



MONITORING YEAR 2 ANNUAL REPORT Final

UNDERWOOD MITIGATION SITE

Chatham County, NC
DENR Contract 003268
NCEP Project Number 94641

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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 9,133 linear feet (LF) of stream and restore, enhance, and create 13.84 acres (ac) of wetlands in Chatham County, North Carolina. The project streams consist of South Fork Cane Creek (South Fork) and three unnamed tributaries (UTs) of the South Fork. The largest of these streams, South Fork, ultimately drains to the Haw River. At the downstream limits of the project, the drainage area is 3,362 acres (5.25 square miles).

The Underwood Mitigation Site, hereafter referred to as the Site, consists of two separate areas (Harris Site and Lindley Site) located in western Chatham County north of Siler City, North Carolina. The Harris site is located within the upstream area of the project watershed along Clyde Underwood Road, just west of Planfield Church Road. The Lindley Site is located downstream from the Harris Site, southwest of Moon Lindley Road between Johnny Lindley Road and Bob Clark Road (see Figure 1). The Site is located within the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998). The Sites are located within the North Carolina Division of Water Resources (NCDWR) subbasin 03-06-04 of the Cape Fear River Basin (United States Geological Survey (USGS) Hydrologic Unit 03030002050050). Approximately 60% of the land in the project watershed is forest, 39% is classified as managed herbaceous cover or agricultural, and the remaining 1% is split between unmanaged herbaceous and open water (MRLC, 2001). The Site is the ownership of Mary Jean Harris, William Darrel Harris, James Randall Lindley, and Jonathan Marshall Lindley.

Prior to construction activities, the streams and wetlands on the Harris Site were impacted by cattle grazing, which led to stream bank erosion and instability. The Lindley site was used for row crop agriculture and the streams were straightened and deepened and much of the riparian vegetation was removed. Related degradation includes declining aquatic habitat, loss of forest, degraded riparian buffers, loss of wetlands, and water quality problems related to increased sediment and nutrient loadings. 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 and adjacent riparian wetlands. 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. These objectives were achieved by restoring and enhancing 9,133 linear feet (LF) of perennial and intermittent stream channel, and restoring, enhancing, and creating 13.84 acres of riparian and non-riparian wetland. The Stream Site and Wetland Site riparian areas were also planted to stabilize streambanks, improve habitat, and protect water quality. Figure 2 and Table 1 present design applications for the Sites.

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

- Restore and stabilize stream dimensions, pattern, and profile;
- Establish proper substrate distribution throughout restored and enhanced streams;
- Improve aquatic and benthic habitat;
- Reduce nutrient loads within the watershed and to downstream waters;
- Further improve water quality within the watershed through reductions of sediment, bacteria, and other pollutants;
- Decrease water temperature and increase dissolved oxygen concentrations;
- Establish appropriate hydrology for wetland areas;



- Restore native vegetation to wetlands and riparian buffers/improve existing buffers; and
- Create appropriate terrestrial habitat.

Stream and wetland restoration, enhancement, and creation construction efforts were completed in November 2012. A conservation easement is in place on 37.8 ac acres of riparian corridor and stream resources to protect them in perpetuity.

Monitoring Year 2 (MY-2) monitoring and site visits were completed during May-December, 2014 to assess the conditions of the project. Overall, the Site has met the required hydrologic, vegetation, and stream success criteria for MY-2. The sites overall average stem density of 481 stems/ acre is greater than the 320 stem/ acre density required for MY-3. With the exception of an isolated enhancement reach, all restored and enhanced streams are stable and functioning as designed. The majority of the Site has met the Monitoring Year 5 (MY5) hydrology success criteria. With the exception of one groundwater gage, the Site has met the MY-2 success criteria.



UNDERWOOD MITIGATION SITE
Monitoring Year 2 Annual Report

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Section 1: PROJECT OVERVIEW

The Underwood Mitigation Site, hereafter referred to as the Site, consists of two separate areas (Harris Site and Lindley Site) located in western Chatham County within the Cape Fear River Basin (USGS Hydrologic Unit 03030002) north of Siler City, North Carolina. The Harris site is located within the upstream area of the project watershed along Clyde Underwood Road, just west of Planfield Church Road. The Lindley Site is located downstream from the Harris Site, southwest of Moon Lindley Road between Johnny Lindley Road and Bob Clark Road. The Site is located within the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998). The project watersheds consist of forested, managed herbaceous, and unmanaged herbaceous and open water (MRLC, 2001). The drainage areas for the Harris Site and Lindley Site are 1,051 acres (1.64 square miles) and 3,362 acres (5.25 square miles) respectively.

The project stream reaches consist of SF1, SF3, SF4, SF4A, UT1, and UT2 (stream restoration and/or enhancement level I approach) and SF2, SF3, UT1, UT1A, and UT1B (enhancement level II approach). Mitigation work within the Site included restoring and enhancing 9,133 linear feet (LF) of perennial and intermittent stream channel and restoring, enhancing, and creating 13.84 acres of riparian and non-riparian wetland. The stream and wetland areas were also planted with native vegetation to improve habitat and protect water quality. Construction activities were completed by Land Mechanics Designs, Inc. in November 2012. Planting and seeding activities were completed by Bruton Natural Systems, Inc. in January 2013. Four separate conservation easements have been recorded and are in place along the riparian corridors and stream resources to protect them in perpetuity; 7.68 acres (Deed Book 1578, Page 495) within the tract owned by Mary Jean Harris, 18.44 acres (Deed Book 1578, Page 507) within the tract owned by William Darrel Harris, 5.34 acres property (Deed Book 1579, Page 1067) within the tract owned by James Randall Lindley, and 6.29 acres property (Deed Book 716, Page 707) within the tract owned by Jonathan Marshall Lindley. Directions and a map of the Site are provided in Figure 1 and project components are illustrated for the Site in Figures 2a and 2b.

1.1 Project Goals and Objectives

Prior to construction activities, the streams and wetlands on the Harris Site were impacted by cattle grazing, which led to stream bank erosion and instability. The Lindley site was used for row crop agriculture and the streams were straightened and deepened and much of the riparian vegetation was removed. Related degradation includes declining aquatic habitat, loss of forest, degraded riparian buffers, loss of wetlands, and water quality problems related to increased sediment and nutrient loadings. Table 4 in Appendix 1 and Tables 10a, 10b, and 10c in Appendix 4 present the pre-restoration conditions in detail.

The Sites were designed to meet the over-arching goals as described in the mitigation plan (2011) to address the effects from watershed and project site stressors. The project addresses multiple watershed stressors that have been documented for both the Cane Creek and Jordan Lake watersheds. While many of these benefits are limited to the Underwood Site project area, 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:

- Restore and stabilize stream dimensions, pattern, and profile;
- Establish proper substrate distribution throughout restored and enhanced streams;
- Improve aquatic and benthic habitat;
- Reduce nutrient loads within the watershed and to downstream waters;



- Further improve water quality within the watershed through reductions of sediment, bacteria, and other pollutants;
- Decrease water temperature and increase dissolved oxygen concentrations;
- Establish appropriate hydrology for wetland areas;
- Restore native vegetation to wetlands and riparian buffers/improve existing buffers; and
- Create appropriate terrestrial habitat.

The project goals were addressed through the following project objectives:

- Construct stream channels that will remain relatively stable over time and adequately transport their sediment loads without significant erosion or aggradation;
- Construct stream channels that maintain riffles with coarse bed material and pools with finer bed material;
- Provide aquatic and benthic habitat diversity in the form of pools, riffles, woody debris, and in-stream structures;
- Add riffle features and structures and riparian vegetation to decrease water temperatures and increase dissolved oxygen to improve water quality;
- Construct stream reaches so that floodplains and wetlands are frequently flooded to provide energy dissipation, detain and treat flood flows, and create a more natural hydrologic regime;
- Construct fencing to keep livestock out of the streams;
- Raise local groundwater table through raising stream beds and removing agricultural drainage features;
- Grade wetland creation areas as necessary to promote wetland hydrology; and
- Plant native tree species to establish appropriate wetland and floodplain communities and retain existing, native trees where possible.

The design streams and wetlands 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 mitigation project corrected incision and lack of pattern caused by channelization, bank instability caused by erosion and livestock access, lack of vegetation in riparian zones, lack of riparian and aquatic habitat, and depletion of hydrology for adjacent wetlands. The final mitigation plan was submitted and accepted by the NCEP in September of 2011. Construction activities were completed by Land Mechanics Designs, Inc. in November 2012. Planting and seeding activities were completed by Bruton Natural Systems, Inc. in January 2013. Baseline monitoring (MY-0) was conducted between December 2012 and February of 2013. Annual monitoring will be conducted for five years with the close-out anticipated to commence in 2018 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 2 Data Assessment

Annual monitoring and quarterly site visits were conducted during monitoring year 2 (MY-2) to assess the condition of the project. The stream and wetland mitigation success criteria for the Site follow the approved success criteria presented in the Underwood Mitigation Plan (2011).

1.2.1 Vegetative Assessment

Planted woody vegetation is being monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-NCEP Level 2 Protocol (Lee et al., 2008). A total of 42 (29 at the Harris Site; 13 at the Lindley Site) vegetation plots were established during the baseline monitoring

within the project easement areas using standard 10 meter by 10 meter vegetation monitoring plots. 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 MY-5. The interim measure of vegetative success for the Stream and Wetland Sites will be the survival of at least 320 planted stems per acre at the end of the third monitoring year (MY-3).

The MY-2 vegetative survey was completed in May 2014. The 2014 annual vegetation monitoring resulted in an average stem density of 481 stems per acre, which is greater than the interim requirement of 320 stems/acre and approximately 32% less than the baseline (MY-0) density recorded (712 stems/acre). There was an average of 12 stems per plot compared to 19 stems per plot during MY-0. While the Site as a whole is on track to meet the interim requirement, seven plots are not meeting the success criteria. A supplemental planting is scheduled for those areas identified with low survival rates. 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

Isolated areas of low planted stem survivability were noted in MY-2 and are primarily associated with the Harris Site. Details regarding the tentative maintenance plan are discussed below in section 1.2.7.

1.2.3 Stream Assessment

Morphological surveys for the MY-2 were conducted in May 2014. With the exception of SF4A, all streams within the Site are stable with little to no erosion and have met the success criteria for MY-2. 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.

In general 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 SF1, UT2, SF3, UT1, and SF4 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. Degradation was documented in the upper portion of SF4A (approximate STA 900+00-905+33). In this section the stream has downcut up to 0.5 ft in some locations. Although the adjustments in SF4A's profile were not intended in the design, the stream is maintaining a stable bedform at a lower elevation. SF4A will be closely monitored over the upcoming MY-3 to document this trend towards stability. If during MY-3 degradation continues along SF4A, Wildlands will prepare a maintenance plan to address the problem areas. Details regarding the tentative maintenance plan are discussed below in section 1.2.7. 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-2 that indicated a change in the radius of curvature or channel belt width.

1.2.4 Stream Areas of Concern

While SF4A appears to have stabilized at a lower bedform elevation, this reach will continue to be closely monitored during subsequent monitoring years.



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. Additional bankfull events were recorded on all the streams except for UT2 with crest gages during the MY-2 data collection. Please refer to Appendix 5 for hydrologic data.

1.2.6 Wetland Assessment

Fifteen groundwater monitoring gages were established during the baseline monitoring within the wetland restoration, creation, and enhancement zones. The gages were installed at appropriate locations so that the data collected will provide an indication of groundwater levels throughout the site. To provide data for the determination of the growing season for the wetland areas, two soil temperature loggers were installed in representative areas within RW3 and RW4. A barotroll logger (to measure barometric pressure used in the calculations of groundwater levels with well transducer data) and a rain gage were also installed within the wetland areas on both the Harris and Lindley Site. All monitoring gages were downloaded on a quarterly basis and maintained on an as needed basis. The success criteria for wetland hydrology is to have a free groundwater surface within 12 inches of the ground surface for 7.5 percent of the growing season, which is measured on consecutive days under typical precipitation conditions. With the exception of gage 13, all other groundwater gages met the annual wetland hydrology success criteria for MY-2. Please refer to Appendix 2 for the groundwater gage locations and Appendix 5 for groundwater hydrology data and plots.

1.2.7 Maintenance Plan

Wildlands is proposing a supplemental planting in the winter of 2015 to address areas noted with low planted stem survivability. Additionally, Wildlands will continue to monitor SF4A and will develop a maintenance plan if it becomes apparent that the stream continues to downcut or otherwise destabilize. A maintenance plan to correct this problem would likely consist of installation of sills at the downstream end of riffles to stabilize those features, add additional grade control, and backfill over time to raise the bed through the riffle sections.

1.3 Monitoring Year 2 Summary

With the exception of SF4A, all streams within the Site are stable and functioning as designed. Degradation observed on SF4A will be monitored for indications of long term instability. A maintenance plan will be prepared after MY-3 if conditions continue to degrade. The average stem density for the Site is on track to meeting the MY-5 success criteria; however, some individual vegetation plots did not meet the MY-3 success criteria as noted in the Integrated Current Condition Plan View. With the exception of UT2, there have been multiple documented bankfull events with the crest gage recordings along UT1, SF2, SF3, SF4, and SF4A since construction completion. The MY-5 stream hydrology attainment requirement has been partially met for the Site at this time. With the exception of one gage, the MY-2 hydrology success criteria has been met.

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. Summary information/data related to 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 (formerly Restoration Plan) documents



available on EEP's website. All raw data supporting the tables and figures in the appendices is available from NCEEP upon request.



Section 2: METHODOLOGY

Geomorphic data was collected followed 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). Cross-sectional data were collected using a total station and were georeferenced. All Integrated Current Condition Mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcView. Crest gages and pressure transducers 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 1.2.1 (NCEEP, 2009).

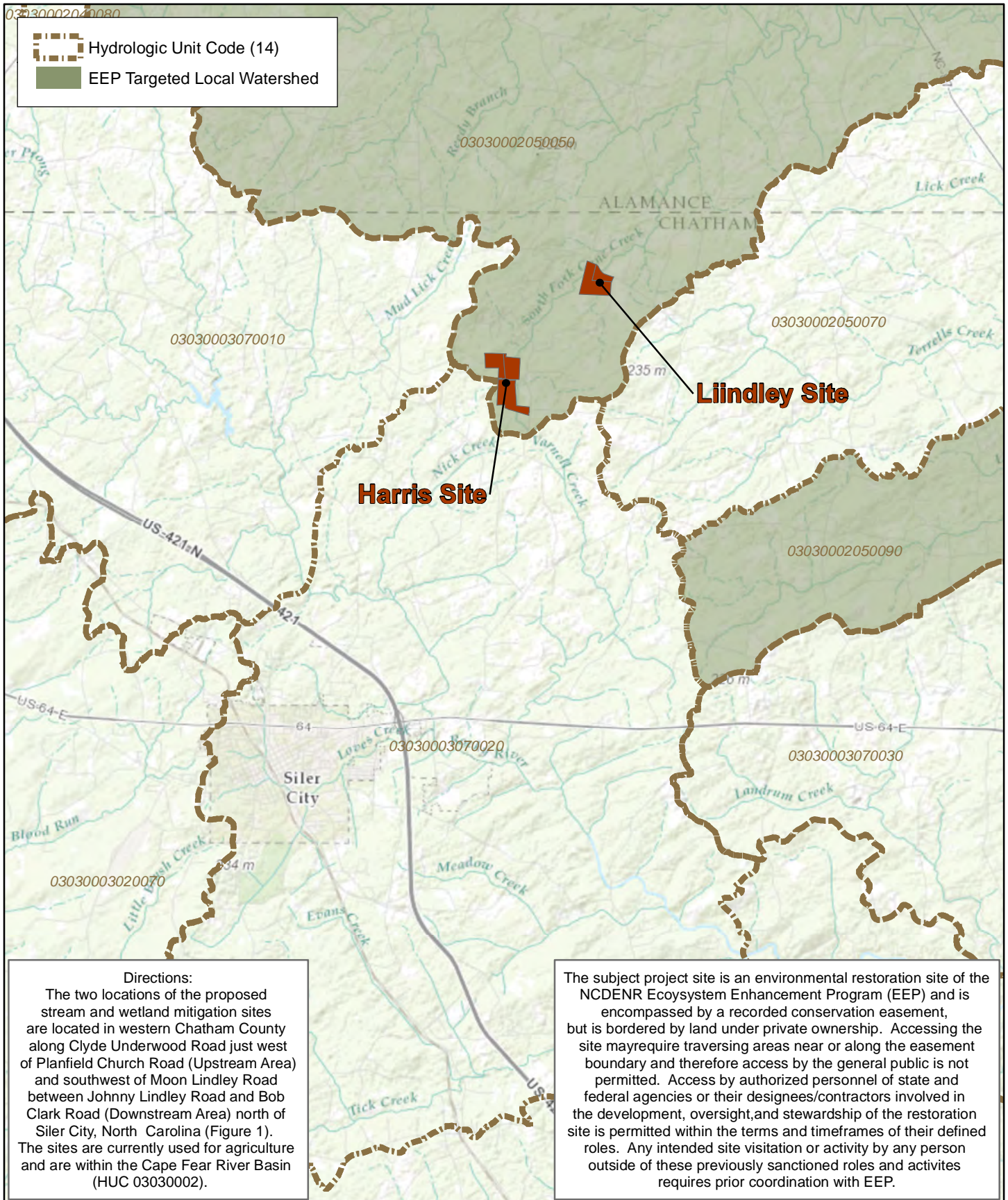


Section 3: REFERENCES

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APPENDIX 1. General Tables and Figures



0 0.625 1.25 Miles



Figure 1 Project Vicinity Map
 Underwood Mitigation Site
 NCEEP Project No. 94641
 Monitoring Year 2

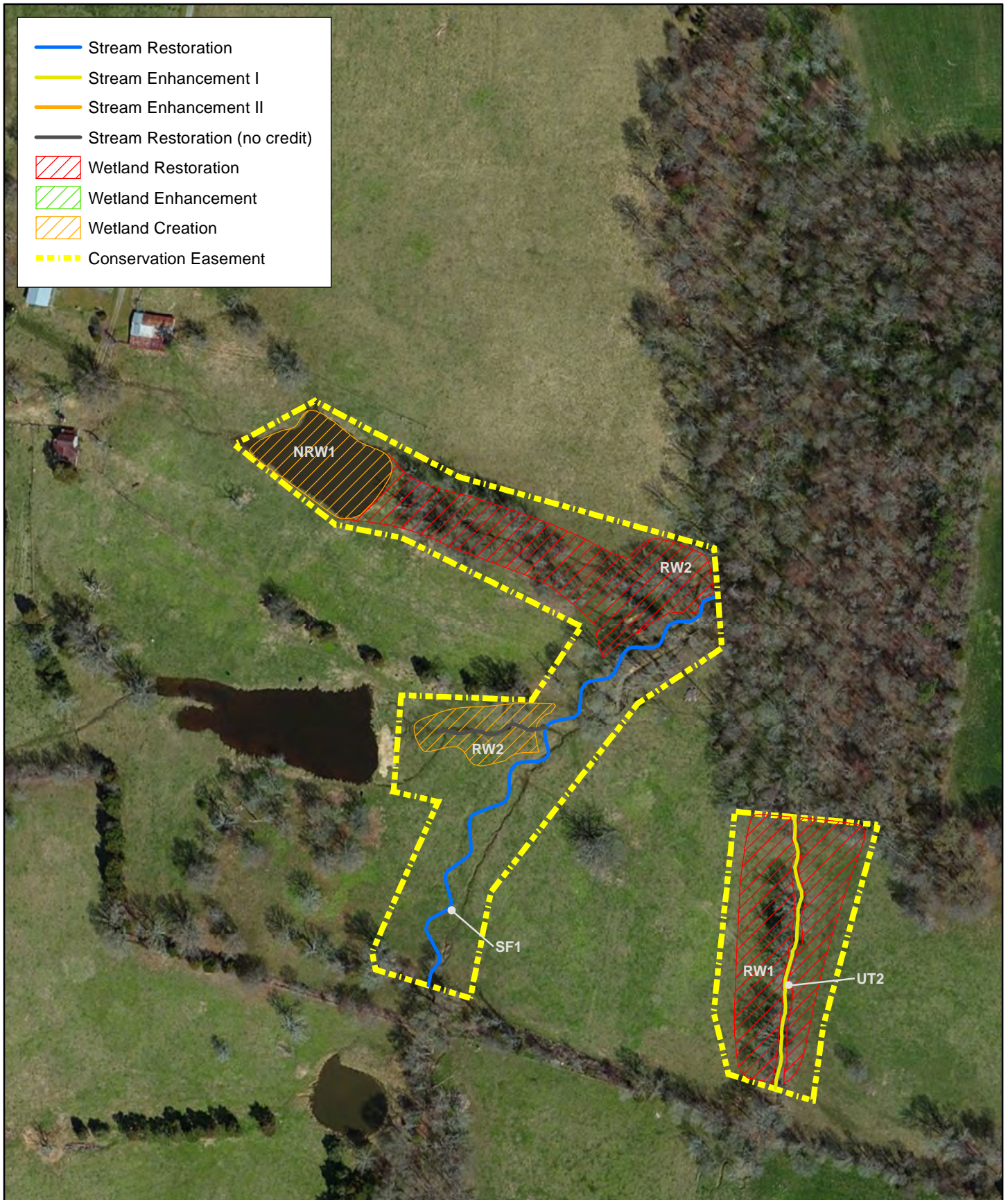
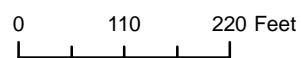


Figure 2a Project Component/Asset Map
 Underwood Mitigation Site - Harris Site
 NCEEP Project No. 94641
 Monitoring Year 2



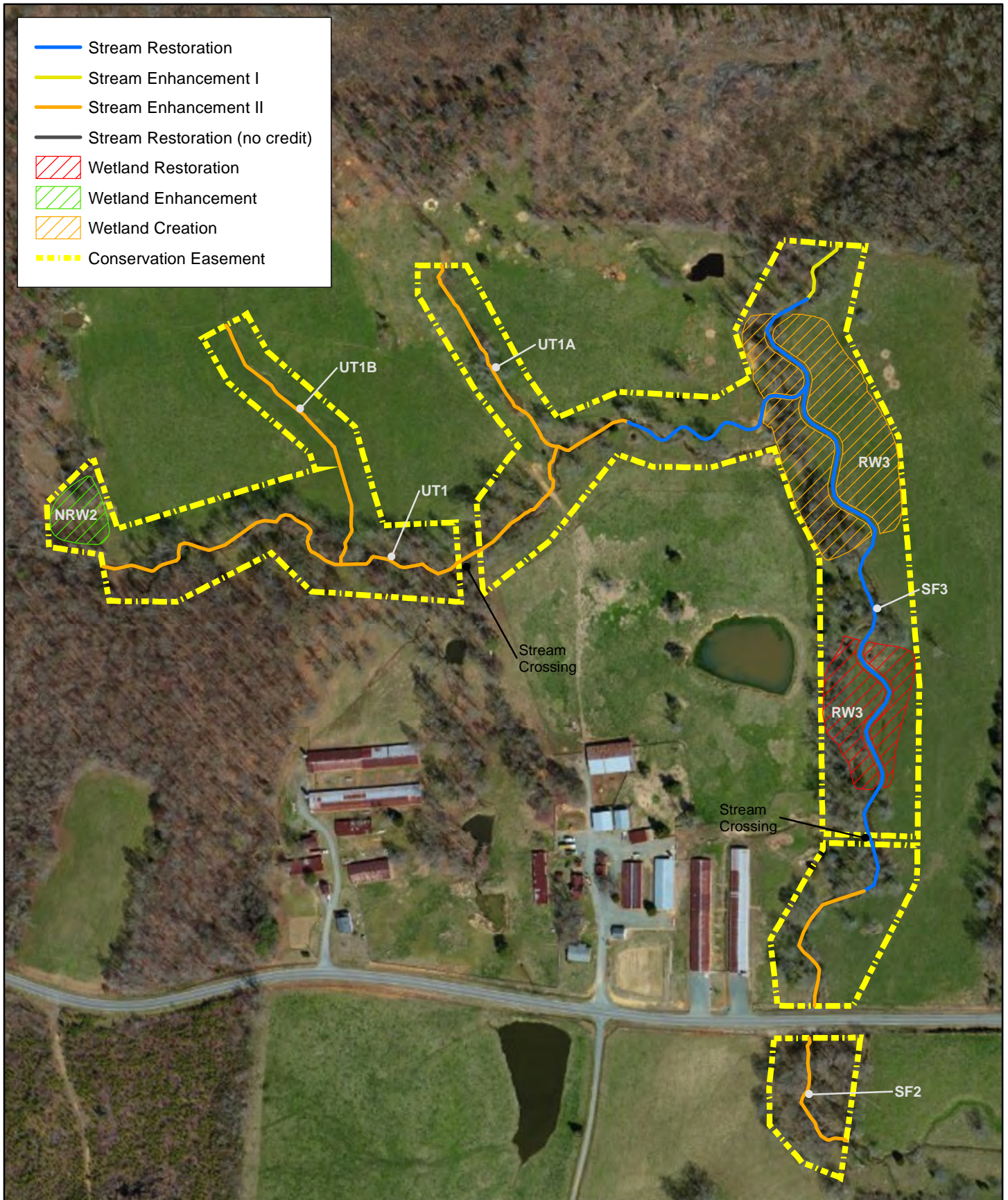
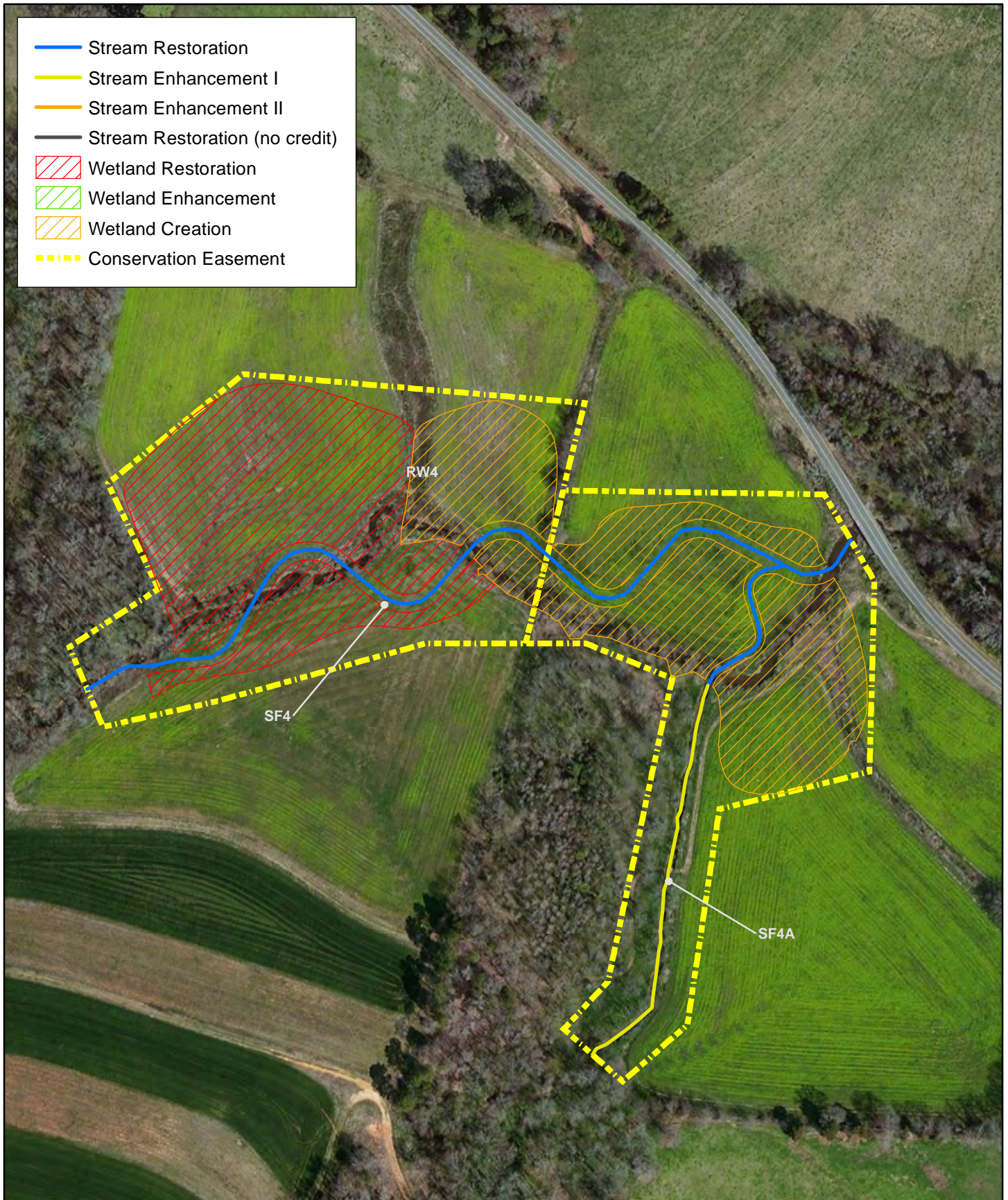


Figure 2b Project Component/Asset Map
 Underwood Mitigation Site - Harris Site
 NCEP Project No. 94641
 Monitoring Year 2



0 150 300 Feet





0 100 200 Feet



Figure 2c Project Component/Asset Map
Underwood Mitigation Site - Lindley Site
NCEEP Project No. 94641
Monitoring Year 2

Chatham County, NC

Table 1. Project Components and Mitigation Credits
 Underwood Mitigation Site (NCEP Project No.94641)
 Monitoring Year 2

Mitigation Credits									
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	6,765		8.0		1.1		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			
Streams									
SF1	100+00-108+74	773	Priority 1	Restoration	874	1:1			
SF2	300+00-303+02	302	N/A	Enhancement Level II	302	2.5:1			
SF3	400+00-421+20	532	N/A	Enhancement Level II	359	2.5:1			
		1,499	Priority 1	Restoration	1,586	1:1			
		152	N/A	Enhancement Level I	153	1.5:1			
SF4	800+00-814+29	1,450	Priority 1	Restoration	1,429	1:1			
SF4A	900+00-908+66	0	Priority 1	Restoration	257	1:1			
		609	N/A	Enhancement Level I	609	1.5:1			
UT1	500+00-520+38	1,463	N/A	Enhancement Level II	1,468	2.5:1			
		452	Priority 1	Restoration	515	1:1			
UT1A	700+00-705+11	524	N/A	Enhancement Level II	511	2.5:1			
UT1B	600+00-606+52	660	N/A	Enhancement Level II	652	2.5:1			
UT2	0+00-4+18	421	N/A	Enhancement Level I	418	1.5:1			
Wetlands									
RW1	N/A	1.25	N/A	Restoration	1.12	1:1			
RW2	N/A	0.45	N/A	Creation	0.30	3:1			
		0.50		Restoration	0.40	1:1			
RW3	N/A	2.63	N/A	Creation	2.53	3:1			
		1.33		Restoration	1.02	1:1			
RW4	N/A	3.95	N/A	Creation	3.63	3:1			
		3.65		Restoration	3.30	1:1			
NRW1	N/A	1.20	N/A	Restoration	0.75	1:1			
				Creation	0.45	3:1			
NRW2	N/A	0.34	N/A	Enhancement	0.34	2:1			
Component Summation									
Restoration Level	Stream (LF)	Riparian Wetland (Ac)		Non-Riparian Wetland (acres)	Buffer (sq. ft)	Upland (acres)			
		Riverine	Non-Riverine						
Restoration	4,661	5.84	-	0.75	-	-			
Enhancement				0.34	-	-			
Enhancement I	1,180								
Enhancement II	3,292								
Creation		6.46	-	0.45					
Preservation	-	-	-	-					
High Quality Preservation	-	-	-	-					

* Note that lengths do not match stationing because channel sections that do not generate credit have been removed from length calculations.

Table 2. Project Activity and Reporting History
Underwood Mitigation Site (NCEEP Project No.94641)
Monitoring Year 2

Activity or Report	Date Collection Complete	Completion or Scheduled Delivery
Mitigation Plan	September 2011	September 2011
Final Design - Construction Plans	July 2012	July 2012
Construction	November 2012	November 2012
Temporary S&E mix applied to entire project area ¹	November 2012	November 2012
Permanent seed mix applied to reach/segments	November 2012	November 2012
Bare root and live stake plantings for reach/segments	January 2013	January 2013
Baseline Monitoring Document (Year 0 Monitoring - baseline)	March 2013	March 2013
Year 1 Monitoring	September 2013	November 2013
Year 2 Monitoring	December 2014	December 2014
Year 3 Monitoring	2015	December 2015
Year 4 Monitoring	2016	December 2016
Year 5 Monitoring	2017	December 2017

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

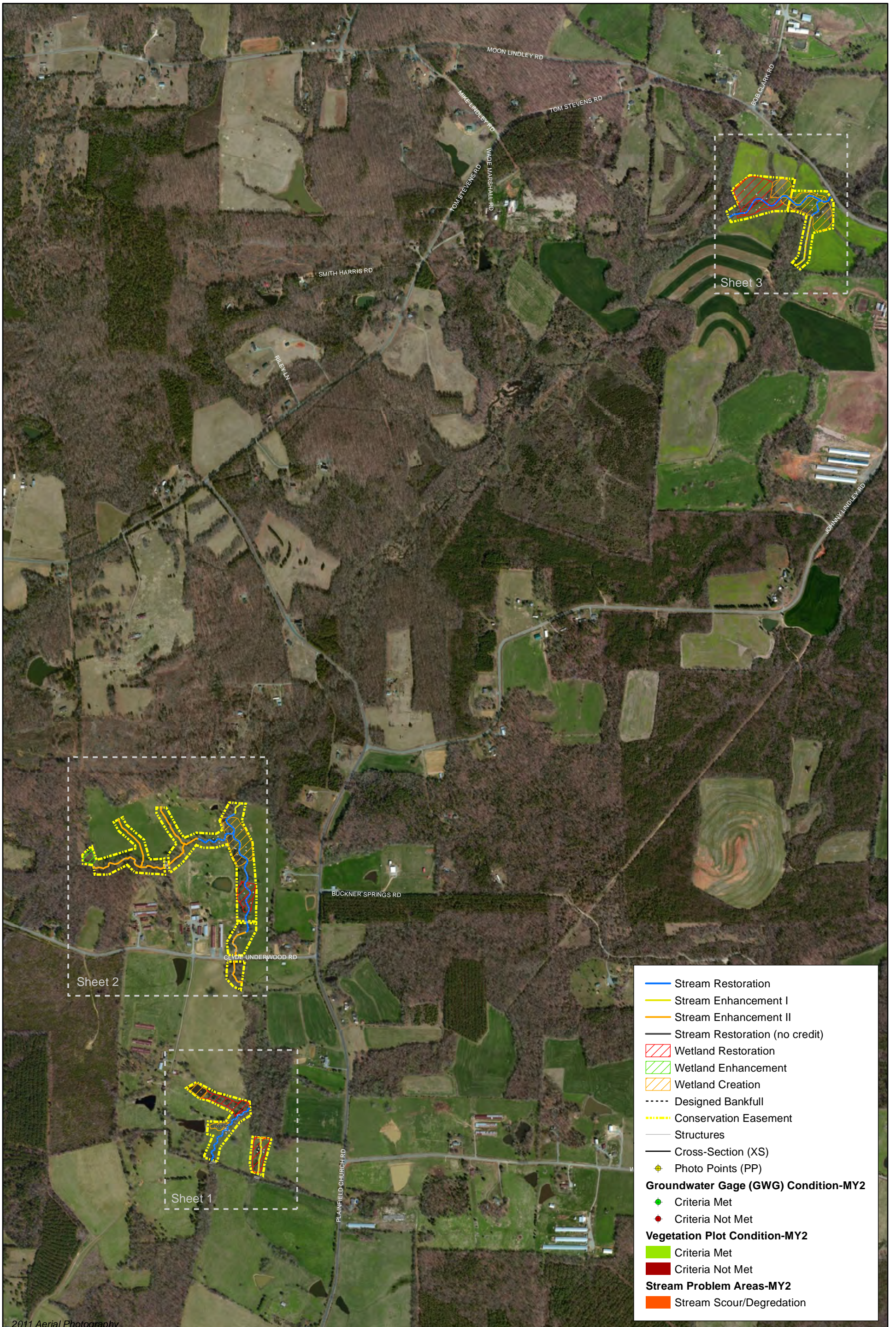
Table 3. Project Contact Table
Underwood Mitigation Site (NCEEP Project No.94641)
Monitoring Year 2

Designer	Wildlands Engineering, Inc.
Nicole Makaluso, PE	312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Construction Contractor	Land Mechanic Designs, Inc.
	126 Circle G Lane Willow Spring, NC 27592
Planting Contractor	Bruton Natural Systems, Inc
	P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	Land Mechanic Designs, Inc.
	126 Circle G Lane Willow Spring, NC 27592
Seed Mix Sources	Green Resource, LLC
Nursery Stock Suppliers	
Bare Roots	ArborGlen, Inc
Live Stakes	Foggy Mountain Nursery
Monitoring Performers	Wildlands Engineering, Inc.
Stream, Vegetation, and Wetland Monitoring POC	Kirsten Gimbert 704.332.7754, ext. 110

**Table 4. Project Baseline Information and Attributes
Underwood Mitigation Site (NCEEP Project No.94641)
Monitoring Year 2**

Project Information									
Project Name	Underwood Mitigation Site								
County	Chatham County								
Project Area (acres)	38 ac								
Project Coordinates (latitude and longitude)	35° 48' 05"N, 79° 24' 10"W (Harris Site), 35° 49' 51"N, 79° 22' 60"W (Lindley Site)								
Project Watershed Summary Information									
Physiographic Province	Carolina Slate Belt of the Piedmont Physiographic Province								
River Basin	Cape Fear								
USGS Hydrologic Unit 8-digit	03030002								
USGS Hydrologic Unit 14-digit	03030002050050								
DWQ Sub-basin	03-06-04								
Project Drainage Area (acres)	1,504 ac (Harris Site) and 3,362 ac (Lindley Site)								
Project Drainage Area Percentage of Impervious Area	<1%								
CGIA Land Use Classification	60% Forest Land, 39% managed herbaceous cover/agricultural, 1% unmanaged herbaceous/open water								
Reach Summary Information									
Parameters	SF1	SF2	SF3	UT1	UT1A	UT1B	UT2	SF4	SF4A
Length of reach (linear feet) - Post-Restoration	874	302	2,098	1,983	511	652	418	1,429	866
Drainage area (acres)	134	781	1,056	230	11	11	78	3,362	637
NCDWQ stream identification score	36.0/50.5/43.3			40.0	22.8	24.3	38.0	---	34.5
NCDWQ Water Quality Classification	WS-V, NSW	WS-V, NSW	WS-V, NSW	C	C	C	C	WS-V, NSW	C
Morphological Description (stream type)	P	P	P	P	I	I	P	P	P
Evolutionary trend (Simon's Model) - Pre-Restoration	IV	IV	IV	IV	IV	IV	IV	IV	IV
Underlying mapped soils	Nanford-Baden Complex						Georgeville Silt Loam	Chewacla and Wehadkee	
Drainage class	---	---	---	---	---	---	---	---	---
Soil Hydric status	---	---	---	---	---	---	---	---	---
Slope	---	---	---	---	---	---	---	---	---
FEMA classification	---	---	---	---	---	---	---	AE	---
Native vegetation community	Piedmont bottomland forest								
Percent composition of exotic invasive vegetation - Post-Restoration	0%								
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. 3689						
Waters of the United States - Section 401		X							
Division of Land Quality (Dam Safety)	N/A	N/A	N/A						
Endangered Species Act	X	X	Underwood Mitigation Plan; no critical habitat for listed species exists within the project area (USFWS correspondence letter)						
Historic Preservation Act	X	X	No historic resources were found to be impacted (letter from SHPO)						
Coastal Zone Management Act (CZMA) / Area Management Act (CAMA)	N/A	N/A	N/A						
FEMA Floodplain Compliance	X	X	Approved CLOMR						
Essential Fisheries Habitat	N/A	N/A	N/A						

APPENDIX 2. Visual Assessment Data



- Stream Restoration
- Stream Enhancement I
- Stream Enhancement II
- Stream Restoration (no credit)
- Wetland Restoration
- Wetland Enhancement
- Wetland Creation
- Designed Bankfull
- Conservation Easement
- Structures
- Cross-Section (XS)
- ◆ Photo Points (PP)
- Groundwater Gage (GWG) Condition-MY2**
- ◆ Criteria Met
- ◆ Criteria Not Met
- Vegetation Plot Condition-MY2**
- Criteria Met
- Criteria Not Met
- Stream Problem Areas-MY2**
- Stream Scour/Degradation

