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 06

Prepared for:
NCDMS, 1652 Mail Service Center, Raleigh, NC 27699-1652

Construction Completed: April 2014
Data Collection: 2019
Submitted: December 2019

Mitigation Project Name	**Stanley's Slough Stream and Wetland Site**	**County**	**Northampton**	**USACE Action ID**	**2012-01918**
DMS ID	**95356**	**Date Project Instituted**	**8/1/2012**	**NCDWR Permit No**	**2013-0596**
River Basin	**Chowan**	**Date Prepared**	**6/13/2019**		
Cataloging Unit	**03010204**				

Credit Release Milestone	Stream Credits						Wetland Credits							
	Scheduled Releases (Stream)	Warm	Cool	Cold	Anticipated Release Year (Stream)	Actual Release Date (Stream)	Scheduled Releases (Forested)	Riparian Riverine	Riparian Non-riverine	Non-riparian	Scheduled Releases (Coastal)	Coastal	Anticipated Release Year (Wetland)	Actual Release Year (Wetland)
Potential Credits (Mitigation Plan)		**4,274.000**						**3.120**						
Potential Credits (As-Built Survey)		**4,274.000**						**3.120**						
1 (Site Establishment)	**N/A**	N/A			N/A	N/A	**N/A**	N/A			**N/A**		N/A	N/A
2 (Year 0 / As-Built)	**30%**	1,282.200			2014	7/2/2014	**30%**	0.936			**N/A**		2014	7/2/2014
3 (Year 1 Monitoring)	**10%**	427.400			2015	4/23/2015	**10%**	0.312			**N/A**		2015	4/23/2015
4 (Year 2 Monitoring)	**10%**	427.400			2016	4/28/2016	**10%**	0.312			**N/A**		2016	4/28/2016
5 (Year 3 Monitoring)	**10%**	427.400			2017	4/3/2017	**15%**	0.468			**N/A**		2017	4/3/2017
6 (Year 4 Monitoring)	**5%**	213.700			2018	4/25/2018	**5%**	0.156			**N/A**		2018	4/25/2018
7 (Year 5 Monitoring)	**10%**	427.400			2019	4/26/2019	**15%**	0.468			**N/A**		2019	4/26/2019
8 (Year 6 Monitoring)	**5%**				2020		**5%**				**N/A**		2020	
9 (Year 7 Monitoring)	**10%**				2021		**10%**				**N/A**		2021	
Stream Bankfull Standard	**10%**	427.400			2017	4/3/2017	**N/A**				**N/A**			
Total Credits Released to Date		**3,632.900**						**2.652**						

NOTES:

CONTINGENCIES:

Signature of Wilmington District Official Approving Credit Release

27 Sept 2019

Date

1 - For DMS, no credits are released during the first milestone

2 - For DMS projects, the second credit release milestone occurs automatically when the as-built report (baseline monitoring report) has been made available to the NCIRT by posting it to the NCEEP Portal, provided the following criteria have been met:

1) Approval of the final Mitigation Plan
2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property
3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan
4) Reciept of necessary DA permit authorization or written DA approval for porjects where DA permit issuance is not required

3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met

Mitigation Project Name	**Stanley's Slough Stream and Wetland Site**	**County**	**Northampton**	**USACE Action ID**	**2012-01918**
DMS ID	**95356**	**Date Project Instituted**	**8/1/2012**	**NCDWR Permit No**	**2013-0596**
River Basin	**Chowan**	**Date Prepared**	**6/13/2019**		
Cataloging Unit	**03010204**				

DEBITS (released credits only)

			Ratios	1	1.5	2.5	5	1.15385	3	2	5	1	3	2	5	1	3	2	5
				Stream Restoration	Stream Enhancment I	Stream Enhancement II	Stream Preservation	Riparian Restoration	Riparian Creation	Riparian Enhancement	Riparian Preservation	Nonriparian Restoration	Nonriparian Creation	Nonriparian Enhancement	Nonriparian Preservation	Coastal Marsh Restoration	Coastal Marsh Creation	Coastal Marsh Enhancement	Coastal Marsh Preservation
As-Built Amounts (feet and acres)				**4,274.000**				**3.600**											
As-Built Amounts (mitigation credits)				**4,274.000**				**3.120**											
Percentage Released				**85%**				**85%**											
Released Amounts (feet / acres)				**3,632.900**				**3.060**											
Released Amounts (credits)				**3,632.900**				**2.652**											
NCDWR Permit	USACE Action ID	Project Name																	
Remaining Amounts (feet / acres)				**3,632.900**				**3.060**											
Remaining Amounts (credits)				**3,632.900**				**2.652**											

Mitigation Project Name	**Stanley's II**	**County**	**Northampton**	**USACE Action ID**	2012-01918
DMS ID	**95838**	**Date Project Instituted**	**4/17/2013**	**NCDWR Permit No**	2013-0596
River Basin	**Chowan**	**Date Prepared**	**6/13/2019**		
Cataloging Unit	**03010204**				

Credit Release Milestone	Stream Credits						Wetland Credits							
	Scheduled Releases (Stream)	Warm	Cool	Cold	Anticipated Release Year (Stream)	Actual Release Date (Stream)	Scheduled Releases (Forested)	Riparian Riverine	Riparian Non-riverine	Non-riparian	Scheduled Releases (Coastal)	Coastal	Anticipated Release Year (Wetland)	Actual Release Date (Wetland)
Potential Credits (Mitigation Plan)									**6.940**					
Potential Credits (As-Built Survey)									**6.940**					
1 (Site Establishment)	**N/A**				N/A	N/A	**N/A**		N/A		**N/A**		N/A	N/A
2 (Year 0 / As-Built)	**N/A**				N/A	N/A	**30%**		2.082		**N/A**		2014	7/2/2014
3 (Year 1 Monitoring)	**N/A**				N/A	N/A	**10%**		0.694		**N/A**		2015	4/23/2015
4 (Year 2 Monitoring)	**N/A**				N/A	N/A	**10%**		0.694		**N/A**		2016	4/28/2016
5 (Year 3 Monitoring)	**N/A**				N/A	N/A	**15%**		1.041		**N/A**		2017	10/20/2017
6 (Year 4 Monitoring)	**N/A**				N/A	N/A	**5%**		0.347		**N/A**		2018	4/25/2018
7 (Year 5 Monitoring)	**N/A**				N/A	N/A	**15%**		1.041		**N/A**		2019	4/26/2019
8 (Year 6 Monitoring)	**N/A**				N/A	N/A	**5%**				**N/A**		2020	
9 (Year 7 Monitoring)	**N/A**				N/A	N/A	**10%**				**N/A**		2021	
Stream Bankfull Standard	**N/A**						**N/A**				**N/A**			
Total Credits Released to Date									**5.899**					

NOTES:

CONTINGENCIES:

Signature of Wilmington District Official Approving Credit Release

27 Sept 2019

Date

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1) Approval of the final Mitigation Plan
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3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met

Mitigation Project Name	**Stanley's II**	**County**	**Northampton**	**USACE Action ID**	2012-01918
DMS ID	**95838**	**Date Project Instituted**	**4/17/2013**	**NCDWR Permit No**	2013-0596
River Basin	**Chowan**	**Date Prepared**	**6/13/2019**		
Cataloging Unit	**03010204**				

DEBITS (released credits only)

			Ratios	1	1.5	2.5	5	**1.0951**	3	2	5	1	3	2	5	1	3	2	5
				Stream Restoration	Stream Enhancment I	Stream Enhancement II	Stream Preservation	Riparian Restoration	Riparian Creation	Riparian Enhancement	Riparian Preservation	Nonriparian Restoration	Nonriparian Creation	Nonriparian Enhancement	Nonriparian Preservation	Coastal Marsh Restoration	Coastal Marsh Creation	Coastal Marsh Enhancement	Coastal Marsh Preservation
As-Built Amounts (feet and acres)								**7.600**											
As-Built Amounts (mitigation credits)								**6.940**											
Percentage Released								**85.000%**											
Released Amounts (feet / acres)								**6.460**											
Released Amounts (credits)								**5.899**											
NCDWR Permit	USACE Action ID	Project Name																	
Remaining Amounts (feet / acres)								**6.460**											
Remaining Amounts (credits)								**5.899**											

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 13, 2020
To: Lindsay Crocker, DMS Project Manager
From: Adam Spiller, Project Manager
KCI Associates of North Carolina, PA
Subject: MY-06 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-06 Monitoring Report comments from NCDMS received on January 21, 2020, for the Stanley's Slough/Stanley's II Restoration Sites.

1. Add the number of days of continuous flow for graphs of stream gauges 1, 4, and 5.
   KCI Response: This change has been made.

2. Add dates for pictures on pages 23, 24, 28, 29.
   KCI Response: These dates have been added

3. The shapefile shown on the legend for 2016 supplemental planting does not show on the map. Update to show on CCPV or remove.
   KCI Response: This has been removed from the CCPV.

4. Assets- In reviewing previous monitoring reports, the wetland assets on SS appear to differ slightly from previous monitoring tables. Refer to comments from the MY3 report by DMS and revise the table clipped from previous year's reports below to match DMS accounting, and the debit ledger. For SSII, update table to match out 3 significant digits (also pasted/attached).
   KCI Response: This change has been made.

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

Sincerely,

Adam Spiller
Project Manager

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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. 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. 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.

Vegetation monitoring did not take place in Monitoring Year 6, as stipulated in the Mitigation Plan. Vegetation monitoring will resume in 2020.

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 the growing season begins March 11 and ends November 20 (255 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% (23 days) of the 255-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). At the beginning of the 2018 growing season, KCI installed three additional groundwater monitoring gauges in the SSII area of the site.

The daily rainfall data was obtained from a local weather station in Emporia, VA; provided by the NC State Climate Office. For the 2019-year, the months of February, April, June, and October experienced above average rainfall, while January, March, July, and April experienced average rainfall. The months of May, September, and November recorded below average rainfall for the site. Overall, the area experienced average rainfall during the 2019 growing season.

During the site's sixth growing season, all fifteen of the gauges met the success criterion.

During the first growing season, March 28 to November 7 were incorrectly used as the growing season dates for the calculations of gauge success. This error was repeated throughout the monitoring years until it was discovered during MY06. Gauge success has since been recalculated for all years using the growing season dates from the approved mitigation plan (March 11 to November 20). In most cases this resulted in a minor change from what was reported in previous years for the number of days and percentage of the growing season that gauges were within 12 inches of the surface. In six cases, however, this resulted in a change in whether success criteria was achieved or not. These instances include Gauge 7 in MY02, Gauge 17 in MY03, and Gauges 6, 10, 12, and 14 in MY04. Correcting the growing season to the approved dates in the mitigation plan does not significantly change the status or trend of the hydrology at any of these gauge locations. See Table 8 in Appendix D for the corrected hydrology results for all years.

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. At a meeting with the IRT in 2018, it was requested that the relic berm along the stream in the wooded portion of SSS be broken up more than it already was, in order to encourage the continued development of a braided system. This work was completed in November 2019 during a period when the stream was completely dry. See Appendix B – Visual Assessment Data for more information.

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 126 consecutive days of flow between them and Gauge 18 (on T2) achieved 118 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 DMS 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

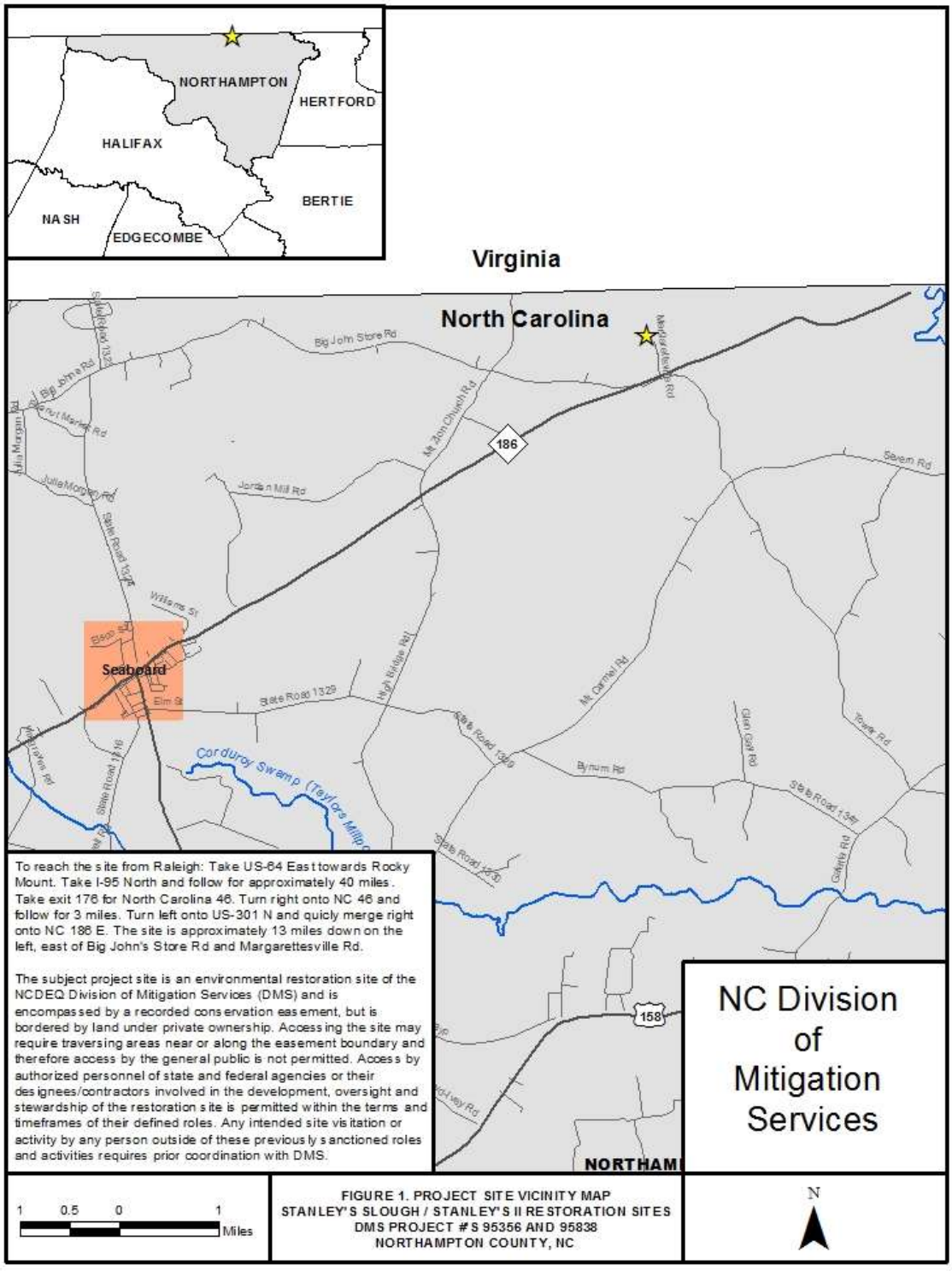


FIGURE 1. PROJECT SITE VICINITY MAP
STANLEY'S SLOUGH / STANLEY'S II RESTORATION SITES
DMS PROJECT #'S 95356 AND 95838
NORTHAMPTON COUNTY, NC

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 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	
Year 5 Monitoring	Dec 2018	Dec 2018
Vegetation Monitoring	July 17, 2018	
Photo Points	Aug 31, 2018	
Gauge Downloads	Dec. 6, 2018	
Year 6 Monitoring	Nov 2019	Dec 2019
Photo Points	Nov 15, 2019	
Gauge Downloads	Nov 15, 2019	
Berm along stream in wooded area removed		Nov 14, 2019

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	
	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		

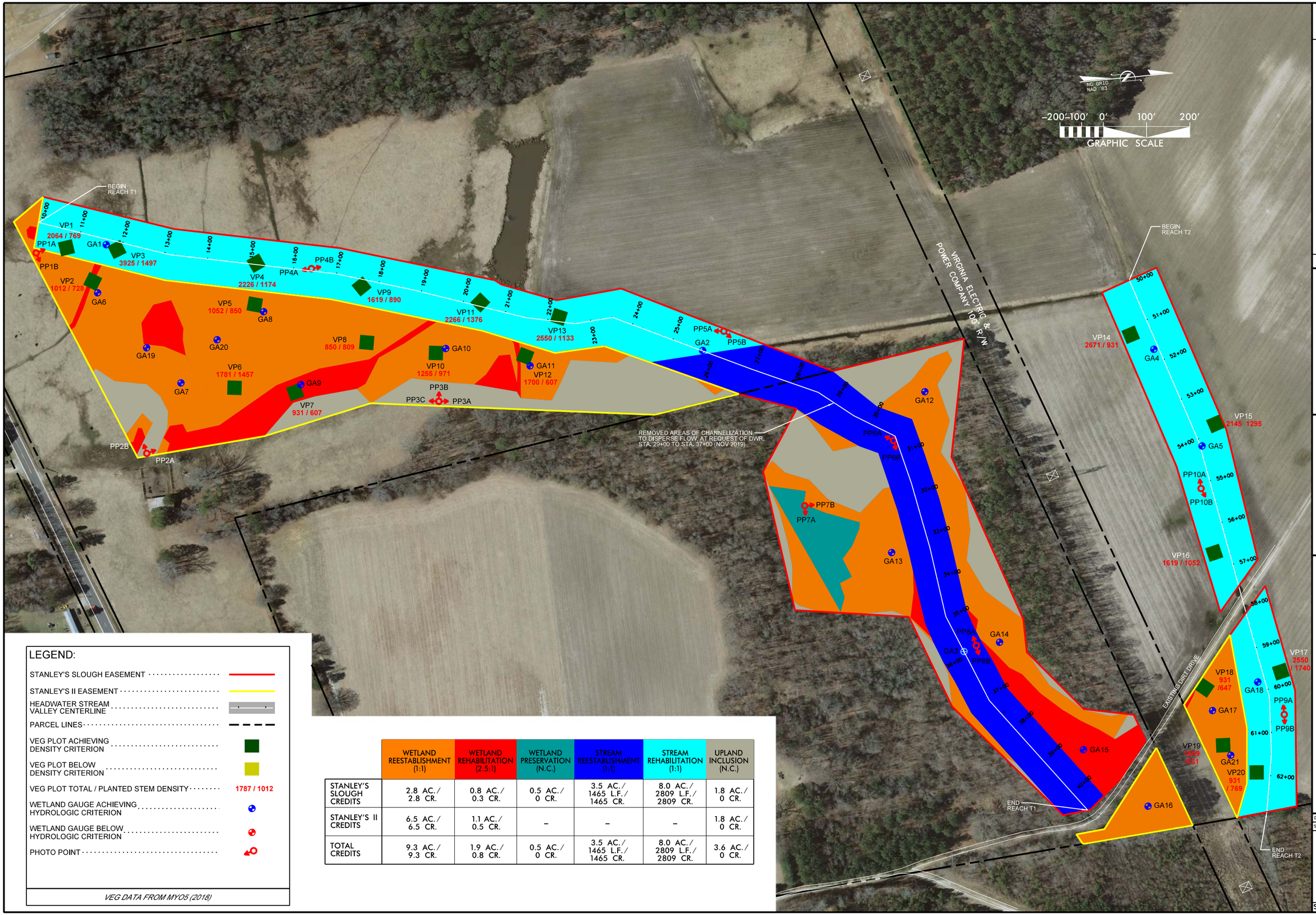
Reach Summery Information (Post Restoration)		
Parameters	**T1**	**T2**
Length of reach (linear feet)	3,054	1,220
Valley classification	Valley Type X	Valley Type X
Drainage area (acres)	84 acres	29 acres
NCDWQ Water Quality Classification	Project Reach Not Classified; Receiving water = Meherrin River (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 — 1787 / 1012
- WETLAND GAUGE ACHIEVING HYDROLOGIC CRITERION
- WETLAND GAUGE BELOW HYDROLOGIC CRITERION
- PHOTO POINT

VEG DATA FROM MY05 (2018)

	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 06

DATE: DEC 2019
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-06 – 11/14/19

PP1b – MY-00 – 4/17/14

PP1b – MY-06 – 11/14/19

PP2a – MY-00 – 4/17/14

PP2a – MY-06 – 11/14/19

PP2b – MY-00 – 4/17/14

PP2b – MY-06 – 11/14/19

PP3a – MY-00 – 4/17/14

PP3a – MY-06 – 11/14/19

PP3b – MY-00 – 4/17/14

PP3b – MY-06 – 11/14/19

PP3c – MY-00 – 4/17/14

PP3c – MY-06 – 11/14/19

PP4a – MY-00 – 4/17/14

PP4a – MY-06 – 11/14/19

PP4b – MY-00 – 4/17/14

PP4b – MY-06 – 11/14/19

PP5a – MY-00 – 4/17/14

PP5a – MY-06 – 11/14/19

PP5b – MY-00 – 4/17/14

PP5b – MY-06 – 11/14/19

PP6a – MY-00 – 4/17/14

PP6a – MY-06 – 11/14/19

PP6b – MY-00 – 4/17/14

PP6b – MY-06 – 11/14/19

PP7a – MY-00 – 4/17/14

PP7a – MY-06 – 11/14/19

PP7b – MY-00 – 4/17/14

PP7b – MY-06 – 11/14/19

PP8a – MY-00 – 4/17/14

PP8a – MY-06 – 11/14/19

PP8b – MY-00 – 4/17/14

PP8b – MY-06 – 11/14/19

PP9a – MY-00 – 4/17/14

PP9a – MY-06 – 11/14/19

PP9b – MY-00 – 4/17/14

PP9b – MY-06 – 11/14/19

PP10a – MY-00 – 4/17/14

PP10a – MY-06 – 11/14/19

PP10b – MY-00 – 4/17/14

PP10b – MY-06 – 11/14/19

Relic Berm Removal Photos

STA 31+00 – Before berm removal 8/31/18

STA 31+00 Right after berm removal before water had returned to stream – 11/15/19

Stream after berm removal and after water had returned to the stream – 1/22/20

Stream after berm removal and after water had returned to the stream – 1/22/20

Appendix C

Vegetation Plot Data

Table 6. 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

			Annual Means														
			MY5 (2018)			MY3 (2016)			MY2 (2015)			MY1 (2014)			MY0 (2014)		
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
Acer negundo	boxelder	Tree						1									
Acer rubrum	red maple	Tree	9	9	18	10	10	12	8	8	9	9	9	10	11	11	11
Baccharis halimifolia	baccharis	Shrub			1			1									
Betula nigra	river birch	Tree	69	69	70	68	68	68	67	67	67	67	67	67	73	73	73
Celtis laevigata	sugarberry	Tree									1			1			
Diospyros virginiana	common persimmon	Tree	2	2	4												
Fraxinus pennsylvanica	green ash	Tree	115	115	121	115	115	119	113	113	116	113	113	113	117	117	117
Ilex opaca	American holly	Tree			1												
Juniperus virginiana	eastern redcedar	Tree			1			1			1						
Liquidambar styraciflua	sweetgum	Tree			114			56			56			32			
Liriodendron tulipifera	tuliptree	Tree									1						
Magnolia virginiana	sweetbay	Tree	9	9	9	10	10	10	11	11	11	9	9	9	19	19	19
Nyssa biflora	swamp tupelo	Tree	35	35	38	42	42	42									
Nyssa sylvatica	blackgum	Tree	12	12	12	12	12	12	41	41	41	42	42	42	46	46	46
Pinus taeda	loblolly pine	Tree			154			6			2			2			
Platanus occidentalis	American sycamore	Tree	13	13	34	13	13	27	13	13	24	15	15	27	19	19	19
Populus deltoides	eastern cottonwood	Tree			5			1									
Quercus	oak	Tree									1						
Quercus falcata	southern red oak	Tree	19	19	20	23	23	23	22	22	22	27	27	27	30	30	30
Quercus michauxii	swamp chestnut oak	Tree	46	46	46	48	48	49	56	56	56	57	57	57	50	50	50
Quercus nigra	water oak	Tree							1	1	1				1	1	1
Quercus pagoda	cherrybark oak	Tree			3												
Quercus phellos	willow oak	Tree	48	48	49	50	50	52	56	56	62	49	49	49	65	65	65
Salix nigra	black willow	Tree			31			17			22			23			
Taxodium distichum	bald cypress	Tree	121	121	146	128	128	132	32	32	36	32	32	32	33	33	33
Ulmus americana	American elm	Tree			4												
Unknown		Shrub or Tree	2	2	2	1	1	1	5	5	5	2	2	2	52	52	52
		Stem count	500	500	883	520	520	630	425	425	534	422	422	493	516	516	516
		size (ares)	20			20			20			20			20		
		size (ACRES)	0.49			0.49			0.49			0.49			0.49		
		Species count	13	13	22	12	12	19	12	12	19	11	11	15	12	12	12
		Stems per ACRE	1012	1012	1787	1052	1052	1275	860	860	1081	854	854	998	1044	1044	1044

Appendix D

Hydrologic Data

Table 7. 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
11/15/19	Observation of flow, development of multiple channel threads	6

