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

Northampton County, NC
CU# 03010204
DWR# 2013-0596
SAW# 2012-01918

Monitoring Year 04

Prepared for:

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

Construction Completed: April 2014
Data Collection: 2017
Submitted: January 2018

Design and Monitoring Firm

4505 Falls of Neuse Road
Suite 400
Raleigh, NC 27609
Phone: (919) 278-2514
Fax: (919) 783-9266

Project Contact: Tim Morris
Email: tim.morris@kci.com
KCI Project No: 20122005

KCI ASSOCIATES OF NORTH CAROLINA, PA

ENGINEERS • SCIENTISTS • SURVEYORS • CONSTRUCTION MANAGERS

4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 (919) 783-9214 (919) 783-9266 Fax

MEMORANDUM

Date: February 14, 2018
To: Lindsay Crocker, DMS Project Manager
From: Adam Spiller, Project Manager
KCI Associates of North Carolina, PA
Subject: MY-04 Monitoring Report Comments
Stanley's Slough IMS#95356, Contract 004635
Stanley's Slough II, IMS#95838, Contract 005151
Chowan River Basin CU 03010204
Northampton County, North Carolina

Please find below our responses in italics to the MY-04 Monitoring Report comments from NCDMS received on January 30, 2018, for the Stanley's Slough/Stanley's II Restoration Sites.

- Please add the Project County, CU, DWR and USACE numbers for this project on the cover page.
  - *These have been added to the cover page.*

- Stanlye's II Asset Table 1B. This table appears to have changed from the AB, Mitigation Plan, and previous monitoring year data. I am thinking this is just an error and needs to be updated.
  - *This typo has been corrected.*

- Page 33, 70/30 Graph- It may be useful to show the antecedent rainfall from November and December of 2016 as these low amounts may account for gauges not meeting hydrology in MY4.
  - *This data has been added to the 70/30 Graph.*

- I do not see the hydrology data from the reference gauge. Is this available and useful in justifying the lower hydrology for some gauges in MY4?
  - *The reference gauge hydrograph has been added to the report and Table 10 has been updated to include the reference data for all years. This data shows the reference gauge meeting in the previous two years (when data was collected) and not meeting in the current year.*

- Be prepared to discuss why some of the gauges did not meet for the 2018 Credit Release meeting.
  - *KCI believes the low achievement of the hydrology success criteria is due to the low amount of rainfall that the site received in 2017 and is prepared to discuss this with the IRT.*

Please contact me if you have any questions or would like clarification concerning these responses.

Sincerely,

Adam Spiller
Project Manager

Table of Contents

Appendix A – Project Vicinity Map and Background Tables

Appendix B – Visual Assessment Data

Appendix C – Hydrologic Data

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. Vegetation monitoring did not occur during Monitoring Year 4, in accordance with the mitigation plan, but will be repeated again in Monitoring Year 5.

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 2017 year, no months experienced an above average rainfall, while March, April, May, August, September, and October experienced average rainfall. The months of January, February, June, and July recorded below average rainfall for the site. Overall, the area experienced below average rainfall during the 2017 growing season.

During the site's fourth growing season, five of the twelve gauges met the success criterion. Gauges 6, 7, 10, 11, 12, 14, and 17 did not meet the success criterion. Collectively the wetland gauges averaged 14.2% (31 days) continuous saturation. The reference gauge, located approximately 900 feet north of T2 also did not achieve the success criteria this year. The low rate of achievement of success criteria across the site is likely due to the very low amount of rain that the site received this year and is not seen as indicative of a problem with the site.

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 122 consecutive days of flow between them and Gauge 18 (on T2) achieved 39 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

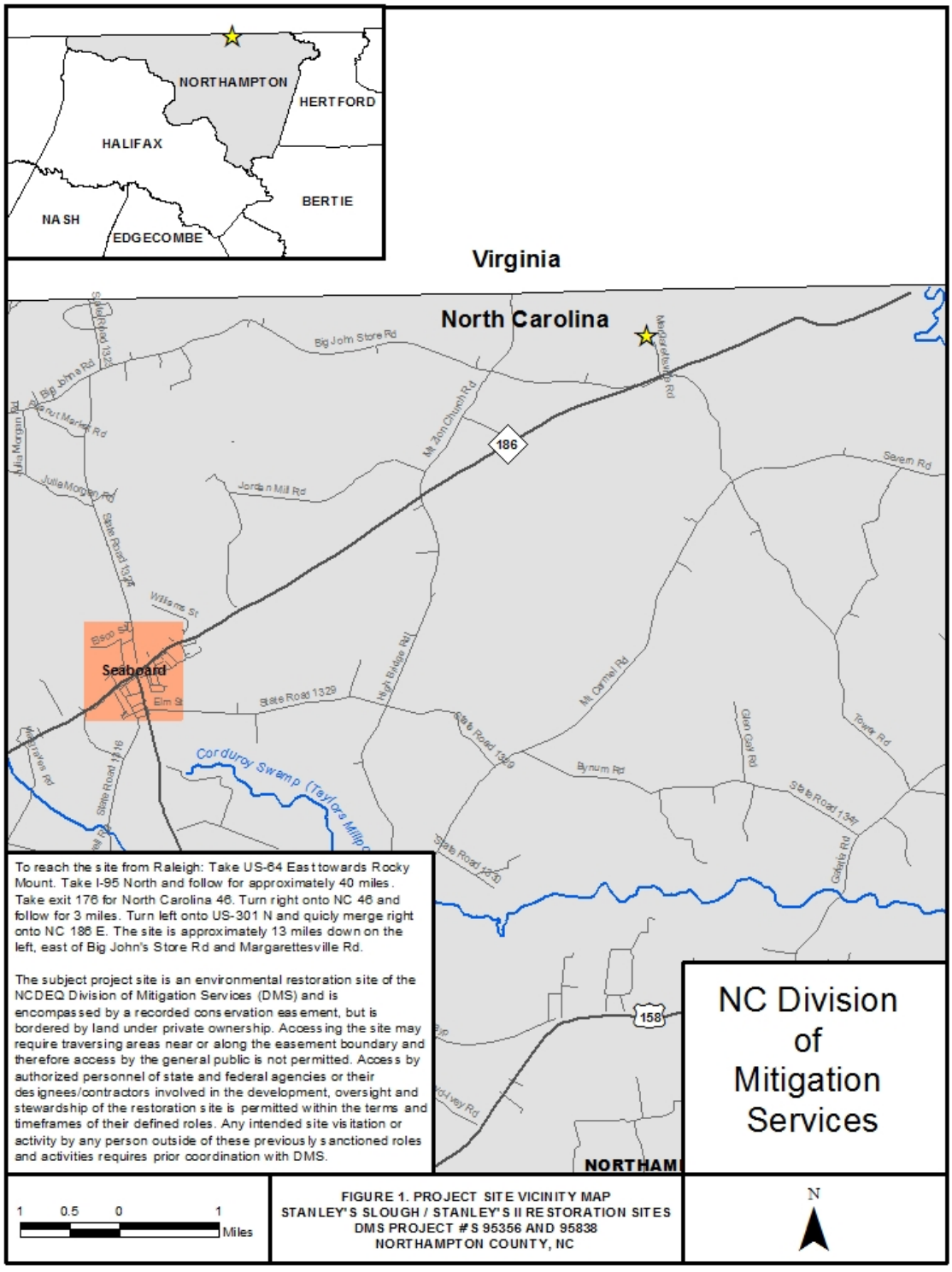


FIGURE 1. PROJECT SITE VICINITY MAP
STANLEY'S SLOUGH / STANLEY'S II RESTORATION SITES
DMS PROJECT #'S 95356 AND 95838
NORTHAMPTON COUNTY, NC

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/Acerage	4,274		3.59						
Credits	4,274		3.12						
TOTAL CREDITS	4,274		3.12						

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	2.81	1:1
Wetland Rehabilitation				Restoration	0.78	2.5:1
Wetland Preservation				N/A	0.52	NA

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetlands (Acres)	Non-Riparian Wetlands (Acres)	Buffer (square feet)	Upland (Acres)
Restoration	4,274	3.12			
Enhancement I					
Enhancement II					
TOTAL SMU	**4,274**				
TOTAL WMU		**3.12**			

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			
Acerage			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 2013
Final Design - Construction Plans		Oct 2013
Construction		April 2014
Planting		April 2014
Baseline Monitoring/Report	May 2014	May 2014
Vegetation Monitoring	May 19, 2014	
Photo Points	April 17, 2014	
Year 1 Monitoring	Nov 2014	Dec 2014
Vegetation Monitoring	Oct 23, 2014	
Photo Points	Nov 20, 2014	
Gauge Downloads	Nov 24, 2014	
Year 2 Monitoring	Nov 2015	Dec 2015
Vegetation Monitoring	July 10, 2015	
Photo Points	July 10, 2015	
Gauge Downloads	Nov 10, 2015	
Supplemental Planting		April 2016
Year 3 Monitoring	Dec 2016	Dec 2016
Vegetation Monitoring	July 27, 2016	
Photo Points	Aug 19, 2016	
Gauge Downloads	Dec 13, 2016	
Year 4 Monitoring	Dec 2017	Jan 2018
Photo Points	Dec 12, 2017	
Gauge Downloads	Nov. 27, 2017	

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 – MY04	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		

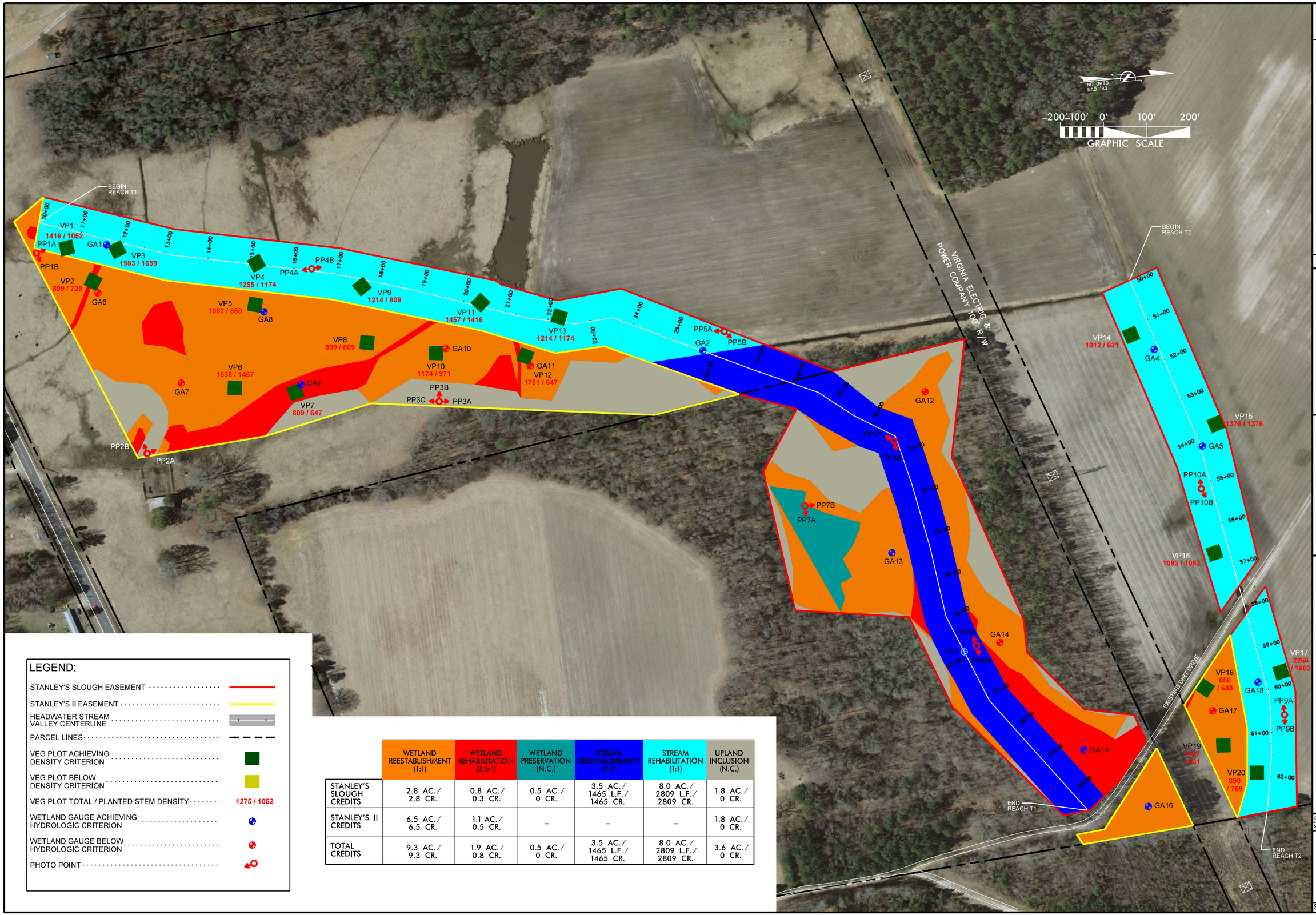
Reach Summery Information (Post Restoration)		
Parameters	**T1**	**T2**
Length of reach (linear feet)	3,054	1,220
Valley classification	Valley Type X	Valley Type X
Drainage area (acres)	84 acres	29 acres
NCDWQ Water Quality Classification	Project Reach Not Classified; Receiving water = Meherrin River (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 04

