FINAL
MONITORING REPORT (MY1)

ALLIANCE HEADWATERS MITIGATION SITE
Johnston County, North Carolina

NCDEQ Contract No. 6832
DWR ID No. 20160405
DMS ID No. 97086
USACE Action ID No. SAW-2016-00882
RFP No. 16-006477

Neuse River Basin
HUC 03020201

Data Collection: January-November 2020
Submission: January 2021

Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NORTH CAROLINA 27699-1652

Alliance Headwaters -- Year 1 (2020) Monitoring Summary

General Notes

- No encroachment was identified in Year 1 (2020)
- No evidence of nuisance animal activity (i.e., heavy deer browsing, beaver activated, etc.) was observed.
- Wide-spread wetland gauge malfunctions occurred – further discussion below and within Section 2.1 of the Monitoring Report.
- Project Photos – Appendix H

Streams

- Stream monitoring measurements indicate minimal changes in the cross-sections as compared to as-built data. The channel geometry compares favorably with the proposed conditions outlined in the Detailed Restoration Plan and as constructed.

- Across the Site, all in-stream structures are intact and functioning as designed. No stream areas of concern were identified during year 1 (2020) monitoring. Tables for year 1 (2020) data and annual quantitative assessments are included in Appendix D.

- All seven flow gauges recorded continuous flow for more than the 30-days. Flow periods ranged from 97 to 201 consecutive days (Appendix H).

- Two bankfull events were documented during year 1 (2020) monitoring, April 30, 2020, & November 19, 2020 (Table 17, Appendix H).

Wetlands

- Sixteen of the twenty-nine groundwater gauges met success criteria. Ten gauges malfunctioned, and the manufacturer was unable to retrieve any usable data. Across the Site, the development of herbaceous hydrophytic species is abundant. RS originally installed Onset's Bluetooth enabled HOBO MX2001 Water Level Loggers, which we identified as highly accurate water level and temperature gauge. In the end, using this type of logger may have been the issue for failure, in that the freeze-thaw cycle during the winter of 2019/2020 likely compromised these gauges and allowed moisture to enter the gauge and eventually cause misreadings and/or gauge failure. In January of 2021, all twenty-nine groundwater gauges were replaced with a standard Onset HOBO pressure-based water level data logger.

  RS and Axiom conducted a comprehensive review of the gauge data, including multiple site visits, and could not determine a pattern or reasoning behind the gauge failure/malfunction. In an abundance of caution, an additional five wetland gauges are to be installed ahead of the 2021 growing season in areas of the Site we feel need additional data points (Near GW 7, GW1/2, GW 12-15, GW19, and vegetation plots 31/32). RS will provide a wetland update to DMS ahead of the 2021 growing season, including gauge location and soil profiles.

  In general, on-site observations indicate wetland re-establishment is trending towards achieving success criteria. Given the degree of watershed manipulation before restoration, including the complete disconnection of the watershed via perimeter ditching, we feel the Site has responded well in its first-year post-restoration.

Vegetation

- All 32 fixed vegetation monitoring plots met success in year 1 with an average of 502 planted stems/acre, down from 531 in MY0. Additionally, 14 random transects met success, ranging from 405 to 1,052 stems/acre. No areas of vegetation concern were identified in year 1.

Site Monitoring Activity and Reporting History

Project Millstones	Stream Monitoring Complete	Vegetation Monitoring Complete	Wetland Monitoring	Data Analysis Complete	Completion or Delivery
Construction Earthwork	--	--	--	--	July 31, 2019
Planting	--	--	--	--	January 16, 2020
As-Built Documentation	Dec. 11-16, 2020	Jan. 16-17, 2020	--	January 2020	March 2020
Year 1 Monitoring	July 23, 2020	July 27-28, 2020	Jan. – Nov. 2020	November 2020	January 2021

Site Maintenance Report (2020)

Invasive Species Work	Maintenance work
None	None

RS Response to DMS comments on Draft Yr. 1 (2020) Monitoring Report

1. Some of the summary data in the tables with the cross-section pictures (pages 58-75) do not match the morphology data shown on table 14b. Please QC this and ensure the numbers are correct.
   Cross-section plots and morphology tables were checked, and all data is now matching and correct.

2. CCPV. Please provide location of soil temp probe on legend and map per IRT request. It may also be beneficial to label hydroperiods on the gauges (add to attribute table and label) to show overall trends that may help in IRT discussions of gauge performance.
   The soil temperature probe/rain gauge location was added to Figure 2. Additionally, hydroperiods for the groundwater gauges (in percent of growing season) were added to the labels on Figure 2.

3. Provide response to IRT MY0 comments in MY1 report as appendix.
   IRT MY0 comment responses are included as Appendix F.

4. It appears that some gauges are responding slower than others to hydrology modifications. This is especially apparent in the lower section of UT1R3 where road removal was part of restoration. It may be helpful if RS has any explanation of why this may be occurring in the text. The other areas where gauges did not meet appear to be trending toward success or located on borders of credit, suggesting additional gauges may be helpful in future years to provide credit insurance. Please also ensure that offsets are accounted for correctly to ensure that that is not the issue.
   We concur; please see added wetland discussion in the Executive Summary and Section 2.1 of the Report.

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1.0 PROJECT SUMMARY

Restoration Systems, LLC has established the North Carolina Division of Mitigation Services (NCDMS) Alliance Headwaters Mitigation Site (Site).

1.1 Project Goals & Objectives

Project goals and associated objectives are summarized in Table A.

Table A: Summary of Goals and Objectives for the Alliance Headwaters Mitigation Project

Goals	Objectives	Pre-construction Functional Status	Post-construction Functional Status
Goals Specific to the Neuse River and Hannah Creek Watershed Discussed in the RBRP (NCDMS 2010 and 2015) and *Neuse River Basinwide Plan* (NCDWQ 2009)			
Remove Direct Nutrient Inputs from Agricultural Lands	• Restoration and enhancement of minimum 50-foot riparian buffers along all Project reaches • Protection of riparian buffers with a perpetual conservation easement • Reducing the amount of land in active row crop agriculture • Decreasing drainage to restore wetlands, promoting higher water table conditions, and denitrification	Not Functioning	Functioning
Remove Direct Sediment Inputs from Agricultural Lands	• Restoration of stabilized headwater stream systems • Restoration of wetlands and riparian buffers to filter runoff • Increase the distance between active farming operations and receiving waters • Stabilization of gullies and ditches	Not Functioning	Functioning
Additional Benefits to Hannah Creek Significant Natural Heritage Area			
Improved Aquatic Habitats	• Restoration of appropriate bed form diversity, headwater stream/wetland form, and in-stream structures to provide suitable habitat • Restoration of self-sustaining stream/wetland headwaters • Restoration of riparian buffer vegetation to provide organic matter and shade	Not Functioning	Functioning
Improved Connectivity	• Restore connectivity to historic remnant channel features. • Improved aquatic connectivity to Hannah Creek	Not Functioning	Functioning

1.2 Project Background

The Alliance Headwaters Mitigation Site (Site) is in Johnston County, approximately six miles southeast of Four Oaks and one mile east of US 701 (Figure 1, Appendix A). The Project is located within the NC Division of Mitigation Services (DMS) targeted watershed for the Neuse River Basin Hydrologic Unit (HU) 03020201150020 and the NC Division of Water Resources (NCDWR) subbasin 03-04-04.

A review of historic aerials of the Site, and adjacent parcels, taken in 1939, 1965, 1971, 1988, and 2005, revealed that while agriculture was prevalent in the area, much of the Site was not converted to agricultural uses until after 1997/1998. Additional aerial photographs from Google Earth show that before construction, the project site had been manipulated for agricultural production numerous times between

1997/1998 and 2019. The channelization of perimeter ditches to carry stream flow served to undermine the hydrologic connection between the headwaters of UT3 and UT4 (located in the forested sections of the Site) from their downstream channels. In addition, two small impoundments were excavated on the historical flow paths of UT1 and UT3 during this time. The Site has existed in its pre-construction condition since approximately 2005.

Current land use near the Site is predominately agriculture (crop and livestock production) and silviculture. While the Site is near (< 6 miles) to two major interstates (I-95 and I-40), there are no foreseeable signs of impending land use changes or development pressure that would impact the Project's watershed. The conservation easement will eliminate the potential for future development and/or agricultural use in the floodplain areas of the restored streams.

1.3 Project Components and Structure

Proposed Site restoration activities generated 6029 Stream Mitigation Units (SMUs) and 39.4 riverine Wetland Mitigation Units (WMUs) within a 71.7-acre conservation easement as the result of the following.

- Restoration of 6,529 linear feet of stream channels that have been straightened and channelized for agricultural purposes
- Restoration of 32.6 acres of drained hydric soil to riparian riverine wetlands as the result of stream restoration activities and ditch plugging
- Areas of potential wetland riparian riverine restoration total approximately 7.0 acres of drained soils with hydric inclusions
- Enhancement of 0.38 acres of jurisdictional riparian headwater forest through stream realignment activities and supplemental wetland plantings
- Creation of 1.99 acres of riparian riverine wetlands in areas of drained hydric soil requiring bench excavation
- Preservation of 16.39 acres of jurisdictional riparian riverine wetlands located within forested headwater systems

Additional activities that occurred at the Site included the following.

- Planting 49.9 acres of the Site with 35,200 stems (planted species and densities by zone are included in Table 7 [Appendix C])
- Application of permanent seed mix across 49.9 acres of the Site and temporary seed mix consisting of grain rye, millet, clover, and turnip

Site design was completed in October 2018. Construction started on May 13, 2019, and ended within a final walkthrough on July 31, 2019. The Site was planted on January 16, 2020. Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 1-4 (Appendix A).

1.4 Success Criteria

Performance criteria outlined in the *NCDMS Mitigation Plan Template* (ver. 10/2015), and *US Army Corps of Engineers – Wilmington District Public Notice: Notification of Issuance of Guidance for Compensatory Stream and Wetland Mitigation Conducted for Wilmington District* (October 24, 2016), will be followed and are briefly outlined below. Monitoring data collected on the Site will include reference photos, plant survival analyses, channel stability analyses, wetland hydrological analysis, and biological data if specifically required by permit conditions.

Monitoring will be conducted for seven years, unless the USACE, in consultation with the Interagency Review Team (IRT), agrees that monitoring may be terminated early. Early closure will only be provided through written approval from the USACE in consultation with the IRT. Annual monitoring reports will be submitted to the NCDMS by RS no later than November 30 of each monitoring year.

Table B: Success Criteria

Streams
• All streams must maintain an Ordinary High-Water Mark (OHWM), per RGL 05-05. • A continuous surface flow must be documented each year for at least 30 consecutive days. • Bank height ratio (BHR) cannot exceed 1.2 for a majority of measured cross sections on a given reach. • Entrenchment ratio (ER) must be 2.2 or above for a majority of measured riffle cross-sections on a given reach. • BHR and ER should not change by more than 10% in any given year for a majority of a given reach. • Must document the occurrence of at least 4 bankfull events in separate years during the monitoring period.
Wetland Hydrology
• Saturation or inundation within the upper 12 inches of the soil surface for, at a minimum, 10 percent of the growing season during average climatic conditions. Note: Soil temperature for growing season establishment will be determined using a continuously logging soil probe installed at the rain gauge. Soil temperature will be measured from mid-February through the end of April (at a minimum).
Vegetation
• Within planted portions of the Site, a minimum of 320 stems per acre must be present at year 3; a minimum of 260 stems per acre must be present at year 5; and a minimum of 210 stems per acre must be present at year 7. • Trees must average 7 feet in height at year 5 and 10 feet in height at year 7. • Planted and volunteer stems are counted, provided they are included in the approved planting list for the Site. • Any single species can only account for 50% of the required stems per monitoring plot.

2.0 METHODS

Monitoring requirements and success criteria outlined in this plan follow the October 24, 2016, NC Interagency Review Team *Wilmington District Stream and Wetland Compensatory Mitigation Update*. Monitoring will be conducted by Axiom Environmental, Inc. Annual monitoring reports of the data collected will be submitted to the NCDMS by Restoration Systems no later than December 31 of each monitoring year data is collected. The monitoring schedule is summarized in Table C.

Table C: Monitoring Schedule

Resource	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Streams	x	x	x		x		x
Wetlands	x	x	x	x	x	x	x
Vegetation	x	x	x		x		x
Visual Assessment	x	x	x	x	x	x	x
Report Submittal	x	x	x	x	x	x	x

2.1 Monitoring

The monitoring parameters are summarized in Table D.

Stream Summary

All streams are functioning as designed, and no stream areas of concern were observed during year 1 (2020) monitoring. Stream morphology data is available in Appendix D.

Wetland Summary

Summary of Monitoring Period/Hydrology Success Criteria by Year

Year	Soil Temperatures/Date Bud Burst Documented	Monitoring Period Used for Determining Success	10 Percent of Monitoring Period
2020 (Year 1)	March 2, 2020*	March 2-November 4 (248 days)	25 days

*Based on observed/documented bud burst and data collected from a soil temperature data logger located on the Site.

Sixteen of the twenty-nine groundwater gauges met success criteria for the year 1 (2020) monitoring period (Appendix E). Ten gauges malfunctioned, and the manufacturer was unable to retrieve any usable data. Across the Site, the development of herbaceous hydrophytic species is abundant. RS originally installed Onset's Bluetooth enabled HOBO MX2001 Water Level Loggers, which we identified as highly accurate water level and temperature gauge. In the end, using this type of logger may have been the issue for failure, in that the freeze-thaw cycle during the winter of 2019/2020 likely compromised these gauges and allowed moisture to enter the gauge and eventually cause misreadings and/or gauge failure. In January of 2021, all twenty-nine groundwater gauges were replaced with a standard Onset HOBO pressure-based water level data logger.

RS and Axiom conducted a comprehensive review of the gauge data, including multiple site visits, and could not determine a pattern or reasoning behind the gauge failure/malfunction. In an abundance of caution, an additional five wetland gauges are to be installed ahead of the 2021 growing season in areas of the Site we feel need additional data points (Near GW 7, GW1/2, GW 12-15, GW19, and vegetation plots 31/32). RS will provide a wetland update to DMS ahead of the 2021 growing season, including gauge location and soil profiles.

In general, on-site observations indicate wetland re-establishment is trending towards achieving success criteria. Given the degree of watershed manipulation before restoration, including the complete disconnection of the watershed via perimeter ditching, we feel the Site has responded well in its first-year post-restoration.

Vegetation Summary

During quantitative vegetation sampling, 32 sample plots (10-meter by 10-meter) were installed within the Site as per guidelines established in *CVS-EEP Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008). Measurements also included 14 random sample plots (25-meter by 4-meter). Measurements of all 46 plots resulted in an average of 618 planted stems/acre excluding livestakes. Additionally, all individual plots met success criteria (Tables 8-11, Appendix C).

Table D: Monitoring Summary

Stream Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Stream Profile	Full longitudinal survey	As-built (unless otherwise required)	All restored stream channels	Graphic and tabular data.
Stream Dimension	Cross-sections	Years 1, 2, 3, 5, and 7	Total of 16 cross-sections on restored channels	Graphic and tabular data.
Channel Stability	Visual Assessments	Yearly	All restored stream channels	Areas of concern to be depicted on a plan view figure with a written assessment and photograph of the area included in the report.
	Additional Cross-sections	Yearly	Only if instability is documented during monitoring	Graphic and tabular data.
Stream Hydrology	Continuous monitoring of surface water gauges and/or trail camera	Continuous recording through the monitoring period	Total of 7 surface water gauges: One gauge on UT1 – R2, UT1 – R3, UT1A, UT2, UT3 – R1, UT3 – R2, and UT4	Surface water data for each monitoring period as depicted in Figures 2A-2B.
Bankfull Events	Continuous monitoring of surface water gauges and/or trail camera	Continuous recording through the monitoring period	Total of 7 surface water gauges: One gauge on UT1 – R2, UT1 – R3, UT1A, UT2, UT3 – R1, UT3 – R2, and UT4	Surface water data for each monitoring period
	Visual/Physical Evidence	Continuous through the monitoring period	All restored stream channels	Visual evidence, photo documentation, and/or rain data.
Wetland Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Wetland Hydrology	Groundwater gauges	Years 1, 2, 3, 4, 5, 6, and 7 throughout the year, with the growing season defined as March 1-November 4	26 gauges spread throughout restored wetlands	Soil temperature at the beginning of each monitoring period to verify the start of the growing season, groundwater and rain data for each monitoring period
Vegetation Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Vegetation establishment and vigor	Permanent vegetation plots 0.0247 acre (100 square meters) in size; *CVS-EEP Protocol for Recording Vegetation*, *Version 4.2* (Lee et al. 2008)	As-built, Years 1, 2, 3, 5, and 7	32 plots spread across the Site	Species, height, planted vs. volunteer, stems/acre
	Annual random vegetation plots, 0.0247 acre (100 square meters) in size	As-built, Years 1, 2, 3, 5, and 7	18 plots randomly selected each year	Species and height

3.0 REFERENCES

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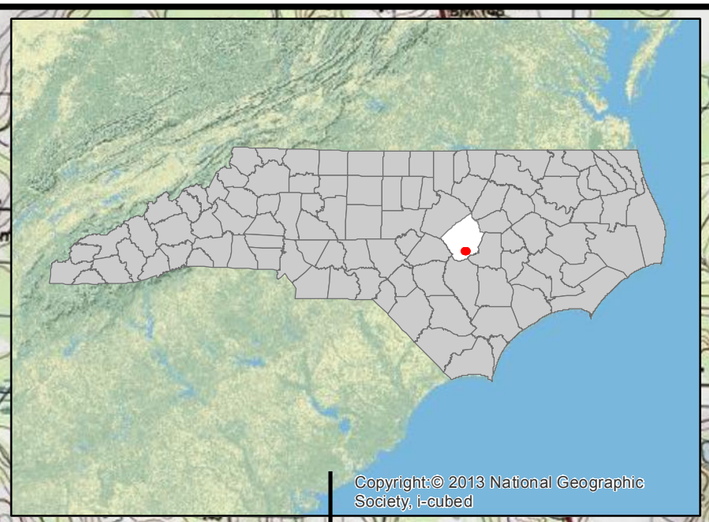
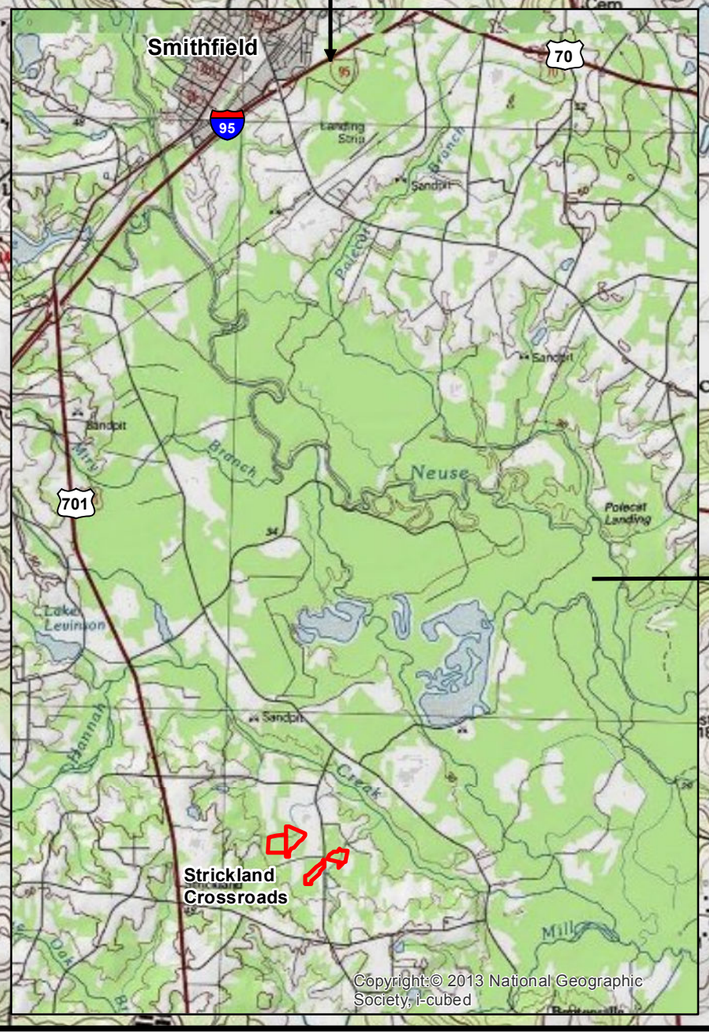
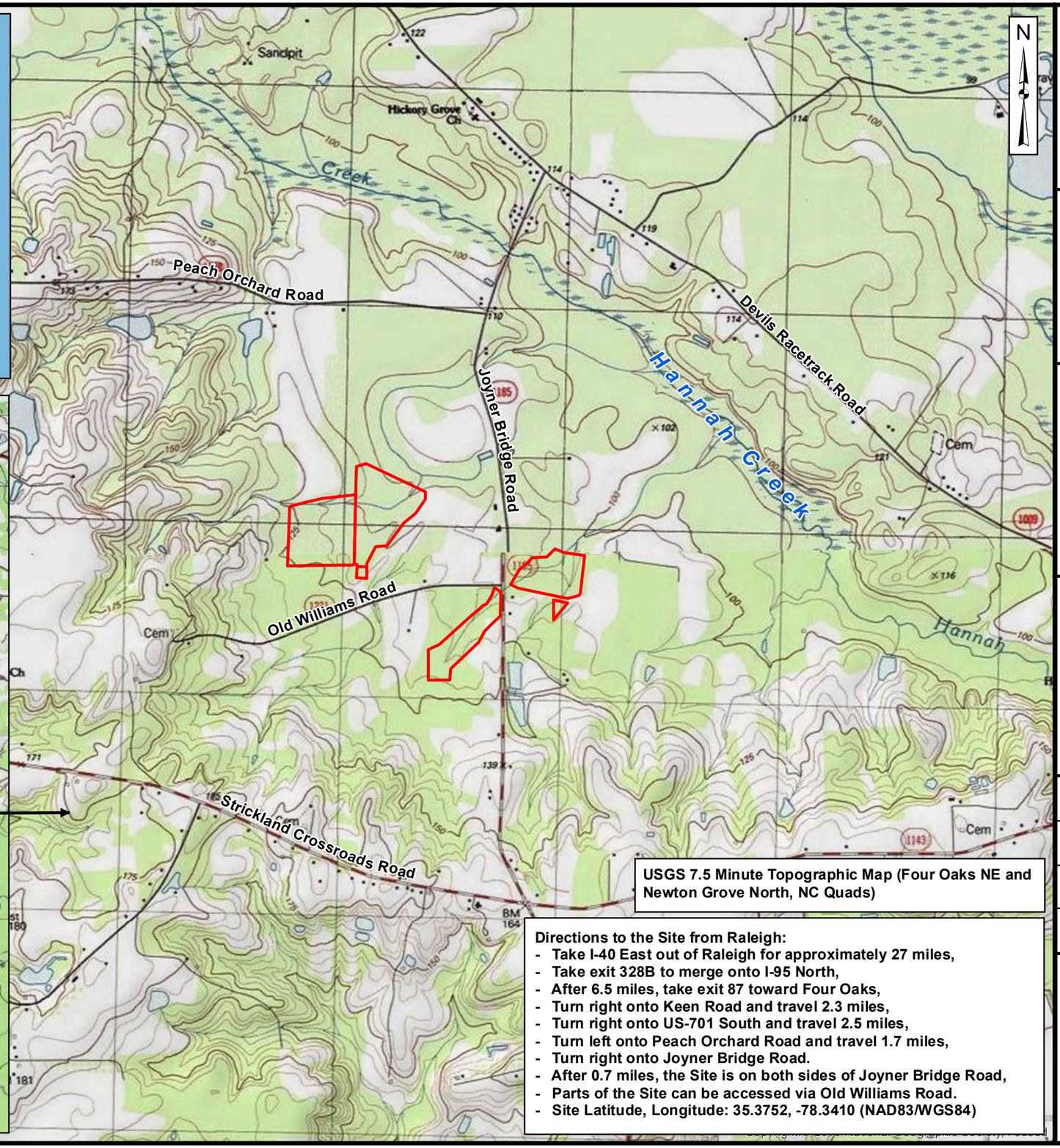
APPENDIX A: BACKGROUND TABLES AND MAP

Figure 1. Site Location
Table 1. Project Components and Mitigation Units
Table 2. Project Activity and Reporting History
Table 3. Project Contacts Table
Table 4. Project Attributes Table







USGS 7.5 Minute Topographic Map (Four Oaks NE and Newton Grove North, NC Quads)

Directions to the Site from Raleigh:
- **Take I-40 East out of Raleigh for approximately 27 miles,**
- **Take exit 328B to merge onto I-95 North,**
- **After 6.5 miles, take exit 87 toward Four Oaks,**
- **Turn right onto Keen Road and travel 2.3 miles,**
- **Turn right onto US-701 South and travel 2.5 miles,**
- **Turn left onto Peach Orchard Road and travel 1.7 miles,**
- **Turn right onto Joyner Bridge Road.**
- **After 0.7 miles, the Site is on both sides of Joyner Bridge Road,**
- **Parts of the Site can be accessed via Old Williams Road.**
- **Site Latitude, Longitude: 35.3752, -78.3410 (NAD83/WGS84)**

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ALLIANCE HEADWATERS MITIGATION SITE

Johnston County, NC

Title:

SITE LOCATION

Drawn by: KRJ/CLF

Date: AUG 2017

Scale: 1:20,000

Project No.: 17-002

FIGURE

1

Table 1. Project Components and Mitigation Credits
Alliance Headwaters Restoration Site

Reach ID	Stream Stationing/ Wetland Type	Existing Footage/ Acreage	Mitigation Plan Footage/ Acreage	Restoration Footage/ Acreage	Restoration Level	Restoration or Restoration Equivalent	Mitigation Ratio	Mitigation Credits	Comment
UT 1A	10+00 to 10+87	--	87	87	Restoration	87	1:1	87	
UT 1 Reach 1	10+00 to16+71	4761	671	671	Restoration	671	1:1	671	
UT 1 Reach 2	16+71 to 30+33		1362	1362	Restoration	1362-70= 1292	1:1	1292	70 feet is outside of the easement and is therefore non-credit generating.
UT 1 Reach 3	10+00 to 24+63		1463	1463	Restoration	1463-149= 1314	1.3:1	1011	149 feet is outside of the easement and is therefore non-credit generating.
UT 2	10+00 to 19+97	<1	997	997	Restoration	997-146= 851	1.3:1	655	146 feet either does not have proper buffer width or is outside of the easement and is therefore non-credit generating.
UT 3 Reach 1	10+00 to 16+39	3313	639	639	Restoration	639	1:1	639	
UT 3 Reach 2	16+39 to 29+15		1276	1276	Restoration	1276-132= 1144	1:1	1144	132 feet is outside of the easement and is therefore non-credit generating.
UT 4	10+00 to 15+31	1142	531	531	Restoration	531	1:1	531	
Wetland R1	Riparian Riverine	0	7.11	7.108	Restoration	7.108	1:1	7.108	Wetland Restoration
Wetland R2	Riparian Riverine	0	6.97	6.973	Restoration	6.973	1.3:1	5.364	Wetland Restoration
Wetland R3	Riparian Riverine	0	18.47	18.473	Restoration	18.473	1:1	18.473	Wetland Restoration
Wetland R4	Riparian Riverine	0	0.29	0.285	Restoration	0.285	1:1	0.285	Wetland Restoration
Wetland R5	Riparian Riverine	0	0.95	0.950	Restoration	0.950	1:1	0.950	Wetland Restoration
Wetland R6	Riparian Riverine	0	0.90	0.896	Restoration	0.896	1:1	0.896	Wetland Restoration
Wetland R7	Riparian Riverine	0	0.28	0.284	Restoration	0.284	1:1	0.284	Wetland Restoration

Table 1. Project Components and Mitigation Credits (continued)
Alliance Headwaters Restoration Site

Reach ID	Stream Stationing/ Wetland Type	Existing Footage/ Acreage	Mitigation Plan Footage/ Acreage	Restoration Footage/ Acreage	Restoration Level	Restoration or Restoration Equivalent	Mitigation Ratio	Mitigation Credits	Comment
Wetland R8	Riparian Riverine	0	1.47	1.472	Restoration	1.472	1.3:1	1.132	Wetland Restoration
Wetland R9	Riparian Riverine	0	0.87	0.867	Restoration	0.867	1.3:1	0.667	Wetland Restoration
Wetland R10	Riparian Riverine	0	1.11	1.105	Restoration	1.105	1:1	1.105	Wetland Restoration
Wetland R11	Riparian Riverine	0	0.97	0.970	Restoration	0.970	1:1	0.970	Wetland Restoration
Wetland R12	Riparian Riverine	0	0.17	0.170	Restoration	0.170	1:1	0.170	Wetland Restoration
Wetland E1	Riparian Riverine	0.38	0.38	0.384	Enhancement	0.384	3.25:1	0.118	Wetland Enhancement
Wetland C1	Riparian Riverine	0	0.54	0.540	Creation	0.540	10:1	0.054	Wetland Creation
Wetland C2	Riparian Riverine	0	0.55	0.546	Creation	0.546	13:1	0.042	Wetland Creation
Wetland C3	Riparian Riverine	0	0.90	0.901	Creation	0.901	10:1	0.090	Wetland Creation
Wetland P1	Riparian Riverine	16.39	16.39	16.392	Preservation	16.392	10:1	1.639	Wetland Preservation

Length & Area Summations by Mitigation Category		
Restoration Level	**Stream (linear footage)**	**Riparian Wetland (acreage)**
Restoration	6529*	39.553
Enhancement	--	0.384
Creation	--	1.987
Preservation	--	16.392

*An additional 497 linear feet of stream restoration is located outside of the conservation easement and is therefore not included in this total or in mitigation credit calculations.

Overall Assets Summary	
Asset Category	**Overall Credits**
Stream	**6029.384**
Riparian Riverine Wetland	**39.354**

Table 2. Project Activity and Reporting History
Alliance Headwaters Restoration Site

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Technical Proposal (RFP No. 16-006477)	October 15, 2015	October 28, 2015
Institution Date (NCDMS Contract No. 6832)	--	March 21, 2016
404 Permit	--	December 3, 2018
Mitigation Plan	--	October 12, 2018
Construction Plans	--	October 12, 2018
Site Construction	--	May 13, 2019-July 31, 2019
Planting	--	January 16, 2020
As-built Baseline Stream Data Collection	December 11-16, 2019	--
As-built Baseline Vegetation Data Collection	January 16-17, 2020	--
As-built Baseline Monitoring (MY0)	October 2019 – January 2020	March 2020
Monitoring Year 1 (2020) Stream Data Collection	July 23, 2020	--
Monitoring Year 1 (2020) Vegetation Data Collection	July 27-28, 2020	--
Monitoring Year 1 (MY1)	January-November 2020	January 2021

Table 3. Project Contacts Table
Alliance Headwaters Mitigation Site

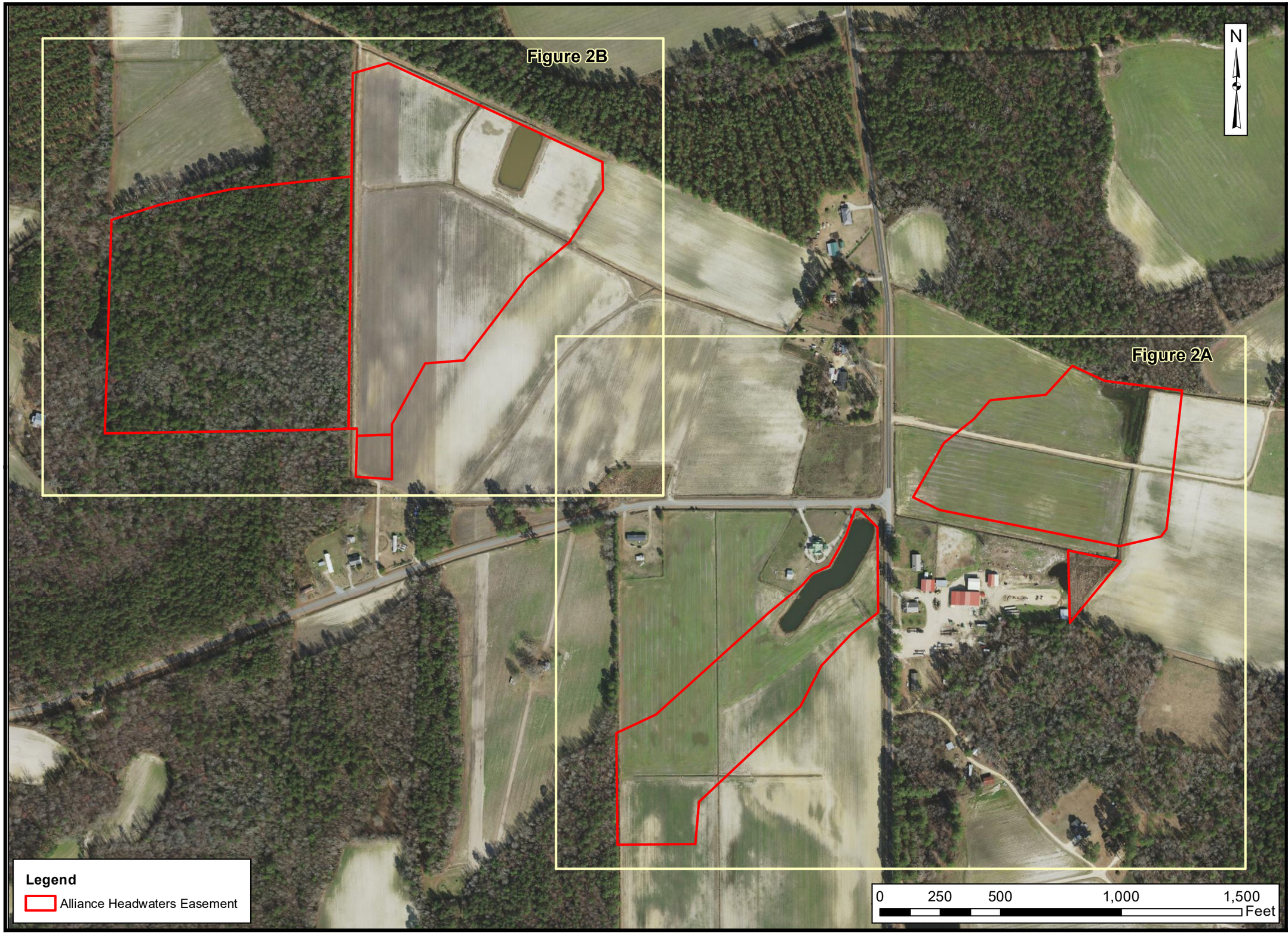
Full Delivery Provider Restoration Systems 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 Worth Creech 919-755-9490	**Construction Contractor** Land Mechanic Designs 780 Landmark Road Willow Spring, NC 27592 Lloyd Glover 919-639-6132
Designer, Construction Plans, and Sediment/Erosion Control Plans Ecosystem Planning & Restoration 1150 SE Maynard Road, Suite 140 Cary, NC 27511 Kevin Tweedy, PE 919-999-0262	**Planting Contractor** Restoration Systems 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 Josh Merritt 919-755-9490
As-built Surveyor K2 Design Group 5688 US Highway 70 East Goldsboro, NC 27534 John Rudolph 919-751-0075	**Baseline & Monitoring Data Collection** Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693

Table 4. Project Attribute Table
Alliance Headwaters Mitigation Site

Project Information					
Project Name	Alliance Headwaters Mitigation Site				
Project County	Johnston County, North Carolina				
Project Area (acres)	71.7				
Project Coordinates (latitude & latitude)	35.372028ºN, 78.340514ºW				
Planted area (acres)	49.9				
Project Watershed Summary Information					
Physiographic Province	Coastal Plain				
Project River Basin	Neuse				
USGS HUC for Project (14-digit)	03020201150020				
NCDWR Sub-basin for Project	03-04-04				
Project Drainage Area (acres)	132 to 546				
Percentage of Project Drainage Area that is Impervious	<2%				
CGIA Land Use Classification	Agriculture & Forested/Scrubland				
Reach Summary Information					
Parameters	**UT1**	**UT1A**	**UT2**	**UT 3**	**UT4**
Length of reach (linear feet)	3495	87	997	1915	531
Valley Classification & Confinement	Alluvial, unconfined				
Drainage Area (acres)	546	6.4	147	354	132
NCDWR Stream ID Score	Blue Line	NA	Blue Line	27.25	27.25
Perennial, Intermittent, Ephemeral	Perennial	Intermittent	Perennial	Perennial/ Intermittent	Perennial/ Intermittent
NCDWR Water Quality Classification	C, NSW				
Proposed Stream Classification (Rosgen 1996)	C5	C5	C5	C5	C5
Underlying Mapped Soils	Leaf silt loam				
Drainage Class	Poorly-drained				
Hydric Soil Status	Hydric				
FEMA Classification	NA				
Native Vegetation Community	Coastal Plain Small Stream Swamp				
Watershed Land Use/Land Cover (Site)	31% forest,67% agricultural land, <2% low density residential/impervious surface				
Percent Composition of Exotic Invasive Vegetation	<2%				

APPENDIX B: VISUAL ASSESSMENT DATA

Figures 2 & 2A-2B. Current Conditions Plan View
Tables 5A-5H. Visual Stream Morphology Stability Assessment
Table 6. Vegetation Condition Assessment
Vegetation Plot Photographs



