MONITORING YEAR 1 ANNUAL REPORT
Final

BYRDS CREEK MITIGATION SITE
Person County, NC
DENR Contract 003987
NCEEP Project Number 95020

Data Collection Period: March 2014-September 2014
Draft Submission Date: December 1, 2014
Final Submission Date: December 10, 2014

PREPARED FOR:

NC Department of Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

PREPARED BY:

Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Kirsten Y. Gimbert
kgimbert@wildlandseng.com
Phone: 704.332.7754
Fax: 704.332.3306

EXECUTIVE SUMMARY

Wildlands Engineering (Wildlands) completed a full-delivery project for the North Carolina Ecosystem Enhancement Program (NCEEP) to restore and enhance a total of 7,328 linear feet (LF) of stream in Person County, North Carolina. The project streams consist of Byrds Creek, a third order stream, as well as three unnamed first and second order tributaries to Byrds Creek (South Branch, Southeast Branch, and West Branch). At the downstream limits of the project, the drainage area is 2,957 acres (4.62 square miles).

The Byrds Creek Mitigation Site, hereafter referred to as the Site, is approximately 1.8 miles south of Hurdle Mills, NC off of Wolfe Road in southwestern Person County (see Figure 1). The Site is located in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998). The site is within the South Flat River watershed (North Carolina Division of Water Resources (NCDWR) Subbasin 03-04-01) of the Neuse River Basin (United States Geological Survey (USGS) Hydrologic Unit 03020201010020). Land use within the watershed is rural and is dominated by forestry, agriculture, and livestock operations; with approximately 60% of the watershed used for agriculture and 40% forested. The Site is located in an active cattle pasture surrounded by wooded lots, small agricultural operations, and rural residential areas. The Site is comprised of three contiguous, but separately owned tracts totaling 377-acres.

Prior to construction activities, the streams on the Byrds Creek Site were heavily impacted by cattle, which led to stream bank erosion and instability. The primary objectives of the project were to decrease on-site nutrient inputs, stabilize streambanks, restore riffle/pool sequences, improve habitat diversity, restore the riparian buffer, and implement a conservation easement within the project area. These objectives were achieved by restoring 3,096 LF of perennial and intermittent stream channel and enhancing 4,232 LF of perennial stream channel. Figure 2 and Table 1 present the restoration and enhancement design for the site.

The following project goals were established to address the effects listed above in the executive summary from watershed and project site stressors:

- Reduce nutrient loads within the watershed and to downstream waters;
- Stabilize eroding stream banks greatly reducing, if not eliminating, sediment loads;
- Restore riffle/pool sequencing resulting in decreased water temperatures and increased dissolved oxygen concentrations;
- Establish in-stream structures to improve habitat diversity and trap detritus;
- Restore native vegetation and riparian buffers; and
- Protect the restored land in perpetuity through a conservation easement.

Restoration and enhancement construction and planting efforts were completed in December 2013. A conservation easement is in place on 25.6 acres of riparian corridor and stream resources to protect them in perpetuity.

Monitoring Year 1 (MY-1) monitoring and site visits were completed during March-September, 2014 to assess the conditions of the project. All streams within the Site are stable and functioning as designed. The sites overall average stem density of 653 stems/ acre is greater than the 320 stem/ acre density required for MY-3. Hydrologic monitoring gauges documented bankfull events for reaches BC3 and SB1. The Monitoring Year 5 (MY-5) hydrology success criteria has been partially met for the Site at this time.

TABLE OF CONTENTS

Section 1: PROJECT OVERVIEW 1-1
1.1 Project Goals and Objectives 1-1
1.2 Monitoring Year 1 Data Assessment 1-2
1.2.1 Vegetative Assessment 1-3
1.2.2 Vegetation Areas of Concern 1-3
1.2.3 Stream Assessment 1-3
1.2.4 Stream Areas of Concern 1-3
1.2.5 Hydrology Assessment 1-4
1.2.6 Maintenance Plan 1-4
1.3 Monitoring Year 1 Summary 1-4
Section 2: METHODOLOGY 2-1
Section 3: REFERENCES 3-1

APPENDICES

Appendix 1 **General Tables and Figures**
Figure 1 Project Vicinity Map
Figure 2 Project Component/Asset Map
Table 1 Project Components and Mitigation Credits
Table 2 Project Activity and Reporting History
Table 3 Project Contacts Table
Table 4 Project Baseline Information and Attributes

Appendix 2 **Visual Assessment Data**
Figure 3 Integrated Current Condition Plan View
Table 5a-i Visual Stream Morphology Stability Assessment Table
Table 6 Vegetation Condition Assessment Table
Stream Photographs
Vegetation Photographs

Appendix 3 **Vegetation Plot Data**
Table 7 Vegetation Plot Criteria Attainment
Table 8 CVS Vegetation Plot Metadata
Table 9 Planted and Total Stem Counts (Species by Plot with Annual Means)

Appendix 4 **Morphological Summary Data and Plots**
Table 10a-c Baseline Stream Data Summary
Table 11 Monitoring Data – Dimensional Morphology Summary (Dimensional Parameters – Cross-Section)
Table 12a-f Monitoring Data – Stream Reach Data Summary
Longitudinal Profile Plots
Cross-Section Plots
Reachwide and Cross-Section Pebble Count Plots

Appendix 5 **Hydrology Data**
Table 13 Verification of Bankfull Events
Byrds Creek Stream Gauge Plot
South Branch Stream Gauge Plot

Section 1: PROJECT OVERVIEW

The Byrds Creek Mitigation Site, hereafter referred to as the Site, is located in southwestern Person County within the Neuse River Basin (USGS Hydrologic Unit 03020201). The project site is located south and east of Wolfe Road south of Hurdle Mills, North Carolina. The Site is located in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998). The Multi-Resolution Land Characteristics Consortium (MRLC, 2001) classified approximately 57% of the land in the project watershed as managed herbaceous cover or agricultural, 42% is classified as forested/scrubland, and the remaining 1% is open water. The drainage area for the Byrds Creek Site is 2,957 acres (4.62 square miles).

The project stream reaches consist of Byrds Creek reach 2 (BC-2), Byrds Creek reach 3 (BC-3), South branch (SB-1), Southeast branch reach 1 (SE-1), and Southeast branch reach 2 (SE-2) [stream restoration and/or enhancement level I approach] and Byrds Creek reach 1 (BC-1), Byrds Creek reach 4 (BC-4), and West branch (WB-1) [enhancement level II approach]. Mitigation work within the Site included restoring and enhancing 7,328 linear feet of perennial and intermittent stream channel. The stream areas were also planted with native vegetation to improve habitat and protect water quality. Construction activities were completed by North State Environmental in September 2013. Planting and seeding activities were completed by Bruton Natural Systems, Inc. in December 2013. Three separate conservation easements have been recorded and are in place along the riparian corridors and stream resources to protect them in perpetuity; 19.701 acres (Deed Book 819, Page 176) within the tract owned by The Homeplace, 3.39 acres (Deed Book 819, Page 202) within the tract owned by Charles E. Hall, and 2.542 acres (Deed Book 819, Page 191) within the tract owned by Noell W. Bradsher and Floyd D. Bradsher. Directions and a map of the Site are provided in Figure 1 and project components are illustrated for the Site in Figure 2.

1.1 Project Goals and Objectives

Prior to construction activities, the streams on the Byrds Creek Site were heavily impacted by cattle, which led to stream bank erosion and instability. Related degradation includes declining aquatic habitat, loss of forest, degraded riparian buffers, and water quality problems related to increased sediment and nutrient loadings. Tables 10a, 10b, and 10c in Appendix 4 present the pre-restoration conditions in detail.

The Site was designed to meet the over-arching goals as described in the mitigation plan (2013). The project is intended to provide numerous ecological benefits within the Neuse River Basin. While many of these benefits are limited to the Site, others, such as pollutant removal and improved aquatic and terrestrial habitat, have more far-reaching effects. The following project specific goals established in the mitigation plan include:

- Reduce nutrient loads within the watershed and to downstream waters;
- Stabilize eroding stream banks greatly reducing, if not eliminating, sediment loads;
- Restore riffle/pool sequencing resulting in decreased water temperatures and increased dissolved oxygen concentrations;
- Establish in-stream structures to improve habitat diversity and trap detritus;
- Restore native vegetation and riparian buffers; and
- Protect the restored land in perpetuity through a conservation easement.

The design features of this project were developed to achieve multiple project objectives. The stream restoration elements were designed to frequently flood the reconnected floodplain. This design approach provides more frequent dissipation of energy from higher flows (bankfull and above) to

improve channel stability; provide water quality treatment through detention, settling, and biological removal of pollutants; and restore a more natural hydrologic regime. The project objectives defined in the mitigation plan (2013) are as follows:

- On-site nutrient inputs will be decreased by removing cattle from streams and filtering on-site runoff through buffer zones. Off-site nutrient input will be absorbed on-site by filtering flood flows through restored floodplain areas, where flood flow will spread through native vegetation. Vegetation is expected to uptake excess nutrients.
- Stream bank erosion which contributes sediment load to the creek will be greatly reduced, if not eliminated, in the project area. Eroding stream banks will be stabilized using bioengineering, natural channel design techniques, and grading to reduce bank angles and bank height. Storm flow containing grit and fine sediment will be filtered through restored floodplain areas, where flow will spread through native vegetation. Spreading flood flows will also reduce velocity and allow sediment to settle out. Sediment transport capacity of restored reaches will be improved so that capacity balances more closely to load. Sediment load reduction will be monitored through assessing bank stability with cross section and profile surveys and visual assessment through photo documentation which serves as an accepted surrogate for direct turbidity measurements.
- Restored riffle/pool sequences will promote aeration of water and create deep water zones, helping to lower water temperature. Establishment and maintenance of riparian buffers will create long-term shading of the channel flow to minimize thermal heating. Lower water temperatures will help maintain dissolved oxygen concentrations.
- In-stream structures will be constructed to improve habitat diversity and trap detritus. Wood habitat structures will be included in the stream as part of the restoration design. Such structures may include log drops and rock structures that incorporate woody debris.
- Adjacent buffer and riparian habitats will be restored with native vegetation as part of the project. Native vegetation will provide cover and food for terrestrial creatures. Native plant species will be planted and invasive species will be treated. Eroding and unstable areas will also be stabilized with vegetation as part of this project.
- The restored land will be protected in perpetuity through a conservation easement.

The design streams were restored to the appropriate type based on the surrounding landscape, climate, and natural vegetation communities but also with strong consideration to existing watershed conditions and trajectory. The designs were developed to correct incision and lack of pattern caused by channelization, bank instability caused by erosion and livestock access, lack of vegetation in riparian zones, and lack of riparian and aquatic habitat. The final mitigation plan was submitted and accepted by the NCEEP in January of 2013. Construction activities were completed by North State Environmental in September 2013. Planting and seeding activities were completed by Bruton Natural Systems, Inc. in December 2013. Baseline monitoring (MY-0) was conducted between October 2013 and January of 2014. Annual monitoring will be conducted for five years with the close-out anticipated to commence in 2019 given the success criteria are met. Appendix 1 provides more detailed project activity, history, contact information, and watershed/site background information for this project.

1.2 Monitoring Year 1 Data Assessment

Annual monitoring and quarterly site visits were conducted during monitoring year 1 (MY-1) to assess the condition of the project. The stream success criteria for the Site follow the approved success criteria presented in the Byrds Creek Mitigation Plan (2013).

1.2.1 Vegetative Assessment

Planted woody vegetation is being monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-NCEEP Level 2 Protocol (Lee et al., 2008). A total of 14 vegetation plots were established during the baseline monitoring within the project easement area. The majority of the plots were established as standard 10 meter by 10 meter plot with one plot established as a 5 meter by 20 meter plot. The final vegetative success criteria will be the survival of 260 planted stems per acre in the riparian corridor along restored and enhanced reaches at the end of year five of the monitoring period. The interim measure of vegetative success for the Site will be the survival of at least 320 planted stems per acre at the end of year three of the monitoring period.

The MY-1 vegetative survey was completed in September 2014. The 2014 annual vegetation monitoring resulted in an average stem density of 653 stems per acre, which is greater than the interim requirement of 320 stems/acre, but approximately 11% less than the baseline density recorded (734 stems/acre) in January 2014. There is an average of 16 stems per plot and all plots are on track to meet the success criteria required for MY-5 (Table 9, Appendix 3). The isolated areas of floodplain scour between station 35+00 and 40+00 were stabilized with new matting and a seeding application in the spring of 2014. Please refer to Appendix 2 for vegetation plot photographs and the vegetation condition assessment table and Appendix 3 for vegetation data tables.

1.2.2 Vegetation Areas of Concern

The isolated area of tree of heaven (*Ailanthis altissima*) documented at the site was treated during MY-1 and will be assessed during subsequent monitoring efforts. The presence of this invasive species does not appear to be affecting the survivability of planted stems.

1.2.3 Stream Assessment

Morphological surveys for the MY-1 were conducted in April 2014. All streams within the Site are stable with little to no erosion and have met the success criteria for MY-1. Please refer to Appendix 2 for the visual assessment table, Integrated Current Condition Plan View, and reference photographs. Refer to Appendix 4 for the morphological data and plots.

While there have been some minor post-construction adjustments within the restored channels; the cross-sections show little to no change in the bankfull area, maximum depth ratio, or width-to-depth ratio. Surveyed riffle cross-sections fell within the parameters defined for channels of the appropriate Rosgen stream type. The surveyed longitudinal profile data for BC2, BC3, SB1, SE1, SE2a and SE2b illustrates that the bedform features are maintaining lateral and vertical stability. The riffles are remaining steeper and shallower than the pools, while the pools are remaining deeper than the riffles and maintaining flat water surface slopes. The longitudinal profiles show that the bank height ratios remain very near to 1.0 for the restoration reaches. Pattern data will be collected in MY-5 only if there are indicators from the profile or dimensions that significant geomorphic adjustments have occurred. No changes were observed during MY-1 that indicated a change in the radius of curvature or channel belt width.

1.2.4 Stream Areas of Concern

No stream areas of concern were identified during MY-1.

1.2.5 Hydrology Assessment

At the end of the five year monitoring period, two or more bankfull events must have occurred in separate years within the restoration reaches. Bankfull events were recorded for two of the three gauged streams during the MY-1 data collection. Please refer to Appendix 5 for hydrologic data.

1.2.6 Maintenance Plan

Maintenance of invasive vegetation will be assessed in the winter of 2014/2015 and a follow up herbicide application will occur in the spring of 2015 if deemed necessary. Additional follow up treatments will be conducted annually as necessary to control their spread and dominance.

1.3 Monitoring Year 1 Summary

All streams within the Site are stable and functioning as designed. The average stem density for the Site is 653 stems per acre and is on track to meeting the MY-3 interim success criteria. Bankfull events were documented with the gauges located on BC3 and SB1 during MY-1. The MY-5 stream hydrology attainment requirement has been partially met for the Site at this time.

Summary information and data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Mitigation Plan documents available on NCEEP's website. All raw data supporting the tables and figures in the appendices are available from NCEEP upon request.

Section 2: METHODOLOGY

Geomorphic data was collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). Longitudinal and cross-sectional data were collected using a total station and were georeferenced. All CCPV mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcView. Crest gages were installed in surveyed riffle cross-sections and monitored quarterly. Hydrology attainment installation and monitoring methods are in accordance with the USACE (2003) standards. Vegetation monitoring protocols followed the Carolina Vegetation Survey-NCEEP Level 2 Protocol (Lee et al., 2008). Reporting follows the NCEEP Monitoring Report Template and Guidance Version 1.3 (NCEEP, 2010).

Section 3: REFERENCES

Doll, B.A., Grabow, G.L., Hall, K.A., Halley, J., Harman, W.A., Jennings, G.D., and Wise, D.E. 2003. Stream Restoration A Natural Channel Design Handbook.

Harrelson, C.C., Rawlins, C.L., Potyondy, J.P. 1994. *Stream Channel Reference Sites: An Illustrated Guide to Field Technique.* Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

Lee, M.T., Peet, R.K., S.D., Wentworth, T.R. 2008. CVS-EEP Protocol for Recording Vegetation Version 4.2. Retrieved from http://cvs.bio.unc.edu/protocol/cvs-eep-protocol-v4.2-lev1-5.pdf.

North Carolina Ecosystem Enhancement Program (NCEEP). 2010. Monitoring Report Template and Guidance. Version 1.3. Raleigh, NC.

Rosgen, D. L. 1994. A classification of natural rivers. *Catena* 22:169-199.

Rosgen, D.L. 1996. Applied River Morphology. Pagosa Springs, CO: Wildland Hydrology Books.

Rosgen, D.L. 1997. A Geomorphological Approach to Restoration of Incised Rivers. Proceedings of the Conference on Management of Landscapes Disturbed by Channel Incision. Center For Computational Hydroscience and Bioengineering, Oxford Campus, University of Mississippi, Pages 12-22.

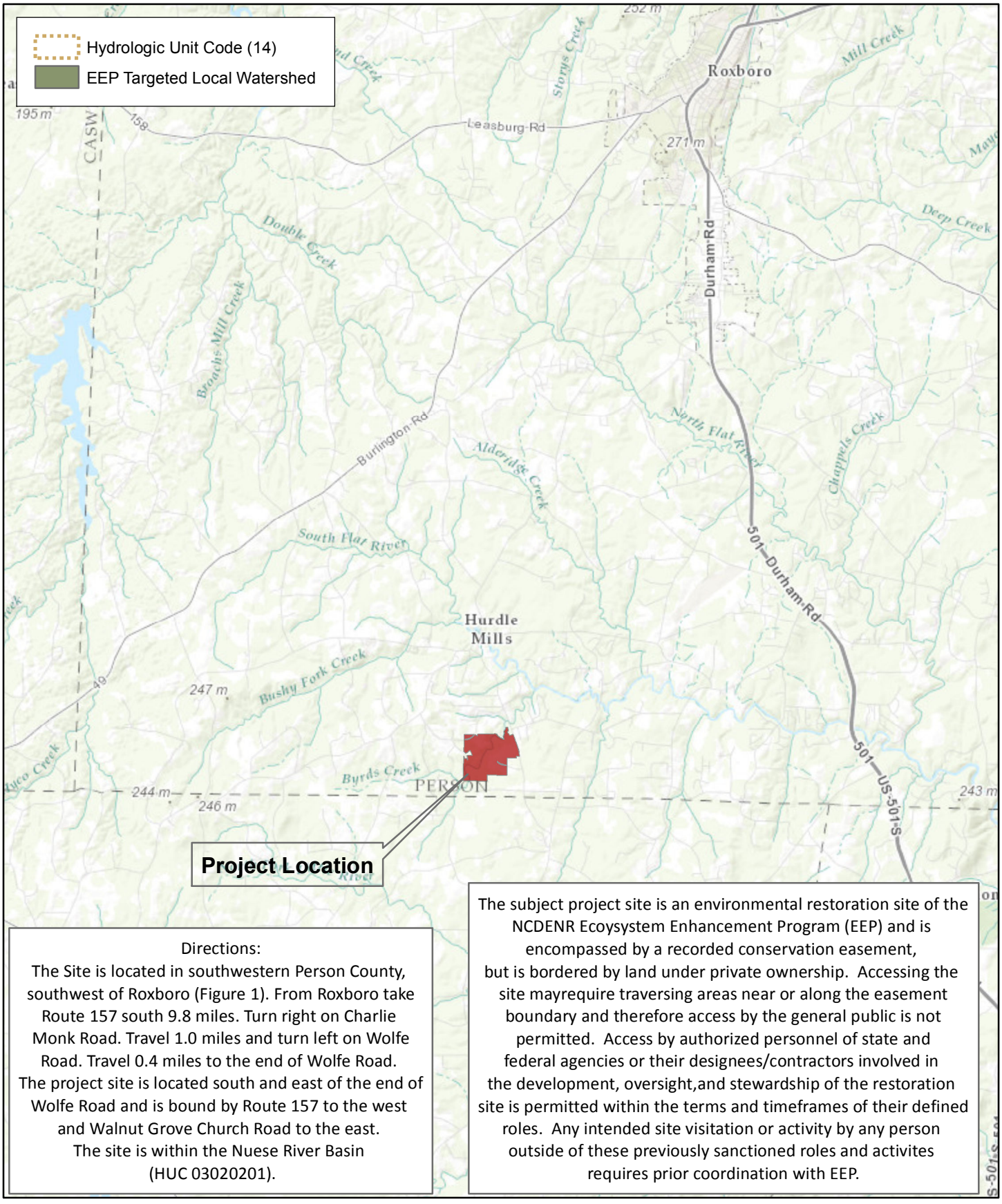
United States Army Corps of Engineers (USACE). 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

United States Geological Survey (USGS). 1998. North Carolina Geology. http://www.geology.enr.state.nc.us/usgs/carolina.htm.

Wildlands Engineering, Inc. 2013. Byrds Creek Mitigation Site Mitigation Plan. NCEEP, Raleigh, NC.

Wildlands Engineering, Inc. 2014. Byrds Creek Mitigation Site Baseline Monitoring Document and As-Built Baseline Report. NCEEP, Raleigh, NC.

APPENDIX 1. General Tables and Figures



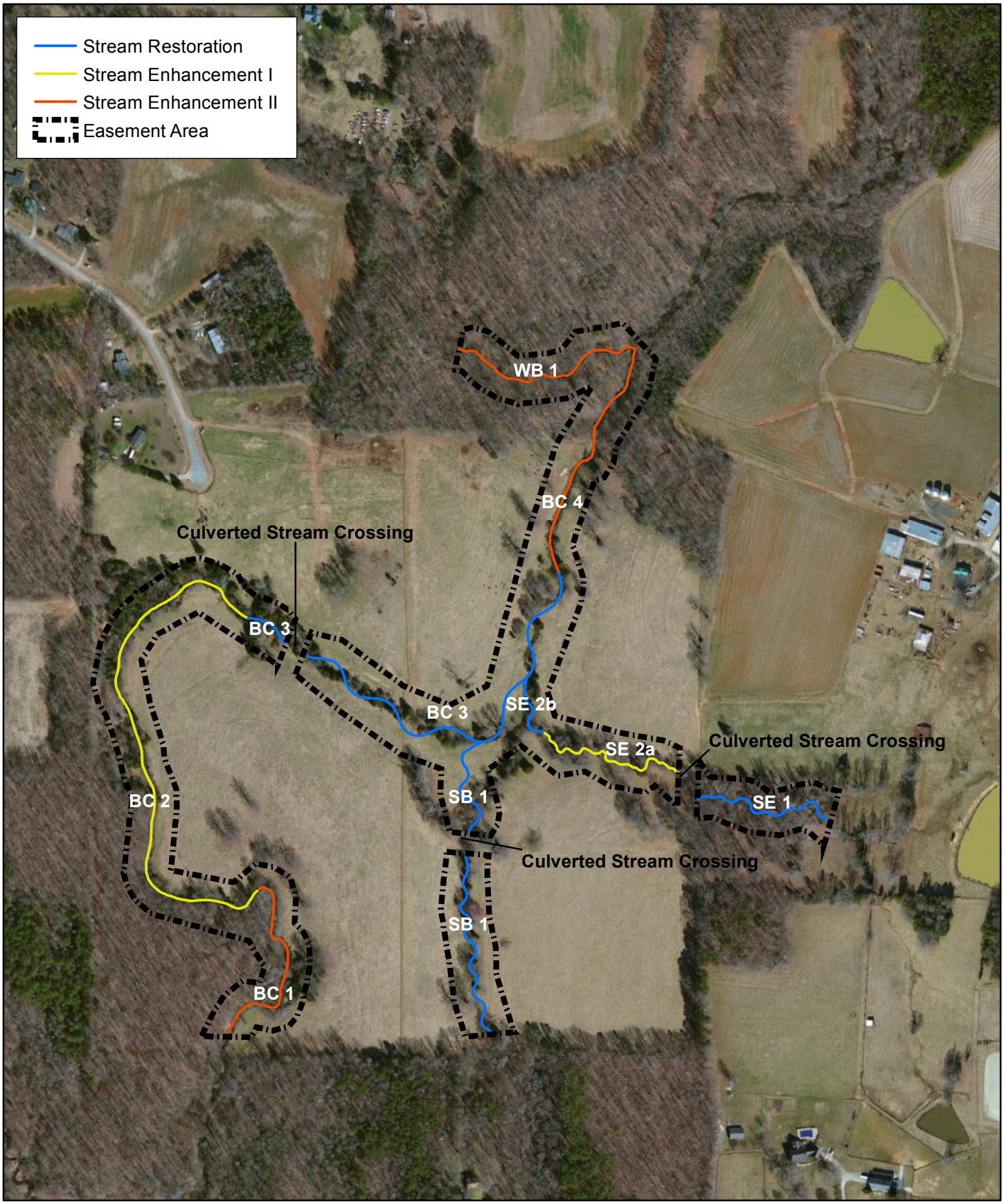
WILDLANDS ENGINEERING

0 1 2 Miles

N

Figure 1 Project Vicinity Map
Byrds Creek Mitigation Site
NCEEP Project # 95020
Monitoring Year 1

Person County, NC



WILDLANDS ENGINEERING

0 250 500 Feet

N

Figure 2 Project Componenet/ Asset Map
Byrds Creek Mitigation Site
NCEEP Project #95020
Monitoring Year 1

Person County, NC

Table 1. Project Components and Mitigation Credits
Byrds Creek Mitigation Site (NCEEP Project No.95020)
Monitoring Year 1

Mitigation Credits									
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	5,371	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Project Components							
Reach ID	As-Built Stationing / Location (LF)	Existing Footage (LF) / Acreage (Ac)	Approach	Restoration or Restoration Equivalent	Restoration Footage (LF) / Acreage (Ac)	Mitigation Ratio	Credits (SMU/ WMU)
Streams							
BC1	10+00-16+43	643	N/A	Enhancement Level II	643	2.5:1	257
BC2	16+43-32+89	1,630	N/A	Enhancement Level I	1,646	1.5:1	1,097
BC3	32+89-34+05 34+64-47+55	1,368	Priority 1	Restoration	1,407	1:1	1,407
BC4	47+55-55+51	796	N/A	Enhancement Level II	796	2.5:1	318
SB1	60+00-66+48 67+08-70+69	976	Priority 1	Restoration	1,009	1:1	1,009
SE1	80+00-84+85	916	Priority 1	Restoration	485	1:1	485
SE2a	85+88-91+24	524	N/A	Enhancement Level I	536	1.5:1	357
SE2b	91+24-93+19	50	Priority 1	Restoration	195	1:1	195
WB1	100+00-106+11	611	N/A	Enhancement Level II	611	2.5:1	244

Component Summation						
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-Riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	3,096	-	-	-	-	-
Enhancement		-	-	-	-	-
Enhancement I	2,182					
Enhancement II	2,050					
Creation		-	-	-		
Preservation	-	-	-	-		-
High Quality Preservation	-	-	-	-		-

Table 2. Project Activity and Reporting History
Byrds Creek Mitigation Site (NCEEP Project No.95020)
Monitoring Year 1

Activity or Report	Date Collection	Completion or Scheduled
Mitigation Plan	January 2013	January 2013
Final Design - Construction Plans	June 2013	June 2013
Construction	September 2013	September 2013
Temporary S&E mix applied to entire project area[1]	September 2013	September 2013
Permanent seed mix applied to reach/segments	September 2013	September 2013
Bare root and live stake plantings for reach/segments	December 2013	December 2013
Baseline Monitoring Document (Year 0)	October 2013	January 2014
Year 1 Monitoring	September 2014	December 2014
Year 2 Monitoring	2015	December 2015
Year 3 Monitoring	2016	December 2016
Year 4 Monitoring	2017	December 2017
Year 5 Monitoring	2018	December 2018

[1]Seed and mulch is added as each section of construction is completed.