DATE: DEC 2017
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%

Photo Reference Points

PP1a – MY-00 – 4/17/14

PP1a – MY-04 – 12/12/17

PP1b – MY-00 – 4/17/14

PP1b – MY-04 – 12/12/17

PP2a – MY-00 – 4/17/14

PP2a – MY-04 – 12/12/17

PP2b – MY-00 – 4/17/14

PP2b – MY-04 – 12/12/17

PP3a – MY-00 – 4/17/14

PP3a – MY-04 – 12/12/17

PP3b – MY-00 – 4/17/14

PP3b – MY-04 – 12/12/17

PP3c – MY-00 – 4/17/14

PP3c – MY-04 – 12/12/17

PP4a – MY-00 – 4/17/14

PP4a – MY-04 – 12/12/17

PP4b – MY-00 – 4/17/14

PP4b – MY-04 – 12/12/17

PP5a – MY-00 – 4/17/14

PP5a – MY-04 – 12/12/17

PP5b – MY-00 – 4/17/14

PP5b – MY-04 – 12/12/17

PP6a – MY-00 – 4/17/14

PP6a – MY-04 – 12/12/17

PP6b – MY-00 – 4/17/14

PP6b – MY-04 – 12/12/17

PP7a – MY-00 – 4/17/14

PP7a – MY-04 – 12/12/17

PP7b – MY-00 – 4/17/14

PP7b – MY-04 – 12/12/17

PP8a – MY-00 – 4/17/14

PP8a – MY-04 – 12/12/17

PP8b – MY-00 – 4/17/14

PP8b – MY-04 – 12/12/17

PP9a – MY-00 – 4/17/14

PP9a – MY-04 – 12/12/17

PP9b – MY-00 – 4/17/14

PP9b – MY-04 – 12/12/17

PP10a – MY-00 – 4/17/14

PP10a – MY-04 – 12/12/17

PP10b – MY-00 – 4/17/14

PP10b – MY-04 – 12/12/17

Appendix C

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
4/7/16	Observation of flow, development of multiple channel threads	4, 5