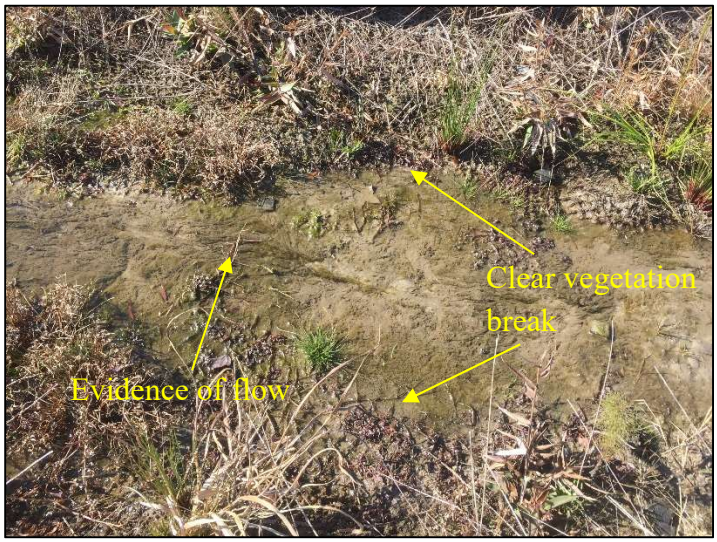


Photo 1. Evidence of flow in restored stream channel 11/20/14


Photo 2. Weir at Gauge 3 11/20/14

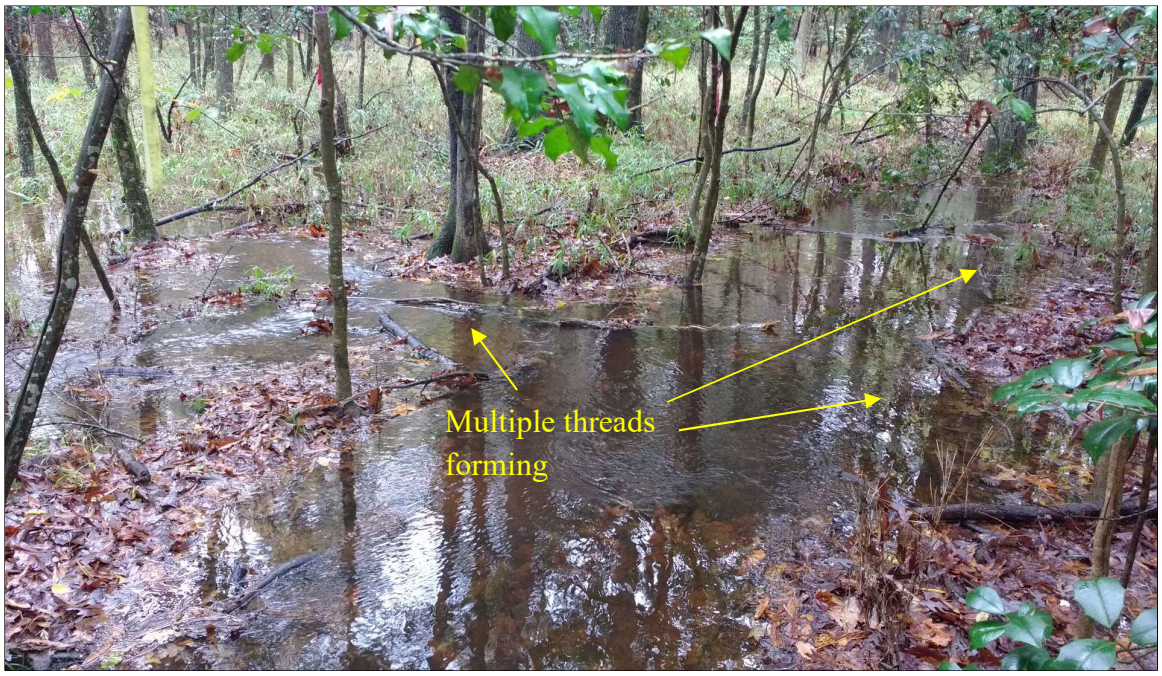


Photo 3. Development of multi-thread channel system 11/11/15

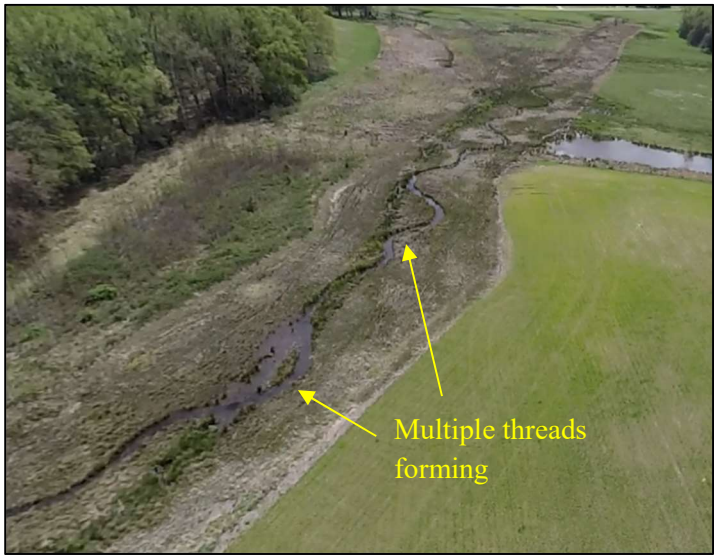
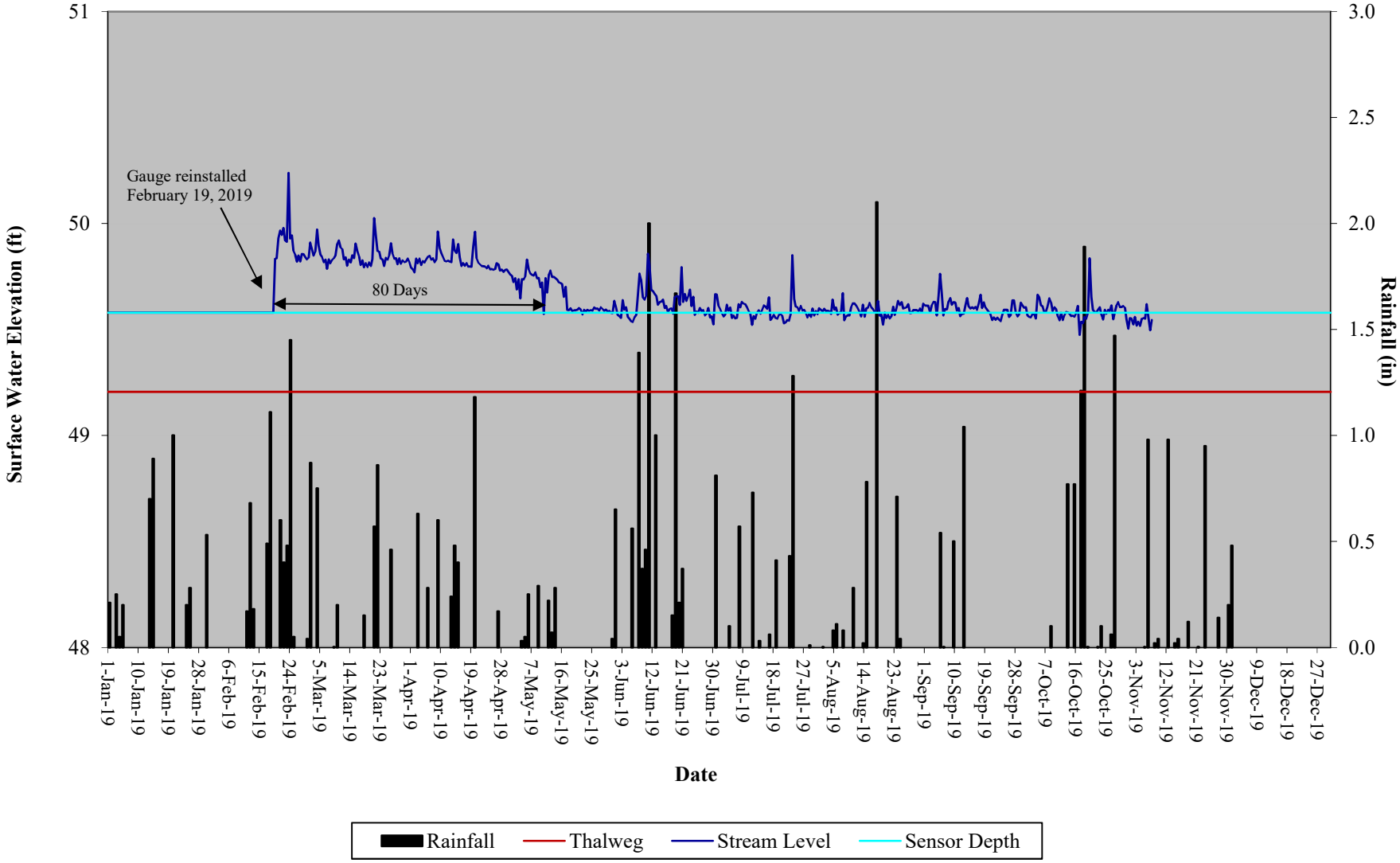


Photo 4. Development of multi-thread channel on T1 4/7/16

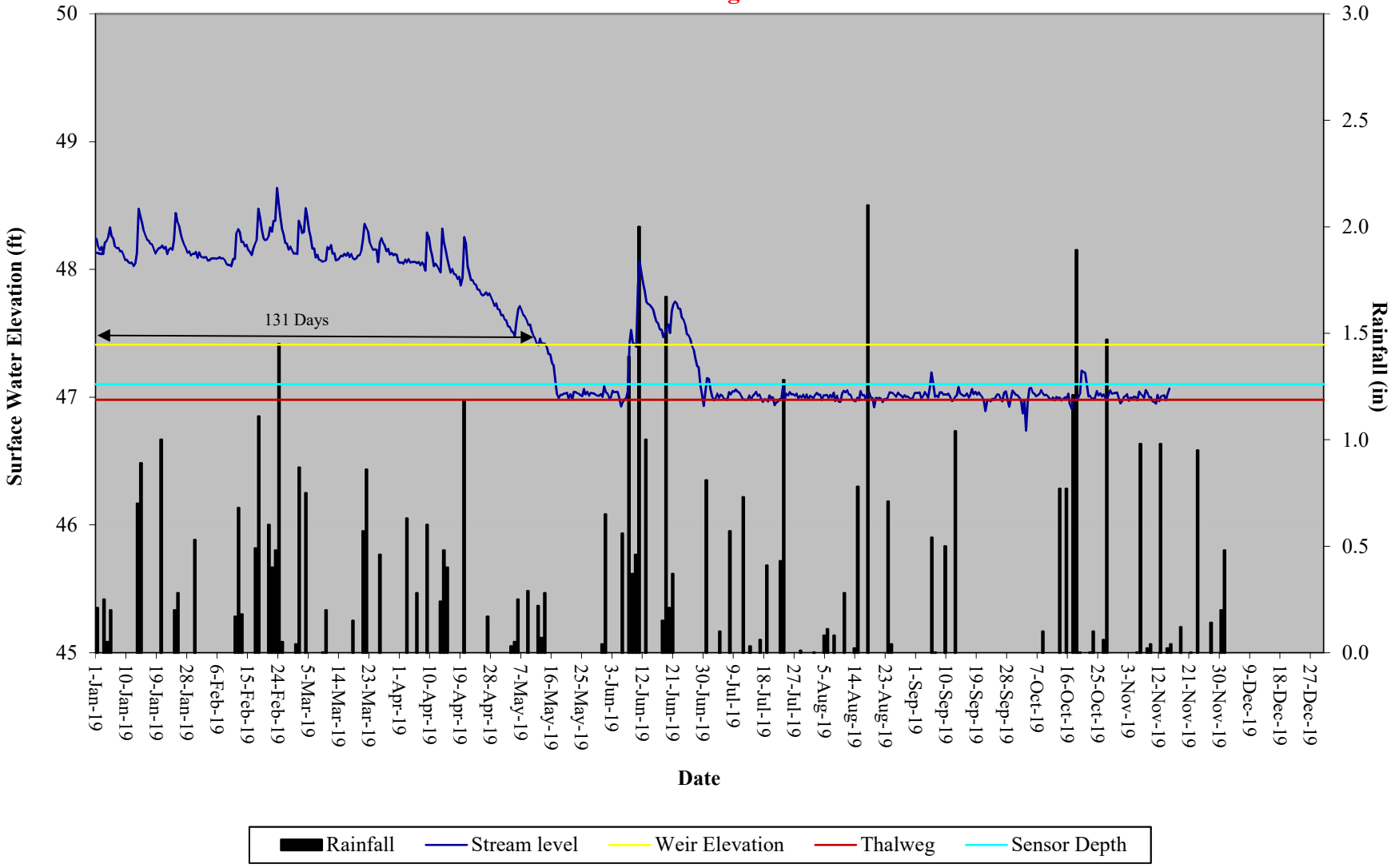
Photo 5. Development of multi thread channel on T2 4/7/16

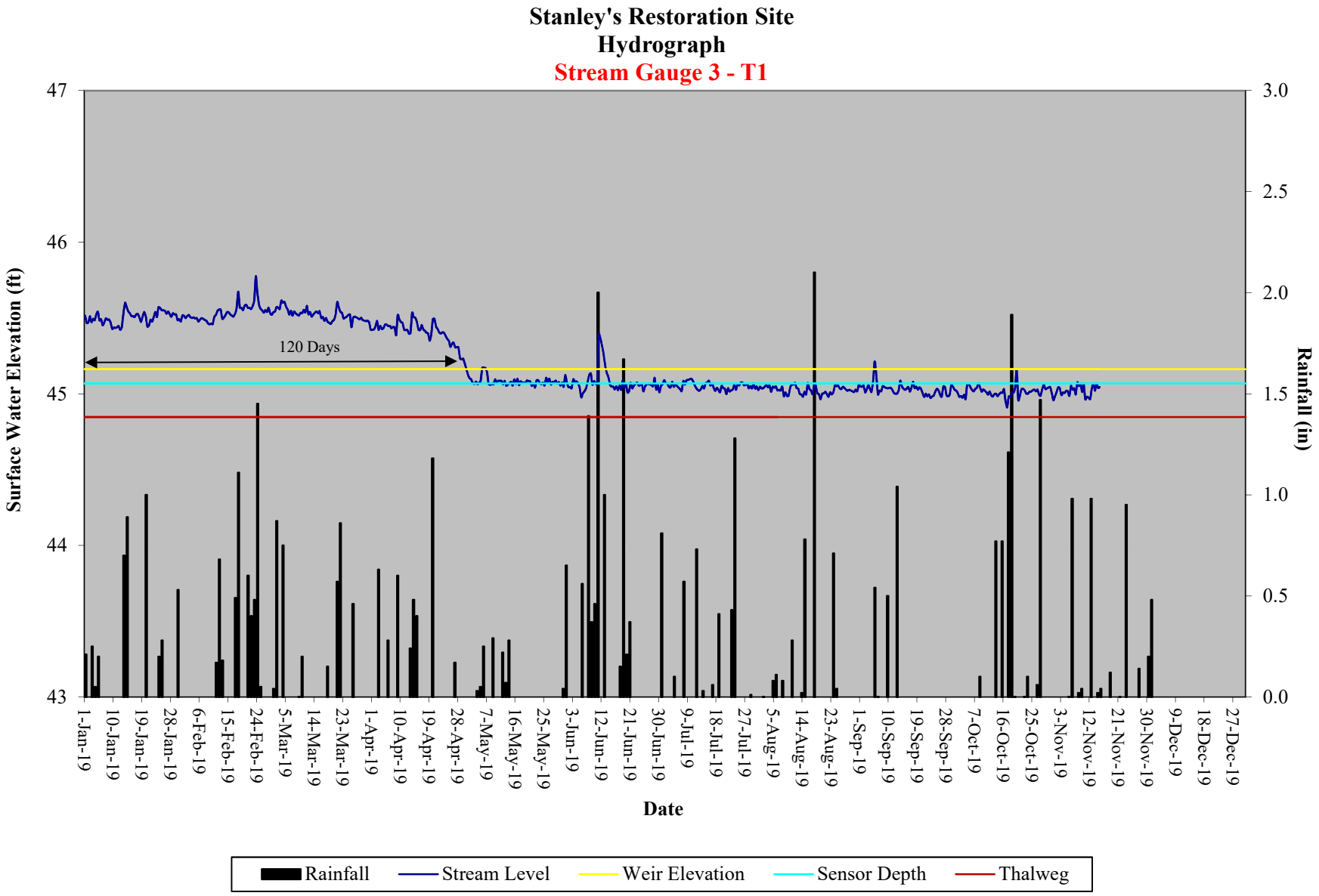
Photo 6. Development of multi-thread channel on T2 11/15/19

Stanley's Restoration Site
Hydrograph
Stream Gauge 1 - T1

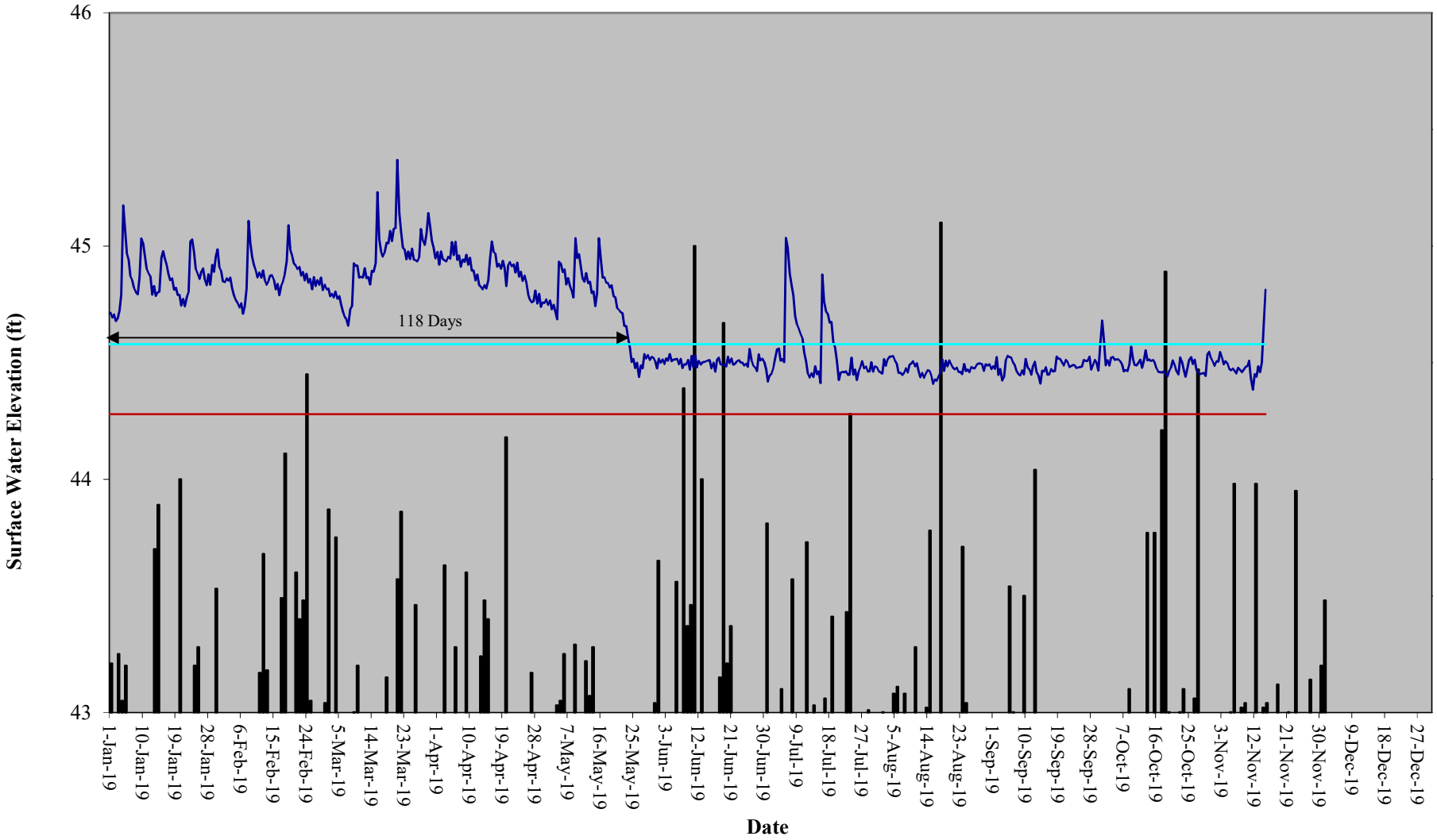


Stanley's Restoration Site
Hydrograph
Stream Gauge 2 - T1

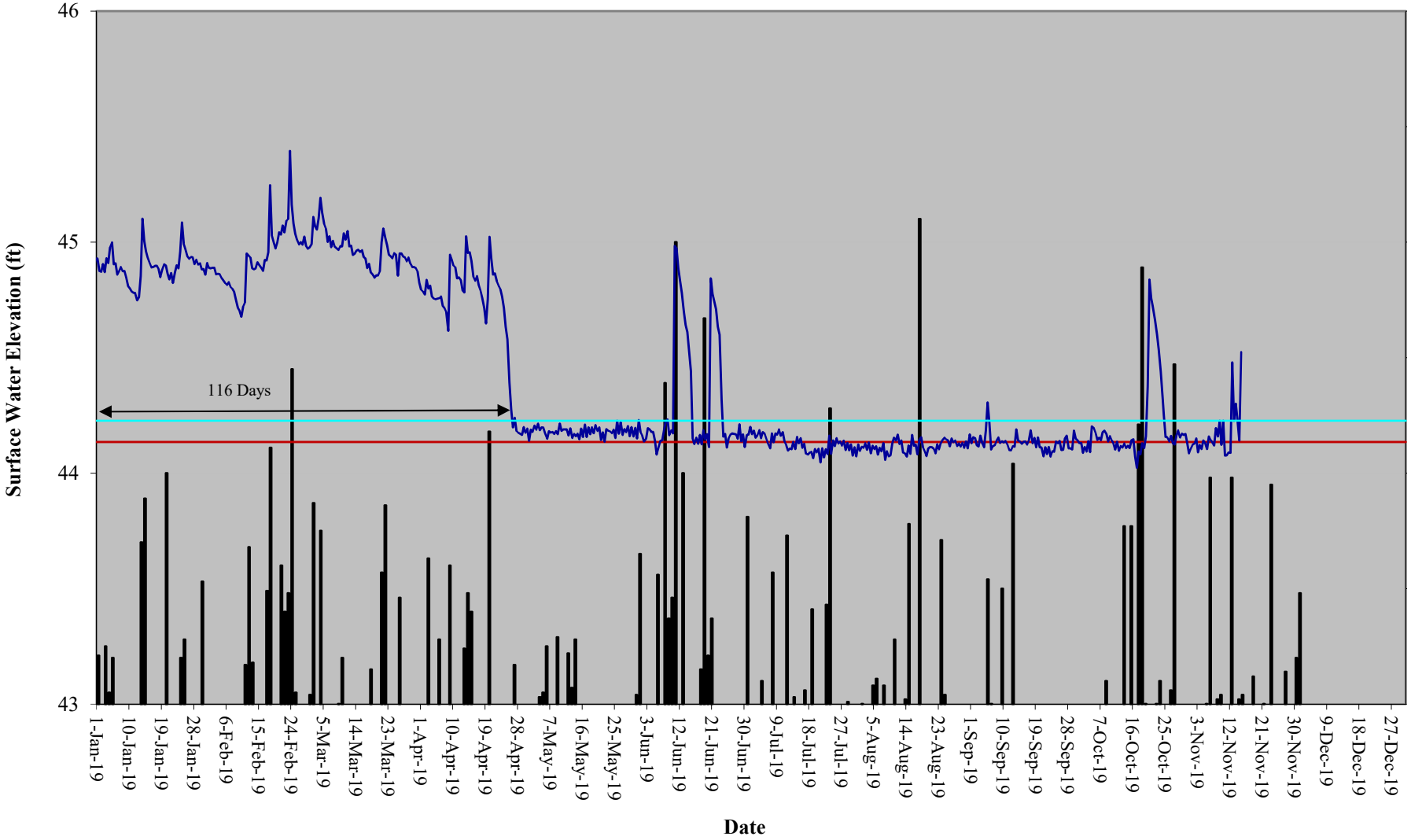



Stanley's Restoration Site
Hydrograph
Stream Gauge 3 - T1
Surface Water Elevation (ft)
Rainfall (in)
120 Days
47
46
45
44
43
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1-Jan-19
10-Jan-19
19-Jan-19
28-Jan-19
6-Feb-19
15-Feb-19
24-Feb-19
5-Mar-19
14-Mar-19
23-Mar-19
1-Apr-19
10-Apr-19
19-Apr-19
28-Apr-19
7-May-19
16-May-19
25-May-19
3-Jun-19
12-Jun-19
21-Jun-19
30-Jun-19
9-Jul-19
18-Jul-19
27-Jul-19
5-Aug-19
14-Aug-19
23-Aug-19
1-Sep-19
10-Sep-19
19-Sep-19
28-Sep-19
7-Oct-19
16-Oct-19
25-Oct-19
3-Nov-19
12-Nov-19
21-Nov-19
30-Nov-19
9-Dec-19
18-Dec-19
27-Dec-19
Date
Rainfall
Stream Level
Weir Elevation
Sensor Depth
Thalweg

Stanley's Restoration Site
Hydrograph
Stream Gauge 4 - T2



Stanley's Restoration Site
Hydrograph
Stream Gauge 5 - T2



Stanley's Restoration Site
Hydrograph
Stream Gauge 18 - T2

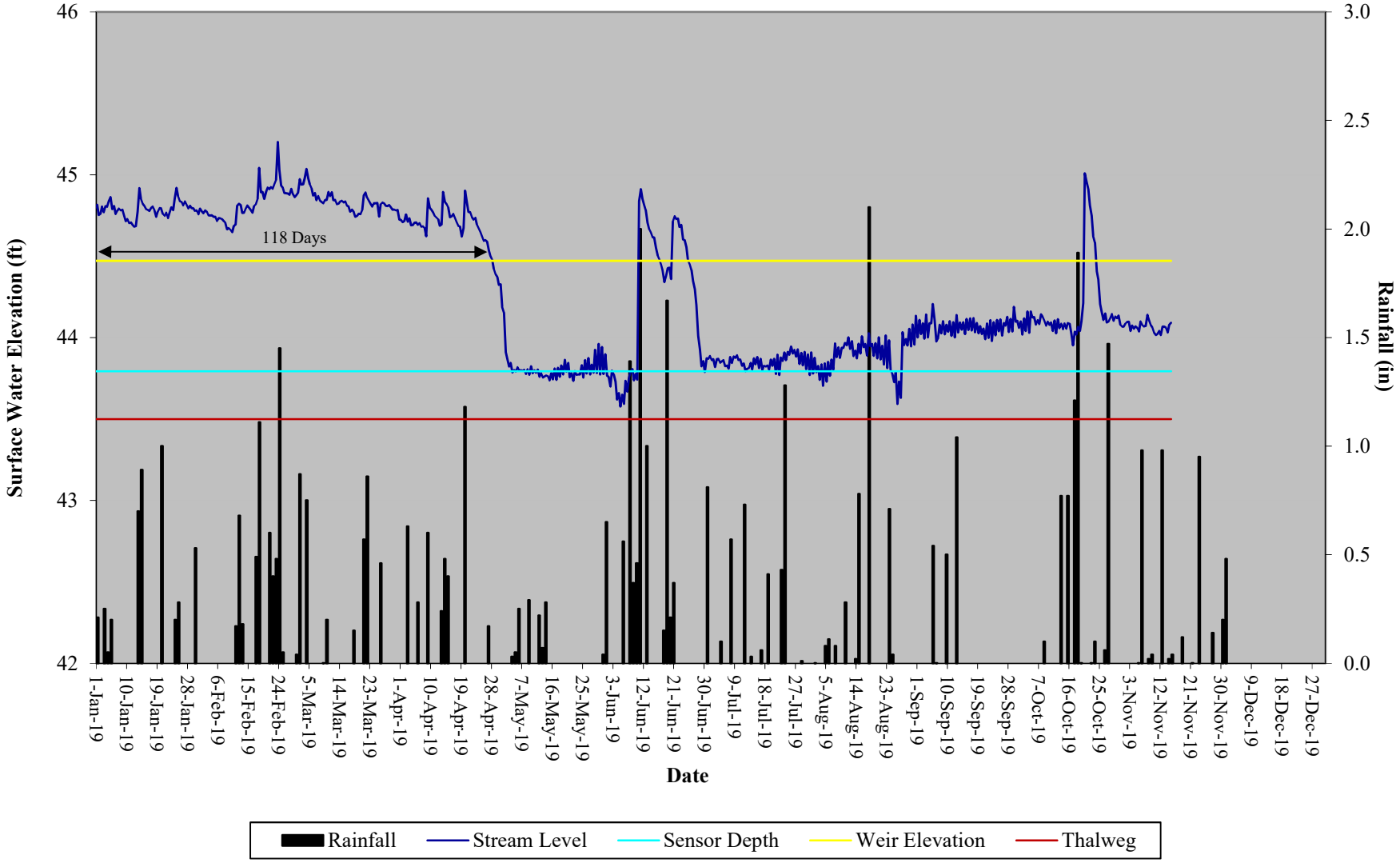
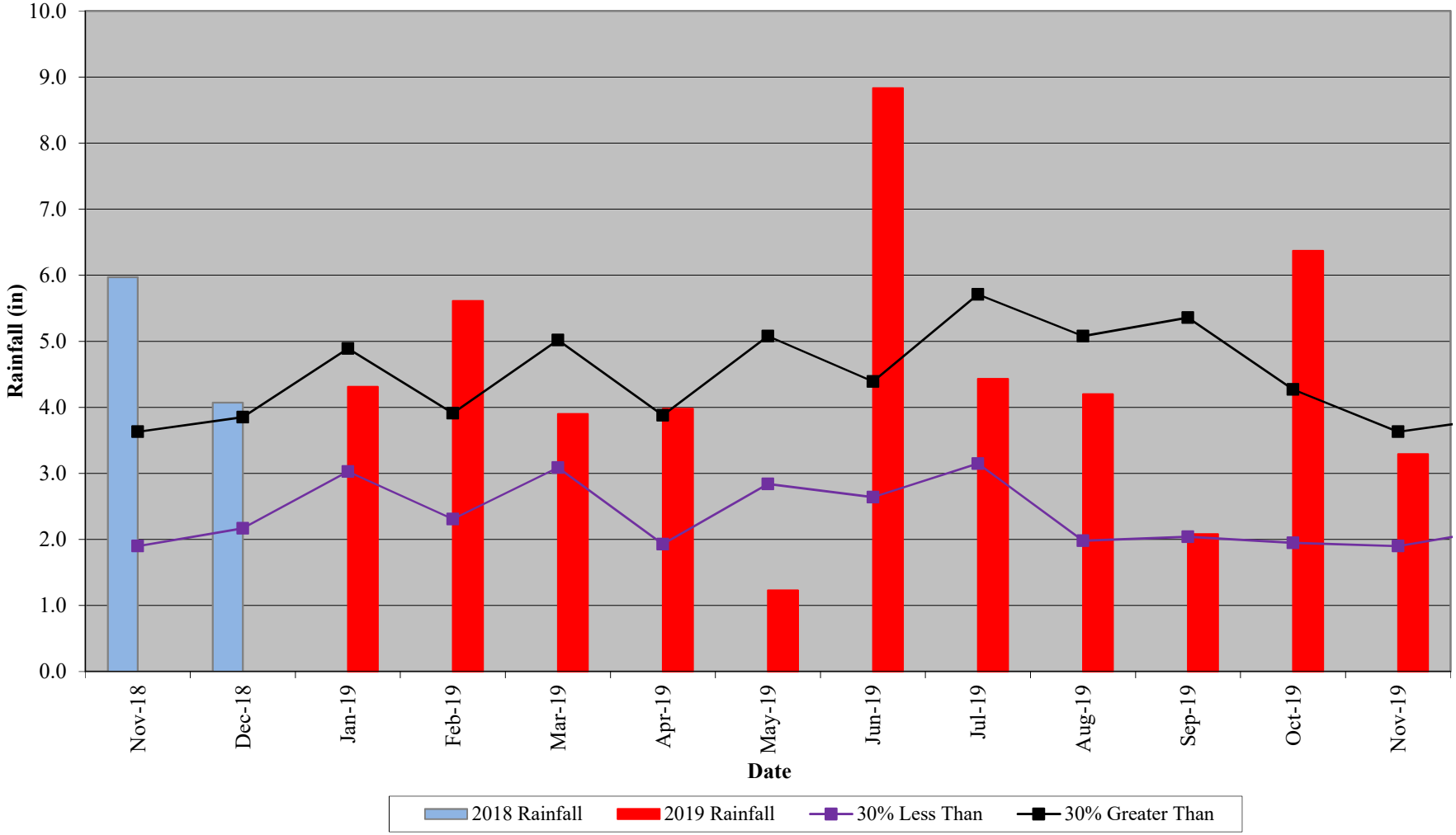


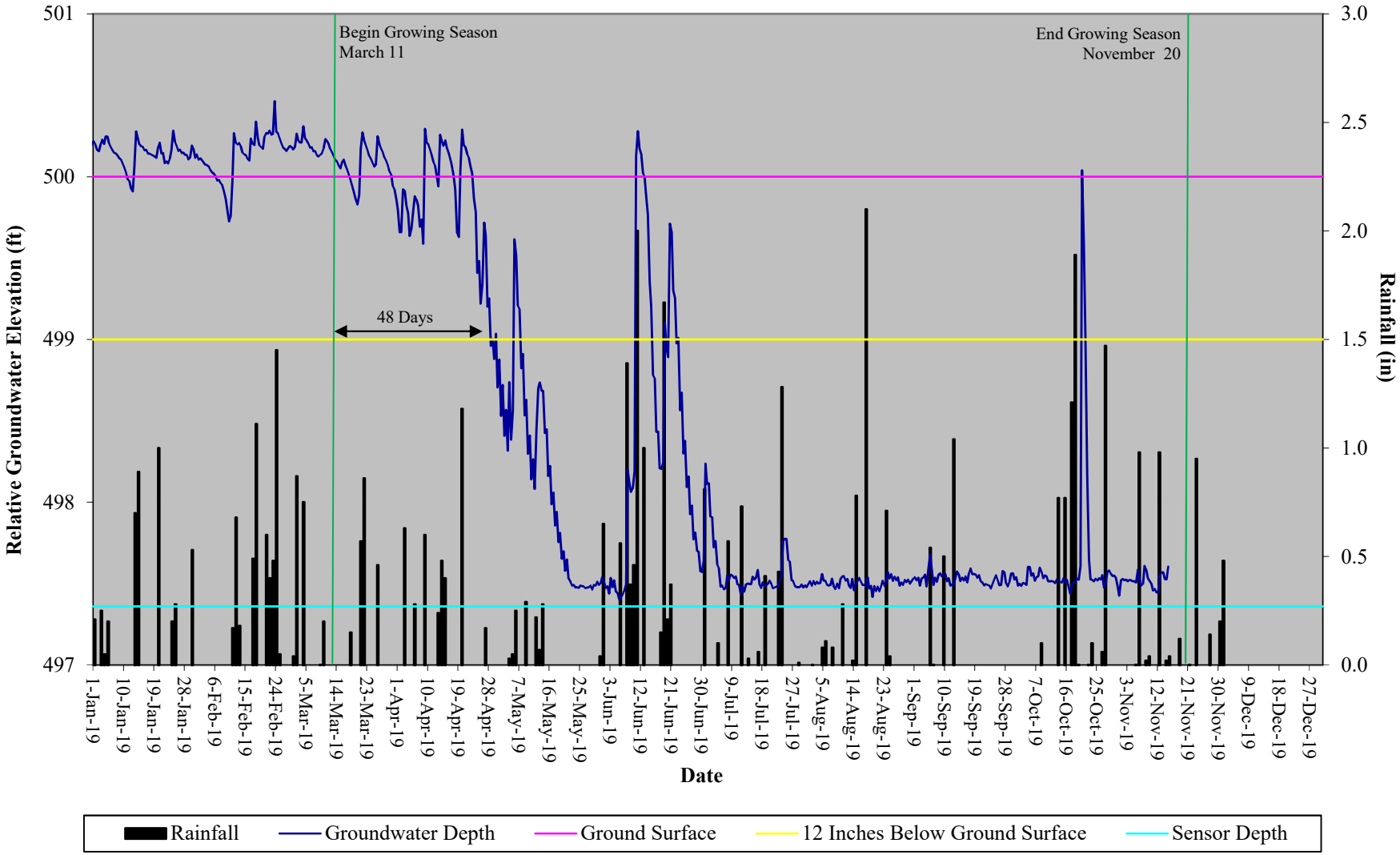
Table 8. Wetland Hydrology Criteria Attainment Stanley's Slough and Stanley's Slough II Restoration Sites, DMS Project Number 95356/95838								
		Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
Location	Gauge	MY01 (2014)	MY02 (2015)	MY03 (2016)	MY04 (2017)	MY05 (2018)	MY06 (2019)	MY07 (2020)
SII Res.	6	No/10 (3.7%)	Yes/56 (24.8%)	Yes/34 (13.3%)	Yes/30 (11.8%)	Yes/42 (16.3%)	Yes/49 (19.0%)	
SII Res.	7	No/12 (4.5%)	Yes/25 (9.8%)	Yes/33 (12.7%)	No/14 (5.3%)	No/18 (7.1%)	Yes/39 (15.1%)	
SII Res.	8	Yes/44 (17.3%)	Yes/60 (26.6%)	Yes/61 (23.9%)	Yes/68 (26.7%)	Yes/55 (21.4%)	Yes/51 (20.0%)	
SII Reh.	9	Yes/61 (23.9%)	Yes/97 (43.3%)	Yes/96 (37.5%)	Yes/85 (33.3%)	Yes/90 (35.1%)	Yes/69 (27.1%)	
SII Res.	10	Yes/48 (18.8%)	Yes/64 (28.6%)	Yes/67 (26.3%)	Yes/36 (13.9%)	Yes/53 (20.8%)	Yes/50 (19.4%)	
SII Res.	11	Yes/44 (17.3%)	Yes/45 (20.1%)	Yes/40 (15.7%)	No/10 (3.9%)	Yes/41 (15.9%)	Yes/44 (17.1%)	
SSS Res.	12	Yes/45 (17.5%)	Yes/55 (24.3%)	Yes/42 (16.5%)	Yes/32 (12.5%)	Yes/54 (21.2%)	Yes/49 (19.0%)	
SSS Res.	13	Yes/58 (22.7%)	Yes/63 (27.9%)	Yes/78 (30.4%)	Yes/53 (20.8%)	Yes/54 (21.2%)	Yes/54 (21.0%)	
SSS Res.	14	Yes/44 (17.3%)	Yes/54 (24.1%)	Yes/40 (15.5%)	Yes/31 (12.2%)	Yes/42 (16.5%)	Yes/48 (18.6%)	
SSS Reh.	15	Yes/62 (24.1%)	Yes/69 (30.6%)	Yes/133 (52.2%)	Yes/97 (37.8%)	Yes/99 (38.8%)	Yes/65 (25.5%)	
SII Res.	16	Yes/56 (22.0%)	Yes/64 (28.3%)	Yes/97 (37.8%)	Yes/69 (26.9%)	Yes/62 (24.3%)	Yes/54 (21.0%)	
SII Res.	17	Yes/47 (18.4%)	Yes/56 (24.8%)	Yes/30 (11.8%)	No/11 (4.1%)	Yes/25 (9.8%)	Yes/47 (18.4%)	
SII Res.	19	-	-	-	-	Yes/26 (10.0%)	Yes/49 (19.0%)	
SII Res.	20	-	-	-	-	No/18 (7.1%)	Yes/25 (9.6%)	
SII Res.	21	-	-	-	-	Yes/30 (11.8%)	Yes/51 (20.0%)	
Reference	Reference	-	Yes/43 (16.9%)	Yes/77 (30.2%)	Yes/37 (14.3%)	Yes/54 (21.0%)	Yes/49 (19.0%)	

