Shepherds Tree Stream and Wetland Restoration

EEP Project No. 333
2011 Monitoring Report: Year 7

Construction Completed: 2004
Submission Date: May 2012

Submitted to: NCDENR-EEP
1652 Mail Service Center
Raleigh, NC 27699

Table of Contents

SECTION 1
EXECUTIVE SUMMARY

SECTION 1
EXECUTIVE SUMMARY

1.1 Project Background and Overall Site Monitoring History

The Shepherds Tree Stream and Wetland Restoration Project (Site) was developed as a North Carolina Department of Transportation (NCDOT) project and is located in Iredell County, southeast of Statesville between Triplett Road (SR 2362) and Knox Farm Road (SR 2363) (Appendix A). The Shepherds Tree main channel and its tributary are first order tributaries of Third Creek, located within the Yadkin River watershed (HUC 03040102). The site drains approximately 1.06 square miles, occupying approximately 160 acres within the 2, 10, and 100 year floodplain of Third Creek. The stream and wetland enhancement/restoration was designed by KCI Associates of North Carolina, PA. Construction activities were completed in 2004. Monitoring has been conducted annually from 2005 to present.

Beaver have been plentiful and persistent in making use of the channel since 2006. Per EEP, the USDA wildlife control contractor that works this region has indicated that the Third Creek corridor that runs along the Southern project border and its associated tributaries is heavily populated with beaver. As per EEP, the United States Department of Agriculture (USDA-APHIS) has removed many beaver and dams from the site and was directed to engage in a minimum of monthly monitoring of the site since late 2009 with visits based on reports from monitoring personnel prior to that. The size of the site, heavy vegetation, abundant surrounding beaver population, and the small nature of the project channels combine to permit rapid re-colonization and dam construction, making the site particularly challenging to control for beaver. The area immediately surrounding the confluence of the project main stem and the tributary in the lower third of the project has seen the most activity, although beaver began constructing dams closer to the top as well entering the third creek tributary from the other west side of Triplett road. The combination of extreme drought conditions and beaver precluded measurement of channel cross-sections (required by 1 of the 7 project permits) in 2007 and 2008 to permit measurement under fluvial conditions. However, 4 cross-section overlays are available for 2006, 2009, 2010, and 2011, spanning 6 years of elapsed time. Beaver re-colonized sections of the project again in 2011 in-between control/removal efforts, but no dams were evident in site visits conducted by EEP in early 2012, although beaver activity was evident.

1.2 Goals and Objectives

Historically, the Site was utilized for agricultural activities and improvement projects through the Civilian Conservation Corps, resulting in the re-alignment, ditching and berming of Third Creek. Adjacent floodplains and streams were also cleared, drained, and ditched. These activities are thought to have inhibited stream and wetland function within the Site, resulting in a degraded riparian community.

The main goal of the project was to re-establish an integrated wetland-stream complex that likely existed on the Site before its historic disturbance. This wetland-stream complex was proposed to restore ecosystem processes, structure, and composition to mitigate for wetland functions and values that have been lost as a result of human induced disturbances in the Yadkin River Basin. The proposed mitigation plan included stream, wetland, and riparian restoration components.

The project consisted of restoring approximately 10,704 linear feet of stream, 91 acres of forested wetland, and 5 acres of emergent wetland. The stream restoration component consisted of restoring approximately 9,904 linear feet of perennial stream and 800 linear feet of intermittent stream. A sinuous, stable pattern, with riffle-pool bed features was constructed. In-stream structures were installed to provide bank stabilization, habitat, and maintain grade control. Wetland restoration consisted of plugging and filling agricultural ditches and planting native vegetation. Riparian areas were planted with native bare root seedlings and herbaceous cover to enhance the riparian areas, improve habitat, and stabilize streambanks.

Appendix A provides detailed project activity, history, contact information, and watershed/site background information for this project.

1.3 Vegetation Assessment

Vegetation Plots

The 2011 (year 7) vegetative assessment and vegetative plot analysis was conducted in June 2011. Vegetation assessments were conducted following the NCEEP 2004 Stem Counting Protocol, which consists of counting woody stems within the established vegetation plots. Approximately 91 acres were planted with various native hardwood tree and shrub species for the Site. Previous monitoring reports indicate that ten 50 ft by 50 ft (0.057 acres) monitoring plots were established by NCDOT for this project. During the 2006 monitoring year, four additional vegetation monitoring plots were established and included as additional vegetation plots to be monitored during subsequent monitoring events.

Success criteria established for Site vegetation plots required that the planted woody stem count must meet a minimum density of 320 stems/acre after three years, 290 stems/acre after four years, and 260 stems/acre after five years. The 2011 vegetation monitoring results indicate that the Site is meeting vegetative success criteria. All vegetation plots excluding Plot 10 (246 stems/acre) met the success criteria individually. Average site density is approximately 491 planted stems per acre with an average of 28 live planted stems per plot. A review of the total stem count, including natural recruits, indicated an increase in the average site density to approximately 1,351 stems per acre with an average of 77 total stems per plot. The number of native woody species per plot ranged from 7-13, indicating good diversity as well.

These averages did not include vegetation data from Plots 2 or 7 due to the high density of woody species and the anticipated lack in count accuracy (> 5000 stems per acre). This would have skewed the site average, but needless to say the density of Plots 2 and 7 far exceed regulatory requirements. Plot 2 was composed of a very dense with woody vegetation population and was dominated by red maple (*Acer rubrum*), river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), sweet gum (*Liquidambar styraciflua*), American sycamore (*Platanus occidentalis*), willow oak (*Quercus phellos*), black willow (*Salix nigra*), and winged elm (*Ulmus alata*). Plot 7 was comparatively dense and composed of similar woody species identified within Plot 2; however, species within this plot were dominated by American sycamore. Stem counts estimates for both plots would have increased the current year average for identified woody stems per plot and acre and potentially species diversity; however, data within these plots were not collected and estimates of the increase in average stem and species counts cannot be quantified. Please refer to Appendix B for representative vegetation plot photographs and Appendix C, Tables 6 through 9 for detailed information regarding the 2011 vegetation current conditions and monitoring data results.

Overall Vegetation Assessment

Some loss of streambank vegetation was evident in previous monitoring years and is again present as a result of recent beaver activity near the confluence area with the unnamed tributary. However, this is a small proportion of the site and the overall growth of the riparian buffer is good and appears to have improved in most portions of the Site. Increases in vegetation along the streambank and in some historically affected areas are most likely due to the resprouting of suspected dead saplings and new volunteer species. Black willow stakes have developed into trees that are providing significant bank protection along the project corridor. In many areas, willow trees appear to be reducing the cross sectional areas of the restoration reach, but low flow conditions have precluded erosion around the willows and the occurrence of debris jams.

Autumn olive (*Elaeagnus umbellate*), Nepalese browntop (*Microstegium vimineum*), Chinese privet (*Ligustrum sinense*), kudzu (*Pueraria lobata*) and blackberry (*Rubus* sp.) were observed within the floodplain. Kudzu is most apparent where it is encroaching into the easement area along the easement fencing (primarily along Triplett Road) and streambanks (approximate stationing 38+00 through 46+00). The area along the streambanks appears to be consistent with last year's assessment, although it may be advancing further upstream, away from the stream channel, and expanding into the floodplain areas. NCEEP contracted invasives control treatments in 2010 and 2011 to primarily control the Kudzu making inroads from Triplett Road and from the berm on Third Creek. Please refer to Appendix B for areas that were the subject of treatment.

1.4 Stream Assessment

Morphological measurements for the 2011 monitoring year consisted of a cross-section re-survey and a general stability assessment to comply with the scope of monitoring specified in the permit conditions. As per EEP, channel dimension was not measured in 2007 and 2008 due to very low flow from drought conditions and areas of beaver

impoundment. In lieu of a complete morphological survey, the main channel and its tributary were visually assessed from the upstream point of the project (approximately 285 lf upstream of Triplett Road) to the confluence with Third Creek in 2007 and 2008. In 2009, the cross-sectional surveys were resumed. Certain areas have been impacted from prior beaver inundation, which has contributed to deposition in certain areas. In addition to the beaver, the drought conditions of 2006-2008 promoted in-channel growth of vegetation, which was noted in many small Piedmont channels during that time. The modest valley and channel slopes make for a low energy condition, indicating it may take some time to evacuate deposited sediments.

Average bankfull width (12.06 ft) of the surveyed cross-sections is higher than the proposed 10.20 ft. However, examination of the overall vertical extent of the cross section in each of the overlays (with the exception of XS4) indicates channel widening was not a concern as no widening was evident when comparing the 2006 and 2011 measurements. Over this same period however, some channel deposition (~ mean 0.5 feet) and general decrease in cross-sectional area was noted primarily in the upper portion of the project (XS 1,2,5,6,7) with some cross-sections demonstrating remobilization of this sediment between the 2010 and 2011 observations (e.g. XS 3,7) . Although beaver frequented the area near the confluence with the tributary towards the bottom of the project, there were dams put in place further up the valley as well. The associated backwater conditions, the migration of vegetation to the channel during the drought, modest slopes and lesser hydrology near the top of the project are likely contributing factors to the observed channel deposition. A few of the cross-sections (4, 5 and 14) have illustrated an increase in sediment deposition from the previous monitoring year. Other cross-sections that were previously experiencing aggradation have either scoured out (7) or have exhibited scour through all monitoring events (3). Most of these changes can be attributed to current and historical beaver activity within the Site.

Overall, the restored channels are in fair condition; however, portions of the Site were affected by beaver activity resulting in inundated or backwater conditions in some areas of the mainstem and tributary. The following general observations were made during the 2011 monitoring efforts:

- Beaver rebuilt two dams at station 29+00 and 78+50 with the resulting backwater making assessment of bed condition in these areas difficult. As per EEP, the APHIS control contractor subsequently removed the beaver and the associated dams.

- Beaver related vegetation removal and impoundment have limited the establishment of vegetation along the banks of both the main channel (74+00 to 78+50) and the unnamed tributary (5+00 to 8+00) at their confluence. However, this represents a small proportion of the project and the cross sections surrounding these areas have either exhibited stability, narrowing and/or floodplain deposition when compared to earlier measurements. Banks have been stable with little to no erosion noted (see cross-section overlays and Table 5).

- Emergent vegetation, including broad-leaved cattail (*Typha latifolia*) and soft rush (*Juncus effuses*), continues to grow in portions of the channel where reduced flow velocities and previous sedimentation has occurred. Primarily, this in-stream vegetation growth is occurring between stationing 31+00 to 32+50, and is similar in extent to previous years.

1.5 Wetland Assessment

Seventeen automated groundwater monitoring gauges and four surface water gauges are located on Site. The monitoring gauges are programmed to record water levels daily and were downloaded monthly in order to capture hydrologic data during the growing season. The target wetland hydrology success criterion is saturation or inundation for at least 8 percent (15 days) of the growing season in the lower landscape (floodplain) locations. To achieve the stated hydrologic success criterion, groundwater levels need to be within 12-inches of the ground surface for 15 consecutive days of the April 14 to October 24 growing season.

Groundwater monitoring results from the 2011 monitoring year indicated that twelve of the seventeen groundwater gauges (1, 2, 3, 4, 6, 7, 8, 11, 12, 13, 14, and 16) achieved the wetland success criteria of saturation for 15 consecutive days (8%) during the growing season. Gauges 5, 15, 10, 17, and 18 did not meet the wetland success criteria. The primary source of these gauge failures is the proximity of Third Creek and the associated draw down with localized topographic constraints in the other areas. Within the wetland zones, hydrophytic vegetation and hydrology indicators have developed. Hydrophytic vegetation consists of a thick herbaceous layer of sedge species (*Carex* spp.), rush species (*Juncus* spp.), and bulrush species (*Scirpus* spp.) and cattail in wetter areas. Please refer to Appendix E for wetland plots and a summary of wetland criteria attainment.

Four surface gauges are located within the Shepherds Tree project site (three on the main channel and one on the tributary). More than one bankfull or greater event was recorded on the main channel and its tributary during the 2011 monitoring year. Additionally, visual assessments, such as wrack lines, were used to verify that a bankfull or greater event occurred along the restored reaches. Please refer to Appendix D for detailed stream data tables and plots and Appendix B for the location of the monitoring features and current conditions for the 2011 monitoring year.

1.6 Annual Monitoring Summary

Overall, the Site is meeting mitigation goals in the majority of the proposed areas and continues to mature. Some zones are exhibiting lower vegetation densities and some gauges are not meeting the wetland hydrologic thresholds.

The background information provided in this report is referenced from the NCDOT mitigation plan (prepared by KCI) and the previous monitoring report prepared by Soil

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

SECTION 2
METHODOLOGY

SECTION 2
METHODOLOGY

2.1 Methodology

Methods employed for the Site were a combination of those established by standard regulatory guidance and procedures documents (see below), the Shepherds Tree Mitigation Plan (state project no. 6.769001t) submitted by the NCDOT (prepared by KCI) and the Soil and Environmental Consultants monitoring reports. Vegetation assessments were conducted following the NCDOT protocol which consists of counting woody stems within the established vegetation plots. JJG used the *Flora of the Carolinas, Virginia, Georgia, and surrounding areas* by Alan S. Weakley as the taxonomic standard for vegetation nomenclature for this report. Precipitation data for the hydrographs was obtained from an off-site resource in Statesville, NC weather station (the nearest station offering daily precipitation data) through the Weather Underground website.

SECTION 3
REFERENCES

SECTION 3
REFERENCES

Martin, W. and Nunnally, N. 2001. *Air and Water: An Introduction to the Atmosphere and the Hydrosphere*. Kendall/Hunt Publishing Company, Dubuque, Iowa.

NCDOT. 2001. Shepherds Tree Mitigation Plan (state project no. 6.769001t). Raleigh, NC.

Rosgen, D L. (1996) *Applied River Morphology.* Wildland Hydrology Books, Pagosa Springs, CO.

Soil and Environmental Consultants, PA. 2006. Shepherds Tree Stream and Wetland Restoration 2005 Annual Monitoring Report (Year 1). Raleigh, NC.

State Climate Office of North Carolina (SCONC). 2007. Data retrieval from Statesville for 1948-01-01 through 2007-01-01. NC CRONOS Database, Raleigh, North Carolina.

USACOE (2003) *Stream Mitigation Guidelines*. USACOE, USEPA, NCWRC, NCDENR-DWQ.

USACOE (1987) *Corps of Engineers Wetlands Delineation Manual.* Tech report Y-87-1. AD/A176.

Weakley, A.S. 2008. *Flora of the Carolinas, Virginia, Georgia, Northern Florida, and Surrounding Areas* (Draft April 2008). University of North Carolina at Chapel Hill: Chapel Hill, NC.

SECTION 4
APPENDICES

Appendix A – Project Vicinity Map and Background Tables

Appendix B – Visual Assessment Data

Appendix C – Vegetation Plot Data

Appendix D – Stream Survey Data

Appendix E – Hydrologic Data

APPENDIX A
PROJECT VICINITY MAP AND BACKGROUND TABLES

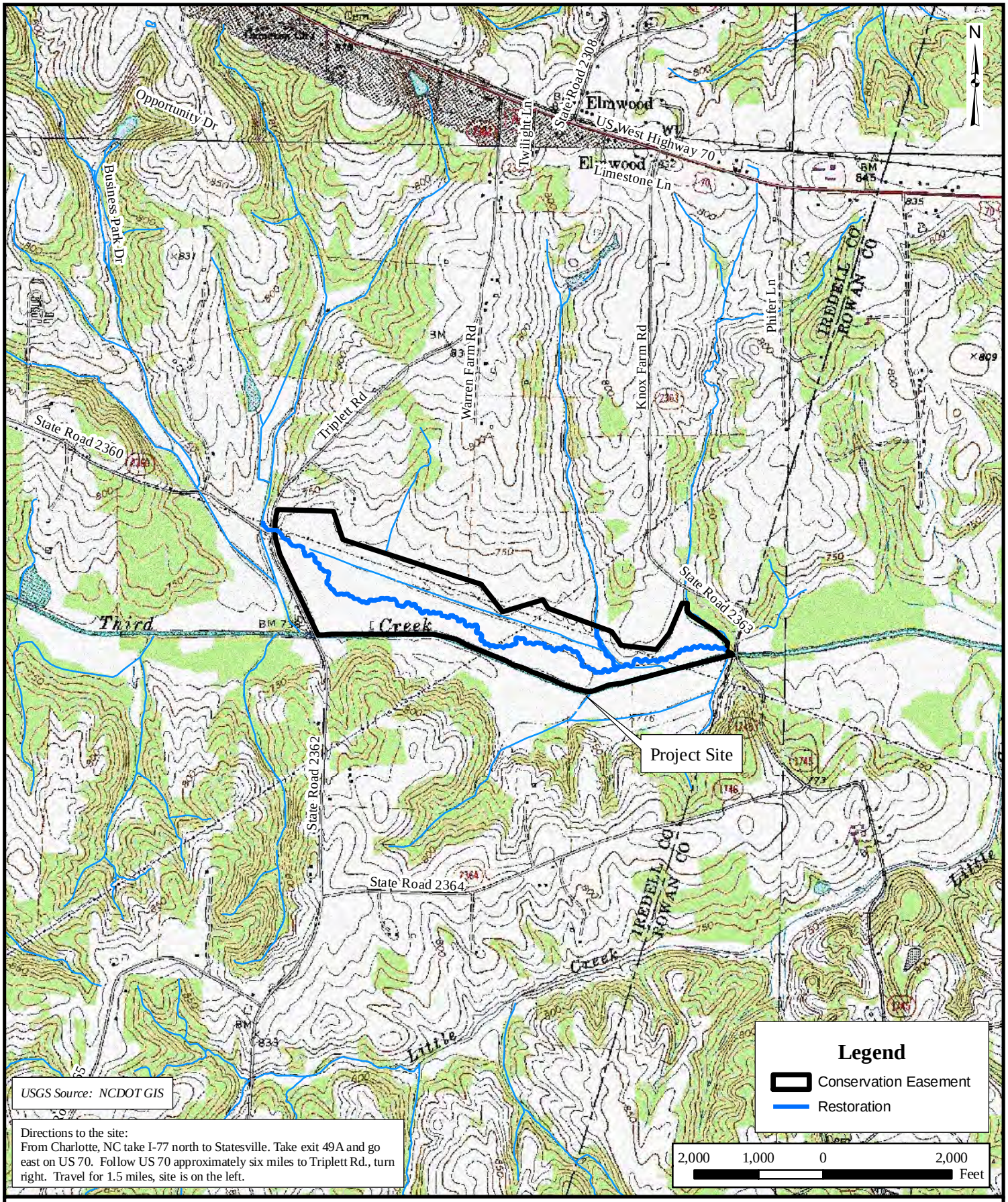


Figure 1. Vicinity Map
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Iredell County, NC
Monitoring Year 7
Submittal Date: May 2012

Appendix A. Project Vicinity Map and Background Tables
Table 1: Project Components and Mitigation Credits
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Mitigation Credits						
	Stream	**Riparian Wetland**	**Non-riparian Wetland**	**Buffer**	**Nitrogen Nutrient Offset**	**Phosphorous Nutrient Offset**
Type	R, P1	R, C, P	N/A	N/A	N/A	N/A
Totals	10,988 lf	95.61 ac	N/A	N/A	N/A	N/A

Project Components						
Project Component/Reach ID	**Stationing (ft)**	**Existing Footage/ Acreage**	**Approach**	**Restoration or Restoration Equivalent**	**Restoration Footage or Acres**	**Mitigation Ratio**
Perennial Mainstem Reach	0+00-99+04	U	P1	Restoration	9,904 lf	1:1
Intermittent Tributary	0+00-8+00	U	P1	Restoration	800 lf	1:1
Piedmont/Mountain Bottomland Hardwood Forest	N/A	U	-	Restoration	48.56 acres	1:1
		U	-	Creation	37.71 acres	3:1
Piedmont/Mountain Swamp Hardwood Forest	N/A	U	-	Restoration	5 acres	1:1
Low Elevation Seep	N/A	U	-	Preservation	4.54 acres	5:1
Phase III	N/A	U	P1	Restoration	284 lf	1:1

Component Summations						
Restoration Level	**Stream (linear feet)**	**Riparian Wetland (acres)**		**Non-riparian Wetland (acres)**	**Buffer (square feet)**	**Upland (acres)**
		Riverine	**Non-Riverine**			
Restoration (R)	10,988	53.56	N/A	N/A	N/A	N/A
Enhancement (E)	N/A	N/A	N/A	N/A	N/A	N/A
Enahncement I (E)	N/A	N/A	N/A	N/A	N/A	N/A
Enhancement II (E)	N/A	N/A	N/A	N/A	N/A	N/A
Creation (C)	N/A	37.71	N/A	N/A	N/A	N/A
Preservation (P)	N/A	4.54	N/A	N/A	N/A	N/A
HQ Preservation (P)	N/A	N/A	N/A	N/A	N/A	N/A
Totals	**10,988**	**95.61**	**N/A**	**N/A**	**N/A**	**N/A**

BMP Elements			
Element	**Location**	**Purpose/Function**	**Notes**
N/A	N/A	N/A	N/A

BMP Elements
BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP - Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer
*Enhancement and Preservation reaches were not stationed.

Appendix A. Project Vicinity Map and Background Tables
Table 2: Project Activity and Reporting History
Shepherds Tree Stream and Wetland Restoration/EEP Project 333
Monitoring Year 7

Elapsed Time Since Grading Complete: 7+ Years
Elapsed Time Since Planting Complete: Unknown
Number of Reporting Years: 7

Activity or Report	Data Collection Completed	Actual Completion or Delivery
Restoration Plan	N/A	Jun-01
Final Design-90%	N/A	N/A
Construction	N/A	2004
Temporary S&E mix applied to entire project area*	Fall 2001	Fall 2001
Permanent seed mix applied to reach	Spring 2002	Spring 2002
Mitigation Plan/ As-Built (Year 0 Monitoring)	Jun-01/2004	Jun-01/2004
Year 1 Monitoring**	2005	Feb-06
Year 2 Monitoring **	2006	Jan-07
Year 3 Monitoring**	2007	Nov-07
Year 4 Monitoring**	2008	Dec-08
Year 5 Monitoring**	2009	Jan-10
Year 6 Monitoring**	2010	Dec-10
Year 7 Monitoring**	2011	Feb-12

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

**Data is collected throughout the monitoring year.

Appendix A. Project Vicinity Map and Background Tables
Table 3: Project Contacts Table
Shepherds Tree Stream and Wetland Restoration/EEP Project 333
Monitoring Year 7

Designer	KCI Associates of North Carolina, PA Suite 200 Landmark Center I 4601 Six Forks Rd Raleigh, NC 27609
Contractor's Name (Phase I)	NCDOT Highway Maintenance
Contractor's Name (Phase II)	Northstate Environmental
Contractor's Name (Phase III)	NCDOT Bridge and Highway Maintenance
Planting Contractor	Unknown
Seeding Contractor	Unknown
Monitoring Performers	Jordan, Jones and Goulding 309 E. Morehead Street, Suite 110 Charlotte, NC 28202
Stream Monitoring, POC	Alison Nichols, 770-455-8555
Vegetation Monitoring, POC	
Wetland Monitoring, POC	

Appendix A. Project Vicinity Map and Background Tables
Table 4 Project Attribute Table
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Project Information		
Project Name	Shepherds Tree Stream and Wetland Restoration	
Project County	Iredell County, North Carolina	
Project Area (acres)	164.9 acres	
Project Coordinates	35º 43' 45.26" N 80º 45' 48.26" W	
Project Watershed Summary Information		
Physiographic Region	Piedmont	
River Basin	Yadkin	
USGS HUC for Project (8 digit)	03040102	
USGS HUC for Project (14 digit)	03040102040030	
DWQ Sub-basin	03-07-06	
Project Drainage Area (acres)	1,389	
Project Drainage Area Percentage of Impervious Area*	-	
CGIA Land Use Classification	-	
Reach Summary Information		
Parameters	**Main Channel**	**Tributary**
Length of reach (linear feet)	9,904	800
Valley classification	-	-
Drainage area (acres)	678	U
NCDWQ stream identification score	-	-
NCDWQ Water Quality Classification	C	C
Morphological Description (stream type)	Perennial	Intermittent
Evolutionaly trend	E5	N/A
Underlying mapped soils	Chewacla	Conagree
Drainage Class	U	U
Soil Hydric status	Secondary	No
Slope	0.0041	0.0041
FEMA classification	100 year floodplain	100 year floodplain
Native vegetation community	Piedmont/Mountain Levee Forest, Low Elevation Seep, Scrub-Shrub	
Percent composition of exotic invasive vegetation	U	U

Wetland Summary Information**				
Parameters	Piedmont/Mountain Bottomland Hardwood Forest - Restoration	Piedmont/Mountain Bottomland Hardwood Forest - Creation	Piedmont/Mountain Swamp Hardwood Forest - Restoration	Low Elevation Seep - Preservation
Size of Wetland (acres)	48.56	37.71	5.00	4.54
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	riparian riverine	riparian riverine	riparian riverine	riparian riverine
Mapped Soil Series	Wehadkee	Wehadkee, Chewacla	Wehadkee	Congaree
Drainage class	U	U	U	U
Soil Hydric Status	Yes	Yes, Secondary	Yes	No
Source of Hydrology	U	U	U	U
Hydrologic impairment	N/A	N/A	N/A	N/A
Native vegetation community	U	U	U	U
Percent composition of exotic invasive vegetation	U	U	U	U

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States - Section 404	No	N/A	N/A
Waters of the United States - Section 401	No	N/A	N/A
Endangered Species Act	No	N/A	N/A
Historic Preservation Act	No	N/A	N/A
Costal Zone Managemetn Act (CZMA)/Costal Area	No	N/A	N/A
FEMA Floodplain Compliance	Yes	U	N/A
Essential Fisheries Habitat	No	N/A	N/A

*****At the time of project completion.

******Wetland mitigation was not included for this restoration project.

"N/A": items do not apply / "-": items are unavailable / "U": items are unknown

APPENDIX B
VISUAL ASSESSMENT DATA

Figure 2	**Current Condition Plan View (CCPV)**
Table 5	**Visual Stream Morphology Stability Assessment Table**
Table 6	**Vegetation Condition Assessment Table**
Photos	**Stream Station Photos**
Photos	**Vegetation Plot Photos**

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

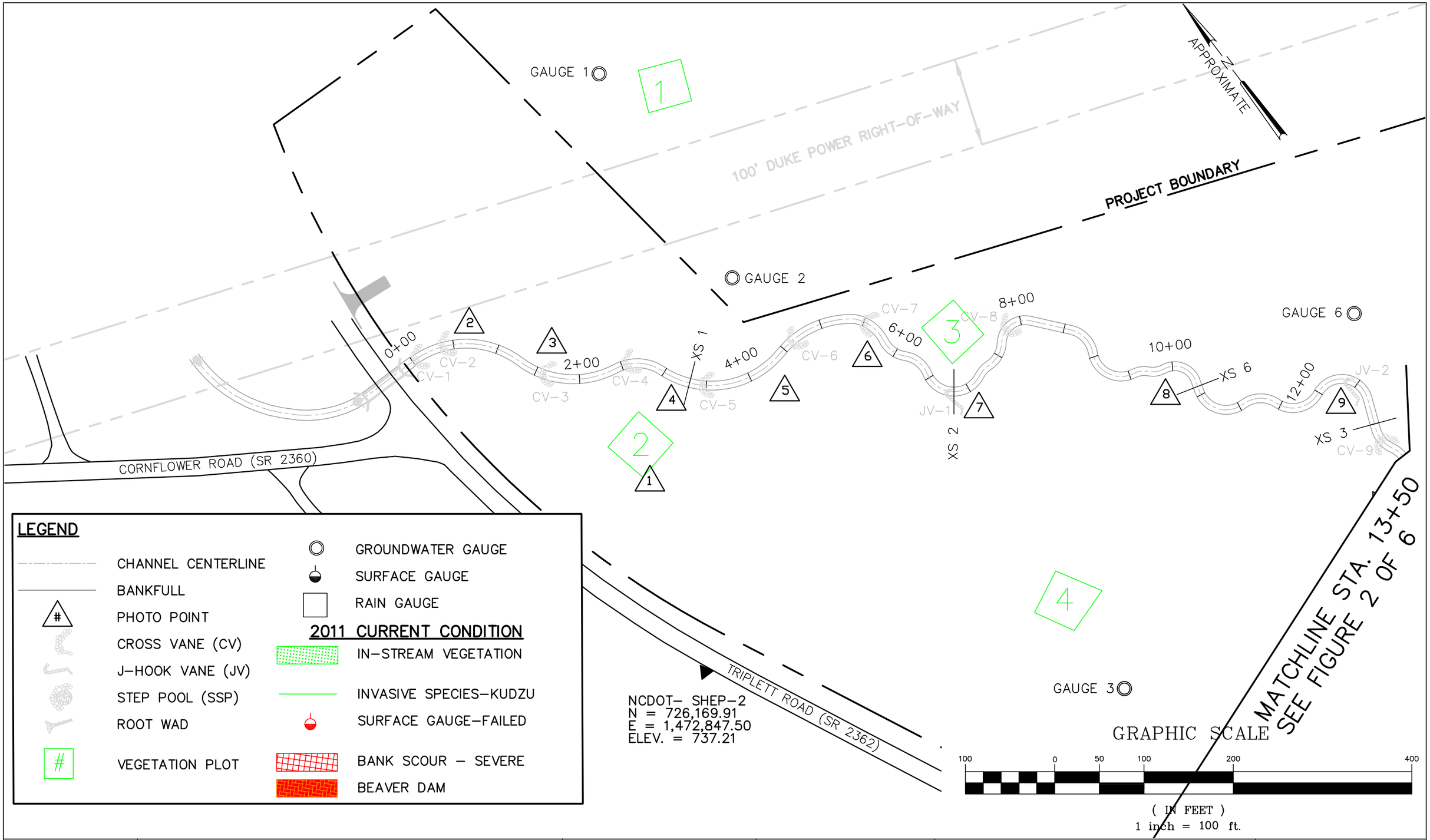
EEP PROJECT NO. 333
IREDELL COUNTY,
NORTH CAROLINA
MONITORING YEAR 7

NC ECOSYSTEM ENHANCEMENT PROGRAM
SHEPHERDS TREE STREAM & WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE : APRIL 2011
SCALE : 1"=600'
JOB NO.: JJX31100

FIGURE KEY



LEGEND

- CHANNEL CENTERLINE
- BANKFULL
- PHOTO POINT
- CROSS VANE (CV)
- J-HOOK VANE (JV)
- STEP POOL (SSP)
- ROOT WAD
- VEGETATION PLOT
- GROUNDWATER GAUGE
- SURFACE GAUGE
- RAIN GAUGE

2011 CURRENT CONDITION

- IN-STREAM VEGETATION
- INVASIVE SPECIES-KUDZU
- SURFACE GAUGE-FAILED
- BANK SCOUR - SEVERE
- BEAVER DAM

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

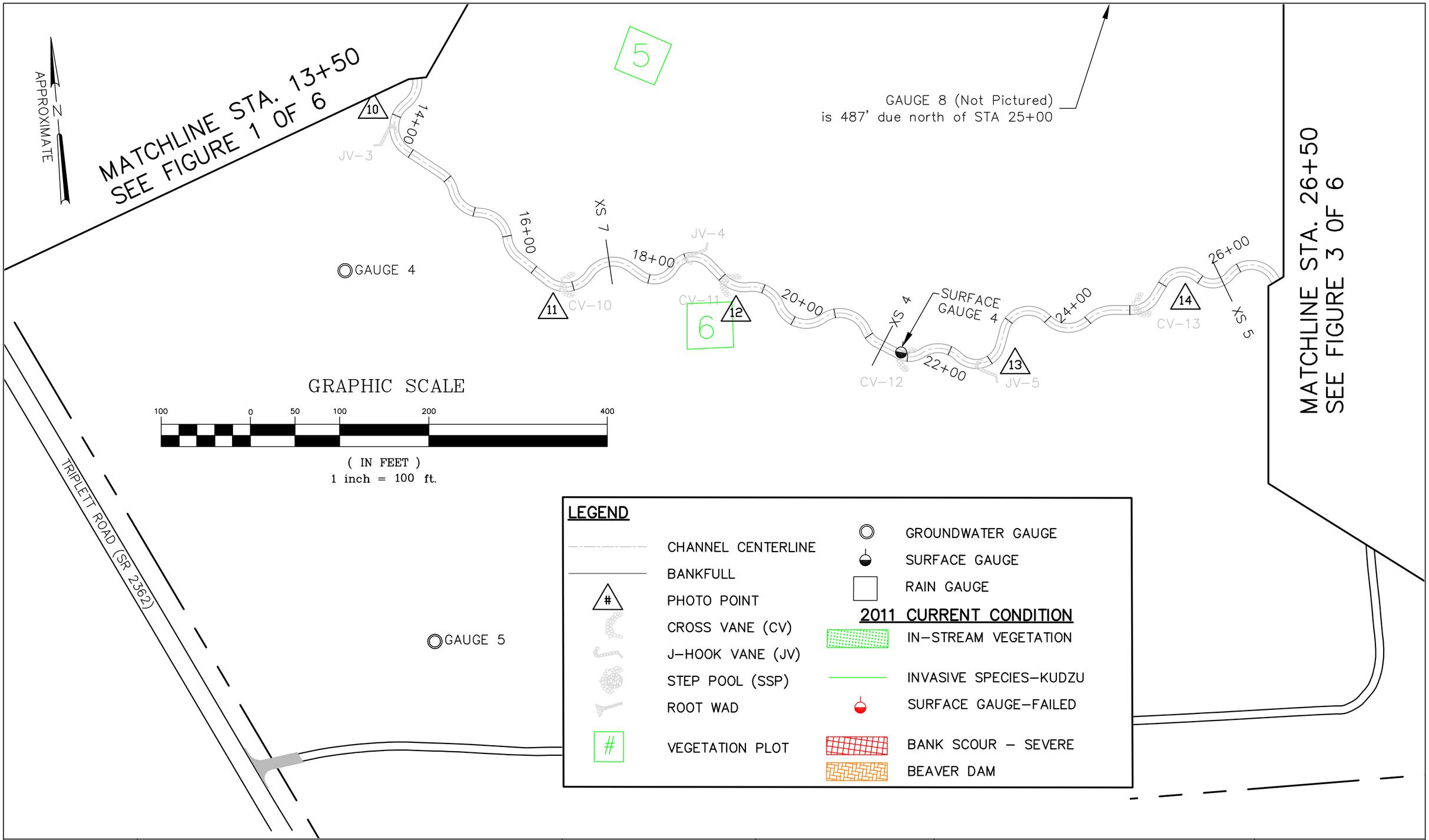
EEP PROJECT NO. 333
IREDELL COUNTY,
NORTH CAROLINA
MONITORING YEAR 7

NC ECOSYSTEM ENHANCEMENT PROGRAM
SHEPHERDS TREE STREAM & WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE : APRIL 2011
SCALE : 1"=100'
JOB NO.: JJX31100

FIGURE 1 OF 6



NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

EEP PROJECT NO. 333
IREDELL COUNTY,
NORTH CAROLINA
MONITORING YEAR 7

NC ECOSYSTEM ENHANCEMENT PROGRAM
SHEPHERDS TREE STREAM & WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE : APRIL 2011
SCALE : 1"=100'
JOB NO.: JJX31100

FIGURE 2 OF 6

APPROXIMATE

GAUGE 11

GAUGE 12

GAUGE 7

14

7

MATCHLINE STA. 40+50
SEE FIGURE 4 OF 6

MATCHLINE STA. 26+50
SEE FIGURE 2 OF 6

40+00
38+00
36+00
34+00
32+00
30+00
28+00

JV-9
JV-10
JV-8
JV-6
JV-7
CV-15
CV-16
CV-17
CV-14

15
16
17
18
19
20

LEGEND

- CHANNEL CENTERLINE
- BANKFULL
- PHOTO POINT
- CROSS VANE (CV)
- J-HOOK VANE (JV)
- STEP POOL (SSP)
- ROOT WAD
- VEGETATION PLOT
- GROUNDWATER GAUGE
- SURFACE GAUGE
- RAIN GAUGE

2011 CURRENT CONDITION

- IN-STREAM VEGETATION
- INVASIVE SPECIES-KUDZU
- SURFACE GAUGE-FAILED
- BANK SCOUR - SEVERE
- BEAVER DAM

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100 ft.

