

Shepherds Tree Stream and Wetland Restoration

EEP Project No. 333

2010 Monitoring Report: Year 6



Construction Completed: 2004
Submission Date: February 2011

Prepared for:

NCDENR-EEP
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SECTION 1
EXECUTIVE SUMMARY

SECTION 1

EXECUTIVE SUMMARY

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 1.1). The Shepherds Tree main channel and its tributary are a first order stream 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 construction. As per correspondence with North Carolina Ecosystem Enhancement Program (NCEEP), a wildlife control contractor was dispatched by NCEEP on 5 separate control efforts to remove the beaver and the associated dams so that the stream could be evaluated under a fluvial state as opposed to one of partial impoundment. The intense drought that impacted the area from late 2006 to early 2009 also contributed to the basis for survey delays in that the areas not intermittently impounded by beaver exhibited little to no flow through much of this time period. Due to some remnant dam material left by the contractor and the rapid recolonization by beaver after each control effort, impoundment and backwater conditions were observed to varying degrees between 2007 and 2010. The small channel size in combination with the extensive acreage of the Site and the apparent abundant beaver population make this a particularly challenging site to monitor. As such, the Site has been under constant (monthly) monitoring by NCEEP's wildlife control contractor for the last year.

This report serves the sixth year of monitoring for the Site.

1.1 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 2 provides detailed project activity, history, contact information, and watershed/site background information for this project.

1.2 Vegetative Assessment

The 2010 (year 6) vegetative assessment and vegetative plot analysis was conducted in September 2010. 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 indicated that ten 50 ft by 50 ft (0.057 acres) monitoring plots were established by NCDOT for this project. During the 2006 monitoring year, fourteen vegetative plots were identified and monitored, which is different than the ten originally reported to have been established. The following success goals for vegetation were established for the Site.

- 320 stems per acre years 1 through 3
- 290 stems per acre year 4
- 260 stems per acre year 5

The 2010 vegetation monitoring results indicated that the Site is meeting vegetative success criteria. Although, not all the plots meet the success criteria individually (Plots 2, 5, and 10), the average site density is approximately 436 planted stems per acre, which exceeds the year 5 goal of 260 planted stems per acre. There is an average of 42 live planted stems per plot. A review of the natural recruits monitored indicated an increase in the average site density to approximately 1,321 stems per acre with an average of 99 recruitment stems per plot. The total number of native woody species per plot ranged from 8-15, indicating good diversity as well. Plots 2, 5, and 10 also meet the success criteria with the addition of natural recruits; 289, 232, and 232 planted stems per acre, respectively. Some loss of streambank vegetation was evident in previous monitoring years due to beaver activity; however, the overall growth of the streambank vegetation is good and appears to have improved over the past few years. This is most likely due to the resprouting of suspected dead saplings and new volunteer species.

Throughout the Site and along the easement fencing, Kudzu (*Pueraria lobata*) encroachment has remained an issue. Near and within vegetation Plot 8, Kudzu has dominated the vegetation along the stream channel and is strangling planted woody species. During the 2010 monitoring year, NCEEP initiated active exotic invasive vegetation treatments to control the Kudzu. An additional follow up treatment will be conducted in 2011 as well. Please refer to Appendix 1.2

for specific information on the areas of concern. The Site has met the vegetation success criteria requirements for monitoring year 6 (2010). Although a few of the plots did not meet the vegetation success threshold (Plots 2, 5, and 10), the inclusion of the natural woody recruits to the Plot's woody planted stem density resulted in the Plot being considered successful. Please refer to Appendix 3 for detailed information on the 2010 vegetation data results.

1.3 Stream Assessment

Morphological measurements for the 2010 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. The dimensional measurements were not evaluated in 2007 or 2008 as per consultation with NCEEP due to the aforementioned reasons of partial, periodic impoundment and low flow due to drought. 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 by beaver activity, resulting in inundated, backwater conditions for extended periods in previous monitoring years. This has most likely attributed to the areas of aggradation and in-stream vegetation that have developed within the Site.

Overall, the present stream dimensions along Shepherds Tree appear to be stable with some areas of minor aggradation. The average bankfull width (11.56 ft) of the surveyed cross-sections is higher than the proposed 10.20 ft and the average surveyed mean bankfull depth is 1.41 ft compared to the proposed 1.85 ft. The surveyed bankfull widths and depths lead to an average Width/Depth (W/D) ratio of 9.12, which has increased since the 2006 (6.37) and 2009 (8.85) monitoring years. A few of the cross-sections (1, 2, and 7) have illustrated an increase in sediment deposition from the previous monitoring year. Other cross-sections that were previously experiencing aggradation, have either scoured out (5 and 8) or have remained the same (6 and 11). Most of these changes can be attributed to the beaver activity and state wide drought conditions that have occurred over the past six monitoring years. With control of beaver activity and time to allow for higher flow events, the system should continue to flush out finer, aggraded sediments.

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 the main channel and its tributary during the 2010 monitoring year. Due to an on-going malfunction with surface gauge 2 in 2010, visual assessments, such as wrack lines, were used in lieu of the surface gauge to verify that a bankfull or greater event occurred along the tributary. Please refer to Appendix 4 for detailed stream data tables and plots and Appendix 1.2 for the location of the monitoring features and current conditions for the 2010 monitoring year.

1.4 Wetland Assessment

Seventeen automated groundwater monitoring gauges and four surface water gauges are located on Site. The monitoring gauges are programmed to download 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 2010 monitoring year indicated that twelve of the seventeen groundwater gauges (1, 2, 4, 6, 8, 11, 12, 13, 14, 15, 16, and 17) achieved the wetland success criteria of saturation for 15 consecutive days (8%) during the growing season. Gauges 3, 5, 7, 10, and 18 did not meet the wetland success criteria. Topographic constraints may be contributing to the lack of wetland hydrological success at these gauges. 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.). Please refer to Appendix 5 for wetland plots and a summary of wetland criteria attainment.

1.5 Annual Monitoring Summary

Overall, the Site is meeting mitigation goals in the majority of the proposed areas. Some zones are exhibiting lower vegetation densities and some gauges are not meeting the hydrologic thresholds. The Site will continue to be controlled for beaver activity on a monthly basis and will be monitored again in 2011 to further assess the Site's success and to allow the streams and wetlands to return to a more typical hydrologic flow regime.

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 mitigation and restoration plan documents available on NCEEP's website. All raw data supporting the tables and figures in the appendices is available from NCEEP 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 Weather Underground URL (http://www.wunderground.com/history/airport/KSVH/2008/1/1/CustomHistory.html?dayend=31&monthend=10&yearend=2008&req_city=NA&req_state=NA&req_stationname=NA&MR=1).



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 1 - General Figures and Plan Views

Appendix 2 - General Project Tables

Appendix 3 - Vegetation Assessment Data

Appendix 4 - Stream Assessment Data

Appendix 5 - Wetland Assessment Data

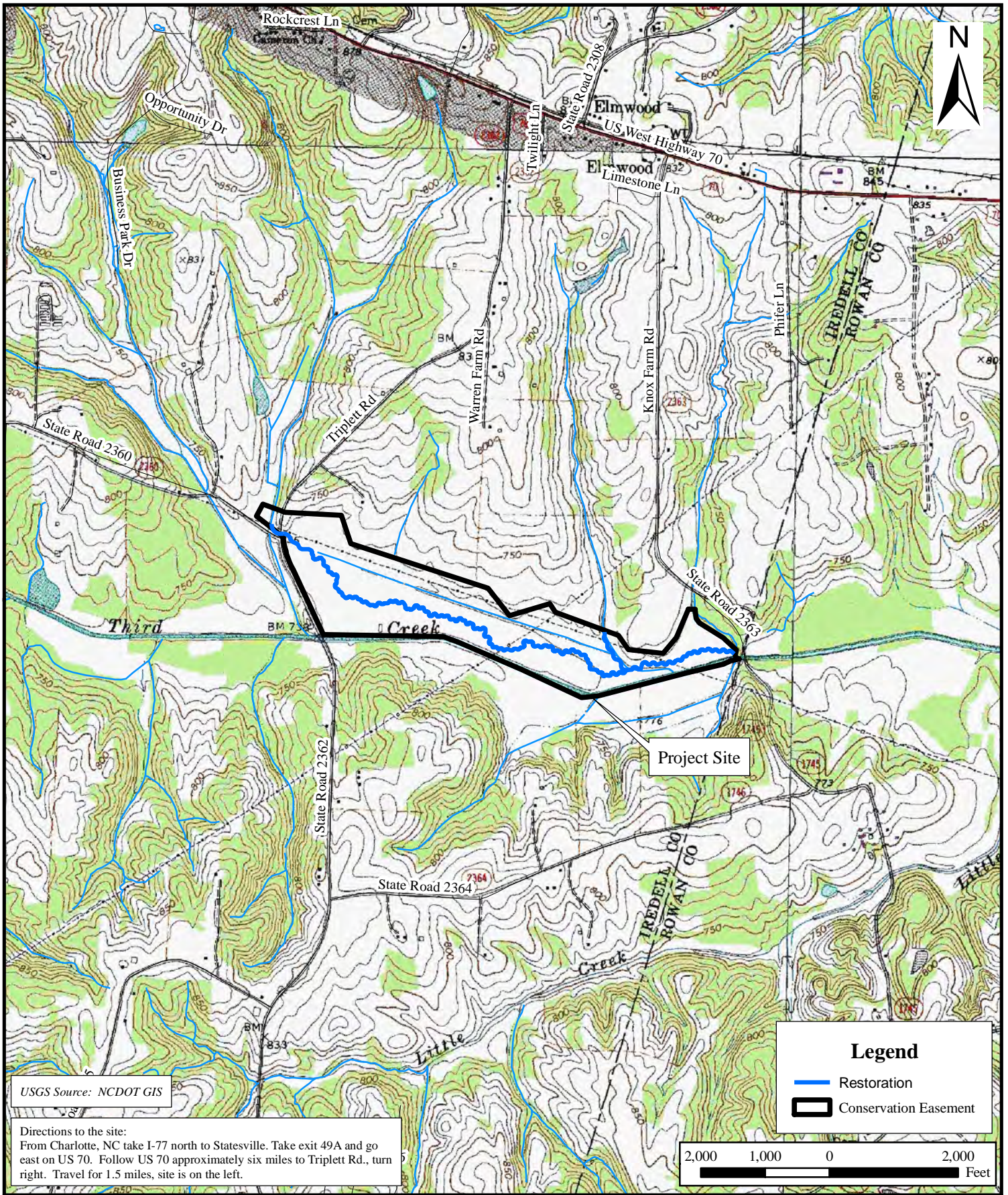


APPENDIX 1

GENERAL FIGURES AND PLAN VIEWS

1.1 Project Vicinity Map

1.2 Current Condition Plan View

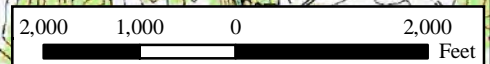


USGS Source: NCDOT GIS

Directions to the site:
 From Charlotte, NC take I-77 north to Statesville. Take exit 49A and go east on US 70. Follow US 70 approximately six miles to Triplett Rd., turn right. Travel for 1.5 miles, site is on the left.

Legend

- Restoration
- Conservation Easement



Appendix 1.1 Project Vicinity Map
 Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
 Iredell County, NC
 Monitoring Year 6
 Submittal Date: February 2010





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

ECP PROJECT NO. 333
 IREDELL COUNTY,
 NORTH CAROLINA
 MONITORING YEAR 6



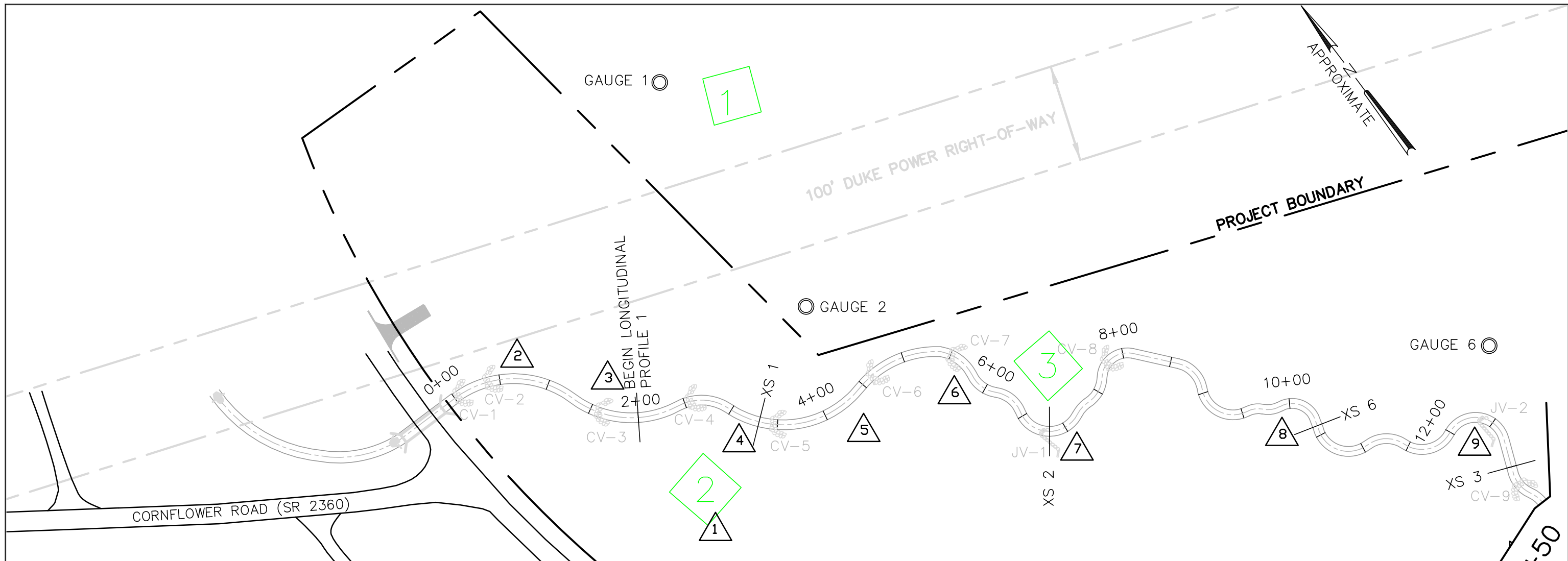
NC ECOSYSTEM ENHANCEMENT PROGRAM
 SHEPHERDS TREE STREAM & WETLAND RESTORATION

DATE : DECEMBER 2010
 SCALE : 1"=600'
 JOB NO.: JJX31100

APPENDIX 1.2
 CURRENT CONDITION PLAN VIEW

FIGURE KEY

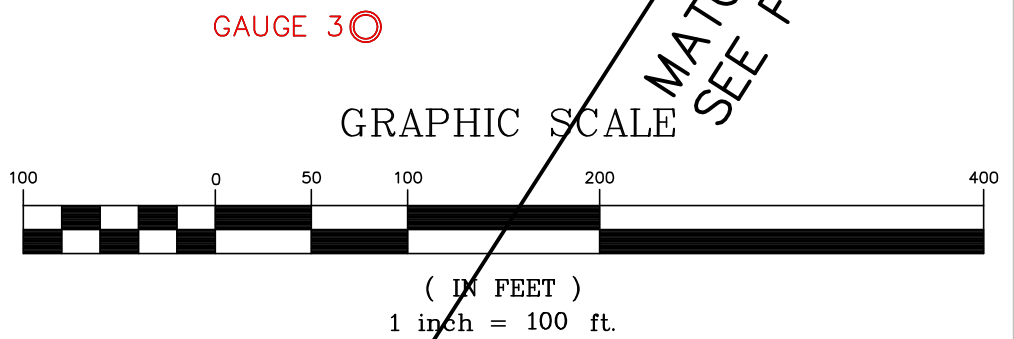




NCDOT- SHEP-2
 N = 726,169.91
 E = 1,472,847.50
 ELEV. = 737.21

LEGEND

	CHANNEL CENTERLINE		GROUNDWATER GAUGE
	BANKFULL		SURFACE GAUGE
	PHOTO POINT		RAIN GAUGE
	CROSS VANE (CV)	2010 CURRENT CONDITION	
	J-HOOK VANE (JV)		IN-STREAM VEGETATION
	STEP POOL (SSP)		INVASIVE SPECIES-KUDZU
	ROOT WAD		VEGETATION PLOT- INVASIVE SPECIES
	VEGETATION PLOT		GROUNDWATER GAUGE-FAILED



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

EEP PROJECT NO. 333
 IREDELL COUNTY,
 NORTH CAROLINA
 MONITORING YEAR 6

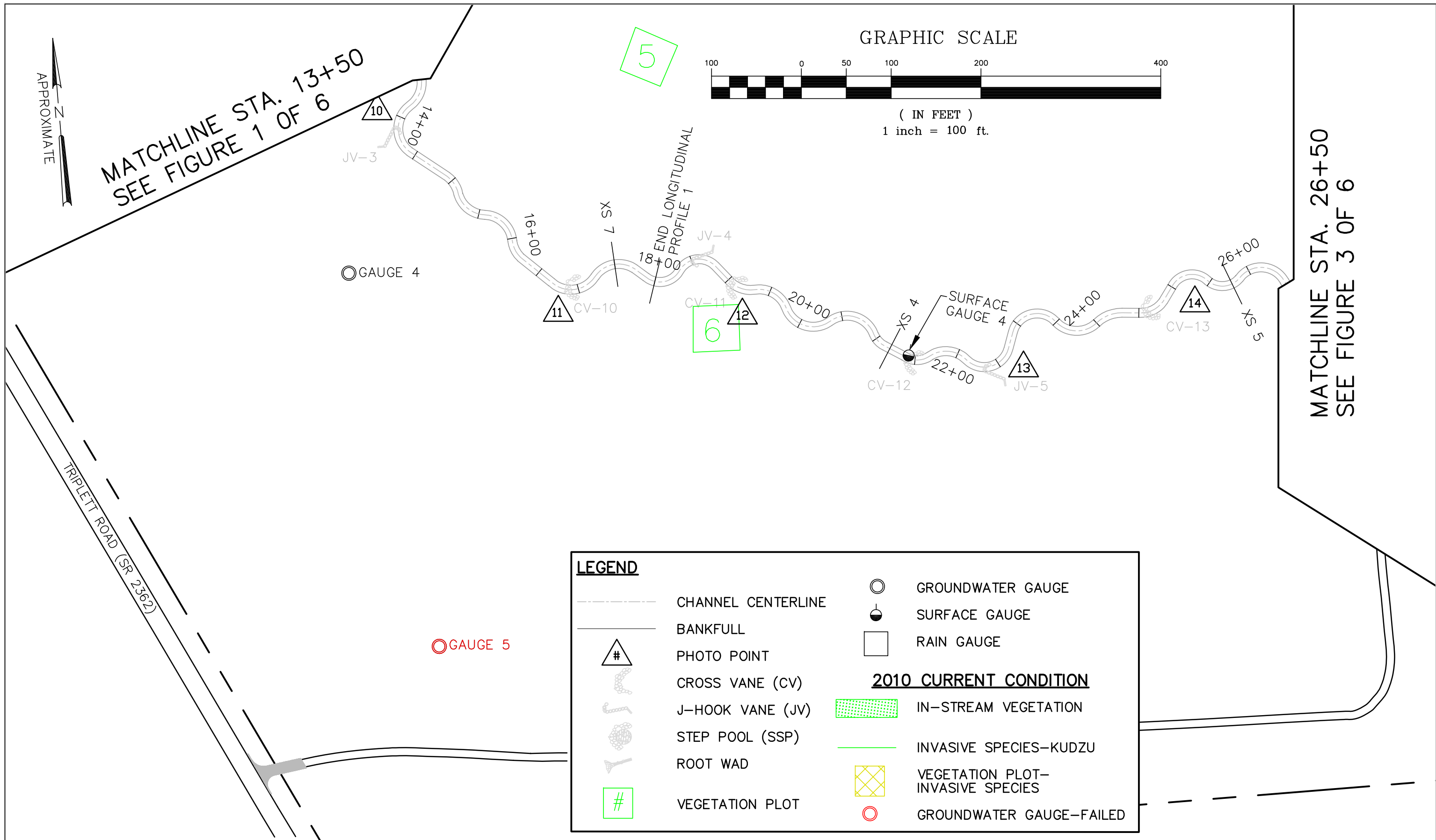


NC ECOSYSTEM ENHANCEMENT PROGRAM
 SHEPHERDS TREE STREAM & WETLAND RESTORATION

APPENDIX 1.2
 CURRENT CONDITION PLAN VIEW

DATE : DECEMBER 2010
 SCALE : 1"=100'
 JOB NO.: JJX31100

FIGURE 1 OF 6



NOTES:
 1. GENERAL SITE DATA PROVIDED BY NCEEP.
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ECP PROJECT NO. 333
 IREDELL COUNTY,
 NORTH CAROLINA
 MONITORING YEAR 6



NC ECOSYSTEM ENHANCEMENT PROGRAM
 SHEPHERDS TREE STREAM & WETLAND RESTORATION

APPENDIX 1.2
 CURRENT CONDITION PLAN VIEW

DATE : DECEMBER 2010
 SCALE : 1"=100'
 JOB NO.: JJX31100

FIGURE 2 OF 6



APPROXIMATE

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

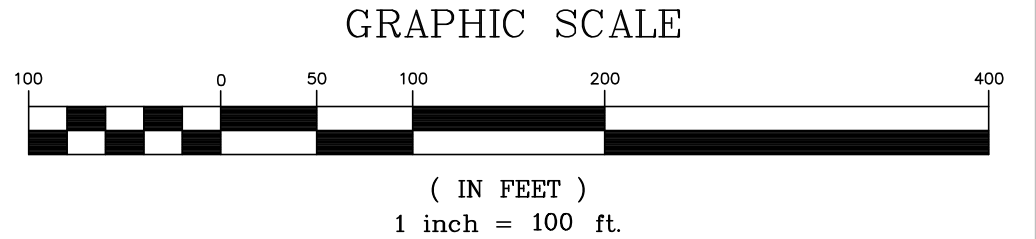
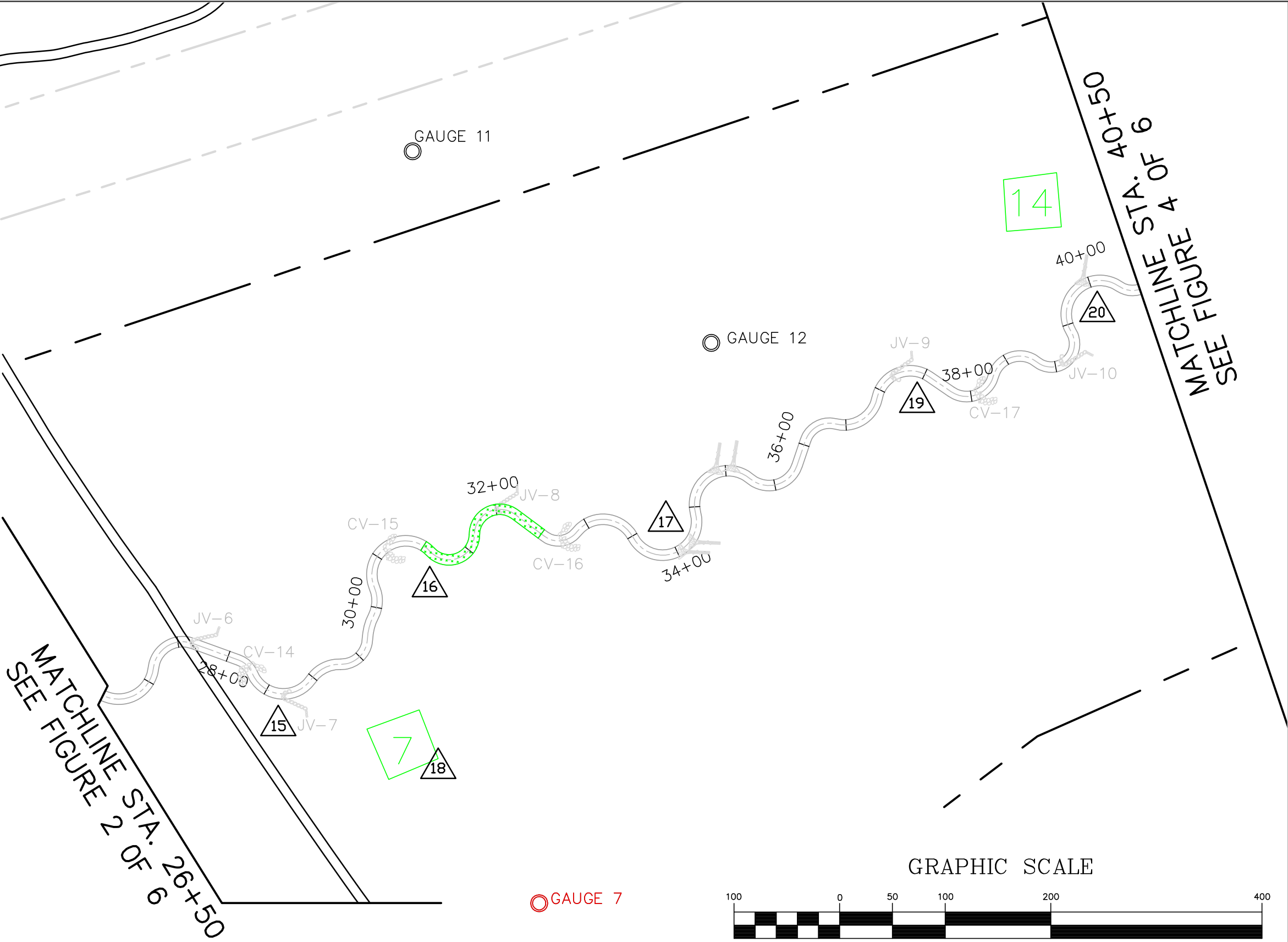
2010 CURRENT CONDITION

- IN-STREAM VEGETATION
- INVASIVE SPECIES-KUDZU
- VEGETATION PLOT-INVASIVE SPECIES
- GROUNDWATER GAUGE-FAILED

MATCHLINE STA. 26+50
SEE FIGURE 2 OF 6

14

MATCHLINE STA. 40+50
SEE FIGURE 4 OF 6



NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
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ECP PROJECT NO. 333
IREDELL COUNTY,
NORTH CAROLINA
MONITORING YEAR 6



NC ECOSYSTEM ENHANCEMENT PROGRAM
SHEPHERD'S TREE STREAM & WETLAND RESTORATION

APPENDIX 1.2
CURRENT CONDITION PLAN VIEW

DATE : DECEMBER 2010
SCALE : 1"=100'
JOB NO.: JJX31100

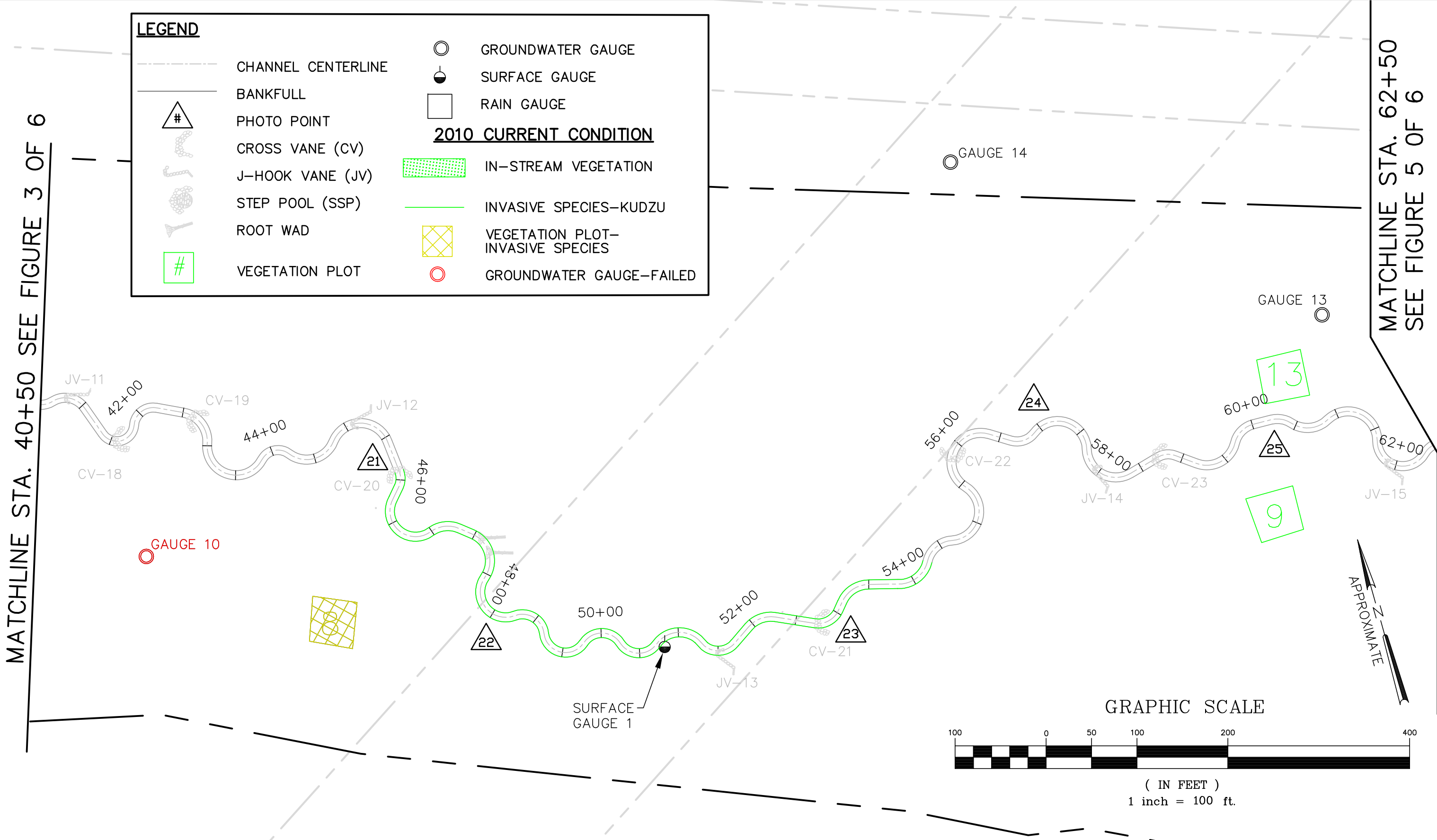
FIGURE 3 OF 6

MATCHLINE STA. 40+50 SEE FIGURE 3 OF 6

MATCHLINE STA. 62+50
SEE FIGURE 5 OF 6

LEGEND

	CHANNEL CENTERLINE		GROUNDWATER GAUGE
	BANKFULL		SURFACE GAUGE
	PHOTO POINT		RAIN GAUGE
	CROSS VANE (CV)	2010 CURRENT CONDITION	
	J-HOOK VANE (JV)		IN-STREAM VEGETATION
	STEP POOL (SSP)		INVASIVE SPECIES-KUDZU
	ROOT WAD		VEGETATION PLOT- INVASIVE SPECIES
	VEGETATION PLOT		GROUNDWATER GAUGE-FAILED



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ECP PROJECT NO. 333
IREDELL COUNTY,
NORTH CAROLINA
MONITORING YEAR 6



NC ECOSYSTEM ENHANCEMENT PROGRAM
SHEPHERD'S TREE STREAM & WETLAND RESTORATION

APPENDIX 1.2
CURRENT CONDITION PLAN VIEW

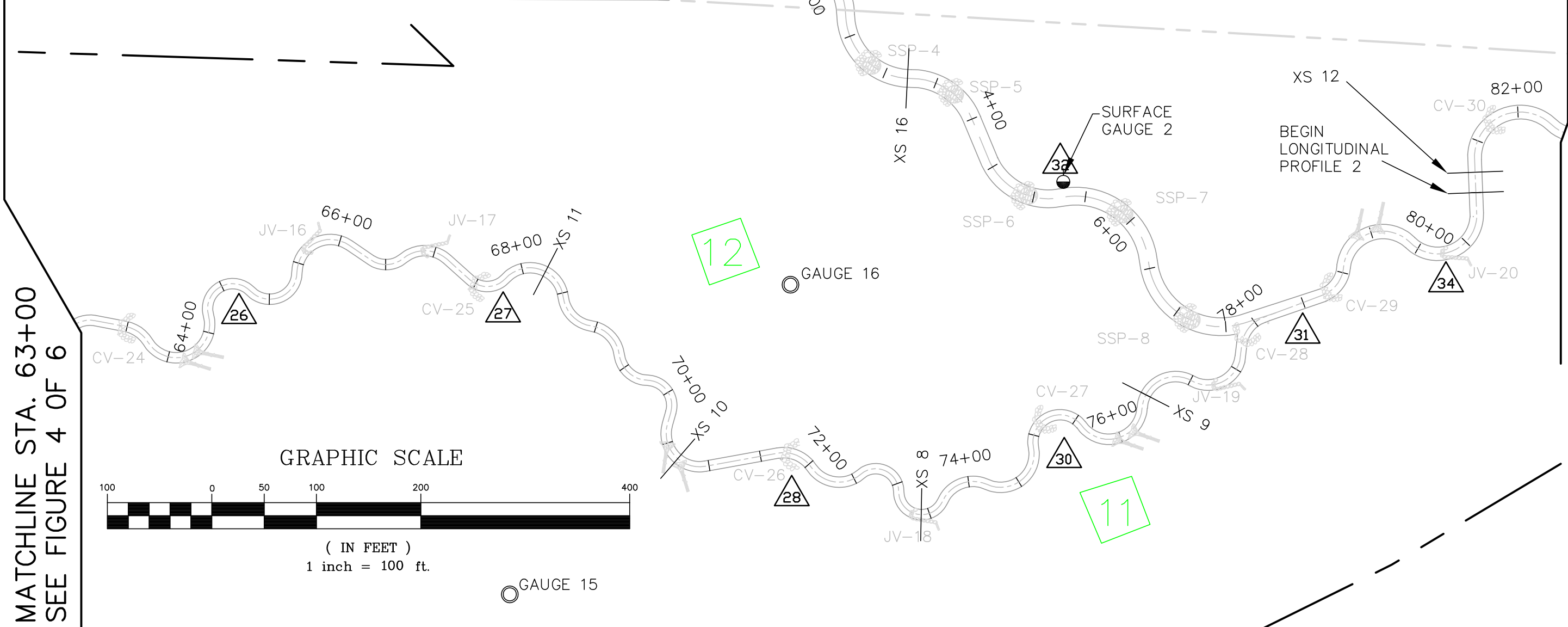
DATE : DECEMBER 2010
SCALE : 1"=100'
JOB NO.: JJX31100

FIGURE 4 OF 6



LEGEND

	CHANNEL CENTERLINE		GROUNDWATER GAUGE
	BANKFULL		SURFACE GAUGE
	PHOTO POINT		RAIN GAUGE
	CROSS VANE (CV)	2010 CURRENT CONDITION	
	J-HOOK VANE (JV)		IN-STREAM VEGETATION
	STEP POOL (SSP)		INVASIVE SPECIES-KUDZU
	ROOT WAD		VEGETATION PLOT-INVASIVE SPECIES
	VEGETATION PLOT		GROUNDWATER GAUGE-FAILED



MATCHLINE STA. 63+00
SEE FIGURE 4 OF 6

MATCHLINE STA. 82+50
SEE FIGURE 6 OF 6



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ECP PROJECT NO. 333
 IREDELL COUNTY,
 NORTH CAROLINA
 MONITORING YEAR 6



NC ECOSYSTEM ENHANCEMENT PROGRAM
 SHEPHERDS TREE STREAM & WETLAND RESTORATION

APPENDIX 1.2
 CURRENT CONDITION PLAN VIEW

DATE : DECEMBER 2010
 SCALE : 1"=100'
 JOB NO.: JJX31100

FIGURE 5 OF 6

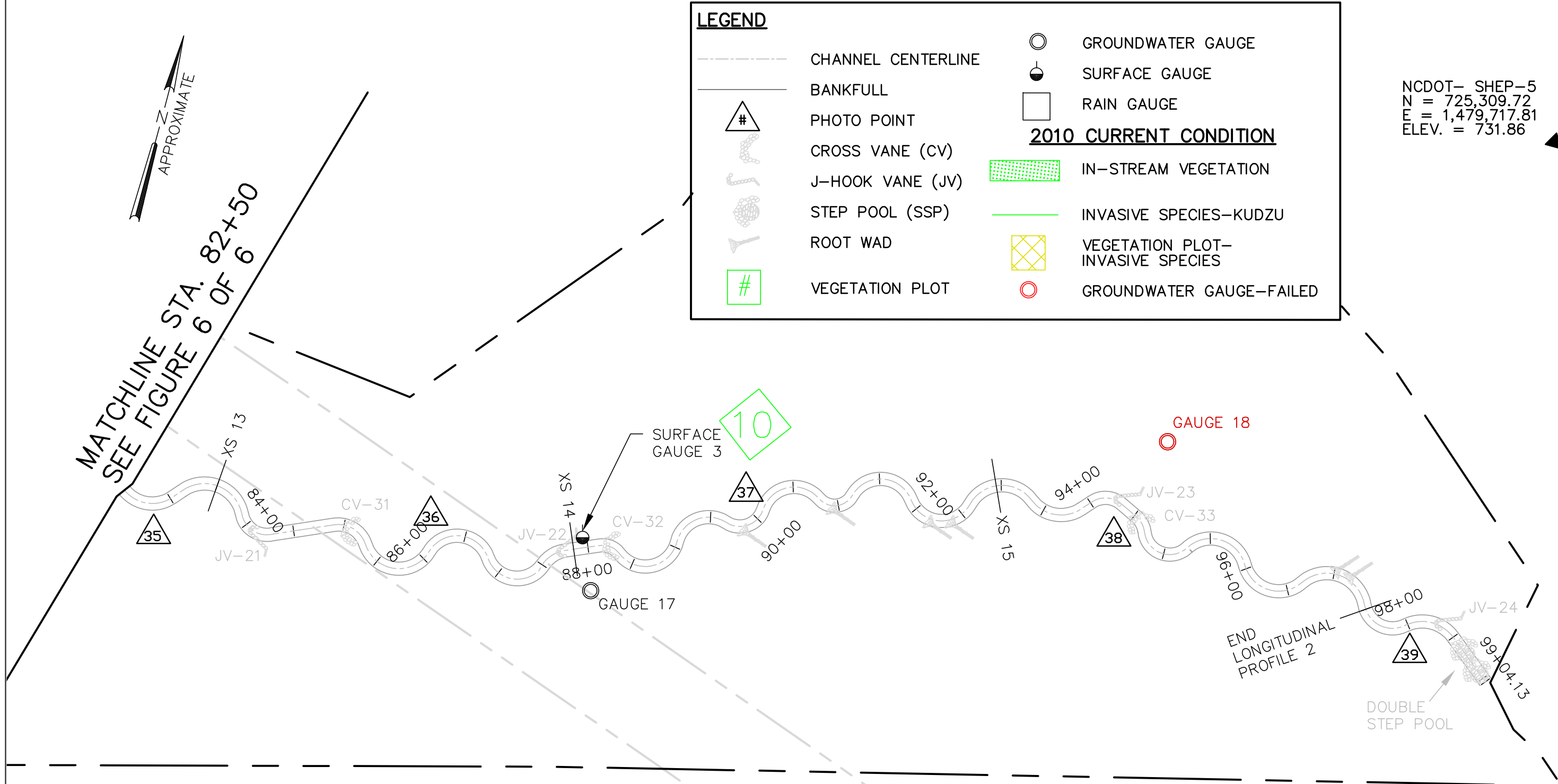


MATCHLINE STA. 82+50
SEE FIGURE 6 OF 6

LEGEND

---	CHANNEL CENTERLINE	○	GROUNDWATER GAUGE
---	BANKFULL	●	SURFACE GAUGE
△ #	PHOTO POINT	□	RAIN GAUGE
~	CROSS VANE (CV)	2010 CURRENT CONDITION	
~	J-HOOK VANE (JV)	▨	IN-STREAM VEGETATION
~	STEP POOL (SSP)	—	INVASIVE SPECIES-KUDZU
~	ROOT WAD	▩	VEGETATION PLOT- INVASIVE SPECIES
□ #	VEGETATION PLOT	○	GROUNDWATER GAUGE-FAILED

NCDOT- SHEP-5
N = 725,309.72
E = 1,479,717.81
ELEV. = 731.86



GRAPHIC SCALE



(IN FEET)
1 inch = 100 ft.



NOTES:
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EEP PROJECT NO. 333
IREDELL COUNTY,
NORTH CAROLINA
MONITORING YEAR 6



NC ECOSYSTEM ENHANCEMENT PROGRAM
SHEPHERDS TREE STREAM & WETLAND RESTORATION

APPENDIX 1.2
CURRENT CONDITION PLAN VIEW

DATE : DECEMBER 2010
SCALE : 1"=100'
JOB NO.: JJX31100

FIGURE 6 OF 6



APPENDIX 2 GENERAL PROJECT TABLES

2.1 Project Mitigation Structure and Objectives

2.2 Project Activity and Reporting History

2.3 Project Contacts

2.4 Project Attribute Table

Appendix 2.1 Project Mitigation Structure and Objectives
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

Segment/Reach	Mitigation Type	Approach	Linear Footage or Acres	Stationing (ft)	Comments	
Perennial Mainstem Reach	R	P1	9,904 lf	0+00-99+04	Channel restoration, relocation with use of grade control and bank protection structures.	
Intermittent Tributary	R	P1	800 lf	0+00-8+00	Channel restoration, relocation with use of grade control and bank protection structures.	
Piedmont/Mountain Bottomland Hardwood Forest	R	-	48.56 acres	N/A	Restoration/Enhancement of bottomland hardwood communities by breaching channel berms, plugging drainage ditches and revegetation	
	C	-	37.71 acres			
Piedmont/Mountain Swamp Hardwood Forest	R	-	5 acres	N/A	Restoration/Enhancement of swamp hardwood communities by breaching channel berms, plugging drainage ditches and revegetation	
Low Elevation Seep	P	-	4.54 acres	N/A	Preservation of an existing levee forest	
Phase III	R	P1	284 lf	N/A	Channel Relocation	
Component Summations						
Restoration Level	Stream (lf)	Wetland (ac)		Upland (ac)	Buffer (ac)	BMP
		Riparian	Non-Riparian			
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
Enhancement 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

**Appendix 2.2 Project Activity and Reporting History
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6**

**Elapsed Time Since Grading Complete: 6 Years
Elapsed Time Since Planting Complete: Unknown
Number of Reporting Years: 6**

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	TBD	TBD

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

**Data is collected throughout the monitoring year.

Appendix 2.3 Project Contacts Table
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

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, 704-527-4106 ext.227
Vegetation Monitoring, POC	
Wetland Monitoring, POC	

Table 2.4 Project Attribute Table
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

Project County	Iredell, North Carolina	
Physiographic Region	Piedmont	
Ecoregion	Outer Piedmont	
Project River Basin	Yadkin	
USGS HUC for Project (14 digit)	03040102040030	
NCDWQ Sub-basin for Project and Reference	03-07-06	
Within extent of EEP Watershed Plan?	U	
WRC Class (Warm, Cool, Cold)	U	
% of project easement fenced or demarcated?	100%	
Beaver activity observed during design phase?	U	
Restoration Component Attribute Table		
	Main Channel	Tributary
Drainage Area (sq.mi.)	2.17	
Stream Order	1st	
Restored Length (ft)	9904.13	800
Perennial or Intermittent	Perennial	Perennial
Watershed type (Rural, Urban, Developing)	Rural	
Watershed LULC Distribution		
Agriculture	-	
Commercial	-	
Public/Institutional	-	
Residential	-	
Transportation	-	
Watershed Impervious Cover (%)	~10%	
NCDWQ AU/Index number	-	
NCDWQ classification	C	
303d listed?	No	
Upstream of a 303d listed sediment?	No	
Reasons for 303d listing or stressor	N/A	
Total acreage of easement	164.9 acres	
Total vegetated acreage within the easement	U	
Total planted acreage as part of the restoration	U	
Rosgen classification of the pre-existing	U	N/A
Rosgen classification of the As-Built	E5	N/A
Valley Type	U	
Valley slope	U	
Valley side slope range	U	
Valley toe slope range	U	
Cowardin classification	R2U3B4	
Trout waters designation	No	
Species of concern, endangered, etc? (Y/N)	N/A	
Dominant soil series and characteristics	Chewacla, Congaree	
Series	Chewacla	Congaree
Depth	-	-
Clay %	-	-
K	-	-
T	-	-

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



APPENDIX 3 VEGETATION ASSESSMENT DATA

3.1 Vegetation Plot Mitigation Success

3.2 Vegetation Monitoring Plot Photos

3.3 Vegetation Plot Summary Data Table

3.4 Vegetation Condition Assessment

Appendix 3.1 Vegetation Plot Mitigation Success
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

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



Vegetation Plot 1
(10/2010)



Vegetation Plot 2
(10/2010)



Vegetation Plot 3
(10/2010)



Vegetation Plot 4
(10/2010)

Prepared For:



Appendix 3.2 Vegetation Monitoring Plot Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Vegetation Plot 5
(10/2010)



Vegetation Plot 6
(10/2010)



Vegetation Plot 7
(10/2010)



Vegetation Plot 8
(10/2010)

Prepared For:



Appendix 3.2 Vegetation Monitoring Plot Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Vegetation Plot 9
(10/2010)



Vegetation Plot 10
(10/2010)



Vegetation Plot 11
(10/2010)



Vegetation Plot 12
(10/2010)

Prepared For:



Appendix 3.2 Vegetation Monitoring Plot Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Vegetation Plot 13
(10/2010)



Vegetation Plot 14
(10/2010)

Prepared For:



Appendix 3.2 Vegetation Monitoring Plot Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:



Appendix 3.3 Vegetation Plot Summary Data Table
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

Species	Common Name	Type	Current Data (MY6-2010)																												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		
			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	
<i>Acer negundo</i>	boxelder	T					1	1					5	2	20	2	17		9	2	2		12	5	5	10	10	8	12		2	5	8	2	2	7	7	7	8	5	13	5	7
<i>Acer rubrum</i>	red maple	T		13		32		8		15		13		20		15		4		4								10		14	N/A	10	N/A	N/A	N/A	N/A	N/A	N/A	13	N/A	13	N/A	10
<i>Alnus serrulata</i>	tag alder	T/S						5									1		1								12		1	N/A	4	N/A	N/A	N/A	N/A	N/A	N/A	6	N/A	4	N/A	4	
<i>Betula nigra</i>	river birch	T				16								1		7		2				3	2	4					2	N/A	3	N/A	N/A	N/A	N/A	N/A	7	N/A	5	N/A	3		
<i>Cephalanthus occidentalis</i>	button bush	T/S	2	2	2		1	1	1	1	3	8	8	8	1	1	1				1	1	1						2	2	2	3	3	2	2	2	3	2	5	2	2		
<i>Cornus amomum</i>	silky dogwood	S										1				1										4			2	N/A	2	N/A	N/A	N/A	N/A	N/A		N/A	2	N/A	2		
<i>Fraxinus pennsylvanica</i>	green ash	T	2	8		8	4	14	15	16	3	6		2	4	4		10	10	11	7	15	12	17	11	11		4	5	5	6	10	6	6	9	9	9	12	7	14	7	10	
<i>Liquidambar styraciflua</i>	sweet gum	T		5		2												1										2			N/A	3	N/A	N/A	N/A	N/A	N/A	8	N/A	4	N/A	4	
<i>Liriodendron tulipifera</i>	tulip poplar	T	1	2			1	1	10	11																				1	2	5	5	5	5	5	6	5	7	1	2		
<i>Nyssa sylvatica</i>	black gum	T		3				2									9										1				N/A	4	N/A	N/A	N/A	N/A	N/A	3	N/A	4	N/A	4	
<i>Platanus occidentalis</i>	sycamore	T				12	7	13		10			2	20	1	51	10	11	6	20		6	4	29	17	20	15	15	10	15	9	20	6	6	10	10	10	11	10	20	10	21	
<i>Populus deltoides</i>	cottonwood	T																		1										N/A	1	N/A	N/A	N/A	N/A	N/A		N/A	1	N/A	1		
<i>Quercus nigra</i>	water oak	T	1	5				3	2	2				4	3	6		4										3	5	2	4	2	2	2	2	2	3	2	5	2	5		
<i>Quercus michauxii</i>	swamp chestnut oak	T		3	2	10	4	4	1	6		2	2	2		4			4	5		2	3	5	7	15			4	8	4	5	3	3	4	4	4	8	5	9	6	6	
<i>Quercus pagoda</i>	cherrybark oak	T	12	15			3	3	2	7	4	4			3	7	3	5	4	4		4		3	4	4	10	10	6	6	5	6	5	5	5	5	5	6	5	8	5	6	
<i>Quercus phellos</i>	willow oak	T	2	10	3	7							8	10	1	7						2	5	2	2			7	7	7	7	4	6	2	2	4	4	3	5	4	9	4	6
<i>Salix nigra</i>	black willow	T				15		4		7		3	1	4	10	10	1	8		8						7	2	7	4	6	4	7	6	6	4	4	4	6	4	11	4	6	
<i>Ulmus alata</i>	winged elm	T														1		4										2		7	N/A	3	N/A	N/A	N/A	N/A	N/A	2	N/A	1	N/A	1	
Plot Area (acres)			0.057																																								
Species Count			6	10	3	8	7	12	6	9	3	8	6	10	8	15	4	12	5	10	2	9	6	8	6	9	5	10	8	14	10	18	5	5	5	8	5	7	10	18			
Stem Count			20	66	7	102	21	59	31	75	10	42	23	95	25	135	15	65	26	60	9	51	27	65	51	76	42	81	41	82	42	99	19	29	29	64	26	45	46	101			
Stems per Acre			351	1158	123	1789	368	1035	544	1316	175	737	404	1667	439	2368	263	1140	456	1053	158	895	474	1140	895	1333	737	1421	719	1439	436	1321	340	528	524	1174	482	831	470	1242			

Type=Shrub or Tree
P = Planted
T = Total

Appendix 3.4 Vegetation Condition Assessment
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

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



APPENDIX 4 STREAM ASSESSMENT DATA

4.1 Stream Station Photos

4.2 Qualitative Visual Stability Assessment

4.3 Verification of Bankfull Events

4.4 Cross-Section Plots and Raw Data Tables*

*Raw data tables have been provided electronically.



Photo Point 1-Vegetation Plot
(10/2010)



Photo Point 2-View Upstream
Main Channel (7/2010)



Photo Point 2-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 3-View Upstream
Main Channel (7/2010)



Photo Point 3-View Downstream
Main Channel (7/2010)



Photo Point 4-View Upstream
Main Channel (7/2010)



Photo Point 4-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 5-View Upstream
Main Channel (7/2010)



Photo Point 5-View Downstream
Main Channel (7/2010)



Photo Point 6-View Upstream
Main Channel (7/2010)



Photo Point 6-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 7-View Upstream
Main Channel (7/2010)



Photo Point 7-View Downstream
Main Channel (7/2010)



Photo Point 8-View Upstream
Main Channel (7/2010)



Photo Point 8-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 9-View Upstream
Main Channel (7/2010)



Photo Point 9-View Downstream
Main Channel (7/2010)



Photo Point 10-View Upstream
Main Channel (7/2010)



Photo Point 10-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 11-View Upstream
Main Channel (7/2010)



Photo Point 11-View Downstream
Main Channel (7/2010)



Photo Point 13-View Upstream
Main Channel (7/2010)



Photo Point 13-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 14-View Upstream
Main Channel (7/2010)



Photo Point 14-View Downstream
Main Channel (7/2010)

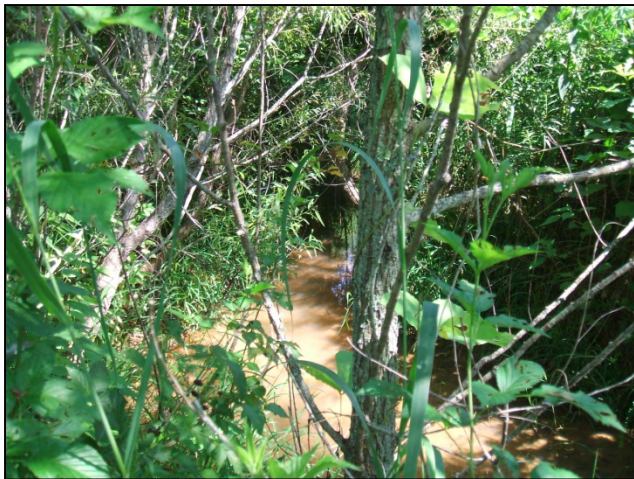


Photo Point 15-View Upstream
Main Channel (7/2010)



Photo Point 15-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 16-View Upstream
Main Channel (7/2010)



Photo Point 16-View Downstream
Main Channel (7/2010)



Photo Point 17-View Upstream
Main Channel (7/2010)



Photo Point 17-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 18-Vegetation Plot (7/2010)



Photo Point 19-View Upstream
Main Channel (7/2010)



Photo Point 19-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 20-View Upstream
Main Channel (7/2010)



Photo Point 20-View Downstream
Main Channel (7/2010)



Photo Point 21-View Upstream
Main Channel (7/2010)



Photo Point 21-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 22-View Upstream
Main Channel (7/2010)



Photo Point 22-View Downstream
Main Channel (7/2010)



Photo Point 23-View Upstream
Main Channel (7/2010)



Photo Point 23-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 24-View Upstream
Main Channel (7/2010)



Photo Point 24-View Downstream
Main Channel (7/2010)



Photo Point 25-View Upstream
Main Channel (7/2010)



Photo Point 25-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 26-View Upstream
Main Channel (7/2010)



Photo Point 26-View Downstream
Main Channel (7/2010)



Photo Point 27-View Upstream
Main Channel (7/2010)



Photo Point 27-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 28-View Upstream
Main Channel (7/2010)



Photo Point 28-View Downstream
Main Channel (7/2010)



Photo Point 30-View Upstream
Main Channel (7/2010)



Photo Point 30-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 31-View Upstream
Main Channel (7/2010)



Photo Point 31-View Downstream
Main Channel (7/2010)



Photo Point 32-View Upstream
Main Channel (7/2010)



Photo Point 32-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 33-View Upstream
Main Channel (7/2010)



Photo Point 33-View Downstream
Main Channel (7/2010)



Photo Point 34-View Upstream
Main Channel (7/2010)



Photo Point 34-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 35-View Upstream
Main Channel (7/2010)



Photo Point 35-View Downstream
Main Channel (7/2010)



Photo Point 36-View Upstream
Main Channel (7/2010)

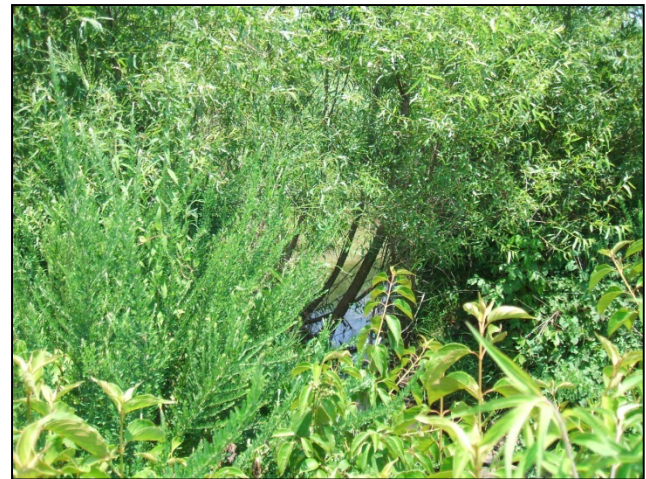


Photo Point 36-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 37-View Upstream
Main Channel (7/2010)



Photo Point 37-View Downstream
Main Channel (7/2010)



Photo Point 38-View Upstream
Main Channel (7/2010)



Photo Point 38-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:





Photo Point 39-View Upstream
Main Channel (7/2010)



Photo Point 39-View Downstream
Main Channel (7/2010)

Prepared For:



Appendix 4.1 Stream Station Photos
Shepherds Tree Stream and Wetland Restoration/EEP Project No. 333
Monitoring Year 6
Submittal Date: February 2011

Prepared By:



Appendix 4.2 Qualitative Visual Stability Assessment
Main Channel (9,904.13 lf)
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

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)	150	150			100%			
		Thalweg centering at downstream of meander bend (Glide)	150	150			100%			
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
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 4.2 Qualitative Visual Stability Assessment
Tributary (800 lf)
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6**

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%					
					Totals		0	0	100%	0	0	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 \geq 1.6 Rootwads/logs providing some cover at baseflow.	U	7			U					

U:Unknown

**Appendix 4.3 Verification of Bankfull Events
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6**

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

Appendix 4.4 Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-1, Riffle
Survey Date	11/2010



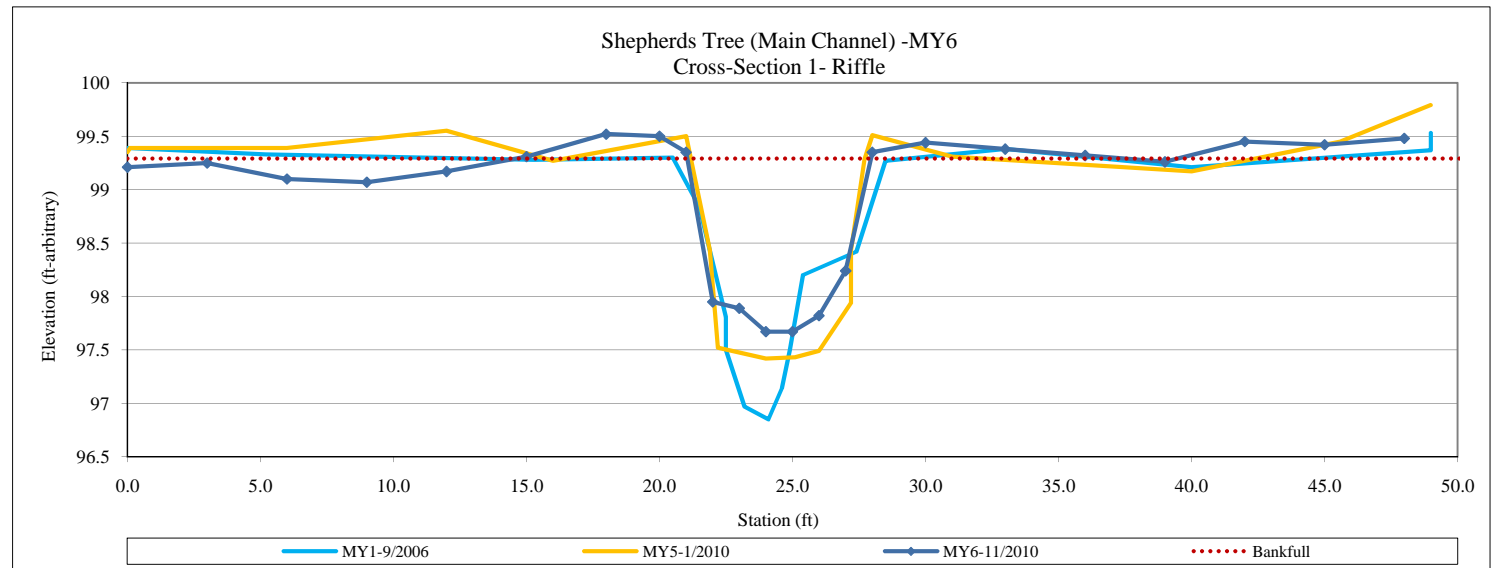
XS-1: View Upstream



XS-1: View Downstream

SUMMARY DATA	
Bankfull Elevation (ft)	99.29
Bankfull Cross-Sectional Area (ft²)	10.63
Bankfull Width (ft)	6.90
Flood Prone Area Elevation (ft)	100.91
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	1.22
Bankfull Max Depth (ft)	1.62
W/D Ratio	5.66
Entrenchment Ratio	>2.2
Bank Height Ratio	1.00

Station	Elevation	Notes
0	99.21	x1
3	99.25	x1
6	99.1	x1
9	99.07	x1
12	99.17	x1
15	99.31	x1
18	99.52	x1
20	99.5	x1
21	99.35	x1
22	97.95	x1
23	97.89	x1
24	97.67	x1
25	97.67	x1
26	97.82	x1
27	98.24	x1
28	99.35	x1
30	99.44	x1
33	99.38	x1
36	99.32	x1
39	99.26	x1
42	99.45	x1
45	99.42	x1
48	99.48	x1



Appendix 4.4 Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-2, Pool
Survey Date	11/2010

SUMMARY DATA	
Bankfull Elevation (ft)	100.10
Bankfull Cross-Sectional Area (ft²)	5.12
Bankfull Width (ft)	7.90
Flood Prone Area Elevation (ft)	101.41
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	0.65
Bankfull Max Depth (ft)	1.31
W/D Ratio	12.15
Entrenchment Ratio	N/A
Bank Height Ratio	1.15

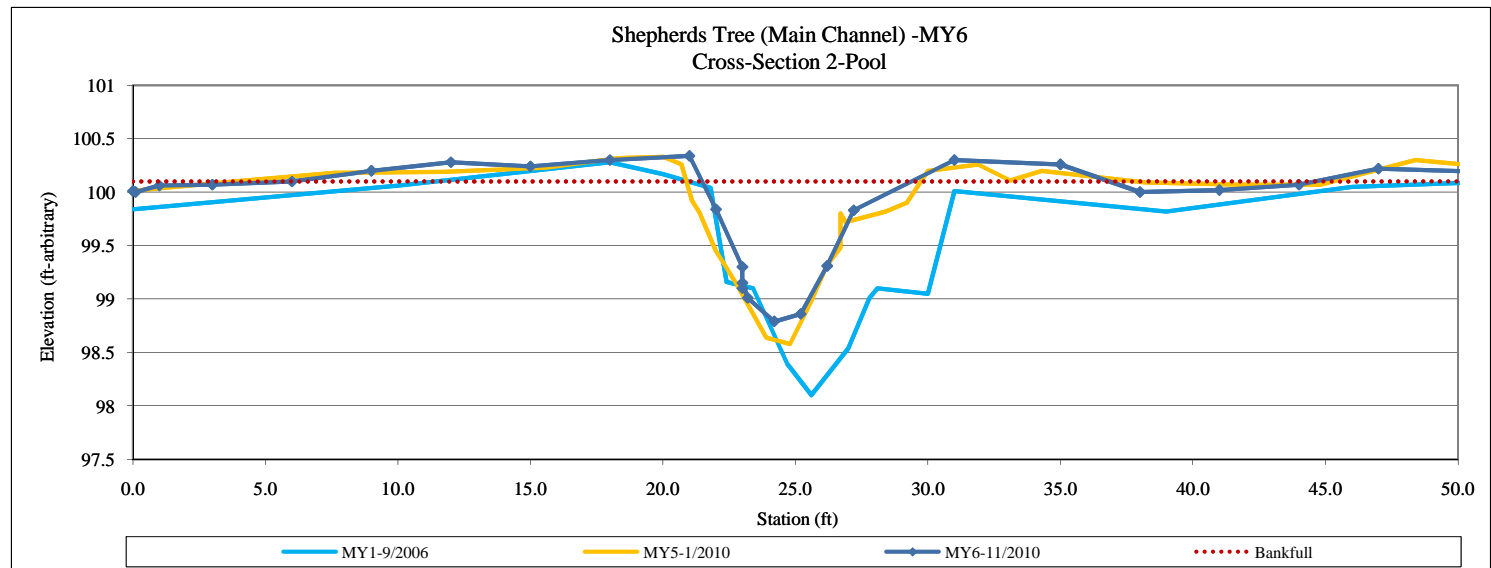


XS-2: View Upstream



XS-2: View Downstream

Station	Elevation	Notes
0	100.01	x2
0.1	100	x2
1	100.06	x2
3	100.07	x2
6	100.1	x2
9	100.2	x2
12	100.28	x2
15	100.24	x2
18	100.3	x2
21	100.34	x2
22	99.84	x2
23	99.3	x2
23	99.1	x2
23	99.15	x2
23.2	99.01	x2
24.2	98.79	x2
25.2	98.86	x2
26.2	99.31	x2
27.2	99.83	x2
31	100.3	x2
35	100.26	x2
38	100	x2
41	100.02	x2
44	100.07	x2
47	100.22	x2
51	100.19	x2
52	100.22	x2
52.1	100.44	x3



Appendix 4.4 Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-3, Riffle
Survey Date	11/2010

SUMMARY DATA	
Bankfull Elevation (ft)	99.82
Bankfull Cross-Sectional Area (ft²)	7.37
Bankfull Width (ft)	10.31
Flood Prone Area Elevation (ft)	101.15
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	0.71
Bankfull Max Depth (ft)	1.33
W/D Ratio	14.52
Entrenchment Ratio	>2.2
Bank Height Ratio	1.00

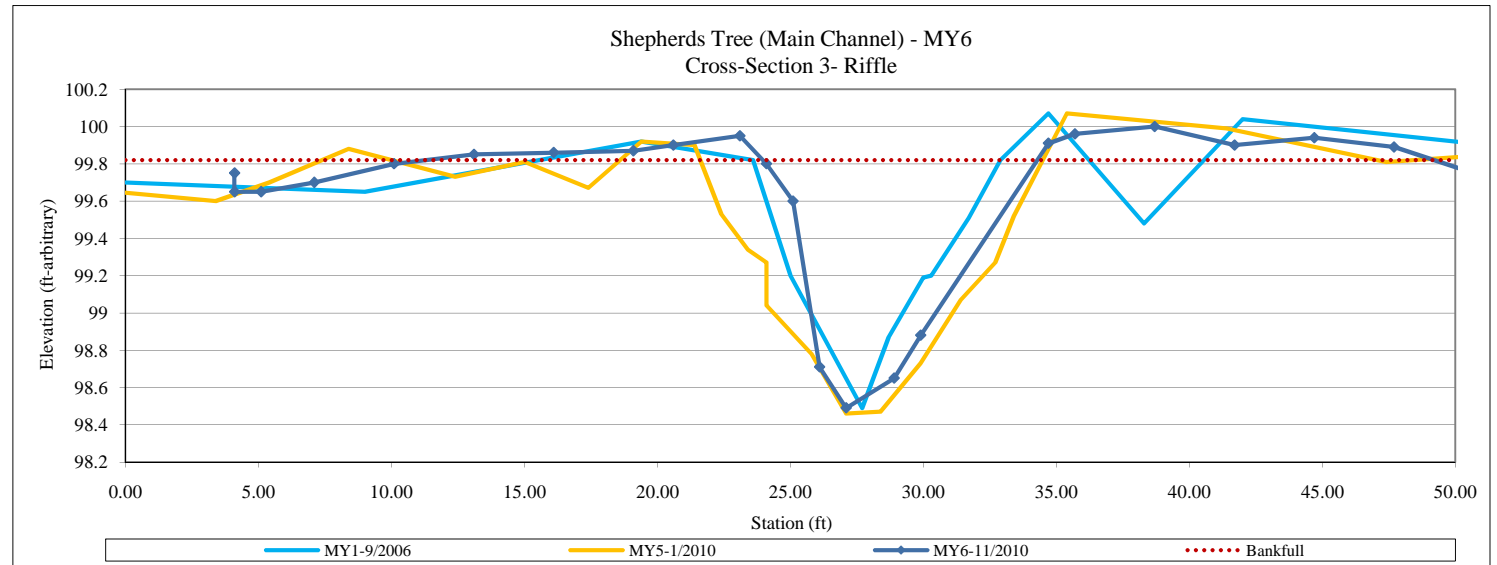


XS-3: View Upstream



XS-3: View Downstream

Station	Elevation	Notes
4.1	99.75	x3
4.1	99.65	x3
5.1	99.65	x3
7.1	99.7	x3
10.1	99.8	x3
13.1	99.85	x3
16.1	99.86	x3
19.1	99.87	x3
20.6	99.9	x3
23.1	99.95	x3
24.1	99.8	x3
25.1	99.6	x3
26.1	98.71	x3
27.1	98.49	x3
28.9	98.65	x3
29.9	98.88	x3
34.7	99.91	x3
35.7	99.96	x3
38.7	100	x3
41.7	99.9	x3
44.7	99.94	x3
47.7	99.89	x3
50.7	99.75	x3
53.7	99.84	x3
54.1	99.75	x3



Appendix 4.4 Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-4, Riffle
Survey Date	11/2010

SUMMARY DATA	
Bankfull Elevation (ft)	94.10
Bankfull Cross-Sectional Area (ft²)	17.63
Bankfull Width (ft)	9.64
Flood Prone Area Elevation (ft)	96.74
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	1.83
Bankfull Max Depth (ft)	2.64
W/D Ratio	5.27
Entrenchment Ratio	>2.2
Bank Height Ratio	1.00

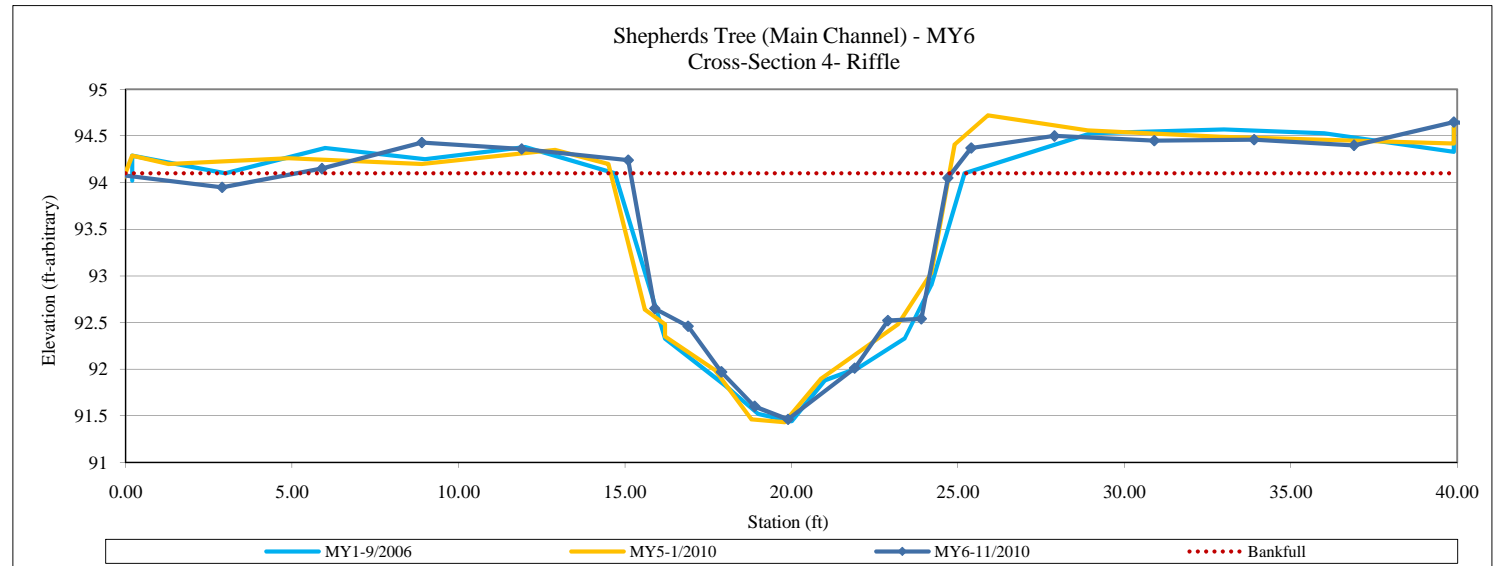


XS-4: View Upstream



XS-4: View Downstream

Station	Elevation	Notes
2.9	93.95	x4
5.9	94.15	x4
8.9	94.43	x4
11.9	94.36	x4
15.1	94.24	x4
15.9	92.65	x4
16.9	92.46	x4
17.9	91.97	x4
18.9	91.6	x4
19.9	91.46	x4
21.9	92.01	x4
22.9	92.52	x4
23.9	92.54	x4
24.7	94.05	x4
25.4	94.37	x4
27.9	94.5	x4
30.9	94.45	x4
33.9	94.46	x4
36.9	94.4	x4
39.9	94.65	x4
42.9	94.54	x4
46.9	94.57	x4



Appendix 4.4 Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-5, Pool
Survey Date	11/2010

SUMMARY DATA	
Bankfull Elevation (ft)	94.71
Bankfull Cross-Sectional Area (ft²)	13.17
Bankfull Width (ft)	8.86
Flood Prone Area Elevation (ft)	96.99
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	1.49
Bankfull Max Depth (ft)	2.28
W/D Ratio	5.95
Entrenchment Ratio	N/A
Bank Height Ratio	1.00

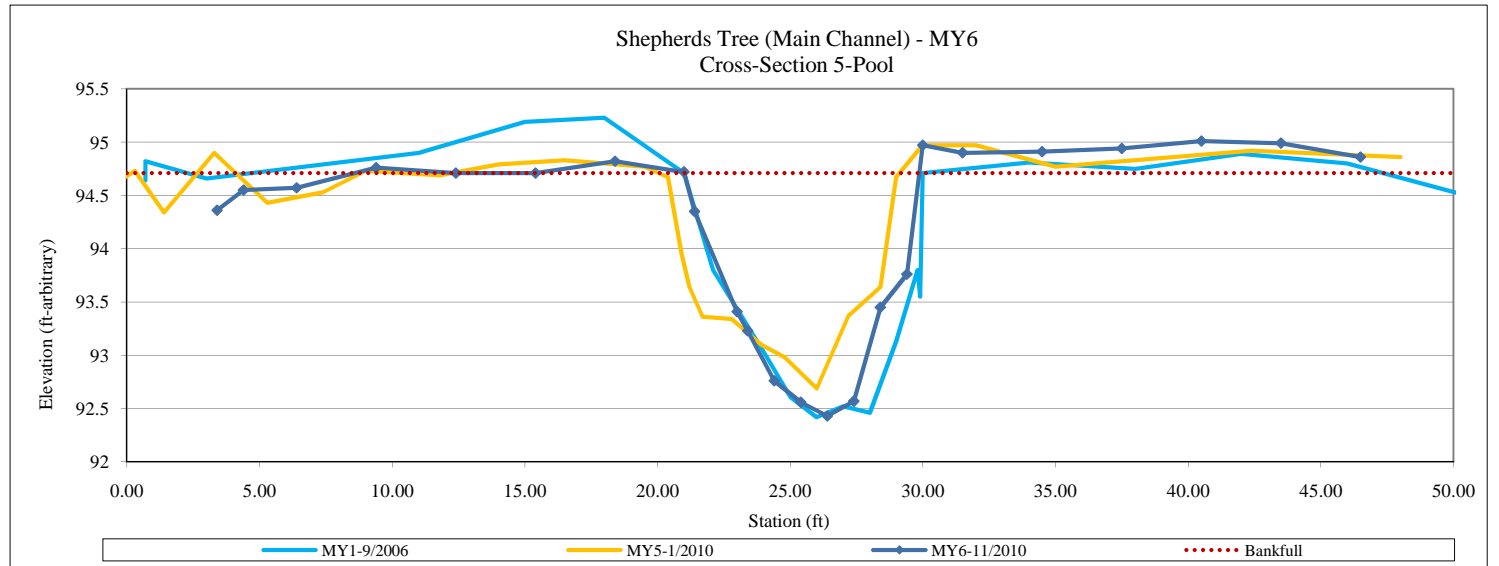


XS-5: View Upstream



XS-5: View Downstream

Station	Elevation	Notes
3.4	94.55	x4
3.4	94.36	x4
4.4	94.55	x4
6.4	94.57	x4
9.4	94.76	x4
12.4	94.71	x4
15.4	94.71	x4
18.4	94.82	x4
21	94.72	x4
21.4	94.35	x4
23	93.41	x4
23.4	93.23	x4
24.4	92.76	x4
25.4	92.56	x4
26.4	92.43	x4
27.4	92.57	x4
28.4	93.45	x4
29.4	93.76	x4
30	94.97	x4
31.5	94.9	x4
34.5	94.91	x4
37.5	94.94	x4
40.5	95.01	x4
43.5	94.99	x4
46.5	94.86	x4
47.5	95.06	x4



Appendix 4.4 Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-6, Riffle
Survey Date	11/2010

SUMMARY DATA	
Bankfull Elevation (ft)	94.37
Bankfull Cross-Sectional Area (ft²)	2.75
Bankfull Width (ft)	5.78
Flood Prone Area Elevation (ft)	95.15
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	0.48
Bankfull Max Depth (ft)	0.78
W/D Ratio	12.04
Entrenchment Ratio	>2.2
Bank Height Ratio	4.41

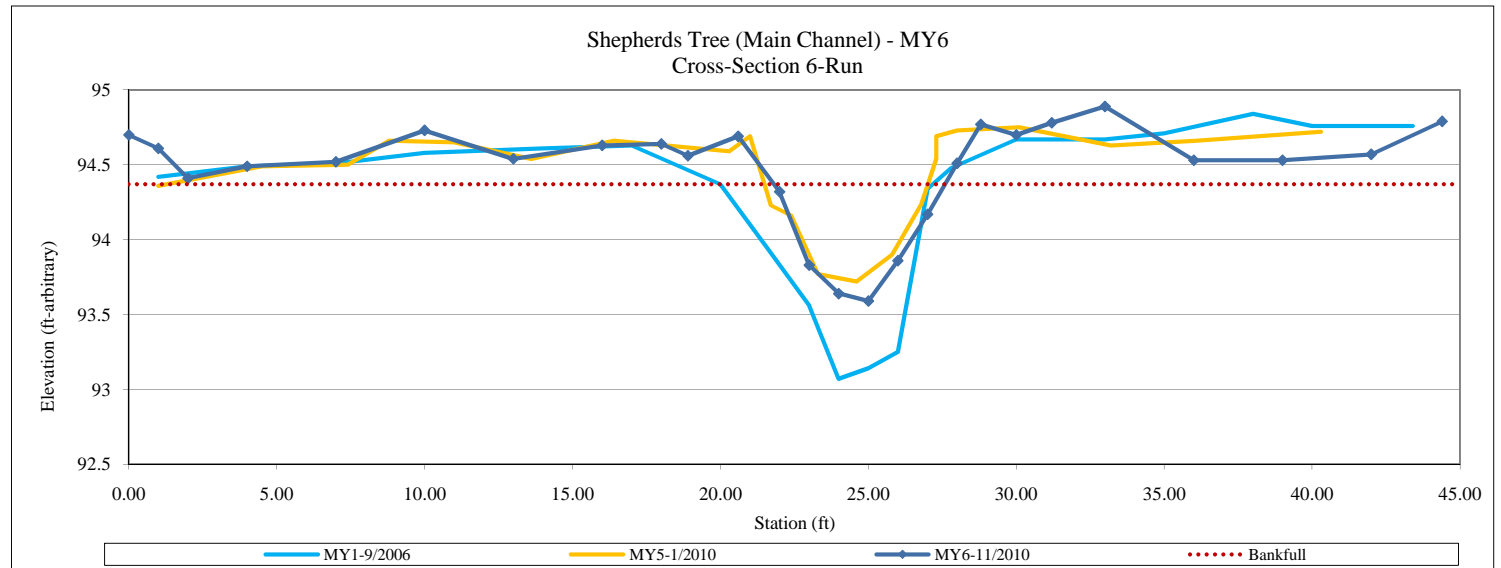


XS-6: View Upstream



XS-6: View Downstream

Station	Elevation	Notes
0	94.7	x6
1	94.61	x6
2	94.41	x6
4	94.49	x6
7	94.52	x6
10	94.73	x6
13	94.54	x6
16	94.63	x6
18	94.64	x6
18.9	94.56	x6
20.6	94.69	x6
22	94.32	x6
23	93.83	x6
24	93.64	x6
25	93.59	x6
26	93.86	x6
27	94.17	x6
28	94.51	x6
28.8	94.77	x6
30	94.7	x6
31.2	94.78	x6
33	94.89	x6
36	94.53	x6
39	94.53	x6
42	94.57	x6
44.4	94.79	x6



Appendix 4.4 Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-7, Pool
Survey Date	11/2010



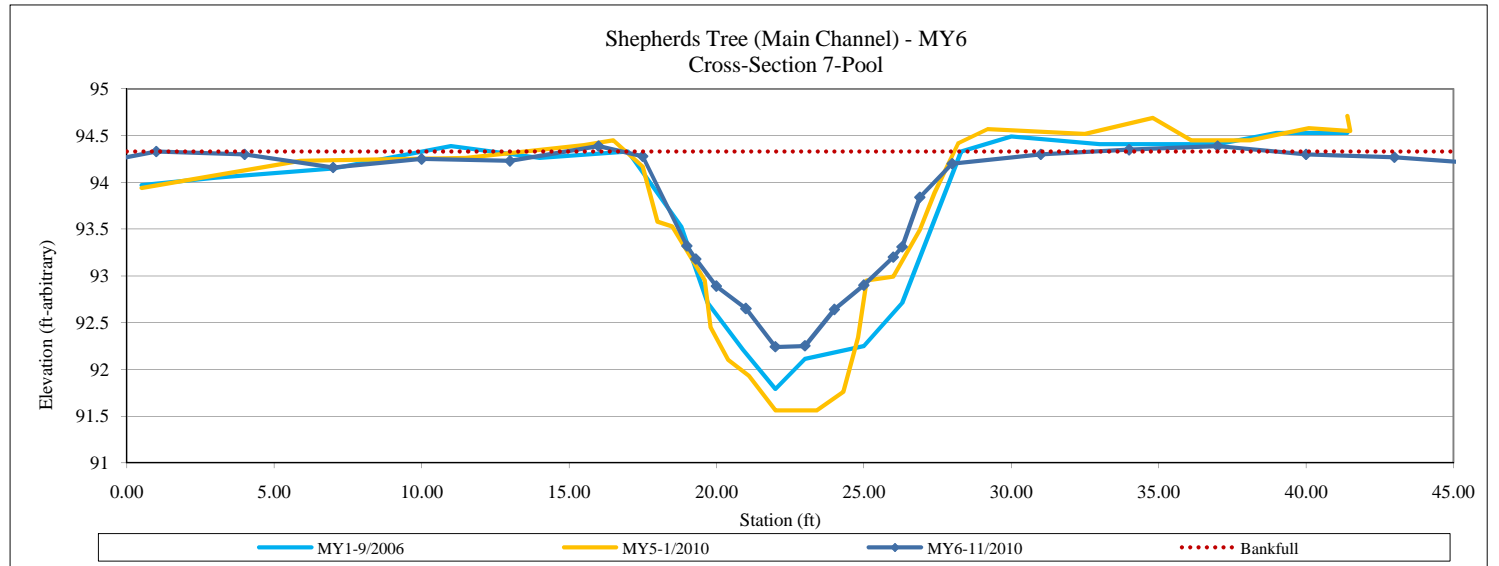
XS-7: View Upstream



XS-7: View Downstream

SUMMARY DATA	
Bankfull Elevation (ft)	94.33
Bankfull Cross-Sectional Area (ft²)	13.68
Bankfull Width (ft)	15.98
Flood Prone Area Elevation (ft)	96.42
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	0.86
Bankfull Max Depth (ft)	2.09
W/D Ratio	18.58
Entrenchment Ratio	N/A
Bank Height Ratio	1.00

Station	Elevation	Notes
1	94.33	x7
4	94.3	x7
7	94.16	x7
10	94.25	x7
13	94.23	x7
16	94.39	x7
17.5	94.28	x7
19	93.32	x7
19.3	93.18	x7
20	92.89	x7
21	92.65	x7
22	92.24	x7
23	92.25	x7
24	92.64	x7
25	92.9	x7
26	93.2	x7
26.3	93.31	x7
26.9	93.84	x7
28	94.2	x7
31	94.3	x7
34	94.35	x7
37	94.39	x7
40	94.3	x7
43	94.27	x7
46	94.2	x7
49	94.17	x7
49.7	94.18	x7



Appendix 4.4 Cross-Section Plots and Raw Data Tables
 Shepherds Tree Stream and Wetland Restoration/EEP Project #333

Main Channel

Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-8, Pool
Survey Date	11/2010



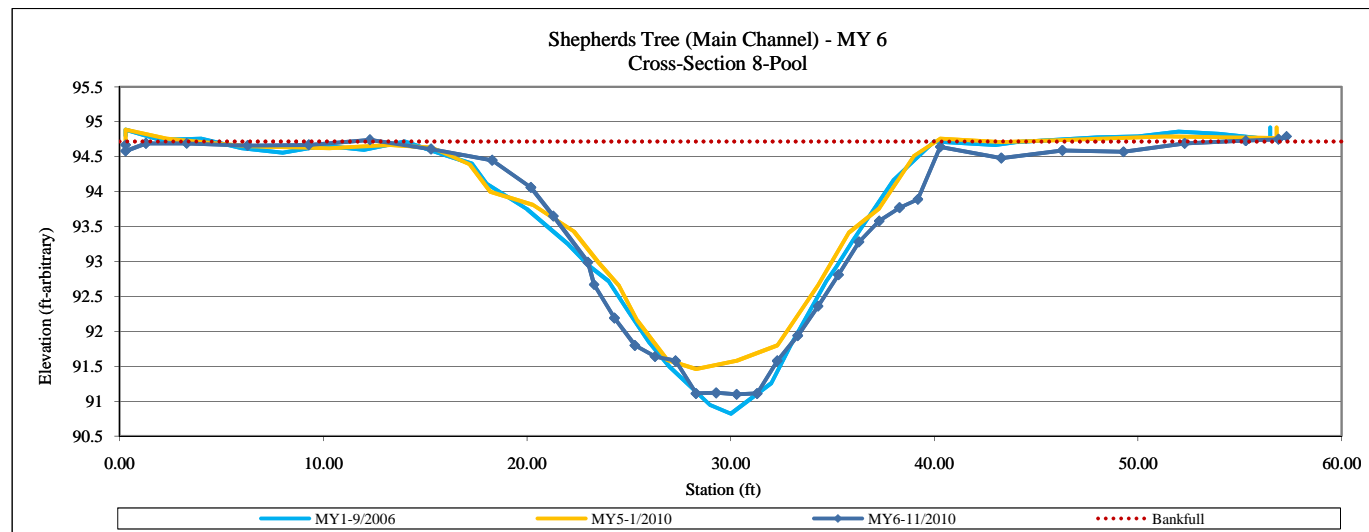
XS-8: View Upstream



XS-8: View Downstream

SUMMARY DATA	
Bankfull Elevation (ft)	94.72
Bankfull Cross-Sectional Area (ft ²)	47.18
Bankfull Width (ft)	27.64
Flood Prone Area Elevation (ft)	98.34
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	1.71
Bankfull Max Depth (ft)	3.62
W/D Ratio	16.16
Entrenchment Ratio	N/A
Bank Height Ratio	1.00

Station	Elevation	Notes
0.3	94.67	x8
0.3	94.58	x8
1.3	94.69	x8
3.3	94.69	x8
6.3	94.66	x8
9.3	94.67	x8
12.3	94.74	x8
15.3	94.61	x8
18.3	94.45	x8
20.2	94.06	x8
21.3	93.65	x8
23	92.99	x8
23.3	92.67	x8
24.3	92.19	x8
25.3	91.8	x8
26.3	91.64	x8
27.3	91.58	x8
28.3	91.11	x8
29.3	91.12	x8
30.3	91.1	x8
31.3	91.11	x8
32.3	91.58	x8
33.3	91.94	x8
34.3	92.36	x8
35.3	92.81	x8
36.3	93.28	x8
37.3	93.58	x8
38.3	93.77	x8
39.2	93.89	x8
40.3	94.64	x8
43.3	94.48	x8
46.3	94.59	x8
49.3	94.57	x8
52.3	94.69	x8
55.3	94.73	x8
56.9	94.75	x8
57.3	94.79	x8



Appendix 4.4 Cross-Section Plots and Raw Data Tables
 Shepherds Tree Stream and Wetland Restoration/EEP Project #333

Main Channel
 Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-9, Riffle
Survey Date	11/2010

SUMMARY DATA	
Bankfull Elevation (ft)	94.30
Bankfull Cross-Sectional Area (ft ²)	37.05
Bankfull Width (ft)	21.74
Flood Prone Area Elevation (ft)	97.82
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	1.70
Bankfull Max Depth (ft)	3.52
W/D Ratio	12.79
Entrenchment Ratio	>2.2
Bank Height Ratio	1.05

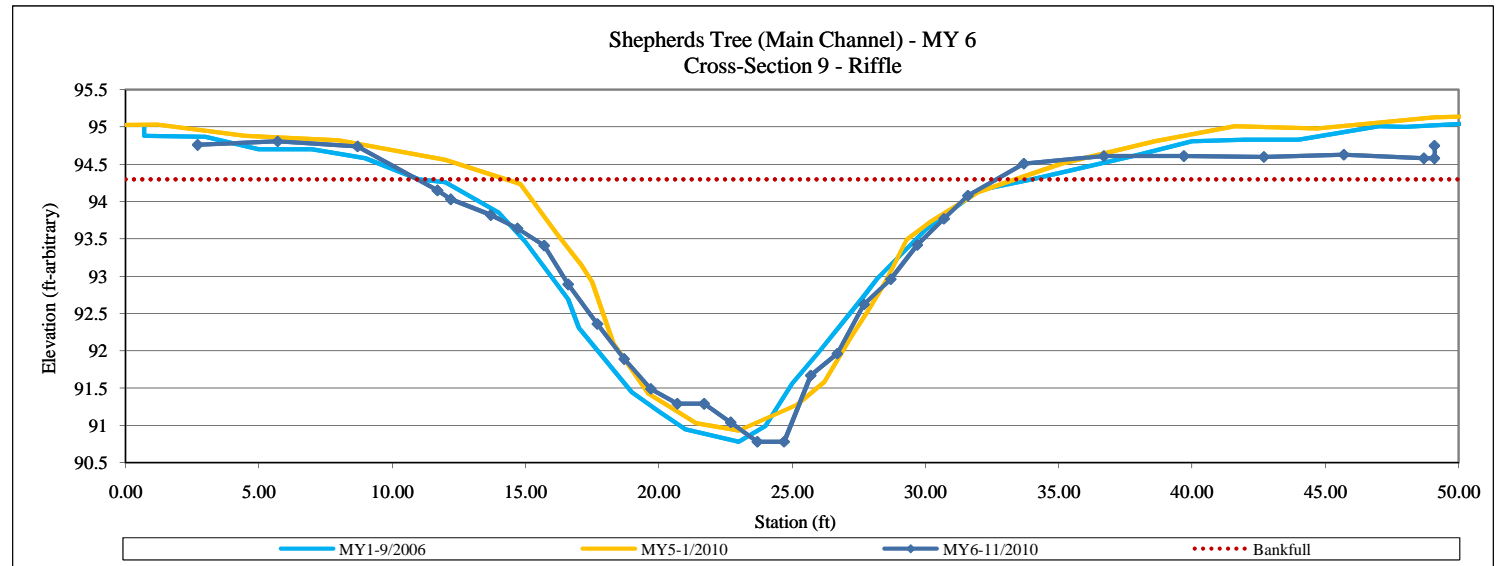


XS-9: View Upstream



XS-9: View Downstream

Station	Elevation	Notes
2.7	94.76	x9
5.7	94.81	x9
8.7	94.74	x9
11.7	94.15	x9
12.2	94.03	x9
13.7	93.82	x9
14.7	93.64	x9
15.7	93.41	x9
16.6	92.89	x9
17.7	92.36	x9
18.7	91.89	x9
19.7	91.49	x9
20.7	91.29	x9
21.7	91.29	x9
22.7	91.04	x9
23.7	90.78	x9
24.7	90.78	x9
25.7	91.67	x9
26.7	91.96	x9
27.7	92.62	x9
28.7	92.96	x9
29.7	93.42	x9
30.7	93.77	x9
31.6	94.08	x9
33.7	94.51	x9
36.7	94.61	x9
39.7	94.61	x9
42.7	94.6	x9
45.7	94.63	x9
48.7	94.58	x9
49.1	94.58	x9
49.1	94.75	x9



Appendix 4.4 Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-10, Pool
Survey Date	11/2010

SUMMARY DATA	
Bankfull Elevation (ft)	95.16
Bankfull Cross-Sectional Area (ft²)	24.81
Bankfull Width (ft)	16.29
Flood Prone Area Elevation (ft)	98.26
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	1.52
Bankfull Max Depth (ft)	3.10
W/D Ratio	10.72
Entrenchment Ratio	N/A
Bank Height Ratio	1.00

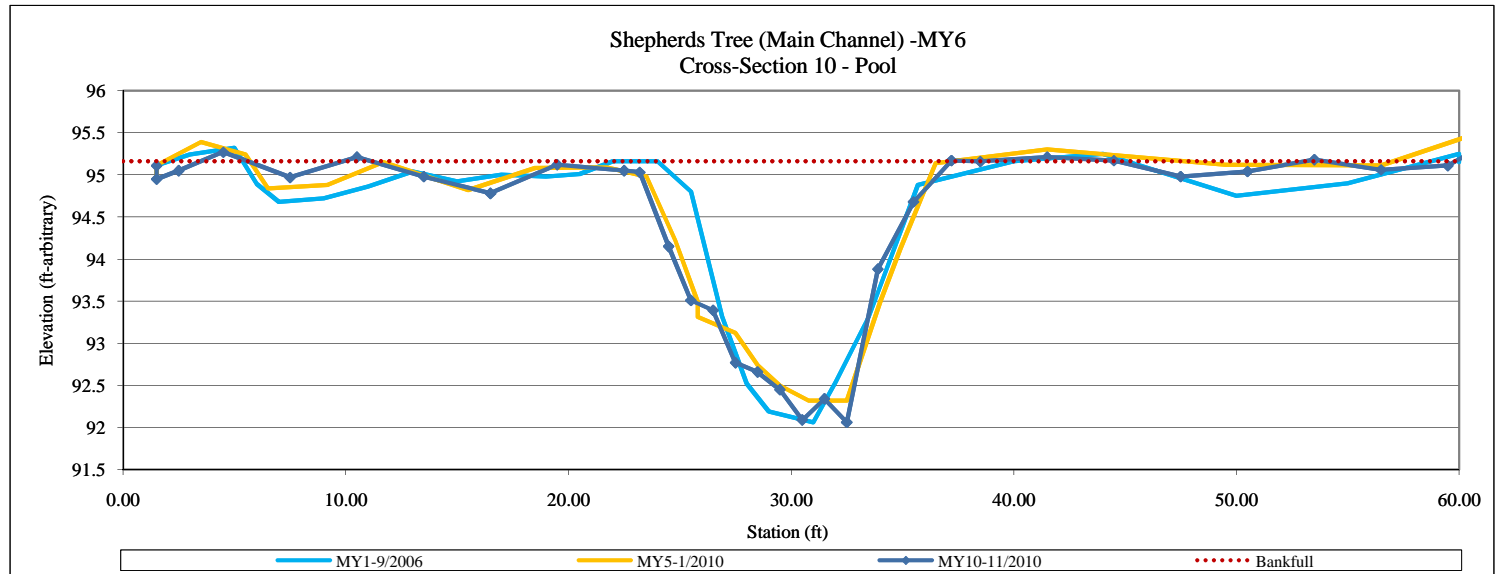


XS-10: View Upstream



XS-10: View Downstream

Station	Elevation	Notes
1.5	95.11	x10
1.5	94.95	x10
2.5	95.05	x10
4.5	95.27	x10
7.5	94.97	x10
10.5	95.21	x10
13.5	94.98	x10
16.5	94.78	x10
19.5	95.12	x10
22.5	95.05	x10
23.2	95.03	x10
24.5	94.15	x10
25.5	93.51	x10
26.5	93.39	x10
27.5	92.77	x10
28.5	92.66	x10
29.5	92.45	x10
30.5	92.09	x10
31.5	92.34	x10
32.5	92.06	x10
33.9	93.88	x10
35.5	94.68	x10
37.2	95.17	x10
38.5	95.16	x10
41.5	95.21	x10
44.5	95.17	x10
47.5	94.98	x10
50.5	95.04	x10
53.5	95.18	x10
56.5	95.06	x10
59.5	95.11	x10
60.5	95.26	x10



Appendix 4.4 Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-11, Pool
Survey Date	11/2010

SUMMARY DATA	
Bankfull Elevation (ft)	95.00
Bankfull Cross-Sectional Area (ft²)	19.11
Bankfull Width (ft)	13.17
Flood Prone Area Elevation (ft)	97.79
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	1.45
Bankfull Max Depth (ft)	2.79
W/D Ratio	9.08
Entrenchment Ratio	N/A
Bank Height Ratio	1.00

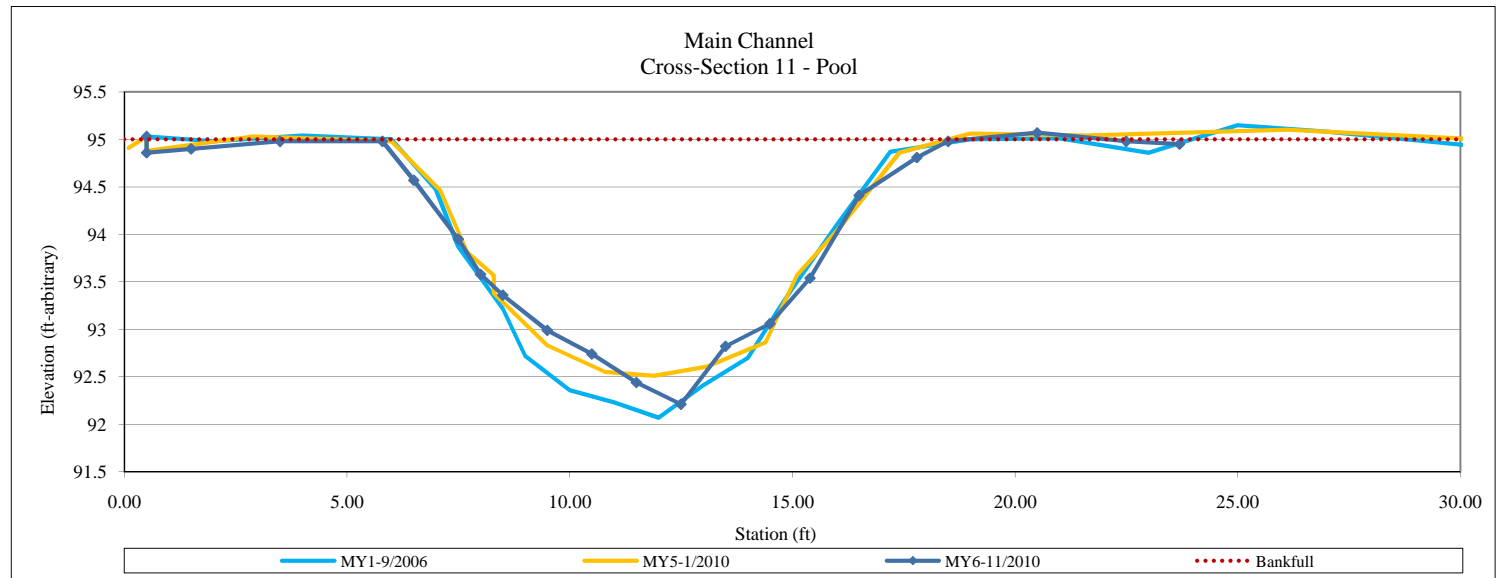


XS-11: View Upstream



XS-11: View Downstream

Station	Elevation	Notes
0.5	95.03	x11
0.5	94.86	x11
1.5	94.9	x11
3.5	94.98	x11
5.8	94.98	x11
6.5	94.57	x11
7.5	93.95	x11
8	93.58	x11
8.5	93.36	x11
9.5	92.99	x11
10.5	92.74	x11
11.5	92.44	x11
12.5	92.21	x11
13.5	92.82	x11
14.5	93.06	x11
15.4	93.54	x11
16.5	94.41	x11
17.8	94.81	x11
18.5	94.98	x11
20.5	95.07	x11
22.5	94.98	x11
23.7	94.95	x11



Appendix 4.4 Cross-Section Plots and Raw Data Tables
 Shepherds Tree Stream and Wetland Restoration/EEP Project #333

Main Channel
 Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-12 Riffle
Survey Date	11/2010



