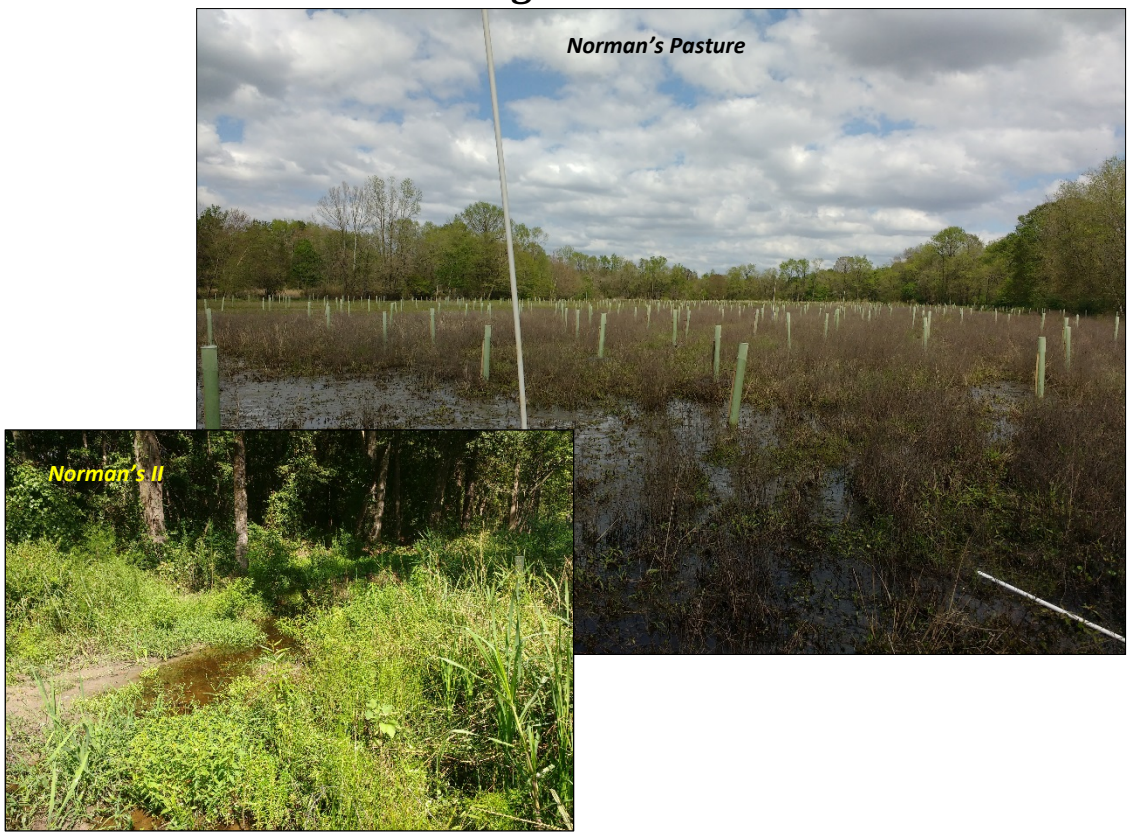
# Monitoring Report

**Norman's Pasture Restoration Site**
**DMS Contract 005010**
**DMS Project Number 95717**

**Norman's Pasture II Restoration Site**
**DMS Contract 5787**
**DMS Project Number 96310**

## Monitoring Year 01




**Construction Completed: Feb 2016**
**Data Collection: Oct-Nov 2016**
**Submitted: December 2016**

# Monitoring and Design Firm

Prepared by:

KCI Associates of North Carolina, PC
4505 Falls of Neuse Rd. Suite 400
Raleigh, NC 27609
(919) 783-9214

**Project Contact: Tim Morris**
**Email: tim.morris@kci.com**
**KCI Project # 20122925/20145090**

## December 2016

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## 1.0 EXECUTIVE SUMMARY / PROJECT ABSTRACT

There are two separate projects included within this report. The projects are adjacent to each other, which is why the reporting structure for these projects is combined. The Norman's Pasture Restoration Site (NPRS) was completed in February 2016 and restored a total of 16.2 acres of riparian wetlands. Two on-site tributaries were also restored to integrated headwater/stream systems, but no stream mitigation credit is included in the NPRS. The NPRS is a riparian wetland system in the Cape Fear River Basin (03030006 8-digit HUC) in eastern Sampson County, North Carolina, that had been substantially modified to maximize agricultural production. The completed project will restore impacted agricultural lands to riparian wetland habitat.

The Norman's Pasture II Restoration Site (NPII) is located directly adjacent to NPRS, was also completed in February 2016, and includes a total of 10.2 acres of riparian wetland restoration and 843 linear feet of stream enhancement II. The NPII also includes 0.8 acres of existing wetland preservation. The completed NPII project will expand on the restoration efforts of the NPRS by extending restoration and protection initiatives to the headwater extents of much of the local watershed. The site will restore and protect a range of unique aquatic resources in one setting – existing riparian wetlands, a forested tributary that had lost connection with its historic floodplain, lower gradient seep-fed headwaters, and adjacent upland buffers.

The NPRS is protected by a 36.9-acre permanent conservation easement, while NPII is protected by a 16.3-acre permanent conservation easement, both held by the State of North Carolina. Both sites are located on two parcels located off of Cornwallis Road, approximately 5 miles west of Magnolia, North Carolina. The project sites are bounded by Stewarts Creek to the south, agricultural land to the north, Cornwallis Road to the east, and woodlands to the west. The sites have a long history of hydrologic modification in order to allow for farming to take place on the property.

The Cape Fear River Basin Restoration Priorities state the goals for the NPRS and NPII's 14-digit HUC are to protect and improve water quality throughout the Basin by reducing sediment and nutrient inputs into streams and rivers and to support efforts to restore local watersheds (NCDENR EEP, 2009). The project goals for NPRS and NPII are in line with the basin priorities and include the following:

- Reconnect a continuous stream and wetland headwater wetland system to Stewarts Creek.
- Expand and protect riparian habitat along Stewart's Creek.
- Buffer nutrient inputs from adjacent agricultural and grazing practices.

Additional goals for the project include:

- Increase the local hydroperiod by encouraging both surface and subsurface storage and retention.
- Restore and establish a functional and diverse stream/wetland complex.

The project goals will be addressed through the following objectives:

- Redevelop a stream/wetland complex that has previously been impacted by ditching and cattle grazing.
- Fill field ditches to restore surface flow retention and historic flow paths.
- Protect and integrate existing riparian wetlands into the project design.
- Re-forest riparian areas with native plant communities.
- Re-connect headwater seeps to the broader swamp forest community of Stewarts Creek being restored by NPRS and NPII

Project planting and construction were completed in February 2016. The NPRS involved restoration and establishment a functional stream/wetland complex with 16.2 acres of riparian wetland restoration (15.5 acres of re-establishment and 0.7 acre of wetland rehabilitation). Select ditches across the site were modified or filled and seeps were redirected and redeveloped to retain and distribute surface flow across the site. The two project tributaries (Tributaries 1 and 2 to Stewarts Creek) were restored to integrated headwater/stream systems, but no stream mitigation credit is included in NPRS. Approximately 9.0 acres of wetland preservation is included throughout the NPRS, but for no additional credit.

The NPII aimed to restore and establish a stream/wetland complex with 10.2 acres of riparian wetland restoration (8.8 acres of re-establishment and 1.4 acres of rehabilitation). Approximately 843 linear feet of Tributary 1 to Stewarts Creek were improved with Enhancement II and reconnected to the historic floodplain. Also, approximately 0.8 acre of existing wetlands were included as preservation at NPII (no mitigation credit).

Both NPRS and NPII were constructed as designed with only a few modifications made to the design plan during construction. On NPRS, several portions of the on-site ditches were not filled and a ditch plug was not installed to allow Stewart's Creek better flood access to the site. Two extra areas were also planted as Headwater Forest Communities. On NPII, one riffle enhancement and one log drop were not installed at the very beginning of the stream reach. Several extra HDPE pipes were also added at the crossings to allow better hydraulic connectivity between the different areas of the site.

The monitoring components were installed in February and March 2016 for both sites. 22 monitoring gauges (9 on NPRS and 13 on NPII) were installed to evaluate the attainment of jurisdictional wetland hydrology for both sites. One additional monitoring gauge was installed in the stream on NPII to document the presence of surface water and record the occurrence of bankfull events. To determine the success of the planted mitigation areas, 31 permanent vegetation monitoring plots (18 on NPRS and 13 on NPII) were established according to the CVS-EEP Level 2 protocol. Ten permanent photo points have been established with a total of twelve photos to be taken annually. The site will be monitored for five to seven years or until the success criteria are achieved. Reports will be submitted to the DMS each year.

The success criteria for the sites state that the planted wetlands must meet the success criteria of a site average of 320 stems/acre after three years, 288 stems/acre after four years, 260 stems/acre after five years, and 210 stems/acre after seven years to be considered successful. The first year monitoring counted an average of 778 planted stems/acre and 1,040 total stems/acre. Thirty of the 31 vegetation monitoring plots met the success criteria. Plot 14 (NPRS) was the only plot below the success criteria with 283 planted stems/acre and 405 total stems/acre.

Wetland hydrology will be monitored with the series of 22 automatic gauges described above that record water table depth. An additional two other were installed outside of the credit bearing area to monitor hydrology in what could become a (non-credit bearing) wetland creation area within the easement. To meet the success criterion, the upper 12 inches of the soil profile must have continuously saturated or inundated conditions for at least 9.0% of the growing season in the Headwater Forest community and 12.0% of the growing season in the Riverine Swamp Forest community during normal weather conditions. During the sites first growing season, 8 of the 9 gauges at NPRS and 7 of the 13 gauges at NPII met the success criteria.

## 2.0 MONITORING RESULTS

### 2.1 Vegetation Monitoring Results

The vegetation monitoring success criterion for the planted mitigation area is a density of 320 stems/acre after the third year of monitoring and an allowance for 10% mortality in the following years for a stem density of 288 stems/acre after four years, 260 stems/acre after five years, and 210 stems/acre after seven years to be considered successful. To determine the success of the planted mitigation area, thirty-one permanent vegetation monitoring plots (10 by 10 meters) have been established in the mitigation area at a density that represents the total mitigation acreage. Eighteen of these plots are in NPRS and thirteen of these are in NPII. The first-year vegetation monitoring was based on the Level 2 CVS-EEP vegetation monitoring protocol. The site's average density for this monitoring period was 778 planted stems/acre. All plots except for Plot 14 (NPRS) exceeded 320 planted stems/acre. Including volunteers, the site averaged 1,040 total stems/acre.

The vegetation monitoring was completed on November 1, 2016.

### 2.2 Hydrology Monitoring Results

Twenty-two groundwater monitoring gauges were installed in the wetland mitigation areas to measure wetland hydrology. Nine of these gauges are in Norman's Pasture (NP) and thirteen are in Norman's Pasture II (NPII). In addition to this, two other gauges were installed outside of the credit bearing area to monitor hydrology in what could become a (non-credit bearing) wetland creation area within the easement. The soil survey for Sampson County estimates that the growing season begins February 28 and ends November 21 (267 days). The success criteria for the site states that the water table of the restored wetlands must be within 12" of the soils surface continuously for at least 9% (24 days) of the growing season for headwater forest systems and 12% (32 days) for riverine swamp forest systems during normal weather conditions. A "normal" year is based on NRCS climatological data for Sampson County, and using the 30th to 70th percentile thresholds as the range of normal, as documented in the USACE Technical Report "Accessing and Using Meteorological Data to Evaluate Wetland Hydrology" (Sprecher and Warne, 2000).

The daily rainfall data was obtained from a local weather station Clinton, NC; provided by the NC State Climate Office. For the 2016-year, the months of February, May, September, and October experienced an above average rainfall, while April, June, July, and August experienced average rainfall. The months of January, March, and November recorded below average rainfall for the site. Overall, the area experienced above average rainfall during the 2016 growing season.

During the site's first growing season, fifteen of the twenty-two wells met the success criterion of having saturated soil conditions occurring within 12 inches of the ground surface for a minimum continuous period of 9% (24 days) for headwater forest systems or 12% (32 days) for riverine swamp forest systems of the 267 day growing season (February 28 to November 21) during average climatic conditions. The gauges that did not meet are Gauges NP8, NPII 5, NPII 6, NPII 8, NPII 9, NPII 10, and NPII 11. Gauge NP8 had over 11% hydrology, just under the necessary 12%. Many of the NPII gauges were also close to meeting the success criteria. It is expected that as the site settles and matures, more of the gauges will document wetland hydrology in future monitoring years. Please refer to Table 10 in Appendix D.

As part of the site success criteria the stream must experience two bankfull events in separate years. The stream experienced several bankfull events in 2016. See Table 9 in Appendix D.

## 2.3 Visual Monitoring Results

A yearly visual assessment of the enhanced stream on NPII will occur every year. The first year monitoring visual assessment found the stream to be in good condition. As the photos show, there has been a high survival rate of live stakes and herbaceous streamside vegetation is thriving. Recently after construction one small area of erosion developed, which was repaired. Despite numerous large flow events, the stream has shown no additional signs of erosion since. The stream corridor is also showing signs of a higher water table, which was a goal of raising the streambed elevation. This is evidenced by more standing surface water compared to pre-construction conditions.

# 3.0 REFERENCES


Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2 (http://cvs.bio.unc.edu/methods.htm)

NCDENR, Ecosystem Enhancement Program. 2009. Cape Fear River Basin Restoration Priorities 2009. Raleigh, NC. https://ncdenr.s3.amazonaws.com/s3fs-public/PublicFolder/Work%20With/Watershed%20Planners/RBRP%20Cape%20Fear%202009.pdf

Sprecher, S. W., and Warne, A. G. (2000). "Accessing and Using Meteorological Data to Evaluate Wetland Hydrology," ERDC/EL TR-WRAP-00-1, U.S. Army Engineer Research and Development Center, Vicksburg, MS.USACE. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

USACE. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

United States Department of Agriculture. 1985. Soil Survey of Sampson County, North Carolina. USDA, NCDENR, SCS. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/north_carolina/NC163/0/sampson.pdf

# Appendix A

# Project Vicinity Map and Background Tables

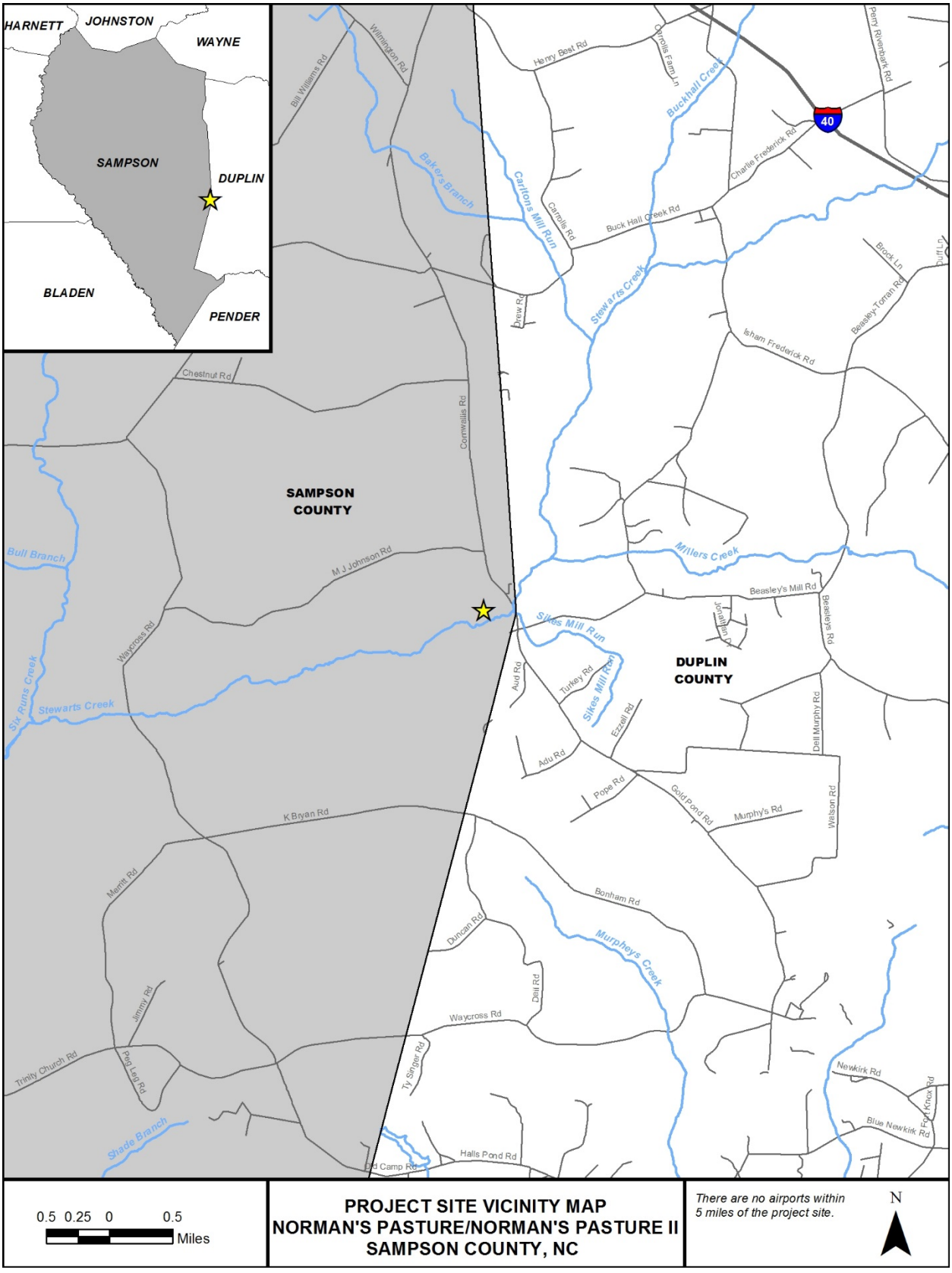

HARNETT
JOHNSTON
WAYNE
SAMPSON
DUPLIN
BLADEN
PENDER
SAMPSON COUNTY
DUPLIN COUNTY
Wilmington Rd
Bill Williams Rd
Henry Best Rd
Carrolls Farm Ln
Buckhall Creek
Perry Riverbank Rd
40
Charlie Frederick Rd
Baker's Branch
Carlions Mill Run
Carrolls Rd
Buck Hall Creek Rd
Brock Ln
Beasley Toman Rd
Stewarts Creek
Isham Frederick Rd
Chestnut Rd
Cornwallis Rd
Millers Creek
Beasley's Mill Rd
Bull Branch
M J Johnson Rd
Sikes Mill Run
Waycross Rd
Six Runs Creek
Stewarts Creek
Aud Rd
Turkey Rd
Sikes Mill Road
Ezzell Rd
Dell Murphy Rd
Adu Rd
Pope Rd
Gold Pond Rd
Murphy's Rd
Welson Rd
K Bryan Rd
Merritt Rd
Bonham Rd
Duncan Rd
Murpheys Creek
Dell Rd
Jimmy Rd
Waycross Rd
Ty Singer Rd
Trinity Church Rd
Peg Leg Rd
Newkirk Rd
Fort Knox Rd
Blue Newkirk Rd
Shade Branch
Old Camp Rd
Halls Pond Rd
0.5 0.25 0 0.5
Miles
PROJECT SITE VICINITY MAP
NORMAN'S PASTURE/NORMAN'S PASTURE II
SAMPSON COUNTY, NC
There are no airports within 5 miles of the project site.
N

**Table 1a. Project Components and Mitigation Credits**
**Norman's Pasture Restoration Site, DMS Project #95717**

**Mitigation Credits**

| | Stream | | Riparian Wetland | | Non-riparian Wetland | | Buffer | Nitrogen Nutrient Offset | Phosphorous Nutrient Offset |
|---|---|---|---|---|---|---|---|---|---|
| **Type** | R | RE | R | RE | R | RE | | | |
| **Length** | | | 16.2 | | | | | | |
| **Credits** | | | 16.0 | | | | | | |
| **TOTAL CREDITS** | | | 16.0 | | | | | | |

**Project Components**

| Project Component -or- Reach ID | Stationing/ Location | Existing Footage/ Acreage | Approach (PI, PII etc.) | Restoration -or- Restoration Equivalent | Restoration Footage/Acreage | Mitigation Ratio |
|---|---|---|---|---|---|---|
| Wetland Reestablishment | | | | Restoration | 15.5 | 1:1 |
| Wetland Rehabilitation | | | | Restoration | 0.7 | 1.5:1 |
| Wetland Preservation | | | | Preservation | 9.0 | NA |

**Component Summation**

| Restoration Level | Stream (linear feet) | Riparian Wetlands (Acres) | | Non-Riparian Wetlands (Acres) | Buffer (square feet) | Upland (Acres) |
|---|---|---|---|---|---|---|
| | | Riverine | Non-Riverine | | | |
| Restoration | | 16.2 | | | | |
| Enhancement | | | | | | |
| Enhancement I | | | | | | |
| Enhancement II | | | | | | |
| Creation | | | | | | |
| Preservation | | | | | | |
| High Quality Preservation | | | | | | |
| **TOTAL CREDITS** | | **16.0** | | | | |

**Table 1b. Project Components and Mitigation Credits**
**Norman's II Restoration Site, DMS Project #96310**

**Mitigation Credits**

| | Stream | | Riparian Wetland | | Non-riparian Wetland | | Buffer | Nitrogen Nutrient Offset | Phosphorous Nutrient Offset |
|---|---|---|---|---|---|---|---|---|---|
| **Type** | R | RE | R | RE | R | RE | | | |
| **Length** | | 843 | 10.2 | | | | | | |
| **Credits** | | 337 | 9.7 | | | | | | |
| **TOTAL CREDITS** | 337 | | 9.7 | | | | | | |

**Project Components**

| Project Component -or- Reach ID | Stationing/ Location | Existing Footage/ Acreage | Approach (PI, PII etc.) | Restoration -or- Restoration Equivalent | Restoration Footage/Acreage | Mitigation Ratio |
|---|---|---|---|---|---|---|
| Tributary 1 | 10+00 – 18+43 | 843 | | Enhancement II | 843 | 2:5 |
| Wetland Reestablishment | | | | Restoration | 8.8 | 1:1 |
| Wetland Rehabilitation | | | | Restoration | 1.4 | 1.5:1 |
| Wetland Preservation | | | | Preservation | 0.8 | NA |

**Component Summation**

| Restoration Level | Stream (linear feet) | Riparian Wetlands (Acres) | | Non-Riparian Wetlands (Acres) | Buffer (square feet) | Upland (Acres) |
|---|---|---|---|---|---|---|
| | | Riverine | Non-Riverine | | | |
| Restoration | | | 9.7 | | | |
| Enhancement | | | | | | |
| Enhancement I | | | | | | |
| Enhancement II | 337 | | | | | |
| Creation | | | | | | |
| Preservation | | | | | | |
| High Quality Preservation | | | | | | |
| **TOTAL CREDITS** | **337** | | **9.7** | | | |

| Table 2. Project Activity & Reporting History<br>Norman's Pasture and Norman's II Restoration Sites | | |
|---|---|---|
| **Activity or Report** | **Data Collection Complete** | **Actual Completion or Delivery** |
| Mitigation Plan | | Nov 14 |
| Final Design - Construction Plans | | Jan 15 |
| Construction | | Jan 16 |
| Planting | | Feb 16 |
| Baseline Monitoring/Report | April 16 | April 16 |
| Year 1 Monitoring | Nov 16 | Dec 16 |

| Table 3. Project Contacts<br>Norman's Pasture and Norman's II Restoration Sites | |
|---|---|
| **Design Firm** | KCI Associates of North Carolina, PC<br>4505 Falls of Neuse Rd. Suite 400<br>Raleigh, NC 27609<br>Contact: Mr. Tim Morris<br>Phone: (919) 278-2512<br>Fax: (919) 783-9266 |
| **Construction Contractor** | KCI Environmental Technologies and Construction<br>4505 Falls of Neuse Rd. Suite 400<br>Raleigh, NC 27609<br>Contact: Mr. Tim Morris<br>Phone: (919) 278-2512 |
| **Planting Contractor** | Conservation Services Inc.<br>1620 N. Delphine Ave.<br>Waynesboro, VA 22980<br>Contact: Mr. David Coleman<br>Phone: (540) 941-0067 |
| **Monitoring Performers** | |
| **MY-00 – MY-01** | KCI Associates of North Carolina, PC<br>4505 Falls of Neuse Rd.<br>Suite 400<br>Raleigh, NC 27609<br>Contact: Mr. Adam Spiller<br>Phone: (919) 278-2514<br>Fax: (919) 783-9266 |

**Table 4a. Project Information, Norman's Pasture Restoration Site, DMS Project #95717**

| | | | |
|---|---|---|---|
| **Project Name** | Norman's Pasture Restoration Site | | |
| **County** | Sampson County | | |
| **Project Area (acres)** | 36.92 acres | | |
| **Project Coordinates (lat. and long.)** | 34.904893 N , -78.151460 W | | |
| **Project Watershed Summary Information** | | | |
| **Physiographic Province** | Coastal Plain | | |
| **River Basin** | Cape Fear | | |
| **USGS Hydrologic Unit 8-digit** | 03030006 | **USGS Hydrologic Unit 14-digit** | 03030006110040 |
| **DWQ Sub-basin** | 03-06-19 | | |
| **Project Drainage Area (acres)** | 186 acres | | |
| **Project Drainage Area Percentage of Impervious Area** | 1% | | |
| **CGIA Land Use Classification** | Managed Herbaceous Cover 42% (77.3 ac), Cultivated 24% (44.3 ac), Bottomland Forest/Hardwood Swamps 17% (31.0 ac), Southern Yellow Pine 10% (19.5 ac), Mixed Hardwoods/Conifers 5% (9.2 ac), and Evergreen Shrubland 2% (4.2 ac) | | |

| **Reach Summery Information (Post Restoration)** | | |
|---|---|---|
| **Parameters** | **T1** | **T2** |
| Length of reach (linear feet) | 1,585 | 1,612 |
| Valley classification | Valley Type X | Valley Type X |
| Drainage area (acres) | 112 acres | 36 acres |
| NCDWQ Water Quality Classification | Project Reach Not Classified; Receiving water = Stewart's Creek (C; SW) | Project Reach Not Classified; Receiving water = Stewart's Creek (C; SW) |
| Morphological Description (stream type) | Portions ditched channel; other C5 | Portions headwater stream; others ditched channel |
| Evolutionary trend | Channelized | Channelized |
| Mapped Soil Series | Chipley Johnston; Torhunta | Bibb and Johnston; Johnston; Lumbee |
| Drainage class | Somewhat poorly drained, very poorly drained, very poorly drained | Poorly drained; very poorly drained; poorly drained |
| Soil Hydric status | Drained hydric | Drained hydric |
| Slope | 0-2% | 0-2% |
| FEMA classification | Zone AE | Zone AE |
| Native vegetation community | Pasture, Headwater Forest | Pasture, Riverine Swamp Forest |
| Percent composition of exotic invasive vegetation | <5% | <5% |

| **Wetland Summary Information (Post Restoration)** | | | | |
|---|---|---|---|---|
| **Parameters** | **Area 1** | **Area 4** | **Area 9** | **Area 10** |
| Size of Wetland (acres) | 1.99 acres | 5.20 acres | 2.19 acres | 0.02 acres |
| Wetland Type | Riparian | Riparian | Riparian | Riparian |
| Mapped Soil Series | Bibb and Johnston | Lumbee | Bibb and Johnston | Bibb and Johnston |
| Drainage class | Poorly or very poorly drained | Poorly drained | Poorly or very poorly drained | Poorly or very poorly drained |
| Soil Hydric Status | Drained hydric | Drained hydric | Drained hydric | Drained hydric |
| Source of Hydrology | Seepage/ Precipitation | Seepage/ Precipitation | Seepage/ Precipitation | Seepage/ Precipitation |
| Hydrologic Impairment | Ditching and Crops | Ditching and Crops | Ditching and Crops | Ditching and Crops |

| | | | | |
|---|---|---|---|---|
| Native vegetation community | Crops, Pasture, Wetland | Crops, Pasture, Forested Wetland | Crops, Pasture, Forested Wetland | Crops, Pasture |
| Percent composition of exotic invasive vegetation | <5% | <5% | <5% | <5% |

| **Regulatory Considerations** | | | |
|---|---|---|---|
| **Regulation** | **Applicable?** | **Resolved?** | **Supporting Documentation** |
| Waters of the United States – Section 404 | Yes | Yes | Jurisdictional Determination |
| Waters of the United States – Section 401 | Yes | Yes | Jurisdictional Determination |
| Endangered Species Act | No | N/A | N/A |
| Historic Preservation Act | No | N/A | N/A |
| Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA) | No | N/A | N/A |
| FEMA Floodplain Compliance | Yes | Yes | No-Rise Certification/FEMA Floodplain Checklist |
| Essential Fisheries Habitat** | No | N/A | N/A |

| Table 4b. Project Information, Norman's II Restoration Site, DMS Project #96310 | | | | | |
|---|---|---|---|---|---|
| Project Name | Norman's II Restoration Site | | | | |
| County | Sampson County | | | | |
| Project Area (acres) | 16.3 acres | | | | |
| Project Coordinates (lat. and long.) | 34.906839 N , -78.151797 W | | | | |
| **Project Watershed Summary Information** | | | | | |
| Physiographic Province | Coastal Plain | | | | |
| River Basin | Cape Fear | | | | |
| USGS Hydrologic Unit 8-digit | 03030006 | **USGS Hydrologic Unit 14-digit** | 03030006110040 | | |
| DWQ Sub-basin | 03-06-19 | | | | |
| Project Drainage Area (acres) | 139 acres | | | | |
| Project Drainage Area Percentage of Impervious Area | 1% | | | | |
| CGIA Land Use Classification | Cultivated 32% (44.3 ac), Managed Herbaceous Cover 31% (42.9 ac), Bottomland Forest/Hardwood Swamps 14% (19.5 ac), Southern Yellow Pine 14% (19.5 ac), Mixed Hardwoods/Conifers 6% (9.0 ac), and Evergreen Shrubland 3% (4.2 ac) | | | | |
| **Reach Summery Information (Post Restoration)** | | | | | |
| **Parameters** | **T1** | | | | |
| Length of reach (linear feet) | 843 | | | | |
| Valley classification | Valley Type X | | | | |
| Drainage area (acres) | 112 acres | | | | |
| NCDWQ Water Quality Classification | Project Reach Not Classified; Receiving water = Stewart's Creek (C; SW) | | | | |
| Morphological Description (stream type) | Modified E5 | | | | |
| Evolutionary trend | Stage III | | | | |
| Mapped Soil Series | Johnston | | | | |
| Drainage class | Very poorly drained | | | | |
| Soil Hydric status | Drained hydric | | | | |
| Slope | 0-1% | | | | |
| FEMA classification | Zone AE & Zone X | | | | |
| Native vegetation community | Headwater Forest | | | | |
| Percent composition of exotic invasive vegetation | <5% | | | | |
| **Wetland Summary Information (Post Restoration)** | | | | | |
| **Parameters** | **Area 6*** | **Area 7*** | **Area 8*** | **Area 9*** | **Area 11*** |
| Size of Wetland (acres) | 0.09 acre | 0.17 acre | 0.37 acre | 0.02 acre | 0.08 acre |
| Wetland Type | Riparian | Riparian | Pond and Riparian | Riparian | Riparian |
| Mapped Soil Series | Bibb and Johnston; Lumbee | Johnston loam | Lynn Haven | Bibb and Johnston | Torhunta Variant |
| Drainage class | Poorly or very poorly drained | Very poorly drained | Poorly or very poorly drained | Poorly or very poorly drained | Very poorly drained |
| Soil Hydric Status | Drained Hydric | Drained Hydric | Drained Hydric | Drained Hydric | Drained Hydric |
| Source of Hydrology | Seepage/ Precipitation | Seepage / Precipitation | Seepage/ Precipitation | Seepage / Precipitation | Seepage / Precipitation |
| Hydrologic Impairment | Ditching and Crops | Ditching and Crops | Ditching and Crops | Ditching and Crops | Ditching |
| Native vegetation community | Crops, Pasture, Wetland | Crops, Pasture, Wetland | Crops, Pasture | Crops, Pasture, Forested Wetland | Forested Wetland |

| | | | | | |
|---|---|---|---|---|---|
| Percent composition of exotic invasive vegetation | 0% | 0% | 0% | 0% | |

| **Project Information continued - Norman's II Restoration Site Restoration Site** | | | |
|---|---|---|---|
| **Regulatory Considerations** | | | |
| **Regulation** | **Applicable?** | **Resolved?** | **Supporting Documentation** |
| Waters of the United States – Section 404 | Yes | Yes | Jurisdictional Determination |
| Waters of the United States – Section 401 | Yes | Yes | Jurisdictional Determination |
| Endangered Species Act** | No | N/A | N/A |
| Historic Preservation Act** | No | N/A | N/A |
| Coastal Zone Management Act ** (CZMA)/ Coastal Area Management Act (CAMA) | No | N/A | N/A |
| FEMA Floodplain Compliance | Yes | Yes | FEMA Floodplain Checklist |
| Essential Fisheries Habitat** | No | N/A | N/A |

# Appendix B

# Visual Assessment Data

MATCHLINE - SEE SHEET 2

PP6
PP7
NPII-17
VP8
1133/728
VP31
688/647
NPII-11
VP10
3157/445
PP9
VP13
567/486
NPI-1
VP14
405/283
VP11
1295/1052
NPII-12
CORNWALLIS ROAD
VP12
688/526
NPII-13
SEEP ENHANCEMENT
NPI-C2
NPI-C1
VP26
688/647
VP27
2023/769
PP10
NPI-9
VP29
890/647
NPI-4
VP24
1133/890
VP30
405/405
NPI-3
VP22
445/445
PP8
VP15
1093/1093
VP19
1538/1538
VP25
1133/809
PP11
VP23
1133/931
VP28
1093/445
NPI-2
NPI-8
PP12
VP20
1093/1093
NPI-6
VP16
1497/1497
VP17
1416/1376
NPI-7
NPI-5
VP21
1214/1012
STABILIZED DRAINAGE OUTFALL
VP18
850/688
STEWARTS CREEK

NC GRID NAD 83

–80 –40 0 80 160
GRAPHIC SCALE

| | WETLAND REESTABLISHMENT (1:1) | WETLAND REHABILITATION (1.5:1) | WETLAND PRESERVATION (NO CREDIT) | STREAM ENHANCEMENT II (2.5:1) |
|---|---|---|---|---|
| NORMAN'S PASTURE CREDITS | 15.5 AC./ 15.5 CR. | 0.7 AC./ 0.5 CR. | 9.0 AC./ 0 CR. | – |
| NORMAN'S PASTURE II CREDITS | 8.8 AC./ 8.8 CR. | 1.4 AC./ 0.9 CR. | 0.8 AC./ 0 CR. | 843 L.F./ 337 CR. |

## LEGEND:

- VEG PLOT ACHIEVING DENSITY CRITERION
- VEG PLOT BELOW DENSITY CRITERION
- VEG PLOT TOTAL / PLANTED STEM DENSITY ····· 1040/778
- WETLAND GAUGE ACHIEVING HYDROLOGIC CRITERION
- WETLAND GAUGE BELOW HYDROLOGIC CRITERION
- PHOTO POINT
- FILLED DITCHES
- CONSERVATION EASEMENT (NORMANS I)
- CONSERVATION EASEMENT (NORMANS II)
- STREAM ENHANCEMENT II
- WETLAND REESTABLISHMENT
- WETLAND REHABILITATION
- WETLAND PRESERVATION
- HEADWATER FOREST COMMUNITY
- RIVERINE SWAMP FOREST

| DATE | REVISIONS |
|---|---|

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD
RALEIGH, NORTH CAROLINA 27609

NORMAN'S PASTURE & NORMAN'S PASTURE II RESTORATION SITES

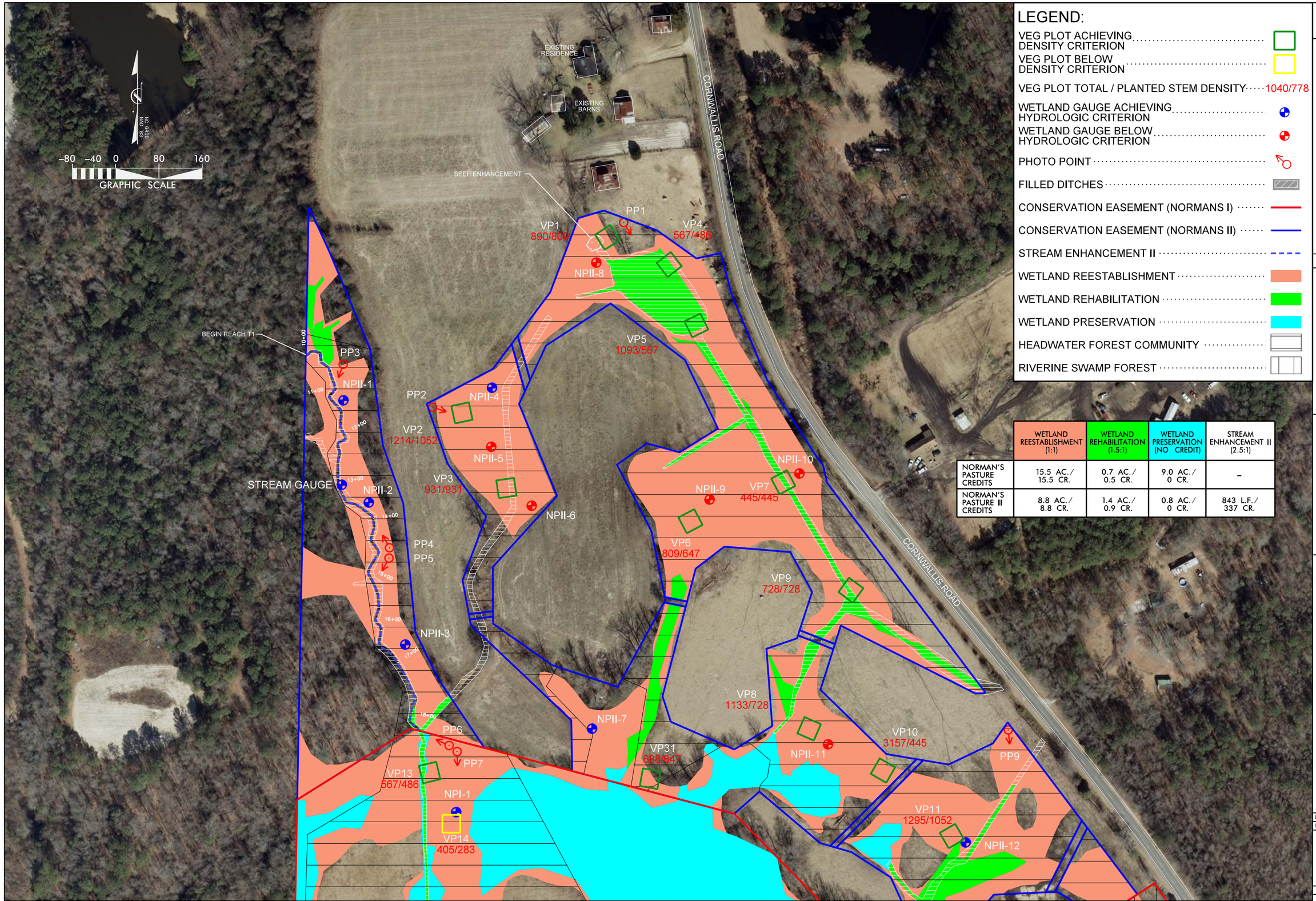
SAMPSON COUNTY, NORTH CAROLINA

MONITORING YEAR 01

DATE: DEC 2016
SCALE: GRAPHIC

CURRENT CONDITION PLAN VIEW

SHEET 1 OF 2




## LEGEND:

- VEG PLOT ACHIEVING DENSITY CRITERION
- VEG PLOT BELOW DENSITY CRITERION
- VEG PLOT TOTAL / PLANTED STEM DENSITY ····· 1040/778
- WETLAND GAUGE ACHIEVING HYDROLOGIC CRITERION
- WETLAND GAUGE BELOW HYDROLOGIC CRITERION
- PHOTO POINT
- FILLED DITCHES
- CONSERVATION EASEMENT (NORMANS I)
- CONSERVATION EASEMENT (NORMANS II)
- STREAM ENHANCEMENT II
- WETLAND REESTABLISHMENT
- WETLAND REHABILITATION
- WETLAND PRESERVATION
- HEADWATER FOREST COMMUNITY
- RIVERINE SWAMP FOREST

| | WETLAND REESTABLISHMENT (1:1) | WETLAND REHABILITATION (1.5:1) | WETLAND PRESERVATION (NO CREDIT) | STREAM ENHANCEMENT II (2.5:1) |
|---|---|---|---|---|
| NORMAN'S PASTURE CREDITS | 15.5 AC. / 15.5 CR. | 0.7 AC. / 0.5 CR. | 9.0 AC. / 0 CR. | – |
| NORMAN'S PASTURE II CREDITS | 8.8 AC. / 8.8 CR. | 1.4 AC. / 0.9 CR. | 0.8 AC. / 0 CR. | 843 L.F. / 337 CR. |

DATE

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# NORMAN'S PASTURE & NORMAN'S PASTURE II RESTORATION SITES

SAMPSON COUNTY, NORTH CAROLINA

MONITORING YEAR 01

DATE: DEC 2016

SCALE: GRAPHIC

CURRENT CONDITION PLAN VIEW

**Table 5a. Vegetation Condition Assessment**
**Norman's Pasture Restoration Site, DMS Project #95717**

**Planted Acreage 36.92** **Easement Acreage 36.92**

| Vegetation Category | Definitions | Mapping Threshold | CCPV Depiction | Number of Polygons | Combined Acreage | % of Planted Acreage |
|---|---|---|---|---|---|---|
| **1. Bare Areas** | Very limited cover of both woody and herbaceous material. | 0.1 acre | Pattern and Color | 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 acre | Pattern and Color | 0 | 0.00 | 0.0% |
| | | | **Total** | 0 | 0.00 | 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 acre | Pattern and Color | 0 | 0.00 | 0.0% |
| | | | **Cumulative Total** | 0 | 0.00 | 0.0% |
| | | | | | | |
| **4. Invasive Areas of Concern** | Areas or points (if too small to render as polygons at map scale). | 1,000 SF | Pattern and Color | 0 | 0.00 | 0.0% |
| | | | | | | |
| **5. Easement Encroachment Areas** | Areas or points (if too small to render as polygons at map scale). | none | Pattern and Color | 0 | 0.00 | 0.0% |

**Table 5b. Vegetation Condition Assessment**
**Norman's Pasture II Restoration Site, DMS Project #96310**

**Planted Acreage 16.3** **Easement Acreage 16.3**

| Vegetation Category | Definitions | Mapping Threshold | CCPV Depiction | Number of Polygons | Combined Acreage | % of Planted Acreage |
|---|---|---|---|---|---|---|
| **1. Bare Areas** | Very limited cover of both woody and herbaceous material. | 0.1 acre | Pattern and Color | 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 acre | Pattern and Color | 0 | 0.00 | 0.0% |
| | | | **Total** | 0 | 0.00 | 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 acre | Pattern and Color | 0 | 0.00 | 0.0% |
| | | | **Cumulative Total** | 0 | 0.00 | 0.0% |
| | | | | | | |
| **4. Invasive Areas of Concern** | Areas or points (if too small to render as polygons at map scale). | 1,000 SF | Pattern and Color | 0 | 0.00 | 0.0% |
| | | | | | | |
| **5. Easement Encroachment Areas** | Areas or points (if too small to render as polygons at map scale). | none | Pattern and Color | 0 | 0.00 | 0.0% |

# Vegetation Monitoring Plot Photos

Plot 1 – MY-01 – 10/26/16

Plot 2 – MY-01 – 10/26/16

Plot 3 – MY-01 – 10/26/16

Plot 4 – MY-01 – 10/26/16

Plot 5 – MY-01 – 10/26/16

Plot 6 – MY-01 – 10/26/16

Plot 7 – MY-01 – 10/26/16

Plot 8 – MY-01 – 10/26/16

Plot 9 – MY-01 – 10/26/16

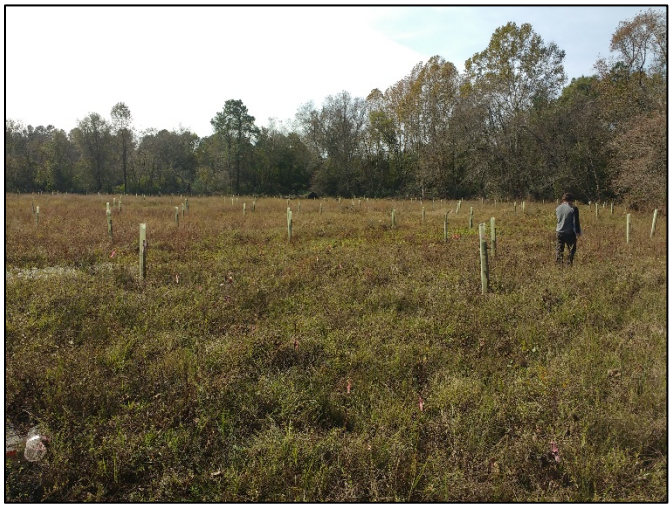
Plot 10 – MY-01 – 10/27/16

Plot 11 – MY-01 – 10/27/16

Plot 12 – MY-01 – 10/27/16

Plot 13 – MY-01 – 10/26/16

Plot 14 – MY-01 – 10/26/16



Plot 15 – MY-01 – 11/01/16

Plot 16 – MY-01 – 11/01/16

Plot 17 – MY-01 – 11/01/16

Plot 18 – MY-01 – 11/01/16

Plot 19 – MY-01 – 11/01/16

Plot 20 – MY-01 – 10/27/16

Plot 21 – MY-01 – 10/27/16

Plot 22 – MY-01 – 11/01/16

Plot 23 – MY-01 – 10/27/16

Plot 24 – MY-01 – 10/27/16

Plot 25 – MY-01 – 10/27/16

Plot 26 – MY-01 – 11/01/16

Plot 27 – MY-01 – 11/01/16

Plot 28 – MY-01 – 10/27/16

Plot 29 – MY-01 – 10/27/16

Plot 30 – MY-01 – 10/27/16

Plot 31 – MY-01 – 10/26/16

# Photo Reference Points

PP01 – MY-00 – 4/15/16

PP01 – MY-01 – 8/16/2016

PP02 – MY-00 – 4/15/16

PP02 – MY-01 – 8/16/2016

PP03 – MY-00 – 4/15/16

PP03 – MY-01 – 8/16/2016

PP04 – MY-00 – 4/15/16

PP04 – MY-01 – 8/16/2016

PP05 – MY-00 – 4/15/16

PP05 – MY-01 – 8/16/2016

PP06 – MY-00 – 4/15/16

PP06 – MY-01 – 8/16/2016

PP07 – MY-00 – 4/15/16

PP07 – MY-01 – 8/16/2016

PP08 – MY-00 – 4/15/16

PP08 – MY-01 – 8/16/2016

PP09 – MY-00 – 4/15/16

PP09 – MY-01 – 8/16/2016

PP10 – MY-00 – 4/15/16

PP10 – MY-01 – 8/16/2016

PP11 – MY-00 – 4/15/16

PP11 – MY-01 – 8/16/2016

PP12 – MY-00 – 4/15/16

PP12 – MY-01 – 8/16/2016

# Appendix C

# Vegetation Plot Data

| Table 6. Vegetation Plot Criteria Attainment<br>Norman's Pasture & Norman's Pasture II Restoration Sites | | | | |
|---|---|---|---|---|
| **Vegetation Plot ID** | **Location** | **Vegetation Survival Threshold Met?** | **Monitoring Year 01 Planted Stem Density (stems/acre)** | **Monitoring Year 01 Total Stem Density (stems/acre)** |
| 1 | NPII | Yes | 809 | 890 |
| 2 | NPII | Yes | 1,052 | 1,214 |
| 3 | NPII | Yes | 931 | 931 |
| 4 | NPII | Yes | 486 | 567 |
| 5 | NPII | Yes | 567 | 1,093 |
| 6 | NPII | Yes | 647 | 809 |
| 7 | NPII | Yes | 445 | 445 |
| 8 | NPII | Yes | 728 | 1,133 |
| 9 | NPII | Yes | 728 | 728 |
| 10 | NPII | Yes | 445 | 3,157 |
| 11 | NPII | Yes | 1,052 | 1,295 |
| 12 | NPII | Yes | 526 | 688 |
| 13 | NPRS | Yes | 486 | 567 |
| 14 | NPRS | No | 283 | 405 |
| 15 | NPRS | Yes | 1,093 | 1,093 |
| 16 | NPRS | Yes | 1,497 | 1,497 |
| 17 | NPRS | Yes | 1,376 | 1,416 |
| 18 | NPRS | Yes | 688 | 850 |
| 19 | NPRS | Yes | 1,538 | 1,538 |
| 20 | NPRS | Yes | 1,093 | 1,093 |
| 21 | NPRS | Yes | 1,012 | 1,214 |
| 22 | NPRS | Yes | 445 | 445 |
| 23 | NPRS | Yes | 931 | 1,133 |
| 24 | NPRS | Yes | 890 | 1,133 |
| 25 | NPRS | Yes | 809 | 1,133 |
| 26 | NPRS | Yes | 647 | 688 |
| 27 | NPRS | Yes | 445 | 2,023 |
| 28 | NPRS | Yes | 769 | 1,093 |
| 29 | NPRS | Yes | 647 | 890 |
| 30 | NPRS | Yes | 405 | 405 |
| 31 | NPII | Yes | 647 | 688 |

| Table 7. CVS Vegetation Plot Metadata | |
|---|---|
| **Norman's Pasture & Norman's Pasture II Restoration Sites** | |
| **Report Prepared By** | Randall Jones |
| **Date Prepared** | 12/29/2016 11:44 |
| | |
| | |
| **database name** | KCI-2016-Normans.mdb |
| **database location** | M:\2012\20122925 Norman's Pasture FDP\Monitoring\Veg database |
| **computer name** | 44-8PQ3J72 |
| **file size** | 50855936 |
| | |
| | |
| **DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------** | |
| **Metadata** | Description of database file, the report worksheets, and a summary of project(s) and project data. |
| **Proj, planted** | Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes. |
| **Proj, total stems** | Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems. |
| **Plots** | List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.). |
| **Vigor** | Frequency distribution of vigor classes for stems for all plots. |
| **Vigor by Spp** | Frequency distribution of vigor classes listed by species. |
| **Damage** | List of most frequent damage classes with number of occurrences and percent of total stems impacted by each. |
| **Damage by Spp** | Damage values tallied by type for each species. |
| **Damage by Plot** | Damage values tallied by type for each plot. |
| **Planted Stems by Plot and Spp** | A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded. |
| **ALL Stems by Plot and spp** | A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded. |
| | |
| **PROJECT SUMMARY----------** | |
| **Project Code** | 95717 |
| **project Name** | Norman's Pasture |
| **Description** | wetland restoration site |
| **River Basin** | Cape Fear |

| Table 8. CVS Stem Count Total and Planted by Plot and Species, Norman's Pasture and Norman's Pasture II Restoration Sites | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DMS Project #: 95717/96310 | | | Current Plot Data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 95717-01-0001 | | | 95717-01-0002 | | | 95717-01-0003 | | | 95717-01-0004 | | | 95717-01-0005 | | | 95717-01-0006 | | | 95717-01-0007 | | | 95717-01-0008 | | | 95717-01-0009 | | | 95717-01-0010 | | |
| | | | NPII | | | NPII | | | NPII | | | NPII | | | NPII | | | NPII | | | NPII | | | NPII | | | NPII | | | NPII | | |
| Scientific Name | Common Name | Species Type | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T |
| Acer rubrum | red maple | Tree | | | | | | 1 | | | | | | 1 | | | 11 | | | | | | | | | 5 | | | | | | 60 |
| Alnus serrulata | tag alder | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Baccharis | baccharis | Shrub | | | | | | | | | | | | 1 | | | 1 | | | | | | | | | | | | | | | |
| Betula nigra | river birch | Tree | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 5 | 5 | 5 | 8 | 8 | 8 | 2 | 2 | 2 | 2 | 2 | 2 | | | | 1 | 1 | 1 |
| Cephalanthus occidentalis | common buttonbush | Shrub | 1 | 1 | 1 | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | |
| Cornus amomum | silky dogwood | Shrub | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| Corylus americana | American hazelnut | Shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Crataegus | hawthorn | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fraxinus pennsylvanica | green ash | Tree | 3 | 3 | 3 | 3 | 3 | 3 | 5 | 5 | 5 | | | | | | | | | | 3 | 3 | 3 | | | | 4 | 4 | 4 | 2 | 2 | 3 |
| Juglans nigra | black walnut | Tree | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 2 | | | | | | 1 |
| Liquidambar styraciflua | sweetgum | Tree | | | | | | | | | | | | | | | | | | 4 | | | | | | 4 | | | | | | 4 |
| Liriodendron tulipifera | tuliptree | Tree | 3 | 3 | 3 | 1 | 1 | 3 | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | 1 | 1 | 1 | 4 | 4 | 4 | | | |
| Myrica | sweetgale | shrub | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| Nyssa aquatica | water tupelo | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nyssa biflora | swamp tupelo | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prunus serotina | black cherry | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Quercus laurifolia | laurel oak | Tree | 3 | 3 | 3 | 5 | 5 | 5 | 1 | 1 | 1 | | | | 1 | 1 | 1 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 4 | 4 | 4 |
| Quercus lyrata | overcup oak | Tree | 5 | 5 | 5 | 6 | 6 | 6 | 4 | 4 | 4 | 1 | 1 | 1 | 3 | 3 | 3 | 1 | 1 | 1 | | | | 4 | 4 | 4 | 2 | 2 | 2 | 1 | 1 | 1 |
| Quercus michauxii | swamp chestnut oak | Tree | 1 | 1 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 7 | 7 | 7 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 5 | 5 | 5 | 1 | 1 | 1 | | | |
| Quercus minima | dwarf live oak | Shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Quercus phellos | willow oak | Tree | | | | 1 | 1 | 1 | | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | |
| Rhus copallinum | flameleaf sumac | shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Salix nigra | black willow | Tree | | | 2 | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | |
| Taxodium distichum | bald cypress | Tree | 2 | 2 | 2 | 4 | 4 | 4 | 8 | 8 | 8 | | | | 1 | 1 | 1 | | | | 2 | 2 | 2 | 2 | 2 | 2 | 5 | 5 | 5 | 2 | 2 | 2 |
| Ulmus americana | American elm | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unknown | | Shrub or Tree | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | | | | | | | | 1 | 1 | 1 |
| **Stem count** | | | 20 | 20 | 22 | 26 | 26 | 30 | 23 | 23 | 23 | 12 | 12 | 14 | 14 | 14 | 27 | 16 | 16 | 20 | 11 | 11 | 11 | 18 | 18 | 28 | 18 | 18 | 18 | 11 | 11 | 78 |
| **size (ares)** | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | |
| **size (ACRES)** | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | |
| **Species count** | | | 8 | 8 | 9 | 9 | 9 | 11 | 6 | 6 | 6 | 4 | 4 | 6 | 8 | 8 | 11 | 6 | 6 | 7 | 5 | 5 | 5 | 7 | 7 | 9 | 6 | 6 | 6 | 6 | 6 | 10 |
| **Stems per ACRE** | | | 809 | 809 | 890 | 1052 | 1052 | 1214 | 931 | 931 | 931 | 486 | 486 | 567 | 567 | 567 | 1093 | 647 | 647 | 809 | 445 | 445 | 445 | 728 | 728 | 1133 | 728 | 728 | 728 | 445 | 445 | 3157 |

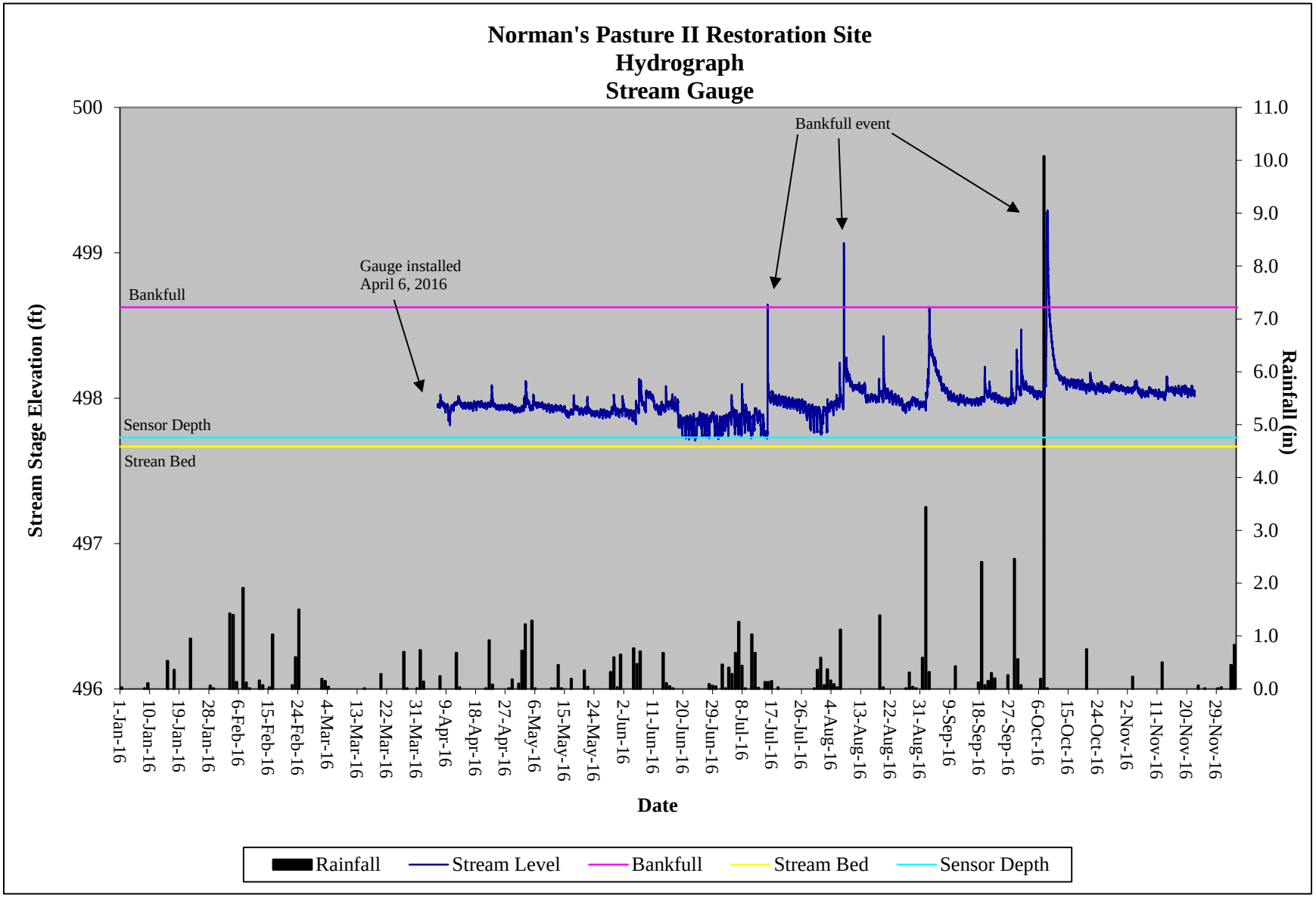
| Table 8. CVS Stem Count Total and Planted by Plot and Species, Norman's Pasture and Norman's Pasture II Restoration Sites | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DMS Project #: 95717/96310 | | | Current Plot Data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 95717-01-0011 | | | 95717-01-0012 | | | 95717-01-0013 | | | 95717-01-0014 | | | 95717-01-0015 | | | 95717-01-0016 | | | 95717-01-0017 | | | 95717-01-0018 | | | 95717-01-0019 | | | 95717-01-0020 | | |
| | | | NPII | | | NPII | | | NPRS | | | NPRS | | | NPRS | | | NPRS | | | NPRS | | | NPRS | | | NPRS | | | NPRS | | |
| Scientific Name | Common Name | Species Type | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T |
| Acer rubrum | red maple | Tree | | | 1 | | | 4 | | | 1 | | | 2 | | | | | | | | | | | | 1 | | | 2 | | | | |
| Alnus serrulata | tag alder | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Baccharis | baccharis | Shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Betula nigra | river birch | Tree | 3 | 3 | 3 | | | | 1 | 1 | 1 | | | | 2 | 2 | 2 | | | | | | | 2 | 2 | 2 | 3 | 3 | 3 | | | | |
| Cephalanthus occidentalis | common buttonbush | Shrub | 1 | 1 | 1 | | | | 2 | 2 | 2 | | | | 2 | 2 | 2 | | | | 5 | 5 | 5 | | | | | | | | | | |
| Cornus amomum | silky dogwood | Shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Corylus americana | American hazelnut | Shrub | 4 | 4 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Crataegus | hawthorn | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fraxinus pennsylvanica | green ash | Tree | 4 | 4 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | | | | | | | | | | | | | | | | | | | | | | |
| Juglans nigra | black walnut | Tree | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Liquidambar styraciflua | sweetgum | Tree | | | | | | | | | 1 | | | 1 | | | | | | | | | | | | 2 | | | | | | | |
| Liriodendron tulipifera | tuliptree | Tree | 2 | 2 | 2 | | | | 2 | 2 | 2 | | | | | | | | | | | | | | | | | | | | | | |
| Myrica | sweetgale | shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nyssa aquatica | water tupelo | Tree | | | | | | | | | | | | | 13 | 13 | 13 | 5 | 5 | 5 | 13 | 13 | 13 | 6 | 6 | 6 | 16 | 16 | 16 | 11 | 11 | 11 | |
| Nyssa biflora | swamp tupelo | Tree | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Prunus serotina | black cherry | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Quercus laurifolia | laurel oak | Tree | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | | | | 5 | 5 | 5 | | | | | | | 2 | 2 | 2 | | | | | | | |
| Quercus lyrata | overcup oak | Tree | 2 | 2 | 2 | | | | | | | | | | 2 | 2 | 2 | | | | 1 | 1 | 1 | 3 | 3 | 3 | | | | 3 | 3 | 3 | |
| Quercus michauxii | swamp chestnut oak | Tree | 3 | 3 | 3 | | | | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 2 | | | | 1 | 1 | 1 | | | | 10 | 10 | 10 | 4 | 4 | 4 | |
| Quercus minima | dwarf live oak | Shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Quercus phellos | willow oak | Tree | | | | | | | | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | |
| Rhus copallinum | flameleaf sumac | shrub | | | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Salix nigra | black willow | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Taxodium distichum | bald cypress | Tree | | | | 9 | 9 | 9 | | | | 6 | 6 | 6 | | | | 32 | 32 | 32 | 14 | 14 | 14 | | | | 9 | 9 | 9 | 9 | 9 | 9 | |
| Ulmus americana | American elm | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Unknown | | Shrub or Tree | 2 | 2 | 2 | | | | 1 | 1 | 1 | | | | | | | | | | | | | 4 | 4 | 4 | | | | | | | |
| **Stem count** | | | 26 | 26 | 32 | 13 | 13 | 17 | 12 | 12 | 14 | 7 | 7 | 10 | 27 | 27 | 27 | 37 | 37 | 37 | 34 | 34 | 35 | 17 | 17 | 21 | 38 | 38 | 38 | 27 | 27 | 27 | |
| **size (ares)** | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | |
| **size (ACRES)** | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | |
| **Species count** | | | 11 | 11 | 13 | 3 | 3 | 4 | 7 | 7 | 9 | 2 | 2 | 4 | 7 | 7 | 7 | 2 | 2 | 2 | 5 | 5 | 6 | 5 | 5 | 7 | 4 | 4 | 4 | 4 | 4 | 4 | |
| **Stems per ACRE** | | | 1052 | 1052 | 1295 | 526 | 526 | 688 | 486 | 486 | 567 | 283 | 283 | 405 | 1093 | 1093 | 1093 | 1497 | 1497 | 1497 | 1376 | 1376 | 1416 | 688 | 688 | 850 | 1538 | 1538 | 1538 | 1093 | 1093 | 1093 | |

| Table 8. CVS Stem Count Total and Planted by Plot and Species, Norman's Pasture and Norman's Pasture II Restoration Sites | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DMS Project #: 95717/96310 | | | Current Plot Data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 95717-01-0021 | | | 95717-01-0022 | | | 95717-01-0023 | | | 95717-01-0024 | | | 95717-01-0025 | | | 95717-01-0026 | | | 95717-01-0027 | | | 95717-01-0028 | | | 95717-01-0029 | | | 95717-01-0030 | | |
| | | | NPRS | | | NPRS | | | NPRS | | | NPRS | | | NPRS | | | NPRS | | | NPRS | | | NPRS | | | NPRS | | | NPRS | | |
| Scientific Name | Common Name | Species Type | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T |
| Acer rubrum | red maple | Tree | | | | | | | | | | | | 1 | | | | | | | | | | | | | | 2 | | | |
| Alnus serrulata | tag alder | | | | | | | | | | | | | | | | | | | 1 | | | 3 | | | | | | | | |
| Baccharis | baccharis | Shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Betula nigra | river birch | Tree | 4 | 4 | 4 | | | | | | | | | | 1 | 1 | 1 | 4 | 4 | 4 | | | 14 | | | | 1 | 1 | 1 | | | |
| Cephalanthus occidentalis | common buttonbush | Shrub | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | | | | 2 | 2 | 2 | | | | 1 | 1 | 1 | 3 | 3 | 3 |
| Cornus amomum | silky dogwood | Shrub | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | | | | | | | |
| Corylus americana | American hazelnut | Shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Crataegus | hawthorn | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | |
| Fraxinus pennsylvanica | green ash | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Juglans nigra | black walnut | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Liquidambar styraciflua | sweetgum | Tree | | | 5 | | | | | | | | | | | | 4 | | | | | | | | 2 | | | 2 | | | | |
| Liriodendron tulipifera | tuliptree | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Myrica | sweetgale | shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nyssa aquatica | water tupelo | Tree | 1 | 1 | 1 | | | | 6 | 6 | 6 | | | | | | | 3 | 3 | 3 | | | | 3 | 3 | 3 | | | | 2 | 2 | 2 |
| Nyssa biflora | swamp tupelo | Tree | | | | | | | | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | |
| Prunus serotina | black cherry | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Quercus laurifolia | laurel oak | Tree | 5 | 5 | 5 | 1 | 1 | 1 | 1 | 1 | 1 | | | | 6 | 6 | 6 | 3 | 3 | 3 | 5 | 5 | 5 | 4 | 4 | 4 | | | | 4 | 4 | 4 |
| Quercus lyrata | overcup oak | Tree | | | | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 8 | 8 | | | | 6 | 6 | 6 | | | | 8 | 8 | 8 | | | |
| Quercus michauxii | swamp chestnut oak | Tree | 2 | 2 | 2 | | | | 1 | 1 | 1 | | | | 1 | 1 | 1 | | | | 2 | 2 | 2 | | | | | | | | | |
| Quercus minima | dwarf live oak | Shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Quercus phellos | willow oak | Tree | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rhus copallinum | flameleaf sumac | shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Salix nigra | black willow | Tree | | | | | | | | | 3 | | | 5 | | | 1 | | | | | | 14 | | | | | | | | | |
| Taxodium distichum | bald cypress | Tree | 7 | 7 | 7 | 7 | 7 | 7 | 13 | 13 | 13 | 20 | 20 | 20 | 3 | 3 | 3 | 5 | 5 | 5 | 1 | 1 | 1 | 2 | 2 | 2 | 6 | 6 | 6 | 1 | 1 | 1 |
| Ulmus americana | American elm | Tree | | | | | | | | | 2 | | | | | | 3 | | | | | | | | | | | | 1 | | | |
| Unknown | | Shrub or Tree | 5 | 5 | 5 | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 16 | | | | | | |
| **Stem count** | | | 25 | 25 | 30 | 11 | 11 | 11 | 23 | 23 | 28 | 22 | 22 | 28 | 20 | 20 | 28 | 16 | 16 | 17 | 19 | 19 | 50 | 11 | 11 | 27 | 16 | 16 | 22 | 10 | 10 | 10 |
| **size (ares)** | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | |
| **size (ACRES)** | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | |
| **Species count** | | | 7 | 7 | 8 | 4 | 4 | 4 | 6 | 6 | 8 | 3 | 3 | 5 | 6 | 6 | 9 | 5 | 5 | 6 | 7 | 7 | 10 | 4 | 4 | 5 | 4 | 4 | 8 | 4 | 4 | 4 |
| **Stems per ACRE** | | | 1012 | 1012 | 1214 | 445 | 445 | 445 | 931 | 931 | 1133 | 890 | 890 | 1133 | 809 | 809 | 1133 | 647 | 647 | 688 | 769 | 769 | 2023 | 445 | 445 | 1093 | 647 | 647 | 890 | 405 | 405 | 405 |

| Table 8. CVS Stem Count Total and Planted by Plot and Species, Norman's Pasture and Norman's Pasture II Restoration Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DMS Project #: 95717/96310 | | | Current Plot Data | | | Annual Means | | | | | | |
| | | | 95717-01-0031 | | | MY1 (2016) | | | MY0 (2016) | | | |
| | | | NPII | | | | | | | | | |
| Scientific Name | Common Name | Species Type | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | |
| Acer rubrum | red maple | Tree | | | | | | 92 | | | | |
| Alnus serrulata | tag alder | | | | | | | 4 | | | | |
| Baccharis | baccharis | Shrub | | | | | | 2 | | | | |
| Betula nigra | river birch | Tree | 1 | 1 | 1 | 47 | 47 | 61 | 42 | 42 | 42 | |
| Cephalanthus occidentalis | common buttonbush | Shrub | | | | 21 | 21 | 21 | | | | |
| Cornus amomum | silky dogwood | Shrub | | | | 2 | 2 | 2 | | | | |
| Corylus americana | American hazelnut | Shrub | | | | 4 | 4 | 4 | | | | |
| Crataegus | hawthorn | Tree | | | | | | 1 | | | | |
| Fraxinus pennsylvanica | green ash | Tree | 1 | 1 | 1 | 30 | 30 | 31 | 36 | 36 | 36 | |
| Juglans nigra | black walnut | Tree | | | 1 | 2 | 2 | 5 | | | | |
| Liquidambar styraciflua | sweetgum | Tree | | | | | | 29 | | | | |
| Liriodendron tulipifera | tuliptree | Tree | 4 | 4 | 4 | 19 | 19 | 21 | 10 | 10 | 10 | |
| Myrica | sweetgale | shrub | | | | | | 1 | | | | |
| Nyssa aquatica | water tupelo | Tree | | | | 79 | 79 | 79 | 60 | 60 | 60 | |
| Nyssa biflora | swamp tupelo | Tree | | | | 2 | 2 | 2 | | | | |
| Prunus serotina | black cherry | Tree | | | | | | 1 | | | | |
| Quercus laurifolia | laurel oak | Tree | 5 | 5 | 5 | 70 | 70 | 70 | 68 | 68 | 68 | |
| Quercus lyrata | overcup oak | Tree | 1 | 1 | 1 | 65 | 65 | 65 | 33 | 33 | 33 | |
| Quercus michauxii | swamp chestnut oak | Tree | 3 | 3 | 3 | 60 | 60 | 60 | 41 | 41 | 41 | |
| Quercus minima | dwarf live oak | Shrub | | | | | | | 1 | 1 | 1 | |
| Quercus phellos | willow oak | Tree | | | | 3 | 3 | 3 | 1 | 1 | 1 | |
| Rhus copallinum | flameleaf sumac | shrub | | | | | | 5 | | | | |
| Salix nigra | black willow | Tree | | | | | | 26 | | | | |
| Taxodium distichum | bald cypress | Tree | 1 | 1 | 1 | 171 | 171 | 171 | 169 | 169 | 169 | |
| Ulmus americana | American elm | Tree | | | | | | 6 | | | | |
| Unknown | | Shrub or Tree | | | | 21 | 21 | 35 | 213 | 213 | 213 | |
| | | **Stem count** | 16 | 16 | 17 | 596 | 596 | 797 | 674 | 674 | 674 | |
| | | **size (ares)** | 1 | | | 31 | | | 31 | | | |
| | | **size (ACRES)** | 0.02 | | | 0.77 | | | 0.77 | | | |
| | | **Species count** | 7 | 7 | 8 | 15 | 15 | 25 | 11 | 11 | 11 | |
| | | **Stems per ACRE** | 647 | 647 | 688 | 778 | 778 | 1040 | 880 | 880 | 880 | |

# Appendix D

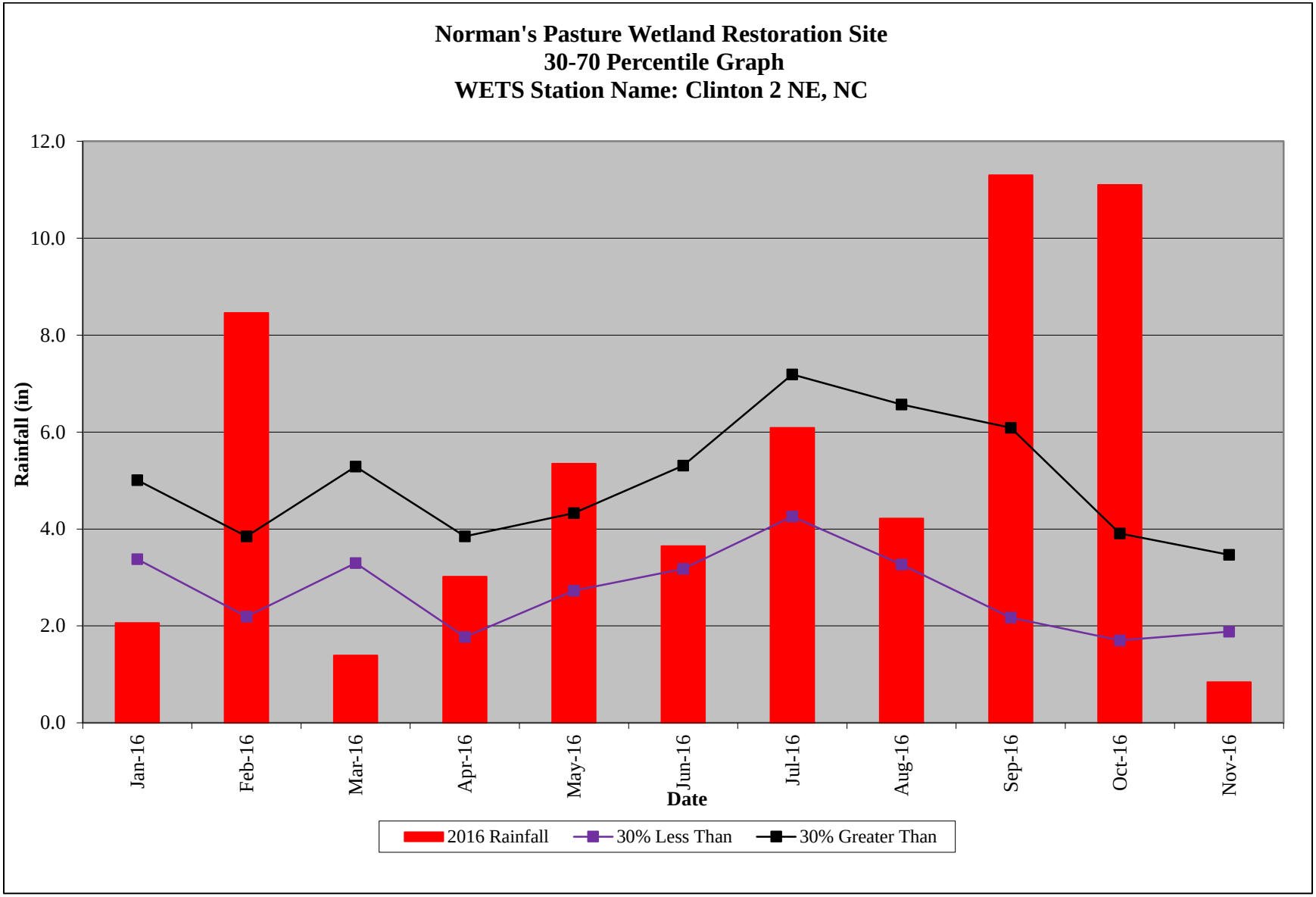
# Hydrologic Data

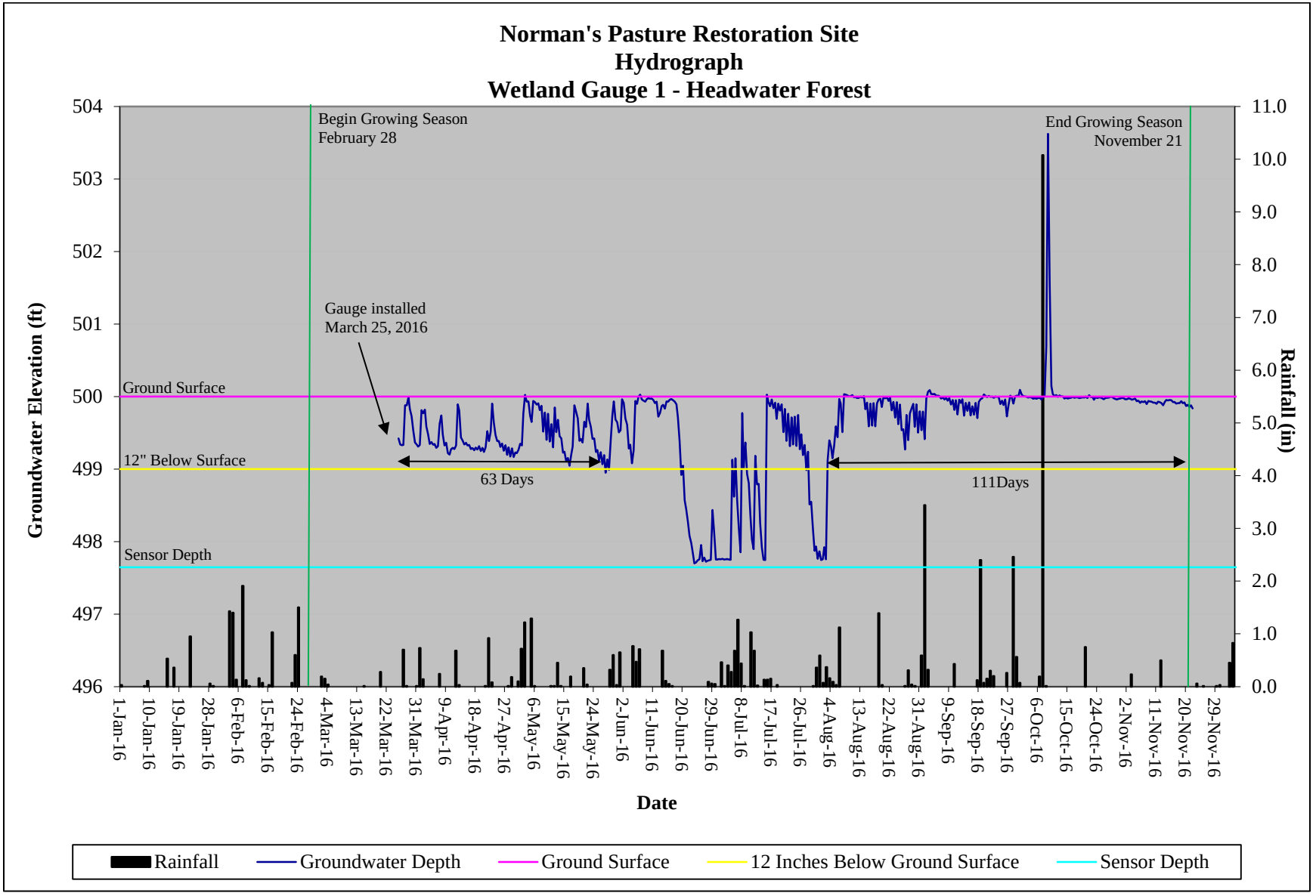

Norman's Pasture II Restoration Site
Hydrograph
Stream Gauge
Stream Stage Elevation (ft)
Rainfall (in)
Date
Bankfull event
Gauge installed
April 6, 2016
Bankfull
Sensor Depth
Strean Bed
500
499
498
497
496
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1-Jan-16
10-Jan-16
19-Jan-16
28-Jan-16
6-Feb-16
15-Feb-16
24-Feb-16
4-Mar-16
13-Mar-16
22-Mar-16
31-Mar-16
9-Apr-16
18-Apr-16
27-Apr-16
6-May-16
15-May-16
24-May-16
2-Jun-16
11-Jun-16
20-Jun-16
29-Jun-16
8-Jul-16
17-Jul-16
26-Jul-16
4-Aug-16
13-Aug-16
22-Aug-16
31-Aug-16
9-Sep-16
18-Sep-16
27-Sep-16
6-Oct-16
15-Oct-16
24-Oct-16
2-Nov-16
11-Nov-16
20-Nov-16
29-Nov-16
Rainfall
Stream Level
Bankfull
Stream Bed
Sensor Depth

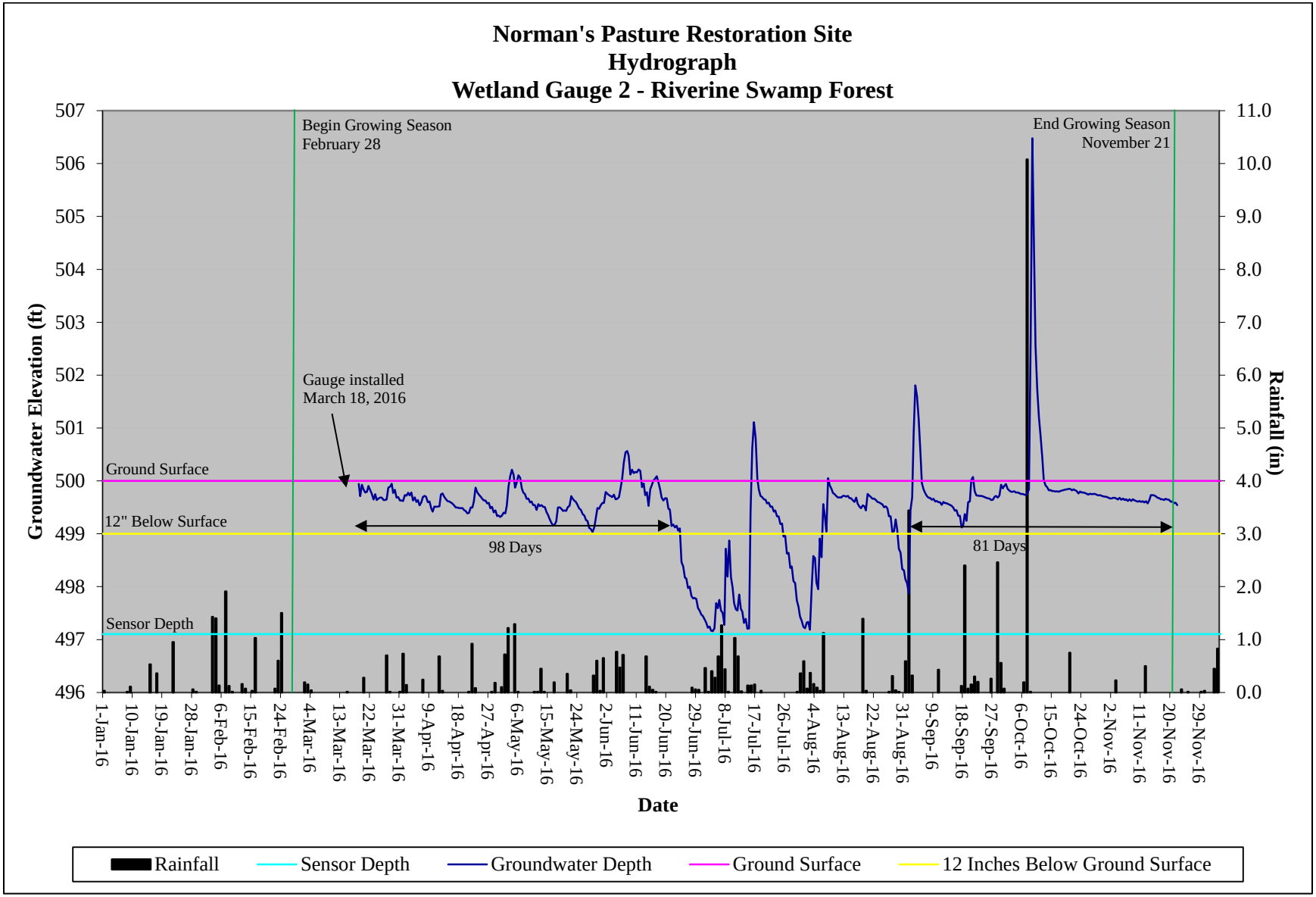
| Table 9. Verification of Bankfull Events<br>Norman's Pasture and Norman's Pasture II Restoration Sites, DMS Project Number 95717/96310 | | | |
|---|---|---|---|
| **Date of Data Collection** | **Date of Occurrence** | **Method** | **Photo Number** |
| 7/15/2016 | 7/15/2016 | On-site automatic gauge | N/A |
| 8/7/2016 | 8/7/2016 | On-site automatic gauge | N/A |
| 10/8/2016 | 10/8/2016 | On-site automatic gauge | N/A |

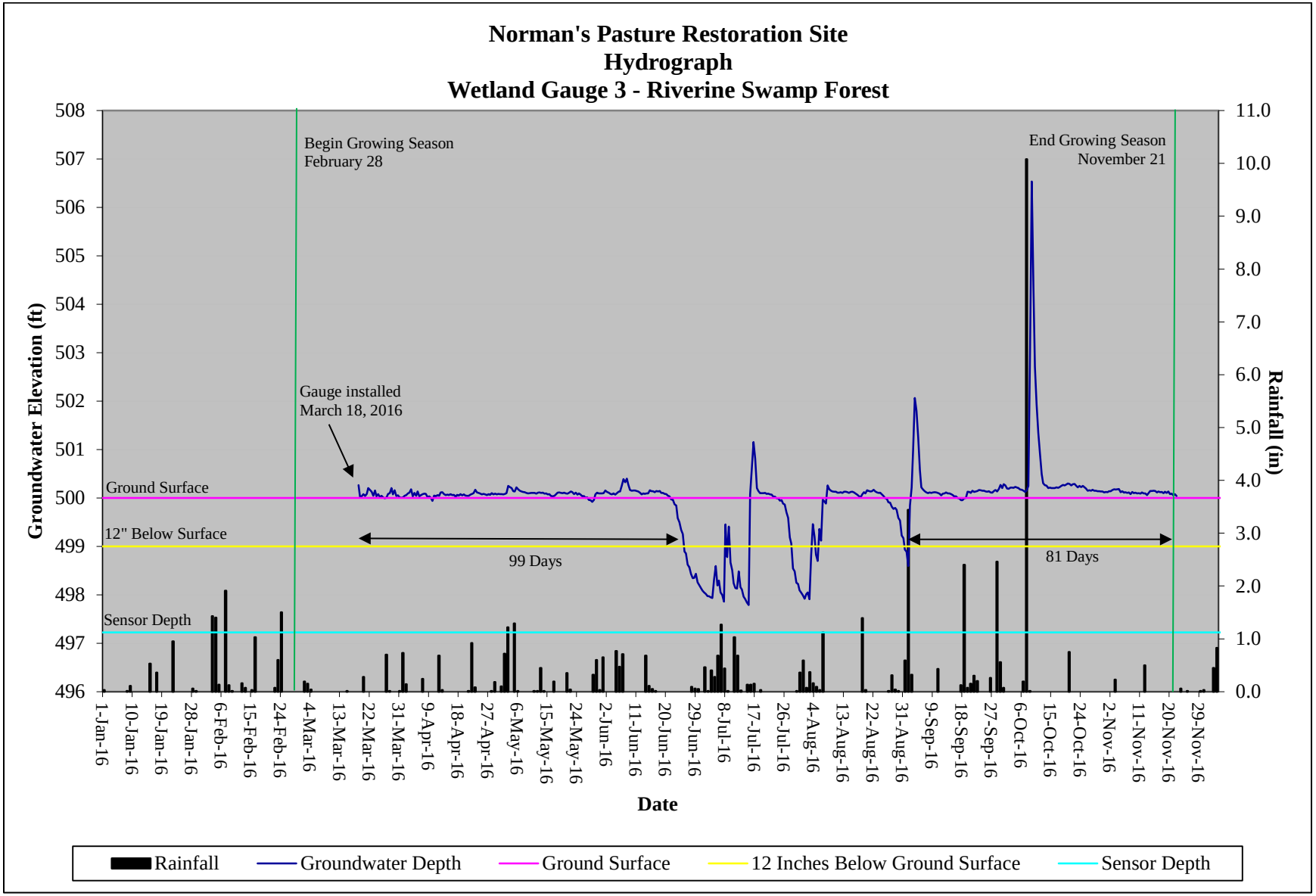
| Table 10. Wetland Hydrology Criteria Attainment<br>Norman's Pasture and Norman's Pasture II Restoration Sites, DMS Project Number 95717/96310 | | | | |
|---|---|---|---|---|
| | **Success Criteria Achieved** | **Max Consecutive Days (Success Criteria, Headwater Forest: days=9%; Riverine Swamp Forest: days=12%)** | **Actual %** | **Notes** |
| NP1 | YES | 111 | 41.6% | Headwater Forest |
| NP2 | YES | 98 | 36.7% | Riverine Swamp Forest |
| NP3 | YES | 99 | 37.1% | Riverine Swamp Forest |
| NP4 | YES | 81 | 30.3% | Riverine Swamp Forest |
| NP5 | YES | 64 | 24.0% | Riverine Swamp Forest |
| NP6 | YES | 100 | 37.5% | Riverine Swamp Forest |
| NP7 | YES | 64 | 24.0% | Riverine Swamp Forest |
| NP8 | No | 30 | 11.2% | Riverine Swamp Forest |
| NP9 | YES | 39 | 14.6% | Riverine Swamp Forest |
| NPII 1 | YES | 65 | 24.3% | Headwater Forest |
| NPII 2 | YES | 81 | 30.3% | Headwater Forest |
| NPII 3 | YES | 50 | 18.7% | Headwater Forest |
| NPII 4 | YES | 64 | 24.0% | Headwater Forest |
| NPII 5 | No | 22 | 8.2% | Headwater Forest |
| NPII 6 | No | 6 | 2.2% | Headwater Forest |
| NPII 7 | YES | 29 | 10.9% | Headwater Forest |
| NPII 8 | No | 12 | 4.5% | Headwater Forest |
| NPII 9 | No | 18 | 6.7% | Headwater Forest |
| NPII 10 | No | 18 | 6.7% | Headwater Forest |
| NPII 11 | No | 9 | 3.4% | Headwater Forest |
| NPII 12 | YES | 27 | 10.1% | Headwater Forest |
| NPII 13 | YES | 64 | 24.0% | Headwater Forest |
| NPC1* | No | 11 | 4.1% | Non-credited Creation Area |
| NPC2* | Yes | 24 | 9.0% | Non-credited Creation Area |

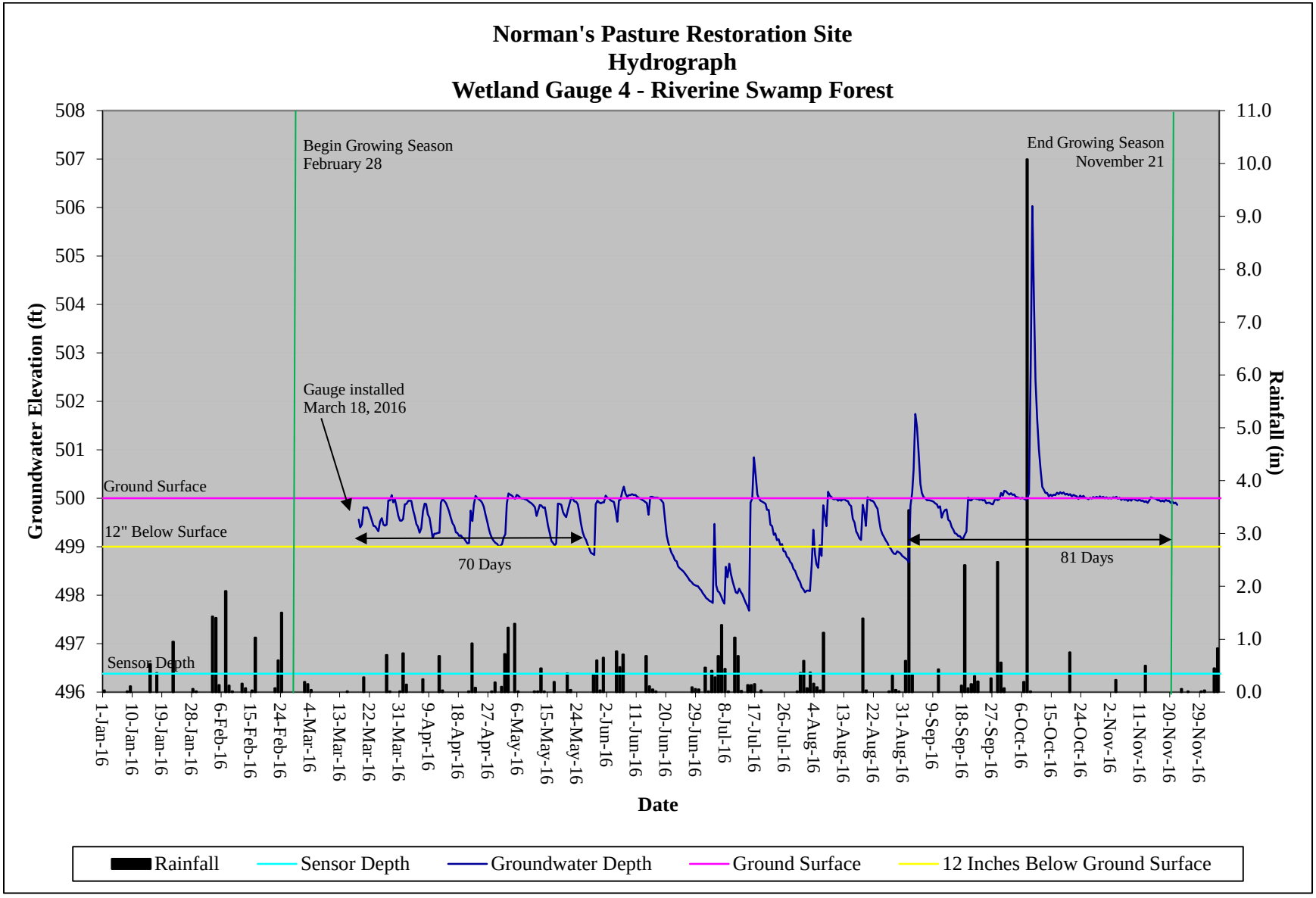
*=gauge installed October 5, 2016

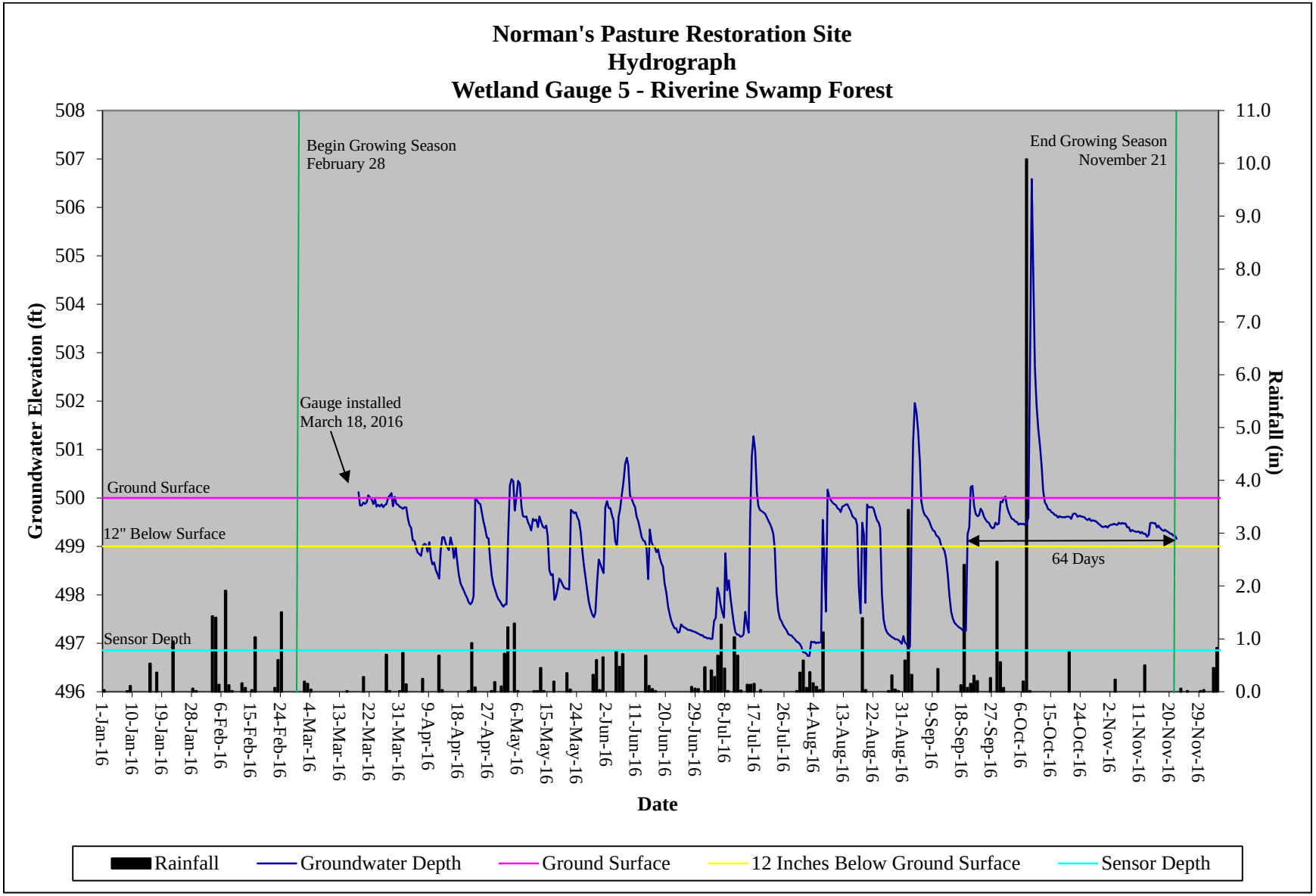

Norman's Pasture Wetland Restoration Site
30-70 Percentile Graph
WETS Station Name: Clinton 2 NE, NC
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Rainfall (in)
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Date
2016 Rainfall
30% Less Than
30% Greater Than

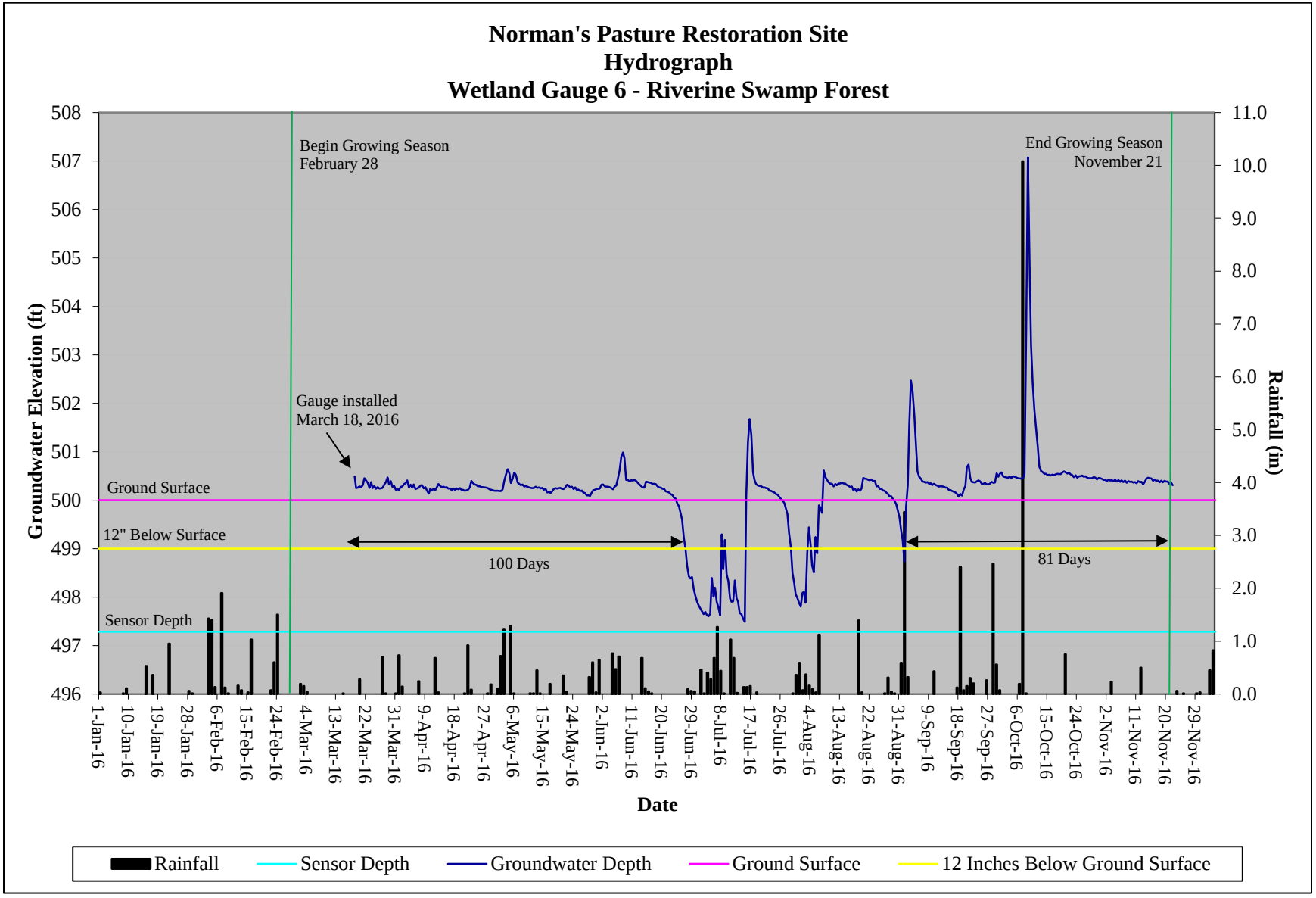

Norman's Pasture Restoration Site
Hydrograph
Wetland Gauge 1 - Headwater Forest
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 25, 2016
Ground Surface
12" Below Surface
Sensor Depth
63 Days
111Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

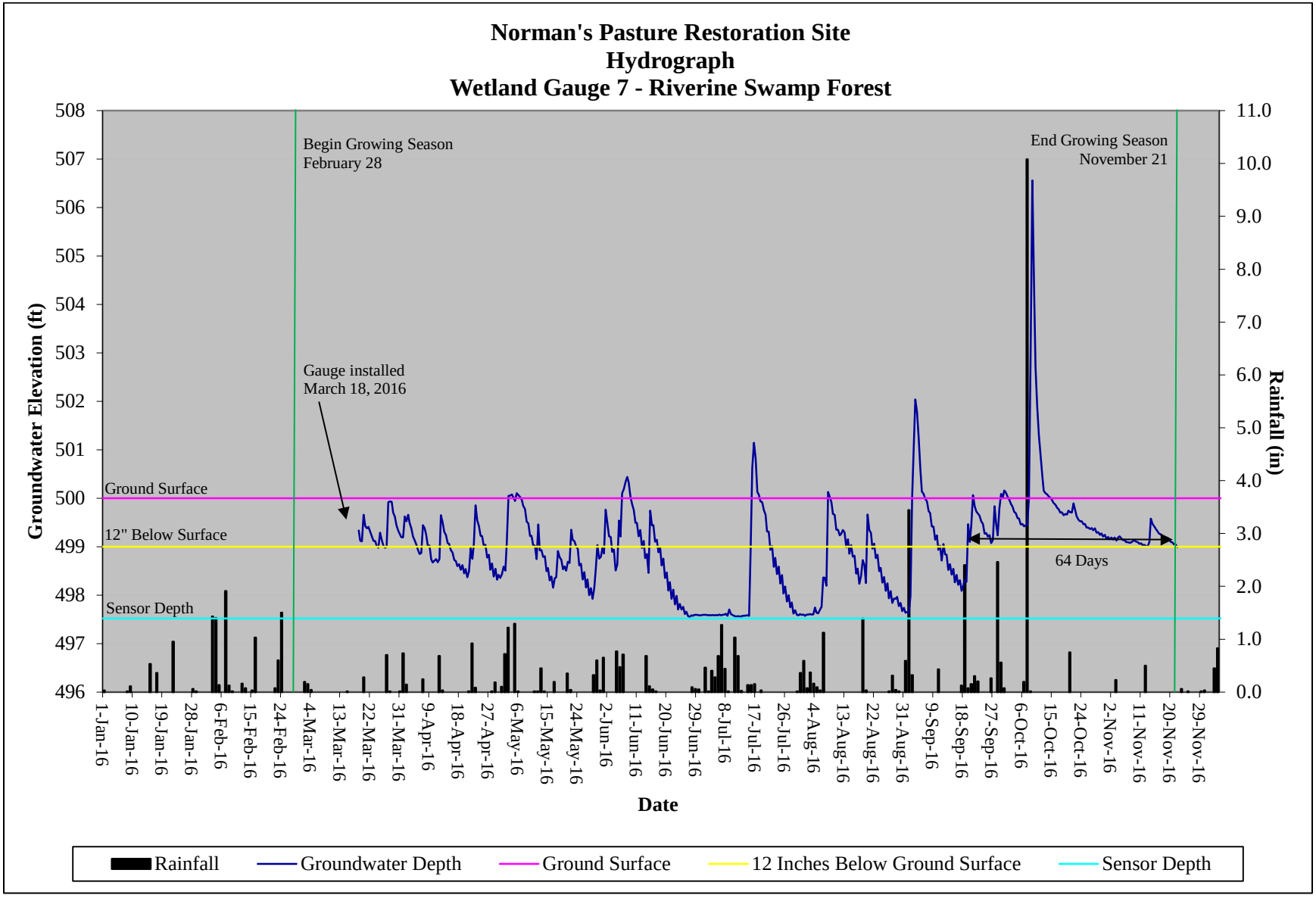

Norman's Pasture Restoration Site
Hydrograph
Wetland Gauge 2 - Riverine Swamp Forest
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 18, 2016
Ground Surface
12" Below Surface
Sensor Depth
98 Days
81 Days
507
506
505
504
503
502
501
500
499
498
497
496
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1-Jan-16
10-Jan-16
19-Jan-16
28-Jan-16
6-Feb-16
15-Feb-16
24-Feb-16
4-Mar-16
13-Mar-16
22-Mar-16
31-Mar-16
9-Apr-16
18-Apr-16
27-Apr-16
6-May-16
15-May-16
24-May-16
2-Jun-16
11-Jun-16
20-Jun-16
29-Jun-16
8-Jul-16
17-Jul-16
26-Jul-16
4-Aug-16
13-Aug-16
22-Aug-16
31-Aug-16
9-Sep-16
18-Sep-16
27-Sep-16
6-Oct-16
15-Oct-16
24-Oct-16
2-Nov-16
11-Nov-16
20-Nov-16
29-Nov-16
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface

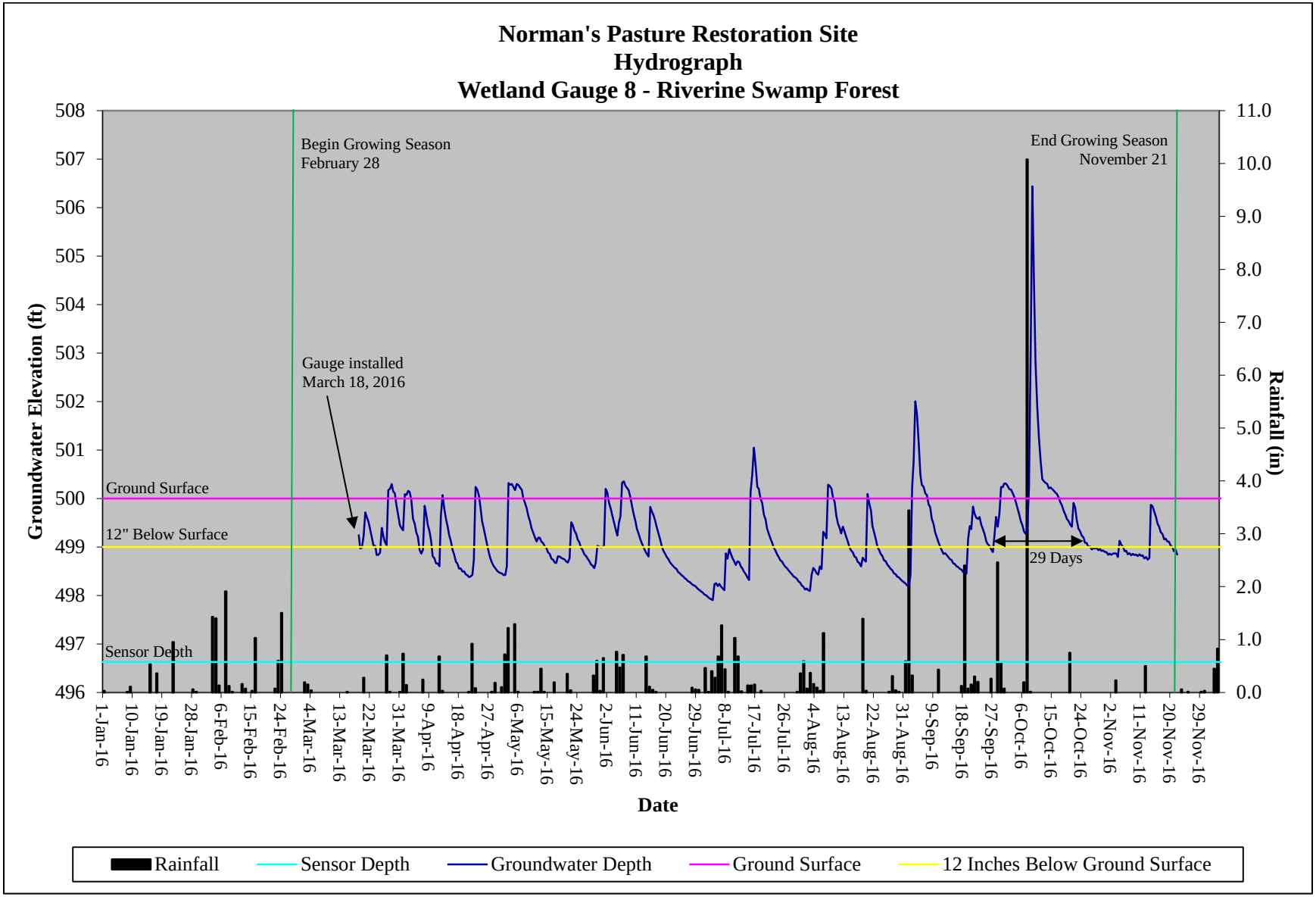

Norman's Pasture Restoration Site
Hydrograph
Wetland Gauge 3 - Riverine Swamp Forest
Groundwater Elevation (ft)
Rainfall (in)
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 18, 2016
Ground Surface
12" Below Surface
Sensor Depth
99 Days
81 Days
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

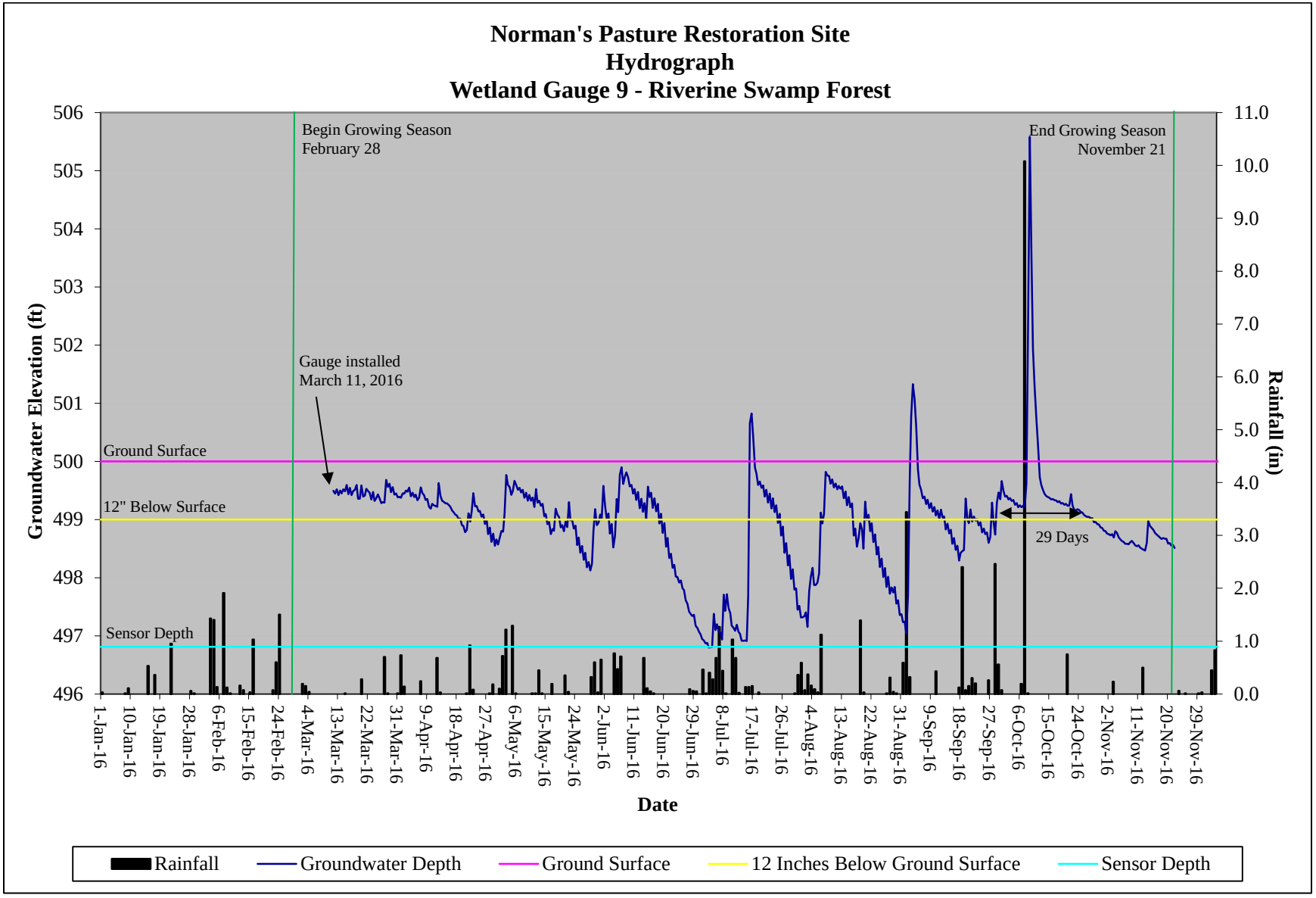

Norman's Pasture Restoration Site
Hydrograph
Wetland Gauge 4 - Riverine Swamp Forest
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 18, 2016
Ground Surface
12" Below Surface
Sensor Depth
70 Days
81 Days
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface


Norman's Pasture Restoration Site
Hydrograph
Wetland Gauge 5 - Riverine Swamp Forest
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 18, 2016
Ground Surface
12" Below Surface
Sensor Depth
64 Days
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Norman's Pasture Restoration Site
Hydrograph
Wetland Gauge 6 - Riverine Swamp Forest
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 18, 2016
Ground Surface
12" Below Surface
Sensor Depth
100 Days
81 Days
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface


Norman's Pasture Restoration Site
Hydrograph
Wetland Gauge 7 - Riverine Swamp Forest
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 18, 2016
Ground Surface
12" Below Surface
Sensor Depth
64 Days
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Norman's Pasture Restoration Site
Hydrograph
Wetland Gauge 8 - Riverine Swamp Forest
Groundwater Elevation (ft)
Rainfall (in)
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 18, 2016
Ground Surface
12" Below Surface
Sensor Depth
29 Days
Date
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface


Norman's Pasture Restoration Site
Hydrograph
Wetland Gauge 9 - Riverine Swamp Forest
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 11, 2016
Ground Surface
12" Below Surface
Sensor Depth
29 Days
506
505
504
503
502
501
500
499
498
497
496
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
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28-Jan-16
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24-May-16
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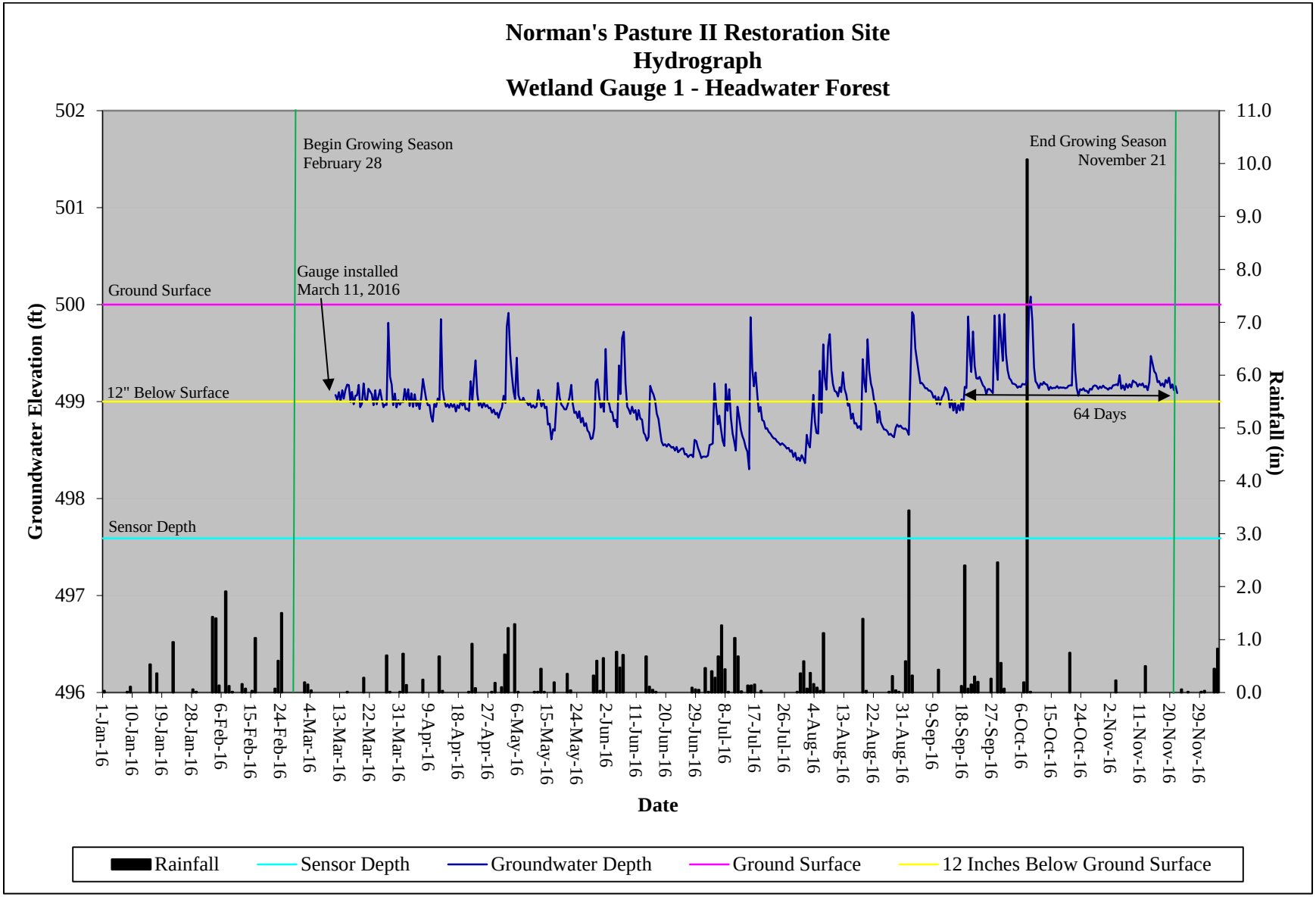
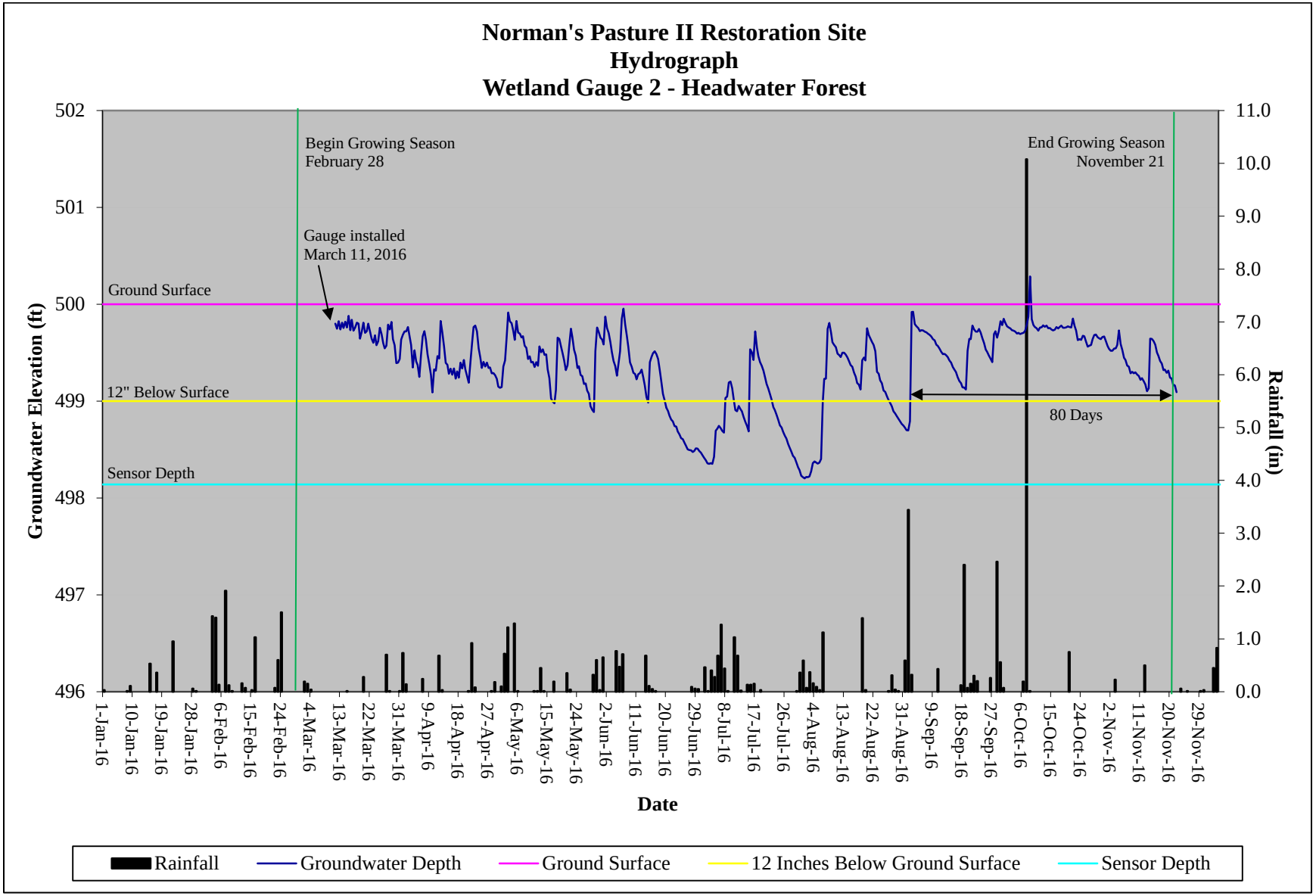
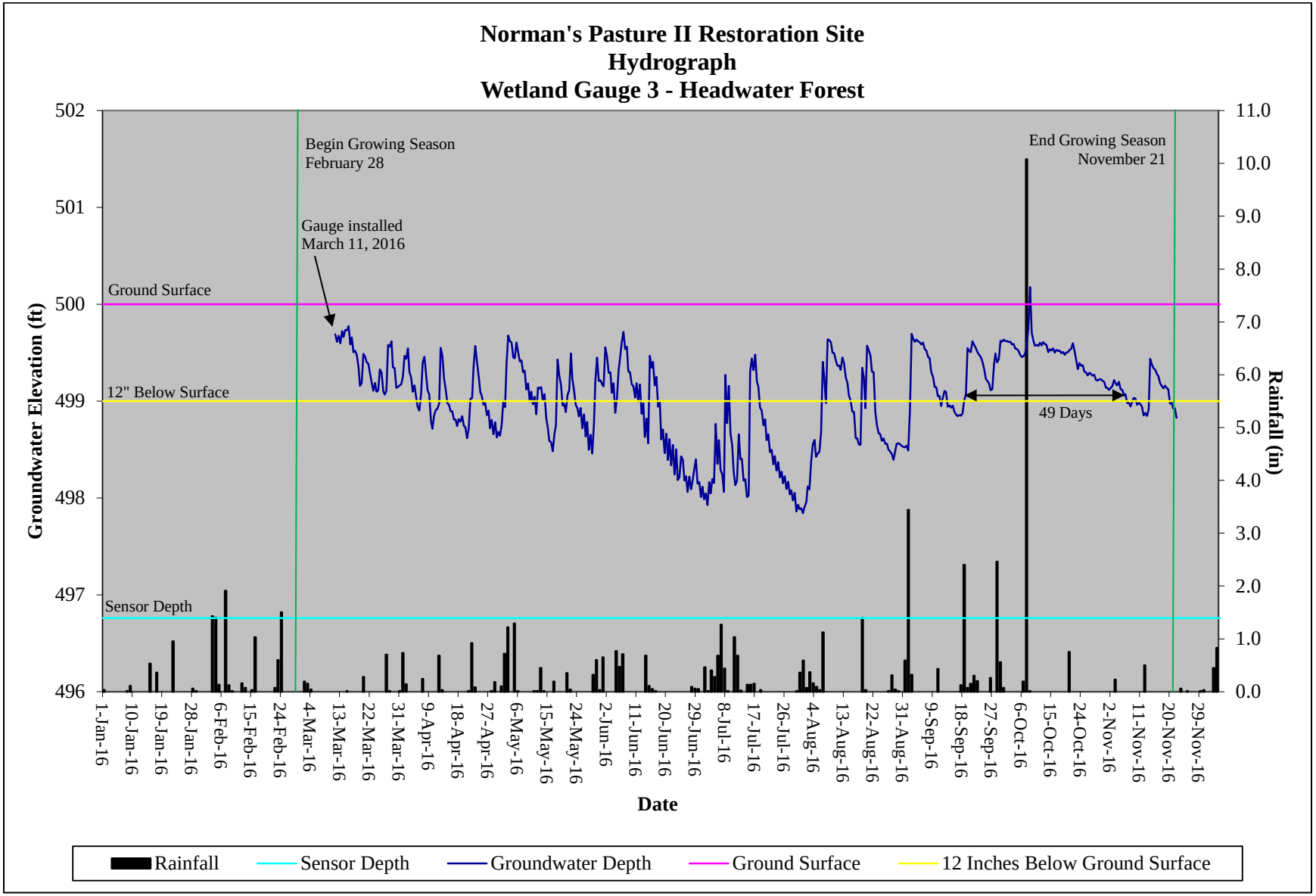
9-Sep-16
18-Sep-16
27-Sep-16
6-Oct-16
15-Oct-16
24-Oct-16
2-Nov-16
11-Nov-16
20-Nov-16
29-Nov-16
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 1 - Headwater Forest
Groundwater Elevation (ft)
Rainfall (in)
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 11, 2016
Ground Surface
12" Below Surface
Sensor Depth
64 Days
Date
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 2 - Headwater Forest
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 11, 2016
Ground Surface
12" Below Surface
Sensor Depth
80 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 3 - Headwater Forest
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 11, 2016
Ground Surface
12" Below Surface
Sensor Depth
49 Days
502
501
500
499
498
497
496
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
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2.0
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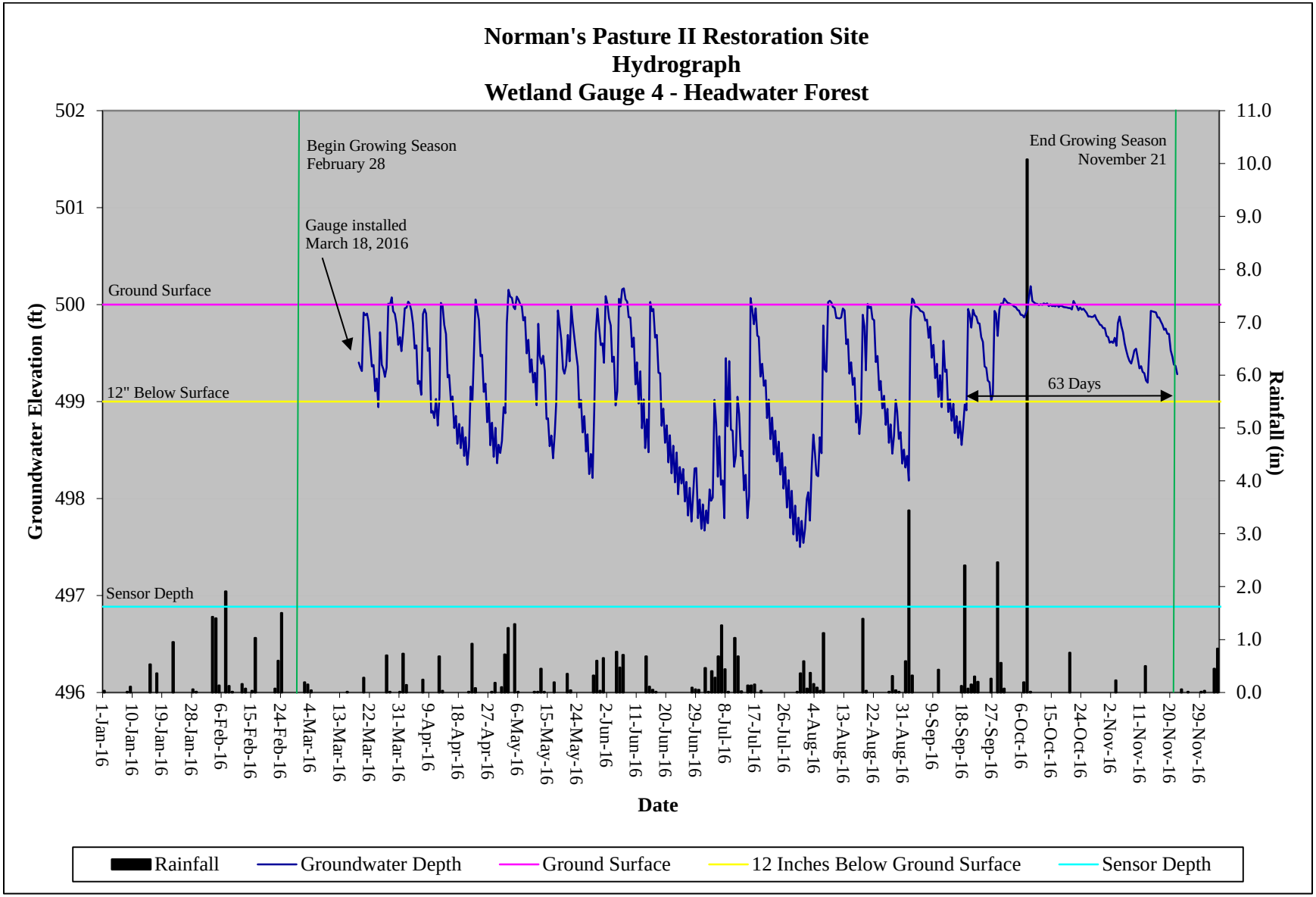
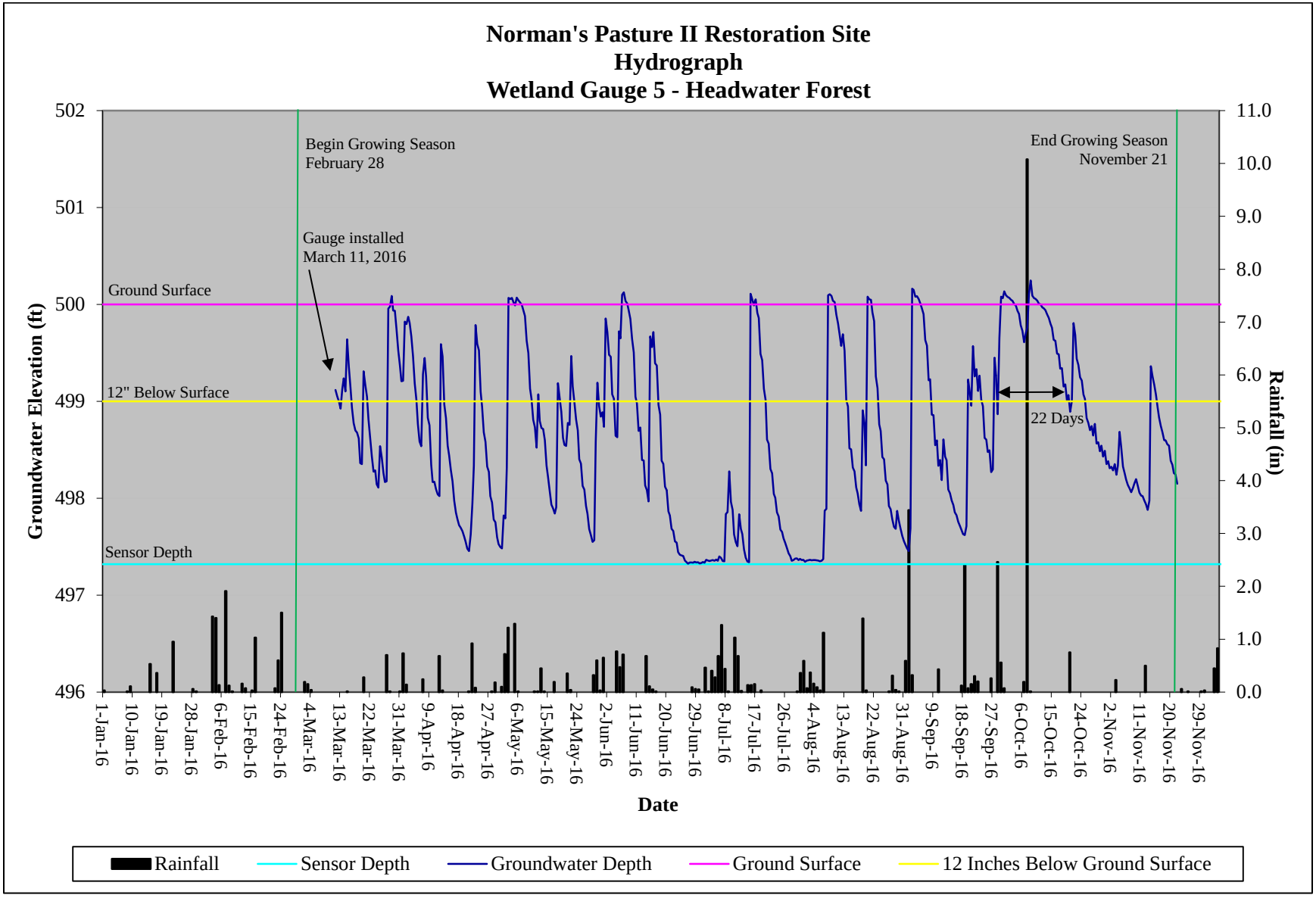
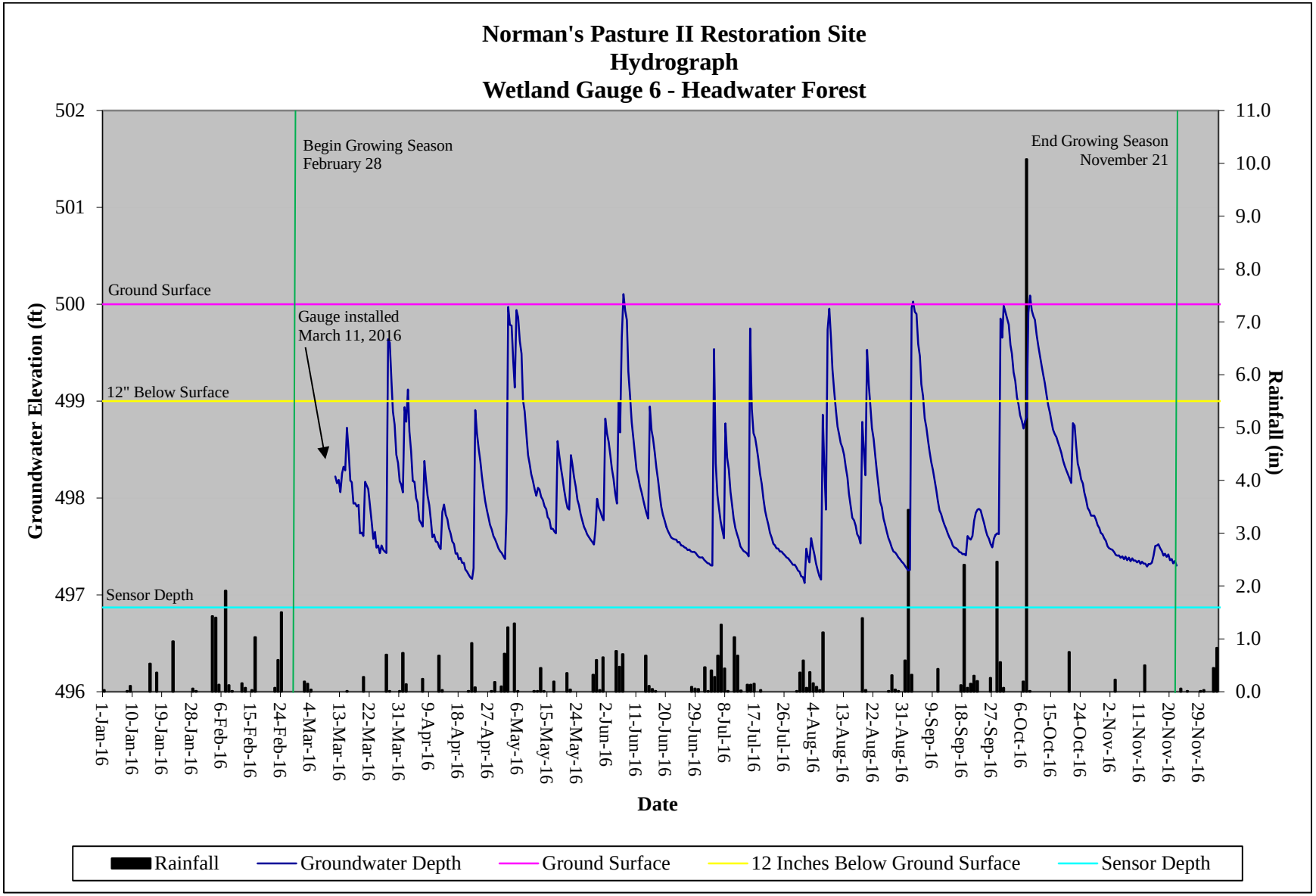
18-Sep-16
27-Sep-16
6-Oct-16
15-Oct-16
24-Oct-16
2-Nov-16
11-Nov-16
20-Nov-16
29-Nov-16
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 4 - Headwater Forest
Begin Growing Season
February 28
Gauge installed
March 18, 2016
End Growing Season
November 21
Ground Surface
12" Below Surface
Sensor Depth
63 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 5 - Headwater Forest
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 11, 2016
Ground Surface
12" Below Surface
Sensor Depth
22 Days
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 6 - Headwater Forest
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
February 28
End Growing Season
November 21
Ground Surface
Gauge installed
March 11, 2016
12" Below Surface
Sensor Depth
502
501
500
499
498
497
496
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1-Jan-16
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28-Jan-16
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24-Feb-16
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22-Mar-16
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9-Apr-16
18-Apr-16
27-Apr-16
6-May-16
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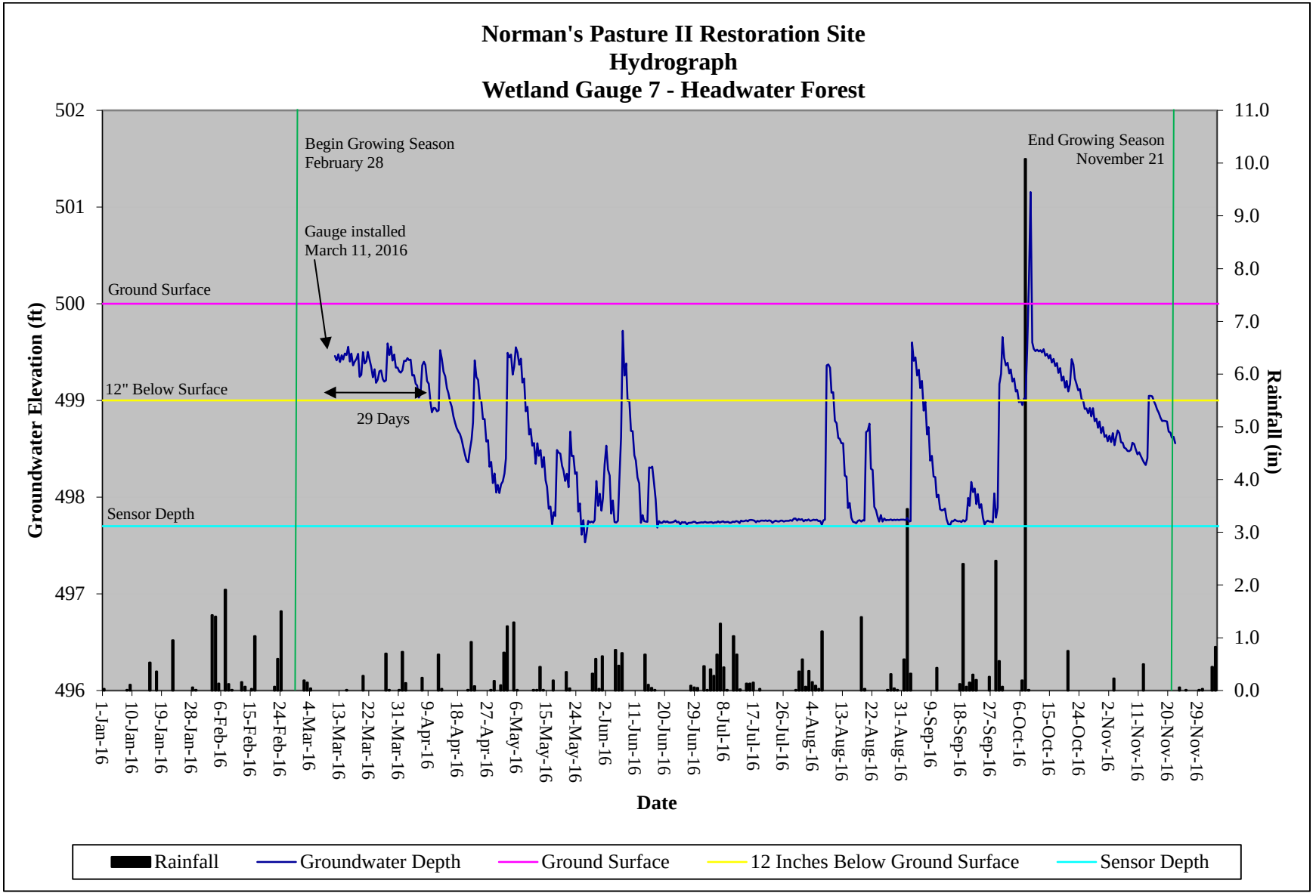
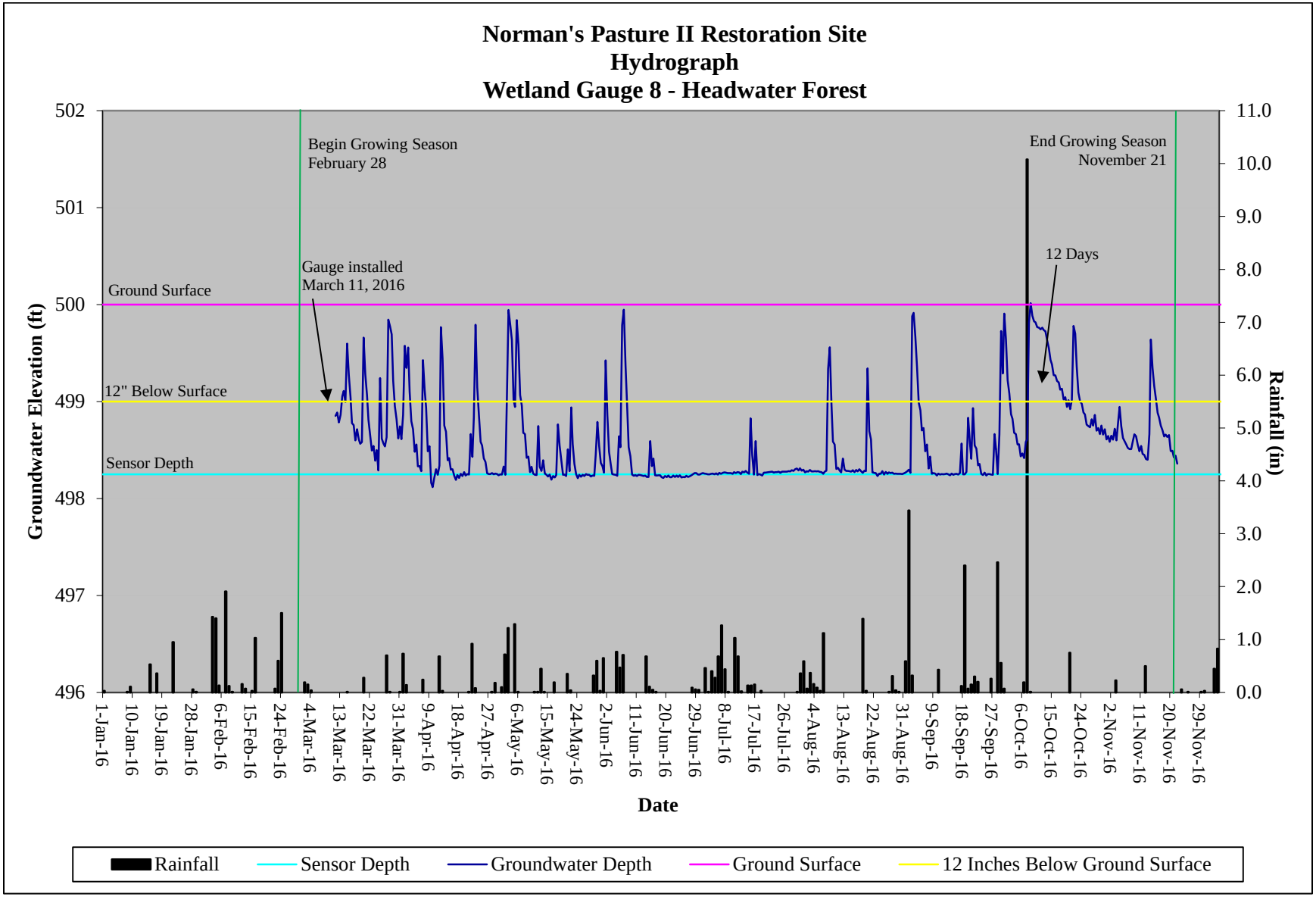
18-Sep-16
27-Sep-16
6-Oct-16
15-Oct-16
24-Oct-16
2-Nov-16
11-Nov-16
20-Nov-16
29-Nov-16
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 7 - Headwater Forest
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 11, 2016
Ground Surface
12" Below Surface
29 Days
Sensor Depth
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 8 - Headwater Forest
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 11, 2016
12 Days
Ground Surface
12" Below Surface
Sensor Depth
502
501
500
499
498
497
496
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1-Jan-16
10-Jan-16
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28-Jan-16
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15-Feb-16
24-Feb-16
4-Mar-16
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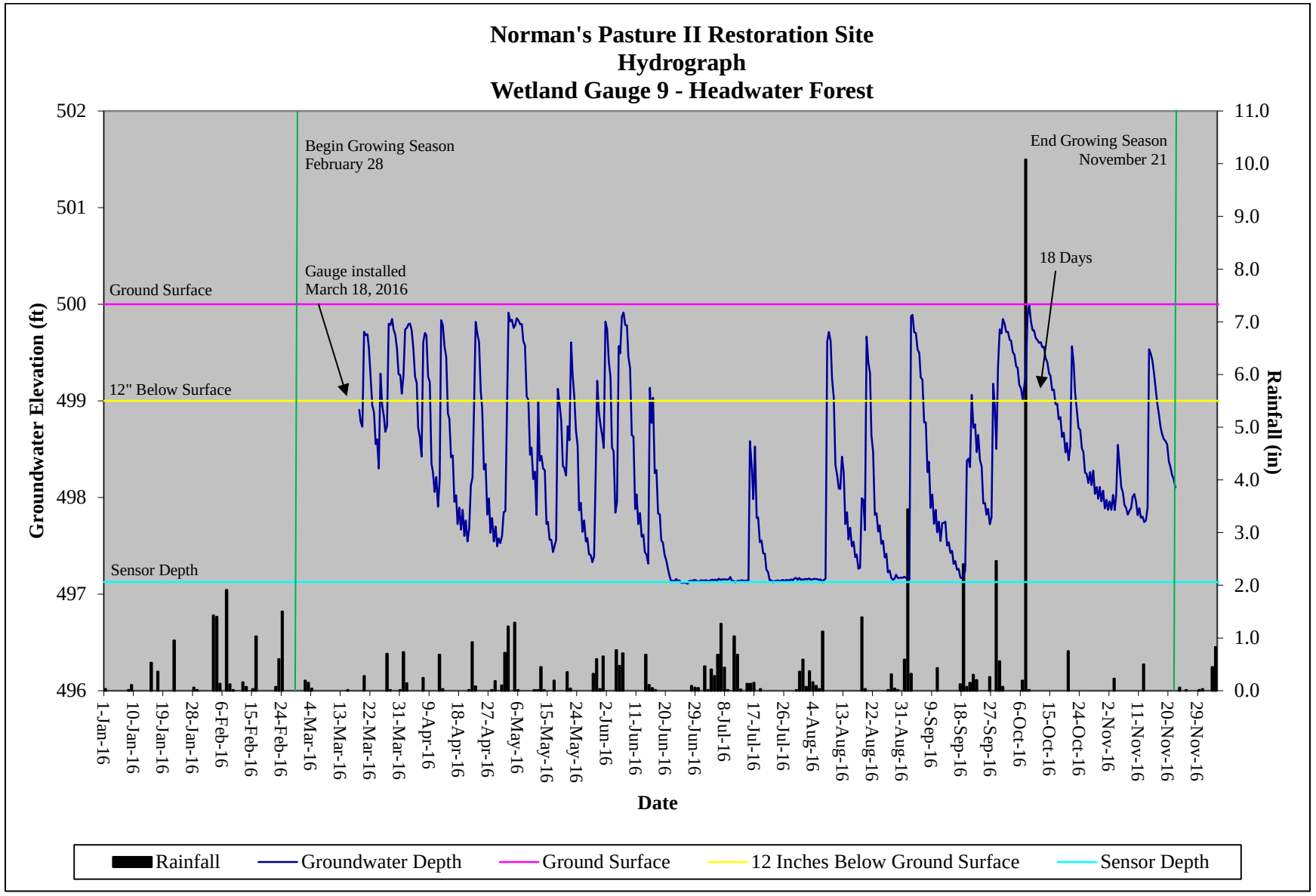
18-Sep-16
27-Sep-16
6-Oct-16
15-Oct-16
24-Oct-16
2-Nov-16
11-Nov-16
20-Nov-16
29-Nov-16
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 9 - Headwater Forest
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 18, 2016
18 Days
Ground Surface
12" Below Surface
Sensor Depth
502
501
500
499
498
497
496
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1-Jan-16
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6-Feb-16
15-Feb-16
24-Feb-16
4-Mar-16
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6-May-16
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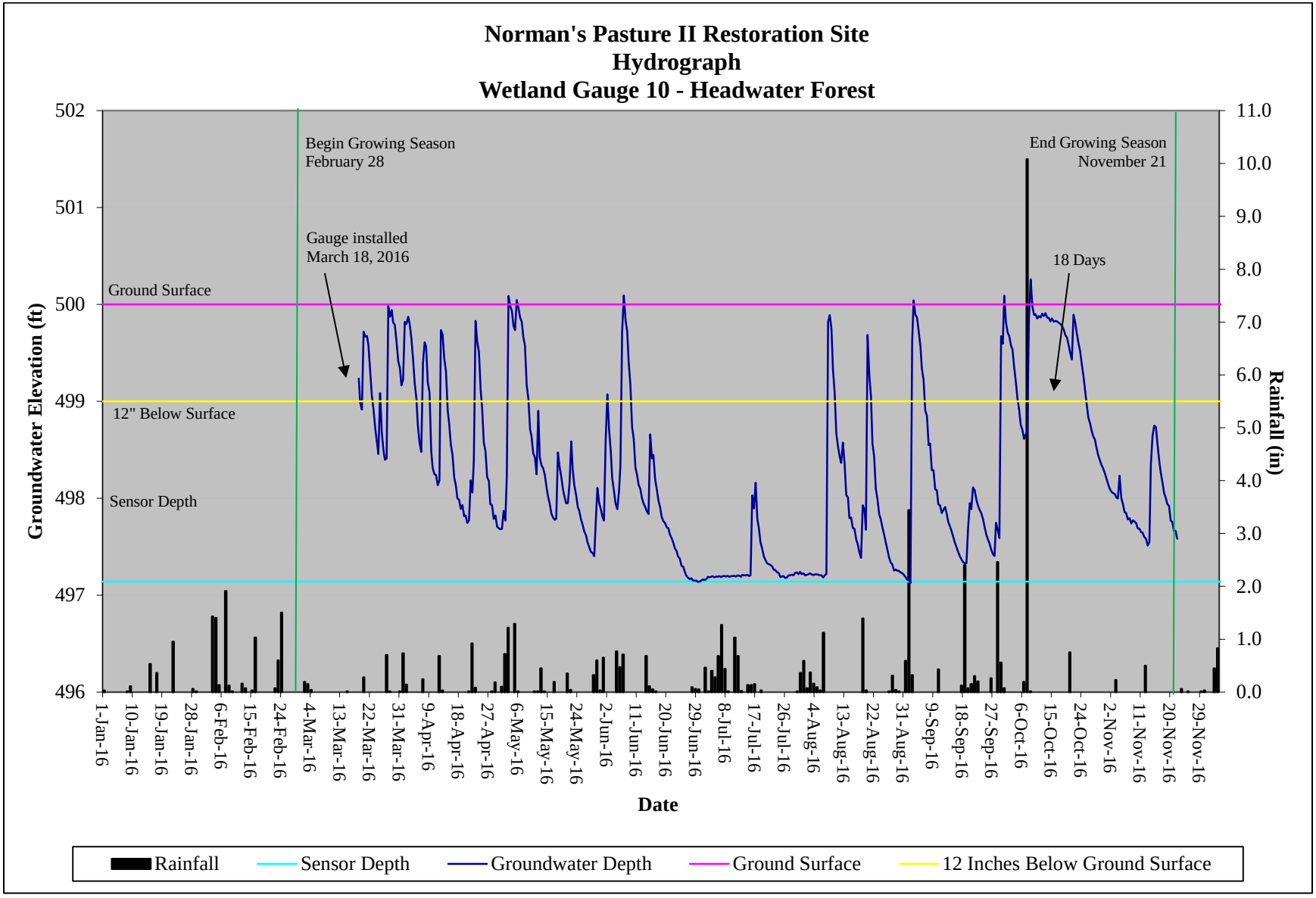
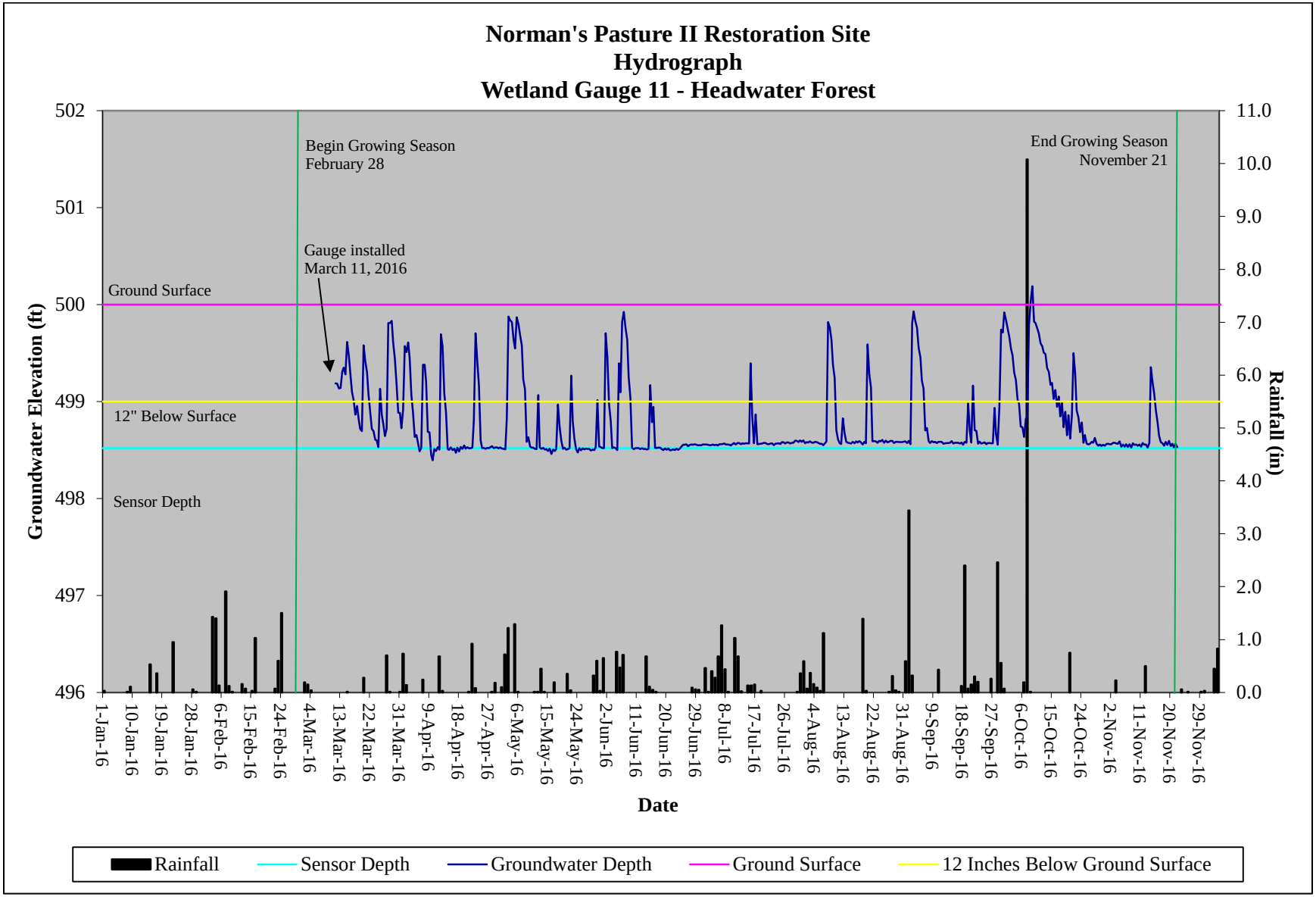
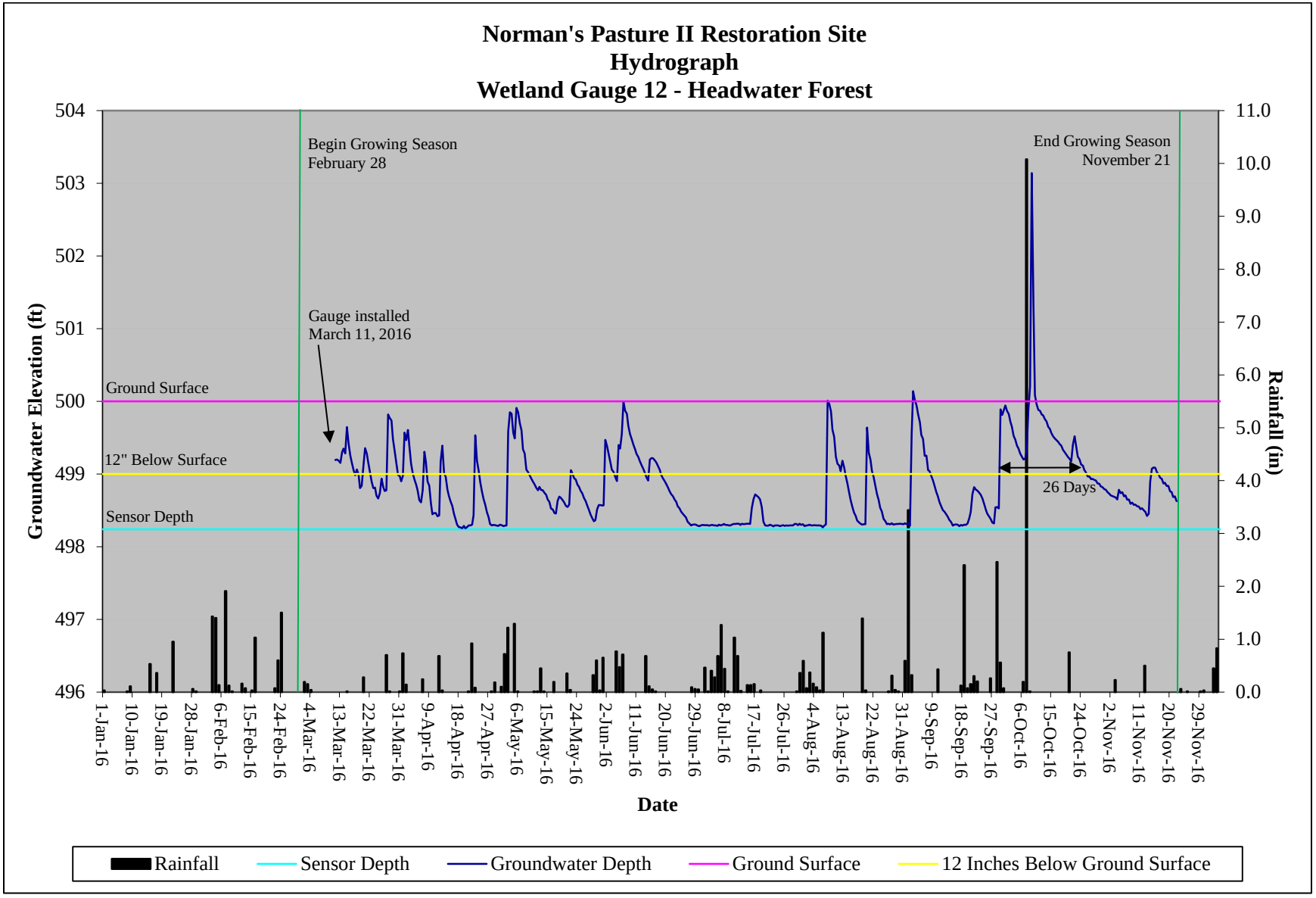
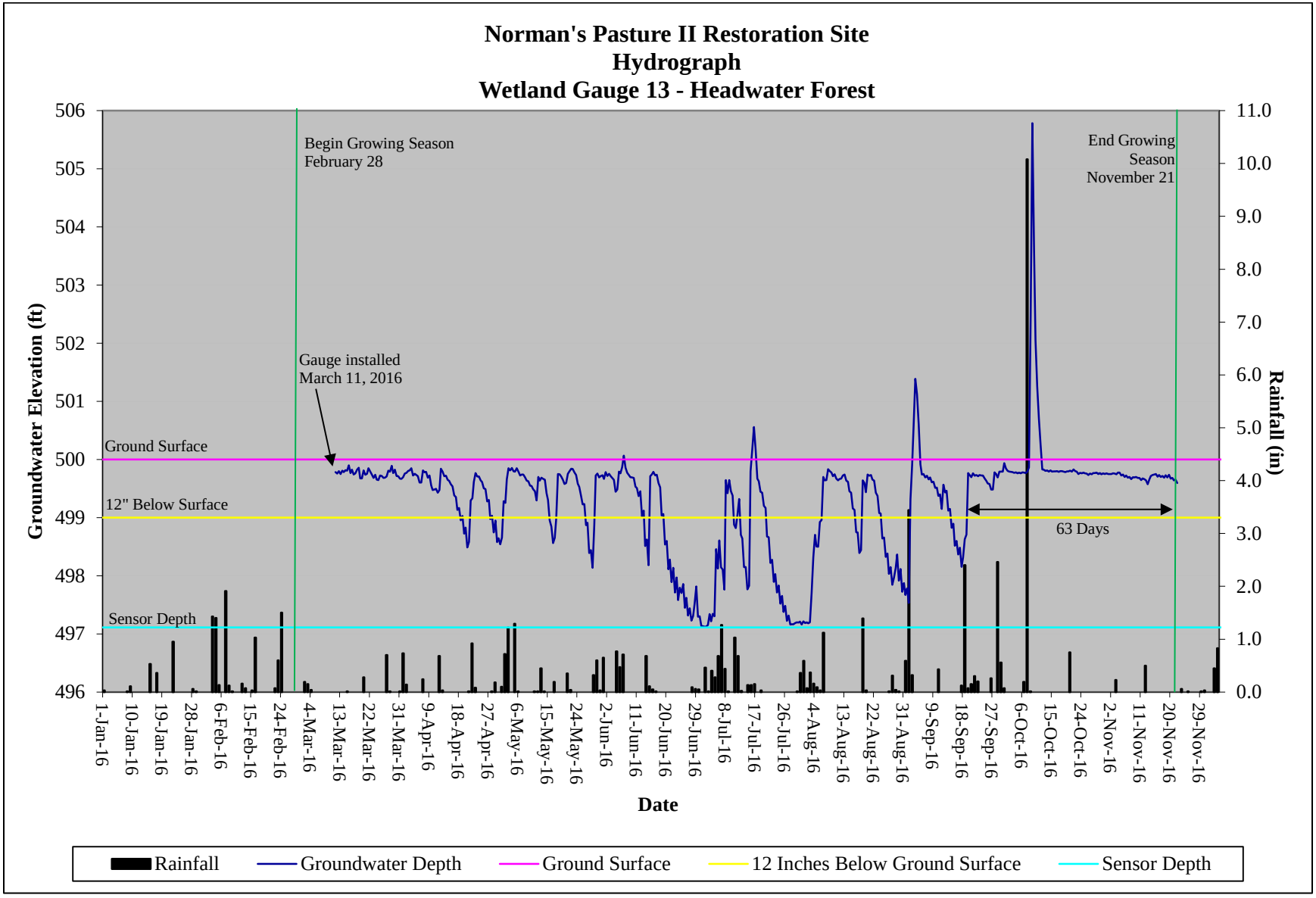
9-Sep-16
18-Sep-16
27-Sep-16
6-Oct-16
15-Oct-16
24-Oct-16
2-Nov-16
11-Nov-16
20-Nov-16
29-Nov-16
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 10 - Headwater Forest
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 18, 2016
18 Days
Ground Surface
12" Below Surface
Sensor Depth
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 11 - Headwater Forest
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 11, 2016
Ground Surface
12" Below Surface
Sensor Depth
Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 12 - Headwater Forest
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
March 11, 2016
Ground Surface
12" Below Surface
Sensor Depth
26 Days
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface


Norman's Pasture II Restoration Site
Hydrograph
Wetland Gauge 13 - Headwater Forest
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season
February 28
End Growing
Season
November 21
Gauge installed
March 11, 2016
Ground Surface
12" Below Surface
Sensor Depth
63 Days
506
505
504
503
502
501
500
499
498
497
496
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
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0.0
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22-Mar-16
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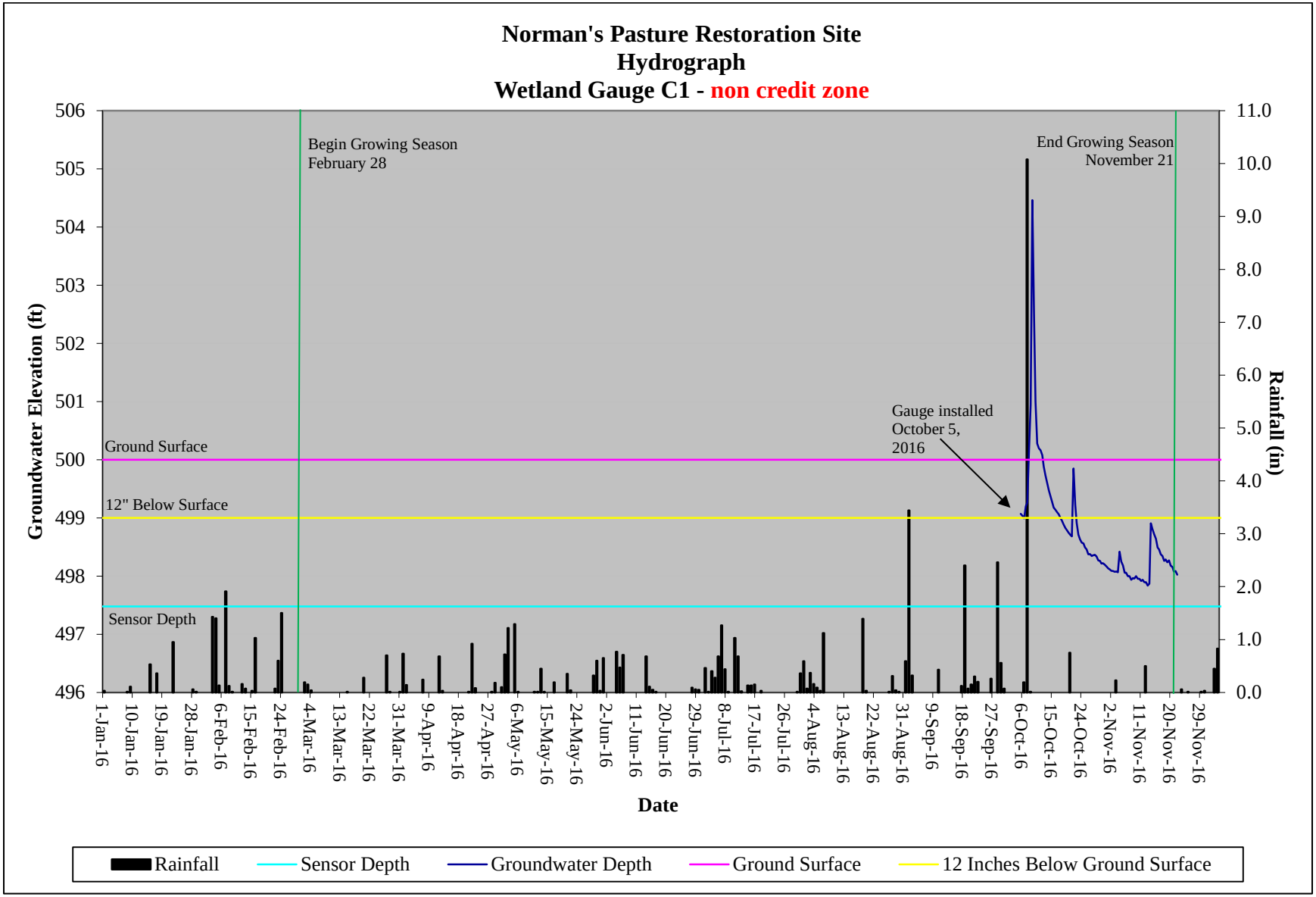
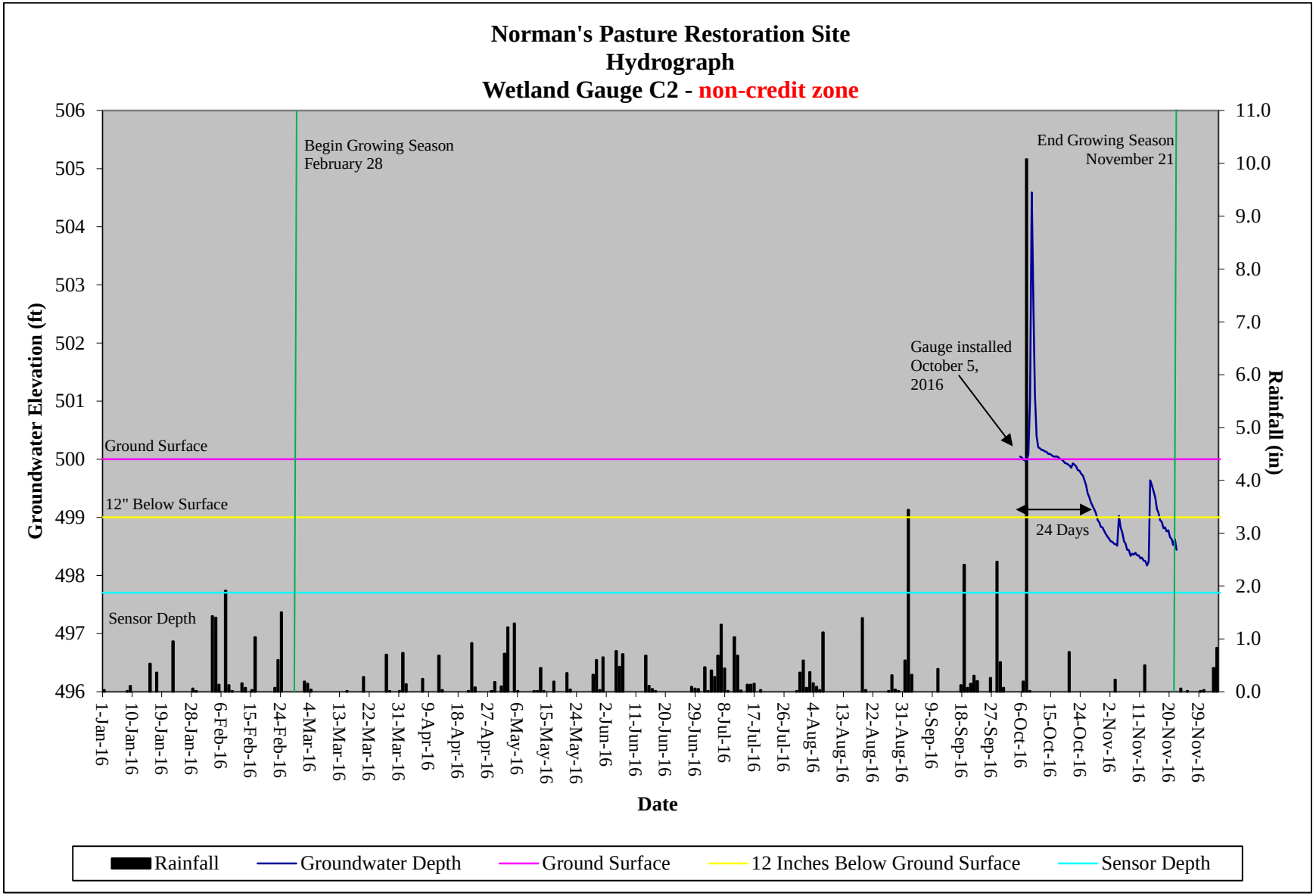
18-Sep-16
27-Sep-16
6-Oct-16
15-Oct-16
24-Oct-16
2-Nov-16
11-Nov-16
20-Nov-16
29-Nov-16
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Norman's Pasture Restoration Site
Hydrograph
Wetland Gauge C1 - non credit zone
Groundwater Elevation (ft)
Rainfall (in)
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
October 5,
2016
Ground Surface
12" Below Surface
Sensor Depth
Date
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface


Norman's Pasture Restoration Site
Hydrograph
Wetland Gauge C2 - non-credit zone
Groundwater Elevation (ft)
Rainfall (in)
Begin Growing Season
February 28
End Growing Season
November 21
Gauge installed
October 5,
2016
Ground Surface
12" Below Surface
Sensor Depth
24 Days
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth