Coddle Creek Tributary
(Indian Run) Stream Restoration
EEP Project # 94
DENR Contract # 5360

Annual Monitoring Report Year 3 of 5
Cabarrus County, North Carolina

Prepared for:

North Carolina Department of Environmental and Natural Resources
Ecosystem Enhancement Program
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Report Submission: December 2014

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APPENDICES

1.0 EXECUTIVE SUMMARY

The Coddle Creek Tributary (Indian Run) Stream Restoration Project, completed in March 2011, enhanced (level1) or restored a total of 2,270 linear feet of stream in the Upper Rocky River watershed including restoring 6.17 acres of riparian buffer. In addition, approximately 1,540 linear feet of stream was preserved within the 19.61 acre conservation easement. The project is located in the USGS Hydrologic Unit (HU) 03040105020010 of the Yadkin Pee-Dee River Basin. This HU is within the EEP's Upper Rocky River Local Watershed Plan and is also listed as a Targeted Local Watershed (TLW) in EEP's Lower Yadkin Pee-Dee River Basin Restoration Priorities Plan 2009. The project site, which is protected by a 19.61-acre permanent conservation easement held by the State of North Carolina, is situated in Cabarrus County in the Southern Outer Piedmont ecoregion of the Piedmont physiographic province. Coddle Creek, from 0.2 miles upstream of NC Highway 73 (NC-73) to Rocky River, is currently listed on the NC 303(d) List as impaired due to turbidity (NCDENR 2012). In addition to the current non-supporting use classification for the lower portions of Coddle Creek, anticipated high rates of development in the watershed pose critical challenges in managing the region's aquatic resources. The project goals and objectives are listed below.

Project Goals

- Improve local water quality by reestablishing stream stability and capacity to transport watershed flows and sediment load.
- Provide additional floodplain storage by increasing the capacity of the stream to mitigate flood flows.
- Restore aquatic and riparian habitat.
- Reducing non-point source sedimentation and nutrient inputs into the project reaches.

Project Objectives

- Restore/Enhance (level 1) 2,270 linear feet of stable stream channel morphology, supported by instream habitat and grade/bank stabilization structures.
- Preserve 852 linear feet of stream within the conservation easement.
- Eliminate accelerated bank erosion by creating a bankfull bench, floodplain, and laying back slopes.
- Reestablish a native riparian buffer.

Vegetation Assessment

The vegetative success of the restoration site is based on criteria established in the USACE Stream Mitigation Guidelines (2003). Vegetation monitoring will be considered successful if a minimum of 260 planted stems/acre are surviving at the end of five years. The interim measure of vegetative success for the site will be the survival of a minimum of 320 planted stems/acre in year three and 288 stems/acre at the end of year four. The Monitoring Year 3 (MY3) stem counts are located in Tables 7 and 9 in Appendix C. Currently, only Vegetation Plot 8 is not meeting the interim measure of success. Vegetation throughout the reach appears to be growing at acceptable rates and the mortality rate appears to be fairly low. Areas noted in the previous monitoring year as having sparse vegetation or being bare now include herbaceous plants and small woody stems.

Cattails (*Typha latifolia*) continue to dominate the bed and banks throughout both reaches. These locations are noted on the CCPV and represent approximately 265 linear feet of the reach or 11 % of the total reach. The cattails are likely to continue to grow and take over additional stream footage without

maintenance activities to control the growth. The cattails aren't currently creating issues to the current vegetation; however, they may start outcompeting other riparian herbaceous species and appear to be having some effects on channel morphology. No other invasive species were observed. No new easement encroachments were noted.

Stream Assessment

The upper and lower reaches of the restoration project were observed to be in stable condition. The channel's profile and cross-sections adjusted minimally from the baseline conditions. The channel accesses its floodplain and evidence of bankfull events were observed during Year 3 monitoring. This evidence included the presence of wrack lines, sediment deposits, and a crest gauge reading of 35" above bankfull. The substrate continues to shows a gradual change to more coarse material in the upper reach although the lower reach still has finer sediment. This is expected as the lower reach is an offline channel restoration and the larger particles haven't yet migrated downstream.

One notable area of aggradation was observed on the lower reach at Sta. 10+68 which could be the result of the cattail growth near that location. Three areas of bar formation were noted at Sta. 25+29 – 25+62 and Sta. 26+50 – 26+67 on the upper reach and Sta. 11+35 on the lower reach. One area of bank erosion was noted between Sta. 22+12 and 23+00 on the upper reach which could have resulted from effects of the beaver dam. The terrace rill at approximately Sta. 18+00 on the left bank of the upper reach was noted in the Monitoring Year 1 report, but appears to have stabilized. This area will continue to be monitored for erosion. Two headcuts were noted at Sta. 20+00 on the upper reach and Sta. 17+75 on the lower reach. Both headcuts are outside of the stream channel and seem to be due to overland flow. A debris jam was noted at Sta. 15+60 on the lower reach. One beaver dam was noted at Sta. 22+12 on the upper reach and was removed in September 2014. Other than the previously mentioned bank erosion, this area did not appear to be negatively impacting channel morphology. A second beaver dam was noted at Sta. 14+43 on the lower reach and was removed in October 2014. The channel morphology upstream of this area shows evidence of minor impact in channel morphology. All problem areas are noted on the Current Conditions Plan View (CCPV) sheets in Appendix B.

In response to continued observations of beaver activity in the stream, EEP has placed the project site on a quarterly inspection schedule for beaver and beaver dam removal with the USDA Animal and Plant Health Inspection Service (USDA-APHIS).

Pebble count data for the upper reach cross sections indicate similar or coarser values compared to baseline. This indicates a good movement of material at least in the upstream parts of the upper reach. The lower reach riffle at cross section 8 still exhibits a small particle size making up the riffle section; however, the riffle at cross section 5 exhibits larger particle sizes. As the lower reach was constructed as an offline segment, these values are not unexpected. It will take longer for coarser material to progress to the lower reach from upstream areas. Also, effects from the beaver dam on the lower reach downstream of Cross Section 6 may play a role in the type of bed material. Since the cross section dimensions have remained relatively the same for the lower reach, the sections are stable despite the smaller bed material.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting documentation formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly the Restoration Plan) documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

2.0 METHODOLOGY

The following methods were utilized during the Year 3 monitoring for data collection and post-processing:

- Geomorphic topographic data collections were performed in the field using a survey grade GPS such that each survey point has three-dimensional coordinates, and is georeferenced (NAD83-State Plane Feet – FIPS3200).
- Longitudinal stationing was developed using the as-built survey thalweg as a baseline.
- The particle size distribution protocol used was the Modified-Wolman pebble count.
- The CVS Level 2 methodology was utilized for the vegetation plot data collection.

3.0 REFERENCES

HDR Engineering, Inc. 2007. Final Stream Restoration Plan for Indian Run (Trib. to Coddle Creek).

HDR Engineering, Inc. 2009. Indian Run Stream Restoration Final Plans (90%).

HDR Engineering, Inc. 2011. Baseline Monitoring and As Built Baseline Report.

HDR Engineering, Inc. 2012. Monitoring Report Year 1 of 5.

Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation. Version 4.0. (http://cvs.bio.unc.edu/methods.htm)

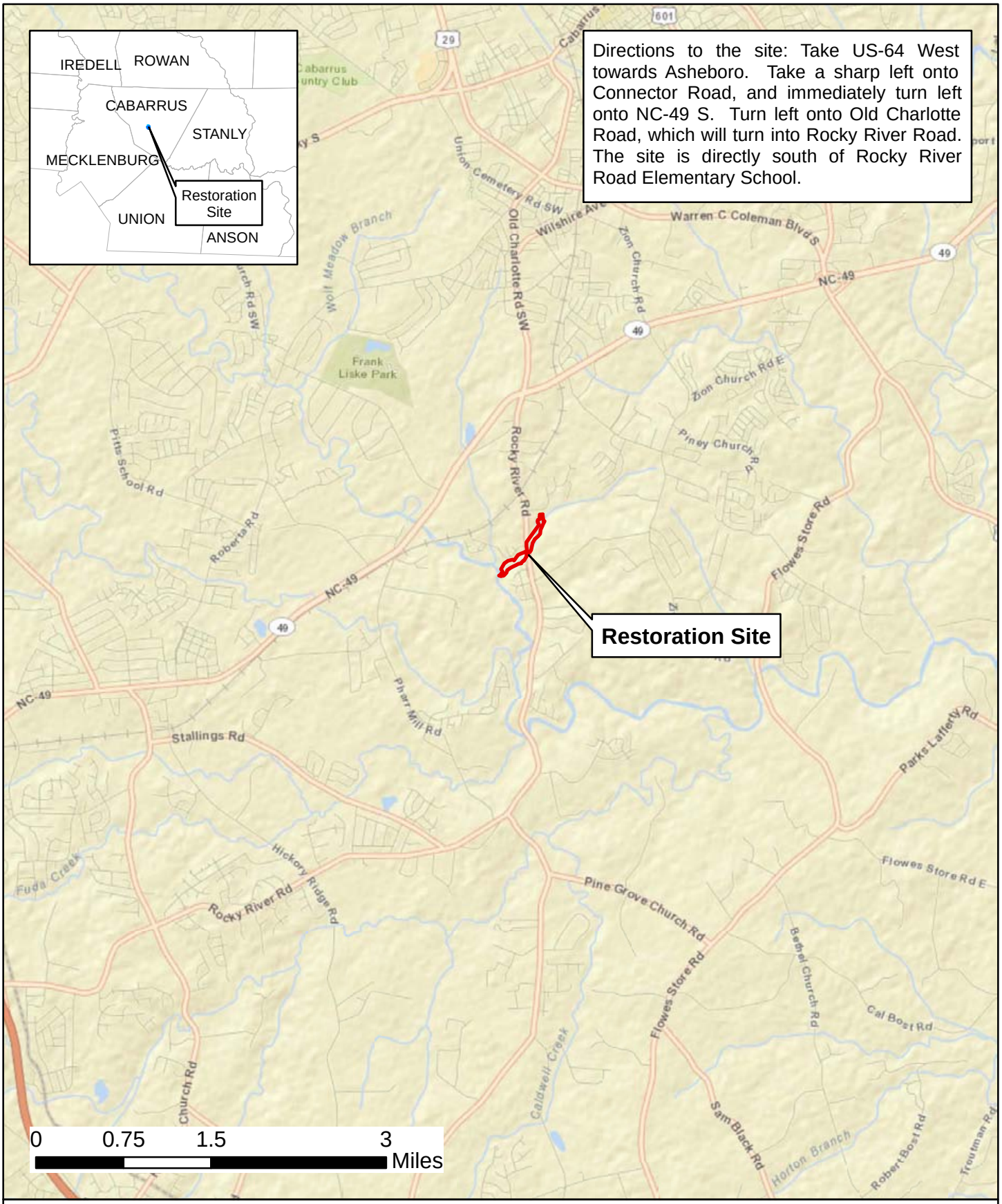
North Carolina Ecosystem Enhancement Program. 2011. Procedure Guidance and Content Requirements for EEP Monitoring Reports. Version 1.4 (http://www.nceep.net/business/EEP_Mon_Rep_Temp_1.3_01-15-10.pdf)

SEPI Engineering & Construction, Inc. 2013. Coddle Creek Tributary (Indian Run) Annual Monitoring Report Year 2 of 5.

U.S. Army Corps of Engineers, Wilmington District. 2003. Stream Mitigation Guidelines. North Carolina Division of Water Quality (DWQ), U.S. Environmental Protection Agency, Region IV (EPA), Natural Resources Conservation Service (NRCS) and the North Carolina Wildlife Resources Commission (WRC).

Appendix A

Project Vicinity Map and Background Tables



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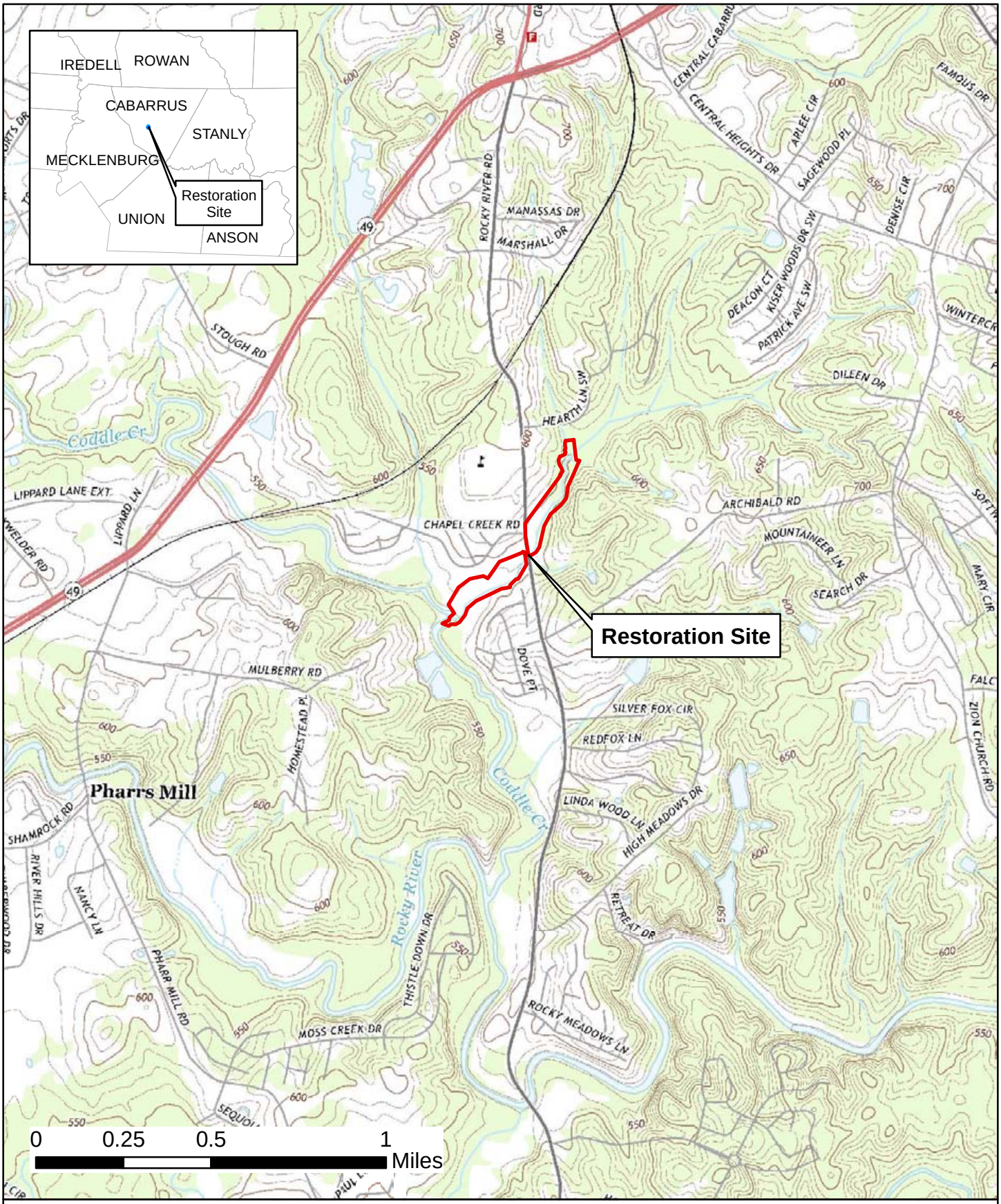
Restoration Site Vicinity

Coddle Creek Tributary (Indian Run)

Monitoring Year 3 Cabarrus County, NC

December 2014 Project # 94 Figure 1

N W E S



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USGS Concord SE Quadrangle, 2013

Coddle Creek Tributary (Indian Run)

Monitoring Year 3 Cabarrus County, NC

December 2014 Project # 94 Figure 2

N W E S

Table 1a. Project Components									
Coddle Creek Tributary (Indian Run) / 94									
Project Component or Reach ID	Existing Feet/Acres	Restoration Level	Approach	Footage or Acreage	Stationing	Mitigation Ratio	Mitigation Units	BMP Elements	Comment
Reach 1 - Upper	1275 lf	E (Level 1)	P3	1275 lf	15+00-26+26 & 26+46-27+95	1.5:1	850		Restored bankfull dimension within the existing channel, utilized a partial floodplain bench to restore floodprone conditions, and enhanced existing pattern and profile.
Reach 1 - Upper	20 lf	E (Level 1)	P3	20 lf	26+26-26+46	3:1	7		Restored bankfull dimension within the existing channel, utilized a partial floodplain bench to restore floodprone conditions, and enhanced existing pattern and profile.
Reach 1 - Upper	415 lf	P		415 lf	07+52-09+10 & 09+34-11+72 & 14+45-14+64	10:1	42		Preserved channel in its existing condition within the conservation easement.
Reach 1 - Upper	327 lf	P		297 lf*	09+10-9+34 & 11+72-14+45	20:1	15		Preserved channel in its existing condition within the utility easement. *30 feet of sanitary sewer easement will not receive mitigation credits
Reach 2 - Lower	735 lf	R	P2	975 lf	10+00-19+75	1:1	975		Fully restored pattern, dimension and profile, excavated a new channel within an adjoining floodplain bench to restore floodplain conditions.
Reach 2 - Lower	434 lf	P		434 lf	21+72-23+58 & 24+45-26+93	20:1	22		Preserved channel in its existing condition within the utility easement.
Reach 2 - Lower	394 lf	P		394 lf	19+75-21+72 & 23+58-24+45 & 26+93-28+03	10:1	39		Preserved channel in its existing condition within the conservation easement.