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ALLIANCE HEADWATERS STREAM AND WETLAND MITIGATION SITE

Wayne County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

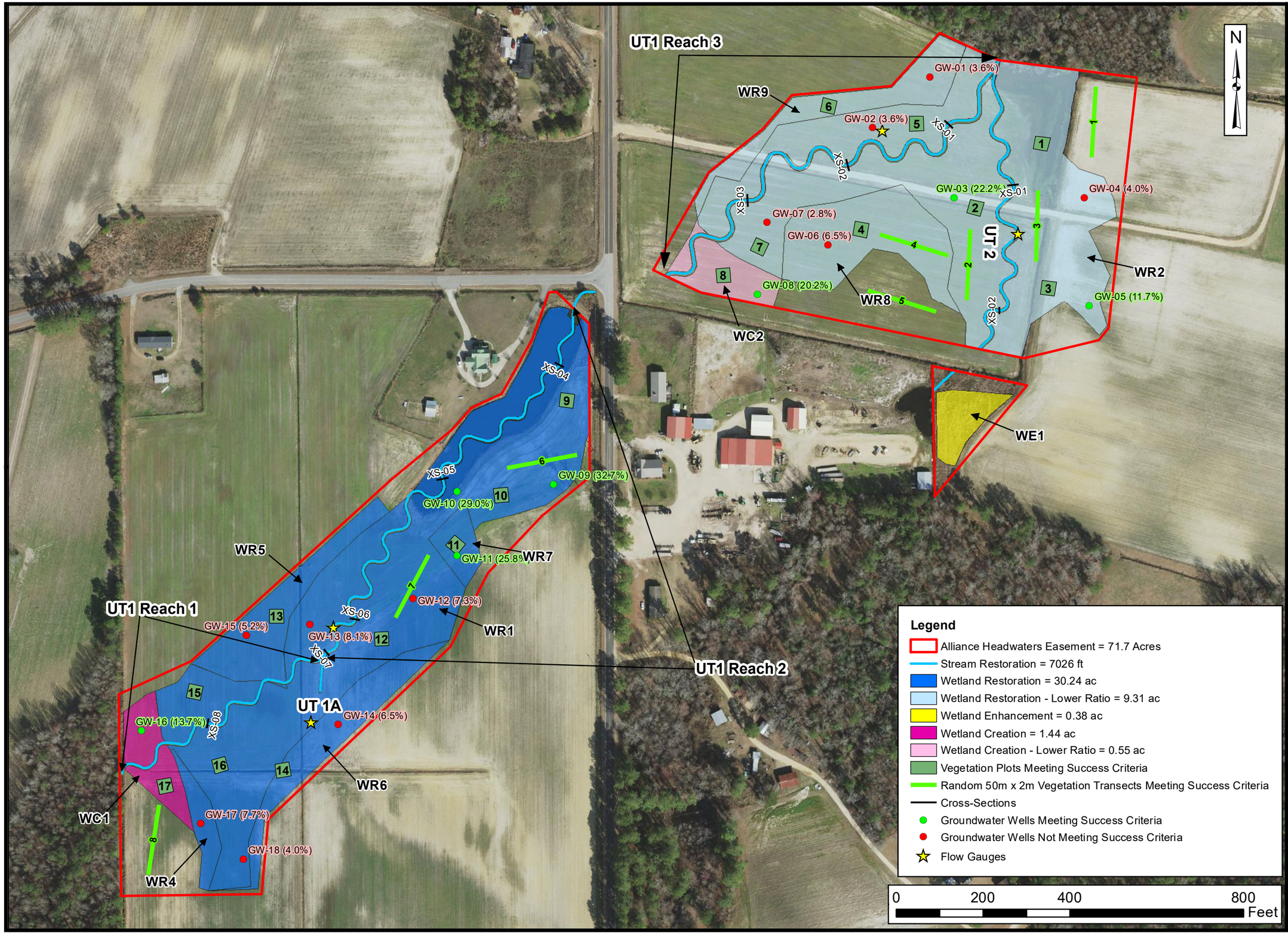
Date: JAN 2021

Scale: 1:4500

Project No.: 18-035

FIGURE

2



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ALLIANCE HEADWATERS STREAM AND WETLAND MITIGATION SITE

Johnston County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

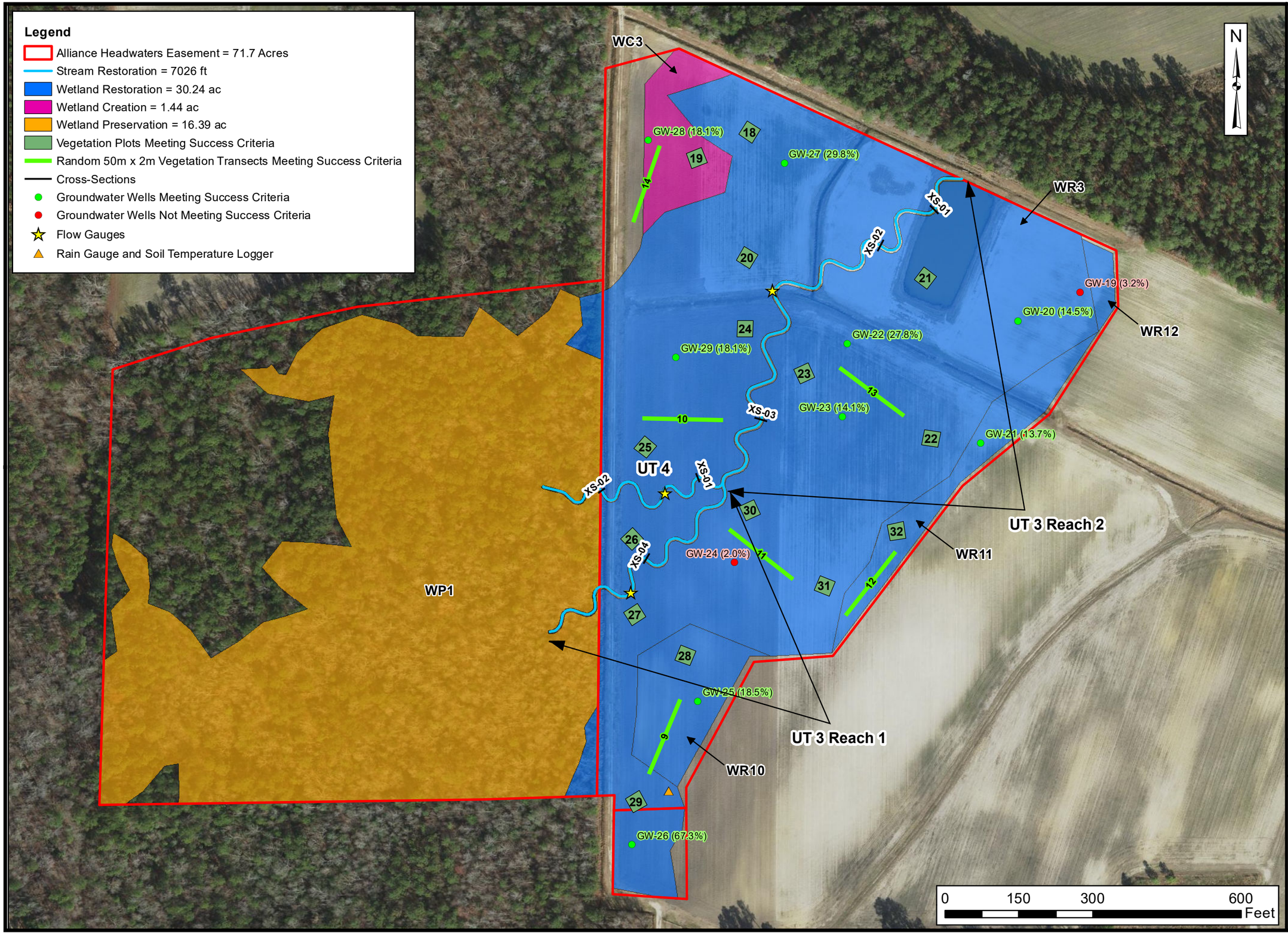
Date: JAN 2021

Scale: 1:2500

Project No.: 18-035

FIGURE

2A



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

ALLIANCE HEADWATERS STREAM AND WETLAND MITIGATION SITE

Johnston County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

Date: JAN 2021

Scale: 1:2200

Project No.: 18-035

FIGURE

2B

Table 5A **Visual Stream Morphology Stability Assessment**
Reach ID **Alliance UT-1 Reach 1**
Assessed Length **671**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	14	14			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	13	13			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	13	13			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	13	13			100%			
		2. Thalweg centering at downstream of meander (Glide)	13	13			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	13	13			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	13	13			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	13	13			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	13	13			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	13	13			100%			

Table 5B **Visual Stream Morphology Stability Assessment**
Reach ID **Alliance UT-1 Reach 2**
Assessed Length **1373**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	27	27			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	28	28			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	28	28			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	28	28			100%			
		2. Thalweg centering at downstream of meander (Glide)	28	28			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	25	25			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	25	25			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	25	25			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	25	25			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	25	25			100%			

Table 5C **Visual Stream Morphology Stability Assessment**
Reach ID **Alliance UT-1 Reach 3**
Assessed Length **1451**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	20	20			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	19	19			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	19	19			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	19	19			100%			
		2. Thalweg centering at downstream of meander (Glide)	19	19			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	18	18			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	18	18			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	18	18			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	18	18			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	18	18			100%			

Table 5D **Visual Stream Morphology Stability Assessment**
Reach ID **Alliance UT-1A**
Assessed Length **87**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	3	3			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	2	2			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	2	2			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	2	2			100%			
		2. Thalweg centering at downstream of meander (Glide)	2	2			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	2	2			NA			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	2	2			NA			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			NA			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	2	2			NA			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	2	2			NA			

Table 5E **Visual Stream Morphology Stability Assessment**
Reach ID **Alliance UT-2**
Assessed Length **997**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	15	15			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	14	14			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	14	14			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	14	14			100%			
		2. Thalweg centering at downstream of meander (Glide)	14	14			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	14	14			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	14	14			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	14	14			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	14	14			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	14	14			100%			

Table 5F **Visual Stream Morphology Stability Assessment**
Reach ID **Alliance UT-3 Reach 1**
Assessed Length **639**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	11	11			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	11	11			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	11	11			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	11	11			100%			
		2. Thalweg centering at downstream of meander (Glide)	11	11			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	11	11			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	11	11			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	11	11			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	11	11			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	11	11			100%			

Table 5G **Visual Stream Morphology Stability Assessment**
Reach ID **Alliance UT-3 Reach 2**
Assessed Length **1276**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	19	19			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	19	19			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	19	19			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	19	19			100%			
		2. Thalweg centering at downstream of meander (Glide)	19	19			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	18	18			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	18	18			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	18	18			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	18	18			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	18	18			100%			

Table 5H **Visual Stream Morphology Stability Assessment**
Reach ID **Alliance UT-4**
Assessed Length **531**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	9	9			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	9	9			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	9	9			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	9	9			100%			
		2. Thalweg centering at downstream of meander (Glide)	9	9			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	9	9			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	9	9			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	9	9			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	9	9			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	9	9			100%			

Table 6 — Vegetation Condition Assessment

Alliance Headwaters

Planted Acreage[1] **49.9**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	None	0.1 acres	none	0	0.00	0.0%
2. Low Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
2B. Low Planted Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	None	0.25 acres	none	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%

Easement Acreage[2] **71.7**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	None	1000 SF	none	0	0.00	0.0%
5. Easement Encroachment Areas[3]	None	none	none	0	0.00	0.0%

1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

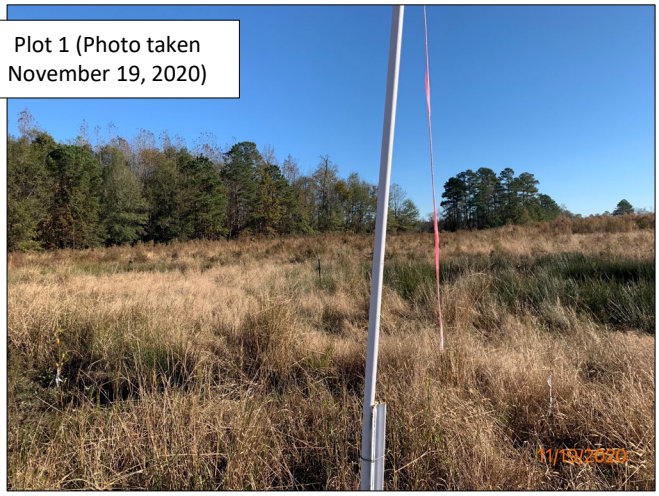
2 = The acreage within the easement boundaries.

3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1,2 or 3) as well as a parallel tally in item 5.

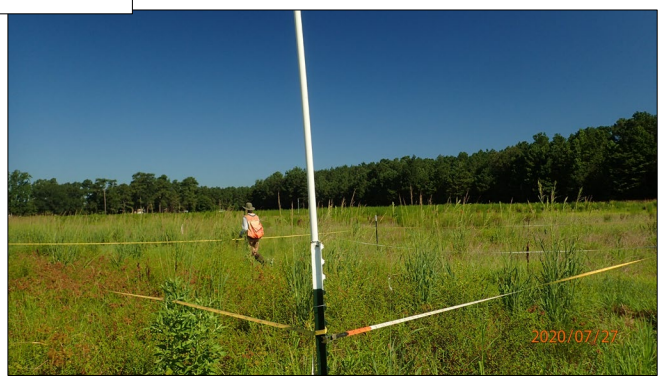
4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern spcies are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by DMS such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likley trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly ealry in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolzing invasives polygons, particulalry for situations where the conditon for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

Alliance Headwaters
MY-01 (2020) Vegetation Monitoring Photographs
Taken July 2020

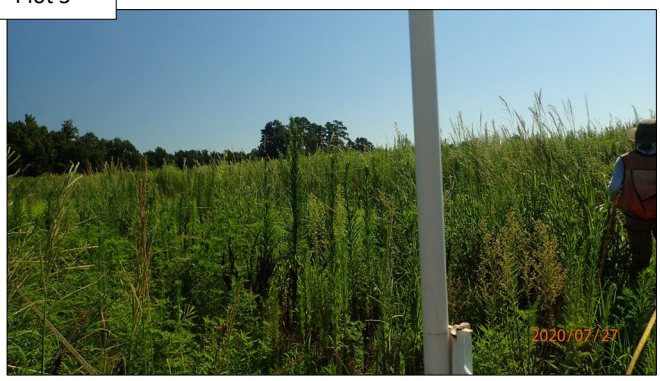
Plot 1 (Photo taken November 19, 2020)



Plot 2

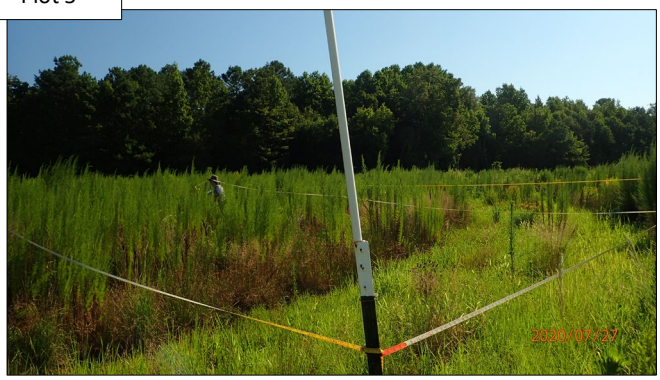


Plot 3

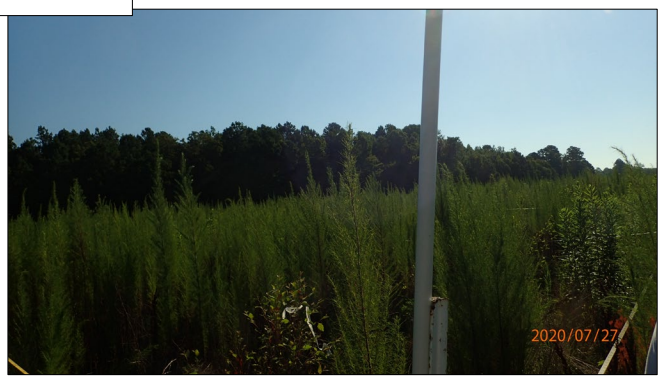


Plot 4

Plot 5



Plot 6



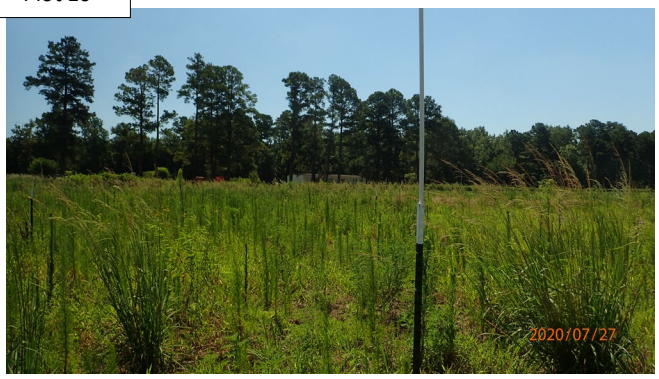
Alliance Headwaters
MY-01 (2020) Vegetation Monitoring Photographs
Taken July 2020

Plot 7

Plot 8

Plot 9

Plot 10

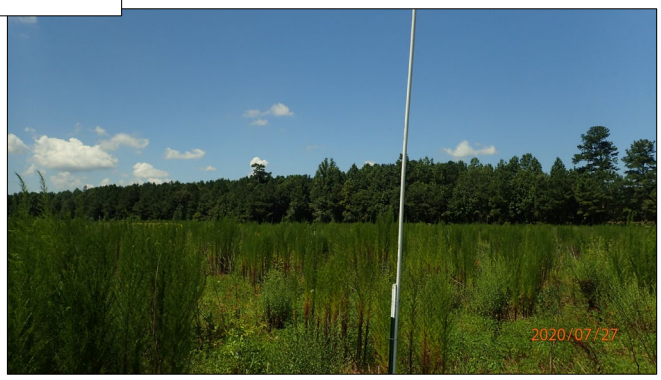


Plot 11

Plot 12

Alliance Headwaters
MY-01 (2020) Vegetation Monitoring Photographs
Taken July 2020

Plot 13

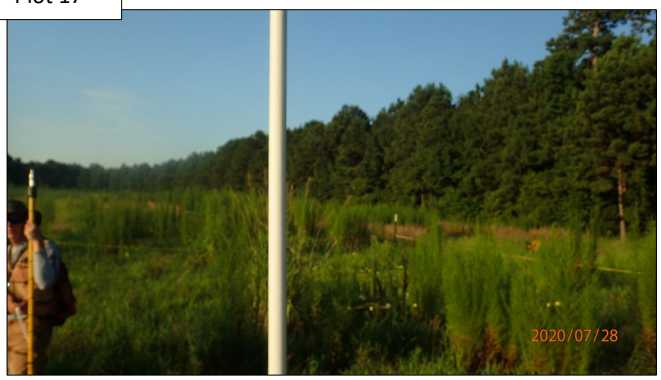


Plot 14

Plot 15

Plot 16

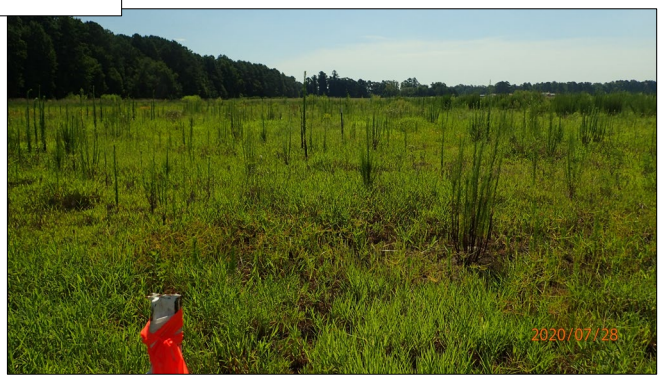
Plot 17



Plot 18

Alliance Headwaters
MY-01 (2020) Vegetation Monitoring Photographs
Taken July 2020

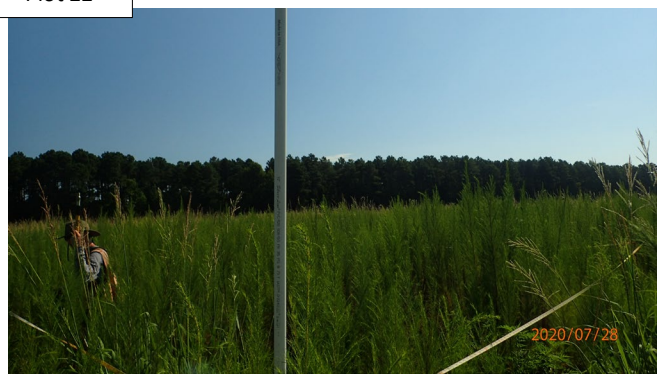
Plot 19



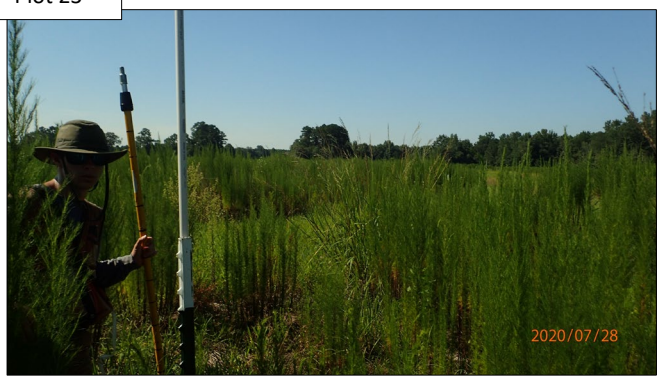
Plot 20

Plot 21

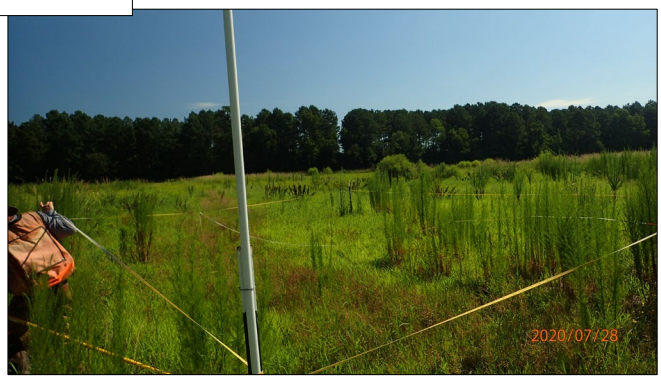
Plot 22



Plot 23

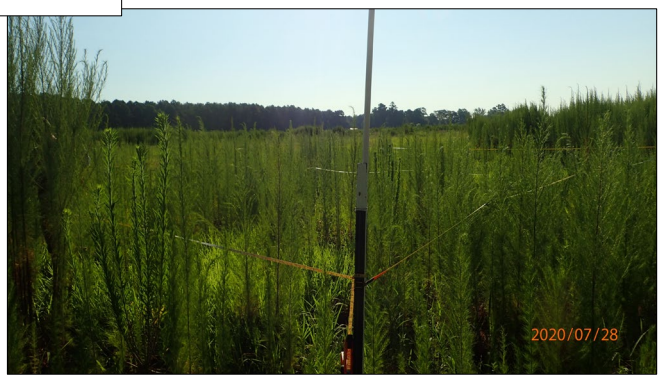


Plot 24

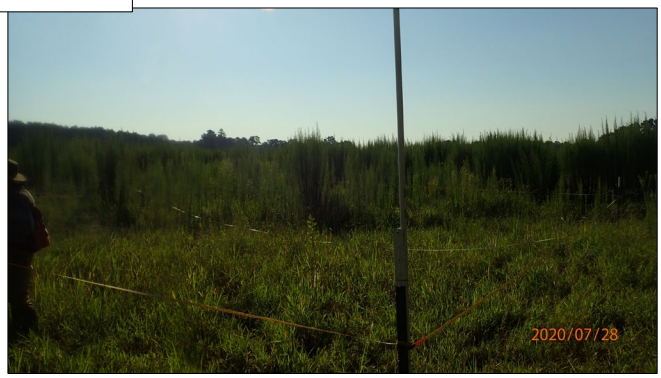


Alliance Headwaters
MY-01 (2020) Vegetation Monitoring Photographs
Taken July 2020

Plot 25



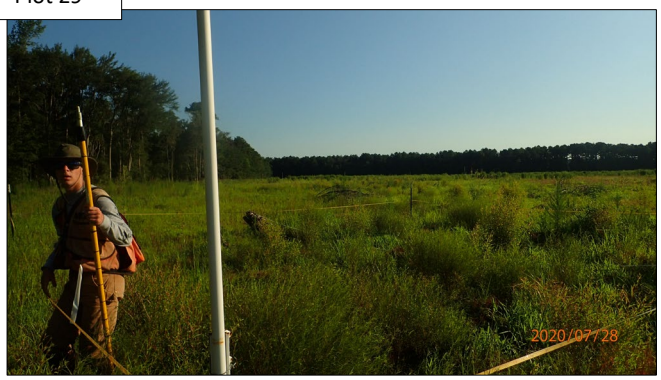
Plot 26



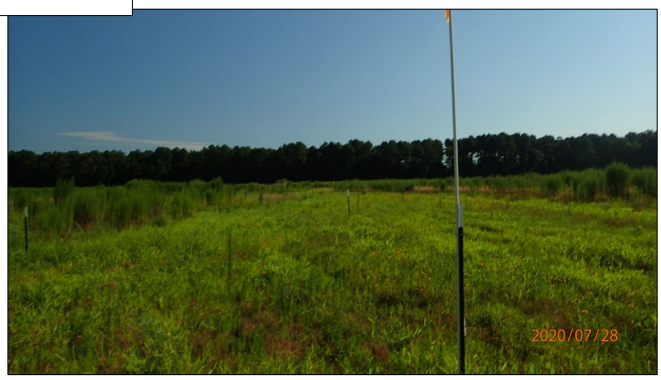
Plot 27

Plot 28

Plot 29



Plot 30



Alliance Headwaters
MY-01 (2020) Vegetation Monitoring Photographs
Taken July 2020

Plot 31

Plot 32

APPENDIX C: VEGETATION DATA

Table 7. Planted Bare Root Woody Vegetation
Table 8. Total Stems by Plot and Species
Table 9. Temporary Vegetation Plot Data
Table 10. MY1 Planted Vegetation Totals
Table 11. MY1 Temporary Vegetation Plot Planted Vegetation Totals

Table 7. Planted Bare Root Woody Vegetation
Alliance Headwaters Mitigation Site

Species	Upland Planting	Riparian Planting	Total Stems
Betula Nigra	0	2,900	2,900
Morella cerifera	0	1,300	1,300
Carpinus caroliniana	300	0	300
Diospyros virginiana	100	0	100
Liriodendron tulipifera	500	2,800	3,300
Magnolia virginiana	0	1,600	1,600
Morus rubra	100	0	100
Nyssa sylvatica	700	300	1,000
Persea palustris	0	800	800
Prunus serotina	400	0	400
Quercus alba	800	0	800
Quercus bicolor	0	500	500
Quercus laurifolia	0	2,000	2,000
Quercus shumardii	0	200	200
Quercus lyrata	0	4,200	4,200
Quercus michauxii	800	3,900	4,700
Quercus pagoda	650	3,050	3,700
Taxodium distichum	0	4,500	4,500
Ulmus americana	0	2,800	2,800
	4,350	**30,850**	**35,200**

*Some species planted onsite were not included in the mitigation plan, including *Morella cerifera*, *Morus rubra*, *Quercus bicolor*, and *Quercus shumardii*. These were determined to be viable substitutions that were made based on bare-root stem availability at the time of site planting.

Table 8. Planted Stems by Plot and Species
CVS Project Code 18035. Project Name: Alliance Headwaters

			Current Plot Data (MY1 2020)																																
			18035-01-0001			18035-01-0002			18035-01-0003			18035-01-0004			18035-01-0005			18035-01-0006			18035-01-0007			18035-01-0008			18035-01-0009			18035-01-0010			18035-01-0011			18035-01-0012		
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**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Betula nigra	river birch	Tree	1	1	1	3	3	3	2	2	2				1	1	1	3	3	3	2	2	2															
Carpinus caroliniana	American hornbeam	Tree																																			
Cornus amomum	silky dogwood	Shrub																																			
Diospyros virginiana	common persimmon	Tree																																			
Liriodendron tulipifera	tuliptree	Tree							5	5	5																3	3	3	1	1	1					
Magnolia virginiana	sweetbay	Tree	5	5	5	3	3	3							1	1	1																				
Morella cerifera	wax myrtle	shrub				2	2	2	3	3	3																1	1	1	2	2	2					
Nyssa	tupelo	Tree																																			
Nyssa sylvatica	blackgum	Tree																1	1	1							1	1	1								
Persea palustris	swamp bay	tree													1	1	1	2	2	2				1	1	1	1	1	1								
Prunus serotina	black cherry	Tree																1	1	1																	
Quercus	oak	Tree	3	3	3	4	4	4				4	4	4				1	1	1	6	6	6	8	8	8				3	3	3	4	4	4	3	3	3
Quercus alba	white oak	Tree										1	1	1							1	1	1										1	1	1			
Quercus bicolor	swamp white oak	Tree																																			
Quercus lyrata	overcup oak	Tree																									1	1	1								
Quercus michauxii	swamp chestnut oak	Tree	2	2	2				1	1	1				1	1	1	1	1	1	6	6	6							2	2	2	4	4	4			
Quercus nigra	water oak	Tree										4	4	4				2	2	2							4	4	4							1	1	1
Quercus pagoda	cherrybark oak	Tree							1	1	1				1	1	1				1	1	1	1	1	1	1	1	1							2	2	2
Quercus phellos	willow oak	Tree																2	2	2							1	1	1								
Taxodium distichum	bald cypress	Tree										4	4	4	8	8	8	4	4	4	2	2	2	1	1	1	1	1	1	2	2	2	3	3	3	5	5	5
Ulmus americana	American elm	Tree	6	6	6				11	11	11				1	1	1																				
Unknown		Shrub or Tree																						1	1	1											
		Stem count	17	17	17	12	12	12	23	23	23	13	13	13	14	14	14	17	17	17	18	18	18	12	12	12	14	14	14	10	10	10	12	12	12	11	11	11
		size (ares)	1			1			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			0.02			0.02		
		Species count	5	5	5	4	4	4	6	6	6	4	4	4	7	7	7	9	9	9	6	6	6	5	5	5	9	9	9	5	5	5	4	4	4	4	4	4
		Stems per ACRE	688	688	688	485.6	485.6	485.6	930.8	930.8	930.8	526.1	526.1	526.1	566.6	566.6	566.6	688	688	688	728.4	728.4	728.4	485.6	485.6	485.6	566.6	566.6	566.6	404.7	404.7	404.7	485.6	485.6	485.6	445.2	445.2	445.2

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes
P-all = Planted including livestakes
T = All planted and natural recruits including livestakes
T includes natural recruits

Table 8. Planted Stems by Plot and Species (continued)
CVS Project Code 18035. Project Name: Alliance Headwaters

			Current Plot Data (MY1 2020)																														
			18035-01-0013			18035-01-0014			18035-01-0015			18035-01-0016			18035-01-0017			18035-01-0018			18035-01-0019			18035-01-0020			18035-01-0021			18035-01-0022			18035-01-0023			18035-01-0024		
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	PnoLS	P-all	T	PnoLS	P-all	T
Betula nigra	river birch	Tree	1	1	1	4	4	4	3	3	3	1	1	1										5	5	5				2	2	2						
Carpinus caroliniana	American hornbeam	Tree																																				
Cornus amomum	silky dogwood	Shrub																																				
Diospyros virginiana	common persimmon	Tree																																				
Liriodendron tulipifera	tuliptree	Tree				2	2	2				1	1	1																				1	1	1
Magnolia virginiana	sweetbay	Tree																1	1	1				1	1	1	1	1	1					3	3	3
Morella cerifera	wax myrtle	shrub				2	2	2							2	2	2	3	3	3	2	2	2							1	1	1						
Nyssa	tupelo	Tree										2	2	2																								
Nyssa sylvatica	blackgum	Tree							1	1	1																											
Persea palustris	swamp bay	tree	1	1	1										1	1	1																					
Prunus serotina	black cherry	Tree													3	3	3																					
Quercus	oak	Tree	2	2	2	1	1	1	2	2	2	1	1	1	3	3	3	4	4	4	2	2	2	1	1	1	6	6	6	4	4	4	4	4	4			
Quercus alba	white oak	Tree	1	1	1				2	2	2																											
Quercus bicolor	swamp white oak	Tree										2	2	2																								
Quercus lyrata	overcup oak	Tree							1	1	1				4	4	4																	1	1	1			
Quercus michauxii	swamp chestnut oak	Tree	1	1	1	2	2	2				6	6	6	2	2	2	1	1	1	2	2	2												1	1	1
Quercus nigra	water oak	Tree	3	3	3				1	1	1	1	1	1																			2	2	2			
Quercus pagoda	cherrybark oak	Tree	1	1	1	1	1	1							3	3	3	1	1	1				1	1	1				4	4	4				3	3	3
Quercus phellos	willow oak	Tree																																				
Taxodium distichum	bald cypress	Tree				5	5	5													2	2	2				4	4	4	2	2	2	6	6	6	2	2	2
Ulmus americana	American elm	Tree				1	1	1										4	4	4	1	1	1															
Unknown		Shrub or Tree																															1	1	1			
		Stem count	10	10	10	18	18	18	10	10	10	14	14	14	18	18	18	14	14	14	9	9	9	8	8	8	11	11	11	13	13	13	14	14	14	10	10	10
		size (ares)	1			1			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			0.02			0.02		
		Species count	7	7	7	8	8	8	6	6	6	7	7	7	7	7	7	6	6	6	5	5	5	4	4	4	3	3	3	5	5	5	5	5	5	5	5	5
		Stems per ACRE	404.7	404.7	404.7	728.4	728.4	728.4	404.7	404.7	404.7	566.6	566.6	566.6	728.4	728.4	728.4	566.6	566.6	566.6	364.2	364.2	364.2	323.7	323.7	323.7	445.2	445.2	445.2	526.1	526.1	526.1	566.6	566.6	566.6	404.7	404.7	404.7

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes
P-all = Planted including livestakes
T = All planted and natural recruits including livestakes
T includes natural recruits

Table 8. Planted Stems by Plot and Species (continued)
CVS Project Code 18035. Project Name: Alliance Headwaters

			Current Plot Data (MY1 2020)																						Annual Means					
			18035-01-0025			18035-01-0026			18035-01-0027			18035-01-0028			18035-01-0029			18035-01-0030			18035-01-0031			18035-01-0032			MY1 (2020)			MY0 (2020)		
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
Betula nigra	river birch	Tree																3	3	3	1	1	1				32	32	32	36	36	36
Carpinus caroliniana	American hornbeam	Tree																			1	1	1				1	1	1			
Cornus amomum	silky dogwood	Shrub																												2	2	2
Diospyros virginiana	common persimmon	Tree																												2	2	2
Liriodendron tulipifera	tuliptree	Tree	3	3	3																						16	16	16	26	26	26
Magnolia virginiana	sweetbay	Tree													1	1	1										16	16	16	28	28	28
Morella cerifera	wax myrtle	shrub	1	1	1	2	2	2				1	1	1	2	2	2	1	1	1							25	25	25	29	29	29
Nyssa	tupelo	Tree																									2	2	2	3	3	3
Nyssa sylvatica	blackgum	Tree																									3	3	3	12	12	12
Persea palustris	swamp bay	tree																			1	1	1				8	8	8	12	12	12
Prunus serotina	black cherry	Tree																									4	4	4	5	5	5
Quercus	oak	Tree	1	1	1				2	2	2	1	1	1	1	1	1	3	3	3							74	74	74	101	101	101
Quercus alba	white oak	Tree																									6	6	6	2	2	2
Quercus bicolor	swamp white oak	Tree	1	1	1																						3	3	3	2	2	2
Quercus lyrata	overcup oak	Tree																2	2	2							9	9	9	13	13	13
Quercus michauxii	swamp chestnut oak	Tree	1	1	1							1	1	1	1	1	1							1	1	1	36	36	36	10	10	10
Quercus nigra	water oak	Tree				1	1	1	1	1	1										6	6	6	5	5	5	31	31	31	18	18	18
Quercus pagoda	cherrybark oak	Tree				6	6	6	1	1	1	2	2	2	1	1	1	1	1	1							32	32	32	34	34	34
Quercus phellos	willow oak	Tree																									3	3	3			
Taxodium distichum	bald cypress	Tree	2	2	2				2	2	2	3	3	3	2	2	2							1	1	1	61	61	61	60	60	60
Ulmus americana	American elm	Tree							5	5	5							2	2	2				2	2	2	33	33	33	21	21	21
Unknown		Shrub or Tree																									2	2	2	4	4	4
		Stem count	9	9	9	9	9	9	11	11	11	8	8	8	8	8	8	12	12	12	9	9	9	9	9	9	397	397	397	420	420	420
		size (ares)	1			1			1			1			1			1			1			1			32			32		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.79			0.79		
		Species count	6	6	6	3	3	3	5	5	5	5	5	5	6	6	6	6	6	6	4	4	4	4	4	4	20	20	20	20	20	20
		Stems per ACRE	364.2	364.2	364.2	364.2	364.2	364.2	445.2	445.2	445.2	323.7	323.7	323.7	323.7	323.7	323.7	485.6	485.6	485.6	364.2	364.2	364.2	364.2	364.2	364.2	502.1	502.1	502.1	531.1	531.1	531.1

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes
P-all = Planted including livestakes
T = All planted and natural recruits including livestakes
T includes natural recruits

Table 9. MY1 Temporary Vegetation Plot Data
Alliance Headwaters Restoration Site

Species	T-1 (20°)	T-2 (186°)	T-3 (202°)	T-4 (303°)	T-5 (302°)	T-6 (243°)	T-7 (219°)
Betula nigra		5	6	1	1	2	1
Liriodendron tulipifera	1			3		2	
Magnolia virginiana		1	2				1
Morella cerifera		2	1	1			1
Nyssa Spp.	2					1	
Persea palustris							
Quercus spp.	1						
Quercus alba	1				2		
Quercus lyrata				2	1	1	2
Quercus michauxii	6	2	7	3	5	10	10
Quercus nigra				3	1		
Quercus pagoda			1		4	1	1
Taxodium distichum				7	4	3	10
Total Number of Stems	**11**	**10**	**17**	**20**	**18**	**20**	**26**
Stems/Acre	**445**	**405**	**688**	**809**	**728**	**809**	**1052**

Table 9. Temporary Vegetation Plot Data (continued)
Alliance Headwaters Restoration Site

Species	T-8 (175°)	T-9 (28°)	T-10 (141°)	T-11 (122°)	T-12 (28°)	T-13 (310°)	T-14 (18°)
Betula nigra		5	5	3	2	2	1
Liriodendron tulipifera	2		2	2	2		
Magnolia virginiana			1	4	4	1	1
Morella cerifera			2			2	3
Nyssa Spp.							
Persea palustris							
Quercus spp.	7	1		4			3
Quercus alba	1						
Quercus lyrata	7	5					
Quercus michauxii	8		2	3	6	3	6
Quercus nigra					3	1	
Quercus pagoda			2	4		1	
Taxodium distichum		4	4	5	5	3	
Total Number of Stems	**25**	**15**	**18**	**25**	**22**	**13**	**14**
Stems/Acre	**1012**	**607**	**728**	**1012**	**890**	**526**	**567**

Table 10. MY1 Planted Vegetation Totals
Alliance Headwaters Mitigation Site

Plot #	Planted Stems/Acre	Success Criteria Met?
1	688	Yes
2	486	Yes
3	931	Yes
4	526	Yes
5	567	Yes
6	688	Yes
7	728	Yes
8	445	Yes
9	567	Yes
10	405	Yes
11	486	Yes
12	445	Yes
13	405	Yes
14	728	Yes
15	405	Yes
16	567	Yes
17	728	Yes
18	567	Yes
19	364	Yes
20	324	Yes
21	445	Yes
22	526	Yes
23	526	Yes
24	405	Yes
25	364	Yes
26	364	Yes
27	445	Yes
28	324	Yes
29	324	Yes
30	486	Yes
31	364	Yes
32	364	Yes
Average Planted Stems/Acre	**500**	**Yes**

Table 11. MY1 Temporary Vegetation Plot Planted Vegetation Totals
Alliance Headwaters Mitigation Site (continued)

Transect#	Planted Stems/Acre	Success Criteria Met?
T-1	445	Yes
T-2	405	Yes
T-3	688	Yes
T-4	809	Yes
T-5	728	Yes
T-6	809	Yes
T-7	1052	Yes
T-8	1012	Yes
T-9	607	Yes
T-10	728	Yes
T-11	1012	Yes
T-12	890	Yes
T-13	526	Yes
T-14	567	Yes
Average Planted Stems/Acre	**734**	**Yes**

APPENDIX D: STREAM GEOMORPHOLOGY DATA

Tables 12A-12E. Baseline Stream Data Summary
Tables 13A-13E. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Tables 14A-14D. Monitoring Data-Dimensional Morphology Summary (Dimensional Parameters-Cross-sections)
Tables 15A-15E. Monitoring Data-Stream Reach Data Summary
Cross-Section Plots

