Fletcher-Meritor Site
(UT to Cane Creek) Stream and Wetland Restoration
Project No: 138

Monitoring Report Year 6 of 6

Henderson County, North Carolina

Prepared for:

North Carolina Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

Construction Complete: May 2012
Data Collected: March, May, & November 2018
Report Submission: December 2018

December 20, 2018

Harry Tsomides
Project Manager
NCDEQ – Division of Mitigation Services
5 Ravenscroft Drive
Suite 102
Asheville, NC 28801

Subject: Monitoring Year 6 (MY06) Report – Final Submittal
Fletcher-Meritor Site – DMS ID #138
DEQ Contract Number 004923

Dear Mr. Tsomides,

HDR Engineering Inc. of the Carolinas (HDR) has updated the Fletcher-Meritor Year 6 Monitoring Report which is included on the attached cd as well as provided responses to comments in this letter. The original comments from DMS are in italics and the responses are in normal font but blue in color to assist with review. Please let us know if you have additional comments.

Asset map / Figure 2 – Cane Creek is incorrectly labelled as "Cone" Creek
Figure 2 has been revised and replaced for the final report.

Figures 3b/c/d – Use black for all structures; some of the structures are showing as the same color as beaver dams.
Using black only creates issues when looking at the structures which are silted in. We revised the color scheme to better illustrate the structure condition and not appear as beaver dams.

Figure 3c – Are the two mapped CE disturbances still a problem? Last time on site (summer 2018) these issues seem to have been rectified with additional signage. If there is no longer a concern, these polygons should be removed.
These polygons were removed as the additional signage has prevented encroachments.

Photo section – The photo section (53 pages) should be double sided if possible to reduce bulk and paper. Similarly, please double side any of the other large appendices, graphs etc. as much as possible.
Large sections of the appendices will be double sided for printing purposes. Please let us know the number of printed copies you would like.

Vegetation section - There are discrepancies between the CVS table (species per plot) and the summary table (plot numbers) / report text. Please check your vegetation data and update the CVS table, the wetland/stream vegetation total table, and the CCPVs (success vs. failed plots coloring)for accuracy and consistency across all report components.
The vegetation section has been revised in the report and appendices.

CVS table – (a) Color coding is missing; (b) formatting cuts off MY4 annual average (needs reformat or resizing); (c) can the "unknown" species observed in large quantities in MY3 and MY4 be identified?
The color coding has been corrected. This is the way the program is sending out the report so we have manually corrected the color coding. I am uncertain if this is due to the fact this was a 5 year monitoring project rather than 6 as all data for year six was uncolored. The unknown species was the *Salix caprea* which was not identified until recently. Now that the species has been identified we have updated all the years and corrected the data tables. This species was not planted and is listed as an exotic species. You will notice in the vegetation data that we have pulled out the exotic species and calculated the stem information with both natives and exotics as this was the reason for the data not matching the first table in Appendix C.

Cross section graphs – Please zoom in on the cross-sectional area so the reader can more fully evaluate what is going on with the channel dimensions from year to year (see following example); most of the graphs show project floodplains rather than channel dimensions.
These have been revised in the attached document.

Table 13 (Gauge data) – If possible, please add a column before "Year 1" indicating the wetland to which each gauge belongs (Wetland D = Gauges 1 through 5, Wetland A = Gauges 6-20, etc.).
Table 13 has been revised to include the wetlands in which the gauges are located.

General – Since HDR visited the site in November 2018 to pick up final gauge data, please indicate (in the narrative) whether or not the site was significantly impacted by Hurricane Florence.
The site was not significantly impacted by Hurricane Florence based on our review during the final gauge download. We did not fully walk the entire site but the areas we checked were similar to what we had seen previously. The area at the tie with Cane Creek seems to be the most impacted by large storms as that bank has been eroding over the years.

A CD containing a PDF of the revised Year 6 Monitoring Report and all digital support files in the correct file structure is included. Please let us know the number of hard copies of the report you would like.

If you have any questions, please do not hesitate to call me at (919) 232-6637.

Sincerely,

Vickie Miller, AICP, PWS
Senior Project Manager

Prepared by:

HDR Engineering
555 Fayetteville Street, Suite 900
Raleigh, NC 27601

Fletcher-Meritor Site
(UT to Cane Creek) Stream and Wetland Restoration
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Monitoring Report Year 6 of 6

Henderson County, North Carolina

TABLE OF CONTENTS

LIST OF APPENDICES

APPENDIX A GENERAL TABLES AND FIGURES

1.0 EXECUTIVE SUMMARY

The Fletcher-Meritor Site Stream and Wetland Restoration Project, completed in May 2012, restored 3,575 linear feet of meandering C/E-type stream along an Unnamed Tributary (UT) to Cane Creek plus 648 linear feet of a first order tributary (Tributary) to the Main Stem as well as re-establish hydrology and hydrophytic vegetation to 6.7 acres of historical wetlands. This natural channel restoration consists of a Priority II restoration that includes a bankfull bench to allow for flood attenuation before reconnecting to the natural floodplain. The riparian buffer was planted with species representing an Alluvial Forest grading to a Bottomland Forest Community (Schafale and Weakley, 1990). This stream was preserved within the 20.3 acre conservation easement.

Efforts to restore or enhance wetlands on the project site included restoring topography, hydrology, and habitats of a natural wetland system by excavating overburden/berms and filling agricultural ditches to promote an increase in ground water elevation. Following excavation, removal of drain tiles and plugging of drainage ditches, the wetland areas were planted with native hardwoods.

The project goals and objectives are listed below.

Project Goals

- Improve local water quality by reestablishing stream stability and capacity to transport watershed flows and sediment load.
- Provide additional floodplain storage by increasing the capacity of the stream to mitigate flood flows.
- Restore aquatic and riparian habitat.
- Reducing non-point source sedimentation and nutrient inputs into the project reaches.

Project Objectives

- Restore/enhance approximately 4,223 linear feet to stable stream channel morphology, supported by instream habitat and grade/bank stabilization structures. Restoration and enhancement consists of restoring the channel pattern and profile and building a floodplain bench along the reaches.
- Reestablish hydrology and hydrophytic vegetation to 6.7 acres of historic wetlands by removing overburden/berms, plugging agricultural drainage ditches, and replanting with native grasses, shrubs and trees.
- Eliminate accelerated bank erosion by creating a bankfull bench, floodplain, and laying back slopes.
- Reestablish a native riparian buffer. Revegetation of the buffer was accomplished by planting tree and shrub species for Alluvial and Bottomland Hardwood Communities.

The project has been divided into segments, which include three stream reaches and four wetland areas:

- Upper Reach Main Stem – 1796 linear feet
- Lower Reach Main Stem – 1779 linear feet
- Tributary – 648 linear feet
- Wetland A – approximately 2.92 acres
- Wetland B – approximately 1.43 acres
- Wetland C – approximately 1.34 acres
- Wetland D – approximately 0.97 acres

The project site, which is protected by a 20.3-acre permanent conservation easement held by the State of North Carolina, is situated in Henderson County in the North Carolina Mountains Physiographic

Province. The project is located in the French Broad River Basin, USGS Hydrologic Unit Code (HUC) 06010105 and NCDWQ subbasin 04-03-02. Cane Creek is a North Carolina Class C stream. The final 2016 303(d) and Integrated Report no longer lists as impaired the section of Cane Creek from Cushion Branch to the French Broad River, to which the restoration project drains (NCDEQ 2016). The restored reaches drain lands with significant non-point source impacts to water quality from agriculture, industrial/commercial development, and historical clay strip mining. Land use data indicates that more than 60 percent of the 1.1-square mile UT to Cane Creek watershed is currently pervious with a predominance of open fields/lawn/low-density residential lands, and about 40 percent is impervious commercial/institutional buildings/roads.

The vegetative success of the restoration site is based on criteria established in the USACE Stream Mitigation Guidelines (2003). Vegetation monitoring is considered successful if a minimum of 260 planted stems/acre are surviving at the end of five years. The Monitoring Year 6 (MY6) stem counts are located in Tables 7 and 9 in Appendix C. Currently, 14 of 17 vegetation plots are meeting the measures of success; however, all of the plots are meeting the five year success criteria with inclusion of the volunteer species. Vegetation throughout the reach appears to be growing at acceptable rates and the mortality rate appears to be fairly low. The three plots that are not meeting success criteria include two along the tributary were not planted at the appropriate density, and the plot closest to the confluence with Cane Creek which has had backwater impacts numerous times over the monitoring years.

Numerous locations along the reaches have been noted as having sparse vegetation during previous monitoring events; however, these areas are much smaller than in previous years. These areas are illustrated on the Current Condition Plan View (CCPV) in Appendix B. In addition to these locations, a large area of cattails (*Typha latifolia*) is growing within the upper wetland area. The cattails are not posing problems to the reaches currently; however, this location provides a seed source and should be watched. Cattails have created issues when stands grow within streams by out-competing other riparian herbaceous species and creating potential areas for aggradation. One location of multiflora rose (*Rosa multiflora*) was noted near vegetation plot 9. Butterfly bush (*Buddleja davidii*) is growing in the rock along the permanent crossing. Along the edges of the site adjacent to the farmed areas there are several pears (appears to be *Pyrus calleryana*) which were not included in planting plan. No other invasive species were noted.

There were no issues with access during the annual site reviews. In previous years there were signs of encroachment during the visits. Division of Mitigation Services (DMS) installed new signs in 2015 where farming activities were encroaching on the easement and no new areas of encroachment were noted; however, the previous farming activities continue to occur in close proximity to the easement boundary. In addition, the farm access road adjacent to the western side of the tributary reach (within the Wetland C area) is not gated. A ditch was also cut in 2014 (adjacent to the conservation easement boundary near the proposed Wetland D on the Lower Reach) that could become an issue for maintaining hydrology at this location; however, the wetland is currently meeting criteria.

The reaches of the restoration project were observed to be in stable condition. The channels access their floodplain and evidence of bankfull events were observed during Year 6 monitoring. This evidence included the presence of wrack lines, sediment deposits, and the crest gauge data. In previous years the substrate has shown a gradual change to more coarse material in the Upper and Lower Reaches, although the Tributary reach still has a hard clay substrate. This is expected, as the tributary reach has little available alluvium/substrate to migrate into the system. Pebble counts were not completed in 2018 (MY6).

Notable areas of concern occur on all project reaches. In previous years one of the greatest areas of concern were the number of beaver dams on the Main Stem reach; however, most of those have been breached and the stream system has recovered from their removal. In MY6 there appears to be continued beaver activity on the lower reach and on November 2018 a portion of the lower reach was ponded. Beaver activity is also evident in the quantity of eaten trees and shrubs. The other notable concern is the past structure failures along the Tributary Reach. Over half of the log structures along the Tributary Reach are eroded or completely undermined during low flow periods; however, during normal and higher flows they structures appear to function as intended. The substrate along the Tributary remains clay and there doesn't appear to be any larger size particles moving into the reach. The most likely cause of the structure issues was the heavy rains received between May and December, 2013 following construction.

The temporary utility line crossing located on the Lower Reach has been removed and appears to be stable. It was replanted once following the initial planting due to questionable vegetation survivability. No issues were noted during the MY6 assessment.

The permanent stream crossing near Sta. 24+00 on the Upper Reach has evidence of past erosion. Removal of the upstream beavers and their dams may limit some of the debris that reaches this area in the future and minimize erosion. In addition to potential blockages of the permanent crossing, the removal of the beaver dams resulted in recovery of channel morphology, specifically the riffle cross sections, in the majority of this reach and significantly reduced past ponding concerns.

Other areas of minor aggradation, erosion, or areas of sparse vegetation are shown in the photos and illustrated on the attached mapping. These areas do not appear to be negatively impacting the channel morphology.

In September 2018, Hurricane Florence made landfall in North Carolina causing flooding across the state during in a year that the drought monitor stated was wet. Although there were signs that Cane Creek and the tributaries had been out of there banks, there were no major reach failures that had not previously been documented. The area that is most impacted by the erosive flows of Cane Creek during flood events is the confluence of the restoration reach with Cane Creek which has been actively eroding over the course of monitoring the site.

Summary information/data related to the occurrence of the aforementioned items and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting documentation formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly the Restoration Plan) documents available on DMS's website. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

2.0 METHODOLOGY AND RESULTS

Channel stability and vegetation survival were monitored on the project site. Post restoration monitoring will occur for a minimum of five years or until the success criteria are met. The monitoring assessment was completed using submeter accuracy GPS and Trimble VRS System on March 19 and 20, 2018. This report details the results of Monitoring Year 6.

2.1 Morphometric Parameters and Channel Stability

2.1.1 Dimension

Nine cross sections were measured by HDR staff in March of 2018. The morphological and cross-sectional data is presented in Table 11 in Appendix D. Upper Reach cross sections 2 and 3 showed little change from the previous year. Upper Reach cross section 1 showed notable decrease in bankfull width and cross sectional area from Year 5.

Permanent riffle and pool cross sections for the Lower Reach continued to perform well in Year 6 with little variation from the previous year regarding dimensional morphology.

For the Tributary reach, cross sections 8 and 9 showed increases in maximum depth and an increase in cross sectional area compared to the previous year. Values for cross section 7 stayed very similar to the previous yer.

2.1.2 Photo Documentation

Photos were taken at the 52 stream photo stations and 17 vegetation plots on March 19 and May 10, 2018. The locations of the photos stations and vegetation plots are noted on Figure 3 in Appendix B. The photos for monitoring Year 6 are also provided in Appendix B.

2.2 Vegetation

The Carolina Vegetation Survey (CVS) Protocol Level 2 methodology was used to sample vegetation on May 10, 2018. Monitoring was conducted on seventeen vegetation plots (3 on the tributary, 7 on the main stem Upper Reach, and 7 on the main steam Lower Reach). The 100-square meter CVS plots are permanently marked with galvanized metal pipe. The plots occur within the floodplain/riparian area with a few running upslope slightly.