Res. = Wetland Reestablishment, Reh. = Wetland Rehabilitation

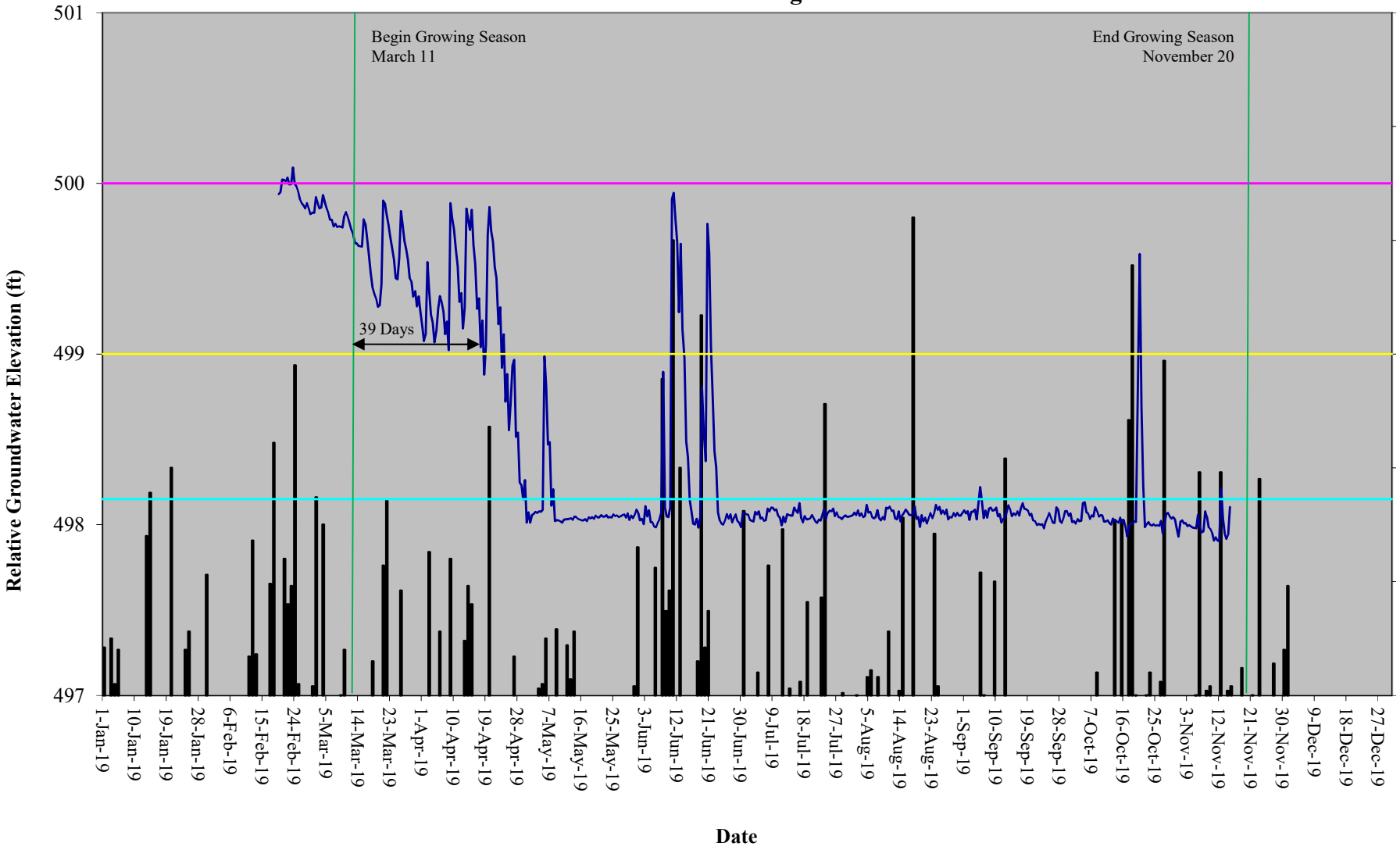
Stanley's Slough/Stanley's II Restoration Site
30-70 Percentile Graph
WETS Station Name: Emporia Greensville Regional Airport



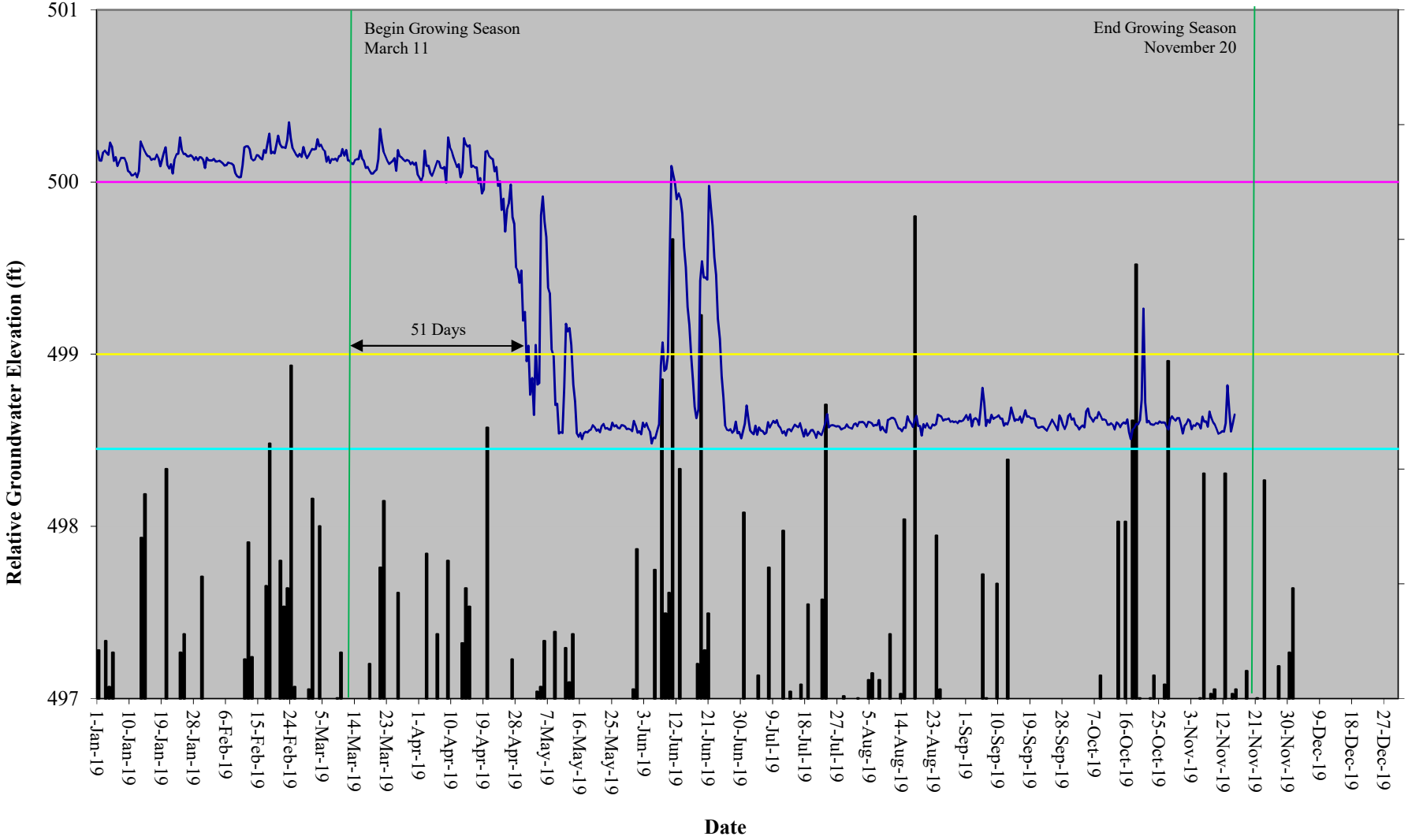
Stanley's Restoration Site
Hydrograph
Wetland Gauge 6

