

**FINAL
MY2 (2023) MONITORING REPORT**

SWAMP GRAPE STREAM AND WETLAND MITIGATION SITE

Robeson County, North Carolina

Lumber River Basin

Cataloging Unit 03040204

DMS Project No. 100115

Full Delivery Contract No. 7869

DMS RFP No. 16-007705

USACE Action ID No. SAW-2019-00904

DWR Project No. 2019-0675

Data Collection: January - November 2023

Submission: January 2024



Prepared for:



Mitigation Services
ENVIRONMENTAL QUALITY

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY

DIVISION OF MITIGATION SERVICES

1652 MAIL SERVICE CENTER

RALEIGH, NORTH CAROLINA 27699-1652



Response to Monitoring Year 2 (2023) DMS Comments

Swamp Grape Mitigation Site

Lumber River Basin – CU# 03040204 – Robeson County

DMS Project ID No. 100115, Contract # 7869

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

Report & Field Visit:

1. During site visit a newly created beaver dam was observed on UT-1, on the downstream stream enhancement II reach, upstream of the conservation easement boundary. Overall, the site looked great. [The location of the beaver dam was added to the report, CCPV, and digital submittal.](#)

Digital Deliverables:

1. Please note for all future submissions, all vegetation data presented in the report are required to be submitted in digital format, for fixed and temporary/mobile plots. [Understood, Table 8 in the document and digital submittal has been updated to include temporary plots.](#)

Swamp Grape Year 2, 2023 Monitoring Summary

General Notes

- A small area of encroachment was observed during year 2 (2023) along UT-2. Restoration Systems replanted this area with 3-gallon upland containerized species from an approved Site Mitigation plan during the 2023/2024 dormant season. RS also installed additional fence posts along this boundary line with signage (Site Photo Log, Appendix A).
- Minimal evidence of nuisance animal activity (beaver) was observed. One beaver dam was observed on UT-1 at the northern easement boundary. Beavers and the dam will be removed.

Streams

- All streams are functioning as designed. Upstream on UT2 has experienced some sediment deposition in pools during year 2. Cross sections of this area were measured several times throughout the year, and sediment appears to be moving its way through the reach.
- All engineered structures were stable and functioning within design parameters; no stream areas of concern were documented.
- Four bankfull events were documented during MY2 (2023), making 7 total bankfull events during the 2 monitoring years (Table 11, Appendix D).

Vegetation

- Measurements of the 23 vegetation plots resulted in an average of 458 planted stems/acre. All individual plots met success criteria except plots 2, 19, and 23 (Tables 7-8, Appendix B). Plots 2, 19, and 23 averaged 243, 243, and 283 stems per acre, respectively.
- Three random vegetation transects (50m x 5m) were conducted in year 2 (2023). None of the transects met the success criteria of 320 stems per acre (Table 7B, Appendix B).
- Three random herbaceous vegetation plots (5-meter by 2-meter) were sampled in year 2 (2023). All three plots met the success criteria of at least 3 different herbaceous species per plot (Table 7C, Appendix B).
- Invasive vegetation treatments have been effective in reducing populations and currently areas of invasive vegetation are below the mapping threshold. These areas will continue to be monitored and treated as needed.

Wetlands

- Twelve of sixteen groundwater gauges met success criteria for the year 2 (2023) monitoring period. Insufficient and inconsistent rainfall between mid-February and late-March likely caused groundwater levels in the vicinity of gauges 1, 2, 3, and 6 to drop below 12 inches for a few short periods during this time (Appendix D).

Site Maintenance Report (2023)

Invasive Species Work	Maintenance work
05/22-23/2023: Cattail, Chinese Privet	07/04/2023: Repaired Fence
06/26-27/2023: Chinaberry, Chinese Privet	09/19/2023: Beaver Dam Removal
10/11/2023: Cattail, Chinaberry, Chinese Privet	12/12/2023: Easement Encroachment area (3-gallon container planting, additional easement marking)

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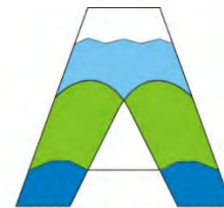


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1.0 PROJECT SUMMARY

Restoration Systems, LLC (RS) has established the North Carolina Division of Mitigation Services (NCDMS) Swamp Grape Stream and Wetland Mitigation Site (Site). The Site is on two contiguous parcels used primarily for row crop production with small pockets of livestock pasture in the Atlantic Southern Loam Plains portion of the Southeastern Plains ecoregion of North Carolina. Located in the Lumber River Basin, Cataloging Unit 03040204, the Site is in the Targeted Local Watershed (TLW) 03040204048010 and North Carolina Division of Water Resources [NCDWR] subbasin number 03-07-55. The Site is not located in a Local Watershed Plan (LWP), Regional Watershed Plan (RWP), or Targeted Resource Area (TRA). Site watersheds range from approximately 0.41 of a square mile (263 acres) on UT2 to 1.53 square miles (977 acres) at the Site's outfall.

1.1 Project Background, Components, and Structure

Located approximately 4 miles northwest of Rowland and 2.5 miles southwest of Alfordsville along the southwest edge of Robeson County, the Site encompasses 24.68 acres. Mitigation work within the Site included 1) stream restoration, 2) stream enhancement (Level I), 3) stream enhancement (Level II), 4) wetland reestablishment, 5) wetland rehabilitation, 6) wetland enhancement, 7) wetland creation, and 7) vegetation planting. The Site is expected to provide 3,228.333 warm water stream credits and 12.705 riparian wetland credits by closeout (Table 1, Page 2). A conservation easement was granted to the State of North Carolina and recorded at the Robeson County Register of Deeds on February 23, 2021.

Before construction, land use at the Site was characterized by breached agriculture ponds, failed/eroded agricultural crossings, row crops, livestock pasture, and disturbed forest. Site design was completed in June 2021; construction started on July 12, 2021, and ended with a final walkthrough on September 23, 2021. The Site was planted on January 18, 2022. Completed project activities, reporting history, completion dates, and project contacts are summarized in Tables 13-14 (Appendix E).

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Table 1. Swamp Grape Mitigation Site (ID-100115) Project Mitigation Quantities and Credits

Project Segment	Original Mitigation Plan Ft/Ac	As-Built Ft/Ac	Original Mitigation Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Credits	Comments
Stream							
UT 1 Reach 1	297	296	Warm	EI	2.00000	148.500	
UT 1 Reach 2	1215	1211	Warm	R	1.00000	1,215.000	
UT 1 Reach 3	546	544	Warm	EI	2.00000	273.000	
UT 1 Reach 4	235	235	Warm	EII	3.00000	78.333	
UT 1 Reach 5	230	230	Warm	R	1.00000	230.000	
UT 1 Reach 6	165	166	Warm	EI	2.00000	82.500	
UT 1 Reach 7	206	207	Warm	R	1.00000	206.000	
UT 1 Reach 8	87	88	Warm	EI	2.00000	43.500	
UT 2 Reach 1	684	681	Warm	R	1.00000	684.000	
UT 2 Reach 2	266	265	Warm	EI	2.00000	133.000	
UT 3 Reach 1	133	132	Warm	EI	2.00000	66.500	
UT 3 Reach 2	68	66	Warm	R	1.00000	68.000	
					Total:	3,228.333	
Wetland							
Wetland Reestablish	4.470	4.47	R	REE	1.00000	4.470	
Wetland Rehabilitation	2.671	2.671	R	RH	1.50000	1.781	
Wetland Enhancement	12.244	12.244	R	E	2.00000	6.122	
Wetland Creation	0.997	0.997	R	C	3:100	0.332	
					Total:	12.705	

Project Credits

Restoration Level	Stream			Riparian	Non-Rip	Coastal
	Warm	Cool	Cold	Wetland	Wetland	Marsh
Restoration	2,403.000					
Re-establishment				4.470		
Rehabilitation				1.781		
Enhancement				6.122		
Enhancement I	747.000					
Enhancement II	78.333					
Creation				0.332		
Preservation	0.000					

Totals **3,228.333** **12.705**

Total Stream Credit **3,228.333**

Total Wetland Credit **12.705**

Wetland Mitigation Category

CM Coastal Marsh
R Riparian
NR Non-Riparian

Restoration Level

HQP High Quality Preservation
P Preservation
E Wetland Enhancement - Veg and Hydro
EII Stream Enhancement II
EI Stream Enhancement I
C Wetland Creation
RH Wetland Rehabilitation - Veg and Hydro
REE Wetland Re-establishment Veg and Hydro
R Restoration

Table 2. Summary: Goals, Performance, and Results

Goals	Objectives	Success Criteria
(1) HYDROLOGY		
<ul style="list-style-type: none"> Minimize downstream flooding to the maximum extent possible. Connect streams to functioning wetland systems. 	<ul style="list-style-type: none"> Construct new channel at historic floodplain elevation to restore overbank flows and restore jurisdictional wetlands Plant woody riparian buffer Remove livestock Remove a ditch/drain tile network that contributes surface waters directly to the channel Protect riparian buffers with a perpetual conservation easement 	<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Increase stream stability within the Site so that channels are neither aggrading nor degrading. 	<ul style="list-style-type: none"> Construct channels with the proper pattern, dimension, and longitudinal profile Remove livestock from the Site Construct stable channels that do not contribute sediment to downstream receiving waters. Plant woody riparian buffer 	<ul style="list-style-type: none"> Cross-section measurements indicate a stable channel with appropriate substrate Visual documentation of stable channels and structures BHR not to exceed 1.2 < 10% change in BHR in any given year Livestock excluded from the easement Attain Vegetation Success Criteria
(1) WATER QUALITY		
<ul style="list-style-type: none"> Remove direct nutrient and pollutant inputs from the Site and reduce contributions to downstream waters. 	<ul style="list-style-type: none"> Remove livestock and reduce agricultural land/inputs Plant woody riparian buffer Restore/enhance jurisdictional wetlands adjacent to Site streams Remove a ditch/drain tile network that contributes surface waters directly to the channel Restore overbank flooding by constructing channels at historic floodplain elevation. 	<ul style="list-style-type: none"> Livestock excluded from the easement Attain Wetland Hydrology Success Criteria Attain Vegetation Success Criteria
(1) HABITAT		
<ul style="list-style-type: none"> Improve instream and stream-side habitat. 	<ul style="list-style-type: none"> Construct stable channels with woody debris available as instream habitat Plant woody riparian buffer to provide organic matter and shade Construct new channel at historic floodplain elevation to restore overbank flows Protect riparian buffers with a perpetual conservation easement Restore/enhance jurisdictional wetlands adjacent to Site streams Stabilize stream banks Install in-stream structures 	<ul style="list-style-type: none"> Cross-section measurement indicates a stable channel with appropriate substrate Visual documentation of stable channels and in-stream structures. Attain Wetland Hydrology Success Criteria Attain Vegetation Success Criteria Conservation Easement recorded

1.2 Success Criteria

Monitoring and success criteria for stream restoration should relate to project goals and objectives identified from onsite NC SAM and NC WAM data collection. From a mitigation perspective, several 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 summarizes Site success criteria.

Project Success Criteria

Streams
<ul style="list-style-type: none"> 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. BHR at any measured riffle cross-section should not change by more than 10% from baseline condition during any given monitoring period. 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
<ul style="list-style-type: none"> Saturation or inundation within the upper 12 inches of the soil surface for, at a minimum, 12 percent of the growing season, during average climatic conditions.
Vegetation
<ul style="list-style-type: none"> 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 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. Herbaceous vegetation plots must have a minimum of three species present.

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
Visual Assessment	X	X	X	X	X	X	X
Report Submittal	X	X	X	X	X	X	X

2.1 Monitoring

The monitoring parameters are summarized in 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 16 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	NA	NA	NA	NA
Bankfull Events	Continuous monitoring surface water gauges (pressure transducers) and/or trail camera	Continuous recording through monitoring period	3 surface water gauges on UT 1 and UT 2	Surface water data for each monitoring period
	Visual/Physical Evidence	Continuous through monitoring period	N.A.	Visual evidence, photo documentation, and/or rain data.
Wetland Parameters				
Parameter	Method	Schedule/Frequency	Number/Extent	Data Collected/Reported
Wetland Restoration	Groundwater gauges	As-built, Years 1, 2, 3, 4, 5, 6, and 7 throughout the year with the growing season defined as March 1-November 6	16 gauges spread throughout restored wetlands	Soil temperature at the beginning of each monitoring period to verify the start of the growing season, groundwater and rain data for each monitoring period. Graphic and tabular data.
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; <i>CVS-EEP Protocol for Recording Vegetation, Version 4.2</i> (Lee et al. 2008)	As-built, Years 1, 2, 3, 5, and 7	23 plots spread across the Site (2 plots in cypress gum swamp and 21 plots in C.P. small stream swamp)	Species, height, planted vs. volunteer, stems/acre, areas of concern
	Annual random vegetation plots, 0.0247 acre (100 square meters) in size	As-built, Years 1, 2, 3, 5, and 7	As needed to determine vegetation density in a questionable area	Species and height
	Annual random herbaceous vegetation plots, 0.00247 acre (5 meters by 2 meters) in size	Years 1, 2, 3, 5, and 7	3 plots located in herbaceous dominated vegetation areas	Number of species in plot

Note: All vegetation plots and stream cross sections have fixed photo point locations. In addition, fixed photo points will be installed at two culverts entering the Site.

Note: Vegetation data should be collected between July 1 and leaf drop. In addition, vegetation data will not be collected until 180 days after Site planting.

Stream Summary

All streams are functioning as designed. Upstream on UT2 has experienced some sediment deposition in pools during year 2. Cross sections of this area were measured several times throughout the year, and sediment appears to be moving its way through the reach. However, the reach will be closely monitored during subsequent years.

Wetland Summary

Summary of Monitoring Period/Hydrology Success Criteria by Year

Year	Soil Temperatures/Date Bud Burst Documented	Monitoring Period Used for Determining Success	12 Percent of the Monitoring Period
2022 (Year 1)	March 1, 2022	March 1-November 6 (251 days)	30 days
2023 (Year 2)	March 1, 2023*	March 1-November 6 (251 days)	30 days

*Based on bud burst and a soil temperature of 58.1°F documented on March 1. Soil temperature did not fall below 49.44°F after March 1.

Twelve of sixteen groundwater gauges met success criteria for the year 2 (2023) monitoring period. Insufficient and inconsistent rainfall between mid-February and late-March likely caused groundwater levels in the vicinity of gauges 1, 2, 3, and 6 to drop below 12 inches for a few short periods during this time (Figure D1 and Groundwater Gauge Graphs, Appendix D). It is expected that with normal to above-average rainfall during this time, all gauges would have met the 12% hydroperiod.

Vegetation Summary

During quantitative vegetation sampling, 23 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 (2023) vegetation measurements occurred on September 14, 2023. Measurements of all 23 plots resulted in an average of 458 stems/acre, excluding livestock. Additionally, 20 of the 23 individual plots met the year 3 stem density requirement (Tables 7-8, Appendix B).

Table 8 (Appendix B) indicates that plots 2, 3, 6, 7, 9, 10, 11, 15, 20, and 21 each exceeded 50% dominant species composition during year 2, and plots 2, 6, 10, 15, 16, 20, 21, and 22 each had less than 4 different species counted during year 2. Although these criteria are not explicitly tied to vegetation success, they will be monitored closely during subsequent monitoring years. It is expected that vegetation within these areas will continue to diversify as natural recruitment increases throughout the monitoring period.

Three temporary plots were counted, resulting in an average of 243 average stems per acre across the 3 plots. Additionally, none of the temporary plots met year 3 stem density requirement. These areas will be further assessed to determine if a replanting effort is needed (Table 7B, Appendix B).

Three random herbaceous vegetation plots (5-meter by 2-meter) were also sampled in year 2 (2023). All 3 plots met the success criteria of at least 3 different herbaceous species per plot (Table 7C, Appendix B).

One small area of easement encroachment was observed during year 2 (2023) along UT-2. RS replanted this area with 3-gallon upland containerized species from the approved Site Mitigation plan during the 2023/2024 dormant season. Additional fence post corners were installed along this boundary line with signage (Site Photo Log, Appendix A).

Table 3. Project Attribute Table
Swamp Grape Mitigation Site

Project Information				
Project Name	Swamp Grape Mitigation Site			
Project County	Robeson County, North Carolina			
Project Area (acres)	24.7			
Project Coordinates (latitude & longitude)	34.5639, -79.3490			
Planted Area (acres)	22.5			
Project Watershed Summary Information				
Physiographic Province	Atlantic Southern Loam Plains			
Project River Basin	Lumber			
USGS HUC for Project (14-digit)	03040204048010			
NCDWR Sub-basin for Project	03-07-55			
Project Drainage Area (acres)	977.0			
Percentage of Project Drainage Area that is Impervious	<2%			
CGIA Land Use Classification	Managed Herbaceous Cover & Hardwood Swamps			
Reach Summary Information				
Parameters	UT 1 Upstream	UT 1 Downstream	UT 2	UT 3
Length of reach (linear feet)	1293	1673	826	149
Valley Classification & Confinement	Wide and flat alluvial valley			
Drainage Area (acres)	192	977	263	392
NCDWR Stream ID Score	--	--	--	--
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial
NCDWR Water Quality Classification	C, Sw			
Existing Morphological Description (Rosgen 1996)	F 5	Eg 5	Cg 5	Eg 5
Proposed Stream Classification (Rosgen 1996)	Ce 5	Ce 5	Ce 5	Ce 5
Existing Evolutionary Stage (Simon and Hupp 1986)	III/IV	V	V	III/IV
Underlying Mapped Soils	Bibb Soils			
Drainage Class	Poorly drained			
Hydric Soil Status	Hydric			
Valley Slope	0.0062	0.0036	0.0042	0.0125
FEMA Classification	NA	Zone AE	NA	NA
Native Vegetation Community	Cypress-Gum Swamp (Brownwater Subtype) and Coastal Plain Small Stream Swamp (Brownwater Subtype)			
Watershed Land Use/Land Cover (Site)	15% agriculture land, 84% disturbed swamp forest, <1% low density residential/impervious surface			
Watershed Land Use/Land Cover (McRae and Jordan Cr Reference Channel)	McRae - 40% agriculture, 35% forest, 5% low density residential/impervious surface Jordan Cr - 70% agriculture, 28% forest, 2% low density residential/impervious surface			
Percent Composition of Exotic Invasive Vegetation	<5%			

Table 3. Project Attribute Table (continued)

Swamp Grape Mitigation Site

Wetland Summary Information			
Parameters	Wetlands		
Wetland acreage	5.32 acre drained/impacted & 15.07 acre degraded		
Wetland Type	Riparian riverine		
Mapped Soil Series	Bibb		
Drainage Class	Poorly drained		
Hydric Soil Status	Hydric		
Source of Hydrology	Groundwater, stream overbank		
Hydrologic Impairment	Impoundment, incised streams, compacted soils, livestock, ditches		
Native Vegetation Community	Cypress-Gum Swamp (Brownwater Subtype) and Coastal Plain Small Stream Swamp (Brownwater Subtype)		
% 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	Section 401 Certification
Waters of the United States-Section 404	Yes	Yes	Section 404 Permit
Endangered Species Act	Yes	Yes	CE Document (Mitigation Plan, App E)
Historic Preservation Act	Yes	Yes	CE Document (Mitigation Plan, App E)
Coastal Zone Management Act	No	--	NA
FEMA Floodplain Compliance	Yes	Yes	DMS FEMA Checklist (Mitigation Plan, App F)
Essential Fisheries Habitat	No	--	NA

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3.0 REFERENCES

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, North Carolina.

