Monitoring Report

Stanley's Slough Stream and Wetland Restoration Site
DMS Contract 004635
DMS Project Number 95356

Stanley's II Wetland Restoration Site
DMS Contract 5151
DMS Project Number 95838

Monitoring Year 03

Prepared for:

NCDMS, 1652 Mail Service Center, Raleigh, NC 27699-1652

Construction Completed: April 2014
Data Collection: 2016
Submitted: December 2016

Design and Monitoring Firm

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1.0 EXECUTIVE SUMMARY / PROJECT ABSTRACT

The Stanley's Slough Stream and Wetland Restoration Site (SSS) was completed in April 2014 and restored a total of 4,274 linear feet of headwater stream along with restoring 3.6 acres of riparian wetlands. The SSS is a headwater stream and riparian wetland system in the Chowan River Basin (03010204 8-digit HUC) in northern Northampton County, North Carolina, that had been substantially modified to maximize agricultural production. The Stanley's II Wetland Restoration Site (SII) is located directly adjacent to SSS and was also completed in April 2014, restoring a total of 7.6 acres of riparian wetland restoration. The completed SII project restored, enhanced, and protected wetlands within a productive headwater stream/wetland system.

The SSS is protected by a 17.6-acre permanent conservation easement, while SII is protected by a 9.4-acre permanent conservation easement, both held by the State of North Carolina. Both sites are located on two parcels located off of Margarettsville Road, approximately 0.3 mile north of Margarettsville, North Carolina. The project sites are bounded by NC 186 to the south and by agricultural land on all other sides. The sites have a long history of hydrologic modification in order to allow for farming to take place on the property.

The Chowan River Basin Restoration Priorities state the goals for the SSS and SII's 14-digit HUC are to protect and improve water quality throughout the basin by reducing sediment and nutrient inputs into streams and rivers and to support efforts to restore local watersheds (NCDENR EEP, 2009). The project goals for SSS and SII are in line with the basin priorities and include the following:

- Restore streams and riparian buffers to provide shade and temperature control and increase instream woody debris for habitat.
- Restore and protect sensitive aquatic resources to improve habitat and species diversity through the restoration of wetlands, streams, and riparian buffers.
- Implement wetland and stream restoration projects that reduce sources of nutrient pollution and surface runoff by restoring hydrology and vegetation, stabilizing banks, and restoring natural geomorphology where appropriate.

Additional goals for the project include:

- Increase the local hydroperiod by encouraging both surface and subsurface storage and retention.
- Restore and establish a functional and diverse headwater stream/wetland community.

The project goals will be addressed through the following objectives:

- Restore a headwater stream/wetland vegetation community through maintenance and germination of volunteer wetland vegetation from adjacent seed sources, planting of native trees and shrubs, and incorporation of a custom native seed mix.
- Elevate the local groundwater table through the elimination of lateral drainage ditches and modification of existing channelized streams.
- Reconnect site hydrology to historic flow paths.

The mitigation at SSS included approximately 4,274 linear feet of stream restoration, 3.6 acres of riparian wetland restoration, and 0.5 acre of wetland preservation for a total of 4,274 Stream Mitigation Units and 3.1 Wetland Mitigation Units. The mitigation at SII included approximately 7.6 acres of riparian wetland restoration for a total of 6.9 Wetland Mitigation Units.

2.0 MONITORING RESULTS

2.1 Vegetation Monitoring Results

The vegetation monitoring success criterion for the planted mitigation area is a density of 320 stems/acre after the third year of monitoring and an allowance for 10% mortality in the following years for a stem density of 288 stems/acre after four years, 260 stems/acre after five years, and 210 stems/acre after seven years to be considered successful. To determine the success of the planted mitigation area, twenty permanent vegetation monitoring plots (10 by 10 meters) have been established in the mitigation area at locations that represent all site conditions. Eleven of these plots are in SSS and nine of these are in SII. The site's average density for this monitoring period was 1,052 planted stems/acre. All twenty plots had greater than 320 planted stems/acre. Including volunteers, the site averaged 1,275 total stems/acre. In April 2016, KCI performed a supplemental planting of the site to address areas of low stem density due to prolonged inundation. Gallon and bare root size *Taxodium distichum* and bare root size *Nyssa biflora* were planted throughout the stream rehabilitation portion of the site in areas that have extended periods of standing water.

The CVS-EEP protocol, Level 2 (Lee, et al., 2008) was used to collect vegetation data from the site. The vegetation monitoring was completed on August 19, 2016.

2.2 Hydrology Monitoring Results

Twelve groundwater monitoring gauges were installed in the wetland mitigation areas to measure soil saturation and any surface ponding at the site. Four of these gauges are in SSS and eight of these are in SII. The soil survey for Northampton County estimates that the growing season begins March 11 and ends November 20 (254 days). The success criteria for the site states that the water table of the restored wetlands must be within 12" of the soils surface continuously for at least 9% (22 days) of the 254-day growing season during normal weather conditions. A "normal" year is based on NRCS climatological data for Northampton County, and using the 30th to 70th percentile thresholds as the range of normal, as documented in the USACE Technical Report "Accessing and Using Meteorological Data to Evaluate Wetland Hydrology" (Sprecher and Warne, 2000).

The daily rainfall data was obtained from a local weather station in Emporia, VA; provided by the NC State Climate Office. For the 2016-year, the months of February, June, and September experienced an above average rainfall, while April, May, and October experienced average rainfall. The months of January, March, July, August, and November recorded below average rainfall for the site. Overall, the area experienced average rainfall during the 2016 growing season.

During the site's third growing season, eleven of the twelve gauges met the success criterion. The gauge that did not meet the success criterion is Gauge 17, which had a continuous saturation percentage of 8.0%. This gauge is located in SII.

2.3 Headwater Stream Performance

SSS will also be monitored to document the development of the headwater stream system. The success criteria for the headwater stream states that it will have continuous surface water flow within the valley, for at least 30 consecutive days annually. Additionally, the stream must show signs of supporting the restored channel form as documented with photos. These indicators may include evidence of scour, sediment deposition and sorting, multiple flow events, wrack lines and flow over vegetation, leaf litter, or water staining.

In the headwater stream, six automatic recording gauges were installed to document the presence of surface water within the restored channel. Weirs were constructed just downstream of three (Gauges 2, 3 and Gauge 18) of these gauges to provide a known elevation at which the stream could be considered flowing. Using these elevations as the basis for flow, all three gauges achieved at least 30 consecutive days of flow. Gauges 2 and 3 (on T1) averaged 170 consecutive days of flow between them and Gauge 18 (on T2) achieved 101 consecutive days of flow. See Appendix D, Photo 2 for an example of these weirs.

Summary information/data related to the occurrence of items such as 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 and in the Mitigation Plan documents available on the DMSs website. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

3.0 REFERENCES

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2 (http://cvs.bio.unc.edu/methods.htm)

NCDENR, Ecosystem Enhancement Program. 2009. Chowan River Basin Restoration Priorities 2009. Raleigh, NC. http://www.nceep.net/services/restplans/FINAL_RBRP_Chowan_2009.pdf

Sprecher, S. W., and Warne, A. G. (2000). "Accessing and Using Meteorological Data to Evaluate Wetland Hydrology," ERDC/EL TR-WRAP-00-1, U.S. Army Engineer Research and Development Center, Vicksburg, MS.USACE. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

USACE. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

United States Department of Agriculture. 1994. Soil Survey of Northampton County, North Carolina. USDA, NCDENR, SCS. http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/north_carolina/NC131/0/northampton.pdf

Appendix A

Project Vicinity Map and Background Tables

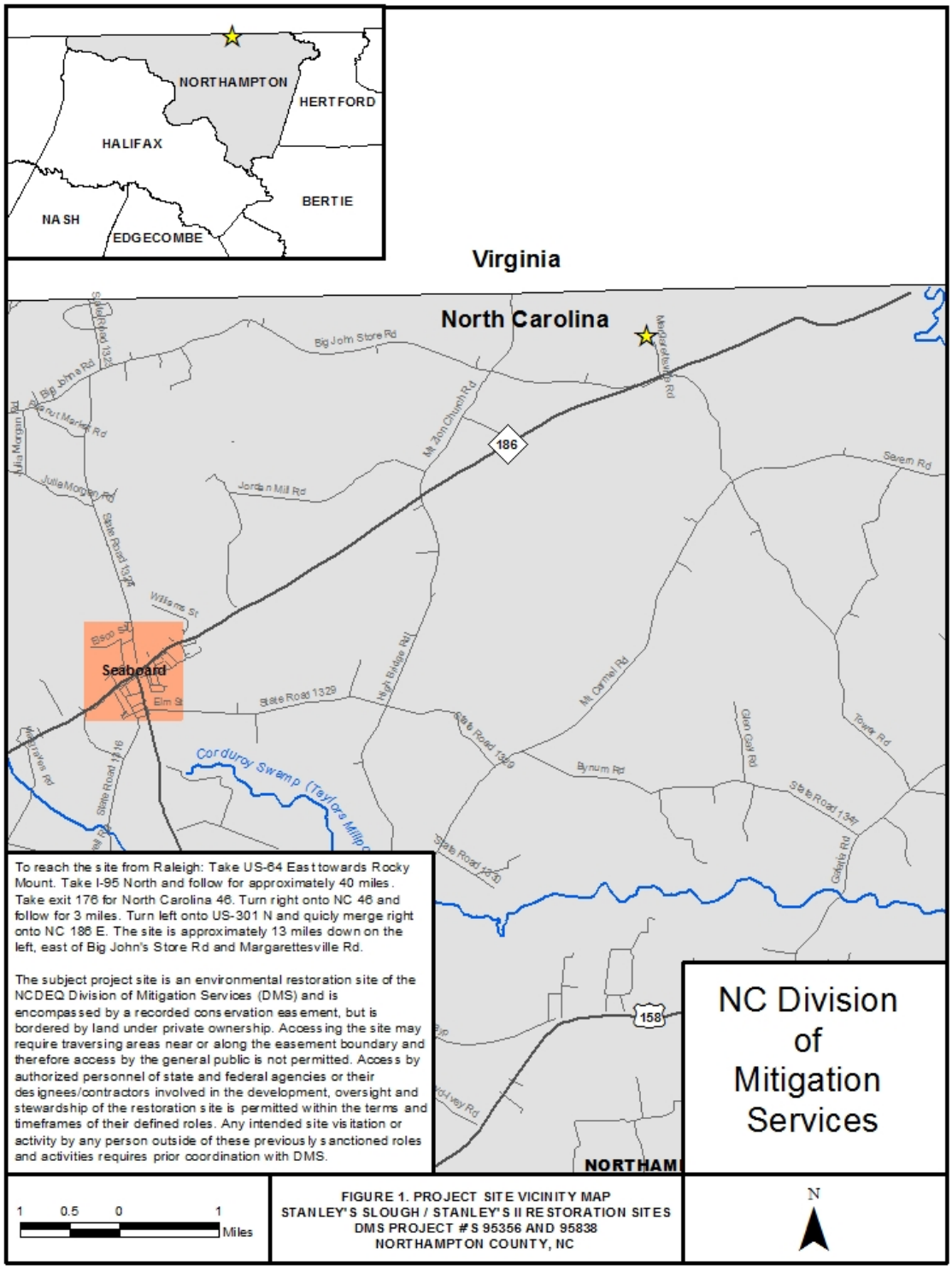


FIGURE 1. PROJECT SITE VICINITY MAP
STANLEY'S SLOUGH / STANLEY'S II RESTORATION SITES
DMS PROJECT #'S 95356 AND 95838
NORTHAMPTON COUNTY, NC

Table 1a. Project Components and Mitigation Credits
Stanley's Slough Restoration Site, DMS Project #95356

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Length	4,274		3.600						
Credits	4,274		3.120						
TOTAL CREDITS	4,274		3.120						

Project Components

Project Component -or- Reach ID	Stationing/ Location	Existing Footage/ Acreage	Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	Restoration Footage/Acreage	Mitigation Ratio
T1	10+00 – 41+55	2,600	Headwater Stream Valley	Restoration	3,054	1:1
T2	50+00 – 62+85	1,220	N/A	Restoration	1,220	1:1
Wetland Reestablishment				Restoration	2.800	1:1
Wetland Rehabilitation				Restoration	0.800	2.5:1
Wetland Preservation				N/A	0.500	NA

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetlands (Acres)	Non-Riparian Wetlands (Acres)	Buffer (square feet)	Upland (Acres)
Restoration	4,274	3.600			
Enhancement I					
Enhancement II					
TOTAL SMU	**4,274**				
TOTAL WMU		**3.120**			

Table 1b. Project Components and Mitigation Credits
Stanley's Slough II Restoration Site, DMS Project #95838

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Length			7.600						
Credits			6.940						
TOTAL CREDITS									

Project Components

Project Component -or- Reach ID	Stationing/ Location	Existing Footage/ Acreage	Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	Restoration Footage/Acreage	Mitigation Ratio
Wetland Reestablishment				Restoration	6.500	1:1
Wetland Rehabilitation				Restoration	1.110	2.5:1

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetlands (Acres)		Non-Riparian Wetlands (Acres)	Buffer (square feet)	Upland (Acres)	
		Riverine	Non-Riverine				
Restoration		-	7.600				
Enhancement I							
Enhancement II							
TOTAL WMU			**6.940**				

Table 2. Project Activity & Reporting History Stanley's Slough & Stanley's II Restoration Sites		
Activity or Report	**Data Collection Complete**	**Actual Completion or Delivery**
Mitigation Plan		Aug 13
Final Design - Construction Plans		Oct 13
Construction		April 14
Planting		April 14
Baseline Monitoring/Report	April/May 14	May 14
Year 1 Monitoring	Oct 14	Dec 14
Year 2 Monitoring	July 15	Dec 15
Supplemental Planting		April 16
Year 3 Monitoring	July 16	Dec 16

Table 3. Project Contacts Stanley's Slough & Stanley's Slough II Restoration Sites	
Design Firm	KCI Associates of North Carolina, PA 4505 Falls of Neuse Rd. Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512 Fax: (919) 783-9266
Construction Contractor	Wright Contracting, LLC 160 Walker Road Lawndale, NC 28090 Contact: Mr. Stephen James Phone: (704) 692-4633
Planting Contractor	Forestree Management Co. 1280 Maudis Road Bailey, NC 27807 Contact: Mr. Tony Cortez Phone: (252) 243-2513
Monitoring Performers	
MY00 – MY03	KCI Associates of North Carolina, PA 4505 Falls of Neuse Rd. Suite 400 Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

Table 4a. Project Information			
Stanley's Slough Restoration Site, DMS Project #95356			
Project Name	Stanley's Slough Restoration Site		
County	Northampton County		
Project Area (acres)	17.6 acres		
Project Coordinates (lat. and long.)	36.539006 N, -77.348222 W		
Project Watershed Summary Information			
Physiographic Province	Coastal Plain		
River Basin	Chowan		
USGS Hydrologic Unit 8-digit	03010204	**USGS Hydrologic Unit 14-digit**	03010204180040
DWQ Sub-basin	03-01-02		
Project Drainage Area (acres)	113 acres		
Project Drainage Area Percentage of Impervious Area	<1%		
CGIA Land Use Classification	43.7% forested land, 33.8% rangeland, 22.5% agriculture		