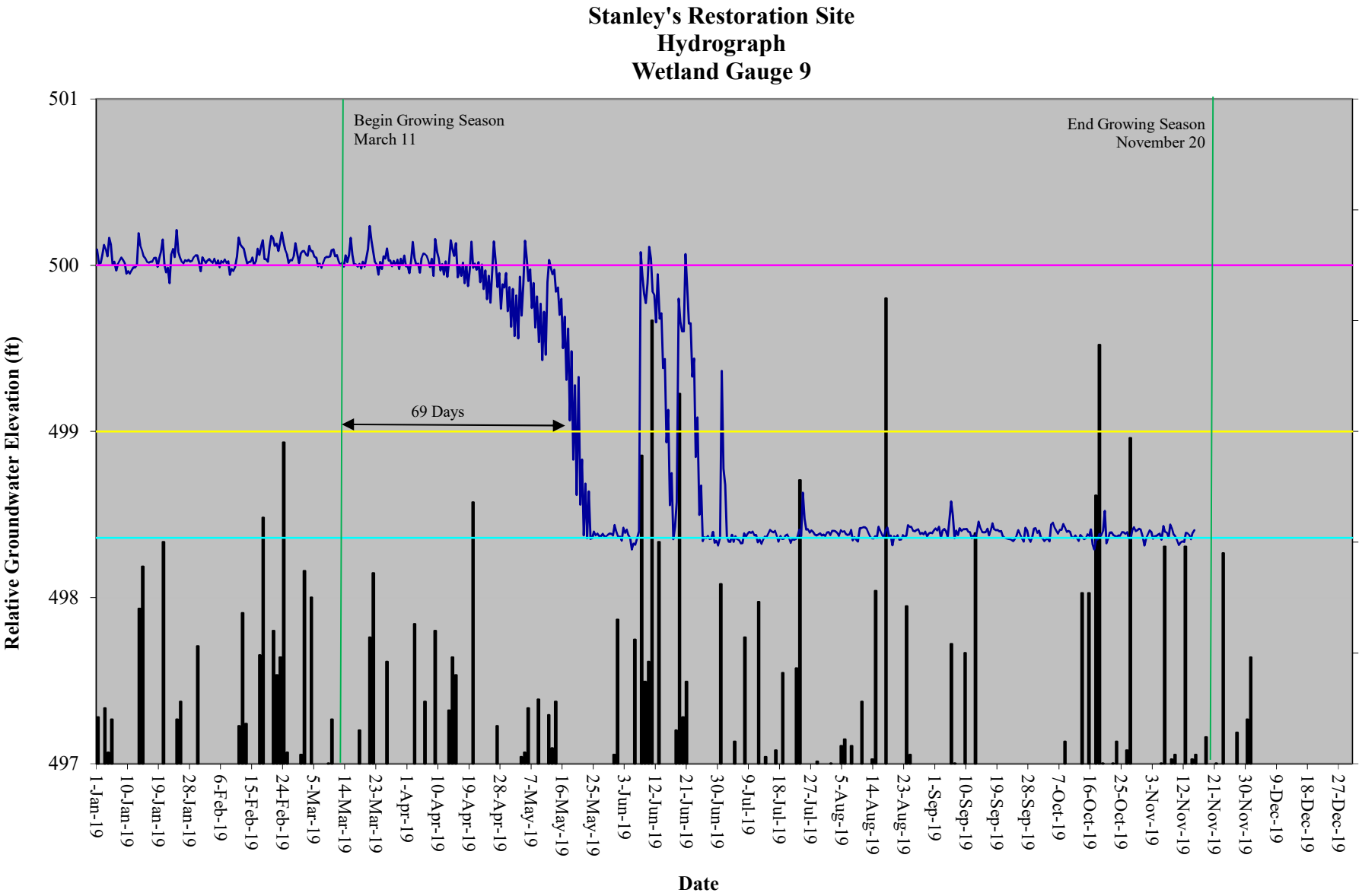


Stanley's Restoration Site
Hydrograph
Wetland Gauge 7

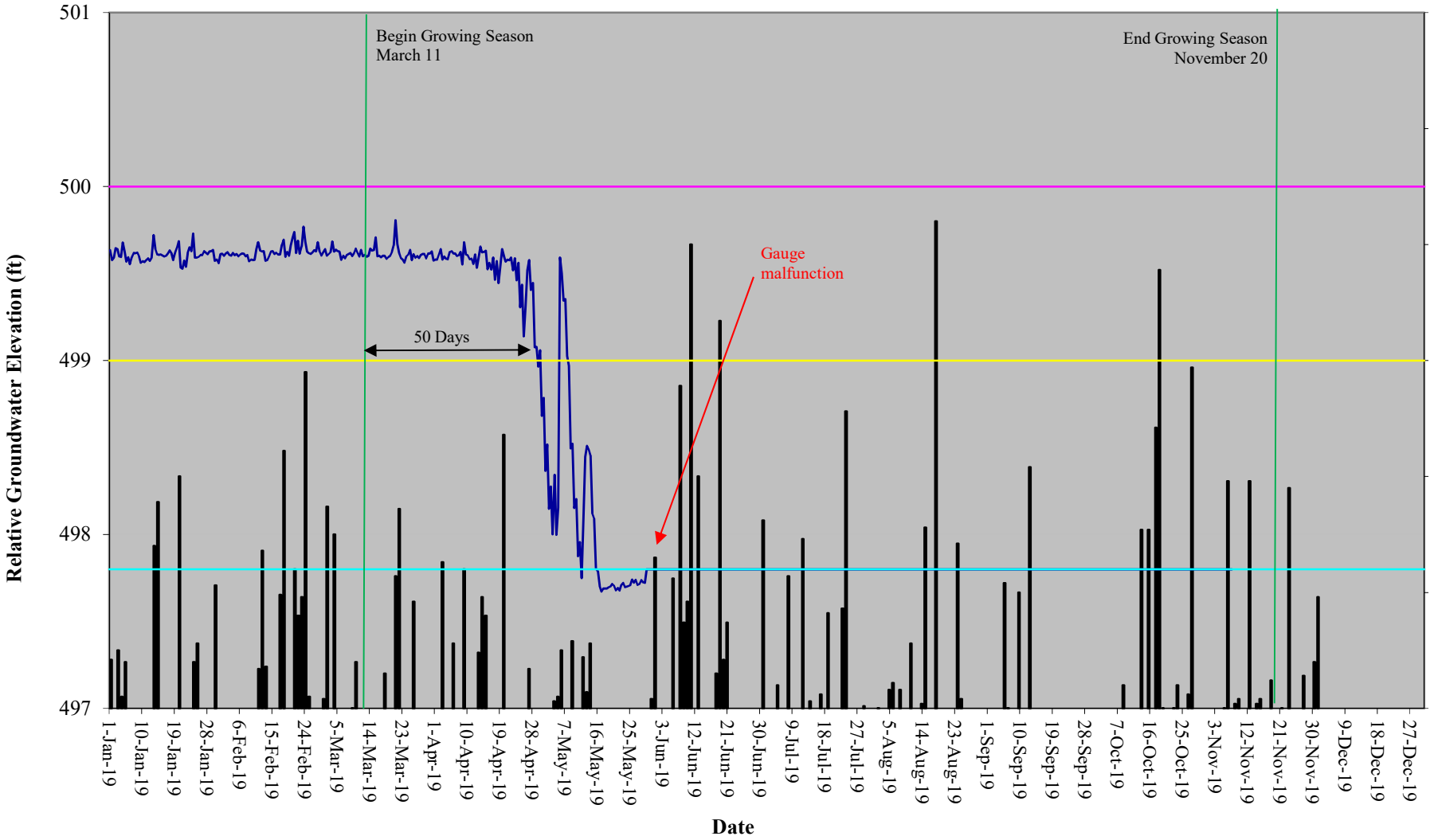


Stanley's Restoration Site
Hydrograph
Wetland Gauge 8

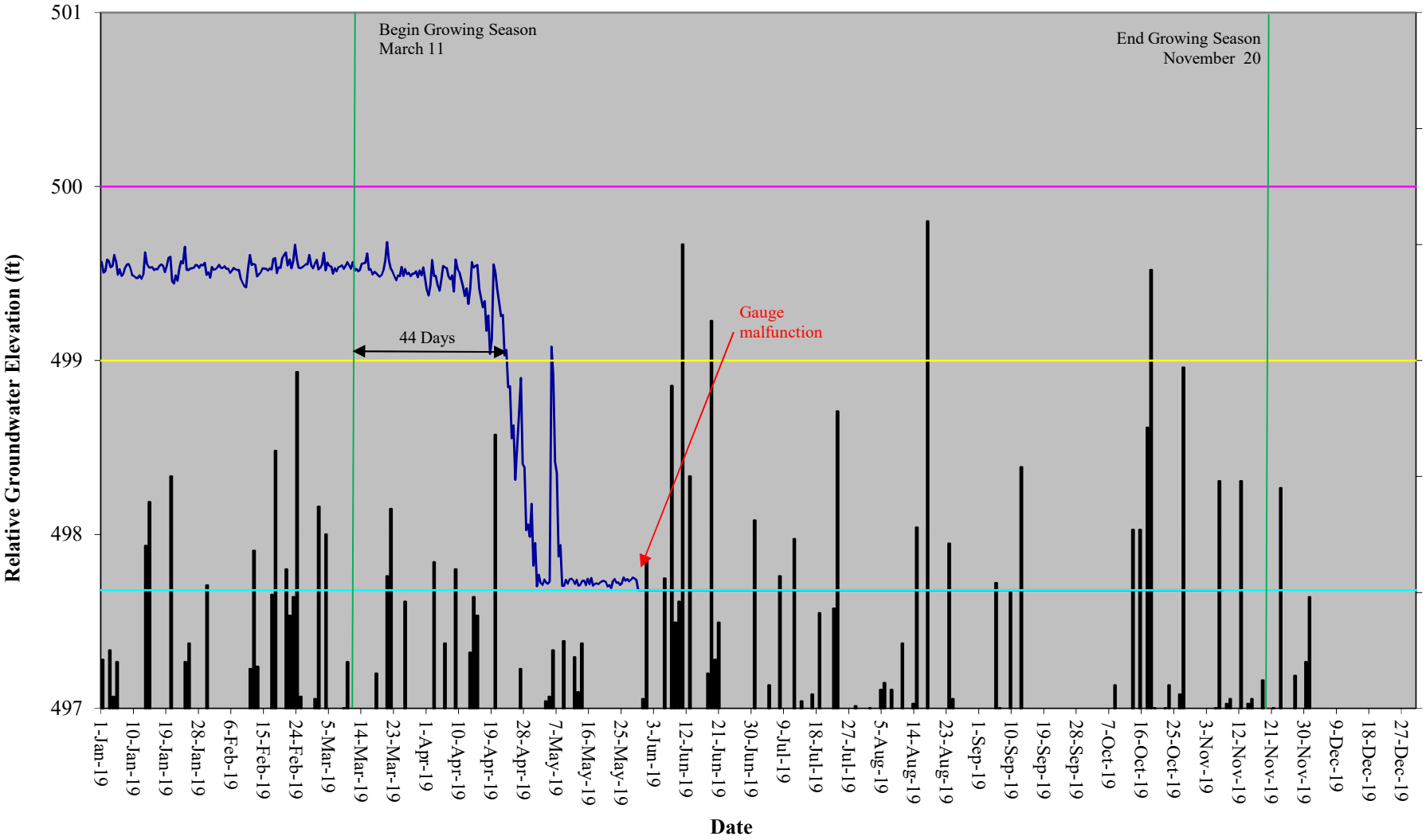



Stanley's Restoration Site
Hydrograph
Wetland Gauge 9
Begin Growing Season
March 11
End Growing Season
November 20
69 Days
Relative Groundwater Elevation (ft)
501
500
499
498
497
Date
1-Jan-19
10-Jan-19
19-Jan-19
28-Jan-19
6-Feb-19
15-Feb-19
24-Feb-19
5-Mar-19
14-Mar-19
23-Mar-19
1-Apr-19
10-Apr-19
19-Apr-19
28-Apr-19
7-May-19
16-May-19
25-May-19
3-Jun-19
12-Jun-19
21-Jun-19
30-Jun-19
9-Jul-19
18-Jul-19
27-Jul-19
5-Aug-19
14-Aug-19
23-Aug-19
1-Sep-19
10-Sep-19
19-Sep-19
28-Sep-19
7-Oct-19
16-Oct-19
25-Oct-19
3-Nov-19
12-Nov-19
21-Nov-19
30-Nov-19
9-Dec-19
18-Dec-19
27-Dec-19

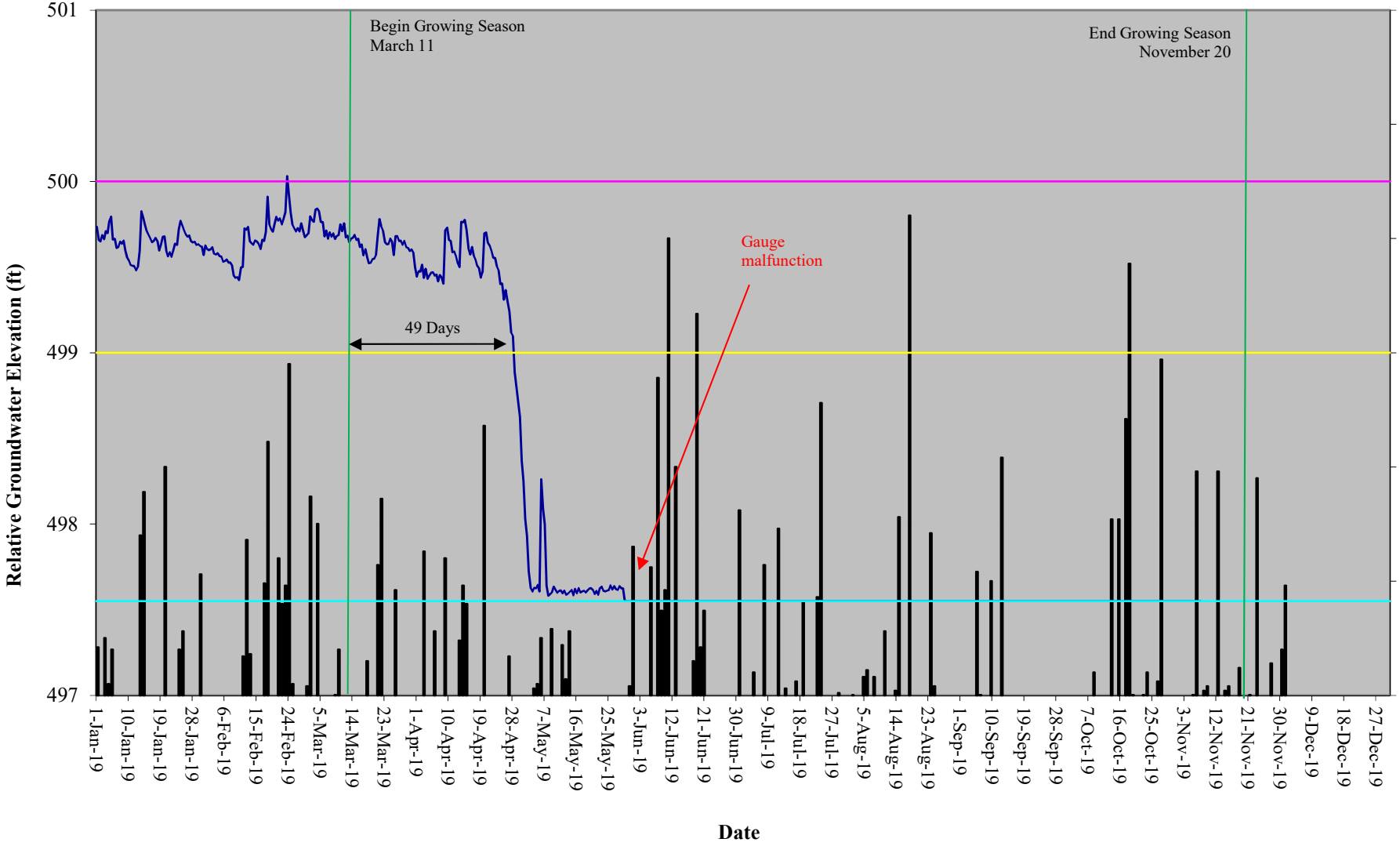
Stanley's Restoration Site
Hydrograph
Wetland Gauge 10



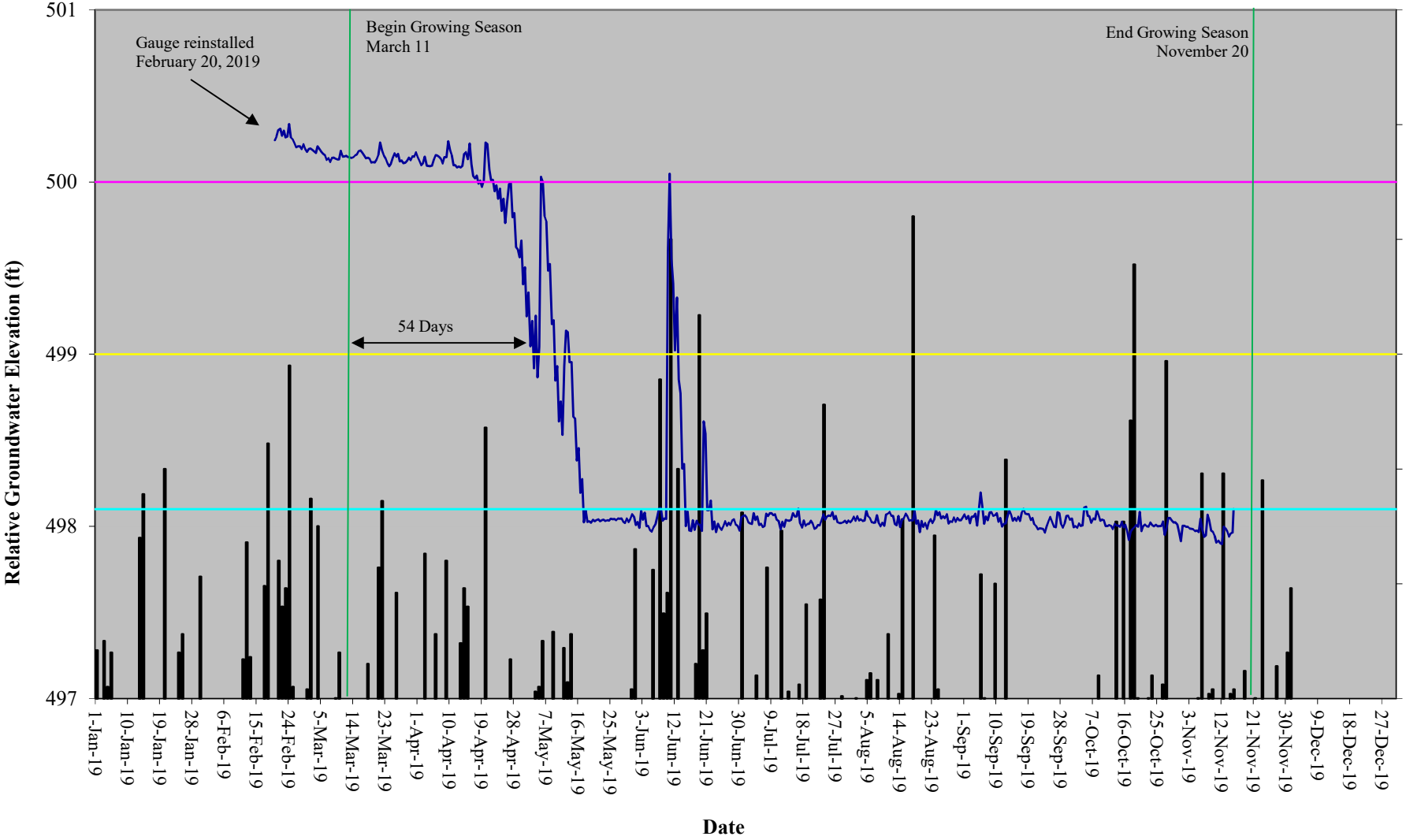
Stanley's Restoration Site
Hydrograph
Wetland Gauge 11



