

Year 2 Monitoring Report
DRAFT Bear Swamp Stream & Wetland Mitigation Project

Robeson County, North Carolina

Monitoring Year 2

Data Collection Period:
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DMS RFP No. 16-007337
DMS ID No. 100054
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NCDWR ID: 20180782
Lumber River Basin
HUC 03040203

Prepared For:



NC Department of Environmental Quality
Division of Mitigation Services
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Bear Swamp Stream and Wetland Mitigation Project
Year 2 Monitoring Report
DMS Project ID #100054
Robeson County, North Carolina



Ms. Emily Dunnigan
NCDEQ – Division of Mitigation Services
217 W. Jones St.
Raleigh, NC 27603

January 30, 2023

**RE: Response to Draft MY2 Monitoring Report Comments dated January 13, 2023
Bear Swamp Stream and Wetland Mitigation Site
Lumber River Basin – CU# 03040203 - Robeson County, North Carolina
NCDMS Project # 100054, Contract # 7516**

Dear Ms. Dunnigan,

Ecosystem Planning and Restoration (EPR) has reviewed the Division of Mitigation Services (DMS) comments on the Draft MY2 Monitoring Report provided to DMS November 30, 2022. The comments have been addressed as described below and the Final MY2 Report and electronic deliverables have been revised in response to this review.

- **Section 1.0 Project Summary** – *Change stream mitigation credits (SMCs) to stream mitigation units (SMUs) and wetland mitigation credits (WMCs) to wetland mitigation units (WMUs).*
 - **Stream and wetland mitigation credits are the terms used in the RFP and have been used in all other EPR-completed 2022 DMS project monitoring reports. Credits is also the term used in table templates (e.g., Table 1) provided on DMS' website; therefore, the terms SMCs and WMCs have been retained.**
- **Table 1** – *Carry credits to 3 decimal places.*
 - **All credit amounts have been carried to three decimal points.**
- **Table 2, Section 2.3:** *Please note that cumulative success of wetland gauges does not provide wetland function data and cannot be used to justify success. Suggest removing discussion from Table 2 and Section 2.3.*
 - **EPR still feels that presenting this data is worthwhile, though the discussion has been removed from Table 2. The discussion in Section 2.3 has been revised to rely less on the cumulative day totals and to note that any cumulative level data is not used to justify success.**
- **Section 2.2.1, 2nd paragraph:** *Correct typo of Year 1 to Year 2.*
 - **Correction made.**

- **Section 2.2.2:** *Reference invasive management plan from the mitigation plan to support your work in the invasive areas. Clarify if you received prior approval from the IRT to use an excavator to cut privet within a jurisdictional wetland. Please provide correspondence or describe within this section.*
 - **The invasive species plan from the Mitigation Plan states that invasive species ‘will be managed and controlled using a combination of chemical and/or mechanical methods.’ For the last remaining areas of untreated Chinese privet, mechanical methods were judged to be the most effective option as the stand was too dense to complete cutting and chemical treatment by hand in a time efficient manner. The machine used to control the privet was an excavator mounted with a mulching head—this substitution changes the functionality of the machine to mulching instead of excavation. Therefore, prior approval from the IRT was determined not to be required. Clarification was added to the text.**
- **Table 6:** *Suggest removing 1-2 stems of overcup oak from Random Plot 3, so it meets the 50% success criteria and removing from the narrative. If you prefer to leave it, suggest changing the color of the plot on the CCPV to green, as it’s meeting the stems/acre requirement.*
 - **EPR prefers to leave the plot as-is; on the MY1 report comments, it was noted to separately indicate on the CCPV a plot exceeding 50% maximum species concentration, regardless of if it met the stems/acre requirement. To be consistent across monitoring years, the plot color was not changed.**
- **Table 5:** *Include invasive area of concern acreage.*
 - **As all remaining patches of privet have been treated, the current acreage shown in Table 5 is zero. If the original acreage is input, it will not reflect the treatment actions that have occurred since the project was built.**
- **Appendix C:** *Please provide a table summarizing wetland gauge success. A template is provided in the 2020 DMS report tables.*
 - **A wetland gage success summary has been provided as Table 8 in Appendix C (previous Table 8 has been renumbered to Table 10).**
- **Appendix C BS1 Groundwater graph:** *Fix legend for Begin Growing Season.*
 - **Correction made.**



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- **Appendix C:** Please include a table of performance for the headwater portion of the stream (UT to Bear Swamp, see attached example).
 - A headwater performance table as shown in the comments example has been provided as Table 9 in Appendix C (previous Table 9 has been renumbered to Table 11).

Comments from Site Visit with DMS (Emily Dunnigan and Lindsay Crocker) on 1/26/2023

- *There are multiple encroachments occurring with varying degrees of severity. Within the report, please detail the adaptive management for the encroachments (timeline, marking, planting, landowner coordination, etc.) and include any additional encroachment areas on the CCPV/Table 5. Photo documentation of completed work must be included in the MY3 report.*
 - Discussion of these encroachments have been added to Table 2 and to the narrative in Section 2.2.1 (Vegetation Monitoring Data). The CCPV and Table 5 have also been updated to reflect conditions at the site.

If you have any questions regarding the MY2 Monitoring Report, please contact me at 919-623-5411 or via email at ajames@eprusa.net.

Sincerely,

A handwritten signature in black ink that reads 'Amy James'. The signature is fluid and cursive, with a long horizontal line extending to the right.

Amy James, PWS

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1.0 PROJECT SUMMARY

Ecosystem Planning and Restoration, PLLC (EPR) implemented the Bear Swamp Stream and Wetland Mitigation Project (Project; Site) for the North Carolina Division of Mitigation Services (NCDMS) to provide 2,220 stream mitigation credits (SMCs) and 2.6 riparian wetland mitigation credits (WMCs) in the Lumber River Basin, Hydrologic Unit Code (HUC) 03040203 (Figure 1). The Project was instituted via NCDEQ-DMS RFP # 16-007337. The Project restored 2,222 linear feet (LF) of an intermittent unnamed tributary to Bear Swamp and restored or preserved 2.88 acres of riparian wetland within a 15.3-acre conservation easement. The easement provides a minimum 50-foot buffer on either side of the stream and is well over 100 feet wide in most areas. Mitigation assets are listed in Table 1.

The Site is located in DMS targeted local watershed 03040203050010. The Site was utilized for intensive row crop production, including soybeans, cotton, and corn. As such, streams and existing wetlands in the project area were adversely impacted by agricultural activities, removal of riparian buffers, and stream channelization. The Site is situated in a WS-IV watershed that is approximately 61% agricultural land, 27% forest, and 13% low density residential development (Table 3). Prior to construction activities, the project stream was channelized and straightened, and adjacent headwater wetlands were not functioning due to drainage and removal of native vegetation. Photos and a more detailed description of site conditions before restoration are available in the Mitigation Plan (final version submitted March 2020).

1.1 Goals and Objectives

The Project goals were established based on an assessment of site conditions and restoration potential with careful consideration of the stressors identified in the Lumber River Basin Restoration Priorities (RBRP; NCEEP, 2008) and the Bear Swamp Local Watershed Plan (NCEEP, 2013). These goals and objectives are presented in Table 2.

Site construction and the as-built survey were completed in November 2020; planting, and baseline vegetation data collection was completed in March 2021. A detailed timeline of the Project activity and reporting history is provided in Appendix D.

1.2 Performance Criteria

Project success criteria were established in accordance with the *NCDMS Mitigation Plan Template* (ver. 06/2017), and *U.S. Army Corps of Engineers – Wilmington District Public Notice: Notification of Issuance of Guidance for Compensatory Stream and Wetland Mitigation Conducted for Wilmington District* (October 24, 2016). The monitoring plan for the site follows the guidance *NCDMS Annual Monitoring Report Format, Data, and Content Requirements* (October 2020). Table 2 details the United States Army Corps of Engineers (USACE) success criteria that evaluate whether project goals have been met throughout the monitoring period.



Table 1. Project Mitigation Quantities and Credits

Project Component (reach or wetland ID, etc.)	Original Mitigation Plan (ft/ac)	As-built (ft/ac)	Mitigation Category (Thermal Regime; Wetland Type)	Original Restoration Level ¹	Original Mitigation Ratio (X:1)	Mitigation Credits	Notes/Comments
UT to Bear Swamp	2,222.000	2,331.120	Warm	R ²	1.00000	2,220.000	Full Channel Restoration, Planted Buffer, and Permanent Conservation Easement.
Wetland A	0.417 ⁴	0.417	Riparian	P	10.00000	0.042	Protect with Permanent Conservation Easement
Wetland B	2.490	2.490	Riparian	R	1.00000	2.490	Restore wetland indicators (vegetation, hydrology, and soil), as defined by the USACE.
Wetland C	0.348	0.348	Riparian	R	1.00000	0.348	
Total Assets Summary:						2,220.000 SMCs 2.88 WMCs	
Length and Area Summations by Mitigation Category				Overall Assets Summary			
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)	Non-riparian Wetland (acres)	Asset Category	Overall Credits		
Restoration	2,220.000	2.838		Stream	2,220.000		
Enhancement				Riparian Wetland	2.880³		
Enhancement I							
Enhancement II							
Rehabilitation							
Preservation		0.417					
High Quality Pres							

¹ R=Restoration; P=Preservation

² Headwater (or Valley) Stream Restoration

³ Contracted amount of riparian wetland credits is 2.600 acres; any surplus credits will not be realized by EPR