2011 Aerial Photography

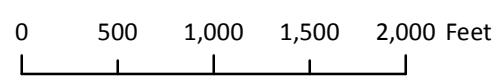
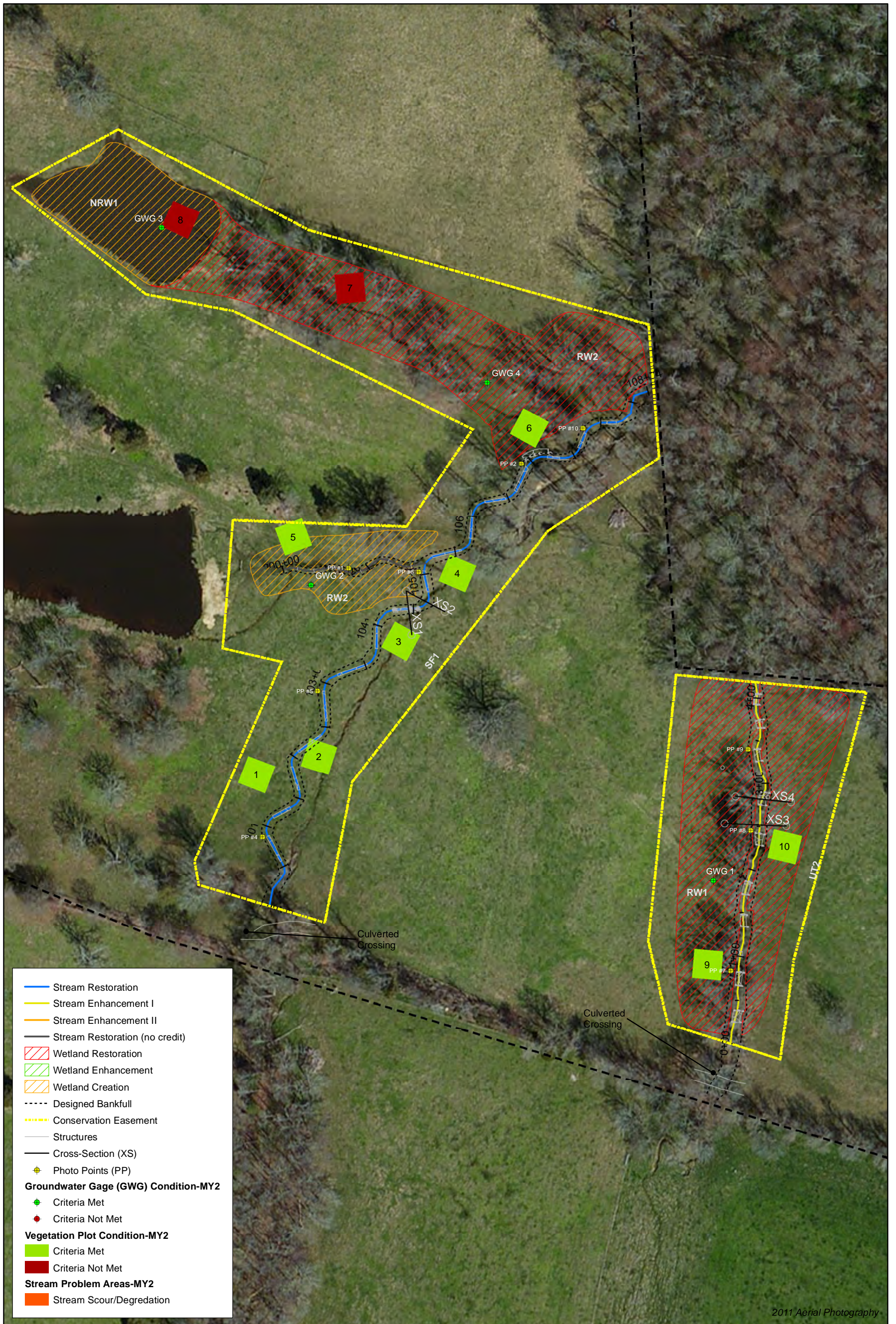
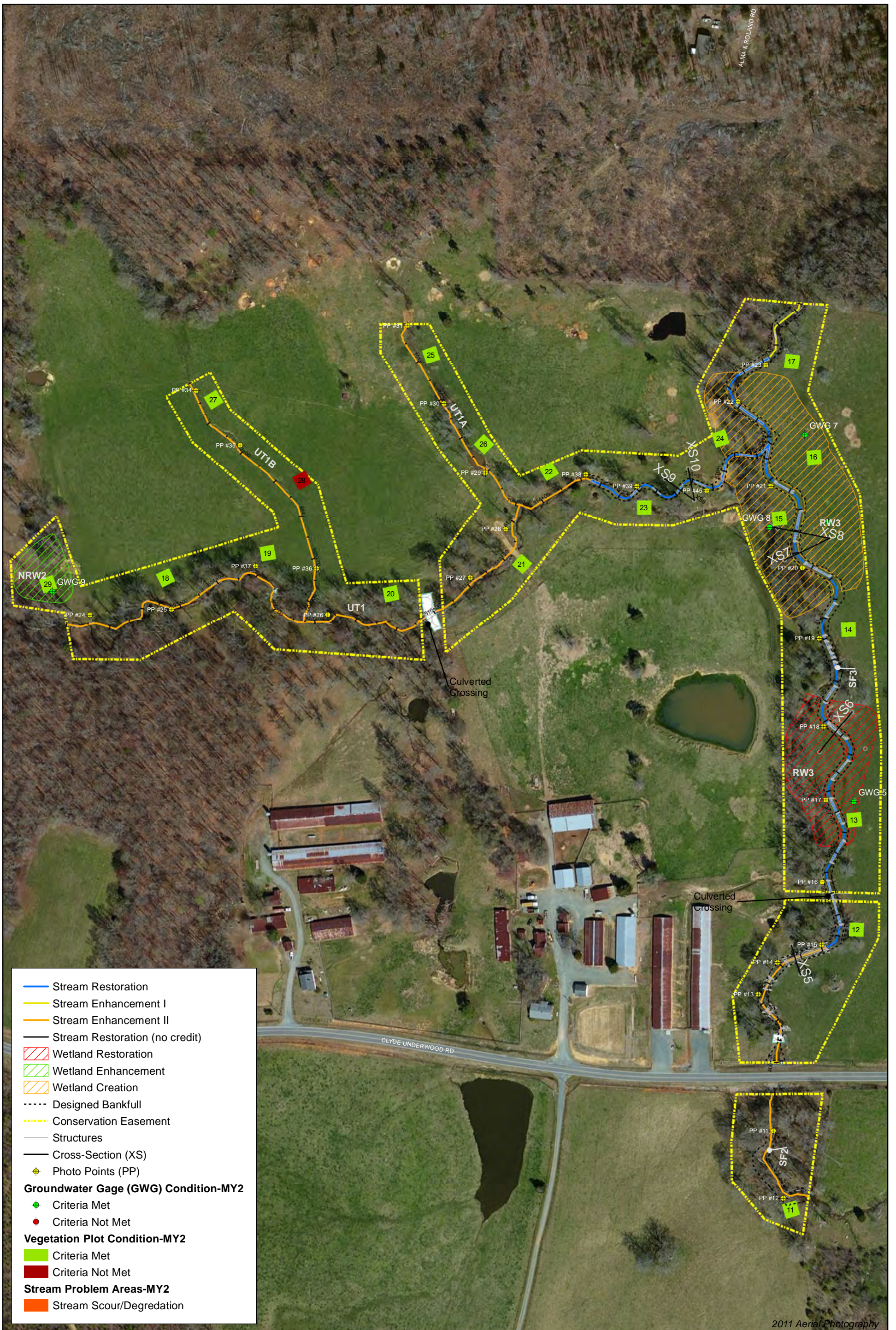


Figure 3.0 Integrated Current Condition Plan View (Key)
 Underwood Mitigation Site
 NCEP Project No. 94641
 Monitoring Year 2
 Chatham County, NC



2011 Aerial Photography



	Stream Restoration
	Stream Enhancement I
	Stream Enhancement II
	Stream Restoration (no credit)
	Wetland Restoration
	Wetland Enhancement
	Wetland Creation
	Designed Bankfull
	Conservation Easement
	Structures
	Cross-Section (XS)
	Photo Points (PP)
Groundwater Gage (GWG) Condition-MY2	
	Criteria Met
	Criteria Not Met
Vegetation Plot Condition-MY2	
	Criteria Met
	Criteria Not Met
Stream Problem Areas-MY2	
	Stream Scour/Degradation

2011 Aerial Photography

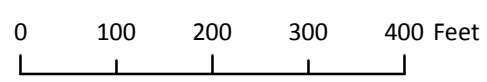
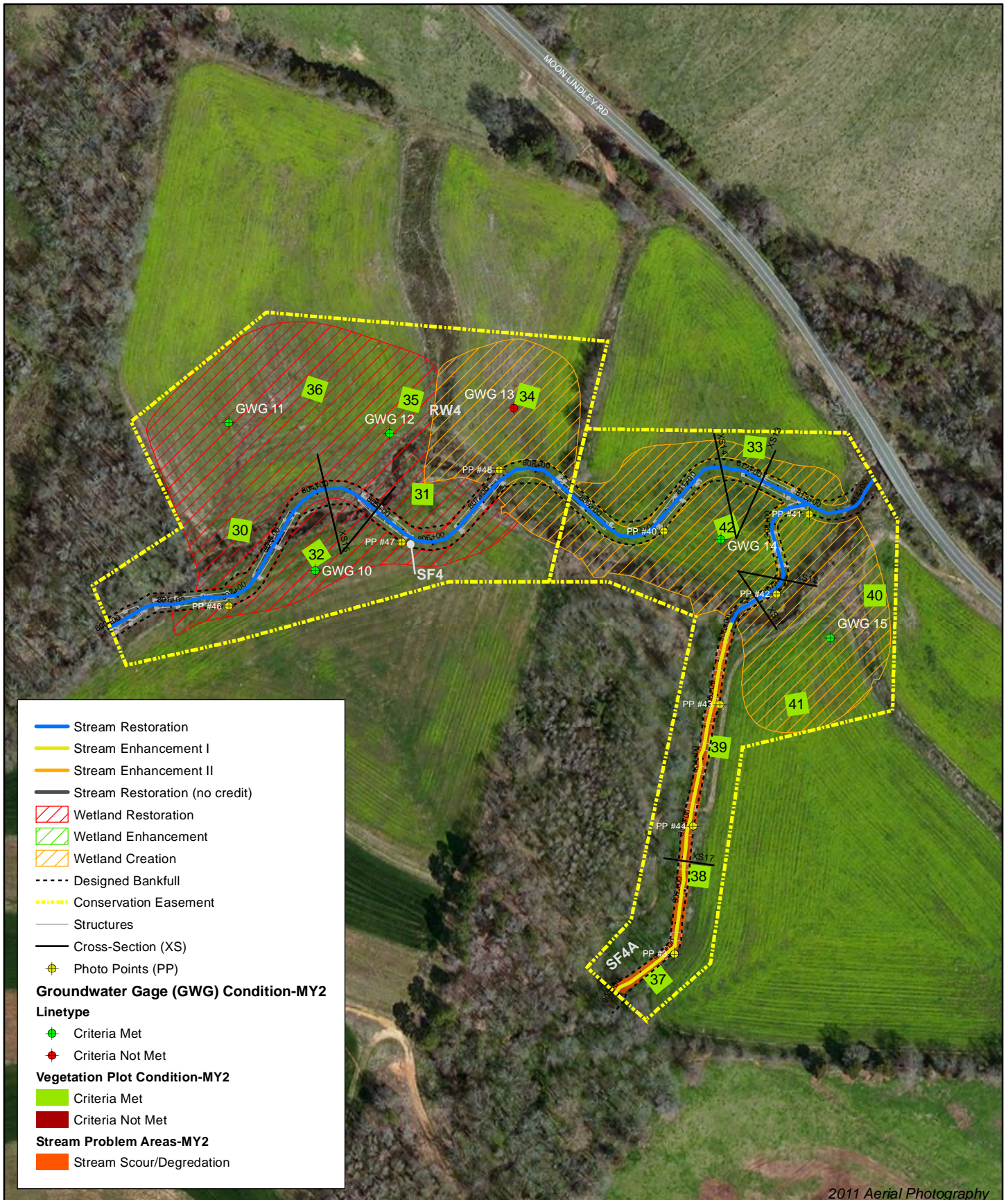


Figure 3.2 Integrated Current Condition Plan View
 (Sheet 2 of 3)
 Underwood Mitigation Site - Harris Site
 NCEEP Project No. 94641
 Monitoring Year 2
 Chatham County, NC



2011 Aerial Photography

Figure 3.3 Integrated Current Condition Plan View (Sheet 3 of 3)
 Underwood Mitigation Site - Harris Site
 NCEP Project No. 94641
 Monitoring Year 2

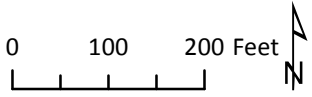


Table 5a. Visual Stream Morphology Stability Assessment Table
Underwood Mitigation Site (NCEP Project No. 94641)
Harris Site; SF1 (874 LF)
Monitoring Year 2

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					100%			
		Degradation					100%			
	2. Riffle Condition	Texture/Substrate	15	15		100%				
		3. Meander Pool Condition	Depth Sufficient	15		15	100%			
	Lenth Appropriate		15	15		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	15	15		100%				
Thalweg centering at downstream of meander bend (Glide)		15	15	100%						
Totals						0	0	100%	n/a	n/a
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion					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					100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse					100%	n/a	n/a	n/a
Totals					0	0	100%	n/a	n/a	n/a
3. Engineered Structures¹	1. Overall Integrity	Structures physically intact with no dilodged boulders or logs.	10	10			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	10	10			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	10	10			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	10	10			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	10	10			100%			

¹Excludes constructed riffles since they are evaluated in section 1.

Table 5b. Visual Stream Morphology Stability Assessment Table
Underwood Mitigation Site (NCEEP Project No. 94641)
Harris Site; UT2 (418 LF)
Monitoring Year 2

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%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	10	10			100%			
	3. Meander Pool Condition	Depth Sufficient	10	10			100%			
		Lenth Appropriate	10	10			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	10	10			100%			
		Thalweg centering at downstream of meander bend (Glide)	10	10			100%			
Totals					0	0	100%	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	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			

¹Excludes constructed riffles since they are evaluated in section 1.

Table 5c. Visual Stream Morphology Stability Assessment Table

Underwood Mitigation Site (NCEP Project No. 94641)

Harris Site; SF2 (302 LF)

Monitoring Year 2

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						
Totals					0	0	100%	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 5d. Visual Stream Morphology Stability Assessment Table

Underwood Mitigation Site (NCEEP Project No. 94641)

Harris Site; SF3 (2,120 LF)

Monitoring Year 2

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. Bed¹	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	19	19			100%			
	3. Meander Pool Condition	Depth Sufficient	19	19			100%			
		Lenth Appropriate	19	19			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	19	19			100%			
Thalweg centering at downstream of meander bend (Glide)		19	19	100%						
Totals							0	0	100%	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 Structures²	1. Overall Integrity	Structures physically intact with no dilodged boulders or logs.	7	7			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	7	7			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	7	7			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	7	7			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	7	7			100%			

¹Number of riffles and pools are determined based on the as-built survey along Restoration and Enhancement Level I reaches.

²Excludes constructed riffles since they are evaluated in section 1.

Table 5e. Visual Stream Morphology Stability Assessment Table

Underwood Mitigation Site (NCEP Project No. 94641)

Harris Site; UT1 (2,038 LF)

Monitoring Year 2

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. Bed¹	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	7	7			100%			
	3. Meander Pool Condition	Depth Sufficient	7	7			100%			
		Lenth Appropriate	7	7			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	7	7			100%			
Thalweg centering at downstream of meander bend (Glide)		7	7	100%						
Totals					0	0	100%	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 Structures²	1. Overall Integrity	Structures physically intact with no dilodged boulders or logs.	15	15			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	15	15			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	15	15			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	15	15			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	15	15			100%			

¹Number of riffles and pools are determined based on the as-built survey along Restoration and Enhancement Level I reaches.

²Excludes constructed riffles since they are evaluated in section 1.

Table 5f. Visual Stream Morphology Stability Assessment Table
Underwood Mitigation Site (NCEEP Project No. 94641)
Harris Site; UT1A & UT1B (1,163 LF)
Monitoring Year 2

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%			
		Degradation			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						
Totals					0	0	100%	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 5g. Visual Stream Morphology Stability Assessment Table

Underwood Mitigation Site (NCEEP Project No. 94641)

Lindley Site; SF4 (1,429 LF)

Monitoring Year 2

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	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	8	8			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%						
Totals							0	0	100%	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 ²	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	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			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.	2	2			100%			

¹Number of riffles and pools are determined based on the as-built survey along Restoration and Enhancement Level I reaches.

²Excludes constructed riffles since they are evaluated in section 1.

Table 5h. Visual Stream Morphology Stability Assessment Table

Underwood Mitigation Site (NCEP Project No. 94641)

Lindley Site; SF4A (866 LF)

Monitoring Year 2

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	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			1	533	63%			
	2. Riffle Condition	Texture/Substrate	8	10		80%				
	3. Meander Pool Condition	Depth Sufficient	7	9		78%				
		Lenth Appropriate	7	9		78%				
	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%						
Totals										
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	533	38%	1	533	57%
	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										
3. Engineered Structures ²	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	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			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.	2	2			100%			

¹Number of riffles and pools are determined based on the as-built survey along Restoration and Enhancement Level I reaches. Approximately 533 LF of the stream bed has downcut along SF4A and riffles and pools shifted have shifted downstream. Although these conditions were not intended in the design, the stream has maintained a stable bedform with riffles and pools at a lower elevation.

²Excludes constructed riffles since they are evaluated in section 1.

**Table 6. Vegetation Condition Assessment Table
Undewood Mitigation Site (EEP Project No. 94641)
Monitoring Year 2**

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	0.0%
Cumulative Total			0	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).	1000	0	0	0.0%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	0	0	0.0%

Stream Photographs
(Harris Site)



Photo Point 1 – looking upstream (05/18/2014)



Photo Point 1 – looking downstream (05/18/2014)



Photo Point 2 – looking upstream (05/18/2014)



Photo Point 2 – looking downstream (05/18/2014)



Photo Point 3 – looking upstream (05/18/2014)



Photo Point 3 – looking downstream (05/18/2014)



Photo Point 4 – looking upstream (05/18/2014)



Photo Point 4 – looking downstream (05/18/2014)



Photo Point 5 – looking upstream (05/18/2014)



Photo Point 5 – looking downstream (05/18/2014)



Photo Point 6 – looking upstream (05/18/2014)



Photo Point 6 – looking downstream (05/18/2014)



Photo Point 7 – looking upstream (05/18/2014)



Photo Point 7 – looking downstream (05/18/2014)



Photo Point 8 – looking upstream (05/18/2014)



Photo Point 8 – looking downstream (05/18/2014)



Photo Point 9 – looking upstream (05/18/2014)



Photo Point 9 – looking downstream (05/18/2014)



Photo Point 10 – looking upstream (05/19/2014)



Photo Point 10 – looking downstream (05/19/2014)



Photo Point 11 – looking upstream (05/19/2014)



Photo Point 11 – looking downstream (05/19/2014)



Photo Point 12 – looking upstream (05/19/2014)



Photo Point 12 – looking downstream (05/19/2014)



Photo Point 13 – looking upstream (05/18/2014)



Photo Point 13 – looking downstream (05/18/2014)



Photo Point 14 – looking upstream (05/18/2014)



Photo Point 14 – looking downstream (05/18/2014)



Photo Point 15 – looking upstream (05/18/2014)



Photo Point 15 – looking downstream (05/18/2014)



Photo Point 16 – looking upstream (05/18/2014)



Photo Point 16 – looking downstream (05/18/2014)



Photo Point 17 – looking upstream (05/18/2014)



Photo Point 17 – looking downstream (05/18/2014)



Photo Point 18 – looking upstream (05/18/2014)



Photo Point 18 – looking downstream (05/18/2014)



Photo Point 19 – looking upstream (05/18/2014)



Photo Point 19 – looking downstream (05/18/2014)



Photo Point 20 – looking upstream (05/18/2014)



Photo Point 20 – looking downstream (05/18/2014)



Photo Point 21 – looking upstream (05/18/2014)



Photo Point 21 – looking downstream (05/18/2014)



Photo Point 22 – looking upstream (05/18/2014)



Photo Point 22 – looking downstream (05/18/2014)



Photo Point 23 – looking upstream (05/18/2014)



Photo Point 23 – looking downstream (05/18/2014)



Photo Point 24 – looking upstream (05/18/2014)



Photo Point 24 – looking downstream (05/18/2014)



Photo Point 25 – looking upstream (05/18/2014)



Photo Point 25 – looking downstream (05/18/2014)



Photo Point 26 – looking upstream (05/18/2014)



Photo Point 26 – looking downstream (05/18/2014)



Photo Point 27 – looking upstream (05/18/2014)



Photo Point 27 – looking downstream (05/18/2014)



Photo Point 28 – looking upstream (05/18/2014)



Photo Point 28 – looking downstream (05/18/2014)



Photo Point 29 – looking upstream (05/18/2014)



Photo Point 29 – looking downstream (05/18/2014)



Photo Point 30 – looking upstream (05/18/2014)



Photo Point 30 – looking downstream (05/18/2014)



Photo Point 31 – looking upstream (05/18/2014)



Photo Point 31 – looking downstream (05/18/2014)



Photo Point 34 – looking upstream (05/18/2014)



Photo Point 34 – looking downstream (05/18/2014)



Photo Point 35 – looking upstream (05/18/2014)



Photo Point 35 – looking downstream (05/18/2014)



Photo Point 36 – looking upstream (05/18/2014)



Photo Point 36 – looking downstream (05/18/2014)



Photo Point 37 – looking upstream (05/18/2014)



Photo Point 37 – looking downstream (05/18/2014)



Photo Point 38 – looking upstream (05/18/2014)



Photo Point 38 – looking downstream (05/18/2014)



Photo Point 39 – looking upstream (05/18/2014)



Photo Point 39 – looking downstream (05/18/2014)

Stream Photographs
(Lindley Site)



Photo Point 40 – looking upstream (05/19/2014)



Photo Point 40 – looking downstream (05/19/2014)



Photo Point 41 – looking upstream (05/19/2014)



Photo Point 41 – looking downstream (05/19/2014)



Photo Point 42 – looking upstream (05/19/2014)



Photo Point 42 – looking downstream (05/19/2014)



Photo Point 43 – looking upstream (05/19/2014)



Photo Point 43 – looking downstream (05/19/2014)



Photo Point 44 – looking upstream (05/19/2014)



Photo Point 44 – looking downstream (05/19/2014)



Photo Point 45 – looking upstream (05/19/2014)



Photo Point 45 – looking downstream (05/19/2014)



Photo Point 46 – looking upstream (05/19/2014)



Photo Point 46 – looking downstream (05/19/2014)



Photo Point 47 – looking upstream (05/19/2014)



Photo Point 47 – looking downstream (05/19/2014)



Photo Point 48 – looking upstream (05/19/2014)

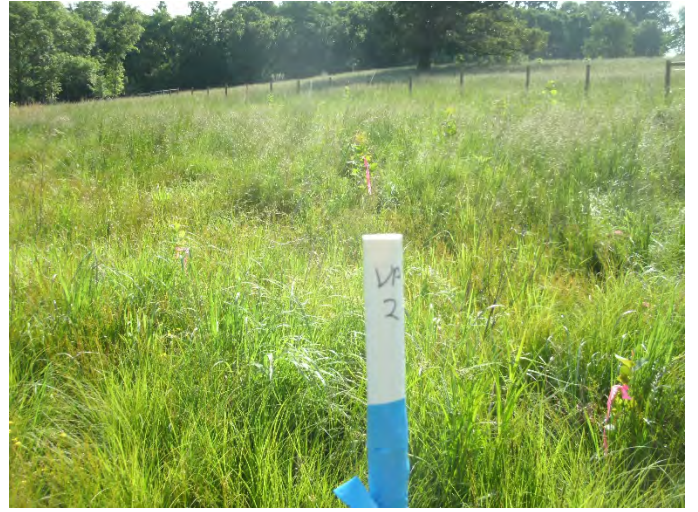


Photo Point 48 – looking downstream (05/19/2014)

Vegetation Photographs
(Harris Site)



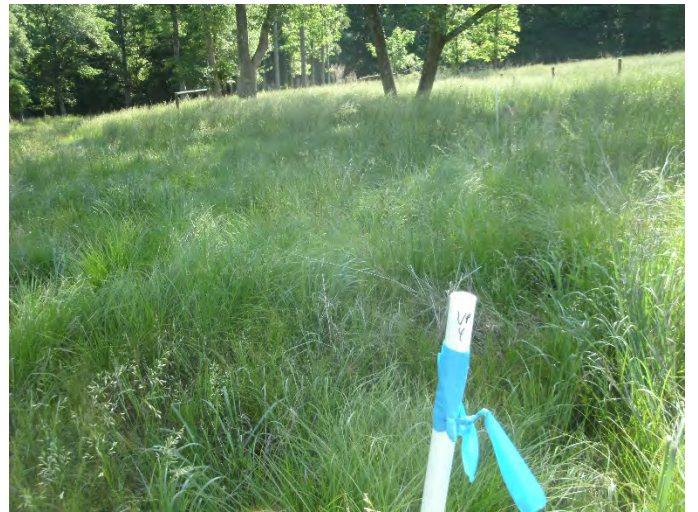
Vegetation Plot 1 (05/21/2014)



Vegetation Plot 2 (05/21/2014)



Vegetation Plot 3 (05/21/2014)



Vegetation Plot 4 (05/21/2014)



Vegetation Plot 5 (05/21/2014)



Vegetation Plot 6 (05/21/2014)



Vegetation Plot 7 (05/21/2014)



Vegetation Plot 8 (05/21/2014)



Vegetation Plot 9 (05/21/2014)



Vegetation Plot 10 (05/21/2014)



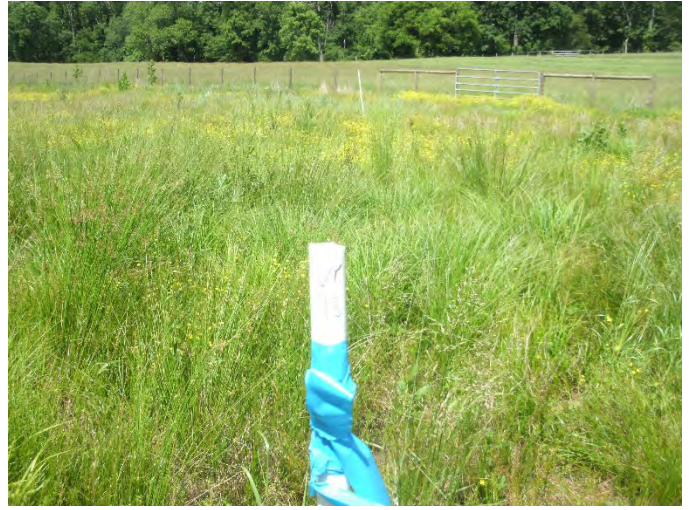
Vegetation Plot 11 (05/21/2014)



Vegetation Plot 12 (05/21/2014)



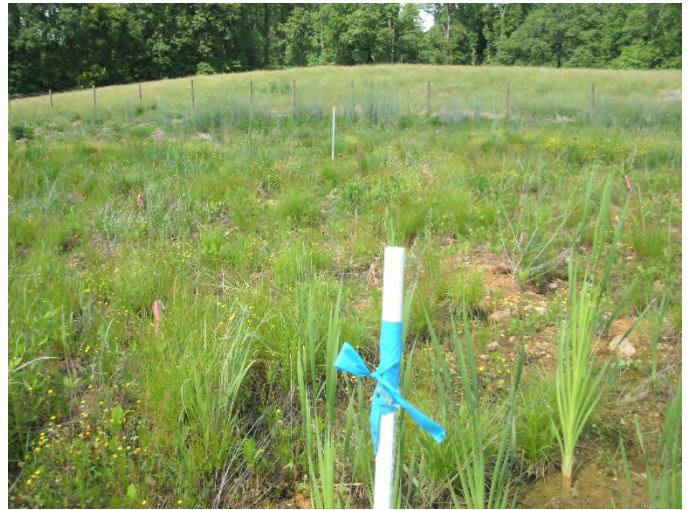
Vegetation Plot 13 (05/21/2014)



Vegetation Plot 14 (05/21/2014)



Vegetation Plot 15 (05/20/2014)



Vegetation Plot 16 (05/20/2014)



Vegetation Plot 17 (05/20/2014)



Vegetation Plot 18 (05/20/2014)



Vegetation Plot 19 (05/20/2014)



Vegetation Plot 20 (05/20/2014)



Vegetation Plot 21 (05/20/2014)



Vegetation Plot 22 (05/20/2014)



Vegetation Plot 23 (05/20/2014)



Vegetation Plot 24 (05/20/2014)



Vegetation Plot 25 (05/20/2014)



Vegetation Plot 26 (05/20/2014)



Vegetation Plot 27 (05/20/2014)



Vegetation Plot 28 (05/20/2014)



Vegetation Plot 29 (05/20/2014)

Vegetation Photographs
(Lindley Site)



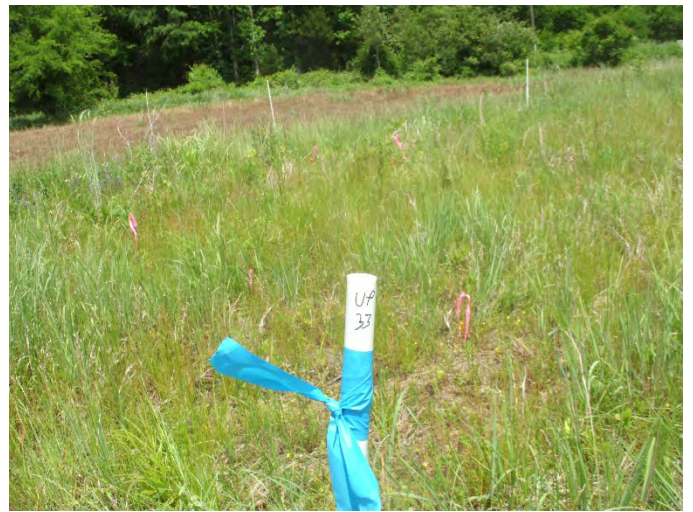
Vegetation Plot 30 (05/20/2014)



Vegetation Plot 31 (05/20/2014)



Vegetation Plot 32 (05/20/2014)



Vegetation Plot 33 (05/21/2014)



Vegetation Plot 34 (05/20/2014)



Vegetation Plot 35 (05/20/2014)



Vegetation Plot 36 (05/20/2014)



Vegetation Plot 37 (05/20/2014)



Vegetation Plot 38 (05/20/2014)



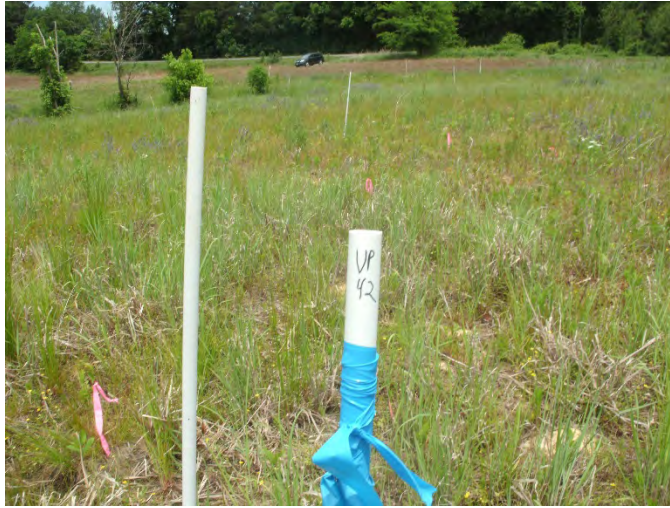
Vegetation Plot 39 (05/20/2014)



Vegetation Plot 40 (05/20/2014)



Vegetation Plot 41 (05/20/2014)



Vegetation Plot 42 (05/21/2014)

APPENDIX 3. Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment
Underwood Mitigation Site (NCEEP Project No. 94641)
Monitoring Year 2

Harris Site		
Plot	MY2 Success Criteria Met (Y/N)	Tract Mean
1	Y	79%
2	Y	
3	Y	
4	Y	
5	Y	
6	Y	
7	N	
8	N	
9	Y	
10	N	
11	Y	
12	N	
13	Y	
14	Y	
15	Y	
16	N	
17	Y	
18	Y	
19	Y	
20	Y	
21	Y	
22	Y	
23	Y	
24	Y	
25	Y	
26	Y	
27	Y	
28	N	
29	Y	

Lindley Site		
Plot	MY2 Success Criteria Met (Y/N)	Tract Mean
30	Y	92%
31	Y	
32	Y	
33	Y	
34	Y	
35	Y	
36	Y	
37	Y	
38	Y	
39	Y	
40	N	
41	Y	
42	Y	

Table 8. CVS Vegetation Tables - Metadata

Underwood Mitigation Site (NCEEP Project No. 94641)

Monitoring Year 2

Database name	Underwood MY2 cvs-eep-entrytool-v2.3.1.mdb
Database location	C:\Users\CMcKenzie\Desktop
Computer name	GUEST1
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	94641
project Name	Underwood Mitigation Site
Description	Stream and Wetland
Sampled Plots	42

Table 9. Planted and Total Stem Counts
 Underwood Mitigation Site (NCEEP Project Code 94641)
 Monitoring Year 2

Scientific Name	Common Name	Species Type	Current Plot Data (MY2 - 5/2014)														
			94641-WEI-0001			94641-WEI-0002			94641-WEI-0003			94641-WEI-0004			94641-WEI-0005		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	red maple	Tree															
<i>Betula nigra</i>	river birch	Tree	2	2	2	2	2	2	2	2	2				2	2	2
<i>Cornus amomum</i>	silky dogwood	Shrub															
<i>Fraxinus pennsylvanica</i>	green ash	Tree	2	2	2	2	2	2	1	1	2	4	4	4	3	3	3
<i>Juglans nigra</i>	black walnut	Tree															
<i>Liquidambar styraciflua</i>	sweetgum	Tree															
<i>Liriodendron tulipifera</i>	tuliptree	Tree	1	1	1	1	1	1	2	2	2						
<i>Platanus occidentalis</i>	American sycamore	Tree	5	5	5	5	5	5	3	3	3	4	4	4	7	7	7
<i>Quercus michauxii</i>	swamp chestnut oak	Tree	4	4	4				6	6	6	4	4	4			
<i>Quercus pagoda</i>	cherrybark oak	Tree	4	4	4	2	2	2	1	1	1	1	1	1			
<i>Quercus phellos</i>	willow oak	Tree	2	2	2	6	6	6							3	3	3
<i>Salix sericea</i>	silky willow	Shrub															
Stem count			20	20	20	18	18	18	15	15	16	13	13	13	15	15	15
size (ares)			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02		
Species count			7	7	7	6	6	6	6	6	6	4	4	4	4	4	4
Stems per ACRE			809	809	809	728	728	728	607	607	647	526	526	526	607	607	607

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%
- Volunteer species included in total

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
 Underwood Mitigation Site (NCEEP Project Code 94641)
 Monitoring Year 2

Scientific Name	Common Name	Species Type	Current Plot Data (MY2 - 5/2014)														
			94641-WEI-0006			94641-WEI-0007			94641-WEI-0008			94641-WEI-0009			94641-WEI-0010		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	red maple	Tree															
<i>Betula nigra</i>	river birch	Tree	1	1	1	2	2	2	1	1	1	2	2	2	1	1	1
<i>Cornus amomum</i>	silky dogwood	Shrub														1	1
<i>Fraxinus pennsylvanica</i>	green ash	Tree				1	1	2							3	3	3
<i>Juglans nigra</i>	black walnut	Tree															
<i>Liquidambar styraciflua</i>	sweetgum	Tree			5									2			
<i>Liriodendron tulipifera</i>	tuliptree	Tree															
<i>Platanus occidentalis</i>	American sycamore	Tree	5	5	5	2	2	2	1	1	1	1	1	1			
<i>Quercus michauxii</i>	swamp chestnut oak	Tree													1	1	1
<i>Quercus pagoda</i>	cherrybark oak	Tree	3	3	3							1	1	1			
<i>Quercus phellos</i>	willow oak	Tree	2	2	2							7	7	7			
<i>Salix sericea</i>	silky willow	Shrub										2	2			5	5
Stem count			11	11	16	5	5	6	2	2	2	11	13	15	5	11	11
size (ares)			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02		
Species count			4	4	5	3	3	3	2	2	2	4	5	6	3	5	5
Stems per ACRE			445	445	647	202	202	243	80.9	80.9	80.9	445	526	607	202	445	445

Color Coding for Table

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T: Total Stems

Table 9. Planted and Total Stem Counts
 Underwood Mitigation Site (NCEEP Project Code 94641)
 Monitoring Year 2

Scientific Name	Common Name	Species Type	Current Plot Data (MY2 - 5/2014)														
			94641-WEI-0011			94641-WEI-0012			94641-WEI-0013			94641-WEI-0014			94641-WEI-0015		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	red maple	Tree															
<i>Betula nigra</i>	river birch	Tree	1	1	1	2	2	2				1	1	1	6	6	6
<i>Cornus amomum</i>	silky dogwood	Shrub															
<i>Fraxinus pennsylvanica</i>	green ash	Tree	3	3	3			20			20	1	1	21	3	3	23
<i>Juglans nigra</i>	black walnut	Tree									1						
<i>Liquidambar styraciflua</i>	sweetgum	Tree						5						2			
<i>Liriodendron tulipifera</i>	tuliptree	Tree															
<i>Platanus occidentalis</i>	American sycamore	Tree	4	4	4	3	3	3	17	17	22	5	5	5	4	4	4
<i>Quercus michauxii</i>	swamp chestnut oak	Tree	4	4	4							2	2	2			
<i>Quercus pagoda</i>	cherrybark oak	Tree	1	1	1							2	2	2	1	1	1
<i>Quercus phellos</i>	willow oak	Tree	2	2	2	1	1	1				4	4	4	1	1	1
<i>Salix sericea</i>	silky willow	Shrub									1					1	1
Stem count			15	15	15	6	6	31	17	17	44	15	15	37	15	16	36
size (ares)			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02		
Species count			6	6	6	3	3	5	1	1	4	6	6	7	5	6	6
Stems per ACRE			607	607	607	243	243	1255	688	688	1781	607	607	1497	607	647	1457

Color Coding for Table

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- Exceeds requirements, but by less than 10%
- Fails to meet requirements, by less than 10%
- Fails to meet requirements by more than 10%
- Volunteer species included in total

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
 Underwood Mitigation Site (NCEEP Project Code 94641)
 Monitoring Year 2

Scientific Name	Common Name	Species Type	Current Plot Data (MY2 - 5/2014)														
			94641-WEI-0016			94641-WEI-0017			94641-WEI-0018			94641-WEI-0019			94641-WEI-0020		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	red maple	Tree															
<i>Betula nigra</i>	river birch	Tree	3	3	3												
<i>Cornus amomum</i>	silky dogwood	Shrub		4	4												
<i>Fraxinus pennsylvanica</i>	green ash	Tree			20			20	3	3	7	1	1	1			
<i>Juglans nigra</i>	black walnut	Tree															
<i>Liquidambar styraciflua</i>	sweetgum	Tree			5			20								5	
<i>Liriodendron tulipifera</i>	tuliptree	Tree			1	4	4	4	1	1	1	2	2	2	1	1	1
<i>Platanus occidentalis</i>	American sycamore	Tree	2	2	2	1	1	1	2	2	2	7	7	7	3	3	3
<i>Quercus michauxii</i>	swamp chestnut oak	Tree	1	1	1				3	3	3	2	2	2	5	5	5
<i>Quercus pagoda</i>	cherrybark oak	Tree				3	3	3							3	3	3
<i>Quercus phellos</i>	willow oak	Tree	1	1	1	6	6	6	1	1	1	1	1	1			
<i>Salix sericea</i>	silky willow	Shrub		4	4												
Stem count			7	15	41	14	14	54	10	10	18	13	13	13	12	12	17
size (ares)			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02		
Species count			4	6	9	4	4	6	5	5	6	5	5	5	4	4	5
Stems per ACRE			283	607	1659	567	567	2185	405	405	728	526	526	526	486	486	688

Color Coding for Table

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- Fails to meet requirements by more than 10%
- Volunteer species included in total

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
 Underwood Mitigation Site (NCEEP Project Code 94641)
 Monitoring Year 2

Scientific Name	Common Name	Species Type	Current Plot Data (MY2 - 5/2014)														
			94641-WEI-0021			94641-WEI-0022			94641-WEI-0023			94641-WEI-0024			94641-WEI-0025		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	red maple	Tree															
<i>Betula nigra</i>	river birch	Tree	1	1	1				1	1	1	1	1	1			
<i>Cornus amomum</i>	silky dogwood	Shrub															
<i>Fraxinus pennsylvanica</i>	green ash	Tree	1	1	1	1	1	1	1	1	1	1	1	21			
<i>Juglans nigra</i>	black walnut	Tree															
<i>Liquidambar styraciflua</i>	sweetgum	Tree			20												
<i>Liriodendron tulipifera</i>	tuliptree	Tree				1	1	1									
<i>Platanus occidentalis</i>	American sycamore	Tree	2	2	2	2	2	2	1	1	1	6	6	6	6	6	6
<i>Quercus michauxii</i>	swamp chestnut oak	Tree	2	2	2	8	8	8	2	2	2				1	1	1
<i>Quercus pagoda</i>	cherrybark oak	Tree	2	2	2	2	2	2	3	3	3				2	2	2
<i>Quercus phellos</i>	willow oak	Tree	1	1	1	3	3	3				3	3	3	4	4	4
<i>Salix sericea</i>	silky willow	Shrub										2	18				
Stem count			9	9	29	17	17	17	8	8	8	11	13	49	13	13	13
size (ares)			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02		
Species count			6	6	7	6	6	6	5	5	5	4	5	5	4	4	4
Stems per ACRE			364	364	1174	688	688	688	324	324	324	445	526	1983	526	526	526

Color Coding for Table

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- Fails to meet requirements by more than 10%
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PnoLS: Number of Planted stems excluding live stakes

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T: Total Stems

Table 9. Planted and Total Stem Counts
 Underwood Mitigation Site (NCEEP Project Code 94641)
 Monitoring Year 2

Scientific Name	Common Name	Species Type	Current Plot Data (MY2 - 5/2014)														
			94641-WEI-0026			94641-WEI-0027			94641-WEI-0028			94641-WEI-0029			94641-WEI-0030		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	red maple	Tree														5	
<i>Betula nigra</i>	river birch	Tree	1	1	1							7	7	7	1	1	1
<i>Cornus amomum</i>	silky dogwood	Shrub															
<i>Fraxinus pennsylvanica</i>	green ash	Tree	4	4	4	2	2	2	3	3	3	1	1	1	9	9	14
<i>Juglans nigra</i>	black walnut	Tree															
<i>Liquidambar styraciflua</i>	sweetgum	Tree														5	
<i>Liriodendron tulipifera</i>	tuliptree	Tree	1	1	1	1	1	1									
<i>Platanus occidentalis</i>	American sycamore	Tree	3	3	3							7	7	7			
<i>Quercus michauxii</i>	swamp chestnut oak	Tree	5	5	5	2	2	2	1	1	1						
<i>Quercus pagoda</i>	cherrybark oak	Tree	2	2	2	4	4	4			1	3	3	3	2	2	2
<i>Quercus phellos</i>	willow oak	Tree							2	2	2	1	1	1	1	1	1
<i>Salix sericea</i>	silky willow	Shrub											2	2		2	2
Stem count			16	16	16	9	9	9	6	6	7	19	21	21	13	15	30
size (ares)			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02		
Species count			6	6	6	4	4	4	3	3	4	5	6	6	4	5	7
Stems per ACRE			647	647	647	364	364	364	243	243	283	769	850	850	526	607	1214

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%
- Volunteer species included in total

PnoLS: Number of Planted stems excluding live stakes

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T: Total Stems

Table 9. Planted and Total Stem Counts
 Underwood Mitigation Site (NCEEP Project Code 94641)
 Monitoring Year 2

Scientific Name	Common Name	Species Type	Current Plot Data (MY2 - 5/2014)														
			94641-WEI-0031			94641-WEI-0032			94641-WEI-0033			94641-WEI-0034			94641-WEI-0035		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	red maple	Tree			20			2								3	
<i>Betula nigra</i>	river birch	Tree	4	4	4				2	2	2				1	1	1
<i>Cornus amomum</i>	silky dogwood	Shrub		1	1		1	1		1	1		3	3		1	1
<i>Fraxinus pennsylvanica</i>	green ash	Tree	2	2	22	4	4	24	4	4	4	4	4	24	1	1	1
<i>Juglans nigra</i>	black walnut	Tree															
<i>Liquidambar styraciflua</i>	sweetgum	Tree			5			5									5
<i>Liriodendron tulipifera</i>	tuliptree	Tree															
<i>Platanus occidentalis</i>	American sycamore	Tree	1	1	1	4	4	4	9	9	9	4	4	24	7	7	7
<i>Quercus michauxii</i>	swamp chestnut oak	Tree							1	1	1						
<i>Quercus pagoda</i>	cherrybark oak	Tree	5	5	5	4	4	4				2	2	2	2	2	2
<i>Quercus phellos</i>	willow oak	Tree	1	1	1	1	1	1	3	3	3	2	2	2			
<i>Salix sericea</i>	silky willow	Shrub		5	8		2	7					5	5			
Stem count			13	19	67	13	16	48	19	20	20	12	20	60	11	12	20
size (ares)			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02		
Species count			5	7	9	4	6	8	5	6	6	4	6	6	4	5	7
Stems per ACRE			526	769	2711	526	647	1942	769	809	809	486	809	2428	445	486	809