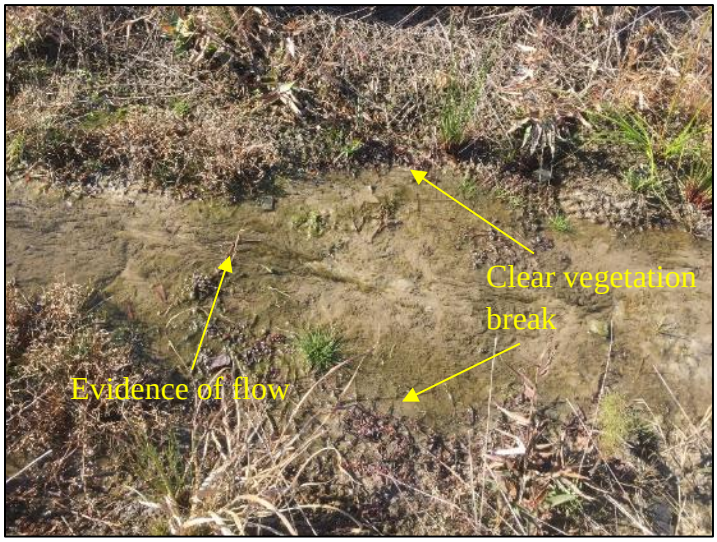


Photo 1. Evidence for support of the restored stream channel


Photo 2. Weir at Gauge 3

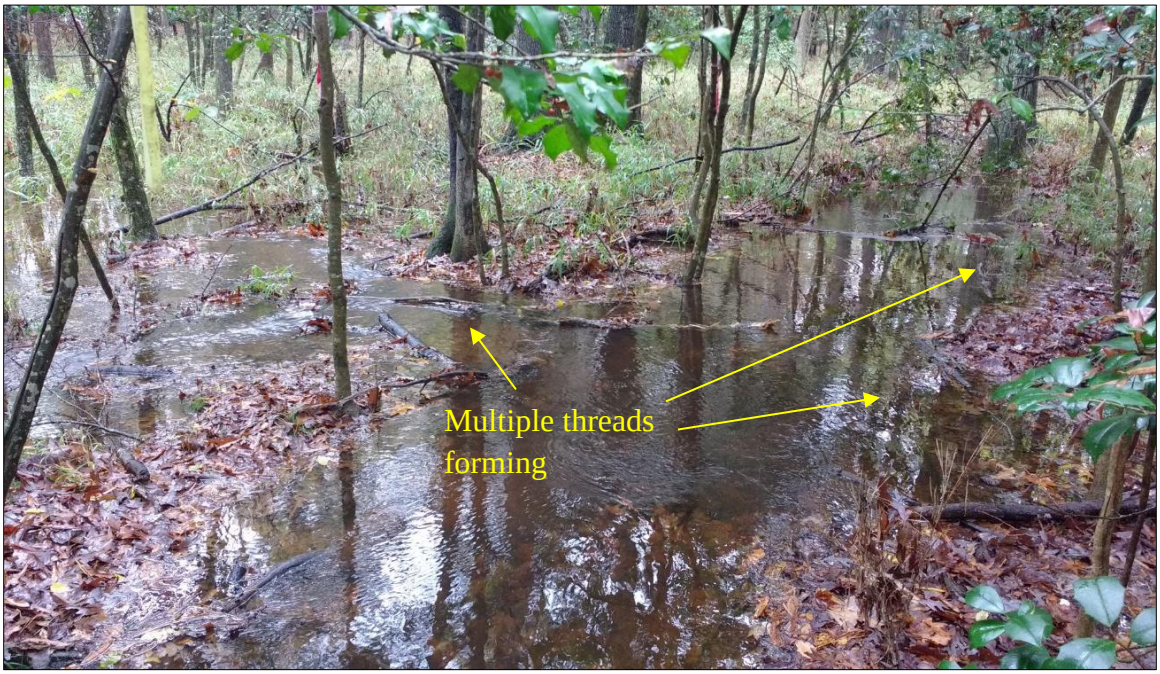


Photo 3. Development of multi-thread channel system

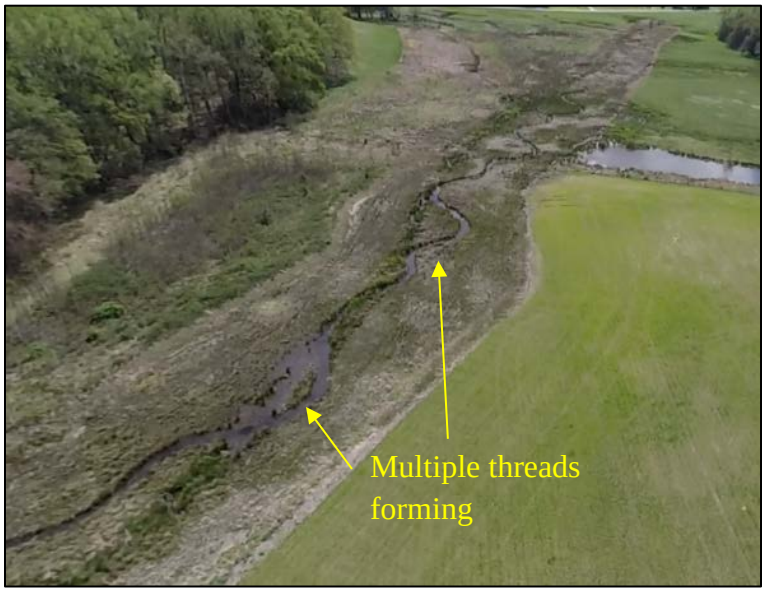


Photo 4. Development of multi-thread channel system on T1

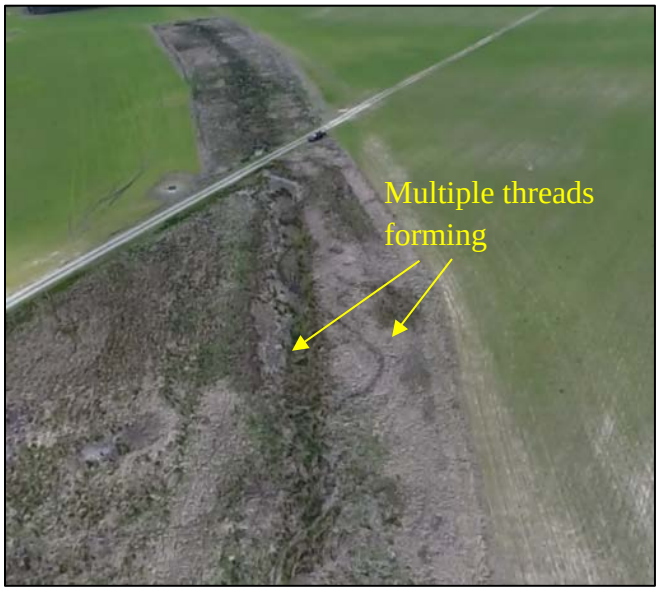
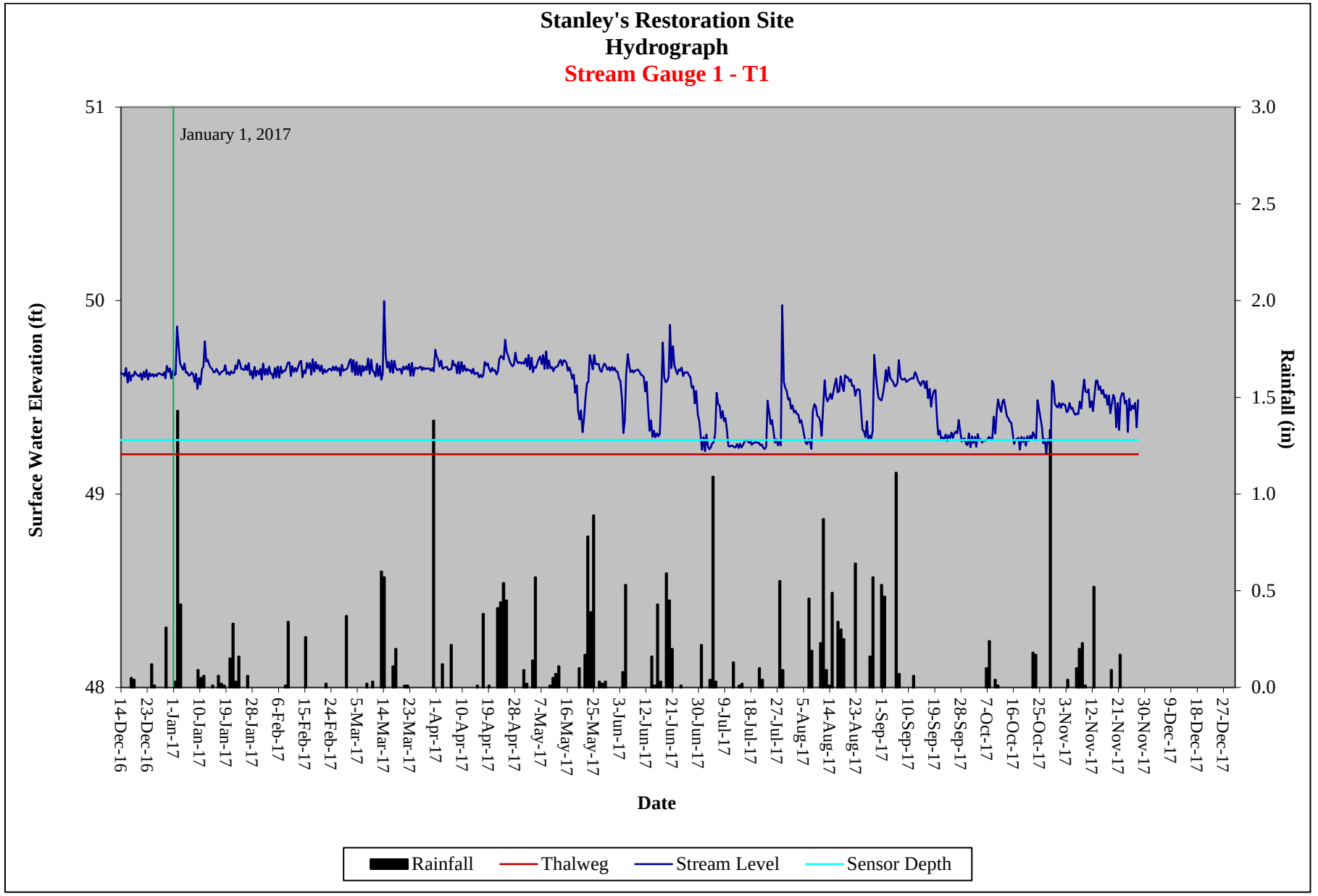
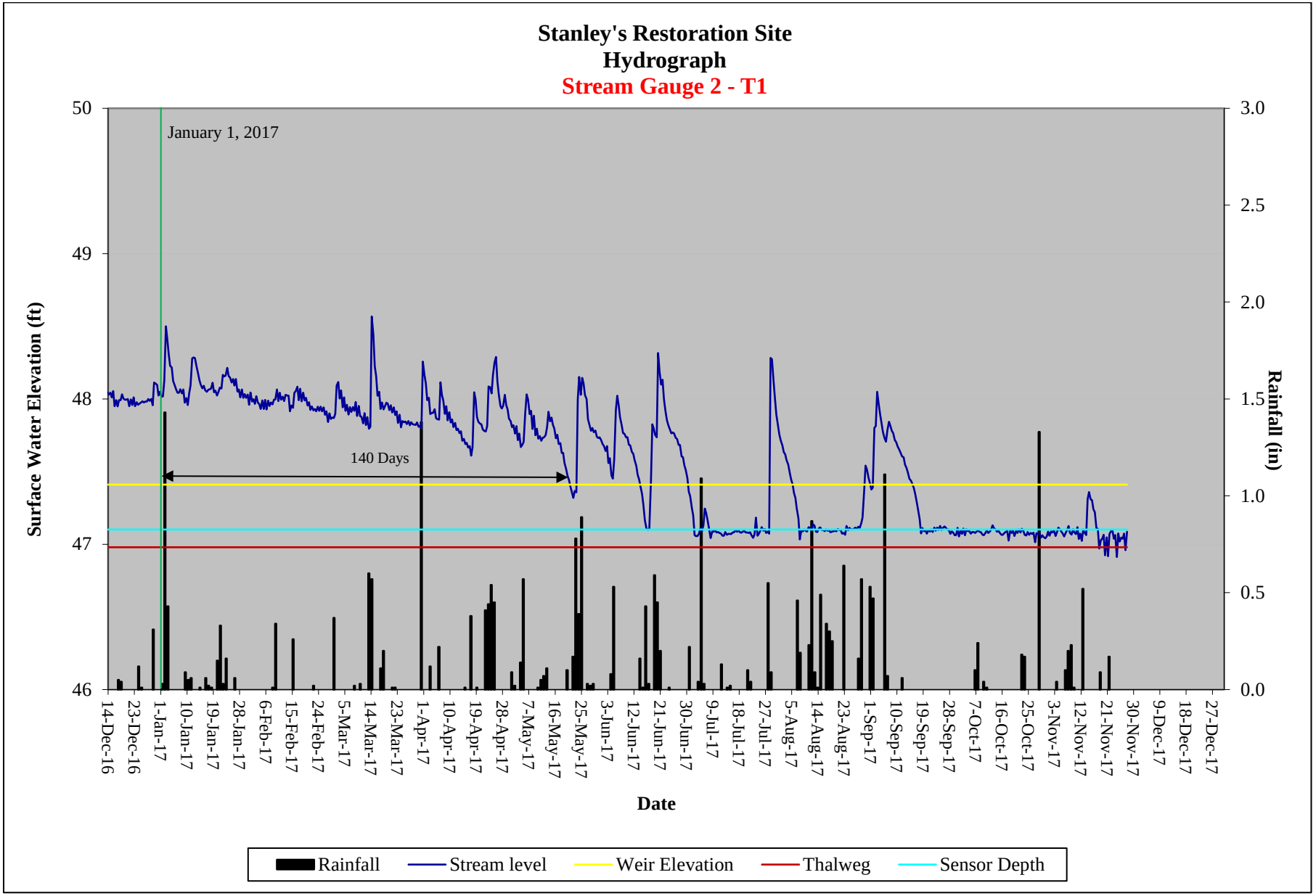
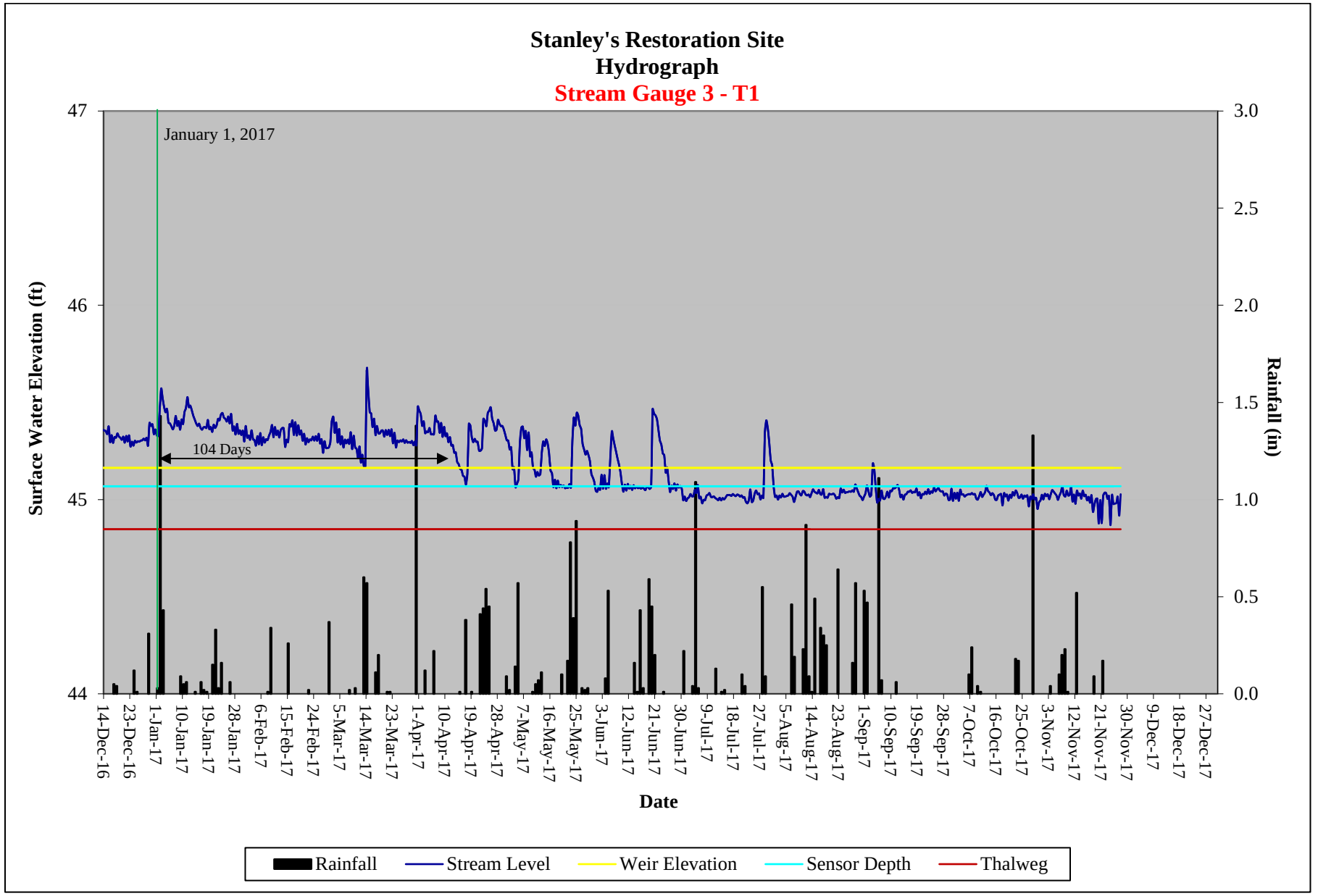
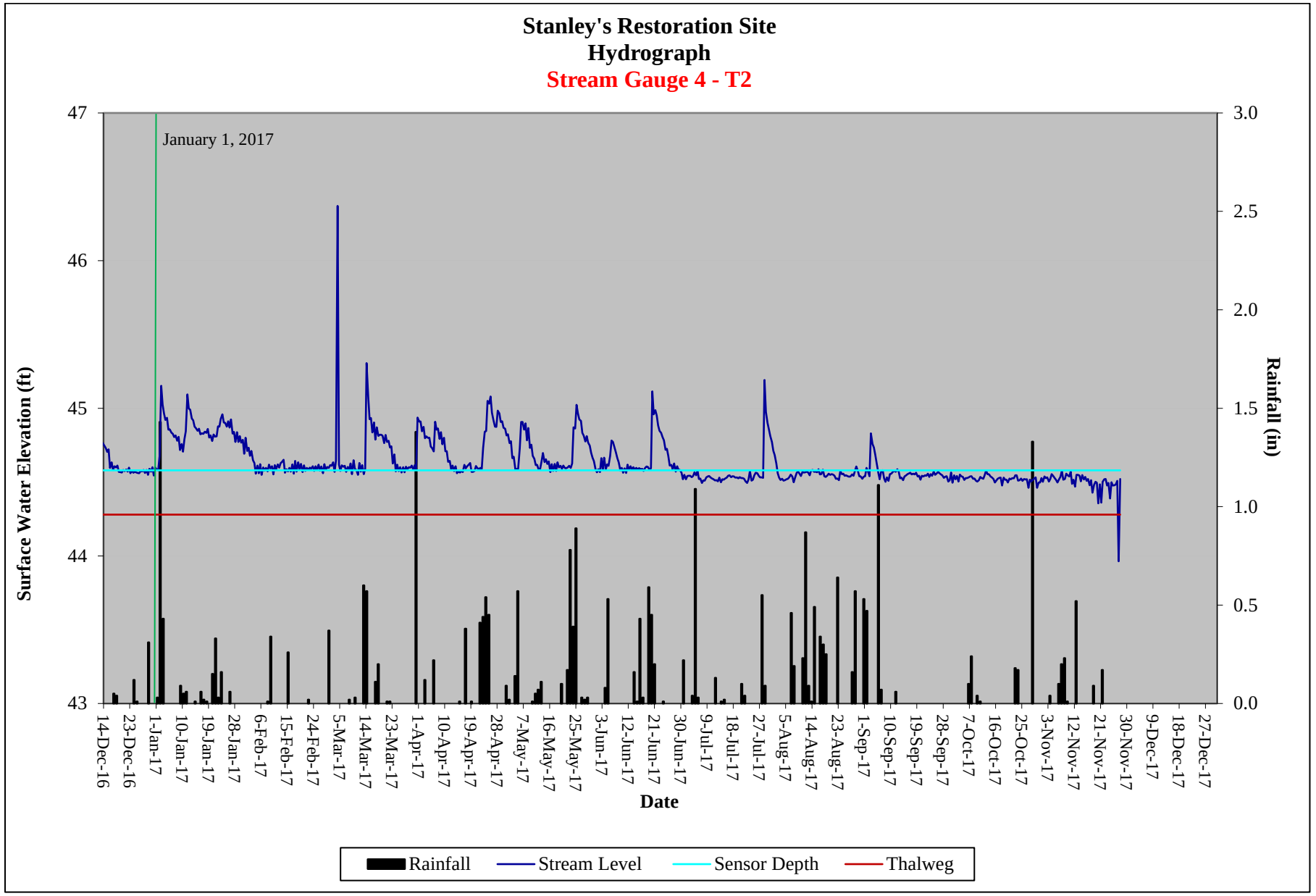


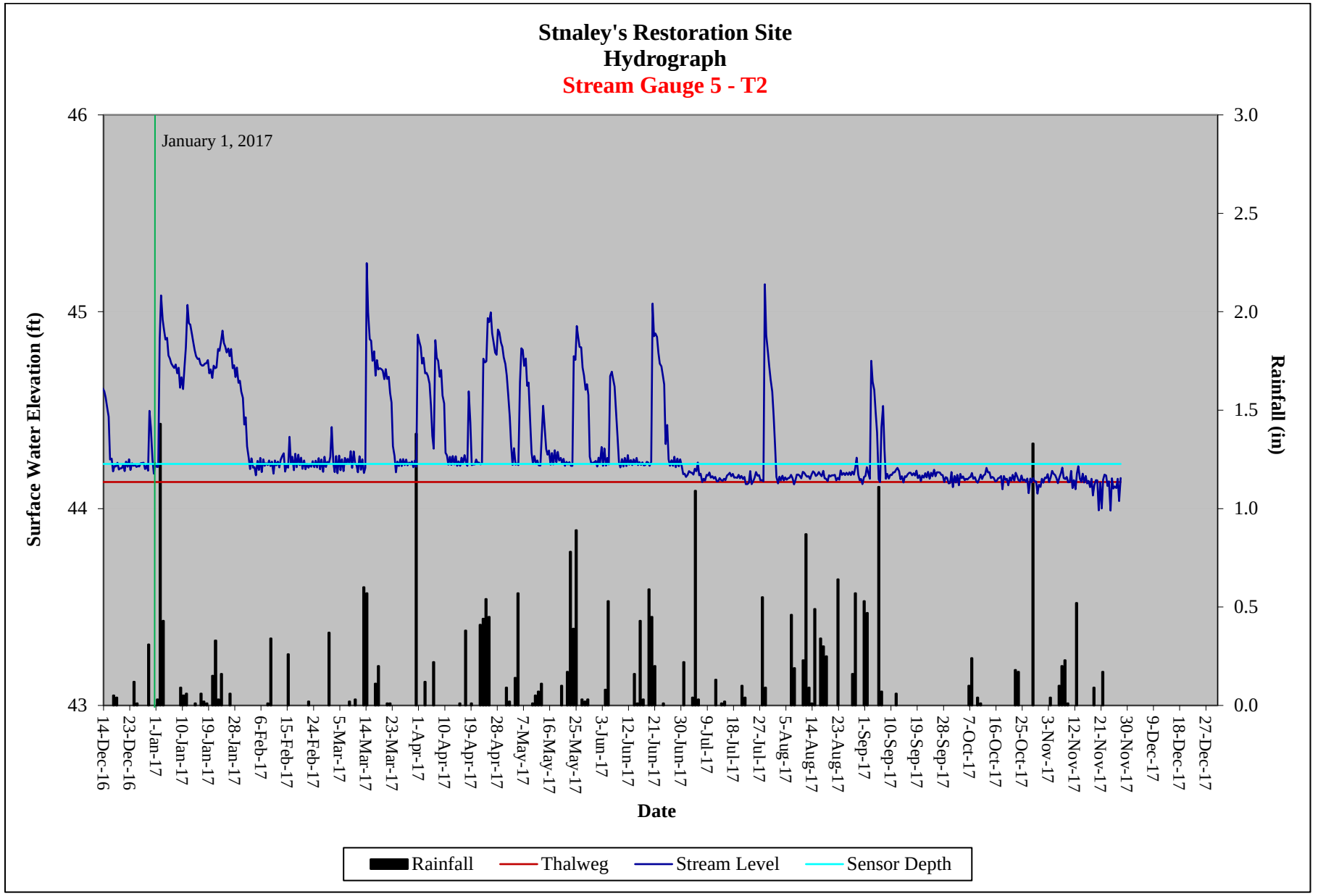
Photo 5. Development of multi-thread channel system on T2


Stanley's Restoration Site
Hydrograph
Stream Gauge 1 - T1
January 1, 2017
Surface Water Elevation (ft)
Rainfall (in)
Date
51
50
49
48
3.0
2.5
2.0
1.5
1.0
0.5
0.0
14-Dec-16
23-Dec-16
1-Jan-17
10-Jan-17
19-Jan-17
28-Jan-17
6-Feb-17
15-Feb-17
24-Feb-17
5-Mar-17
14-Mar-17
23-Mar-17
1-Apr-17
10-Apr-17
19-Apr-17
28-Apr-17
7-May-17
16-May-17
25-May-17
3-Jun-17
12-Jun-17
21-Jun-17
30-Jun-17
9-Jul-17
18-Jul-17
27-Jul-17
5-Aug-17
14-Aug-17
23-Aug-17
1-Sep-17
10-Sep-17
19-Sep-17
28-Sep-17
7-Oct-17
16-Oct-17
25-Oct-17
3-Nov-17
12-Nov-17
21-Nov-17
30-Nov-17
9-Dec-17
18-Dec-17
27-Dec-17
Rainfall
Thalweg
Stream Level
Sensor Depth