Table 12a. Baseline Stream Data Summary
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT1/Reach 1&2 (2033 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Johanna Creek Ref			Still Creek Ref			Cole Property Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					8.4	13.3		24				9.7			7.4			6.5			6.5 - 7.5		7.1		7.9	8.6		2
Floodprone Width (ft)					100	100		100													100		100		100	100		2
Bankfull Mean Depth (ft)					1.43	1.68		2.25				0.8			0.82			0.6			0.50 - 0.70		0.5		0.5	0.5		2
[1]Bankfull Max Depth (ft)												0.75 - 1.00			0.75 - 1.00			0.75 - 1.00			0.60 - 0.71		0.9		1	1.1		2
Bankfull Cross Sectional Area (ft^2)					12.9	22.2		42				8			6.1			3.8			3.0 - 4.0		3.6		4	4.4		2
Width/Depth Ratio												12			9			10			14		14		15.6	17.2		2
Entrenchment Ratio					1.3	1.65		2				> 3.0			> 3.0			> 3.0			6.9 - 10.2		11.6		12.9	14.1		2
																							0.9		1	1.1		2
[1]Bank Height Ratio					2.7	3.0		3.3				1.0 - 1.2			1.0 - 1.2			1.0 - 1.2			1.0		1.0		1.0	1.0		2
Profile																												
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																7.0 - 30.0		9	28.6	28.45	49.5	10.7	35
Riffle Slope (ft/ft)																							0.000	0.010	0.009	0.021	0.007	13
Pool Length (ft)																							4.3	10.9	9.14	39.8	7.5	27
Pool Max depth (ft)																							1.7		1.8	2		3
Pool Spacing (ft)																							25.3	49.8	50.71	89.2	14.7	35
Pattern																												
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																							
Radius of Curvature (ft)												1.5 - 2.8			2.9 - 6.4			1.2 - 2.3										
Rc:Bankfull width (ft/ft)																												
Meander Wavelength (ft)																												
Meander Width Ratio												1.4 - 2.1			2.1 - 6.6			5.4 - 8.2										
Transport parameters																												
Reach Shear Stress (competency) lb/f^2																												
Max part size (mm) mobilized at bankfull																												
Stream Power (transport capacity) W/m^2																												
Additional Reach Parameters																												
Rosgen Classification					Incised B5c						C5/E5			E5			E5/C5			C5			C5					
Bankfull Velocity (fps)																				1.4 -2.1			1.4 -2.1					
Bankfull Discharge (cfs)																				4.2 -8.4								
Valley length (ft)																												
Channel Thalweg length (ft)																				2033			2033					
Sinuosity (ft)					1						1.22 - 1.59			1.22 - 1.59			1.22 - 1.59			1.26 -1.29			1.26 -1.29					
Water Surface Slope (Channel) (ft/ft)					0.007						0.0027 - 0.0088			0.0027 - 0.0088			0.0027 - 0.0088			0.0026 - 0.0049			0.0049					
BF slope (ft/ft)																												
[3]Bankfull Floodplain Area (acres)																												
[4]% of Reach with Eroding Banks																												
Channel Stability or Habitat Metric																												
Biological or Other																												

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 12b. Baseline Stream Data Summary
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT1/Reach 3 (1463 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Johanna Creek Ref			Still Creek Ref			Cole Property Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Med	Max	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)					5	6		7				9.7			7.4			6.5			9.9		10.4		10.4	10.4		1
Floodprone Width (ft)					100	100		100													100		100		100	100		1
Bankfull Mean Depth (ft)												0.8			0.82			0.6			0.5 - 0.7		0.8		0.8	0.8		1
[1]Bankfull Max Depth (ft)					0.6	0.7		0.8				0.75 - 1.00			0.75 - 1.00			0.75 - 1.00			0.93		1.4		1.4	1.4		1
Bankfull Cross Sectional Area (ft^2)					1	1.75		2.5				8			6.1			3.8			7.0		8.4		8.4	8.4		1
Width/Depth Ratio					6.6	8.6		10.6				12			9			10			14		13		13	13		1
Entrenchment Ratio					1.3	1.65		2				> 3.0			> 3.0			> 3.0			6.7		9.6		9.6	9.6		1
																							1.4		1.4	1.4		1
[1]Bank Height Ratio					2.7	3.0		3.3				1.0 - 1.2			1.0 - 1.2			1.0 - 1.2			1.0		1.0		1.0	1.0		1
Profile																												
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																14.0 - 25.0		12.2	39.6	38.7	63.2	12.7	23
Riffle Slope (ft/ft)																							0.001	0.006	0.003	0.029	0.009	10
Pool Length (ft)																							4.7	13	11.75	32	6.4	22
Pool Max depth (ft)																							1.9	2.1	2.1	2.3		2
Pool Spacing (ft)																							37.3	68	73.78	87.5	13.9	22
Pattern																												
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																							
Radius of Curvature (ft)												1.5 - 2.8			2.9 - 6.4			1.2 - 2.3										
Rc:Bankfull width (ft/ft)																												
Meander Wavelength (ft)																												
Meander Width Ratio												1.4 - 2.1			2.1 - 6.6			5.4 - 8.2										
Transport parameters																												
Reach Shear Stress (competency) lb/f^2																												
Max part size (mm) mobilized at bankfull																												
Stream Power (transport capacity) W/m^2																												
Additional Reach Parameters																												
Rosgen Classification					Incised B5c						C5/E5			E5			E5/C5			C5			C5					
Bankfull Velocity (fps)																					1.5		1.5					
Bankfull Discharge (cfs)																					10.7							
Valley length (ft)																												
Channel Thalweg length (ft)																					1463		1463					
Sinuosity (ft)					1						1.22 - 1.59			1.22 - 1.59			1.22 - 1.59			1.35			1.35					
Water Surface Slope (Channel) (ft/ft)					0.026						0.0027 - 0.0088			0.0027 - 0.0088			0.0027 - 0.0088			0.0018			0.0028					
BF slope (ft/ft)																												
[3]Bankfull Floodplain Area (acres)																												
[4]% of Reach with Eroding Banks																												
Channel Stability or Habitat Metric																												
Biological or Other																												

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 12c. Baseline Stream Data Summary
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT2 (996.7 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Johanna Creek Ref			Still Creek Ref			Cole Property Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					5	6		7				9.7			7.4			6.5			7.5		9.9		9.9	9.9		1
Floodprone Width (ft)					100	100		100													100		100		100	100		1
Bankfull Mean Depth (ft)												0.8			0.82			0.6			0.6		0.6		0.6	0.6		1
[1]Bankfull Max Depth (ft)					0.6	0.7		0.8				0.75 - 1.00			0.75 - 1.00			0.75 - 1.00			0.7		1.3		1.3	1.3		1
Bankfull Cross Sectional Area (ft^2)					1	1.75		2.5				8			6.1			3.8			4.0		6.1		6.1	6.1		1
Width/Depth Ratio					6.6	8.6		10.6				12			9			10			14		16.1		16.1	16.1		1
Entrenchment Ratio					1.3	1.65		2				> 3.0			> 3.0			> 3.0			5.6		10.1		10.1	10.1		1
																							1.3		1.3	1.3		1
[1]Bank Height Ratio					2.7	3.0		3.3				1.0 - 1.2			1.0 - 1.2			1.0 - 1.2			1.0		1.0		1.0	1.0		1
Profile																												
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																14.0 - 50.0		15.7	29.9	28.44	52.3	10.8	11
Riffle Slope (ft/ft)																							0.000	0.014	0.004	0.014	0.005	8
Pool Length (ft)																							2.4	14.2	12.38	28.4	7.4	17
Pool Max depth (ft)																							1.6	1.6	1.6	1.6		1
Pool Spacing (ft)																							34.5	55.6	54.92	73.1	10.7	16
Pattern																												
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																							
Radius of Curvature (ft)												1.5 - 2.8			2.9 - 6.4			1.2 - 2.3										
Rc:Bankfull width (ft/ft)																												
Meander Wavelength (ft)																												
Meander Width Ratio												1.4 - 2.1			2.1 - 6.6			5.4 - 8.2										
Transport parameters																												
Reach Shear Stress (competency) lb/f^2																												
Max part size (mm) mobilized at bankfull																												
Stream Power (transport capacity) W/m^2																												
Additional Reach Parameters																												
Rosgen Classification					G5						C5/E5			E5			E5/C5			C5			C5					
Bankfull Velocity (fps)																				2.1			2.1					
Bankfull Discharge (cfs)																				8.4								
Valley length (ft)																												
Channel Thalweg length (ft)																				997			997					
Sinuosity (ft)					1						1.22 - 1.59			1.22 - 1.59			1.22 - 1.59			1.22			1.22					
Water Surface Slope (Channel) (ft/ft)					0.004						0.0027 - 0.0088			0.0027 - 0.0088			0.0027 - 0.0088			0.0049			0.0031					
BF slope (ft/ft)																												
[3]Bankfull Floodplain Area (acres)																												
[4]% of Reach with Eroding Banks																												
Channel Stability or Habitat Metric																												
Biological or Other																												

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 12d. Baseline Stream Data Summary
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT3 (1914.8 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Johanna Creek Ref			Still Creek Ref			Cole Property Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					5	6		7				9.7			7.4			6.5			7.5 - 9.2		7.3		8.1	8.9		2
Floodprone Width (ft)					100	100		100													100		100		100	100		2
Bankfull Mean Depth (ft)												0.8			0.82			0.6			0.6 - 0.7		0.6		0.6	0.6		2
[1]Bankfull Max Depth (ft)					0.6	0.7		0.8				0.75 - 1.00			0.75 - 1.00			0.75 - 1.00			0.7 - 0.86		1		1	1		2
Bankfull Cross Sectional Area (ft^2)					1	1.75		2.5				8			6.1			3.8			4.0 - 6.0		4.3		4.9	5.4		2
Width/Depth Ratio					6.6	8.6		10.6				12			9			10			14		12.4		13.5	14.7		2
Entrenchment Ratio					1.3	1.65		2				> 3.0			> 3.0			> 3.0			4.3 - 5.3		11.2		12.5	13.7		2
																							1.0		1.0	1.0		2
[1]Bank Height Ratio					2.7	3.0		3.3				1.0 - 1.2			1.0 - 1.2			1.0 - 1.2			1.0		1.0		1.0	1.0		2
Profile																												
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																8.0 - 29.8		22.1	39	35.67	60.9	10	29
Riffle Slope (ft/ft)																							0.001	0.005	0.005	0.010	0.003	14
Pool Length (ft)																							7	10.7	10.06	16.8	2.5	28
Pool Max depth (ft)																							1.6	1.65	1.65	1.7		2
Pool Spacing (ft)																							45.6	63	60.35	91.7	11.3	28
Pattern																												
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																							
Radius of Curvature (ft)												1.5 - 2.8			2.9 - 6.4			1.2 - 2.3										
Rc:Bankfull width (ft/ft)																												
Meander Wavelength (ft)																												
Meander Width Ratio												1.4 - 2.1			2.1 - 6.6			5.4 - 8.2										
Transport parameters																												
Reach Shear Stress (competency) lb/f^2																												
Max part size (mm) mobilized at bankfull																												
Stream Power (transport capacity) W/m^2																												
Additional Reach Parameters																												
Rosgen Classification					Incised B5c						C5/E5			E5			E5/C5			C5			C5					
Bankfull Velocity (fps)																					1.9 - 2.6		1.9 - 2.6					
Bankfull Discharge (cfs)																					7.5 - 15.4							
Valley length (ft)																												
Channel Thalweg length (ft)																					1915		1915					
Sinuosity (ft)					1						1.22 - 1.59			1.22 - 1.59			1.22 - 1.59			1.21 - 1.38		1.21 - 1.38					
Water Surface Slope (Channel) (ft/ft)					0.003						0.0027 - 0.0088			0.0027 - 0.0088			0.0027 - 0.0088			0.0038 - 0.0040		0.0033					
BF slope (ft/ft)																												
[3]Bankfull Floodplain Area (acres)																												
[4]% of Reach with Eroding Banks																												
Channel Stability or Habitat Metric																												
Biological or Other																												

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 12e. Baseline Stream Data Summary
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT4 (530.9 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Johanna Creek Ref			Still Creek Ref			Cole Property Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					5	6		7				9.7			7.4			6.5			6.5		7.5		7.5	7.5		1
Floodprone Width (ft)					100	100		100													100		100		100	100		1
Bankfull Mean Depth (ft)												0.8			0.82			0.6			0.5		0.5		0.5	0.5		1
[1]Bankfull Max Depth (ft)					0.6	0.7		0.8				0.75 - 1.00			0.75 - 1.00			0.75 - 1.00			0.61		0.9		0.9	0.9		1
Bankfull Cross Sectional Area (ft^2)					1	1.75		2.5				8			6.1			3.8			3.0		3.8		3.8	3.8		1
Width/Depth Ratio					6.6	8.6		10.6				12			9			10			14		14.8		14.8	14.8		1
Entrenchment Ratio					1.3	1.65		2				> 3.0			> 3.0			> 3.0			6.2		13.3		13.3	13.3		1
																							0.9		0.9	0.9		1
[1]Bank Height Ratio					2.7	3.0		3.3				1.0 - 1.2			1.0 - 1.2			1.0 - 1.2			1.0		1.0		1.0	1.0		1
Profile																												
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																10.0 -11.0		17.4	36.6	31.69	74.4	16.6	9
Riffle Slope (ft/ft)																							0.006	0.008	0.008	0.015	0.003	9
Pool Length (ft)																							5.2	9.5	9.34	12.3	2.3	9
Pool Max depth (ft)																							1.4	1.4	1.4	1.4		1
Pool Spacing (ft)																							21.2	49.6	46.5	75.4	15.6	9
Pattern																												
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.																							
Radius of Curvature (ft)												1.5 - 2.8			2.9 - 6.4			1.2 - 2.3										
Rc:Bankfull width (ft/ft)																												
Meander Wavelength (ft)																												
Meander Width Ratio												1.4 - 2.1			2.1 - 6.6			5.4 - 8.2										
Transport parameters																												
Reach Shear Stress (competency) lb/f^2																												
Max part size (mm) mobilized at bankfull																												
Stream Power (transport capacity) W/m^2																												
Additional Reach Parameters																												
Rosgen Classification												C5/E5			E5			E5/C5			C5				C5			
Bankfull Velocity (fps)																					2.1				2.1			
Bankfull Discharge (cfs)																					6.2							
Valley length (ft)																												
Channel Thalweg length (ft)																					531				531			
Sinuosity (ft)												1.22 - 1.59			1.22 - 1.59			1.22 - 1.59			1.36				1.36			
Water Surface Slope (Channel) (ft/ft)												0.0027 - 0.0088			0.0027 - 0.0088			0.0027 - 0.0088			0.0057				0.0051			
BF slope (ft/ft)																												
[3]Bankfull Floodplain Area (acres)																												
[4]% of Reach with Eroding Banks																												
Channel Stability or Habitat Metric																												
Biological or Other																												

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 13a. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT1/Reach 1&2 (2033 feet)

Parameter	Pre-Existing Condition							Johanna Creek Reference Reach Data							Still Creek Reference Reach Data							Cole Propery Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																																		58	10	23	9			
[1]SC% / Sa% / G% / C% / B% / Be%		100							100							100							100																		
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{pp} (mm)																																									
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																																									
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																																									

Shaded cells indicate that these will typically not be filled in.
1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates
3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtcion distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 13b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT1/Reach 3 (1463 feet)

Parameter	Pre-Existing Condition							Johanna Creek Reference Reach Data							Still Creek Reference Reach Data							Cole Propery Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																																		59	11	19	11			
[1]SC% / Sa% / G% / C% / B% / Be%		100							100							100							100																		
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{pp} (mm)																																									
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																																									
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																																									

Shaded cells indicate that these will typically not be filled in.
1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates
3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtcion distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 13c. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT2 (996.7 feet)

Parameter	Pre-Existing Condition							Johanna Creek Reference Reach Data							Still Creek Reference Reach Data							Cole Propery Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																																		53	10	25	12			
[1]SC% / Sa% / G% / C% / B% / Be%		100							100							100							100																		
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{pp} (mm)																																									
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																																									
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																																									

Shaded cells indicate that these will typically not be filled in.
1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates
3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtcion distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 13d. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT3 (1914.8 feet)

Parameter	Pre-Existing Condition							Johanna Creek Reference Reach Data							Still Creek Reference Reach Data							Cole Propery Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																																	63	10	17	10			
[1]SC% / Sa% / G% / C% / B% / Be%		100							100							100							100																		
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{pp} (mm)																																									
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																																									
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																																									

Shaded cells indicate that these will typically not be filled in.
1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates
3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtcion distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 13e. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT4 (530.9 feet)

Parameter	Pre-Existing Condition							Johanna Creek Reference Reach Data							Still Creek Reference Reach Data							Cole Propery Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																																	63	11	16	10			
[1]SC% / Sa% / G% / C% / B% / Be%		100							100							100							100																		
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{pp} (mm)																																									
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																																									
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																																									

Shaded cells indicate that these will typically not be filled in.
1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates
3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtcion distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 14a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT1/Reach 1,2,3 (3496 feet)

	Cross Section 1 (Pool)							Cross Section 2 (Pool)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																				
Bankfull Width (ft)	15.4	16.1						16.4	20.3						10.4	14.6						10.2	11.7						8.6	16.7					
Floodprone Width (ft)	NA	NA						NA	NA						100	100						NA	NA						100	100					
Bankfull Mean Depth (ft)	0.9	0.9						1.1	0.9						0.8	0.6						0.9	0.8						0.5	0.3					
Bankfull Max Depth (ft)	1.9	2.1						2.3	2.3						1.4	1.2						1.7	1.6						1.1	1.0					
Bankfull Cross Sectional Area (ft^2)	14.5	14.5						18.5	18.5						8.4	8.4						9.0	9.0						4.4	4.4					
Bankfull Width/Depth Ratio	NA	NA						NA	NA						12.9	25.4						NA	NA						16.8	63.4					
Bankfull Entrenchment Ratio	NA	NA						NA	NA						9.6	6.8						NA	NA						11.6	6.0					
Low Bank Height (ft)	1.9	2.2						2.3	2.4						1.4	1.3						1.7	1.8						1.1	1.0					
Bankfull Bank Height Ratio	1.00	1.05						1.00	1.04						1.00	1.08						1.00	1.13						1.00	1.00					
Cross Sectional Area between end pins (ft^2)	23.4	26.7						20.1	24.1						11.4	11.3						16.9	14.0						8.8	12.5					
d50 (mm)																																				
	Cross Section 6 (Pool)							**Cross Section 7 (Pool)**							**Cross Section 8 (Riffle)**																						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+															
Record elevation (datum) used																																				
Bankfull Width (ft)	10.4	13.4						8.0	8.8						7.1	7.0																				
Floodprone Width (ft)	NA	NA						NA	NA						100	100																				
Bankfull Mean Depth (ft)	0.6	0.5						0.9	0.8						0.5	0.5																				
Bankfull Max Depth (ft)	2.0	1.2						1.8	1.8						0.9	0.8																				
Bankfull Cross Sectional Area (ft^2)	6.1	6.1						6.8	6.8						3.6	3.6																				
Bankfull Width/Depth Ratio	NA	NA						NA	NA						14.0	13.6																				
Bankfull Entrenchment Ratio	NA	NA						NA	NA						14.1	14.3																				
Low Bank Height (ft)	2.0	1.3						1.8	1.9						0.9	0.8																				
Bankfull Bank Height Ratio	1.0	1.08						1.0	1.06						1.0	1.00																				
Cross Sectional Area between end pins (ft^2)	12.8	12.4						11.7	11.2						6.1	4.8																				
d50 (mm)																																				

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Table 14b. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT2 (996.7 feet)

	Cross Section 1 (Pool)							Cross Section 2 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used														
Bankfull Width (ft)	11.8	25.8						9.9	10.9					
Floodprone Width (ft)	NA	NA						100	100					
Bankfull Mean Depth (ft)	0.7	0.3						0.6	0.6					
Bankfull Max Depth (ft)	1.6	1.1						1.3	1.5					
Bankfull Cross Sectional Area (ft^2)	8.8	8.8						6.1	6.1					
Bankfull Width/Depth Ratio	NA	NA						16.1	19.5					
Bankfull Entrenchment Ratio	NA	NA						10.1	9.2					
Low Bank Height (ft)	1.6	1.0						1.3	1.6					
Bankfull Bank Height Ratio	1.00	0.91						1.00	1.07					
Cross Sectional Area between end pins (ft^2)	10.9	6.7						10.8	10.1					
d50 (mm)														
Based on fixed baseline bankfull elevation[1]														
Record elevation (datum) used														
Bankfull Width (ft)														
Floodprone Width (ft)														
Bankfull Mean Depth (ft)														
Bankfull Max Depth (ft)														
Bankfull Cross Sectional Area (ft^2)														
Bankfull Width/Depth Ratio														
Bankfull Entrenchment Ratio														
Low Bank Height (ft)														
Bankfull Bank Height Ratio														
Cross Sectional Area between end pins (ft^2)														
d50 (mm)														

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Table 14c. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT3 (1914.8 feet)

	Cross Section 1 (Pool)							Cross Section 2 (Riffle)							Cross Section 3 (Pool)							Cross Section 4 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																												
Bankfull Width (ft)	11.0	15.8						8.9	9.0						13.6	14.8						7.3	8.0					
Floodprone Width (ft)	NA	NA						100	100						NA	NA						100	100					
Bankfull Mean Depth (ft)	0.9	0.6						0.6	0.6						0.9	0.9						0.6	0.5					
Bankfull Max Depth (ft)	1.6	1.7						1.0	1.1						1.7	2.0						1.0	1.0					
Bankfull Cross Sectional Area (ft^2)	10.2	10.2						5.4	5.4						12.7	12.7						4.3	4.3					
Bankfull Width/Depth Ratio	NA	NA						14.7	15.0						NA	NA						12.4	14.9					
Bankfull Entrenchment Ratio	NA	NA						11.2	11.1						NA	NA						13.7	12.5					
Low Bank Height (ft)	1.6	1.7						1.0	1.1						1.7	2.0						1.0	1.0					
Bankfull Bank Height Ratio	1.00	1.00						1.00	1.00						1.00	1.00						1.00	1.00					
Cross Sectional Area between end pins (ft^2)	14.1	17.1						16.8	18.4						22.9	16.2						7.6	10.9					
d50 (mm)																												
Based on fixed baseline bankfull elevation[1]																												
Record elevation (datum) used																												
Bankfull Width (ft)																												
Floodprone Width (ft)																												
Bankfull Mean Depth (ft)																												
Bankfull Max Depth (ft)																												
Bankfull Cross Sectional Area (ft^2)																												
Bankfull Width/Depth Ratio																												
Bankfull Entrenchment Ratio																												
Low Bank Height (ft)																												
Bankfull Bank Height Ratio																												
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Table 14d. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT4 (530.9 feet)

	Cross Section 1 (Pool)							Cross Section 2 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used														
Bankfull Width (ft)	10.9	11.8						7.5	11.7					
Floodprone Width (ft)	NA	NA						100	100					
Bankfull Mean Depth (ft)	0.7	0.7						0.5	0.3					
Bankfull Max Depth (ft)	1.4	1.4						0.9	0.8					
Bankfull Cross Sectional Area (ft^2)	7.9	7.9						3.8	3.8					
Bankfull Width/Depth Ratio	NA	NA						14.8	36.0					
Bankfull Entrenchment Ratio	NA	NA						13.3	8.5					
Low Bank Height (ft)	1.4	1.4						0.9	0.8					
Bankfull Bank Height Ratio	1.00	1.00						1.00	1.00					
Cross Sectional Area between end pins (ft^2)	13.3	13.1						8.0	5.3					
d50 (mm)														
Based on fixed baseline bankfull elevation[1]														
Record elevation (datum) used														
Bankfull Width (ft)														
Floodprone Width (ft)														
Bankfull Mean Depth (ft)														
Bankfull Max Depth (ft)														
Bankfull Cross Sectional Area (ft^2)														
Bankfull Width/Depth Ratio														
Bankfull Entrenchment Ratio														
Low Bank Height (ft)														
Bankfull Bank Height Ratio														
Cross Sectional Area between end pins (ft^2)														
d50 (mm)														

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Exhibit Table 15a. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT1/Reach 1&2 (2033 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	7.1		7.9	8.6		2	7		11.9	16.7		2																								
Floodprone Width (ft)	100		100	100		2	100		100	100		2																								
Bankfull Mean Depth (ft)	0.5		0.5	0.5		2	0.5		0.5	0.5		2																								
[1]Bankfull Max Depth (ft)	0.9		1	1.1		2	0.8		0.9	1		2																								
Bankfull Cross Sectional Area (ft^2)	3.6		4	4.4		2	3.6		4	4.4		2																								
Width/Depth Ratio	14		15.6	17.2		2	13.8		23.6	33.4		2																								
Entrenchment Ratio	11.6		12.9	14.1		2	6		10.1	14.3		2																								
Low Bank Height (ft)	0.9		1.0	1.1		2	0.8		0.9	1.0		2																								
[1]Bank Height Ratio	1.0		1.0	1.0		2	1.0		1.0	1.0		2																								
Profile																																				
Riffle Length (ft)	9	28.6	28.5	49.5	10.7	35																														
Riffle Slope (ft/ft)	0	0.01	0.01	0.02	0.01	13																														
Pool Length (ft)	4.3	10.9	9.14	39.8	7.5	27																														
Pool Max depth (ft)	1.7		1.8	2		3																														
Pool Spacing (ft)	25.3	49.8	50.7	89.2	14.7	35																														
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																																				
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	C5																																			
Channel Thalweg length (ft)	2033																																			
Sinuosity (ft)	1.26 -1.29																																			
Water Surface Slope (Channel) (ft/ft)	0.0049																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	0																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 15b. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT1/Reach 3 (1463 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	10.4		10.4	10.4		1	14.6		14.6	14.6		1																								
Floodprone Width (ft)	100		100	100		1	100		100	100		1																								
Bankfull Mean Depth (ft)	0.8		0.8	0.8		1	0.8		0.8	0.8		1																								
[1]Bankfull Max Depth (ft)	1.4		1.4	1.4		1	1.2		1.2	1.2		1																								
Bankfull Cross Sectional Area (ft^2)	8.4		8.4	8.4		1	8.4		8.4	8.4		1																								
Width/Depth Ratio	13		13	13		1	18.3		18.3	18.3		1																								
Entrenchment Ratio	9.6		9.6	9.6		1	6.8		6.8	6.8		1																								
Low Bank Height (ft)	1.4		1.4	1.4		1	1.3		1.3	1.3		1																								
[1]Bank Height Ratio	1.0		1.0	1.0		1	1.1		1.1	1.1		1																								
Profile																																				
Riffle Length (ft)	12.2	39.6	38.7	63.2	12.7	23																														
Riffle Slope (ft/ft)	0	0.01	0	0.03	0.01	10																														
Pool Length (ft)	4.7	13	11.8	32	6.4	22																														
Pool Max depth (ft)	1.9	2.1	2.1	2.3		2																														
Pool Spacing (ft)	37.3	68	73.8	87.5	13.9	22																														
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																																				
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	C5																																			
Channel Thalweg length (ft)	1463																																			
Sinuosity (ft)	1.35																																			
Water Surface Slope (Channel) (ft/ft)	0.0028																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	0																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.

2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table

3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

4. = Of value/needed only if the n exceeds 3

Exhibit Table 15c. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT2 (996.7 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	9.9		9.9	9.9		1	10.9		10.9	10.9		1																								
Floodprone Width (ft)	100		100	100		1	100		100	100		1																								
Bankfull Mean Depth (ft)	0.6		0.6	0.6		1	0.6		0.6	0.6		1																								
[1]Bankfull Max Depth (ft)	1.3		1.3	1.3		1	1.5		1.5	1.5		1																								
Bankfull Cross Sectional Area (ft^2)	6.1		6.1	6.1		1	6.1		6.1	6.1		1																								
Width/Depth Ratio	16.1		16.1	16.1		1	19.5		19.5	19.5		1																								
Entrenchment Ratio	10.1		10.1	10.1		1	9.2		9.2	9.2		1																								
Low Bank Height (ft)	1.3		1.3	1.3		1	1.5		1.5	1.5		1																								
[1]Bank Height Ratio	1.0		1.0	1.0		1	1.1		1.1	1.1		1																								
Profile																																				
Riffle Length (ft)	15.7	29.9	28.4	52.3	10.8	11																														
Riffle Slope (ft/ft)	0.00	0.01	0.00	0.01	0.00	8																														
Pool Length (ft)	2.4	14.2	12.4	28.4	7.4	17																														
Pool Max depth (ft)	1.6	1.6	1.6	1.6		1																														
Pool Spacing (ft)	34.5	55.6	54.9	73.1	10.7	16																														
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																																				
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	C5																																			
Channel Thalweg length (ft)	996.7																																			
Sinuosity (ft)	1.22																																			
Water Surface Slope (Channel) (ft/ft)	0.0031																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	0																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.

2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table

3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

4. = Of value/needed only if the n exceeds 3

Exhibit Table 15d. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT3 (1914.8 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	7.3		8.1	8.9		2	8		8.5	9		2																								
Floodprone Width (ft)	100		100	100		2	100		100	100		2																								
Bankfull Mean Depth (ft)	0.6		0.6	0.6		2	0.5		0.6	0.6		2																								
[1]Bankfull Max Depth (ft)	1		1	1		2	1		1.1	1.1		2																								
Bankfull Cross Sectional Area (ft^2)	4.3		4.9	5.4		2	4.3		4.9	5.4		2																								
Width/Depth Ratio	12.4		13.5	14.7		2	14.9		15	15		2																								
Entrenchment Ratio	11.2		12.5	13.7		2	11.1		11.8	12.5		2																								
Low Bank Height (ft)	1.0		1.0	1.0		2	1.0		1.1	1.1		2																								
[1]Bank Height Ratio	1.0		1.0	1.0		2	1.0		1.0	1.0		2																								
Profile																																				
Riffle Length (ft)	22.1	39	35.7	60.9	10	29																														
Riffle Slope (ft/ft)	0	0.01	0	0.01	0	14																														
Pool Length (ft)	7	10.7	10.1	16.8	2.5	28																														
Pool Max depth (ft)	1.6	1.65	1.65	1.7		2																														
Pool Spacing (ft)	45.6	63	60.4	91.7	11.3	28																														
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																																				
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	C5																																			
Channel Thalweg length (ft)	1914.8																																			
Sinuosity (ft)	1.21 - 1.38																																			
Water Surface Slope (Channel) (ft/ft)	0.0033																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.

2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table

3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

4. = Of value/needed only if the n exceeds 3

Exhibit Table 15e. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Alliance Headwaters/97086) - Segment/Reach: UT4 (530.9 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	7.5		7.5	7.5		1	11.7		11.7	11.7		1																								
Floodprone Width (ft)	100		100	100		1	100		100	100		1																								
Bankfull Mean Depth (ft)	0.5		0.5	0.5		1	0.3		0.3	0.3		1																								
[1]Bankfull Max Depth (ft)	0.9		0.9	0.9		1	0.8		0.8	0.8		1																								
Bankfull Cross Sectional Area (ft^2)	3.8		3.8	3.8		1	3.8		3.8	3.8		1																								
Width/Depth Ratio	14.8		14.8	14.8		1	36		36	36		1																								
Entrenchment Ratio	13.3		13.3	13.3		1	8.5		8.5	8.5		1																								
Low Bank Height (ft)	0.9		0.9	0.9		1	0.8		0.8	0.8		1																								
[1]Bank Height Ratio	1.0		1.0	1.0		1	1.0		1.0	1.0		1																								
Profile																																				
Riffle Length (ft)	17.4	36.6	31.7	74.4	16.6	9																														
Riffle Slope (ft/ft)	0.01	0.01	0.01	0.01	0	9																														
Pool Length (ft)	5.2	9.5	9.34	12.3	2.3	9																														
Pool Max depth (ft)	1.4	1.4	1.4	1.4		1																														
Pool Spacing (ft)	21.2	49.6	46.5	75.4	15.6	9																														
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																																				
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	C5																																			
Channel Thalweg length (ft)	530.9																																			
Sinuosity (ft)	1.36																																			
Water Surface Slope (Channel) (ft/ft)	0.0051																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.

2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table

3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

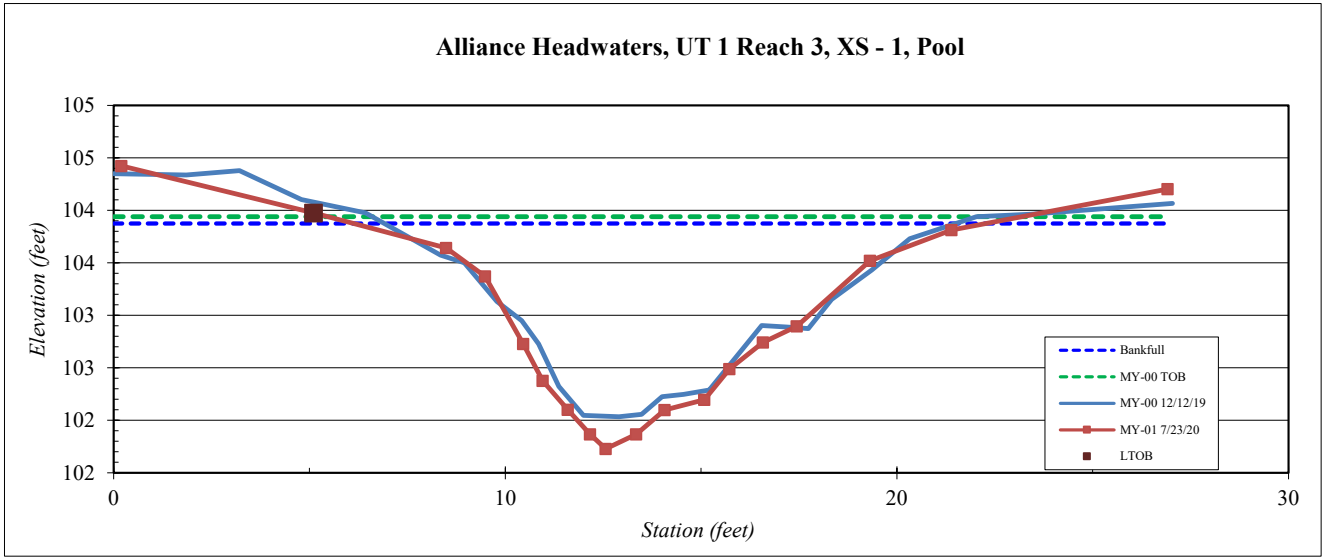
4. = Of value/needed only if the n exceeds 3

Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 1 Reach 3, XS - 1
Feature	Pool
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.2	104.42
5.1	103.98
8.5	103.64
9.5	103.37
10.5	102.73
11.0	102.38
11.6	102.10
12.2	101.87
12.6	101.73
13.3	101.87
14.1	102.10
15.1	102.20
15.7	102.49
16.6	102.74
17.4	102.90
19.3	103.52
21.4	103.81
26.9	104.20

SUMMARY DATA	
Bankfull Elevation:	103.9
Bankfull Cross-Sectional Area:	14.5
Bankfull Width:	16.1
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.1
Low Bank Height:	2.2
Mean Depth at Bankfull:	0.9
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.05

Stream Type	C5

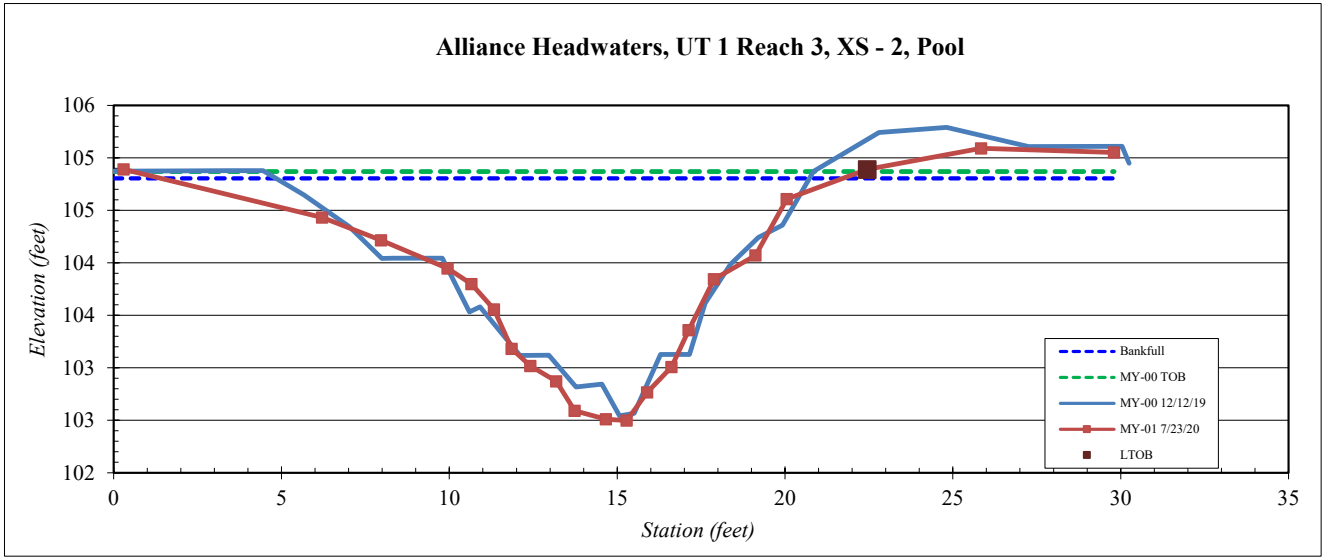


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 1 Reach 3, XS - 2
Feature	Pool
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.3	104.89
6.2	104.43
8.0	104.22
9.9	103.95
10.7	103.80
11.3	103.56
11.9	103.18
12.4	103.02
13.2	102.87
13.7	102.59
14.7	102.51
15.3	102.50
15.9	102.77
16.6	103.01
17.1	103.36
17.9	103.84
19.1	104.07
20.1	104.61
22.4	104.89
25.8	105.09
29.8	105.05

SUMMARY DATA	
Bankfull Elevation:	104.8
Bankfull Cross-Sectional Area:	18.5
Bankfull Width:	20.3
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.3
Low Bank Height:	2.4
Mean Depth at Bankfull:	0.9
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.04

Stream Type	C5

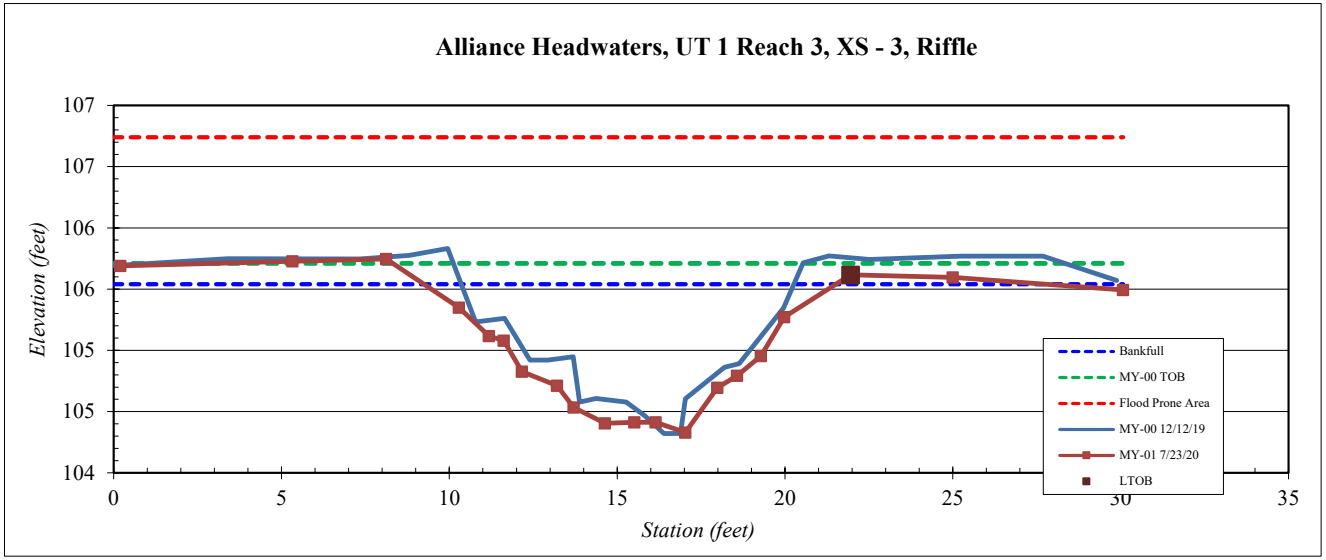


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 1 Reach 3, XS - 3
Feature	Riffle
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.2	105.69
5.3	105.73
8.1	105.75
10.3	105.35
11.2	105.12
11.6	105.08
12.2	104.83
13.2	104.71
13.7	104.53
14.6	104.41
15.5	104.41
16.1	104.41
17.0	104.33
18.0	104.70
18.6	104.79
19.3	104.95
20.0	105.27
22.0	105.62
25.0	105.60
30.1	105.49

SUMMARY DATA	
Bankfull Elevation:	105.5
Bankfull Cross-Sectional Area:	8.4
Bankfull Width:	14.6
Flood Prone Area Elevation:	106.7
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.2
Low Bank Height:	1.3
Mean Depth at Bankfull:	0.6
W / D Ratio:	25.4
Entrenchment Ratio:	6.8
Bank Height Ratio:	1.08

Stream Type	C5

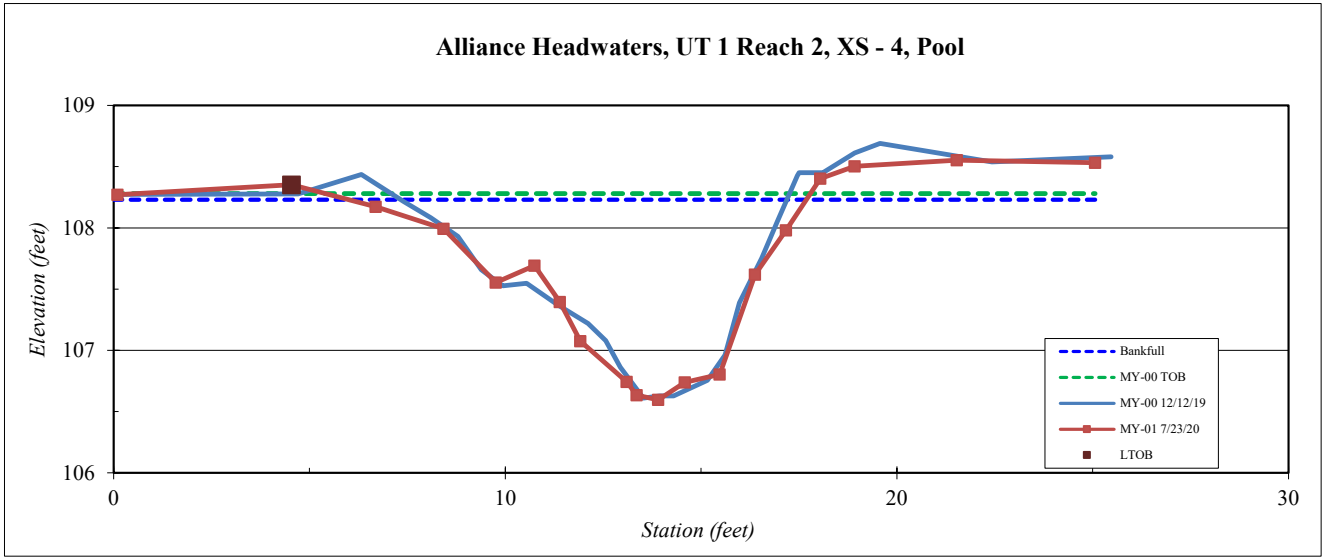


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 1 Reach 2, XS - 4
Feature	Pool
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.1	108.27
4.5	108.35
6.7	108.17
8.4	107.99
9.8	107.55
10.7	107.69
11.4	107.40
11.9	107.08
13.1	106.74
13.4	106.63
13.9	106.60
14.6	106.74
15.5	106.80
16.4	107.62
17.2	107.98
18.0	108.40
18.9	108.50
21.5	108.55
25.1	108.53

SUMMARY DATA	
Bankfull Elevation:	108.2
Bankfull Cross-Sectional Area:	9.0
Bankfull Width:	11.7
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.6
Low Bank Height:	1.8
Mean Depth at Bankfull:	0.8
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.13

Stream Type	C5

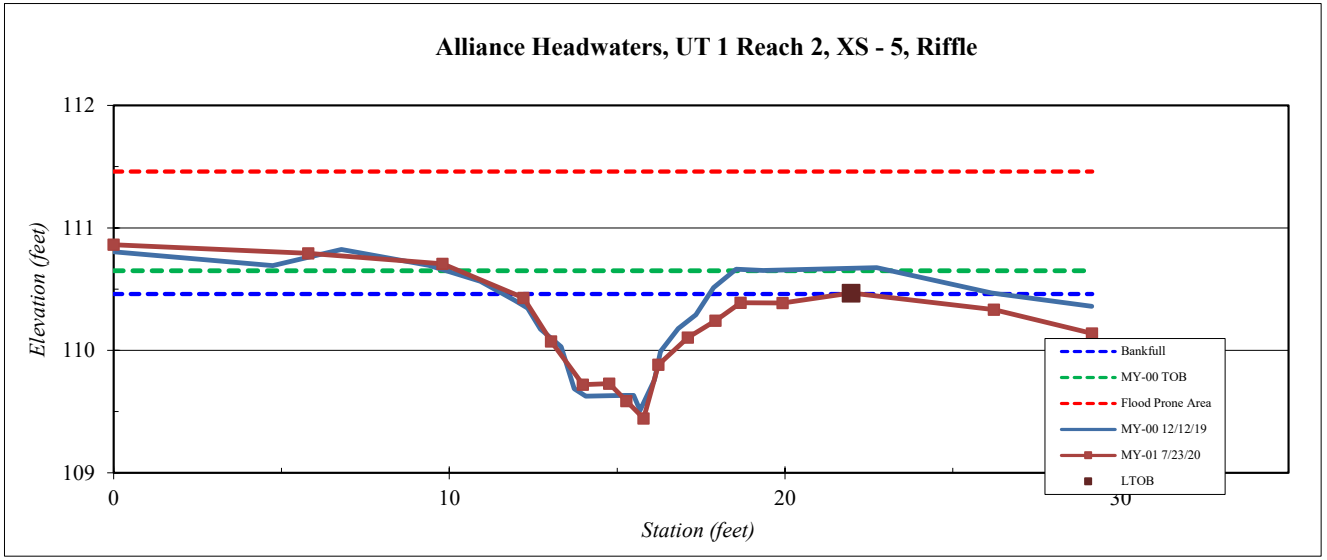


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 1 Reach 2, XS - 5
Feature	Riffle
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.0	110.86
5.8	110.79
9.8	110.71
12.2	110.43
13.0	110.07
14.0	109.72
14.8	109.73
15.3	109.59
15.8	109.44
16.2	109.88
17.1	110.11
17.9	110.24
18.7	110.39
19.9	110.39
22.0	110.47
26.2	110.33
29.2	110.14

SUMMARY DATA	
Bankfull Elevation:	110.5
Bankfull Cross-Sectional Area:	4.4
Bankfull Width:	16.7
Flood Prone Area Elevation:	111.5
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.0
Low Bank Height:	1.0
Mean Depth at Bankfull:	0.3
W / D Ratio:	63.4
Entrenchment Ratio:	6.0
Bank Height Ratio:	1.00

Stream Type	C5

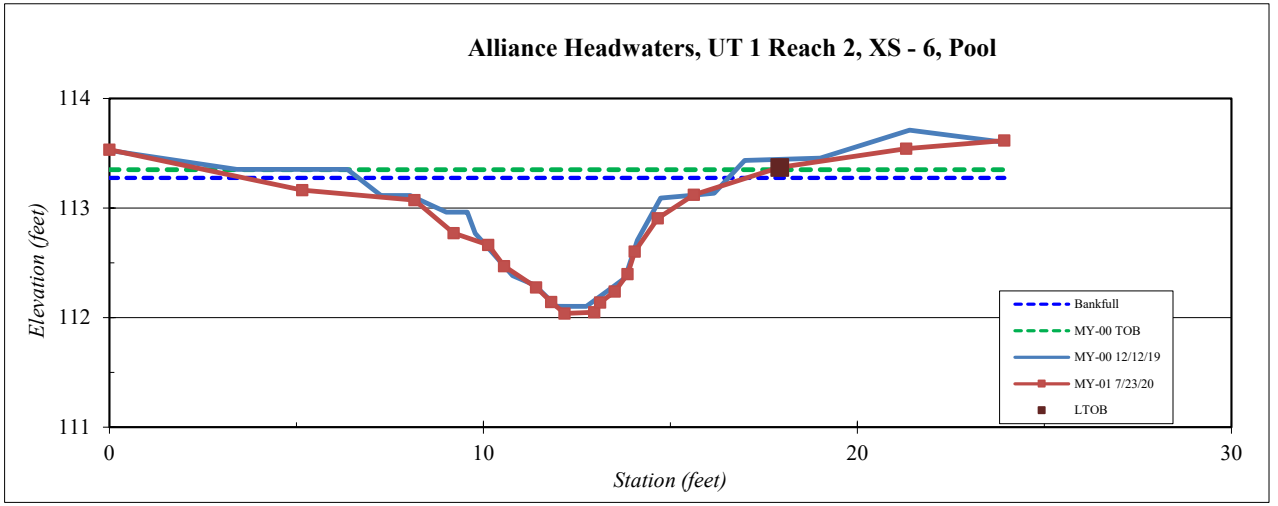


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 1 Reach 2, XS - 6
Feature	Pool
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.0	113.5
5.2	113.2
8.2	113.1
9.2	112.8
10.1	112.7
10.6	112.5
11.4	112.3
11.8	112.1
12.2	112.0
13.0	112.0
13.1	112.1
13.5	112.2
13.9	112.4
14.0	112.6
14.7	112.9
15.6	113.1
17.9	113.4
21.3	113.5
23.9	113.6

SUMMARY DATA	
Bankfull Elevation:	113.3
Bankfull Cross-Sectional Area:	6.1
Bankfull Width:	13.4
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.2
Low Bank Height:	1.3
Mean Depth at Bankfull:	0.5
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.08

Stream Type	C5

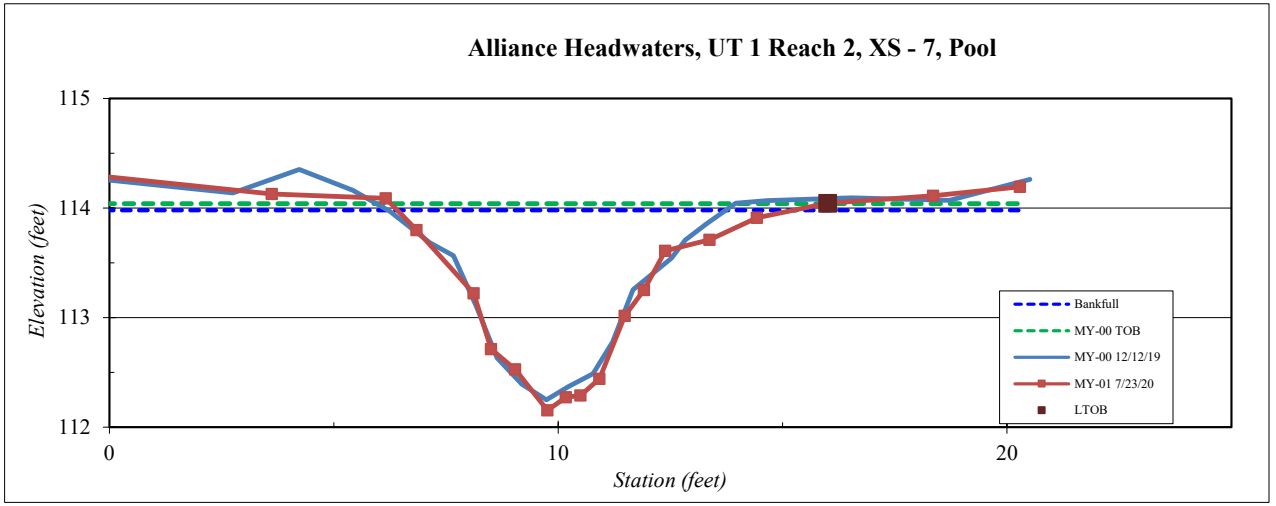


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 1 Reach 2, XS - 7
Feature	Pool
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
-0.1	114.3
3.6	114.1
6.2	114.1
6.8	113.8
8.1	113.2
8.5	112.7
9.0	112.5
9.8	112.2
10.2	112.3
10.5	112.3
10.9	112.4
11.5	113.0
11.9	113.3
12.4	113.6
13.4	113.7
14.4	113.9
16.0	114.0
18.4	114.1
20.3	114.2

SUMMARY DATA	
Bankfull Elevation:	114.0
Bankfull Cross-Sectional Area:	6.8
Bankfull Width:	8.8
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.8
Low Bank Height:	1.9
Mean Depth at Bankfull:	0.8
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.06

Stream Type	C5

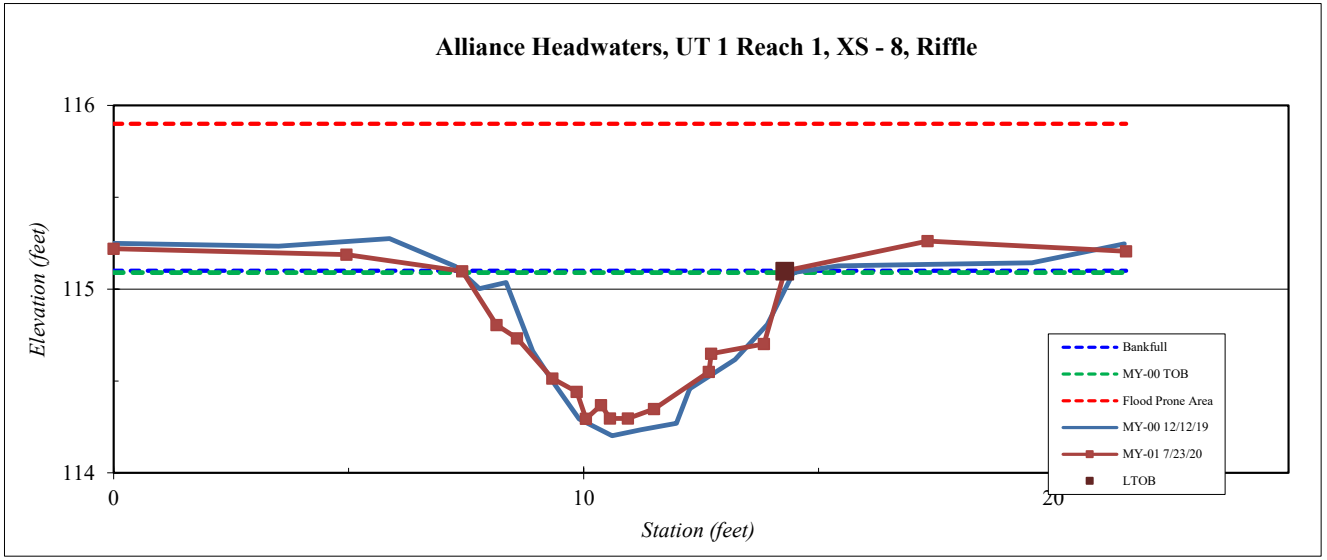


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 1 Reach 1, XS - 8
Feature	Riffle
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.0	115.22
5.0	115.19
7.4	115.10
8.1	114.80
8.6	114.73
9.3	114.51
9.9	114.44
10.1	114.29
10.4	114.37
10.6	114.30
10.9	114.30
11.5	114.35
12.7	114.55
12.7	114.65
13.8	114.70
14.3	115.10
17.3	115.26
21.5	115.21

SUMMARY DATA	
Bankfull Elevation:	115.1
Bankfull Cross-Sectional Area:	3.6
Bankfull Width:	7.0
Flood Prone Area Elevation:	115.9
Flood Prone Width:	100.0
Max Depth at Bankfull:	0.8
Low Bank Height:	0.8
Mean Depth at Bankfull:	0.5
W / D Ratio:	13.6
Entrenchment Ratio:	14.3
Bank Height Ratio:	1.00

Stream Type	C5

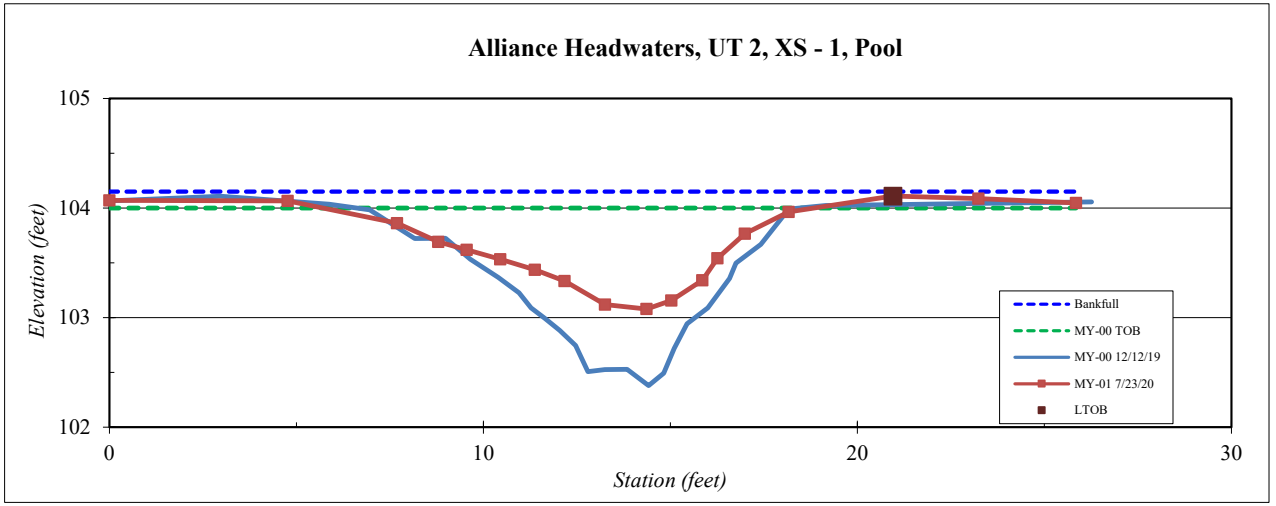


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 2, XS - 1
Feature	Pool
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.0	104.1
4.8	104.1
7.7	103.9
8.8	103.7
9.6	103.6
10.4	103.5
11.4	103.4
12.2	103.3
13.2	103.1
14.4	103.1
15.0	103.2
15.9	103.3
16.3	103.5
17.0	103.8
18.2	104.0
21.0	104.1
23.2	104.1
25.8	104.0

SUMMARY DATA	
Bankfull Elevation:	104.2
Bankfull Cross-Sectional Area:	8.8
Bankfull Width:	25.8
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.1
Low Bank Height:	1.0
Mean Depth at Bankfull:	0.3
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.91

Stream Type	C5

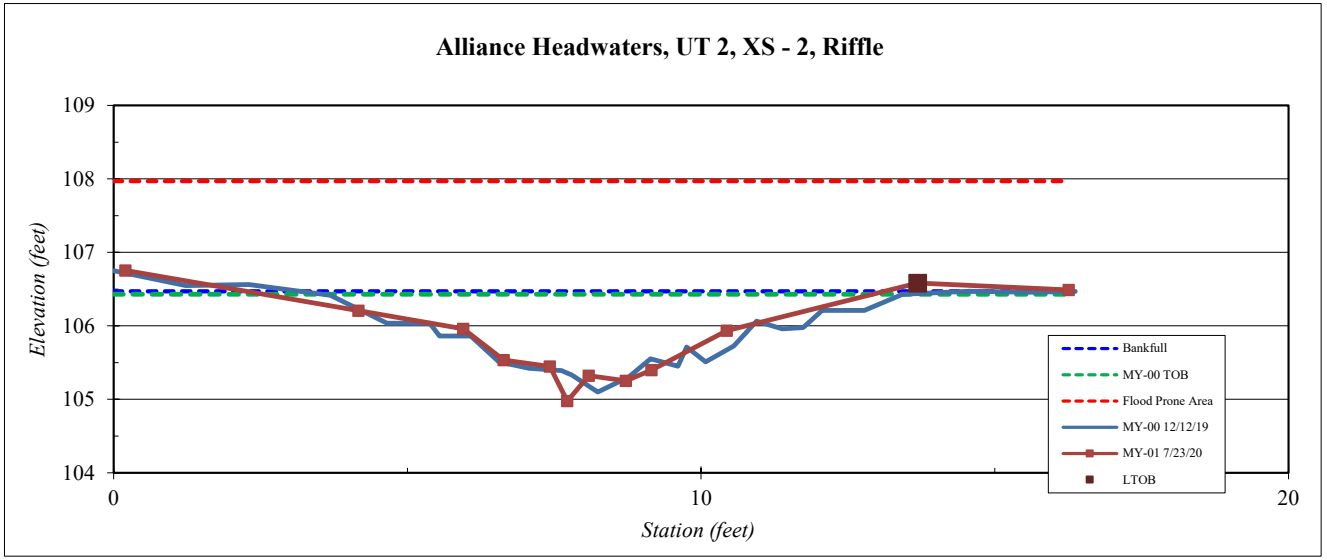


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 2, XS - 1
Feature	Riffle
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.2	106.8
4.2	106.2
6.0	106.0
6.6	105.5
7.4	105.4
7.7	105.0
8.1	105.3
8.7	105.3
9.2	105.4
10.4	105.9
13.7	106.6
16.3	106.5

SUMMARY DATA	
Bankfull Elevation:	106.5
Bankfull Cross-Sectional Area:	6.1
Bankfull Width:	10.9
Flood Prone Area Elevation:	108.0
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.5
Low Bank Height:	1.6
Mean Depth at Bankfull:	0.6
W / D Ratio:	19.5
Entrenchment Ratio:	9.2
Bank Height Ratio:	1.07

Stream Type	C5

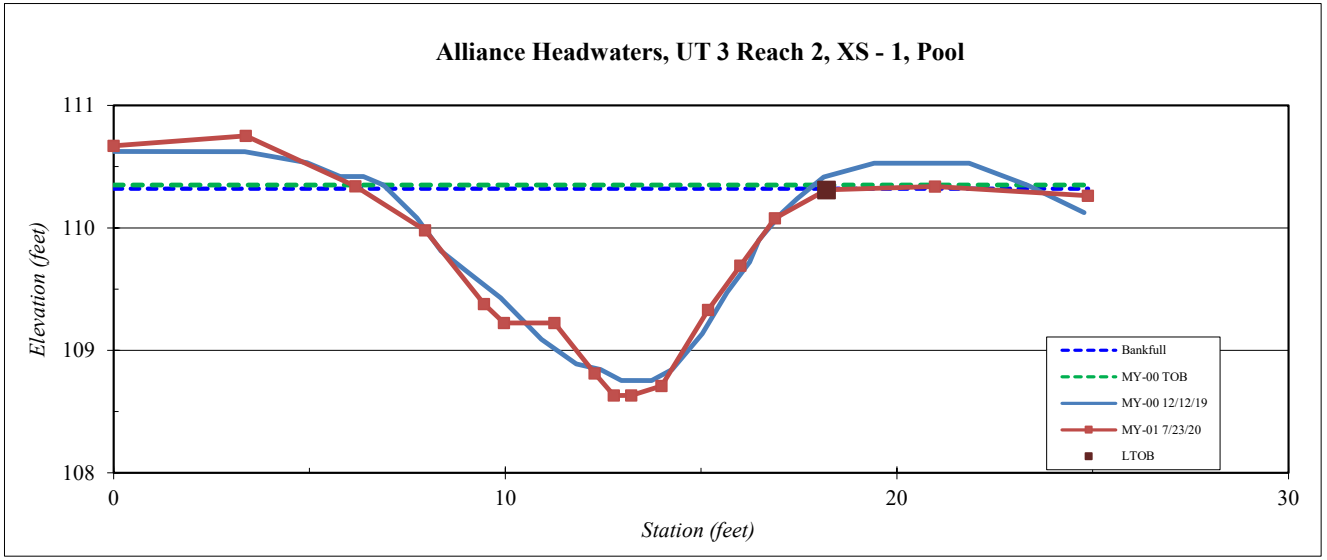


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 3 Reach 2, XS - 1
Feature	Pool
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.0	110.7
3.4	110.8
6.2	110.3
8.0	110.0
9.5	109.4
10.0	109.2
11.3	109.2
12.3	108.8
12.8	108.6
13.2	108.6
14.0	108.7
15.2	109.3
16.0	109.7
16.9	110.1
18.2	110.3
21.0	110.3
24.9	110.3

SUMMARY DATA	
Bankfull Elevation:	110.3
Bankfull Cross-Sectional Area:	10.2
Bankfull Width:	15.8
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.7
Low Bank Height:	1.7
Mean Depth at Bankfull:	0.6
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.00

Stream Type	C5

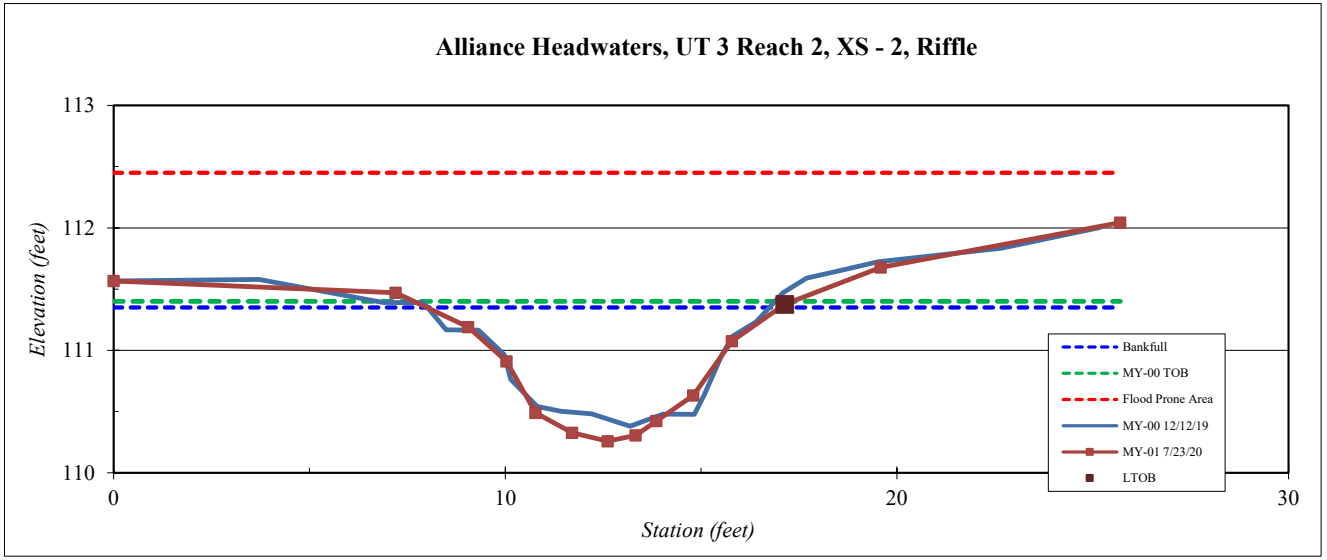


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 3 Reach 2, XS - 2
Feature	Riffle
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.0	111.6
7.2	111.5
9.1	111.2
10.0	110.9
10.8	110.5
11.7	110.3
12.6	110.3
13.3	110.3
13.9	110.4
14.8	110.6
15.8	111.1
17.1	111.4
19.6	111.7
25.7	112.0

SUMMARY DATA	
Bankfull Elevation:	111.4
Bankfull Cross-Sectional Area:	5.4
Bankfull Width:	9.0
Flood Prone Area Elevation:	112.5
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.1
Low Bank Height:	1.1
Mean Depth at Bankfull:	0.6
W / D Ratio:	15.0
Entrenchment Ratio:	11.1
Bank Height Ratio:	1.00

Stream Type	C5

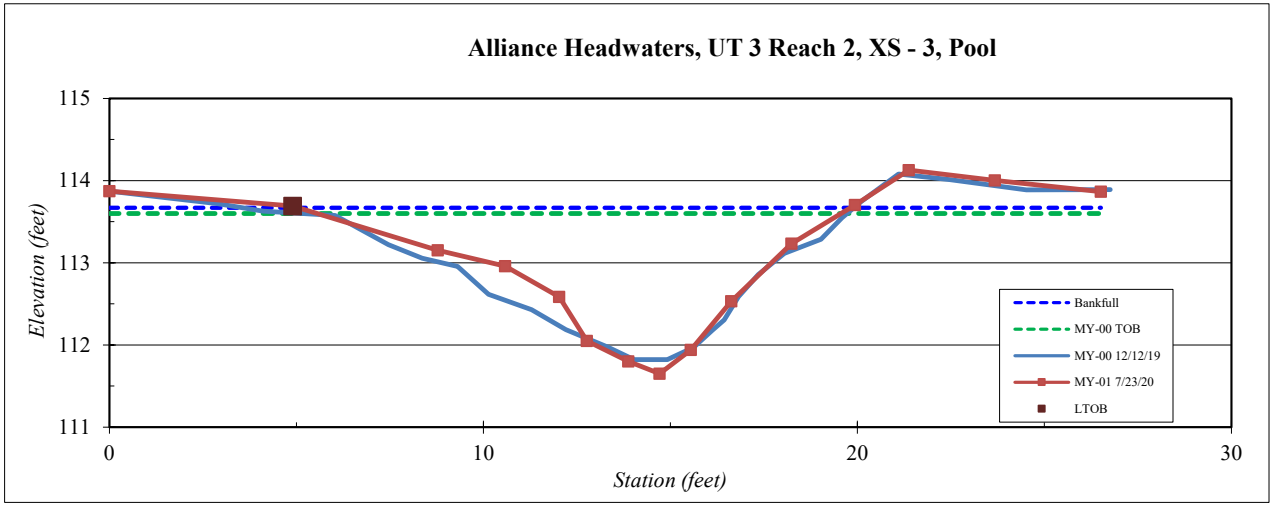


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 3 Reach 2, XS - 3
Feature	Pool
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.0	113.9
4.9	113.7
8.8	113.2
10.6	113.0
12.0	112.6
12.8	112.0
13.9	111.8
14.7	111.7
15.5	111.9
16.6	112.5
18.2	113.2
19.9	113.7
21.4	114.1
23.7	114.0
26.5	113.9

SUMMARY DATA	
Bankfull Elevation:	113.7
Bankfull Cross-Sectional Area:	12.7
Bankfull Width:	14.8
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.0
Low Bank Height:	2.0
Mean Depth at Bankfull:	0.9
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.00

Stream Type	C5

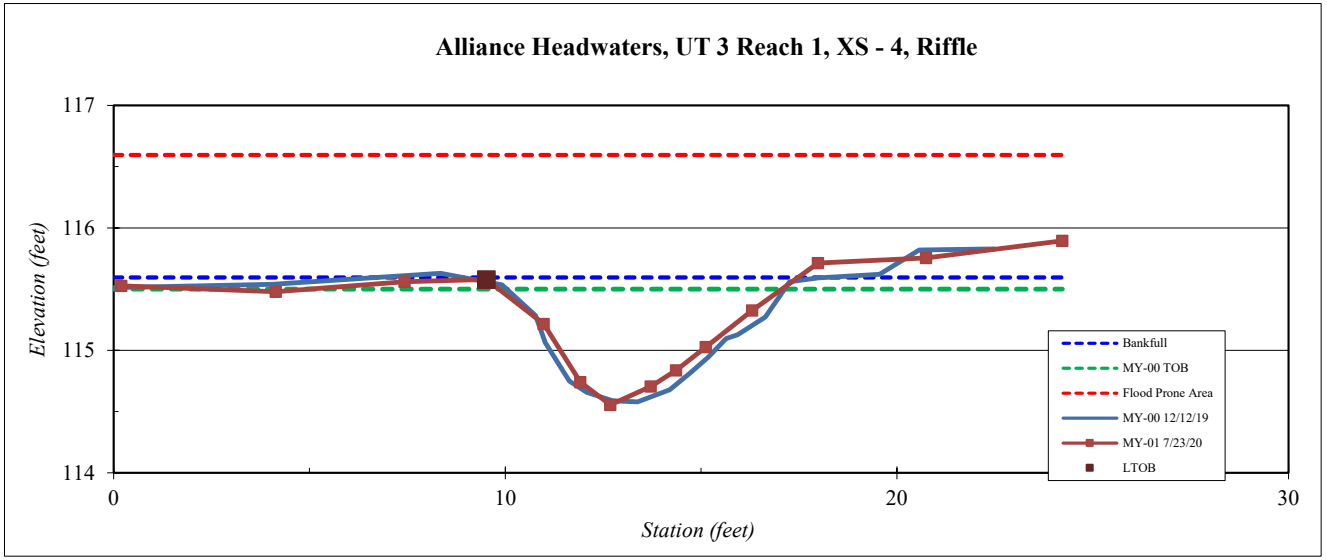


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 3 Reach 1, XS - 4
Feature	Riffle
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.2	115.5
4.1	115.5
7.4	115.6
9.5	115.6
11.0	115.2
11.9	114.7
12.7	114.6
13.7	114.7
14.4	114.8
15.1	115.0
16.3	115.3
18.0	115.7
20.7	115.8
24.2	115.9

SUMMARY DATA	
Bankfull Elevation:	115.6
Bankfull Cross-Sectional Area:	4.3
Bankfull Width:	8.0
Flood Prone Area Elevation:	116.6
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.0
Low Bank Height:	1.0
Mean Depth at Bankfull:	0.5
W / D Ratio:	14.9
Entrenchment Ratio:	12.5
Bank Height Ratio:	1.00

Stream Type	C5

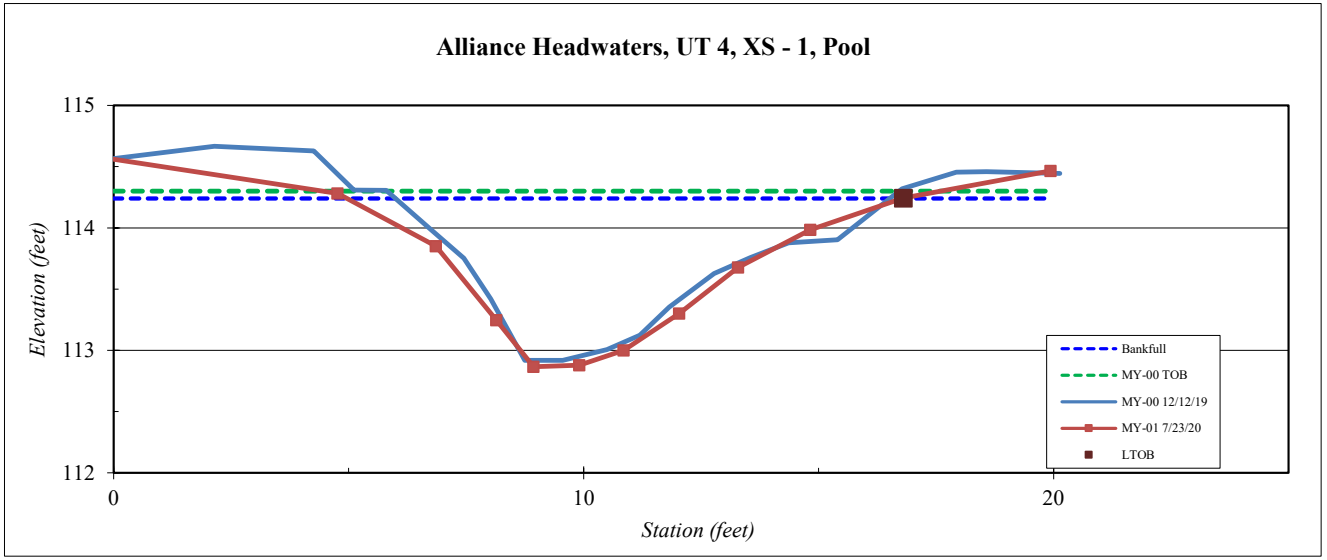


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 4, XS - 1
Feature	Pool
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
-0.1	114.57
4.8	114.28
6.9	113.85
8.1	113.25
8.9	112.87
9.9	112.88
10.9	113.00
12.0	113.30
13.3	113.68
14.8	113.98
16.8	114.24
19.9	114.47

SUMMARY DATA	
Bankfull Elevation:	114.2
Bankfull Cross-Sectional Area:	7.9
Bankfull Width:	11.8
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.4
Low Bank Height:	1.4
Mean Depth at Bankfull:	0.7
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.00

Stream Type	C5

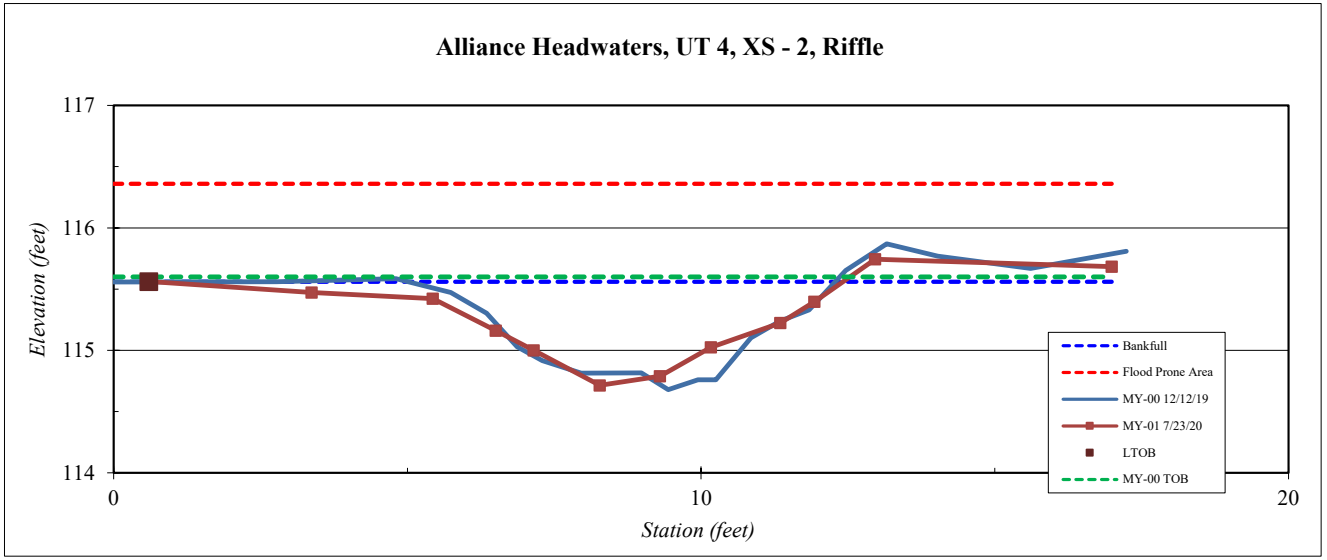


Site	Alliance Headwaters
Watershed:	Neuse River, 03020201
XS ID	UT 3, XS - 2
Feature	Riffle
Date:	7/23/2020
Field Crew:	Perkinson, Keith

Station	Elevation
0.6	115.56
3.4	115.47
5.4	115.42
6.5	115.16
7.2	115.00
8.3	114.71
9.3	114.79
10.2	115.03
11.4	115.22
11.9	115.40
13.0	115.74
17.0	115.68

SUMMARY DATA	
Bankfull Elevation:	115.6
Bankfull Cross-Sectional Area:	3.8
Bankfull Width:	11.7
Flood Prone Area Elevation:	116.4
Flood Prone Width:	100.0
Max Depth at Bankfull:	0.8
Low Bank Height:	0.8
Mean Depth at Bankfull:	0.3
W / D Ratio:	36.0
Entrenchment Ratio:	8.5
Bank Height Ratio:	1.00

Stream Type	C5



APPENDIX E: HYDROLOGY DATA

Tables 16A-G. Channel Evidence
Stream Gauge Graphs
Table 17. Verification of Bankfull Events
Figure E1. 30/70 Percentile Graph for Rainfall
Table 18. Groundwater Hydrology Data
Groundwater Gauge Graphs

Table 16A. UT1 Downstream Channel Evidence

UT1 Downstream Channel Evidence	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)
Max consecutive days channel flow	201						
Presence of litter and debris (wracking)	Yes						
Leaf litter disturbed or washed away	Yes						
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes						
Sediment deposition and/or scour indicating sediment transport	Yes						
Water staining due to continual presence of water	Yes						
Formation of channel bed and banks	Yes						
Sediment sorting within the primary path of flow	Yes						
Sediment shelving or a natural line impressed on the banks	Yes						
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes						
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes						
Exposure of woody plant roots within the primary path of flow	No						
Other:							

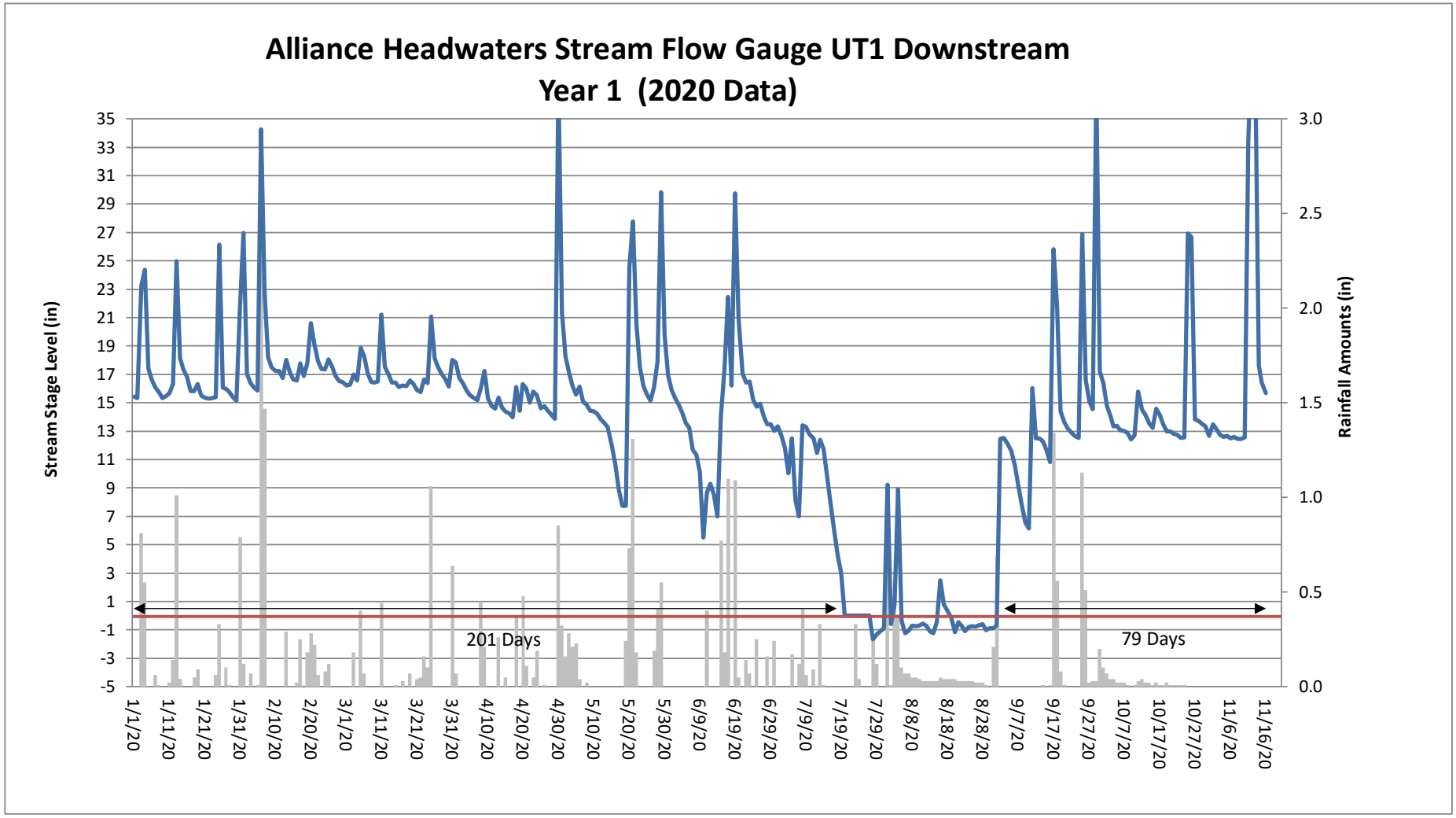

Alliance Headwaters Stream Flow Gauge UT1 Downstream
Year 1 (2020 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
35
33
31
29
27
25
23
21
19
17
15
13
11
9
7
5
3
1
-1
-3
-5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
201 Days
79 Days
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

Table 16B. UT1 Upstream Channel Evidence

UT1 Upstream Channel Evidence	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)
Max consecutive days channel flow	190						
Presence of litter and debris (wracking)	Yes						
Leaf litter disturbed or washed away	Yes						
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes						
Sediment deposition and/or scour indicating sediment transport	Yes						
Water staining due to continual presence of water	Yes						
Formation of channel bed and banks	Yes						
Sediment sorting within the primary path of flow	Yes						
Sediment shelving or a natural line impressed on the banks	Yes						
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes						
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes						
Exposure of woody plant roots within the primary path of flow	No						
Other:							

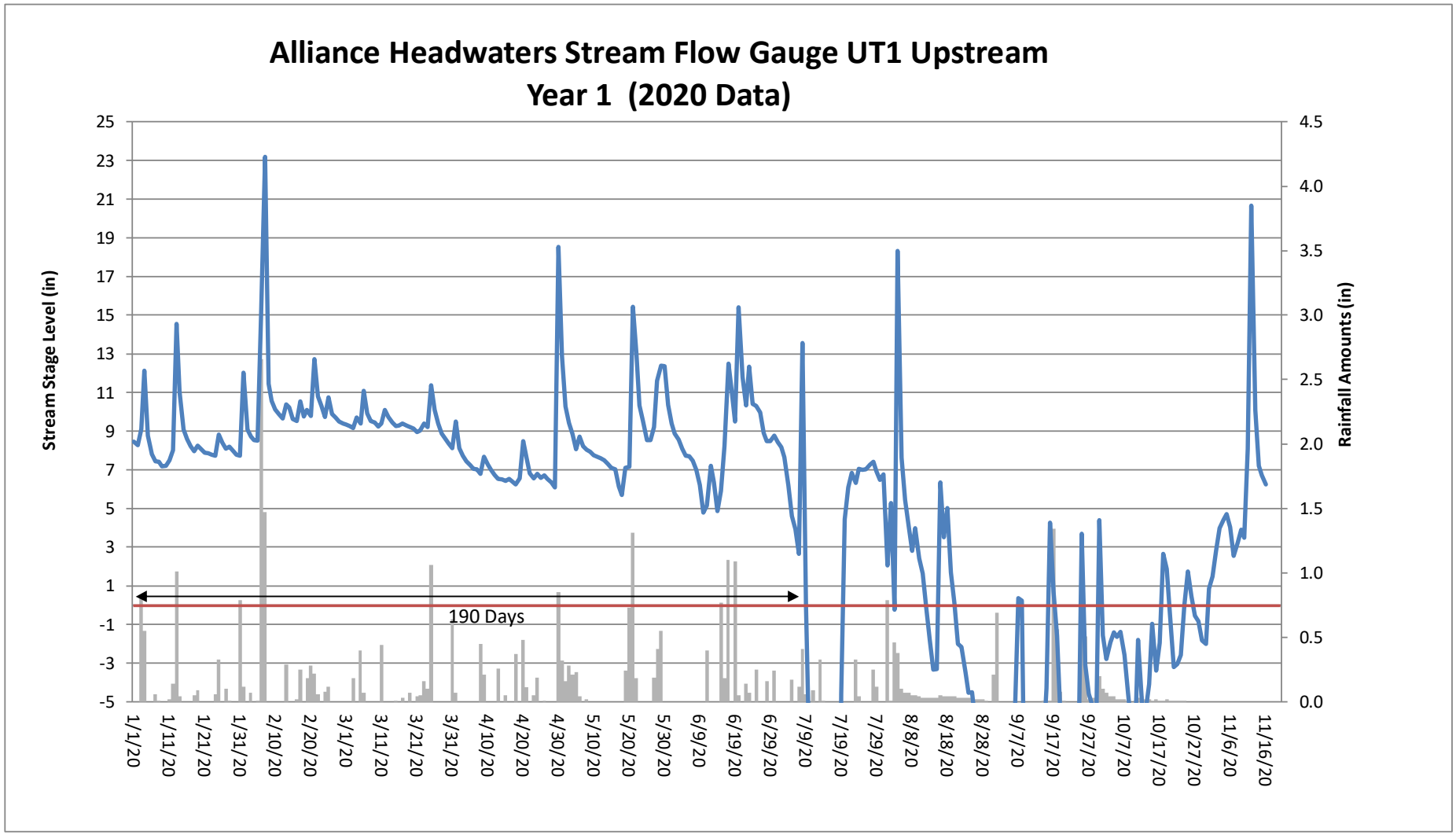

Alliance Headwaters Stream Flow Gauge UT1 Upstream
Year 1 (2020 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
25
23
21
19
17
15
13
11
9
7
5
3
1
-1
-3
-5
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
190 Days
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

Table 16C. UT1A Channel Evidence

UT1A Channel Evidence	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)
Max consecutive days channel flow	97						
Presence of litter and debris (wracking)	Yes						
Leaf litter disturbed or washed away	Yes						
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes						
Sediment deposition and/or scour indicating sediment transport	Yes						
Water staining due to continual presence of water	Yes						
Formation of channel bed and banks	Yes						
Sediment sorting within the primary path of flow	Yes						
Sediment shelving or a natural line impressed on the banks	Yes						
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes						
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes						
Exposure of woody plant roots within the primary path of flow	No						
Other:							

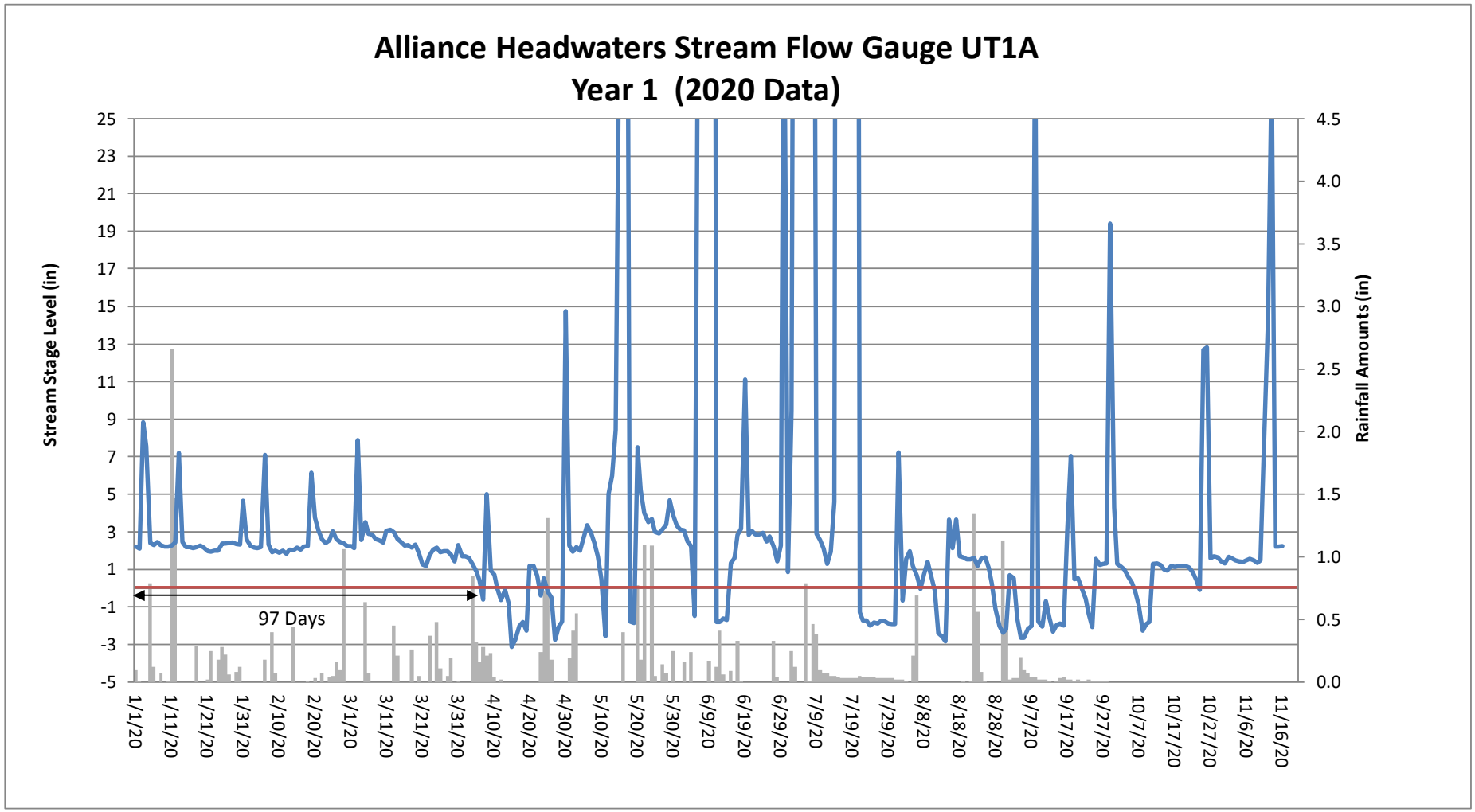

Alliance Headwaters Stream Flow Gauge UT1A
Year 1 (2020 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
25
23
21
19
17
15
13
11
9
7
5
3
1
-1
-3
-5
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
97 Days
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

Table 16D. UT2 Channel Evidence

UT2 Channel Evidence	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)
Max consecutive days channel flow	199						
Presence of litter and debris (wracking)	Yes						
Leaf litter disturbed or washed away	Yes						
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes						
Sediment deposition and/or scour indicating sediment transport	Yes						
Water staining due to continual presence of water	Yes						
Formation of channel bed and banks	Yes						
Sediment sorting within the primary path of flow	Yes						
Sediment shelving or a natural line impressed on the banks	Yes						
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes						
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes						
Exposure of woody plant roots within the primary path of flow	No						
Other:							

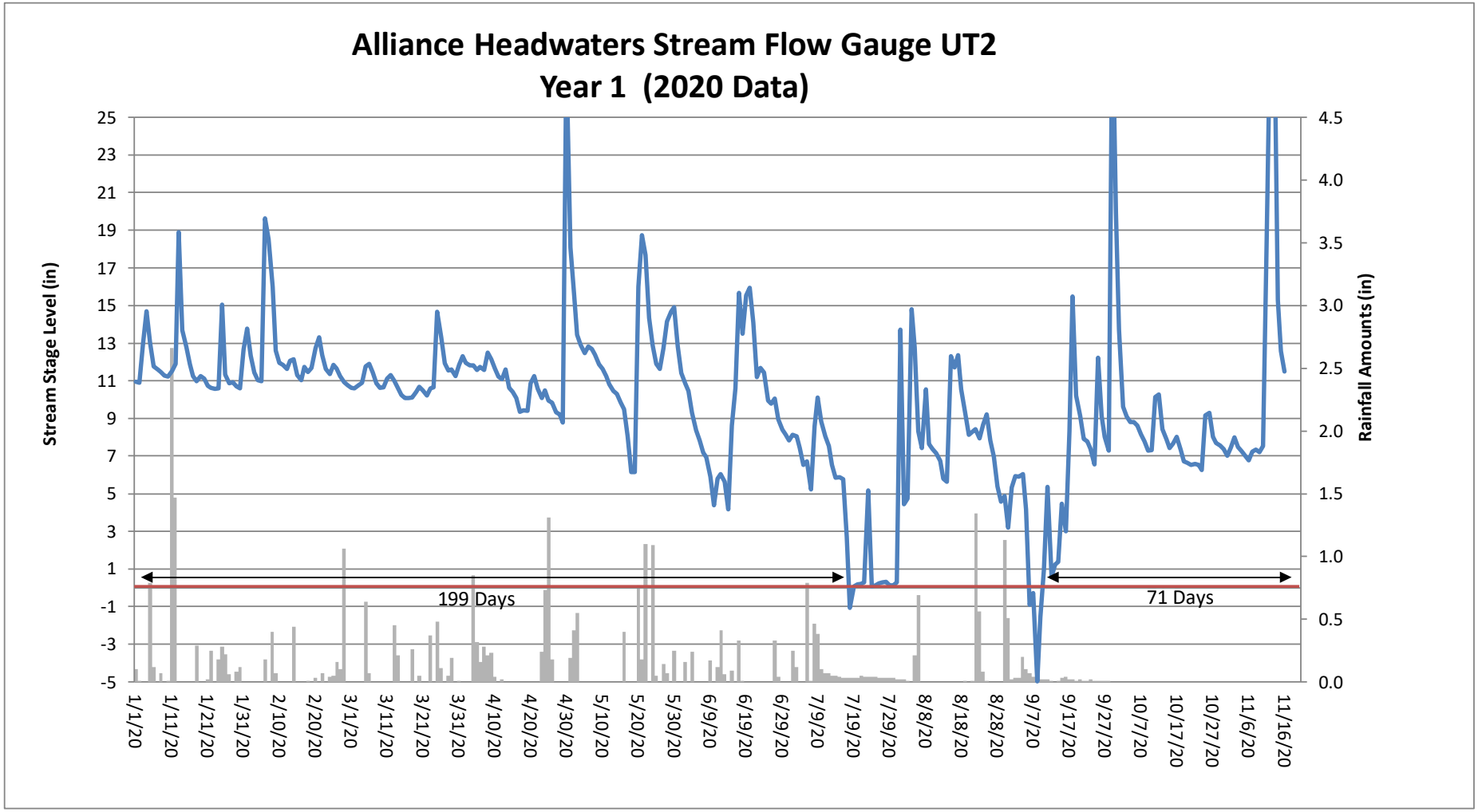

Alliance Headwaters Stream Flow Gauge UT2
Year 1 (2020 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
25
23
21
19
17
15
13
11
9
7
5
3
1
-1
-3
-5
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
199 Days
71 Days
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

Table 16E. UT3 Downstream Channel Evidence

UT3 Downstream Channel Evidence	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)
Max consecutive days channel flow	119						
Presence of litter and debris (wracking)	Yes						
Leaf litter disturbed or washed away	Yes						
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes						
Sediment deposition and/or scour indicating sediment transport	Yes						
Water staining due to continual presence of water	Yes						
Formation of channel bed and banks	Yes						
Sediment sorting within the primary path of flow	Yes						
Sediment shelving or a natural line impressed on the banks	Yes						
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes						
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes						
Exposure of woody plant roots within the primary path of flow	No						
Other:							

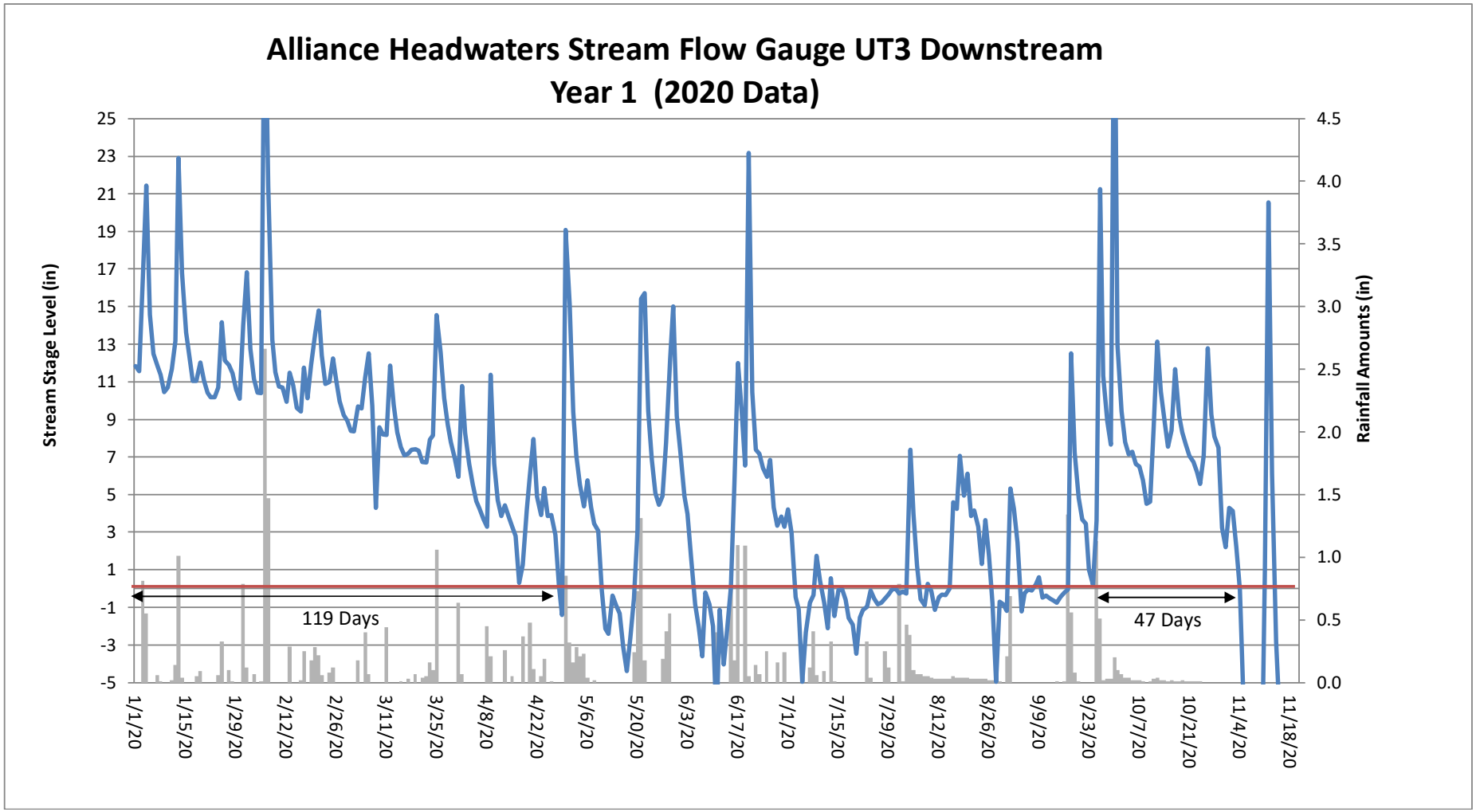

Alliance Headwaters Stream Flow Gauge UT3 Downstream
Year 1 (2020 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
25
23
21
19
17
15
13
11
9
7
5
3
1
-1
-3
-5
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
119 Days
47 Days
1/1/20
1/15/20
1/29/20
2/12/20
2/26/20
3/11/20
3/25/20
4/8/20
4/22/20
5/6/20
5/20/20
6/3/20
6/17/20
7/1/20
7/15/20
7/29/20
8/12/20
8/26/20
9/9/20
9/23/20
10/7/20
10/21/20
11/4/20
11/18/20

Table 16F. UT3 Upstream Channel Evidence

UT3 Upstream Channel Evidence	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)
Max consecutive days channel flow	136						
Presence of litter and debris (wracking)	Yes						
Leaf litter disturbed or washed away	Yes						
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes						
Sediment deposition and/or scour indicating sediment transport	Yes						
Water staining due to continual presence of water	Yes						
Formation of channel bed and banks	Yes						
Sediment sorting within the primary path of flow	Yes						
Sediment shelving or a natural line impressed on the banks	Yes						
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes						
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes						
Exposure of woody plant roots within the primary path of flow	No						
Other:							

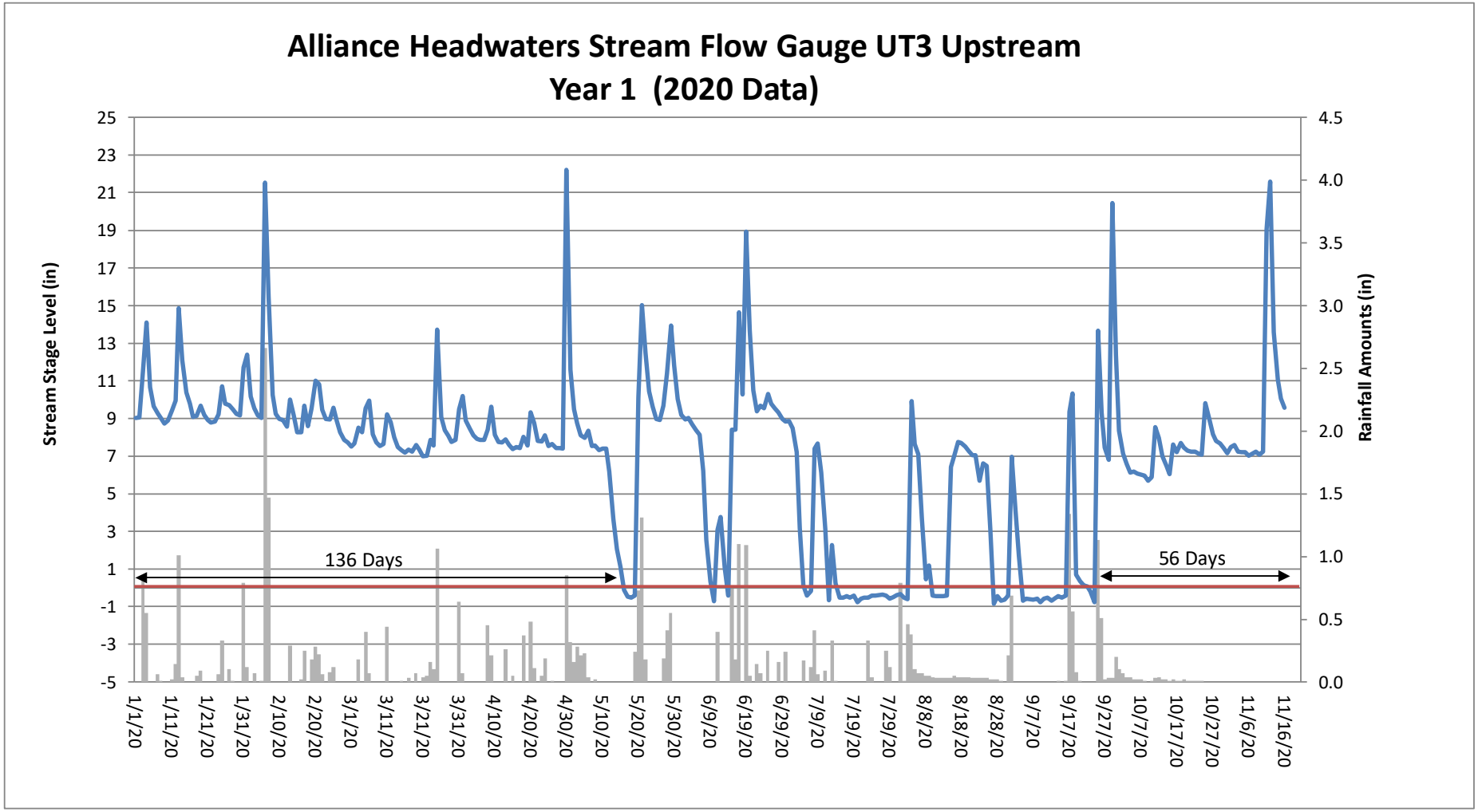

Alliance Headwaters Stream Flow Gauge UT3 Upstream
Year 1 (2020 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
25
23
21
19
17
15
13
11
9
7
5
3
1
-1
-3
-5
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
136 Days
56 Days
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

Table 16G. UT4 Channel Evidence

UT4 Channel Evidence	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)
Max consecutive days channel flow	130						
Presence of litter and debris (wracking)	Yes						
Leaf litter disturbed or washed away	Yes						
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes						
Sediment deposition and/or scour indicating sediment transport	Yes						
Water staining due to continual presence of water	Yes						
Formation of channel bed and banks	Yes						
Sediment sorting within the primary path of flow	Yes						
Sediment shelving or a natural line impressed on the banks	Yes						
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes						
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes						
Exposure of woody plant roots within the primary path of flow	No						
Other:							

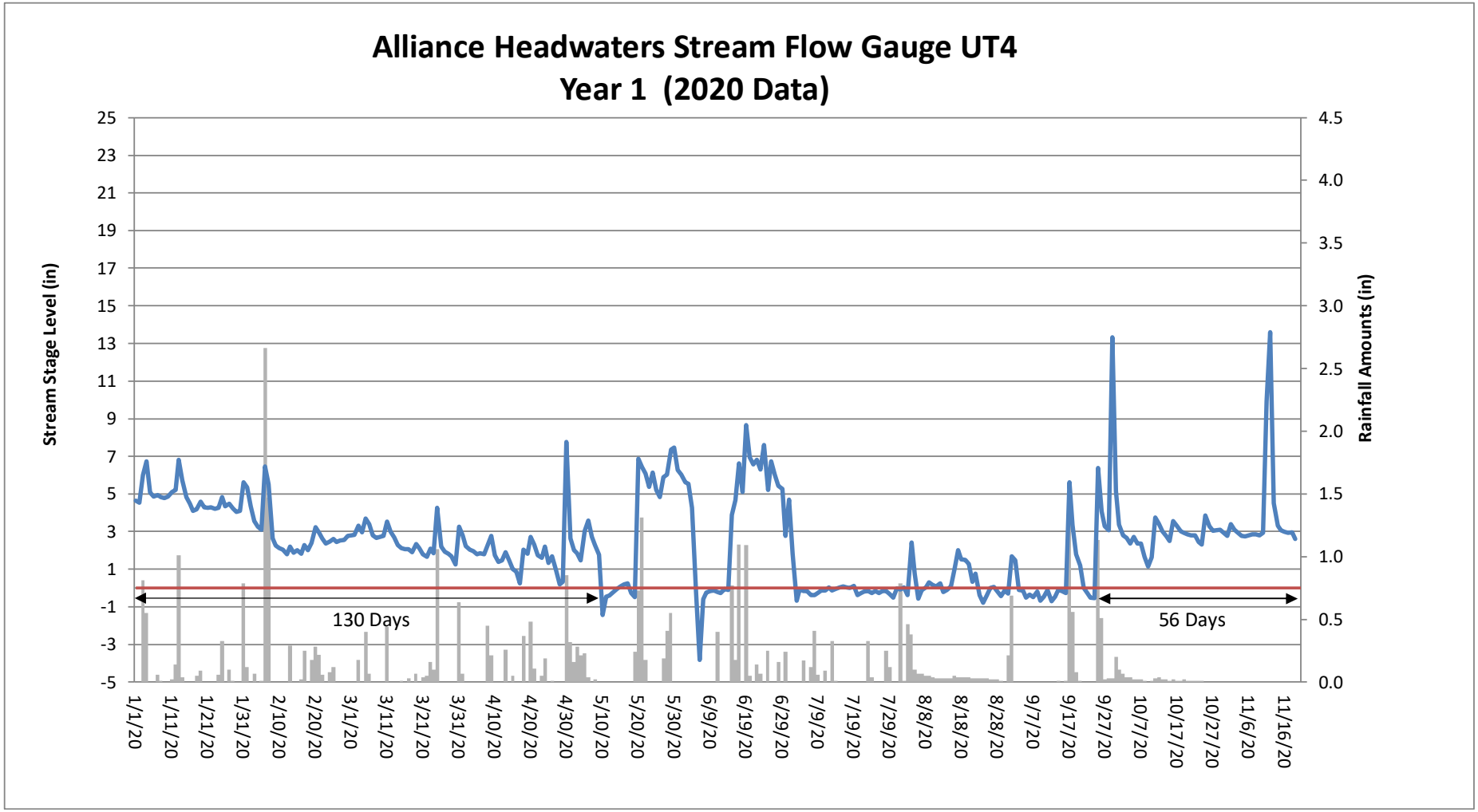

Alliance Headwaters Stream Flow Gauge UT4
Year 1 (2020 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
25
23
21
19
17
15
13
11
9
7
5
3
1
-1
-3
-5
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
130 Days
56 Days
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

Table 17. Verification of Bankfull Events

Date of Data Collection	Date of Occurrence	Method	Photo (if available)
April 30, 2020	April 30, 2020	Stream gauges and trail cameras captured a bankfull event at UT3 after 1.17 inches of rain was documented between April 30 and May 1, 2020 at an onsite rain gauge	1
November 19, 2020	November 12, 2020	Wrack and laid-back vegetation were observed outside the TOB of UT1 after 3.61 inches of rain was documented between November 12 and 13, 2020 at a nearby weather station.	2

Photo 1: UT3 at bankfull stage

Photo 2: Wrack and laid-back vegetation outside the TOB of UT1 after a bankfull event.

Figure E1: Alliance Headwaters
30-70 Percentile Graph for Rainfall

Current year data from onsite rain gauge
30-70th percentile data from WETS Station: Smithfield, NC

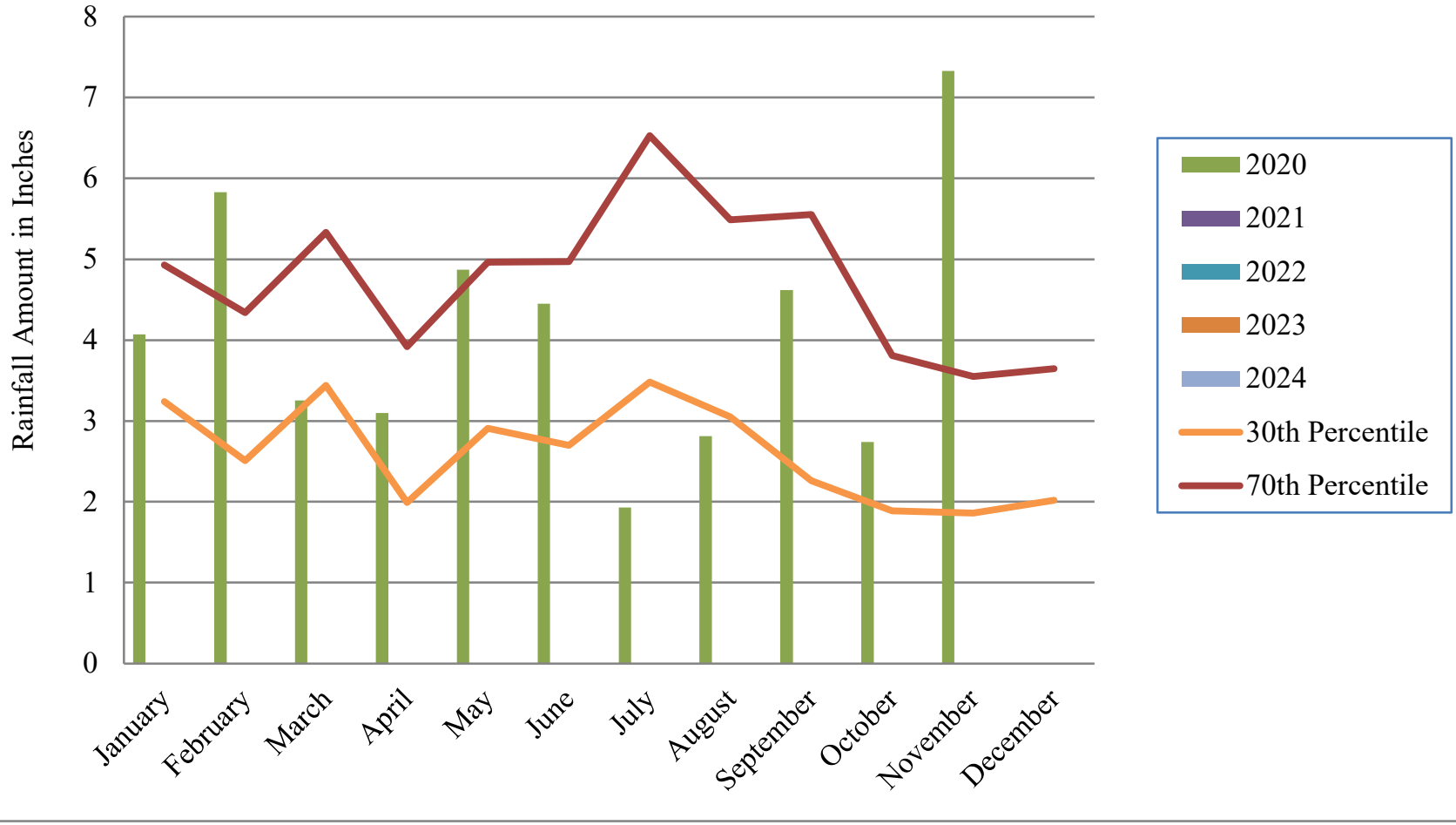
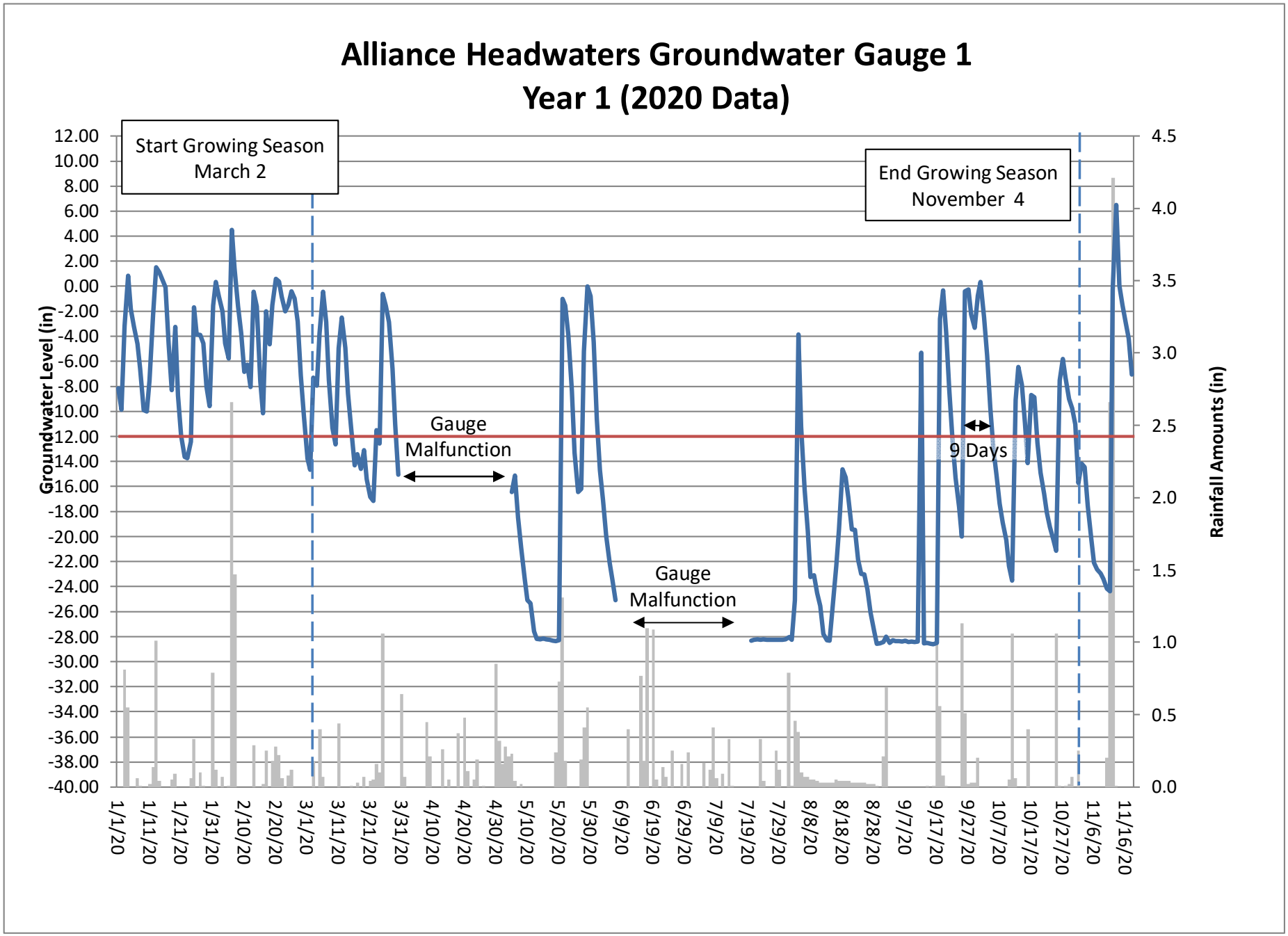


Table 18. Groundwater Hydrology Data

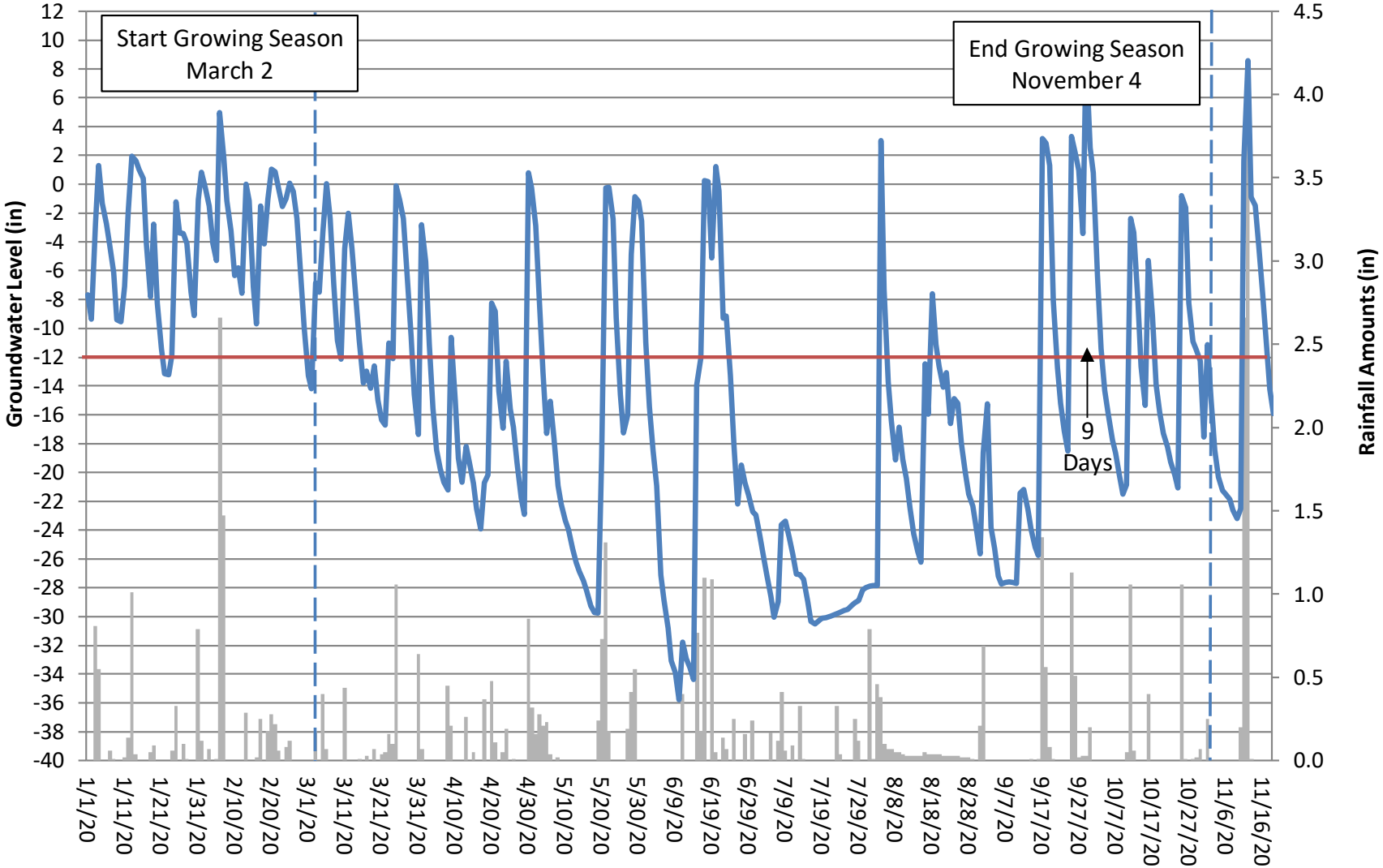
Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)
1	No 9 days (3.6%)						
2	No 9 days (3.6%)						
3	Yes 55 days (22.2%)						
4	No 10 days (4.0%)						
5	Yes 29 days (11.7%)						
6	No 16 days (6.5%)						
7	No 7 days (2.8%)						
8	Yes 50 days (20.2%)						
9	Yes 75 days (32.7%)						
10	Yes 72 days (29.0%)						
11	Yes 64 days (25.8%)						
12	No 18 days (7.3%)						
13	No 20 days (8.1%)						
14	No 16 days (6.5%)						
15	No 13 days (5.2%)						
16	Yes 34 days (13.7%)						
17	No 19 days (7.7%)						
18	No 10 days (4.0%)						
19	No 8 days (3.2%)						

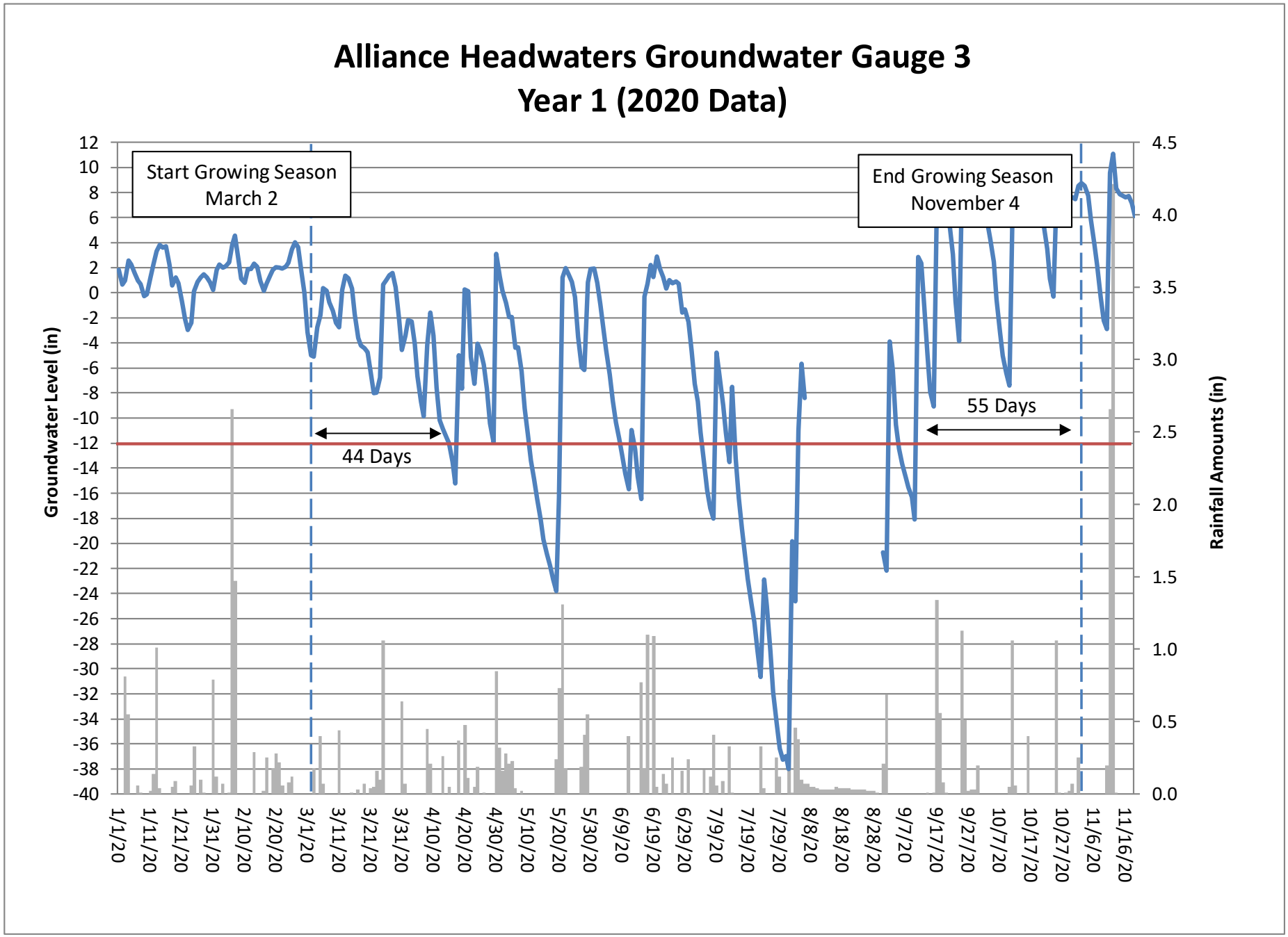
Table 18. Groundwater Hydrology Data (continued)

Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)
20	Yes 36 days (14.5%)						
21	Yes 34 days (13.7%)						
22	Yes 69 days (27.8%)						
23	Yes 35 days (14.1%)						
24	No 5 days (2.0%)						
25	Yes 46 days (18.5%)						
26	Yes 167 days (67.3%)						
27	Yes 74 days (29.8%)						
28	Yes 45 days (18.1%)						
29	Yes 45 days (18.1%)						

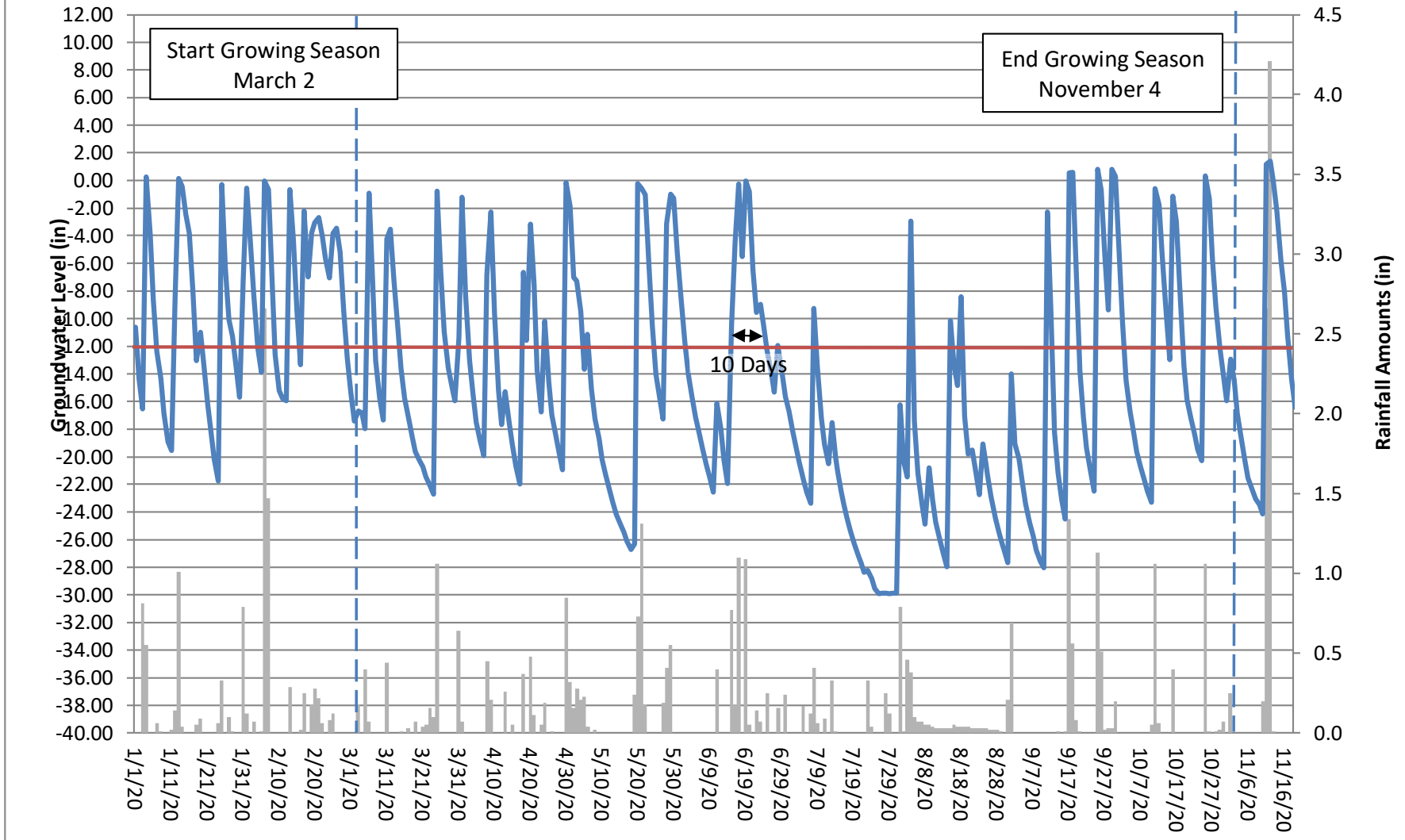

Alliance Headwaters Groundwater Gauge 1
Year 1 (2020 Data)
Start Growing Season
March 2
End Growing Season
November 4
Gauge
Malfunction
Gauge
Malfunction
9 Days
Groundwater Level (in)
Rainfall Amounts (in)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
-16.00
-18.00
-20.00
-22.00
-24.00
-26.00
-28.00
-30.00
-32.00
-34.00
-36.00
-38.00
-40.00
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

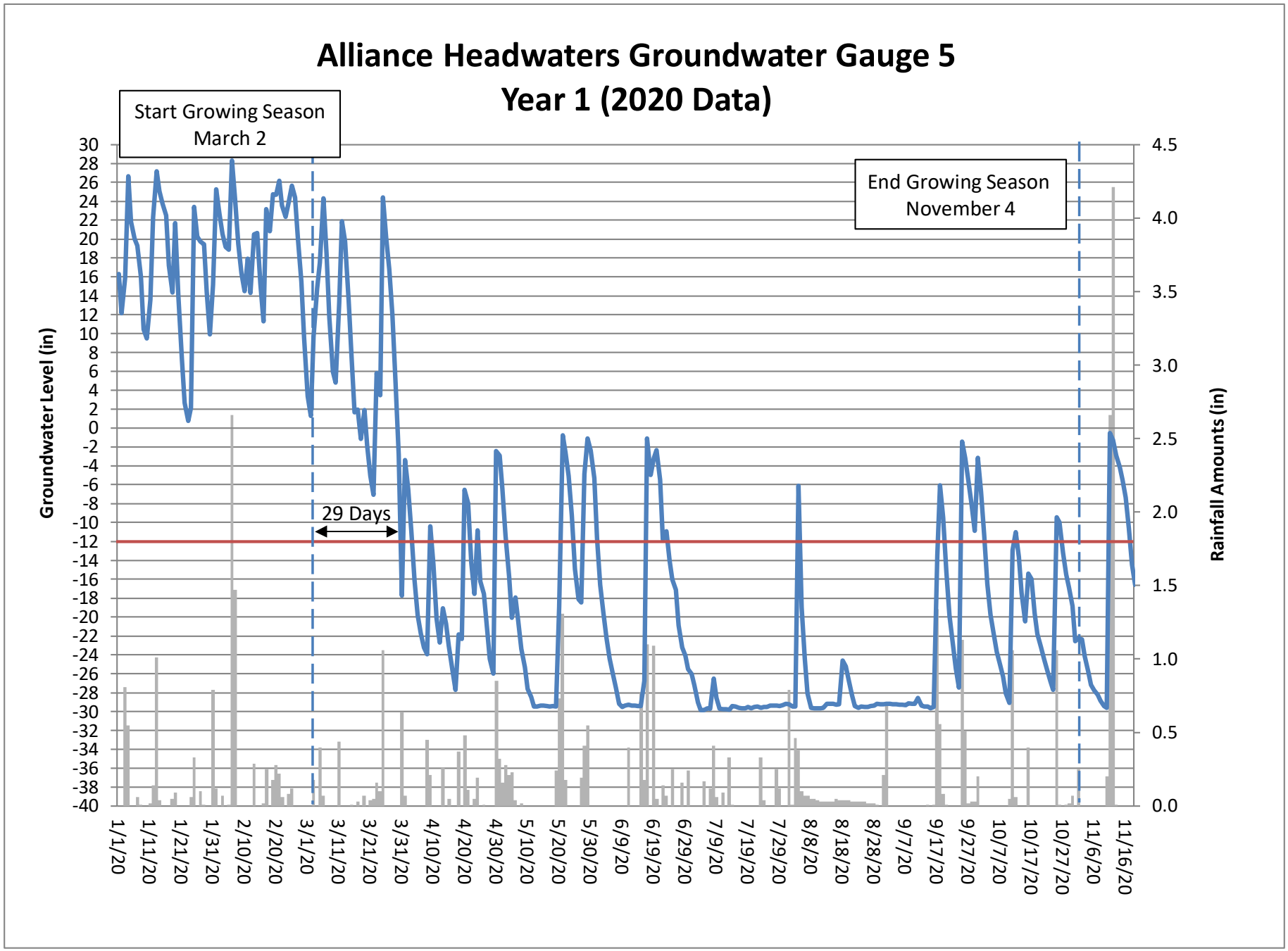
Alliance Headwaters Groundwater Gauge 2
Year 1 (2020 Data)



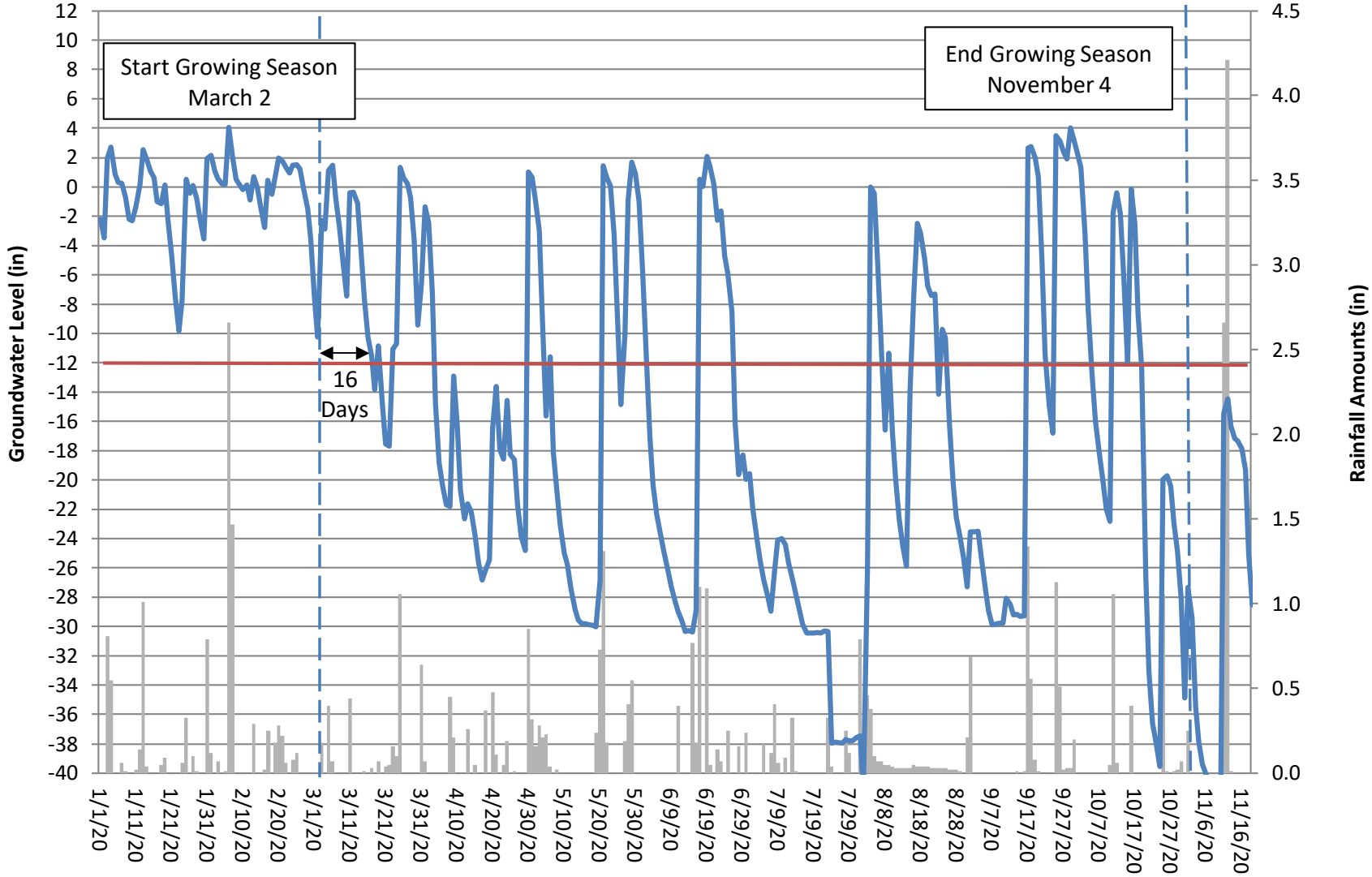

Alliance Headwaters Groundwater Gauge 3
Year 1 (2020 Data)
Start Growing Season
March 2
End Growing Season
November 4
44 Days
55 Days
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

Alliance Headwaters Groundwater Gauge 4
Year 1 (2020 Data)

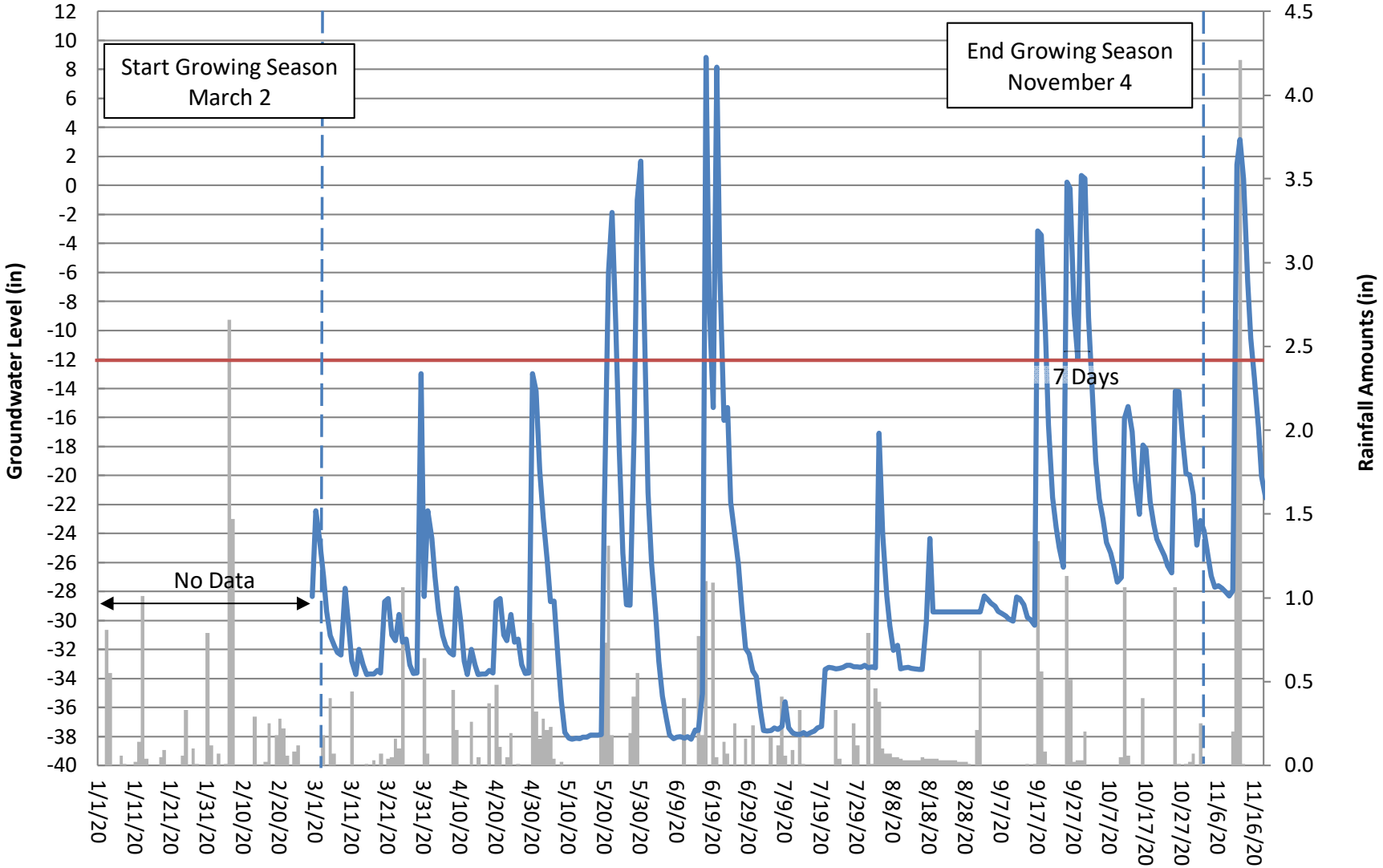


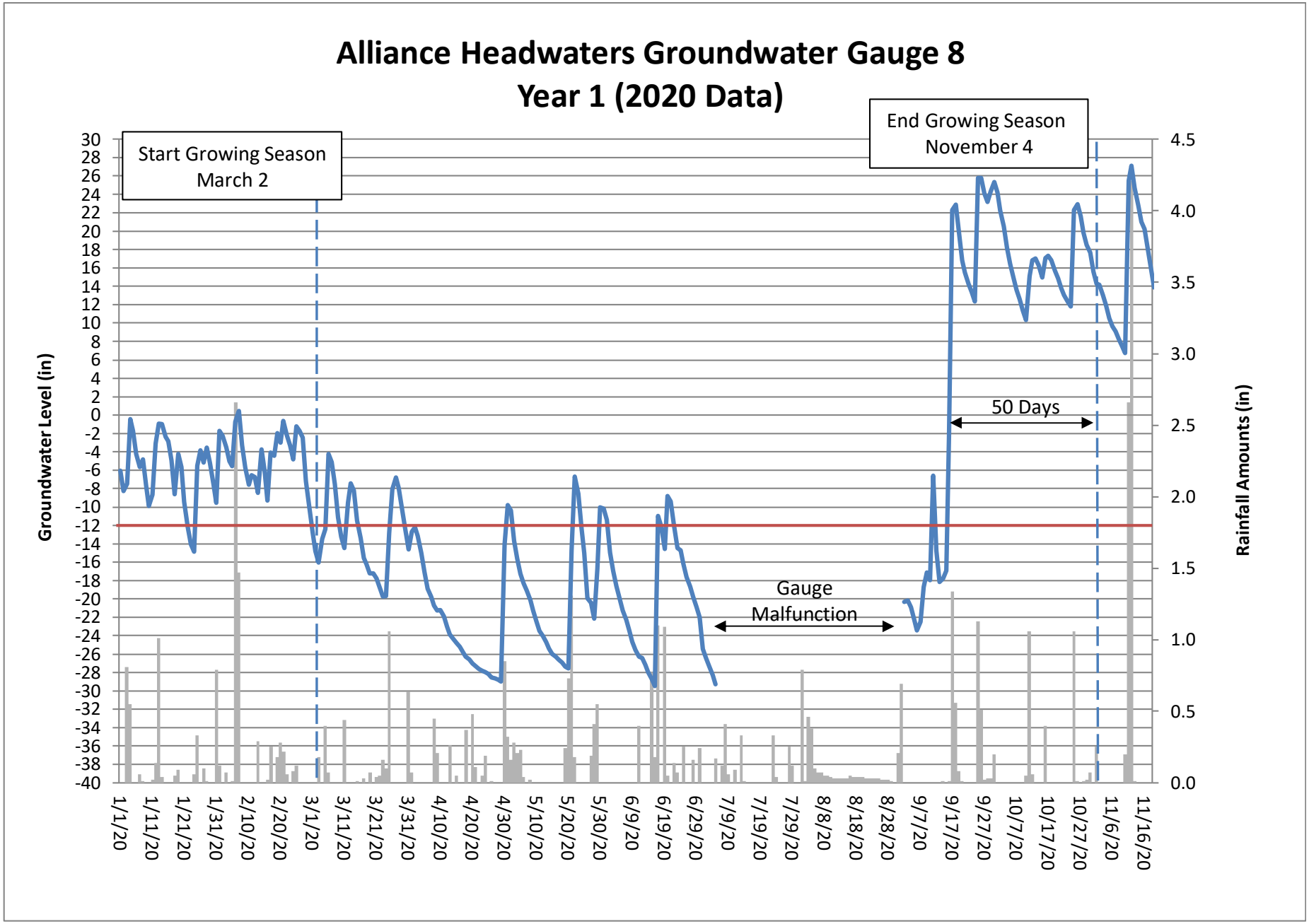

Alliance Headwaters Groundwater Gauge 5
Year 1 (2020 Data)
Start Growing Season
March 2
End Growing Season
November 4
29 Days
Groundwater Level (in)
Rainfall Amounts (in)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

Alliance Headwaters Groundwater Gauge 6
Year 1 (2020 Data)

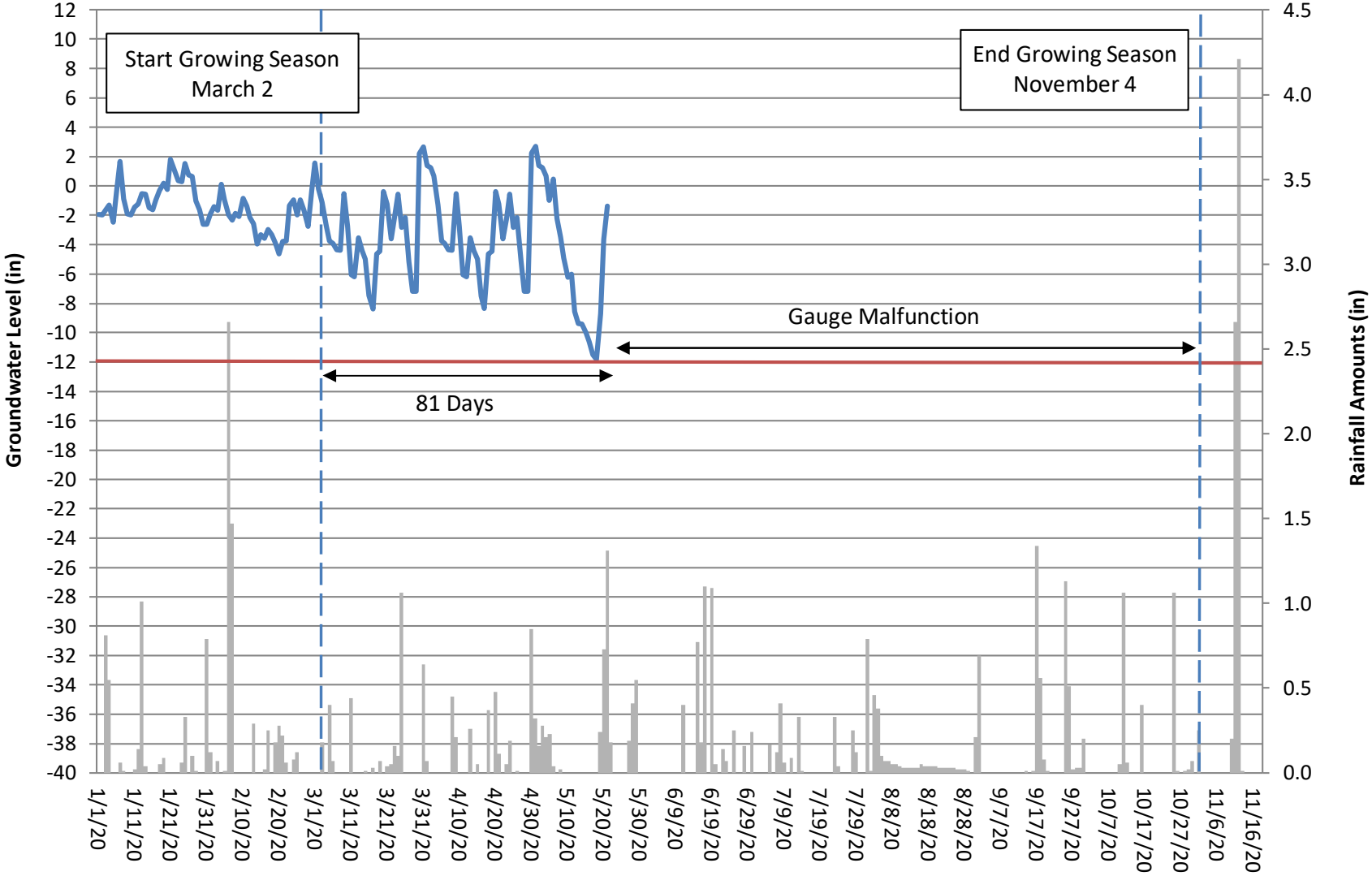


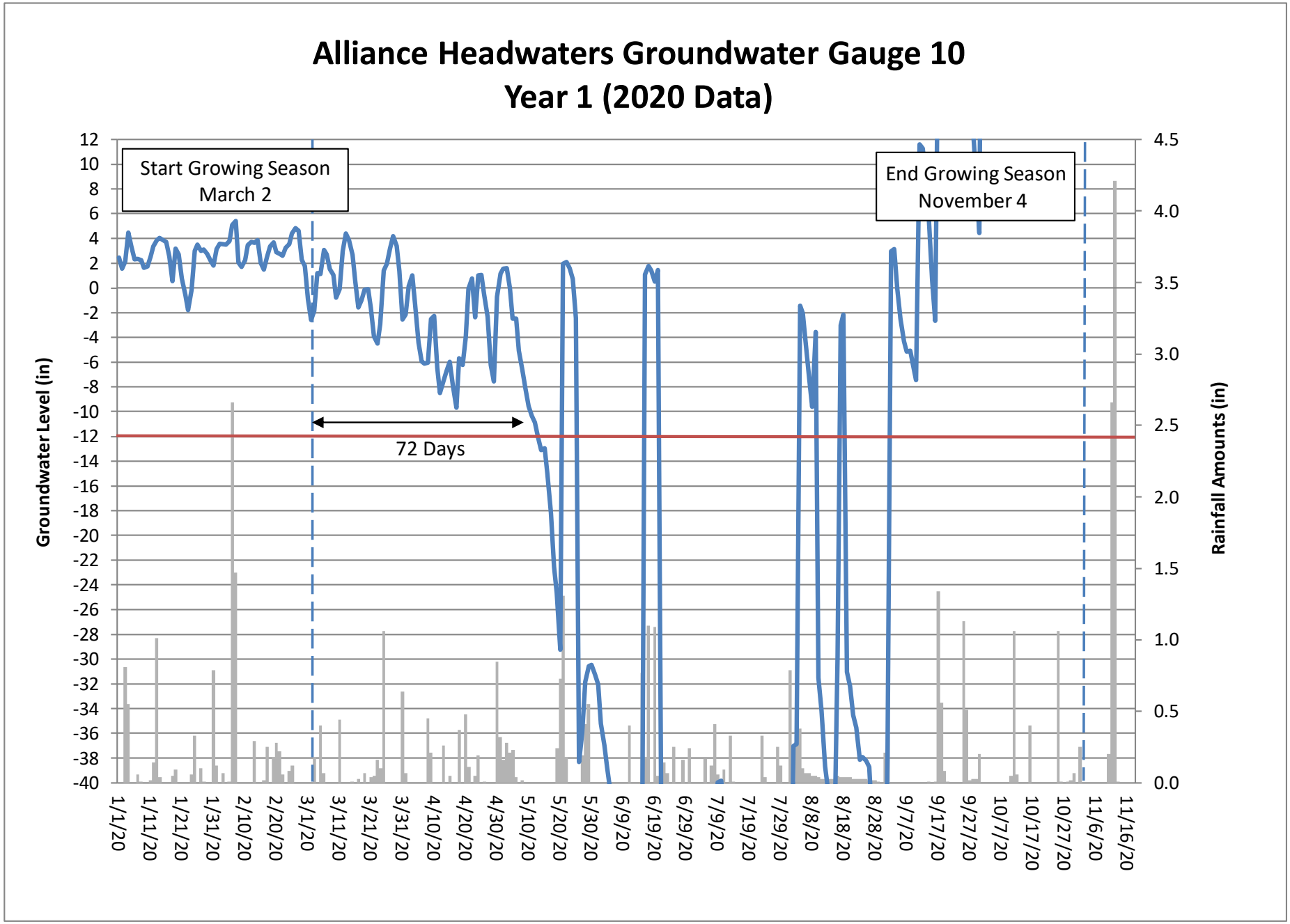
Alliance Headwaters Groundwater Gauge 7
Year 1 (2020 Data)



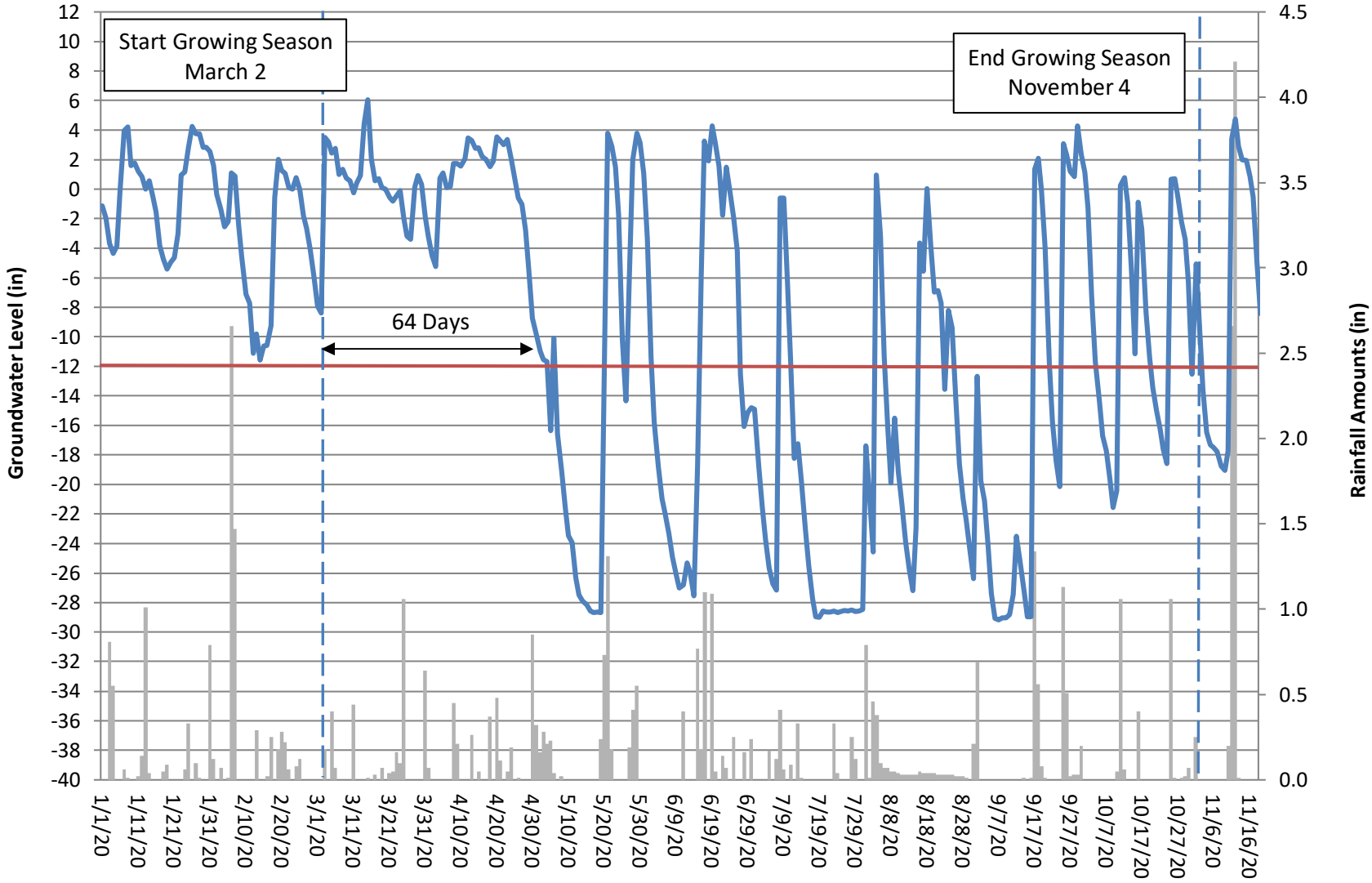

Alliance Headwaters Groundwater Gauge 8
Year 1 (2020 Data)
Start Growing Season
March 2
End Growing Season
November 4
50 Days
Gauge
Malfunction
Groundwater Level (in)
Rainfall Amounts (in)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

Alliance Headwaters Groundwater Gauge 9
Year 1 (2020 Data)

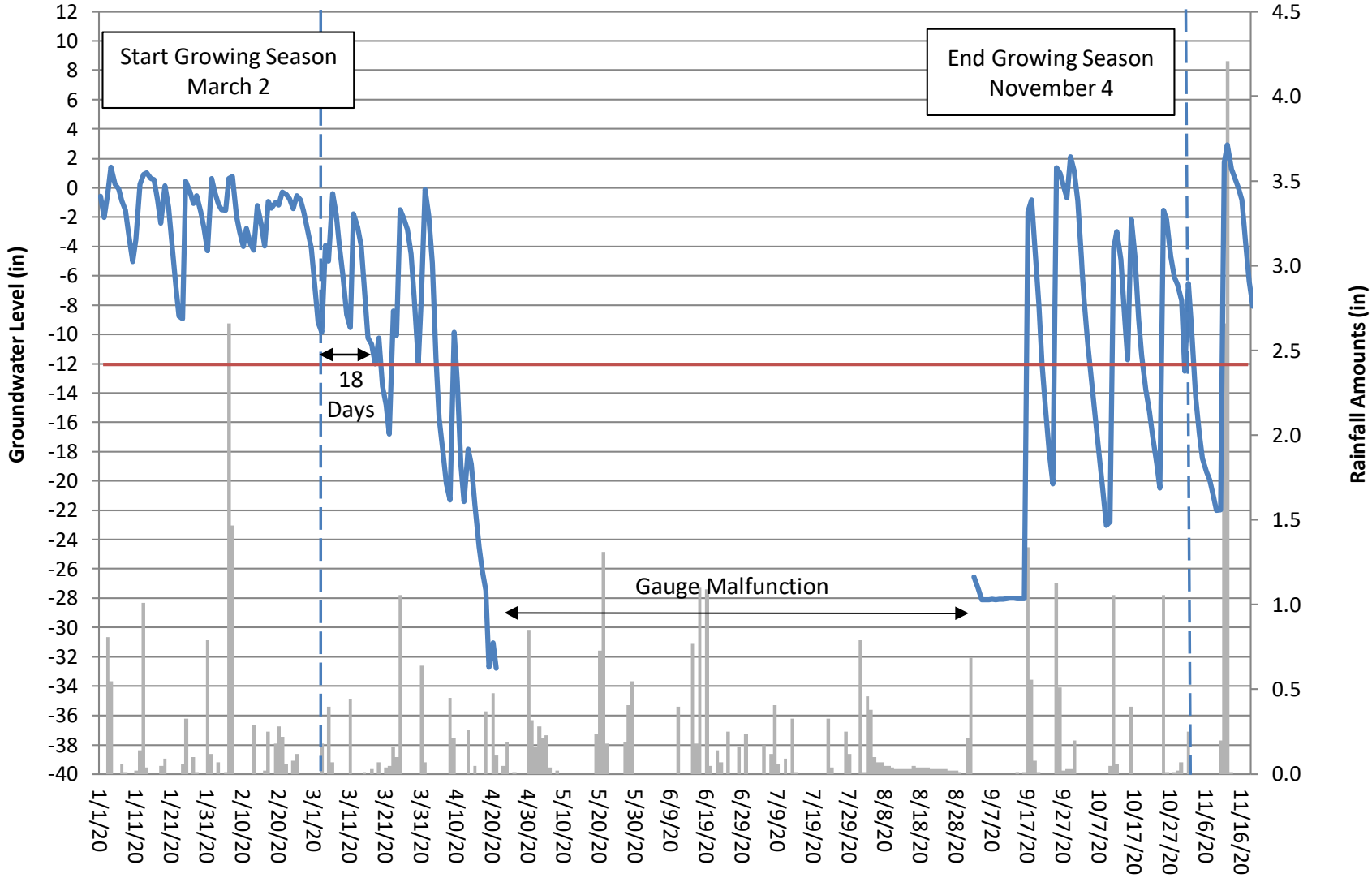



Alliance Headwaters Groundwater Gauge 10
Year 1 (2020 Data)
Start Growing Season
March 2
End Growing Season
November 4
72 Days
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

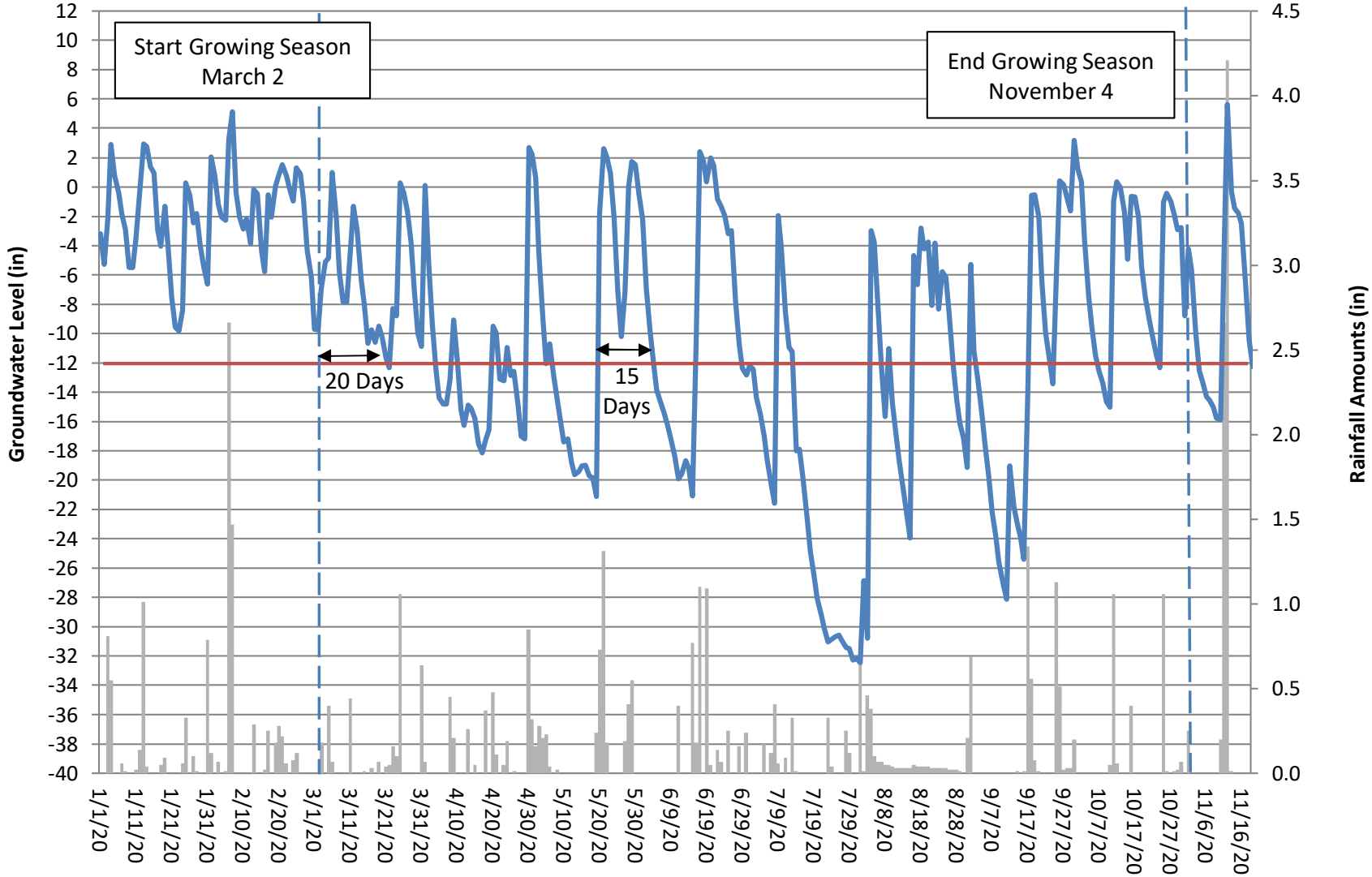
Alliance Headwaters Groundwater Gauge 11
Year 1 (2020 Data)



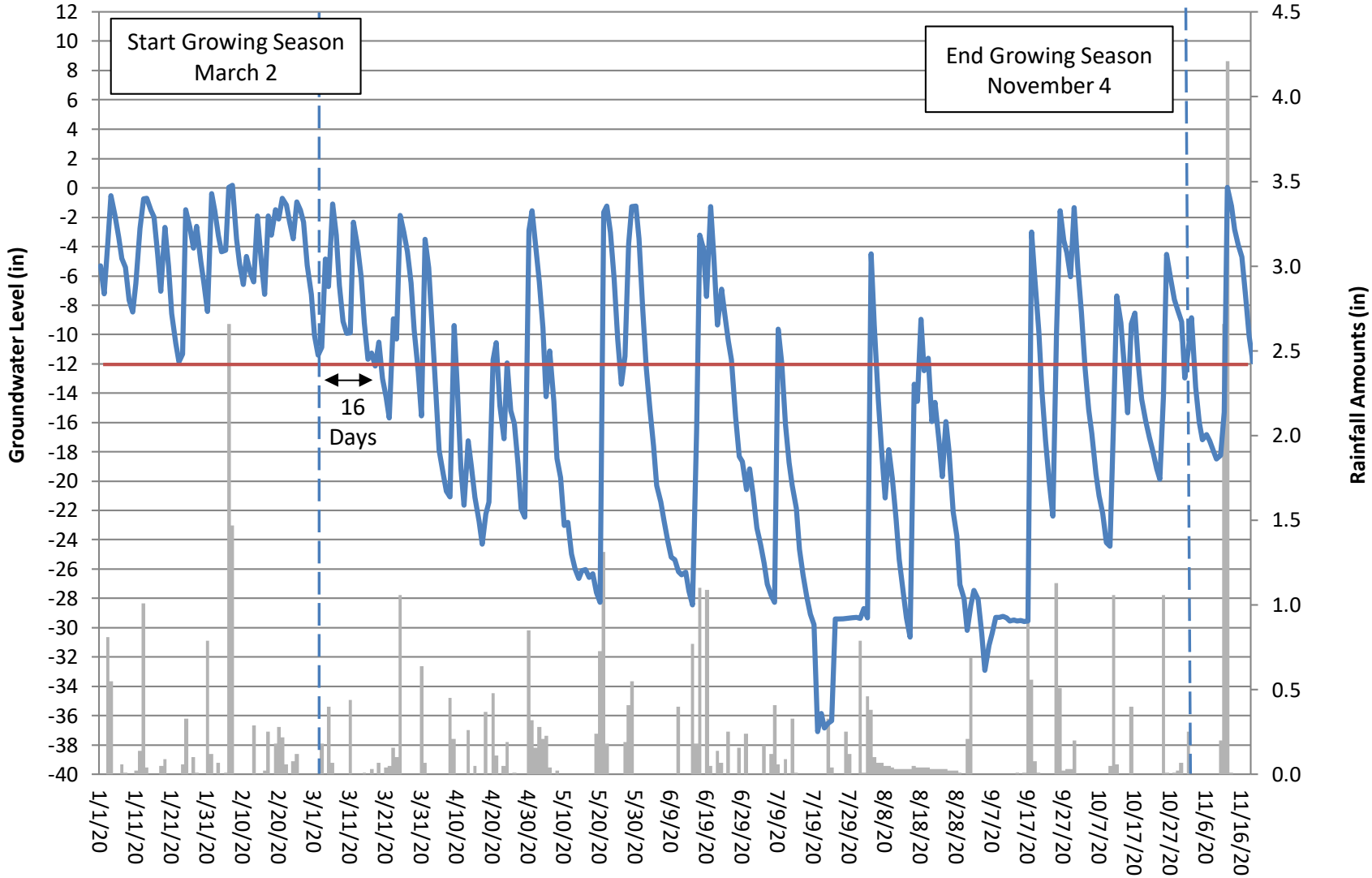
Alliance Headwaters Groundwater Gauge 12
Year 1 (2020 Data)



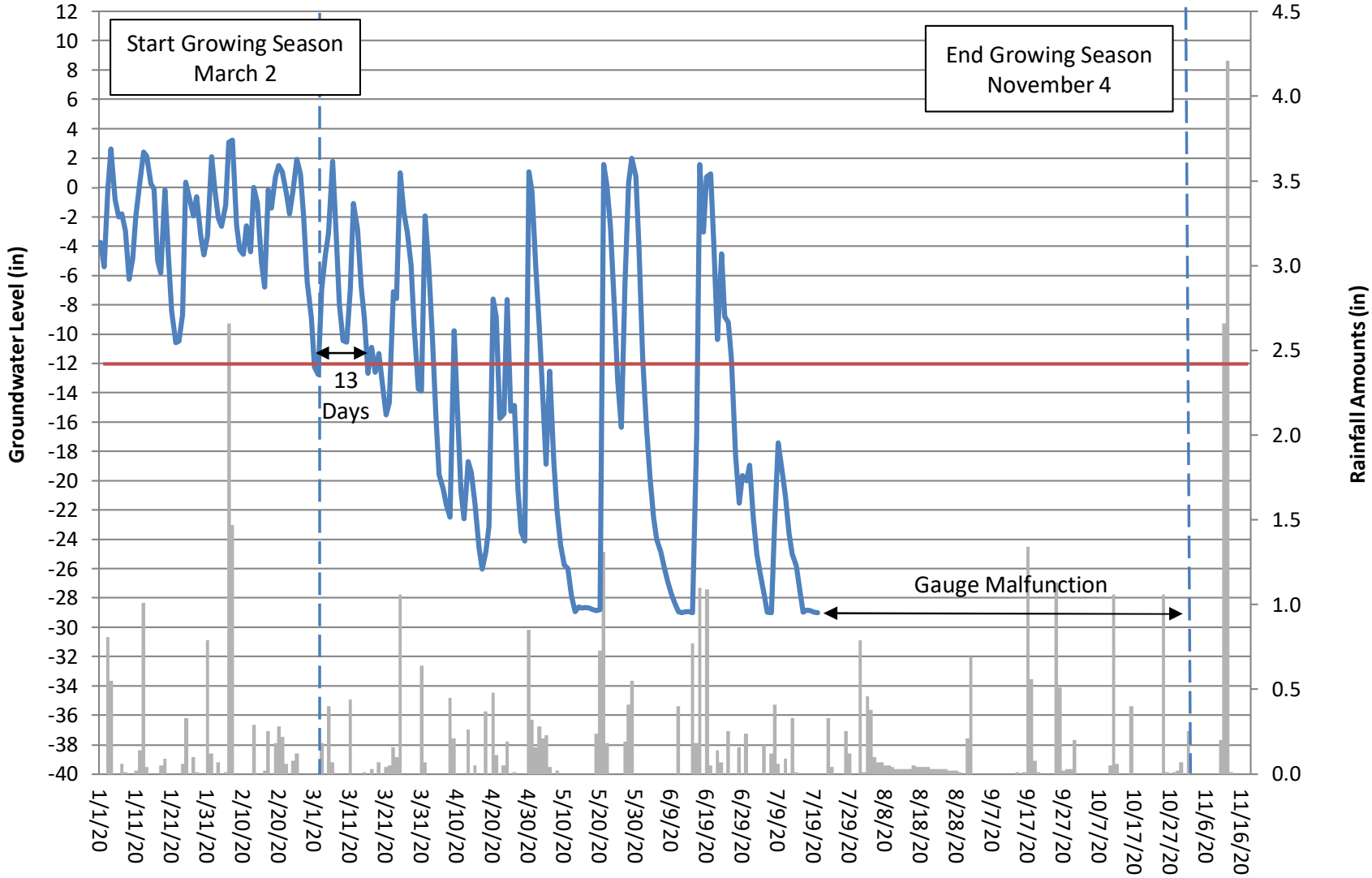
Alliance Headwaters Groundwater Gauge 13
Year 1 (2020 Data)



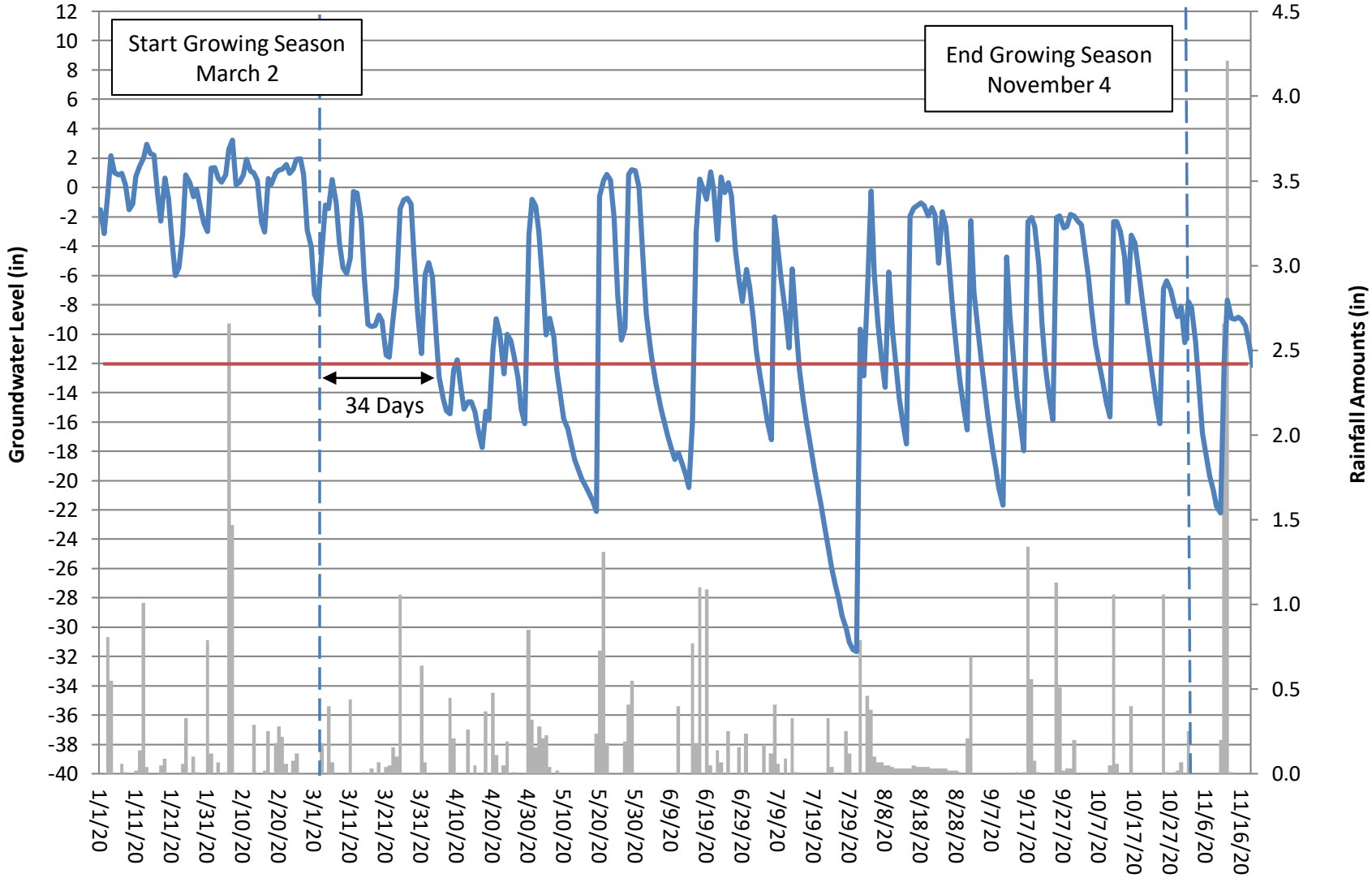
Alliance Headwaters Groundwater Gauge 14
Year 1 (2020 Data)



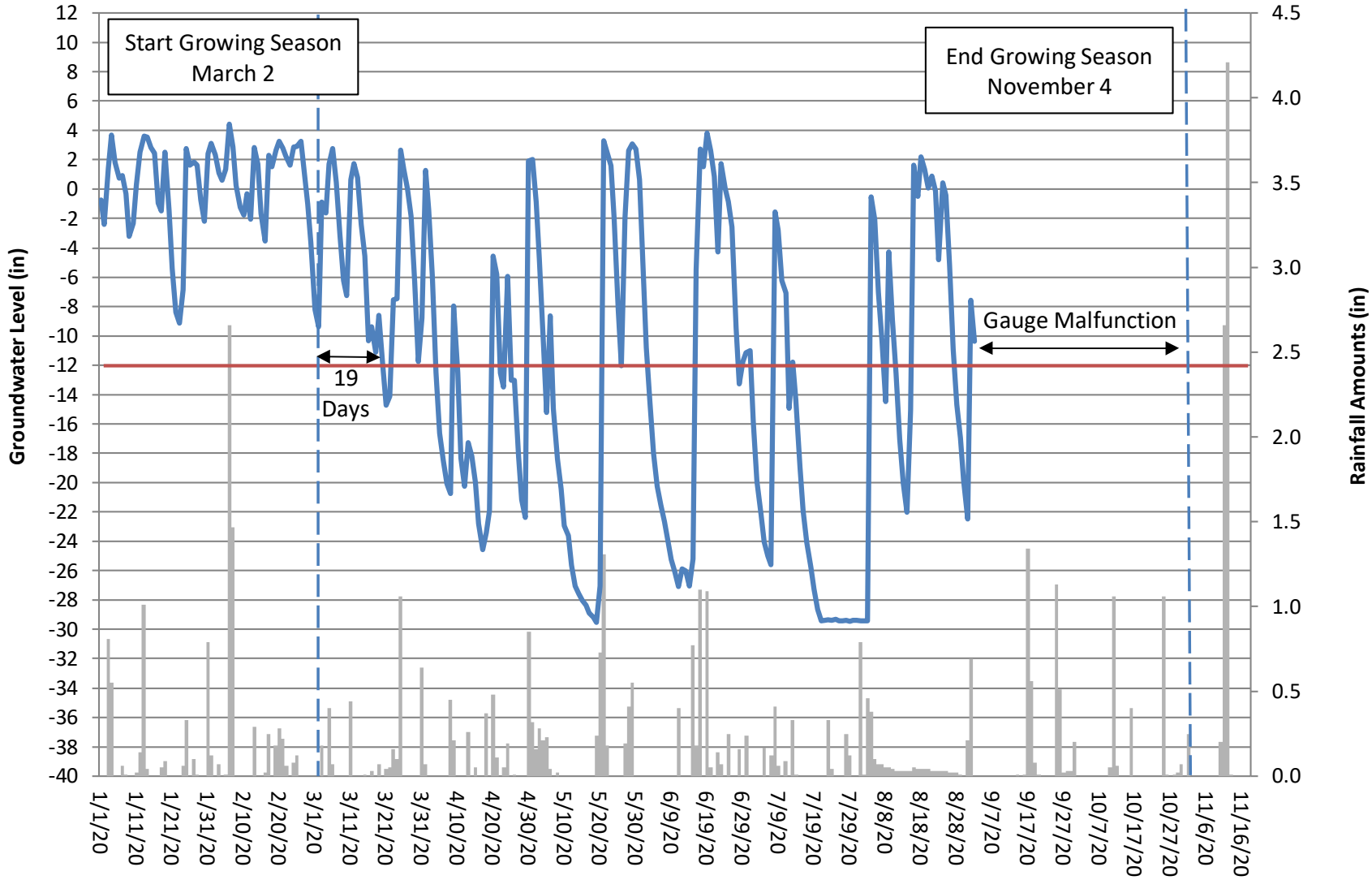
Alliance Headwaters Groundwater Gauge 15
Year 1 (2020 Data)



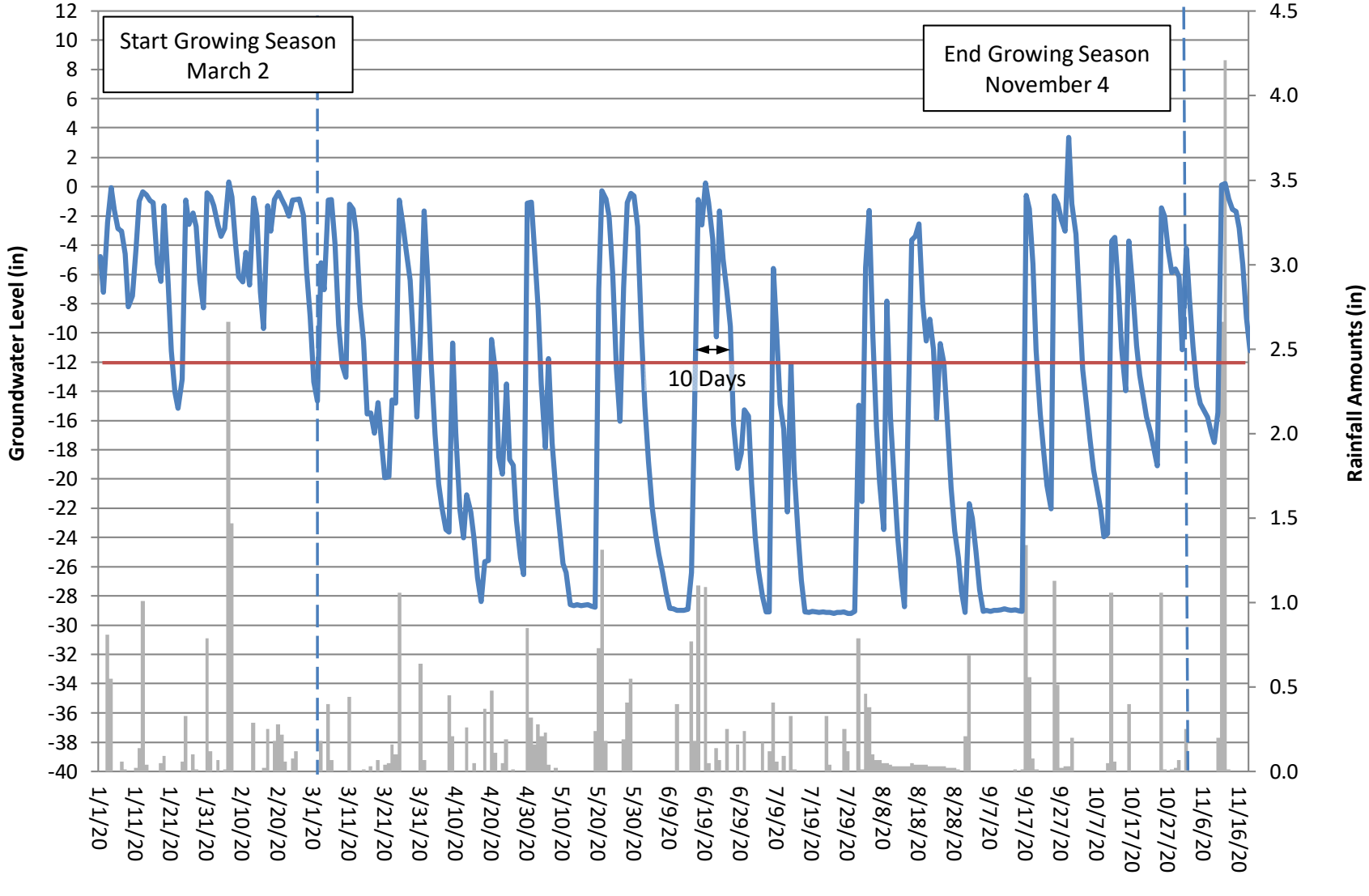
Alliance Headwaters Groundwater Gauge 16
Year 1 (2020 Data)



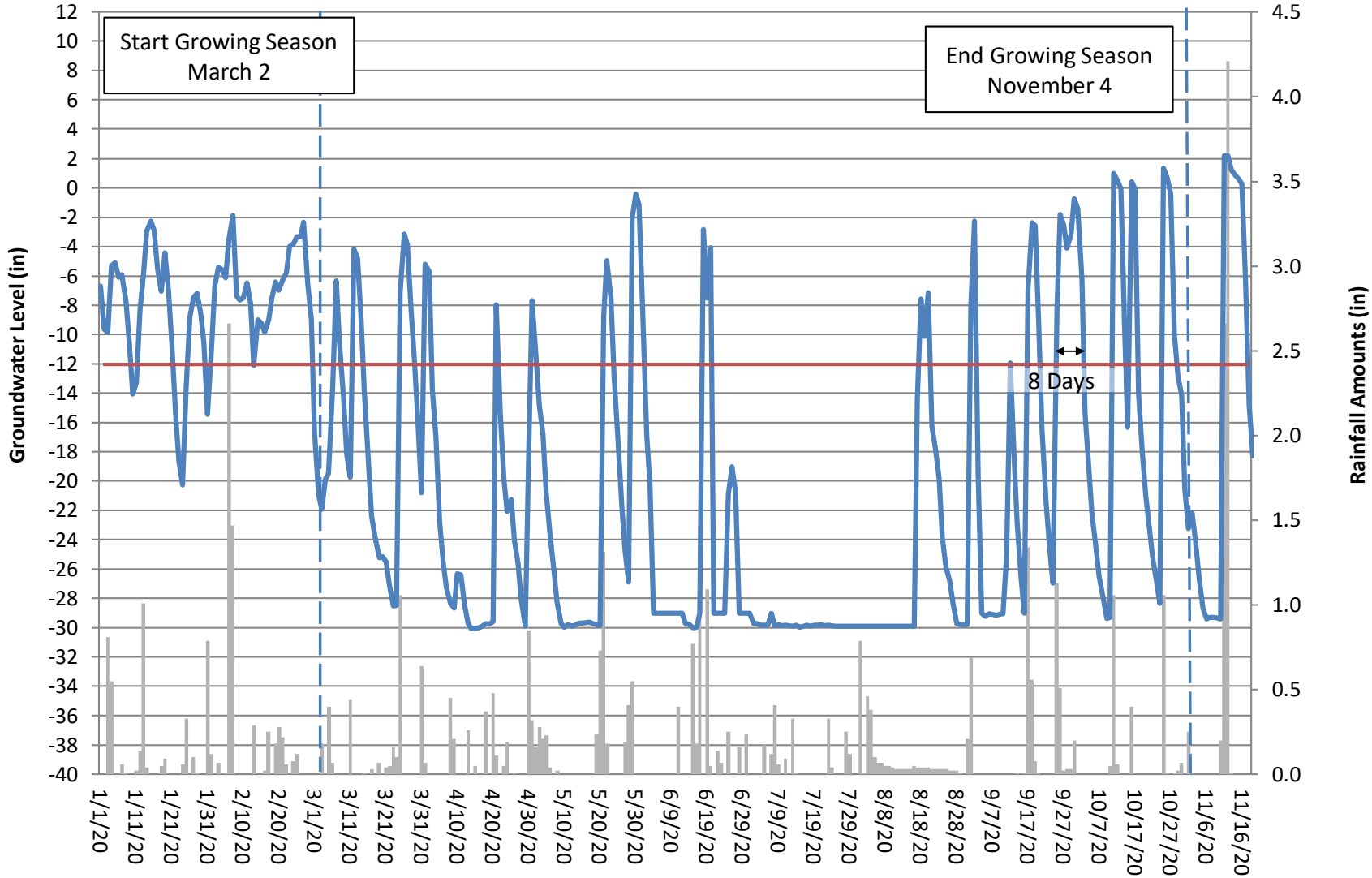
Alliance Headwaters Groundwater Gauge 17
Year 1 (2020 Data)



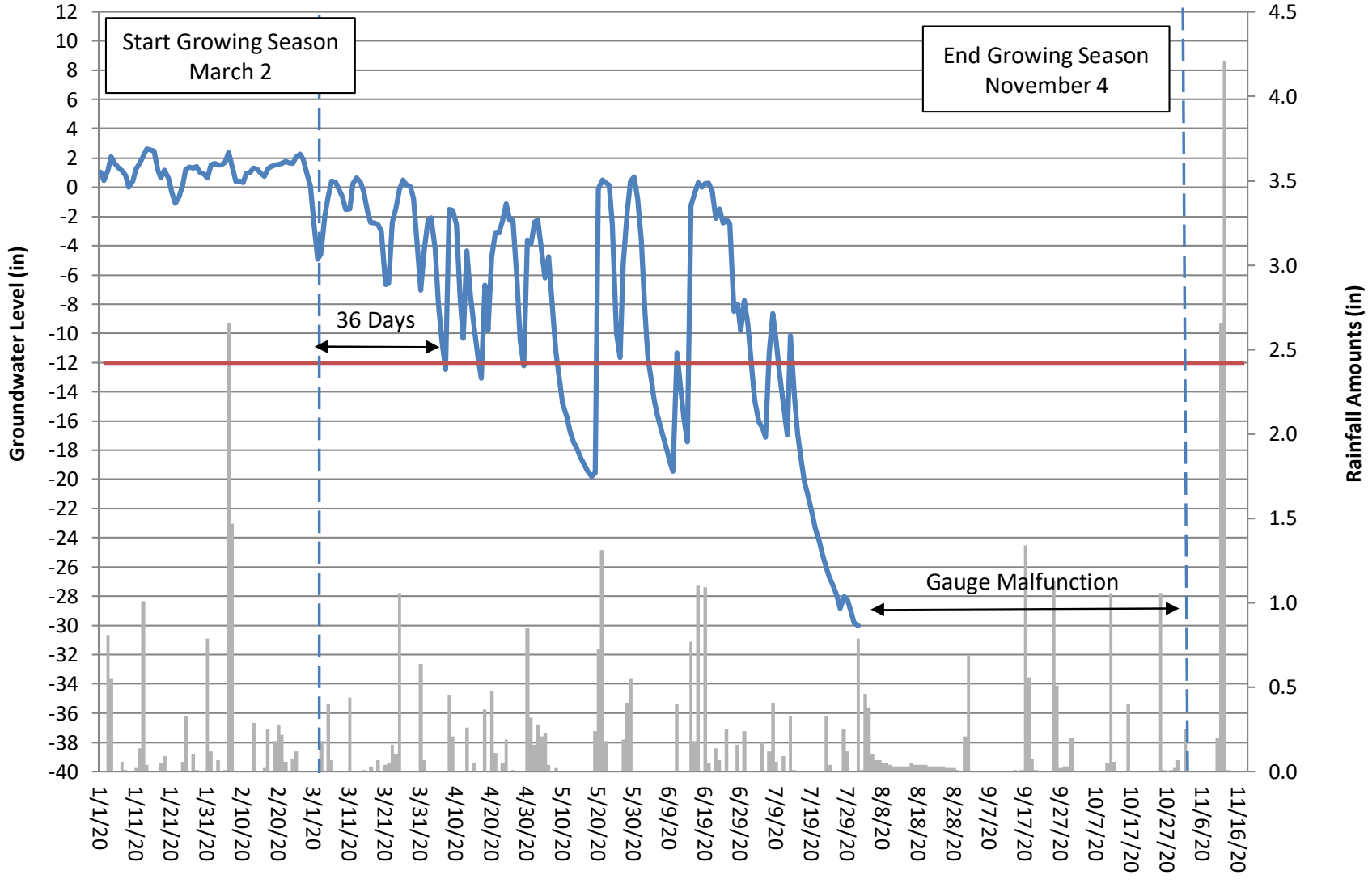
Alliance Headwaters Groundwater Gauge 18
Year 1 (2020 Data)



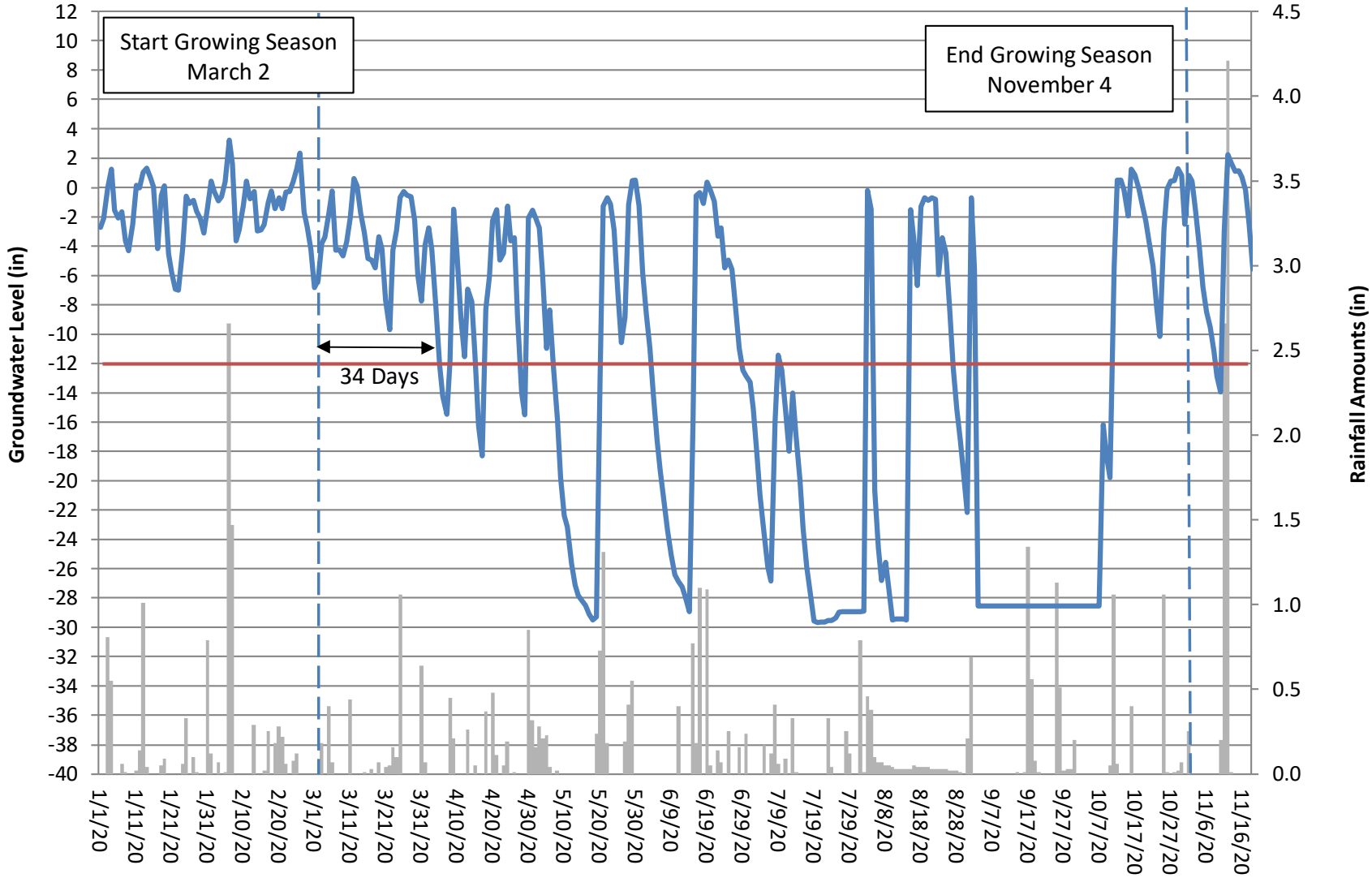
Alliance Headwaters Groundwater Gauge 19
Year 1 (2020 Data)

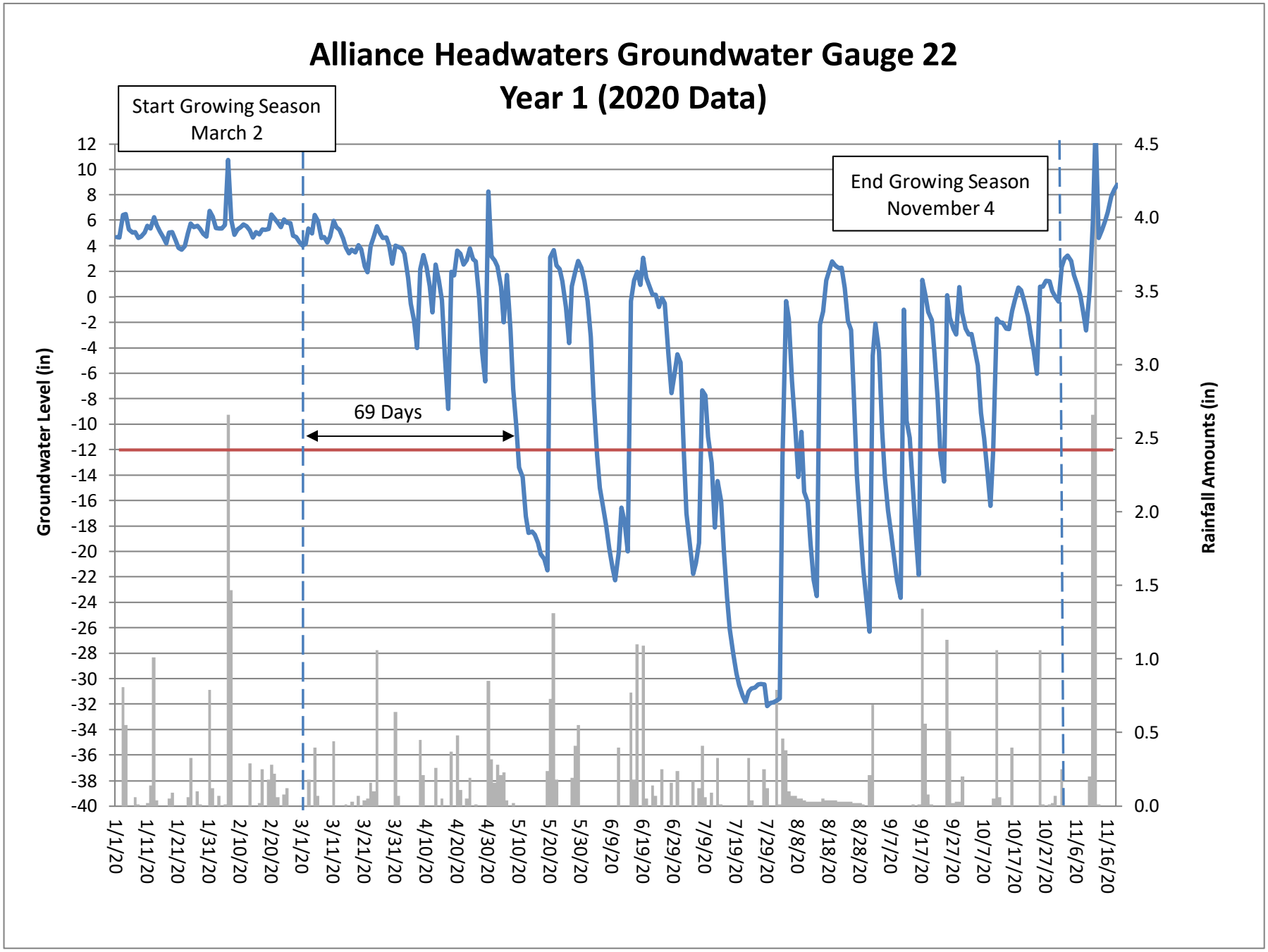


Alliance Headwaters Groundwater Gauge 20
Year 1 (2020 Data)

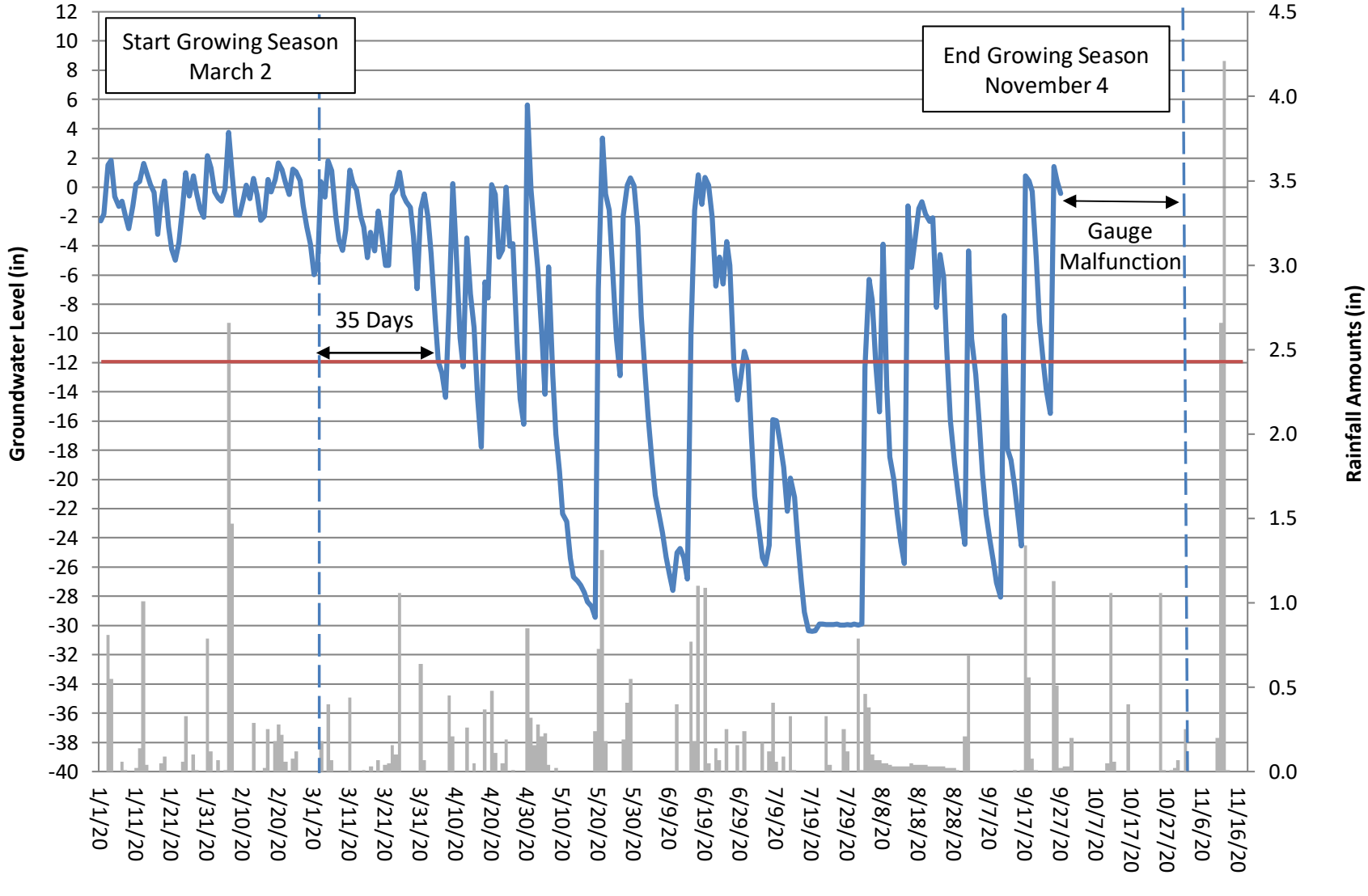


Alliance Headwaters Groundwater Gauge 21
Year 1 (2020 Data)

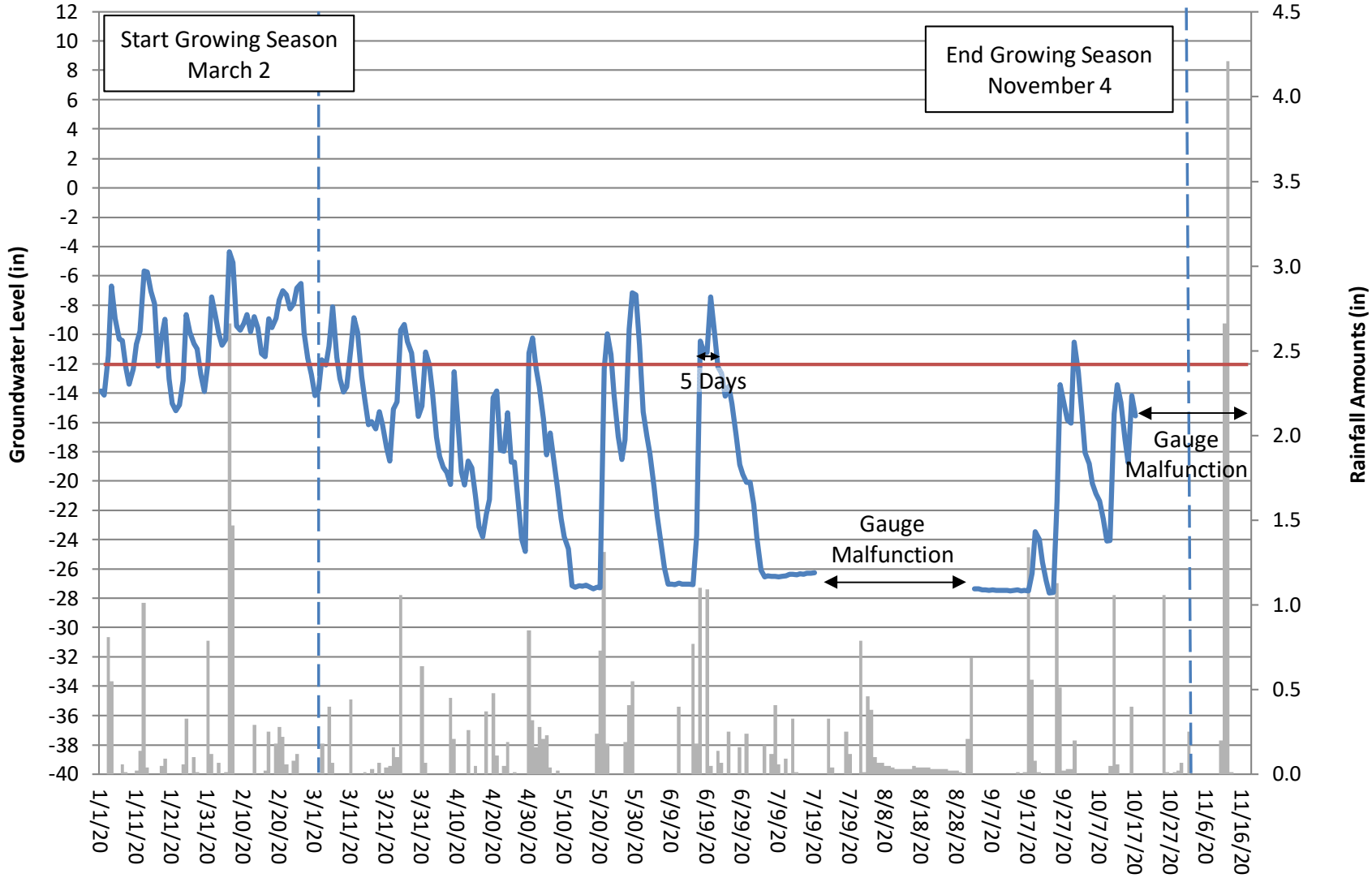



Alliance Headwaters Groundwater Gauge 22
Year 1 (2020 Data)
Start Growing Season
March 2
End Growing Season
November 4
69 Days
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

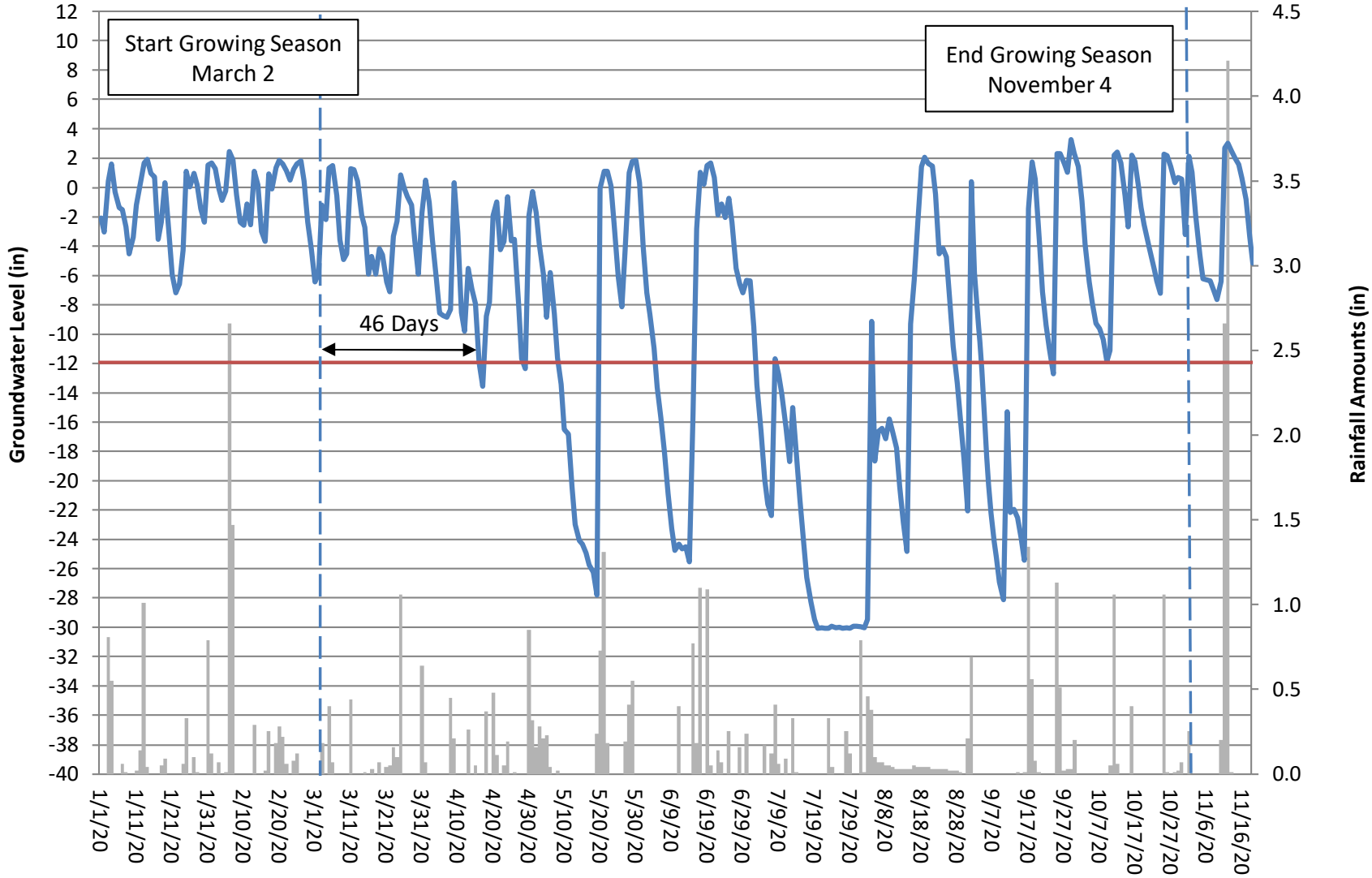
Alliance Headwaters Groundwater Gauge 23
Year 1 (2020 Data)

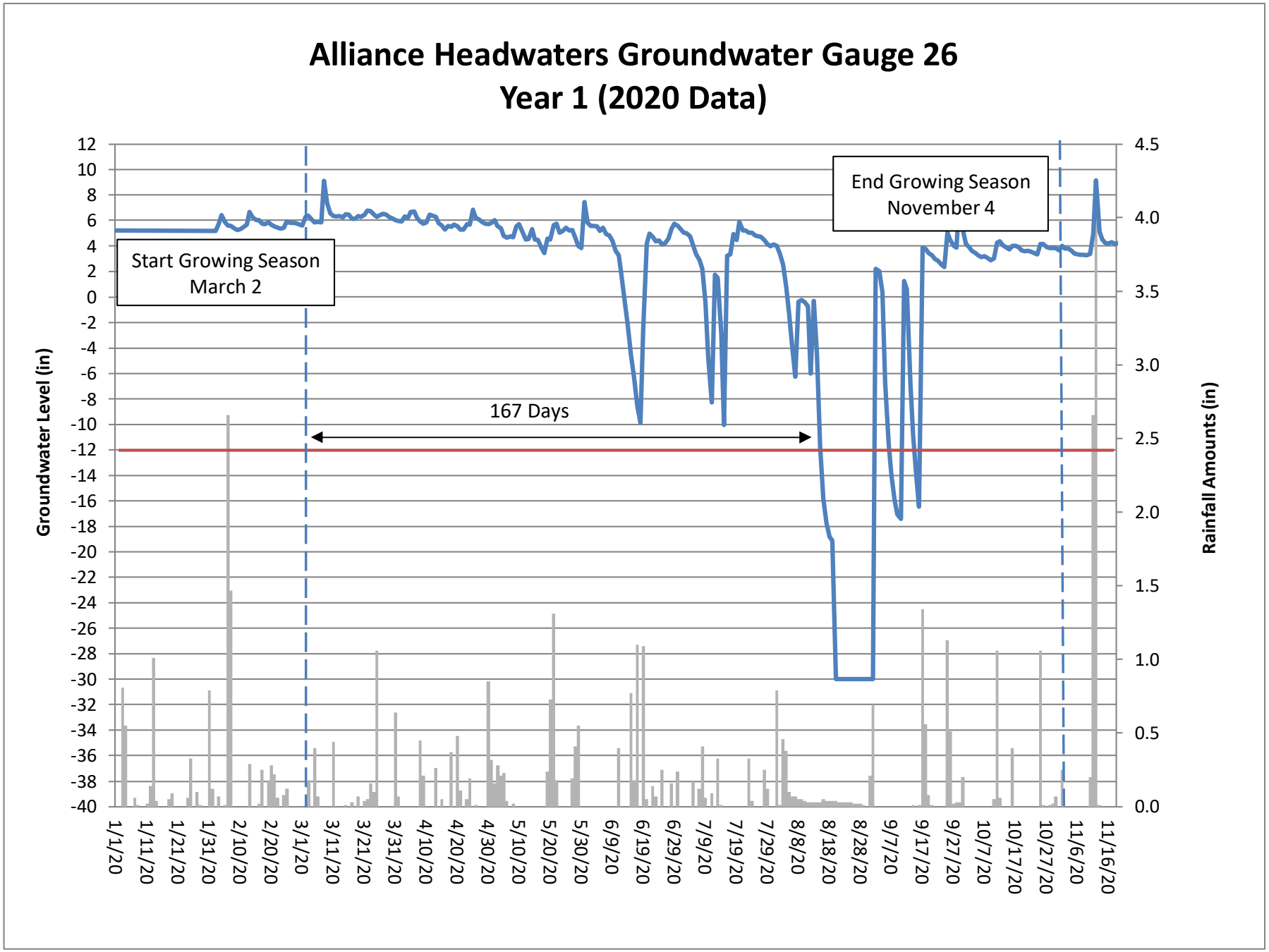


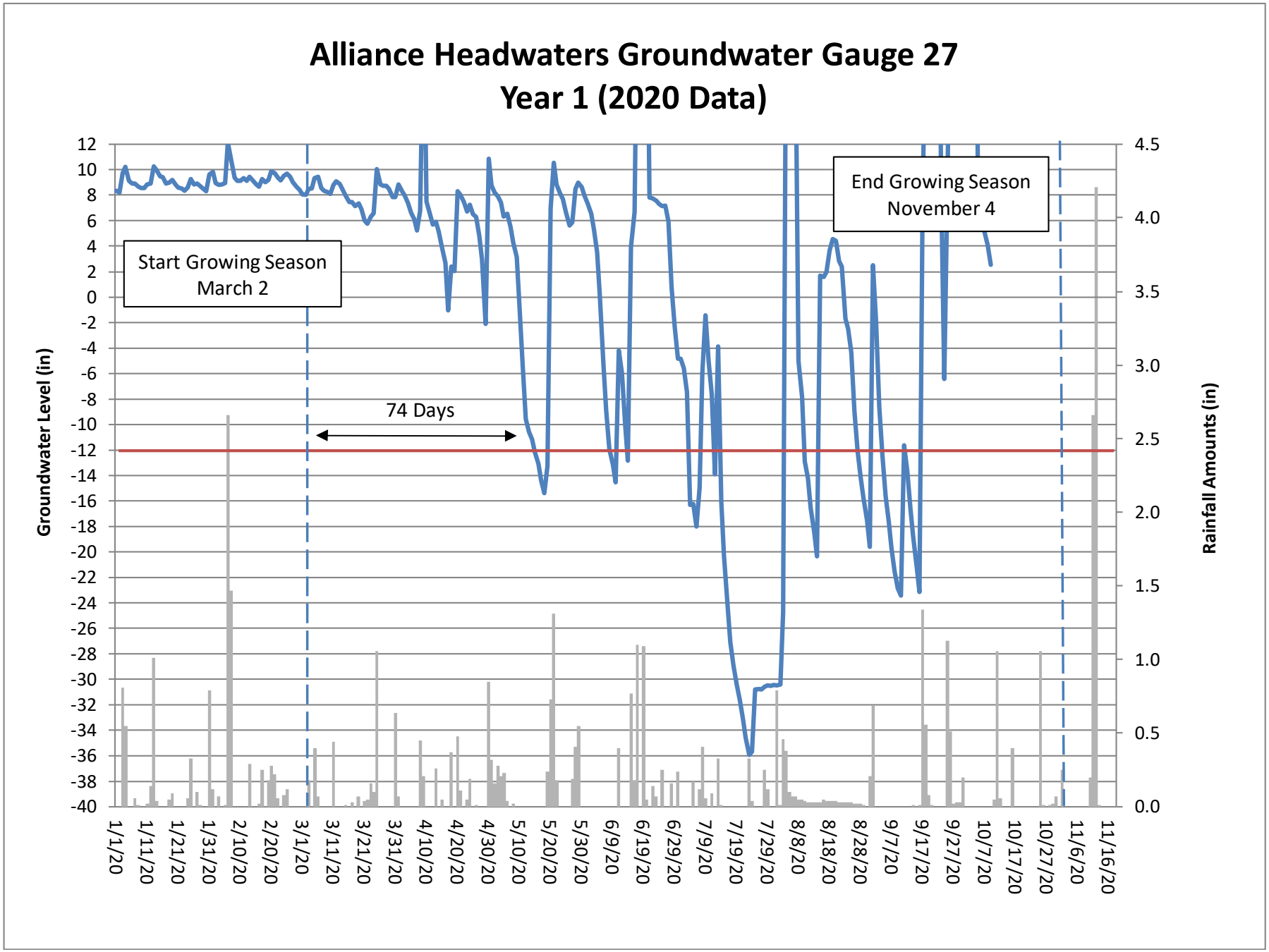
Alliance Headwaters Groundwater Gauge 24
Year 1 (2020 Data)



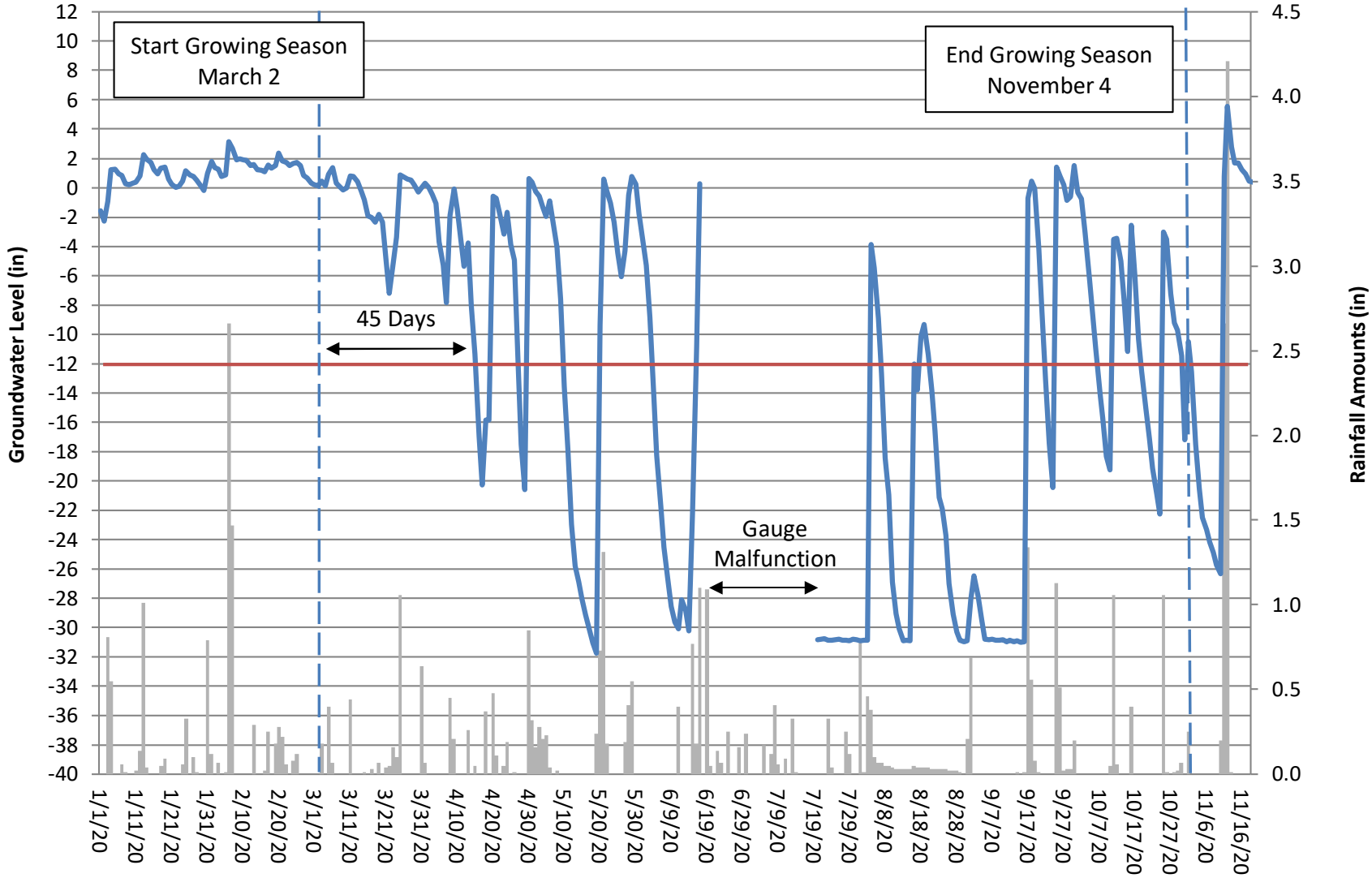
Alliance Headwaters Groundwater Gauge 25
Year 1 (2020 Data)



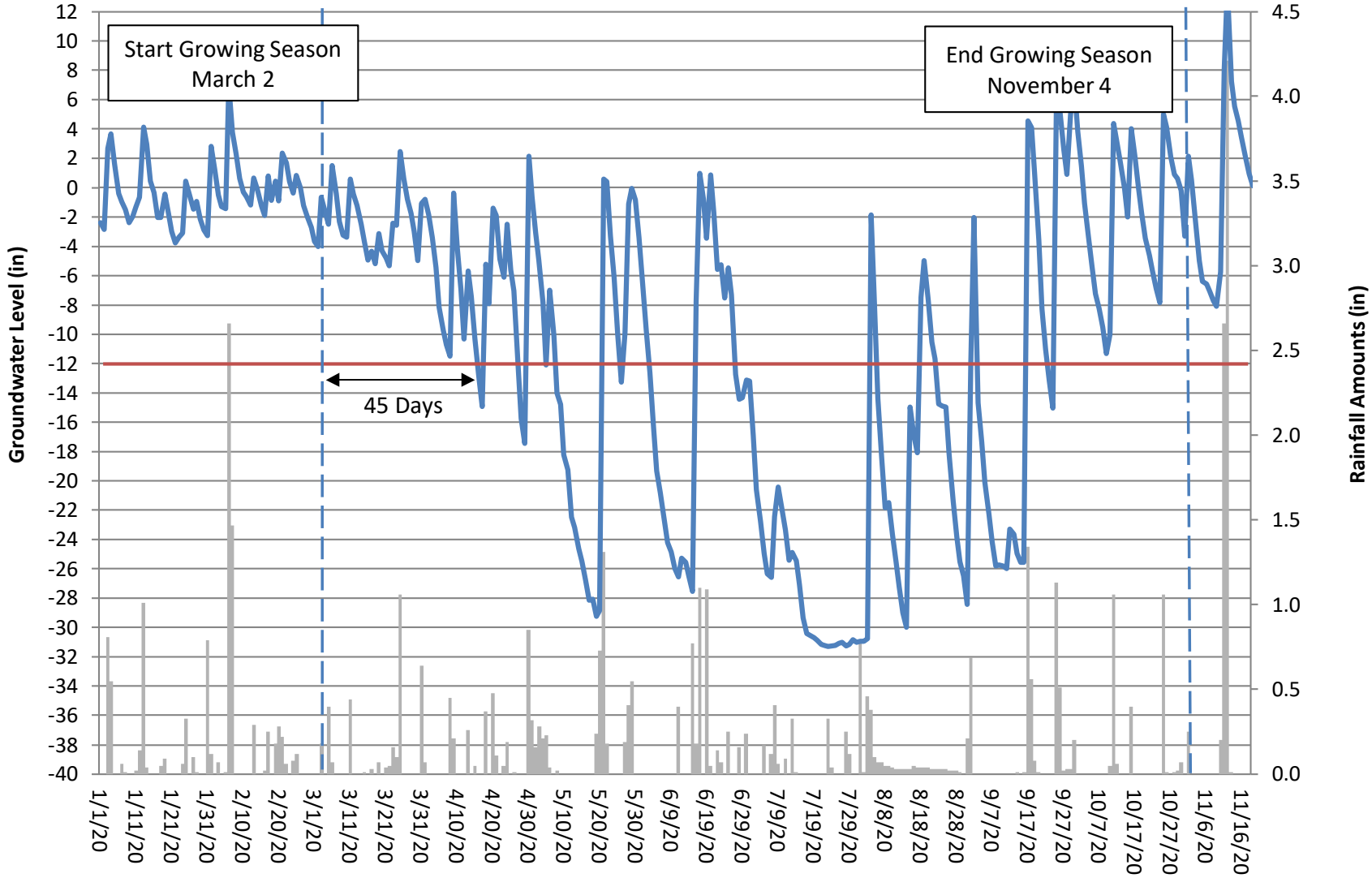

Alliance Headwaters Groundwater Gauge 26
Year 1 (2020 Data)
Start Growing Season
March 2
End Growing Season
November 4
167 Days
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20


Alliance Headwaters Groundwater Gauge 27
Year 1 (2020 Data)
Groundwater Level (in)
Rainfall Amounts (in)
Start Growing Season
March 2
End Growing Season
November 4
74 Days
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/20
1/11/20
1/21/20
1/31/20
2/10/20
2/20/20
3/1/20
3/11/20
3/21/20
3/31/20
4/10/20
4/20/20
4/30/20
5/10/20
5/20/20
5/30/20
6/9/20
6/19/20
6/29/20
7/9/20
7/19/20
7/29/20
8/8/20
8/18/20
8/28/20
9/7/20
9/17/20
9/27/20
10/7/20
10/17/20
10/27/20
11/6/20
11/16/20

Alliance Headwaters Groundwater Gauge 28
Year 1 (2020 Data)



Alliance Headwaters Groundwater Gauge 29
Year 1 (2020 Data)



APPENDIX F: RESPONSES TO MY0 IRT COMMENTS

Response to IRT Comments – As-Built and Baseline Monitoring Document
Comments Received April 22nd, 2020
IRT Site Visit May 20th, 2020 (DWR only – Mac Haupt & Erin Davis)

Comments Received (Black Text) & Responses (Blue Text)

EPA Comments, Todd Bowers:

1. Monitoring Summary table lists "Wetland Restoration" and would be appropriately called "Wetland Hydrology" as that is the parameter of interest here. While I understand that hydrology and growing season are tied together and the trees have only been in the ground for 3 months, much of it outside the growing season, it would be interesting and potentially beneficial to have hydrology data going back to installation. Data from groundwater gauges is listed as a parameter scheduled to be monitored as part of the as-built report.
   Groundwater gauge data was not monitored for the Asbuilt Report as gauges were not installed until late 2019. "Asbuilt" was included in the "Schedule/Frequency" column of the Monitoring Summary table in error and has been removed. This report depicts groundwater gauge data from January 1, 2020 through the growing season.

2. Vegetation Plot #15 needs close attention as supplemental planting may be needed in the vicinity. Overall averages look normal for just planted.
   Vegetation plot 15 and all other vegetation plots met success criteria during year 1 (2020).

3. Figure 1 Project Name is erroneous.
   The Figure 1 Project name was updated.

4. Figure 2A Wetland Restoration acreage is erroneous (Should be approximately 9.5 acres instead of 30.24)
   DMS feels it is prudent to show the site-wide wetland acreage and stream footage on Figures 2A and 2B to avoid confusion with site assets.

5. Figure 2A Wetland Creation (WC1) should be 0.54 acres instead of 1.44 acres
   DMS feels it is prudent to show the site-wide wetland acreage and stream footage on Figures 2A and 2B to avoid confusion with site assets.

6. Figure 2B Wetland Restoration acreage should be approximately 20.7 acres (30.24 listed)
   DMS feels it is prudent to show the site-wide wetland acreage and stream footage on Figures 2A and 2B to avoid confusion with site assets.

7. Figure 2B Wetland Creation (WC3) should be 0.90 acres instead of 1.44 acres
   DMS feels it is prudent to show the site-wide wetland acreage and stream footage on Figures 2A and 2B to avoid confusion with site assets.

DWR Comments, Mac Haupt:

1. Please be sure to include the soil temperature probes on the CCPV for the monitoring reports.
   The rain gauge and soil temperature probe were added to Figure 2A.

2. Will need to watch a few areas of wetland restoration given some of the grading, particularly upper UT1- R3, and other similar areas.
   Understood

3. The drone footage was good. I would recommend next time to include the inset map for full flight after construction as well.
   Understood

4. Some drone photos at the end of the document were good to see the tributaries coming out of the headwater wetland. Perhaps more of these in the future.
   Additional photos were added to the Year 1 (2020) Monitoring Report. We will continue to supply photos with the annual monitoring report.

APPENDIX G: SITE PHOTOS

UT1 Reach 3 & UT2

UT2 (XC-02)

UT2 Downstream

UT2 – Flow Gauge

UT1 Reach 3 – Upstream

UT1 Reach 3 – Flow Gauge

UT1 Reach 2

UT1 Reach 1 & 2 + UT1A

UT1 Reach 1

UT1 Reach 1 & UT1A Confluence

UT1 Reach 2 – XS-06

UT3 & UT4

UT3 & UT4

UT3 & UT4 Confluence

UT3

UT4

Looking south of UT3 Reach 1 (GW Gauge 25 & 26)

Looking north of UT4 (GW Gauge 28 & 29)

APPENDIX H: NOTICE OF CREDIT RELEASE

Mitigation Project Name	**Alliance Headwaters Stream Mitigation Site**	**USACE Action ID**	**2016-00882**
DMS ID	**97086**	**DWR Permit**	**16-0405v2**
River Basin	**Neuse**	**Date Project Instituted**	**3/21/2016**
Cataloging Unit	**03020201**	**Stream/Wet. Service Area**	**Neuse 03020201**
County	**Johnston**	**Date Prepared**	**3/25/2020**

Signature & Date of Official Approving Credit Release

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

2 - For NCDMS projects, the initial credit release milestone occurs when the as-built report (baseline monitoring report) has been approved by the NCIRT and posted to the NCDMS Portal, provided the following criteria have been met:

1) Approved of 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) Receipt of necessary DA permit authorization or written DA approval for projects 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.

Credit Release Milestone	**Warm Stream Credits**						
Project Credits	**Scheduled Releases %**	**Proposed Releases %**	**Proposed Released #**	**Not Approved # Releases**	**Approved Credits**	**Anticipated Release Year**	**Actual Release Date**
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	30.00%	1,808.815	0.000	1,808.815	2020	3/25/2020
3 - Year 1 Monitoring	10.00%					2021	
4 - Year 2 Monitoring	10.00%					2022	
5 - Year 3 Monitoring	10.00%					2023	
6 - Year 4 Monitoring	5.00%					2024	
7 - Year 5 Monitoring	10.00%					2025	
8 - Year 6 Monitoring	5.00%					2026	
9 - Year 7 Monitoring	10.00%					2027	
Stream Bankfull Standard	10.00%						
			Totals		1,808.815		

Total Gross Credits	6,029.384
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	1,808.815
Total Percentage Released	30.00%
Remaining Unreleased Credits	4,220.569

Credit Release Milestone	**Riparian Credits**						
Project Credits	**Scheduled Releases %**	**Proposed Releases %**	**Proposed Released #**	**Not Approved # Releases**	**Approved Credits**	**Anticipated Release Year**	**Actual Release Date**
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	30.00%	11.807	0.000	11.807	2020	3/25/2020
3 - Year 1 Monitoring	10.00%					2021	
4 - Year 2 Monitoring	10.00%					2022	
5 - Year 3 Monitoring	15.00%					2023	
6 - Year 4 Monitoring	5.00%					2024	
7 - Year 5 Monitoring	15.00%					2025	
8 - Year 6 Monitoring	5.00%					2026	
9 - Year 7 Monitoring	10.00%					2027	
Stream Bankfull Standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Totals		11.807		

Total Gross Credits	39.354
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	11.807
Total Percentage Released	30.00%
Remaining Unreleased Credits	27.547

Mitigation Project Name	**Alliance Headwaters Stream Mitigation Site**	**USACE Action ID**	**2016-00882**
DMS ID	**97086**	**DWR Permit**	**16-0405v2**
River Basin	**Neuse**	**Date Project Instituted**	**3/21/2016**
Cataloging Unit	**03020201**	**Stream/Wet. Service Area**	**Neuse 03020201**
County	**Johnston**	**Date Prepared**	**3/25/2020**

Notes

Contingencies (if any)

Project Quantities

Mitigation Type	Restoration Type	Physical Quantity
Warm Stream	Restoration	6,529.000
Riparian	Restoration	40.460
Riparian	Creation	1.090
Riparian	Enhancement	0.380
Riparian	Preservation	16.390

Debits

							Stream Restoration Credits	Riparian Restoration	Riparian Restoration Equivalent Credits
Beginning Balance (mitigation credits)							**6,029.384**	**37.598**	**1.756**
Unrealized Credits							**0.000**	**0.000**	**0.000**
Converted Credits							**0.000**	**0.000**	**0.000**
Owning Program	**Req. Id**	**TIP #**	**Project Name**	**USACE Permit #**	**DWR Permit #**	**DCM Permit #**			
NCDOT Stream & Wetland ILF Program	REQ-008290	R-2721A	R-2721A - NC 540 - West of NC 55 to East of SR 1389	2009-02240	2018-1249		1,808.815		
Statewide Stream & Wetland ILF Program	REQ-002988		Town of Cary Windsor Oaks Water/Sewer Ext		2006-0613			0.095	
Statewide Stream & Wetland ILF Program	REQ-006127		Austin Creek Phase 2	2011-01676	2014-0695			0.216	
Statewide Stream & Wetland ILF Program	REQ-006448		Knightdale Station	2015-01553	2015-0838			0.490	
Statewide Stream & Wetland ILF Program	REQ-006546		Martin Marietta's Benson Quarry	2014-00845	1995-0153			10.479	
Statewide Stream & Wetland ILF Program	REQ-006546		Martin Marietta's Benson Quarry	2014-00845	1995-0153				0.527
Remaining Available balance (Released credits)							**0.000**	**0.000**	**0.000**
Remaining balance (mitigation credits)							**4,220.569**	**26.318**	**1.229**