Table 3. Project Contact Table
Byrds Creek Mitigation Site (NCEEP Project No.95020)
Monitoring Year 1

Designer	**Wildlands Engineering, Inc.**
Jeff Keaton, PE	312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Construction Contractor	**North State Environmental** 2889 Lowery Street Winston Salem, NC 27101
Planting Contractor	**Bruton Natural Systems, Inc** P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	**North State Environmental** 2889 Lowery Street Winston Salem, NC 27101
Seed Mix Sources	**Green Resource, LLC**
Nursery Stock Suppliers	
Bare Roots	**ArborGlen, Inc**
Live Stakes	**Foggy Mountain Nursery**
Monitoring Performers	**Wildlands Engineering, Inc.**
Stream and Vegetation Monitoring, POC	Kirsten Gimbert 704.332.7754, ext. 110

Table 4. Project Information and Attributes
Byrds Creek Mitigation Site (NCEEP Project No.95020)
Monitoring Year 1

Project Information									
Project Name	Byrds Creek Mitigation Site								
County	Person County								
Project Area (acres)	24.42								
Project Coordinates (latitude and longitude)	36° 14.744' N, 79° 79° 2.636' W								
Project Watershed Summary Information									
Physiographic Province	Carolina Slate Belt of the Piedmont Physiographic Province								
River Basin	Neuse								
USGS Hydrologic Unit 8-digit	03020201								
USGS Hydrologic Unit 14-digit	03020201010020								
DWQ Sub-basin	03-04-01								
Project Drainiage Area (acres)	2,957 ac								
Project Drainage Area Percentage of Impervious Area	<1%								
CGIA Land Use Classification	57% managed herbaceous cover/agricultural, 42% forested/scrubland, 1% open water								
Reach Summary Information									
Parameters	**BC1**	**BC2**	**BC3**	**BC4**	**SB1**	**SE1**	**SE2a**	**SE2b**	**WB1**
Length of reach (linear feet) - Post-Restoration	643	1,646	1,407	796	1,009	485	536	195	611
Drainage area (acres)	2,635	2,637	2,703	2,957	164	56	62	62	255
NCDWQ stream identification score	51.75				25.75	46.25			46.75
NCDWQ Water Quality Classification	WS-III, NSW								
Morphological Desription (stream type)	P	P	P	P	I	P	P	P	P
Evolutionary trend (Simon's Model) - Pre- Restoration	IV/V	IV	IV/V	IV	III	IV/V	III/IV	III/IV	IV/V
Underlying mapped soils	Chewacla / Georgeville Loam								
Drainage class	---	---	---	---	---	---	---	---	---
Soil Hydric status	---	---	---	---	---	---	---	---	---
Slope	---	---	---	---	---	---	---	---	---
FEMA classification	---	---	---	---	---	---	---	---	---
Native vegetation community	Piedmont bottomland forest								
Percent composition exotic invasive vegetation -Post-Restoration	0.8%								

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States - Section 404	X	X	USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3885
Waters of the United States - Section 401	X	X	
Division of Land Quality (Dam Safety)	N/A	N/A	N/A
Endangered Species Act	X	X	Byrds Creek Mitigation Plan; no critical habitat for listed species exists within the project area (Pedestrian Survey)
Historic Preservation Act	X	X	No historic resources were found to be impacted (letter from SHPO)
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	N/A	N/A	N/A
FEMA Floodplain Compliance	N/A	N/A	N/A
Essential Fisheries Habitat	N/A	N/A	N/A

APPENDIX 2. Visual Assessment Data

WILDLANDS ENGINEERING

0 125 250 375 500 Feet

N

Figure 3 Integrated Current Condition Plan View
Byrd's Creek Stream Restoration Site
NCEEP Project No. 95020
Monitoring Year 1
Person County, NC

Table 5a. Visual Stream Morphology Stability Assessment Table
Byrds Creek Mitigation Site (NCEEP Project No.95020)
BC1 (643 LF)
Monitoring Year 1

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	n/a	n/a			n/a			
	3. Meander Pool Condition	Depth Sufficient	n/a	n/a			n/a			
		Lenth Appropriate	n/a	n/a			n/a			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	n/a	n/a			n/a			
		Thalweg centering at downstream of meander bend (Glide)	n/a	n/a			n/a			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dilodged boulders or logs.	n/a	n/a			n/a			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	n/a	n/a			n/a			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	n/a	n/a			n/a			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	n/a	n/a			n/a			

Table 5b. Visual Stream Morphology Stability Assessment Table
Byrds Creek Mitigation Site (NCEEP Project No.95020)
BC2 (1,646 LF)
Monitoring Year 1

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	10	10			100%			
	3. Meander Pool Condition	Depth Sufficient	9	9			100%			
		Lenth Appropriate	9	9			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	9	9			100%			
		Thalweg centering at downstream of meander bend (Glide)	9	9			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dilodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	1	1			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	1	1			100%			

Table 5c. Visual Stream Morphology Stability Assessment Table
Byrds Creek Mitigation Site (NCEEP Project No.95020)
BC3 (1,407 LF)
Monitoring Year 1

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	11	11			100%			
	3. Meander Pool Condition	Depth Sufficient	11	11			100%			
		Lenth Appropriate	11	11			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	11	11			100%			
		Thalweg centering at downstream of meander bend (Glide)	11	11			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dilodged boulders or logs.	5	5			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	3	3			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	3	3			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	1	1			100%			

Table 5d. Visual Stream Morphology Stability Assessment Table
Byrds Creek Mitigation Site (NCEEP Project No.95020)
BC4 (2,957 LF)
Monitoring Year 1

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	n/a	n/a			n/a			
	3. Meander Pool Condition	Depth Sufficient	n/a	n/a			n/a			
		Lenth Appropriate	n/a	n/a			n/a			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	n/a	n/a			n/a			
		Thalweg centering at downstream of meander bend (Glide)	n/a	n/a			n/a			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dilodged boulders or logs.	n/a	n/a			n/a			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	n/a	n/a			n/a			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	n/a	n/a			n/a			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	n/a	n/a			n/a			

Table 5e. Visual Stream Morphology Stability Assessment Table
Byrds Creek Mitigation Site (NCEEP Project No.95020)
SB1 (1,009 LF)
Monitoring Year 1

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	17	17			100%			
	3. Meander Pool Condition	Depth Sufficient	14	14			100%			
		Lenth Appropriate	14	14			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	14	14			100%			
		Thalweg centering at downstream of meander bend (Glide)	14	14			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dilodged boulders or logs.	n/a	n/a			n/a			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	n/a	n/a			n/a			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	n/a	n/a			n/a			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	n/a	n/a			n/a			

Table 5f. Visual Stream Morphology Stability Assessment Table
Byrds Creek Mitigation Site (NCEEP Project No.95020)
SE1 (485 LF)
Monitoring Year 1

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	12	12			n/a			
	3. Meander Pool Condition	Depth Sufficient	7	7			n/a			
		Lenth Appropriate	7	7			n/a			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	7	7			n/a			
		Thalweg centering at downstream of meander bend (Glide)	7	7			n/a			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dilodged boulders or logs.	11	11			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	11	11			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	11	11			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	11	11			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	n/a	n/a			n/a			

Table 5g. Visual Stream Morphology Stability Assessment Table
Byrds Creek Mitigation Site (NCEEP Project No.95020)
SE2a (536 LF)
Monitoring Year 1

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	12	12			100%			
	3. Meander Pool Condition	Depth Sufficient	8	8			100%			
		Lenth Appropriate	8	8			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	8	8			100%			
		Thalweg centering at downstream of meander bend (Glide)	8	8			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dilodged boulders or logs.	9	9			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	6	6			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	6	6			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	9	9			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	3	3			100%			

Table 5h. Visual Stream Morphology Stability Assessment Table
Byrds Creek Mitigation Site (NCEEP Project No.95020)
SE2b (195 LF)
Monitoring Year 1

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	4	4			100%			
	3. Meander Pool Condition	Depth Sufficient	3	3			100%			
		Lenth Appropriate	3	3			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	3	3			100%			
		Thalweg centering at downstream of meander bend (Glide)	3	3			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dilodged boulders or logs.	3	3			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	3	3			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	3	3			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	n/a	n/a			n/a			

Table 5i. Visual Stream Morphology Stability Assessment Table
Byrds Creek Mitigation Site (NCEEP Project No.95020)
Wb1 (611 LF)
Monitoring Year 1

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	n/a	n/a			n/a			
	3. Meander Pool Condition	Depth Sufficient	n/a	n/a			n/a			
		Lenth Appropriate	n/a	n/a			n/a			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	n/a	n/a			n/a			
		Thalweg centering at downstream of meander bend (Glide)	n/a	n/a			n/a			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dilodged boulders or logs.	n/a	n/a			n/a			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	n/a	n/a			n/a			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	n/a	n/a			n/a			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	n/a	n/a			n/a			

Table 6. Vegetation Condition Assessment Table
Byrds Creek Mitigation Site (EEP Project No. 95020)
Monitoring Year 1

Planted Acreage **38**

Vegetation Category	Definitions	Mapping Threshold (Ac)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	0	0	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1	0	0.0	0.0%
		Total	**0**	**0.0**	**0.0%**
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 Ac	0	0	0%
		Cumulative Total	**0**	**0.0**	**0%**

Easement Acreage **38**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Planted Acreage
Invasive Areas of Concern	Areas of points (if too small to render as polygons at map scale).	1,000	1	0.29	0.8%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	0	0	0%

Stream Photographs

	
Photo Point 1 – looking upstream (04/28/2014)	Photo Point 1 – looking downstream (04/28/2014)
	
Photo Point 2 – looking upstream (04/28/2014)	Photo Point 2 – looking downstream (04/28/2014)
	
Photo Point 3 – looking upstream (04/28/2014)	Photo Point 3 – looking downstream (04/28/2014)

	
Photo Point 4 – looking upstream (04/28/2014)	Photo Point 4 – looking downstream (04/28/2014)
	
Photo Point 5 – looking upstream (04/28/2014)	Photo Point 5 – looking downstream (04/28/2014)
	
Photo Point 6 – looking upstream (04/28/2014)	Photo Point 6 – looking downstream (04/28/2014)

	
Photo Point 7 – looking upstream (04/28/2014)	Photo Point 7 – looking downstream (04/28/2014)
	
Photo Point 8 – looking upstream (04/28/2014)	Photo Point 8 – looking downstream (04/28/2014)
	
Photo Point 9 – looking upstream (04/28/2014)	Photo Point 9 – looking downstream (04/28/2014)

Photo Point 10 – looking upstream (04/28/2014)

Photo Point 10 – looking downstream (04/28/2014)

Photo Point 11 – looking upstream (04/28/2014)

Photo Point 11 – looking downstream (04/28/2014)

Representative Photos of Matting Repairs and Seeding

Photo Point 12 – looking upstream (04/28/2014)

Photo Point 12 – looking downstream (04/28/2014)

Photo Point 13 – looking upstream (04/28/2014)

Photo Point 13 – looking downstream (04/28/2014)

Photo Point 14 – looking upstream (04/28/2014)

Photo Point 14 – looking downstream (04/28/2014)

Photo Point 15 – looking upstream (04/28/2014)

Photo Point 15 – looking downstream (04/28/2014)

Photo Point 16 – looking upstream (04/28/2014)

Photo Point 16 – looking downstream (04/28/2014)

Photo Point 19 – looking downstream (08/04/2014)

	
Photo Point 20 – looking upstream (04/28/2014)	Photo Point 20 – looking downstream (04/28/2014)
	
Photo Point 21 – looking upstream (04/28/2014)	Photo Point 21 – looking downstream (04/28/2014)
	
Photo Point 22 – looking upstream (04/28/2014)	Photo Point 22 – looking downstream (04/28/2014)

	
Photo Point 23 – looking upstream (04/28/2014)	Photo Point 23 – looking downstream (04/28/2014)
	
Photo Point 24 – looking upstream (04/28/2014)	Photo Point 24 – looking downstream (04/28/2014)
	
Photo Point 25 – looking upstream (04/28/2014)	Photo Point 25 – looking downstream (04/28/2014)

	
Photo Point 26 – looking upstream (04/28/2014)	Photo Point 26 – looking downstream (04/28/2014)
	
Photo Point 27 – looking upstream (04/28/2014)	Photo Point 27 – looking downstream (04/28/2014)
	
Photo Point 28 – looking upstream (04/28/2014)	Photo Point 28 – looking downstream (04/28/2014)

	
Photo Point 29 – looking upstream (04/28/2014)	Photo Point 29 – looking downstream (04/28/2014)
	
Photo Point 30 – looking upstream (04/28/2014)	Photo Point 30 – looking downstream (04/28/2014)
	
Photo Point 31 – looking upstream (04/28/2014)	Photo Point 31 – looking downstream (04/28/2014)

	
Photo Point 32 – looking upstream (04/28/2014)	Photo Point 32 – looking downstream (04/28/2014)
	
Photo Point 33 – looking upstream (04/28/2014)	Photo Point 33 – looking downstream (04/28/2014)
	
Photo Point 34 – looking upstream (04/28/2014)	Photo Point 34 – looking downstream (04/28/2014)

	
Photo Point 35 – looking upstream (04/28/2014)	Photo Point 35 – looking downstream (04/28/2014)
	
Photo Point 36 – looking upstream (04/28/2014)	Photo Point 36 – looking downstream (04/28/2014)

Vegetation Photographs

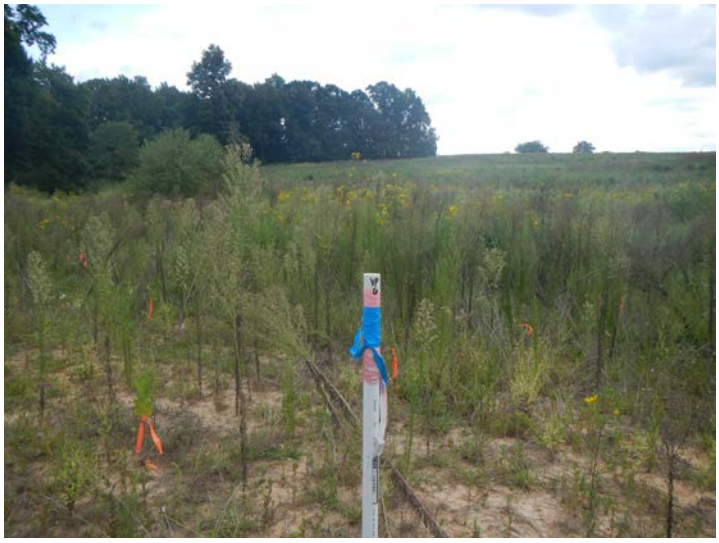
Vegetation Plot 1 (09/04/2014)

Vegetation Plot *2* (09/04/2014)

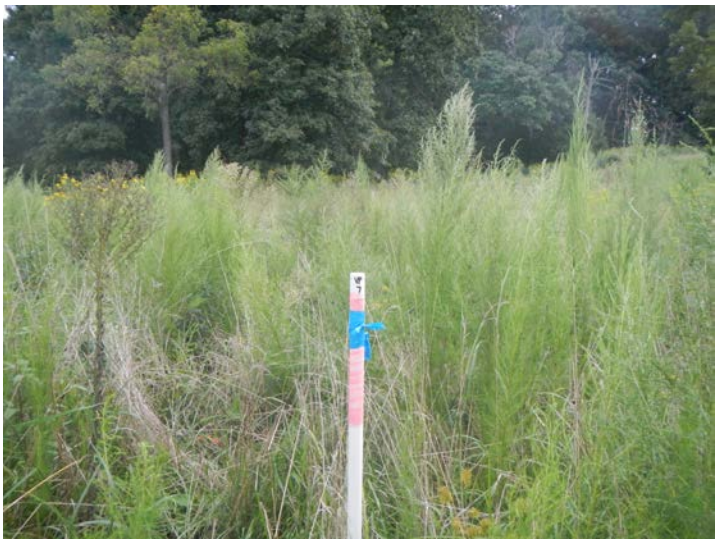
Vegetation Plot 3 (09/04/2014)

Vegetation Plot 4 (09/04/2014)

Vegetation Plot 5 (09/04/2014)



Vegetation Plot 6 (09/04/2014)



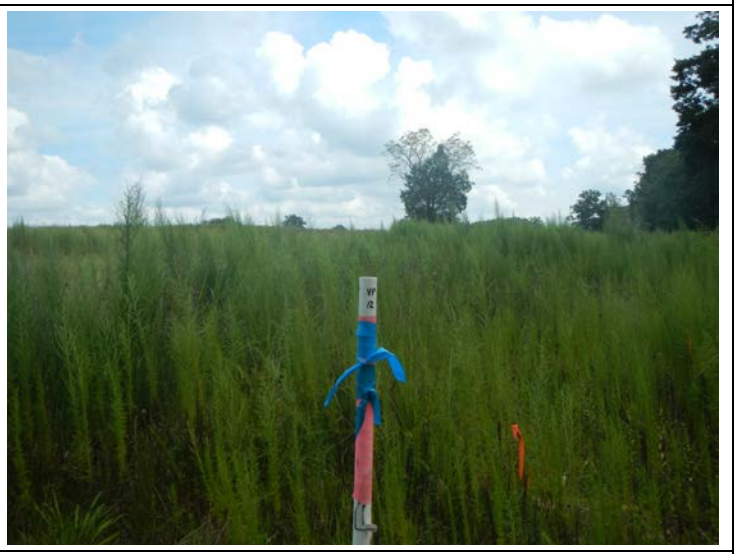
Vegetation Plot 7 (09/04/2014)

Vegetation Plot 8 (09/04/2014)

Vegetation Plot 9 (09/04/2014)

Vegetation Plot 10 (09/04/2014)

Vegetation Plot 11 (09/04/2014)



Vegetation Plot 12 (09/04/2014)

	
Vegetation Plot 13 (09/04/2014)	Vegetation Plot 14 (09/04/2014)

APPENDIX 3. Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
Monitoring Year 1

Plot	MY1 Success Criteria Met (Y/N)	Tract Mean
1	Y	100%
2	Y	
3	Y	
4	Y	
5	Y	
6	Y	
7	Y	
8	Y	
9	Y	
10	Y	
11	Y	
12	Y	
13	Y	
14	Y	

Table 8. CVS Vegetation Tables - Metadata
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
Monitoring Year 1

Database name	Byrds Creek MY1 cvs-eep-entrytool-v2.3.1.mdb
Database location	T:\ACTIVE PROJECTS (NC)\005-02128 Byrds Creek Mitigation Site\Monitoring\Monitoring Year 1\Vegetation Assessment
Computer name	WIN-PC
File size	52690944
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	95020
project Name	Byrds Creek Mitigation Site
Description	Stream Mitigation Site
River Basin	Neuse
Sampled Plots	14

Table 9. Planted and Total Stem Counts
Byrds Creek Mitigation Site (NCEEP Project Code 95020)
Monitoring Year 1

			Current Plot Data (MY1 - 9/2014)														
			95020-01-0001			95020-01-0002			95020-01-0003			95020-01-0004			95020-01-0005		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Betula nigra	river birch	Tree	3	3	3	1	1	1	2	2	2				2	2	2
Carpinus caroliniana	American hornbeam	Tree															
Cercis canadensis	eastern redbud	Tree	1	1	1												
Fraxinus pennsylvanica	green ash	Tree	3	3	3	8	8	8	9	9	9	13	13	13	1	1	1
Liriodendron tulipifera	tuliptree	Tree	2	2	2	4	4	4	2	2	2	1	1	1	5	5	5
Platanus occidentalis	American sycamore	Tree	2	2	2	1	1	1	1	1	1				8	8	8
Quercus michauxii	swamp chestnut oak	Tree	1	1	1										1	1	1
Quercus phellos	willow oak	Tree	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1
Quercus rubra	northern red oak	Tree	2	2	2	1	1	1									
		Stem count	15	15	15	17	17	17	15	15	15	15	15	15	18	18	18
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02		
		Species count	8	8	8	6	6	6	5	5	5	3	3	3	6	6	6
		Stems per ACRE	607	607	607	688	688	688	607	607	607	607	607	607	728	728	728

Color Coding for Table

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

PnoLS: Number of Planted stems excluding live stakes

P-all: Number of planted stems including live stakes,

T: Total Stems

Table 9. Planted and Total Stem Counts
Byrds Creek Mitigation Site (NCEEP Project Code 95020)
Monitoring Year 1

			Current Plot Data (MY1 - 9/2014)														
			95020-01-0006			95020-01-0007			95020-01-0008			95020-01-0009			95020-01-0010		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Betula nigra	river birch	Tree	2	2	2	1	1	1	3	3	3	2	2	2	2	2	2
Carpinus caroliniana	American hornbeam	Tree	1	1	1				1	1	1						
Cercis canadensis	eastern redbud	Tree	1	1	1	2	2	2	1	1	1	2	2	2			
Fraxinus pennsylvanica	green ash	Tree	4	4	4	1	1	1	1	1	1	4	4	4	11	11	11
Liriodendron tulipifera	tuliptree	Tree	3	3	3	2	2	2	2	2	2	6	6	6	2	2	2
Platanus occidentalis	American sycamore	Tree	3	3	3	4	4	4	3	3	3				1	1	1
Quercus michauxii	swamp chestnut oak	Tree	2	2	2	1	1	1	2	2	2						
Quercus phellos	willow oak	Tree							3	3	3	2	2	2			
Quercus rubra	northern red oak	Tree	1	1	1	1	1	1	1	1	1				1	1	1
		Stem count	17	17	17	12	12	12	17	17	17	16	16	16	17	17	17
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02		
		Species count	8	8	8	7	7	7	9	9	9	5	5	5	5	5	5
		Stems per ACRE	688	688	688	486	486	486	688	688	688	647	647	647	688	688	688

Color Coding for Table

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

PnoLS: Number of Planted stems excluding live stakes

P-all: Number of planted stems including live stakes,

T: Total Stems

Table 9. Planted and Total Stem Counts
Byrds Creek Mitigation Site (NCEEP Project Code 95020)
Monitoring Year 1

			Current Plot Data (MY1 - 9/2014)												Annual Means					
			95020-01-0011			95020-01-0012			95020-01-0013			95020-01-0014			MY1 (9/2014)			MY0 (1/2014)		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Betula nigra	river birch	Tree	2	2	2	2	2	2	4	4	4	3	3	3	29	29	29	41	41	41
Carpinus caroliniana	American hornbeam	Tree										1	1	1	3	3	3	12	12	12
Cercis canadensis	eastern redbud	Tree				1	1	1							8	8	8			
Fraxinus pennsylvanica	green ash	Tree	5	5	5	2	2	2	4	4	4	7	7	7	73	73	73	72	72	72
Liriodendron tulipifera	tuliptree	Tree	4	4	4	2	2	2	2	2	2	3	3	3	40	40	40	49	49	49
Platanus occidentalis	American sycamore	Tree				4	4	4	4	4	4				31	31	31	32	32	32
Quercus michauxii	swamp chestnut oak	Tree	3	3	3	1	1	1	1	1	1	1	1	1	13	13	13	19	19	19
Quercus phellos	willow oak	Tree	2	2	2	2	2	2	3	3	3	2	2	2	20	20	20	13	13	13
Quercus rubra	northern red oak	Tree				1	1	1				1	1	1	9	9	9	16	16	16
		Stem count	16	16	16	15	15	15	18	18	18	18	18	18	226	226	226	254	254	254
		size (ares)		1			1			1			1			42			42	
		size (ACRES)		0.02			0.02			0.02			0.02			0.35			0.35	
		Species count	5	5	5	8	8	8	6	6	6	7	7	7	9	9	9	8	8	8
		Stems per ACRE	647	647	647	607	607	607	728	728	728	728	728	728	653	653	653	734	734	734

Color Coding for Table

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

PnoLS: Number of Planted stems excluding live stakes

P-all: Number of planted stems including live stakes,

T: Total Stems

APPENDIX 4. Morphological Summary Data and Plots

Table 10a. Baseline Stream Data Summary
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
Monitoring Year 1

Parameter	Gage	Pre-Restoration Condition				Reference Reach Data								Design				As-Built/Baseline			
		BC2		BC3		Spencer Creek Downstream		UT Cane Creek[1]		UT Richland Creek Upstream[2]		UT Rocky Branch[2]		BC2		BC3		BC2		BC3	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																					
Bankfull Width (ft)		19.0	26.1	27.4	35.9	10.7	11.2	11.5	12.3	8.8	10.4	12.2		33.2	38.3	25.0		28.9	42.7	20.4	36.9
Floodprone Width (ft)		145	231	116	124	60.0	114+	31.0		27.6	31.4	72.0		156	160	95	350	150+	150+	150+	150+
Bankfull Mean Depth		2.2	3.4	1.9	2.3	1.6	1.8	0.8	1.0	0.8	0.9	1.3		1.6	1.9	1.8		1.6	2.1	1.0	1.4
Bankfull Max Depth		3.8	4.4	2.6	3.4	2.1	2.6	1.2	1.6	1.1	1.3	1.8		2.8	3.2	2.8		2.9	3.4	2.1	3.0
Bankfull Cross-sectional Area (ft^2)	n/a	58.4	64.5	62.5	66.7	17.8	19.7	8.9	12.2	7.8	8.5	16.3		59.8	61.5	45.3		56.2	88.7	28.8	37.4
Width/Depth Ratio		5.6	11.7	9.3	19.3	5.8	7.1	12.3	14.4	10.0	12.8	9.1		18.0	24.5	13.8		14.8	22.2	14.5	36.5
Entrenchment Ratio		5.5	12.1	3.2	5.5	5.5	10.2	>2.5		2.5	4.0	6.0		4.1	4.8	3.8	14.0	3.5+	5.2+	4.7+	7.4+
Bank Height Ratio		1.0	1.0	1.0	1.3	1.0		---		1.4	2.1	1.0		1.0		1.0		1.0	1.0	1.0	1.0
D50 (mm)		0.41		22.6														12.5	26.4	29.3	45.0
Profile																					
Riffle Length (ft)						---		---		---		---		---		---		13	59	12	57
Riffle Slope (ft/ft)		0.0074	0.0075	0.0043	0.0133	0.0130		0.0188	0.0704	0.0210	0.0450	0.0606	0.0892	0.0029	0.0052	0.0076	0.0134	0.0036	0.0097	0.0022	0.0190
Pool Length (ft)	n/a					---		---		---		---		---		---		34	179	46	129
Pool Max Depth (ft)		---	---	---	---	---		---		---		---		---		---		1.21	2.58	0.97	2.43
Pool Spacing (ft)^		54	103	70	124	71.0		27	73	N/A		26	81	102	211	60	141	84	278	73	129
Pool Volume (ft^3)																					
Pattern																					
Channel Beltwidth (ft)		N/A		N/A		38	41	102		N/A		N/A		---		52	116	26	57	31	62
Radius of Curvature (ft)		N/A		N/A		11	15	23	38	N/A		N/A		---		50	80	19	79	44	84
Rc:Bankfull Width (ft/ft)	n/a	---		---		1.0	1.3	2.0	3.1	N/A		N/A		---		2.0	3.2	0.7	1.9	2.2	2.3
Meander Length (ft)		N/A		N/A		46	48	45	81	N/A		N/A		---		177	263	279	603	190	255
Meander Width Ratio		---		---		3.6	3.7	3.9	6.6	N/A		N/A		---		2.1	4.6	0.9	1.3	1.5	1.7
Substrate, Bed and Transport Parameters																					
Ri%/Ru%/P%/G%/S%																					
SC%/Sa%/G%/C%/B%/Be%																					
d16/d35/d50/d84/d95/d100	n/a	SC/0.19/0.41/116/232/>2048		SC/0.41/22.6/143.4/2048/>2048		---		---		---		---						SC/SC/SC/55/128/362		SC/SC/SC/107.3/362/>2048	
Reach Shear Stress (Competency) lb/ft^2		---		---										---		0.69	1.71	N/A		0.31	0.23
Max part size (mm) mobilized at bankfull																					
Stream Power (Capacity) W/m^2																					
Additional Reach Parameters																					
Drainage Area (SM)		4.12		4.22		0.96		0.29		0.28		1.10		4.12		4.22		4.12		4.22	
Watershed Impervious Cover Estimate (%)		1%		<1%		---		---		---		---		1%		<1%		1%		<1%	
Rosgen Classification		C5/E5		C4/E4		E4		C4/E4		C4/E4		E4b		C4		C4		C4		C4	
Bankfull Velocity (fps)		2.7	3.0	2.5	2.5	4.9	5.4	3.8		3.5	4.1	5.5		3.0	3.3	4.6		3.6		7.3	
Bankfull Discharge (cfs)		---		---		97		40		29.1	32.0	85.0		~200		210		200		210	
Q-NFF regression		---		---																	
Q-USGS extrapolation	n/a	---		---																	
Q-Mannings		---		---																	
Valley Length (ft)		---		---		---		---		---		---		---		---					
Channel Thalweg Length (ft)		1,630		1,368		---		---		---		---		1,630		1,402		1,646		1,407	
Sinuosity (ft^3)		1.18		1.01		1.30		1.40		1.00		1.10		---		1.11		1.18		1.06	
Water Surface Slope (ft/ft^2)		---		---		---		---		---		---		---		0.0039		0.0016		0.0043	
Bankfull Slope (ft/ft)		---		---		---		---		---		---		---		0.0046		0.0013		0.0042	

(---): Data was not provided
N/A: Not Applicable

[1]UT Cane Creek reference reach data only utilized for pattern and a reference point in the project specific regional curve.