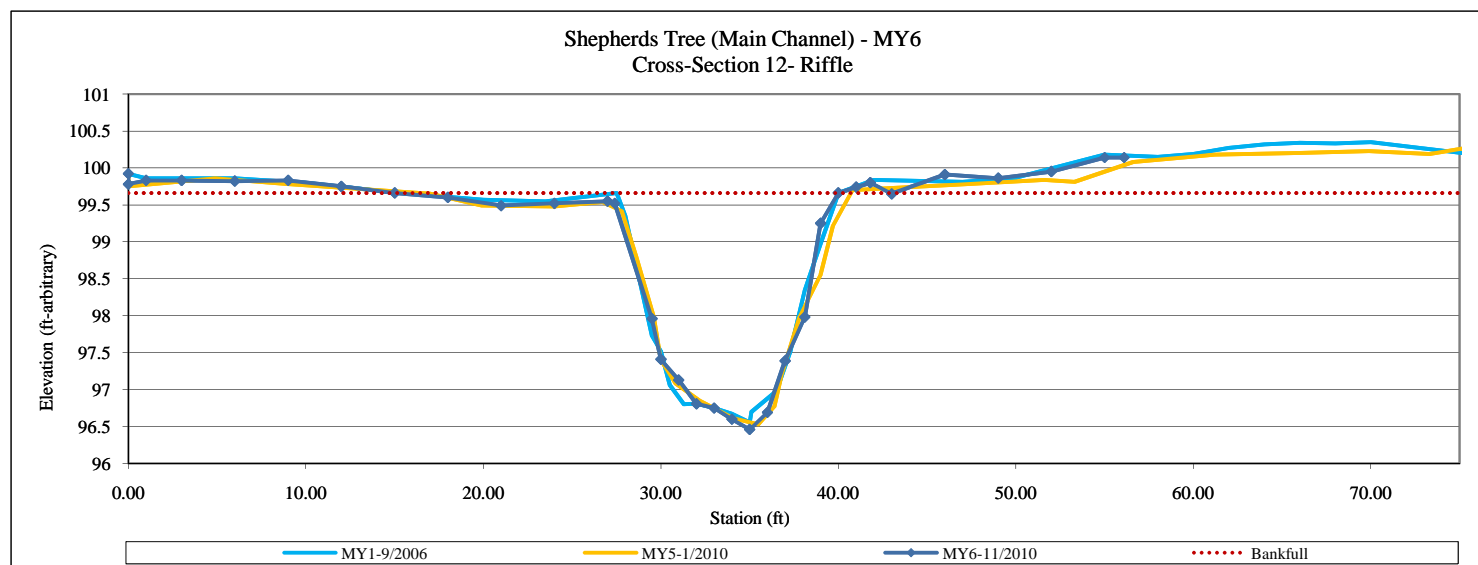
XS-12: View Upstream



XS-12: View Downstream

SUMMARY DATA	
Bankfull Elevation (ft)	99.66
Bankfull Cross-Sectional Area (ft ²)	26.07
Bankfull Width (ft)	13.00
Flood Prone Area Elevation (ft)	102.86
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	2.01
Bankfull Max Depth (ft)	3.20
W/D Ratio	6.47
Entrenchment Ratio	>2.2
Bank Height Ratio	1.00

Station	Elevation	Notes
0	99.92	x12
0	99.78	x12
1	99.83	x12
3	99.83	x12
6	99.82	x12
9	99.83	x12
12	99.75	x12
15	99.66	x12
18	99.6	x12
21	99.49	x12
24	99.52	x12
27	99.55	x12
27.4	99.52	x12
29.5	97.96	x12
30	97.41	x12
31	97.13	x12
32	96.81	x12
33	96.75	x12
34	96.6	x12
35	96.46	x12
36	96.69	x12
37	97.39	x12
38.1	97.98	x12
39	99.25	x12
40	99.66	x12
41	99.74	x12
41.8	99.8	x12
43	99.65	x12
46	99.91	x12
49	99.86	x12
52	99.95	x12
55	100.14	x12
56.1	100.14	x12



Appendix 4.4 Cross-Section Plots and Raw Data Tables
 Shepherds Tree Stream and Wetland Restoration/EEP Project #333

Main Channel
 Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-13, Pool
Survey Date	11/2010



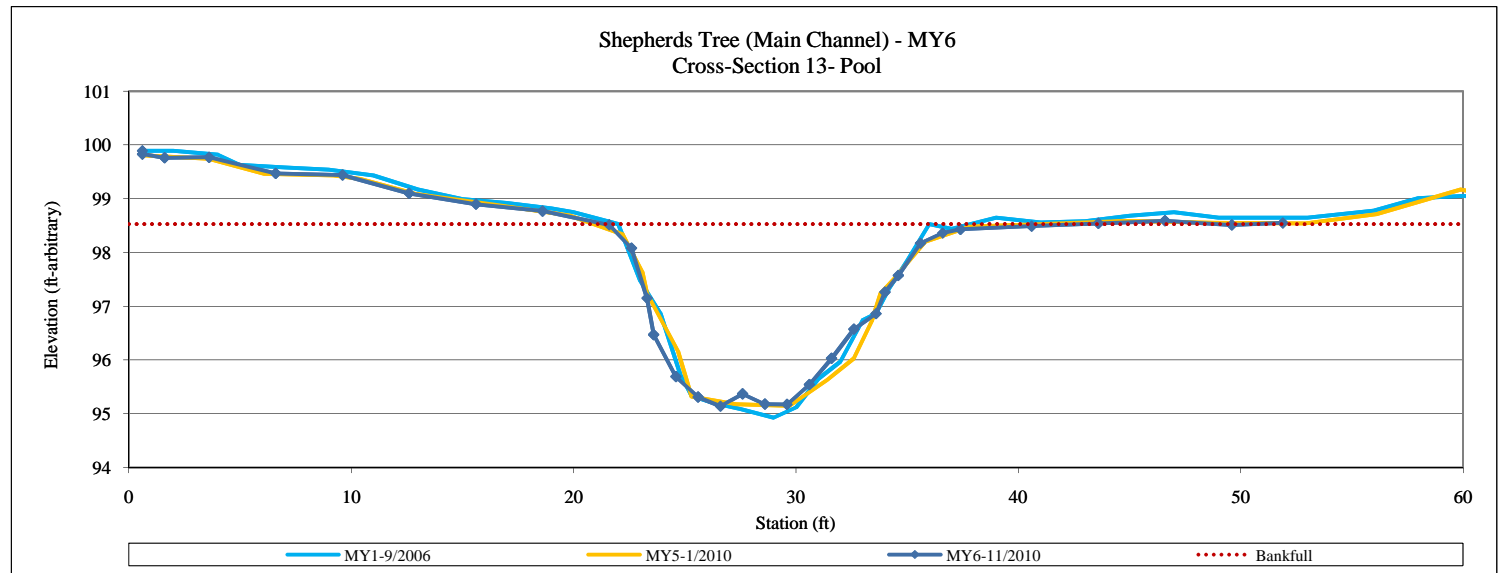
XS-13: View Upstream



XS-13: View Downstream

SUMMARY DATA	
Bankfull Elevation (ft)	98.53
Bankfull Cross-Sectional Area (ft ²)	32.59
Bankfull Width (ft)	21.63
Flood Prone Area Elevation (ft)	101.92
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	1.51
Bankfull Max Depth (ft)	3.39
W/D Ratio	14.32
Entrenchment Ratio	N/A
Bank Height Ratio	1.00

Station	Elevation	Notes
0.6	99.89	x13
0.6	99.83	x13
1.6	99.76	x13
3.6	99.77	x13
6.6	99.47	x13
9.6	99.44	x13
12.6	99.1	x13
15.6	98.9	x13
18.6	98.77	x13
21.6	98.51	x13
22.6	98.08	x13
23.3	97.15	x13
23.6	96.47	x13
24.6	95.69	x13
25.6	95.31	x13
26.6	95.14	x13
27.6	95.37	x13
28.6	95.18	x13
29.6	95.17	x13
30.6	95.54	x13
31.6	96.03	x13
32.6	96.57	x13
33.6	96.86	x13
34	97.26	x13
34.6	97.57	x13
35.6	98.17	x13
36.6	98.36	x13
37.4	98.43	x13
40.6	98.49	x13
43.6	98.54	x13
46.6	98.59	x13
49.6	98.51	x13
51.9	98.55	x13



Appendix 4.4 Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Main Channel
Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-14 Riffle
Survey Date	11/2010

SUMMARY DATA	
Bankfull Elevation (ft)	102.20
Bankfull Cross-Sectional Area (ft²)	26.10
Bankfull Width (ft)	13.58
Flood Prone Area Elevation (ft)	105.74
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	1.92
Bankfull Max Depth (ft)	3.54
W/D Ratio	7.07
Entrenchment Ratio	>2.2
Bank Height Ratio	1.00

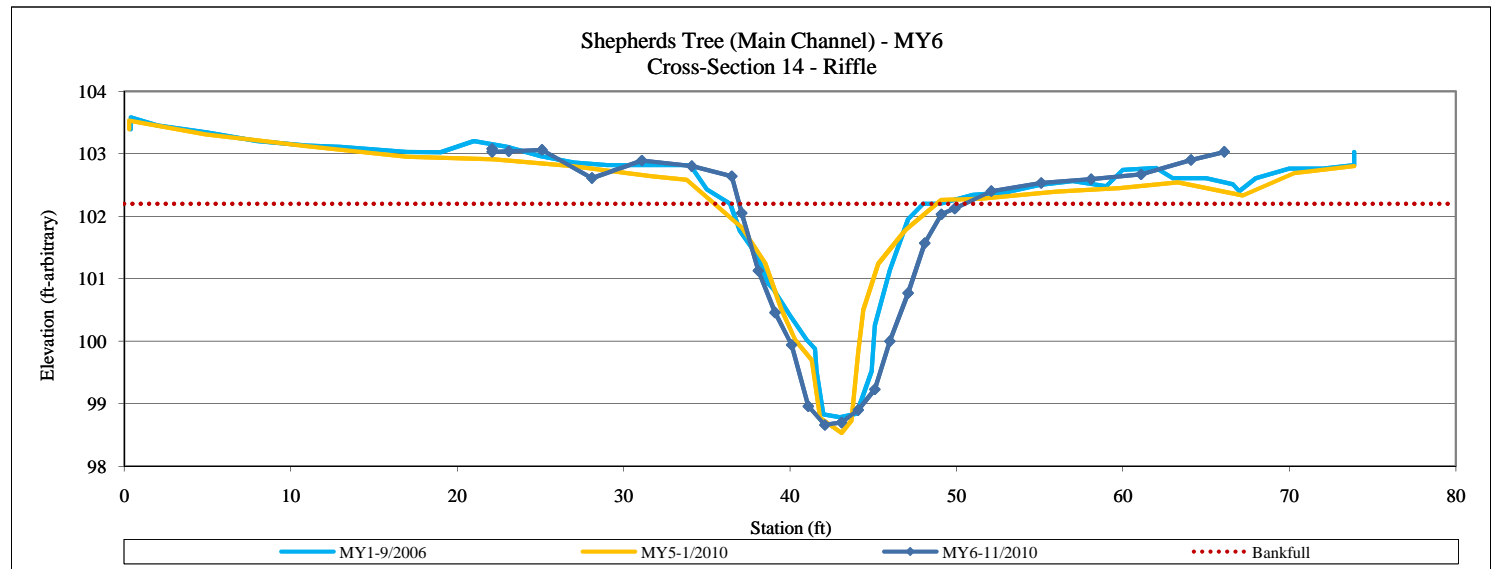


XS-14: View Upstream



XS-14: View Downstream

Station	Elevation	Notes
22.1	103.08	x14
22.1	103.03	x14
23.1	103.04	x14
25.1	103.06	x14
28.1	102.61	x14
31.1	102.89	x14
34.1	102.8	x14
36.5	102.64	x14
37.1	102.05	x14
38.1	101.13	x14
39.1	100.46	x14
40.1	99.94	x14
41.1	98.96	x14
42.1	98.66	x14
43.1	98.7	x14
44.1	98.9	x14
45.1	99.23	x14
46	100	x14
47.1	100.77	x14
48.1	101.57	x14
49.1	102.03	x14
49.9	102.12	x14
52.1	102.4	x14
55.1	102.53	x14
58.1	102.59	x14
61.1	102.67	x14
64.1	102.9	x14
66.1	103.03	x14



Appendix 4.4 Cross-Section Plots and Raw Data Tables
 Shepherds Tree Stream and Wetland Restoration/EEP Project #333

Main Channel
 Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-15, Pool
Survey Date	11/2010



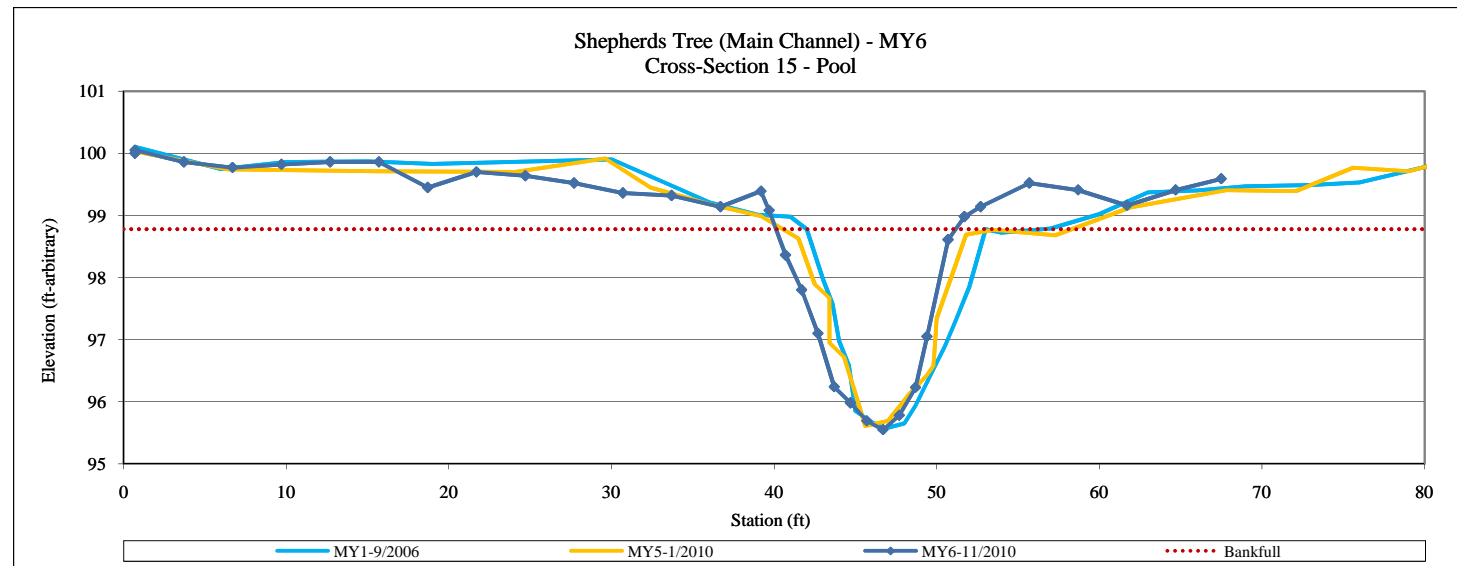
XS-15: View Upstream



XS-15: View Downstream

SUMMARY DATA	
Bankfull Elevation (ft)	98.78
Bankfull Cross-Sectional Area (ft ²)	21.70
Bankfull Width (ft)	11.04
Flood Prone Area Elevation (ft)	102.01
Flood Prone Width (ft)	N/A
Bankfull Mean Depth (ft)	1.97
Bankfull Max Depth (ft)	3.23
W/D Ratio	5.60
Entrenchment Ratio	N/A
Bank Height Ratio	1.18

Station	Elevation	Notes
0.7	100	x15
0.7	100.05	x15
3.7	99.86	x15
6.7	99.77	x15
9.7	99.82	x15
12.7	99.86	x15
15.7	99.86	x15
18.7	99.45	x15
21.7	99.7	x15
24.7	99.64	x15
27.7	99.52	x15
30.7	99.36	x15
33.7	99.32	x15
36.7	99.14	x15
39.2	99.39	x15
39.7	99.08	x15
40.7	98.36	x15
41.7	97.8	x15
42.7	97.1	x15
43.7	96.24	x15
44.7	95.98	x15
45.7	95.69	x15
46.7	95.55	x15
47.7	95.78	x15
48.7	96.23	x15
49.4	97.05	x15
50.7	98.61	x15
51.7	98.98	x15
52.7	99.14	x15
55.7	99.52	x15
58.7	99.41	x15
61.7	99.16	x15
64.7	99.41	x15
67.5	99.59	x15



Appendix 4.4 Cross-Section Plots and Raw Data Tables
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Tributary
Monitoring Year 6

Project Name	Shepherds Tree
EEP Project Number	333
Cross-Section ID	XS-16 Riffle
Survey Date	11/2010

SUMMARY DATA	
Bankfull Elevation (ft)	93.48
Bankfull Cross-Sectional Area (ft²)	5.19
Bankfull Width (ft)	8.35
Flood Prone Area Elevation (ft)	94.74
Flood Prone Width (ft)	>100
Bankfull Mean Depth (ft)	0.62
Bankfull Max Depth (ft)	1.26
W/D Ratio	13.47
Entrenchment Ratio	>2.2
Bank Height Ratio	1.25

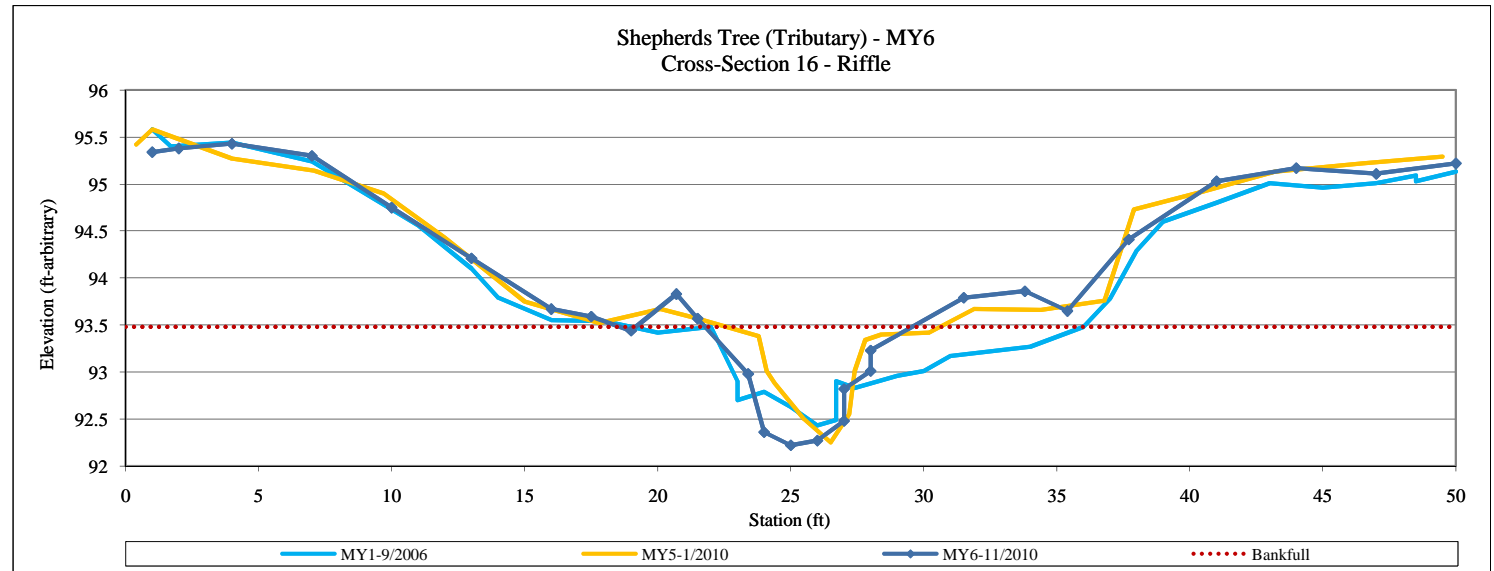


XS-16: View Upstream



XS-16: View Downstream

Station	Elevation	Notes
1	95.34	x16
2	95.38	x16
4	95.43	x16
7	95.3	x16
10	94.75	x16
13	94.21	x16
16	93.67	x16
17.5	93.59	x16
19	93.44	x16
20.7	93.83	x16
21.5	93.57	x16
23.4	92.98	x16
24	92.36	x16
25	92.22	x16
26	92.27	x16
27	92.48	x16
27	92.82	x16
28	93.01	x16
28	93.23	x16
31.5	93.79	x16
33.8	93.86	x16
35.4	93.65	x16
37.7	94.41	x16
41	95.03	x16
44	95.17	x16
47	95.11	x16
50	95.22	x16
50.1	95.23	x16





APPENDIX 5 WETLAND DATA ASSESSMENT

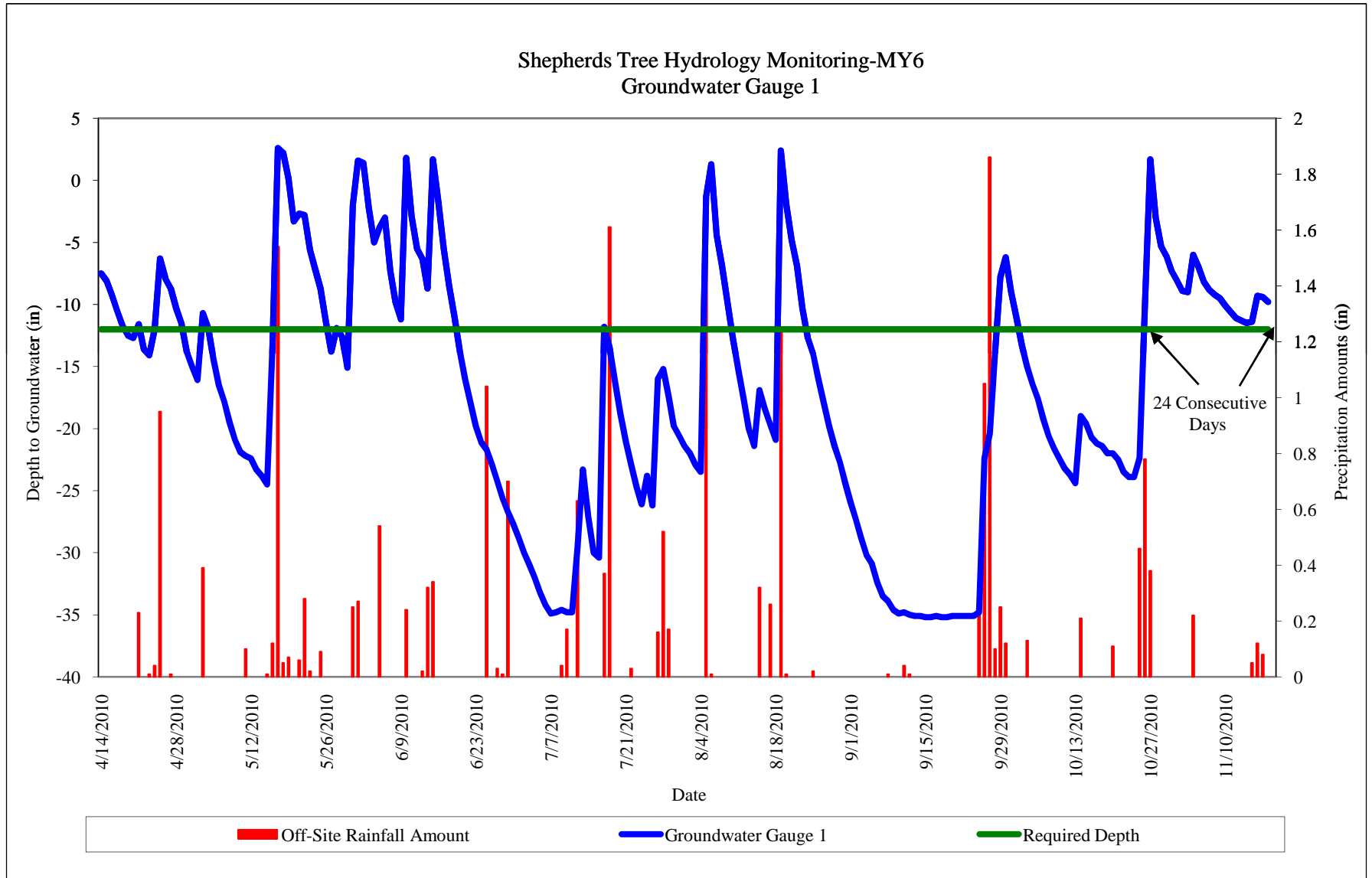
5.1 Precipitation – Water Level Plots for Gauges*

5.2 Wetland Criteria Attainment

*Raw data tables have been provided electronically.

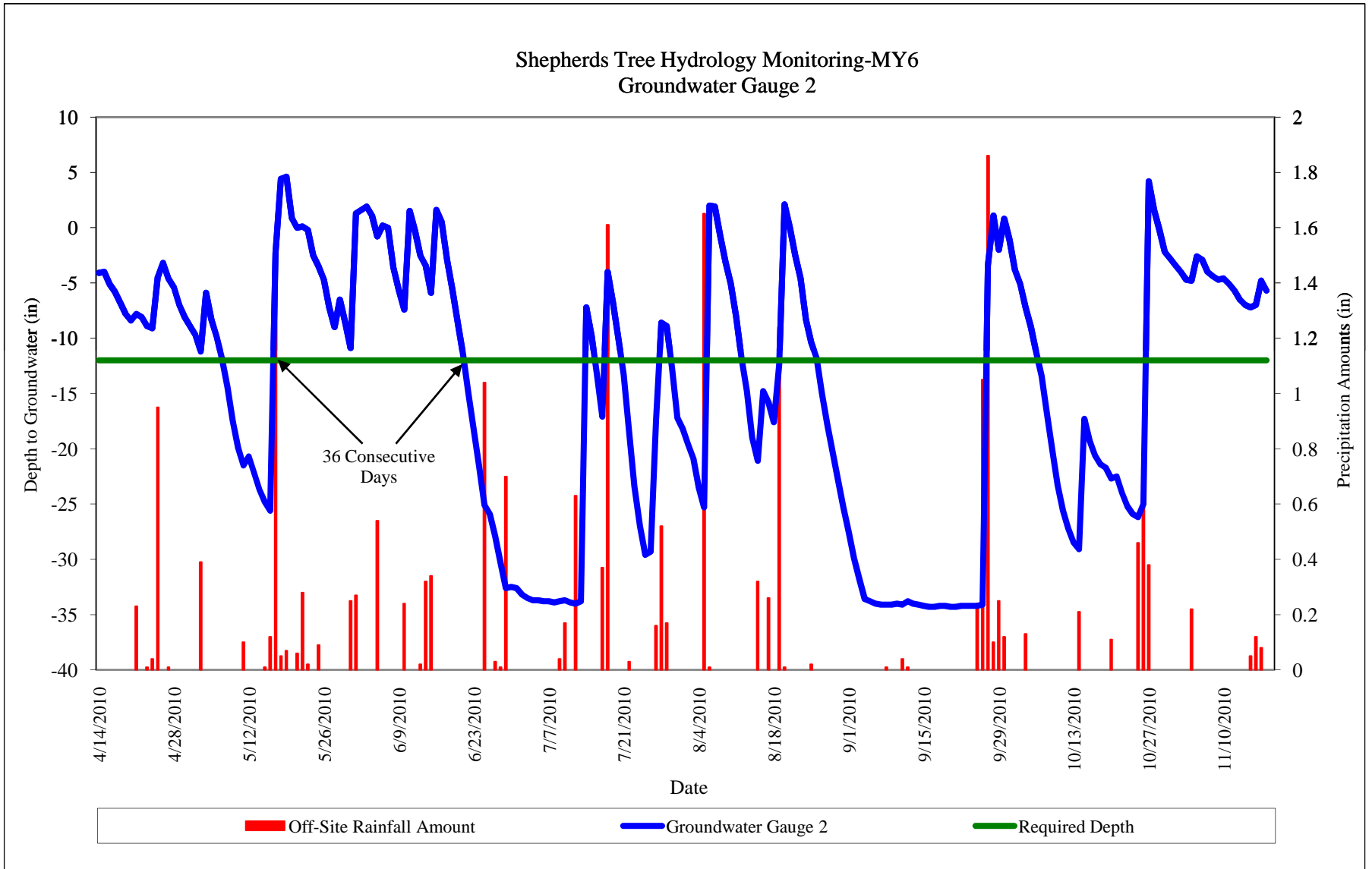
**Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6**

Growing Season: April 14-October 24



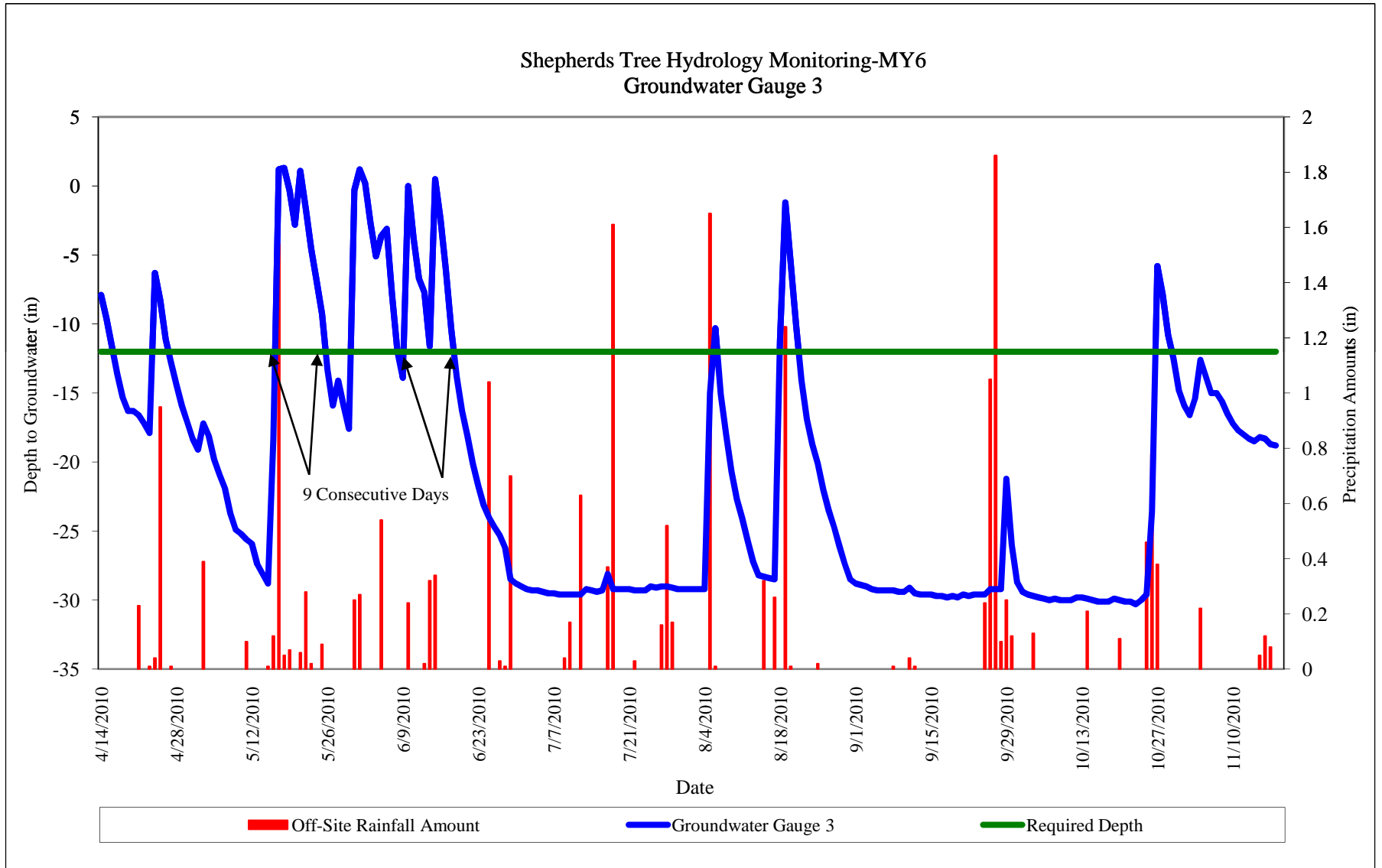
Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

Growing Season: April 14-October 24



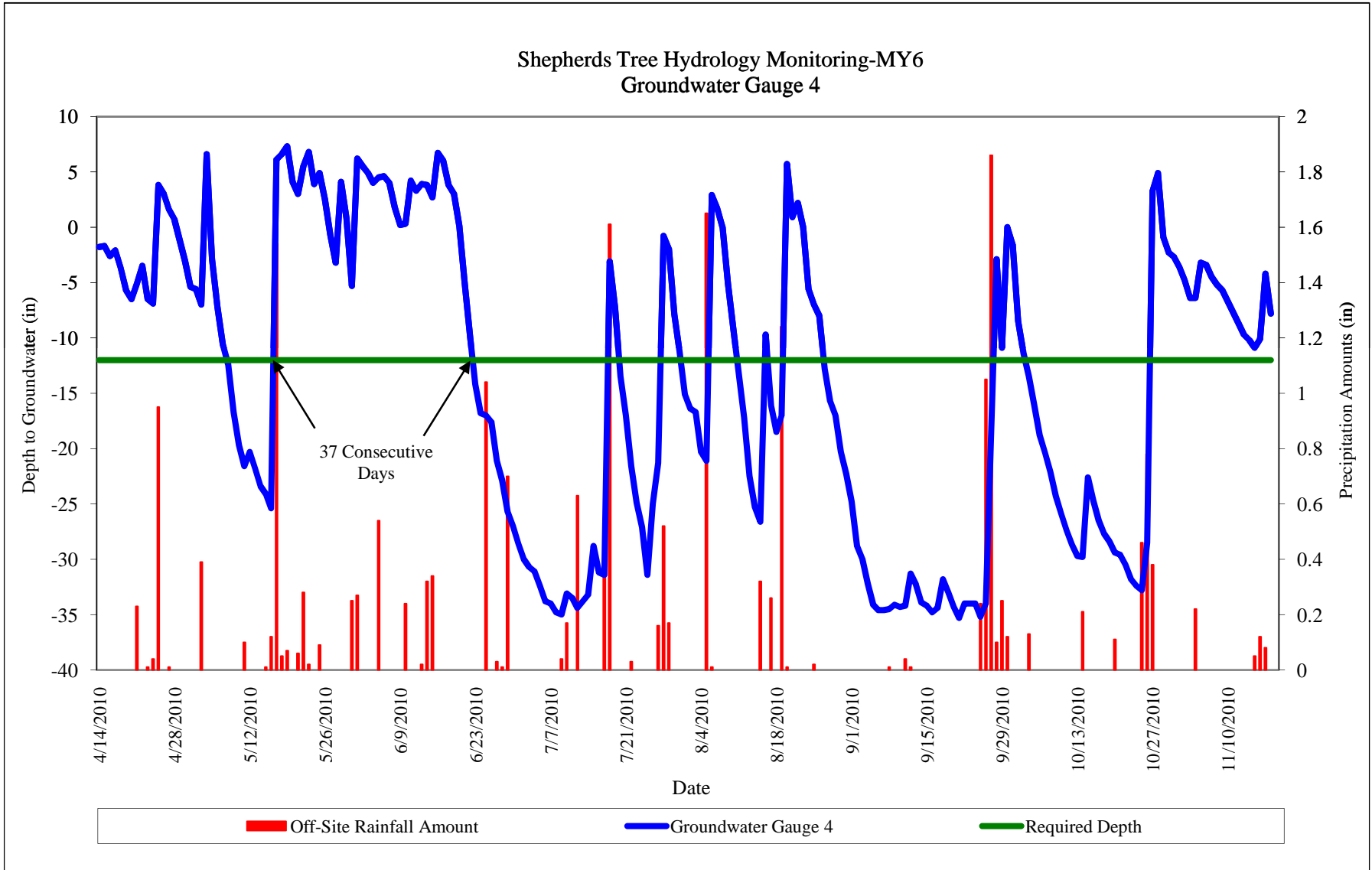
**Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6**

Growing Season: April 14-October 24



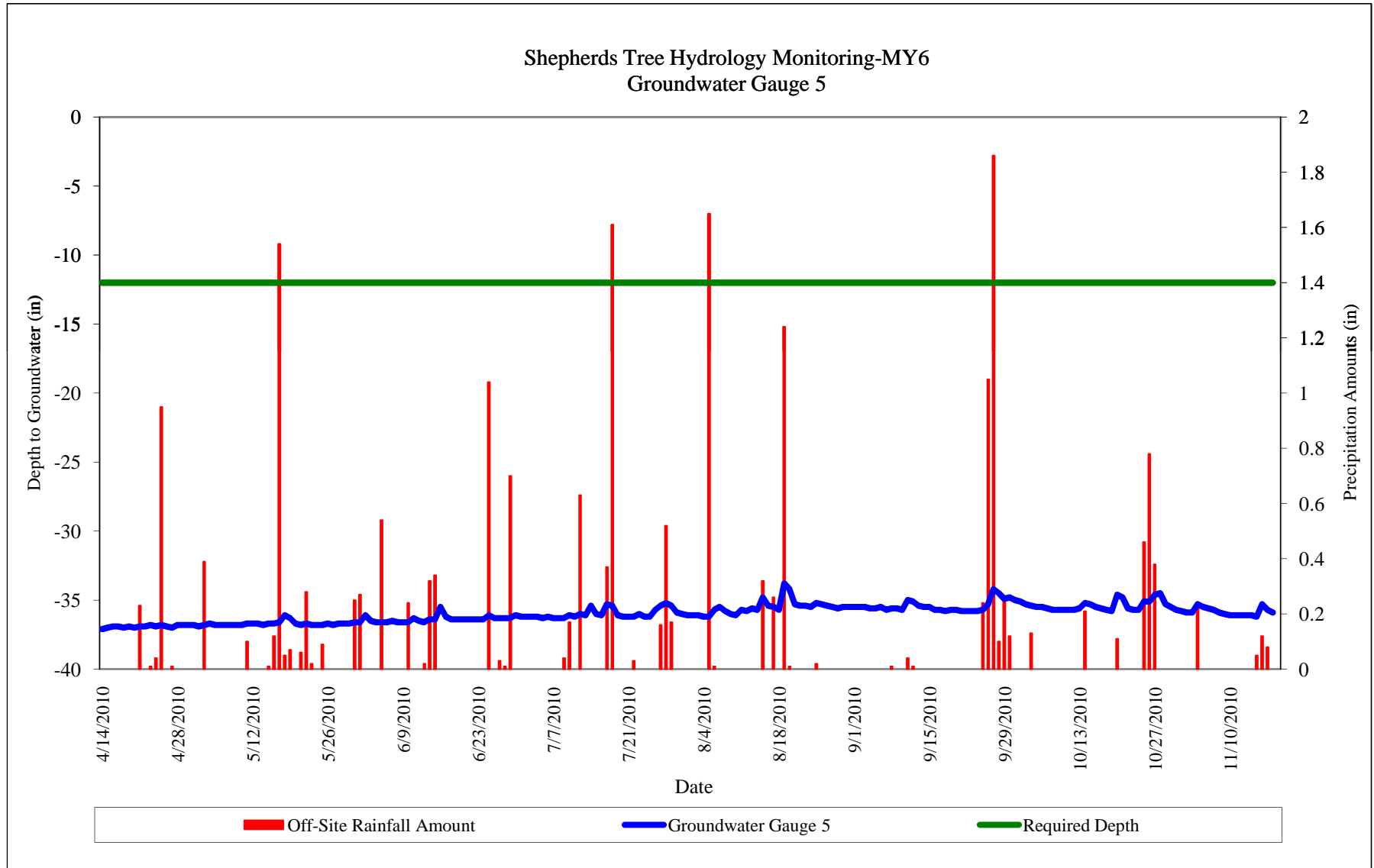
**Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6**

Growing Season: April 14-October 24



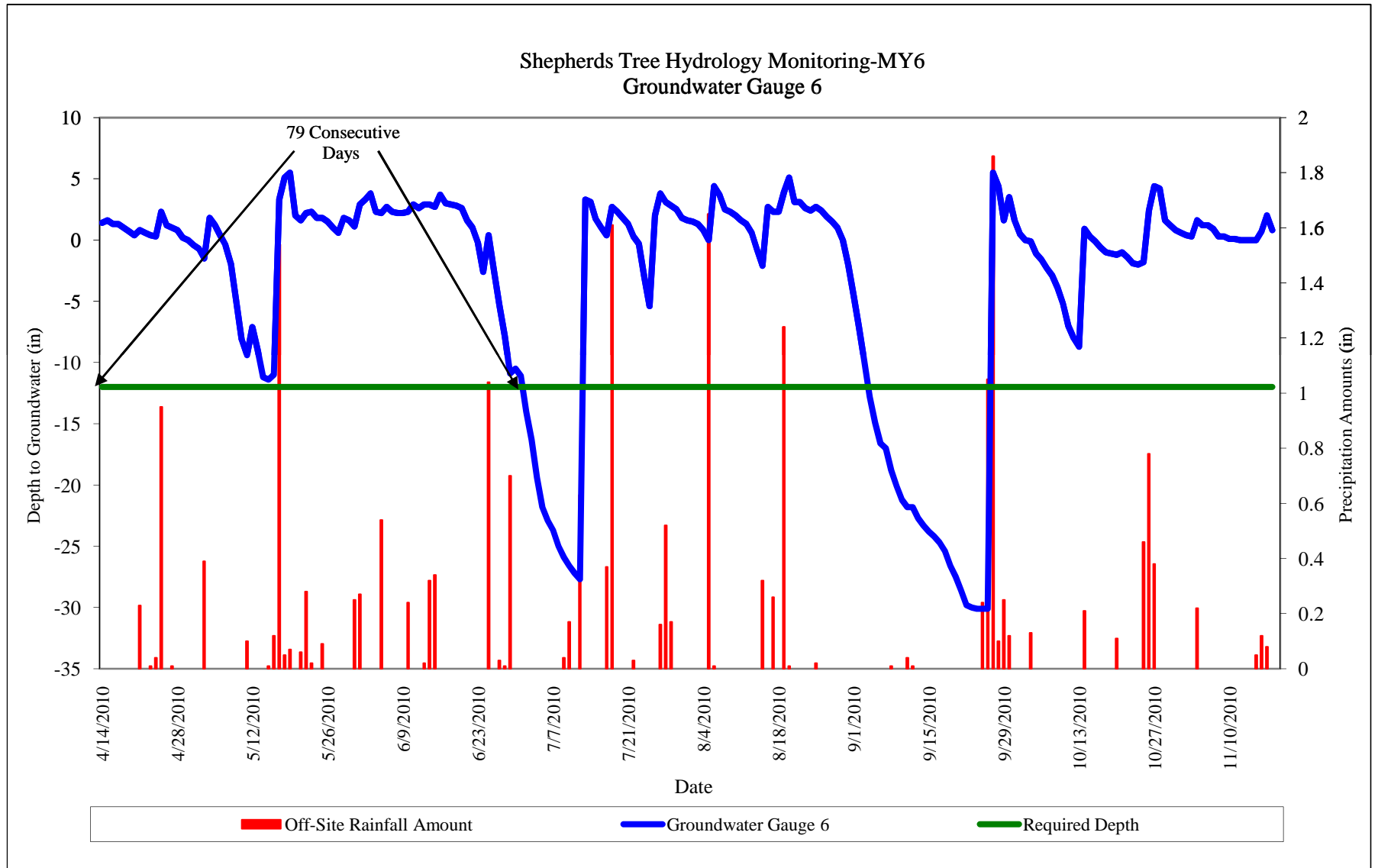
Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

Growing Season: April 14-October 24



Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

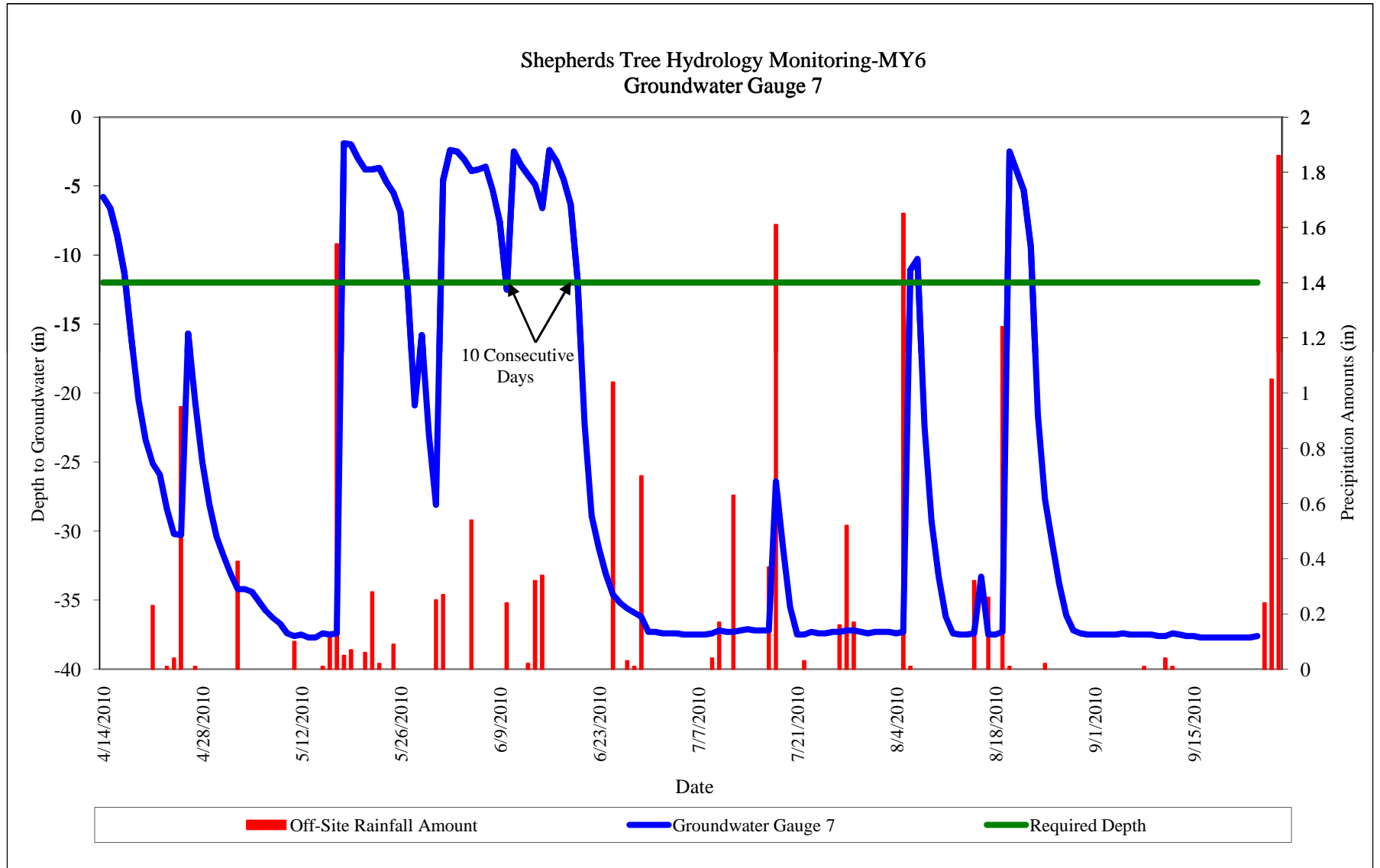
Growing Season: April 14-October 24



**Appendix 5.1 Precipitation - Water Level Plots for Gauges
 Shepherds Tree Stream and Wetland Restoration/EEP Project #333
 Monitoring Year 6**

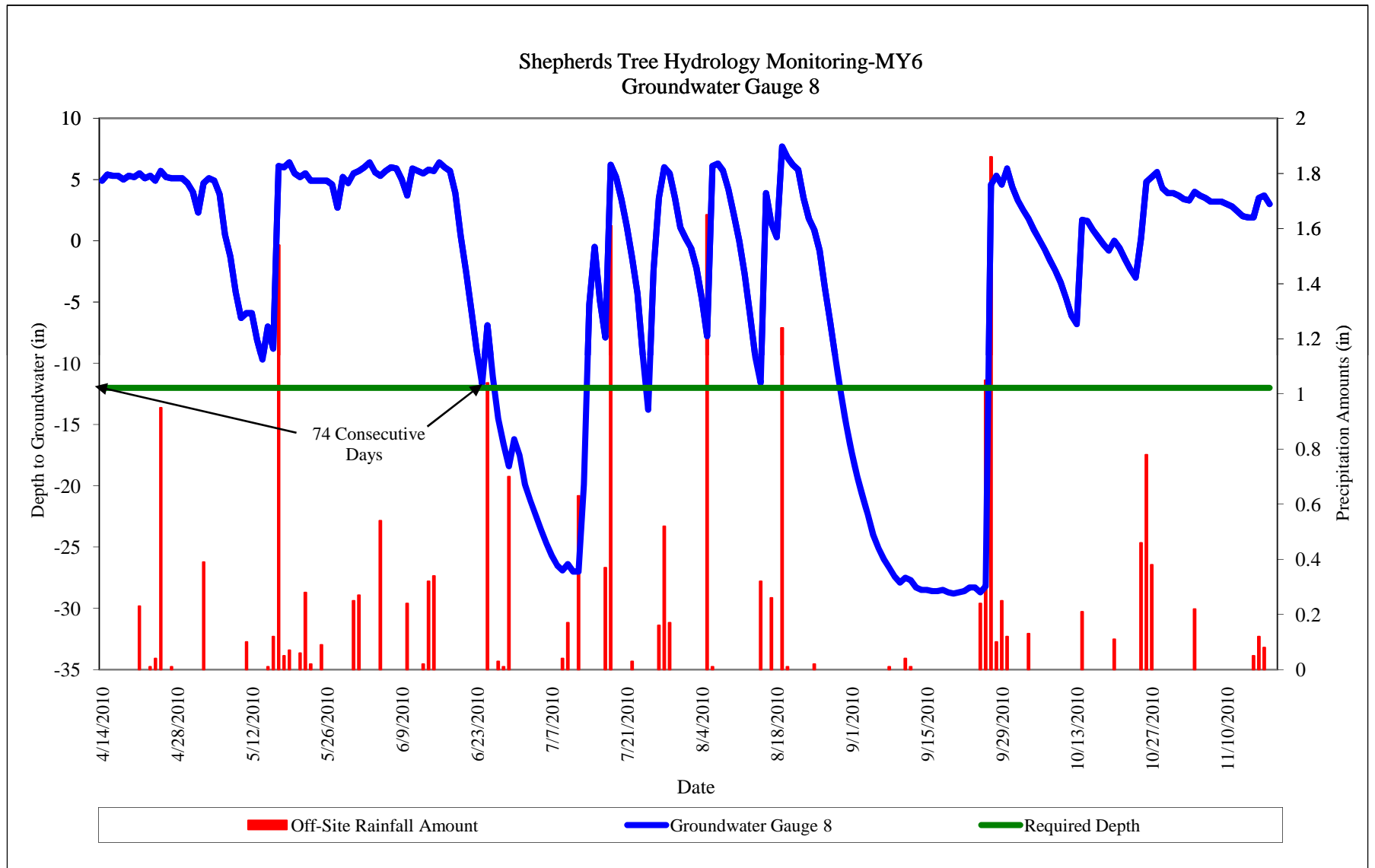
Growing Season: April 14-October 24

(Gauge malfunctioned 9/2010)



Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

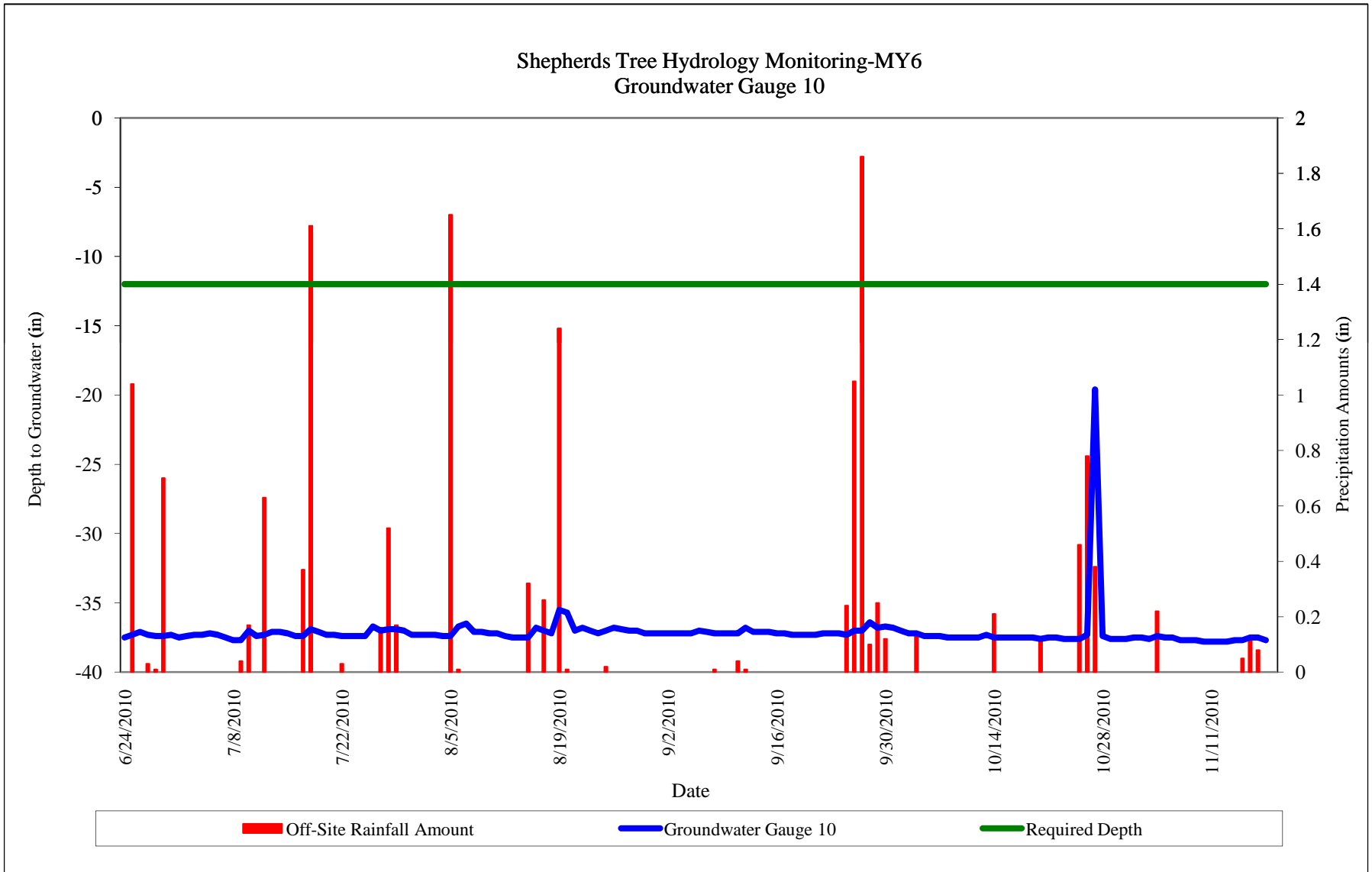
Growing Season: April 14-October 24



**Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6**

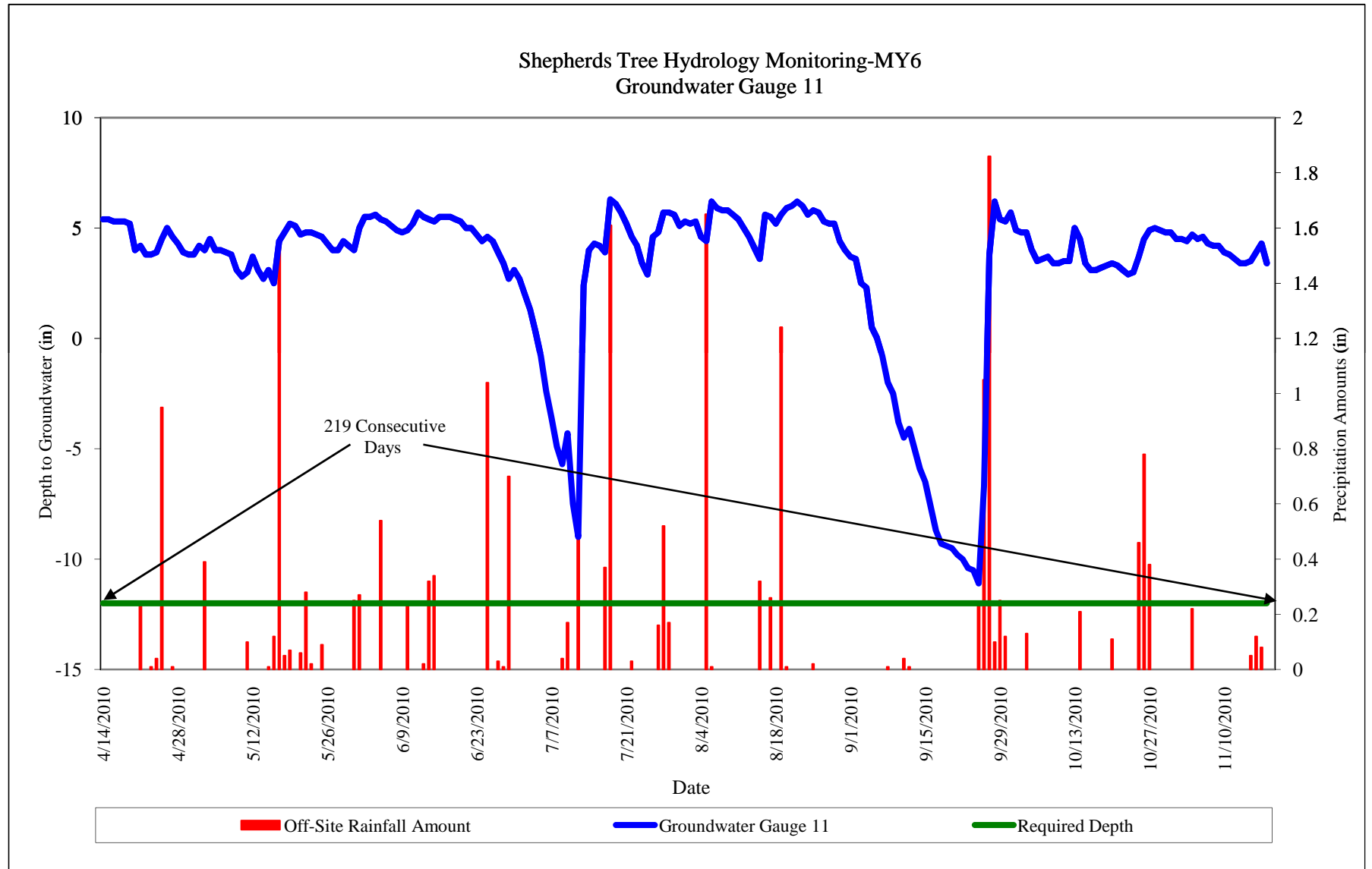
Growing Season: April 14-October 24

(Gauge malfunctioned at the beginning of the growing season prior to starting the 2010 monitoring)



Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

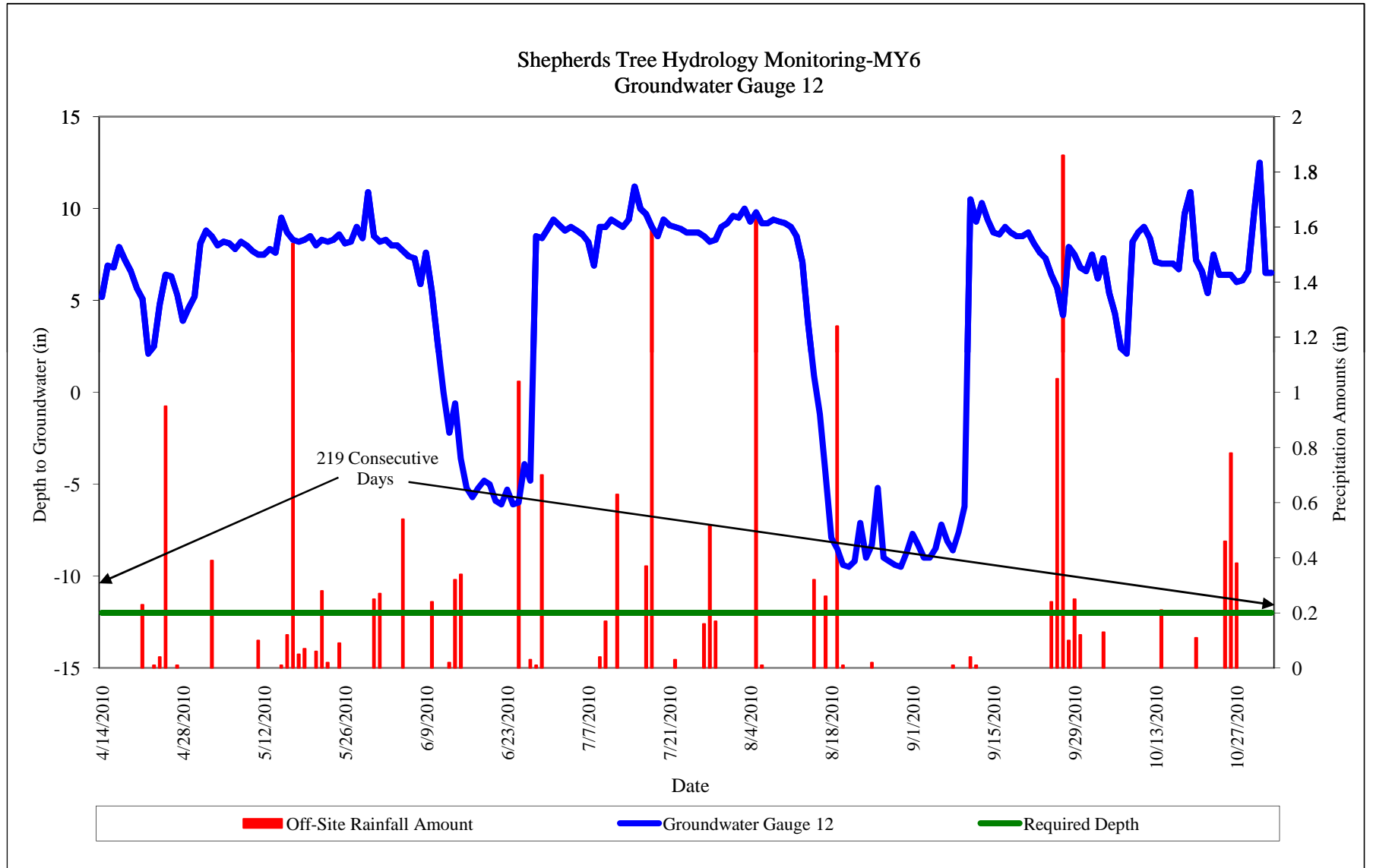
Growing Season: April 14-October 24



**Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6**

Growing Season: April 14-October 24

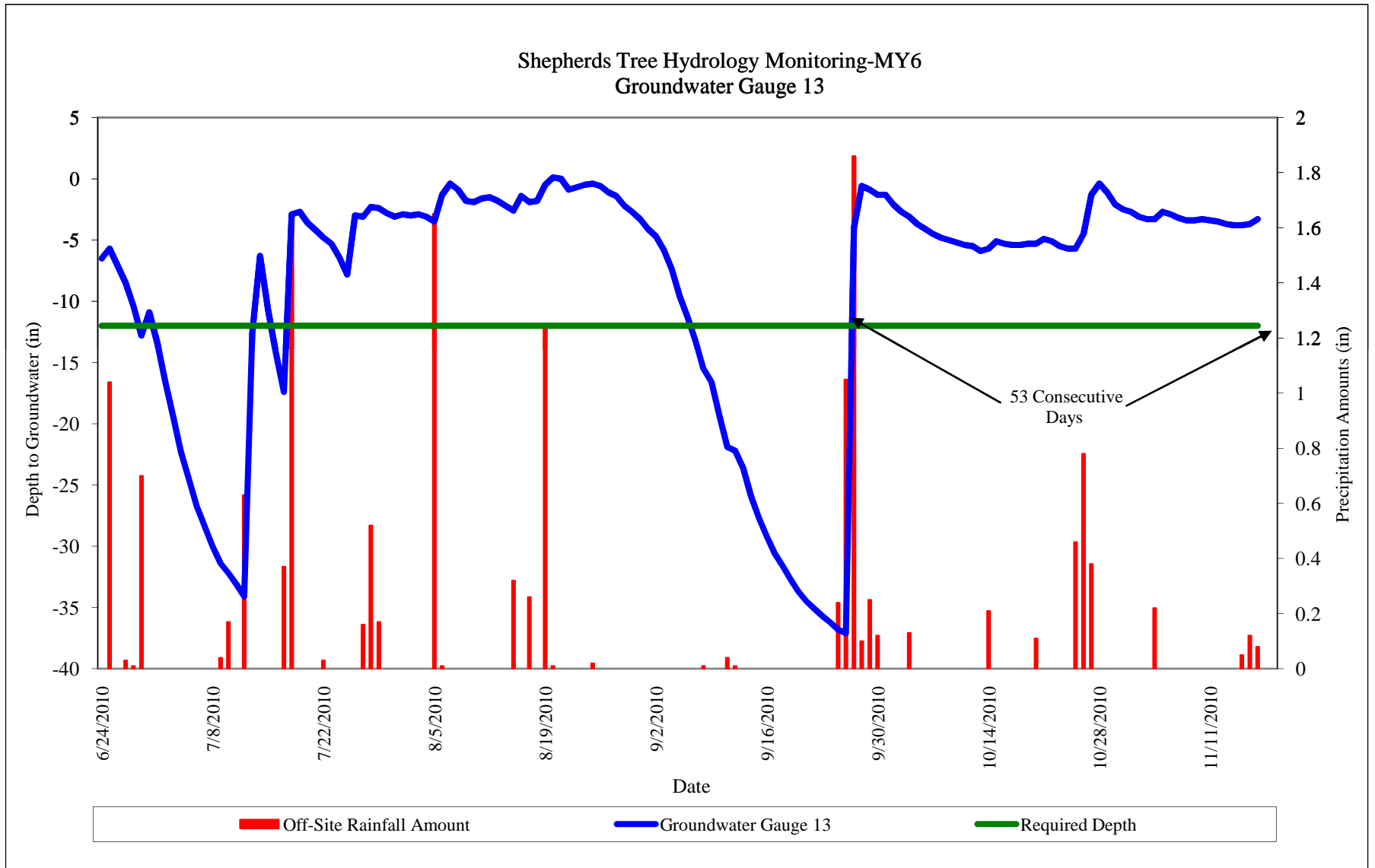
(Gauge malfunctioned 11/2010)



**Appendix 5.1 Precipitation - Water Level Plots for Gauges
 Shepherds Tree Stream and Wetland Restoration/EEP Project #333
 Monitoring Year 6**

Growing Season: April 14-October 24

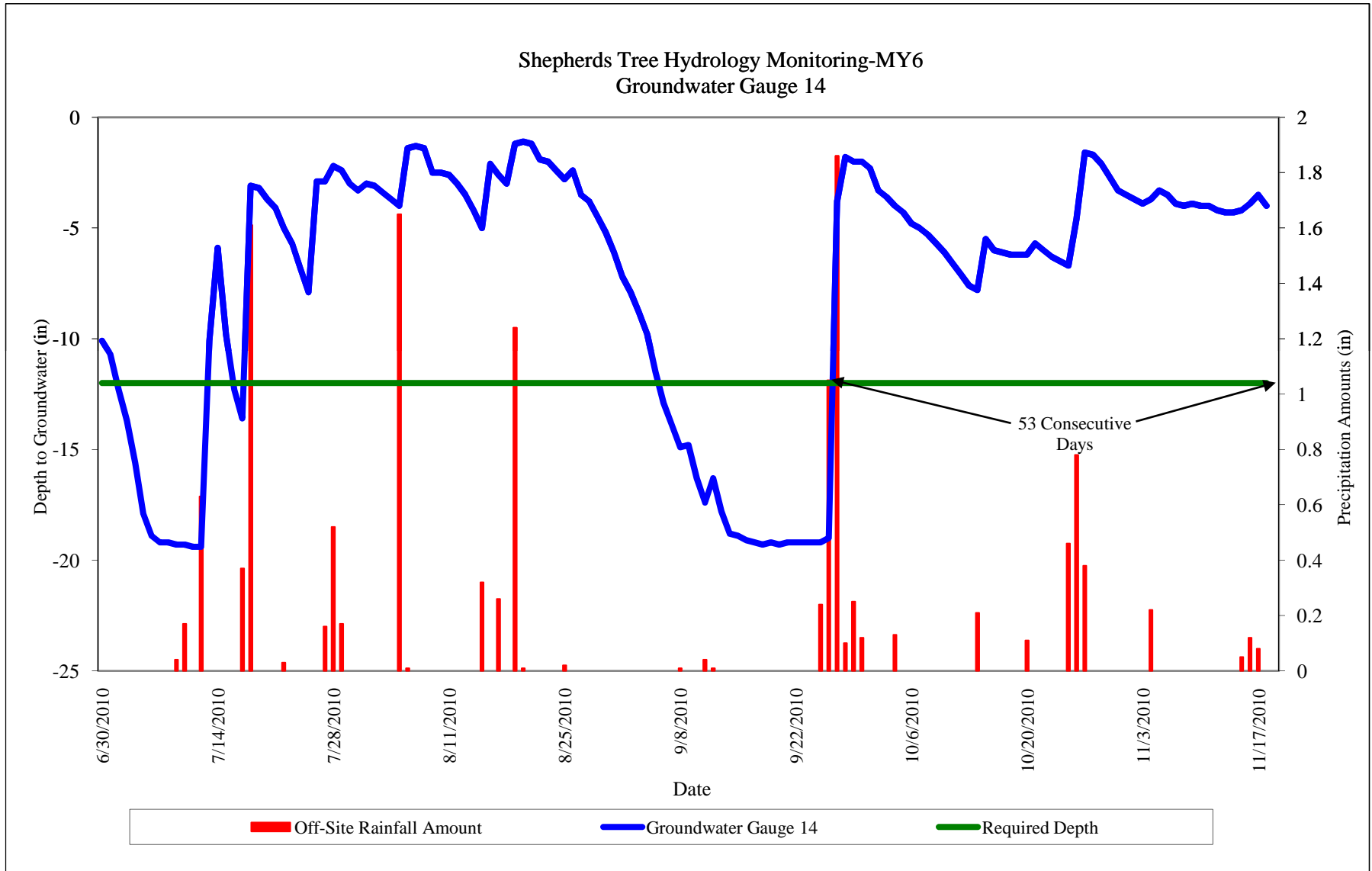
(Gauge malfunctioned at the beginning of the growing season prior to starting the 2010 monitoring)



**Appendix 5.1 Precipitation - Water Level Plots for Gauges
 Shepherds Tree Stream and Wetland Restoration/EEP Project #333
 Monitoring Year 6**

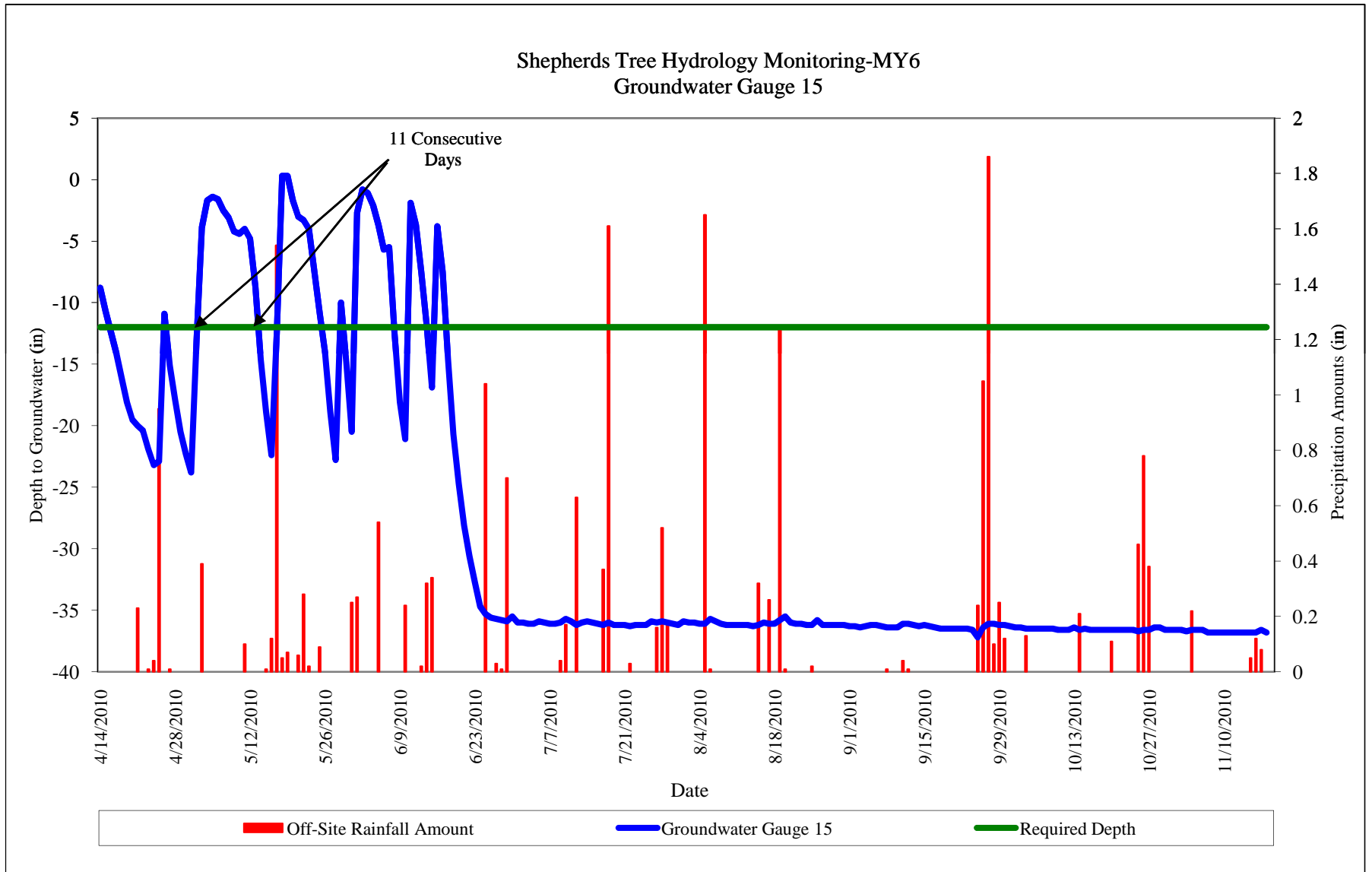
Growing Season: April 14-October 24

(Gauge malfunctioned at the beginning of the growing season prior to starting the 2010 monitoring)



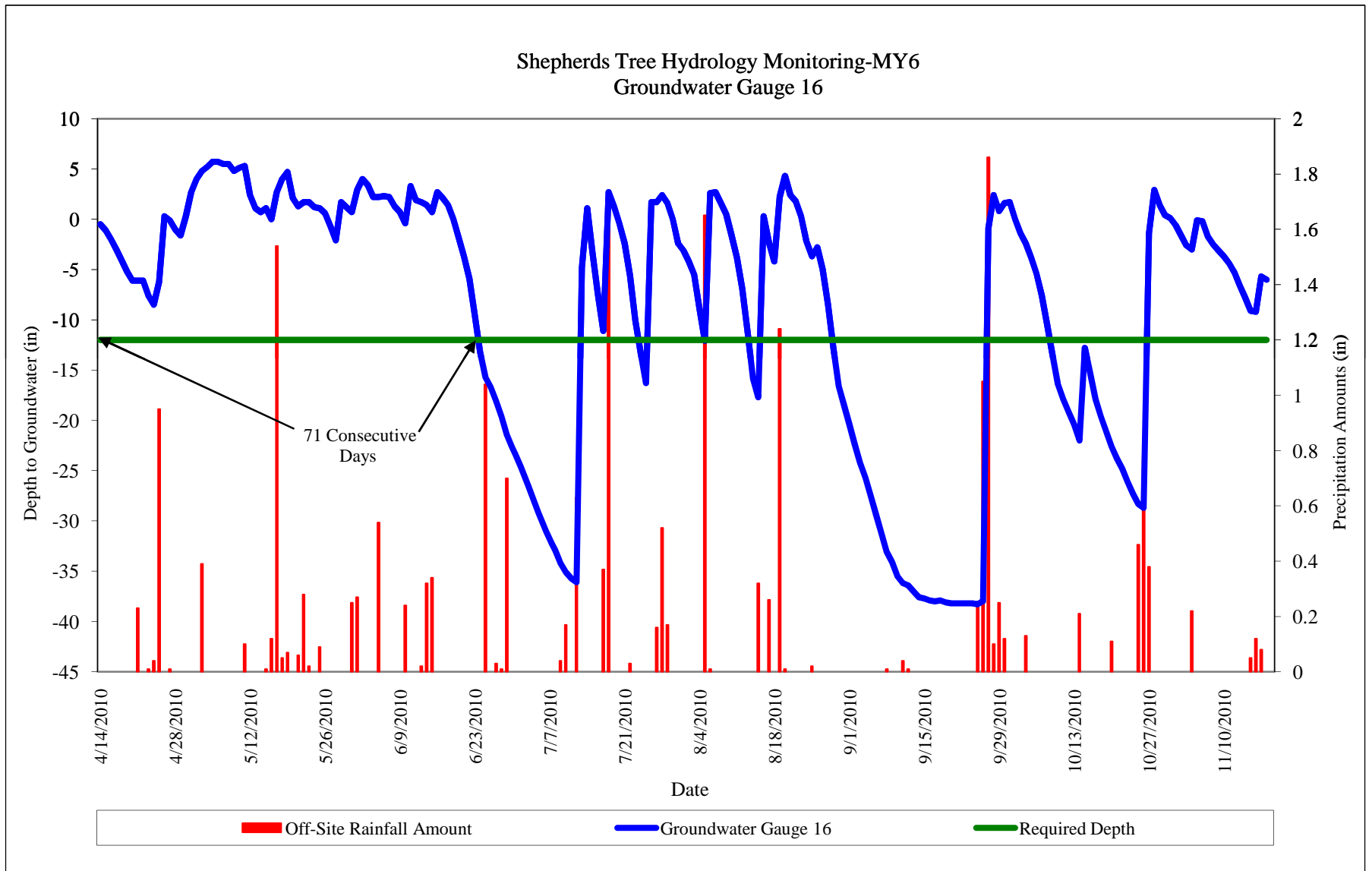
**Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6**

Growing Season: April 14-October 24



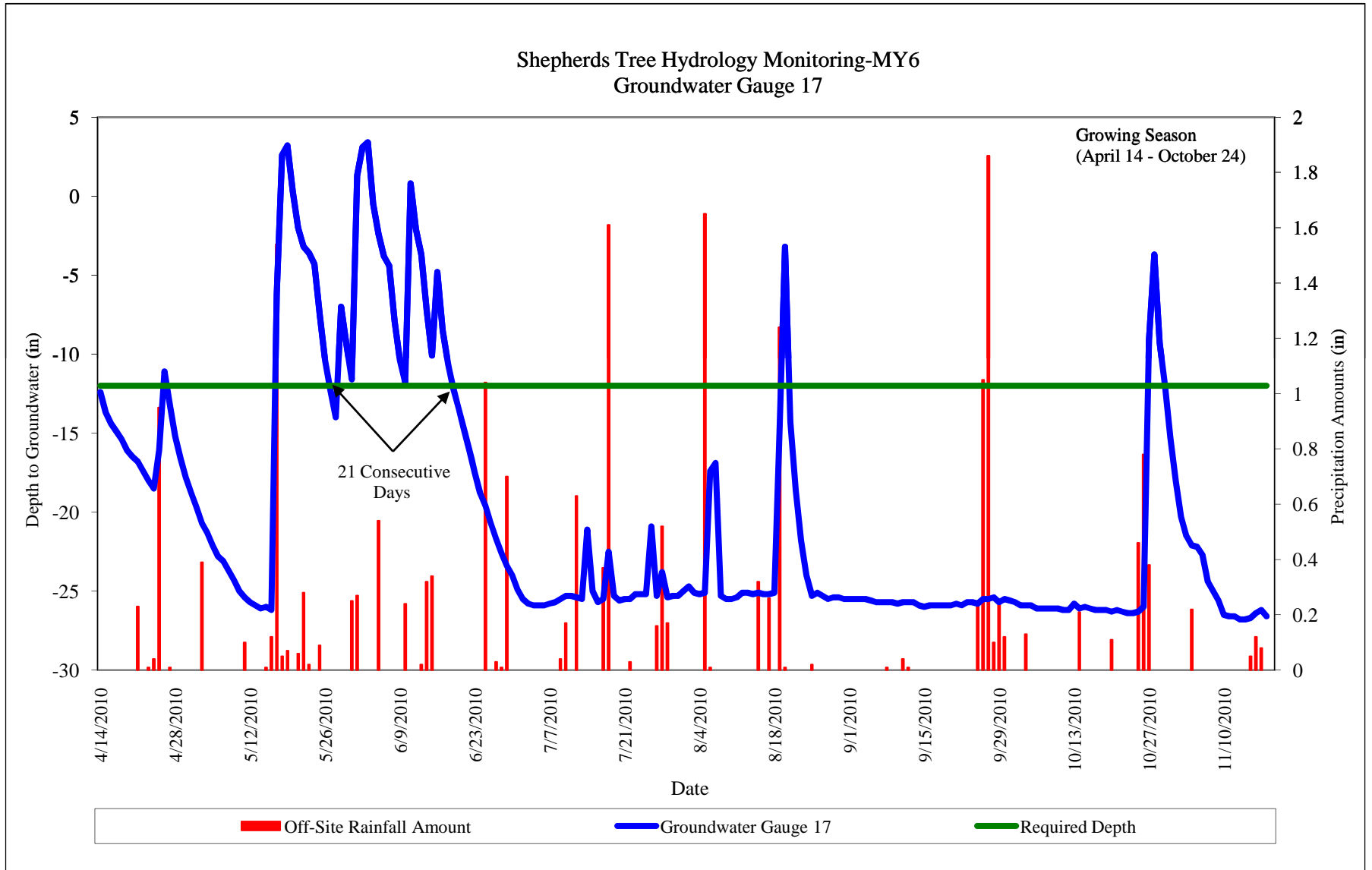
Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

Growing Season: April 14-October 24



Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6

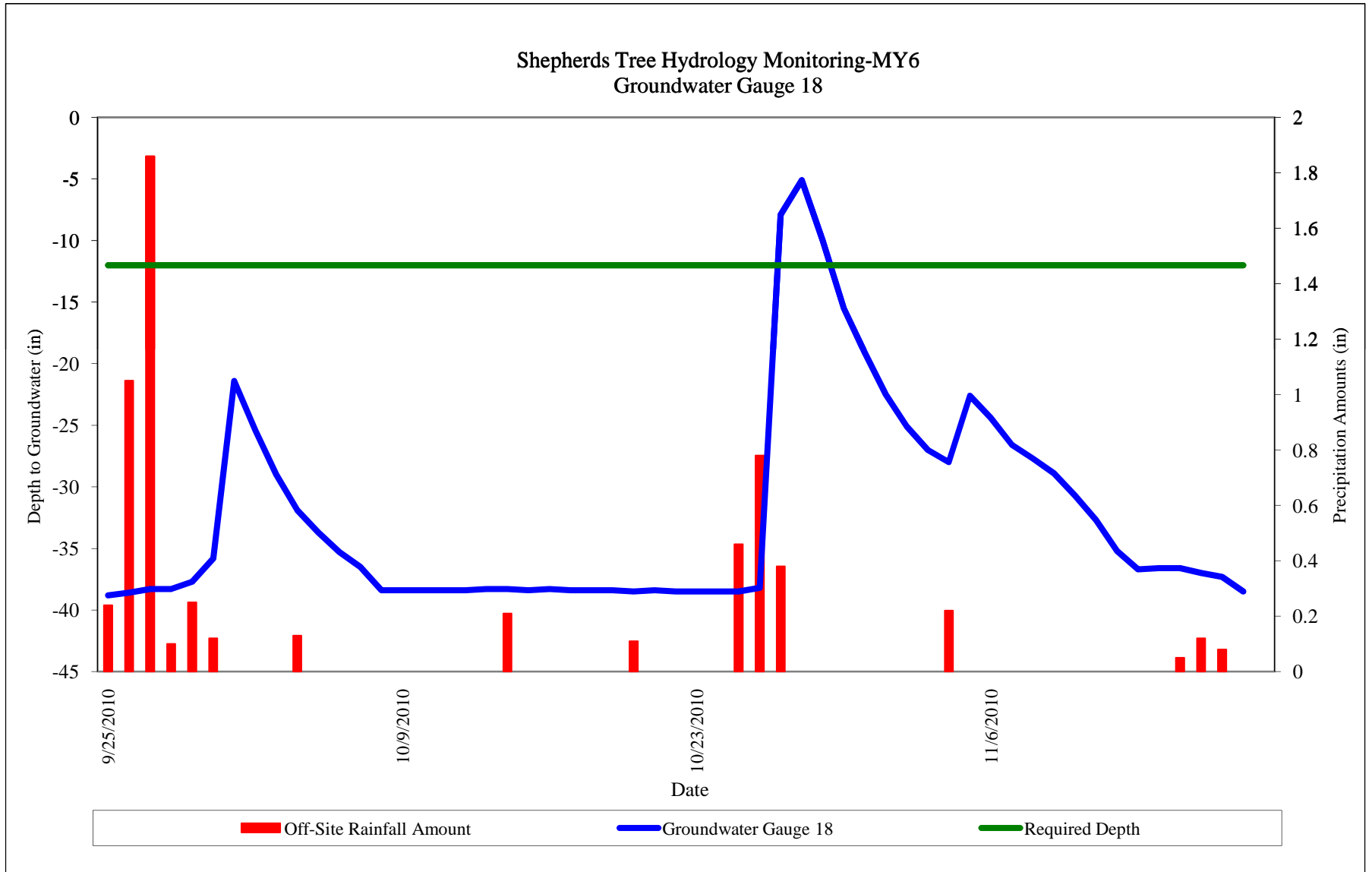
Growing Season: April 14-October 24



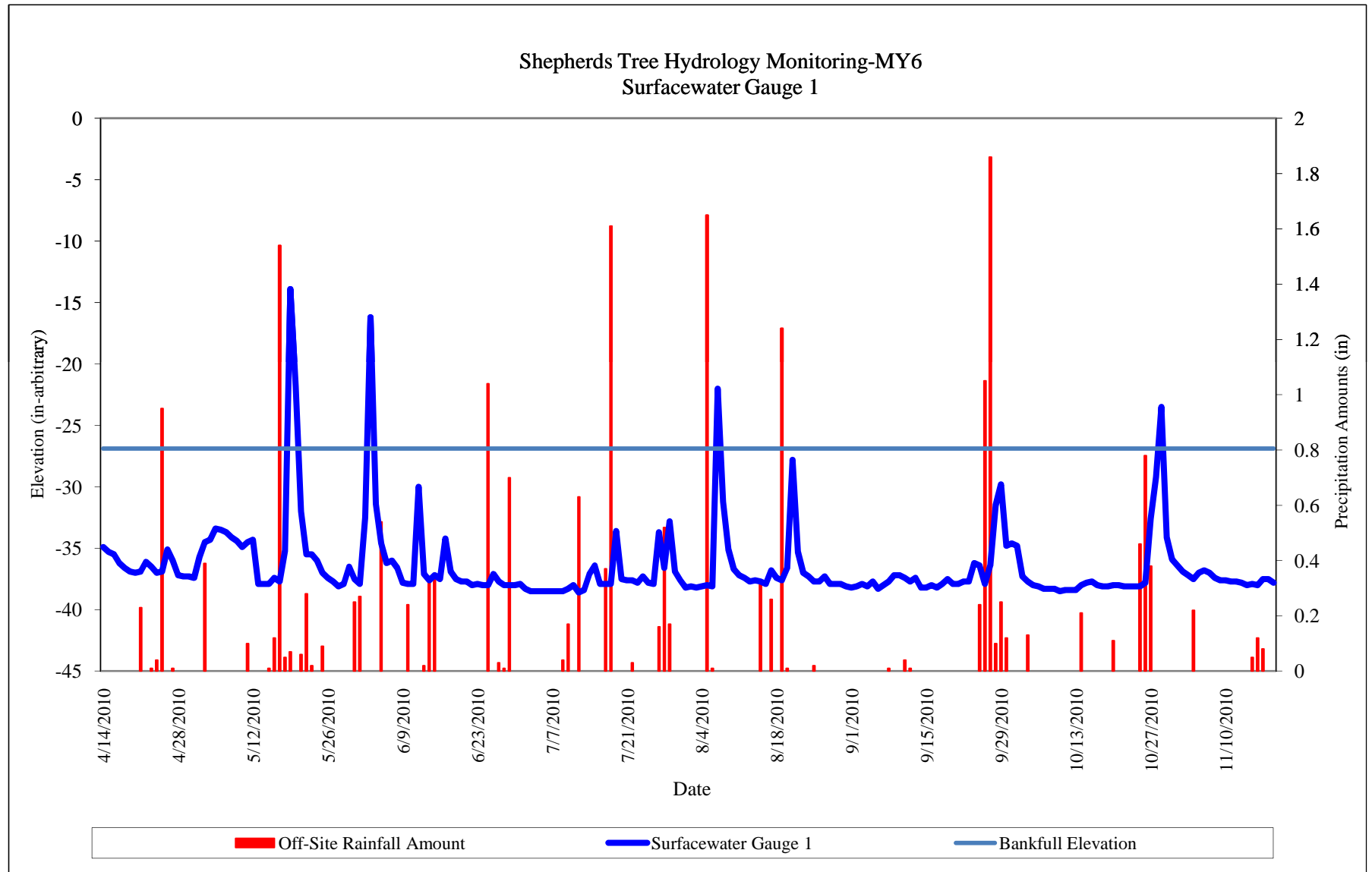
**Appendix 5.1 Precipitation - Water Level Plots for Gauges
 Shepherds Tree Stream and Wetland Restoration/EEP Project #333
 Monitoring Year 6**

Growing Season: April 14-October 24

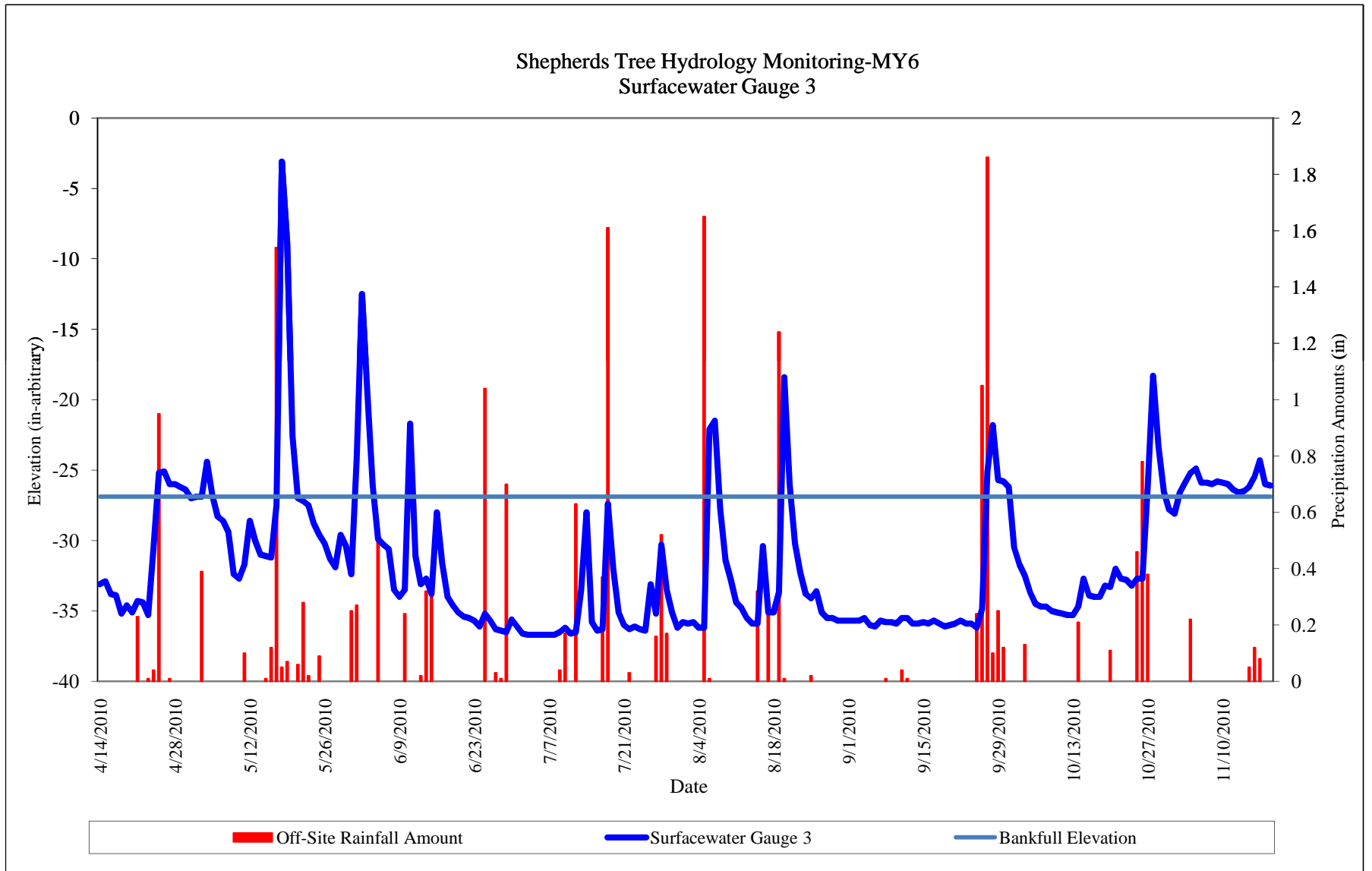
(Gauge malfunctioned at the beginning of the growing season prior to starting the 2010 monitoring; another malfunction or an incorrect calibration occurred in 7/2010 and 8/2010)



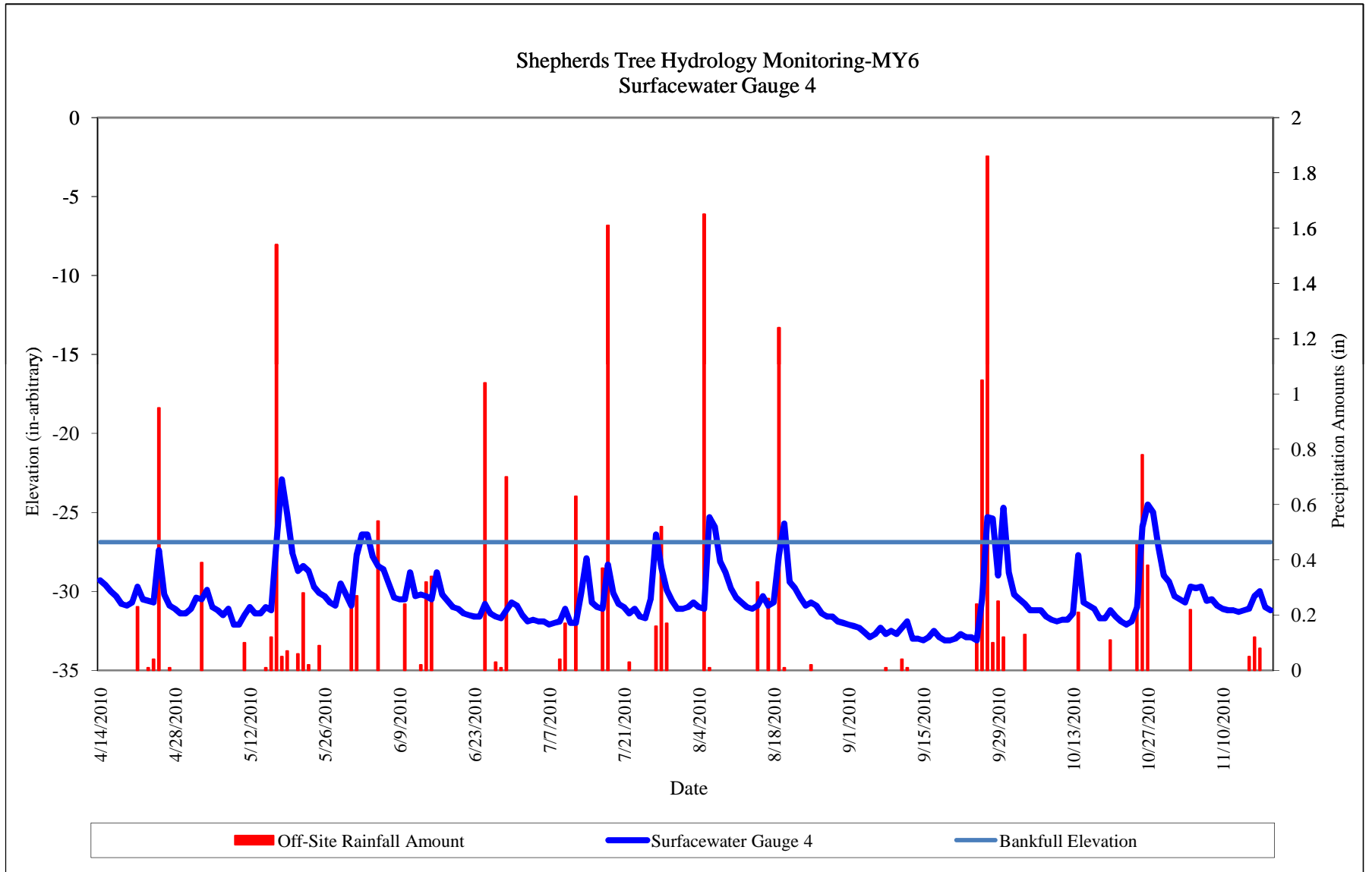
**Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6**



**Appendix 5.1 Precipitation - Water Level Plots for Gauges
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6**



**Appendix 5.1 Precipitation - Water Level Plots for Gauges
 Shepherds Tree Stream and Wetland Restoration/EEP Project #333
 Monitoring Year 6**



**Appendix 5.2 Wetland Criteria Attainment
Shepherds Tree Stream and Wetland Restoration/EEP Project #333
Monitoring Year 6**

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%)	
GW2	No	No/1 Days (1%)	No/0 Days (0%)	Yes/194 Days (100%)	Yes/29 Days (35%)	Yes/36 Days (52%)	
GW3	No	**	No/8 Days (4%)	Yes/20 Days (29%)	Yes/16 Days (24%)	No/9 Days (18%)	
GW4	Yes	Yes/25 Days (37%)	No/11 Days (6%)	Yes/46 Days (37%)	Yes/49 Days (51%)	Yes/37 Days (50%)	
GW5	No	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%)	
GW7	No	Yes/22 Days (32%)	No/11 Days (6%)	No/5 Days (12%)	Yes/15 Days (21%)	No/10 Days (23%)	
GW8	Yes	Yes/54 Days (78%)	Yes/33 Days (30%)	Yes/46 Days (66%)	Yes/81 Days (70%)	Yes/74 Days (79%)	
GW10	Yes	Yes/109 Days (86%)	No/4 Days (2%)	No/5 Days (8%)	No/4 Days (7%)	No/0 Days (0%)**	
GW11	Yes	Yes/194 Days (100%)	Yes/150 Days (77%)	Yes/194 Days (100%)	Yes/194 Days (100%)	Yes/219 Days (100%)	
GW12	Yes	Yes/94 Days (88%)	Yes/61 Days (49%)	Yes/61 Days (85%)^	Yes/87 Days (86%)	Yes/200 Days (93%)	
GW13	No	Yes/194 Days (100%)	Yes/47 Days (45%)	Yes/80 Days (90%)	Yes/81 Days (70%)	Yes/53 Days (76%)**	
GW14	Yes	Yes/194 Days (100%)	Yes/46 Days (44%)	Yes/67 Days (89%)	Yes/80 Days (60%)	Yes/53 Days (75%)**	
GW15	No	Yes/194 Days (100%)	No/9 Days (5%)	Yes/161 Days (87%)	No/12 Days (16%)	Yes/11 Days (16%)	
GW16	No	Yes/194 Days (100%)	No/3 Days (3%)	Yes/160 Days (86%)	Yes/21 Days (42%)	Yes/71 Days (68%)	
GW17	N/A	No/4 Days (8%)	No/3 Days (2%)	No/5 Days (8%)	Yes/19 Days (18%)	Yes/21 Days (16%)	
GW18	N/A	No/11 Days (18%)	No/8 Days (4%)	No/13 Days (16%)	No/9 Days (16%)	No/5 Days (1%)^^	

*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 malfunctioned 10/7/2008, replaced 11/2008.

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

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