⁴ Only includes part of existing Wetland A being claimed as preservation



Table 2. Summary: Goals, Performance and Results

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurements	Cumulative Monitoring Results
Replace riparian buffers	<ul style="list-style-type: none"> Restore minimum 50-foot riparian buffers to filter runoff. 	<ul style="list-style-type: none"> Restored riparian buffers will provide woody debris and detritus for aquatic organisms, reduced water temperatures, and increased dissolved oxygen concentrations, as well as shade and diverse aquatic and terrestrial habitats that are appropriate for the ecoregion and setting. 	<ul style="list-style-type: none"> Vegetation success criteria of 320 native stems/acre in Year 3, 260 stems/acre in Year 5 and 210 native stems/acre in Year 7. Trees must average 7 feet in height at year 5, and 10 feet in height at year 7. 	<p><u>Permanent and Annual Random Vegetation Plots</u></p> <p>5 permanent vegetation plots and 5 randomly selected vegetation plots 0.02 acre in size, surveyed during As-built, Years 1, 2, 3, 5, and 7 between July 1st and leaf drop. Data collection includes species, height, planted vs. volunteer, and age.</p>	<p>In MY2, all permanent and random vegetation plots exceeded the performance standard as indicated for stem density in Year 3 (320 stems/acre). Permanent plots had an average of 534 stems/acre while random plots had an average of 542 stems/acre. Random Plot 3 exceeded the 50% species requirement for overcup oak (<i>Quercus lyrata</i>, 56%). Average plot height across all plots was 2.9 ft.</p>
Repair channelized streams	<ul style="list-style-type: none"> Restore appropriate bed form diversity, headwater stream/wetland form, and install in-stream structures to provide appropriate habitat. Restore self-sustaining stream/wetland headwaters 	<ul style="list-style-type: none"> Functional uplift will be achieved by reducing the impact of adjacent agriculture and restoring natural riparian vegetation, appropriate stream form, and adjacent headwater wetlands. 	<ul style="list-style-type: none"> Continuous surface flow within the valley or crenulation must be documented each year for at least 30 consecutive days. 	<p><u>Stream Hydrology Monitoring</u></p> <p>2 pressure transducers and a rain gauge will record precipitation and streamflow data continuously through the monitoring period.</p>	<p>Flow gauge data from MY2 indicate that the project stream met the established success criteria of 30 days or more of consecutive flow throughout the year.</p>
Preserve existing resources	<ul style="list-style-type: none"> Place a conservation easement on existing riparian headwater stream/ wetland system at southern end of the project. 		<ul style="list-style-type: none"> Documentation of field indicators of channel formation and an ordinary high-water mark using photographs and applicable data sheets. 	<p><u>Channel Formation</u></p> <p>Documentation of applicable field indicators using photography and data sheets</p>	<p>Sediment deposition and sorting, wracking/debris, and multiple observed flow events were the main channel formation indicators observed in MY2.</p>
Improve Water Quality Where Degraded by Pollutant Inputs	<ul style="list-style-type: none"> Restore and preserve riparian wetland systems. Restore riparian buffer vegetation to filter runoff and provide organic matter and shade. Remove cropland from active production. 	<ul style="list-style-type: none"> The addition of in-stream structures will provide greater bedform diversity, enhancing aquatic habitat for native species. 	<ul style="list-style-type: none"> Visual documentation of stream stability during annual monitoring. 	<p><u>Visual Assessment</u></p> <p>Conducted yearly for restored wetlands, stream channels, and in-stream habitat and grade control structures (debris jams and woody riffle).</p>	<p>Stream photo points and visual assessment indicate that the restored channel and in-stream structures are performing as intended. No stream problem areas were observed.</p>



Table 2. Summary: Goals, Performance and Results

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurements	Cumulative Monitoring Results
<p>Improve Functions Degraded by Loss of Channel-Riparian Zone Connection</p>	<ul style="list-style-type: none"> ▪ Restore self-sustaining stream/wetland headwaters. ▪ Restore minimum 50-foot riparian buffers that will include riparian wetlands and terrestrial edges. 		<ul style="list-style-type: none"> ▪ Water table gauges and wells document high water table conditions. ▪ Wetland hydrology success criteria of saturation or inundation for 12 percent of the growing season. 	<p><u>Wetland Hydrology Monitoring</u></p> <p>5 pressure transducers (4 in restored wetland areas and 1 reference) will record groundwater levels continuously throughout the monitoring period.</p>	<p>Based on consecutive successful days within the growing season, only BS1 (reference) satisfied the 12% hydroperiod requirement.</p>
<p>Protect Against Future Threats</p>	<ul style="list-style-type: none"> ▪ Place a permanent conservation easement on the project area. 	<ul style="list-style-type: none"> ▪ Functional uplift will occur by restoring the stream to its historic valley, raising the streambed, and connecting it to adjacent wetlands at lower flows. 	<ul style="list-style-type: none"> ▪ Recordation and protection of a conservation easement meeting NCDMS guidelines 	<p><u>Observations of Easement Encroachment</u></p> <p>Document any encroachments into easement from adjoining land use</p>	<p>Mowing encroachments of approximately 0.2 acre were observed in three main places along the western boundary of the easement. Two of these are the result of mowing along the crop field and one is intentional mowing by an adjacent property renter. EPR will take further steps to communicate to the adjacent land-owner that encroachment on the easement is occurring to try and stop this behavior. Along the crop field, additional t-posts marked with tall sections of PVC will be installed to avoid encroachment in the future. The addition of 'horse tape' may also be explored along the sections of easement that border the crop fields.</p>



Table 3. Project Attribute Table

Project Background Information			
Project Name		Bear Swamp Stream and Wetland Restoration Project	
County		Robeson	
Project Area (acres)		15.3	
Project Coordinates (latitude and longitude)		latitude 34 deg 40' 549" N, longitude 79 deg 9' 19" W	
Planted Acreage (Acres of Woody Stems Planted)		12.07	
Project Watershed Summary Information			
Physiographic Province		Coastal Plain	
River Basin		Lumber	
USGS Hydrologic Unit 8-digit	03040203	USGS Hydrologic Unit 14-digit	03040203050010
Project Drainage Area (Acres and Sq. Mi.)		59.2 acres/ 0.09 Sq.Mi. (Total)	
Project Stream Thermal Regime		Warm	
Project Drainage Area Percentage of Impervious Area		<1%	
CGIA Land Use Classification		Agriculture/Pasture 61%, Forest 27%, 13% Residential/Developed	
Reach Summary Information			
Parameters	UT1		
Length of reach (linear feet)	2,432 (original length)		
Valley confinement (Confined, moderately confined, unconfined)	Unconfined		
Drainage area (Acres and Square Miles)	0.09 Sq.Mi., 59.2 Ac		
Perennial, Intermittent, Ephemeral	Intermittent (25.5)		
NCDWR Water Quality Classification	WS-IV; Sw		
Stream Classification (existing)	G5/B5c		
Stream Classification (proposed)	most similar to DA		
Evolutionary trend (Simon)	II		
FEMA classification	X		
Wetland Summary Information			
Parameters	Wetland A	Wetland B	Wetland C
Pre-project (acres)	0.417	0.00	0.00
Post-project (acres)	0.417	2.49	0.348
Wetland Type (non-riparian, riparian)	Riparian	Riparian	Riparian
Mapped Soil Series	Johnston	Bibb	Norfolk loamy sand
Soil Hydric Status	Hydric	Hydric	Hydric ¹
Regulatory Considerations			
Parameters	Applicable?	Resolved?	Supporting Docs?
Water of the United States - Section 404	Yes	Yes	USACE NWP 27 - ID# SAW-2018-01154
Water of the United States - Section 401	Yes	Yes	DWR 401 WQC No. 4134 -- ID # 18-0782
Division of Land Quality (Erosion and Sediment Control)	Yes	Yes	General Permit NCG010000 ID # ROBES-2020-028
Endangered Species Act	No	Yes	Categorical Exclusion Document; Appendix 6 in Mitigation Plan
Historic Preservation Act	No	Yes	
Coastal Zone Management Act	No	N/A	N/A
FEMA Floodplain Compliance	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

¹: This soil unit is not considered hydric by the NRCS, but detailed field investigations found soils meeting hydric criteria (as presented in the Mitigation Plan).



2.0 MONITORING DATA ASSESSMENT

Monitoring Year 2 (MY2) data was collected in October and November 2022. Current site conditions and monitoring data are described in the following sections to evaluate whether the project is meeting the success criteria established in the mitigation plan.

2.1 Stream Monitoring

Stream monitoring involves field data collection to assess the hydrologic and geomorphic functions of UT1. Monitored parameters, methods, schedule/frequency, and extent are summarized in Table 2. These monitoring parameters follow USACE guidance but will also allow for monitoring of other parameters to document site performance related to the project goals listed in Table 2. The locations of the stream gauges and photo points are shown in Figure 2 Current Condition Plan View (CCPV).

2.1.1 Valley Profile

Because this project utilizes valley restoration, a full longitudinal profile was not required per the mitigation plan. A small pilot channel was dug along the low point of the valley during construction to route flow; the thalweg of this channel is shown on the CCPV (Figure 2). No significant movement of this channel was noted during MY2.

2.1.2 Channel Formation

Headwater stream (or valley) restoration requires that evidence of channel formation be documented during each monitoring year. Applicable field indicators of channel formation are found in RGL 05-05 and outlined in the 2016 USACE Guidance; these indicators change based on monitoring year. The main channel formation indicators applicable to monitoring years 1-4 observed in MY2 are shown in Table 9 in Appendix C; this table will be updated in additional monitoring years. Representative photos of the observed indicators in MY2 are found in the photolog in Appendix A.

2.1.3 Channel Stability

Channel stability is assessed on a yearly basis using photographs to visually document the condition of the restored project streams. Photographs are typically taken from the same location in the same direction each year, though locations may change if the pilot channel moves laterally. Twelve (12) photo points were established during baseline monitoring and are shown in Appendix A. The locations of each permanent photo point are shown in the CCPV (Figure 2). Visual assessments of channel stability and in-stream structure condition were also made regularly throughout Monitoring Year 2.

Stream photo points and visual assessments indicate that the restored channel and in-stream structures are in good condition and performing as intended. Along much of the alignment outside the forested area, the channel is full of hydrophytic vegetation (e.g., *Persicaria* spp., *Juncus effusus*) and the riparian area is also densely vegetated. This vegetation, as well as the low energy nature of the system, likely prevents instability in the channel and adjacent riparian area.

2.1.4 Stream Hydrology

Two (2) pressure transducers were installed in UT1 to document days of continuous stream flow during the monitoring year. The locations of these gauges are shown in the CCPV (Figure 2).

This Project utilizes a tipping bucket rain gauge to accurately document rainfall at the Site. The rainfall data can be compared to the flow gauge data to verify that high flows at the Site are correlated with rainfall events. The monitoring gauges were downloaded regularly throughout Monitoring Year 2.



Monthly rainfall summary data are presented in Figure 3; the precipitation and water level hydrographs are included in Appendix C.

Flow gauge data from MY2 indicate that the project stream met the established success criteria of 30 days or more of consecutive flow throughout the year. According to the upstream gauge for the UT to Bear Swamp (BS5), the stream had 108 days of consecutive flow, while the downstream gauge (BS6) showed 89 days of consecutive flow.

