Year 1 Monitoring Report

Bear Swamp Stream & Wetland Mitigation Project

Robeson County, North Carolina

Monitoring Year 1

Data Collection Period:	**Submission Date:**
October & November 2021	January 2022

NCDEQ Contract No. 7516
DMS RFP No. 16-007337
DMS ID No. 100054
USACE Action ID No. SAW-2018-01154
NCDWR ID: 20180782
Lumber River Basin
HUC 03040203

Prepared For:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27603

Prepared By:

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Mr. Kelly Phillips
NCDEQ – Division of Mitigation Services
610 East Center Ave.
Mooresville, NC 28115

January 28, 2022

RE: Response to Draft MY1 Monitoring Report Comments dated January 24, 2022
Bear Swamp Stream and Wetland Mitigation Site
Lumber River Basin – CU# 03040203 - Robeson County, North Carolina
NCDMS Project # 100054, Contract # 7516

Dear Mr. Phillips,

Ecosystem Planning and Restoration (EPR) has reviewed the comments on the Draft MY1 Monitoring Report provided to DMS November 29, 2021. The comments have been addressed as described below and the Final MY1 Report and electronic deliverables have been revised in response to this review.

- ***Title Page****: Add the RFP Number.*
  - **The RFP number has been added to the title page.**

- ***Section 1.0 Project Summary –*** *Change stream mitigation credits (SMCs) to stream mitigation units (SMUs).*
  - **Stream mitigation credits is the term used in the RFP and has been used in all other EPR-completed 2021 DMS project monitoring reports. Credits is also the term used in table templates (e.g., Table 1) provided on DMS' website; therefore, the term SMCs has been retained.**

- ***Section 2.2.1 Vegetation Monitoring Data:*** *In the report text, please discuss the species that exceeded the 50% threshold as shown in Table 6.*
  - **A sentence has been added to the text that identifies the plot exceeding the 50% threshold and the species responsible. Cumulative monitoring results have also been updated for vegetation in Table 2.**

- ***Table 1*** *- Update SMU & WMU credits to three decimal points (ex. 2.880).*
  - **All credit amounts have been updated to show three decimal points.**

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- ***2.1.4 Stream Hydrology:*** *Rain gauge data are required per the approved mitigation plan. Data collection ceased after October 10th due to the gauge memory being full. Please revise the field methodology or equipment to prevent loss of data during MY2.*
    - **Noted.**

- ***2.2.1 Vegetation Monitoring Data:*** *Include discussion of the performance criteria for height requirement at years 5 & 7 and indicate how this metric was addressed during MY1.*
    - **A discussion of average MY1 heights across plots was added to the text and related to the MY5 requirement, as it is the closest temporally. However, speculation on attainment of the MY7 requirement was judged to be premature at this stage.**

- ***2.3 Wetland Hydrology:*** *The report proposes the growing season which is given by the WETS table as March 15 - November 15 be changed to March 1 - November 15 based on bud burst and soil temperature. You will also need to determine the growing season end date using measurements such as temperature and leaf drop. Please provide the supporting data and summarize in the report for DMS review and IRT concurrence.*
    - **Per the Final Mitigation Plan, the beginning of the growing season "will be confirmed annually by soil temperatures exceeding 41 degrees Fahrenheit at 20 inches (50cm) depth, which will be corroborated with observations of bud burst. Soil temperatures will be collected in early March of each monitoring year and will be reported in the annual monitoring report." There is no confirmation requirement given for the end of the growing season. Photos of soil temperature and bud burst are provided in the photolog for the beginning of the growing season.**

- ***Assessment Tables 4 & 5:*** *Please include the date that the project was visually assessed at the top of each table.*
    - **These dates have been added to each table.**

- ***Table 6 Vegetation Plot Data:*** *The table indicates a Mitigation Plan Addendum is being proposed. The table also shows a 55% dominant species. Please provide details of these items in section 2.2.1 Vegetation Monitoring Data and in the Adaptive Management Plan Section. If an Adaptive Management Plan (AMP) or Mitigation Plan Addendum is being proposed it should be provided to DMS for an initial review. The final AMP or Addendum should then be submitted to the IRT for review and approval prior to the implementation of the proposed project repairs.*
    - **The table notes are automatically generated by DMS' Shinyapp veg table tool for every output, no matter if there are species proposed to be added through a mitigation plan addendum or not. Based on the table notes, approved and unapproved species are indicated correctly in the table (regular font and italic font,**

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respectively). There are no species proposed to be added through an addendum (these would be indicated with bold font). A bolded sentence has been added under note #3 to indicate that the number of stems is the same for both the Mitigation Plan Performance Standard and the Post Mitigation Plan Performance Standard in MY1 (since all species counted in the stem totals were approved during the Mitigation Plan stage). The 55% dominant species was addressed in Section 2.2.1 as discussed above.

- ***CCPV Maps:*** *The maximum species concentration is 50%. Please show any vegetation plots that exceed this criteria on the CCPV Map.*
    - **The vegetation plot exceeding the 50% maximum species concentration has been indicated on the CCPV.**

Electronic Support File Comments:

- *Please include the wetland gage data with the digital deliverable.*
    - **Wetland and stream gage data, in the form of excel workbooks, have been provided in the digital deliverable.**

Phone Discussion on 1/28/2022 between Mr. Kelly Phillips (DMS) and Amy James (EPR)

- There are still untreated areas of Chinese privet (*Ligustrum sinense*) in the forested section of the easement, though less than half of what was present remains. EPR is prioritizing planting of already treated areas (0.85 acre) in February 2022 with woody species from the Mitigation Plan but will continue to treat the remaining privet areas in the spring, early summer, and fall of 2022. By the end of MY2, all invasive areas will be treated.

If you have any questions regarding the MY1 Monitoring Report, please contact me at 919-874-5314 or via email at ajames@eprusa.net.

Sincerely,

Amy James, PWS

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APPENDICES

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	2,222.000	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:			**2,220.00 SMCs 2.88 WMCs**

Length and Area Summations by Mitigation Category			
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)	Non-riparian Wetland (acres)
Restoration	2,222	2.838	
Enhancement			
Enhancement I			
Enhancement II			
Rehabilitation			
Preservation		0.417	
High Quality Pres			

Overall Assets Summary	
Asset Category	**Overall Credits**
Stream	**2,222.000**
Riparian Wetland	**2.880[3]**

[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	▪ Restore minimum 50-foot riparian buffers to filter runoff.	▪ 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.	▪ 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.	Permanent and Annual Random Vegetation Plots 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.	In MY1, 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 575 stems/acre while random plots had an average of 567 stems/acre.
Repair channelized streams	▪ Restore appropriate bed form diversity, headwater stream/wetland form, and install in-stream structures to provide appropriate habitat. ▪ Restore self-sustaining stream/wetland headwaters	▪ Functional uplift will be achieved by reducing the impact of adjacent agriculture and restoring natural riparian vegetation, appropriate stream form, and adjacent headwater wetlands.	▪ Continuous surface flow within the valley or crenulation must be documented each year for at least 30 consecutive days.	Stream Hydrology Monitoring 2 pressure transducers and a rain gauge will record precipitation and streamflow data continuously through the monitoring period.	Flow gauge data from MY1 indicate that the project stream met the established success criteria of 30 days or more of consecutive flow throughout the year.
Preserve existing resources	▪ Place a conservation easement on existing riparian headwater stream/ wetland system at southern end of the project.		▪ Documentation of field indicators of channel formation and an ordinary high-water mark using photographs and applicable data sheets.	Channel Formation Documentation of applicable field indicators using photography and data sheets	Sediment deposition and matted vegetation along the channel were the main channel formation indicators observed in MY1.
Improve Water Quality Where Degraded by Pollutant Inputs	▪ Restore and preserve riparian wetland systems. ▪ Restore riparian buffer vegetation to filter runoff and provide organic matter and shade. ▪ Remove cropland from active production.	▪ The addition of in-stream structures will provide greater bedform diversity, enhancing aquatic habitat for native species.	▪ Visual documentation of stream stability during annual monitoring.	Visual Assessment Conducted yearly for restored wetlands, stream channels, and in-stream habitat and grade control structures (debris jams and woody riffle).	Stream photo points and visual assessment indicate that the restored channels and in-stream structures are performing as intended. No stream problem areas were observed.