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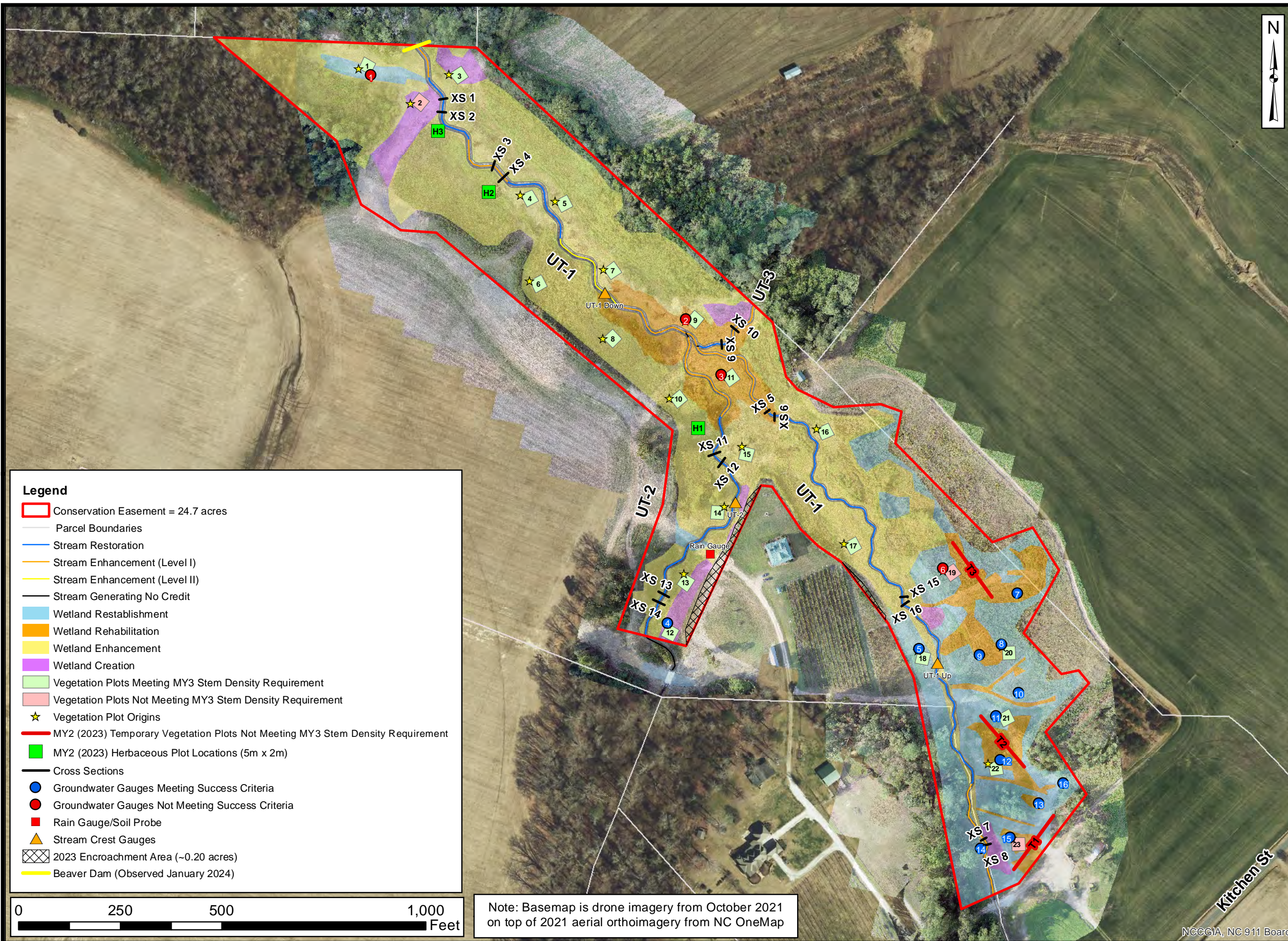
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Appendix A

Visual Assessment Data

Figure 1. Current Conditions Plan View
Tables 4A-D. Stream Visual Stability Assessment
Table 5. Visual Vegetation Assessment
Vegetation Plot Photographs
Site Photo Log



Legend

- Conservation Easement = 24.7 acres
- Parcel Boundaries
- Stream Restoration
- Stream Enhancement (Level I)
- Stream Enhancement (Level II)
- Stream Generating No Credit
- Wetland Restablishment
- Wetland Rehabilitation
- Wetland Enhancement
- Wetland Creation
- Vegetation Plots Meeting MY3 Stem Density Requirement
- Vegetation Plots Not Meeting MY3 Stem Density Requirement
- ★ Vegetation Plot Origins
- MY2 (2023) Temporary Vegetation Plots Not Meeting MY3 Stem Density Requirement
- MY2 (2023) Herbaceous Plot Locations (5m x 2m)
- Cross Sections
- Groundwater Gauges Meeting Success Criteria
- Groundwater Gauges Not Meeting Success Criteria
- Rain Gauge/Soil Probe
- ▲ Stream Crest Gauges
- 2023 Encroachment Area (~0.20 acres)
- Beaver Dam (Observed January 2024)

Note: Basemap is drone imagery from October 2021 on top of 2021 aerial orthoimagery from NC OneMap



Project:

SWAMP GRAPE MITIGATION SITE

Robeson County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

Date: JAN 2024

Scale: 1:2700

Project No.: 20-003

FIGURE 1

Table 4A. Visual Stream Stability Assessment

Reach UT 1 Upstream
 Assessed Stream Length 1849
 Assessed Bank Length 3698

Survey Date: November 20, 2023

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	Surface Scour/Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	28	28		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in DMS monitoring guidance document)	28	28		100%

Table 4B. Visual Stream Stability Assessment

Reach UT 1 Downstream
 Assessed Stream Length 1157
 Assessed Bank Length 2314

Survey Date: November 20, 2023

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	Surface Scour/Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in DMS monitoring guidance document)	5	5		100%

Table 4C. Visual Stream Stability Assessment

Reach UT 2
 Assessed Stream Length 1070
 Assessed Bank Length 2140

Survey Date: November 20, 2023

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	Surface Scour/Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	6	6		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in DMS monitoring guidance document)	6	6		100%

Table 4D. Visual Stream Stability Assessment

Reach UT 3
 Assessed Stream Length 199
 Assessed Bank Length 398

Survey Date: November 20, 2023

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	Surface Scour/Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	3	3		100%
	Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in DMS monitoring guidance document)	3	3		100%

Table 5. Visual Vegetation Assessment

Planted acreage

22.5

Survey Date: November 20, 2023

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10acres	0.00	0.0%
Total			0.00	0.0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10 acres	0.00	0.0%
Cumulative Total			0.00	0.0%

Easement Acreage

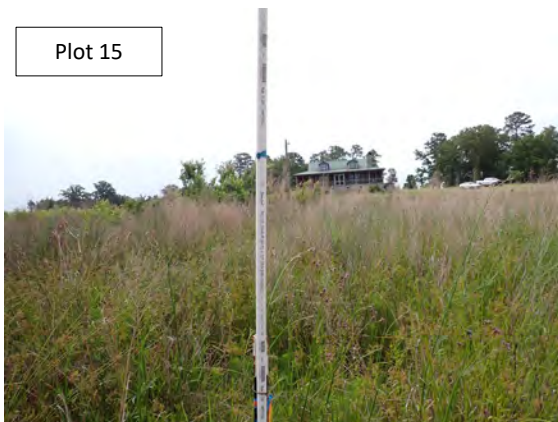
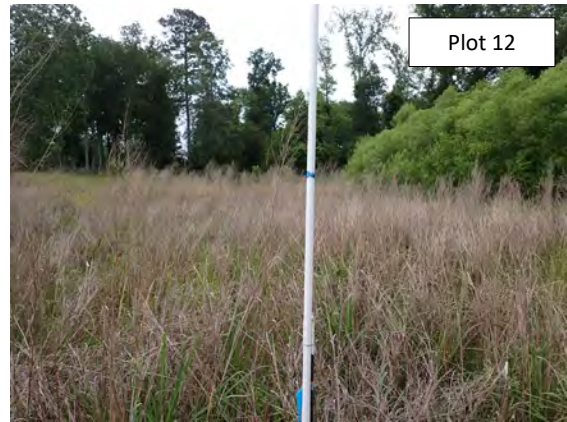
24.7

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage- Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Species included in summation above should be identified in report summary.	0.10 acres	0.00	0.0%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	0.20 acres of encroachment near the right bank of UT2 and left bank of UT1	

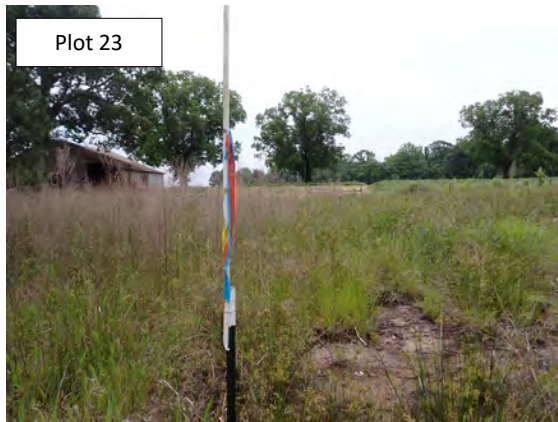
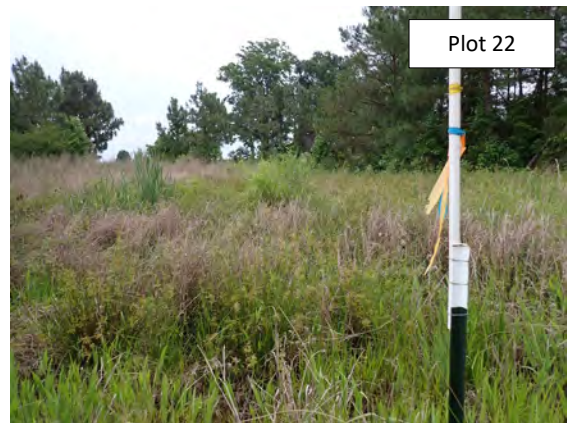
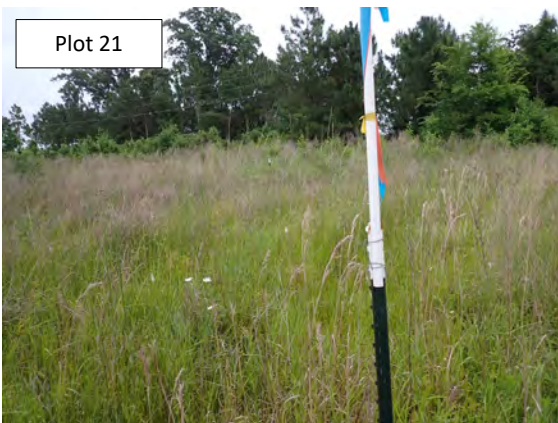
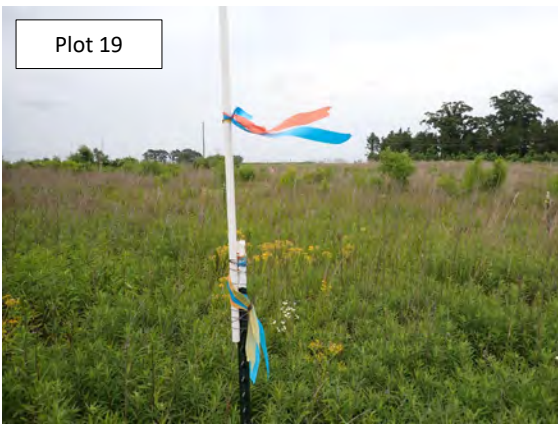
Swamp Grape Site
MY2 (2023) Vegetation Monitoring Photographs



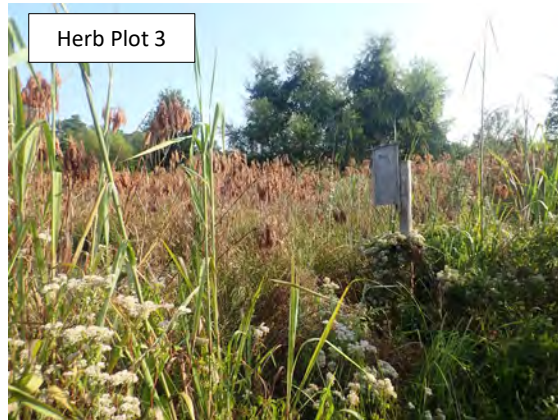
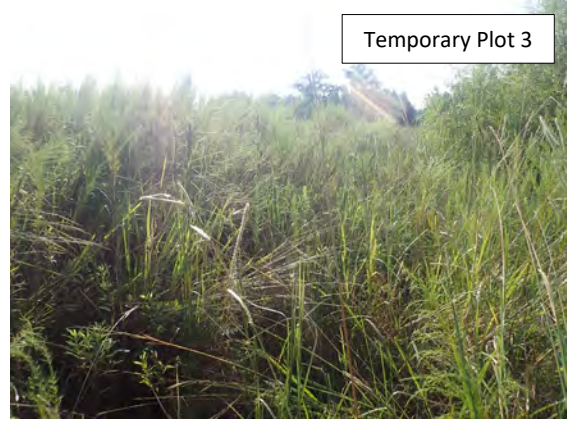
Swamp Grape Site
MY2 (2023) Vegetation Monitoring Photographs



Swamp Grape Site
MY2 (2023) Vegetation Monitoring Photographs



Swamp Grape Site
MY2 (2023) Vegetation Monitoring Photographs



**Swamp Grape
MY-02 (2023) Photo Log**

Photo 1: UT1



Photo 2: Wetland development at groundwater
gauge 15



**Swamp Grape
MY-02 (2023) Photo Log**

Photo 3: Culvert on UT 1 upstream of easement boundary



Photo 4: UT 2 Upstream



**Swamp Grape
MY-02 (2023) Photo Log**



Photo 5: Crossing on UT 2 (upstream from easement boundary)
downstream end, facing upstream



Photo 6: Crossing on UT 2 (upstream from easement boundary)
Upstream end, facing downstream

**Swamp Grape
MY-02 (2023) Photo Log**

Photo 7: UT 1 Channel



Photo 8: Stream flow on UT 1



**Swamp Grape
MY-02 (2023) Photo Log**



Photo 9: Herbaceous wetland vegetation



Photo 10: Wetland Vegetation

Swamp Grape
MY-02 (2023) Photo Log

Photo 11: Bud burst of *Celtis occidentalis*
Photo taken 2/28/23

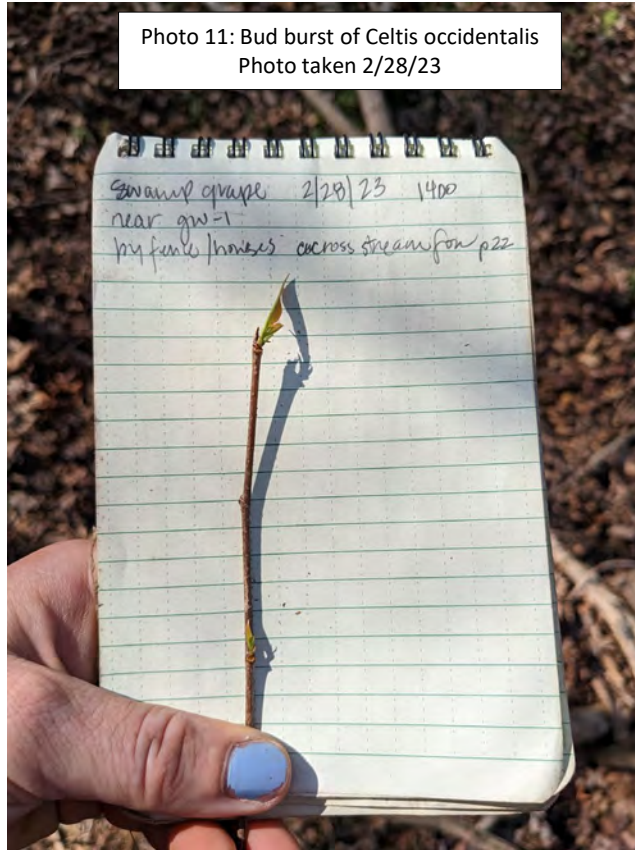
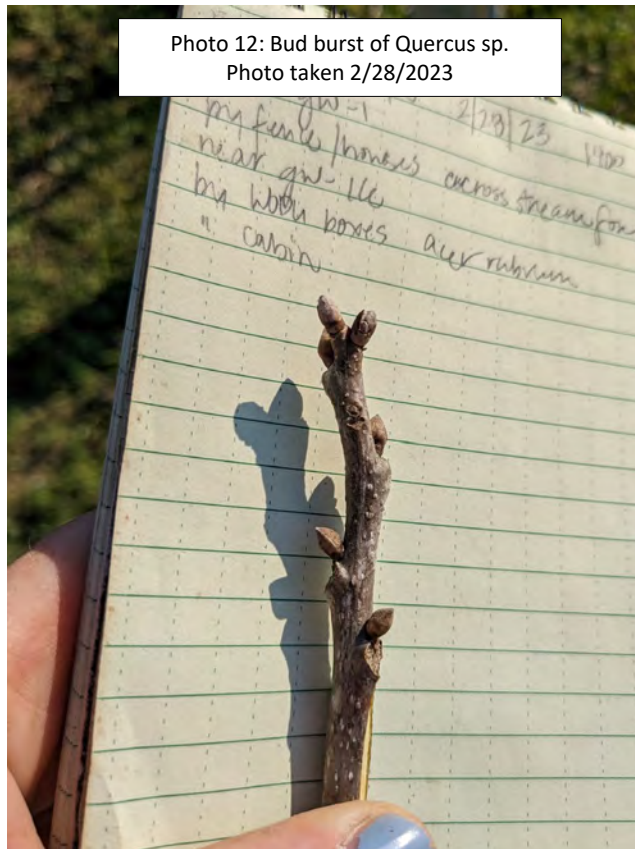


Photo 12: Bud burst of *Quercus* sp.
Photo taken 2/28/2023



**Swamp Grape
MY-02 (2023) Photo Log**

Photo 13: Emergent wetland vegetation and bud burst of *Salix nigra*
Photo taken 2/28/23



Photo 14: Easement marking and supplemental planting
Photo taken 12/12/23



**Swamp Grape
MY-02 (2023) Photo Log**

Photo 15: Easement marking and supplemental planting
Photo taken 12/12/23



Photo 16: Easement marking and supplemental planting
Photo taken 12/12/23



Appendix B Vegetation Data

Table 6. Planted Bare-Root Woody Vegetation

Table 7A. Vegetation Plot Counts and Densities

Table 7B. Temporary Vegetation Plots Data

Table 7C. Herbaceous Vegetation Plots

Table 8. Vegetation Plot Data Table from Vegetation Data Entry Tool

**Table 6. Planted Bare Root Woody Vegetation
Swamp Grape Stream and Wetland Mitigation Site**

Species	Total
Acres	22.5
<i>Alnus serrulata</i>	750
<i>Betula nigra</i>	1,000
<i>Carya aquatica</i>	800
<i>Carya ovata</i>	800
<i>Cephalanthus occidentalis</i>	800
<i>Nyssa aquatica</i>	500
<i>Nyssa sylvatica</i>	700
<i>Quercus nigra</i>	2,200
<i>Quercus phellos</i>	2,200
<i>Quercus shumardii</i>	2,000
<i>Taxodium ascendens</i>	1,000
<i>Taxodium distichum</i>	3,000
<i>Ulmus americana</i>	2,000
TOTALS	17,750
Average Stems/Acre	789

**Table 7A. Planted Vegetation Totals
Swamp Grape Stream and Wetland Mitigation Site**

Plot #	Planted Stems/Acre	Success Criteria Met?
1	648	Yes
2	243	No
3	486	Yes
4	526	Yes
5	567	Yes
6	445	Yes
7	445	Yes
8	486	Yes
9	364	Yes
10	405	Yes
11	526	Yes
12	648	Yes
13	648	Yes
14	526	Yes
15	607	Yes
16	324	Yes
17	445	Yes
18	486	Yes
19	243	No
20	364	Yes
21	445	Yes
22	364	Yes
23	283	No
Average Planted Stems/Acre	458	Yes

**Table 7B. Temporary Vegetation Plots
Swamp Grape Stream and Wetland Mitigation Site**

Species	50m x 2m Temporary Plots		
	T-1	T-2	T-3
<i>Cephalanthus occidentalis</i>	1	0	1
<i>Liriodendron tulipifera</i>	6	4	3
<i>Quercus nigra</i>	0	0	1
<i>Salix nigra</i>	0	2	0
Total Stems	7	6	5
Total Stems/Acre	283	243	202
Average Stems/Acre:	243		

**Table 7C. Herbaceous Vegetation Plots
Swamp Grape Stream and Wetland Mitigation Site**

Plot #	Species Count	Success Criteria Met?	Taxa Identified
H1	6	Yes	<i>Carex</i> sp. <i>Cladium mariscus</i> <i>Eclipta prostrata</i> <i>Galium tinctorium</i> <i>Penthorum sedoides</i> <i>Juncus effusus</i>
H2	5	Yes	<i>Carex</i> sp. <i>Eupatorium capillifolium</i> <i>Juncus effusus</i> <i>Rubus</i> sp. <i>Scirpus cyperinus</i>
H3	4	Yes	<i>Juncus effusus</i> <i>Ludwigia alternifolia</i> <i>Scirpus cyperinus</i> <i>Carex</i> sp.
Average	5	Yes	

Table 8. Vegetation Plot Data Table from Vegetation Data Entry Tool

Planted Acreage	22.5
Date of Initial Plant	2022-01-18
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2023-09-14
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/S hrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F		Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	<i>Alnus serrulata</i>	hazel alder	Tree	OBL	4	4							1	1			1	1	2	2
	<i>Betula nigra</i>	river birch	Tree	FACW									1	1						
	<i>Carya sp.</i>																			
	<i>Cephalanthus occidentalis</i>	common buttonbush	Shrub	OBL	4	4			1	1	2	2								
	<i>Liriodendron tulipifera</i>	tuliptree	Tree	FACU																
	<i>Nyssa sp.</i>												2	2						
	<i>Nyssa sylvatica</i>	blackgum	Tree	FAC					1	1										
	<i>Quercus nigra</i>	water oak	Tree	FAC	3	3							3	3	2	2			4	4
	<i>Quercus phellos</i>	willow oak	Tree	FAC	2	2					6	6	1	1			2	2	2	2
	<i>Quercus shumardii</i>	Shumard's oak	Tree	FAC	1	1	1	1	1	1	2	2								
	<i>Quercus sp.</i>				1	1	4	4	2	2			2	2	6	6	2	2	4	4
	<i>Salix nigra</i>	black willow	Tree	OBL																
<i>Salix sp.</i>																				
<i>Taxodium sp.</i>						1	1	7	7			3	3			6	6			
<i>Ulmus americana</i>	American elm	Tree	FACW	1	1					3	3	1	1	3	3					
Sum	Performance Standard				16	16	6	6	12	12	13	13	14	14	11	11	11	11	12	12
Mitigation Plan Performance Standard	Current Year Stem Count				16		6		12		13		14		11		11		12	
	Stems/Acre				648		243		486		526		567		445		445		486	
	Species Count				7		3		5		4		8		3		4		4	
	Dominant Species Composition (%)				25		67		58		46		21		55		55		33	
	Average Plot Height (ft.)				2		2		2		2		3		2		3		3	
% Invasives				0		0		0		0		0		0		0		0		
Post Mitigation Plan Performance Standard	Current Year Stem Count				16		6		12		13		14		11		11		12	
	Stems/Acre				648		243		486		526		567		445		445		486	
	Species Count				7		3		5		4		8		3		4		4	
	Dominant Species Composition (%)				25		67		58		46		21		55		55		33	
	Average Plot Height (ft.)				2		2		2		2		3		2		3		3	
% Invasives				0		0		0		0		0		0		0		0		

- 1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
- 2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
- 3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 8. Vegetation Plot Data Table from Vegetation Data Entry Tool (continued)

Planted Acreage	22.5
Date of Initial Plant	2022-01-18
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2023-09-14
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/S hrub	Indicator Status	Veg Plot 9 F		Veg Plot 10 F		Veg Plot 11 F		Veg Plot 12 F		Veg Plot 13 F		Veg Plot 14 F		Veg Plot 15 F		Veg Plot 16 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	<i>Alnus serrulata</i>	hazel alder	Tree	OBL	1	1					4	4								
	<i>Betula nigra</i>	river birch	Tree	FACW										4	4					
	<i>Carya sp.</i>																			
	<i>Cephalanthus occidentalis</i>	common buttonbush	Shrub	OBL	1	1			1	1	1	1								
	<i>Liriodendron tulipifera</i>	tuliptree	Tree	FACU																
	<i>Nyssa sp.</i>														1	1	7	7		
	<i>Nyssa sylvatica</i>	blackgum	Tree	FAC	2	2	3	3	1	1					3	3	3	3		
	<i>Quercus nigra</i>	water oak	Tree	FAC					3	3				1	1					
	<i>Quercus phellos</i>	willow oak	Tree	FAC							2	2	5	5					5	5
	<i>Quercus shumardii</i>	Shumard's oak	Tree	FAC							2	2	1	1						
	<i>Quercus sp.</i>								1	1	1	1								1
	<i>Salix nigra</i>	black willow	Tree	OBL																
	<i>Salix sp.</i>															1	1			
<i>Taxodium sp.</i>					5	5	7	7	7	7	6	6	6	6	1	1			3	3
<i>Ulmus americana</i>	American elm	Tree	FACW										3	3	3	3				
Sum	Performance Standard				9	9	10	10	13	13	16	16	16	16	13	13	15	15	8	8
Mitigation Plan Performance Standard	Current Year Stem Count				9		10		13		16		16		13		15		8	
	Stems/Acre				364		405		526		648		648		526		607		324	
	Species Count				4		2		5		6		5		6		3		3	
	Dominant Species Composition (%)				56		70		54		38		38		31		47		50	
	Average Plot Height (ft.)				3		3		3		2		2		2		2		2	
% Invasives				0		0		0		0		0		0		0		0		
Post Mitigation Plan Performance Standard	Current Year Stem Count				9		10		13		16		16		13		15		8	
	Stems/Acre				364		405		526		648		648		526		607		324	
	Species Count				4		2		5		6		5		6		3		3	
	Dominant Species Composition (%)				56		70		54		38		38		31		47		50	
	Average Plot Height (ft.)				3		3		3		2		2		2		2		2	
% Invasives				0		0		0		0		0		0		0		0		

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.

