FINAL
MY1 MONITORING REPORT

NESBIT SITE
Union County, North Carolina
Catawba River Basin
Cataloging Unit 03050103

DMS Project No. 100121
Full Delivery Contract No. 7868
DMS RFP No. 16-007704 (issued 9/6/2018)
USACE Action ID No. SAW-2019-00832
DWR Project No. 2019-0862

Data Collection: February 2022-November 2022
Submission: February 2023

Prepared for:

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

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Response to DMS Comments
Nesbit Stream and Wetland Mitigation Site, Union County
Catawba River Basin, Cataloging Unit 03050103
DMS Project ID No. 100121, Full Delivery Contract No. 7868, RFP No. 16-007704
USACE Action ID No. SAW-2019-00832, DWR Project No. 2019-0862

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

Report Document:

1. 2022 Monitoring Summary: Thank you for providing the comprehensive monitoring summary at the beginning of the document. This section indicates additional marking was added in response to scalloped areas. Please indicate the entire boundary will be inspected going forward to follow-up with the supplemental marking.
   Response: A note was added to the monitoring summary indicating that the easement boundary will be inspected during future monitoring years to ensure that the easement remains well-marked and that no additional encroachment occurs.

2. Monitoring Year 1 – Data Assessment: Please indicate if each success criteria are being met in each subsection to include Ordinary High Water Mark and BHR.
   Response: A brief discussion was added to Section 3.1 Stream Assessment indicating that all streams are maintaining an OHWM, have minimal changes in BHR, and maintained at least 30 consecutive days of flow. Wetland and vegetative success criteria are covered in Sections 3.2-3.3.

3. Figure 1 CCPV: The location for Photos 1 and 2 on Figure 1 are at the upstream and downstream end of the UT-1 crossing. Photos 1 and 2 in the photo log are a site overview and Glen Branch. Please include photos for both views at each crossing and edit the CCPV photo locations to match the Photo Log for all referenced photos.
   Response: The four photo points depicted on the CCPV are the only permanent site photo points proposed (other than vegetation plot photos and cross-section photos). These photos have been moved to the front of the photo log to avoid confusion and will be photographed annually. The additional photos in the photo log are to provide a general overview of site conditions, and their locations will change from year to year. Therefore, a description of each photo location is provided, but they will not be depicted as permanent photo points on the CCPV.

Digital Deliverable:

1. Update photos to be consistent with the CCPV and the Photo Log section of the report.
   Response: A “Photo Log” folder was added to the photos section of the visual assessment folder in the digital submittal. The folder contains all photos labeled to correspond with the Site Photo Log in Appendix A.

Nesbit Year 1, 2022 Monitoring Summary

General Notes

- Minor occurrences of encroachment occurred in Year 1 (2022).
  - Minor areas of scalping occurred along the easement.
  - In 2022, a combine was driven across the project near vegetation plot 1, where a pre-construction crossing once existed. No evidence of impacts to the stream, wetland, or vegetation was observed by RS staff, who investigated the encroachment in late October 2022 (Photo Log, Appendix A).
  - Matthew Harrell, with Restoration Systems, worked with the landowner and his farm operations manager to review the easement footprint where minor areas of scalping occurred to ensure encroachment does not continue (Appendix F).
  - The easement was marked with 6-inch treated posts upon completion of restoration activities in October/November 2021. Additional marking was added during 2022, and high-visibility flagging was added to all treated post corners to further delineate the easement area.
  - The entire easement boundary will be inspected during future monitoring years to ensure that the easement remains well-marked and that no additional encroachment occurs.
- Deer browsing was observed on planted stems within the upper reaches of the Site. No evidence of beaver activated was observed.

Site Maintenance Report (2022)

Invasive Species Work	Maintenance work
09/11/2022: Basal bark treatments for privet 10/09/2022: Basal bark treatments for privet	11/30/2022: - Lime, fertilizer, and seeding - Enhanced boundary marking with yellow markers

Streams

- Streams remained stable with little to no deviations from MY0.
- All engineered structures were stable and functioning within design parameters; no stream areas of concern were documented.
- One bankfull event was documented during MY1 (2022) (Table 11, Appendix D).

Vegetation

- Measurements of the 18 vegetation plots resulted in an average of 468 approved stems/acre. Thirteen of the sixteen permanent vegetation plots and both temporary transects met the interim success criteria. Plot 9 was 4 stems short of the required stem density, and plots 14 and 16 were each 3 stems short.
- Two areas of observed low stem density were included on the MY1 (2022) CCPV – Figure 1, Appendix 1 near vegetation monitoring plots 14 and 16, and 9 – 1.32 acres total, 8.25 % of the total planted area (16 acres). RS will conduct four vegetation transects within the areas of observed low stem density in the spring of 2023 to determine if additional planting is required.
- Observed bare areas by DMS Staff during the MY0 site visit (August 2022) were addressed with lime, fertilizer, and permanent seeding in November 2022.
- In late 2022, several clusters of Parrot feather were identified on the riffles above cross-section 12 of Glen Branch at the top of the Site. It is believed these clusters washed into the Site from upstream waters. The clusters are not a concern to channel stability or planted vegetation and thus do not appear in Table 4A, Table 5, or the CCPV. Treatment for Parrot Feather will begin early in 2023 and will occur throughout 2023 and the monitoring period.

Wetlands

- Three of the nine groundwater gauges met success criteria during MY1 (2022). Gauges 1, 2, 4, 6, 7, and 8 did not meet success criteria with hydroperiods of 6.6%, 1.6%, 11.1%, 3.3%, 3.7%, and 2.5%, respectively. (Appendix D).

- When compared with 30-year 30-70th percentile rainfall, on-site rainfall amounts were low during February and March (Figure D1, Appendix D), with very little occurring between March 17 and April 1. Five of the six gauges that didn't meet success criteria dipped below 12 inches from the surface during this period before rising again with each precipitation event. Gauge 4 dropped below 12 inches just 2 days shy of the 12% hydroperiod. It is expected that with normal rainfall early in the growing season, the groundwater would be sufficiently recharged at the start of the growing season, and all gauges would have met hydrology success criteria.

Yr. 1 (2022) Groundwater Hydrology Data

Gauge	12% Hydroperiod 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 – 16 Days (6.6%)						
2	No – 4 Days (1.6%)						
3	Yes – 50 Days (20.6%)						
4	No – 27 Days (11.1%)						
5	Yes – 30 Days (12.3%)						
6	No – 8 Days (3.3%)						
7	No – 9 Days (3.7%)						
8	No – 6 Days (2.5%)						
9	Yes – 49 Days (20.2%)						

Site Monitoring Activity and Reporting History

Project Milestones	Stream Monitoring Complete	Vegetation Monitoring Complete	Wetland Monitoring	Data Analysis Complete	Completion or Delivery
Construction Earthwork	--	--	--	--	December 7, 2021
Planting	--	--	--	--	February 3, 2022
As-Built Documentation	Feb. 8-9, 2022	February 8, 2022	--	February 2022	September 2022
Year 1 Monitoring	Sep. 18, 2022	August 24, 2022	Feb. – Nov. 2022	November 2022	February 2023

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1 PROJECT SUMMARY

Restoration Systems, LLC (RS) has established the North Carolina Division of Mitigation Services (NCDMS) Nesbit Site (Site). The Site is on one parcel along the warm water Glen Branch and unnamed tributaries to Glen Branch in the Carolina Slate Belt portion of the Piedmont ecoregion of North Carolina. Located in the Catawba River Basin, cataloguing unit 03050103, the Site is in Targeted Local Watershed 030501003030030 and North Carolina Division of Water Resources (NCDWR) subbasin number 03-08-38. The Site is not located in a Local Watershed Plan (LWP), Regional Watershed Plan (RWP), or Targeted Resource Area (TRA). The Site watershed ranges from approximately 0.07 of a square mile (46 acres) on UT2 to 1.25 square miles (799 acres) at the Site's outfall.

1.1 Project Background, Components, and Structure

Located seven miles southwest of Monroe and five miles southeast of Waxhaw in the southwest corner of Union County near the North Carolina and South Carolina border, the Site encompasses 18.0 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, and 7) vegetation planting. The Site is expected to provide 5198.736 warm water stream credits and 6.477 riparian wetland credits by closeout (Table 1, Page 2). A conservation easement was granted to the State of North Carolina and recorded at the Union County Register of Deeds on August 28, 2020.

Before construction, the Site was characterized by agricultural row crops. Site design was completed in June 2021. Construction started on October 7, 2021 and ended within a final walkthrough on December 20, 2021. The Site was planted on February 3, 2022. Completed project activities, reporting history, completion dates, and project contacts are summarized in Tables 14-15 (Appendix E).

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Table 1. Nesbit Mitigation Site (ID-100121) 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								
Glen Br Reach 1	1275	1260	Warm	R	1.00000	1,275.000		
Glen Br Reach 2	63	62	Warm	EI	1.50000	42.000		
Glen Br Reach 3	2776	2763	Warm	R	1.00000	2,776.000		
UT 1A	314	314	Warm	EII	5.00000	62.800		
UT 1 Reach 1	253	253	Warm	EI	2.50000	101.200		
UT 1 Reach 2	381	373	Warm	R	1.00000	381.000		
UT 1 Reach 3	115	116	Warm	EII	2.50000	46.000		
UT 1 Reach 4	171	169	Warm	R	1.00000	171.000		
UT 2 Reach 1	112	112	Warm	EII	2.50000	44.800		
UT 2 Reach 2	197	197	Warm	R	1.00000	197.000		
					Total:	**5,096.800**		
Wetland								
Wetland Reestablishment	5.338	5.338	R	REE	1.00000	5.338		
Wetland Rehabilitation	0.902	0.902	R	RH	1.50000	0.601		
Wetland Enhancement	1.075	1.075	R	E	2.00000	0.538		
					Total:	**6.477**		

Project Credits

	Stream			Riparian	Non-Rip	Coastal
Restoration Level	Warm	Cool	Cold	Wetland	Wetland	Marsh
Restoration	4,800.000	0.000	0.000	0.000	0.000	0.000
Re-establishment				5.338	0.000	0.000
Rehabilitation				0.601	0.000	0.000
Enhancement				0.538	0.000	0.000
Enhancement I	143.200	0.000	0.000			
Enhancement II	153.600	0.000	0.000			
Preservation				0.000	0.000	0.000
Benthics	101.936	0.000	0.000	0.000	0.000	
Totals	**5,198.736**	**0.000**	**0.000**	**6.477**	**0.000**	**0.000**

Total Stream Credit **5,198.736**
Total Wetland Credit **6.477**

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		
- Minimize downstream flooding to the maximum extent possible. - Connect streams to functioning wetland systems.	- Construct a new channel at historic floodplain elevation to restore overbank flows and restore/enhance jurisdictional wetlands - Plant woody riparian buffer - Install marsh treatment areas - Remove agricultural row crops - Deep rip floodplain soils to reduce compaction and increase soil surface roughness - Protect riparian buffers with a perpetual conservation easement	- BHR not to exceed 1.2 - Document four overbank events in separate monitoring years - Attain Wetland Hydrology Success Criteria - Attain Vegetation Success Criteria - Conservation Easement recorded
- Increase stream stability within the Site so that channels are neither aggrading nor degrading.	- Construct channels with a proper pattern, dimension, and longitudinal profile - Remove agricultural row crops - Construct stable channels with the appropriate substrate - Upgrade forded crossings - Plant woody riparian buffer - Stabilize stream banks	- Cross-section measurements indicate a stable channel with the appropriate substrate - Visual documentation of stable channels and structures - BHR not to exceed 1.2 - < 10% change in BHR in any given year - Attain Vegetation Success Criteria
(1) WATER QUALITY		
- Remove direct nutrient and pollutant inputs from the Site and reduce contributions to downstream waters.	- Remove agricultural row crops and reduce agricultural land/inputs - Install marsh treatment areas - Plant woody riparian buffer - Restore/enhance jurisdictional wetlands adjacent to Site streams - Provide surface roughness and reduce compaction through deep ripping/plowing - Restore overbank flooding by constructing channels at historic floodplain elevation	- Attain Wetland Hydrology Success Criteria - Attain Vegetation Success Criteria
(1) HABITAT		
- Improve instream and streamside habitat.	- Construct stable channels with the appropriate substrate - Plant woody riparian buffer to provide organic matter and shade - Construct a new channel at historic floodplain elevation to restore overbank flows - Plant woody riparian buffer - Protect riparian buffers with a perpetual conservation easement - Restore/enhance jurisdictional wetlands adjacent to Site streams - Stabilize stream banks - Install in-stream structures	- Cross-section measurement indicates a stable channel with the 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 on-site North Carolina Stream Assessment Method (NC SAM) data collection (NC SFAT 2015). From a mitigation perspective, several of the goals and objectives are assumed to be functionally elevated by restoration activities without direct measurement. Other goals and objectives will be considered successful upon achieving success criteria. The following summarizes Site success criteria.

Table A. Success Criteria

Streams
• All streams must maintain an Ordinary High-Water Mark (OHWM), per RGL 05-05. • A continuous surface flow must be documented each year for at least 30 consecutive days. • Bank height ratio (BHR) cannot exceed 1.2 at any measured cross-section. • BHR at any measure 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 individual years, during the monitoring years 1-7. • Intermittent streams will demonstrate at least 30-days consecutive flow.
Wetland Hydrology
• Annual 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
• Within planted portions of the Site, a minimum of 320 stems per acre must be present at year 3; a minimum of 260 stems per acre must be present at year 5; and a minimum of 210 stems per acre must be present at year 7. • Trees must average 7 feet in height at year 5 and 10 feet in height at year 7 in each plot. • Planted and volunteer stems are counted, provided they are included in the approved planting list for the Site; natural recruits not on the planting list may be considered by the IRT on a case-by-case basis.

2 METHODS

Monitoring will be conducted in accordance with 2016 North Carolina Interagency Review Team (NCIRT) Guidelines. Monitoring will be conducted by Axiom Environmental, Inc based on the schedule in the following table. A monitoring summary is outlined in the table on page 6. Annual monitoring reports will be submitted to the NCDMS by Restoration Systems no later than December 1 of each monitoring year data is collected.

Table B. Monitoring Schedule

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

Table C. 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 12 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 photographs
	Additional Cross-sections	Yearly	Only if instability is documented during monitoring	Graphic and tabular data.
Stream Hydrology	Continuous monitoring of surface water gauges and/or trail camera	Continuous recording through the monitoring period	1 surface water gauge on UT1 and 1 surface water gauge on UT2	Surface water data for each monitoring period
Bankfull Events	Continuous monitoring of surface water gauges and/or trail camera	Continuous recording through the monitoring period	1 surface water gauges on Glen Branch	Surface water data for each monitoring period
	Visual/Physical Evidence	Continuous through the monitoring period	All restored stream channels	Visual evidence, photo documentation, and/or rain data.
Benthic Macroinvertebrates	"Qual 4" method described in *Standard Operating Procedures for Collection and Analysis of Benthic Macroinvertebrates, Version 5.0* (NCDWR 2016)	Pre-construction, Years 3, 5, and 7 during the "index period" referenced in *Small Streams Biocriteria Development* (NCDWQ 2009)	3 stations (Glen Br upper and lower reaches, and the lower reach of UT 1)	Results* will be presented on a site-by-site basis and will include a list of taxa collected, an enumeration of *Ephemeroptera, Plecoptera,* and *Tricopetera* taxa as well as Biotic Index values.
Wetland Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Wetland Restoration	Groundwater gauges	Years 1, 2, 3, 4, 5, 6, and 7 throughout the year with the growing season defined as March 17-November 14**	9 gauges spread throughout restored wetlands	Groundwater and rain data for each monitoring period
Vegetation Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Vegetation establishment and vigor	Permanent vegetation plots 0.0247 acre (100 square meters) in size; *CVS-EEP Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008)	As-built, Years 1, 2, 3, 5, and 7	16 plots spread across the Site	Species, height, planted vs. volunteer, stems/acre
	Annual random vegetation plots, 0.0247 acre (100 square meters) in size	As-built, Years 1, 2, 3, 5, and 7	Only if poor vegetation grow is documented during monitoring	Species and height

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

**In accordance with IRT request after submittal of the MY0 report, the growing season for this site will be based on the latest 30-year WETS data (Station Monroe 2 SE, NC, 1991-2021) and is defined as March 17 to November 14 (243 days). Soil temperature and bud burst documentation will not be required to verify growing season start dates.

3 MONITORING YEAR 1 – DATA ASSESSMENT

Annual monitoring and site visits were conducted between February and November 2022 to assess the condition of the project. Stream, wetland, and vegetation criteria for the Site follow the approved success criteria presented in the Mitigation Plan and summarized in Section 1.2; monitoring methods are detailed in Section 2.

3.1 Stream Assessment

Morphological surveys for MY1 were conducted on September 18, 2022. All streams within the Site are stable and functioning as designed. Site streams continue to maintain an ordinary high-water mark, and no cross-sections have bank height ratios greater than 1.2. Additionally, UT1 and UT2 each maintained flow for well over than 30 consecutive days during MY1, with 125 and 98 days, respectively. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table and Stream Photographs. Refer to Appendix C for Stream Geomorphology Data. No stream areas of concern were identified during MY1.

3.2 Wetland Assessment

Three of nine groundwater gauges met success criteria during MY1 (2022). Gauges 1, 2, 4, 6, 7, and 8 did not meet success criteria with hydroperiods of 6.6%, 1.6%, 11.1%, 3.3%, 3.7%, and 2.5%, respectively.

When compared with 30-year 30-70th percentile rainfall, on-site rainfall amounts were low during February and March (Figure D1, Appendix D), with very little occurring between March 17 and April 1. Five of the six gauges that didn't meet success criteria dipped below 12 inches from the surface during this period before rising again with each precipitation event. Gauge 4 dropped below 12 inches just 2 days shy of the 12% hydroperiod. It is expected that with normal rainfall early in the growing season, the groundwater would be sufficiently recharged at the start of the growing season, and all gauges would have met hydrology success criteria.

3.3 Vegetative Assessment

The MY1 vegetative survey was completed on August 24, 2022. Vegetation monitoring resulted in a sitewide stem density average of 468 planted stems per acre, above the interim requirement of 320 stems per acre required at MY3. Thirteen of the sixteen permanent vegetation plots and both temporary transects met the interim success criteria. Plot 9 was 4 stems short of the required stem density and plots 14 and 16 were each 3 stems short. Please refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table, and Appendix B for Vegetation Plot Data.

Two areas of observed low stem density were included on the MY1 (2022) CCPV – Figure 1, Appendix 1 near vegetation monitoring plots 14 and 16, and 9 – 1.32 acres total, 8.25 % of the total planted area (16 acres). RS will conduct four vegetation transects within the areas of observed low stem density in the spring of 2023 to determine if additional planting is required.

Table 3. Project Attribute Table					
Project Information					
Project Name	Nesbit Site				
Project County	Union County, North Carolina				
Project Area (acres)	18				
Project Coordinates (latitude & latitude)	34.8936, -80.6544				
Planted Area (acres)	16				
Project Watershed Summary Information					
Physiographic Province	Piedmont				
Project River Basin	Catawba				
USGS HUC for Project (14-digit)	03050103030030				
NCDWR Sub-basin for Project	03-08-38				
Project Drainage Area (acres)	798.8				
Percentage of Project Drainage Area that is Impervious	<5%				
CGIA Land Use Classification	Managed Herbaceous Cover				
Reach Summary Information					
Parameters	**Glen Br Upstream**	**Glen Br Downstream**	**UT 1A**	**UT1**	**UT 2**
Length of reach (linear feet)	1586	2499	314	971	309
Valley Classification & Confinement	Alluvial, confined				
Drainage Area (acres)	494.6	798.8	152.6	176.7	45.6
NCDWR Stream ID Score	--	--	28	33	30
Stream Thermal Regime	Warm				
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial/ Intermittent	Perennial	Perennial/ Intermittent
NCDWR Water Quality Classification	C				
Existing Morphological Description (Rosgen 1996)	Cg4	Eg 4	-----	Eg 4	Eg 6
Proposed Stream Classification (Rosgen 1996)	Ce 3/4	Ce 3/4	-----	Ce 3/4	Ce 3/4
Existing Evolutionary Stage (Simon and Hupp 1986)	III/IV	III/IV	III	II/III	II/III
Underlying Mapped Soils	Secrest Cid complex				
Drainage Class	Somewhat poorly drained				
Hydric Soil Status	Nonhydric (may contain hydric inclusions)				
Valley Slope	0.0077	0.0048	0.0204	0.0086	0.0147
FEMA Classification	AE floodway	AE floodway	NA	NA	AE floodway
Native Vegetation Community	Piedmont Alluvial Forest/Dry-Mesic Oak-Hickory Forest				
Watershed Land Use/Land Cover (Site)	30% forest, 65% ag. land, 5% low density residential/impervious surface				
Watershed Land Use/Land Cover (Uwharrie Reference Channel)	100% forest				
Percent Composition of Exotic Invasive Vegetation	15%				

Wetland Summary Information	
Parameters	**Wetlands**
Wetland acreage	5.338 acres reestablished & 1.977 acres enhanced/rehabilitated
Wetland Type	Riparian riverine
Mapped Soil Series	Secrest Cid Complex
Drainage Class	Somewhat Poorly drained
Hydric Soil Status	Nonhydric (may contain hydric inclusions)
Source of Hydrology	Groundwater, stream overbank
Hydrologic Impairment	Incised streams, compacted soils, agriculture
Native Vegetation Community	Piedmont/Low Mountain Alluvial Forest
% Composition of Exotic Invasive Vegetation	<5%
Restoration Method	Hydrologic and vegetative
Enhancement Method	---

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 (App E)
Historic Preservation Act	Yes	Yes	CE Document (App E)
Coastal Zone Management Act	No	--	NA
FEMA Floodplain Compliance	Yes	Yes	DMS FEMA Checklist (App E)
Essential Fisheries Habitat	No	--	NA

4 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.

North Carolina Division of Mitigation Services (NCDMS). 2014. Stream and Wetland Mitigation Monitoring Guidelines. North Carolina Department of Environmental Quality, Raleigh, North Carolina.