[2]Data only utilized as a reference point on the the project-specific drainage area-discharge curve.

[3]Existing condition sinuosity based on valley length/channel length given no flow and therefore no water sureface shots at time of survey.

Table 10b. Baseline Stream Data Summary
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
Monitoring Year 1

Parameter	Gage	Pre-Restoration Condition				Reference Reach Data										Design				As-Built/Baseline			
		SB1		SE1		Spencer Creek Upstream		UT Richland Creek Downstream		UT Cane Creek[1]		UT Richland Creek Upstream[2]		UT Rocky Branch[2]		SB1		SE1		SB1		SE1	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																							
Bankfull Width (ft)		7.4	7.9	7.7		8.7		13.3	15.2	11.5	12.3	8.8	10.4	12.2		10.0		8.0		9.3		19.0	
Floodprone Width (ft)		96.0	98.0	9.5		229.0		>50		31.0		27.6	31.4	72.0		70.0	375.0	30	100	>100		>75	
Bankfull Mean Depth		1.0	1.2	0.8		1.2		1.1	1.3	0.8	1.0	0.8	0.9	1.3		1.0		0.7		0.7		0.5	
Bankfull Max Depth		2.3	2.4	1.0		1.9		1.8	2.1	1.2	1.6	1.1	1.3	1.8		1.3		1.0		1.4		1.5	
Bankfull Cross-sectional Area (ft^2)	n/a	8.0	8.7	6.2		10.6		16.5	17.5	8.9	12.2	7.8	8.5	16.3		9.6		5.7		6.5		9.6	
Width/Depth Ratio		6.2	7.8	9.6		7.3		10.1	13.9	12.3	14.4	10.0	12.8	9.1		10.4		11.2		13.4		37.7	
Entrenchment Ratio		12.4	13.1	1.2		26.3		>2.5		>2.5		2.5	4.0	6.0		7.0	37.5	3.8	12.5	>2.2		>2.2	
Bank Height Ratio		1.0		3.7		1.0		1.4	2.1	---		1.4	2.1	1.0		1.0		1.0		1.0		1.0	
D50 (mm)		1.0		0.09																56.1		28.5	
Profile																							
Riffle Length (ft)						---		---		---		---		---		---		---		8	46	10	28
Riffle Slope (ft/ft)		0.0176	0.0349	0.0247	0.0490	0.0188	0.0704	0.0183	0.0355	0.0188	0.0704	0.0210	0.0450	0.0606	0.0892	0.0052	0.0199	0.0220	0.0410	0.0021	0.0178	0.0023	0.0527
Pool Length (ft)	n/a					---		---		---		---		---		---		---		20	64	7	45
Pool Max Depth (ft)		---	---	---	---	---		---		---		---		---		---		---		0.4	2.2	0.9	2.3
Pool Spacing (ft)^		30	62	35	90	13	47	33	93	27	73	N/A		26	81	34	85	21	53	36	116	26	58
Pool Volume (ft^3)																							
Pattern																							
Channel Beltwidth (ft)		N/A		N/A		24	52	NA		102		N/A		N/A		25	48	16	39	14	35	10	27
Radius of Curvature (ft)		N/A		N/A		5.4	22.1	NA		23	38	N/A		N/A		20	35	18	26	17	32	14	30
Rc:Bankfull Width (ft/ft)	n/a	---		---		0.6	2.5	NA		2.0	3.1	N/A		N/A		2.0	3.5	2.3	3.3	1.8	3.4	0.7	1.6
Meander Length (ft)		N/A		N/A		54	196	NA		45	81	N/A		N/A		76	120	47	93	78	127	65	74
Meander Width Ratio		---		---		2.8	6	NA		3.9	6.6	N/A		N/A		7.6	12.0	5.9	11.6	8.4	13.6	3.4	3.9
Substrate, Bed and Transport Parameters																							
Ri%/Ru%/P%/G%/S%																							
SC%/Sa%/G%/C%/B%/Be%																							
d16/d35/d50/d84/d95/d100	n/a	SC/SC/1.0/45/107.33/180		SC/SC/0.09/26.23/50.61/180		---		---		---		---		---						SC/SC/SC/103.6/256/362		SC/SC/SC/68.1/180/362	
Reach Shear Stress (Competency) lb/ft		---		---												0.28	0.98	0.94	1.34	0.23		0.37	
Max part size (mm) mobilized at bankfull																							
Stream Power (Capacity) W/m																							
Additional Reach Parameters																							
Drainage Area (SM)		0.25		0.09		0.50		0.97		0.29		0.28		1.10		0.25		0.09		0.25		0.09	
Watershed Impervious Cover Estimate (%)		<1%		1%		---		---		---		---		---		<1%		1%		<1%		1%	
Rosgen Classification		E5		E6/G6		E4		C4/E4		C4/E4		C4/E4		E4b		E4		E4		C3		C4	
Bankfull Velocity (fps)		3.7		2.8		---		4.2	4.5	3.8		3.5	4.1	5.5		3.1		3.5		4.6		2.1	
Bankfull Discharge (cfs)		---		---		---		68.9	78.6	40		29.1	32.0	85.0		30		20		30		20	
Q-NFF regression		---		---																			
Q-USGS extrapolation	n/a	---		---																			
Q-Mannings		---		---																			
Valley Length (ft)		---		---		---		---		---		---		---		---		---					
Channel Thalweg Length (ft)		976		916		---		---		---		---		---		971		792		1,009		485	
Sinuosity (ft^3)		1.03		1.31		1.40		1.10		1.40		1.00		1.10		---		1.13		1.06		1.18	
Water Surface Slope (ft/ft)		---		---		---		---		---		---		---		0.0068		0.0161		0.0070		0.0138	
Bankfull Slope (ft/ft)		---		---		---		---		---		---		---		0.0075		0.0182		0.0068		0.0136	

(---): Data was not provided
N/A: Not Applicable
[1]UT Cane Creek reference reach data only utilized for pattern and a reference point in the project specific regional curve.
[2]Data only utilized as a reference point on the the project-specific drainage area-discharge curve.
[3]Existing condition sinuosity based on valley length/channel length given no flow and therefore no water sureface shots at time of survey.

Table 10c. Baseline Stream Data Summary
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
Monitoring Year 1

Parameter	Gage	Pre-Restoration Condition		Reference Reach Data										Design		Design		As-Built/Baseline		As-Built/Baseline	
		SE2		Spencer Creek Upstream		UT Richland Creek Downstream		UT Cane Creek[1]		UT Richland Creek Upstream[2]		UT Rocky Branch[2]		SE2a		SE2b		SE2a		SE2b	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																					
Bankfull Width (ft)	n/a	7.2	7.4	8.7		13.3	15.2	11.5	12.3	8.8	10.4	12.2		11.7	15.0	9.0		10.6			
Floodprone Width (ft)		8.0	9.8	229.0		>50		31.0		27.6	31.4	72.0		114.7	120.1	140.0	310.0	>100			
Bankfull Mean Depth		1.3	1.4	1.2		1.1	1.3	0.8	1.0	0.8	0.9	1.3		0.7	0.9	0.7		0.6			
Bankfull Max Depth		1.6	1.9	1.9		1.8	2.1	1.2	1.6	1.1	1.3	1.8		0.9	1.0	1.0		1.2			
Bankfull Cross-sectional Area (ft^2)		8.9	9.4	10.6		16.5	17.5	8.9	12.2	7.8	8.5	16.3		10.2	10.5	6.5		6.8			
Width/Depth Ratio		5.8	7.3	7.3		10.1	13.9	12.3	14.4	10.0	12.8	9.1		13.5	21.3	12.5		16.5			
Entrenchment Ratio		1.6	6.2	26.3		>2.5		>2.5		2.5	4.0	6.0		7.7	10.3	15.6	34.4	>2.2			
Bank Height Ratio		1.5	2.1	1.0		1.4	2.1	---		1.4	2.1	1.0		1.0		1.0		1.0			
D50 (mm)		0.04																37.2			
Profile																					
Riffle Length (ft)	n/a			---		---		---		---		---		---		---		4	20	11	36
Riffle Slope (ft/ft)		0.0047	0.0147	0.0188	0.0704	0.0183	0.0355	0.0188	0.0704	0.0210	0.0450	0.0606	0.0892	0.0122	0.0367	0.0202		0.0145	0.0454	0.0119	0.0606
Pool Length (ft)				---		---		---		---		---		---		---		21	53	27	45
Pool Max Depth (ft)		---	---	---		---		---		---		---		---		---		1.3	2.6	0.89	2.23
Pool Spacing (ft)^		17	122	13	47	33	93	27	73	N/A		26	81	27	55	43	49	25	54	34	73
Pool Volume (ft^3)																					
Pattern																					
Channel Beltwidth (ft)	n/a	N/A		24	52	NA		102		N/A		N/A		N/A		27		3	22	12	22
Radius of Curvature (ft)		N/A		5.4	22.1	NA		23	38	N/A		N/A		N/A		22	30	7	58	21	25
Rc:Bankfull Width (ft/ft)		---		0.6	2.5	NA		2.0	3.1	N/A		N/A		N/A		2.4	3.3	0.7	5.5	N/A	
Meander Length (ft)		N/A		54	196	NA		45	81	N/A		N/A		N/A		82.0		43	80	88	88
Meander Width Ratio		---		2.8	6	NA		3.9	6.6	N/A		N/A		N/A		3.0		4.1	7.5	N/A	
Substrate, Bed and Transport Parameters																					
Ri%/Ru%/P%/G%/S%	n/a																				
SC%/Sa%/G%/C%/B%/Be%																					
d16/d35/d50/d84/d95/d100		SC/0.02/0.04/0.05/33.2/79.6		---		---		---		---		---						SC/SC/SC/70.9/256/362		SC/SC/SC/70.9/256/362	
Reach Shear Stress (Competency) lb/ft		---												0.93	1.14	0.93	1.14	0.47		N/A	
Max part size (mm) mobilized at bankfull																					
Stream Power (Capacity) W/m																					
Additional Reach Parameters																					
Drainage Area (SM)		0.09		0.50		0.97		0.29		0.28		1.10		0.09		0.10		0.09		0.10	
Watershed Impervious Cover Estimate (%)		1%		---		---		---		---		---		*1%*		*1%*		*1%*		*1%*	
Rosgen Classification		E6/G6		E4		C4/E4		C4/E4		C4/E4		E4b		C4		C4		C4		C4	
Bankfull Velocity (fps)		2.9	3.4	---		4.2	4.5	3.8		3.5	4.1	5.5		3.0	3.3	3.1		4.4		N/A	
Bankfull Discharge (cfs)		---		---		68.9	78.6	40		29.1	32.0	85.0		~30		20		30		N/A	
Q-NFF regression		---																			
Q-USGS extrapolation	n/a	---																			
Q-Mannings		---																			
Valley Length (ft)		---		---		---		---		---		---		---		---					
Channel Thalweg Length (ft)		524		---		---		---		---		---		533		180		536		195	
Sinuosity (ft)[3]		1.17		1.40		1.10		1.40		1.00		1.10		---		1.21		1.11		1.23	
Water Surface Slope (ft/ft)		---		---		---		---		---		---		---		0.0101		0.0144		0.0160	
Bankfull Slope (ft/ft)		---		---		---		---		---		---		---		0.0122		0.0146		0.0168	

(---): Data was not provided
N/A: Not Applicable
[1]UT Cane Creek reference reach data only utilized for pattern and a reference point in the project specific regional curve.
[2]Data only utilized as a reference point on the the project-specific drainage area-discharge curve.
[3]Existing condition sinuosity based on valley length/channel length given no flow and therefore no water sureface shots at time of survey.

Table 11. Baseline Stream Data Summary
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
Monitoring Year 1

	BC2																											
	Cross-Section 1 (Riffle)						Cross-Section 2 (Pool)						Cross-Section 3 (Riffle)						Cross-Section 4 (Riffle)						Cross-Section 5 (Pool)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation																												
Bankfull Width (ft)	36.4	36.6					42.2	42.1					28.9	24.7					42.7	36.0					34.8	34.3				
Floodprone Width (ft)	>150	>150					N/A	N/A					>150	>150					>150	>150					N/A	N/A				
Bankfull Mean Depth (ft)	1.6	1.4					1.9	1.9					1.9	2.1					2.1	2.2					2.4	2.3				
Bankfull Max Depth (ft)	2.9	2.7					4.6	4.5					3.4	3.2					3.2	3.2					3.7	4.3				
Bankfull Cross-Sectional Area (ft^2)	59.8	51.1					80.3	79.9					56.2	51.6					88.7	78.3					84.3	80.2				
Bankfull Width/Depth Ratio	22.2	26.2					22.1	22.2					14.8	11.8					20.6	16.6					14.3	14.7				
Bankfull Entrenchment Ratio	>2.2	>2.2					N/A	N/A					>2.2	>2.2					>2.2	>2.2					N/A	N/A				
Bankfull Bank Height Ratio	1.0	1.0					1.0	1.0					1.0	1.0					1.0	1.0					1.0	1.0				
	BC3																								SB1					
	Cross-Section 6 (Pool)						Cross-Section 7 (Riffle)						Cross-Section 8 (Riffle)						Cross-Section 9 (Pool)						Cross-Section 10 (Riffle)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation																												
Bankfull Width (ft)	34.7	49.0					20.4	22.6					36.9	45.0					34.2	33.6					9.3	8.8				
Floodprone Width (ft)	N/A	N/A					>150	>150					>150	>150					N/A	N/A					>100	>100				
Bankfull Mean Depth (ft)	1.4	1.0					1.4	1.4					1.0	1.2					2.0	2.0					0.7	0.7				
Bankfull Max Depth (ft)	3.2	3.0					2.1	2.2					3.0	2.8					3.9	3.8					1.4	1.3				
Bankfull Cross-Sectional Area (ft^2)	47.7	50.2					28.8	31.0					37.4	54.1					69.6	66.5					6.5	6.4				
Bankfull Width/Depth Ratio	25.3	47.7					14.5	16.5					36.5	37.5					16.8	17.0					13.4	12.2				
Bankfull Entrenchment Ratio	N/A	N/A					>2.2	>2.2					>2.2	>2.2					N/A	N/A					>2.2	>2.2				
Bankfull Bank Height Ratio	1.0	1.0					1.0	1.0					1.0	1.0					1.3	1.3					1.0	1.0				
	SB1						SE1						SE1						SE2											
	Cross-Section 11 (Pool)						Cross-Section 12 (Riffle)						Cross-Section 13 (Pool)						Cross-Section 14 (Pool)						Cross-Section 15 (Riffle)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation																												
Bankfull Width (ft)	10.2	9.7					19.0	16.8					12.8	8.6					16.7	14.8					10.6	9.7				
Floodprone Width (ft)	N/A	N/A					>75	>75					N/A	N/A					N/A	N/A					>100	>100				
Bankfull Mean Depth (ft)	1.1	1.0					0.5	0.3					1.3	1.1					1.7	1.5					0.6	0.6				
Bankfull Max Depth (ft)	2.0	1.9					1.5	0.9					2.5	2.3					3.5	3.2					1.2	1.0				
Bankfull Cross-Sectional Area (ft^2)	11.6	10.1					9.6	5.2					16.9	9.4					28.0	22.0					6.8	5.8				
Bankfull Width/Depth Ratio	8.9	9.2					37.7	54.9					9.8	7.9					10.0	10.0					16.5	16.4				
Bankfull Entrenchment Ratio	N/A	N/A					>2.2	>2.2					N/A	N/A					N/A	N/A					>2.2	>2.2				
Bankfull Bank Height Ratio	1.0	1.0					1.0	1.0					1.0	1.0					1.0	1.0					1.0	1.0				

Table 12a. Monitoring Data - Stream Reach Data Summary
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
BC2
Monitoring Year 1

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	28.9	42.7	24.7	36.6								
Floodprone Width (ft)	150+	150+	150+	150+								
Bankfull Mean Depth	1.6	2.1	1.4	2.2								
Bankfull Max Depth	2.9	3.4	2.7	3.2								
Bankfull Cross-sectional Area (ft^2)	56.2	88.7	51.1	78.3								
Width/Depth Ratio	14.8	22.2	11.8	26.2								
Entrenchment Ratio	3.5+	5.2+	>2.2	>2.2								
Bank Height Ratio	1.0	1.0	1.0	1.0								
D50 (mm)	12.5	26.4										
Profile												
Riffle Length (ft)	13	59	12	59								
Riffle Slope (ft/ft)	0.0036	0.0097	0.0019	0.0147								
Pool Length (ft)	34	179	34	182								
Pool Max Depth (ft)	3.7	4.6	4.3	4.5								
Pool Spacing (ft)	84	278	80	214								
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	26	57										
Radius of Curvature (ft)	19	79										
Rc:Bankfull Width (ft/ft)	0.7	1.9										
Meander Wave Length (ft)	279	603										
Meander Width Ratio	0.9	1.3										
Additional Reach Parameters												
Rosgen Classification	C4		C4									
Channel Thalweg Length (ft)	1,646		1,646									
Sinuosity (ft)	1.2		1.2									
Water Surface Slope (ft/ft)	0.0016		0.0018									
Bankfull Slope (ft/ft)	0.0013		0.0018									
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.2/0.6/5.6/55/128/362		0.3/1.2/2.9/75.9/122.5/256									
% of Reach with Eroding Banks			0%									

Table 12b. Monitoring Data - Stream Reach Data Summary
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
BC3
Monitoring Year 1

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	20.4	36.9	22.6	45.0								
Floodprone Width (ft)	150+	150+	150+	150+								
Bankfull Mean Depth	1.0	1.4	1.2	1.4								
Bankfull Max Depth	2.1	3.0	2.2	2.8								
Bankfull Cross-sectional Area (ft^2)	28.8	37.4	31.0	54.1								
Width/Depth Ratio	14.5	36.5	16.5	37.5								
Entrenchment Ratio	4.7+	7.4+	>2.2	>2.2								
Bank Height Ratio	1.0	1.0	1.0	1.0								
D50 (mm)	29.3	45.0										
Profile												
Riffle Length (ft)	12	57	26	43								
Riffle Slope (ft/ft)	0.0022	0.0190	0.0065	0.0311								
Pool Length (ft)	46	129	33	134								
Pool Max Depth (ft)	3.2	3.9	3.0	3.8								
Pool Spacing (ft)	73	129	82	190								
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	31	62										
Radius of Curvature (ft)	44	84										
Rc:Bankfull Width (ft/ft)	2.2	2.3										
Meander Wave Length (ft)	190	255										
Meander Width Ratio	1.5	1.7										
Additional Reach Parameters												
Rosgen Classification	C4		C4									
Channel Thalweg Length (ft)	1,407		1,407									
Sinuosity (ft)	1.1		1.1									
Water Surface Slope (ft/ft)	0.0043		0.0045									
Bankfull Slope (ft/ft)	0.0042		0.0047									
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.1/0.6/16/107.3/362/>2048		0.2/9.1/29/82.6/180/362									
% of Reach with Eroding Banks			0%									

Table 12c. Monitoring Data - Stream Reach Data Summary
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SB1
Monitoring Year 1

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	9.3		8.8									
Floodprone Width (ft)	>100		>100									
Bankfull Mean Depth	0.7		0.7									
Bankfull Max Depth	1.4		1.3									
Bankfull Cross-sectional Area (ft^2)	6.5		6.4									
Width/Depth Ratio	13.4		12.2									
Entrenchment Ratio	>2.2		>2.2									
Bank Height Ratio	1.0		1.0									
D50 (mm)	56.1											
Profile												
Riffle Length (ft)	8	46	10	39								
Riffle Slope (ft/ft)	0.0021	0.0178	0.0022	0.0431								
Pool Length (ft)	20	64	22	65								
Pool Max Depth (ft)	2.0		1.9									
Pool Spacing (ft)	36	116	22	87								
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	14	35										
Radius of Curvature (ft)	17	32										
Rc:Bankfull Width (ft/ft)	1.8	3.4										
Meander Wave Length (ft)	78	127										
Meander Width Ratio	8.4	13.6										
Additional Reach Parameters												
Rosgen Classification	C3		C3									
Channel Thalweg Length (ft)	1,009		1,009									
Sinuosity (ft)	1.1		1.1									
Water Surface Slope (ft/ft)	0.0070		0.0065									
Bankfull Slope (ft/ft)	0.0068		0.0062									
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/SC/SC/103.6/256/362		SC/0.2/5.3/71.7/141.1/180									
% of Reach with Eroding Banks			0%									

Table 12d. Monitoring Data - Stream Reach Data Summary
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SE1
Monitoring Year 1

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	19.0		16.8									
Floodprone Width (ft)	>75		>75									
Bankfull Mean Depth	0.5		0.3									
Bankfull Max Depth	1.5		0.9									
Bankfull Cross-sectional Area (ft^2)	9.6		5.2									
Width/Depth Ratio	37.7		54.9									
Entrenchment Ratio	>2.2		>2.2									
Bank Height Ratio	1.0		1.0									
D50 (mm)	28.5											
Profile												
Riffle Length (ft)	10	28	10	28								
Riffle Slope (ft/ft)	0.0023	0.0527	0.0100	0.0390								
Pool Length (ft)	7	45	10	54								
Pool Max Depth (ft)	2.5		2.3									
Pool Spacing (ft)	26	58	18	78								
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	10	27										
Radius of Curvature (ft)	14	30										
Rc:Bankfull Width (ft/ft)	0.7	1.6										
Meander Wave Length (ft)	65	74										
Meander Width Ratio	3.4	3.9										
Additional Reach Parameters												
Rosgen Classification	C4		C4									
Channel Thalweg Length (ft)	485		485									
Sinuosity (ft)	1.2		1.2									
Water Surface Slope (ft/ft)	0.0138		0.0140									
Bankfull Slope (ft/ft)	0.0136		0.0141									
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/0.2/8/68.1/180/362		SC/0.1/4/67.2/151.8/362									
% of Reach with Eroding Banks			0%									

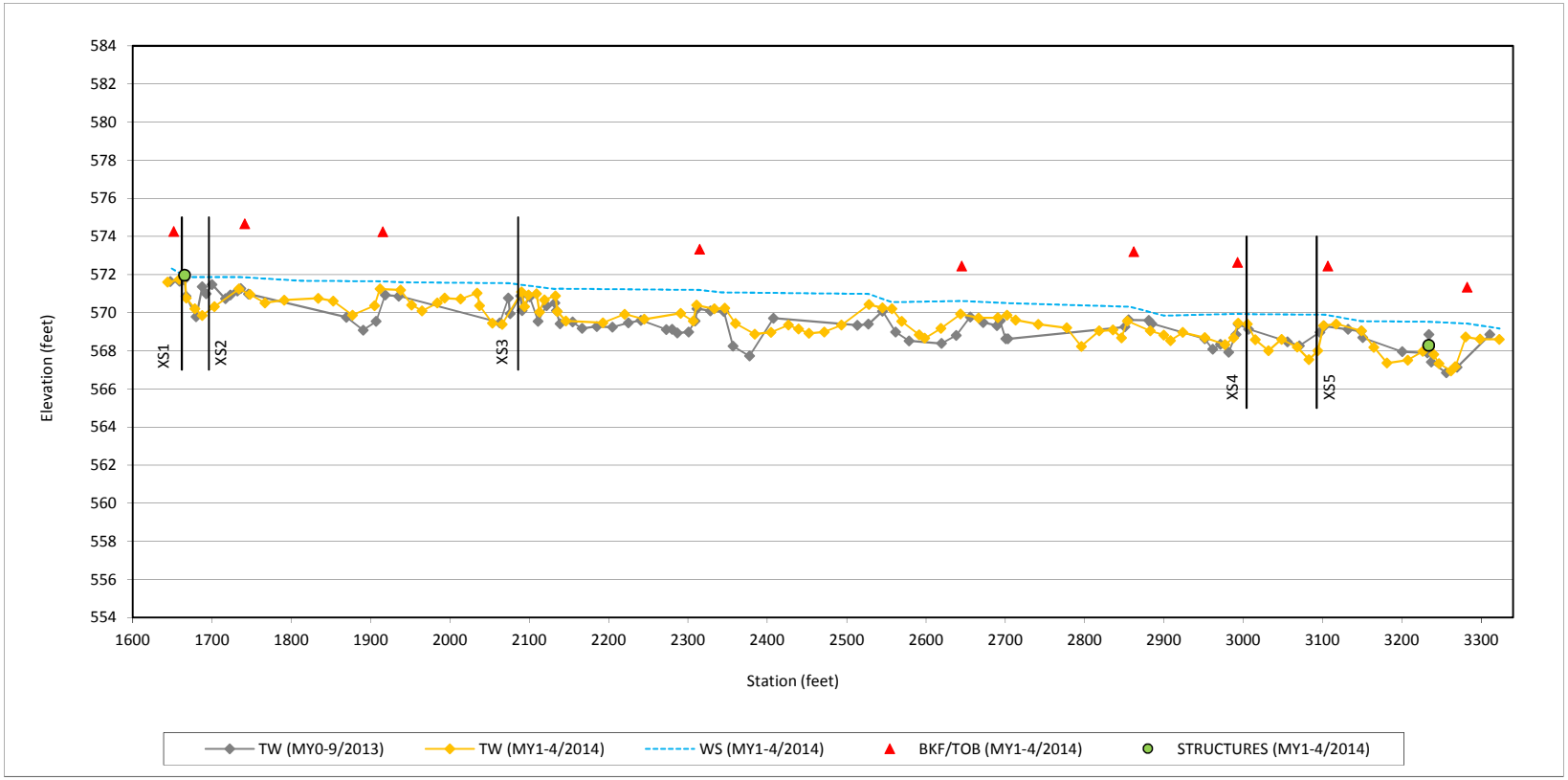
Table 12e. Monitoring Data - Stream Reach Data Summary
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SE2a
Monitoring Year 1

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	10.6		9.7									
Floodprone Width (ft)	>100		>100									
Bankfull Mean Depth	0.6		0.6									
Bankfull Max Depth	1.2		1.0									
Bankfull Cross-sectional Area (ft^2)	6.8		5.8									
Width/Depth Ratio	16.5		16.4									
Entrenchment Ratio	>2.2		>2.2									
Bank Height Ratio	1.0		1.0									
D50 (mm)	37.2											
Profile												
Riffle Length (ft)	4	20	4	26								
Riffle Slope (ft/ft)	0.0145	0.0454	0.0017	0.0845								
Pool Length (ft)	21	53	9	44								
Pool Max Depth (ft)	3.5		3.2									
Pool Spacing (ft)	25	54	16	88								
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	3	22										
Radius of Curvature (ft)	7	58										
Rc:Bankfull Width (ft/ft)	0.7	5.5										
Meander Wave Length (ft)	43	80										
Meander Width Ratio	4.1	7.5										
Additional Reach Parameters												
Rosgen Classification	C4		C4									
Channel Thalweg Length (ft)	536		536									
Sinuosity (ft)	1.1		1.1									
Water Surface Slope (ft/ft)	0.0144		0.0134									
Bankfull Slope (ft/ft)	0.0146		0.0135									
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/0.1/17.1/70.9/256/362		SC/0.1/18/78.1/143.4/362									
% of Reach with Eroding Banks			0%									

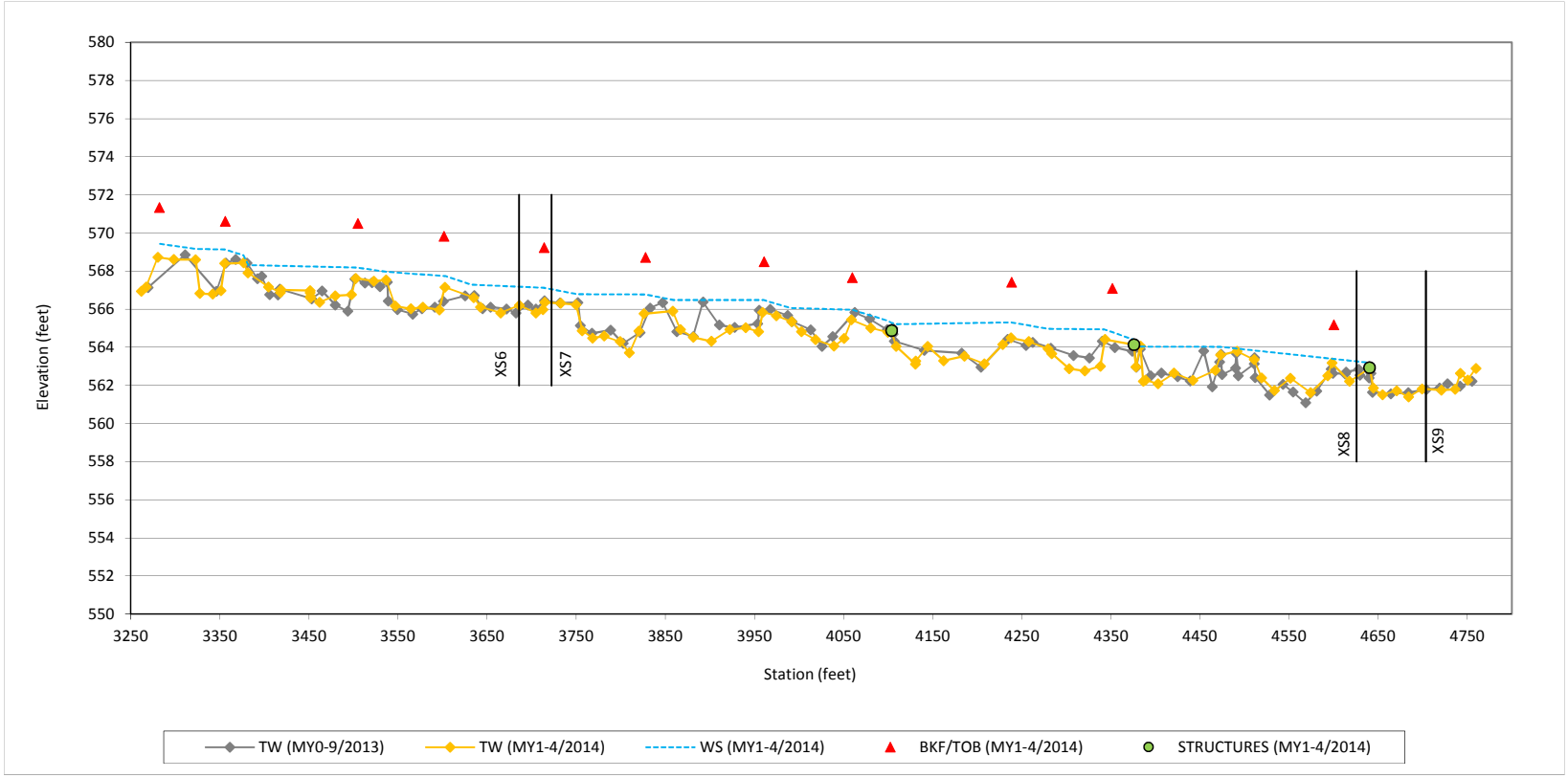
Table 12f. Monitoring Data - Stream Reach Data Summary
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SE2b
Monitoring Year 1

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	10.6		9.7									
Floodprone Width (ft)	>100		>100									
Bankfull Mean Depth	0.6		0.6									
Bankfull Max Depth	1.2		1.0									
Bankfull Cross-sectional Area (ft^2)	6.8		5.8									
Width/Depth Ratio	16.5		16.4									
Entrenchment Ratio	>2.2		>2.2									
Bank Height Ratio	1.0		1.0									
D50 (mm)	37.2											
Profile												
Riffle Length (ft)	11	36	14	36								
Riffle Slope (ft/ft)	0.0119	0.0606	0.0017	0.0520								
Pool Length (ft)	27	45	27	44								
Pool Max Depth (ft)	3.5		3.2									
Pool Spacing (ft)	34	73	33	60								
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	12	22										
Radius of Curvature (ft)	21	25										
Rc:Bankfull Width (ft/ft)	N/A											
Meander Wave Length (ft)	88	88										
Meander Width Ratio	N/A											
Additional Reach Parameters												
Rosgen Classification	C4		C4									
Channel Thalweg Length (ft)	195		195									
Sinuosity (ft)	1.2		1.2									
Water Surface Slope (ft/ft)	0.0160		0.0085									
Bankfull Slope (ft/ft)	0.0168		0.0092									
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/0.1/17.1/70.9/256/362		SC/0.1/18/78.1/143.4/362									
% of Reach with Eroding Banks			0%									

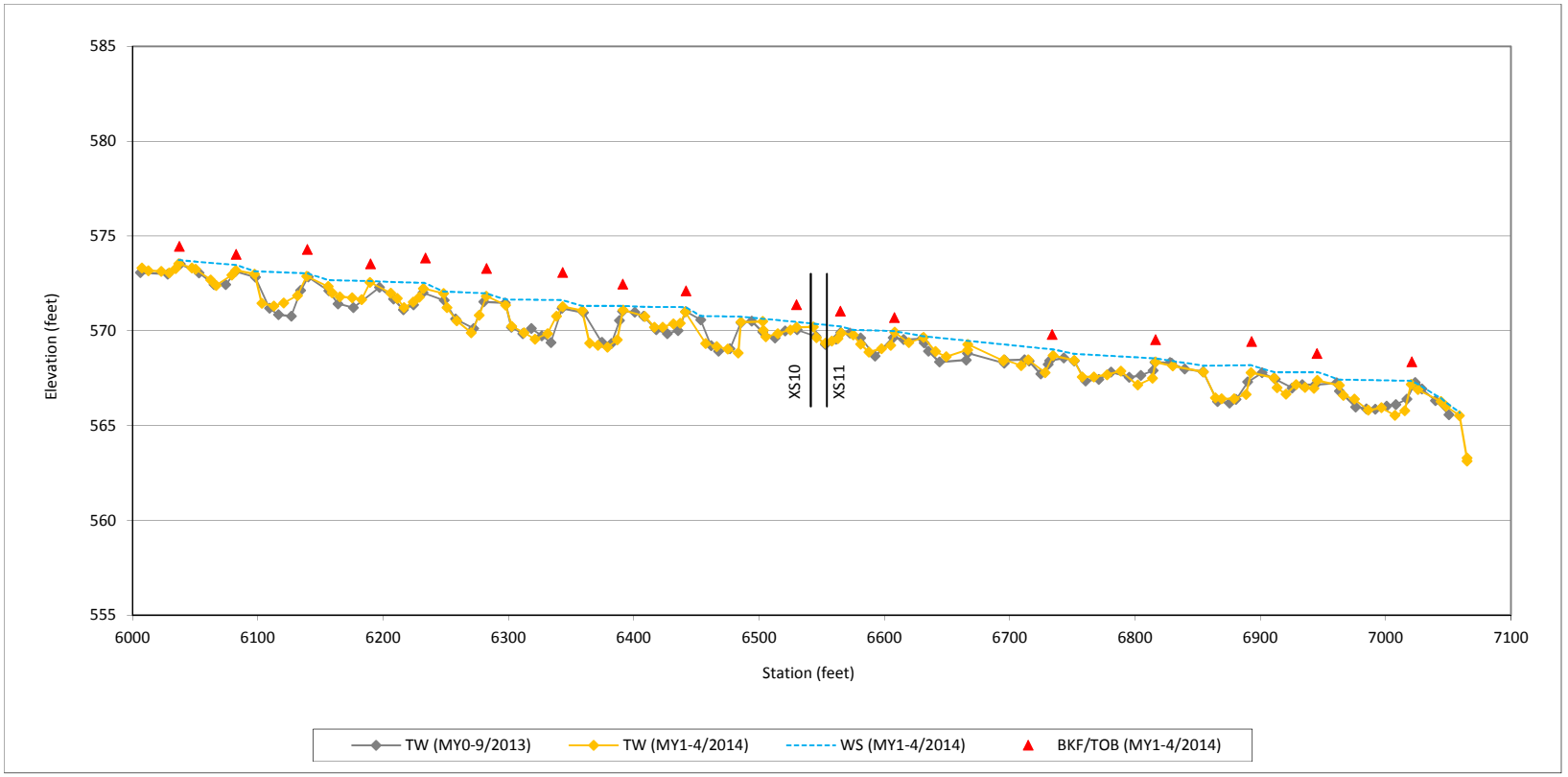
Longitudinal Profile Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
BC2
Monitoring Year 1



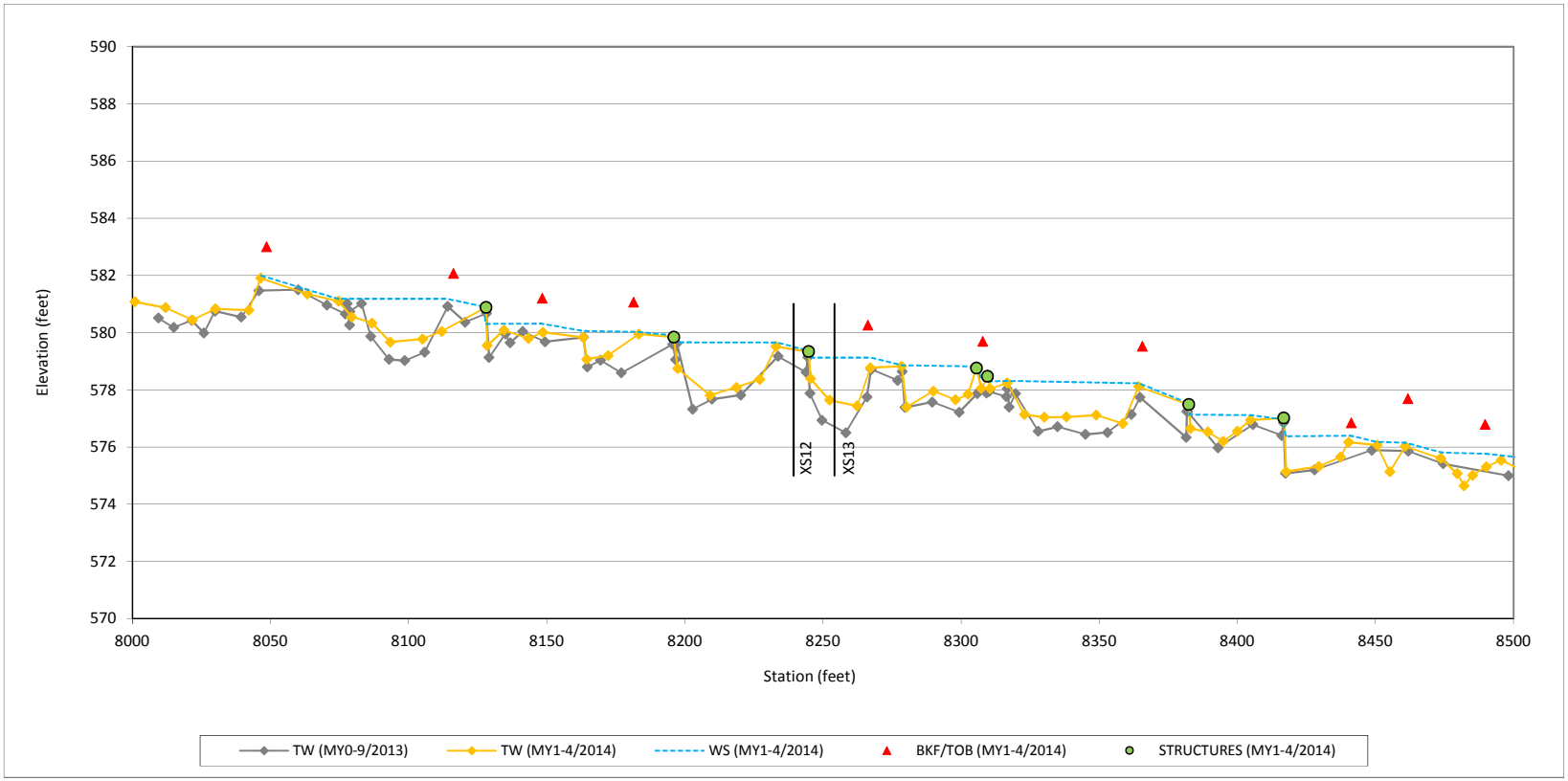
Longitudinal Profile Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
BC3
Monitoring Year 1



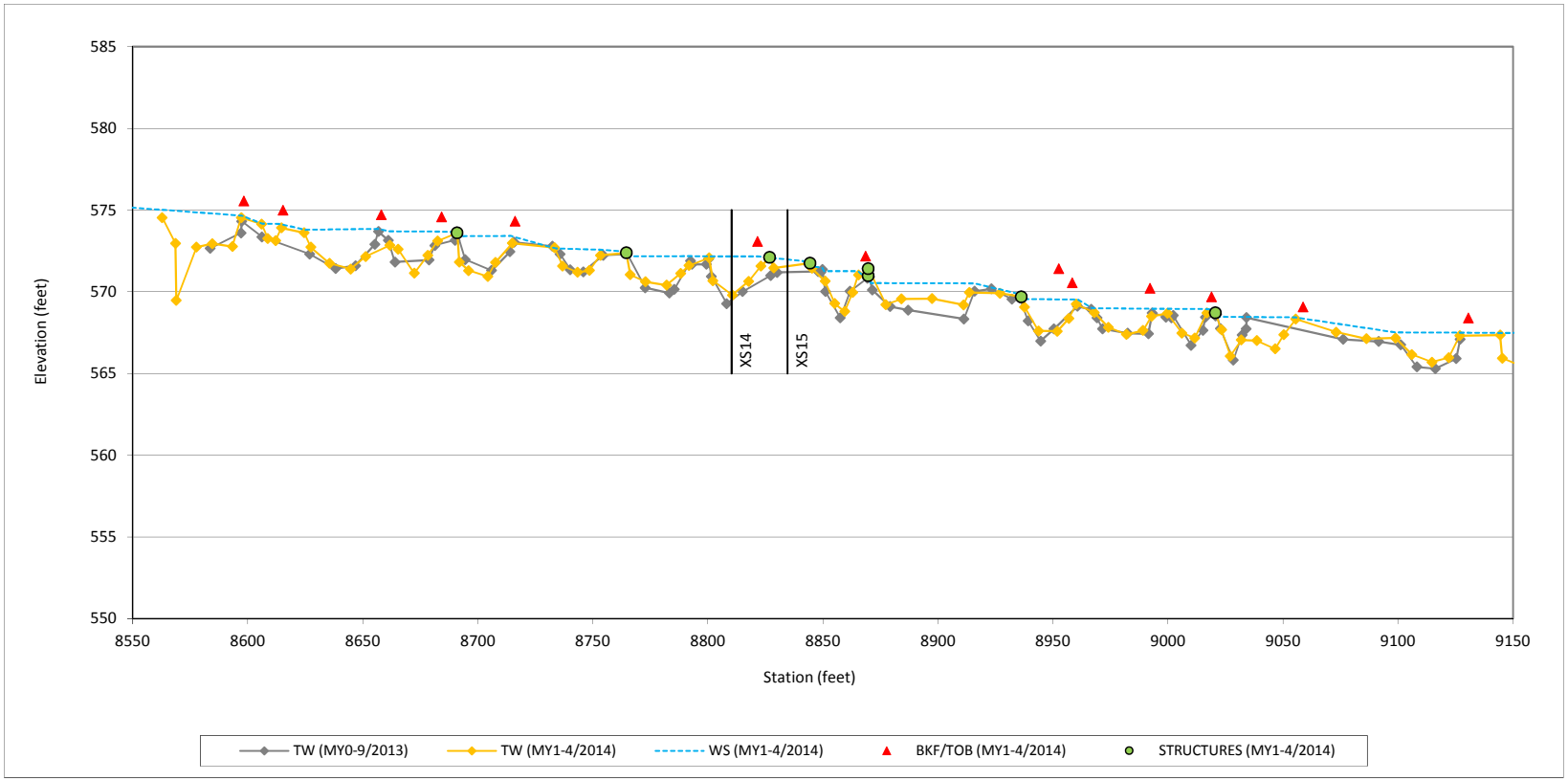
Longitudinal Profile Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SB1
Monitoring Year 0



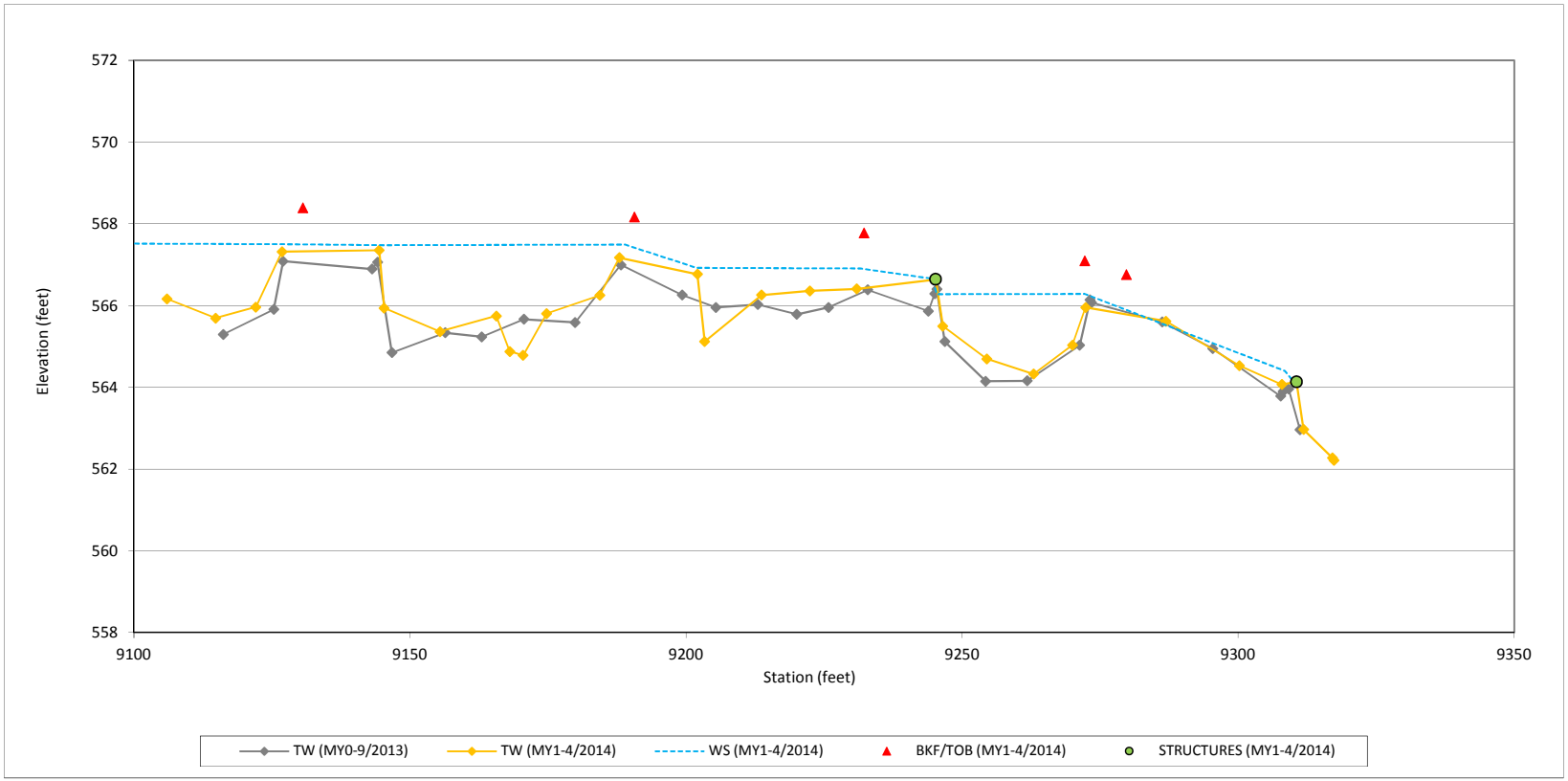
Longitudinal Profile Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SE1
Monitoring Year 1



Longitudinal Profile Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SE2a
Monitoring Year 0

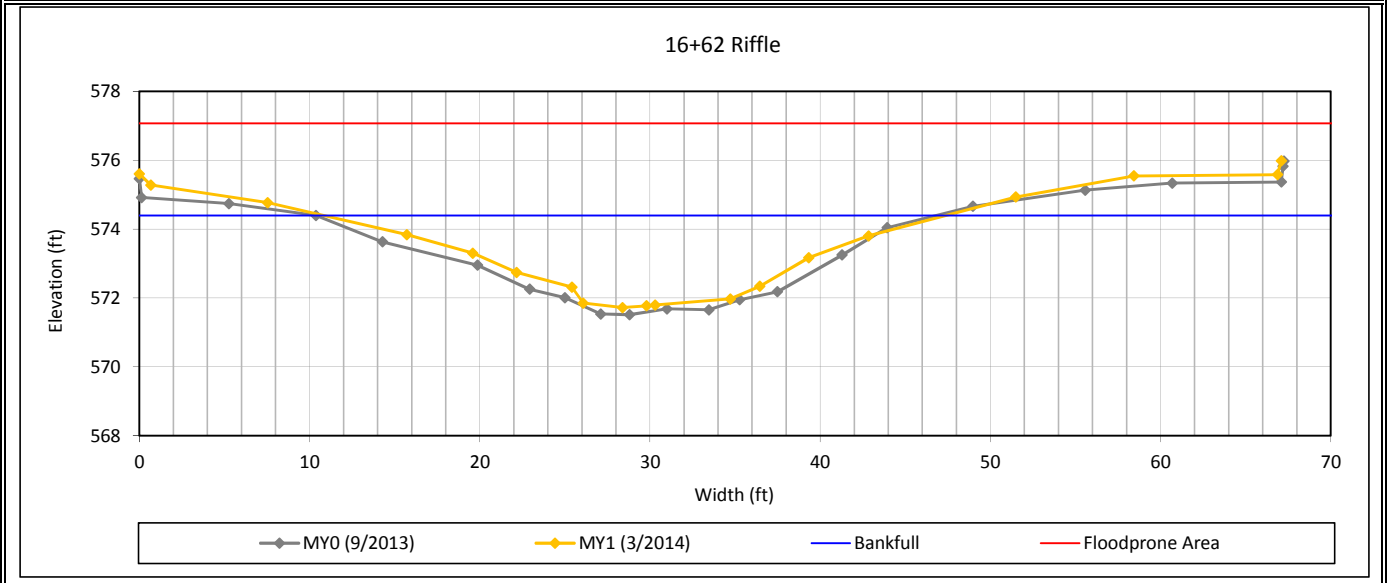


Longitudinal Profile Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SE2b
Monitoring Year 1



Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 1-BC2



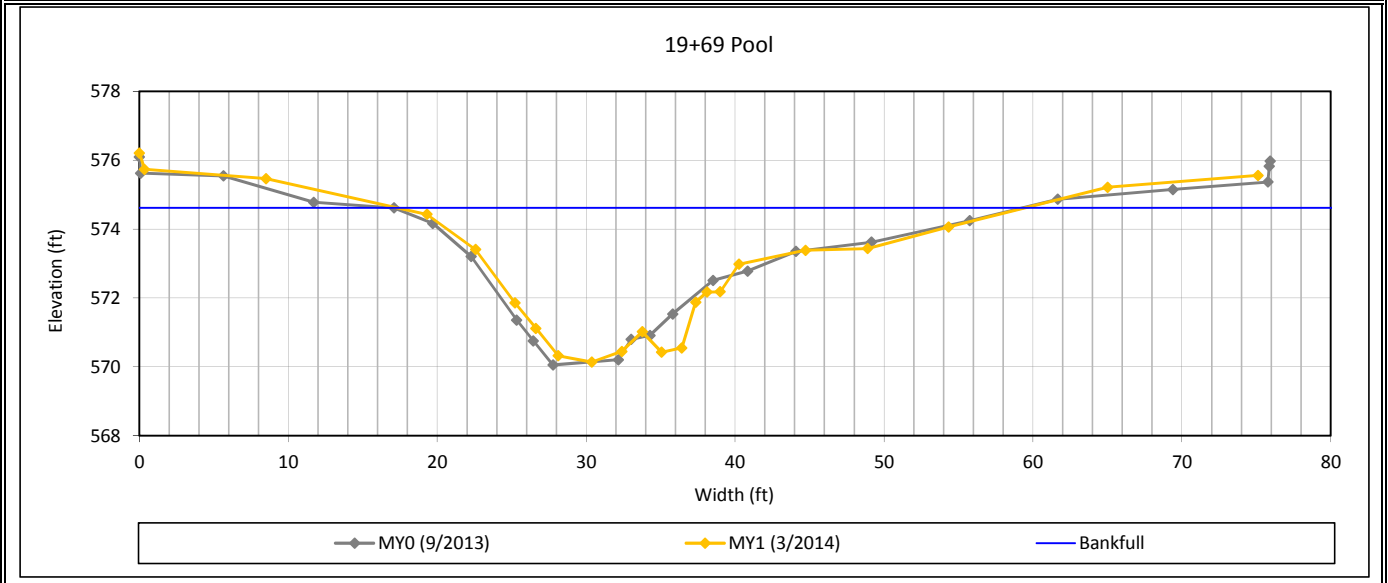
Bankfull Dimensions	
51.1	x-section area (ft.sq.)
36.6	width (ft)
1.4	mean depth (ft)
2.7	max depth (ft)
37.1	wetted parimeter (ft)
1.4	hyd radi (ft)
26.2	width-depth ratio
150.0	W flood prone area (ft)
4.1	entrenchment ratio
1.0	low bank height ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 2-BC2



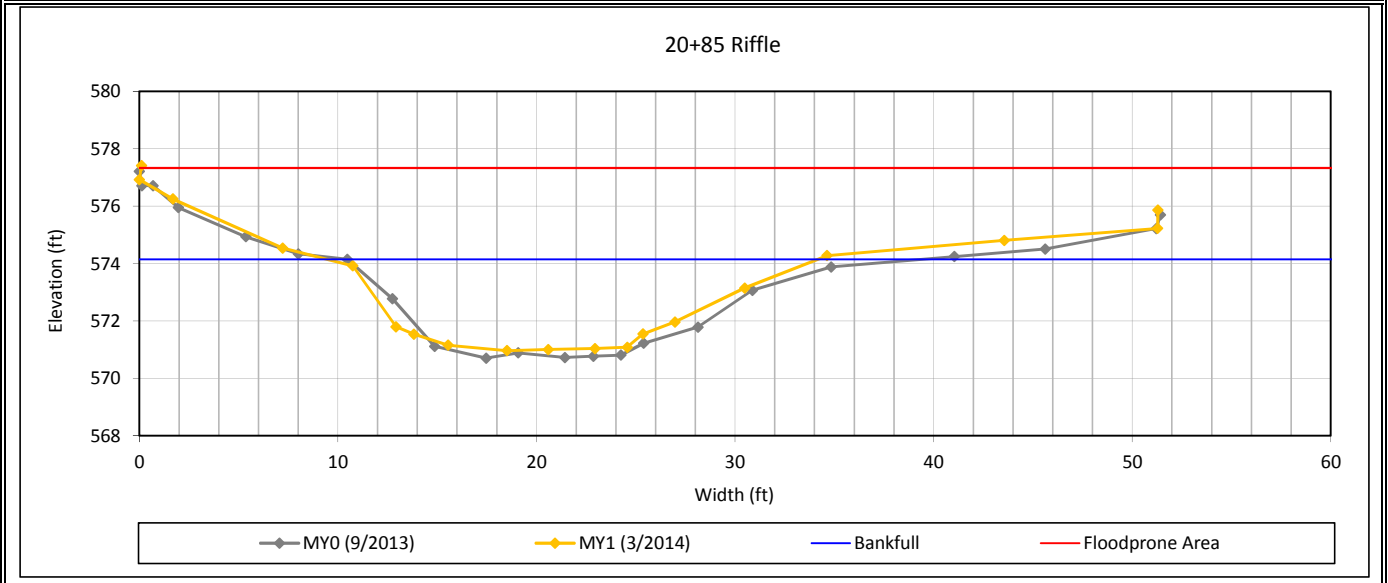
Bankfull Dimensions	
79.9	x-section area (ft.sq.)
42.1	width (ft)
1.9	mean depth (ft)
4.5	max depth (ft)
44.4	wetted parimeter (ft)
1.8	hyd radi (ft)
22.2	width-depth ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 3-BC2



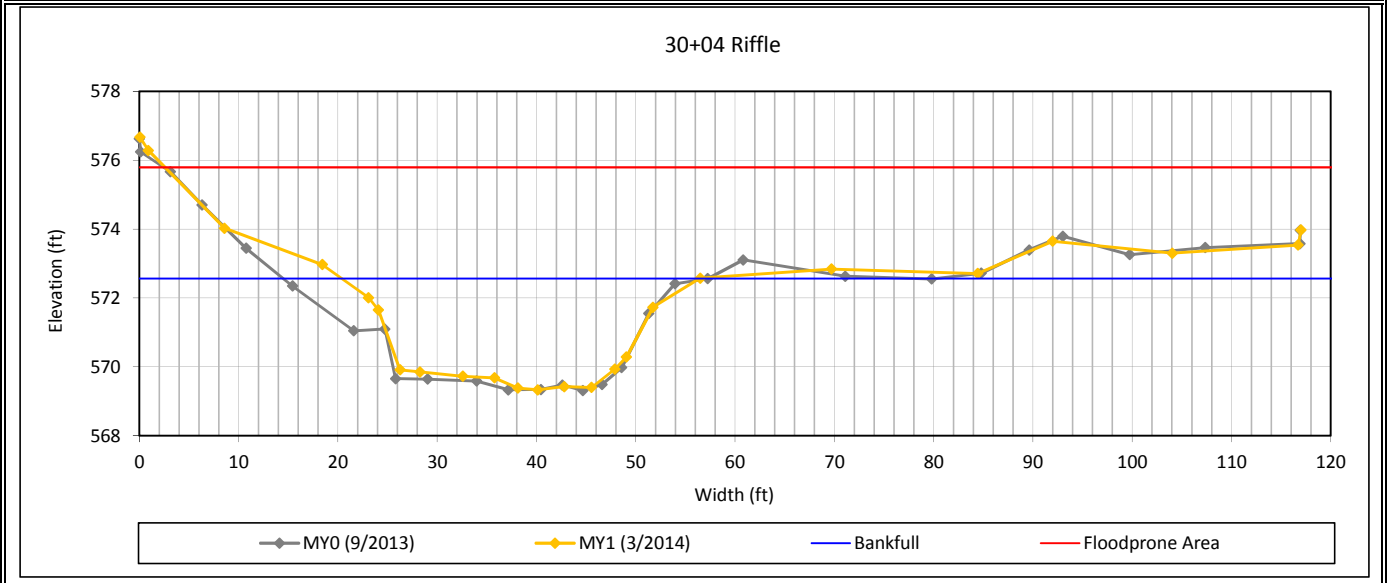
Bankfull Dimensions	
51.6	x-section area (ft.sq.)
24.7	width (ft)
2.1	mean depth (ft)
3.2	max depth (ft)
26.2	wetted parimeter (ft)
2.0	hyd radi (ft)
11.8	width-depth ratio
150.0	W flood prone area (ft)
6.1	entrenchment ratio
1.0	low bank height ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 4-BC2



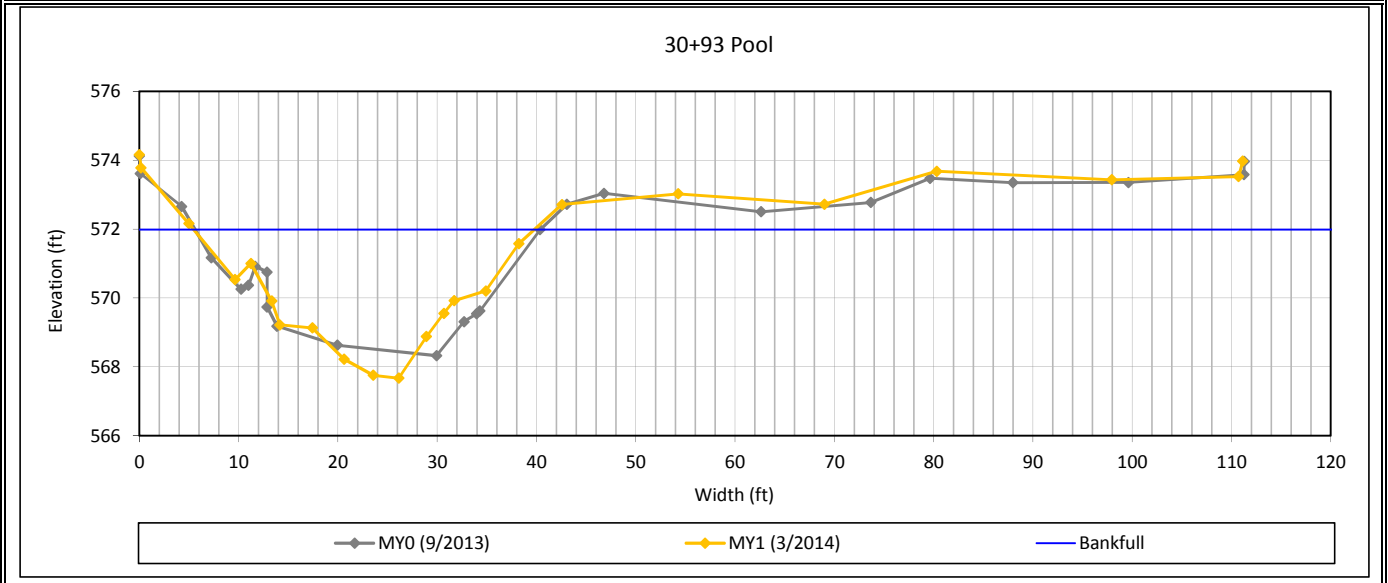
Bankfull Dimensions	
78.3	x-section area (ft.sq.)
36.0	width (ft)
2.2	mean depth (ft)
3.2	max depth (ft)
37.3	wetted parimeter (ft)
2.1	hyd radi (ft)
16.6	width-depth ratio
150.0	W flood prone area (ft)
4.2	entrenchment ratio
1.0	low bank height ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 5-BC2



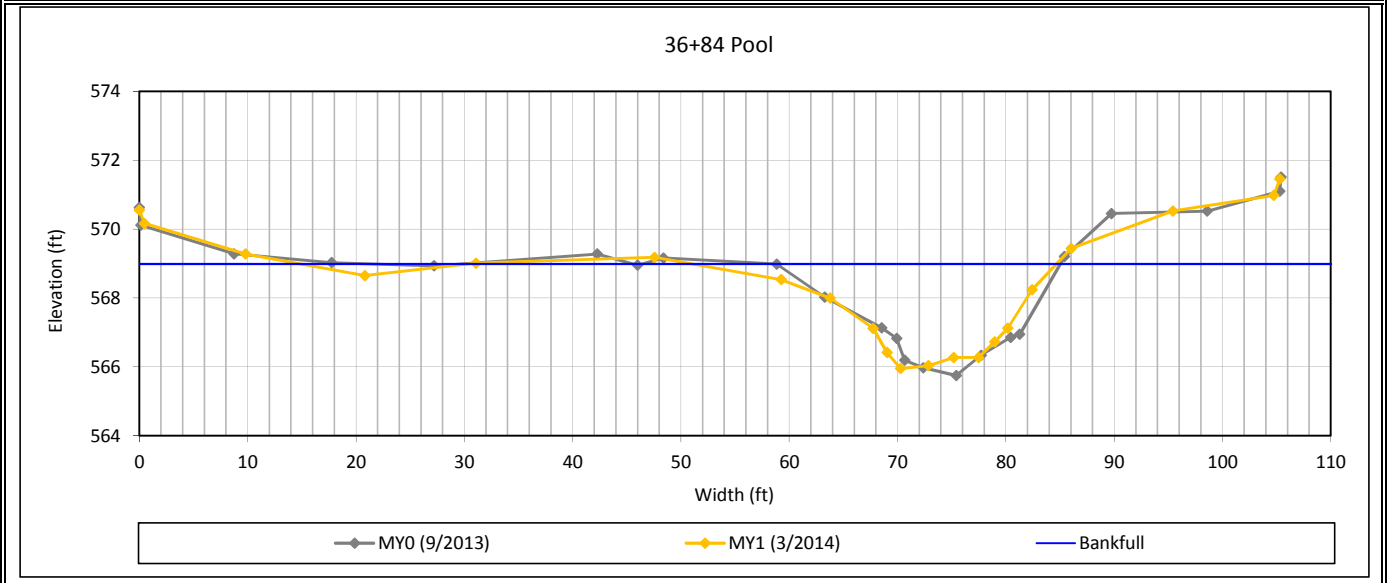
Bankfull Dimensions	
80.2	x-section area (ft.sq.)
34.3	width (ft)
2.3	mean depth (ft)
4.3	max depth (ft)
36.1	wetted parimeter (ft)
2.2	hyd radi (ft)
14.7	width-depth ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 6-BC3



Bankfull Dimensions

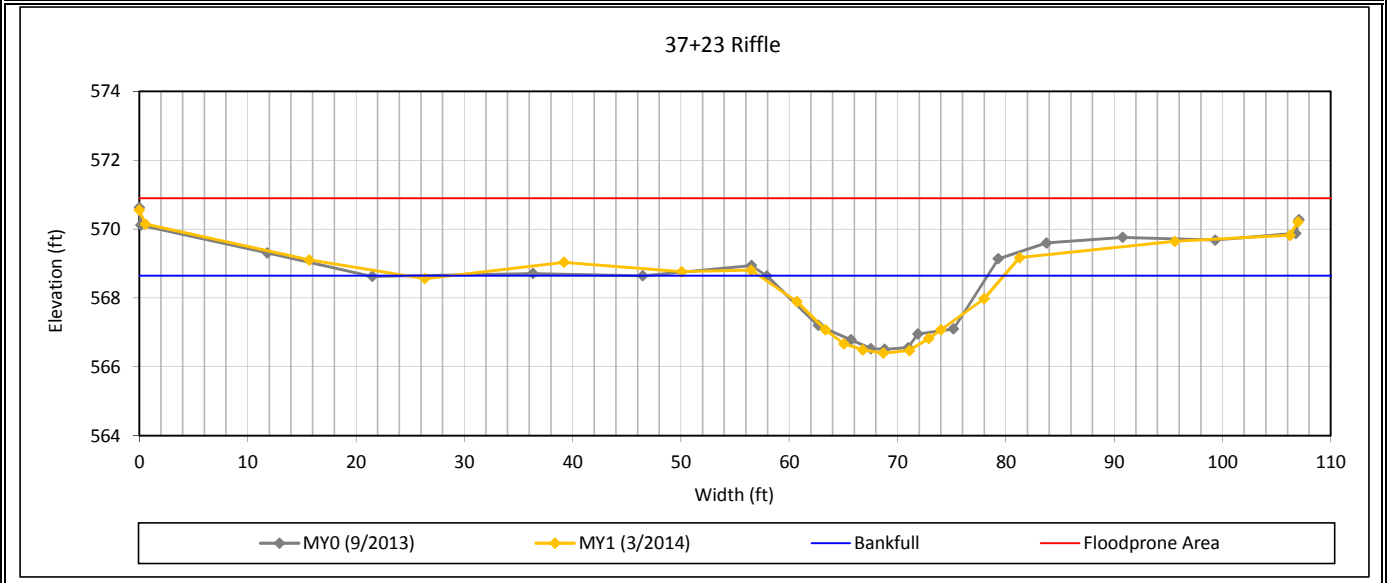
45.8	x-section area (ft.sq.)
25.4	width (ft)
1.8	mean depth (ft)
3.0	max depth (ft)
26.3	wetted parimeter (ft)
1.7	hyd radi (ft)
14.1	width-depth ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 7-BC3



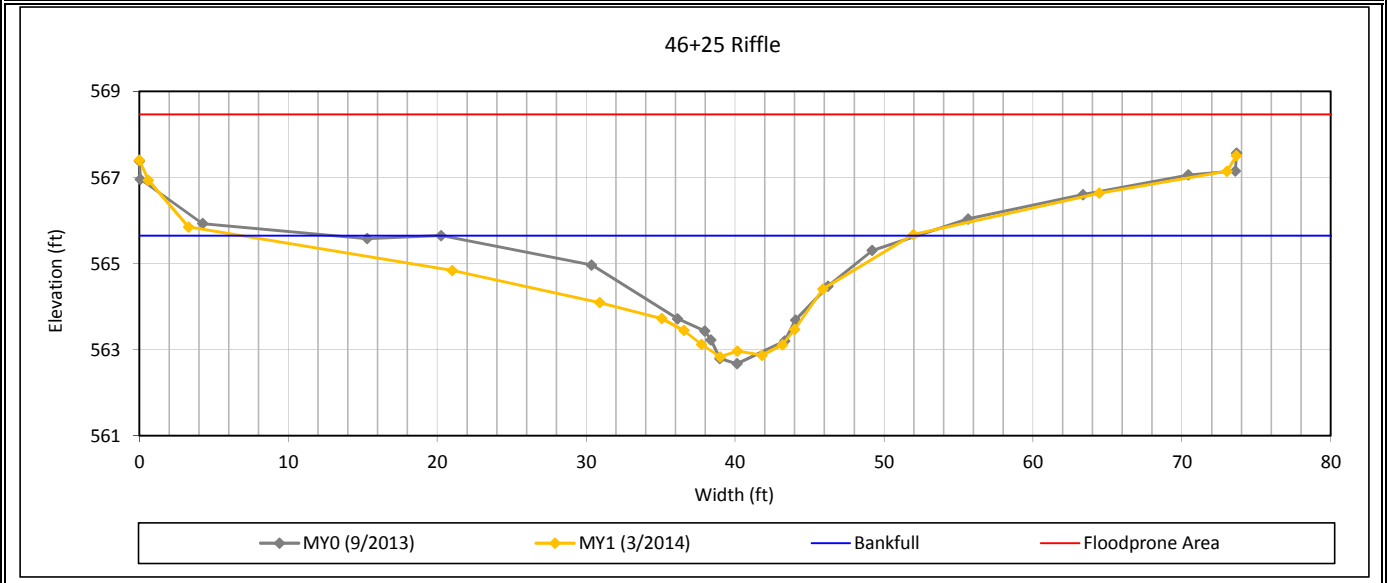
Bankfull Dimensions	
31.0	x-section area (ft.sq.)
22.6	width (ft)
1.4	mean depth (ft)
2.2	max depth (ft)
23.2	wetted parimeter (ft)
1.3	hyd radi (ft)
16.5	width-depth ratio
---	W flood prone area (ft)
---	entrenchment ratio
1.0	low bank height ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 8-BC3



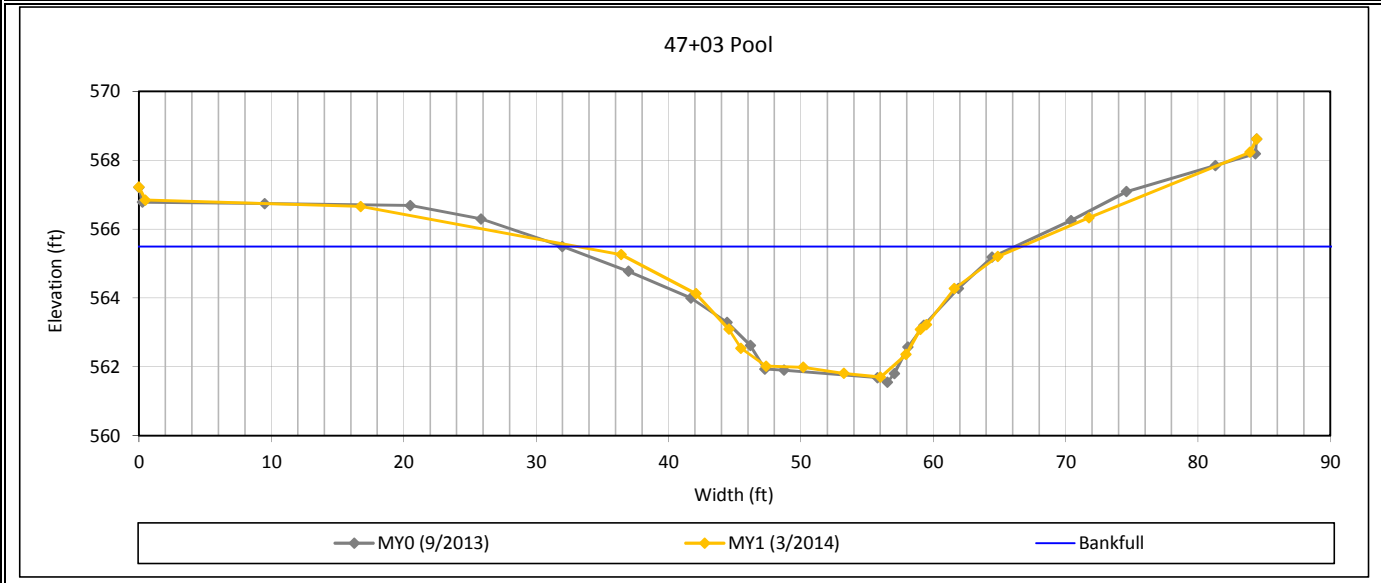
Bankfull Dimensions	
54.1	x-section area (ft.sq.)
45.0	width (ft)
1.2	mean depth (ft)
2.8	max depth (ft)
45.6	wetted parimeter (ft)
1.2	hyd radi (ft)
37.5	width-depth ratio
150.0	W flood prone area (ft)
3.3	entrenchment ratio
1.0	low bank height ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 9-BC3



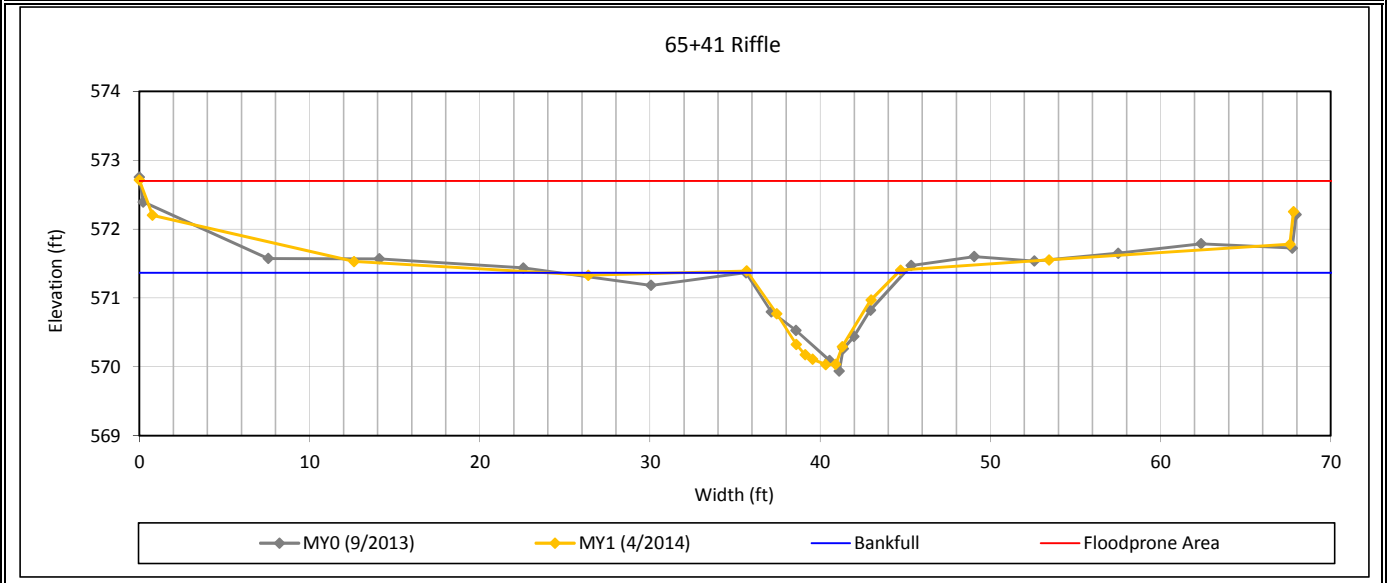
Bankfull Dimensions	
66.5	x-section area (ft.sq.)
33.6	width (ft)
2.0	mean depth (ft)
3.8	max depth (ft)
34.9	wetted parimeter (ft)
1.9	hyd radi (ft)
17.0	width-depth ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 10-SB1



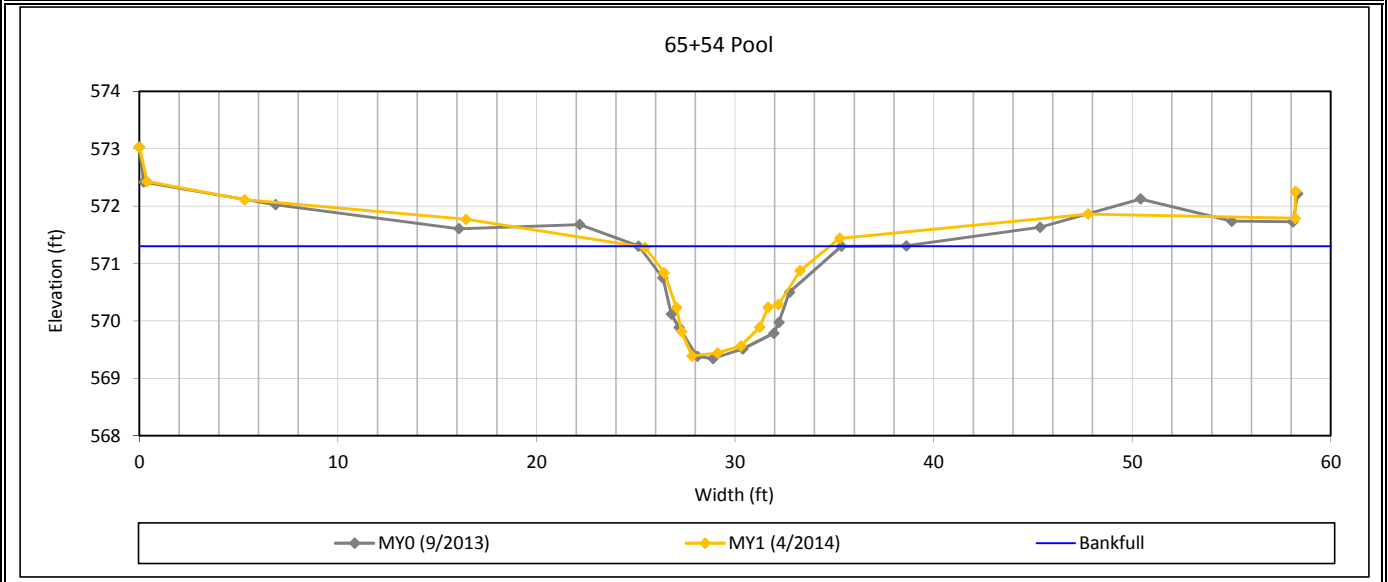
Bankfull Dimensions	
6.4	x-section area (ft.sq.)
8.8	width (ft)
0.7	mean depth (ft)
1.3	max depth (ft)
9.3	wetted parimeter (ft)
0.7	hyd radi (ft)
12.2	width-depth ratio
100.0	W flood prone area (ft)
11.4	entrenchment ratio
1.0	low bank height ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 11-SB1



Bankfull Dimensions

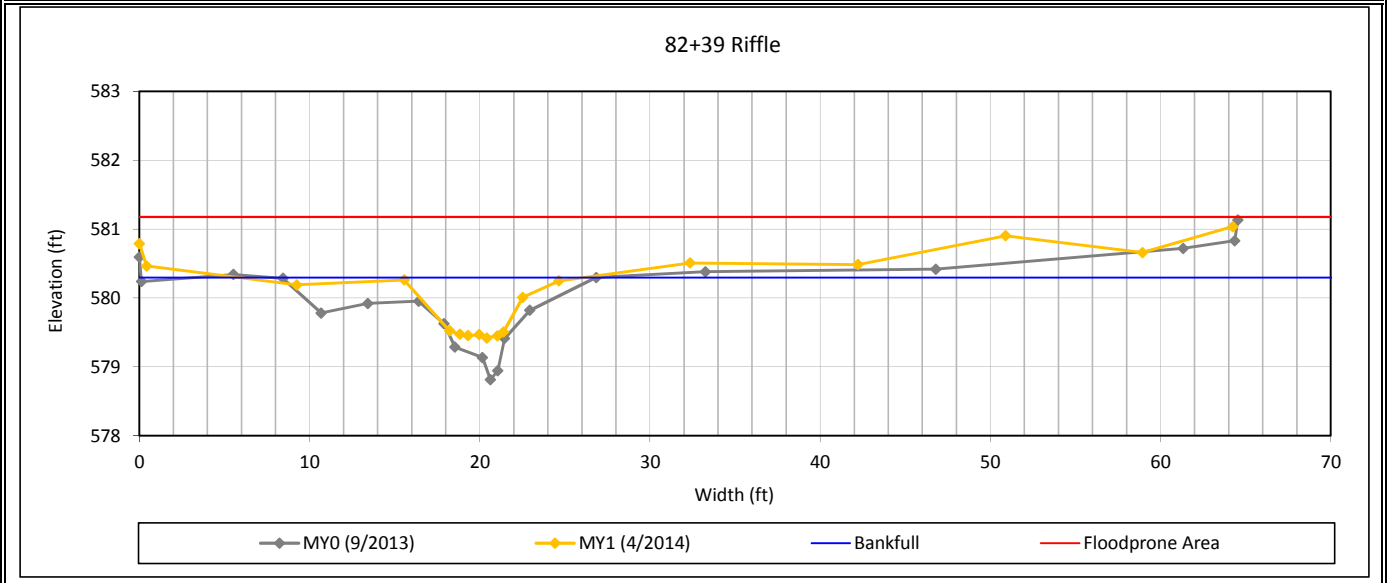
10.1	x-section area (ft.sq.)
9.7	width (ft)
1.0	mean depth (ft)
1.9	max depth (ft)
10.8	wetted parimeter (ft)
0.9	hyd radi (ft)
9.2	width-depth ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 12 - SE1



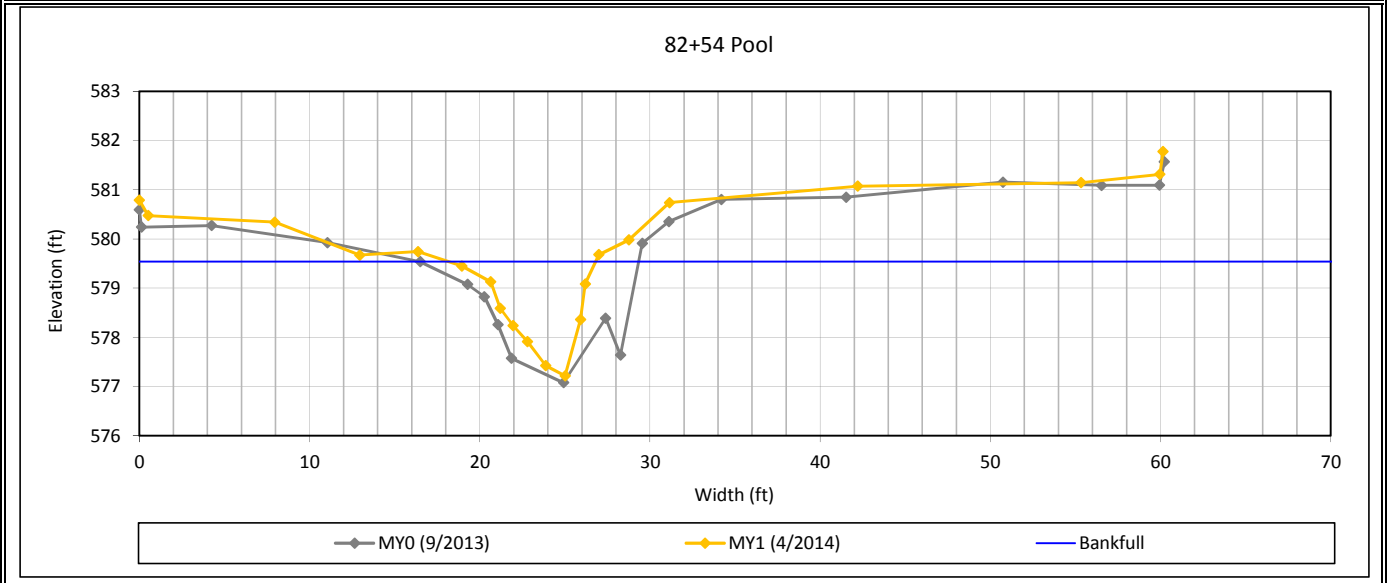
Bankfull Dimensions	
5.2	x-section area (ft.sq.)
16.8	width (ft)
0.3	mean depth (ft)
0.9	max depth (ft)
17.1	wetted parimeter (ft)
0.3	hyd radi (ft)
54.9	width-depth ratio
75.0	W flood prone area (ft)
4.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 13 - SE1



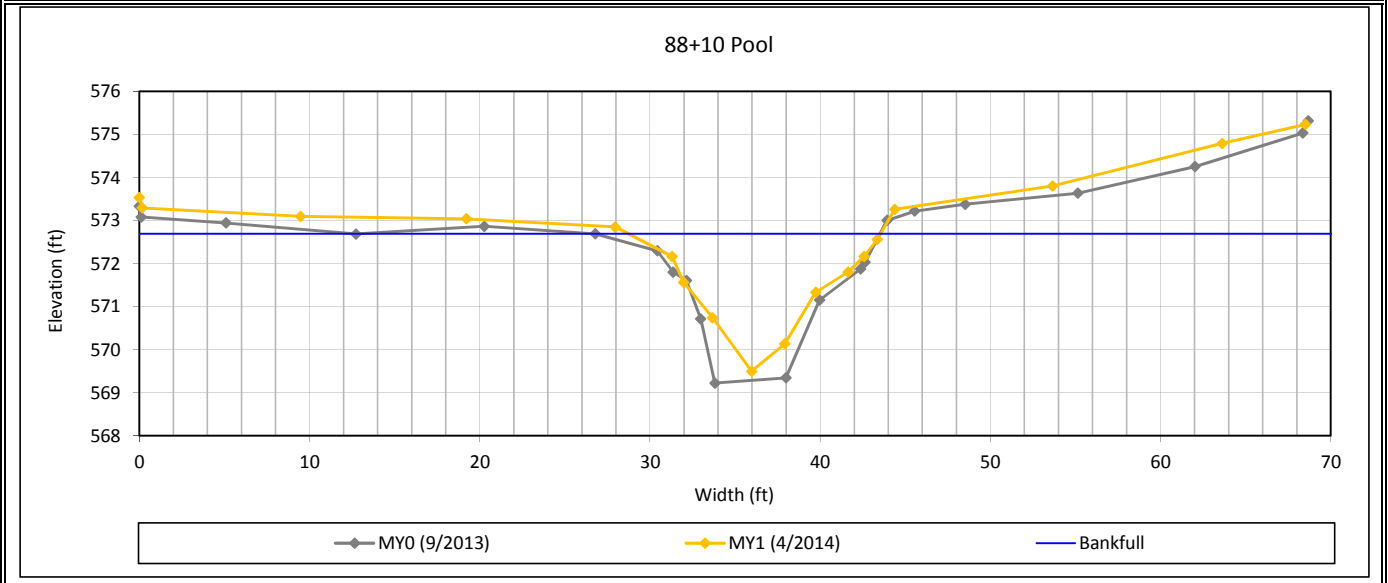
Bankfull Dimensions	
9.4	x-section area (ft.sq.)
8.6	width (ft)
1.1	mean depth (ft)
2.3	max depth (ft)
10.4	wetted parimeter (ft)
0.9	hyd radi (ft)
7.9	width-depth ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 14 - SE2



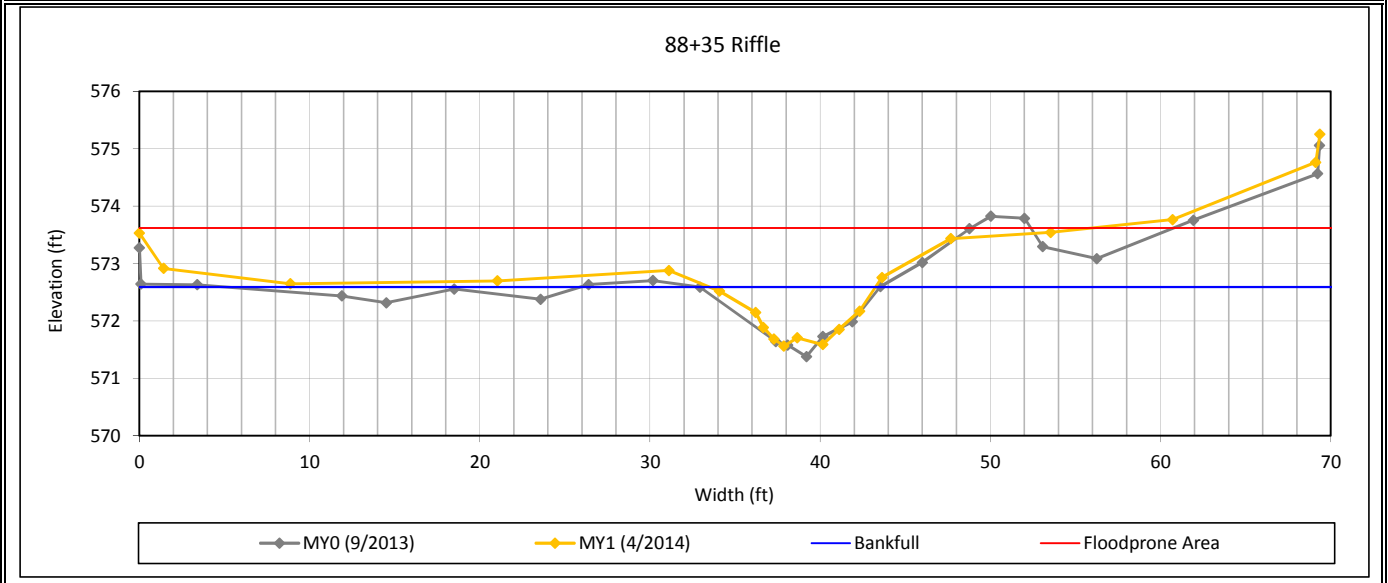
Bankfull Dimensions	
22.0	x-section area (ft.sq.)
14.8	width (ft)
1.5	mean depth (ft)
3.2	max depth (ft)
16.3	wetted parimeter (ft)
1.3	hyd radi (ft)
10.0	width-depth ratio

Survey Date: 2/2014
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots
Byrds Creek Mitigtion Site (Project No. 95020)
Monitoring Year 1

Cross Section 15 - SE2



Bankfull Dimensions	
5.8	x-section area (ft.sq.)
9.7	width (ft)
0.6	mean depth (ft)
1.0	max depth (ft)
10.1	wetted parimeter (ft)
0.6	hyd radi (ft)
16.4	width-depth ratio
100.0	W flood prone area (ft)
10.3	entrenchment ratio
1.0	low bank height ratio

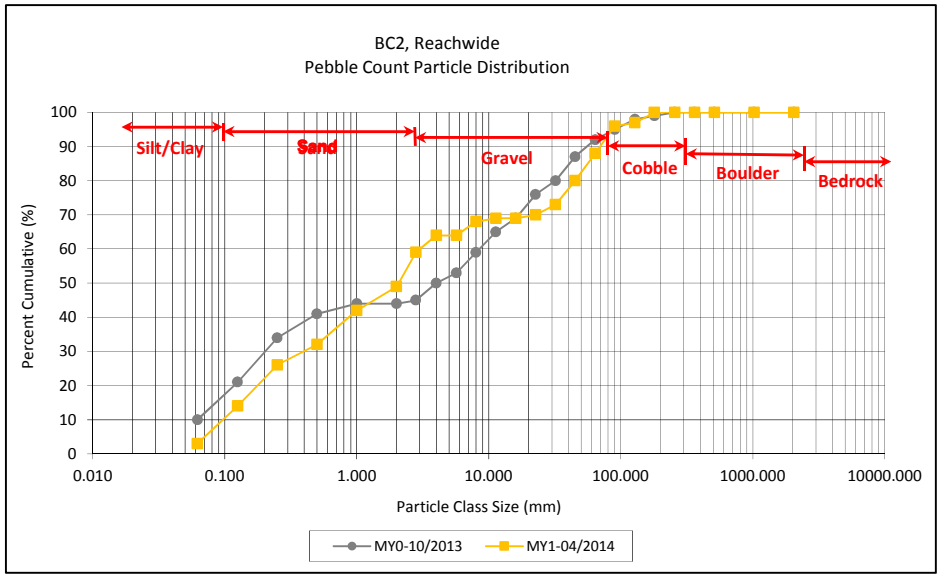
Survey Date: 2/2014
Field Crew: Wildlands Engineering

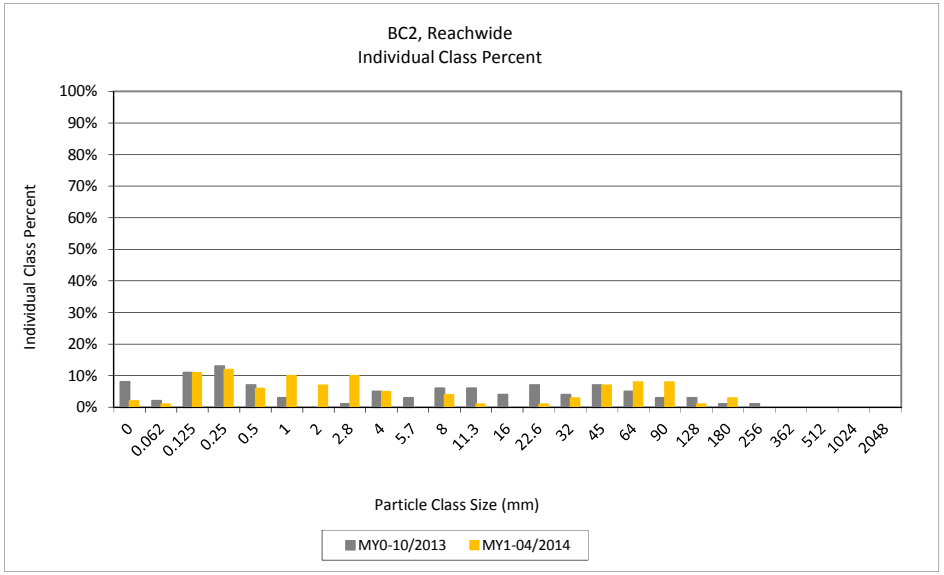
View Downstream

Reachwide and Cross-Section Pebble Count Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
BC2, Reachwide
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count			BC2 Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		2	2	2	2
SAND	Very fine	0.062	0.125		1	1	1	3
	Fine	0.125	0.250	4	7	11	11	14
	Medium	0.250	0.500	2	10	12	12	26
	Coarse	0.5	1.0	2	4	6	6	32
	Very Coarse	1.0	2.0	3	7	10	10	42
GRAVEL	Very Fine	2.0	2.8	2	5	7	7	49
	Very Fine	2.8	4.0	5	5	10	10	59
	Fine	4.0	5.7	2	3	5	5	64
	Fine	5.7	8.0					64
	Medium	8.0	11.3	4		4	4	68
	Medium	11.3	16.0		1	1	1	69
	Coarse	16.0	22.6					69
	Coarse	22.6	32	1		1	1	70
	Very Coarse	32	45	3		3	3	73
	Very Coarse	45	64	7		7	7	80
COBBLE	Small	64	90	5	3	8	8	88
	Small	90	128	6	2	8	8	96
	Large	128	180	1		1	1	97
	Large	180	256	3		3	3	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.3
D_{35} =	1.2
D_{50} =	2.9
D_{84} =	75.9
D_{95} =	122.5
D_{100} =	256.0

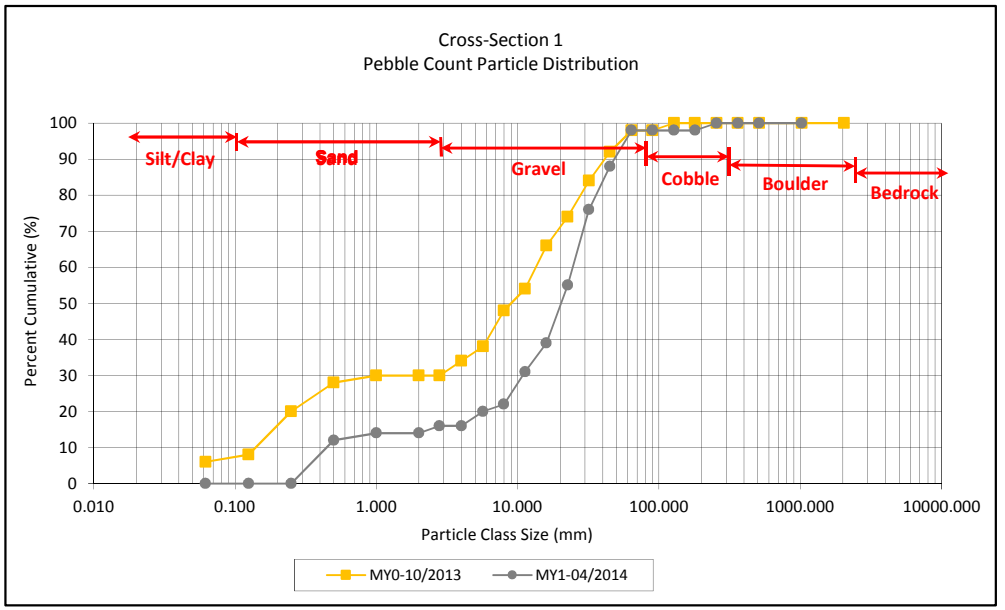


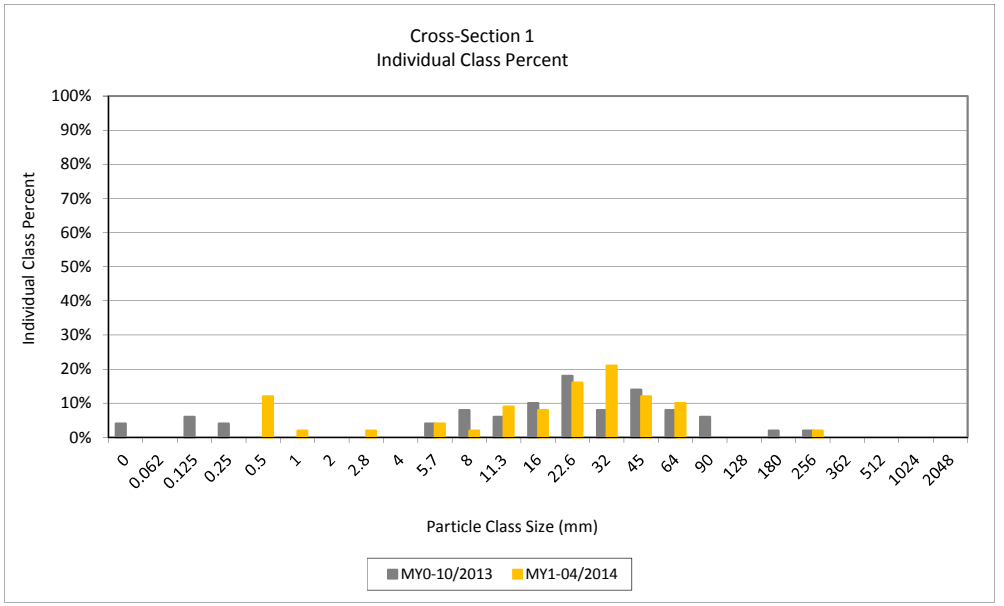


Reachwide and Cross-Section Substrate Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
BC2, Cross-Section 1
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count	Cross-Section 1 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.250	0.500			0
	Coarse	0.5	1.0	12	12	12
	Very Coarse	1.0	2.0	2	2	14
GRAVEL	Very Fine	2.0	2.8			14
	Very Fine	2.8	4.0	2	2	16
	Fine	4.0	5.7			16
	Fine	5.7	8.0	4	4	20
	Medium	8.0	11.3	2	2	22
	Medium	11.3	16.0	9	9	31
	Coarse	16.0	22.6	8	8	39
	Coarse	22.6	32	16	16	55
	Very Coarse	32	45	21	21	76
	Very Coarse	45	64	12	12	88
COBBLE	Small	64	90	10	10	98
	Small	90	128			98
	Large	128	180			98
	Large	180	256			98
BOULDER	Small	256	362	2	2	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 1	
Channel materials (mm)	
D_{16} =	5.6
D_{35} =	19.0
D_{50} =	28.7
D_{84} =	56.9
D_{95} =	81.3
D_{100} =	362.0

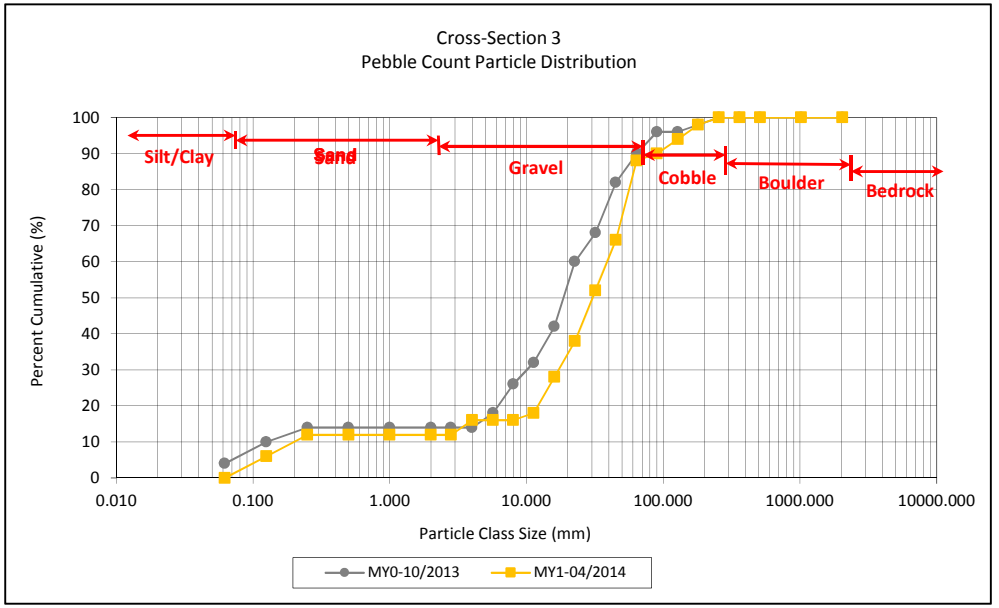


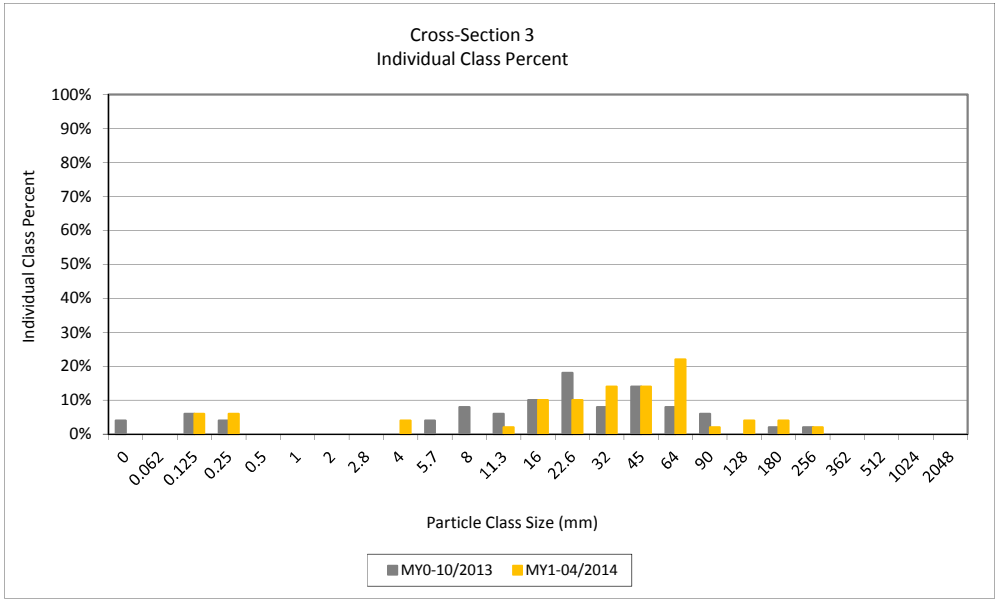


Reachwide and Cross-Section Substrate Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
BC2, Cross-Section 3
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count	Cross-Section 3 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	6	6	6
	Medium	0.250	0.500	6	6	12
	Coarse	0.5	1.0			12
	Very Coarse	1.0	2.0			12
GRAVEL	Very Fine	2.0	2.8			12
	Very Fine	2.8	4.0			12
	Fine	4.0	5.7	4	4	16
	Fine	5.7	8.0			16
	Medium	8.0	11.3			16
	Medium	11.3	16.0	2	2	18
	Coarse	16.0	22.6	10	10	28
	Coarse	22.6	32	10	10	38
	Very Coarse	32	45	14	14	52
	Very Coarse	45	64	14	14	66
COBBLE	Small	64	90	22	22	88
	Small	90	128	2	2	90
	Large	128	180	4	4	94
	Large	180	256	4	4	98
BOULDER	Small	256	362	2	2	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 3	
Channel materials (mm)	
D_{16} =	11.0
D_{35} =	28.8
D_{50} =	42.9
D_{84} =	84.6
D_{95} =	196.6
D_{100} =	362.0

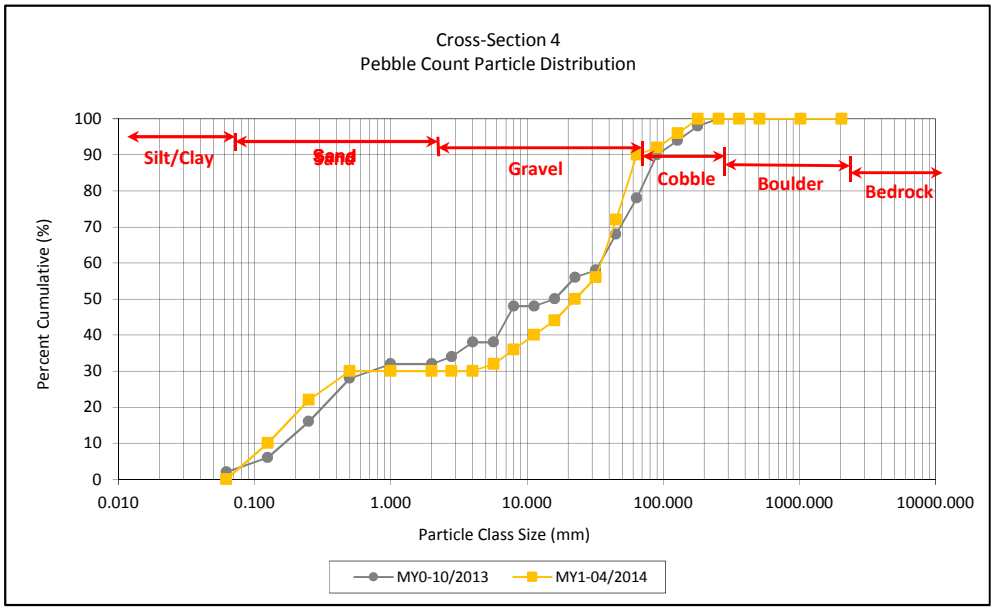


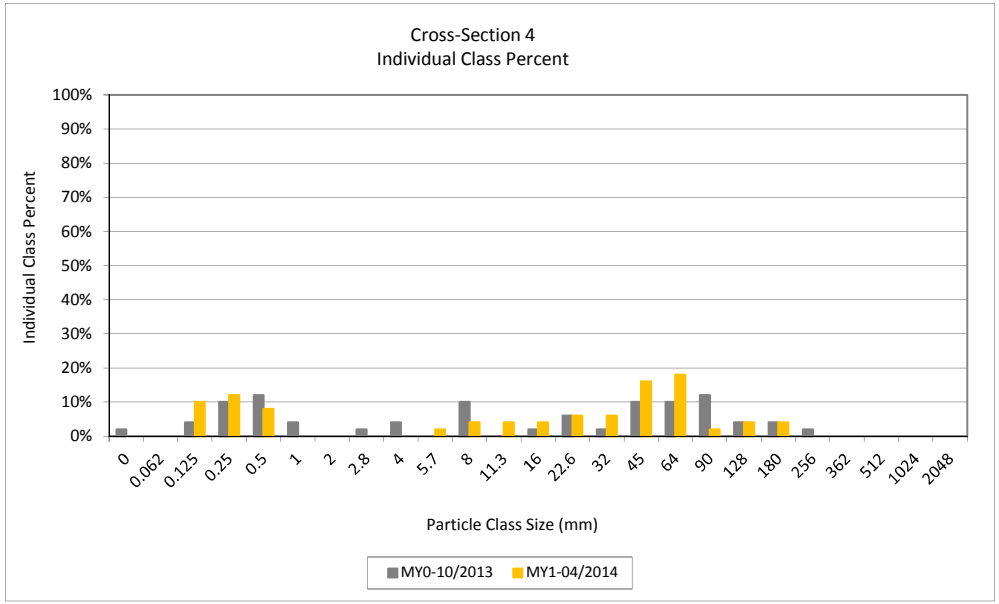


Reachwide and Cross-Section Substrate Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
BC2, Cross-Section 4
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count	Cross-Section 4 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	10	10	10
	Medium	0.250	0.500	12	12	22
	Coarse	0.5	1.0	8	8	30
	Very Coarse	1.0	2.0			30
GRAVEL	Very Fine	2.0	2.8			30
	Very Fine	2.8	4.0			30
	Fine	4.0	5.7			30
	Fine	5.7	8.0	2	2	32
	Medium	8.0	11.3	4	4	36
	Medium	11.3	16.0	4	4	40
	Coarse	16.0	22.6	4	4	44
	Coarse	22.6	32	6	6	50
	Very Coarse	32	45	6	6	56
	Very Coarse	45	64	16	16	72
COBBLE	Small	64	90	18	18	90
	Small	90	128	2	2	92
	Large	128	180	4	4	96
	Large	180	256	4	4	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 4	
Channel materials (mm)	
D_{16} =	0.4
D_{35} =	10.2
D_{50} =	32.0
D_{84} =	80.3
D_{95} =	165.3
D_{100} =	256.0

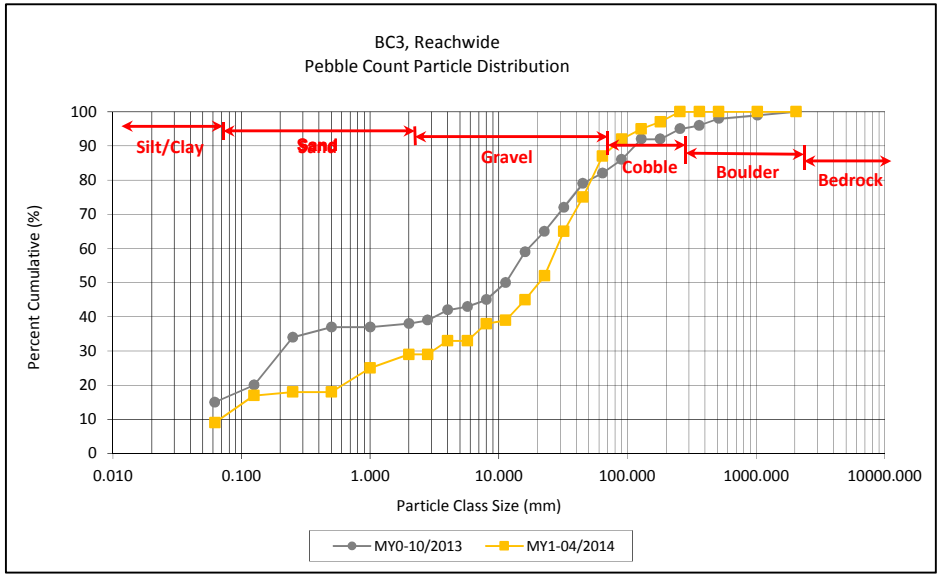


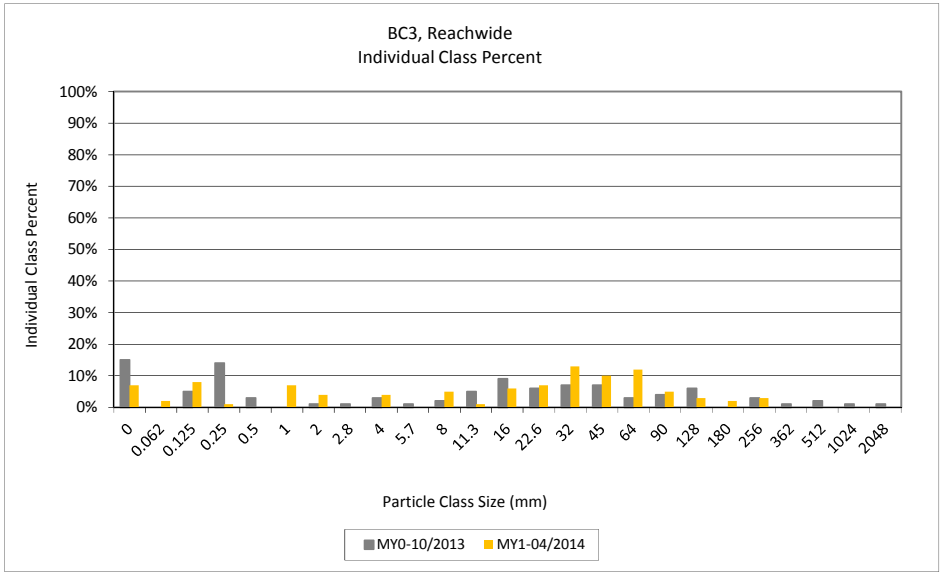


Reachwide and Cross-Section Pebble Count Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
BC3, Reachwide
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count			BC3 Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	6	7	7	7
SAND	Very fine	0.062	0.125		2	2	2	9
	Fine	0.125	0.250	1	7	8	8	17
	Medium	0.250	0.500	1		1	1	18
	Coarse	0.5	1.0					18
	Very Coarse	1.0	2.0		7	7	7	25
GRAVEL	Very Fine	2.0	2.8		4	4	4	29
	Very Fine	2.8	4.0					29
	Fine	4.0	5.7	2	2	4	4	33
	Fine	5.7	8.0					33
	Medium	8.0	11.3	4	1	5	5	38
	Medium	11.3	16.0		1	1	1	39
	Coarse	16.0	22.6	2	4	6	6	45
	Coarse	22.6	32	4	3	7	7	52
	Very Coarse	32	45	8	5	13	13	65
	Very Coarse	45	64	7	3	10	10	75
COBBLE	Small	64	90	10	2	12	12	87
	Small	90	128	4	1	5	5	92
	Large	128	180	3		3	3	95
	Large	180	256	1	1	2	2	97
BOULDER	Small	256	362	2	1	3	3	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.2
D_{35} =	9.1
D_{50} =	29.0
D_{84} =	82.6
D_{95} =	180.0
D_{100} =	362.0

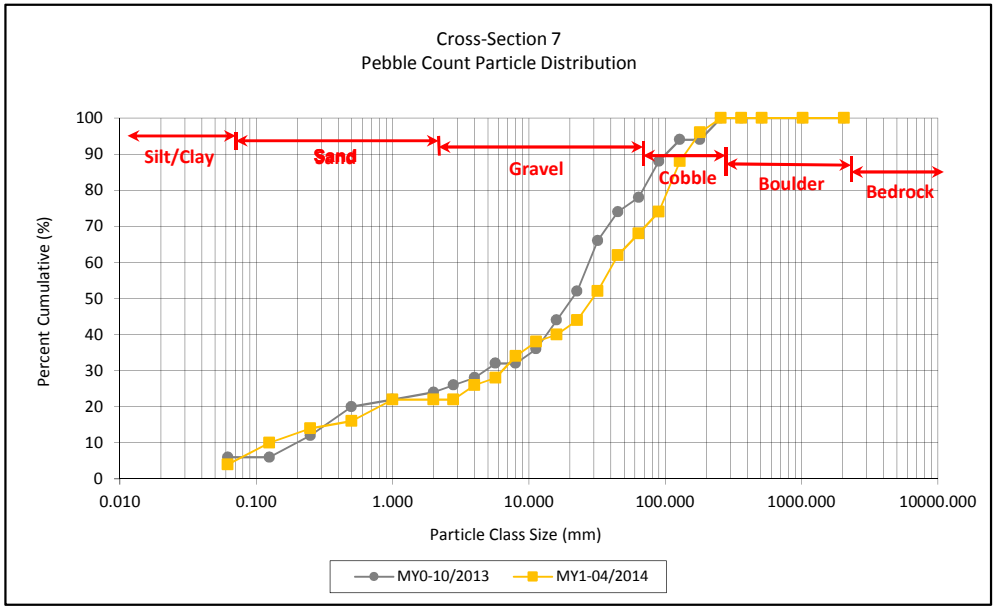


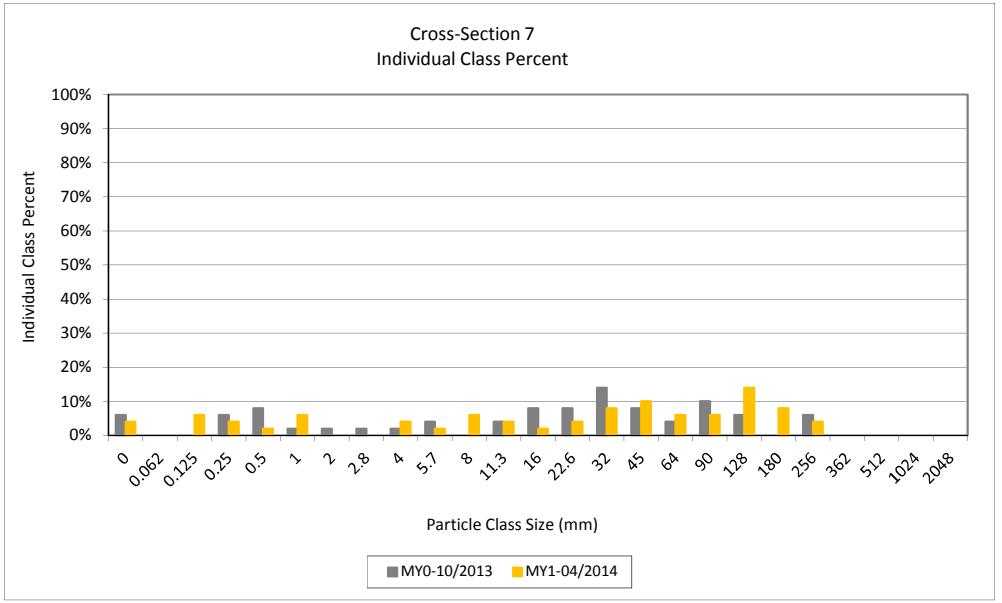


Reachwide and Cross-Section Substrate Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
BC3, Cross-Section 7
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count	Cross-Section 7 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	4	4	4
SAND	Very fine	0.062	0.125			4
	Fine	0.125	0.250	6	6	10
	Medium	0.250	0.500	4	4	14
	Coarse	0.5	1.0	2	2	16
	Very Coarse	1.0	2.0	6	6	22
GRAVEL	Very Fine	2.0	2.8			22
	Very Fine	2.8	4.0			22
	Fine	4.0	5.7	4	4	26
	Fine	5.7	8.0	2	2	28
	Medium	8.0	11.3	6	6	34
	Medium	11.3	16.0	4	4	38
	Coarse	16.0	22.6	2	2	40
	Coarse	22.6	32	4	4	44
	Very Coarse	32	45	8	8	52
	Very Coarse	45	64	10	10	62
COBBLE	Small	64	90	6	6	68
	Small	90	128	6	6	74
	Large	128	180	14	14	88
	Large	180	256	8	8	96
BOULDER	Small	256	362	4	4	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 1	
Channel materials (mm)	
D_{16} =	1.0
D_{35} =	12.1
D_{50} =	41.3
D_{84} =	163.3
D_{95} =	245.0
D_{100} =	362.0

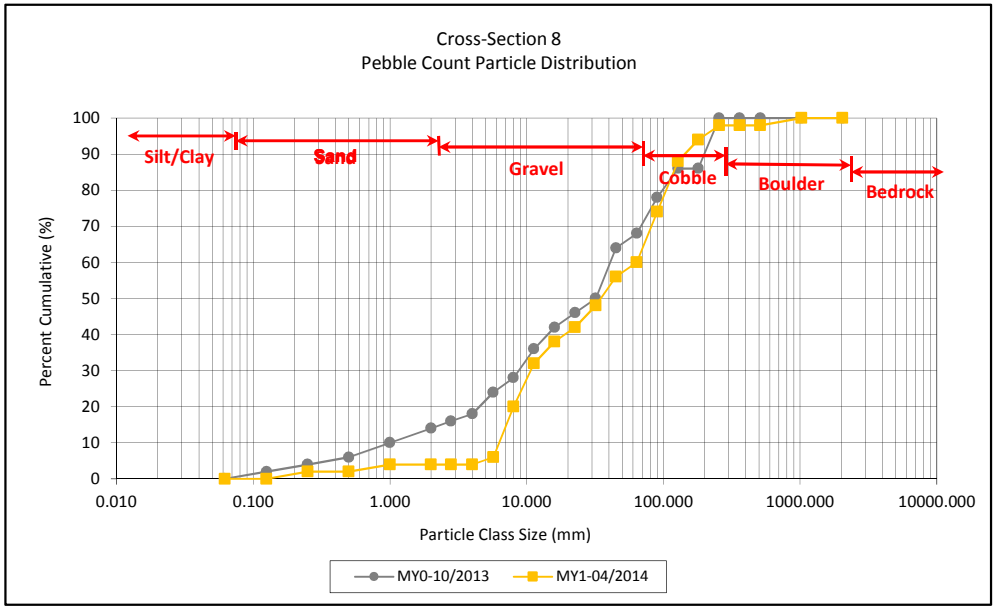


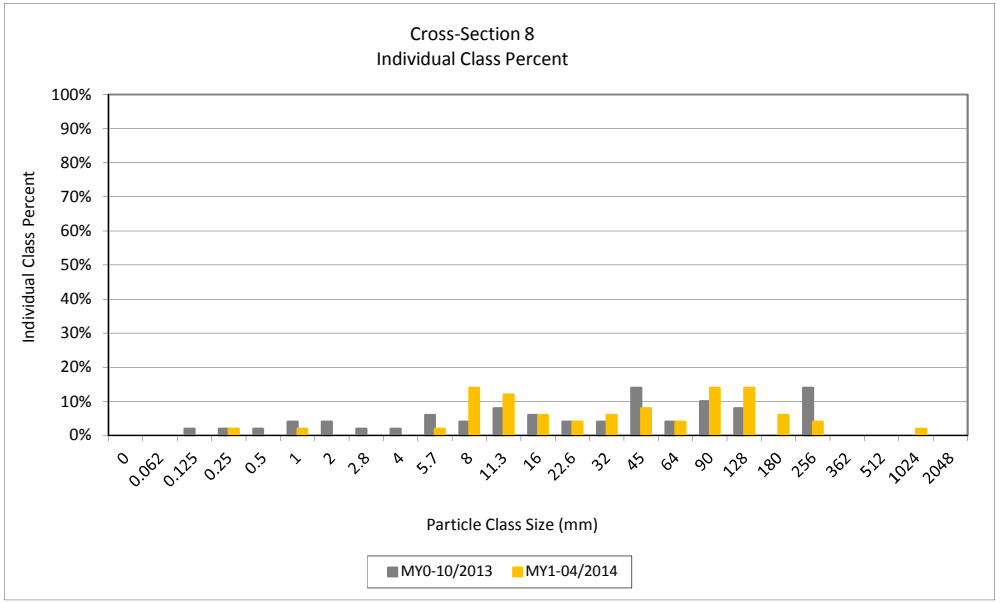


Reachwide and Cross-Section Substrate Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
BC3, Cross-Section 8
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count	Cross-Section 8 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.250	0.500	2	2	2
	Coarse	0.5	1.0			2
	Very Coarse	1.0	2.0	2	2	4
GRAVEL	Very Fine	2.0	2.8			4
	Very Fine	2.8	4.0			4
	Fine	4.0	5.7			4
	Fine	5.7	8.0	2	2	6
	Medium	8.0	11.3	14	14	20
	Medium	11.3	16.0	12	12	32
	Coarse	16.0	22.6	6	6	38
	Coarse	22.6	32	4	4	42
	Very Coarse	32	45	6	6	48
	Very Coarse	45	64	8	8	56
COBBLE	Small	64	90	4	4	60
	Small	90	128	14	14	74
	Large	128	180	14	14	88
	Large	180	256	6	6	94
BOULDER	Small	256	362	4	4	98
	Small	362	512			98
	Medium	512	1024			98
	Large/Very Large	1024	2048	2	2	100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 1	
Channel materials (mm)	
D_{16} =	10.0
D_{35} =	19.0
D_{50} =	49.1
D_{84} =	163.3
D_{95} =	279.2
D_{100} =	2048.0

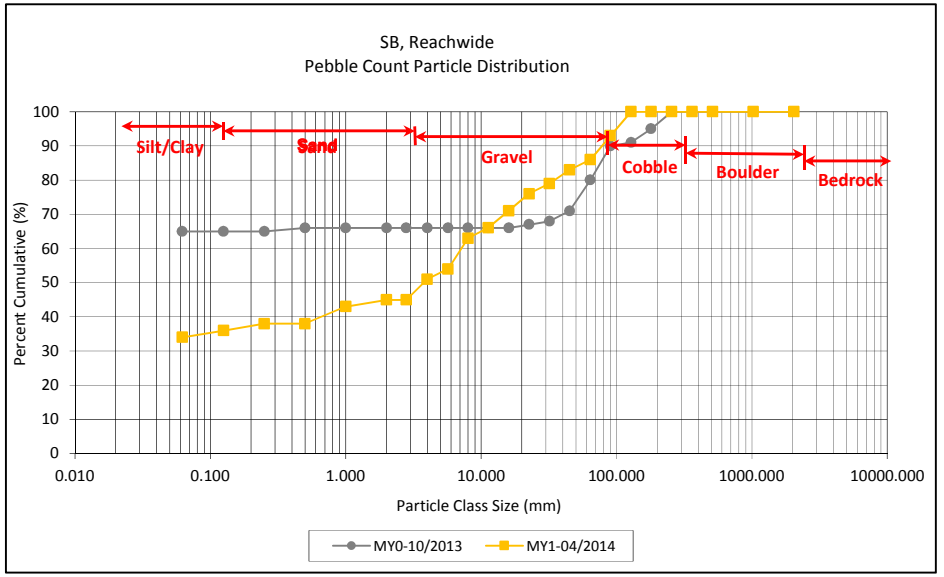


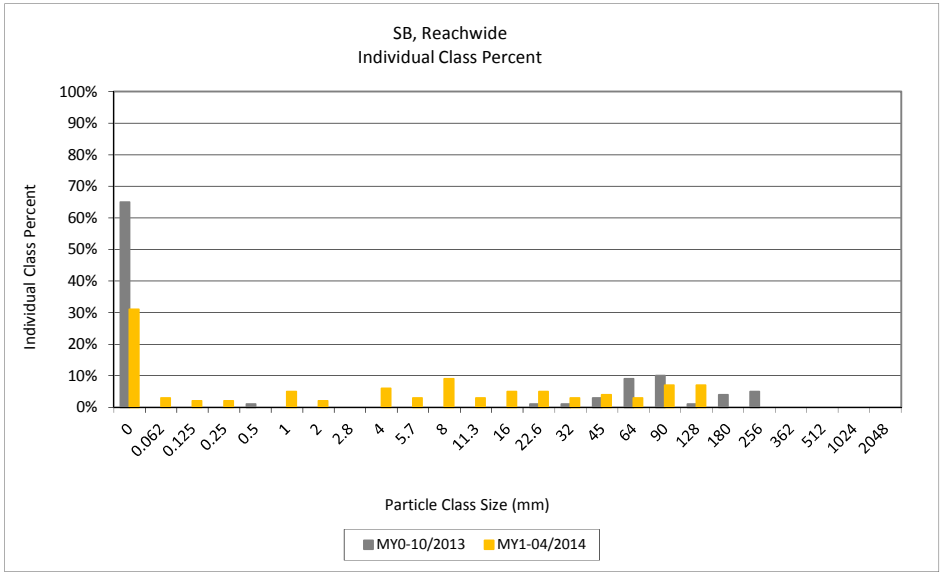


Reachwide and Cross-Section Pebble Count Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SB, Reachwide
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count			SB Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	5	26	31	31	31
SAND	Very fine	0.062	0.125		3	3	3	34
	Fine	0.125	0.250		2	2	2	36
	Medium	0.250	0.500	1	1	2	2	38
	Coarse	0.5	1.0					38
	Very Coarse	1.0	2.0	3	2	5	5	43
GRAVEL	Very Fine	2.0	2.8	1	1	2	2	45
	Very Fine	2.8	4.0					45
	Fine	4.0	5.7	2	4	6	6	51
	Fine	5.7	8.0	2	1	3	3	54
	Medium	8.0	11.3	4	5	9	9	63
	Medium	11.3	16.0	3		3	3	66
	Coarse	16.0	22.6	1	4	5	5	71
	Coarse	22.6	32	5		5	5	76
	Very Coarse	32	45	3		3	3	79
	Very Coarse	45	64	3	1	4	4	83
COBBLE	Small	64	90	3		3	3	86
	Small	90	128	7		7	7	93
	Large	128	180	7		7	7	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.2
D_{50} =	5.3
D_{84} =	71.7
D_{95} =	141.1
D_{100} =	180.0

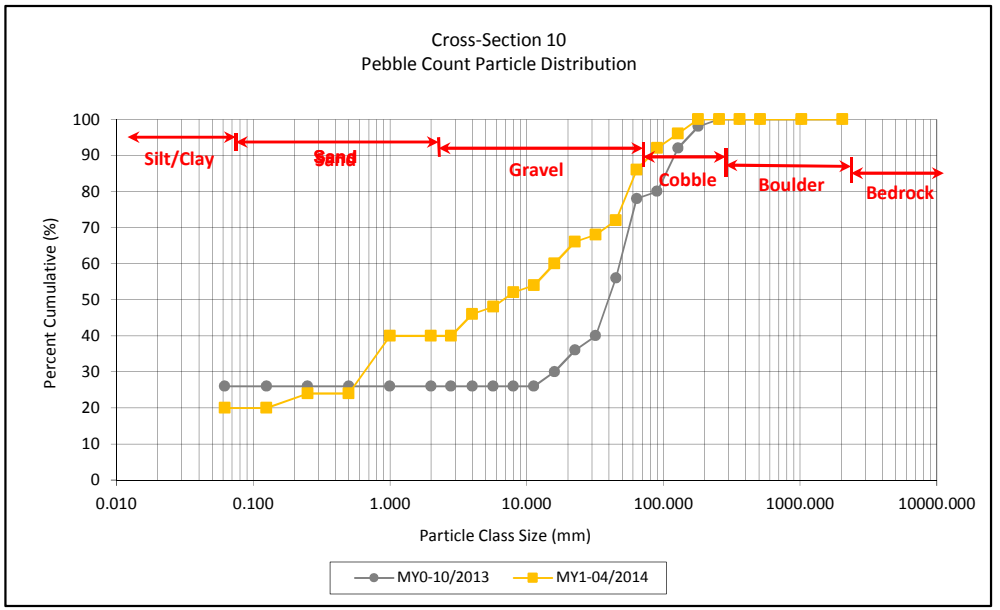


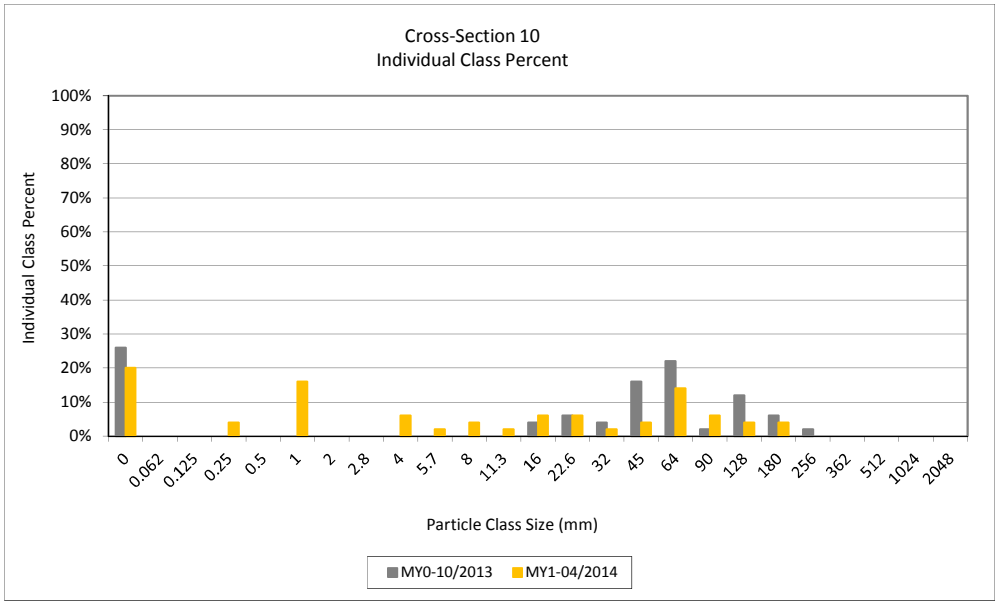


Reachwide and Cross-Section Substrate Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SB, Cross-Section 10
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count	Cross-Section 10 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	20	20	20
SAND	Very fine	0.062	0.125			20
	Fine	0.125	0.250			20
	Medium	0.250	0.500	4	4	24
	Coarse	0.5	1.0			24
	Very Coarse	1.0	2.0	16	16	40
GRAVEL	Very Fine	2.0	2.8			40
	Very Fine	2.8	4.0			40
	Fine	4.0	5.7	6	6	46
	Fine	5.7	8.0	2	2	48
	Medium	8.0	11.3	4	4	52
	Medium	11.3	16.0	2	2	54
	Coarse	16.0	22.6	6	6	60
	Coarse	22.6	32	6	6	66
	Very Coarse	32	45	2	2	68
	Very Coarse	45	64	4	4	72
COBBLE	Small	64	90	14	14	86
	Small	90	128	6	6	92
	Large	128	180	4	4	96
	Large	180	256	4	4	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 10	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	1.6
D_{50} =	9.4
D_{84} =	85.7
D_{95} =	165.3
D_{100} =	256.0

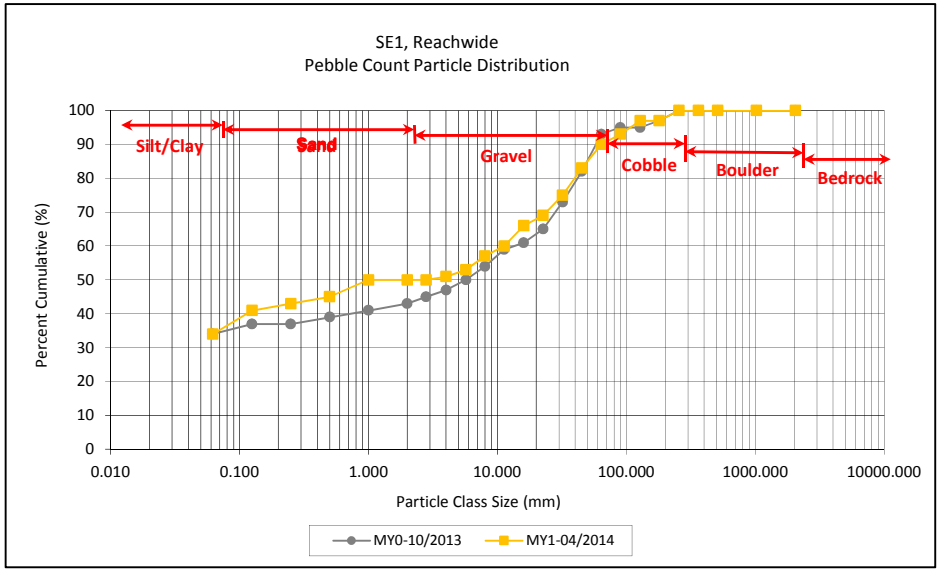


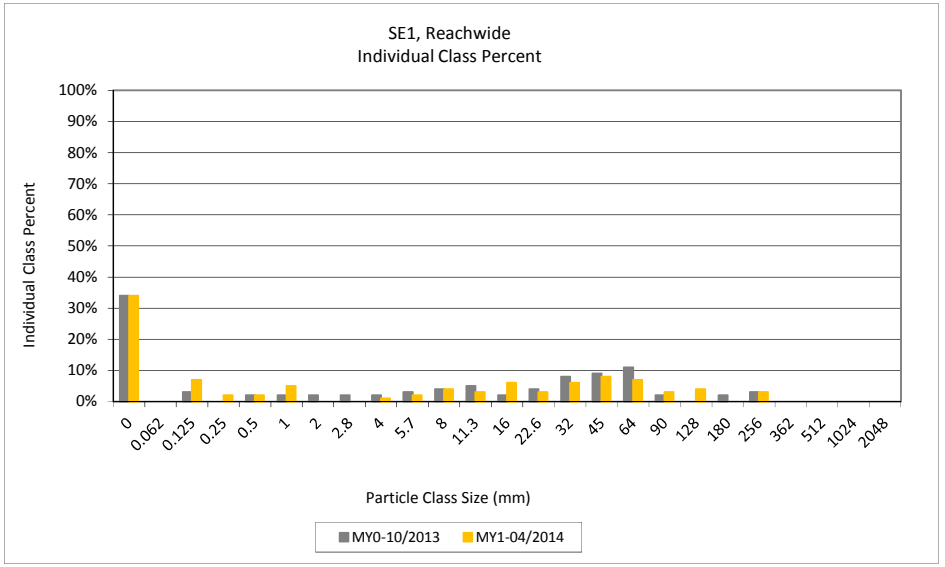


Reachwide and Cross-Section Pebble Count Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SE1, Reachwide
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count			SE1 Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	4	30	34	34	34
SAND	Very fine	0.062	0.125					34
	Fine	0.125	0.250		7	7	7	41
	Medium	0.250	0.500		2	2	2	43
	Coarse	0.5	1.0	2		2	2	45
	Very Coarse	1.0	2.0	2	3	5	5	50
GRAVEL	Very Fine	2.0	2.8					50
	Very Fine	2.8	4.0					50
	Fine	4.0	5.7	1		1	1	51
	Fine	5.7	8.0	2		2	2	53
	Medium	8.0	11.3	2	2	4	4	57
	Medium	11.3	16.0	3		3	3	60
	Coarse	16.0	22.6	2	4	6	6	66
	Coarse	22.6	32	2	1	3	3	69
	Very Coarse	32	45	6		6	6	75
	Very Coarse	45	64	7	1	8	8	83
COBBLE	Small	64	90	7		7	7	90
	Small	90	128	3		3	3	93
	Large	128	180	4		4	4	97
	Large	180	256					97
BOULDER	Small	256	362	3		3	3	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.1
D_{50} =	4.0
D_{84} =	67.2
D_{95} =	151.8
D_{100} =	362.0

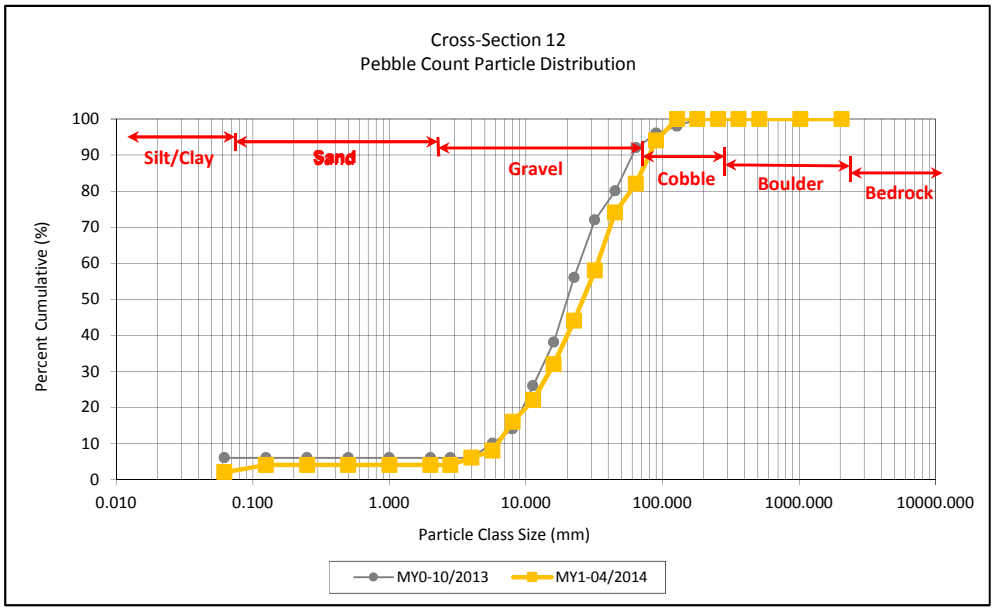


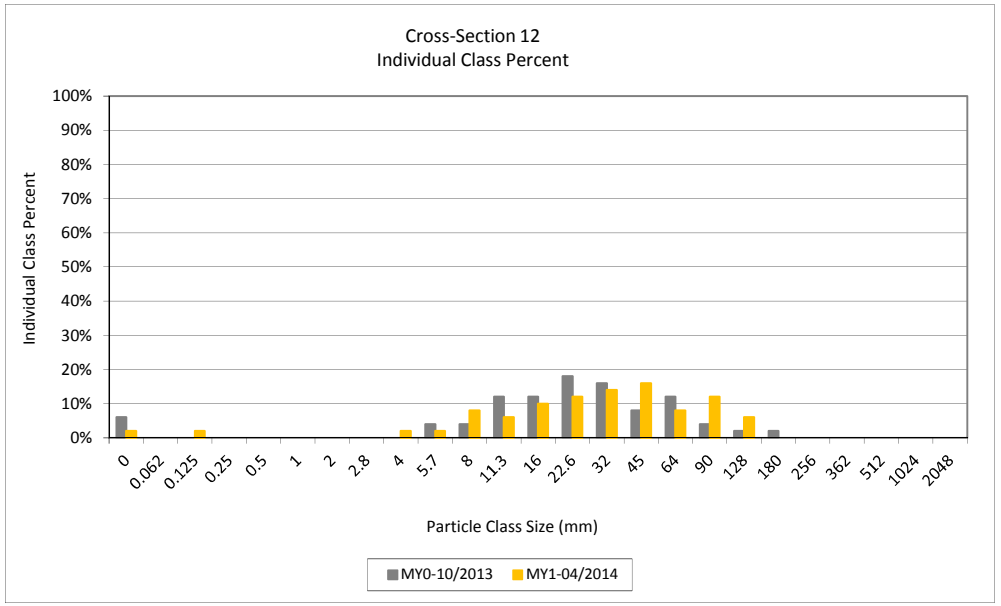


Reachwide and Cross-Section Substrate Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SE1, Cross-Section 12
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count	Cross-Section 12 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	2	2
SAND	Very fine	0.062	0.125			2
	Fine	0.125	0.250	2	2	4
	Medium	0.250	0.500			4
	Coarse	0.5	1.0			4
	Very Coarse	1.0	2.0			4
GRAVEL	Very Fine	2.0	2.8			4
	Very Fine	2.8	4.0			4
	Fine	4.0	5.7	2	2	6
	Fine	5.7	8.0	2	2	8
	Medium	8.0	11.3	8	8	16
	Medium	11.3	16.0	6	6	22
	Coarse	16.0	22.6	10	10	32
	Coarse	22.6	32	12	12	44
	Very Coarse	32	45	14	14	58
	Very Coarse	45	64	16	16	74
COBBLE	Small	64	90	8	8	82
	Small	90	128	12	12	94
	Large	128	180	6	6	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 12	
Channel materials (mm)	
D_{16} =	11.0
D_{35} =	24.7
D_{50} =	37.0
D_{84} =	95.4
D_{95} =	135.5
D_{100} =	180.0

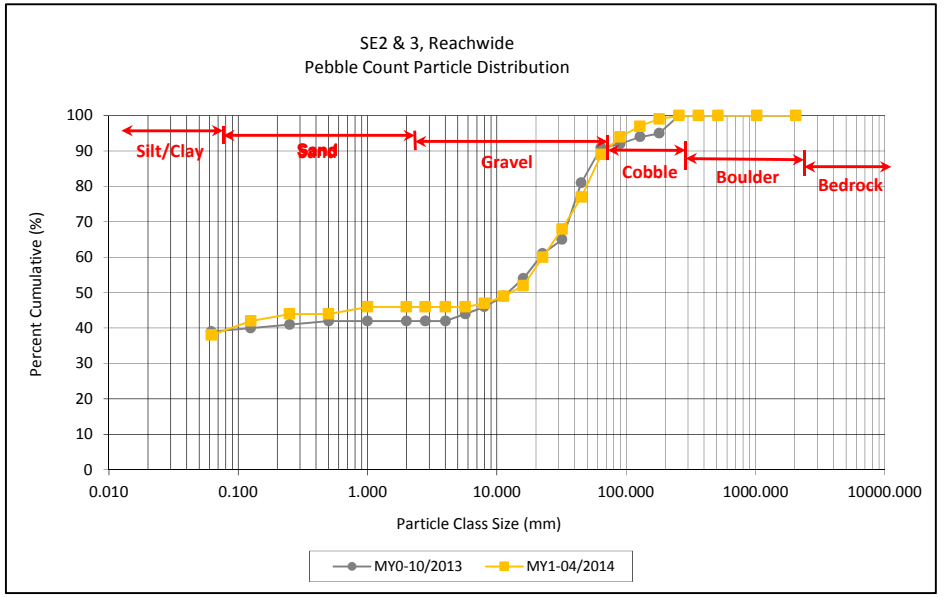


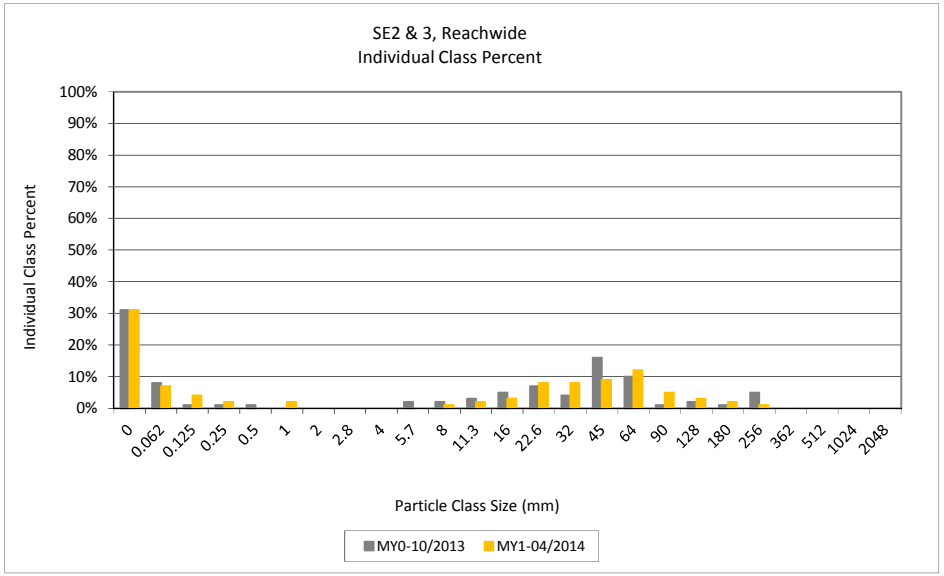


Reachwide and Cross-Section Pebble Count Plots
Byrds Creek Mitigation Site (NCEEP Project No. 94641)
SE 2 and 3, Reachwide
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count			SE2 & 3 Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	30	31	31	31
SAND	Very fine	0.062	0.125		7	7	7	38
	Fine	0.125	0.250		4	4	4	42
	Medium	0.250	0.500		2	2	2	44
	Coarse	0.5	1.0					44
	Very Coarse	1.0	2.0		2	2	2	46
GRAVEL	Very Fine	2.0	2.8					46
	Very Fine	2.8	4.0					46
	Fine	4.0	5.7					46
	Fine	5.7	8.0					46
	Medium	8.0	11.3	1		1	1	47
	Medium	11.3	16.0	2		2	2	49
	Coarse	16.0	22.6	2	1	3	3	52
	Coarse	22.6	32	6	2	8	8	60
	Very Coarse	32	45	8		8	8	68
	Very Coarse	45	64	8	1	9	9	77
COBBLE	Small	64	90	12		12	12	89
	Small	90	128	5		5	5	94
	Large	128	180	3		3	3	97
	Large	180	256	1	1	2	2	99
BOULDER	Small	256	362	1		1	1	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.1
D_{50} =	18.0
D_{84} =	78.1
D_{95} =	143.4
D_{100} =	362.0

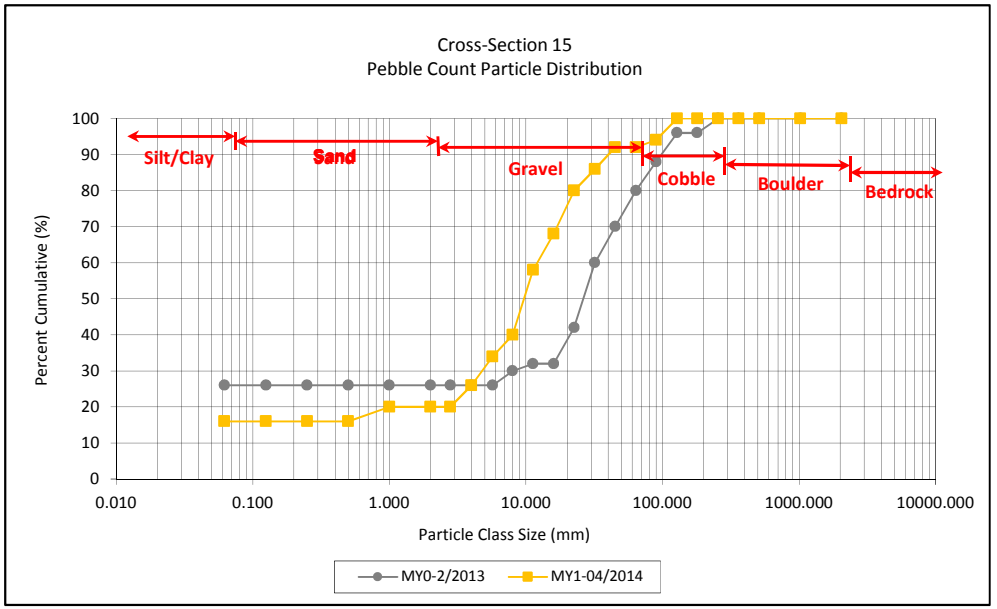


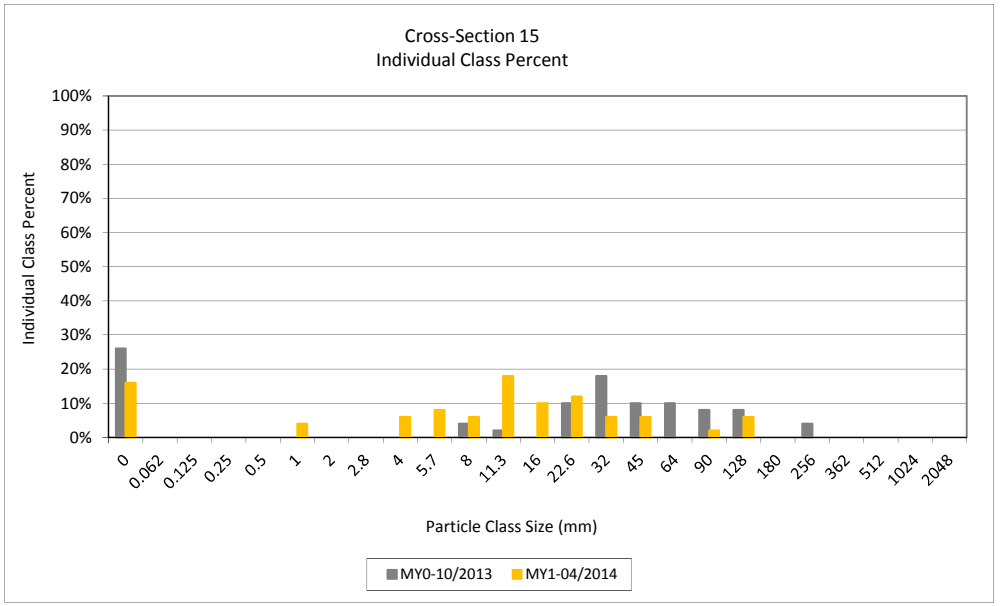


Reachwide and Cross-Section Substrate Plots
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
SE2, Cross-Section 15
Monitoring Year 1

Particle Class		Diameter (mm)		Particle Count	Cross-Section 15 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	16	16	16
SAND	Very fine	0.062	0.125			16
	Fine	0.125	0.250			16
	Medium	0.250	0.500			16
	Coarse	0.5	1.0			16
	Very Coarse	1.0	2.0	4	4	20
GRAVEL	Very Fine	2.0	2.8			20
	Very Fine	2.8	4.0			20
	Fine	4.0	5.7	6	6	26
	Fine	5.7	8.0	8	8	34
	Medium	8.0	11.3	6	6	40
	Medium	11.3	16.0	18	18	58
	Coarse	16.0	22.6	10	10	68
	Coarse	22.6	32	12	12	80
	Very Coarse	32	45	6	6	86
	Very Coarse	45	64	6	6	92
COBBLE	Small	64	90			92
	Small	90	128	2	2	94
	Large	128	180	6	6	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 15	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	8.4
D_{50} =	13.5
D_{84} =	40.2
D_{95} =	135.5
D_{100} =	180.0





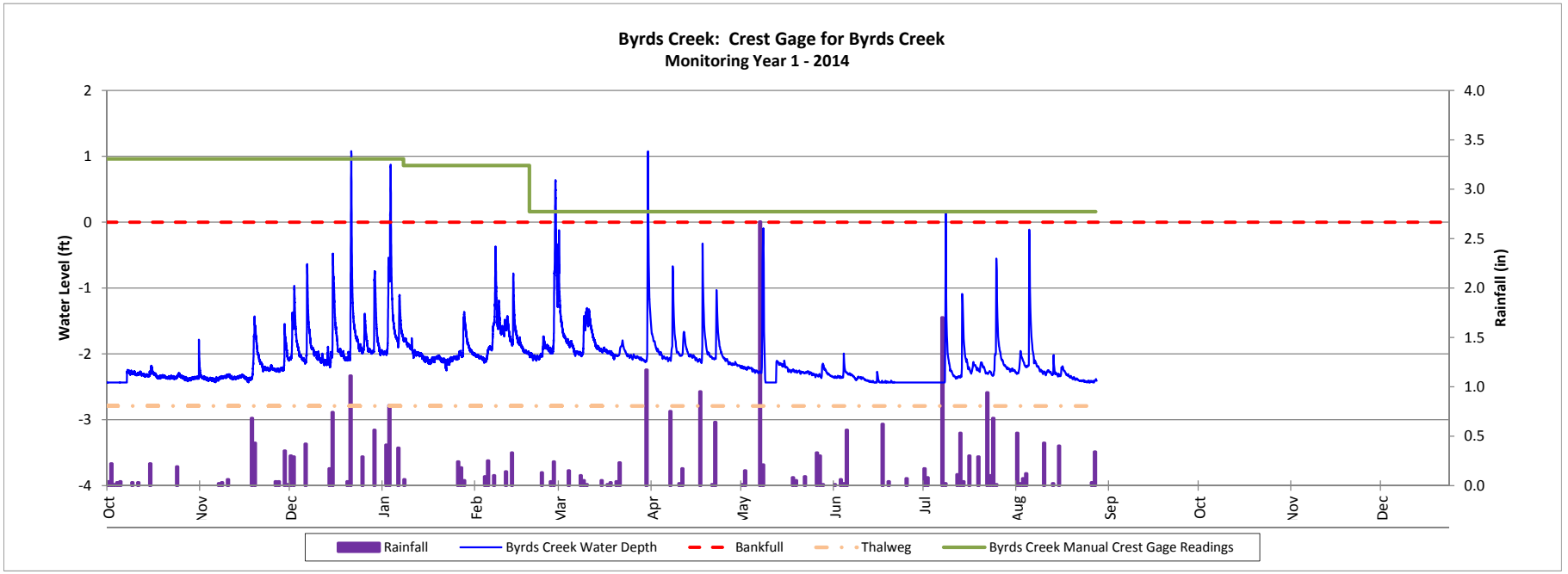
APPENDIX 5. Hydrology Summary Data and Plots

Table 13. Verification of Bankfull Events
Byrds Creek Mitigation Site (NCEEP Project No. 95020)
Monitoring Year 1

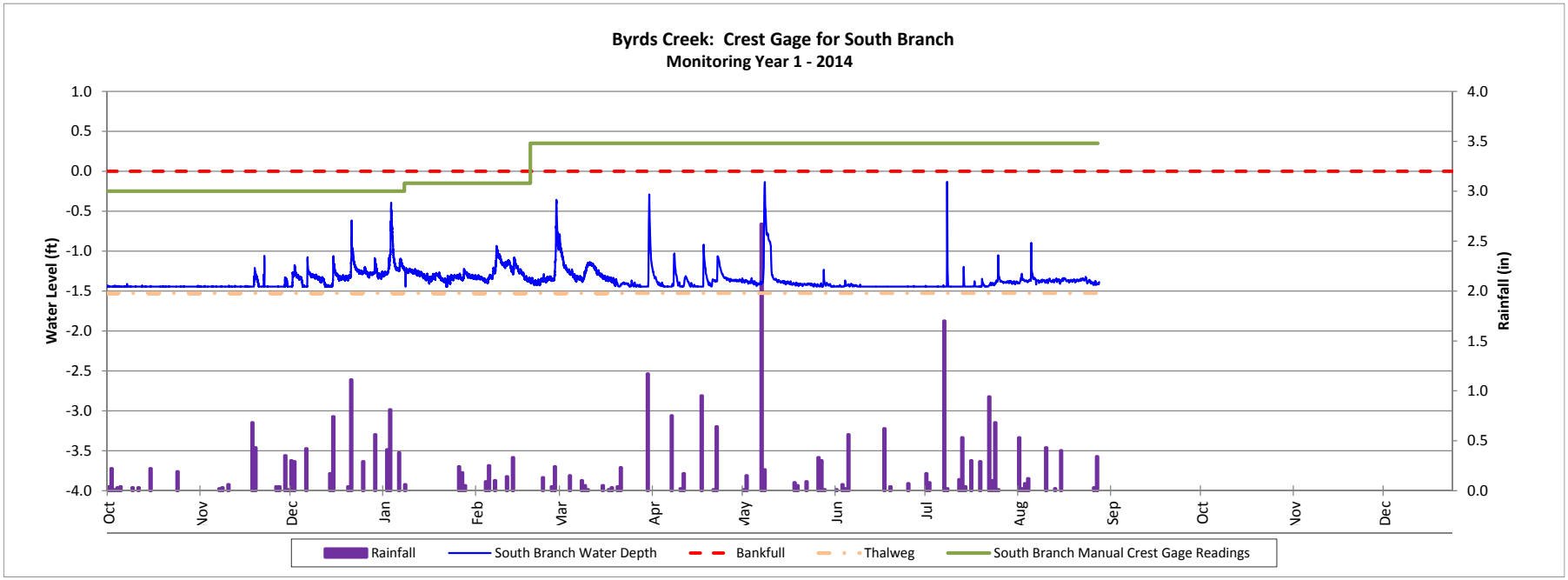
Reach	Date of Data Collection	Approximate Date of Occurrence	Method
BC3	1/16/2014	1/11/2014	Crest Gage / Pressure Transducer
	2/27/2014	*	
	9/4/2014	4/7/2014	
SB1	1/16/2014	*	
	2/27/2014	*	
	9/4/2014	5/15/2014	
SE2a	1/16/2014	*	
	2/27/2014	*	
	9/4/2014	*	

*data collected, but level was below bankfull elevation

Recorded Bankfull Events
Byrd's Creek Stream Restoration Project (EEP Project No. 95020)
Monitoring Year 1 - 2014



Recorded Bankfull Events
Byrd's Creek Stream Restoration Project (EEP Project No. 95020)
Monitoring Year 1 - 2014



Mitigation Project Name	**Byrd's Creek Mitigation Site**	**County**	**Person**	**USACE Action ID**	2012-00230
DMS IMS ID	**95020**	**Date Project Instituted**	**7/27/2011**	**NCDWR Permit No**	2012-0102
River Basin	**Neuse**	**Date Prepared**	**4/13/2015**		
Cataloging Unit	**03020201**				

Credit Release Milestone	Stream Credits						Wetland Credits							
	Scheduled Releases (Stream)	Warm	Cool	Cold	Anticipated Release Year (Stream)	Actual Release Date (Stream)	Scheduled Releases (Forested)	Riparian Riverine	Riparian Non riverine	Non-riparian	Scheduled Releases (Coastal)	Coastal	Anticipated Release Year (Wetland)	Actual Release Date (Wetland)
Potential Credits (Mitigation Plan)		**5,592.00**												
Potential Credits (As-Built Survey)		**5,370.67**												
1 (Site Establishment)	**N/A**				N/A	N/A	**N/A**				**N/A**		N/A	N/A
2 (Year 0 / As-Built)	**30%**	1,611.20			2014	3/31/2014	**30%**				**30%**		N/A	N/A
3 (Year 1 Monitoring)	**10%**	537.07			2015	4/23/2015	**10%**				**10%**		N/A	N/A
4 (Year 2 Monitoring)	**10%**				2016		**15%**				**15%**		N/A	N/A
5 (Year 3 Monitoring)	**10%**				2017		**20%**				**20%**		N/A	N/A
6 (Year 4 Monitoring)	**10%**				2018		**10%**				**10%**		N/A	N/A
7 (Year 5 Monitoring)	**15%**				2019		**15%**				**15%**		N/A	N/A
Stream Bankfull Standard	**15%**						**N/A**				**N/A**		N/A	N/A
Total Credits Released to Date		**2,148.27**												

DEBITS (released credits only)

			Ratios	1	1.5	2.5	5	1	3	2	5	1	3	2	5	1	3	2	5
				Stream Restoration	Stream Enhancment I	Stream Enhancement II	Stream Preservation	Riparian Restoration	Riparian Creation	Riparian Enhancement	Riparian Preservation	Nonriparian Restoration	Nonriparian Creation	Nonriparian Enhancement	Nonriparian Preservation	Coastal Marsh Restoration	Coastal Marsh Creation	Coastal Marsh Enhancement	Coastal Marsh Preservation
As-Built Amounts (feet and acres)				**3,096.00**	**2,182.00**	**2,050.00**													
As-Built Amounts (mitigation credits)				**3,096.00**	**1,454.67**	**820.00**													
Percentage Released				**40%**	**40%**	**40%**													
Released Amounts (feet / acres)				**1,238.40**	**872.80**	**820.00**													
Released Amounts (credits)				**1,238.40**	**581.87**	**328.00**													
NCDWR Permit	USACE Action ID	Project Name																	
2001-1689	2002-20819	NCDOT TIP R-2547 / R-2641 Knightdale Bypass		84.89															
2001-0550	1996-01836	NCDOT TIP R-2809 - Wake Forest Bypass		430.68															
2001-0681	1997-00175	NCDOT TIP R-2907 - Widening of NC 55 at Sunset Lake		9.15															
2007-0018	2007-01106-292	42 East		210.79															
2007-1057	2007-02520-292	Perry Creek Road Ext.		193.29															
2007-1057	2007-02520-292	Perry Creek Road Ext.			326.42														
2006-1617	2006-20100-292	Wendell Falls			328.18	615.00													
Remaining Amounts (feet / acres)				**309.60**	**218.20**	**205.00**													
Remaining Amounts (credits)				**309.60**	**145.47**	**82.00**													

Contingencies (if any): None

TUGWELL.TODD.JASON.1048429293
2015.07.20 17:19:28 -04'00'

Signature of Wilmington District Official Approving Credit Release **Date**

1 - For DMS, no credits are released during the first milestone
2 - For DMS projects, the second credit release milestone occurs automatically when the as-built report (baseline monitoring report) has been made available to the NCIRT by posting it to the NCEEP Portal, provided the following criteria have been met:
1) Approval of the final Mitigation Plan
2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property
3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan
4) Reciept of necessary DA permit authorization or written DA approval for porjects where DA permit issuance is not required

3 - A 15% reserve of credits is to be held back until the bankfull event performance standard has been met