FINAL
MONITORING REPORT (MY2)

SLINGSHOT MITIGATION SITE
Rockingham County, North Carolina

DMS Project ID No. 100058
Full Delivery Contract No. 7525 USACE
Action ID No. SAW-2018-01170
DWR ID 20180795
RFP No. 16-007330

Cape Fear River Basin
Cataloging Unit 03030002

Data Collection: January - October
2021 Submission: January 2022

Prepared for:

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

Restoration Systems, LLC
1101 Haynes St. Suite 211
Raleigh, North Carolina
Ph: (919) 755-9490
Fx: (919) 755-9492

Response to Monitoring Year 2 (2021) DMS Comments

Slingshot Mitigation Site
Cape Fear River Basin – CU# 03030002 – Rockingham County
DMS Project ID No. 100058
Contract # 7525

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

1. The monitoring summary's Site Maintenance Report table shows three instances of invasive and nuisance vegetation management during the monitoring period. The treatment locations should be shown on the CCPV as points or polygons and areas shown on Table 6.
   Response: Invasive treatment areas have been included on the CCPV and Table 6.

2. Table 12 – This Table should include the current cross sectional area, i.e., the LTOB cross sectional area. The "Cross Sectional Area Between End Pins" row could be replaced with LTOB cross sectional area. This should also be reported with the summary data associated with the cross section graphs. We also recommend displaying the LTOB on the graphs as a line instead of a point for easier comparison with Bankfull based on MY0 XSA.
   Response: The row "Cross Sectional Area Between End Pins" was replaced with "LTOB Cross Sectional Area" in Table 12. Additionally, a row for LTOB Cross Sectional Area" was added to the cross-section figures. The point for LTOB on the graphs was replaced with a line.

3. Please include the excel workbook used to create Tables 9 & 10.
   Response: This Excel file is included in the digital submittal.

4. Please include the stream gauge figures in the report and send supporting soil temperature data with the resubmittal.
   Response: Stream gauge graphs are included in the final PDF, and soil temperature data is located in the master groundwater gauge workbook.

5. In Appendix E, please include a figure displaying the 30th and 70th percentile of monthly precipitation with the observed monthly precipitation, and submit the data used to create this figure.
   Response: This figure is included in Appendix E. The excel data used to create it is included in the digital submittal.

***Gauge data was updated to follow the growing season methodology approved in the mitigation plan.

Slingshot Year 2, 2021 Monitoring Summary

General Notes

- No encroachment was identified in Year 2
- No evidence of nuisance animal activity (i.e., beaver, heavy deer browsing, etc.) was observed.

Streams

- Stream monitoring data show that all stream channels and structures are stable.

Wetlands

- Ten of Eleven groundwater gauges met success for the Year 2 (2021) monitoring period. Wetland hydrology data is in Appendix E.

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	Yes 26 days (11.4%)	Yes 62 days (24.5%)					
2	Yes 61 days (26.8%)	Yes 253 days (100%)					
3	Yes 187 days (82.0%)	Yes 123 days (48.6%)					
4	Yes 187 days (82.0%)	Yes 178 days (70.4%)					
5	Yes 100 days (43.9%)	Yes 123 days (48.6%)					
6	Yes 127 days (55.7%)	Yes 143 days (56.5%)					
7	Yes 83 days (36.4%)	Yes 210 days (83.0%)					
8	Yes 29 days (12.7%)	Yes 71 days (28.0%)					
9	Yes 73 days (32.0%)	Yes 109 days (43.1%)					
10	No 4 days (1.8%)	No 5 days (2.0%)					
11*	Yes 46 days (20.2%)	Yes 151 days (59.7%)					

*Gauge 11 was installed in an area not previously identified for wetland reestablishment but appeared to be exhibiting wetland characteristics post-construction. During 2021 monitoring, the additional wetlands surrounding gauge 11 were delineated, resulting in approximately 0.52 acres of wetlands on-site that were not previously accounted for (Appendix F).

Vegetation

- Year 2 (2021) vegetation measurements occurred on October 21, 2021 and included 2 additional random sample plots (50-meter by 2-meter). Measurements of all 12 plots resulted in an average of 644 stems/acre excluding livestakes. Additionally, all permanent plots met success criteria, while transect 2 was two stems shy of success. (Tables 8-10, Appendix C).

Site Permitting/Monitoring Activity and Reporting History

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Technical Proposal (RFP No. 16-007330)	February 2, 2018	February 8, 2018
Institution Date (NCDMS Contract No. 100058)	--	April 24, 2018
Mitigation Plan	September 2018	June 2019
Construction Plans	--	November 18, 2019
404 Permit	--	January 2, 2020
Site Construction Final Walkthrough	--	April 30, 2020
Planting	--	April 30, 2020
As-built Baseline Monitoring (MY0)	May 2020	August 2020
Annual Monitoring (MY1)	November 2020	January 2021
Annual Monitoring (MY2)	October 2021	January 2022

Site Maintenance Report (2021)

Invasive Species Work	Maintenance work
7/28/2021 Kudzu, Multiflora Rose, Privet, Sweetgum, Honeysuckle, Tree-of-Heaven, Callery Pear, Cattail 8/02/2021 Tree-of-Heaven, Callery Pear, Kudzu, Privet, Multiflora Rose, Honeysuckle, Sweetgum, Princess Tree 9/24/2021 Kudzu	None

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Prepared by:

Restoration Systems, LLC
1101 Haynes Street, Suite 211
Raleigh, North Carolina 27604
Contact: Worth Creech
919-755-9490 (phone)
919-755-9492 (fax)

And

Axiom Environmental, Inc.
218 Snow Avenue
Raleigh, North Carolina 27603
Contact: Grant Lewis
919-215-1693 (phone)

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APPENDICES

1.0 PROJECT SUMMARY

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

1.1 Project Goals & Objectives

Project goals were based on the *Cape Fear River Basin Restoration Priorities* (RBRP) report (NCEEP 2009) and on-site preconstruction data collection of channel morphology and function observed during field investigations. The Site is located within Targeted Local Watershed (TLW) 03030002010010. The RBRP report documents benthic ratings vary between "Fair" and "Good-Fair" possibly due to cattle, dairy, and poultry operations.

The project is located within the Troublesome Creek and Little Troublesome Creek Local Watershed Planning area (NCEEP 2004); project activities addressed priorities associated with the LWP and site-specific information following the LWP goals in parenthesis.

1. Protect and improve water quality by restoring wetland, stream, and riparian area functions and values, which may have been, or may be, lost through historic, current, and future impacts (4115 linear feet of stream restored/enhanced/preserved, 1.71 acres of wetland restored/enhanced, and 11.6. acres of riparian buffer restored/enhanced).
2. Achieve a net increase in riparian zone buffers and wetlands acreage, functions, and values (11.6 acres of riparian buffer were restored/enhanced, and wetland acreage was increased by 1.02 acres).
3. Promote a comprehensive approach for the protection of natural resources (protected the Site, streams, wetlands, and riparian buffer through a permanent conservation easement).

In addition to the defined Troublesome Creek LWP goals, additional goals for the area generally revolve around reducing stressors to water quality. Stressors and how each was addressed by project activities are as follows.

1. Nutrient Inputs – (livestock were removed from streams resulting in a direct reduction of 474.7 pounds of nitrogen, 39.3 pounds of phosphorus per year, and 4.7×10^{11} colonies of fecal coliform; eliminated fertilizer applications; and installed marsh treatment areas).
2. Streambank Erosion – (reduction of 220 tons of sediment per year).
3. Stormwater – (reduced bank height ratios and installed marsh treatment area to reduce stormwater pulses).
4. Disturbed Riparian Buffer – (restored/enhanced 11.6 acres of riparian buffer along 4115 linear feet of stream).
5. Floodplain Alteration – (eliminated straightened, entrenched streams and removed spoil material deposited in the floodplain).

Site-specific mitigation goals and objectives were developed through the use of North Carolina Stream Assessment Method (NC SAM) and North Carolina Wetland Assessment Method (NC WAM) analyses of preconstruction and reference stream systems at the Site (NC SFAT 2015 and NC WFAT 2010) (see table below).

Stream/Wetland Targeted Functions, Goals, and Objectives

Targeted Functions	Goals	Objectives	Compatibility of Success Criteria
(1) HYDROLOGY			
(2) Flood Flow (Floodplain Access) (3) Streamside Area Attenuation (4) Floodplain Access (4) Wooded Riparian Buffer	• Attenuate flood flow across the Site. • Minimize downstream flooding to the maximum extent possible. • Connect streams to functioning wetland systems.	• Construct new channel at historic floodplain elevation to restore overbank flows and restore jurisdictional wetlands • Plant woody riparian buffer • Remove livestock • Deep rip floodplain soils to reduce compaction and increase soil surface roughness • Protect riparian buffers with a perpetual conservation easement	• Over the monitoring period BHR not to exceed 1.2 • Document four overbank events in separate monitoring years • Livestock excluded from the easement • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria • Conservation Easement recorded
(3) Stream Stability (4) Sediment Transport (4) Stream Geomorphology	• Increase stream stability within the Site so that channels are neither aggrading nor degrading.	• Construct channels with proper pattern, dimension, and longitudinal profile • Remove livestock • Construct stable channels with cobble/gravel substrate • Plant woody riparian buffer	• Cross-section measurements indicate a stable channel with cobble/gravel substrate • Visual documentation of stable channels and structures • Over the monitoring period BHR not to exceed 1.2 • < 10% change in BHR over the monitoring period • Livestock excluded from the easement • Attain Vegetation Success Criteria
(1) WATER QUALITY			
(2) Streamside Area Vegetation (3) Upland Pollutant Filtration (2) Indicators of Stressors Wetland Particulate Change	• Remove direct nutrient and pollutant inputs from the Site and reduce contributions to downstream waters.	• Remove livestock and reduce agricultural land/inputs • Install marsh treatment areas, where necessary • Plant woody riparian buffer • Restore/enhance jurisdictional wetlands adjacent to Site streams	• Livestock excluded from the easement • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria
(1) HABITAT			
(2) In-stream Habitat (3) Substrate (3) In-Stream Habitat (2) Stream-side Habitat (3) Stream-side Habitat (3) Thermoregulation Wetland Physical Structure Wetland Landscape Patch Structure Wetland Vegetation Composition	• Improve instream and streamside habitat.	• Construct stable channels with cobble/gravel substrate • Add large woody debris in the form of log vane structures • Plant permanent seed mixtures along banks to add rooting material and leafy vegetation for macroinvertebrates • Plant woody riparian buffer to provide organic matter and shade • Protect riparian buffers with a perpetual conservation easement • Restore/enhance jurisdictional wetlands adjacent to Site streams	• Cross-section measurement indicate a stable channel with cobble/gravel substrate • Visual documentation of stable channels and in-stream structures. • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria • Conservation Easement recorded

1.2 Project Background

The Slingshot Mitigation Site (hereafter referred to as the "Site") encompasses 11.6 acres of disturbed forest and livestock pasture along warm water, unnamed tributaries to Lake Hunt. The Site is located approximately 2 miles west of Reidsville, east of Lake Hunt, and north NC Highway 158 in Rockingham County (Figure 1, Appendix A).

Before construction, Site land use consisted of livestock pasture, hayfields, and disturbed forest. Livestock had unrestricted access to Site streams. A narrow riparian fringe had developed on the stream margins that was composed of opportunistic species, invasive species, and a few mature tree species. Approximately 55 percent of the stream channel was degraded, contributing to sediment export from the Site resulting from mechanical processes from livestock hoof shear. In addition, streamside wetlands were cleared and drained by channel downcutting, and land uses. Preconstruction Site conditions resulted in degraded water quality, a loss of aquatic habitat, reduced nutrient and sediment retention, and unstable channel characteristics (loss of horizontal flow vectors that maintain pools and an increase in erosive forces to channel bed and banks). Site restoration activities restored riffle-pool morphology, aided in energy dissipation, increased aquatic habitat, stabilized channel banks, and greatly reduced sediment loss from channel banks.

1.3 Project Components and Structure

Proposed Site restoration activities generated 3185 Stream Mitigation Units (SMUs) and 1.321 Riparian Wetland Mitigation Units (WMUs) as the result of the following.

- 2501 linear feet of Priority I stream restoration
- 587 linear feet of stream enhancement (Level I)
- 635 linear feet of stream enhancement (Level II)
- 391 linear feet of stream preservation
- 1.018 acre of riparian wetland restoration
- 0.606 acre of riparian wetland enhancement

Additional activities that occurred at the Site included the following.

- Planting 12.05 acres of the Site with 10,950 stems (planted species are included in Table 5 [Appendix C]).

Deviations from the construction plans included removing the left vane arm from the structure at station 05+63 on Slingshot Creek and removing the three log cross-vanes between station 03+00 and 04+00 on UT1 due to bedrock presence. No other deviations of significance occurred between construction plans and the as-built condition. In addition, no issues have arisen since construction occurred.

Site design was completed in November 2019. Construction started on March 13, 2020, and ended within a final walkthrough on April 30, 2020. The Site was also planted on April 30, 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

Project success criteria have been established per the October 24, 2016, NC Interagency Review Team *Wilmington District Stream and Wetland Compensatory Mitigation Update*. Monitoring and success criteria relate to project goals and objectives. From a mitigation perspective, several of the goals and

objectives are assumed to be functionally elevated by restoration activities without direct measurement. Other goals and objectives will be considered successful upon achieving success criteria. The following table summarizes Site success criteria.

Success Criteria

Streams
• All streams must maintain an Ordinary High-Water Mark (OHWM), per RGL 05-05. • Bank height ratio (BHR) cannot exceed 1.2 at any measured cross-section over the monitoring period. • BHR at any measured riffle cross-section should not change by more than 10% from baseline condition over the monitoring period. • A minimum of 30-days continuous surface flow for intermittent streams. • The stream project shall remain stable and all other performance standards shall be met through four separate bankfull events, occurring in separate years, during the monitoring years 1-7.
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: Growing season length will be confirmed with a continuous recording temperature gauge that will measure from February to April each monitoring year.
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 in each plot. • Planted and volunteer stems are counted, provided they are included in the approved planting list for the site; natural recruits not on the planting list may be considered by the IRT on a case-by-case basis.

Note: BHR will be calculated using procedures outlined in the latest approved guidance from NCDMS.

2.0 METHODS

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 the following table.

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
Macroinvertebrates			X		X		X
Visual Assessment*	X	X	X	X	X	X	X
Report Submittal	X	X	X	X	X	X	X

*Visual Assessment will be complimented by permanent photographic points located at each permanent cross section and vegetation plot.

2.1 Monitoring

The monitoring parameters are summarized in the following table.

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 14 cross-sections on restored channels	Graphic and tabular data.
Channel Stability	Visual Assessments	Yearly	All restored stream channels	Areas of concern will 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 surface water gauges and/or trail camera	Continuous recording through monitoring period	Stream flow regime is not in question. However, surface water gauges and/or cameras will be used to document bankfull events.	NA
Bankfull Events	Continuous monitoring surface water gauges and/or trail camera	Continuous recording through monitoring period	Surface water gauge on Slingshot Creek and UT 1	Surface water data for each monitoring period
	Visual/Physical Evidence	Continuous through monitoring period	All restored stream channels	Visual evidence, photo documentation, and/or rain data.
Benthic Macroinvertebrates	"Qual 4" method described in *Standard Operating Procedures for Collection and Analysis of Benthic Macroinvertebrates, Version 5.0* (NCDWR 2016)	Preconstruction, Years 3, 5, and 7 during the "index period" referenced in *Small Streams Biocriteria Development* (NCDWQ 2009)	2 stations (one at the lower end of UT1 and one at the lower end of Slingshot Creek)	Results* will be presented on a site-by-site basis and will include a list of taxa collected, an enumeration of *Ephemeroptera, Plecoptera,* and *Tricopetera* taxa as well as Biotic Index values.
Wetland Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Wetland Restoration	Groundwater gauges	Years 1, 2, 3, 4, 5, 6, and 7 throughout the year with the growing season defined as March 26-November 8	11 gauges spread throughout restored/enhanced 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	10 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	2 plots randomly selected each year	Species and height

*Benthic Macroinvertebrate sampling data will not be tied to success criteria; however, the data may be used as a tool to observe positive gains to in-stream habitat

Stream Summary

All streams are functioning as designed, and no stream areas of concern were observed during year 2 (2021) 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 26, 2020*	March 26-November 8 (228 days)	23 days
2021 (Year 2)	March 1, 2021**	March 1-November 8 (253 days)	25 Days

* NRCS growing season used for MY1 (2020) since gauges and soil temperature logger were not installed until May 6, 2020.
** Growing season start date confirmed with soil temperature reading of 47.83°F on March 1, 2021 and dropping no lower than 41.96°F thereafter (Appendix E).

All groundwater gauges met success criteria for the year 2 (2021) monitoring period except Gauge 10 (Appendix E).

Vegetation Summary

During quantitative vegetation sampling, 10 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). Year 2 (2021) vegetation measurements occurred on October 21, 2021, and included 2 additional random sample plots (50-meter by 2-meter). Measurements of all 12 plots resulted in an average of 644 stems/acre, excluding livestakes. Additionally, all permanent plots met success criteria, while transect 2 was two stems shy of success. (Tables 8-10, Appendix C).

3.0 REFERENCES

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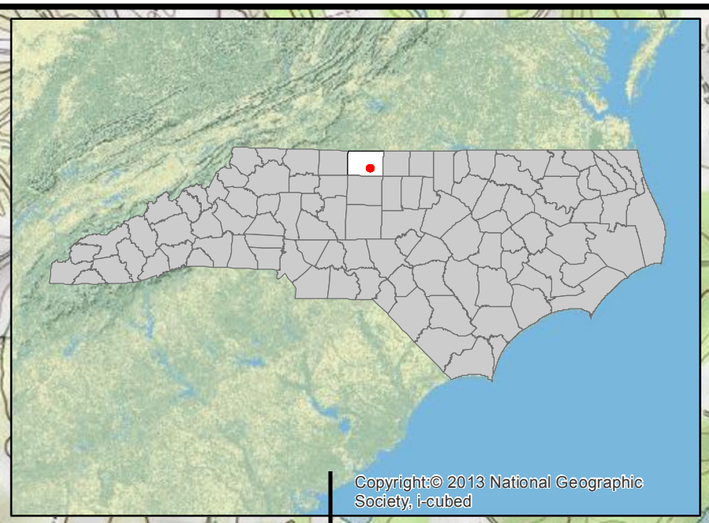
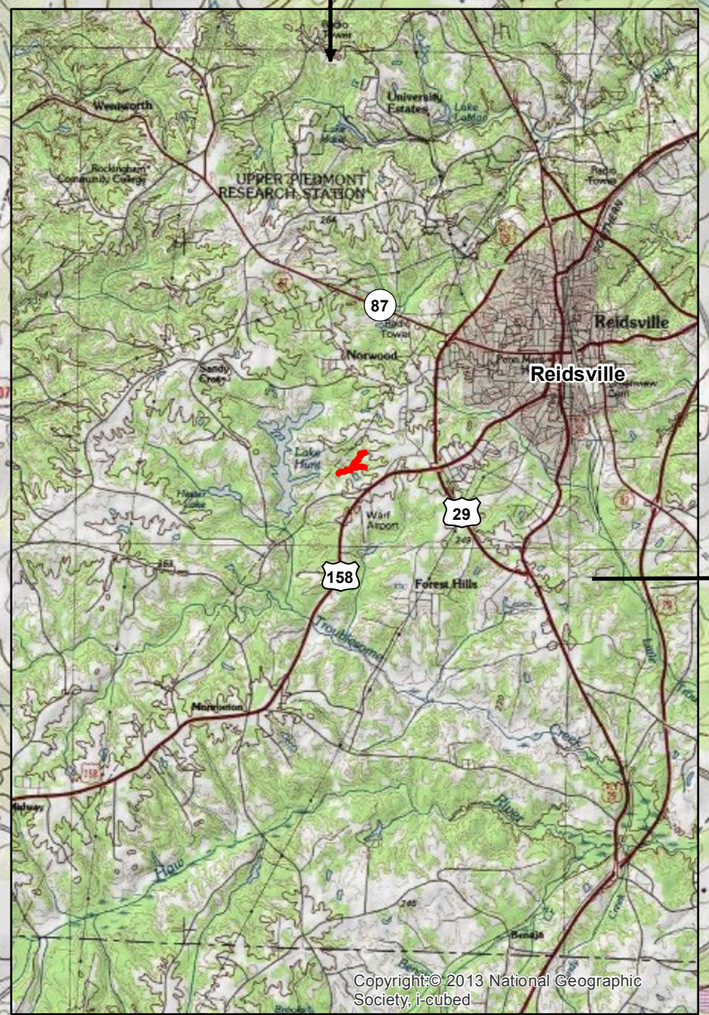
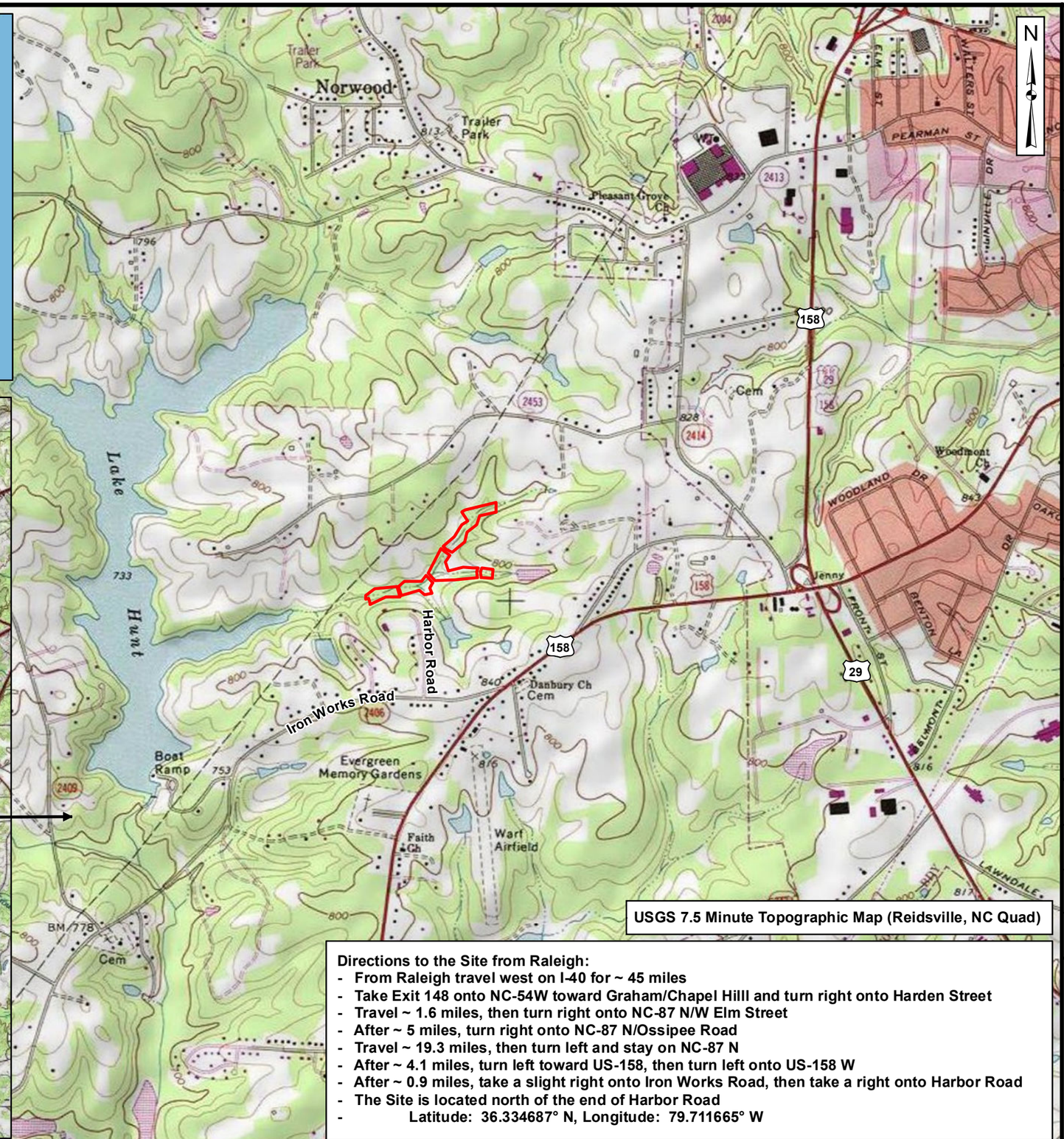
Appendix A
Background Map and Tables

Figure 1. Project 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 (Reidsville, NC Quad)

Directions to the Site from Raleigh:

- From Raleigh travel west on I-40 for ~ 45 miles
- Take Exit 148 onto NC-54W toward Graham/Chapel Hilll and turn right onto Harden Street
- Travel ~ 1.6 miles, then turn right onto NC-87 N/W Elm Street
- After ~ 5 miles, turn right onto NC-87 N/Ossipee Road
- Travel ~ 19.3 miles, then turn left and stay on NC-87 N
- After ~ 4.1 miles, turn left toward US-158, then turn left onto US-158 W
- After ~ 0.9 miles, take a slight right onto Iron Works Road, then take a right onto Harbor Road
- The Site is located north of the end of Harbor Road
- Latitude: 36.334687° N, Longitude: 79.711665° W

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

SLINGSHOT CREEK STREAM AND WETLAND MITIGATION SITE

Rockingham County, NC

Title:

SITE LOCATION

Drawn by: KRJ

Date: DEC 2018

Scale: 1:20,000

Project No.: 18-013

FIGURE

1

Table 1. Project Components and Mitigation Credits
Slingshot Creek Restoration Site

Project Segment	Stream Stationing/ Wetland Type	Existing Footage/ Acreage	Mitigation Plan Footage/ Acreage	Restoration Level	Mitigation Ratio	Restoration Footage/ Acreage	Comment
Slingshot Creek-Reach 1	00+00 to 03+05	305	305	Preservation	10:1	305	
Slingshot Creek-Reach 2	03+05 to 04+59	154	154	Enhancement (Level II)	2.5:1	154	
Slingshot Creek-Reach 3	04+59 to 05+78	156	119	Restoration (Priority I)	1:1	124	
Slingshot Creek-Reach 4	05+78 to 07+17	139	139	Enhancement (Level I)	1.5:1	143	
Slingshot Creek-Reach 5	07+17 to 27+77	2069	2060-50-51-25= 1934	Restoration (Priority I)	1:1	1970	126 lf of Slingshot Creek is located outside of the conservation easement and therefore is not generating credit
Slingshot Creek-Reach 6	27+77 to 28+74	97	97	Enhancement (Level II)	2.5:1	97	
UT 1A	00+00 to 01+95	195	195	Enhancement (Level II)	2.5:1	195	
UT 1B	01+95 to 06+95	500	500-52= 448	Enhancement (Level I)	1.5:1	475	52 lf of the UT1 is located outside of the conservation easement and therefore is not generating credit
UT 1C	06+95 to 09+70	273	275	Restoration (Priority I)	1:1	270	
UT 2	00+04 to 01+78	130	173	Restoration (Priority I)	1:1	169	
UT 3	00+00 to 01+89	189	189	Enhancement (Level II)	2.5:1	189	
UT 4	00+00 to 00+86	86	86	Preservation	10:1	86	
Wetland Restoration	--	--	1.018	Restoration	1:1	1.018	
Wetland Enhancement	--	0.69	0.606	Enhancement	2:1	0.606	

Table 1. Project Components and Mitigation Credits (continued)
Slingshot Creek Restoration Site

Restoration Level	Stream			Riparian Wetland		Non-Rip	Coastal
	Warm	Cool	Cold	Riverine	Non-Riv	Wetland	Marsh
Restoration	**2501.000***				**1.018**		
Re-establishment							
Rehabilitation							
Enhancement					**0.303**		
Enhancement I	**391.333****						
Enhancement II	**254.000**						
Creation							
Preservation	**39.100**						
TOTALS	**3185.433**				**1.321**		

*An additional 126 linear feet of stream restoration is outside of the conservation easement and is therefore not included in this total or in mitigation credit calculations.
**An additional 52 linear feet of stream enhancement (level I) is outside of the conservation easement and is therefore not included in this total or in mitigation credit calculations.

Table 2. Project Activity and Reporting History
Slingshot Creek Restoration Site

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Technical Proposal (RFP No. 16-007330)	February 2, 2018	February 8, 2018
Institution Date (NCDMS Contract No. 100058)	--	April 24, 2018
Mitigation Plan	September 2018	June 2019
Construction Plans	--	November 18, 2019
404 Permit	--	January 2, 2020
Site Construction Final Walkthrough	--	April 30, 2020
Planting	--	April 30, 2020
As-built Baseline Monitoring (MY0)	May 2020	August 2020
Annual Monitoring (MY1)	November 2020	December 2020
Annual Monitoring (MY2)	October 2021	January 2022

Table 3. Project Contacts Table
Slingshot Creek Restoration Site

Full Delivery Provider	Restoration Systems 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 Worth Creech 919-755-9490
Designer & Monitoring Provider	Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693

Table 4. Project Attribute Table
Slingshot Creek Restoration Site

Project Information	
Project Name	Slingshot Creek Restoration Site
Project County	Rockingham County, North Carolina
Project Area (acres)	11.6
Project Coordinates (latitude & latitude)	36.334687ºN, 79.711665ºW
Planted Area (acres)	9.3
Project Watershed Summary Information	
Physiographic Province	Piedmont
Project River Basin	Cape Fear
USGS HUC for Project (14-digit)	03030002010010
NCDWR Sub-basin for Project	03-06-01
Project Drainage Area (acres)	270
Percentage of Project Drainage Area that is Impervious	<5%
CGIA Land Use Classification	Managed Herbaceous Cover & Hardwood Swamps

Table 4. Project Attribute Table
Slingshot Creek Restoration Site (continued)

Reach Summary Information					
Parameters	**Slingshot Creek**	**UT 1**	**UT 2**	**UT 3**	**UT 4**
Length of reach (linear feet)	2920	968	130	189	86
Valley Classification & Confinement	Alluvial, confined				
Drainage Area (acres)	270	60	65	9	22
NCDWR Stream ID Score	---	---	---	---	---
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Intermittent	Perennial
NCDWR Water Quality Classification	WS-III, B, NSW				
Existing Morphological Description (Rosgen 1996)	G4/5	G5	G5	C5	Eg4
Proposed Stream Classification (Rosgen 1996)	C/E 4	C/E 4	C/E 4	C5	Eg4
Existing Evolutionary Stage (Simon and Hupp 1986)	III/IV	I/III/IV	III/IV	II/III	II/III
Underlying Mapped Soils	Clifford sandy clay loam, Codorus loam, Davie sandy loam, Fairview-Poplar complex, Nathalie sandy loam, Poplar Forest sandy clay loam				
Drainage Class	Well-drained, moderately well-drained, somewhat poorly-drained, well-drained, well-drained, well-drained, well-drained				
Hydric Soil Status	Nonhydric, nonhydric, nonhydric, nonhydric, nonhydric, nonhydric, nonhydric, respectively				
Valley Slope	0.0195	0.0315	0.0218	---	---
FEMA Classification	NA				
Native Vegetation Community	Piedmont Alluvial Forest/Dry-Mesic Oak-Hickory Forest				
Watershed Land Use/Land Cover (Site)	43% forest,55% agricultural land, <2% low density residential/impervious surface				
Watershed Land Use/Land Cover (Cedarock Reference Channel)	65% forest, 30% agricultural land, <5% low density residential/impervious surface				
Percent Composition of Exotic Invasive Vegetation	<5%				

Table 4. Project Attribute Table
Slingshot Creek Restoration Site (continued)

Wetland Summary Information			
Parameters	**Wetlands**		
Wetland acreage	1.02 acre drained & 0.69 acre degraded		
Wetland Type	Riparian riverine		
Mapped Soil Series	Worsham		
Drainage Class	Poorly drained		
Hydric Soil Status	Hydric		
Source of Hydrology	Groundwater, stream overbank		
Hydrologic Impairment	Incised streams, compacted soils, livestock		
Native Vegetation Community	Piedmont/Low Mountain Alluvial Forest		
% Composition of Exotic Invasive Vegetation	<5%		
Restoration Method	Hydrologic, vegetative, livestock		
Enhancement Method	Vegetative, livestock		
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation***
Waters of the United States-Section 401	Yes	Yes	JD Package (App D)
Waters of the United States-Section 404	Yes	Yes	JD Package (App D)
Endangered Species Act	Yes	Yes	CE Document (App E)
Historic Preservation Act	Yes	Yes	CE Document (App E)
Coastal Zone Management Act	No	--	NA
FEMA Floodplain Compliance	No	--	CE Document (App E)
Essential Fisheries Habitat	No	--	NA

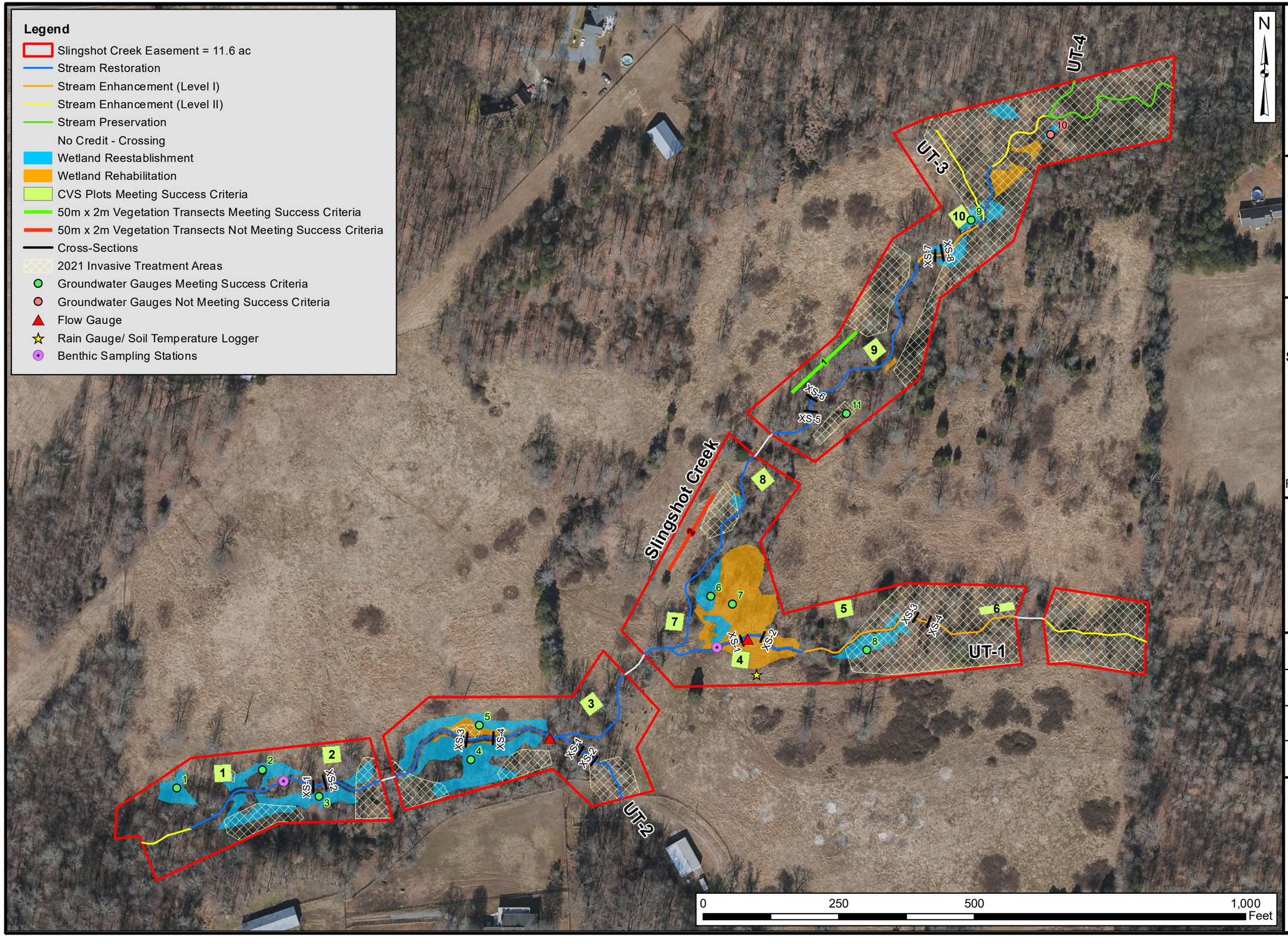
*included in the Detailed Mitigation Plan

Appendix B
Visual Assessment Data

Figure 2. Current Conditions Plan View
Tables 5A-5C. Visual Stream Morphology Stability Assessment
Table 6. Vegetation Condition Assessment
Vegetation Plot Photographs

Legend

- Slingshot Creek Easement = 11.6 ac
- Stream Restoration
- Stream Enhancement (Level I)
- Stream Enhancement (Level II)
- Stream Preservation
- No Credit - Crossing
- Wetland Reestablishment
- Wetland Rehabilitation
- CVS Plots Meeting Success Criteria
- 50m x 2m Vegetation Transects Meeting Success Criteria
- 50m x 2m Vegetation Transects Not Meeting Success Criteria
- Cross-Sections
- 2021 Invasive Treatment Areas
- Groundwater Gauges Meeting Success Criteria
- Groundwater Gauges Not Meeting Success Criteria
- Flow Gauge
- Rain Gauge/ Soil Temperature Logger
- Benthic Sampling Stations



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

SLINGSHOT CREEK STREAM AND WETLAND MITIGATION SITE

Rockingham County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

Date: JAN 2022

Scale: 1:2000

Project No.: 18-013

FIGURE

2

Table 5A **Visual Stream Morphology Stability Assessment**
Reach ID **Slingshot Creek**
Assessed Length **2920**

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	48	48			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	49	49			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	49	49			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	49	49			100%			
		2. Thalweg centering at downstream of meander (Glide)	49	49			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.	20	20			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	20	20			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	20	20			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)	20	20			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	20	20			100%			

Table 5B **Visual Stream Morphology Stability Assessment**
Reach ID **Slingshot UT-1**
Assessed Length **968**

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.	10	10			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	10	10			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	10	10			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)	10	10			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	10	10			100%			

Table 5C **Visual Stream Morphology Stability Assessment**
Reach ID **Slingshot UT-2**
Assessed Length **130**

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	6	6			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	5	5			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	5	5			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	5	5			100%			
		2. Thalweg centering at downstream of meander (Glide)	5	5			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.	1	1			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	1	1			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1			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)	1	1			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	1	1			100%			

Table 6 Vegetation Condition Assessment

Slingshot

Planted Acreage[1] **9.3**

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] **11.6**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Populations of cattail, kudzu, privet, multiflora rose, princess tree, and tree of heaven observed within the easement. All populations were treated during MY2 (2021).	1000 SF	yellow hatched polygons	13	4.57	39.4%
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.

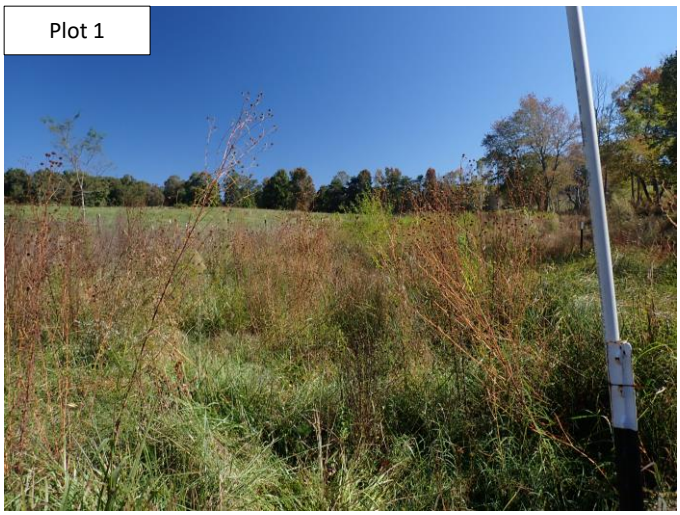
2 = The acreage within the easement boundaries.

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.

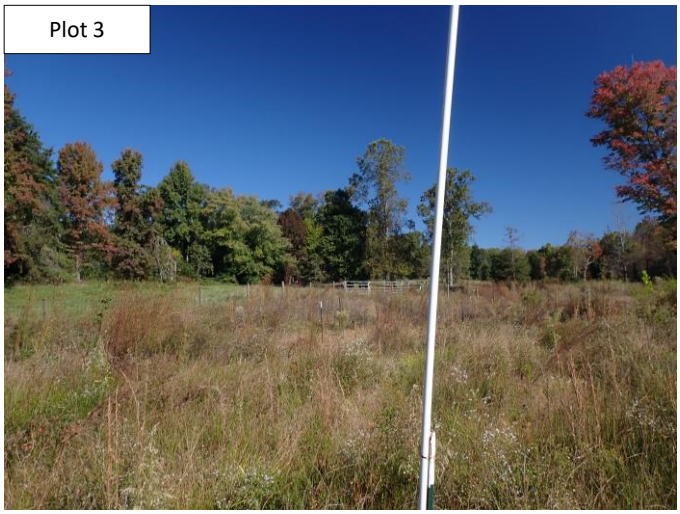
Slingshot
MY2 (2021) Vegetation Monitoring Photographs (October 2021)

Plot 1



Plot 2

Plot 3



Plot 4

Plot 5

Slingshot
MY2 (2021) Vegetation Monitoring Photographs (October 2021)

Plot 6

Plot 7

Plot 8

Plot 9

Plot 10

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. Planted Vegetation Totals

Table 7. Planted Bare Root Woody Vegetation
Slingshot Creek Restoration Site

Species	Total*
Acres	**12.05**
Alnus serrulata	350
Betula nigra	700
Celtis occidentalis	300
Cercis canadensis	200
Cornus amomum	1700
Diospyros virginiana	200
Fraxinus pennsylvanica	400
Fraxinus caroliniana	100
Liriodendron tulipifera	500
Nyssa sylvatica	500
Platanus occidentalis	1500
Prunus serotina	300
Quercus alba	500
Quercus nigra	1500
Quercus phellos	1400
Quecus shumardii	500
Rhamnus caroliniana	300
TOTALS	**10,950**
Average Stems/Acre	**909**

*Approximately 2000 live stakes of willow (*Salix* spp.), elderberry (*Sambucus canadensis*), silky dogwood (*Cornus amomum*), and ninebark (*Physocarpus opulifolius*) were planted but are not included in this table.

Table 8. Planted and Total Stems by Plot and Species
Project Code 18013. Project Name: Slingshot

			Current Plot Data (MY2 2021)																									Annual Means								
			18013-01-0001			18013-01-0002			18013-01-0003			18013-01-0004			18013-01-0005			18013-01-0006			18013-01-0007			18013-01-0008			18013-01-0009			18013-01-0010			MY2 (2021)			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**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Alnus serrulata	hazel alder	Shrub																															1	1	1	1	1	1
Betula nigra	river birch	Tree										5	5	5				3	3	3	2	2	2	1	1	1							11	11	11	11	11	11	11	11	11
Carpinus caroliniana	American hornbeam	Tree																																						4
Celtis occidentalis	common hackberry	Tree				4	4	4							1	1	1																5	5	5	3	3	3	3	3	3
Cercis canadensis	eastern redbud	Tree																																		1	1	1	1	1	1
Cornus amomum	silky dogwood	Shrub	1	1	1				2	2	2	9	9	9	7	7	7	3	3	3	7	7	7	2	2	2	3	3	3	12	12	12	46	46	46	47	47	47	58	58	58
Diospyros virginiana	common persimmon	Tree									2																								2					
Fraxinus pennsylvanica	green ash	Tree													3	3	3																3	3	3	3	3	3	3	3	3
Juniperus virginiana	eastern redcedar	Tree																																							1
Liriodendron tulipifera	tuliptree	Tree													1	1	1							5	5	5	6	6	6				12	12	12	13	13	13	27	27	27
Nyssa sylvatica	blackgum	Tree	2	2	2	1	1	1							2	2	2																5	5	5	8	8	8	8	8	8
Platanus occidentalis	American sycamore	Tree									4	2	2	2				19	19	19	12	12	19	3	3	3	8	8	8	3	3	3	47	47	58	49	49	49	56	56	56
Prunus serotina	black cherry	Tree																																		2	2	2	3	3	3
Quercus	oak	Tree	3	3	3	3	3	3	3	3	3				1	1	1				2	2	2				1	1	1				13	13	13	21	21	21	27	27	27
Quercus alba	white oak	Tree	3	3	3	3	3	3	1	1	1				1	1	1																8	8	8	9	9	9	11	11	11
Quercus nigra	water oak	Tree	3	3	3	1	1	1	1	1	1	1	1	1	5	5	5				1	1	1							1	1	1	13	13	13	20	20	20	22	22	22
Quercus phellos	willow oak	Tree	1	1	1	3	3	3	1	1	1	1	1	1				1	1	1	2	2	2				1	1	1				10	10	10	6	6	6	5	5	5
		Stem count	13	13	13	15	15	15	8	8	14	18	18	18	21	21	21	26	26	26	26	26	33	11	11	11	19	19	19	16	16	16	173	173	186	194	194	194	236	236	241
		size (ares)	1			1			1			1			1			1			1			1			1			1			10			10			10		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.25			0.25			0.25		
		Species count	6	6	6	6	6	6	5	5	7	5	5	5	8	8	8	4	4	4	6	6	6	4	4	4	5	5	5	3	3	3	11	11	12	14	14	14	14	14	16
		Stems per ACRE	526.1	526.1	526.1	607	607	607	323.7	323.7	566.6	728.4	728.4	728.4	849.8	849.8	849.8	1052	1052	1052	1052	1052	1335	445.2	445.2	445.2	768.9	768.9	768.9	647.5	647.5	647.5	700.1	700.1	752.7	785.1	785.1	785.1	955.1	955.1	975.3

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

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

Table 9. Temporary Vegetation Plot Data
Slingshot Creek Restoration Site

Species	T-1 (271°)	T-2 (232°)
Carya sp.	1	
Cornus amomum		1
Diospyros virgniana	2	
Fraxinus pennsylvanca	1	
Platanus occidentalis	5	2
Quercus pagoda		1
Quercus phellos	1	
Quercus lyrata	2	
Quercus shumardii		2
Total Number of Stems	**12**	**6**
Stems/Acre	**485.8**	**242.9**

Table 10. Planted Vegetation Totals
Slingshot Creek Restoration Site

Plot #	Planted Stems/Acre	Success Criteria Met?
1	526	Yes
2	607	Yes
3	324	Yes
4	728	Yes
5	850	Yes
6	1052	Yes
7	1052	Yes
8	445	Yes
9	769	Yes
10	647	Yes
T-1	485	Yes
T-2	242	No
Average Planted Stems/Acre	644	**Yes**

Appendix D
Stream Geomorphology Data

Tables 11A-11D. Baseline Stream Data Summary
Tables 12A-12D. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Tables 13A-13D. Monitoring Data-Dimensional Morphology Summary (Dimensional Parameters-Cross-sections)
Tables 14A-14D. Monitoring Data-Stream Reach Data Summary
Cross-Section Plots

Table 11A. Baseline Stream Data Summary

Project Name/Number (Slingshot Creek Stream and Wetland Mitigation Site/100058) - Segment/Reach: Slingshot Creek Downstream (1200 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Flint Rock Farm Reference Data						Caswell Gameland Reference Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					8.7	11.7		15.8			6.9	7.5		8.1			14.6	18.4		21.9			11.5	12.5	13.3						
Floodprone Width (ft)					12	20		100			100	100		100			23	33.5		44			70	100	150						
Bankfull Mean Depth (ft)					0.7	1		1.3			0.7	0.8		0.9			0.9	1		1			0.8	0.9	1						
[1]Bankfull Max Depth (ft)					1.1	1.6		1.9			1.4	1.4		1.4			1.3	1.4		1.5			1.1	1.2	1.3						
Bankfull Cross Sectional Area (ft^2)					11.1	11.1		11.1			6.1	6.1		6.1			17.6	17.6		17.6			11.1	11.1	11.1						
Width/Depth Ratio					6.7	12.4		22.6			7.7	9.6		11.6			14.9	19.6		24.3			12	14	16						
Entrenchment Ratio					1.1	1.6		10.5			12.3	13.4		14.5			1.5	1.8		2			5.6	8	12						
[1]Bank Height Ratio					**1.3**	**3**		**4.5**			**1**	**1**		**1**			**1.4**	**1.8**		**2.2**			**1**	**1**	**1.2**						
Profile																															
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to staightening activities																											
Riffle Slope (ft/ft)											0	0.005		0.019			0	0.015		0.036			0.02	0.025	0.034						
Pool Length (ft)																															
Pool Max depth (ft)											1.6	2		2.3			2.3	2.3		2.3			1.2	1.7	1.9						
Pool Spacing (ft)											8.9	17.8		32.7			31.6	58.2		101.8			37.4	49.9	99.7						
Pattern																															
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to staightening activities						7.9	14.3		24.9			15	28.6		42.2			24.9	37.4	49.9						
Radius of Curvature (ft)											5.2	8.4		12.8			18.6	31.1		46.3			24.9	37.4	124.7						
Rc:Bankfull width (ft/ft)											**0.8**	**1.1**		**2.1**			**0.8**	**1.1**		**2.1**			**2**	**3**	**10**						
Meander Wavelength (ft)											13.4	29.4		47.2			61	104.6		154.7			74.8	106	149.6						
Meander Width Ratio											1.1	1.9		4.1			1	1.6		1.9			2	3	4						
Transport parameters																															
Reach Shear Stress (competency) lb/f^2					4.7																		0.82								
Max part size (mm) mobilized at bankfull																															
Stream Power (transport capacity) W/m^2					47.38																		47.1								
Additional Reach Parameters																															
Rosgen Classification					G 4/5						E 5						Cg 3/4						E/C 3/4								
Bankfull Velocity (fps)					0.74																		4								
Bankfull Discharge (cfs)					44.4																										
Valley length (ft)					1200																										
Channel Thalweg length (ft)					1368																										
Sinuosity (ft)					1.14						1.22						1.14						1.15								
Water Surface Slope (Channel) (ft/ft)					0.0171						0.0049						0.01						0.017								
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 11B. Baseline Stream Data Summary

Project Name/Number (Slingshot Creek Stream and Wetland Mitigation Site/100058) - Segment/Reach: Slingshot Creek Upstream (1609 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Flint Rock Farm Reference Data						Caswell Gameland Reference Data						Design			Monitoring Baseline					
		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Dimension and Substrate - Riffle Only																															
Bankfull Width (ft)					6	8.8		14.6			6.9	7.5		8.1			14.6	18.4		21.9			10	10.8	11.5						
Floodprone Width (ft)					12	16		100			100	100		100			23	33.5		44			30	50	70						
Bankfull Mean Depth (ft)					0.6	0.9		1.4			0.7	0.8		0.9			0.9	1		1			0.7	0.8	0.8						
[1]Bankfull Max Depth (ft)					0.7	1.4		1.9			1.4	1.4		1.4			1.3	1.4		1.5			0.9	1.1	1.2						
Bankfull Cross Sectional Area (ft^2)					8.3	8.3		8.3			6.1	6.1		6.1			17.6	17.6		17.6			8.3	8.3	8.3						
Width/Depth Ratio					4.3	9.8		24.3			7.7	9.6		11.6			14.9	19.6		24.3			12	14	16						
Entrenchment Ratio					1.2	1.5		11.4			12.3	13.4		14.5			1.5	1.8		2			2.8	4.6	6.5						
[1]Bank Height Ratio					**1.4**	**2.2**		**3.6**			**1**	**1**		**1**			**1.4**	**1.8**		**2.2**			**1**	**1**	**1.2**						
Profile																															
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to staightening activities																											
Riffle Slope (ft/ft)											0	0.005		0.019			0	0.015		0.036			0.018	0.023	0.031						
Pool Length (ft)																															
Pool Max depth (ft)											1.6	2		2.3			2.3	2.3		2.3			1	1.5	1.6						
Pool Spacing (ft)											8.9	17.8		32.7			31.6	58.2		101.8			32.3	43.1	86.2						
Pattern																															
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to staightening activities						7.9	14.3		24.9			15	28.6		42.2			21.6	32.3	43.1						
Radius of Curvature (ft)											5.2	8.4		12.8			18.6	31.1		46.3			21.6	32.3	107.8						
Rc:Bankfull width (ft/ft)											**0.8**	**1.1**		**2.1**			**0.8**	**1.1**		**2.1**			**2**	**3**	**10**						
Meander Wavelength (ft)											13.4	29.4		47.2			61	104.6		154.7			64.7	91.6	129.4						
Meander Width Ratio											1.1	1.9		4.1			1	1.6		1.9			2	3	4						
Transport parameters																															
Reach Shear Stress (competency) lb/ft^2					0.315																		0.64								
Max part size (mm) mobilized at bankfull																															
Stream Power (transport capacity) W/m^2					30.4																		32.22								
Additional Reach Parameters																															
Rosgen Classification					G 4/5						E 5						Cg 3/4						E/C 3/4								
Bankfull Velocity (fps)					0.91																		3.94								
Bankfull Discharge (cfs)					32.7																										
Valley length (ft)					1609																										
Channel Thalweg length (ft)					1898																										
Sinuosity (ft)					1.18						1.22						1.14						1.15								
Water Surface Slope (Channel) (ft/ft)					0.049						0.0049						0.01						0.0153								
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 11C. Baseline Stream Data Summary

Project Name/Number (Slingshot Creek Stream and Wetland Mitigation Site/100058) - Segment/Reach: UT 1 (968 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Flint Rock Farm Reference Data						Caswell Gameland Reference Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					4.4	7.2		14.5			6.9	7.5		8.1			14.6	18.4		21.9			7	7.6	8.1						
Floodprone Width (ft)					9	12		100			100	100		100			23	33.5		44			30	50	90						
Bankfull Mean Depth (ft)					0.3	0.6		0.9			0.7	0.8		0.9			0.9	1		1			0.5	0.5	0.6						
[1]Bankfull Max Depth (ft)					0.6	1.1		1.4			1.4	1.4		1.4			1.3	1.4		1.5			0.6	0.8	0.8						
Bankfull Cross Sectional Area (ft^2)					4	4		4			6.1	6.1		6.1			17.6	17.6		17.6			4.1	4.1	4.1						
Width/Depth Ratio					4.9	12		48.3			7.7	9.6		11.6			14.9	19.6		24.3			12	14	16						
Entrenchment Ratio					1.4	2		13.7			12.3	13.4		14.5			1.5	1.8		2			4	6.6	11.9						
[1]Bank Height Ratio					**1.2**	**2.4**		**3.7**			**1**	**1**		**1**			**1.4**	**1.8**		**2.2**			**1**	**1**	**1.2**						
Profile																															
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to staightening activities																											
Riffle Slope (ft/ft)											0	0.005		0.019			0	0.015		0.036			0.032	0.039	0.053						
Pool Length (ft)																															
Pool Max depth (ft)											1.6	2		2.3			2.3	2.3		2.3			0.7	1	1.1						
Pool Spacing (ft)											8.9	17.8		32.7			31.6	58.2		101.8			22.7	30..3	60.6						
Pattern																															
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to staightening activities						7.9	14.3		24.9			15	28.6		42.2			15.2	22.7	30.3						
Radius of Curvature (ft)											5.2	8.4		12.8			18.6	31.1		46.3			15.2	22.7	75.8						
Rc:Bankfull width (ft/ft)											**0.8**	**1.1**		**2.1**			**0.8**	**1.1**		**2.1**			**2**	**3**	**10**						
Meander Wavelength (ft)											13.4	29.4		47.2			61	104.6		154.7			45.5	64.4	90.9						
Meander Width Ratio											1.1	1.9		4.1			1	1.6		1.9			2	3	4						
Transport parameters																															
Reach Shear Stress (competency) lb/ft^2					7.09																		0.78								
Max part size (mm) mobilized at bankfull																															
Stream Power (transport capacity) W/m^2					24.99																		25.44								
Additional Reach Parameters																															
Rosgen Classification					G 5						E 5						Cg 3/4						E/C 3/4								
Bankfull Velocity (fps)					0.75																		3.78								
Bankfull Discharge (cfs)					15																										
Valley length (ft)					968																										
Channel Thalweg length (ft)					1142																										
Sinuosity (ft)					1.18						1.22						1.14						1.2								
Water Surface Slope (Channel) (ft/ft)					0.0267						0.0049						0.01						0.0263								
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 11D. Baseline Stream Data Summary

Project Name/Number (Slingshot Creek Stream and Wetland Mitigation Site/100058) - Segment/Reach: UT 2 (130 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Flint Rock Farm Reference Data						Caswell Gameland Reference Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)											6.9	7.5		8.1			14.6	18.4		21.9			7	7.6	8.1						
Floodprone Width (ft)											100	100		100			23	33.5		44			30	50	90						
Bankfull Mean Depth (ft)											0.7	0.8		0.9			0.9	1		1			0.5	0.5	0.6						
[1]Bankfull Max Depth (ft)											1.4	1.4		1.4			1.3	1.4		1.5			0.6	0.8	0.8						
Bankfull Cross Sectional Area (ft^2)											6.1	6.1		6.1			17.6	17.6		17.6			4.1	4.1	4.1						
Width/Depth Ratio											7.7	9.6		11.6			14.9	19.6		24.3			12	14	16						
Entrenchment Ratio											12.3	13.4		14.5			1.5	1.8		2			4	6.6	11.9						
[1]Bank Height Ratio											**1**	**1**		**1**			**1.4**	**1.8**		**2.2**			**1**	**1**	**1.2**						
Profile																															
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to staightening activities																											
Riffle Slope (ft/ft)											0	0.005		0.019			0	0.015		0.036			0.032	0.039	0.053						
Pool Length (ft)																															
Pool Max depth (ft)											1.6	2		2.3			2.3	2.3		2.3			0.7	1	1.1						
Pool Spacing (ft)											8.9	17.8		32.7			31.6	58.2		101.8			22.7	30..3	60.6						
Pattern																															
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to staightening activities						7.9	14.3		24.9			15	28.6		42.2			15.2	22.7	30.3						
Radius of Curvature (ft)											5.2	8.4		12.8			18.6	31.1		46.3			15.2	22.7	75.8						
Rc:Bankfull width (ft/ft)											**0.8**	**1.1**		**2.1**			**0.8**	**1.1**		**2.1**			**2**	**3**	**10**						
Meander Wavelength (ft)											13.4	29.4		47.2			61	104.6		154.7			45.5	64.4	90.9						
Meander Width Ratio											1.1	1.9		4.1			1	1.6		1.9			2	3	4						
Transport parameters																															
Reach Shear Stress (competency) lb/ft^2					14.79																		0.78								
Max part size (mm) mobilized at bankfull																															
Stream Power (transport capacity) W/m^2					18.45																		25.44								
Additional Reach Parameters																															
Rosgen Classification					G 5						E 5						Cg 3/4						E/C 3/4								
Bankfull Velocity (fps)					0.27																		3.78								
Bankfull Discharge (cfs)					15.9																										
Valley length (ft)					130																										
Channel Thalweg length (ft)					152																										
Sinuosity (ft)					1.17						1.22						1.14						1.2								
Water Surface Slope (Channel) (ft/ft)					0.0186						0.0049						0.01						0.0263								
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 12A. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Project Name/Number (Slingshot Creek Stream and Wetland Mitigation Site/100058) - Segment/Reach: Slingshot Creek Downstream (1200 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)	13.4	18.8	15.7					12.6	12.6	12.6					16.1	22.1	20.7					12.7	13.0	13.5				
Floodprone Width (ft)	NA	NA	NA					100	100	100					NA	NA	NA					100	100	100				
Bankfull Mean Depth (ft)	1.4	1.0	1.2					0.9	0.9	0.9					1.4	1.0	1.1					0.9	0.8	0.8				
Bankfull Max Depth (ft)	2.0	2.2	2.1					1.2	1.3	1.3					2.3	2.3	2.5					1.2	1.3	1.2				
Bankfull Cross Sectional Area (ft^2)	18.2	18.2	18.2					10.8	10.8	10.8					22.1	22.1	22.1					11.0	11.0	11.0				
Bankfull Width/Depth Ratio	NA	NA	NA					14.7	14.7	14.8					NA	NA	NA					14.7	15.4	16.6				
Bankfull Entrenchment Ratio	NA	NA	NA					7.9	7.9	7.9					NA	NA	NA					7.9	7.7	7.4				
Low Bank Height (ft)	2	2.2	2.1					1.2	1.3	1.293					2.3	2.3	2.5					1.2	1.3	1.4				
Bankfull Bank Height Ratio	NA	NA	NA					1.0	1.03	1.0					NA	NA	NA					1.0	1.04	1.10				
LTOB Cross Sectional Area (ft^2)	18.2	19.4	18.1					10.8	11.3	10.2					22.1	21.7	20.6					11	11.6	12.7				
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 DMS. 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 12B. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Project Name/Number (Slingshot Creek Stream and Wetland Mitigation Site/100058) - Segment/Reach: Slingshot Creek Upstream (1609 feet)

	Cross Section 5 (Riffle)							Cross Section 6 (Pool)							Cross Section 7 (Riffle)							Cross Section 8 (Pool)						
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)	11.2	16.2	12.3					12.1	18.6	14.8					11.7	13.7	11.9					12.4	19.4	17.4				
Floodprone Width (ft)	100	100	100					NA	NA	NA					100	100	100					NA	NA	NA				
Bankfull Mean Depth (ft)	0.7	0.5	0.6					1.2	0.8	1.0					0.9	0.7	0.8					1.3	0.8	0.9				
Bankfull Max Depth (ft)	1.0	1.1	1.1					1.8	2.0	2.0					1.4	1.4	1.4					2.3	2.0	2.0				
Bankfull Cross Sectional Area (ft^2)	7.4	7.4	7.4					14.3	14.3	14.3					10.1	10.1	10.1					16.3	16.3	16.3				
Bankfull Width/Depth Ratio	16.8	35.5	20.4					NA	NA	NA					13.5	18.6	14.0					NA	NA	NA				
Bankfull Entrenchment Ratio	9.0	6.2	8.1					NA	NA	NA					8.5	7.3	8.4					NA	NA	NA				
Low Bank Height (ft)	1.0	1.2	1.1					1.8	2.0	1.8					1.4	1.4	1.4					2.3	2.0	1.9				
Bankfull Bank Height Ratio	1.0	1.09	1.0					NA	NA	NA					1.0	1.0	1.03					NA	NA	NA				
LTOB Cross Sectional Area (ft^2)	7.4	9.3	7.3					14.3	14.2	11.6					10.1	9.9	10.6					16.3	17.6	14.3				
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 DMS. 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 12C. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Slingshot Creek Stream and Wetland Mitigation Site/100058) - Segment/Reach: UT 1 (968 feet)

	Cross Section 1 (Riffle)							Cross Section 2 (Pool)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)						
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)	8.0	7.6	7.2					11.0	17.3	12.4					15.4	16.4	15.1					12.8	16.5	13.1				
Floodprone Width (ft)	100	100	100					NA	NA	NA					100	100	100					NA	NA	NA				
Bankfull Mean Depth (ft)	0.4	0.4	0.4					1.0	0.7	0.9					1.1	1.0	1.1					1.4	1.1	1.4				
Bankfull Max Depth (ft)	0.7	0.8	0.9					2.0	2.0	2.0					1.9	1.8	1.8					2.4	2.4	2.6				
Bankfull Cross Sectional Area (ft^2)	3.2	3.2	3.2					11.4	11.4	11.4					16.4	16.4	16.4					18.1	18.1	18.1				
Bankfull Width/Depth Ratio	19.7	18.1	16.3					NA	NA	NA					14.4	16.4	13.9					NA	NA	NA				
Bankfull Entrenchment Ratio	12.5	13.2	13.9					NA	NA	NA					6.5	6.1	6.6					NA	NA	NA				
Low Bank Height (ft)	0.7	0.9	0.9					2.0	2.0	1.9					1.9	1.8	1.8					2.4	2.5	2.6				
Bankfull Bank Height Ratio	1.0	1.04	1.0					NA	NA	NA					1.0	1.02	1.02					NA	NA	NA				
LTOB Cross Sectional Area (ft^2)	3.2	3.2	3.3					11.4	11.6	10					16.4	16.9	17					18.1	20.1	18.5				
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 DMS. 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 12D. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Slingshot Creek Stream and Wetland Mitigation Site/100058) - Segment/Reach: UT 2 (130 feet)

	Cross Section 1 (Riffle)							Cross Section 2 (Pool)						
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)	9.5	11.9	9.8					7.8	14.5	9.4				
Floodprone Width (ft)	100	100	100					NA	NA	NA				
Bankfull Mean Depth (ft)	0.6	0.5	0.6					0.8	0.4	0.7				
Bankfull Max Depth (ft)	0.9	0.9	1.0					1.3	1.0	1.3				
Bankfull Cross Sectional Area (ft^2)	5.4	5.4	5.4					6.3	6.3	6.3				
Bankfull Width/Depth Ratio	16.7	26.2	17.6					NA	NA	NA				
Bankfull Entrenchment Ratio	10.6	8.4	10.3					NA	NA	NA				
Low Bank Height (ft)	0.7	1.0	1.0					1.3	1.0	1.3				
Bankfull Bank Height Ratio	1.0	1.04	1.06					NA	NA	NA				
LTOB Cross Sectional Area (ft^2)	5.4	5.8	6					6.3	6.1	5.4				
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 DMS. 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 13A. Monitoring Data - Stream Reach Data Summary

Project Name/Number (Slingshot Creek Stream and Wetland Mitigation Site/100058) - Segment/Reach: Slingshot Creek Downstream (XS 1 - 4) (1200 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)	12.6	12.6	12.6	12.7	0.07	2	12.6		12.8	13		2	12.6		13.1	13.5		2																		
Floodprone Width (ft)	100	100	100	100	0	2	100		100	100		2	100		100	100		2																		
Bankfull Mean Depth (ft)	0.86	0.86	0.86	0.87	0.01	2	0.8		0.9	0.9		2	0.8		0.8	0.9		2																		
[1]Bankfull Max Depth (ft)	1.19	1.21	1.21	1.24	0.03	2	1.3		1.3	1.3		2	1.2		1.3	1.3		2																		
Bankfull Cross Sectional Area (ft^2)	10.8	10.9	10.9	11	0.14	2	10.8		10.9	11		2	10.8		10.9	11		2																		
Width/Depth Ratio	14.7	14.7	14.7	14.7	0.01	2	14.7		15	15.4		2	14.8		15.7	16.6		2																		
Entrenchment Ratio	7.88	7.91	7.91	7.95	0.05	2	7.7		7.8	7.9		2	7.4		7.7	7.9		2																		
[1]Bank Height Ratio	**1**	**1**	**1**	**1**	**0**		**1.03**		**1.03**	**1.04**		**2**	**1**		**1.05**	**1.1**		**2**																		
Profile																																				
Riffle Length (ft)	No distinct repetitive pattern of riffles and pools due to staightening activities																																			
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline																					
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	G 4/5																																			
Channel Thalweg length (ft)	1368																																			
Sinuosity (ft)	1.14																																			
Water Surface Slope (Channel) (ft/ft)	0.0171																																			
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																																				

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 13B. Monitoring Data - Stream Reach Data Summary

Project Name/Number (Slingshot Creek Stream and Wetland Mitigation Site/100058) - Segment/Reach: Slingshot Creek UpStream (XS 5 - 8) (1200 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)	11.2	11.4	11.4	11.7	0.37	2	13.7		15	16.2		2	11.9		12.1	12.3		2																		
Floodprone Width (ft)	100	100	100	100	0	2	100		100	100		2	100		100	100		2																		
Bankfull Mean Depth (ft)	0.66	0.76	0.76	0.86	0.14	2	0.5		0.6	0.7		2	0.6		0.7	0.8		2																		
[1]Bankfull Max Depth (ft)	1.03	1.2	1.2	1.36	0.23	2	1.1		1.3	1.4		2	1.1		1.3	1.4		2																		
Bankfull Cross Sectional Area (ft^2)	7.42	8.78	8.78	10.1	1.92	2	7.4		8.8	10.1		2	7.4		8.8	10.1		2																		
Width/Depth Ratio	13.5	15.2	15.2	16.8	2.31	2	18.6		27	35.5		2	14		17.2	20.4		2																		
Entrenchment Ratio	8.53	8.74	8.74	8.95	0.3	2	6.2		6.7	7.3		2	8.1		8.3	8.4		2																		
[1]Bank Height Ratio	**1**	**1**	**1**	**1**	**0**		**1.0**		**1.0**	**1.09**		**2**	**1.0**		**1.0**	**1.03**		**2**																		
Profile																																				
Riffle Length (ft)	No distinct repetitive pattern of riffles and pools due to staightening activities																																			
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline																			
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	G 4/5																																			
Channel Thalweg length (ft)	1898																																			
Sinuosity (ft)	1.18																																			
Water Surface Slope (Channel) (ft/ft)	0.049																																			
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																																				

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 13C. Monitoring Data - Stream Reach Data Summary

Project Name/Number (Slingshot Creek Stream and Wetland Mitigation Site/100058) - Segment/Reach: Slingshot Creek UT 1 (XS 1 - 4) (1200 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)	7.97	11.7	11.7	15.4	5.25	2	7.6		12	16.4		2	7.2		11.2	15.1		2																		
Floodprone Width (ft)	100	100	100	100	0	2	100		100	100		2	100		100	100		2																		
Bankfull Mean Depth (ft)	0.41	0.74	0.74	1.07	0.47	2	0.4		0.7	1		2	0.4		0.8	1.1		2																		
[1]Bankfull Max Depth (ft)	0.7	1.29	1.29	1.88	0.83	2	0.8		1.3	1.8		2	0.9		1.4	1.8		2																		
Bankfull Cross Sectional Area (ft^2)	3.23	9.82	9.82	16.4	9.31	2	3.2		9.8	16.4		2	3.2		9.8	16.4		2																		
Width/Depth Ratio	14.4	17.1	17.1	19.7	3.69	2	16.4		17.2	18.1		2	13.9		15.1	16.3		2																		
Entrenchment Ratio	6.5	9.52	9.52	12.5	4.28	2	6.1		9.6	13.2		2	6.6		10.3	13.9		2																		
[1]Bank Height Ratio	**1**	**1**	**1**	**1**	**0**		**1.02**		**1.02**	**1.04**		**2**	**1**		**1**	**1.02**		**2**																		
Profile																																				
Riffle Length (ft)	No distinct repetitive pattern of riffles and pools due to staightening activities																																			
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline																			
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	G 5																																			
Channel Thalweg length (ft)	1142																																			
Sinuosity (ft)	1.18																																			
Water Surface Slope (Channel) (ft/ft)	0.0267																																			
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																																				

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 13D. Monitoring Data - Stream Reach Data Summary

Project Name/Number (Slingshot Creek Stream and Wetland Mitigation Site/100058) - Segment/Reach: Slingshot Creek UT 2 (XS 1 - 2) (1200 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)	9.45	9.45	9.45	9.45		1	11.9		11.9	11.9		1	9.8		9.8	9.8		1																		
Floodprone Width (ft)	100	100	100	100		1	100		100	100		1	100		100	100		1																		
Bankfull Mean Depth (ft)	0.57	0.57	0.57	0.57		1	0.5		0.5	0.5		1	0.6		0.6	0.6		1																		
[1]Bankfull Max Depth (ft)	0.93	0.93	0.93	0.93		1	0.9		0.9	0.9		1	1		1	1		1																		
Bankfull Cross Sectional Area (ft^2)	5.35	5.35	5.35	5.35		1	5.4		5.4	5.4		1	5.4		5.4	5.4		1																		
Width/Depth Ratio	16.7	16.7	16.7	16.7		1	26.2		26.2	26.2		1	17.6		17.6	17.6		1																		
Entrenchment Ratio	10.6	10.6	10.6	10.6		1	8.4		8.4	8.4		1	10.3		10.3	10.3		1																		
[1]Bank Height Ratio	**1**	**1**	**1**	**1**		**1**	**1.04**		**1.04**	**1.04**		**1**	**1.06**		**1.06**	**1.06**		**1**																		
Profile																																				
Riffle Length (ft)	No distinct repetitive pattern of riffles and pools due to staightening activities																																			
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline																			
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	G 5																																			
Channel Thalweg length (ft)	152																																			
Sinuosity (ft)	1.17																																			
Water Surface Slope (Channel) (ft/ft)	0.0186																																			
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																																				

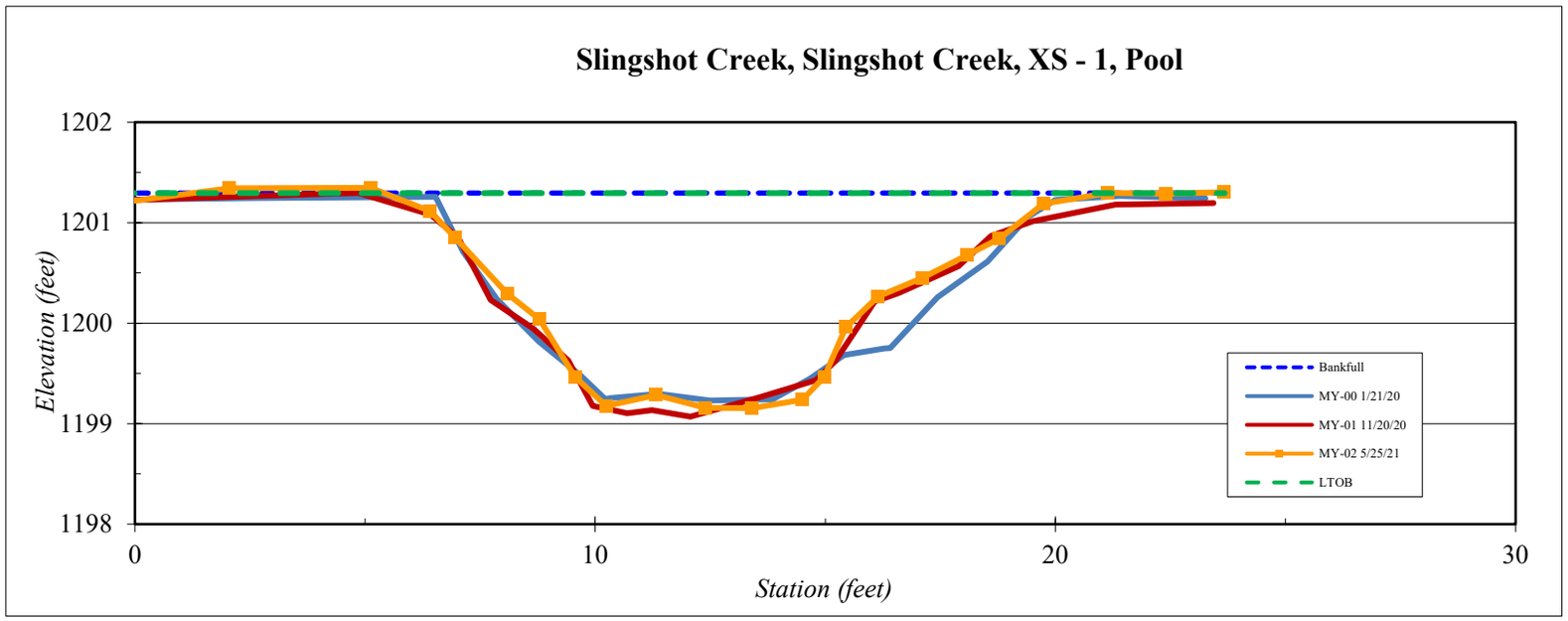
Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section measurements and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual 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	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	Slingshot Creek, XS - 1, Pool
Feature	Pool
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
0.0	1202.7
-0.4	1201.2
2.0	1201.3
5.1	1201.3
6.4	1201.1
7.0	1200.9
8.1	1200.3
8.8	1200.0
9.6	1199.5
10.2	1199.2
11.3	1199.3
12.4	1199.2
13.4	1199.2
14.5	1199.2
15.0	1199.5
15.4	1200.0
16.2	1200.3
17.1	1200.5
18.1	1200.7
18.8	1200.8
19.7	1201.2
21.1	1201.3
22.4	1201.3
23.7	1201.304

SUMMARY DATA	
Bankfull Elevation:	1201.3
Bankfull Cross-Sectional Area:	18.2
Bankfull Width:	15.7
LTOB Cross-Sectional Area:	18.1
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.1
Low Bank Height:	2.1
Mean Depth at Bankfull:	1.2
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	NA

Stream Type	E/C 3/4

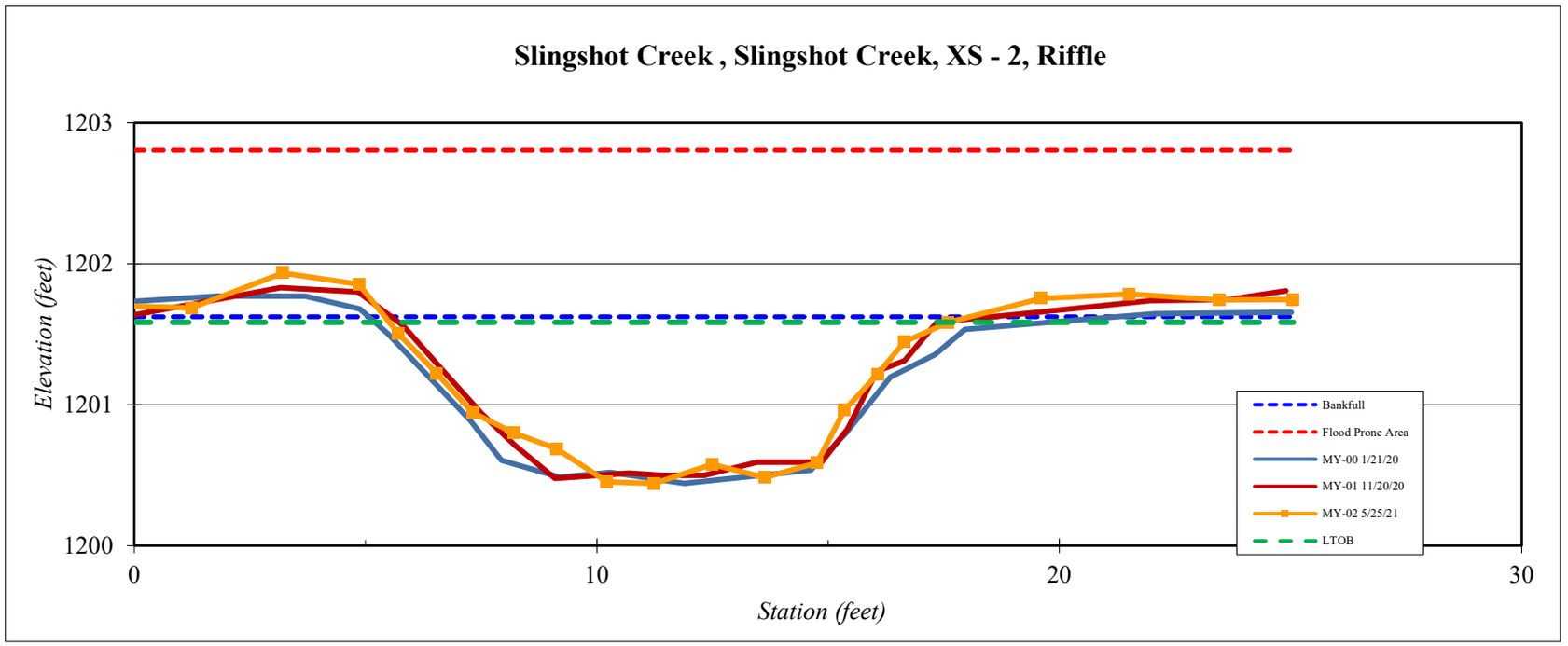


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	Slingshot Creek, XS -2, Riffle
Feature	Riffle
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
-0.1	1201.5
1.2	1201.5
3.2	1201.8
4.9	1201.7
5.7	1201.3
6.5	1200.9
7.3	1200.6
8.2	1200.5
9.1	1200.3
10.2	1200.1
11.2	1200.1
12.5	1200.2
13.6	1200.1
14.8	1200.2
15.4	1200.7
16.1	1200.9
16.7	1201.2
17.6	1201.4
19.6	1201.5
21.5	1201.6
23.5	1201.54
25.1	1201.5

SUMMARY DATA	
Bankfull Elevation:	1201.4
Bankfull Cross-Sectional Area:	10.8
Bankfull Width:	12.6
LTOB Cross-Sectional Area:	10.2
Flood Prone Area Elevation:	1202.7
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.3
Low Bank Height:	1.3
Mean Depth at Bankfull:	0.9
W / D Ratio:	14.8
Entrenchment Ratio:	7.9
Bank Height Ratio:	1.0

Stream Type	E/C 3/4

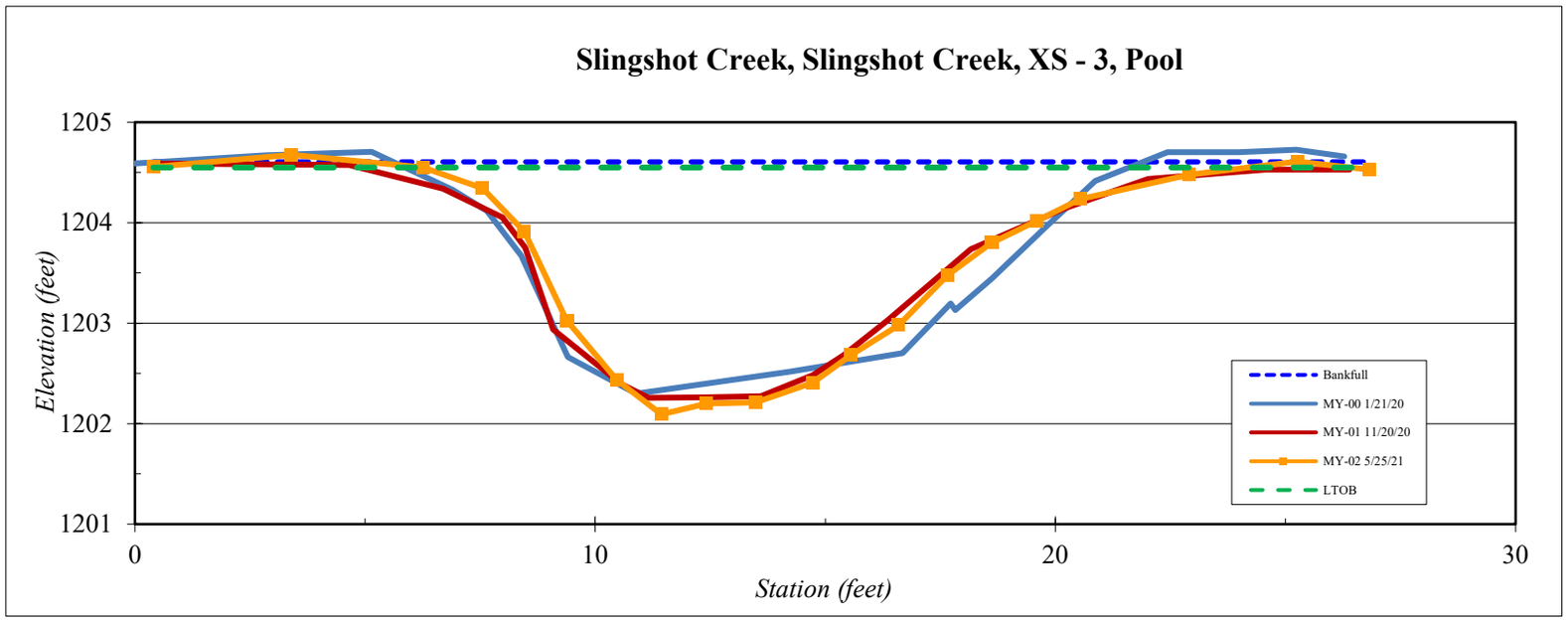


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	Slingshot Creek, XS - 3, Pool
Feature	Pool
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
0.4	1204.6
3.4	1204.7
6.3	1204.5
7.6	1204.3
8.5	1203.9
9.4	1203.0
9.4	1203.0
10.5	1202.4
11.4	1202.1
12.4	1202.2
13.5	1202.2
14.7	1202.4
15.6	1202.7
16.6	1203.0
17.7	1203.5
18.6	1203.8
18.6	1203.8
19.6	1204.0
20.5	1204.2
22.9	1204.5
25.3	1204.6
26.8	1204.5

SUMMARY DATA	
Bankfull Elevation:	1204.6
Bankfull Cross-Sectional Area:	22.1
Bankfull Width:	22.5
LTOB Cross-Sectional Area:	20.6
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.5
Low Bank Height:	2.5
Mean Depth at Bankfull:	1.0
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	NA

Stream Type	E/C 3/4

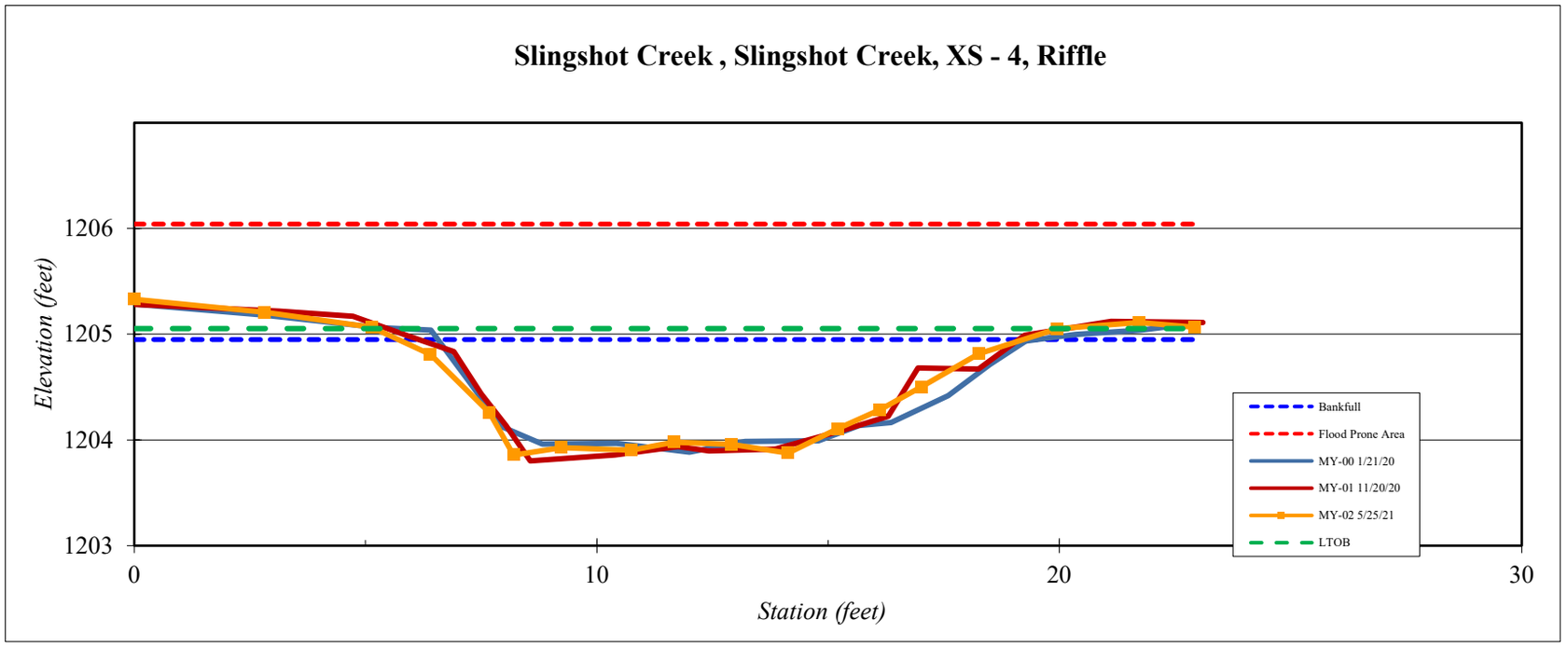


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	Slingshot Creek, XS - 4, Riffle
Feature	Riffle
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
0.0	1205.6
2.8	1205.5
5.1	1205.3
6.4	1205.0
7.7	1204.4
8.2	1203.9
9.2	1204.0
10.8	1204.0
11.7	1204.1
12.9	1204.0
14.1	1203.9
15.2	1204.2
16.1	1204.4
17.0	1204.7
18.3	1205.0
20.0	1205.3
21.7	1205.3
22.9	1205.3

SUMMARY DATA	
Bankfull Elevation:	1205.2
Bankfull Cross-Sectional Area:	11.0
Bankfull Width:	13.5
LTOB Cross-Sectional Area:	12.7
Flood Prone Area Elevation:	1206.4
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.2
Low Bank Height:	1.4
Mean Depth at Bankfull:	0.8
W / D Ratio:	16.6
Entrenchment Ratio:	7.4
Bank Height Ratio:	1.10

Stream Type	E/C 3/4

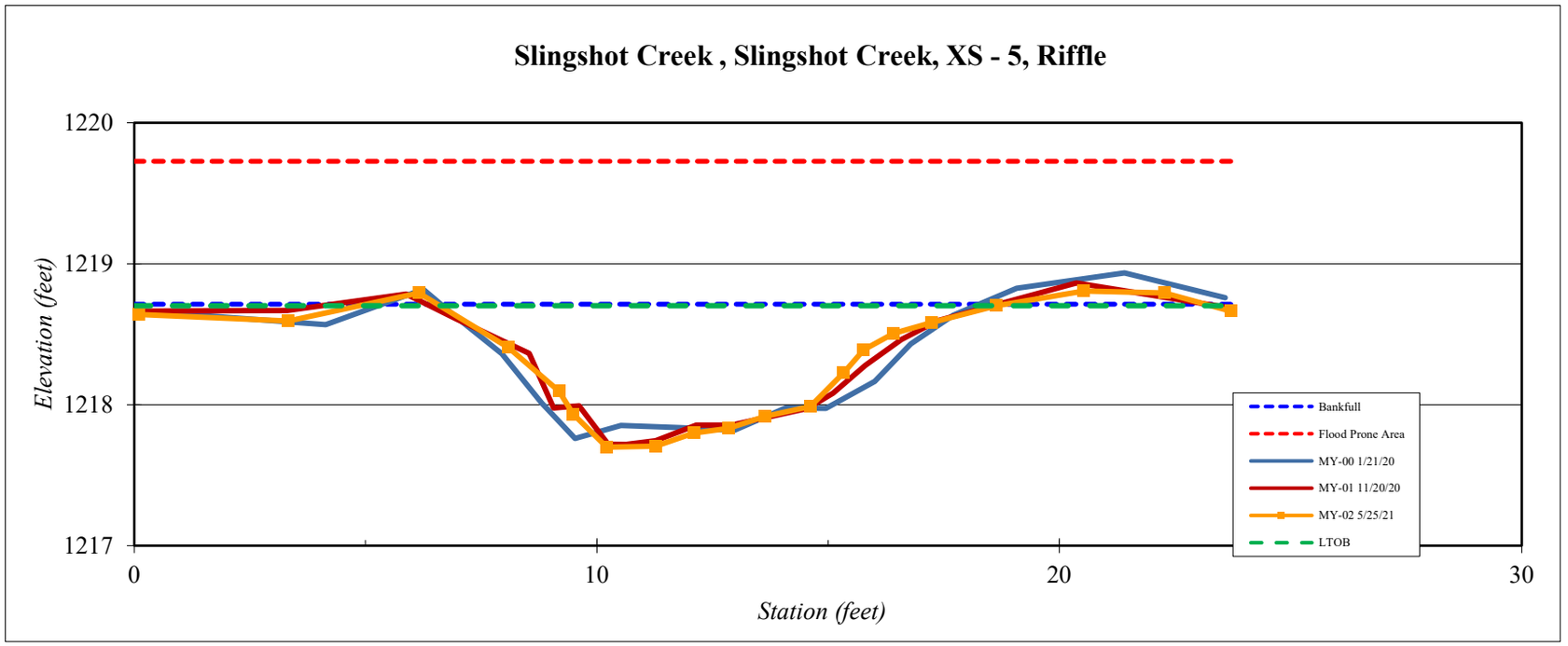


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	Slingshot Creek, XS -5, Riffle
Feature	Riffle
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
0.1	1218.4
3.3	1218.3
6.2	1218.5
8.1	1218.1
9.2	1217.8
9.5	1217.6
10.2	1217.3
11.3	1217.3
12.1	1217.4
12.8	1217.5
13.6	1217.6
14.6	1217.6
15.3	1217.9
15.8	1218.1
16.4	1218.2
17.2	1218.3
18.6	1218.4
20.5	1218.6
22.3	1218.5
23.7	1218.4

SUMMARY DATA	
Bankfull Elevation:	1218.5
Bankfull Cross-Sectional Area:	7.4
Bankfull Width:	12.8
LTOB Cross-Sectional Area:	7.3
Flood Prone Area Elevation:	1219.6
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:	22.2
Entrenchment Ratio:	7.8
Bank Height Ratio:	1.0

Stream Type	E/C 3/4

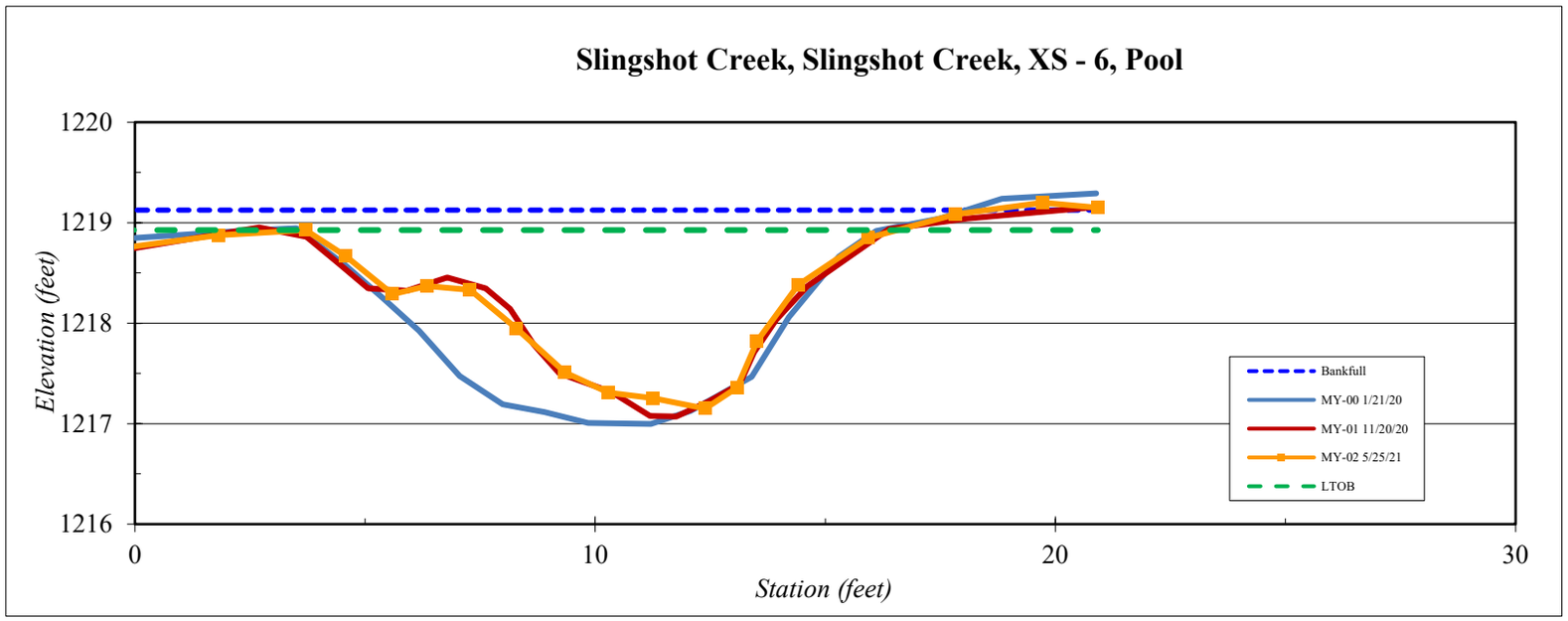


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	Slingshot Creek, XS - 6, Pool
Feature	Pool
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
-0.4	1218.7
1.8	1218.9
3.7	1218.9
4.6	1218.7
5.6	1218.3
6.3	1218.4
7.3	1218.3
8.3	1218.0
9.4	1217.5
10.3	1217.3
11.2	1217.3
12.4	1217.2
13.1	1217.4
13.5	1217.8
14.4	1218.4
15.9	1218.8
17.8	1219.1
19.7	1219.2
20.9	1219.1

SUMMARY DATA	
Bankfull Elevation:	1219.1
Bankfull Cross-Sectional Area:	14.3
Bankfull Width:	14.8
LTOB Cross-Sectional Area:	11.6
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.0
Low Bank Height:	1.8
Mean Depth at Bankfull:	1.0
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	NA

Stream Type	E/C 3/4

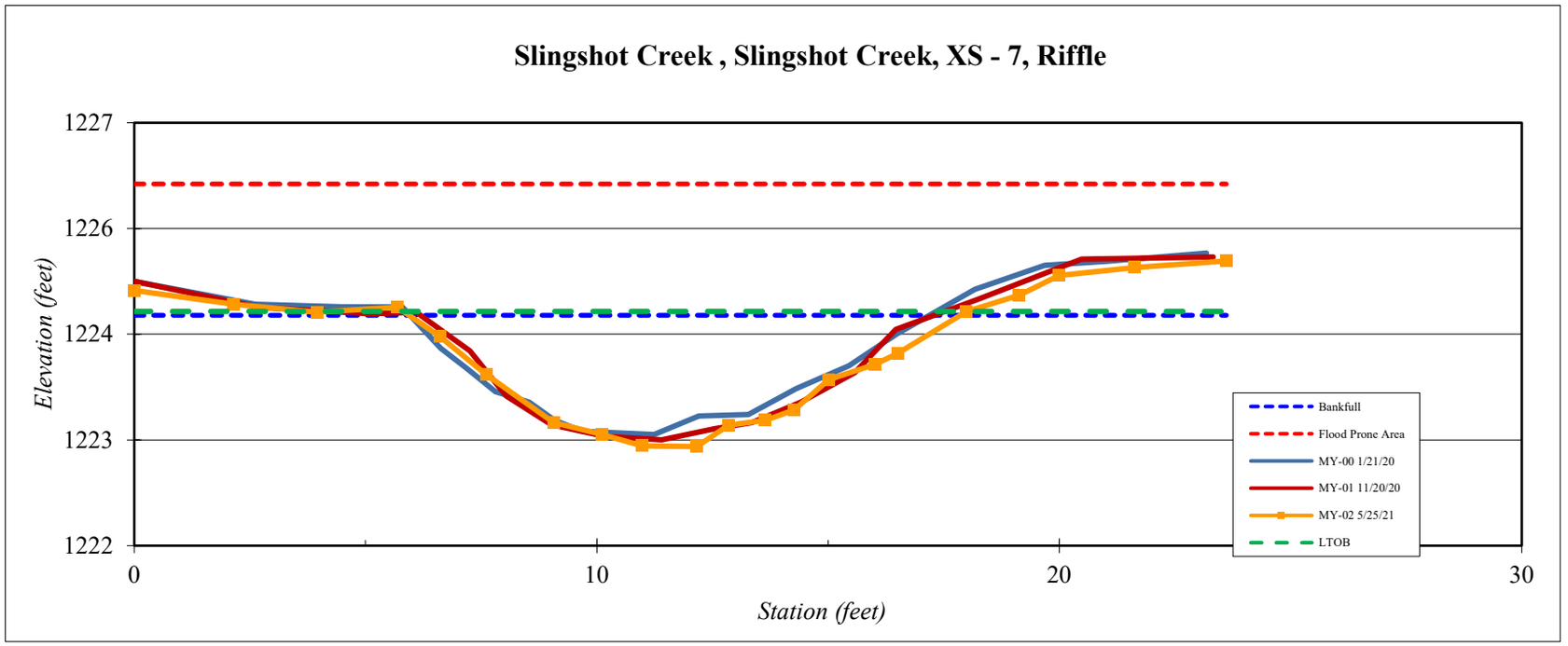


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	Slingshot Creek, XS -7, Riffle
Feature	Riffle
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
0.0	1224.9
2.2	1224.8
4.0	1224.7
5.7	1224.7
6.6	1224.4
7.6	1224.0
9.1	1223.5
10.1	1223.4
11.0	1223.2
12.2	1223.2
12.9	1223.5
13.6	1223.5
14.3	1223.6
15.0	1224.0
16.0	1224.1
16.5	1224.2
18.0	1224.7
19.1	1224.9
20.0	1225.1
21.6	1225.2
23.6	1225.22

SUMMARY DATA	
Bankfull Elevation:	1224.6
Bankfull Cross-Sectional Area:	10.1
Bankfull Width:	11.9
LTOB Cross-Sectional Area:	10.6
Flood Prone Area Elevation:	1226.0
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.4
Low Bank Height:	1.4
Mean Depth at Bankfull:	0.9
W / D Ratio:	14.0
Entrenchment Ratio:	8.4
Bank Height Ratio:	1.03

Stream Type	E/C 3/4

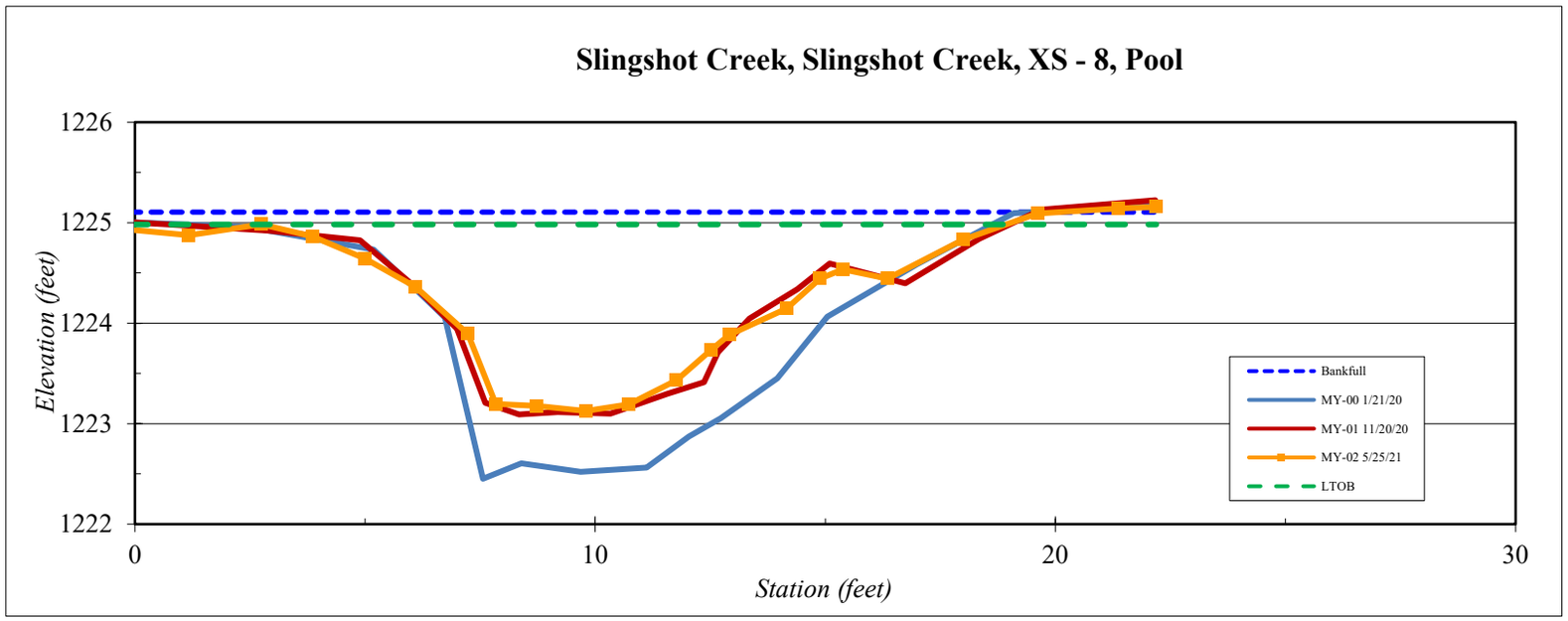


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	Slingshot Creek, XS - 8, Pool
Feature	Pool
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
-0.1	1225.0
-0.1	1224.9
1.2	1224.9
2.8	1225.0
3.8	1224.9
5.0	1224.6
6.1	1224.4
7.2	1223.9
7.8	1223.2
8.7	1223.2
9.8	1223.1
10.7	1223.2
11.8	1223.4
12.5	1223.7
12.9	1223.9
14.2	1224.1
14.9	1224.4
15.4	1224.5
16.3	1224.4
18.0	1224.8
19.6	1225.1
21.4	1225.1
22.2	1225.2

SUMMARY DATA	
Bankfull Elevation:	1225.1
Bankfull Cross-Sectional Area:	16.3
Bankfull Width:	17.4
LTOB Cross-Sectional Area:	14.3
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.0
Low Bank Height:	1.9
Mean Depth at Bankfull:	0.9
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	NA

Stream Type	E/C 3/4

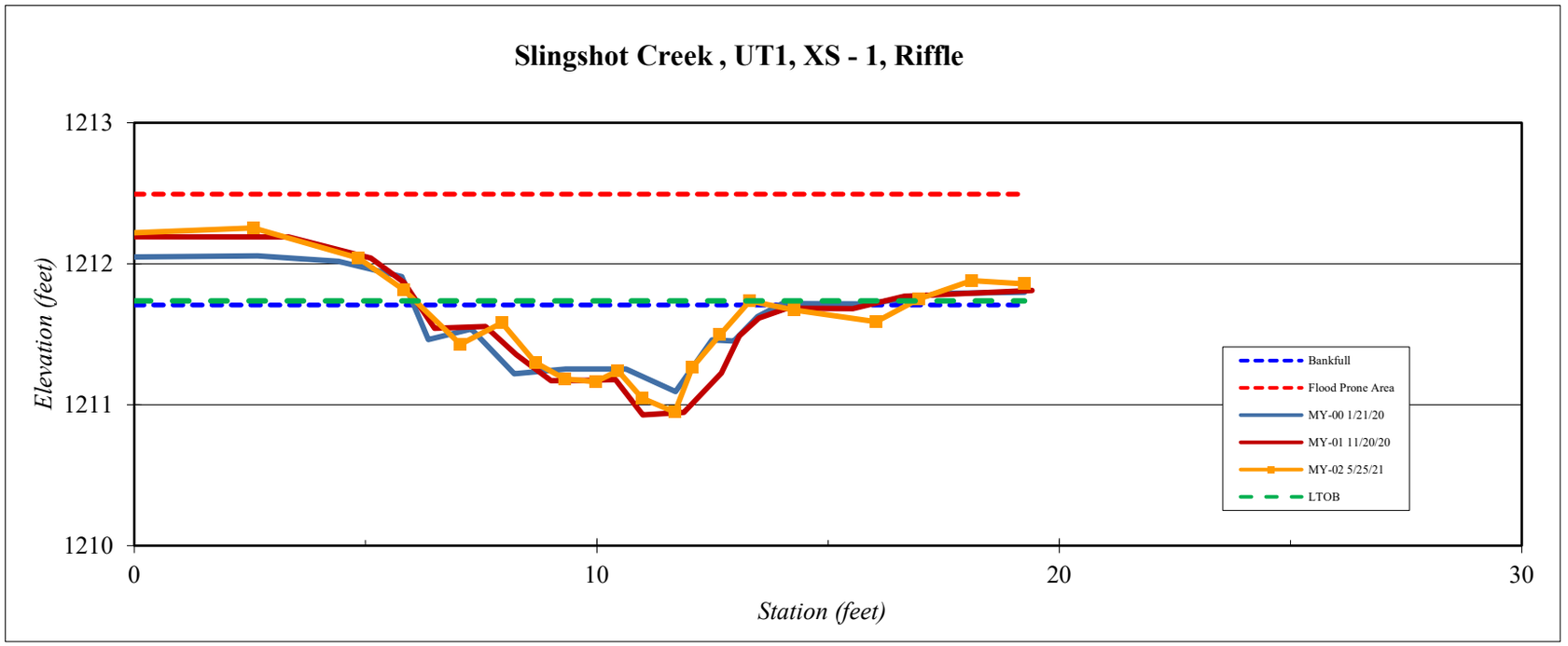


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	UT1, XS -1, Riffle
Feature	Riffle
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
-0.1	1212.2
2.6	1212.3
4.8	1212.0
5.8	1211.8
7.1	1211.4
7.9	1211.5
8.7	1211.2
9.3	1211.1
10.0	1211.1
10.5	1211.1
11.0	1210.9
11.7	1210.8
12.1	1211.2
12.7	1211.4
13.3	1211.7
14.3	1211.6
16.0	1211.5
17.0	1211.7
18.1	1211.9
19.3	1211.8

SUMMARY DATA	
Bankfull Elevation:	1211.7
Bankfull Cross-Sectional Area:	3.2
Bankfull Width:	7.2
LTOB Cross-Sectional Area:	3.3
Flood Prone Area Elevation:	1212.6
Flood Prone Width:	100.0
Max Depth at Bankfull:	0.9
Low Bank Height:	0.9
Mean Depth at Bankfull:	0.4
W / D Ratio:	16.0
Entrenchment Ratio:	13.9
Bank Height Ratio:	1.0

Stream Type	E/C 3/4

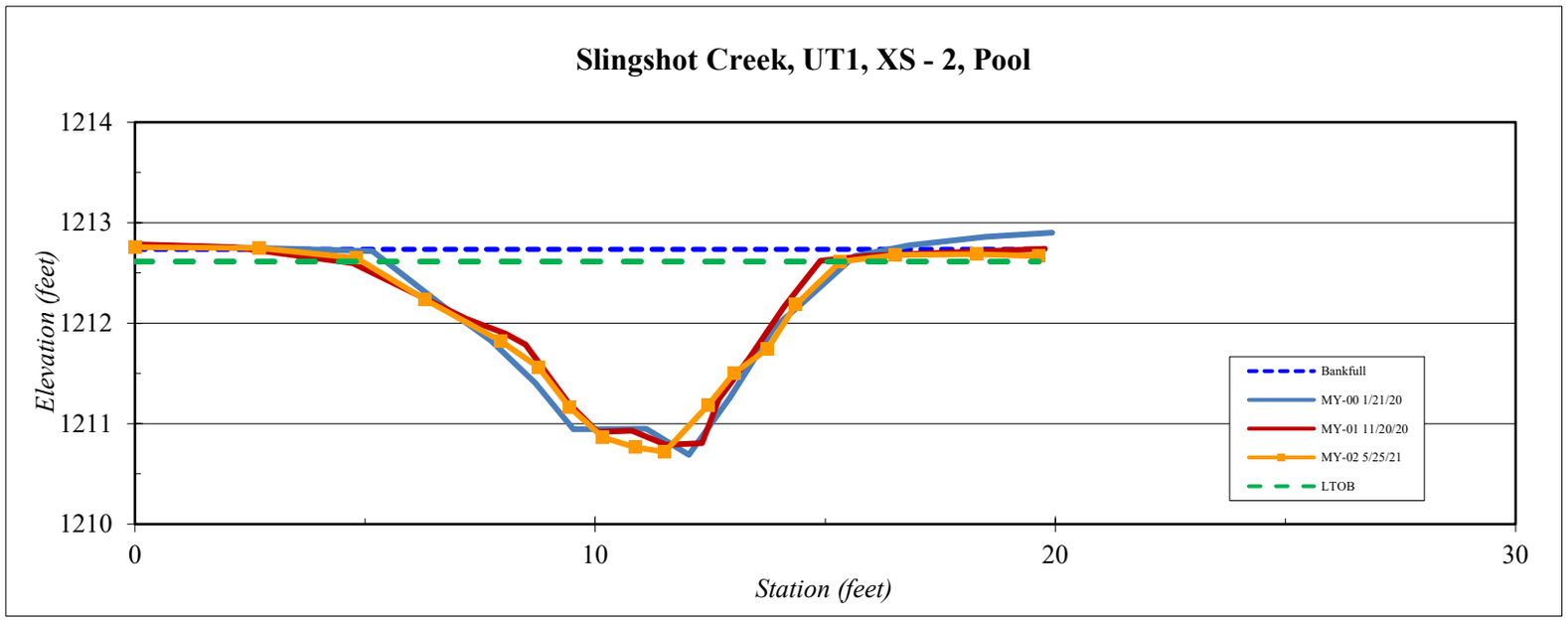


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	UT1, XS - 2, Pool
Feature	Pool
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
0.0	1212.8
2.7	1212.7
4.8	1212.6
6.3	1212.2
7.9	1211.8
8.8	1211.6
9.4	1211.2
10.2	1210.9
10.9	1210.8
11.5	1210.7
12.4	1211.2
13.0	1211.5
13.8	1211.7
14.4	1212.2
15.3	1212.6
16.5	1212.7
18.3	1212.7
19.6	1212.7

SUMMARY DATA	
Bankfull Elevation:	1212.7
Bankfull Cross-Sectional Area:	11.4
Bankfull Width:	12.4
LTOB Cross-Sectional Area:	10.0
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.0
Low Bank Height:	1.9
Mean Depth at Bankfull:	0.9
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	NA

Stream Type	E/C 3/4

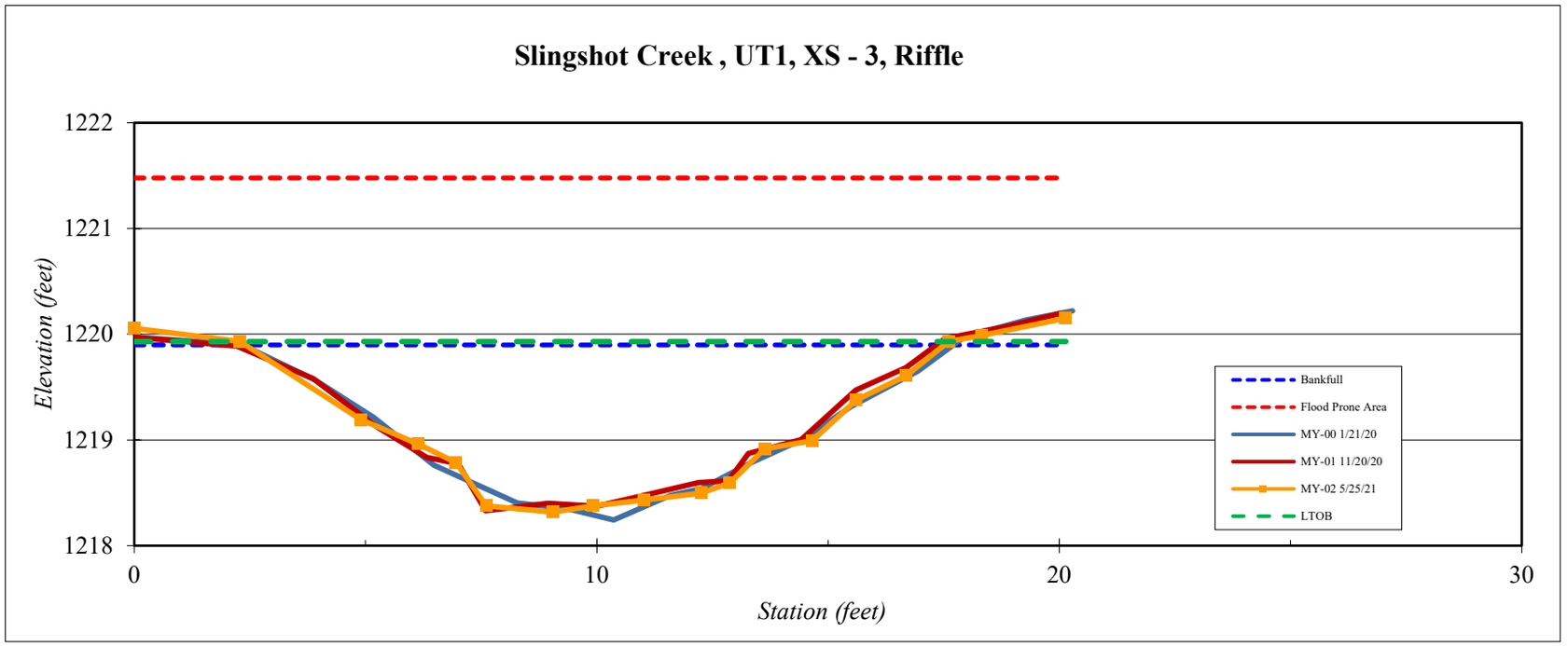


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	UT1, XS -3, Riffle
Feature	Riffle
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
0.0	1220.0
2.3	1219.8
4.9	1219.0
6.1	1218.7
7.0	1218.5
7.6	1218.1
9.1	1218.0
9.9	1218.1
11.0	1218.1
12.3	1218.2
12.9	1218.3
13.6	1218.7
14.7	1218.8
15.6	1219.2
16.7	1219.5
17.6	1219.8
18.3	1219.9
20.1	1220.1

SUMMARY DATA	
Bankfull Elevation:	1219.8
Bankfull Cross-Sectional Area:	16.4
Bankfull Width:	15.1
LTOB Cross-Sectional Area:	17.0
Flood Prone Area Elevation:	1221.6
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.8
Low Bank Height:	1.8
Mean Depth at Bankfull:	1.1
W / D Ratio:	13.9
Entrenchment Ratio:	6.6
Bank Height Ratio:	1.02

Stream Type	E/C 3/4

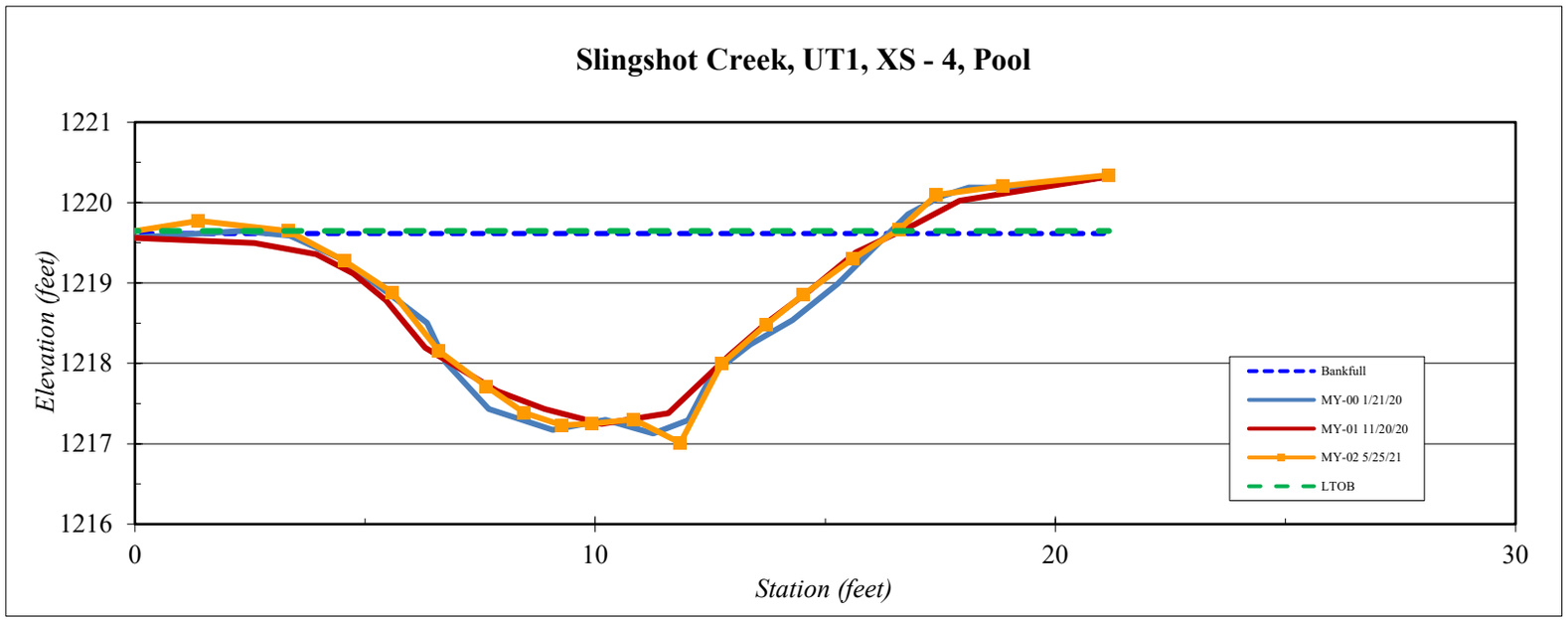


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	UT1, XS - 4, Pool
Feature	Pool
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
-0.3	1219.6
1.4	1219.8
3.3	1219.6
4.6	1219.3
5.6	1218.9
6.6	1218.1
7.6	1217.7
8.5	1217.4
9.3	1217.2
9.9	1217.2
10.8	1217.3
11.9	1217.0
12.7	1218.0
13.7	1218.5
14.5	1218.9
15.6	1219.3
16.6	1219.7
17.4	1220.1
18.9	1220.2
21.2	1220.3

SUMMARY DATA	
Bankfull Elevation:	1219.6
Bankfull Cross-Sectional Area:	18.1
Bankfull Width:	13.1
LTOB Cross-Sectional Area:	18.5
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.6
Low Bank Height:	2.6
Mean Depth at Bankfull:	1.4
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	NA

Stream Type	E/C 3/4

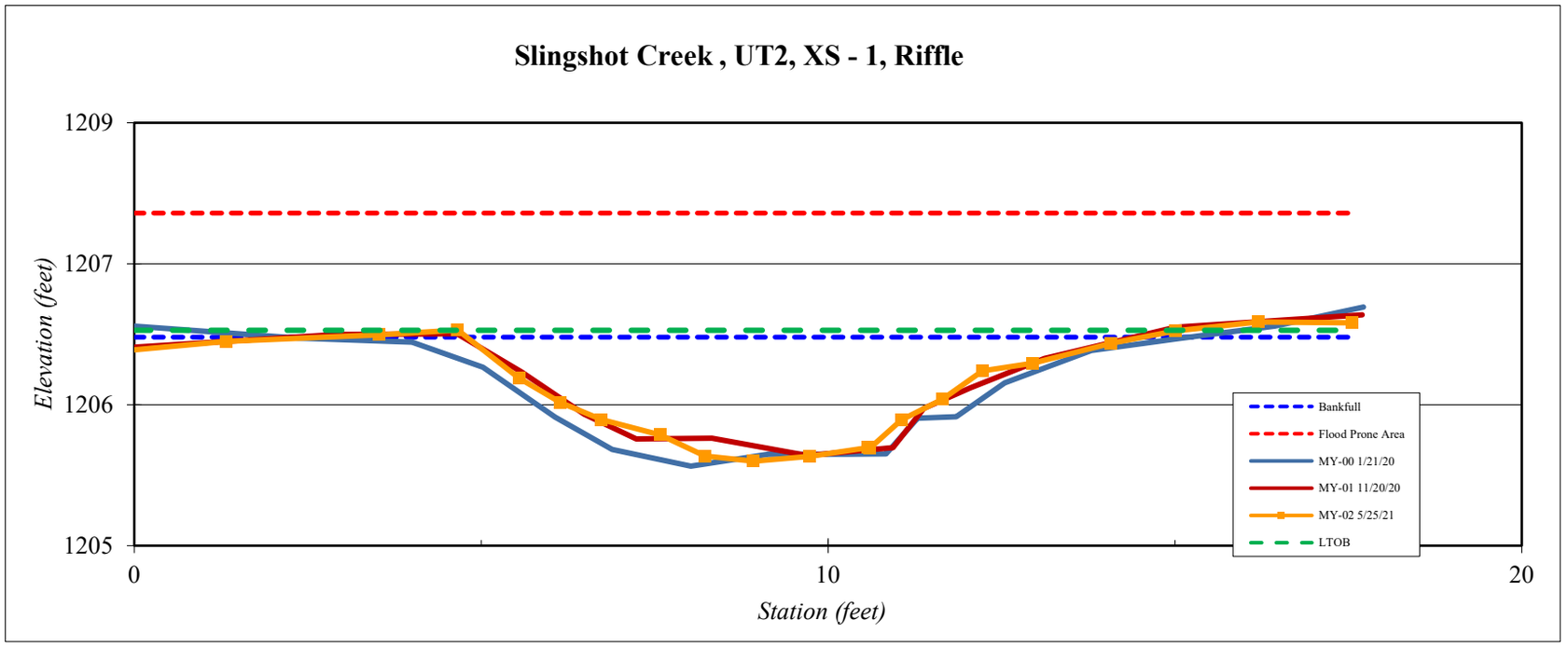


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	UT2, XS -1, Riffle
Feature	Riffle
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
-0.1	1206.8
1.3	1206.9
3.5	1206.9
4.7	1206.9
5.5	1206.6
6.1	1206.4
6.7	1206.2
7.6	1206.1
8.2	1205.9
8.9	1205.9
9.7	1205.9
10.6	1206.0
10.6	1206.0
11.1	1206.2
11.7	1206.4
12.2	1206.6
13.0	1206.7
14.1	1206.8
15.0	1206.9
16.2	1207.0
17.6	1207.00

SUMMARY DATA	
Bankfull Elevation:	1206.9
Bankfull Cross-Sectional Area:	5.4
Bankfull Width:	9.8
LTOB Cross-Sectional Area:	6.0
Flood Prone Area Elevation:	1207.9
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.0
Low Bank Height:	1.0
Mean Depth at Bankfull:	0.6
W / D Ratio:	17.6
Entrenchment Ratio:	10.3
Bank Height Ratio:	1.06

Stream Type	E/C 3/4

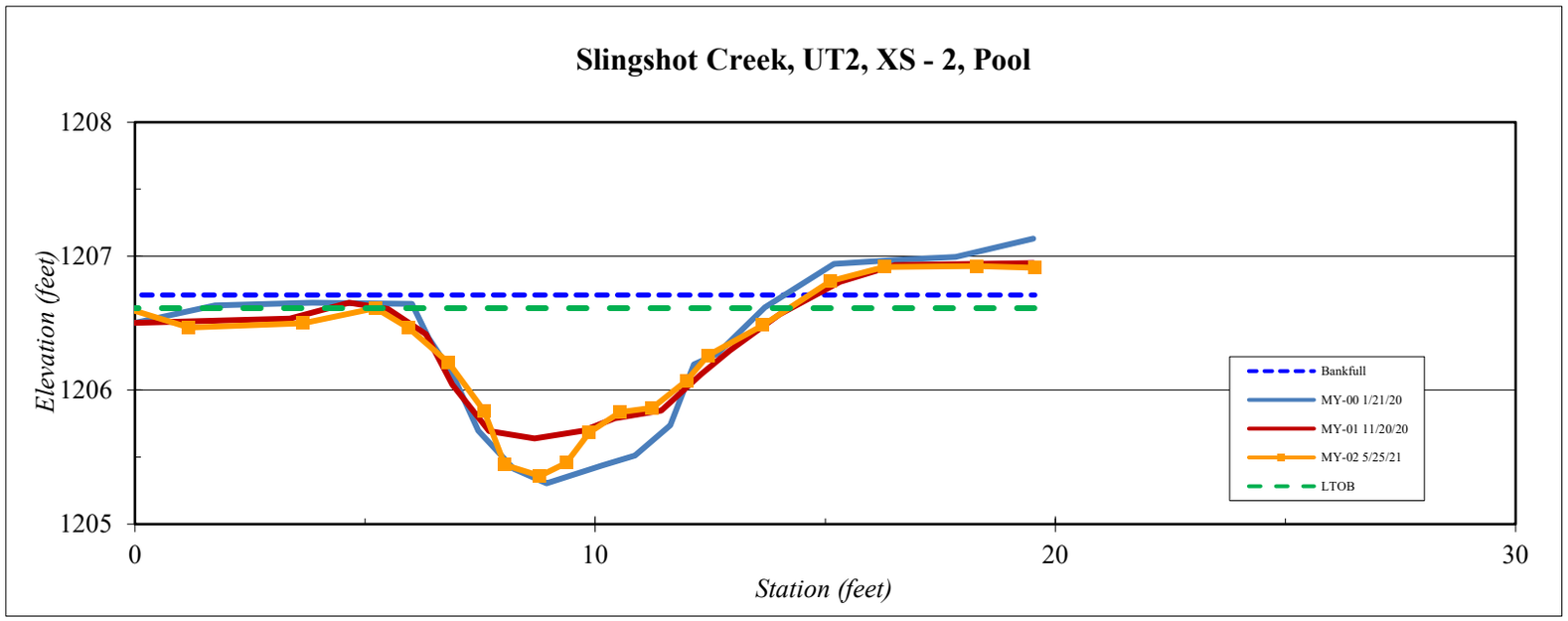


Site	Slingshot Creek
Watershed:	Cape Fear, 03030002
XS ID	UT2, XS - 2, Pool
Feature	Pool
Date:	5/25/2021
Field Crew:	Perkinson

Station	Elevation
-0.3	1206.6
1.2	1206.5
3.6	1206.5
5.2	1206.6
5.9	1206.5
6.8	1206.2
7.6	1205.8
8.0	1205.4
8.8	1205.4
9.4	1205.5
9.9	1205.7
10.5	1205.8
11.2	1205.9
12.0	1206.1
12.4	1206.3
13.6	1206.5
15.1	1206.8
16.3	1206.9
18.3	1206.9
19.6	1206.9

SUMMARY DATA	
Bankfull Elevation:	1206.7
Bankfull Cross-Sectional Area:	6.3
Bankfull Width:	9.4
LTOB Cross-Sectional Area:	5.4
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.3
Low Bank Height:	1.3
Mean Depth at Bankfull:	0.7
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	NA

Stream Type	E/C 3/4



Appendix E
HYDROLOGY DATA

Table 15. Verification of Bankfull Events
Stream Gauge Graphs
Table 16. Groundwater Hydrology Data
Soil Temperature Graph
Figure E1. 30-70 Percentile Graph for Rainfall
Groundwater Gauge Graphs

Table 15. Verification of Bankfull Events

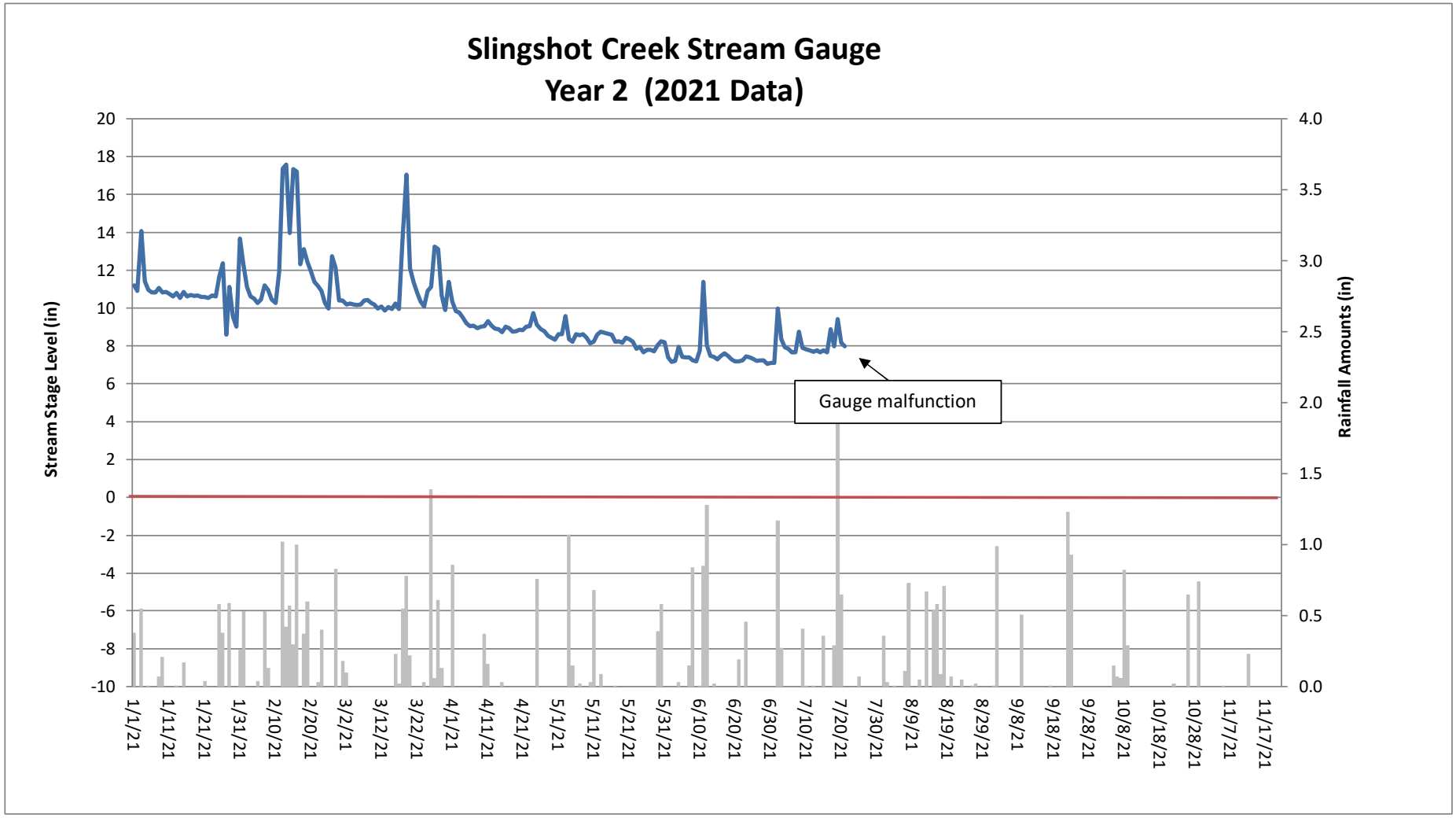
Date of Data Collection	Date of Occurrence	Method	Photo (if available)
June 3, 2020	May 21, 2020	Stream gauges and trail cameras captured a bankfull event after 5.37 inches of rain was documented between May 20th and 22nd, 2020 at an on-site rain gauge. Flow gauge recorded a stream stage of 2.15 feet.	1
November 18, 2020	November 12, 2020	Stream gauges and trail cameras captured a bankfull event after 3.1 inches of rain was documented between November 10th and 13th, 2020 at an on-site rain gauge. Flow gauge recorded a stream stage of 2.94 feet.	2, 3
February 25, 2021	February 15. 2021	Wrack was observed along the floodplain of Slingshot Creek and the crest gauge captured a bankfull event after 2.31 inches of rain was documented between February 12th and 15th, 2021 at an on-site rain gauge. The trail camera was damaged by the accompanying ice storm. Flow gauge recorded a stream stage of 1.45 feet.	4
March 27, 2021	March 2, 2021	Stream gauges and trail cameras captured Slingshot Creek receding from a bankfull event after 1.45 inches of rain was documented between March 26th and 27th, 2021 at an on-site rain gauge. Flow gauge recorded a stream stage of 1.10 feet.	5

Photo-2

Photo-3


Photo-4


Photo-5
29.41 inHg - 66°F 03/27/2021 03:27PM SLNGDS


Slingshot Creek Stream Gauge
Year 2 (2021 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Gauge malfunction
1/1/21
1/11/21
1/21/21
1/31/21
2/10/21
2/20/21
3/2/21
3/12/21
3/22/21
4/1/21
4/11/21
4/21/21
5/1/21
5/11/21
5/21/21
5/31/21
6/10/21
6/20/21
6/30/21
7/10/21
7/20/21
7/30/21
8/9/21
8/19/21
8/29/21
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10/28/21
11/7/21
11/17/21

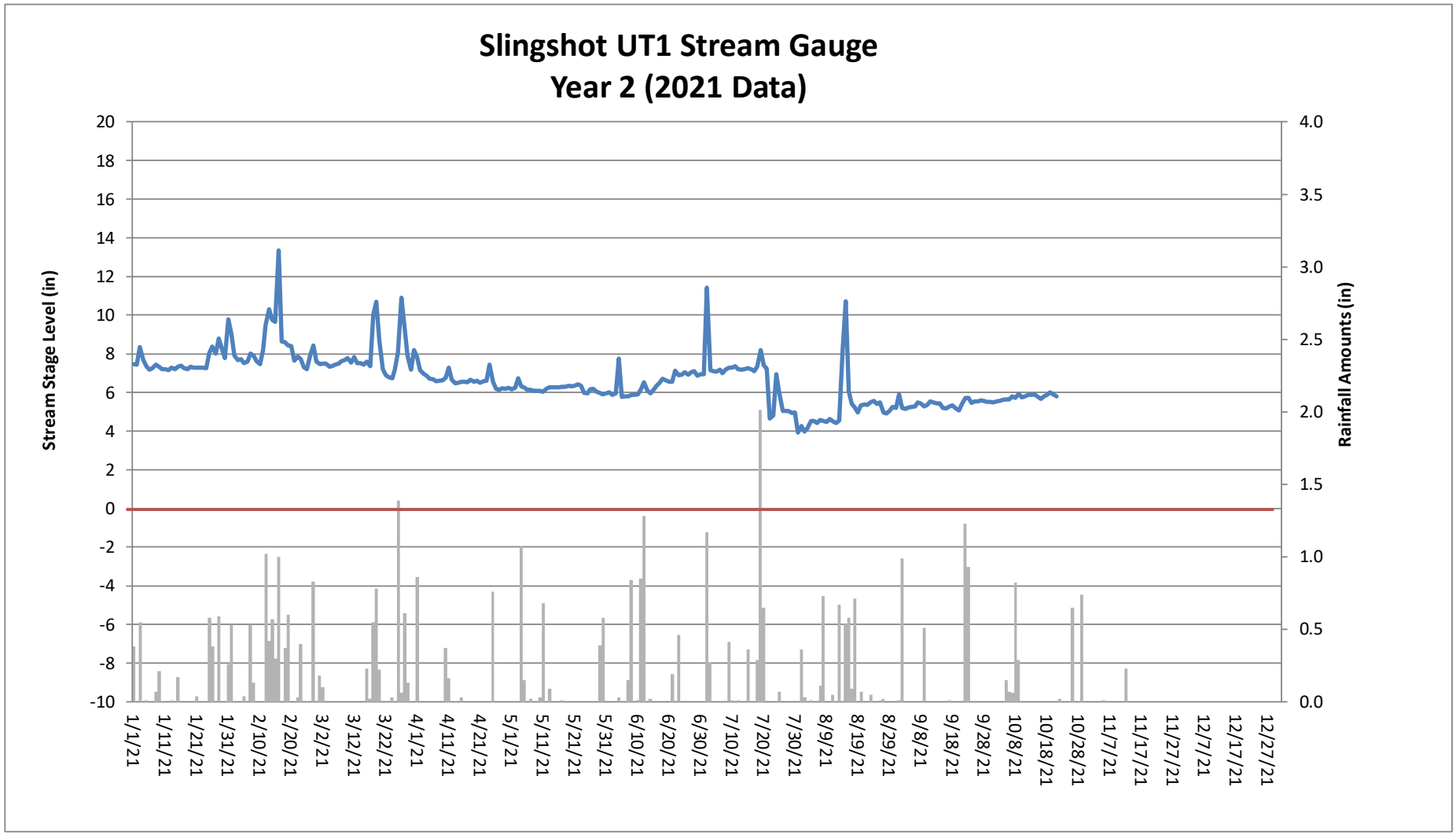

Slingshot UT1 Stream Gauge
Year 2 (2021 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/21
1/11/21
1/21/21
1/31/21
2/10/21
2/20/21
3/2/21
3/12/21
3/22/21
4/1/21
4/11/21
4/21/21
5/1/21
5/11/21
5/21/21
5/31/21
6/10/21
6/20/21
6/30/21
7/10/21
7/20/21
7/30/21
8/9/21
8/19/21
8/29/21
9/8/21
9/18/21
9/28/21
10/8/21
10/18/21
10/28/21
11/7/21
11/17/21
11/27/21
12/7/21
12/17/21
12/27/21

Table 16. 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	Yes 26 days (11.4%)	Yes 62 days (24.5%)					
2	Yes 61 days (26.8%)	Yes 253 days (100%)					
3	Yes 187 days (82.0%)	Yes 123 days (48.6%)					
4	Yes 187 days (82.0%)	Yes 178 days (70.4%)					
5	Yes 100 days (43.9%)	Yes 123 days (48.6%)					
6	Yes 127 days (55.7%)	Yes 143 days (56.5%)					
7	Yes 83 days (36.4%)	Yes 210 days (83.0%)					
8	Yes 29 days (12.7%)	Yes 71 days (28.0%)					
9	Yes 73 days (32.0%)	Yes 109 days (43.1%)					
10	No 4 days (1.8%)	No 5 days (2.0%)					
11*	Yes 46 days (20.2%)	Yes 151 days (59.7%)					

*Gauge 11 was installed in an area not previously identified for wetland reestablishment but appeared to be exhibiting wetland characteristics post-construction. During 2021 monitoring, the additional wetlands surrounding gauge 11 were delineated, resulting in approximately 0.52 acres of wetlands on-site that were not previously accounted for (Appendix F).

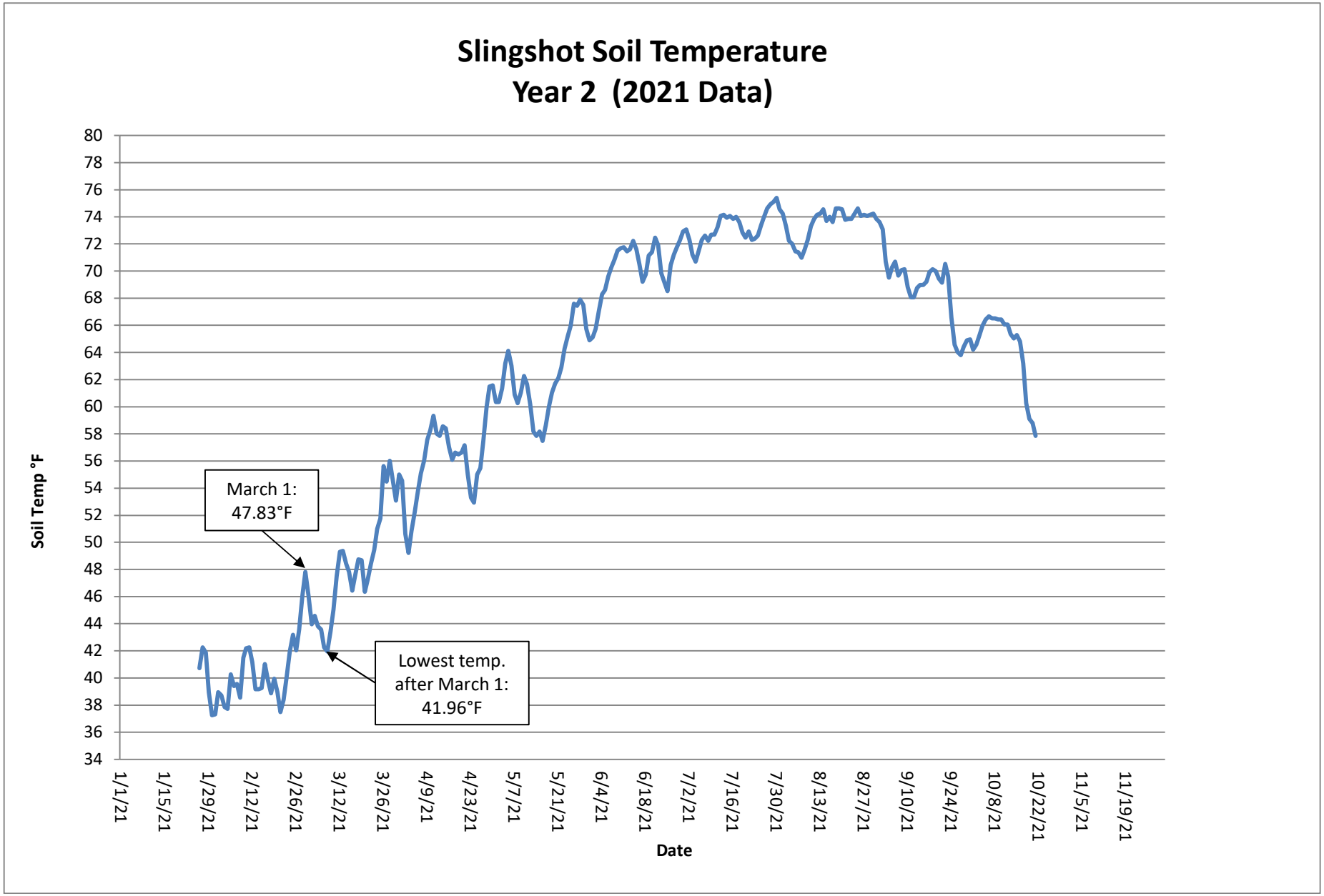
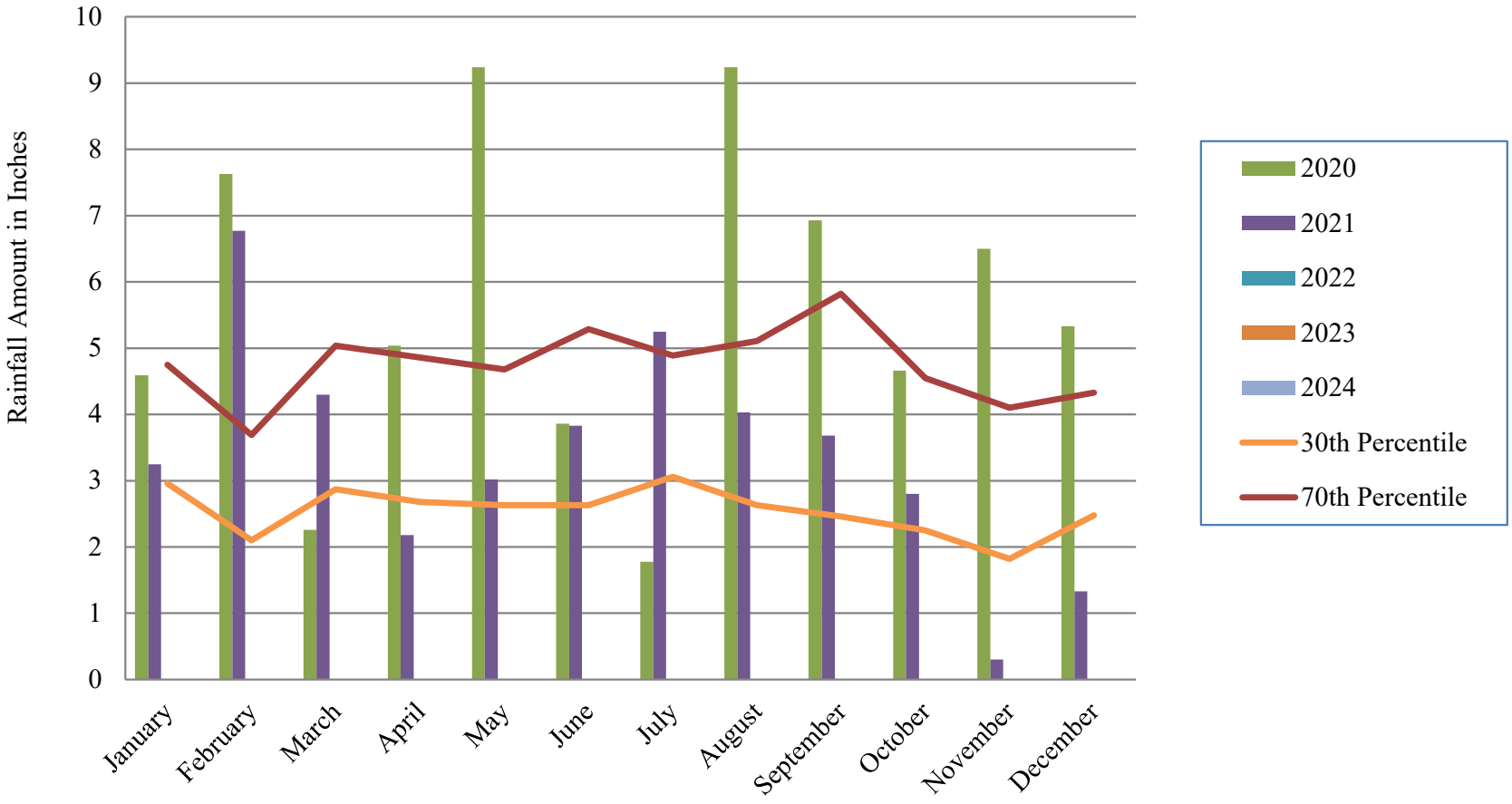
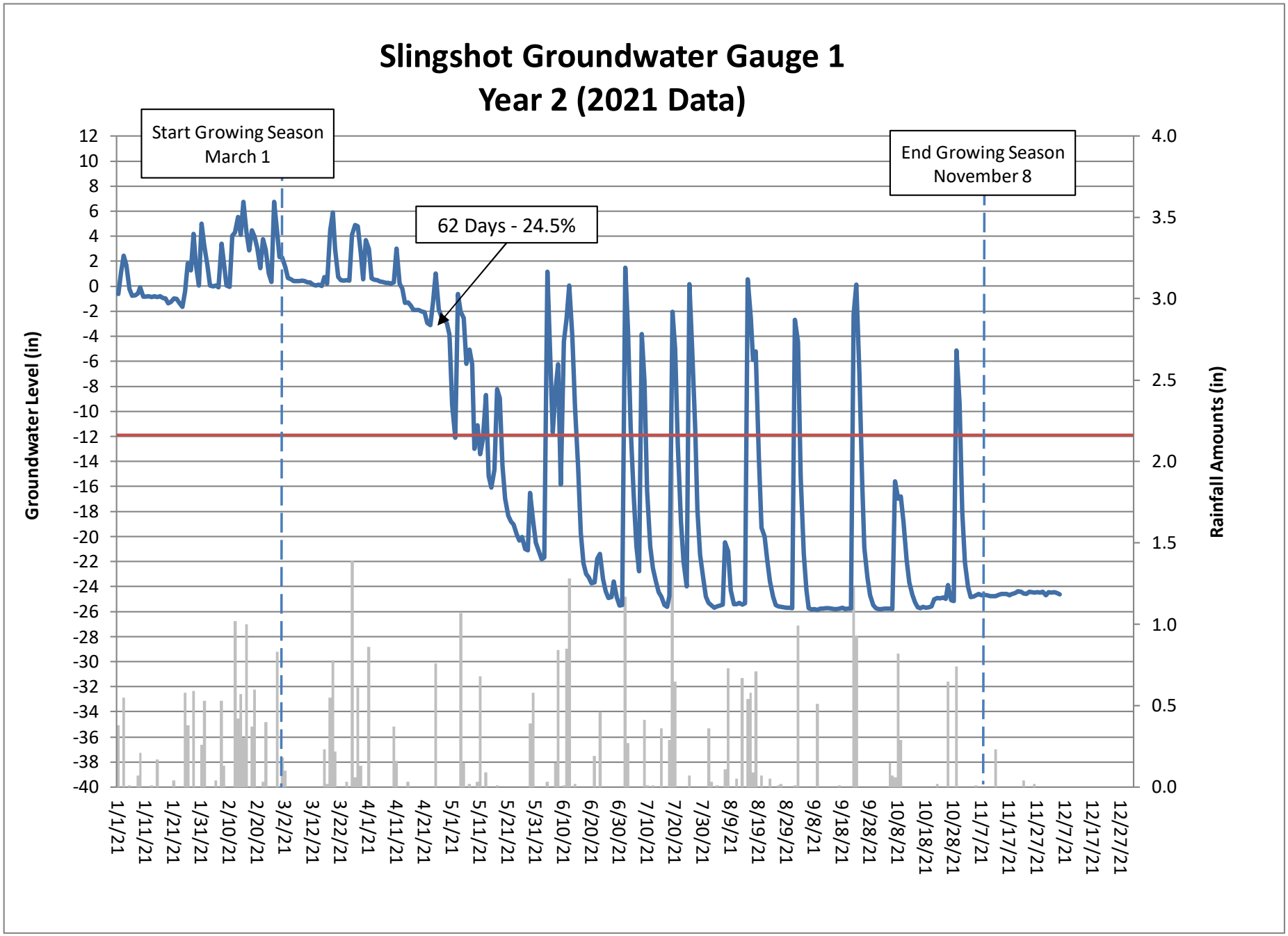
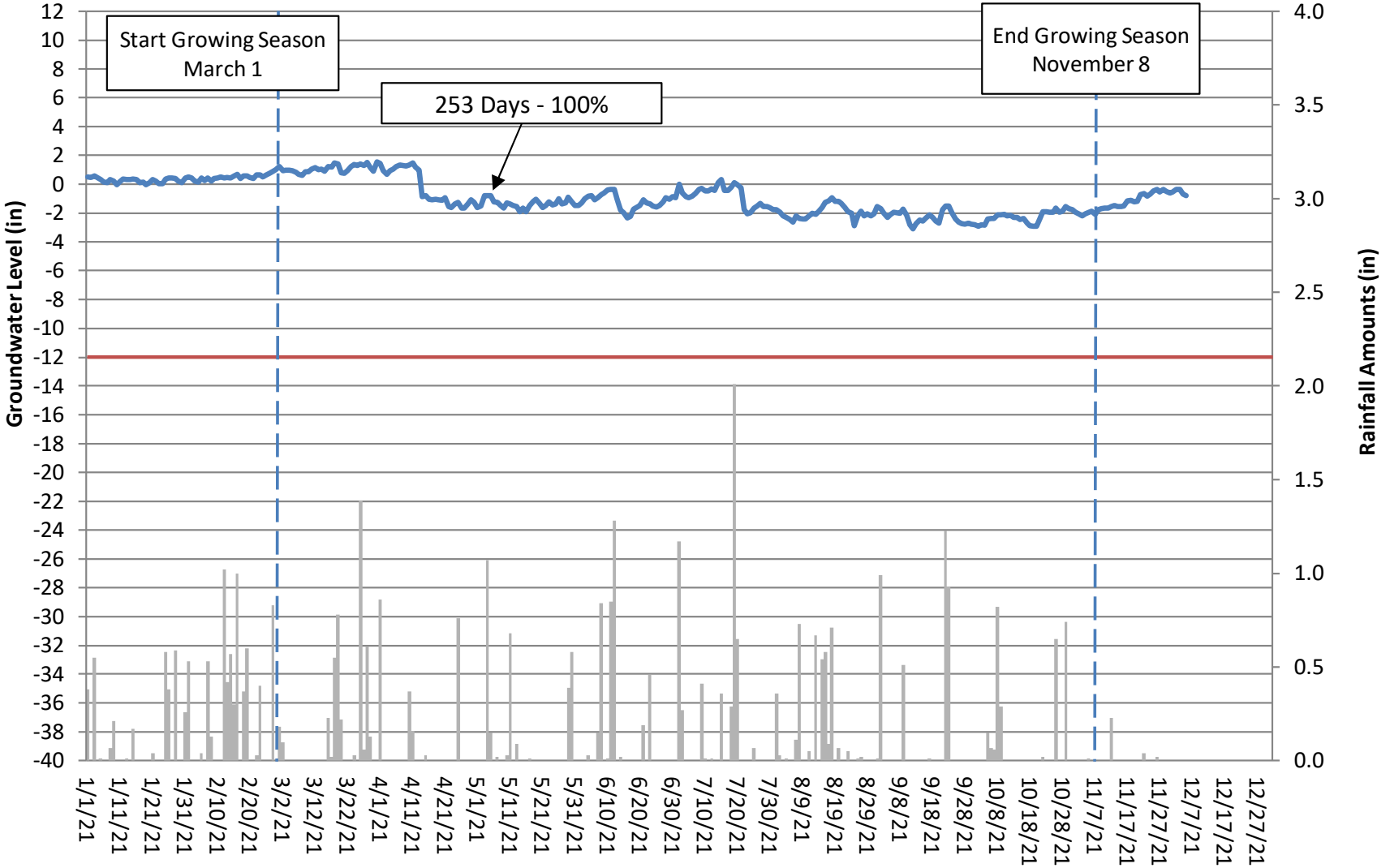

Slingshot Soil Temperature
Year 2 (2021 Data)
Soil Temp °F
80
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
38
36
34
March 1:
47.83°F
Lowest temp.
after March 1:
41.96°F
1/1/21
1/15/21
1/29/21
2/12/21
2/26/21
3/12/21
3/26/21
4/9/21
4/23/21
5/7/21
5/21/21
6/4/21
6/18/21
7/2/21
7/16/21
7/30/21
8/13/21
8/27/21
9/10/21
9/24/21
10/8/21
10/22/21
11/5/21
11/19/21
Date

Figure E1: Slingshot
30-70 Percentile Graph for Rainfall
Current year data from onsite rain gauge
30-70th percentile data from WETS Station: Reidsville 2 NW

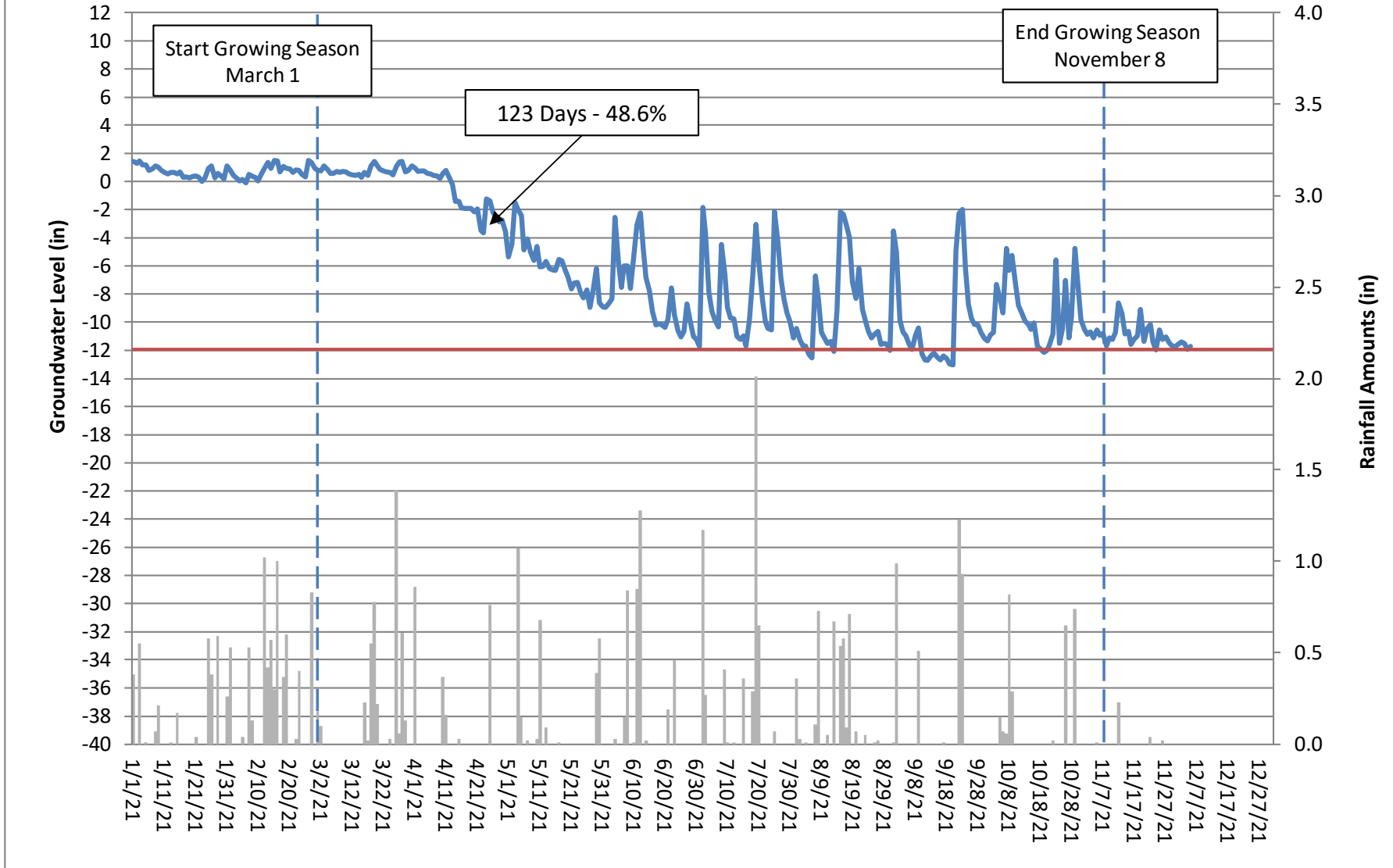


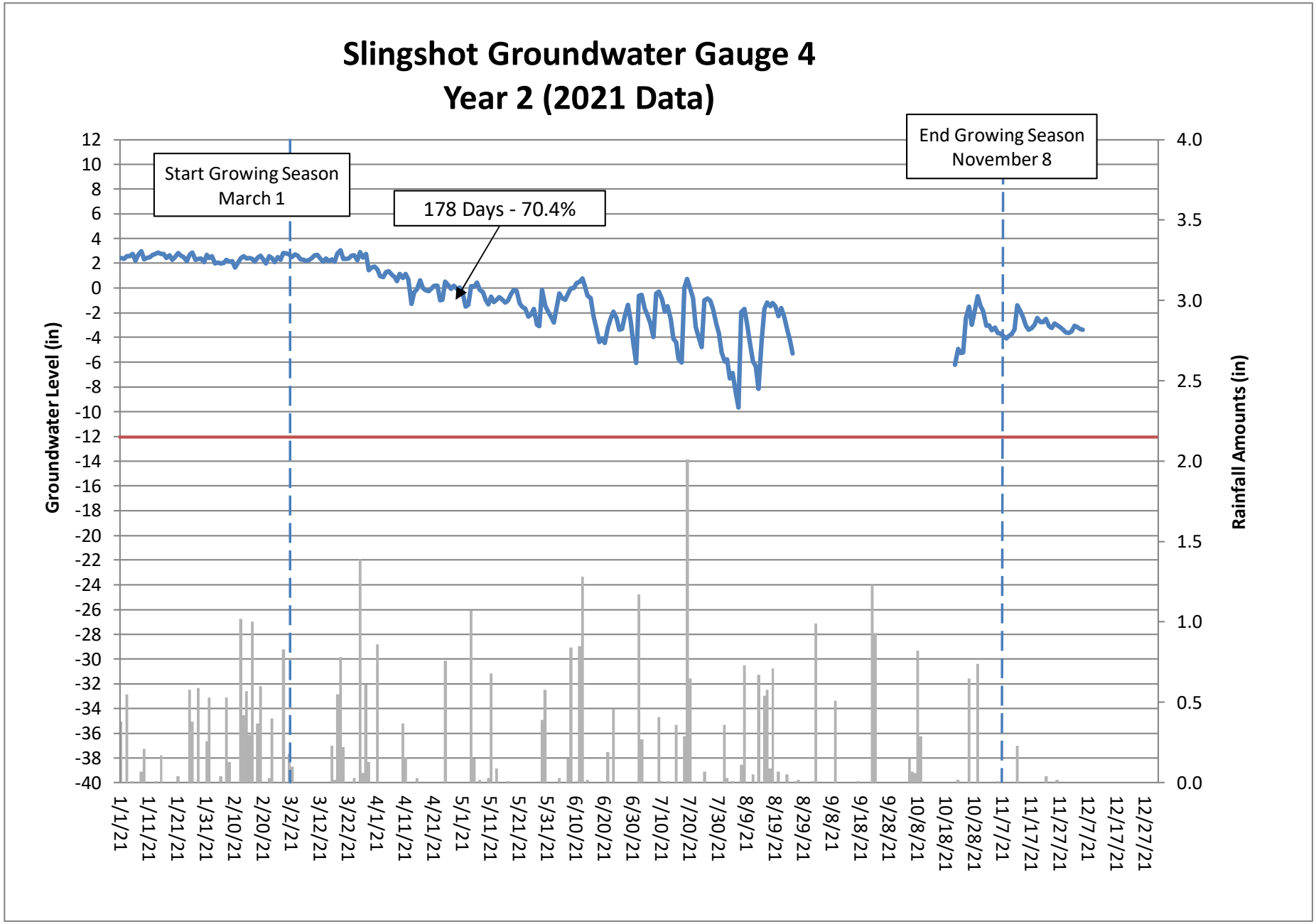

Slingshot Groundwater Gauge 1
Year 2 (2021 Data)
Start Growing Season
March 1
End Growing Season
November 8
62 Days - 24.5%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/21
1/11/21
1/21/21
1/31/21
2/10/21
2/20/21
3/2/21
3/12/21
3/22/21
4/1/21
4/11/21
4/21/21
5/1/21
5/11/21
5/21/21
5/31/21
6/10/21
6/20/21
6/30/21
7/10/21
7/20/21
7/30/21
8/9/21
8/19/21
8/29/21
9/8/21
9/18/21
9/28/21
10/8/21
10/18/21
10/28/21
11/7/21
11/17/21
11/27/21
12/7/21
12/17/21
12/27/21

Slingshot Groundwater Gauge 2
Year 2 (2021 Data)

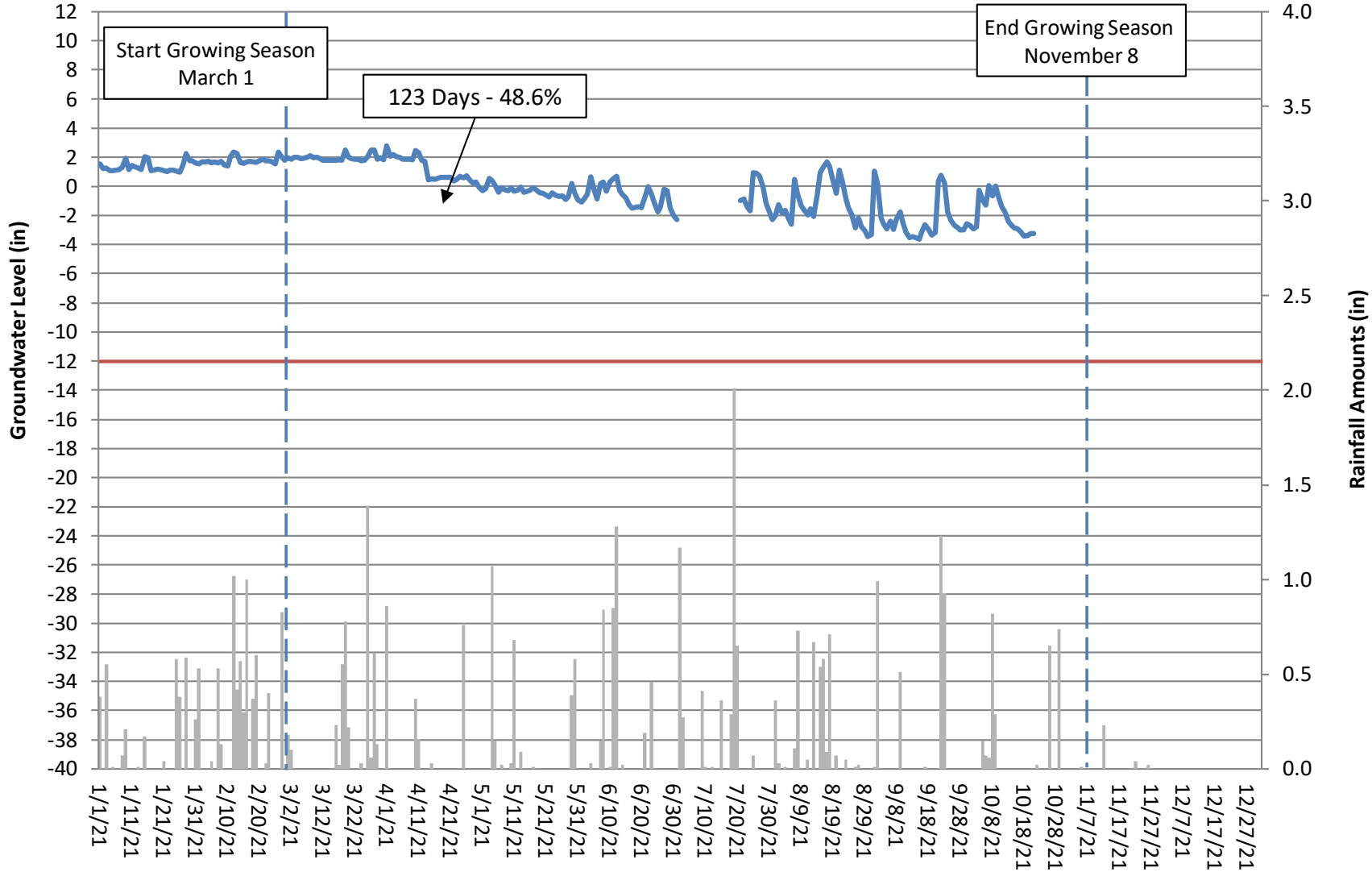


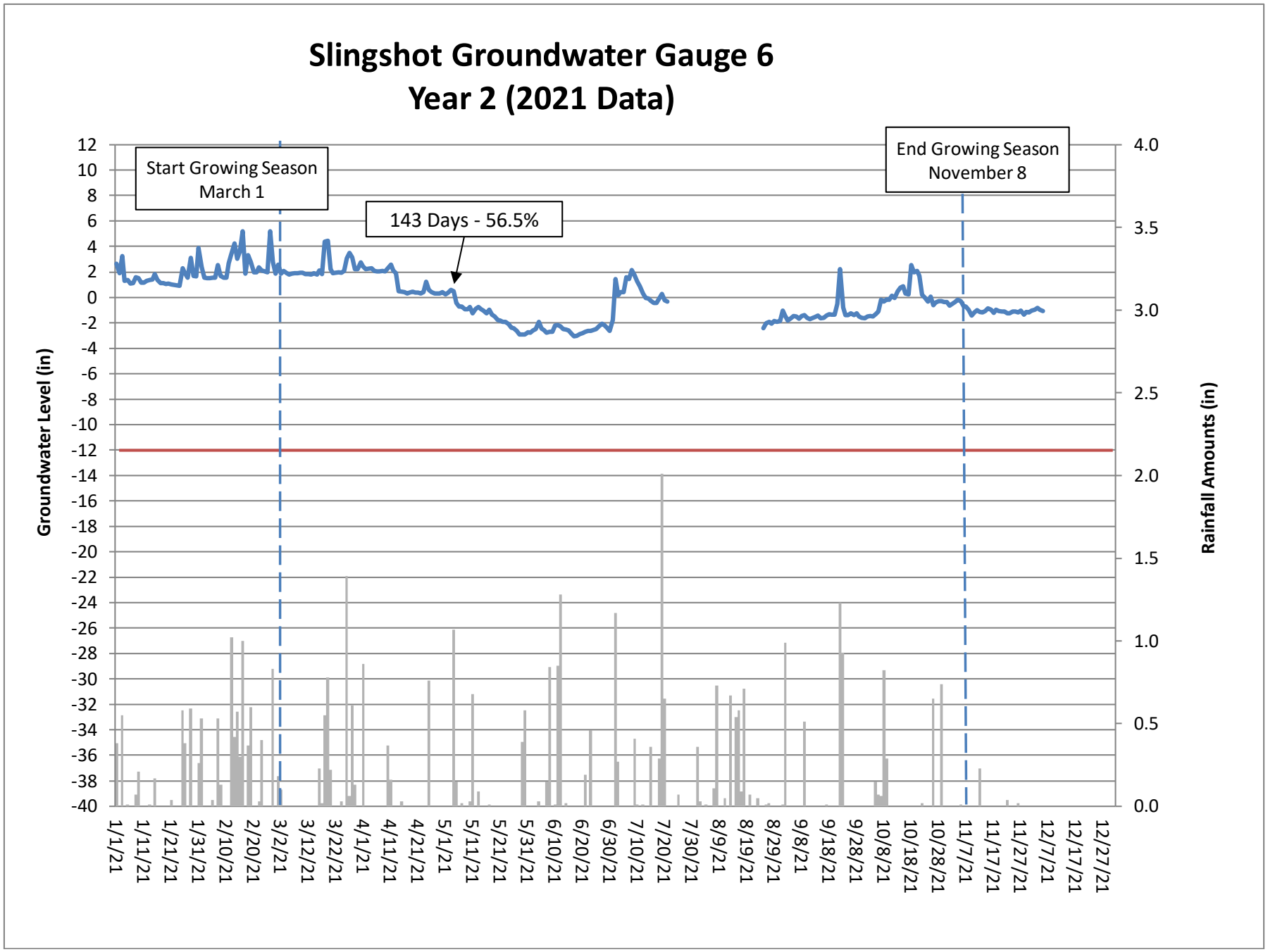
Slingshot Groundwater Gauge 3
Year 2 (2021 Data)



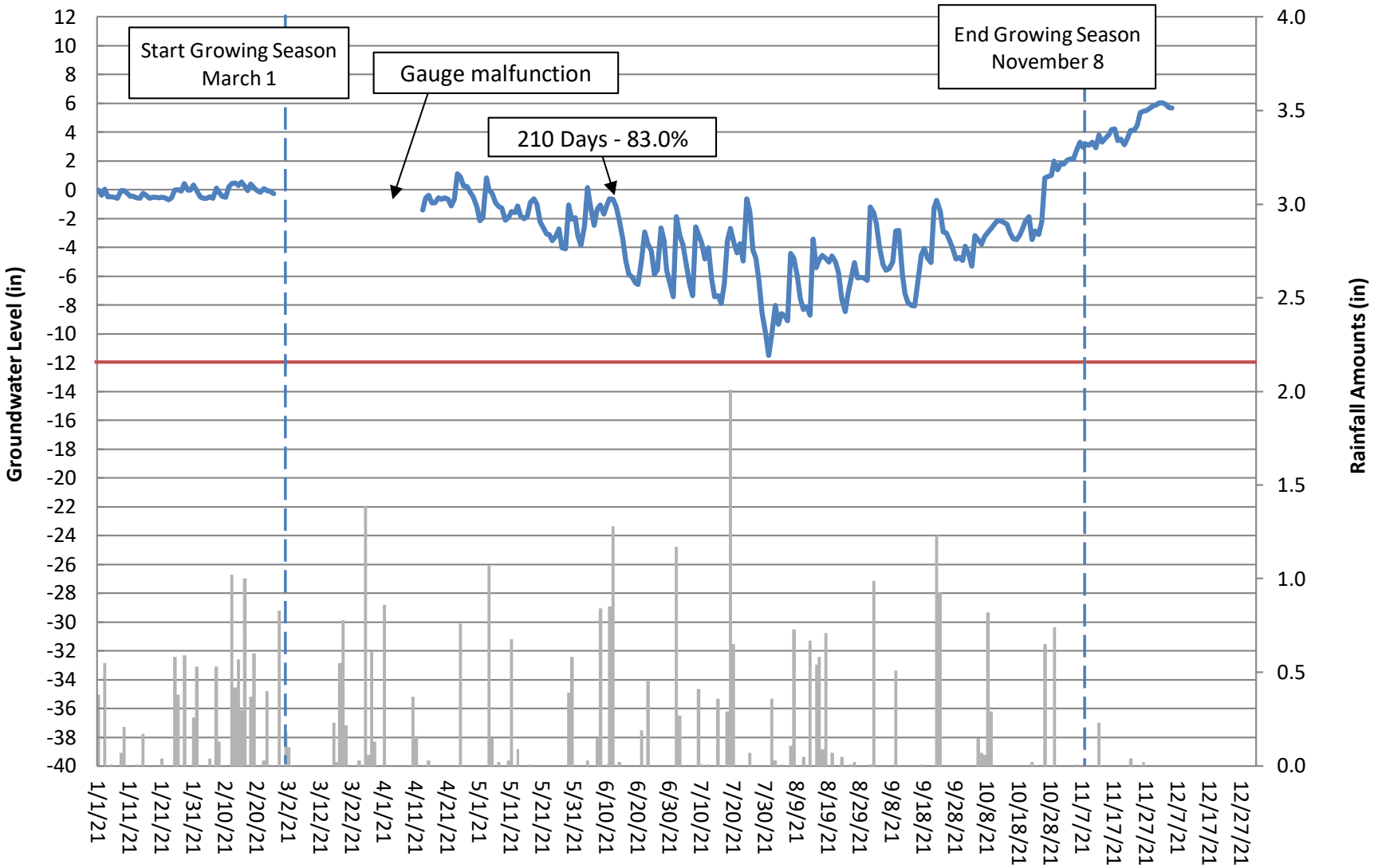

Slingshot Groundwater Gauge 4
Year 2 (2021 Data)
Start Growing Season
March 1
178 Days - 70.4%
End Growing Season
November 8
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/21
1/11/21
1/21/21
1/31/21
2/10/21
2/20/21
3/2/21
3/12/21
3/22/21
4/1/21
4/11/21
4/21/21
5/1/21
5/11/21
5/21/21
5/31/21
6/10/21
6/20/21
6/30/21
7/10/21
7/20/21
7/30/21
8/9/21
8/19/21
8/29/21
9/8/21
9/18/21
9/28/21
10/8/21
10/18/21
10/28/21
11/7/21
11/17/21
11/27/21
12/7/21
12/17/21
12/27/21

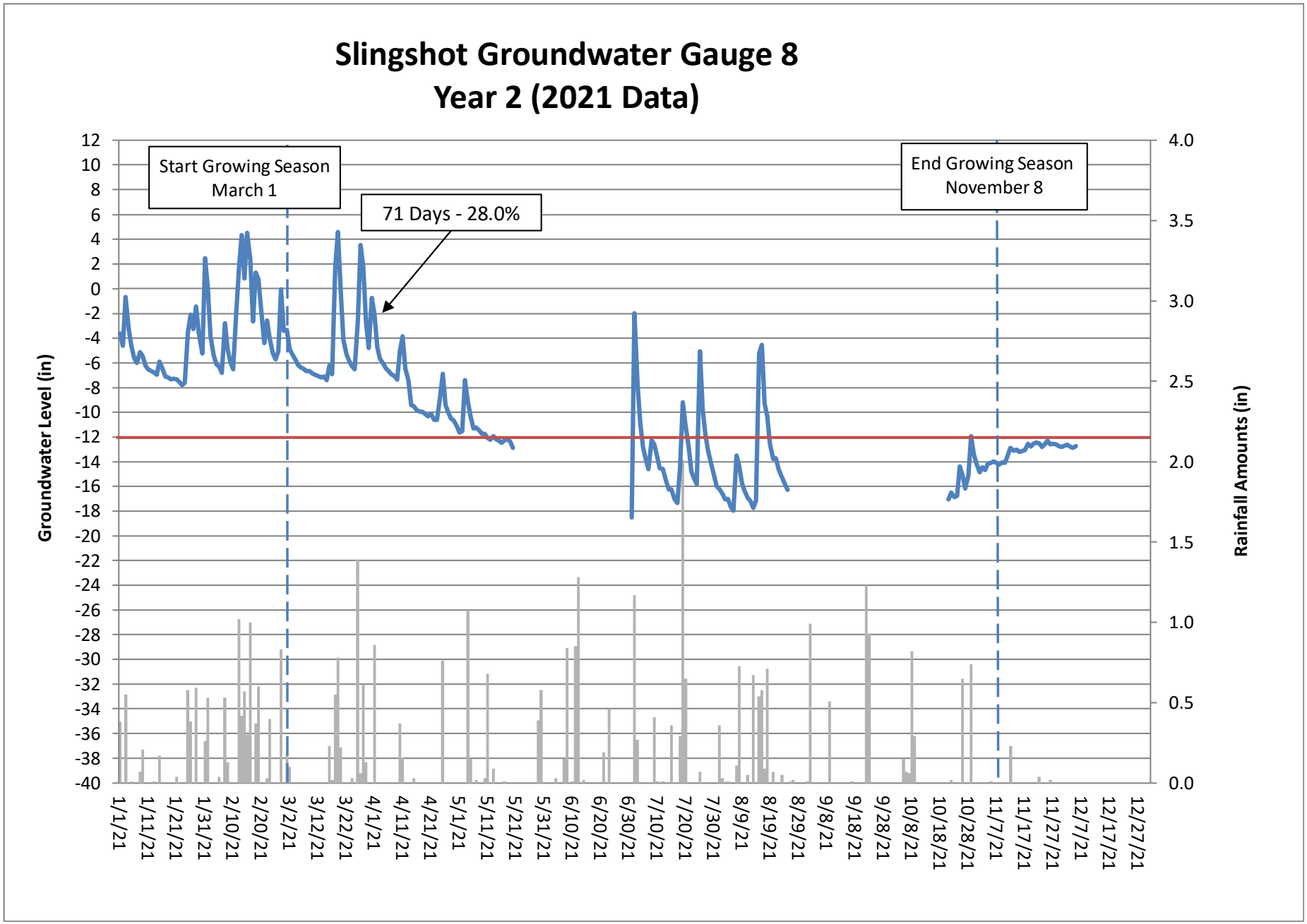
Slingshot Groundwater Gauge 5
Year 2 (2021 Data)



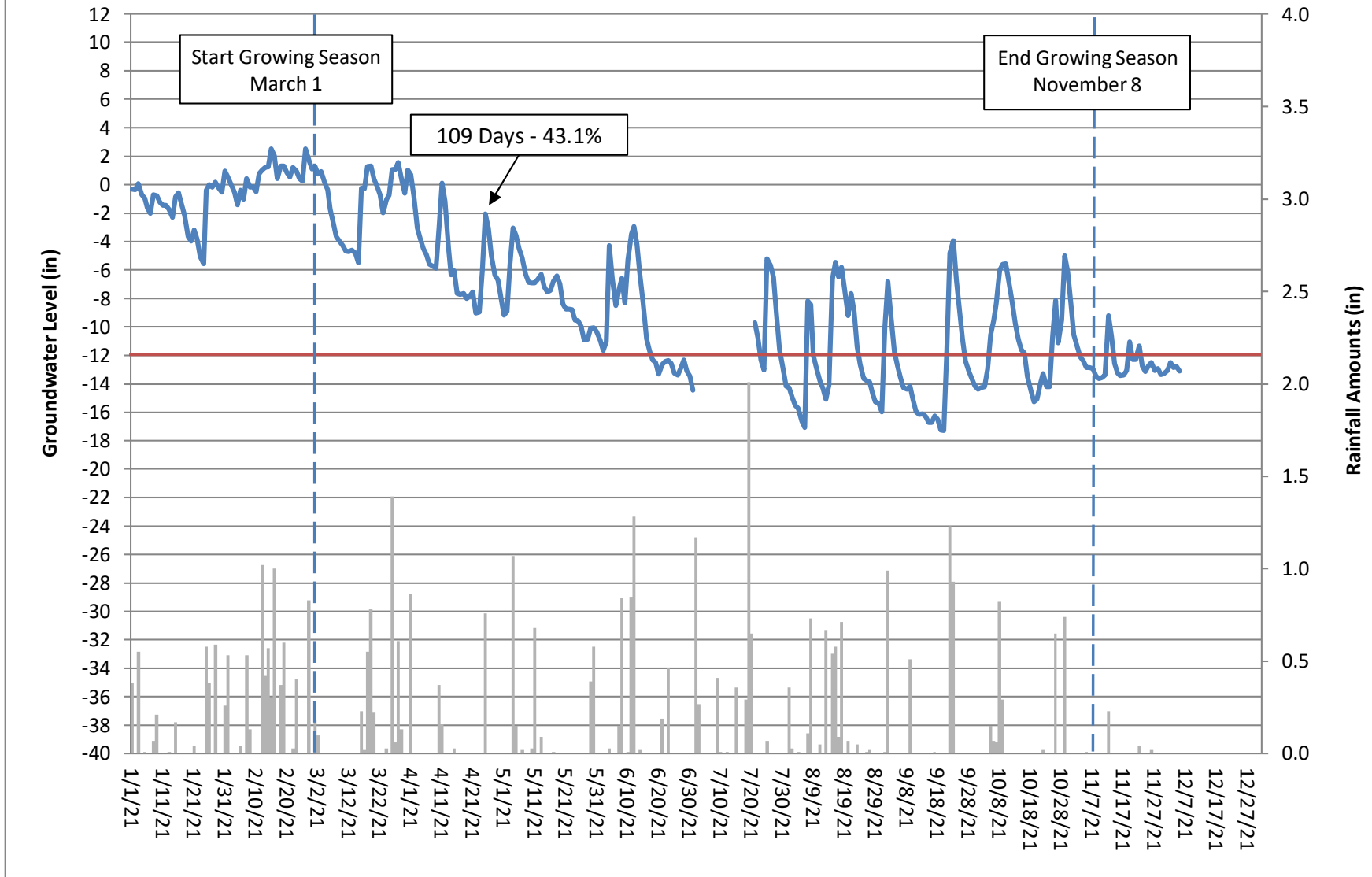

Slingshot Groundwater Gauge 6
Year 2 (2021 Data)
Start Growing Season
March 1
143 Days - 56.5%
End Growing Season
November 8
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/21
1/11/21
1/21/21
1/31/21
2/10/21
2/20/21
3/2/21
3/12/21
3/22/21
4/1/21
4/11/21
4/21/21
5/1/21
5/11/21
5/21/21
5/31/21
6/10/21
6/20/21
6/30/21
7/10/21
7/20/21
7/30/21
8/9/21
8/19/21
8/29/21
9/8/21
9/18/21
9/28/21
10/8/21
10/18/21
10/28/21
11/7/21
11/17/21
11/27/21
12/7/21
12/17/21
12/27/21

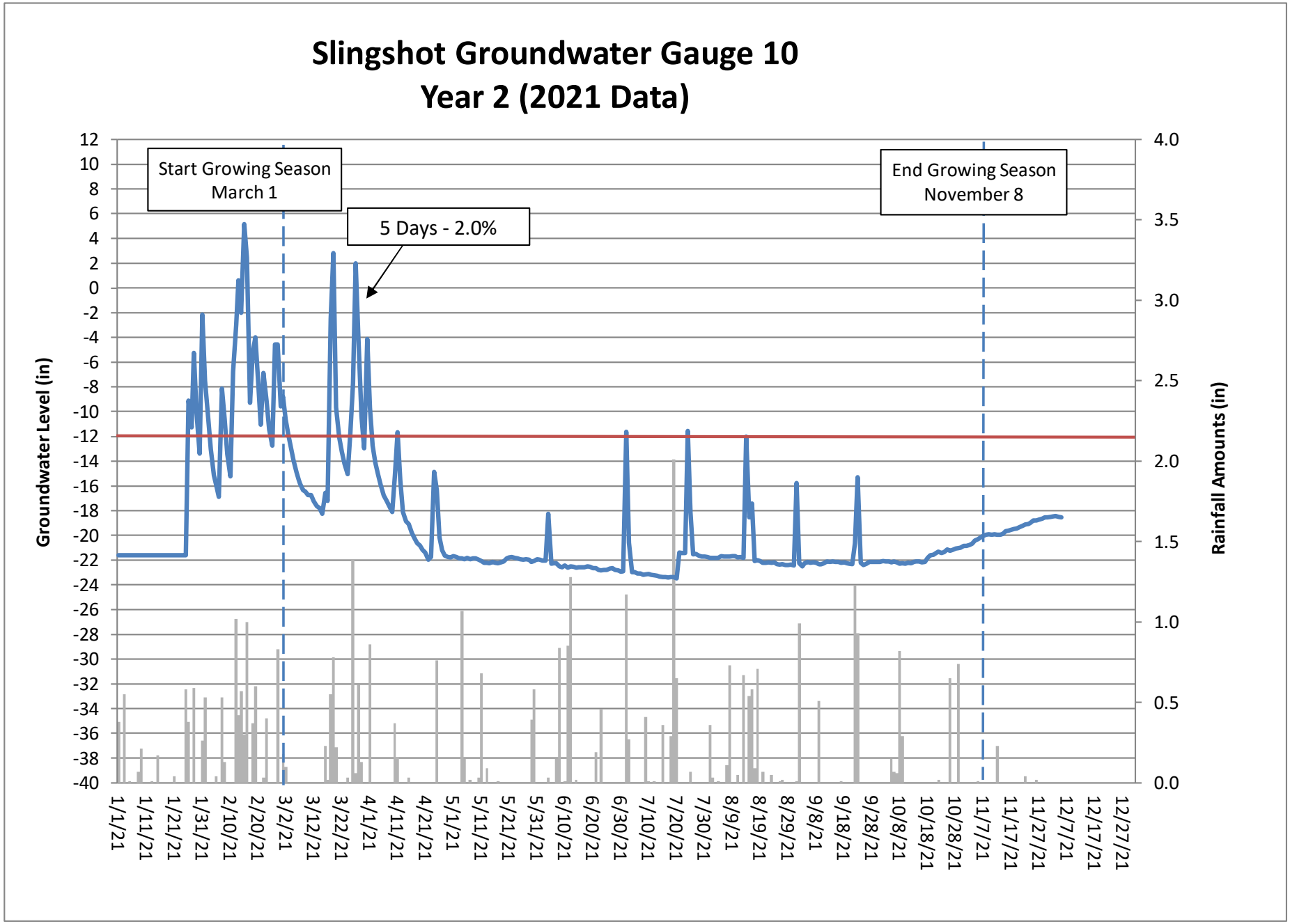
Slingshot Groundwater Gauge 7
Year 2 (2021 Data)

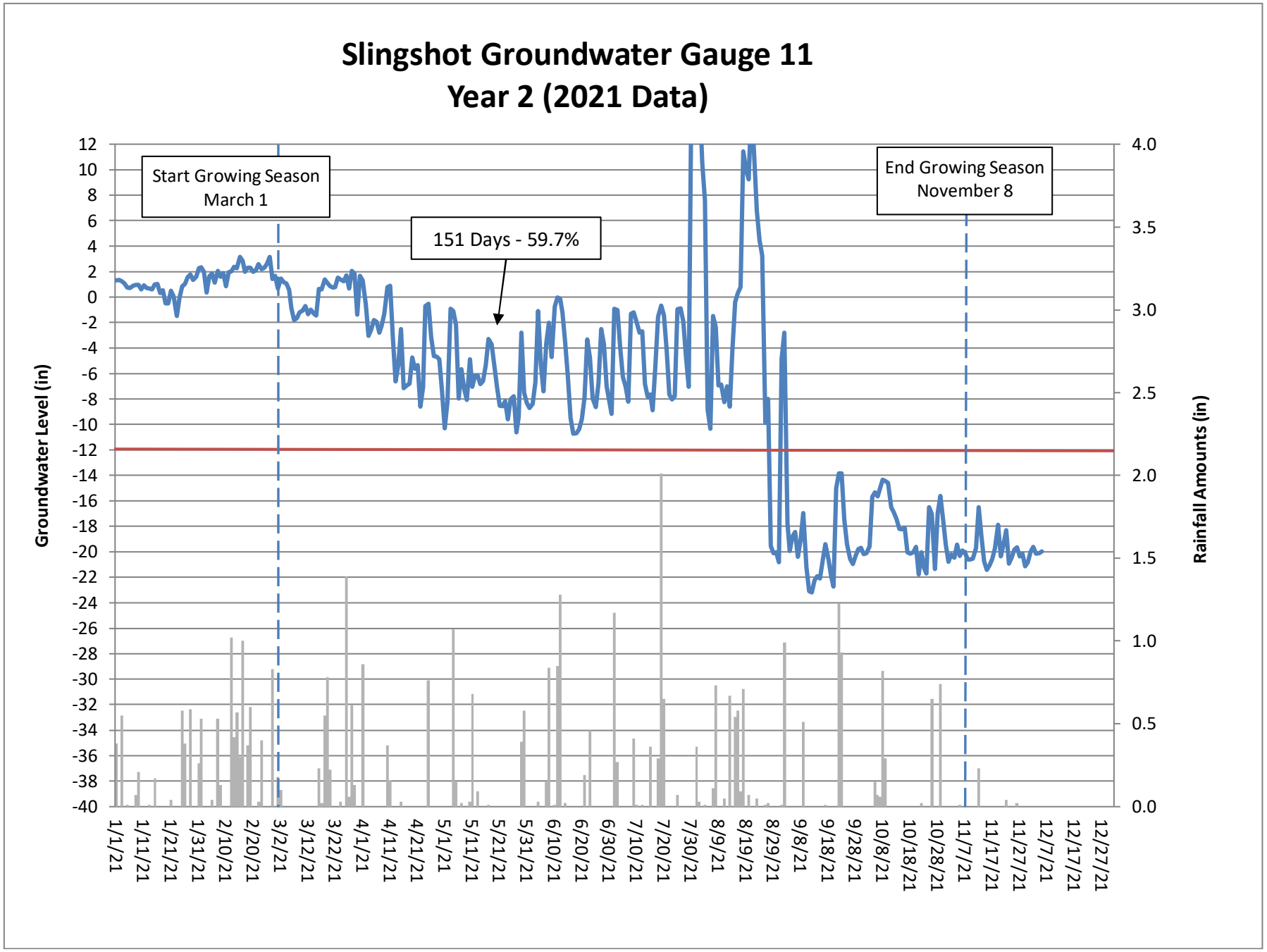



Slingshot Groundwater Gauge 8
Year 2 (2021 Data)
Start Growing Season
March 1
71 Days - 28.0%
End Growing Season
November 8
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/21
1/11/21
1/21/21
1/31/21
2/10/21
2/20/21
3/2/21
3/12/21
3/22/21
4/1/21
4/11/21
4/21/21
5/1/21
5/11/21
5/21/21
5/31/21
6/10/21
6/20/21
6/30/21
7/10/21
7/20/21
7/30/21
8/9/21
8/19/21
8/29/21
9/8/21
9/18/21
9/28/21
10/8/21
10/18/21
10/28/21
11/7/21
11/17/21
11/27/21
12/7/21
12/17/21
12/27/21

Slingshot Groundwater Gauge 9
Year 2 (2021 Data)



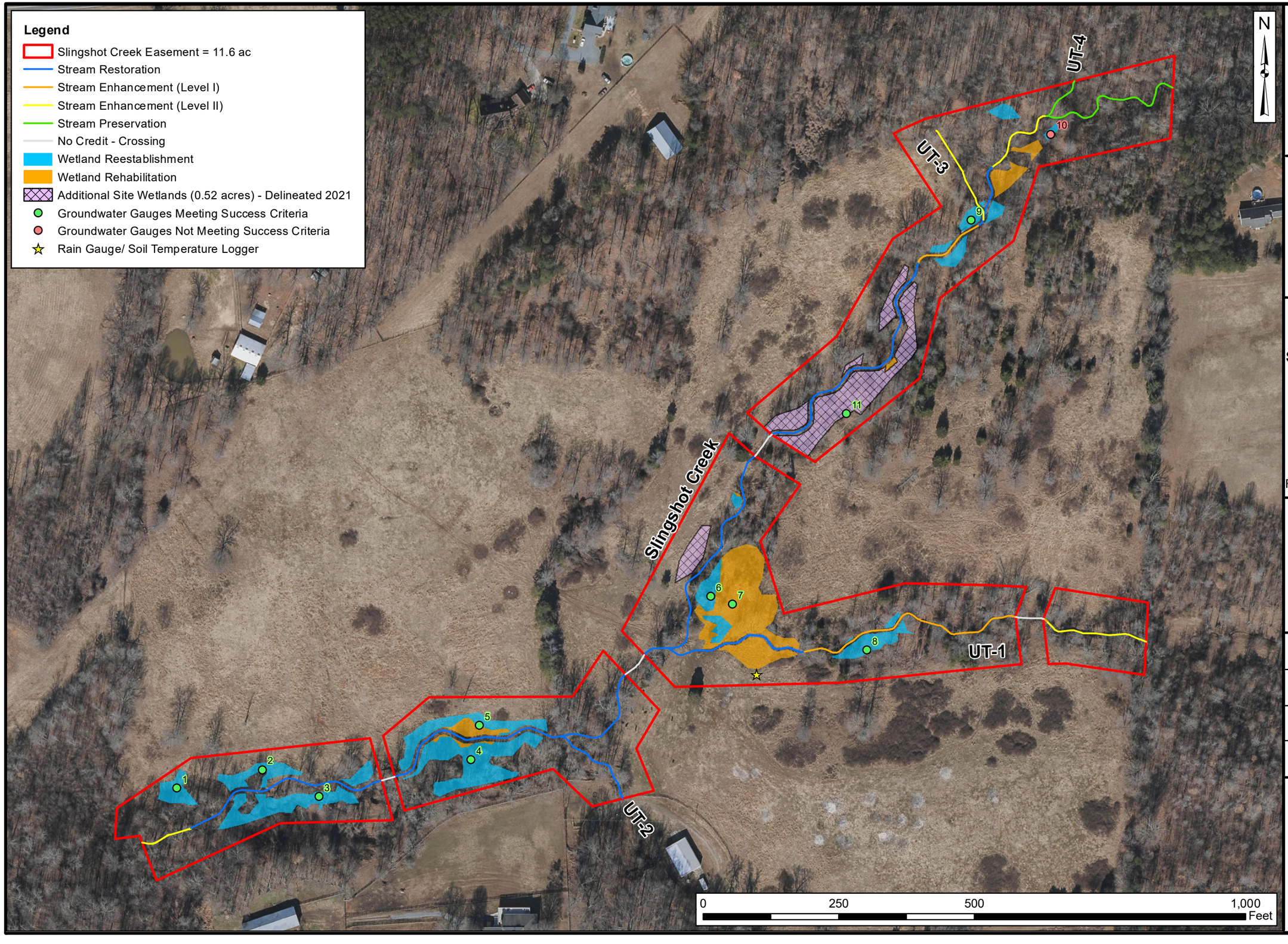

Slingshot Groundwater Gauge 10
Year 2 (2021 Data)
Start Growing Season
March 1
End Growing Season
November 8
5 Days - 2.0%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/21
1/11/21
1/21/21
1/31/21
2/10/21
2/20/21
3/2/21
3/12/21
3/22/21
4/1/21
4/11/21
4/21/21
5/1/21
5/11/21
5/21/21
5/31/21
6/10/21
6/20/21
6/30/21
7/10/21
7/20/21
7/30/21
8/9/21
8/19/21
8/29/21
9/8/21
9/18/21
9/28/21
10/8/21
10/18/21
10/28/21
11/7/21
11/17/21
11/27/21
12/7/21
12/17/21
12/27/21


Slingshot Groundwater Gauge 11
Year 2 (2021 Data)
Start Growing Season
March 1
End Growing Season
November 8
151 Days - 59.7%
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
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/21
1/11/21
1/21/21
1/31/21
2/10/21
2/20/21
3/2/21
3/12/21
3/22/21
4/1/21
4/11/21
4/21/21
5/1/21
5/11/21
5/21/21
5/31/21
6/10/21
6/20/21
6/30/21
7/10/21
7/20/21
7/30/21
8/9/21
8/19/21
8/29/21
9/8/21
9/18/21
9/28/21
10/8/21
10/18/21
10/28/21
11/7/21
11/17/21
11/27/21
12/7/21
12/17/21
12/27/21

Appendix F
WETLAND STUDIES

Figure F-1. Site Wetlands Overview

To further provide an understanding of the Site's wetland mitigation assets, RS mapped the additional wetland areas in the vicinity of Gauge 11 and along Slingshot Creek in the middle portion of the Site. Gauge 11 was installed in an area that was not previously identified for wetland reestablishment but appeared to be exhibiting wetland characteristics post-construction. Groundwater data for monitoring years 1 and 2 indicate that this area is trending toward successful wetland reestablishment of 0.52 acres.



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

SLINGSHOT CREEK STREAM AND WETLAND MITIGATION SITE

Rockingham County, NC

Title:

SITE WETLANDS OVERVIEW

Drawn by: KRJ

Date: DEC 2021

Scale: 1:2200

Project No.: 18-013

FIGURE

F-1