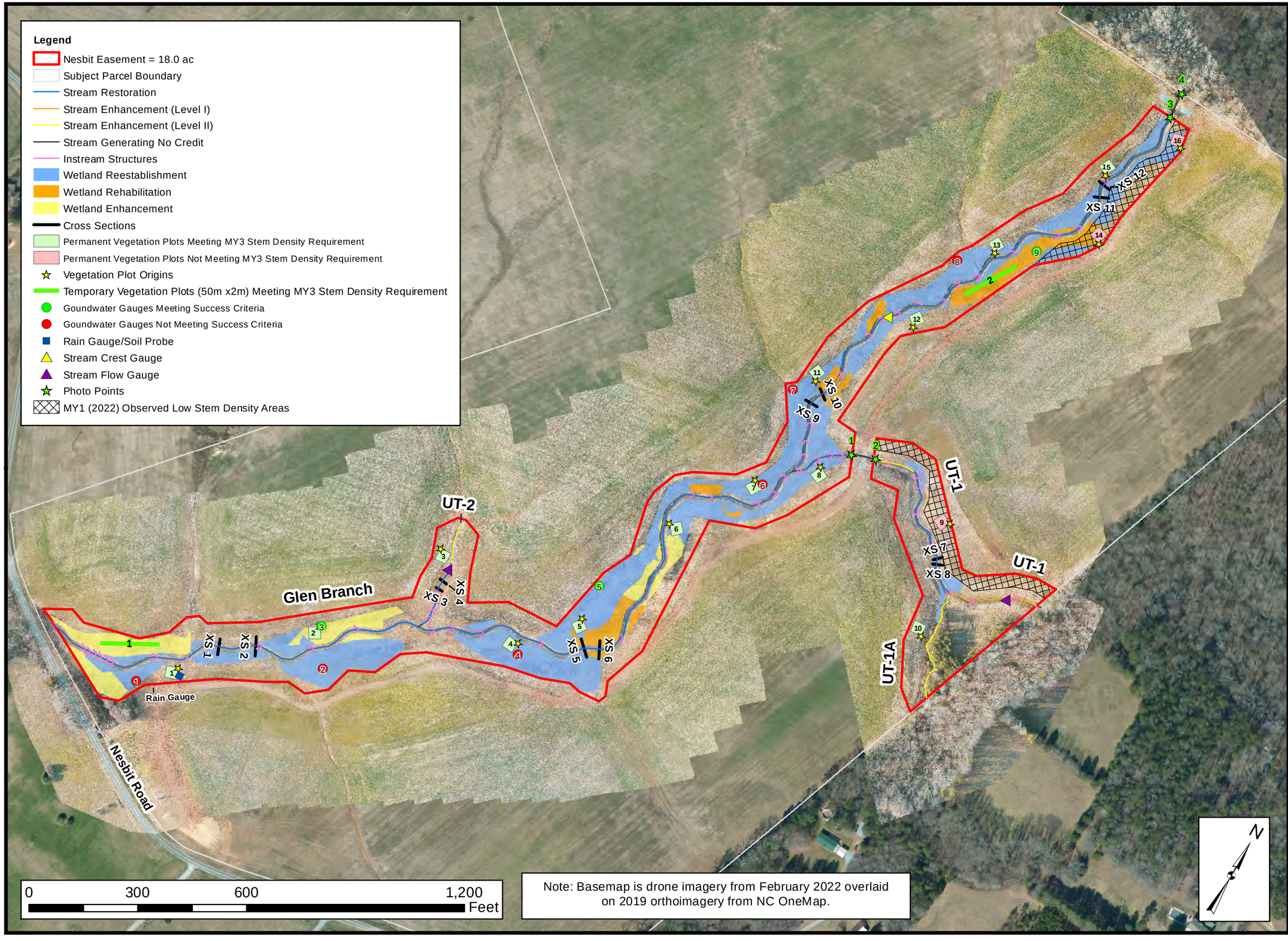
North Carolina Ecosystem Enhancement Program (NCEEP 2007). Lower Catawba River Basin Restoration Priorities 2007 (online). Available: https://files.nc.gov/ncdeq/Mitigation%20Services/Watershed_Planning/Catawba_River_Basin/RBRP_2007%20Lower%20CAT_032013%20Final.pdf. North Carolina Department of Environment and Natural Resources, Raleigh (December 18, 2018).

North Carolina Stream Functional Assessment Team. (NC SFAT 2015). N.C. Stream Assessment Method (NC SAM) User Manual. Version 2.1.

North Carolina Wetland Functional Assessment Team. (NC WFAT 2010). N.C. Wetland Assessment Method (NC WAM) User Manual. Version 4.1.

Appendix A: Visual Assessment Data

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



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

NESBIT SITE

Union County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: BEF

Date: DEC 2022

Scale: 1:3000

Project No.: 20-007

FIGURE

1

Table 4A. Visual Stream Stability Assessment

Reach	Glen Branch
Assessed Stream Length	4085
Assessed Bank Length	8170

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 NOT 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.	32	32		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	32	32		100%

Table 4B. Visual Stream Stability Assessment

Reach UT 1
Assessed Stream Length 971
Assessed Bank Length 1942

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 NOT 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.	15	15		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	15	15		100%

Table 4C. Visual Stream Stability Assessment

Reach	UT 2
Assessed Stream Length	309
Assessed Bank Length	618

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 NOT 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.	4	4		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	4	4		100%

Table 5. Visual Vegetation Assessment

Planted acreage **16.0**

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.	0.10 acres	1.32	8.3%
		Total	1.32	8.3%
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	1.32	8.3%

Easement Acreage **18.0**

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	

Nesbit Site
MY1 (2022) Vegetation Monitoring Photographs (taken August 24, 2022)

Plot 1

Plot 2

Plot 3

Plot 4

Plot 5

Plot 6

Plot 7

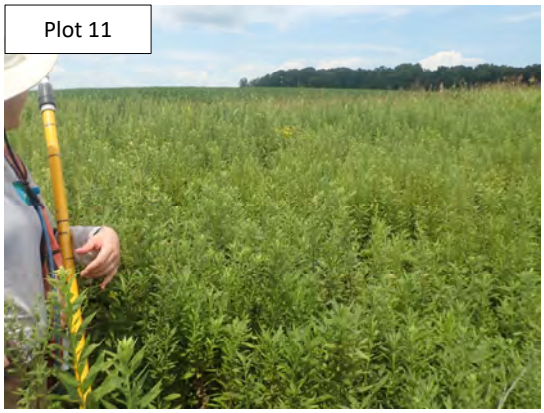
Plot 8

Nesbit Site
MY1 (2022) Vegetation Monitoring Photographs (taken August 24, 2022)

Plot 9

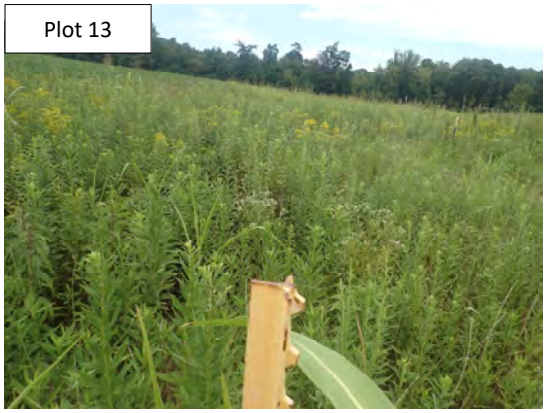
Plot 10

Plot 11



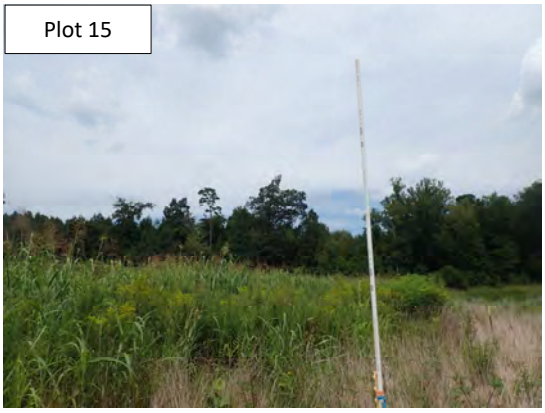
Plot 12

Plot 13

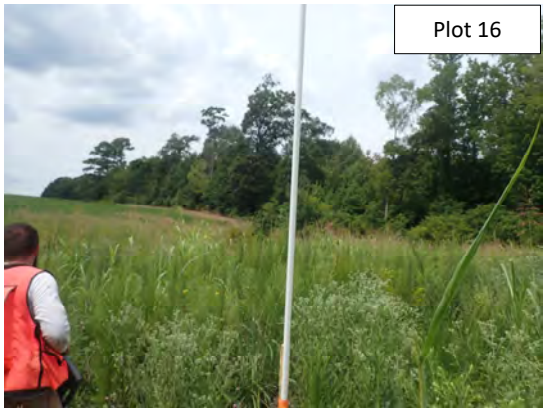


Plot 14

Plot 15



Plot 16



Nesbit
MY-01 (2022) Photo Log

Photo 1: CCPV Permanent Photo Point 1
UT 1 Crossing, facing upstream

Photo 2: CCPV Permanent Photo Point 2
UT 1 Crossing, facing downstream

Nesbit
MY-01 (2022) Photo Log

Photo 3: CCPV Permanent Photo Point 3
Glen Branch Crossing, facing upstream

Photo 4: CCPV Permanent Photo Point 4
Glen Branch Crossing, facing downstream

Nesbit
MY-01 (2022) Photo Log

Photo 5: Site Overview from Nesbit Road

Photo 6: Glen Branch Upper Reach Overview

Nesbit
MY-01 (2022) Photo Log

Photo 7: Glen Branch Upper Reach

Photo 8: Glen Branch Cross Vane

Nesbit
MY-01 (2022) Photo Log

Photo 9: UT-2

Photo 10: UT-1

Nesbit
MY-01 (2022) Photo Log

Photo 11: Easement Signage

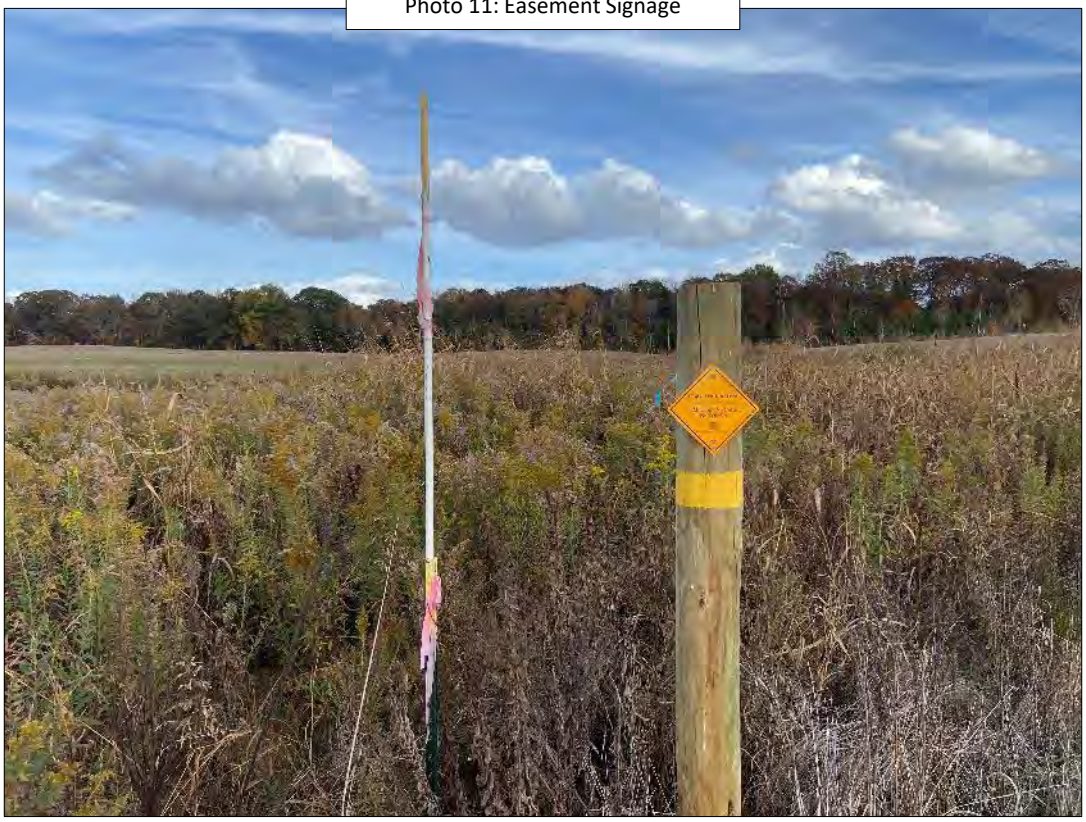


Photo 12: Easement Signage

Nesbit
MY-01 (2022) Photo Log

Photo 13: Easement Signage

Photo 14: Easement Signage

Nesbit
MY-01 (2022) Photo Log

Photo 15: Planted *Platanus occidentalis*

Photo 16: Bud Burst of *Ulmus alata*
Photo Taken 3/1/22

Nesbit
MY-01 (2022) Photo Log

Photo 17: Bud Burst of *Liquidambar styraciflua*
Photo Taken 3/1/22

Photo 18: Bud Burst of *Prunus serotina*
Photo Taken 3/1/22

Nesbit
MY-01 (2022) Photo Log

Photo 19: Enhanced Easement Signage

Photo 20: Site Outfall looking downstream

Nesbit
MY-01 (2022) Photo Log

Photo 21: Site Outfall looking upstream

Photo 22: Glen Branch looking downstream near CS 5 and 6

Nesbit
MY-01 (2022) Photo Log

Photo 23: Glen Branch looking upstream near CS 5 and 6

Photo 24: Glen Branch & UT 1 confluence

Nesbit
MY-01 (2022) Photo Log

Photo 25: Glen Branch ford crossing (Near CCPV Photo Points 3 and 4)

Photo 26: Glen Branch, right bank, looking downstream

Nesbit
MY-01 (2022) Photo Log

Photo 27: Glen Branch, combine crossing, from the right easement edge

Photo 28: Glen Branch, combine crossing, from the right easement edge

Appendix B: Vegetation Data

Table 6A. Planted Bare-Root Woody Vegetation
Table 6B-C. Permanent Seed Mixes
Table 7. Vegetation Plot Counts and Densities
Table 8. Vegetation Plot Data Table from Vegetation Data Entry Tool

Table 6A. Planted Bare Root Woody Vegetation
Nesbit Site

Vegetation Association	Piedmont/Mountain Bottomland Forest*		Dry-Mesic Oak-Hickory Forest*		Stream-side Assemblage**		TOTAL
Area (acres)	**7.2**		**5.0**		**3.8**		**16.0**
Species	**# planted***	**% of total**	**# planted***	**% of total**	**# planted****	**% of total**	**# planted**
River birch (*Betula nigra*)	250	5	--	--	1750	17	2000
Shagbark hickory (*Carya cordiformis*)	500	10	--	--	--	--	500
Hackberry (*Celtis occidentalis*)	400	8	--	--	600	6	1000
Red bud (*Cercis canadensis*)	--	--	600	18	--	--	600
Silky dogwood (*Cornus amomum*)	350	7	--	--	2150	21	2500
Persimmon (*Diospyros virginiana*)	--	--	500	15	--	--	500
Green ash (*Fraxinus pennsylvanica*)	200	4.5	--	--	700	7	900
Tulip poplar (*Liriodendron tulipifera*)	200	4.5	150	4	650	6.5	1000
Red mulberry (*Morus rubra*)	--	--	150	4	350	3	500
Black gum (*Nyssa sylvatica*)	300	6	--	--	950	9	1250
Sycamore (*Platanus occidentalis*)	400	8	150	4	1700	16.5	2250
White oak (*Quercus alba*)	200	4.5	150	4	650	6	1000
Water oak (*Quercus nigra*)	1000	20	1000	30	--	--	2000
Willow oak (*Quercus phellos*)	200	4.5	--	--	800	8	1000
Red oak (*Quercus rubra*)	--	--	500	15	--	--	500
Shumard oak (*Quercus shumardii*)	600	12	--	--	--	--	600
American elm (*Ulmus americana*)	300	6	200	6	--	--	500
TOTAL	**4900**	**100**	**3400**	**100**	**10300**	**100**	**18600**

Table 6B. Permanent Seed Mix

Nesbit Site – Sitewide Mix

Species*	Percentage	Species*	Percentage
Achillea millefolium	0.4	*Gaillardia perennial*	2
Agrostis gigantea	15	*Helianthus angustifolius*	1
Agrostis hyemalis	5	*Heliopsis helianthoides*	1
Agrostis stolonifera	2	*Hibiscus moscheutos*	0.5
Baptisia australis	2	*Juncus tenuis*	0.5
Carex vulpinoidea	1	*Lespedeza capitata*	0.5
Chamaecrista fasciculata	1	*Liatris spicata*	1
Chamaecrista nictitans	1	*Monarda fistulosa*	0.5
Chrysanthemum leucanthemum	4.5	*Panicum clandestinum*	5
Chrysanthemum x superbum	3	*Panicum rigidulum*	0.5
Coreopsis lanceolata	4	*Penstemon digitalis*	1
Coreopsis tinctoria	4	*Rudbeckia amplexicaulis*	1
Cosmos bipinnatus	1	*Rudbeckia hirta*	3
Delphinium ajacis	2	*Schizachyrium scoparium*	5
Desmodium canadense	1	*Senna hebecarpa*	0.5
Echinacea purpurea	5	*Tridens flavus*	18
Elymus virginicus	5	*Verbena hastata*	1
Eupatorium perfoliatum	0.5		
		Total	**100**

Table 6C. Permanent Seed Mix

Nesbit Site – Streamside & Wetland Mix

Species*	Percentage	Species*	Percentage
Bidens aristosa	10	*Panicum rigidulum*	30
Carex albolutescens	6	*Panicum virgatum*	5
Elymus virginicus	15	*Rudbeckia hirta*	4
Helianthus angustifolius	10	*Sorghastrum nutans*	15
Juncus coriaceus	5		
		Total	**100**

* Both seed mixes were applied at 2 lbs per acre; however, in streamside areas, an additional 160 lbs of temporary soil health mix (turnip, clover, chicory) were applied along the easement boundary and in the upland areas.

Table 7. Planted Vegetation Totals

Nesbit Site

Plot #	Planted Stems/Acre	Success Criteria Met?
1	526	Yes
2	486	Yes
3	526	Yes
4	810	Yes
5	405	Yes
6	850	Yes
7	486	Yes
8	607	Yes
9	162	No
10	283	Yes
11	486	Yes
12	405	Yes
13	364	Yes
14	202	No
15	769	Yes
16	202	No
T1	526	Yes
T2	324	Yes
Average Planted Stems/Acre	468	**Yes**

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

Planted Acreage	16
Date of Initial Plant	2022-02-03
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2022-08-24
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	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		Veg Plot 9 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Betula nigra	river birch	Tree	FACW									4	4								
	Carya cordiformis	bitternut hickory	Tree	FACU	1	1									1	1						
	Celtis occidentalis	common hackberry	Tree	FACU									1	1								
	Cornus amomum	silky dogwood	Shrub	FACW			2	2	3	3	10	10			6	6			4	4		
	Diospyros virginiana	common persimmon	Tree	FAC											2	2			1	1	1	1
	Fraxinus pennsylvanica	green ash	Tree	FACW		1	3	3			2	2	1	1			2	2				
	Liriodendron tulipifera	tuliptree	Tree	FACU					5	5											2	2
	Morus rubra	red mulberry	Tree	FACU	2	2	1	1														
	Nyssa sylvatica	blackgum	Tree	FAC	2	2									1	1	1	1				
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	4	4							3	3	6	6				
	Quercus alba	white oak	Tree	FACU									1	1							1	1
	Quercus nigra	water oak	Tree	FAC			2	2	2	2	2	2	1	1								
	Quercus phellos	willow oak	Tree	FAC	2	2					2	2	1	1	7	7			6	6		
	Quercus rubra	northern red oak	Tree	FACU							1	1			1	1	1	1				
	Quercus shumardii	Shumard's oak	Tree	FAC													1	1				
	Quercus sp.				2	2			3	3	2	2	1	1			1	1	3	3		
	Ulmus americana	American elm	Tree	FACW							1	1							1	1		
Sum	Performance Standard				12	13	12	12	13	13	20	20	10	10	21	21	12	12	15	15	4	4
Mitigation Plan Performance Standard	Current Year Stem Count					13		12		13		20		10		21		12		15		4
	Stems/Acre					526		486		526		810		405		850		486		607		162
	Species Count					7		5		4		7		7		7		6		5		3
	Dominant Species Composition (%)					23		33		38		50		40		33		50		40		50
	Average Plot Height (ft.)					2		2		1		2		2		2		2		1		1
	% Invasives					0		0		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					13		12		13		20		10		21		12		15		4
	Stems/Acre					526		486		526		810		405		850		486		607		162
	Species Count					7		5		4		7		7		7		6		5		3
	Dominant Species Composition (%)					23		33		38		50		40		33		50		40		50
	Average Plot Height (ft.)					2		2		1		2		2		2		2		1		1
	% Invasives					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.

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

Planted Acreage	16
Date of Initial Plant	2022-02-03
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2022-08-24
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	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		Veg Plot 1 R	Veg Plot 2 R
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total	Total
Species Included in Approved Mitigation Plan	Betula nigra	river birch	Tree	FACW			1	1	4	4	3	3								
	Carya cordiformis	bitternut hickory	Tree	FACU							1	1								
	Celtis occidentalis	common hackberry	Tree	FACU																
	Cornus amomum	silky dogwood	Shrub	FACW			5	5							4	4				
	Diospyros virginiana	common persimmon	Tree	FAC			1	1			1	1	1	1			1	1		
	Fraxinus pennsylvanica	green ash	Tree	FACW															10	
	Liriodendron tulipifera	tuliptree	Tree	FACU			1	1					1	1						
	Morus rubra	red mulberry	Tree	FACU							1	1								
	Nyssa sylvatica	blackgum	Tree	FAC																
	Platanus occidentalis	American sycamore	Tree	FACW					1	1					6	6	2	2	1	5
	Quercus alba	white oak	Tree	FACU	3	3	1	1							2	2	1	1		
	Quercus nigra	water oak	Tree	FAC		1	1	1	4	4			1	1	2	2				2
	Quercus phellos	willow oak	Tree	FAC	4	4									1	1	1	1	2	
	Quercus rubra	northern red oak	Tree	FACU																1
	Quercus shumardii	Shumard's oak	Tree	FAC									1	1						
	Quercus sp.						2	2	1	1	3	3	1	1	4	4				
	Ulmus americana	American elm	Tree	FACW																
Sum	Performance Standard				7	8	12	12	10	10	9	9	5	5	19	19	5	5	13	8
Mitigation Plan Performance Standard	Current Year Stem Count					8		12		10		9		5		19		5	13	8
	Stems/Acre					324		486		405		364		202		769		202	526	324
	Species Count					2		7		4		5		5		6		4	3	3
	Dominant Species Composition (%)					57		42		40		33		20		32		40	77	62
	Average Plot Height (ft.)					1		2		2		1		2		2		2	2	2
	% Invasives					0		0		0		0		0		0		0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count					8		12		10		9		5		19		5	13	8
	Stems/Acre					324		486		405		364		202		769		202	526	324
	Species Count					2		7		4		5		5		6		4	3	3
	Dominant Species Composition (%)					57		42		40		33		20		32		40	77	62
	Average Plot Height (ft.)					1		2		2		1		2		2		2	2	2
	% Invasives					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

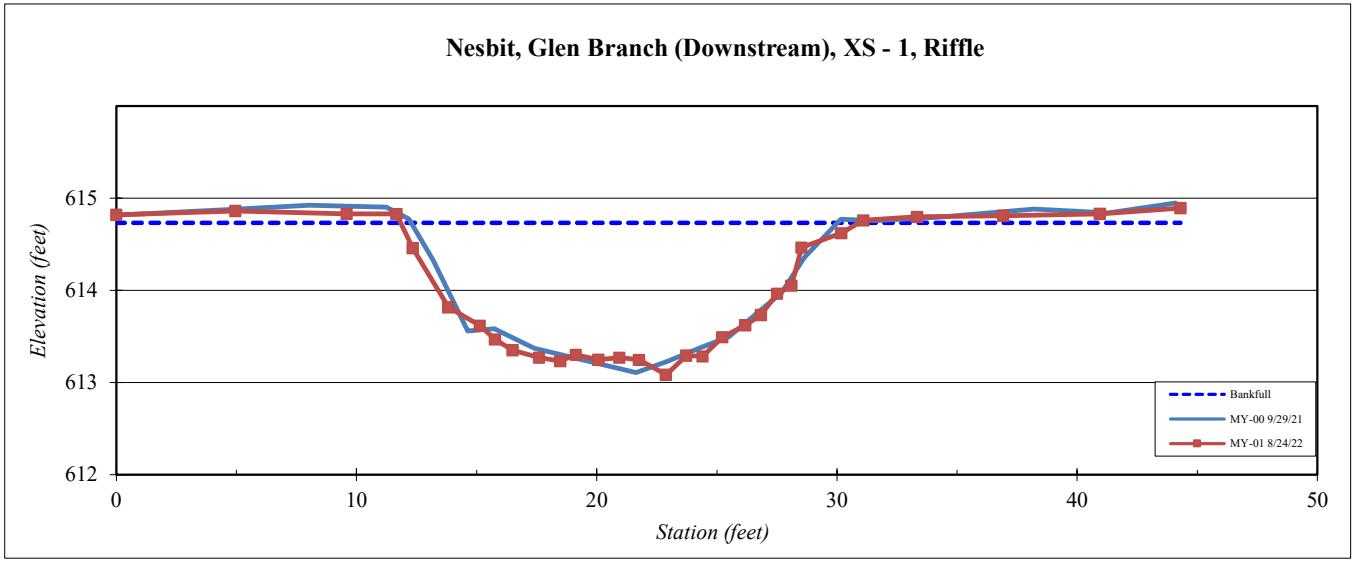
Cross-Sections with Annual Overlays
Table 9A-D. Baseline Stream Data Summary Tables
Table 10A-C. Cross-Section Morphology Monitoring Summary

Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Downstream), XS - 1, Riffle
Feature	Riffle
Date:	8/24/2022
Field Crew:	Perkinson, Adams, Lance, Fleming

Station	Elevation
0.0	614.8
5.0	614.9
9.6	614.9
11.7	614.9
12.3	614.4
13.8	613.7
15.1	613.5
15.8	613.3
16.5	613.2
17.6	613.1
18.5	613.0
19.1	613.1
20.1	613.1
20.9	613.1
21.8	613.1
22.9	612.9
23.7	613.1
24.4	613.1
25.2	613.3
26.2	613.5
26.8	613.61
27.5	613.9
28.1	614.0
28.5	614.4
30.2	614.6
31.1	614.8
33.3	614.8
36.9	614.8
40.9	614.9
44.3	614.9

SUMMARY DATA	
Bankfull Elevation:	614.74
Bank Hieght Ratio:	1.02
Thalweg Elevation:	612.88
LTOB Elevation:	614.77
LTOB Max Depth:	1.90
LTOB Cross Sectional Area:	23.5

Stream Type	E/C 5

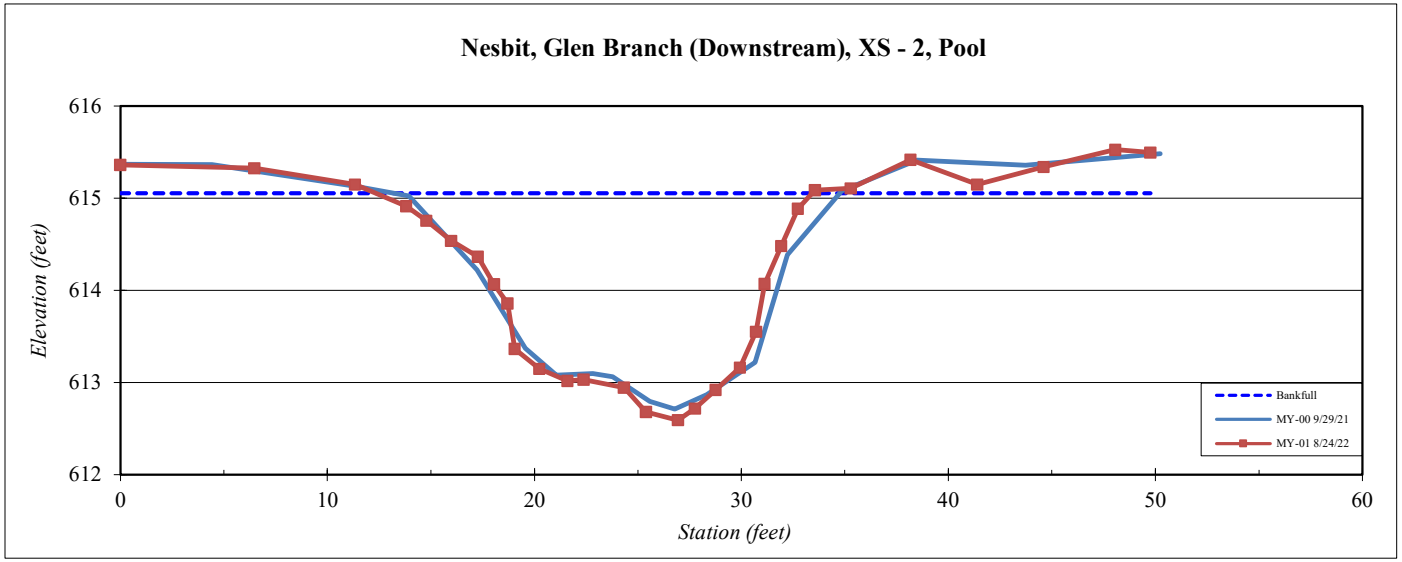


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Downstream), XS - 2, Pool
Feature	Pool
Date:	8/24/2022
Field Crew:	Perkinson, Adams, Lance, Fleming

Station	Elevation
0.0	615.5
6.5	615.4
11.3	615.2
13.8	614.9
14.8	614.8
16.0	614.5
17.3	614.3
18.0	614.0
18.7	613.8
19.1	613.2
20.2	612.9
21.6	612.8
22.4	612.8
24.3	612.7
25.4	612.4
26.9	612.3
27.8	612.5
28.8	612.7
29.9	613.0
30.7	613.4
31.1	613.99
31.9	614.5
32.7	614.9
33.6	615.1
35.3	615.2
38.2	615.5
41.4	615.2
44.6	615.4
48.1	615.6
49.8	615.6

SUMMARY DATA	
Bankfull Elevation:	615.11
Bank Hieght Ratio:	1.01
Thalweg Elevation:	612.32
LTOB Elevation:	615.14
LTOB Max Depth:	2.82
LTOB Cross Sectional Area:	34.0

Stream Type	E/C 5

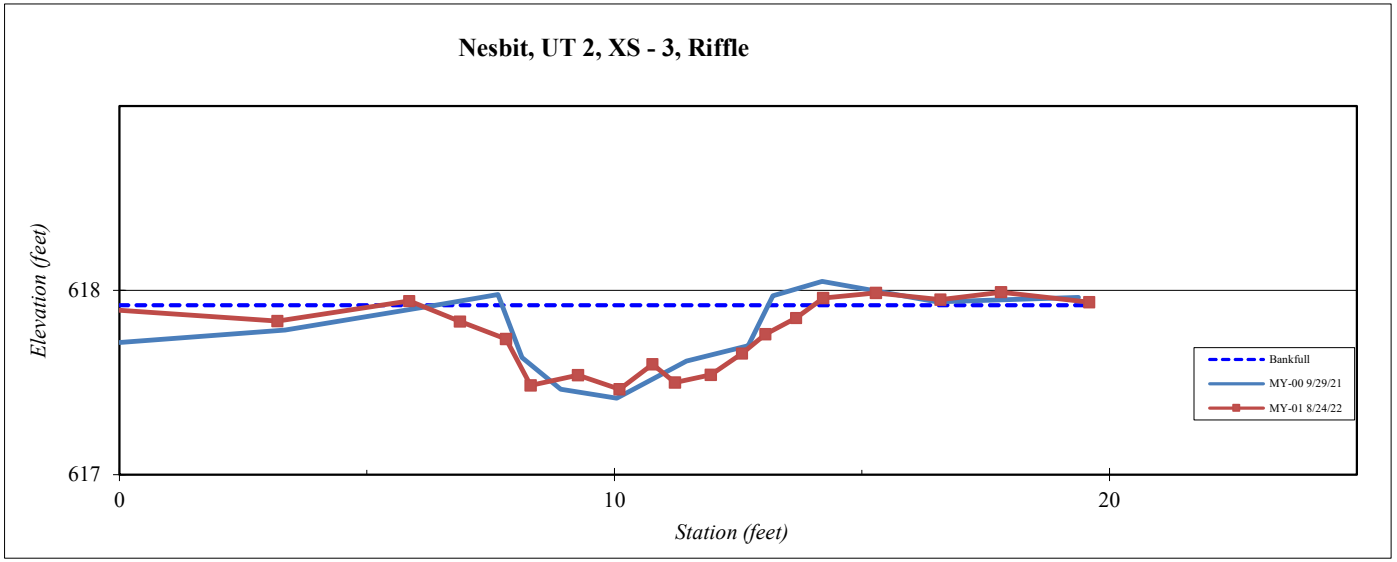


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	UT 2, XS - 3, Riffle
Feature	Riffle
Date:	8/24/2022
Field Crew:	Perkinson, Adams, Lance, Fleming

Station	Elevation
-0.4	618.3
3.2	618.2
5.9	618.4
6.9	618.2
7.8	618.1
8.3	617.9
9.3	617.9
10.1	617.8
10.8	618.0
11.2	617.9
11.9	617.9
12.6	618.0
13.1	618.2
13.7	618.3
14.2	618.4
15.3	618.4
16.6	618.4
17.8	618.4
19.6	618.4

SUMMARY DATA	
Bankfull Elevation:	618.35
Bank Hieght Ratio:	1.05
Thalweg Elevation:	617.83
LTOB Elevation:	618.37
LTOB Max Depth:	0.54
LTOB Cross Sectional Area:	2.6

Stream Type	E/C 5

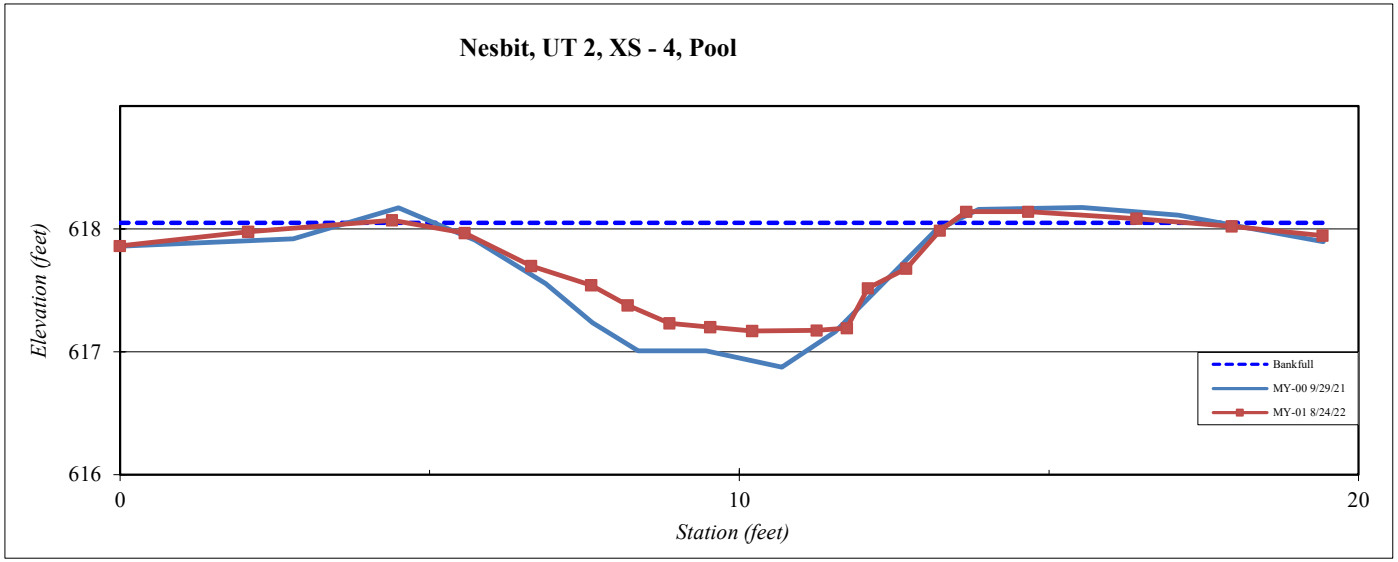


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	UT 2, XS - 4, Pool
Feature	Pool
Date:	8/24/2022
Field Crew:	Perkinson, Adams, Lance, Fleming

Station	Elevation
0.0	618.3
2.1	618.4
4.4	618.5
5.6	618.4
6.6	618.1
7.6	617.9
8.2	617.7
8.9	617.6
9.5	617.5
10.2	617.5
11.3	617.5
11.7	617.5
12.1	617.9
12.7	618.1
13.2	618.4
13.7	618.6
14.7	618.6
16.4	618.5
18.0	618.5
19.4	618.4

SUMMARY DATA	
Bankfull Elevation:	618.49
Bank Hieght Ratio:	1.02
Thalweg Elevation:	617.50
LTOB Elevation:	618.52
LTOB Max Depth:	1.02
LTOB Cross Sectional Area:	5.5

Stream Type	E/C 5

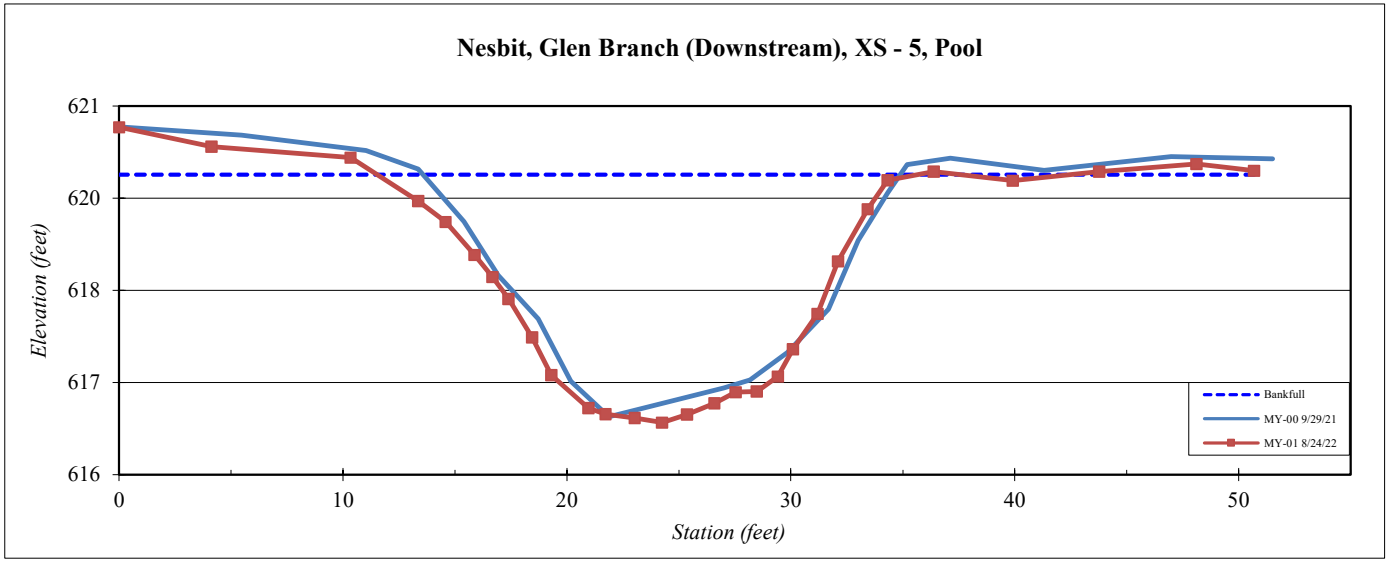


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Downstream), XS - 5, Pool
Feature	Pool
Date:	8/24/2022
Field Crew:	Perkinson, Adams, Lance, Fleming

Station	Elevation
0.0	620.4
4.1	620.2
10.3	620.1
13.4	619.5
14.6	619.3
15.9	618.9
16.7	618.6
17.4	618.3
18.5	617.9
19.3	617.4
21.0	617.0
21.7	616.9
23.0	616.9
24.3	616.8
25.4	616.9
26.6	617.1
27.5	617.2
28.5	617.2
29.4	617.4
30.1	617.7
31.2	618.15
32.1	618.8
33.4	619.4
34.3	619.8
36.4	619.9
39.9	619.8
43.8	619.9
48.1	620.0
50.7	619.9

SUMMARY DATA	
Bankfull Elevation:	619.86
Bank Hieght Ratio:	1.01
Thalweg Elevation:	616.81
LTOB Elevation:	619.90
LTOB Max Depth:	3.08
LTOB Cross Sectional Area:	43.2

Stream Type	E/C 5

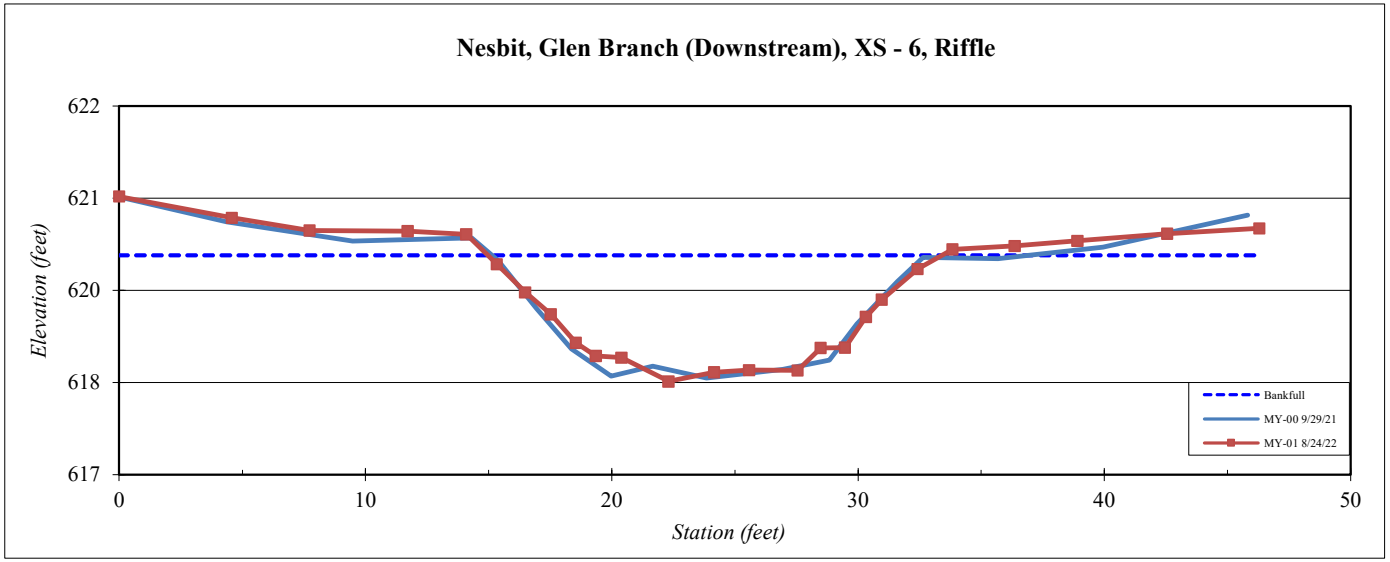


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Downstream), XS - 6, Riffle
Feature	Riffle
Date:	8/24/2022
Field Crew:	Perkinson, Adams, Lance, Fleming

Station	Elevation
0.0	620.7
4.6	620.5
7.7	620.3
11.7	620.3
14.1	620.3
15.3	619.9
16.5	619.5
17.5	619.3
18.5	618.9
19.4	618.8
20.4	618.7
22.3	618.5
24.2	618.6
25.6	618.6
27.5	618.6
28.5	618.9
29.5	618.9
30.3	619.2
31.0	619.5
32.4	619.8
33.8	620.07
36.4	620.1
38.9	620.2
42.6	620.3
46.3	620.3

SUMMARY DATA	
Bankfull Elevation:	620.00
Bank Hieght Ratio:	1.05
Thalweg Elevation:	618.45
LTOB Elevation:	620.07
LTOB Max Depth:	1.62
LTOB Cross Sectional Area:	19.9

Stream Type	E/C 5

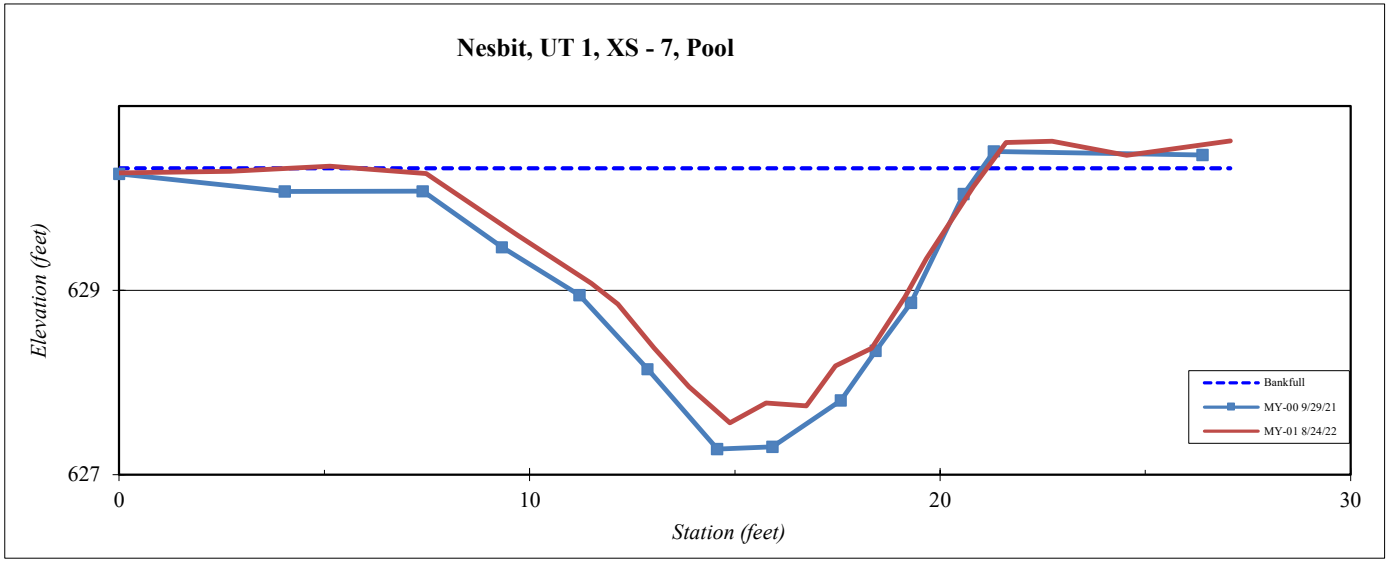


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	UT 1, XS - 7, Pool
Feature	Pool
Date:	8/24/2022
Field Crew:	Perkinson, Adams, Lance, Fleming

Station	Elevation
0.0	629.3
2.7	629.3
5.1	629.4
7.5	629.3
9.7	629.0
11.5	628.7
12.1	628.5
13.0	628.3
13.9	628.0
14.9	627.8
15.8	627.9
16.7	627.9
17.5	628.1
18.3	628.3
19.1	628.6
19.7	628.8
20.8	629.2
21.6	629.5
22.7	629.5
24.5	629.4
27.1	629.53

SUMMARY DATA	
Bankfull Elevation:	629.36
Bank Hieght Ratio:	1.01
Thalweg Elevation:	627.80
LTOB Elevation:	629.38
LTOB Max Depth:	1.58
LTOB Cross Sectional Area:	11.8

Stream Type	E/C 5

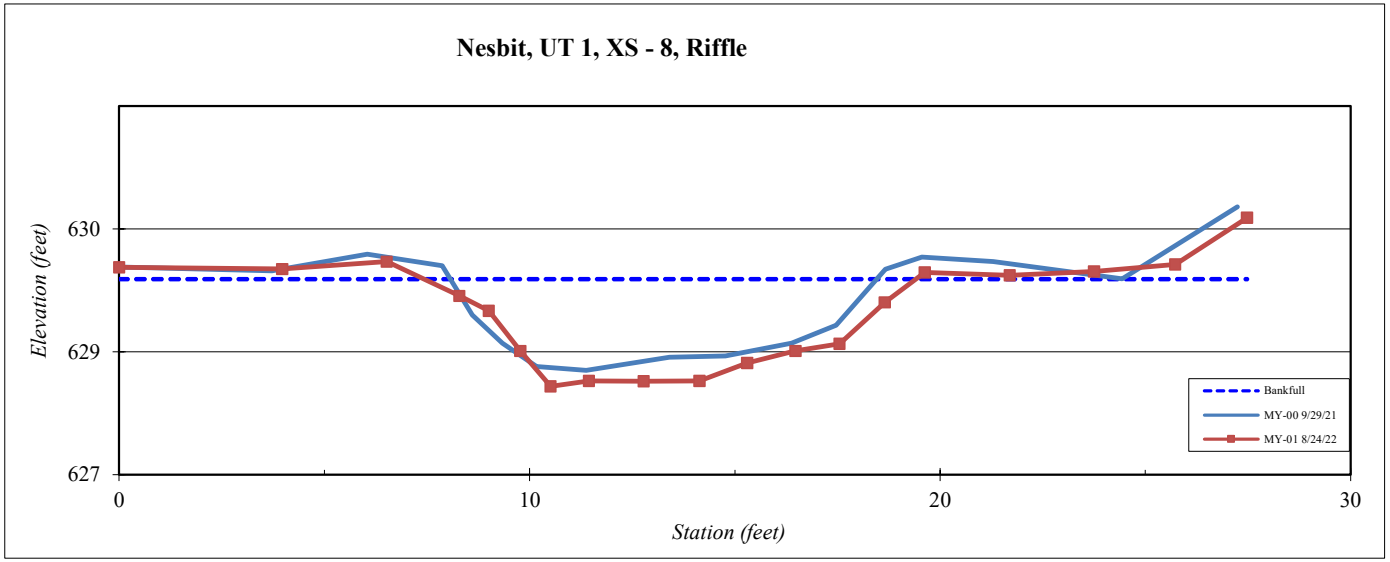


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	UT 1, XS - 8, Riffle
Feature	Riffle
Date:	8/24/2022
Field Crew:	Perkinson, Adams, Lance, Fleming

Station	Elevation
0.0	629.4
4.0	629.4
6.5	629.4
8.3	629.1
9.0	629.0
9.8	628.6
10.5	628.3
11.4	628.3
12.8	628.3
14.1	628.3
15.3	628.5
16.5	628.6
17.6	628.7
18.7	629.1
19.6	629.3
21.7	629.3
23.8	629.4
25.7	629.4
27.5	629.8

SUMMARY DATA	
Bankfull Elevation:	629.28
Bank Hieght Ratio:	1.06
Thalweg Elevation:	628.29
LTOB Elevation:	629.34
LTOB Max Depth:	1.05
LTOB Cross Sectional Area:	8.4

Stream Type	E/C 5

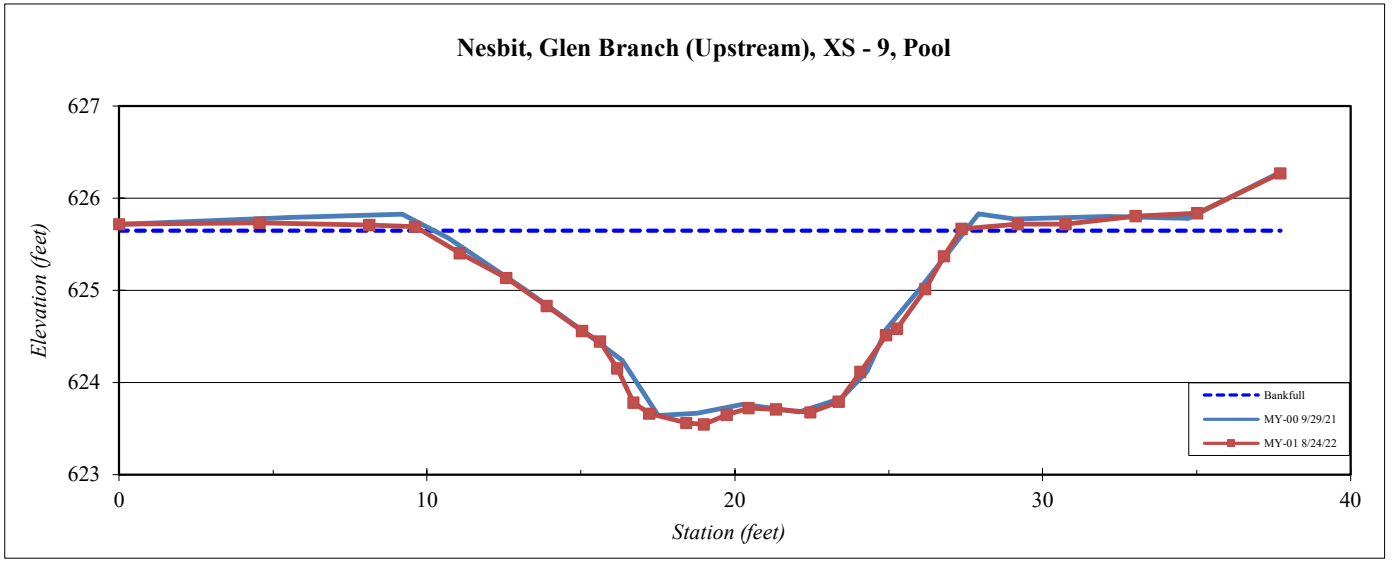


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Upstream), XS - 9, Pool
Feature	Pool
Date:	8/24/2022
Field Crew:	Perkinson, Adams, Lance, Fleming

Station	Elevation
0.0	626.0
4.6	626.1
8.1	626.0
9.6	626.0
11.1	625.7
12.6	625.4
13.9	625.0
15.0	624.7
15.6	624.6
16.2	624.3
16.7	623.8
17.2	623.7
18.4	623.6
19.0	623.6
19.7	623.7
20.5	623.8
21.3	623.8
22.5	623.7
23.4	623.9
24.1	624.2
24.9	624.67
25.3	624.8
26.2	625.2
26.8	625.6
27.4	626.0
29.2	626.0
30.7	626.0
33.0	626.1
35.0	626.2
37.7	626.7

SUMMARY DATA	
Bankfull Elevation:	625.95
Bank Hieght Ratio:	1.03
Thalweg Elevation:	623.57
LTOB Elevation:	626.02
LTOB Max Depth:	2.45
LTOB Cross Sectional Area:	26.2

Stream Type	E/C 5

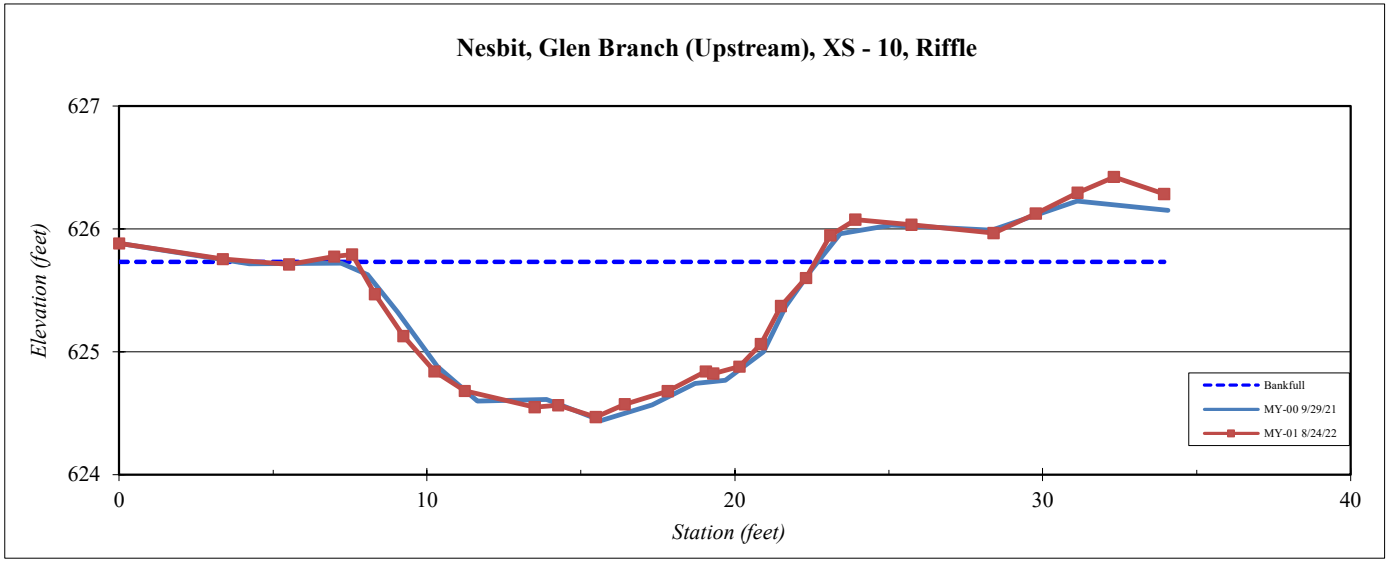


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Upstream), XS - 10, Riffle
Feature	Riffle
Date:	8/24/2022
Field Crew:	Perkinson, Adams, Lance, Fleming

Station	Elevation
0.0	626.2
3.4	626.1
5.5	626.0
7.0	626.1
7.6	626.1
8.3	625.8
9.2	625.4
10.2	625.0
11.2	624.9
13.5	624.7
14.3	624.7
15.5	624.6
16.4	624.7
17.8	624.9
19.1	625.0
19.3	625.0
20.1	625.1
20.9	625.3
21.5	625.6
22.3	625.9
23.1	626.29
23.9	626.4
25.7	626.4
28.4	626.3
29.8	626.5
31.1	626.7
32.3	626.8
34.0	626.7

SUMMARY DATA	
Bankfull Elevation:	626.05
Bank Hieght Ratio:	1.05
Thalweg Elevation:	624.62
LTOB Elevation:	626.12
LTOB Max Depth:	1.50
LTOB Cross Sectional Area:	15.8

Stream Type	E/C 5

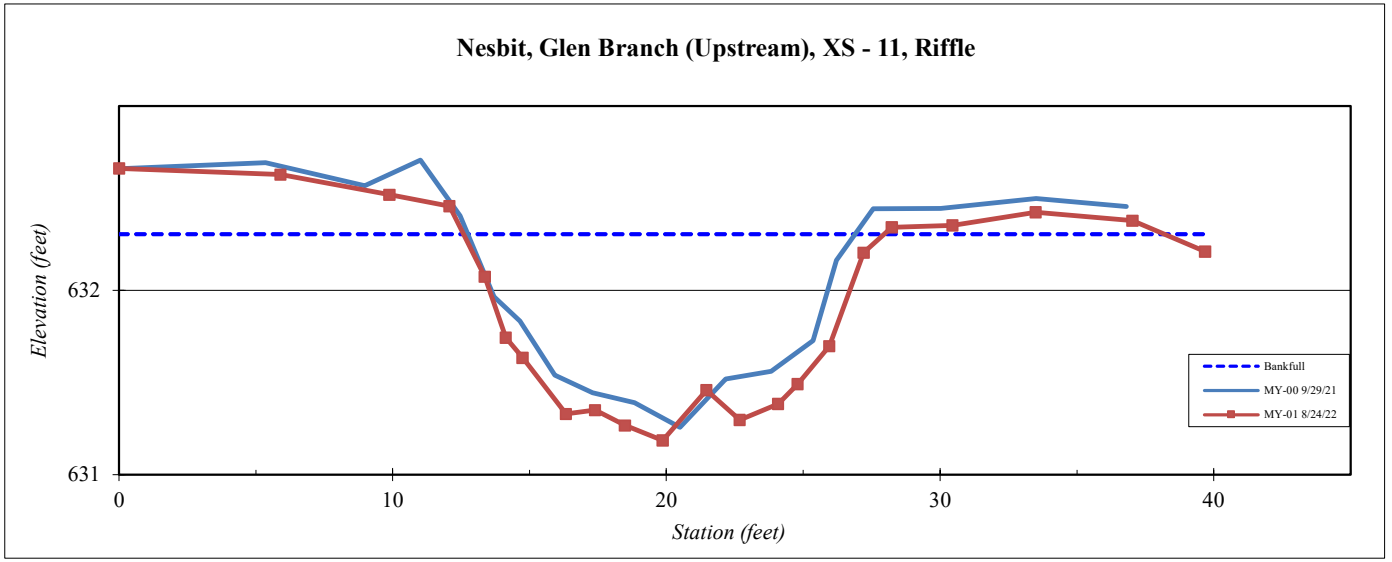


Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Upstream), XS - 11, Riffle
Feature	Riffle
Date:	8/24/2022
Field Crew:	Perkinson, Adams, Lance, Fleming

Station	Elevation
0.0	632.8
5.9	632.7
9.9	632.6
12.1	632.5
13.4	632.1
14.1	631.7
14.8	631.6
16.3	631.2
17.4	631.3
18.5	631.2
19.9	631.1
21.5	631.4
22.7	631.2
24.1	631.3
24.8	631.4
26.0	631.7
27.2	632.2
28.2	632.4
30.5	632.4
33.5	632.5
37.0	632.43
39.7	632.2

SUMMARY DATA	
Bankfull Elevation:	632.35
Bank Hieght Ratio:	1.03
Thalweg Elevation:	631.08
LTOB Elevation:	632.39
LTOB Max Depth:	1.31
LTOB Cross Sectional Area:	13.8

Stream Type	E/C 5



Site	Nesbit
Watershed:	Catawba River Basin, 03050103
XS ID	Glen Br (Upstream), XS - 12, Pool
Feature	Pool
Date:	8/24/2022
Field Crew:	Perkinson, Adams, Lance, Fleming

Station	Elevation
0.0	633.1
2.1	633.0
8.5	632.7
11.3	632.3
12.6	631.9
13.4	631.6
14.2	631.2
15.0	630.7
16.4	630.5
17.7	630.3
19.4	630.5
21.1	630.5
22.7	630.7
23.8	630.8
24.5	631.3
25.4	631.7
25.9	631.8
27.1	632.6
28.3	632.9
30.5	632.9
34.6	632.94
37.8	633.0

SUMMARY DATA	
Bankfull Elevation:	632.67
Bank Hieght Ratio:	1.02
Thalweg Elevation:	630.34
LTOB Elevation:	632.72
LTOB Max Depth:	2.38
LTOB Cross Sectional Area:	27.0

Stream Type	E/C 5

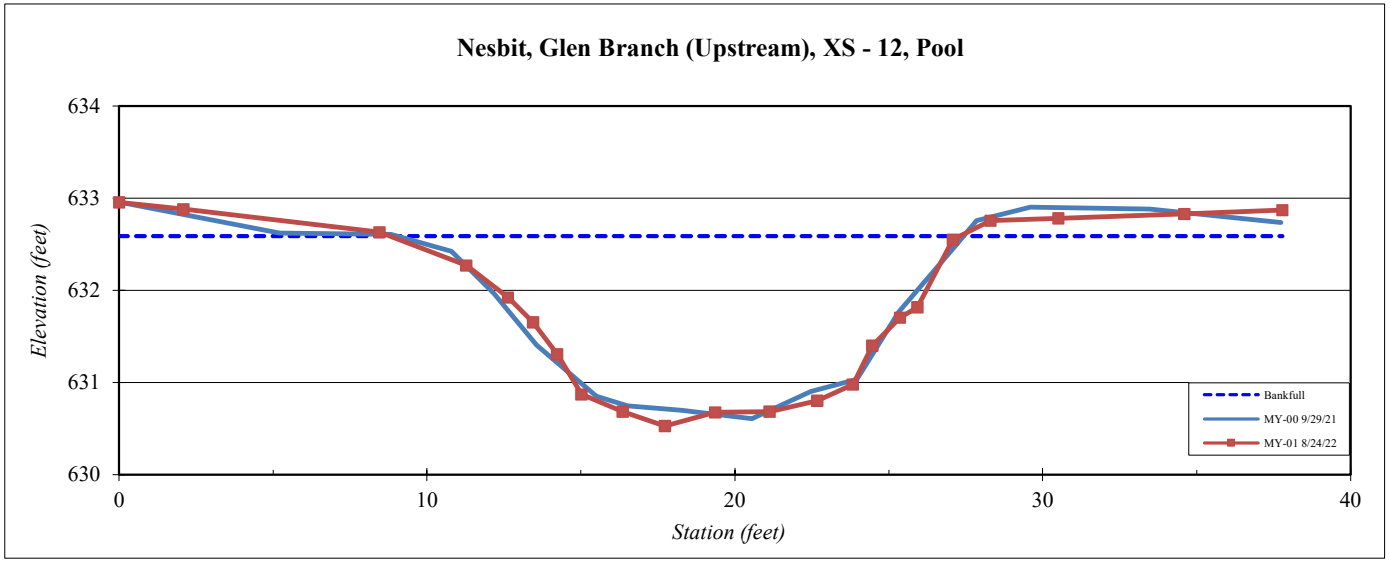


Table 9A. Baseline Stream Data Summary Nesbit - Glen Branch (Upstream)										
Parameter	**Pre-Existing Condition (applicaple)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	11.0		15.1	26	7	14.2	16.3	15.2	15.4	2
Floodprone Width (ft)	16		50	100	7	50	100	75	75	2
Bankfull Mean Depth (ft)	0.6		1.1	1.5	7	1	1.2	0.9	1.0	2
Bankfull Max Depth (ft)	1.3		2	2.2	7	1.3	1.8	1.3	1.4	2
Bankfull Cross Sectional Area (ft^2)	16.7		16.7	16.7	7	16.7	16.7	13.1	14.7	2
Width/Depth Ratio	7.3		13.7	43.3	7	12	16	16.2	17.8	2
Entrenchment Ratio	1.4		2.8	6.5	7	3.5	6.1	4.9	4.9	2
Bank Height Ratio	**1**		**1.8**	**2.2**	**7**	**1**	**1.3**	1	1	**2**
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Cg 4					Ce 3/4		Ce 3/4		
Bankfull Discharge (cfs)	68.7					68.7		68.7		
Sinuosity (ft)	1.03					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0..75					0.0067		0.006		
Other										

Table 9B. Baseline Stream Data Summary Nesbit - Glen Branch (Downstream)										
Parameter	**Pre-Existing Condition (applicaple)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	11.2		15.7	18.2	7	16.7	19.3	17.4	18.0	2
Floodprone Width (ft)	25		100	100	7	50	150	100	100	2
Bankfull Mean Depth (ft)	1.3		1.5	2.1	7	1.4	1.4	1.1	1.3	2
Bankfull Max Depth (ft)	1.6		2.4	2.8	7	1.5	2.1	1.5	1.9	2
Bankfull Cross Sectional Area (ft^2)	23.2		23.2	23.2	7	23.2	23.2	18.4	22.8	2
Width/Depth Ratio	5.3		10.5	14	7	12	16	14.1	16.4	2
Entrenchment Ratio	1.4		5.9	8.9	7	3	7.8	5.6	5.8	2
Bank Height Ratio	**1.3**		**1.7**	**2.1**	**7**	**1**	**1.3**	1	1	**2**
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Eg 4					Ce 3/4		Ce 3/4		
Bankfull Discharge (cfs)	97.3					97.3		97.3		
Sinuosity (ft)	1.03					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0.0047					0.0042		0.0046		
Other										

Table 9C. Baseline Stream Data Summary Nesbit - UT 1										
Parameter	**Pre-Existing Condition (applicable)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	7.1		8.7	9.5	5	10	11.6	11.0	11.0	1
Floodprone Width (ft)	20		29	50	5	50	100	75.0	75.0	1
Bankfull Mean Depth (ft)	0.9		1	1.2	5	0.7	0.8	0.7	0.7	1
Bankfull Max Depth (ft)	0.9		1	1.3	5	0.9	1.3	1.0	1.0	1
Bankfull Cross Sectional Area (ft^2)	8.4		8.4	8.4	5	8.4	8.4	7.6	7.6	1
Width/Depth Ratio	5.9		8.7	10.6	5	12	16	15.9	15.9	1
Entrenchment Ratio	2.5		3.2	7	5	5	8.6	6.8	6.8	1
Bank Height Ratio	**1.4**		**1.7**	**1.8**	**5**	**1**	**1.3**	1.0	1.0	**1**
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Eg 4					Ce 3/4		Ce 3/4		
Bankfull Discharge (cfs)	32.9					32.9		32.9		
Sinuosity (ft)	1.06					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0.0081					0.0075		0.0069		
Other										

Table 9D. Baseline Stream Data Summary Nesbit - UT 2										
Parameter	**Pre-Existing Condition (applicable)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	3.4		4.7	7.9	3	6.2	7.2	5.6	5.6	1
Floodprone Width (ft)	7		30	50	3	25	75	100.0	100.0	1
Bankfull Mean Depth (ft)	0.4		0.7	0.9	3	0.4	0.5	0.4	0.4	1
Bankfull Max Depth (ft)	0.6		1.1	1.5	3	0.6	0.8	0.6	0.6	1
Bankfull Cross Sectional Area (ft^2)	3.2		3.2	3.2	3	3.2	3.2	2.4	2.4	1
Width/Depth Ratio	3.8		6.7	19.8	3	12	16	13.1	13.1	1
Entrenchment Ratio	1.5		3.8	14.7	3	4	10.5	17.8	17.8	1
Bank Height Ratio	**1.6**		**2.5**	**8.7**	**3**	**1**	**1.3**	1.0	1.0	**1**
Max part size (mm) mobilized at bankfull										
Rosgen Classification	Eg 6					Ce 3/4		Ce 3/4		
Bankfull Discharge (cfs)	11.8					11.8		11.8		
Sinuosity (ft)	1.03					1.15		1.15		
Water Surface Slope (Channel) (ft/ft)	0.0143					0.0128		0.0089		
Other										

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

(Nesbit/ DMS:100121) Glen Branch Upstream

	Glen Br (Upstream) - XS 1 (Riffle)							Glen Br (Upstream) - XS 2 (Pool)							Glen Br (Upstream) - XS 5 (Pool)							Glen Br (Upstream) - XS 6 (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+								
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	614.79	614.74						615.07	615.11						619.98	619.95						619.97	619.98													
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	1.02						1.00	1.01						1.00	1.01						1.00	1.05													
Thalweg Elevation	612.90	612.88						612.46	612.32						616.89	616.90						618.49	618.43													
LTOB[2] Elevation	614.79	614.77						615.07	615.14			`			619.98	619.99						619.97	620.05													
LTOB[2] Max Depth (ft)	1.88	1.90						2.61	2.82						3.09	3.08						1.48	1.62													
LTOB[2] Cross Sectional Area (ft^2)	22.9	23.48						33.2	34.03						42.3	43.21						18.5	19.87													
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)																																				
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)																																				

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:

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.

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 recroded and tracked above as LTOB max depth.

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 decereases. 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

(Nesbit/ DMS:100121) Glen Branch Downstream

	Glen Br (Downstream) - XS 9 (Pool)							Glen Br (Downstream) - XS 10 (Riffle)							Glen Br (Downstream) - XS 11 (Riffle)							Glen Br (Downstream) - XS 12 (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	626.03	625.95						626.04	626.05						632.51	632.46						632.69	632.67													
Bank Height Ratio_Based on AB Bankfull[1] Area	1.03	1.03						1.00	1.05						1.00	1.03						1.00	1.02													
Thalweg Elevation	623.71	623.57						624.59	624.62						631.16	631.19						630.43	630.34													
LTOB[2] Elevation	626.09	626.02						626.04	626.12			`			632.51	632.50						632.69	632.72													
LTOB[2] Max Depth (ft)	2.38	2.45						1.45	1.50						1.34	1.31						2.27	2.38													
LTOB[2] Cross Sectional Area (ft^2)	26.0	26.21						14.7	15.77						13.2	13.83						26.11	27.04													
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)																																				
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)																																				

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:

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.

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 recroded and tracked above as LTOB max depth.

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 decereases. Some of the variability above is the result of this factor and some is due to the large amount of depositional sediments observed.

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

(Nesbit/ DMS:100121) UT 1 and UT 2

	UT 1 - Cross Section 7 (Pool)							UT 1 - Cross Section 8 (Riffle)							UT 2 - Cross Section 3 (Riffle)							UT 2 - Cross Section 4 (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	629.22	629.26						629.40	629.35						618.41	618.35						618.33	618.49					
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	1.01						1.00	1.06						1.00	1.05						1.00	1.02					
Thalweg Elevation	627.64	627.70						628.44	628.36						617.78	617.83						617.17	617.50					
LTOB[2] Elevation	629.22	629.28						629.40	629.41						618.41	618.37						618.33	618.52					
LTOB[2] Max Depth (ft)	1.58	1.58						0.96	1.05						0.64	0.54						1.17	1.02					
LTOB[2] Cross Sectional Area (ft^2)	11.6	11.81						7.7	8.42						2.4	2.64						5.3	5.47					
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)																													
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)																													

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:

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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 recroded and tracked above as LTOB max depth.

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 decereases. 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

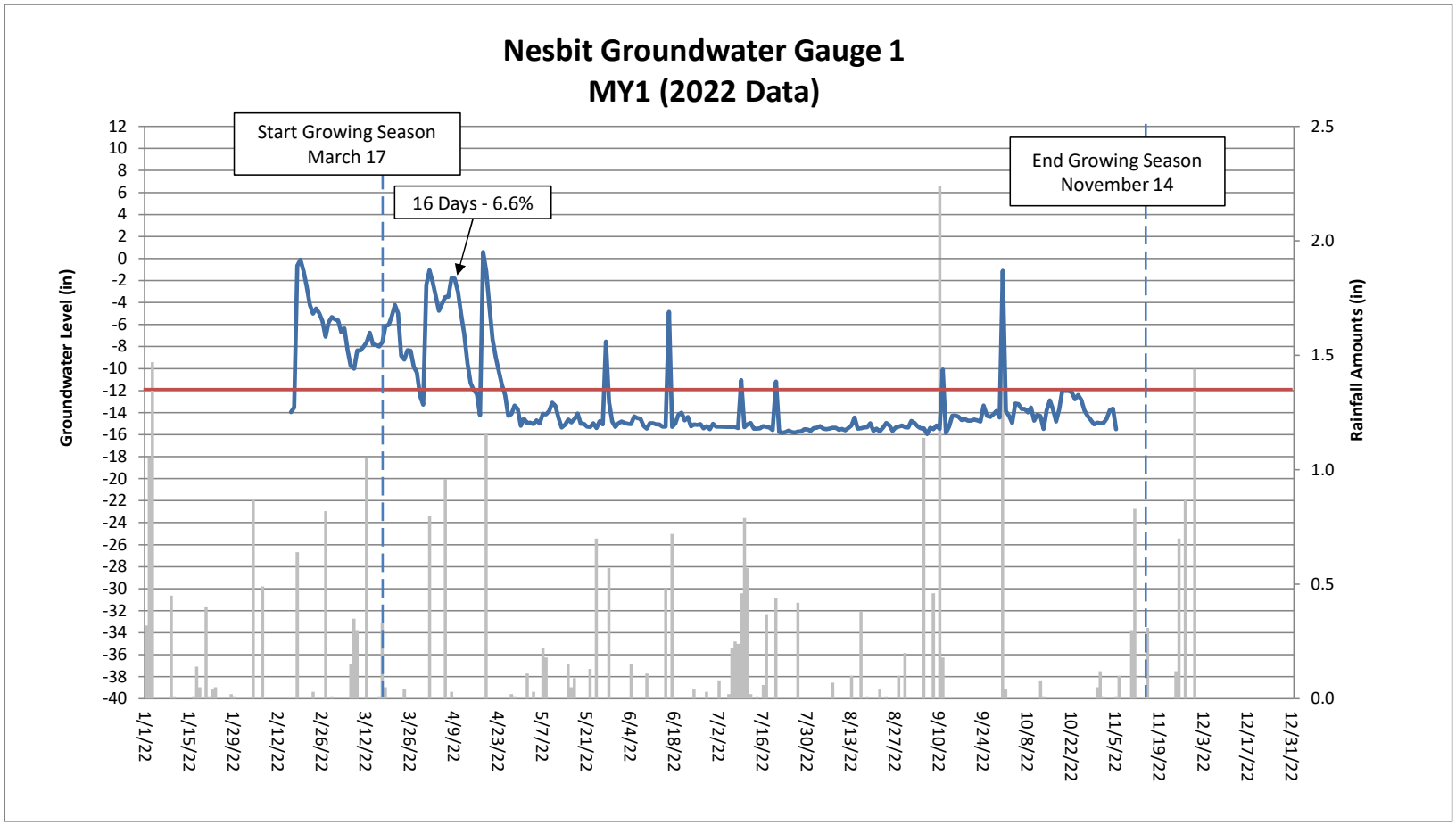
Table 11. Verification of Bankfull Events
Table 12. Groundwater Hydrology Data
Groundwater Gauge Graphs
Tables 13A-B. Channel Evidence
Surface Water Gauge Graphs
Figure D1. 30-70 Percentile Graph for Rainfall
Soil Temperature Graph
WETS Table

Table 11. Verification of Bankfull Events

Date of Data Collection	Date of Occurrence	Method	Photo (if available)
July 11, 2022	July 11, 2022	Crest gauges documented a bankfull event on Glen Branch and UT2 after 2.55" of rain was recorded between July 6-11, 2022 at an on-site rain gauge. Glen Branch crested at 1.80 ft, and UT2 crested at 1.36 ft.	--

Table 12. Groundwater Hydrology Data
Summary of Monitoring Period/Hydrology Success Criteria by Year

Gauge	12% Hydroperiod 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 – 16 Days (6.6%)						
2	No – 4 Days (1.6%)						
3	Yes – 50 Days (20.6%)						
4	No – 27 Days (11.1%)						
5	Yes – 30 Days (12.3%)						
6	No – 8 Days (3.3%)						
7	No – 9 Days (3.7%)						
8	No – 6 Days (2.5%)						
9	Yes – 49 Days (20.2%)						


Nesbit Groundwater Gauge 1
MY1 (2022 Data)
Start Growing Season
March 17
16 Days - 6.6%
End Growing Season
November 14
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/15/22
1/29/22
2/12/22
2/26/22
3/12/22
3/26/22
4/9/22
4/23/22
5/7/22
5/21/22
6/4/22
6/18/22
7/2/22
7/16/22
7/30/22
8/13/22
8/27/22
9/10/22
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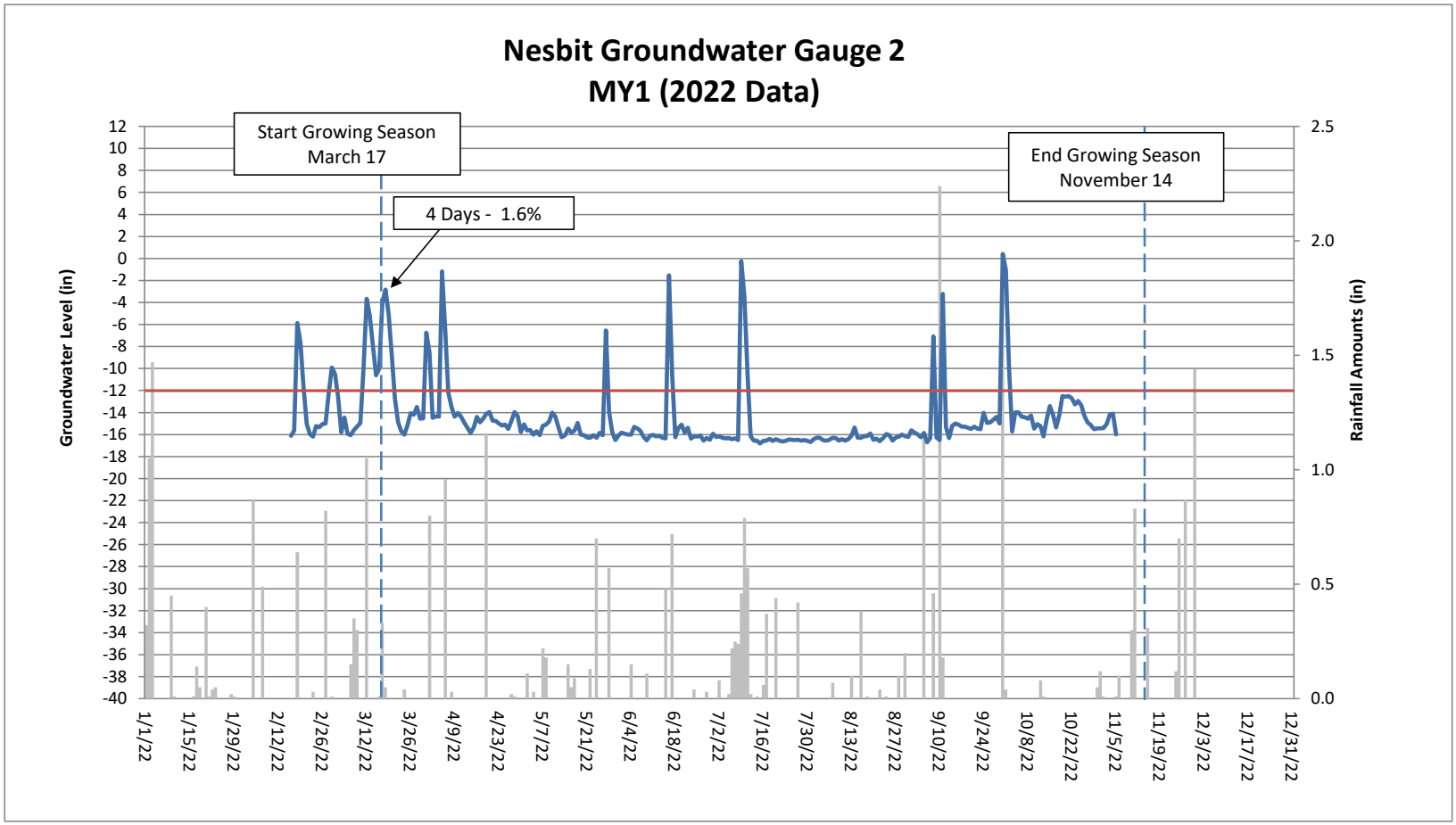
11/5/22
11/19/22
12/3/22
12/17/22
12/31/22


Nesbit Groundwater Gauge 2
MY1 (2022 Data)
Start Growing Season
March 17
End Growing Season
November 14
4 Days - 1.6%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/15/22
1/29/22
2/12/22
2/26/22
3/12/22
3/26/22
4/9/22
4/23/22
5/7/22
5/21/22
6/4/22
6/18/22
7/2/22
7/16/22
7/30/22
8/13/22
8/27/22
9/10/22
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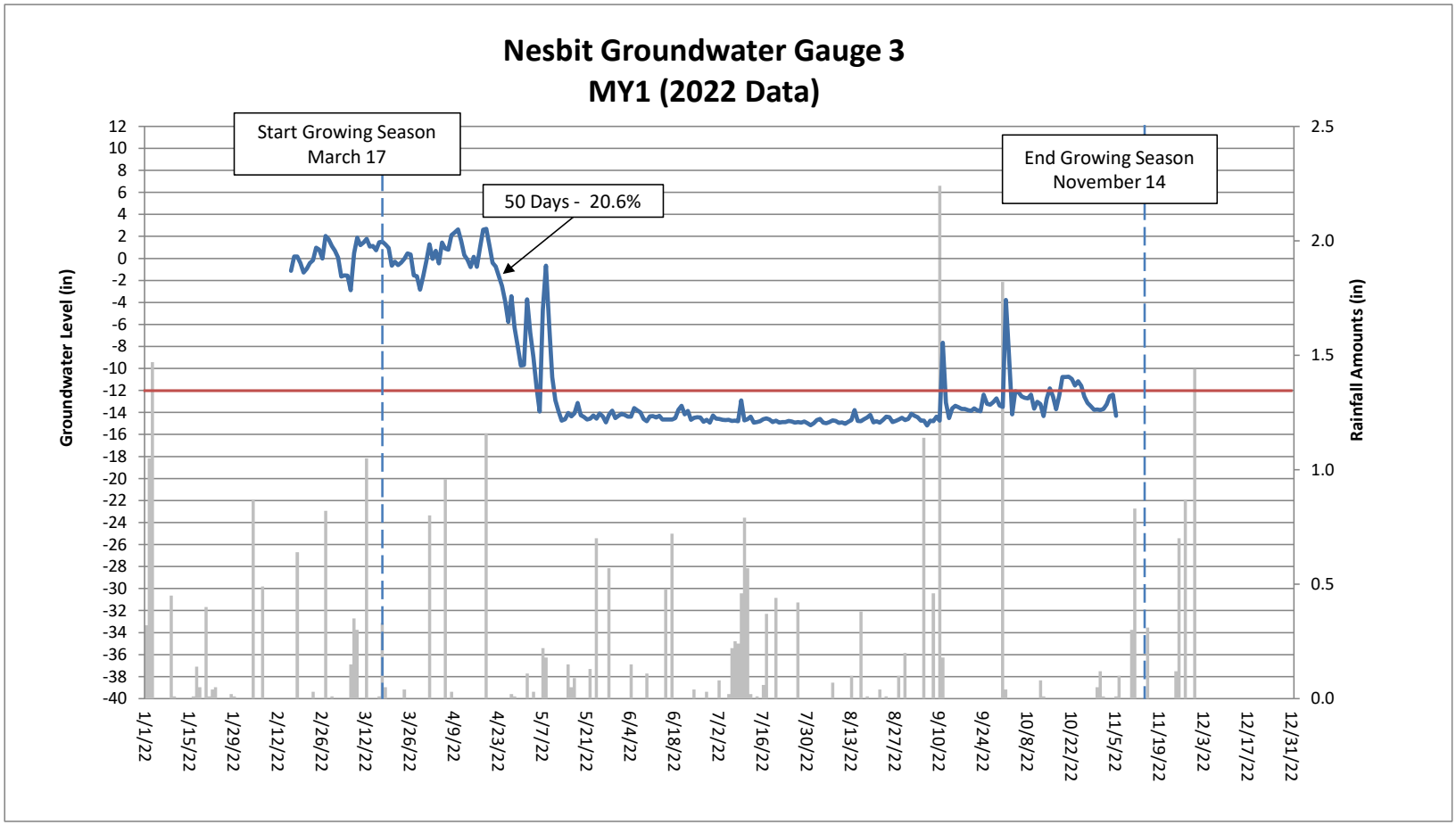
11/19/22
12/3/22
12/17/22
12/31/22


Nesbit Groundwater Gauge 3
MY1 (2022 Data)
Start Growing Season
March 17
50 Days - 20.6%
End Growing Season
November 14
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/15/22
1/29/22
2/12/22
2/26/22
3/12/22
3/26/22
4/9/22
4/23/22
5/7/22
5/21/22
6/4/22
6/18/22
7/2/22
7/16/22
7/30/22
8/13/22
8/27/22
9/10/22
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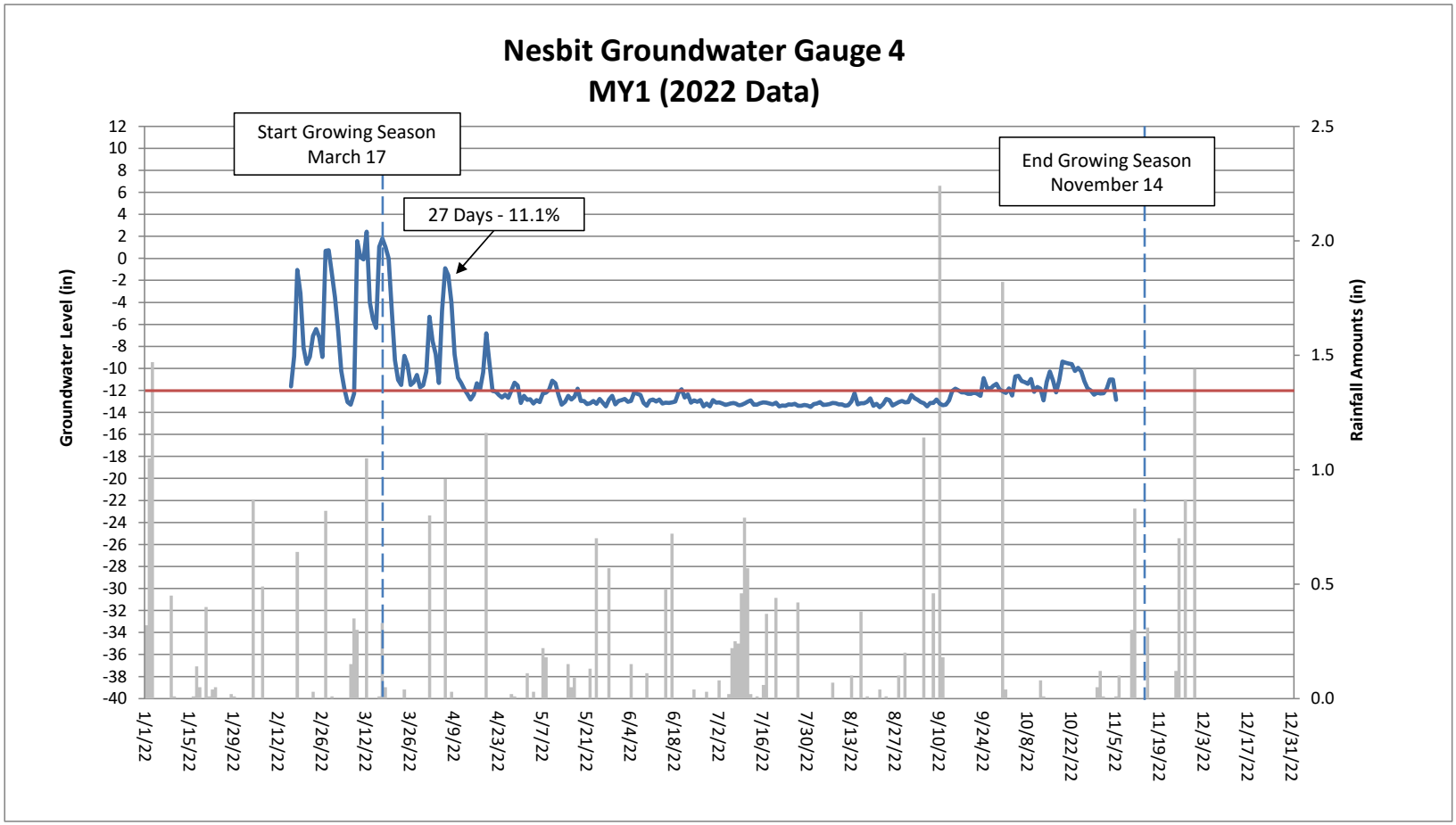
12/3/22
12/17/22
12/31/22


Nesbit Groundwater Gauge 4
MY1 (2022 Data)
Start Growing Season
March 17
End Growing Season
November 14
27 Days - 11.1%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/15/22
1/29/22
2/12/22
2/26/22
3/12/22
3/26/22
4/9/22
4/23/22
5/7/22
5/21/22
6/4/22
6/18/22
7/2/22
7/16/22
7/30/22
8/13/22
8/27/22
9/10/22
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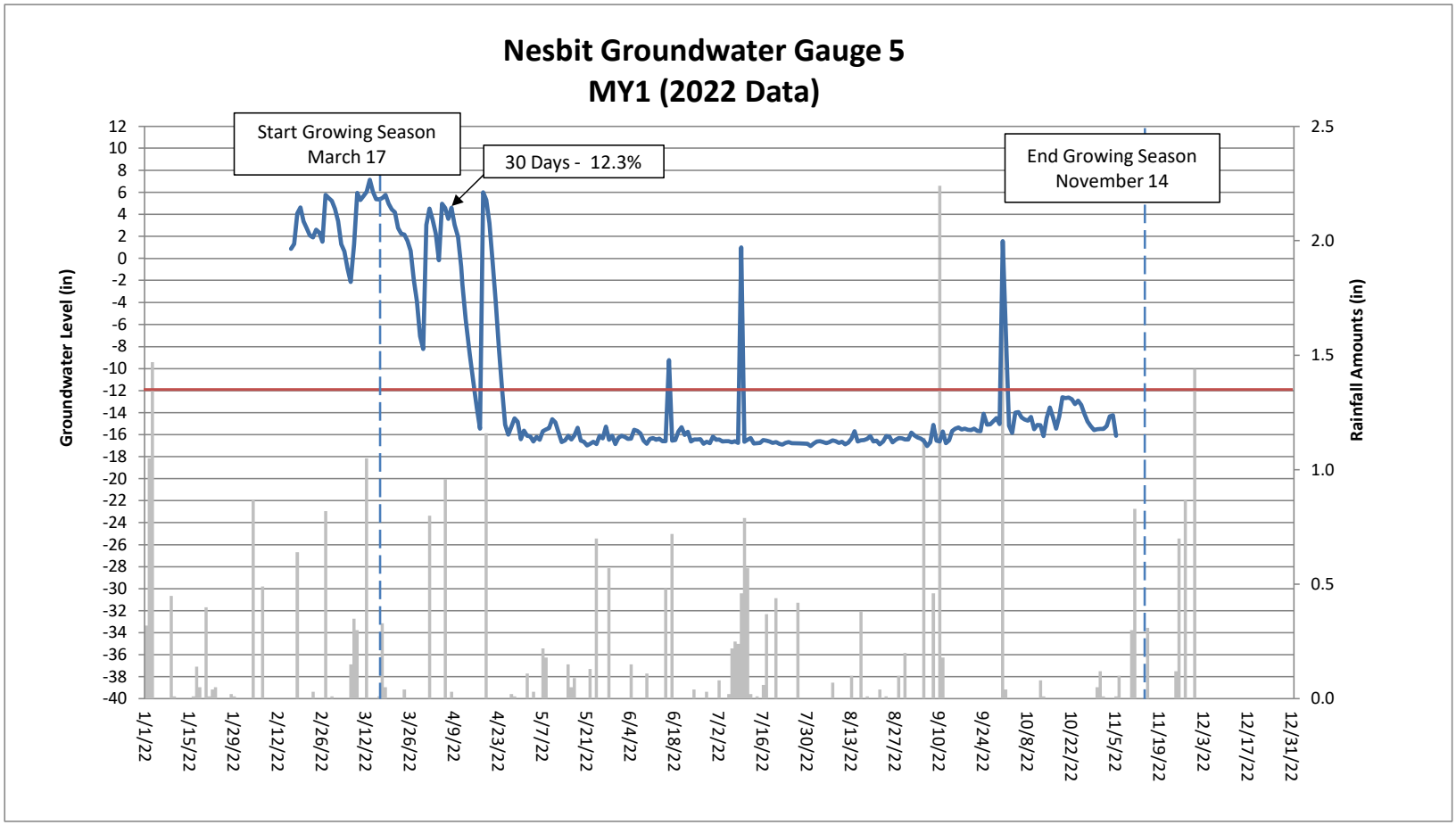
12/3/22
12/17/22
12/31/22


Nesbit Groundwater Gauge 5
MY1 (2022 Data)
Start Growing Season
March 17
30 Days - 12.3%
End Growing Season
November 14
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/15/22
1/29/22
2/12/22
2/26/22
3/12/22
3/26/22
4/9/22
4/23/22
5/7/22
5/21/22
6/4/22
6/18/22
7/2/22
7/16/22
7/30/22
8/13/22
8/27/22
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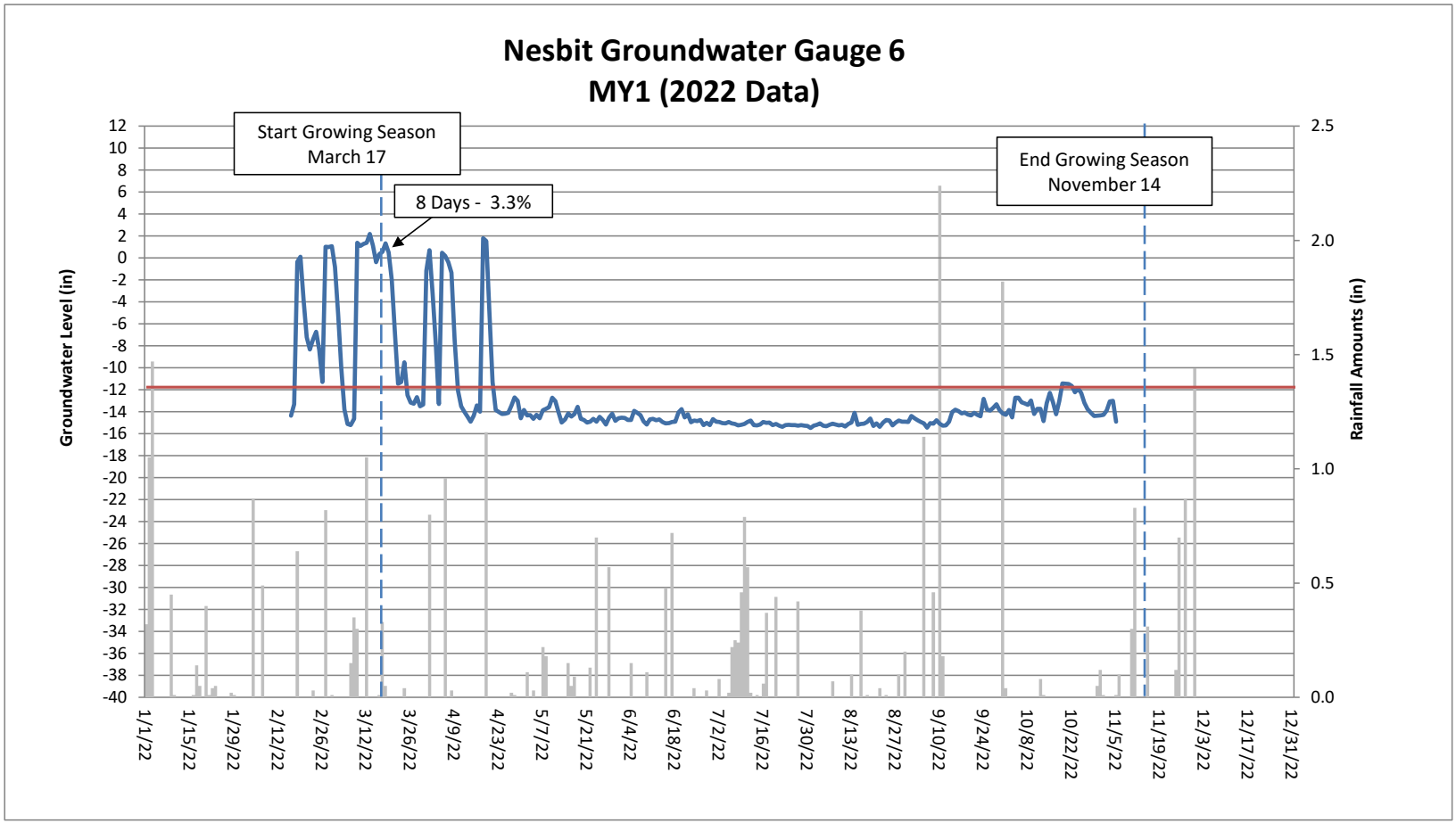
11/19/22
12/3/22
12/17/22
12/31/22


Nesbit Groundwater Gauge 6
MY1 (2022 Data)
Start Growing Season
March 17
8 Days - 3.3%
End Growing Season
November 14
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/15/22
1/29/22
2/12/22
2/26/22
3/12/22
3/26/22
4/9/22
4/23/22
5/7/22
5/21/22
6/4/22
6/18/22
7/2/22
7/16/22
7/30/22
8/13/22
8/27/22
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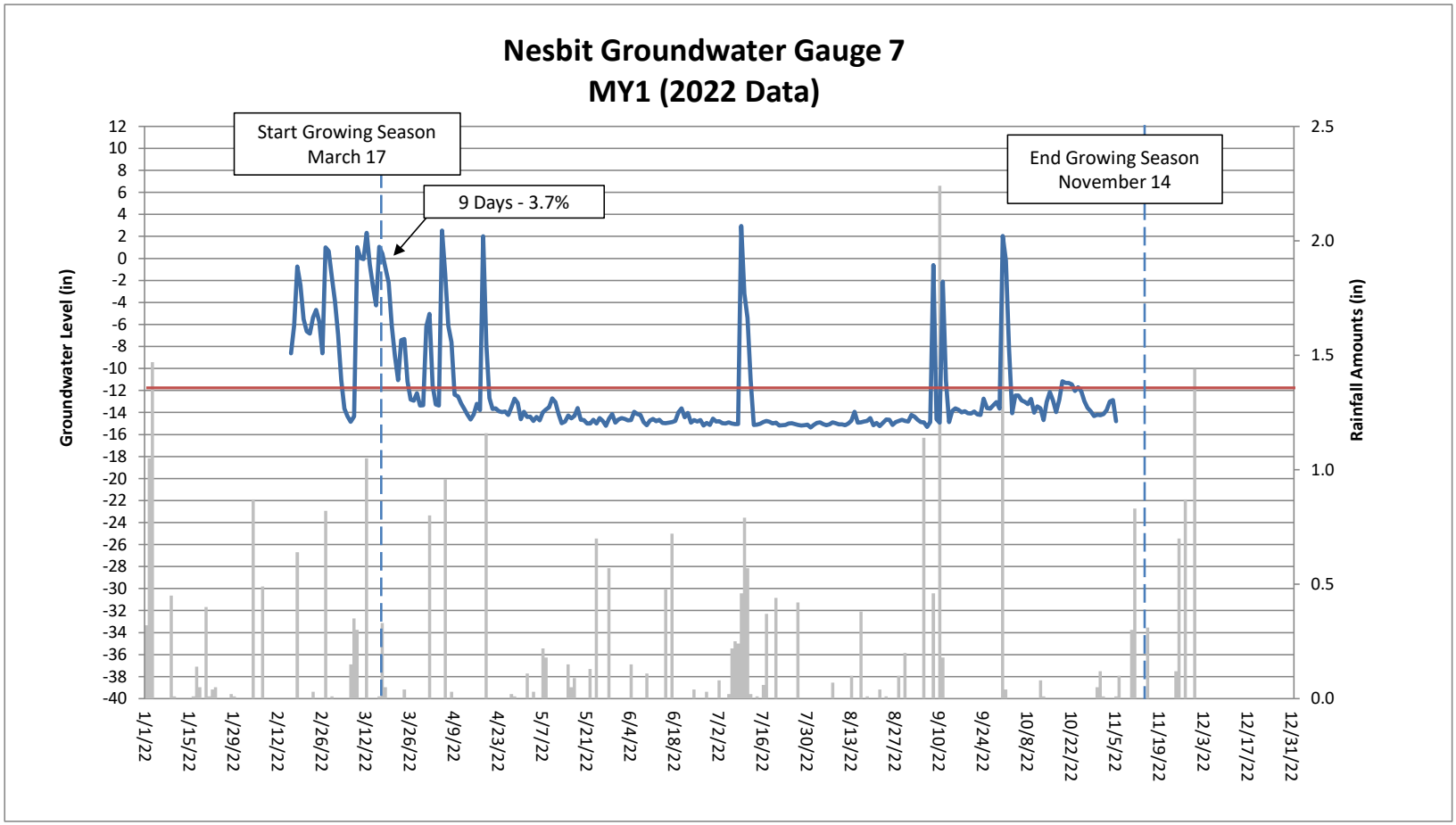
12/3/22
12/17/22
12/31/22


Nesbit Groundwater Gauge 7
MY1 (2022 Data)
Start Growing Season
March 17
9 Days - 3.7%
End Growing Season
November 14
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/15/22
1/29/22
2/12/22
2/26/22
3/12/22
3/26/22
4/9/22
4/23/22
5/7/22
5/21/22
6/4/22
6/18/22
7/2/22
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8/27/22
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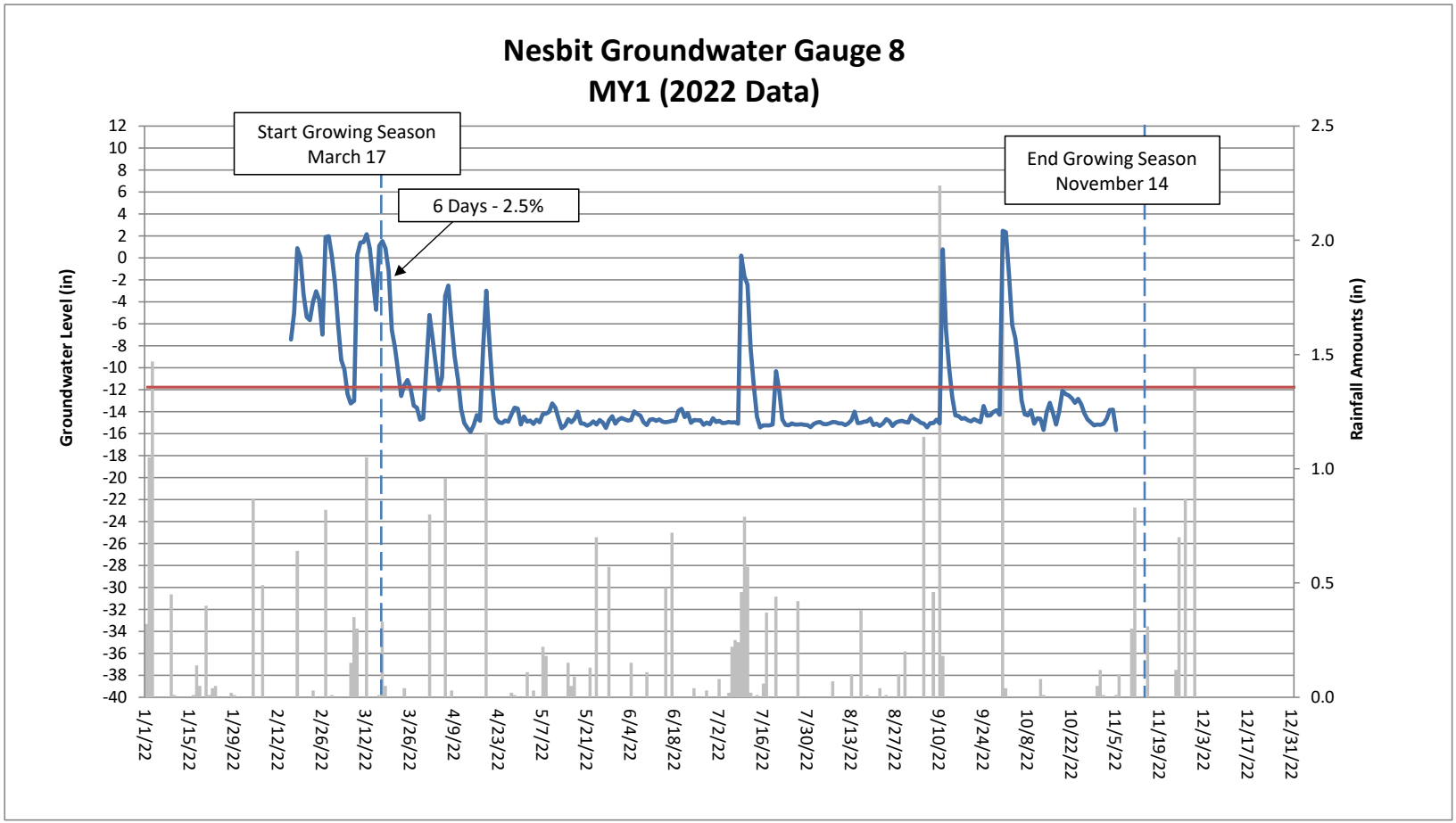
12/17/22
12/31/22


Nesbit Groundwater Gauge 8
MY1 (2022 Data)
Start Growing Season
March 17
6 Days - 2.5%
End Growing Season
November 14
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/15/22
1/29/22
2/12/22
2/26/22
3/12/22
3/26/22
4/9/22
4/23/22
5/7/22
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6/4/22
6/18/22
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7/16/22
7/30/22
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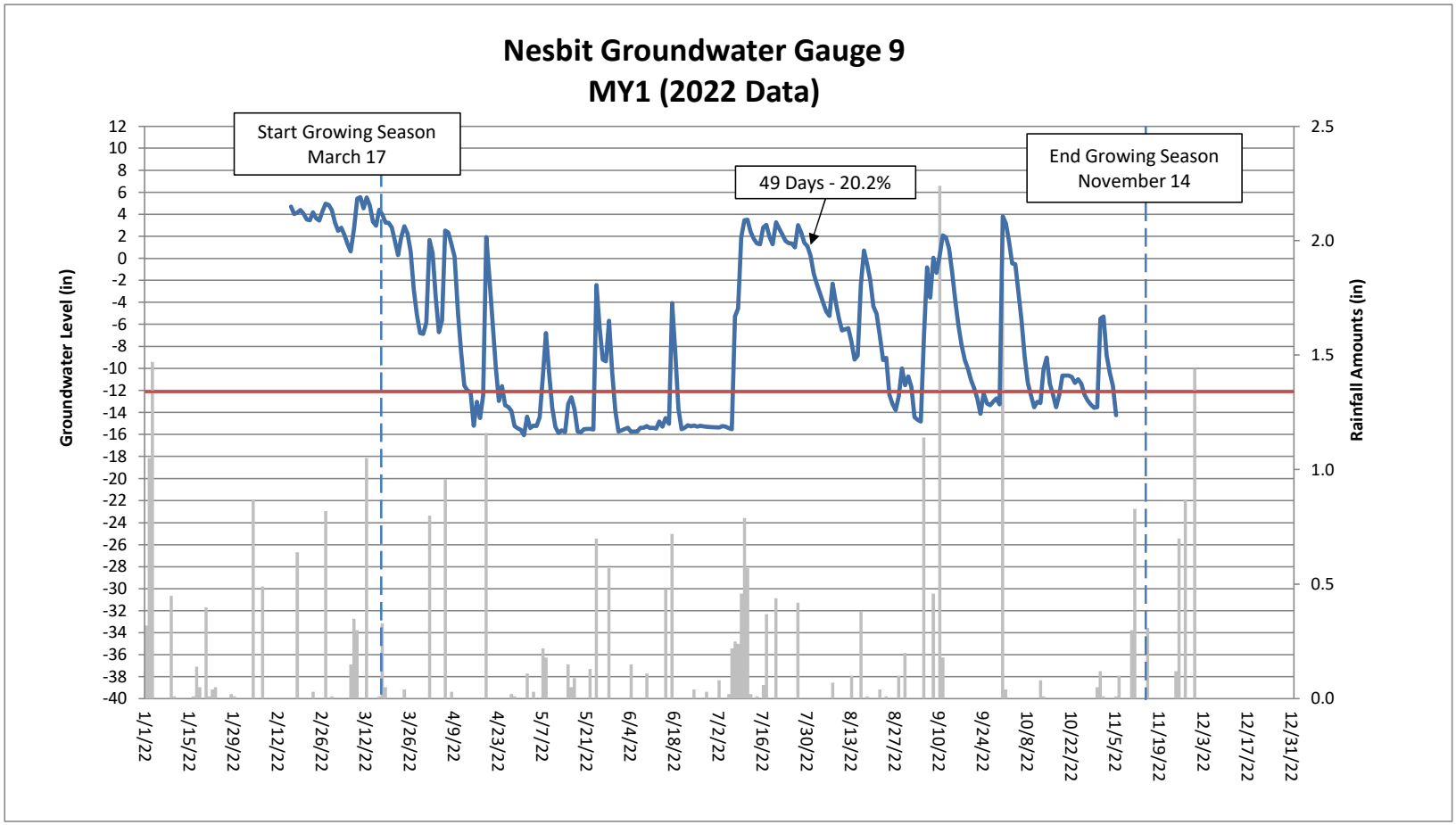
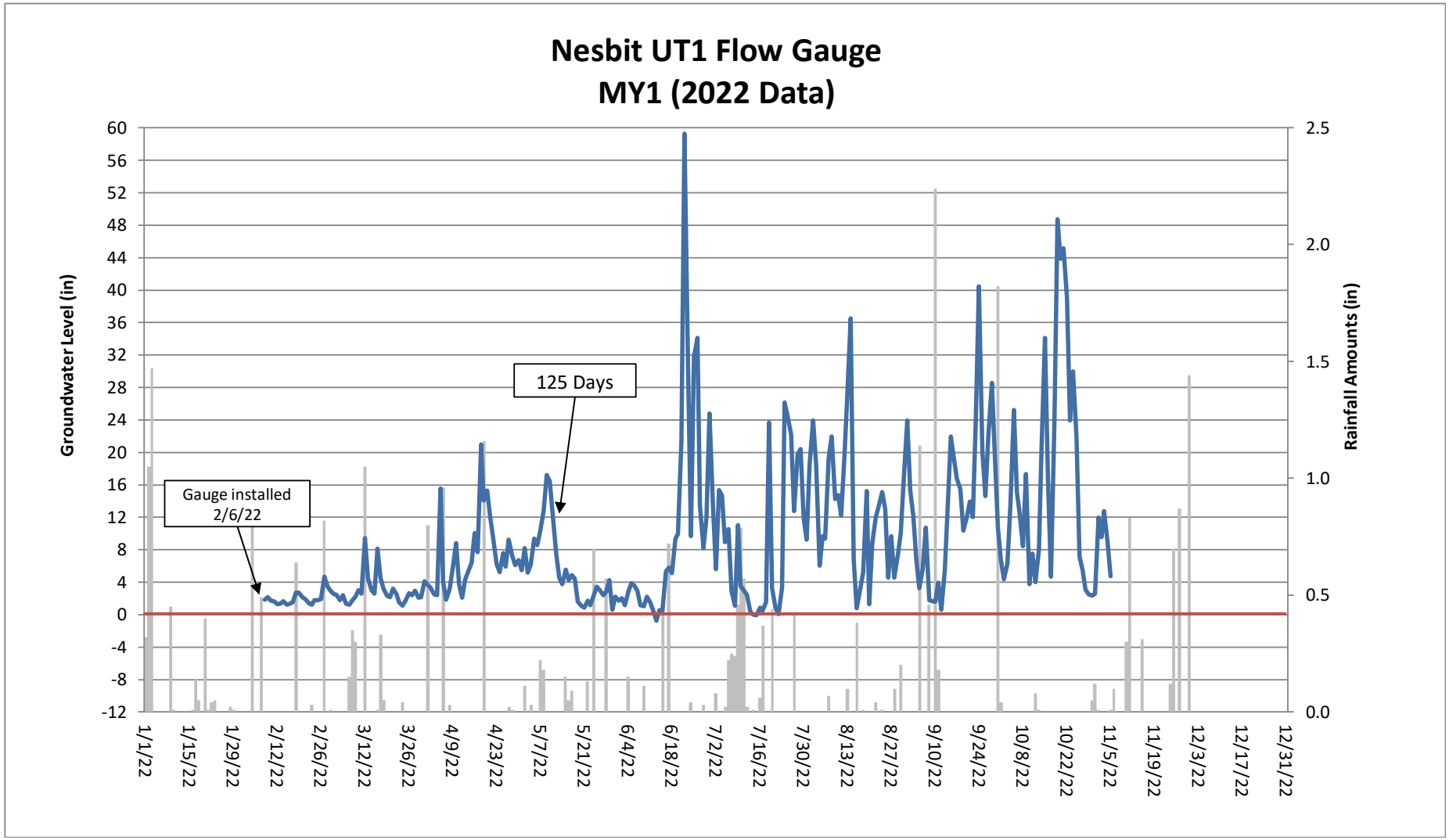

Nesbit Groundwater Gauge 9
MY1 (2022 Data)
Start Growing Season
March 17
49 Days - 20.2%
End Growing Season
November 14
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
2.5
2.0
1.5
1.0
0.5
0.0
1/1/22
1/15/22
1/29/22
2/12/22
2/26/22
3/12/22
3/26/22
4/9/22
4/23/22
5/7/22
5/21/22
6/4/22
6/18/22
7/2/22
7/16/22
7/30/22
8/13/22
8/27/22
9/10/22
9/24/22
10/8/22
10/22/22
11/5/22
11/19/22
12/3/22
12/17/22
12/31/22

Table 13A. UT-1 Channel Evidence

UT-1 Upstream Channel Evidence	Year 1 (2022)
Max consecutive days channel flow	125
Presence of litter and debris (wracking)	Yes
Leaf litter disturbed or washed away	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes
Sediment deposition and/or scour indicating sediment transport	Yes
Water staining due to continual presence of water	Yes
Formation of channel bed and banks	Yes
Sediment sorting within the primary path of flow	Yes
Sediment shelving or a natural line impressed on the banks	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes
Exposure of woody plant roots within the primary path of flow	No
Other:	

Table 13B. UT-2 Channel Evidence

UT-2 Channel Evidence	Year 1 (2022)
Max consecutive days channel flow	98
Presence of litter and debris (wracking)	Yes
Leaf litter disturbed or washed away	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes
Sediment deposition and/or scour indicating sediment transport	Yes
Water staining due to continual presence of water	Yes
Formation of channel bed and banks	Yes
Sediment sorting within the primary path of flow	Yes
Sediment shelving or a natural line impressed on the banks	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes
Exposure of woody plant roots within the primary path of flow	No
Other:	


Nesbit UT1 Flow Gauge
MY1 (2022 Data)
Groundwater Level (in)
Rainfall Amounts (in)
60
56
52
48
44
40
36
32
28
24
20
16
12
8
4
0
-4
-8
-12
2.5
2.0
1.5
1.0
0.5
0.0
125 Days
Gauge installed
2/6/22
1/1/22
1/15/22
1/29/22
2/12/22
2/26/22
3/12/22
3/26/22
4/9/22
4/23/22
5/7/22
5/21/22
6/4/22
6/18/22
7/2/22
7/16/22
7/30/22
8/13/22
8/27/22
9/10/22
9/24/22
10/8/22
10/22/22
11/5/22
11/19/22
12/3/22
12/17/22
12/31/22

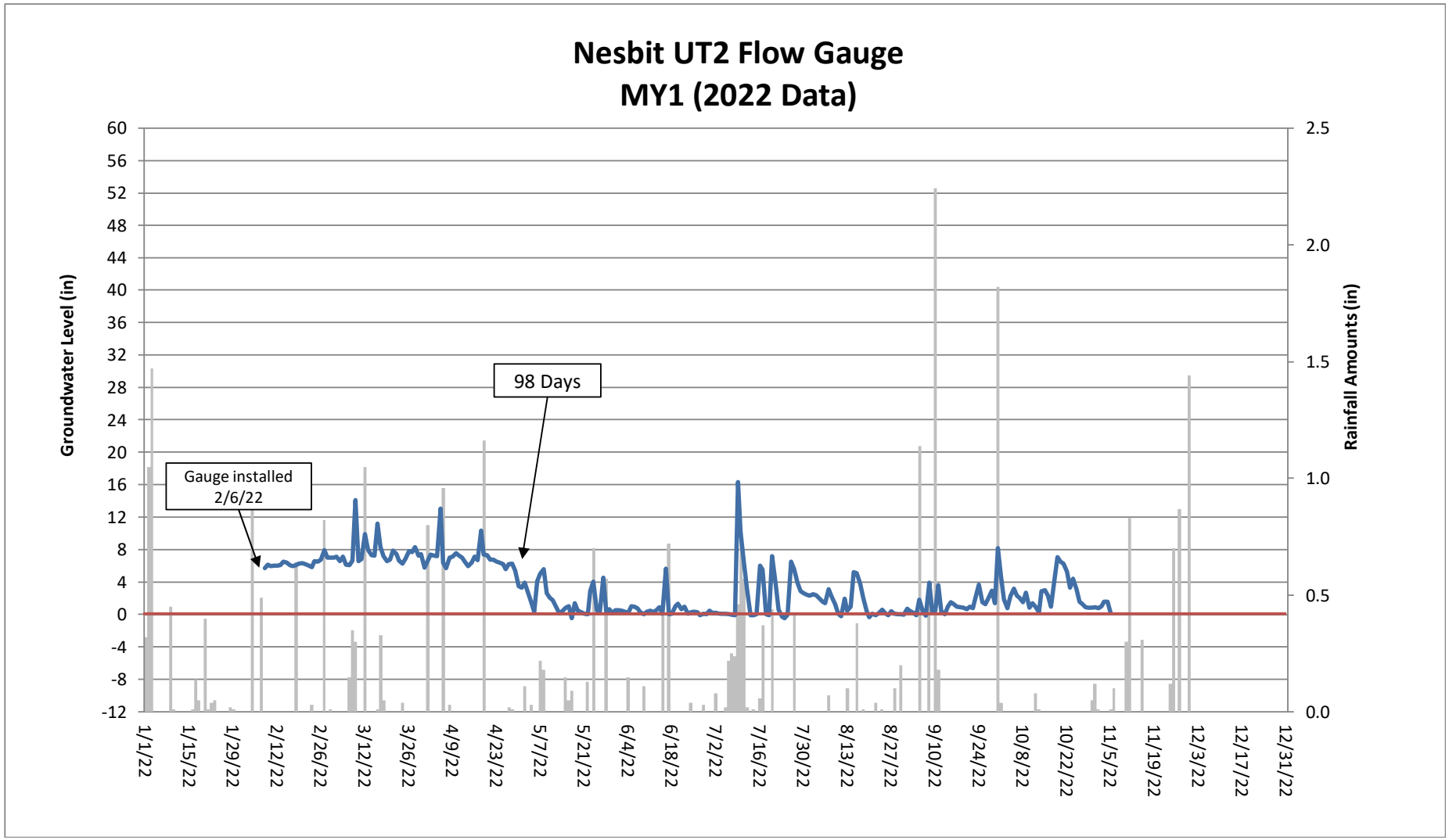
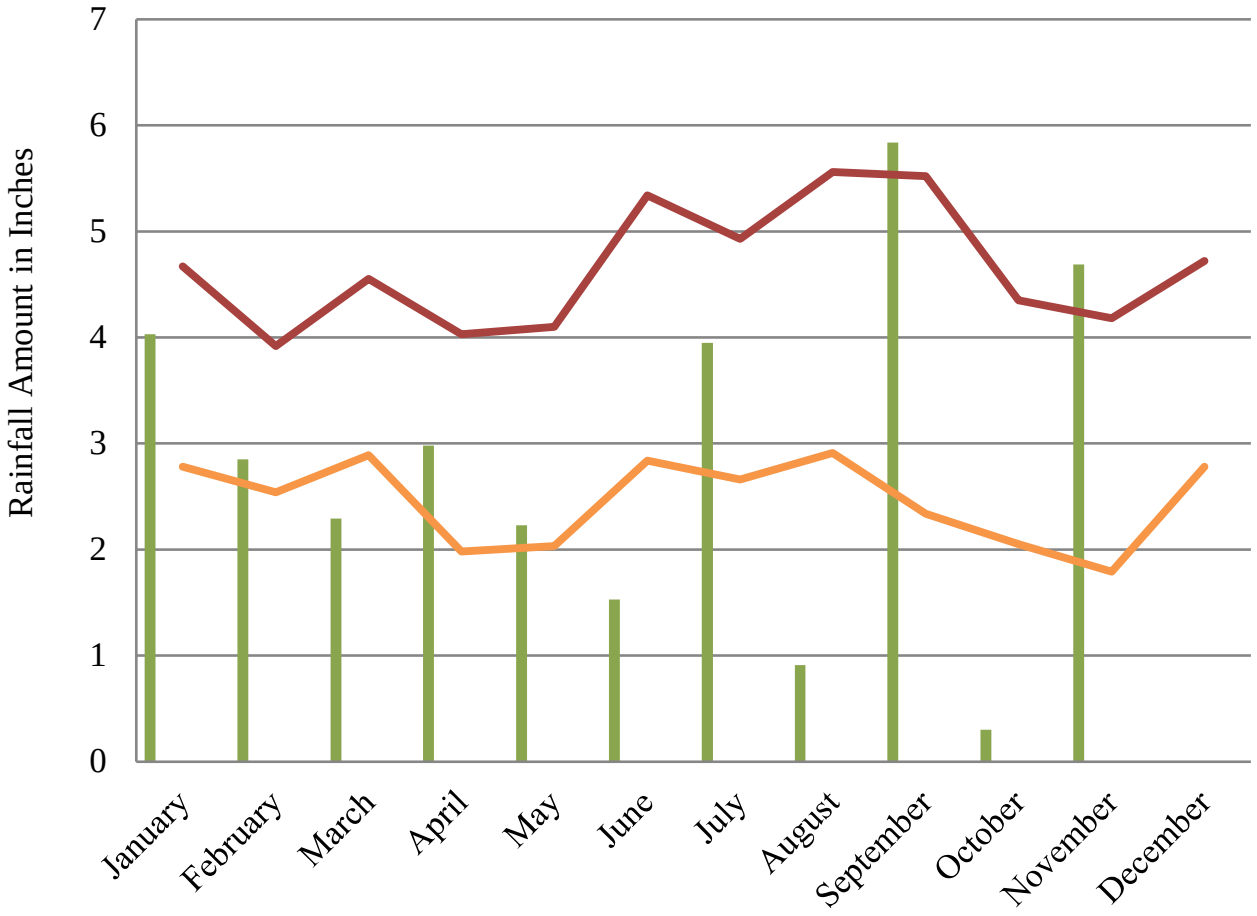
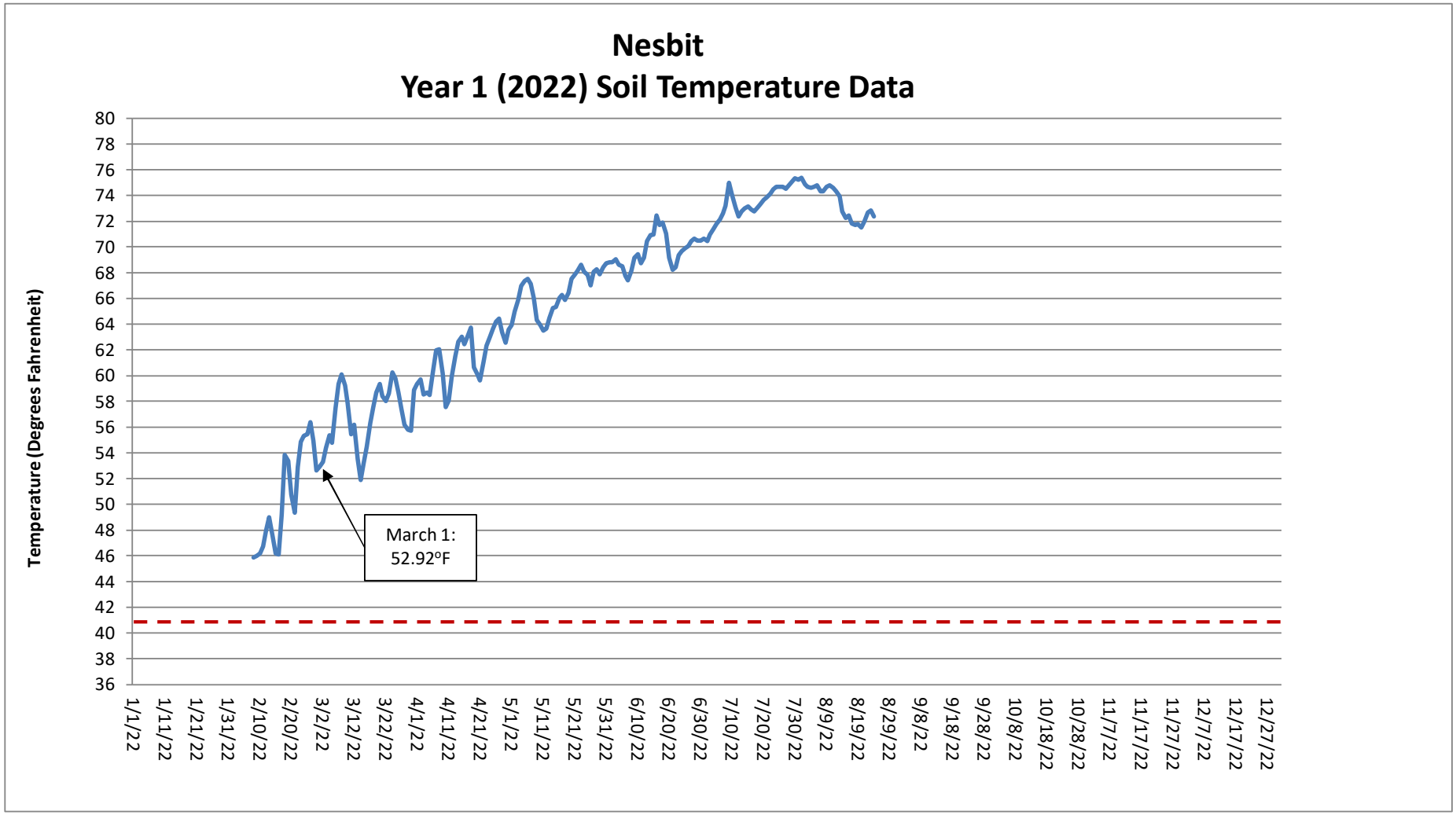

Nesbit UT2 Flow Gauge
MY1 (2022 Data)
Groundwater Level (in)
Rainfall Amounts (in)
60
56
52
48
44
40
36
32
28
24
20
16
12
8
4
0
-4
-8
-12
2.5
2.0
1.5
1.0
0.5
0.0
Gauge installed 2/6/22
98 Days
1/1/22
1/15/22
1/29/22
2/12/22
2/26/22
3/12/22
3/26/22
4/9/22
4/23/22
5/7/22
5/21/22
6/4/22
6/18/22
7/2/22
7/16/22
7/30/22
8/13/22
8/27/22
9/10/22
9/24/22
10/8/22
10/22/22
11/5/22
11/19/22
12/3/22
12/17/22
12/31/22

Figure D1: Nesbit
30-70 Percentile Graph for Rainfall

Current year data from onsite rain gauge*
30-70th percentile data from WETS Station: Monroe 2 SE, NC (1992-2022)



*Onsite rain gauge installed 3/1/22 and was last downloaded 11/5/22. Jan., Feb., and late-Nov. data are from a nearby WeatherUnderground Station (KNCMONRO94).


Nesbit
Year 1 (2022) Soil Temperature Data
Temperature (Degrees Fahrenheit)
80
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
38
36
March 1:
52.92°F
1/1/22
1/11/22
1/21/22
1/31/22
2/10/22
2/20/22
3/2/22
3/12/22
3/22/22
4/1/22
4/11/22
4/21/22
5/1/22
5/11/22
5/21/22
5/31/22
6/10/22
6/20/22
6/30/22
7/10/22
7/20/22
7/30/22
8/9/22
8/19/22
8/29/22
9/8/22
9/18/22
9/28/22
10/8/22
10/18/22
10/28/22
11/7/22
11/17/22
11/27/22
12/7/22
12/17/22
12/27/22

WETS Table

WETS Station: MONROE 2 SE, NC								
Requested years: 1991 - 2021								
Month	Avg Max Temp	Avg Min Temp	Avg Mean Temp	Avg Precip	30% chance precip less than	30% chance precip more than	Avg number days precip 0.10 or more	Avg Snowfall
Jan	53.0	31.3	42.1	3.93	2.78	4.66	6	1.5
Feb	56.8	33.6	45.2	3.32	2.49	3.88	6	0.6
Mar	64.6	39.8	52.2	4.02	2.95	4.73	7	0.3
Apr	73.8	48.0	60.9	3.38	2.00	4.11	6	0.1
May	80.6	57.0	68.8	3.37	2.02	4.08	5	0.0
Jun	87.5	65.5	76.5	4.58	3.04	5.49	7	0.0
Jul	90.9	69.1	80.0	4.12	2.66	4.95	7	0.0
Aug	88.8	68.0	78.4	4.76	3.02	5.74	7	0.0
Sep	83.3	61.8	72.6	4.43	2.25	5.41	5	0.0
Oct	74.0	49.7	61.9	3.56	2.00	4.30	4	0.0
Nov	63.6	38.5	51.0	3.37	1.76	4.12	5	0.0
Dec	55.6	33.7	44.7	3.96	2.79	4.70	6	0.2
Annual:					42.15	50.81		
Average	72.7	49.7	61.2	-	-	-	-	-
Total	-	-	-	46.80			71	2.7

GROWING SEASON DATES			
Years with missing data:	24 deg = 2	28 deg = 1	32 deg = 1
Years with no occurrence:	24 deg = 0	28 deg = 0	32 deg = 0
Data years used:	24 deg = 29	28 deg = 30	32 deg = 30
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	2/27 to 11/30: 276 days	3/17 to 11/14: 242 days	4/3 to 11/4: 215 days
70 percent *	2/20 to 12/7: 290 days	3/13 to 11/19: 251 days	3/29 to 11/9: 225 days
* Percent chance of the growing season occurring between the Beginning and Ending dates.			

STATS TABLE - total precipitation (inches)													
Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl
1896	2.07	5.53	M1.50	2.00	4.24	7.38	9.21	1.42	M3.30	1.58	3.37	2.37	43.97
1897	2.27	5.85	6.07	4.81	3.63	4.22	6.73	2.05	2.02	1.91	2.40	2.17	44.13
1898	2.34	0.84	4.07	3.16	1.28	3.46	5.10	11.65	4.72	4.72	M4.22	1.11	46.67
1899	3.68	8.66	5.23	2.21	2.55	3.02	4.59	2.97	3.09	7.10	3.43	2.73	49.26
1900	1.84	4.93	4.78	5.63	0.92	5.57	6.95	3.50	1.62	2.78	5.76	5.17	49.45
1901	2.83	1.71	5.00	8.54	7.20	8.15	3.50	14.00	6.24	2.16	0.64	6.40	66.37
1902	3.12	6.81	3.19	2.12	2.23	3.29	2.79	5.49	4.25	5.54	4.50	3.13	46.46
1903	3.03	8.63	6.53	3.32	0.59	11.07	1.71	4.62	3.03	3.40	1.21	1.56	48.70

1904	2.59	4.15	2.22	0.85	2.34	4.34	5.46	11.89	1.31	0.98	3.64	3.78	43.55
1905	1.69	5.32	1.83	4.66	6.68	0.93	4.70	11.01	1.31	0.97	0.82	7.09	47.01
1906	5.14	1.25	5.06	2.17	3.96	4.65	7.51	6.65	3.40	6.02	0.66	2.50	48.97
1907	0.24	3.62	1.76	4.13	4.34	8.39	5.84	2.43	3.94	0.27	5.00	6.40	46.36
1908	M5.21	5.62	4.67	3.82	3.21	3.88	4.80	19.38	5.09	7.52	1.68	4.19	69.07
1909	1.27	4.27	2.79	2.47	5.60	6.95	2.98	3.00	2.51	1.31	0.20	2.94	36.29
1910	3.45	3.88	1.36	1.08	4.49	6.15	4.86	5.42	1.70	4.23	0.36	3.35	40.33
1911	2.50	1.83	2.55	1.83	0.64	1.68	1.96	5.64	3.69	5.02	3.33	6.12	36.79
1912	3.66	6.98	7.68	1.89	3.70	7.97	4.25	2.93	6.02	1.73	3.93	2.37	53.11
1913	4.68	3.78	7.52	2.40	3.00	4.47	5.22	4.04	5.74	M2.28	2.69	4.41	50.23
1914	2.70	M3.09	2.32	3.42	0.25	4.16	5.34	4.62	2.06	3.30	M3.23	6.90	41.39
1915	6.28	2.13	3.81	1.54	4.90	5.53	2.08	7.40	2.59	3.01	2.50	3.27	45.04
1916	2.64	4.76	1.95	1.24	4.46	5.21	12.44	4.12	0.85	1.68	0.49	1.86	41.70
1917	2.67	4.45	4.56	3.92	4.07	6.75	4.46	2.36	4.97	3.94	1.24	1.59	44.98
1918	4.81	1.29	2.15	6.46	2.19	2.29	5.05	4.21	3.78	2.23	2.39	3.72	40.57
1919	5.42	4.44	2.67	2.75	5.89	2.88	8.49	3.50	1.01	3.51	0.56	1.95	43.07
1920	3.79	4.56	4.79	3.73	1.37	3.89	4.20	9.51	2.67	0.53	4.05	4.21	47.30
1921	4.84	5.45	3.56	2.47	6.02	4.15	3.69	3.67	1.15	1.39	3.20	1.67	41.26
1922	3.71	7.88	9.00	7.41	3.63	5.20	3.98	3.71	0.88	4.44	1.15	4.36	55.35
1923	4.07	4.03	5.12	3.40	4.46	0.69	4.83	3.22	3.16	1.23	2.39	2.19	38.79
1924	3.95	4.91	1.58	5.36	3.50	2.64	3.53	0.15	9.55	1.00	2.09	4.41	42.67
1925	6.36	1.52	2.40	1.89	1.42	3.77	2.08	1.73	0.80	2.21	M2.65	2.70	29.53
1926	5.01	4.04	4.85	1.31	1.07	2.44	7.71	5.14	0.98	1.29	4.16	3.48	41.48
1927	0.84	3.36	3.96	2.62	1.13	4.32	4.21	2.43	1.81	5.31	1.49	6.68	38.16
1928	0.73	4.18	2.68	7.80	3.80	6.33	2.48	10.58	11.74	2.14	0.61	1.29	54.36
1929	2.63	8.70	9.09	3.13	5.20	3.22	5.33	4.97	6.70	7.49	5.33	3.88	65.67
1930	3.51	0.91	2.21	1.09	3.12	4.91	3.42	4.34	4.17	1.34	4.51	3.84	37.37
1931	2.19	1.44	2.12	4.00	5.92	1.25	8.40	12.00	0.00	1.35	0.16	6.60	45.43
1932	6.17	3.71	3.88	2.91	4.82	8.21	3.53	1.70	2.17	9.95	3.01	5.44	55.50
1933	2.65	3.52	1.56	3.60	2.94	2.99	4.39	6.22	0.71	1.29	0.77	1.41	32.05
1934	1.52	2.75	4.30	2.78	5.06	4.34	4.94	4.50	3.61	3.00	4.27	3.00	44.07
1935	2.81	2.83	2.16	4.26	3.72	1.77	3.99	2.57	M7.52	0.70	2.52	2.73	37.58
1936	8.17	4.73	7.13	7.60	0.07	4.05	3.41	5.41	5.12	5.46	1.48	5.76	58.39
1937	5.49	3.68	2.13	5.90	1.30	10.30	1.91	5.96	0.50	1.98	2.28	2.47	43.90

1938	2.09	0.67	2.43	4.16	2.14	5.83	7.31	2.52	3.79	1.06	2.21	3.31	37.52
1939	3.36	8.58	2.91	2.70	1.86	3.23	8.05	7.13	1.76	0.44	1.40	M2.64	44.06
1940	2.90	2.82	2.13	1.96	2.63	2.28	3.16	3.35	0.63	0.73	5.96	2.57	31.12
1941	M2.13	2.47	2.82	2.89	0.04	5.23	3.97	8.36	1.89	1.84	0.73	5.38	37.75
1942	2.43	3.38	6.93	1.75	5.93	3.96	6.30	6.01	3.43	2.06	2.83	3.21	48.22
1943	4.31	1.67	5.42	2.94	2.68	4.84	3.41	2.41	2.01	0.26	0.79	3.81	34.55
1944	M3.80	6.62	7.76	5.97	0.87	2.72	9.39	1.87	2.63	3.35	2.61	1.74	49.33
1945	2.48	5.21	1.51	2.61	2.78	2.36	3.03	3.98	11.44	1.57	1.49	6.62	45.08
1946	2.90	2.25	1.99	4.54	2.04	3.17	11.25	3.60	M2.33	5.48	1.71	1.11	42.37
1947	5.96	0.99	4.29	3.78	1.16	3.06	2.70	3.39	5.17	2.50	6.36	2.52	41.88
1948	4.30	3.58	5.32	3.34	5.14	3.18	2.90	3.82	5.58	2.34	11.12	5.88	56.50
1949	3.37	4.12	M1.93	4.99	6.44	1.95	4.18	8.68	9.78	3.47	2.76	2.41	54.08
1950	2.16	1.52	3.21	1.17	2.23	2.67	5.00	3.66	3.35	1.87	1.87	2.81	31.52
1951	1.72	M0.89	4.47	4.45	0.50	6.30	4.18	3.44	6.76	0.40	3.19	4.66	40.96
1952	3.29	5.16	6.90	3.53	3.91	2.32	5.21	13.00	3.07	0.80	M1.35	3.82	52.36
1953	3.05	4.77	4.17	3.26	3.47	2.71	5.44	8.59	5.88	0.17	1.01	6.09	48.61
1954	5.89		4.46	1.75	3.34	0.56	5.87	1.38	T	5.81	2.39	3.02	34.47
1955	3.49	3.67	1.90	5.59	2.79	3.61	6.69	2.67	1.83	4.37	2.85	0.44	39.90
1956	1.48	6.38	3.92	3.27	2.56	1.97	2.56	3.65	6.31	2.51	1.37	1.91	37.89
1957	2.21	2.84	4.15	1.84	8.25	3.92	2.26	4.43	6.26	2.12	8.80	1.90	48.98
1958	4.70	3.40	3.29	4.93	3.15	4.61	6.90	2.54	0.27	4.24	0.95	4.32	43.30
1959	2.72	3.03	3.96	5.73	2.17	1.78	12.19	5.43	8.30	5.70	0.66	2.47	54.14
1960	6.05	7.81	4.91	3.88	2.51	5.03	5.82	9.02	1.96	2.31	1.60	2.32	53.22
1961	2.41	6.61	5.29	4.28	3.33	5.84	1.42	4.34	0.20	0.75	2.12	4.60	41.19
1962	6.80	4.80	4.53	3.75	1.06	4.60	4.30	1.48	7.72	0.34	5.65	3.42	48.45
1963	3.79	4.07	3.70	3.07	6.20	3.80	4.71	2.08	4.23	0.20	3.99	3.35	43.19
1964	5.54	5.33	5.43	3.51	1.56	3.11	8.32	8.90	2.74	10.47	1.56	5.09	61.56
1965	2.15	3.70	6.15	3.95	0.31	4.84	8.22	4.84	1.60	2.11	2.44	0.68	40.99
1966	4.87	4.88	3.36	2.45	4.17	1.94	2.27	3.42	8.28	4.28	1.06	2.64	43.62
1967	1.98	4.32	1.59	2.54	4.26	2.10	4.64	11.61	4.40	0.63	3.82	4.41	46.30
1968	5.98	0.80	2.52	1.72	4.04	4.05	3.93	3.91	0.16	3.02	5.18	2.74	38.05
1969	2.40	5.24	4.22	4.72	2.76	4.63	5.36	7.11	4.39	2.87	0.87	3.64	48.21
1970	2.49	3.26	4.88	1.29	4.66	0.64	M4.65	7.95	1.10	7.64	1.39	2.49	42.44
1971	6.03	4.67	6.61	2.96	5.45	5.04	5.05	7.84	1.67	8.72	2.01	2.02	58.07

1972	4.96	4.27	3.54	1.29	5.99	4.51	3.64	2.11	3.18	1.42	3.56	9.07	47.54
1973	5.11	4.75	4.89	5.98	4.18	8.99	4.64	1.55	2.36	2.22	0.35	5.66	50.68
1974	3.40	4.73	3.26	3.71	5.55	2.78	3.57	5.40	6.59	T	2.67	5.15	46.81
1975	7.03	4.12	7.58	2.28	6.86	4.25	8.32	3.17	7.11	1.29	2.79	4.76	59.56
1976	2.00	1.23	4.49	0.48	4.27	7.17	4.92	2.03	3.90	7.03	3.29	4.63	45.44
1977	3.74	1.35	8.59	1.51	1.15	4.52	1.24	5.92	6.93	7.69	2.87	2.49	48.00
1978	7.87	0.63	4.39	2.12	4.03	5.01	9.70	2.69	0.86	1.25	2.95	2.48	43.98
1979	5.49	6.40	3.37	5.00	2.55	5.68	3.92	1.00	8.41	2.32	6.70	1.40	52.24
1980	4.78	M1.50	9.86	1.54	3.30	2.46	2.69	0.69	9.14	3.91	4.05	0.96	44.88
1981	0.48	3.93	1.95	0.56	2.10	1.57	8.71	2.63	2.90	2.93	0.81	7.75	36.32
1982	M4.00	7.01	1.87	4.16	4.14	5.86	3.77	4.15	4.24	6.54	2.65	5.65	54.04
1983	3.71	6.22	8.68	4.14	2.44	2.87	0.75	7.26	2.21	1.91	4.35	9.06	53.60
1984	6.26	6.27	5.10	4.15	5.12	2.53	7.18	2.92	0.27	2.00	1.48	3.09	46.37
1985	4.28	3.95	1.30	1.46	3.77	5.82	6.09	10.63	0.05	4.64	6.46	0.92	49.37
1986	1.40	1.23	3.08	0.85	1.13	1.16	2.84	13.66	1.63	2.88	4.73	3.92	38.51
1987	7.77	4.65	5.75	3.25	0.95	6.96	2.71	2.61	M10.54	0.48	4.80	3.05	53.52
1988	4.43	1.49	2.33	2.24	2.69	2.81	4.17	7.17	3.64	3.35	4.15	1.51	39.98
1989	1.77	5.56	8.05	5.14	5.89	5.34	6.12	4.22	5.48	6.58	2.39	3.66	60.20
1990	3.22	6.21	3.44	2.58	7.00	0.35	5.90	4.24	1.22	15.94	2.45	3.50	56.05
1991	6.08	M1.96	7.49	6.08	3.09	5.43	7.38	6.96	1.66	1.48	2.22	3.53	53.36
1992	3.17	3.64	3.52	3.00	4.62	6.62	0.80	6.28	1.26	6.18	6.17	M2.64	47.90
1993	6.55	3.23	8.32	3.41	3.52	1.45	3.19	3.91	3.34	2.60	3.77	3.44	46.73
1994	4.26	3.44	4.99	0.75	2.55	7.97	6.47	3.02	5.63	3.38	3.07	2.38	47.91
1995	4.37	4.91	2.72	0.60	3.09	5.83	1.40	9.11	2.61	7.42	4.41	1.36	47.83
1996	3.92	2.64	5.37	4.02	1.30	3.71	3.06	5.37	5.19	4.41	3.80	2.63	45.42
1997	4.09	4.15	4.32	4.71	M1.74	2.98	M8.95	0.32	2.47	4.43	4.59	4.32	47.07
1998	9.81	5.27	5.24	5.28	3.70	2.89	6.45	3.70	7.42	3.86	1.66	3.36	58.64
1999	4.97	2.13	2.42	3.84	2.42	3.60	1.14	1.74	11.36	4.47	1.80	1.54	41.43
2000	M6.29	2.70	2.95	3.61	1.22	3.39	4.22	3.58	8.06	0.00	2.83	1.41	40.26
2001	1.80	2.27	5.54	1.56	1.90	4.70	4.99	1.04	2.74	2.91	0.71	2.30	32.46
2002	5.54	1.63	3.72	1.07	2.35	1.26	3.78	4.19	5.12	6.20	3.69	4.72	43.27
2003	1.90	6.14	8.04	6.85	5.21	5.32	6.65	6.01	3.66	2.75	1.20	2.30	56.03
2004	0.91	3.98	1.30	1.03	0.91	7.23	6.18	5.96	13.90	2.57	2.56	2.14	48.67
2005	2.03	M3.07	M4.22	3.04	M1.01	M5.28	M3.39	8.79	0.17	4.38	M2.49	M5.13	43.00

2006	2.62	1.71	1.35	M2.25	1.93	10.83	1.00	6.87	M3.11	4.41	8.31	3.38	47.77
2007	M1.73	3.43	2.56	M1.89	0.87	4.40	0.96	2.85	1.37	3.44	M0.31	4.70	28.51
2008	2.13	4.16	3.44	6.06	2.37	M0.99	3.29	8.85	4.72	M1.64	3.09	5.86	46.60
2009	M2.60	M1.70	6.55	M1.65	M3.83	M2.46	6.16	2.30	1.30	3.37	7.26	8.71	47.89
2010	M5.05	M4.00	M2.55	M0.96	M4.39	8.29	M3.75	M4.71	M0.62	M0.07	1.44	M2.00	37.83
2011	1.76	M2.59	M5.68	M2.62	M7.79	M4.46	M2.42	M5.13	M4.43	4.69	M3.01		44.58
2012	M3.93	1.32	M3.02	M2.40	M5.22	M1.66	M5.33	9.83	4.79	1.75	M1.24	M3.90	44.39
2013	4.48	3.66	3.08	5.09	1.70	7.68	5.54	4.19	1.46	0.23	2.99	5.79	45.89
2014	3.45	2.89	5.10	5.61	4.05	3.76	6.24	2.11	6.55	1.68	5.12	M4.85	51.41
2015	M2.66	2.98	2.62	4.32	0.79	2.07	4.33	7.41	2.61	7.92	9.50	M7.21	54.42
2016	2.09	3.10	2.42	0.79	5.25	3.55	2.98	2.45	3.92	5.80	0.22	3.08	35.65
2017	5.51	1.31	2.62	6.27	5.87	8.08	5.49	2.67	3.95	1.77	0.73	3.22	47.49
2018	4.47	2.43	3.95	3.81	2.94	2.65	3.30	4.73	12.36	5.59	6.83	8.64	61.70
2019	4.59	3.70	3.94	4.84	3.41	4.14	1.87	6.45	0.66	3.33	3.28	7.15	47.36
2020	4.88	6.89	3.26	6.41	11.95	1.96	4.17	3.45	5.59	5.66	5.22	3.18	62.62
2021	4.24	5.95	2.42	0.97	1.73	4.25	2.71	3.59	1.49	2.03	1.04	3.92	34.34
2022	6.29	3.22	3.34	4.26	3.61	1.22	6.81	2.33	4.41	M2.67			38.16

Notes: Data missing in any month have an "M" flag. A "T" indicates a trace of precipitation.

Data missing for all days in a month or year is blank.

Creation date: 2022-10-24

Appendix E: Project Timeline and Contact Info

Table 14. Project Timeline
Table 15. Project Contacts

Table 14. Project Timeline

Activity or Deliverable	Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted	NA	Apr-19
Mitigation Plan Approved	Jun-20	May-21
Construction (Grading) Completed	NA	07-Dec-21
Planting Completed	NA	Febuary 3, 2022
As-built Survey Completed	NA	Jun-22
MY-0 Baseline Report	Feb-22	Sep-22
MY-1 Monitoring Report	Nov-22	Dec-22

Table 15. 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. 2022 Misc. Items

Communications with the farm manager

Ray Holz

From: Alex Duchesneau <Alex.Duchesneau14@outlook.com>
Sent: Monday, December 05, 2022 10:26 AM
To: Matthew Harrell
Cc: Ray Holz; franklinhowey@aol.com
Subject: RE: Nesbit Road Conservation Easement- Scalloping

Hi Matt-

I know we talked over the phone, but I wanted to get you a response in writing.

We have had staff meetings about this and our hope is that those will deter our encroachment into the easement going forward. We apologize for the scalloping that occurred and will do our best to ensure it does not happen in the future.

Once again, we appreciate you working with us and we will continue to emphasize the boundaries of each easement to our staff as they harvest and plant in 2023.

Thanks,
Alex

From: Matthew Harrell <mharrell@restorationsystems.com>
Sent: Thursday, November 3, 2022 10:24 AM
To: Alex Duchesneau <Alex.Duchesneau14@outlook.com>
Cc: Ray Holz <rholz@restorationsystems.com>; franklinhowey@aol.com
Subject: Nesbit Road Conservation Easement- Scalloping

Hi Alex,

As we discussed yesterday the State DMS folks have called out scalloping along the easement boundary. This is where farm activities have slightly encroached into the easement. See attached pictures. The State takes this seriously and we need to make sure to get it taken care of sooner rather than later.

There are about ten areas like this along the boundary where we will have to add boundary posts to satisfy the State. As soon as the beans are harvested I will add those posts. As discussed yesterday, I will also add a taller pole to the existing corner markers to make it easier for your guys to see while operating equipment- I suspect some of the existing wooden posts were hard to see in the Johnson grass. On your end please make sure the equipment operators know that the easement is a no-go zone. I've attached a kmz of the boundary so everyone can readily see where the lines are.

Thanks,
Matthew

Matthew Harrell
Sr. Project Manager |Restoration Systems, LLC
1101 Haynes St.|Suite 211|Raleigh, NC 27604
c: 252.299.1655 |p: 919.755.9490
www.restorationsystems.com

Photos sent to Alex Duchesneau, Farm Manager, on 11/03/2022