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

EEP PROJECT NO. 333
IREDELL COUNTY,
NORTH CAROLINA
MONITORING YEAR 7

NC ECOSYSTEM ENHANCEMENT PROGRAM
SHEPHERDS TREE STREAM & WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE : APRIL 2011
SCALE : 1"=100'
JOB NO.: JJX31100

FIGURE 3 OF 6

LEGEND

- CHANNEL CENTERLINE
- BANKFULL
- PHOTO POINT
- CROSS VANE (CV)
- J-HOOK VANE (JV)
- STEP POOL (SSP)
- ROOT WAD
- VEGETATION PLOT
- GROUNDWATER GAUGE
- SURFACE GAUGE
- RAIN GAUGE

2011 CURRENT CONDITION

- IN-STREAM VEGETATION
- INVASIVE SPECIES-KUDZU
- SURFACE GAUGE-FAILED
- BANK SCOUR - SEVERE
- BEAVER DAM

MATCHLINE STA. 40+50 SEE FIGURE 3 OF 6

MATCHLINE STA. 62+50 SEE FIGURE 5 OF 6

GAUGE 14

GAUGE 13

GAUGE 10

SURFACE GAUGE 1

JV-11 42+00 CV-19 44+00 JV-12 CV-18 CV-20 46+00 48+00 50+00 52+00 54+00 CV-21 JV-13 56+00 CV-22 58+00 JV-14 60+00 CV-23 62+00 JV-15

8 9 13 21 22 23 24 25

APPROXIMATE N

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)

1 inch = 100 ft.

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

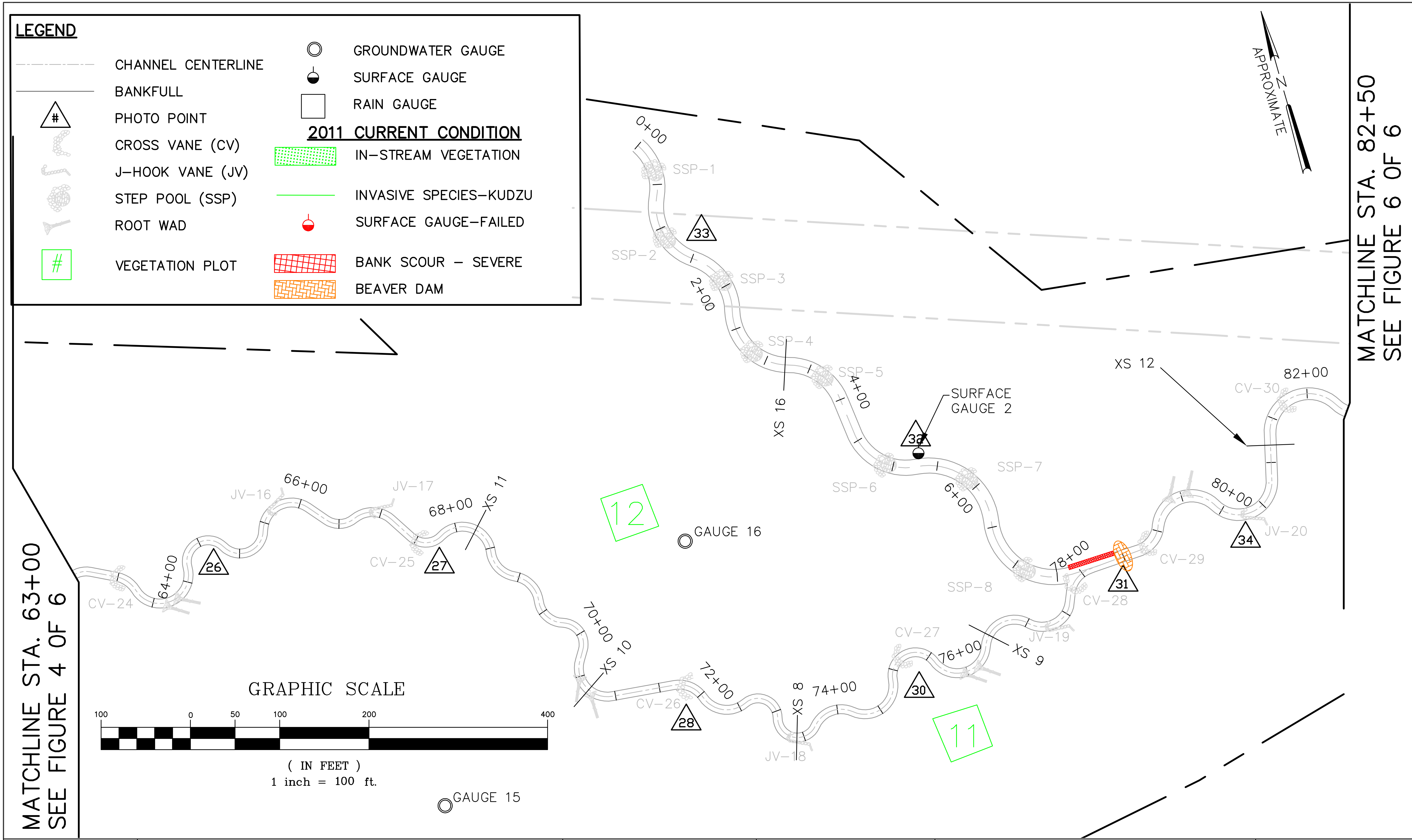
EEP PROJECT NO. 333
IREDELL COUNTY,
NORTH CAROLINA
MONITORING YEAR 7

NC ECOSYSTEM ENHANCEMENT PROGRAM
SHEPHERDS TREE STREAM & WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE : APRIL 2011
SCALE : 1"=100'
JOB NO.: JJX31100

FIGURE 4 OF 6


LEGEND
CHANNEL CENTERLINE
BANKFULL
PHOTO POINT
CROSS VANE (CV)
J-HOOK VANE (JV)
STEP POOL (SSP)
ROOT WAD
VEGETATION PLOT
GROUNDWATER GAUGE
SURFACE GAUGE
RAIN GAUGE
2011 CURRENT CONDITION
IN-STREAM VEGETATION
INVASIVE SPECIES-KUDZU
SURFACE GAUGE-FAILED
BANK SCOUR – SEVERE
BEAVER DAM
N
APPROXIMATE
MATCHLINE STA. 82+50
SEE FIGURE 6 OF 6
MATCHLINE STA. 63+00
SEE FIGURE 4 OF 6
0+00
2+00
4+00
6+00
64+00
66+00
68+00
70+00
72+00
74+00
76+00
78+00
80+00
82+00
SSP-1
SSP-2
SSP-3
SSP-4
SSP-5
SSP-6
SSP-7
SSP-8
XS 16
XS 12
XS 11
XS 10
XS 9
XS 8
SURFACE GAUGE 2
GAUGE 16
GAUGE 15
JV-16
JV-17
JV-18
JV-19
JV-20
CV-24
CV-25
CV-26
CV-27
CV-28
CV-29
CV-30
12
11
GRAPHIC SCALE
100
0
50
100
200
400
(IN FEET)
1 inch = 100 ft.

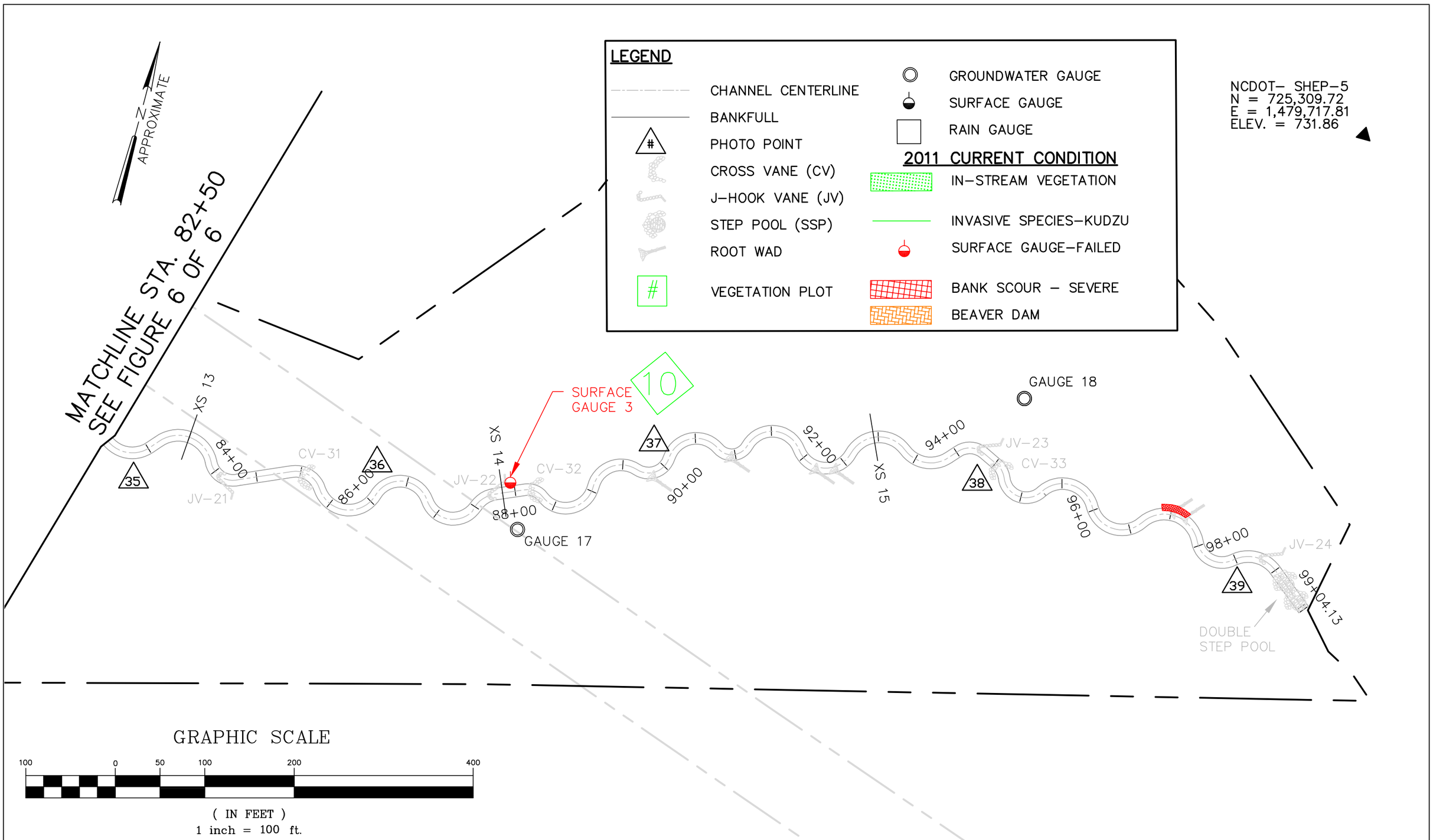
NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

EEP PROJECT NO. 333
IREDELL COUNTY,
NORTH CAROLINA
MONITORING YEAR 7

NC ECOSYSTEM ENHANCEMENT PROGRAM
SHEPHERDS TREE STREAM & WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE : APRIL 2011
SCALE : 1"=100'
JOB NO.: JJX31100
FIGURE 5 OF 6



NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

EEP PROJECT NO. 333
IREDELL COUNTY,
NORTH CAROLINA
MONITORING YEAR 7

NC ECOSYSTEM ENHANCEMENT PROGRAM
SHEPHERDS TREE STREAM & WETLAND RESTORATION

CURRENT CONDITION PLAN VIEW

DATE : APRIL 2011
SCALE : 1"=100'
JOB NO.: JJX31100

FIGURE 6 OF 6

Appendix B. Visual Assessment Data
Table 5. Visual Stream Morphology Stability Assessment Table
Main Channel (9,904.13 lf)
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

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			2	1600	84%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	0	U			0%			
	3. Meander Pool Condition	Depth Sufficient	U	150			U			
		Length Appropriate	U	150			U			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	U	150			U			
		Thalweg centering at downstream of meander bend (Glide)	U	150			U			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			2	115	99%	2	115	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	2	115	97%	2	115	100%
3. Engineered Structures*	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	U	57			U			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	U	57			U			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	U	57			U			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	57	57			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	U	57			U			

U:Unknown
*Several structures have been buried with sediment and therefore a majority of the structures could not be assessed.

Appendix B. Visual Assessment Data
Table 5. Visual Stream Morphology Stability Assessment Table
Tributary (800 lf)
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

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			1	800	0%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	0	U			0%			
	3. Meander Pool Condition	Depth Sufficient	U	7			U			
		Length Appropriate	U	7			U			
	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%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	U	7			U			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	U	7			U			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	U	7			U			
	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.	U	7			U			

U:Unknown

Appendix B. Visual Assessment Data
Table 6: Vegetation Condition Assessment Table
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Planted Acreage **91**

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	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%
		Total	**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	0	0	10%

Easement Acreage **164.9**

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	3	U	U
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	Various Locations	U	U

U: Unknown

Photo Point 1-Vegetation Plot
(MY 2 – 9/2006)

Photo Point 1-Vegetation Plot
(MY 7 – 6/2011)

Photo Point 2-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 2-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 2-View Downstream
(MY 2 – 9/2006)

Photo Point 2-View Downstream
(MY 7 – 6/2011)

Photo Point 3-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 3-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 3-View Downstream
(MY 2 – 9/2006)

Photo Point 3-View Downstream
(MY 7 – 6/2011)

Photo Point 4-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 4-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 4-View Downstream
(MY 2 – 9/2006)

Photo Point 4-View Downstream
(MY 7 – 6/2011)

Photo Point 5-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 5-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 5-View Downstream
(MY 2 – 9/2006)

Photo Point 5-View Downstream
(MY 7 – 6/2011)

Photo Point 6-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 6-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 6-View Downstream
(MY 2 – 9/2006)

Photo Point 6-View Downstream
(MY 7 – 6/2011)

Photo Point 7-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 7-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 7-View Downstream
(MY 2 – 9/2006)

Photo Point 7-View Downstream
(MY 7 – 6/2011)

Photo Point 8-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 8-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 8-View Downstream
(MY 2 – 9/2006)

Photo Point 8-View Downstream
(MY 7 – 6/2011)

Photo Point 9-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 9-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 9-View Downstream
(MY 2 – 9/2006)

Photo Point 9-View Downstream
(MY 7 – 6/2011)

Photo Point 10-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 10-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 10-View Downstream
(MY 2 – 9/2006)

Photo Point 10-View Downstream
(MY 7 – 6/2011)

Photo Point 11-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 11-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 11-View Downstream
(MY 2 – 9/2006)

Photo Point 11-View Downstream
(MY 7 – 6/2011)

Photo Point 12-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 12-View Upstream
Main Channel (MY 7 - 8/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 12-View Downstream
(MY 2 – 9/2006)

Photo Point 12-View Downstream
(MY 7 – 8/2011)

Photo Point 13-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 13-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 13-View Downstream
(MY 2 – 9/2006)

Photo Point 13-View Downstream
(MY 7 – 6/2011)

Photo Point 14-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 14-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 14-View Downstream
(MY 2 – 9/2006)

Photo Point 14-View Downstream
(MY 7 – 6/2011)

Photo Point 15-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 15-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 15-View Downstream
(MY 2 – 9/2006)

Photo Point 15-View Downstream
(MY 7 – 6/2011)

Photo Point 16-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 16-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 16-View Downstream
(MY 2 – 9/2006)

Photo Point 16-View Downstream
(MY 7 – 6/2011)

Photo Point 17-View Upstream
Main Channel (MY 2 - 9/2006)

Photo Point 17-View Upstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 17-View Downstream
(MY 2 – 9/2006)

Photo Point 17-View Downstream
(MY 7 – 6/2011)

Photo Point 18-Vegetation Plot
Main Channel (MY 2 - 9/2006)

Photo Point 18-Vegetation Plot
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 19-View Upstream
(MY 2 – 9/2006)

Photo Point 19-View Upstream
(MY 7 – 6/2011)

Photo Point 19-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 19-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 20-View Upstream
(MY 2 – 9/2006)

Photo Point 20-View Upstream
(MY 7 – 6/2011)

Photo Point 20-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 20-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 21-View Upstream
(MY 2 – 9/2006)

Photo Point 21-View Upstream
(MY 7 – 6/2011)

Photo Point 21-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 21-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 22-View Upstream
(MY 2 – 9/2006)

Photo Point 22-View Upstream
(MY 7 – 6/2011)

Photo Point 22-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 22-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 23-View Upstream
(MY 2 – 9/2006)

Photo Point 23-View Upstream
(MY 7 – 6/2011)

Photo Point 23-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 23-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 24-View Upstream
(MY 2 – 9/2006)

Photo Point 24-View Upstream
(MY 7 – 6/2011)

Photo Point 24-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 24-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 25-View Upstream
(MY 2 – 9/2006)

Photo Point 25-View Upstream
(MY 7 – 6/2011)

Photo Point 25-View Downstream
Main Channel (MY 2 - 3/2006)

Photo Point 25-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 26-View Upstream
(MY 2 – 9/2006)

Photo Point 26-View Upstream
(MY 7 – 6/2011)

Photo Point 26-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 26-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 27-View Upstream
(MY 2 – 3/2006)

Photo Point 27-View Upstream
(MY 7 – 6/2011)

Photo Point 27-View Downstream
Main Channel (MY 2 - 3/2006)

Photo Point 27-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 28-View Upstream
(MY 2 – 3/2006)

Photo Point 28-View Upstream
(MY 7 – 6/2011)

Photo Point 28-View Downstream
Main Channel (MY 2 - 3/2006)

Photo Point 28-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 30-View Upstream
(MY 2 – 3/2006)

Photo Point 30-View Upstream
(MY 7 – 6/2011)

Photo Point 30-View Downstream
Main Channel (MY 2 - 3/2006)

Photo Point 30-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 31-View Upstream
(MY 2 – 9/2006)

Photo Point 31-View Upstream
(MY 7 – 6/2011)

Photo Point 31-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 31-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 32-View Upstream
(MY 2 – 9/2006)

Photo Point 32-View Upstream
(MY 7 – 6/2011)

Photo Point 32-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 32-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 33-View Upstream
(MY 2 – 9/2006)

Photo Point 33-View Upstream
(MY 7 – 6/2011)

Photo Point 33-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 33-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 34-View Upstream
(MY 2 – 9/2006)

Photo Point 34-View Upstream
(MY 7 – 6/2011)

Photo Point 34-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 34-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 35-View Upstream
(MY 2 – 9/2006)

Photo Point 35-View Upstream
(MY 7 – 6/2011)

Photo Point 35-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 35-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 36-View Upstream
(MY 2 – 9/2006)

Photo Point 36-View Upstream
(MY 7 – 6/2011)

Photo Point 36-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 36-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 37-View Upstream
(MY 2 – 9/2006)

Photo Point 37-View Upstream
(MY 7 – 6/2011)

Photo Point 37-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 37-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 38-View Upstream
(MY 2 – 9/2006)

Photo Point 38-View Upstream
(MY 7 – 6/2011)

Photo Point 38-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 38-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Photo Point 39-View Upstream
(MY 2 – 3/2006)

Photo Point 39-View Upstream
(MY 7 – 6/2011)

Photo Point 39-View Downstream
Main Channel (MY 2 - 9/2006)

Photo Point 39-View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 1 -View Upstream
(MY 2 – 1/2007)

Cross Section 1 -View Downstream
Main Channel (MY 2 - 1/2007)

Cross Section 1 -View Upstream
(MY 7 – 6/2011)

Cross Section 1 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 2 -View Upstream
(MY 2 – 1/2007)

Cross Section 2 -View Downstream
Main Channel (MY 2 - 1/2007)

Cross Section 2 -View Upstream
(MY 7 – 6/2011)

Cross Section 2 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 3 -View Upstream
(MY 2 – 1/2007)

Cross Section 3 -View Upstream
(MY 7 – 8/2011)

Cross Section 3 -View Downstream
Main Channel (MY 2 - 1/2007)

Cross Section 3 -View Downstream
Main Channel (MY 7 - 8/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 4 -View Upstream
(MY 2 – 1/2007)

Cross Section 4 -View Upstream
(MY 7 – 6/2011)

Cross Section 4 -View Downstream
Main Channel (MY 2 - 1/2007)

Cross Section 4 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 5 -View Upstream
(MY 2 – 1/2007)

Cross Section 5 -View Upstream
(MY 7 – 6/2011)

Cross Section 5 -View Downstream
Main Channel (MY 2 - 1/2007)

Cross Section 5 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 6 -View Upstream
(MY 2 – 1/2007)

Cross Section 6 -View Upstream
(MY 7 – 6/2011)

Cross Section 6 -View Downstream
Main Channel (MY 2 - 1/2007)

Cross Section 6 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 7 -View Upstream
(MY 2 – 1/2007)

Cross Section 7 -View Upstream
(MY 7 – 6/2011)

Cross Section 7 -View Downstream
Main Channel (MY 2 - 1/2007)

Cross Section 7 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 8 -View Upstream
(MY 2 – 1/2007)

Cross Section 8 -View Upstream
(MY 7 – 6/2011)

Cross Section 8 -View Downstream
Main Channel (MY 2 - 1/2007)

Cross Section 8 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 9 -View Upstream
(MY 2 – 1/2007)

Cross Section 9 -View Upstream
(MY 7 – 6/2011)

Cross Section 9 -View Downstream
Main Channel (MY 2 - 1/2007)

Cross Section 9 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 10 -View Upstream
(MY 2 – 1/2007)

Cross Section 10 -View Upstream
(MY 7 – 6/2011)

Cross Section 10 -View Downstream
Main Channel (MY 2 - 1/2007)

Cross Section 10 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 11 -View Upstream
(MY 2 – 1/2007)

Cross Section 11 -View Upstream
(MY 7 – 6/2011)

Cross Section 11 -View Downstream
Main Channel (MY 2 - 1/2007)

Cross Section 11 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 12 -View Upstream
(MY 2 – 9/2006)

Cross Section 12 -View Upstream
(MY 7 – 6/2011)

Cross Section 12 -View Downstream
Main Channel (MY 2 - 9/2006)

Cross Section 12 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 13 -View Upstream
(MY 2 – 9/2006)

Cross Section 13 -View Upstream
(MY 7 – 6/2011)

Cross Section 13 -View Downstream
Main Channel (MY 2 - 9/2006)

Cross Section 13 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 14 -View Upstream
(MY 2 – 9/2006)

Cross Section 14 -View Upstream
(MY 7 – 6/2011)

Cross Section 14 -View Downstream
Main Channel (MY 2 - 9/2006)

Cross Section 14 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 15 -View Upstream
(MY 2 – 9/2006)

Cross Section 15 -View Upstream
(MY 7 – 6/2011)

Cross Section 15 -View Downstream
Main Channel (MY 2 - 9/2006)

Cross Section 15 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Cross Section 16 -View Upstream
(MY 2 – 1/2007)

Cross Section 16 -View Upstream
(MY 7 – 6/2011)

Cross Section 16 -View Downstream
Main Channel (MY 2 - 1/2007)

Cross Section 16 -View Downstream
Main Channel (MY 7 - 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B – Visual Assessment Data
Stream Station & Cross Section Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Vegetation Plot 1
(MY 2 - 5/2006)

Vegetation Plot 1
(MY 7 – 6/2011)

Vegetation Plot 2
(MY 2 – 5/2006)

Vegetation Plot 2 – Photo 1
(MY 7 – 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B Visual Assessment Data
Vegetation Plot Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Vegetation Plot 2 – Photo 2
(MY 7 – 6/2011)

Vegetation Plot 2 – Photo 3
(MY 7 – 6/2011)

Vegetation Plot 2 – Photo 4
(MY 7 – 6/2011)

Vegetation Plot 3
(MY 2 - 5/2006)

Vegetation Plot 3
(MY 7 - 6/2011)

Vegetation Plot 4
(MY 2 – 5/2006)

Vegetation Plot 4
(MY 7 – 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B Visual Assessment Data
Vegetation Plot Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Vegetation Plot 5
(MY 2 - 5/2006)

Vegetation Plot 5
(MY 7 - 6/2011)

Vegetation Plot 6
(MY 2 – 5/2006)

Vegetation Plot 6
(MY 7 – 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B Visual Assessment Data
Vegetation Plot Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Vegetation Plot 7
(MY 2 - 5/2006)

Vegetation Plot 7
(MY 7 - 6/2011)

Vegetation Plot 8
(MY 2 – 5/2006)

Vegetation Plot 8
(MY 7 – 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B Visual Assessment Data
Vegetation Plot Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Vegetation Plot 9
(MY 2 - 5/2006)

Vegetation Plot 9
(MY 7 - 6/2011)

Vegetation Plot 10
(MY 2 – 5/2006)

Vegetation Plot 10
(MY 7 – 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B Visual Assessment Data
Vegetation Plot Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Vegetation Plot 11
(MY 2 - 5/2006)

Vegetation Plot 11
(MY 7 - 6/2011)

Vegetation Plot 12
(MY 2 – 5/2006)

Vegetation Plot 12
(MY 7 – 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B Visual Assessment Data
Vegetation Plot Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

Vegetation Plot 13
(MY 2 - 5/2006)

Vegetation Plot 13
(MY 7 - 6/2011)

Vegetation Plot 14
(MY 2 – 5/2006)

Vegetation Plot 14
(MY 7 – 6/2011)

Prepared For:

Ecosystem Enhancement Program

Appendix B Visual Assessment Data
Vegetation Plot Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 7
Submittal Date: May 2012

Prepared By:

JJG

APPENDIX C
VEGETATION PLOT DATA

Table 7	**Vegetation Plot Mitigation Success Summary Table**
Table 8	**Not Included – Shepherds Tree is monitored on the 2004 NCEEP Stem Count Protocol**
Table 9	**Stem Count Total and Planted by Plat and Species**

Appendix C. Vegetation Plot Data
Table 7 Vegetation Plot Mitigation Success
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Vegetation Plot ID	Vegetation Survival Threshold Met (Y/N)
Plot 1	Y
Plot 2	Y
Plot 3	Y
Plot 4	Y
Plot 5	Y
Plot 6	Y
Plot 7	Y
Plot 8	Y
Plot 9	Y
Plot 10	Y
Plot 11	Y
Plot 12	Y
Plot 13	Y
Plot 14	Y

Appendix C. Vegetation Plot Data
Table 9: Stem Count Total and Planted by Plot and Species
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Species	Common Name	Type	Current Data (MY7-2011)																										Annual Means											
			Plot 1		Plot 2*		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7*		Plot 8		Plot 9		Plot 10		Plot 11		Plot 12		Plot 13		Plot 14		Current Mean		MY1-2005		MY2-2006		MY3-2007		MY4-2008		MY5-2009		MY6-2010	
			P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Acer negundo	boxelder	T							1	1	1	1		1			3	14		1		8	4	32	6	12		2		4	**4**	**9**	**2**	**2**	**7**	**7**	**7**	**8**	**5**	**13**	**5**	**7**	**5**	**8**
Acer rubrum	red maple	T		17				4		2	1	4	4	13				3	6	15					1	2	3	25	1	24	**2**	**12**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**13**	**N/A**	**13**	**N/A**	**10**	**N/A**	**10**
Alnus serrulata	tag alder	T/S					2	7																			1	2			**2**	**5**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**6**	**N/A**	**4**	**N/A**	**4**	**N/A**	**4**
Betula nigra	river birch	T															1	2	1	2			1	2	2	2		1		1	**1**	**2**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**7**	**N/A**	**5**	**N/A**	**3**	**N/A**	**3**
Cephalanthus occidentalis	button bush	T/S	2	7				3			8	8																			**5**	**6**	**3**	**3**	**2**	**2**	**2**	**3**	**2**	**5**	**2**	**2**	**2**	**2**
Cornus amomum	silky dogwood	S							1	1	1	1										1			6	7			1		**3**	**3**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**		**N/A**	**2**	**N/A**	**2**	**N/A**	**2**
Fraxinus pennsylvanica	green ash	T	2	4			11	16	2	2	2	2	1	1			3	7	10	17	6	12	4	14	7	10	7	18	6	9	**6**	**11**	**6**	**6**	**9**	**9**	**9**	**12**	**7**	**14**	**7**	**10**	**6**	**10**
Juniperus virginiana	eastern red cedar	T																				1									**N/A**	**1**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**		
Liquidambar styraciflua	sweet gum	T		1				2		4				4				1		4		1						2			**N/A**	**2**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**8**	**N/A**	**4**	**N/A**	**4**	**N/A**	**3**
Liriodendron tulipifera	tulip poplar	T	1	1				2	1	1																					**1**	**2**	**5**	**5**	**5**	**5**	**5**	**6**	**5**	**7**	**1**	**2**	**1**	**2**
Nyssa sylvatica	black gum	T							1	1		1		1																	**N/A**	**1**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**3**	**N/A**	**4**	**N/A**	**4**	**N/A**	**4**
Platanus occidentalis	sycamore	T							7	10			3	61			3	11	8	13		4	9	16	11	15	10	19	1	9	**7**	**12**	**6**	**6**	**10**	**10**	**10**	**11**	**10**	**20**	**10**	**21**	**9**	**20**
Populus deltoides	cottonwood	T										1		1					1	1											**1**	**1**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**1**	**N/A**	**1**	**N/A**	**1**
Pinus taeda	loblolly pine	T		1								1																			**N/A**	**1**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Quercus lyrata	overcup oak	T					2	4			8	10	4	8				2	1	1	2	2			6	6	4	4	10	10	**5**	**5**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Quercus michauxii	swamp chestnut oak	T		2				2	8	9	3	3					1	2	2	2		1	1	3	6	7			2	8	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**8**	**5**	**9**	**6**	**6**	**4**	**5**
Quercus nigra	water oak	T	1	7			3	4	3	3			8	10			3	6									4	5		5	**3**	**5**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**5**	**2**	**5**	**2**	**4**
Quercus pagoda	cherrybark oak	T	16	16					3	6								1		1	2	4	3	7							**7**	**6**	**5**	**5**	**5**	**5**	**5**	**6**	**5**	**8**	**5**	**6**	**5**	**6**
Quercus phellos	willow oak	T	3	3			1	1	3	6	1	1	8	9			5	6	12	16	4	6					1	2	6	2	**4**	**5**	**2**	**2**	**4**	**4**	**3**	**5**	**4**	**9**	**4**	**6**	**4**	**6**
Salix nigra	black willow	T					2	6				5		2			1	1							3	4	2	6	1	22	**2**	**7**	**6**	**6**	**4**	**4**	**4**	**6**	**4**	**11**	**4**	**6**	**4**	**7**
Salix sericea	silky willow	T		7																								9			**N/A**	**8**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**		
Sambucus canadensis	elderberry	S					1	1			1	9																			**1**	**5**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**		
Ulmus alata	winged elm	T						5						1				45		3				4		3		14	4	26	**4**	**14**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**2**	**N/A**	**1**	**N/A**	**1**	**N/A**	**3**
Plot Area (acres)																	**0.057**																											
Species Count			**6**	**11**			**7**	**13**	**10**	**12**	**9**	**11**	**7**	**13**			**8**	**13**	**8**	**12**	**4**	**10**	**6**	**7**	**9**	**11**	**8**	**13**	**8**	**11**	**8**	**11**	**5**		**5**		**5**	**8**	**5**	**7**	**10**	**18**	**10**	**18**
Stem Count			**25**	**66**			**22**	**57**	**30**	**46**	**26**	**45**	**29**	**113**			**20**	**101**	**41**	**76**	**14**	**40**	**22**	**78**	**48**	**69**	**33**	**113**	**26**	**120**	**28**	**77**	**19**		**29**		**29**	**64**	**26**	**45**	**46**	**101**	**42**	**99**
Stems per Acre			**439**	**1158**			**386**	**1000**	**526**	**807**	**456**	**789**	**509**	**1982**			**351**	**1772**	**719**	**1333**	**246**	**702**	**386**	**1368**	**842**	**1211**	**579**	**1982**	**456**	**2105**	**491**	**1351**	**340**		**528**		**524**	**1174**	**482**	**831**	**470**	**1242**	**436**	**1321**

Type=**S**hrub or **T**ree

APPENDIX D
STREAM SURVEY DATA

Figure 3a-3p	**Cross-sections with Annual Overlays**
Figure 4	**N/A**
Figure 5	**N/A**
Tables 10a, b	**Baseline Stream Data Summary Tables**
Table 11a	**Morphologic and Hydraulic Monitoring Summary**
Table 11b	**Stream Reach Data Summary**

Appendix D. Stream Survey Data
Figure 3a: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

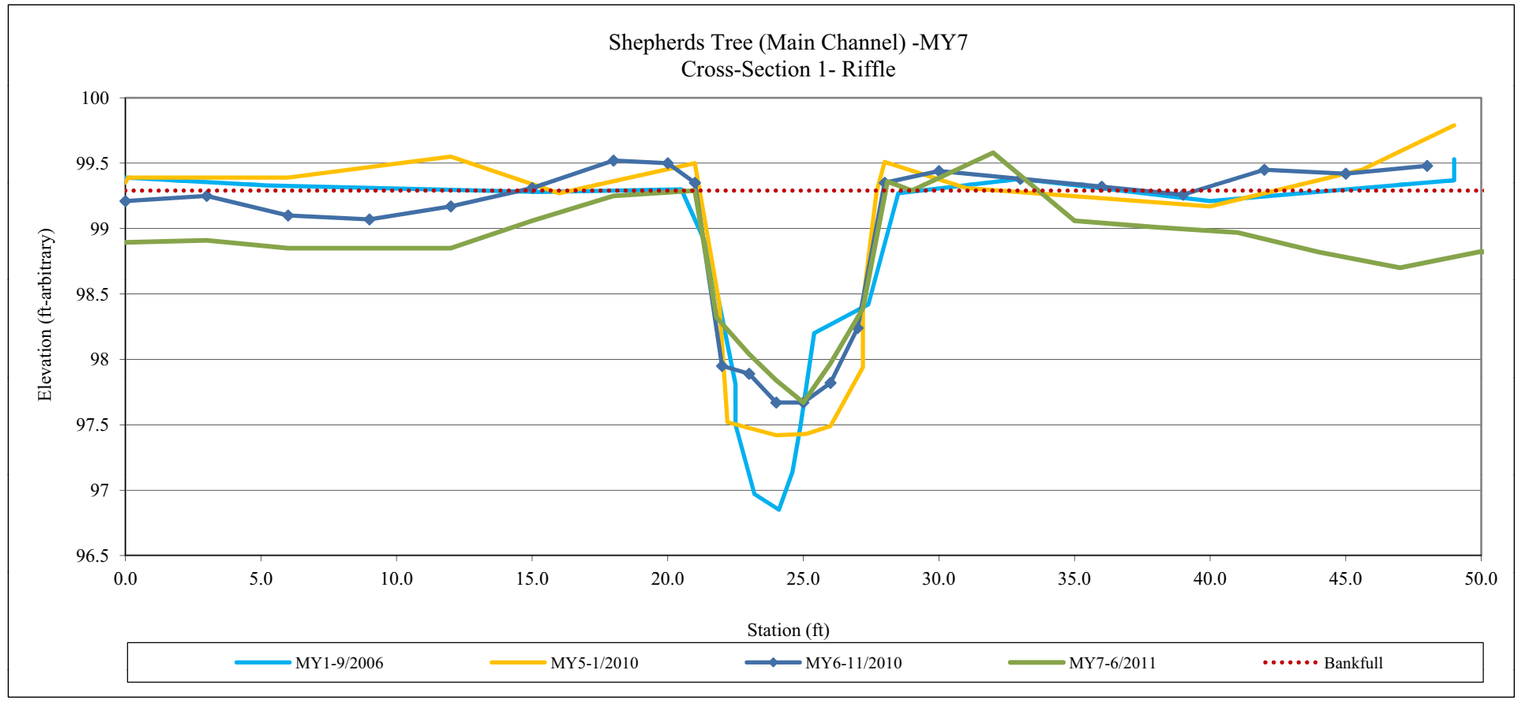
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-1, Riffle**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	99.29
Bankfull Cross-Sectional Area (ft^2)	7.78
Bankfull Width (ft)	7.21
Flood Prone Area Elevation (ft)	100.91
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	1.08
Bankfull Max Depth (ft)	1.62
W/D Ratio	6.68
Entrenchment Ratio	>2.2
Bank Height Ratio	1.00

XS-1: View Upstream

XS-1: View Downstream

Station	Elevation	Notes
-3	98.93	x1
-3	98.87	x1
0	98.90	x1
3	98.91	x1
6	98.85	x1
9	98.85	x1
12	98.85	x1
15	99.06	x1
18	99.25	x1
21	99.29	x1
21.8	98.32	x1
23	98.04	x1
24	97.84	x1
25	97.67	x1
26	97.97	x1
27.2	98.39	x1
28.1	99.36	x1
29	99.29	x1
32	99.58	x1
35	99.06	x1
38	99.01	x1
41	98.97	x1
44	98.82	x1
47	98.70	x1
50	98.83	x1
53.2	98.68	x1
53.2	98.72	x1



Appendix D. Stream Survey Data
Figure 3b: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

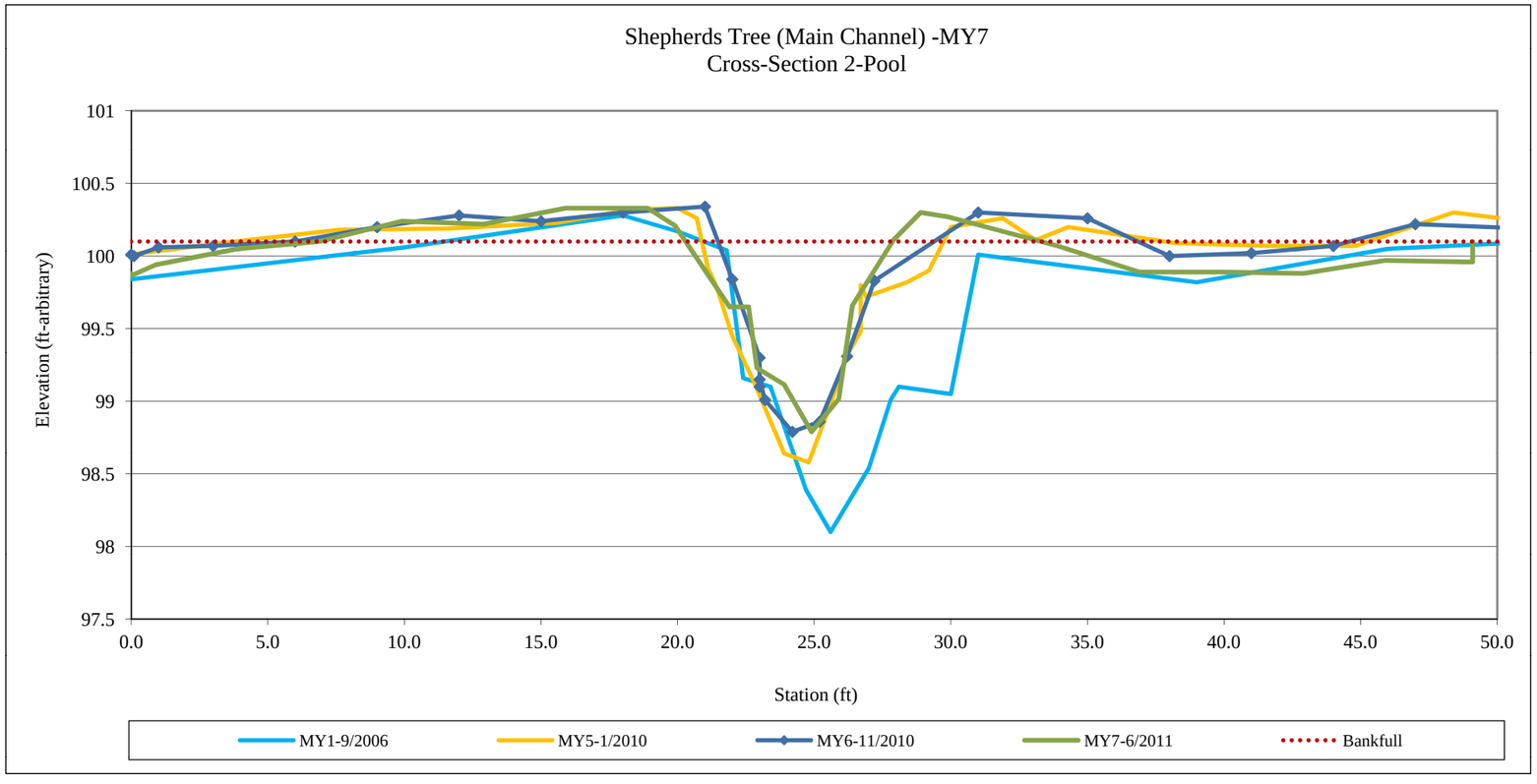
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-2, Pool**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	100.11
Bankfull Cross-Sectional Area (ft^2)	4.93
Bankfull Width (ft)	7.64
Flood Prone Area Elevation (ft)	101.43
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	0.64
Bankfull Max Depth (ft)	1.32
W/D Ratio	11.94
Entrenchment Ratio	N/A
Bank Height Ratio	1.15

XS-2: View Upstream

XS-2: View Downstream

Station	Elevation	Notes
0	99.88	x2
0	99.865	x2
0.9	99.94	x2
3.9	100.05	x2
6.9	100.1	x2
9.9	100.24	x2
12.9	100.22	x2
15.9	100.33	x2
18.9	100.33	x2
19.9	100.21	x2
20.9	99.93	x2
21.9	99.65	x2
22.6	99.65	x2
22.9	99.23	x2
23.9	99.115	x2
24.9	98.79	x2
25.9	99.015	x2
26.4	99.66	x2
27.9	100.11	x2
28.9	100.3	x2
29.9	100.27	x2
30.9	100.22	x2
33.9	100.07	x2
36.9	99.89	x2
39.9	99.89	x2
42.9	99.88	x2
45.9	99.97	x2
48.9	99.96	x2
49.1	99.96	x2
49.1	100.1	x2



Appendix D. Stream Survey Data
Figure 3c: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

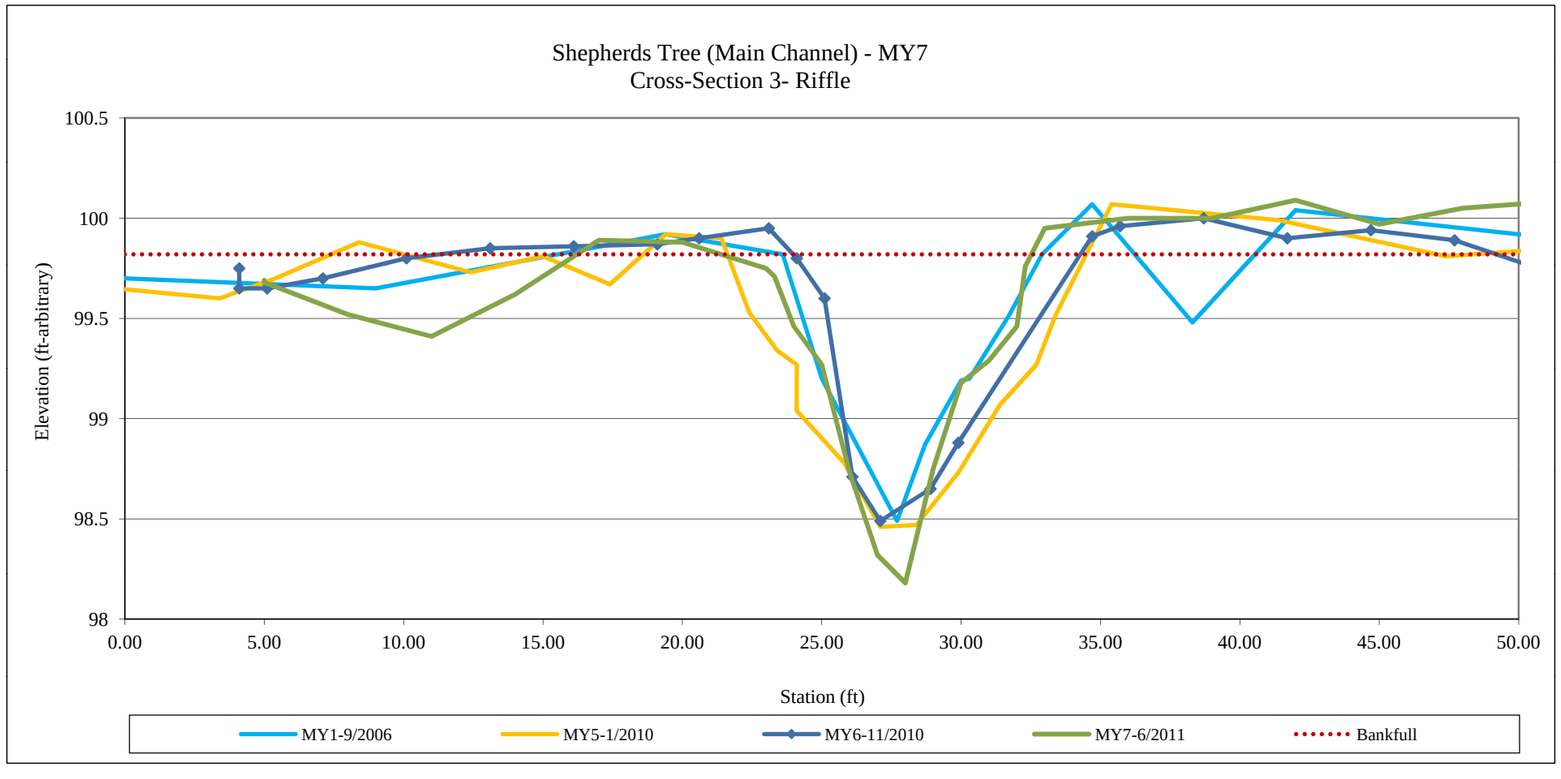
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-3, Riffle**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	99.81
Bankfull Cross-Sectional Area (ft^2)	7.59
Bankfull Width (ft)	10.87
Flood Prone Area Elevation (ft)	101.44
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	0.70
Bankfull Max Depth (ft)	1.63
W/D Ratio	15.53
Entrenchment Ratio	4.52
Bank Height Ratio	1.00

XS-3: View Upstream

XS-3: View Downstream

Station	Elevation	Notes
4	99.69	x3
4	99.68	x3
7	99.52	x3
10	99.41	x3
13	99.62	x3
16	99.89	x3
19	99.88	x3
22	99.75	x3
22.3	99.71	x3
23	99.46	x3
24	99.27	x3
25	98.73	x3
26	98.32	x3
27	98.18	x3
28	98.75	x3
29	99.18	x3
30	99.29	x3
31	99.46	x3
31.3	99.76	x3
32	99.95	x3
35	100	x3
38	100	x3
41	100.09	x3
44	99.97	x3
47	100.05	x3
50	100.08	x3
53	100.03	x3
53.1	100	x3



Appendix D. Stream Survey Data
Figure 3d: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

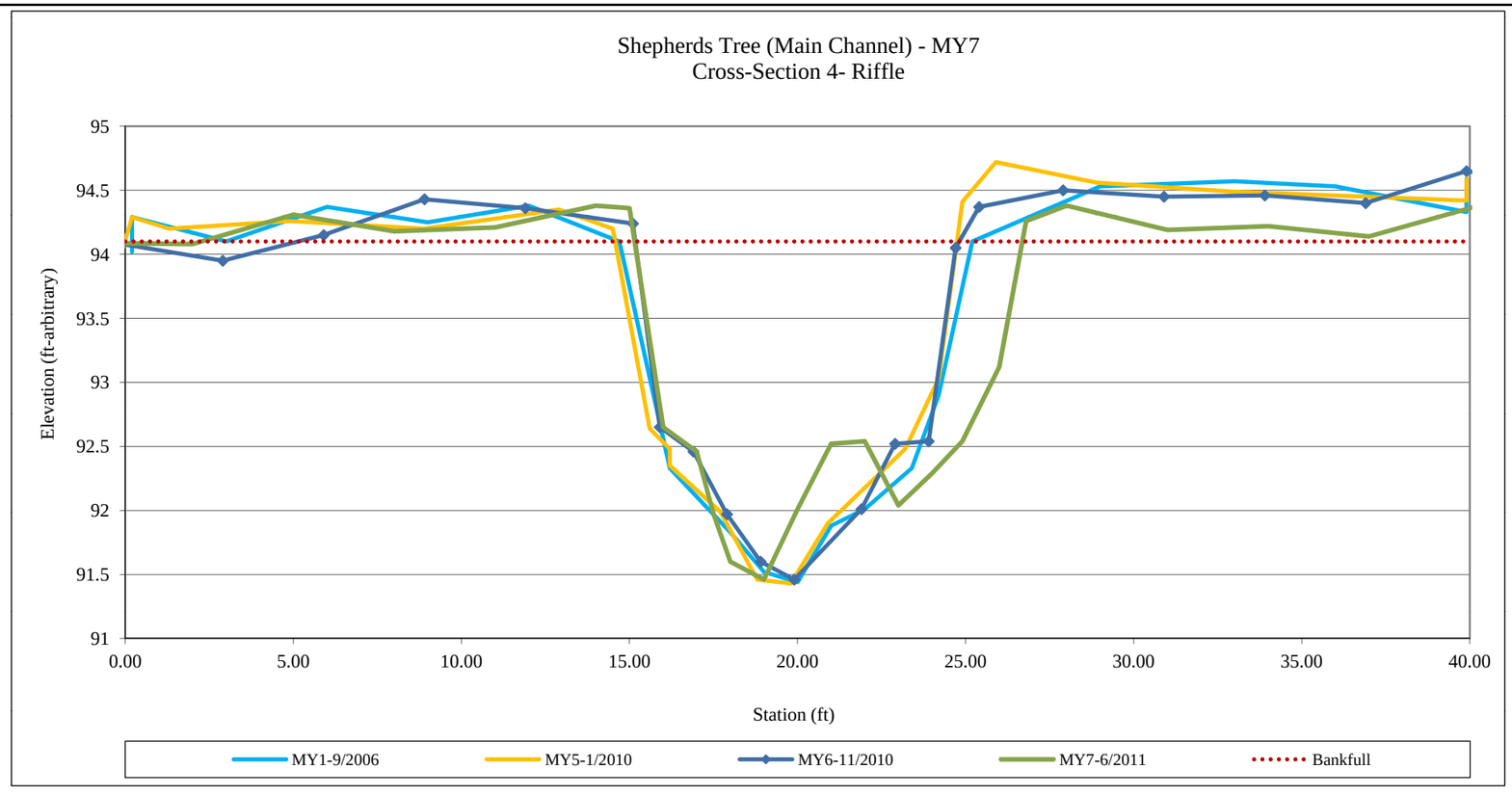
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-4, Riffle**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	94.10
Bankfull Cross-Sectional Area (ft^2)	19.60
Bankfull Width (ft)	11.54
Flood Prone Area Elevation (ft)	96.74
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	1.70
Bankfull Max Depth (ft)	2.64
W/D Ratio	6.79
Entrenchment Ratio	3.85
Bank Height Ratio	1.06

XS-4: View Upstream

XS-4: View Downstream

Station	Elevation	Notes
-4	94.29	x4
-4	94.185	x4
-1	94.09	x4
2	94.08	x4
5	94.31	x4
8	94.18	x4
11	94.21	x4
14	94.38	x4
15	94.36	x4
16	92.65	x4
17	92.46	x4
17.5	91.97	x4
18	91.6	x4
19	91.46	x4
20	92.01	x4
21	92.52	x4
22	92.54	x4
23	92.04	x4
24	92.29	x4
24.9	92.54	x4
26	93.12	x4
26.8	94.26	x4
28	94.38	x4
31	94.19	x4
34	94.22	x4
37	94.14	x4
40.4	94.39	x4
40.4	94.64	x4



Appendix D. Stream Survey Data
Figure 3e: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

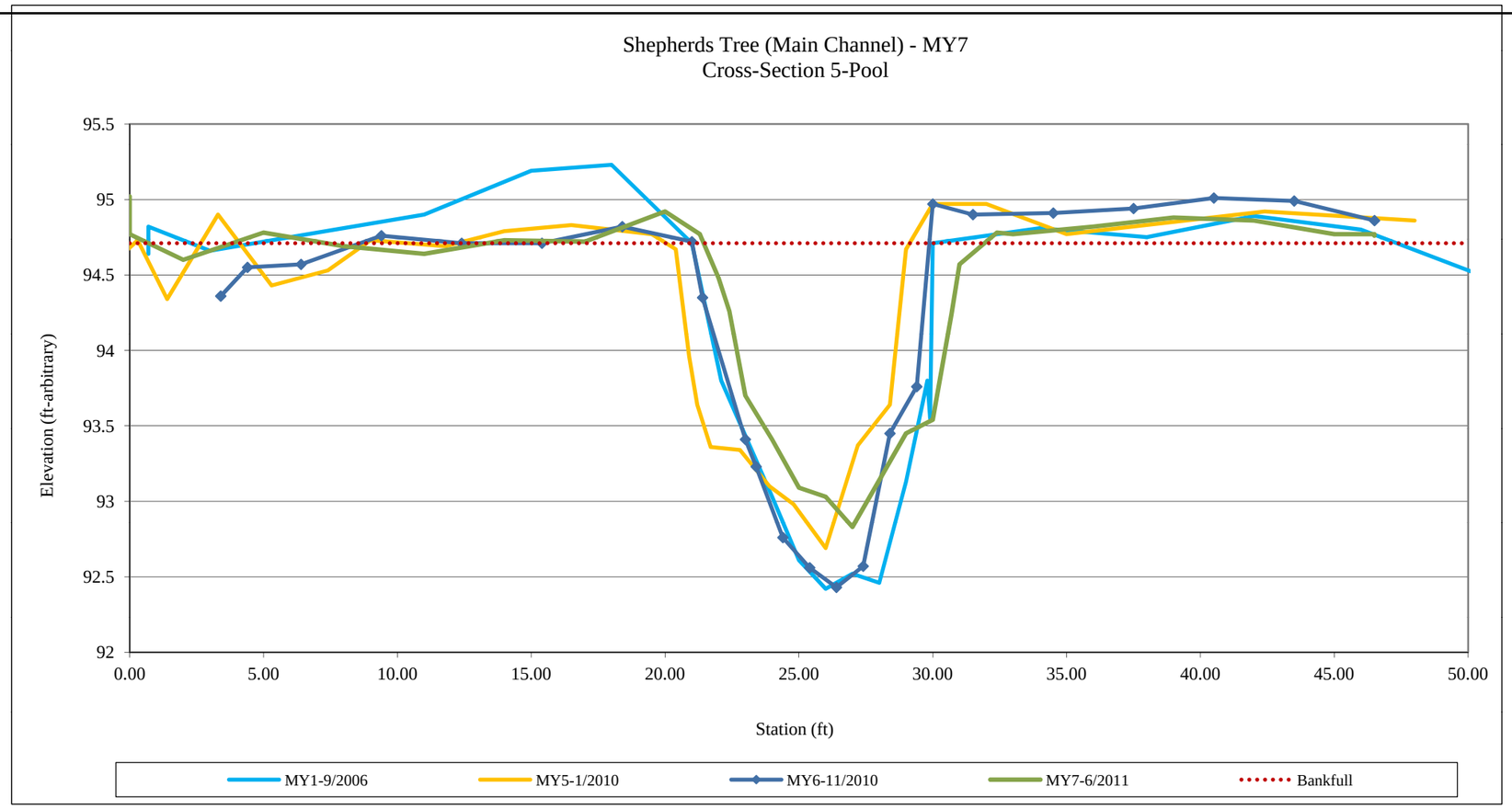
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-5, Pool**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	94.72
Bankfull Cross-Sectional Area (ft^2)	11.87
Bankfull Width (ft)	10.28
Flood Prone Area Elevation (ft)	96.61
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	1.15
Bankfull Max Depth (ft)	1.89
W/D Ratio	8.94
Entrenchment Ratio	N/A
Bank Height Ratio	1.03

XS-5: View Upstream

XS-5: View Downstream

Station	Elevation	Notes
0	95.02	x4
0	94.77	x4
2	94.6	x4
5	94.78	x4
8	94.69	x4
11	94.64	x4
14	94.73	x4
17	94.72	x4
20	94.92	x4
21.3	94.77	x4
22	94.48	x4
22.4	94.26	x4
23	93.7	x4
24	93.41	x4
25	93.09	x4
26	93.03	x4
27	92.83	x4
28	93.14	x4
29	93.45	x4
30	93.54	x4
30.7	94.24	x4
31	94.57	x4
32.4	94.78	x4
33	94.77	x4
36	94.82	x4
39	94.88	x4
42	94.86	x4
45	94.77	x4
46.5	94.77	x4
46.5	94.76	x4



Appendix D. Stream Survey Data
Figure 3f: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

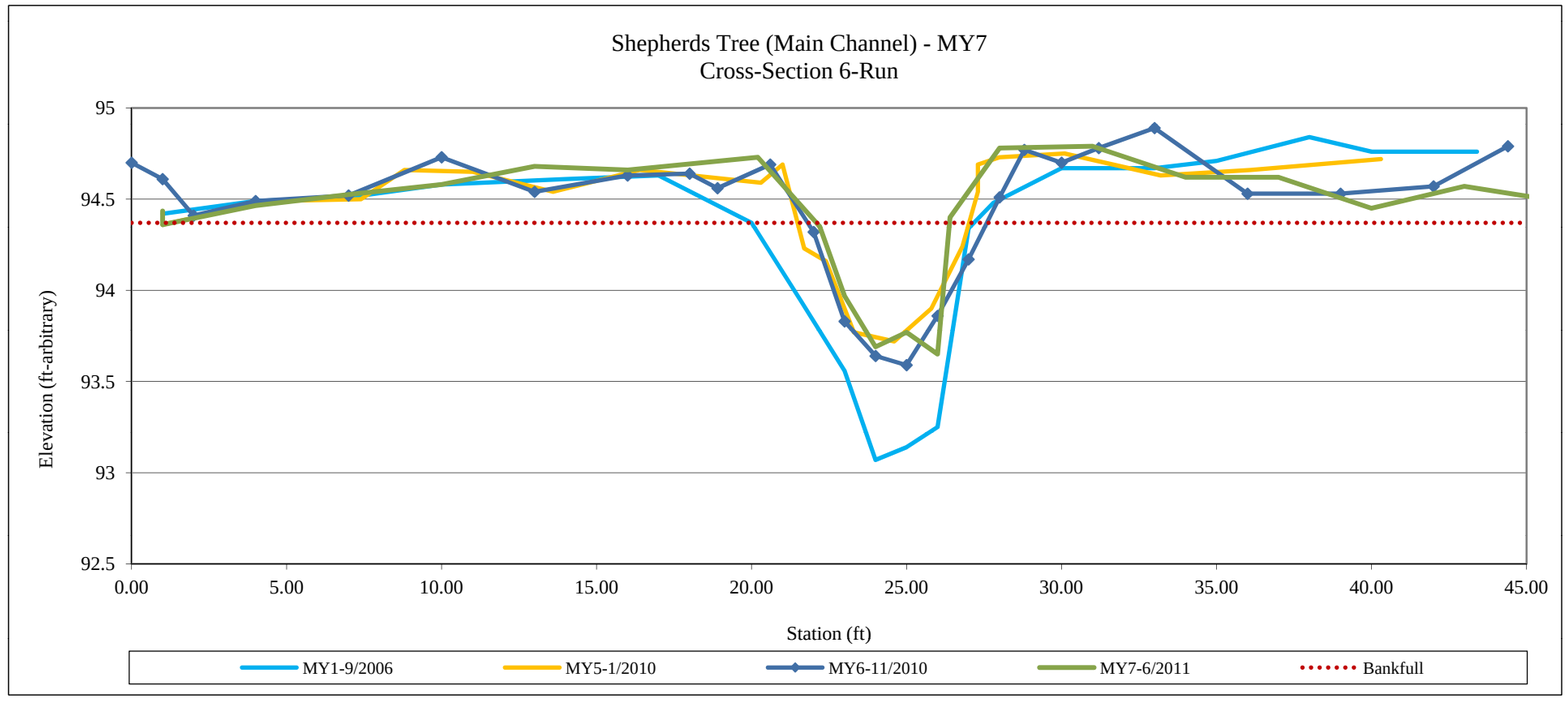
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-6, Riffle**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	94.38
Bankfull Cross-Sectional Area (ft^2)	2.19
Bankfull Width (ft)	4.35
Flood Prone Area Elevation (ft)	95.11
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	0.50
Bankfull Max Depth (ft)	0.73
W/D Ratio	8.70
Entrenchment Ratio	>2.2
Bank Height Ratio	1.42

XS-6: View Upstream

XS-6: View Downstream

Station	Elevation	Notes
0	94.44	x6
0	94.36	x6
3	94.47	x6
6	94.53	x6
9	94.58	x6
12	94.68	x6
15	94.66	x6
18	94.71	x6
19.2	94.73	x6
21.2	94.35	x6
22	93.97	x6
23	93.69	x6
24	93.77	x6
25	93.65	x6
25.4	94.40	x6
27	94.78	x6
30	94.79	x6
33	94.62	x6
36	94.62	x6
39	94.45	x6
42	94.57	x6
45	94.49	x6
45.2	94.48	x6



Appendix D. Stream Survey Data
Figure 3g: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

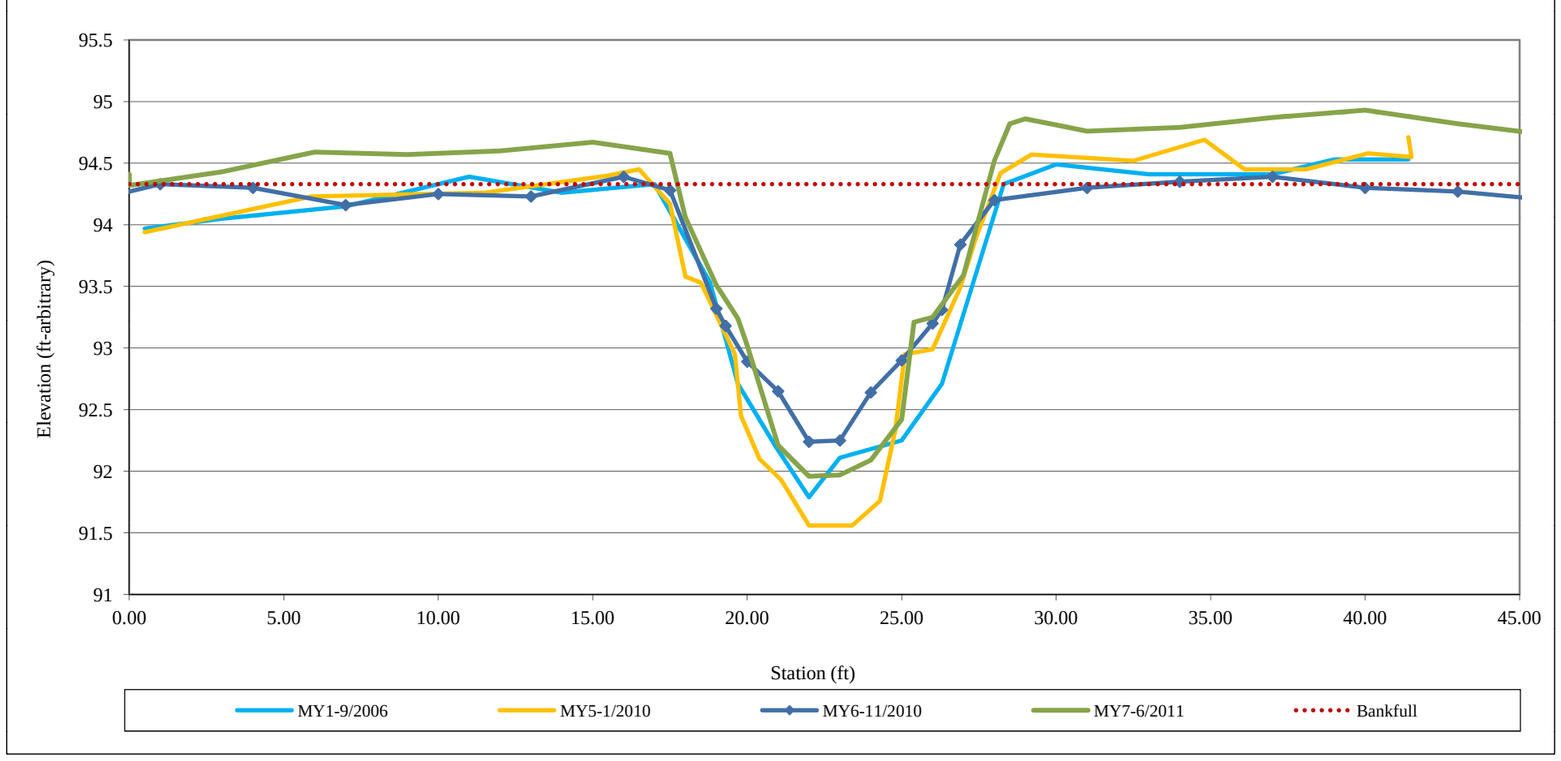
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-7, Pool**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	94.33
Bankfull Cross-Sectional Area (ft^2)	14.78
Bankfull Width (ft)	10.06
Flood Prone Area Elevation (ft)	96.70
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	1.47
Bankfull Max Depth (ft)	2.37
W/D Ratio	6.84
Entrenchment Ratio	N/A
Bank Height Ratio	1.10

XS-7: View Upstream

XS-7: View Downstream

Station	Elevation	Notes
-5	94.41	x7
0	94.41	x7
0	94.32	x7
3	94.43	x7
6	94.59	x7
9	94.57	x7
12	94.6	x7
15	94.67	x7
17.5	94.58	x7
18	94.06	x7
19	93.51	x7
19.7	93.24	x7
20	93.02	x7
21	92.21	x7
22	91.96	x7
23	91.97	x7
24	92.09	x7
25	92.42	x7
25.4	93.21	x7
26	93.25	x7
27	93.59	x7
28	94.52	x7
28.5	94.82	x7
29	94.86	x7
30	94.81	x7
31	94.76	x7
34	94.79	x7
37	94.87	x7
40	94.93	x7
43	94.82	x7
45.6	94.74	x7
45.6	94.94	x7



Appendix D. Stream Survey Data
Figure 3h: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

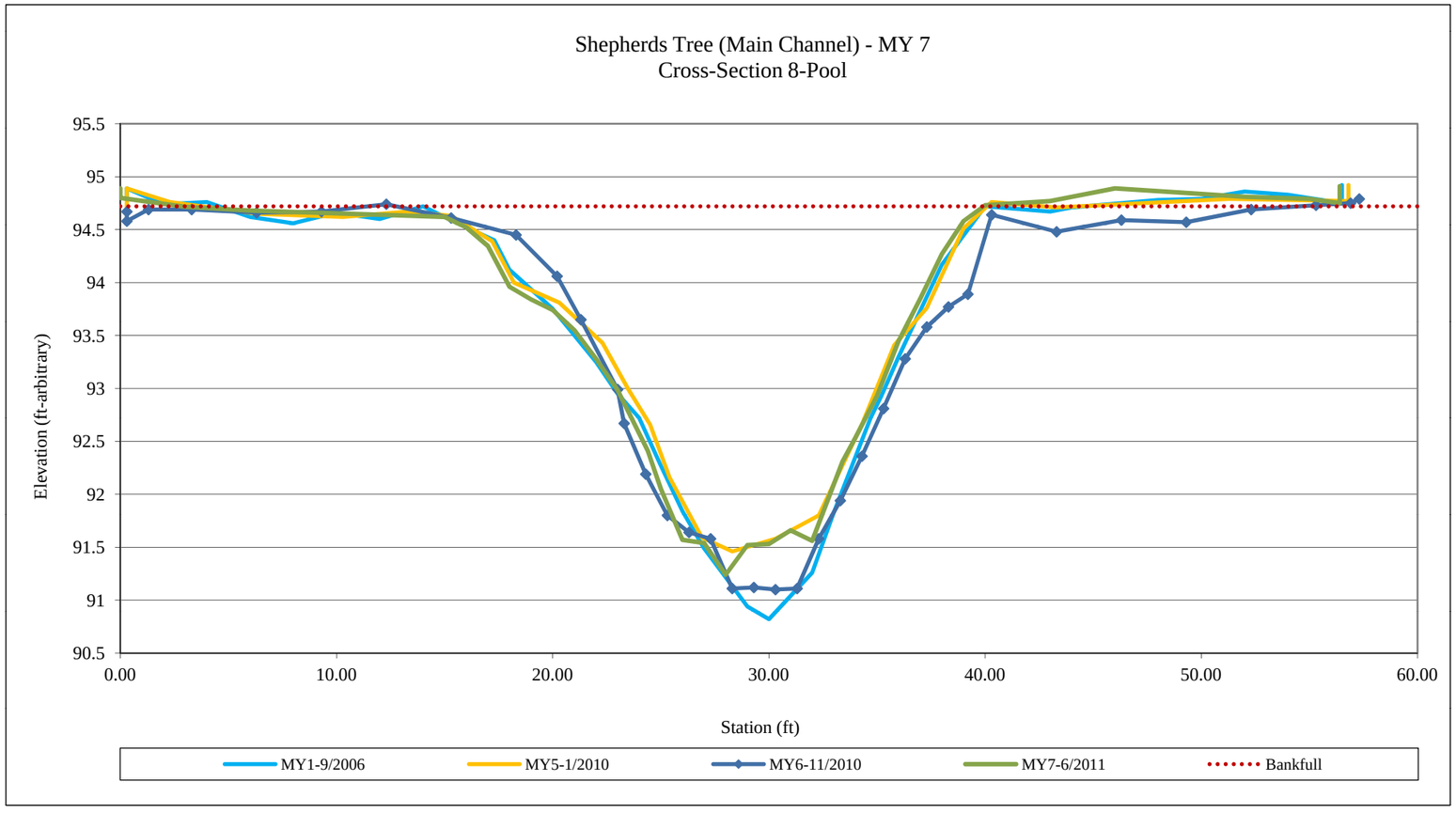
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-8, Pool**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	94.73
Bankfull Cross-Sectional Area (ft^2)	44.35
Bankfull Width (ft)	24.92
Flood Prone Area Elevation (ft)	98.22
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	1.78
Bankfull Max Depth (ft)	3.49
W/D Ratio	14.00
Entrenchment Ratio	N/A
Bank Height Ratio	1.00

XS-8: View Upstream

XS-8: View Downstream

Station	Elevation	Notes
0	94.89	x8
0	94.8	x8
3	94.715	x8
6	94.68	x8
9	94.66	x8
12	94.64	x8
15	94.62	x8
16	94.52	x8
17	94.345	x8
18	93.96	x8
19	93.84	x8
20	93.74	x8
21	93.55	x8
22	93.28	x8
23	92.985	x8
24.4	92.41	x8
25	92.05	x8
26	91.57	x8
27	91.54	x8
28	91.24	x8
29	91.52	x8
30	91.53	x8
31	91.66	x8
32	91.56	x8
33.4	92.31	x8
34	92.535	x8
35	92.93	x8
36	93.45	x8
37	93.85	x8
38	94.27	x8
39	94.58	x8
40	94.73	x8
43	94.77	x8
46	94.89	x8
49	94.85	x8
52	94.81	x8
55	94.79	x8
56.4	94.75	x8
56.4	94.91	x8



Appendix D. Stream Survey Data
Figure 3i: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

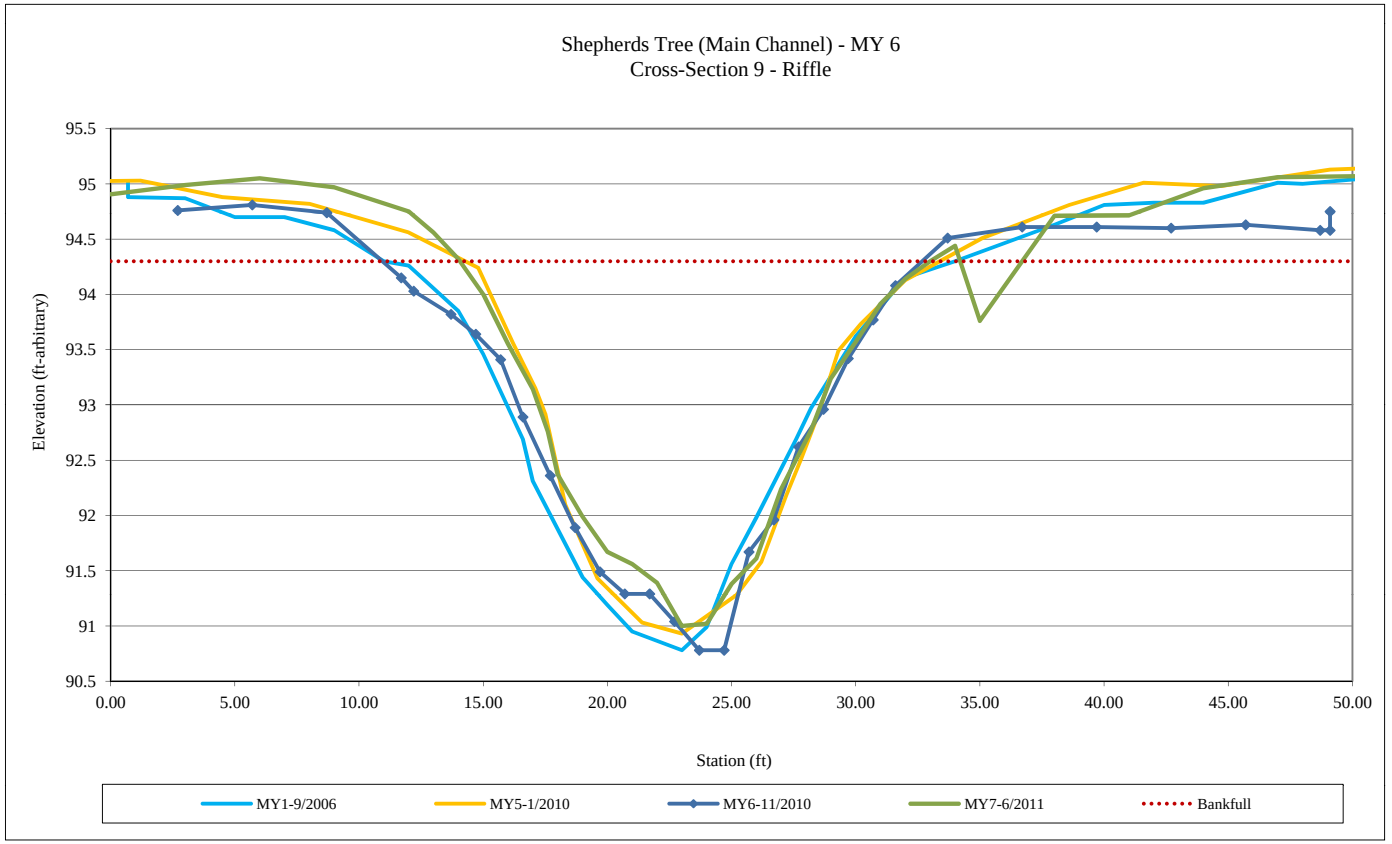
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-9, Riffle**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	94.30
Bankfull Cross-Sectional Area (ft^2)	32.90
Bankfull Width (ft)	18.94
Flood Prone Area Elevation (ft)	97.60
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	1.74
Bankfull Max Depth (ft)	3.30
W/D Ratio	10.89
Entrenchment Ratio	>2.2
Bank Height Ratio	1.00

XS-9: View Upstream

XS-9: View Downstream

Station	Elevation	Notes
-6	95.02	x9
-6	95.02	x9
-3	95.11	x9
0	94.905	x9
3	94.99	x9
6	95.05	x9
9	94.97	x9
12	94.75	x9
13	94.56	x9
14	94.32	x9
15	94	x9
16	93.55	x9
17	93.14	x9
17.6	92.76	x9
18	92.37	x9
19	91.99	x9
20	91.67	x9
21	91.56	x9
22	91.39	x9
23	91	x9
24	91.02	x9
25	91.38	x9
26	91.61	x9
27	92.24	x9
28.2	92.765	x9
29	93.24	x9
30	93.57	x9
31	93.915	x9
32	94.14	x9
33	94.3	x9
34	94.44	x9
35	93.76	x9
38	94.71	x9
41	94.715	x9
44	94.96	x9
47	95.06	x9
50.6	95.07	x9
50.6	95.11	x9



Appendix D. Stream Survey Data
Figure 3j: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

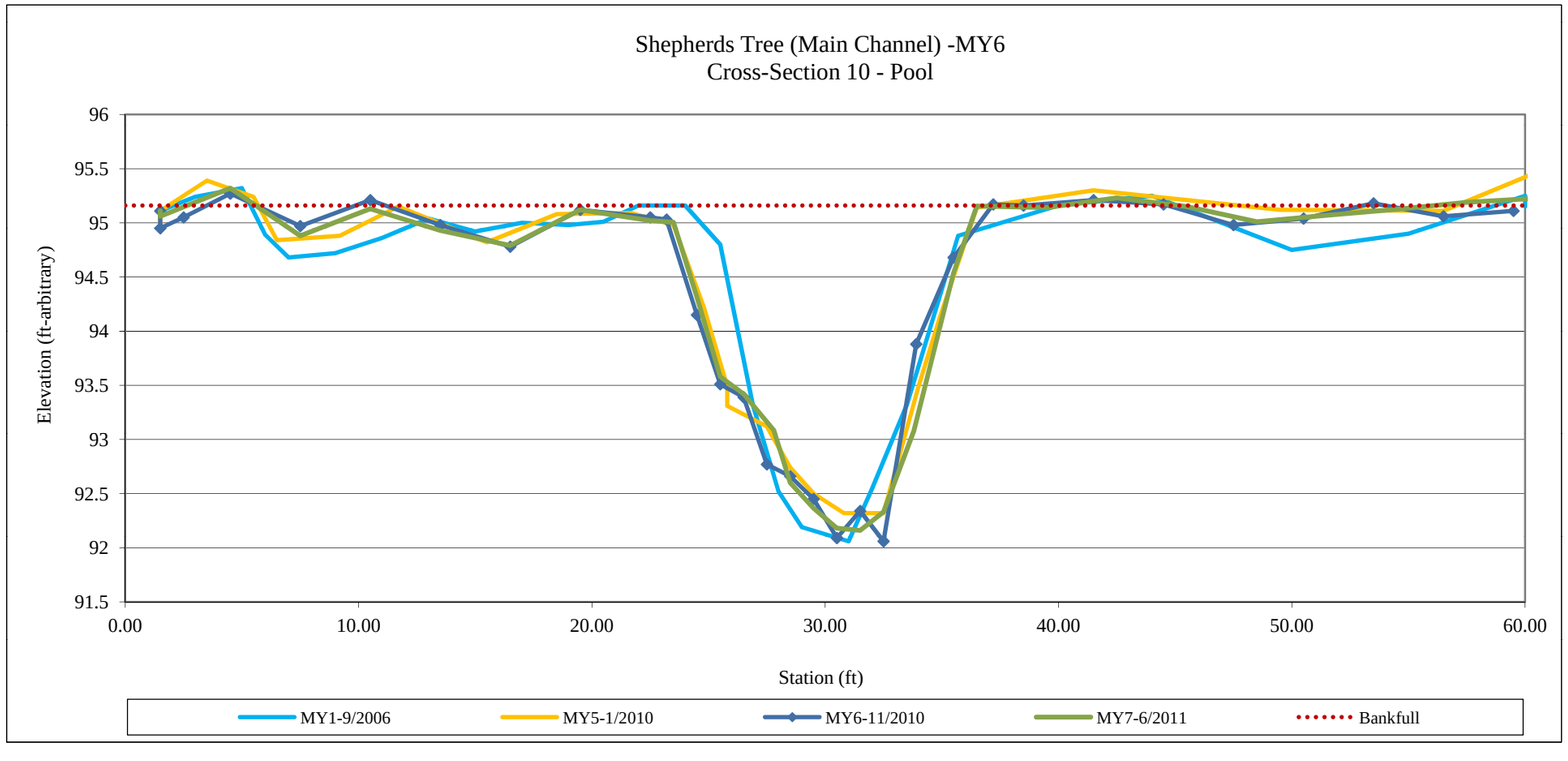
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-10, Pool**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	95.17
Bankfull Cross-Sectional Area (ft^2)	25.03
Bankfull Width (ft)	14.20
Flood Prone Area Elevation (ft)	98.18
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	1.76
Bankfull Max Depth (ft)	3.01
W/D Ratio	8.07
Entrenchment Ratio	N/A
Bank Height Ratio	1.00

XS-10: View Upstream

XS-10: View Downstream

Station	Elevation	Notes
1.5	95.11	x10
1.5	95.06	x10
4.5	95.32	x10
7.5	94.88	x10
10.5	95.13	x10
13.5	94.93	x10
16.5	94.79	x10
19.5	95.12	x10
22.5	95.02	x10
23.5	95.005	x10
24.5	94.315	x10
25.5	93.58	x10
26.5	93.42	x10
27.8	93.085	x10
28.5	92.6	x10
29.5	92.365	x10
30.5	92.18	x10
31.5	92.16	x10
32.5	92.33	x10
33.8	93.08	x10
35.5	94.54	x10
36.5	95.155	x10
39.5	95.14	x10
42.5	95.23	x10
45.5	95.15	x10
48.5	95.01	x10
51.5	95.07	x10
54.5	95.125	x10
57.5	95.19	x10
60.8	95.23	x10
60.8	95.26	x10



Appendix D. Stream Survey Data
Figure 3k: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

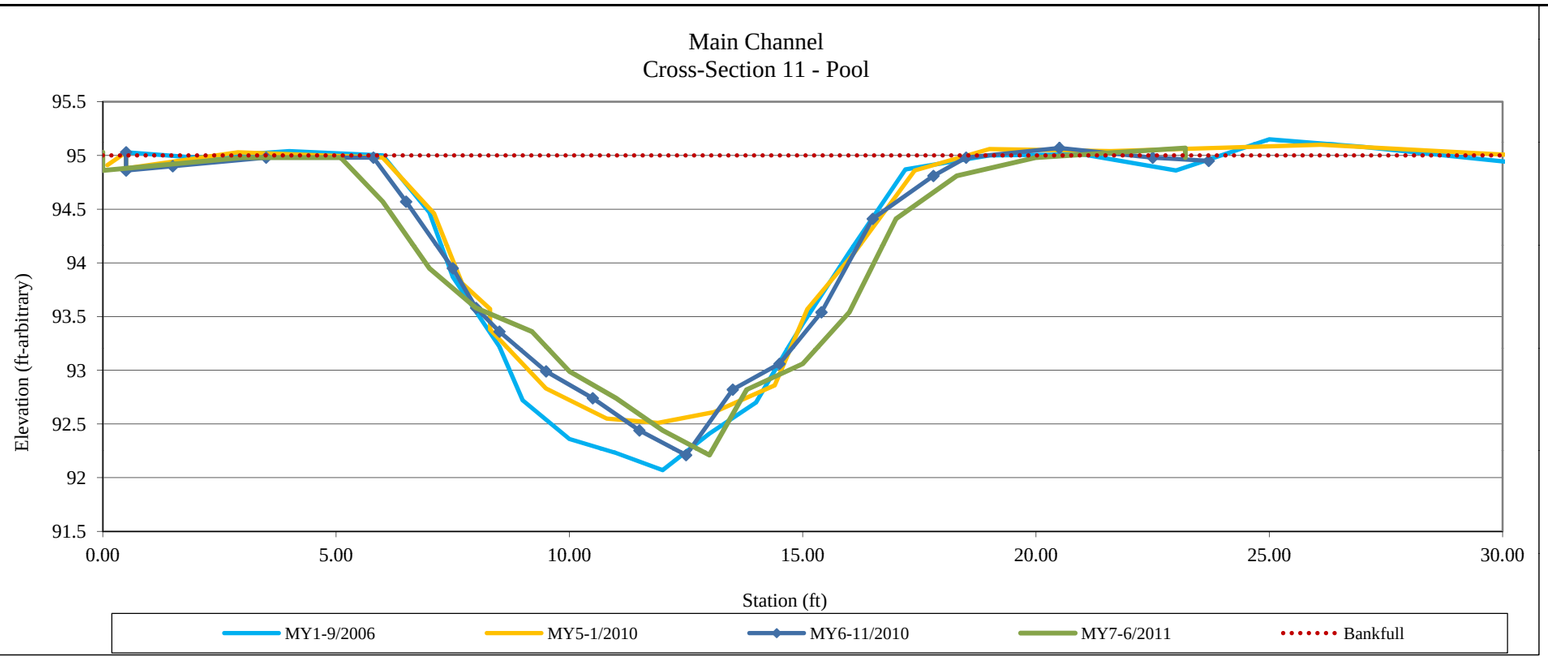
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-11, Pool**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	99.64
Bankfull Cross-Sectional Area (ft^2)	25.43
Bankfull Width (ft)	13.10
Flood Prone Area Elevation (ft)	102.81
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	1.94
Bankfull Max Depth (ft)	3.17
W/D Ratio	6.75
Entrenchment Ratio	N/A
Bank Height Ratio	1.00

XS-11: View Upstream

XS-11: View Downstream

Station	Elevation	Notes
0	95.03	x11
0	94.86	x11
3	94.98	x11
5.1	94.98	x11
6	94.57	x11
7	93.95	x11
8	93.58	x11
9.2	93.36	x11
10	92.99	x11
11	92.74	x11
12	92.44	x11
13	92.21	x11
13.8	92.82	x11
15	93.06	x11
16	93.54	x11
17	94.41	x11
18.3	94.81	x11
20	94.98	x11
23.2	95.07	x11
23.2	94.98	x11



Appendix D. Stream Survey Data
Figure 3l: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

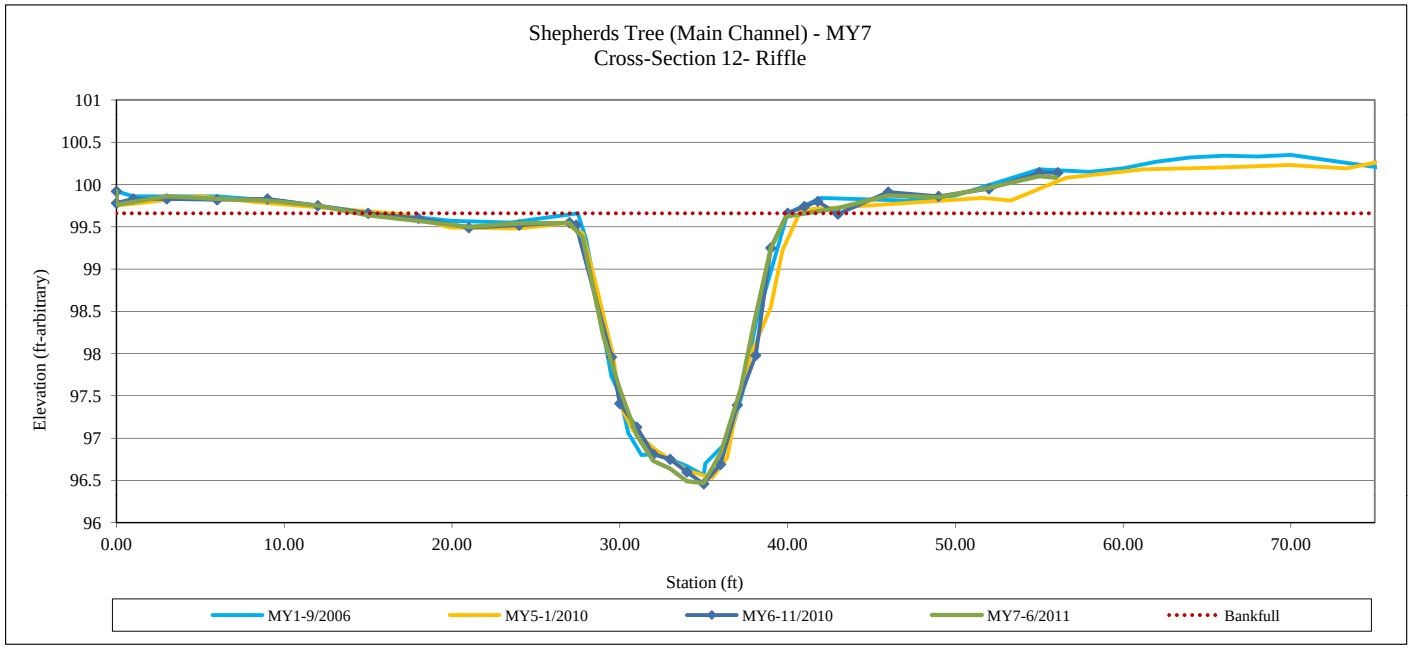
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-12 Riffle**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	99.53
Bankfull Cross-Sectional Area (ft^2)	24.05
Bankfull Width (ft)	12.39
Flood Prone Area Elevation (ft)	102.59
Flood Prone Width (ft)	>200
Bankfull Mean Depth (ft)	1.94
Bankfull Max Depth (ft)	3.06
W/D Ratio	6.39
Entrenchment Ratio	4.52
Bank Height Ratio	1.00

XS-12: View Upstream

XS-12: View Downstream

Station	Elevation	Notes
0	99.92	x12
0	99.76	x12
3	99.86	x12
6	99.83	x12
9	99.81	x12
12	99.75	x12
15	99.635	x12
18	99.57	x12
21	99.5	x12
24	99.54	x12
27	99.545	x12
27.8	99.37	x12
29	98.22	x12
30	97.58	x12
31	97.04	x12
32	96.73	x12
33	96.64	x12
34	96.49	x12
35	96.47	x12
36	96.82	x12
37.2	97.58	x12
38	98.36	x12
39	99.24	x12
39.9	99.62	x12
43	99.72	x12
46	99.87	x12
49	99.85	x12
52	99.96	x12
55	100.1	x12
56	100.08	x12
56	100.09	x12



Appendix D. Stream Survey Data
Figure 3m: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