Stanley's Restoration Site
Hydrograph
Stream Gauge 2 - T1
January 1, 2017
140 Days
Surface Water Elevation (ft)
Rainfall (in)
Date
50
49
48
47
46
3.0
2.5
2.0
1.5
1.0
0.5
0.0
14-Dec-16
23-Dec-16
1-Jan-17
10-Jan-17
19-Jan-17
28-Jan-17
6-Feb-17
15-Feb-17
24-Feb-17
5-Mar-17
14-Mar-17
23-Mar-17
1-Apr-17
10-Apr-17
19-Apr-17
28-Apr-17
7-May-17
16-May-17
25-May-17
3-Jun-17
12-Jun-17
21-Jun-17
30-Jun-17
9-Jul-17
18-Jul-17
27-Jul-17
5-Aug-17
14-Aug-17
23-Aug-17
1-Sep-17
10-Sep-17
19-Sep-17
28-Sep-17
7-Oct-17
16-Oct-17
25-Oct-17
3-Nov-17
12-Nov-17
21-Nov-17
30-Nov-17
9-Dec-17
18-Dec-17
27-Dec-17
Rainfall
Stream level
Weir Elevation
Thalweg
Sensor Depth


Stanley's Restoration Site
Hydrograph
Stream Gauge 3 - T1
January 1, 2017
104 Days
Surface Water Elevation (ft)
Rainfall (in)
Date
47
46
45
44
3.0
2.5
2.0
1.5
1.0
0.5
0.0
14-Dec-16
23-Dec-16
1-Jan-17
10-Jan-17
19-Jan-17
28-Jan-17
6-Feb-17
15-Feb-17
24-Feb-17
5-Mar-17
14-Mar-17
23-Mar-17
1-Apr-17
10-Apr-17
19-Apr-17
28-Apr-17
7-May-17
16-May-17
25-May-17
3-Jun-17
12-Jun-17
21-Jun-17
30-Jun-17
9-Jul-17
18-Jul-17
27-Jul-17
5-Aug-17
14-Aug-17
23-Aug-17
1-Sep-17
10-Sep-17
19-Sep-17
28-Sep-17
7-Oct-17
16-Oct-17
25-Oct-17
3-Nov-17
12-Nov-17
21-Nov-17
30-Nov-17
9-Dec-17
18-Dec-17
27-Dec-17
Rainfall
Stream Level
Weir Elevation
Sensor Depth
Thalweg


Stanley's Restoration Site
Hydrograph
Stream Gauge 4 - T2
January 1, 2017
Surface Water Elevation (ft)
Rainfall (in)
47
46
45
44
43
3.0
2.5
2.0
1.5
1.0
0.5
0.0
14-Dec-16
23-Dec-16
1-Jan-17
10-Jan-17
19-Jan-17
28-Jan-17
6-Feb-17
15-Feb-17
24-Feb-17
5-Mar-17
14-Mar-17
23-Mar-17
1-Apr-17
10-Apr-17
19-Apr-17
28-Apr-17
7-May-17
16-May-17
25-May-17
3-Jun-17
12-Jun-17
21-Jun-17
30-Jun-17
9-Jul-17
18-Jul-17
27-Jul-17
5-Aug-17
14-Aug-17
23-Aug-17
1-Sep-17
10-Sep-17
19-Sep-17
28-Sep-17
7-Oct-17
16-Oct-17
25-Oct-17
3-Nov-17
12-Nov-17
21-Nov-17
30-Nov-17
9-Dec-17
18-Dec-17
27-Dec-17
Date
Rainfall
Stream Level
Sensor Depth
Thalweg


Stnaley's Restoration Site
Hydrograph
Stream Gauge 5 - T2
January 1, 2017
Surface Water Elevation (ft)
Rainfall (in)
Date
46
45
44
43
3.0
2.5
2.0
1.5
1.0
0.5
0.0
14-Dec-16
23-Dec-16
1-Jan-17
10-Jan-17
19-Jan-17
28-Jan-17
6-Feb-17
15-Feb-17
24-Feb-17
5-Mar-17
14-Mar-17
23-Mar-17
1-Apr-17
10-Apr-17
19-Apr-17
28-Apr-17
7-May-17
16-May-17
25-May-17
3-Jun-17
12-Jun-17
21-Jun-17
30-Jun-17
9-Jul-17
18-Jul-17
27-Jul-17
5-Aug-17
14-Aug-17
23-Aug-17
1-Sep-17
10-Sep-17
19-Sep-17
28-Sep-17
7-Oct-17
16-Oct-17
25-Oct-17
3-Nov-17
12-Nov-17
21-Nov-17
30-Nov-17
9-Dec-17
18-Dec-17
27-Dec-17
Rainfall
Thalweg
Stream Level
Sensor Depth

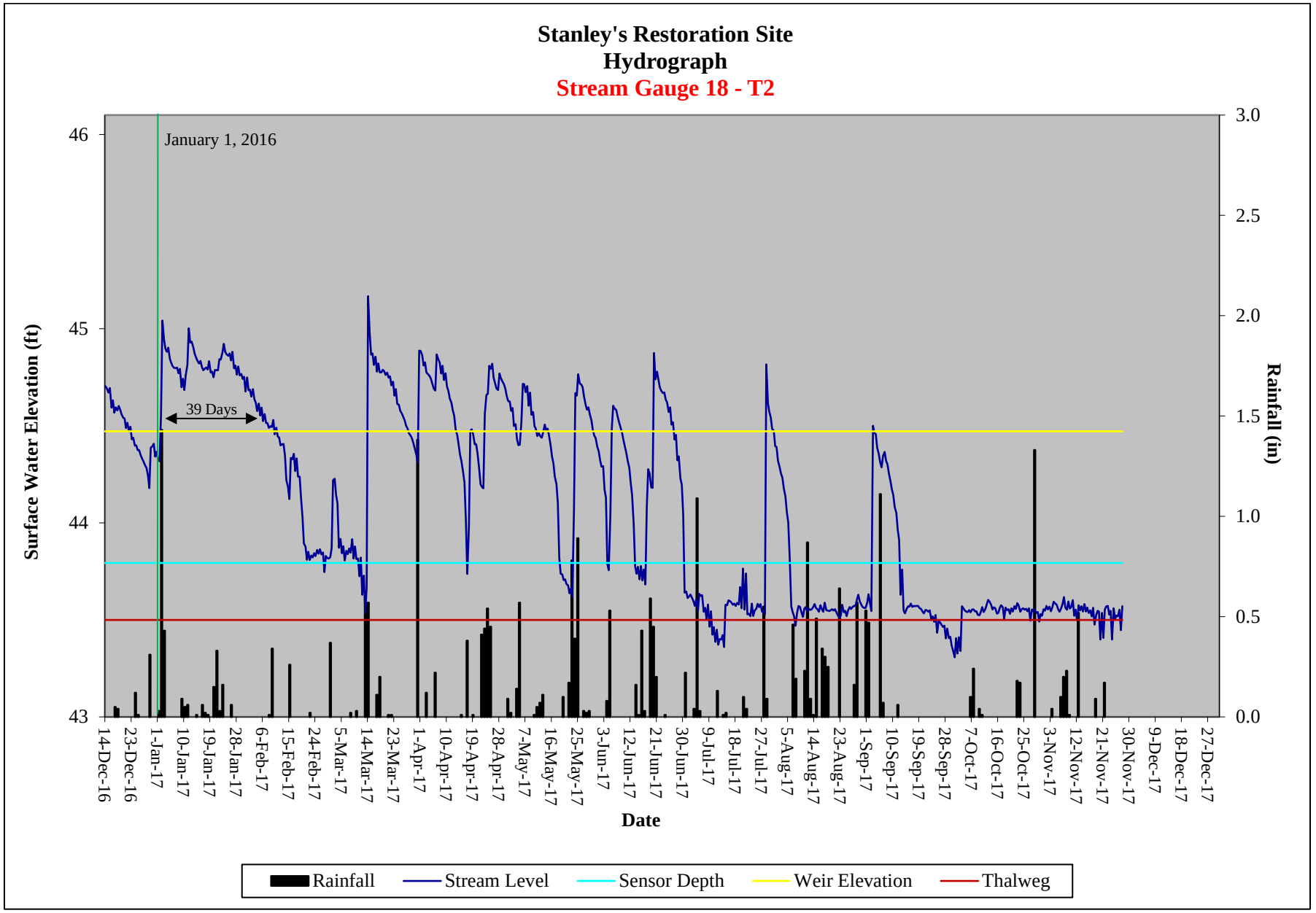
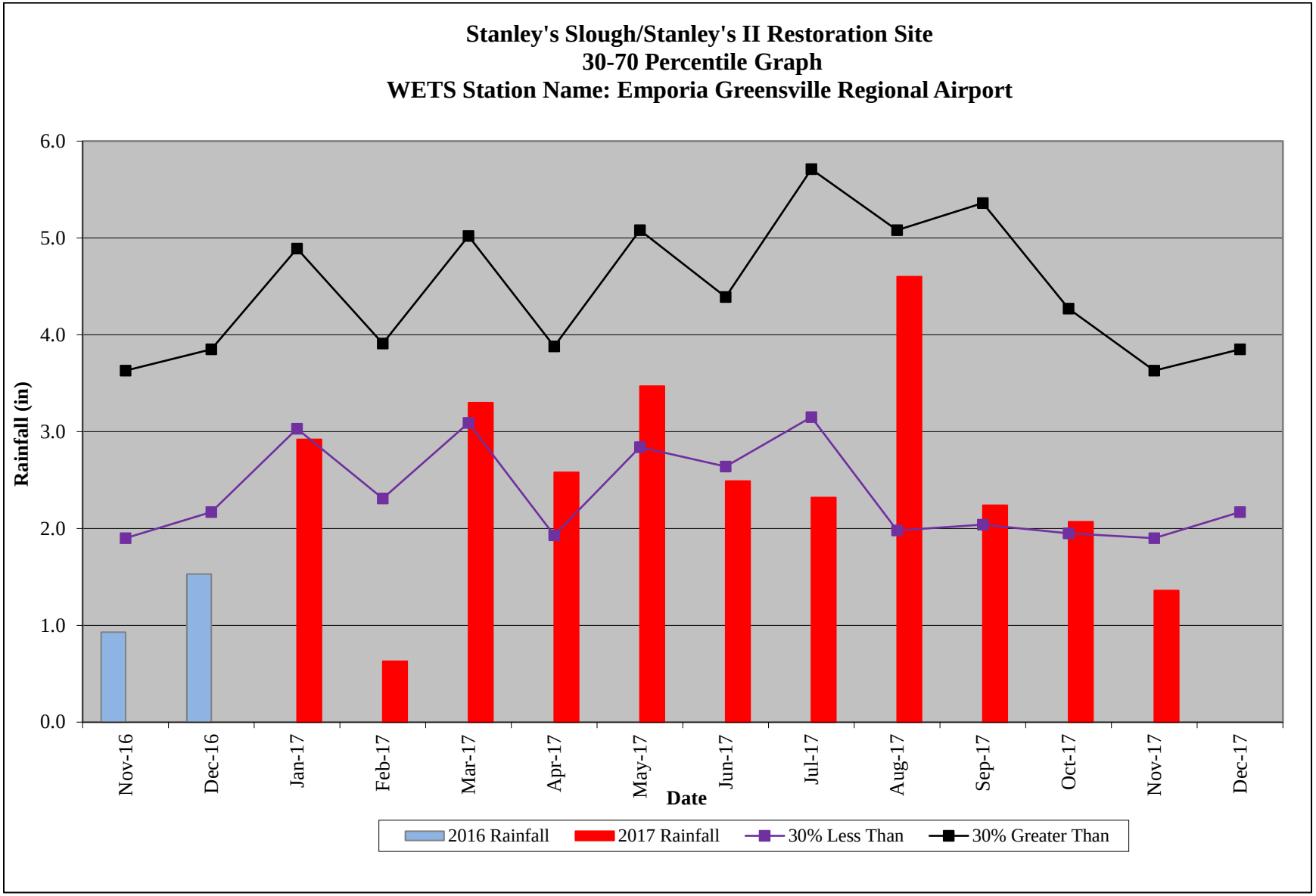
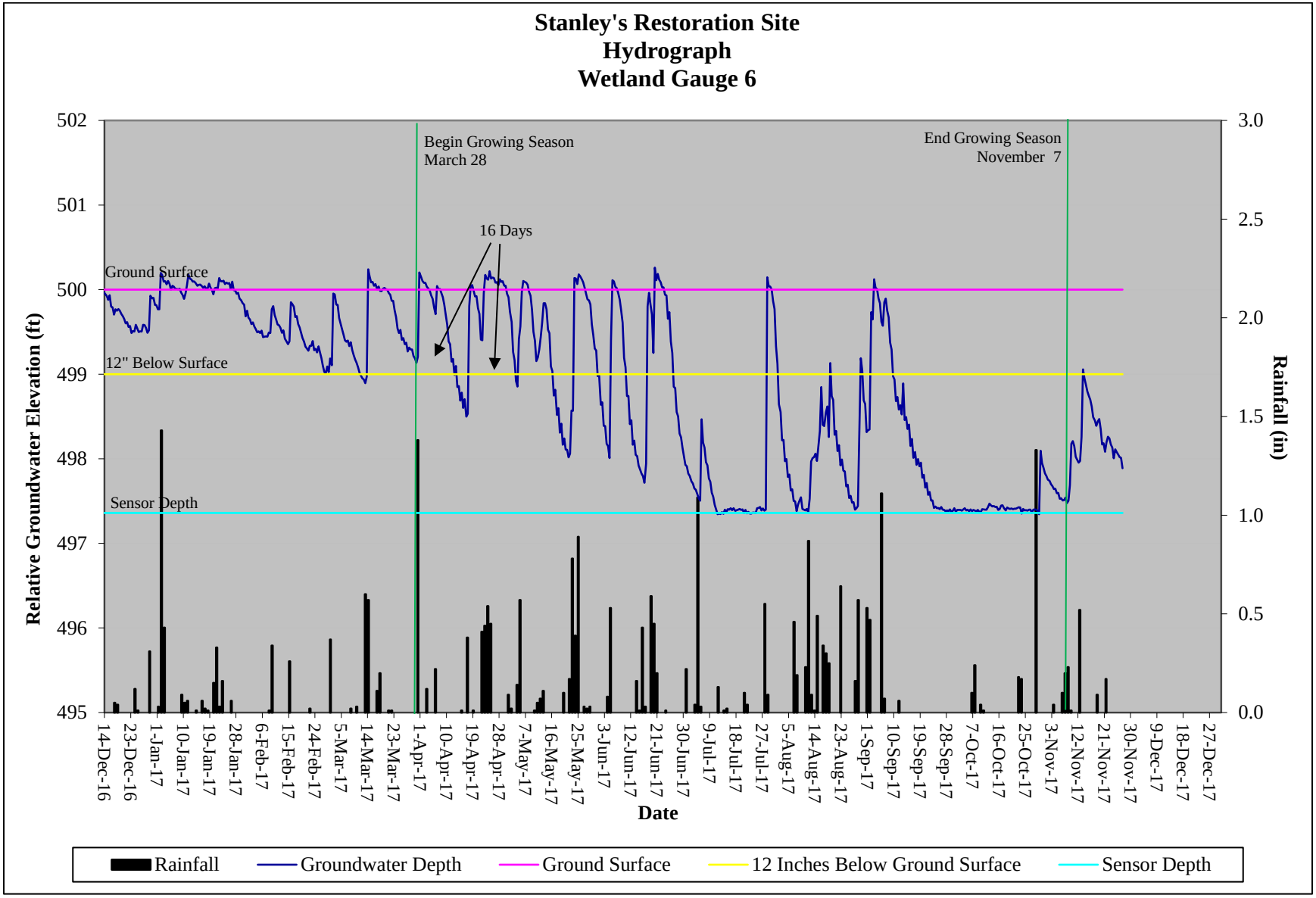
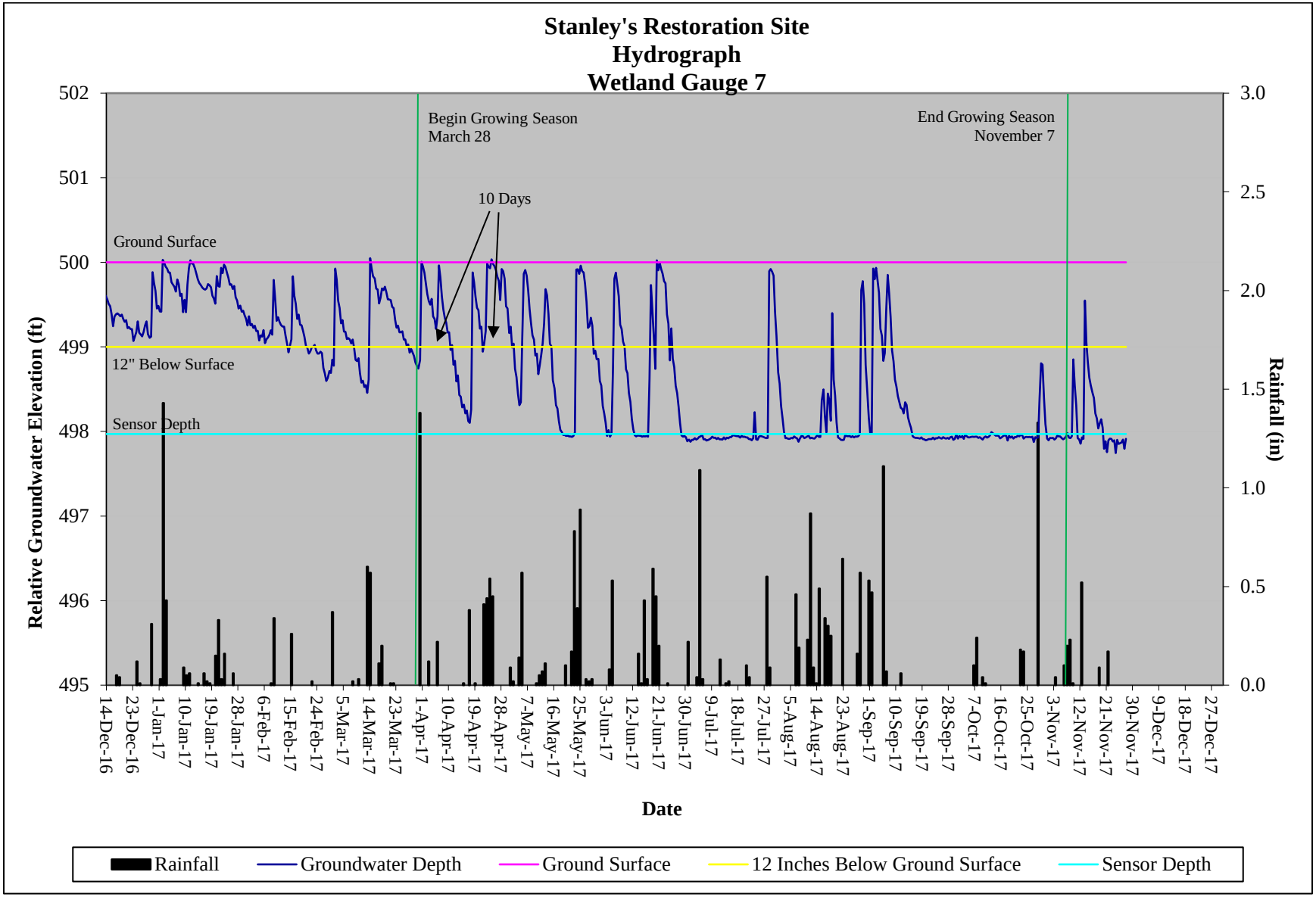

Stanley's Restoration Site
Hydrograph
Stream Gauge 18 - T2
January 1, 2016
39 Days
Surface Water Elevation (ft)
Rainfall (in)
Date
46
45
44
43
3.0
2.5
2.0
1.5
1.0
0.5
0.0
14-Dec-16
23-Dec-16
1-Jan-17
10-Jan-17
19-Jan-17
28-Jan-17
6-Feb-17
15-Feb-17
24-Feb-17
5-Mar-17
14-Mar-17
23-Mar-17
1-Apr-17
10-Apr-17
19-Apr-17
28-Apr-17
7-May-17
16-May-17
25-May-17
3-Jun-17
12-Jun-17
21-Jun-17
30-Jun-17
9-Jul-17
18-Jul-17
27-Jul-17
5-Aug-17
14-Aug-17
23-Aug-17
1-Sep-17
10-Sep-17
19-Sep-17
28-Sep-17
7-Oct-17
16-Oct-17
25-Oct-17
3-Nov-17
12-Nov-17
21-Nov-17
30-Nov-17
9-Dec-17
18-Dec-17
27-Dec-17
Rainfall
Stream Level
Sensor Depth
Weir Elevation
Thalweg

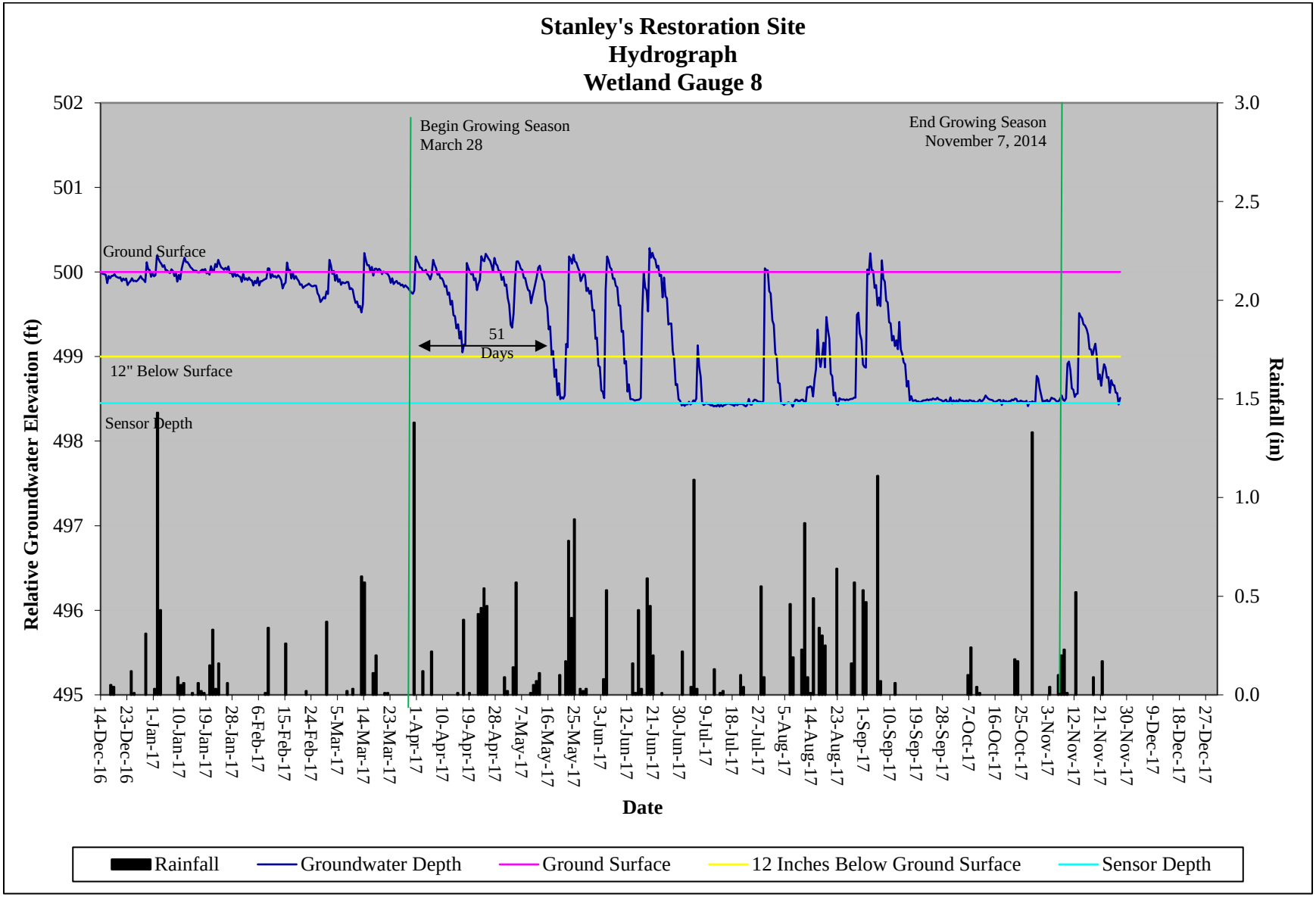
Table 10. Wetland Hydrology Criteria Attainment Stanley's Slough and Stanley's Slough II Restoration Sites, DMS Project Number 95356/95838								
		Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
Location	Gauge	MY01 (2014)	MY02 (2015)	MY03 (2016)	MY04 (2017)	MY05 (2018)	MY06 (2019)	MY07 (2020)
SII Res.	6	No/10 (4.2%)	Yes/39 (17.2%)	Yes/34 (15.2%)	No/16 (7.1%)			
SII Res.	7	No/12 (5.1%)	No/8 (3.3%)	Yes/33 (14.5%)	No/10 (4.5%)			
SII Res.	8	Yes/44 (19.4%)	Yes/43 (19.0%)	Yes/48 (21.4%)	Yes/51 (22.8%)			
SII Reh.	9	Yes/62 (27.5%)	Yes/80 (35.7%)	Yes/79 (35.0%)	Yes/68 (30.4%)			
SII Res.	10	Yes/48 (21.2%)	Yes/47 (21.0%)	Yes/50 (22.3%)	No/19 (8.3%)			
SII Res.	11	Yes/44 (19.4%)	Yes/28 (12.5%)	Yes/23 (10.3%)	No/5 (2.2%)			
SSS Res.	12	Yes/44 (19.4%)	Yes/38 (16.7%)	Yes/33 (14.7%)	No/18 (8.0%)			
SSS Res.	13	Yes/58 (25.7%)	Yes/46 (20.3%)	Yes/61 (27.0%)	Yes/36 (16.1%)			
SSS Res.	14	Yes/44 (19.4%)	Yes/37 (16.5%)	Yes/23 (10.0%)	No/17 (7.6%)			
SSS Reh.	15	Yes/61 (27.2%)	Yes/52 (23.0%)	Yes/116 (51.8%)	Yes/80 (35.5%)			
SII Res.	16	Yes/56 (24.8%)	Yes/47 (20.8%)	Yes/80 (35.5%)	Yes/51 (22.8%)			
SII Res.	17	Yes/47 (20.8%)	Yes/39 (17.2%)	No/18 (8.0%)	No/11 (4.7%)			
Reference	Reference	-	Yes/43 (19.2%)	Yes/60 (26.8%)	No/20 (8.7%)			

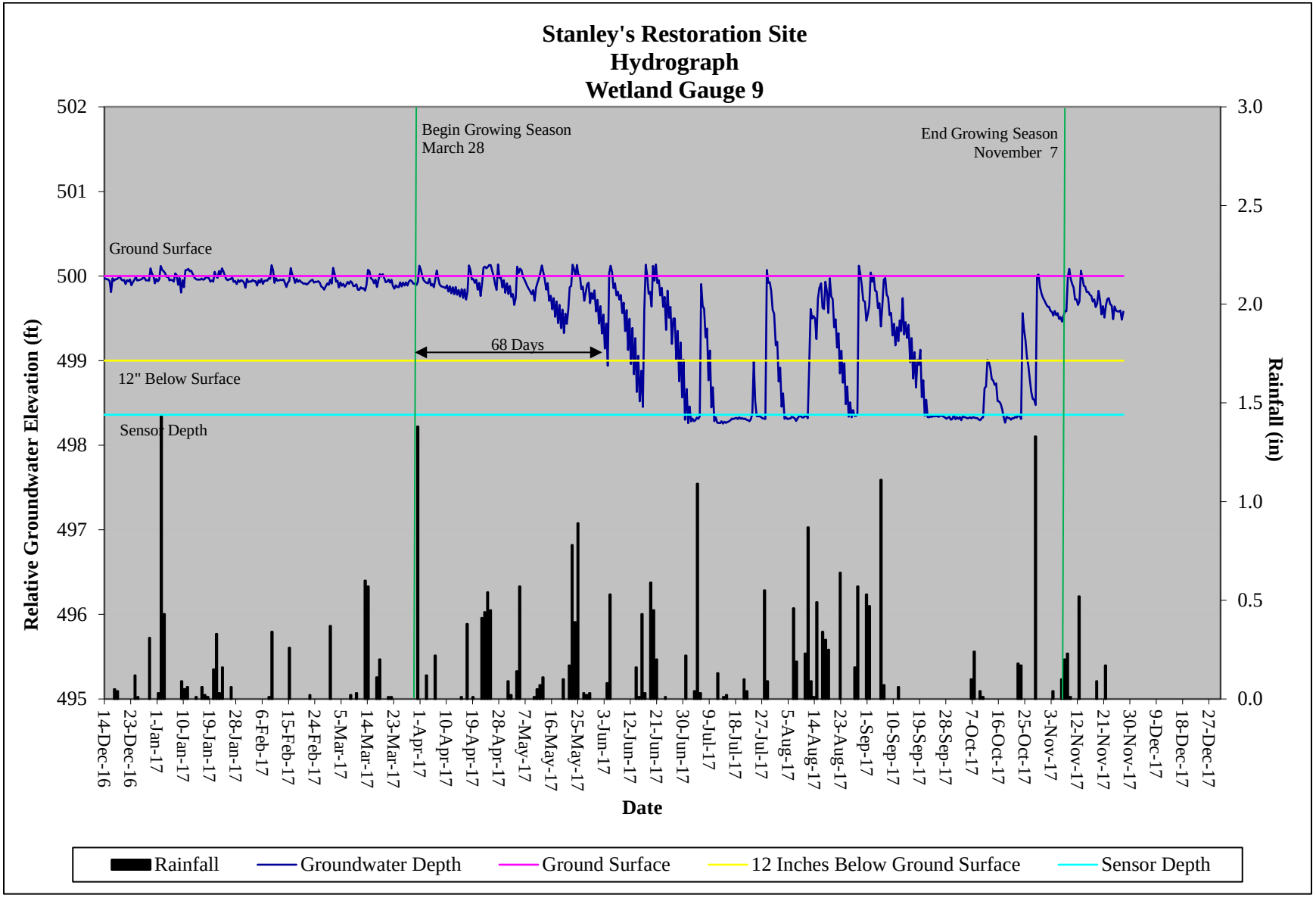
Res. = Wetland Reestablishment, Reh. = Wetland Rehabilitation