2.2 Riparian and Wetland Vegetation Monitoring

Riparian and wetland vegetation monitoring evaluates the growth and development of planted and volunteer vegetation across the site. Monitored parameters, methods, schedule/frequency, and extent are summarized in Table 2. These monitoring parameters follow USACE guidance but will also allow for monitoring of other parameters to document site performance related to the project goals listed in Table 2.

2.2.1 Vegetation Monitoring Data

Five (5) permanent (or fixed) vegetation monitoring plots were assessed across the site. The corners of the permanent vegetation plots were marked using steel t-posts and the location of each plot was surveyed during the as-built survey. The individual trees within each permanent plot were marked with pin flags to facilitate monitoring efforts in future years. In addition to the 5 permanent plots, 5 randomly placed vegetation plots are established each vegetation monitoring year and the location of these plots is recorded using GPS. All vegetation plots for MY2 are shown in the CCPV (Figure 2). Annual vegetation data was compiled and summarized using the DMS Vegetation Data Entry Tool (Version 3/25/2022; see Tables 6 and 7 in Appendix B).

Year 2 vegetation monitoring occurred on October 26, 2022. Stem counts for the vegetation plots (fixed and random) ranged from 9 trees per plot (364 stems per acre) in FP-1 (Fixed) to 16 trees per plot (607 stems per acre) in RP-3 (Random). The average stem density from all 10 vegetation plots (fixed and random) was 13 trees per plot (526 stems per acre). Therefore, the vegetation plot data indicates that planted trees on the Site are on track to meet the interim success criteria in Monitoring Year 3 of 320 stems/acre. Only one plot exceeded the 50% species threshold (RP-3, Random), with overcup oak (*Quercus lyrata*) comprising 56% of individuals identified in the plot.

The average plot height is 2.9 feet across both fixed and random plots, with an overall average tree height of 3.1 feet. It is hard to predict if the vegetation will meet the MY5 vegetation height requirement of 7 feet, but the steady overall increase in stem heights from MY1 to MY2 indicate the project is on a trajectory towards meeting this requirement.

Mowing encroachment is occurring in three main places along the western easement border. Two of these are adjacent to the active crop fields and are being mowed inadvertently. More t-posts with tall sections of PVC will be placed along these areas to deter future mowing in MY3 and EPR will determine if any additional planting needs to occur. 'Horse tape' between the t-posts may be explored as an additional deterrent. The remaining mowing encroachment is the result of intentional mowing by an adjacent property renter along the southwest easement boundary. DMS has spoken to the renter about the situation, but no change in behavior was made. EPR will take additional steps to make the adjacent land-owner aware of the encroachment in MY3, in an attempt to stop the mowing. This part of the



easement was not planted during the construction phase; if the renter discontinues mowing, this area will be planted.

2.2.2 Invasive Species

Chinese privet (*Ligustrum sinense*) was the most common non-native invasive species found within the forested section of the easement. Several other non-native invasive species were identified along the field edge of the forested section, including Japanese privet (*Ligustrum japonicum*) and Chinaberry (*Melia azedarach*); however, these species were not as prevalent as Chinese privet. During construction, most of the forested area was left intact; therefore, much of the privet remained, mostly along the southeast border of the easement, but also scattered throughout the southwest section. In the summer of 2021, the privet boundaries were more comprehensively mapped than they were for the as-built report. It was determined that the acreage of privet was approximately 1.3 acres instead of 0.85, as reported in the as-built report. In February 2021, approximately 0.40 acre was cut, and stumps treated with Vastlan™ (Triclopyr choline). Between February and October 2021, an additional 0.45 acre of privet was cut, and stumps treated with Vastlan™. This area was planted in late winter 2022 with surplus stems taken from a nearby section of easement, which were planted originally for this purpose. Limited re-sprouting of privet was observed in this area during the late summer and early fall of 2022; new growth will continue to be treated into MY3.

Due to its density, the remaining 0.45 acre of privet not treated in 2021 required more mechanical means for efficient treatment, which is consistent with the Mitigation Plan (Appendix 9). Therefore, this area of privet was mechanically cut in November 2022 using a mulching head mounted on a Caterpillar 316 excavator (see photolog in Appendix A). This area is within a jurisdictional wetland; however, as no actual excavation was performed and ground disturbance was minimal, it was determined that prior approval by the IRT was not required. This section of the easement will be planted during the dormant season in early 2023 (MY3).

2.3 Wetland Hydrology

Four (4) groundwater wells were installed in restored wetland areas (2 each in Wetlands B and C) to document percent hydroperiod during the growing season. In addition, a fifth groundwater well was installed in the existing wetland area as a reference. The locations of these wells are shown in the CCPV (Figure 2). Based on the soils mapped in the restored wetland areas, the target growing season hydroperiod is 12%. This Project also utilizes a tipping bucket rain gauge to accurately document rainfall at the Site (see note about data loss in Section 2.1.4). The rainfall data can be compared to the well data to verify that high water table conditions at the Site are correlated with rainfall events. The monitoring gauges were downloaded regularly throughout MY2.

The growing season for this project, based on WETS data tables for Robeson County, was given as March 15 – November 15 in the mitigation plan. However, based on readings of soil temperature at 20 inches (> 41° F) and observation of bud burst on March 1 (see photolog in Appendix A), it is proposed that the beginning growing season date be moved to March 1. Trees with dropped leaves were observed on November 23 (see photolog in Appendix A), so the end of the growing season was kept at November 15. Twelve (12) percent (target hydroperiod) of this duration (March 1 – November 15) is 31 days.

Monthly rainfall totals over the growing season are shown on Figure 3 (Appendix C), including an overlay of WETS-derived 30th and 70th percentile monthly rain totals. In MY1, the 30th and 70th percentiles were based on data from 1920-2019. To better reflect modern conditions, for MY2, the 30th and 70th



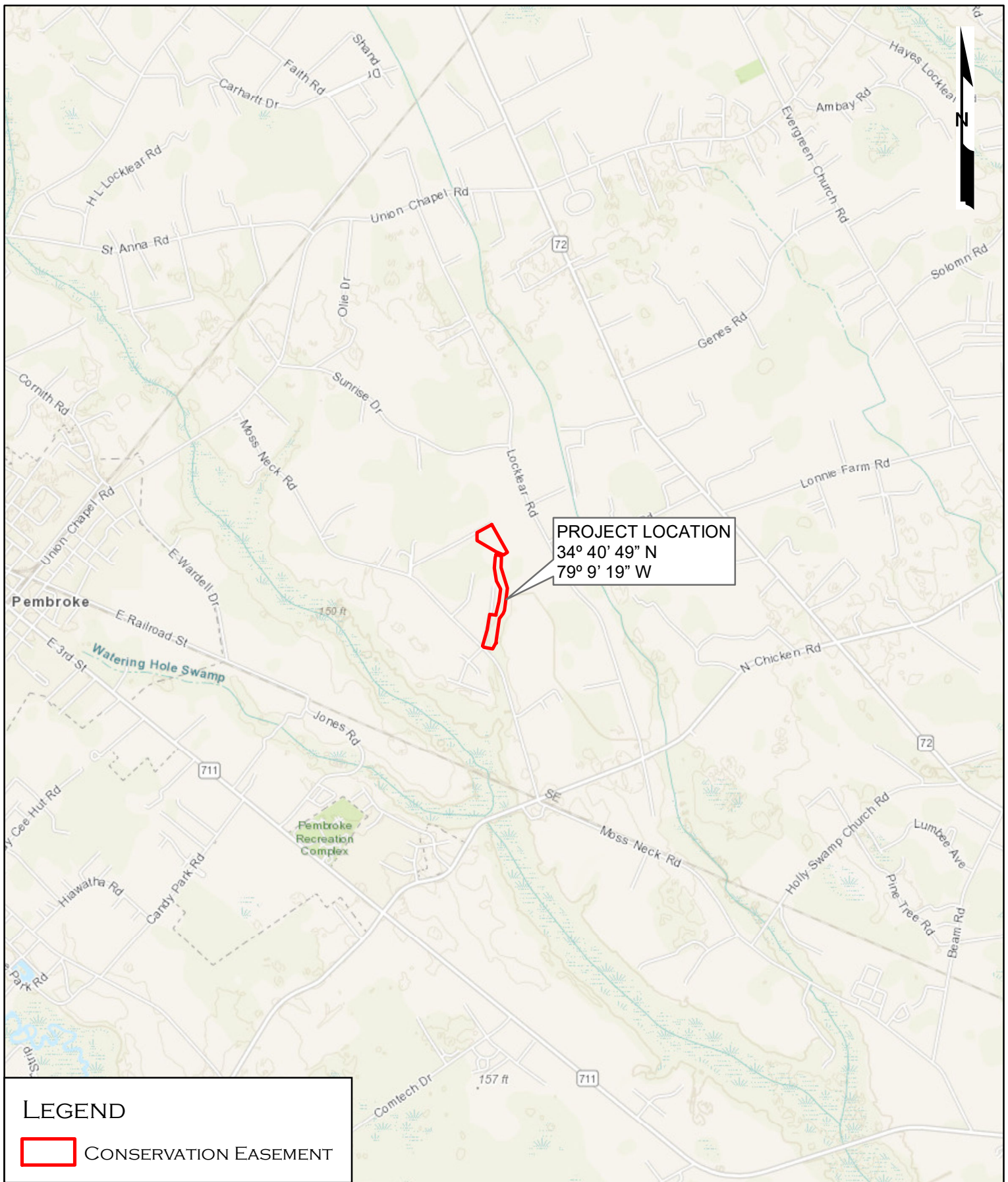
percentiles were based on data from 1971-2022. Rainfall was at or below the 30th percentile for five months of the growing season, leading to very dry conditions. Approximately fifteen (15) weeks were categorized as ‘moderate drought’ in this area of Robeson County by the NC drought monitor¹ (mainly in late April, May, and June).

While not used as a success criterion, EPR notes that, 4 of 5 wetland wells (all except BS3) met the 12% target hydroperiod using the cumulative total of days in the growing season where the water table was within 12 inches of the surface (see hydrographs in Appendix C). Only one (1) well met the 12% target hydroperiod using the consecutive number of days where the water table with within 12 inches of the surface (BS1-reference) with 61 consecutive days. A wetland gage summary is provided in Appendix C (Table 8).

It is important to note that both MY1 (2021) and MY2 (2022) were dry years at the Site. The end of 2021 was below normal for monthly precipitation (see Figure 3), as was the late winter and spring of 2022, which did not allow the Site to fully bounce back from dry conditions in 2021. During the 2022 growing season, the bulk of the rain at the Site occurred during the summer months, when evapotranspiration is highest. All wells that did not meet the 12% target hydroperiod using consecutive days met at least the general wetland hydrology criterion of 5%, as defined by the USACE (Environmental Laboratory 1987), with an average of 6.7% hydroperiod. The only well to meet the 12% target hydroperiod using consecutive days was BS1, which is in a wetter location of the reference wetland. EPR proposes to install another reference well along the edge of the reference wetland in MY3 to better compare to the non-reference wetland wells in drier years.

¹ <https://www.ncdrought.org/>

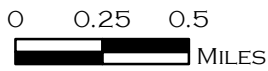




PROJECT LOCATION
 34° 40' 49" N
 79° 9' 19" W

LEGEND

 CONSERVATION EASEMENT



BEAR SWAMP STREAM & WETLAND RESTORATION VICINITY MAP

PREPARED FOR:
 NCDEQ
 DIVISION OF
 MITIGATION SERVICES

FIGURE 1

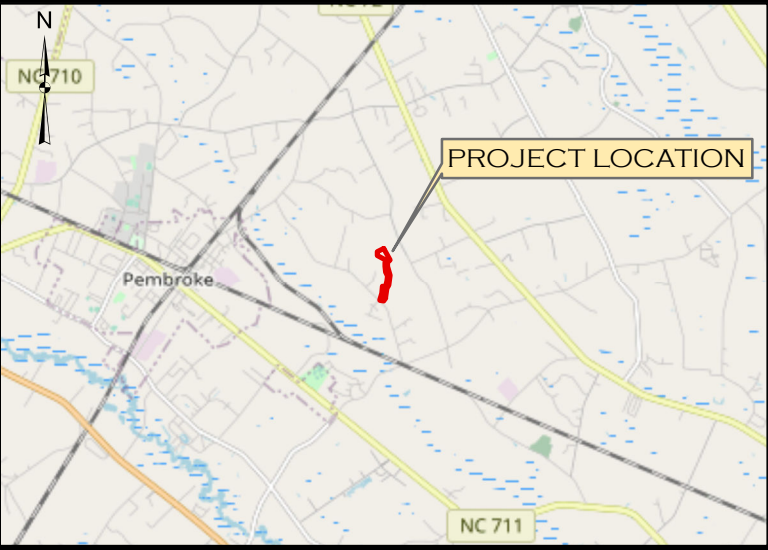
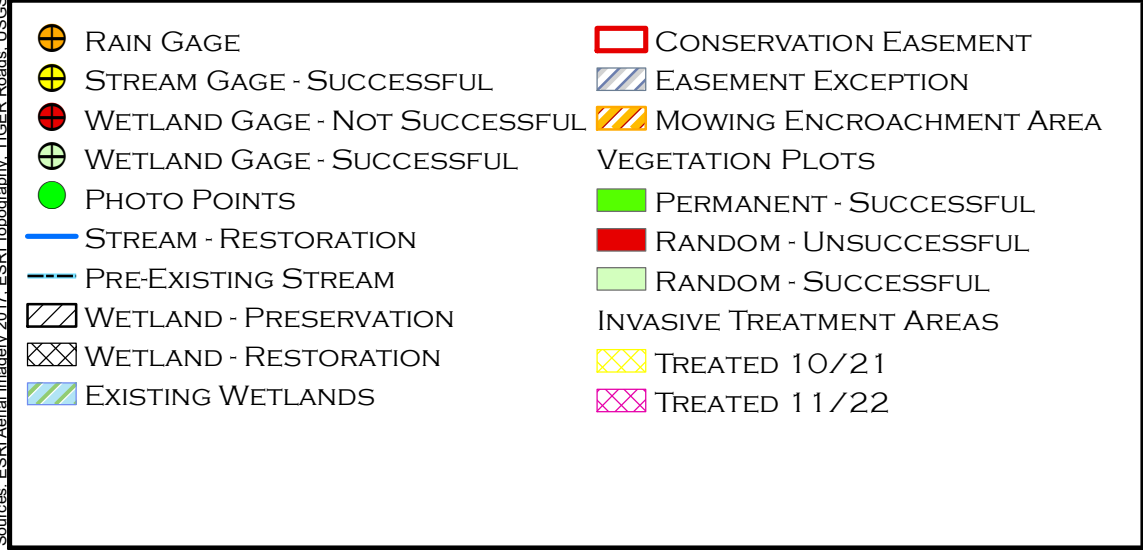
ROBESON COUNTY, NC

PREPARED BY:
 ECOSYSTEM
 PLANNING &
 RESTORATION



Sources: ESRI Aerial Imagery 2017; ESRI Topography; TIGER Roads; USGS NHD Streams

Path: R:\Projects\RD001010_NCDEC\Bear_Swamp_FDGIS\Maps\Monitoring\Figure_2_CCPV_MY2.mxd | Date: 1/30/2023 | Time: 1:45:42 PM | User Name: alames



BEAR SWAMP STREAM AND WETLAND RESTORATION SITE
 CURRENT CONDITION PLAN VIEW: ASSET MAP
 MY2: 2022
 ROBESON COUNTY, NC

PREPARED FOR:

 PREPARED BY:

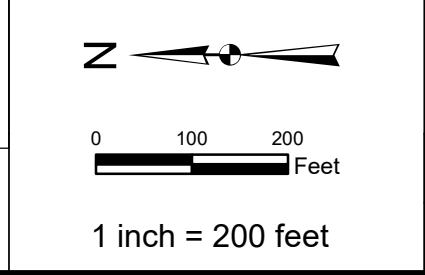


FIGURE 2

DATE:
 JANUARY 2023

3.0 REFERENCES

- Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.
- North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). DMS Vegetation Data Entry Tool, March 2022. https://ncdms.shinyapps.io/Veg_Table_Tool/
- North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). Annual Monitoring Report Format, Data, and Content Requirements, October 2020.
- U.S. Army Corps of Engineers. October 2016. Wilmington District Public Notice: Notification of Issuance of Guidance for Compensatory Stream and Wetland Mitigation Conducted for Wilmington District.



Appendix A

Visual Assessment Data

Table 4. Visual Stream Morphology Stability Assessment Table

Table 5. Vegetation Condition Assessment Table

Vegetation Photo Log

Photo Log

**Table 4. Visual Stream Morphology Stability Assessment Table
Bear Swamp Stream and Wetland Mitigation Project (DMS No.100054)**

Reach ID UT1
 Assessed Stream Length (ft) 2,220
 Assessed Bank Length (ft) 4440
 Assessment Date 11/23/2022

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	Surface Scour/Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade.	5	5		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)	22	22		100%
	Habitat	Debris jams/rootwads remain in contact with baseflow and provide cover	17	17		100%

**Table 5. Vegetation Condition Assessment Table
Bear Swamp Stream and Wetland Mitigation Project (DMS No.100054)**

Planted Acreage **10.58**
Assessment Date **10/26/2022**

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.1 acres	0.00	0.0%
Total			0.00	0.0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.25 acres	0.00	0.0%
Cumulative Total			0.00	0.0%

Easement Acreage **15.3**

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.	0.1 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	Mowing encroachments noted on western boundary (approximately 0.2 acre)	

**Bear Swamp Stream and Wetland Mitigation Project
Monitoring Year 2 (October 2022) - Vegetation Photo Log**



Veg Plot 1 F – East Corner (10/26/2022)



Veg Plot 2 F – East Corner (11/23/2022)



Veg Plot 3 F – SE Corner (10/26/2022)



Veg Plot 4 F – SE Corner (10/26/2022)



Veg Plot 5 F – SE Corner (10/26/2022)



Veg Plot 1 R – SW Corner (10/26/2022)



Veg Plot 2 R – SW Corner (10/26/2022)



Veg Plot 3 R – SW Corner (10/26/2022)



Veg Plot 4 R – NW Corner (10/26/2022)



Veg Plot 5 R – SE Corner (10/26/2022)

**Bear Swamp Stream and Wetland Mitigation Project
Monitoring Year 2 (March, October, and November 2022) - Photo Log**



Photo Point 1 – Sta. 10+00
Facing Upstream Towards Wetland B (11/23/2022)



Photo Point 2 – Sta. 10+00
Facing Downstream (11/23/2022)



Photo Point 3 – Sta. 11+75
Facing Downstream (11/23/2022)



Photo Point 4 – Sta. 14+60
Facing Upstream (11/23/2022)



Photo Point 5 – Sta. 15+90
Facing Downstream (11/23/2021)



Photo Point 6 – Sta. 17+45
Facing Upstream (11/23/2022)



Photo Point 7 – Sta. 20+00
Facing Downstream (11/23/2022)



Photo Point 8 – Sta. 20+50
Looking Upstream at Ditch from Stream (11/23/2022)



Photo Point 9 – Sta. 21+90
Facing Upstream (11/23/2022)



Photo Point 10 – UT1 Reach 3, Sta. 23+80
Facing Downstream (11/23/2022)



Photo Point 11 – Sta. 26+50
Facing Upstream, Towards BS6 (11/23/2022)



Photo Point 12 – Sta. 27+50
Facing Downstream (11/23/2022)



Permanent Ford Crossing
Facing East (11/23/2022)



Evidence of channel formation: sediment deposition in
channel (10/26/2022)



Evidence of channel formation: wracking (3/1/2022)



Evidence of channel formation: wracking and debris
(10/26/2022)



Area of mechanically mulched Chinese privet
(11/7/2022)



Area of mechanically mulched Chinese privet
(11/7/2022)



Privet area treated with herbicide and planted with trees (orange flag in foreground; 3/1/2022)



Soil temperature reading at 20 inches on 3/1/2022



Bud burst observed on 3/1/2022



Bud burst observed on 3/1/2022



One of the easement mowing encroachments along the western boundary of the easement (10/26/2022)



Added PVC to easement markers to deter mowing encroachment (11/7/2022)



Evidence of leaf fall (11/23/2022)

Appendix B

Vegetation Plot Data

Table 6. Vegetation Plot Data

Table 7. Vegetation Performance Standards Summary Table

Table 6. Vegetation Plot Data
Bear Swamp Stream and Wetland Mitigation Project (NCDMS Project No. 100054)

Planted Acreage	10.2
Date of Initial Plant	2021-03-19
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2022-10-26
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/S hrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F		Veg Plot 1 R	Veg Plot 2 R	Veg Plot 3 R	Veg Plot 4 R	Veg Plot 5 R	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total	Total	Total	Total	Total	
Species Included in Approved Mitigation Plan	<i>Betula nigra</i>	river birch	Tree	FACW	1	1			2	2	1	1					2	1		
	<i>Diospyros virginiana</i>	common persimmon	Tree	FAC			1	1							3	1			1	
	<i>Liriodendron tulipifera</i>	tuliptree	Tree	FACU				1												1
	<i>Magnolia virginiana</i>	sweetbay	Tree	FACW	1	1	4	5	3	3	1	1	3	3	1	2			3	
	<i>Nyssa sylvatica</i>	blackgum	Tree	FAC	1	1					1	1				2				
	<i>Quercus laurifolia</i>	laurel oak	Tree	FACW			1	1							1		1	3		
	<i>Quercus lyrata</i>	overcup oak	Tree	OBL	2	2			2	2	5	5	5	5	1	4	9	2	4	
	<i>Quercus pagoda</i>	cherrybark oak	Tree	FACW	3	3	1	1	4	4	2	2	2	3	2	3	2	3	3	
	<i>Taxodium distichum</i>	bald cypress	Tree	OBL	1	1	5	5	4	4	2	2	4	4	6	2	2	2	1	2
<i>Ulmus americana</i>	American elm	Tree	FAC							1	1									
Sum	Performance Standard				9	9	12	14	15	15	13	13	14	15	14	14	16	13	11	
Post Mitigation Plan Species	<i>Carya sp.</i>					1														
Sum	Proposed Standard				9	9	12	14	15	15	13	13	14	15	14	14	16	13	11	
Mitigation Plan Performance Standard	Current Year Stem Count				9		14		15		13		15	14	14	16	13	11		
	Stems/Acre				364		567		607		526		607	567	567	607	526	445		
	Species Count				6		6		5		7		4	6	6	5	6	5		
	Dominant Species Composition (%)				30		36		27		38		33	43	29	56	23	36		
	Average Plot Height (ft.)				3		2		3		3		3	3	3	2	4	3		
	% Invasives				0		0		0		0		0	0	0	0	0	0		
Post Mitigation Plan Performance Standard	Current Year Stem Count				9		14		15		13		15	14	14	16	13	11		
	Stems/Acre				364		567		607		526		607	567	567	607	526	445		
	Species Count				6		6		5		7		4	6	6	5	6	5		
	Dominant Species Composition (%)				30		36		27		38		33	43	29	56	23	36		
	Average Plot Height (ft.)				3		2		3		3		3	3	3	2	4	3		
	% Invasives				0		0		0		0		0	0	0	0	0	0		

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded), species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems. **As of MY2, this project does not have any post mitigation plan approved or proposed stems; therefore, the number of stems is the same for both standards.**

Table 7. Vegetation Performance Standards Summary Table
Bear Swamp Stream and Wetland Mitigation Project (NCDMS Project No. 100054)

Vegetation Performance Standards Summary Table												
	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	364		6	0	567		6	0	607		5	0
Monitoring Year 1	486		7	0	567		6	0	688		6	0
Monitoring Year 0	445		7	0	526		5	0	688		6	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot Group 1 R			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	526		7	0	607		4	0	567		6	0
Monitoring Year 1	526		7	0	607		5	0				
Monitoring Year 0	486		7	0	607		5	0				
	Veg Plot Group 2 R				Veg Plot Group 3 R				Veg Plot Group 4 R			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	567		6	0	607		5	0	526		6	0
Monitoring Year 1												
Monitoring Year 0												
	Veg Plot Group 5 R											
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives								
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	445		5	0								
Monitoring Year 1												
Monitoring Year 0												
				Meets Interim Success Criteria				Does Not Meet Interim Success Criteria				

*Each monitoring year represents a different plot for the random vegetation plot "groups". Random plots are denoted with an R, and fixed plots with an F.

Appendix C

Hydrologic Data

Table 8. Wetland Gage Summary

Table 9. Indicators of Channel Formation

Figure 3. Monthly Rainfall Summary Data

Precipitation and Water Level Hydrographs

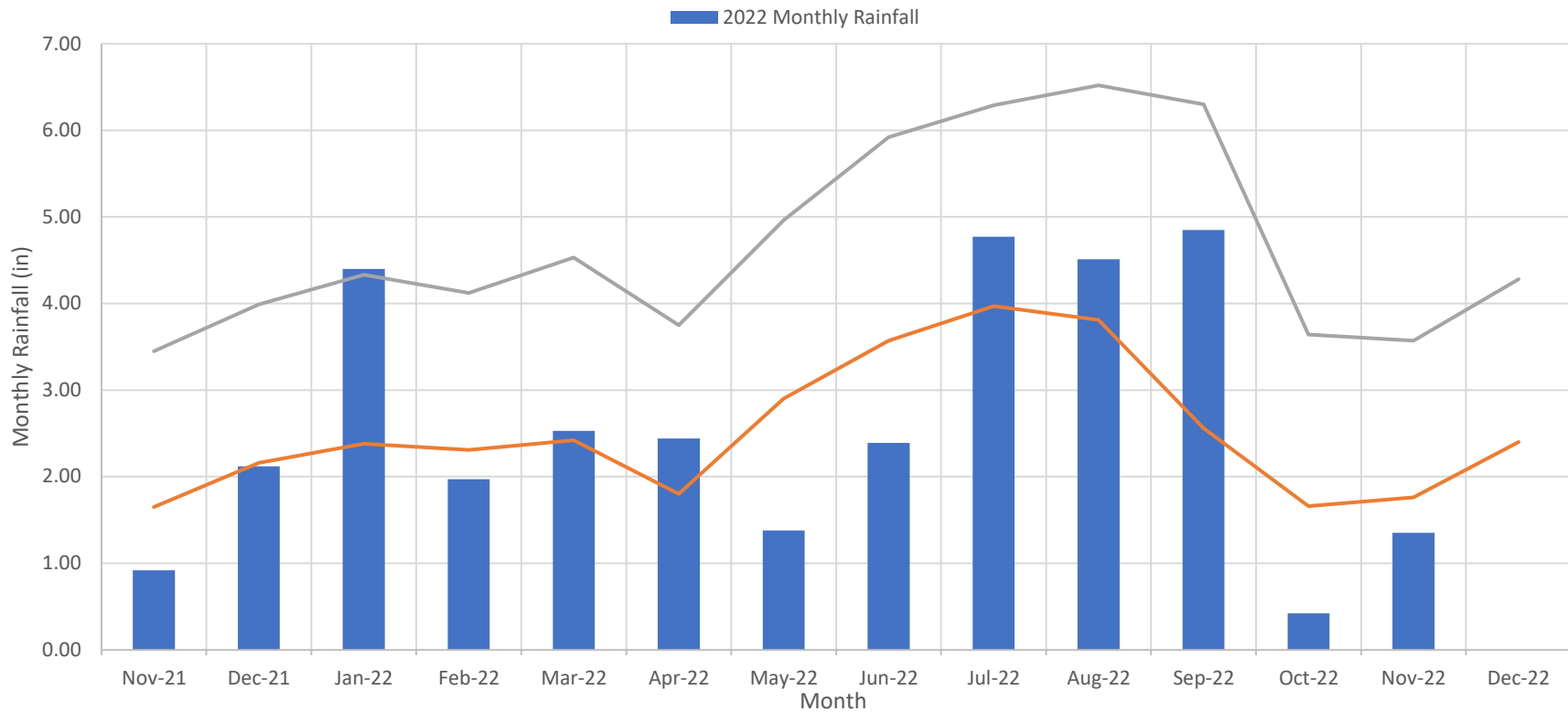
Table 8. Bear Swamp Wetland Gage Summary

Monitoring Gauge	Performance Standard: 12 % WETS Station: Lumberton, NC Growing Season: 3/1 to 11/15 (258 days)						
	Max. Consecutive Hydroperiod (%)						
	2021	2022	2023	2024	2025	2026	2027
BS-GW1	23	24					
BS-GW2	7	7					
BS-GW3	15	7					
BS-GW4	3	5					
BS-GW7	8	7					

Table 9. Indicators of Headwater Channel Formation (UT to Bear Swamp)

Indicators	Year 1 (2021)	Year 2 (2022)	Year 3 (2023)	Year 4 (2024)	Year 5 (2025)	Year 6 (2026)	Year 7 (2027)
Years 1-7							
Multiple observed flow events (max consecutive days)	Yes (BS 5: 105; BS 6: 107)	Yes (BS 5: 108; BS6: 89)					
Scour	No	No					
Sediment deposition	Yes	Yes					
Sediment sorting	Yes	Yes					
Destruction of terrestrial vegetation	No	No					
Presence of litter and other debris	No	Yes					
Wracking	No	Yes					
Vegetation matted down, bent, or absent	Yes	No					
Leaf litter disturbed or washed away	No	No					
Years 5-7 Only (OHWM Development)							
Bed and banks							
Natural line impressed on bank							
Shelving of sediment depositions							
Water staining of rooted vegetation							
Change in plant community							
Changes in character of soil (texture and/or chroma)							

Bear Swamp Stream and Wetland Mitigation Project
 Figure 3. Monthly Rainfall Data
 Monitoring Year 2 - 2022



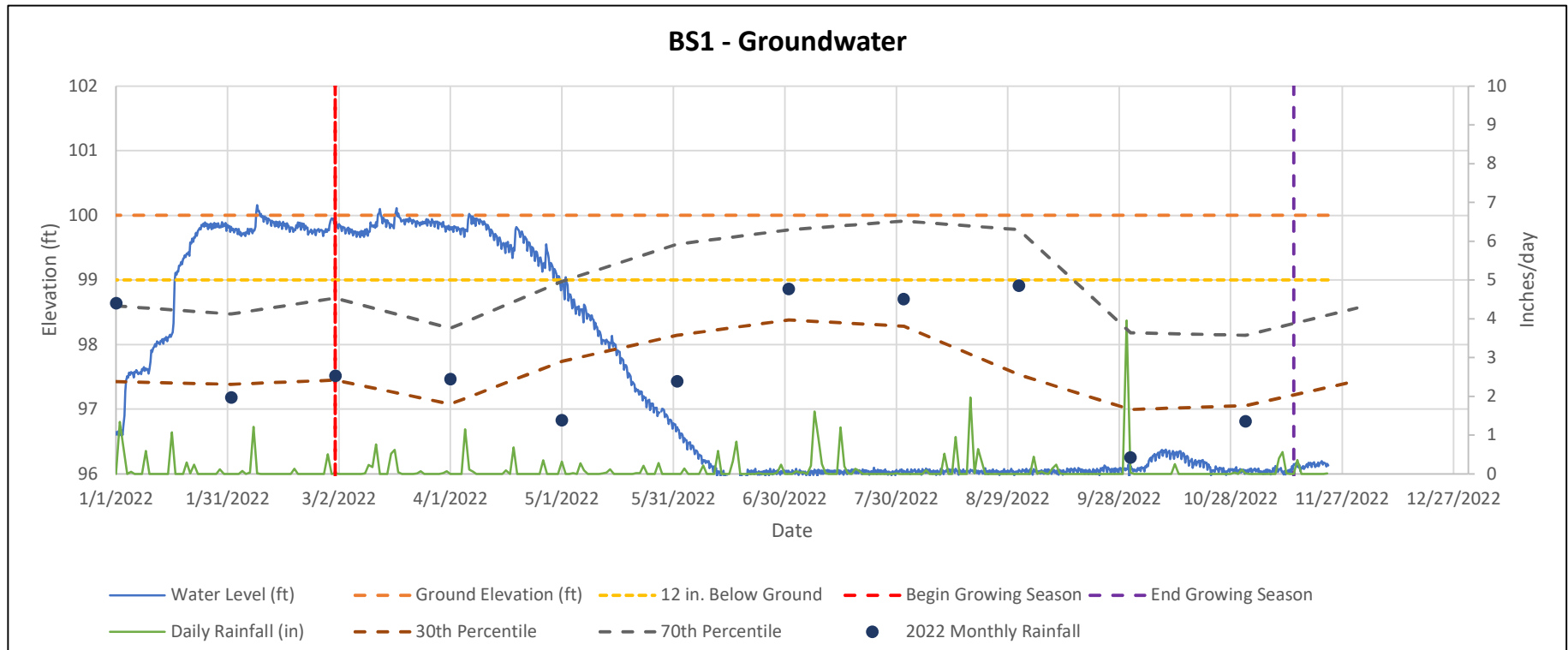
Note: Percentiles calculated using historic rainfall data from WETS Station: Lumberton, NC, 1971-2022. Project rainfall data from HOBO Tipping Bucket Rain Gauge located on-site.

Rainfall Summary							
	2021*	2022^	2023	2024	2025	2026	2027
Recorded Precip Total	28.26	31.01	-	-	-	-	-
WETS 30th Percentile	30.64	44.79	-	-	-	-	-
WETS 70th Percentile	56.69	52.96	-	-	-	-	-
Normal	N	N	-	-	-	-	-

*Total recorded only includes March-December 2021. On-site rain gage not functional January and February 2021.

^ Annual total 1/1/2022-11/23/2022; likely not to be in normal range for 2022 using data from 1971-2022

Bear Swamp Year 2 (2022) Groundwater Data

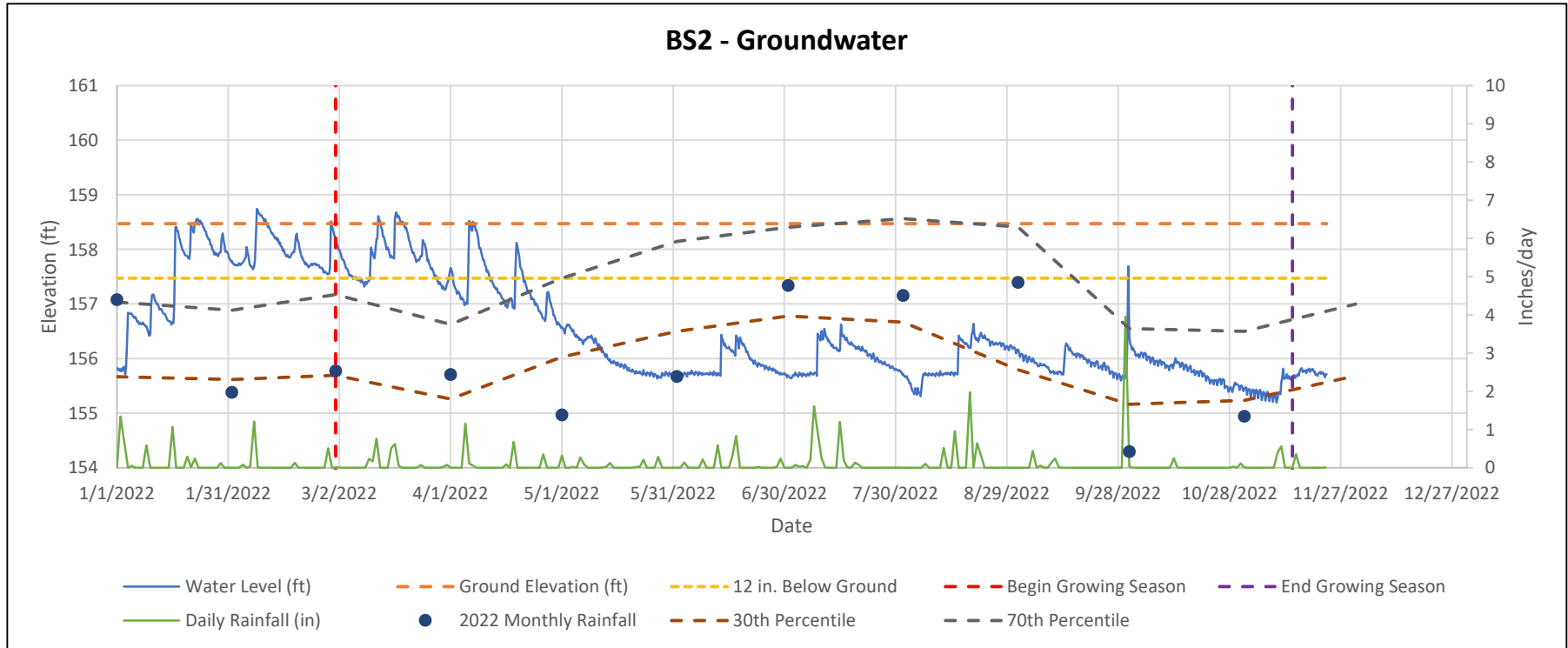


Site Info (Year 2)	
Site	Bear Swamp
Begin Date	11/18/2021
End Date	11/23/2022
Total Days of Well Data	740

-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland
 -Percentile lines in reference to WETS historic monthly Rainfall data for Lumberton, NC

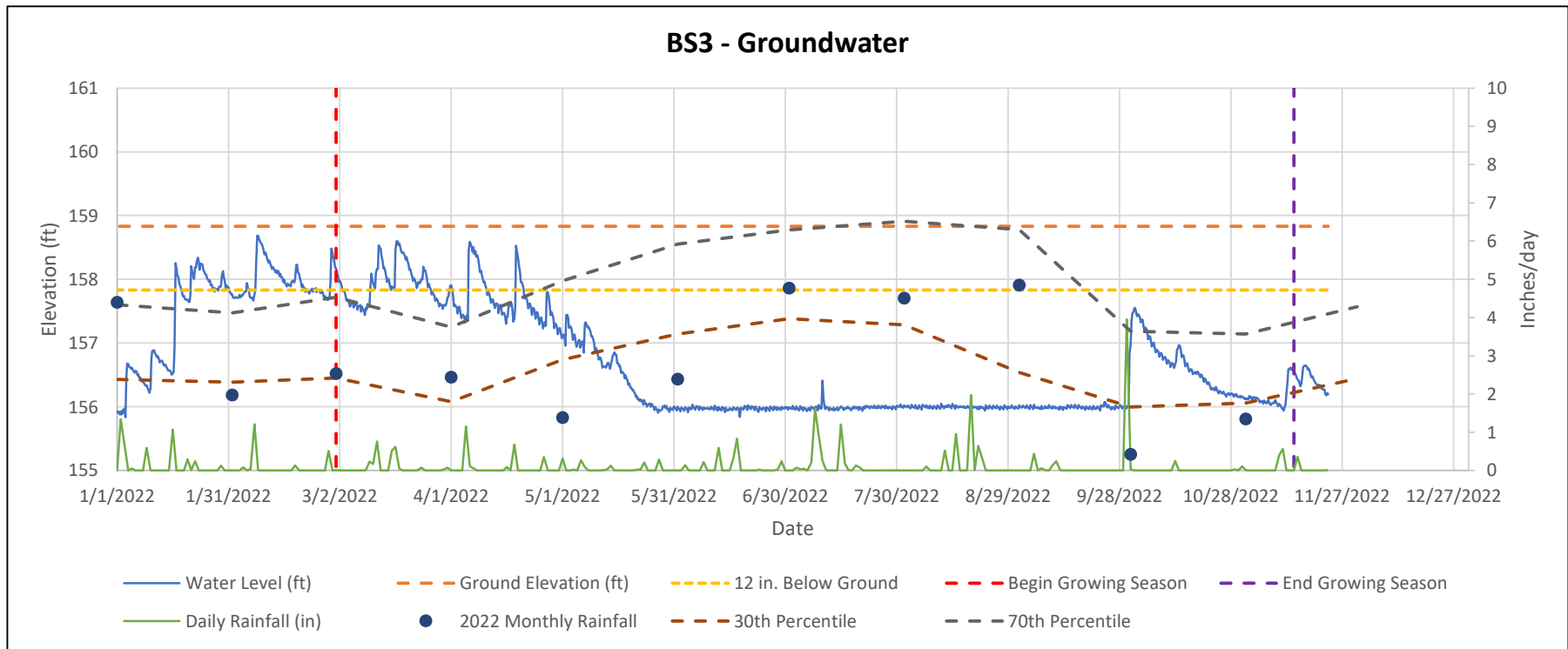
Growing Season Information (Year 2 - 2022)		
Site		Bear Swamp
Gauge ID		BS1 - Groundwater
Serial #		20452191
Growing Season Start Date		3/1/2022
Growing Season End Date		11/14/2022
Total Growing Season Days		258
NRCS Soil Series		Johnston
Success Criteria		
12.0%	Growing Season (Days)	31
Most Consecutive Successful Days Within Growing Season		61
Percent of Growing Season with Consecutive Successful Days		23.6%
Average Water Level Elevation During Growing Season (ft)		97.05
Total Cumulative Successful Days Within Growing Season		62

Bear Swamp Year 2 (2022) Groundwater Data



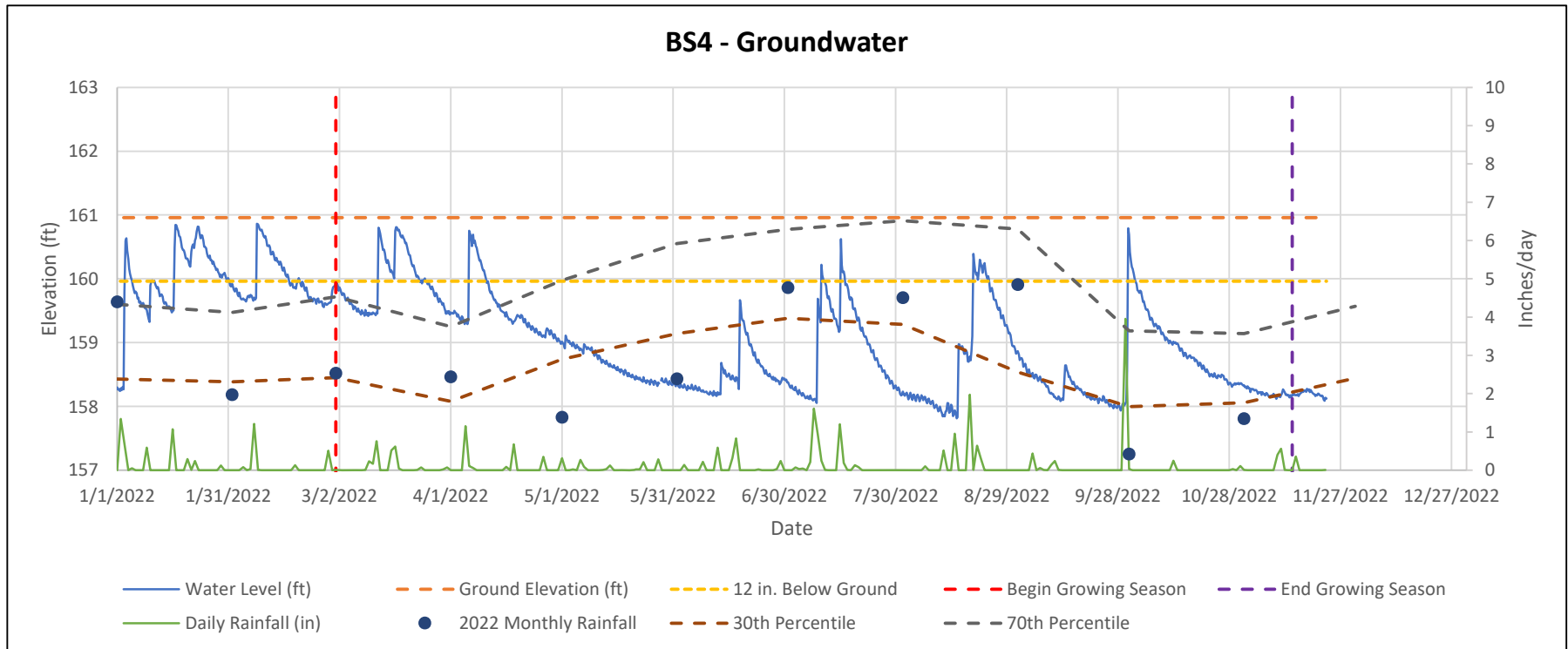
Site Info (Year 2)		Growing Season Information (Year 2 - 2022)	
Site	Bear Swamp	Site	Bear Swamp
Begin Date	11/18/2021	Gauge ID	BS2 - Groundwater
End Date	11/23/2022	Serial #	20452193
Total Days of Well Data	740	Growing Season Start Date	3/1/2022
-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland -Percentile lines in reference to WETS historic monthly Rainfall data for Lumberton, NC		Growing Season End Date	11/14/2022
		Total Growing Season Days	258
		NRCS Soil Series	Johnston
Success Criteria			
12.0%	Growing Season (Days)	31	
Most Consecutive Successful Days Within Growing Season		19	
Percent of Growing Season with Consecutive Successful Days		7.4%	
Average Water Level Elevation During Growing Season (ft)		156.15	
Total Cumulative Successful Days Within Growing Season		36	

Bear Swamp Year 2 (2022) Groundwater Data



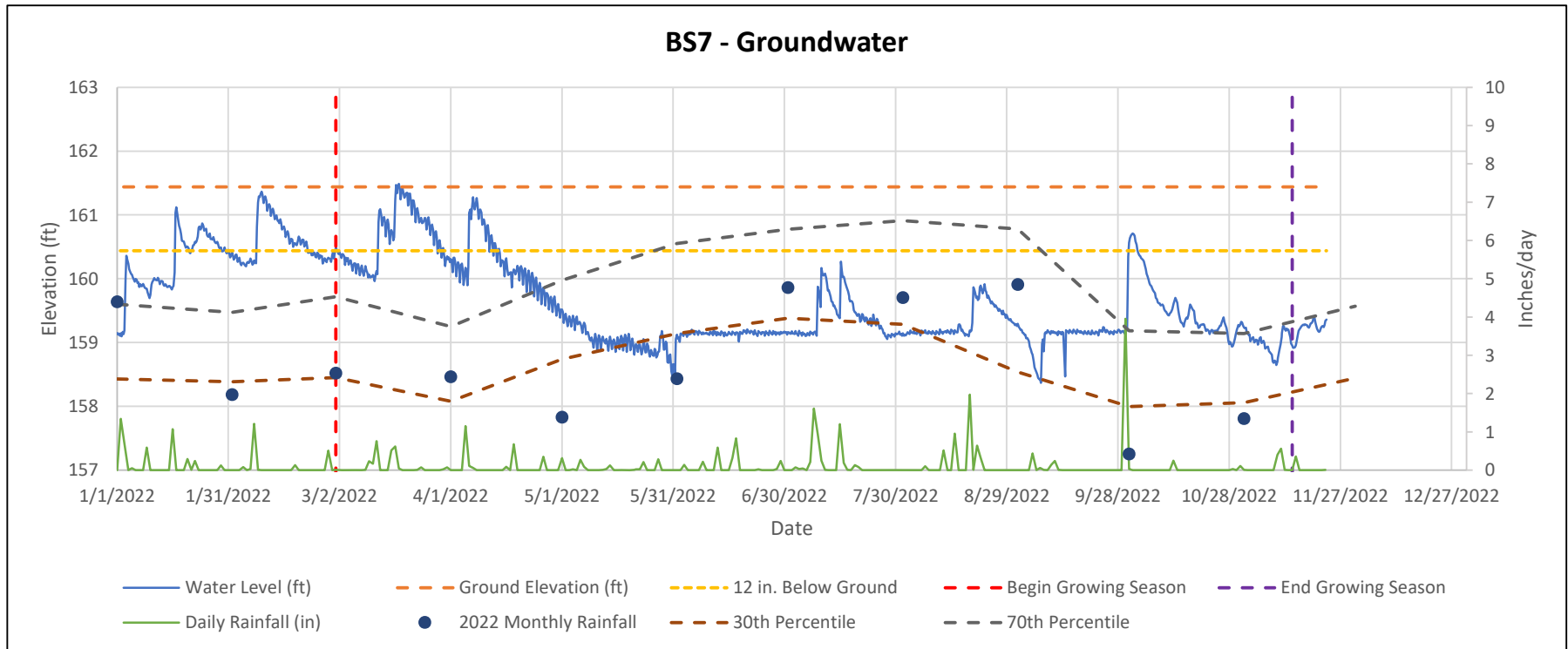
Site Info (Year 2)		Growing Season Information (Year 2 - 2022)		
Site	Bear Swamp	Site	Bear Swamp	
Begin Date	11/18/2021	Gauge ID	BS3 - Groundwater	
End Date	11/23/2022	Serial #	20452194	
Total Days of Well Data	740	Growing Season Start Date	3/1/2022	
-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland -Percentile lines in reference to WETS historic monthly Rainfall data for Lumberton, NC		Growing Season End Date	11/14/2022	
		Total Growing Season Days	258	
		NRCS Soil Series	Johnston	
		Success Criteria		
		12.0%	Growing Season (Days)	31
		Most Consecutive Successful Days Within Growing Season	18	
		Percent of Growing Season with Consecutive Successful Days	7.0%	
		Average Water Level Elevation During Growing Season (ft)	156.42	
		Total Cumulative Successful Days Within Growing Season	30	

Bear Swamp Year 2 (2022) Groundwater Data



Site Info (Year 2)		Growing Season Information (Year 2 - 2022)	
Site	Bear Swamp	Site	Bear Swamp
Begin Date	11/18/2021	Gauge ID	BS4 - Groundwater
End Date	11/23/2022	Serial #	20452199
Total Days of Well Data	740	Growing Season Start Date	3/1/2022
-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland Mitigation Project *Percentile lines in reference to WETS historic monthly rainfall data		Growing Season End Date	11/14/2022
		Total Growing Season Days	258
		NRCS Soil Series	Bibb
Success Criteria			
12.0%		Growing Season (Days)	31
		Most Consecutive Successful Days Within Growing Season	14
		Percent of Growing Season with Consecutive Successful Days	5.4%
		Average Water Level Elevation During Growing Season (ft)	158.75
		Total Cumulative Successful Days Within Growing Season	31

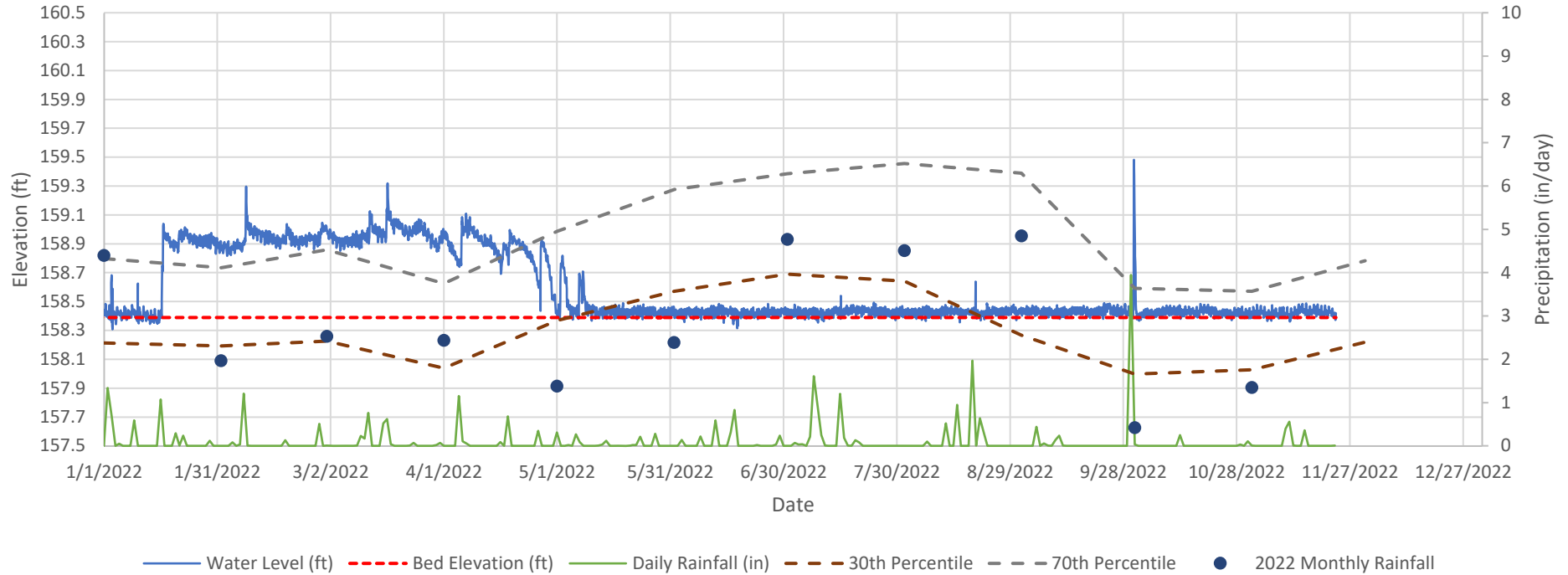
Bear Swamp Year 2 (2022) Groundwater Data



Site Info (Year 2)		Growing Season Information (Year 2 - 2022)			
Site	Bear Swamp	Site	Bear Swamp		
Begin Date	11/18/2021	Gauge ID	BS7 - Groundwater		
End Date	11/23/2022	Serial #	20859909		
Total Days of Well Data	740	Growing Season Start Date	3/1/2022		
-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland -Percentile lines in reference to WETS historic monthly Rainfall data for Lumberton, NC		Growing Season End Date	11/14/2022		
		Total Growing Season Days	258		
		NRCS Soil Series	Bibb		
		Success Criteria			
		12.0%	Growing Season (Days)	31	
		Most Consecutive Successful Days Within Growing Season	18		
		Percent of Growing Season with Consecutive Successful Days	7.0%		
		Average Water Level Elevation During Growing Season (ft)	159.52		
		Total Cumulative Successful Days Within Growing Season	31		

Bear Swamp Year 2 (2022) Streamflow Data

BS5 - Stream



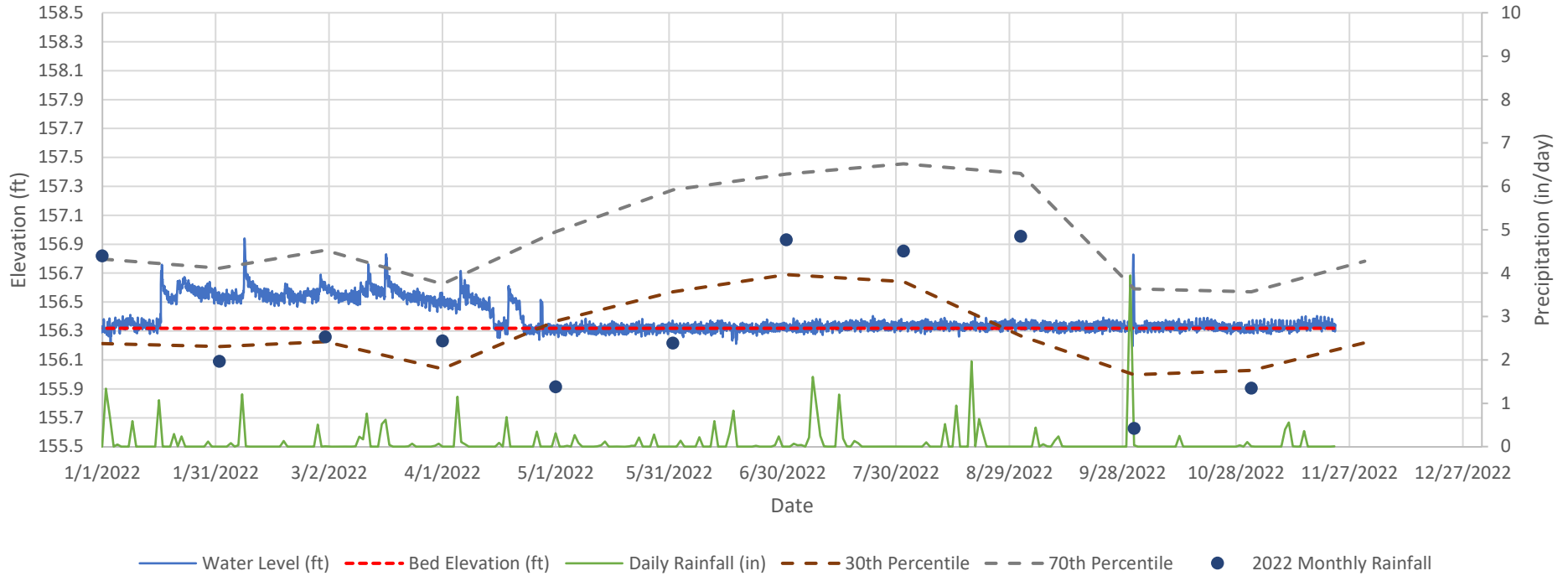
Site Info	
Stream	Bear Swamp
Reach	Bear Swamp
Date Installed	11/9/2020
Serial Number	20452196
Reach Type	Intermittent

-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland Mitigation Project
 -Percentile lines in reference to WETS historic monthly rainfall data for Lumberton, NC

Year 2 (2022) Streamflow Data	
Gauge ID	BS5 - Stream
Start Date	1/1/2022
End Date	12/31/2022
Flow Criteria (Days)	30
Recordings Per Day	24
Logger Elevation (ft)	158.39
Controlling Grade Elevation (ft)	158.39
Bankfull Elevation (ft)	158.89
Most Consecutive Days of Flow	108
Total Days of Flow	119
Meets Success Criteria	Yes

Bear Swamp Year 2 (2022) Streamflow Data

BS6 - Stream



Site Info	
Stream	Bear Swamp
Reach	Bear Swamp
Date Installed	11/9/2020
Serial Number	20452197
Reach Type	Intermittent

-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland Mitigation Project.

-Percentile lines in reference to WETS historic monthly rainfall data for Lumberton, NC

Year 2 (2022) Streamflow Data	
Gauge ID	BS6 - Stream
Start Date	1/1/2022
End Date	12/31/2022
Flow Criteria (Days)	30
Recordings Per Day	24
Logger Elevation (ft)	156.32
Controlling Grade Elevation (ft)	156.32
Bankfull Elevation (ft)	156.82
Most Consecutive Days of Flow	89
Total Days of Flow	96
Meets Success Criteria	Yes

Appendix D

Project Timeline and Contact Information

Table 10. Project Activity and Reporting History

Table 11. Project Contacts Table

Table 10. Project Activity and Reporting History
Bear Swamp Stream and Wetland Mitigation Project (NCDMS Project No. 100054)

Elapsed Time Since grading complete: 2 yrs 0 months
 Elapsed Time Since planting complete: 1 yrs 8 months
 Number of reporting Years: 2

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Institution Date	--	Jun-18
404 permit date	--	Apr-20
Final Mitigation Plan	2018 - 2019	Mar-20
Final Design – Construction Plans	--	Oct-20
Site Earthwork	October - November 2020	Nov-20
Bare-root plantings	--	Mar-21
As-built Survey	Nov-20	Nov-20
As-built Baseline Monitoring Report	Apr-21	Jul-21
Year 1 Monitoring	October - November 2021	Dec-21
Year 2 Monitoring	October - November 2022	Dec-22
Year 3 Monitoring	2023	Nov-23
Year 4 Monitoring	2024	Nov-24
Year 5 Monitoring	2025	Nov-25
Year 6 Monitoring	2026	Nov-26
Year 7 Monitoring	2027	Nov-27

**Table 11. Project Activity and Reporting History
Bear Swamp Stream and Wetland Mitigation Project (NCDMS Project No. 100054)**

Designer	Ecosystem Planning and Restoration, PLLC 2 yrs 0 months
Primary project design POC	1 yrs 8 months
Construction Contractor	Land Mechanics Design, Inc. 126 Circle G Lane, Willow Spring, NC 27592
Construction contractor POC	Charles Hill
Survey Contractor	Kinder Land Surveying 203 W. Lebanon St., Mount Airy, NC 27030
Survey contractor POC	Frank Kinder (336) 783-4200
Planting Contractor	Bruton Natural Systems Post Office Box 1197, Fremont, NC 27830
Planting contractor POC	Charlie Bruton
Invasive Species Contractor	Land Mechanics Design, Inc. 126 Circle G Lane, Willow Spring, NC 27592
Contractor POC	Cole Glover
Seed Mix Source	
Nursery Stock Supplier	Dykes and Son Nursery McMinnville, TN 37110 931-668-8833
	Mellow Marsh Farm Siler City, NC 27344 919-742-1200
Monitoring Performers	Ecosystem Planning and Restoration, PLLC
Monitoring POC	Amy James, EPR (919) 623-5411