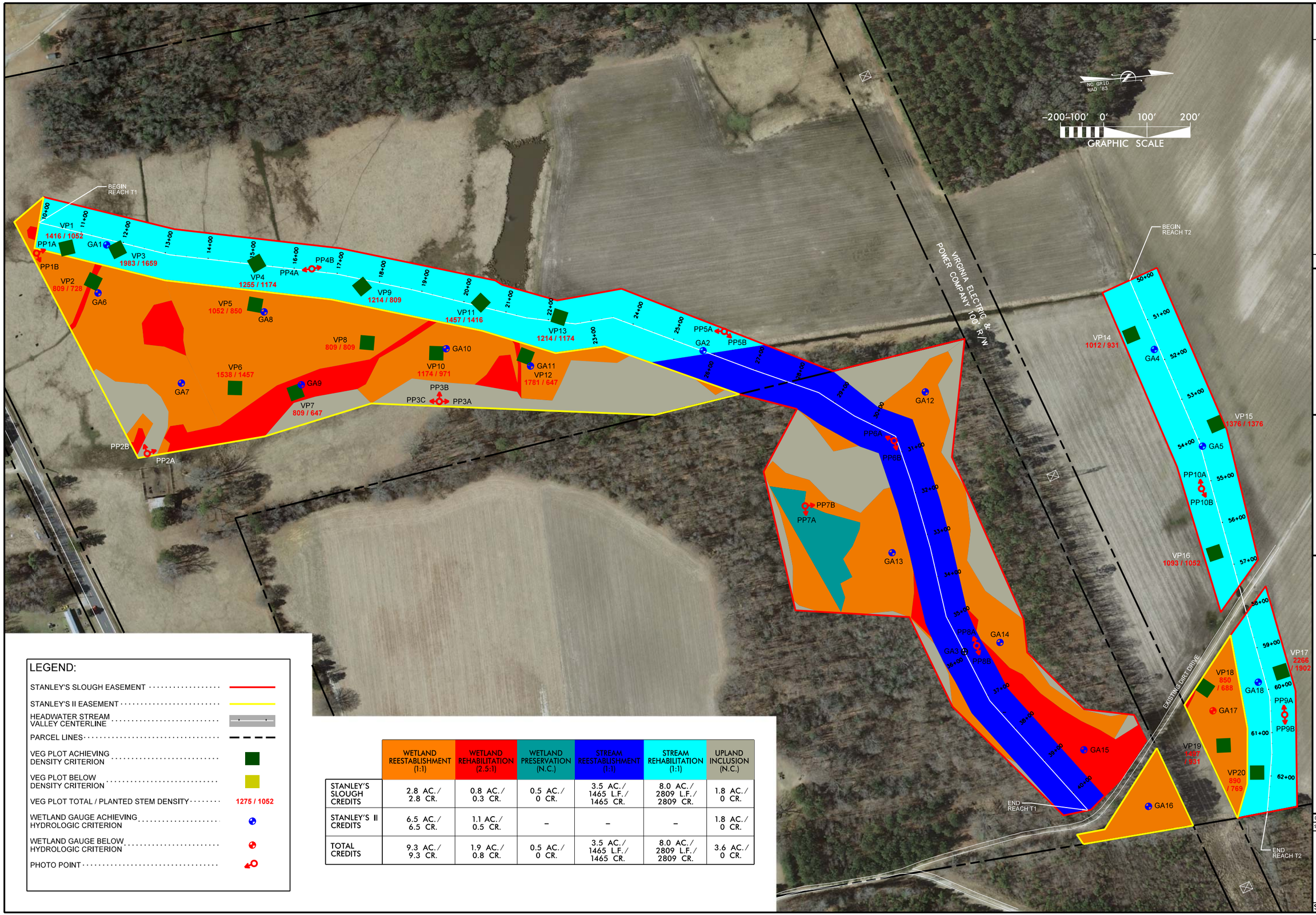
Reach Summery Information (Post Restoration)		
Parameters	**T1**	**T2**
Length of reach (linear feet)	3,054	1,220
Valley classification	Valley Type X	Valley Type X
Drainage area (acres)	84 acres	29 acres
NCDWQ Water Quality Classification	Project Reach Not Classified; Receiving water = Meherrin River (C; NSW)	Project Reach Not Classified; Receiving water = Meherrin River (C; NSW)
Morphological Description (stream type)	Headwater Stream Valley	Headwater Stream Valley
Evolutionary trend	Channelized	Channelized
Mapped Soil Series	Tomotley, Roanoke, Altavista, Wehadkee	Altavista, Roanoke
Drainage class	Poorly drained, poorly drained, moderately well drained, poorly drained	Moderately well drained, poorly drained
Soil Hydric status	Hydric	Hydric
Slope	0.2%	0.06%
FEMA classification	Zone X, parts in Zone AE(backwater of Meherrin River)	Zone X, parts in Zone AE (backwater of Meherrin River)
Native vegetation community	Headwater Forest Community	Headwater Forest Community
Percent composition of exotic invasive vegetation	0%	0%

Wetland Summary Information (Post Restoration)	
Parameters	
Size of Wetland (acres)	3.6 acres
Wetland Type	Riparian
Mapped Soil Series	Roanoke and Tomotley
Drainage class	Poorly drained
Soil Hydric Status	Hydric
Source of Hydrology	Hillside seepage and precipitation
Hydrologic Impairment	Ditching and Cattle damage
Native vegetation community	Headwater Forest Community
Percent composition of exotic invasive vegetation	0%

Table 4b. Project Information			
Stanley's II Restoration Site, DMS Project #95838			
Project Name	Stanley's II Restoration Site		
County	Northampton County		
Project Area (acres)	9.4 acres		
Project Coordinates (lat. and long.)	34.922569 N , -77.319871 W		
Project Watershed Summary Information			
Physiographic Province	Coastal Plain		
River Basin	Chowan		
USGS Hydrologic Unit 8-digit	03010204	**USGS Hydrologic Unit 14-digit**	03010204180040
DWQ Sub-basin	03-01-02		
Project Drainage Area (acres)	80 acres		
Project Drainage Area Percentage of Impervious Area	<1%		
CGIA Land Use Classification	53.0% forested land, 34.9% rangeland, 12.1% agriculture		
Wetland Summary Information (Post Restoration)			
Parameters			
Size of Wetland (acres)	7.6 acres		
Wetland Type	Riparian		
Mapped Soil Series	Tomotley, Roanoke		
Drainage class	Poorly Drained		
Soil Hydric Status	Hydric		
Source of Hydrology	Hillside seepage and precipitation		
Hydrologic Impairment	Ditching and Crops		
Native vegetation community	Headwater Forest Community		
Percent composition of exotic invasive vegetation	0%		

Appendix B

Visual Assessment Data



LEGEND:

- STANLEY'S SLOUGH EASEMENT
- STANLEY'S II EASEMENT
- HEADWATER STREAM VALLEY CENTERLINE
- PARCEL LINES
- VEG PLOT ACHIEVING DENSITY CRITERION
- VEG PLOT BELOW DENSITY CRITERION
- VEG PLOT TOTAL / PLANTED STEM DENSITY — 1275 / 1052
- WETLAND GAUGE ACHIEVING HYDROLOGIC CRITERION
- WETLAND GAUGE BELOW HYDROLOGIC CRITERION
- PHOTO POINT

	WETLAND REESTABLISHMENT (1:1)	WETLAND REHABILITATION (2.5:1)	WETLAND PRESERVATION (N.C.)	STREAM REESTABLISHMENT (1:1)	STREAM REHABILITATION (1:1)	UPLAND INCLUSION (N.C.)
STANLEY'S SLOUGH CREDITS	2.8 AC./ 2.8 CR.	0.8 AC./ 0.3 CR.	0.5 AC./ 0 CR.	3.5 AC./ 1465 L.F./ 1465 CR.	8.0 AC./ 2809 L.F./ 2809 CR.	1.8 AC./ 0 CR.
STANLEY'S II CREDITS	6.5 AC./ 6.5 CR.	1.1 AC./ 0.5 CR.	–	–	–	1.8 AC./ 0 CR.
TOTAL CREDITS	9.3 AC./ 9.3 CR.	1.9 AC./ 0.8 CR.	0.5 AC./ 0 CR.	3.5 AC./ 1465 L.F./ 1465 CR.	8.0 AC./ 2809 L.F./ 2809 CR.	3.6 AC./ 0 CR.

REVISIONS

SYM.	DESCRIPTION	DATE

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD
RALEIGH, NORTH CAROLINA 27609

STANLEY'S SLOUGH / STANLEY'S II RESTORATION SITES

DMS PROJECT #95356 & 95838
NORTHAMPTON COUNTY, NORTH CAROLINA

MONITORING YEAR 03

DATE: DEC 2016
SCALE: GRAPHIC

CURRENT CONDITION PLAN VIEW

SHEET 1 OF 1

Table 5a. Vegetation Condition Assessment
Stanley's Slough Restoration Site, DMS Project #95356

Planted Acreage 8.74 **Easement Acreage 17.6**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acre	Pattern and Color	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acre	Pattern and Color	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acre	Pattern and Color	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1,000 SF	Pattern and Color	0	0.00	0.0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

Table 5b. Vegetation Condition Assessment
Stanley's II Restoration Site, DMS Project #95838

Planted Acreage 8.57 **Easement Acreage 9.4**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acre	Pattern and Color	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acre	Pattern and Color	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acre	Pattern and Color	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1,000 SF	Pattern and Color	0	0.00	0.0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

Vegetation Monitoring Plot Photos

Plot 1 – MY-03 – 7/22/16

Plot 2 – MY-03 – 7/22/16

Plot 3 – MY-03 – 7/22/16

Plot 4 – MY-03 – 7/22/16

Plot 5 – MY-03 – 7/22/16

Plot 6 – MY-03 – 7/22/16

Plot 7 – MY-03 – 7/22/16

Plot 8 – MY-03 – 7/22/16

Plot 9 – MY-03 – 7/22/16

Plot 10 – MY-03 – 7/22/16

Plot 11 – MY-03 – 7/22/16

Plot 12 – MY-03 – 7/22/16

Plot 13 – MY-03 – 7/22/16

Plot 14 – MY-03 – 7/22/16

Plot 15 – MY-03 – 7/22/16

Plot 16 – MY-03 – 7/22/16

Plot 17 – MY-03 – 7/22/16

Plot 18 – MY-03 – 7/22/16

Plot 19 – MY-03 – 7/22/16

Plot 20 – MY-03 – 7/22/16

Photo Reference Points

PP1a – MY-00 – 4/17/14

PP1a – MY-03 – 8/19/16

PP1b – MY-00 – 4/17/14

PP1b – MY-03 – 8/19/16

PP2a – MY-00 – 4/17/14

PP2a – MY-03 – 8/19/16

PP2b – MY-00 – 4/17/14

PP2b – MY-03 – 8/19/16

PP3a – MY-00 – 4/17/14

PP3a – MY-03 – 8/19/16

PP3b – MY-00 – 4/17/14

PP3b – MY-03 – 8/19/16

PP3c – MY-00 – 4/17/14

PP3c – MY-03 – 8/19/16

PP4a – MY-00 – 4/17/14

PP4a – MY-03 – 8/19/16

PP4b – MY-00 – 4/17/14

PP4b – MY-03 – 8/19/16

PP5a – MY-00 – 4/17/14

PP5a – MY-03 – 8/19/16

PP5b – MY-00 – 4/17/14

PP5b – MY-03 – 8/19/16

PP6a – MY-00 – 4/17/14

PP6a – MY-03 – 8/19/16

PP6b – MY-00 – 4/17/14

PP6b – MY-03 – 8/19/16

PP7a – MY-00 – 4/17/14

PP7a – MY-03 – 8/19/16

PP7b – MY-00 – 4/17/14

PP7b – MY-03 – 8/19/16

PP8a – MY-00 – 4/17/14

PP8a – MY-03 – 8/19/16

PP8b – MY-00 – 4/17/14

PP8b – MY-03 – 8/19/16

PP9a – MY-00 – 4/17/14

PP9a – MY-03 – 8/19/16

PP9b – MY-00 – 4/17/14

PP9b – MY-03 – 8/19/16

PP10a – MY-00 – 4/17/14

PP10a – MY-03 – 8/19/16

PP10b – MY-00 – 4/17/14

PP10b – MY-03 – 8/19/16

Appendix C

Vegetation Plot Data

Table 6. Vegetation Plot Criteria Attainment Stanley's Slough & Stanley's Slough II Restoration Sites			
Vegetation Plot ID	**Vegetation Survival Threshold Met?**	**Monitoring Year 03 Planted Stem Density (stems/acre)**	**Monitoring Year 03 Total Stem Density (stems/acre)**
Stanley's Slough			
1	Yes	1,052	1,416
3	Yes	1,659	1,983
4	Yes	1,174	1,255
9	Yes	809	1,214
11	Yes	1,416	1,457
13	Yes	1,174	1,214
14	Yes	931	1,012
15	Yes	1,376	1,376
16	Yes	1,052	1,093
17	Yes	1,902	2,266
20	Yes	769	890
Stanley's II			
2	Yes	728	809
5	Yes	850	1,052
6	Yes	1,457	1,538
7	Yes	647	809
8	Yes	809	809
10	Yes	971	1,174
12	Yes	647	1,781
18	Yes	688	850
19	Yes	931	1,497

Table 7. CVS Vegetation Plot Metadata Stanley's Slough & Stanley's Slough II Restoration Sites	
Report Prepared By	Randall Jones
Date Prepared	8/17/2016 15:28
database name	KCI-2015-S.mdb
database location	M:\2012\20122005 Stanley FDP\Monitoring\Vegetation CVS Database
computer name	12-3ZV4FP1
file size	50548736
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	95356
project Name	Stanley's Slough
Description	Stream and Wetland Restoration Site
River Basin	Chowan
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	20

Table 8. CVS Stem Count Total and Planted by Plot and Species
Stanley's Slough and Sttanley's Slough II Restoration Sites, DMS Project Number 95356/95838

			Current Plot Data (MY3 2016)																														
			95356-01-0001			95356-01-0002			95356-01-0003			95356-01-0004			95356-01-0005			95356-01-0006			95356-01-0007			95356-01-0008			95356-01-0009			95356-01-0010		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree									1																						
Acer rubrum	red maple	Tree										1	1	2				6	6	6			1										
Baccharis	baccharis	Shrub									1																						
Betula nigra	river birch	Tree				5	5	5	4	4	4	2	2	2				5	5	5	2	2	2	8	8	8	9	9	9	3	3	3
Celtis laevigata	sugarberry	Tree																															
Fraxinus pennsylvanica	green ash	Tree				2	2	2				21	21	21	11	11	13	15	15	15	4	4	5	6	6	6				7	7	7
Juniperus virginiana	eastern redcedar	Tree																															
Liquidambar styraciflua	sweetgum	Tree			7			1			4						2						2						1			3
Liriodendron tulipifera	tuliptree	Tree																															
Magnolia virginiana	sweetbay	Tree													1	1	1				1	1	1										
Nyssa biflora	swamp tupelo	Tree	2	2	2	7	7	7	3	3	3																						
Nyssa sylvatica	blackgum	Tree																									2	2	2				
Pinus taeda	loblolly pine	Tree									1																		1			1	
Platanus occidentalis	American sycamore	Tree			1			1						1			1												2	1	1	2	
Populus	cottonwood																																
Quercus	oak	Tree																															
Quercus falcata	southern red oak	Tree	4	4	4	1	1	1							1	1	1	3	3	3	1	1	1				1	1	1				
Quercus michauxii	swamp chestnut oak	Tree							8	8	8										4	4	4	3	3	3	4	4	4	2	2	2	
Quercus nigra	water oak	Tree																															
Quercus phellos	willow oak	Tree	1	1	1	1	1	1							8	8	8	3	3	5	3	3	3	3	3	3	1	1	1	11	11	11	
Salix nigra	black willow	Tree																											6				
Taxodium distichum	bald cypress	Tree	19	19	20	2	2	2	26	26	27	5	5	5				3	3	3	1	1	1				3	3	3				
Unknown		Shrub or Tree																1	1	1													
		Stem count	26	26	35	18	18	20	41	41	49	29	29	31	21	21	26	36	36	38	16	16	20	20	20	20	20	20	30	24	24	29	
		size (ares)	1			1			1			1			1			1			1			1			1			1			
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			
		Species count	4	4	6	6	6	8	4	4	8	4	4	5	4	4	6	7	7	7	7	7	9	4	4	4	6	6	10	5	5	7	
		Stems per ACRE	1052	1052	1416	728	728	809	1659	1659	1983	1174	1174	1255	850	850	1052	1457	1457	1538	647	647	809	809	809	809	809	809	1214	971	971	1174	

