
10.4	5.12	636.54	GRND
12.9	5.78	635.88	GRND
13.5	6.00	635.66	BKF
14.9	6.77	634.89	BNK
16.4	7.33	634.33	BED
17.9	7.37	634.29	BED
19.9	7.51	634.15	BED
20.4	7.55	634.11	EOW
21.4	7.71	633.95	BED
22.9	8.05	633.61	BED
23.9	8.01	633.65	BED
24.9	7.92	633.74	BED
26.9	7.73	633.93	BED
27.9	7.52	634.14	BED
29.7	7.11	634.55	BED
30.7	7.57	634.09	BED
32.7	7.37	634.29	BED
33.9	6.62	635.04	BNK
34.9	6.19	635.47	BNK
35.9	5.64	636.02	BKF
36.9	5.40	636.26	GRND
37.9	5.25	636.41	GRND
39.9	5.32	636.34	GRND
44.9	5.15	636.51	GRND
45.9	4.73	636.93	GRND
50.4	2.40	639.26	GRND

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

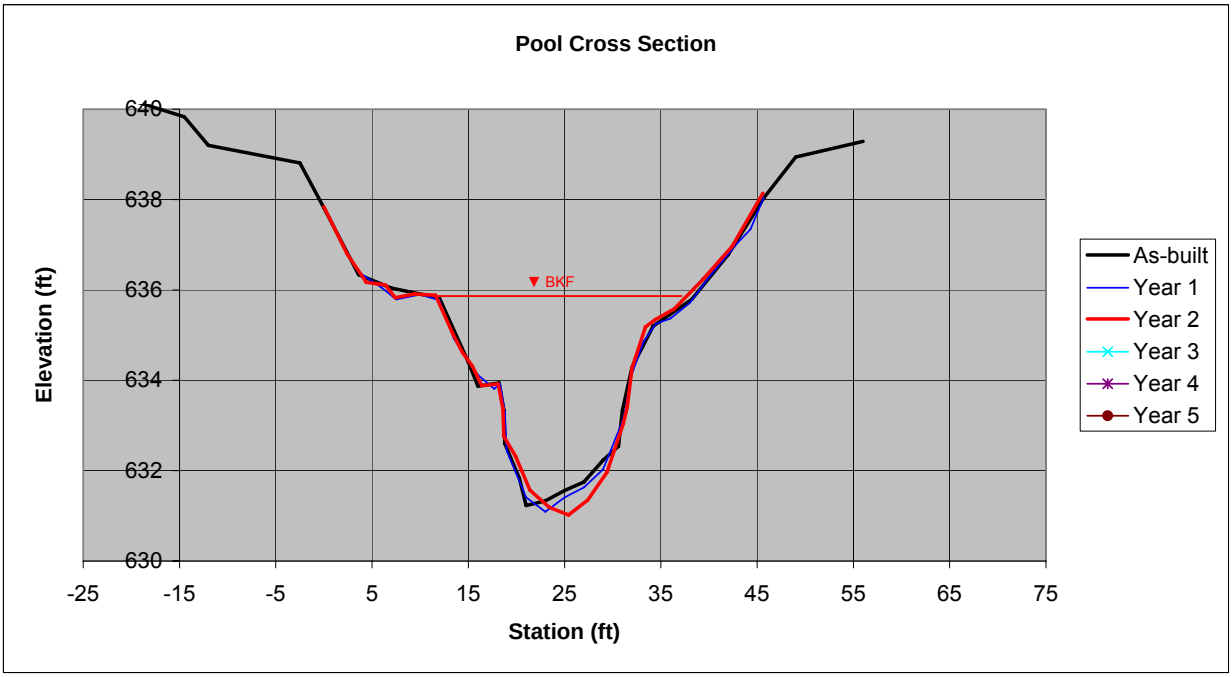
Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

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

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL3
Reach 3 - Buckhorn Creek - Sta 13+33.1

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/12/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	62.7	Area	62.8	Area	66.2	Area	0.0	Area	0.0	Area	0.0
Bkf W	22.2	Bkf W	22.5	Bkf W	22.8	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	2.8	Dmean	2.8	Dmean	2.9	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	4.6	Dmax	4.7	Dmax	4.9	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	7.9	W/d	8.1	W/d	7.9	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL3
Reach 3 - Buckhorn Creek - Sta 13+33.1

As-Built			
Station	FS/BS	Elev.	Desc.
BM	5.88	638.55	RF3 IR Lt
HI		644.43	
-20	4.23	640.20	
-14.5	4.60	639.83	
-12	5.23	639.20	
-2.5	5.62	638.81	
0	6.61	637.82	
3.6	8.09	636.34	
7	8.39	636.04	
12	8.61	635.82	BKF
15	10.03	634.40	
16	10.56	633.87	
18.2	10.49	633.94	LOG
18.7	11.09	633.34	EOW
18.8	11.83	632.60	
20.3	12.60	631.83	
21	13.20	631.23	
23	13.10	631.33	
25	12.87	631.56	
27	12.68	631.75	
29	12.20	632.23	
30.6	11.89	632.54	
31	11.09	633.34	EOW
32	10.14	634.29	
34.2	9.23	635.20	BKF
38.2	8.64	635.79	
42	7.65	636.78	
45.7	6.39	638.04	GRND
49	5.49	638.94	
56	5.14	639.29	
66	4.82	639.61	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	3.92	638.55	PL2 IT Lt
HI		642.47	
0	4.62	637.85	GRND
2	5.48	636.99	GRND
3.5	6.06	636.41	GRND
6	6.42	636.05	GRND
7.5	6.68	635.79	GRND
10	6.57	635.9	GRND
12	6.70	635.77	BKF LT
13.5	7.55	634.92	BNK
16	8.35	634.12	BNK
17.7	8.66	633.81	BNK
18.3	8.54	633.93	LOG
18.8	9.17	633.3	EOW
19	10.03	632.44	BED
21	11.06	631.41	BED
23	11.38	631.09	BED
25	11.06	631.41	BED
27	10.84	631.63	BED
29	10.44	632.03	BED
31	9.38	633.09	BED
31.3	9.14	633.33	EOW
31.8	8.44	634.03	BNK
33.2	7.61	634.86	BNK
34.5	7.22	635.25	BKF RT
36	7.10	635.37	GRND
38	6.76	635.71	GRND
40	6.19	636.28	GRND
43	5.42	637.05	GRND
44.3	5.13	637.34	GRND
45.7	4.42	638.05	GRND

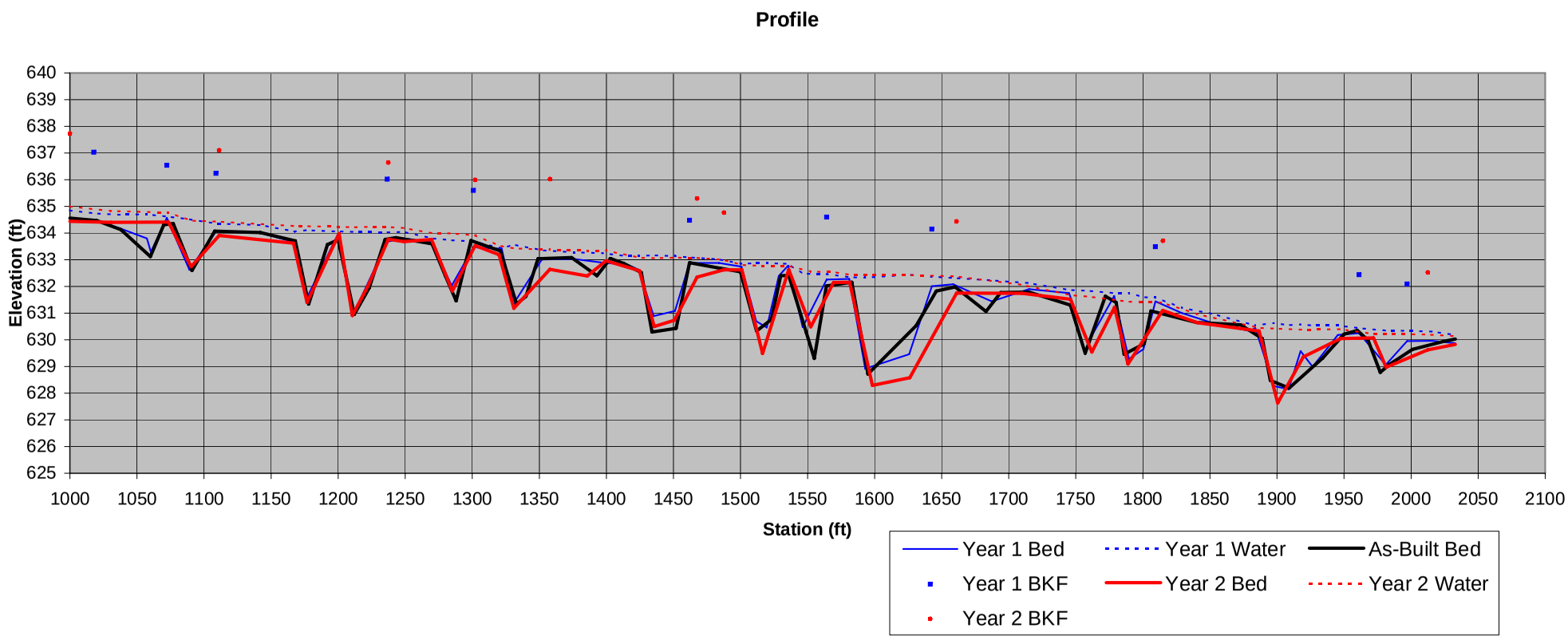
Year 2			
Station	FS/BS	Elev.	Desc.
BM	3.11	638.55	IR Lt
HI		641.66	
0	3.82	637.84	GRND
2.4	4.86	636.80	GRND
4.4	5.49	636.17	GRND
6.4	5.55	636.11	GRND
7.4	5.83	635.83	GRND
9.4	5.75	635.91	GRND
11.6	5.78	635.88	BKF
13.4	6.64	635.02	BNK
14.4	7.05	634.61	BNK
15.4	7.34	634.32	BNK
16.4	7.78	633.88	BED
18.1	7.74	633.92	LOG
18.6	8.29	633.37	EOW
18.7	8.90	632.76	BED
19.9	9.34	632.32	BED
21.4	10.09	631.57	BED
23.4	10.47	631.19	BED
25.4	10.64	631.02	BED
27.4	10.31	631.35	BED
29.4	9.70	631.96	BED
31.1	8.61	633.05	BED
31.5	8.25	633.41	EOW
32	7.39	634.27	BNK
33.4	6.48	635.18	BNK
34.4	6.32	635.34	BKF
36.4	6.08	635.58	GRND
39.4	5.42	636.24	GRND
42.4	4.70	636.96	GRND
45.6	3.52	638.14	GRND

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

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

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

Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 3 - Buckhorn Creek



Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 3 - Buckhorn Creek

Year 1

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
644.20	1000	9.76	0.56	6.46	6.5 alt bkf HOR	634.44	635.00	637.74
644.20	1031	9.80	0.43			634.40	634.83	
644.20	1074	9.79	0.36			634.41	634.77	
644.20	1091	11.46	1.73			632.74	634.47	
644.20	1112	10.29	0.52	7.09	7.72 alt bkf HOR	633.91	634.43	637.11
644.20	1167.8	10.58	0.65			633.62	634.27	
644.20	1178	12.80	2.86			631.40	634.26	
640.89	1202	6.91	0.26			633.98	634.24	
640.89	1212	9.98	3.31			630.91	634.22	
640.89	1224	8.85	2.19			632.04	634.23	
640.89	1239	7.12	0.46	4.25	4.82 alt bkf HOR	633.77	634.23	636.64
640.89	1250.7	7.21	0.51			633.68	634.19	
640.89	1271.4	7.13	0.24			633.76	634.00	
640.89	1287	9.06	2.16			631.83	633.99	
640.89	1304	7.36	0.39	4.89	5.11 alt bkf HOR	633.53	633.92	636.00
640.89	1322	7.70	0.34			633.19	633.53	
640.89	1333.1	9.71	2.25			631.18	633.43	
640.89	1360	8.25	0.74	4.86	5.58 alt bkf HOR	632.64	633.38	636.03
640.89	1388	8.50	0.95			632.39	633.34	
640.89	1402	7.93	0.39			632.96	633.35	
640.89	1427	8.30	0.49			632.59	633.08	
640.89	1438	10.39	2.56			630.50	633.06	
640.89	1453	10.16	2.35			630.73	633.08	
640.89	1470	8.54	0.72	5.60		632.35	633.07	635.29
640.89	1490	8.27	0.38	6.12		632.62	633.00	634.77
640.89	1503.5	8.27	0.19			632.62	632.81	
640.89	1519	11.40	3.28			629.49	632.77	
640.89	1538.5	8.26	0.14			632.63	632.77	
640.89	1555	10.40	2.07			630.49	632.56	
640.89	1572	8.74	0.39			632.15	632.54	
640.89	1584	8.73	0.28			632.16	632.44	
639.13	1601	10.84	4.15			628.29	632.44	
639.13	1629	10.55	3.85			628.58	632.43	
639.13	1664	7.38	0.63	4.69		631.75	632.38	634.44
639.13	1713	7.39	0.32			631.74	632.06	
639.13	1749	7.61	0.16			631.52	631.68	
639.13	1765	9.59	2.07			629.54	631.61	
639.13	1782	7.91	0.28			631.22	631.50	
639.13	1792	10.04	2.34			629.09	631.43	
639.13	1818	8.03	0.29	5.42	5.72 alt bkf HOR	631.10	631.39	633.71
639.13	1844	8.49	0.32			630.64	630.96	
639.13	1890	8.80	0.12			630.33	630.45	
639.13	1904	11.50	2.79			627.63	630.42	
637.23	1923	7.87	1.02			629.36	630.38	
637.23	1951	7.18	0.35			630.05	630.40	
637.23	1975.5	7.16	0.15			630.07	630.22	
637.23	1985	8.26	1.25			628.97	630.22	
637.23	2016	7.61	0.58	4.70	5.44 alt bkf HOR	629.62	630.20	632.53
637.23	2036.7	7.40	0.31			629.83	630.14	

Pebble Count Weighted by Channel Feature

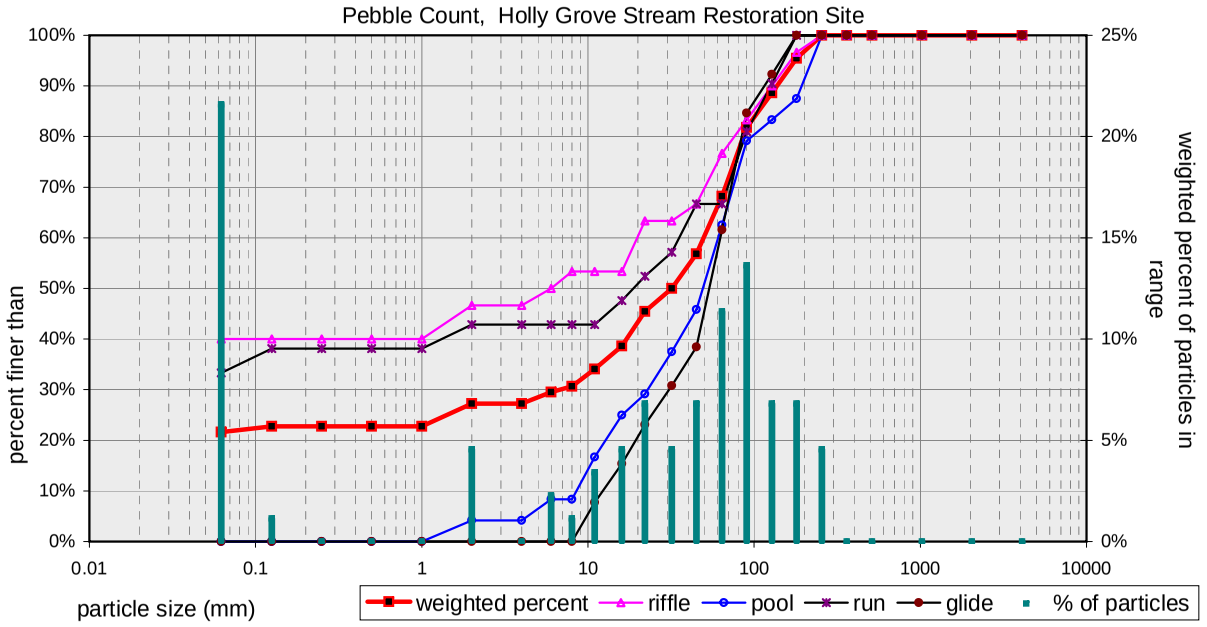
Percent Riffle:	33	Percent Run:	22
Percent Pool:	32	Percent Glide:	13

Pebble Count,

Holly Grove Stream Restoration Site
Guilford County, NC
Buckhorn Creek: Reach 3
Note: **Reach Data 3** 22%

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	19.0	#
very fine sand	0.062	0.13	1.0	#
fine sand	0.13	0.25	0.0	#
medium sand	0.25	0.5	0.0	#
coarse sand	0.5	1	0.0	#
very coarse sand	1	2	4.0	#
very fine gravel	2	4	0.0	#
fine gravel	4	6	2.0	#
fine gravel	6	8	1.0	#
medium gravel	8	11	3.0	#
medium gravel	11	16	4.0	#
coarse gravel	16	22	6.0	#
coarse gravel	22	32	4.0	#
very coarse gravel	32	45	6.0	#
very coarse gravel	45	64	10.0	#
small cobble	64	90	12.0	#
medium cobble	90	128	6.0	#
large cobble	128	180	6.0	#
very large cobble	180	256	4.0	#
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:			88.0	

bedrock		12.0
clay hardpan		0.0
detritus/wood		0.0
artificial		0.0
weighted total count:		100



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	11.86	32.0	58	101	176	259.6	2.5	40.3

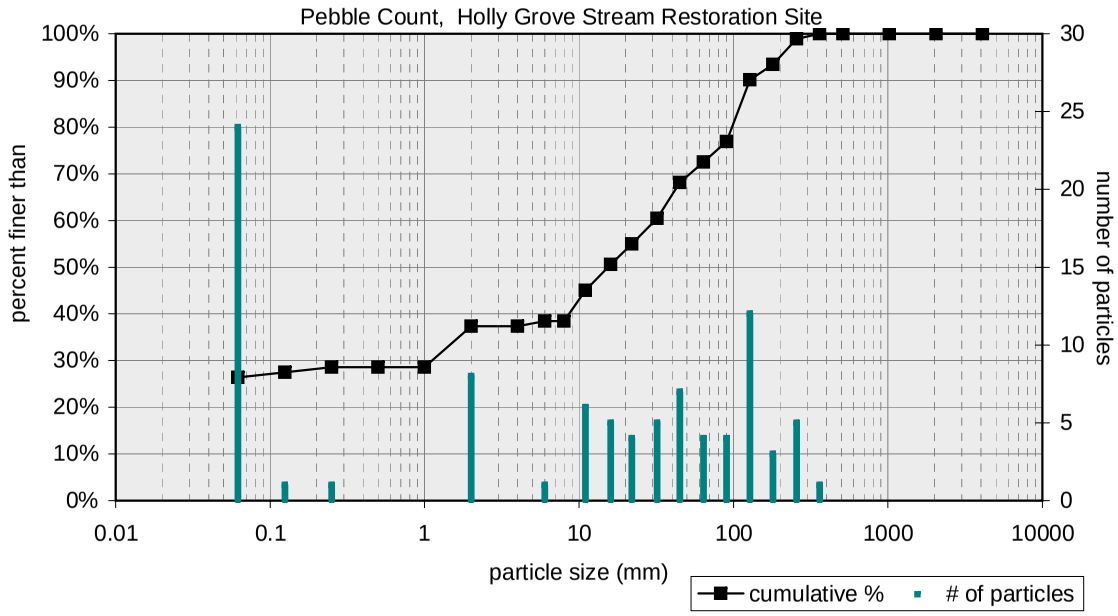
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	19%	5%	36%	28%	0%	12%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count	
silt/clay	0	0.062	**24**	##
very fine sand	0.062	0.13	**1**	##
fine sand	0.13	0.25	**1**	##
medium sand	0.25	0.5		##
coarse sand	0.5	1		##
very coarse sand	1	2	**8**	##
very fine gravel	2	4		##
fine gravel	4	6	**1**	##
fine gravel	6	8		##
medium gravel	8	11	**6**	##
medium gravel	11	16	**5**	##
coarse gravel	16	22	**4**	##
coarse gravel	22	32	**5**	##
very coarse gravel	32	45	**7**	##
very coarse gravel	45	64	**4**	##
small cobble	64	90	**4**	##
medium cobble	90	128	**12**	##
large cobble	128	180	**3**	##
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:		91	

bedrock			**9**
clay hardpan			
detritus/wood			
artificial			
	total count:		100

Pebble Count,
Holly Grove Stream Restoration Site
Guilford County, NC
Buckhorn Creek: Reach 3
Note: **Riffle RF3**



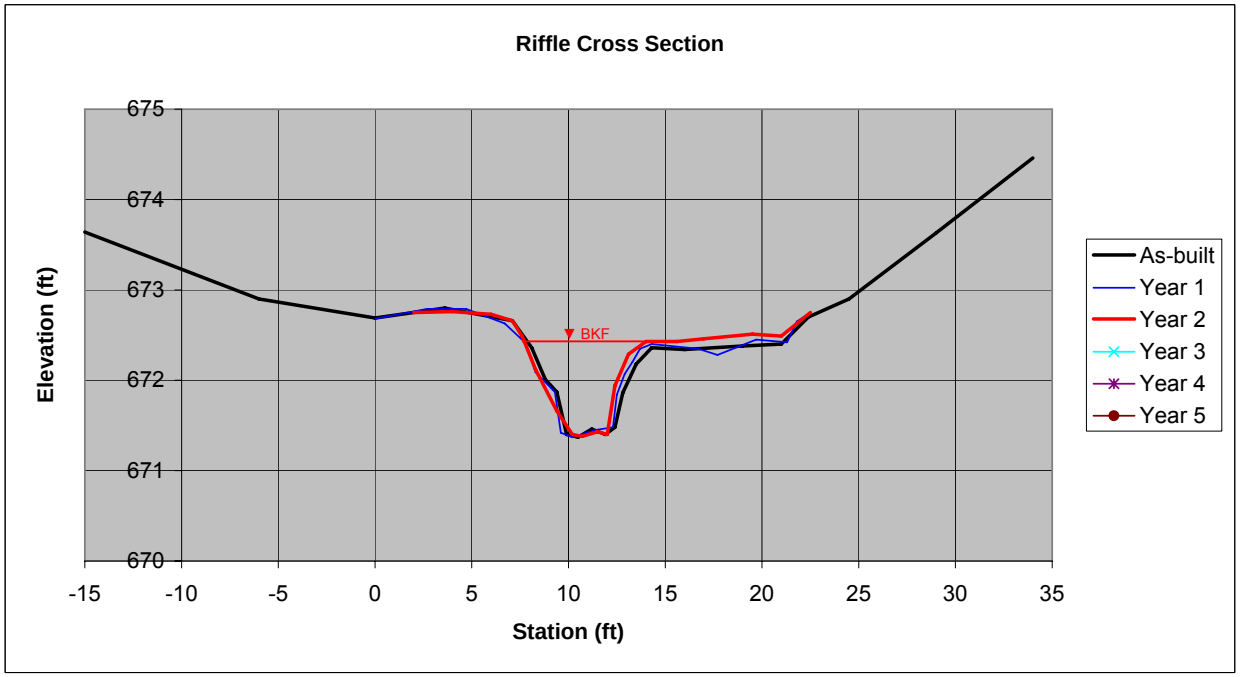
based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	1.66	15.4	39	109	199	127.8	2.6	41.9

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	24%	10%	32%	24%	1%	9%	0%	0%	0%

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF4
Reach 4 - Middle Branch - Sta 10+89.9

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/11/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	3.7	Area	3.5	Area	3.8	Area	0.0	Area	0.0	Area	0.0
Bkf W	6.2	Bkf W	6.4	Bkf W	6.9	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	0.6	Dmean	0.5	Dmean	0.5	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	1.0	Dmax	1.0	Dmax	1.0	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	10.4	W/d	11.8	W/d	12.6	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF4
Reach 4 - Middle Branch - Sta 10+89.9

As-Built			
Station	FS/BS	Elev.	Desc.
BM	3.96	674.94	BP4 IR Lt
HI		678.90	
-15	5.26	673.64	
-6	6.00	672.90	
0	6.21	672.69	
3.6	6.10	672.80	
7.1	6.24	672.66	
8.1	6.54	672.36	bkf
8.8	6.89	672.01	
9.4	7.03	671.87	
9.9	7.50	671.40	
10.5	7.53	671.37	
11.2	7.44	671.46	
11.9	7.50	671.40	
12.4	7.42	671.48	
12.8	7.04	671.86	
13.5	6.72	672.18	
14.3	6.54	672.36	bkf
16	6.56	672.34	
19	6.52	672.38	
21	6.50	672.40	
22.4	6.20	672.70	
24.5	6.00	672.90	
29	5.27	673.63	
34	4.44	674.46	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	4.31	674.77	BP4 IR Rt
HI		679.08	
0	6.40	672.68	GRND
2.7	6.29	672.79	GRND
4.7	6.29	672.79	GRND
6.7	6.45	672.63	GRND
7.7	6.65	672.43	GRND
7.9	6.74	672.34	BKF LT
8.3	6.99	672.09	BNK
9.3	7.21	671.87	BNK
9.6	7.66	671.42	BED
10.2	7.71	671.37	BED
10.8	7.67	671.41	BED
11.4	7.63	671.45	BED
12.3	7.60	671.48	BED
12.5	7.24	671.84	BNK
12.9	7.01	672.07	BKF
13.3	6.88	672.20	GRND
13.7	6.73	672.35	GRND
14.3	6.68	672.40	GRND
16.7	6.73	672.35	GRND
17.7	6.80	672.28	GRND
19.7	6.63	672.45	GRND
21.3	6.66	672.42	GRND
21.8	6.43	672.65	GRND
22.3	6.36	672.72	GRND

Year 2			
Station	FS/BS	Elev.	Desc.
BM	4.75	674.77	IR Rt
HI		679.52	
2	6.77	672.75	GRND
4	6.76	672.76	GRND
6	6.79	672.73	GRND
7.1	6.86	672.66	BKF
7.6	7.03	672.49	BNK
8.3	7.40	672.12	BNK
9.4	7.86	671.66	BNK
10.2	8.12	671.40	BED
10.7	8.14	671.38	BED
11.5	8.09	671.43	BED
12	8.12	671.40	BED
12.4	7.58	671.94	BNK
13.1	7.23	672.29	BNK
14	7.09	672.43	BKF
15.6	7.09	672.43	GRND
17	7.06	672.46	GRND
19.5	7.01	672.51	GRND
21	7.03	672.49	GRND
22.5	6.77	672.75	GRND

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

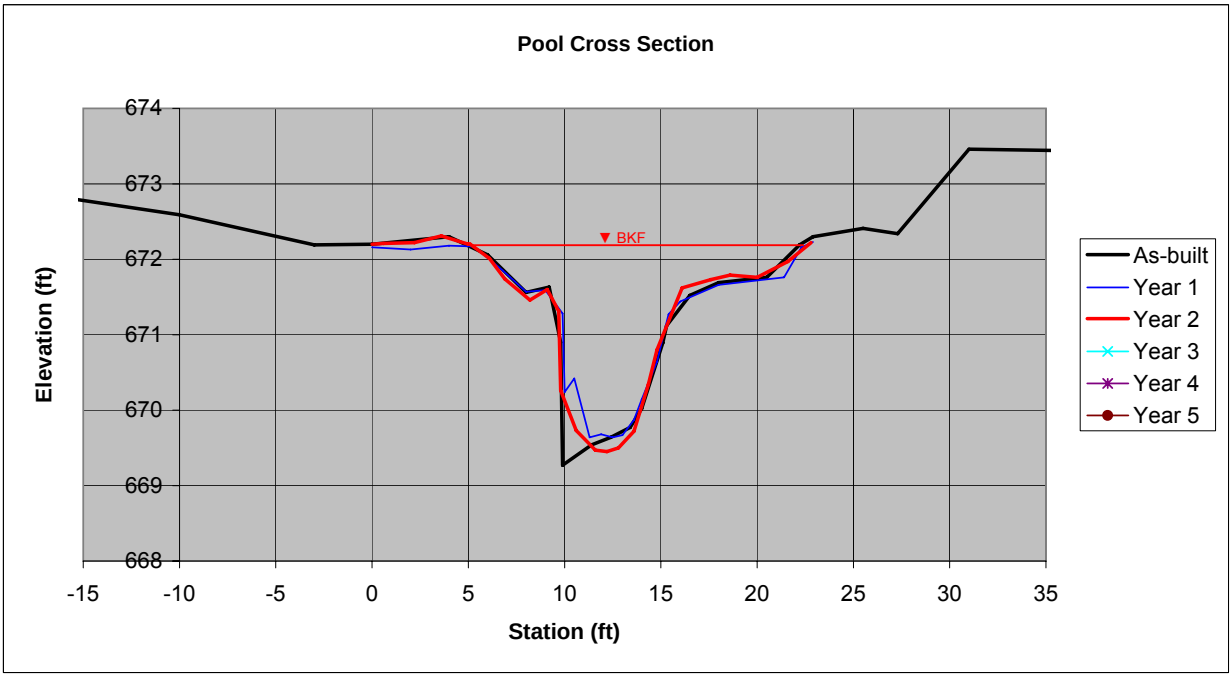
Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

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

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL4
Reach 4 - Middle Branch - Sta 11+14.3

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/11/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	20.5	Area	17.0	Area	18.2	Area	0.0	Area	0.0	Area	0.0
Bkf W	18.9	Bkf W	17	Bkf W	17.7	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	1.1	Dmean	1.0	Dmean	1.0	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	3.0	Dmax	2.5	Dmax	2.8	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	17.4	W/d	17.0	W/d	17.2	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL4
Reach 4 - Middle Branch - Sta 11+14.3

As-Built			
Station	FS/BS	Elev.	Desc.
BM	3.20	674.94	BP4 IR Lt
HI		678.14	
-20	5.17	672.97	
-10	5.55	672.59	
-3	5.95	672.19	
0	5.94	672.20	
4	5.84	672.30	
6	6.08	672.06	
8	6.58	671.56	
9.2	6.51	671.63	
9.8	7.24	670.90	EOW
9.9	8.87	669.27	
11.4	8.60	669.54	
12.4	8.50	669.64	
13.4	8.37	669.77	
14	8.12	670.02	
15.1	7.25	670.89	EOW
15.3	7.02	671.12	
16.5	6.62	671.52	
18	6.45	671.69	
20.5	6.38	671.76	
22.2	5.95	672.19	
22.9	5.84	672.30	
25.5	5.73	672.41	
27.3	5.80	672.34	
31	4.68	673.46	
36	4.70	673.44	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	4.31	674.77	BP4 IR Rt
HI		679.08	
0	6.92	672.16	GRND
2	6.95	672.13	GRND
4	6.90	672.18	GRND
5.3	6.91	672.17	GRND
6.8	7.23	671.85	GRND
8	7.51	671.57	GRND
9	7.49	671.59	LOG
9.9	7.80	671.28	LOG
10	8.84	670.24	BED
10.5	8.66	670.42	BLDR
11.3	9.44	669.64	BED
11.9	9.40	669.68	BED
12.5	9.44	669.64	BED
13	9.41	669.67	BED
13.6	9.21	669.87	BED
14	8.94	670.14	BED
14.8	8.44	670.64	BED
15.4	7.81	671.27	BNK
16	7.64	671.44	BKF RT
18	7.42	671.66	GRND
21.4	7.32	671.76	GRND
22.3	6.92	672.16	GRND
22.9	6.85	672.23	GRND

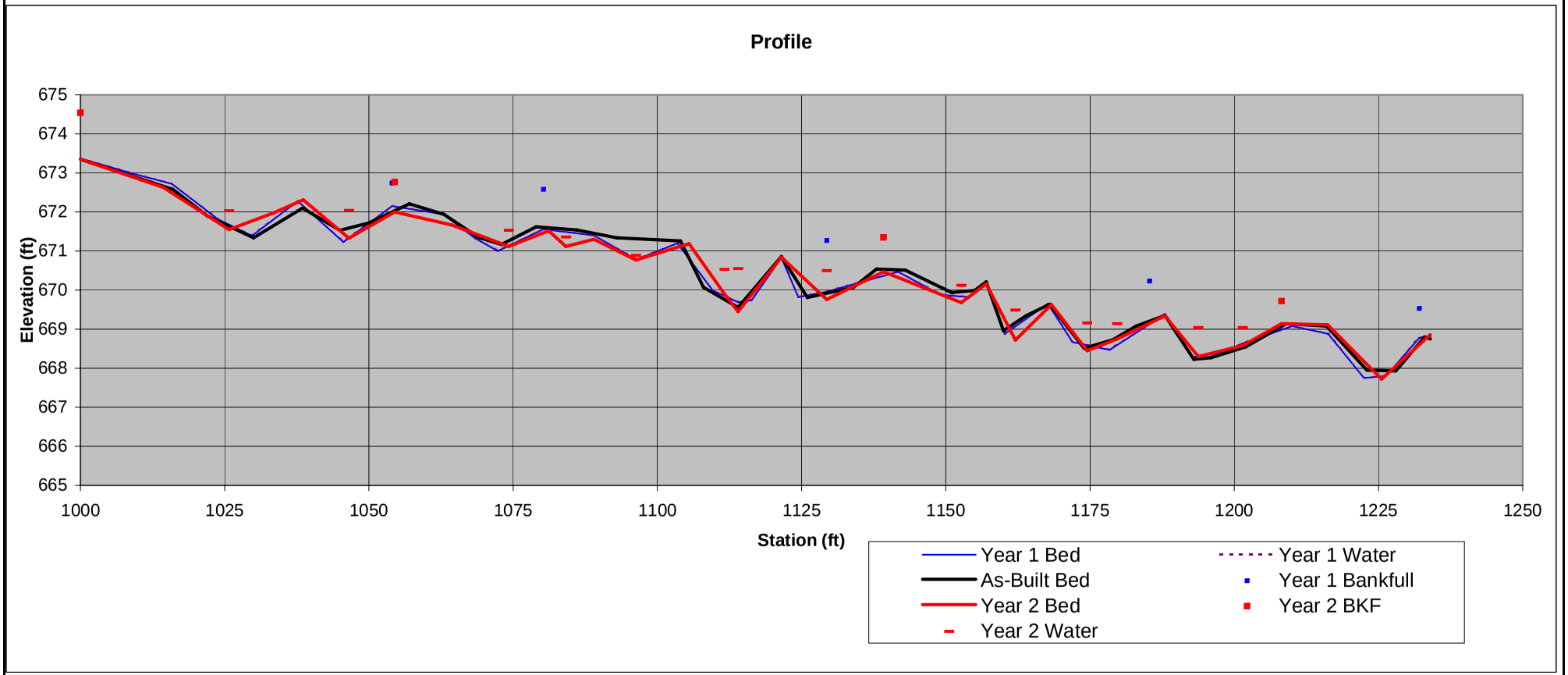
Year 2			
Station	FS/BS	Elev.	Desc.
BM	4.75	674.77	IR Lt
HI		679.52	
0	7.32	672.20	GRND
0.6	7.31	672.21	GRND
2.2	7.30	672.22	GRND
3.6	7.21	672.31	GRND
5	7.32	672.20	GRND
5.1	7.32	672.20	BKF
6.1	7.51	672.01	BNK
6.9	7.78	671.74	BNK
8.2	8.06	671.46	BNK
9.1	7.92	671.60	LOG
9.7	8.21	671.31	LOG
9.8	9.26	670.26	EOW
10.6	9.79	669.73	BED
11.6	10.05	669.47	BED
12.2	10.07	669.45	THL
12.8	10.02	669.50	BED
13.6	9.80	669.72	BED
14.35	9.18	670.34	EOW
14.8	8.72	670.80	BNK
16.1	7.90	671.62	BNK
17.6	7.79	671.73	BKF
18.6	7.73	671.79	GRND
20	7.76	671.76	GRND
21.6	7.55	671.97	GRND
22.8	7.30	672.22	GRND

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

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

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

Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 4 - Middle Branch



Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 4 - Middle Branch

Year 1

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
679.97	1000	6.62		5.43	5.57 alt bkf HOR	673.35	672.03	674.54
679.97	1014.5	7.34				672.63	672.03	
679.97	1026	8.42	0.48			671.55	672.03	
679.97	1034	7.98				671.99	672.04	
679.97	1039	7.66				672.31	672.04	
679.97	1047	8.64	0.71			671.33	672.04	
679.97	1055	7.97		7.20	7.37 alt bkf HOR	672.00	671.53	672.77
679.97	1065	8.30				671.67	671.53	
679.97	1075	8.85	0.41			671.12	671.53	
679.97	1082	8.45				671.52	671.36	
679.97	1085	8.85	0.24			671.12	671.36	
679.97	1089.9	8.67				671.30	670.89	
679.97	1097	9.20	0.12			670.77	670.89	
679.97	1106	8.78				671.19	670.53	
679.97	1112	10.07	0.63			669.90	670.53	
679.97	1114.3	10.52	1.10			669.45	670.55	
679.97	1123	9.13				670.84	670.50	
679.97	1131	10.21	0.74			669.76	670.50	
679.97	1141	9.50		8.62	8.79 alt bkf HOR	670.47	670.12	671.35
679.97	1154.7	10.29	0.44			669.68	670.12	
679.97	1159.1	9.81				670.16	669.49	
679.97	1164	11.25	0.77			668.72	669.49	
679.97	1170	10.34				669.63	669.16	
679.97	1176	11.52	0.71			668.45	669.16	
679.97	1181	11.22	0.39			668.75	669.14	
679.97	1189	10.63				669.34	669.04	
679.97	1195	11.67	0.74			668.30	669.04	
679.97	1203	11.39	0.46			668.58	669.04	
679.97	1210	10.83		10.25		669.14	668.87	669.72
679.97	1218.3	10.86				669.11	668.87	
679.97	1228	12.25				667.72	668.87	
679.97	1236.8	11.11	0.01			668.86	668.87	

Pebble Count Weighted by Channel Feature

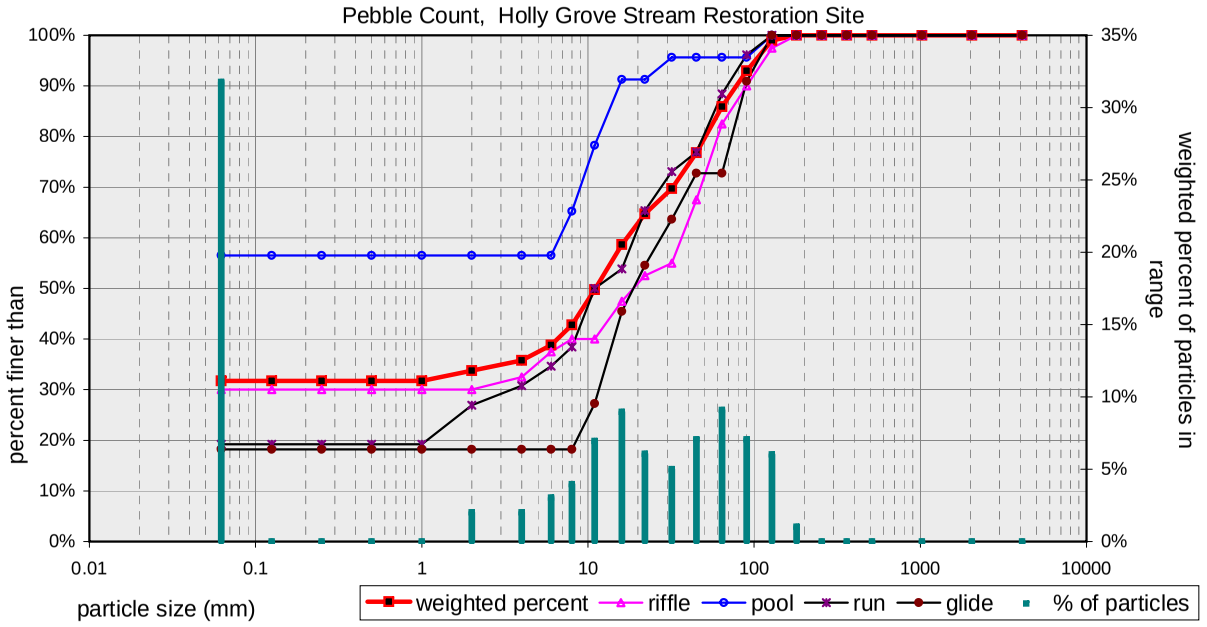
Percent Riffle:	**40**	Percent Run:	**26**
Percent Pool:	**23**	Percent Glide:	**11**

Pebble Count,

Holly Grove Stream Restoration Site
Guilford County, NC
Middle Branch: Reach 4
Note: **Reach Data 4** 32%

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	31.5	#
very fine sand	0.062	0.13	0.0	#
fine sand	0.13	0.25	0.0	#
medium sand	0.25	0.5	0.0	#
coarse sand	0.5	1	0.0	#
very coarse sand	1	2	2.0	#
very fine gravel	2	4	2.0	#
fine gravel	4	6	3.0	#
fine gravel	6	8	3.9	#
medium gravel	8	11	6.9	#
medium gravel	11	16	8.9	#
coarse gravel	16	22	6.0	#
coarse gravel	22	32	5.0	#
very coarse gravel	32	45	7.0	#
very coarse gravel	45	64	9.0	#
small cobble	64	90	7.0	#
medium cobble	90	128	6.0	#
large cobble	128	180	1.0	#
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:			99.0	

bedrock		1.0
clay hardpan		0.0
detritus/wood		0.0
artificial		0.0
weighted total count:		100



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	3.04	11.1	22	59	101	92.4	1.9	31.0

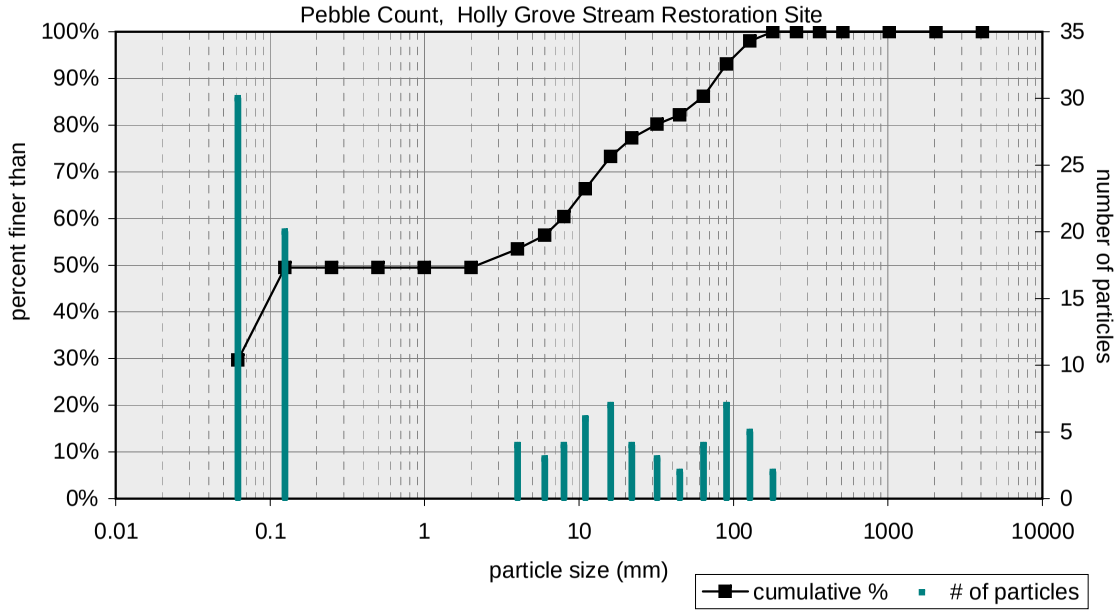
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	31%	2%	52%	14%	0%	1%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count
silt/clay	0	0.062	**30**
very fine sand	0.062	0.13	**20**
fine sand	0.13	0.25	
medium sand	0.25	0.5	
coarse sand	0.5	1	
very coarse sand	1	2	
very fine gravel	2	4	**4**
fine gravel	4	6	**3**
fine gravel	6	8	**4**
medium gravel	8	11	**6**
medium gravel	11	16	**7**
coarse gravel	16	22	**4**
coarse gravel	22	32	**3**
very coarse gravel	32	45	**2**
very coarse gravel	45	64	**4**
small cobble	64	90	**7**
medium cobble	90	128	**5**
large cobble	128	180	**2**
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:		101

bedrock		
clay hardpan		
detritus/wood		
artificial		
	total count:	101

Pebble Count,
Holly Grove Stream Restoration Site
Guilford County, NC
Middle Branch: Reach 4
Note: **Riffle RF4**



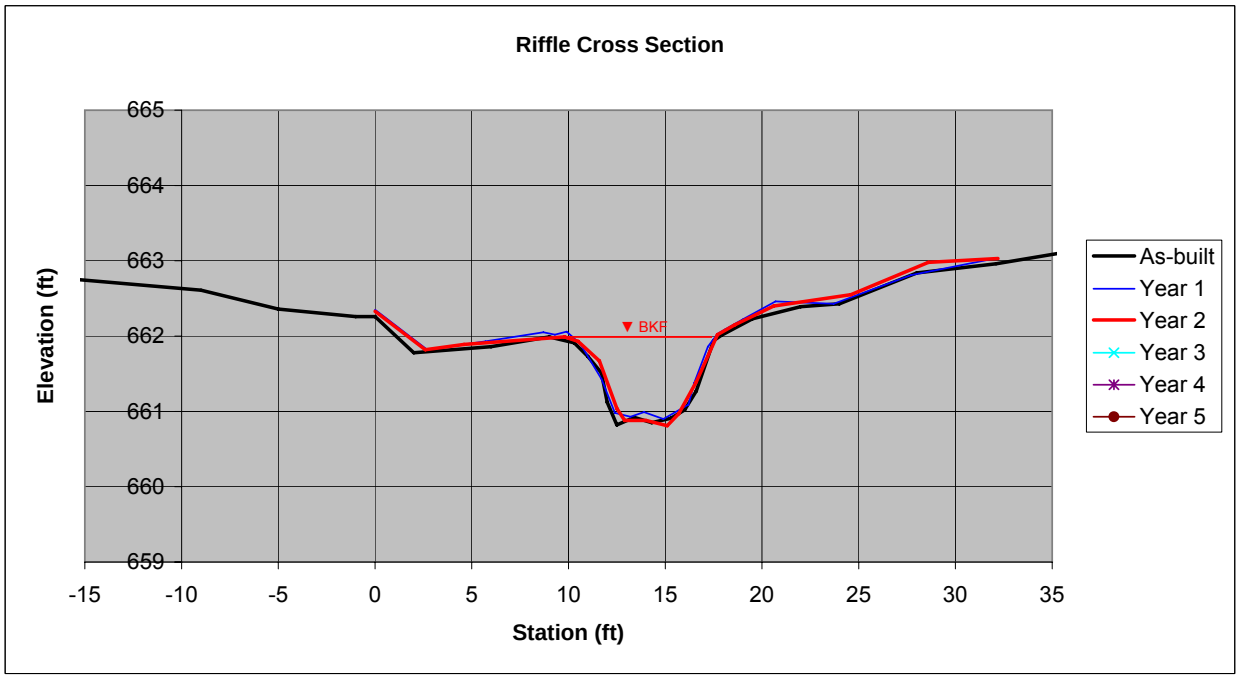
based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	0.07	2.2	10	53	103	29.7	1.8	29.2

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	30%	20%	37%	14%	0%	0%	0%	0%	0%

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF5
Reach 5 - Middle Branch - Sta 11+68.1

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/11/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	6.0	Area	5.9	Area	5.6	Area	0.0	Area	0.0	Area	0.0
Bkf W	8.9	Bkf W	8.2	Bkf W	7.9	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	0.7	Dmean	0.7	Dmean	0.7	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	1.2	Dmax	1.2	Dmax	1.2	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	13.2	W/d	11.5	W/d	11.1	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF5
Reach 5 - Middle Branch - Sta 11+68.1

As-Built

Station	FS/BS	Elev.	Desc.
BM	2.82	665.59	BP5 IR Lt
HI		668.41	
-18	5.60	662.81	
-9	5.80	662.61	
-5	6.05	662.36	
-1	6.15	662.26	
0	6.15	662.26	
2	6.63	661.78	
6	6.55	661.86	
9	6.42	661.99	
10.3	6.50	661.91	
11	6.68	661.73	
11.7	6.90	661.51	
12	7.29	661.12	
12.5	7.59	660.82	
13.4	7.49	660.92	
14.3	7.56	660.85	
15.3	7.50	660.91	
16	7.39	661.02	
16.6	7.14	661.27	
17.5	6.47	661.94	
17.9	6.40	662.01	
19.5	6.18	662.23	
22	6.02	662.39	
24	5.98	662.43	
28	5.57	662.84	
32.1	5.45	662.96	
37	5.24	663.17	
42	5.42	662.99	
52	5.3	663.11	

Year 1

Station	FS/BS	Elev.	Desc.
BM	3.98	665.59	BP5 IR Lt
HI		669.57	
0	7.22	662.35	GRND
2.7	7.75	661.82	GRND
5.7	7.64	661.93	GRND
8.7	7.52	662.05	GRND
9.3	7.55	662.02	GRND
9.9	7.51	662.06	BKF LT
10.6	7.67	661.90	BNK
11.7	8.14	661.43	BNK
12.4	8.59	660.98	BED
13.2	8.64	660.93	BED
13.9	8.58	660.99	BED
14.9	8.67	660.90	BED
16.2	8.48	661.09	BED
16.5	8.19	661.38	BANK
17.2	7.71	661.86	BANK
17.7	7.54	662.03	BANK
18.1	7.48	662.09	BKF RT
19	7.35	662.22	GRND
20.7	7.11	662.46	GRND
23.7	7.14	662.43	GRND
27.7	6.76	662.81	GRND
32.2	6.53	663.04	GRND

Year 2

Station	FS/BS	Elev.	Desc.
BM	5.57	662.74	IR Lt
HI		668.31	
0	5.98	662.33	GRND
2.6	6.49	661.82	GRND
4.6	6.42	661.89	GRND
9.8	6.32	661.99	GRND
10.5	6.38	661.93	BKF
11.6	6.64	661.67	BNK
12.5	7.27	661.04	BED
12.9	7.43	660.88	BED
14	7.43	660.88	BED
15.1	7.50	660.81	BED
15.7	7.34	660.97	TOE
16.6	6.92	661.39	BNK
17.7	6.29	662.02	BNK
18.6	6.16	662.15	BKF
20.6	5.91	662.40	GRND
24.6	5.76	662.55	GRND
28.6	5.33	662.98	GRND
32.2	5.28	663.03	GRND

Year 3

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

Year 4

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

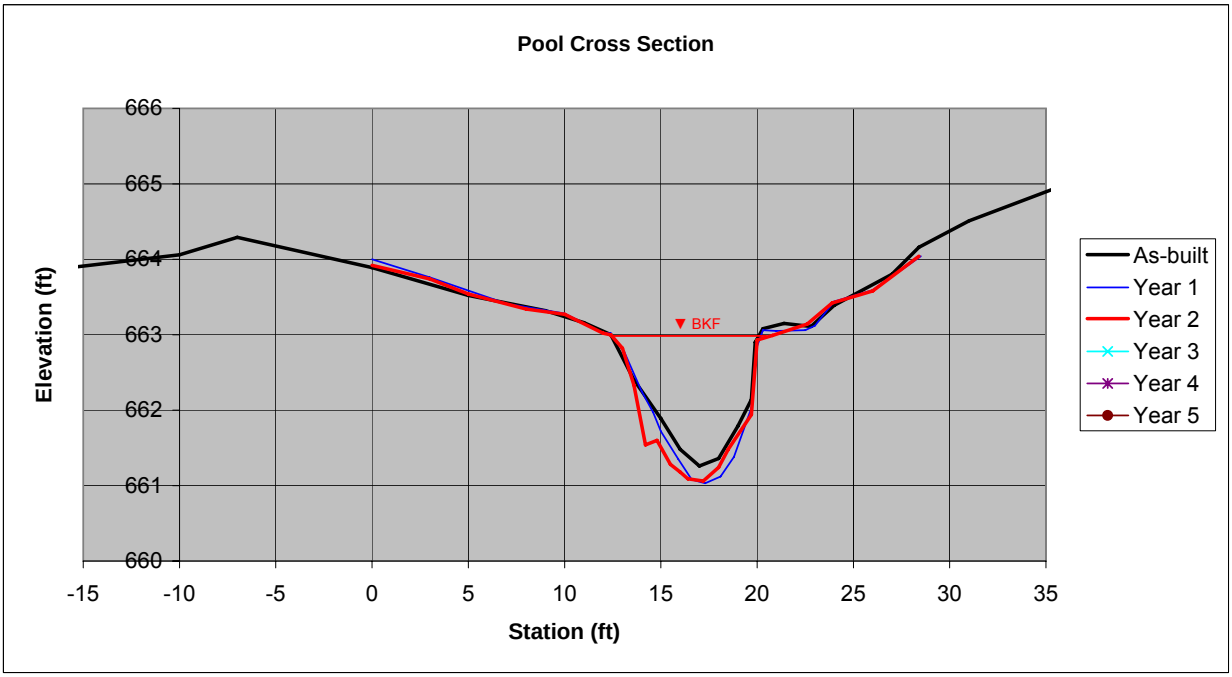
Year 5

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

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL5
Reach 5 - Middle Branch - Sta 10+63.1

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/11/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	8.4	Area	9.7	Area	10.1	Area	0.0	Area	0.0	Area	0.0
Bkf W	7.9	Bkf W	8.6	Bkf W	8.4	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	1.1	Dmean	1.1	Dmean	1.2	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	1.7	Dmax	2.0	Dmax	1.9	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	7.4	W/d	7.6	W/d	7.0	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL5
Reach 5 - Middle Branch - Sta 10+63.1

As-Built			
Station	FS/BS	Elev.	Desc.
BM	2.82	665.59	BP5 IR Lt
HI		668.41	
-20	4.65	663.76	
-10	4.35	664.06	
-7	4.12	664.29	
0	4.52	663.89	
5	4.89	663.52	
9	5.09	663.32	
11	5.25	663.16	
12.4	5.41	663.00	
13.6	6.01	662.40	
15	6.52	661.89	
16	6.93	661.48	
17	7.15	661.26	
18	7.05	661.36	
19	6.62	661.79	
19.7	6.27	662.14	
19.9	5.51	662.90	
20.3	5.33	663.08	
21.4	5.26	663.15	
22.8	5.30	663.11	
24	5.02	663.39	
27	4.61	663.80	
28.4	4.25	664.16	
31	3.90	664.51	
36	3.42	664.99	
		668.41	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	3.98	665.59	BP5 IR Lt
HI		669.57	
0	5.57	664	GRND
3	5.81	663.76	GRND
7	6.16	663.41	GRND
10	6.29	663.28	GRND
12	6.55	663.02	GRND
12.4	6.55	663.02	BKF LT
13.1	6.80	662.77	BNK
14	7.32	662.25	BNK
14.6	7.60	661.97	BNK
15	7.85	661.72	BED
15.9	8.22	661.35	BED
16.6	8.49	661.08	BED
17.3	8.54	661.03	BED
18.1	8.45	661.12	BED
18.8	8.19	661.38	BED
19.7	7.54	662.03	BNK
20	6.72	662.85	LOG
20.3	6.51	663.06	LOG
21	6.52	663.05	BNK
22.5	6.51	663.06	GRND
23	6.45	663.12	GRND
24	6.13	663.44	GRND
26	5.98	663.59	GRND
28.5	5.53	664.04	GRND

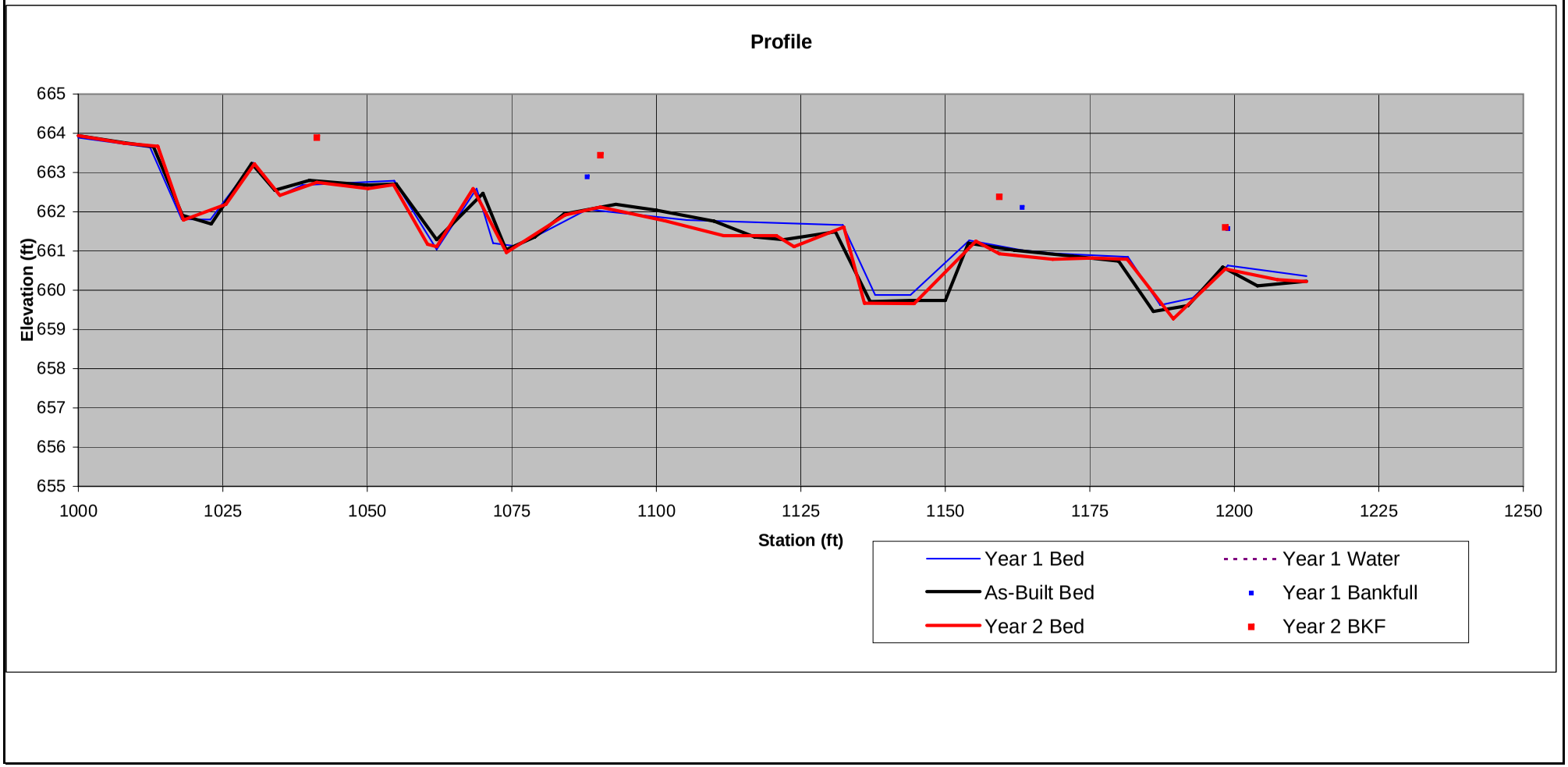
Year 2			
Station	FS/BS	Elev.	Desc.
BM	3.55	665.59	IR Lt
HI		669.14	
0	5.22	663.92	GRND
3	5.40	663.74	GRND
5	5.60	663.54	GRND
8	5.80	663.34	GRND
10	5.87	663.27	GRND
12	6.12	663.02	GRND
12.4	6.14	663.00	BKF
13	6.32	662.82	BNK
13.6	6.81	662.33	BNK
14.2	7.60	661.54	BNK
14.8	7.54	661.60	BNK
15.5	7.86	661.28	TOE
16	7.96	661.18	BED
16.4	8.05	661.09	BED
17.2	8.08	661.06	BED
18	7.90	661.24	BED
18.5	7.66	661.48	BED
19.7	7.20	661.94	BED
20	6.21	662.93	BNK
20.8	6.15	662.99	BNK
22.6	6.00	663.14	BNK
23.9	5.72	663.42	TOB
26	5.56	663.58	GRND
28.4	5.10	664.04	GRND

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

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

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

Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 5 - Middle Branch



Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 5 - Middle Branch

Year 1

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
669.47	1000	5.53	0.01	4.30	4.62 alt bkf THL	663.94	663.95	665.17
669.47	1008	5.72	0.01			663.75	663.76	
669.47	1014	5.80	0.01			663.67	663.68	
669.47	1018.5	7.68	0.01			661.79	661.80	
669.47	1026	7.28	0.01			662.19	662.20	
669.47	1031	6.25	0.01			663.22	663.23	
669.47	1035.5	7.05	0.01			662.42	662.43	
669.47	1042	6.72	0.01	5.58	5.9 alt bkf HOR	662.75	662.76	663.89
669.47	1051	6.88	0.01			662.59	662.60	
669.47	1055.5	6.78	0.01			662.69	662.70	
669.47	1061.5	8.30	0.01			661.17	661.18	
669.47	1063.1	8.36	0.01			661.11	661.12	
669.47	1069.3	6.88	0.01			662.59	662.60	
669.47	1075	8.51	0.01			660.96	660.97	
669.47	1085	7.55	0.01			661.92	661.93	
669.47	1091	7.35	0.01	6.03	6.51 alt bkf HOR	662.12	662.13	663.44
669.47	1102	7.70	0.01			661.77	661.78	
669.47	1112	8.08	0.01			661.39	661.40	
669.47	1121	8.08	0.01			661.39	661.40	
669.47	1124	8.36	0.01			661.11	661.12	
669.47	1132.5	7.86	0.01			661.61	661.62	
669.47	1136	9.80	0.01			659.67	659.68	
669.47	1144.5	9.81	0.01			659.66	659.67	
669.47	1155	8.22	0.01			661.25	661.26	
669.47	1159	8.54	0.01	7.09	7.35 alt bkf HOR	660.93	660.94	662.38
669.47	1168.1	8.68	0.01			660.79	660.80	
669.47	1175	8.65	0.01			660.82	660.83	
669.47	1181	8.68	0.01			660.79	660.80	

Pebble Count Weighted by Channel Feature

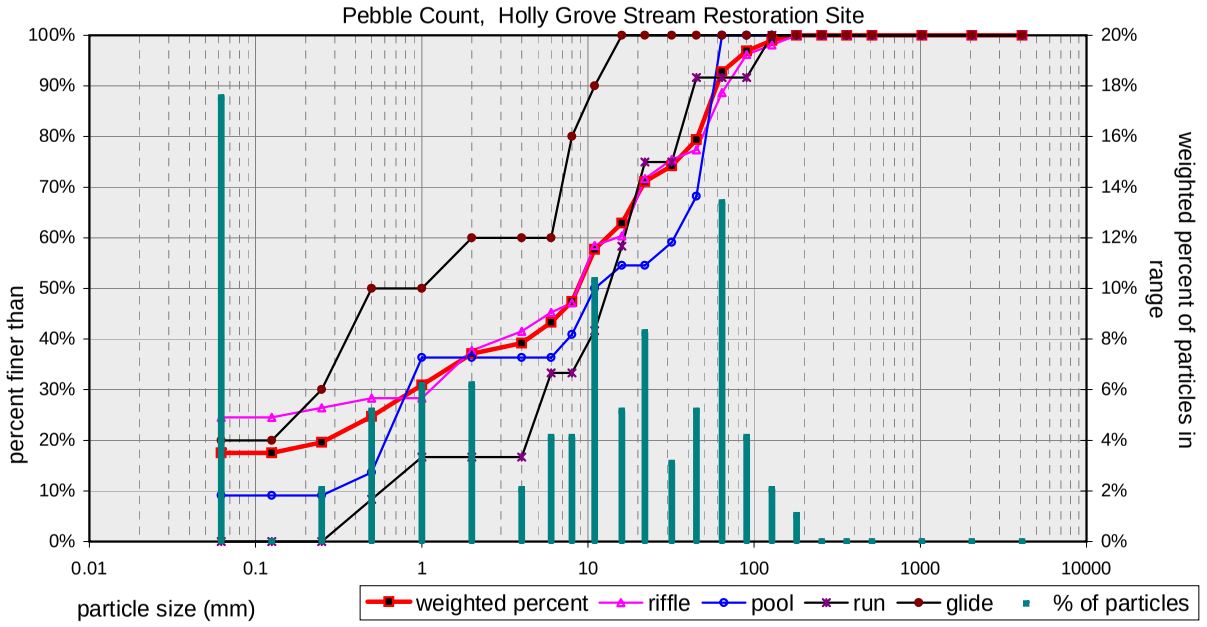
Percent Riffle:	**52**	Percent Run:	**15.7**
Percent Pool:	**22.5**	Percent Glide:	**9.8**

Pebble Count,

Holly Grove Stream Restoration Site
Guilford County, NC
Middle Branch: Reach 5
Note: **Reach Data 5** 18%

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	16.7	#
very fine sand	0.062	0.13	0.0	#
fine sand	0.13	0.25	2.0	#
medium sand	0.25	0.5	4.9	#
coarse sand	0.5	1	5.9	#
very coarse sand	1	2	5.9	#
very fine gravel	2	4	2.0	#
fine gravel	4	6	3.9	#
fine gravel	6	8	3.9	#
medium gravel	8	11	9.8	#
medium gravel	11	16	4.9	#
coarse gravel	16	22	7.8	#
coarse gravel	22	32	2.9	#
very coarse gravel	32	45	4.9	#
very coarse gravel	45	64	12.7	#
small cobble	64	90	3.9	#
medium cobble	90	128	2.0	#
large cobble	128	180	1.0	#
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:			95.1	

bedrock		4.9
clay hardpan		0.0
detritus/wood		0.0
artificial		0.0
weighted total count:		100



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	1.58	8.7	17	51	77	72.8	1.8	28.6

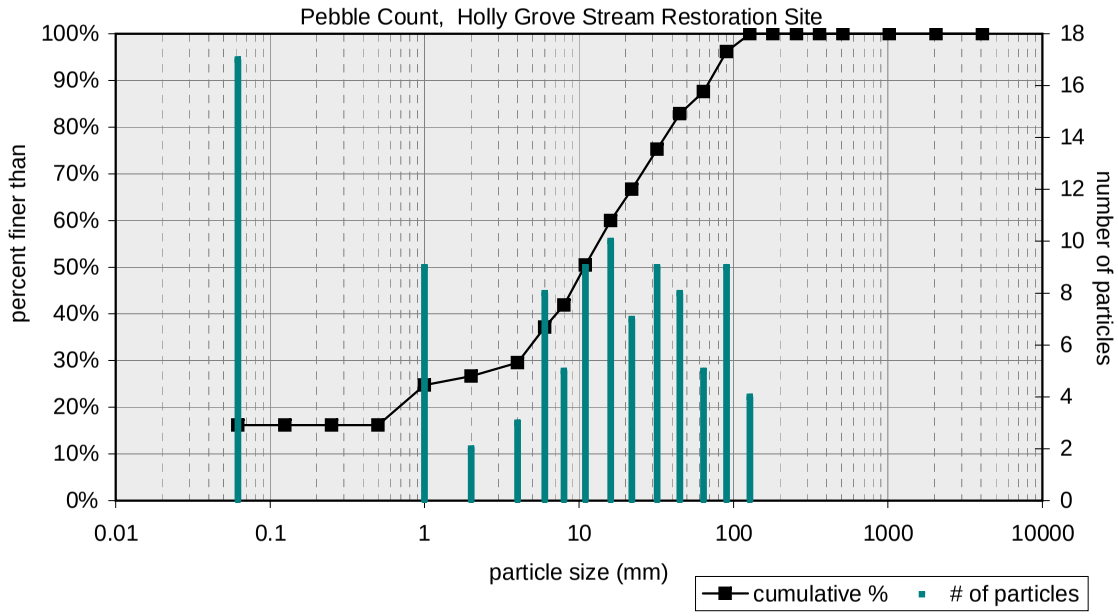
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	17%	19%	53%	7%	0%	5%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count
silt/clay	0	0.062	**17**
very fine sand	0.062	0.13	
fine sand	0.13	0.25	
medium sand	0.25	0.5	
coarse sand	0.5	1	**9**
very coarse sand	1	2	**2**
very fine gravel	2	4	**3**
fine gravel	4	6	**8**
fine gravel	6	8	**5**
medium gravel	8	11	**9**
medium gravel	11	16	**10**
coarse gravel	16	22	**7**
coarse gravel	22	32	**9**
very coarse gravel	32	45	**8**
very coarse gravel	45	64	**5**
small cobble	64	90	**9**
medium cobble	90	128	**4**
large cobble	128	180	
very large cobble	180	256	
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
	total particle count:		105

bedrock			
clay hardpan			
detritus/wood			
artificial			
	total count:		105

Pebble Count,
Holly Grove Stream Restoration Site
Guilford County, NC
Middle Branch: Reach 5
Note: **Riffle RF5**



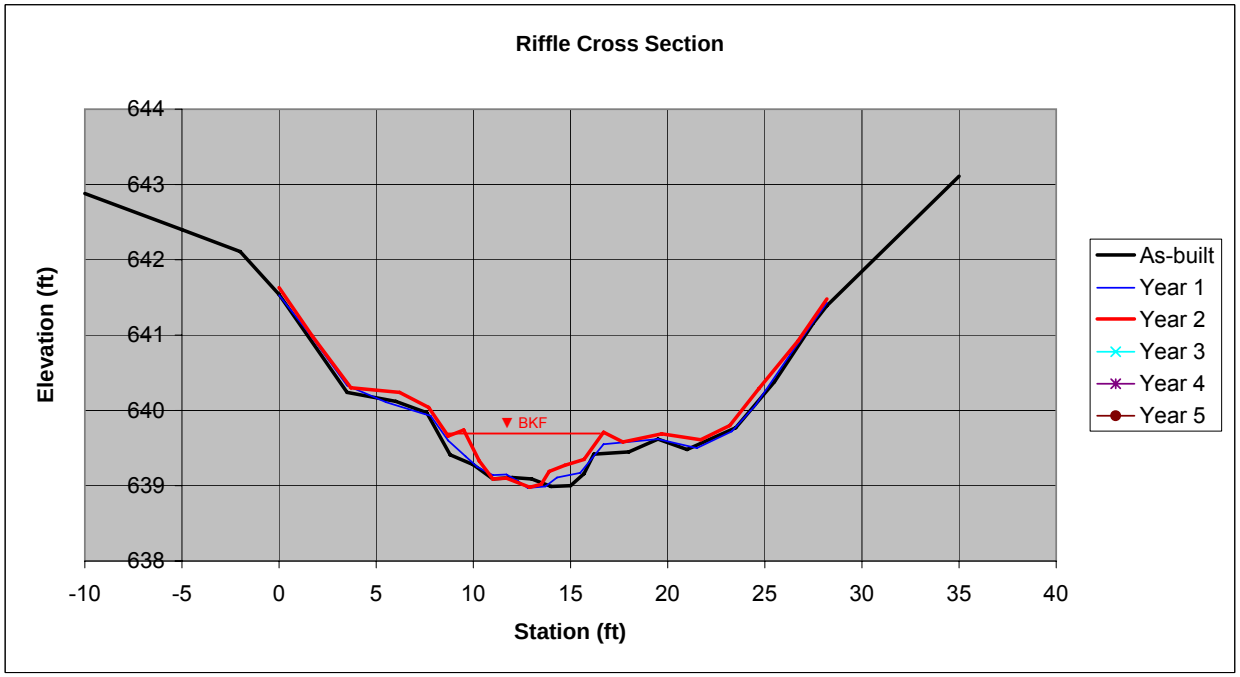
based on sediment particles only	size percent less than (mm) D16	D35	D50	D65	D84	D95	particle size distribution gradation	geo mean	std dev
	0.062	5.35	10.8	20	49	86	89.4	1.7	28.1

based on total count	percent by substrate type silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	16%	10%	61%	12%	0%	0%	0%	0%	0%

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF6
Reach 6 - Lower East Branch - Sta 11+07.2

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/12/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	4.0	Area	2.8	Area	3.0	Area	0.0	Area	0.0	Area	0.0
Bkf W	10.7	Bkf W	8	Bkf W	8	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	0.4	Dmean	0.4	Dmean	0.4	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	0.6	Dmax	0.6	Dmax	0.7	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	28.5	W/d	22.7	W/d	21.6	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF6
Reach 6 - Lower East Branch - Sta 11+07.2

As-Built			
Station	FS/BS	Elev.	Desc.
BM	5.02	643.14	BP6 IR Lt
HI		648.16	
-10	5.28	642.88	
-5	5.76	642.40	
-2	6.05	642.11	
0	6.62	641.54	
3.5	7.92	640.24	
6	8.04	640.12	
7.6	8.19	639.97	
8.8	8.75	639.41	
10	8.88	639.28	
11	9.07	639.09	
12	9.05	639.11	
13	9.07	639.09	
14	9.17	638.99	
15	9.16	639.00	
15.7	9.00	639.16	
16.2	8.74	639.42	
18	8.71	639.45	
19.5	8.54	639.62	
21	8.68	639.48	
23.5	8.39	639.77	
25.5	7.78	640.38	
27.5	7.00	641.16	
28.2	6.77	641.39	
35	5.05	643.11	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	6.06	643.14	BP6 IR Lt
HI		649.20	
0	7.67	641.53	GRND
1.5	8.16	641.04	GRND
3.5	8.87	640.33	GRND
5.5	9.09	640.11	GRND
7.5	9.25	639.95	GRND
7.8	9.27	639.93	BKF LT
8.7	9.60	639.60	BNK
9.6	9.81	639.39	BNK
10.2	9.95	639.25	BED
11	10.06	639.14	BED
11.7	10.05	639.15	BED
12.3	10.14	639.06	BED
12.8	10.23	638.97	BED
13.7	10.21	638.99	BED
14.3	10.09	639.11	BED
15.5	10.03	639.17	BNK
16.7	9.65	639.55	BKF RT
19.5	9.58	639.62	GRND
21.5	9.70	639.50	GRND
23.3	9.48	639.72	GRND
24.5	9.14	640.06	GRND
26.3	8.46	640.74	GRND
28.2	7.77	641.43	GRND

Year 2			
Station	FS/BS	Elev.	Desc.
BM	4.08	641.78	IR Lt
HI		645.86	
0	4.23	641.63	GRND
1.7	4.87	640.99	GRND
3.7	5.56	640.30	GRND
6.2	5.62	640.24	GRND
7.7	5.82	640.04	GRND
8.7	6.20	639.66	BKF
9.5	6.12	639.74	BNK
10.3	6.53	639.33	BED
11	6.77	639.09	BED
11.7	6.76	639.10	BED
12.9	6.88	638.98	BED
13.5	6.84	639.02	BED
13.9	6.67	639.19	BED
14.7	6.59	639.27	BNK
15.7	6.51	639.35	BNK
16.7	6.15	639.71	BKF
17.7	6.28	639.58	GRND
19.7	6.17	639.69	GRND
21.7	6.25	639.61	GRND
23.2	6.06	639.80	GRND
24.7	5.57	640.29	GRND
26.7	4.94	640.92	GRND
28.2	4.38	641.48	GRND

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

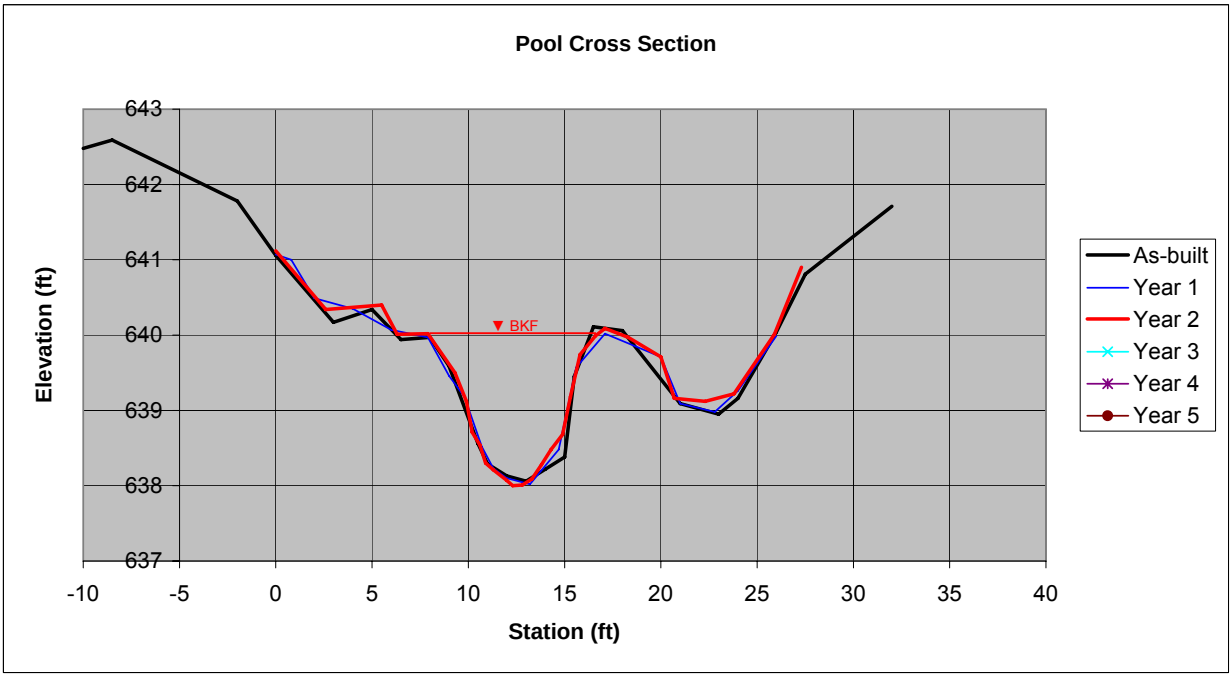
Year 4			
Station	FS/BS	Elev.	Desc.
BM	0.00	100.00	IR Lt
HI		100.00	

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

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL6
Reach 6 - Lower East Branch - Sta 11+33.0

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/12/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	10.2	Area	10.0	Area	10.2	Area	0.0	Area	0.0	Area	0.0
Bkf W	8.5	Bkf W	9.2	Bkf W	9.2	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	1.2	Dmean	1.1	Dmean	1.1	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	1.9	Dmax	2.0	Dmax	2.0	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	7.1	W/d	8.5	W/d	8.3	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL6
Reach 6 - Lower East Branch - Sta 11+33.0

As-Built			
Station	FS/BS	Elev.	Desc.
BM	5.02	643.14	BP6 IR Lt
HI		648.16	
-10	5.68	642.48	
-8.5	5.57	642.59	
-2	6.38	641.78	
0	7.10	641.06	
3	7.99	640.17	
5	7.82	640.34	
6.5	8.22	639.94	
8	8.19	639.97	
9	8.57	639.59	
10.5	9.60	638.56	
11	9.87	638.29	
12	10.03	638.13	
13	10.10	638.06	
14	9.94	638.22	
15	9.78	638.38	
15.5	8.71	639.45	
16.5	8.05	640.11	
18	8.10	640.06	
21	9.07	639.09	
23	9.21	638.95	
24	9.00	639.16	
26	8.12	640.04	
27.5	7.35	640.81	
32	6.45	641.71	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	6.06	643.14	BP6 IR Lt
HI		649.20	
0	8.13	641.07	GRND
0.8	8.20	641	GRND
2	8.71	640.49	GRND
4	8.85	640.35	GRND
6	9.13	640.07	GRND
7.9	9.23	639.97	BKF LT
9	9.74	639.46	BNK
9.8	10.02	639.18	BNK
10.7	10.68	638.52	BNK
11.3	10.97	638.23	BED
12	11.10	638.1	BED
13.2	11.18	638.02	BED
14.7	10.72	638.48	BED
15.6	9.63	639.57	BED
17.1	9.18	640.02	BED
20	9.49	639.71	BNK
21	10.11	639.09	LOG
22.8	10.22	638.98	LOG
24	9.94	639.26	BNK
26	9.21	639.99	GRND

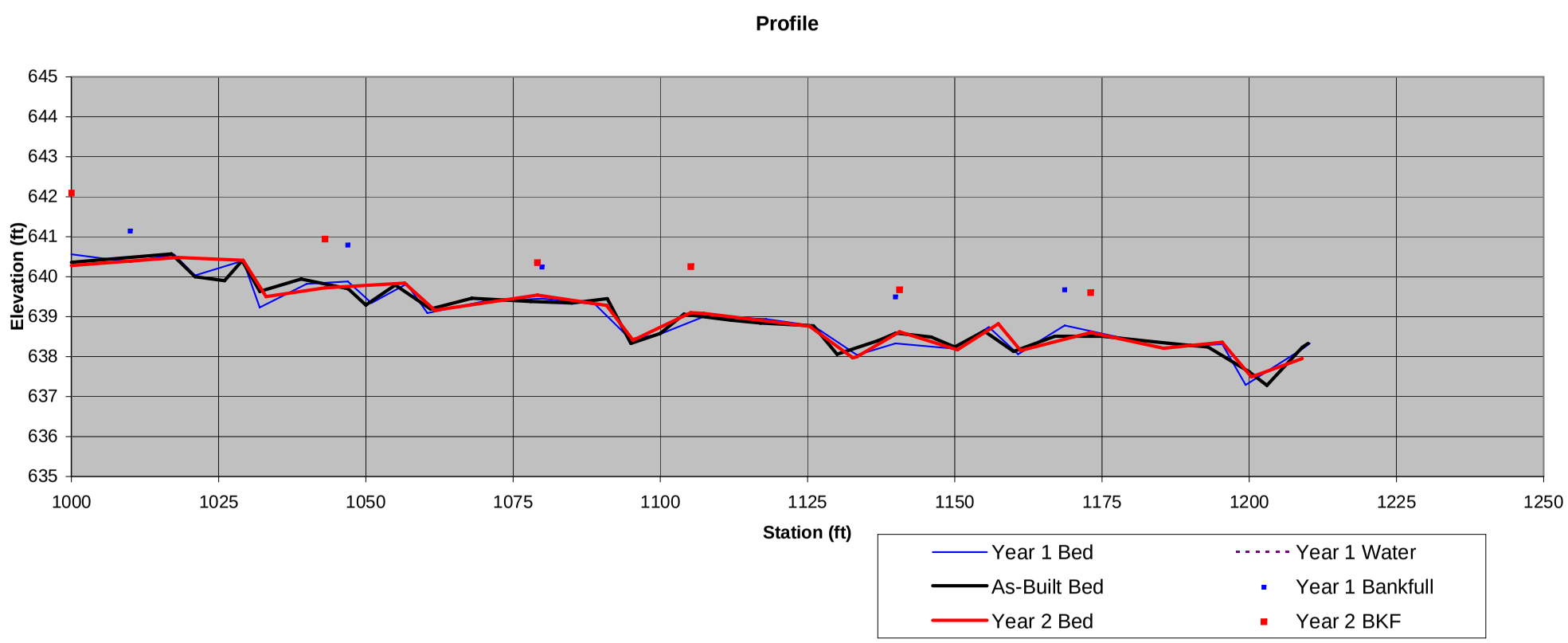
Year 2			
Station	FS/BS	Elev.	Desc.
BM	3.25	641.75	IR Lt
HI		645.00	
0	3.88	641.12	GRND
2.6	4.66	640.34	GRND
5.5	4.60	640.40	GRND
6.3	4.99	640.01	GRND
7.9	4.98	640.02	BKF
9.3	5.50	639.50	BNK
9.9	5.88	639.12	BNK
10.2	6.29	638.71	BNK
10.6	6.46	638.54	BED
10.9	6.70	638.30	TOE
11.3	6.79	638.21	BED
12	6.93	638.07	BED
12.3	7.00	638.00	BED
12.8	6.99	638.01	BED
13.3	6.91	638.09	BED
13.8	6.72	638.28	BED
14.3	6.52	638.48	BED
14.9	6.32	638.68	BED
15.3	5.82	639.18	ROOTWAD
15.8	5.26	639.74	ROOTWAD
16.6	5.01	639.99	BNK
17.1	4.91	640.09	BKF
18.3	5.03	639.97	GRND
20	5.29	639.71	GRND
20.7	5.84	639.16	GRND
22.3	5.88	639.12	GRND
23.8	5.78	639.22	GRND
25.9	4.99	640.01	GRND
27.3	4.10	640.90	GRND

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

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

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

Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 6 - Lower East Branch



Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 6 - Lower East Branch

Year 1

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
646.54	1000	6.26	0.01	4.45	5.29 alt bkf HOR	640.28	640.29	642.09
646.54	1018	6.06	0.01			640.48	640.49	
646.54	1029.1	6.13	0.01			640.41	640.42	
646.54	1033	7.04	0.01			639.50	639.51	
646.54	1043	6.82	0.01	5.60		639.72	639.73	640.94
646.54	1056.5	6.70	0.01			639.84	639.85	
646.54	1061.6	7.38	0.01			639.16	639.17	
646.54	1079	7.00	0.01	6.19		639.54	639.55	640.35
646.54	1090.7	7.26	0.01			639.28	639.29	
646.54	1095.2	8.13	0.01			638.41	638.42	
646.54	1105	7.44	0.01	6.29		639.10	639.11	640.25
646.54	1107.2	7.46	0.01			639.08	639.09	
645.00	1125	6.24	0.01			638.76	638.77	
645.00	1132.3	7.03	0.01			637.97	637.98	
645.00	1133	7.00	0.01			638.00	638.01	
645.00	1140.3	6.38	0.01	5.33		638.62	638.63	639.67
645.00	1150.2	6.83	0.01			638.17	638.18	
645.00	1157.2	6.18	0.01			638.82	638.83	
645.00	1161	6.85	0.01			638.15	638.16	
645.00	1173	6.40	0.01	5.40		638.60	638.61	639.60
645.00	1185.5	6.79	0.01			638.21	638.22	
645.00	1195.5	6.64	0.01			638.36	638.37	
645.00	1200.5	7.51	0.01			637.49	637.50	
645.00	1209.2	7.05	0.01			637.95	637.96	

Pebble Count Weighted by Channel Feature

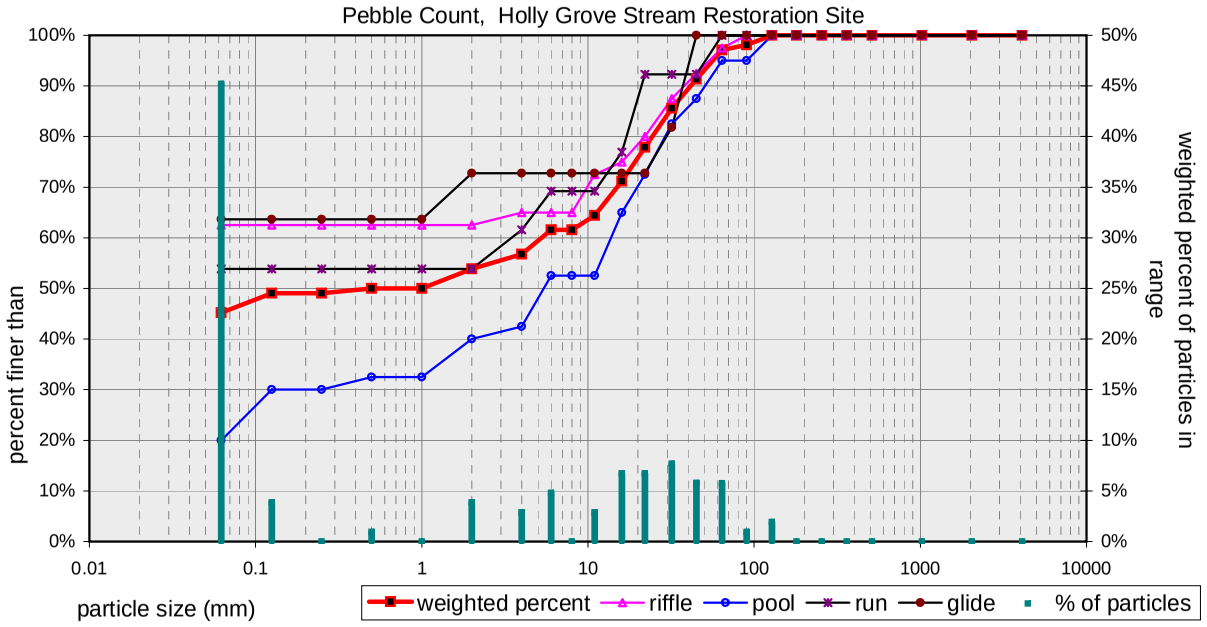
Percent Riffle:	**38.7**	Percent Run:	**13.2**
Percent Pool:	**37.7**	Percent Glide:	**10.4**

Pebble Count,

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	44.4	#
very fine sand	0.062	0.13	3.8	#
fine sand	0.13	0.25	0.0	#
medium sand	0.25	0.5	0.9	#
coarse sand	0.5	1	0.0	#
very coarse sand	1	2	3.8	#
very fine gravel	2	4	2.8	#
fine gravel	4	6	4.7	#
fine gravel	6	8	0.0	#
medium gravel	8	11	2.8	#
medium gravel	11	16	6.6	#
coarse gravel	16	22	6.6	#
coarse gravel	22	32	7.5	#
very coarse gravel	32	45	5.7	#
very coarse gravel	45	64	5.7	#
small cobble	64	90	0.9	#
medium cobble	90	128	1.9	#
large cobble	128	180	0.0	#
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:			98.1	

bedrock		1.9
clay hardpan		0.0
detritus/wood		0.0
artificial		0.0
weighted total count:		100

Holly Grove Stream Restoration Site
Guilford County, NC
East Branch: Reach 6
Note: **Reach Data 6** 45%



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	0.06	0.5	11	30	56	33.9	1.4	21.9

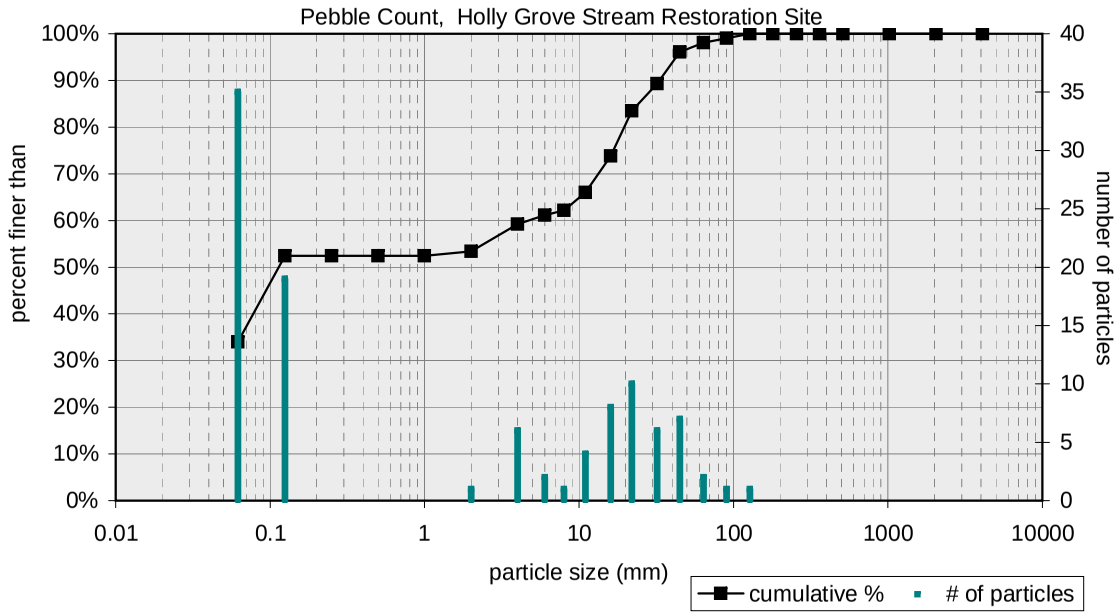
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	44%	8%	42%	3%	0%	2%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count
silt/clay	0	0.062	**35**
very fine sand	0.062	0.13	**19**
fine sand	0.13	0.25	
medium sand	0.25	0.5	
coarse sand	0.5	1	
very coarse sand	1	2	**1**
very fine gravel	2	4	**6**
fine gravel	4	6	**2**
fine gravel	6	8	**1**
medium gravel	8	11	**4**
medium gravel	11	16	**8**
coarse gravel	16	22	**10**
coarse gravel	22	32	**6**
very coarse gravel	32	45	**7**
very coarse gravel	45	64	**2**
small cobble	64	90	**1**
medium cobble	90	128	**1**
large cobble	128	180	
very large cobble	180	256	
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
	total particle count:		103

bedrock			**2**
clay hardpan			
detritus/wood			
artificial			
	total count:		105

Pebble Count,
Holly Grove Stream Restoration Site
Guilford County, NC
East Branch: Reach 6
Note: **Riffle RF6**



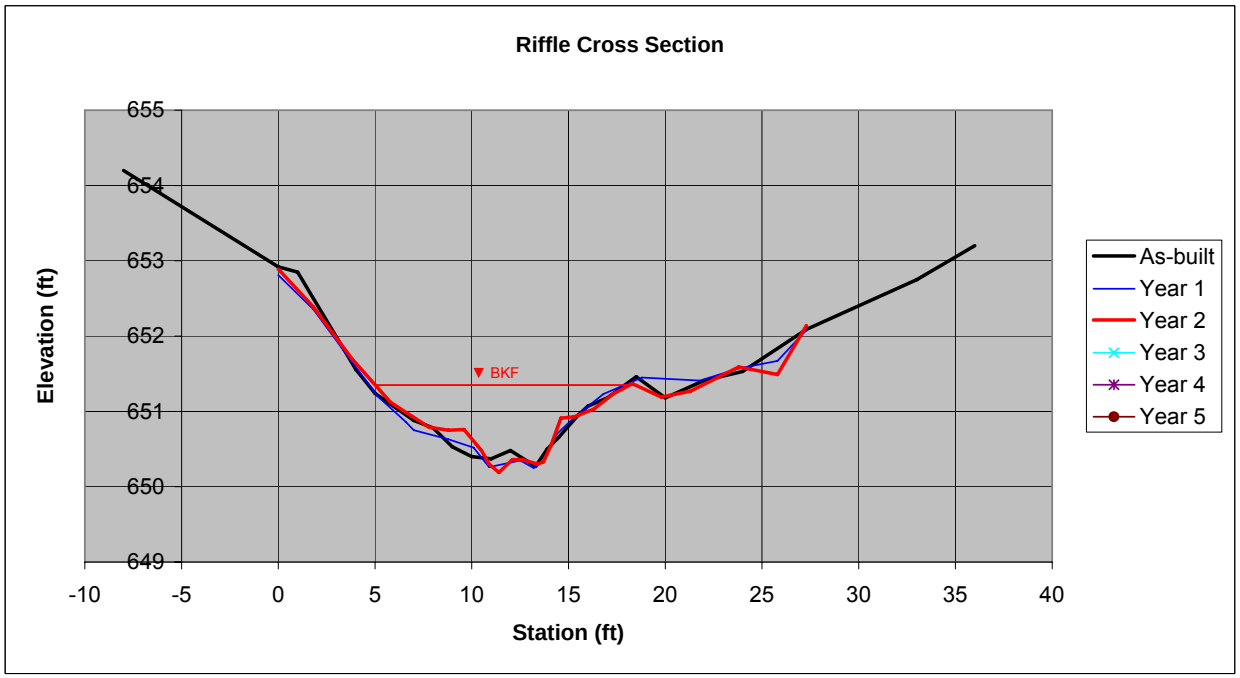
based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	0.06	0.1	10	23	43	100.6	1.2	19.1

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	33%	19%	44%	2%	0%	2%	0%	0%	0%

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF7
Reach 7 - Southeast Creek - Sta 11+20.6

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/12/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	9.4	Area	9.5	Area	7.6	Area	0.0	Area	0.0	Area	0.0
Bkf W	14.5	Bkf W	15	Bkf W	14.5	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	0.6	Dmean	0.6	Dmean	0.5	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	1.2	Dmax	1.2	Dmax	1.2	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	22.3	W/d	23.8	W/d	27.7	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF7
Reach 7 - Southeast Creek - Sta 11+20.6

As-Built

Station	FS/BS	Elev.	Desc.
BM	7.17	653.43	BP7 IR Lt
HI		660.60	
-8	6.40	654.20	
0	7.68	652.92	
1	7.75	652.85	
4	9.04	651.56	
5	9.36	651.24	
7	9.72	650.88	
8	9.82	650.78	
9	10.07	650.53	
10	10.20	650.40	
11	10.23	650.37	
12	10.12	650.48	
13.3	10.33	650.27	
13.9	10.10	650.50	
14.5	9.94	650.66	
15.5	9.65	650.95	
16	9.53	651.07	
17	9.42	651.18	
18.5	9.14	651.46	
20	9.42	651.18	
22	9.19	651.41	
24	9.07	651.53	
27.3	8.51	652.09	
33	7.85	652.75	
36	7.40	653.20	

Year 1

Station	FS/BS	Elev.	Desc.
BM	5.15	653.43	BP7 IR Lt
HI		658.58	
0	5.77	652.81	GRND
1.8	6.22	652.36	GRND
3.8	6.92	651.66	GRND
5.1	7.37	651.21	GRND
6.6	7.72	650.86	BKF LT
7	7.83	650.75	
8.8	7.95	650.63	
10.1	8.06	650.52	
10.9	8.32	650.26	
12.5	8.23	650.35	
13.2	8.33	650.25	
13.7	8.23	650.35	
14.4	7.88	650.70	
15.3	7.66	650.92	BKF RT
16.8	7.35	651.23	GRND
18.8	7.13	651.45	GRND
21.8	7.17	651.41	GRND
23.8	7.01	651.57	GRND
25.8	6.91	651.67	GRND
27.3	6.50	652.08	GRND

Year 2

Station	FS/BS	Elev.	Desc.
BM	5.27	653.16	IR Lt
HI		658.43	
0	5.54	652.89	GRND
1.8	6.04	652.39	GRND
3.8	6.73	651.70	GRND
5.8	7.31	651.12	GRND
7.8	7.64	650.79	GRND
8.8	7.68	650.75	GRND
9.6	7.67	650.76	BKF
10.5	7.95	650.48	BNK
10.9	8.13	650.30	EOW
11.4	8.24	650.19	BED
12.1	8.07	650.36	BED
12.6	8.07	650.36	BED
13.4	8.13	650.30	BED
13.7	8.10	650.33	EOW
14.1	7.88	650.55	BNK
14.6	7.52	650.91	BKF
15.3	7.50	650.93	GRND
16.3	7.40	651.03	GRND
17.3	7.20	651.23	GRND
18.3	7.06	651.37	GRND
19.8	7.24	651.19	GRND
21.3	7.16	651.27	GRND
23.8	6.84	651.59	GRND
25.8	6.94	651.49	GRND
27.3	6.29	652.14	GRND

Year 3

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

Year 4

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

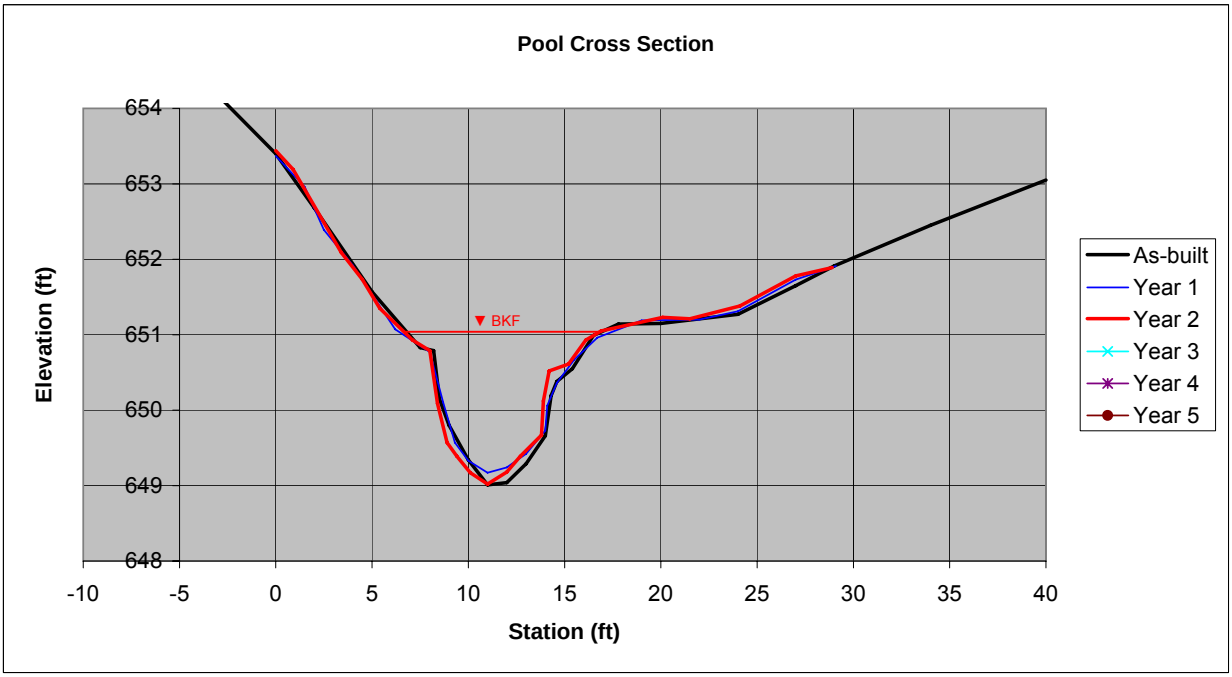
Year 5

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

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL7
Reach 7 - Southeast Creek - Sta 11+32.3

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/12/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	10.5	Area	9.6	Area	9.6	Area	0.0	Area	0.0	Area	0.0
Bkf W	9.5	Bkf W	9.7	Bkf W	9.8	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	1.1	Dmean	1.0	Dmean	1.0	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	2.0	Dmax	1.8	Dmax	1.9	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	8.6	W/d	9.8	W/d	10.0	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL7
Reach 7 - Southeast Creek - Sta 11+32.3

As-Built			
Station	FS/BS	Elev.	Desc.
BM	7.17	653.43	BP7 IR Lt
HI		660.60	
-4	6.17	654.43	
0	7.20	653.40	
2	7.92	652.68	
5	9.03	651.57	
7.5	9.77	650.83	
8.2	9.81	650.79	
8.5	10.45	650.15	
9	10.80	649.80	
10	11.26	649.34	
11	11.59	649.01	
12	11.56	649.04	
13	11.31	649.29	
14	10.94	649.66	
14.3	10.41	650.19	
14.6	10.22	650.38	
15.4	10.05	650.55	
16.5	9.61	650.99	
17.8	9.46	651.14	
20	9.45	651.15	
24	9.33	651.27	
27	8.95	651.65	
29	8.69	651.91	
34	8.15	652.45	
40	7.55	653.05	
		660.60	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	5.15	653.43	BP7 IR Lt
HI		658.58	
0	5.21	653.37	GRND
1.5	5.62	652.96	GRND
2.5	6.19	652.39	GRND
4	6.66	651.92	GRND
6.2	7.51	651.07	GRND
8	7.81	650.77	LOG
8.7	8.48	650.1	EOW
9.3	9.01	649.57	
10	9.25	649.33	
11	9.41	649.17	
12	9.34	649.24	
13	9.16	649.42	
14	8.85	649.73	
14.1	8.52	650.06	EOW
14.6	8.22	650.36	
15.5	7.91	650.67	BKF RT
16.7	7.62	650.96	GRND
19	7.39	651.19	GRND
22	7.38	651.2	GRND
24	7.27	651.31	GRND
27	6.85	651.73	GRND
29.1	6.67	651.91	GRND

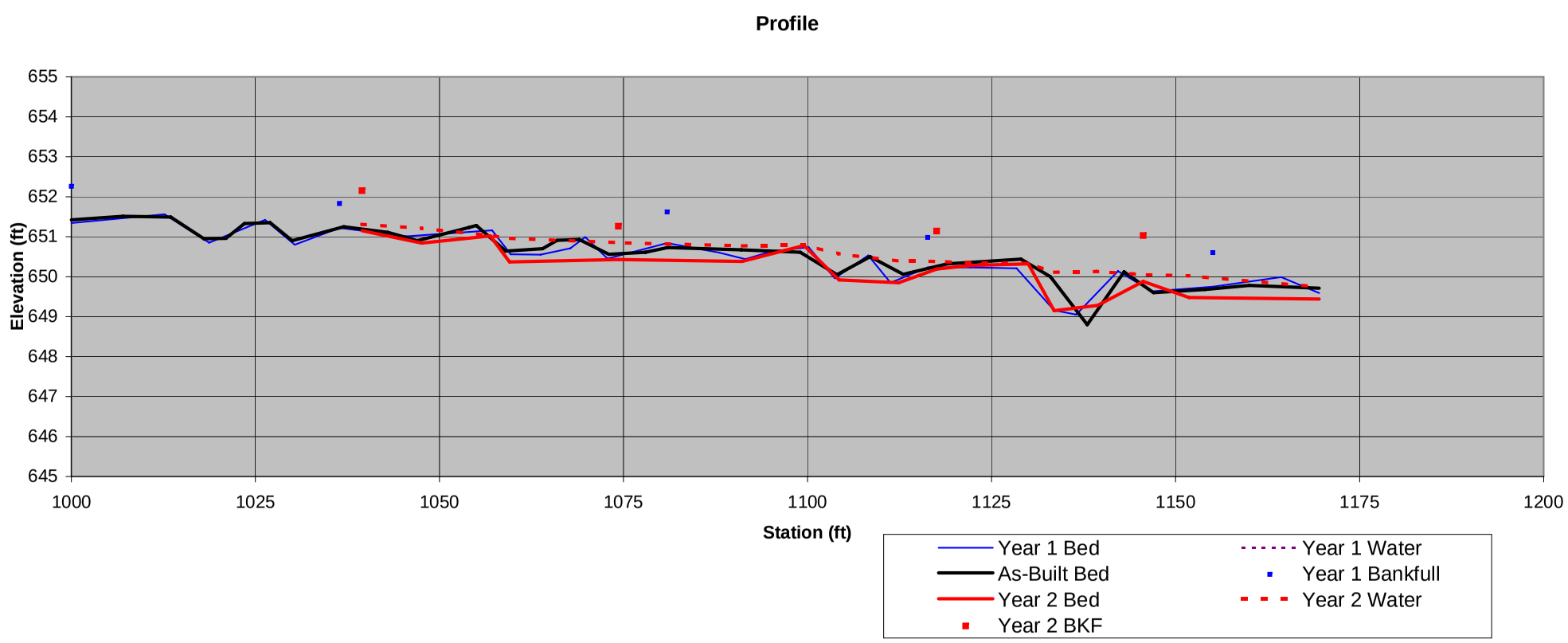
Year 2			
Station	FS/BS	Elev.	Desc.
BM	4.94	652.34	IR Lt
HI		657.28	
0	3.84	653.44	GRND
0.9	4.09	653.19	GRND
3.4	5.19	652.09	GRND
4.5	5.55	651.73	GRND
5.4	5.93	651.35	GRND
7.1	6.35	650.93	GRND
8	6.49	650.79	LOG
8.4	7.19	650.09	LOG/EOW
8.9	7.71	649.57	BED
9.4	7.89	649.39	BED
10.1	8.11	649.17	BED
11	8.26	649.02	BED
12	8.10	649.18	BED
12.7	7.89	649.39	BED
13.8	7.61	649.67	BED
13.9	7.16	650.12	EOW
14.2	6.76	650.52	BNK
15.2	6.67	650.61	BNK
16.1	6.35	650.93	BNK
16.9	6.23	651.05	BKF
20.1	6.05	651.23	GRND
21.5	6.07	651.21	GRND
24.1	5.90	651.38	GRND
27	5.50	651.78	GRND
28.9	5.39	651.89	GRND

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

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

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

Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 7 - Southeast Creek



Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 7 - Southeast Creek

Year 1

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
657.28	1039	6.13	0.16	5.13		651.15	651.31	652.15
657.28	1047	6.44	0.37			650.84	651.21	
657.28	1056.2	6.26	0.01			651.02	651.03	
657.28	1058.8	6.91	0.59			650.37	650.96	
657.28	1073.4	6.85	0.42	6.02		650.43	650.85	651.26
657.28	1090	6.90	0.39			650.38	650.77	
657.28	1098.3	6.50	0.01			650.78	650.79	
657.28	1103	7.36	0.65			649.92	650.57	
657.28	1111	7.43	0.54			649.85	650.39	
657.28	1116.1	7.09	0.19	6.14		650.19	650.38	651.14
657.28	1120.6	7.00	0.07			650.28	650.35	
657.28	1128.7	6.96	0.01			650.32	650.33	
657.28	1132.3	8.13	0.96			649.15	650.11	
657.28	1138	8.00	0.85			649.28	650.13	
657.28	1144	7.40	0.17	6.25	6.54 alt bkf HOR	649.88	650.05	651.03
657.28	1150	7.80	0.54			649.48	650.02	
657.28	1167.1	7.84	0.30			649.44	649.74	

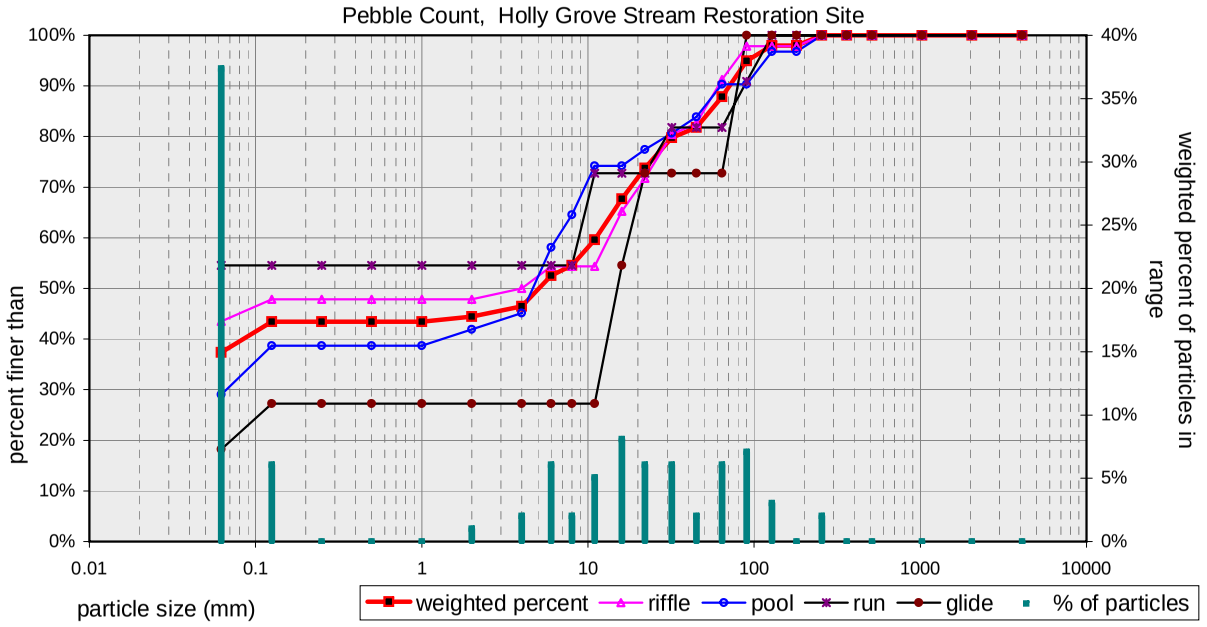
Pebble Count Weighted by Channel Feature

Percent Riffle:	**46**	Percent Run:	**12**		
Percent Pool:	**31**	Percent Glide:	**11**		

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	37.0	#
very fine sand	0.062	0.13	6.0	#
fine sand	0.13	0.25	0.0	#
medium sand	0.25	0.5	0.0	#
coarse sand	0.5	1	0.0	#
very coarse sand	1	2	1.0	#
very fine gravel	2	4	2.0	#
fine gravel	4	6	6.0	#
fine gravel	6	8	2.0	#
medium gravel	8	11	5.0	#
medium gravel	11	16	8.0	#
coarse gravel	16	22	6.0	#
coarse gravel	22	32	6.0	#
very coarse gravel	32	45	2.0	#
very coarse gravel	45	64	6.0	#
small cobble	64	90	7.0	#
medium cobble	90	128	3.0	#
large cobble	128	180	0.0	#
very large cobble	180	256	2.0	#
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:			99.0	

bedrock		1.0
clay hardpan		0.0
detritus/wood		0.0
artificial		0.0
weighted total count:		100

Pebble Count,
Holly Grove Stream Restoration Site
Guilford County, NC
Southeast Creek: Reach 7
Note: **Reach Data 7** 37%



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	0.06	5.1	14	51	91	45.9	1.8	28.7

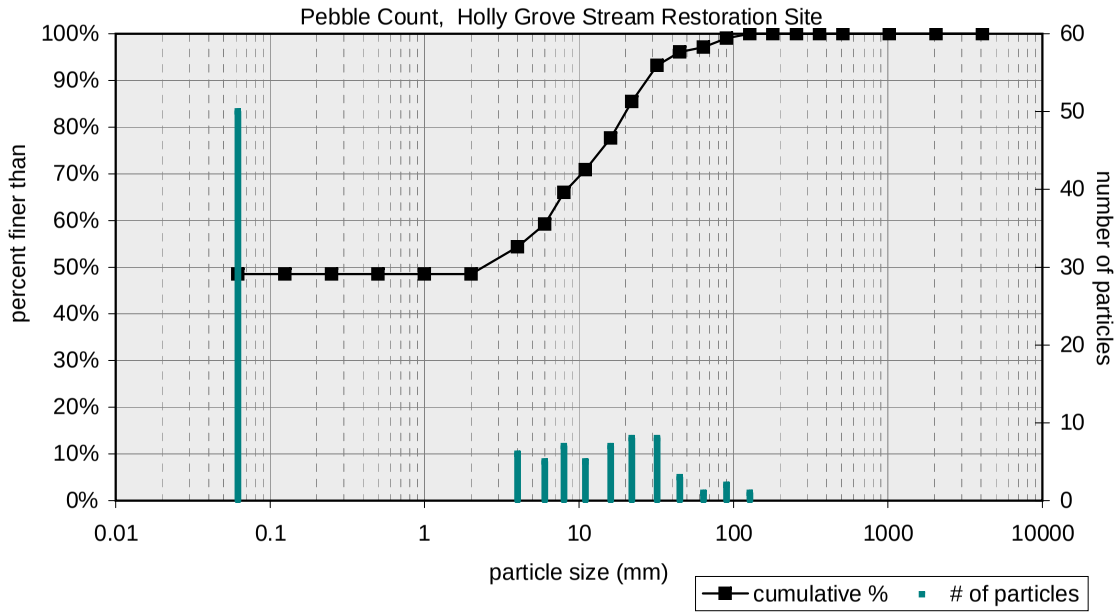
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	37%	7%	43%	12%	0%	1%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count	
silt/clay	0	0.062	**50**	##
very fine sand	0.062	0.13		##
fine sand	0.13	0.25		##
medium sand	0.25	0.5		##
coarse sand	0.5	1		##
very coarse sand	1	2		##
very fine gravel	2	4	**6**	##
fine gravel	4	6	**5**	##
fine gravel	6	8	**7**	##
medium gravel	8	11	**5**	##
medium gravel	11	16	**7**	##
coarse gravel	16	22	**8**	##
coarse gravel	22	32	**8**	##
very coarse gravel	32	45	**3**	##
very coarse gravel	45	64	**1**	##
small cobble	64	90	**2**	##
medium cobble	90	128	**1**	##
large cobble	128	180		##
very large cobble	180	256		##
small boulder	256	362		##
small boulder	362	512		##
medium boulder	512	1024		##
large boulder	1024	2048		##
very large boulder	2048	4096		##
		total particle count:	103	

bedrock		**1**
clay hardpan		
detritus/wood		
artificial		
	total count:	104

Pebble Count,
Holly Grove Stream Restoration Site
Guilford County, NC
Southeast Creek: Reach 7
Note: **Riffle RF7**



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	0.06	2.4	8	21	39	23.5	1.1	18.3

based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	48%	0%	48%	3%	0%	1%	0%	0%	0%

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF8
Reach 8 - Southwest Creek - Sta 11+49.9

Year 2

Facing Downstream

As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/12/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	3.4	Area	4.4	Area	4.9	Area	0.0	Area	0.0	Area	0.0
Bkf W	8	Bkf W	8.2	Bkf W	8.4	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	0.4	Dmean	0.5	Dmean	0.6	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	0.7	Dmax	0.7	Dmax	0.8	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	18.6	W/d	15.2	W/d	14.5	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Riffle Cross Section RF8
Reach 8 - Southwest Creek - Sta 11+49.9

As-Built

Station	FS/BS	Elev.	Desc.
BM	2.51	98.99	Stump
HI		101.50	
-15	3.36	98.14	
-8	3.67	97.83	
-3	3.94	97.56	
0	4.05	97.45	
3	4.10	97.40	
7	4.04	97.46	
9.3	4.24	97.26	
10.6	4.56	96.94	
11.9	5.04	96.46	
12.3	5.26	96.24	
12.6	5.41	96.09	
12.8	5.58	95.92	
14	5.56	95.94	
15	5.76	95.74	
16	5.56	95.94	
17	5.46	96.04	
18	5.43	96.07	
18.7	5.34	96.16	
19.4	5.23	96.27	
19.9	5.04	96.46	
21.2	4.91	96.59	
22.4	4.71	96.79	
24.9	4.23	97.27	
26.9	3.99	97.51	
28	4.03	97.47	
28.9	3.86	97.64	
30	3.92	97.58	
33	3.64	97.86	
37	2.72	98.78	
40	2.35	99.15	

Year 1

Station	FS/BS	Elev.	Desc.
BM	3.78	100.42	BP8 IR Rt
HI		104.20	
0	6.68	97.52	GRND
2	6.77	97.43	GRND
6	6.71	97.49	GRND
8	6.70	97.50	GRND
9	6.83	97.37	GRND
10	7.05	97.15	GRND
11	7.33	96.87	BKF
11.9	7.63	96.57	BNK
12.5	8.15	96.05	BED
13.6	8.29	95.91	BED
15	8.37	95.83	BED
16.6	8.34	95.86	BED
18	8.18	96.02	BED
19	7.93	96.27	BNK
20.1	7.63	96.57	BKF
21	7.59	96.61	GRND
23	7.22	96.98	GRND
26	6.77	97.43	GRND

Year 2

Station	FS/BS	Elev.	Desc.
BM	5.42	97.59	IR Lt
HI		103.01	
0	5.52	97.49	GRND
1.8	5.75	97.26	GRND
4.5	5.60	97.41	GRND
6.5	5.56	97.45	GRND
8.5	5.70	97.31	GRND
9.5	5.82	97.19	GRND
11.1	6.21	96.80	GRND
11.5	6.36	96.65	GRND
11.9	6.46	96.55	BKF
12.1	6.54	96.47	BNK
12.4	7.20	95.81	TOE
13.4	7.23	95.78	BED
14.5	7.12	95.89	BED
14.9	7.28	95.73	BED
15.5	7.12	95.89	BED
16.8	7.11	95.90	BED
17.7	7.11	95.90	BED
18.5	7.00	96.01	BED
19.3	6.84	96.17	BED
19.8	6.63	96.38	BNK
20.3	6.44	96.57	BNK
20.8	6.38	96.63	BKF
21.7	6.33	96.68	GRND
23.2	6.01	97.00	GRND
24.5	5.80	97.21	GRND
26.2	5.64	97.37	GRND
27	5.53	97.48	GRND
28.3	5.52	97.49	GRND
29	5.45	97.56	GRND

Year 3

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

Year 4

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

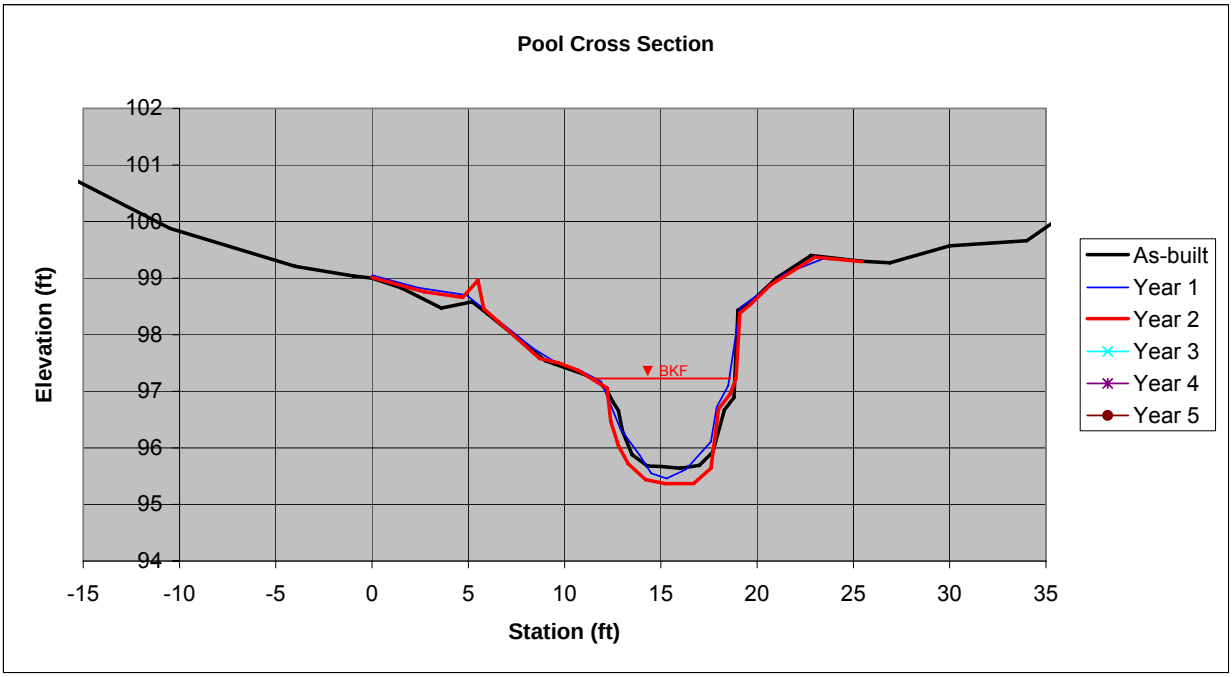
Year 5

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

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL8
Reach 8 - Middle Branch - Sta 100+78.5

Year 2

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	1/8/09	Date	10/20/09	Date	10/12/10	Date	0/0/0	Date	0/0/0	Date	0/0/0
Area	7.9	Area	7.4	Area	9.1	Area	0.0	Area	0.0	Area	0.0
Bkf W	7.1	Bkf W	6.6	Bkf W	7.2	Bkf W	10	Bkf W	10	Bkf W	10
Dmean	1.1	Dmean	1.1	Dmean	1.3	Dmean	0.0	Dmean	0.0	Dmean	0.0
Dmax	1.6	Dmax	1.7	Dmax	1.8	Dmax	0.0	Dmax	0.0	Dmax	0.0
W/d	6.4	W/d	5.9	W/d	5.7	W/d	0.0	W/d	0.0	W/d	0.0

Holly Grove Stream Restoration Site
Guilford County, NC
Pool Cross Section PL8
Reach 8 - Middle Branch - Sta 100+78.5

As-Built			
Station	FS/BS	Elev.	Desc.
BM	5.31	98.99	Stump
HI		104.30	
-17	3.29	101.01	
-10.5	4.42	99.88	
-4	5.09	99.21	
-1	5.26	99.04	
0	5.30	99.00	
1.5	5.47	98.83	
3.6	5.83	98.47	
5.2	5.72	98.58	
6	5.93	98.37	
9	6.76	97.54	
11	7.00	97.30	
11.7	7.11	97.19	
12.2	7.28	97.02	
12.5	7.48	96.82	
12.8	7.64	96.66	
13	8.00	96.30	
13.5	8.42	95.88	
14.3	8.62	95.68	
15	8.63	95.67	
16	8.66	95.64	
17	8.61	95.69	
17.7	8.37	95.93	
18.3	7.63	96.67	
18.8	7.41	96.89	
19	5.87	98.43	
19.9	5.65	98.65	
21	5.30	99.00	
22.8	4.9	99.40	
25.4	5	99.30	
26.9	5.03	99.27	
30	4.73	99.57	
34	4.64	99.66	
36	4.17	100.13	
40	4.06	100.24	

Year 1			
Station	FS/BS	Elev.	Desc.
BM	3.78	100.42	BP8 IR Rt
HI		104.20	
0	5.15	99.05	GRND
2.4	5.37	98.83	GRND
4.9	5.50	98.7	GRND
8.4	6.45	97.75	GRND
9.4	6.66	97.54	GRND
10.9	6.85	97.35	GRND
11.9	7.03	97.17	BKF
12.9	7.86	96.34	BNK
13.9	8.33	95.87	BED
14.5	8.65	95.55	BED
15.3	8.74	95.46	BED
16.3	8.58	95.62	BED
17.6	8.09	96.11	BED
17.9	7.48	96.72	ROOTWAD
18.5	7.10	97.1	ROOT
19.1	5.73	98.47	TOB
19.9	5.53	98.67	GRND
21.4	5.13	99.07	GRND
23.4	4.86	99.34	GRND
25.4	4.89	99.31	GRND

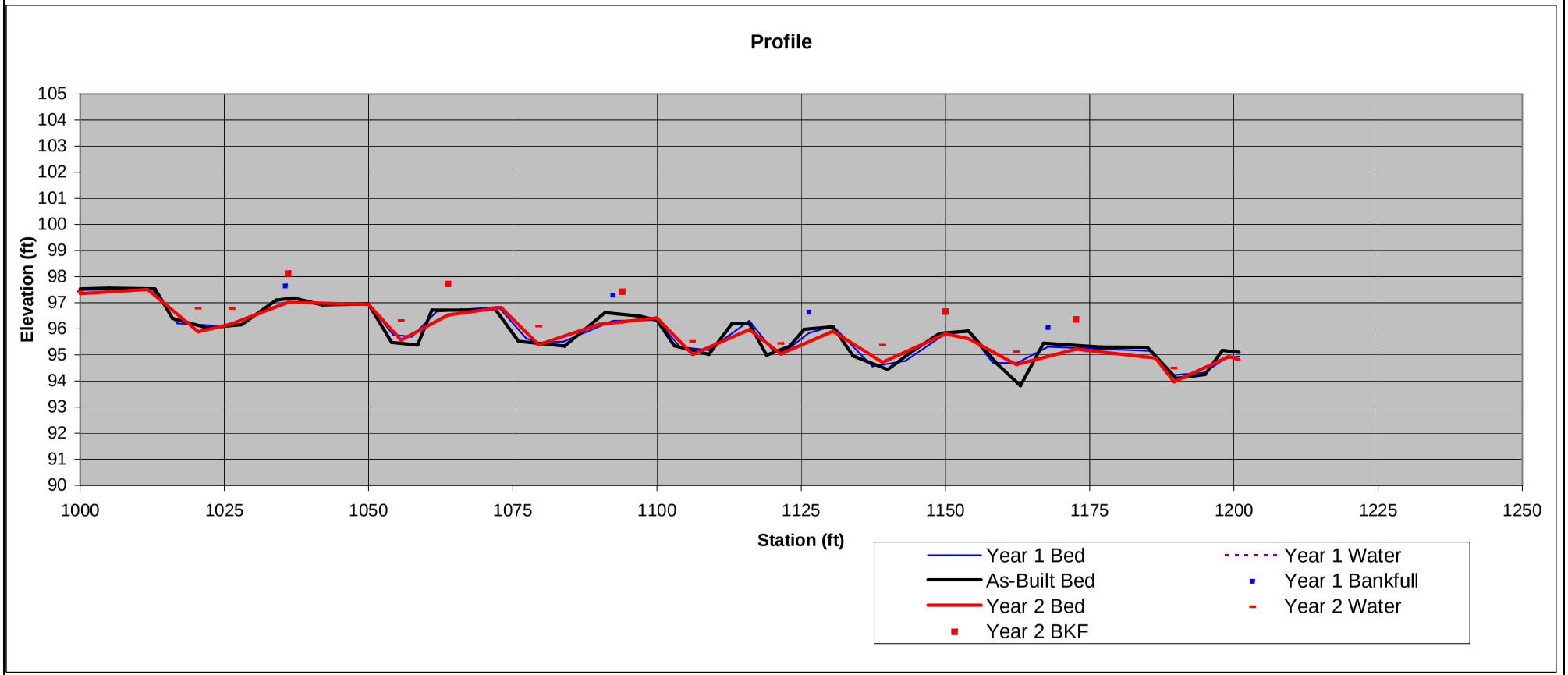
Year 2			
Station	FS/BS	Elev.	Desc.
BM	5.61	99.09	IR Lt
HI		104.70	
0	5.69	99.01	GRND
2.7	5.94	98.76	GRND
4.7	6.04	98.66	GRND
5.5	5.74	98.96	LOG
5.8	6.24	98.46	GRND
8.7	7.12	97.58	GRND
9.7	7.20	97.50	BKF
10.7	7.33	97.37	BNK
11.7	7.54	97.16	BNK
12.2	7.64	97.06	BNK
12.4	8.23	96.47	BED
12.8	8.66	96.04	EOW
13.3	8.98	95.72	BED
14.2	9.26	95.44	BED
15.2	9.33	95.37	BED
16.7	9.33	95.37	BED
17.6	9.06	95.64	BED
18	8.01	96.69	BNK
18.6	7.75	96.95	BNK
18.9	7.47	97.23	BNK
19.1	6.32	98.38	GRND
19.7	6.15	98.55	GRND
20.7	5.82	98.88	GRND
23	5.33	99.37	GRND
25.45	5.41	99.29	GRND

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

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

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

Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 8 - Southwest Creek



Holly Grove Stream Restoration Site
Guilford County, NC
Profile Reach 8 - Southwest Creek

Year 2

HI	Station	Bed FS	Water Depth	Bankfull FS	Description	Bed Elev.	Water Elev.	Bankfull Elev.
104.82	1000	7.47	0.09			97.35	97.44	
104.82	1012	7.31				97.51	96.79	
104.82	1021	8.93	0.90			95.89	96.79	
104.82	1027	8.63	0.59			96.19	96.78	
104.82	1037	7.80		6.70	7.18 alt bkf HOR	97.02	96.32	98.12
104.82	1051.3	7.88				96.94	96.32	
104.82	1056.5	9.25	0.75			95.57	96.32	
104.82	1064	8.29		7.10		96.53	96.10	97.72
104.82	1072.5	8.00				96.82	96.10	
104.82	1078.5	9.43	0.71			95.39	96.10	
104.82	1088.4	8.65				96.17	95.52	
104.82	1092.2	8.55		7.40	7.44 alt bkf HOR	96.27	95.52	97.42
104.82	1097.9	8.40				96.42	95.52	
104.82	1104.3	9.80	0.50			95.02	95.52	
104.82	1114.5	8.85				95.97	95.44	
104.82	1120.5	9.78	0.40			95.04	95.44	
104.82	1130.4	8.91				95.91	95.38	
104.82	1139	10.10	0.66			94.72	95.38	
104.82	1149.9	9.01		8.16		95.81	95.12	96.66
104.82	1155	9.20				95.62	95.12	
104.82	1163	10.19	0.49			94.63	95.12	
104.82	1173	9.60		8.46	8.57 alt bkf HOR	95.22	94.50	96.36
103.01	1186.3	8.13				94.88	94.50	
103.01	1189.4	9.04	0.53			93.97	94.50	
103.01	1198.6	8.07		6.85		94.94		96.16
103.01	1200.3	8.19				94.82		

Pebble Count Weighted by Channel Feature

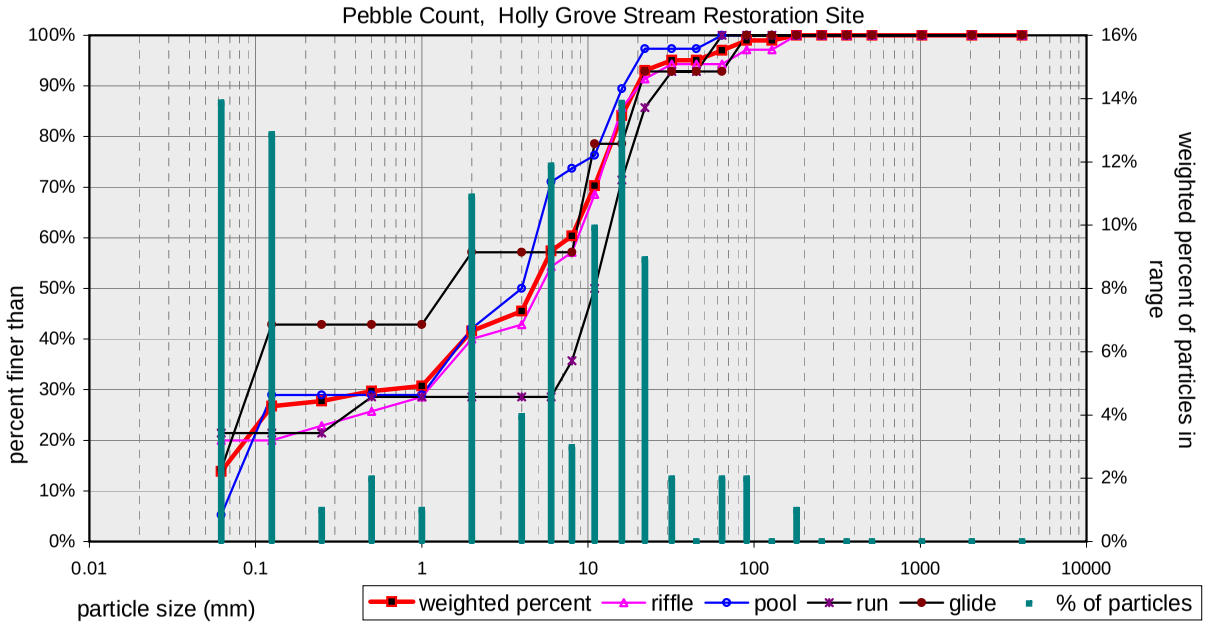
Percent Riffle:	**34.7**	Percent Run:	**13.9**
Percent Pool:	**37.6**	Percent Glide:	**13.9**

Pebble Count,

Material	Size Range (mm)		weighted	
silt/clay	0	0.062	13.9	#
very fine sand	0.062	0.13	12.9	#
fine sand	0.13	0.25	1.0	#
medium sand	0.25	0.5	2.0	#
coarse sand	0.5	1	1.0	#
very coarse sand	1	2	10.9	#
very fine gravel	2	4	4.0	#
fine gravel	4	6	11.9	#
fine gravel	6	8	3.0	#
medium gravel	8	11	9.9	#
medium gravel	11	16	13.9	#
coarse gravel	16	22	8.9	#
coarse gravel	22	32	2.0	#
very coarse gravel	32	45	0.0	#
very coarse gravel	45	64	2.0	#
small cobble	64	90	2.0	#
medium cobble	90	128	0.0	#
large cobble	128	180	1.0	#
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:			100.1	

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

Holly Grove Stream Restoration Site
Guilford County, NC
Southwest Creek: Reach 8
Note: **Reach Data 8** 14%



based on sediment particles only	size percent less than (mm) D16	D35	D50	D65	D84	D95	particle size distribution gradation	geo mean	std dev
	0.070	1.32	4.7	9	16	32	35.2	1.1	15.1

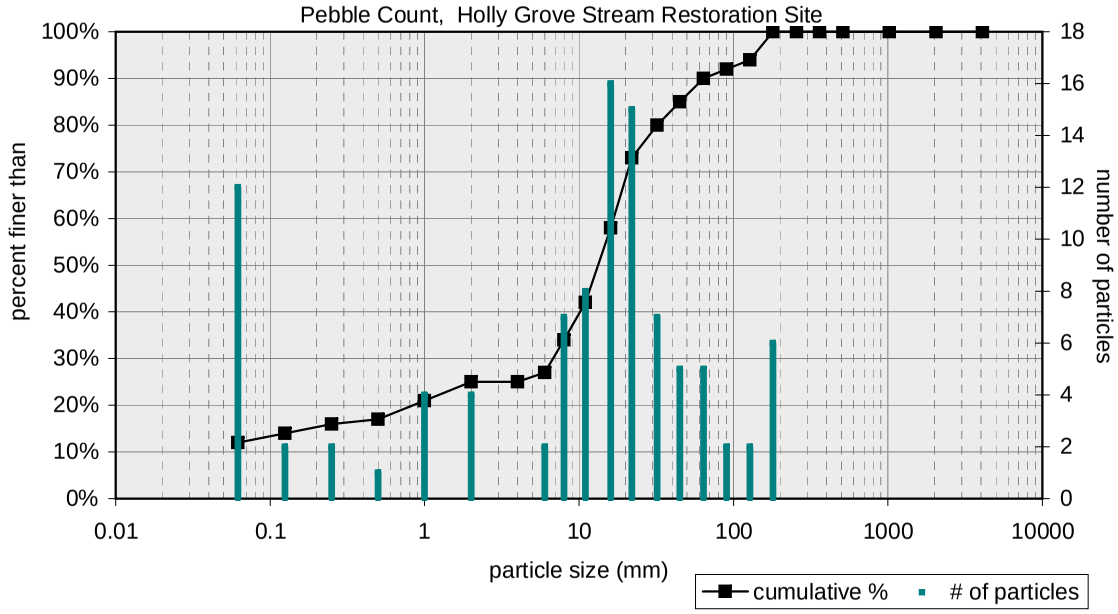
based on total count	percent by substrate type silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	14%	28%	55%	3%	0%	0%	0%	0%	0%

Pebble Count of Channel Reach

Material	Size Range (mm)		Count
silt/clay	0	0.062	**12**
very fine sand	0.062	0.13	**2**
fine sand	0.13	0.25	**2**
medium sand	0.25	0.5	**1**
coarse sand	0.5	1	**4**
very coarse sand	1	2	**4**
very fine gravel	2	4	
fine gravel	4	6	**2**
fine gravel	6	8	**7**
medium gravel	8	11	**8**
medium gravel	11	16	**16**
coarse gravel	16	22	**15**
coarse gravel	22	32	**7**
very coarse gravel	32	45	**5**
very coarse gravel	45	64	**5**
small cobble	64	90	**2**
medium cobble	90	128	**2**
large cobble	128	180	**6**
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:		100

bedrock		
clay hardpan		
detritus/wood		
artificial		
	total count:	100

Pebble Count,
Holly Grove Stream Restoration Site
Guilford County, NC
Southwest Creek: Reach 8
Note: **Riffle RF8**



based on sediment particles only	size percent less than (mm) D16	D35	D50	D65	D84	D95	particle size distribution gradation	geo mean	std dev
	0.250	8.32	13.3	19	42	135	28.1	3.2	13.0

based on total count	percent by substrate type silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	12%	13%	65%	10%	0%	0%	0%	0%	0%