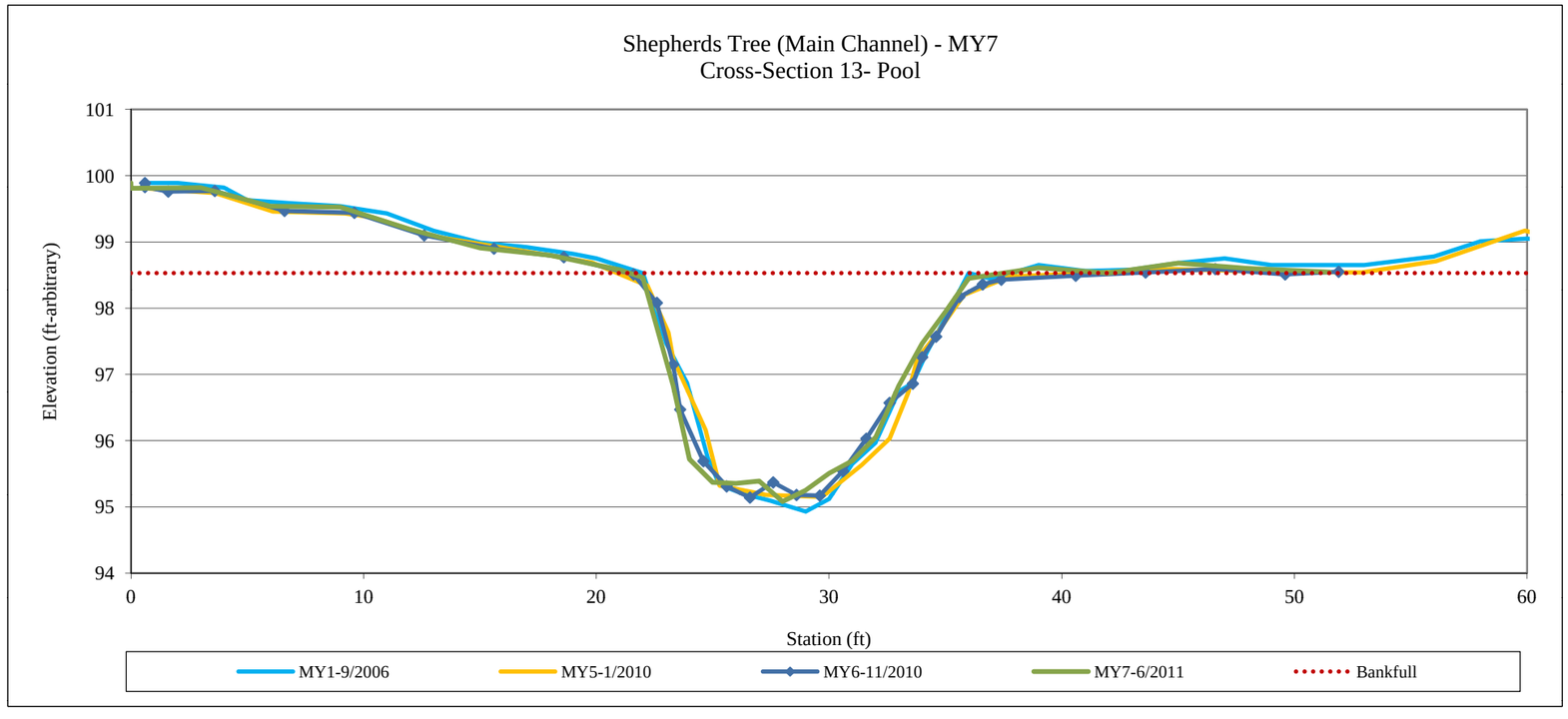
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-13, Pool**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	98.52
Bankfull Cross-Sectional Area (ft^2)	31.97
Bankfull Width (ft)	15.00
Flood Prone Area Elevation (ft)	101.96
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	2.13
Bankfull Max Depth (ft)	3.44
W/D Ratio	7.04
Entrenchment Ratio	N/A
Bank Height Ratio	1.00

XS-13: View Upstream

XS-13: View Downstream

Station	Elevation	Notes
0	99.89	x13
0	99.81	x13
3	99.82	x13
6	99.54	x13
9	99.525	x13
12	99.19	x13
15	98.91	x13
18	98.8	x13
21	98.58	x13
22	98.46	x13
23.3	96.83	x13
24	95.72	x13
25	95.37	x13
26	95.355	x13
27	95.39	x13
28	95.08	x13
29	95.25	x13
30	95.505	x13
31	95.695	x13
32	96.05	x13
33	96.83	x13
34	97.465	x13
35	97.945	x13
36	98.45	x13
39	98.61	x13
42	98.53	x13
45	98.68	x13
48	98.6	x13
51.5	98.545	x13
51.5	98.545	x13



Appendix D. Stream Survey Data
Figure 3n: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

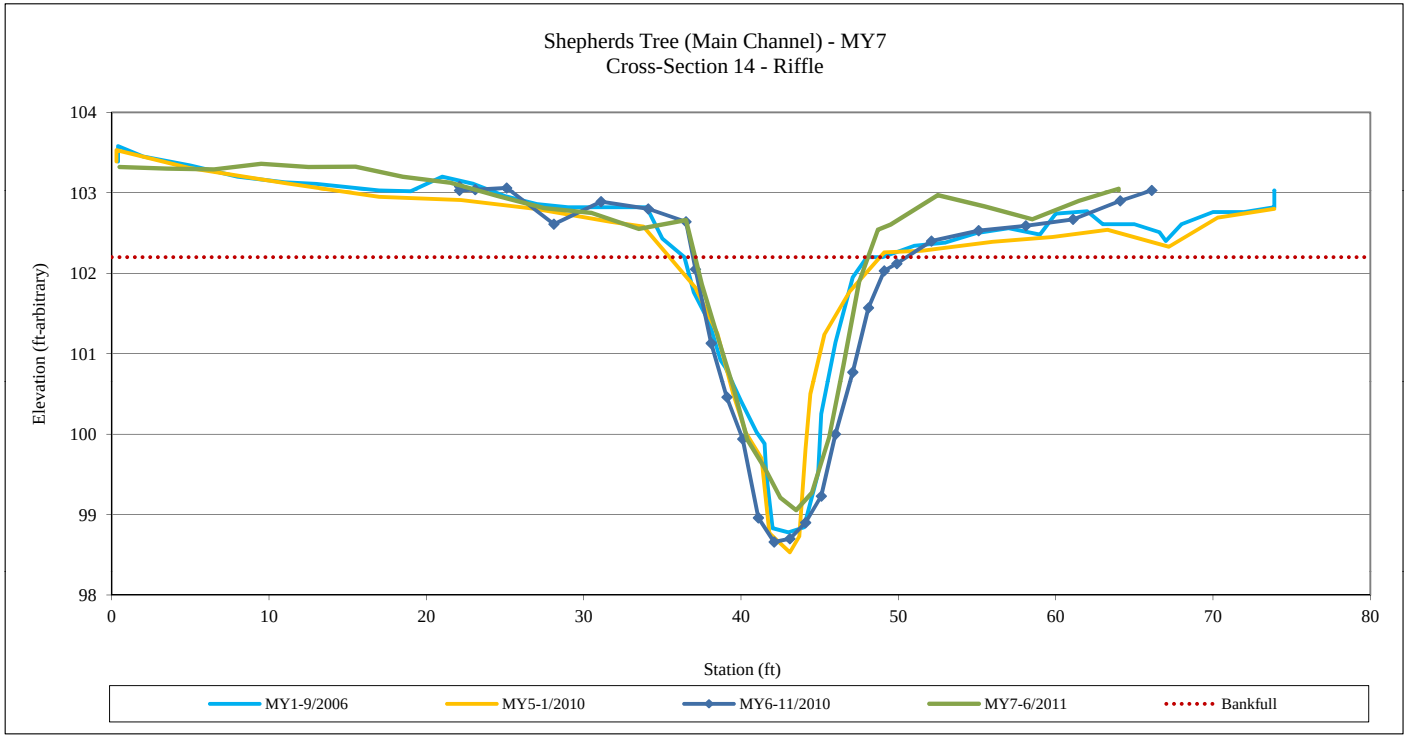
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-14 Riffle**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	102.22
Bankfull Cross-Sectional Area (ft^2)	20.97
Bankfull Width (ft)	11.06
Flood Prone Area Elevation (ft)	105.39
Flood Prone Width (ft)	>200
Bankfull Mean Depth (ft)	1.90
Bankfull Max Depth (ft)	3.16
W/D Ratio	5.82
Entrenchment Ratio	>2.2
Bank Height Ratio	1.10

XS-14: View Upstream

XS-14: View Downstream

Station	Elevation	Notes
0.5	103.32	x14
3.5	103.3	x14
6.5	103.29	x14
9.5	103.36	x14
12.5	103.32	x14
15.5	103.325	x14
18.5	103.2	x14
21.5	103.125	x14
24.5	102.96	x14
27.5	102.81	x14
30.5	102.75	x14
33.5	102.55	x14
36.5	102.66	x14
37.5	101.86	x14
38.5	101.22	x14
39.5	100.59	x14
40.4	99.93	x14
41.5	99.58	x14
42.5	99.21	x14
43.5	99.055	x14
44.5	99.27	x14
45.6	99.96	x14
46.5	100.85	x14
47.5	101.89	x14
48.7	102.54	x14
49.5	102.605	x14
52.5	102.97	x14
55.5	102.83	x14
58.5	102.67	x14
61.5	102.9	x14
64	103.05	x14
64	103.03	x14



Appendix D. Stream Survey Data
Figure 3o: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 7

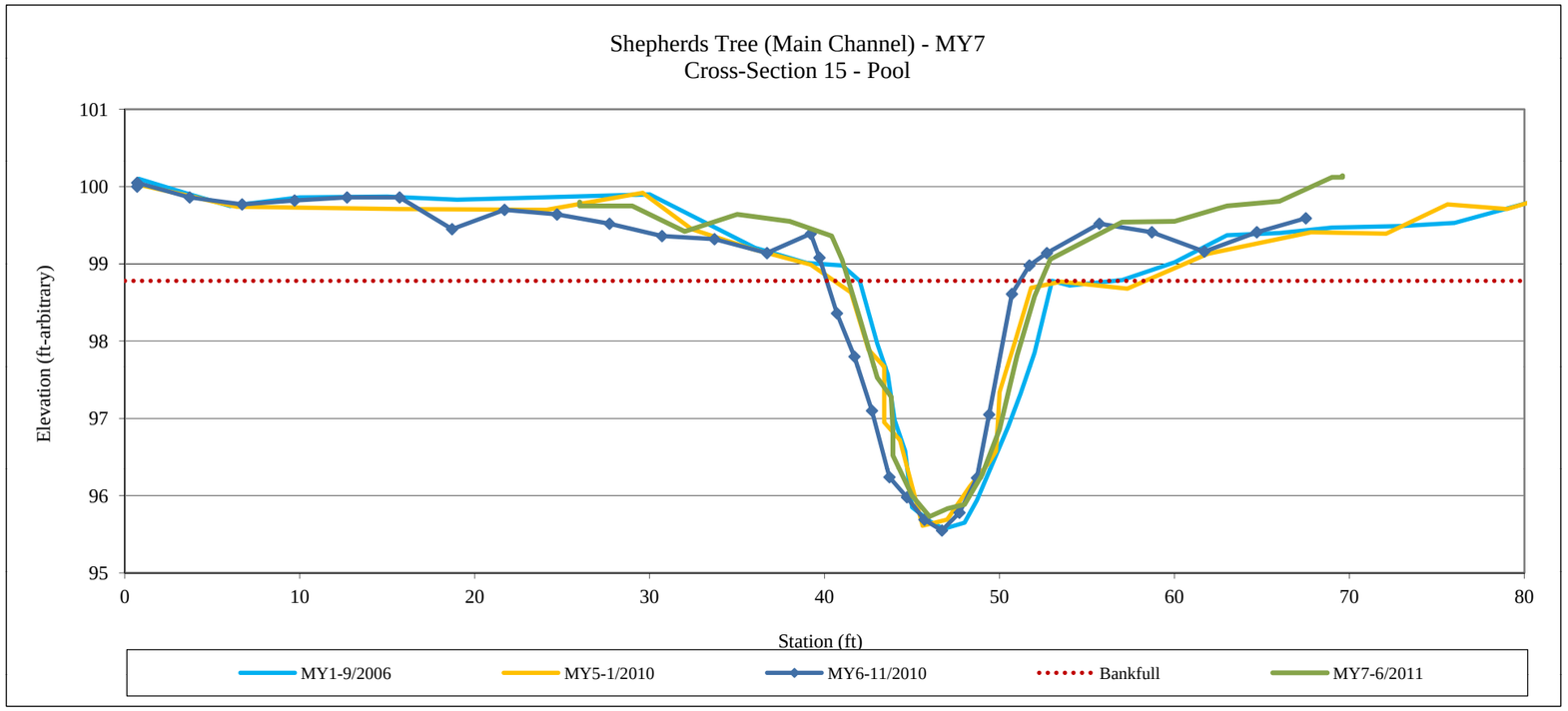
Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-15, Pool**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	99.87
Bankfull Cross-Sectional Area (ft^2)	18.64
Bankfull Width (ft)	10.35
Flood Prone Area Elevation (ft)	101.61
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	1.80
Bankfull Max Depth (ft)	2.84
W/D Ratio	5.75
Entrenchment Ratio	N/A
Bank Height Ratio	1.17

XS-15: View Upstream

XS-15: View Downstream

Station	Elevation	Notes
26	100	x15
26	99.95	x15
29	99.95	x15
32	99.62	x15
35	99.84	x15
38	99.75	x15
40.4	99.56	x15
41	99.25	x15
42	98.5	x15
43	97.73	x15
43.8	97.48	x15
43.9	97.045	x15
43.9	96.72	x15
45	96.2	x15
46	95.93	x15
47	96.03	x15
48	96.085	x15
49	96.47	x15
50	97.06	x15
51	98.01	x15
52	98.78	x15
52.9	99.26	x15
54	99.39	x15
57	99.74	x15
60	99.75	x15
63	99.95	x15
66	100.01	x15
69	100.32	x15
69.6	100.32	x15
69.6	100.34	x15



Appendix D. Stream Survey Data
Figure 3p: Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Tributary
Monitoring Year 7

Project Name	**Shepherds Tree**
EEP Project Number	**333**
Cross-Section ID	**XS-16 Riffle**
Survey Date	**6/2011**

SUMMARY DATA	
Bankfull Elevation (ft)	93.49
Bankfull Cross-Sectional Area (ft^2)	5.81
Bankfull Width (ft)	7.50
Flood Prone Area Elevation (ft)	94.70
Flood Prone Width (ft)	>200
Bankfull Mean Depth (ft)	0.77
Bankfull Max Depth (ft)	1.20
W/D Ratio	9.74
Entrenchment Ratio	>2.2
Bank Height Ratio	1.17

XS-16: View Upstream

XS-16: View Downstream

Station	Elevation	Notes
0	95.18	x16
0	94.95	x16
3	95.03	x16
6	94.87	x16
9	94.34	x16
12	93.85	x16
15	93.60	x16
18	93.41	x16
19	93.44	x16
20	93.74	x16
21.1	93.76	x16
22	93.30	x16
23	92.58	x16
23.6	92.47	x16
24	92.29	x16
25	92.30	x16
25.5	92.51	x16
26	92.56	x16
27	92.69	x16
28	92.79	x16
29	93.46	x16
30	93.69	x16
33	93.72	x16
36	94.15	x16
39	94.53	x16
42	94.72	x16
45	94.67	x16
48	94.77	x16
49.1	94.80	x16
49.1	94.84	x16

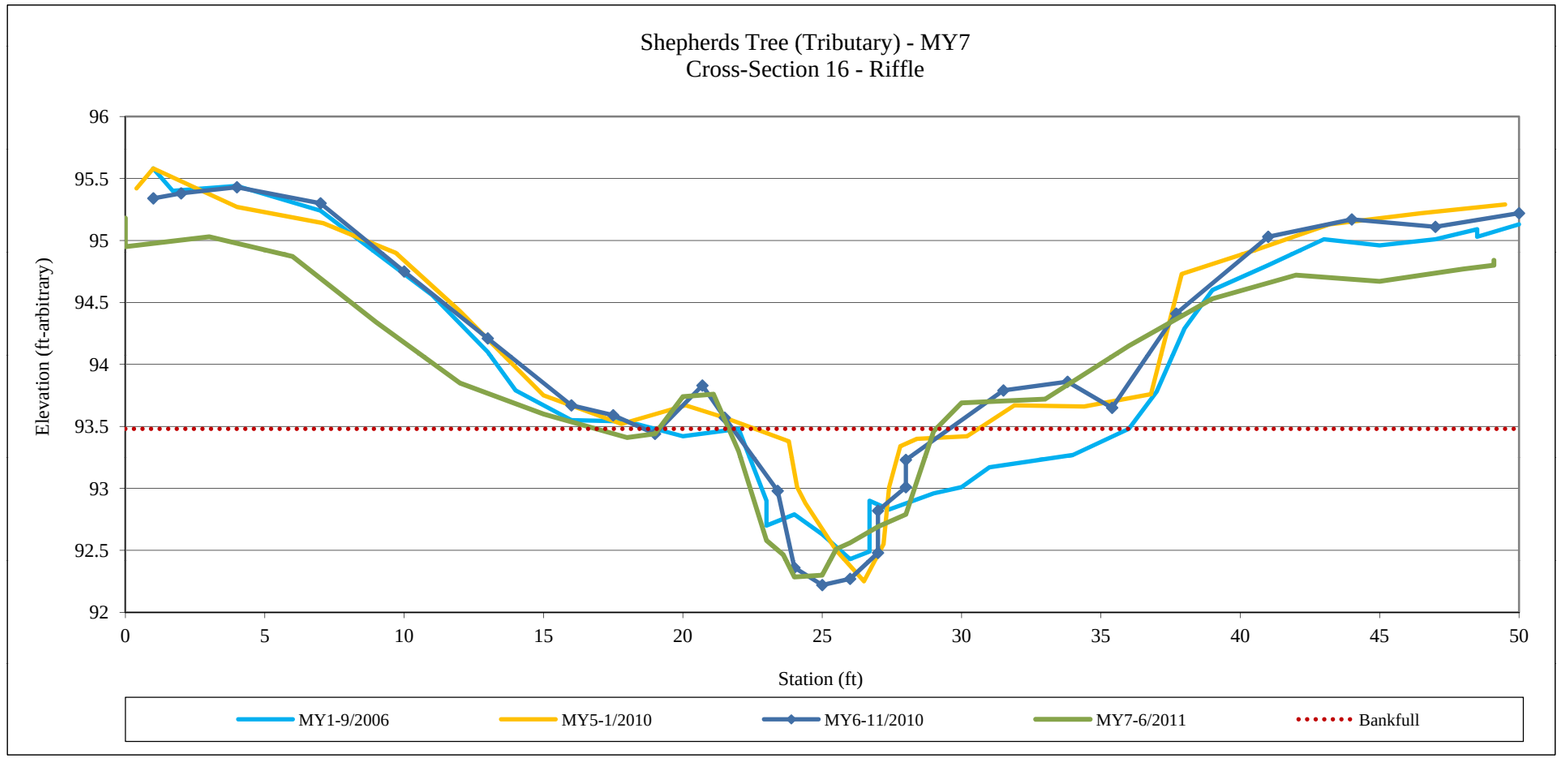


Table 10a. Baseline Stream Data Summary
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Parameter	Gauge	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			Monitoring Baseline*					
Dimension and Substrate - Riffle	-	**LL**	**UL**	**Eq.**	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	-	-	-		-	-	-	-	-	-	-	7.1	-	-	-	-	-	10.2	-	-	-	-	-	-	-
Floodprone Width (ft)					-	-	-	-	-	-	-	>100	-	-	-	-	-	>100	-	-	-	-	-	-	-
Bankfull Mean Depth (ft)	-	-	-		-	-	-	-	-	-	-	1.3	-	-	-	-	-	1.85	-	-	-	-	-	-	-
Bankfull Max Depth (ft)	-				-	-	-	-	-	-	-	1.71	-	-	-	-	-	2.7	-	-	-	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	-	-	-		-	-	-	-	-	-	-	9.3	-	-	-	-	-	18.7	-	-	-	-	-	-	-
Width/Depth Ratio	-				-	-	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-	-	-
Entrenchment Ratio	-				-	-	-	-	-	-	-	>10	-	-	-	-	-	>5.0	-	-	-	-	-	-	-
Bank Height Ratio	-				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pattern																									
Channel Beltwidth (ft)						-			-	-	51	-	-	92	-	-	-	85		-	-	-	-	-	-
Radius of Curvature (ft)					-	-	-	-	-	-	13.1	-	-	22.3	-	-	19.5	-	30.6	-	-	-	-	-	-
Rc:Bankfull width (ft/ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-
Meander Wavelength (ft)					-	-	-	-	-	-	77	-	-	100.7	-	-	114	-	138	-	-	-	-	-	-
Meander Width Ratio					-	-	-	-	-	-	5.2	-	-	12.5	-	-		4.2		-	-	-	-	-	-
Profile																									
Riffle Length (ft)					-	-	-	-	-	-		-	-		-	-	-	-		-	-	-	-	-	-
Riffle Slope (ft/ft)					-	-	-	-	-	-	0.006	-		0.02	-	-	0.006	-	0.02	-	-	-	-	-	-
Pool Length (ft)					-	-	-	-	-	-	13	-	-	22	-	-	20	-	29	-	-	-	-	-	-
Pool Max Depth (ft)					-	-	-	-	-	-		-	-	-	-	-	-	-		-	-	-	-	-	-
Pool Spacing (ft)					-	-	-	-	-	-	26	-	-	65	-	-	57	-	69	-	-	-	-	-	-
Transport Parameters																									
Reach Shear Stress (competency) lb/ft^2					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Max part size (mm) mobilized at bankful					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stream Power (transport capacity) W/m^2					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Additional Reach Parameters																									
Rosgen Classification	-				-						E5						E5			-					
Bankful Velocity (fps)	-	-	-	-	-						-						-			-					
Bankful Discharge (cfs)	-	-	-	-	-						-						-			-					
Valley Length (ft)					-						-						-			-					
Channel Thalweg Length (ft)					-						-						-			-					
Sinuosity (ft)					-						1.36						1.4			-					
Water Surface Slope (ft/ft)	-				-						0.0049-0.0064						**0.0015-0.0017/0.004			-					
BF slope (ft/ft)	-				-						-						-			-					
Bankful Floodplain Area (acres)					-						-						-			-					
% of Reach with Eroding Banks					-						-						-			-					
Channel Stability or Habitat Metric					-						-						-			-					
Biological or Other					-						-						-			-					

*Baseline monitoring dada was not completed due to the lack of an as-built survey (per KCI Associates and EEP)

Appendix D. Stream Survey Data

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank and Hydrologic Containment Parameter Distributions)

Shepherds Tree Stream and Wetland Restoration/EEP Project #333

Monitoring Year 7

Parameter	Pre-Existing Condition	Reference Reach Data	Design	As-built/Baseline
Ri%/Ru%/P%/G%/S%	-	-	-	-
SC% / Sa% / G% / C% / B% / Be%	-	-	-	-
d16 / d35 / d50 / d84 / d95 (mm)	-	-	-	-
Entrenchment Class<1.5/1.5-1.99/2.0-4.9/5.0-9.9/>10	-	-	-	-
Incision Class <1.2/1.2-1.49/1.5-1.99/>2.0	-	-	-	-

Appendix D. Stream Survey Data
Table 11a: Morphologic and Hydraulic Monitoring Summary
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

PARAMETER	Cross-Section 1 Riffle				Cross-Section 2 Pool				Cross-Section 3 Riffle				Cross-Section 4 Riffle			
DIMENSION	MY2-2006	MY5-2009	MY6-2010	MY7-2011	MY2-2006	MY5-2009	MY6-2010	MY7-2011	MY2-2006	MY5-2009	MY6-2010	MY7-2011	MY2-2006	MY5-2009	MY6-2010	MY7-2011
Bankfull Width (ft)	8.0	6.5	6.9	7.2	9.19	9.2	7.9	7.6	9.04	13.4	10.3	12.5	10.42	10.3	9.6	11.5
Floodprone Width (ft)	>100	>100	>100	>100	N/A	N/A	N/A	N/A	>100	>100	>100	>100	>100	>100	>100	>100
Bankfull Mean Depth	1.20	1.5	1.2	1.1	1.31	0.8	0.7	0.6	0.76	0.8	0.7	0.7	2.05	1.9	1.8	1.7
Bankfull Max Depth (ft)	2.43	1.9	1.6	1.6	2.64	1.6	1.3	1.3	1.45	1.4	1.3	1.7	2.92	2.8	2.6	2.6
Bankfull Cross-sectional Area (ft^2)	9.6	9.7	10.6	7.8	12.07	7.4	5.1	4.9	6.86	11.3	7.4	8.3	21.41	19.6	17.6	19.6
Bankfull Width/Depth Ratio	6.63	4.4	5.7	6.6	7.02	11.5	12.2	11.9	11.89	15.9	14.5	18.9	5.08	5.4	5.3	6.8
Bankfull Entrenchment Ratio	>2.2	>2.2	>2.2	>2.2	N/A	N/A	N/A	N/A	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2
Bankfull Bankheight Ratio	*	1.0	1.0	1.0	*	1.0	1.0	1.0	*	1.0	1.0	1.0	*	1.0	1.0	1.1
Cross Sectional Area between end pins (ft^2)	*	30.0	18.0	8.0	*	12.4	9.7	8.6	*	16.2	8.4	17.8	*	24.4	30.4	29.0
d50 (mm)	0.050	Silt	Silt	Silt	0.030	Silt	Silt	Silt	0.030	Silt	Silt	Silt	0.400	Silt	Silt	Silt

PARAMETER	Cross-Section 5 Pool				Cross-Section 6 Riffle				Cross-Section 7 Pool				Cross-Section 8 Pool			
DIMENSION	MY2-2006	MY5-2009	MY6-2010	MY7-2011	MY2-2006	MY5-2009	MY6-2010	MY7-2011	MY2-2006	MY5-2009	MY6-2010	MY7-2011	MY2-2006	MY5-2009	MY6-2010	MY7-2011
Bankfull Width (ft)	8.86	8.6	8.9	10.3	7.8	6.2	5.8	4.4	11.17	11.5	16.0	10.1	25.96	26.5	27.6	24.9
Floodprone Width (ft)	N/A	N/A	N/A	N/A	>100	>100	>100	>100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bankfull Mean Depth	1.75	1.3	8.9	1.2	0.95	0.6	0.5	0.5	1.61	1.6	0.9	1.5	1.8	1.5	1.7	1.8
Bankfull Max Depth (ft)	2.42	2.0	2.3	1.9	1.59	0.9	0.8	0.7	2.65	2.8	2.1	2.4	3.9	3.2	3.6	3.5
Bankfull Cross-sectional Area (ft^2)	15.5	11.4	13.2	11.9	7.44	3.6	2.8	2.2	18.04	18.8	13.7	14.8	46.62	41.0	47.2	44.4
Bankfull Width/Depth Ratio	5.06	6.5	6.0	8.9	8.21	10.6	12.0	8.7	6.94	7.1	18.6	6.8	14.42	17.2	16.2	14.0
Bankfull Entrenchment Ratio	N/A	N/A	N/A	N/A	>2.20	>2.20	>2.20	>2.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bankfull Bankheight Ratio	*	1.0	1.0	1.0	*	1.0	1.0	1.0	*	1.0	1.0	1.1	*	1.0	1.0	1.0
Cross Sectional Area between end pins (ft^2)	*	17.5	25.2	14.0	*	8.0	12.6	3.0	*	26.5	16.2	24.7	*	51.7	51.6	48.6
d50 (mm)	0.040	Silt	Silt	Silt	0.040	Silt	Silt	Silt	0.040	Silt	Silt	Silt	0.060	Silt	Silt	Silt

PARAMETER	Cross-Section 9 Riffle				Cross-Section 10 Pool				Cross-Section 11 Pool				Cross-Section 12 Riffle			
DIMENSION	MY2-2006	MY5-2009	MY6-2010	MY7-2011	MY2-2006	MY5-2009	MY6-2010	MY7-2011	MY2-2006	MY5-2009	MY6-2010	MY7-2011	MY2-2006	MY5-2009	MY6-2010	MY7-2011
Bankfull Width (ft)	22.62	18.1	21.7	18.9	15.73	15.5	16.3	14.2	12.96	12.9	13.2	14.4	12.5	12.8	13.0	13.1
Floodprone Width (ft)	>100	>100	>100	>100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	>200	>200	>200	>200
Bankfull Mean Depth	1.7	1.8	1.7	1.7	1.43	1.5	1.5	1.8	1.57	1.5	1.5	1.5	2.1	2.1	2.0	1.9
Bankfull Max Depth (ft)	3.56	3.3	3.5	3.3	3.12	2.8	3.1	3.0	2.94	2.6	2.8	2.8	3.1	3.2	3.2	3.2
Bankfull Cross-sectional Area (ft^2)	38.46	33.3	37.1	32.9	22.52	23.9	24.8	25.0	20.39	19.4	19.1	20.8	25.8	26.8	26.1	25.4
Bankfull Width/Depth Ratio	13.31	9.8	12.8	10.9	11	10.1	10.7	8.1	8.25	8.6	9.1	9.9	6.1	6.1	6.5	6.8
Bankfull Entrenchment Ratio	>2.2	>2.2	>2.2	>2.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	>2.2	>2.2	>2.2	>2.2
Bankfull Bankheight Ratio	*	1.0	1.1	1.0	*	1.0	1.0	1.0	*	1.0	1.0	1.0	*	1.0	1.0	1.0
Cross Sectional Area between end pins (ft^2)	*	61.7	50.9	56.3	*	41.6	34.5	32.3	*	18.4	18.7	22.3	*	64.4	50.9	45.9
d50 (mm)	0.050	Silt	Silt	Silt	0.060	Silt	Silt	Silt	0.060	Silt	Silt	Silt	0.060	Silt	Silt	Silt

PARAMETER	Cross-Section 13 Pool				Cross-Section 14 Riffle				Cross-Section 15 Pool				Cross-Section 16 Riffle			
DIMENSION	MY2-2006	MY5-2009	MY6-2010	MY7-2011	MY2-2006	MY5-2009	MY6-2010	MY7-2011	MY2-2006	MY5-2009	MY6-2010	MY7-2011	MY2-2006	MY5-2009	MY6-2010	MY7-2011
Bankfull Width (ft)	14.00	16.6	21.6	15.0	11.6	13.9	13.6	11.1	11.0	12.9	11.0	10.4	14.0	6.9	8.4	7.5
Floodprone Width (ft)	N/A	N/A	N/A	N/A	>200	>200	>200	>200	N/A	N/A	N/A	N/A	>200	>200	>200	>200
Bankfull Mean Depth	2.31	1.9	1.5	2.1	1.7	1.4	1.9	1.9	2.0	1.6	2.0	1.8	0.5	0.4	0.6	0.8
Bankfull Max Depth (ft)	3.60	3.3	3.4	3.4	3.4	3.7	3.5	3.2	3.2	3.2	3.2	2.8	1.1	1.2	1.3	1.2
Bankfull Cross-sectional Area (ft^2)	32.40	31.8	32.6	32.0	20.2	20.0	26.1	21.0	22.1	20.1	21.7	18.6	6.7	3.1	5.2	5.8
Bankfull Width/Depth Ratio	6.06	8.6	14.3	7.0	6.7	9.7	7.1	5.8	5.5	8.3	5.6	5.8	29.2	17.8	13.5	9.7
Bankfull Entrenchment Ratio	N/A	N/A	N/A	N/A	>2.2	>2.2	>2.2	>2.2	N/A	N/A	N/A	N/A	>2.2	>2.2	>2.2	>2.2
Bankfull Bankheight Ratio	*	1.0	1.0	1.0	*	1.0	1.0	1.1	*	1.0	1.0	1.0	*	1.0	1.0	1.0
Cross Sectional Area between end pins (ft^2)	*	101.9	86.5	80.9	*	80.3	47.5	63.4	*	85.5	62.8	53.3	*	56.9	54.5	46.2
d50 (mm)	0.050	Silt	Silt	Silt	0.040	Silt	Silt	Silt	0.060	Silt	Silt	Silt	0.060	Silt	Silt	Silt

* Data was not provided

Appendix D. Stream Survey Data
Table 11b: Stream Reach Data Summary
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Parameter	Baseline*						MY 2 2006						MY 2 2009**					
DIMENSION	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	-	-	-	-	-	-	8.0	11.4	11.6	14.0	2.2	16	6.2	12.6	12.8	26.5	5.1	16
Floodprone Width (ft)	-	-	-	-	-	-	>100	>100	>100	>100	n/a	16	n/a	n/a	n/a	n/a	n/a	16
Bankfull Mean Depth (ft)	-	-	-	-	-	-	0.5	1.6	1.9	2.1	0.7	16	0.4	1.4	1.5	2.1	0.5	16
Bankfull Max Depth (ft)	-	-	-	-	-	-	1.1	2.7	3.2	3.4	1.1	16	0.9	2.5	2.8	3.7	0.9	16
Bankfull Cross Sectional Area (ft2)	-	-	-	-	-	-	6.7	16.9	20.2	25.8	8.3	16	3.1	18.8	19.5	41.0	10.9	16
Width/Depth Ratio	-	-	-	-	-	-	5.5	11.8	6.4	29.2	11.6	16	4.4	9.8	9.1	17.8	4.1	16
Entrenchment Ratio	-	-	-	-	-	-	>2.2	>2.2	>2.2	>2.2	n/a	16	>2.2	>2.2	>2.2	>2.2	n/a	16
Bank Height Ratio	-	-	-	-	-	-	-	-	-	-	-	-	1.0	1.0	1.0	1.0	0.0	16
Bankfull Velocity (fps)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PROFILE																		
Riffle Length (ft)	-	-	-	-	-	-	18.5	-	23.3	28.0	-	-	-	-	-	-	-	-
Riffle Slope (ft/ft)	-	-	-	-	-	-	0.0038	-	0.0126	0.02214	-	-	-	-	-	-	-	-
Pool Length (ft)	-	-	-	-	-	-	8.2	-	76.6	174.1	-	-	-	-	-	-	-	-
Pool Max depth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pool Spacing (ft)	-	-	-	-	-	-	27.9	-	142.8	315.2	-	-	-	-	-	-	-	-
PATTERN																		
Channel Beltwidth (ft)	-	-	-	-	-	-	40.0	-	45.0	60.0	-	-	-	-	-	-	-	-
Radius of Curvature (ft)	-	-	-	-	-	-	19.0	-	30.0	50.0	-	-	-	-	-	-	-	-
Meander Wavelength (ft)	-	-	-	-	-	-	90.0	-	120.0	140.0	-	-	-	-	-	-	-	-
Meander Width Ratio	-	-	-	-	-	-	7.1	-	9.4	11.0	-	-	-	-	-	-	-	-
ADDITIONAL REACH PARAMETERS																		
Rosgen Classification	-						E6						-					
Channel Thalweg length (ft)	-						1718						-					
Sinuosity (ft)	-						1.40						-					
Water Surface Slope (Channel) (ft/ft)	-						0.027						-					
BF slope (ft/ft)	-						0.0026						-					
Ri%/Ru%/P%/G%/S%	-	-	-	-	-													
SC%/Sa%/G%/C%/B%/Be%																		
d16 / d35 / d50 / d84 / d95																		
% of reach with eroding banks	-						-						-					
Channel Stability or Habitat Metric	-						-						-					
Biological or Other	-						-						-					

Parameter	MY 6 2010**						MY 7 2011**					
DIMENSION	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	5.8	13.2	12.0	27.6	6.1	16	4.4	12.1	11.3	24.9	4.9	16
Floodprone Width (ft)	>100	>100	>100	>100	n/a	16	>100	>100	>100	>100	n/a	16
Bankfull Mean Depth (ft)	0.5	1.8	1.5	8.9	2.0	16	0.5	1.4	1.6	2.1	0.5	16
Bankfull Max Depth (ft)	0.8	2.5	2.7	3.6	1.0	16	0.7	2.4	2.7	3.5	0.9	16
Bankfull Cross Sectional Area (ft2)	2.8	19.4	18.4	47.2	12.5	16	2.2	18.5	19.1	44.4	11.7	16
Width/Depth Ratio	5.3	10.6	11.4	18.6	4.3	16	5.8	9.2	8.4	18.9	3.5	16
Entrenchment Ratio	>2.2	>2.2	>2.2	>2.2	n/a	16	>2.2	>2.2	>2.2	>2.2	n/a	16
Bank Height Ratio	1.0	1.0	1.0	1.1	0.01	16	1.0	1.0	1.0	1.1	0.04	16
Bankfull Velocity (fps)												
PROFILE												
Riffle Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-
Riffle Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-
Pool Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-
Pool Max depth	-	-	-	-	-	-	-	-	-	-	-	-
Pool Spacing (ft)	-	-	-	-	-	-	-	-	-	-	-	-
PATTERN												
Channel Beltwidth (ft)	-	-	-	-	-	-	-	-	-	-	-	-
Radius of Curvature (ft)	-	-	-	-	-	-	-	-	-	-	-	-
Meander Wavelength (ft)	-	-	-	-	-	-	-	-	-	-	-	-
Meander Width Ratio	-	-	-	-	-	-	-	-	-	-	-	-
ADDITIONAL REACH PARAMETERS												
Rosgen Classification	-						-					
Channel Thalweg length (ft)	-						-					
Sinuosity (ft)	-						-					
Water Surface Slope (Channel) (ft/ft)	-						-					
BF slope (ft/ft)	-						-					
Ri%/Ru%/P%/G%/S%	-	-	-	-	-	-	-	-	-	-	-	-
SC%/Sa%/G%/C%/B%/Be%												
d16 / d35 / d50 / d84 / d95												
% of reach with eroding banks	-						-					
Channel Stability or Habitat Metric	-						-					
Biological or Other	-						-					

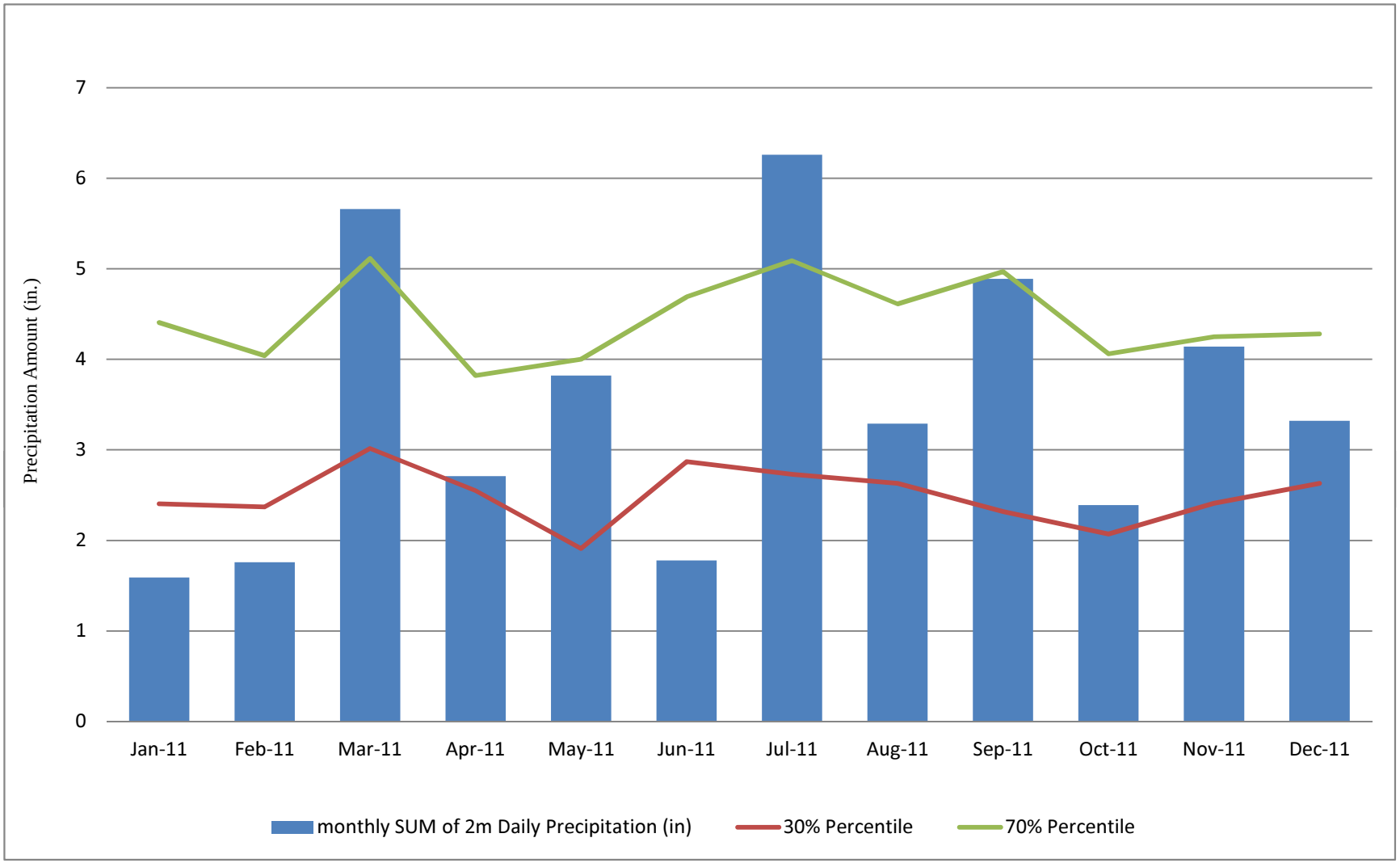
*Baseline monitoring dada was not completed due to the lack of an as-built survey (per KCI Associates and EEP)
**Longitudinal profile was not surveyed

APPENDIX E
HYDROLOGIC DATA

Appendix E. Hydrologic Data
Table 12. Verification of Bankfull Events
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Date of Collection	Date of Occurrence	Method	Photo # (if available)
N/A	Jun-05	Visual Assessment	N/A
N/A	Aug-05	Surface Gauge 1 and 3-MC	N/A
N/A	Oct-05	Surface Gauge 1-MC	N/A
N/A	Dec-05	Surface Gauge 1-MC	N/A
N/A	Nov-06	Surface Gauge 3-MC	N/A
N/A	Dec-06	Surface Gauge 3-MC	N/A
N/A	Jan-07	Surface Gauge 3-MC	N/A
N/A	Mar-07	Surface Gauge 3-MC	N/A
N/A	Aug-08	Surface Gauge 3-MC	N/A
N/A	Sep-08	Surface Gauge 3-MC	N/A
N/A	Apr-09	Surface Gauge 2-Trib	N/A
N/A	Mar-09	Surface Gauge 3-MC	N/A
N/A	Apr-09	Surface Gauge 3-MC	N/A
N/A	Jun-09	Surface Gauge 3-MC	N/A
N/A	Apr-09	Surface Gauge 2-Trib	N/A
N/A	Jun-09	Surface Gauge 2-Trib	N/A
N/A	Aug-09	Surface Gauge 2-Trib	N/A
N/A	Sep-09	Surface Gauge 2-Trib	N/A
N/A	Apr-10	Surface Gauge 3-MC	N/A
N/A	May-10	Surface Gauge 1, 3 and 4-MC	N/A
N/A	Jun-10	Surface Gauge 1, 3 and 4-MC	N/A
N/A	Jul-10	Surface Gauge 4-MC	N/A
N/A	Aug-10	Surface Gauge 1, 3 and 4-MC	N/A
N/A	Sep-10	Surface Gauge 3 and 4-MC	N/A
N/A	Oct-10	Surface Gauge 1, 3 and 4-MC	N/A
N/A	Various-2011	Surface Gauge 1, 2, 3 and 4-MC	N/A

Appendix E. Hydrologic Data
Figure 6: Shepherds Tree 30-70 Percentile Graph for Rainfall in 2011
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7



*Historical rainfall data referenced from NC Cronos Database Divisonal Data for the Southern Piedmont of North Carloina (Station ID: 318292)
Data Period January 2011 through December 2011

Figure 7a: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

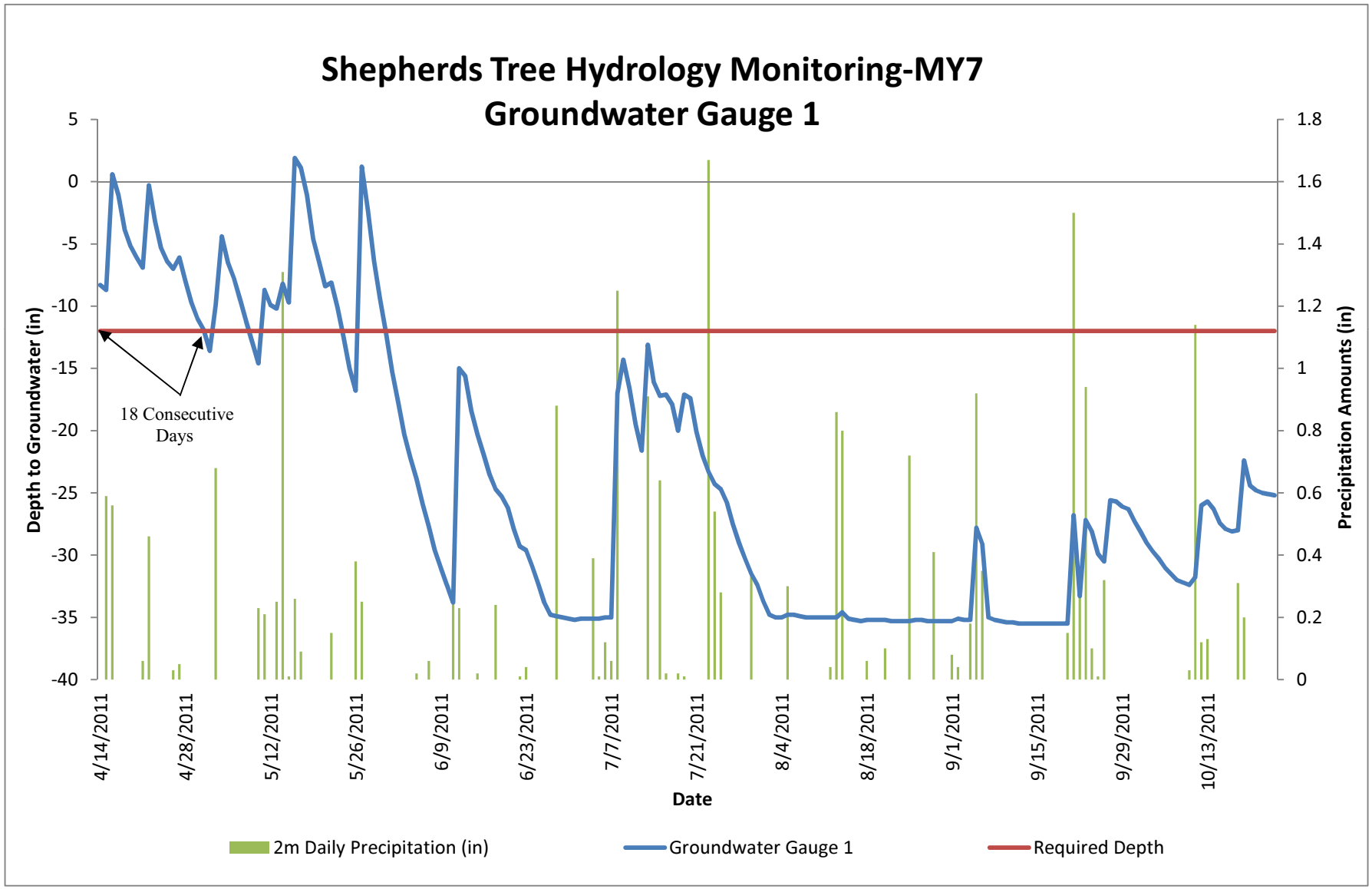


Figure 7b: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

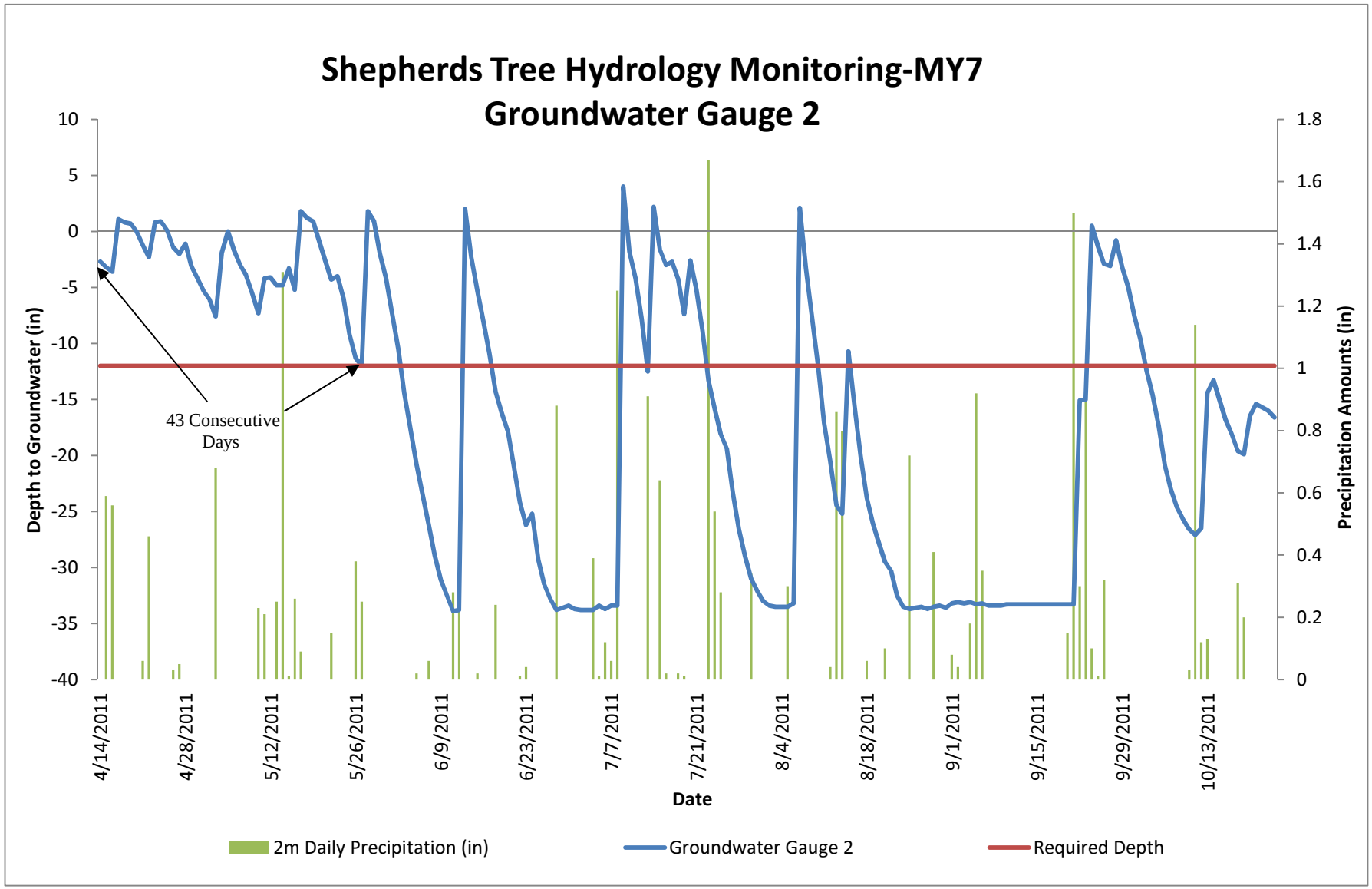


Figure 7c: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

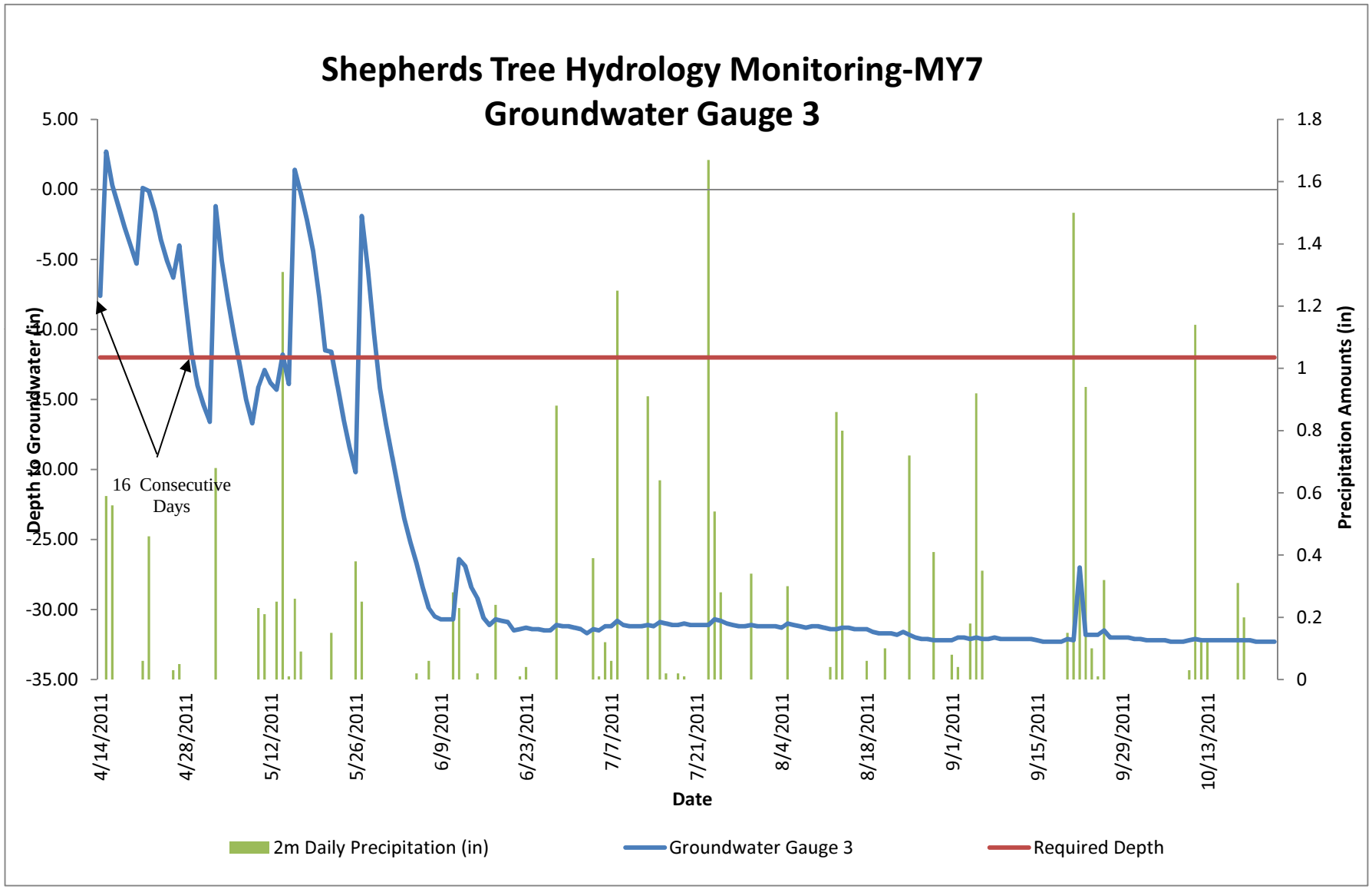


Figure 7d: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

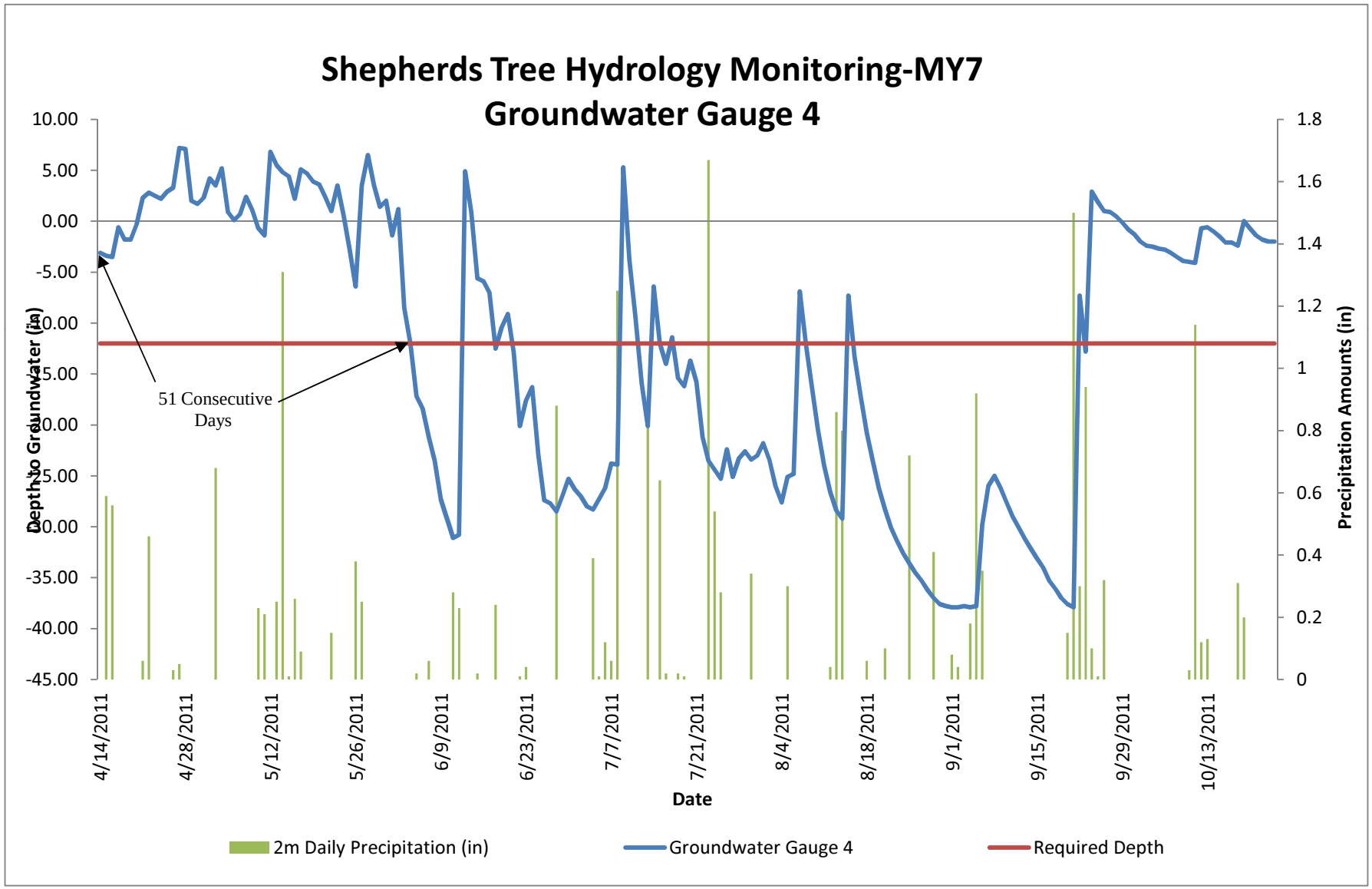


Figure 7e: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

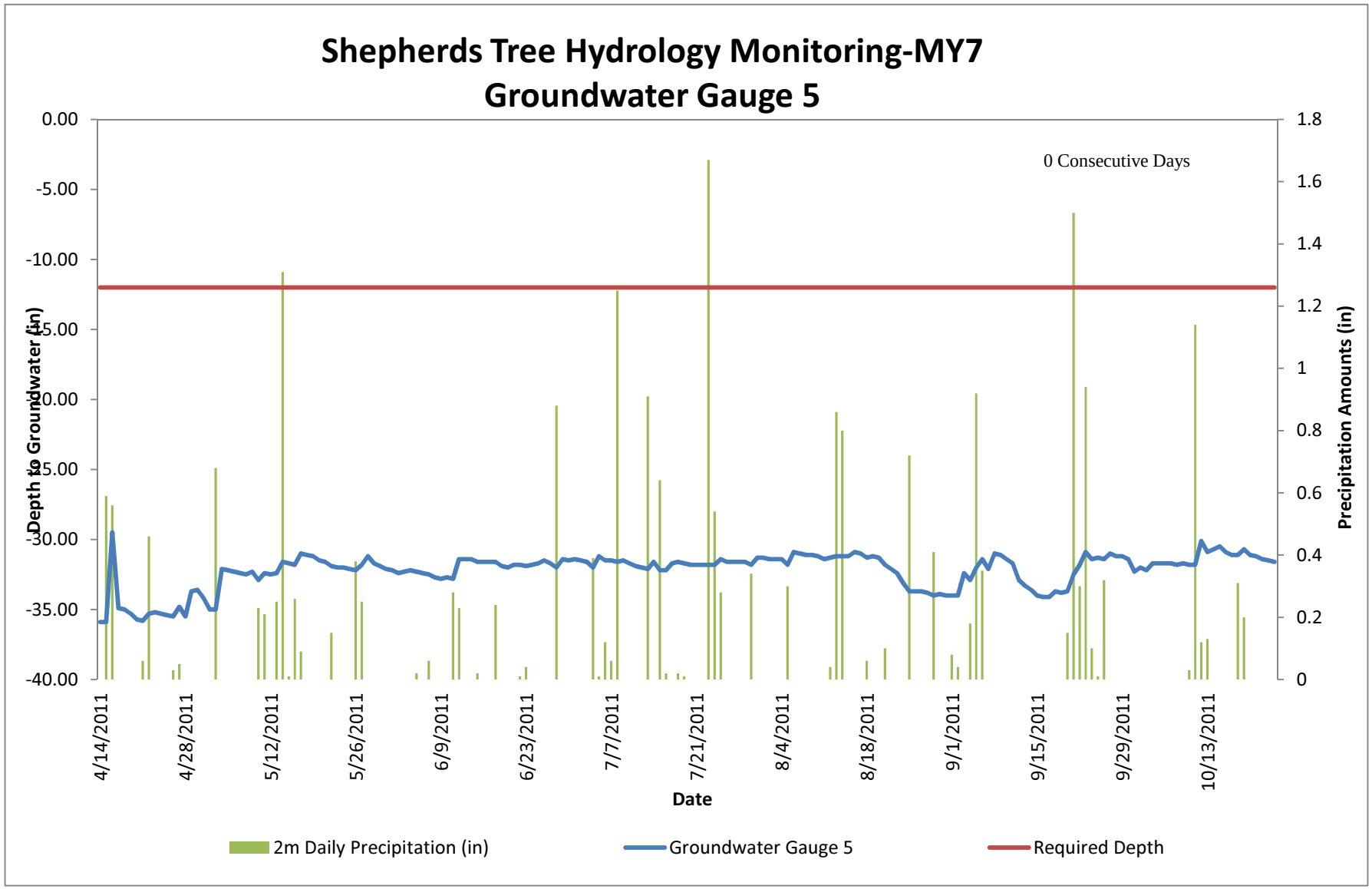


Figure 7f: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

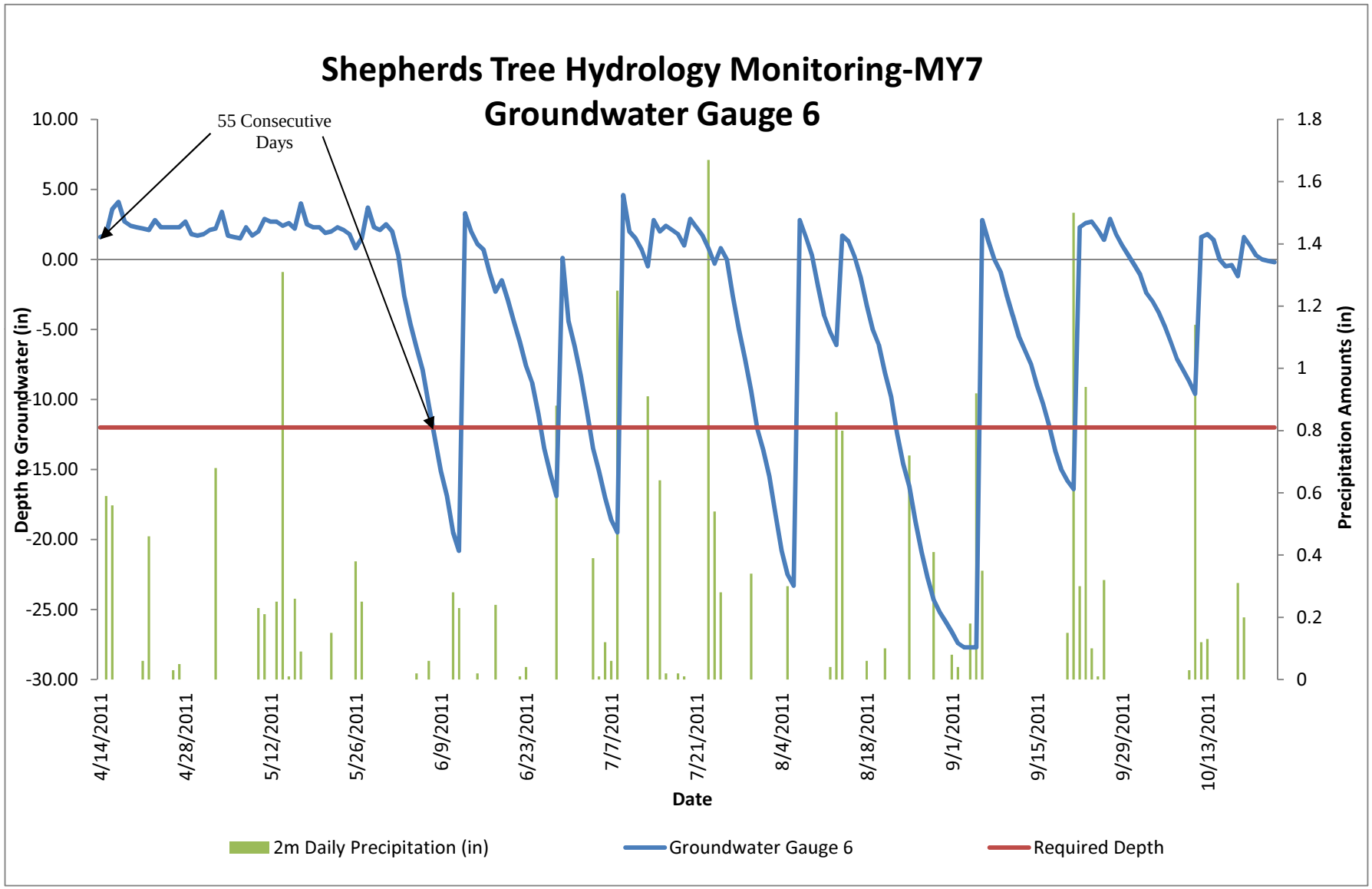


Figure 7g: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

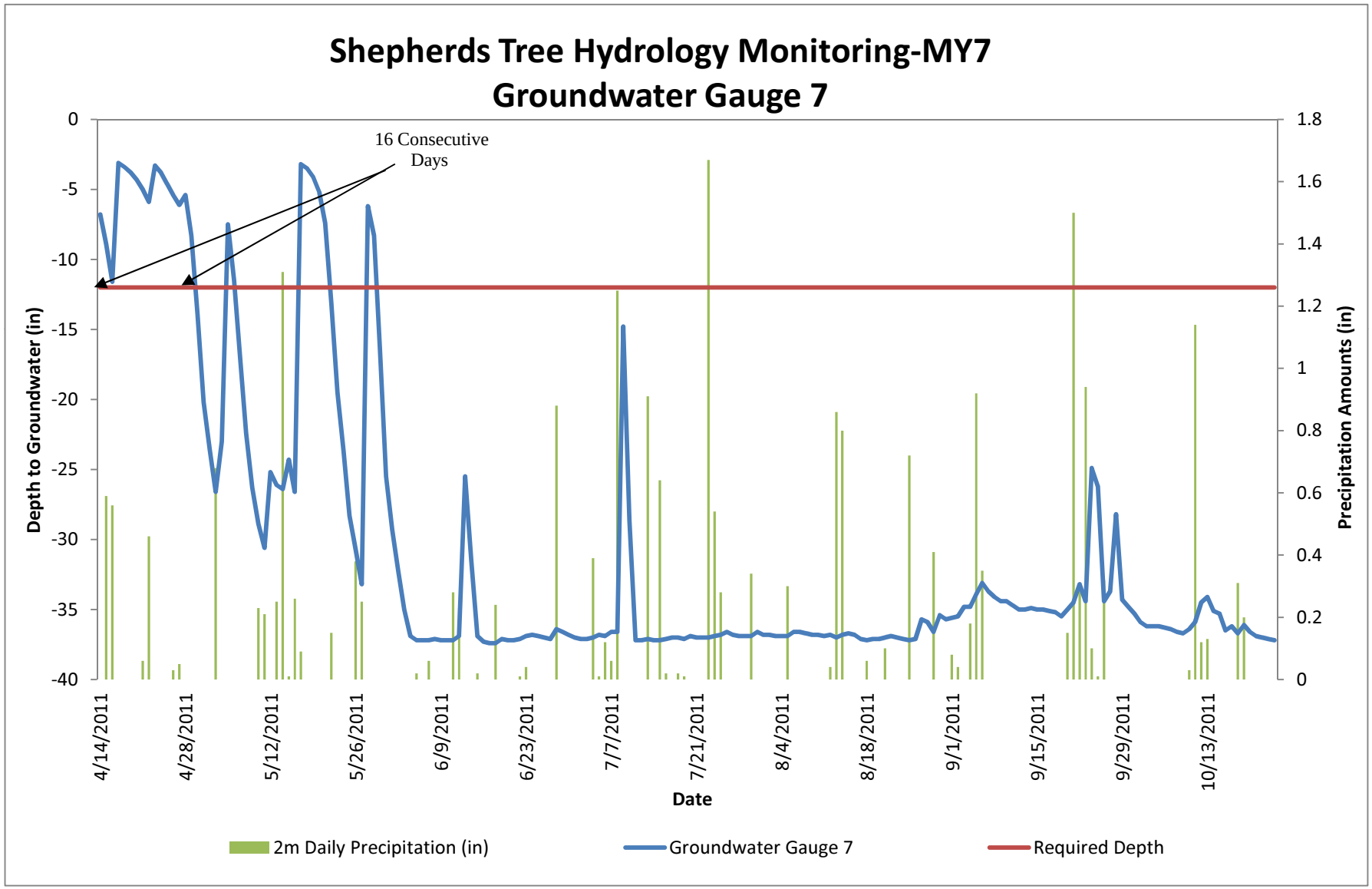


Figure 7h: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

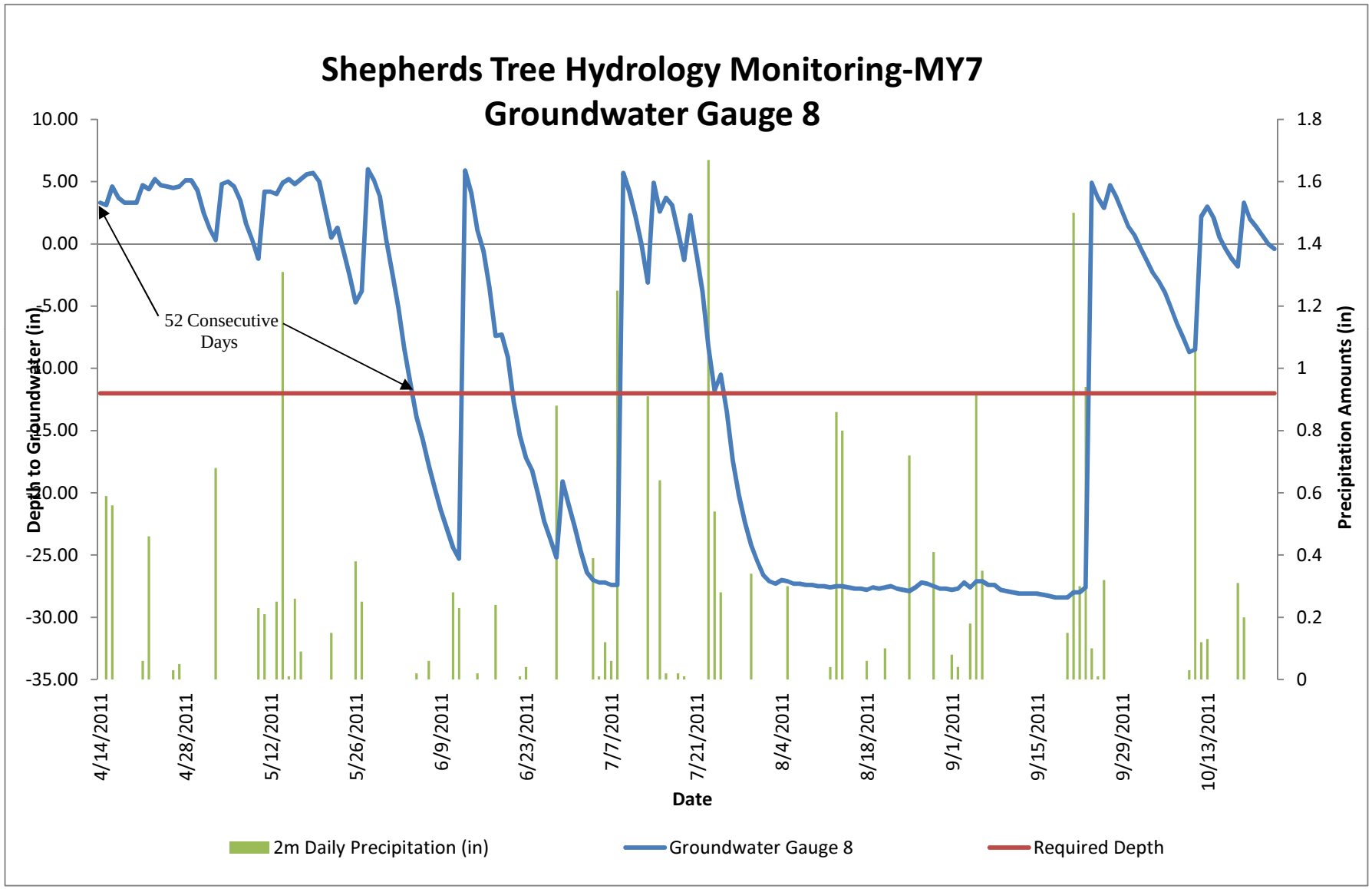


Figure 7j: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

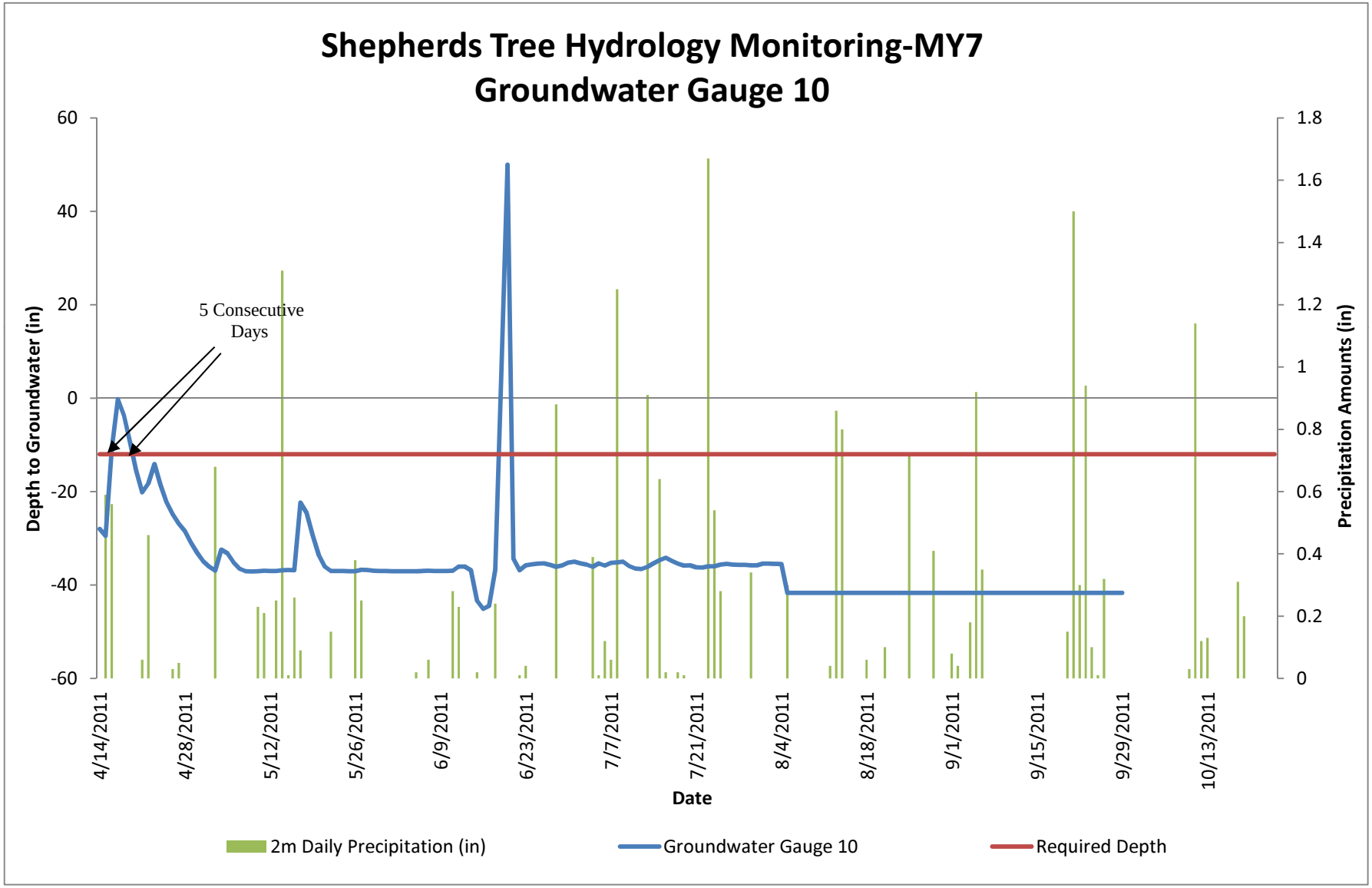


Figure 7k: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

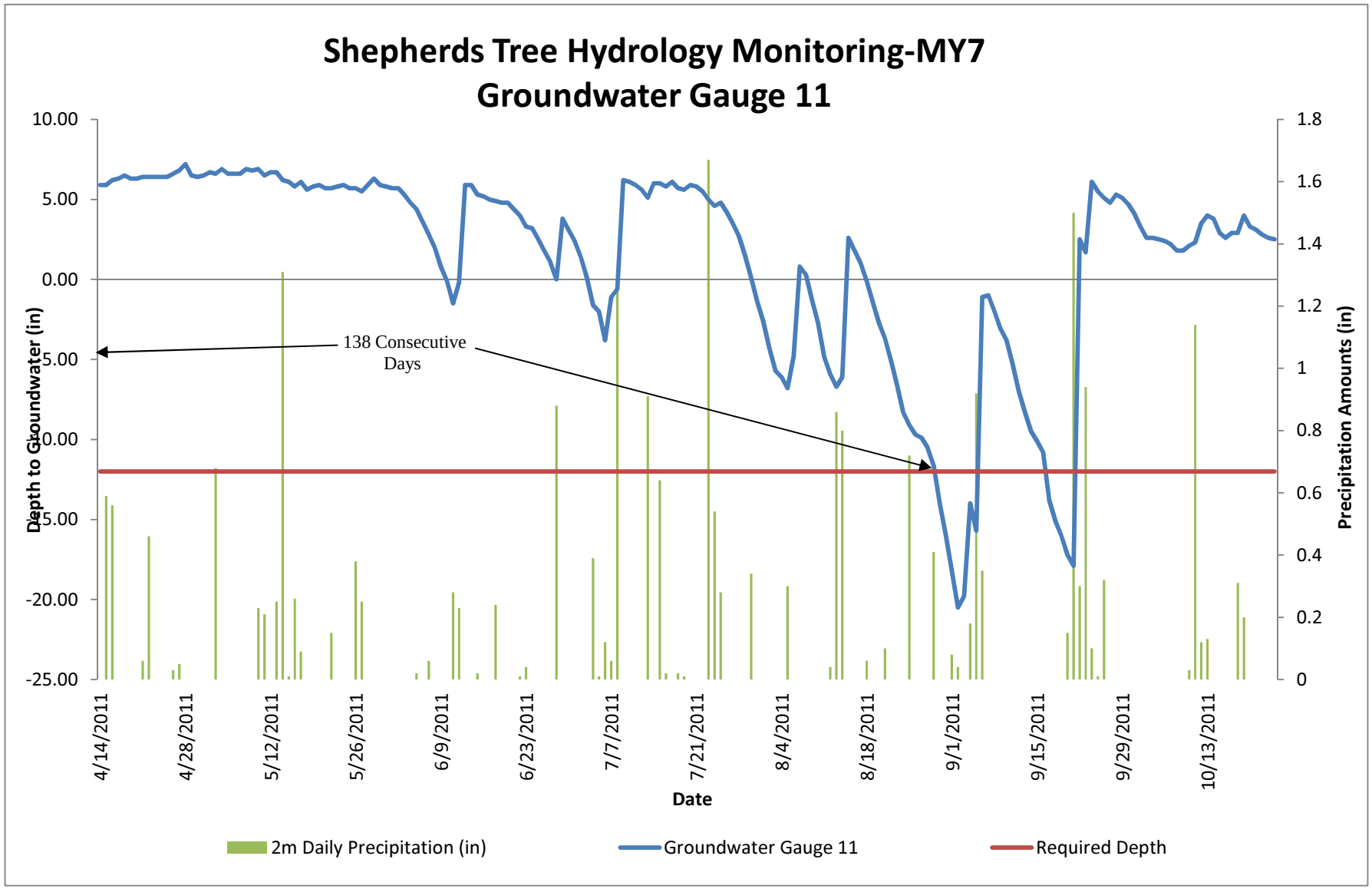


Figure 7l: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

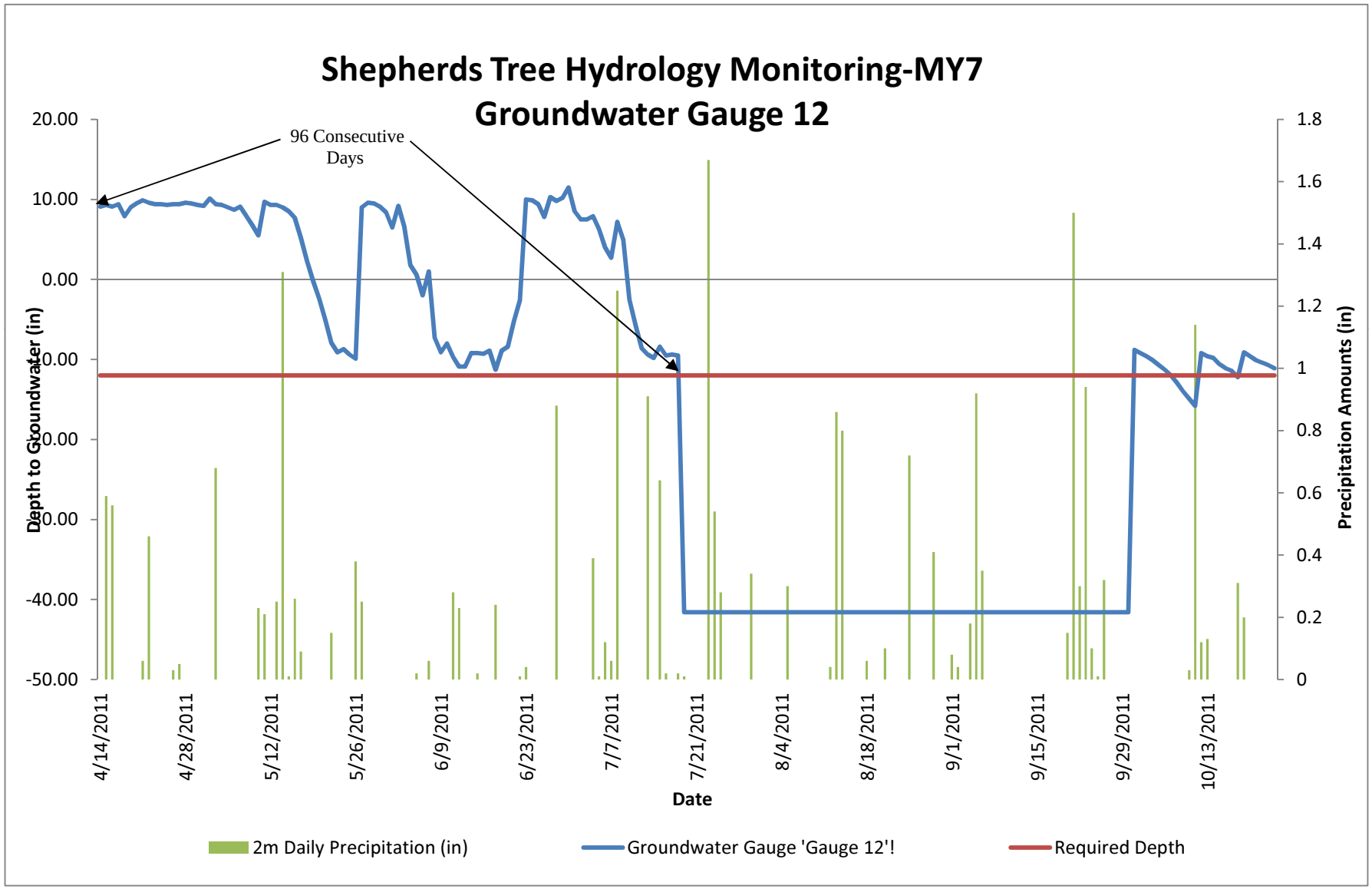


Figure 7m: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

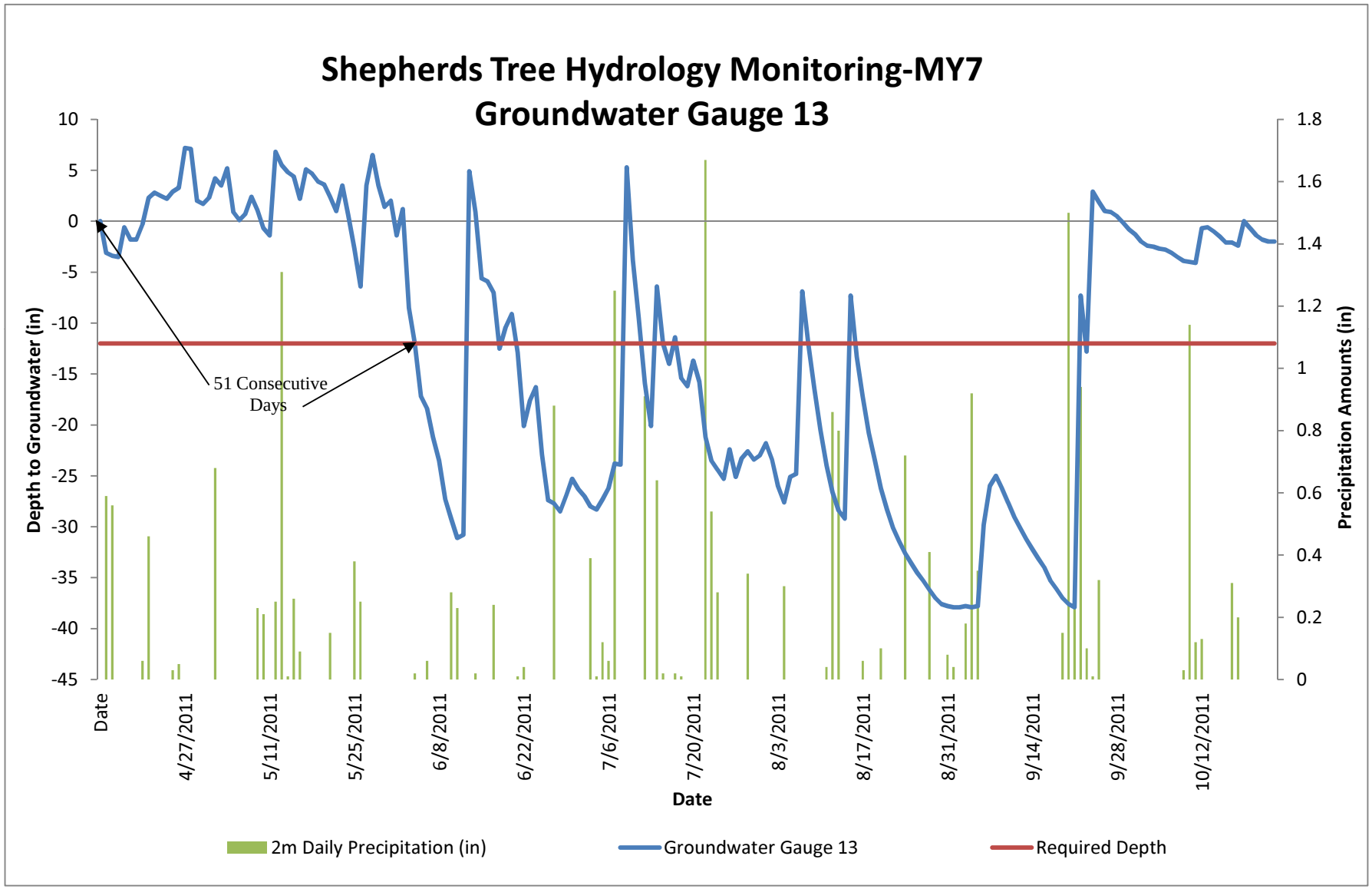


Figure 7n: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

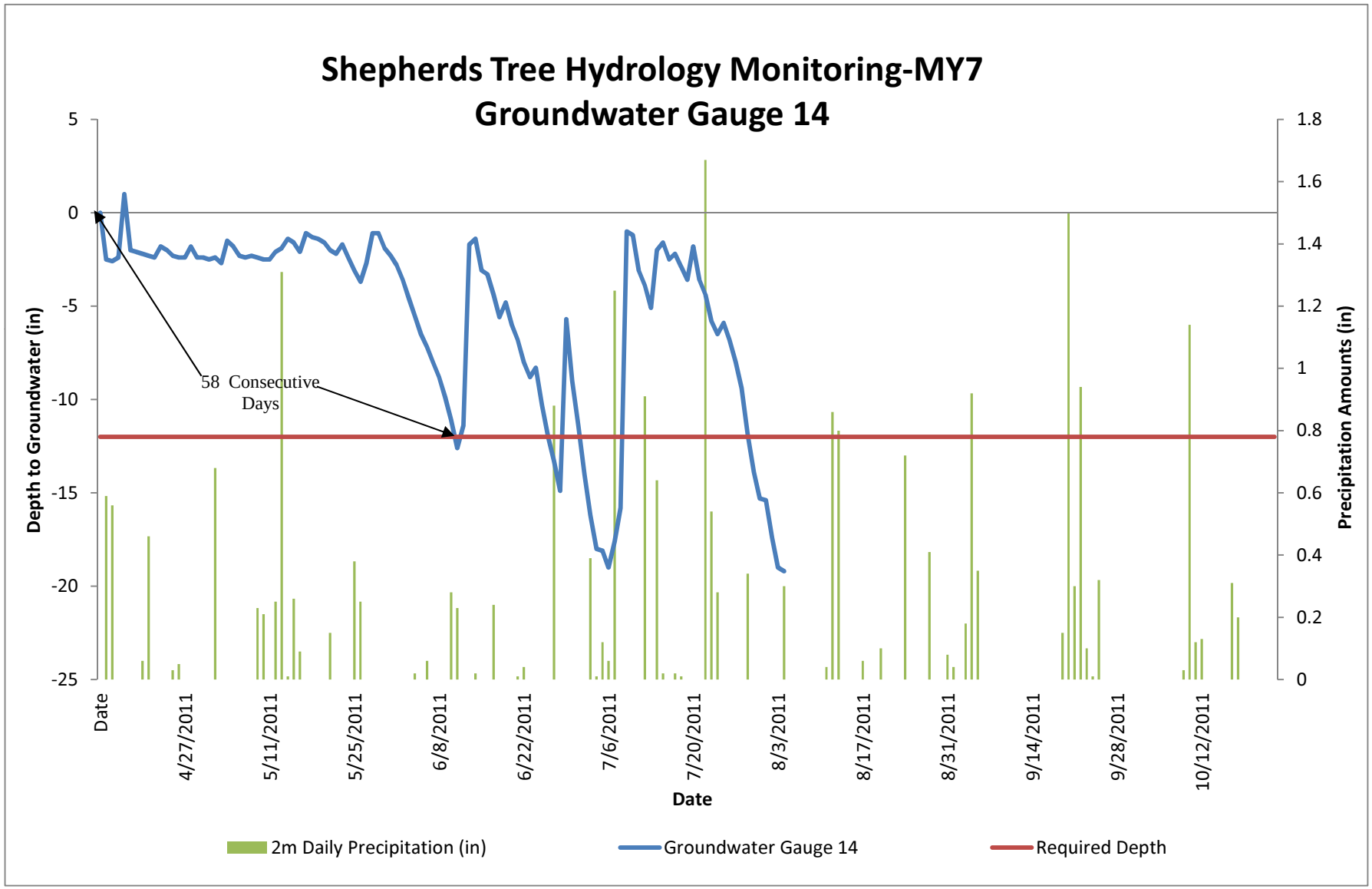


Figure 7o: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

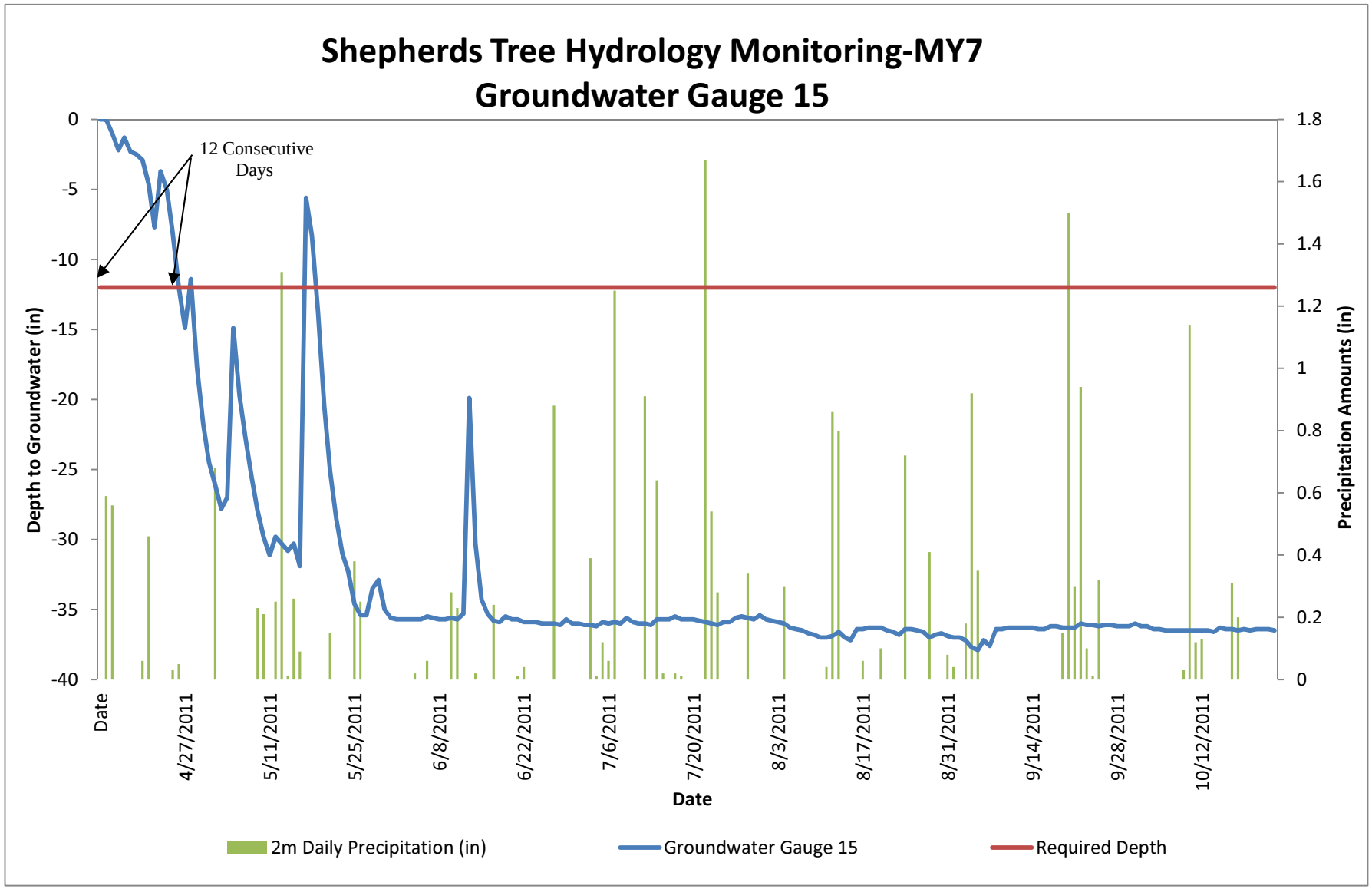


Figure 7p: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

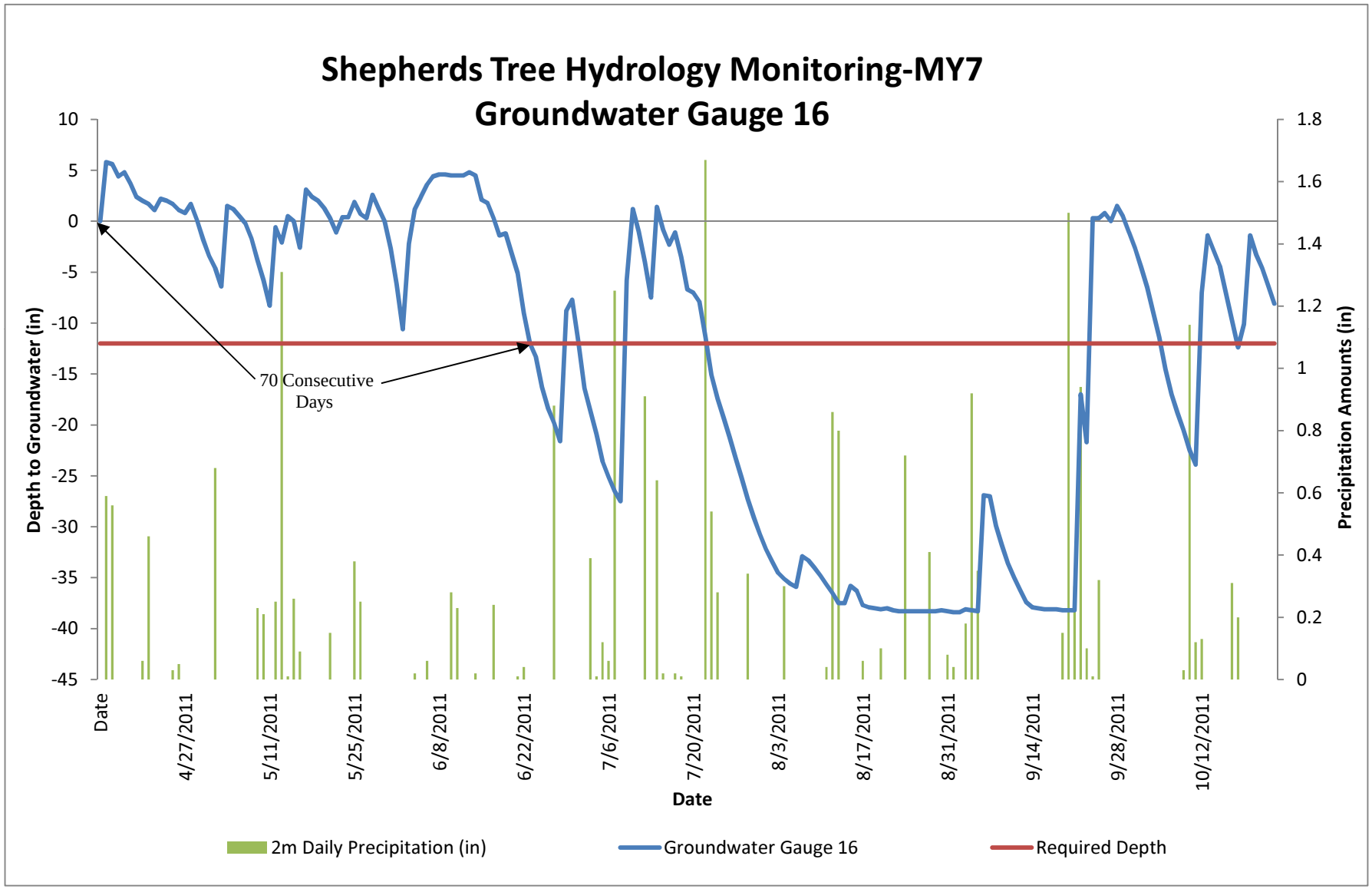


Figure 7q: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

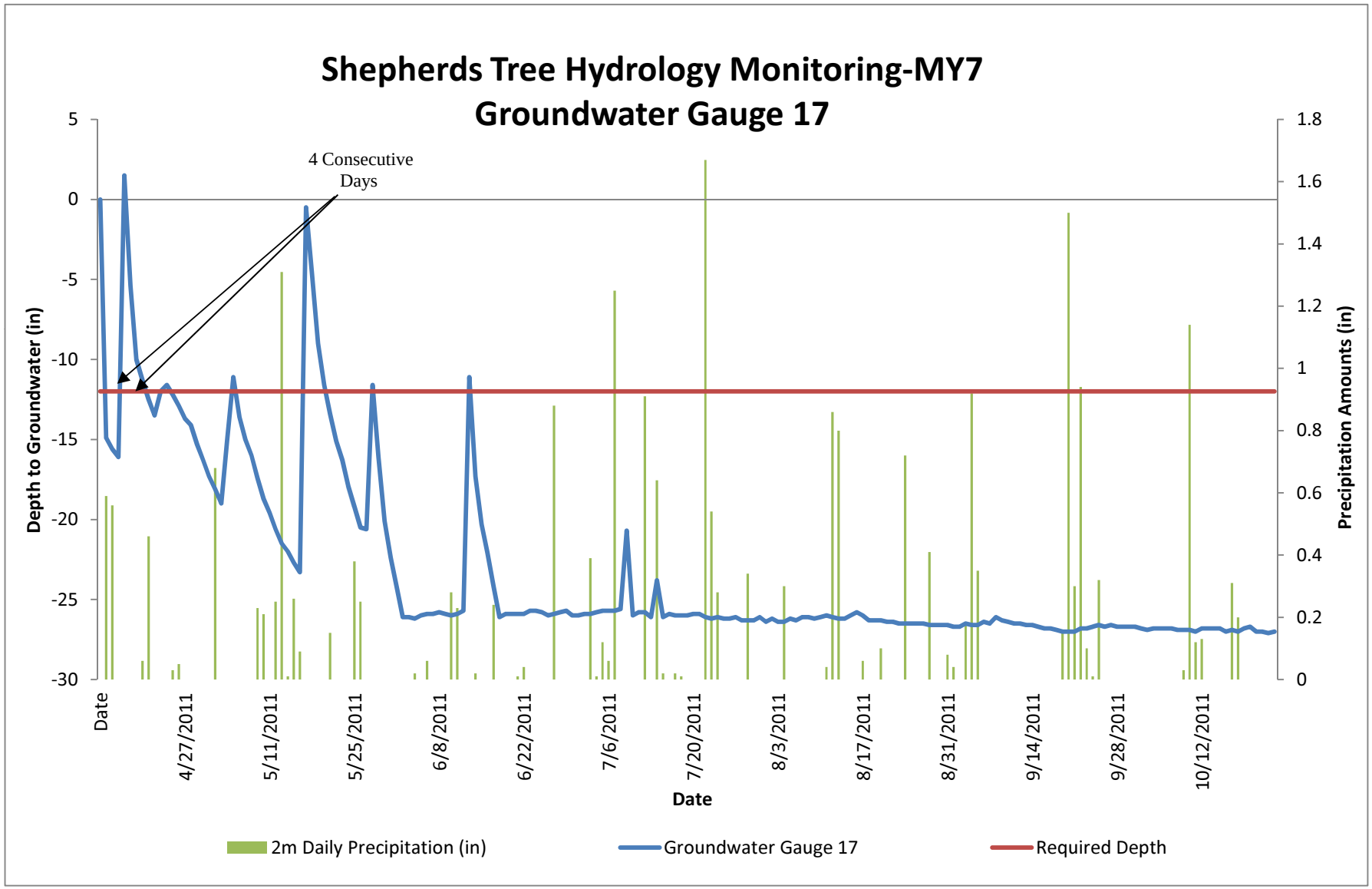


Figure 7r: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Growing Season: April 14-October 24

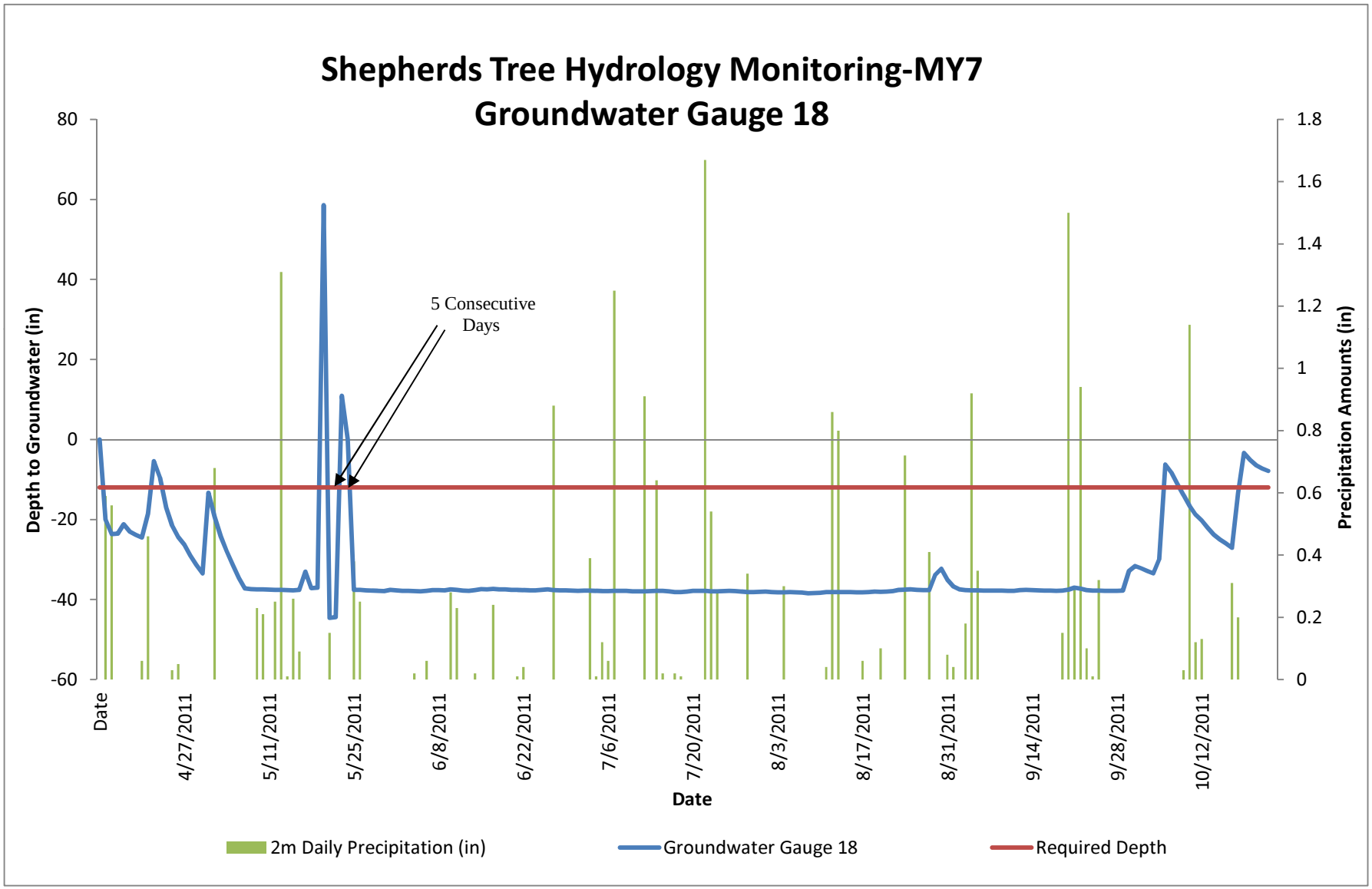


Figure 7r: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

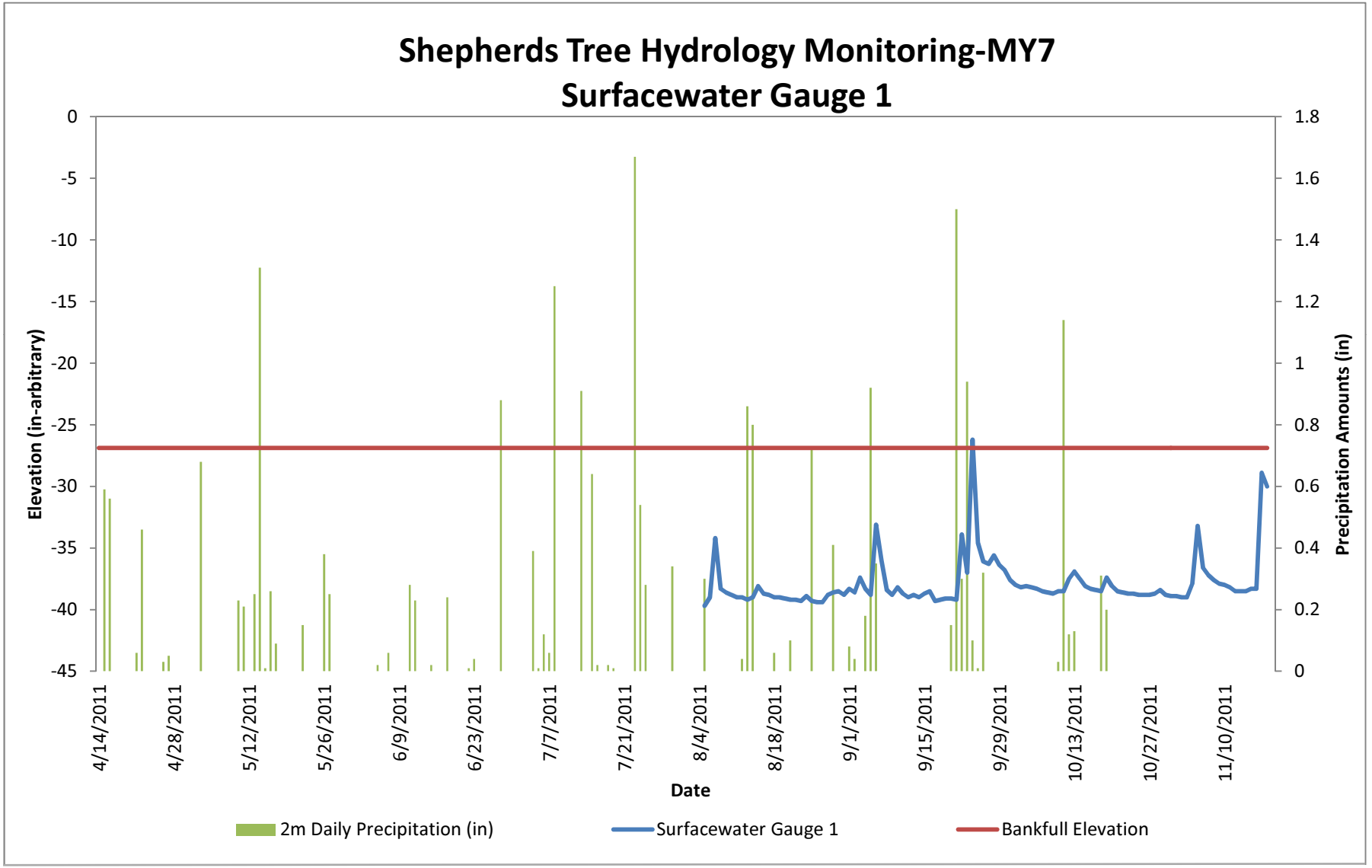


Figure 7t: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

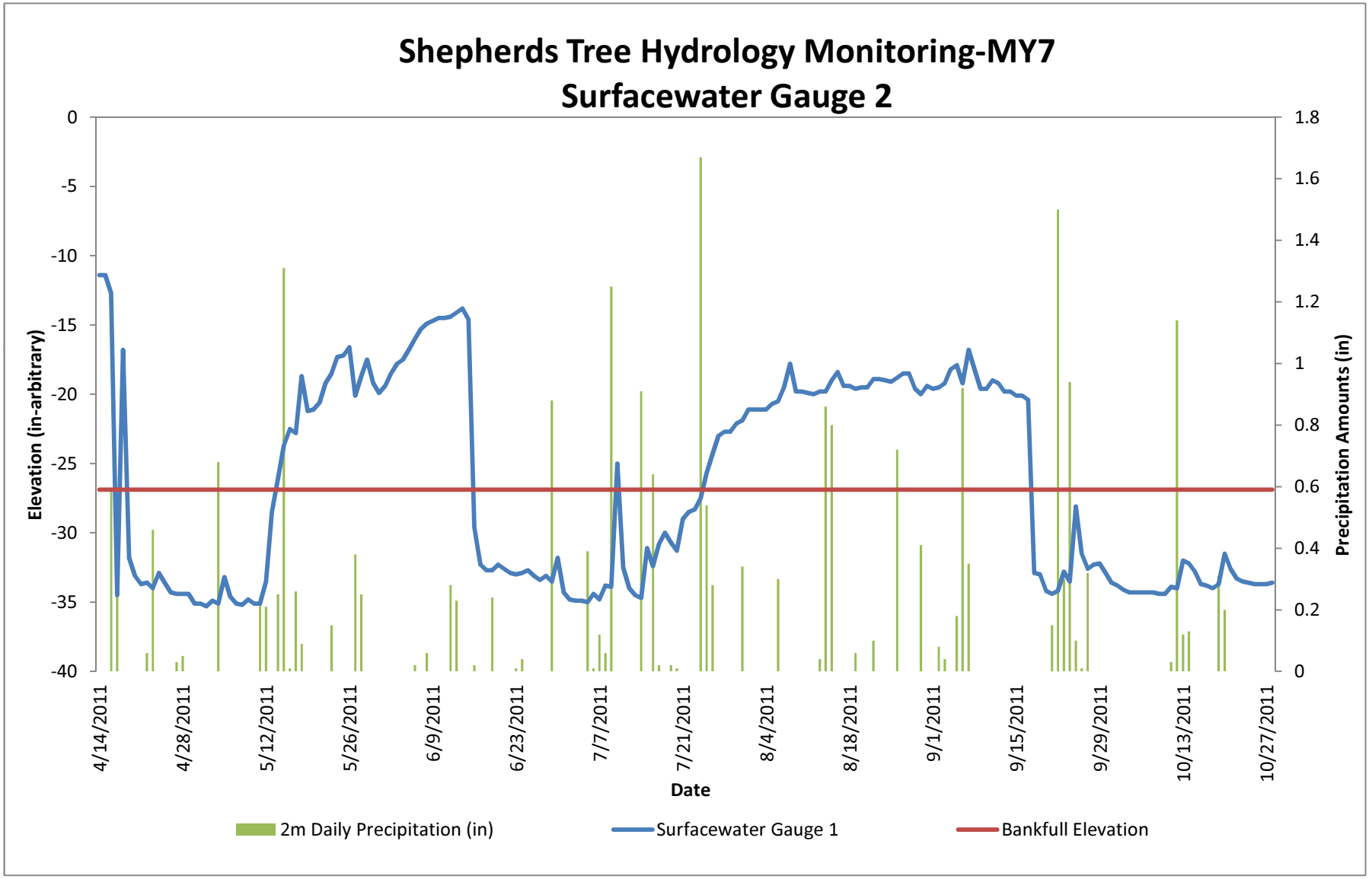


Figure 7u: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

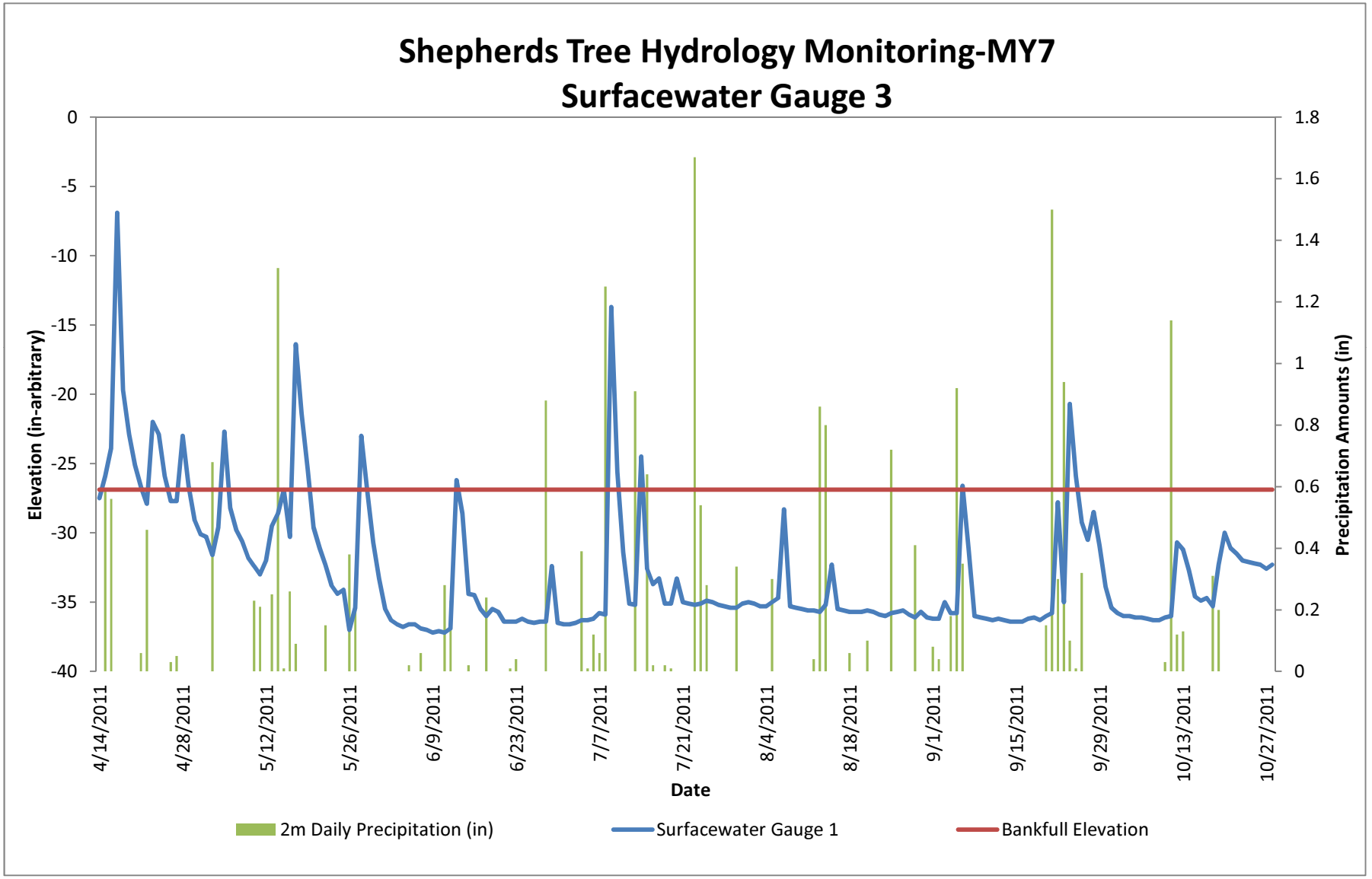
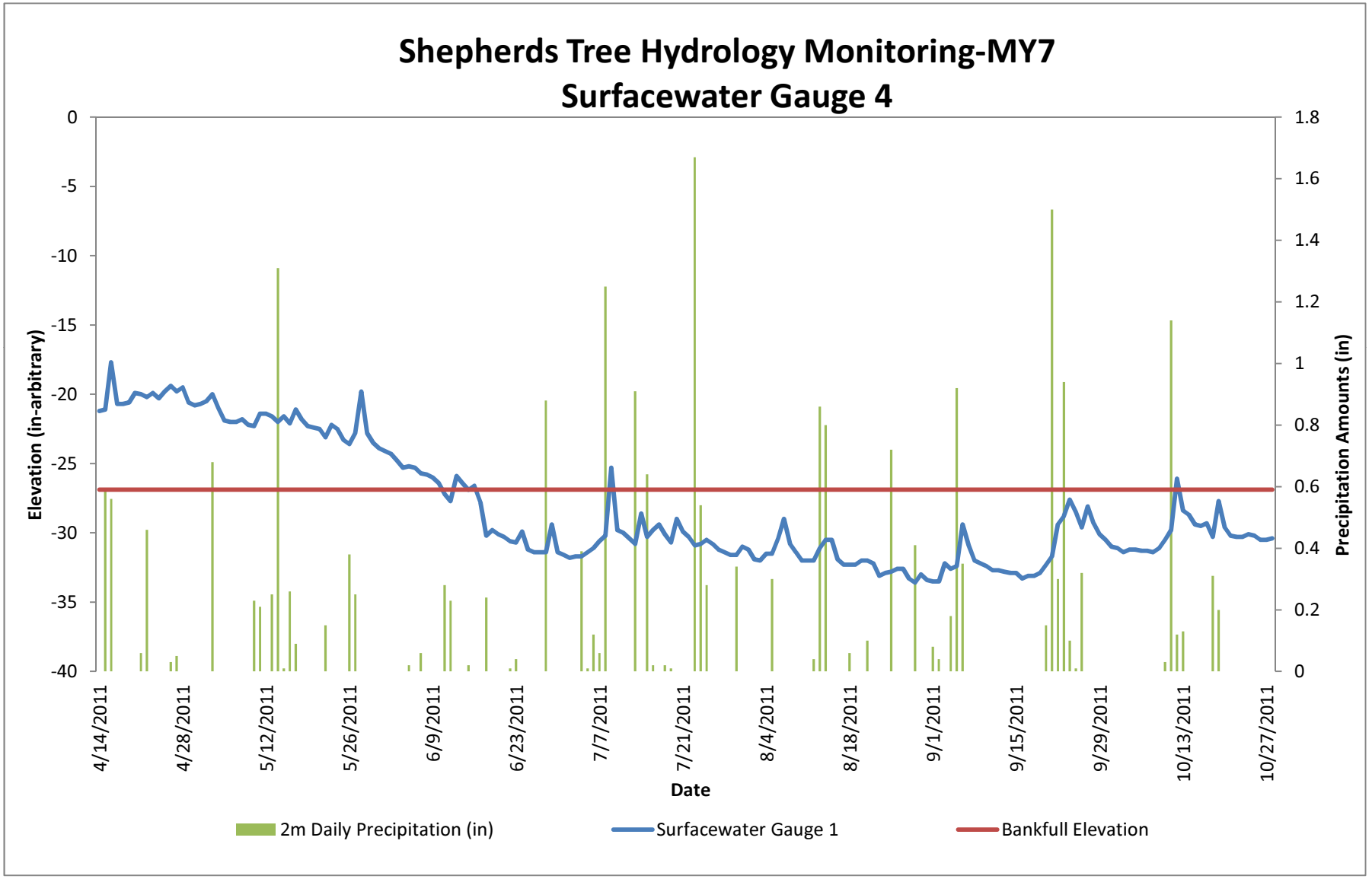


Figure 7v: Precipitation and Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7



Appendix E. Hydrologic Data
Table 13: Wetland Hydrology Criteria Attainment
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 7

Summary of Groundwater Gauge Results for Years 1 through 7							
Gauge	**Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage %)**						
	Year 1 (2005)*	**Year 2 (2006)**	**Year 3 (2007)**	**Year 4 (2008)**	**Year 5 (2009)**	**Year 6 (2010)**	**Year 7 (2011)**
GW1	Yes	Yes/35 Days (44%)	Yes/17 Days (9%)	Yes/18 Days (25%)	Yes/17 Days (30%)	Yes/24 Days (38%)	Yes/18 Days (9%)
GW2	No	No/1 Days (1%)	No/0 Days (0%)	Yes/194 Days (100%)	Yes/29 Days (35%)	Yes/36 Days (52%)	Yes/43 Days (22%)
GW3	No	**	No/8 Days (4%)	Yes/20 Days (29%)	Yes/16 Days (24%)	No/9 Days (18%)	Yes/16 Days (8%)
GW4	Yes	Yes/25 Days (37%)	No/11 Days (6%)	Yes/46 Days (37%)	Yes/49 Days (51%)	Yes/37 Days (50%)	Yes/51 Days (26%)
GW5	No	No/0 Days (0%)	No/0 Days (0%)	No/0 Days (0%)	No/0 Days (0%)	No/0 Days (0%)	No/0 Days (0%)
GW6	No	Yes/76 Days (72%)	Yes/76 Days (74%)	Yes/59 Days (83%)	Yes/111 Days (94%)	Yes/79 Days (84%)	Yes/55 Day (28%)
GW7	No	Yes/22 Days (32%)	No/11 Days (6%)	No/5 Days (12%)	Yes/15 Days (21%)	No/10 Days (23%)	Yes/16 Days (8%)
GW8	Yes	Yes/54 Days (78%)	Yes/33 Days (30%)	Yes/46 Days (66%)	Yes/81 Days (70%)	Yes/74 Days (79%)	Yes/52 Days (27%)
GW10	Yes	Yes/109 Days (86%)	No/4 Days (2%)	No/5 Days (8%)	No/4 Days (7%)	No/0 Days (0%)**	No/5 Days (3%)
GW11	Yes	Yes/194 Days (100%)	Yes/150 Days (77%)	Yes/194 Days (100%)	Yes/194 Days (100%)	Yes/219 Days (100%)	Yes/138 Days (71%)
GW12	Yes	Yes/94 Days (88%)	Yes/61 Days (49%)	Yes/61 Days (85%)^	Yes/87 Days (86%)	Yes/200 Days (93%)	Yes/96 Days (49%)
GW13	No	Yes/194 Days (100%)	Yes/47 Days (45%)	Yes/80 Days (90%)	Yes/81 Days (70%)	Yes/53 Days (76%)**	Yes/51 Days (26%)
GW14	Yes	Yes/194 Days (100%)	Yes/46 Days (44%)	Yes/67 Days (89%)	Yes/80 Days (60%)	Yes/53 Days (75%)**	Yes/58 Days (30%)
GW15	No	Yes/194 Days (100%)	No/9 Days (5%)	Yes/161 Days (87%)	No/12 Days (16%)	Yes/11 Days (16%)	No/12 Days (6%)
GW16	No	Yes/194 Days (100%)	No/3 Days (3%)	Yes/160 Days (86%)	Yes/21 Days (42%)	Yes/71 Days (68%)	Yes/70 Days (36%)
GW17	N/A	No/4 Days (8%)	No/3 Days (2%)	No/5 Days (8%)	Yes/19 Days (18%)	Yes/21 Days (16%)	No/4 Days (2%)
GW18	N/A	No/11 Days (18%)	No/8 Days (4%)	No/13 Days (16%)	No/9 Days (16%)	No/5 Days (3%)^^	No/5 Days (3%)

*Raw data was not provided, results from 2005 monitoring report.

**Gauge malfunctioned and was not replaced until after the growing season and beaver removal.

^Gauge mailfunctioned 10/7/2008, replaced 11/2008.

**Gauge mailfunctioned prior to monitoring beginning (date of failure unknown-unable to download gauge), replaced 6/2010.

^^Gauge mailfunctioned prior to monitoring starting date; malfunction or incorrect calibration occurred after first visit (date of failure unknown-unable to download gauge), replaced 9/2010.