2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).

3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 8. Vegetation Plot Data Table from Vegetation Data Entry Tool (continued)

Planted Acreage	22.5
Date of Initial Plant	2022-01-18
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2023-09-14
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/S hrub	Indicator Status	Veg Plot 17 F		Veg Plot 18 F		Veg Plot 19 F		Veg Plot 20 F		Veg Plot 21 F		Veg Plot 22 F		Veg Plot 23 F		Veg Plot 1 R	Veg Plot 2 R	Veg Plot 3 R
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total
Species Included in Approved Mitigation Plan	<i>Alnus serrulata</i>	hazel alder	Tree	OBL																	
	<i>Betula nigra</i>	river birch	Tree	FACW					1	1					3	3					
	<i>Carya sp.</i>												1	1			2	2			
	<i>Cephalanthus occidentalis</i>	common buttonbush	Shrub	OBL															1		1
	<i>Liriodendron tulipifera</i>	tuliptree	Tree	FACU															6	4	3
	<i>Nyssa sp.</i>																				
	<i>Nyssa sylvatica</i>	blackgum	Tree	FAC	2	2			2	2											
	<i>Quercus nigra</i>	water oak	Tree	FAC	1	1															1
	<i>Quercus phellos</i>	willow oak	Tree	FAC	1	1	4	4	1	1					3	3	2	2			
	<i>Quercus shumardii</i>	Shumard's oak	Tree	FAC	1	1					5	5									
	<i>Quercus sp.</i>				1	1	1	1			1	1	3	3			1	1			
	<i>Salix nigra</i>	black willow	Tree	OBL																2	
	<i>Salix sp.</i>																				
<i>Taxodium sp.</i>					2	2	5	5	2	2	3	3	7	7	3	3	2	2			
<i>Ulmus americana</i>	American elm	Tree	FACW	3	3	2	2														
Sum	Performance Standard				11	11	12	12	6	6	9	9	11	11	9	9	7	7	7	6	5
Mitigation Plan Performance Standard	Current Year Stem Count				11		12		6		9		11		9		7	7	6	5	
	Stems/Acre				445		486		243		364		445		364		283	283	243	202	
	Species Count				7		4		4		3		3		3		4	2	2	3	
	Dominant Species Composition (%)				27		42		33		56		64		33		29	86	67	60	
	Average Plot Height (ft.)				2		2		2		2		2		2		2	2	2	2	
% Invasives				0		0		0		0		0		0		0	0	0	0		
Post Mitigation Plan Performance Standard	Current Year Stem Count				11		12		6		9		11		9		7	7	6	5	
	Stems/Acre				445		486		243		364		445		364		283	283	243	202	
	Species Count				7		4		4		3		3		3		4	2	2	3	
	Dominant Species Composition (%)				27		42		33		56		64		33		29	86	67	60	
	Average Plot Height (ft.)				2		2		2		2		2		2		2	2	2	2	
% Invasives				0		0		0		0		0		0		0	0	0	0		

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
 2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
 3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Appendix C

Stream Geomorphology Data

Cross-Sections with Annual Overlays

Table 9A-D. Baseline Stream Data Summary Tables

Table 10A-C. Cross-Section Morphology Monitoring Summary

**Table 9A. Baseline Stream Data Summary
Swamp Grape - UT 1 (Upstream)**

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Riffle Only										
Bankfull Width (ft)	5.2		13.2	17.6	8	6.8	7.9	8.8	11.8	3
Floodprone Width (ft)	8		20	50	8	50	150	100	100	3
Bankfull Mean Depth (ft)	0.2		0.3	0.8	8	0.5	0.6	0.2	0.4	3
Bankfull Max Depth (ft)	0.4		0.7	1.5	8	0.6	0.9	0.6	0.9	3
Bankfull Cross Sectional Area (ft ²)	3.9		3.9	3.9	8	3.9	3.9	2.9	3.9	3
Width/Depth Ratio	6.5		44	88	8	12	16	19.8	48.0	3
Entrenchment Ratio	1		1.5	9.3	8	7.3	19	8.4	11.3	3
Bank Height Ratio	1.5		2.8	6.6	8	1	1.3	1	1	3
Max part size (mm) mobilized at bankfull										
Rosgen Classification	F 5					Ce 5		Ce 5		
Bankfull Discharge (cfs)	3.5					3.5		3.5		
Sinuosity (ft)	1.01					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0.0062					0.0031		0.0024		
Other										

**Table 9B. Baseline Stream Data Summary
Swamp Grape - UT 1 (Downstream)**

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Riffle Only										
Bankfull Width (ft)	10.2		12.2	20.3	7	12.4	14.4	17.9	19.4	2
Floodprone Width (ft)	50		150	150	7	100	200	100	100	2
Bankfull Mean Depth (ft)	0.6		1.1	2.4	7	0.9	1	0.6	0.7	2
Bankfull Max Depth (ft)	1.1		1.8	2.4	7	1.2	1.6	1.2	1.3	2
Bankfull Cross Sectional Area (ft ²)	12.9		12.9	12.9	7	12.9	12.9	11.9	12.8	2
Width/Depth Ratio	7.8		11.1	33.8	7	12	16	25.1	31.5	2
Entrenchment Ratio	2.8		12.3	14.7	7	8	13.9	5.2	5.6	2
Bank Height Ratio	1		1.3	1.8	7	1	1.3	1	1	2
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Eg 5					Ce 5		Ce 5		
Bankfull Discharge (cfs)	12.1					12.1		12.1		
Sinuosity (ft)	1.3					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0.0036					0.0054		0.00474		
Other										

**Table 9C. Baseline Stream Data Summary
Swamp Grape - UT 2**

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Riffle Only										
Bankfull Width (ft)	6.9		7.5	7.9		7.7	8.9	8.8	16.7	2
Floodprone Width (ft)	50		75	75		100	200	100.0	100.0	2
Bankfull Mean Depth (ft)	0.6		0.6	0.7		0.6	0.6	0.4	0.4	2
Bankfull Max Depth (ft)	1.2		1.4	1.7		0.7	1	0.7	0.9	2
Bankfull Cross Sectional Area (ft ²)	4.9		4.9	4.9		4.9	4.9	3.5	6.0	2
Width/Depth Ratio	9.9		12.5	13.2		12	16	22.2	46.5	2
Entrenchment Ratio	6.7		9.5	10.9		13	22.6	6.0	11.4	2
Bank Height Ratio	1.1		1.3	1.4		1	1.3	1.0	1.0	2
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Cg 5					Ce 5		Ce 5		
Bankfull Discharge (cfs)	4.5					4.5		4.5		
Sinuosity (ft)	1.02					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0.0042					0.0035		0.0029		
Other										

**Table 9D. Baseline Stream Data Summary
Swamp Grape - UT 3**

Parameter	Pre-Existing Condition (applicable)					Design		Monitoring Baseline (MY0)		
	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Riffle Only										
Bankfull Width (ft)	6.8		7.8	8.8		8.9	10.3	15.8	15.8	1
Floodprone Width (ft)	27		31	35		100	200	100.0	100.0	1
Bankfull Mean Depth (ft)	0.7		0.9	1		0.6	0.7	0.4	0.4	1
Bankfull Max Depth (ft)	1.2		1.3	1.4		0.8	1.1	1.1	1.1	1
Bankfull Cross Sectional Area (ft ²)	6.6		6.6	6.6		6.6	6.6	5.9	5.9	1
Width/Depth Ratio	6.8		9.7	12.6		12	16	42.0	42.0	1
Entrenchment Ratio	3.1		4.1	5.1		11.2	19.5	6.3	6.3	1
Bank Height Ratio	1.4		1.6	1.8		1	1.3	1.0	1.0	1
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Eg 5					Ce 5		Ce 5		
Bankfull Discharge (cfs)	6.1					6.1		6.1		
Sinuosity (ft)	1.17					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0.0125					0.0039		0.0032		
Other										

Table 10A. Monitoring Data - Cross Section Morphology Monitoring Summary

(Swamp Grape/ DMS:100115) UT 1

	UT 1 - Cross Section 1 (Pool)							UT 1 - Cross Section 2 (Riffle)							UT 1 - Cross Section 3 (Pool)							UT 1 - Cross Section 4 (Riffle)							UT 1 - Cross Section 5 (Riffle)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	109.50	109.49	109.25					110.09	110.14	110.07					110.37	110.36	110.69					110.50	110.54	110.63					113.72	113.78	113.63				
Bank Height Ratio_Based on AB Bankfull ¹ Area	1.00	1.03	0.97					1.00	0.98	0.95					1.00	0.92	0.79					1.00	1.01	0.98					1.00	1.06	1.01				
Thalweg Elevation	107.77	107.92	107.67					108.75	108.60	108.13					108.60	108.41	108.55					109.30	109.12	109.30					113.01	112.99	112.89				
LTOB ² Elevation	109.50	109.54	109.20					110.09	110.10	109.97					110.37	110.21	110.24					110.50	110.55	110.60					113.72	113.83	113.64				
LTOB ² Max Depth (ft)	1.73	1.62	1.53					1.34	1.50	1.84					1.77	1.80	1.69					1.20	1.43	1.30					0.70	0.84	0.74				
LTOB ² Cross Sectional Area (ft ²)	13.9	14.65	13.24					12.8	12.15	11.28					17.8	15.09	11.78					11.9	12.09	11.38					3.4	3.92	3.52				
	UT 1 - Cross Section 6 (Pool)							UT 1 - Cross Section 7 (Riffle)							UT 1 - Cross Section 8 (Pool)							UT 1 - Cross Section 15 (Riffle)							UT 1 - Cross Section 16 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	114.21	113.94	113.74					120.40	120.35	120.25					120.44	120.46	120.69					116.68	116.64	116.85					116.80	116.83	116.82				
Bank Height Ratio_Based on AB Bankfull ¹ Area	1.00	0.77	0.94					1.00	1.17	1.09					1.00	0.96	1.01					1.00	1.07	0.96					1.00	0.97	0.90				
Thalweg Elevation	113.00	111.90	111.76					119.79	119.67	119.47					119.11	119.22	119.38					115.79	115.92	116.03					115.47	115.41	115.42				
LTOB ² Elevation	114.21	113.47	113.61					120.40	120.46	120.32					120.44	120.42	120.71					116.68	116.69	116.82					116.80	116.79	116.68				
LTOB ² Max Depth (ft)	1.22	1.57	1.85					0.60	0.79	0.85					1.33	1.20	1.33					0.89	0.76	0.79					1.34	1.38	1.26				
LTOB ² Cross Sectional Area (ft ²)	6.2	9.15	11.53					2.9	3.07	2.77					6.5	6.03	6.56					3.9	4.43	3.54					9.6	8.99	8.01				
<p>The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners. The outcome resulted in the focus on three primary morphological parameters of interest for the purposes of tracking channel change moving forward. They are the bank height ratio using a constant As-built bankfull area and the cross sectional area and max depth based on each years low top of bank. These are calculated as follows:</p> <p>1 - Bank Height Ratio (BHR) takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation. For example if the As-built bankfull area was 10 ft2, then the MY1 bankfull elevation would be adjusted until the calculated bankfull area within the MY1 cross section survey = 10 ft2. The BHR would then be calculated with the difference between the low top of bank (LTOB) elevation for MY1 and the thalweg elevation for MY1 in the numerator with the difference between the MY1 bankfull elevation and the MY1 thalweg elevation in the denominator. This same process is then carried out in each successive year.</p> <p>2 - LTOB Area and Max depth - These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recoded and tracked above as LTOB max depth.</p>																																			
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area																																			
Bank Height Ratio_Based on AB Bankfull ¹ Area																																			
Thalweg Elevation																																			
LTOB ² Elevation																																			
LTOB ² Max Depth (ft)																																			
LTOB ² Cross Sectional Area (ft ²)																																			

Note: The smaller the channel the closer the survey measurements are to their limit of reliable detection, therefore inter-annual variation in morphological measurement (as a percentage) is by default magnified as channel size decreases. Some of the variability above is the result of this factor and some is due to the large amount of depositional sediments observed.

Table 10B. Monitoring Data - Cross Section Morphology Monitoring Summary

(Swamp Grape/ DMS:100115) UT 2

	UT 2 - Cross Section 11 (Pool)							UT 2 - Cross Section 12 (Riffle)							UT 2 - Cross Section 13 (Riffle)							UT 2 - Cross Section 14 (Pool)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area	113.81	113.83	113.80					114.20	114.27	114.24					114.95	114.98	115.10					115.20	115.27	115.52				
Bank Height Ratio_Based on AB Bankfull ¹ Area	1.00	1.02	0.88					1.00	0.87	1.03					1.00	1.09	1.10					1.00	0.92	1.04				
Thalweg Elevation	112.08	112.06	112.01					113.28	113.22	113.40					114.27	114.33	114.34					113.78	113.79	114.73				
LTOB ² Elevation	113.81	113.87	113.58					114.2	114.14	114.26					114.95	115.04	115.18					115.20	115.15	115.59				
LTOB ² Max Depth (ft)	1.73	1.80	1.57					0.92	0.92	0.86					0.68	0.71	0.83					1.42	1.36	1.78				
LTOB ² Cross Sectional Area (ft ²)	10.8	11.12	8.89					6.0	4.62	6.49					3.5	3.91	4.18					9.19	7.83	10.76				
Bankfull Elevation (ft) - Based on AB-Bankfull ¹ Area																												
Bank Height Ratio_Based on AB Bankfull ¹ Area																												
Thalweg Elevation																												
LTOB ² Elevation																												
LTOB ² Max Depth (ft)																												
LTOB ² Cross Sectional Area (ft ²)																												
	<p>The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners. The outcome resulted in the focus on three primary morphological parameters of interest for the purposes of tracking channel change moving forward. They are the bank height ratio using a constant As-built bankfull area and the cross sectional area and max depth based on each years low top of bank. These are calculated as follows:</p> <p>1 - Bank Height Ratio (BHR) takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation. For example if the As-built bankfull area was 10 ft2, then the MY1 bankfull elevation would be adjusted until the calculated bankfull area within the MY1 cross section survey = 10 ft2. The BHR would then be calculated with the difference between the low top of bank (LTOB) elevation for MY1 and the thalweg elevation for MY1 in the numerator with the difference between the MY1 bankfull elevation and the MY1 thalweg elevation in the denominator. This same process is then carried out in each successive year.</p> <p>2 - LTOB Area and Max depth - These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recoded and tracked above as LTOB max depth.</p>																											
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LTOB ² Max Depth (ft)																												
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Note: The smaller the channel the closer the survey measurements are to their limit of reliable detection, therefore inter-annual variation in morphological measurement (as a percentage) is by default magnified as channel size decreases. Some of the variability above is the result of this factor and some is due to the large amount of depositional sediments observed.

Appendix D

Hydrologic Data

Table 11. Verification of Bankfull Events
Stream Crest Gauge Graphs

Table 12. Groundwater Hydrology Data
Groundwater Gauge Graphs

Figure D1. 30/70 Percentile Graph for Rainfall
Soil Temperature Graph

Table 11. Verification of Bankfull Events

Date of Data Collection	Date of Occurrence	Method	Photo (if available)
July 18, 2022	July 10, 2022	Crest gauges documented a bankfull event on UT2 after 4.95" of rain was recorded between July 8-10, 2022 at an onsite rain gauge. UT2 crested at 2.44 ft, and wrack lines were observed along UT1 and UT2.	1
August 19-20, 2022	August 19, 2022	Crest gauges documented a bankfull event on UT1 and UT2 after 2.73" of rain was recorded at an onsite rain gauge. UT1 and UT2 crested at 2.92 ft and 2.63 ft, respectively.	--
November 17, 2022	September 30, 2022	Crest gauges documented a bankfull event on UT1 and UT2 after 1.04" of rain was recorded between July 8-10, 2022 at an onsite rain gauge. UT1 and UT2 crested at 2.42 ft and 2.48 ft, respectively. Additionally, wrack lines were observed along UT1 and UT2.	2-3
February 28, 2023	January 25, 2023	Crest gauges documented a bankfull event on UT1 and UT2 after 1.75" of rain was recorded the day before at an onsite rain gauge. UT1 and UT2 crested at 1.60' and 1.77', respectively.	4
May 19, 2023	April 9, 2023	Crest gauges and trail cameras documented a bankfull event on UT1 and UT2 after 2.30" of rain was recorded over two days at an onsite rain gauge. UT1 and UT2 crested at 2.00' and 1.52', respectively.	5
August 3, 2023	June 21, 2023	Crest gauges documented a bankfull event on UT1 and UT2 after 5.90" of rain was recorded the day before at an onsite rain gauge. UT1 and UT2 crested at 3.99' and 2.81', respectively.	--
November 20, 2023	August 31, 2023	Crest gauges trail cameras documented a bankfull event on UT1 and UT2 after 3.29" of rain was recorded over two days at an onsite rain gauge. UT1 and UT2 crested at 3.17' and 1.96', respectively. Wrack lines were observed along UT1.	6-7



Photo 1: Wrack line along UT1 resulting from a bankfull event.



Photo 2: Wrack lines along UT1 resulting from a bankfull event.

Photo 3: Wrack line along UT2 resulting from a bankfull event.



Photo 4: Overbank event occurring on UT1
(NOTE: Date malfunction on photo footer, but it was confirmed based on the metadata of the file)

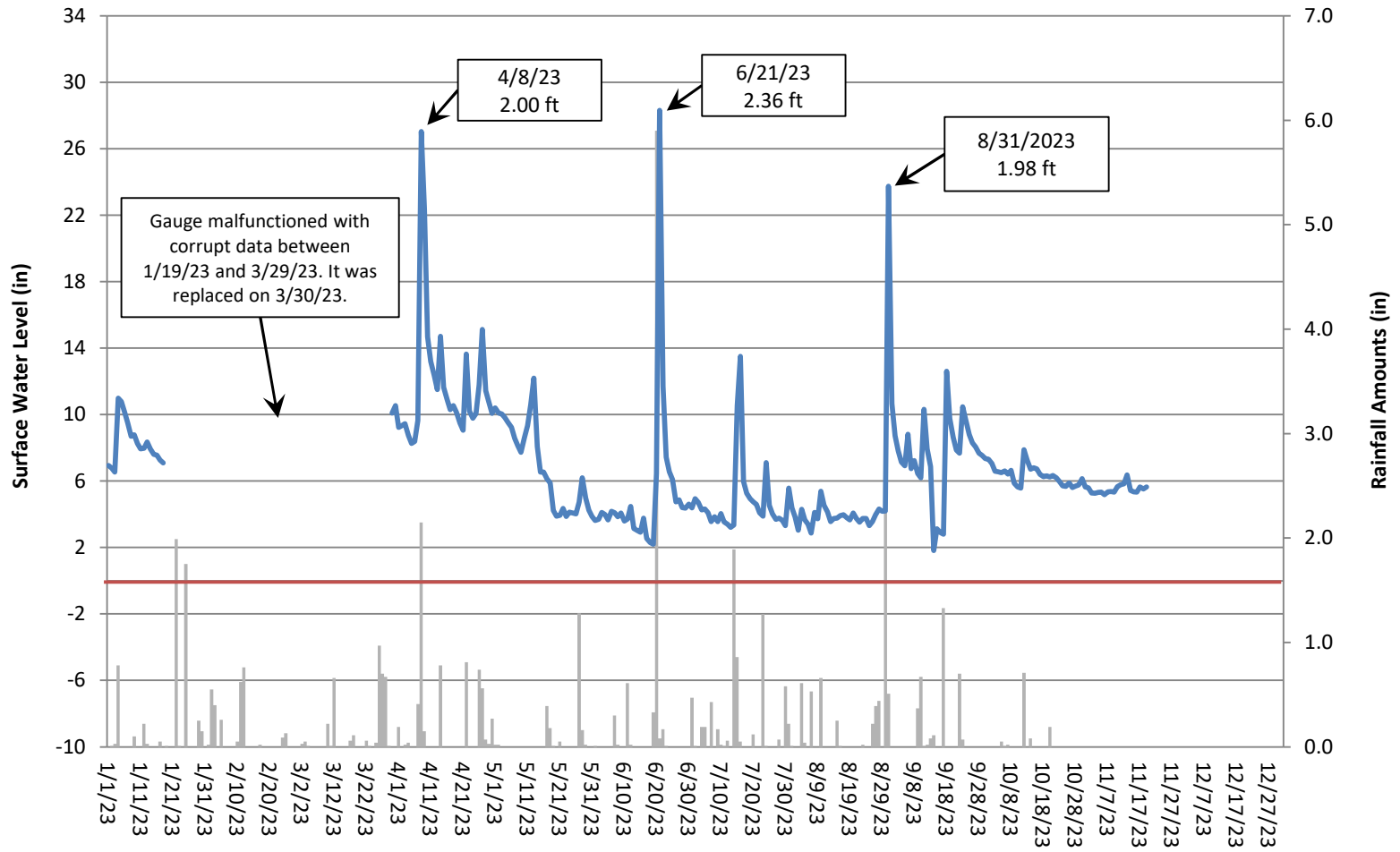




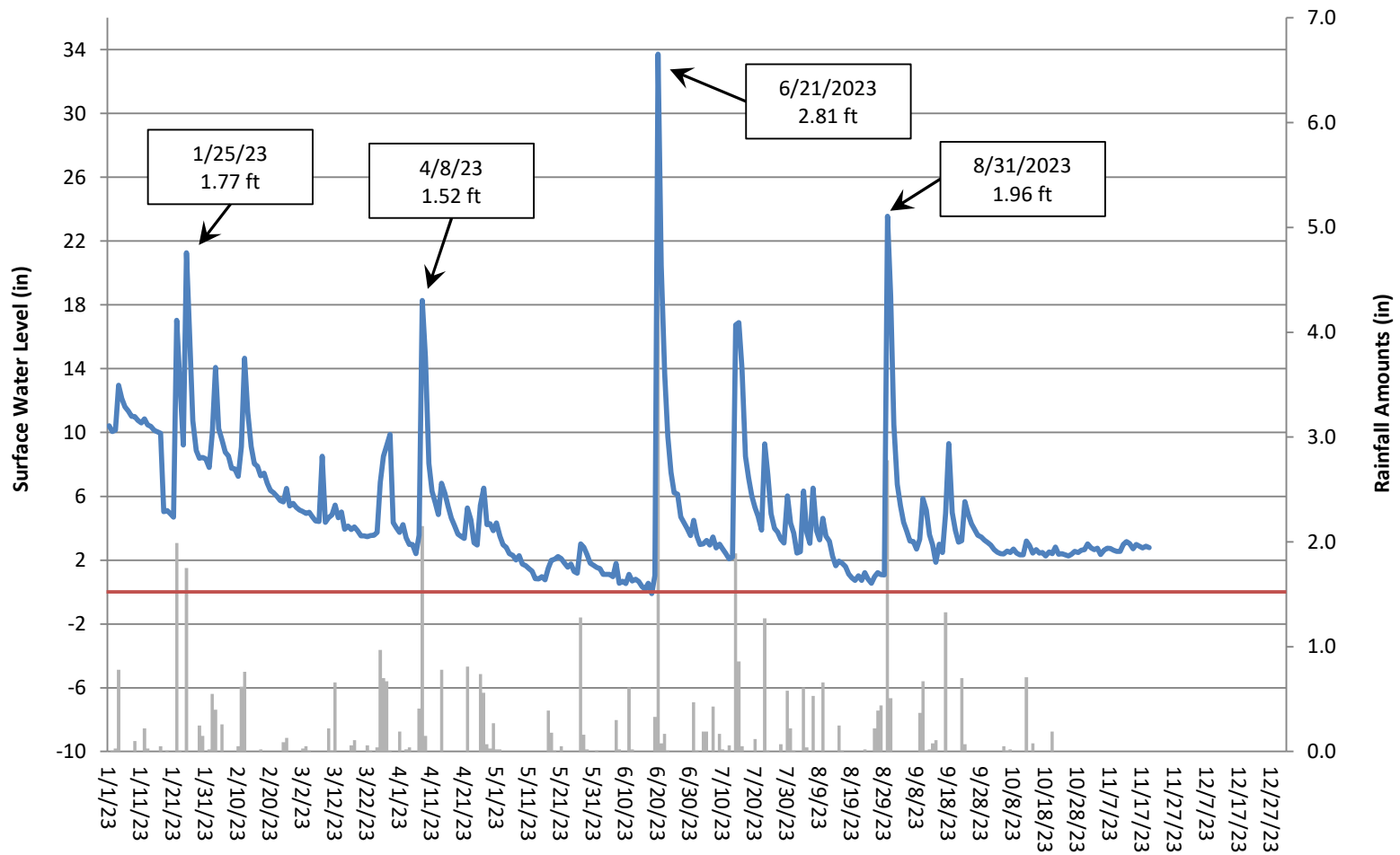
Photo 7: Wrack lines along UT1 resulting from a bankfull event.



Swamp Grape Crest Gauge UT1 Upstream Year 2 (2023 Data)



Swamp Grape Crest Gauge UT2 Year 2 (2023 Data)



Swamp Grape Crest Gauge UT1 Downstream Year 2 (2023 Data)

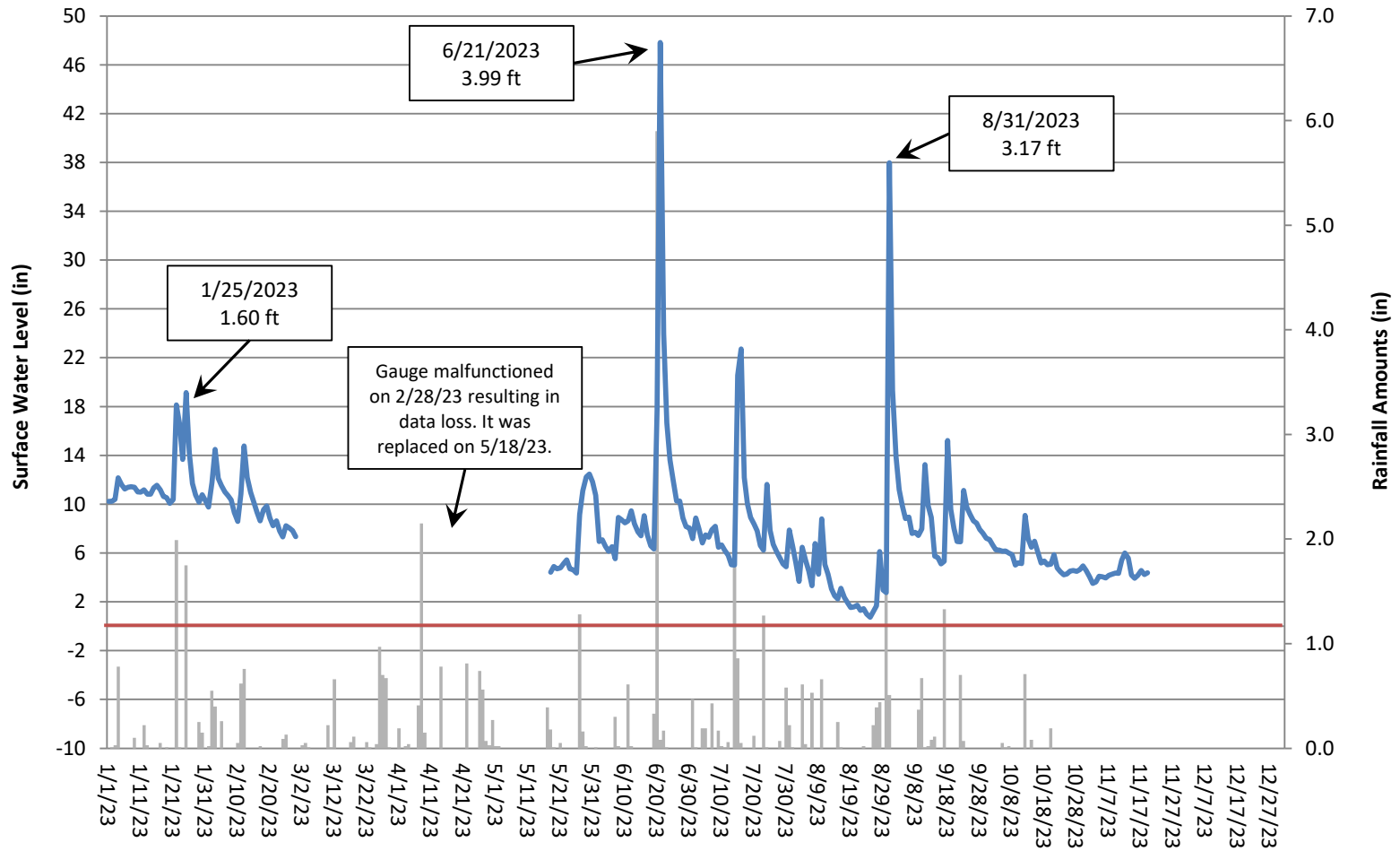
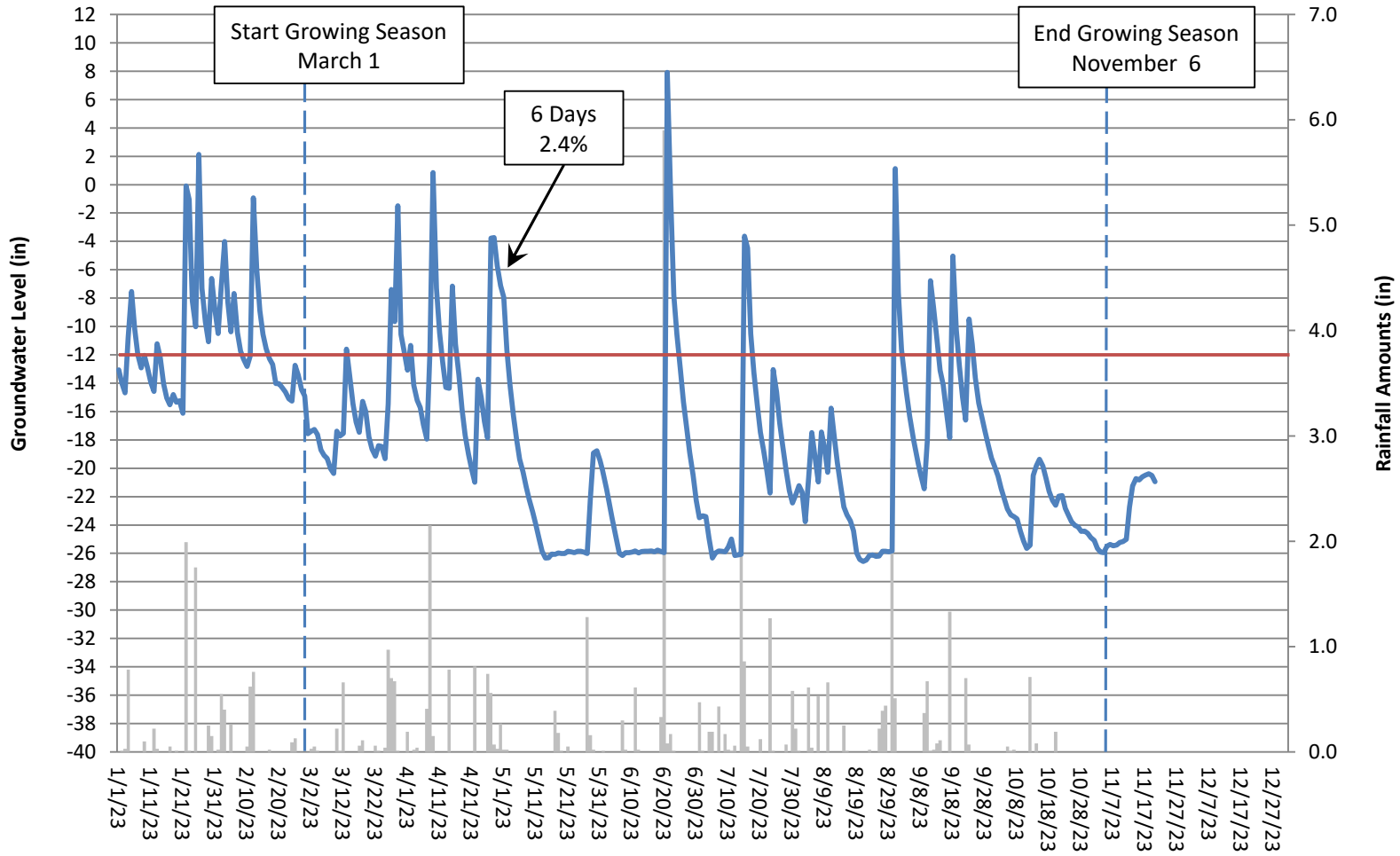


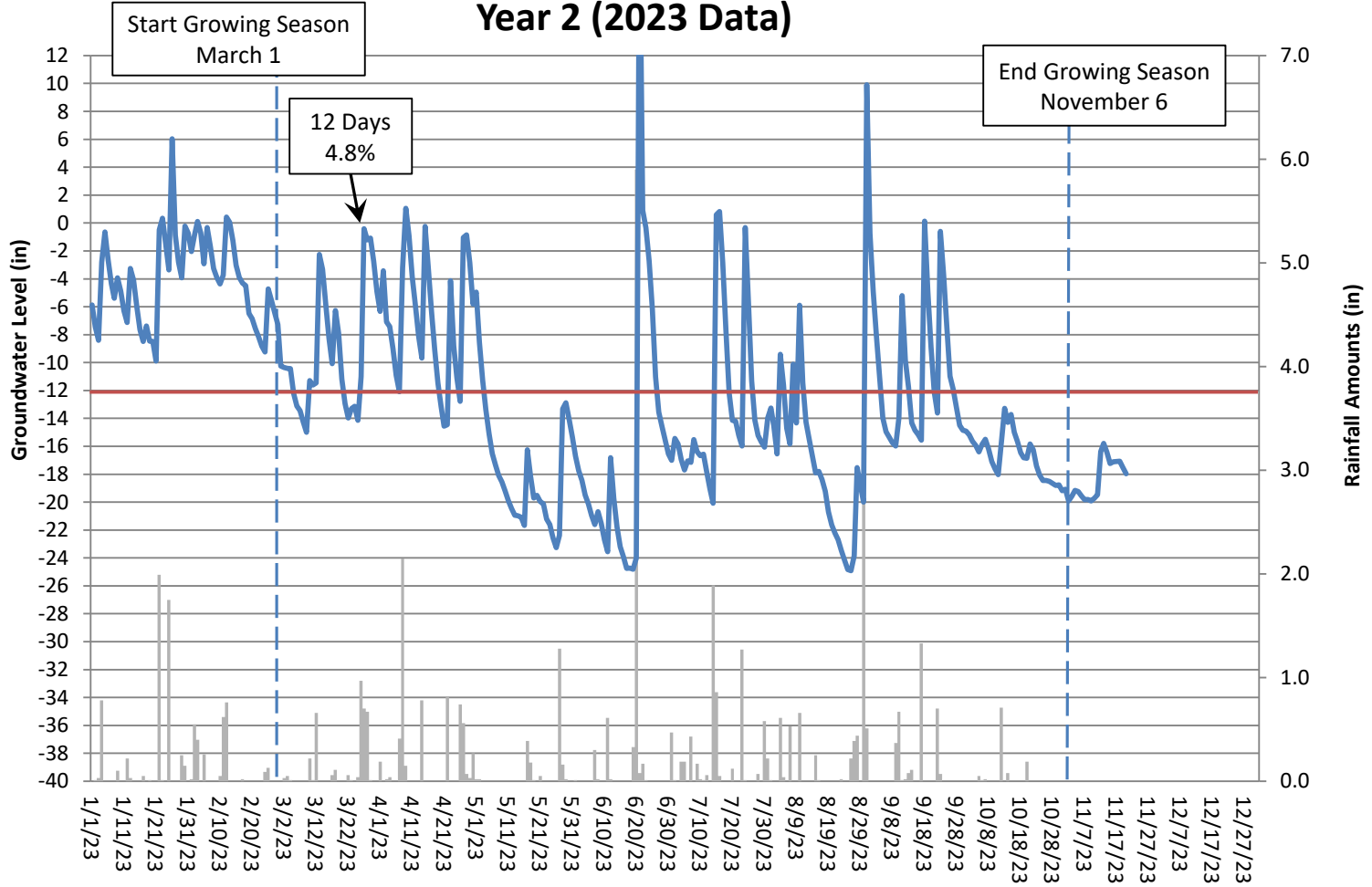
Table 12. Groundwater Hydrology Data

Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2022)	Year 2 (2023)	Year 3 (2024)	Year 4 (2025)	Year 5 (2026)	Year 6 (2027)	Year 7 (2028)
1	No 8 days (3.2%)	No 6 Days (2.4%)					
2	No 14 days (5.6%)	No 12 Days (4.8%)					
3	No 12 days (4.8%)	No 11 Days (4.4%)					
4	No 17 days (6.8%)	Yes 73 Days (30.4%)					
5	No 12 days (4.8%)	Yes 51 Days (20%)					
6	No 3 days (1.2%)	No 4 Days (1.6%)					
7	Yes 82 days (32.7%)	Yes 95 Days (32.7%)					
8	Yes 80 days (31.9%)	Yes 85 Days (33.9%)					
9	Yes 61 days (24.3%)	Yes 73 Days (29%)					
10	Yes 83 days (33.1%)	Yes 86 Days (34.2%)					
11	Yes 52 Days (20.7%)	Yes 65 Days (25.9%)					
12	Yes 70 Days (27.9%)	Yes 101 Days (40.2%)					
13	Yes 83 Days (33.1%)	Yes 108 Days (43.0%)					
14	Yes 128 Days (51.0%)	Yes 251 Days (100%)					
15	Yes 58 Days (23.1%)	Yes 74 Days (29.5%)					
16	Yes 34 Days (13.5%)	Yes 69 Days (27.5%)					

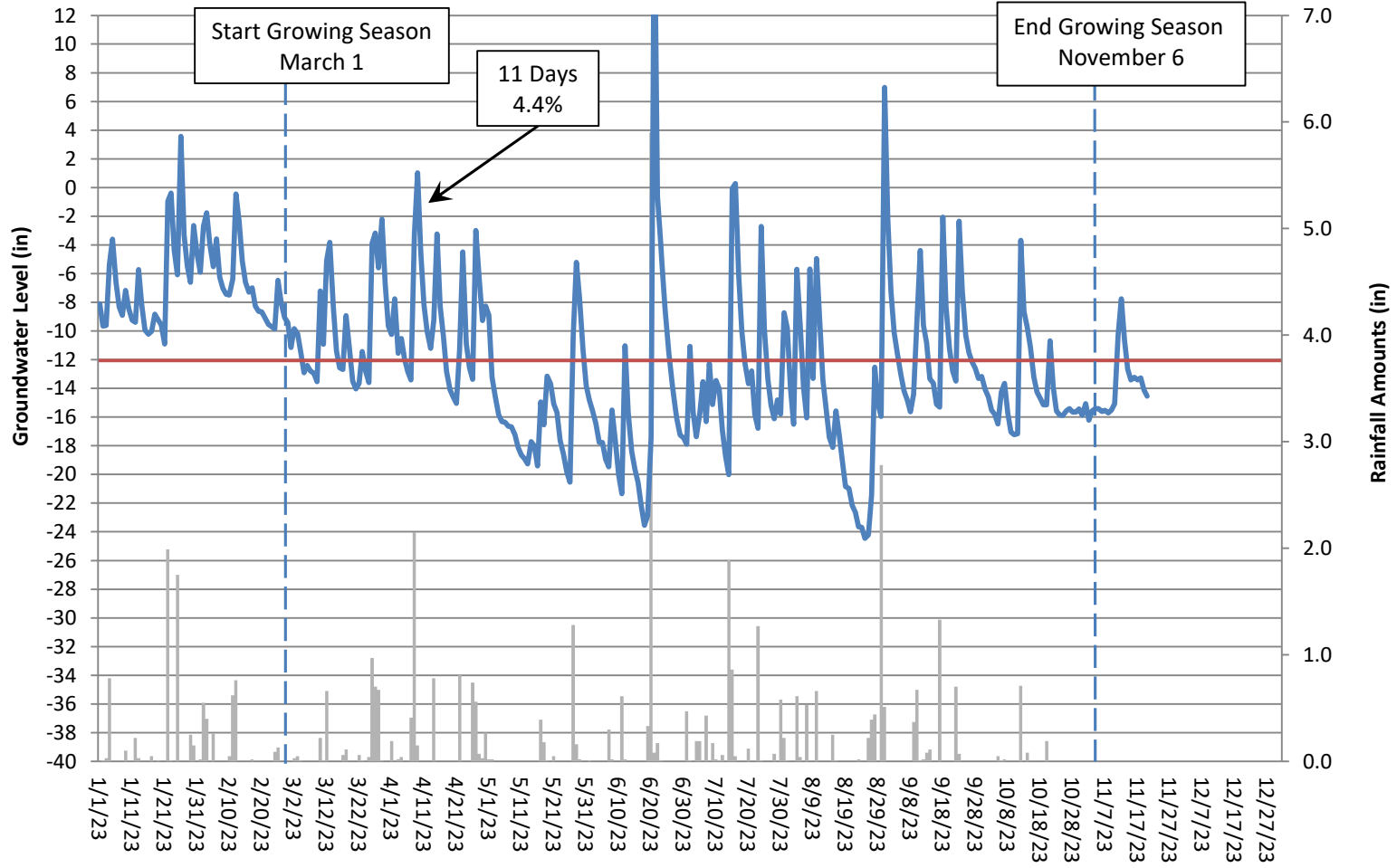
Swamp Grape Groundwater Gauge 1 Year 2 (2023 Data)



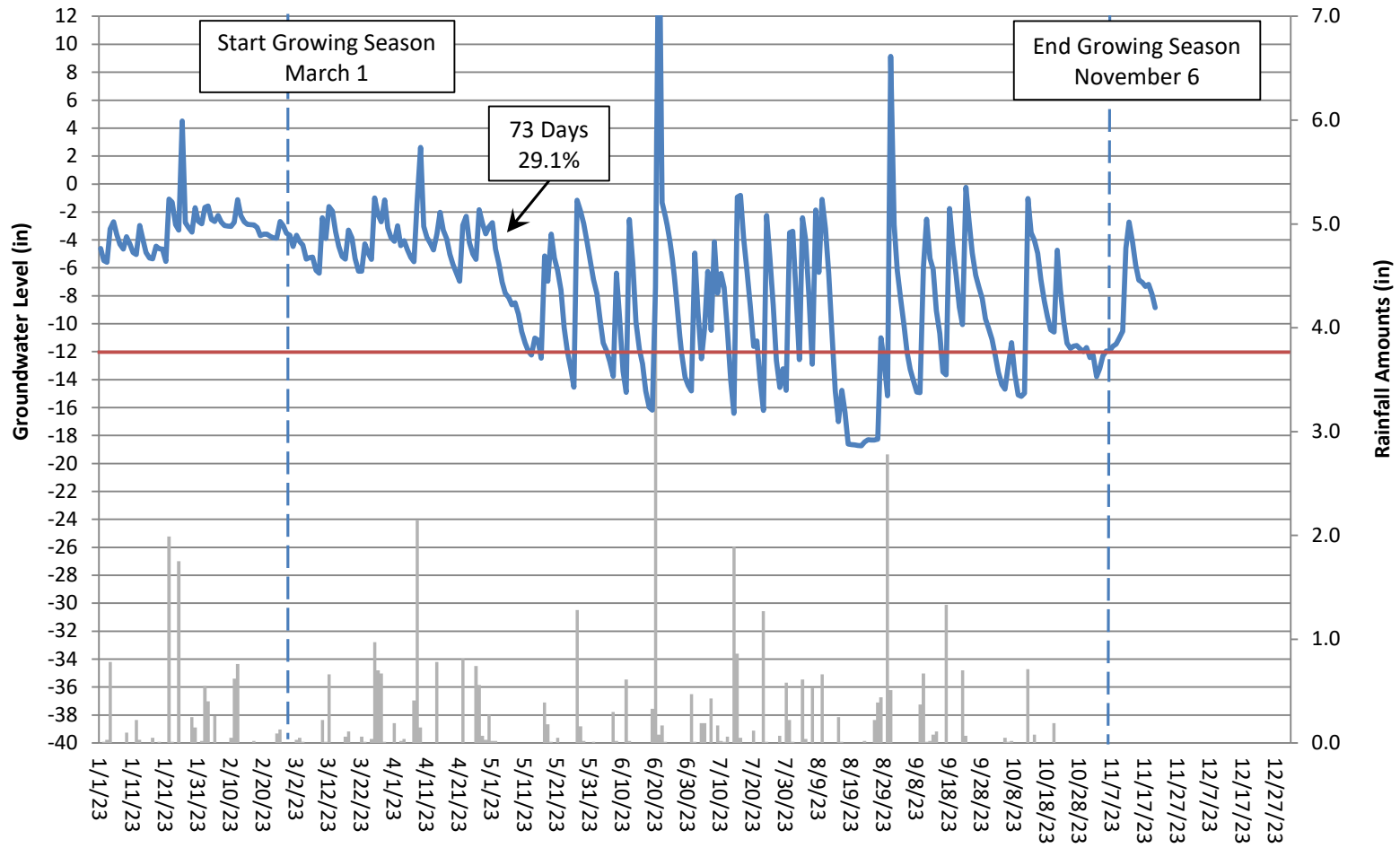
Swamp Grape Groundwater Gauge 2 Year 2 (2023 Data)



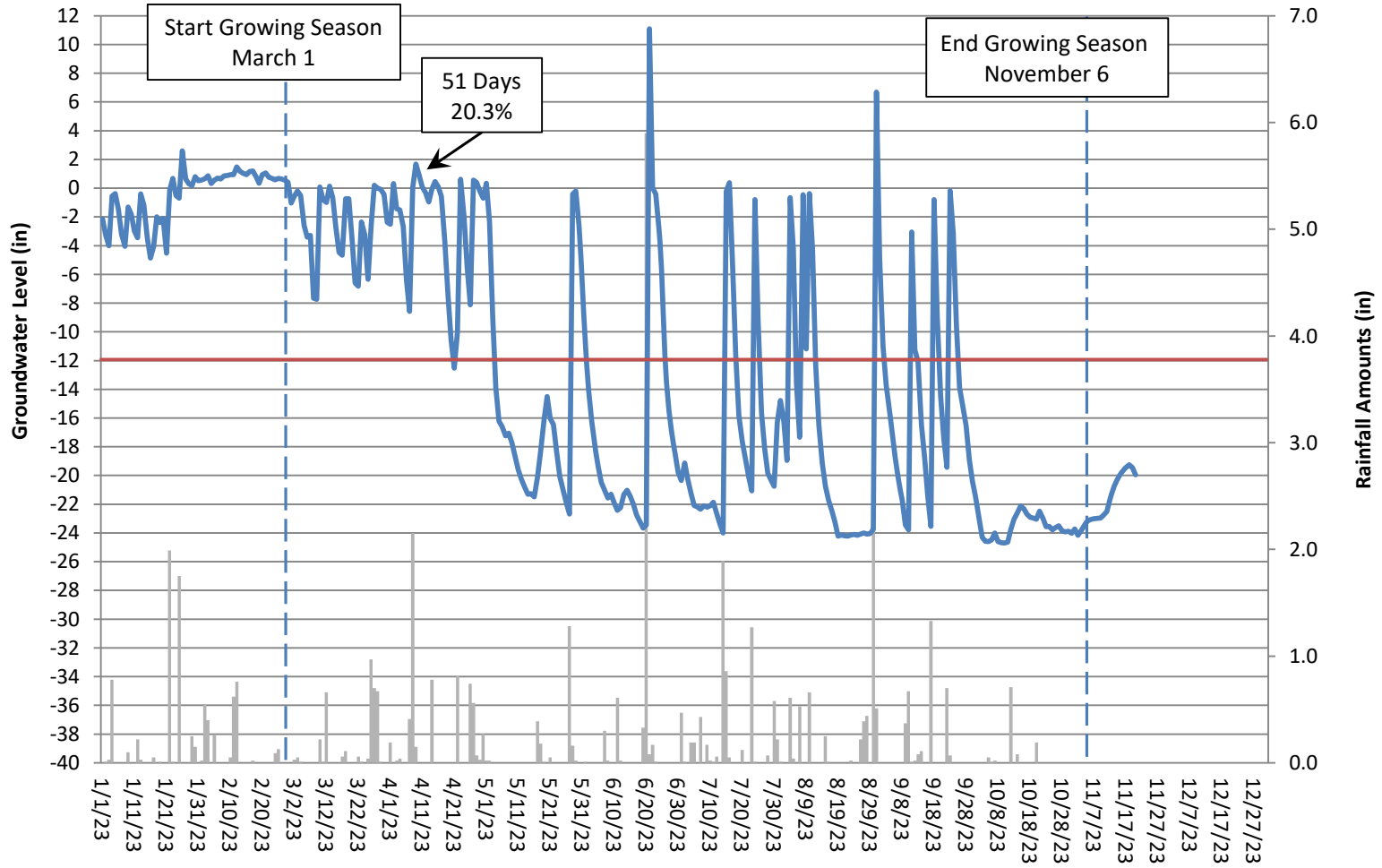
Swamp Grape Groundwater Gauge 3 Year 2 (2023 Data)



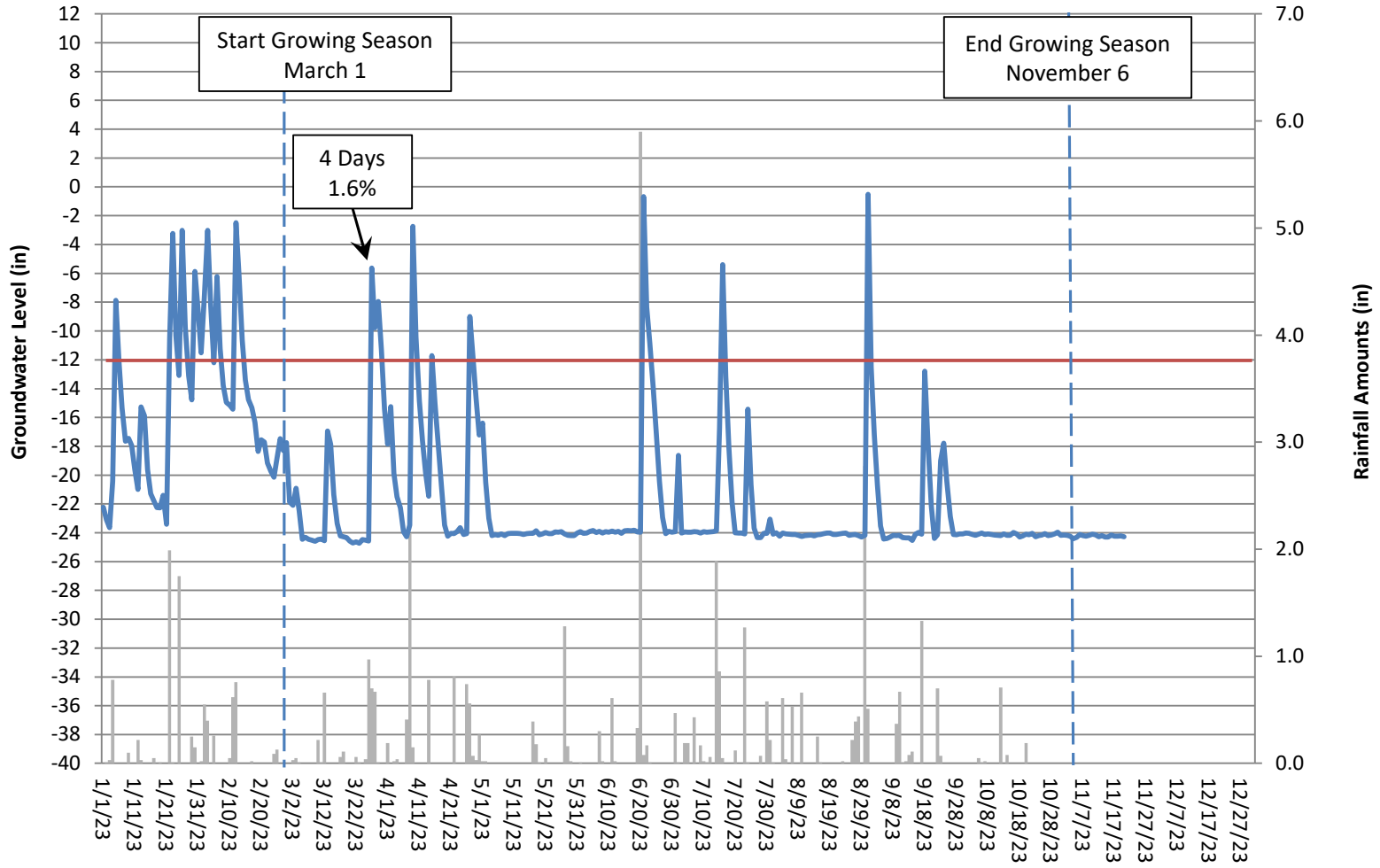
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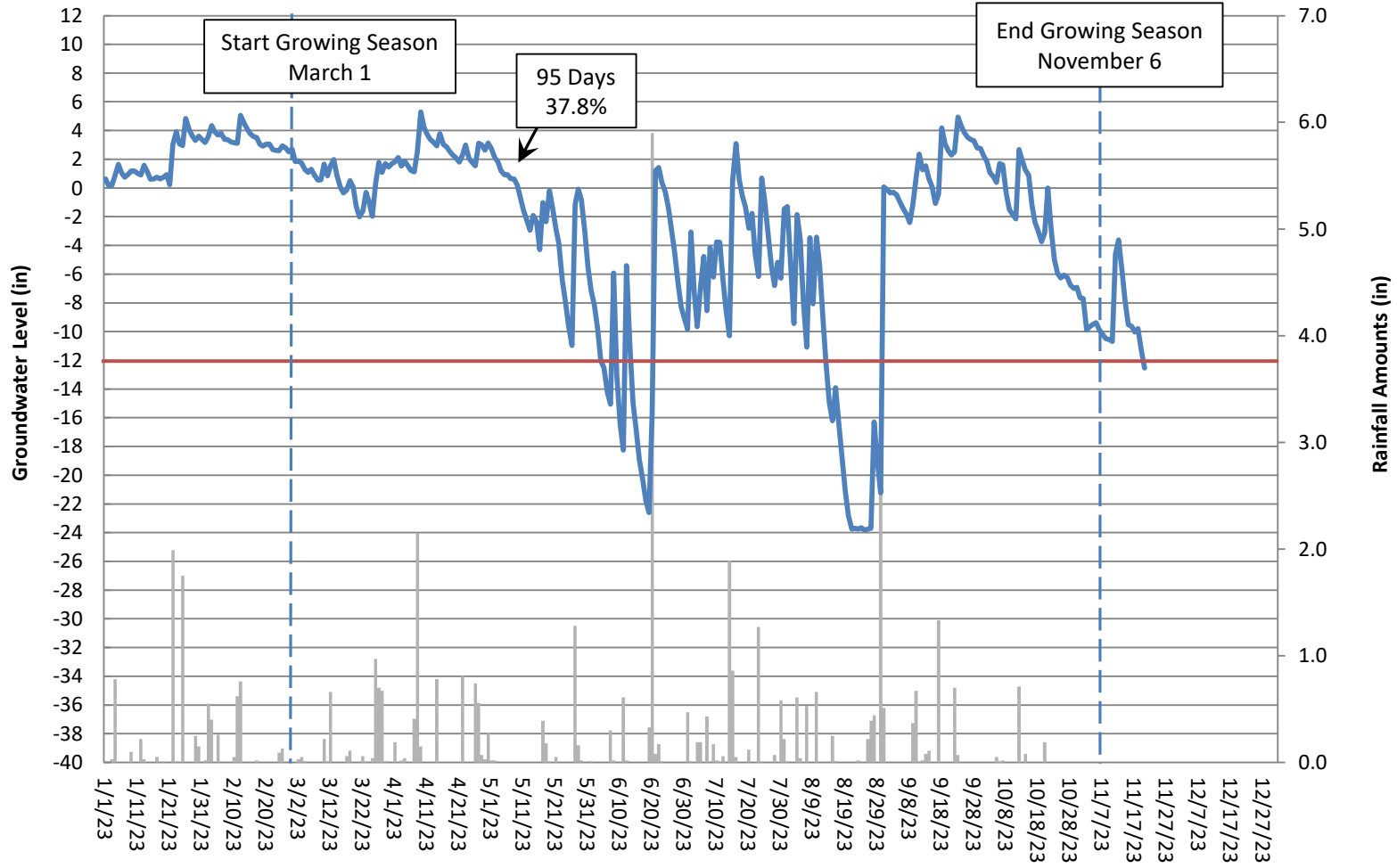
Swamp Grape Groundwater Gauge 5 Year 2 (2023 Data)



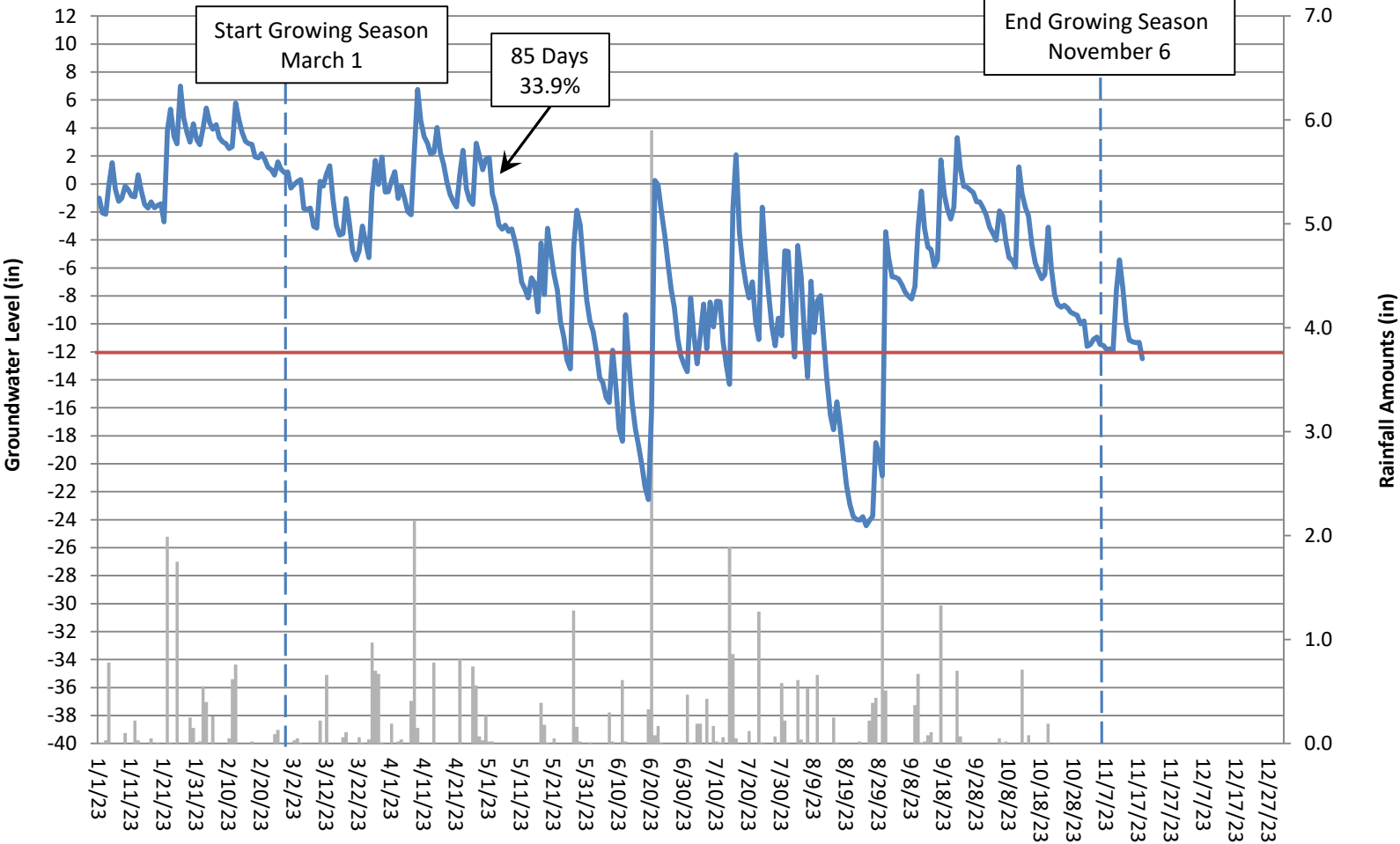
Swamp Grape Groundwater Gauge 6 Year 2 (2023 Data)



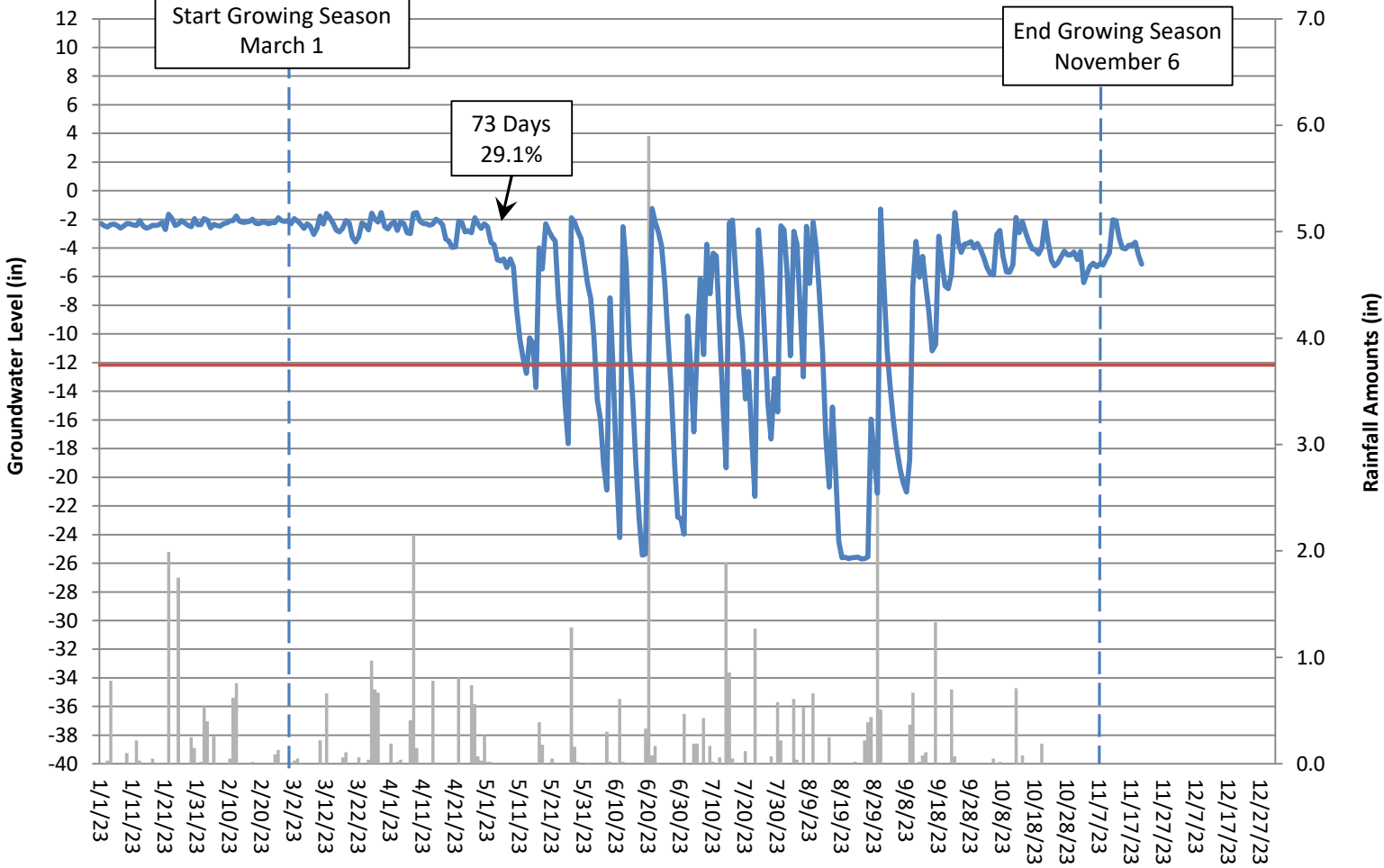
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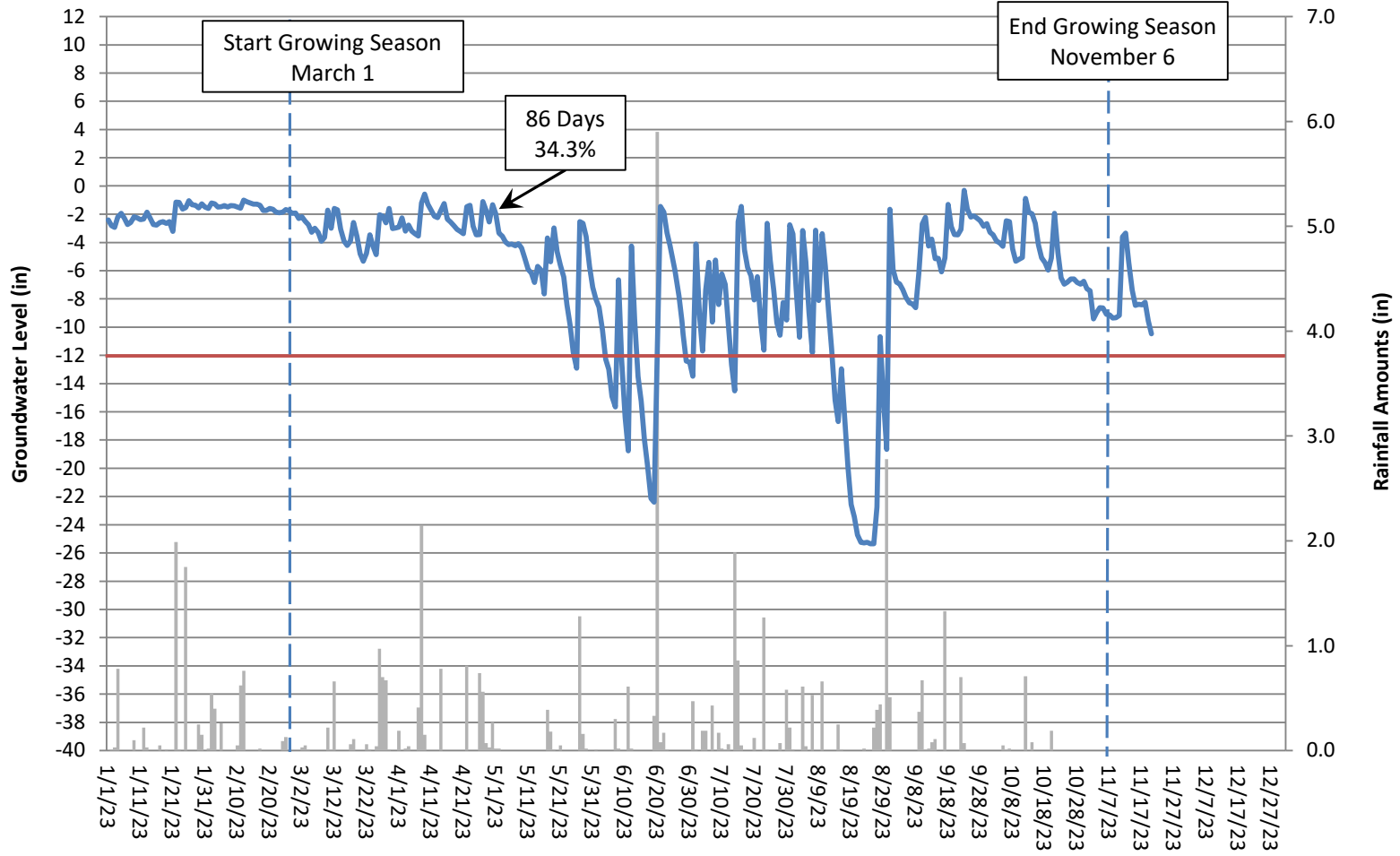
Swamp Grape Groundwater Gauge 8 Year 2 (2023 Data)



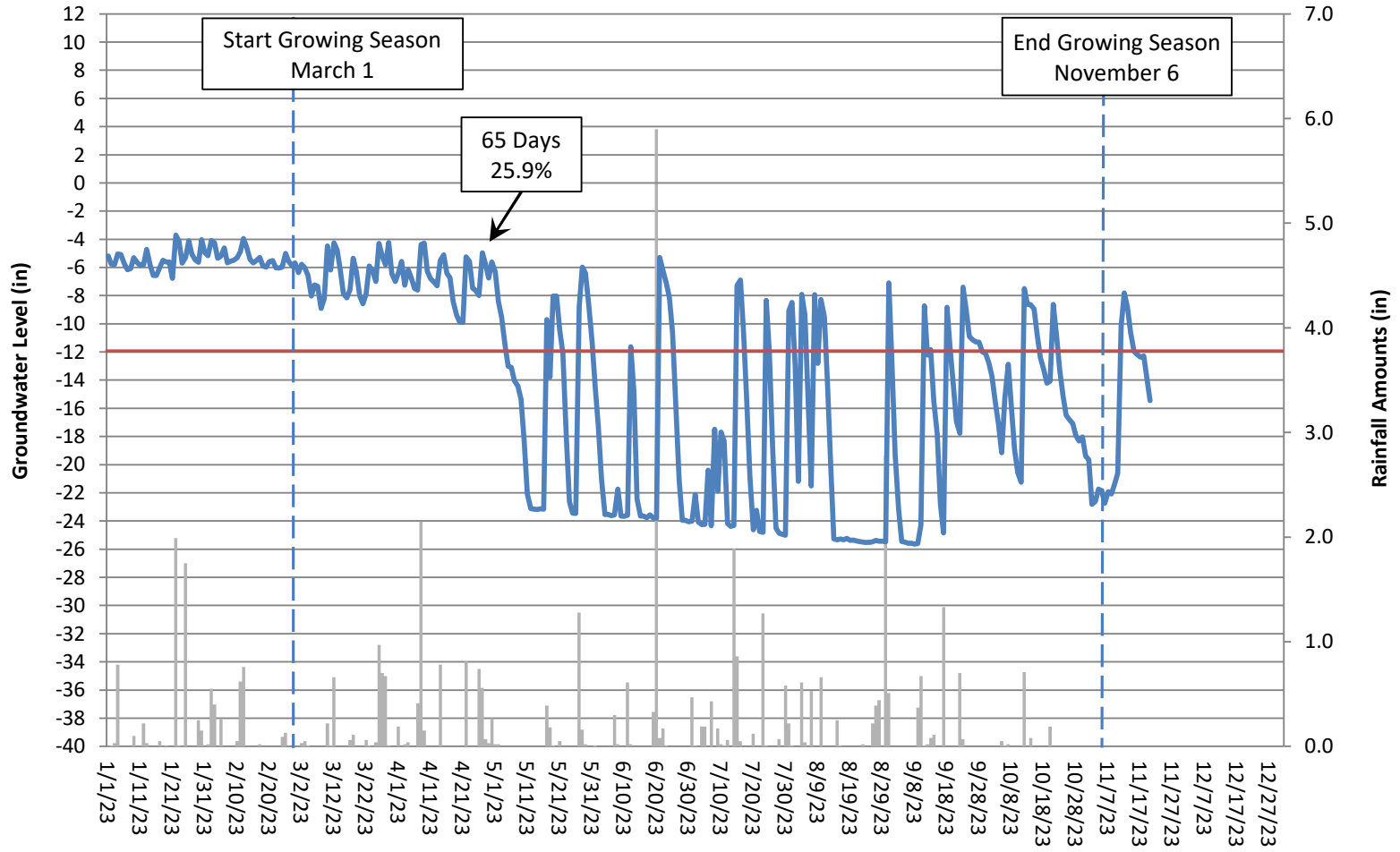
Swamp Grape Groundwater Gauge 9 Year 2 (2023 Data)



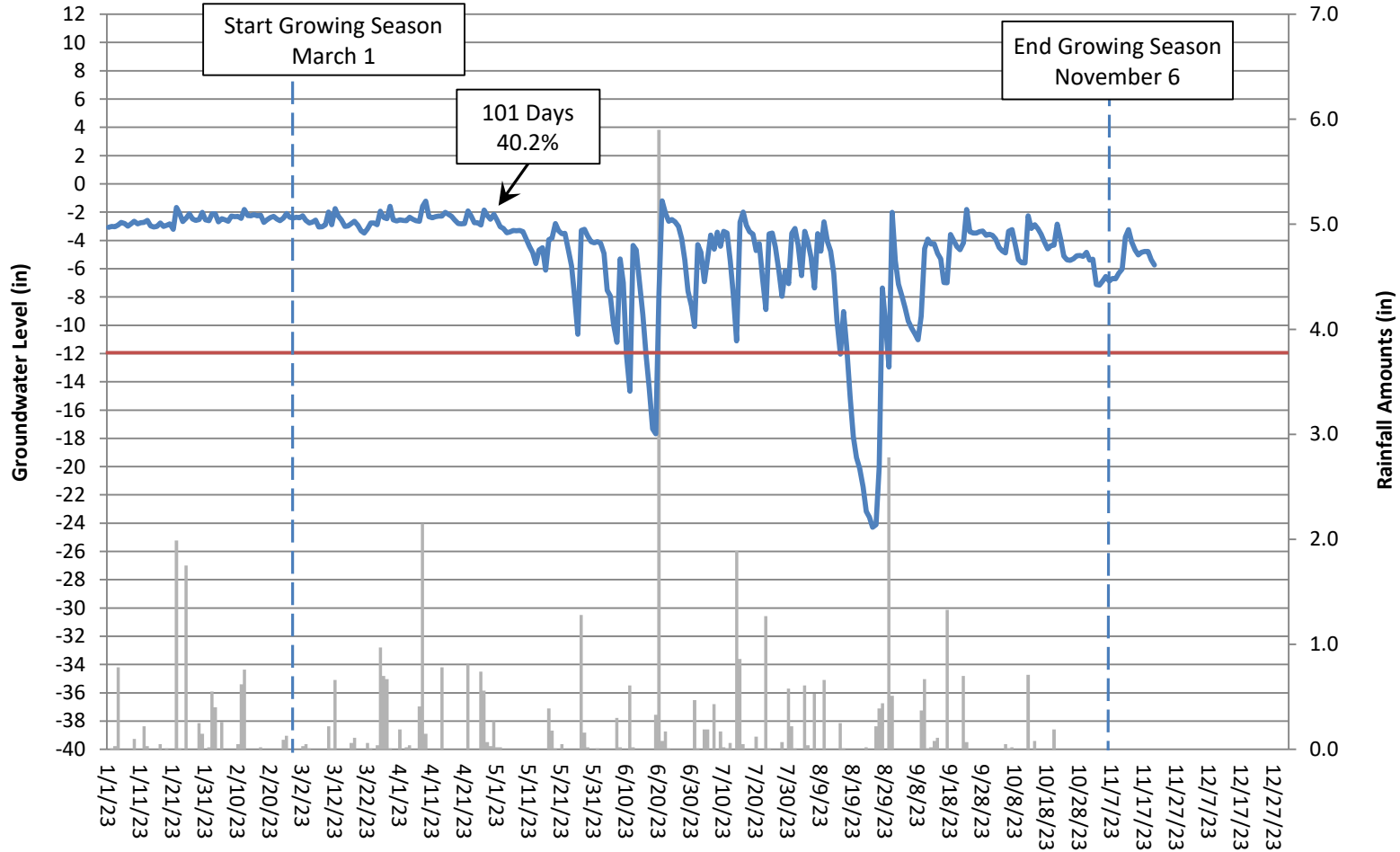
Swamp Grape Groundwater Gauge 10 Year 2 (2023 Data)



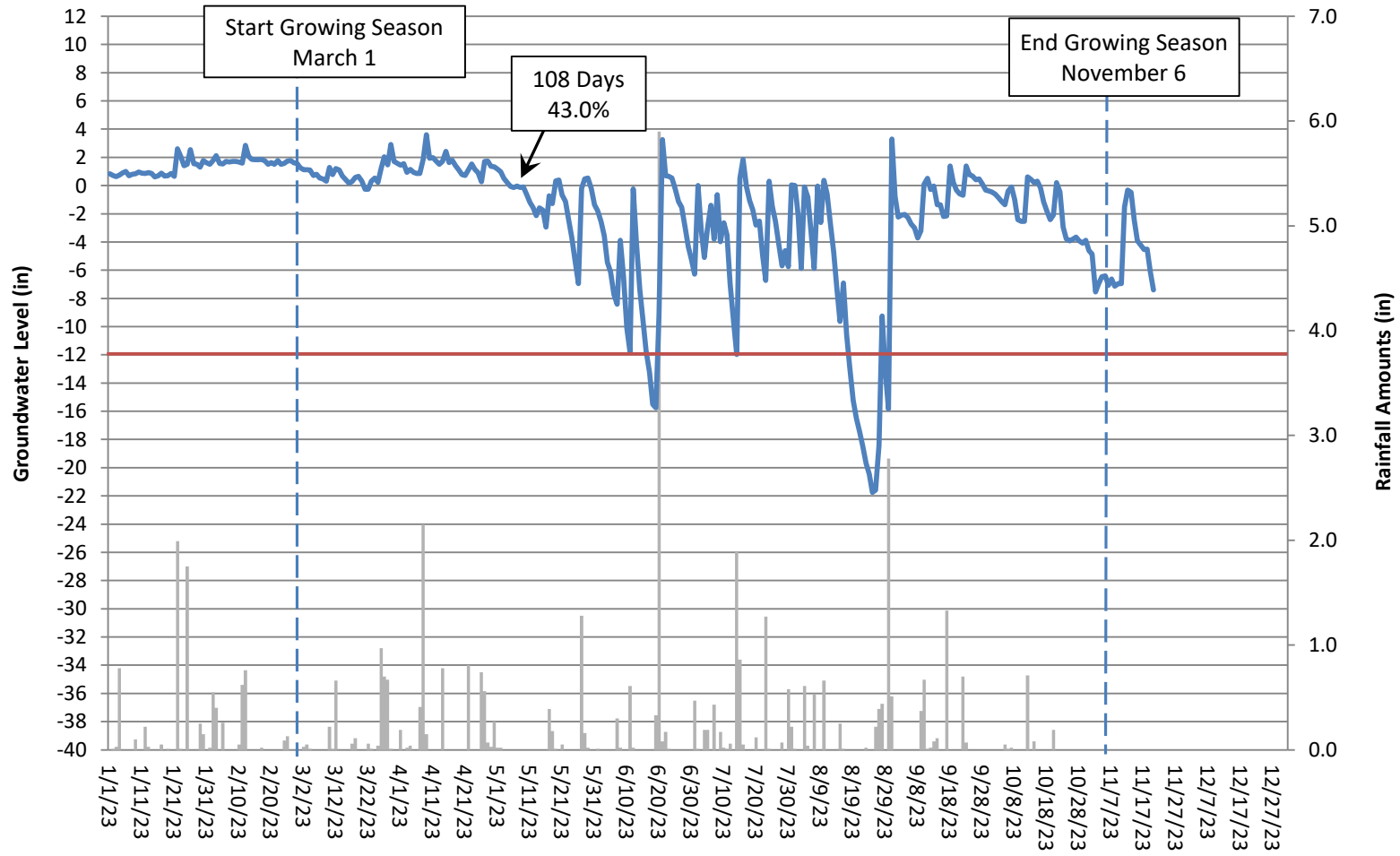
Swamp Grape Groundwater Gauge 11 Year 2 (2023 Data)



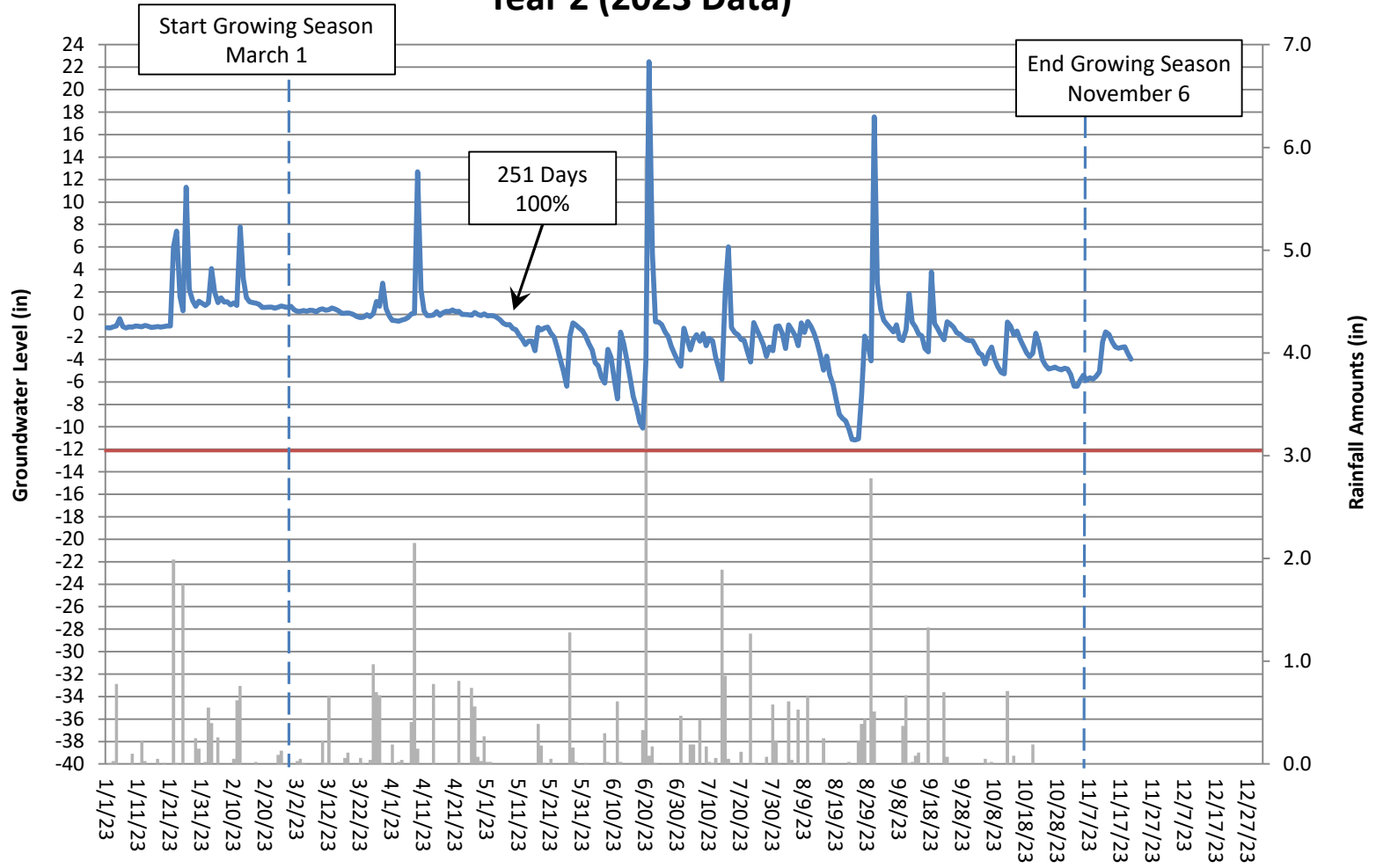
Swamp Grape Groundwater Gauge 12 Year 2 (2023 Data)



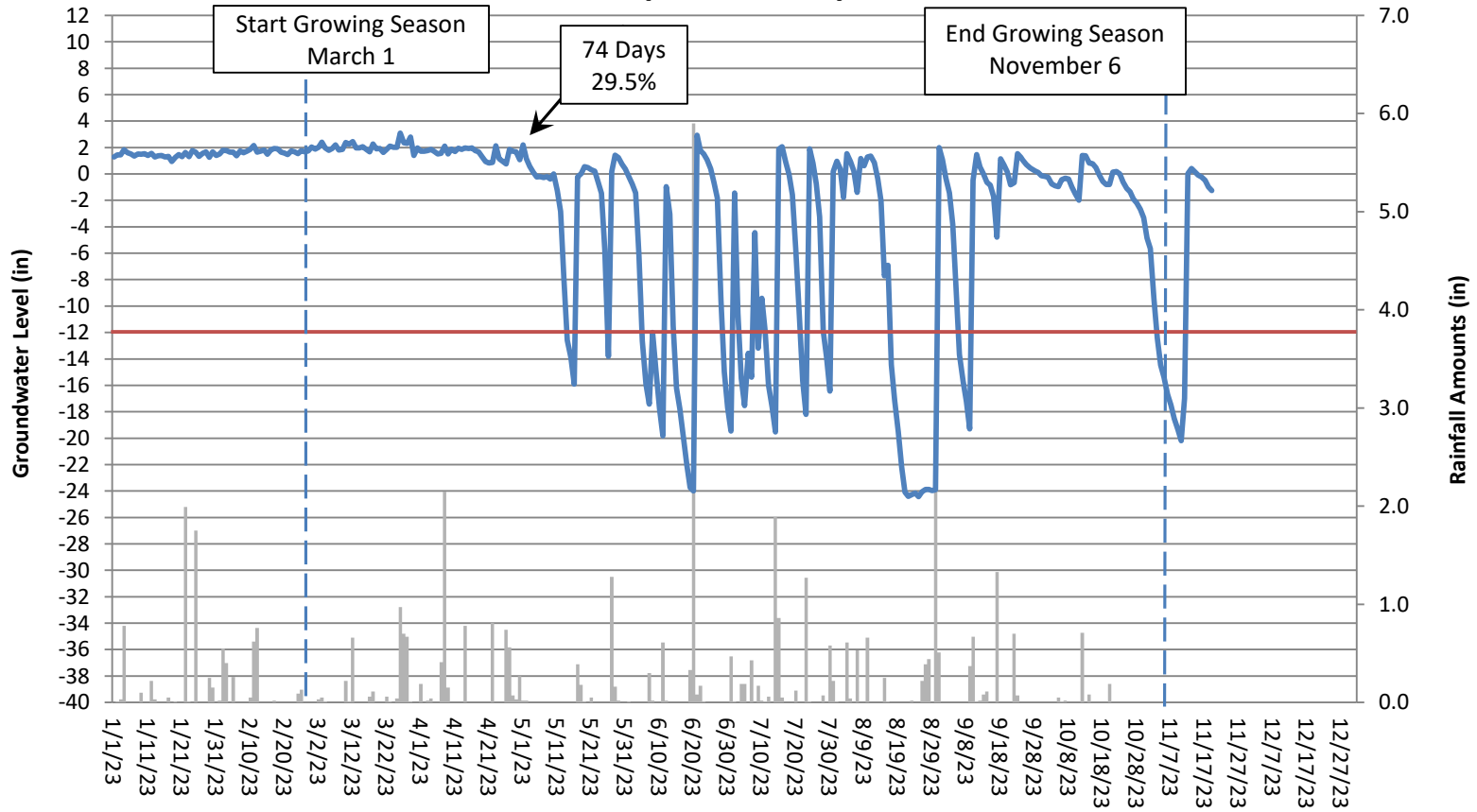
Swamp Grape Groundwater Gauge 13 Year 2 (2023 Data)



Swamp Grape Groundwater Gauge 14 Year 2 (2023 Data)



Swamp Grape Groundwater Gauge 15 Year 2 (2023 Data)



Swamp Grape Groundwater Gauge 16 Year 2 (2023 Data)

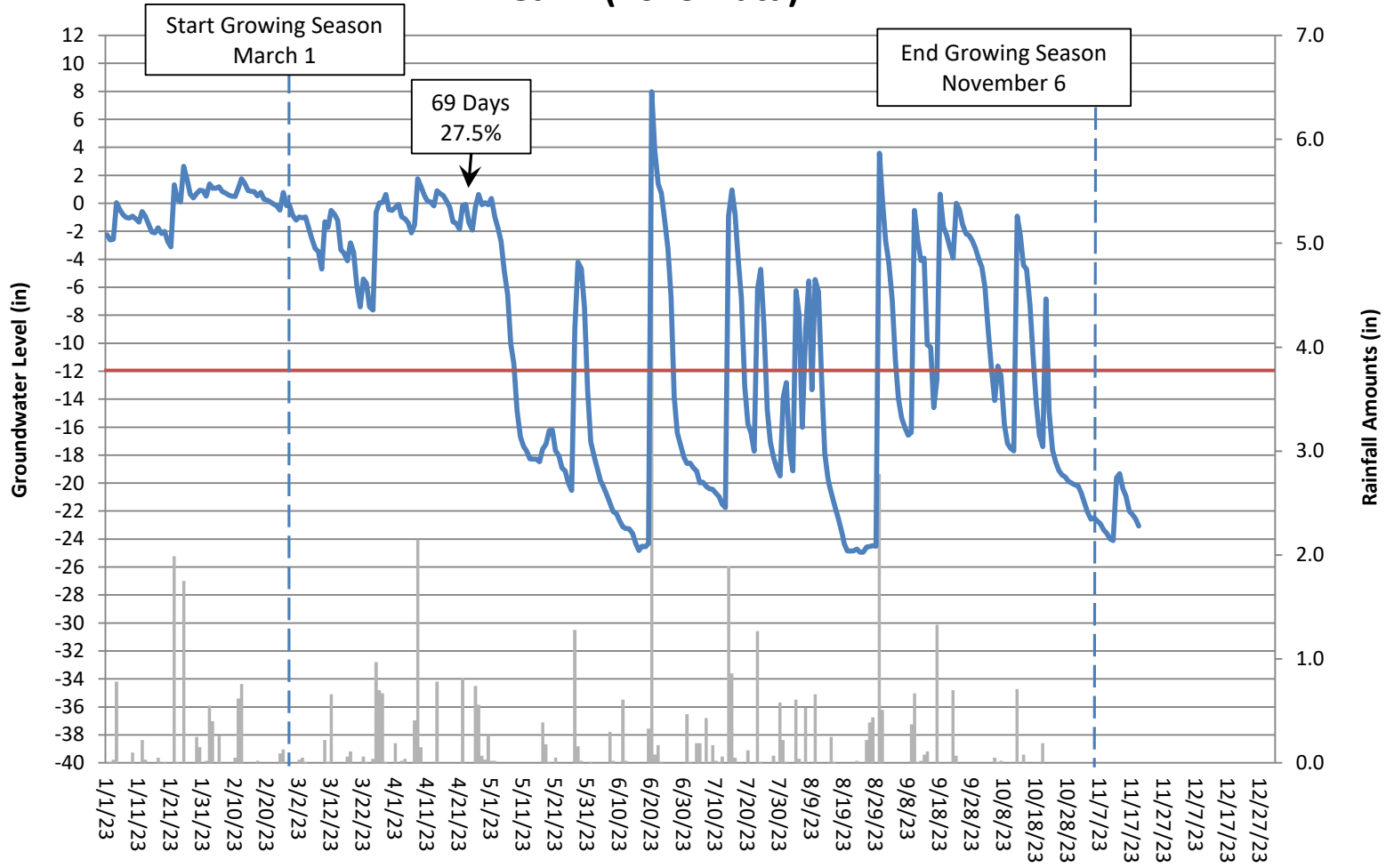
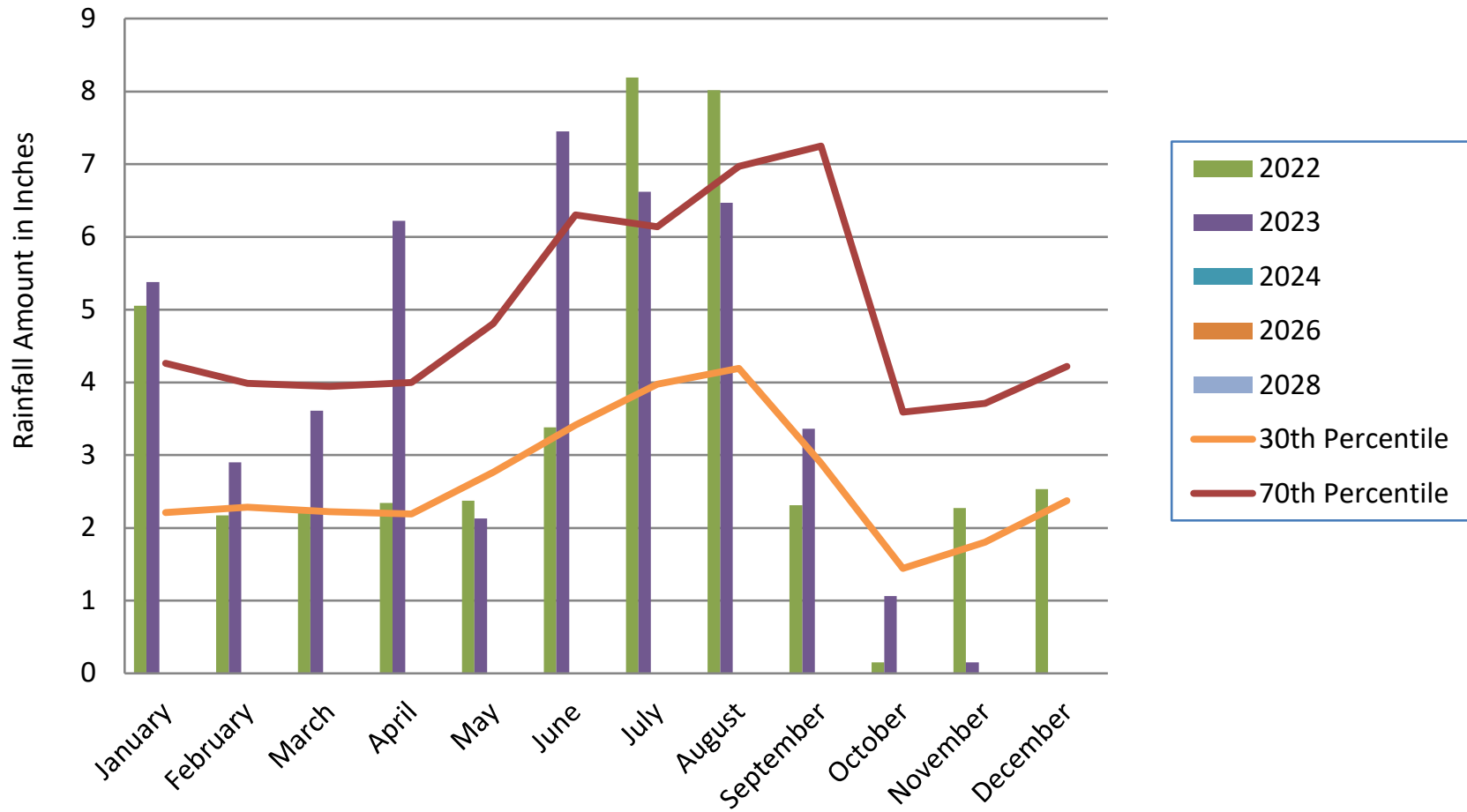
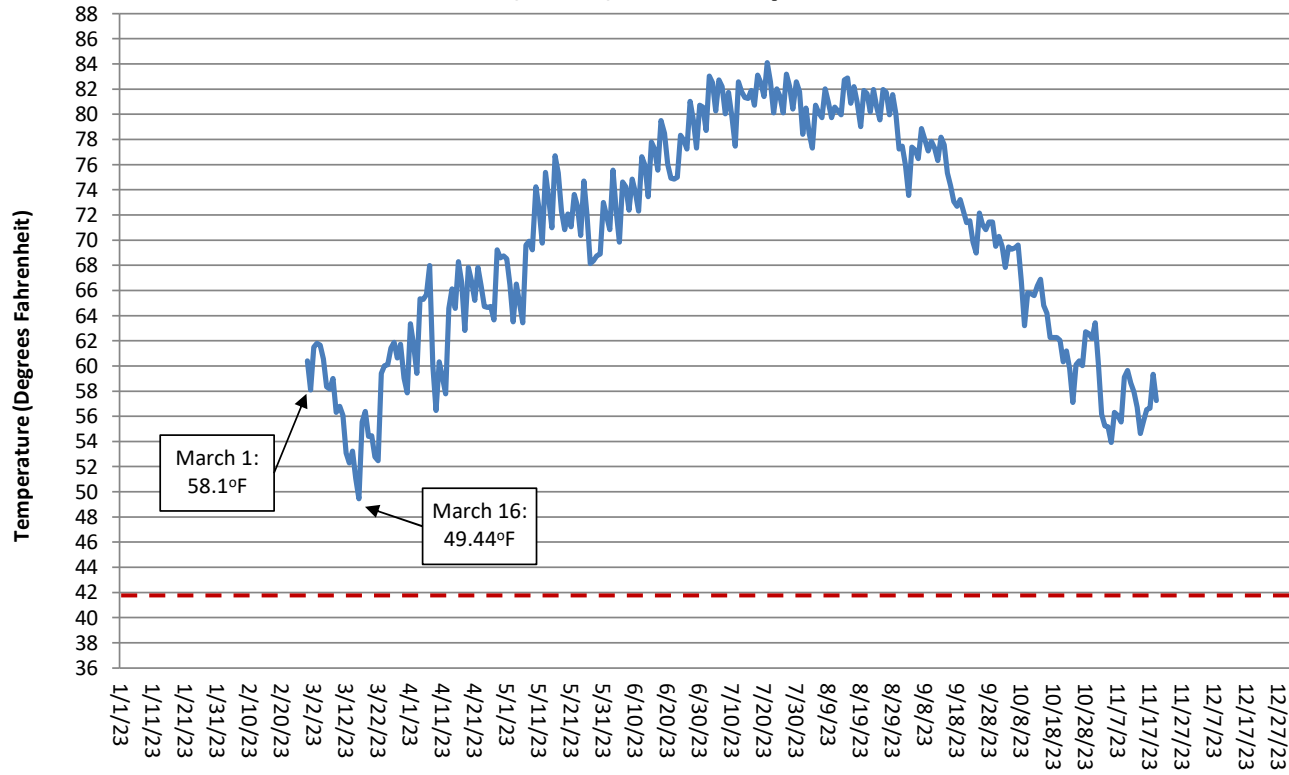


Figure D1: Swamp Grape 30-70 Percentile Graph for Rainfall

30-70th percentile data from WETS Station: Lumberton, NC



Swamp Grape Year 2 (2023) Soil Temperature Data



Appendix E

Project Timeline and Contact Info

Table 13. Project Timeline

Table 14. Project Contacts

Table 13. Project Timeline

Activity or Deliverable	Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted	NA	Apr-19
Mitigation Plan Approved	NA	Feb-21
Construction (Grading) Completed	NA	23-Sep-21
Planting Completed	NA	18-Jan-22
As-built Survey Completed	NA	Sep-21
MY0 Baseline Report	Jan-22	Feb-22
MY1 Monitoring Report	Nov-22	Dec-22
MY2 Monitoring Report	Nov-23	Dec-23
MY3-MY7 Monitoring Reports	On Schedule	On Schedule

Table 14. Project Contacts

Swamp Grape Stream and Wetland Mitigation Site/100115	
Provider	Restoration Systems, LLC 1101 Haynes Street, Suite 211 Raleigh, NC 27604
Mitigation Provider POC	Worth Creech 919-755-9490
Designer	Axiom Environmental, Inc. 218 Snow Ave Raleigh, NC 27603
Primary project design POC	Grant Lewis 919-215-1693
Construction Contractor	Land Mechanics Designs, Inc. 126 Circle G Lane Willow Spring, NC 27592 Charles Hill 919-639-6132

Appendix F Project Notes

Aggradation Memo to DMS June 7, 2023
IRT Site Visit Notes July 14, 2023



Wednesday, June 7, 2023

Jeremiah Dow
Eastern Regional Supervisor, Division of Mitigation Services
North Carolina Department of Environmental Quality
Sent Electronically: jeremiah.dow@ncdenr.gov

Subject: Observations of Aggregation During MY2 (2023) / Upper Half of UT2
Swamp Grape Stream and Wetland Mitigation Site, DMS Project No. 100115
Lumber River Basin 03040204, Robeson County
Full Delivery Contract No. 7869, DMS RFP No. 16-007705
USACE Action ID No. SAW-2019-00904, DWR Project No. 2019-0675

Dear Mr. Dow,

While conducting a quarterly site assessment walkthrough in May of Swamp Grape, Axiom Environmental Inc. (Axiom) noted that the upper reach of UT 2 has received excess sediment deposition. The aggregation begins above the UT2 vented-ford crossing, located outside the Site's conservation easement, and continues downstream through cross sections 14 (pool) and 13 (riffle). Minimal observance of aggregation was documented in cross-section 12 (riffle), and none was observed in cross-section 11 (pool).

Once the deposition was noted, Axiom conducted surveys of cross-sections 11-14 to ascertain the degree of aggradation. Cross sections are plotted in Figure 1, attached with photo documentation.

Possible causes of aggradation include:

- 1.) Excessive upstream erosion/agriculture. The online USGS StreamStats portal delineated the UT 2 drainage area entering at 243 acres. Of the drainage area, 80.2% is in agricultural production, with much of the land drained by non-buffered ditches and streams.
- 2.) A lack of flushing stormwater discharges. Between September 2022 and December 2022, rainfall data indicates rainfall was at or below the 30th percentile. While enough rain fell to move sediment within UT2's watershed, the rain events lacked the energy to move sediment through the Site's restored UT2 reach. Rainfall has normalized in the first quarter of 2023.
- 3.) As indicated in the MY1 (2022) CCPV and included in Figure 1, herbicide treatment for Cattail within and around the subject UT2 area was conducted. While the Cattail treatment successfully curtailed the problematic areas, some Cattail remains (which will be treated in 2023). It is possible that the root structure of the treated Cattail remains and is providing stability to the sediment within UT2.

We believe that a combination of these causes resulted in the observed aggregation, with the lack of flushing flows being the main contributor. No aggregation/excess sediment deposition was observed on UT1 or UT3. Restoration Systems is aware of the aggradation and wanted to ensure DMS and the IRT know about this development prior to the July 12th IRT Site walkthrough. Please feel free to contact me to discuss this at your convenience.

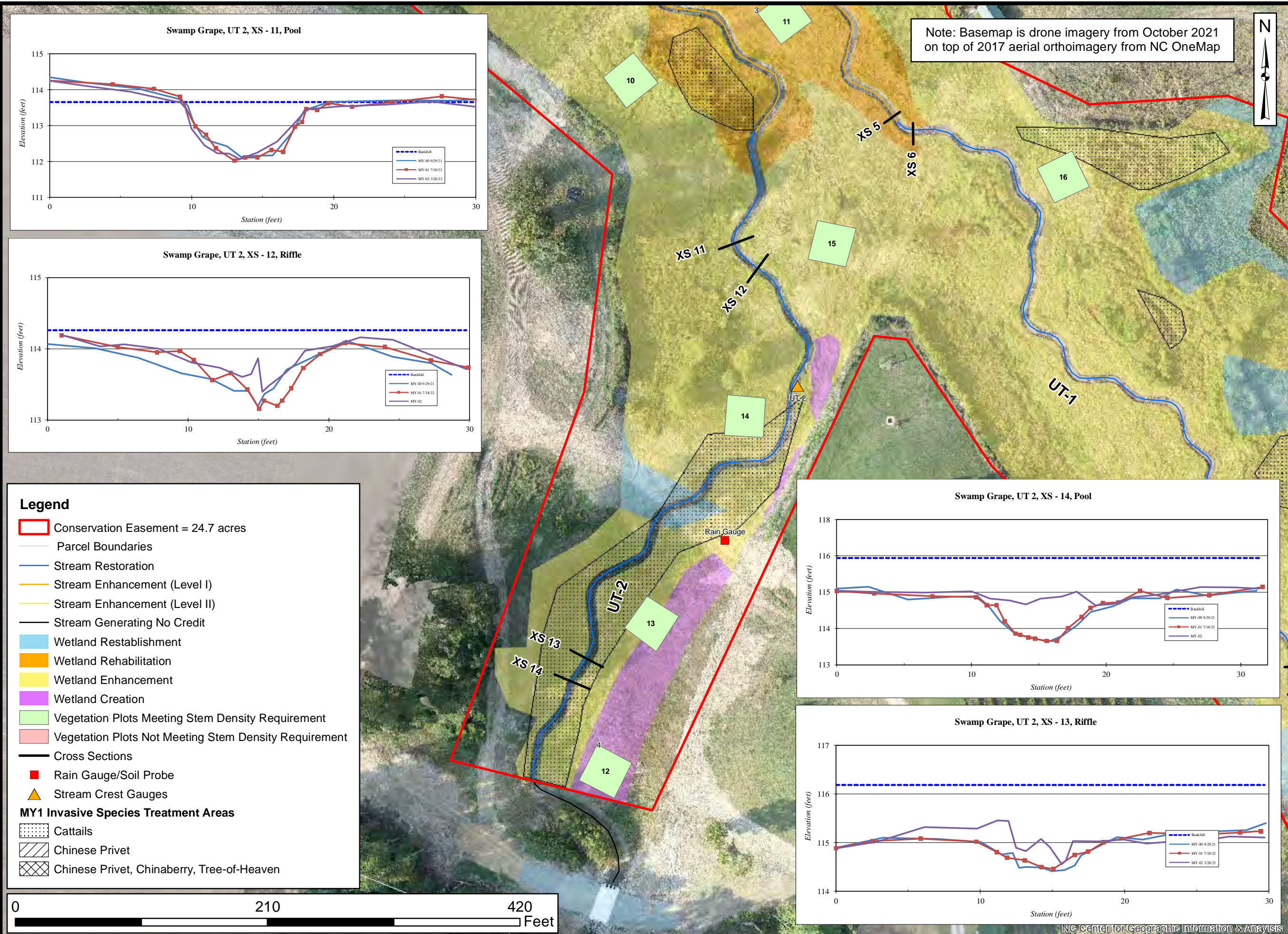
Sincerely,

A handwritten signature in blue ink that reads 'Raymond Holz'.

Raymond Holz

Attachments:

- Figure 1, Overview and Cross Sections
- Photo Documentation
- USGS StreamStats – UT 2 Drainage Area Report
- 30-70 Percentile Graph for Rainfall



Project:
SWAMP GRAPE MITIGATION SITE
 Robeson County, NC

Title:
Agradation Areas

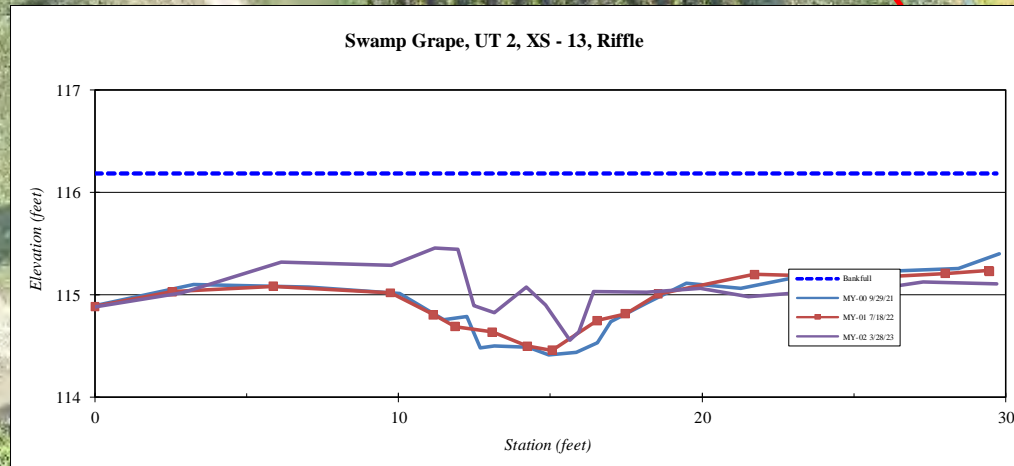
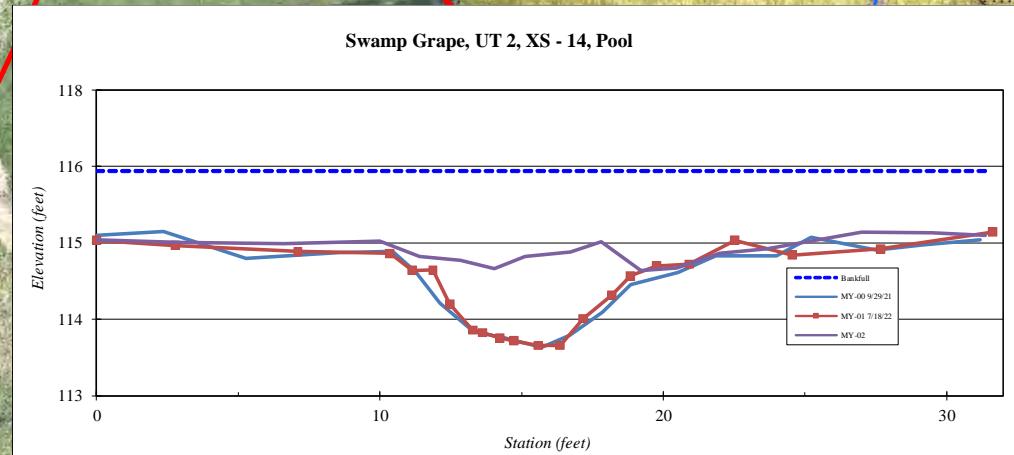
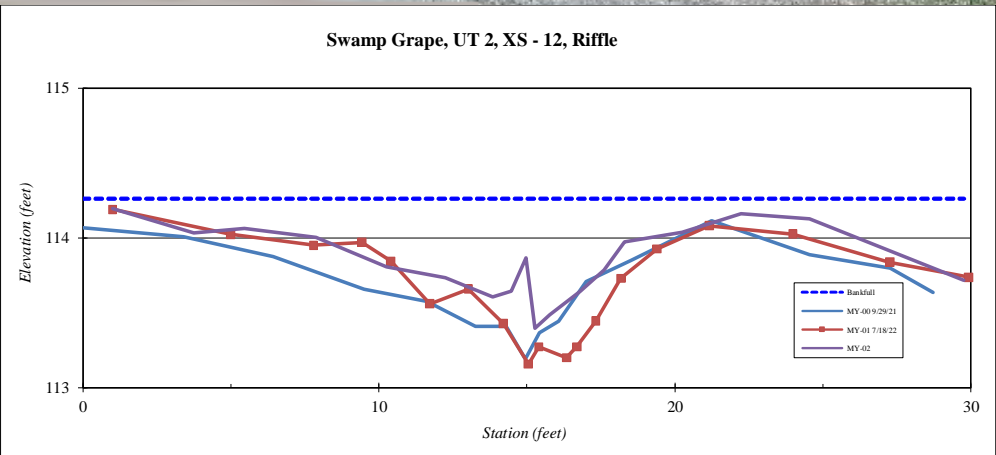
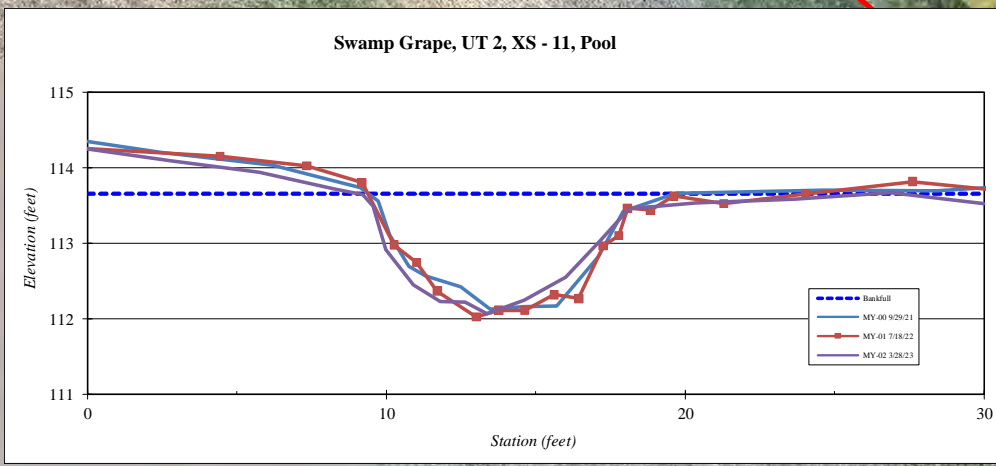
Drawn by: CML

Date: NOV 2022

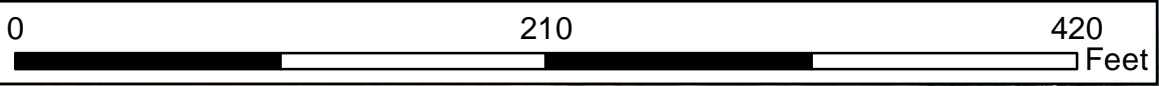
Scale: 1:2700

Project No.: 20-003

FIGURE
1



- Legend**
- Conservation Easement = 24.7 acres
 - Parcel Boundaries
 - Stream Restoration
 - Stream Enhancement (Level I)
 - Stream Enhancement (Level II)
 - Stream Generating No Credit
 - Wetland Reestablishment
 - Wetland Rehabilitation
 - Wetland Enhancement
 - Wetland Creation
 - Vegetation Plots Meeting Stem Density Requirement
 - Vegetation Plots Not Meeting Stem Density Requirement
 - Cross Sections
 - Rain Gauge/Soil Probe
 - ▲ Stream Crest Gauges
 - MY1 Invasive Species Treatment Areas**
 - Cattails
 - Chinese Privet
 - Chinese Privet, Chinaberry, Tree-of-Heaven





UT2 Cross Section 14 (pool) - 03/30/2023



UT2 Cross Section 13 (riffle) - 03/30/2023



UT2 Cross Section 12 (riffle) - 03/30/2023



UT2 Cross Section 11 (pool) - 03/30/2023

Swamp Grape Mitigation Site: MY2(2023) Observations of Aggregation, UT2
DMS Contract #: 7869; DMS Project ID: 100115; RFP # 16-007705



UT2 Vented Ford Crossing - 05/17/2023



UT2 below the Vented Ford Crossing - 05/17/2023



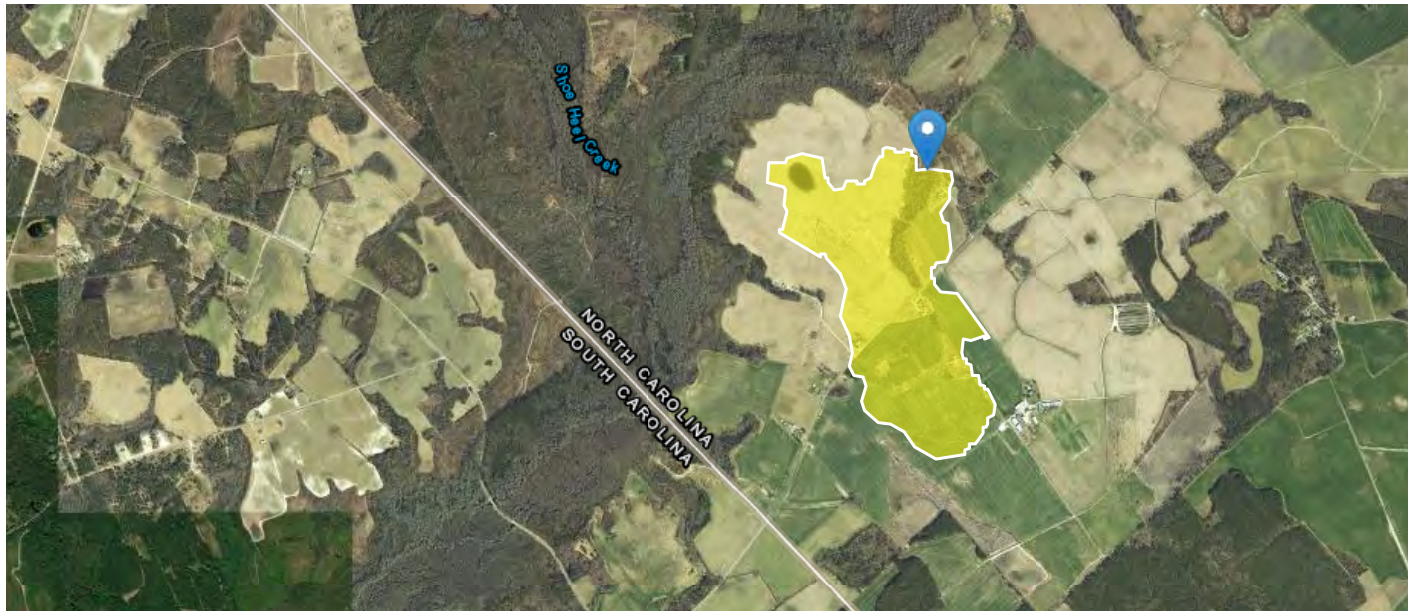
UT2 upstream of cross section 14 - 05/17/2023



UT2 upstream between cross sections 13 and 12 - 05/17/2023

StreamStats Report

Region ID: NC
Workspace ID: NC20230607134256487000
Clicked Point (Latitude, Longitude): 34.56208, -79.34942
Time: 2023-06-07 09:43:11 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BASINPERIM	Perimeter of the drainage basin as defined in SIR 2004-5262	3.98	miles
BSLDEM30FT	Mean basin slope, based on slope percent grid	1.15	percent
CSL10_85fm	Change in elevation between points 10 and 85 percent of length along main channel to basin divide divided by length between points ft per mi	16.71	feet per mi
DRNAREA	Area that drains to a point on a stream	0.38	square miles
ELEV	Mean Basin Elevation	147	feet
ELEVMAX	Maximum basin elevation	152	feet
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	7.71	inches
LC01BARE	Percentage of area barren land, NLCD 2001 category 31	0	percent
LC01CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2001	80.2	percent
LC01DEV	Percentage of land-use from NLCD 2001 classes 21-24	1.4	percent
LC01FOREST	Percentage of forest from NLCD 2001 classes 41-43	1.5	percent
LC01HERB	Percentage of herbaceous upland from NLCD 2001 class 71	0	percent
LC01IMP	Percent imperviousness of basin area 2001 NLCD	0.09	percent
LC01SHRUB	Percent of area covered by shrubland using 2001 NLCD	1.8	percent
LC01WATER	Percentage of open water, class 11, from NLCD 2001	0	percent

Parameter Code	Parameter Description	Value	Unit
LC01WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2001	15	percent
LC06BARE	Percent of area covered by barren rock using 2006 NLCD	0	percent
LC06DEV	Percentage of land-use from NLCD 2006 classes 21-24	1.4	percent
LC06FOREST	Percentage of forest from NLCD 2006 classes 41-43	1.5	percent
LC06GRASS	Percent of area covered by grassland/herbaceous using 2006 NLCD	0	percent
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	0.09	percent
LC06PLANT	Percent of area in cultivation using 2006 NLCD	80.2	percent
LC06SHRUB	Percent of area covered by shrubland using 2006 NLCD	1.8	percent
LC06WATER	Percent of open water, class 11, from NLCD 2006	0	percent
LC06WETLND	Percent of area covered by wetland using 2006 NLCD	15	percent
LC11BARE	Percentage of barren from NLCD 2011 class 31	0	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	80.2	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	1.4	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	1.5	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	0	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0.1	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	1.8	percent
LC11WATER	Percent of open water, class 11, from NLCD 2011	0	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	15.1	percent
LC92FOREST	Percentage of forest from NLCD 1992 classes 41-43	27.3	percent
LFPLENGTH	Length of longest flow path	1.209	miles
LU92BARE	Percent of area covered by barren rock using 1992 NLCD	0	percent
LU92DEV	Percent of area covered by all densities of developed land using 1992 NLCD	0	percent
LU92PLANT	Percent of area in cultivation using 1992 NLCD	67.3	percent
LU92WATER	Percent of area covered by water using 1992 NLCD	0	percent
LU92WETLN	Percent of area covered by wetland using 1992 NLCD	5.3	percent
MINBELEV	Minimum basin elevation	130	feet
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	134	feet
PCTREG1	Percentage of drainage area located in Region 1 - Piedmont / Ridge and Valley	0	percent
PCTREG2	Percentage of drainage area located in Region 2 - Blue Ridge	0	percent
PCTREG3	Percentage of drainage area located in Region 3 - Sandhills	0	percent
PCTREG4	Percentage of drainage area located in Region 4 - Coastal Plains	100	percent
PCTREG5	Percentage of drainage area located in Region 5 - Lower Tifton Uplands	0	percent
PRECIP	Mean Annual Precipitation	48.1	inches
PROTECTED	Percent of area of protected Federal and State owned land	0	percent
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	3	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	47.1	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	25.4	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	24.4	percent

General Disclaimers

This watershed has been edited, computed flows and basin characteristics may not apply. For more information, submit a support request from the 'Help' button in the upper-right of the screen, attach a pdf of this report and request assistance from your local StreamStats regional representative.

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

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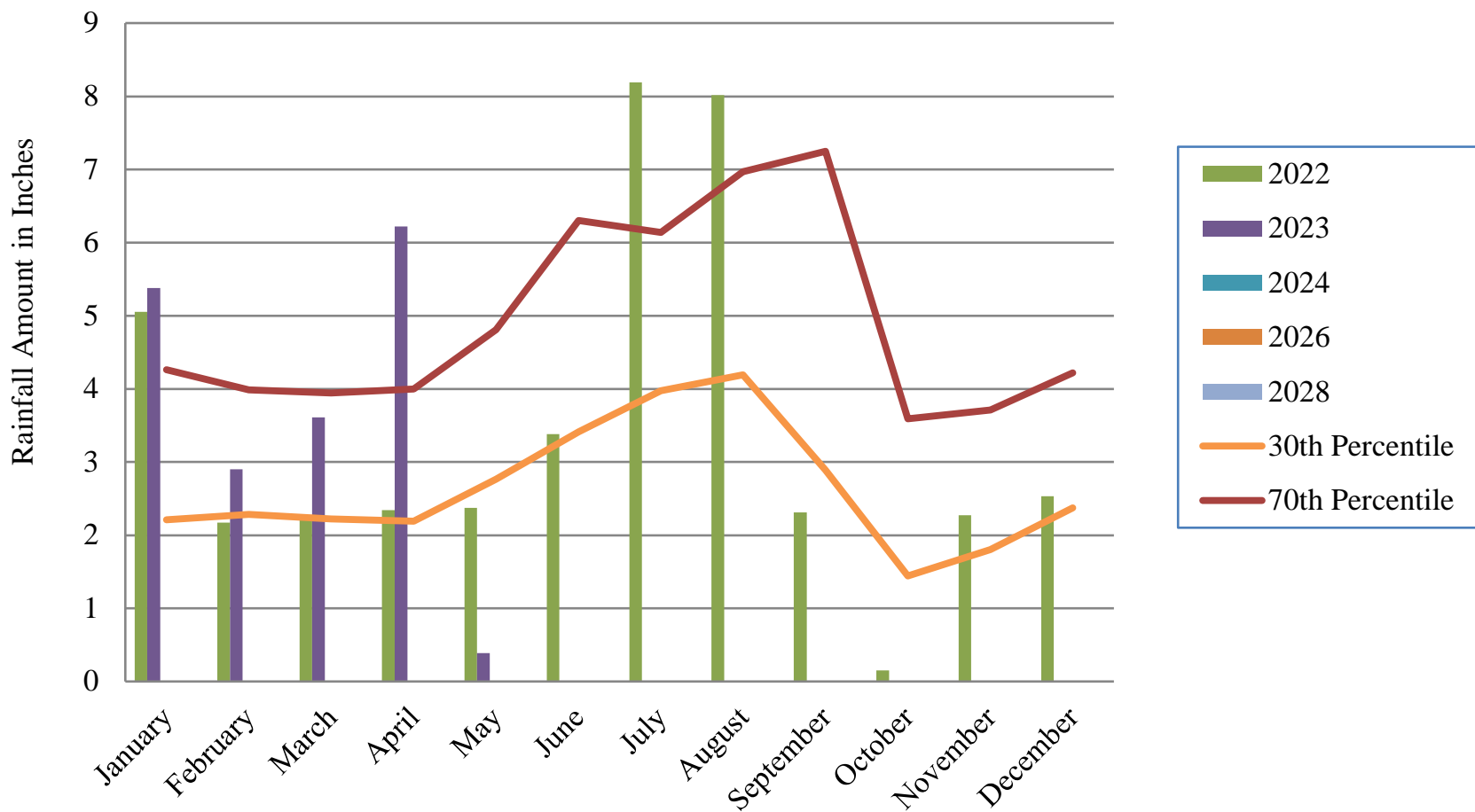
USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.15.0

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

Figure D1: Swamp Grape
30-70 Percentile Graph for Rainfall
 30-70th percentile data from WETS Station: Lumberton, NC





July 14, 2023

Emily Dunnigan

Project Manager – Eastern Region

Division of Mitigation Services

Sent via email to: Emily.Dunnigan@deq.nc.gov

Copied, Jeremiah Dow, Eastern Regional Supervisor, Division of Mitigation Services: jeremiah.dow@ncdenr.gov

Subject: Swamp Grape, MY2 (2023) IRT Site Visit Notes

DMS Project No. 100115

USACE Action ID No. SAW-2019-00904 & DWR Project No. 2019-0675

On July 12, 2023, Restoration Systems (RS) held an on-site meeting with regulatory agencies to review and discuss the Swamp Grape Mitigation Site (Site). Below is a list of attendees and site visit notes, accompanied by a proposed planting effort.

Attendees:

USACE:

- Todd Tugwell
- Erin Davis

NC DMS:

- Emily Dunnigan

Restoration Systems:

- Raymond Holz

Axiom Environmental:

- Grant Lewis

NC DWR:

- Maria Polizzi
- Mac Haupt

Site Visit Notes:

General

- The perennial nature of the Site's streams has prevented the channels from becoming choked out by herbaceous vegetation. RS has not completed and does not anticipate having to perform any stream maintenance work regarding in-channel herbaceous vegetation. RS will continue to monitor the channels for excessive herbaceous vegetation and report to the IRT if the condition changes.
- The sedimentation of UT2's upper reach, as reported in RS's June 7th letter, appeared to have mostly worked its way through the Site. RS will continue to monitor this reach for sedimentation issues.
- The UT1 and UT2 crossings are performing as expected.
 - The IRT noted that the height of the vented ford crossing on UT2 may be a contributing factor to sediment deposition above and below the crossing.
- Treatment of cattails has significantly reduced the on-site monoculture clusters. Treatment will continue, and RS will continue to plot cattail clusters on the yearly CCPV.
- Herbaceous monitoring will continue, and RS/Axiom will move the plots yearly, focusing on observed emergent wetland areas.
- Beginning in the Year 3 (2024) monitoring report, RS will plot observed emergent wetland areas throughout the Site.

UT1-Upper Reach, Right-bank Wetland Seeps

- Based on Year 1 (2022) permanent vegetation monitoring plots, and on-site observations, RS will conduct three (3) random vegetation transects between permanent vegetation monitoring plots 19-23, as shown on the attached meeting notes, CCPV.

Easement Encroachment – Residential lot between UT1 and UT2

- RS and the IRT reviewed the observed area of encroachment along UT2’s right easement boundary (shown in the attached figure). RS will replant this area with 3-gallon upland containerized species from the approved Site Mitigation Plan during the dormant season of 2023/2024. The approved mitigation plan planting list is provided below for reference.
- RS will install additional treated fence post corners along this boundary line and add additional signage.

Table 1. Planting Plan (Swamp Grape Final/Approved Mitigation Plan

Vegetation Association	Cypress Gum Swamp*		Coastal Plain Small Stream Swamp*		Stream-side Assemblage**		TOTAL
Area (acres)	2.3		17.4		2.8		22.5
Species	# planted*	% of total	# planted*	% of total	# planted**	% of total	# planted
Swamp black gum (<i>Nyssa biflora</i>)	391	25	2366	20	776	10	3533
Bald cypress (<i>Taxodium distichum</i>)	391	25	2366	20	776	10	3533
Tupelo gum (<i>Nyssa aquatica</i>)	391	25	--	--	--	--	391
Pond cypress (<i>Taxodium ascendens</i>)	391	25	--	--	--	--	391
Water oak (<i>Quercus nigra</i>)	--	--	1775	15	776	10	2550
Willow oak (<i>Quercus phellos</i>)	--	--	1775	15	776	10	2550
Schumard oak (<i>Quercus schumardii</i>)	--	--	1183	10	776	10	1959
American elm (<i>Ulmus americana</i>)	--	--	1183	10	776	10	1959
Shagbark hickory (<i>Carya ovata</i>)	--	--	1183	10	776	10	1959
Black willow (<i>Salix nigra</i>)	--	--	--	--	776	10	776
Tag alder (<i>Alnus serrulata</i>)	--	--	--	--	776	10	776
Buttonbush (<i>Cephalanthus occidentalis</i>)	--	--	--	--	776	10	776
TOTAL	1564	100	11832	100	7756	100	21,152

Highlighted Species are those RS will use for 3-gallon replanting in the observed MY2 (2023) encroachment areas.

Attachment:

- MY 1 (2022) CCPV with Site Visit Notes



Prepared for:



Project:

SWAMP GRAPE MITIGATION SITE

Robeson County, NC

Title:

CCPV

Drawn by:

CML

Date:

NOV 2022

Scale:

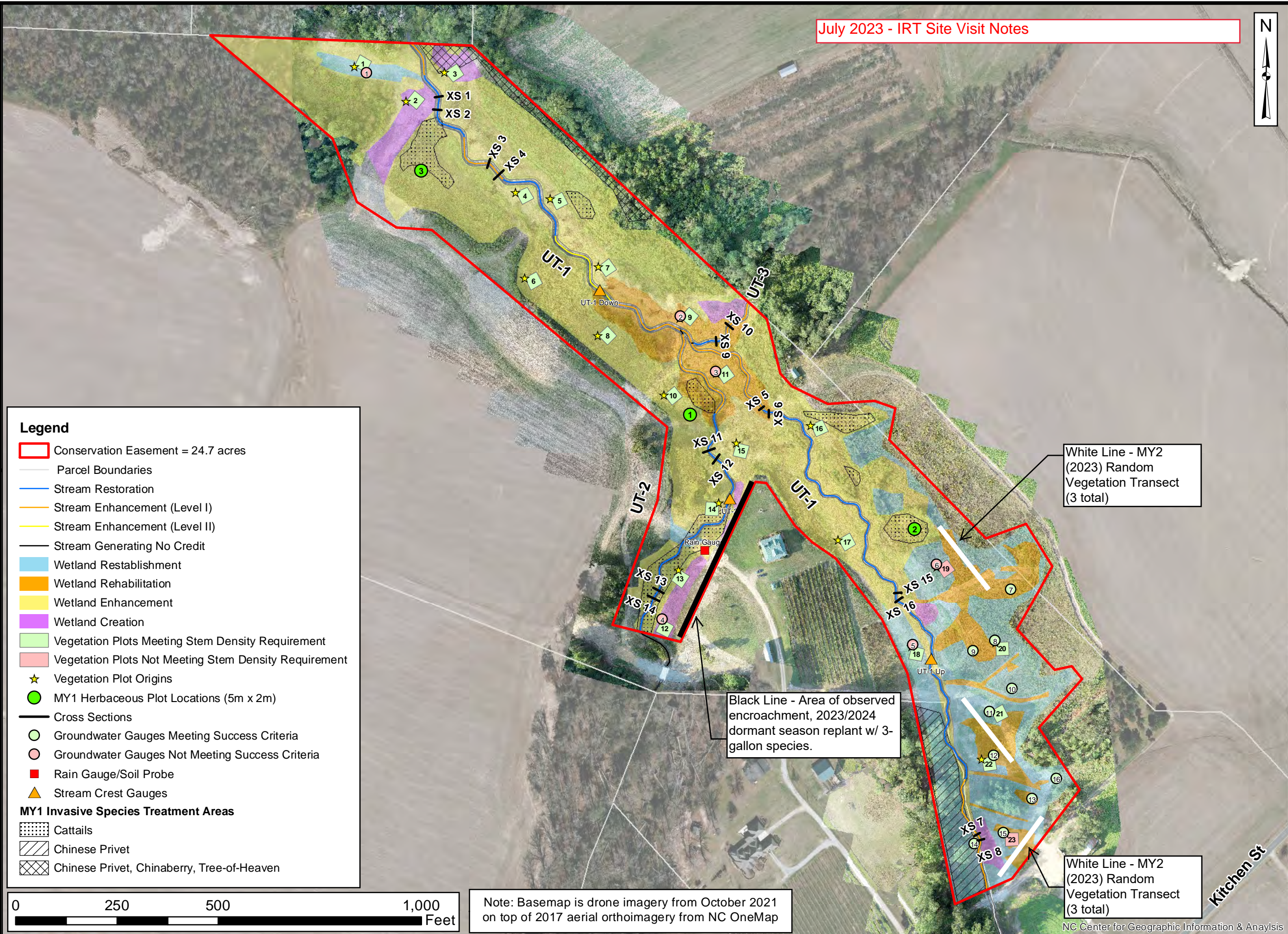
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Project No.:

20-003

FIGURE

1



Legend

- Conservation Easement = 24.7 acres
- Parcel Boundaries
- Stream Restoration
- Stream Enhancement (Level I)
- Stream Enhancement (Level II)
- Stream Generating No Credit
- Wetland Reestablishment
- Wetland Rehabilitation
- Wetland Enhancement
- Wetland Creation
- Vegetation Plots Meeting Stem Density Requirement
- Vegetation Plots Not Meeting Stem Density Requirement
- ★ Vegetation Plot Origins
- MY1 Herbaceous Plot Locations (5m x 2m)
- Cross Sections
- Groundwater Gauges Meeting Success Criteria
- Groundwater Gauges Not Meeting Success Criteria
- Rain Gauge/Soil Probe
- ▲ Stream Crest Gauges

MY1 Invasive Species Treatment Areas

- Cattails
- Chinese Privet
- Chinese Privet, Chinaberry, Tree-of-Heaven

White Line - MY2 (2023) Random Vegetation Transect (3 total)

Black Line - Area of observed encroachment, 2023/2024 dormant season replant w/ 3-gallon species.

White Line - MY2 (2023) Random Vegetation Transect (3 total)

Note: Basemap is drone imagery from October 2021 on top of 2017 aerial orthoimagery from NC OneMap