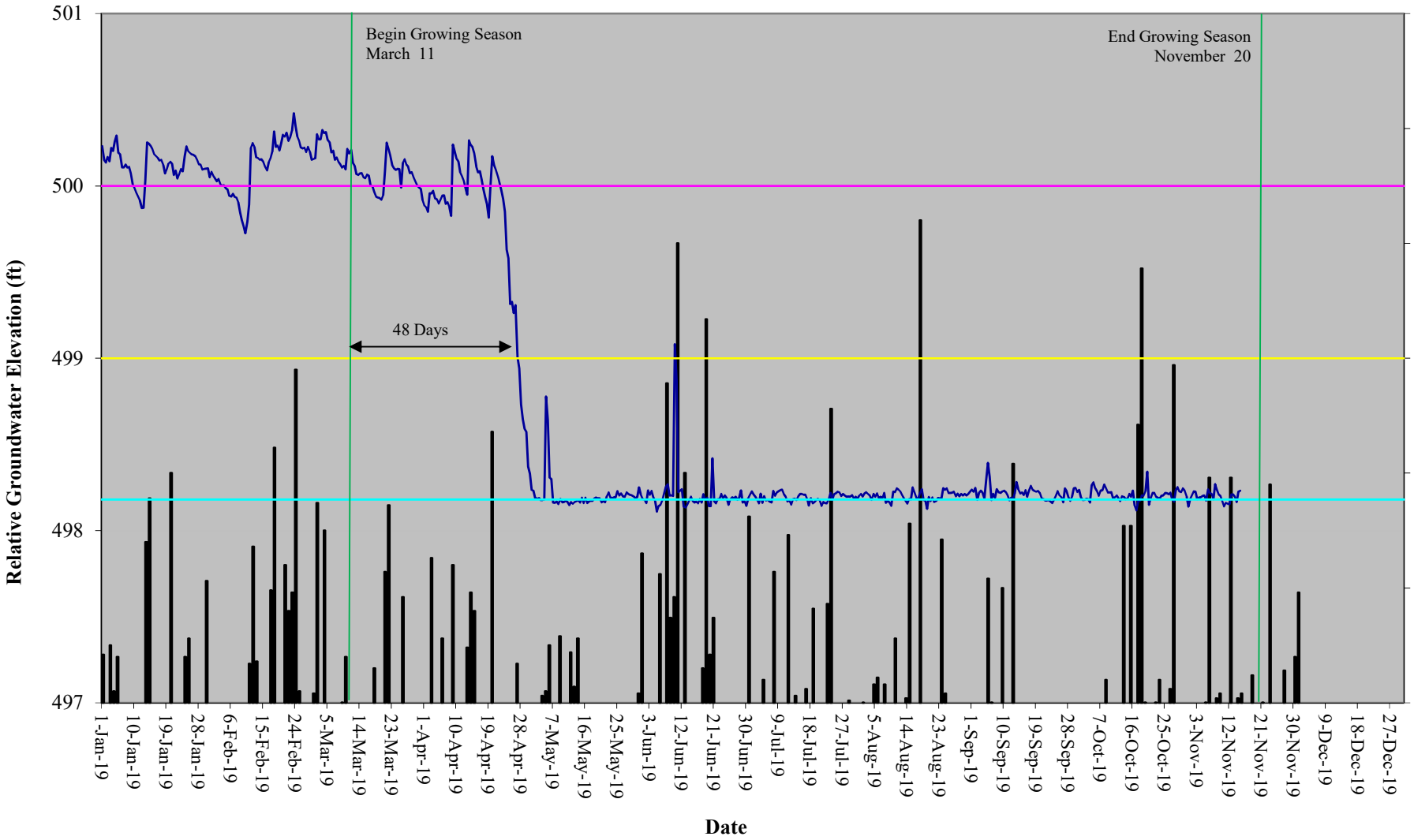
Stanley's Restoration Site
Hydrograph
Wetland Gauge 12



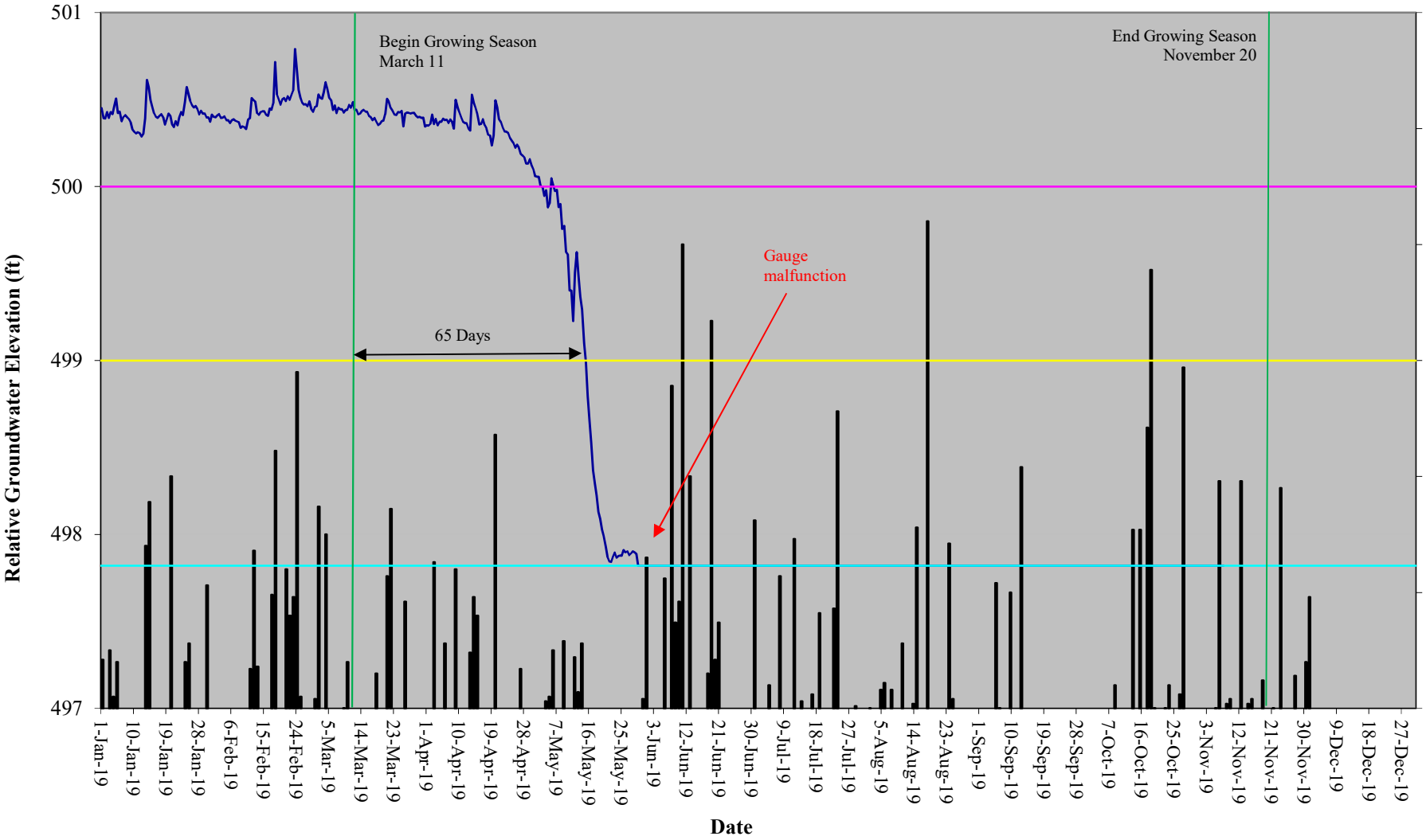
Stanley's Restoration Site
Hydrograph
Wetland Gauge 13



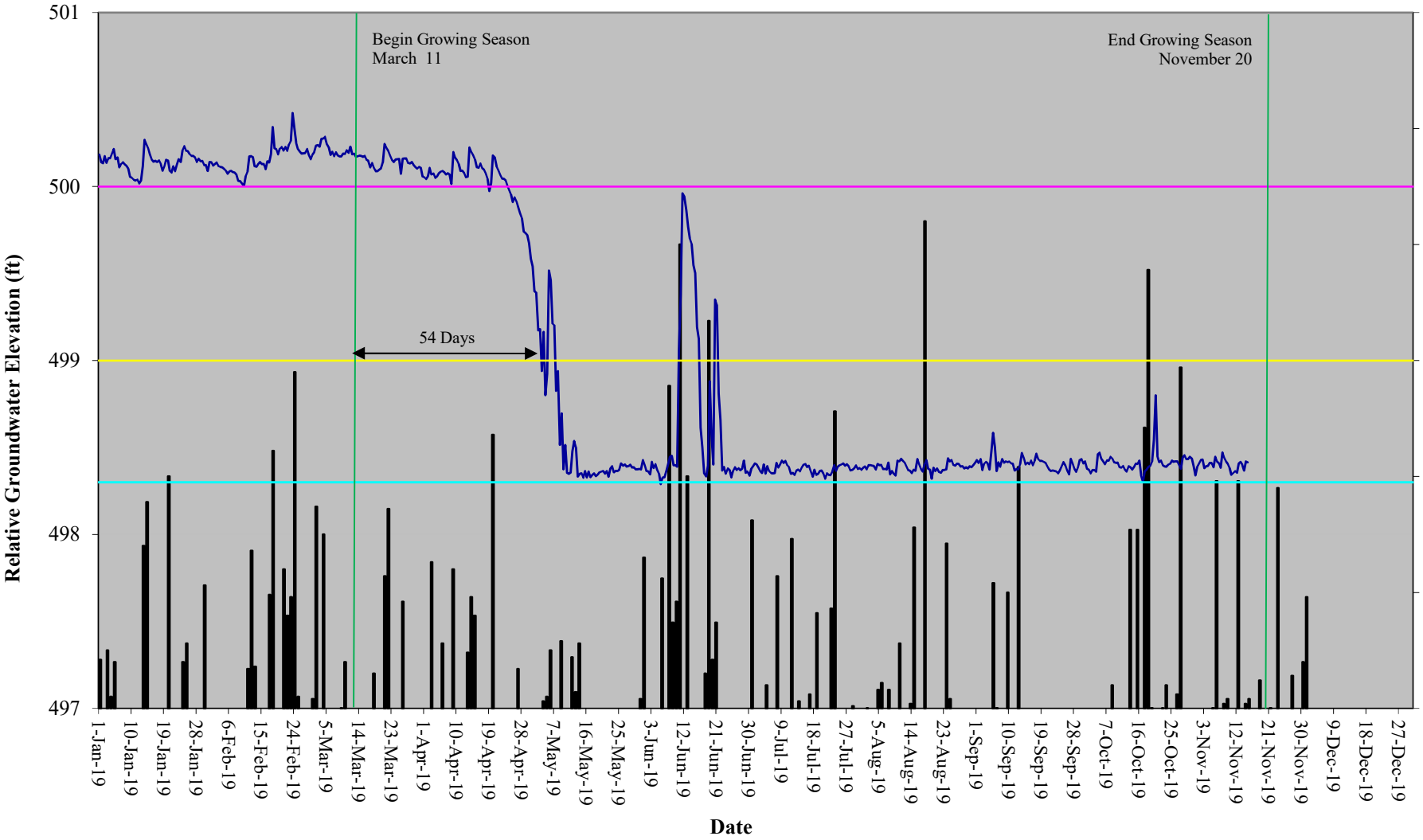
Stanley's Restoration Site
Hydrograph
Wetland Gauge 14



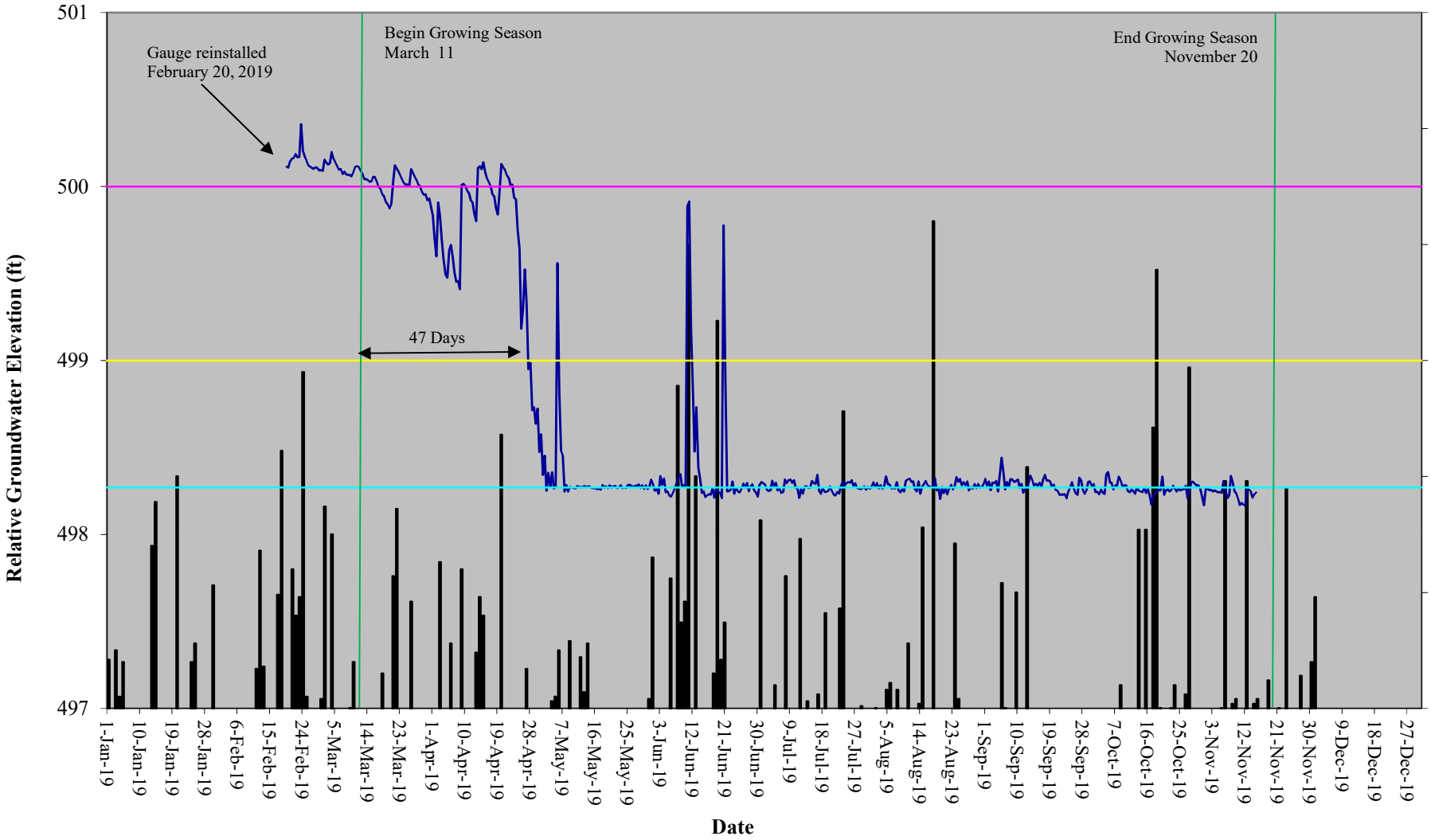
Stanley's Restoration Site
Hydrograph
Wetland Gauge 15



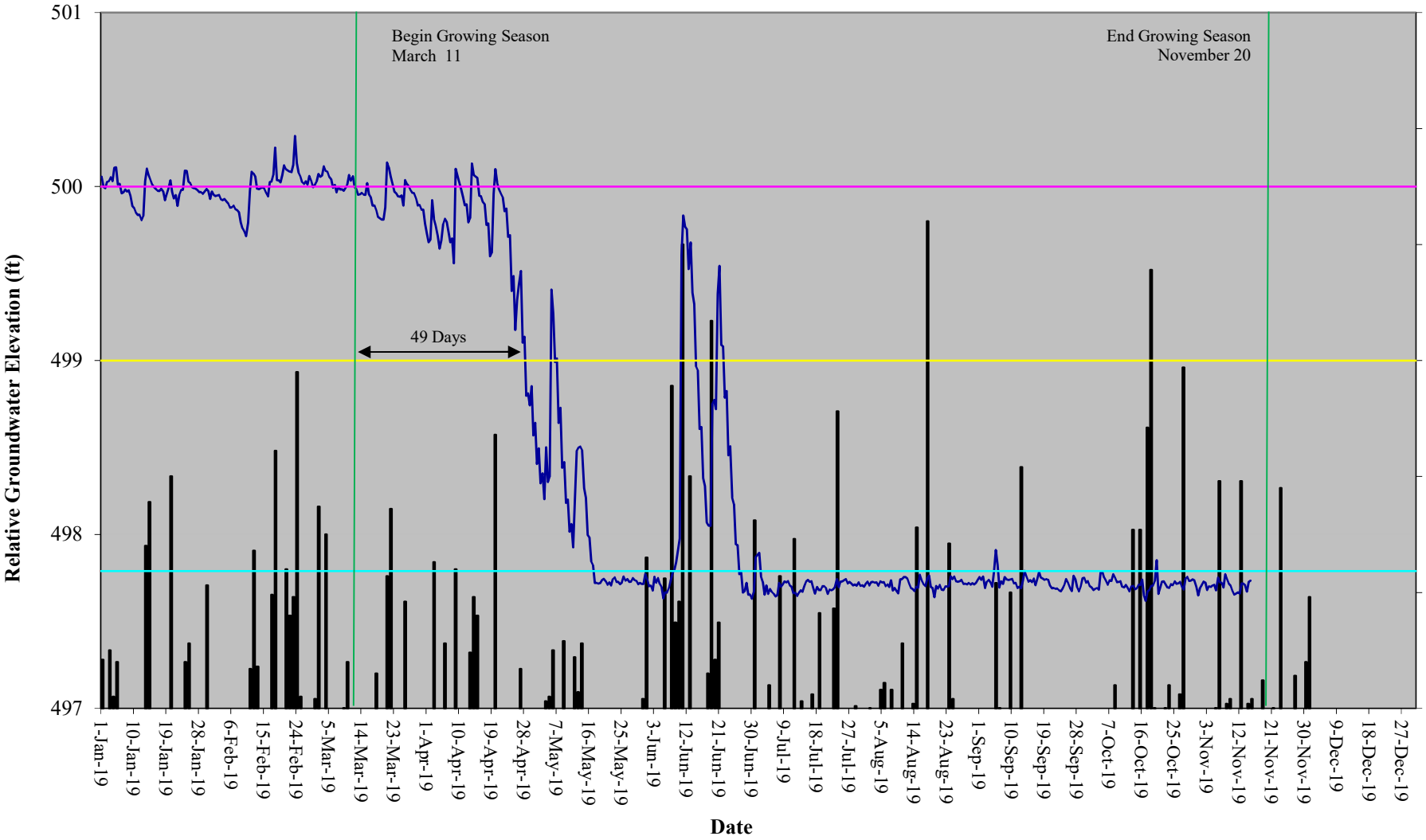
Stanley's Restoration Site
Hydrograph
Wetland Gauge 16



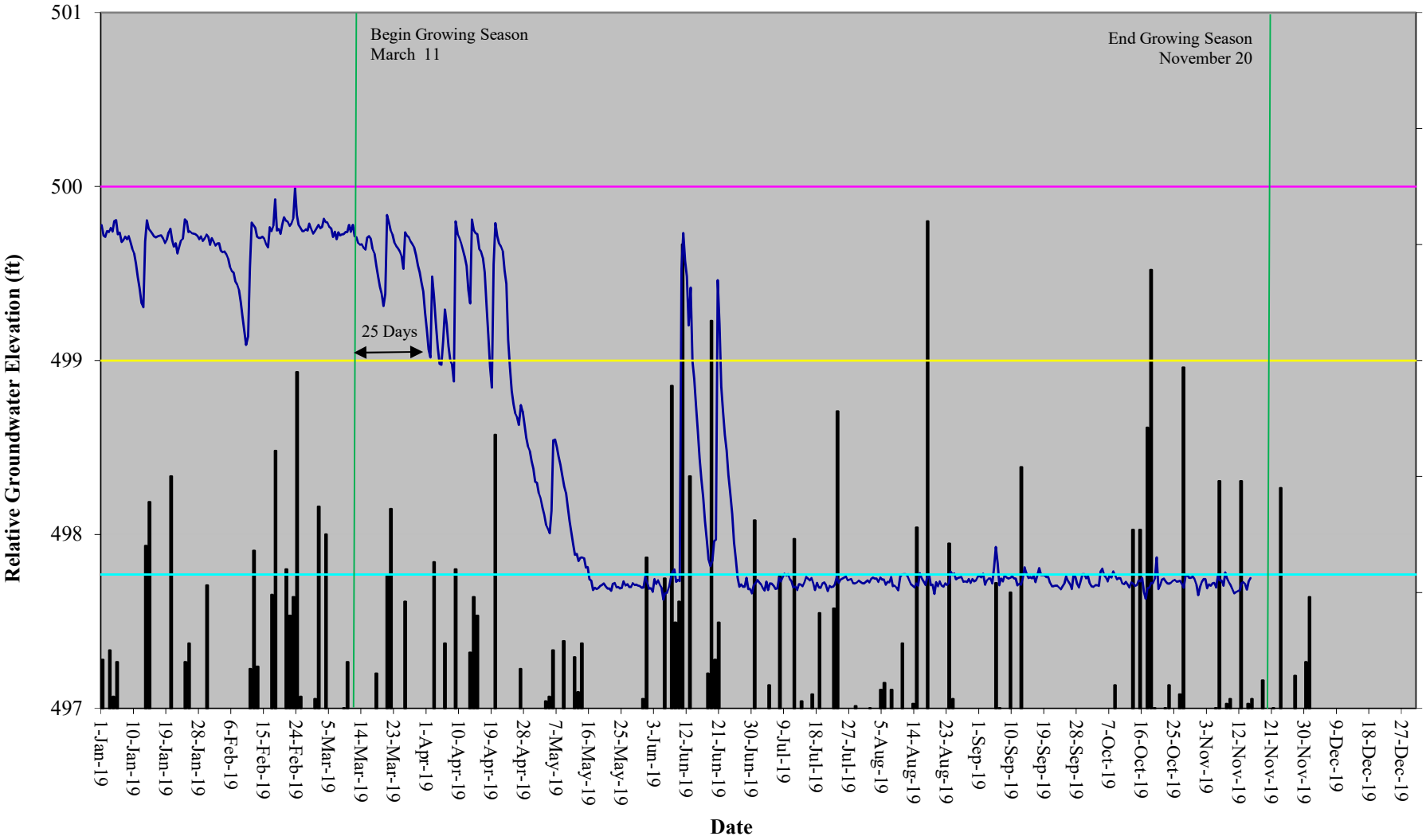
Stanley's Restoration Site
Hydrograph
Wetland Gauge 17



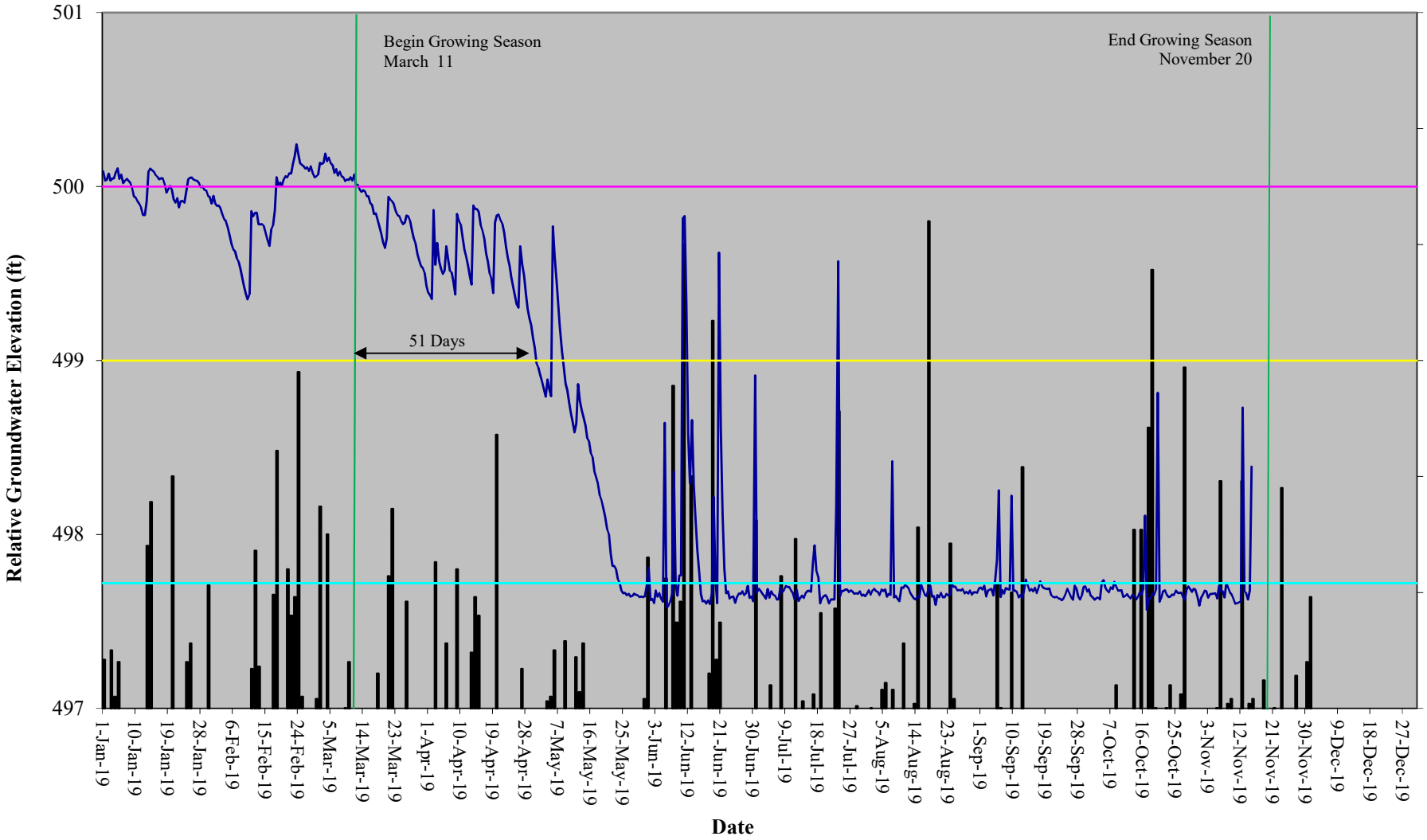
Stanley's Restoration Site
Hydrograph
Wetland Gauge 19

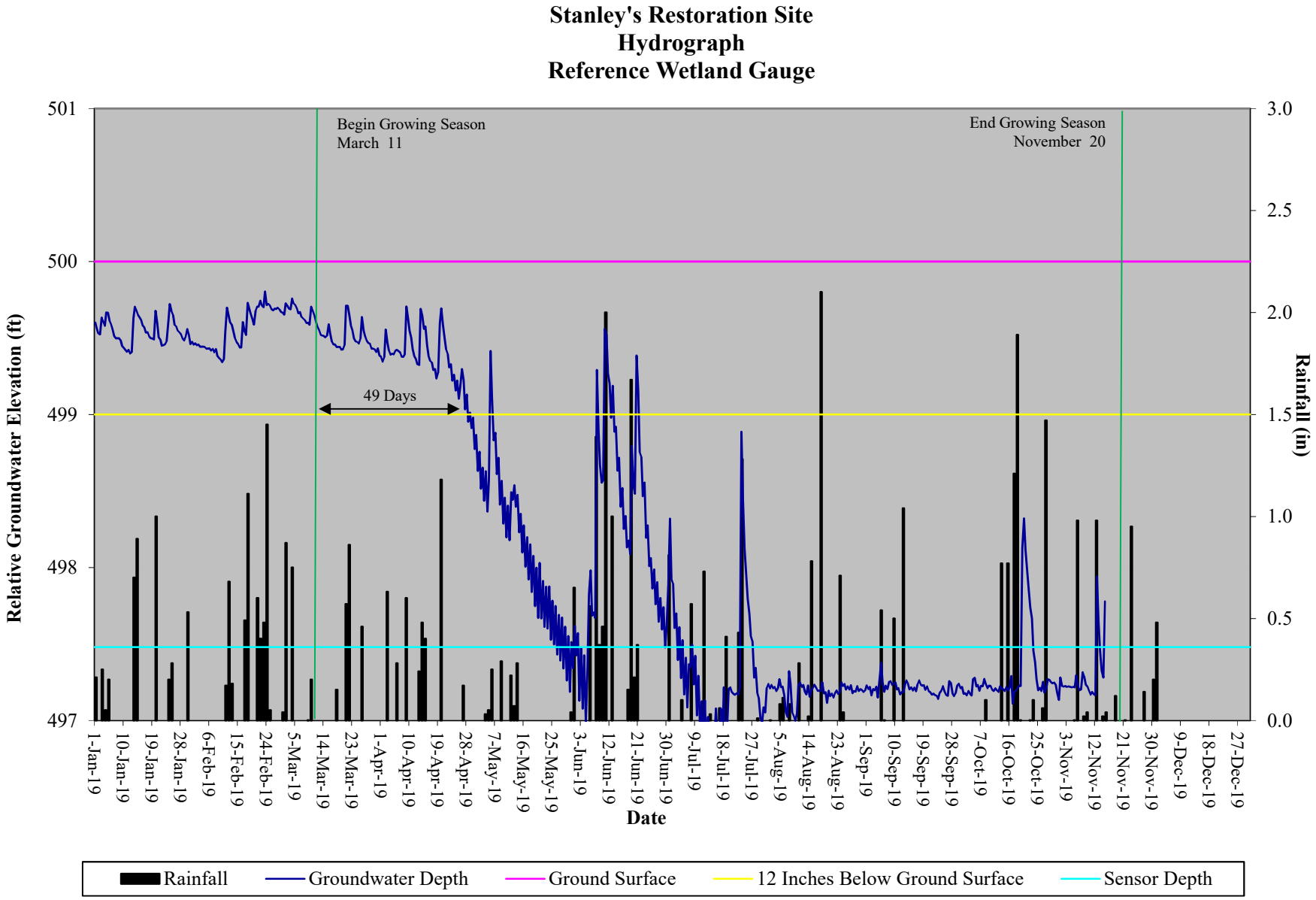


Stanley's Restoration Site
Hydrograph
Wetland Gauge 20



Stanley's Restoration Site
Hydrograph
Wetland Gauge 21




Stanley's Restoration Site
Hydrograph
Reference Wetland Gauge
Begin Growing Season
March 11
End Growing Season
November 20
49 Days
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
501
500
499
498
497
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1-Jan-19
10-Jan-19
19-Jan-19
28-Jan-19
6-Feb-19
15-Feb-19
24-Feb-19
5-Mar-19
14-Mar-19
23-Mar-19
1-Apr-19
10-Apr-19
19-Apr-19
28-Apr-19
7-May-19
16-May-19
25-May-19
3-Jun-19
12-Jun-19
21-Jun-19
30-Jun-19
9-Jul-19
18-Jul-19
27-Jul-19
5-Aug-19
14-Aug-19
23-Aug-19
1-Sep-19
10-Sep-19
19-Sep-19
28-Sep-19
7-Oct-19
16-Oct-19
25-Oct-19
3-Nov-19
12-Nov-19
21-Nov-19
30-Nov-19
9-Dec-19
18-Dec-19
27-Dec-19
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth