Stricker Branch Stream Restoration Project
Contract # D06054-G

County:	Cabarrus
Cataloging Unit:	Yadkin 03040105; Targeted Watershed 020040
Monitoring Firm POC:	Mid-Atlantic Mitigation, LLC Rich Mogensen (704) 782-4133
Prepared For:	Ecosystem Enhancement Program

Year 1 (2008) Monitoring Report

Mid-Atlantic
Mitigation, LLC
AN EARTHMARK COMPANY

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1.0 EXECUTIVE SUMMARY/PROJECT ABSTRACT

On behalf of the North Carolina Ecosystem Enhancement Program (NCEEP), Mid-Atlantic Mitigation, LLC (MAM) with technical assistance from Kimley-Horn and Associates (KHA) restored, enhanced and preserved 2,910 linear feet of stream on Stricker Branch in downtown Concord, NC. Construction of the project began in April 2007 with removal of the concrete spillway and drainage of a former mill pond, and continued into January 2008 with final planting completed in February 2008. The Stricker Branch Stream Restoration Project (Project) will provide NCEEP with approximately 2,910 Stream Mitigation Units (SMUs).

Stricker Branch was designed using Priority I restoration in the old pond bed and Priority II restoration for all existing stream channel. All designed channels are Rosgen C4/5. The project is divided into three sections, the Lower Section below Sign Drive, the Middle Section between Sign Drive and the old pond spillway, and the Upper Section which includes the relic pond area.

Upper Section: The concrete spillway of the mill pond was removed and the remaining water drained from the pond. This was completed in Spring of 2007 and the pond area was allowed to "dry out" for approximately 6 months. Priority I restoration was done on this section. There is a rip rap spillway between the storm water BMP pond outside of the easement and the new channel. Work on the pond area was completed in January 2008, which completed the project.

Middle Section: Priority II stream restoration was done in this section. There are two rip rap areas protecting storm water out fall pipes. There is also a sewer line crossing upstream of the culvert and bridge at Sign Drive with two A-vane, step pool structures in this area, which are not part of the conservation easement or restoration. A runoff swale was incorporated as a storm water feature by digging a shallow channel for the runoff to enter the stream, which was then protected with matting, seeding and live stakes.

Lower Section: Work below Sign Drive was completed first, with completion in August of 2007. This section of the project has had ample time to stabilize and has already held up well through several bank full events as documented in the photo log in Appendix E. Priority II restoration was done in this section, with the exception of two sewer line crossings which are not included in the restoration or the conservation easement. A constructed swale diverts storm water from an adjacent parking lot to a stabilized outlet, before entering the stream.

Based on the Restoration Plan and As-built drawing, the Stricker Branch Site yields 2,910 stream mitigation units (2,115 x 1 = 2,115; 795 x 1 = 795; 2,115 + 795 = 2,910). Several easements bisect the project including Duke Power (60 feet), City and County sewer (totaling 60 feet and 60 feet, respectively), and a crossing for the primary land owner (30 feet). While the entire reach from McGill Road to the confluence of Irish Buffalo Creek is approximately 3,200 feet, these easements along with constructability

issues, especially in the former pond area, causing the length of the final layout to be unpredictable decreased the final SMU's from 3,000 feet to 2,910. One 30 foot section of the city sewer has been decommissioned, but removal of the areal pipe and accompanying easement for inclusion in the project will take negotiations with the city. MAM plans to make every effort to include this section, if possible.

Monitoring Plan
Monitoring of the Project began on August 5th, 2008 with photos and pebble counts, survey work was completed in September and vegetation monitoring took place on October 17th, 2008. Strategies and methodologies laid out in the Monitoring Plan will be followed for a minimum of five years of monitoring. The stream will be monitored for stability of dimension, pattern, and profile using standard practices including permanent cross sections, longitudinal profile, and pebble counts. Standardized, permanent (10m by 10m) vegetation plots will be monitored for species diversity and survival. Monitoring data will be analyzed to determine what remedial actions if any are required and any remedial actions proposed will be detailed in the following monitoring report.

2.0 PROJECT BACKGROUND

2.1 LOCATION AND SETTING

The Stricker Branch Stream Restoration Site (Site) is located in the City of Concord, Cabarrus County, North Carolina on McGill Avenue next to the Gibson Mill redevelopment project off Highway 29. A location map is included in Figure 1. The project site is located in the HUC 03040105 and in the urbanized EEP Targeted Watershed 03040105020040 of the Yadkin River Basin and the 03-07-12 sub-basin. The project watershed is approximately 1.6 sq. mi. flowing into Irish Buffalo Creek, a 303(d)-listed stream. The majority of the Site consisted of highly unstable, incised and straightened stream channel which had been highly altered, degraded, and entrenched with almost no woody vegetation. The upper section of the project area was historically an impounded water supply for the former textile mill. This former textile mill has been purchased for redevelopment into a mixed use commercial and residential project, now known as Gibson Mill. The lower section was deeply entrenched/incised and highly unstable with strong visible evidence of actively failing banks. This section was sparsely wooded and contained invasive species such as Chinese Privet

2.2 STRUCTURE AND OBJECTIVES

The objective of the restoration approach was to restore the site to a more naturally functioning stream system designed to address impairment issues typically associated with highly disturbed urban stream systems.

- The project will provide ecological, functional lift to the existing system by restoring the stream and riparian habitat to a stable stream type and vegetative community that is appropriate for its particular valley and watershed conditions.

- Water quality will be improved by reduced sediment load through stabilization, and nutrient and other pollutant input will be reduced through the addition of forested riparian buffers planted with native species.
- Forested buffers and reconnection with an active floodplain bench will improve channel hydraulics and system capacity.
- Improvements to the ecosystem include the addition of in-stream habitat using in-stream structures and bank revetments such as root wads and log vanes.
- By providing an appropriate mix of native forest vegetation to create an appropriate canopy and under story, the soil structure will improve, leaf litter will be established to support aquatic and terrestrial ecosystems, and shading and cooling will provide improved water quality.

Together, these improvements will provide functional uplift for the watershed as a whole.

The dimension, pattern, and profile were restored using Rosgen Priority I and II natural channel design techniques, which stabilized the banks and added flood storage and habitat diversity. The objective of using these techniques was:

- To create a stable bank full dimension and allow greater than bank full storm events to access the floodplain.
- To create a pattern that is appropriate and stable for the given stream and valley types.
- Stream profile was adjusted to decrease the slope by adding length. This improves the channel's ability to handle the sediment load without aggrading or degrading.
- The plan also incorporates the use of storm water BMPs located both outside and inside the conservation easement to attenuate and treat runoff from the surrounding development and associated impervious surfaces.

The stream restoration project and associated conservation easement are surrounded by a larger project involving the redevelopment of the old textile mill by South Paw Investors. The stream buffer design will help control access to the restored channel while allowing for some passive public access and visibility to the restored channel. A water quality detention pond located at the upstream end of the project site was constructed in conjunction with the stream restoration efforts. South Paw Investors will be responsible for the pond and its associated maintenance, which is not within the conservation easement.

Table I. Project Mitigation Structure and Objectives Table

MITIGATION SUMMARY					
RESTORATION TYPE		**PRIORITY 1 (1:1)**	**PRIORITY 2 (1:1)**	**TOTAL MUs**	**% RESTORATION**
STREAM	LENGTH (FEET)	795	2115	2910	100%
	MITIGATION UNITS	795	2115		

Table II. Project Activity and Reporting History

Activity or Report	Calendar Year of Completion or Planned Completion	Actual Completion Date
Restoration Plan	January 2007	January 2007
Construction	February 2007*	January 2008
Temporary /Permanent seeding	February 2007	February 2008
Containerized Plantings	March 2007	February 2008
Mitigation Plan	May 2007	March 2008
Year 1 Monitoring	December 2007	October 2008
Year 2 Monitoring	December 2008	
Year 3 Monitoring	December 2009	
Year 4 Monitoring	December 2010	
Year 5 Monitoring	December 2011	

***Project was delayed for approximately 2 months by difficult land closings and city access agreements. Original contractor broke ground in April 2007. Disagreements pertaining toconstruction scope and quality arose between MAM and original contractor in August 2007. New Contractor was assigned to project in November 2007.**

Table III. Project Contacts

Project Manager Mid-Atlantic Mitigation, LLC	1960 Derita Road Concord, NC 28027 Rich Mogensen (704) 782-4133
Designer Kimley-Horn and Associates Inc.	4651 Charlotte Park Dr Suite 300 Charlotte, NC 28217 Will Wilhelm (704) 333-5131
Construction Contractor Earthwork Inc. GW Liles Construction Co. Inc.	343 Chapman Drive Sanford, NC 27330 Dan Wood (919) 718-6812 325 McGill Ave. Suite 120 Concord, NC 28026
Planting & Seeding Contractor HARP Seed mixes provided by IKEX Nursery Stock provided by Native Roots Nursery (Formerly Southern Shade)	9305-D Monroe Road Charlotte, NC 28270 Alan Peoples (704) 841-2841
Monitoring Performers Mid-Atlantic Mitigation, LLC	1960 Derita Road Concord, North Carolina 28027 Christine Cook (704) 782-4140

3.0 PROJECT CONDITION AND MONITORING RESULTS

3.1 VEGETATION ASSESSMENT

3.1.1 Soil Data

Table IV. Preliminary Soil Data

Series	Max Depth (in)	% Clay on Surface	K	T	OM %
Chewacla-	70	18 - 35	.28	5	1-4

3.1.2 Vegetative Problem Areas

At this time, the only vegetative problem area that could be mentioned is the robust growth of *polygonum pennsylvanicum* in the former pond area. This affected the plant counts in Vegetation Plots 5 and 6. Living individuals may be present under the polygonum, several were located and pulled free of the dense herbaceous material. Polygonum is a typical first year succession plant and MAM believes that in year 2 other species will begin to dominate as the site finds equilibrium. Some of these missing trees may survive this transition. Treatment of the polygonum or a supplemental planting will only be considered after the Year 2 monitoring plant count. No invasive species problems were observed. The site is stabilized and vegetated with native woody and herbaceous species.

3.1.3 Stem Counts

Four hardwood planting zones were established as follows: Zone 1 – Stream Bank; Zone 2- Riparian/Bank full Bench; Zone 3 – Transitional; and Zone 4 – Upland. Live stakes were installed along the new constructed channel within Zones 1 and 2; and in some areas of Zone 3. Plantings were spaced approximately 3 feet apart and differed in sizes ranging from .25" to 2" in diameter and 2' to 5' in height. Zones 2 – 4 consist of bare root seedlings in the first half of the lower section and 1 gallon containerized plants, which were planted 3' to 12' apart throughout the project. A reduction in the percentage of nuisance vegetation in areas with existing vegetation to less than 15% will indicate establishment of native wetland vegetation. Study plots showing that the composition and density of vegetation in the restoration areas compares closely to the reference areas will indicate restoration success for vegetation. Success will be gauged by stem counts of planted species. Stem counts of over 320 woody stems per acre after 3 years and 260 stems per acre after 5 years will be considered successful. Photos taken at established photo points should indicate maturation of riparian vegetation community. Photographs will help to capture the health of the planted vegetation and the severity of any invasive or exotic species that establish within the site. Permanent vegetative plots have been established at 6 locations. The success of vegetation plantings will be measured through stems counts. These plots will be used to sample primarily Zones 1 through 3. Each plot covers 100 square meters for tree counts. Within each plot, a 1 meter plot will be sampled to measure herbaceous coverage. During the counts, the health of the vegetation

will be noted. In addition to stem counts, the samples will inventory species diversity to allow for comparison between the reference and restoration wetlands and track the percent cover of nuisance species. The vegetation survey will occur during the growing season.

On October 27th, 2008, the first year-vegetative monitoring was performed on the established vegetative plots.

Exhibit Table V: Stem Counts for Each Species Arranged by Plot

Species	Plots						Initial Totals	Year 1 Totals	Year 2 Totals	Year 3 Totals	Year 4 Totals	Survival %
	1	2	3	4	5	6						
Alnus serrulata			1		2	2	7	5				71.4%
Aronia arbutiflora	1	1		1			4	3				75.0%
Betula nigra	2	2			3	1	7	8				114.3%
Celtis laevigata			1				3	1				33.3%
Cephalanthus occidentalis							1	0				0.0%
Cornus amomum				3	1		25	4				16.0%
Fraxinus pennsylvanica		1					2	1				50.0%
Hamamelis virginiana	1	6					7	7				14.3%
Liriodendron tulipifera	1	1		2	1		7	5				71.4%
Nyssa biflora	1	1		1	1		5	4				80.0%
Populus deltoides (vols)	2			2			0	4				> 100%
Quercus michauxii				1			1	1				100.0%
Quercus nigra	3	2					5	5				100.0%
Quercus phellos		3	3				6	6				100.0%
Quercus sp.		1					7	1				14.3%
Salix nigra			6	3	1	2	14	12				85.7%
Totals	11	18	11	13	9	5	101	63				61.4%

3.1.4 Vegetation Assessment Summary

Vegetation success will be defined as tree survival to meet 320 stems per acre after three years and 260 stems per acre after five years inside the permanent vegetative plots and herbaceous cover evaluated with photos showing 75% coverage, after five years.

Plot 1 lost three planted individuals and is host to several small Cottonwood volunteer seedlings. The two largest cottonwood individuals were noted on the grid for future tracking. Herbaceous cover was greater than 75%, with wetland species, primarily *Juncus effusus* dominating. Plot 2 lost no plants, an "extra" river birch was noted and herbaceous cover was greater than 75% and similar in composition to Plot 1.

Plot 3 lost four individuals and had 100% survival of live stakes. Herbaceous cover is around 75%, with some bare sections on the steeper part of the slope, dominant species include various grasses, including dead annual rye. Herbaceous cover in plots 3 and 4 should improve in year two once the annual rye is succeeded by other perennial grasses. Plot 4 sustained damage from sand deposition during bankfull events, most notably the Hurricane event of August 27th, 2008. The sand deposition caused high livestake mortality (greater than 50%). Because the problem in this area is deposition, not erosion, replacement livestakes are not necessary and the plot stem count is still at an acceptable level. Two cottonwood volunteers were also noted in Plot 4.

As mentioned above in the Section 3.1.2, Plots 5 and 6 are overgrown with a particularly robust variety of polygonum, with stems up to an inch in diameter. Several live individuals were found hidden under this polygonum growth, however not all individuals were located and pulled free. This means that some missing individuals could still be alive and may re-emerge when the polygonum dies back and the herbaceous community finds equilibrium. While the stem counts on Plots 5 and 6 are below success criteria, MAM believes it is best to wait until after the Year 2 count to determine if any missing individuals can be located. If the polygonum over growth persists into year 2 and stem counts in these plots are still below success criteria, treatment of the polygonum and/or a supplemental planting will be considered. Herbaceous cover was 100% with polygonum dominating. Three "extra" river birches were noted in Plot 5 indicating that these may indeed be volunteers not individuals missed during the baseline count. Overall, without the missing and dead individuals, the plant count indicates 58% survival and 367 stems per acre for the site. Counting of four cottonwood volunteers and four river birches that are volunteers and /or may have been missed during the baseline count, brings the stem count to 420 overall.

In Appendix A, the vegetative survey data tables show the actual counts of each species found per plot, stressed and dead plants were noted. The herbaceous cover plant community was monitored in a 1 m by 1 m square at one corner of each plot. Each herbaceous quadrant showed at least 75% cover and all were at or close to 100%.

3.2 CHANNEL STABILITY ASSESSMENT

3.2.1 Cross Sections

Since as-built documents were submitted, the site has been subject to several bankfull events, including hurricane remnant rainfall on August 27th, 2008. CS 1 and 2 on the lower section show no significant change since submittal of the as-built plans. The middle section of the project is the most susceptible to erosion and deposition problems. CS 3 shows some scouring on the left bank, while CS 4 shows deposition on the left bank. This is the same sand deposit present in veg plot 4. CS 5 and 6 are located at the end of the upper section (former pond area) where the concrete weir was removed. CS 5 shows some scouring on the right bank. CS 6 shows the most adjustment since the as built survey, with slight scouring on both banks. The Cross Section plots are located in Appendix B.

3.2.2 Bank Full Events

A Crest Stage Gage (CSG) is located near Vegetation Plot 2, below Sign Drive in the lower section of the project. A significant number of bankfull events registered on the CSG and were documented, indicating the flashly nature of the drainage area. The lowest documented bankfull event occurred with rainfall of approximately .65 inches. Rainfall records indicated many more events greater than .65 inches which may also have resulted in bankfull conditions that were not documented. Documentation is shown in the Bank Full Event Photo Log in Appendix E and in the table below. Rain fall data is also presented in table form in Appendix E.

Exhibit Table VI. Bankfull Events

Site Visit Date	Associated Rainfall Event Date	Rainfall Amount (Inches)	Method Documented
2/1/2008	February 1st and 2nd	2.2	On site/ Photos
3/7/2008	March 4th	1.39	CSG
3/10/2008	March 7th	0.65	CSG
4/18/2008	April 4th and 5th	0.86	CSG
5/16/2008	May 9th and 10th	1.31	CSG
6/24/2008	June 22nd and 23rd	2.67	CSG
8/29/2008	August 25th to 28th	23.02	Photos

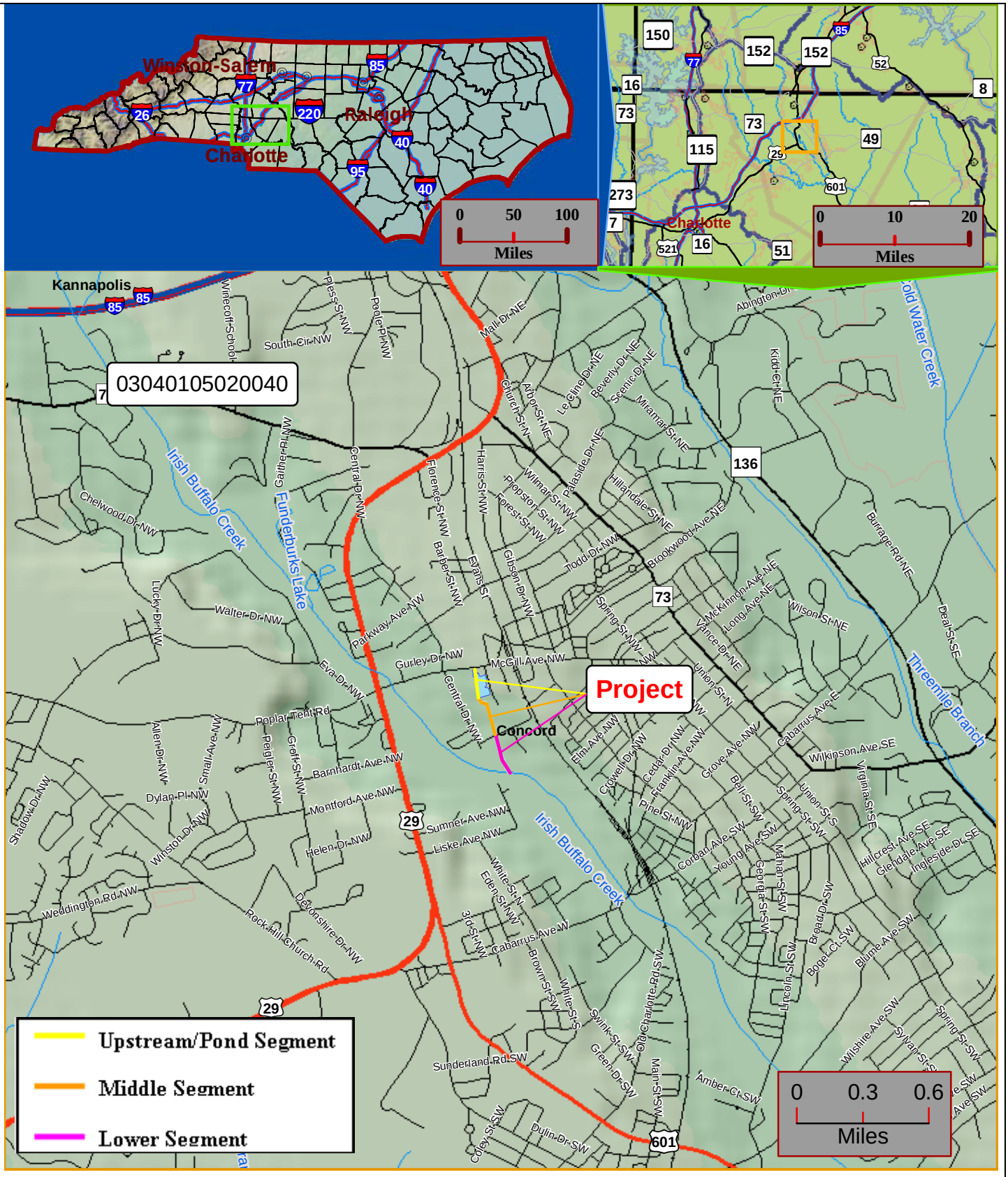
3.2.3 Longitudinal Profiles

Extreme rainfall and bankfull events have produced some changes in the stream profile. Generally, large amounts of sand have and will continue working through the system and moving downstream. Some pool positions have shifted, but depths have remained consistent, in the upper and lower sections. In the middle section, however, sand has significantly affected pool depth. The system is designed to continue moving this sand downstream during bankfull events and is expected to do so.

Bed material was also sampled at one riffle in each section on Cross Sections 2, 3, and 5. Cross Section 5, in the upper section, is dominated with medium and coarse gravel. Cross Section 3, in the middle section, has a fairly equal distribution of various particle sizes, particularly small cobble, medium gravel and coarse sand. The middle section is the section of the project where sand deposition is most problematic as discussed above and in sections 3.1.4 and 3.2.1. Cross Section 2, in the lower section, is dominated by coarse to fine gravel.

3.2.4 Site Stability Assessment Summary

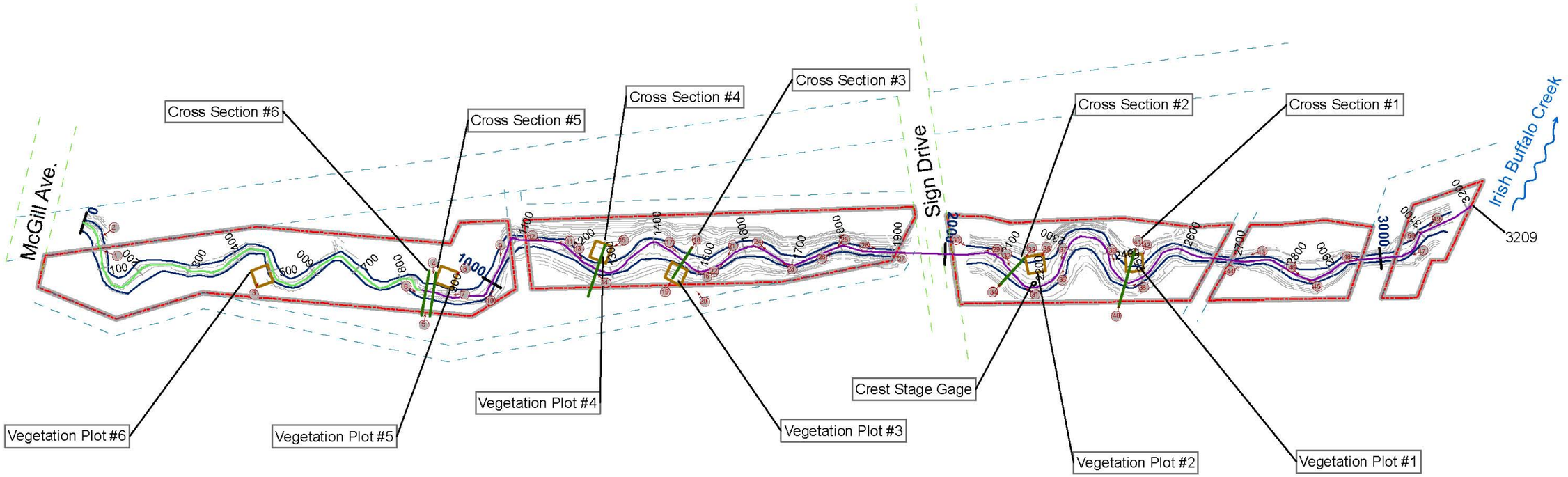
Overall, the stream channel has stabilized well and weathered multiple bankfull events, including several high rainfall events and hurricane remnant rainfall events. Areas that sustained damage due to bankfull conditions were repaired by hand and the contractor was mobilized twice for more significant repairs which are documented in the photo log. The herbaceous vegetative cover has also developed a healthy and diverse community throughout most of the site. The planted trees and shrubs have also done well and are supplemented by an existing buffer community which will provide a seed source for volunteers well suited to the current site conditions.



Title	Project Site Vicinity Map

Prepared For: Ecosystem Enhancement Program

Project	Stricker Branch Stream Restoration Cabarrus County, North Carolina	
Date	**Project Number**	**Figure**
1/5/07	018285002	1



Title	Stricker Branch Monitoring Map
Prepared For: **Mid-Atlantic Mitigation, LLC.**	**Project**: Stricker Branch Stream Restoration Cabarrus County, North Carolina

Date	**KHA Project Number**	**Figure**
3/11/08	018285002	2

Prepared by Chris Tinklenberg / Jason Diaz

Kimley-Horn and Associates, Inc.

APPENDIX A: VEGETATION DATA

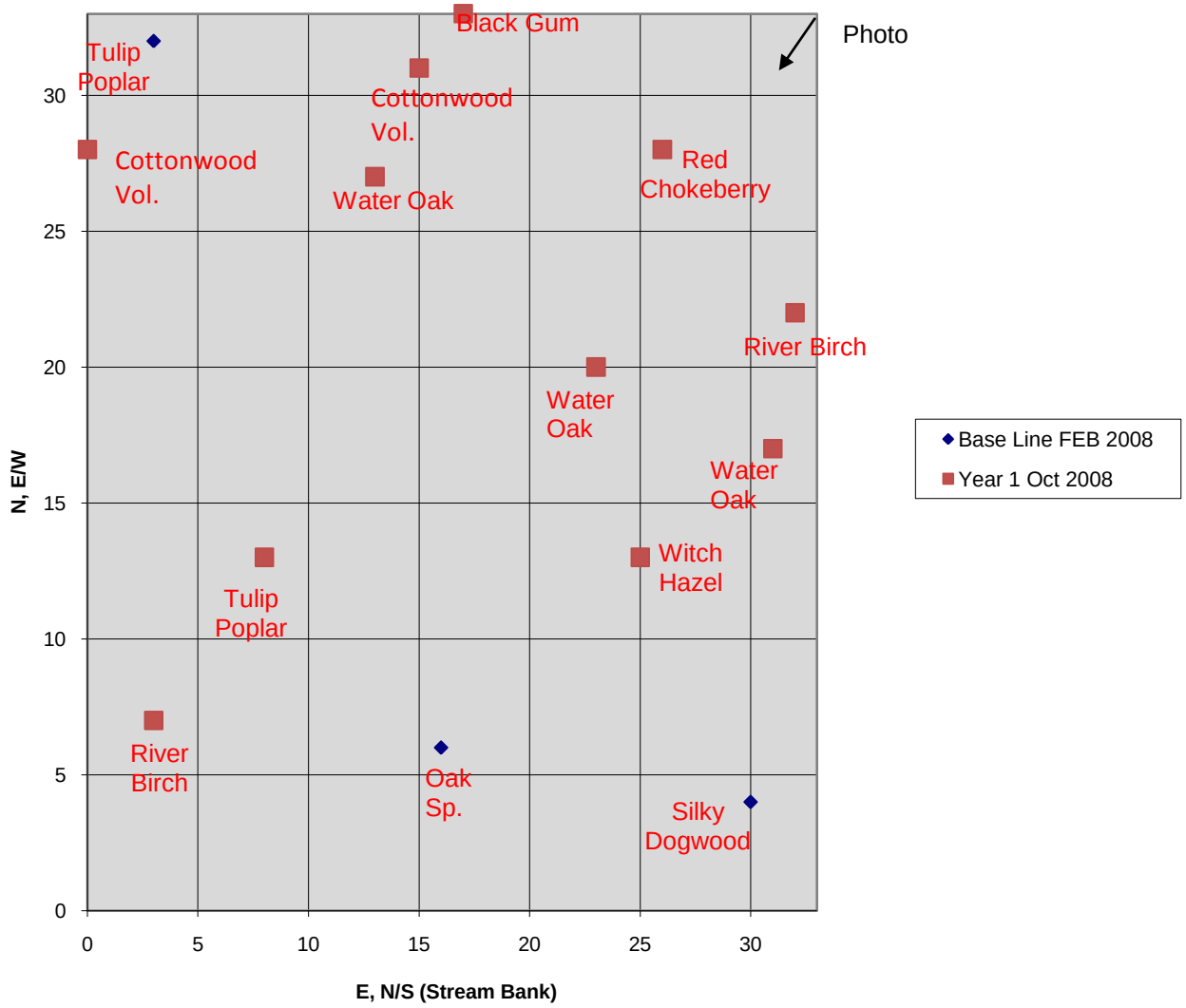
Hardwood Tree and Shrub Planting Year 1 Totals for Stricker Branch Stream Restoration Site

Scientific Name	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Species Total	
Alnus serrulata			1		2	2	5	
Aronia arbutifolia	1	1		1		0	3	
*Betula nigra**	2	2	0		3	1	8	
Celtis laevigata			1	0		0	1	
Cephalanthus occidentalis			0				0	
Cornus amomum	0		0	3	1	0	4	1 livestakes
Fraxinus pennsylvanica		1			0		1	
Hamamelis virginiana	1	6					7	
Lindera benzoin							0	
Liriodendron tulipifera	1	1		2	1		5	
Nyssa slyvatica	1	1		1	1	0	4	
*Populus deltoides**	2			2			4	
Quercus michauxii		0	0	1	0	0	1	
Quercus nigra	3	2					5	
Quercus phellos		3	3				6	
Quercus sp.		1					1	
Salix nigra			6	3	1	2	12	9 livestakes
Total	11	18	11	13	9	5	**67**	
% Survival	75%	100%	71%	58%	33%	24%	**58%**	
Stem Per Acre	360	680	440	440	240	200	367	
SPA w/ volunteers*	440	720	440	520	240	200	420	

VP 1

X	Y	Species	X	Y	Year 1	Year 2	Year 3	Year 4	Year 5
3	7	River Birch	3	7	Alive				
3	32	Tulip Poplar			Dead				
8	13	Tulip Poplar	8	13	Alive				
13	27	Water Oak	13	27	Alive				
16	6	Oak Sp.			Couldn't find				
17	33	Black Gum	17	33	Alive, Stressed				
23	20	Water Oak	23	20	Alive, Stressed				
25	13	Witch Hazel	25	13	Alive, Stressed				
26	28	Red Choke Berry	26	28	Alive				
30	4	Silky Dogwood			Couldn't find				
31	17	Water Oak	31	17	Alive				
32	22	River Birch	32	22	Alive				
		Cottonwood Vol	0	28	Alive				
		Cottonwood Vol	15	31	Alive				

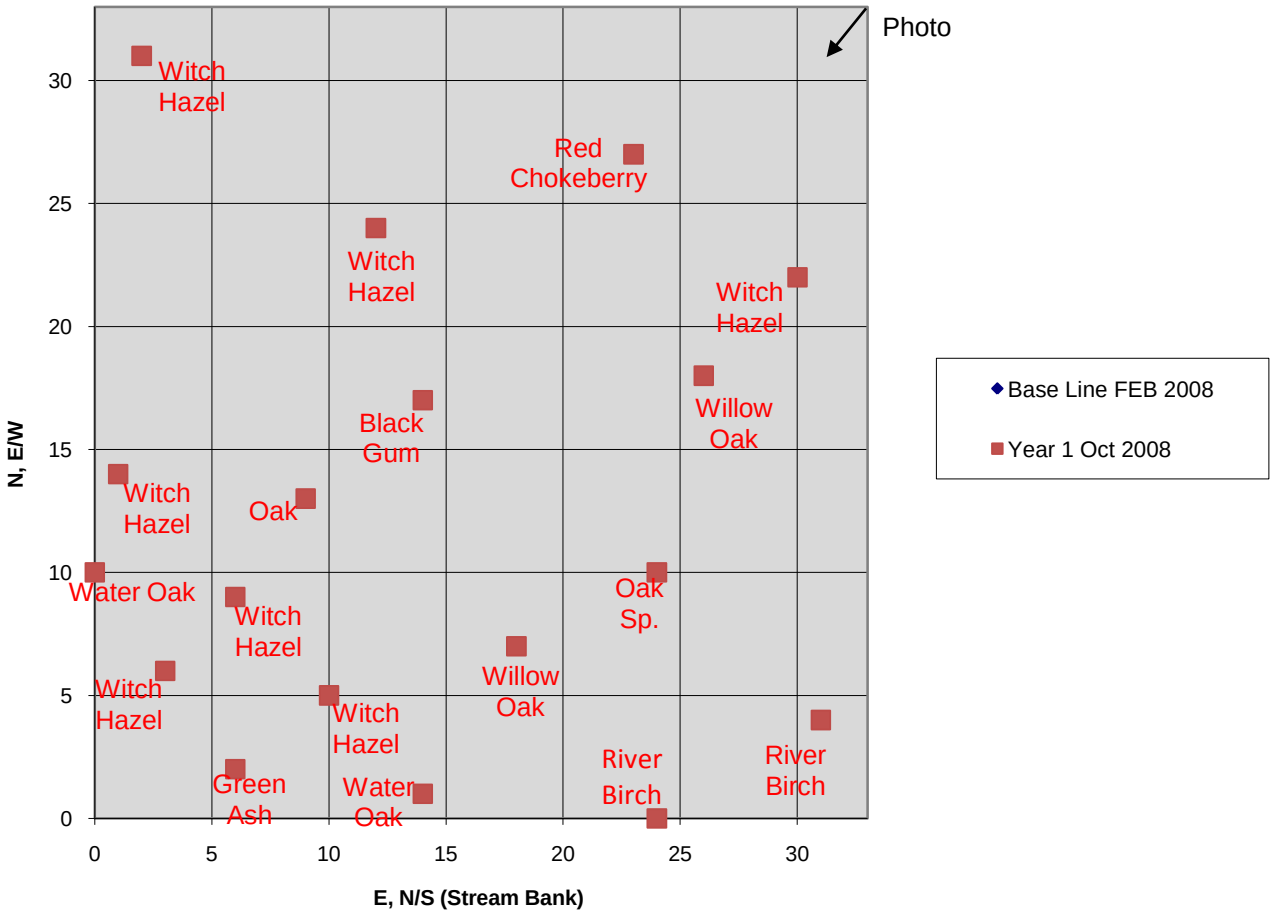
Several smaller Cottonwood Volunteers not counted



VP 2

X	Y	Species	X	Y	Year1	Year2	Year3	Year4	Year5
0	10	Water Oak	0	10	Alive				
1	14	Witch Hazel	1	14	Alive				
2	31	Witch Hazel	2	31	Alive				
3	6	Witch Hazel	3	6	Alive				
6	9	Witch Hazel	6	9	Alive				
6	2	Green Ash	6	2	Alive				
9	13	Willow Oak	9	13	Alive				
10	5	Witch Hazel	10	5	Alive				
12	24	Witch Hazel	12	24	Alive				
14	17	Black Gum	14	17	Alive, stressed				
14	1	Water Oak	14	1	Alive				
18	7	Willow Oak	18	7	Alive, stressed				
23	27	Red Chokeberry	23	27	Alive				
24	10	Oak Sp.	24	10	Alive				
26	18	Willow Oak	26	18	Alive				
30	22	Witch Hazel	30	22	Alive				
31	4	River Birch	31	4	Alive				
		River Birch vol?	24	0	Alive				

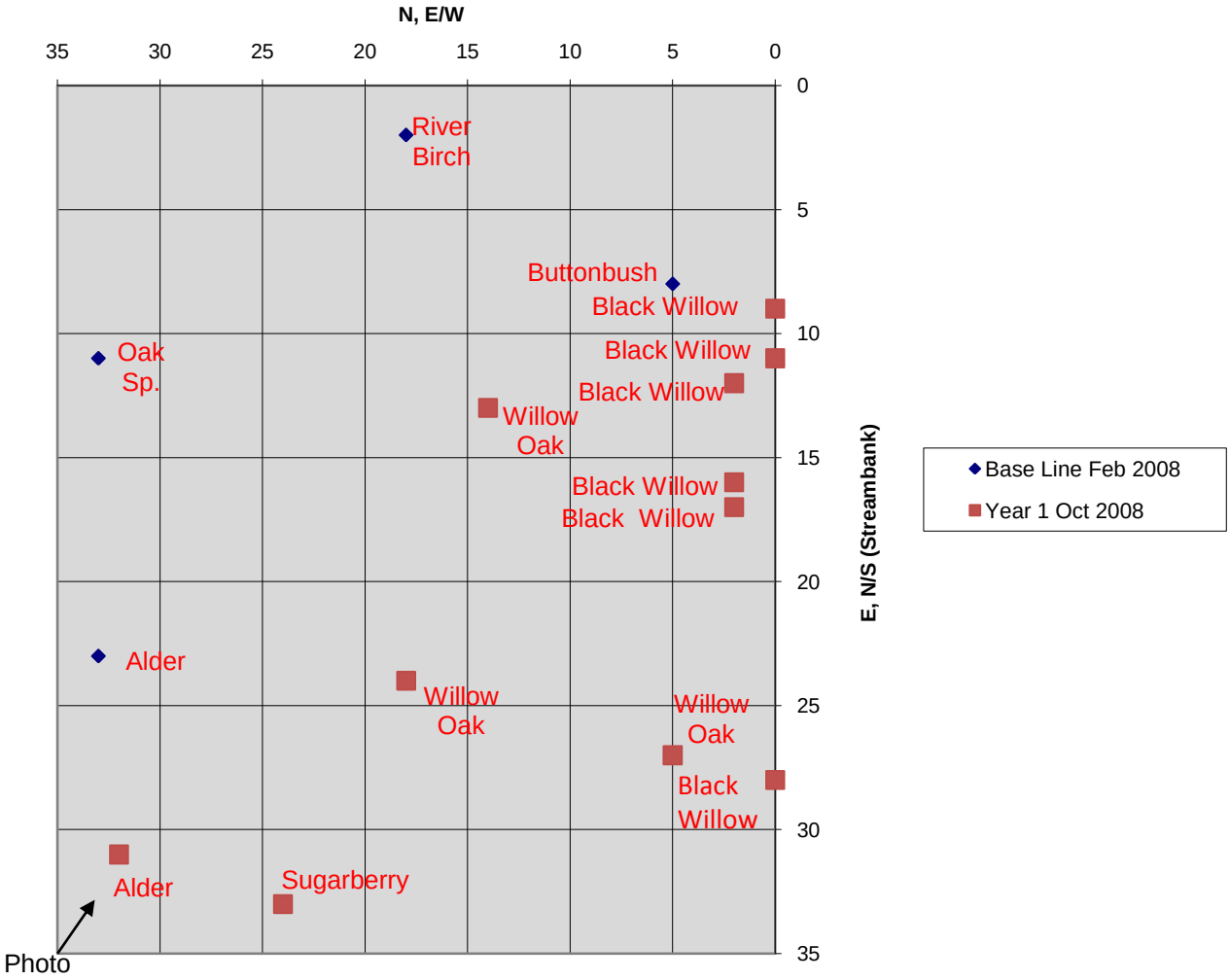
Fairly large river birch right on the line, not counted in baseline?



VP 3

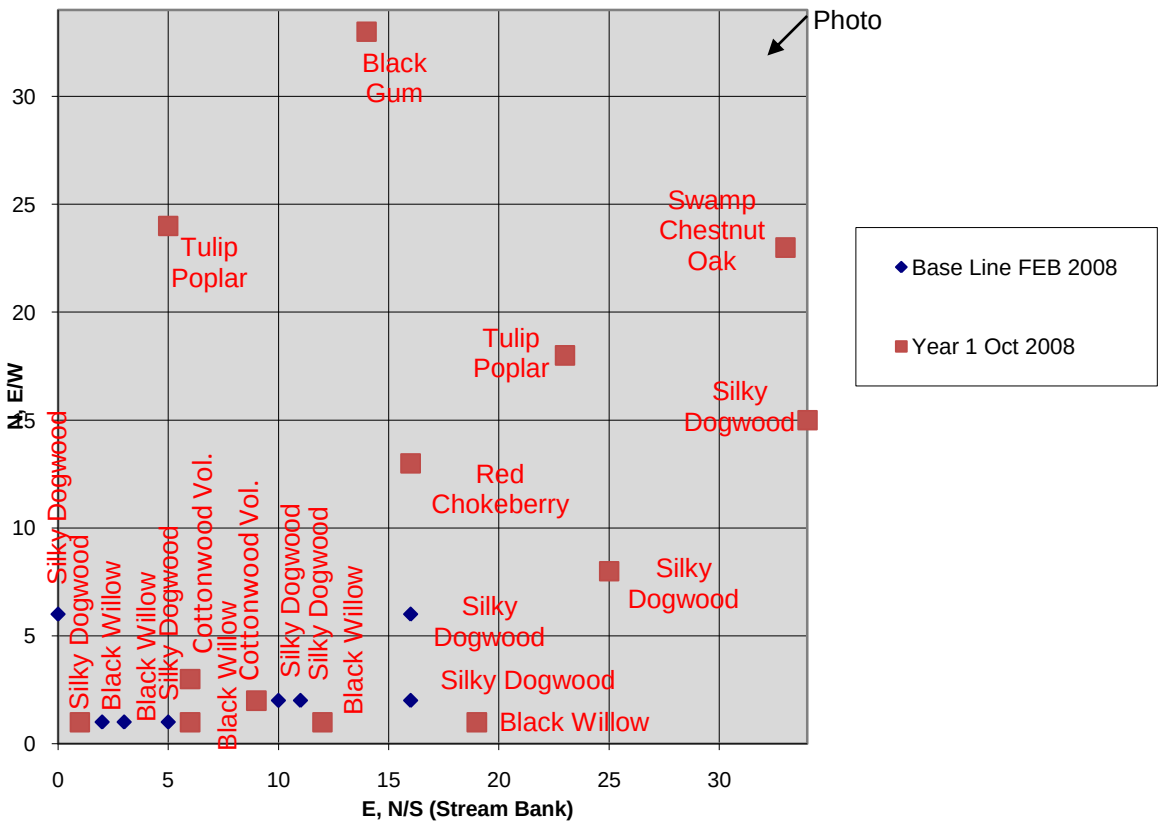
X	Y	Species	X	Y	Year 1	Year 2	Year 3	Year 4	Year 5
18	2	River Birch			Dead				
5	8	Button Bush			Dead				
0	9	Black Willow LS	0	9	Alive				
0	11	Black Willow LS	0	11	Alive				
33	11	Oak Sp.			Dead				
2	12	Black Willow LS	2	12	Alive				
14	13	Willow Oak	14	13	Dead				
2	16	Black Willow LS	2	16	Alive				
2	17	Black Willow LS	2	17	Alive				
33	23	Alder			Dead				
18	24	Willow Oak	18	24	Alive				
5	27	Willow Oak	5	27	Alive				
32	31	Alder	32	31	Alive				
24	33	Sugarberry	24	33	Alive				
		Black Willow LS*	0	28	Alive				

*black willow live stake on line, not counted in baseline



VP 4

X	Y	Species	X	Y	Year 1	Year 2	Year 3	Year 4	Year 5
0	6	Silky Dogwood			Dead				
1	1	Silky Dogwood LS	1	1	Alive				
2	1	Black Willow LS			Dead				
3	1	Black Willow LS			Dead				
5	24	Tulip Poplar	5	24	Alive				
5	1	Silky Dogwood LS			Dead				
6	1	Black Willow LS	6	1	Alive				
10	2	Silky Dogwood LS			Dead				
11	2	Silky Dogwood LS			Dead				
12	1	Black Willow LS	12	1	Alive				
14	33	Black Gum	14	33	Alive, stressed				
16	13	Red Chokeberry	16	13	Alive				
16	6	Silky Dogwood			Coludn't find				
16	2	Silky Dogwood LS			Dead				
19	1	Black Willow LS	19	1	Alive				
23	18	Tulip Poplar	23	18	Alive				
25	8	Silky Dogwood	25	8	Alive				
33	23	Swamp Chestnut Oak	33	23	Alive				
34	15	Silky Dogwood	34	15	Alive				
		Cottonwood Vol.	6	3	Alive				
		Cottonwood Vol.	9	2	Alive				



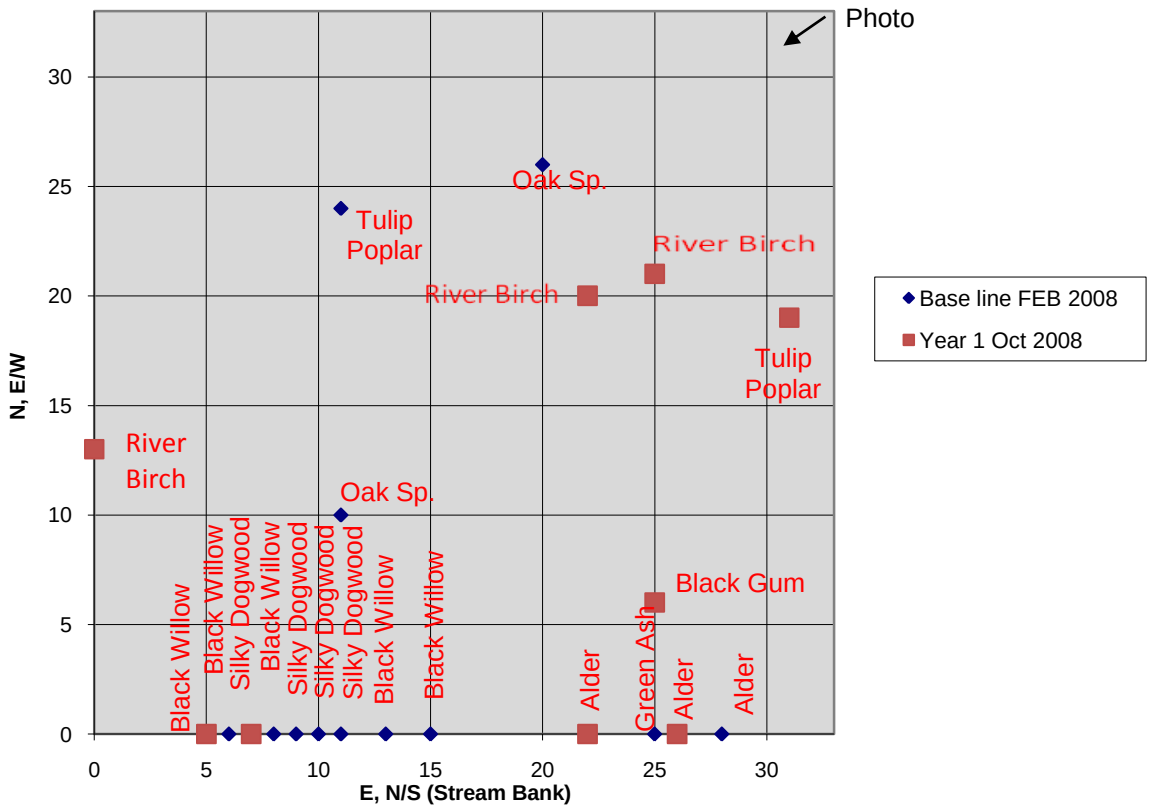
VP 5

X	Y	Species	X	Y	Year 1	Year 2	Year 3	Year 4	Year 5
5	0	Black Willow LS	5	0	Alive				
6	0	Black Willow LS			Dead				
7	0	Silky Dogwood LS	7	0	Alive				
8	0	Black Willow LS			Dead				
9	0	Silky Dogwood LS			Dead				
10	0	Silky Dogwood LS			Dead				
11	24	Tulip Poplar			Couldn't find				
11	10	Oak Sp.			Couldn't find				
11	0	Silky Dogwood LS			Dead				
13	0	Black Willow LS			Dead				
15	0	Black Willow LS			Dead				
20	26	Oak Sp.			Couldn't find				
22	0	Alder Transplant	22	0	Alive				
25	6	Black Gum	25	6	Alive				
25	0	Green Ash Transplant			Dead				
26	0	Alder Transplant	26	0	Alive				
28	0	Alder Transplant			Dead				
31	19	Tulip Poplar	31	19	Alive				
		River Birch vol?	22	20	Alive				
		River Birch vol?	25	21	Alive				
		River Birch vol?	0	13	Alive				

Couldn't find northern corners

half of plot is over grown with extremely hearty polygonum

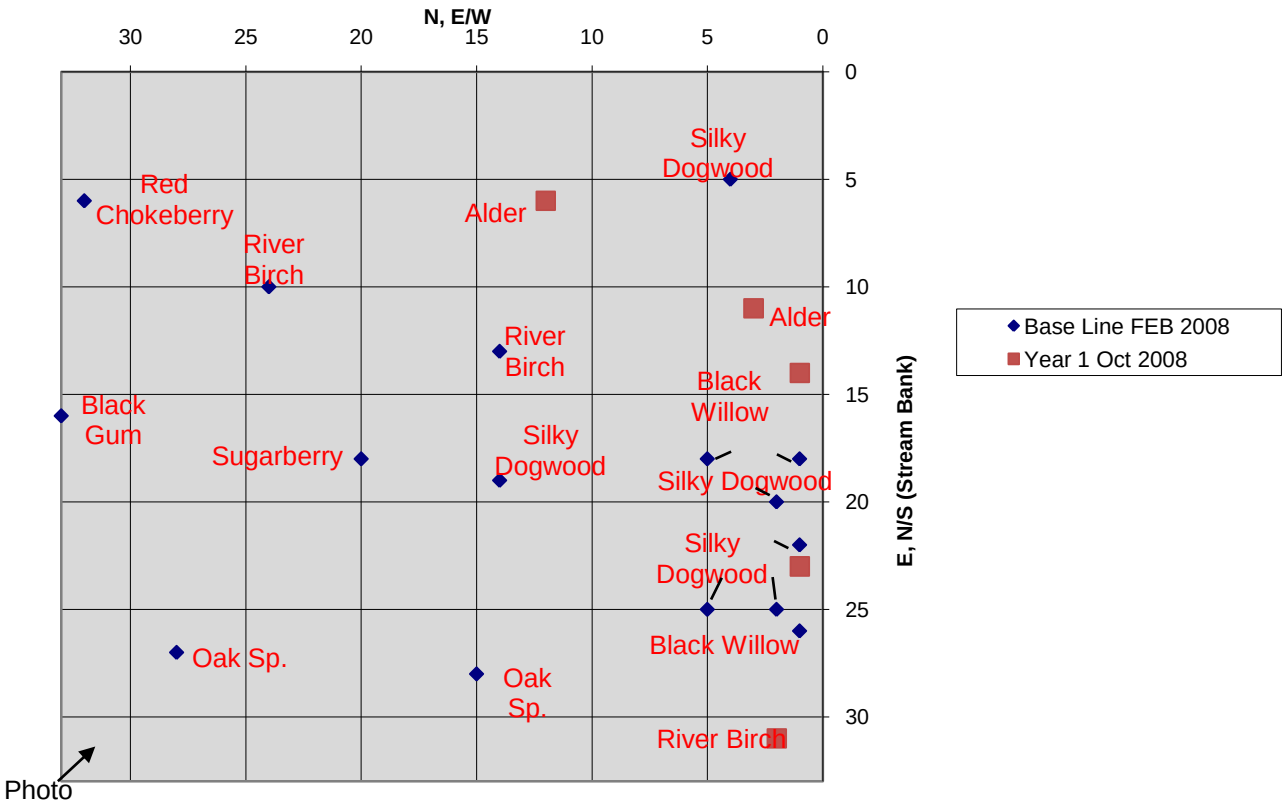
3 new river birches found in plot, must be vols?



VP 6

X	Y	Species	X	Y	Year 1	Year 2	Year 3	Year 4	Year 5
2	31	River Birch	2	31	Alive				
1	23	Black Willow	1	23	Alive				
1	22	Silky Dogwood LS			Dead				
2	20	Silky Dogwood LS			Dead				
1	18	Silky Dogwood LS			Dead				
1	14	Black Willow	1	14	Alive				
3	11	Alder Transplant	3	11	Alive				
4	5	Silky Dogwood			Dead				
1	26	Silky Dogwood LS			Dead				
2	25	Silky Dogwood LS			Dead				
5	18	Silky Dogwood			Dead				
5	25	Silky Dogwood			Dead				
12	6	Alder Transplant	12	6	Alive				
14	13	River Birch			Couldn't find				
14	19	Silky Dogwood			Couldn't find				
15	28	Oak Sp.			Couldn't find				
28	27	Oak Sp.			Couldn't find				
20	18	Sugarberry			Couldn't find				
24	10	River Birch			Couldn't find				
32	6	Red Chokeberry			Couldn't find				
33	16	Black Gum			Couldn't find				

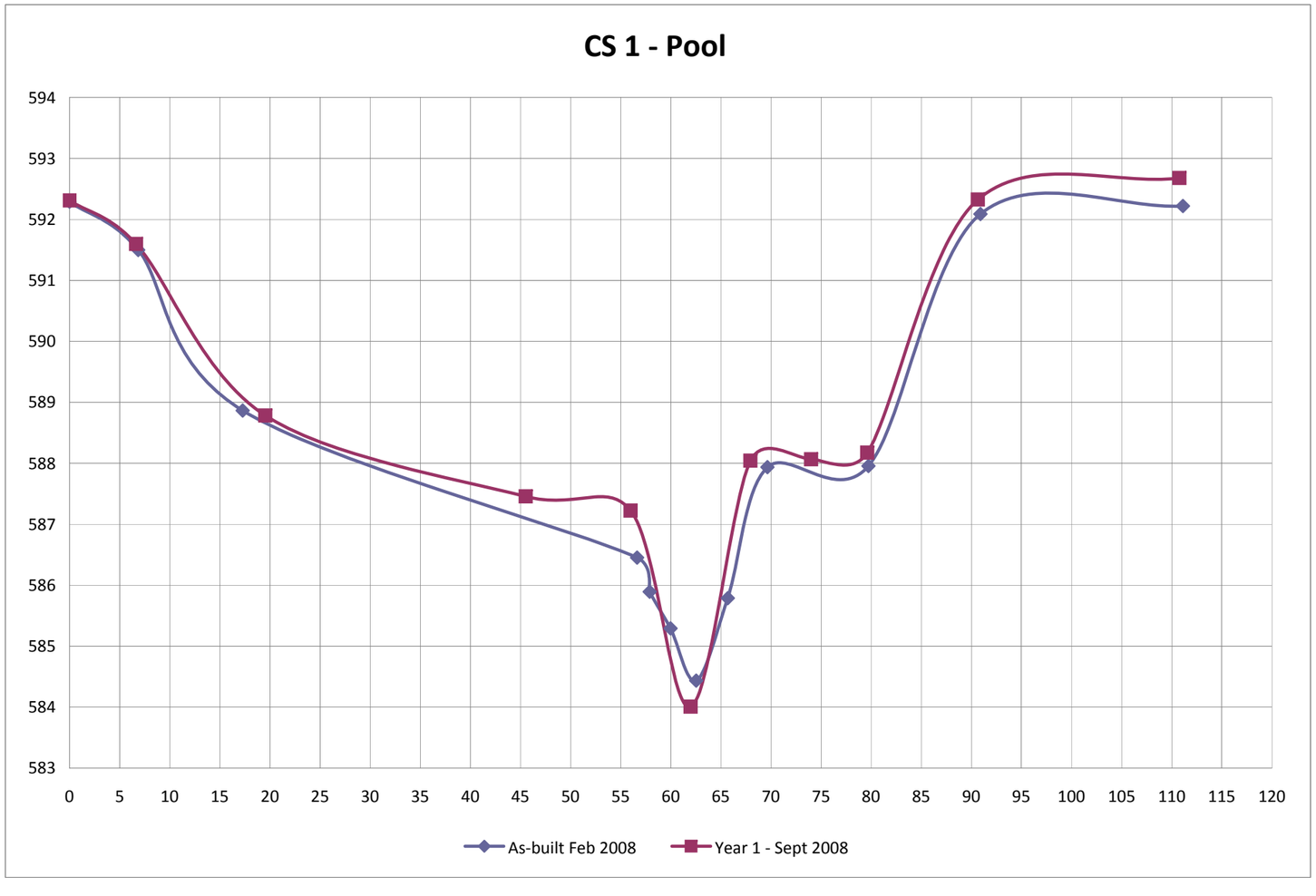
Plot is over grown with extremely hearty polygonum



APPENDIX B: CROSS SECTIONS

CS1 - Survey Data																	
As-built Feb 2008			Year 1 - Sept 2008			Year 2 - Sept 2009			Year 3 - Sept 2010			Year 4 - Sept 2011			Year 5 - Sept 2012		
Station	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**
0	592.291	bf	0	592.309	bf												
6.86	591.498		6.65	591.595													
17.28	588.863		19.54	588.78													
56.64	586.454		45.55	587.457													
57.91	585.892		56.01	587.221													
59.98	585.292		62	584.008	tw												
62.55	584.435	tw	67.96	588.04													
65.7	585.789		74.02	588.065													
69.67	587.935		79.63	588.174													
79.75	587.955		90.68	592.325	rbf												
90.93	592.089	rbf	110.79	592.677													
111.12	592.219																

Summary Data Table	As-built 2008	MY1 2008	MY2 2009	MY3 2010	MY4 2011	MY5 2012
Bankfull Cross Sectional Area:	714.35	754.19				
Bankfull Width:	90.93	90.68				
Bankfull Mean Depth:	5.54	4.76				
Bankfull Max Depth:	7.86	8.32				
Width/Depth Ratio:	11.57	10.90				

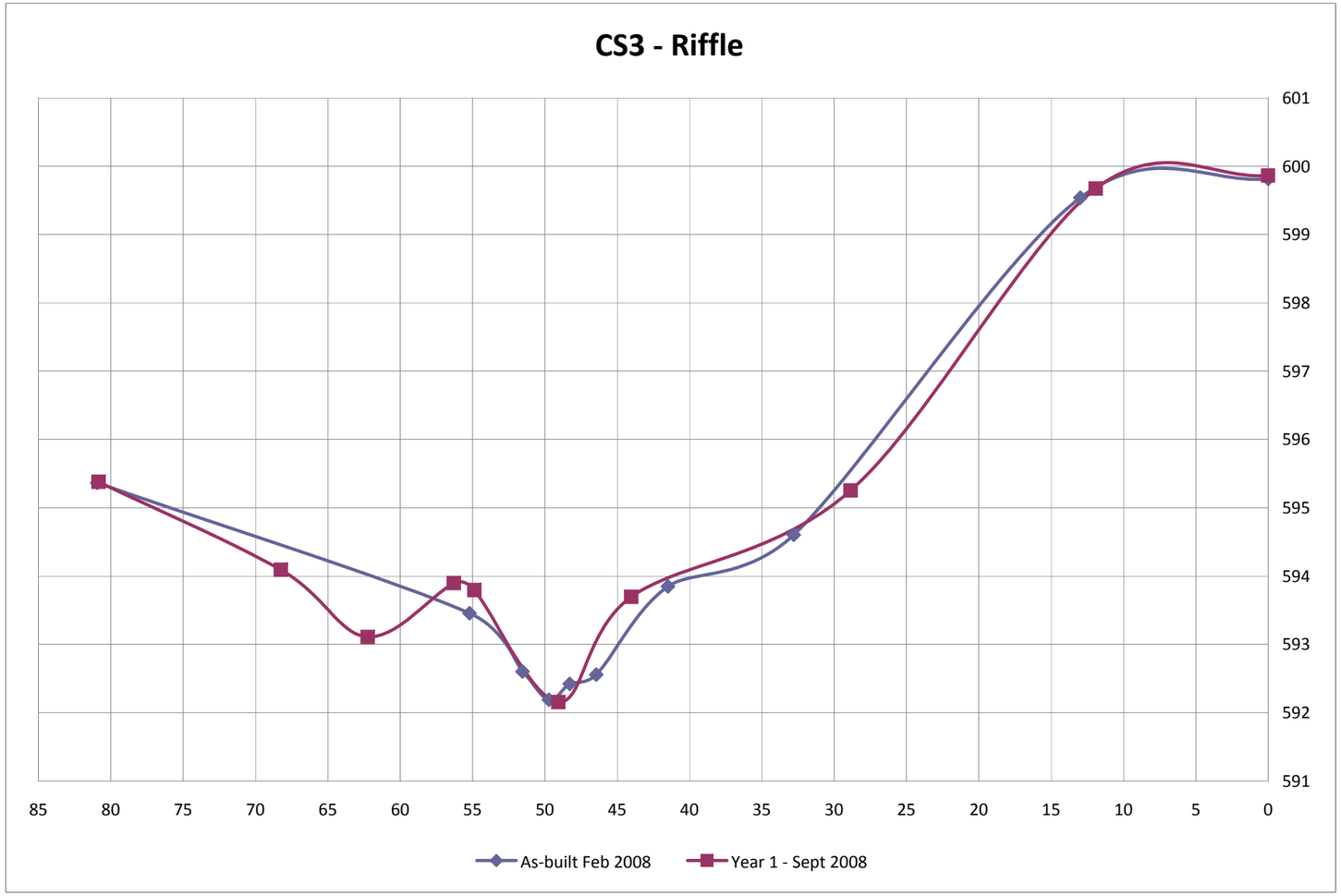


CS2 - Survey Data																	
As-built Feb 2008			Year 1 - Sept 2008			Year 2 - Sept 2009			Year 3 - Sept 2010			Year 4 - Sept 2011			Year 5 - Sept 2012		
Station	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**
0	593.575	bf	0	593.26	bf												
13.79	590.013		14.64	589.857													
44	586.84		30.24	588.037													
46.27	586.274		42.96	587.723													
48.65	586.014	tw	49.54	586.016	tw												
51.6	586.146		55.94	587.416													
54.02	586.388		60.35	588.925													
59.75	589.013		72.65	589.173													
72.81	589.444		88.01	594.202	rbf												
85.08	593.991	rbf															

Summary Data Table	As-built 2008	MY1 2008	MY2 2009	MY3 2010	MY4 2011	MY5 2012
Bankfull Cross Sectional Area:	678.68	720.45				
Bankfull Width:	85.08	88.01				
Bankfull Mean Depth:	6.47	6.04				
Bankfull Max Depth:	7.98	8.19				
Width/Depth Ratio:	10.67	10.75				

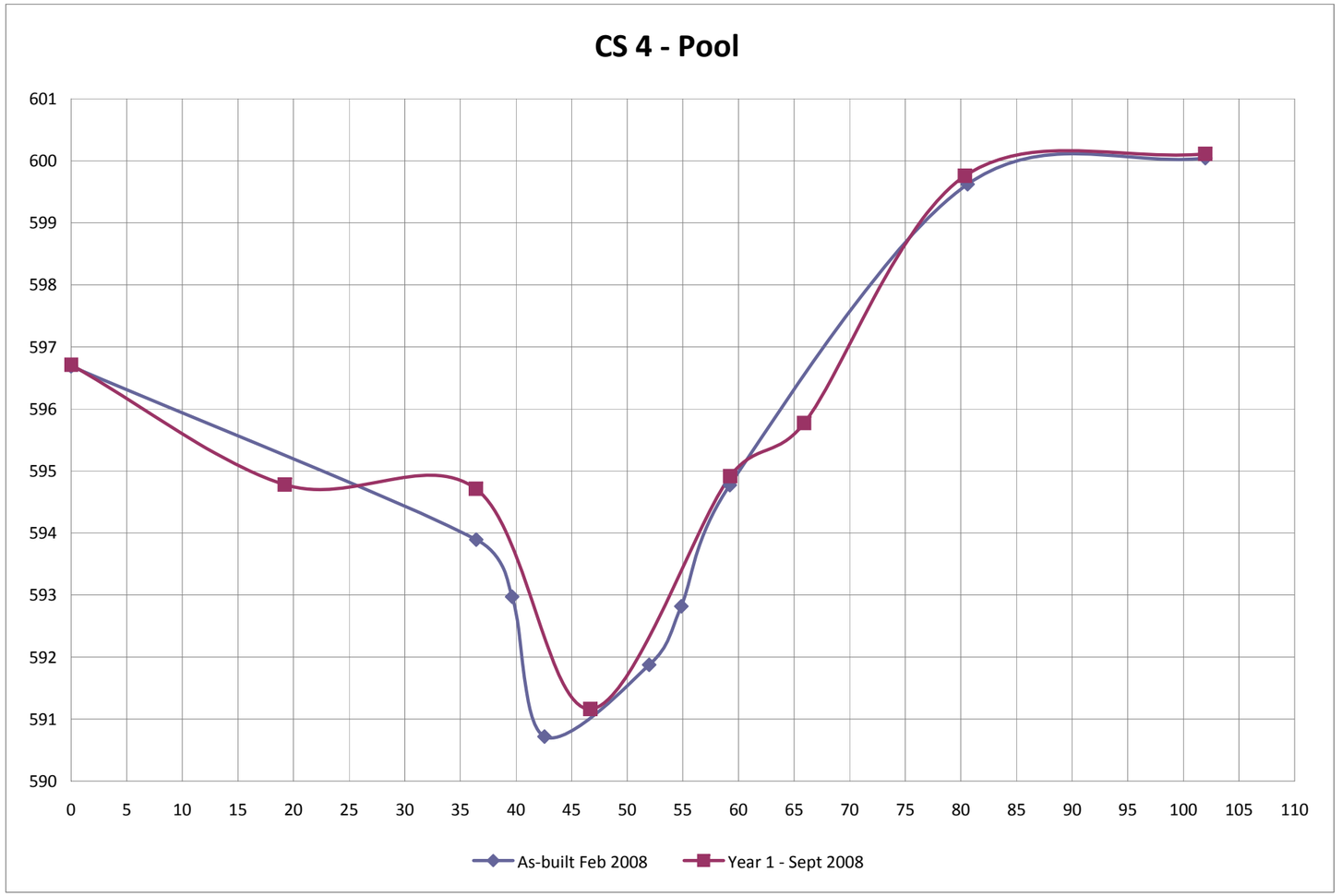
CS3 - Survey Data																	
As-built Feb 2008			Year 1 - Sept 2008			Year 2 - Sept 2009			Year 3 - Sept 2010			Year 4 - Sept 2011			Year 5 - Sept 2012		
Station	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**
0	599.816		0	599.864													
12.98	599.537		11.92	599.673													
32.79	594.604	rbf	28.86	595.251	rbf												
41.49	593.849		44.03	593.696													
46.45	592.558		49.06	592.155	tw												
48.29	592.422		54.87	593.793													
49.72	592.187	tw	56.28	593.895													
51.55	592.602		62.23	593.107													
55.2	593.456		68.24	594.091													
80.93	595.365	bf	80.83	595.377	bf												

Summary Data Table	As-built 2008	MY1 2008	MY2 2009	MY3 2010	MY4 2011	MY5 2012
Bankfull Cross Sectional Area:	152.99	167.45				
Bankfull Width:	48.14	51.97				
Bankfull Mean Depth:	2.52	1.92				
Bankfull Max Depth:	3.18	3.22				
Width/Depth Ratio:	15.15	16.13				



CS4 - Survey Data																	
As-built Feb 2008			Year 1 - Sept 2008			Year 2 - Sept 2009			Year 3 - Sept 2010			Year 4 - Sept 2011			Year 5 - Sept 2012		
Station	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**
0	596.689	bf	0	596.71	bf												
36.42	593.891		19.22	594.777													
39.65	592.972		36.41	594.71													
42.56	590.716	tw	46.69	591.161	tw												
51.98	591.873		59.27	594.913	rbf												
54.86	592.818		65.91	595.772													
59.22	594.771	rbf	80.37	599.757													
80.6	599.623		101.98	600.108													
101.98	600.043																

Summary Data Table	As-built 2008	MY1 2008	MY2 2009	MY3 2010	MY4 2011	MY5 2012
Bankfull Cross Sectional Area:	353.72	328.89				
Bankfull Width:	59.22	59.27				
Bankfull Mean Depth:	4.24	3.16				
Bankfull Max Depth:	5.97	5.55				
Width/Depth Ratio:	9.91	10.68				

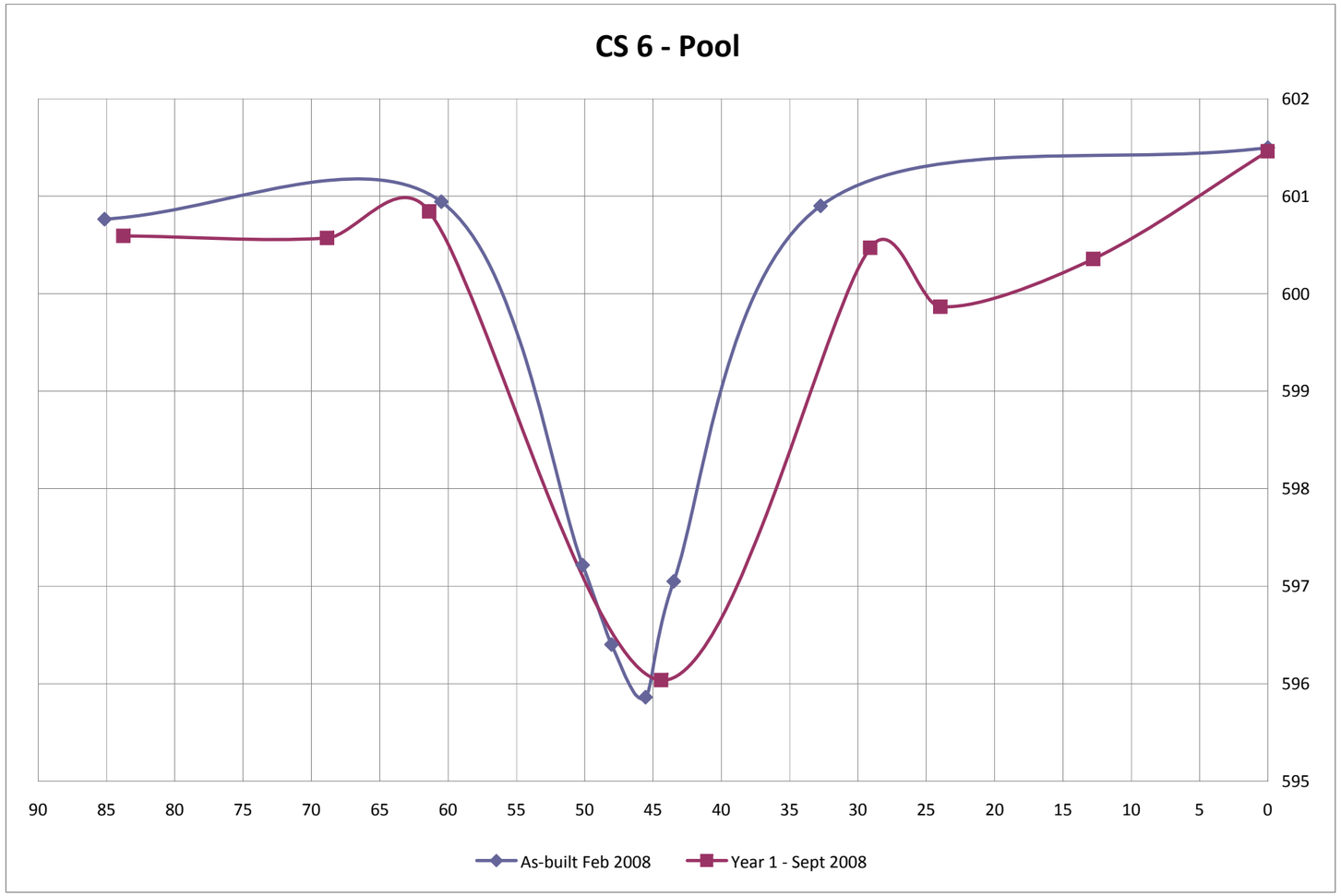


CS5 - Survey Data																	
As-built Feb 2008			Year 1 - Sept 2008			Year 2 - Sept 2009			Year 3 - Sept 2010			Year 4 - Sept 2011			Year 5 - Sept 2012		
Station	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**
0	600.558		0	600.653													
22.58	600.893	bf	23.1	601.034	bf												
36.07	596.665		32.99	598.134													
38	596.286	tw	38.43	596.52	tw												
40.24	596.287		52.55	601.113	rbf												
42.38	596.59		63.19	600.572													
51.74	600.581	rbf	84.99	601.519													
83.42	601.385																
84.65	601.527																

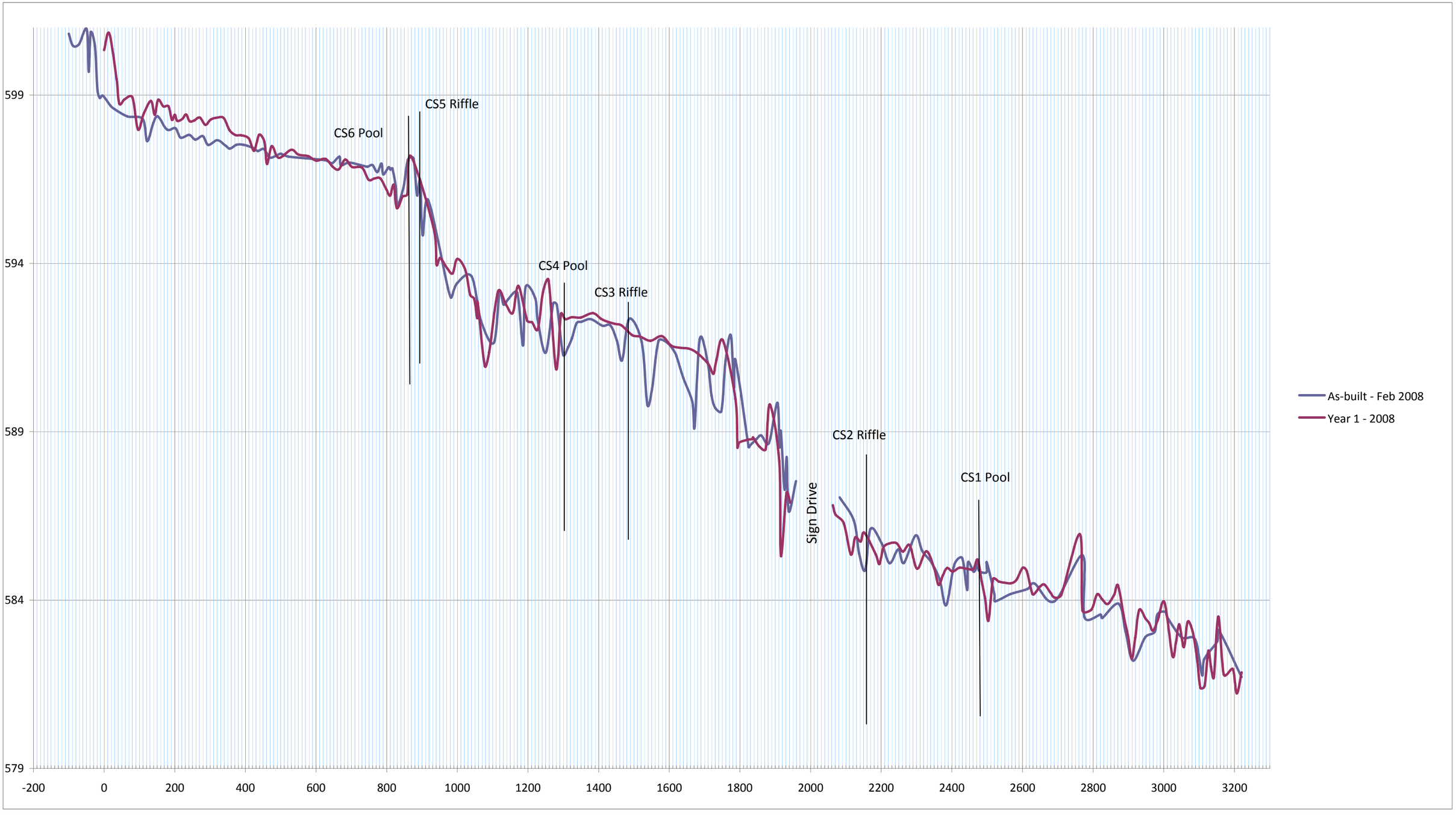
Summary Data Table	As-built 2008	MY1 2008	MY2 2009	MY3 2010	MY4 2011	MY5 2012
Bankfull Cross Sectional Area:	134.34	135.26				
Bankfull Width:	29.16	29.45				
Bankfull Mean Depth:	4.44	3.79				
Bankfull Max Depth:	4.61	4.59				
Width/Depth Ratio:	6.33	6.41				

CS6 - Survey Data																	
As-built Feb 2008			Year 1 - Sept 2008			Year 2 - Sept 2009			Year 3 - Sept 2010			Year 4 - Sept 2011			Year 5 - Sept 2012		
Station	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**	**Station**	**Elevation**	**Feature**
0	601.497		0	601.459													
32.74	600.9	rbf	12.77	600.355													
43.49	597.049		23.97	599.864													
45.54	595.86	tw	29.1	600.47	rbf												
48.03	596.402		44.4	596.036	tw												
50.16	597.215		61.38	600.842	bf												
60.49	600.944	bf	68.85	600.571													
85.14	600.764		83.76	600.593													

Summary Data Table	As-built 2008	MY1 2008	MY2 2009	MY3 2010	MY4 2011	MY5 2012
Bankfull Cross Sectional Area:	141.08	155.14				
Bankfull Width:	27.75	32.28				
Bankfull Mean Depth:	4.31	4.81				
Bankfull Max Depth:	5.08	4.81				
Width/Depth Ratio:	5.46	6.72				



APPENDIX C: PROFILE SURVEY AND PEBBLE COUNTS


599
594
589
584
579
-200
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
CS6 Pool
CS5 Riffle
CS4 Pool
CS3 Riffle
CS2 Riffle
CS1 Pool
Sign Drive
As-built - Feb 2008
Year 1 - 2008

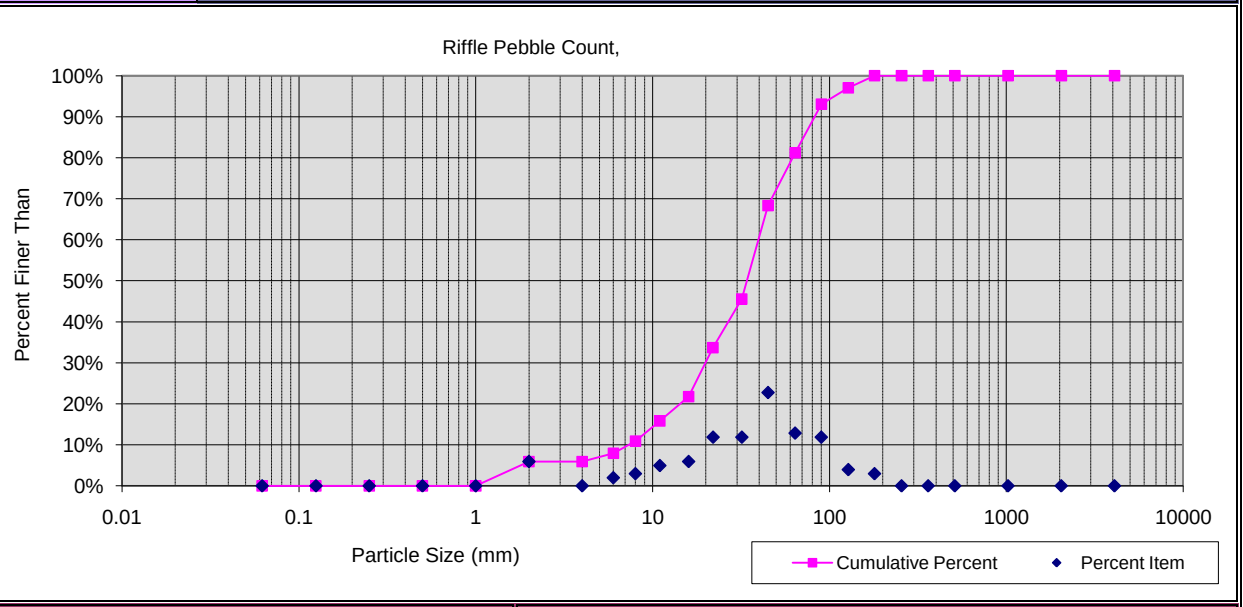
Stricker Pebble Count Data

8/5/2008

Riffle Pebble Count

Material	Size Range (mm)		Count
silt/clay	0	0.062	
very fine sand	0.062	0.13	
fine sand	0.13	0.25	
medium sand	0.25	0.5	
coarse sand	0.5	1	
very coarse sand	1	2	6
very fine gravel	2	4	
fine gravel	4	6	2
fine gravel	6	8	3
medium gravel	8	11	5
medium gravel	11	16	6
coarse gravel	16	22	12
coarse gravel	22	32	12
very coarse gravel	32	45	23
very coarse gravel	45	64	13
small cobble	64	90	12
medium cobble	90	128	4
large cobble	128	180	3
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	
bedrock			
Total Particle Count:			101

	Stricker
	Riffle (XS 5)
	Concord, NC
Note:	



Size percent less than (mm)				
D16	D35	D50	D84	D95
11.110	22.95	34.2	69	107

Percent by substrate type					
silt/clay	sand	gravel	cobble	boulder	bedrock
0%	6%	75%	19%	0%	0%

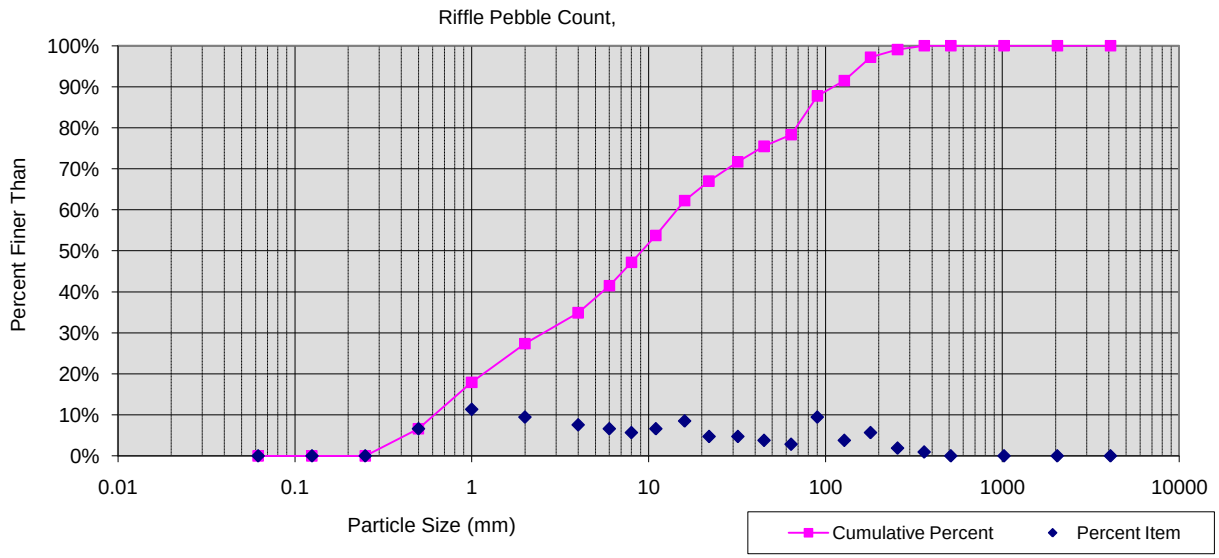
Stricker Pebble Count Data

8/5/2008

Riffle Pebble Count

Material	Size Range (mm)		Count
silt/clay	0	0.062	
very fine sand	0.062	0.13	
fine sand	0.13	0.25	
medium sand	0.25	0.5	7
coarse sand	0.5	1	12
very coarse sand	1	2	10
very fine gravel	2	4	8
fine gravel	4	6	7
fine gravel	6	8	6
medium gravel	8	11	7
medium gravel	11	16	9
coarse gravel	16	22	5
coarse gravel	22	32	5
very coarse gravel	32	45	4
very coarse gravel	45	64	3
small cobble	64	90	10
medium cobble	90	128	4
large cobble	128	180	6
very large cobble	180	256	2
small boulder	256	362	1
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
bedrock			
	Total Particle Count:		106

	Stricker
	Riffle (XS-3)
	Concord, NC
Note:	



Size percent less than (mm)				
D16	D35	D50	D84	D95
0.889	4.02	9.2	79	158

Percent by substrate type					
silt/clay	sand	gravel	cobble	boulder	bedrock
0%	27%	51%	21%	1%	0%

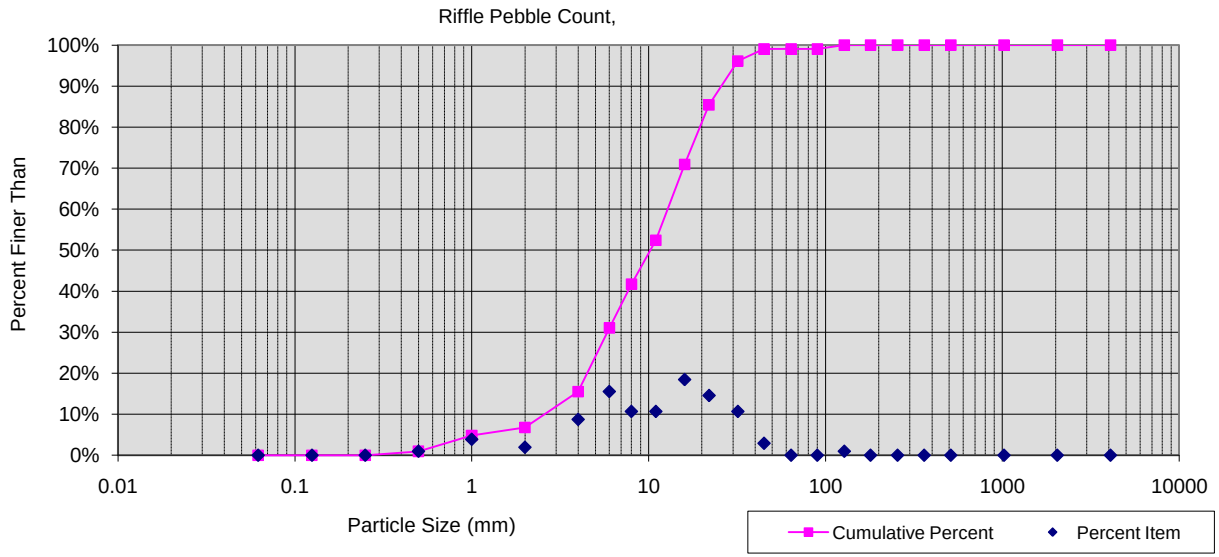
Stricker Pebble Count Data

8/5/2008

Riffle Pebble Count

Material	Size Range (mm)		Count
silt/clay	0	0.062	
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	4
very coarse sand	1	2	2
very fine gravel	2	4	9
fine gravel	4	6	16
fine gravel	6	8	11
medium gravel	8	11	11
medium gravel	11	16	19
coarse gravel	16	22	15
coarse gravel	22	32	11
very coarse gravel	32	45	3
very coarse gravel	45	64	
small cobble	64	90	
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	
bedrock			
		Total Particle Count:	103

	Stricker
	Riffle (XS-2)
	Concord, NC
Note:	



Size percent less than (mm)				
D16	D35	D50	D84	D95
4.049	6.67	10.2	21	31

Percent by substrate type					
silt/clay	sand	gravel	cobble	boulder	bedrock
0%	7%	92%	1%	0%	0%

APPENDIX D: PHOTO LOGS

Stricker Branch Photo Log

Photo Point 1

Photo Point 2

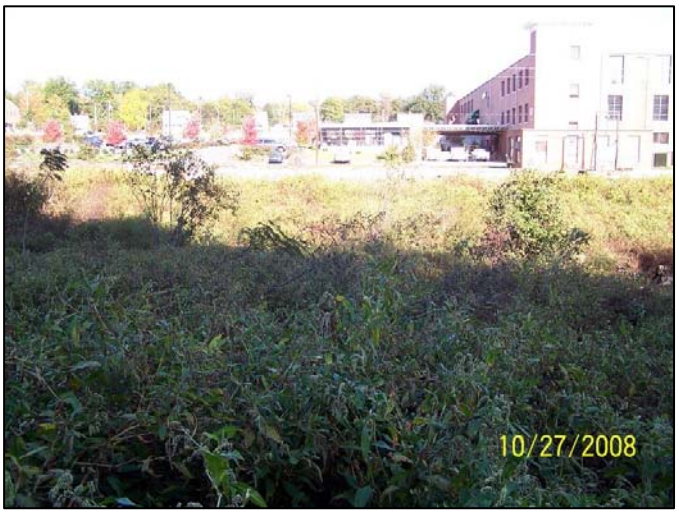


Photo Point 3 (Veg Plot 6)

Photo Point 4

Photo Point 5

Photo Point 6

Photo Point 7

Photo Point 8 (Veg Plot 5)

Photo Point 9

Photo Point 10

Photo Point 11

Photo Point 12

Photo Point 13

Photo Point 14

Photo Point 15 (Veg Plot 4)

Photo Point 16

Photo Point 17

Photo Point 18

Photo Point 19 (Veg Plot 3)

Photo Point 20

Photo Point 21

Photo Point 22

Photo Point 23

Photo Point 24

Photo Point 25

Photo Point 26

Photo Point 27

Photo Point 28

Photo Point 29

Photo Point 30

Photo Point 31

Photo Point 32

Photo Point 33

Photo Point 34

Photo Point 35 (Veg Plot 2)

Photo Point 36

Photo Point 37

Photo Point 38

Photo Point 39

Photo Point 40

Photo Point 41

Photo Point 42 (Veg Plot 1)

Photo Point 43

Photo Point 44

Photo Point 45

Photo Point 46

Photo Point 47

Photo Point 48

Photo Point 49

Photo Point 50

Stricker Branch Flooding (8-27-2008)

Stricker Branch Storm Damage (8-29-2008)

Stricker Branch Repairs

Before

After

Before

After

APPENDIX E: BANKFULL EVENTS AND RAINFALL

Aftermath of hurricane remnant rain event August 25th through 28th totaling approximately 23 inches over 4 days.


08/29/2008


08/29/2008


08/29/2008


08/29/2008

Lower section, below Sign Drive

Middle Section above Sign Drive


08/27/2008


08/27/2008

Upper Section, former pond area


08/27/2008


08/27/2008

Bankfull event February 1st and 2nd 2008.

Bankfull event March 4th, 2008.

Bankfull event March 7th, 2008.

Bankfull event April 4th and 5th, 2008.

Bankfull event May 10th and 11th, 2008.

Bankfull event June 22nd and 23rd, 2008.

Bankfull Events 2008

Site Visit Date	Associated Rainfall Event Date	Rainfall Amount (Inches)	Method Documented
2/1/2008	February 1st and 2nd	2.2	On site/ Photos
3/7/2008	March 4th	1.39	CSG
3/10/2008	March 7th	0.65	CSG
4/18/2008	April 4th and 5th	0.86	CSG
5/16/2008	May 9th and 10th	1.31	CSG
6/24/2008	June 22nd and 23rd	2.67	CSG
8/29/2008	August 25th to 28th	23.02	Photos

Documented Bankfull threshold is set at .65 inches of rainfall

Additional Rain events that may have been bankfull events

Date	Amount (inches)
2/26/2008	0.7
4/26/2008	1.4
4/28 - 4/29/08	3.68
5/18 - 19/08	1.44
5/28 - 29/09	1.06
6/10 - 12/08	1.64
6/26 -7/1/08	1.81
7/4 - 7/11/08	6.36
7/13 - 14/08	1.68
7/22 - 24/09	4.66
7/31 - 8/2/08	2.24
8/13 - 14/08	2.28
8/30 - 9/1/08	1.7
9/10 - 11/08	4.63
9/16 - 17/08	1.06
9/26 - 28/08	2.13
10/8 - 9/08	0.9

STATE CLIMATE OFFICE OF NORTH CAROLINA
NC CRONOS Database
Data retrieval from 311975 - Concord

	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08
1	1.12	0	0	0	0	0.23	0.53	0.12	0.03
2	1.08	0	0	0	0	0	0.68	0	0
3	0.03	0	0.5	0	0.01	0	0.05	0	0
4	0	1.39	0.65	0	0.01	0.56	0	0	0
5	0	0	0.21	0	0	0.83	0	0	0
6	0	0	0.01	0	0	0.51	0	0	0
7	0	0.65	0	0	0	0.24	0	0	0
8	0	0	0	0.03	0	1.15	0	0.08	0.45
9	0	0	0	0.67	0	1.51	0	0.08	0.45
10	0	0	0	0.64	0.42	0.96	0.01	2.28	0
11	0	0	0.03	0.5	0.82	0.6	0.01	2.35	0
12	0.36	0	0.06	0.5	0.4	0	0	0.07	0
13	0.24	0	0	0	0	0.84	1.14	0	0
14	0	0	0	0	0.6	0.84	1.14	0	0
15	0	1	0	0.15	0.6	0	0	0	0
16	0	0	0	0.41	0	0	0.02	0.53	0
17	0.08	0	0	0.26	0	0	0.12	0.53	0.12
18	0	0	0	0.72	0	0	0.1	0	0.12
19	0	0.52	0.04	0.72	0	0	0	0	0
20	0	0	0.04	0.56	0	0	0	0	0
21	0.2	0	0	0.56	0	0.11	0	0	0
22	0.02	0	0	0	1.28	1.49	0	0	0
23	0	0.02	0	0	1.39	2.22	0	0	0
24	0	0	0	0.03	0.11	0.84	0	0	0.06
25	0	0	0	0.03	0	0	0.6	0.02	0.06
26	0.7	0	1.4	0	0.31	0.08	5.41	0.51	0
27	0	0	2	0	0.34	0.08	10.91	0.97	0
28	0	0.05	2.14	0.53	0.11	0.1	6.1	0.65	0
29	0	0.16	1.54	0.53	0.29	0.2	0	0.17	0
30		0.11	0	0	0.53	0.1	0.73	0.03	0
31		0.31		0		1.03			0