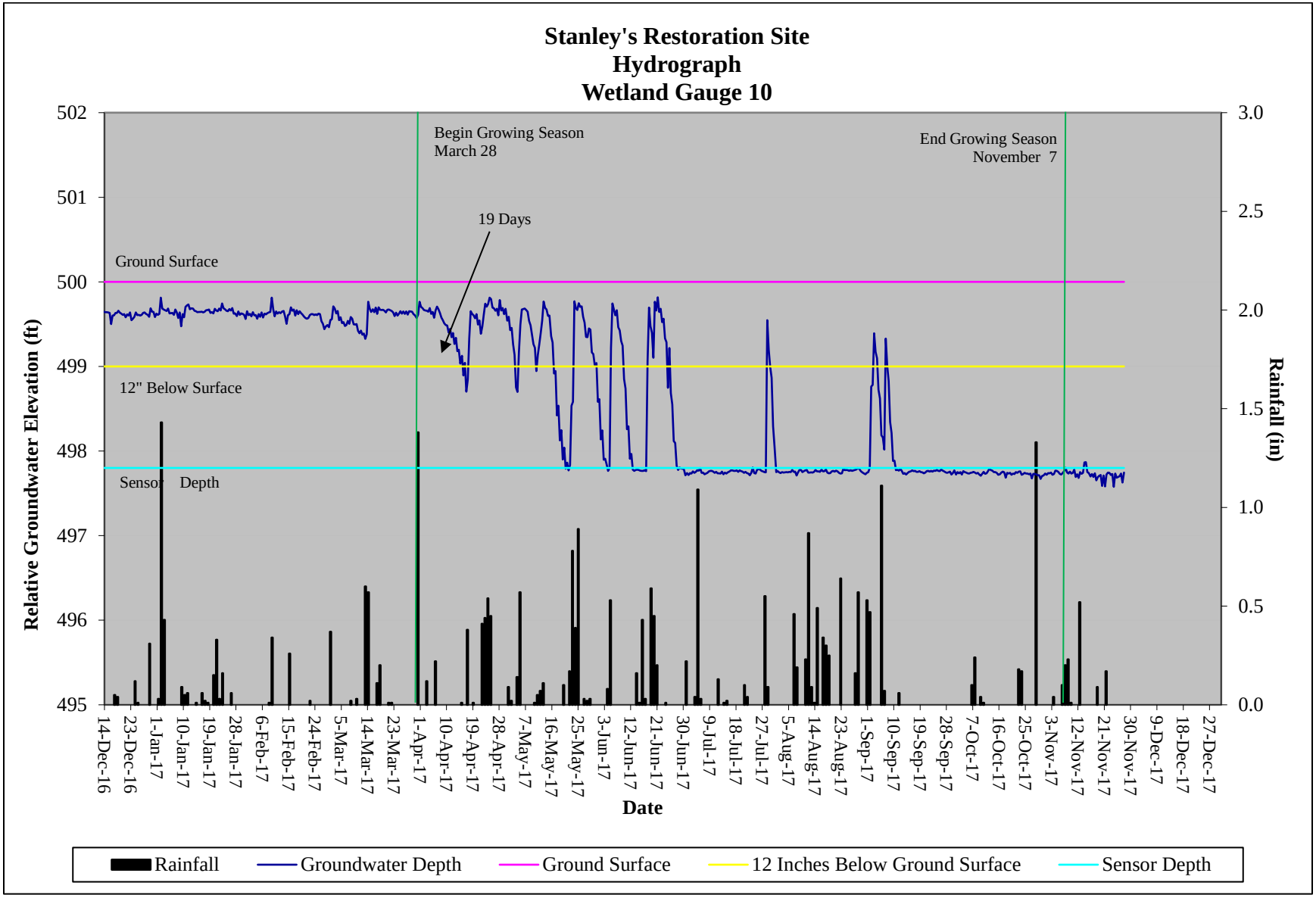

Stanley's Slough/Stanley's II Restoration Site
30-70 Percentile Graph
WETS Station Name: Emporia Greensville Regional Airport
Rainfall (in)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Nov-16
Dec-16
Jan-17
Feb-17
Mar-17
Apr-17
May-17
Jun-17
Jul-17
Aug-17
Sep-17
Oct-17
Nov-17
Dec-17
Date
2016 Rainfall
2017 Rainfall
30% Less Than
30% Greater Than

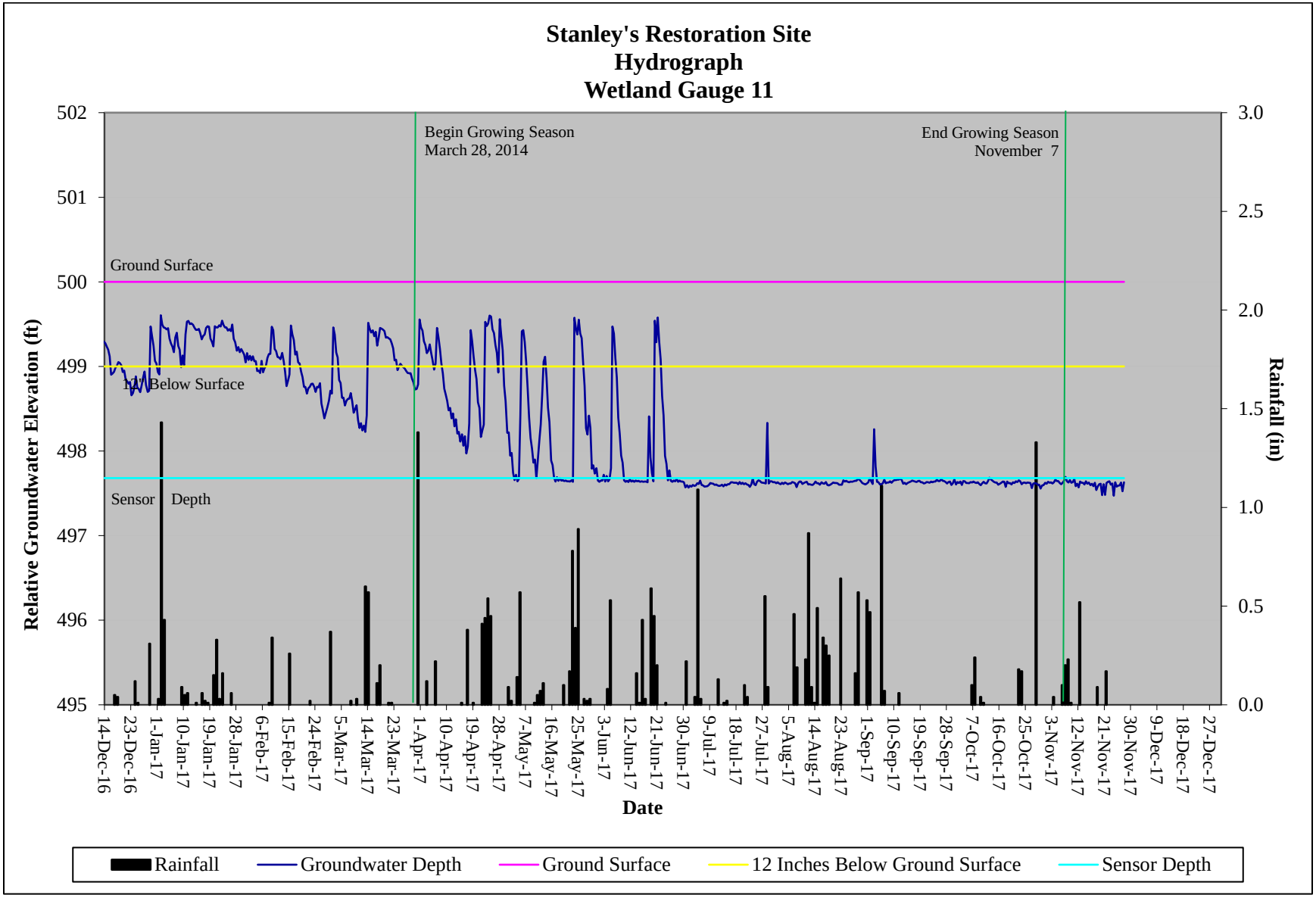

Stanley's Restoration Site
Hydrograph
Wetland Gauge 6
Begin Growing Season
March 28
End Growing Season
November 7
16 Days
Ground Surface
12" Below Surface
Sensor Depth
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

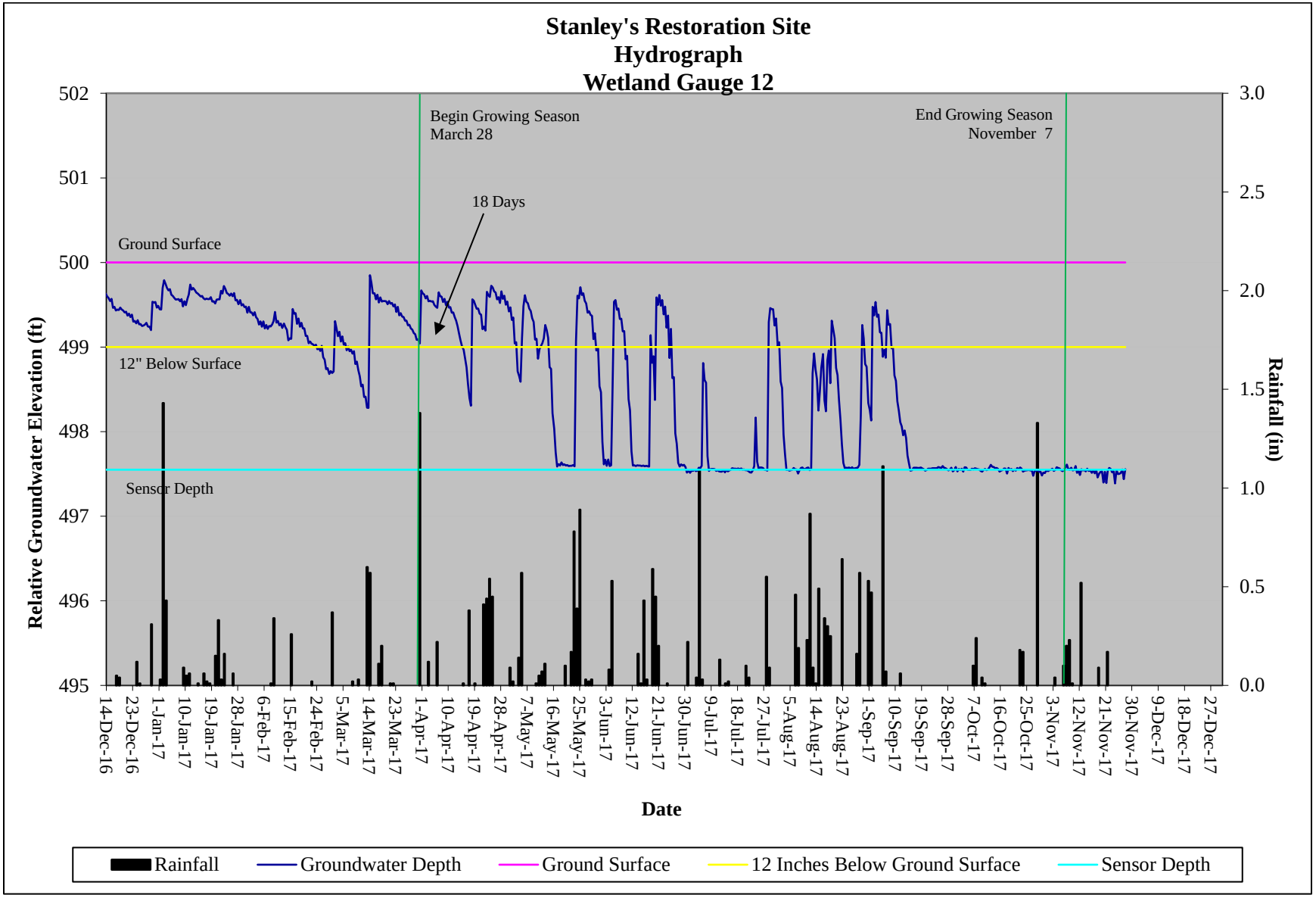

Stanley's Restoration Site
Hydrograph
Wetland Gauge 7
Begin Growing Season
March 28
End Growing Season
November 7
10 Days
Ground Surface
12" Below Surface
Sensor Depth
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor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

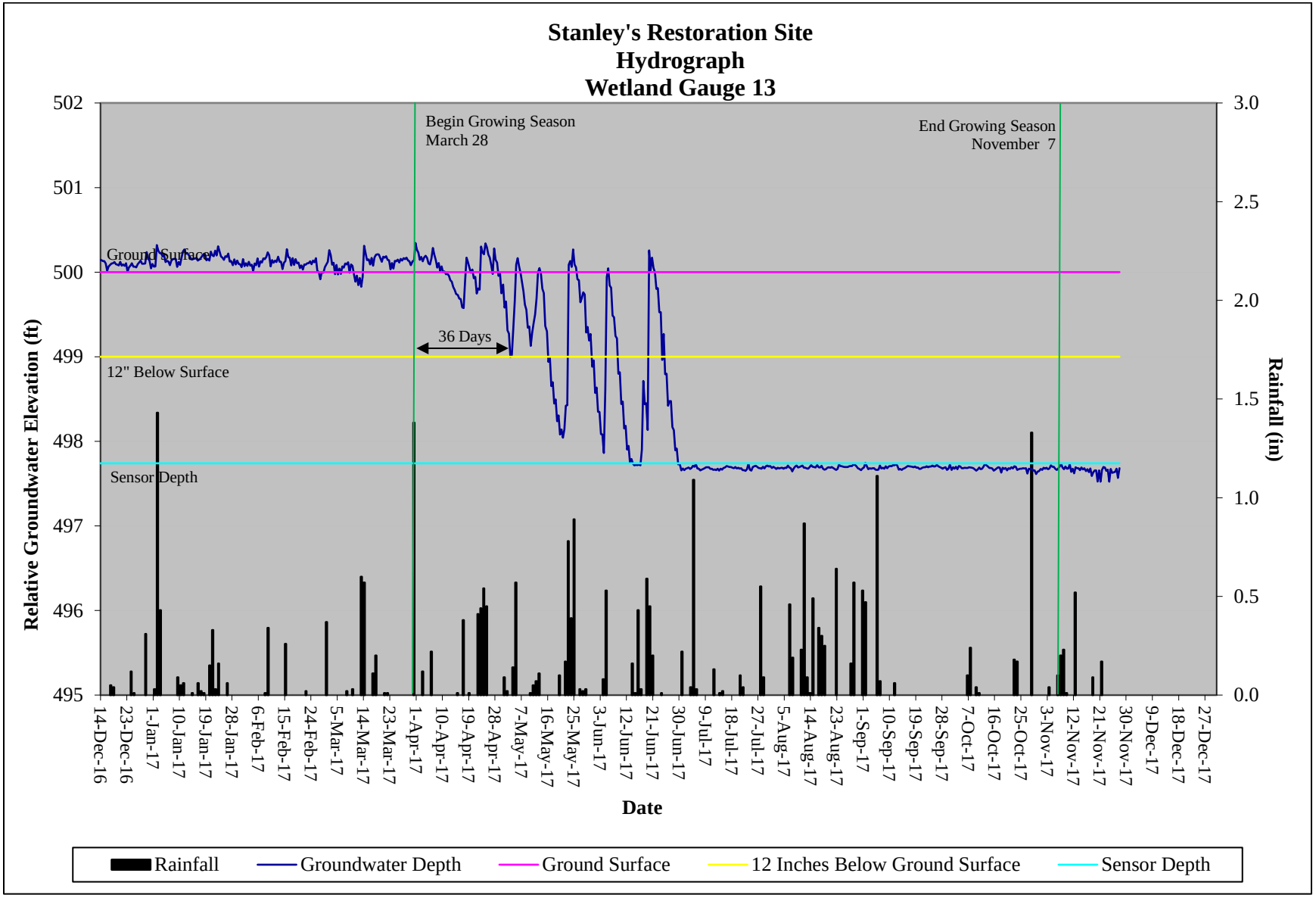

Stanley's Restoration Site
Hydrograph
Wetland Gauge 8
Begin Growing Season
March 28
End Growing Season
November 7, 2014
Ground Surface
12" Below Surface
Sensor Depth
51
Days
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

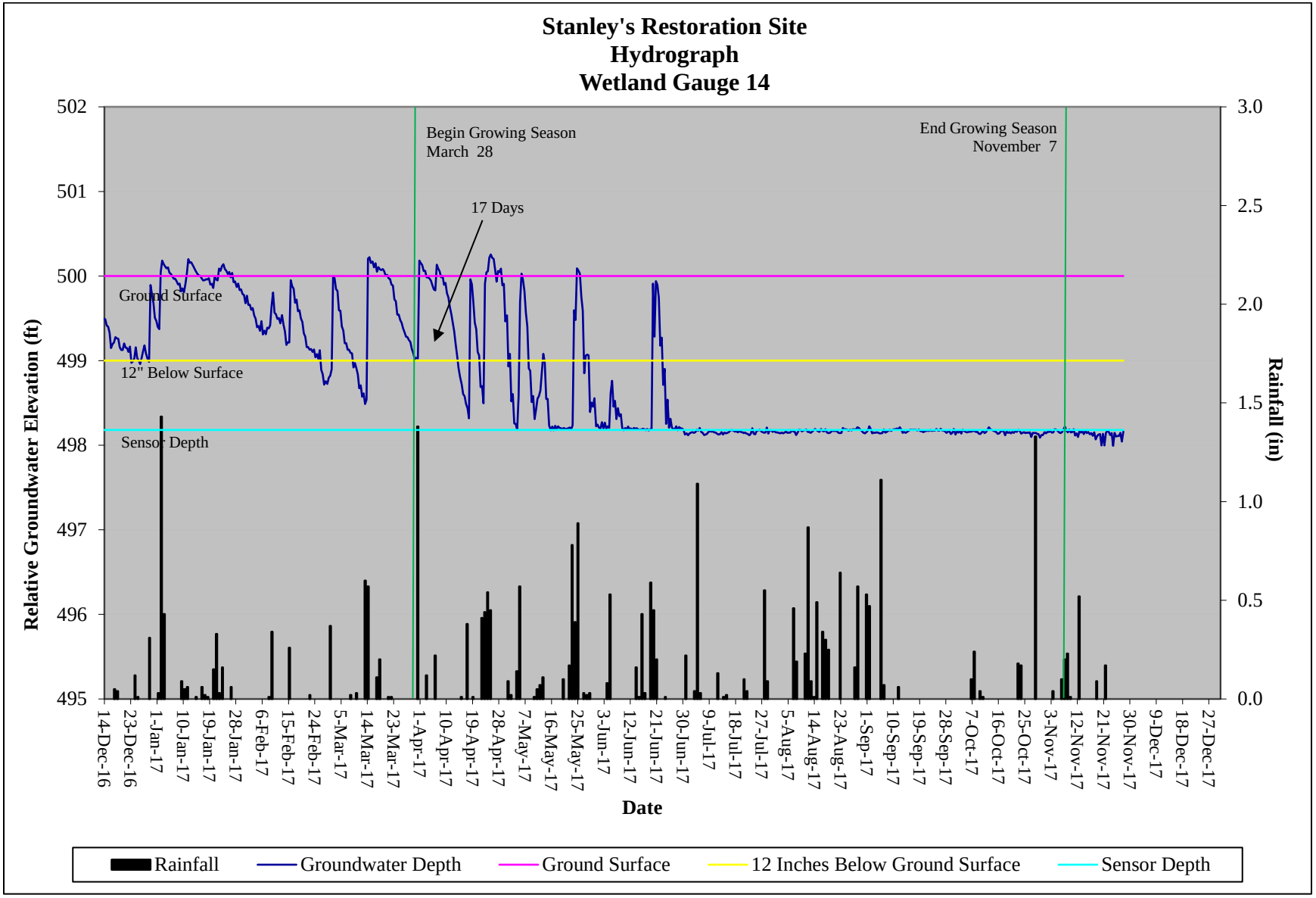

Stanley's Restoration Site
Hydrograph
Wetland Gauge 9
Begin Growing Season
March 28
End Growing Season
November 7
Ground Surface
68 Days
12" Below Surface
Sensor Depth
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
502
501
500
499
498
497
496
495
3.0
2.5
2.0
1.5
1.0
0.5
0.0
14-Dec-16
23-Dec-16
1-Jan-17
10-Jan-17
19-Jan-17
28-Jan-17
6-Feb-17
15-Feb-17
24-Feb-17
5-Mar-17
14-Mar-17
23-Mar-17
1-Apr-17
10-Apr-17
19-Apr-17
28-Apr-17
7-May-17
16-May-17
25-May-17
3-Jun-17
12-Jun-17
21-Jun-17
30-Jun-17
9-Jul-17
18-Jul-17
27-Jul-17
5-Aug-17
14-Aug-17
23-Aug-17
1-Sep-17
10-Sep-17
19-Sep-17
28-Sep-17
7-Oct-17
16-Oct-17
25-Oct-17
3-Nov-17
12-Nov-17
21-Nov-17
30-Nov-17
9-Dec-17
18-Dec-17
27-Dec-17
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

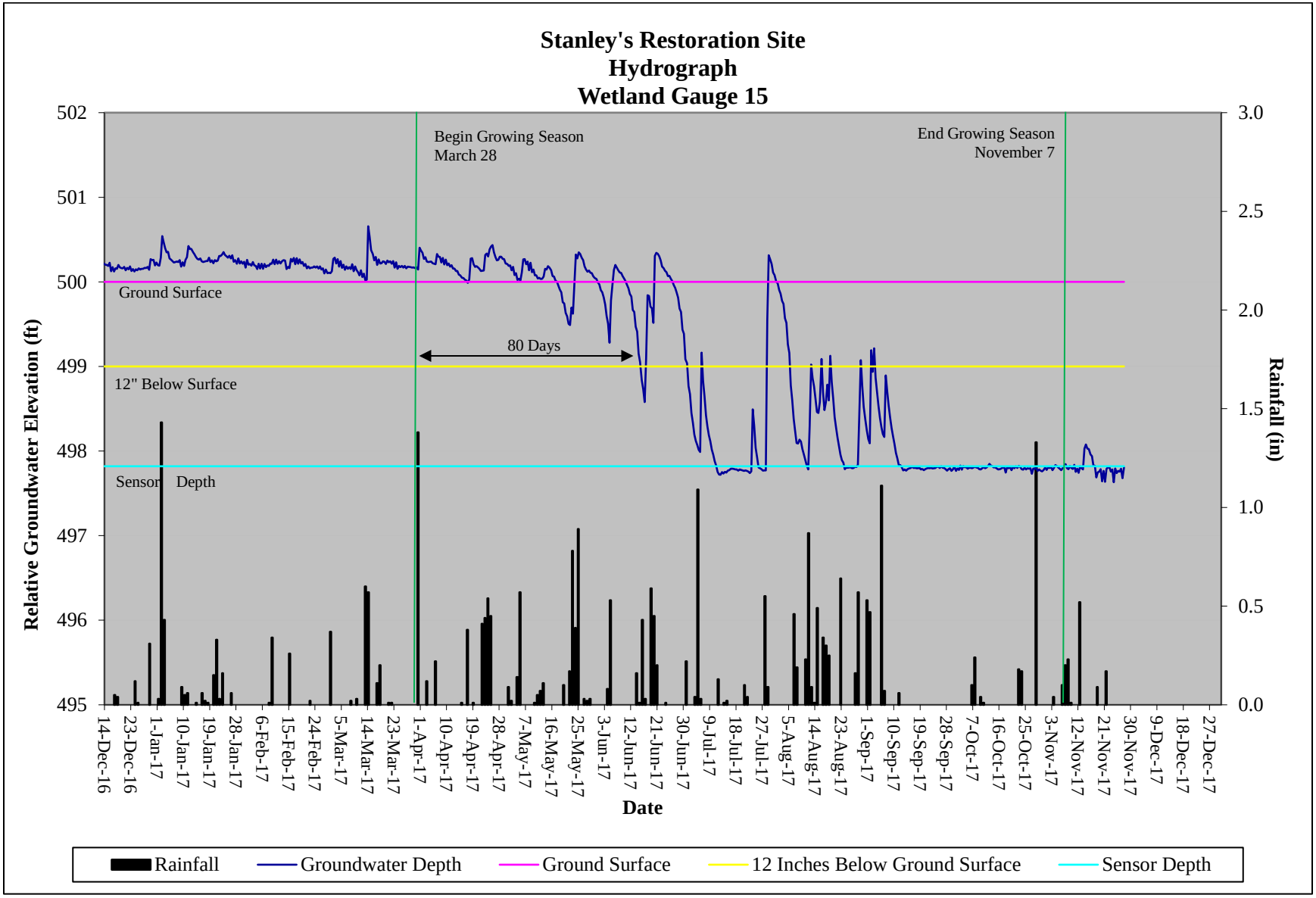

Stanley's Restoration Site
Hydrograph
Wetland Gauge 10
Begin Growing Season
March 28
End Growing Season
November 7
19 Days
Ground Surface
12" Below Surface
Sensor Depth
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor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