Table 8. CVS Stem Count Total and Planted by Plot and Species
Stanley's Slough and Sttanley's Slough II Restoration Sites, DMS Project Number 95356/95838

			Current Plot Data (MY3 2016)																															Annual Means											
			95356-01-0010			95356-01-0011			95356-01-0012			95356-01-0013			95356-01-0014			95356-01-0015			95356-01-0016			95356-01-0017			95356-01-0018			95356-01-0019			95356-01-0020			MY3 (2016)			MY2 (2015)			MY1 (2014)			MY0 (2014)		
Scientific Name	Common Name	Species Type	PnoL	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoL	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree																																				1									
Acer rubrum	red maple	Tree				3	3	3																											10	10	12	8	8	9	9	9	10	11	11	11
Baccharis	baccharis	Shrub																																				1									
Betula nigra	river birch	Tree	3	3	3	4	4	4							9	9	9	3	3	3				7	7	7				5	5	5	2	2	2	68	68	68	67	67	67	67	67	67	73	73	73
Celtis laevigata	sugarberry	Tree																																						1					1			
Fraxinus pennsylvanica	green ash	Tree	7	7	7	5	5	5	8	8	8	1	1	1				5	5	5	10	10	10	2	2	2	5	5	5	9	9	9	4	4	5	115	115	119	113	113	116	113	113	113	117	117	117
Juniperus virginiana	eastern redcedar	Tree																												1								1								
Liquidambar styraciflua	sweetgum	Tree			3						22			1									1			1			2			8			1		56			56			32			
Liriodendron tulipifera	tuliptree	Tree																																						1								
Magnolia virginiana	sweetbay	Tree							1	1	1							1	1	1	4	4	4	1	1	1				1	1	1				10	10	10	11	11	11	9	9	9	19	19	19
Nyssa biflora	swamp tupelo	Tree				3	3	3				13	13	13				3	3	3				4	4	4							7	7	7	42	42	42								
Nyssa sylvatica	blackgum	Tree				2	2	2				2	2	2							4	4	4				2	2	2							12	12	12	41	41	41	42	42	42	46	46	46
Pinus taeda	loblolly pine	Tree			1						1						2																				6			2			2			
Platanus occidentalis	American sycamore	Tree	1	1	2				2	2	2				4	4	4	1	1	1	2	2	2						1	2	2	7	1	1	2	13	13	27	13	13	24	15	15	27	19	19	19
Populus	cottonwood																												1								1								
Quercus	oak	Tree																																						1								
Quercus falcata	southern red oak	Tree				2	2	2				2	2	2	1	1	1				3	3	3	2	2	2							2	2	2	23	23	23	22	22	22	27	27	27	30	30	30
Quercus michauxii	swamp chestnut oak	Tree	2	2	2	2	2	3				4	4	4	6	6	6	3	3	3	2	2	2	2	2	2	4	4	4	3	3	3	1	1	1	48	48	49	56	56	56	57	57	57	50	50	50
Quercus nigra	water oak	Tree																																					1	1	1				1	1	1
Quercus phellos	willow oak	Tree	11	11	11				5	5	5	1	1	1	2	2	2	1	1	1	1	1	1				6	6	6	3	3	3				50	50	52	56	56	62	49	49	49	65	65	65
Salix nigra	black willow	Tree									5															6											17			22			23			
Taxodium distichum	bald cypress	Tree				14	14	14				6	6	6	1	1	1	17	17	17				29	29	31							2	2	2	128	128	132	32	32	36	32	32	32	33	33	33
Unknown		Shrub or Tree																																		1	1	1	5	5	5	2	2	2	52	52	52
		Stem count	24	24	29	35	35	36	16	16	44	29	29	30	23	23	25	34	34	34	26	26	27	47	47	56	17	17	21	23	23	37	19	19	22	520	520	630	425	425	534	422	422	493	516	516	516
		size (ares)	1			1			1			1			1			1			1			1			1			1			1			20			20			20			20		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.49			0.49			0.49			0.49		
		Species count	5	5	7	8	8	8	4	4	7	7	7	8	6	6	7	8	8	8	7	7	8	7	7	9	4	4	7	6	6	8	7	7	8	12	12	19	12	12	19	11	11	15	12	12	12
		Stems per ACRE	971	971	1174	1416	1416	1457	647	647	1781	1174	1174	1214	931	931	1012	1376	1376	1376	1052	1052	1093	1902	1902	2266	688	688	850	931	931	1497	769	769	890	1052	1052	1275	860	860	1081	854	854	998	1044	1044	1044

Appendix D

Hydrologic Data

Table 9. Verification of Support for the Restored Channel Stanley's Slough and Stanley's Slough II Restoration Sites, DMS Project Number 95356/95838		
Date of Data Collection	**Verification**	**Photo #**
11/20/14	Vegetation break, evidence of flow	1
11/11/15	Observation of flow, development of multiple channel threads	3

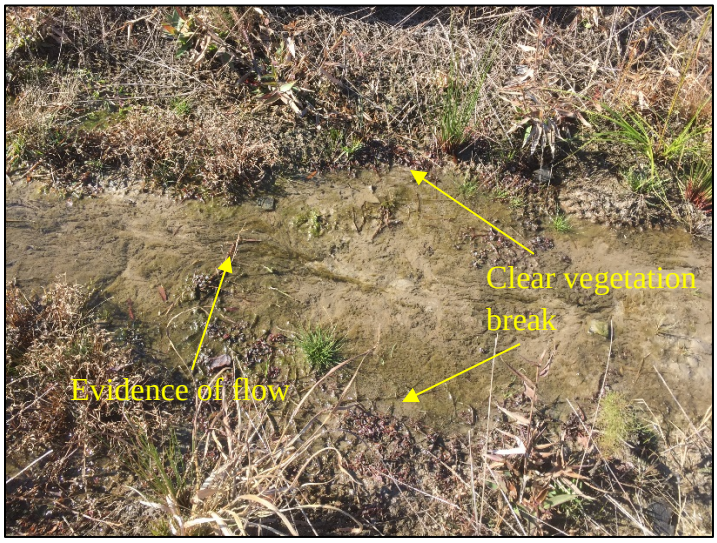


Photo 1. Evidence for support of the restored stream channel


Photo 2. Weir at Gauge 3

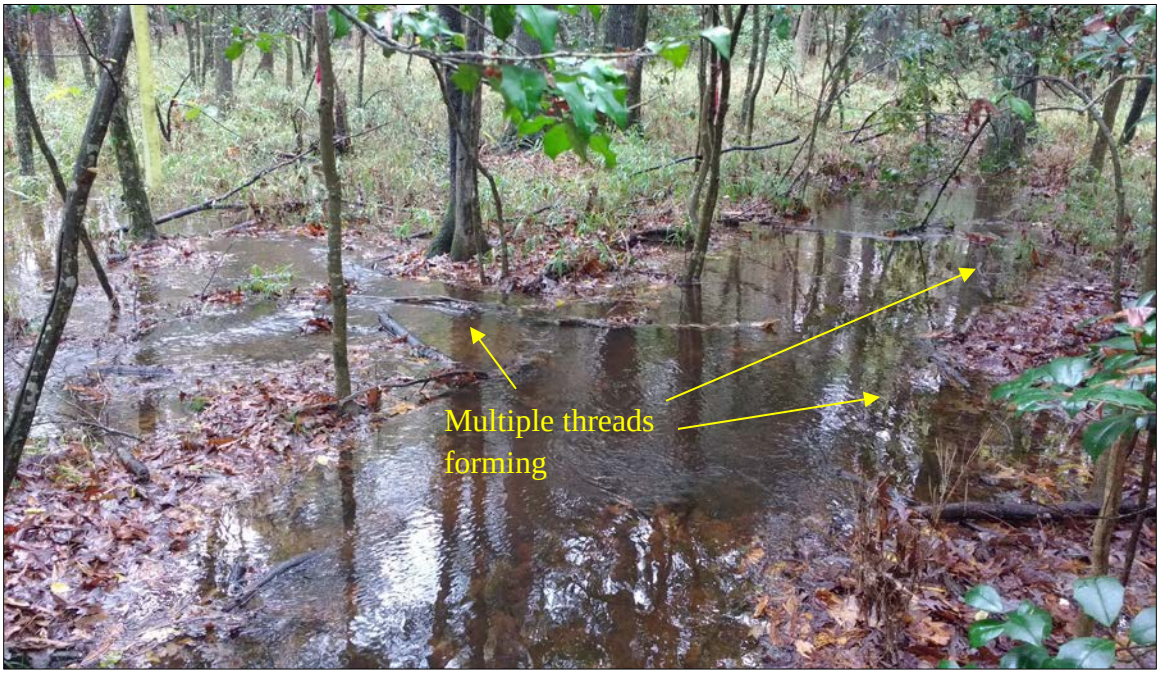
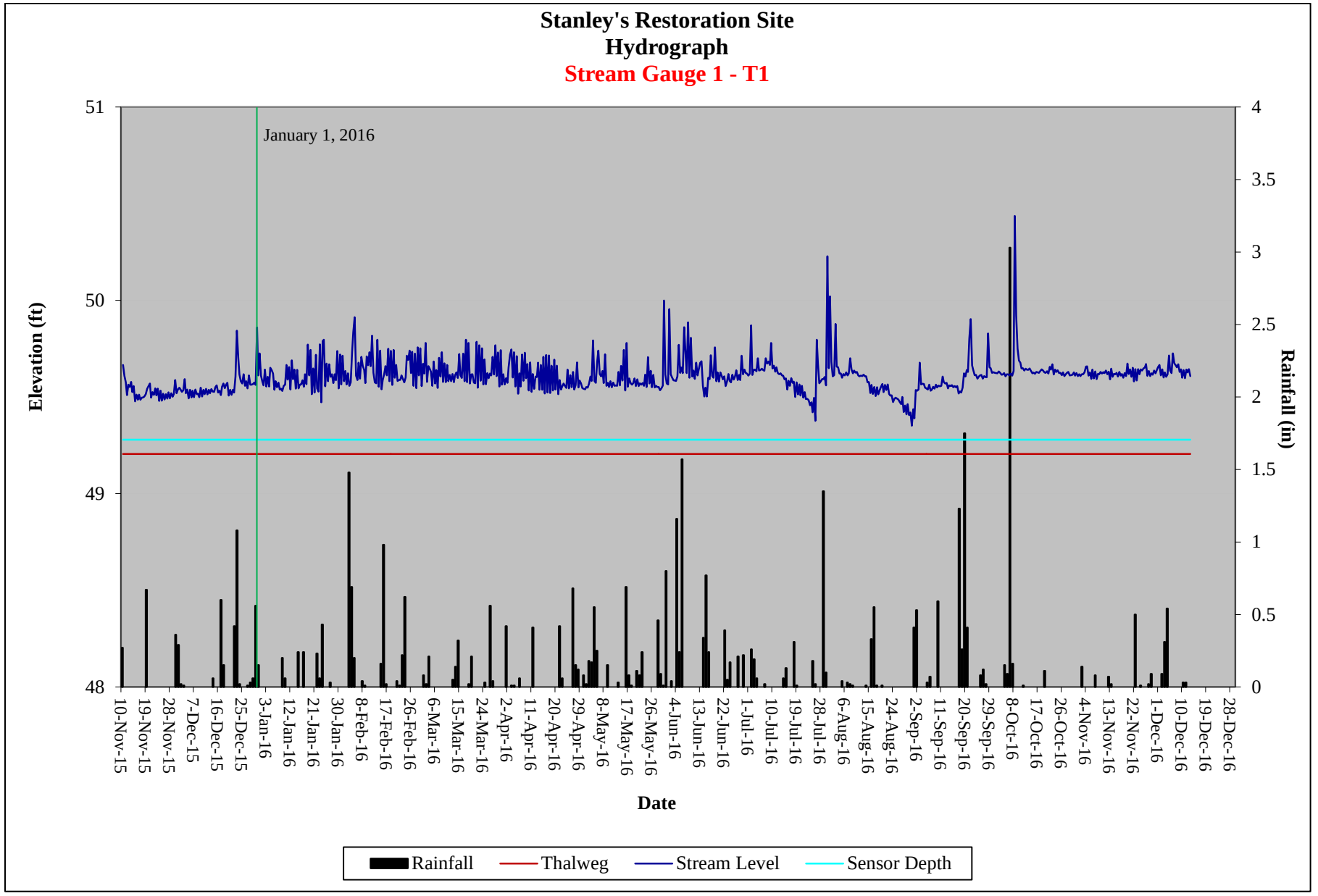
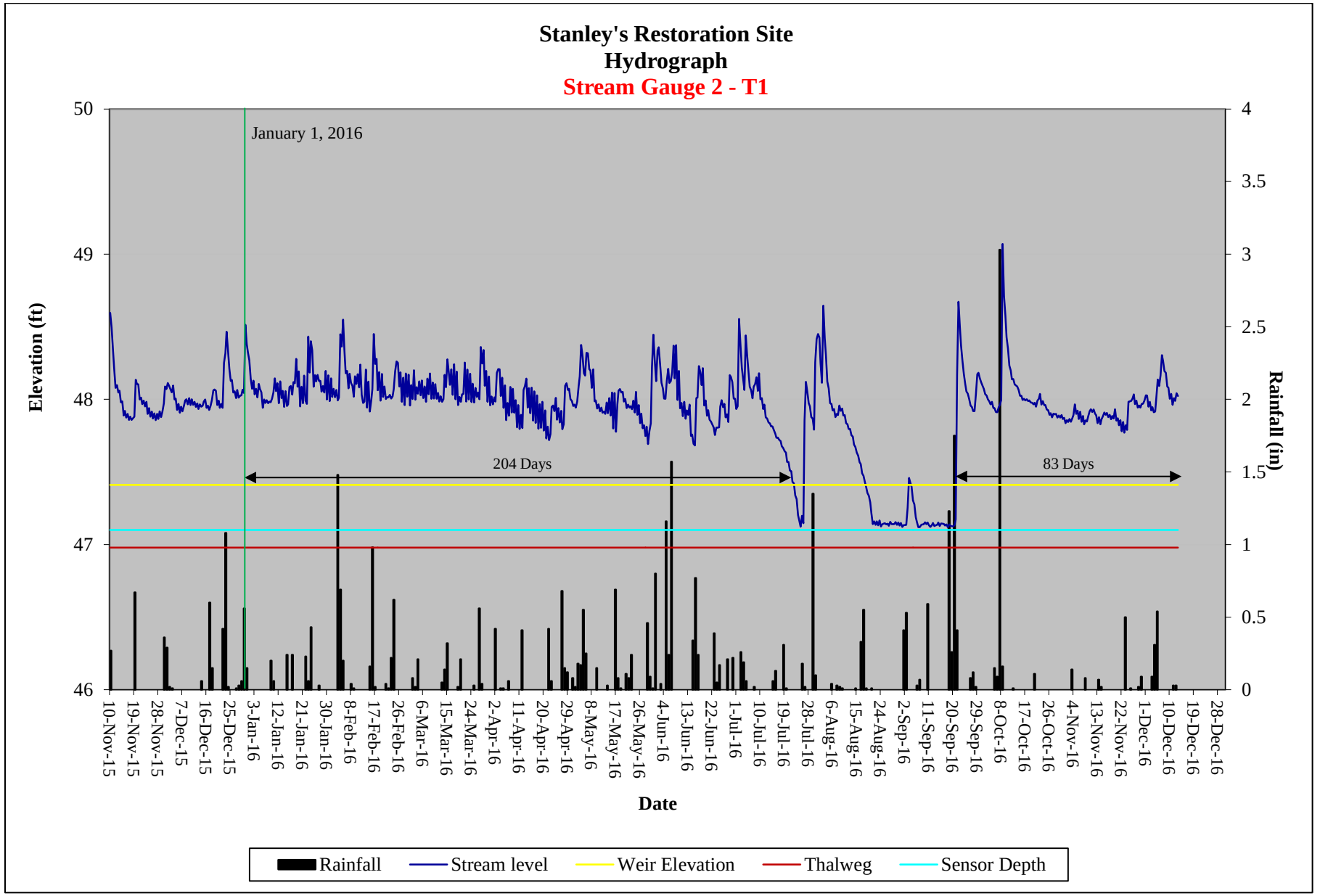
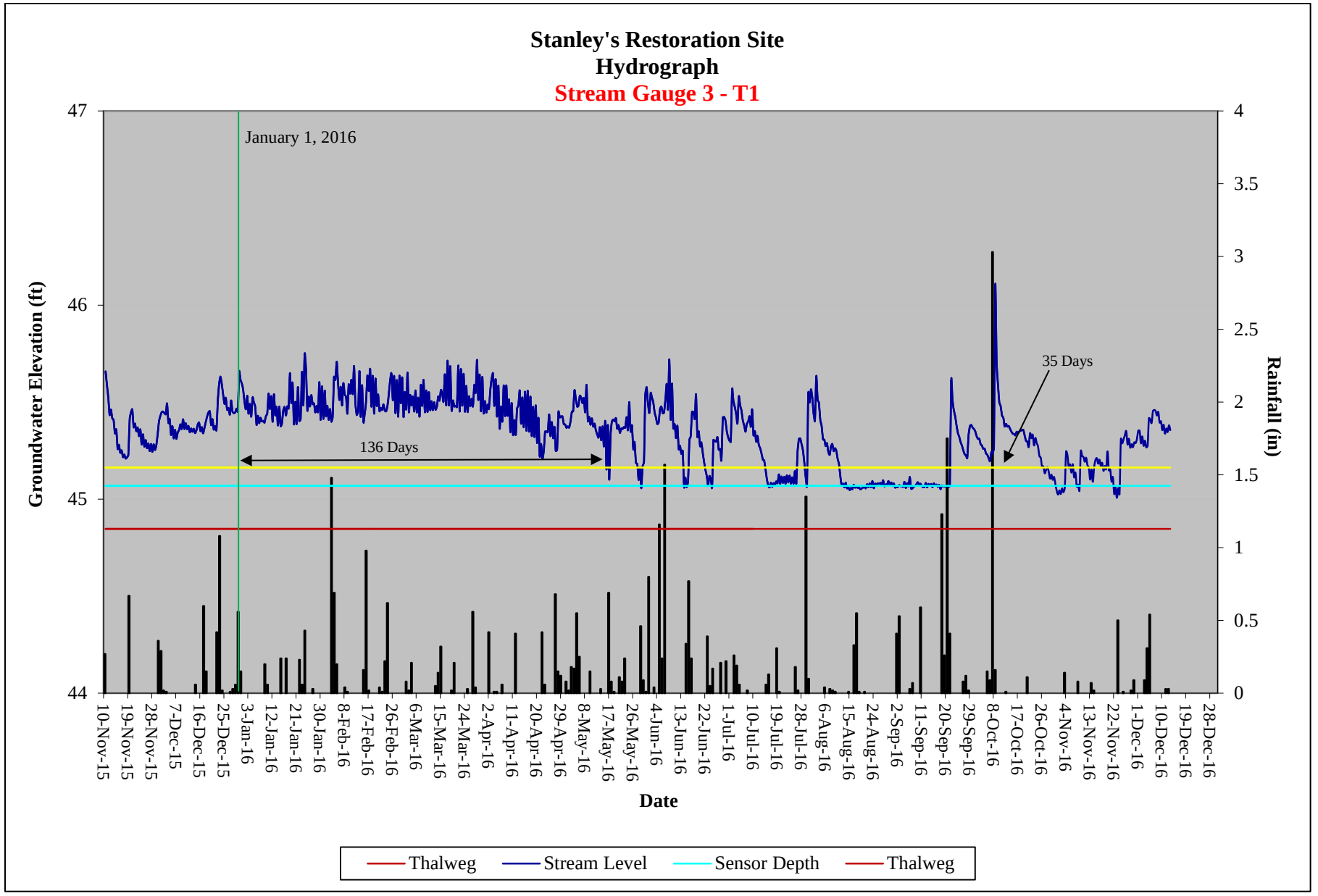
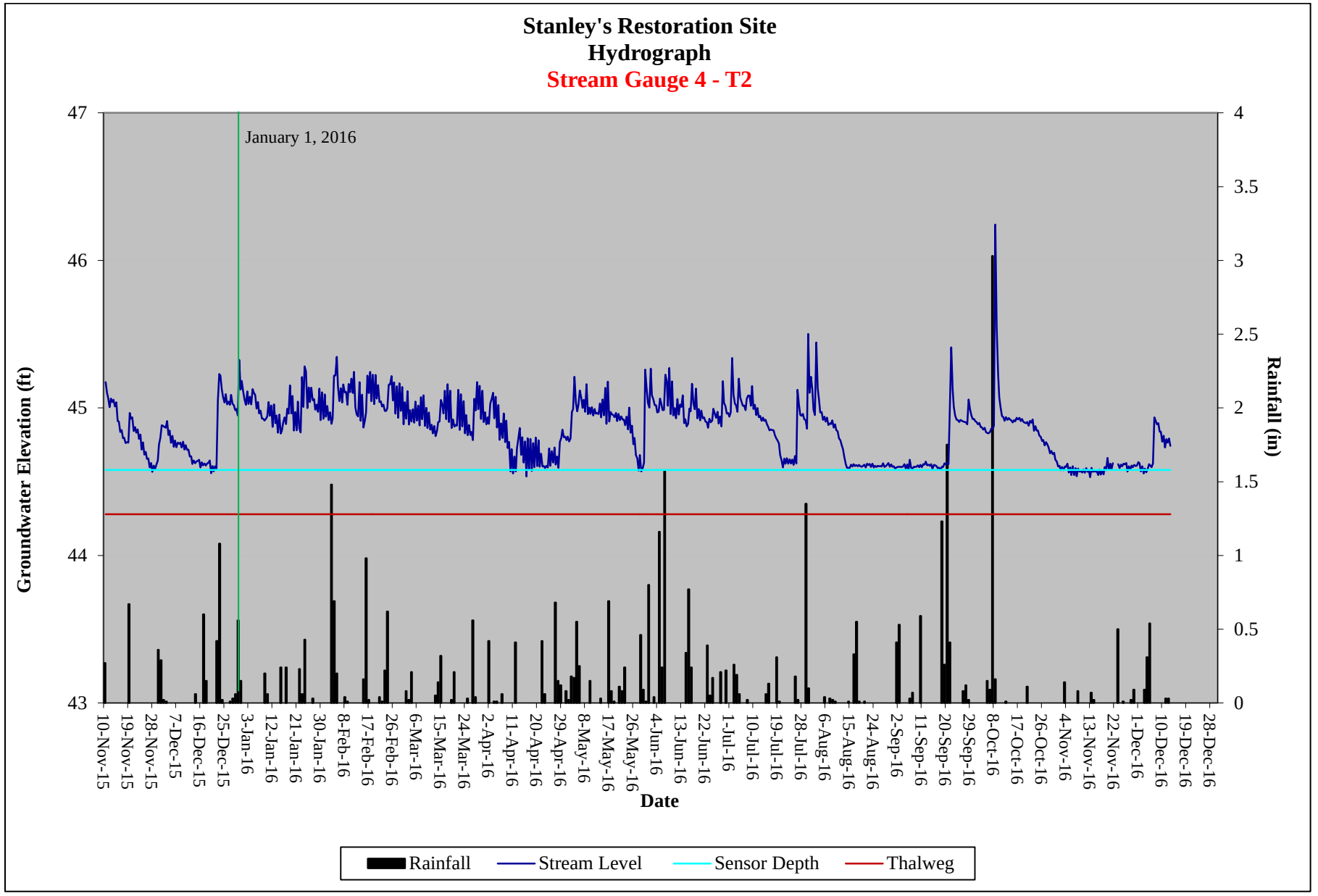


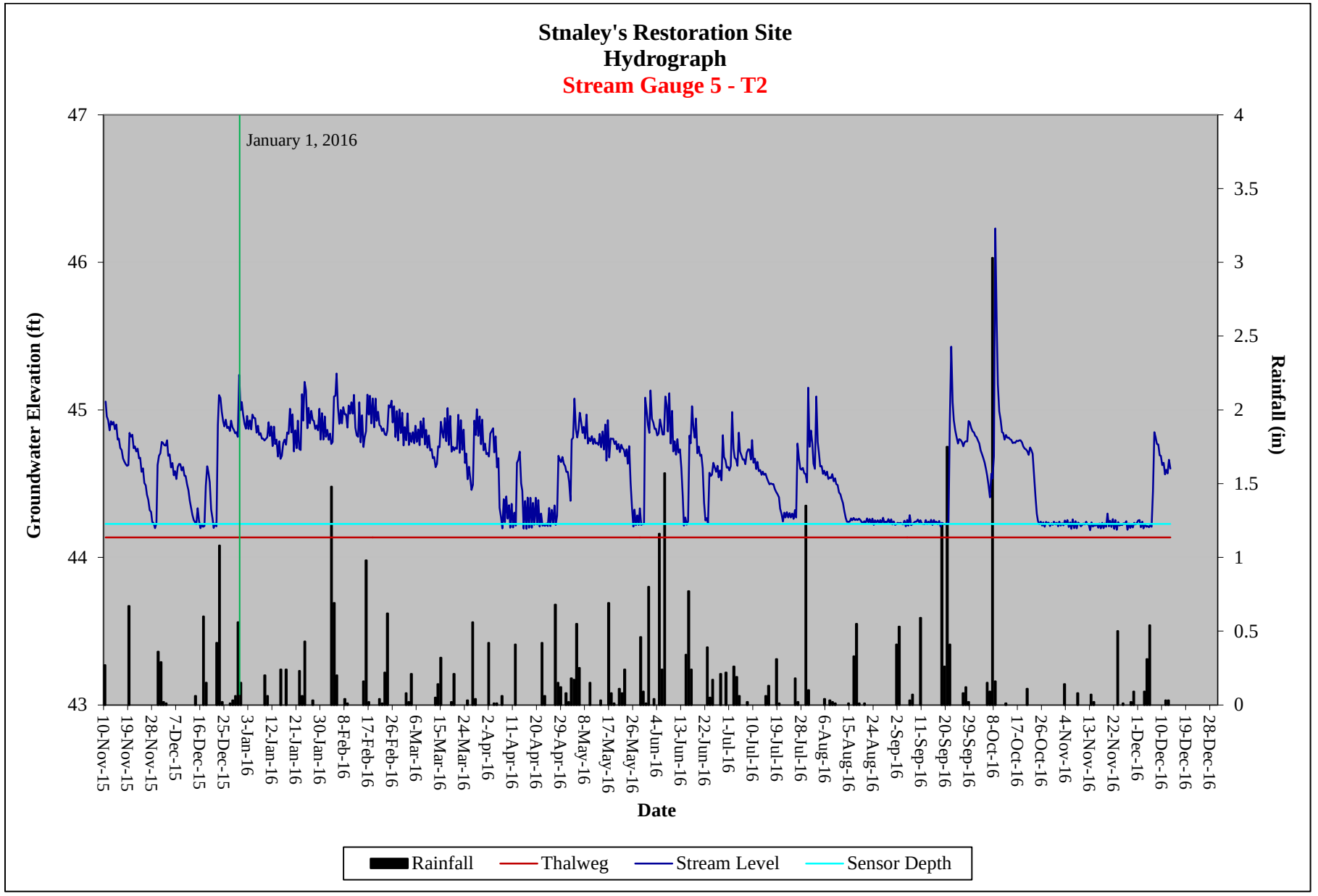
Photo 3. Development of multi-thread channel system


Stanley's Restoration Site
Hydrograph
Stream Gauge 1 - T1
January 1, 2016
Elevation (ft)
Rainfall (in)
Date
51
50
49
48
4
3.5
3
2.5
2
1.5
1
0.5
0
10-Nov-15
19-Nov-15
28-Nov-15
7-Dec-15
16-Dec-15
25-Dec-15
3-Jan-16
12-Jan-16
21-Jan-16
30-Jan-16
8-Feb-16
17-Feb-16
26-Feb-16
6-Mar-16
15-Mar-16
24-Mar-16
2-Apr-16
11-Apr-16
20-Apr-16
29-Apr-16
8-May-16
17-May-16
26-May-16
4-Jun-16
13-Jun-16
22-Jun-16
1-Jul-16
10-Jul-16
19-Jul-16
28-Jul-16
6-Aug-16
15-Aug-16
24-Aug-16
2-Sep-16
11-Sep-16
20-Sep-16
29-Sep-16
8-Oct-16
17-Oct-16
26-Oct-16
4-Nov-16
13-Nov-16
22-Nov-16
1-Dec-16
10-Dec-16
19-Dec-16
28-Dec-16
Rainfall
Thalweg
Stream Level
Sensor Depth


Stanley's Restoration Site
Hydrograph
Stream Gauge 2 - T1
January 1, 2016
204 Days
83 Days
Elevation (ft)
Rainfall (in)
Date
Rainfall
Stream level
Weir Elevation
Thalweg
Sensor Depth


Stanley's Restoration Site
Hydrograph
Stream Gauge 3 - T1
January 1, 2016
136 Days
35 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
47
46
45
44
4
3.5
3
2.5
2
1.5
1
0.5
0
10-Nov-15
19-Nov-15
28-Nov-15
7-Dec-15
16-Dec-15
25-Dec-15
3-Jan-16
12-Jan-16
21-Jan-16
30-Jan-16
8-Feb-16
17-Feb-16
26-Feb-16
6-Mar-16
15-Mar-16
24-Mar-16
2-Apr-16
11-Apr-16
20-Apr-16
29-Apr-16
8-May-16
17-May-16
26-May-16
4-Jun-16
13-Jun-16
22-Jun-16
1-Jul-16
10-Jul-16
19-Jul-16
28-Jul-16
6-Aug-16
15-Aug-16
24-Aug-16
2-Sep-16
11-Sep-16
20-Sep-16
29-Sep-16
8-Oct-16
17-Oct-16
26-Oct-16
4-Nov-16
13-Nov-16
22-Nov-16
1-Dec-16
10-Dec-16
19-Dec-16
28-Dec-16
Thalweg
Stream Level
Sensor Depth
Thalweg


Stanley's Restoration Site
Hydrograph
Stream Gauge 4 - T2
January 1, 2016
Groundwater Elevation (ft)
Rainfall (in)
Date
47
46
45
44
43
4
3.5
3
2.5
2
1.5
1
0.5
0
10-Nov-15
19-Nov-15
28-Nov-15
7-Dec-15
16-Dec-15
25-Dec-15
3-Jan-16
12-Jan-16
21-Jan-16
30-Jan-16
8-Feb-16
17-Feb-16
26-Feb-16
6-Mar-16
15-Mar-16
24-Mar-16
2-Apr-16
11-Apr-16
20-Apr-16
29-Apr-16
8-May-16
17-May-16
26-May-16
4-Jun-16
13-Jun-16
22-Jun-16
1-Jul-16
10-Jul-16
19-Jul-16
28-Jul-16
6-Aug-16
15-Aug-16
24-Aug-16
2-Sep-16
11-Sep-16
20-Sep-16
29-Sep-16
8-Oct-16
17-Oct-16
26-Oct-16
4-Nov-16
13-Nov-16
22-Nov-16
1-Dec-16
10-Dec-16
19-Dec-16
28-Dec-16
Rainfall
Stream Level
Sensor Depth
Thalweg


Stnaley's Restoration Site
Hydrograph
Stream Gauge 5 - T2
January 1, 2016
Groundwater Elevation (ft)
Rainfall (in)
Date
47
46
45
44
43
4
3.5
3
2.5
2
1.5
1
0.5
0
10-Nov-15
19-Nov-15
28-Nov-15
7-Dec-15
16-Dec-15
25-Dec-15
3-Jan-16
12-Jan-16
21-Jan-16
30-Jan-16
8-Feb-16
17-Feb-16
26-Feb-16
6-Mar-16
15-Mar-16
24-Mar-16
2-Apr-16
11-Apr-16
20-Apr-16
29-Apr-16
8-May-16
17-May-16
26-May-16
4-Jun-16
13-Jun-16
22-Jun-16
1-Jul-16
10-Jul-16
19-Jul-16
28-Jul-16
6-Aug-16
15-Aug-16
24-Aug-16
2-Sep-16
11-Sep-16
20-Sep-16
29-Sep-16
8-Oct-16
17-Oct-16
26-Oct-16
4-Nov-16
13-Nov-16
22-Nov-16
1-Dec-16
10-Dec-16
19-Dec-16
28-Dec-16
Rainfall
Thalweg
Stream Level
Sensor Depth

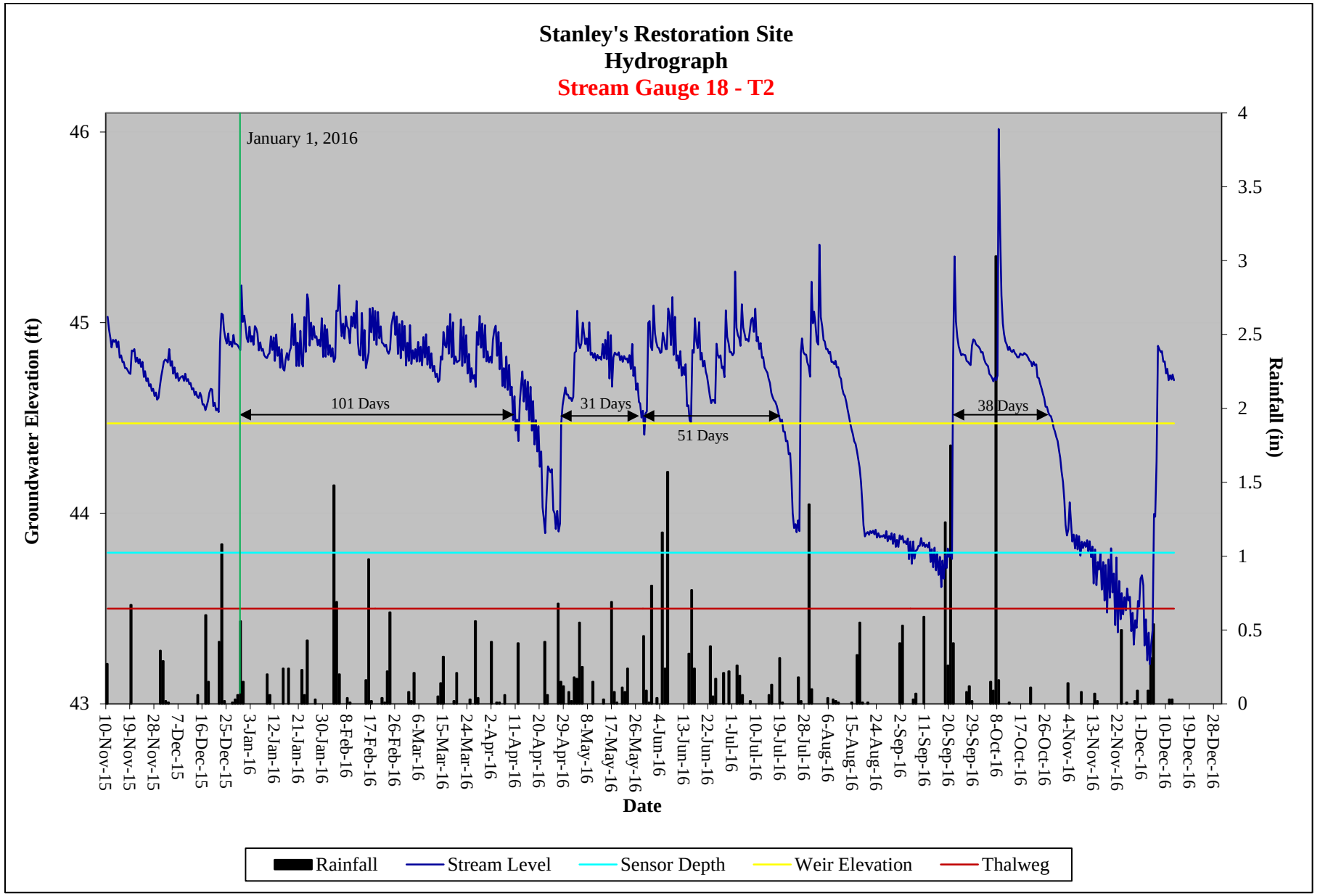
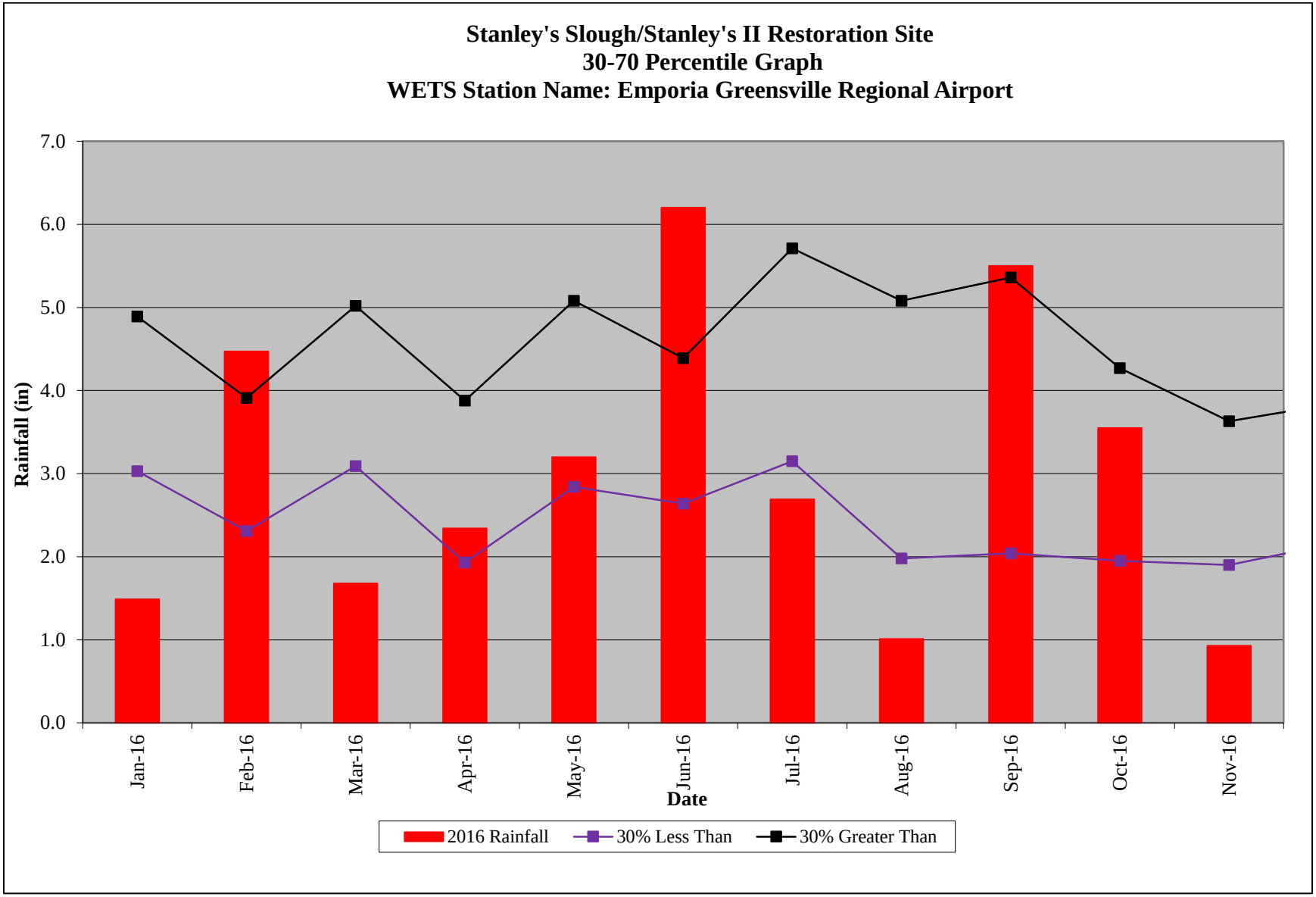
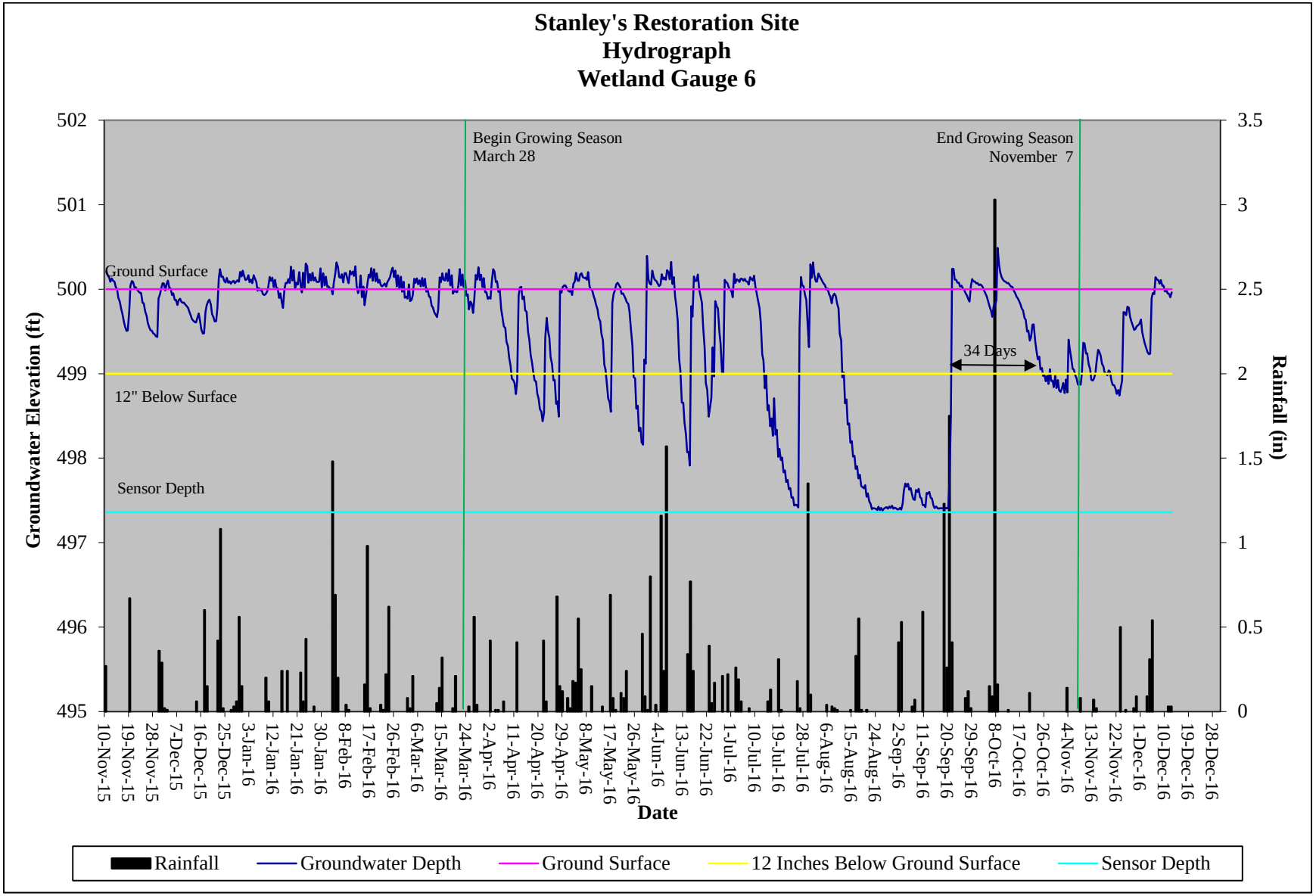
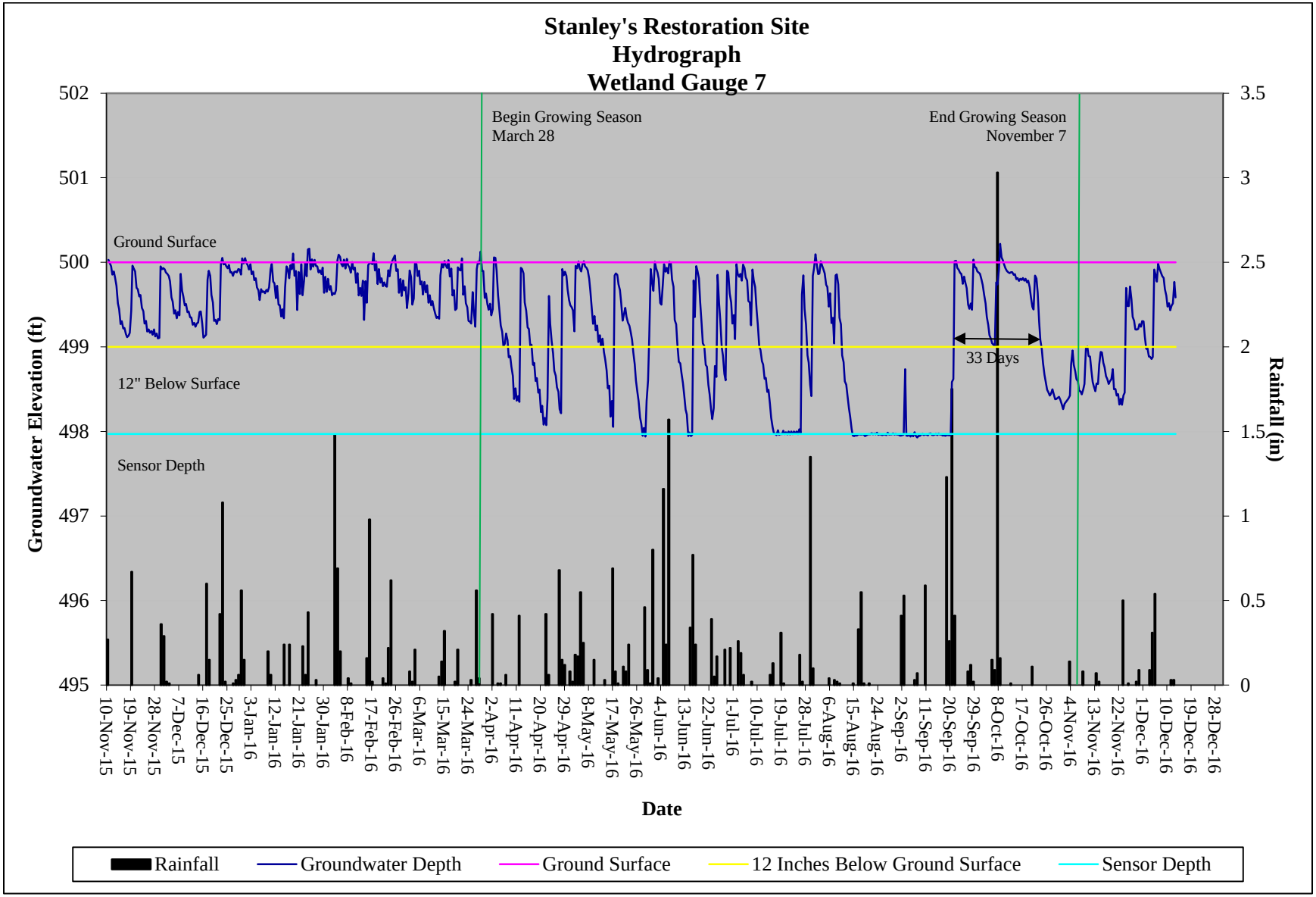

Stanley's Restoration Site
Hydrograph
Stream Gauge 18 - T2
January 1, 2016
101 Days
31 Days
51 Days
38 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Stream Level
Sensor Depth
Weir Elevation
Thalweg

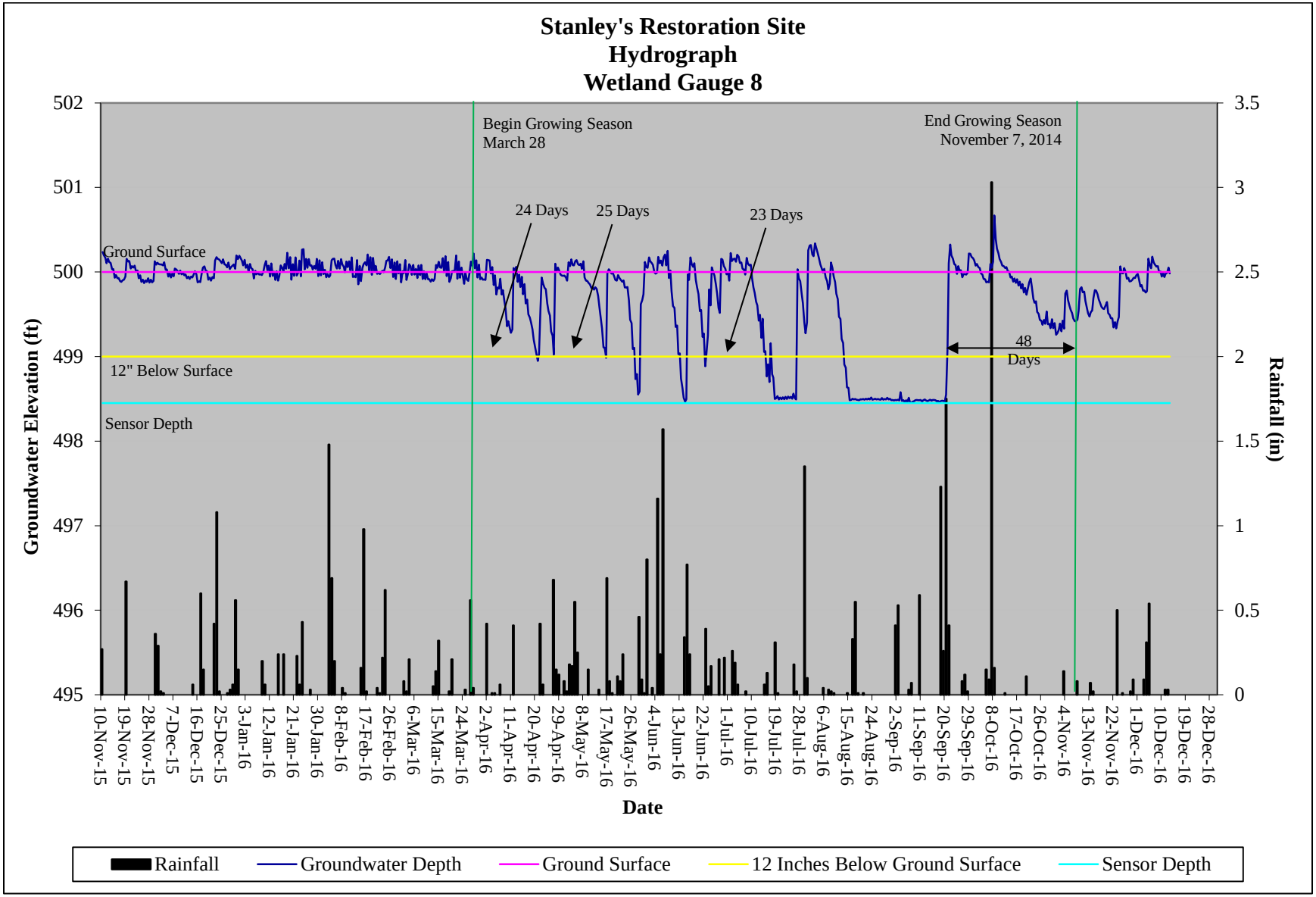
Table 10. Wetland Hydrology Criteria Attainment Stanley's Slough and Stanley's Slough II Restoration Sites, DMS Project Number 95356/95838								
		Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
Location	Gauge	MY01 (2014)	MY02 (2015)	MY03 (2016)	MY04 (2017)	MY05 (2018)	MY06 (2019)	MY07 (2020)
SII Res.	6	No/10 (4.2%)	Yes/39 (17.2%)	Yes/34 (15.2%)				
SII Res.	7	No/12 (5.1%)	No/8 (3.3%)	Yes/33 (14.5%)				
SII Res.	8	Yes/44 (19.4%)	Yes/43 (19.0%)	Yes/48 (21.4%)				
SII Reh.	9	Yes/62 (27.5%)	Yes/80 (35.7%)	Yes/79 (35.0%)				
SII Res.	10	Yes/48 (21.2%)	Yes/47 (21.0%)	Yes/50 (22.3%)				
SII Res.	11	Yes/44 (19.4%)	Yes/28 (12.5%)	Yes/23 (10.3%)				
SSS Res.	12	Yes/44 (19.4%)	Yes/38 (16.7%)	Yes/33 (14.7%)				
SSS Res.	13	Yes/58 (25.7%)	Yes/46 (20.3%)	Yes/61 (27.0%)				
SSS Res.	14	Yes/44 (19.4%)	Yes/37 (16.5%)	Yes/23 (10.0%)				
SSS Reh.	15	Yes/61 (27.2%)	Yes/52 (23.0%)	Yes/116 (51.8%)				
SII Res.	16	Yes/56 (24.8%)	Yes/47 (20.8%)	Yes/80 (35.5%)				
SII Res.	17	Yes/47 (20.8%)	Yes/39 (17.2%)	No/18 (8.0%)				

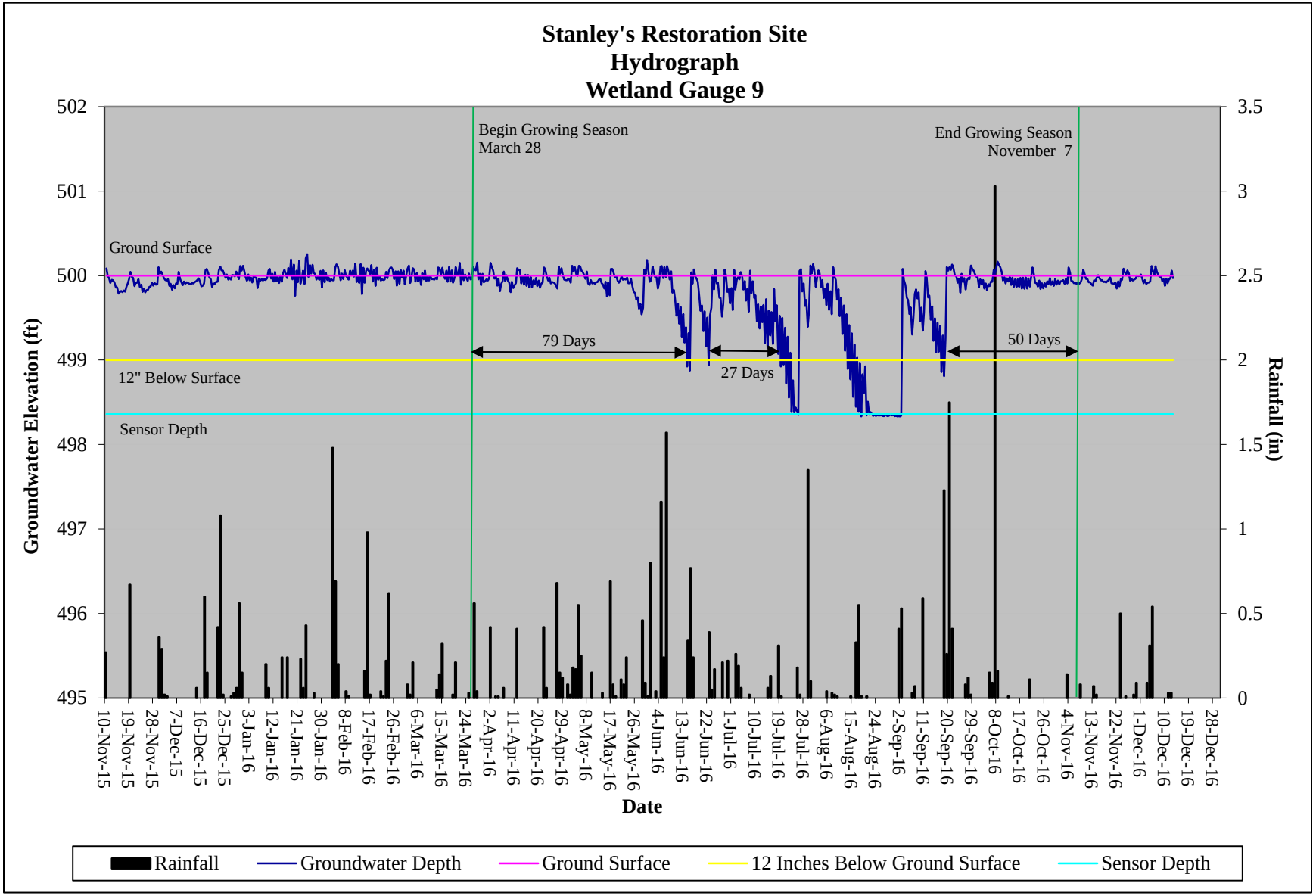
Res. = Wetland Reestablishment, Reh. = Wetland Rehabilitation

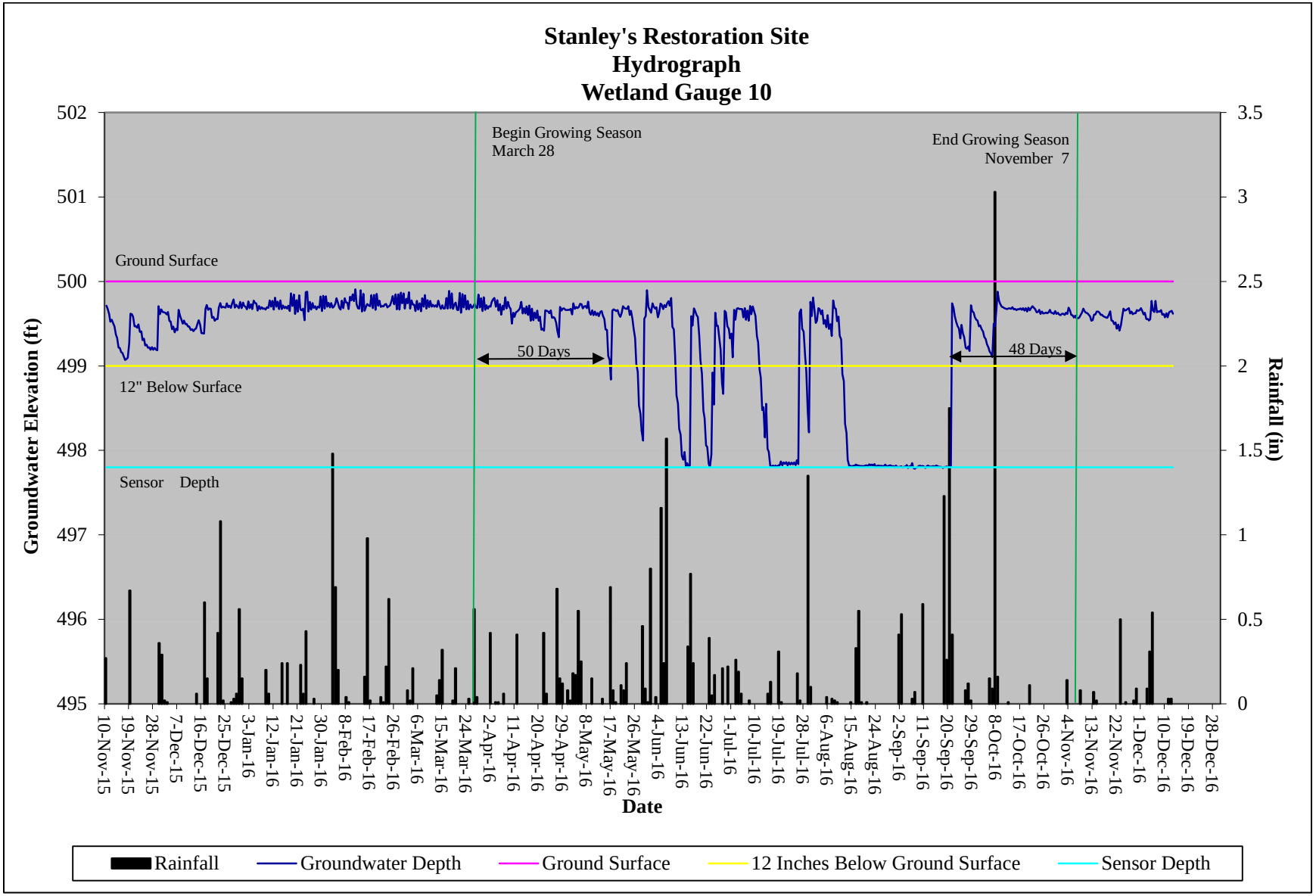

Stanley's Slough/Stanley's II Restoration Site
30-70 Percentile Graph
WETS Station Name: Emporia Greensville Regional Airport
Rainfall (in)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Date
2016 Rainfall
30% Less Than
30% Greater Than

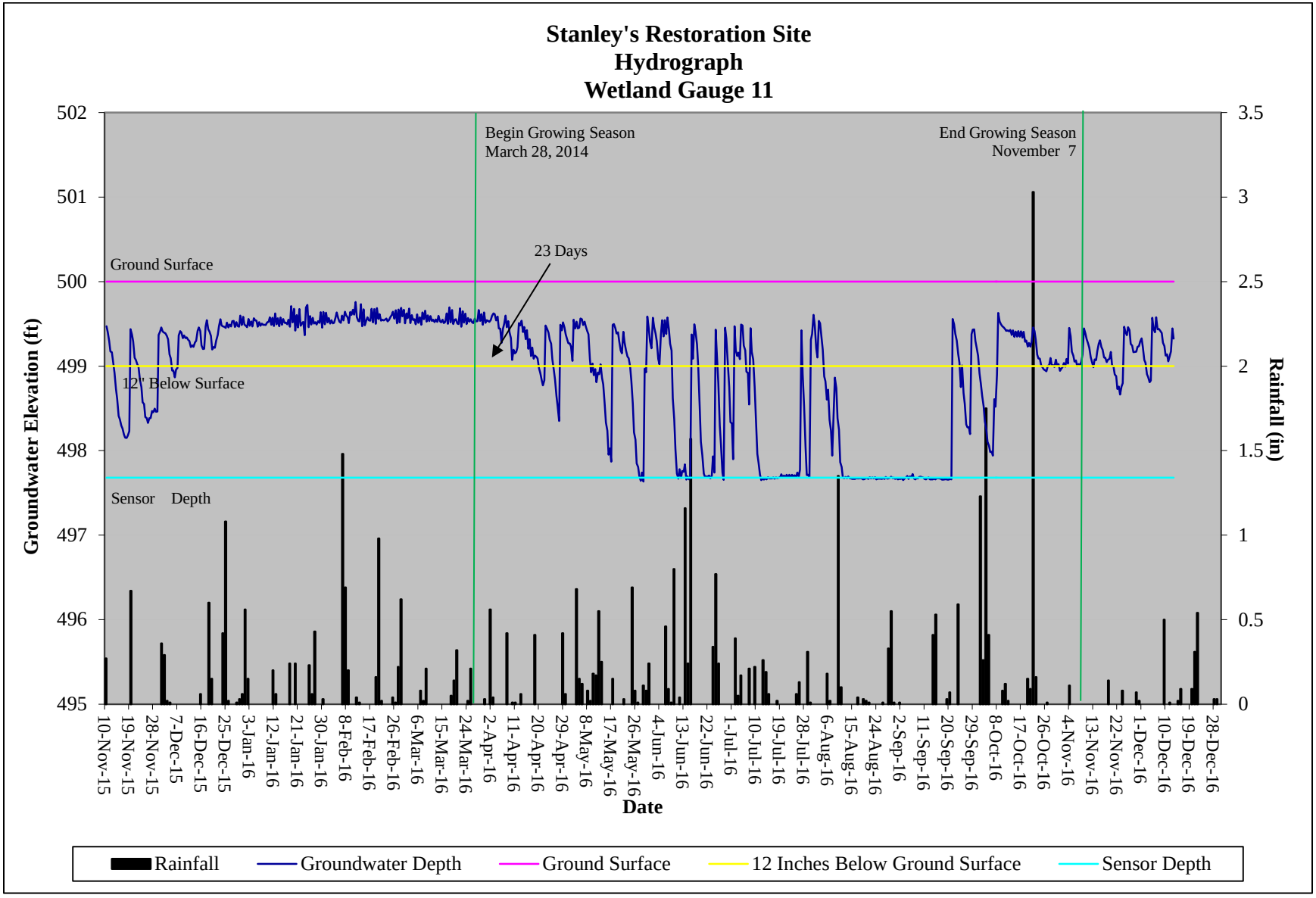

Stanley's Restoration Site
Hydrograph
Wetland Gauge 6
Begin Growing Season
March 28
End Growing Season
November 7
Ground Surface
12" Below Surface
Sensor Depth
34 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
502
501
500
499
498
497
496
495
3.5
3
2.5
2
1.5
1
0.5
0
10-Nov-15
19-Nov-15
28-Nov-15
7-Dec-15
16-Dec-15
25-Dec-15
3-Jan-16
12-Jan-16
21-Jan-16
30-Jan-16
8-Feb-16
17-Feb-16
26-Feb-16
6-Mar-16
15-Mar-16
24-Mar-16
2-Apr-16
11-Apr-16
20-Apr-16
29-Apr-16
8-May-16
17-May-16
26-May-16
4-Jun-16
13-Jun-16
22-Jun-16
1-Jul-16
10-Jul-16
19-Jul-16
28-Jul-16
6-Aug-16
15-Aug-16
24-Aug-16
2-Sep-16
11-Sep-16
20-Sep-16
29-Sep-16
8-Oct-16
17-Oct-16
26-Oct-16
4-Nov-16
13-Nov-16
22-Nov-16
1-Dec-16
10-Dec-16
19-Dec-16
28-Dec-16
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

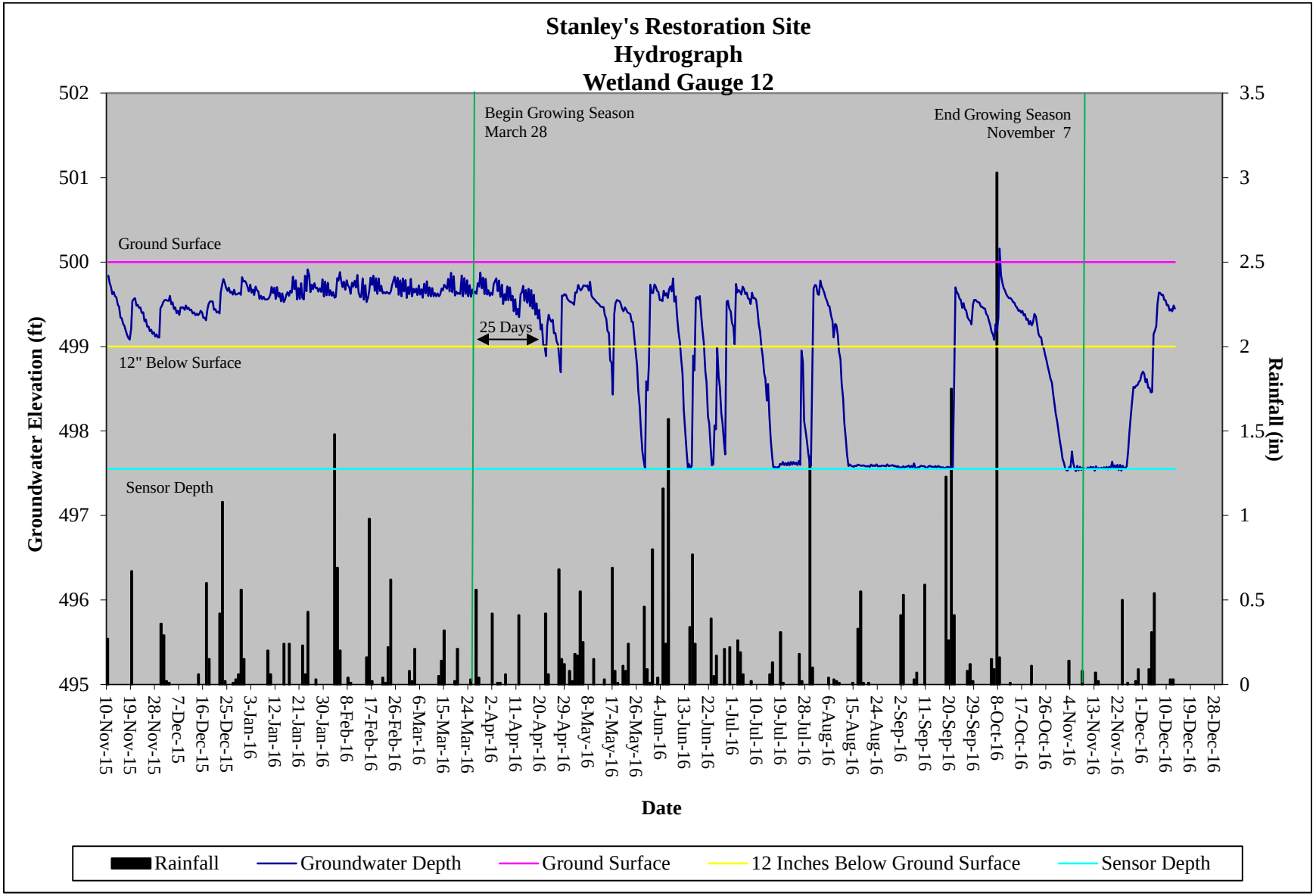

Stanley's Restoration Site
Hydrograph
Wetland Gauge 7
Begin Growing Season
March 28
End Growing Season
November 7
Ground Surface
12" Below Surface
Sensor Depth
33 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

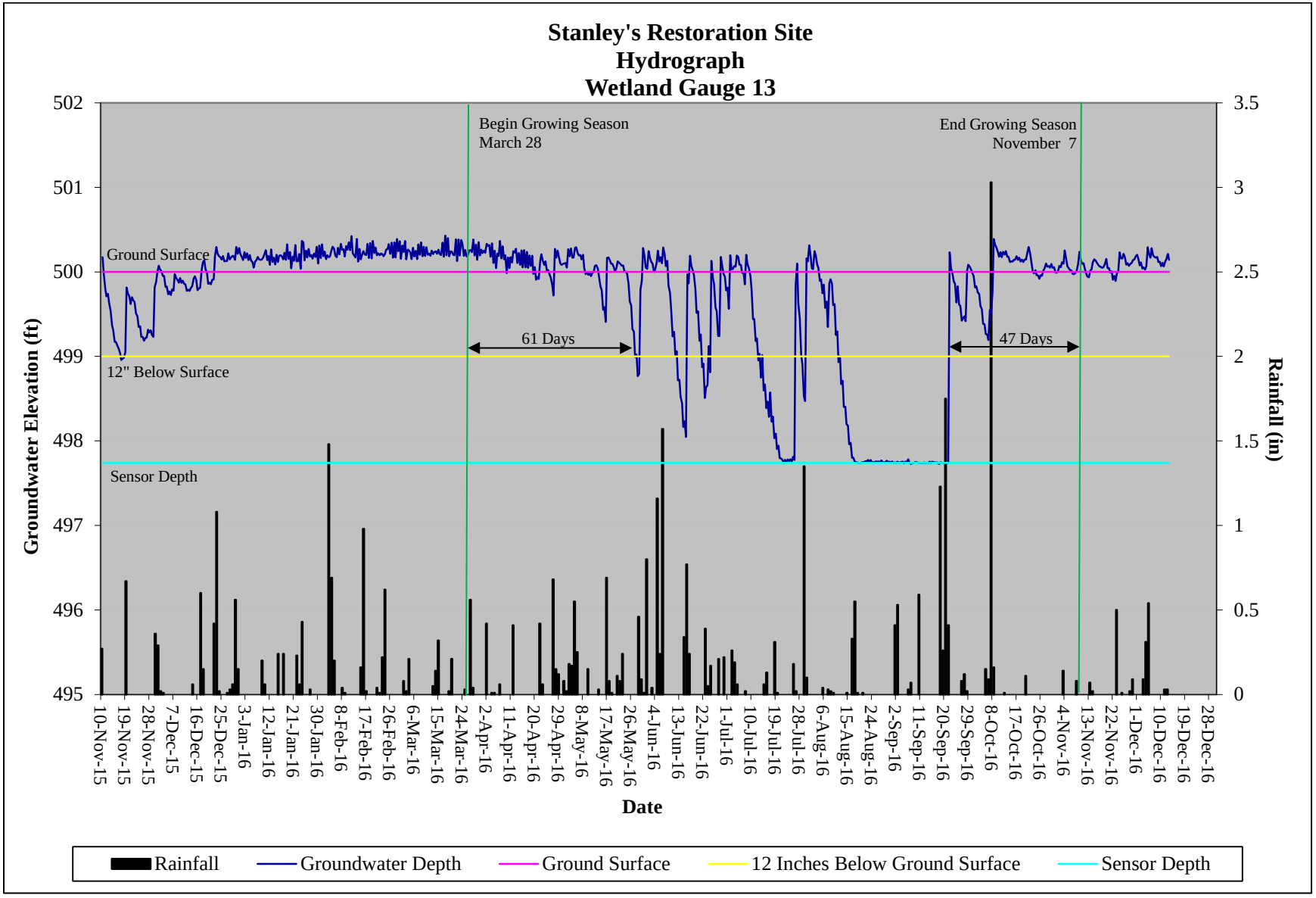

Stanley's Restoration Site
Hydrograph
Wetland Gauge 8
Begin Growing Season
March 28
End Growing Season
November 7, 2014
24 Days
25 Days
23 Days
48
Days
Ground Surface
12" Below Surface
Sensor Depth
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

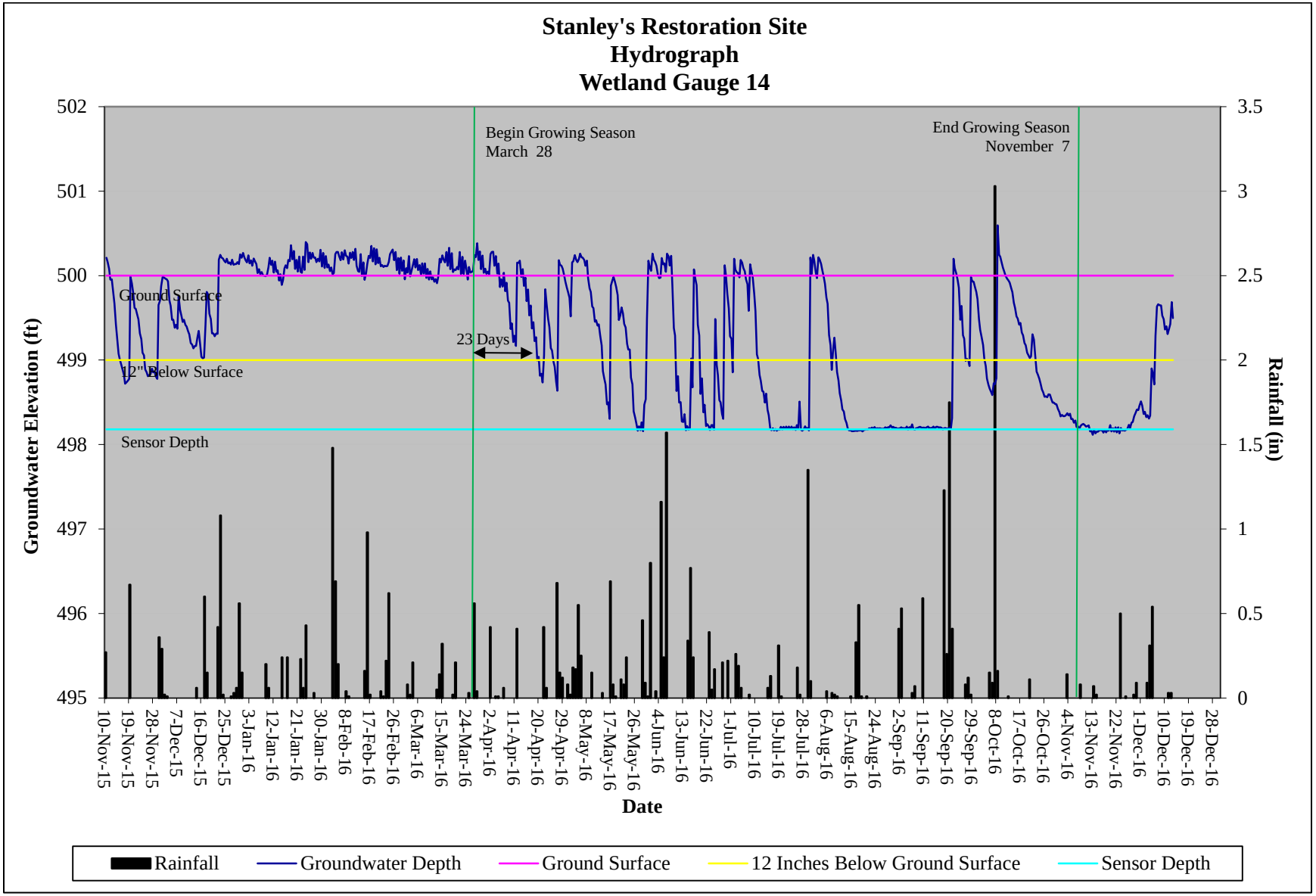

Stanley's Restoration Site
Hydrograph
Wetland Gauge 9
Begin Growing Season
March 28
End Growing Season
November 7
Ground Surface
12" Below Surface
Sensor Depth
79 Days
27 Days
50 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

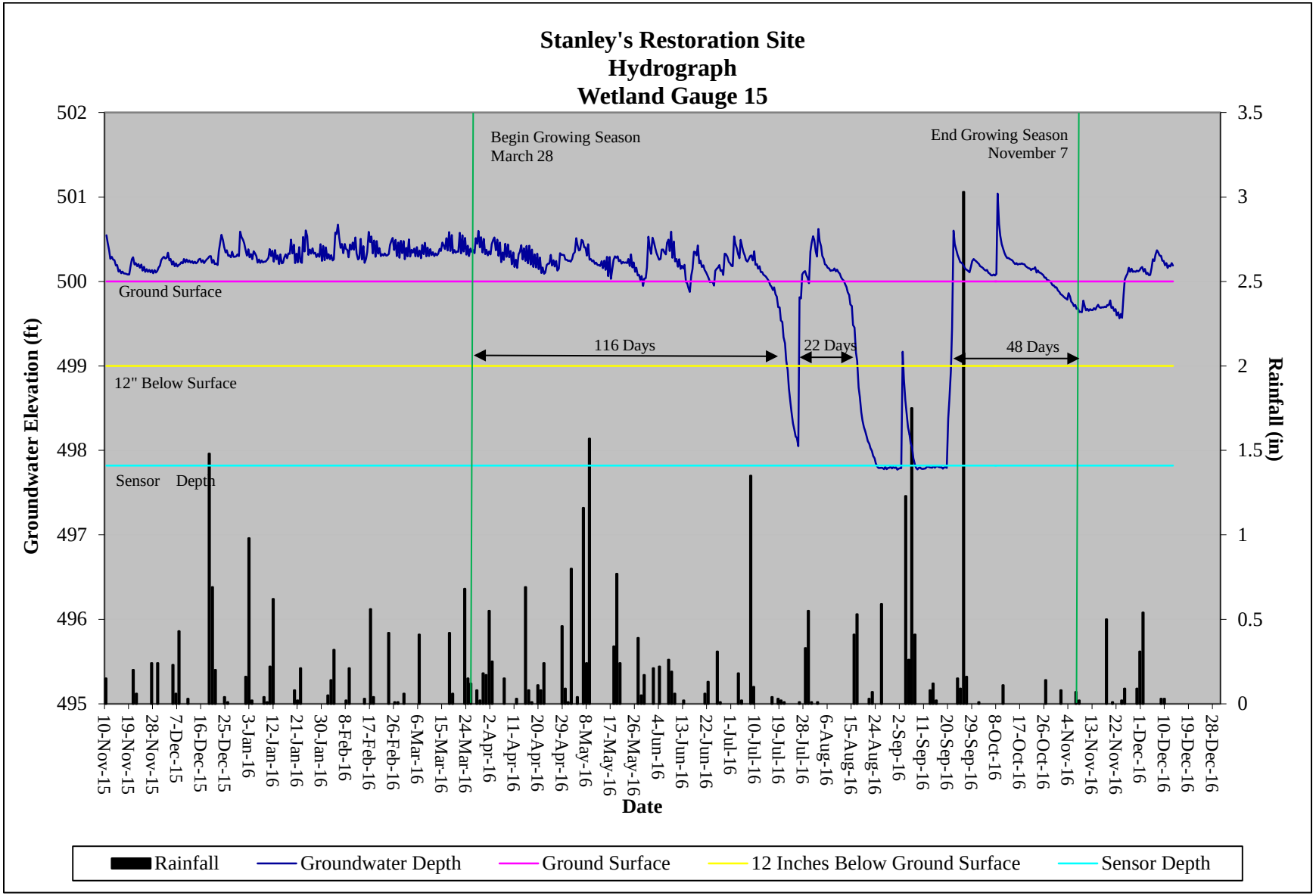

Stanley's Restoration Site
Hydrograph
Wetland Gauge 10
Begin Growing Season
March 28
End Growing Season
November 7
Ground Surface
12" Below Surface
Sensor Depth
50 Days
48 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

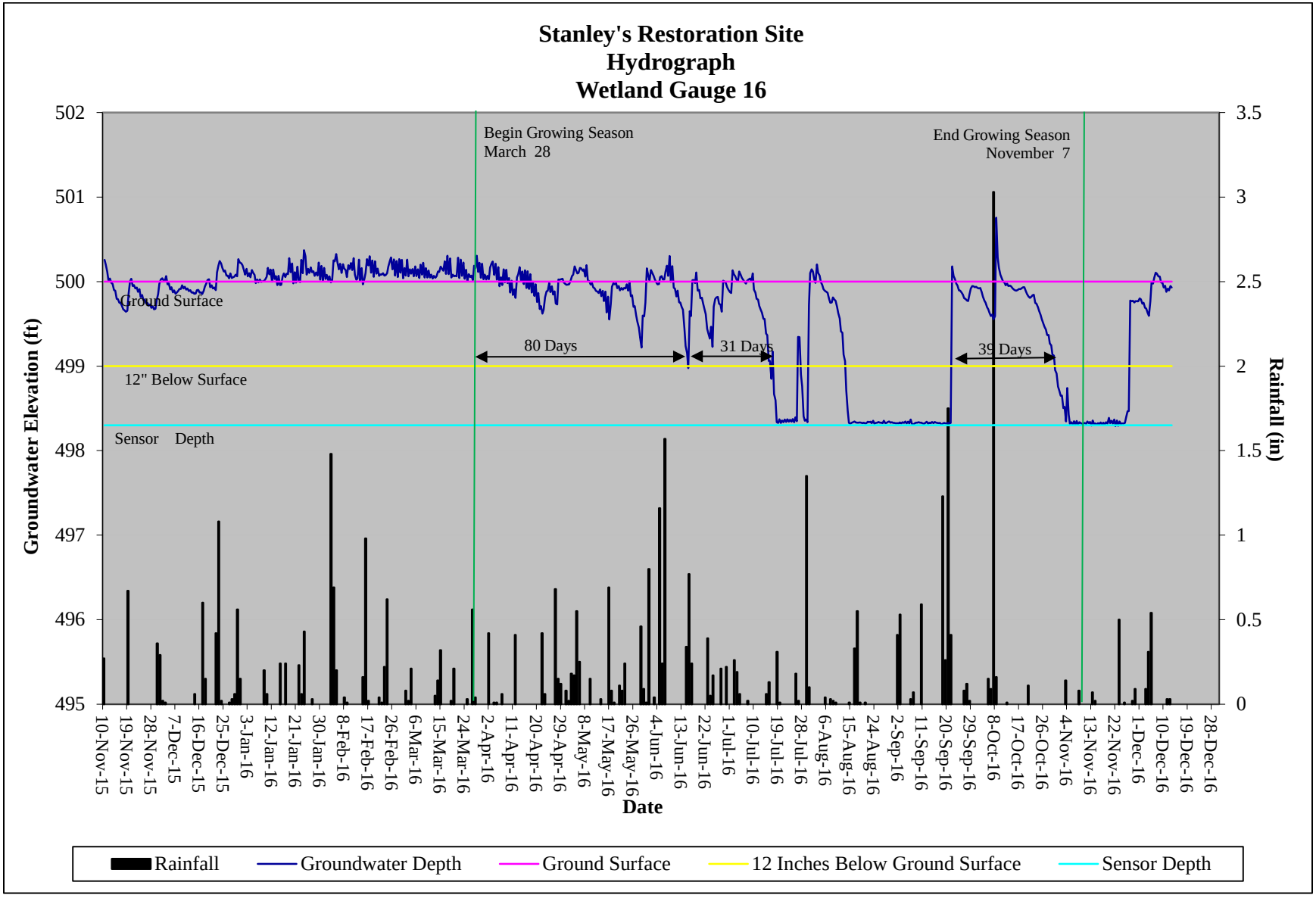

Stanley's Restoration Site
Hydrograph
Wetland Gauge 11
Begin Growing Season
March 28, 2014
End Growing Season
November 7
23 Days
Ground Surface
12" Below Surface
Sensor Depth
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

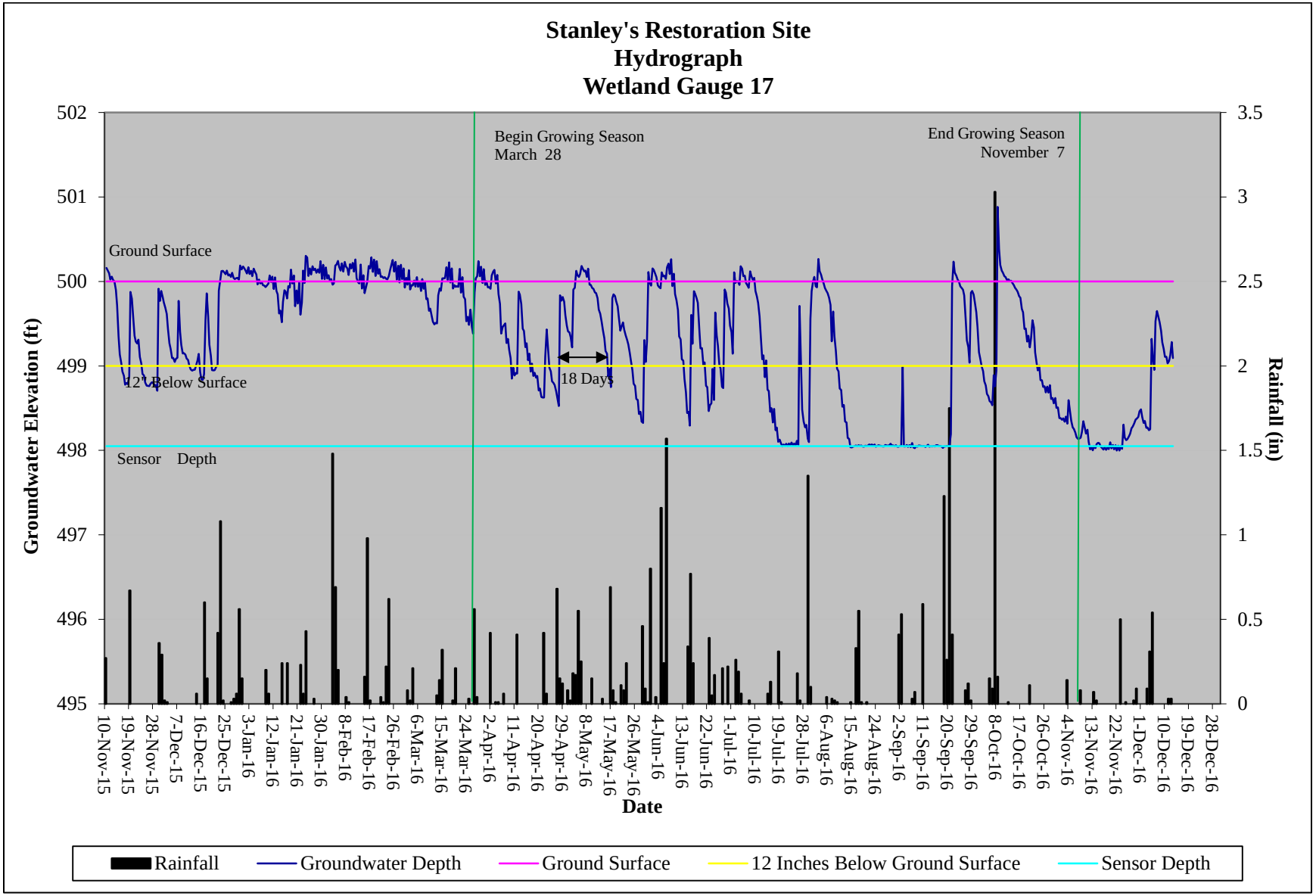

Stanley's Restoration Site
Hydrograph
Wetland Gauge 12
Begin Growing Season
March 28
End Growing Season
November 7
Ground Surface
12" Below Surface
Sensor Depth
25 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Stanley's Restoration Site
Hydrograph
Wetland Gauge 13
Begin Growing Season
March 28
End Growing Season
November 7
Ground Surface
12" Below Surface
Sensor Depth
61 Days
47 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Stanley's Restoration Site
Hydrograph
Wetland Gauge 14
Begin Growing Season
March 28
End Growing Season
November 7
Ground Surface
23 Days
12" Below Surface
Sensor Depth
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Stanley's Restoration Site
Hydrograph
Wetland Gauge 15
Begin Growing Season
March 28
End Growing Season
November 7
Ground Surface
12" Below Surface
Sensor Depth
116 Days
22 Days
48 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Stanley's Restoration Site
Hydrograph
Wetland Gauge 16
Begin Growing Season
March 28
End Growing Season
November 7
Ground Surface
12" Below Surface
Sensor Depth
80 Days
31 Days
39 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Stanley's Restoration Site
Hydrograph
Wetland Gauge 17
Begin Growing Season
March 28
End Growing Season
November 7
Ground Surface
12" Below Surface
Sensor Depth
18 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth