

Monitoring Year 1 Report Final

Rough Horn Swamp Restoration Site Monitoring Year – MY01 2020

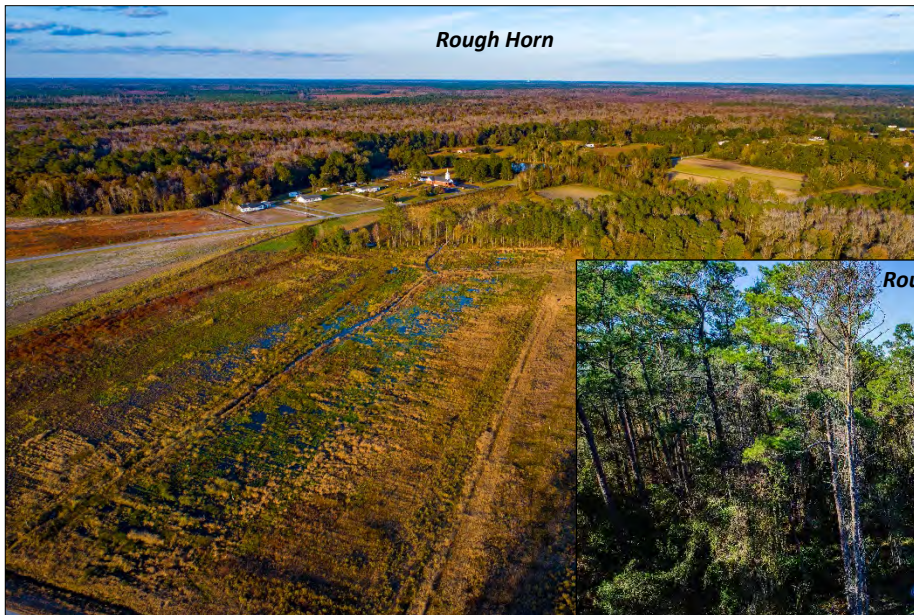
RFP #16-006310

**DMS Site ID Number 97005, DMS Contract 6596
SAW-2015-00952 and NCDEQ DWR 2015-0903**

Rough Horn Swamp II Restoration Site RFP #16-007337

**DMS Site ID Number 100053, DMS Contract 7514
SAW-2016-02026 and NCDEQ DWR 2015-0903**

Columbus County, North Carolina



Prepared for:
NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699

**Monitoring Data Collected: November 2020
Date Submitted: January 2021**

Mitigation Project Name	Rough Horn Swamp II Restoration Site	USACE Action ID	2016-02026
DMS ID	100053	DWR Permit	2015-0903
River Basin	Lumber	Date Project Instituted	4/25/2018
Cataloging Unit	03040203	Date Prepared	5/13/2020
County	Columbus	Stream/Wet. Service Area	Lumber 03040203

Signature of Official Approving Credit Release

- 1 - For NCDMS, no credits are released during the first milestone (Site Establishment).
2 - For NCDMS projects, the initial credit release milestone occurs when the as-built report (baseline monitoring report) has been approved by the NCIRT and posted to the NCDMS Portal, provided the following criteria are met:
- 1) Approval of Final Mitigation Plan;
 - 2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property;
 - 3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan;
 - 4) Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.
- 3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met.

Credit Release Milestone	Warm Stream Credits							
	Project Credits	Scheduled Releases %	Proposed Releases %	Proposed Released #	Not Approved # Releases	Approved Credits	Anticipated Release Year	Actual Release Date
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	30.00%	1,368.960	0.000	1,368.960	2020	5/13/2020	
3 - Year 1 Monitoring	10.00%					2021		
4 - Year 2 Monitoring	10.00%					2022		
5 - Year 3 Monitoring	10.00%					2023		
6 - Year 4 Monitoring	5.00%					2024		
7 - Year 5 Monitoring	10.00%					2025		
8 - Year 6 Monitoring	5.00%					2026		
9 - Year 7 Monitoring	10.00%					2027		
Stream Bankfull Standard	10.00%							
				Totals		1,368.960		

Total Gross Credits	4,563.200
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	1,368.960
Total Percentage Released	30.00%
Remaining Unreleased Credits	3,194.240

Credit Release Milestone	Riparian Credits							
	Project Credits	Scheduled Releases %	Proposed Releases %	Proposed Released #	Not Approved # Releases	Approved Credits	Anticipated Release Year	Actual Release Date
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	30.00%	6.299	0.000	6.299	2020	5/13/2020	
3 - Year 1 Monitoring	10.00%					2021		
4 - Year 2 Monitoring	10.00%					2022		
5 - Year 3 Monitoring	15.00%					2023		
6 - Year 4 Monitoring	5.00%					2024		
7 - Year 5 Monitoring	15.00%					2025		
8 - Year 6 Monitoring	5.00%					2026		
9 - Year 7 Monitoring	10.00%					2027		
Stream Bankfull Standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
				Totals		6.299		

Total Gross Credits	20.993
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	6.299
Total Percentage Released	30.01%
Remaining Unreleased Credits	14.694

Mitigation Project Name **Rough Horn Swamp II Restoration Site**
DMS ID **100053**
River Basin **Lumber**
Cataloging Unit **03040203**
County **Columbus**

USACE Action ID **2016-02026**
DWR Permit **2015-0903**
Date Project Instituted **4/25/2018**
Date Prepared **5/13/2020**
Stream/Wet. Service Area **Lumber 03040203**

Notes

Contingencies (if any)

Project Quantities

Mitigation Type	Restoration Type	Physical Quantity
Warm Stream	Restoration	4,446.000
Warm Stream	Enhancement II	164.000
Warm Stream	Preservation	516.000
Riparian	Restoration	17.079
Riparian	Enhancement	5.956
Riparian	Preservation	15.319

Debits

							Stream Restoration Credits	Stream Restoration Equivalent Credits	Riparian Restoration	Riparian Restoration Equivalent Credits
Beginning Balance (mitigation credits)							4,511.600	51.600	17.079	3.914
Released Credits							1,353.480	15.480	5.124	1.175
Unrealized Credits							0.000	0.000	0.000	0.000
Owning Program	Req. Id	TIP #	Project Name	USACE Permit #	DWR Permit #	DCM Permit #				
Statewide Stream & Wetland ILF Program	REQ-005686		Bojangles' Lumberton	2012-00771	2012-0727v3				0.966	
Statewide Stream & Wetland ILF Program	REQ-005932		Mid South Club	2007-00490	2007-0128				0.340	
Statewide Stream & Wetland ILF Program	REQ-006389		PNG Line 34 Replacement Project	2014-02235	2015-0507				0.359	
NCDOT Stream & Wetland ILF Program	REQ-006688		SR 1504 - Bridge 175 - Division 6	2016-02399					0.040	
NCDOT Stream & Wetland ILF Program	REQ-006702		SR 1005 - Bridge 230126 - Division 6	2017-00317					0.040	
NCDOT Stream & Wetland ILF Program	REQ-006741		SR 1112 - Bridge 19 - Division 8	2017-00450					0.080	
NCDOT Stream & Wetland ILF Program	REQ-007172	P-4900	Rail - Pembroke Connector	2006-33096	2015-0068				0.407	
NCDOT Stream & Wetland ILF Program	REQ-007370	P-4900	Rail - Pembroke Connector	2006-33096	2015-0068				0.050	
NCDOT Stream & Wetland ILF Program	REQ-007370	P-4900	Rail - Pembroke Connector	2006-33096	2015-0068					0.050
Total Credits Debited							0.000	0.000	2.282	0.050
Remaining Available balance (Released credits)							1,353.480	15.480	2.842	1.125
Remaining balance (Unreleased credits)							3,158.120	36.120	11.955	2.739

Mitigation Project Name
DMS ID
River Basin
Cataloging Unit
County

Rough Horn Swamp Restoration Site
97005
Lumber
03040203
Columbus

USACE Action ID
DWR Permit
Date Project Instituted
Date Prepared
Stream/Wet. Service Area

2015-00952
2015-0903
7/16/2015
5/13/2020
Lumber 03040203

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 1) Approval of Final Mitigation Plan;
 2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property;
 3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan;
 4) Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.
 3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met.

Credit Release Milestone	Riparian Credits						
	Scheduled Releases %	Proposed Releases %	Proposed Released #	Not Approved # Releases	Approved Credits	Anticipated Release Year	Actual Release Date
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	30.00%	6.080	0.000	6.080	2020	5/13/2020
3 - Year 1 Monitoring	10.00%					2021	
4 - Year 2 Monitoring	10.00%					2022	
5 - Year 3 Monitoring	15.00%					2023	
6 - Year 4 Monitoring	5.00%					2024	
7 - Year 5 Monitoring	15.00%					2025	
8 - Year 6 Monitoring	5.00%					2026	
9 - Year 7 Monitoring	10.00%					2027	
Stream Bankfull Standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Totals					6.080		

Total Gross Credits	20.267
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	6.080
Total Percentage Released	30.00%
Remaining Unreleased Credits	14.187

Credit Release Milestone	Non-Riparian Credits						
	Scheduled Releases %	Proposed Releases %	Proposed Released #	Not Approved # Releases	Approved Credits	Anticipated Release Year	Actual Release Date
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	30.00%	3.562	0.000	3.562	2020	5/13/2020
3 - Year 1 Monitoring	10.00%					2021	
4 - Year 2 Monitoring	10.00%					2022	
5 - Year 3 Monitoring	15.00%					2023	
6 - Year 4 Monitoring	5.00%					2024	
7 - Year 5 Monitoring	15.00%					2025	
8 - Year 6 Monitoring	5.00%					2026	
9 - Year 7 Monitoring	10.00%					2027	
Stream Bankfull Standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Totals					3.562		

Total Gross Credits	11.873
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	3.562
Total Percentage Released	30.00%
Remaining Unreleased Credits	8.311

Mitigation Project Name	Rough Horn Swamp Restoration Site	USACE Action ID	2015-00952
DMS ID	97005	DWR Permit	2015-0903
River Basin	Lumber	Date Project Instituted	7/16/2015
Cataloging Unit	03040203	Date Prepared	5/13/2020
County	Columbus	Stream/Wet. Service Area	Lumber 03040203

Notes

Contingencies (if any)

Project Quantities

Mitigation Type	Restoration Type	Physical Quantity
Riparian	Restoration	20.267
Non-Riparian	Restoration	11.873

Debits

							Riparian Restoration	Non-Riparian Restoration Credits
Beginning Balance (mitigation credits)							20.267	11.873
Released Credits							6.080	3.562
Unrealized Credits							0.000	0.000
Owning Program	Req. Id	TIP #	Project Name	USACE Permit #	DWR Permit #	DCM Permit #		
Statewide Stream & Wetland ILF Program	REQ-005514		PNG Sutton	2010-01309	2011-0855		3.449	
Statewide Stream & Wetland ILF Program	REQ-006389		PNG Line 34 Replacement Project	2014-02235	2015-0507		1.161	
Statewide Stream & Wetland ILF Program	REQ-006394		PNG Line 1 Replacement	2015-00195			1.280	
Statewide Stream & Wetland ILF Program	REQ-006930		Smithfield Foods Expansion	2017-00550	1991-0022		0.040	
Statewide Stream & Wetland ILF Program	REQ-007528		Industrial Park Utility Expansion	2018-01004	2018-0687		0.150	
Statewide Stream & Wetland ILF Program	REQ-007024		Atlantic Coast Pipeline	2014-01558				3.562
Total Credits Debited							6.080	3.562
Remaining Available balance (Released credits)							0.000	0.000
Remaining balance (Unreleased credits)							14.187	8.311

Monitoring and Design Firm

Prepared by:



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Raleigh, NC 27609
(919) 783-9214

Project Contact: Tim Morris

Email: tim.morris@kci.com



MEMORANDUM

Date: February 2, 2021
To: Kelly Phillips, DMS Project Manager
From: Tim Morris, Project Manager
KCI Associates of North Carolina, PA
Subject: MY-01 Monitoring Report Comments
Rough Horn Swamp DMS #97005, Contract 6596
Rough Horn Swamp II DMS #100053, Contract 7514

Please find below our responses in italics to the MY-01 Monitoring Report comments from NCDMS received on February 1, 2021, for the Rough Horn Swamp and Rough Horn Swamp II Restoration Sites.

1. Cover Sheet: Please add the RFP # to the cover sheet.
KCI Response: This change has been made.
2. Please identify the stream thermal regime (warm) in the project summary information.
KCI Response: This change has been made.
3. Please remind the reader the purpose of the non-credited stream work conducted on the RHS site.
KCI Response: Since Long Bay Creek and UT1 are necessary components of the restored hydrology of the riparian wetlands at RHS, these streams were restored within the boundaries of the site even though no stream credits were generated. A sentence explaining this has been added to the report.
4. Stream Monitoring: During monitoring were the gage battery levels and function checked. Please indicate a brief statement indicating the status of the gage function.
KCI Response: Because this is the first year of the site's monitoring, gauge battery levels were not checked. KCI has found that the gauges have an effective battery life of 5 to 7 years and plans to replace all gauges on site before the beginning of MY05. A statement indicating that all gauges were functioning properly has been added to the report. All gauges will be checked and repaired as necessary before the beginning of the MY02 growing season.
5. General: Several instances of project number 1000053 were shown in the report. Please update.
KCI Response: This error has been corrected.
6. Digital Deliverable Review: The feature that DMS has for Long Bay Creek (100053) has a length of 1866 ft as opposed to the 2049 ft in the asset table. Please submit a feature that accurately characterizes the length reported in the asset table.
KCI Response: The 2049 ft listed in the asset table includes a 30.7 foot crossing and 152.3 feet of uncredited stream between the confluence with UT2 and the point where the stream enters the site. A note about the 153 feet of uncredited stream has been added to the asset table and this portion of the stream has been added to the shapefile.

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

Sincerely,

A handwritten signature in black ink, appearing to read "Tim Morris". The signature is fluid and cursive, with a prominent initial "T" and a stylized "M".

Tim Morris
Project Manager

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PROJECT SUMMARY

The Rough Horn Swap Restoration Site (RHS) was completed in January 2020 and restored 20.267 acres of riparian wetlands and 11.873 of non-riparian wetlands. Additionally, 2,132 linear feet of stream (non-credited) was restored at RHS as part of restoring the hydrology of the riparian wetlands. The site is generating 20.267 riparian wetland mitigation credits, and 11.873 non-riparian wetland mitigation credits. The Rough Horn II Wetland Restoration Site (RHSII) is located immediately upstream of RHS (to the north and east) and was also completed in January 2020. RHSII restored 17.079 acres, enhanced 5.956 acres, and preserved 15.319 acres of riparian wetlands. The site also restored 1.619 acres of non-riparian wetlands (non-credited). Additionally, RHSII restored 4,446 linear feet, enhanced 164 linear feet, and preserved 516 linear feet of stream. The site is generating 20.993 riparian wetland mitigation credits and 4,564 stream mitigation credits.

RHS and RHSII are warm, riparian and non-riparian systems in the Lumber River Basin (03040203 8-digit HUC) in Columbus County, North Carolina, that were historically modified to maximize agricultural production. The completed project aims to restore an integrated stream/wetland ecosystem that will buffer and support the Long Bay Creek/Lumber River corridor.

The RHS is protected by a 34.5-acre permanent conservation easement, while RHSII is protected by a 62.3-acre permanent conservation easement, both held by the North Carolina Division of Mitigation Services (DMS). Both sites are located near the Town of Evergreen in the west-central portion of Columbus County, NC. Specifically, the site is located just southwest of the intersection of Old Boardman Road and CCC Road.

The Lumber River Basin Restoration Priorities state the goals for the RHS and RHSII's 14-digit HUC are to protect and improve water quality throughout the Basin by reducing sediment and nutrient inputs into streams and rivers and to support efforts to restore local watersheds (NCDENR EEP, 2008). The project goals for RHS and RHSII are in line with the basin priorities and include the following:

- Replace buffer
- Repairing channelized streams
- Preserving existing resources

Additional goals for the project include:

- Restore an integrated wetland/stream system
- Reduce nutrient impacts to the Lumber River and its tributaries from existing and adjacent agricultural practices

The project goals will be addressed through the following objectives:

- Plant the site with native trees and shrubs that support the development of wetland communities
- Fill field ditches to slow the flow of surface and subsurface drainage
- Relocate channelized streams to their historic landscape position
- Convert existing agricultural land to wetland and stream buffer

Project planting and construction were completed in March 2020 and the monitoring components were installed at the same time.

To determine the success of the planted mitigation areas, 41 ten meter by ten meter vegetation monitoring plots were established. Of these, 25 are permanent plots, with 16 in RHS (Plots 1-16) and 9 in RHSII (Plots 17-25), and an additional 16 temporary plots were randomly placed and measured throughout RHS (R1-R16). These plots will be repeated throughout the course of monitoring, but at different locations each year.

All permanent plots were installed with flagged metal conduit at each corner and a PVC pipe was installed at the origin corner. In each of the permanent plots, the plant's height, species, location, and origin (planted versus volunteer) will be noted. In the random plots, species and height will be recorded. In all plots, invasive stems will also be recorded to determine the percentage of invasive stems present. Additionally, a photograph will be taken of each plot. The site's vegetation will be monitored in years 1, 2, 3, 5, and 7.

Vegetative success criteria for wetland/stream mitigation is a woody stem density of 260 stems/acre after five years and 210 stems/acre after seven years. Trees in each plot must average 7 feet in height at Year 5 and 10 feet at Year 7. A single species may not account for more than 50% of the required number of stems within any plot. Volunteers must be present for a minimum of two growing seasons before being included in performance standards in Year 5 and Year 7. For any volunteer tree stem to count toward vegetative success, it must be a species from the approved planting list. Visual assessments will also be used to identify problem areas.

Wetland hydrology is monitored with a series of 21 automatic gauges that record water table depth. The growing season for the project monitoring period will be March 1st through November 20th (265 days) based on correspondence with the USACE, as described in the approved Mitigation Plan. To meet the success criterion, the upper 12 inches of the soil profile must have continuously saturated or inundated conditions for at least 12.0% (32 days) of the growing season in the wetland mitigation areas during normal weather conditions. A "normal" year will be based on NRCS climatological data for Columbus County, and using the 30th to 70th percentile thresholds as the range of normal, as documented in the USACE Technical Report "Assessing and Using Meteorological Data to Evaluate Wetland Hydrology, April 2000."

In the headwater stream area, five pressure transducer gauges and five cameras, set to record a short video once a day, will document the presence of surface water flow. These gauges/cameras are located on Long Bay Creek, UT1, UT2-2, UT3-2, and UT4 (one gauge and camera, per reach). The project streams must meet the requirements for headwater stream hydrologic monitoring per the NCIRT 2016 guidelines. Each stream must have continuous surface water flow within a flowpath for a minimum of 30 continuous days within a calendar year (assuming normal precipitation) and for every year of monitoring. The stream must show signs of supporting flowpaths in all monitoring years. These indicators will be documented with pictures and may include evidence of: scour, sediment deposition and sorting, multiple flow events, wrack lines and flow over vegetation, leaf litter, matted vegetation, or water staining.

The site's geomorphology is monitored per the NCIRT's 2016 guidance for headwater streams. Adjustment and lateral movement following construction are anticipated for these headwater stream systems. In monitoring years one through four the streams will be monitored for specific signs of concentrated flow. This could include linear scour, areas of flow that are deeper than adjacent flow, preferential paths through the wetland that are developing, and signs of continuous flow as documented by a field camera. As the site progresses to years five through seven, there should be signs of developing bed and banks throughout the site. These may not always be continuous, but evidence of an ordinary high water mark should be developing. Three cross-sections were installed during MY-01 to monitor the sites geomorphology and the development of areas of concentrated flow. All three of these cross-sections are located along Long Bay Creek, with XS1 located in RHSII and XS2 and XS3 located in RHS

MONITORING RESULTS

Vegetation Monitoring

Monitoring Year 1 vegetation data was collected between October 15 and November 19, 2020. All 41 vegetation monitoring plots had greater than 360 stems/acre. Overall the site had an average of 833 planted stems/acre and 1,906 total stems/acre (including volunteers). Overall the site is well vegetated with extensive herbaceous coverage and many diverse volunteer woody species.

Stream Monitoring

The Monitoring Year 1 cross-section survey found the stream stable and functioning as designed. Because the project streams are part of a headwater system with multiple flow paths, traditional cross-sections measurements such as cross-sectional area, bank height ratio, and entrenchment ratio cannot be calculated. These cross-sections were set to span the entire 100 foot width of the stream valley to monitor where and how the water is flowing through this valley. All three cross-sections showed evidence of the development of multiple flow paths. XS3, because of its proximity to the culvert under CCC Rd. showed the most evidence of having a single flow path, but even this cross-section demonstrated multiple flow paths.

The gauge on Long Bay Creek was installed on March 2, 2020, while the rest of the stream gauges were installed on September 24, 2020. All of the gauges recorded flow for the entirety of the time they collected data (277 days for LBC, 71 days for UT1, UT2-2, UT3-2, and UT4). This was further backed up by the data recorded by the cameras. The camera on LBC was installed on June 8, 2020 and recorded flow for the entire duration that it recorded (179 days). The camera on UT3-2 was installed on April 10, 2020 and recorded a maximum of 78 days. The cameras on UT1, UT2-2, and UT4 were all installed on September 24, 2020 and recorded flow for the entire duration that they recorded (71 days).

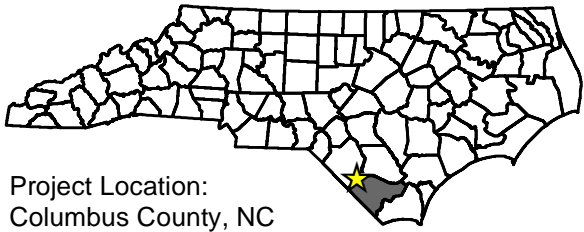
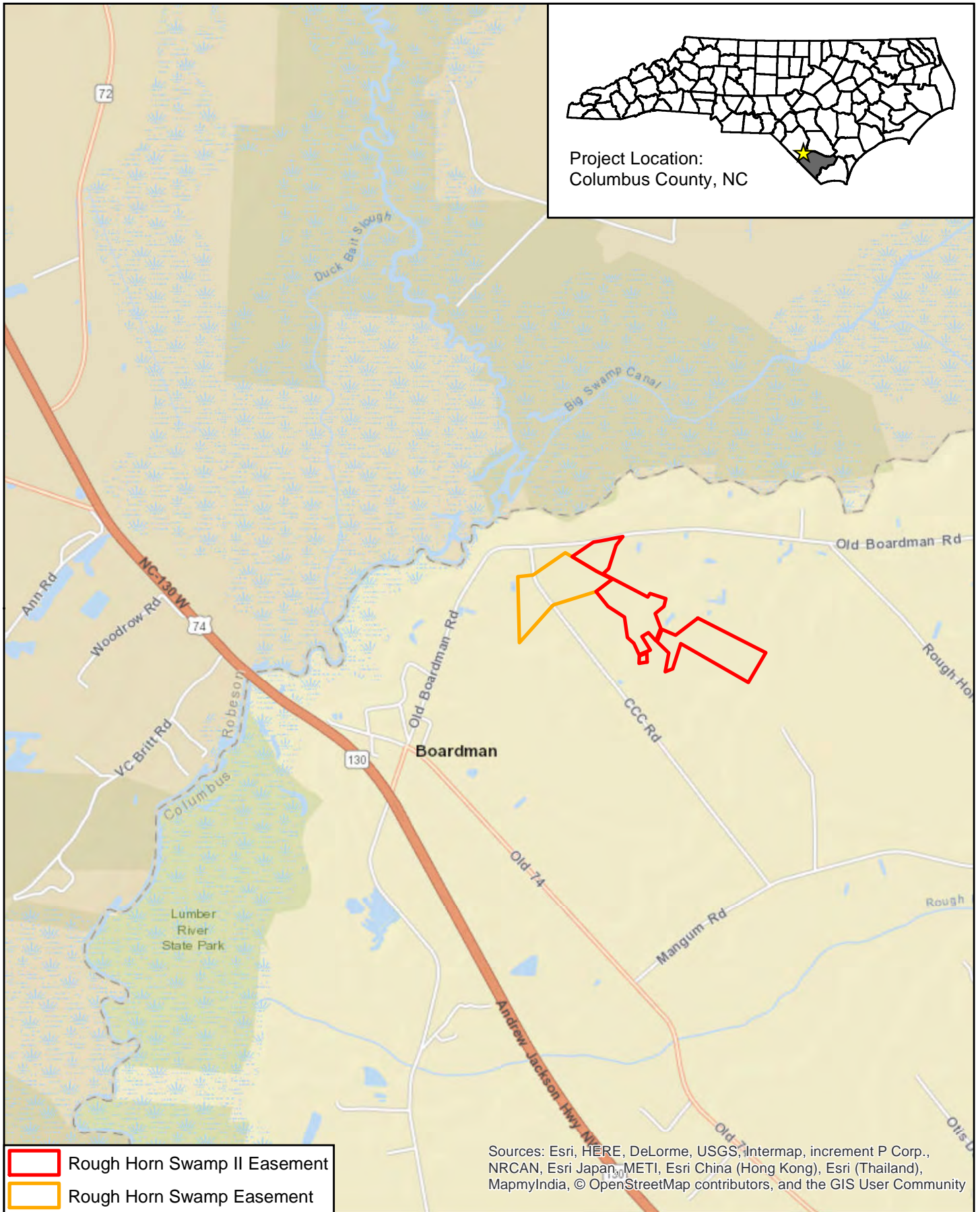
Hydrology Monitoring

During 2020, the months of January, March and October experienced average rainfall. The months of February, April, May, June, August, September, November, and December experienced above average rainfall and the month of July experienced below average rainfall. Overall the site experienced above average rainfall during the 2020 growing season.

Twelve of the thirteen gauges at Rough Horn Swamp, and all eight of the gauges at Rough Horn Swamp II achieved the success criteria of having continuously saturated or inundated conditions for at least 12.0% (32 days) of the growing season. The gauge that did not meet the success criteria (RHS 12) is located in the non-riparian area and was continuously saturated within 12 inches of the soil surface for 7.9% (21 days) of the growing season. No gauges malfunctioned during MY01.

REFERENCES

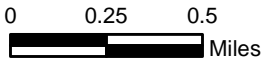
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Project Location:
Columbus County, NC

- Rough Horn Swamp II Easement
- Rough Horn Swamp Easement

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



**PROJECT VICINITY MAP
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC**



APPENDIX A

Background Tables

**Table 1. Mitigation Assets and Components
Rough Horn Swamp Restoration Site
DMS Project #97005**

Project Segment	Existing Footage or Acreage	Mitigation Plan Footage or Acreage	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)	As-built Footage or Acreage	Comments
Long Bay Creek	3,470	1,959	Warm	Restoration	Low Energy Stream	0	1,959	60' ROW over CCC Rd.; completed for no stream credit
UT1	4	233	Warm	Restoration	Low Energy Stream	0	233	Completed for no stream credit
Riparian Wetland	None (drained wetland)	20.267	Riverine Riparian	Restoration (Re-establishment)		1	20.267	
Non-Riparian Wetland	0.16	11.873	Riverine Non-riparian	Restoration (Re-establishment)		1	11.873	
Project Credits								
Restoration Level	Stream			Riparian Wetland		Non-riparian Wetland	Coastal Marsh	
	Warm	Cool	Cold	Riverine	Non-riverine			
Restoration	2,132 (not credited)							
Re-establishment				20.267		11.873		
Rehabilitation								
Enhancement								
Enhancement I								
Enhancement II								
Creation								
Preservation								
Total				20.267		11.873		

Table 1. Mitigation Assets and Components								
Rough Horn Swamp II Restoration Site								
DMS Project #100053								
Project Segment	Existing Footage or Acreage	Mitigation Plan Footage or Acreage	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)	As-built Footage or Acreage	Comments
Long Bay Creek	2,077	2,049	Warm	Restoration	Low Energy Stream	1	2,049	30' crossing exception STA 14+66 to 14+96; 153' non-credited stream
UT1	815	917	Warm	Restoration	Headwater Stream	1	917	
UT2-1	516	516	Warm	Preservation	Headwater Stream	10	516	
UT2-2	120	120	Warm	Restoration	Headwater Stream	1	120	
UT3-1	168	164	Warm	Enhancement II	Headwater Stream	2.5	164	31' crossing exception STA 301+64 to 301+95
UT3-2	571	914	Warm	Restoration	Headwater Stream	1	914	
UT4	447	629	Warm	Restoration	Headwater Stream	1	629	
Riparian Wetland Restoration	None (drained wetland)	17.079	Riverine Riparian	Restoration (Re-establishment)		1	17.079	
Riparian Wetland Enhancement	7.900	5.956	Riverine Riparian	Enhancement		2.5	5.956	
Riparian Wetland Preservation	16.700	15.319	Riverine Riparian	Preservation		10	15.319	
Non-riparian Wetland Restoration	None (drained wetland)	1.619	Riverine Non-riparian	Restoration (Re-establishment)		0	1.619	Completed for no wetland credit
Project Credits								
Restoration Level	Stream			Riparian Wetland		Non-riparian Wetland	Coastal Marsh	
	Warm	Cool	Cold	Riverine	Non-riverine			
Restoration	4,446.000							
Re-establishment				17.079		1.619 (not credited)		
Rehabilitation								
Enhancement				2.382				
Enhancement I								
Enhancement II	65.600							
Creation								
Preservation	51.600			1.532				
Total	4,563.200			20.993				

Table 2. Project Activity & Reporting History Rough Horn Swamp and Rough Horn II Restoration Sites DMS Project #97005 and 100053		
Activity or Report	Data Collection Complete	Actual Completion or Delivery
Mitigation Plan		April 2, 2019
Final Design - Construction Plans		April 16, 2019
Construction		January 24, 2020
Planting		March 13, 2020
Baseline Monitoring/Report	April 2020	April 2020
<i>Vegetation Monitoring</i>	<i>March 25, 2020</i>	
<i>Photo Points</i>	<i>April 8, 2020</i>	
Year 1 Monitoring	Dec 2020	Jan 2021
<i>Cross-section Survey</i>	<i>Aug 12, 2020</i>	
<i>Vegetation Monitoring</i>	<i>Nov 19, 2020</i>	
<i>Photo Points</i>	<i>Dec 3, 2020</i>	

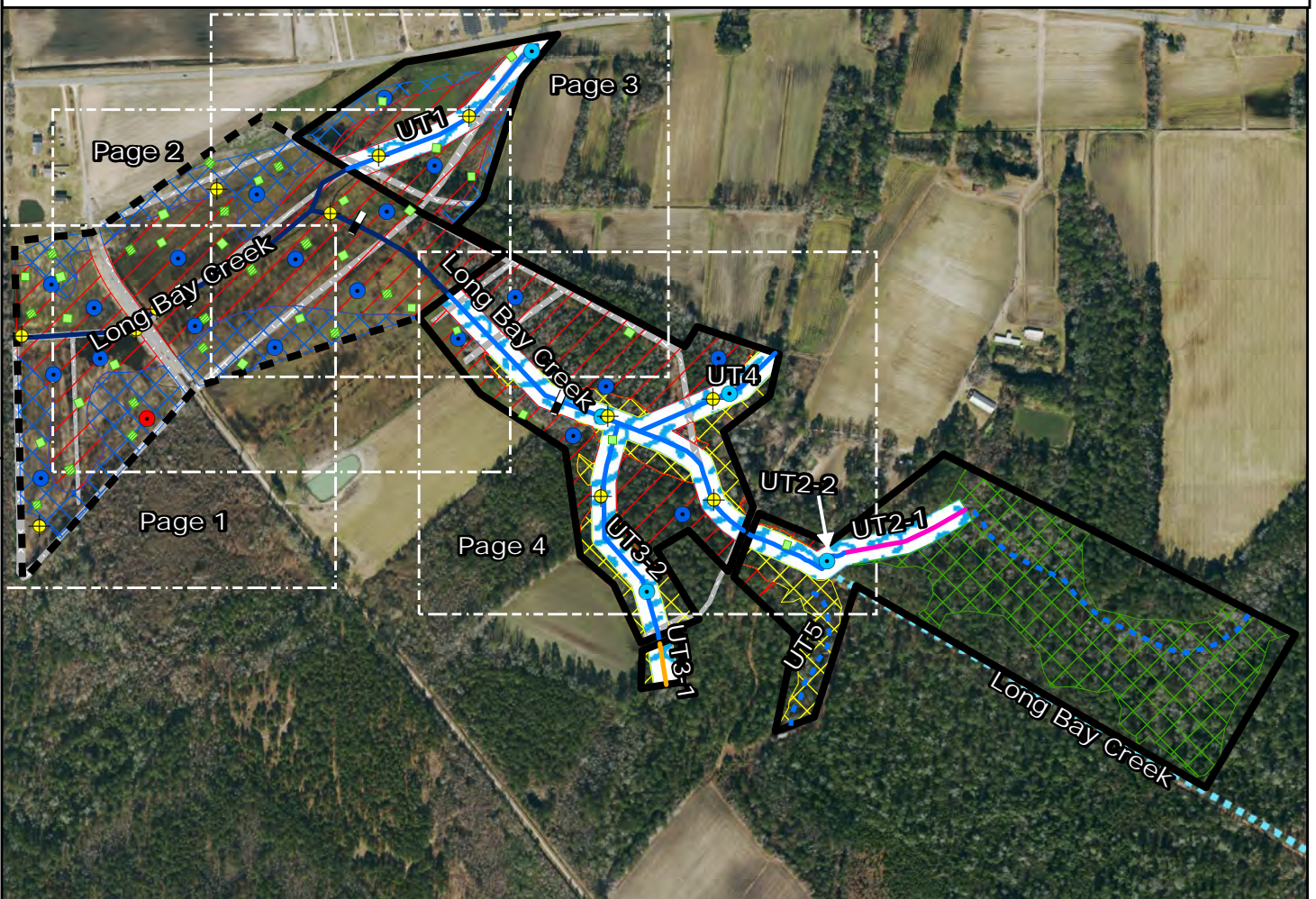
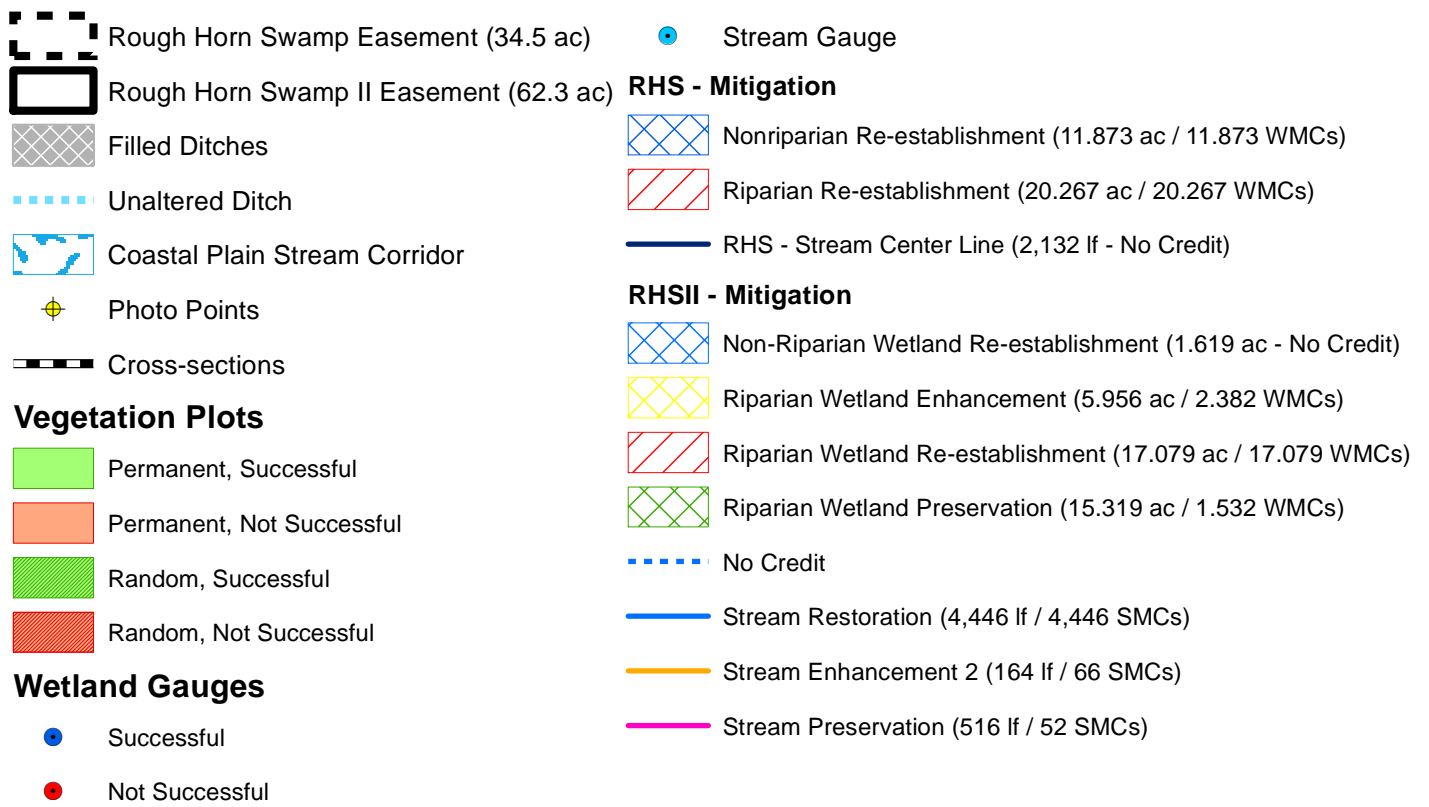
Table 3. Project Contacts Rough Horn Swamp and Rough Horn II Swamp Restoration Sites DMS Project #97005 and 100053	
Design Firm	KCI Associates of North Carolina, PA 4505 Falls of Neuse Rd. Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 783-9214 Fax: (919) 783-9266
Construction Contractor	KCI Environmental Technologies and Construction 4505 Falls of Neuse Rd. Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris
Planting Contractor	Shenandoah Habitats 1983 Jefferson Highway Waynesboro, VA 22980 Contact: Mr. David Coleman Phone: (540) 941-0067
Monitoring Performers	
	KCI Associates of North Carolina, PC 4505 Falls of Neuse Rd. Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 783-9214 Fax: (919) 783-9266

Table 4. Project Attributes			
Rough Horn Swamp Restoration Site , DMS Project #97005			
Project Name	Rough Horn Swamp Restoration Site		
County	Columbus County		
Project Area (acres)	34.5 acres		
Project Coordinates (lat. and long.)	34.4481°, -78.9390°		
Project Watershed Summary Information			
Physiographic Province	Coastal Plain		
River Basin	Lumber		
USGS Hydrologic Unit 8-digit	03040203	USGS Hydrologic Unit 14-digit	03040203190010
DWQ Sub-basin	03-07-53		
Project Drainage Area (acres)	1,800 acres		
Project Drainage Area Percentage of Impervious Area	1%		
CGIA Land Use Classification	Agricultural Land, Forestland		
Reach Summary Information			
Parameters	Long Bay Creek		
Length of reach (linear feet)	3,702		
Valley classification	Type X		
Drainage area (acres)	1,800 acres		
NCDWQ Water Quality Classification	C (Aquatic Life, Secondary Recreation); Sw (Swamp Waters)		
Morphological Description (stream type)	N/A (Ditched Channel)		
Evolutionary trend	Channelized, Stage III		
Mapped Soil Series	Johnston		
Drainage class	Very poorly drained		
Soil Hydric status	Hydric A/D		
Slope	0%		
FEMA classification	Zone X		
Existing vegetation community	Row crops		
Wetland Summary Information (Post Restoration)			
Parameters			
Size of Wetland (acres)	0.16 (W3)		
Wetland Type	Headwater Forest		
Mapped Soil Series	Torhunta		
Drainage class	Very poorly drained		
Soil Hydric Status	Hydric A/D		
Source of Hydrology	Groundwater		
Hydrologic Impairment	Ditching		
Existing vegetation community	Row crops		
Regulatory Considerations			
Regulation	Applicable?	Resolved?	Supporting
Waters of the United States – Section 404	Yes	Yes	Jurisdictional Determination
Waters of the United States – Section 401	Yes	Yes	Jurisdictional Determination
Endangered Species Act**	No	N/A	N/A
Historic Preservation Act**	No	N/A	N/A
Coastal Zone Management Act ** (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	FEMA Floodplain Checklist
Essential Fisheries Habitat**	No	N/A	N/A

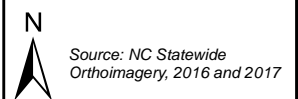
Table 4. Project Attributes						
Rough Horn Swamp II Restoration Site, DMS Project #100053						
Project Name	Rough Horn Swamp II Restoration Site					
County	Columbus County					
Project Area (acres)	62.3 acres					
Project Coordinates (lat.	34.445253° , -81.937000°					
Project Watershed Summary Information						
Physiographic Province	Coastal Plain					
River Basin	Lumber					
USGS Hydrologic Unit 8-digit	03040203	USGS Hydrologic Unit 14-digit			03040203190010	
DWQ Sub-basin	03-07-53					
Project Drainage Area (acres)	1,684 acres (1,638 ac Long Bag Creek + 46 ac UT 1)					
Project Drainage Area Percentage of Impervious Area	1%					
CGIA Land Use Classification	Agricultural Land, Forestland					
Reach Summary Information						
Parameters	Long Bay Creek	UT1	UT2	UT3	UT4	UT5
Length of reach (lf)	2,077 (RHSII)	811 (RHSII)	636	739	447	597
Valley classification	Type X	Type X	Type X	Type X	Type X	Type X
Drainage area (acres)	1,638 acres	46 acres	602 acres	142 acres	84 acres	120 acres
NCDWQ Water Quality Classification	C; SW	C; SW	C; SW	C; SW	C; SW	C; SW
Morphological Description (stream type)	N/A (Ditched channel)	N/A (Ditched channel)	N/A (Ditched channel)	N/A (Ditched)	N/A (Ditched channel)	N/A (Ditched channel)
Evolutionary trend	Channelized	Channelized	Channelized	Channelized	Channelized	Channelized
Mapped Soil Series	Johnston	Torhunta	Johnston	Johnston	Stallings	Johnston
Drainage class	Very poorly drained	Very poorly drained	Very poorly drained	Very poorly drained	Somewhat poorly drained	Very poorly drained
Soil Hydric status	Hydric A/D	Hydric A/D	Hydric A/D	Hydric A/D	Hydric A/D	Hydric A/D
Slope	0%	0%	0%	0%	0%	0%
FEMA classification	None	None	None	None	None	None
Existing vegetation community	Headwater Forest	Row crops	Headwater Forest	Headwater Forest	Headwater Forest	Headwater Forest
Wetland Summary Information						
Parameters	W1, W2, WA		WC, WD		WB, WE	
Size of Wetland (acres)	4.85 acres		3.05 acres		18.92 acres	
Wetland Type	Bottomland hardwood forest		Non-tidal freshwater marsh/headwater forest		Riverine swamp forest	
Mapped Soil Series	Johnston		Johnston		Johnston	
Drainage class	Very poorly drained		Very poorly drained		Very poorly drained	
Soil Hydric Status	Non-hydric		Hydric		Hydric	
Source of Hydrology	Surface water		Stream floodplain		Stream floodplain	
Hydrologic Impairment	Ditching		Ditching		Ditching	
Existing vegetation	Headwater forest		Headwater forest		Headwater forest	
Regulatory Considerations						
Regulation	Applicable?	Resolved?	Supporting			
Waters of the United States – Section 404	Yes	Yes	Jurisdictional			
Waters of the United States – Section 401	Yes	Yes	Jurisdictional			
Endangered Species Act**	No	N/A	N/A			
Historic Preservation Act**	No	N/A	N/A			
Coastal Zone Management Act ** (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	N/A			
FEMA Floodplain Compliance	Yes	Yes	FEMA Floodplain Checklist			
Essential Fisheries Habitat**	No	N/A	N/A			

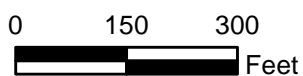
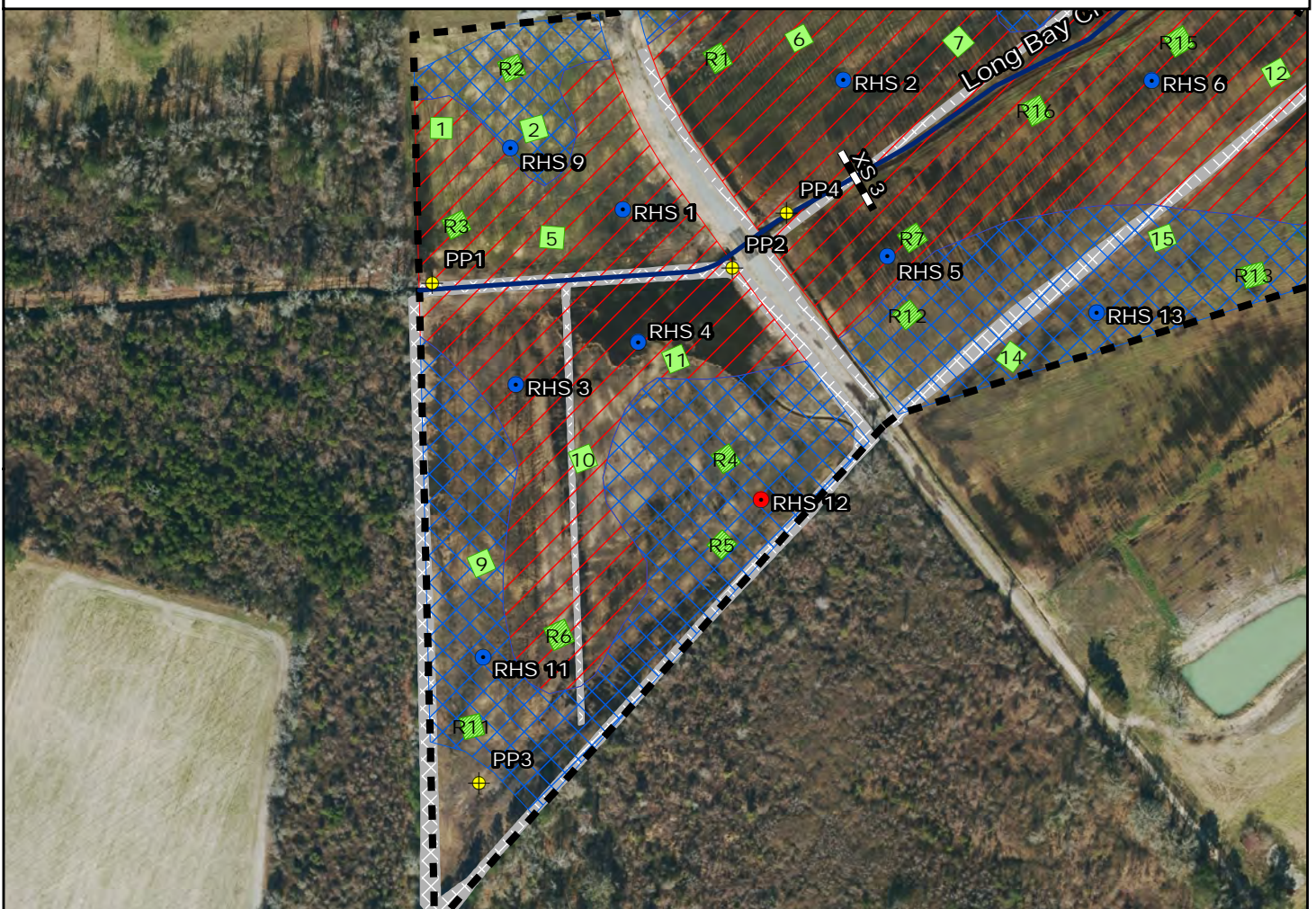
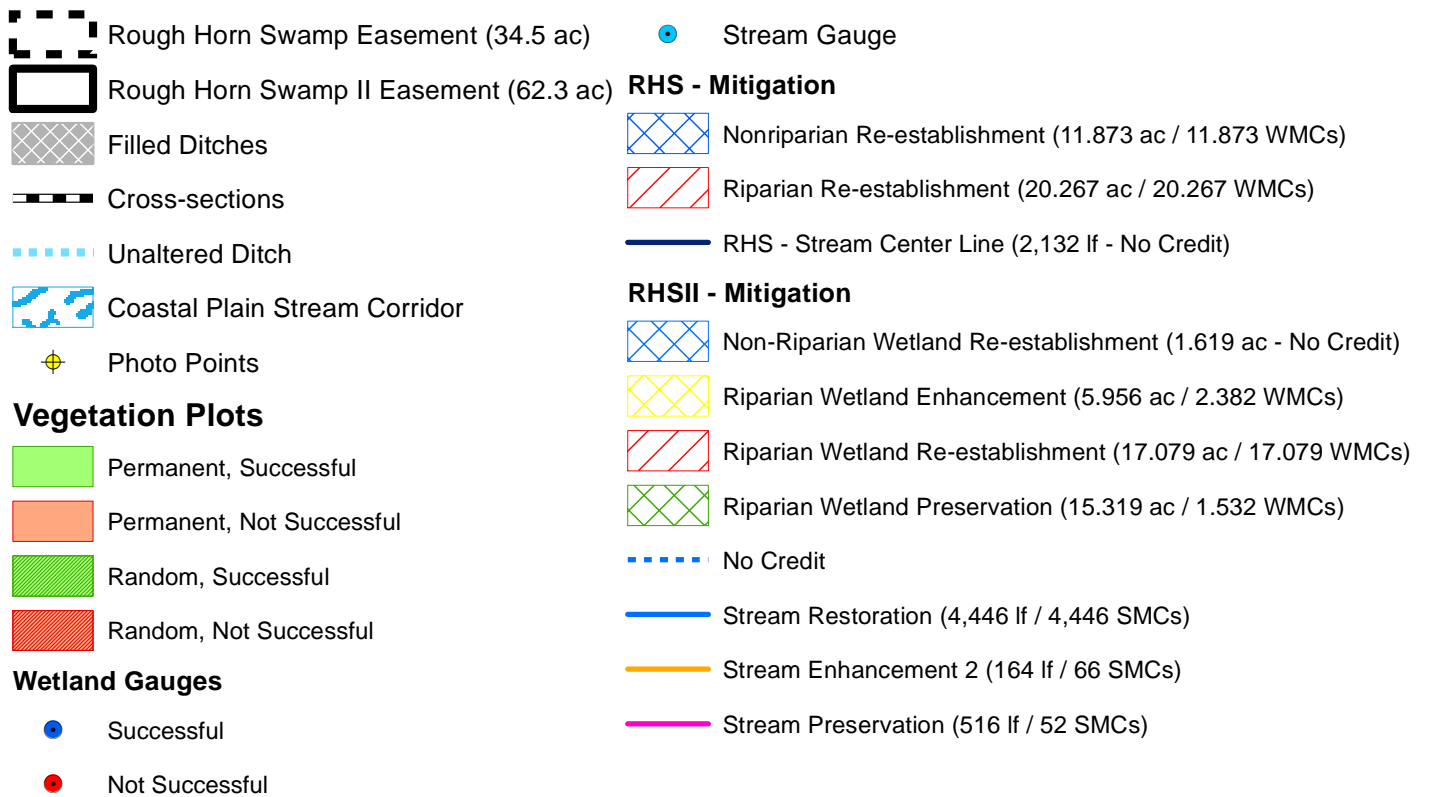
APPENDIX B

Visual Assessment Data



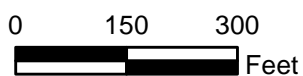
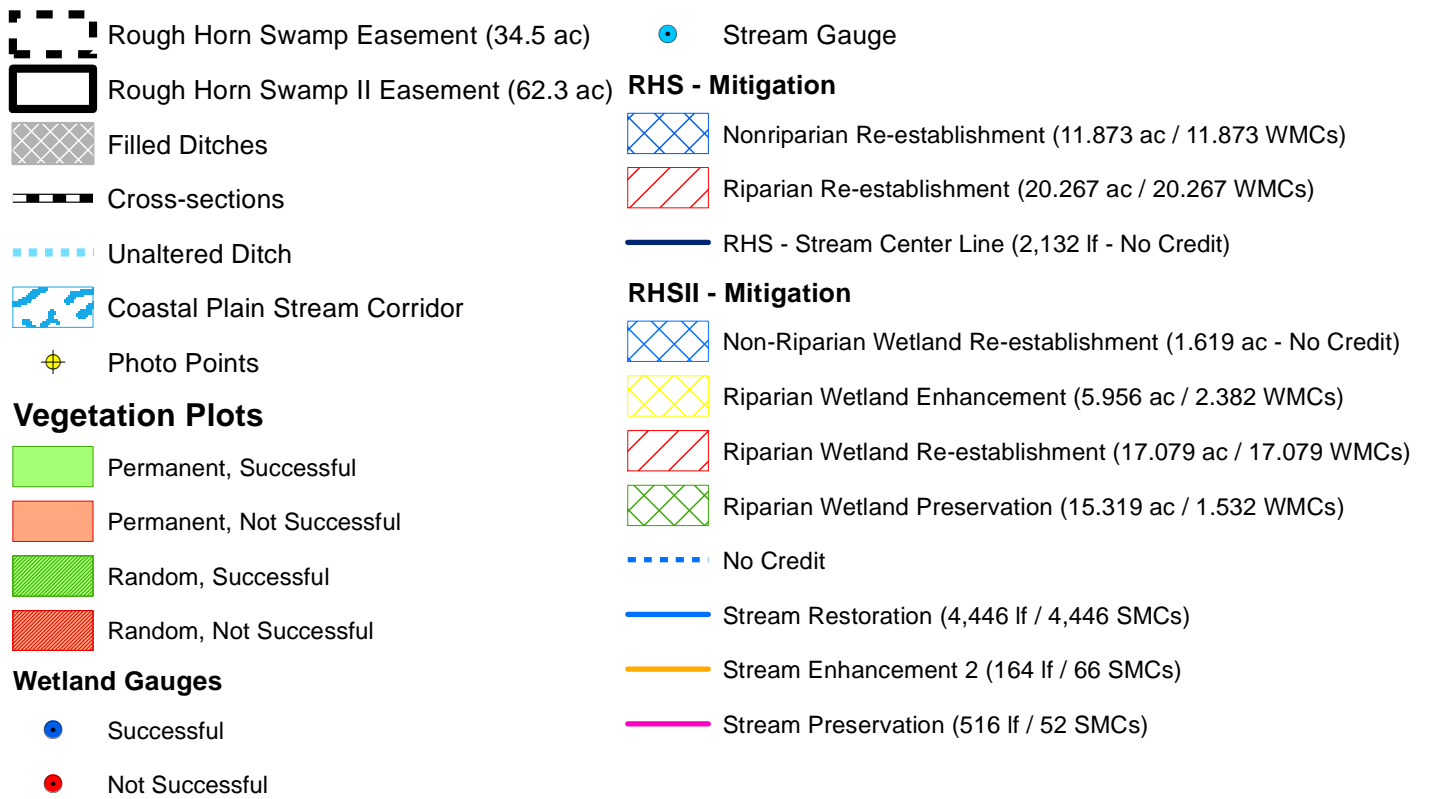
**CURRENT CONDITIONS PLANVIEW
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC**



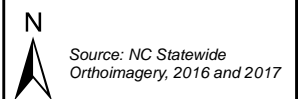


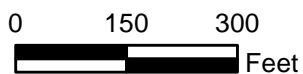
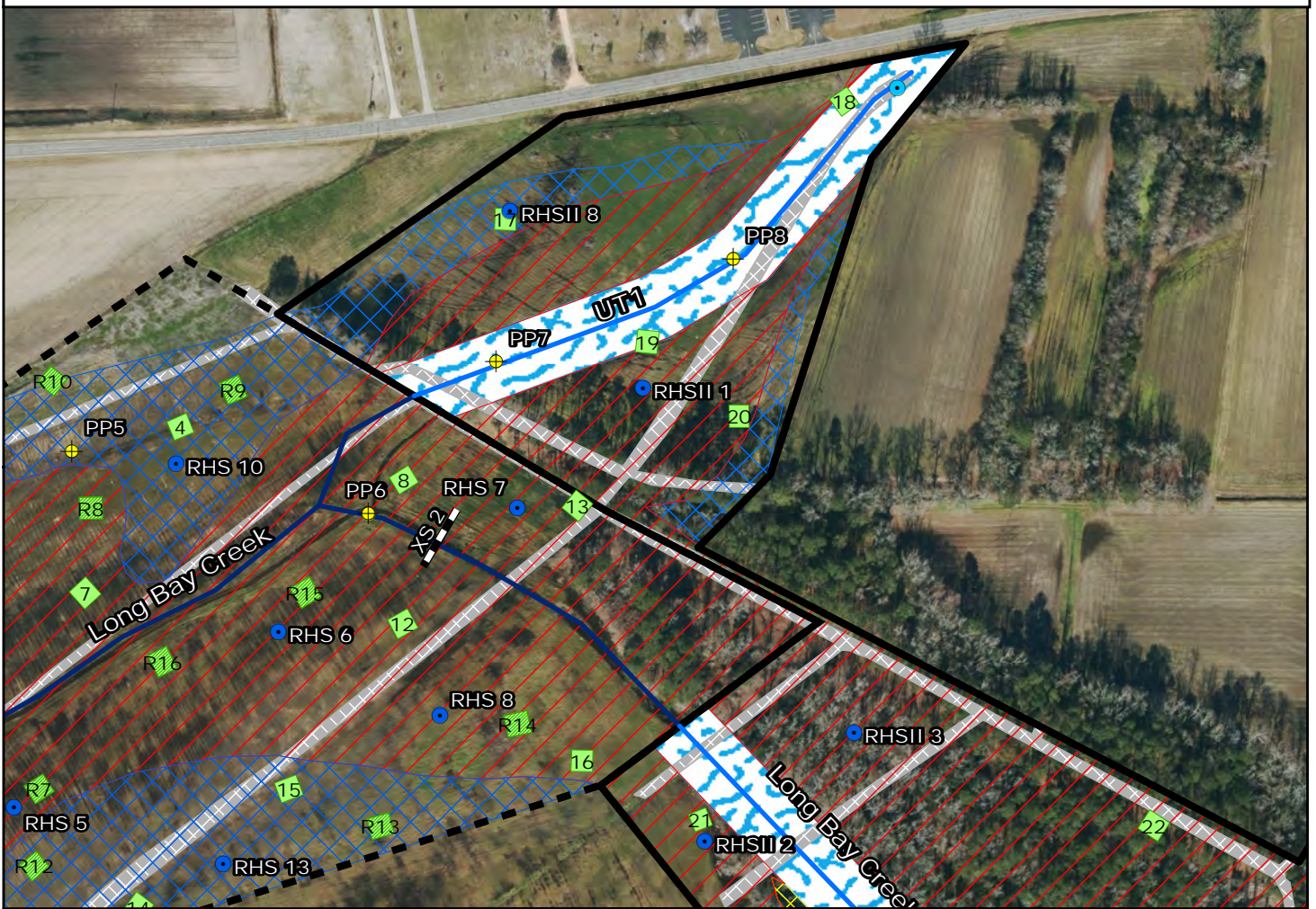
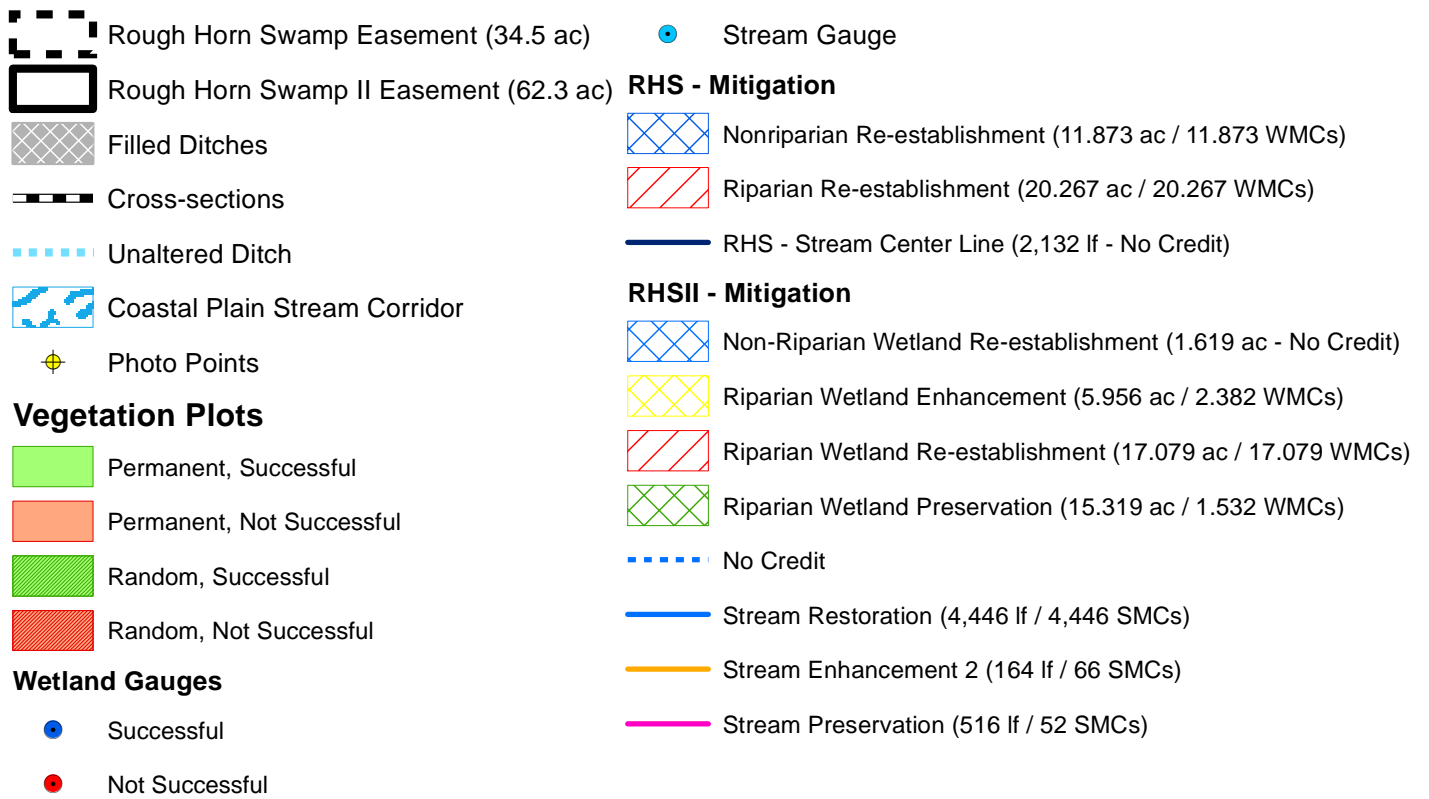
**CURRENT CONDITIONS PLANVIEW
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC**

N
Source: NC Statewide
Orthoimagery, 2016 and 2017

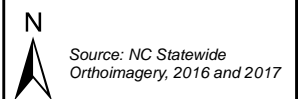


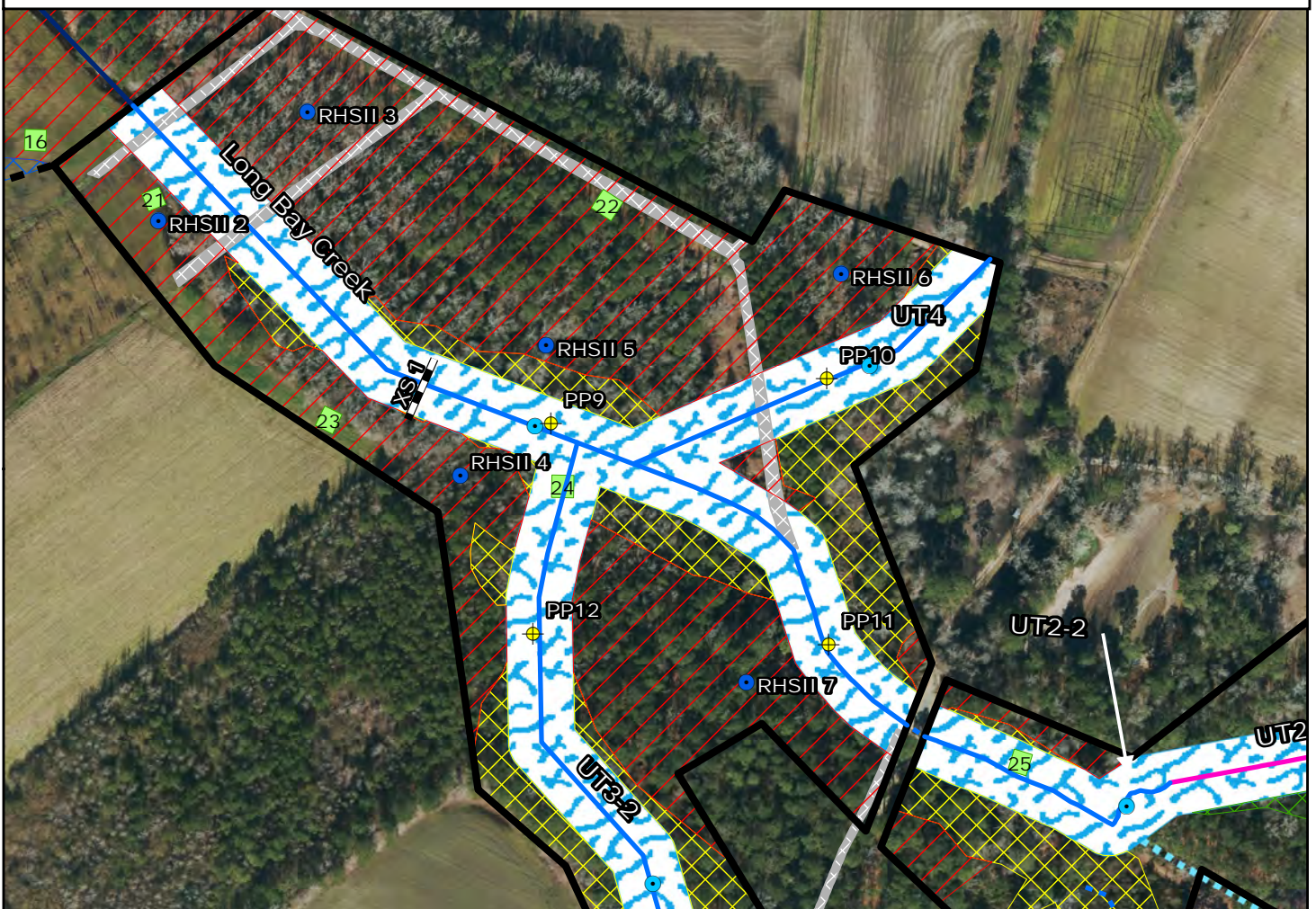
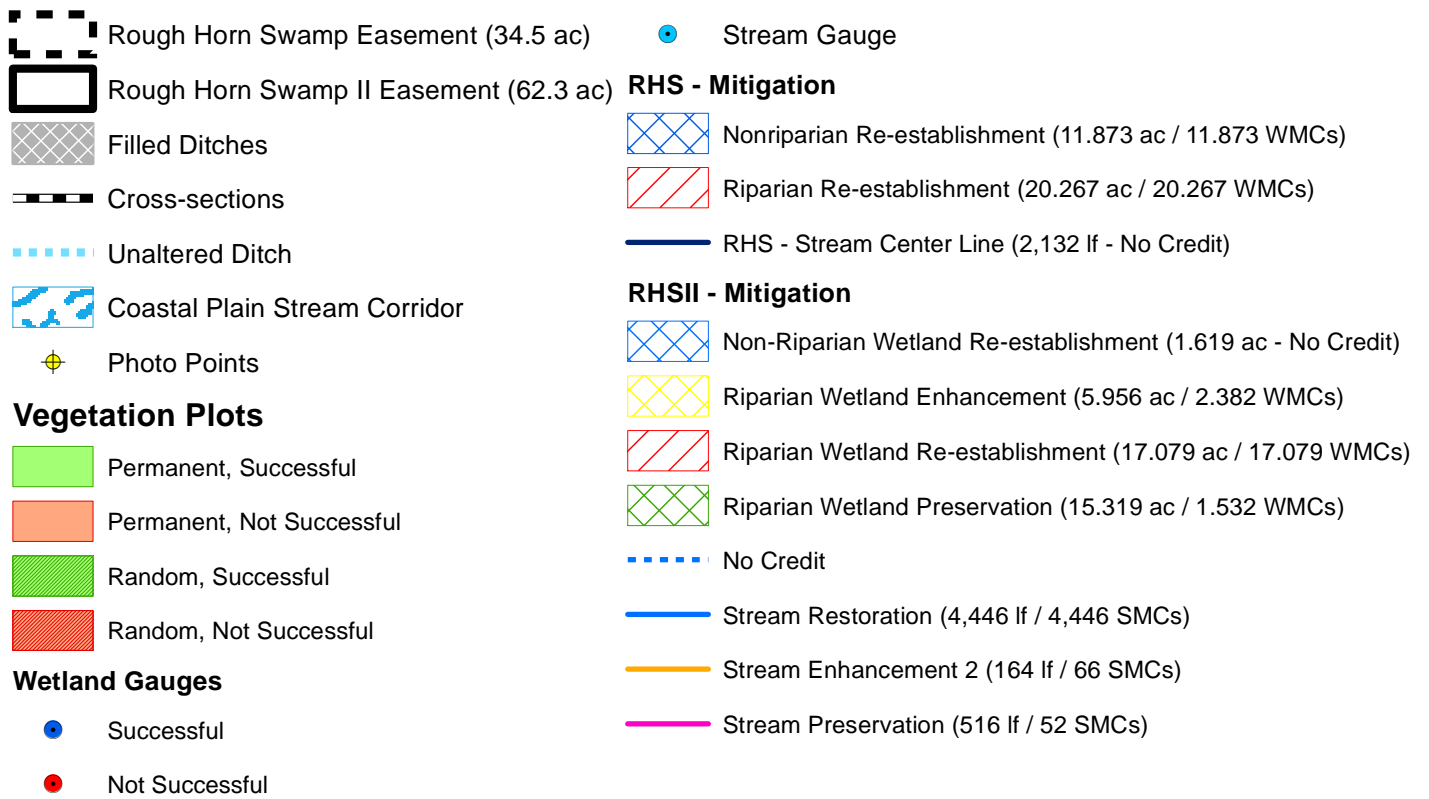
**CURRENT CONDITIONS PLANVIEW
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC**





**CURRENT CONDITIONS PLANVIEW
ROUGH HORN SWAMP RESTORATION SITE &
ROUGH HORN SWAMP II RESTORATION SITE
COLUMBUS COUNTY, NC**





**CURRENT CONDITIONS PLANVIEW
 ROUGH HORN SWAMP RESTORATION SITE &
 ROUGH HORN SWAMP II RESTORATION SITE
 COLUMBUS COUNTY, NC**

N
 Source: NC Statewide
 Orthoimagery, 2016 and 2017

Photo Reference Points



PP1 – MY-00 – 4/8/20



PP1 – MY-01 – 12/3/20



PP2 – MY-00 – 4/8/20



PP2 – MY-01 – 12/3/20



PP3 – MY-00 – 4/8/20



PP3 – MY-01 – 12/3/20



PP4 – MY-00 – 4/8/20



PP4 – MY-01 – 12/3/20



PP5 – MY-00 – 4/8/20



PP5 – MY-01 – 12/3/20



PP6 – MY-00 – 4/8/20 PP11 – MY-00 – 4/8/20



PP6 – MY-01 – 12/3/20



PP7 – MY-00 – 4/8/20



PP7 – MY-01 – 12/3/20



PP8 – MY-00 – 4/8/20



PP8 – MY-01 – 12/3/20



PP9 – MY-00 – 4/8/20



PP9 – MY-01 – 12/3/20



PP10 – MY-00 – 4/8/20



PP10 – MY-01 – 12/3/20



PP11 – MY-00 – 4/8/20



PP11 – MY-01 – 12/3/20



PP12 – MY-00 – 4/8/20



PP12 – MY-01 – 12/3/20

Vegetation Plot Photos



Vegetation Plot 1 – MY-01 – 10/21/20



Vegetation Plot 2 – MY-01 – 10/21/20



Vegetation Plot 3 – MY-01 – 10/21/20



Vegetation Plot 4 – MY-01 – 10/21/20



Vegetation Plot 5 – MY-01 – 10/21/20



Vegetation Plot 6 – MY-01 – 10/21/20



Vegetation Plot 7 – MY-01 – 10/21/20



Vegetation Plot 8 – MY-01 – 11/19/20



Vegetation Plot 9 – MY-01 – 10/21/20



Vegetation Plot 10 – MY-01 – 10/21/20



Vegetation Plot 11 – MY-01 – 10/21/20



Vegetation Plot 12 – MY-01 – 11/19/20



Vegetation Plot 13– MY-00 – 11/19/20



Vegetation Plot 14 – MY-01 – 11/19/20



Vegetation Plot 15 – MY-01 – 11/19/20



Vegetation Plot 16 – MY-01 – 10/23/20



Vegetation Plot 17 – MY-01 – 10/23/20



Vegetation Plot 18 – MY-01 – 10/23/20



Vegetation Plot 19 – MY-01 – 10/23/20



Vegetation Plot 20 – MY-01 – 10/23/20



Vegetation Plot 21 – MY-01 – 10/23/20



Vegetation Plot 22 – MY-01 – 10/23/20



Vegetation Plot 23 – MY-01 – 10/23/20



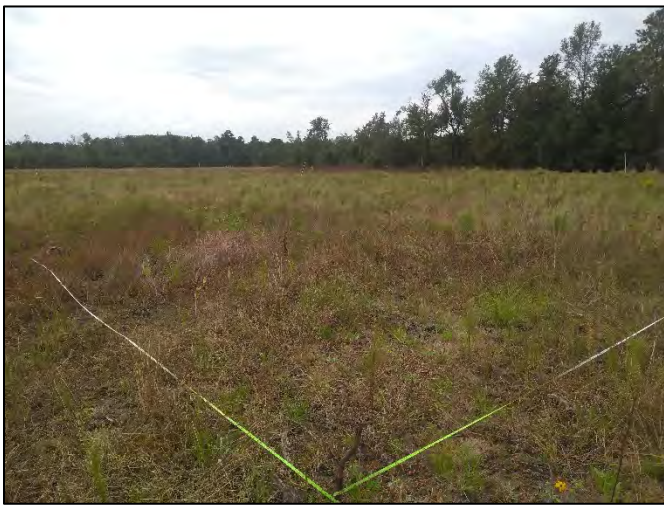
Vegetation Plot 24 – MY-01 – 10/23/20



Vegetation Plot 25 – MY-01 – 10/23/20



Vegetation Plot R1 – MY-01 – 10/15/20



Vegetation Plot R2 – MY-01 – 10/15/20



Vegetation Plot R3 – MY-01 – 10/15/20



Vegetation Plot R4 – MY-01 – 10/15/20



Vegetation Plot R5 – MY-01 – 10/15/20



Vegetation Plot R6 – MY-01 – 10/15/20



Vegetation Plot R7 – MY-01 – 11/19/20



Vegetation Plot R8 – MY-01 – 10/15/20



Vegetation Plot R9 – MY-01 – 10/15/20



Vegetation Plot R10 – MY-01 – 10/15/20



Vegetation Plot R11 – MY-01 – 10/15/20



Vegetation Plot R12 – MY-01 – 11/19/20



Vegetation Plot R13 – MY-01 – 11/19/20



Vegetation Plot R14 – MY-01 – 11/19/20



Vegetation Plot R15 – MY-01 – 11/19/20



Vegetation Plot R16 – MY-01 – 11/19/20

APPENDIX C

Vegetation Plot Data

Table 5. Stem Count by Plot and Species																
Rough Horn Swamp and Rough Horn Swamp II, DMS Project #97005 and 100053																
Species	Current Plot Data (MY01 2020)															
	Plot 01		Plot 02		Plot 03		Plot 04		Plot 05		Plot 06		Plot 07		Plot 08	
	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
American Sycamore (<i>Platanus occidentalis</i>)			1	1	2	2										
Bald Cypress (<i>Taxodium distichum</i>)	14	14			3	3			7	7	8	8	14	14	20	20
Beautyberry (<i>Callicarpa americana</i>)																
Black Willow (<i>Salix nigra</i>)				2		57						2				24
Boxelder (<i>Acer negundo</i>)																
Buttonbush (<i>Cephalanthus occidentalis</i>)	3	3							4	4			2	2	1	1
Eastern Baccharis (<i>Baccharis halimifolia</i>)																
Eastern Cottonwood (<i>Populus deltoides</i>)																18
Laurel Oak (<i>Quercus laurifolia</i>)			1	1					1	1						
Loblolly Pine (<i>Pinus taeda</i>)																
Oak (<i>Quercus sp.</i>)																
Overcup Oak (<i>Quercus lyrata</i>)			1	1	3	3	4	4	2	2			1	1		
Red Chokeberry (<i>Aronia arbutifolia</i>)									1	1			1	1		
Red Maple (<i>Acer rubrum</i>)		6										1				8
River Birch (<i>Betula nigra</i>)	1	1	3	3	4	4	5	5	3	3	8	8				
Silky Dogwood (<i>Cornus amomum</i>)																
Southern Red Oak (<i>Quercus falcata</i>)																
Swamp Bay (<i>Persea palustris</i>)	4	4							2	2	2	2			1	1
Swamp Chestnut Oak (<i>Quercus michauxii</i>)			12	12	2	2	8	8	1	1			2	2	2	2
Sweetgum (<i>Liquidambar styraciflua</i>)		17		53				1		38		2				14
Water Oak (<i>Quercus nigra</i>)																
Water Tupelo (<i>Nyssa aquatica</i>)					1	1					3	3	4	4		
Wax Myrtle (<i>Myrica cerifera</i>)																
Unknown																
Stem count	22	45	18	73	15	72	17	18	21	59	21	26	24	24	24	88
size (ares)	1		1		1		1		1		1		1		1	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025	
Species count	4	6	5	7	6	7	3	4	8	9	4	7	6	6	4	8
Stems per ACRE	890	1,821	728	2,954	607	2,914	688	728	850	2,388	850	1,052	971	971	971	3,561

Table 5. Stem Count by Plot and Species																	
Rough Horn Swamp and Rough Horn Swamp II, DMS Project #97005 and 100053																	
Species	Current Plot Data (MY01 2020)																
	Plot 09		Plot 10		Plot 11		Plot 12		Plot 13		Plot 14		Plot 15		Plot 16		
	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	
American Sycamore (<i>Platanus occidentalis</i>)	1	1										2	2	2	2		
Bald Cypress (<i>Taxodium distichum</i>)	1	1	12	12	12	12	9	9	10	10			1	1	17	17	
Beautyberry (<i>Callicarpa americana</i>)																	
Black Willow (<i>Salix nigra</i>)									3	4		3					
Boxelder (<i>Acer negundo</i>)																	
Buttonbush (<i>Cephalanthus occidentalis</i>)							2	2	1	1							
Eastern Baccharis (<i>Baccharis halimifolia</i>)																	
Eastern Cottonwood (<i>Populus deltoides</i>)																	
Laurel Oak (<i>Quercus laurifolia</i>)	1	1	1	1	2	2					1	1	2	2			
Loblolly Pine (<i>Pinus taeda</i>)																	
Oak (<i>Quercus sp.</i>)																	
Overcup Oak (<i>Quercus lyrata</i>)	11	11									1	1	6	6	1	1	
Red Chokeberry (<i>Aronia arbutifolia</i>)							1	1									
Red Maple (<i>Acer rubrum</i>)		1								3		2		1		11	
River Birch (<i>Betula nigra</i>)	8	8	4	4	2	2	2	2	9	9	9	9	9	9	1	1	
Silky Dogwood (<i>Cornus amomum</i>)									1	1							
Southern Red Oak (<i>Quercus falcata</i>)																	
Swamp Bay (<i>Persea palustris</i>)			1	1											1	1	
Swamp Chestnut Oak (<i>Quercus michauxii</i>)	2	2	2	2	5	5	1	1	1	1	4	4					
Sweetgum (<i>Liquidambar styraciflua</i>)		4		2				2		1				3		25	
Water Oak (<i>Quercus nigra</i>)																	
Water Tupelo (<i>Nyssa aquatica</i>)							1	1			1	1	1	1	1	1	
Wax Myrtle (<i>Myrica cerifera</i>)										1							
Unknown																	
Stem count	24	29	20	22	21	21	16	18	25	31	18	23	21	25	21	57	
size (ares)	1		1		1		1		1		1		1		1		
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		
Species count	6	8	5	6	4	4	6	7	6	9	6	8	6	8	5	7	
Stems per ACRE	971	1,174	809	890	850	850	647	728	1,012	1,255	728	931	850	1,012	850	2,307	

Table 5. Stem Count by Plot and Species
Rough Horn Swamp and Rough Horn Swamp II, DMS Project #97005 and 100053

Species	Current Plot Data (MY01 2020)															
	Plot 17		Plot 18		Plot 19		Plot 20		Plot 21		Plot 22		Plot 23		Plot 24	
	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
American Sycamore (<i>Platanus occidentalis</i>)			3	3												
Bald Cypress (<i>Taxodium distichum</i>)					16	16	6	6	11	11	8	8	9	9	13	13
Beautyberry (<i>Callicarpa americana</i>)																1
Black Willow (<i>Salix nigra</i>)				45						6						
Boxelder (<i>Acer negundo</i>)																
Buttonbush (<i>Cephalanthus occidentalis</i>)					1	1							1	1	1	1
Eastern Baccharis (<i>Baccharis halimifolia</i>)									1							
Eastern Cottonwood (<i>Populus deltoides</i>)																
Laurel Oak (<i>Quercus laurifolia</i>)			2	2							2	2	1	1		
Loblolly Pine (<i>Pinus taeda</i>)																
Oak (<i>Quercus sp.</i>)																
Overcup Oak (<i>Quercus lyrata</i>)	1	1	5	5									1	1		
Red Chokeberry (<i>Aronia arbutifolia</i>)																
Red Maple (<i>Acer rubrum</i>)											40	43	36	13		
River Birch (<i>Betula nigra</i>)	9	9	5	5	1	1	4	4	2	2			5	5	3	3
Silky Dogwood (<i>Cornus amomum</i>)																
Southern Red Oak (<i>Quercus falcata</i>)																1
Swamp Bay (<i>Persea palustris</i>)											2	2	1	1	1	5
Swamp Chestnut Oak (<i>Quercus michauxii</i>)	1	1	4	4	1	1	1	1	1	1			4	4		
Sweetgum (<i>Liquidambar styraciflua</i>)									5	49	343		17	27		
Water Oak (<i>Quercus nigra</i>)																
Water Tupelo (<i>Nyssa aquatica</i>)			4	4			3	3	3	3	7	7				
Wax Myrtle (<i>Myrica cerifera</i>)											1		1			
Unknown																
Stem count	11	11	23	68	19	19	14	26	17	106	19	406	22	76	18	64
size (ares)	1		1		1		1		1		1		1		1	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025	
Species count	3	3	6	7	4	4	4	7	4	6	4	7	7	10	4	8
Stems per ACRE	445	445	931	2,752	769	769	567	1,052	688	4,290	769	16,430	890	3,076	728	2,590

Table 5. Stem Count by Plot and Species																
Rough Horn Swamp and Rough Horn Swamp II, DMS Project #97005 and 100053																
Species	Current Plot Data (MY01 2020)															
	Plot 25		Plot R01		Plot R02		Plot R03		Plot R04		Plot R05		Plot R06		Plot R07	
	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
American Sycamore (<i>Platanus occidentalis</i>)					5	5			4	4						
Bald Cypress (<i>Taxodium distichum</i>)	16	16	5	5	1	1	10	10	2	2	1	1	8	8	13	13
Beautyberry (<i>Callicarpa americana</i>)																
Black Willow (<i>Salix nigra</i>)			30	30	7	7	1	1								
Boxelder (<i>Acer negundo</i>)																
Buttonbush (<i>Cephalanthus occidentalis</i>)			1	1									1	1		
Eastern Baccharis (<i>Baccharis halimifolia</i>)																
Eastern Cottonwood (<i>Populus deltoides</i>)																
Laurel Oak (<i>Quercus laurifolia</i>)					2	2			4	4	2	2				
Loblolly Pine (<i>Pinus taeda</i>)																
Oak (<i>Quercus sp.</i>)																
Overcup Oak (<i>Quercus lyrata</i>)					1	1										
Red Chokeberry (<i>Aronia arbutifolia</i>)																
Red Maple (<i>Acer rubrum</i>)		9		3		2		11		2		1		1		
River Birch (<i>Betula nigra</i>)					12	12	3	3	7	7	4	4			4	4
Silky Dogwood (<i>Cornus amomum</i>)																
Southern Red Oak (<i>Quercus falcata</i>)																
Swamp Bay (<i>Persea palustris</i>)		2		3		3		5	5						2	2
Swamp Chestnut Oak (<i>Quercus michauxii</i>)	2	2			1	1					7	7	3	3	3	3
Sweetgum (<i>Liquidambar styraciflua</i>)		3				19		11						1		
Water Oak (<i>Quercus nigra</i>)									2	2	4	4				
Water Tupelo (<i>Nyssa aquatica</i>)															5	5
Wax Myrtle (<i>Myrica cerifera</i>)																
Unknown																
Stem count	18	32	39	42	29	50	19	41	19	21	18	19	12	14	27	27
size (ares)	1		1		1		1		1		1		1		1	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025	
Species count	2	5	4	5	7	9	4	6	5	6	5	6	3	5	5	5
Stems per ACRE	728	1,295	1,578	1,700	1,174	2,023	769	1,659	769	850	728	769	486	567	1,093	1,093

Table 5. Stem Count by Plot and Species																
Rough Horn Swamp and Rough Horn Swamp II, DMS Project #97005 and 100053																
Species	Current Plot Data (MY01 2020)															
	Plot R08		Plot R09		Plot R10		Plot R11		Plot R12		Plot R13		Plot R14		Plot R15	
	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
American Sycamore (<i>Platanus occidentalis</i>)			5	5	1	1	3	3	3	3	4	4				
Bald Cypress (<i>Taxodium distichum</i>)	13	13					1	1			2	2	3	3	11	11
Beautyberry (<i>Callicarpa americana</i>)																
Black Willow (<i>Salix nigra</i>)			1	1	39	39			1	1						
Boxelder (<i>Acer negundo</i>)				1												
Buttonbush (<i>Cephalanthus occidentalis</i>)	6	6			1	1							2	2	2	2
Eastern Baccharis (<i>Baccharis halimifolia</i>)																
Eastern Cottonwood (<i>Populus deltoides</i>)																
Laurel Oak (<i>Quercus laurifolia</i>)			2	2	2	2	2	2	2	2	2	2				
Loblolly Pine (<i>Pinus taeda</i>)																
Oak (<i>Quercus sp.</i>)																
Overcup Oak (<i>Quercus lyrata</i>)									1	1	3	3				
Red Chokeberry (<i>Aronia arbutifolia</i>)																
Red Maple (<i>Acer rubrum</i>)		2								3	7	28				1
River Birch (<i>Betula nigra</i>)	1	1	8	8	3	3	3	3	5	5	7	7	2	2	6	6
Silky Dogwood (<i>Cornus amomum</i>)																
Southern Red Oak (<i>Quercus falcata</i>)																
Swamp Bay (<i>Persea palustris</i>)	1	1											1	1	1	1
Swamp Chestnut Oak (<i>Quercus michauxii</i>)			1	1			2	2			1	1	1	1	1	1
Sweetgum (<i>Liquidambar styraciflua</i>)				2				8		4	3	9				5
Water Oak (<i>Quercus nigra</i>)					2	2										
Water Tupelo (<i>Nyssa aquatica</i>)			3	3	2	2	2	2	3	3	1	1	2	2	5	5
Wax Myrtle (<i>Myrica cerifera</i>)																
Unknown																
Stem count	21	23	20	23	50	50	13	21	15	22	20	30	11	48	26	32
size (ares)	1		1		1		1		1		1		1		1	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025	
Species count	4	5	6	8	7	7	6	7	6	8	7	9	6	8	6	8
Stems per ACRE	850	931	809	931	2,023	2,023	526	850	607	890	809	1,214	445	1,942	1,052	1,295

Table 5. Stem Count by Plot and Species						
Rough Horn Swamp and Rough Horn Swamp II, DMS Project #97005 and 100053						
Species	Annual Means					
	Plot R16		MY01 (2020)		MY00 (2020)	
	Planted	Total	Planted	Total	Planted	Total
American Sycamore (<i>Platanus occidentalis</i>)			36	36		
Bald Cypress (<i>Taxodium distichum</i>)	10	10	287	287	254	254
Beautyberry (<i>Callicarpa americana</i>)				1		
Black Willow (<i>Salix nigra</i>)			82	222		1
Boxelder (<i>Acer negundo</i>)				1		
Buttonbush (<i>Cephalanthus occidentalis</i>)	4	4	33	33	2	2
Eastern Baccharis (<i>Baccharis halimifolia</i>)				1		
Eastern Cottonwood (<i>Populus deltoides</i>)				18		
Laurel Oak (<i>Quercus laurifolia</i>)			32	32	47	47
Loblolly Pine (<i>Pinus taeda</i>)						3
Oak (<i>Quercus sp.</i>)					221	221
Overcup Oak (<i>Quercus lyrata</i>)			42	42		
Red Chokeberry (<i>Aronia arbutifolia</i>)			3	3		
Red Maple (<i>Acer rubrum</i>)		7		242		21
River Birch (<i>Betula nigra</i>)	3	3	165	165	156	156
Silky Dogwood (<i>Cornus amomum</i>)			1	1	7	7
Southern Red Oak (<i>Quercus falcata</i>)				1		
Swamp Bay (<i>Persea palustris</i>)	3	3	31	37	33	33
Swamp Chestnut Oak (<i>Quercus michauxii</i>)			76	76	9	9
Sweetgum (<i>Liquidambar styraciflua</i>)		2		670		3
Water Oak (<i>Quercus nigra</i>)			8	8		
Water Tupelo (<i>Nyssa aquatica</i>)	2	2	54	54		
Wax Mrytle (<i>Myrica cerifera</i>)				3		
Unknown					166	166
Stem count	22	31	850	1933	895	923
size (ares)	1		41		41	
size (ACRES)	0.025		1.01		1.01	
Species count	5	7	13	21	9	13
Stems per ACRE	890	1,255	839	1,908	883	911

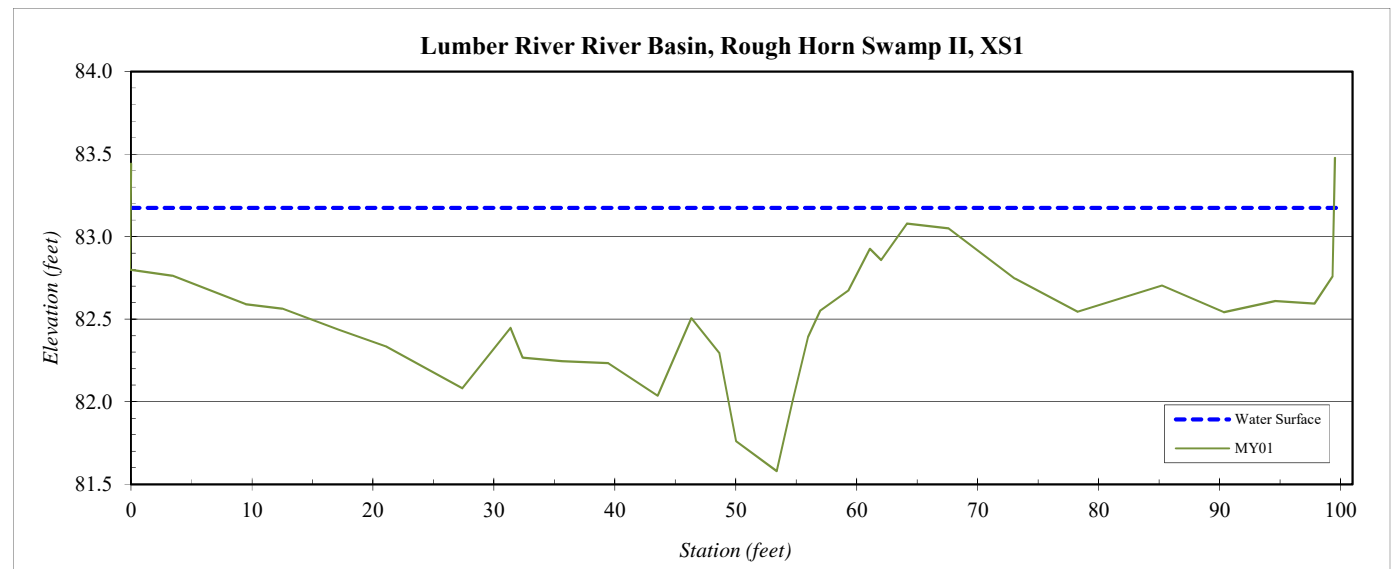
APPENDIX D

Stream Cross-section Data

River Basin:	Lumber River
Site:	Rough Horn Swamp II
XS ID	XS1
Drainage Area (sq mi):	1.50
Date:	8/12/2020
Field Crew:	T. Seelinger, A. Gutierrez



Station	Elevation
0.0	83.4
-0.1	82.8
3.4	82.8
9.5	82.6
12.5	82.6
17.2	82.4
21.1	82.3
27.4	82.1
31.4	82.4
32.4	82.3
35.7	82.2
39.5	82.2
43.5	82.0
46.3	82.5
48.7	82.3
50.0	81.8
53.4	81.6
54.7	82.0
56.0	82.4
57.0	82.6
59.3	82.7
61.1	82.9
62.0	82.9
64.2	83.1
67.6	83.1
73.1	82.7
78.3	82.5
85.2	82.7
90.4	82.5
94.6	82.6
97.9	82.6
99.4	82.8
99.5	83.5

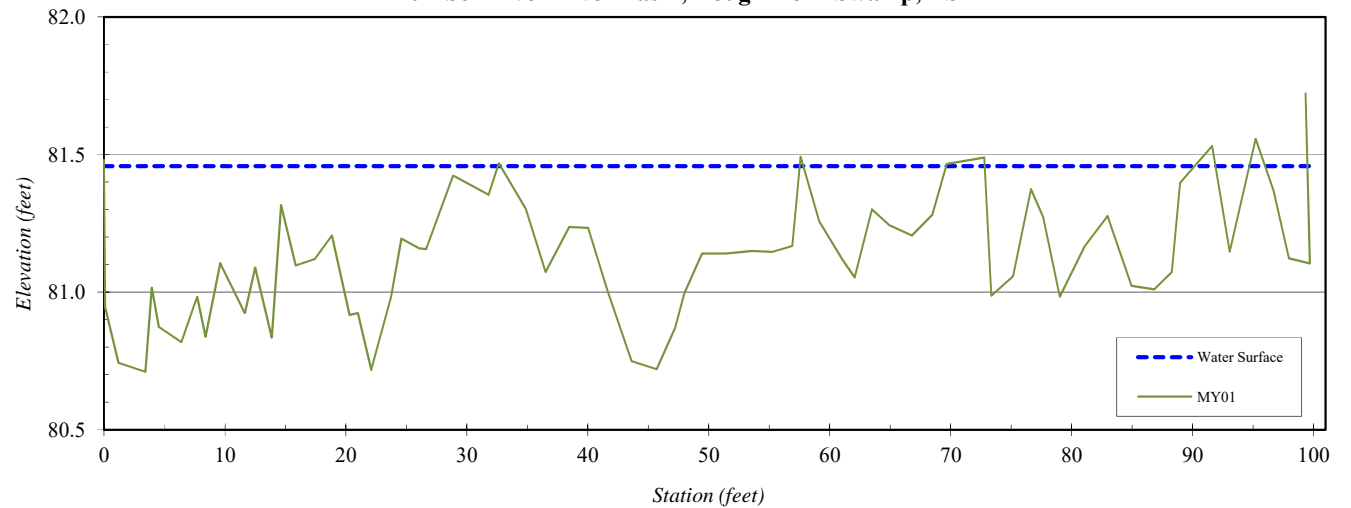


River Basin:	Lumber River
Site:	Rough Horn Swamp
XS ID	XS2
Drainage Area (sq mi):	1.60
Date:	8/12/2020
Field Crew:	T. Seelinger, A. Gutierrez



Station	Elevation	Station	Elevation
0.0	81.5	49.5	81.1
0.1	80.9	51.4	81.1
1.2	80.7	53.6	81.2
3.4	80.7	55.3	81.1
3.9	81.0	56.9	81.2
4.5	80.9	57.6	81.5
6.4	80.8	59.1	81.3
7.7	81.0	61.0	81.1
8.4	80.8	62.1	81.1
9.6	81.1	63.5	81.3
11.7	80.9	65.0	81.2
12.5	81.1	66.8	81.2
13.9	80.8	68.5	81.3
14.6	81.3	69.7	81.5
15.9	81.1	72.8	81.5
17.4	81.1	73.4	81.0
18.8	81.2	75.2	81.1
20.3	80.9	76.6	81.4
21.0	80.9	77.7	81.3
22.1	80.7	79.0	81.0
23.7	81.0	81.1	81.2
24.6	81.2	83.0	81.3
26.1	81.2	84.9	81.0
26.6	81.2	86.8	81.0
28.9	81.4	88.3	81.1
31.8	81.4	89.0	81.4
32.6	81.5	91.6	81.5
34.9	81.3	93.1	81.1
36.5	81.1	95.2	81.6
38.5	81.2	96.7	81.4
40.0	81.2	98.0	81.1
41.7	81.0	99.7	81.1
43.6	80.7	99.3	81.7
45.7	80.7		
47.2	80.9		
48.0	81.0		

Lumber River River Basin, Rough Horn Swamp, XS2

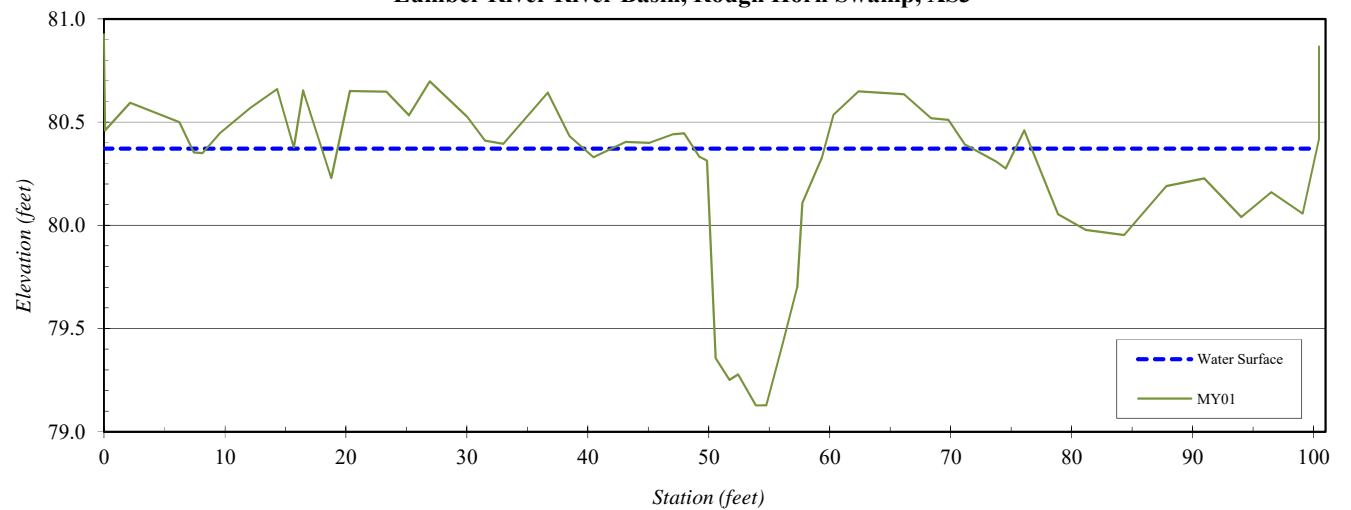


River Basin:	Lumber River
Site:	Rough Horn Swamp
XS ID	XS3
Drainage Area (sq mi):	2.80
Date:	8/12/2020
Field Crew:	T. Seelinger, A. Gutierrez



Station	Elevation	Station	Elevation
0.0	80.9	59.4	80.3
0.1	80.5	60.3	80.5
2.1	80.6	62.4	80.7
6.3	80.5	66.2	80.6
7.4	80.4	68.4	80.5
8.1	80.4	69.8	80.5
9.6	80.4	71.2	80.4
12.1	80.6	73.8	80.3
14.3	80.7	74.6	80.3
15.7	80.4	76.1	80.5
16.5	80.7	78.9	80.1
18.8	80.2	81.1	80.0
20.3	80.7	84.3	80.0
23.3	80.6	87.8	80.2
25.2	80.5	91.0	80.2
26.9	80.7	94.0	80.0
30.0	80.5	96.5	80.2
31.5	80.4	99.1	80.1
33.0	80.4	100.5	80.4
36.7	80.6	100.5	80.9
38.5	80.4		
40.5	80.3		
43.2	80.4		
45.1	80.4		
47.1	80.4		
48.0	80.4		
49.2	80.3		
49.9	80.3		
50.6	79.4		
51.7	79.3		
52.4	79.3		
53.9	79.1		
54.8	79.1		
56.1	79.4		
57.3	79.7		
57.7	80.1		

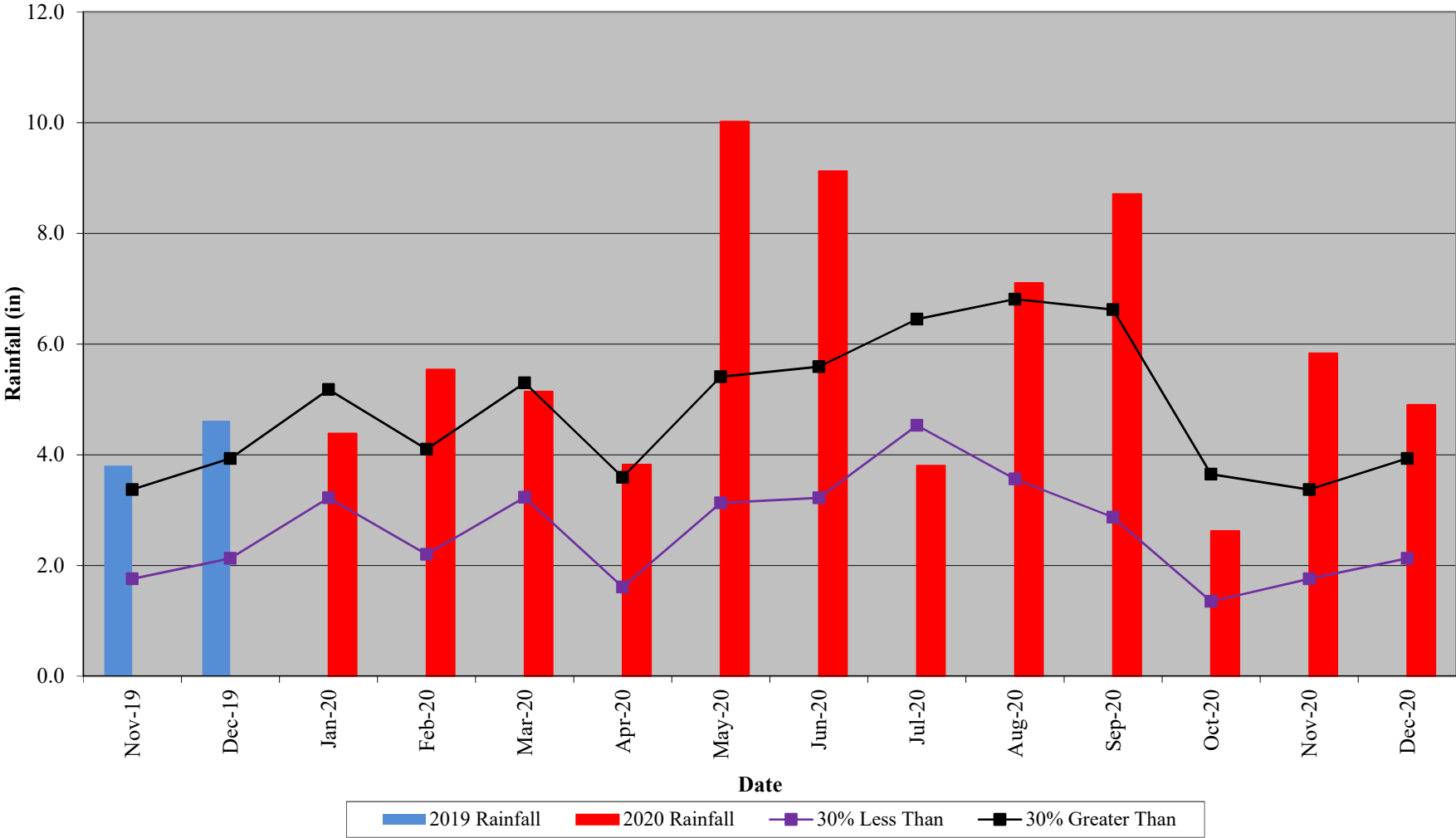
Lumber River River Basin, Rough Horn Swamp, XS3



APPENDIX E

Hydrologic Data

**Rough Horn Swamp Restoration Site
30-70 Percentile Graph
WETS Station Name: Whiteville 7**



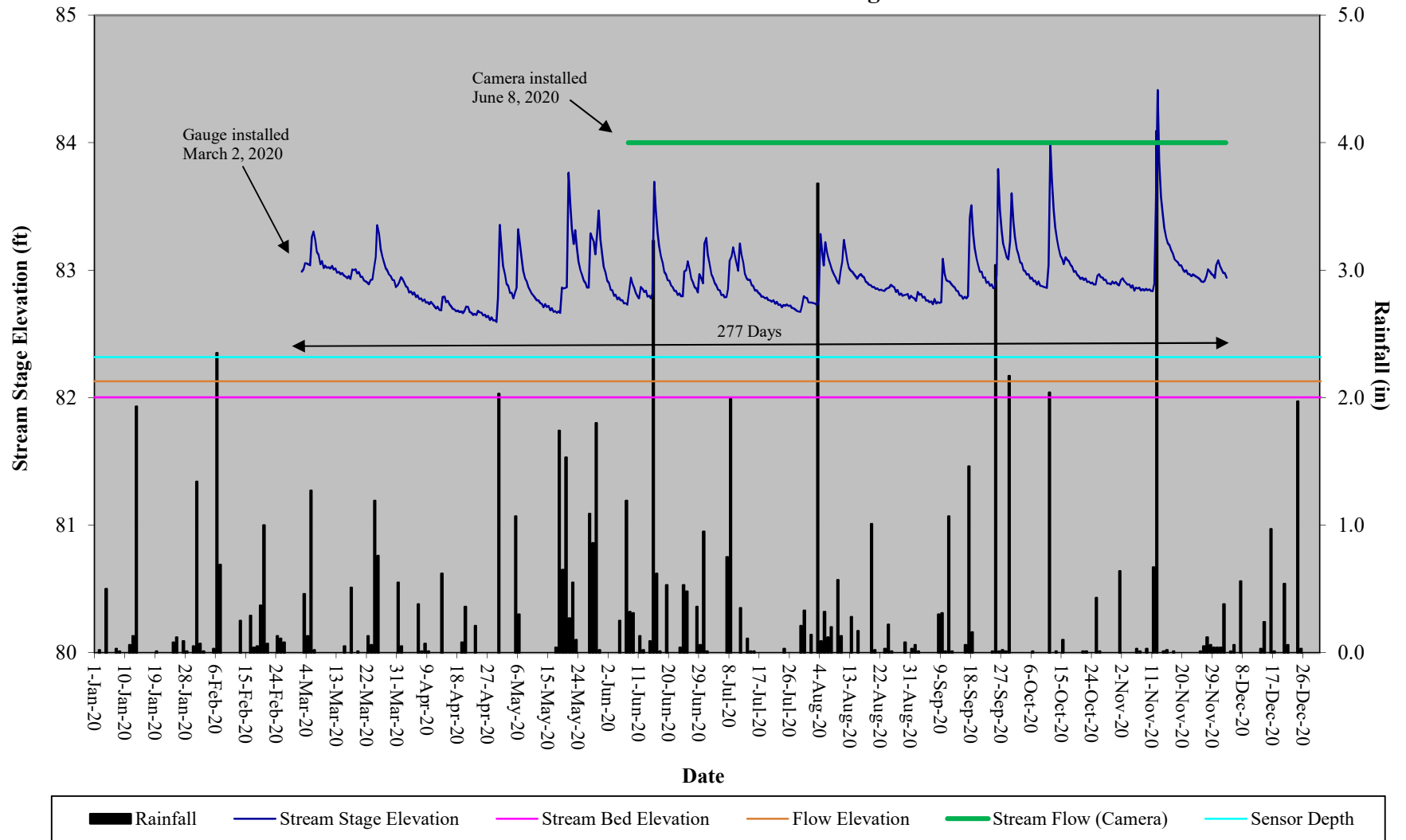
**Table 6. Stream Flow Verification
Rough Horn Swamp and Rough Horn Swamp II Restoration Site,
DMS Project #97005/100053**

	Gauge		Camera	
Reach	Dates Achieving	Maximum Consecutive Days	Dates Achieving	Maximum Consecutive Days
LBC	March 2 – December 3	277	June 8 – December 3	179
UT1	September 24 – December 3	71	September 24 – December 3	71
UT2-2	September 24 – December 3	71	September 24 – December 3	71
UT3-2	September 24 – December 3	71	September 17 – December 3	78
UT4	September 24 – December 3	71	September 24 – December 3	71

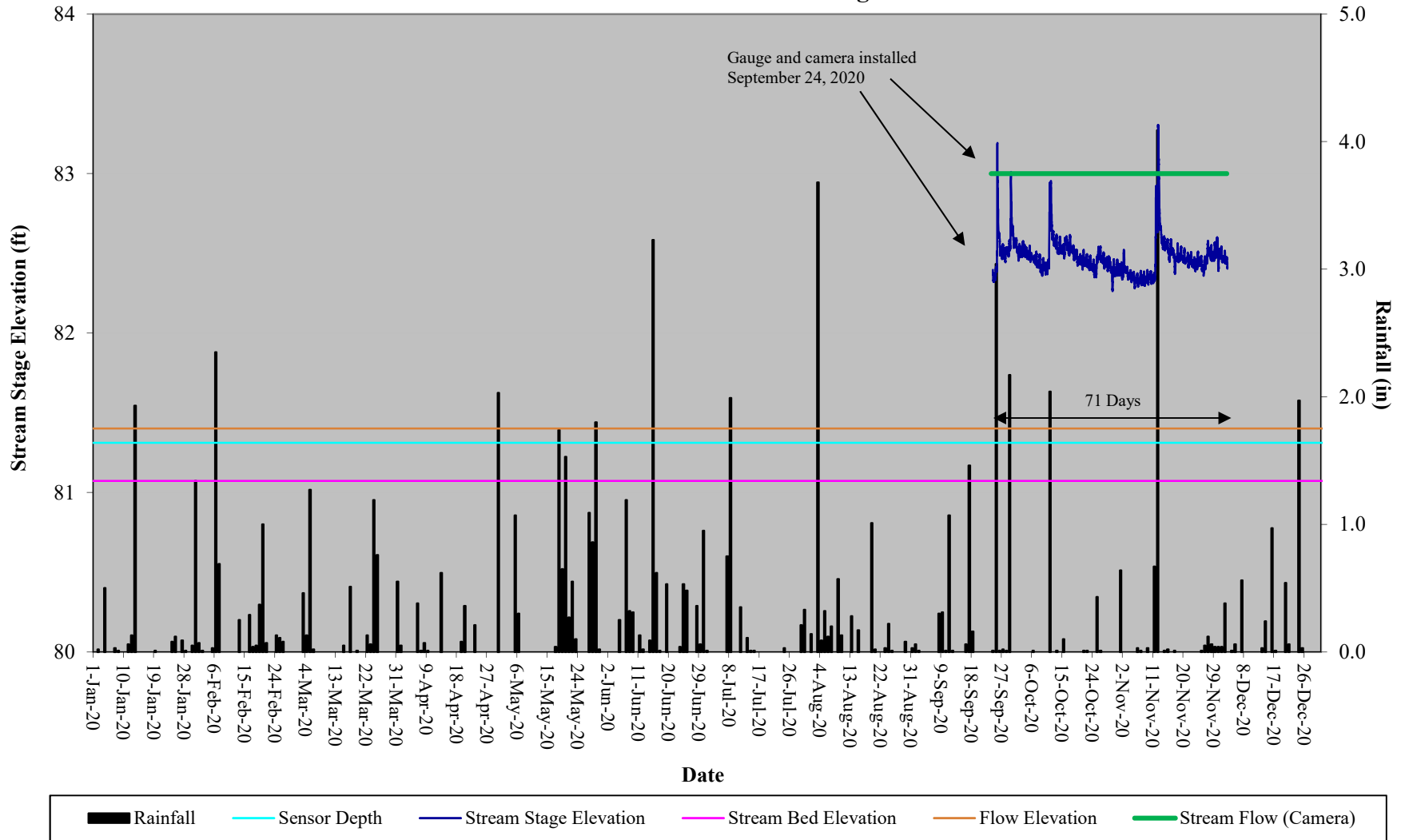
**Table 7. Stream Flow Criteria Attainment
Rough Horn Swamp and Rough Horn Swamp II Restoration Site,
DMS Project #97005/100053**

	Greater than 30 Days of Flow/Max Consecutive Days						
Reach	MY-01 2020	MY-02 2021	MY-03 2022	MY-04 2023	MY-05 2024	MY-06 2025	MY-07 2026
LBC (Gauge)	Yes/277						
LBC (Camera)	Yes/179						
UT1 (Gauge)	Yes/71						
UT1 (Camera)	Yes/71						
UT2-2 (Gauge)	Yes/71						
UT2-2 (Camera)	Yes/71						
UT3-2 (Gauge)	Yes/71						
UT3-2 (Camera)	Yes/78						
UT4 (Gauge)	Yes/71						
UT4 (Camera)	Yes/71						

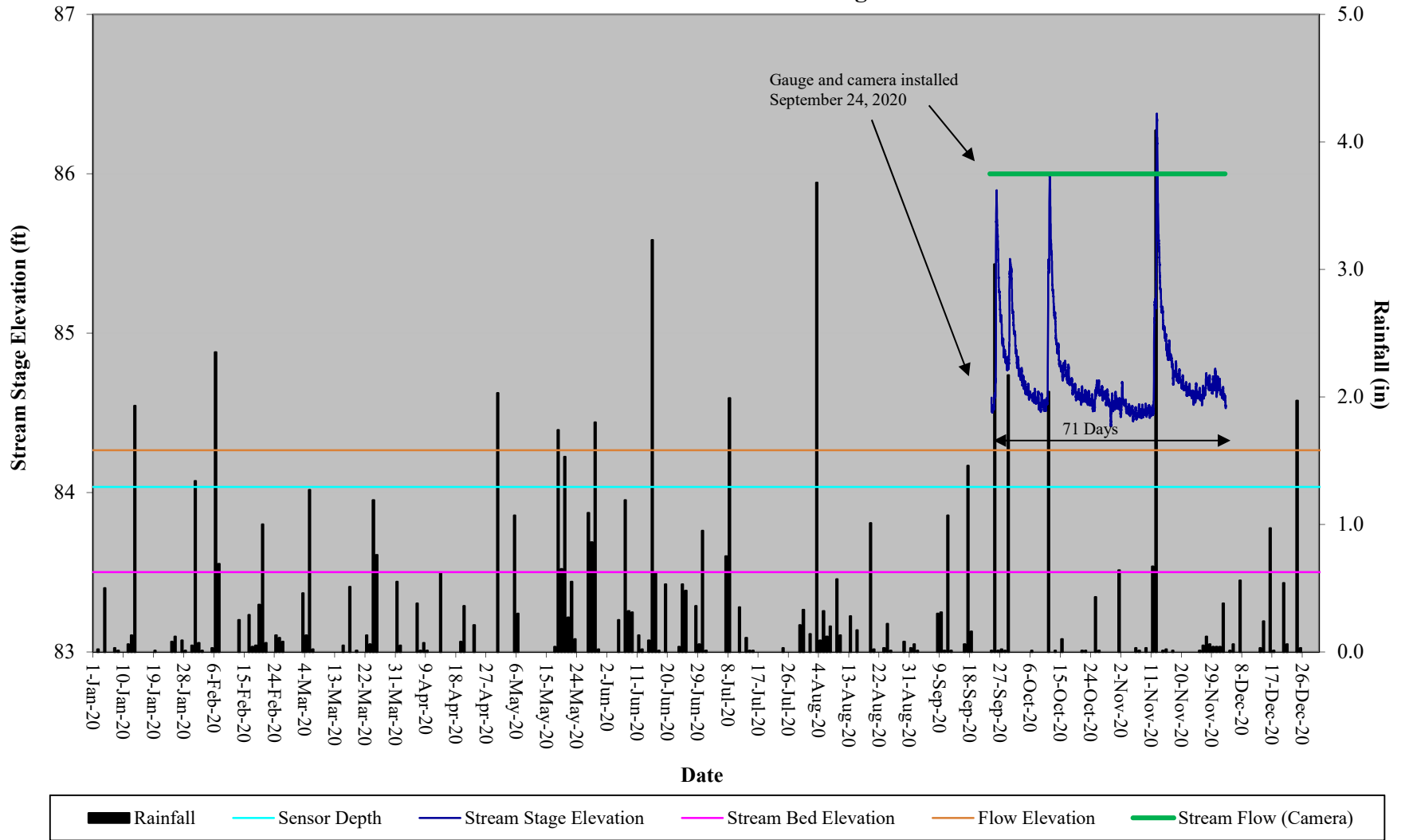
Rough Horn Swamp Restoration Site Hydrograph LBC Stream Flow Gauge



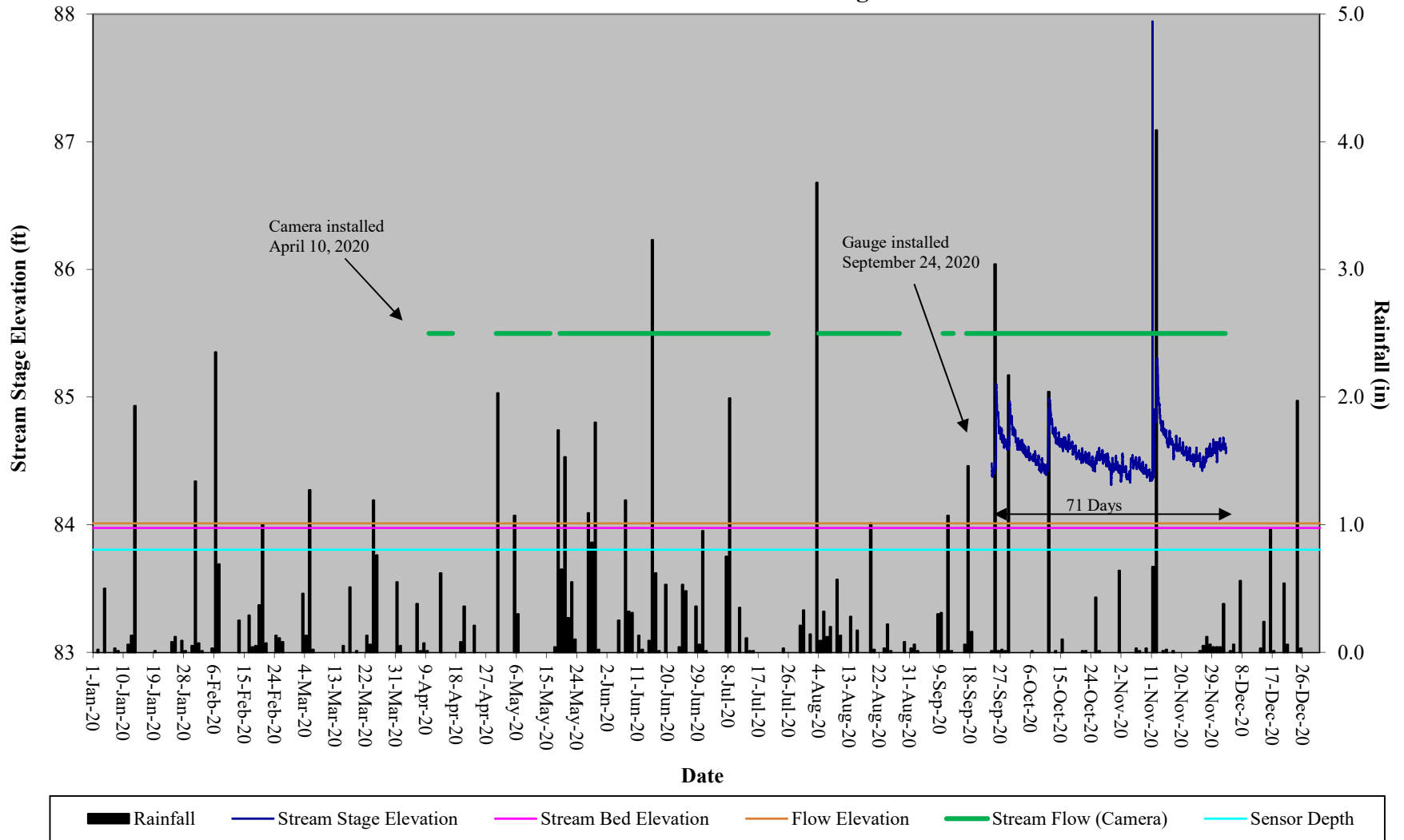
Rough Horn Swamp Restoration Site Hydrograph T1 Stream Flow Gauge



Rough Horn Swamp Restoration Site Hydrograph T2 Stream Flow Gauge



Rough Horn Swamp Restoration Site Hydrograph T3 Stream Flow Gauge



Rough Horn Swamp Restoration Site Hydrograph T4 Stream Flow Gauge

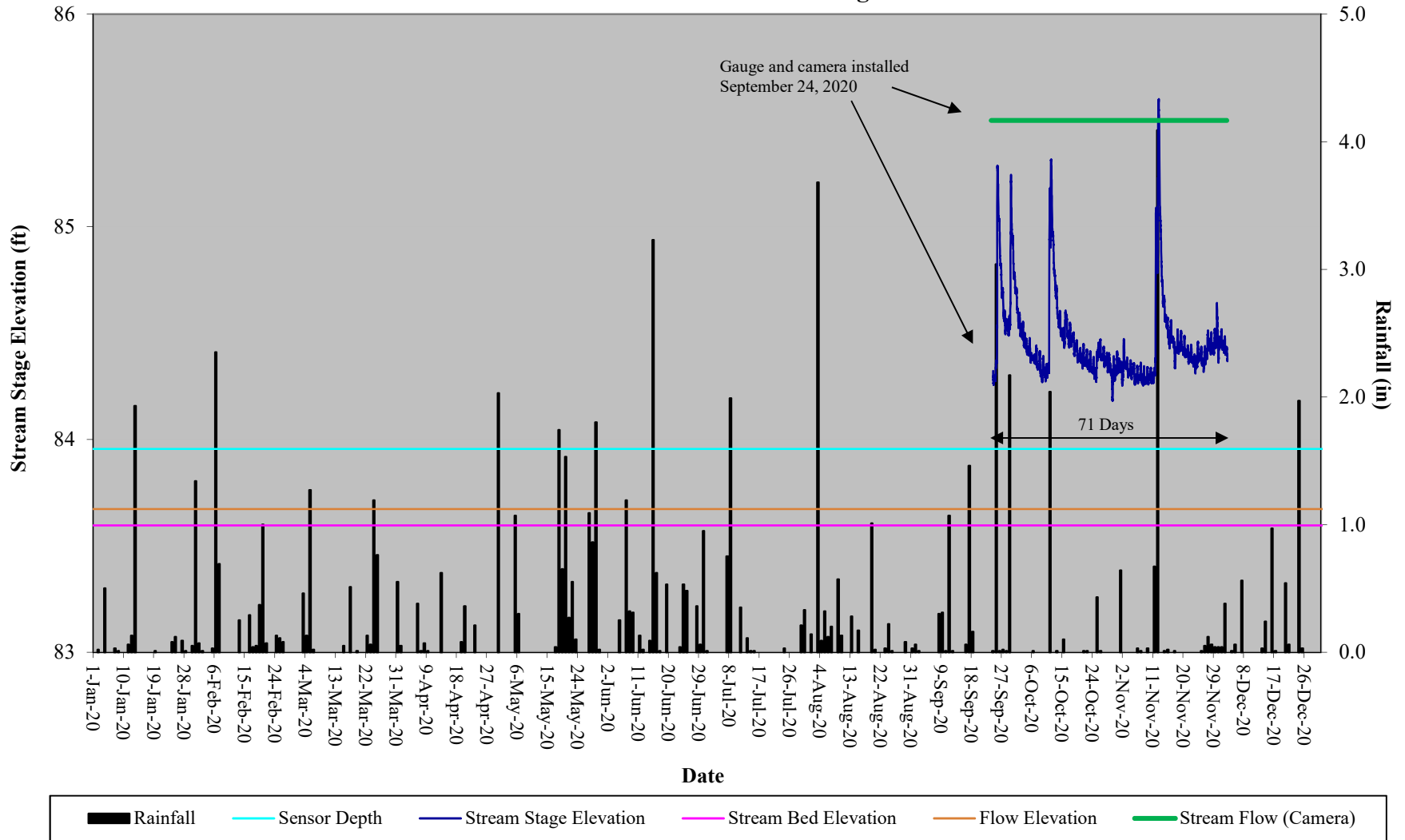
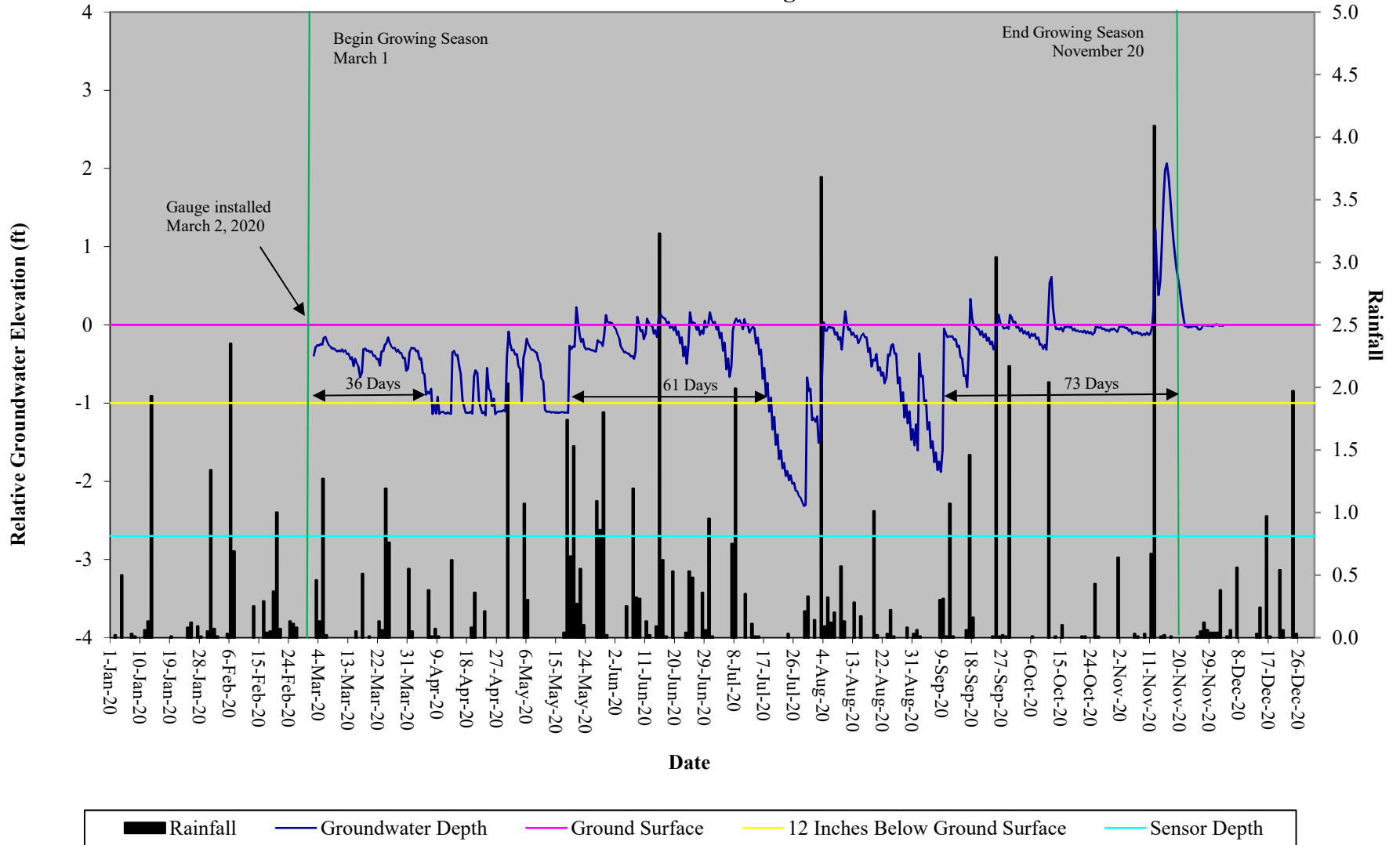


Table 8. Wetland Hydrology Criteria Attainment Table

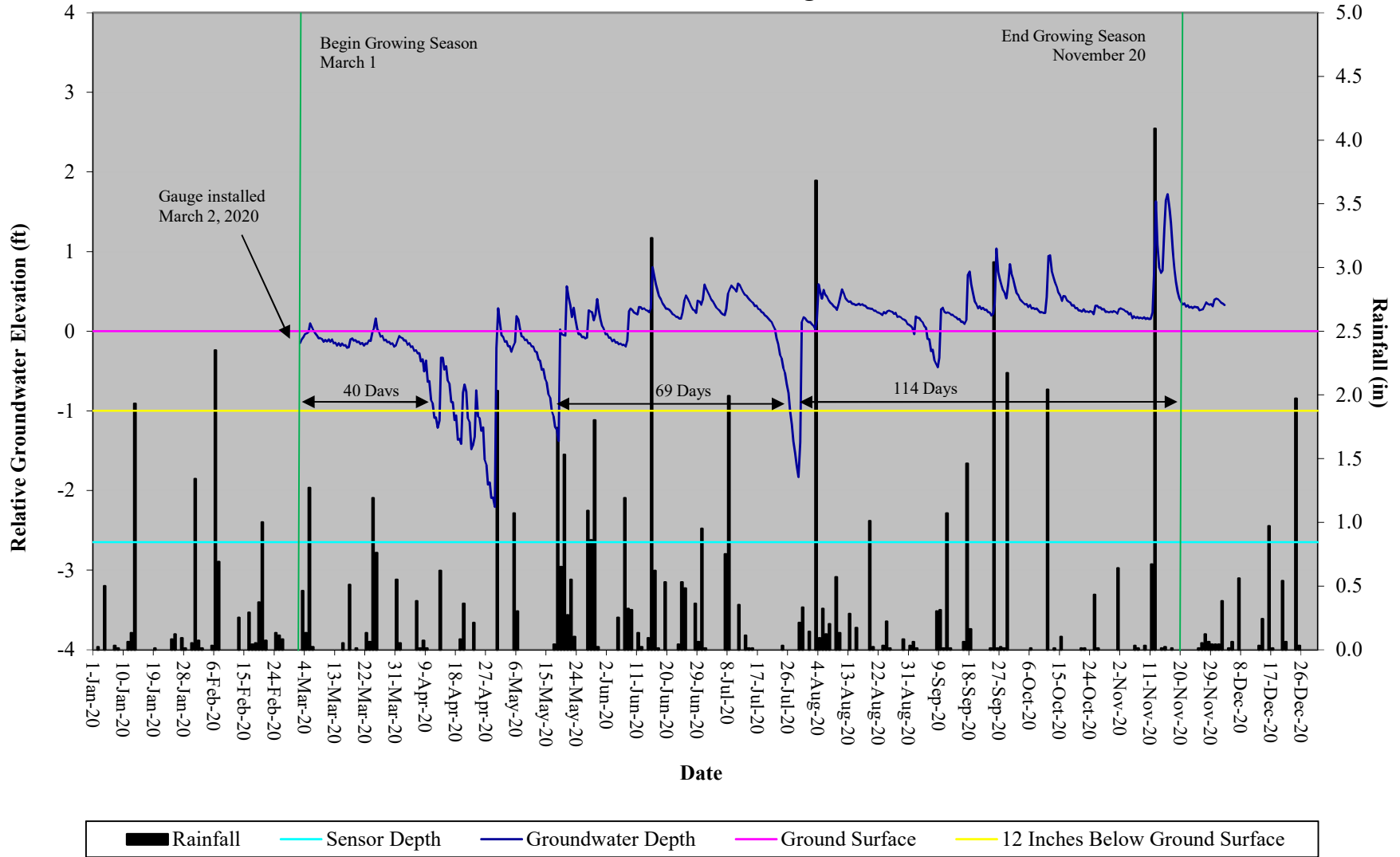
Rough Horn Swamp and Rough Horn Swamp II Restoration Site, Project #97005/100053

Success Criteria (32 Days) (12.0%)	Success Criteria Achieved / Max Consecutive Days During Growing Season (Percentage)						
	MY-01 2020	MY-02	MY-03	MY-04	MY-05	MY-06	MY-07
Gauge RHS-1	Yes/73 (27.5%)						
Gauge RHS-2	Yes/114 (43.0%)						
Gauge RHS-3	Yes/65 (24.5%)						
Gauge RHS-4	Yes/73 (27.5%)						
Gauge RHS-5	Yes/73 (27.5%)						
Gauge RHS-6	Yes/115 (43.4%)						
Gauge RHS-7	Yes/83 (31.3%)						
Gauge RHS-8	Yes/73 (27.5%)						
Gauge RHS-9	Yes/65 (24.5%)						
Gauge RHS-10	Yes/73 (27.5%)						
Gauge RHS-11	Yes/41 (15.5%)						
Gauge RHS-12	No/21 (7.9%)						
Gauge RHS-13	Yes/65 (24.5%)						
Gauge RHSII-1	Yes/73 (27.5%)						
Gauge RHSII-2	Yes/73 (27.5%)						
Gauge RHSII-3	Yes/65 (24.5%)						
Gauge RHSII-4	Yes/264 (99.6%)						
Gauge RHSII-5	Yes/264 (99.6%)						
Gauge RHSII-6	Yes/37 (14.0%)						
Gauge RHSII-7	Yes/33 (12.5%)						
Gauge RHSII-8	Yes/73 (27.5%)						
Gauge Ref	Yes/53 (20.0%)						

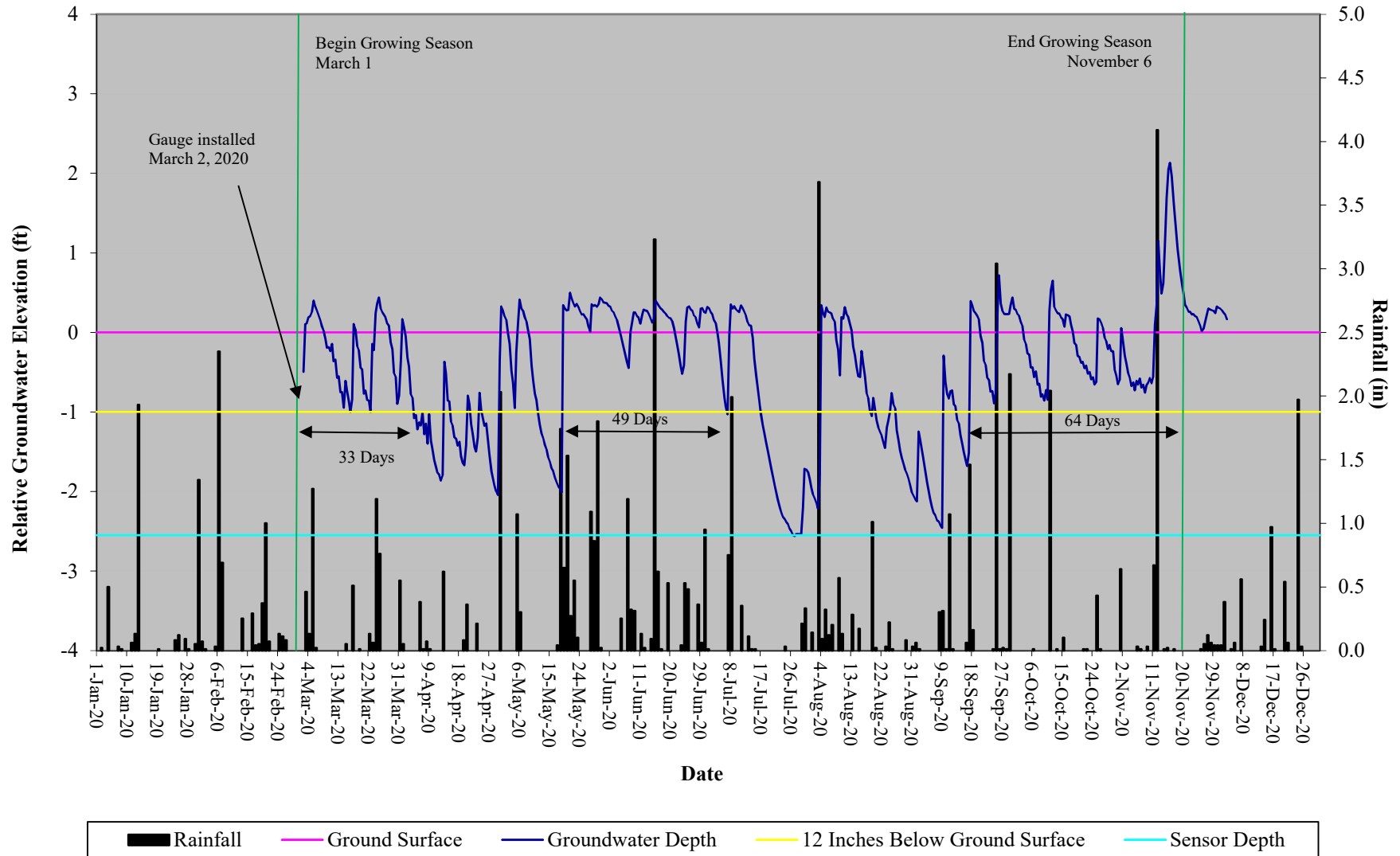
Rough Horn Swamp Restoration Site Hydrograph Wetland Gauge 1



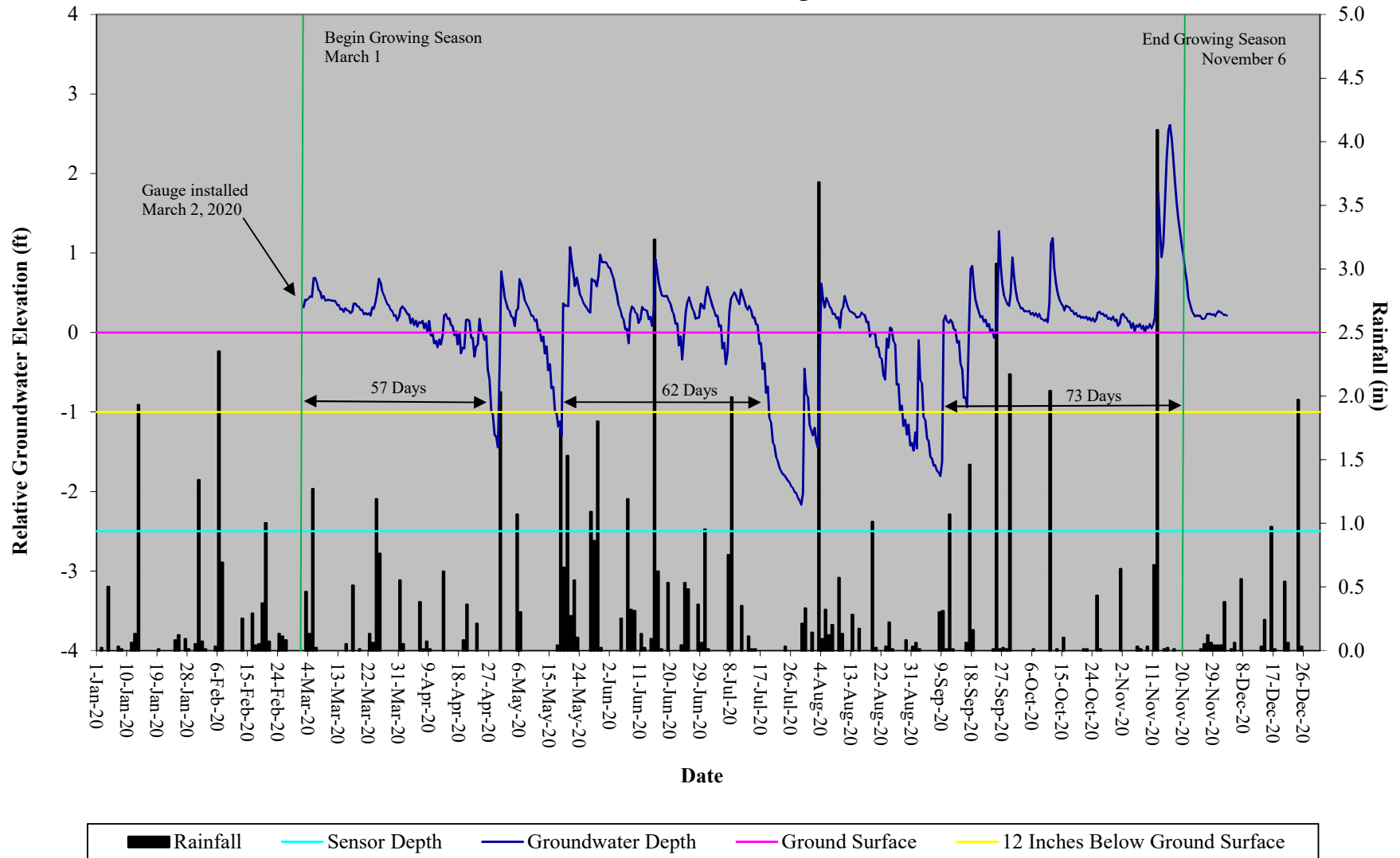
Rough Horn Swamp Restoration Site Hydrograph Wetland Gauge 2



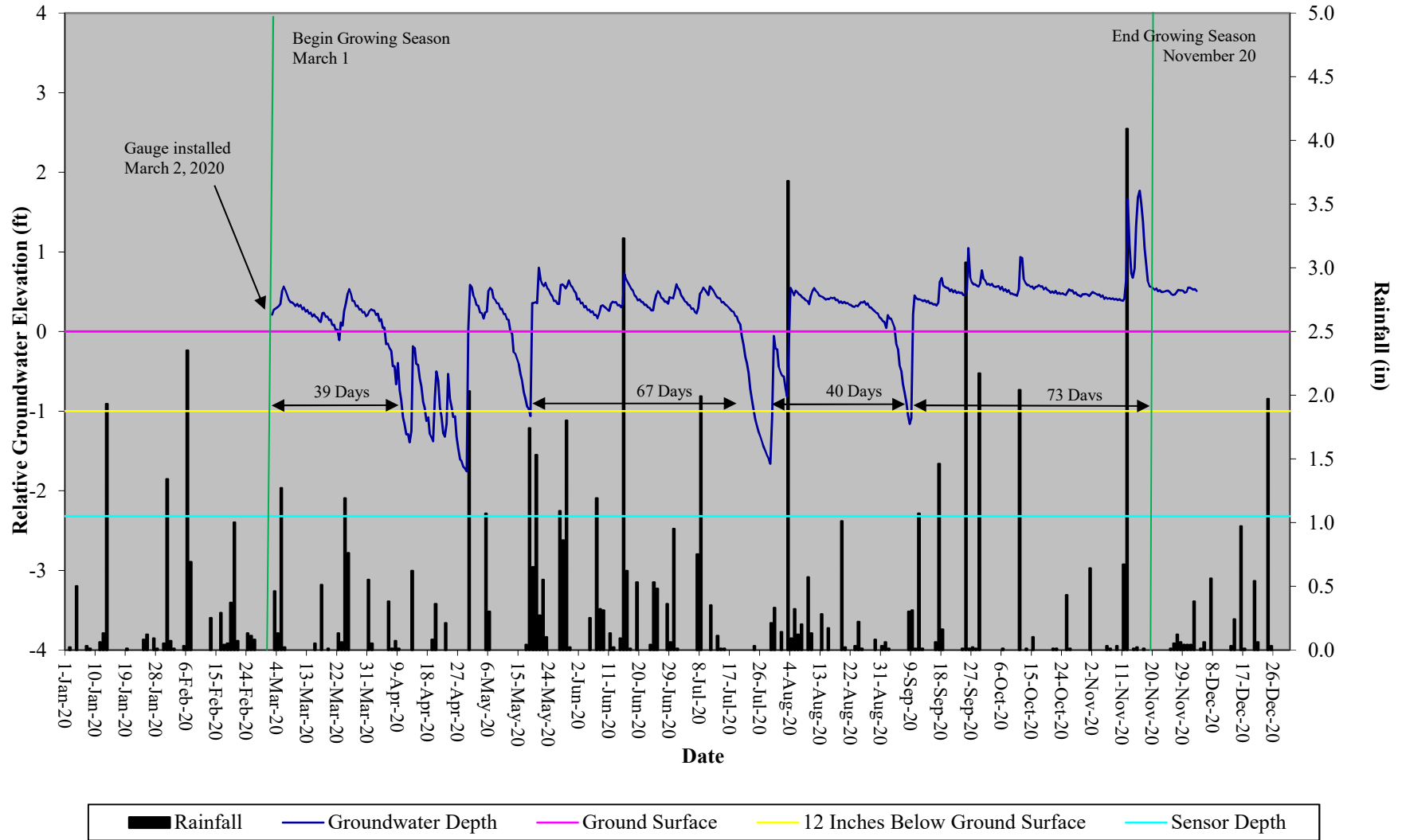
Rough Horn Swamp Restoration Site Hydrograph Wetland Gauge 3



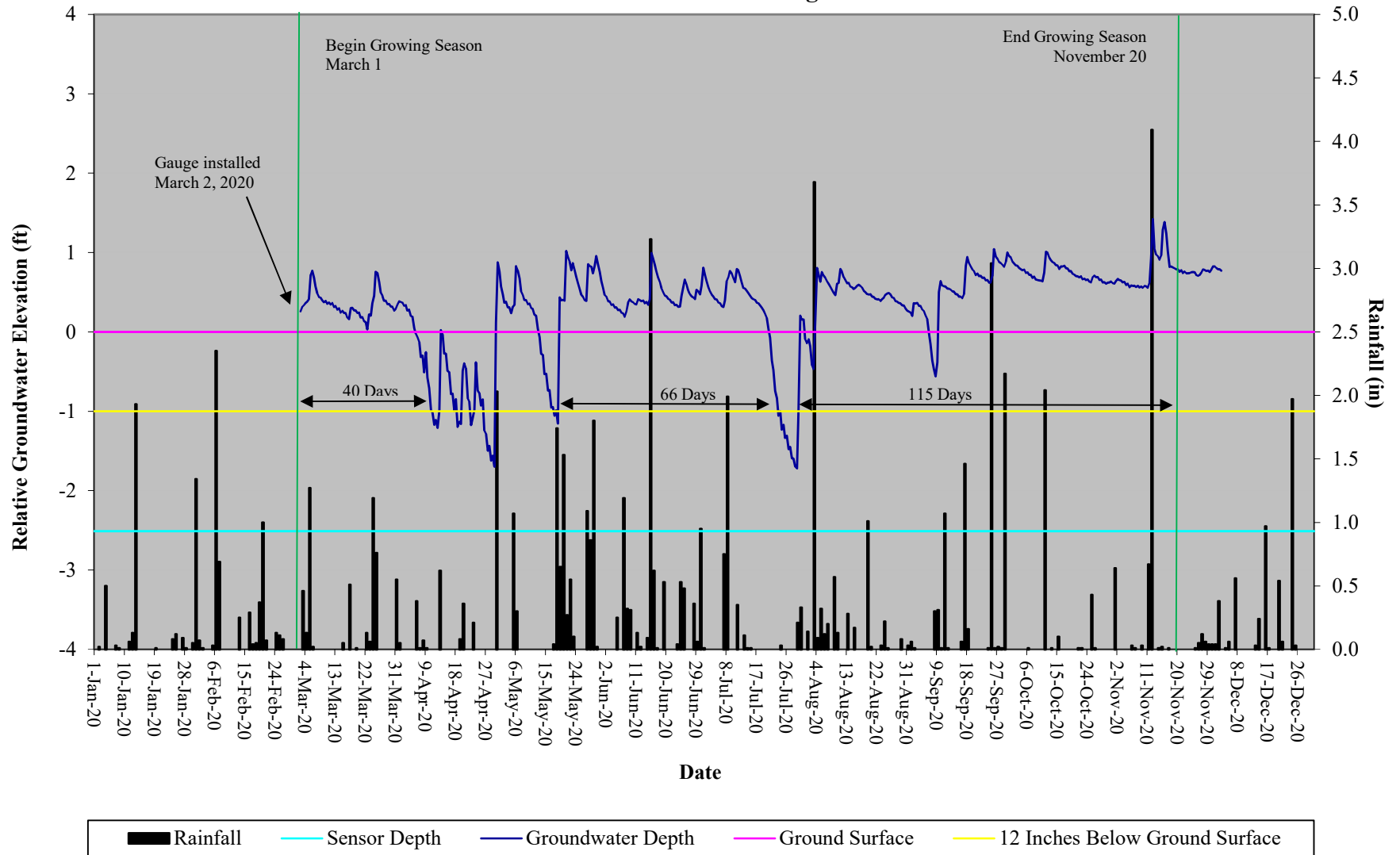
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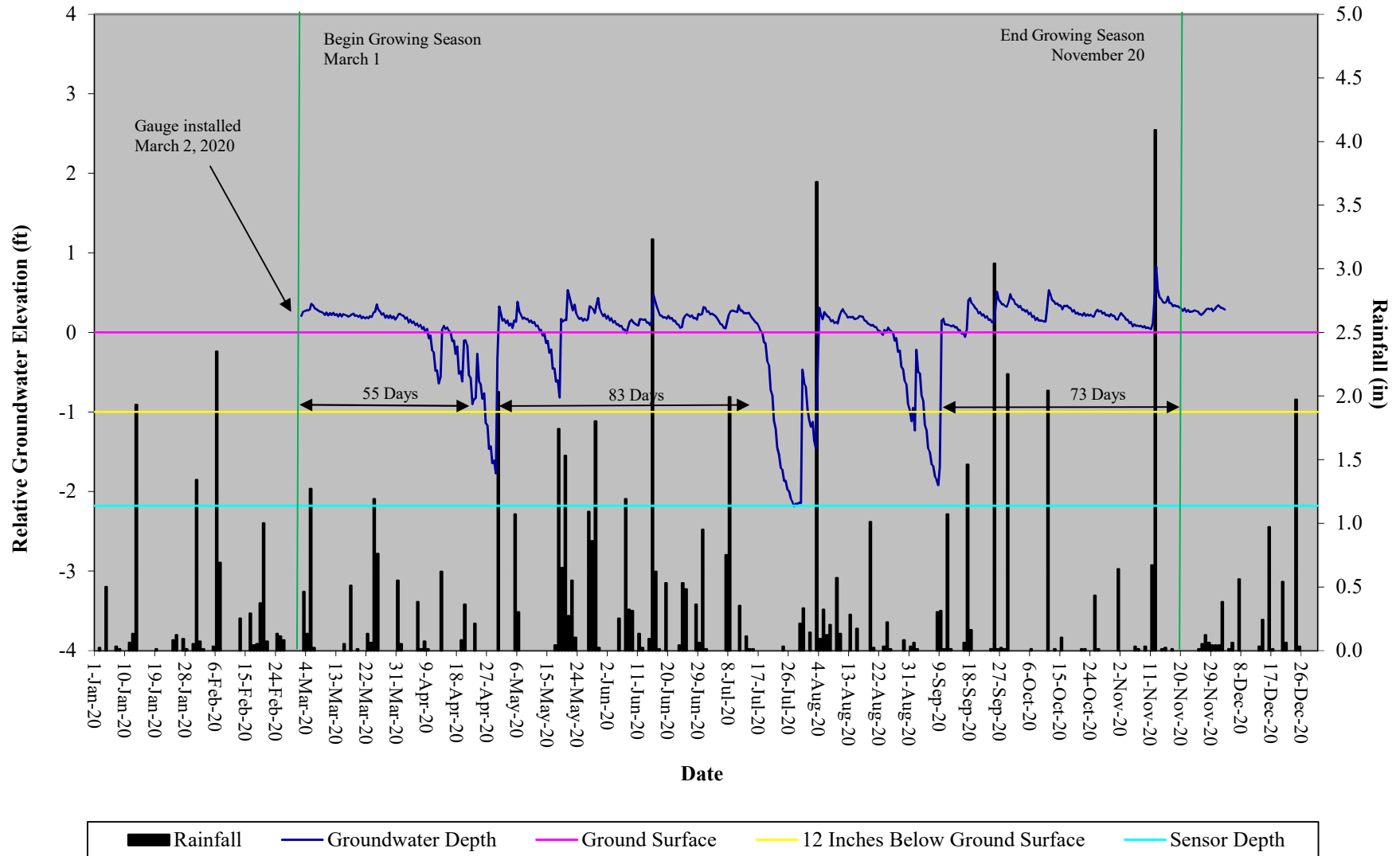
Rough Horn Swamp Restoration Site Hydrograph Wetland Gauge 5



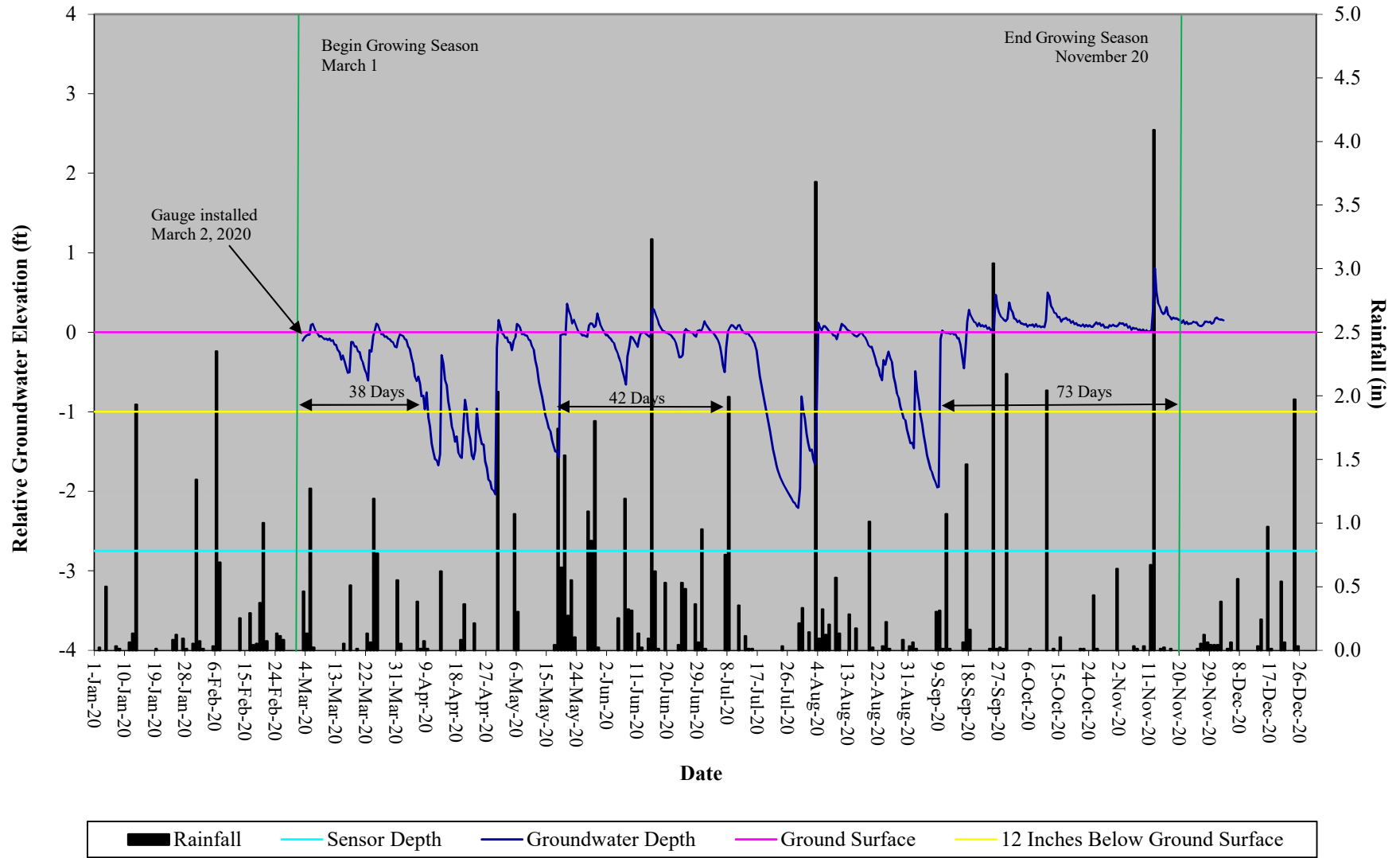
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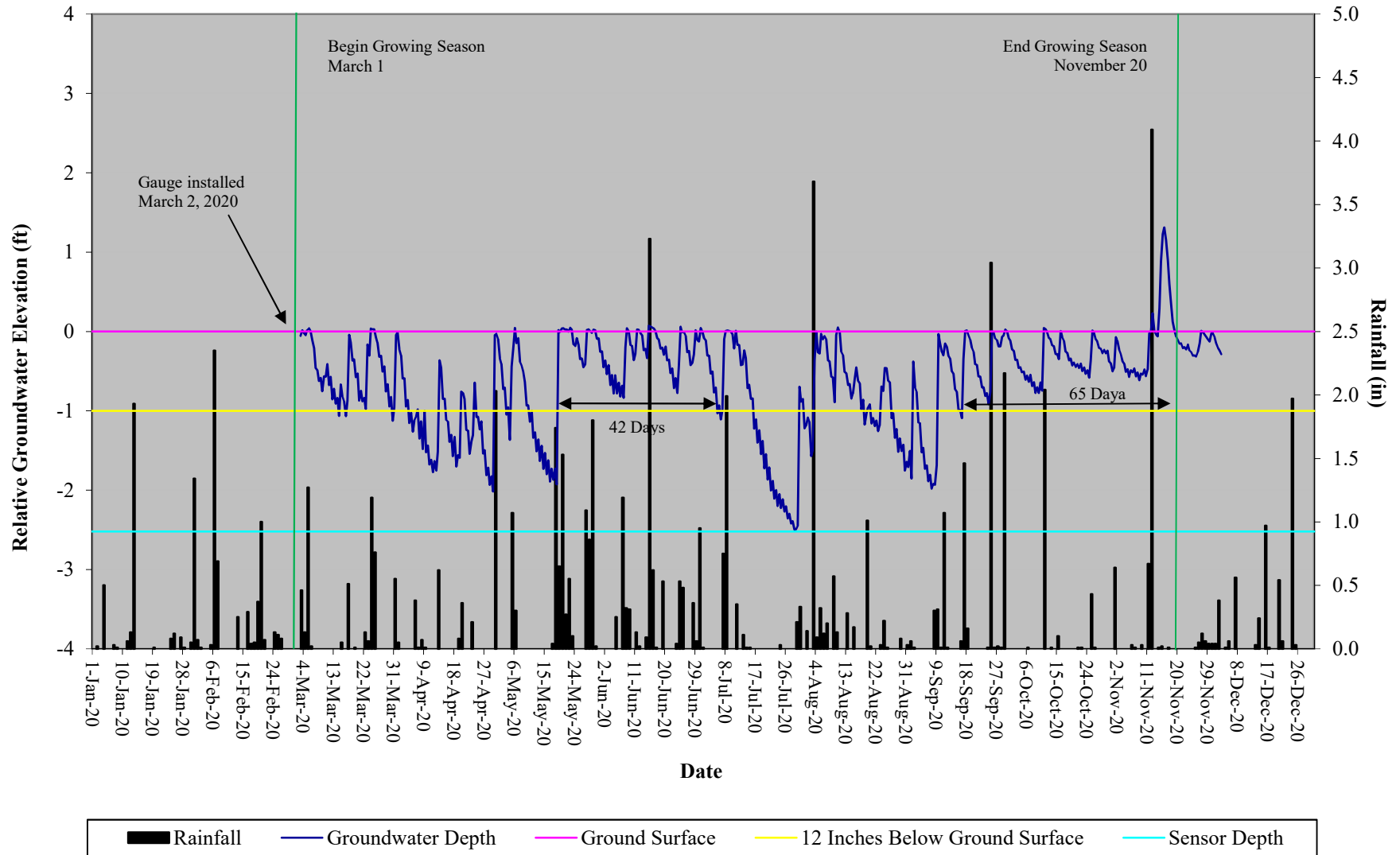
Rough Horn Swamp Restoration Site Hydrograph Wetland Gauge 7



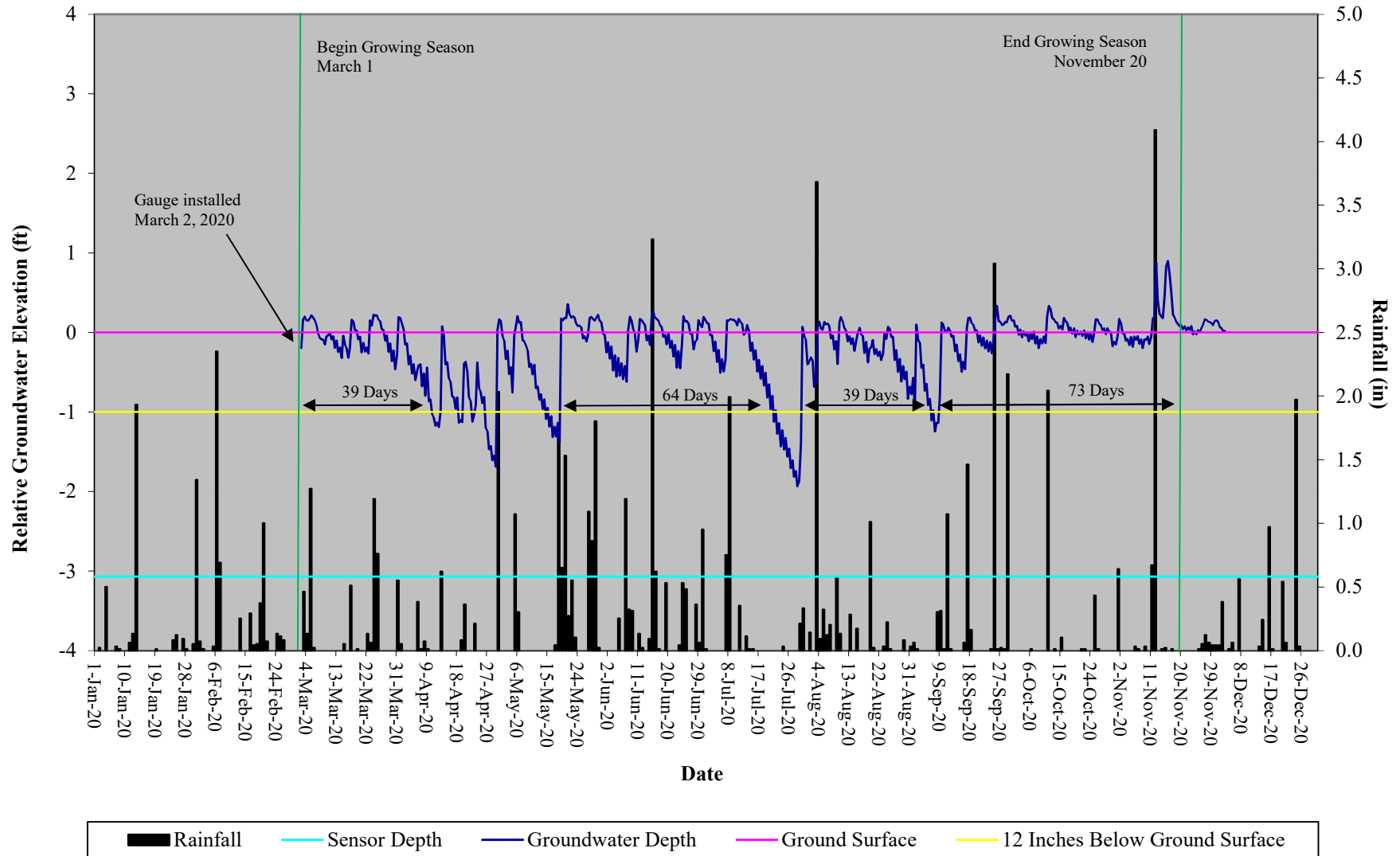
Rough Horn Swamp Restoration Site Hydrograph Wetland Gauge 8



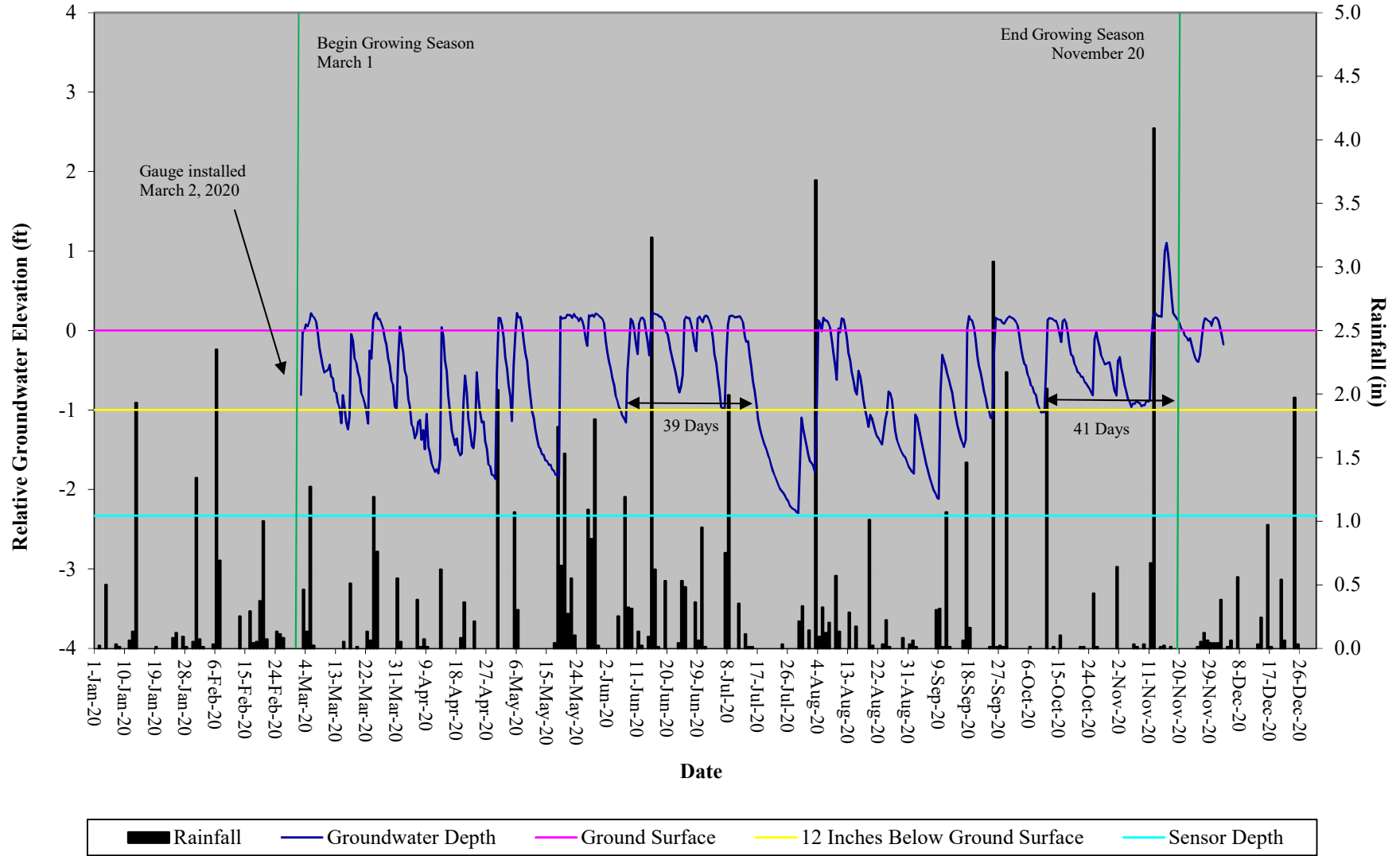
Rough Horn Swamp Restoration Site Hydrograph Wetland Gauge 9



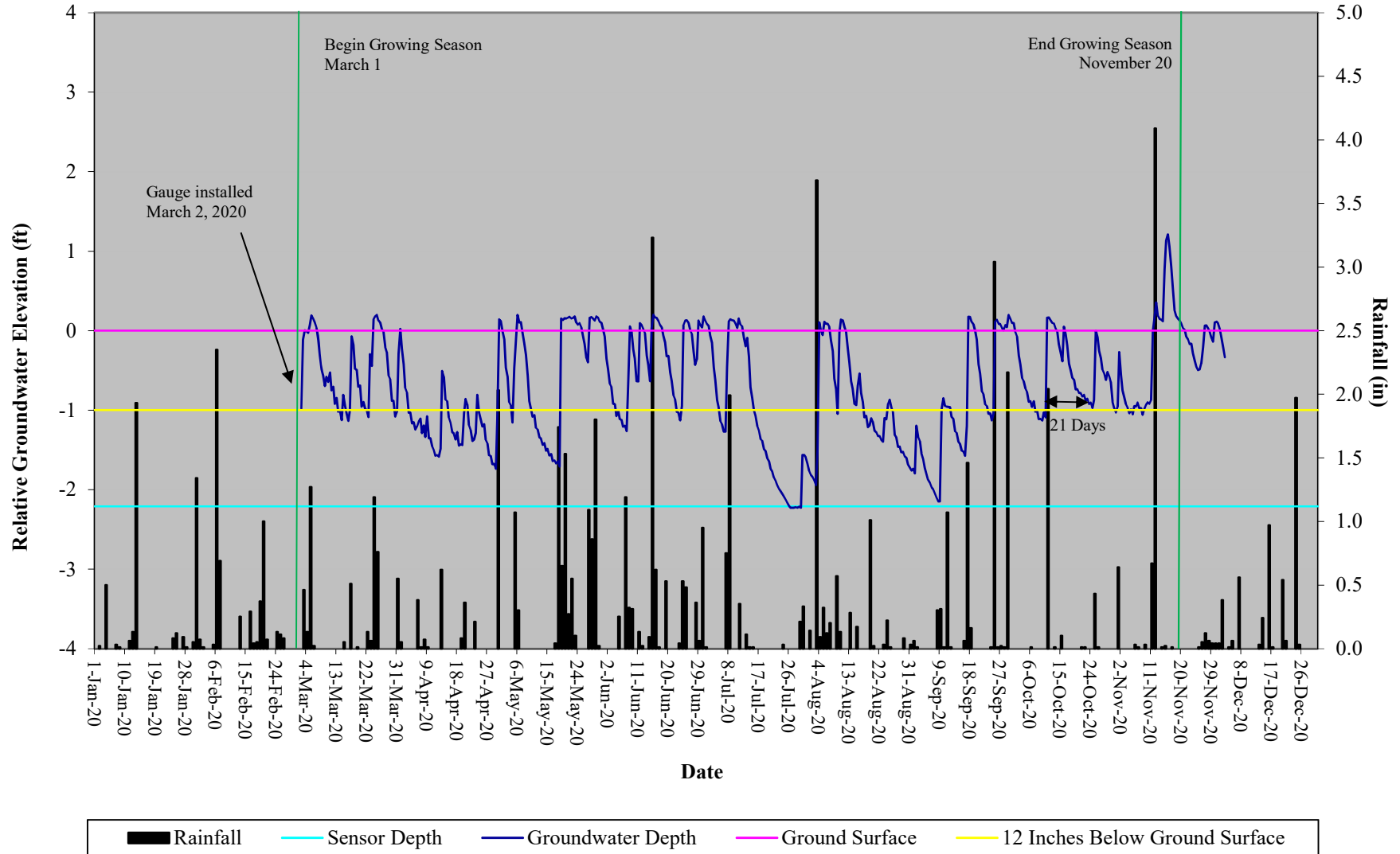
Rough Horn Swamp Restoration Site Hydrograph Wetland Gauge 10



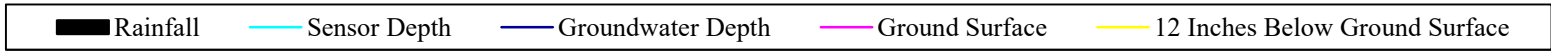
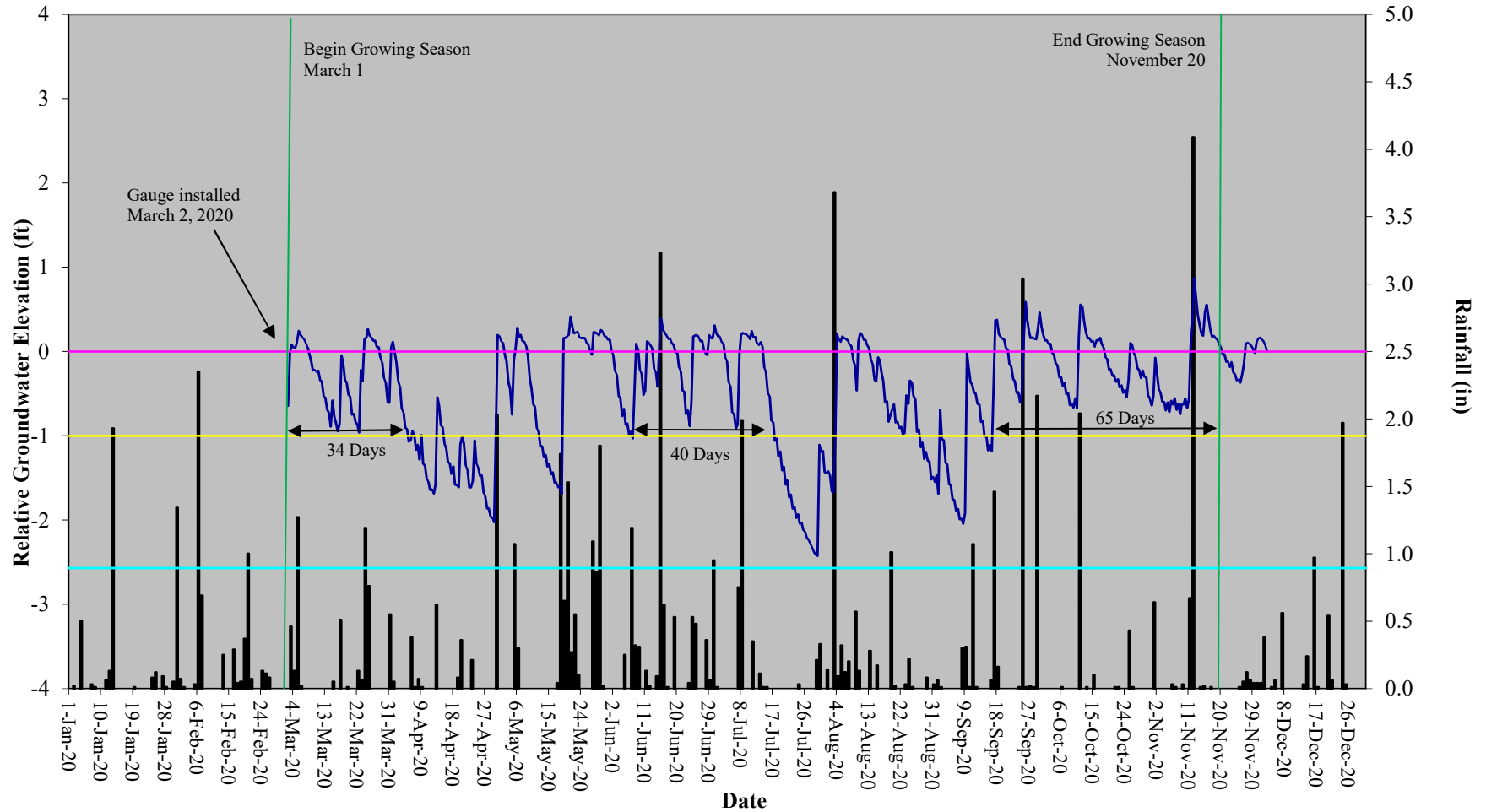
Rough Horn Swamp Restoration Site Hydrograph Wetland Gauge 11



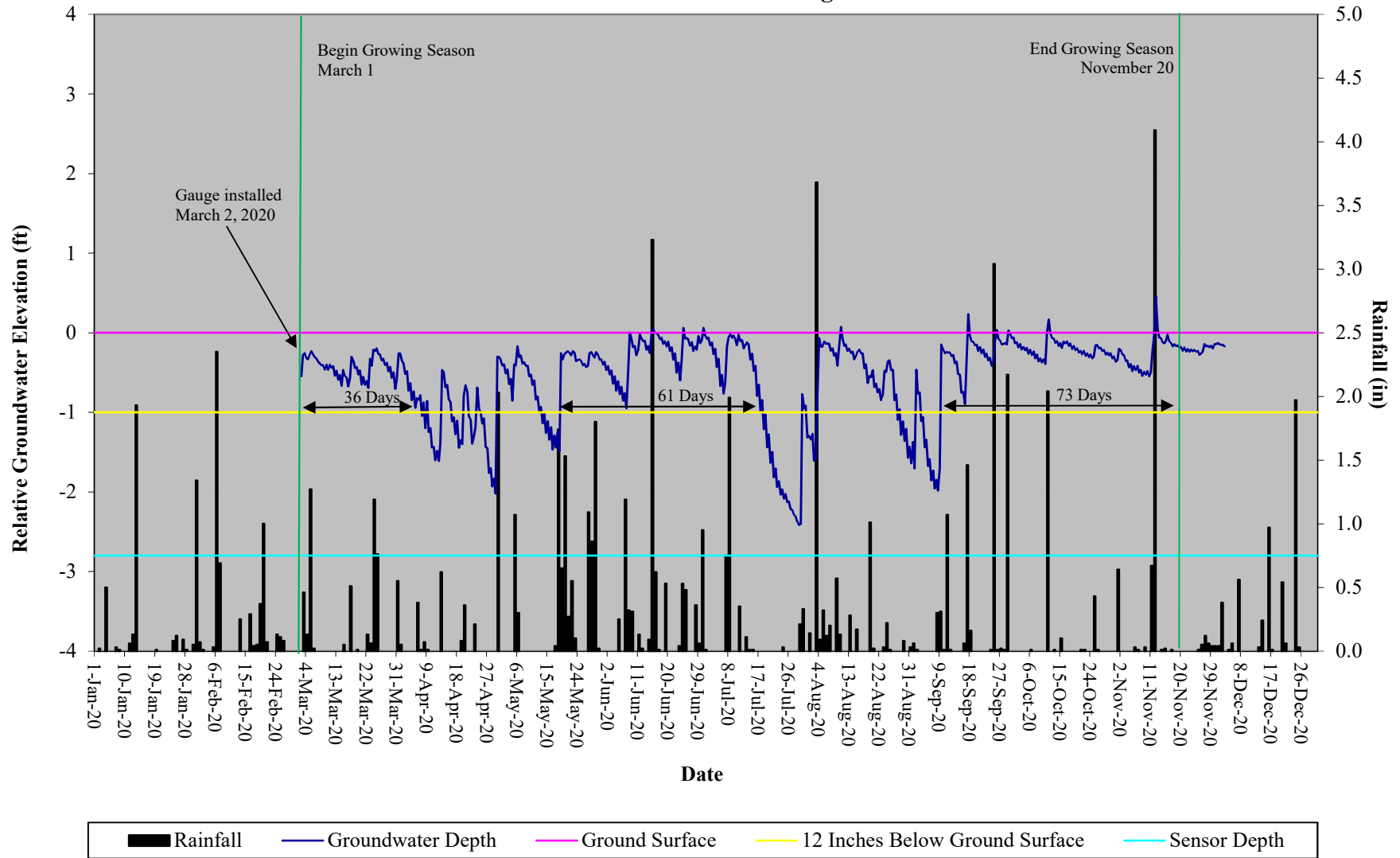
Rough Horn Swamp Restoration Site Hydrograph Wetland Gauge 12



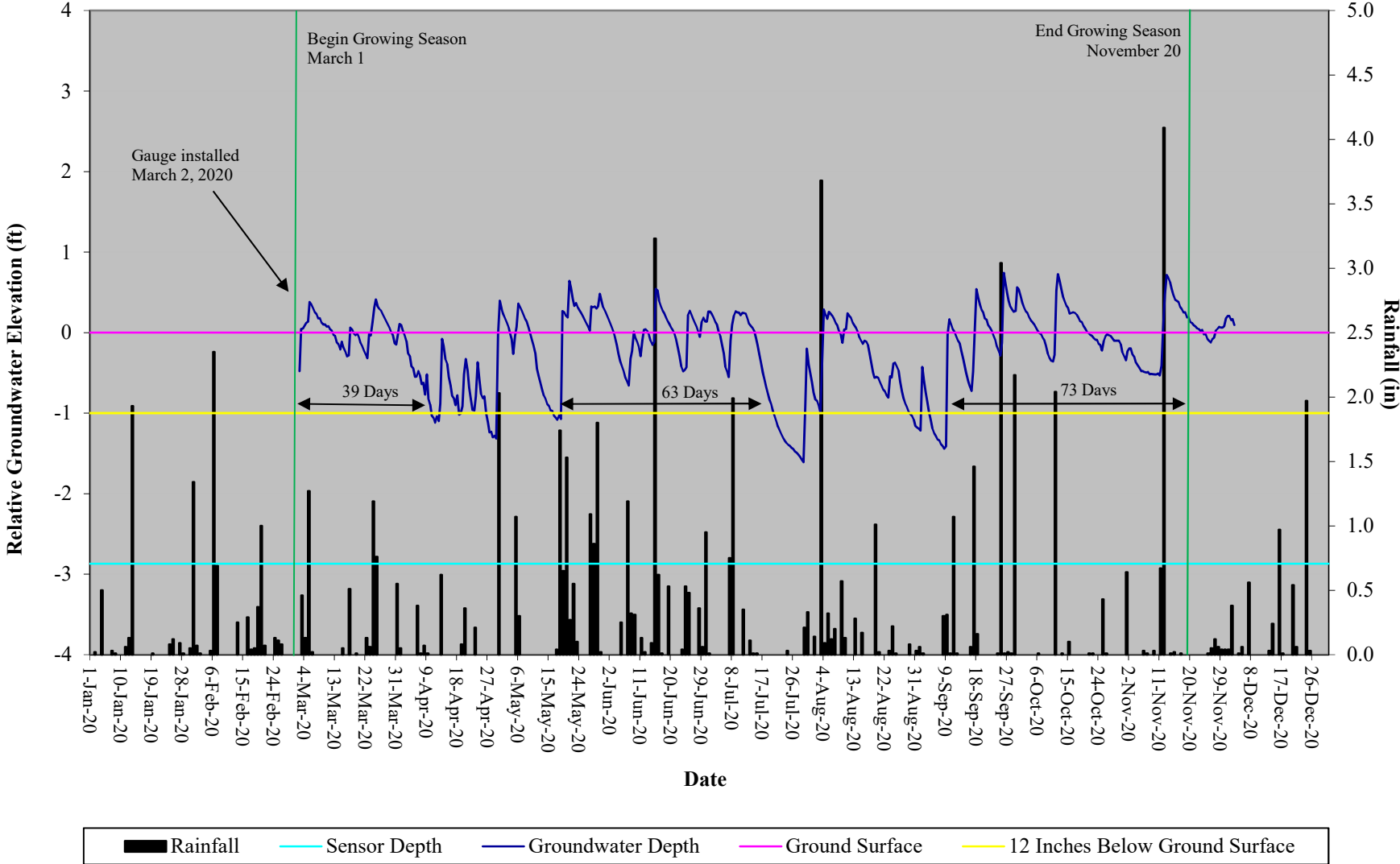
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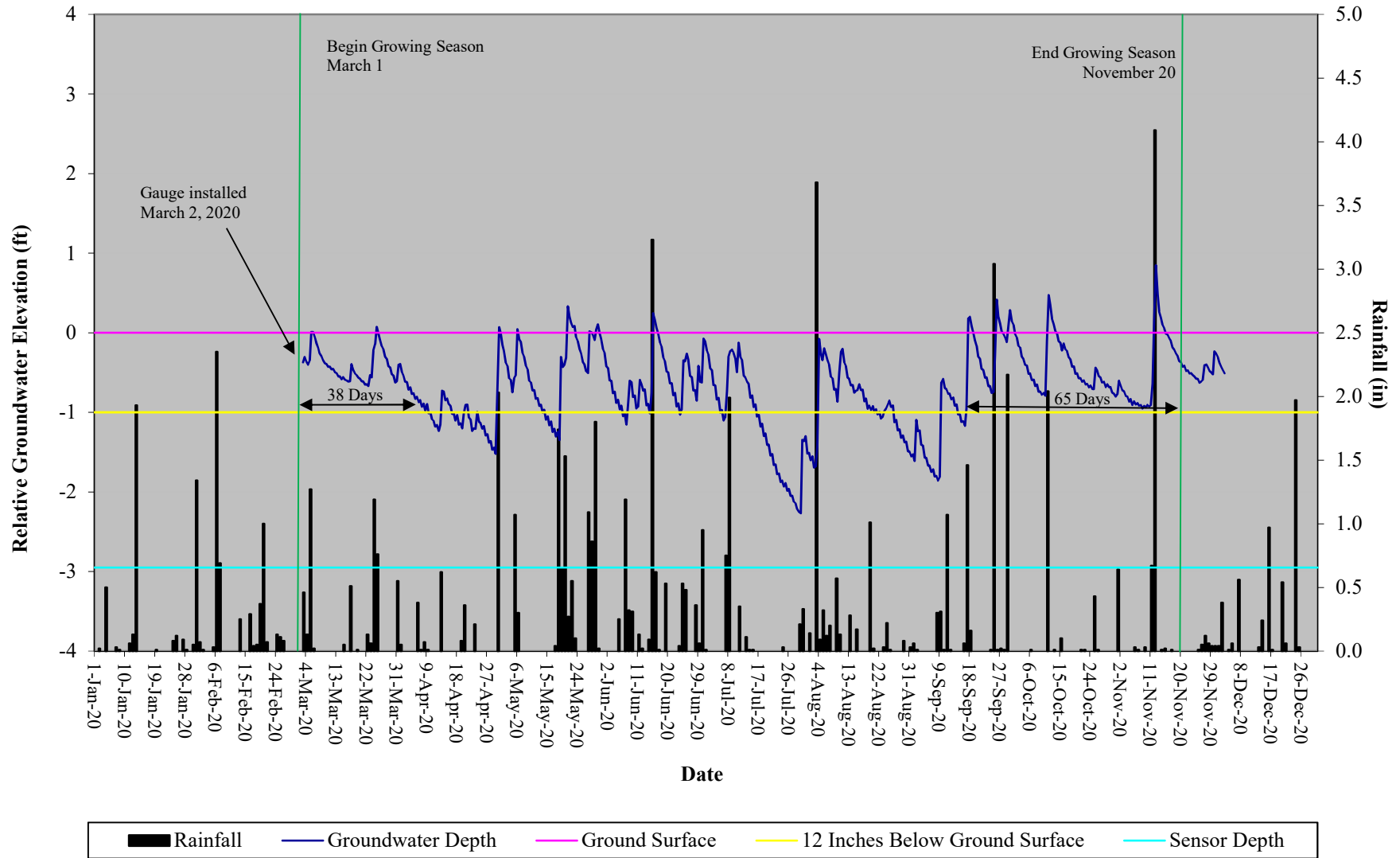
Rough Horn Swamp II Restoration Site Hydrograph Wetland Gauge 1



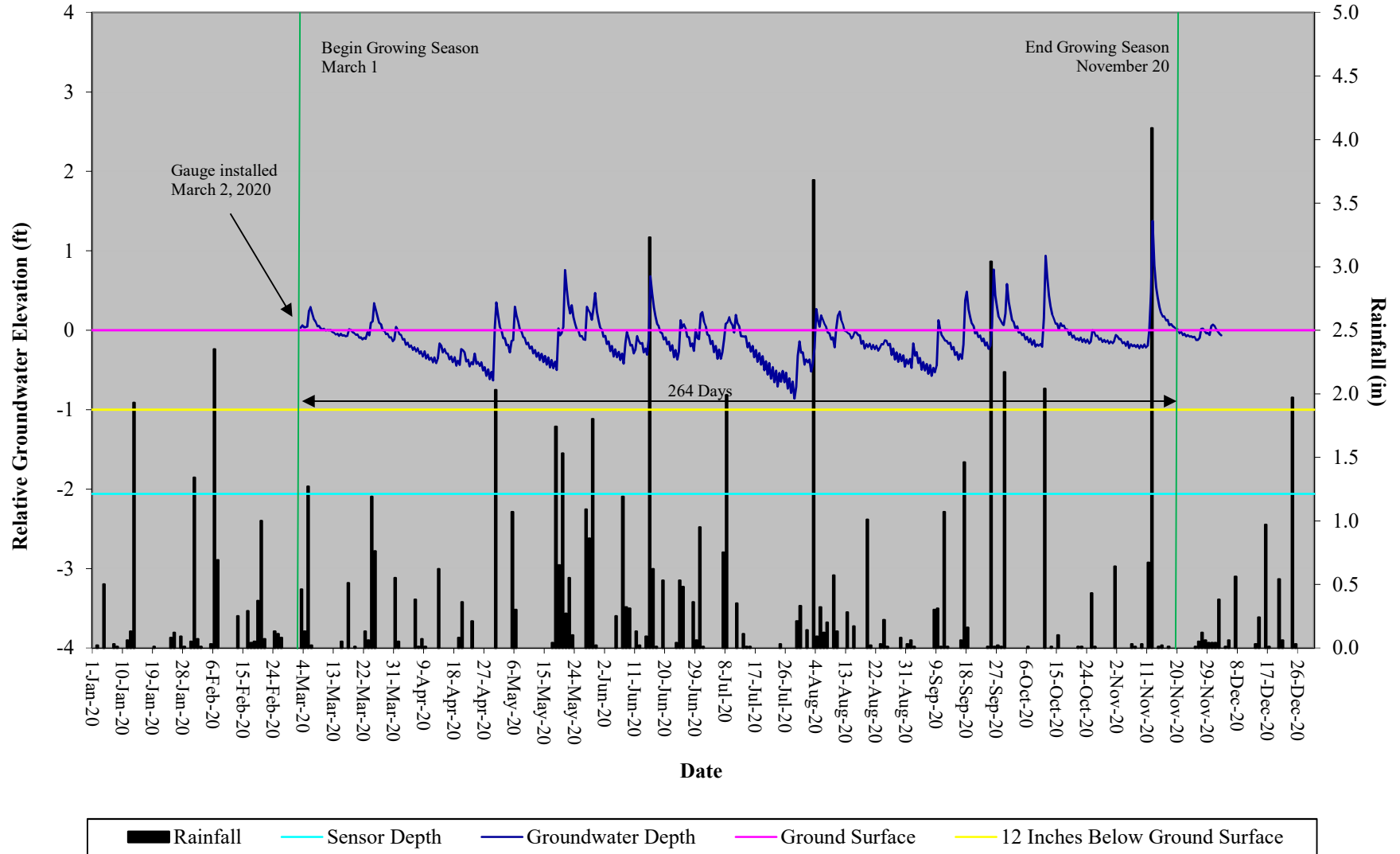
Rough Horn Swamp II Restoration Site Hydrograph Wetland Gauge 2



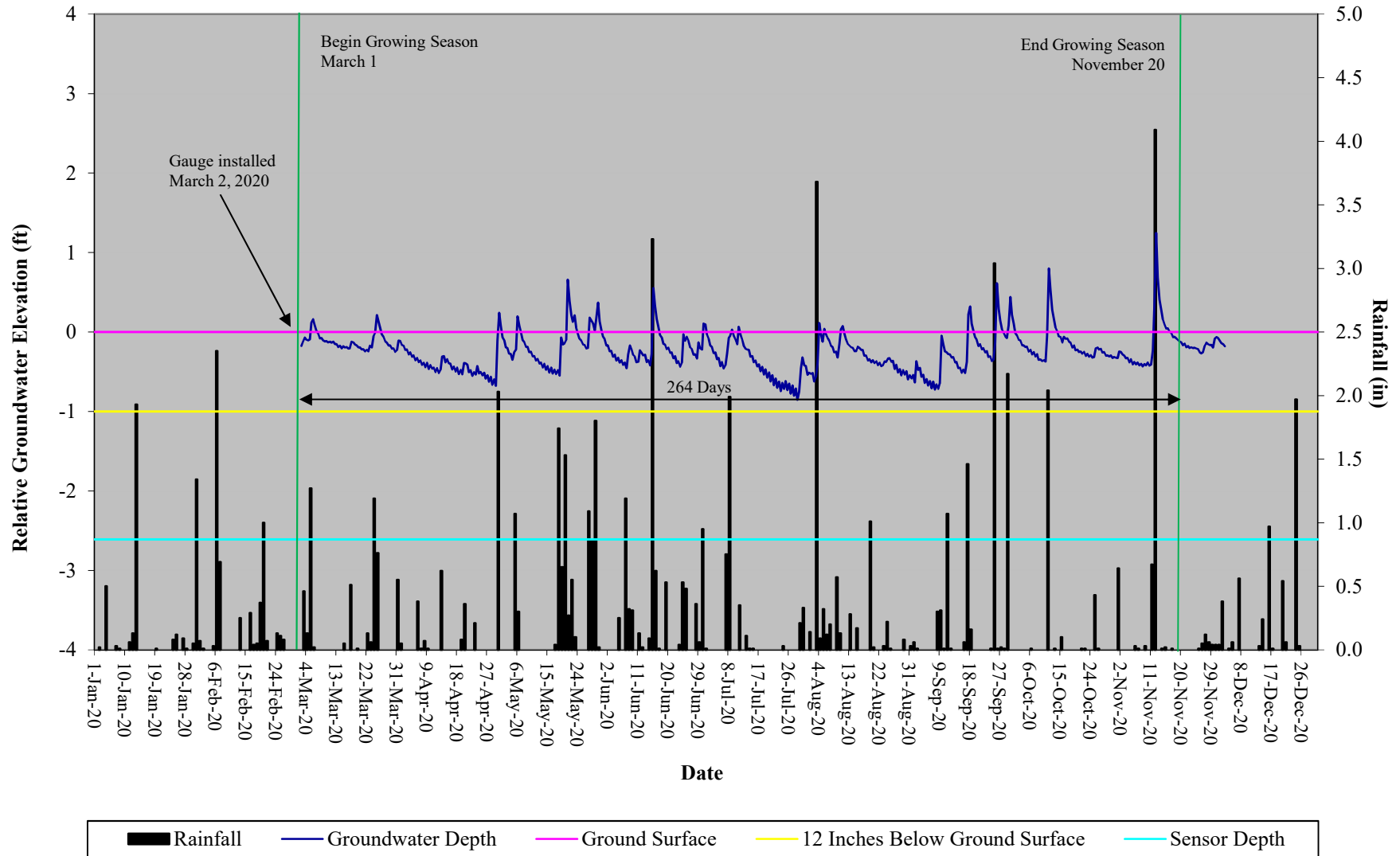
Rough Horn Swamp II Restoration Site Hydrograph Wetland Gauge 3



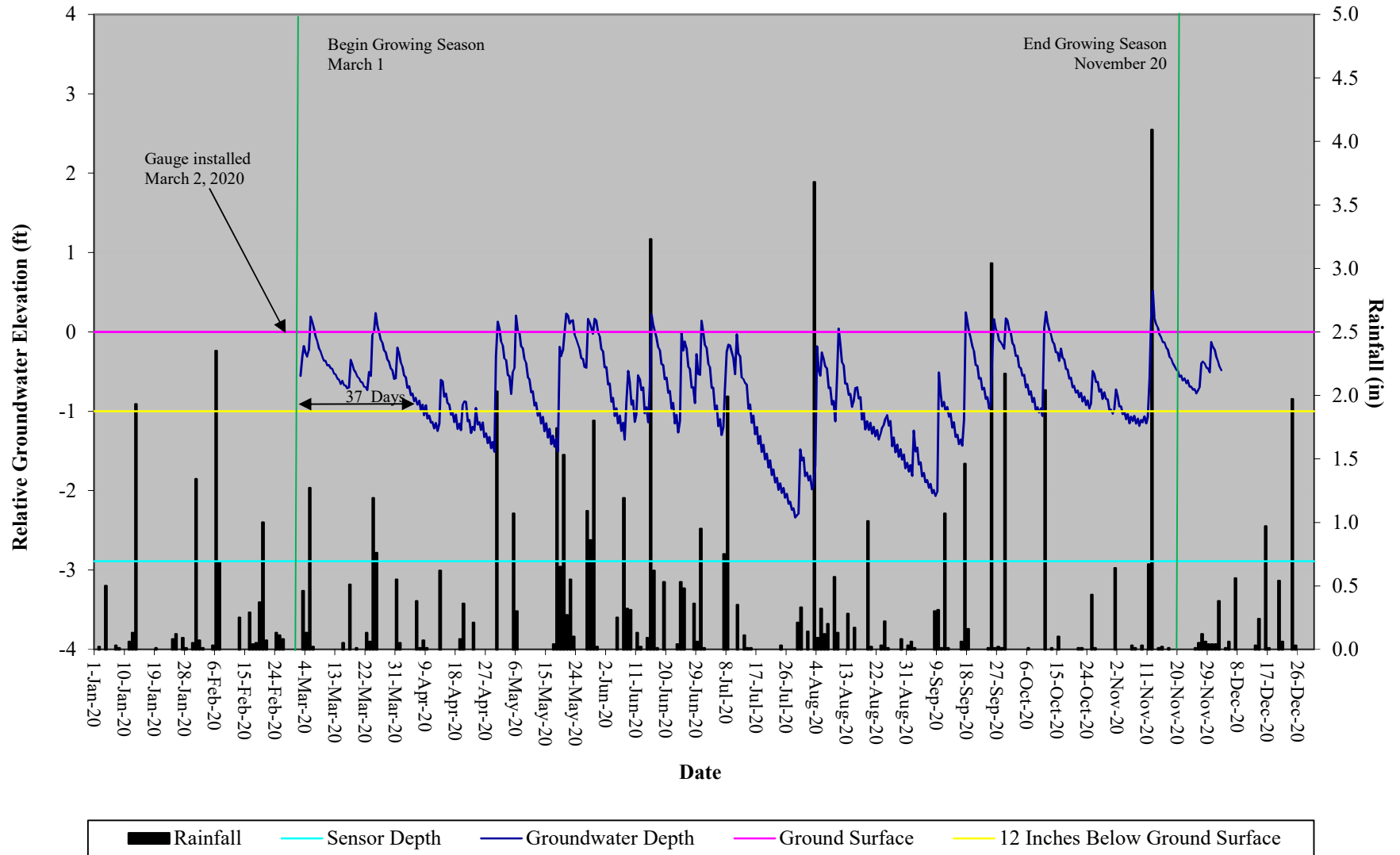
Rough Horn Swamp II Restoration Site Hydrograph Wetland Gauge 4



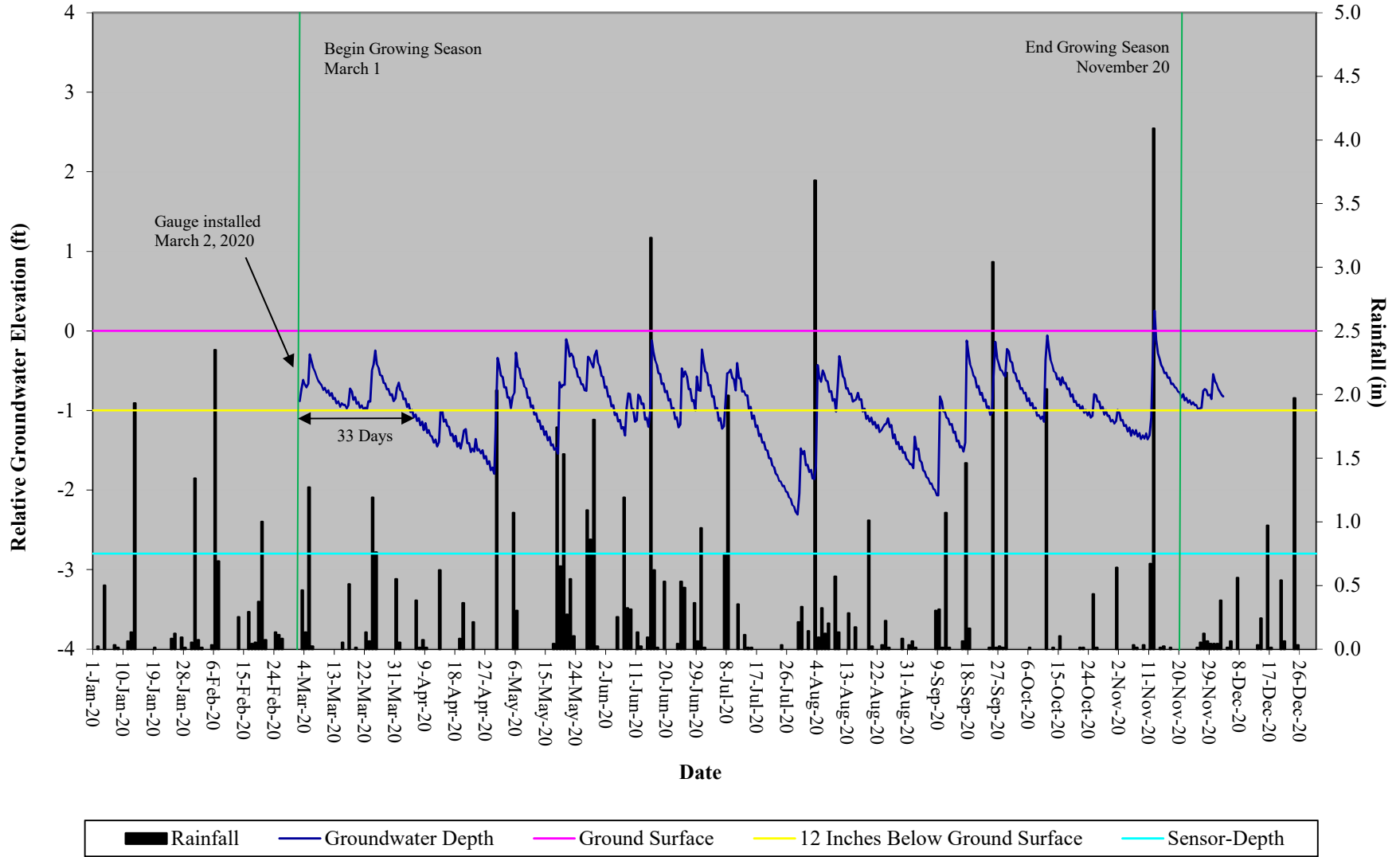
Rough Horn Swamp II Restoration Site Hydrograph Wetland Gauge 5



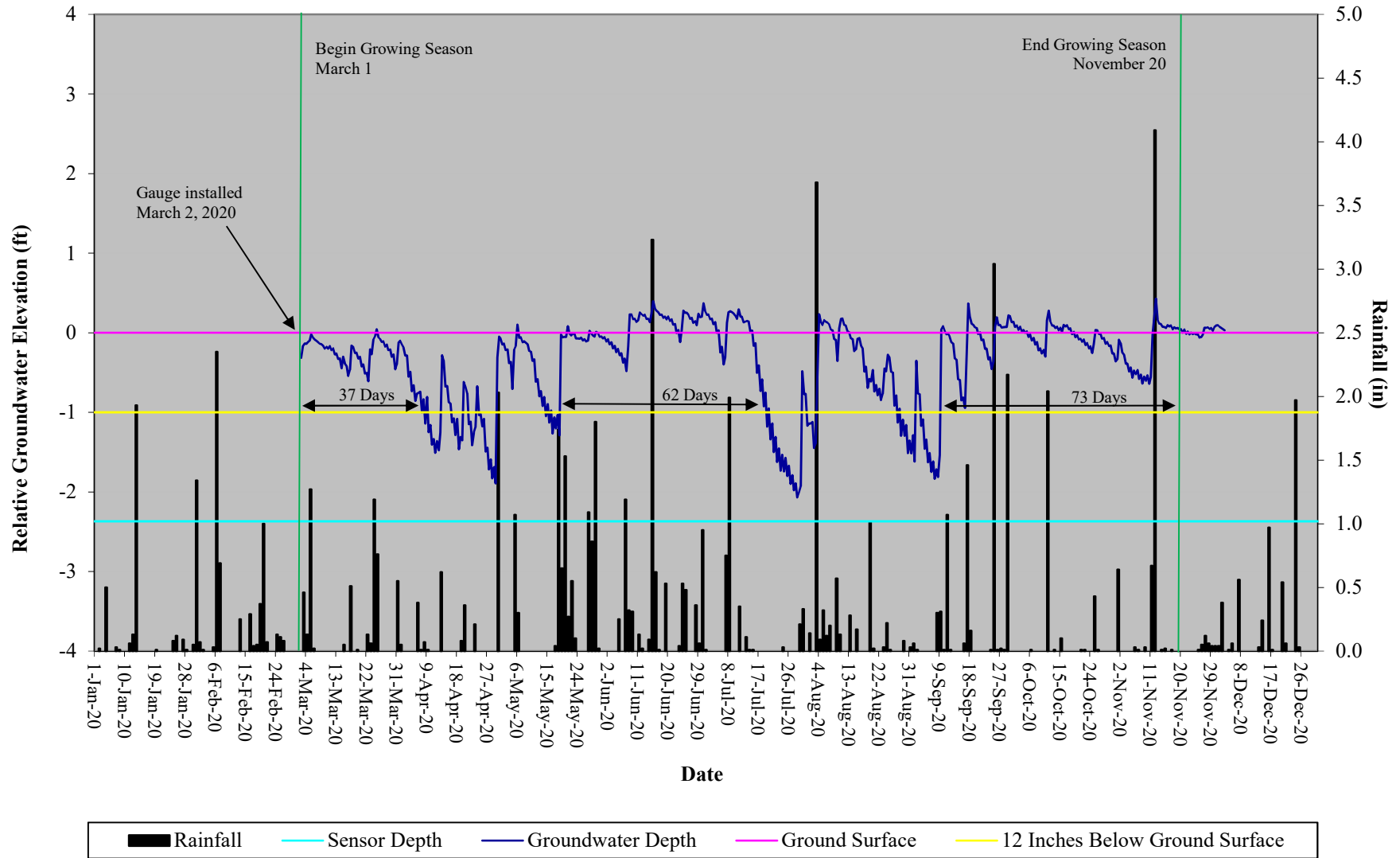
Rough Horn Swamp II Restoration Site Hydrograph Wetland Gauge 6



Rough Horn Swamp II Restoration Site Hydrograph Wetland Gauge 7



Rough Horn Swamp II Restoration Site Hydrograph Wetland Gauge 8



Rough Horn Swamp Restoration Site Hydrograph Reference Wetland Gauge