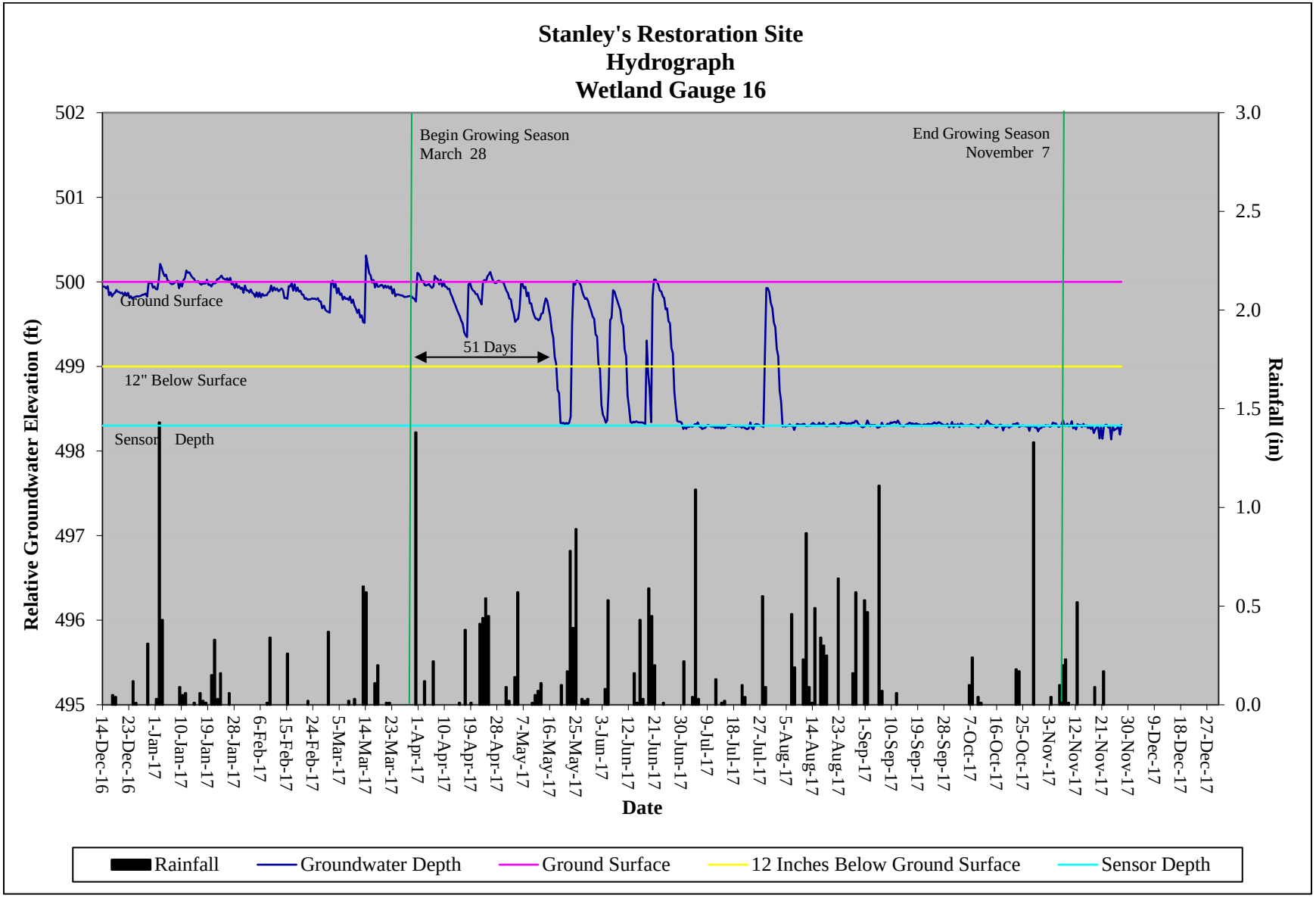

Stanley's Restoration Site
Hydrograph
Wetland Gauge 11
Begin Growing Season
March 28, 2014
End Growing Season
November 7
Ground Surface
12" Below Surface
Sensor Depth
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
502
501
500
499
498
497
496
495
3.0
2.5
2.0
1.5
1.0
0.5
0.0
14-Dec-16
23-Dec-16
1-Jan-17
10-Jan-17
19-Jan-17
28-Jan-17
6-Feb-17
15-Feb-17
24-Feb-17
5-Mar-17
14-Mar-17
23-Mar-17
1-Apr-17
10-Apr-17
19-Apr-17
28-Apr-17
7-May-17
16-May-17
25-May-17
3-Jun-17
12-Jun-17
21-Jun-17
30-Jun-17
9-Jul-17
18-Jul-17
27-Jul-17
5-Aug-17
14-Aug-17
23-Aug-17
1-Sep-17
10-Sep-17
19-Sep-17
28-Sep-17
7-Oct-17
16-Oct-17
25-Oct-17
3-Nov-17
12-Nov-17
21-Nov-17
30-Nov-17
9-Dec-17
18-Dec-17
27-Dec-17
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

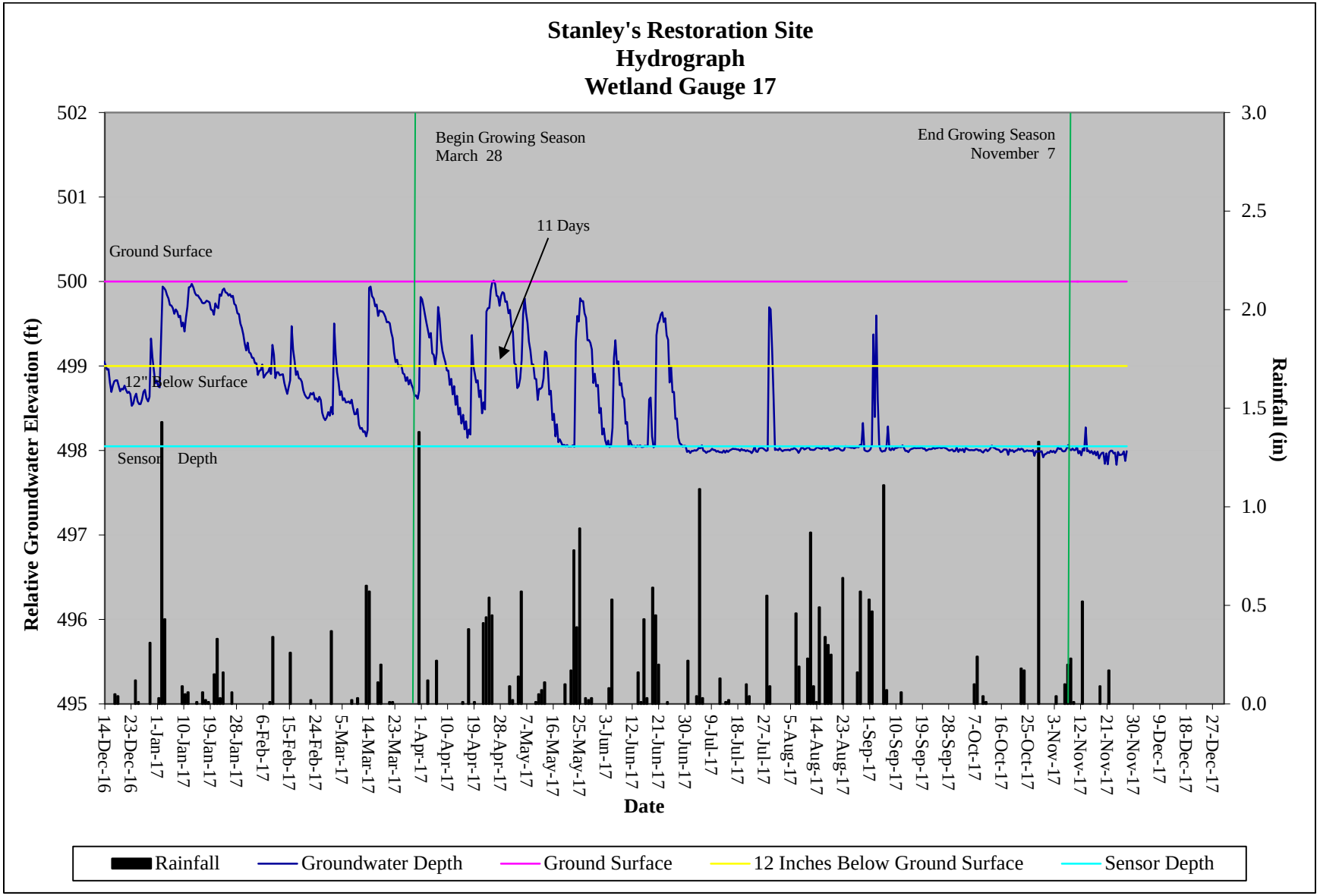

Stanley's Restoration Site
Hydrograph
Wetland Gauge 12
Begin Growing Season
March 28
End Growing Season
November 7
18 Days
Ground Surface
12" Below Surface
Sensor Depth
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor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

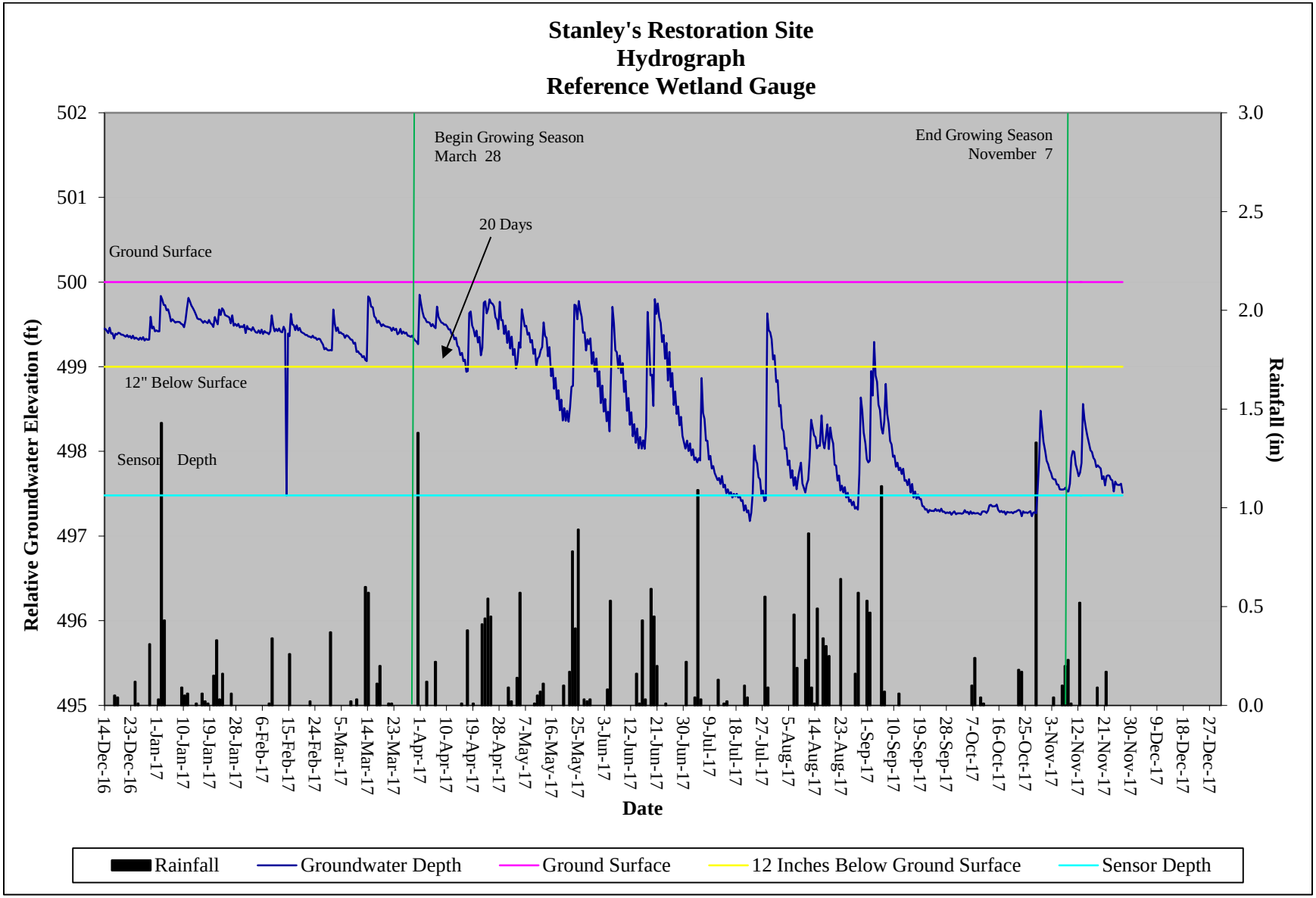

Stanley's Restoration Site
Hydrograph
Wetland Gauge 13
Begin Growing Season
March 28
End Growing Season
November 7
Ground Surface
36 Days
12" Below Surface
Sensor Depth
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor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


Stanley's Restoration Site
Hydrograph
Wetland Gauge 14
Begin Growing Season
March 28
End Growing Season
November 7
17 Days
Ground Surface
12" Below Surface
Sensor Depth
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
502
501
500
499
498
497
496
495
3.0
2.5
2.0
1.5
1.0
0.5
0.0
14-Dec-16
23-Dec-16
1-Jan-17
10-Jan-17
19-Jan-17
28-Jan-17
6-Feb-17
15-Feb-17
24-Feb-17
5-Mar-17
14-Mar-17
23-Mar-17
1-Apr-17
10-Apr-17
19-Apr-17
28-Apr-17
7-May-17
16-May-17
25-May-17
3-Jun-17
12-Jun-17
21-Jun-17
30-Jun-17
9-Jul-17
18-Jul-17
27-Jul-17
5-Aug-17
14-Aug-17
23-Aug-17
1-Sep-17
10-Sep-17
19-Sep-17
28-Sep-17
7-Oct-17
16-Oct-17
25-Oct-17
3-Nov-17
12-Nov-17
21-Nov-17
30-Nov-17
9-Dec-17
18-Dec-17
27-Dec-17
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
80 Days
12" Below Surface
Sensor Depth
Relative 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
51 Days
12" Below Surface
Sensor Depth
Relative 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
11 Days
Ground Surface
12" Below Surface
Sensor Depth
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Stanley's Restoration Site
Hydrograph
Reference Wetland Gauge
Begin Growing Season
March 28
End Growing Season
November 7
20 Days
Ground Surface
12" Below Surface
Sensor Depth
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
502
501
500
499
498
497
496
495
3.0
2.5
2.0
1.5
1.0
0.5
0.0
14-Dec-16
23-Dec-16
1-Jan-17
10-Jan-17
19-Jan-17
28-Jan-17
6-Feb-17
15-Feb-17
24-Feb-17
5-Mar-17
14-Mar-17
23-Mar-17
1-Apr-17
10-Apr-17
19-Apr-17
28-Apr-17
7-May-17
16-May-17
25-May-17
3-Jun-17
12-Jun-17
21-Jun-17
30-Jun-17
9-Jul-17
18-Jul-17
27-Jul-17
5-Aug-17
14-Aug-17
23-Aug-17
1-Sep-17
10-Sep-17
19-Sep-17
28-Sep-17
7-Oct-17
16-Oct-17
25-Oct-17
3-Nov-17
12-Nov-17
21-Nov-17
30-Nov-17
9-Dec-17
18-Dec-17
27-Dec-17
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth