

**Year 2 Monitoring Report**

**FINAL**

**BAREFOOT SITE**

NCDMS Project # 100044 (Contract # 7418)

USACE Action ID: SAW-2018-00433

DWR Project # 2018-0235

Sampson County, North Carolina

Neuse River Basin

HUC 03020201



**Provided by:**



Resource Environmental Solutions, LLC  
For Environmental Banc & Exchange, LLC  
3600 Glenwood Avenue, Suite 100  
Raleigh, NC 27612

**January 2022**



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January 10, 2022

Lindsay Crocker  
NC DEQ Division of Mitigation Services  
217 West Jones Street  
Raleigh, NC 27604

RE: Barefoot, Project ID #100044, DMS Contract #7418

Listed below are comments provided by DMS on November, 2021 regarding the Barefoot Site: Year 2 Monitoring Report and RES' responses.

**Comments:**

1. Vegetation monitoring: it looks like oak mortality is high out here. It is a wise decision to include height data moving forward as it is helpful to determine site vigor which is important at this site given the wetland hydroperiods.

[Stem heights are listed in Table 7 and will continue to be reported throughout the monitoring period.](#)

2. Provide shapefile of replanted area and show on CCPV.

[Done.](#)

3. Describe in the MY2 vegetation narrative if cattail areas are decreasing, increasing, or staying the same. If the areas are larger than ~0.1 acres, it is advisable to start mapping them in each monitoring year to show growth or reduction.

[Done.](#)

4. Clarify in the MY2 hydrology narrative that gages 16 and 17 do not have success criteria because they are out of the credit area. It may also be useful to include that the two gages that did not meet success (1 and 12) were at 9%, which is close to the 10% standard.

[Done.](#)

5. In the pictures it appears there are areas of standing water with no trees, and the southwest corner looks bare of trees. Please respond to those visual observations with a description.

[Random plot 5 was in the southwest corner within the standing water and had 1,416 planted stems per acre. Another photo of the area was added to Appendix B.](#)

6. Revise groundwater gage graphs to show growing season start to end on x axis. As it appears, November 21 is coming before January 21 and it is confusing.

[Graphs have been edited to make growing season clearer.](#)

**Electronic Comments:**

1. The growing season displayed in the groundwater gauge figures appears to show the start of the growing season as occurring after 3/16, but it is specified as 3/13 in the report. Revise to



respond. Also, please refer to the MY1 report as a model for the groundwater gauge plots – the growing season is delineated more clearly in those figures.

Figures have been edited to make growing season clearer.

2. Table 1 'As built acreage' column, update for Wetland W2 so that it reflects the as built area rather than the credits (6.593).

Done.

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## **1.0 Project Summary**

### ***1.1 Project Location and Description***

The Barefoot Project (“Project”) is located within a rural watershed in Sampson County, North Carolina approximately two miles west of Newton Grove and six miles southeast of Peacocks Crossroads. The Project lies within the Neuse River Basin, North Carolina Division of Water Resources (NCDWR) sub-basin 03-04-04 and United States Geological Survey (USGS) 8-digit hydrologic unit code (HUC) 03020201. The Project proposes to re-establish 23.23 acres of non-riparian wetlands within a 123-acre drainage area. The Project is located in the Rolling Coastal Plain level IV ecoregion within the Southeastern Plains level III ecoregion.

The Project area is comprised of a 33.29-acre easement involving a drained mineral flat wetland area, which eventually drains into Mill Creek and later the Neuse River. The wetland mitigation components are summarized in **Table 1**. The Project is located west of Warren Mill Road (SR 1647) and north of Harnett Dunn Highway (Hwy 55) and is accessible from Warren Mill Road. Coordinates for the Project areas are as follows: 35.253742, -78.392667.

The Project area is comprised of one contiguous non-riparian wetland area, that drains to Mill Creek and ultimately to the Neuse River. The total drainage area for the Project is 123 acres (0.19 mi<sup>2</sup>). Primary land use within the drainage area consists of approximately 73 percent forest and 27 percent agricultural land. Impervious area is not present in the drainage area of the Project. Within the agricultural land use, row crops make up 100 percent of the area. Although the project watershed is primarily forested, the majority of the agricultural areas within the watershed are in close proximity to the Project and are drained via ditches and drain tiles, which plays a significant role in the past degradation of the Project wetlands. Historic land use within the immediate project area was primarily crop production and silviculture. These activities negatively impacted both water quality and habitat within the project area.

The primary wetland re-establishment activities included:

- The plugging and backfilling of ditches in and around the cultivated field,
- Removing/plugging all of the drain tiles within the agricultural field,
- Plugging and backfilling the ditches on two sides of the cut-over,
- Removal of spoil berms to reconnect the Project to its historical watershed,
- Creation of shallow depressional features typical of the community type, and
- Regraded areas of cut and fill along interior ditches to create a continuous wetland flat system.

The Site is to be monitored on a regular basis throughout the seven-year post-construction monitoring period, or until performance standards are met. Upon approval for closeout by the Interagency Review Team (IRT), the Site will be transferred to the NCDEQ Stewardship Program. The NCDEQ Stewardship Program will be responsible for periodic inspection of the Site to ensure that restrictions required in the Conservation Easement, or the deed restriction document(s) are upheld.

### ***1.2 Project Goals and Objectives***

The Barefoot Wetland Restoration Project was identified as a wetland restoration opportunity to improve water quality, habitat, and hydrology within the Neuse 01 River Basin. Specific, attainable goals and objectives were realized by the Project. These goals clearly address the degraded water quality and nutrient input from farming that were identified as major watershed stressors in the 2010 Neuse River RBRP (amended in 2018). The Project addresses outlined RBRP Goal 2.

The project goals are:

- Reduce sediment and nutrient input into downslope receiving streams by limited runoff and sediment into connecting ditches,
- Improve filtration of runoff in project drainage area,
- Re-establish a historical aquatic resource into a functioning non-riparian wetland, and
- Improve aquatic and terrestrial habitat.

The project goals were addressed through the following project objectives:

- Convert active row crop land to a nonriverine hardwood forest,
- Plug, fill, and stabilize existing ditches and drainage tiles,
- Treat exotic invasive species,
- Provide habitat and hydrologic connectivity to a larger wetland community, and
- Establish a permanent conservation easement on the Project.

The Project brings functional uplift, benefits, and improvements to the project area and adjacent forests. Restoration of wetland hydrology and reconnection with the supplying watershed has re-established wetlands lost to past agricultural practices, and conversion of agricultural lands has reduced sediment and nutrients contributed to downstream systems. Planting of native species and control of invasives has restored terrestrial habitat, and reconnection of the project area with the adjacent forested wetlands has provided a source of native flora and fauna for the project area.

### ***1.3 Project Success Criteria***

The success criteria for the Project follows the 2016 USACE Wilmington District Stream and Wetland Compensatory Mitigation Update and subsequent agency guidance. Vegetation plot data will be reported in Monitoring Years 0, 1, 2, 3, 5, and 7. Wetland hydrology and visual monitoring will be reported annually. Specific success criteria components are presented below.

#### ***Wetland Restoration Success Criteria***

##### Wetland Hydrology

The NRCS provides a current WETS table for Sampson County upon which to base a normal rainfall amount and average growing season. The closest comparable data station was determined to be WETS station Clinton 2 NE in Clinton NC (NRCS, n.d.). This station is located off Faison Highway near the Timberlake Golf Club approximately 17 miles south-southeast of the proposed mitigation project. The growing season for Sampson County is 254 days long, extending from March 13 to November 22, and is based on a daily minimum temperature greater than 28 degrees Fahrenheit occurring in five of ten years.

Because of the surface roughing and shallow depressions, a range of hydroperiods with areas of seasonal inundation is expected. The target hydroperiod is ten percent (approximately 26 days) for the duration of the monitoring period.

##### Digital Image Stations

The visual assessments include vegetation density, vigor, invasive species, and easement encroachments. Visual assessments of wetland success include an area walkthrough and structure and gauge inspection. Digital images will be taken at fixed representative locations to record each monitoring event, as well as any noted problem areas or areas of concern. Results of visual monitoring will be presented in a plan view exhibit with a brief description of problem areas and digital images. A series of images over time should

indicate successional maturation of wetland vegetation.

### ***Vegetation Success Criteria***

Specific and measurable success criteria for plant density within the wetland areas on the Project will follow IRT Guidance. The interim measures of vegetative success for the Project will be the survival of at least 320 planted three-year old trees per acre at the end of Year 3, five-year old trees at seven feet in height at the end of Year 5, and the final vegetative success criteria will be 210 trees per acre with an average height of ten feet at the end of Year 7. Volunteer trees will be counted, identified to species, and included in the yearly monitoring reports, and may be counted towards the success criteria of total planted stems if appropriate for the community type. Moreover, any single species can only account for up to 50 percent of the required number of stems within any vegetation plot. Any stems in excess of 50 percent will be shown in the monitoring table but will not be used to demonstrate success.

### ***1.4 Project Components***

The Project presents 23.238 acres of proposed non-riparian wetland re-establishment, generating 19.942 Wetland Mitigation Units (WMU) (**Table 1**). This is derived from the mitigation plan, which was consistent with the February 22, 2018, Post Contract IRT Meeting Minutes and IRT response emails.

<b>Wetland ID</b>	<b>Mitigation Approach</b>	<b>Acres</b>	<b>Ratio</b>	<b>Non-Riparian Wetland Mitigation Units</b>
Wetland 1	Re-establishment	16.645	1:1	16.645
Wetland 2	Re-establishment	6.593	2:1	3.297
<b>Total</b>		<b>23.238</b>		<b>19.942</b>

### ***1.5 Wetland Design/Approach***

The Barefoot Mitigation Project provides 19.94 wetland mitigation units through wetland re-establishment. The existing agricultural fields and clear-cut on the Project were re-established by restoring the hydrology, restoring vegetation in the agricultural field, and providing long-term protection. Wetland restoration design activities included: plugging the interior ditches and all ditches surrounding the agricultural fields, removing/plugging the drain tiles, removing spoil along the ditches, and limited grading of the area to reconstruct historical contours that include shallow depressions in the nearly level topography. Additionally, the ditch to the north of W1 was designed to be relocated approximately 95 feet north of the present location to allow continued use of the agricultural fields north of the Project, but to also limit drainage effect on the restored area. The field was planted with trees and a permanent seed mix. No additional plantings within the clear-cut were anticipated to be necessary. A ratio of 1:1 is used within re-established area of W1, which totals 16.64 acres. Within W2, wetland re-establishment at a ratio of 2:1 is used as hydrology is being re-established through the plugging of ditches, but existing vegetation is being left undisturbed. An additional buffer of 50 feet around the area of wetland re-establishment may achieve wetland hydrology at a lower hydroperiod. The remaining area between that and the easement edge is not expected to achieve wetland hydrology but will act as additional buffer between the wetland area and agricultural practices outside the easement. Plan views are provided in **Figure 2** and in **Appendix D**.

### ***1.6 Construction and As-Built Conditions***

Wetland construction and planting was completed in January 2020. Overall, the Barefoot Site was built to design plans and guidelines. A few minor adjustments, however, were made to the plans during construction. The ditch directly north of the easement was constructed about 45 feet closer to the easement

than proposed, to ensure appropriate farm access. This makes the new ditch about 100 feet from the wetland area. A berm was added in the upland area inside the northwest corner of the easement to limit surface draining from the wetland into the new ditch. Also, the ditch directly to the east (outside of the easement) was not filled as proposed due to the discovery of drain tiles draining from the east into it and due to landowner negotiations. If there are any hydrologic effects to the wetland area it will be evident in the hydroperiods of the groundwater wells on the northern and eastern edges. Lastly, a path of forest was cleared in the southwestern portion of the easement. This was done to allow access for plugging the ditch on the southern edge of W2. This area was planted the same as W1. RES does not anticipate any changes to wetland crediting despite these minor field adjustments. As for the planting plan, a few minor adjustments were made due to tree availability. Laurel oak, sweet bay, and Atlantic white cedar were not planted, and water oak, green ash, silky dogwood, buttonbush, yellow poplar, southern crabapple, and sugarberry were planted instead. The rest of the planting plan was carried out as proposed. A redline version of the as-built survey and as-built condition drone photos included in the As-Built Report.

### ***1.7 Baseline Monitoring Performance (MY2)***

The Barefoot Year 2 Monitoring activities were performed in August and November 2021. All Baseline Monitoring data is present below and in the appendices. The Site is on track to meeting vegetation and wetland interim success criteria.

#### Vegetation

Monitoring of the 10 fixed vegetation plots and six random vegetation plots was completed in late August 2021. Vegetation data are in **Appendix C**, associated photos are in **Appendix B**, and plot locations are in **Appendix B**. MY2 monitoring data indicates that all plots are exceeding the interim success criteria of 320 planted stems per acre. Planted stem densities ranged from 647 to 1,174 planted stems per acre with a mean of 870 planted stems per acre across the fixed plots. A total of 14 native species were documented within the fixed plots. Total stems per acre ranged from 526 to 1457 with a mean of 925 total stems per acre. The average stem height in the fixed vegetation plots was 2.3 feet. Five of the six random plots were in planted stem areas, and one was in the wooded section of W2 (as requested by the IRT). The stem densities in the random plots located in planted areas ranged from 526 to 1,416 with an average height of 2.6 feet. The stem density of the random plot in the wooded section of W2 was 2,833 with an average height of 25.7 feet.

Visual assessment of vegetation outside of the monitoring plots indicates that the herbaceous vegetation is becoming well established throughout the project where standing water is not present. In February 2021, RES supplemental planted the eastern portion of the site with laurel oak and sweet bay magnolia (**Appendix B**). This supplemental planting included about 250 trees and the goal was to increase diversity on site. Additionally, RES supplemental planted the southwest portion of the project with 50 buttonbush and laurel oak bareroots and 75 black willow and silky dogwood livestakes (**Appendix B**).

During Year 2 monitoring, RES documented cattails onsite in the same areas observed in MY1 (Figure 2). However, in Year 2, RES observed a noticeable amount of cattail mortality within the patches (**Appendix B**). Because of the observed mortality, RES decided to remove cattail seed heads, like in MY1, in July 2021 to discourage further spreading of the cattails. RES continues to believe that the cattails will not hinder planted stem growth and the overall success of the project. The planted stems will eventually shade out the cattails and lead to cattail mortality. As the vegetation data shows, the cattails are not negatively affecting the planted trees. Additionally, RES concludes that the cattails on the site are the native species, broadleaf cattails (*Typha latifolia*), due to the site location being in Sampson County. The invasive species of cattail, narrowleaf cattail (*Typha angustifolia*) has not been recorded in Sampson County or any other inland county in North Carolina (Vascular Plants of North Carolina, 2019 and USDA Plants, 2014). RES will continue to monitor the cattail patches in the future

## Wetland Hydrology

There are 17 groundwater wells at the Barefoot Site to monitor wetland hydrology. Eleven of the wells are in W1 and four are in W2. Two of the wells (16 & 17) do not have success criteria because they are outside of the wetland crediting area. In MY2, 10 of the 11 wells in W1 and three of the four wells in W2 met success criteria. Well hydroperiods ranged from nine to 40 percent. Groundwater Wells 1 and 12 fell short of the success criteria of 10 percent both with nine percent hydroperiods. Exact well locations can be found on **Figure 2** and associated data is in **Appendix D**.

### **2.0 Methods**

Vegetation success is being monitored at 10 permanent monitoring plots and six random monitoring plots. Vegetation plot monitoring follows the CVS-EEP Level 2 Protocol for Recording Vegetation, version 4.2 (Lee et al. 2008) and includes analysis of species composition and density of planted species. Data are processed using the CVS data entry tool. In the field, the four corners of each plot were permanently marked with PVC at the origin and metal conduit at the other corners. Photos of each plot are to be taken from the origin during vegetation monitoring. Additionally, the six random monitoring plots are to be surveyed, in different locations, during each vegetation monitoring event. One of the six random plots is to be in the wooded section of W2 to document the change in community after the hydrologic uplift. The random plots will be 100 square meters with varying dimensions. The species and height of the trees as well as the location of the plot will be recorded during each monitoring event.

Wetland hydrology is monitored to document groundwater levels in the wetland restoration areas (Groundwater Wells 16 and 17 are located outside of the crediting areas). This is accomplished with 17 automatic pressure transducer gauges (located in groundwater wells) that record daily groundwater levels. One automatic pressure transducer is installed above ground for use as a barometric reference. Gauges are downloaded quarterly and wetland hydroperiods are calculated during the growing season. Gauge installation followed current regulatory guidance. Visual observations of primary and secondary wetland hydrology indicators are also recorded during quarterly site visits.

### **3.0 References**

- Griffith, G.E., J.M.Omernik, J.A. Comstock, M.P. Schafale, W.H.McNab, D.R.Lenat, T.F.MacPherson, J.B. Glover, and V.B. Shelburne. (2002). Ecoregions of North Carolina and South Carolina, (color Poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,500,000).
- Lee Michael T., Peet Robert K., Roberts Steven D., and Wentworth Thomas R., 2008. *CVS-EEP Protocol for Recording Vegetation Level*. Version 4.2
- Peet, R.K., Wentworth, T.S., and White, P.S. (1998), *A flexible, multipurpose method for recording vegetation composition and structure*. *Castanea* 63:262-274
- Resource Environmental Solutions (2019). Barefoot Site Final Mitigation Plan.
- Schafale, M.P. 2012. Classification of the Natural Communities of North Carolina, Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, NCDENR, Raleigh, NC.
- USACE. (2016). Wilmington District Stream and Wetland Compensatory Mitigation Update. NC: Interagency Review Team (IRT).
- Vascular Plants of North Carolina. (2019). Narrowleaf Cattail - *Typha angustifolia* L.

# **Appendix A**

## Background Tables



**Table 1. Barefoot (ID-100044) - Mitigation Assets and Components**

Project Segment	Existing Footage or Acreage	Mitigation Plan Footage or Acreage	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)	Mitigation Plan Credits		As-Built Footage or Acreage	Comments
No Stream Mitigation										
Wetland W1	0	16.645	NR	Re-establishment		1.000	16.645		16.645	Hydrologic restoration via plugging ditches and drainage tiles, planting
Wetland W2	0	6.593	NR	Re-establishment		2.000	3.297		6.593	Hydrologic restoration via plugging ditches

**Project Credits**

Restoration Level	Stream			Riparian Wetland		Non-Rip Wetland	Coastal Marsh
	Warm	Cool	Cold	Riverine	Non-Riv		
Restoration							
Re-establishment						19.942	
Rehabilitation							
Enhancement							
Enhancement I							
Enhancement II							
Creation							
Preservation							
<b>TOTAL</b>						<b>19.942</b>	

**Table 2. Project Activity and Reporting History  
Barefoot Site (ID-100044)**

**Elapsed Time Since grading complete: 1 year 11 months**  
**Elapsed Time Since planting complete: 1 year 11 months**  
**Number of reporting Years<sup>1</sup>: 2**

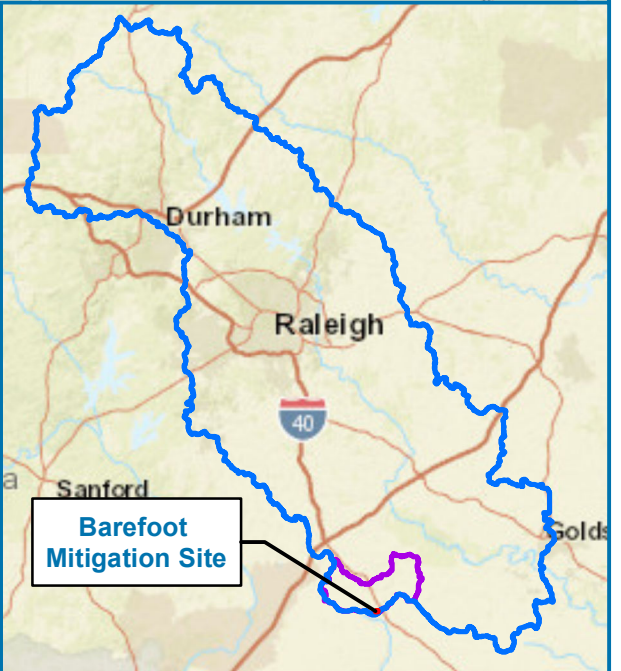
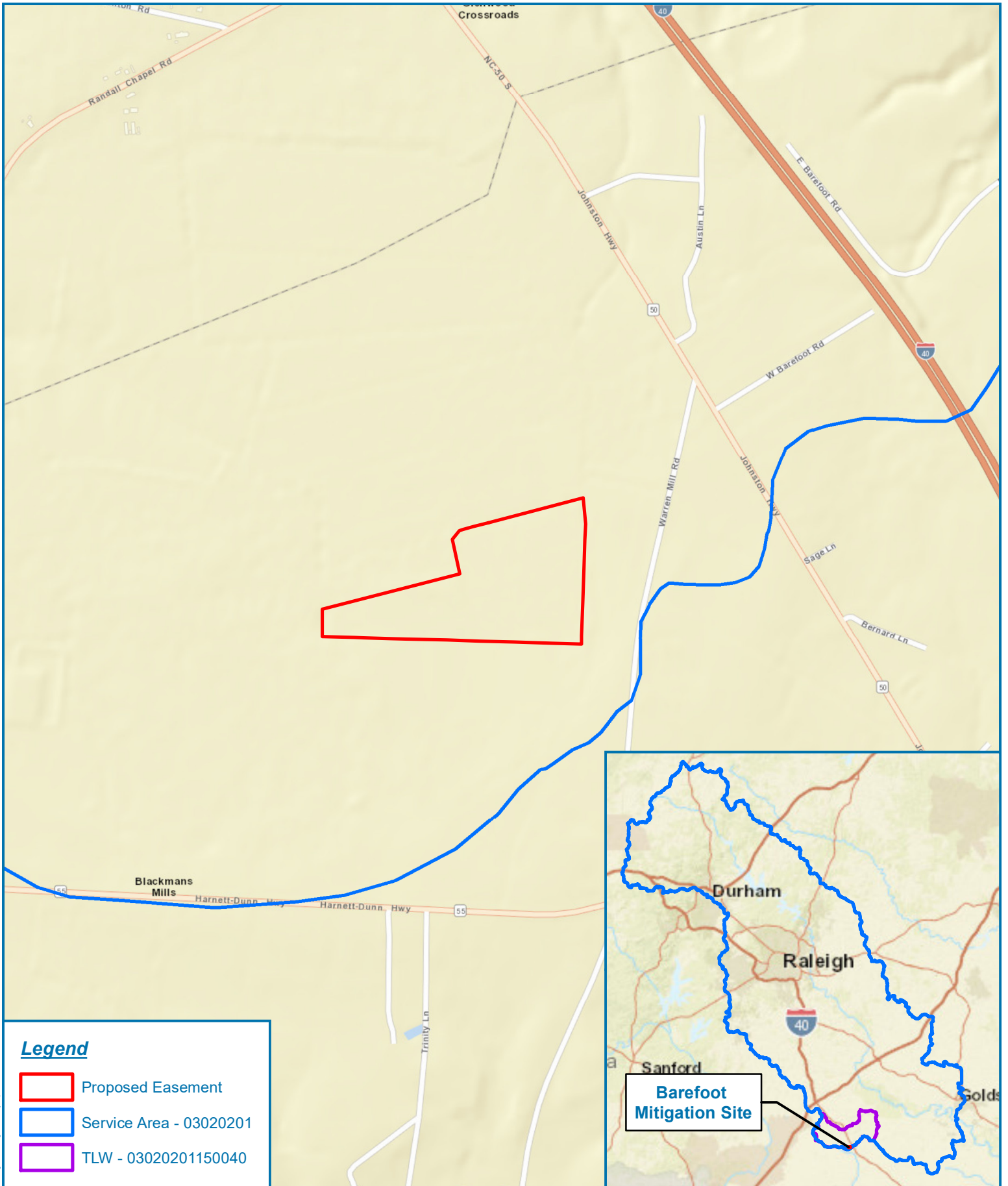
<b>Activity or Deliverable</b>	<b>Data Collection Complete</b>	<b>Completion or Delivery</b>
Restoration Plan	NA	Jul-19
Final Design – Construction Plans	NA	Nov-19
Wetland Construction	NA	Jan-20
Site Planting	NA	Jan-20
As-built (Year 0 Monitoring – baseline)	Jan-20	Apr-20
Cattail Seed Head Removal	NA	Oct-20
Year 1 Monitoring	Nov-20	Dec-20
Supplemental Planting	NA	Feb-21
Cattail Seed Head Removal	NA	Jul-21
Year 2 Monitoring	Aug-21	Nov-21
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		
Year 6 Monitoring		
Year 7 Monitoring		

<sup>1</sup> = The number of reports or data points produced excluding the baseline

**Table 3. Project Contacts Table  
Barefoot (ID-100044)**

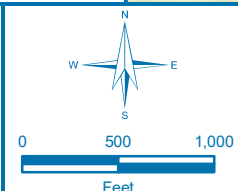
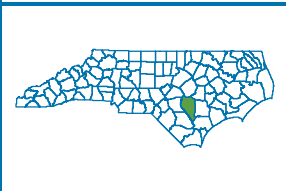
<b>Designer</b>	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Primary project design POC	Sam Fasking
<b>Construction Contractor</b>	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Construction contractor POC	Paul Dunn
<b>Survey Contractor</b>	Matrix East, PLLC / 906 N. Queen St., Suite A, Kinston, NC 28501
Survey contractor POC	Chris Paderick, PLS
<b>Planting Contractor</b>	H&J Forestry
Planting contractor POC	Matt Hitch
<b>Seeding Contractor</b>	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Contractor point of contact	Paul Dunn
<b>Seed Mix Sources</b>	Green Resource
<b>Nursery Stock Suppliers</b>	Arborgen
<b>Monitoring Performers</b>	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Wetland Monitoring POC	Ryan Medic (919) 741-6268
Vegetation Monitoring POC	

Table 4. Project Background Information			
Project Name		Barefoot	
County		Sampson	
Project Area (acres)		32.29	
Project Coordinates (latitude and longitude)		Latitude: 35.4754 N Longitude: -78.3117 W	
Planted Acreage (Acres of Woody Stems Planted)		22.94	
Project Watershed Summary Information			
Physiographic Province		Coastal Plain	
River Basin		Neuse	
USGS Hydrologic Unit 8-digit	03020201	USGS Hydrologic Unit 14-digit	03020201150040
DWR Sub-basin		03-04-04	
Project Drainage Area (Acres and Square Miles)		123 ac (0.19 sqmi)	
Project Drainage Area Percentage of Impervious Area		0%	
CGIA Land Use Classification		Forest (73%) Agriculture (27%)	
Wetland Summary Information			
Parameters	Wetland 1		Wetland 2
Size of Wetland (acres)	16.64		6.59
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	non-riparian		non-riparian
Mapped Soil Series	Rains/Foreston		Rains
Drainage class	Poor		Poor
Soil Hydric Status	Hydric/Nonhydric		Hydric
Source of Hydrology	Groundwater		Groundwater
Restoration or enhancement method (hydrologic, vegetative etc.)	Hydrologic & vegetative restoration		Hydrologic restoration
Regulatory Considerations			
Parameters	Applicable?	Resolved?	Supporting Docs?
Water of the United States - Section 404	Yes	Yes	SAW-2018-00433
Water of the United States - Section 401	No	N/A	N/A
Endangered Species Act	Yes	Yes	USFWS (Corr. Letter)
Historic Preservation Act	Yes	Yes	SHPO (Corr. Letter)
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A



**Legend**

- Proposed Easement
- Service Area - 03020201
- TLW - 03020201150040



**Figure 1 - Vicinity Map**  
**Barefoot Mitigation Site**  
 Sampson County, North Carolina

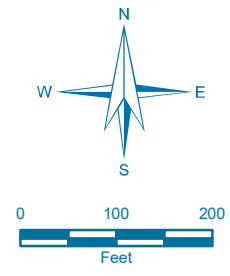
Date: 2/27/2019
Drawn by: SCF
Checked by: JRM
1 inch = 1,000 feet



# **Appendix B**

## Visual Assessment Data





**Figure 2**

Current Conditions  
Plan View

MY2 2021

Barefoot  
Mitigation Site

Sampson County, NC

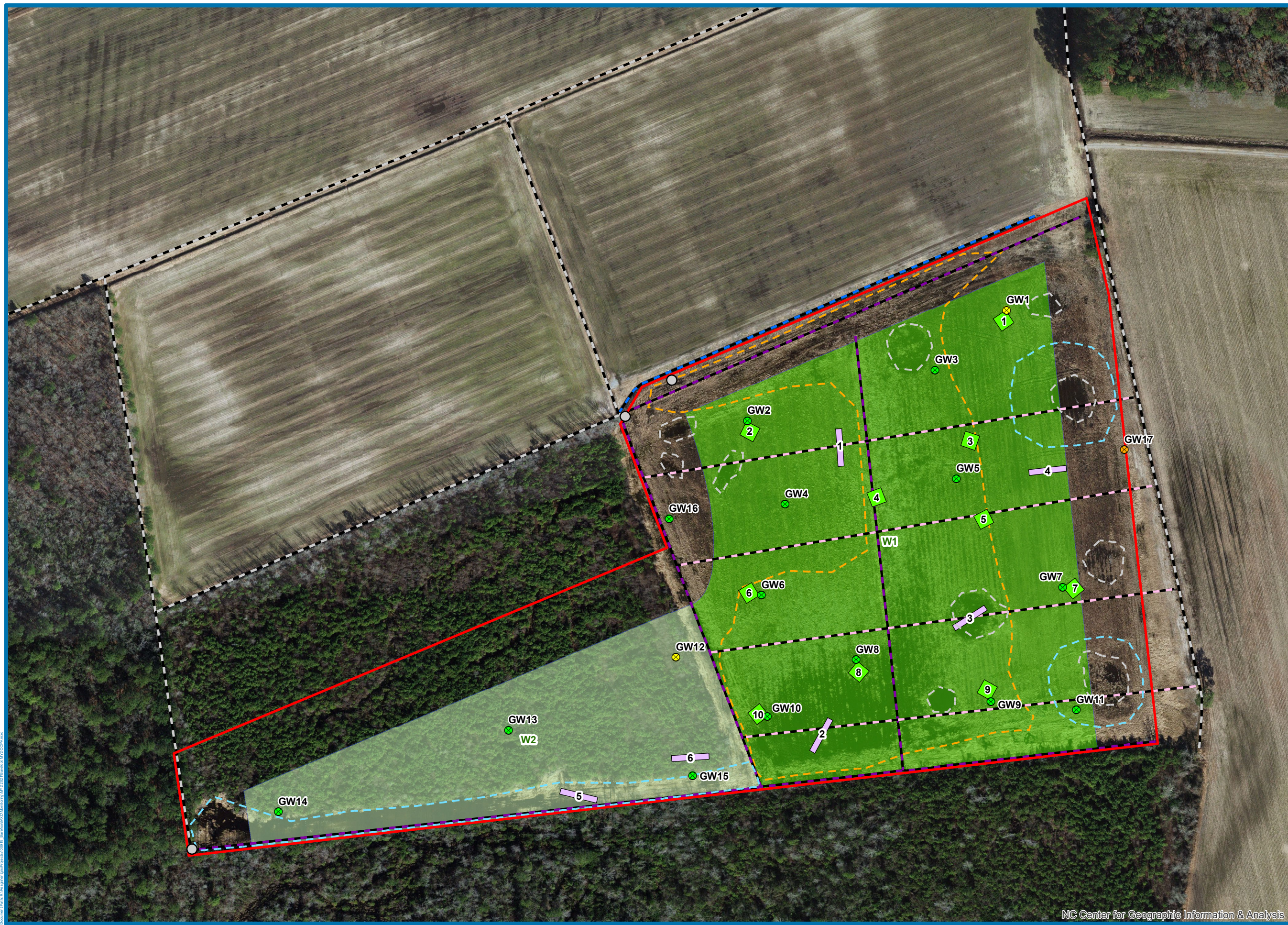
Date: 1/5/2022	Drawn by: RTM
Lat: 35.255825	Long: -78.390648

**LEGEND**

- ▬ Conservation Easement
- - - Supplemental Planting
- Fixed Veg Plot
- ▬ MY2 Random Veg Plot
- - - Cattail Area
- - - Shallow Depression
- Wetland Treatment**
- Re-establishment (1:1)
- Re-establishment (2:1)
- ▬ Constructed Ditch
- ▬ Filled Ditch
- ▬ Plugged Drain Tile
- ▬ No Treatment
- Flow Attenuation Structure
- MY2 Well Hydroperiod**
- >10%
- 5-9%
- <5%

**Vegetation Condition Assessment**

Invasive Species	Target Community		
	Present	Marginal	Absent
Absent	No Fill		
Present			



Document Path: R:\Barefoot\GIS\MapDocs\Map2021\Barefoot\_Mitigation\_Site\_MY2\_2021\_Veg\_Condition\_Assessment.mxd



**Table 5**

**Vegetation Condition Assessment**

**Date Assessed:** Nov 2021

**Planted Acreage<sup>1</sup>**

**22.94**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas		0.1 acres	Red Simple Hatch	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	Orange Simple Hatch	0	0.00	0.0%
<b>Total</b>						0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	Orange Simple Hatch	0	0.00	0.0%
<b>Cumulative Total</b>						0.0%

**Easement Acreage<sup>2</sup>**

**14**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern <sup>4</sup>	Areas or points (if too small to render as polygons at map scale).	1000 SF	Yellow Crosshatch	0	0.00	0.0%
5. Easement Encroachment Areas <sup>3</sup>	Areas or points (if too small to render as polygons at map scale).	none	Red Simple Hatch	0	0.00	0.0%

**1** = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

**2** = The acreage within the easement boundaries.

**3** = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1,2 or 3) as well as a parallel tally in item 5.

**4** = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern species are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by EEP such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likely trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly early in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolizing invasives polygons, particularly for situations where the condition for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

**Barefoot MY2 Fixed Vegetation Monitoring Plot Photos**



Vegetation Plot 1 (08/24/21)



Vegetation Plot 2 (08/25/21)



Vegetation Plot 3 (08/24/21)



Vegetation Plot 4 (08/25/21)



Vegetation Plot 5 (08/24/21)



Vegetation Plot 6 (08/25/21)





Vegetation Plot 7 (08/24/21)



Vegetation Plot 8 (08/24/21)



Vegetation Plot 9 (08/24/21)



Vegetation Plot 10 (08/24/21)



## Barefoot MY2 Random Vegetation Monitoring Plot Photos



Random Vegetation Plot 1 (08/25/21)



Random Vegetation Plot 2 (08/25/21)



Random Vegetation Plot 3 (08/25/21)



Random Vegetation Plot 4 (08/25/21)



Random Vegetation Plot 5 (08/25/21)



Random Vegetation Plot 6 (08/25/21)



## Barefoot MY2 General Site Photos



Buttonbushes in standing water (08/24/21)



Planted sweetbay magnolia (07/01/21)



Shallow depression area (07/01/21)



Dead cattails (07/01/21)



Site overview (07/01/21)



Southwest corner (08/24/21)





Southwest corner (07/01/21)

# **Appendix C**

## **Vegetation Plot Data**



**Table 6. Planted Species Summary**

Common Name	Scientific Name	Total Stems Planted
Swamp Chestnut Oak	<i>Quercus michauxii</i>	6,000
Baldcypress	<i>Taxodium distichum</i>	5,000
Wax Myrtle	<i>Morella cerifera</i>	4,320
Willow Oak	<i>Quercus phellos</i>	4,000
Cherrybark Oak	<i>Quercus pagoda</i>	3,000
Water Oak	<i>Quercus nigra</i>	2,500
Green Ash	<i>Fraxinus pennsylvanica</i>	2,400
Silky Dogwood	<i>Cornus amomum</i>	2,000
Buttonbush	<i>Cephalanthus occidentalis</i>	2,000
Yellow Poplar	<i>Liriodendron tulipifera</i>	1,000
Southern Crab Apple	<i>Malus angustifolia</i>	800
Sugarberry	<i>Celtis laevigata</i>	350
Blackgum	<i>Nyssa sylvatica</i>	40
<b>Total</b>		33,410
Planted Area		22.94
As-built Planted Stems/Acre		1,456

**Table 7. Vegetation Plot Mitigation Success Summary**

Plot #	Planted Stems/Acre	Volunteer Stems/Acre	Total Stems/Acre	Success Criteria Met?	Average Stem Height (ft)
1	1174	0	1174	Yes	1.9
2	809	486	1295	Yes	3.2
3	971	162	1133	Yes	2.7
4	931	0	931	Yes	2.0
5	647	162	809	Yes	2.2
6	1052	405	1457	Yes	1.4
7	931	0	931	Yes	1.7
8	688	0	688	Yes	2.6
9	728	0	728	Yes	2.3
10	769	0	769	Yes	2.7
R1	607	0	607	Yes	3.3
R2	526	0	526	Yes	3.1
R3	769	0	769	Yes	2.4
R4	647	0	647	Yes	2.4
R5	1416	0	1416	Yes	1.7
R6*	2833	0	2833	Yes	25.7
<b>Project Avg</b>	<b>844</b>	<b>81</b>	<b>925</b>	<b>Yes</b>	<b>2.3</b>

\*Random Plot 6 is forested and is not included in the Project Average



Table 9. Random Vegetation Plot 6 Data

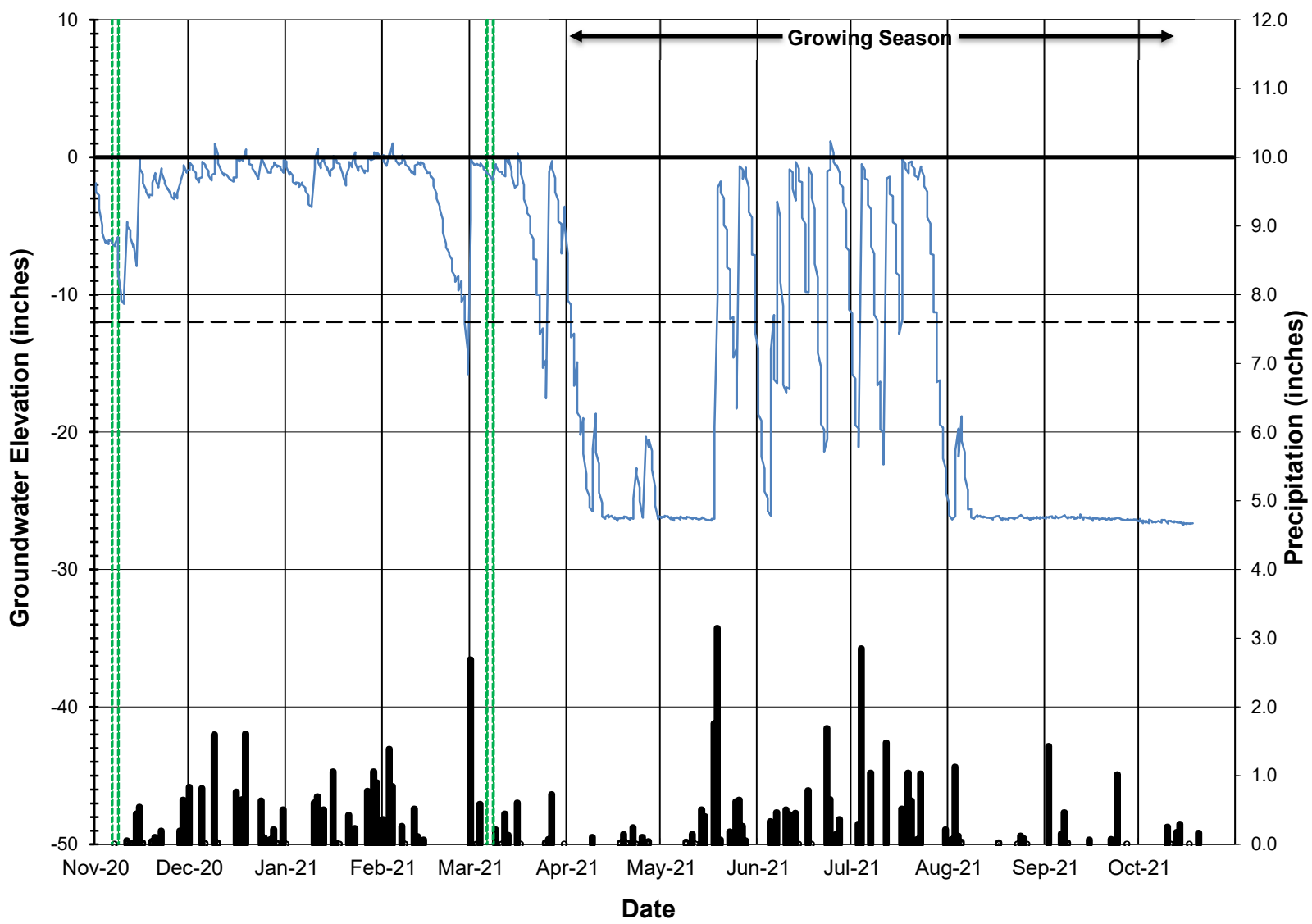
Random Plot 6		
#	Species	Height (cm)
1	<i>Pinus taeda</i>	1000
2	<i>Pinus taeda</i>	900
3	<i>Pinus taeda</i>	800
4	<i>Pinus taeda</i>	850
5	<i>Pinus taeda</i>	1050
6	<i>Pinus taeda</i>	1100
7	<i>Pinus taeda</i>	600
8	<i>Pinus taeda</i>	700
9	<i>Cyrilla racemiflora</i>	1000
10	<i>Cyrilla racemiflora</i>	900
11	<i>Cyrilla racemiflora</i>	950
12	<i>Cyrilla racemiflora</i>	1000
13	<i>Liquidambar styraciflua</i>	800
14	<i>Pinus taeda</i>	500
15	<i>Pinus taeda</i>	600
16	<i>Pinus taeda</i>	700
17	<i>Pinus taeda</i>	700
18	<i>Liquidambar styraciflua</i>	300
19	<i>Pinus taeda</i>	1000
20	<i>Pinus taeda</i>	700
21	<i>Pinus taeda</i>	250
22	<i>Pinus taeda</i>	200
23	<i>Pinus taeda</i>	800
24	<i>Pinus taeda</i>	700
25	<i>Pinus taeda</i>	900
26	<i>Pinus taeda</i>	700
27	<i>Pinus taeda</i>	8000
28	<i>Cyrilla racemiflora</i>	800
29	<i>Cyrilla racemiflora</i>	900
30	<i>Cyrilla racemiflora</i>	1000
31	<i>Cyrilla racemiflora</i>	1000
32	<i>Liquidambar styraciflua</i>	300
33	<i>Liquidambar styraciflua</i>	400
34	<i>Liquidambar styraciflua</i>	500
35	<i>Acer rubrum</i>	700
36	<i>Acer rubrum</i>	800
37	<i>Acer rubrum</i>	800
38	<i>Pinus taeda</i>	1000
39	<i>Pinus taeda</i>	1000

Random Plot 6		
#	Species	Height (cm)
40	<i>Pinus taeda</i>	1100
41	<i>Pinus taeda</i>	800
42	<i>Pinus taeda</i>	700
43	<i>Pinus taeda</i>	800
44	<i>Pinus taeda</i>	900
45	<i>Pinus taeda</i>	900
46	<i>Liquidambar styraciflua</i>	800
47	<i>Liquidambar styraciflua</i>	850
48	<i>Liquidambar styraciflua</i>	900
49	<i>Liquidambar styraciflua</i>	400
50	<i>Liquidambar styraciflua</i>	1000
51	<i>Liquidambar styraciflua</i>	500
52	<i>Nyssa sylvatica</i>	400
53	<i>Quercus michauxii</i>	1200
54	<i>Clethra alnifolia</i>	200
55	<i>Clethra alnifolia</i>	200
56	<i>Clethra alnifolia</i>	100
57	<i>Clethra alnifolia</i>	150
58	<i>Clethra alnifolia</i>	300
59	<i>Clethra alnifolia</i>	150
60	<i>Clethra alnifolia</i>	150
61	<i>Clethra alnifolia</i>	100
62	<i>Clethra alnifolia</i>	200
63	<i>Clethra alnifolia</i>	200
64	<i>Clethra alnifolia</i>	250
65	<i>Pinus taeda</i>	1000
66	<i>Pinus taeda</i>	800
67	<i>Pinus taeda</i>	800
68	<i>Pinus taeda</i>	900
69	<i>Cyrilla racemiflora</i>	600
70	<i>Ilex opaca</i>	500
<b>Stems/Acre</b>		2833
<b>Average Height (cm)</b>		782
<b>Average Height (ft)</b>		25.7
<b>Plot Size (m)</b>		25 x 4

# **Appendix D**

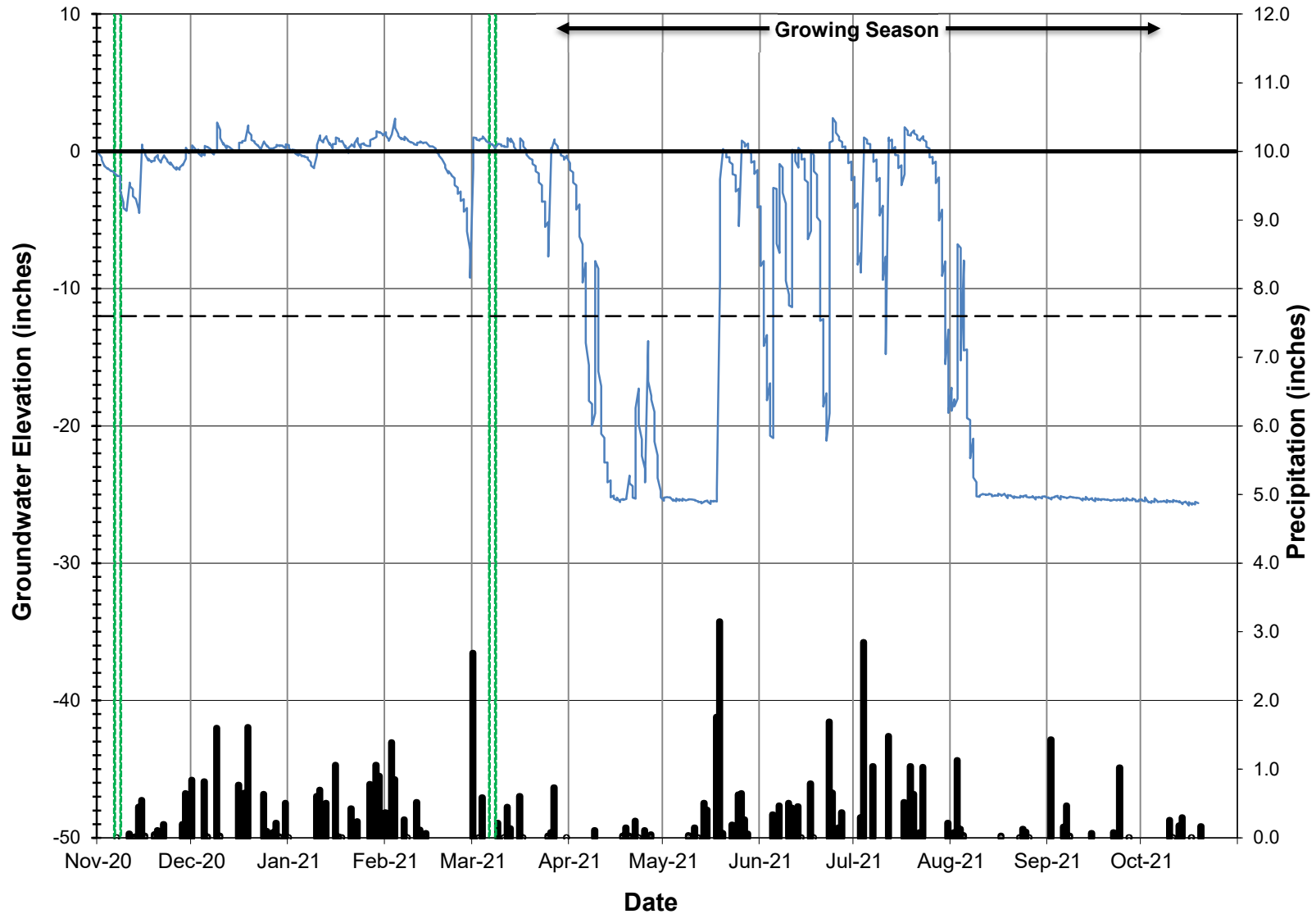
## Hydrology Data

# 2021 Barefoot GW1



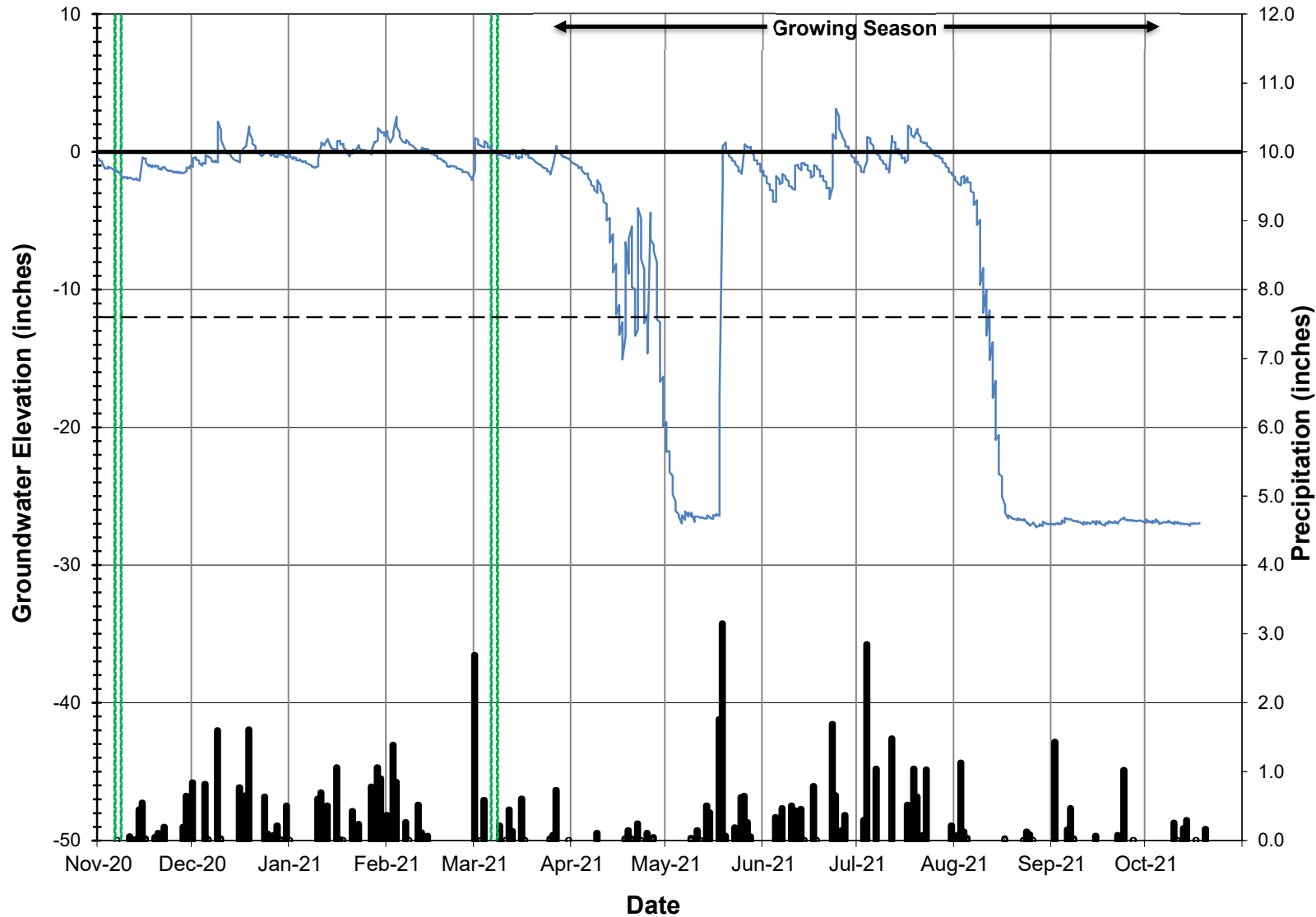
■ Goldsboro Daily Rain    — GW1

# 2021 Barefoot GW2



■ Goldsboro Daily Rain    — GW2

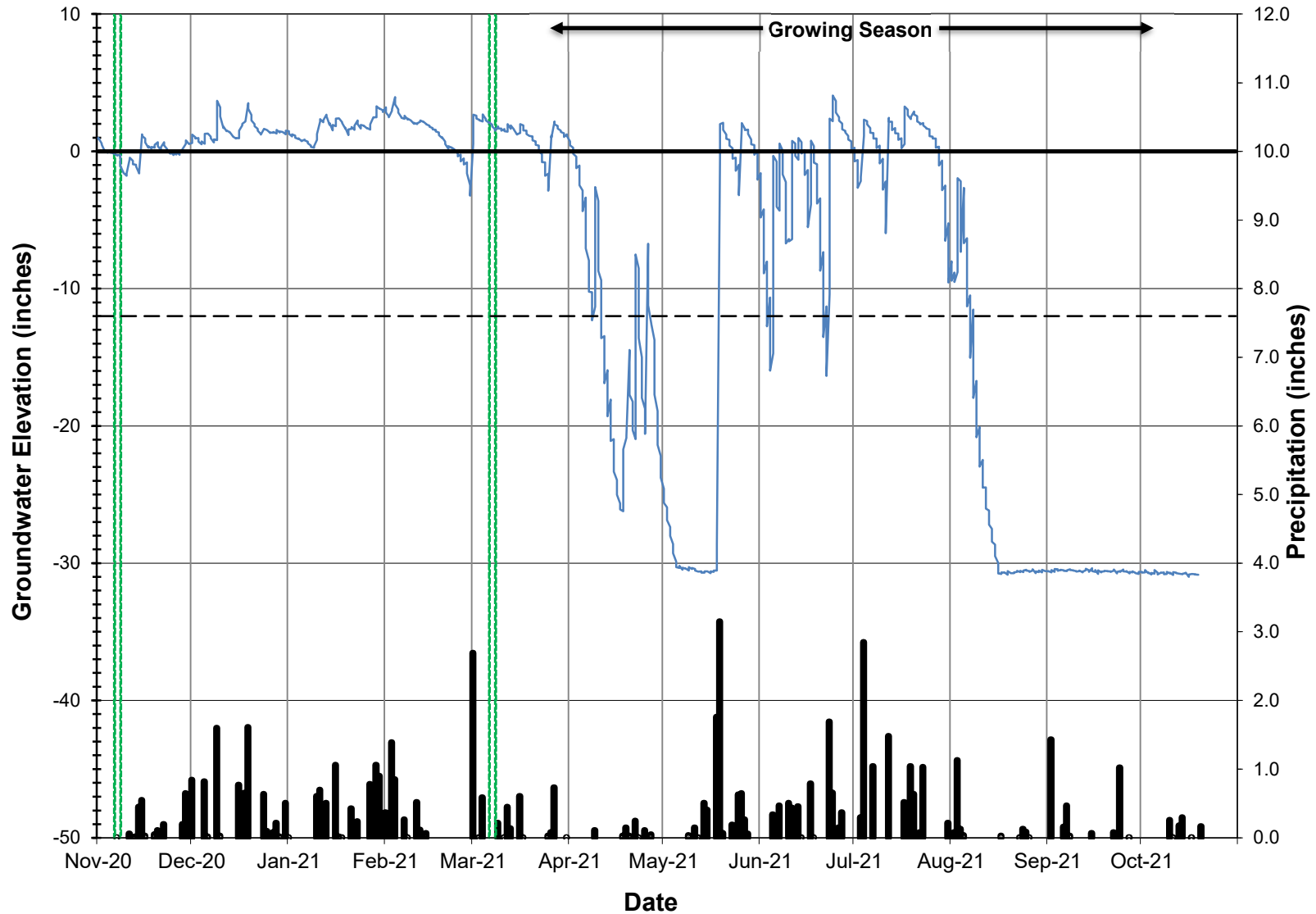
# 2021 Barefoot GW3



■ Goldsboro Daily Rain    — GW3

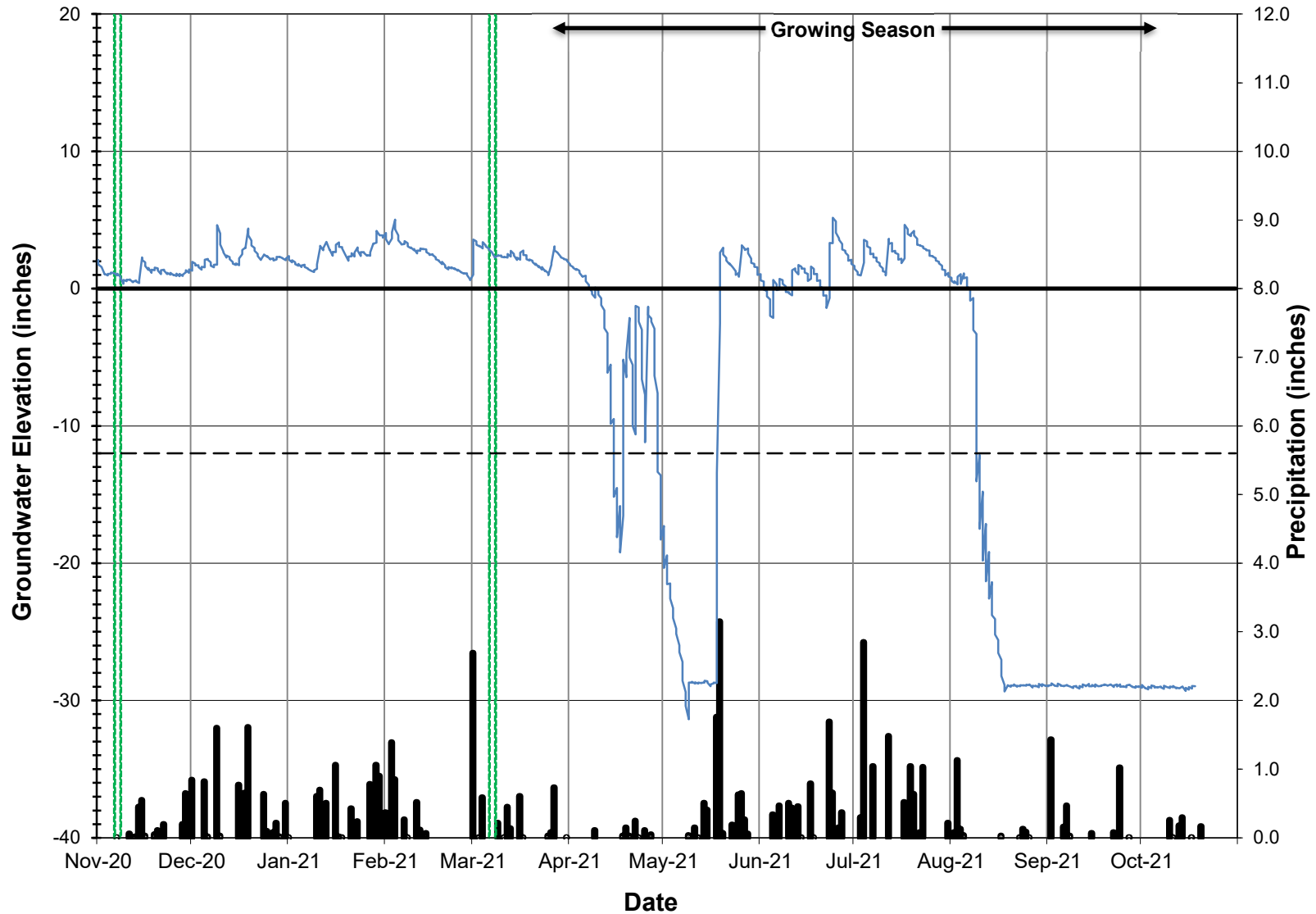


# 2021 Barefoot GW4



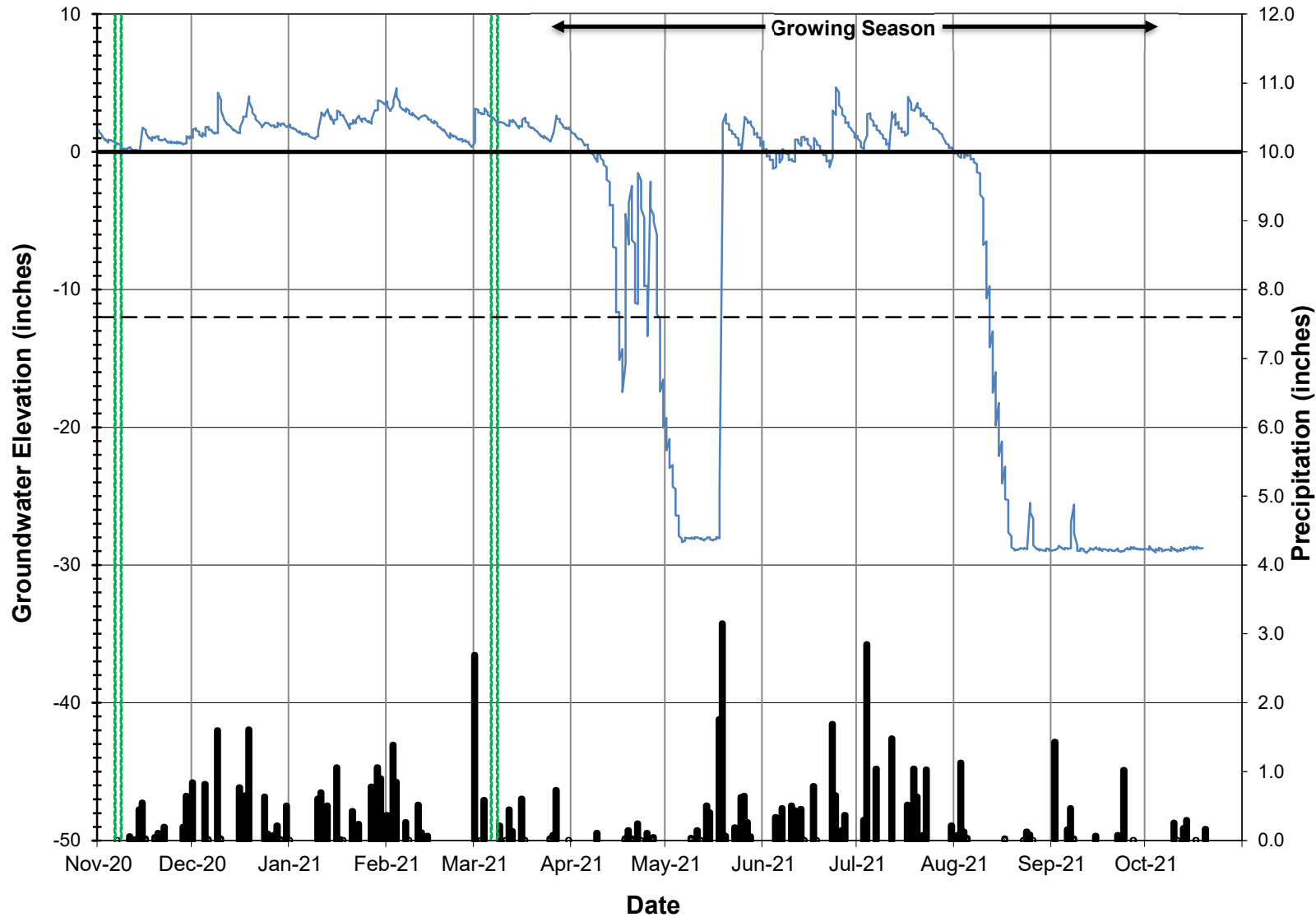
■ Goldsboro Daily Rain    — GW4

# 2021 Barefoot GW5



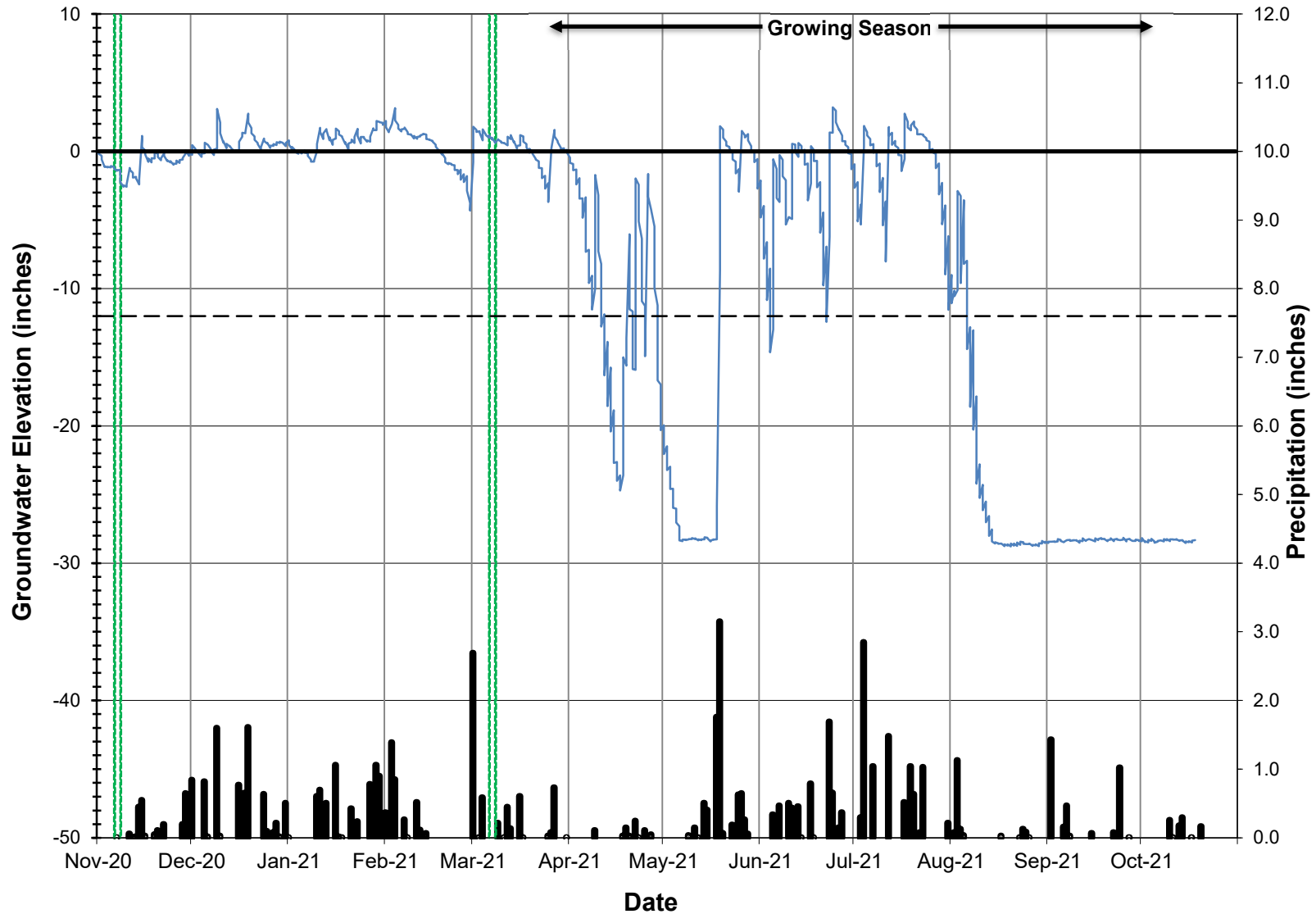
■ Goldsboro Daily Rain — GW5

# 2021 Barefoot GW6



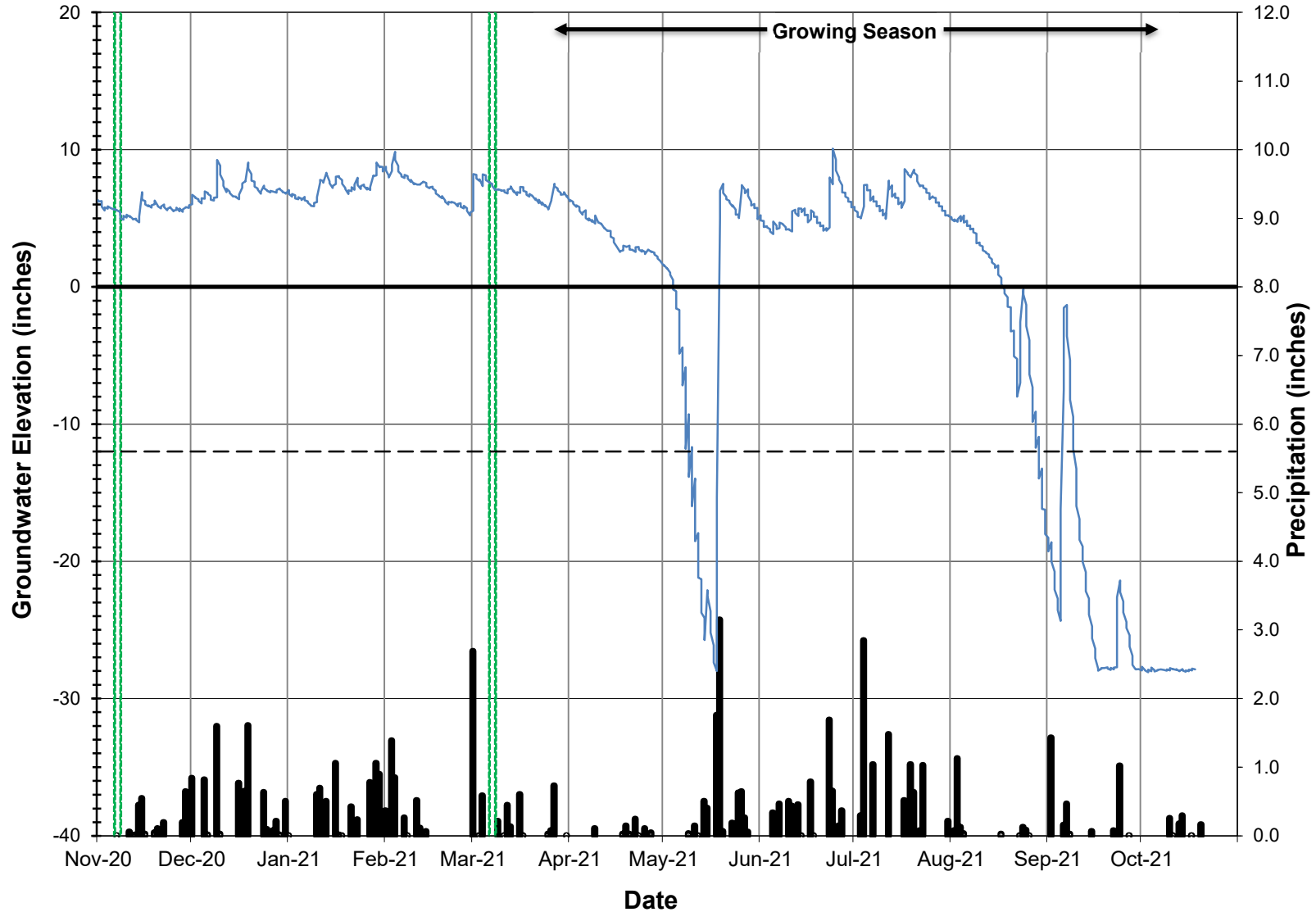
■ Goldsboro Daily Rain    — GW1

# 2021 Barefoot GW7



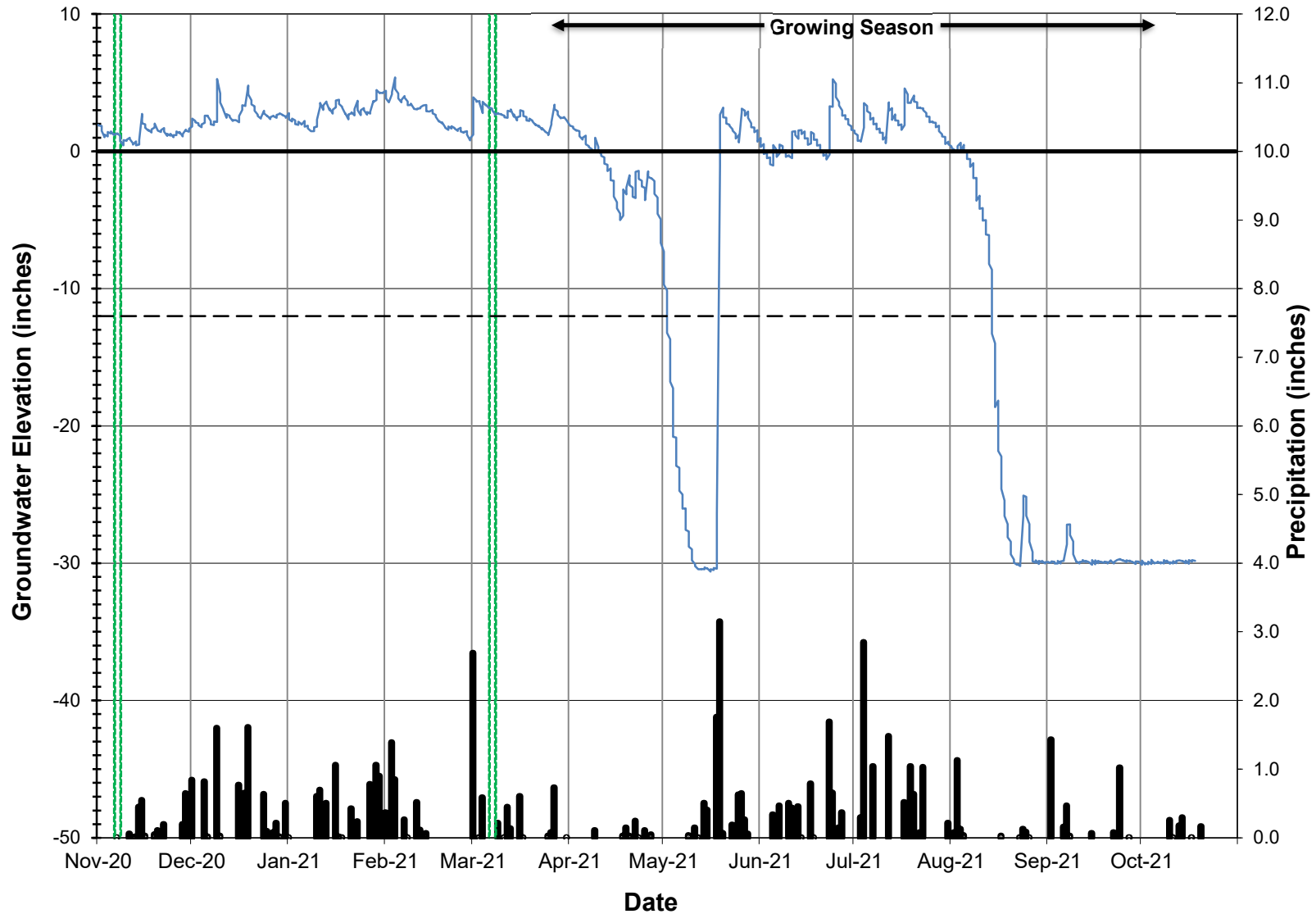
■ Goldsboro Daily Rain    — GW7

# 2021 Barefoot GW8



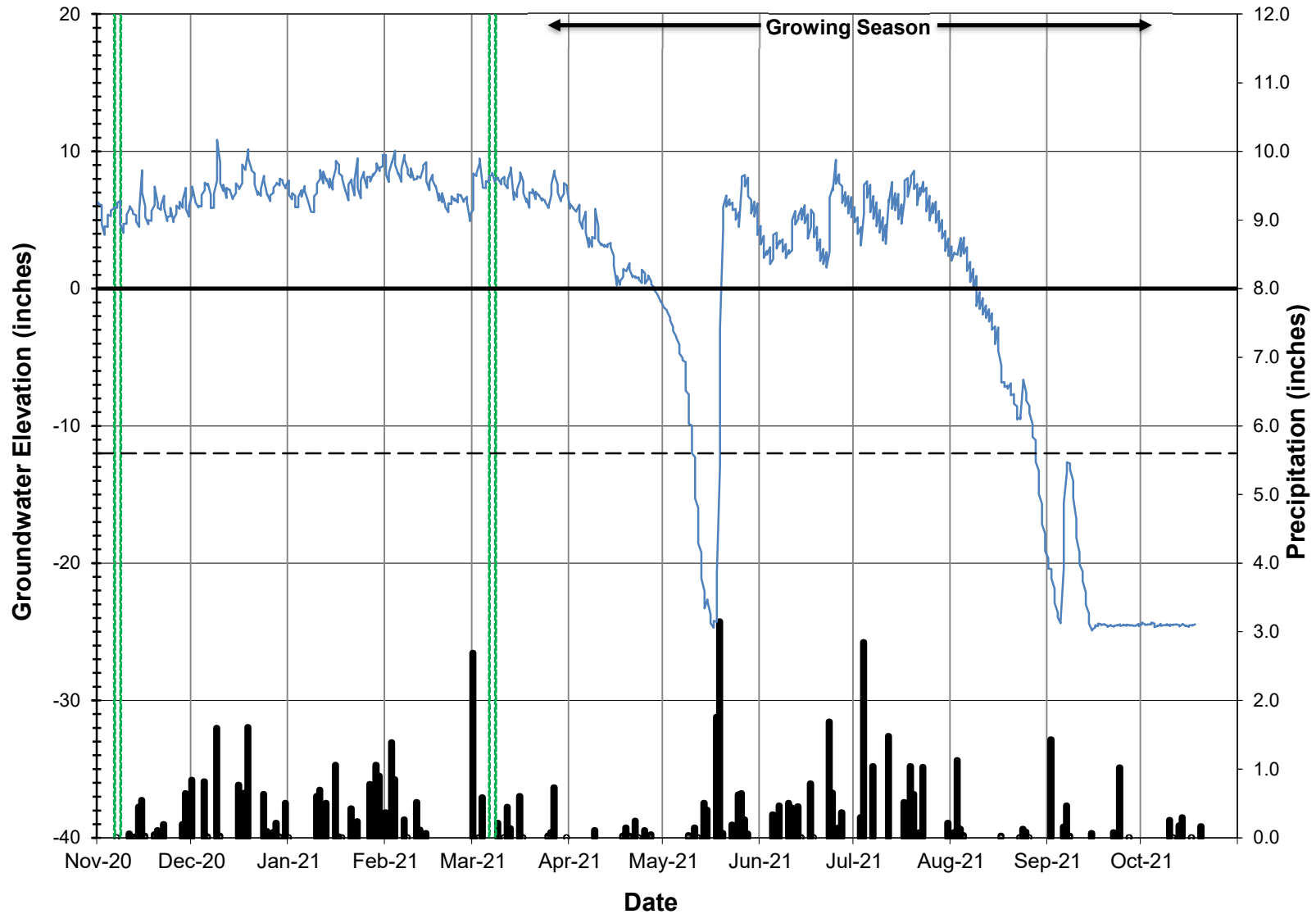
■ Goldsboro Daily Rain    — GW8

# 2021 Barefoot GW9



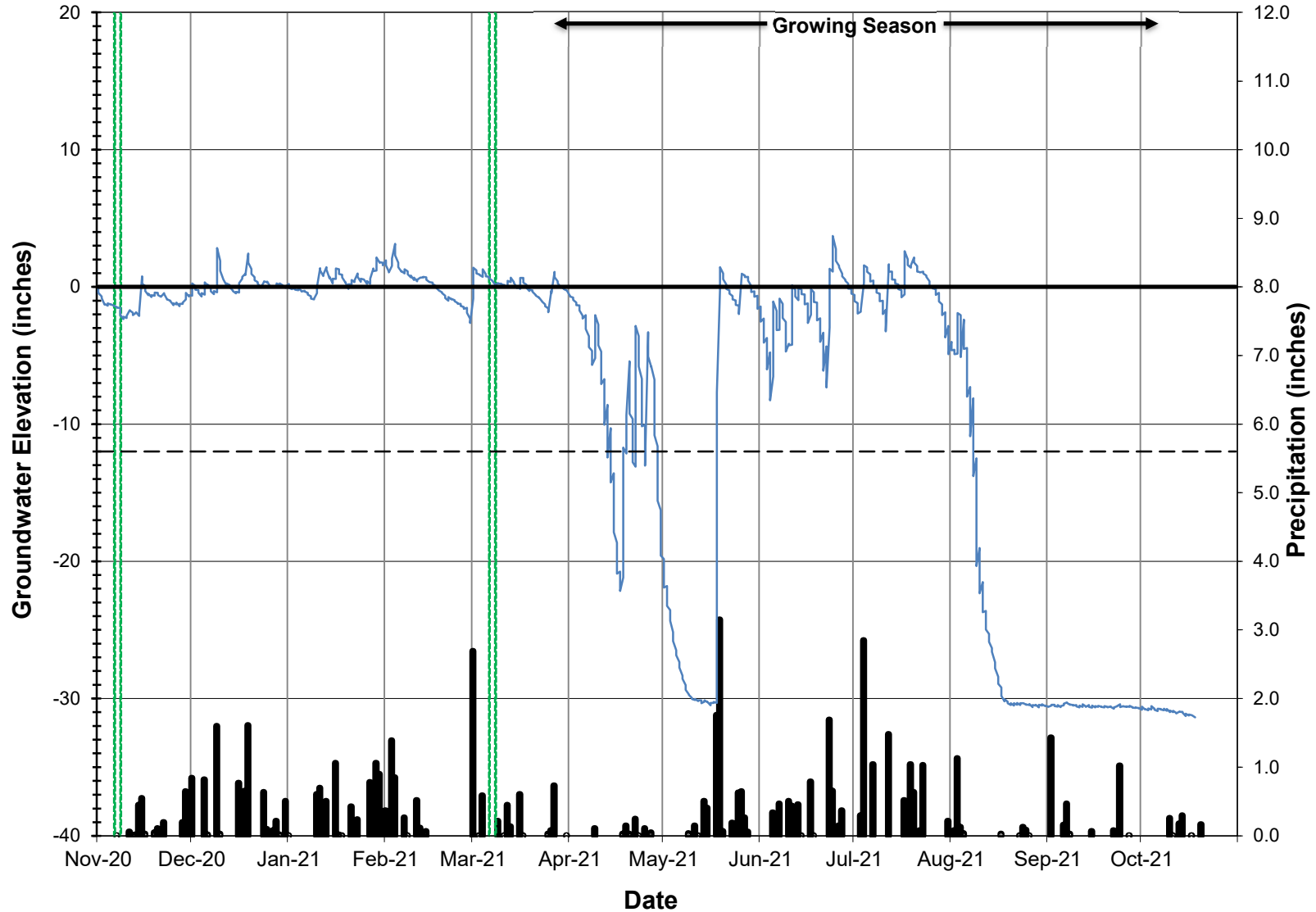
■ Goldsboro Daily Rain — GW9

# 2021 Barefoot GW10



■ Goldsboro Daily Rain    — GW10

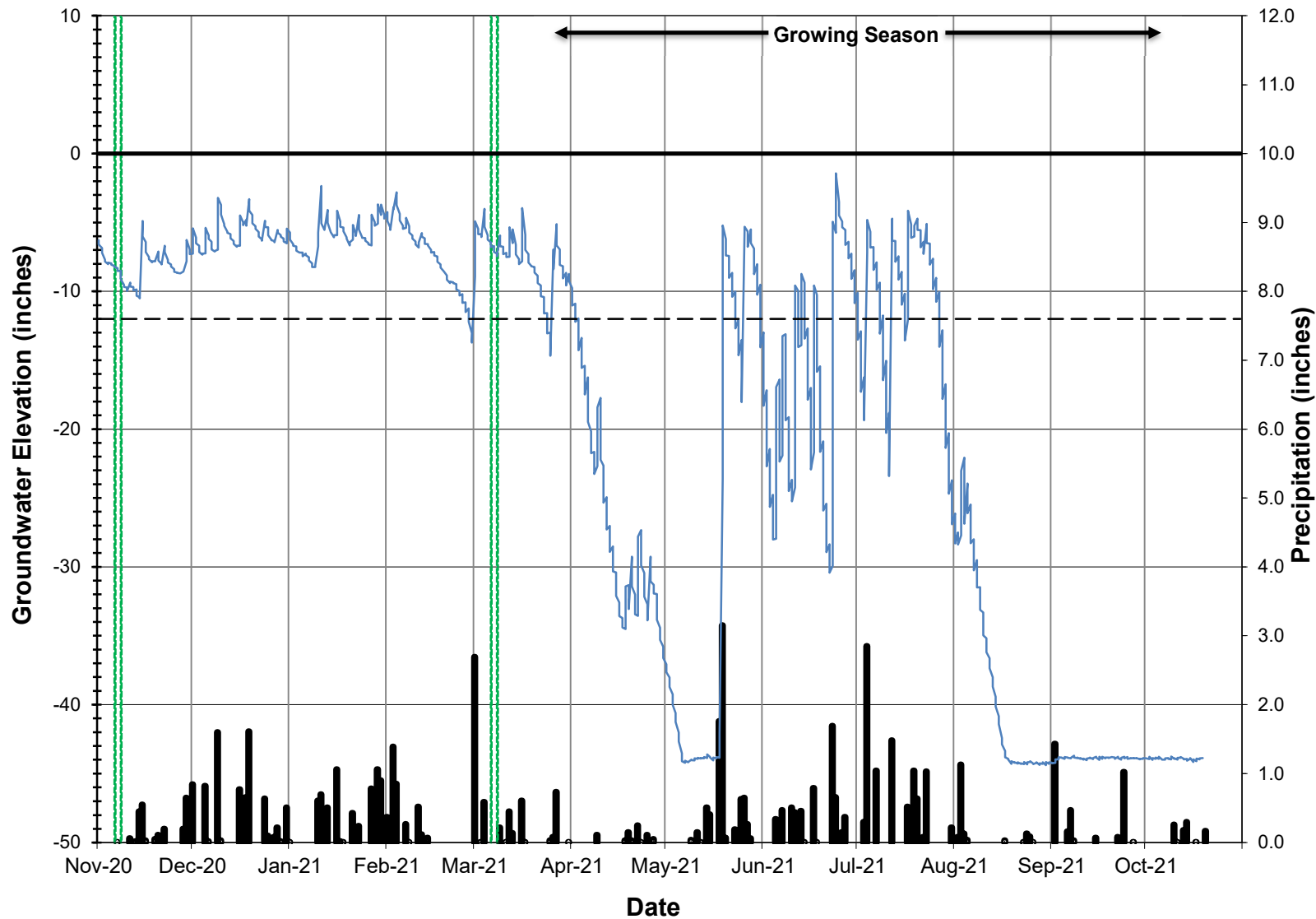
# 2021 Barefoot GW11



■ Goldsboro Daily Rain    — GW11

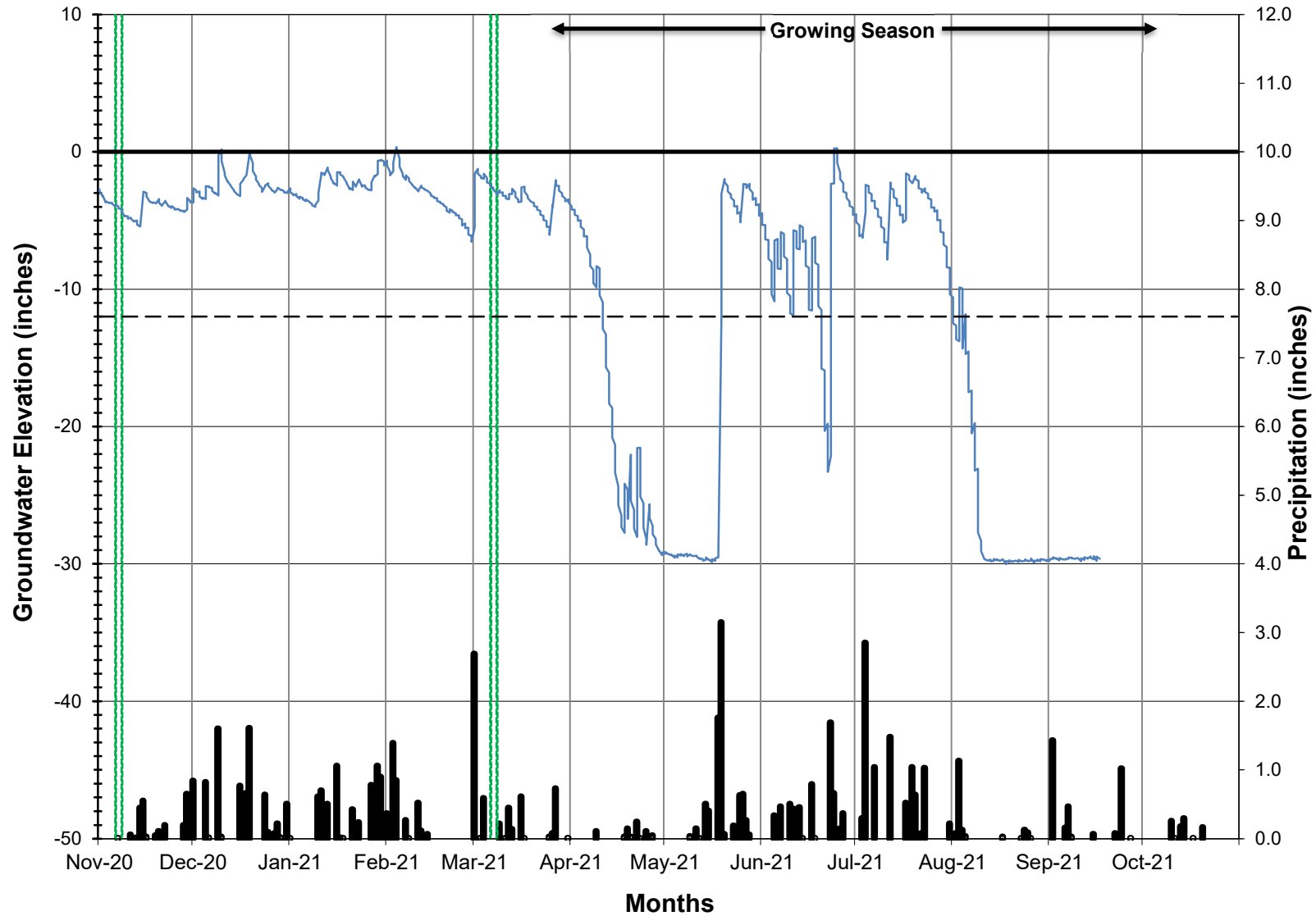


# 2021 Barefoot GW12



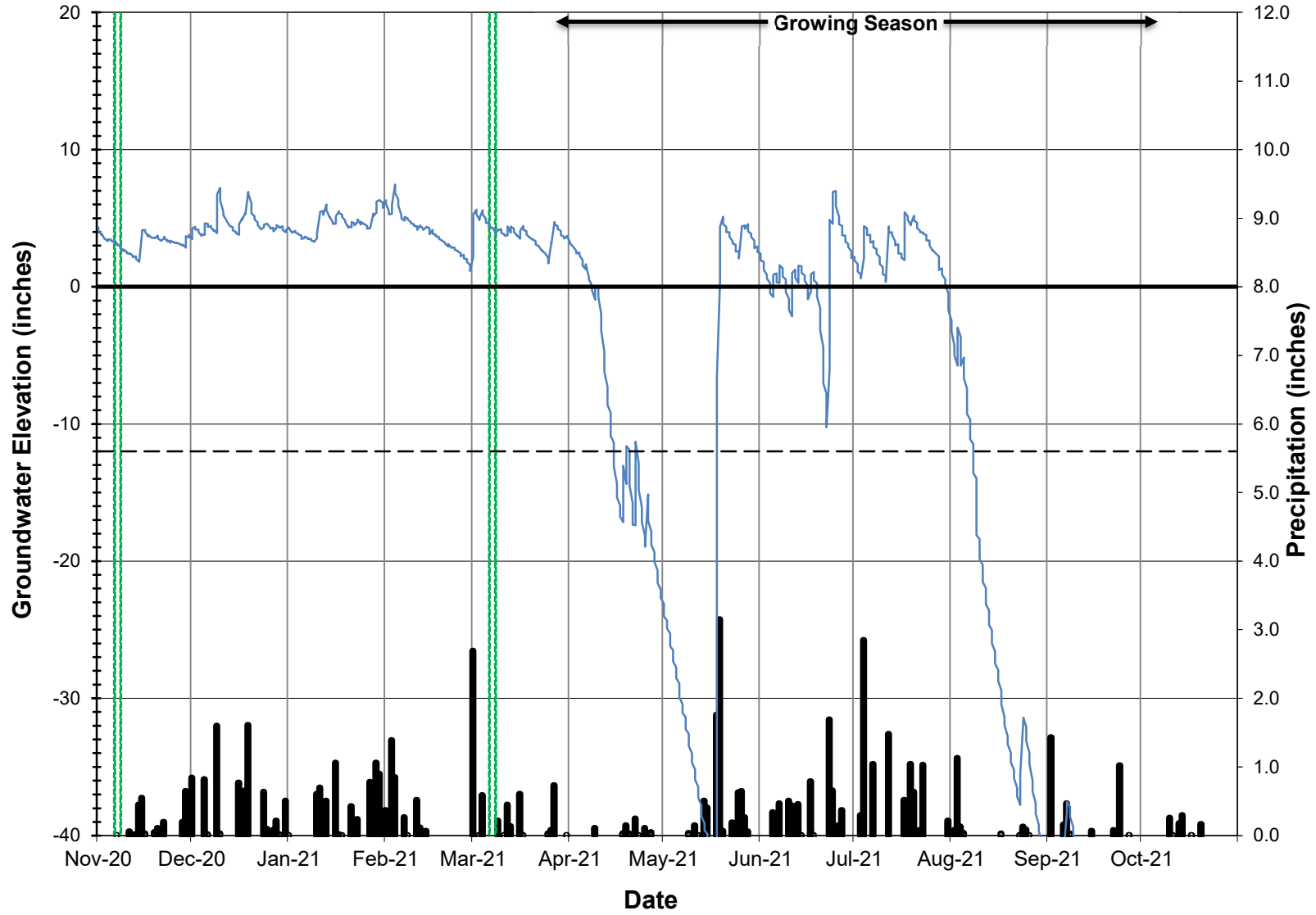
■ Goldsboro Daily Rain    — GW12

# 2021 Barefoot GW13



■ Goldsboro Daily Rain    — GW13

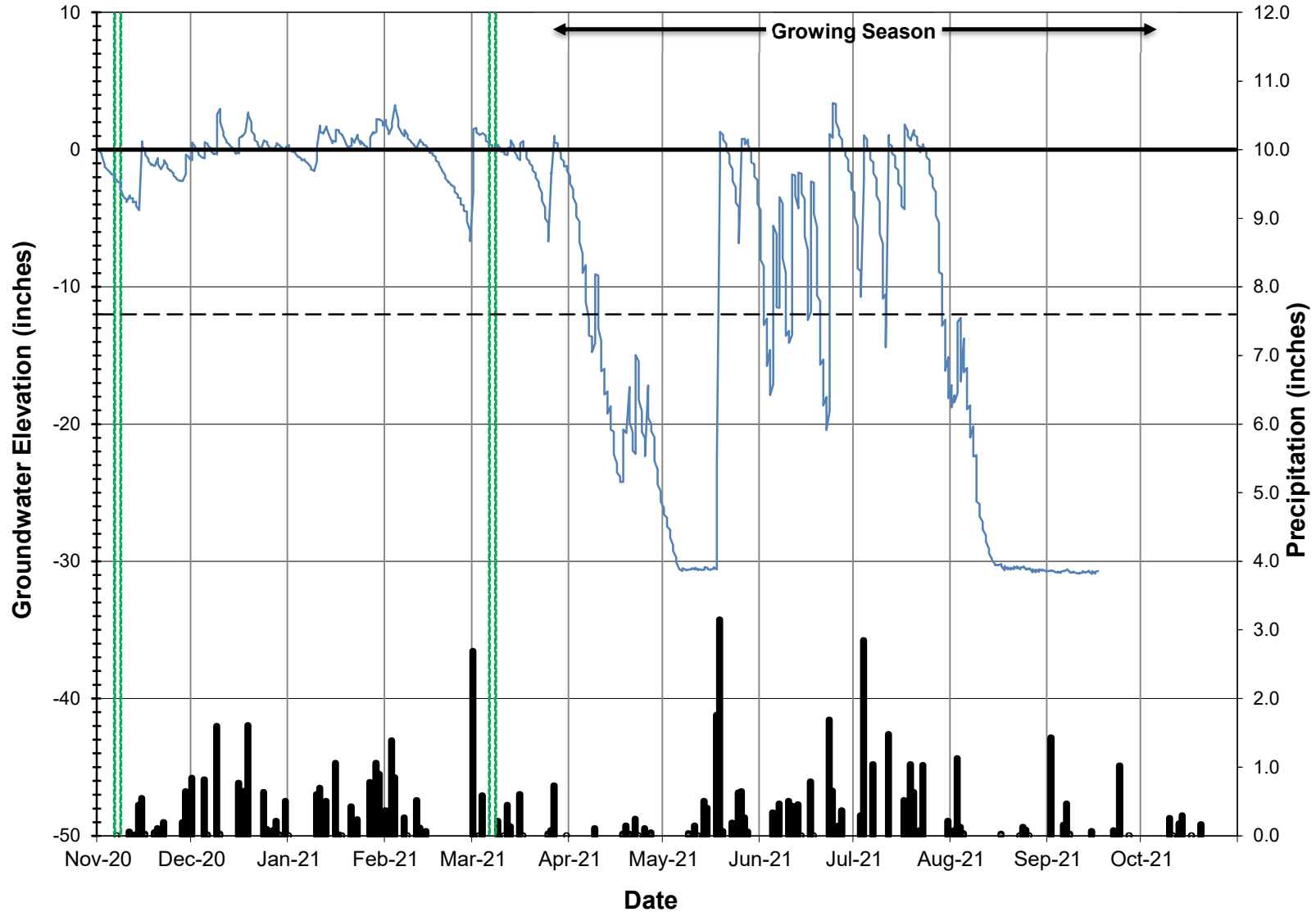
# 2021 Barefoot GW14



■ Goldsboro Daily Rain    — GW14

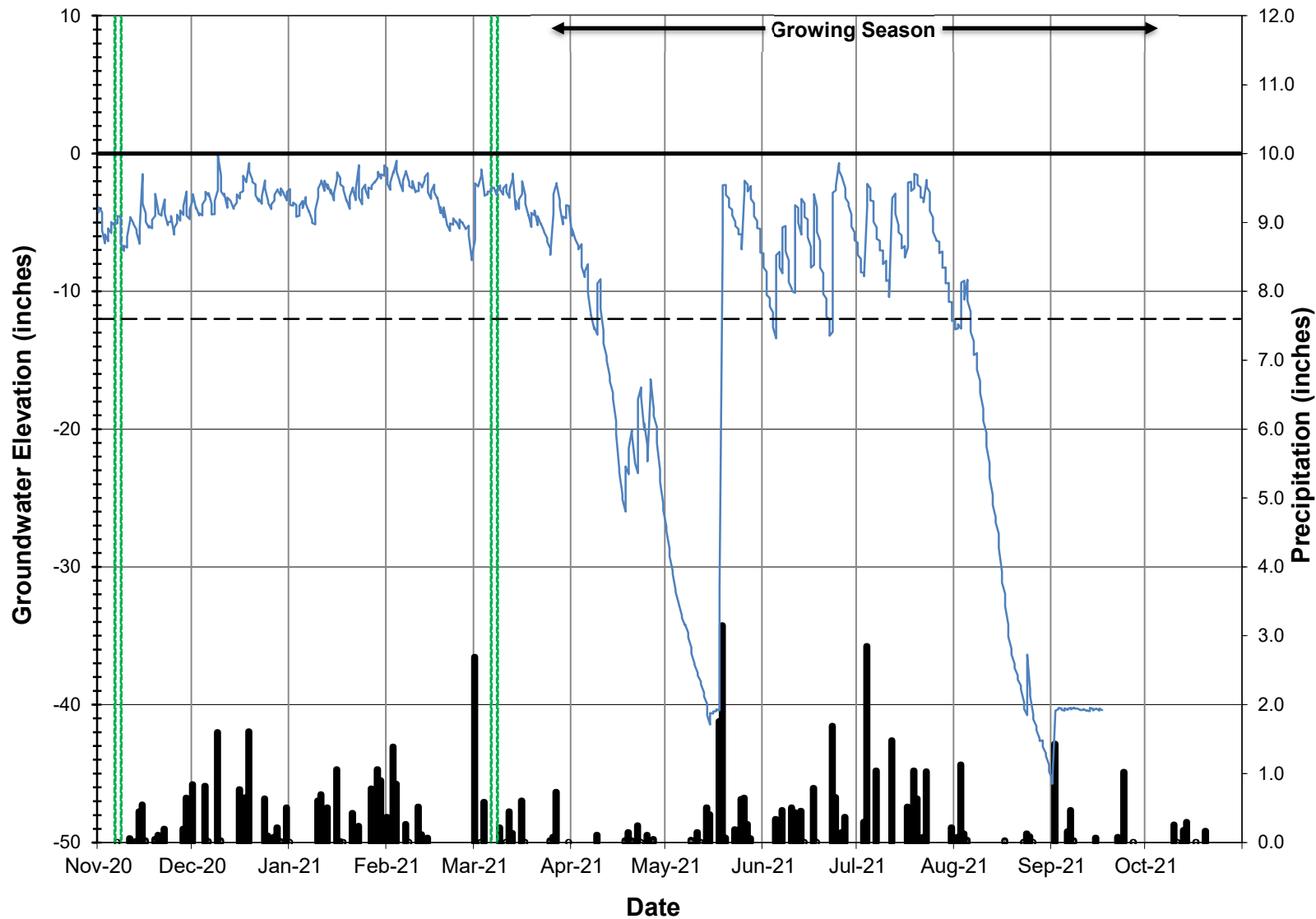


# 2021 Barefoot GW15



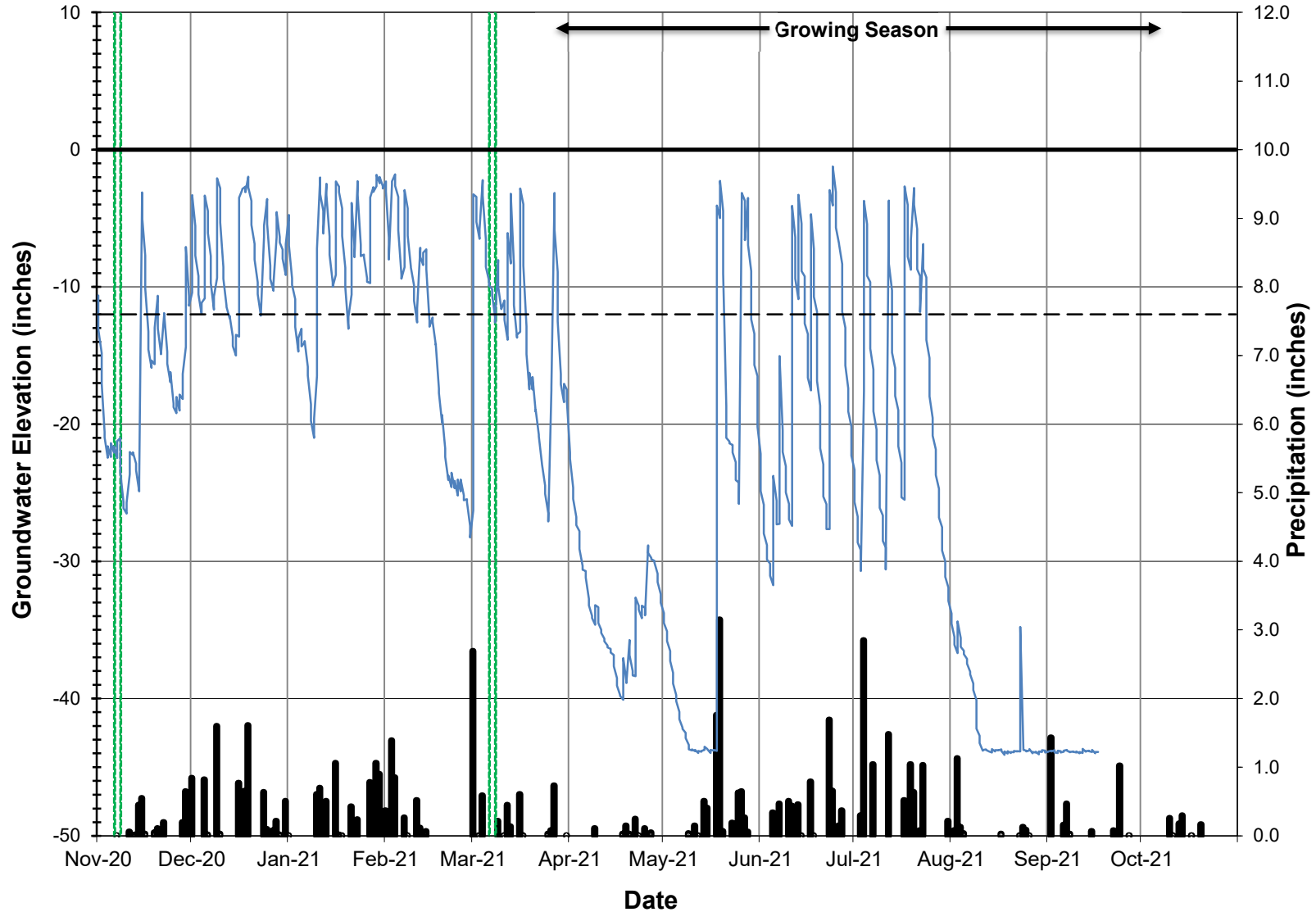
■ Goldsboro Daily Rain    — GW15

# 2021 Barefoot GW16



■ Goldsboro Daily Rain    — GW16

# 2021 Barefoot GW17



■ Goldsboro Daily Rain    — GW17

Table 10.

Month	Average	Normal Limits		Goldsboro Station Precipitation
		30 Percent	70 Percent	
January	4.34	3.38	5.01	7.17
February	3.23	2.19	3.85	7.48
March	4.50	3.30	5.29	4.79
April	3.16	1.77	3.85	0.97
May	3.69	2.73	4.33	1.75
June	4.49	3.18	5.31	9.04
July	6.06	4.26	7.19	9.34
August	5.42	3.27	6.57	4.94
September	4.99	2.17	6.09	2.43
October	3.21	1.70	3.91	1.87
November	2.89	1.88	3.47	0.18
December	3.24	2.20	3.87	---
Total	49.22	32.03	58.74	49.96
Above Normal Limits	Below Normal Limits			

Table 11.

2021 Max Hydroperiod (Growing Season 13-Mar through 22-Nov, 254 days) Success Criterion 10%							
Well ID	Wetland ID	Elevation (ft)	Consecutive		Cumulative		Occurrences
			Days	Hydroperiod (%)	Days	Hydroperiod (%)	
GW1	W1	193.62	23	9	84	36	11
GW2	W1	193.36	40	16	114	49	6
GW3	W1	193.50	86	34	144	62	4
GW4	W1	193.35	64	25	127	55	5
GW5	W1	193.25	83	32	142	61	3
GW6	W1	193.25	86	34	145	62	3
GW7	W1	193.40	62	24	133	57	5
GW8	W1	192.80	103	40	180	77	3
GW9	W1	193.16	88	34	153	66	2
GW10	W1	192.85	101	40	175	75	2
GW11	W1	193.42	82	32	140	60	4
GW12	W2	194.22	24	9	74	32	12
GW13	W2	193.82	45	18	118	51	4
GW14	W2	193.32	82	32	132	57	4
GW15	W2	193.61	40	16	105	45	6
GW16	N/A	193.73	41	16	117	50	6
GW17	N/A	193.82	7	3	42	18	13

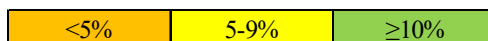




Table 12.

Summary of Groundwater Monitoring Results											
Barefoot											
Well ID	Wetland ID	Elevation (ft)	Hydroperiod (%); Success Criteron 10%								
			Pre-Con (2018)	Pre-Con (2019)	Year 1 (2020)	Year 2 (2021)	Year 3 (2022)	Year 4 (2023)	Year 5 (2024)	Year 6 (2025)	Year 7 (2026)
GW1	W1	193.62	---	---	9	9					
GW2	W1	193.36	---	---	24	16					
GW3	W1	193.50	3	1	41	34					
GW4	W1	193.35	2	0	26	25					
GW5	W1	193.25	2	1	41	32					
GW6	W1	193.25	---	---	41	34					
GW7	W1	193.40	---	---	26	24					
GW8	W1	192.80	---	---	54	40					
GW9	W1	193.16	---	---	41	34					
GW10	W1	192.85	---	---	54	40					
GW11	W1	193.42	---	---	41	32					
GW12	W2	194.22	---	5	10	9					
GW13	W2	193.82	---	---	39	18					
GW14	W2	193.32	---	0	50	32					
GW15	W2	193.61	---	---	26	16					
GW16	N/A	193.73	1	0	26	16					
GW17	N/A	193.82	3	1	3	3					