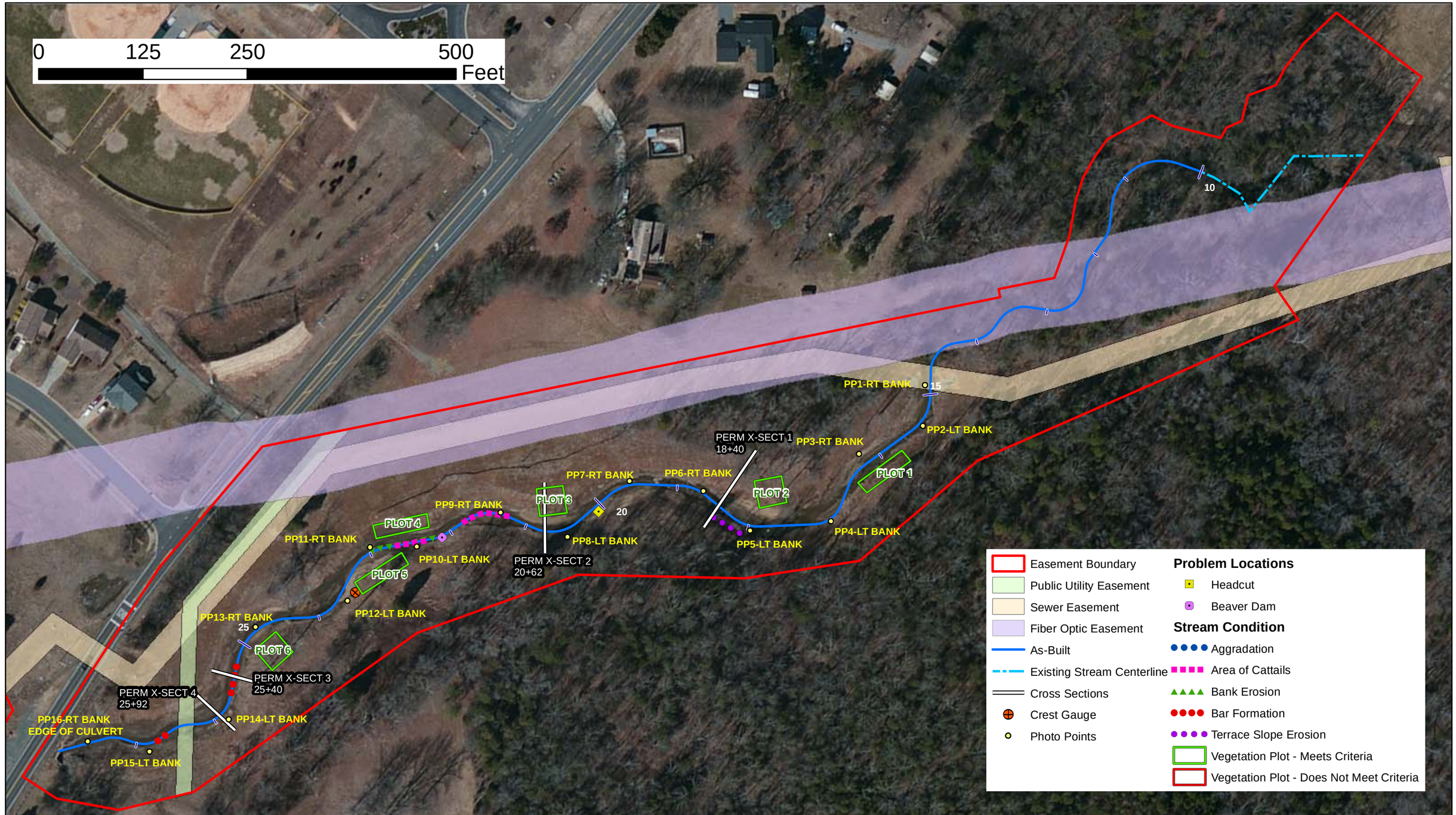
Table 1b. Component Summations Coddle Creek Tributary (Indian Run) / 94								
Restoration Level	Stream (lf)	Stream Mitigation Units	Riparian Wetland (Ac)		Planted Area (Ac)	Potential Buffer Area (Ac)	Total Conservation Area (Ac)	BMP
			Riverine	Non-Riverine				
Restoration (Lower)	975	975			4.21	2.58	10.11	
Enhancement (Upper)	1295	857			4.30	3.59	9.50	
Preservation	1540	118				1.89		
Totals (Feet/Acres)	3,810				8.51	8.06	19.61	
MU Totals		1,950						

Table 2. Project Activity and Reporting History Coddle Creek Tributary (Indian Run) / 94		
Elapsed Time Since Grading Complete: 3 yrs 9 months		
Elapsed Time Since Planting Complete: 3 yrs 9 Months		
Number of Reporting Years: 3		
	Data Collection	Completion or
Activity or Deliverable	Complete	Delivery
Restoration Plan	Jun-07	Aug-07
Final Design – Construction Plans	Jun-07	Jul-09
Construction/Grading	NA	Mar-11
Planting	NA	Mar-11
Final Inspection	NA	Mar-11
Monitoring – baseline)	May-11	Aug-11
Year 1 Monitoring	5/29/2012 - 5/30/2012	Sep-12
Year 2 Monitoring	Nov-13	Mar-14
Year 3 Monitoring	Oct-14	Dec-14
Year 4 Monitoring		
Year 5 Monitoring		

Table 3. Project Contacts Table Coddle Creek Tributary (Indian Run) / 94	
Designer	HDR Engineering Inc. of the Carolinas
	3733 National Drive, Suite 207, Raleigh, NC 27612
Primary project design POC	Jonathan Henderson, PE (919) 785-1118
Construction Contractor	Land Mechanic Designs, Inc.
	126 Circle G Lane, Willow Spring, NC 27592
Construction contractor POC	Lloyd Glover, (919) 639-6132
Survey Contractor	Stewart Proctor Pllc
	319 Chapanoke Road #106, Raleigh, NC 27603
Survey contractor POC	Herb Proctor, (919) 799-1855
Planting Contractor	HARP, Inc.
	301 McCullough Drive, 4th Floor, Charlotte, NC 28262
Planting contractor POC	Alan Peoples, (704) 841-2841
Seeding Contractor	Land Mechanic Designs, Inc.
	126 Circle G Lane, Willow Spring, NC 27592
Contractor point of contact	Lloyd Glover, (919) 639-6132
Seed Mix Sources	Green Resource, Charlotte, NC
	Phone: (704) 927-3100
Nursery Stock Suppliers	Cure Nursery, Pittsboro, NC - (919) 542-6186
	ArborGen, Blenheim, SC - (843) 528-3203
	Foggy Mountain Nursery llc, Creston, NC - (336) 384-5323
	Habitat and Restoration Plants, Lexington, NC - (336) 362-6776
	NC Division of Forest Resources, Greensboro, NC - (919) 731-7988
Monitoring Performers - Baseline & Year 1	HDR Engineering Inc. of the Carolinas
	3733 National Drive, Suite 207, Raleigh, NC 27612
Monitoring Performers - Year 2	SEPI Engineering & Construction, Inc.
	1025 Wade Avenue, Raleigh, NC 27605
Stream Monitoring POC	Phil Beach, PWS (919) 787-9977
Vegetation Monitoring POC	Kim Hamlin, Project Scientist (919) 787-9977

Table 4. Project Attribute Table Coddle Creek Tributary (Indian Run) / 94		
Project County	Cabarrus	
Physiographic Region	Piedmont	
Ecoregion	Southern Outer Piedmont	
Project River Basin	Yadkin / Pee Dee	
USGS HUC for Project (14 digit)	3040105020010	
NCDWQ Sub-basin for Project	03 - 07 - 11	
Within extent of EEP Watershed Plan?	Upper Rocky River	
WRC Hab Class (Warm, Cool, Cold)	Warm	
% of project easement fenced or demarcated	100% marked with EEP easement signage	
Beaver activity observed during design phase?	No	
Restoration Component Attribute Table		
	UPPER	LOWER
Drainage area (ac)	1.5	
Stream order	2nd	
Restored length (feet)	1295	975
Perennial or Intermittent	Per	
Watershed type (Rural, Urban, Developing etc.)	Devel.	
Watershed LULC Distribution (e.g.)		
Medium Density Residential	11	
Low Density Residential / Open Fields/ Lawns	34	
Forested	52	
Watershed impervious cover (%)	3	
NCDWQ AU/Index number	-	
NCDWQ classification	C	
303d listed?	No	
Upstream of a 303d listed segment?	Yes	
Reasons for 303d listing or stressor	Bio. Integ.	Turbidity
Total acreage of easement	9.5	10.11
Total vegetated acreage within the easement	9.5	10.11
Total planted acreage as part of the restoration	4.3	4.21
Rosgen classification of pre-existing	Imp. C4	Ditch
Rosgen classification of As-built	C4	C4
Valley type	VIII	VIII
Valley slope	0.63%	0.61%
Valley side slope range (e.g. 2-3.%)	-	-
Valley toe slope range (e.g. 2-3.%)	-	-
Cowardin classification	NA	
Trout waters designation	No	
Species of concern, endangered etc.? (Y/N)	No	
Dominant soil series and characteristics		
Series	Chewacla	
Depth	U	U
Clay%	U	U
K	U	U
T	U	U

Appendix B
Visual Assessment Data



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Coddle Creek Tributary (Indian Run) Year 3 Monitoring

Current Conditions Plan View Upper Reach Cabarrus County, NC

December 2014 Project # 94 Figure 3A

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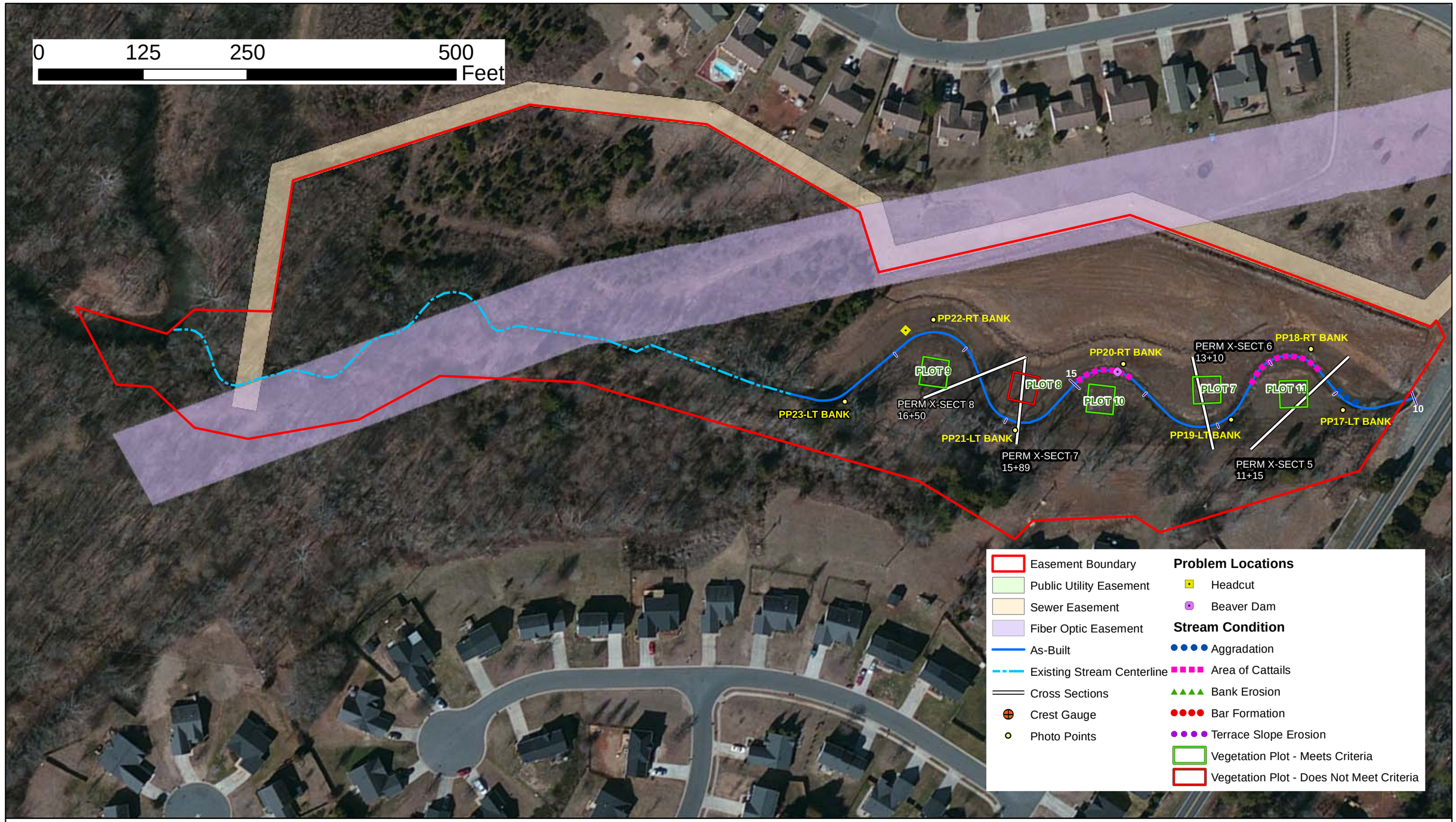

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Coddle Creek Tributary (Indian Run) Year 3 Monitoring

Current Conditions Plan View Lower Reach Cabarrus County, NC

December 2014 Project # 94 Figure 3B

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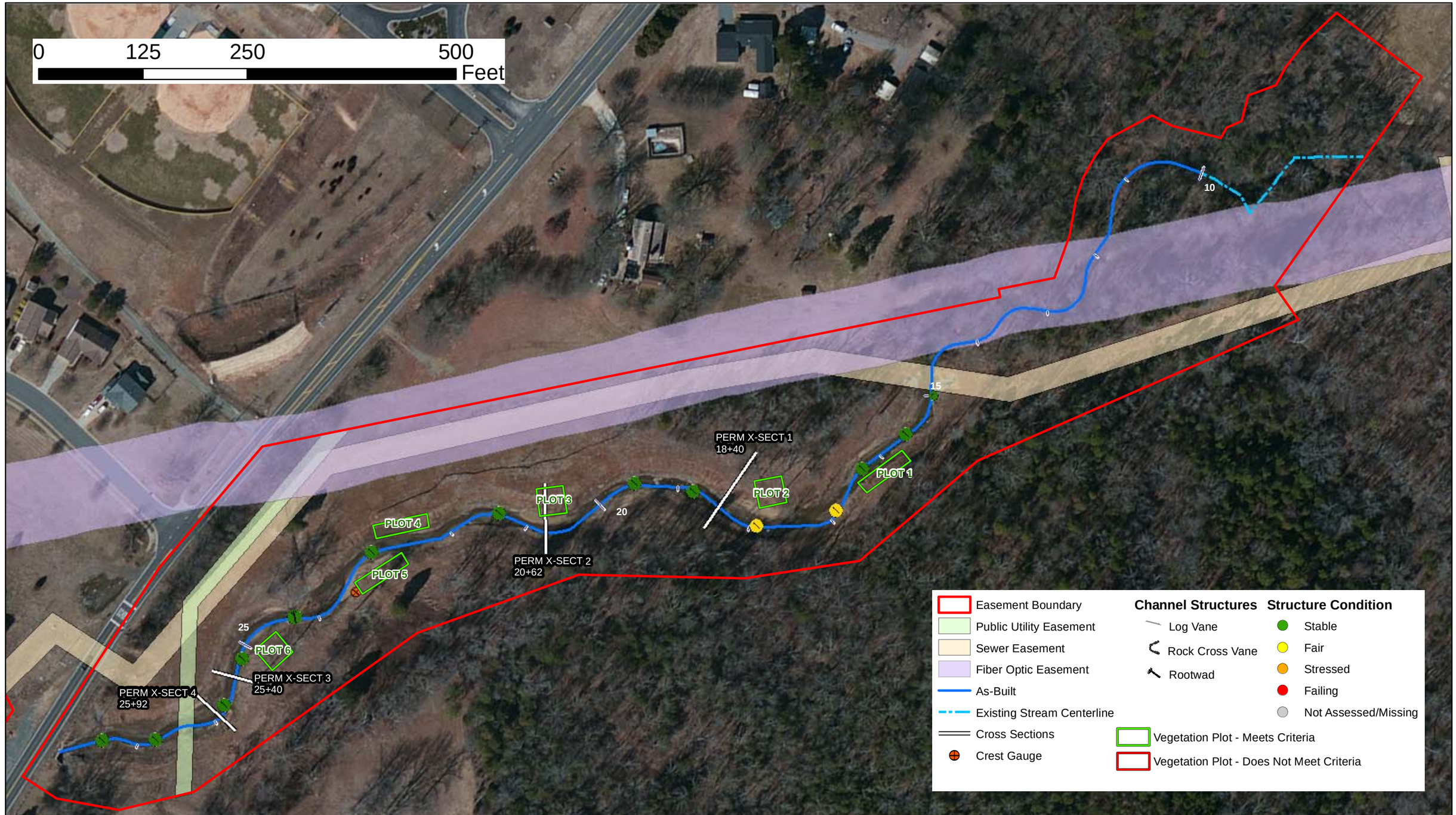

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Coddle Creek Tributary (Indian Run) Year 3 Monitoring

Structure Conditions Upper Reach Cabarrus County, NC

December 2014 Project # 94 Figure 3C

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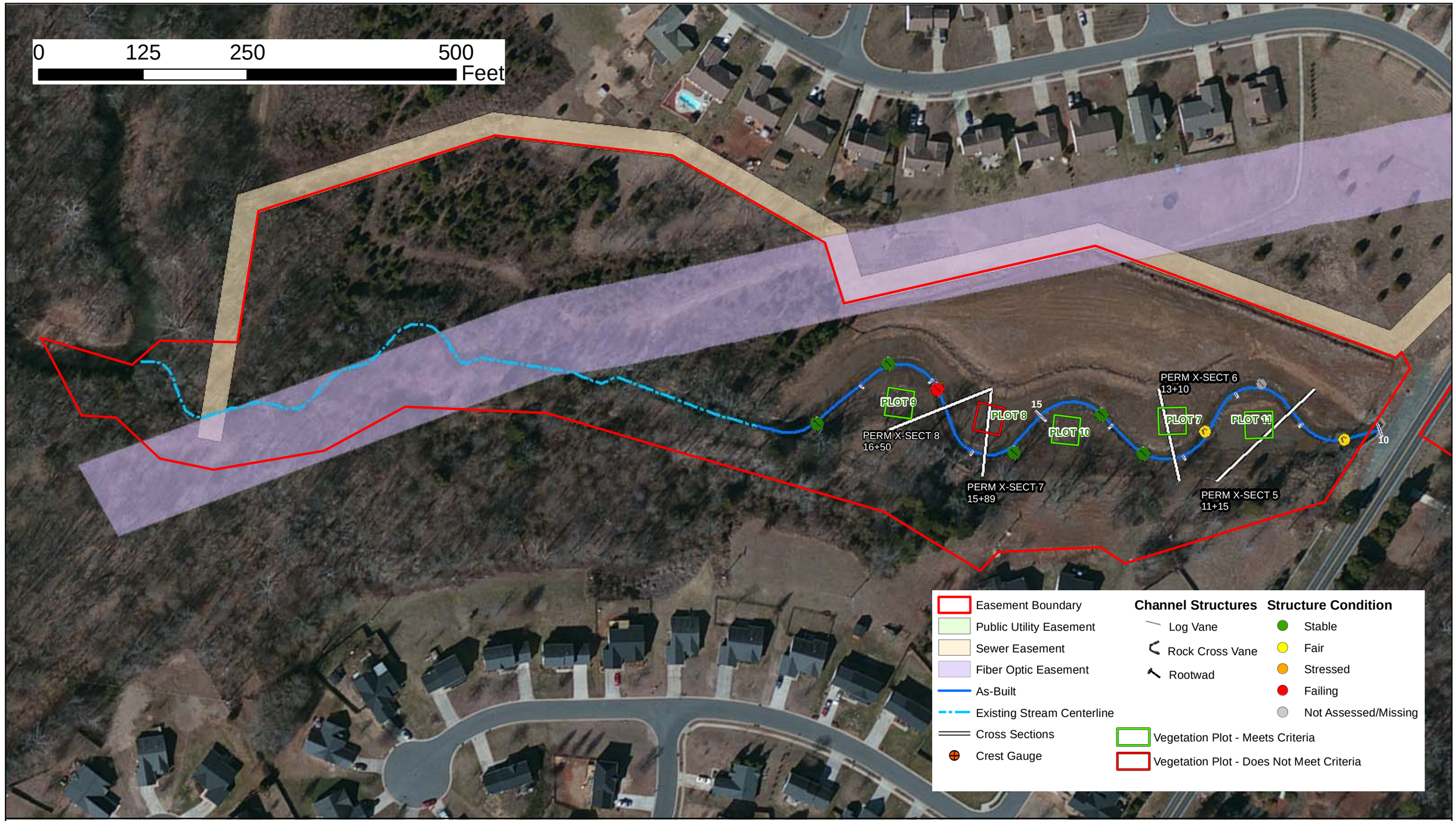

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Coddle Creek Tributary (Indian Run) Year 3 Monitoring

Structure Conditions Lower Reach Cabarrus County, NC

December 2014 Project # 94 Figure 3D

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SEPI Engineering & Construction

Table 5a **Visual Stream Morphology Stability Assessment**
Reach ID **Upper Reach**
Assessed Length **1295**

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	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			2	52	96%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	11	11			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	15	15			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	15	15			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	15	15			100%			
		2. Thalweg centering at downstream of meander (Glide)	15	15			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	88	97%	1	88	100%
	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%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	1	88	97%	1	88	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	14	14			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	14	14			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	13	13			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	13	13			100%			

Table 5b **Visual Stream Morphology Stability Assessment**
Reach ID **Lower Reach**
Assessed Length **975**

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	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			1	31	97%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	6	6			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	7	7			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	7	7			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	7	7			100%			
		2. Thalweg centering at downstream of meander (Glide)	7	7			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	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%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	9	9			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	9			89%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	9	9			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	9	9			100%			

*Riffles were not supplied with coarse substrate in the as-built condition. Aside from minor aggradation, riffles remain stable.

Table 6 Vegetation Condition Assessment

Planted Acreage[1] **8.51**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	Pattern and Color	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	Pattern and Color	0	0.00	0.0%
			Total	0	0.00	0.0%
3. 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 acres	Pattern and Color	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%

Easement Acreage[2] **19.61**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Areas or points (if too small to render as polygons at map scale).	1000 SF	Pattern and Color	0	0.00	0.0%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

Photo Station 1 Downstream (Year 3 – 10/21/2014)

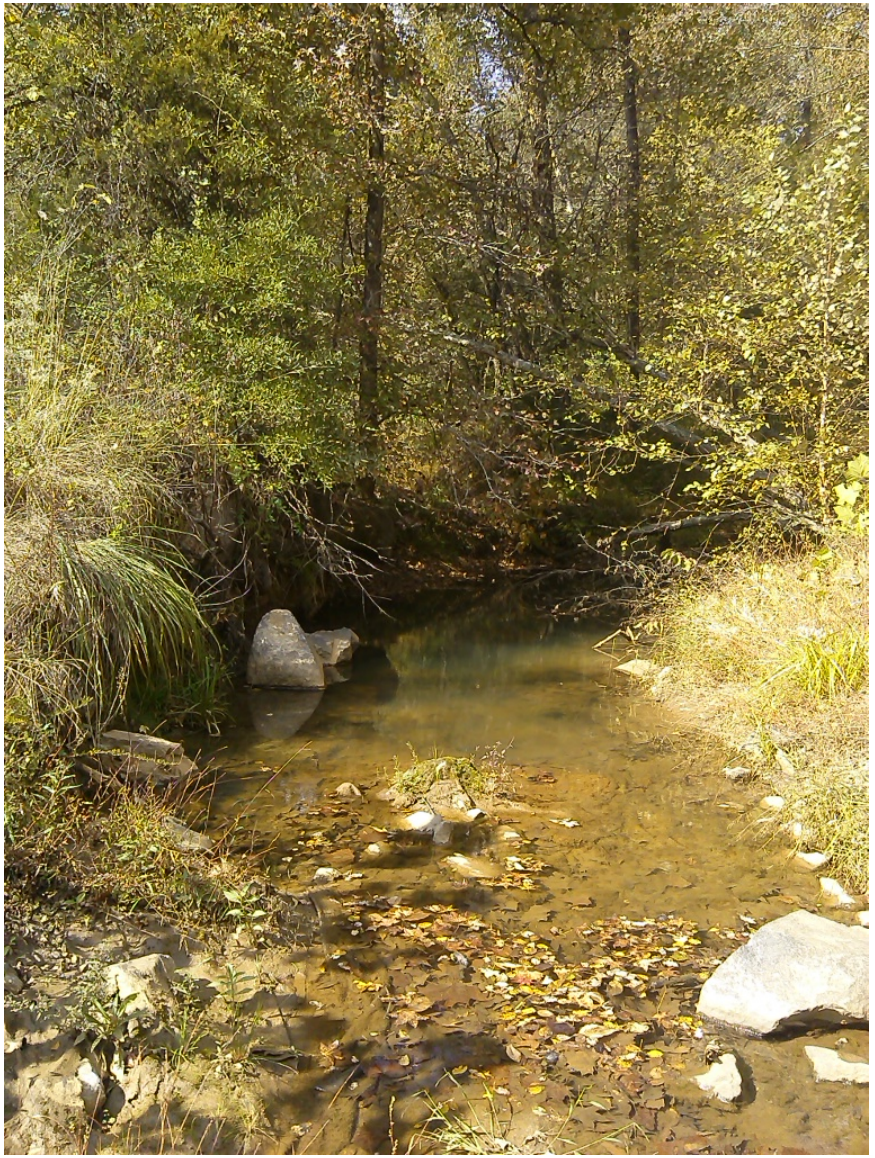


Photo Station 1 Upstream (Year 3 – 10/21/2014)

Photo Station 2 Downstream (Year 3 – 10/21/2014)

Photo Station 2 Upstream (Year 3 – 10/21/2014)

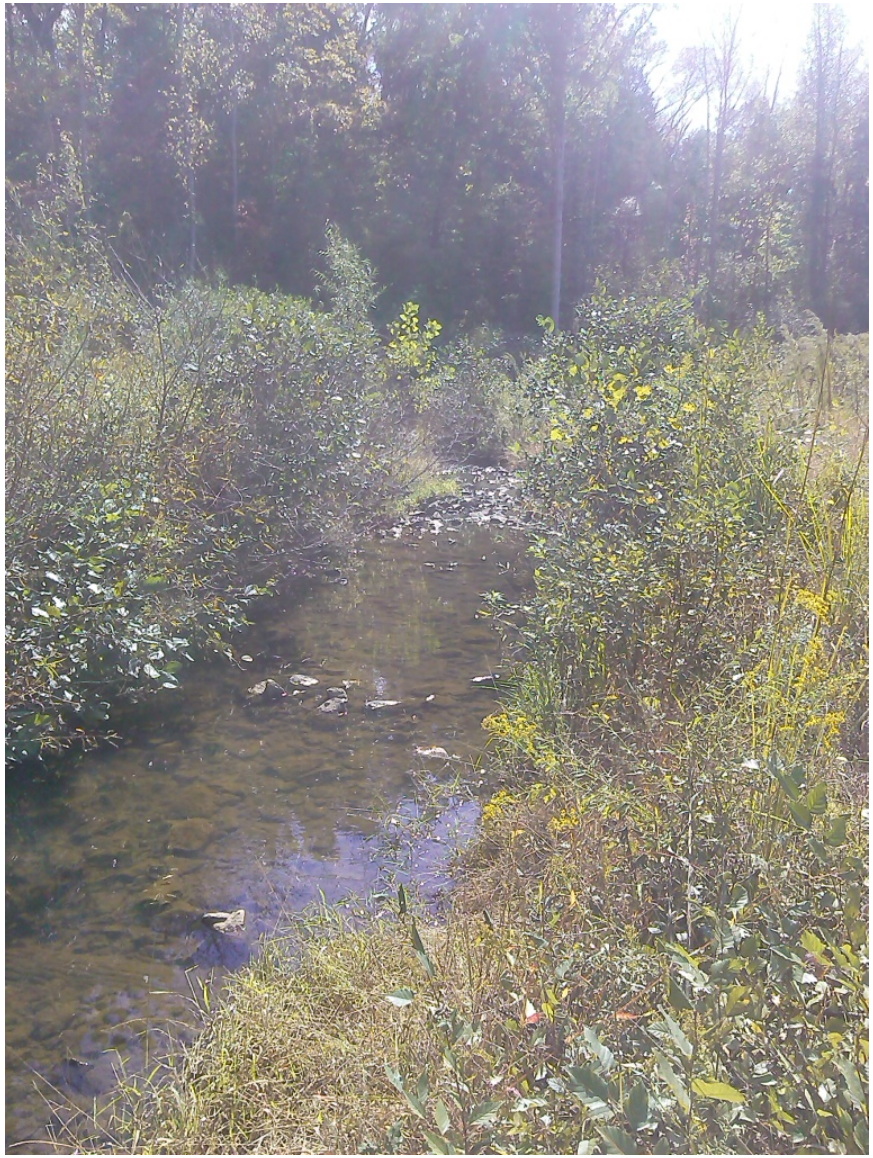


Photo Station 3 Downstream (Year 3 – 10/21/2014)

Photo Station 3 Upstream (Year 3 – 10/21/2014)

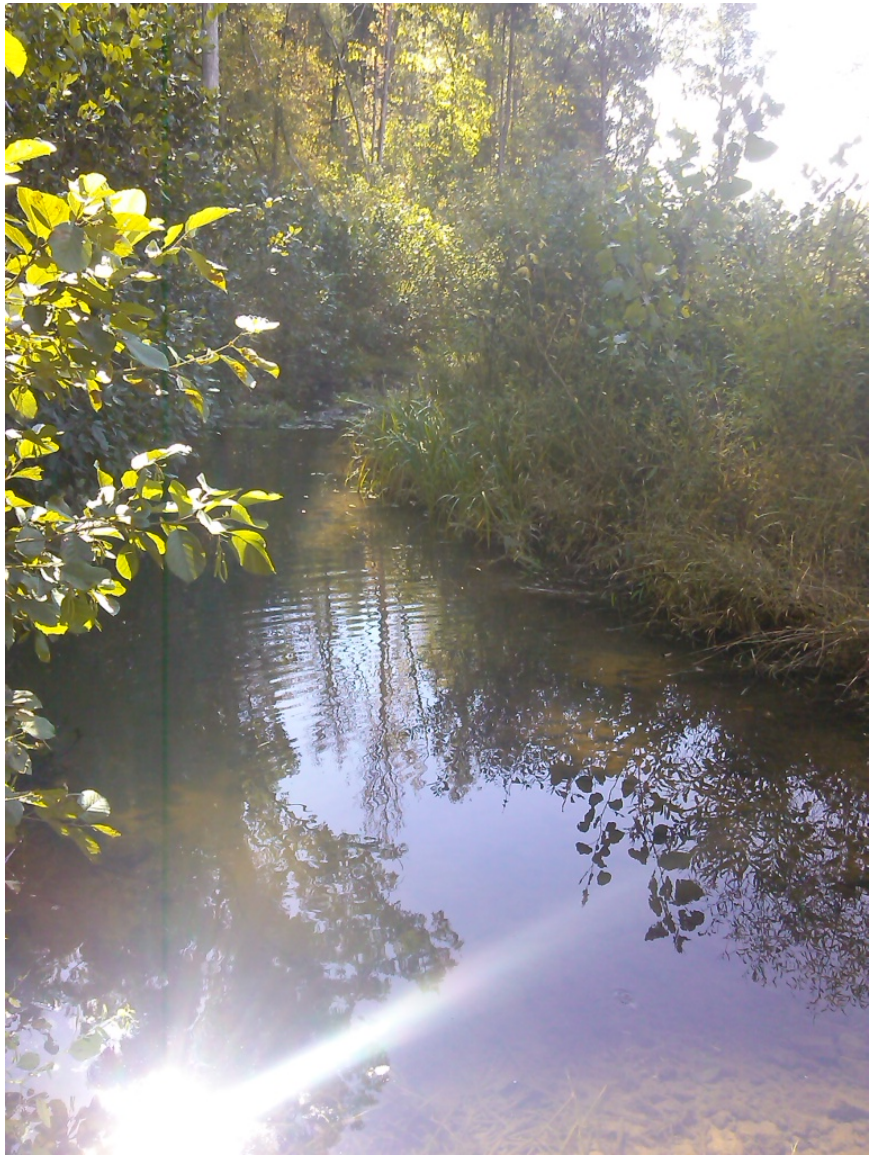


Photo Station 4 Downstream (Year 3 – 10/21/2014)

Photo Station 4 Upstream (Year 3 – 10/21/2014)

Photo Station 5 Downstream (Year 3 – 10/21/2014)

Photo Station 5 Upstream (Year 3 – 10/21/2014)

Photo Station 6 Downstream (Year 3 – 10/21/2014)

Photo Station 6 Upstream (Year 3 – 10/21/2014)

Photo Station 7 Downstream (Year 3 – 10/21/2014)

Photo Station 7 Upstream (Year 3 – 10/21/2014)

Photo Station 8 Downstream (Year 3 – 10/21/2014)

Photo Station 8 Upstream (Year 3 – 10/21/2014)

Photo Station 9 Downstream (Year 3 – 10/21/2014)

Photo Station 9 Upstream (Year 3 – 10/21/2014)

Photo Station 10 Downstream (Year 3 – 10/21/2014)

Photo Station 10 Upstream (Year 3 – 10/21/2014)

Photo Station 11 Downstream (Year 3 – 10/21/2014)

Photo Station 11 Upstream (Year 3 – 10/21/2014)

Photo Station 12 Downstream (Year 3 – 10/21/2014)

Photo Station 12 Upstream (Year 3 – 10/21/2014)

Photo Station 13 Downstream (Year 3 – 10/21/2014)

Photo Station 13 Upstream (Year 3 – 10/21/2014)

Photo Station 14 Downstream (Year 3 – 10/21/2014)

Photo Station 14 Upstream (Year 3 – 10/21/2014)

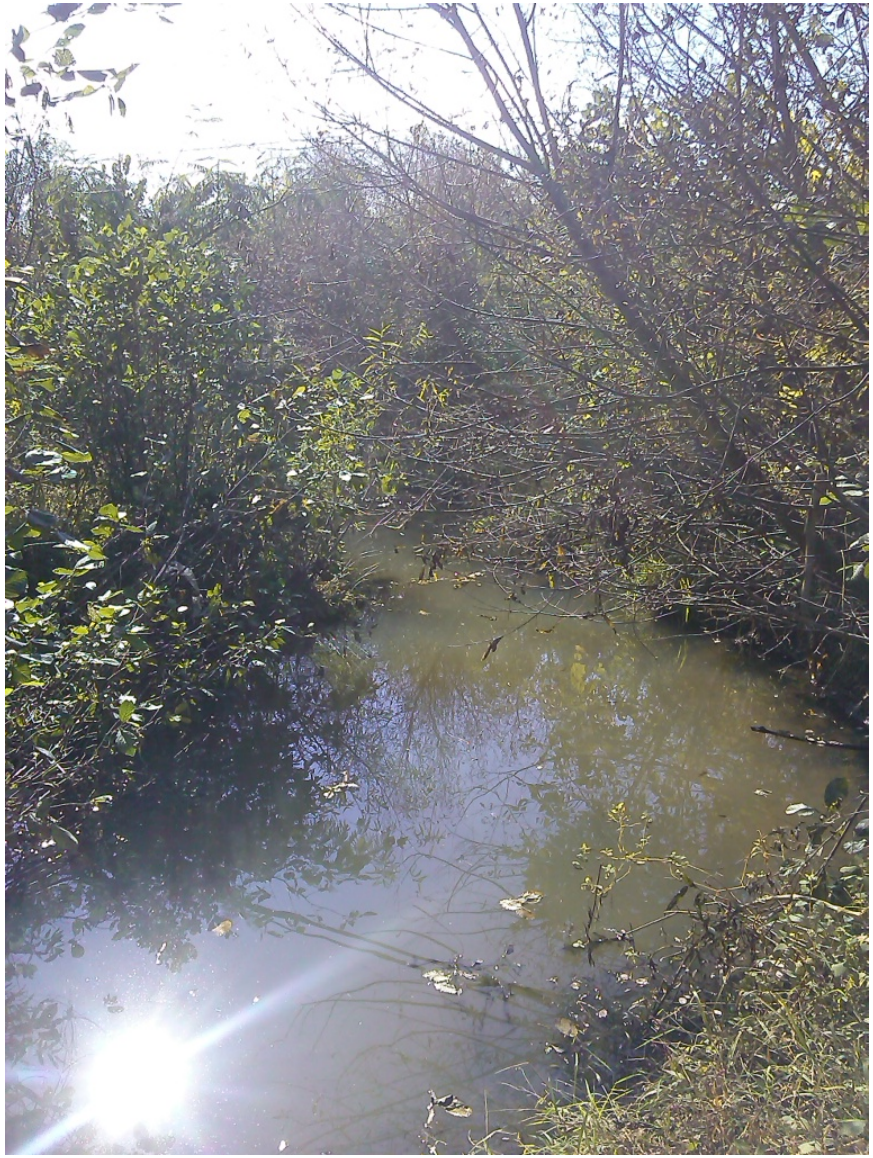


Photo Station 15 Downstream (Year 3 – 10/21/2014)

Photo Station 15 Upstream (Year 3 – 10/21/2014)

Photo Station 16 Downstream (Year 3 – 10/21/2014)

Photo Station 16 Upstream (Year 3 – 10/21/2014)

Photo Station 17 Downstream (Year 3 – 10/21/2014)

Photo Station 17 Upstream (Year 3 – 10/21/2014)

Photo Station 18 Downstream (Year 3 – 10/21/2014)

Photo Station 18 Upstream (Year 3 – 10/21/2014)

Photo Station 19 Downstream (Year 3 – 10/21/2014)

Photo Station 19 Upstream (Year 3 – 10/21/2014)

Photo Station 20 Downstream (Year 3 – 10/21/2014)

Photo Station 20 Upstream (Year 3 – 10/21/2014)

Photo Station 21 Downstream (Year 3 – 11/12/2014)

Photo Station 21 Upstream (Year 3 – 11/12/2014)

Photo Station 22 Downstream (Year 3 – 11/12/2014)

Photo Station 22 Upstream (Year 3 – 11/12/2014)

Photo Station 23 Downstream (Year 3 – 11/12/2014)

Photo Station 23 Upstream (Year 3 – 11/12/2014)

Vegetation Plot 1 – 5m x 20m (Year 3 of 5)

Vegetation Plot 2 – 10m x 10m (Year 3 of 5)

Vegetation Plot 3 – 10m x 10m (Year 3 of 5)

Vegetation Plot 4 – 5m x 20m (10/22/2014 Year 3 of 5)

Vegetation Plot 5 – 5m x 20m (10/22/2014 Year 3 of 5)

Vegetation Plot 6 – 10m x 10m (10/22/2014 Year 3 of 5)

Vegetation Plot 7 – 10m x 10m (10/22/2014 Year 3 of 5)

Vegetation Plot 8 – 10m x 10m (10/22/2014 Year 3 of 5)

Vegetation Plot 9 – 10m x 10m (10/22/2014 Year 3 of 5)

Vegetation Plot 10 – 10m x 10m (10/22/2014 Year 3 of 5)

Vegetation Plot 11 – 10m x 10m (10/22/2014 Year 3 of 5)

Appendix C
Vegetation Plot Data

Table 7. Vegetation Plot Mitigation Success Summary		
Coddle Creek Tributary (Indian Run) / 94		
Plot	Planted Stems/Ac	Meeting Criteria
1	1093	Yes
2	485.6	Yes
3	728.4	Yes
4	607	Yes
5	728.4	Yes
6	728.4	Yes
7	404.7	Yes
8	242.8	No
9	485.6	Yes
10	607	Yes
11	445.2	Yes

Table 8. CVS Vegetation Plot Metadata
Coddle Creek Tributary (Indian Run) - 94

Report Prepared By	Kim Hamlin
Date Prepared	12/3/2014 18:56
database name	Coddle_Creek_Trib_94_MY3_2014.mdb
database location	G:\Environmental\NCEEP Coddle Creek SMS\MY03\AnnualMonitoringReport-MY03\CVS
computer name	W93
file size	49975296

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	94
project Name	Indian Run Tributary to Coddle Creek
Description	Stream Restoration
River Basin	Yadkin-Pee Dee
length(ft)	2270
stream-to-edge width (ft)	100
area (sq m)	42173.71
Required Plots (calculated)	11
Sampled Plots	11

Table 9. Planted and Total Stem Counts (Species by Plot with Annual Means)
EEP Project Code 94. Project Name: Indian Run Tributary to Coddle Creek

			Current Plot Data (MY3 2014)																																					Annual Means											
			094-HDR-0001			094-HDR-0002			094-HDR-0003			094-HDR-0004			094-HDR-0005			094-HDR-0006			094-HDR-0007			094-HDR-0008			094-HDR-0009			094-HDR-0010			094-HDR-0011			MY3 (2014)			MY2 (2013)			MY1 (2012)			MY0 (2011)		
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	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree															3			6			4																13			1			9					
Acer rubrum	red maple	Tree	10	10	10	3	3	3	4	4	4				5	5	5	3	3	3	1	1	1													26	26	26	23	23	24	28	28	36	30	30	38
Albizia julibrissin	silktree	Exotic																		1																	1											
Alnus serrulata	hazel alder	Shrub	5	5	5			1			3	2	2	4	5	5	5	2	2	2	5	5	6			1	1	1	1	1	1	2			2	21	21	32	21	21	31	21	21	21	19	19	19
Baccharis halimifolia	eastern baccharis	Shrub						1																													1			1								
Betula nigra	river birch	Tree			148									8	3	3	5	3	3	6						2	4	4	9	2	2	5	7	7	11	19	19	194	19	19	865	20	20	674	28	28	28
Callicarpa americana	American beautyberry	Shrub																1	1	1																1	1	1	5	5	5	7	7	7	8	8	8
Calycanthus floridus	eastern sweetshrub	Shrub																																					1	1	1	1	1	1	2	2	2
Celtis laevigata	sugarberry	Tree																					1															1	1	1	1	10	10	10	15	15	15
Cornus amomum	silky dogwood	Shrub	1	1	1	3	3	3				8	8	9			3	4	4	4	3	3	4	3	3	3	6	6	7	1	1	3	1	1	2	30	30	39	29	29	31	34	34	34	32	32	32
Diospyros virginiana	common persimmon	Tree							2	2	2				1	1	1	1	1	2							1	1	1	2	2	2				7	7	8	4	4	4	18	18	18	21	21	21
Fraxinus pennsylvanica	green ash	Tree	6	6	6	4	4	4	7	7	7	2	2	2	2	2	2			1																21	21	22	20	20	21	21	21	21	21	21	21
Juglans nigra	black walnut	Tree										1	1	1				1	1	1																2	2	2	2	2	2	5	5	5	6	6	6
Ligustrum sinense	Chinese privet	Exotic																		1																	1											
Liquidambar styraciflua	sweetgum	Tree									7			1			28			11																	47			17			9					
Liriodendron tulipifera	tuliptree	Tree																													1					1											
Morella cerifera	wax myrtle	shrub												2																	1					3			1								
Nyssa sylvatica	blackgum	Tree	1	1	1			1	2	2	2																									3	3	4	3	3	3						
Pinus taeda	loblolly pine	Tree												1																							1			2								
Platanus occidentalis	American sycamore	Tree			24			25			38			632			96			13								1									829			679			1536					
Populus deltoides	eastern cottonwood	Tree			20			3			1			26			3			9			68			217			108			69			14			538			174			662			655
Quercus lyrata	overcup oak	Tree																																	1	1	1	1	1	1	1	1	2					
Quercus nigra	water oak	Tree							1	1	1				1	1	1	1	1	1										1	1	1				4	4	4	6	6	8	8	8	8	12	12	12
Quercus phellos	willow oak	Tree	4	4	4	2	2	3	2	2	2	2	2	2	1	1	1	1	1	4													2	2	2	14	14	18	16	16	16	21	21	21	21	21	21
Salix nigra	black willow	Tree			1									6		1	1		1	1	1	1	1	3	3	3			2	8	8	13				12	14	28	14	16	24	11	13	18	6	8	8
Sambucus canadensis	Common Elderberry	Shrub																1	1	1																1	1	1	1	1	7	2	2	2	2	2	2
Ulmus	elm	Tree																																							2			33					
Ulmus rubra	slippery elm	Tree																																							31								
		Stem count	27	27	220	12	12	44	18	18	67	15	15	694	18	19	154	18	19	68	10	10	85	6	6	226	12	12	129	15	15	97	11	11	32	162	164	1816	166	168	1954	207	209	3125	223	225	888
		size (ares)	1			1			1			1			1			1			1			1			1			1			1			11			11			11			11		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.27			0.27			0.27			0.27		
		Species count	6	6	10	4	4	9	6	6	10	5	5	12	7	8	13	10	11	18	4	4	7	2	2	5	4	4	7	6	6	9	4	4	6	14	14	25	16	16	26	14	14	19	14	14	15
		Stems per ACRE	1093	1093	8903	485.6	485.6	1781	728.4	728.4	2711	607	607	28085	728.4	768.9	6232	728.4	768.9	2752	404.7	404.7	3440	242.8	242.8	9146	485.6	485.6	5220	607	607	3925	445.2	445.2	1295	596	603.3	6681	610.7	618.1	7189	761.5	768.9	11497	820.4	827.8	3267

Appendix D
Stream Survey Data

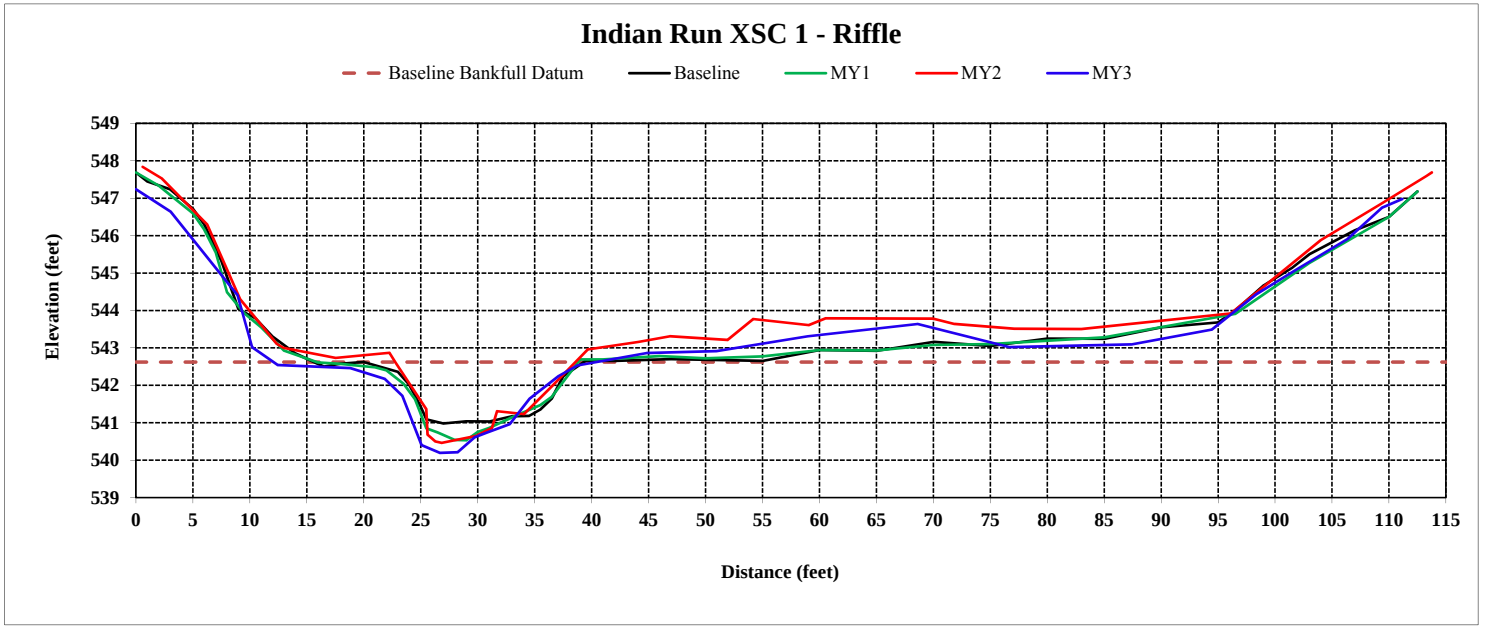
Station	Elevation
0	547.69
1	547.45
3	547.24
5	546.72
6	546.3
7.5	545.33
9	544.04
10.5	543.79
12	543.3
14	542.85
16.5	542.5
18	542.58
20	542.62
23	542.36
24	542.02
25	541.43
25.5	541.09
27	540.98
29	541.04
31	541.03
33	541.17
34.5	541.18
35.5	541.35
36.5	541.64
37.5	542.24
39.5	542.66
42	542.65
47	542.7
50	542.68
55	542.65
60	542.94
65	542.92
70	543.16
75	543.05
80	543.25
85	543.24
90	543.55
95	543.68
96.5	544
99	544.67
101.5	545.14
103	545.5
107	546.14
110	546.5
112.5	547.18

Reach	Indian Run, Upper Reach
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-1, Riffle, Upper Reach, 18+40
Drainage Area (Sq Mi)	1.5
Date	10/21/2014
Observers	P. Beach, C. Flowers

SUMMARY DATA	
Baseline Bankfull Datum, ft	542.62
Bankfull Cross Sectional Area, ft^2	22.3
Bankfull Width, ft	19.93
Max Depth at Bankfull, ft	2.43
Mean Depth at Bankfull, ft	1.12
Width/Depth Ratio	17.81
Flood Prone Width, ft	96
Flood Prone Area Elevation	545
Entrenchment Ratio	4.82
Bank Height Ratio	0.93

Stream Type	C4

Sta. 18+40 Looking Downstream



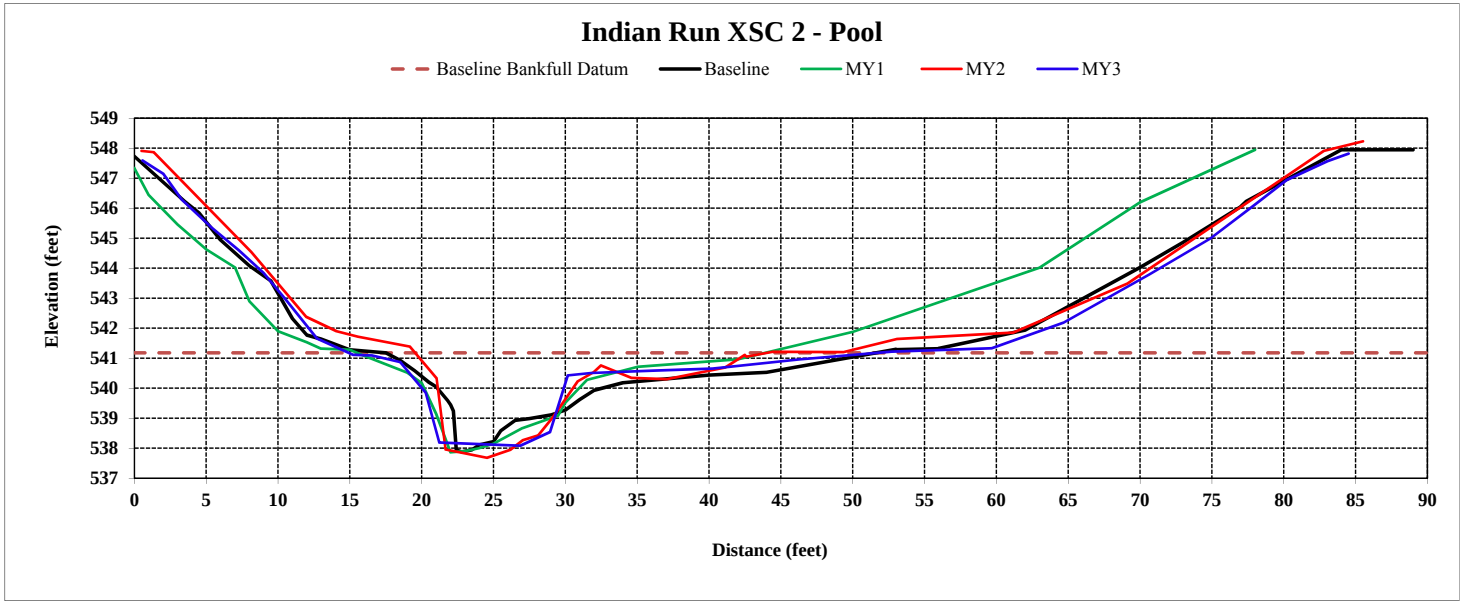
Station	Elevation
0.5	547.91
1.35	547.87
8.14	544.54
11.96	542.38
14.08	541.9
15.56	541.72
19.18	541.39
21.04	540.33
21.66	537.96
24.54	537.68
26.17	537.95
27.04	538.27
28.11	538.43
29.14	539.04
30.86	540.23
31.98	540.54
32.47	540.76
34.61	540.34
37.03	540.3
41.12	540.69
42.48	541.11
42.6	541.05
44.4	541.21
49.33	541.2
53.05	541.64
61.16	541.85
69.12	543.49
82.79	547.91
85.52	548.23

Reach	Indian Run, Upper Reach
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-2, Pool, Upper Reach, 20+62
Drainage Area (Sq Mi)	1.5
Date	10/21/2014
Observers	P. Beach, C. Flowers

SUMMARY DATA	
Baseline Bankfull Datum, ft	541.18
Bankfull Cross Sectional Area, ft^2	28.8
Bankfull Width, ft	30.49
Max Depth at Bankfull, ft	3.1
Mean Depth at Bankfull, ft	0.94
Width/Depth Ratio	32.28
Flood Prone Width, ft	64.5
Flood Prone Area Elevation	544.28
Entrenchment Ratio	2.12
Bank Height Ratio	0.9

Stream Type	C4

Sta. 20+62 Looking Downstream



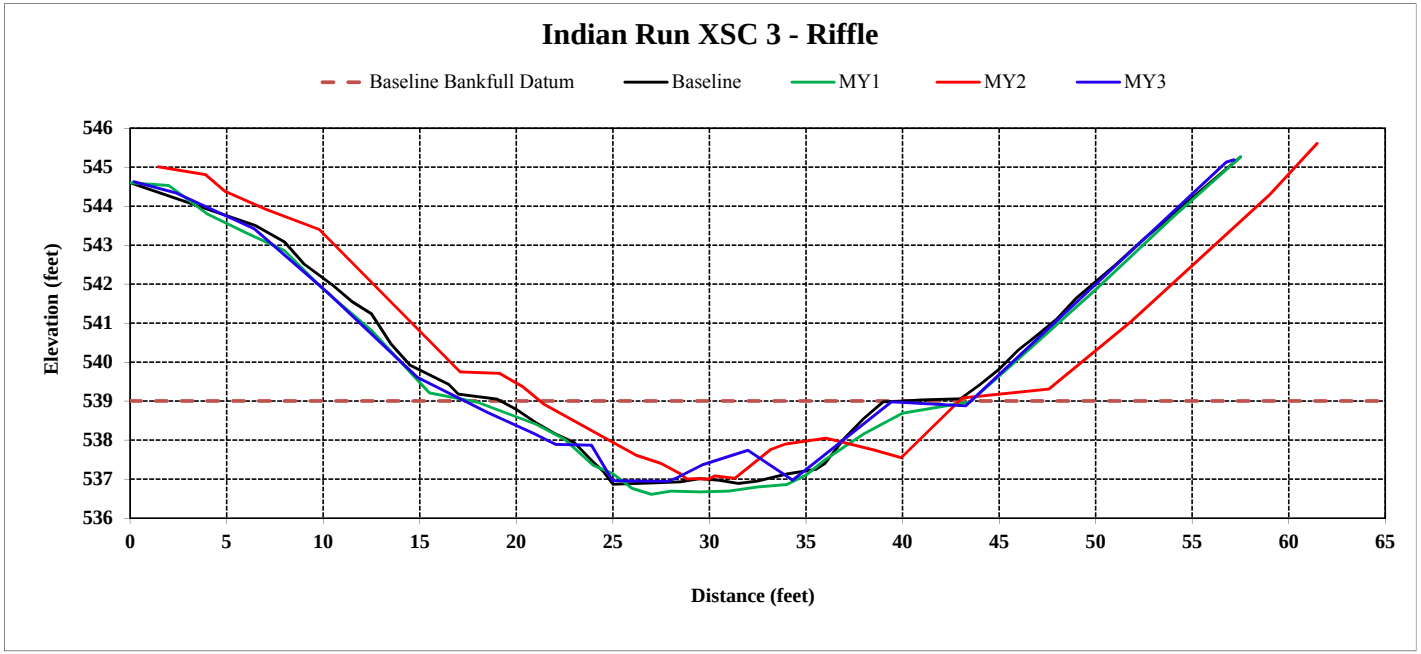
Station	Elevation
1.46	545.01
3.91	544.81
4.91	544.38
7.04	543.92
9.8	543.4
17.09	539.75
19.14	539.71
20.33	539.37
21.43	538.92
26.21	537.61
27.5	537.4
28.48	537.14
28.85	537
29.21	537.01
29.97	537
30.27	537.08
31.32	537.02
33.17	537.76
33.93	537.9
36.04	538.05
38.49	537.75
39.93	537.55
43.09	539.08
47.58	539.31
51.86	541.05
59.02	544.3
61.47	545.61

Reach	Indian Run, Upper Reach
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-3, Riffle, Upper Reach, 25+40
Drainage Area (Sq Mi)	1.5
Date	10/21/2014
Observers	P. Beach, C. Flowers

SUMMARY DATA	
Baseline Bankfull Datum, ft	539.00
Bankfull Cross Sectional Area, ft^2	22.34
Bankfull Width, ft	21.9
Max Depth at Bankfull, ft	2.06
Mean Depth at Bankfull, ft	1.02
Width/Depth Ratio	21.47
Flood Prone Width, ft	35.2
Flood Prone Area Elevation	541
Entrenchment Ratio	1.61
Bank Height Ratio	0.85

Stream Type	C4

Sta. 25+40 Looking Downstream



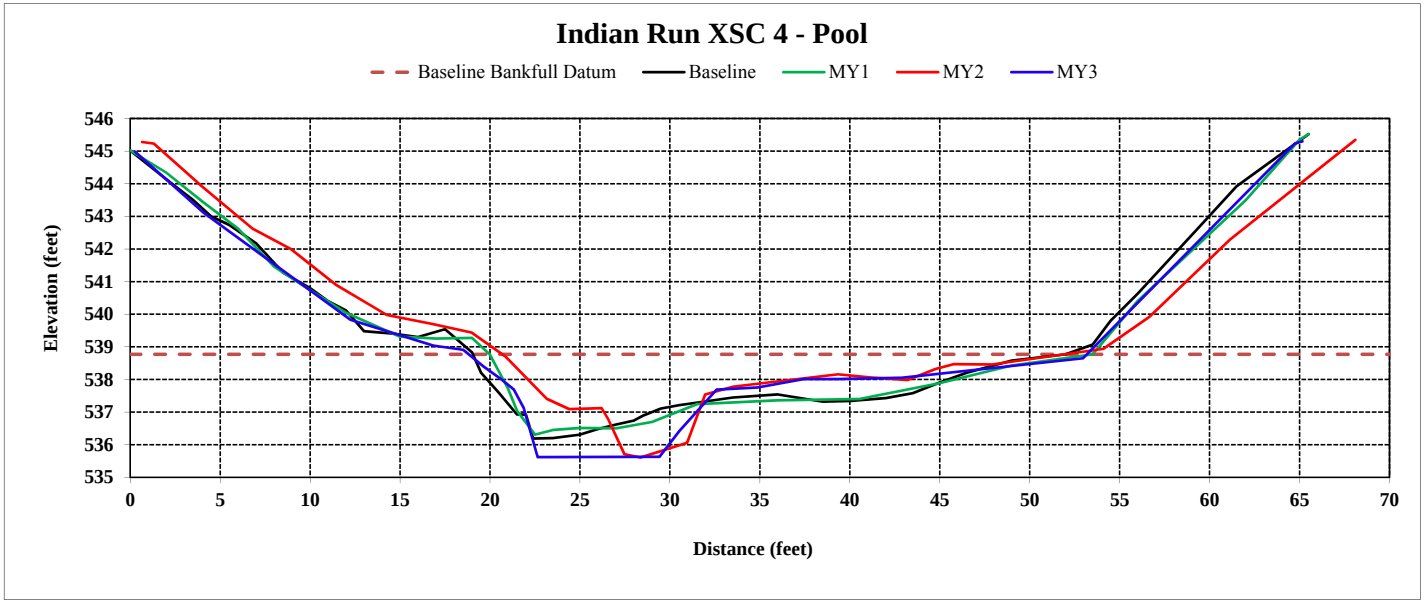
Station	Elevation
0.66	545.28
1.31	545.23
3.96	543.93
6.8	542.62
8.95	541.99
11.44	540.9
14.26	539.98
16.82	539.7
18.98	539.44
20.87	538.7
23.16	537.41
24.41	537.09
26.21	537.12
26.56	536.79
27.47	535.71
28.36	535.61
30.96	536.06
31.96	537.54
33.53	537.78
39.34	538.16
41.22	538.06
43.2	537.98
44.76	538.32
45.76	538.47
47.86	538.46
50.21	538.64
54.09	538.94
56.65	539.92
61.14	542.29
68.1	545.34

Reach	Indian Run, Upper Reach
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-4, Pool, Upper Reach, 25+92
Drainage Area (Sq Mi)	1.5
Date	10/21/2014
Observers	P. Beach, C. Flowers

SUMMARY DATA	
Baseline Bankfull Datum, ft	538.77
Bankfull Cross Sectional Area, ft^2	33.86
Bankfull Width, ft	33.96
Max Depth at Bankfull, ft	3.15
Mean Depth at Bankfull, ft	1.00
Width/Depth Ratio	34.06
Flood Prone Width, ft	55
Flood Prone Area Elevation	541.92
Entrenchment Ratio	1.62
Bank Height Ratio	0.96

Stream Type	C4

Sta. 25+92 Looking Downstream



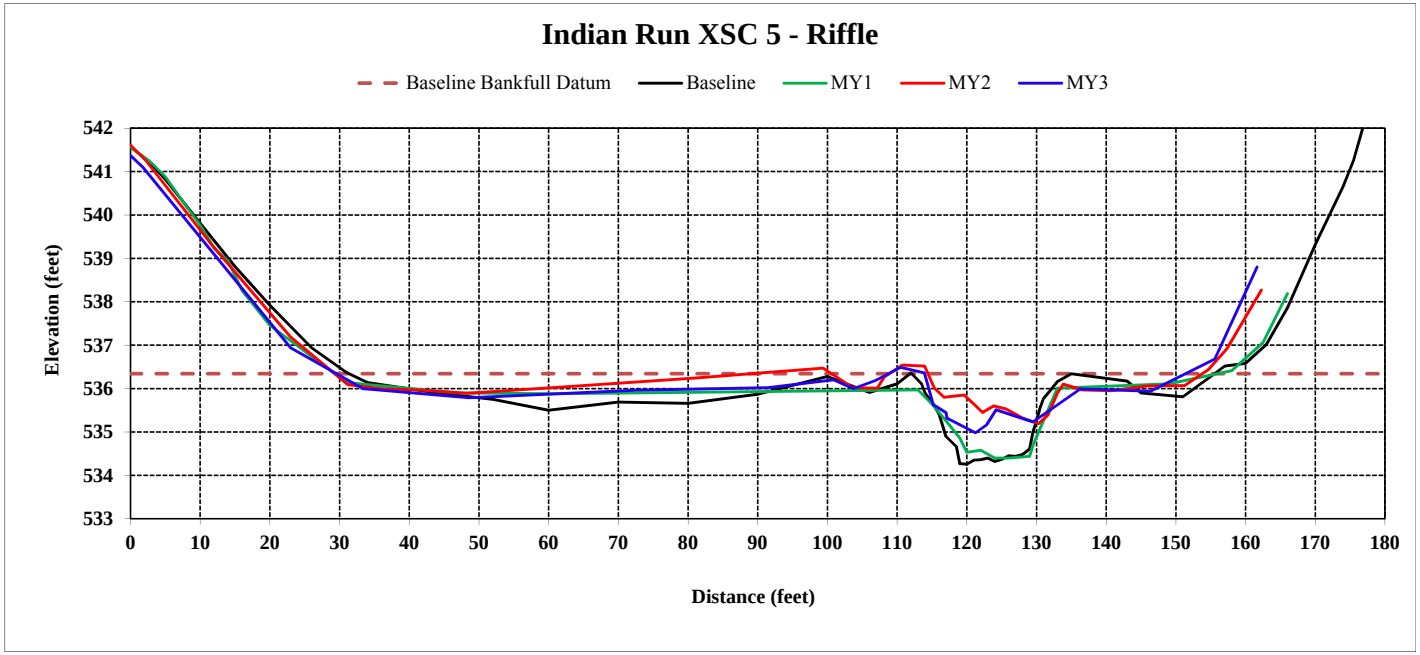
Station	Elevation
0	541.61
2.23	541.25
11.79	539.29
22.97	537.19
31.19	536.09
35.89	536
41.82	535.96
48.23	535.89
60.55	536.02
80.93	536.24
99.37	536.47
103.6	536.02
107.16	536.01
108.12	536.26
110.77	536.54
113.94	536.52
115.35	536.01
116.72	535.8
119.6	535.85
121.18	535.62
122.25	535.45
123.85	535.6
125.63	535.53
127.88	535.33
130.29	535.19
131.64	535.39
133.02	535.9
133.84	536.1
136.58	535.97
140.74	535.95
145.89	536.06
151.24	536.07
154.62	536.43
157.34	536.92
162.27	538.27

Reach	Indian Run, Lower Reach
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-5, Riffle, Lower Reach, 11+15
Drainage Area (Sq Mi)	1.5
Date	10/21/2014
Observers	P. Beach, C. Flowers

SUMMARY DATA	
Baseline Bankfull Datum, ft	536.34
Bankfull Cross Sectional Area, ft^2	22.7
Bankfull Width, ft	37
Max Depth at Bankfull, ft	1.36
Mean Depth at Bankfull, ft	0.61
Width/Depth Ratio	60.31
Flood Prone Width, ft	139.5
Flood Prone Area Elevation	537.7
Entrenchment Ratio	3.77
Bank Height Ratio	1.01

Stream Type	C4

Sta. 11+15 Looking Downstream



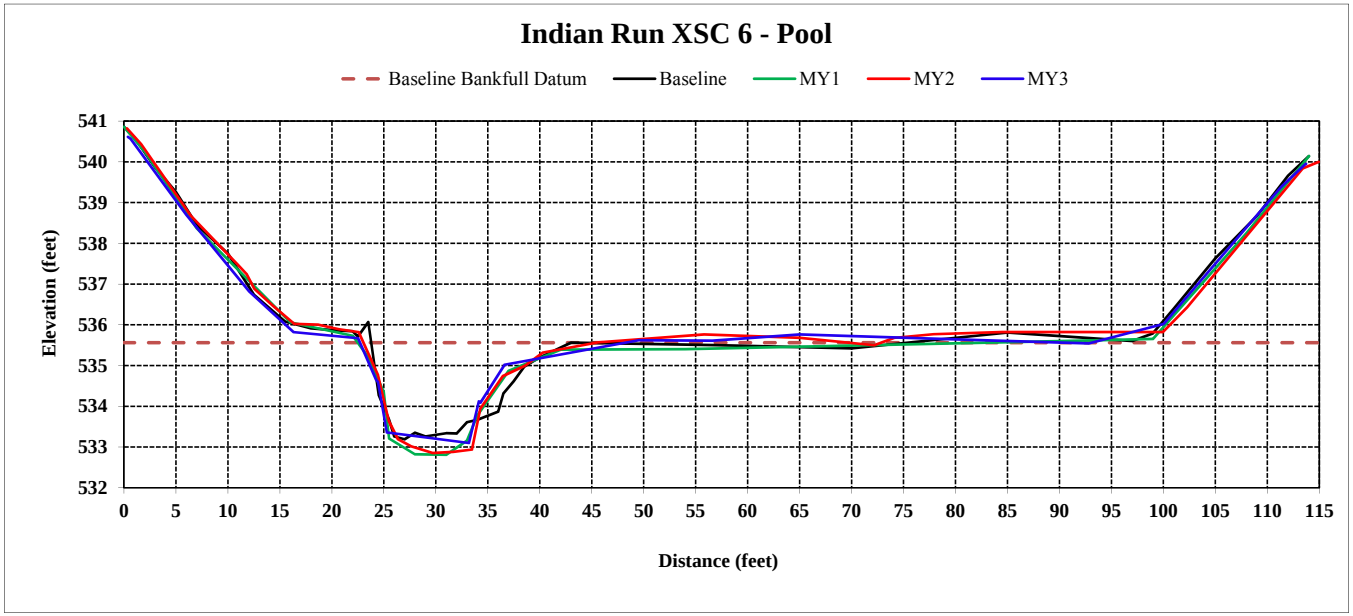
Station	Elevation
0.28	540.82
1.65	540.43
6.44	538.67
10.92	537.48
11.81	537.24
12.55	536.88
14.23	536.49
16.39	536.02
18.72	536
20.69	535.89
22.57	535.82
24.44	534.76
25.47	533.64
26.36	533.19
27.59	533.02
29.74	532.85
31.67	532.88
33.47	532.94
34.27	533.94
36.44	534.74
38.6	535
40.3	535.32
45.61	535.57
55.82	535.76
64.99	535.68
72.18	535.5
74.1	535.68
77.91	535.77
84.49	535.82
99.95	535.82
102.29	536.43
113.4	539.84
114.95	540

Reach	Indian Run, Lower Reach
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-6, Pool, Lower Reach, 13+10
Drainage Area (Sq Mi)	1.5
Date	10/21/2014
Observers	P. Beach, C. Flowers

SUMMARY DATA	
Baseline Bankfull Datum, ft	535.56
Bankfull Cross Sectional Area, ft^2	30.82
Bankfull Width, ft	26.48
Max Depth at Bankfull, ft	2.46
Mean Depth at Bankfull, ft	1.16
Width/Depth Ratio	22.75
Flood Prone Width, ft	99
Flood Prone Area Elevation	538.02
Entrenchment Ratio	3.74
Bank Height Ratio	1.02

Stream Type	C4

Sta. 13+10 Looking Downstream



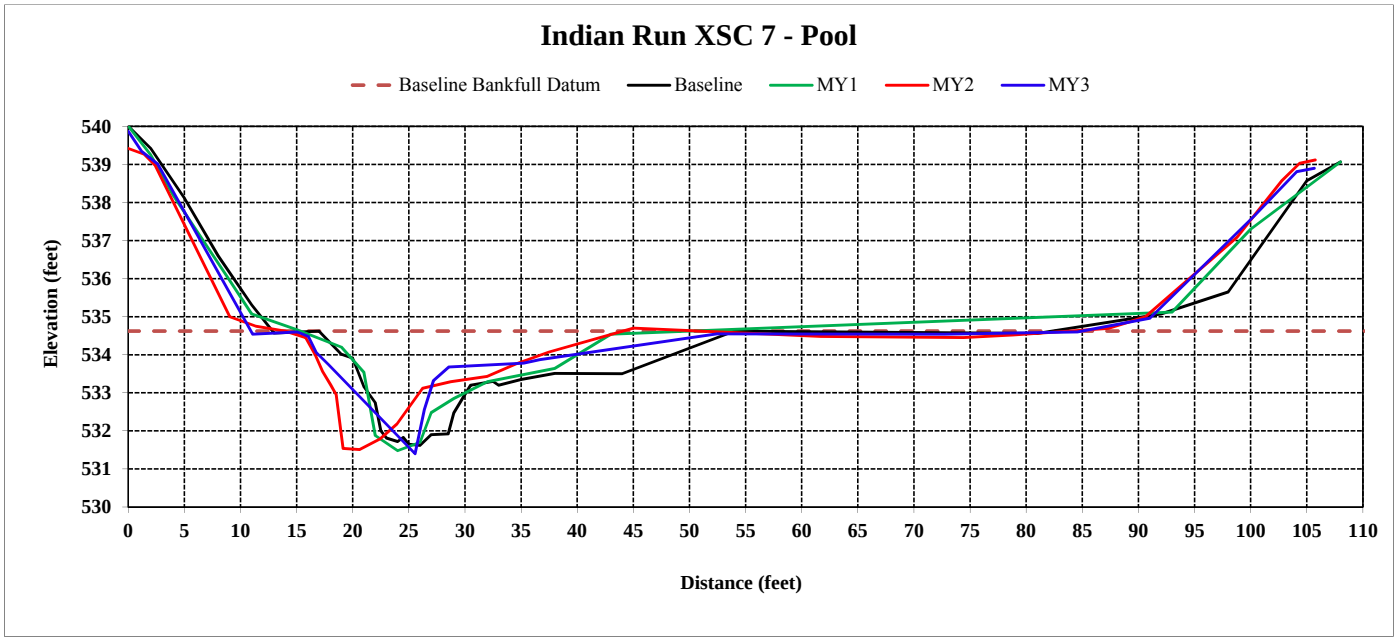
Station	Elevation
0	539.42
1.41	539.27
2.4	538.97
9.05	535
11.37	534.75
14	534.62
15.8	534.45
16.66	534
17.32	533.56
18.03	533.21
18.52	532.95
19.14	531.54
20.61	531.51
22.45	531.79
23.94	532.18
26.22	533.12
28.73	533.29
31.97	533.43
34.53	533.76
37.46	534.07
45.01	534.7
61.7	534.48
74.43	534.45
78.83	534.52
87.28	534.69
90.59	534.99
98.78	537.09
102.78	538.57
104.35	539.03
105.75	539.12

Reach	Indian Run, Lower Reach
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-7, Pool, Lower Reach, 15+89
Drainage Area (Sq Mi)	1.5
Date	11/12/2014
Observers	P. Beach, K. Hamlin

SUMMARY DATA	
Baseline Bankfull Datum, ft	534.62
Bankfull Cross Sectional Area, ft^2	32.89
Bankfull Width, ft	36.4
Max Depth at Bankfull, ft	3.22
Mean Depth at Bankfull, ft	0.90
Width/Depth Ratio	40.28
Flood Prone Width, ft	96
Flood Prone Area Elevation	537.84
Entrenchment Ratio	2.64
Bank Height Ratio	0.96

Stream Type	C4

Sta. 15+89 Looking Downstream



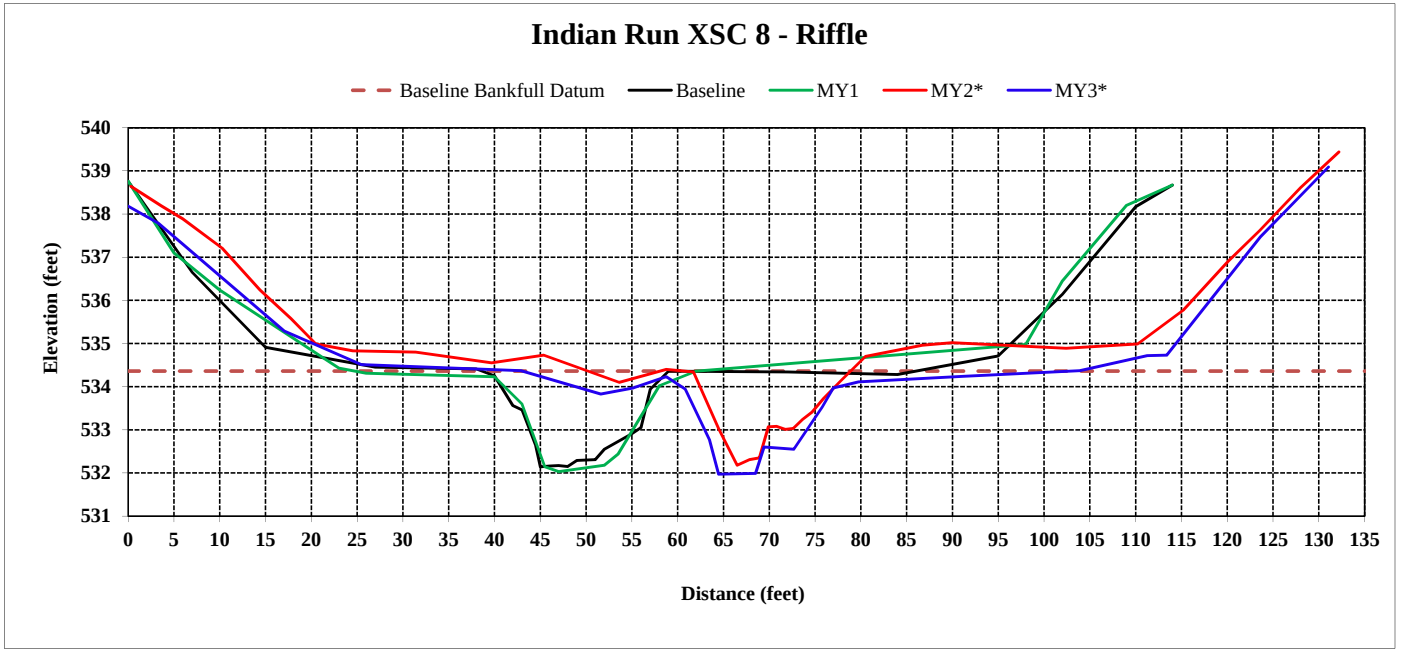
Station	Elevation
0.3	538.64
3.62	538.19
5.97	537.89
10.26	537.21
14.4	536.24
17.77	535.58
20.5	534.99
24.53	534.83
31.4	534.8
39.68	534.55
45.38	534.73
53.62	534.1
58.75	534.4
61.72	534.34
64.48	533.02
66.5	532.18
67.83	532.31
68.92	532.35
69.9	533.07
70.77	533.08
71.74	533.01
72.62	533.03
73.64	533.24
74.66	533.41
75.91	533.72
77.78	534.13
80.5	534.7
86.7	534.96
89.97	535.02
102.41	534.89
110.22	534.99
115.19	535.77
120.13	536.91
123.57	537.62
128.02	538.61
132.2	539.44

Reach	Indian Run, Lower Reach
River Basin	Yadkin/Pee Dee
Cross Section ID	XSC-8, Riffle, Lower Reach, 16+50
Drainage Area (Sq Mi)	1.5
Date	11/12/2014
Observers	P. Beach, K. Hamlin

SUMMARY DATA	
Baseline Bankfull Datum, ft	534.36
Bankfull Cross Sectional Area, ft^2	26.2
Bankfull Width, ft	32.52
Max Depth at Bankfull, ft	2.39
Mean Depth at Bankfull, ft	0.81
Width/Depth Ratio	40.36
Flood Prone Width, ft	112
Flood Prone Area Elevation	536.75
Entrenchment Ratio	3.44
Bank Height Ratio	0.95

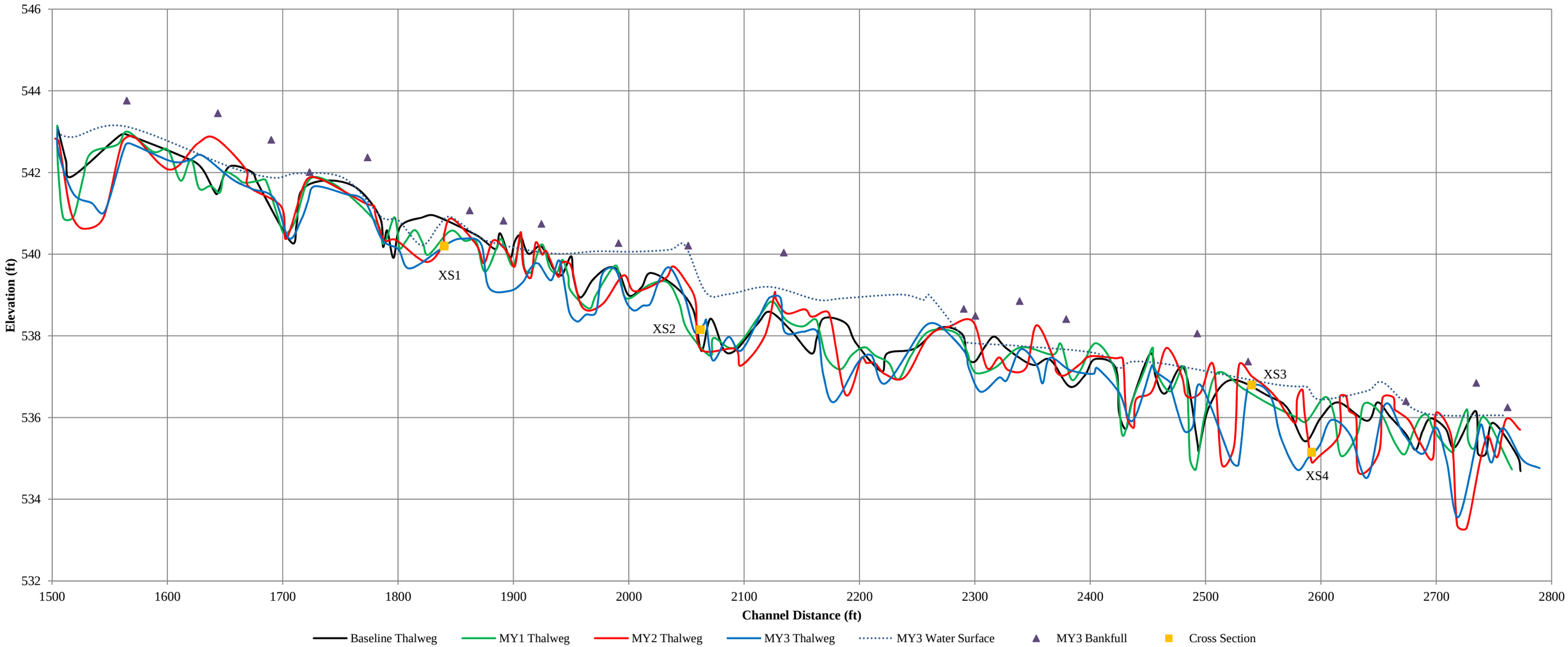
Stream Type	C4

Sta. 16+50 Looking Upstream

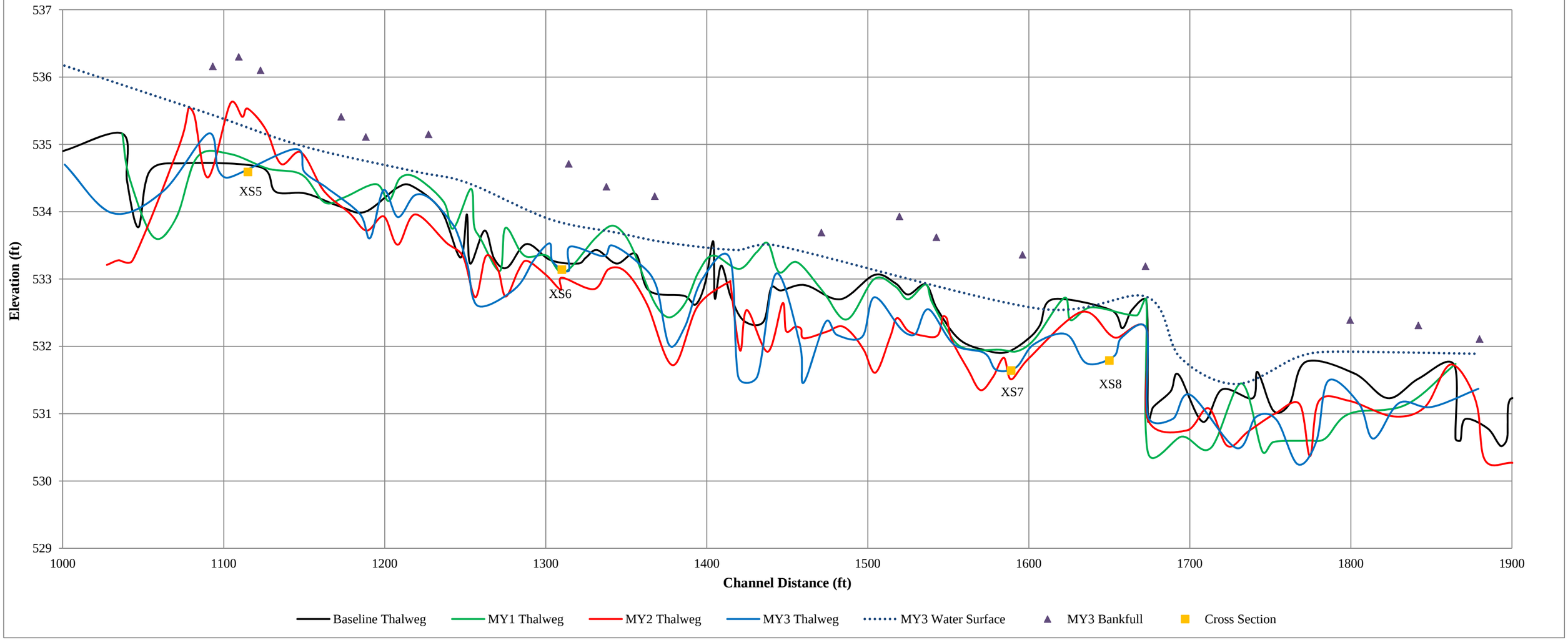


*The pins for XS8 were not located in the field. The location of the cross section for MY3 is approximate and was set during MY2.

Coddle Creek Tributary (Indian Run) Upper Reach - Longitudinal Profile



Coddle Creek Tributary (Indian Run) Lower Reach - Longitudinal Profile

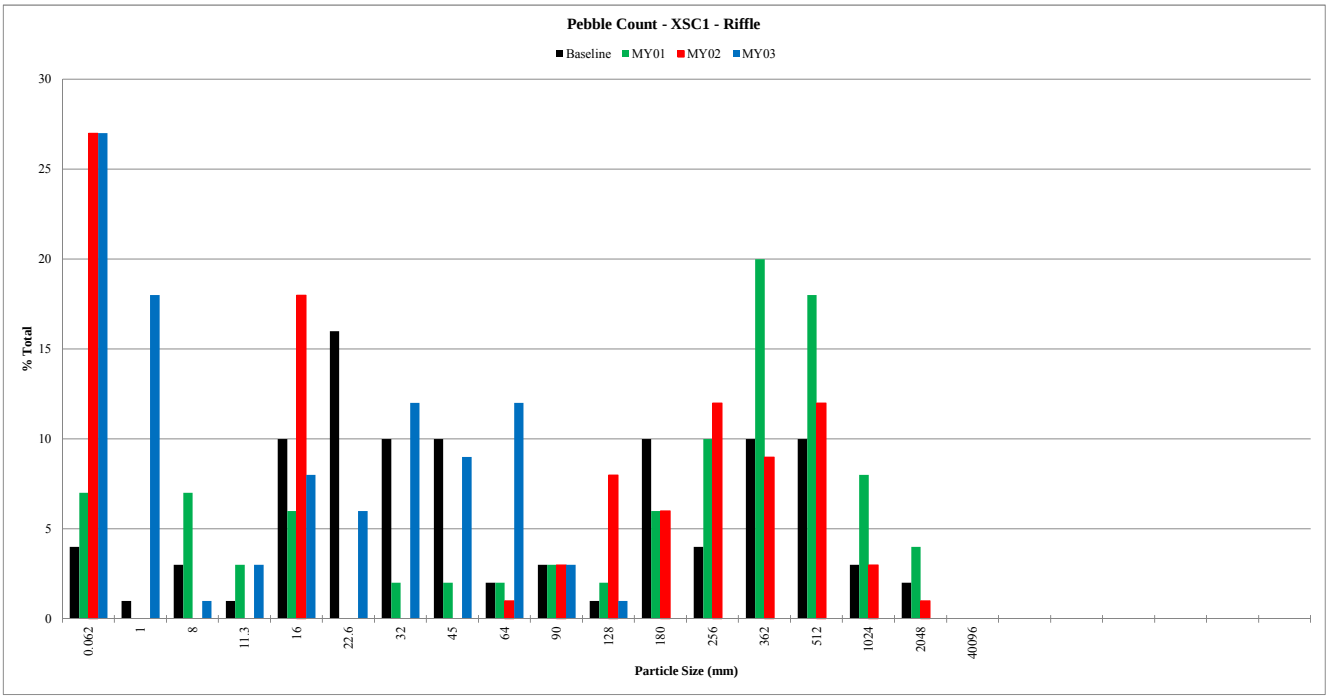


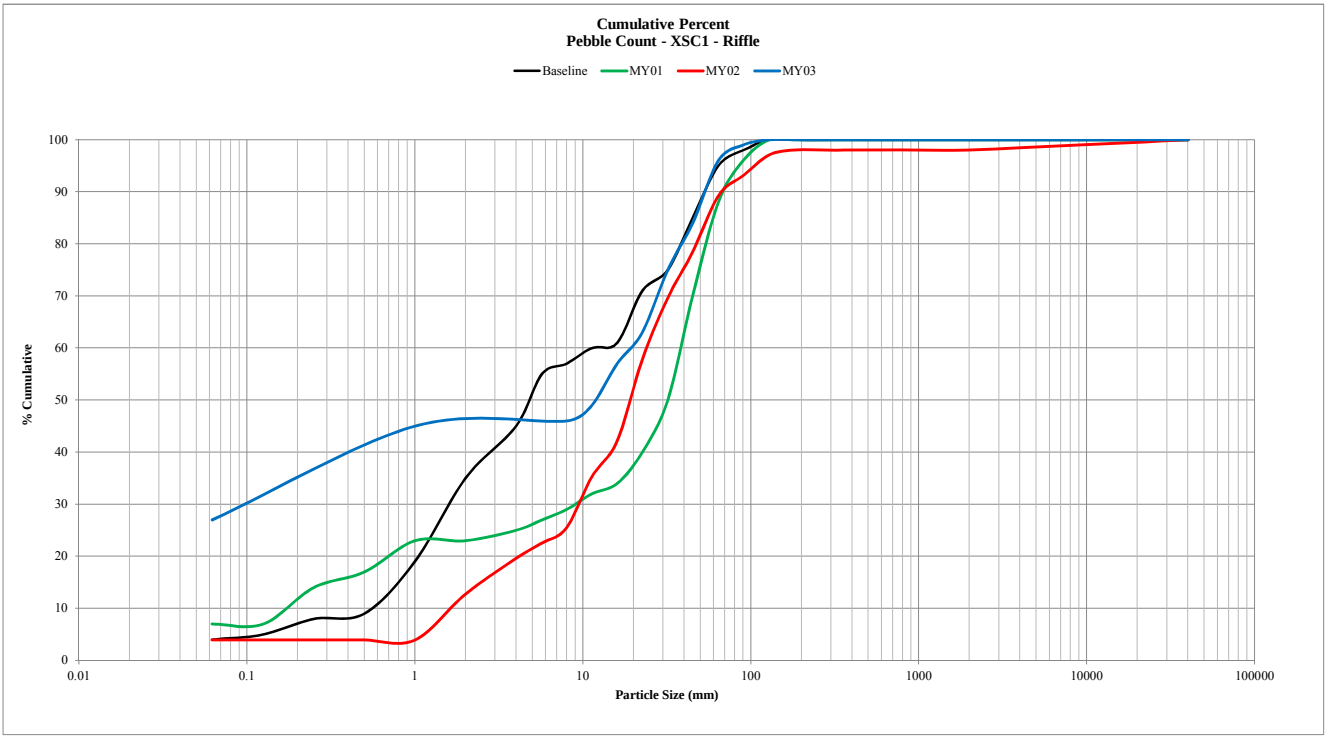
Coddle Creek Triburaty - Indian Run - UR - XS1 Riffle Pebble Count

Location: STA 18+40

Inches	Particle	Millimeters		Count	% Total	% Cum.
	Silt/Clay	<0.062	SAND	27	27	27
	Very Fine	0.062-0.125		0	0	27
	Fine	0.125-0.25		0	0	27
	Medium	0.25-0.50		0	0	27
	Coarse	0.50-1.0		18	18	45
0.04-0.08	Very Coarse	1.0-2		0	0	45
0.08-0.16	Very Fine	2-4	GRAVEL	0	0	45
0.16-0.22	Fine	4-5.7		0	0	45
0.22-0.31	Fine	5.7-8		1	1	46
0.31-0.44	Medium	8-11.3		3	3	49
0.44-0.63	Medium	11.3-16		8	8	57
0.63-0.89	Coarse	16-22.6		6	6	63
0.89-1.26	Coarse	22.6-32		12	12	75
1.26-1.77	Very Coarse	32-45		9	9	84
1.77-2.5	Very Coarse	45-64		12	12	96
2.5-3.5	Small	64-90	COBBLE	3	3	99
3.5-5.0	Small	90-128		1	1	100
5.0-7.1	Medium	128-180		0	0	100
7.1-10.1	Large	180-256		0	0	100
10.1-14.3	Small	256-362	BOULDER	0	0	100
14.3-20	Small	362-512		0	0	100
20-40	Medium	512-1024		0	0	100
40-80	Large	1024-2048		0	0	100
	Bedrock	Bedrock	Bedrock	0	0	100
			Total Counted	100		

Summary Data	
D50	11.3
D84	45
D95	60


Pebble Count - XSC1 - Riffle
Baseline
MY01
MY02
MY03
% Total
30
25
20
15
10
5
0
0.062
1
8
11.3
16
22.6
32
45
64
90
128
180
256
362
512
1024
2048
4096
Particle Size (mm)

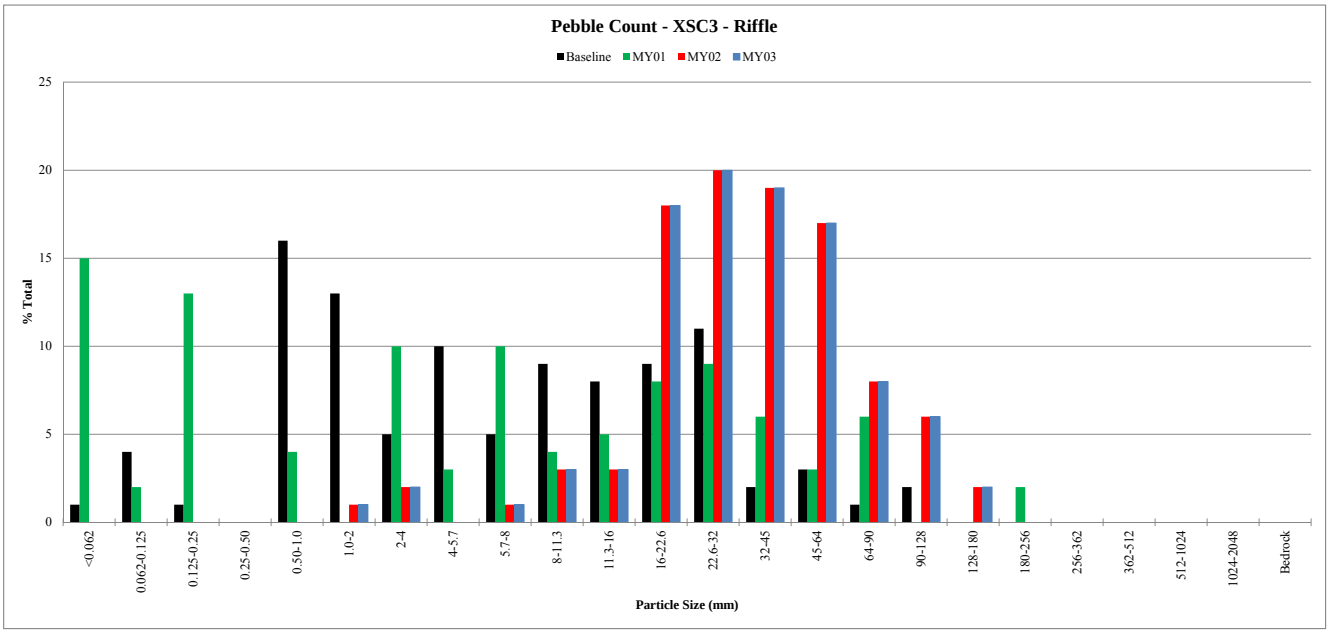

Cumulative Percent
Pebble Count - XSC1 - Riffle
Baseline
MY01
MY02
MY03
% Cumulative
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
100000
Particle Size (mm)

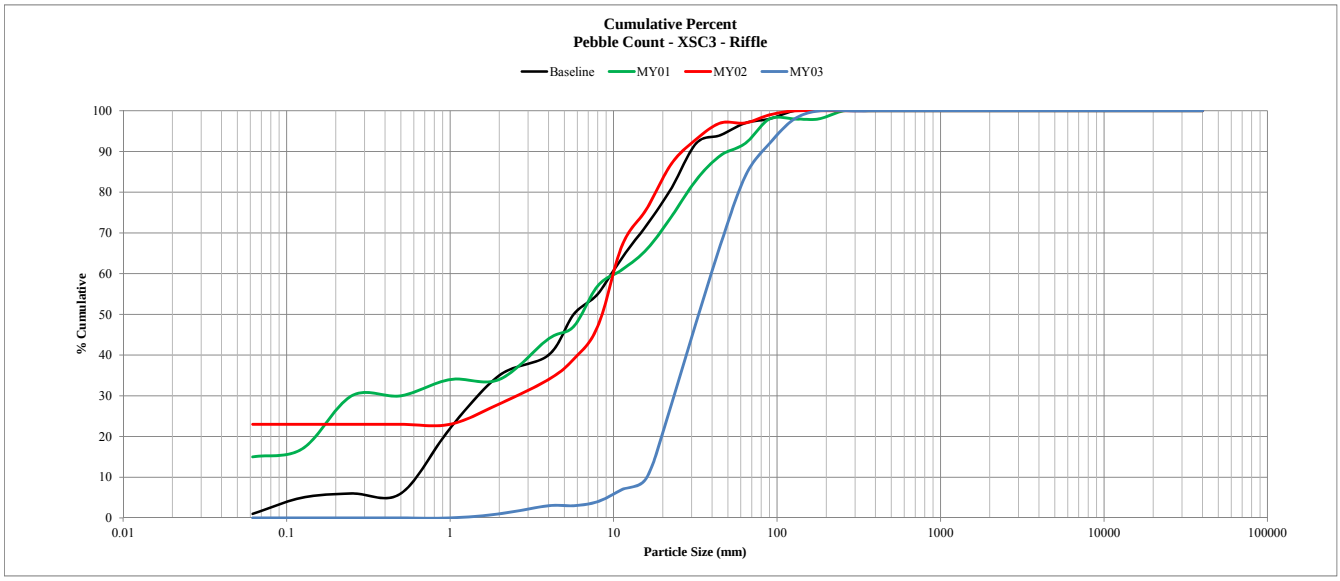
Coddle Creek Tributary - Indian Run -UR - XS3 Riffle Pebble Count

Location: STA 25+40

Inches	Particle	Millimeters		Count	% Total	% Cum.
	Silt/Clay	<0.062		0	0	0
	Very Fine	0.062-0.125	S	0	0	0
	Fine	0.125-0.25	A	0	0	0
	Medium	0.25-0.50	N	0	0	0
	Coarse	0.50-1.0	D	0	0	0
0.04-0.08	Very Coarse	1.0-2		1	1	1
0.08-0.16	Very Fine	2-4		2	2	3
0.16-0.22	Fine	4-5.7		0	0	3
0.22-0.31	Fine	5.7-8	G	1	1	4
0.31-0.44	Medium	8-11.3	R	3	3	7
0.44-0.63	Medium	11.3-16	A	3	3	10
0.63-0.89	Coarse	16-22.6	V	18	18	28
0.89-1.26	Coarse	22.6-32	E	20	20	48
1.26-1.77	Very Coarse	32-45	L	19	19	67
1.77-2.5	Very Coarse	45-64		17	17	84
2.5-3.5	Small	64-90	C	8	8	92
3.5-5.0	Small	90-128	O	6	6	98
5.0-7.1	Medium	128-180	B	2	2	100
7.1-10.1	Large	180-256	B L E	0	0	100
10.1-14.3	Small	256-362	B	0	0	100
14.3-20	Small	362-512	O	0	0	100
20-40	Medium	512-1024	U L D	0	0	100
40-80	Large	1024-2048	E R	0	0	100
	Bedrock	Bedrock	Bedrock	0	0	100
			Total Counted	100		

Summary Data	
D50	33
D84	64
D95	95


Pebble Count - XSC3 - Riffle
Baseline
MY01
MY02
MY03
% Total
25
20
15
10
5
0
<0.062
0.062-0.125
0.125-0.25
0.25-0.50
0.50-1.0
1.0-2
2-4
4-5.7
5.7-8
8-11.3
11.3-16
16-22.6
22.6-32
32-45
45-64
64-90
90-128
128-180
180-256
256-362
362-512
512-1024
1024-2048
Bedrock
Particle Size (mm)

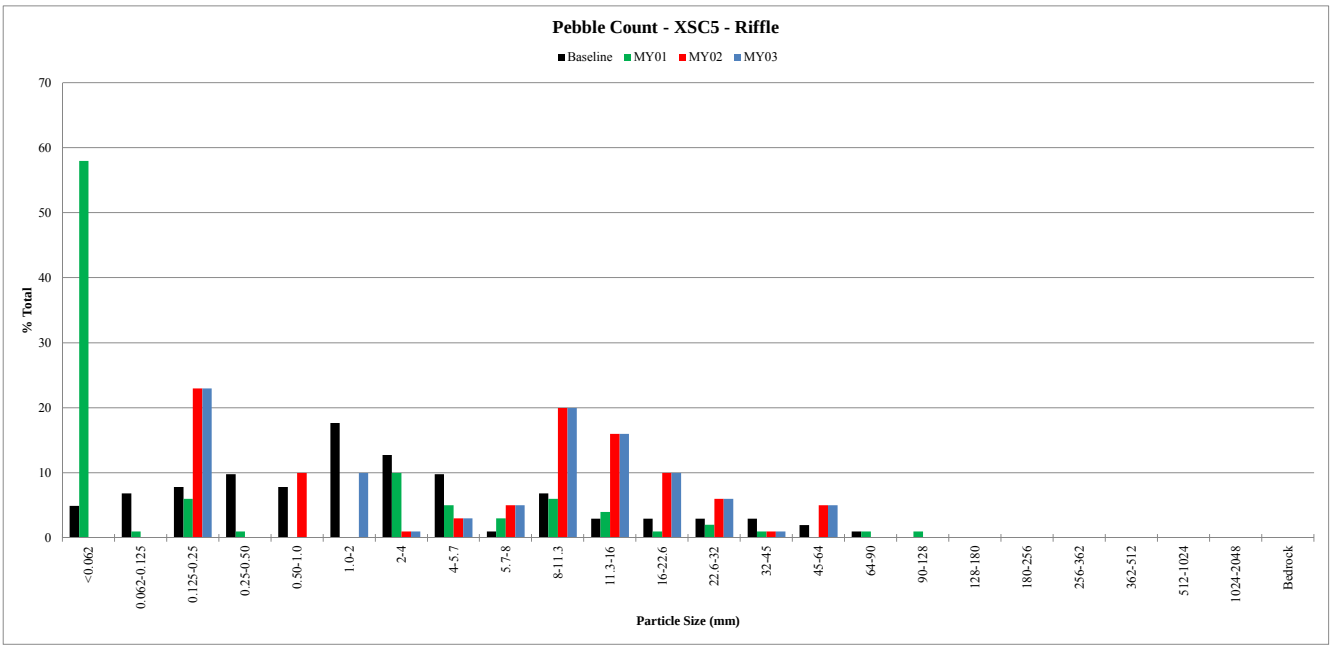

Cumulative Percent
Pebble Count - XSC3 - Riffle
Baseline
MY01
MY02
MY03
% Cumulative
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
100000
Particle Size (mm)

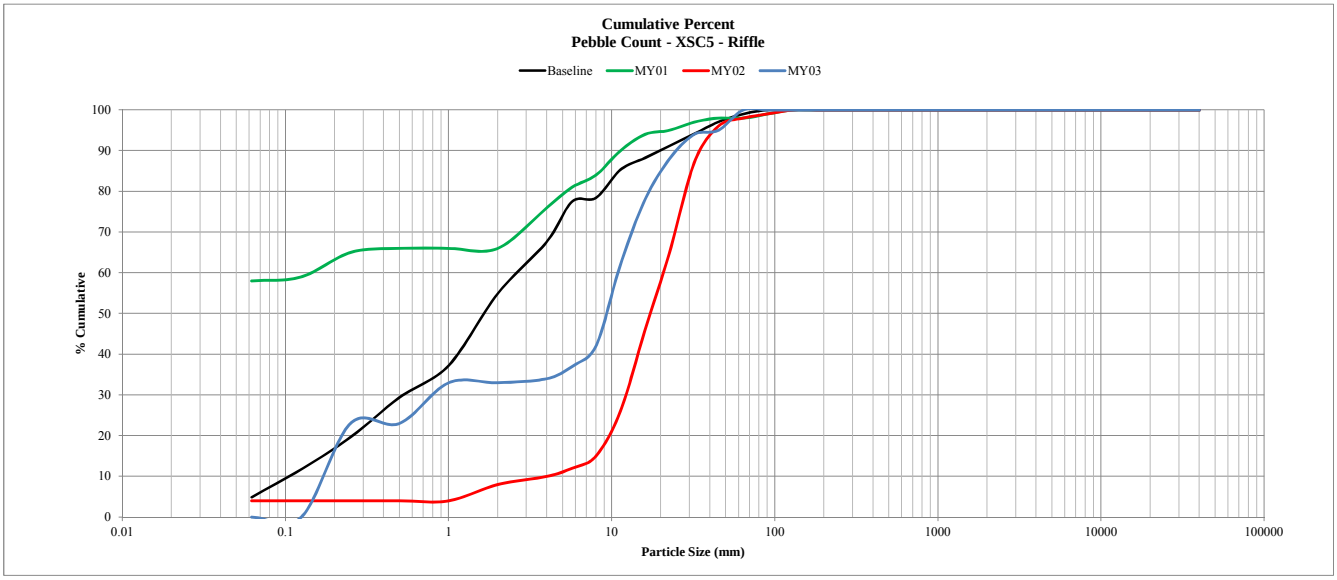
Coddle Creek Tributary - Indian Run - LR - XS5 Riffle Pebble Count

Location: STA 11+15

Inches	Particle	Millimeters		Count	% Total	% Cum.
	Silt/Clay	<0.062		0	0	0
	Very Fine	0.062-0.125	S	0	0	0
	Fine	0.125-0.25	A	23	23	23
	Medium	0.25-0.50	N	0	0	23
	Coarse	0.50-1.0	D	10	10	33
0.04-0.08	Very Coarse	1.0-2		0	0	33
0.08-0.16	Very Fine	2-4		1	1	34
0.16-0.22	Fine	4-5.7		3	3	37
0.22-0.31	Fine	5.7-8	G	5	5	42
0.31-0.44	Medium	8-11.3	R	20	20	62
0.44-0.63	Medium	11.3-16	A	16	16	78
0.63-0.89	Coarse	16-22.6	V	10	10	88
0.89-1.26	Coarse	22.6-32	E	6	6	94
1.26-1.77	Very Coarse	32-45	L	1	1	95
1.77-2.5	Very Coarse	45-64		5	5	100
2.5-3.5	Small	64-90		0	0	100
3.5-5.0	Small	90-128	C	0	0	100
5.0-7.1	Medium	128-180	O	0	0	100
7.1-10.1	Large	180-256	B	0	0	100
10.1-14.3	Small	256-362	B	0	0	100
14.3-20	Small	362-512	L	0	0	100
20-40	Medium	512-1024	E	0	0	100
40-80	Large	1024-2048		0	0	100
	Bedrock	Bedrock	Bedrock	0	0	100
			Total Counted	100		

Summary Data	
D50	9
D84	20
D95	32


Pebble Count - XSC5 - Riffle
Baseline
MY01
MY02
MY03
% Total
70
60
50
40
30
20
10
0
<0.062
0.062-0.125
0.125-0.25
0.25-0.50
0.50-1.0
1.0-2
2-4
4-5.7
5.7-8
8-11.3
11.3-16
16-22.6
22.6-32
32-45
45-64
64-90
90-128
128-180
180-256
256-362
362-512
512-1024
1024-2048
Bedrock
Particle Size (mm)

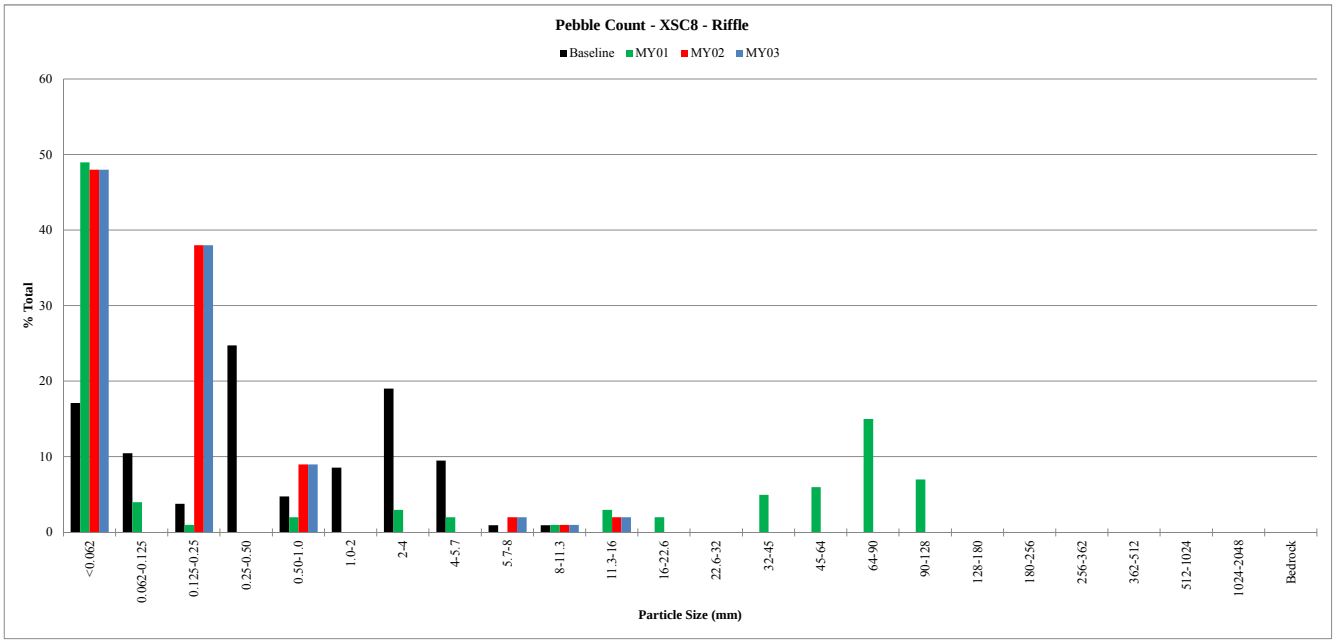

Cumulative Percent
Pebble Count - XSC5 - Riffle
Baseline
MY01
MY02
MY03
% Cumulative
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
100000
Particle Size (mm)

Coddle Creek Tributary - Indian Run - LR - XS8 Riffle Pebble Count

Location: STA 16+50

Inches	Particle	Millimeters		Count	% Total	% Cum.
	Silt/Clay	<0.062	SAND	48	48	48
	Very Fine	0.062-0.125		0	0	48
	Fine	0.125-0.25		38	38	86
	Medium	0.25-0.50		0	0	86
	Coarse	0.50-1.0		9	9	95
0.04-0.08	Very Coarse	1.0-2		0	0	95
0.08-0.16	Very Fine	2-4	GRAVEL	0	0	95
0.16-0.22	Fine	4-5.7		0	0	95
0.22-0.31	Fine	5.7-8		2	2	97
0.31-0.44	Medium	8-11.3		1	1	98
0.44-0.63	Medium	11.3-16		2	2	100
0.63-0.89	Coarse	16-22.6		0	0	100
0.89-1.26	Coarse	22.6-32		0	0	100
1.26-1.77	Very Coarse	32-45		0	0	100
1.77-2.5	Very Coarse	45-64		0	0	100
2.5-3.5	Small	64-90	COBBLE	0	0	100
3.5-5.0	Small	90-128		0	0	100
5.0-7.1	Medium	128-180		0	0	100
7.1-10.1	Large	180-256		0	0	100
10.1-14.3	Small	256-362	BOULDER	0	0	100
14.3-20	Small	362-512		0	0	100
20-40	Medium	512-1024		0	0	100
40-80	Large	1024-2048		0	0	100
	Bedrock	Bedrock	Bedrock	0	0	100
			Total Counted	100		

Summary Data	
D50	0.125
D84	0.25
D95	5.7


Pebble Count - XSC8 - Riffle
Baseline
MY01
MY02
MY03
% Total
60
50
40
30
20
10
0
<0.062
0.062-0.125
0.125-0.25
0.25-0.50
0.50-1.0
1.0-2
2-4
4-5.7
5.7-8
8-11.3
11.3-16
16-22.6
22.6-32
32-45
45-64
64-90
90-128
128-180
180-256
256-362
362-512
512-1024
1024-2048
Bedrock
Particle Size (mm)

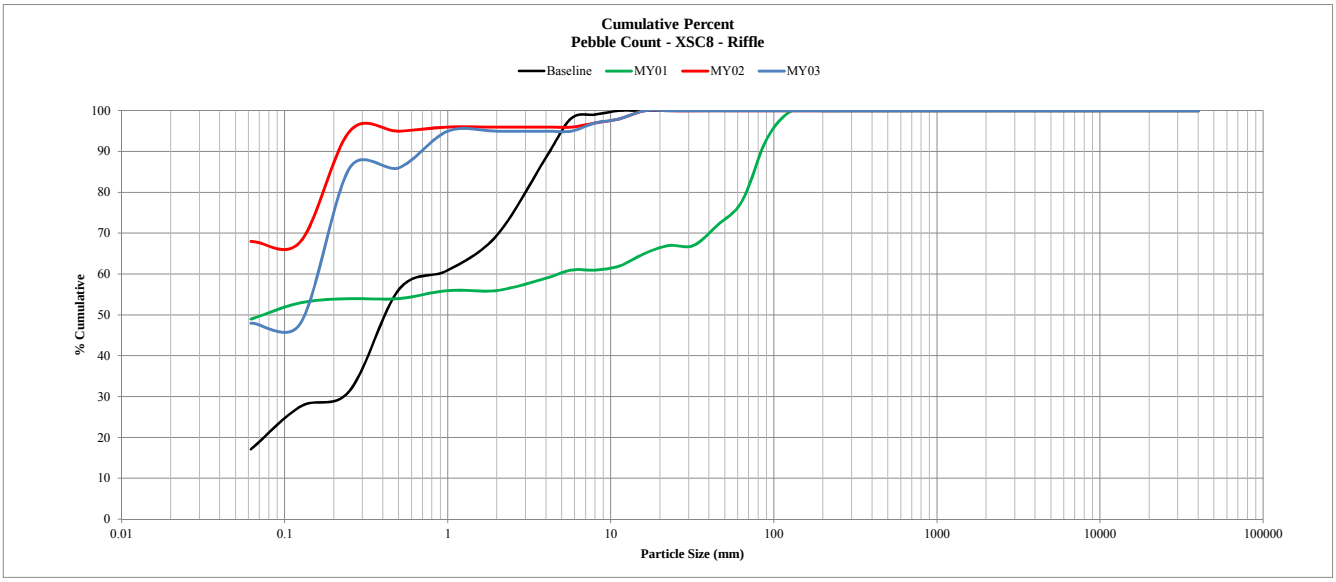

Cumulative Percent
Pebble Count - XSC8 - Riffle
Baseline
MY01
MY02
MY03
% Cumulative
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
100000
Particle Size (mm)

Table 10a. Baseline Stream Data Summary
Coddle Creek Tributary (Indian Run) / 94 - Segment/Reach: Upper (1295 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)							20.0				8.0			9.2				20.0		19.3	20.1		20.8		2
Floodprone Width (ft)							53.7				20.0			92.0				35.0		35.4	62.1		88.7		2
Bankfull Mean Depth (ft)							3.1				1.2			1.5				1.6		1.0	1.2		1.4		2
[1]Bankfull Max Depth (ft)							4.6				1.3			1.9				1.8		1.6	1.9		2.1		2
Bankfull Cross Sectional Area (ft^2)							61.3				11.3			12.3				29.3		19.9	24.7		29.5		2
Width/Depth Ratio							6.5				5.3			7.5				12.0		14.7	16.8		18.8		2
Entrenchment Ratio							2.7				2.5			10.0				1.8		1.7	3.2		4.6		2
[1]Bank Height Ratio											1.6			1.7				1.0		1.0	1.0		1.0		2
Profile																									
Riffle Length (ft)							11.5													11.0	27.9	24.5	62.0	16.2	8
Riffle Slope (ft/ft)							0.027				0.017			0.033				0.0117		0.006	0.013	0.011	0.031	0.008	8
Pool Length (ft)							40				10.8			14.0						18.0	31.6	30.0	55.0	12.2	7
Pool Max depth (ft)							4.79				2.0			2.7				2.85		2.6	3.3	3.3	3.8	0.5	6
Pool Spacing (ft)							10				4.4			47.2			52.0		101.0	47.0	91.4	91.0	126.0	25.4	7
Pattern																									
Channel Beltwidth (ft)							130.0				20.0			69.0			50.0		173.0	50.0	55.6	54.0	67.0	6.7	5
Radius of Curvature (ft)							25.0				6.0			37.0			20.0		60.0	30.0	44.9	50.0	65.0	9.0	16
Rc:Bankfull width (ft/ft)							1.3				0.7			4.6			0.7		4.6	1.6	2.2		3.1		
Meander Wavelength (ft)							115.0				48.0			85.0			104.0		213.0	135.0	168.4	171.5	208.0	21.3	8
Meander Width Ratio							5.8				2.5			8.6			2.5		8.6	2.6	2.8		3.2		
Transport parameters																									
Reach Shear Stress (competency) lb/ft^2							0.53											0.47					0.42		
Max part size (mm) mobilized at bankfull							38.7											35.4					32.0		
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification							Impaired C4							C4				C4					C4		
Bankfull Velocity (fps)							5.4											3.49							
Bankfull Discharge (cfs)							328.4																		
Valley length (ft)							1638											1548					1122		
Channel Thalweg length (ft)							1900											1796					1295		
Sinuosity (ft)							1.16							1.3				1.16					1.15		
Water Surface Slope (Channel) (ft/ft)							0.0051							0.0061 - 0.0130				0.0047					0.0056		
BF slope (ft/ft)							0.0051											0.0047					0.0057		
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Table 10b. Baseline Stream Data Summary
Coddle Creek Tributary (Indian Run) / 94 - Segment/Reach: Lower (975 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)							20.0				8.0			9.2				20.0		20.4	21.7		22.9		2
Floodprone Width (ft)							75.0				20.0			92.0				100.0		96.4	123.4		150.3		2
Bankfull Mean Depth (ft)							3.7				1.2			1.5				1.7		1.3	1.3		1.3		2
[1]Bankfull Max Depth (ft)							5.1				1.3			1.9				1.8		2.1	2.2		2.2		2
Bankfull Cross Sectional Area (ft^2)							74.5				11.3			12.3				29.3		27.1	28.0		28.8		2
Width/Depth Ratio							5.4				5.3			7.5				12.0		15.3	16.8		18.2		2
Entrenchment Ratio							3.8				2.5			10.0				5.0		4.7	5.7		6.6		2
[1]Bank Height Ratio											1.6			1.7				1.1		1.0	1.0		1.0		2
Profile																									
Riffle Length (ft)							6.0													18.0	32.0	31.0	48.0	12.3	5
Riffle Slope (ft/ft)							0.035				0.017			0.033				0.0114		0.0057	0.0090	0.0076	0.0150	0.0042	4
Pool Length (ft)							81.0				10.8			14.0						14.0	47.4	35.0	48.0	30.5	7
Pool Max depth (ft)							5.8				2.0			2.7				2.85		2.4	3.0	3.1	3.5	0.4	6
Pool Spacing (ft)							7.5				4.4			47.2			52		101	92.0	112.8	114.0	131.0	19.7	4
Pattern																									
Channel Beltwidth (ft)											20.0			69.0			50.0		173.0	67.0	77.2	75.0	89.0	9.1	5
Radius of Curvature (ft)											6.0			37.0			35.0		56.0	45.0	48.9	50.0	50.0	3.9	7
Rc:Bankfull width (ft/ft)											0.7			4.6			0.7		4.6	2.2	2.3		2.2		
Meander Wavelength (ft)											48.0			85.0			104.0		213.0	190.0	204.2	210.0	211.0	9.4	5
Meander Width Ratio											2.5			8.6			2.5		8.6	3.3	3.6		3.9		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2							0.53											0.36				0.34			
Max part size (mm) mobilized at bankfull							38.7											27.3				25.4			
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification							Modified Channel							C4				C4				C4			
Bankfull Velocity (fps)							5.9											3.49							
Bankfull Discharge (cfs)							442.9																		
Valley length (ft)							1550											1550				763			
Channel Thalweg length (ft)							1700											1922				975			
Sinuosity (ft)							1.1							1.3				1.24				1.28			
Water Surface Slope (Channel) (ft/ft)							0.0052							0.0061 - 0.0130				0.0035				0.0042			
BF slope (ft/ft)							0.0052											0.0035				0.0042			
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Coddle Creek Tributary (Indian Run) / 94 Segment/Reach: Upper (1295', XS 1-4) and Lower (975', XS 5-8)

	Cross Section 1 (Riffle)							Cross Section 2 (Pool)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)													
Based on fixed baseline bankfull elevation	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	542.62	542.62	542.62	542.62				541.18	541.18	541.18	541.18				539.00	539.00	539.00	539.00				538.77	538.77	538.77	538.77										
Bankfull Width (ft)	19.31	22.90	16	19.93				34.10	35.59	23	30.49				20.80	25.86	21.66	21.9				33.00	33.51	29.34	33.96										
Floodprone Width (ft)	88.70	92.50	91	96				56.20	60.70	65	64.5				35.40	37.80	36.9	35.2				45.70	47.90	51.5	55										
Bankfull Mean Depth (ft)	1.03	0.99	1.71	1.12				1.20	1.16	1.82	0.94				1.40	1.31	1.13	1.02				1.30	1.30	1.06	1										
Bankfull Max Depth (ft)	1.60	2.09	2.16	2.43				3.30	3.32	3.5	3.1				2.10	2.39	2	2.06				2.60	2.46	3.16	3.15										
Bankfull Cross Sectional Area (ft)	19.90	22.60	27.3	22.3				39.43	41.46	41.97	28.8				29.50	33.89	24.53	22.34				43.50	43.72	30.99	33.86										
Bankfull Width/Depth Ratio	18.80	23.20	7.41	17.81				29.50	30.55	12.6	32.28				14.70	19.73	19.13	21.47				25.00	25.68	27.78	34.06										
Bankfull Entrenchment Ratio	4.60	4.04	5.69	4.82				1.60	1.71	2.83	2.12				1.70	1.46	1.7	1.61				1.40	1.43	1.76	1.62										
Bankfull Bank Height Ratio	1.00	0.98	1.16	0.93				1.00	1.00	1	0.9				1.00	1.00	1.04	0.85				1.00	1.00	0.96	0.96										
Cross Sectional Area between end pins (ft)	421.80	411.70	429.37	433.7				457.50	471.20	455.94	451.7				248.40	262.10	264.04	232.26				358.10	361.90	349.78	362.21										
d50 (mm)	4.90	32.00	19	11.3				12.00	27.00						6.00	6.50	8.5	33				0.34	4.40												

	Cross Section 5 (Riffle)							Cross Section 6 (Pool)							Cross Section 7 (Pool)							Cross Section 8 (Riffle)													
Based on fixed baseline bankfull elevation	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+							
Record elevation (datum) used	536.34	536.34	536.34	536.34				535.56	535.56	535.56	535.56				534.62	534.62	534.62	534.62				534.36	534.36	534.36	534.36										
Bankfull Width (ft)	22.90	19.98	18.49	37				19.30	19.03	22.11	26.48				69.30	34.53	31.01	36.4				20.40	22.02	16.78	32.52										
Floodprone Width (ft)	150.30	150.10	138	139.5				95.20	104.40	100.4	99				93.00	99.00	96	96				96.40	95.60	89.5	112										
Bankfull Mean Depth (ft)	1.30	1.40	0.97	0.61				1.50	1.40	1.58	1.16				0.70	1.07	1.20	0.9				1.30	1.30	1.18	0.81										
Bankfull Max Depth (ft)	2.10	1.94	1.15	1.36				2.40	2.75	2.71	2.46				3.00	3.14	3.11	3.22				2.20	2.33	2.18	2.39										
Bankfull Cross Sectional Area (ft)	28.80	27.92	18	22.7				28.20	26.71	34.9	30.82				48.90	37.08	37.17	32.89				27.10	28.64	19.78	26.2										
Bankfull Width/Depth Ratio	18.20	14.30	18.99	60.31				13.10	13.56	14.01	22.75				96.30	32.16	25.87	40.28				15.30	16.93	14.28	40.36										
Bankfull Entrenchment Ratio	6.60	7.51	7.46	3.77				5.00	5.49	4.54	3.74				1.30	2.87	3.1	2.64				4.70	4.34	5.33	3.44										
Bankfull Bank Height Ratio	1.00	0.83	0.79	1.01				1.00	0.94	1	1.02				1.00	1.00	1.03	0.96				1.00	0.94	0.99	0.95										
Cross Sectional Area between end pins (ft)	823.40	870.60	807.93	780.65				467.00	467.40	540.64	520.1				458.80	441.30	480.99	423.02				442.50	431.60	444.59	442.99										
d50 (mm)	1.60	0.062	17	9				0.30	0.29						0.82	0.15						0.42	0.074	0.062	0.125										

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
Coddle Creek Tributary (Indian Run) / 94 - Segment/Reach: Upper (1295 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	19.3	20.1		20.8		2	22.9	24.4		25.9		2	16	18.8		21.6		2	19.93	20.92		21.9		2												
Floodprone Width (ft)	35.4	62.1		88.7		2	37.8	65.2		92.5		2	36.9	63.9		91		2	35.2	65.6		96		2												
Bankfull Mean Depth (ft)	1.0	1.2		1.4		2	1.0	1.2		1.3		2	1.71	1.42		1.13		2	1.02	1.07		1.12		2												
[1]Bankfull Max Depth (ft)	1.6	1.9		2.1		2	1.7	2.1	2.1	2.4	0.2	10	2	2.1		2.16		2	2.06	2.25		2.43		2												
Bankfull Cross Sectional Area (ft^2)	19.9	24.7		29.5		2	22.6	28.2		33.9		2	24.53	25.9		27.3		2	22.3	22.32		22.34		2												
Width/Depth Ratio	14.7	16.8		18.8		2	19.7	21.5		23.2		2	7.41	13.27		19.13		2	17.81	19.64		21.47		2												
Entrenchment Ratio	1.7	3.2		4.6		2	1.5	2.8		4.0		2	1.7	3.7		5.69		2	1.61	3.22		4.82		2												
[1]Bank Height Ratio	1.0	1.0		1.0		2	1.0	1.0		1.0		2	1.04	1.1		1.16		2	0.85	0.89		0.93		2												
Profile																																				
Riffle Length (ft)	11.0	27.9	24.5	62.0	16.2	8	4	13.1	12	23	6.6	11	12.1	25.2	26	39	19.02	5	13.6	28.2	27.8	45.5	12.5	6												
Riffle Slope (ft/ft)	0.0060	0.0126	0.0107	0.0310	0.0078	8	0.0077	0.0234	0.0236	0.0425	0.0124	11	0.02	0.02	0.03	0.03	0.007	5	0.01	0.015	0.013	0.03	0.01	6												
Pool Length (ft)	18.0	31.6	30.0	55.0	12.2	7	13	25.2	20	63	13.3	15	25	48.7	50.1	67.8	21.51	5	24.96	33.14	32.19	45.29	6.917	6												
Pool Max depth (ft)	2.6	3.3	3.3	3.8	0.5	6	2.37	3.23	3.3	4.33	0.63	15	2.3	3.3	3.4	4.3	1.002	5	2.01	2.35	2.22	3.18	0.44	6												
Pool Spacing (ft)	47.0	91.4	91.0	126.0	25.4	7	35	80.9	80	122.5	30.3	10	83.8	125.9	127	158.8	37.64	5	47.1	84.6	72.9	159.8	43.1	6												
Pattern																																				
Channel Beltwidth (ft)	50.0	55.6	54.0	67.0	6.7	5																														
Radius of Curvature (ft)	30.0	44.9	50.0	65.0	9.0	16																														
Rc:Bankfull width (ft/ft)	1.6	2.2		3.1																																
Meander Wavelength (ft)	135.0	168.4	171.5	208.0	21.3	8																														
Meander Width Ratio	2.6	2.8		3.2																																
Additional Reach Parameters																																				
Rosgen Classification	C4						C4						C4						C4																	
Channel Thalweg length (ft)	1295						1295						1295						1295																	
Sinuosity (ft)	1.15						1.15						1.15						1.15																	
Water Surface Slope (Channel) (ft/ft)	0.0056						0.0058						0.0054						0.0057																	
BF slope (ft/ft)	0.0057						0.0055						0.0054						0.006																	
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks							2.3						0						3																	
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Exhibit Table 11c. Monitoring Data - Stream Reach Data Summary
Coddle Creek Tributary (Indian Run) / 94 - Segment/Reach: Lower (975 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	20.4	21.7		22.9		2	20.0	21.0		22.0		2	16.78	17.64		18.49		2	32.52	34.76		37		2												
Floodprone Width (ft)	96.4	123.4		150.3		2	95.6	122.9		150.1		2	89.5	113.8		138		2	112	125.8		139.5		2												
Bankfull Mean Depth (ft)	1.3	1.3		1.3		2	1.3	1.4		1.4		2	0.97	1.07		1.18		2	0.61	0.71		0.81		2												
[1]Bankfull Max Depth (ft)	2.1	2.2		2.2		2	1.9	2.2	2.2	2.4	0.2	7	1.15	1.66		2.18		2	1.36	1.875		2.39		2												
Bankfull Cross Sectional Area (ft[2])	27.1	28.0		28.8		2	27.9	28.3		28.6		2	18	18.89		19.78		2	22.7	24.45		26.2		2												
Width/Depth Ratio	15.3	16.8		18.2		2	14.3	15.6		16.9		2	14.28	16.63		18.99		2	40.36	50.34		60.31		2												
Entrenchment Ratio	4.7	5.7		6.6		2	4.3	5.9		7.5		2	5.33	6.39		7.46		2	3.44	3.605		3.77		2												
[1]Bank Height Ratio	1.0	1.0		1.0		2	0.8	0.9		0.9		2	0.79	0.89		0.99		2	0.95	0.98		1.01		2												
Profile																																				
Riffle Length (ft)	18.0	32.0	31.0	48.0	12.3	5	4.0	13.5	14.5	24.0	7.2	6	10.78	18.17	17.8	27.19	6.162	6	15.48	17.35	17.1	19.46	1.83	5												
Riffle Slope (ft/ft)	0.0057	0.0090	0.0076	0.0150	0.0042	4	0.0088	0.0141	0.0152	0.0188	0.0036	6	0.004	0.012	0.012	0.021	0.007	6	0.016	0.030	0.029	0.033	0.010	5												
Pool Length (ft)	14.0	47.4	35.0	48.0	30.5	7	26.0	45.6	48.0	71.0	17.6	7	16.41	41.3	45.6	66.8	18.71	5	14.79	26.27	28.57	41.33	11.06	5												
Pool Max depth (ft)	2.4	3.0	3.1	3.5	0.4	6	2.4	3.0	2.8	3.9	0.5	7	14.79	18.1	18.37	20.7	2.167	5	2.41	2.84	3.07	3.21	0.39	5												
Pool Spacing (ft)	92.0	112.8	114.0	131.0	19.7	4	45.0	93.1	107.0	141.0	38.0	6	67.6	122.2	122.6	176.1	44.65	4	40.61	50.48	47.13	66.96	10.68	5												
Pattern																																				
Channel Beltwidth (ft)	67.0	77.2	75.0	89.0	9.1	5																														
Radius of Curvature (ft)	45.0	48.9	50.0	50.0	3.9	7																														
Rc:Bankfull width (ft/ft)	2.2	2.3		2.2																																
Meander Wavelength (ft)	190.0	204.2	210.0	211.0	9.4	5																														
Meander Width Ratio	3.3	3.6		3.9																																
Additional Reach Parameters																																				
Rosgen Classification	C4						C4						C4						C4																	
Channel Thalweg length (ft)	975						975						975						975																	
Sinuosity (ft)	1.28						1.28						1.28						1.28																	
Water Surface Slope (Channel) (ft/ft)	0.0042						0.0042						0.0051						0.0051																	
BF slope (ft/ft)	0.0042						0.0046						0.0054						0.005																	
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks							0						0						0																	
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Appendix E
Hydrologic Data

Table 12. Verification of Bankfull Events			
Coddle Creek Tributary (Indian Run)/ 94 Segment/Reach: 2270 feet			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo**
5/30/2012	Between 5/11/2011 - 5/30/2012	Visual observation of wrack lines; stream gauge	Photo in MY1 Report
11/4/2013	Between 5/30/2012 - 11/04/2013	Visual observation of wrack lines; stream gauge	Photo in MY2 Report
11/4/2013	Between 11/04/2013 - 9/19/2014	Visual observation of wrack lines; stream gauge reading at 35" above bankfull	Photo below