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%
- Volunteer species included in total

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
 Underwood Mitigation Site (NCEEP Project Code 94641)
 Monitoring Year 2

Scientific Name	Common Name	Species Type	Current Plot Data (MY2 - 5/2014)														
			94641-WEI-0036			94641-WEI-0037			94641-WEI-0038			94641-WEI-0039			94641-WEI-0040		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	red maple	Tree															20
<i>Betula nigra</i>	river birch	Tree	3	3	3	1	1	1	2	2	2	4	4	4			
<i>Cornus amomum</i>	silky dogwood	Shrub		2	2												
<i>Fraxinus pennsylvanica</i>	green ash	Tree	3	3	23				4	4	24	1	1	21			2
<i>Juglans nigra</i>	black walnut	Tree															
<i>Liquidambar styraciflua</i>	sweetgum	Tree															3
<i>Liriodendron tulipifera</i>	tuliptree	Tree															
<i>Platanus occidentalis</i>	American sycamore	Tree				1	1	1				3	3	3	3	3	3
<i>Quercus michauxii</i>	swamp chestnut oak	Tree				6	6	6	1	1	1	1	1	1			
<i>Quercus pagoda</i>	cherrybark oak	Tree	2	2	2	5	5	5	1	1	1	2	2	2	2	2	2
<i>Quercus phellos</i>	willow oak	Tree	5	5	5	1	1	1				2	2	2			
<i>Salix sericea</i>	silky willow	Shrub		3	3												2
Stem count			13	18	38	14	14	14	8	8	28	13	13	33	5	5	32
size (ares)			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02		
Species count			4	6	6	5	5	5	4	4	4	6	6	6	2	2	6
Stems per ACRE			526	728	1538	567	567	567	324	324	1133	526	526	1335	202	202	1295

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%
- Volunteer species included in total

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
 Underwood Mitigation Site (NCEEP Project Code 94641)
 Monitoring Year 2

Scientific Name	Common Name	Species Type	Current Plot Data (MY2 - 5/2014)						Annual Means								
			94641-WEI-0041			94641-WEI-0042			MY2 (5/2014)			MY1 (9/2013)			MY0 (1/2013)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	red maple	Tree						5			55						
<i>Betula nigra</i>	river birch	Tree	3	3	3	4	4	4	64	64	64	82	82	82	124	124	124
<i>Cornus amomum</i>	silky dogwood	Shrub		1	1		1	1		16	20	25	25	25	30	30	30
<i>Fraxinus pennsylvanica</i>	green ash	Tree			20	1	1	21	74	74	387	82	82	142	86	86	86
<i>Juglans nigra</i>	black walnut	Tree									1						
<i>Liquidambar styraciflua</i>	sweetgum	Tree						5			92						
<i>Liriodendron tulipifera</i>	tuliptree	Tree							15	15	16	20	20	20	35	35	35
<i>Platanus occidentalis</i>	American sycamore	Tree	1	1	6	2	2	22	143	143	193	144	144	204	145	145	145
<i>Quercus michauxii</i>	swamp chestnut oak	Tree							62	62	62	71	71	71	87	87	87
<i>Quercus pagoda</i>	cherrybark oak	Tree	4	4	4	1	1	1	72	72	73	93	93	93	131	131	131
<i>Quercus phellos</i>	willow oak	Tree	1	1	1	1	1	1	69	69	69	72	72	72	64	64	64
<i>Salix sericea</i>	silky willow	Shrub		3	5		1	1		37	66	39	39	39	38	38	38
Stem count			9	13	40	9	11	61	499	552	1098	628	628	748	740	740	740
size (ares)			1			1			42			42			42		
size (ACRES)			0.02			0.02			1.04			1.04			1.04		
Species count			4	6	7	5	7	9	7	9	12	9	9	9	9	9	9
Stems per ACRE			364	526	1619	364	445	2469	481	532	1058	605	605	721	712	712	712

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%
- Volunteer species included in total

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
Underwood Mitigation Site (NCEP Project No. 94641)
Harris Site; SF1 and UT2
Monitoring Year 2

Parameter	Gage	Pre-Restoration Condition				Reference Reach Data				Design				As-Built/Baseline			
		SF1		UT2		Long Branch		UT to Cane Creek		SF1		UT2		SF1		UT2	
		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	7.6		7.0		14.8	18.6	8.2	11.8	8.8	7.1			9.0			16.6
Floodprone Width (ft)		51.9		133.2		50+		40+		50+	200+			50+			200+
Bankfull Mean Depth		1.2		1.4		1.3	2.1	0.9	1.0	0.7	0.6			0.7			0.8
Bankfull Max Depth		2.2		1.8		1.9	2.9	1.5	1.7	1.0	0.7			1.1			1.1
Bankfull Cross-sectional Area (ft ²)		9.5		9.6		25.0	34.6	8.5	10.7	6.5	4.2			6.3			13.6
Width/Depth Ratio		6.2		5.2		7.9	13.8	7.9	13.1	12.0	12.0			12.9			20.4
Entrenchment Ratio		6.8		18.9		3.4+		4.6+		2.2+	2.2+			2.2+			2.2+
Bank Height Ratio		1.6		1.5		1.2	1.5	1.0	1.0	1.0	1.0			1.0			1.0
D50 (mm)		4.7		6.1										119.3			145.5
Profile																	
Riffle Length (ft)	N/A													11	36	7	25
Riffle Slope (ft/ft) ^a		0.0110	0.0100	---		0.0130	0.0120	0.0120	0.0143	0.0255	0.0197	0.0353	0.0053	0.0283	0.0040	0.1512	
Pool Length (ft)													16	34	16	51	
Pool Max Depth (ft)														1.7		2.7	
Pool Spacing (ft) ^a													37	61	23	59	
Pool Volume (ft ³)									35	62	29	50					
Pattern																	
Channel Beltwidth (ft)	N/A	N/A		N/A		60	50	77	26	44	N/A		26	44		N/A	
Radius of Curvature (ft)		N/A		N/A		16	87	11	27	15	25	N/A	15	25		N/A	
Rc:Bankfull Width (ft/ft)						1.1	4.7	1.0	2.5	1.7	2.8	N/A	1.7	2.8		N/A	
Meander Length (ft)		N/A		N/A		66	191	29	96	62	106	N/A	62	106		N/A	
Meander Width Ratio						3.2	4.1	50.0	77.0	3.0	5.0	N/A	3.0	5.0		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		N/A/0.9/4.7/20.9/87/362		N/A/N/A/6.1/62/128/256										SC/SC/SC/46.6/100/256		SC/SC/SC/58.6/111.2/180	
Reach Shear Stress (Competency) lb/ft ^{2.1}										0.42				0.39		N/A	
Max part size (mm) mobilized at bankfull																	
Stream Power (Capacity) W/m ²																	
Additional Reach Parameters																	
Drainage Area (SM)	N/A	0.21		0.12		1.49	0.28		0.21	0.12		0.21		0.21		0.12	
Watershed Impervious Cover Estimate (%)		<1%		<1%						<1%	<1%		<1%		<1%		<1%
Rosgen Classification		E4		E4		C/E4		C/E4		C4	C4		C5		C5		C5
Bankfull Velocity (fps)		3.1		2.0						3.1	3.1		3.2		3.2		1.0
Bankfull Discharge (cfs)		20		13		101	124	21	53	20	13		20		20		13
Q-NFF regression		45.2		31.0													
Q-USGS extrapolation																	
Q-Mannings																	
Valley Length (ft)																	
Channel Thalweg Length (ft)		773		421						878	421		874		418		418
Sinuosity (ft)		1.1		1.0		1.3		1.2		1.2	1.0		1.2		1.0		1.0
Water Surface Slope (ft/ft) ²		0.0110		0.0150		0.0040		0.0050		0.0102	0.0141		0.0104		0.0143		0.0143
Bankfull Slope (ft/ft)						0.0060							0.0104				0.0145

(---): Data was not provided

¹Design Parameters based on revised Shields Diagram.

²Channel was dry at time of baseline survey. Slopes were calculated using the channel thalweg.

³As-Built pattern measurements fell within the design ranges, therefore the design parameters set are still applicable.

⁴Slopes outside of design range are from the tie in points at the channel confluence.

Table 10b. Baseline Stream Data Summary
Underwood Milligation Site (NCEEP Project No. 94641)
Harris Site: SF3 and UT1
Monitoring Year 2

Parameter	Gage	Pre-Restoration Condition				Reference Reach Data				Design				As-Built/Baseline							
		SF3		UT1		Long Branch		UT to Cane Creek		SF3-u/s of UT1		SF3-d/s of UT1		UT1		SF3		UT1			
		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	15.9		9.0		14.8	18.6	8.2	11.8		18.2		18.0		10.7		22.6	29.3	10.1		
Floodprone Width (ft)			48.6		14.2		50+		40+			50+		200+		100+		50+	200+	100+	
Bankfull Mean Depth			1.8		0.8		1.3	2.1	0.9	1.0		1.5		0.9		1.5		1.0	1.5	0.9	
Bankfull Max Depth			2.4		1.5		1.9	2.9	1.5	1.7		2.1		2.1		1.3		2.3	2.6	1.6	
Bankfull Cross-sectional Area (ft ²)			28.9		7.2		25.0	34.6	8.5	10.7		27.5		27.1		9.6		27.0	34.5	9.5	
Width/Depth Ratio			8.8		11.1		7.9	13.8	7.9	13.1		12.0		12.0		12.0		14.8	28.8	10.7	
Entrenchment Ratio			3.1		1.6		3.4+		4.6+			2.2+		2.2+		2.2+		2.2+	2.2+	2.2+	
Bank Height Ratio			1.6		1.9		1.2	1.5	1.0	1.0		1.0		1.0		1.0		1.0	1.0	1.0	
D50 (mm)			4.7		1.0													50.6	63.3	73.8	
Profile																					
Riffle Length (ft)	N/A					---					---				---		12	103	11	26	
Riffle Slope (ft/ft)			0.0300	0.0500			0.0130	0.0120	0.0120	0.0050	0.0090	0.0078	0.0140	0.0118	0.0210		0.0003	0.0169	0.0023	0.0185	
Pool Length (ft)							---			---		---				---		23	100	20	80
Pool Max Depth (ft)							---			---		---				---		2.3	2.6		2.5
Pool Spacing (ft) ¹							---			---		---				---		53	166	58	76
Pool Volume (ft ³)																					
Pattern																					
Channel Beltwidth (ft)	N/A	51	106	31	59	60	50	77	54	91	54	90	32	54	54	91	32	54	32	54	
Radius of Curvature (ft)			27	105	10	83	16	87	11	27	31	51	31	50	21	30	31	51	21	30	
Rc:Bankfull Width (ft/ft)			7.2	16.0	1.1	9.2	1.1	4.7	1.0	2.5	1.7	2.8	1.7	2.8	2.0	2.8	1.7	3.0	2.0	2.8	
Meander Length (ft)			46	272	80	161	66	191	29	96	127	218	126	216	75	129	126	218	75	129	
Meander Width Ratio			26	70	3	7	3.2	4.1	50.0	77.0	3.0	5.0	3.0	5.0	3.0	5.0	3.0	5.0	3.0	5.0	
Substrate, Bed and Transport Parameters																					
Ri%/Ru%/P%/G%/S%	N/A																				
SC%/Sa%/G%/C%/B%/Be%																					
d16/d35/d50/d84/d95/d100			7.53/16.66/40.82/74.02/97.42/180		N/A/N/A/1/16/107.3/256		---		---									0.08/0.21/11/67.2/256/>2048		0.07/0.16/0.3/26.9/71.7/256	
Reach Shear Stress (Competency) lb/ft ² ¹			---		---						0.35	0.52		0.37				0.28		0.37	
Max part size (mm) mobilized at bankfull																					
Stream Power (Capacity) W/m ²																					
Additional Reach Parameters																					
Drainage Area (SM)	N/A	1.27		0.36		1.49		0.28		1.27		0.36		1.27		0.36		1.27		0.36	
Watershed Impervious Cover Estimate (%)			<1%		<1%		---		---		<1%		<1%		<1%		<1%		<1%		<1%
Rosgen Classification			E4		E/G5		C/E4		C/E4		C4		C4		C5		C4		C5		C5
Bankfull Velocity (fps)			3.7		5.9		---		---		3.0		3.4		3.2		3.0		2.9		3.2
Bankfull Discharge (cfs)			82		30		101	124	21	53		82		100		30		82		100	30
Q-NFF regression			159.7		65.7																
Q-USGS extrapolation			---		---																
Q-Mannings			---		---																
Valley Length (ft)			---		---		---		---		---		---		---		---		---		---
Channel Thalweg Length (ft)			2,183		1,915		---		---		2,116		---		1,997		---		2,120		2,038
Sinuosity (ft)			1.2		1.2		1.3		1.2		1.2		1.2		1.2		1.2		1.2		1.2
Water Surface Slope (ft/ft) ²			0.0040		0.0100		0.0040		0.0050		0.0036		0.0056		0.0084		0.0041		0.0041		0.0075
Bankfull Slope (ft/ft)			---		---		0.0060		---		---		---		---		0.0047		---		0.0083

(---): Data was not provided
¹Design Parameters based on revised Shields Diagram.
²Channel was dry at time of baseline survey. Slopes were calculated using the channel thalweg.
³As-Built pattern measurements fell within the design ranges, therefore the design parameters set are still applicable.
⁴Slopes outside of design range are from the tie in points at the channel confluence.

Table 10c. Baseline Stream Data Summary
Underwood Mitigation Site (NCEEP Project No. 94641)
Lindley Site; SF4 and SF4A
Monitoring Year 2

Parameter	Gage	Pre-Restoration Condition				Reference Reach Data				Design				As-Built/Baseline					
		SF4		SFA		Long Branch		UT to Cane Creek		SF4		SFA		SF4		SFA			
		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	18.6		10.3		14.8	18.6	8.2	11.8	14.0		12.0		26.7		27.3		17.3	
Floodprone Width (ft)		157.3		29.4		50+		40+		50+		200+		200+		200+		200+	
Bankfull Mean Depth		2.7		1.6		1.3	2.1	0.9	1.0	1.9		1.2		2.0		2.9		1.6	
Bankfull Max Depth		4.0		2.2		1.9	2.9	1.5	1.7	2.3		1.7		2.9		3.0		2.8	
Bankfull Cross-sectional Area (ft ²)		49.7		16.9		25.0	34.6	8.5	10.7	53.0		18.0		49.0		53.8		27.1	
Width/Depth Ratio		6.9		6.3		7.9	13.8	7.9	13.1	14.0		12.0		13.8		14.6		11.5	
Entrenchment Ratio		3.5		2.9		3.4+		4.6+		2.2+		2.2+		2.2+		2.2+		2.2+	
Bank Height Ratio		1.4		1.8		1.2	1.5	1.0	1.0	1.0		1.0		1.0		1.0		1.0	
D50 (mm)		0.3		0.8											117.2		134.4		82.0
Profile																			
Riffle Length (ft)	N/A													51		112		79	
Riffle Slope (ft/ft)						0.0130	0.0120	0.0120		0.0048	0.0085	0.0108	0.0193	0.0010		0.0098		0.0210	
Pool Length (ft)														54		123		79	
Pool Max Depth (ft)														2.9		3.0		2.8	
Pool Spacing (ft) [^]																146		110	
Pool Volume (ft ³)																210		71	
Pattern³																			
Channel Beltwidth (ft)	N/A	N/A		N/A		60	50	77	82	136	44	74	82		136		74		
Radius of Curvature (ft)		N/A		N/A		16	87	11	27	46	76	25	41	46		76		41	
Rc:Bankfull Width (ft/ft)						1.1	4.7	1.0	2.5	1.7	2.8	1.7	2.8	1.7		2.8		2.8	
Meander Length (ft)		N/A		N/A		66	191	29	96	191	327	103	177	191		327		177	
Meander Width Ratio						3.2	4.1	6.1	6.5	3.0	5.0	3.0	5.0	3.0		5.0		5.0	
Substrate, Bed and Transport Parameters																			
Ri%/Ru%/P%/G%/S%	N/A																		
SC%/Sa%/G%/C%/B%/Be%																			
d16/d35/d50/d84/d95/d100		N/A/N/A/0.3/17.9/45.8/90		N/A/0.1/0.8/204./62.9/362											0.13/0.36/5.3/102.5/320.7/>2048		SC/0.12/1.4/44/71.3/362		
Reach Shear Stress (Competency) lb/ft ^{2.1}										0.32	0.63			0.33		0.33		0.44	
Max part size (mm) mobilized at bankfull																			
Stream Power (Capacity) W/m ²																			
Additional Reach Parameters																			
Drainage Area (SM)	N/A	5.26		1.00		1.49		0.28		5.26		1.00		5.26		1.00			
Watershed Impervious Cover Estimate (%)		<1%		<1%						<1%		<1%		<1%		<1%		<1%	
Rosgen Classification		E5		E5		C/E4		C/E4		C5		C5		C4		C5		C5	
Bankfull Velocity (fps)		5.9		5.3						3.9		3.7		4.2		3.8		2.5	
Bankfull Discharge (cfs)		247		67		101	124	20.6	53.2	204		67		204		67		67	
Q-NFF regression		432.9		134.6															
Q-USGS extrapolation																			
Q-Mannings																			
Valley Length (ft)																			
Channel Thalweg Length (ft)		1,450		609						1,424		868		1,429		866		866	
Sinuosity (ft)	1.3		1.1		1.3		1.2		1.2		1.0		1.2		1.1		1.1		
Water Surface Slope (ft/ft) ²	0.0030		0.0080		0.0040		0.0050		0.0034		0.0077		0.0033		0.0070		0.0070		
Bankfull Slope (ft/ft)					0.0060				0.0034		0.0077		0.0034		0.0067		0.0067		

(---): Data was not provided

¹Design Parameters based on revised Shields Diagram.

²Channel was dry at time of baseline survey. Slopes were calculated using the channel thalweg.

³As-Built pattern measurements fell within the design ranges, therefore the design parameters set are still applicable.

⁴Slopes outside of design range are from the tie in points at the channel confluence.

Table 11. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Underwood Mitigation Site (NCEEP Project No. 94641)
Harris and Lindley Site
Monitoring Year 2

Dimension and Substrate	SF1												UT2											
	Cross-Section 1 (Riffle)						Cross-Section 2 (Pool)						Cross-Section 3 (Pool)						Cross-Section 4 (Riffle)					
	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
<i>based on fixed bankfull elevation</i>																								
Bankfull Width (ft)	8.4	9.0	8.2				11.7	13.9	10.9				15.0	19.4	15.7				16.6	18.6	17.4			
Floodprone Width (ft)	50+	50+	50+				N/A	N/A	N/A				N/A	N/A	N/A				200+	200+	200+			
Bankfull Mean Depth (ft)	0.7	0.7	0.6				0.9	0.9	0.9				1.6	1.4	1.5				0.8	0.9	0.8			
Bankfull Max Depth (ft)	1.0	1.1	1.0				1.7	2.1	1.9				2.7	2.7	2.6				1.1	1.4	1.2			
Bankfull Cross-Sectional Area (ft ²)	5.6	6.3	4.8				12.8	12.2	9.9				24.2	26.2	23.1				13.6	18.6	14.1			
Bankfull Width/Depth Ratio	12.8	12.9	14.2				N/A	N/A	12.0				N/A	N/A	10.7				20.4	25.4	21.4			
Bankfull Entrenchment Ratio	2.2+	2.2+	2.2+				N/A	N/A	N/A				N/A	N/A	N/A				2.2+	2.2+	2.2+			
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.2	1.2	1.2				1.0	1.0	1.0				1.0	1.0	1.0			
Dimension and Substrate	SF3												UT1											
	Cross-Section 5 (Riffle)						Cross-Section 6 (Pool)						Cross-Section 7 (Riffle)						Cross-Section 8 (Pool)					
	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
<i>based on fixed bankfull elevation</i>																								
Bankfull Width (ft)	19.7	22.6	19.4				19.7	24.8	22.7				16.7	29.3	15.8				19.7	22.3	15.9			
Floodprone Width (ft)	200+	200+	200+				N/A	N/A	N/A				200+	200+	200+				N/A	N/A	N/A			
Bankfull Mean Depth (ft)	1.6	1.5	1.5				1.6	2.0	1.9				1.2	1.0	1.2				1.4	1.7	1.6			
Bankfull Max Depth (ft)	2.3	2.5	2.4				2.3	4.1	3.7				2.2	2.6	2.2				3	3.5	3.0			
Bankfull Cross-Sectional Area (ft ²)	30.5	34.5	29.9				30.5	50.2	43.1				20.6	29.8	19.2				28.0	36.9	26.2			
Bankfull Width/Depth Ratio	12.7	14.8	12.5				12.7	12.1	12.0				13.5	28.8	12.9				13.9	13.5	9.7			
Bankfull Entrenchment Ratio	2.2+	2.2+	2.2+				N/A	N/A	N/A				2.2+	2.2+	2.2+				N/A	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	1.0	1.0			
Dimension and Substrate	SF3						UT1						SF4											
	Cross-Section 9 (Riffle)						Cross-Section 10 (Riffle)						Cross-Section 11 (Pool)						Cross-Section 12 (Pool)					
	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
<i>based on fixed bankfull elevation</i>																								
Bankfull Width (ft)	15.9	24.2	14.9				12.6	10.1	11.3				14.2	19.4	12.0				33.3	34.1	29.8			
Floodprone Width (ft)	200+	200+	200+				100+	100+	100+				N/A	N/A	N/A				N/A	N/A	N/A			
Bankfull Mean Depth (ft)	1.2	1.1	1.0				0.8	0.9	0.8				1.3	0.9	1.2				2.2	2.1	2.4			
Bankfull Max Depth (ft)	1.8	2.3	1.8				1.5	1.6	1.5				2.6	2.5	2.3				4.9	4.7	4.9			
Bankfull Cross-Sectional Area (ft ²)	19.0	27.0	15.5				10.5	9.5	9.5				17.7	17.0	14.6				74.4	72.2	70.7			
Bankfull Width/Depth Ratio	13.3	21.6	14.4				15.1	10.7	13.4				11.3	22.1	10.0				14.9	16.2	12.5			
Bankfull Entrenchment Ratio	2.2+	2.2+	2.2+				2.2+	2.2+	2.2+				N/A	N/A	N/A				N/A	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	1.0	1.0			
Dimension and Substrate	SF4												SF4A											
	Cross-Section 13 (Riffle)						Cross-Section 14 (Pool)						Cross-Section 15 (Riffle)						Cross-Section 16 (Riffle)					
	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
<i>based on fixed bankfull elevation</i>																								
Bankfull Width (ft)	27.3	26.7	26.0				38.7	44.4	45.4				27.6	27.3	26.2				23.7	17.3	13.9			
Floodprone Width (ft)	200+	200+	200+				N/A	N/A	N/A				200+	200+	200+				200+	200+	200+			
Bankfull Mean Depth (ft)	1.8	2.9	1.9				1.8	1.8	1.8				1.9	2.0	2.1				0.9	1.6	1.8			
Bankfull Max Depth (ft)	3.0	2.9	2.9				4.3	4.6	5.0				3.2	3.0	3.2				2.3	2.8	3.0			
Bankfull Cross-Sectional Area (ft ²)	49.5	49.0	49.7				70.6	78.1	82.2				51.2	53.8	53.9				20.4	27.1	25.2			
Bankfull Width/Depth Ratio	15.1	14.6	13.6				21.2	25.3	25.1				14.9	13.8	12.8				27.5	11.1	7.7			
Bankfull Entrenchment Ratio	2.2+	2.2+	2.2+				N/A	N/A	N/A				2.2+	2.2+	2.2+				2.2+	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	1.0	1.0			
Dimension and Substrate	SF4A																							
	Cross-Section 17 (Riffle)						Cross-Section 18 (Pool)																	
	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5												
<i>based on fixed bankfull elevation</i>																								
Bankfull Width (ft)	13.9	13.6	12.8				16.0	13.5	10.6															
Floodprone Width (ft)	200+	200+	200+				N/A	N/A	N/A															
Bankfull Mean Depth (ft)	1.3	1.2	1.2				1.4	1.6	1.9															
Bankfull Max Depth (ft)	2.12	2.1	2.4				2.8	3.4	3.0															
Bankfull Cross-Sectional Area (ft ²)	17.5	16.1	15.2				22.9	21.0	20.5															
Bankfull Width/Depth Ratio	11.0	11.5	10.7				11.1	8.6	5.4															
Bankfull Entrenchment Ratio	2.2+	2.2+	2.2+				N/A	N/A	N/A															
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0															

Table 12a. Monitoring Data - Stream Reach Data Summary
Underwood Mitigation Site (NCEEP Project No. 94641)
Harris Site; SF1
Monitoring Year 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	8.4		9.0		8.2							
Floodprone Width (ft)	50+		50+		50+							
Bankfull Mean Depth	0.7		0.7		0.6							
Bankfull Max Depth	1.0		1.1		1.0							
Bankfull Cross-sectional Area (ft ²)	5.6		6.3		4.8							
Width/Depth Ratio	12.8		12.9		14.2							
Entrenchment Ratio	2.2+		2.2+		2.2+							
Bank Height Ratio	1.0		1.0		1.0							
D50 (mm)												
Profile												
Riffle Length (ft)	11	36	13	38	11	37						
Riffle Slope (ft/ft)	0.0053	0.0283	0.0008	0.0376	0.0077	0.0426						
Pool Length (ft)	16	34	15	30	15	33						
Pool Max Depth (ft)	1.7		2.1		1.9							
Pool Spacing (ft)	37	61	36	59	37	59						
Pool Volume (ft ³)												
Pattern												
Channel Beltwidth (ft)	26	44										
Radius of Curvature (ft)	15	25										
Rc:Bankfull Width (ft/ft)	1.7	2.8										
Meander Wave Length (ft)	62	106										
Meander Width Ratio	3.0	5.0										
Additional Reach Parameters												
Rosgen Classification	C5		C5		C5							
Channel Thalweg Length (ft)	874		874		874							
Sinuosity (ft)	1.2		1.2		1.2							
Water Surface Slope (ft/ft)	0.0104		0.0104		0.0111							
Bankfull Slope (ft/ft)	0.0104		0.0108		0.0104							
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/SC/SC/46.6/100/256		SC/SC/SC/91.6/202.4/362		SC/0.2/9.7/42.0/128/256							
% of Reach with Eroding Banks			0%		0%							

Table 12b. Monitoring Data - Stream Reach Data Summary
Underwood Mitigation Site (NCEEP Project No. 94641)
Harris Site; UT2
Monitoring Year 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	16.6		21.6		17.4							
Floodprone Width (ft)	200+		200+		200+							
Bankfull Mean Depth	0.8		0.9		0.8							
Bankfull Max Depth	1.1		1.4		1.2							
Bankfull Cross-sectional Area (ft ²)	13.6		18.6		14.1							
Width/Depth Ratio	20.4		25.4		21.4							
Entrenchment Ratio	2.2+		2.2+		2.2+							
Bank Height Ratio	1.0		1.0		1.0							
D50 (mm)												
Profile												
Riffle Length (ft)	7	25	3	24	4	13						
Riffle Slope (ft/ft)	0.0040	0.1512	0.0045	0.0775	0.0117	0.0373						
Pool Length (ft)	16	51	11	46	18	47						
Pool Max Depth (ft)	2.7		2.7		2.6							
Pool Spacing (ft)	23	59	21	60	21	55						
Pool Volume (ft ³)												
Pattern												
Channel Beltwidth (ft)	N/A											
Radius of Curvature (ft)	N/A											
Rc:Bankfull Width (ft/ft)	N/A											
Meander Wave Length (ft)	N/A											
Meander Width Ratio	N/A											
Additional Reach Parameters												
Rosgen Classification	C5		C5		C5							
Channel Thalweg Length (ft)	418		418		418							
Sinuosity (ft)	1.0		1.0		1.0							
Water Surface Slope (ft/ft)	0.0143		0.0149		0.0152							
Bankfull Slope (ft/ft)	0.0145		0.0141		0.0141							
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/SC/SC/110.1/163.3/256		SC/SC/SC/58.6/111.2/181		SC/0.5/17.4/58.6/99.5/128							
% of Reach with Eroding Banks			0%		0%							

Table 12c. Monitoring Data - Stream Reach Data Summary
Underwood Mitigation Site (NCEEP Project No. 94641)
Harris Site; SF3
Monitoring Year 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	15.9	19.7	22.6	35.6	14.9	19.4						
Floodprone Width (ft)	200+	200+	50+	200+	200+	200+						
Bankfull Mean Depth	1.2	1.6	0.8	1.5	1.0	1.5						
Bankfull Max Depth	1.8	2.3	2.3	2.5	1.8	2.4						
Bankfull Cross-sectional Area (ft ²)	19.0	30.5	27.0	34.5	15.5	29.9						
Width/Depth Ratio	12.7	13.5	14.8	44.2	12.5	14.4						
Entrenchment Ratio	2.2+	2.2+	2.2+	2.2+	2.2+	2.2+						
Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0						
D50 (mm)												
Profile												
Riffle Length (ft)	12	103	29	100	18	102						
Riffle Slope (ft/ft)	0.0003	0.0169	0.0019	0.0129	0.0008	0.0131						
Pool Length (ft)	23	100	45	74	21	72						
Pool Max Depth (ft)	2.3	3.0	3.5	4.1	3.0	3.7						
Pool Spacing (ft)	53	166	50	151	42	156						
Pool Volume (ft ³)												
Pattern												
Channel Beltwidth (ft)	54	91										
Radius of Curvature (ft)	31	51										
Rc:Bankfull Width (ft/ft)	1.7	3.0										
Meander Wave Length (ft)	126	218										
Meander Width Ratio	3.0	5.0										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4							
Channel Thalweg Length (ft)	2,120		2,120		2,120							
Sinuosity (ft)	1.2		1.2		1.2							
Water Surface Slope (ft/ft)	0.0041		0.0045		0.0043							
Bankfull Slope (ft/ft)	0.0047		0.0047		0.0042							
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.08/0.21/11/67.2/256/>2048		0.50/16.47/26/66.8/119.3/180		0.42/9.38/17.3/53.7/90/>2048							
% of Reach with Eroding Banks			0%		0%							

Table 12d. Monitoring Data - Stream Reach Data Summary
Underwood Mitigation Site (NCEEP Project No. 94641)
Harris Site; UT1
Monitoring Year 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	12.7		10.1		11.3							
Floodprone Width (ft)	100+		100+		100+							
Bankfull Mean Depth	0.8		1.5		0.8							
Bankfull Max Depth	1.5		2.1		1.5							
Bankfull Cross-sectional Area (ft ²)	10.5		14.9		9.5							
Width/Depth Ratio	15.1		6.8		13.4							
Entrenchment Ratio	2.2+		2.2+		2.2+							
Bank Height Ratio	1.0		1.0		1.0							
D50 (mm)												
Profile												
Riffle Length (ft)	11	39	19	36	14	36						
Riffle Slope (ft/ft)	0.0023	0.0185	0.0016	0.0258	0.0025	0.0407						
Pool Length (ft)	20	80	18	51	25	53						
Pool Max Depth (ft)	2.6		2.5		2.3							
Pool Spacing (ft)	58	76	39	76	43	73						
Pool Volume (ft ³)												
Pattern												
Channel Beltwidth (ft)	32	54										
Radius of Curvature (ft)	21	30										
Rc:Bankfull Width (ft/ft)	2.0	2.8										
Meander Wave Length (ft)	75	129										
Meander Width Ratio	3.0	5.0										
Additional Reach Parameters												
Rosgen Classification	C5		C5		C5							
Channel Thalweg Length (ft)	2038		2038		2038							
Sinuosity (ft)	1.2		1.2		1.2							
Water Surface Slope (ft/ft)	0.0075		0.0078		0.0070							
Bankfull Slope (ft/ft)	0.0083		0.0058		0.0077							
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.07/0.16/0.3/26.9/71.7/256		SC/1.15/11/67.2/87.8/180		SC/0.20/6.7/45.0/84.1/362							
% of Reach with Eroding Banks			0%		0%							

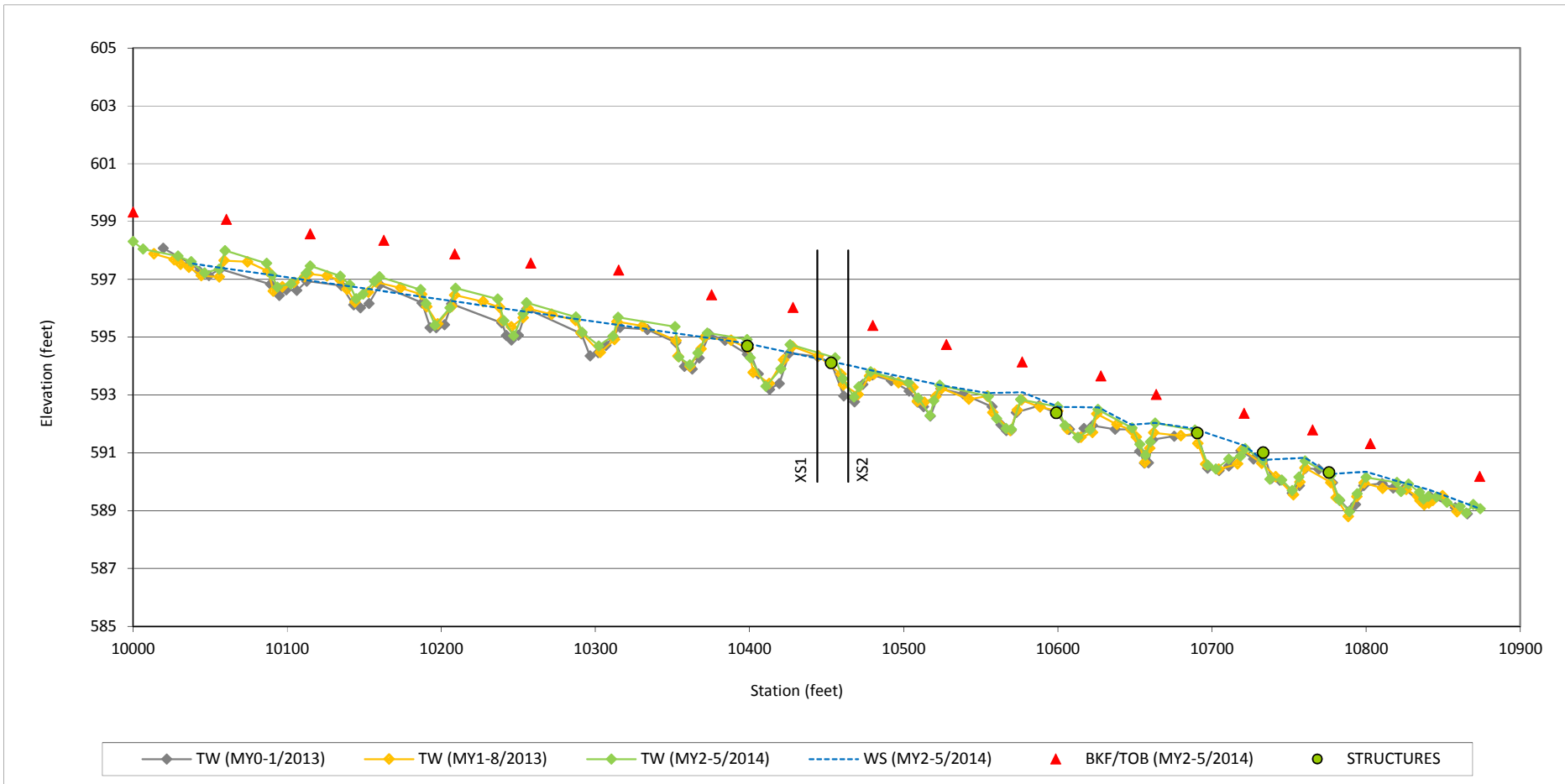
Table 12e. Monitoring Data - Stream Reach Data Summary
Underwood Mitigation Site (NCEEP Project No. 94641)
Lindley Site; SF4
Monitoring Year 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	27.3	27.6	26.7	27.3	26.0	26.2						
Floodprone Width (ft)	200+		200+		200+							
Bankfull Mean Depth	1.8	1.9	2.0	2.9	1.9	3.2						
Bankfull Max Depth	3.0	3.2	2.9	3.0	2.9	3.2						
Bankfull Cross-sectional Area (ft ²)	49.5	51.2	49.0	53.8	49.7	53.9						
Width/Depth Ratio	14.9	15.1	13.8	14.6	12.8	13.6						
Entrenchment Ratio	2.2+		2.2+		2.2+							
Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0						
D50 (mm)												
Profile												
Riffle Length (ft)	51	112	31	111	46	115						
Riffle Slope (ft/ft)	0.0010	0.0098	0.0034	0.0119	0.0028	0.0075						
Pool Length (ft)	54	123	27	169	26	123						
Pool Max Depth (ft)	4.3	4.9	4.6	4.7	4.9	5.0						
Pool Spacing (ft)	146	210	151	211	150	210						
Pool Volume (ft ³)												
Pattern												
Channel Beltwidth (ft)	82	136										
Radius of Curvature (ft)	46	76										
Rc:Bankfull Width (ft/ft)	1.7	2.8										
Meander Wave Length (ft)	191	327										
Meander Width Ratio	3.0	5.0										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4							
Channel Thalweg Length (ft)	1,429		1,429		1,429							
Sinuosity (ft)	1.2		1.2		1.2							
Water Surface Slope (ft/ft)	0.0033		0.0031		0.0031							
Bankfull Slope (ft/ft)	0.0034		0.0034		0.0035							
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	.13/0.36/5.3/102.5/320.7/>204		SC/0.25/5.1/72.7/139.4/256		SC/1.41/16/69.7/115.7/>2048							
% of Reach with Eroding Banks			0%		0%							

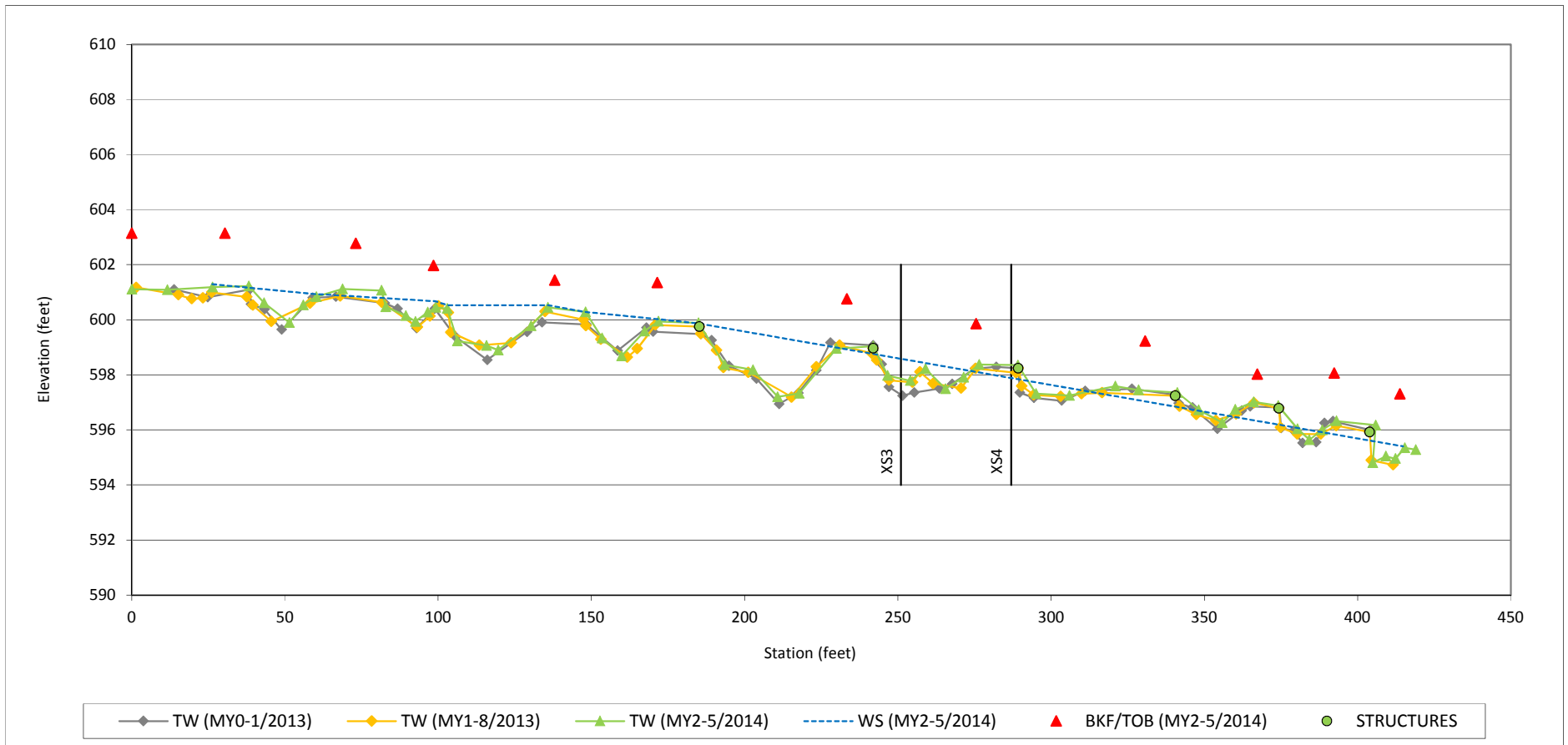
Table 12f. Monitoring Data - Stream Reach Data Summary
Underwood Mitigation Site (NCEEP Project No. 94641)
Lindley Site; SF4A
Monitoring Year 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	13.9	23.7	13.6	15.4	12.8	13.9						
Floodprone Width (ft)	200+		200+		200+							
Bankfull Mean Depth	0.9	1.3	1.2	1.7	1.2	1.8						
Bankfull Max Depth	2.1	2.3	2.1	2.8	2.4	3.0						
Bankfull Cross-sectional Area (ft ²)	17.5	20.4	16.1	26.3	15.2	25.2						
Width/Depth Ratio	11.0	27.5	9.0	11.5	7.7	10.7						
Entrenchment Ratio	2.2+		2.2+		2.2+							
Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0						
D50 (mm)												
Profile												
Riffle Length (ft)	41	79	6	75	5	52						
Riffle Slope (ft/ft)	0.0001	0.0210	0.0177	0.0321	0.0063	0.0577						
Pool Length (ft)	28	79	15	46	16	68						
Pool Max Depth (ft)	2.8		3.4		3.0							
Pool Spacing (ft)	71	110	32	111	35	104						
Pool Volume (ft ³)												
Pattern												
Channel Beltwidth (ft)	44	74										
Radius of Curvature (ft)	25	41										
Rc:Bankfull Width (ft/ft)	1.7	2.8										
Meander Wave Length (ft)	103	177										
Meander Width Ratio	3.0	5.0										
Additional Reach Parameters												
Rosgen Classification	C5		C5		C5							
Channel Thalweg Length (ft)	866		866		866							
Sinuosity (ft)	1.1		1.1		1.1							
Water Surface Slope (ft/ft)	0.0070		0.0047		0.0049							
Bankfull Slope (ft/ft)	0.0067		0.0077		0.0066							
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/0.12/1.4/44/71.3/362		SC/0.10/0.3/48.8/123.6/256		0.93/5.6/12.8/42.0/85.0/180							
% of Reach with Eroding Banks			43%		43%							

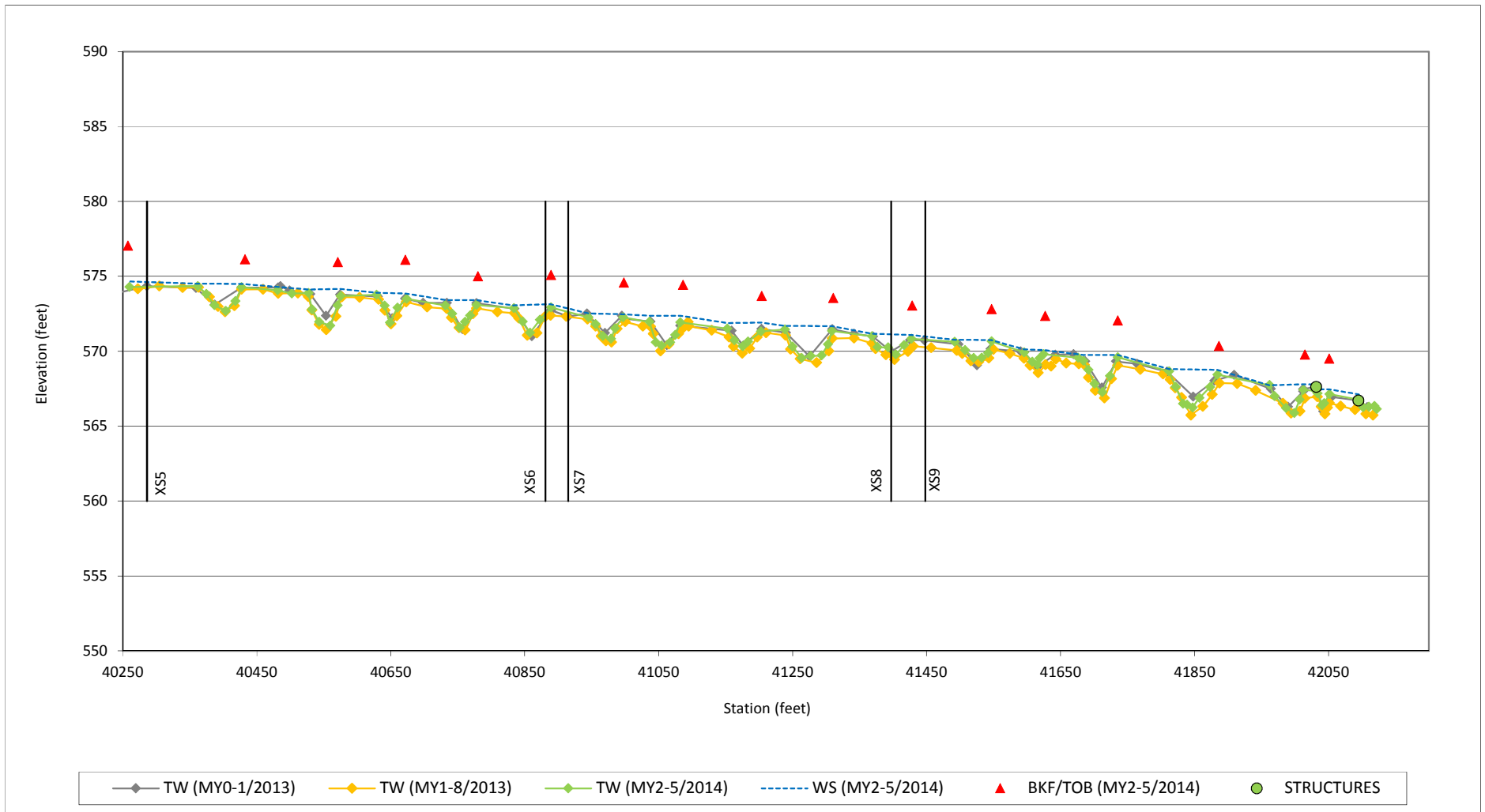
Longitudinal Profile Plots
Underwood Mitigation Site (NCEEP Project No. 94641)
Harris Site; SF1
Monitoring Year 2



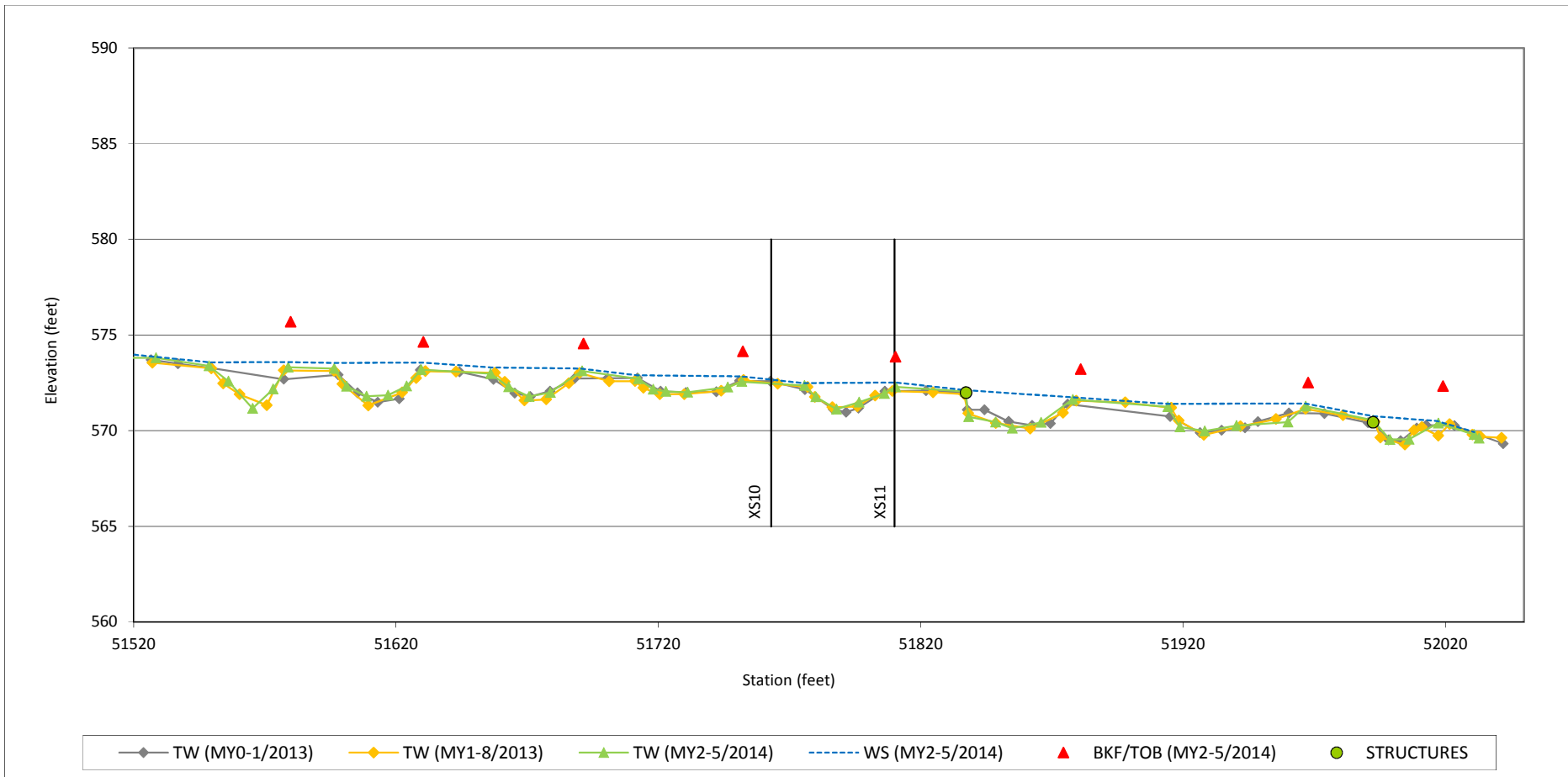
Longitudinal Profile Plots
Underwood Mitigation Site (NCEEP Project No. 94641)
Harris Site; UT2
Monitoring Year 2



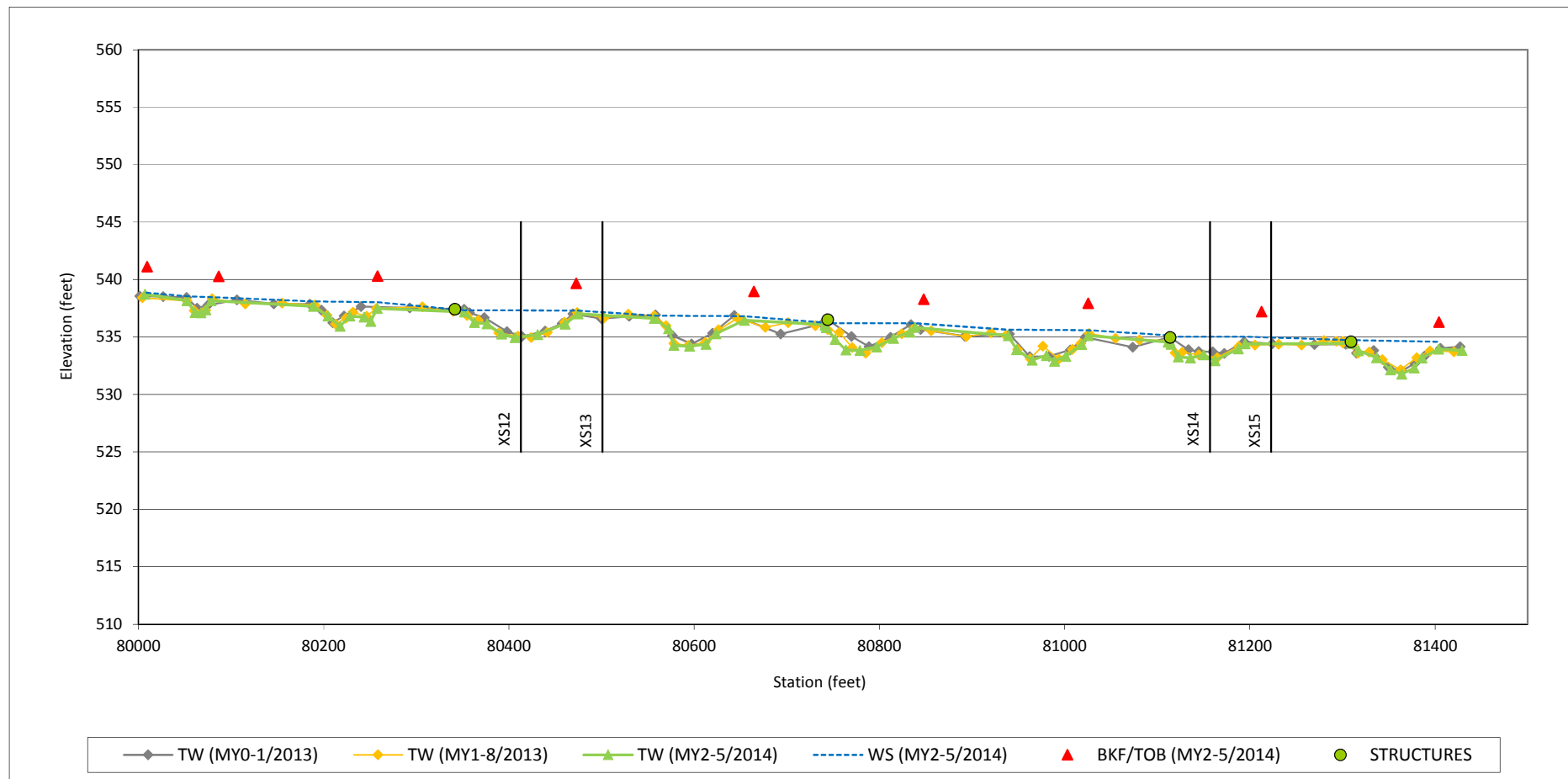
Longitudinal Profile Plots
Underwood Mitigation Site (NCEEP Project No. 94641)
Harris Site; SF3
Monitoring Year 2



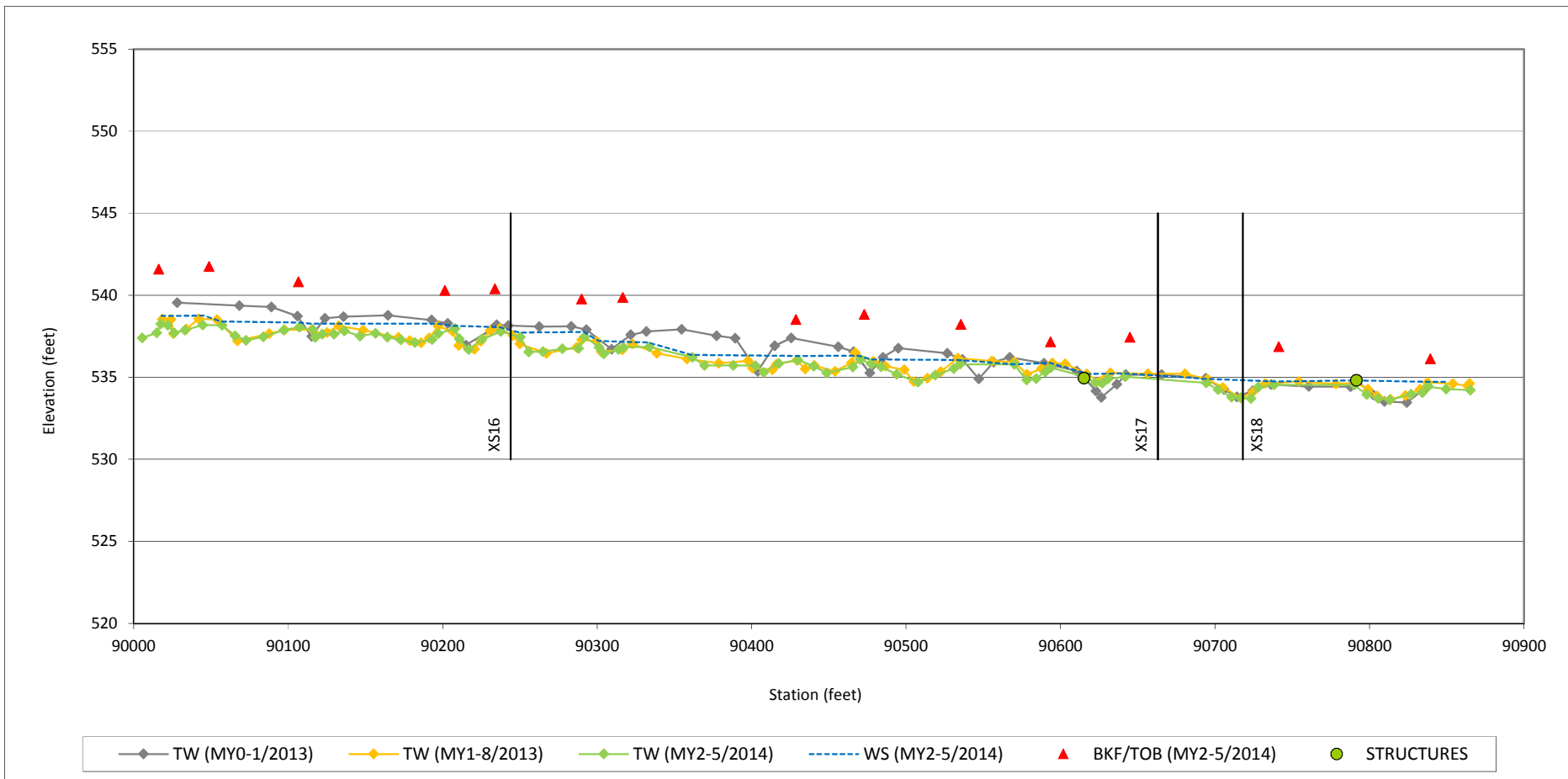
Longitudinal Profile Plots
Underwood Mitigation Site (NCEEP Project No. 94641)
Harris Site; UT1
Monitoring Year 2



Longitudinal Profile Plots
Underwood Mitigation Site (NCEP Project No. 94641)
Lindley Site; SF4
Monitoring Year 2

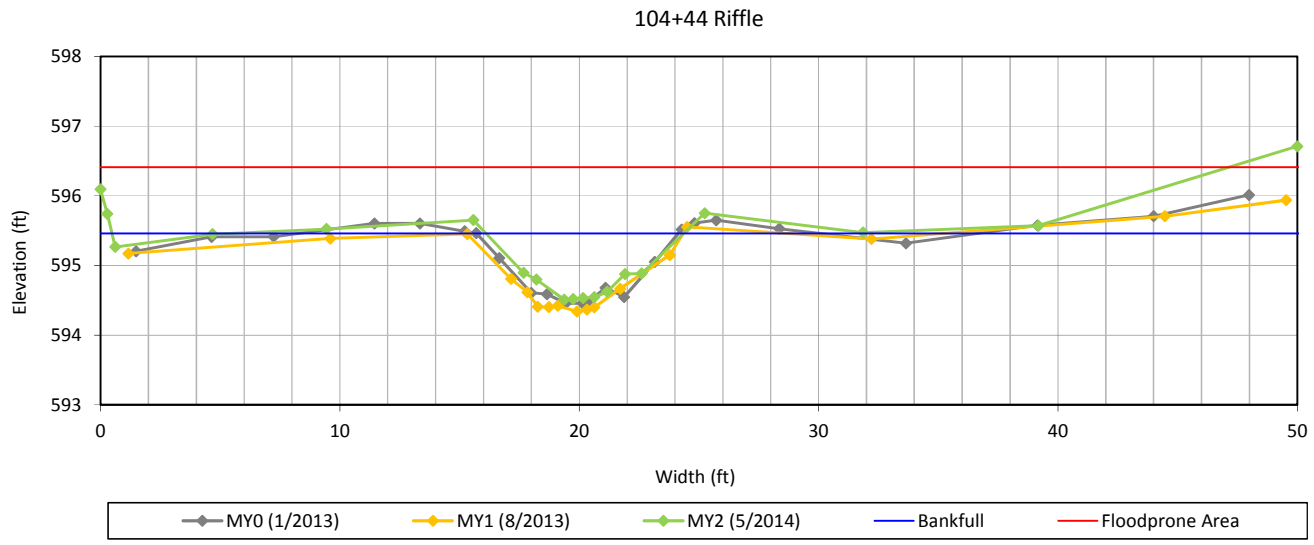


Longitudinal Profile Plots
Underwood Mitigation Site (NCEEP Project No. 94641)
Lindley Site; SF4A
Monitoring Year 2



Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2

Cross Section 1 - SF1



Bankfull Dimensions

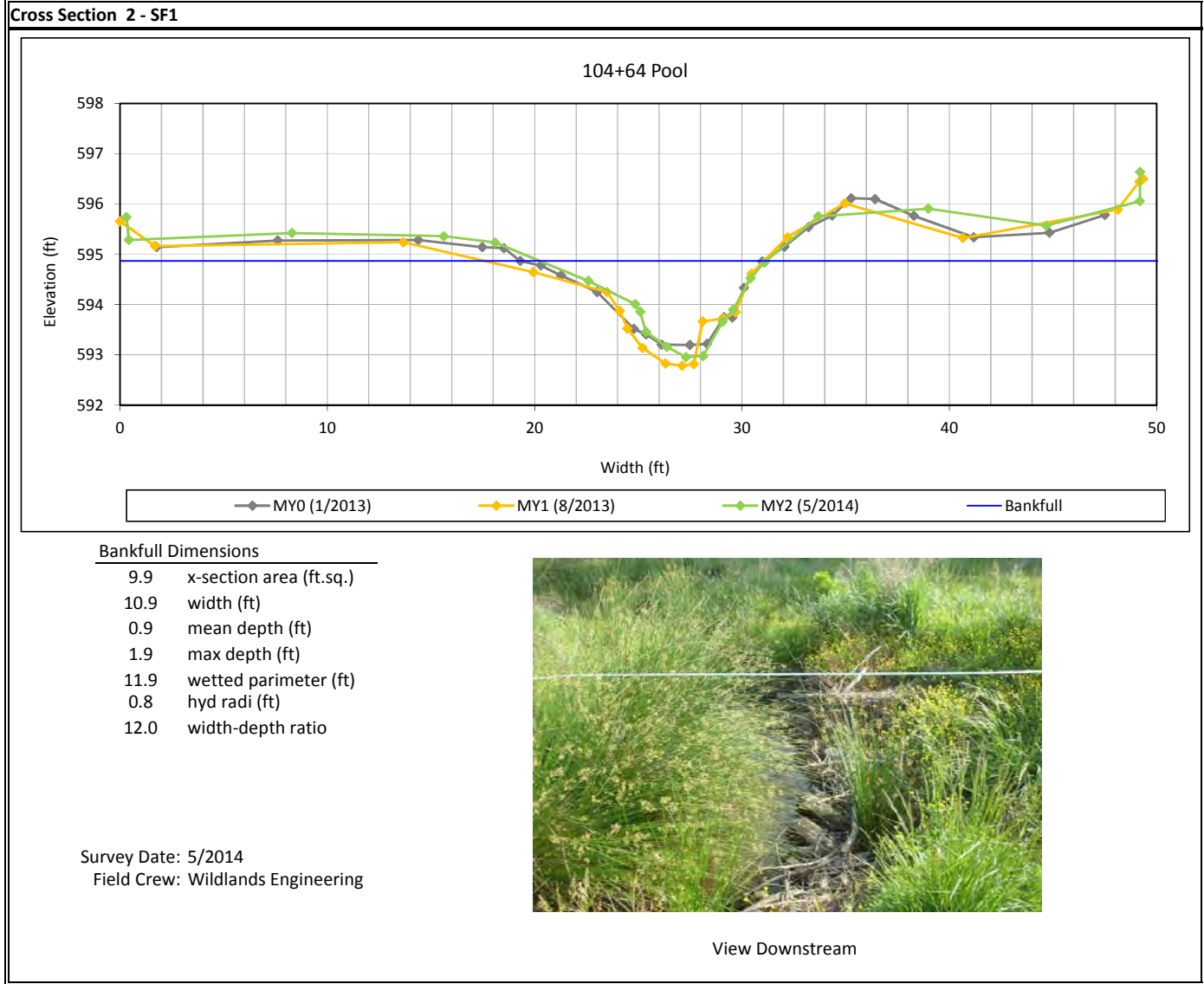
4.8	x-section area (ft.sq.)
8.2	width (ft)
0.6	mean depth (ft)
1.0	max depth (ft)
8.5	wetted perimeter (ft)
0.6	hyd radi (ft)
14.2	width-depth ratio
50.0	W flood prone area (ft)
6.1	entrenchment ratio
---	low bank height ratio

Survey Date: 5/2014
 Field Crew: Wildlands Engineering



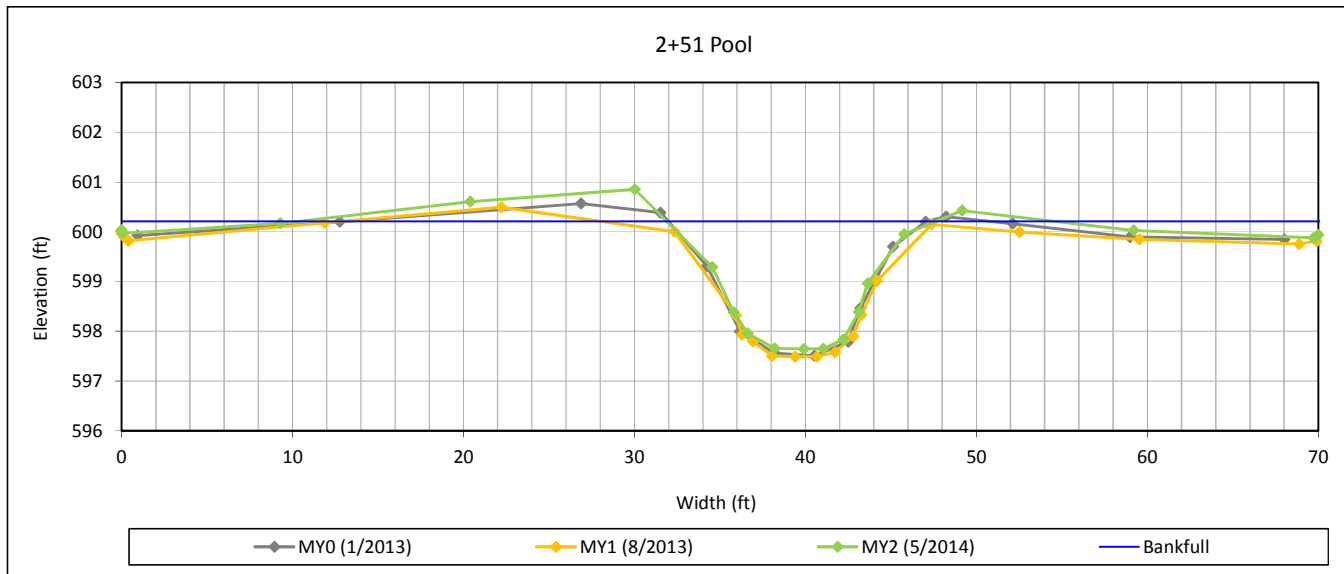
View Downstream

Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2



Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2

Cross Section 3 - UT2



Bankfull Dimensions

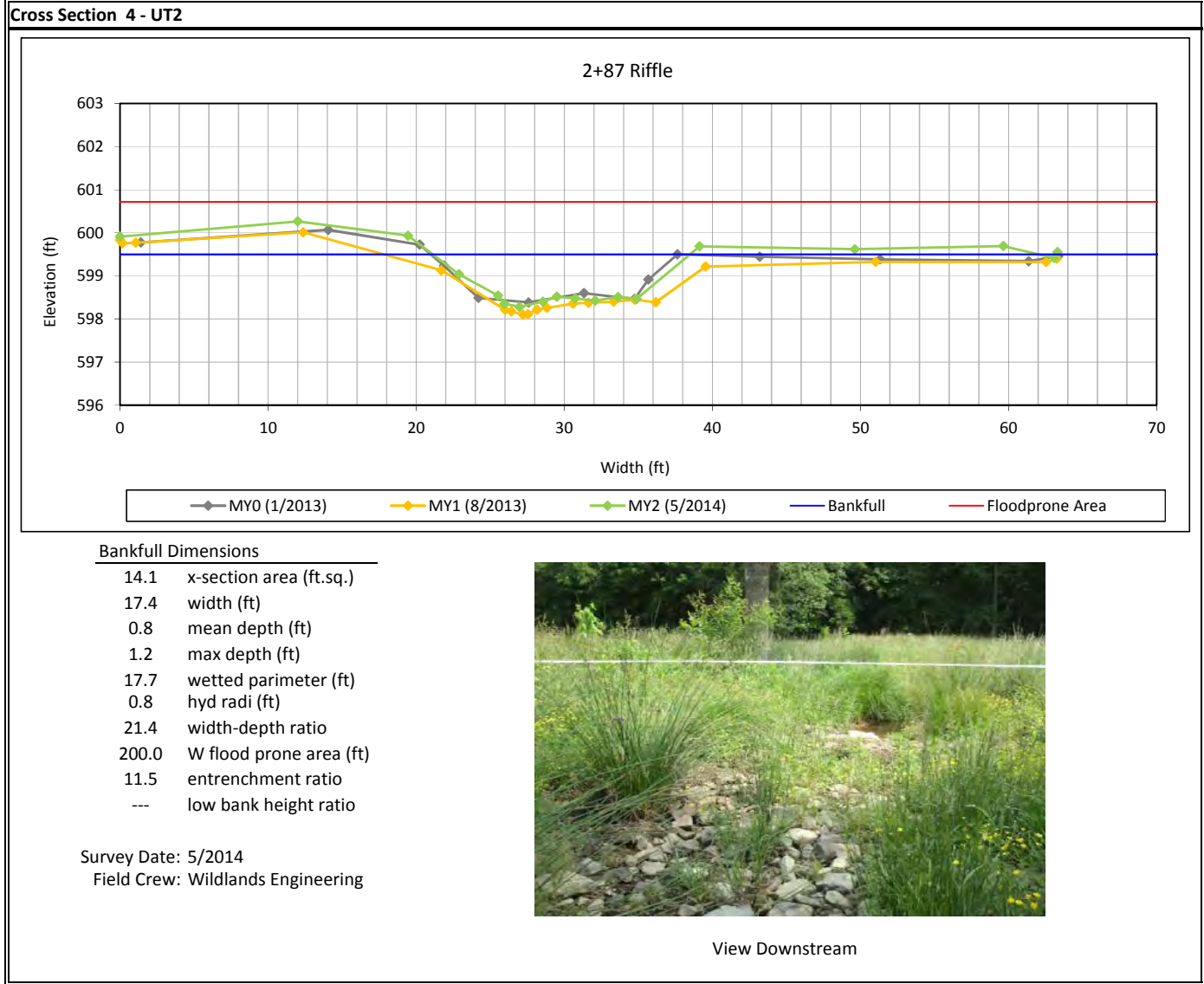
23.1	x-section area (ft.sq.)
15.7	width (ft)
1.5	mean depth (ft)
2.6	max depth (ft)
17.0	wetted perimeter (ft)
1.4	hyd radi (ft)
10.7	width-depth ratio

Survey Date: 5/2014
 Field Crew: Wildlands Engineering

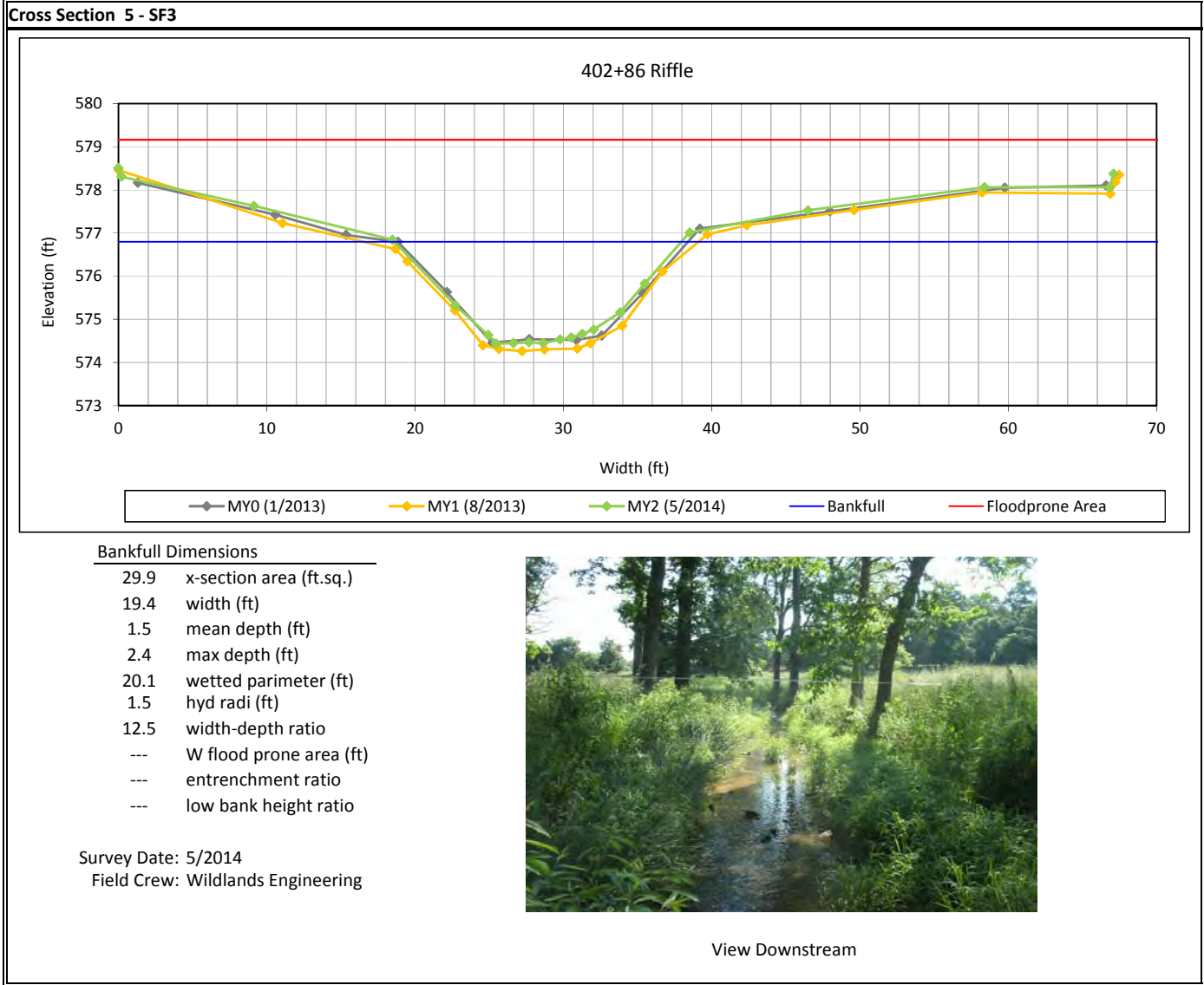


View Downstream

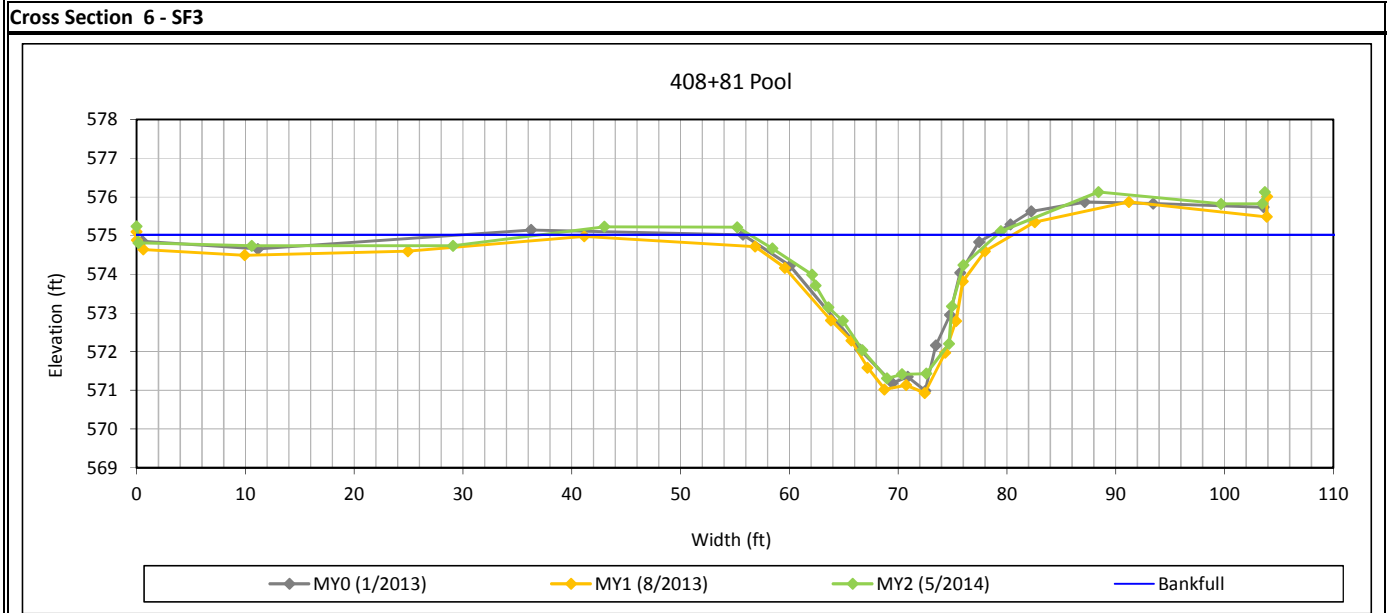
Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2



Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2



Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2



Bankfull Dimensions

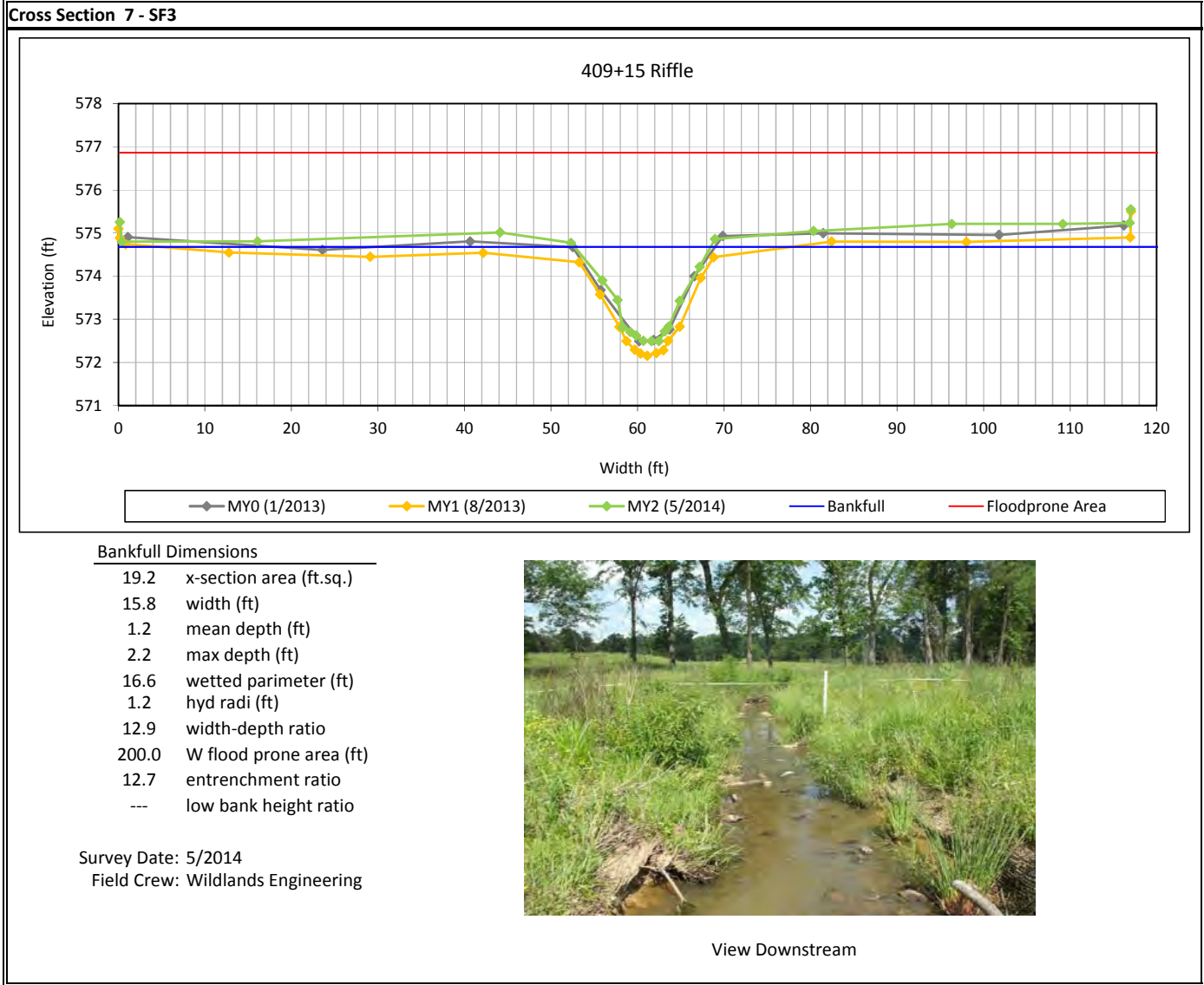
43.1	x-section area (ft.sq.)
22.7	width (ft)
1.9	mean depth (ft)
3.7	max depth (ft)
24.8	wetted parimeter (ft)
1.7	hyd radi (ft)
12.0	width-depth ratio