Table 2. Summary: Goals, Performance and Results

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurements	Cumulative Monitoring Results
Improve Functions Degraded by Loss of Channel-Riparian Zone Connection	▪ Restore self-sustaining stream/wetland headwaters. ▪ Restore minimum 50-foot riparian buffers that will include riparian wetlands and terrestrial edges.	▪ Functional uplift will occur by restoring the stream to its historic valley, raising the streambed, and connecting it to adjacent wetlands at lower flows.	▪ 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.	<u>Wetland Hydrology Monitoring</u> 5 pressure transducers (4 in restored wetland areas and 1 reference) will record groundwater levels continuously throughout the monitoring period.	Based on consecutive successful days within the growing season, only BS1 (reference) and BS3 satisfied the 12% hydroperiod requirement. However, if using cumulative successful days within the growing season, all wells met the 12% hydroperiod requirement.
Protect Against Future Threats	▪ Place a permanent conservation easement on the project area.		▪ Recordation and protection of a conservation easement meeting NCDMS guidelines	<u>Observations of Easement Encroachment</u> Document any encroachments into easement from adjoining land use	No encroachments were noted.

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 1 (MY1) data was collected in October and November 2021. 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 MY1.

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 indicators of channel formation for Monitoring Year 1 documented on the site include sediment deposition and matted vegetation. Representative photos of these indicators 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 1.

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.) 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 1.

Monthly rainfall summary data are presented in Figure 3; the precipitation and water level hydrographs are included in Appendix C. When the rain gauge was downloaded on 11/17/2021, it was determined that the logger memory banks were full, and no rainfall data appeared to have been collected after October 10. To provide an estimate of rainfall during this period, data from the NC State Climate Office[1] was used (Station WCON7, Lumberton NC). The rain gauge was re-launched to enable the old data to be overwritten, per the manufacturer.

Flow gauge data from MY1 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 105 days of consecutive flow, while the downstream gauge (BS6) showed 107 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 MY1 are shown in the CCPV (Figure 2). Annual vegetation data was compiled and summarized using the DMS Vegetation Data Entry Tool (Version 8/23/2021; see Tables 6 and 7 in Appendix B).

Year 1 vegetation monitoring occurred on October 13, 2021. Stem counts for the vegetation plots (fixed and random) ranged from 11 trees per plot (445 stems per acre) in RP-4 (Random) to 18 trees per plot (729 stems per acre) in RP-1 (Random). The average stem density from all 10 vegetation plots (fixed and random) was 16 trees per plot (647 stems per acre). Therefore, the vegetation plot data indicates that planted trees on the Site are meeting the interim success criteria of 320 stems/acre in Monitoring Year 3. Only one plot exceeded the 50% species threshold (Veg Plot 4 – Random), with overcup oak (*Quercus lyrata*) comprising 55% of individuals identified in the plot.

All plots had an average tree height of 2 feet, with an overall average across all plots of 2.2 feet. It is hard to predict if the vegetation will meet the MY5 vegetation height requirement of 7 feet, but MY1 heights are likely to put the project on a trajectory towards meeting this requirement.

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

[1] https://products.climate.ncsu.edu/cardinal/scout/

(*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™ (see photolog in Appendix A). All treated privet appears to be dead and no re-sprouting has been observed. EPR will work to cut and treat the remaining 0.45 acres of invasive species into Monitoring Year 2. All treated areas will be planted with appropriate vegetation from the planting plan. Areas treated and cleared during 2021 will be replanted during the non-growing season in late 2021 or early 2022. Treated and untreated areas are shown on the CCPV (Figure 2).

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 MY1.

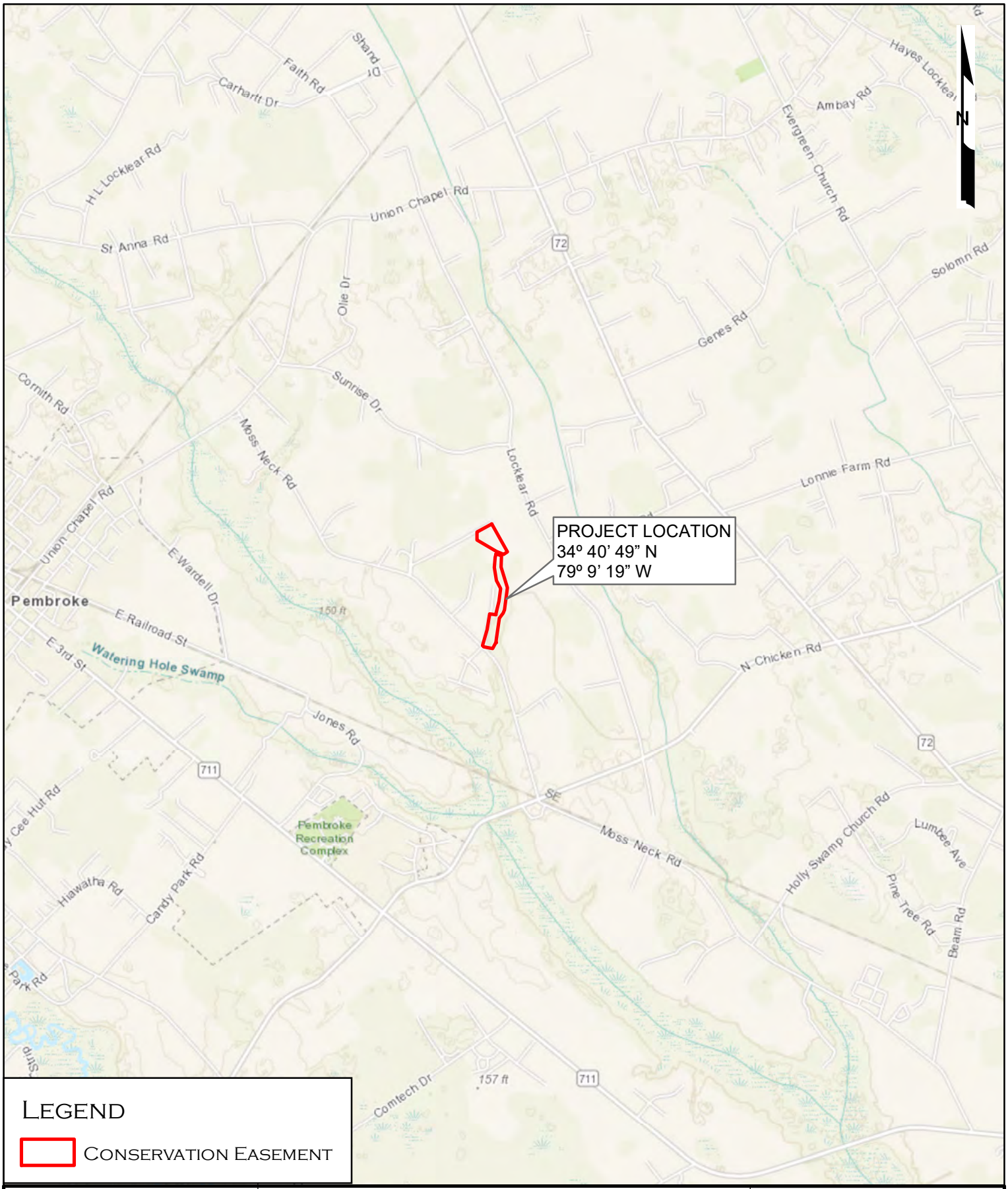
The growing season for this project, based on WETS data tables for Robeson County, was given as March 15 – November 15 in the mitigation plan. However, based on readings of soil temperature at 20 inches on February 24 (> 41° F) and observation of bud burst on March 2 (see photolog in Appendix A), it is proposed that the beginning growing season date be moved to March 1. 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. Rainfall was below the 30th percentile for six months of the growing season, leading to very dry conditions. Approximately ten (10) weeks were categorized as 'moderate drought' in this area of Robeson County by the NC drought monitor[2] (mainly in late April, May, and early to mid-November).

Using the cumulative total of days in the growing season where the water table was within 12 inches of the surface, all wetland wells met the 12% hydroperiod (see hydrographs in Appendix C). The cumulative number of days ranged from 44 (BS4 and BS7 in restored Wetland B) to 106 (BS1-reference). Only two (2) wells met the 12% hydroperiod using the consecutive number of days where the water table with within 12 inches of the surface (BS1 and BS3). BS1 had 60 consecutive days, while BS3 had 38 consecutive days. The other wells ranged from a high of 21 consecutive days (BS7) to a low of 8 consecutive days (BS4). Between June 24 and July 7, the well screen on BS7 was potentially exposed above the bentonite seal; therefore, the gauge readings during this time are compromised. However,

[2] https://www.ncdrought.org/

based on the data from BS4 and rainfall during this period, it is likely that the water table would have been above 12 inches for much of this time. The elevation of the well was adjusted and a new bentonite seal at the new elevation was installed on July 7 to fix this issue.



Legend

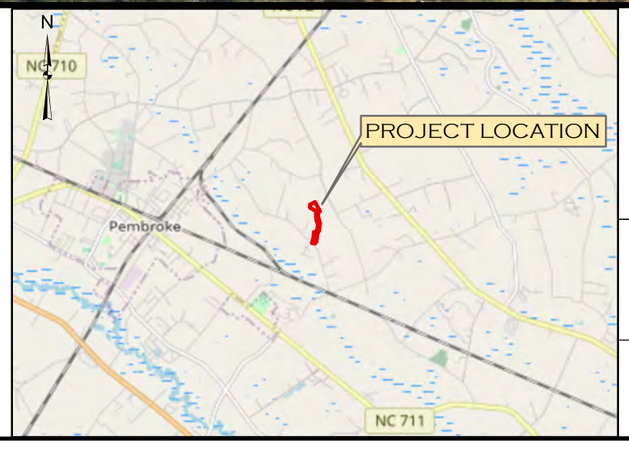
Conservation Easement

0 0.25 0.5 Miles	BEAR SWAMP STREAM & WETLAND RESTORATION VICINITY MAP	PREPARED FOR: NCDEQ Division of Mitigation Services
FIGURE 1	ROBESON COUNTY, NC	PREPARED BY: Ecosystem Planning & Restoration

Rain
RP1
VP2
Wetland B
BS4
BS7
RP2
VP1
1
2
3
VP3
BS5
4
5
RP3
6
VP4
RP4
7
8
9
BS3
Wetland C
RP5
VP5
BS2
10
BS6
11
12
BS1
Wetland A

Rain Gage
Stream Gage
Wetland Gage
Photo Points
Stream - Restoration
Pre-Existing Stream
Wetland - Preservation
Wetland - Restoration
Existing Wetlands
Conservation Easement

Vegetation Plots
Permanent - Successful
Random - Unsucessful
Random - Successful
October 2021 Invasive Areas
To Be Treated
Treated



Bear Swamp Stream and Wetland Restoration Site

Current Condition Plan View: Asset Map
MY1: 2021

Robeson County, NC

Prepared for: NC Mitigation Services Environmental Quality

Prepared by: Ecosystem Planning & Restoration

N

0 90 180 Feet

1 inch = 187 feet

FIGURE 2

DATE:
January 2022

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

Path: R:\Projects\RDU0101_NCDEQ_Bear Swamp_FD\GIS\Maps\Monitoring\Figure_2_CCPV_MY1.mxd | Date: 1/25/2022 | Time: 2:36:33 PM | User Name: ajames

3.0 REFERENCES

North Carolina Department of Environmental Quality, Division of Mitigation Services (DMS). DMS Vegetation Data Entry Tool, August 2021. 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	**11/17/2021**

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.	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 **10/13/2021**

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	0.45	2.9%
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	No Encroachments Noted	

Bear Swamp Stream and Wetland Mitigation Project
Monitoring Year 1 (October 2021) - Vegetation Photo Log

Veg Plot 1 F – East Corner (10/13/2021)

Veg Plot 2 F – East Corner (10/13/2021)

Veg Plot 3 F – SE Corner (10/13/2021)

Veg Plot 4 F – SE Corner (10/13/2021)

Veg Plot 5 F – SE Corner (10/13/2021)

Veg Plot 1 R – NW Corner (2021)

Veg Plot 2 R – NE Corner (10/13/2021)

Veg Plot 3 R – SE Corner (10/13/2021)

Veg Plot 4 R – SE Corner (10/13/2021)

Veg Plot 5 R – SW Corner (10/13/2021)

Bear Swamp Stream and Wetland Mitigation Project
Monitoring Year 1 (October and November 2021) - Photo Log

Photo Point 1 – Sta. 10+00
Facing Upstream Towards Wetland B (11/17/2021)

Photo Point 2 – Sta. 10+00
Facing Downstream (11/17/2021)

Photo Point 3 – Sta. 11+75
Facing Downstream (11/17/2021)

Photo Point 4 – Sta. 14+60
Facing Upstream (11/17/2021)

Photo Point 5 – Sta. 15+90
Facing Downstream (11/17/2021)

Photo Point 6 – Sta. 17+45
Facing Upstream (11/17/2021)

Photo Point 7 – Sta. 20+00
Facing Downstream (11/17/2021)

Photo Point 8 – Sta. 20+50
Looking Upstream at Ditch from Stream (11/17/2021)

Photo Point 9 – Sta. 21+90
Facing Upstream (11/17/2021)

Photo Point 10 – UT1 Reach 3, Sta. 23+80
Facing Downstream (11/17/2021)

Photo Point 11 – Sta. 26+50
Facing Upstream, Towards BS6 (11/17/2021)

Photo Point 12 – Sta. 27+50
Facing Downstream (11/17/2021)

Permanent Ford Crossing
Facing West (11/17/2021)

Evidence of channel formation: sediment deposition in channel (11/17/2021)

Evidence of channel formation: bent vegetation along channel (11/17/2021)

Areas of Chinese privet treated with herbicide (10/21/2021)

Areas of Chinese privet treated with herbicide (10/21/2021)

Soil temperature reading at 20 inches on 2/24/2021

Bud burst observed 3/2/2021

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)	#N/A
Date(s) Mowing	#N/A
Date of Current Survey	2021-10-13
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 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	Betula nigra	river birch	Tree	FACW	1	1			2	2	1	1					5	1	
	Diospyros virginiana	common persimmon	Tree	FAC									1	1	2	2			2
	Liriodendron tulipifera	tuliptree	Tree	FACU				1									1	1	4
	Magnolia virginiana	sweetbay	Tree	FACW	1	1	4	4	3	3	1	1	3	3	1	2		1	
	Nyssa biflora	swamp tupelo	Tree	OBL											1				1
	Nyssa sylvatica	blackgum	Tree	FAC	1	1					1	1							
	other				1	1	1	1	1	1									
	Quercus lyrata	overcup oak	Tree	OBL	1	1	1	1	1	1	5	5	5	5	4	6	4	6	3
	Quercus michauxii	swamp chestnut oak	Tree	FACW													1	1	
	Quercus pagoda	cherrybark oak	Tree	FACW	5	5	1	1	6	6	2	2	2	2	7	2	1		
	Taxodium distichum	bald cypress	Tree	OBL	2	2	6	6	4	4	2	2	4	4	3	1	3	1	3
	Ulmus americana	American elm	Tree	FAC							1	1							
Sum	Performance Standard				12	12	13	14	17	17	13	13	15	15	18	13	15	11	13
Post Mitigation Plan Species	*Carya sp.*					*1*													
Sum	Proposed Standard				12	12	13	14	17	17	13	13	15	15	18	13	15	11	13
Mitigation Plan Performance Standard	*Current Year Stem Count*					*12*		*14*		*17*		*13*		*15*	*18*	*13*	*15*	*11*	*13*
	Stems/Acre					486		567		688		526		607	729	526	607	445	526
	Species Count					7		6		6		7		5	6	5	6	6	5
	Dominant Species Composition (%)					38		43		35		38		33	39	46	33	55	31
	Average Plot Height					2		2		2		2		2	2	2	2	2	2
	% Invasives					0		0		0		0		0	0	0	0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count					12		14		17		13		15	18	13	15	11	13
	Stems/Acre					486		567		688		526		607	729	526	607	445	526
	Species Count					7		6		6		7		5	6	5	6	6	5
	Dominant Species Composition (%)					38		43		35		38		33	39	46	33	55	31
	Average Plot Height					2		2		2		2		2	2	2	2	2	2
	% Invasives					0		0		0		0		0	0	0	0	0	0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems. **As of MY1, 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												
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												
Monitoring Year 1	526		7	0	607		5	0	729		6	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												
Monitoring Year 1	526		5	0	607		6	0	445		6	0
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												
Monitoring Year 1	526		5	0								
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.

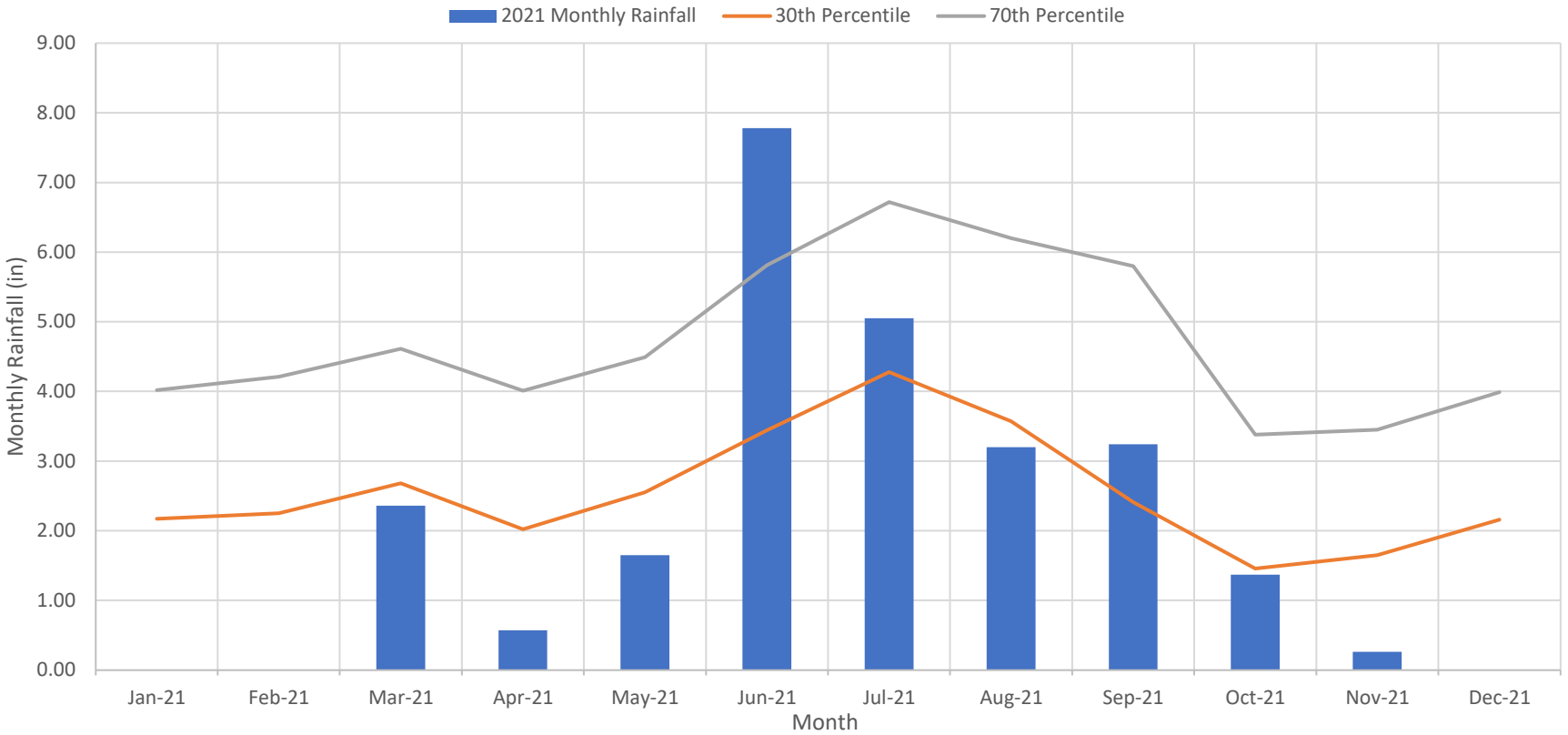
Appendix C

Hydrologic Data

Figure 3. Monthly Rainfall Summary Data

Precipitation and Water Level Hydrographs

Bear Swamp Stream and Wetland Mitigation Project
Figure 3. Monthly Rainfall Data
Monitoring Year 1 - 2021

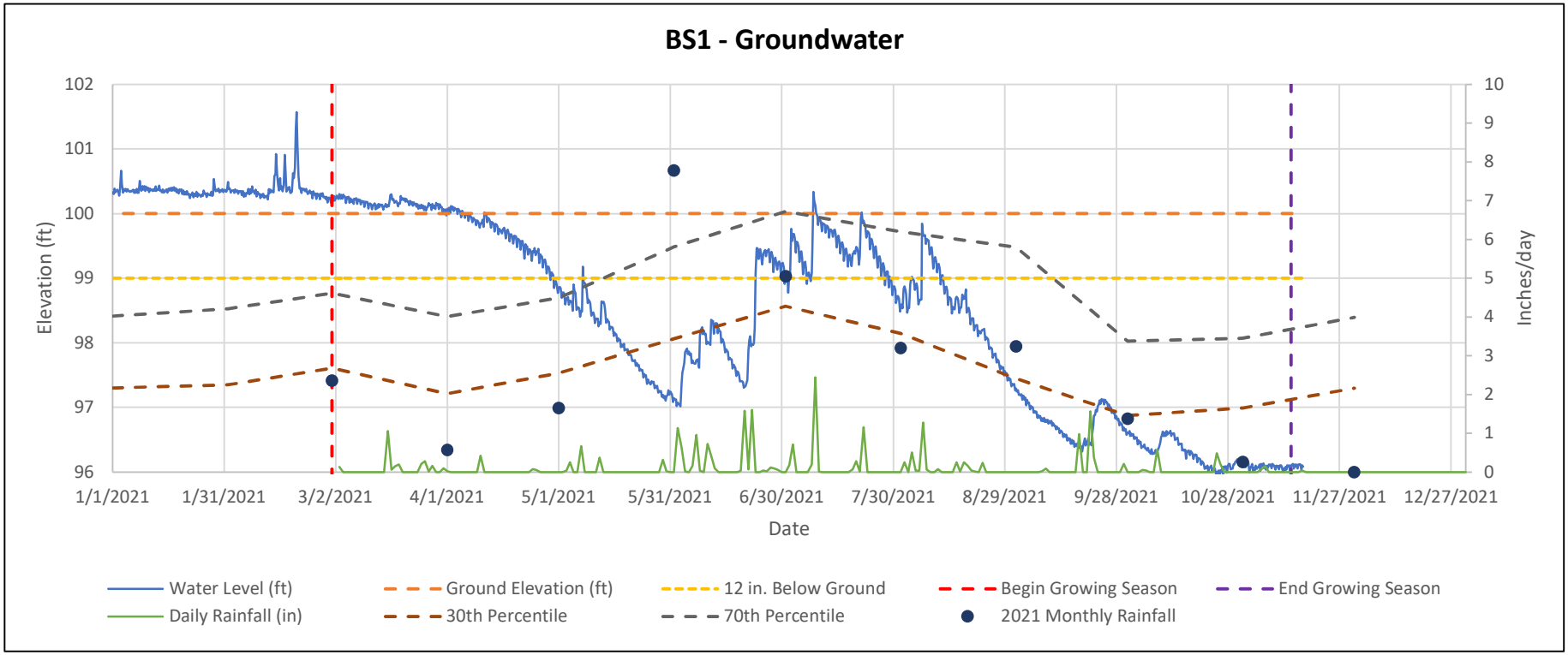


Note: Historic rainfall data from WETS Station: Lumberton, NC, 1971-2019. Project rainfall data from HOBO Tipping Bucket Rain Gauge located on-site, except for 10/10-11/17 when data from NC State Climate Office (Station ID WCON7 in Lumberton) was used as an estimate due to Rain Gauge data collection failure.

Rainfall Summary							
	2021	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Recorded Precip Total	25.48	-	-	-	-	-	-
WETS 30th Percentile	30.64	-	-	-	-	-	-
WETS 70th Percentile	56.69	-	-	-	-	-	-
Normal	N	-	-	-	-	-	-

*Note: Bear Swamp rain gage data banks were full so no rain data was collected from 10/10-11/17. See note for data between this time period.

Bear Swamp
Year 1 (2021) Groundwater Data

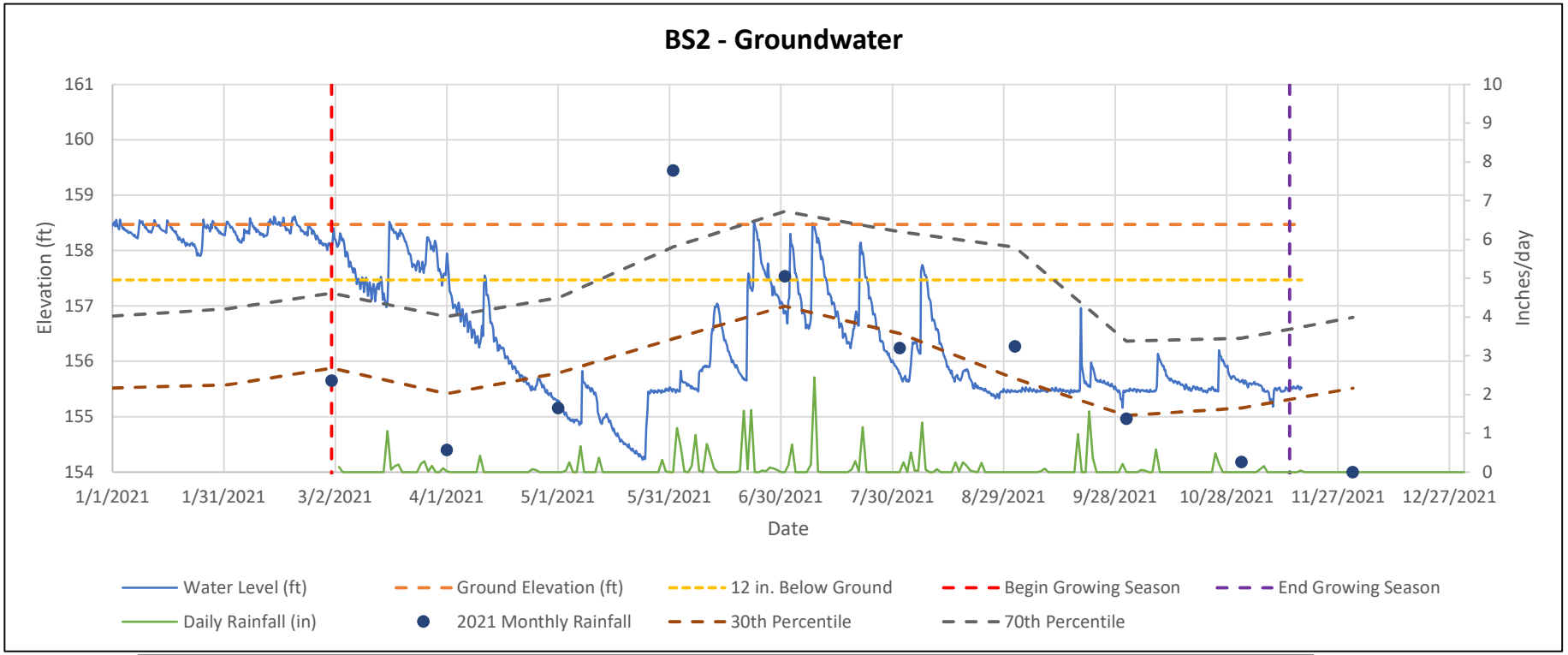


Site Info (Year 1)	
Site	Bear Swamp
Begin Date	11/9/2020
End Date	11/17/2021
Total Days of Well Data	372

-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland Mitigation Project except for 10/10-11/17 where data from NC State Climate Office was used.
-Percentile lines in reference to WETS historic monthly Rainfall data for Lumberton, NC

Growing Season Information (Year 1 - 2021)		
Site		Bear Swamp
Gauge ID		BS1 - Groundwater
Serial #		20452191
Growing Season Start Date		3/1/2021
Growing Season End Date		11/14/2021
Total Growing Season Days		258
NRCS Soil Series		Johnston
Success Criteria		
12.0%	Growing Season (Days)	31
Most Consecutive Successful Days Within Growing Season		60
Percent of Growing Season with Consecutive Successful Days		23.3%
Average Water Level Elevation During Growing Season (ft)		98.07
Total Cumulative Successful Days Within Growing Season		106

Bear Swamp
Year 1 (2021) Groundwater Data

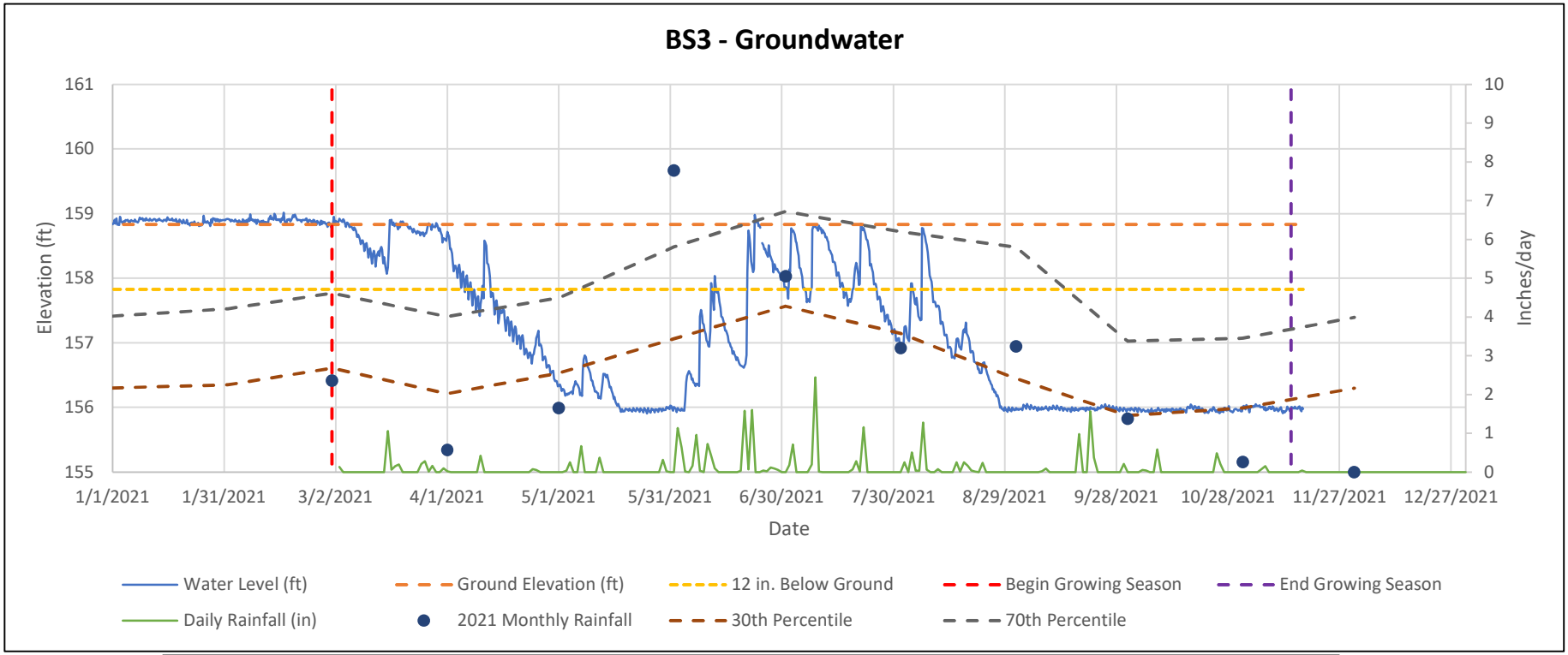


Site Info (Year 1)	
Site	Bear Swamp
Begin Date	11/9/2020
End Date	11/17/2021
Total Days of Well Data	372

-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland Mitigation Project except for 10/10-11/17 where data from NC State Climate Office was used.
-Percentile lines in reference to WETS historic monthly Rainfall data for Lumberton, NC

Growing Season Information (Year 1 - 2021)		
Site		Bear Swamp
Gauge ID		BS2 - Groundwater
Serial #		20452193
Growing Season Start Date		3/1/2021
Growing Season End Date		11/14/2021
Total Growing Season Days		258
NRCS Soil Series		Johnston
Success Criteria		
12.0%	Growing Season (Days)	31
Most Consecutive Successful Days Within Growing Season		17
Percent of Growing Season with Consecutive Successful Days		6.6%
Average Water Level Elevation During Growing Season (ft)		155.86
Total Cumulative Successful Days Within Growing Season		47

Bear Swamp
Year 1 (2021) Groundwater Data

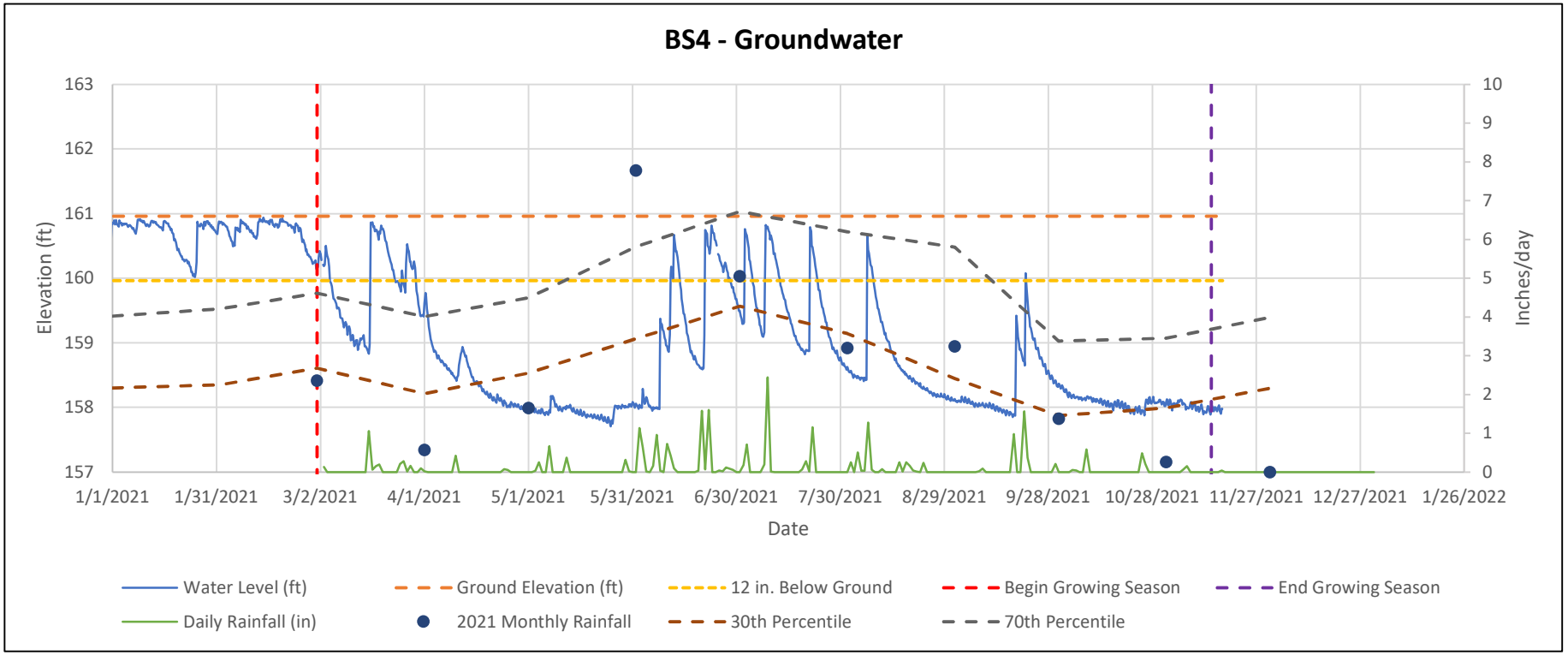


Site Info (Year 1)	
Site	Bear Swamp
Begin Date	11/9/2020
End Date	11/17/2021
Total Days of Well Data	372

-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland Mitigation Project except for 10/10-11/17 where data from NC State Climate Office was used.
-Percentile lines in reference to WETS historic monthly Rainfall data for Lumberton, NC

Growing Season Information (Year 1 - 2021)		
Site		Bear Swamp
Gauge ID		BS3 - Groundwater
Serial #		20452194
Growing Season Start Date		3/1/2021
Growing Season End Date		11/14/2021
Total Growing Season Days		258
NRCS Soil Series		Johnston
Success Criteria		
12.0%	Growing Season (Days)	31
Most Consecutive Successful Days Within Growing Season		38
Percent of Growing Season with Consecutive Successful Days		14.7%
Average Water Level Elevation During Growing Season (ft)		156.71
Total Cumulative Successful Days Within Growing Season		83

Bear Swamp
Year 1 (2021) Groundwater Data

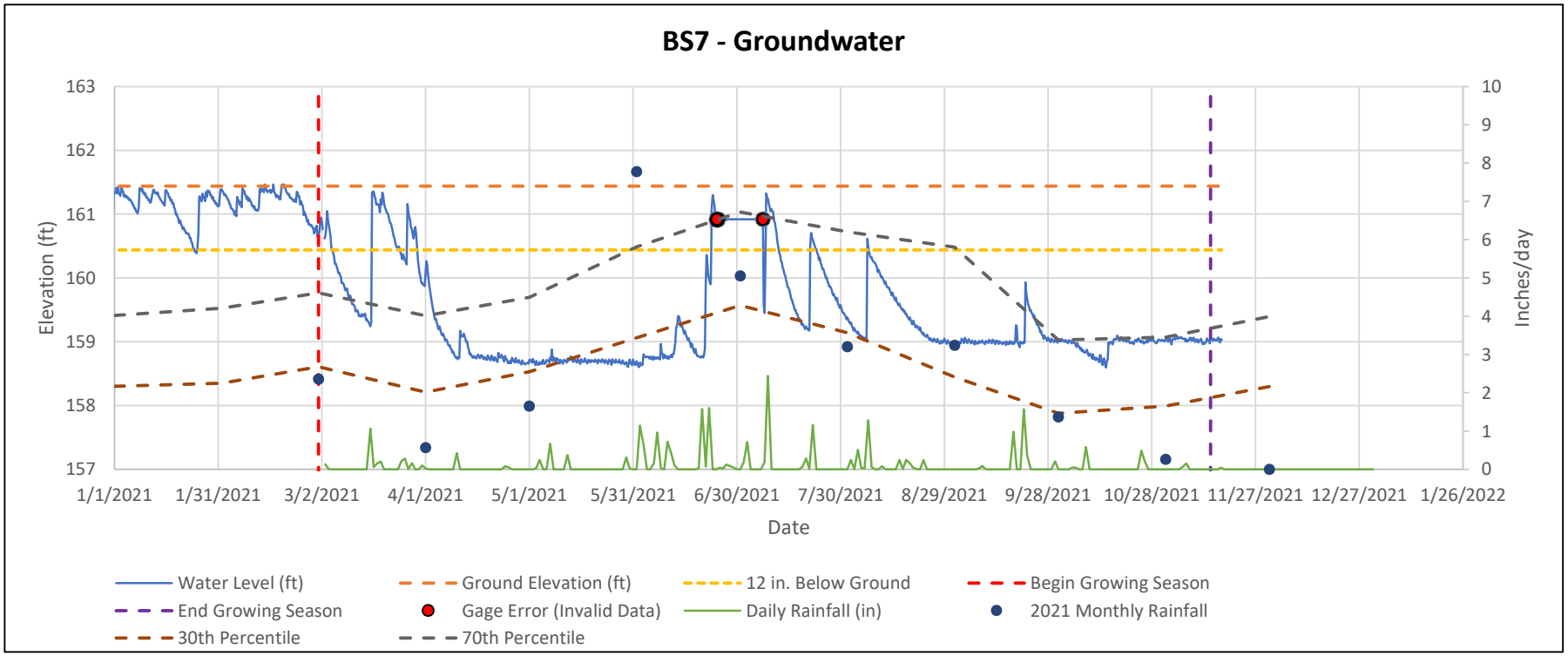


Site Info (Year 1)	
Site	Bear Swamp
Begin Date	11/9/2020
End Date	11/17/2021
Total Days of Well Data	372

-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland Mitigation Project except for 10/10-11/17 where data from NC State Climate Office was used.
*Percentile lines in reference to WETS historic monthly rainfall data

Growing Season Information (Year 1 - 2021)		
Site		Bear Swamp
Gauge ID		BS4 - Groundwater
Serial #		20452199
Growing Season Start Date		3/1/2021
Growing Season End Date		11/14/2021
Total Growing Season Days		258
NRCS Soil Series		Bibb
Success Criteria		
12.0%	Growing Season (Days)	31
Most Consecutive Successful Days Within Growing Season		8
Percent of Growing Season with Consecutive Successful Days		3.1%
Average Water Level Elevation During Growing Season (ft)		158.43
Total Cumulative Successful Days Within Growing Season		44

Bear Swamp
Year 1 (2021) Groundwater Data

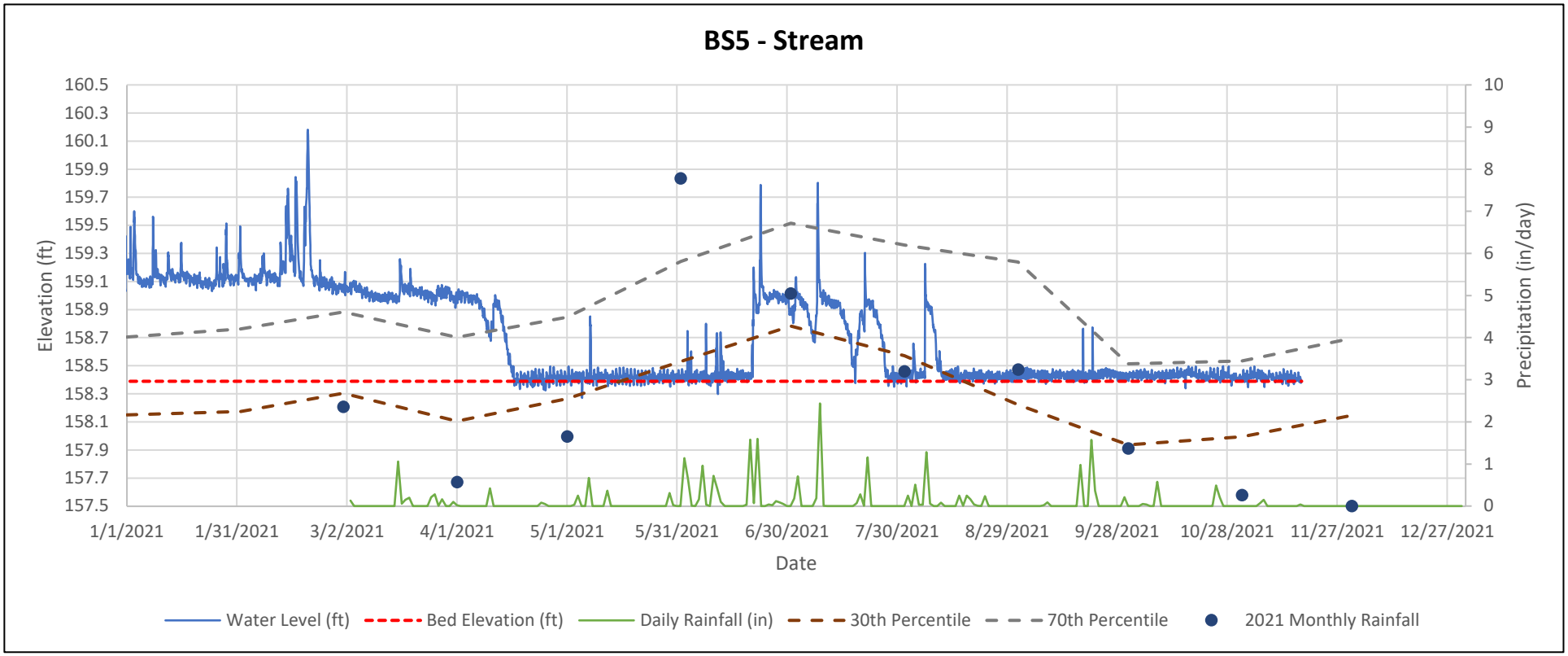


Site Info (Year 1)	
Site	Bear Swamp
Begin Date	11/9/2020
End Date	11/17/2021
Total Days of Well Data	372

-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland Mitigation Project except for 10/10-11/17 where data from NC State Climate Office was used.
-Percentile lines in reference to WETS historic monthly Rainfall data for Lumberton, NC
-Well screen potentially exposed between 6/24 and 7/7; therefore, number of successful days within growing season may be over-estimated

Growing Season Information (Year 1 - 2021)		
Site		Bear Swamp
Gauge ID		BS7 - Groundwater
Serial #		20859909
Growing Season Start Date		3/1/2021
Growing Season End Date		11/14/2021
Total Growing Season Days		258
NRCS Soil Series		Bibb
Success Criteria		
12.0%	Growing Season (Days)	31
Most Consecutive Successful Days Within Growing Season		21
Percent of Growing Season with Consecutive Successful Days		8.1%
Average Water Level Elevation During Growing Season (ft)		159.06
Total Cumulative Successful Days Within Growing Season		44

Bear Swamp
Year 1 (2021) Streamflow Data

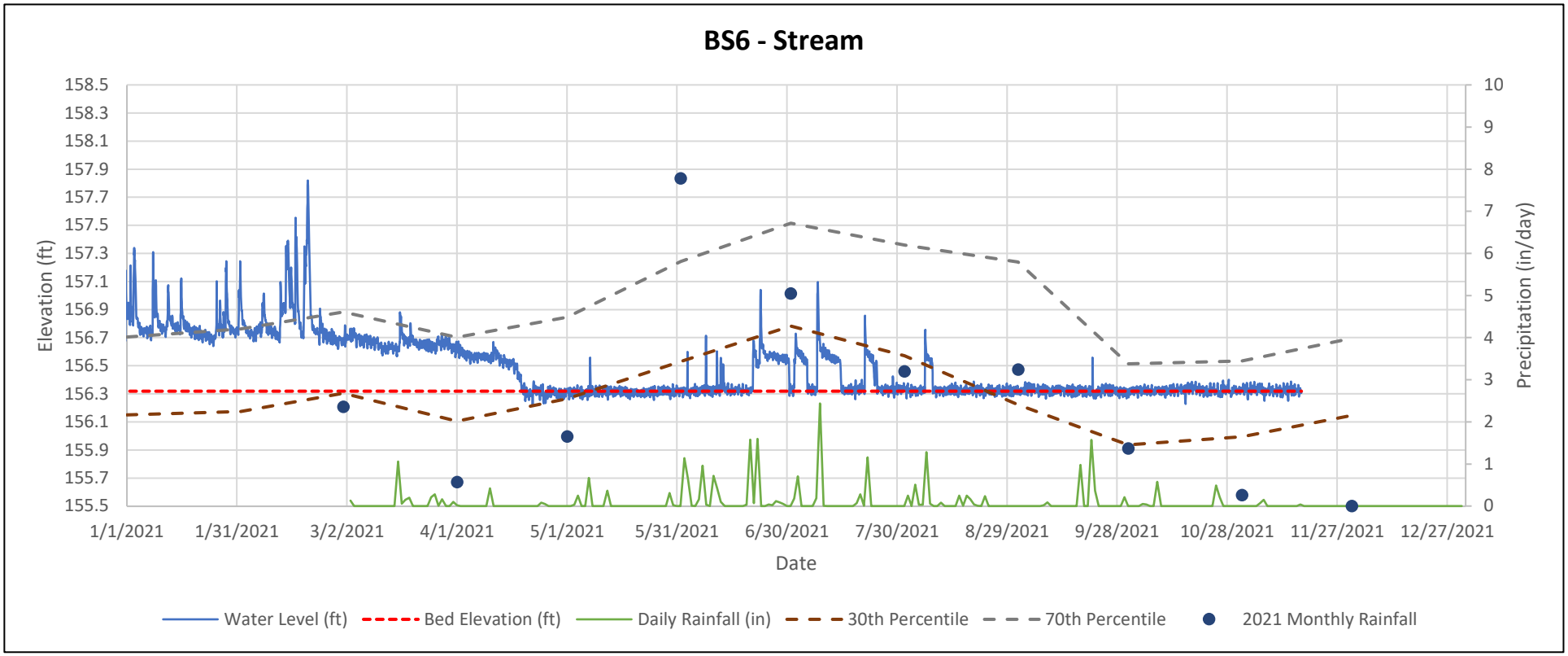


Site Info	
Stream	Bear Swamp
Reach	Bear Swamp
Date Installed	11/9/2020
Serial Number	20452196
Reach Type	Intermittent

-Rainfall data from HOBO Tipping Bucket Rain Gauge located at the Bear Swamp Stream and Wetland Mitigation Project except for 10/10-11/17 where data from NC State Climate Office was used.
-Percentile lines in reference to WETS historic monthly rainfall data for Lumberton, NC

Year 1 (2021) Streamflow Data	
Gauge ID	BS5 - Stream
Start Date	1/1/2021
End Date	12/31/2021
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	105
Total Days of Flow	157
Meets Success Criteria	Yes

Bear Swamp
Year 1 (2021) Streamflow Data



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 except for 10/10-11/17 where data from NC State Climate Office was used.
-Percentile lines in reference to WETS historic monthly rainfall data for Lumberton, NC

Year 1 (2021) Streamflow Data	
Gauge ID	BS6 - Stream
Start Date	1/1/2021
End Date	12/31/2021
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	107
Total Days of Flow	144
Meets Success Criteria	Yes

Appendix D

Project Timeline and Contact Information

Table 8. Project Activity and Reporting

History Table 9. Project Contacts Table

Table 8. Project Activity and Reporting History
Bear Swamp Stream and Wetland Mitigation Project (NCDMS Project No. 100054)

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

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	2022	Nov-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 9. Project Activity and Reporting History
Bear Swamp Stream and Wetland Mitigation Project (NCDMS Project No. 100054)

Designer Primary project design POC	Ecosystem Planning and Restoration, PLLC 1150 SE Maynard Road, Suite 140, Cary, NC 27511 Kevin Tweedy, PE (919) 388-0787
Construction Contractor Construction contractor POC	Land Mechanics Design, Inc. 126 Circle G Lane, Willow Spring, NC 27592 Charles Hill
Survey Contractor Survey contractor POC	Kinder Land Surveying 203 W. Lebanon St., Mount Airy, NC 27030 Frank Kinder (336) 783-4200
Planting Contractor Planting contractor POC	Bruton Natural Systems Post Office Box 1197, Fremont, NC 27830 Charlie Bruton
Seeding Contractor Contractor POC	
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