Survey Date: 5/2014
 Field Crew: Wildlands Engineering

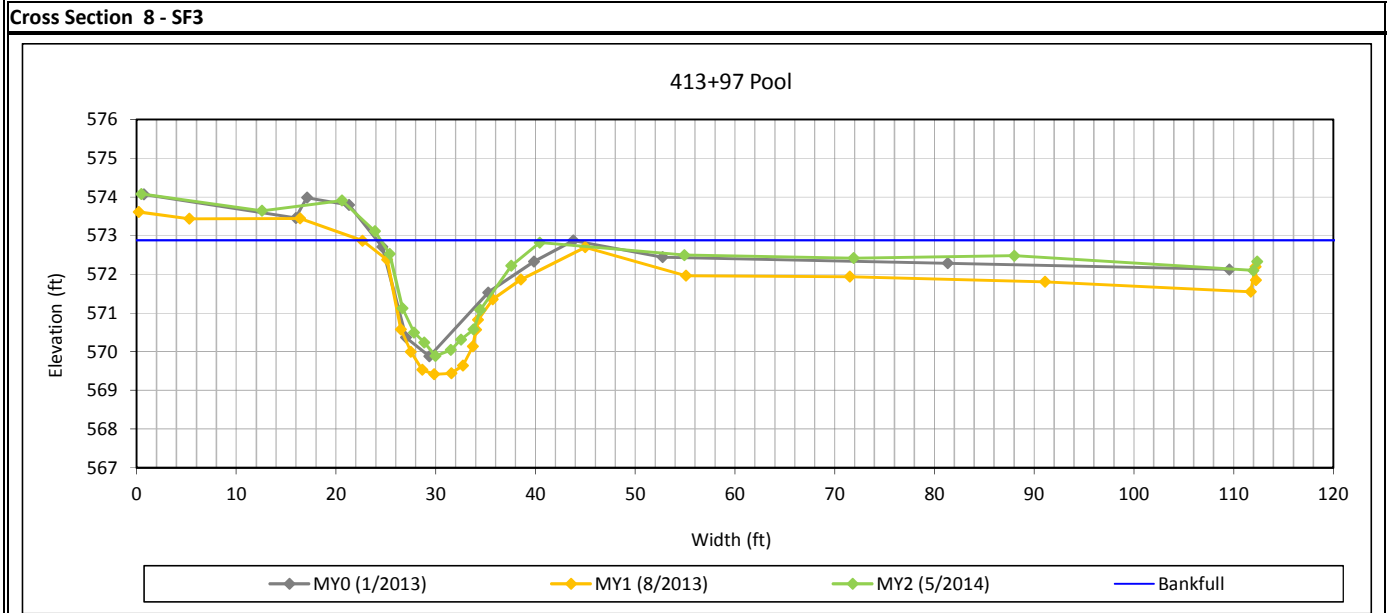


View Downstream

Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2



Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2



Bankfull Dimensions

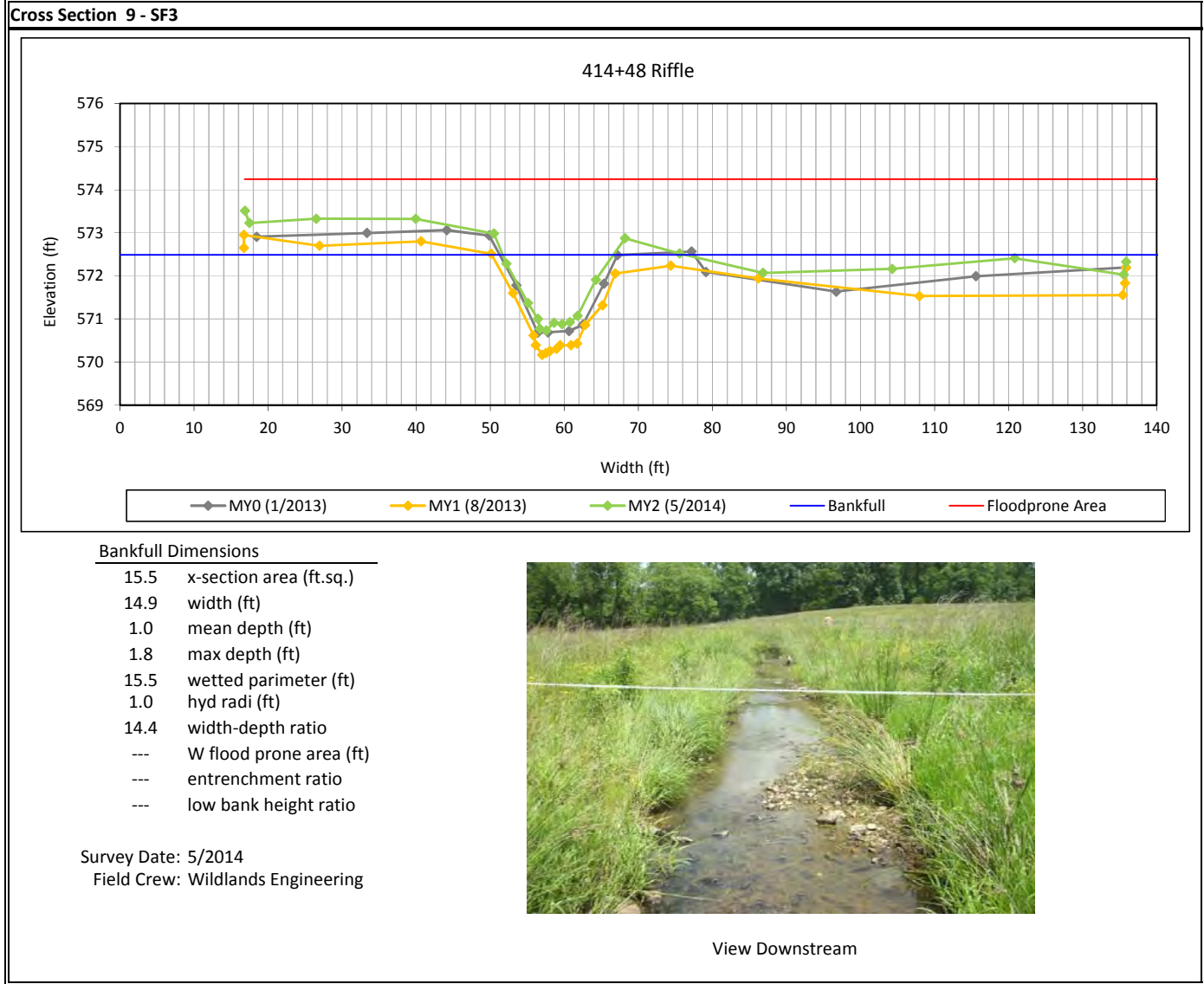
26.2	x-section area (ft.sq.)
15.9	width (ft)
1.6	mean depth (ft)
3.0	max depth (ft)
17.4	wetted parimeter (ft)
1.5	hyd radi (ft)
9.7	width-depth ratio

Survey Date: 5/2014
 Field Crew: Wildlands Engineering

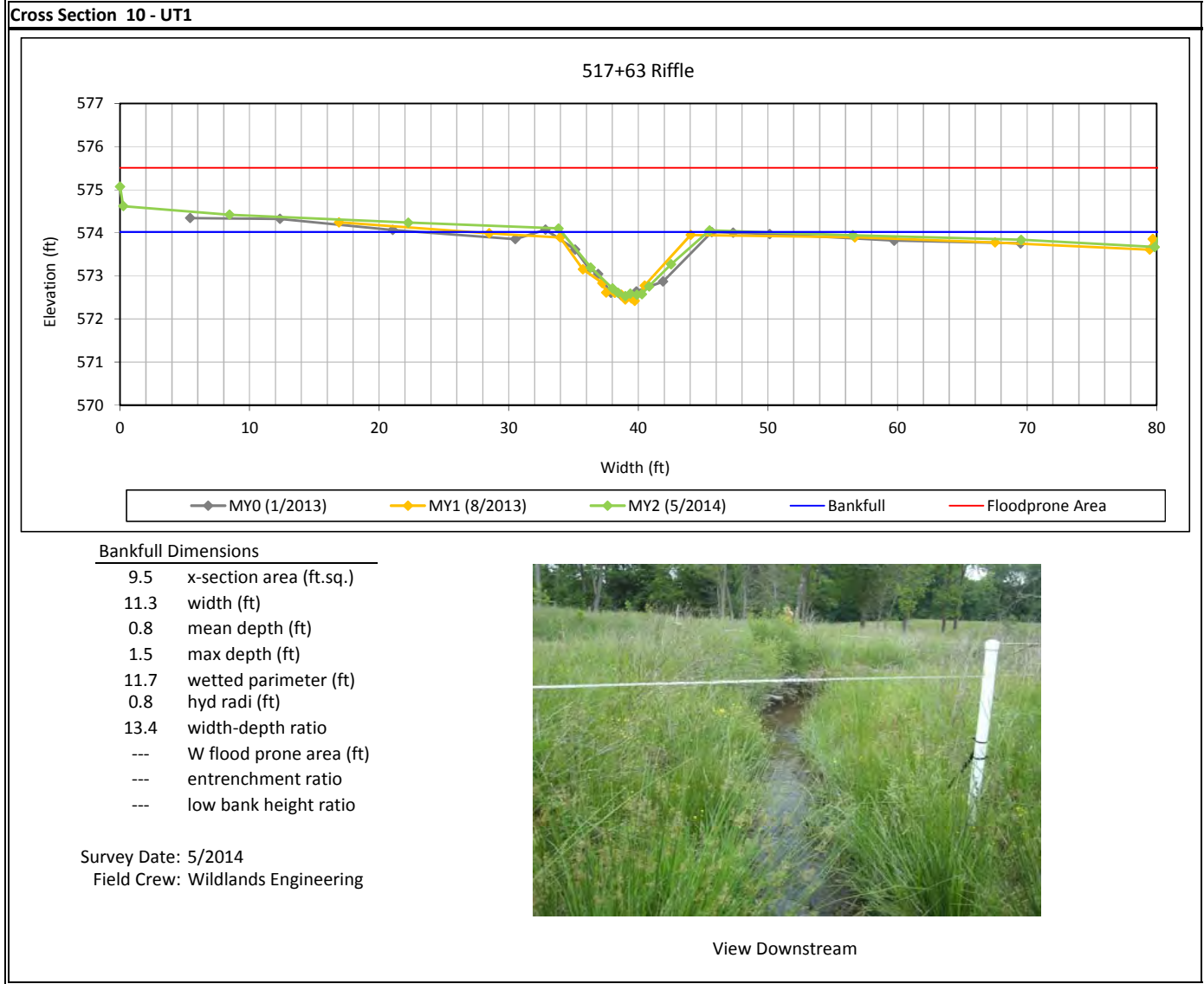


View Downstream

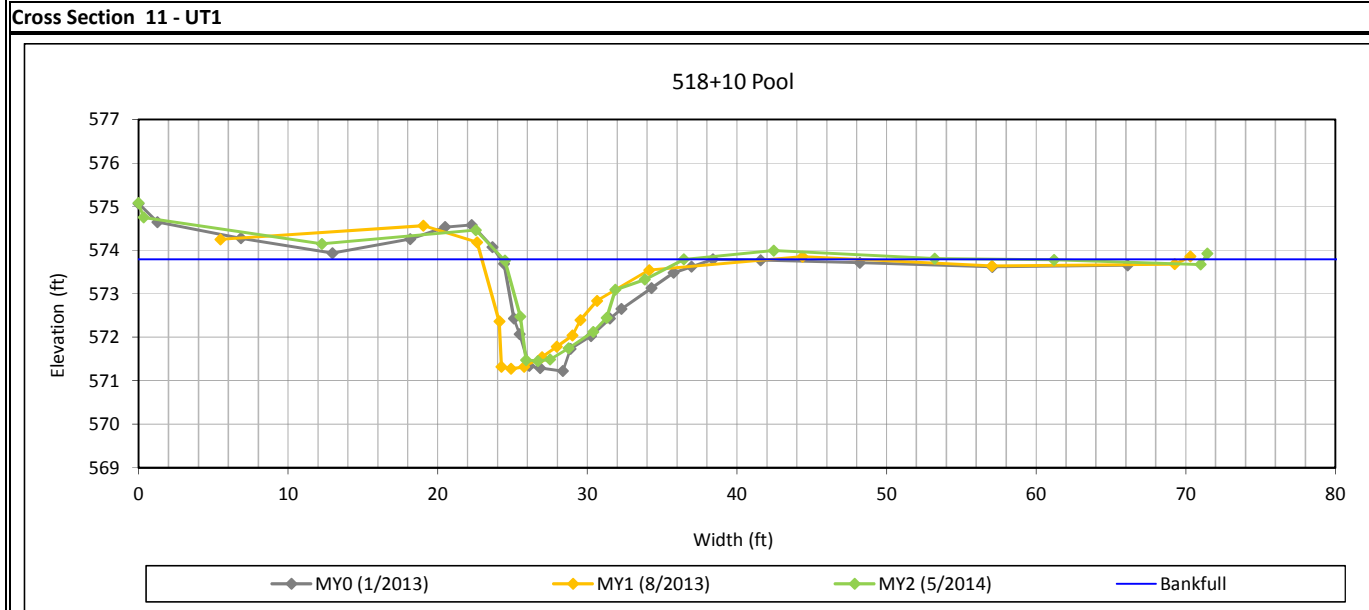
Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2



Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2



Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2



Bankfull Dimensions

14.6	x-section area (ft.sq.)
12.0	width (ft)
1.2	mean depth (ft)
2.3	max depth (ft)
13.8	wetted parimeter (ft)
1.1	hyd radi (ft)
10.0	width-depth ratio

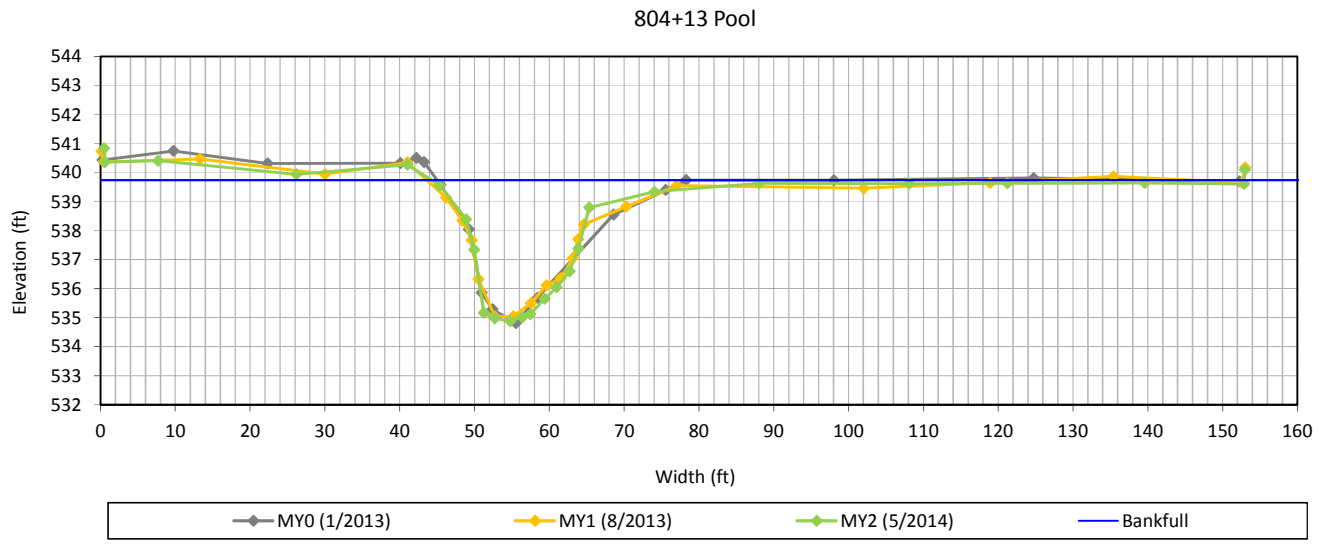
Survey Date: 5/2014
 Field Crew: Wildlands Engineering



View Downstream

Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2

Cross Section 12 - SF4



Bankfull Dimensions

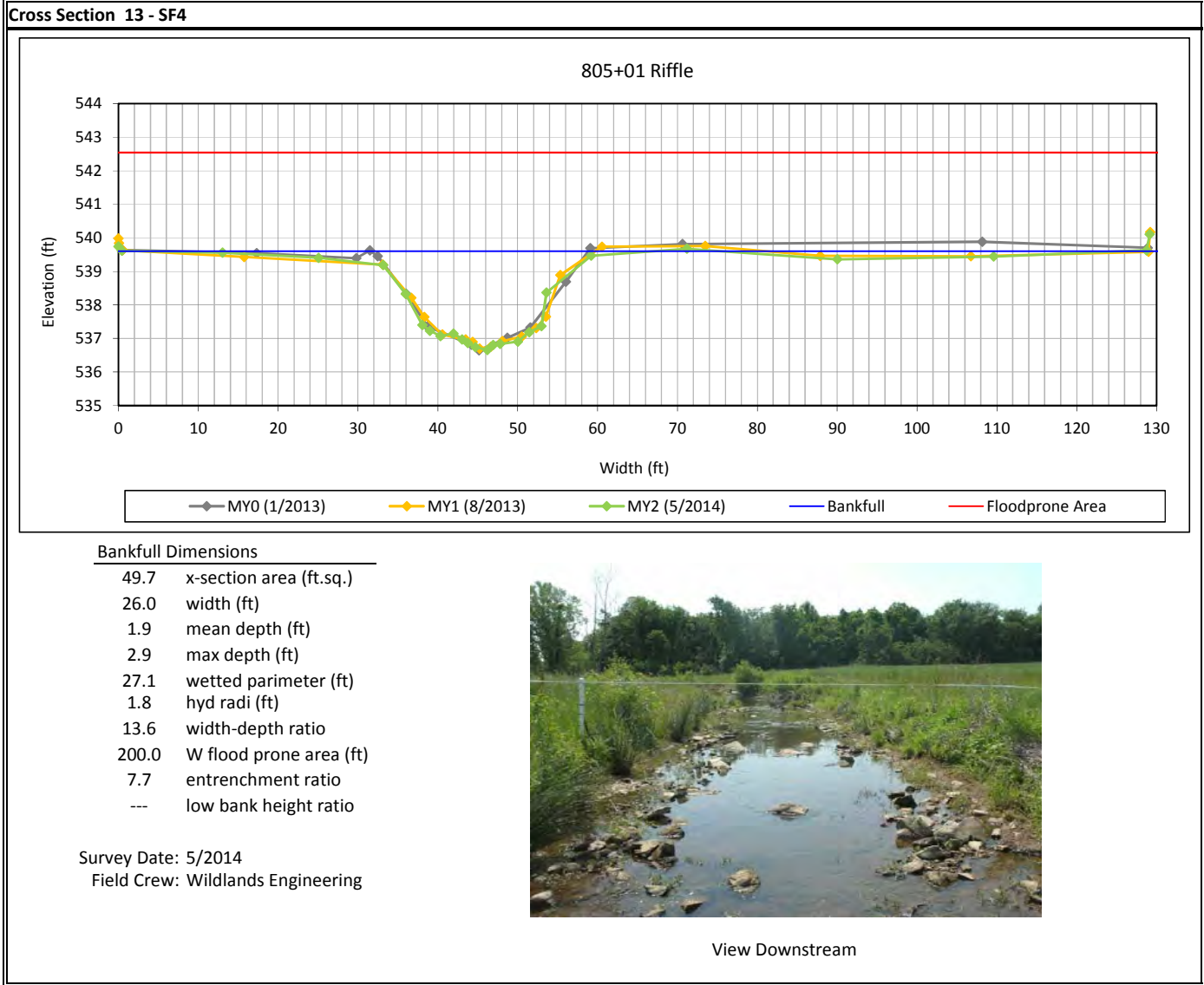
70.7	x-section area (ft.sq.)
29.8	width (ft)
2.4	mean depth (ft)
4.9	max depth (ft)
32.7	wetted parimeter (ft)
2.2	hyd radi (ft)
12.5	width-depth ratio

Survey Date: 5/2014
 Field Crew: Wildlands Engineering

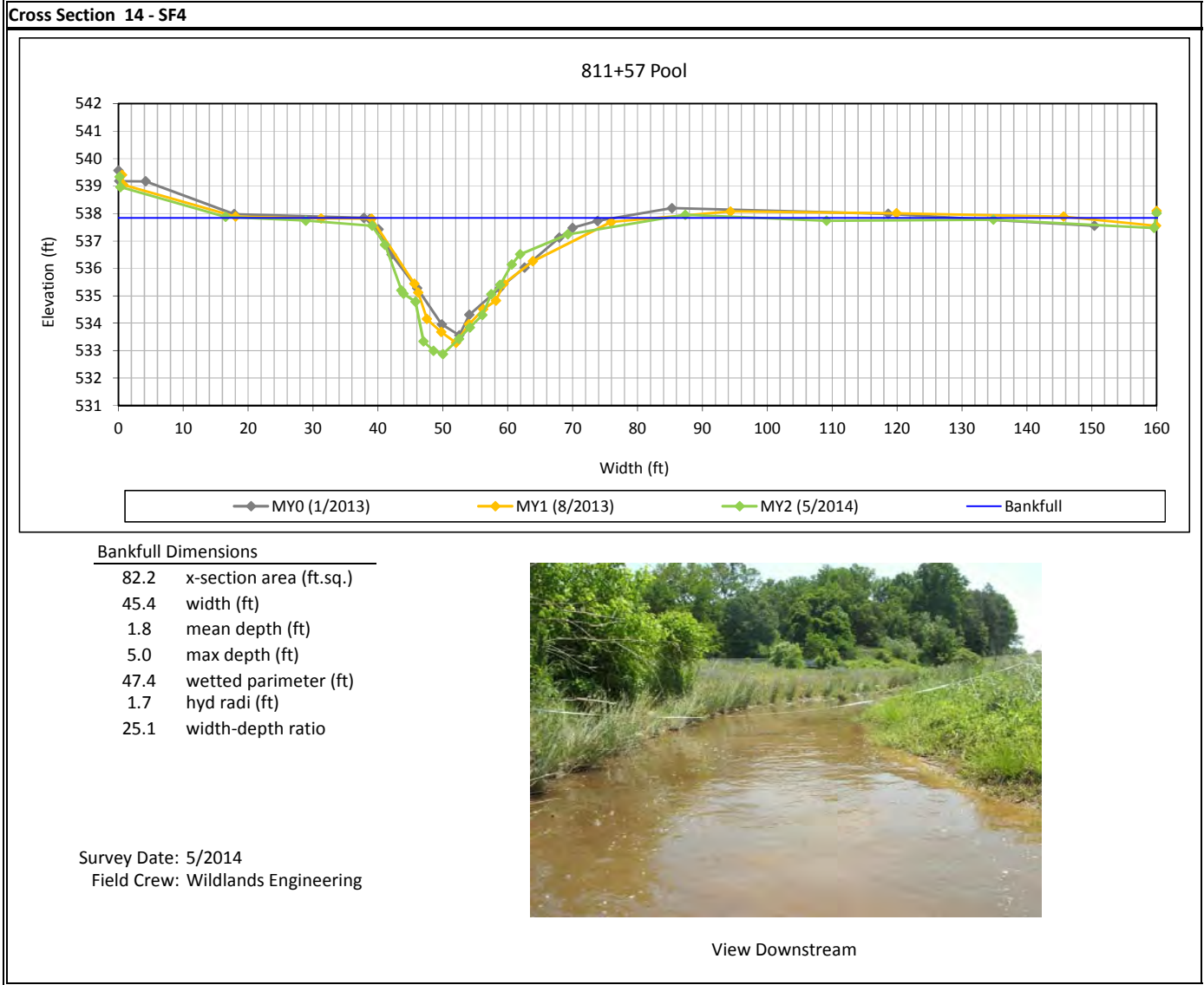


View Downstream

Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2

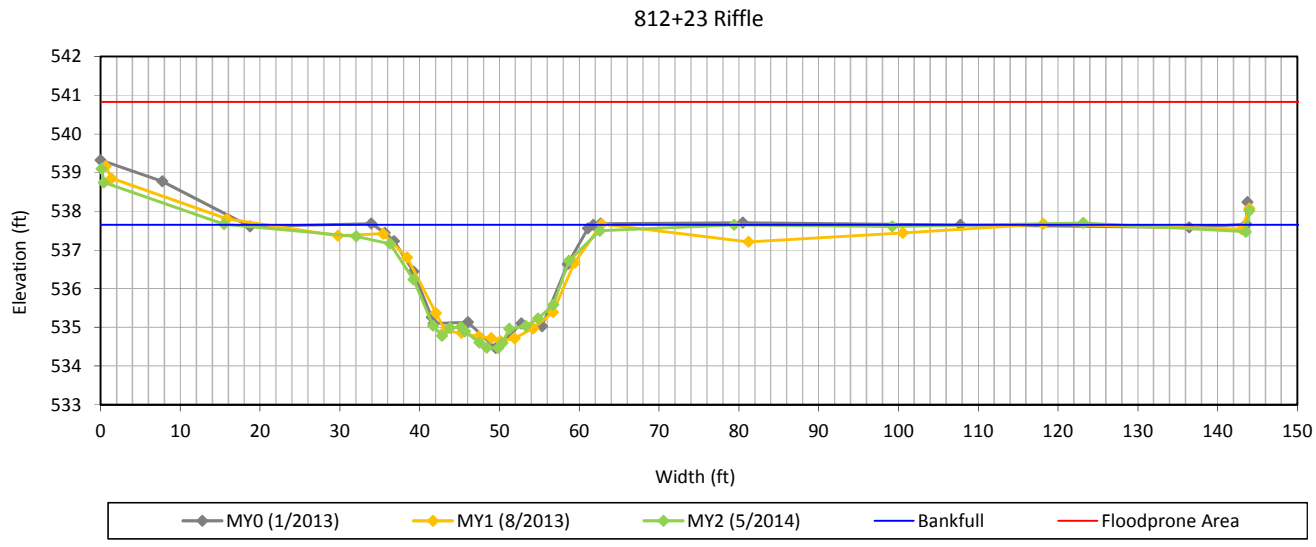


Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2



Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2

Cross Section 15 - SF4



Bankfull Dimensions

53.9	x-section area (ft.sq.)
26.2	width (ft)
2.1	mean depth (ft)
3.2	max depth (ft)
27.3	wetted parimeter (ft)
2.0	hyd radi (ft)
12.8	width-depth ratio
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height ratio

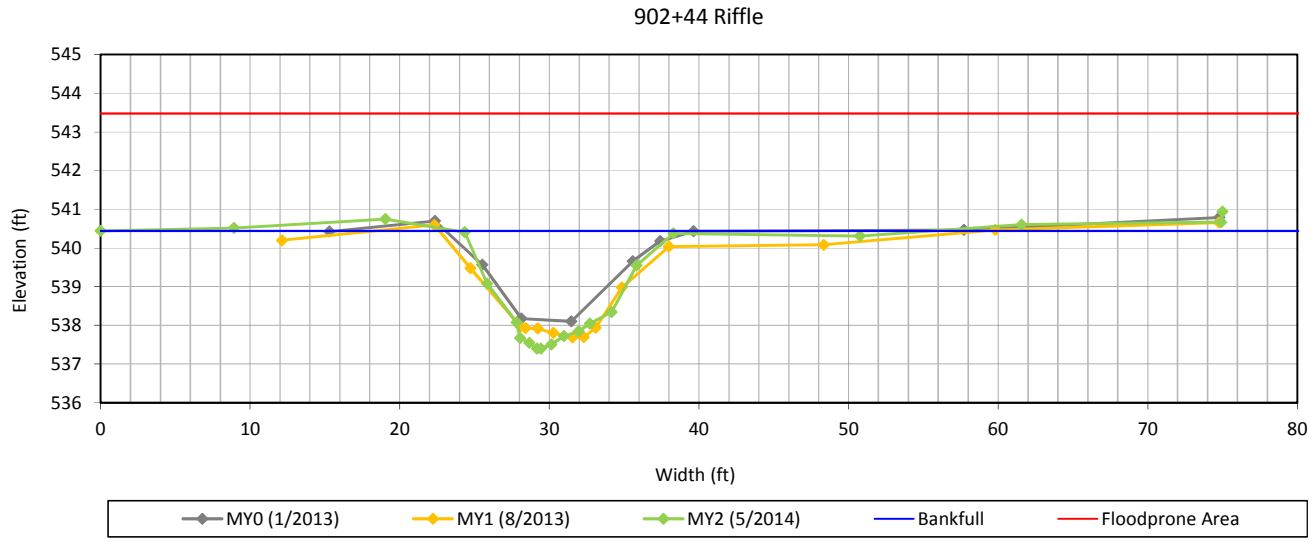
Survey Date: 5/2014
 Field Crew: Wildlands Engineering



View Downstream

Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2

Cross Section 16 - SF4a



Bankfull Dimensions

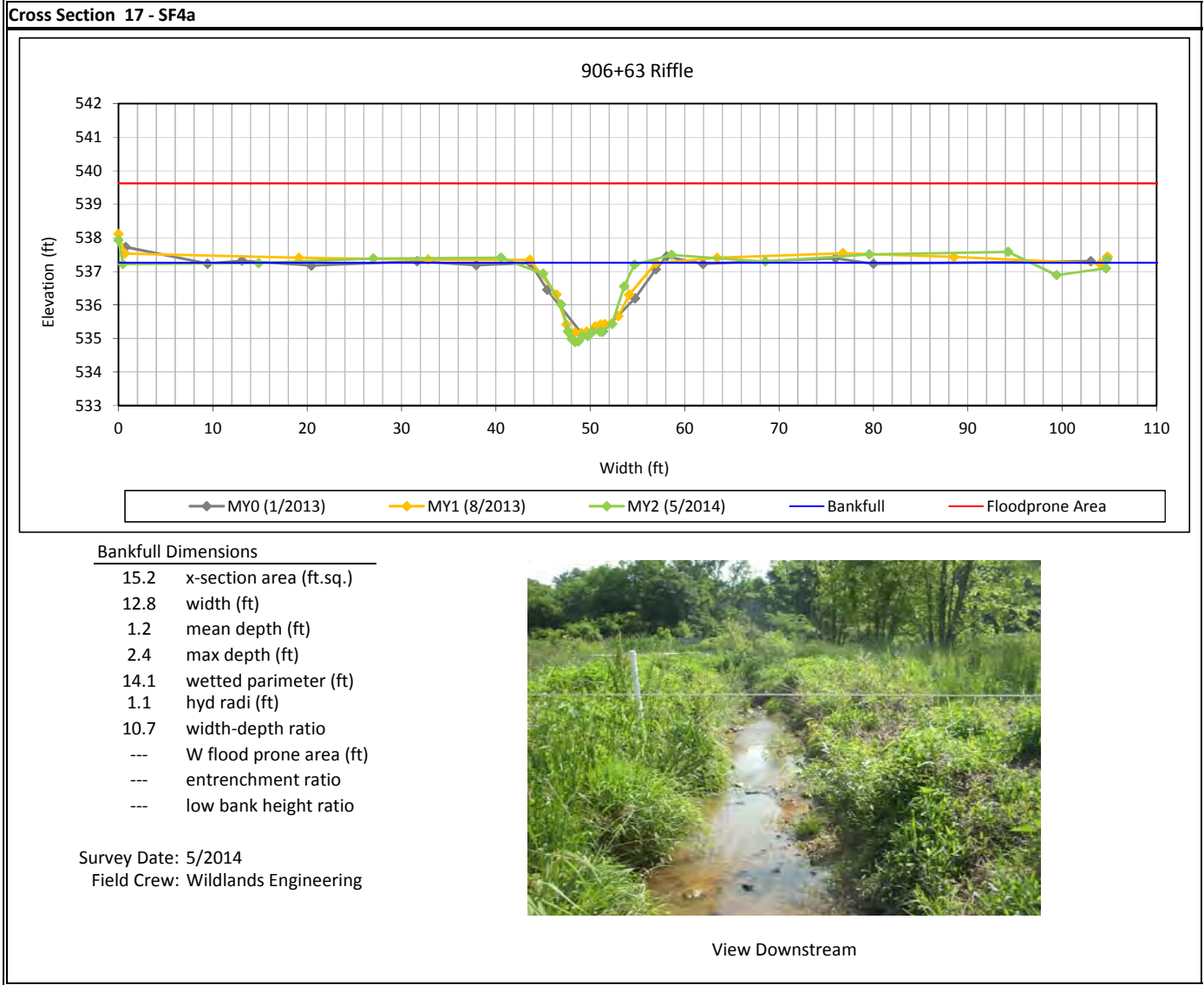
25.2	x-section area (ft.sq.)
13.9	width (ft)
1.8	mean depth (ft)
3.0	max depth (ft)
15.6	wetted parimeter (ft)
1.6	hyd radi (ft)
7.7	width-depth ratio
---	W flood prone area (ft)
---	entrenchment ratio
---	low bank height ratio

Survey Date: 5/2014
 Field Crew: Wildlands Engineering



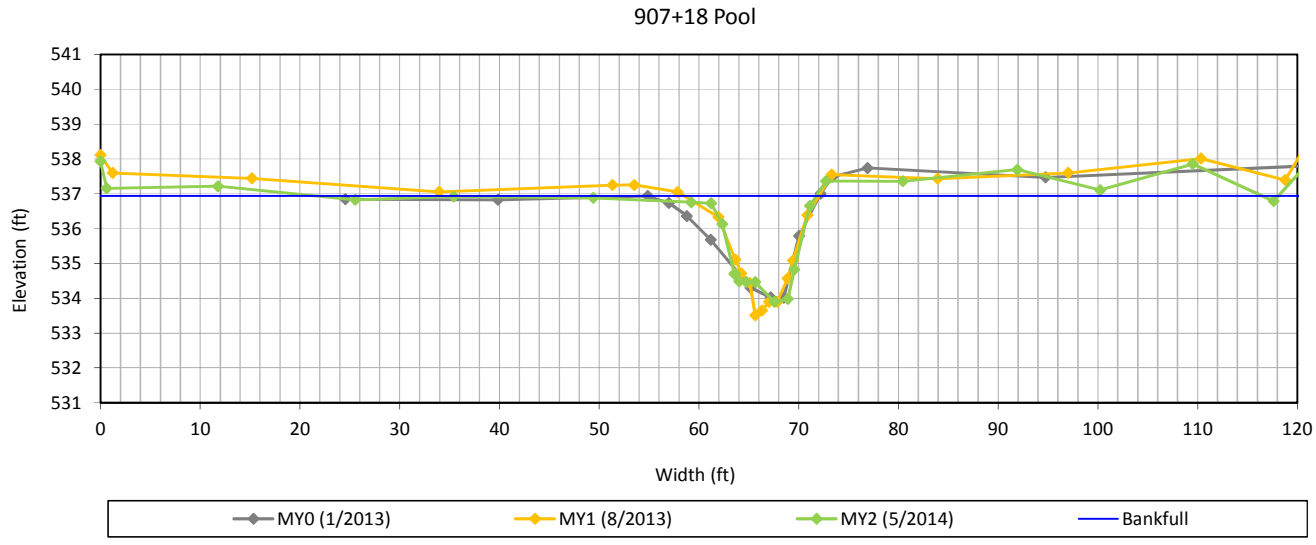
View Downstream

Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2



Cross-Section Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Monitoring Year 2

Cross Section 18 - SF4a



Bankfull Dimensions

20.5	x-section area (ft.sq.)
10.6	width (ft)
1.9	mean depth (ft)
3.0	max depth (ft)
12.8	wetted perimeter (ft)
1.6	hyd radi (ft)
5.4	width-depth ratio

Survey Date: 5/2014
 Field Crew: Wildlands Engineering

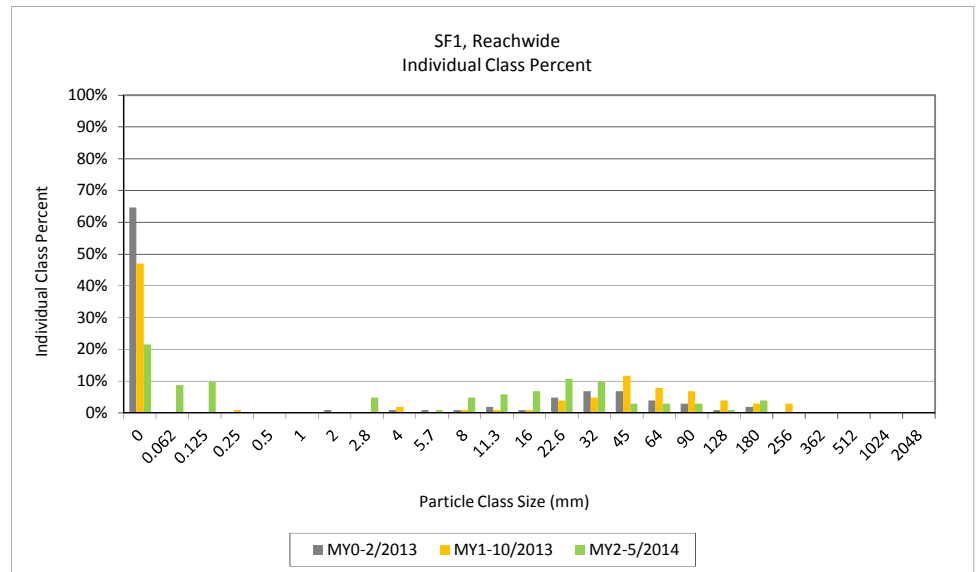


View Downstream

Reachwide and Cross-Section Pebble Count Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Harris Site; SF1, Reachwide
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count			SF1 Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	20	22	22	22
SAND	Very fine	0.062	0.125		9	9	9	31
	Fine	0.125	0.250		10	10	10	41
	Medium	0.250	0.500					41
	Coarse	0.5	1.0					41
	Very Coarse	1.0	2.0					41
GRAVEL	Very Fine	2.0	2.8					41
	Very Fine	2.8	4.0		5	5	5	46
	Fine	4.0	5.7					46
	Fine	5.7	8.0		1	1	1	47
	Medium	8.0	11.3	5		5	5	52
	Medium	11.3	16.0	6		6	6	58
	Coarse	16.0	22.6	6	1	7	7	65
	Coarse	22.6	32	8	3	11	11	76
	Very Coarse	32	45	9	1	10	10	86
Very Coarse	45	64	3		3	3	89	
COBBLE	Small	64	90	3		3	3	92
	Small	90	128	3		3	3	95
	Large	128	180	1		1	1	96
	Large	180	256	4		4	4	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
BOULDER	Large/Very Large	1024	2048					100
								100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

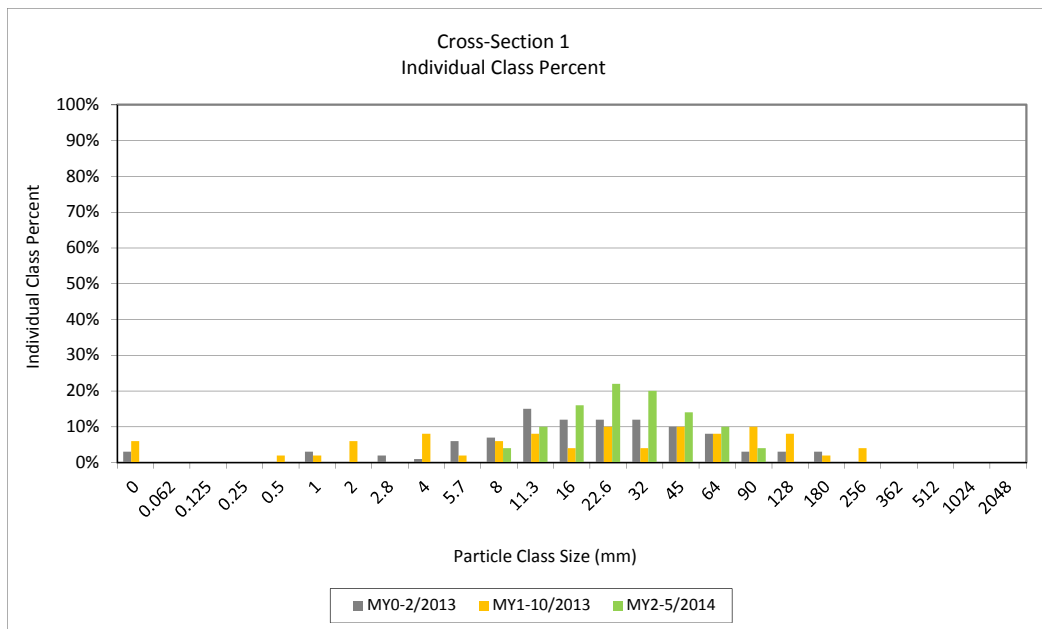
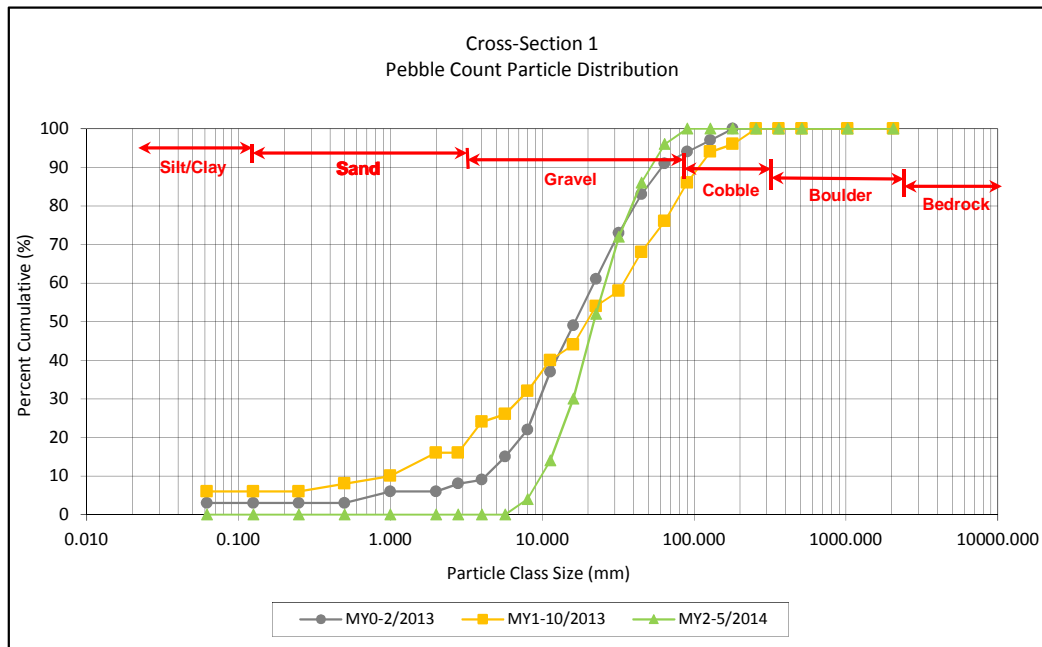
Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	0.2
D ₅₀ =	9.7
D ₈₄ =	42.0
D ₉₅ =	128.0
D ₁₀₀ =	256.0



Reachwide and Cross-Section Substrate Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Harris Site: SF1, Cross-Section 1
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count	Cross-Section 1 Summary	
		min	max		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			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.7			0
	Fine	5.7	8.0			0
	Medium	8.0	11.3	4	4	4
	Medium	11.3	16.0	10	10	14
	Coarse	16.0	22.6	16	16	30
	Coarse	22.6	32	22	22	52
COBBLE	Very Coarse	32	45	20	20	72
	Very Coarse	45	64	14	14	86
BOULDER	Small	64	90	10	10	96
	Small	90	128	4	4	100
	Large	128	180			100
BEDROCK	Large	180	256			100
	Small	256	362			100
	Small	362	512			100
BOULDER	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
Total				100	100	100

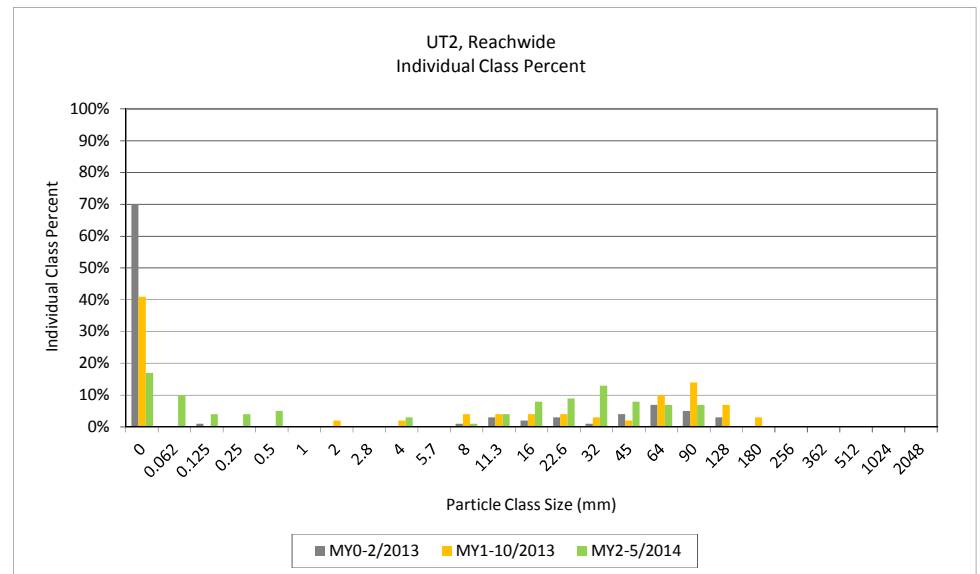
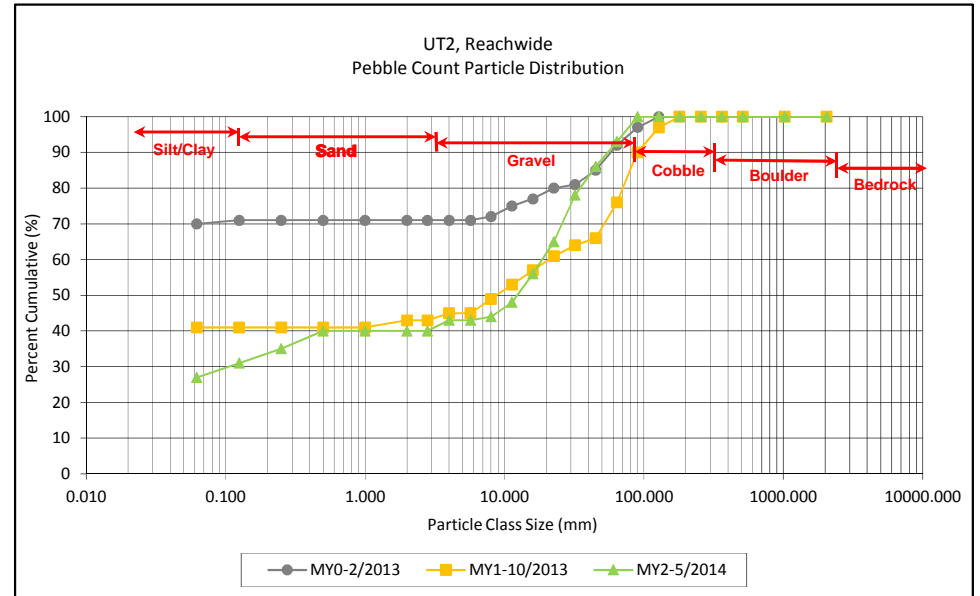
Cross-Section 1 Channel materials (mm)	
D ₁₆ =	16.7
D ₃₅ =	24.5
D ₅₀ =	31.0
D ₈₄ =	60.9
D ₉₅ =	87.0
D ₁₀₀ =	128.0



Reachwide and Cross-Section Pebble Count Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Harris Site: UT2, Reachwide
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count			UT2 Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		17	17	17	17
SAND	Very fine	0.062	0.125		10	10	10	27
	Fine	0.125	0.250	2	2	4	4	31
	Medium	0.250	0.500		4	4	4	35
	Coarse	0.5	1.0		5	5	5	40
	Very Coarse	1.0	2.0					40
GRAVEL	Very Fine	2.0	2.8					40
	Very Fine	2.8	4.0					40
	Fine	4.0	5.7		3	3	3	43
	Fine	5.7	8.0					43
	Medium	8.0	11.3	1		1	1	44
	Medium	11.3	16.0	4		4	4	48
	Coarse	16.0	22.6	5	3	8	8	56
	Coarse	22.6	32	9		9	9	65
	Very Coarse	32	45	11	2	13	13	78
	Very Coarse	45	64	6	2	8	8	86
COBBLE	Small	64	90	6	1	7	7	93
	Small	90	128	6	1	7	7	100
	Large	128	180					100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
BEDROCK	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

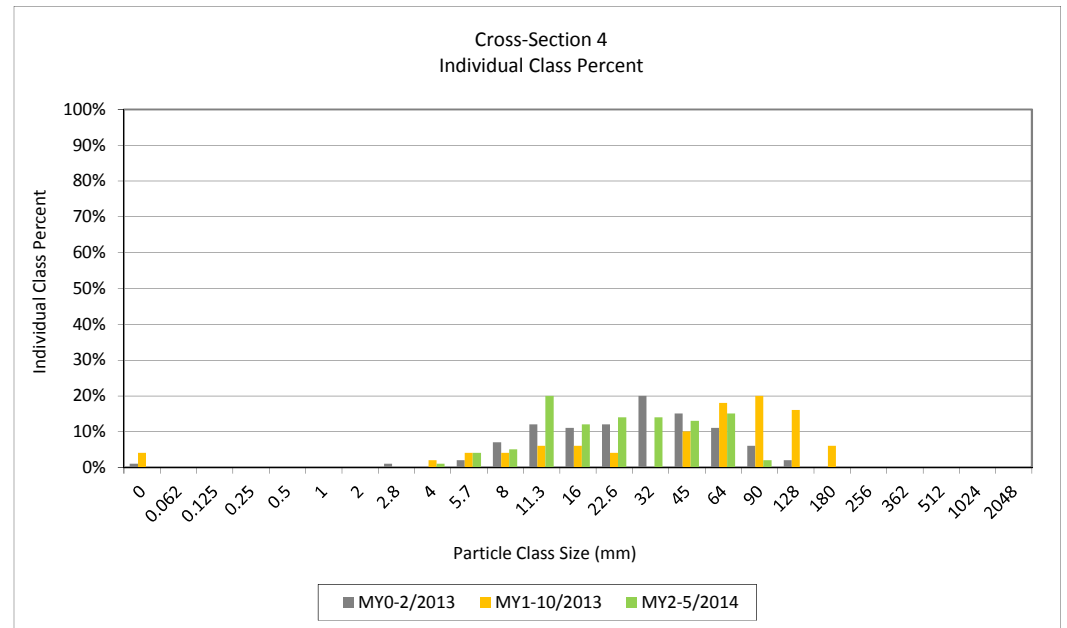
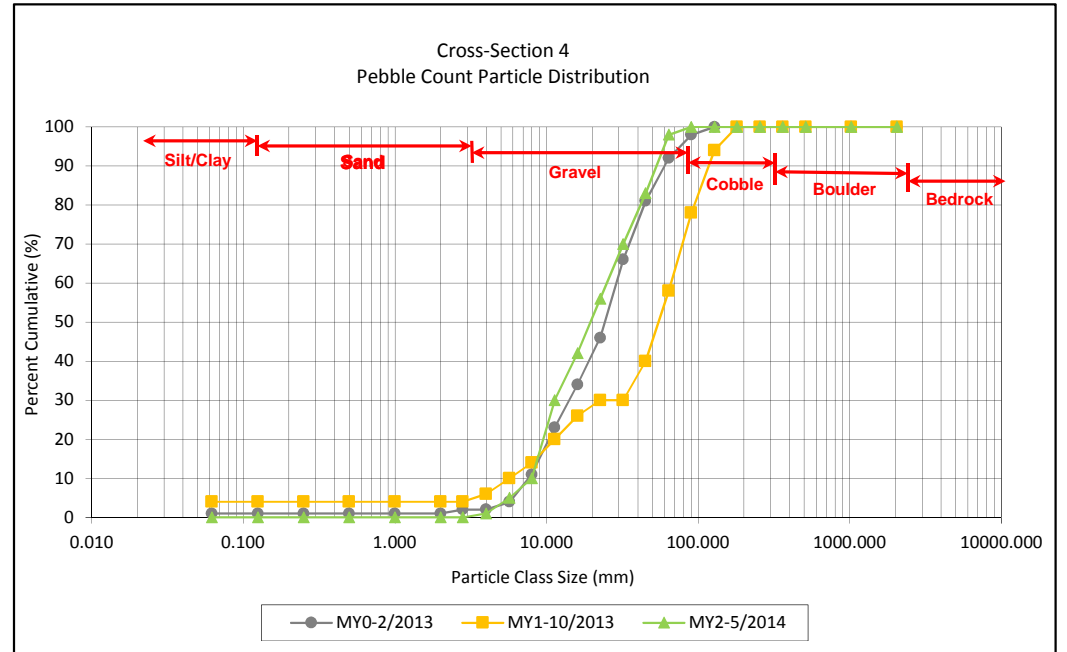
Reachwide	
Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	0.5
D ₅₀ =	17.4
D ₈₄ =	58.6
D ₉₅ =	99.5
D ₁₀₀ =	128.0



Reachwide and Cross-Section Substrate Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Harris Site; UT2, Cross-Section 4
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count Total	Cross-Section 4 Summary	
		min	max		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			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.7	1	1	1
	Fine	5.7	8.0	4	4	5
	Medium	8.0	11.3	5	5	10
	Medium	11.3	16.0	20	20	30
	Coarse	16.0	22.6	12	12	42
	Coarse	22.6	32	14	14	56
	Very Coarse	32	45	14	14	70
COBBLE	Very Coarse	45	64	13	13	83
	Small	64	90	15	15	98
	Small	90	128	2	2	100
	Large	128	180			100
BOULDER	Large	180	256			100
	Small	256	362			100
	Small	362	512			100
BEDROCK	Medium	512	1024			100
	Large/Very Large	1024	2048			100
Bedrock		2048	>2048			100
Total				100	100	100

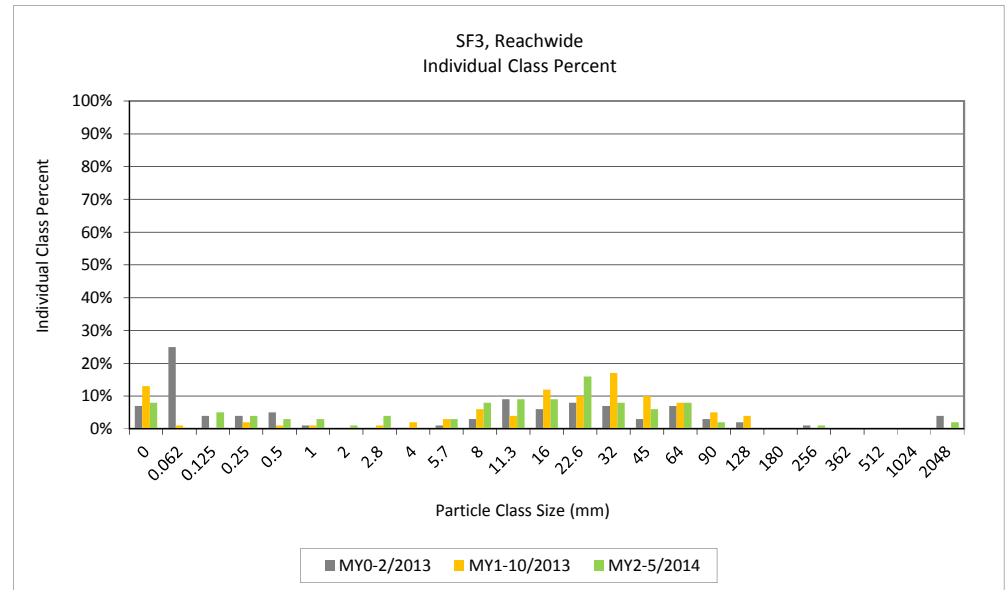
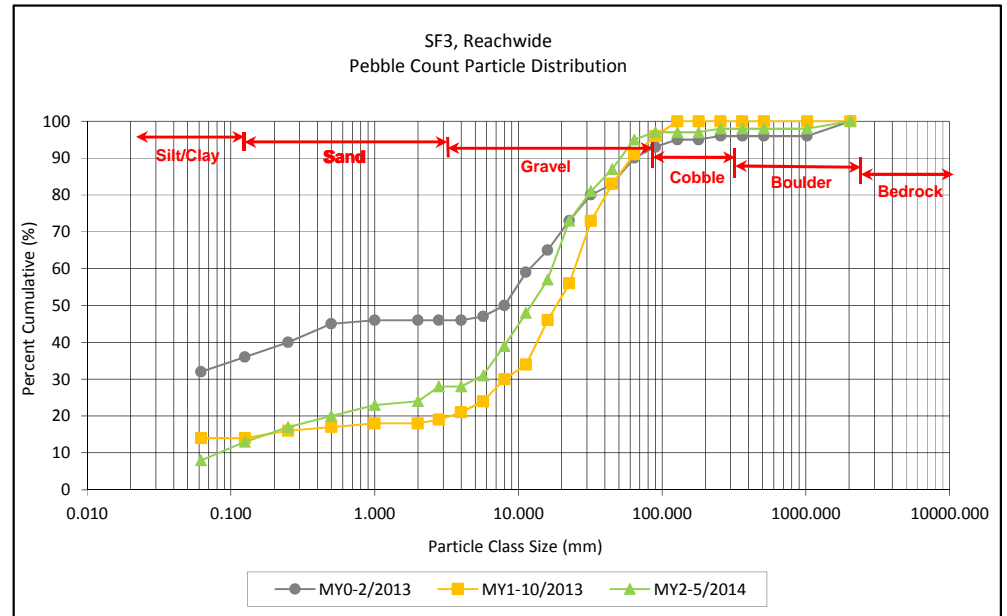
Cross-Section 4 Channel materials (mm)	
D ₁₆ =	12.3
D ₃₅ =	18.5
D ₅₀ =	27.6
D ₈₄ =	65.5
D ₉₅ =	84.1
D ₁₀₀ =	128.0



Reachwide and Cross-Section Pebble Count Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Harris Site; SF3, Reachwide
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count			SF3 Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		8	8	8	8
SAND	Very fine	0.062	0.125					8
	Fine	0.125	0.250		5	5	5	13
	Medium	0.250	0.500		4	4	4	17
	Coarse	0.5	1.0		3	3	3	20
	Very Coarse	1.0	2.0		3	3	3	23
GRAVEL	Very Fine	2.0	2.8		1	1	1	24
	Very Fine	2.8	4.0	1	3	4	4	28
	Fine	4.0	5.7					28
	Fine	5.7	8.0		3	3	3	31
	Medium	8.0	11.3	3	5	8	8	39
	Medium	11.3	16.0	7	2	9	9	48
	Coarse	16.0	22.6	5	4	9	9	57
	Coarse	22.6	32	13	3	16	16	73
	Very Coarse	32	45	6	2	8	8	81
Very Coarse	45	64	5	1	6	6	87	
COBBLE	Small	64	90	6	2	8	8	95
	Small	90	128	2		2	2	97
	Large	128	180					97
	Large	180	256					97
BOULDER	Small	256	362	1		1	1	98
	Small	362	512					98
	Medium	512	1024					98
BEDROCK	Large/Very Large	1024	2048					98
	Bedrock	2048	>2048	1	1	2	2	100
Total				50	50	100	100	100

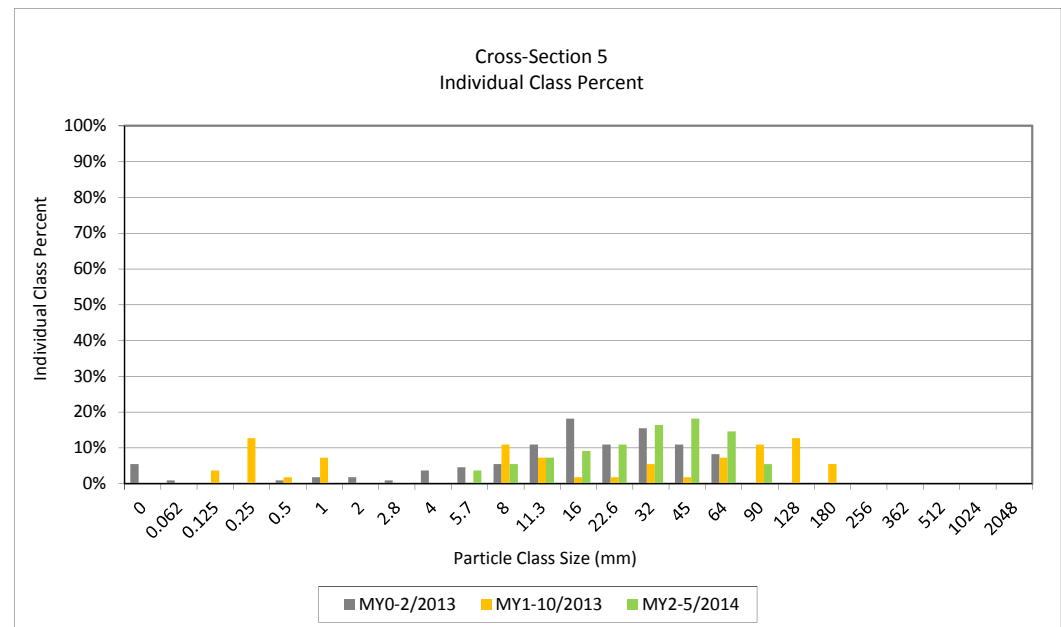
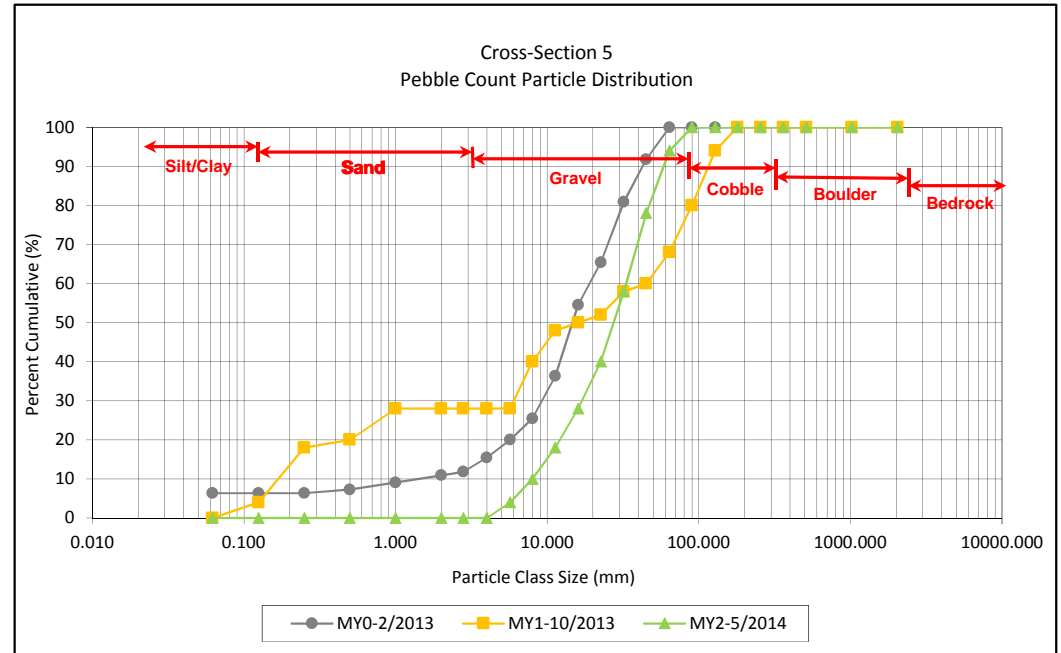
Reachwide	
Channel materials (mm)	
D ₁₆ =	0.42
D ₃₅ =	9.38
D ₅₀ =	17.3
D ₈₄ =	53.7
D ₉₅ =	90.0
D ₁₀₀ =	>2048



Reachwide and Cross-Section Substrate Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Harris Site: SF3, Cross-Section 5
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count	Cross-Section 5 Summary	
		min	max		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			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.7			0
	Fine	5.7	8.0	4	4	4
	Medium	8.0	11.3	6	6	10
	Medium	11.3	16.0	8	8	18
	Coarse	16.0	22.6	10	10	28
	Coarse	22.6	32	12	12	40
	Very Coarse	32	45	18	18	58
COBBLE	Very Coarse	45	64	20	20	78
	Small	64	90	16	16	94
	Small	90	128	6	6	100
	Large	128	180			100
BOULDER	Large	180	256			100
	Small	256	362			100
	Small	362	512			100
BOULDER	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
Total				100	100	100

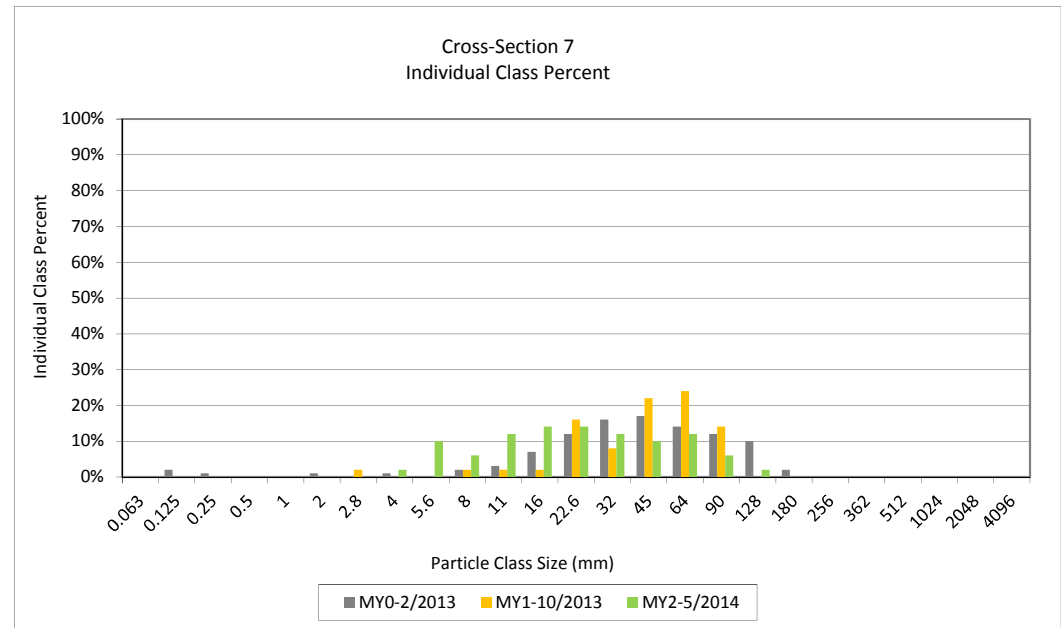
Cross-Section 5 Channel materials (mm)	
D ₁₆ =	14.6
D ₃₅ =	27.7
D ₅₀ =	38.7
D ₈₄ =	72.7
D ₉₅ =	95.4
D ₁₀₀ =	128.0



Reachwide and Cross-Section Substrate Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Harris Site; SF3, Cross-Section 7
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count Total	Cross-Section 7 Summary	
		min	max		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			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0	2	2	2
	Fine	4.0	5.7	10	10	12
	Fine	5.7	8.0	6	6	18
	Medium	8.0	11.3	12	12	30
	Medium	11.3	16.0	14	14	44
	Coarse	16.0	22.6	14	14	58
	Coarse	22.6	32	12	12	70
	Very Coarse	32	45	10	10	80
COBBLE	Very Coarse	45	64	12	12	92
	Small	64	90	6	6	98
	Small	90	128	2	2	100
BOULDER	Large	128	180			100
	Large	180	256			100
BEDROCK	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
BOULDER	Large/Very Large	1024	2048			100
	Bedrock	2048	>2048			100
Total				100	100	100

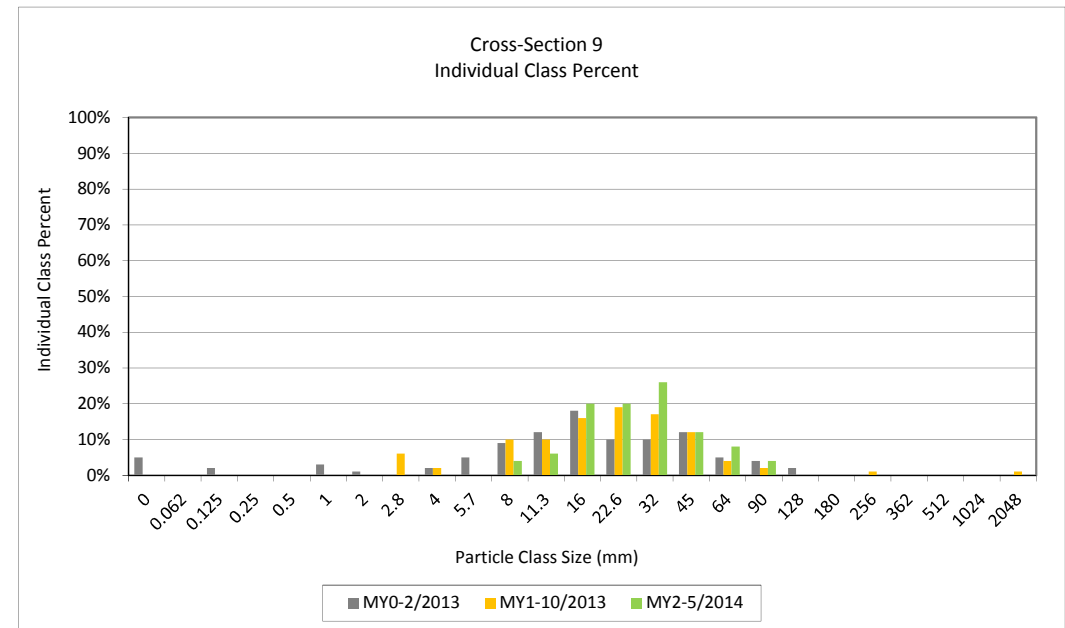
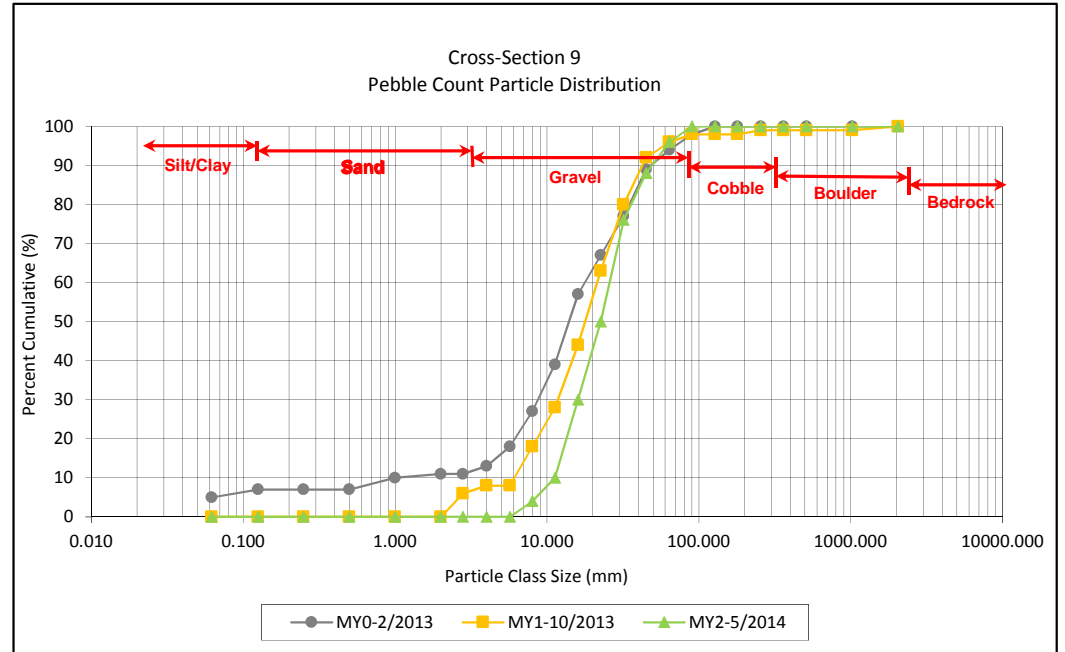
Cross-Section 7 Channel materials (mm)	
D ₁₆ =	7.1
D ₃₅ =	12.6
D ₅₀ =	18.6
D ₈₄ =	50.6
D ₉₅ =	75.9
D ₁₀₀ =	128.0



Reachwide and Cross-Section Substrate Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Harris Site: SF3, Cross-Section 9
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count	Cross-Section 9 Summary	
		min	max		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			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.7			0
	Fine	5.7	8.0			0
	Medium	8.0	11.3	4	4	4
	Medium	11.3	16.0	6	6	10
	Coarse	16.0	22.6	20	20	30
	Coarse	22.6	32	20	20	50
	Very Coarse	32	45	26	26	76
Very Coarse	45	64	12	12	88	
COBBLE	Small	64	90	8	8	96
	Small	90	128	4	4	100
	Large	128	180			100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
BEDROCK	Large/Very Large	1024	2048			100
	Bedrock	2048	>2048			100
Total				100	100	100

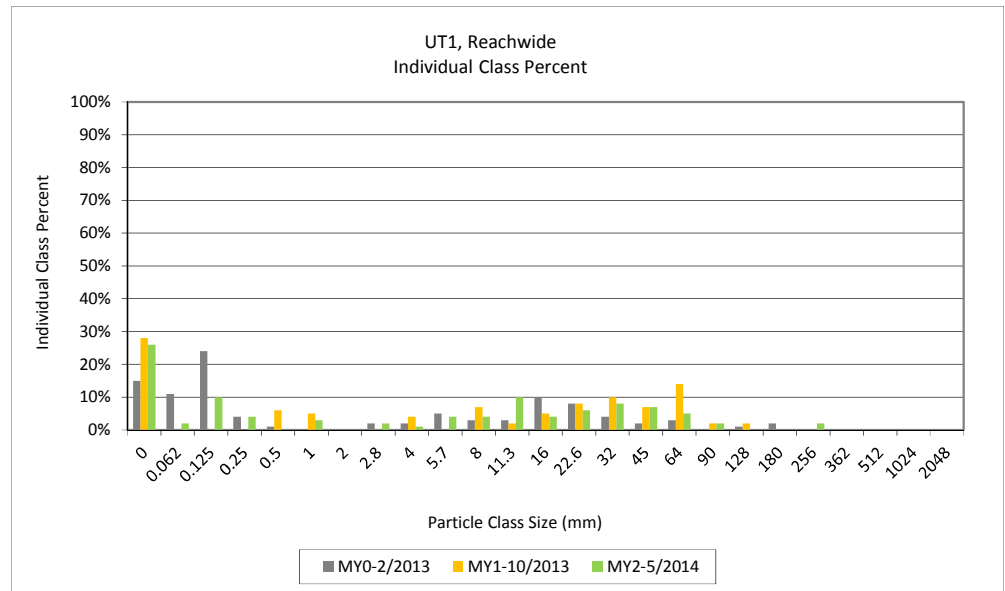
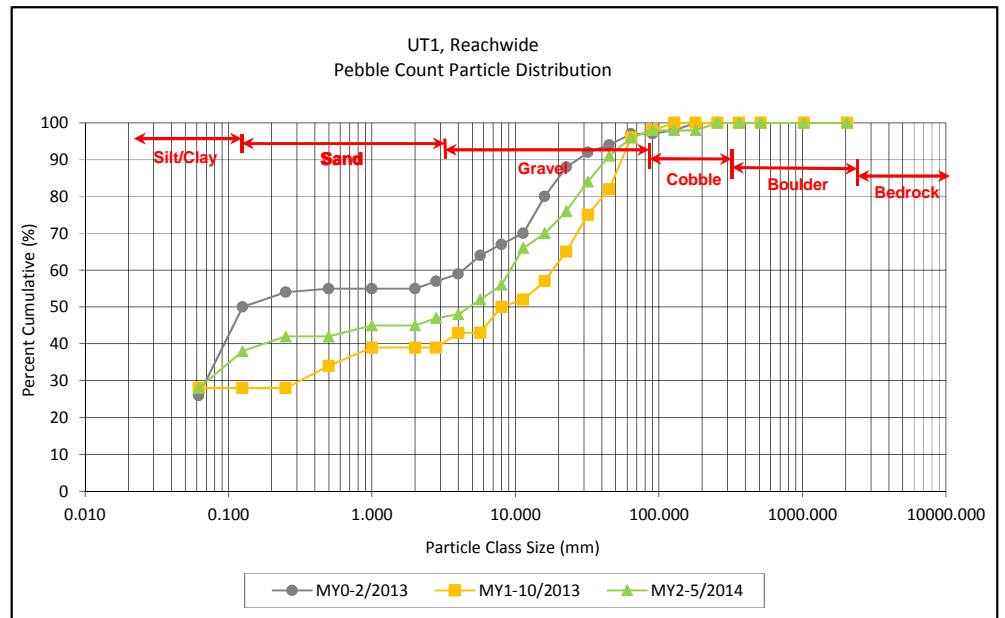
Cross-Section 9 Channel materials (mm)	
D ₁₆ =	17.7
D ₃₅ =	24.7
D ₅₀ =	32.0
D ₈₄ =	56.9
D ₉₅ =	86.2
D ₁₀₀ =	128.0



Reachwide and Cross-Section Pebble Count Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Harris Site; UT1, Reachwide
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count			UT1 Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	25	26	26	26
SAND	Very fine	0.062	0.125		2	2	2	28
	Fine	0.125	0.250		10	10	10	38
	Medium	0.250	0.500		4	4	4	42
	Coarse	0.5	1.0					42
	Very Coarse	1.0	2.0	1	2	3	3	45
GRAVEL	Very Fine	2.0	2.8					45
	Very Fine	2.8	4.0		2	2	2	47
	Fine	4.0	5.7		1	1	1	48
	Fine	5.7	8.0	2	2	4	4	52
	Medium	8.0	11.3	3	1	4	4	56
	Medium	11.3	16.0	10		10	10	66
	Coarse	16.0	22.6	3	1	4	4	70
	Coarse	22.6	32	6		6	6	76
	Very Coarse	32	45	8		8	8	84
	Very Coarse	45	64	7		7	7	91
COBBLE	Small	64	90	5		5	5	96
	Small	90	128	2		2	2	98
	Large	128	180					98
	Large	180	256					98
BOULDER	Small	256	362	2		2	2	100
	Small	362	512					100
	Medium	512	1024					100
BEDROCK	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

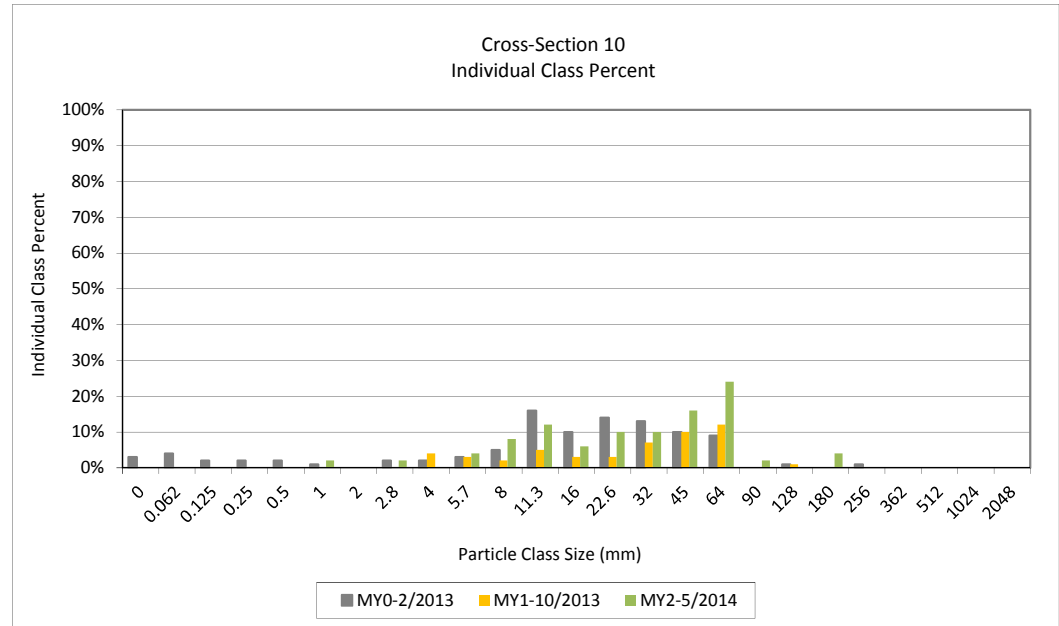
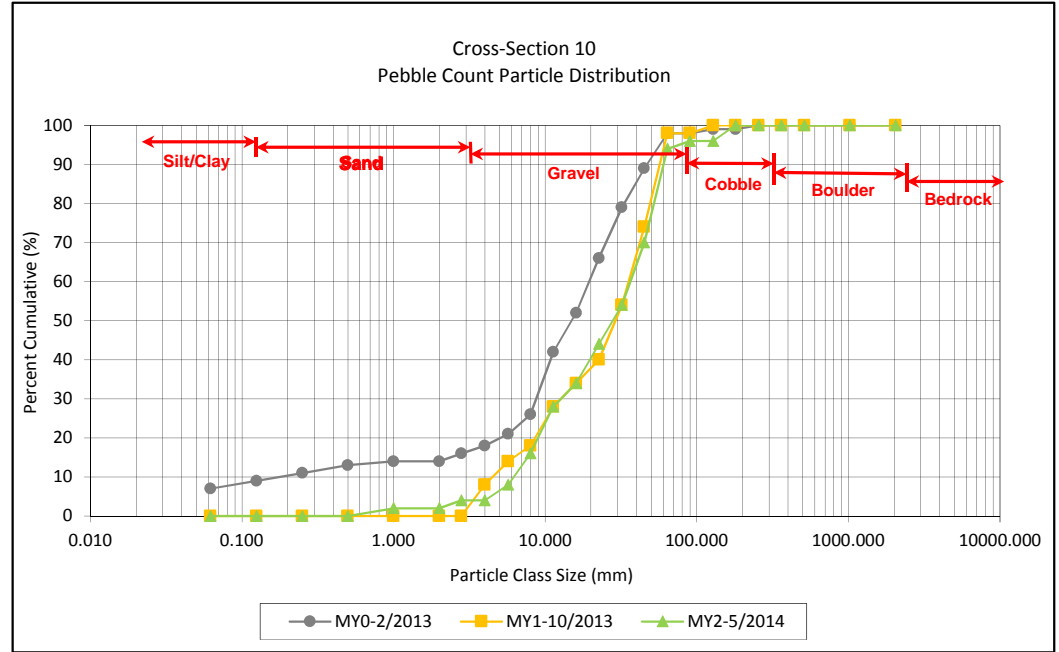
Reachwide	
Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	0.20
D ₅₀ =	6.7
D ₈₄ =	45.0
D ₉₅ =	84.1
D ₁₀₀ =	362.0



Reachwide and Cross-Section Substrate Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Harris Site; UT1, Cross-Section 10
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count	Cross-Section 10 Summary	
		min	max		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			0
	Very Coarse	1.0	2.0	2	2	2
GRAVEL	Very Fine	2.0	2.8			2
	Very Fine	2.8	4.0	2	2	4
	Fine	4.0	5.7			4
	Fine	5.7	8.0	4	4	8
	Medium	8.0	11.3	8	8	16
	Medium	11.3	16.0	12	12	28
	Coarse	16.0	22.6	6	6	34
	Coarse	22.6	32	10	10	44
	Very Coarse	32	45	10	10	54
COBBLE	Very Coarse	45	64	16	16	70
	Small	64	90	24	24	94
	Small	90	128	2	2	96
	Large	128	180			96
BOULDER	Large	180	256	4	4	100
	Small	256	362			100
	Small	362	512			100
BEDROCK	Medium	512	1024			100
	Large/Very Large	1024	2048			100
Total				100	100	100

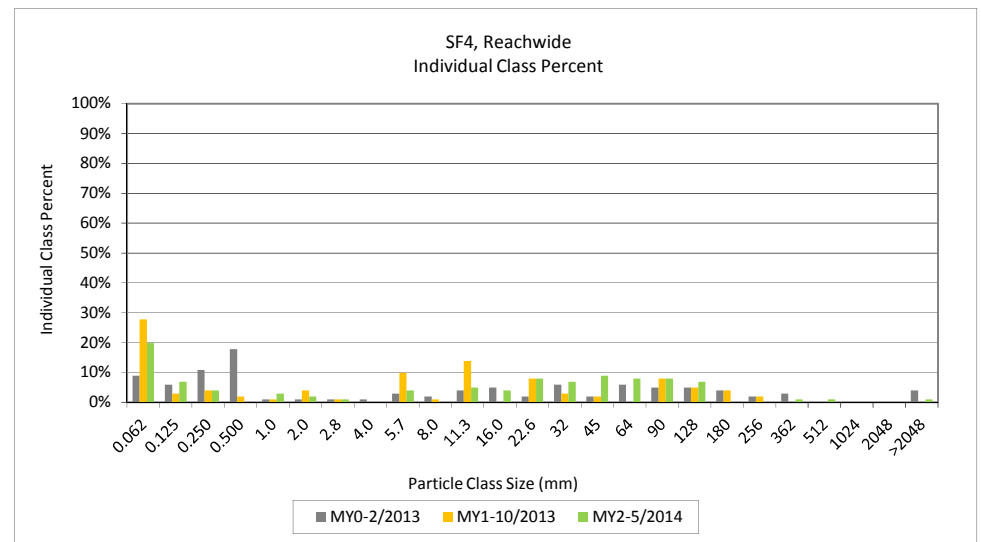
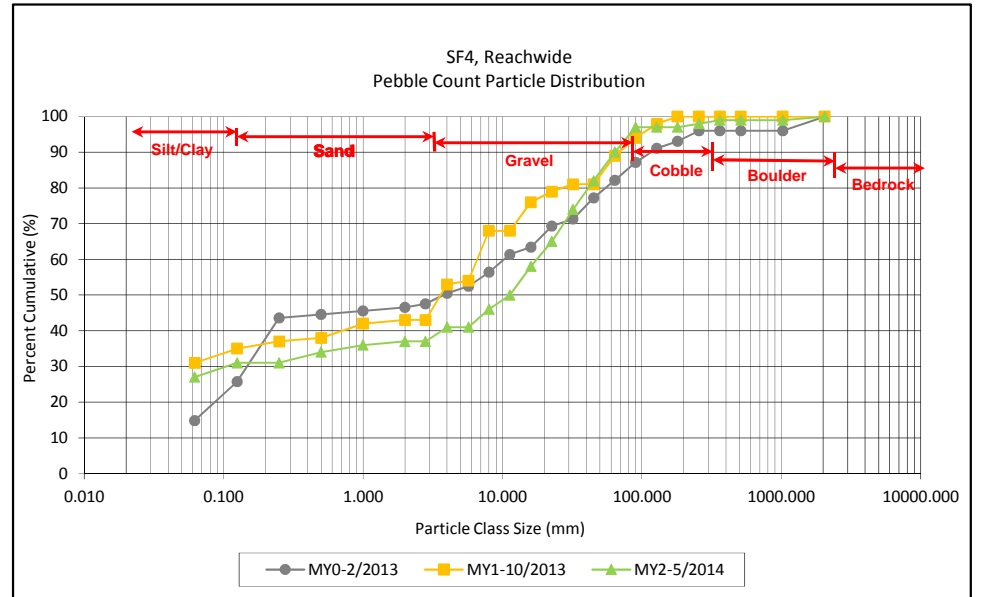
Cross-Section 10 Channel materials (mm)	
D ₁₆ =	11.0
D ₃₅ =	23.4
D ₅₀ =	39.3
D ₈₄ =	78.1
D ₉₅ =	107.3
D ₁₀₀ =	256.0



Reachwide and Cross-Section Pebble Count Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Lindley Site; SF4, Reachwide
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count			SF4 Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	18	20	20	20
SAND	Very fine	0.062	0.125	2	5	7	7	27
	Fine	0.125	0.250	1	3	4	4	31
	Medium	0.250	0.500					31
	Coarse	0.5	1.0		3	3	3	34
	Very Coarse	1.0	2.0		2	2	2	36
GRAVEL	Very Fine	2.0	2.8		1	1	1	37
	Very Fine	2.8	4.0					37
	Fine	4.0	5.7	2	2	4	4	41
	Fine	5.7	8.0					41
	Medium	8.0	11.3	2	3	5	5	46
	Medium	11.3	16.0	1	3	4	4	50
	Coarse	16.0	22.6	5	3	8	8	58
	Coarse	22.6	32	5	2	7	7	65
	Very Coarse	32	45	5	4	9	9	74
	Very Coarse	45	64	8		8	8	82
COBBLE	Small	64	90	7	1	8	8	90
	Small	90	128	7		7	7	97
	Large	128	180					97
	Large	180	256					97
BOULDER	Small	256	362	1		1	1	98
	Small	362	512	1		1	1	99
	Medium	512	1024					99
	Large/Very Large	1024	2048					99
BEDROCK	Bedrock	2048	>2048	1		1	1	100
Total				50	50	100	100	100

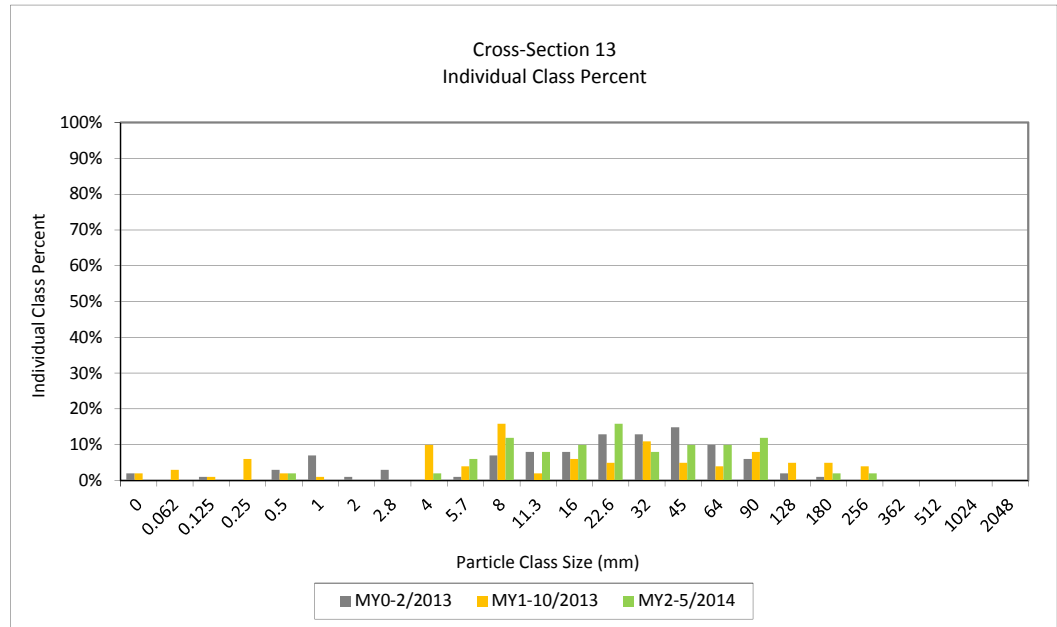
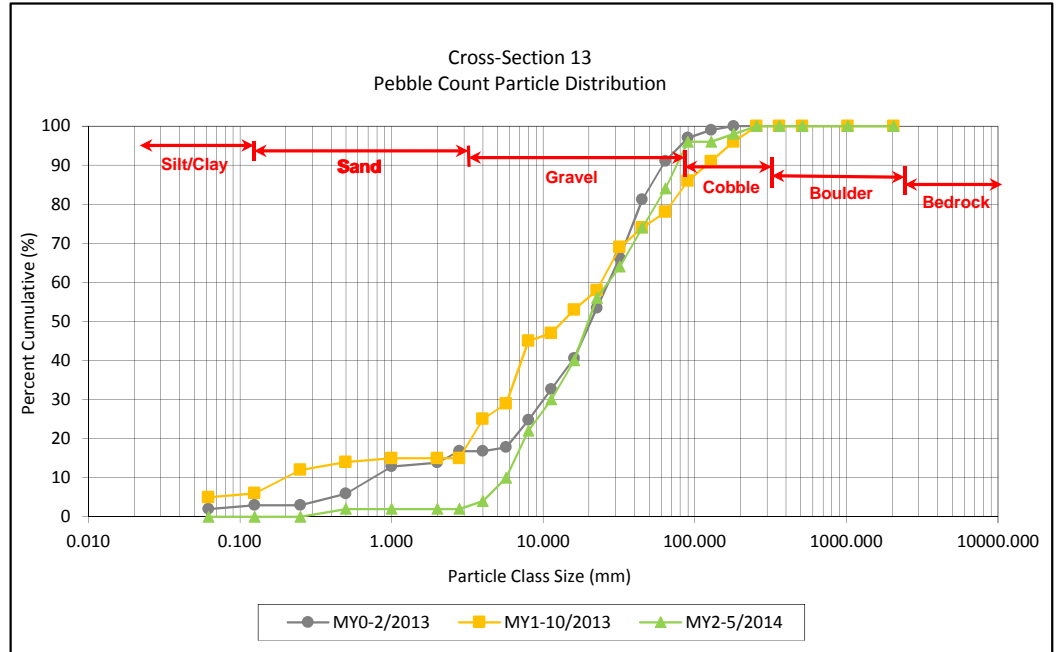
Reachwide Channel materials (mm)	
D ₁₆ =	Silt / Clay
D ₃₅ =	1.41
D ₅₀ =	16.0
D ₈₄ =	69.7
D ₉₅ =	115.7
D ₁₀₀ =	>2048



Reachwide and Cross-Section Substrate Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Lindley Site; SF4, Cross-Section 13
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count Total	Cross-Section 13 Summary	
		min	max		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	2	2	2
	Very Coarse	1.0	2.0			2
GRAVEL	Very Fine	2.0	2.8			2
	Very Fine	2.8	4.0			2
	Fine	4.0	5.7	2	2	4
	Fine	5.7	8.0	6	6	10
	Medium	8.0	11.3	12	12	22
	Medium	11.3	16.0	8	8	30
	Coarse	16.0	22.6	10	10	40
	Coarse	22.6	32	16	16	56
	Very Coarse	32	45	8	8	64
	Very Coarse	45	64	10	10	74
COBBLE	Small	64	90	10	10	84
	Small	90	128	12	12	96
	Large	128	180			96
	Large	180	256	2	2	98
BOULDER	Small	256	362	2	2	100
	Small	362	512			100
	Medium	512	1024			100
BOULDER	Large/Very Large	1024	2048			100
	BEDROCK	Bedrock	2048	>2048		100
Total				100	100	100

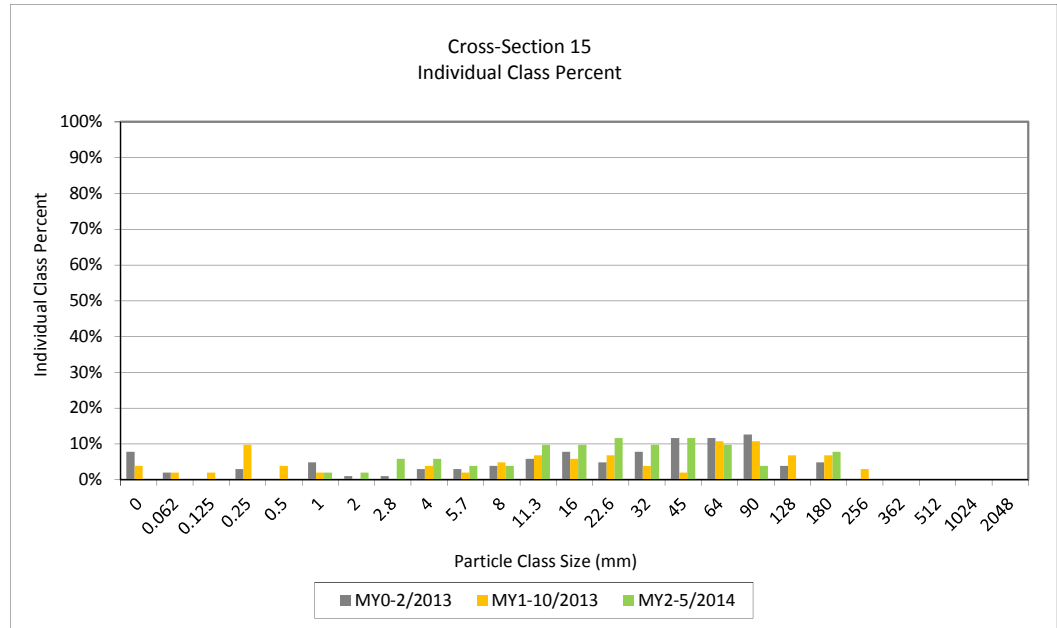
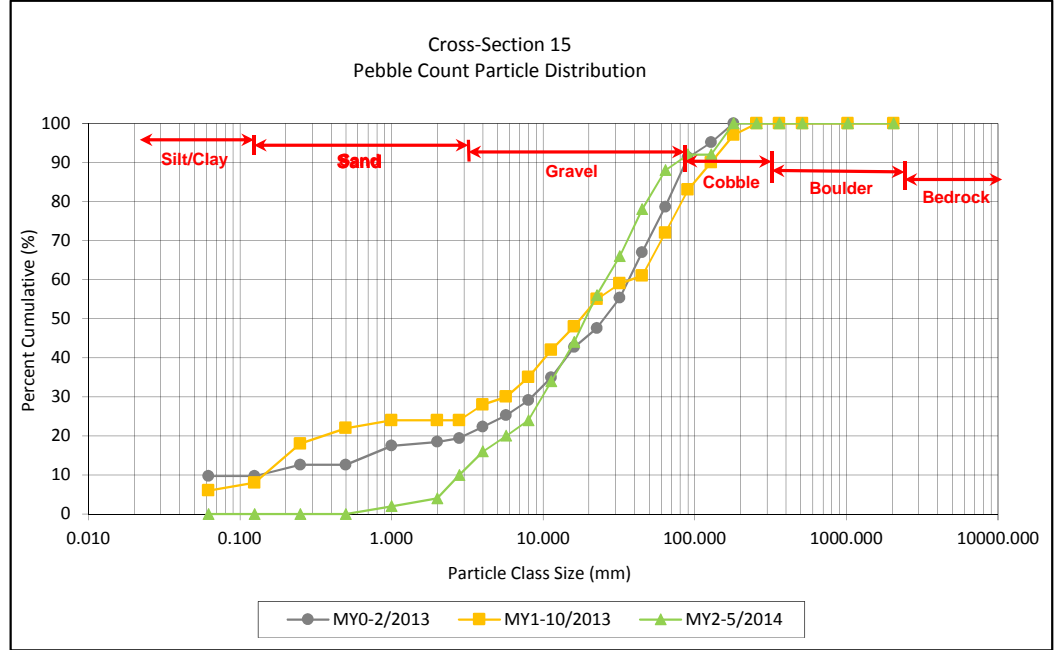
Cross-Section 13 Channel materials (mm)	
D ₁₆ =	9.4
D ₃₅ =	19.0
D ₅₀ =	28.1
D ₈₄ =	90.0
D ₉₅ =	124.3
D ₁₀₀ =	362.0



Reachwide and Cross-Section Substrate Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Lindley Site; SF4, Cross-Section 15
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count	Cross-Section 15 Summary	
		min	max		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			0
	Very Coarse	1.0	2.0	2	2	2
GRAVEL	Very Fine	2.0	2.8	2	2	4
	Very Fine	2.8	4.0	6	6	10
	Fine	4.0	5.7	6	6	16
	Fine	5.7	8.0	4	4	20
	Medium	8.0	11.3	4	4	24
	Medium	11.3	16.0	10	10	34
	Coarse	16.0	22.6	10	10	44
	Coarse	22.6	32	12	12	56
	Very Coarse	32	45	10	10	66
Very Coarse	45	64	12	12	78	
COBBLE	Small	64	90	10	10	88
	Small	90	128	4	4	92
	Large	128	180			92
	Large	180	256	8	8	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
BEDROCK	Large/Very Large	1024	2048			100
	Bedrock	2048	>2048			100
Total				100	100	100

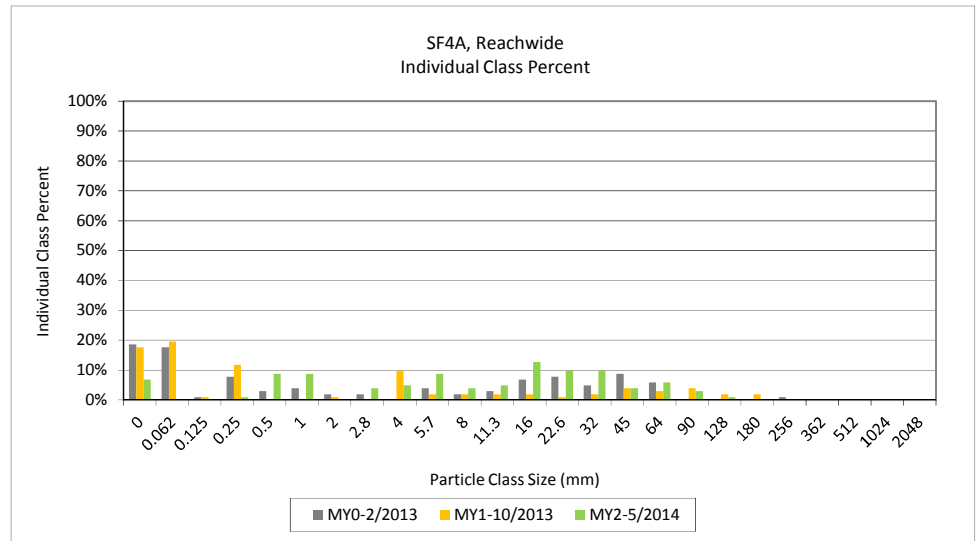
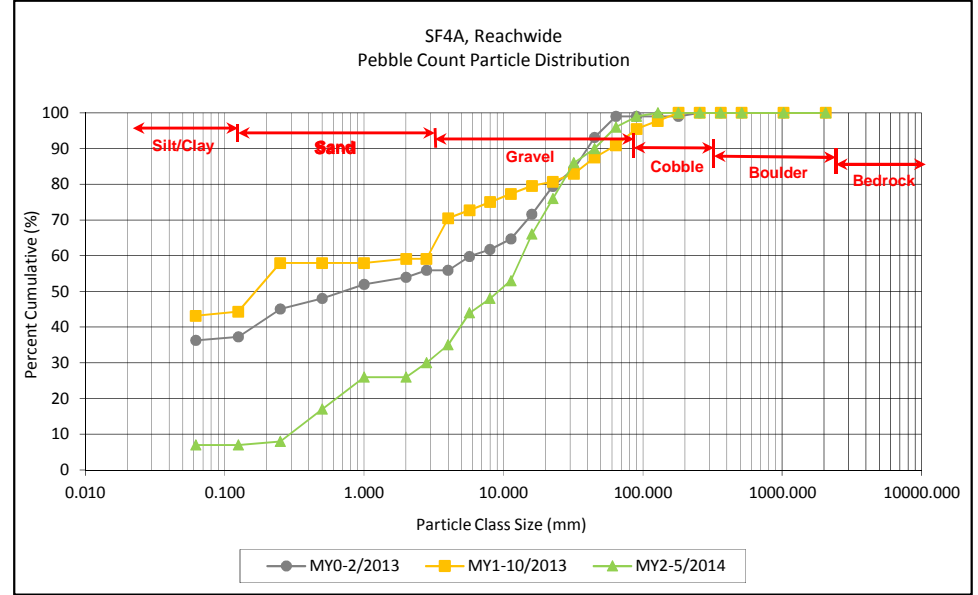
Cross-Section 15 Channel materials (mm)	
D ₁₆ =	5.6
D ₃₅ =	16.6
D ₅₀ =	26.9
D ₈₄ =	78.5
D ₉₅ =	205.4
D ₁₀₀ =	256.0



Reachwide and Cross-Section Pebble Count Plots
 Underwood Mitigation Site (NCEP Project No. 94641)
 Lindley Site; SF4A, Reachwide
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count			SF4A Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		7	7	7	7
SAND	Very fine	0.062	0.125					7
	Fine	0.125	0.250					7
	Medium	0.250	0.500		1	1	1	8
	Coarse	0.5	1.0	2	7	9	9	17
	Very Coarse	1.0	2.0		9	9	9	26
GRAVEL	Very Fine	2.0	2.8					26
	Very Fine	2.8	4.0		4	4	4	30
	Fine	4.0	5.7		5	5	5	35
	Fine	5.7	8.0	2	7	9	9	44
	Medium	8.0	11.3	2	2	4	4	48
	Medium	11.3	16.0	3	2	5	5	53
	Coarse	16.0	22.6	8	5	13	13	66
	Coarse	22.6	32	10		10	10	76
	Very Coarse	32	45	10		10	10	86
	Very Coarse	45	64	4		4	4	90
COBBLE	Small	64	90	5	1	6	6	96
	Small	90	128	3		3	3	99
	Large	128	180	1		1	1	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

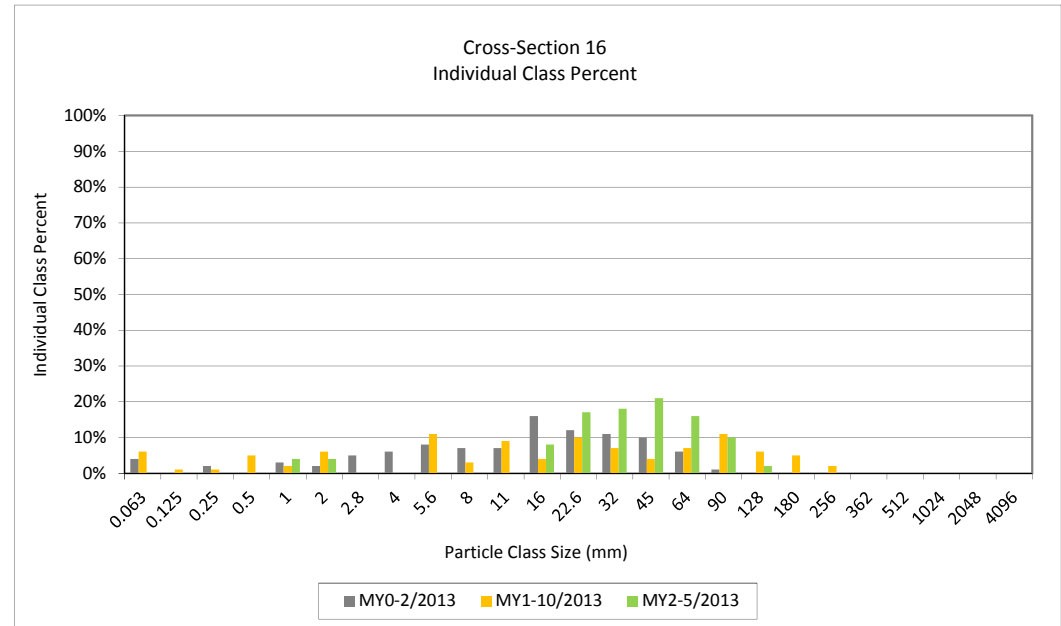
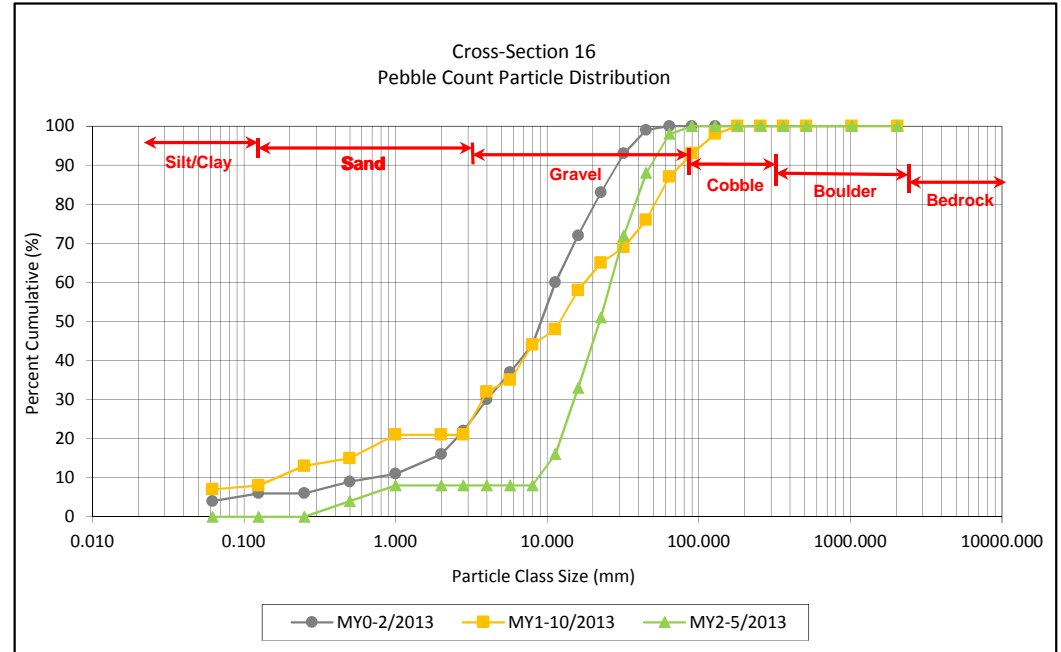
Reachwide	
Channel materials (mm)	
D ₁₆ =	0.93
D ₃₅ =	5.60
D ₅₀ =	12.8
D ₈₄ =	42.0
D ₉₅ =	85.0
D ₁₀₀ =	180.0



Reachwide and Cross-Section Substrate Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Lindley Site: SF4A, Cross-Section 16
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count Total	Cross-Section 16 Summary	
		min	max		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	4	4	4
	Very Coarse	1.0	2.0	4	4	8
GRAVEL	Very Fine	2.0	2.8			8
	Very Fine	2.8	4.0			8
	Fine	4.0	5.7			8
	Fine	5.7	8.0			8
	Medium	8.0	11.3			8
	Medium	11.3	16.0	8	8	16
	Coarse	16.0	22.6	17	17	33
	Coarse	22.6	32	18	18	51
	Very Coarse	32	45	21	21	72
	Very Coarse	45	64	16	16	88
COBBLE	Small	64	90	10	10	98
	Small	90	128	2	2	100
	Large	128	180			100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
BOULDER	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
Total				100	100	100

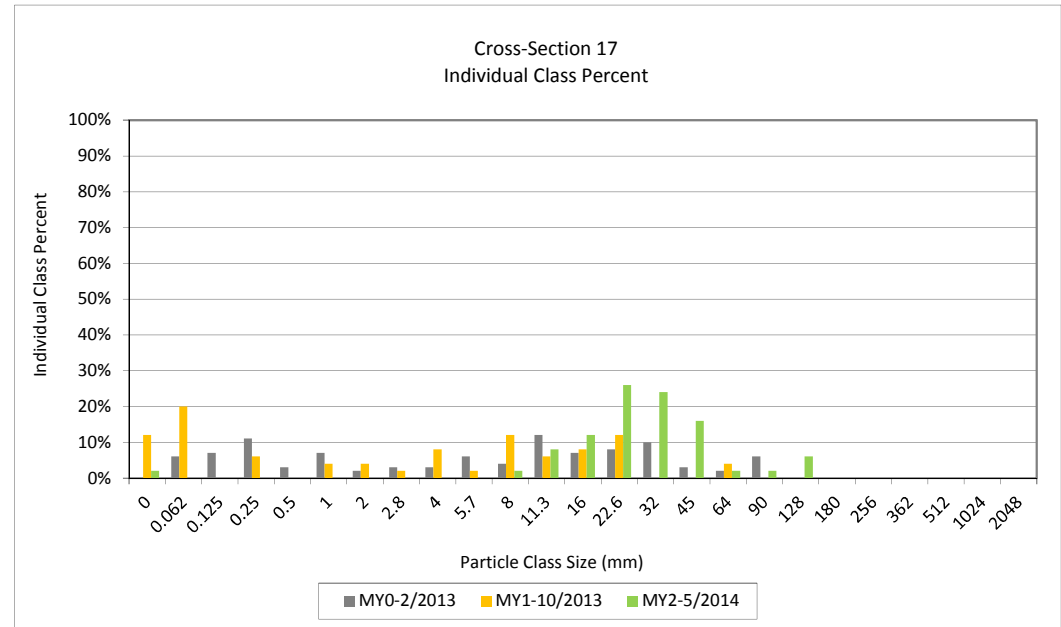
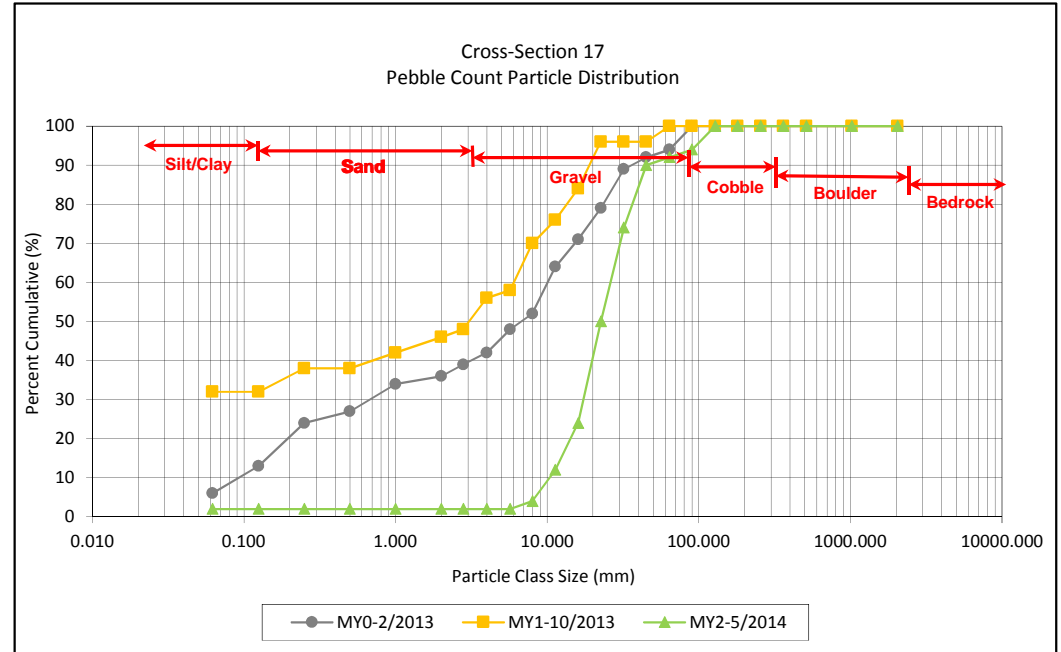
Cross-Section 16 Channel materials (mm)	
D ₁₆ =	16.0
D ₃₅ =	23.5
D ₅₀ =	31.4
D ₈₄ =	58.6
D ₉₅ =	81.3
D ₁₀₀ =	128.0



Reachwide and Cross-Section Substrate Plots
 Underwood Mitigation Site (NCEEP Project No. 94641)
 Lindley Site: SF4A, Cross-Section 17
 Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count	Cross-Section 17 Summary	
		min	max		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
	Medium	0.250	0.500			2
	Coarse	0.5	1.0			2
	Very Coarse	1.0	2.0			2
GRAVEL	Very Fine	2.0	2.8			2
	Very Fine	2.8	4.0			2
	Fine	4.0	5.7			2
	Fine	5.7	8.0			2
	Medium	8.0	11.3	2	2	4
	Medium	11.3	16.0	8	8	12
	Coarse	16.0	22.6	12	12	24
	Coarse	22.6	32	26	26	50
	Very Coarse	32	45	24	24	74
COBBLE	Very Coarse	45	64	16	16	90
	Small	64	90	2	2	92
	Small	90	128	2	2	94
	Large	128	180	6	6	100
BOULDER	Large	180	256			100
	Small	256	362			100
	Small	362	512			100
BOULDER	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
Total				100	100	100

Cross-Section 17 Channel materials (mm)	
D ₁₆ =	18.0
D ₃₅ =	26.2
D ₅₀ =	32.0
D ₈₄ =	56.1
D ₉₅ =	135.5
D ₁₀₀ =	180.0



APPENDIX 5. Hydrology Summary Data and Plots

**Table 13. Verification of Bankfull Events
Underwood Mitigation Site (EEP Project No. 94641)
Monitoring Year 2**

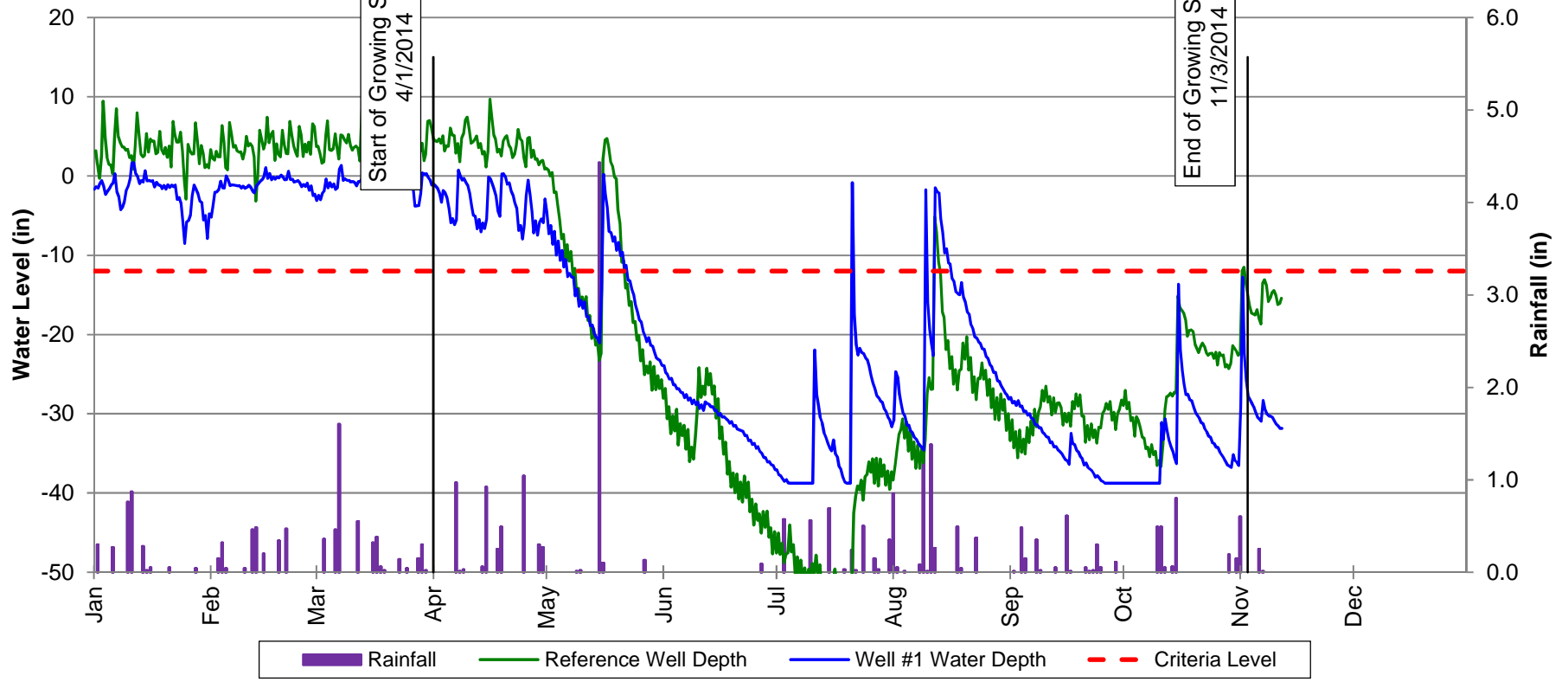
Reach	Date of Data Collection	Approximate Date of Occurrence	Method
SF1	11/12/2014	5/2014-11/2014	Crest Gage
UT2	*		
SF3	11/12/2014	5/2014-11/2014	Crest Gage
UT1	11/12/2014	5/2014-11/2014	Crest Gage
SF4	5/19/2014	1/2014-5/2014	Visual
	11/12/2014	5/2014-11/2014	Crest Gage
SF4A	5/19/2014	1/2014-5/2014	Crest Gage

*data collected, but level was below bankfull elevation

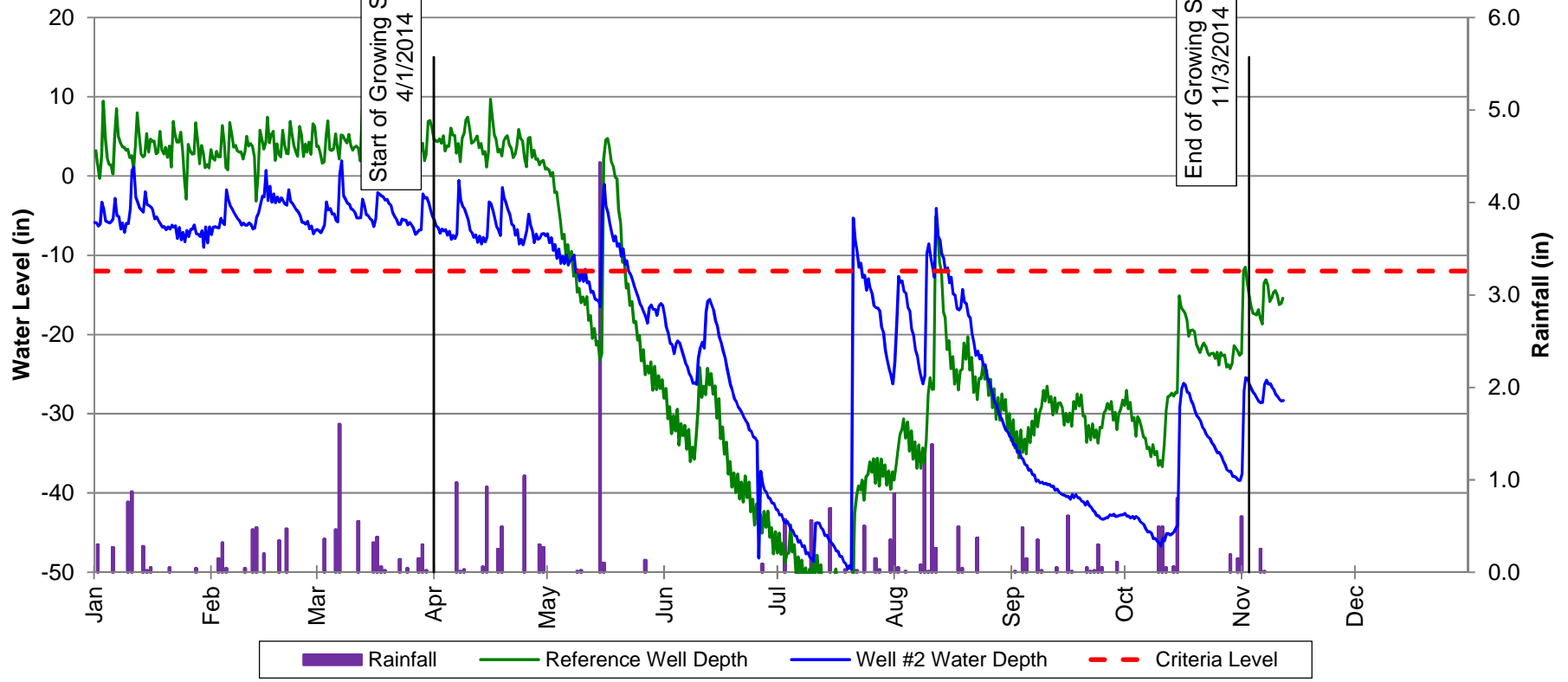
**Table 14. Wetland Gage Attainment Summary
Underwood Mitigation Site (EEP Project No. 94641)
Monitoring Year 2**

Summary of Groundwater Gage Results for Years 1 through 7							
Gage	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2013)	Year 2 (2014)	Year 3 (2015)	Year 4 (2016)	Year 5 (2017)	Year 6 (2018)	Year 7 (2019)
1	Yes/44.5 Days (20.6 %)	Yes/35.5 Days (16.4 %)					
2	Yes/51.5 Days (23.8 %)	Yes/38.5 Days (17.8 %)					
3	Yes/23.5 Days (10.9 %)	Yes/31.5 Days (14.6 %)					
4	Yes/19.5 Days (9.0 %)	Yes/31.5 Days (14.6 %)					
5	Yes/25 Days (11.6 %)	Yes/32.5 Days (15.0 %)					
6	Yes/22.5 Days (10.4 %)	Yes/21 Days (9.7 %)					
7	Yes/44.5 Days (20.6 %)	Yes/31.5 Days (14.6 %)					
8	Yes/22 Days (10.2 %)	Yes/23 Days (14.6 %)					
9	Yes/98 Days (45.4 %)	Yes/41.5 Days (10.6 %)					
10	Yes/96.5 Days (44.7 %)	Yes/36 Days (16.7 %)					
11	Yes/66 Days (30.6 %)	Yes/40.5 Days (18.8 %)					
12	Yes/23 Days (10.6 %)	Yes/32.5 Days (15.0 %)					
13	Yes/22 Days (10.2 %)	No/12.5 Days (5.8 %)					
14	Yes/21 Days (9.7 %)	Yes/32 Days (14.8 %)					
15	Yes/163 Days (75.5 %)	Yes/57 Days (26.4 %)					

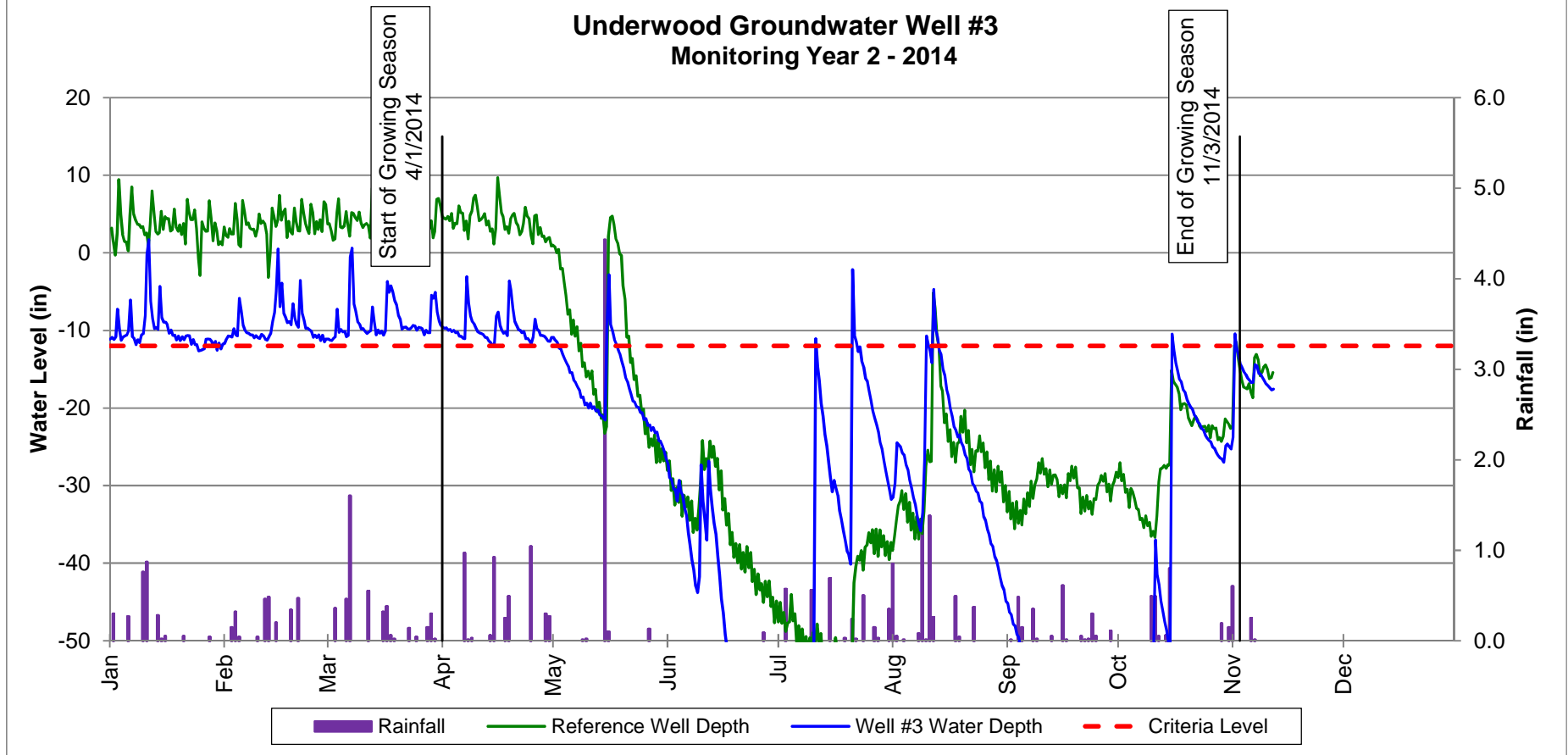
Underwood Groundwater Well #1 Monitoring Year 2 - 2014



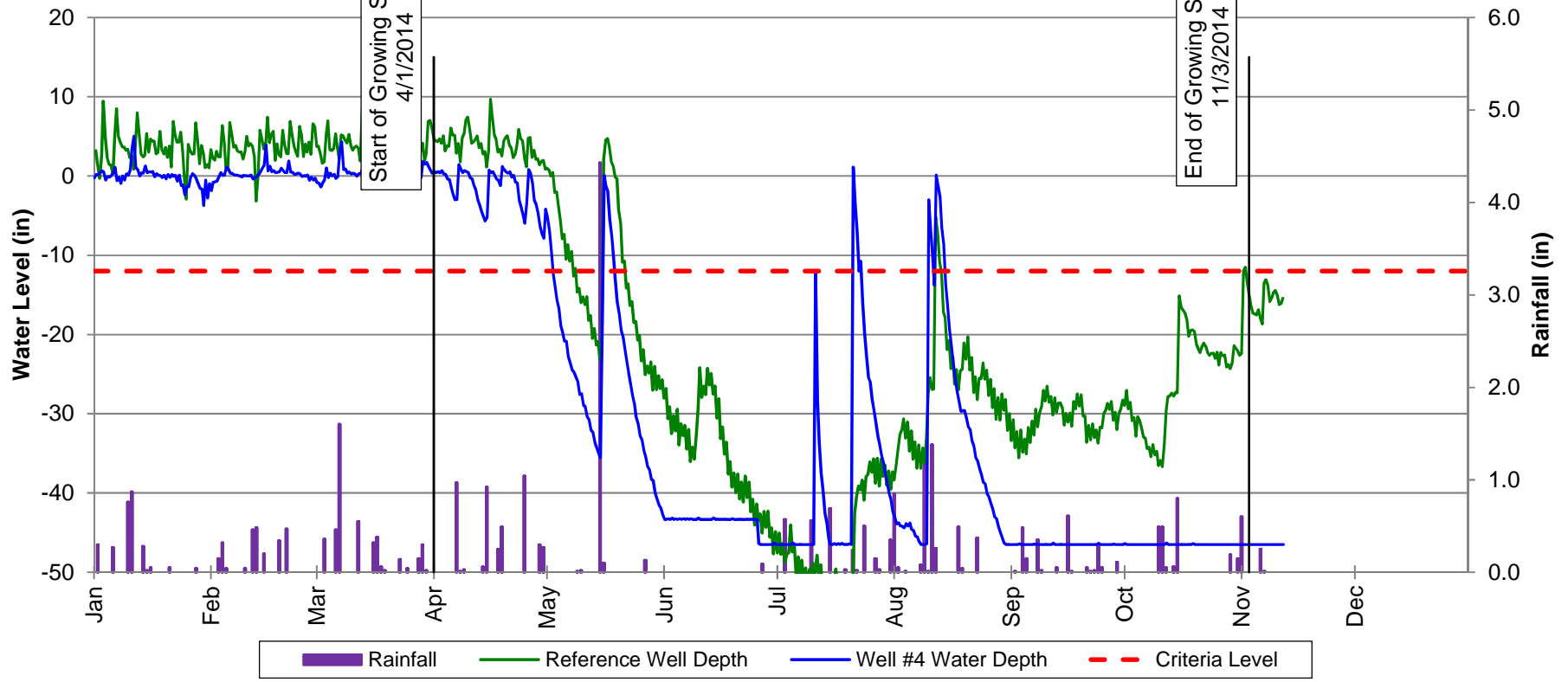
Underwood Groundwater Well #2 Monitoring Year 2 - 2014



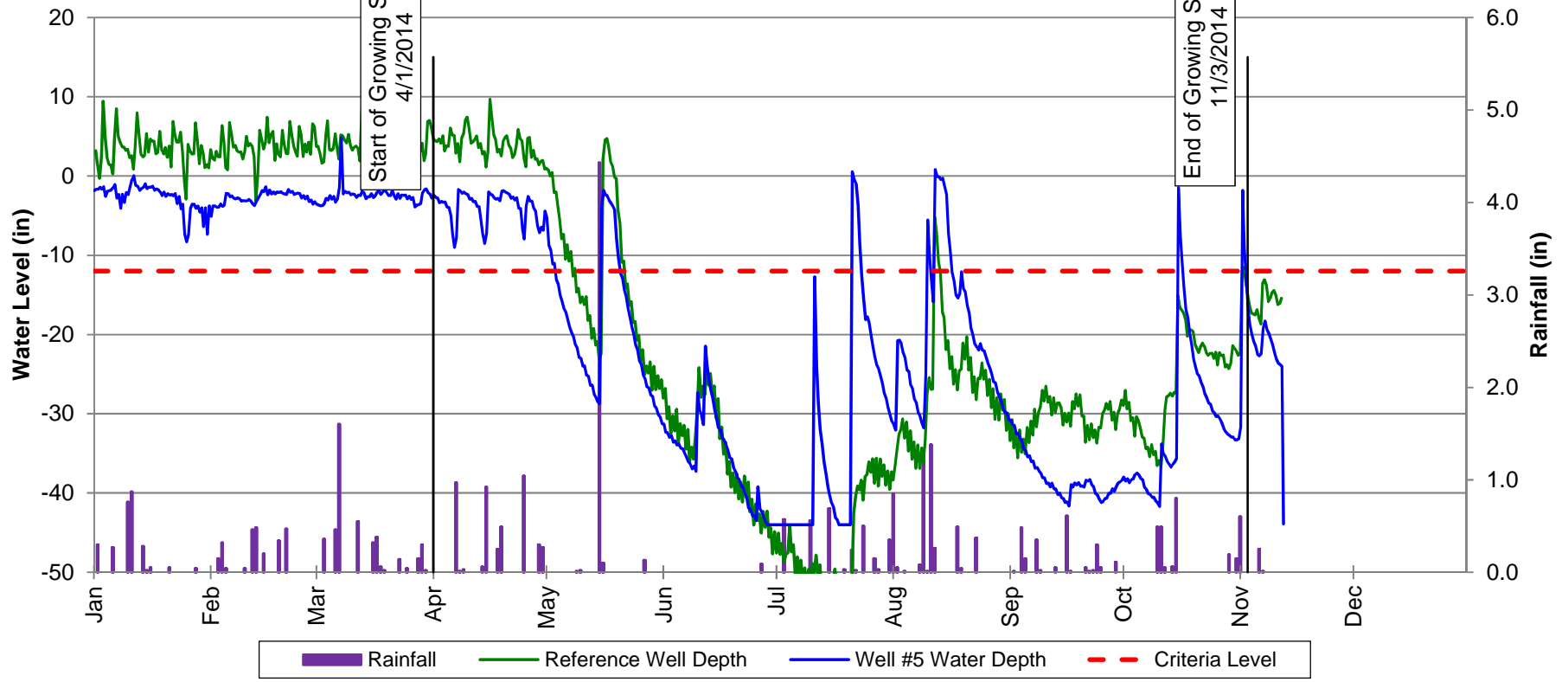
Underwood Groundwater Well #3 Monitoring Year 2 - 2014



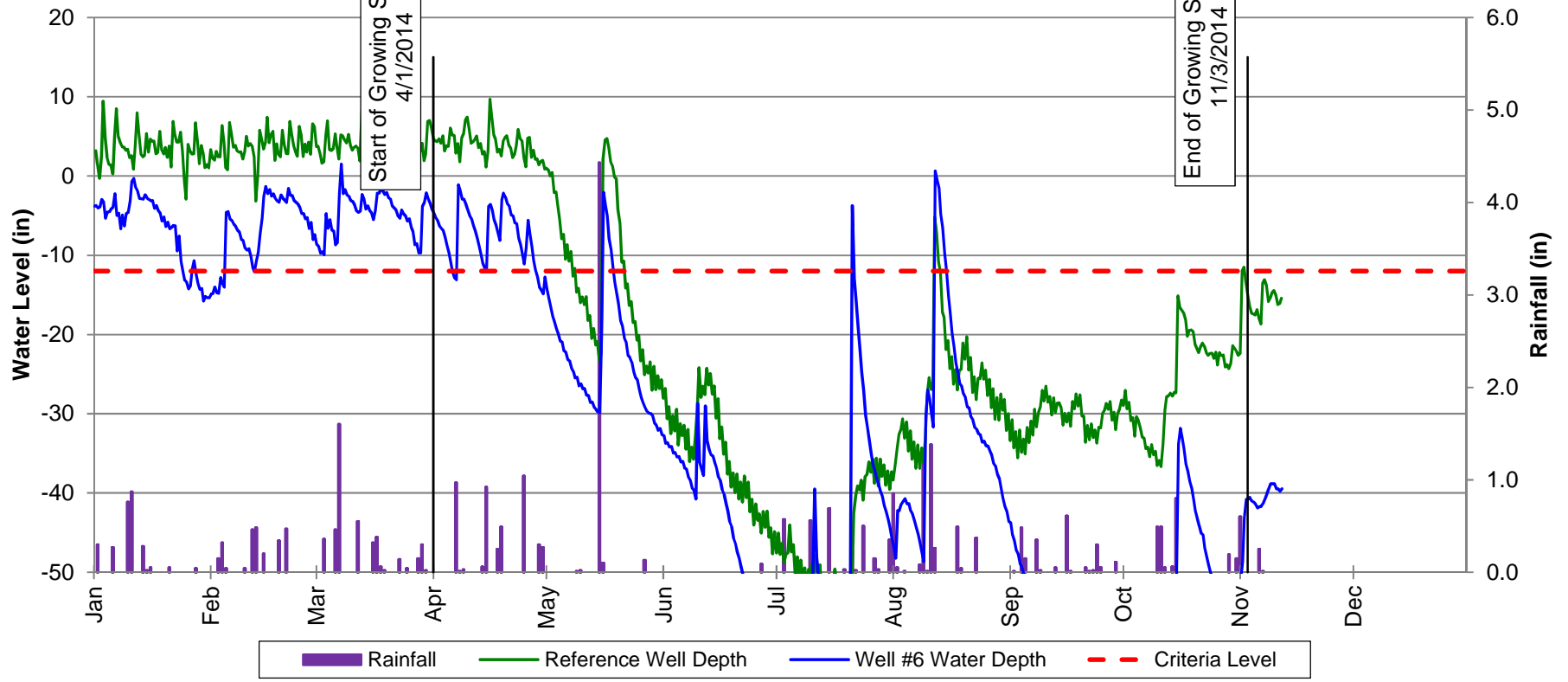
Underwood Groundwater Well #4 Monitoring Year 2 - 2014



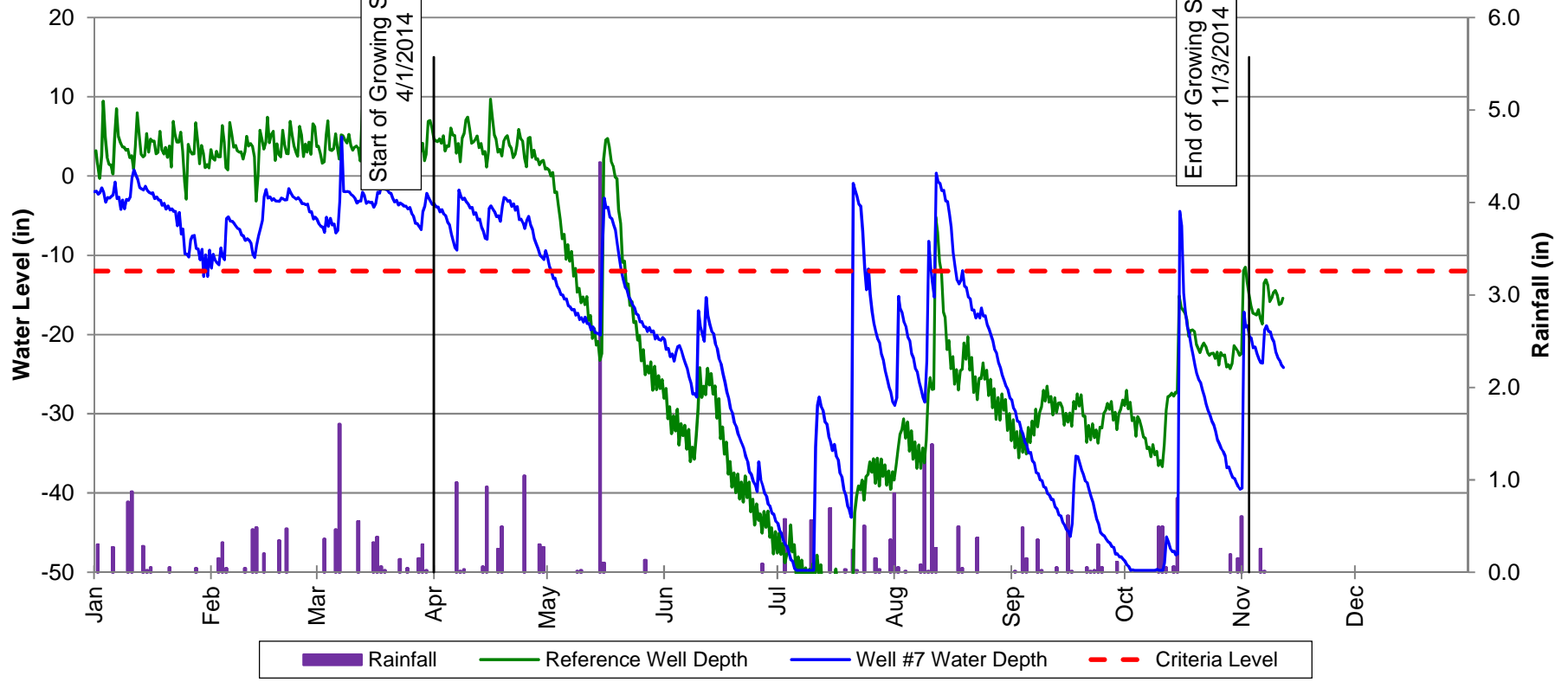
Underwood Groundwater Well #5 Monitoring Year 2 - 2014



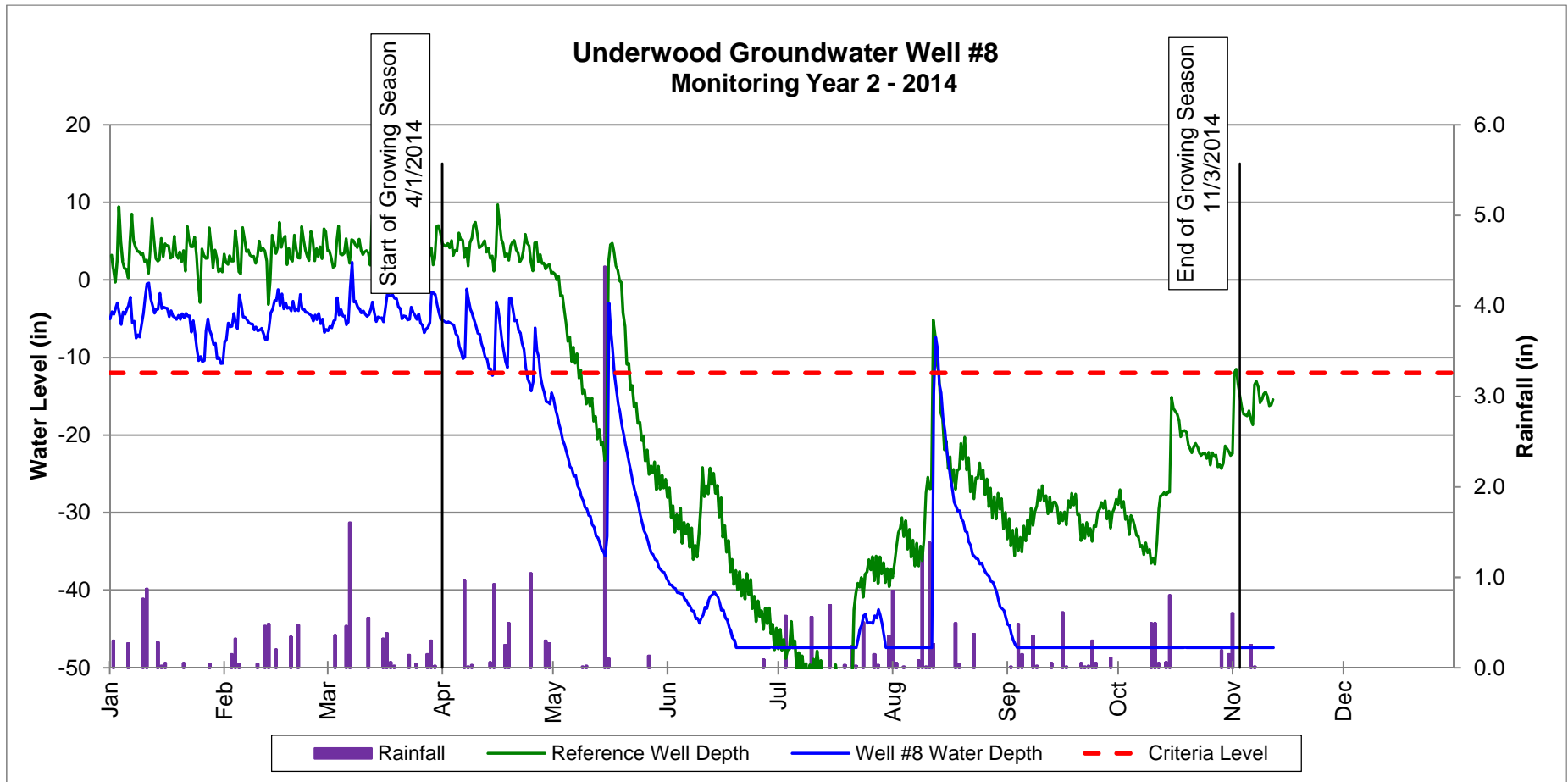
Underwood Groundwater Well #6 Monitoring Year 2 - 2014



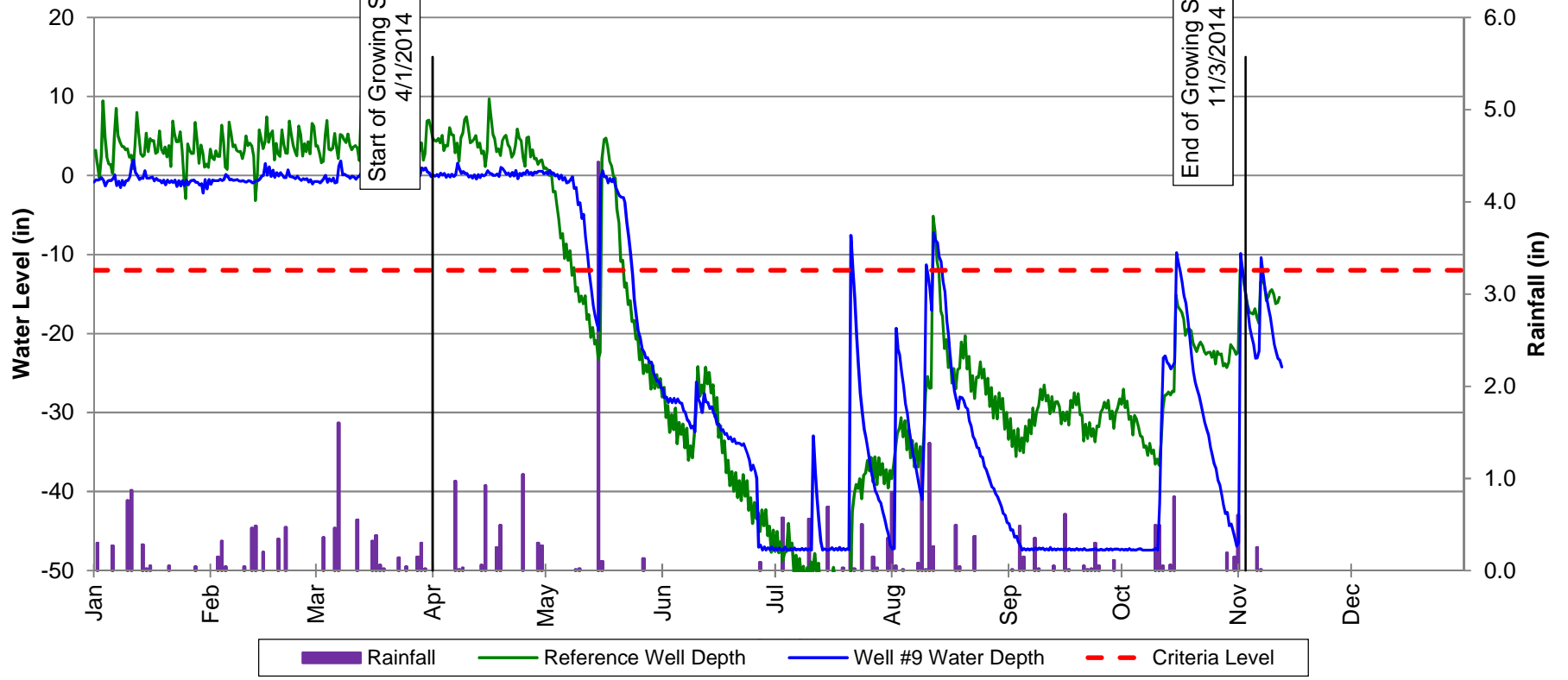
Underwood Groundwater Well #7 Monitoring Year 2 - 2014



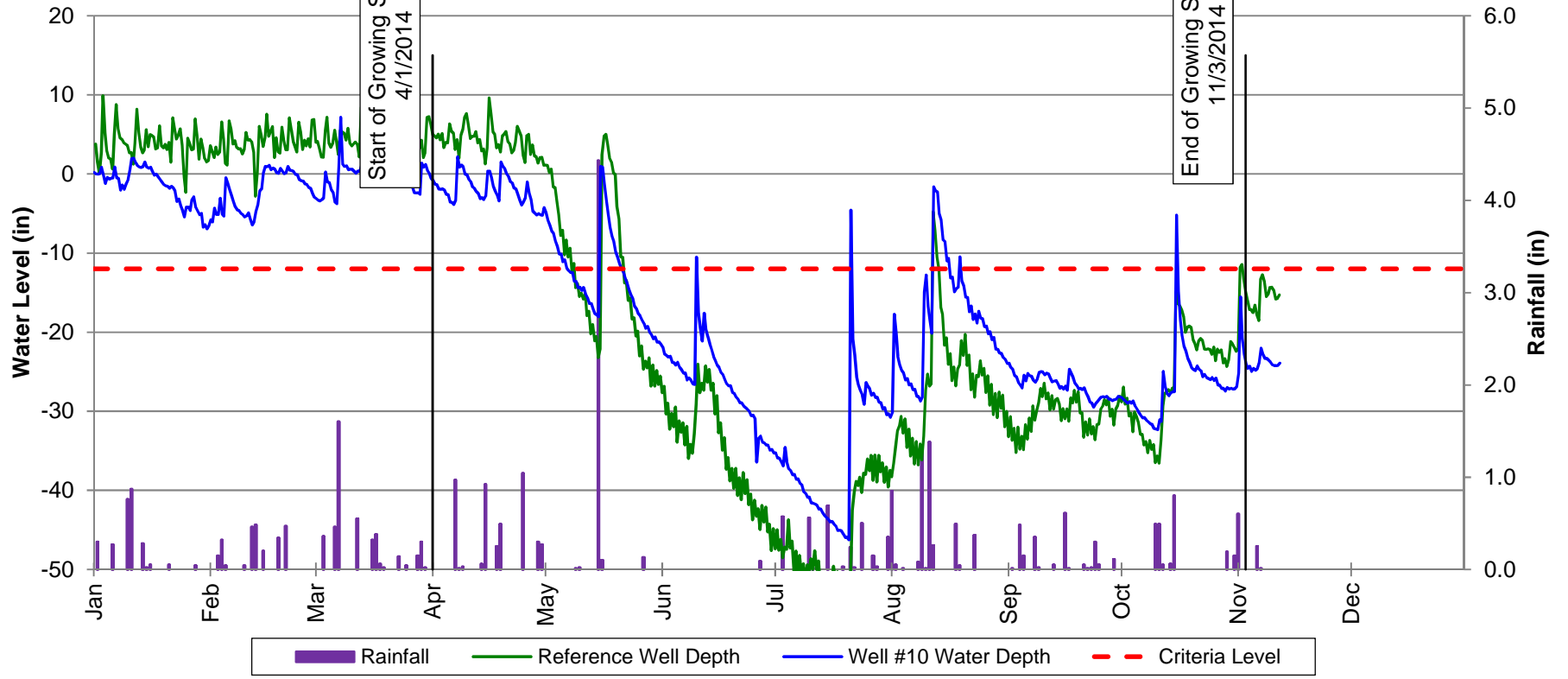
Underwood Groundwater Well #8 Monitoring Year 2 - 2014



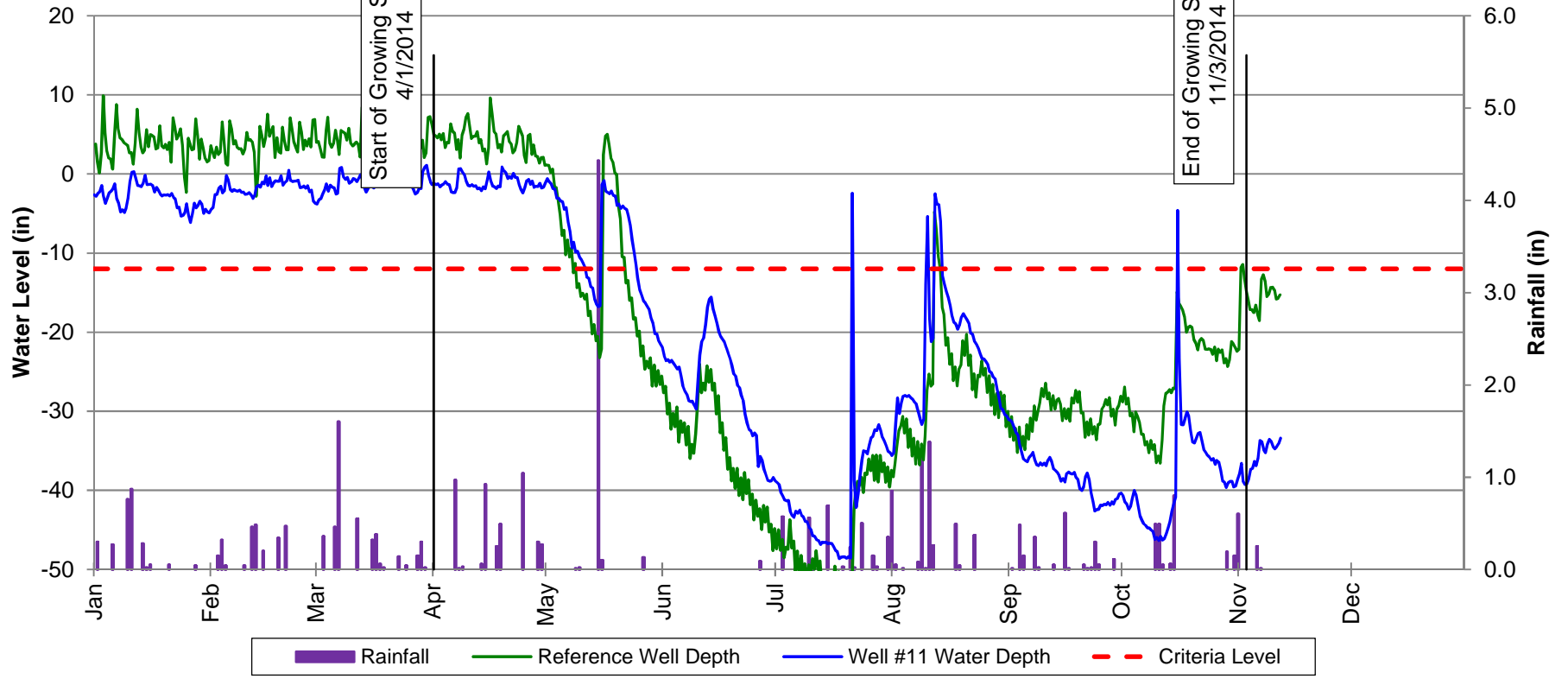
Underwood Groundwater Well #9 Monitoring Year 2 - 2014



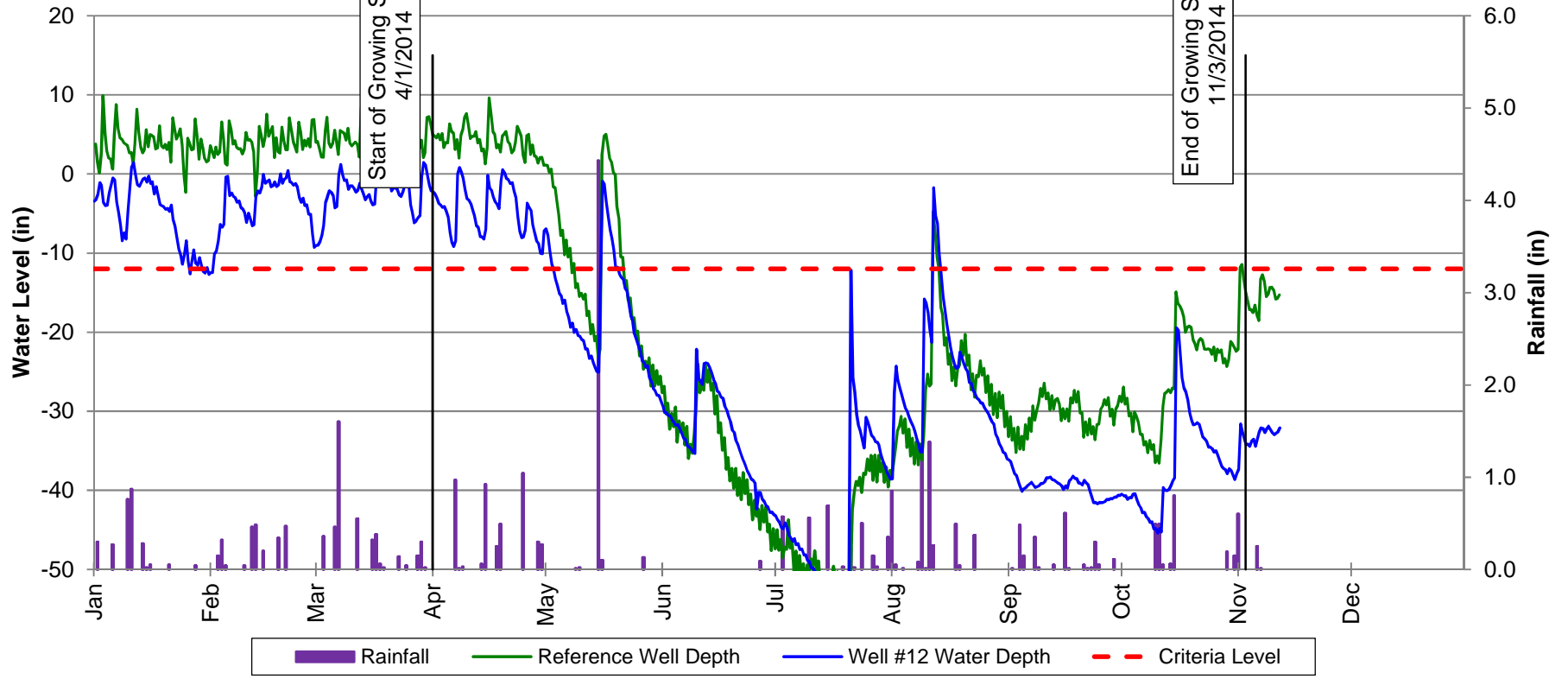
Underwood Groundwater Well #10 Monitoring Year 2 - 2014



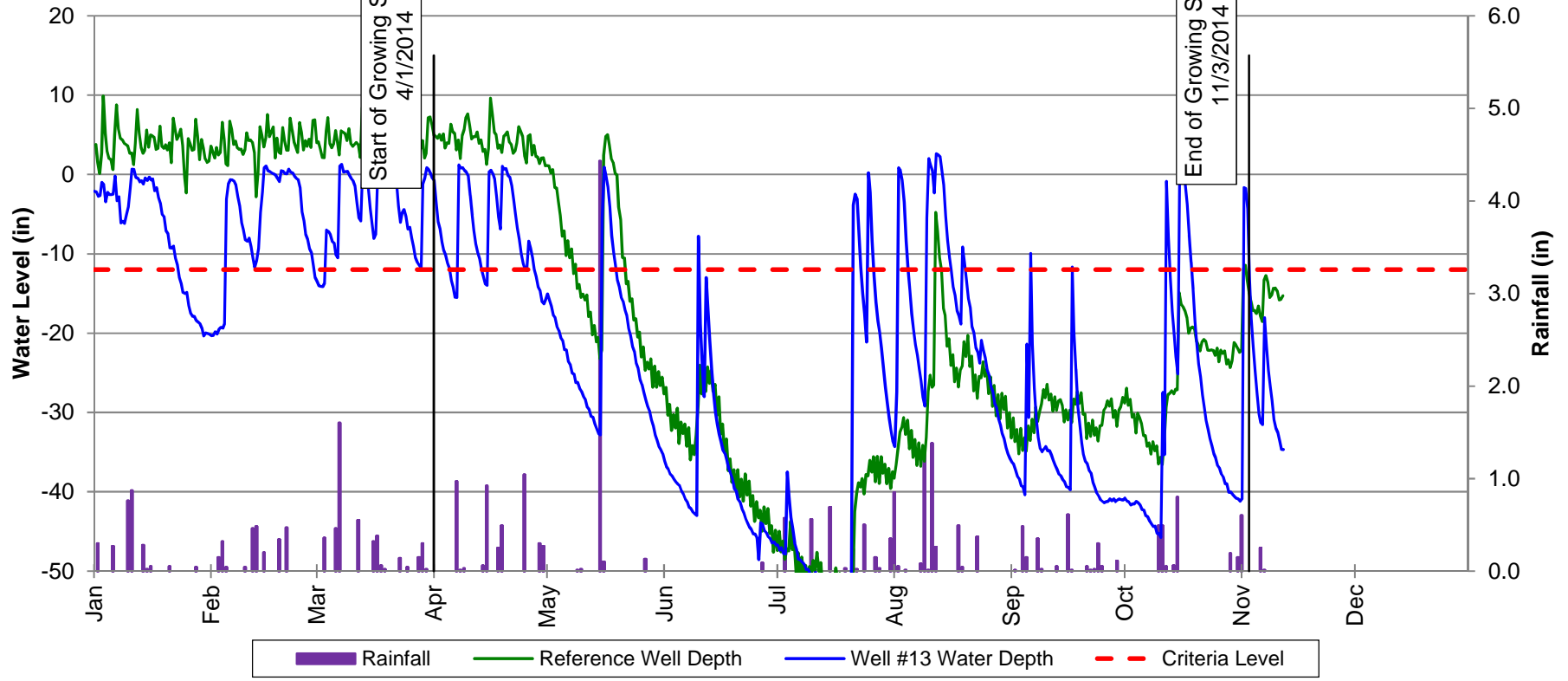
Underwood Groundwater Well #11 Monitoring Year 2 - 2014



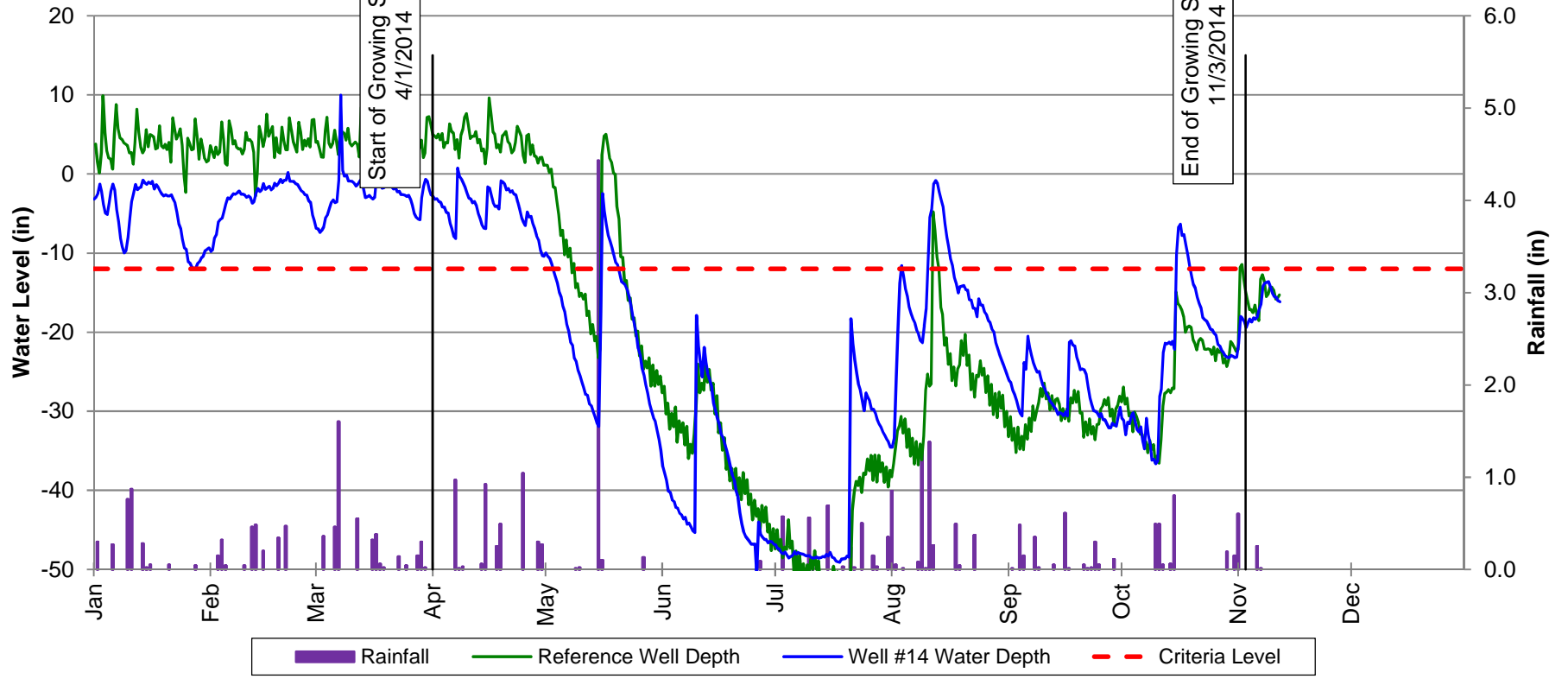
Underwood Groundwater Well #12 Monitoring Year 2 - 2014



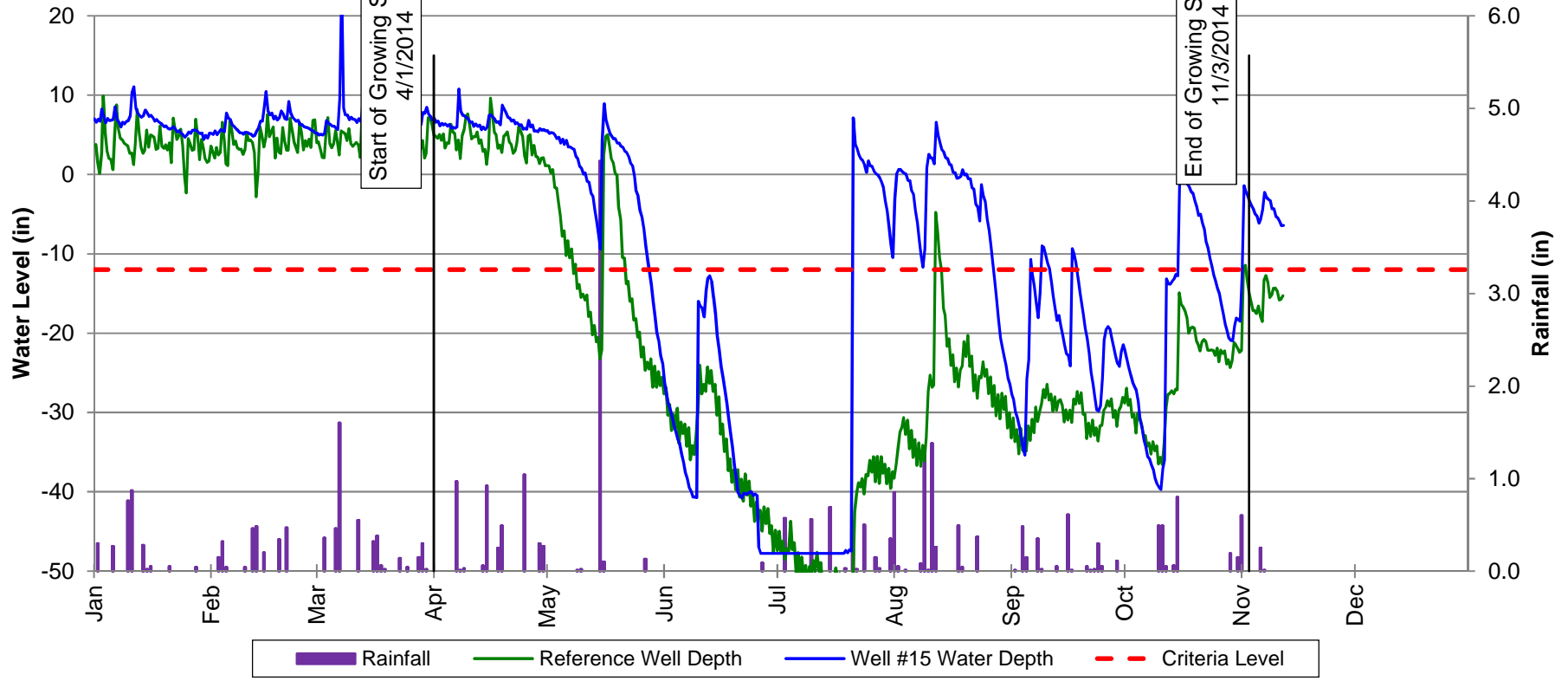
Underwood Groundwater Well #13 Monitoring Year 2 - 2014



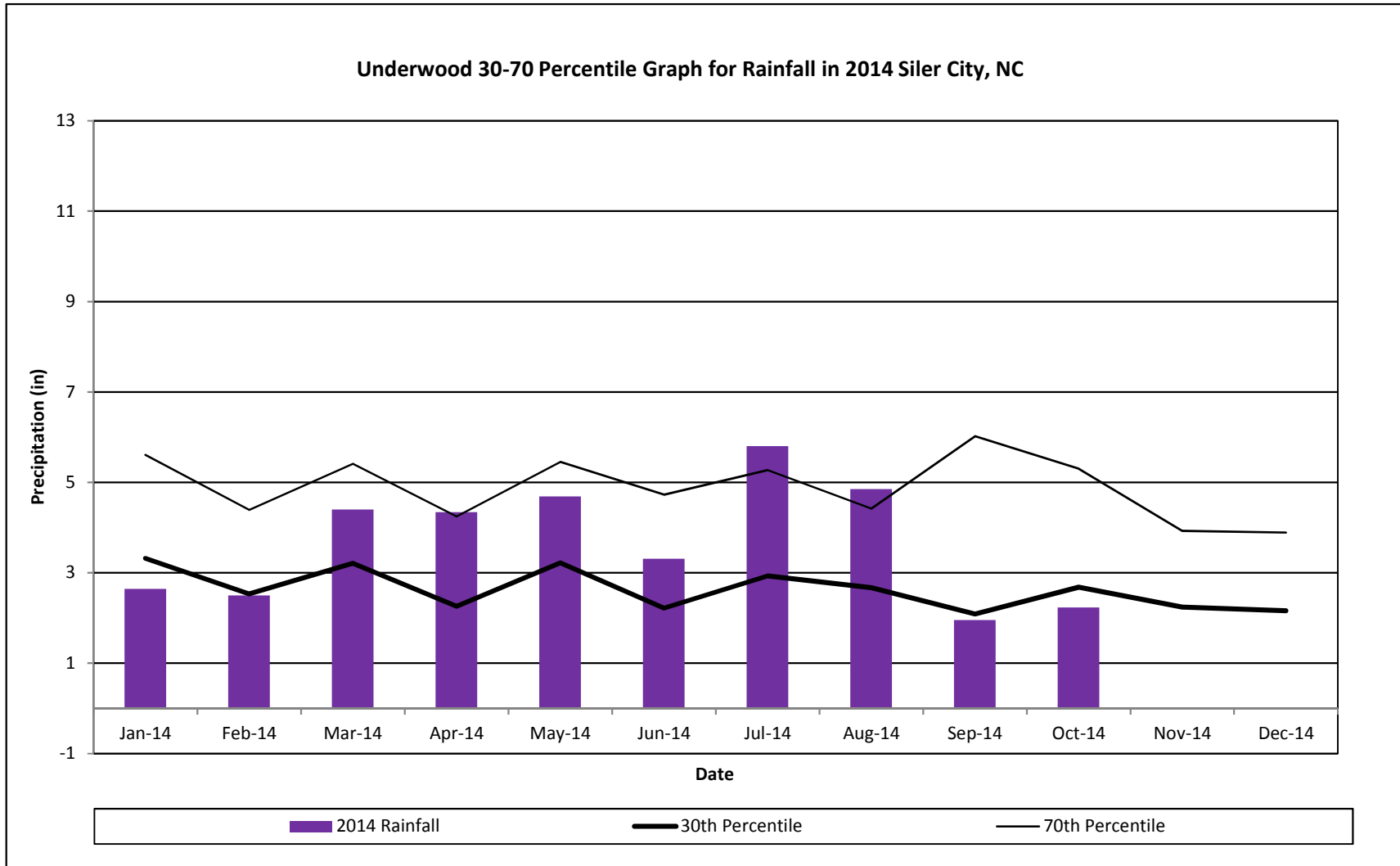
Underwood Groundwater Well #14 Monitoring Year 2 - 2014



Underwood Groundwater Well #15 Monitoring Year 2 - 2014



Monthly Rainfall Data
Underwood Mitigation Site (EEP Project No. 94641)
Monitoring Year 2



¹ 2014 rainfall collected by onsite rainfall gage.

² 30th and 70th percentile rainfall data collected from weather station Siler City 2 S, NC7924 (USDA, 2002).