According to the data collected, the average plant density among the 17 plots is 381 stems/acre with a range from 121 to 769 stems/acre. The highest plant density occurred in plots 4 and 7 with 769 stems/acre. Currently, 14 of the plots are meeting the vegetation success criteria of 260 stems/acre. Year 6 monitoring data is provided in Appendix C. Vegetation throughout the site appears to be growing at acceptable rates and the mortality rate appears to be fairly low. Herbaceous vegetation, which has been noted as sparse during previous monitoring events, appears to be filling in with the exception of a few locations noted on the CCPV. The three plots that are not meeting interim success criteria include two along the Tributary, which may not have been planted at the appropriate density, as well as the plot closest to the confluence with Cane Creek, which has had backwater impacts numerous times since construction. During the monitoring events there has been an unknown species that was documented during the first year and had continued to be noted. This species was not identifiable in the early years; however, has been determined to be a pussy willow or goat willow (*Salix caprea*) following observation during flowering.

2.3 Hydrology

Thirty-five groundwater wells were installed in June 2013 in the proposed wetland areas to document hydrology for the remaining years of monitoring. Several of the wells have not been fully operational since their installation. Two crest gauges were installed and indicated several bankfull events, as well as evidence of bankfull events in the form of wrack lines.

Data from the groundwater monitoring stations showed 33 stations were in operation for a portion of the 2018 growing season. Well 29 was destroyed by a vehicle during monitoring Year 3 and Well 17 had been destroyed by a vehicle in Year 2. The data revealed that 27 of the 33 stations met the soil saturation criterion of groundwater being within 12 inches of the soil surface for at least 5 percent of the growing season (10 consecutive days). Two wells (24 and 34) malfunctioned during the year and didn't provide enough data to determine whether they would meet criteria. Four wells (2, 3, 22, and 28) are not meeting the groundwater criteria. Wells 2 and 3 are located in the proposed Wetland D in which the adjacent landowner has excavated a nearby ditch which is potentially drawing down the water table. This was noted as possibly impacting this proposed wetland in the previous years. Well 22 has not met criteria since it was installed and Well 28 has only met criteria one year.

According to the NC Drought Monitor, the 2015 and 2016 growing seasons were mostly under drought conditions in the project vicinity. It is possible that this impacted the water table at the site, leading to the large number of wells that did not meet the hydrology criteria in 2016 (MY 4). In pulling the historic drought data for Henderson County, it became clear that 2015 (MY 3) and 2016 (MY 4) were not normal years. For example, in 2017 the drought data indicated there were 27 weeks that were normal with only 3 weeks abnormally dry or moderately dry within the growing season. In contrast, 2016 had only 6 normal weeks with the remaining 24 weeks abnormally dry to extreme drought for the growing season. Similar numbers were observed in 2015 with 21 weeks of abnormally dry to extreme drought and 9 normal weeks. Overall, it is assumed that the drought documented within those two years may have played a role in the hydrology of the wetlands for MY 4. The Drought Monitor for the 2018 growing season indicates that the year was wet in comparison to the previous years.

3.0 REFERENCES CITED

HDR Engineering, Inc. 2008. Final Stream & Wetland Restoration Plan for the Fletcher-Meritor Site (UT to Cane Creek).

HDR Engineering, Inc. 2011. UT to Cane Creek Stream Restoration Final Plans (90%).

Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation. Version 4.0. (http://cvs.bio.unc.edu/methods.htm.).

North Carolina Department of Environmental Quality. 2016. Category 5 Water Quality Assessments - 303(d) List [303(d) and Integrated Report].

North Carolina Division of Mitigation Services. 2015. Fletcher-Meritor Site (UT to Cane Creek) Stream and Wetland Restoration Monitoring Report Year 3 of 5.

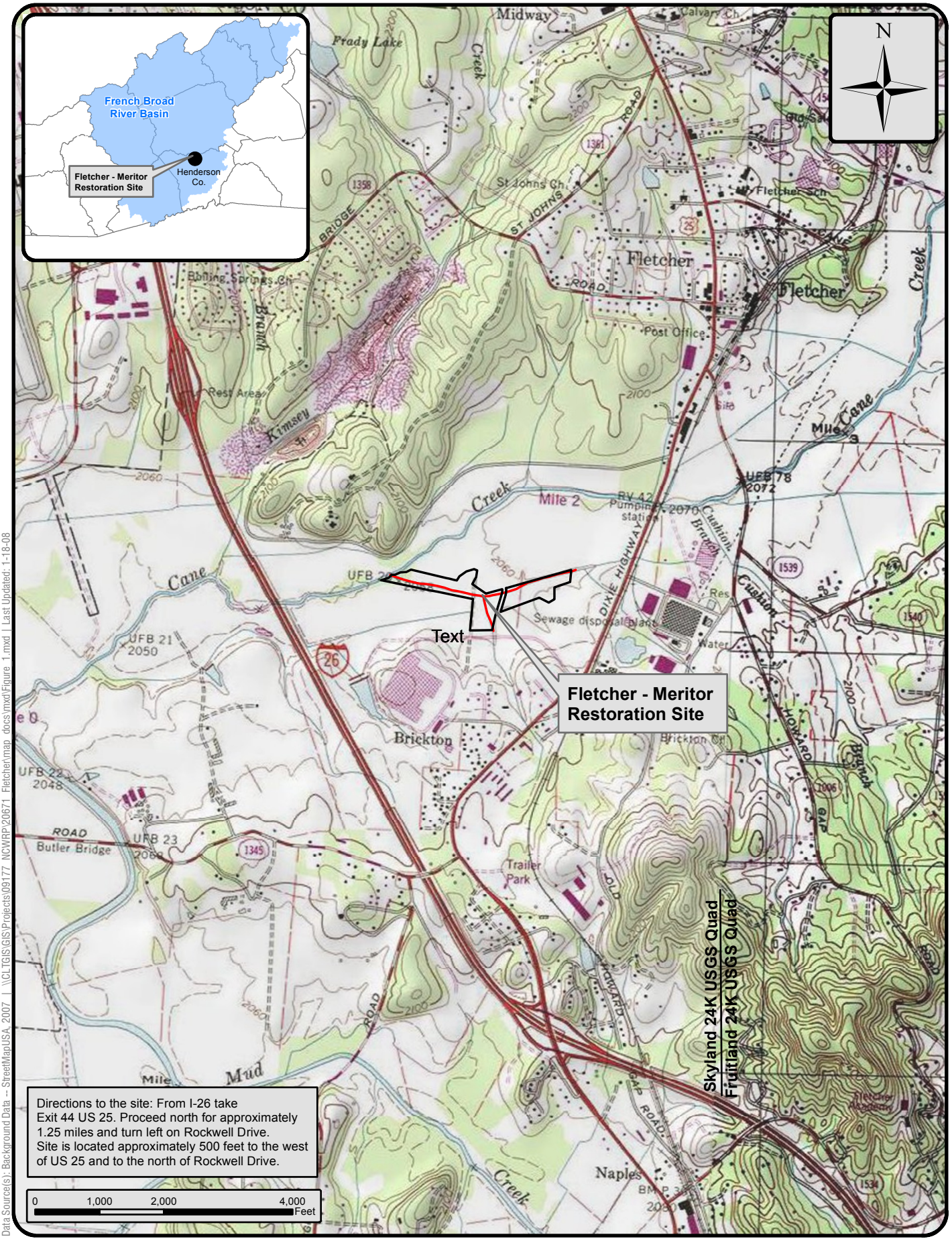
North Carolina Ecosystem Enhancement Program. 2011. Baseline Monitoring Document: Format, Data Requirements, and Content Guidance.

North Carolina Ecosystem Enhancement Program. 2013. Fletcher-Meritor Site (UT to Cane Creek) Stream and Wetland Restoration Monitoring Report Year 1 of 5.

North Carolina Ecosystem Enhancement Program. 2014. Fletcher-Meritor Site (UT to Cane Creek) Stream and Wetland Restoration Monitoring Report Year 2 of 5.

U.S. Army Corps of Engineers, Wilmington District. 2003. Stream Mitigation Guidelines. North Carolina Division of Water Quality (DWQ), U.S. Environmental Protection Agency, Region IV (EPA), Natural Resources Conservation Service (NRCS) and the North Carolina Wildlife Resources Commission (WRC).

Appendix A



Vicinity Map

Figure 1

Fletcher-Meritor Site (UT to Cane Creek) Year 5 Monitoring I Henderson County, NC
NC Division of Mitigation Services | Project No. 138

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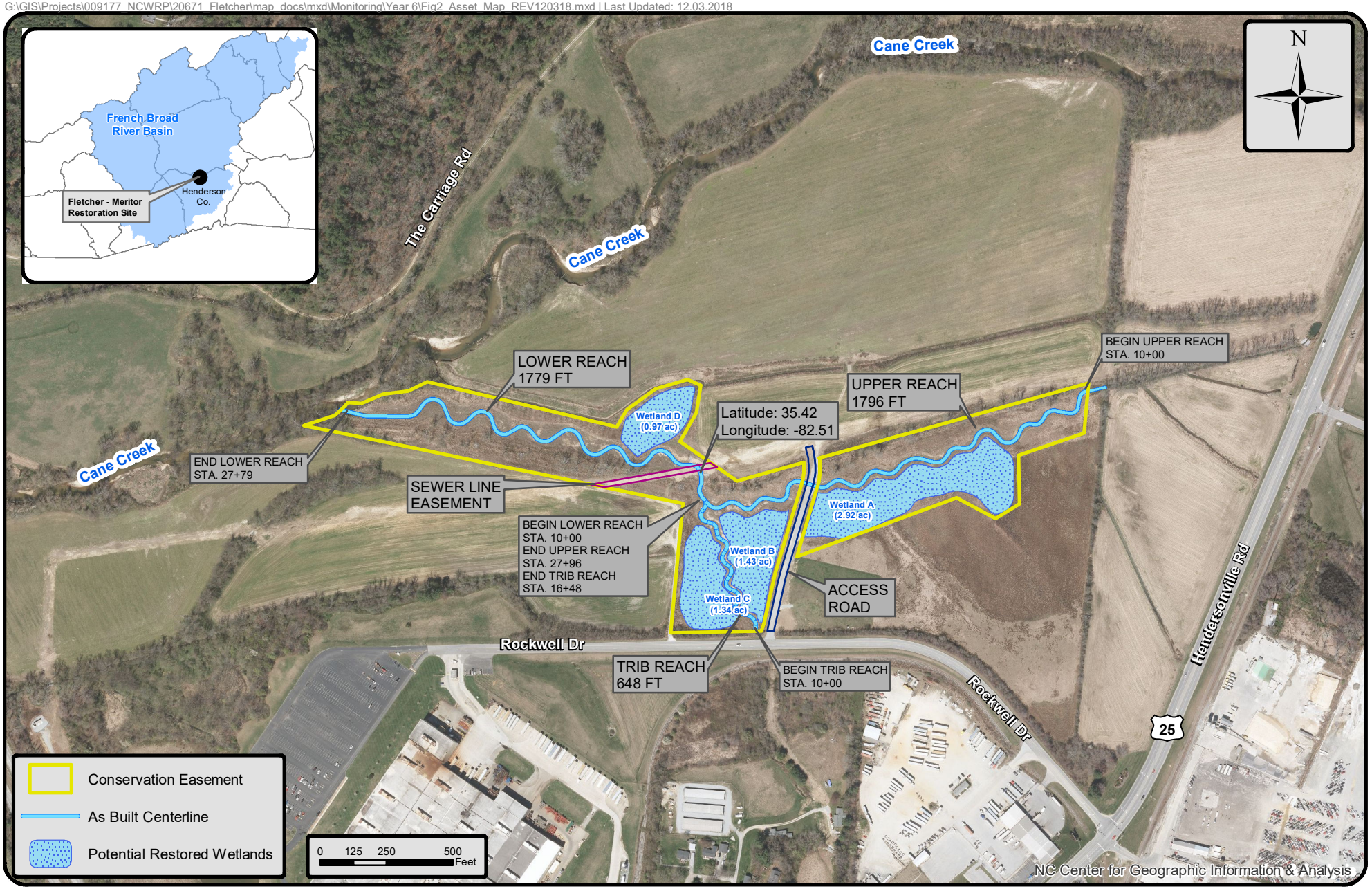


Asset Map

Figure 2

Fletcher-Meritor Site (UT to Cane Creek) Year 6 Monitoring I Henderson County, NC
NC Division of Mitigation Services | Project No. 138

Table 1a. Project Components
Fletcher-Meritor Site (UT to Cane Creek) Stream and Wetland Restoration/Project No. 138

Project Component or Reach ID	Existing Feet/Acres	Restoration Level	Approach	Footage or Acreage	Stationing	Mitigation Ratio	Mitigation Units	BMP Elements	Comment
Main Steam Upper Reach	1520 lf	R	P2	1796 lf	10+00-28+38	1:1	1796		Fully restores pattern, dimension and profile by excavating a new channel with an adjoining floodplain bench that grades to the existing ground elevation in order to partial restore flood prone conditions. A 42 foot road crossing was installed on this reach.
Main Steam Lower Reach	1320 lf	R	P2	1779 lf	10+00-27+79	1:1	1769		Fully restores pattern, dimension and profile by excavating a new channel with an adjoining floodplain bench that grades to the existing ground elevation in order to partial restore flood prone conditions. A 20 foot utility easement crosses this restoration reach. SMUs were at 1/2 credit in the area of this crossing.
Tributary	550 lf	R	P2	648 lf	10+00-16+48	1:1	648		Fully restores pattern, dimension and profile by excavating a new channel with an adjoining floodplain bench that grades to the existing ground elevation in order to partial restore flood prone conditions.
Wetland A	0 acres (TBD)	R		2.92 acres		1:1	2.92		Restores topography, hydrology, and habitats of a natural wetland system by excavating new floodplains and filling agricultural ditches to promote an increase in ground water elevation.
Wetland B	0 acres (TBD)	R		1.43 acres		1:1	1.43		Restores topography, hydrology, and habitats of a natural wetland system by excavating new floodplains and filling agricultural ditches to promote an increase in ground water elevation.
Wetland C	0 acres (TBD)	R		1.34 acres		1:1	1.34		Restores topography, hydrology, and habitats of a natural wetland system by excavating new floodplains and filling agricultural ditches to promote an increase in ground water elevation.
Wetland D	0 acres (TBD)	R		0.97 acres		1:1	0.97		Restores topography, hydrology, and habitats of a natural wetland system by excavating new floodplains and filling agricultural ditches to promote an increase in ground water elevation.

Table 1b. Component Summations
Fletcher-Meritor Site(UT to Cane Creek) Stream and Wetland Restoration/Project No. 138

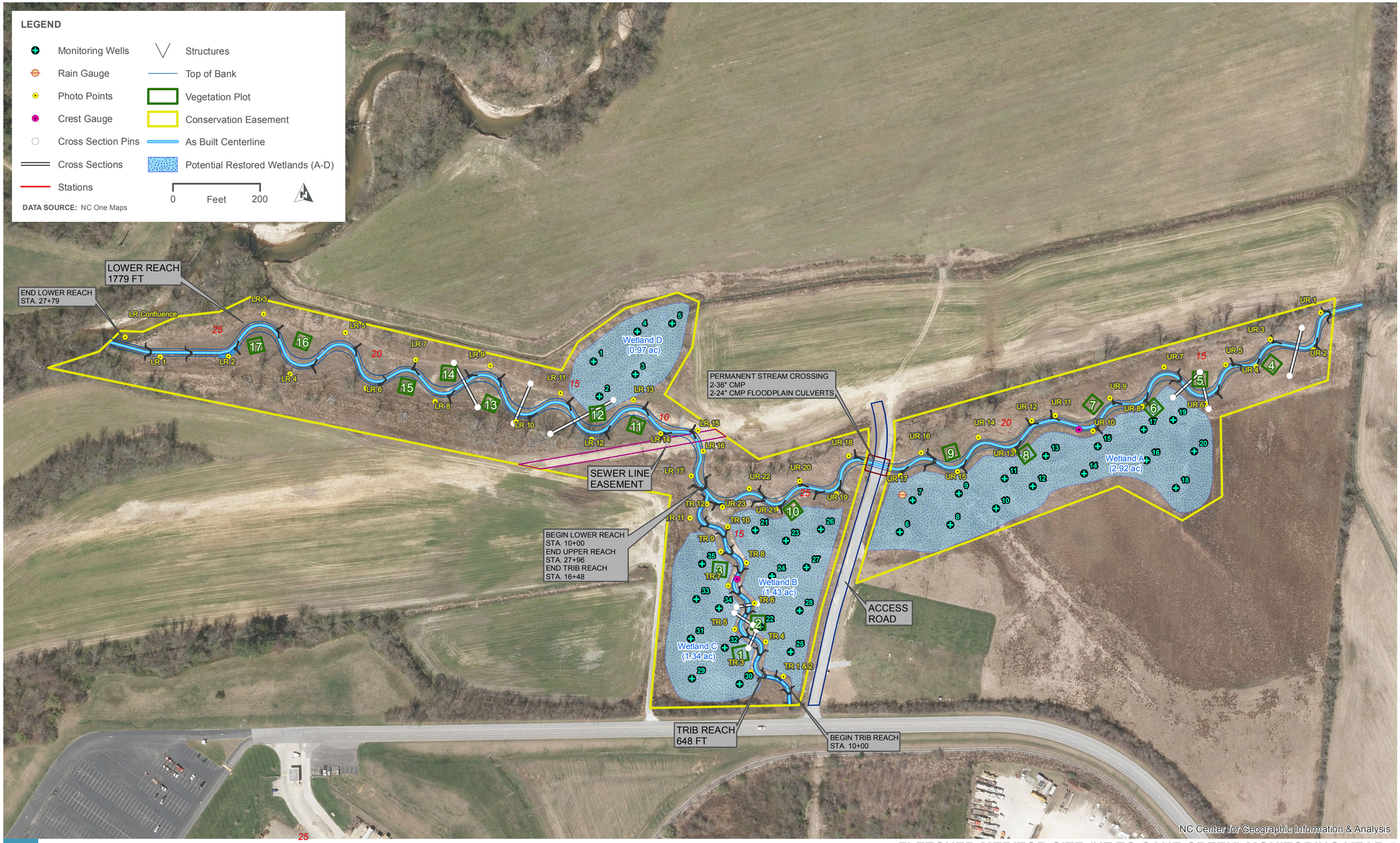
Restoration Level	Stream (lf)	Stream Mitigation Units (lf)	Riparian Wetland (Ac)		Planted Area (Ac)	Potential Buffer Area (sf)	Upland (Ac)	Total Conservation Area (Ac)	BMP
			Riverine	Non-Riverine					
Main Steam Upper Reach	1796	1796	0.0	0.0					
Main Steam Lower Reach	1779	1769	0.0	0.0					
Tributary	648	648	0.0	0.0					
Wetland A	0	0	2.92						
Wetland B	0	0	1.43						
Wetland C	0	0	1.34						
Wetland D	0	0	0.97						
Totals (Feet/Acres)	4,223	4,213	6.7		18.59			20.3	

Table 2. Project Activity and Reporting History Fletcher-Meritor Site (UT to Cane Creek) Stream and Wetland Restoration/Project No. 138		
Elapsed Time Since Grading Complete: 5 yrs 0 months		
Elapsed Time Since Planting Complete: 5 yrs 0 Months		
Number of Reporting Years: 5		
Activity or Deliverable	Data Collection Complete	Completion or Delivery
Restoration Plan	December 2007	February 15, 2008
Final Design – Construction Plans	December 2007	May 2011
Construction/Grading	NA	May 2012
Temporary Seeding	NA	Dec. 2011-April 2012
Permanent Seeding	NA	April 2012
Planting (containerized, bare root)	NA	April 2012
Final Inspection	NA	June 2012
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	September 2012	May 2013
Year 1 Monitoring	May 2013	March 2014
Year 2 Monitoring	May 2014	August 2014
Utility Construction / Planting	Summer 2014	January 2015
Signage/Boundary Marking Improvements	NA	2015
Year 3 Monitoring	May 2015	January 2016
Year 4 Monitoring	March & June 2016	December 2016
Year 5 Monitoring	March & May 2017	January 2018
Year 6 Monitoring	March & May 2018	November 2018

Table 3. Project Contacts Table Fletcher-Meritor Site (UT to Cane Creek) Stream and Wetland Restoration/Project No. 138	
Designer	HDR Engineering Inc. of the Carolinas 3733 National Drive, Suite 207, Raleigh, NC 27612
Primary project design POC	Jonathan Henderson, PE (919) 785-1118
Construction Contractor	Buchanan and Sons, Inc. P.O. Box 123, Whittier, NC 28789
Construction contractor POC	Chris Buchanan, (828) 497-9720
Survey Contractor	Terminus Land Surveying, PLLC 28 Bessie Drive, Fletcher, NC 28724
Survey contractor POC	Christopher J. Gagne, (828) 551-8928
Planting Contractor	HARP, Inc. 301 McCullough Drive, 4th Floor, Charlotte, NC 28262
Planting contractor POC	Alan Peoples, (704) 841-2841
Seeding Contractor	Buchanan and Sons, Inc. P.O. Box 123, Whittier, NC 28789
Contractor point of contact	Chris Buchanan, (828) 497-9720
Seed Mix Sources	Protech Environmental, Charlotte, NC Phone: (704) 676-9788
Nursery Stock Suppliers	Cure Nursery, Pittsboro, NC - (919) 542-6186 Foggy Mountain Nursery LLC, Creston, NC - (336) 384-5323 Supertree Nursery, Blenheim, SC - (800) 222-1290 Habitat and Restoration Plants, Lexington, NC - (336) 362-6776 NC Division of Forest Resources, Greensboro, NC - (919) 731-7988 Little River Nursery, McMinnville, TN - (931) 668-8000 Virginia Department of Forestry, Crimora, VA - (540) 363-5732
Monitoring Performers - Baseline	HDR Engineering Inc. of the Carolinas 3733 National Drive, Suite 207, Raleigh, NC 27612 Vickie Miller, AICP, PWS (919) 232-6637
Stream Monitoring POC	Wyatt Yelverton, PE (919) 232-6623
Vegetation Monitoring POC	Vickie Miller, AICP, PWS (919) 232-6637
Wetland Monitoring POC	NA

Table 4. Project Attribute Table Fletcher-Meritor Site (UT to Cane Creek) Stream and Wetland Restoration/Project No. 138							
Project County	Henderson						
Physiographic Region	Mountains						
Ecoregion	Blue Ridge (Broad Basins)						
Project River Basin	French Broad River Basin						
USGS HUC for Project (8 digit)	6010105						
NCDWQ Sub-basin for Project	04-03-02						
Within extent of EEP Watershed Plan?	No						
WRC Hab Class (Warm, Cool, Cold)	Warm						
% of project easement fenced or demarcated	100% marked with EEP easement signage						
Beaver activity observed during design phase?	No						
Restoration Component Attribute Table							
	Main Steam Upper Reach	Main Steam Lower Reach	Tributary	Wetland A	Wetland B	Wetland C	Wetland D
Drainage area (ac)	480	704	205	NA	NA	NA	NA
Stream order	2nd		1st	NA	NA	NA	NA
Restored length (feet or acreage)	1796	1779	648	2.92	1.43	1.34	0.97
Perennial or Intermittent				NA	NA	NA	NA
Watershed type (Rural, Urban, Developing etc.)	Devel.						
Watershed LULC Distribution (e.g.)							
Watershed impervious cover (%) (Commercial/Institutional Buildings/Roads)	38						
Forested	20						
Low Density Residential / Open Fields/ Lawns	28						
Medium-Density Residential	14						
NCDWQ AU/Index number	-						
NCDWQ classification	C			NA	NA	NA	NA
303d listed?	No			NA	NA	NA	NA
Upstream of a 303d listed segment?	Yes			NA	NA	NA	NA
Reasons for 303d listing or stressor	Biological Integrity (Benthos)			NA	NA	NA	NA
Total acreage of easement	20.3						
Total vegetated acreage within the easement	18.59						
Total planted acreage as part of the restoration	18.59						
Rosgen classification of pre-existing	Impaired Ditch	Impaired Ditch	Impaired Ditch	NA	NA	NA	NA
Rosgen classification of As-built	C/E4	C/E4	C/E4	NA	NA	NA	NA
Valley type	VIII	VIII	VIII	NA	NA	NA	NA
Valley slope	0.31%		0.15%	NA	NA	NA	NA
Valley side slope range (e.g. 2-3.%)	-	-		NA	NA	NA	NA
Valley toe slope range (e.g. 2-3.%)	-	-		NA	NA	NA	NA
Cowardin classification	NA			Palustrine	Palustrine	Palustrine	Palustrine
Trout waters designation	No			NA	NA	NA	NA
Species of concern, endangered etc.? (Y/N)	No						
Dominant soil series and characteristics							
Series	Comus	Codorus	Kinkora	Codorus / Kinkora	Kinkora	Kinkora	Comus / Kinkora
Depth	U	U	U	U	U	U	U
Clay%	U	U	U	U	U	U	U
K	U	U	U	U	U	U	U
T	U	U	U	U	U	U	U

Appendix B

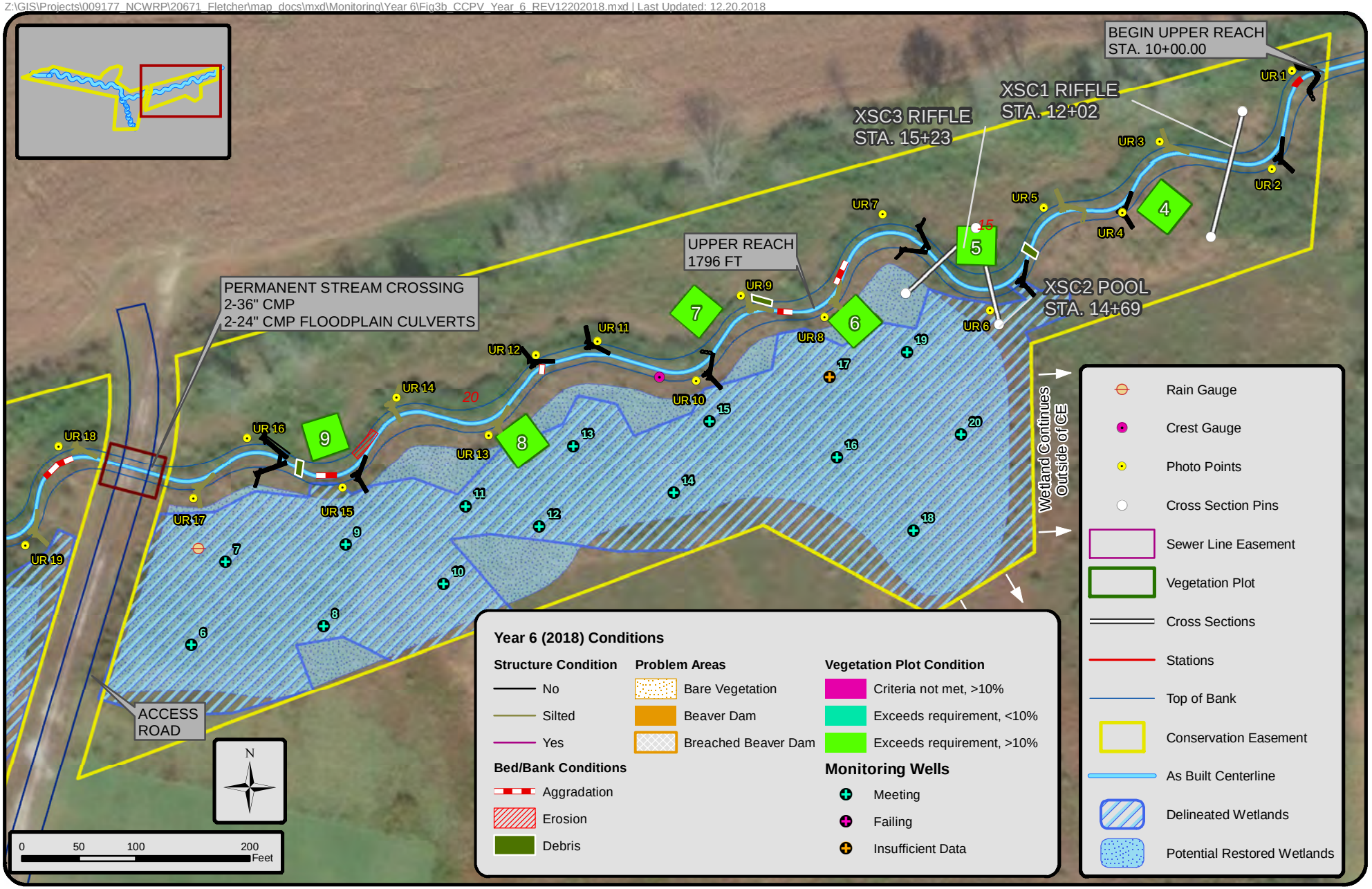


FLETCHER-MERITOR SITE (UT TO CANE CREEK) MONITORING YEAR 5

CURRENT CONDITIONS PLAN VIEW

FIGURE 3A

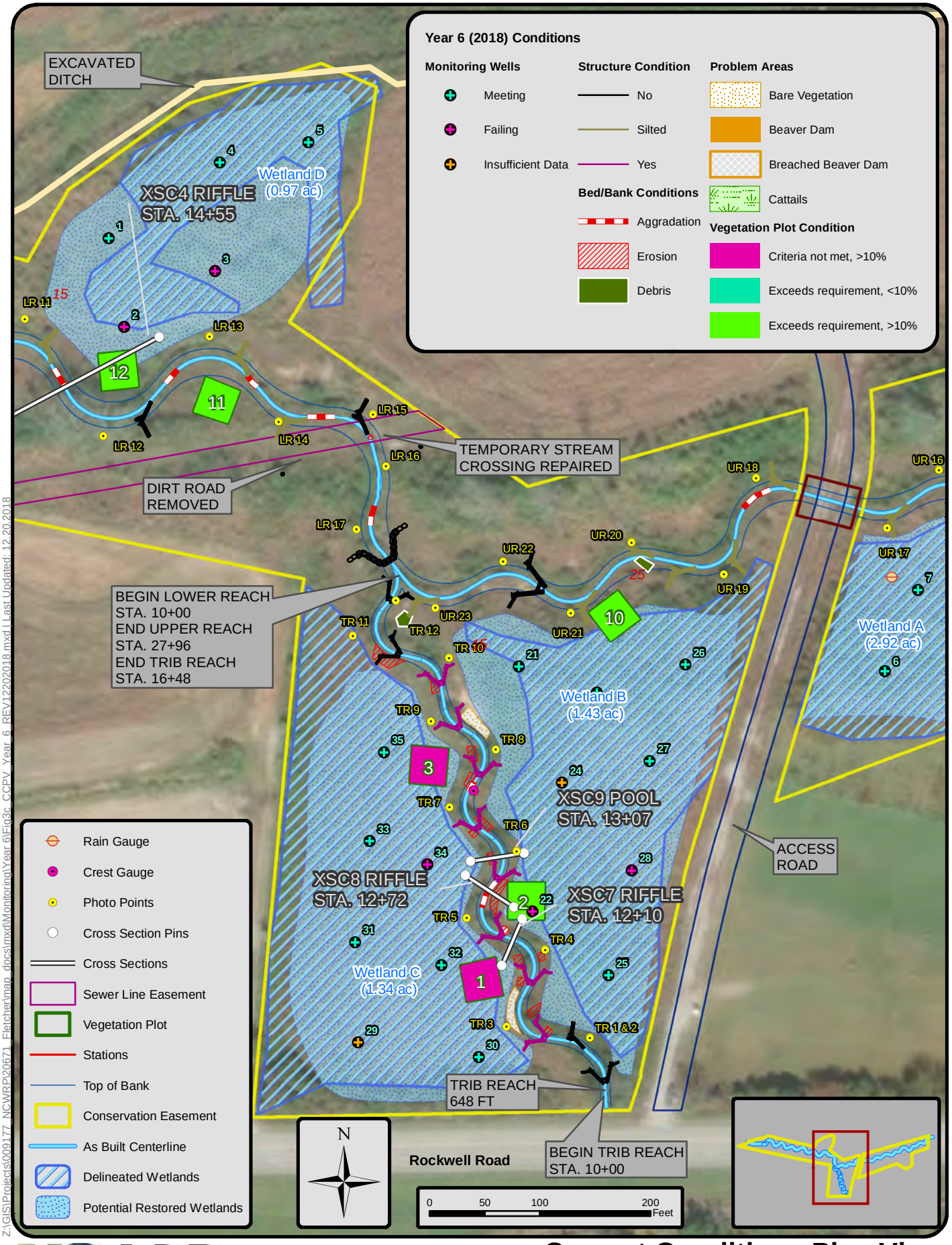
Z:\GIS\Projects\009177_NCWRP\20671_Fletcher\map_docs\mxd\Monitoring\Year 6\Fig3b_CCPV_Year_6_REV12202018.mxd | Last Updated: 12.20.2018



Current Conditions Plan View

Figure 3b

Fletcher-Meritor Site (UT to Cane Creek) Year 6 Monitoring I Henderson County, NC
NC Division of Mitigation Services | Project No. 138



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Current Conditions Plan View

Figure 3c

Fletcher-Meritor Site (UT to Cane Creek) Year 6 Monitoring I Henderson County, NC
NC Division of Mitigation Services | Project No. 138

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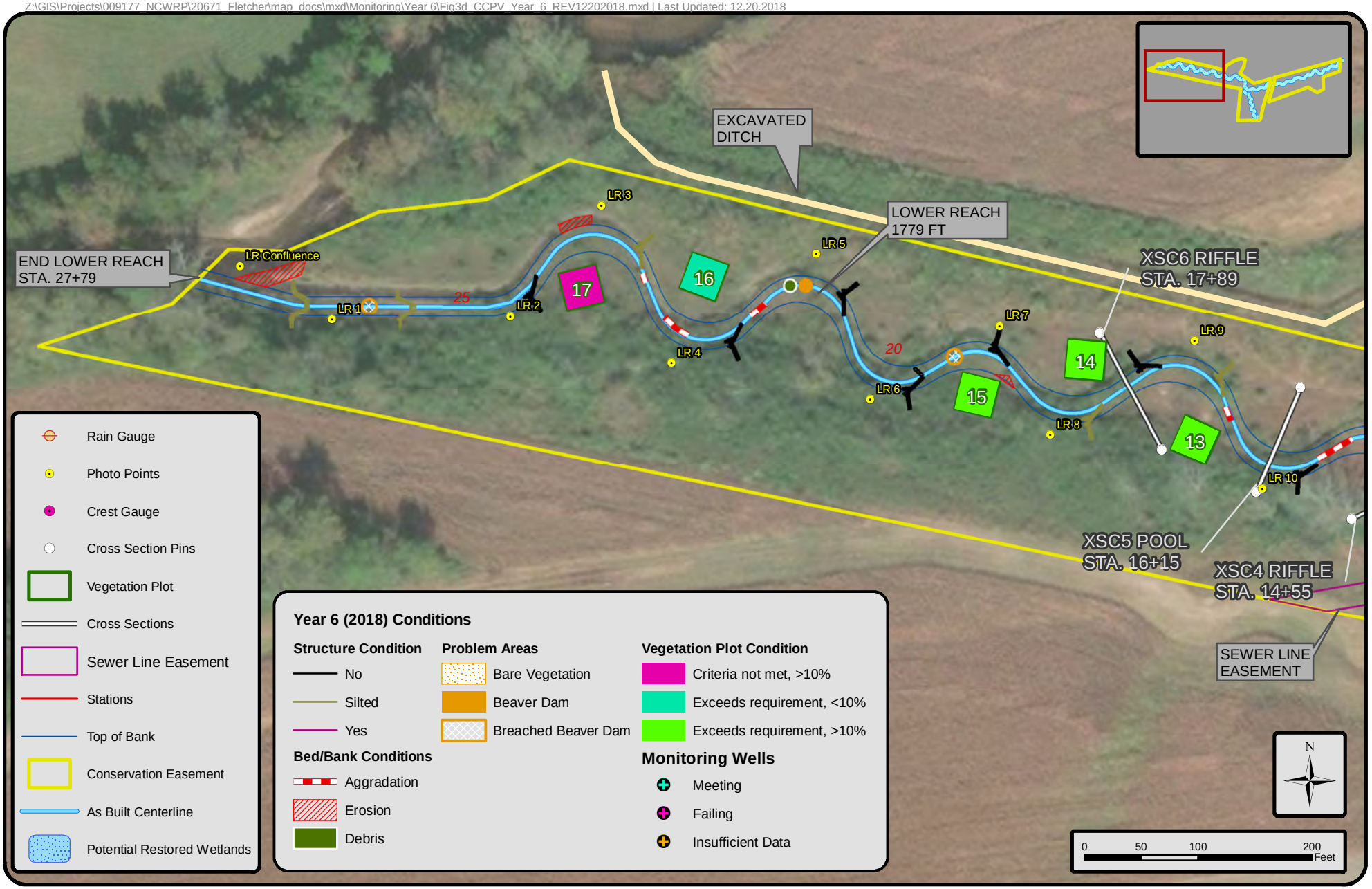


Current Conditions Plan View

Figure 3d

Fletcher-Meritor Site (UT to Cane Creek) Year 6 Monitoring I Henderson County, NC
NC Division of Mitigation Services | Project No. 138

Upper Reach Photo Station 1 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 1 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 2 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 2 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 3 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 3 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 4 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 4 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 5 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 5 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 6 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 6 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 7 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 7 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 8 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 8 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 9 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 9 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 10 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 10 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 11 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 11 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 12 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 12 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 13 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 13 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 14 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 14 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 15 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 15 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 16 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 16 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 17 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 17 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 18 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 18 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 19 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 19 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 20 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 20 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 21 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 21 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 22 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 22 Upstream (3/19/2018 Year 6)

Upper Reach Photo Station 23 Downstream (3/19/2018 Year 6)

Upper Reach Photo Station 23 Upstream (3/19/2018 Year 6)

Confluence with Cane Creek (3/19/2018 Year 6)

Looking upstream of Confluence with Cane Creek (3/19/2018 Year 6)

Lower Reach Photo Station 1 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 1 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 2 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 2 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 3 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 3 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 4 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 4 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 5 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 5 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 6 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 6 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 7 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 7 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 8 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 8 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 9 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 9 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 10 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 10 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 11 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 11 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 12 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 12 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 13 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 13 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 14 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 14 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 15 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 15 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 16 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 16 Upstream (3/19/2018 Year 6)

Lower Reach Photo Station 17 Downstream (3/19/2018 Year 6)

Lower Reach Photo Station 17 Upstream (3/19/2018 Year 6)

Tributary Reach Photo Station 1 Downstream (3/19/2018 Year 6)

Tributary Reach Photo Station 1 Upstream (3/19/2018 Year 6)

Tributary Reach Photo Station 2 Downstream (3/19/2017 Year 6)

Tributary Reach Photo Station 2 Upstream (3/19/2018 Year 6)

Tributary Reach Photo Station 3 Downstream (3/19/2018 Year 6)

Tributary Reach Photo Station 3 Upstream (3/19/2018 Year 6)

Tributary Reach Photo Station 4 Downstream (3/19/2018 Year 6)

Tributary Reach Photo Station 4 Upstream (3/19/2018 Year 6)

Tributary Reach Photo Station 5 Downstream (3/19/2018 Year 6)

Tributary Reach Photo Station 5 Upstream (3/19/2018 Year 6)

Tributary Reach Photo Station 6 Downstream (3/19/2018 Year 6)

Tributary Reach Photo Station 6 Upstream (3/19/2018 Year 6)

Tributary Reach Photo Station 7 Downstream (3/19/2018 Year 6)

Tributary Reach Photo Station 7 Upstream (3/19/2018 Year 6)

Tributary Reach Photo Station 8 Downstream (3/19/2018 Year 6)

Tributary Reach Photo Station 8 Upstream (3/19/2018 Year 6)

Tributary Reach Photo Station 9 Downstream (3/19/2018 Year 6)

Tributary Reach Photo Station 9 Upstream (3/19/2018 Year 6)

Tributary Reach Photo Station 10 Downstream (3/19/2018 Year 6)

Tributary Reach Photo Station 10 Upstream (3/19/2018 Year 6)

Tributary Reach Photo Station 11 Downstream (3/19/2018 Year 6)

Tributary Reach Photo Station 11 Upstream (3/19/2018 Year 6)

Tributary Reach Photo Station 12 Downstream (3/19/2018 Year 6)

Tributary Reach Photo Station 12 Upstream (3/19/2018 Year 6)

Appendix C

Fletcher-Meritor Site (#138)

Year 6 (10-May-2018)

Vegetation Plot Summary Information

Plot #	Riparian Buffer Stems[1]	Stream/ Wetland Stems[2]	Live Stakes	Invasives	Volunteers[3]	Total[4]	Unknown Growth Form
1	n/a	3	0	21	30	**19**	0
2	n/a	8	0	21	17	**11**	0
3	n/a	4	0	3	3	**4**	0
4	n/a	19	0	1	26	**45**	0
5	n/a	11	0	22	31	**21**	0
6	n/a	8	0	25	49	**32**	0
7	n/a	19	0	7	30	**42**	0
8	n/a	11	0	13	199	**197**	0
9	n/a	9	0	2	5	**12**	0
10	n/a	8	0	12	23	**20**	0
11	n/a	11	0	1	207	**217**	0
12	n/a	9	0	1	149	**157**	0
13	n/a	8	0	4	158	**162**	0
14	n/a	8	0	59	137	**86**	0
15	n/a	14	0	2	230	**242**	0
16	n/a	7	0	3	118	**122**	0
17	n/a	3	0	1	320	**322**	0

Wetland/Stream Vegetation Totals

(per acre)

Plot #	Stream/ Wetland Stems[2]	Volunteers[3]	Total[4]	Success Criteria Met?
1	121	1214	769	No
2	324	688	445	Yes
3	162	121	162	No
4	769	1052	1821	Yes
5	445	1255	850	Yes
6	324	1983	1295	Yes
7	769	1214	1700	Yes
8	445	8053	7972	Yes
9	364	202	486	Yes
10	324	931	809	Yes
11	445	8377	8782	Yes
12	364	6030	6354	Yes
13	324	6394	6556	Yes
14	324	5544	3480	Yes
15	567	9308	9793	Yes
16	283	4775	4937	Yes
17	121	12950	13031	No
Project Avg	**381**	**4123**	**4073**	

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

Stem Class	**characteristics**
[1]Buffer Stems	Native planted hardwood trees. Does NOT include shrubs. No pines. No vines.
[2]Stream/ Wetland Stems	Native planted woody stems. Includes shrubs, does NOT include live stakes. No vines
[3]Volunteers	Native woody stems. Not planted. No vines.
[4]Total	Planted + volunteer native woody stems. Includes live stakes. Excl. exotics. Excl. vines.

EEP Project Code 138. Project Name: Fletcher-Meritor Site

Current Plot Data (MY6 2018)

Scientific Name	Common Name	Species Type	138-01-0001			138-01-0002			138-01-0003			138-01-0004			138-01-0005			138-01-0006			138-01-0007			138-01-0008		
			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 negundo	boxelder	Tree							1	1	1				3	3	4				7	7	11			7
Acer rubrum	red maple	Tree						1						5	1	1	1			6			4			9
Acer saccharinum	silver maple	Tree										1	1	1												
Alnus serrulata	hazel alder	Shrub																								
Betula nigra	river birch	Tree										7	7	15	1	1	1	1	1	1	3	3	4	4	4	4
Carya	hickory	Tree																								
Cornus amomum	silky dogwood	Shrub				2	2	3							2	2	2				1	1	1			
Cornus florida	flowering dogwood	Tree																								
Fraxinus pennsylvanica	green ash	Tree	2	2	17	3	3	3	3	3	3	4	4	14				3	3	8	3	3	17	5	5	171
Juglans nigra	black walnut	Tree										3	3	3	1	1	1			1	1	1	1			
Liriodendron tulipifera	tuliptree	Tree																								
Pinus	pine	Tree																								
Platanus occidentalis	American sycamore	Tree	1	1	1	3	3	4				4	4	4	3	3	12	4	4	15	3	3	3	1	1	2
Populus deltoides	eastern cottonwood	Tree																								
Prunus serotina	black cherry	Tree												2							1	1	1			
Salix nigra	black willow	Tree			1															1				1	1	4
Sambucus canadensis	Common Elderberry	Shrub																								
Unknown		Shrub or Tree																								
Viburnum dentatum	southern arrowwood	Shrub												1												
		Stem count	3	3	19	8	8	11	4	4	4	19	19	45	11	11	21	8	8	32	19	19	42	11	11	197
		size (ares)	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		
		Species count	2	2	3	3	3	4	2	2	2	5	5	8	6	6	6	3	3	6	7	7	8	4	4	6
		Stems per ACRE	121.4	121.4	768.9	323.7	323.7	445.2	161.9	161.9	161.9	768.9	768.9	1821	445.2	445.2	849.8	323.7	323.7	1295	768.9	768.9	1700	445.2	445.2	7972

See Below including Salix caprea and Pyrus calleryana - these species were not planted but have volunteered and are noted as exotic

Pyrus calleryana	Callery pear	Exotic	1	1	1						2															
Salix caprea	goat willow	Exotic	6	6	20	7	7	21			1	1	1	1	1	1	22			25			7			13
		Stem count	10	10	40	15	15	32	4	4	7	20	20	46	12	12	43	8	8	57	19	19	49	11	11	210
		size (ares)	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		
		Species count	9	7	8	9	7	7	6	4	6	10	8	10	10	8	8	8	6	9	11	9	10	9	7	8
		Stems per ACRE	404.7	404.7	1619	607	607	1295	161.9	161.9	283.3	809.4	809.4	1862	485.6	485.6	1740	323.7	323.7	2307	768.9	768.9	1983	445.2	445.2	8498

EEP Project Code 138. Project Name: Fletcher-Meritor Site

Scientific Name	Common Name	Species Type	138-01-0009			138-01-0010			138-01-0011			138-01-0012			138-01-0013			138-01-0014			138-01-0015			138-01-0016		
			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 negundo	boxelder	Tree	1	1	1			6	1	1	1	2	2	3												3
Acer rubrum	red maple	Tree			1			1			2			5			1			10			3			5
Acer saccharinum	silver maple	Tree																								
Alnus serrulata	hazel alder	Shrub			1	1	1	1	1	1	1				2	2	3						11			
Betula nigra	river birch	Tree							3	3	205	2	2	113	2	2	152	3	3	63	3	3	213	1	1	101
Carya	hickory	Tree																								
Cornus amomum	silky dogwood	Shrub							1	1	2	5	5	7	2	2	3	4	4	8	10	10	12	3	3	3
Cornus florida	flowering dogwood	Tree																								
Fraxinus pennsylvanica	green ash	Tree	3	3	3	2	2	7	2	2	2			27				1	1	3						
Juglans nigra	black walnut	Tree	1	1	1																					
Liriodendron tulipifera	tuliptree	Tree			1									1												
Pinus	pine	Tree									1															
Platanus occidentalis	American sycamore	Tree	4	4	4	5	5	5	3	3	3				2	2	3				1	1	1	3	3	10
Populus deltoides	eastern cottonwood	Tree																								
Prunus serotina	black cherry	Tree																								
Salix nigra	black willow	Tree												1						2			2			
Sambucus canadensis	Common Elderberry	Shrub																								
Unknown		Shrub or Tree																								
Viburnum dentatum	southern arrowwood	Shrub																								
		Stem count	9	9	12	8	8	20	11	11	217	9	9	157	8	8	162	8	8	86	14	14	242	7	7	122
		size (ares)	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		
		Species count	4	4	7	3	3	5	6	6	8	3	3	7	4	4	5	3	3	5	3	3	6	3	3	5
		Stems per ACRE	364.2	364.2	485.6	323.7	323.7	809.4	445.2	445.2	8782	364.2	364.2	6354	323.7	323.7	6556	323.7	323.7	3480	566.6	566.6	9793	283.3	283.3	4937

See Below including Salix caprea and Pyrus calleryana - these speci

Pyrus calleryana	Callery pear	Exotic				1	1	1																		3
Salix caprea	goat willow	Exotic			2			11			1			1			4			59			2			
		Stem count	9	9	14	9	9	32	11	11	218	9	9	158	8	8	166	8	8	145	14	14	244	7	7	125
		size (ares)	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		
		Species count	8	6	9	9	7	8	10	8	10	7	5	9	9	7	8	8	6	8	8	6	9	8	6	7
		Stems per ACRE	364.2	364.2	566.6	364.2	364.2	1295	445.2	445.2	8822	364.2	364.2	6394	323.7	323.7	6718	323.7	323.7	5868	566.6	566.6	9874	283.3	283.3	5059

EEP Project Code 138. Project Name: Fletcher-Meritor Site

			Annual Means																				
			138-01-0017			MY6 (2018)			MY5 (2017)			MY4 (2016)			MY3 (2015)			MY2 (2014)			MY1 (2013)			MY0 (2012)		
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
Acer negundo	boxelder	Tree				15	15	37	17	17	26	17	17	20	20	20	37	22	22	68	27	27	27	22	22	22
Acer rubrum	red maple	Tree				1	1	54	1	1	24	1	1	4	2	2	11	2	2	72			9			
Acer saccharinum	silver maple	Tree				1	1	1	1	1	1	1	1	1												
Alnus serrulata	hazel alder	Shrub			5	4	4	22	5	5	11	4	4	9	1	1	1									
Betula nigra	river birch	Tree	1	1	311	31	31	1183	32	32	1611	33	33	982	32	32	1110	31	31	1225	29	29	832	26	26	481
Carya	hickory	Tree									1			1												
Cornus amomum	silky dogwood	Shrub	1	1	1	31	31	42	32	32	38	33	33	35	34	34	34	32	32	32	31	31	31	30	30	30
Cornus florida	flowering dogwood	Tree									3															
Fraxinus pennsylvanica	green ash	Tree	1	1	1	32	32	276	34	34	246	33	33	153	36	36	160	37	37	80	40	40	40	36	36	36
Juglans nigra	black walnut	Tree				6	6	7	9	9	9	9	9	12	9	9	11	8	8	8	7	7	7	6	6	6
Liriodendron tulipifera	tuliptree	Tree						2			3			1			1			1						
Pinus	pine	Tree			1			2																		
Platanus occidentalis	American sycamore	Tree				37	37	67	37	37	77	37	37	91	36	36	67	34	34	75	33	33	59	35	35	70
Populus deltoides	eastern cottonwood	Tree										1	1	1	2	2	6	1	1	1						
Prunus serotina	black cherry	Tree				1	1	3	1	1	3	1	1	1			2	1	1	1	1	1	1	1	1	1
Salix nigra	black willow	Tree			3	1	1	14	1	1	10	1	1	5	1	1	10	1	1	11						
Sambucus canadensis	Common Elderberry	Shrub																						1	1	1
Unknown		Shrub or Tree																			1	1	1	1	1	1
Viburnum dentatum	southern arrowwood	Shrub						1																		
		Stem count	3	3	322	160	160	1711	170	170	2063	171	171	1316	173	173	1450	169	169	1574	169	169	1007	158	158	648
		size (ares)	1			17			17			17			17			17			17			17		
		size (ACRES)	0.02			0.42			0.42			0.42			0.42			0.42			0.42			0.42		
		Species count	3	3	6	11	11	14	11	11	14	12	12	14	10	10	12	10	10	11	8	8	9	9	9	9
		Stems per ACRE	121.4	121.4	13031	380.9	380.9	4073	404.7	404.7	4911	407.1	407.1	3133	411.8	411.8	3452	402.3	402.3	3747	402.3	402.3	2397	376.1	376.1	1543

See Below including Salix caprea and Pyrus calleryana - these speci

Pyrus calleryana	Callery pear	Exotic			1	2	2	8	2	2	6	1	1	4	1	1	2									
Salix caprea	goat willow	Exotic				15	15	190							12	12	105	17	17	34						
		Stem count	3	3	323	177	177	1909	172	172	2069	172	172	1320	186	186	1557	186	186	1608	169	169	1007	158	158	648
		size (ares)	1			17			17			17			17			17			17			17		
		size (ACRES)	0.02			0.42			0.42			0.42			0.42			0.42			0.42			0.42		
		Species count	8	6	10	15	13	16	14	12	15	15	13	15	15	13	15	14	12	13	12	10	10	13	11	11
		Stems per ACRE	121.4	121.4	13071	421.3	421.3	4544	409.4	409.4	4925	409.4	409.4	3142	442.8	442.8	3706	442.8	442.8	3828	402.3	402.3	2397	376.1	376.1	1543

Report Prepared By	Vickie Miller
Date Prepared	12/20/2018 21:11

database name	cvs-eep-entrytool-v2.3.1 Fletcher Year 6 - Revised 12_20_2018.mdb
database location	R:\EEP-WRP\20671 Fletcher\Monitoring\Year 6\Fletcher_Meritor_Site_138_2018_MY6\Support Files\Vegetation Plot Data
computer name	RAL-R90R9BFR
file size	60985344

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	138
project Name	Fletcher-Meritor Site
Description	Wetland and Stream mitigation in Henderson County, NC.
River Basin	French Broad
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	17

Vegetation Plot 1 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 2 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 3 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 4 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 5 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 6 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 7 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 8 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 9 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 10 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 11 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 12 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 13 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 14 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 15 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 16 – 10m x 10m (5/10/2018 Year 6)

Vegetation Plot 17 – 10m x 10m (5/10/2018 Year 6)

Appendix D

Station	Elevation
0.00	2061.52
0.23	2061.19
4.83	2061.14
12.44	2060.92
24.32	2060.99
33.46	2060.79
41.44	2060.85
46.83	2060.52
51.35	2060.04
53.96	2059.79
55.84	2059.59
57.88	2059.60
59.13	2059.79
60.29	2059.62
61.13	2059.31
61.71	2059.11
62.14	2058.48
62.85	2057.85
63.62	2057.32
63.75	2057.13
63.99	2057.03
64.38	2056.92
64.72	2056.79
65.26	2056.84
65.90	2056.90
66.58	2056.98
67.05	2057.09
67.33	2057.22
67.84	2057.56
68.07	2057.80
68.74	2058.28
69.05	2058.39
70.87	2058.79
71.69	2058.96
72.78	2059.24
74.04	2059.45
74.96	2059.53
76.56	2059.94
78.60	2059.94
81.68	2060.16
86.09	2060.44
88.93	2060.66
92.25	2061.07
98.47	2061.17
104.32	2061.55
105.31	2061.62
110.56	2061.47

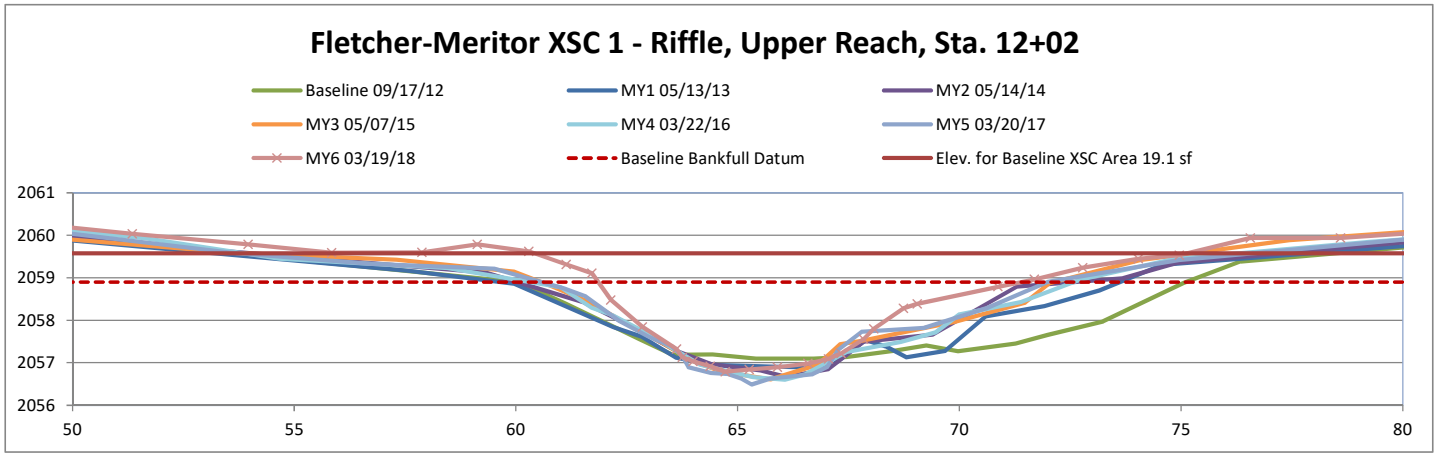
Reach	Fletcher-Meritor, Upper Reach
River Basin	French Broad
Cross Section ID	XSC-1, Riffle, Upper Reach, 12+02
Drainage Area (Sq Mi)	0.75
Date	3/19/2018
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Baseline Bankfull Datum, ft	2058.90
Bankfull Cross Sectional Area, ft^2	11.20
Bankfull Width, ft	9.50
Max Depth at Bankfull, ft	2.11
Mean Depth at Bankfull, ft	1.18
Width/Depth Ratio	8.06
Flood Prone Width, ft	82.40
Flood Prone Area Elevation, ft	2061.01
Entrenchment Ratio	8.67
***Bank Height Ratio**	1.08
***Bankfull Elevation to Achieve As-Built Cross Sec. Area (19.1 sf)**	2059.58

BHR based on updated 2018 guidance

Stream Type	C/E4

Sta. 12+02 Looking Downstream



Station	Elevation
0.00	2060.93
0.18	2060.43
4.22	2060.54
10.64	2060.47
12.23	2060.21
14.13	2060.02
15.69	2059.82
18.34	2059.45
20.62	2059.11
22.19	2058.90
23.49	2058.64
24.32	2058.68
25.34	2058.50
25.84	2058.01
26.51	2057.85
27.04	2056.97
27.37	2056.63
27.59	2055.89
28.14	2055.69
28.79	2055.63
29.27	2055.78
29.92	2055.97
30.39	2056.07
30.85	2056.08
31.68	2056.30
31.76	2056.36
32.24	2057.28
33.03	2057.98
33.70	2058.35
34.41	2058.60
37.72	2058.50
41.81	2058.58
44.83	2058.76
50.03	2059.37
53.37	2059.73
57.82	2060.17
64.09	2060.54
73.60	2060.58
85.20	2060.55
85.20	2060.88

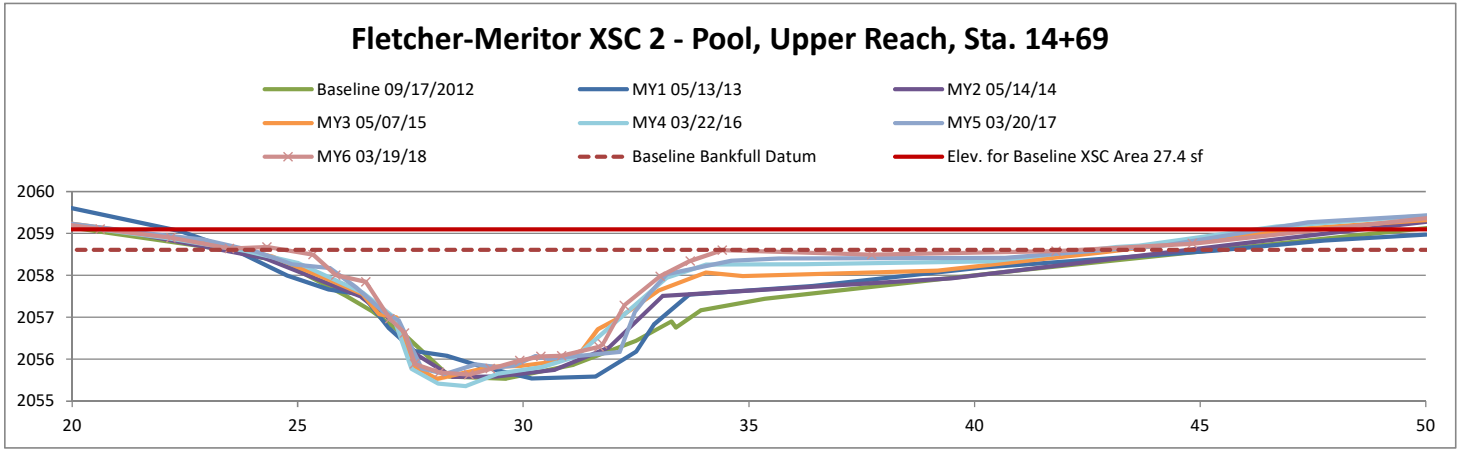
Reach	Fletcher-Meritor, Upper Reach
River Basin	French Broad
Cross Section ID	XSC-2, Pool, Upper Reach, 14+69
Drainage Area (Sq Mi)	0.75
Date	3/19/2018
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Baseline Bankfull Datum, ft	2058.61
Bankfull Cross Sectional Area, ft^2	16.20
Bankfull Width, ft	17.50
Max Depth at Bankfull, ft	2.98
Mean Depth at Bankfull, ft	0.93
Width/Depth Ratio	18.90
Flood Prone Width, ft	>86.00
Flood Prone Area Elevation, ft	2061.59
Entrenchment Ratio	>4.00
***Bank Height Ratio**	0.86
***Bankfull Elevation to Achieve As-Built Cross Sec. Area (27.4 sf)**	2059.10

BHR based on updated 2018 guidance

Stream Type	C/E4

Sta. 14+69 Looking Downstream



Station	Elevation
0.00	2061.19
0.13	2060.73
4.73	2060.64
10.72	2060.96
15.48	2060.70
21.44	2059.62
23.11	2059.45
26.02	2059.18
29.14	2058.95
31.52	2058.81
33.07	2058.40
34.10	2058.21
34.63	2057.81
35.28	2057.71
36.31	2056.38
36.97	2056.23
38.00	2056.02
38.47	2055.90
38.90	2055.96
39.30	2055.99
39.93	2055.99
40.35	2056.19
40.81	2056.16
41.11	2056.51
41.96	2057.27
42.39	2057.58
43.33	2057.79
44.18	2057.98
45.12	2058.49
45.92	2058.81
47.65	2058.98
50.74	2059.15
53.66	2059.29
57.11	2059.57
59.52	2059.86
62.83	2060.29
69.35	2060.65
76.51	2060.76
82.37	2060.39
84.70	2060.67
85.20	2060.88

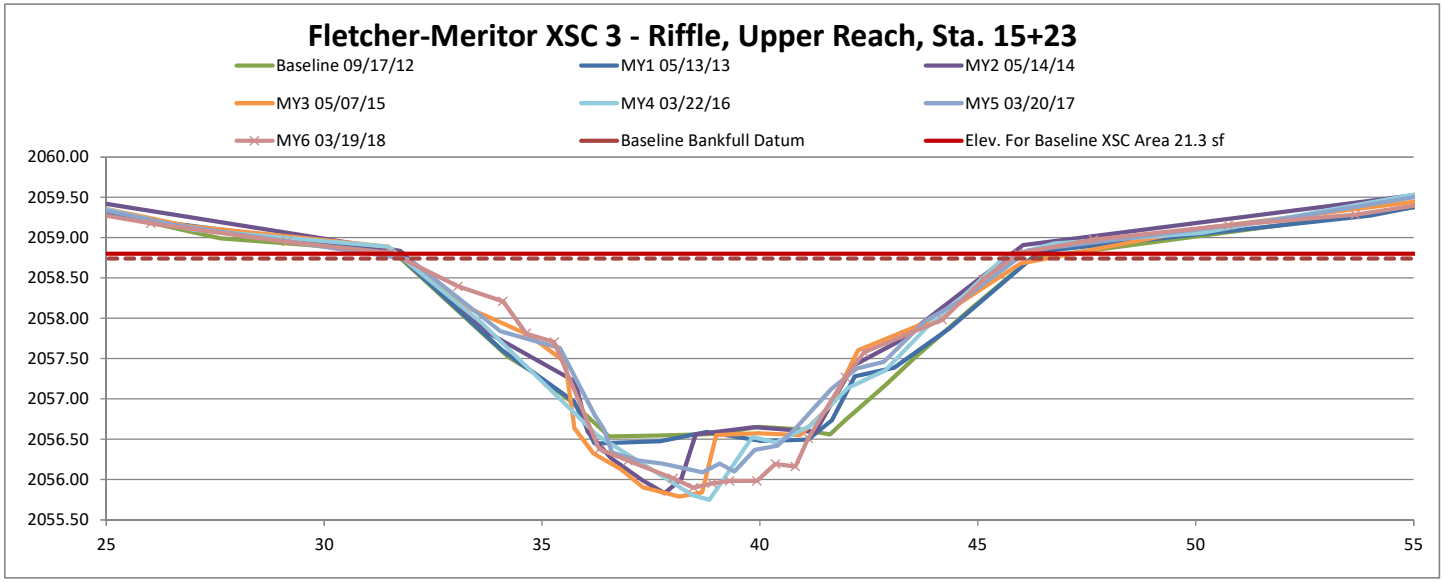
Reach	Fletcher-Meritor, Upper Reach
River Basin	French Broad
Cross Section ID	XSC-3, Riffle, Upper Reach, 15+23
Drainage Area (Sq Mi)	0.75
Date	3/19/2018
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Baseline Bankfull Datum, ft	2058.74
Bankfull Cross Sectional Area, ft^2	20.50
Bankfull Width, ft	14.00
Max Depth at Bankfull, ft	2.84
Mean Depth at Bankfull, ft	1.46
Width/Depth Ratio	9.56
Flood Prone Width, ft	>86.00
Flood Prone Area Elevation, ft	2061.58
Entrenchment Ratio	>6.00
***Bank Height Ratio**	1.00
***Bankfull Elevation to Achieve As-Built Cross Sec. Area (21.3 sf)**	2058.80

BHR based on updated 2018 guidance

Stream Type	C/E4

Sta. 15+23, Looking Downstream



Station	Elevation
0.00	2058.73
0.15	2058.37
2.95	2058.09
8.17	2057.06
11.97	2056.31
15.92	2055.49
18.63	2054.87
22.19	2054.69
31.45	2054.63
38.48	2054.58
42.96	2054.20
48.41	2053.95
53.83	2053.93
56.44	2053.76
58.29	2053.68
59.48	2053.36
60.24	2053.08
61.01	2052.62
61.70	2052.23
62.69	2051.71
63.12	2051.31
63.41	2051.19
63.83	2051.24
64.70	2051.16
65.21	2051.28
65.68	2051.24
66.18	2051.34
66.84	2051.47
67.53	2051.61
68.10	2051.87
68.96	2052.16
69.50	2052.28
70.11	2052.61
71.19	2052.73
73.01	2053.24
73.83	2053.42
74.91	2053.93
75.67	2053.93
77.01	2054.00
79.07	2054.07
85.54	2054.33
94.33	2054.39
105.94	2054.64
117.56	2054.63
128.39	2054.76
136.06	2055.19
140.68	2055.48

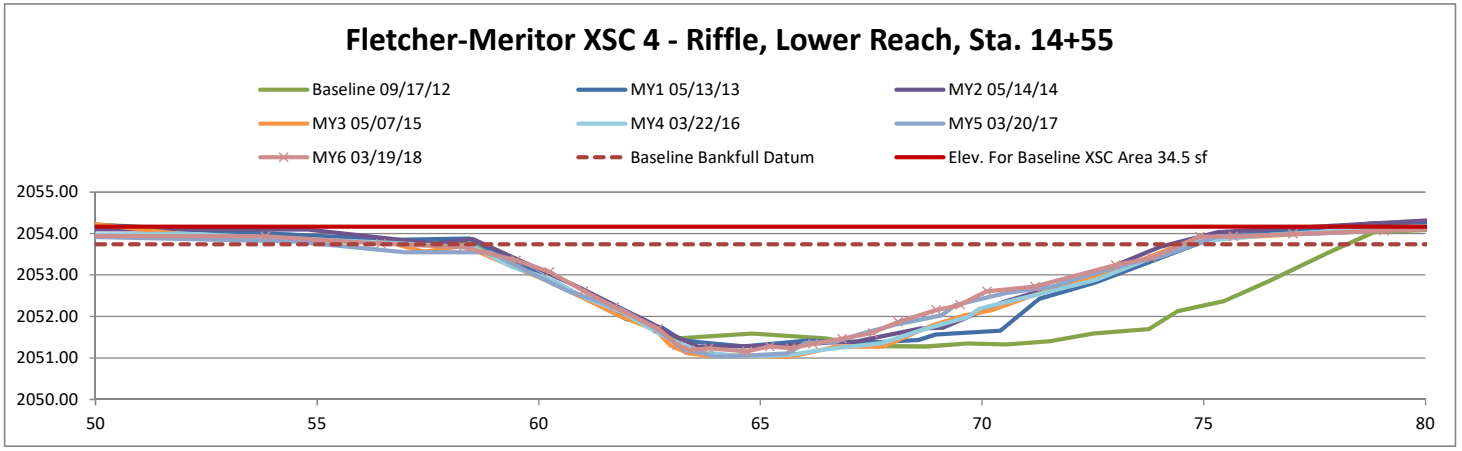
Reach	Fletcher-Meritor, Lower Reach
River Basin	French Broad
Cross Section ID	XSC-4 Riffle, Lower Reach, 14+55
Drainage Area (Sq Mi)	1.1
Date	3/19/2018
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Baseline Bankfull Datum, ft	2053.74
Bankfull Cross Sectional Area, ft^2	23.00
Bankfull Width, ft	17.70
Max Depth at Bankfull, ft	2.58
Mean Depth at Bankfull, ft	1.30
Width/Depth Ratio	13.62
Flood Prone Width, ft	135.00
Flood Prone Area Elevation, ft	2056.32
Entrenchment Ratio	7.63
***Bank Height Ratio**	0.92
***Bankfull Elevation to Achieve As-Built Cross Sec. Area (34.5 sf)**	2054.17

BHR based on updated 2018 guidance

Stream Type	C/E4

Sta. 14+55 Looking Downstream



Station	Elevation
0.00	2058.68
0.14	2058.28
0.61	2058.12
1.56	2057.85
2.76	2057.38
4.10	2056.80
5.65	2056.18
6.98	2055.80
7.59	2055.62
8.94	2055.04
10.42	2054.47
11.31	2054.04
12.07	2053.92
13.31	2053.82
14.38	2053.65
15.28	2053.40
16.14	2053.38
16.96	2053.16
18.45	2052.45
19.36	2052.17
19.98	2051.16
20.53	2050.15
21.21	2050.00
21.80	2049.99
22.59	2049.96
23.30	2050.04
24.20	2050.09
24.76	2050.24
25.57	2050.22
26.24	2050.46
26.95	2050.59
27.28	2051.97
28.13	2052.45
28.71	2052.67
30.88	2052.85
33.68	2052.94
37.37	2052.94
39.58	2052.87
42.51	2053.33
46.63	2053.69
50.64	2053.95
54.30	2053.99
59.40	2054.02
67.48	2054.18
75.04	2054.14
79.99	2054.16
84.77	2054.25

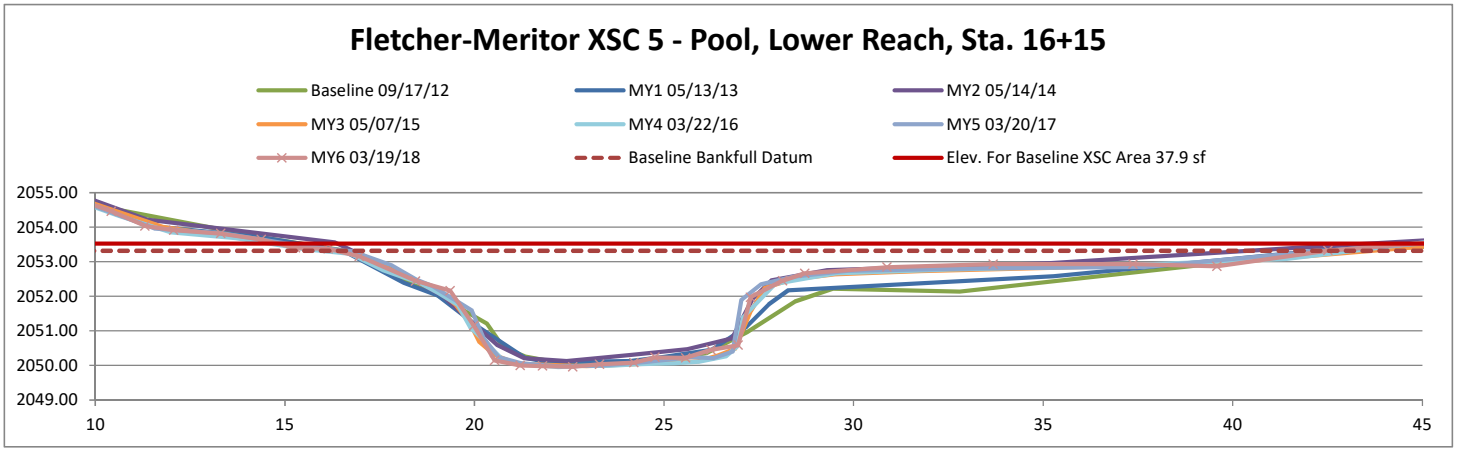
Reach	Fletcher-Meritor, Lower Reach
River Basin	French Broad
Cross Section ID	XSC-5, Pool, Lower Reach, 16+15
Drainage Area (Sq Mi)	1.1
Date	3/19/2018
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Baseline Bankfull Datum, ft	2053.32
Bankfull Cross Sectional Area, ft^2	32.00
Bankfull Width, ft	26.10
Max Depth at Bankfull, ft	3.36
Mean Depth at Bankfull, ft	1.23
Width/Depth Ratio	21.29
Flood Prone Width, ft	85.10
Flood Prone Area Elevation, ft	2056.68
Entrenchment Ratio	3.26
***Bank Height Ratio**	0.96
***Bankfull Elevation to Achieve As-Built Cross Sec. Area (37.9 sf)**	2053.53

BHR based on updated 2018 guidance

Stream Type	C/E4

Sta. 16+15 Looking Downstream



Station	Elevation
0.00	2058.10
0.08	2057.75
1.55	2057.59
4.72	2056.86
10.12	2055.46
13.64	2054.50
16.17	2054.03
20.11	2053.86
25.50	2053.65
30.14	2053.39
36.94	2053.38
43.69	2053.42
46.42	2053.44
51.20	2053.34
52.54	2053.19
54.24	2052.91
55.64	2052.58
56.97	2052.31
58.37	2051.47
60.00	2051.50
61.40	2051.21
62.42	2051.15
63.06	2050.68
63.40	2050.52
64.24	2050.52
65.00	2050.36
65.58	2050.39
65.91	2050.46
66.29	2050.48
67.15	2050.79
67.70	2051.31
68.03	2051.83
68.51	2052.19
69.08	2052.48
69.77	2052.64
71.02	2053.03
71.83	2052.97
73.60	2053.12
75.01	2053.19
78.71	2053.31
84.95	2053.28
92.92	2053.18
101.15	2053.37
104.05	2053.59
105.99	2053.98
108.45	2053.75
109.50	2053.83

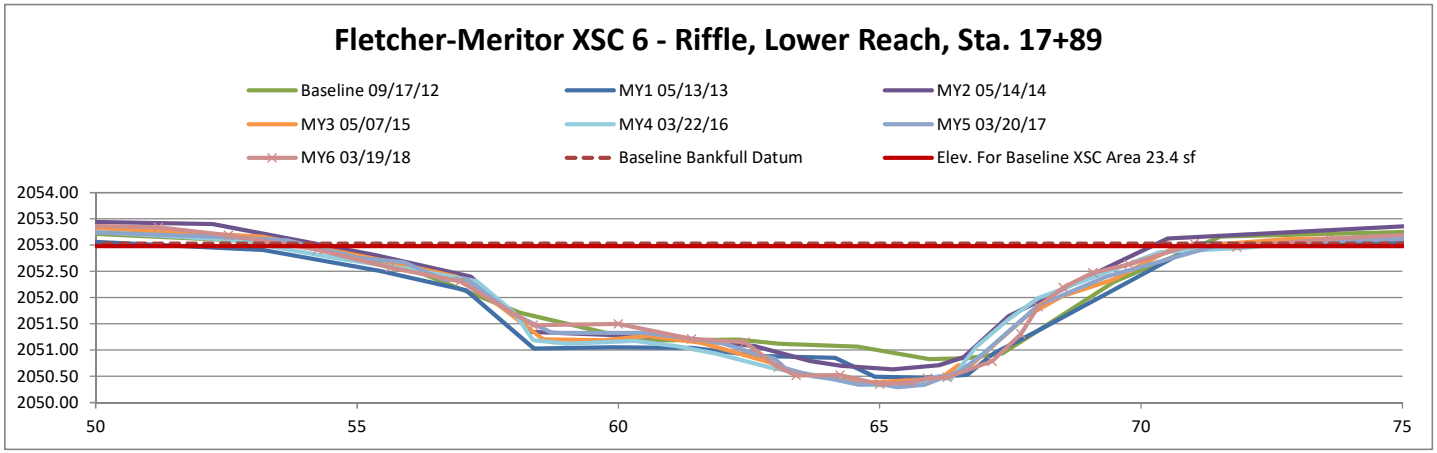
Reach	Fletcher-Meritor, Lower Reach
River Basin	French Broad
Cross Section ID	XSC-6, Riffle, Lower Reach, 17+89
Drainage Area (Sq Mi)	1.1
Date	3/19/2018
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Baseline Bankfull Datum, ft	2053.03
Bankfull Cross Sectional Area, ft^2	24.30
Bankfull Width, ft	19.00
Max Depth at Bankfull, ft	2.67
Mean Depth at Bankfull, ft	1.28
Width/Depth Ratio	14.86
Flood Prone Width, ft	102.50
Flood Prone Area Elevation, ft	2055.70
Entrenchment Ratio	5.39
***Bank Height Ratio**	1.02
***Bankfull Elevation to Achieve As-Built Cross Sec. Area (23.4 sf)**	2052.98

BHR based on updated 2018 guidance

Stream Type	C/E4

Sta. 17+89 Looking Downstream



Station	Elevation
0.00	2061.55
0.10	2061.24
0.76	2061.16
3.66	2061.17
6.43	2061.07
9.38	2060.32
12.22	2059.77
14.25	2059.53
16.41	2059.39
16.62	2059.29
19.44	2059.17
20.22	2058.21
21.76	2057.74
22.02	2057.29
22.55	2057.03
22.69	2056.82
23.10	2056.83
23.35	2057.05
23.99	2057.06
24.29	2057.20
24.68	2057.24
25.01	2057.24
25.35	2058.03
26.26	2058.25
27.15	2058.63
28.71	2058.75
29.31	2058.85
30.69	2059.27
32.74	2059.36
33.49	2059.92
35.12	2060.11
38.19	2060.68
41.21	2060.77
43.98	2060.81
45.96	2060.78
46.05	2060.99

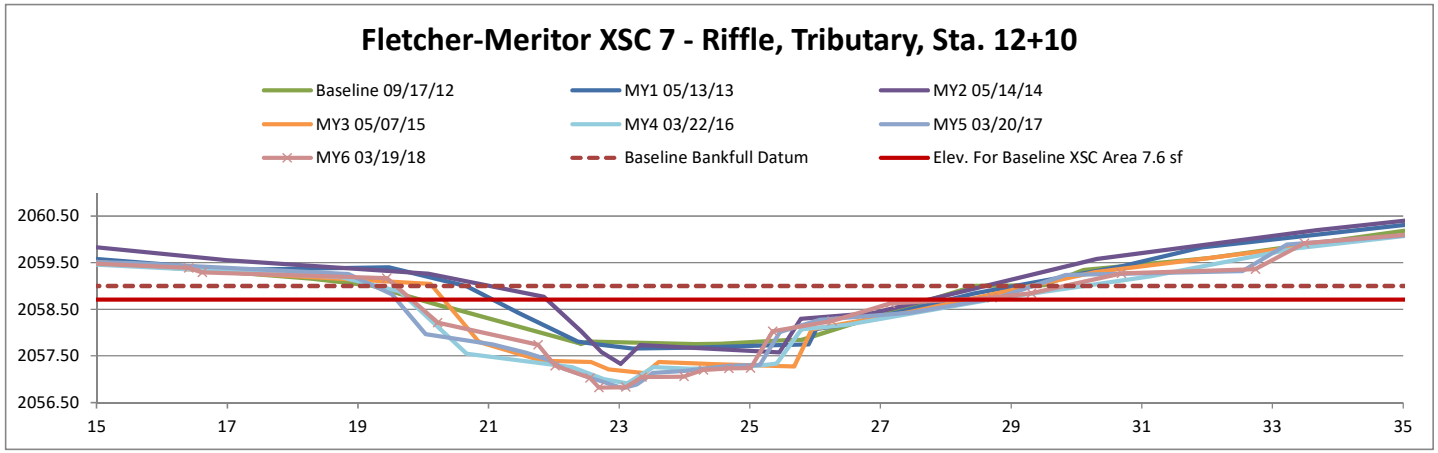
Reach	Fletcher-Meritor, Tributary
River Basin	French Broad
Cross Section ID	XSC-7, Riffle, Tributary, 12+10
Drainage Area (Sq Mi)	0.32
Date	3/19/2018
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Baseline Bankfull Datum, ft	2059.00
Bankfull Cross Sectional Area, ft^2	10.40
Bankfull Width, ft	10.20
Max Depth at Bankfull, ft	2.18
Mean Depth at Bankfull, ft	1.02
Width/Depth Ratio	10.00
Flood Prone Width, ft	>46.05
Flood Prone Area Elevation, ft	2061.18
Entrenchment Ratio	>4.56
***Bank Height Ratio**	0.96
***Bankfull Elevation to Achieve As-Built Cross Sec. Area (7.6 sf)**	2058.71

BHR based on updated 2018 guidance

Stream Type	C/E4

Sta. 12+10 Looking Downstream



Station	Elevation
0.00	2060.86
0.11	2060.54
6.89	2060.54
9.71	2060.44
12.46	2059.72
13.79	2059.37
15.62	2059.05
17.46	2058.67
20.08	2058.45
20.75	2057.84
21.83	2057.65
22.72	2057.73
23.05	2056.31
23.77	2055.88
24.66	2055.74
24.97	2056.26
25.48	2056.21
25.92	2056.32
26.82	2056.48
27.54	2057.35
28.79	2057.53
29.61	2057.96
30.22	2058.78
30.81	2058.84
31.26	2058.83
32.63	2059.06
35.50	2059.41
38.79	2059.99
40.95	2060.45
43.81	2060.46
48.98	2060.32
52.19	2060.66
52.39	2060.98

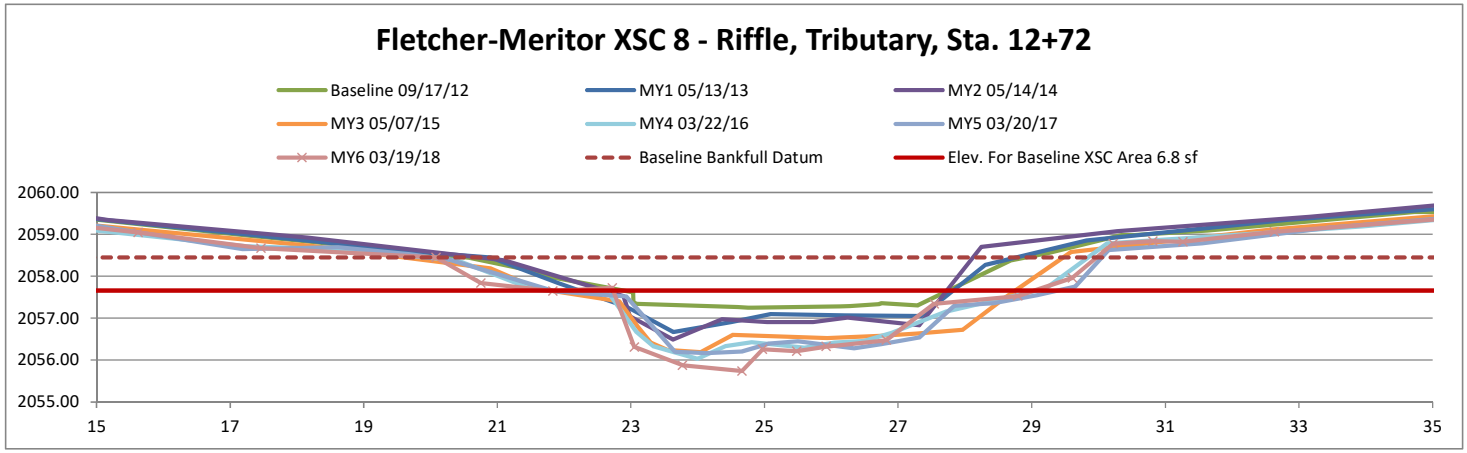
Reach	Fletcher-Meritor, Tributary
River Basin	French Broad
Cross Section ID	XSC-8, Riffle, Tributary, 12+72
Drainage Area (Sq Mi)	0.32
Date	3/19/2018
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Baseline Bankfull Datum, ft	2058.45
Bankfull Cross Sectional Area, ft^2	13.90
Bankfull Width, ft	9.90
Max Depth at Bankfull, ft	2.71
Mean Depth at Bankfull, ft	1.40
Width/Depth Ratio	7.05
Flood Prone Width, ft	52.40
Flood Prone Area Elevation, ft	2061.16
Entrenchment Ratio	5.29
***Bank Height Ratio**	1.04
***Bankfull Elevation to Achieve As-Built Cross Sec. Area (6.8 sf)**	2057.66

BHR based on updated 2018 guidance

Stream Type	C/E4

Sta. 12+72 Looking Downstream



Station	Elevation
0.00	2060.76
0.25	2060.43
2.62	2060.60
4.61	2060.54
6.98	2060.19
9.38	2060.03
11.32	2059.68
12.71	2059.15
14.19	2058.47
16.25	2058.17
18.53	2057.88
21.63	2057.87
24.70	2057.54
26.12	2057.57
27.38	2057.42
28.42	2056.82
28.72	2055.52
29.08	2054.98
29.63	2054.54
30.13	2054.39
30.87	2054.19
31.74	2054.34
32.39	2054.50
32.67	2054.63
33.32	2054.82
33.87	2055.42
34.28	2056.93
34.95	2057.49
35.90	2057.65
36.82	2057.87
38.29	2058.05
40.13	2058.42
42.15	2059.15
45.18	2060.15
47.68	2060.50

Reach	Fletcher-Meritor, Tributary
River Basin	French Broad
Cross Section ID	XSC-9, Pool, Tributary, 13+07
Drainage Area (Sq Mi)	0.32
Date	3/19/2018
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Baseline Bankfull Datum, ft	2057.55
Bankfull Cross Sectional Area, ft^2	16.95
Bankfull Width, ft	9.74
Max Depth at Bankfull, ft	3.36
Mean Depth at Bankfull, ft	1.74
Width/Depth Ratio	5.60
Flood Prone Width, ft	35.40
Flood Prone Area Elevation, ft	2060.91
Entrenchment Ratio	3.63
***Bank Height Ratio**	1.28
***Bankfull Elevation to Achieve As-Built Cross Sec. Area (12.0 sf)**	2056.83

BHR based on updated 2018 guidance

Stream Type	C/E4

Sta. 13+07 Looking Downstream

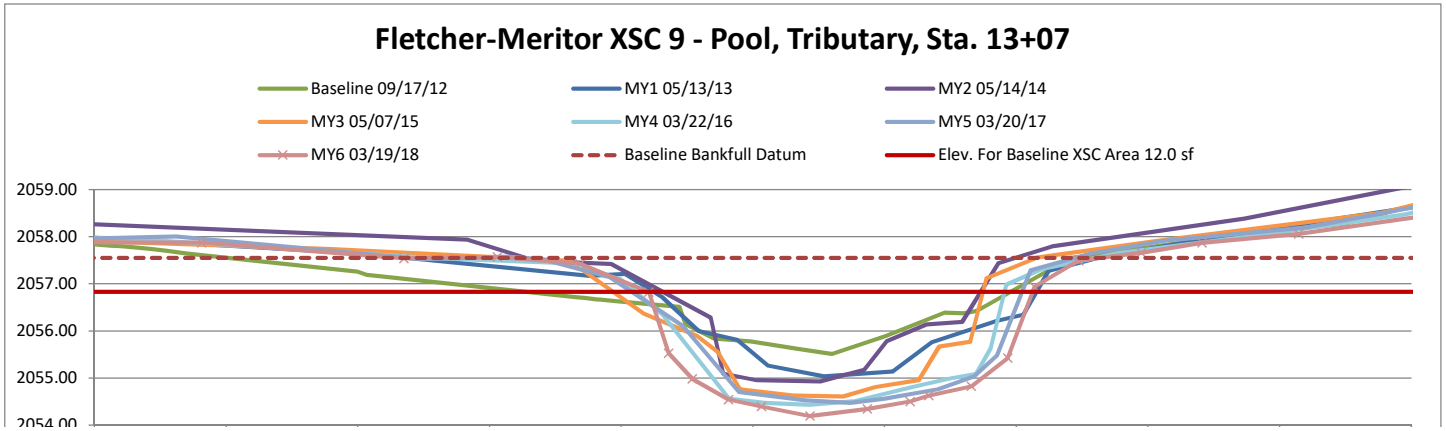


Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Fletcher-Meritor (UT to Cane Creek) Stream and Wetland Restoration/Proj. No. 138 - Upper Reach (1838 ft), Lower Reach (1779 ft), Tributary (648 ft)

	Cross Section 1 (Upper, Riffle)							Cross Section 2 (Upper, Pool)							Cross Section 3 (Upper, Riffle)							Cross Section 4 (Lower, Riffle)							Cross Section 5 (Lower, Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY6	Base	MY1	MY2	MY3	MY4	MY5	MY6	Base	MY1	MY2	MY3	MY4	MY5	MY6	Base	MY1	MY2	MY3	MY4	MY5	MY6	Base	MY1	MY2	MY3	MY4	MY5	MY6
Record elevation (datum) used	2058.90	2058.90	2058.90	2058.90	2058.90	2058.90	2058.90	2058.61	2058.61	2058.61	2058.61	2058.61	2058.61	2058.61	2058.74	2058.74	2058.74	2058.74	2058.74	2058.74	2058.74	2053.74	2053.74	2053.74	2053.74	2053.74	2053.74	2053.74	2053.32	2053.32	2053.32	2053.32	2053.32	2053.32	2053.32
Bankfull Width (ft)	15.10	14.00	12.60	11.60	12.30	11.40	9.50	21.90	21.90	21.40	19.50	18.80	19.00	17.50	14.50	14.40	13.70	14.80	13.80	14.07	14.00	19.77	16.10	15.50	17.70	17.30	19.67	17.70	26.16	25.70	23.60	27.10	27.20	25.66	26.10
Floodprone Width (ft)	53.00	65.20	98.40	94.40	96.90	101.80	82.40	>86.00	>86.00	>86.00	>86.00	>86.00	>86.00	>86.00	>86.00	>86.00	>86.00	>86.00	>86.00	>86.00	>86.00	137.36	132.80	132.50	138.30	138.70	138.50	135.00	83.70	84.30	83.00	84.90	85.60	85.20	85.10
Bankfull Mean Depth (ft)	1.26	1.19	1.13	1.22	1.20	1.23	1.18	1.25	1.18	1.17	1.08	1.05	0.97	0.93	1.47	1.47	1.47	1.39	1.57	1.41	1.46	1.75	1.61	1.53	1.48	1.49	1.25	1.30	1.45	1.38	1.23	1.25	1.24	1.25	1.23
Bankfull Max Depth (ft)	1.80	2.01	2.23	2.29	2.30	2.41	2.11	3.10	3.07	3.03	3.08	3.25	2.96	2.98	2.20	2.29	2.91	2.95	2.99	2.65	2.84	2.47	2.46	2.47	2.71	2.70	2.71	2.58	3.31	3.22	3.19	3.34	3.37	3.35	3.36
Bankfull Cross Sectional Area (ft^2)	19.10	16.70	14.20	14.20	14.70	14.00	11.20	27.40	25.80	25.10	21.00	19.70	18.40	16.20	21.30	21.20	20.10	20.50	21.60	19.90	20.50	34.50	26.00	23.70	26.20	25.80	24.58	23.00	37.88	35.50	29.00	33.80	33.80	31.98	32.00
Bankfull Width/Depth Ratio	11.94	11.74	11.18	9.48	10.29	9.28	8.06	17.50	18.59	18.25	18.11	17.94	19.62	18.90	9.87	9.78	9.34	10.68	8.82	9.95	9.56	11.32	9.97	10.14	11.96	11.60	15.74	13.62	18.07	18.61	19.21	21.73	21.89	20.59	21.29
Bankfull Entrenchment Ratio	3.50	4.70	7.81	8.14	7.88	8.93	8.67	>4.00	>4.00	>4.00	>4.00	>4.00	>4.00	>4.00	>6.00	>6.00	>6.00	>6.00	>6.00	>6.00	>6.01	6.95	8.20	8.55	7.81	8.02	7.04	7.63	3.20	3.30	3.52	3.13	3.15	3.32	3.26
Bankfull Bank Height Ratio	1.00	0.99	0.95	0.99	1.02	1.13	1.08	1.00	1.15	0.94	1.06	0.90	0.93	0.86	1.00	1.03	1.03	1.05	1.01	1.00	1.00	1.00	1.04	1.05	0.99	1.01	0.93	0.92	1.00	1.00	1.08	0.98	1.01	1.00	0.96
Based on current/developing bankfull feature[2]																																			
Record elevation (datum) used																																			
Bankfull Width (ft)																																			
Floodprone Width (ft)																																			
Bankfull Mean Depth (ft)																																			
Bankfull Max Depth (ft)																																			
Bankfull Cross Sectional Area (ft^2)																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

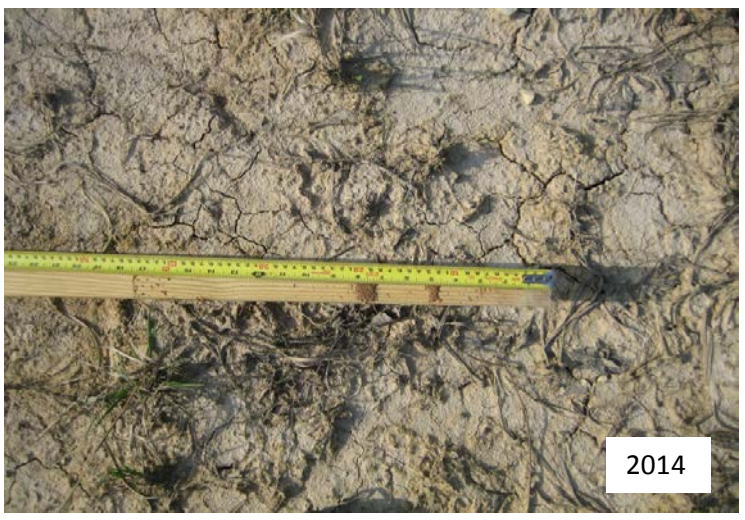
	Cross Section 6 (Lower, Riffle)							Cross Section 7 (Tributary, Riffle)							Cross Section 8 (Tributary, Riffle)							Cross Section 9 (Tributary, Pool)												
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY6	Base	MY1	MY2	MY3	MY4	MY5	MY6	Base	MY1	MY2	MY3	MY4	MY5	MY6	Base	MY1	MY2	MY3	MY4	MY5	MY6	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	2053.03	2053.03	2053.03	2053.03	2053.03	2053.03	2053.03	2059.00	2059.00	2059.00	2059.00	2059.00	2059.00	2059.00	2058.45	2058.45	2058.45	2058.45	2058.45	2058.45	2058.45	2057.55	2057.55	2057.55	2057.55	2057.55	2057.55	2057.55							
Bankfull Width (ft)	17.20	22.60	16.10	17.80	19.70	18.65	19.00	9.24	8.40	7.60	9.20	10.80	10.09	10.20	8.33	7.90	7.40	9.90	9.90	10.00	9.90	12.81	10.50	7.40	8.10	10.10	9.45	9.74							
Floodprone Width (ft)	97.90	101.50	98.50	102.00	102.60	102.70	102.50	24.91	25.20	27.40	34.02	37.22	>46.05	>46.05	22.32	28.20	29.20	45.00	52.00	52.16	52.40	25.89	31.00	32.60	34.70	35.30	35.00	35.40							
Bankfull Mean Depth (ft)	1.36	1.21	1.39	1.40	1.28	1.32	1.28	0.83	0.86	0.80	1.12	1.07	1.11	1.02	0.82	1.06	1.15	1.27	1.31	1.32	1.40	0.93	1.13	1.32	1.60	1.49	1.59	1.74							
Bankfull Max Depth (ft)	2.20	2.56	2.39	2.65	2.70	2.74	2.67	1.25	1.34	1.67	1.87	2.09	2.19	2.18	1.19	1.78	1.96	2.26	2.42	2.28	2.71	2.04	2.51	2.62	2.94	3.12	3.08	3.36							
Bankfull Cross Sectional Area (ft^2)	23.40	27.30	22.40	25.00	25.20	24.70	24.30	7.63	7.20	6.10	10.30	11.60	11.18	10.40	6.80	8.40	8.50	12.60	13.00	13.23	13.90	11.96	11.90	9.80	13.00	15.00	15.00	16.95							
Bankfull Width/Depth Ratio	12.65	18.71	11.57	12.67	15.40	14.08	14.86	11.19	9.90	9.47	8.22	10.06	9.11	10.00	12.21	7.43	6.44	7.78	7.54	7.56	7.05	13.71	9.26	5.59	5.05	6.80	5.95	5.60							
Bankfull Entrenchment Ratio	5.69	4.50	6.12	5.73	5.21	5.51	5.39	2.70	3.00	3.61	3.70	3.45	>4.56	>4.56	2.68	3.60	3.95	4.55	5.25	5.22	5.29	2.02	2.90	4.41	4.28	3.50	3.70	3.63							
Bankfull Bank Height Ratio	1.00	1.00	1.04	0.97	0.94	0.98	1.02	1.00	1.30	1.16	1.03	1.09	1.12	0.96	1.00	1.00	0.97	0.89	0.97	0.98	1.04	1.00	0.89	0.95	0.98	0.96	0.99	1.28							
Based on current/developing bankfull feature[2]																																			
Record elevation (datum) used																																			
Bankfull Width (ft)																																			
Floodprone Width (ft)																																			
Bankfull Mean Depth (ft)																																			
Bankfull Max Depth (ft)																																			
Bankfull Cross Sectional Area (ft^2)																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			
Cross Sectional Area between end pins (ft^2)																																			
d50 (mm)																																			

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

2 = Based on the elevation of any dominant depositional feature that develops and is observed at the time of survey. If the baseline datum remains the only significant depositional feature then these two sets of dimensional parameters will be equal, however, if another depositional feature of significance develops above or below the baseline bankfull datum then this should be tracked and quantified in these cells.

Appendix E

Table 12. Verification of Bankfull Events			
Fletcher Meritor Site (UT to Cane Creek)/ 138 Segment/Reach: feet			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo**
9/18/2012	9/18/2012	Visual observation of bankfull event during monitoring	
5/7/2013	5/6/2013 - 5/7/2013	Visual observation of bankfull event during monitoring	
5/7/2013	Unknown	Stream gauges	
5/13/2014	Unknown	Stream gauges (3 events on the tributary reach and 2 on the main reach)	See below
5/7/2015	Unknown	Stream gauges and observation of bankfull event debris	See below
3/22/2016	Unknown	Stream gauges and observation of bankfull event debris	See below
5/10/2017	Unknown	Stream gauges and observation of bankfull event debris	See below


2014


2014

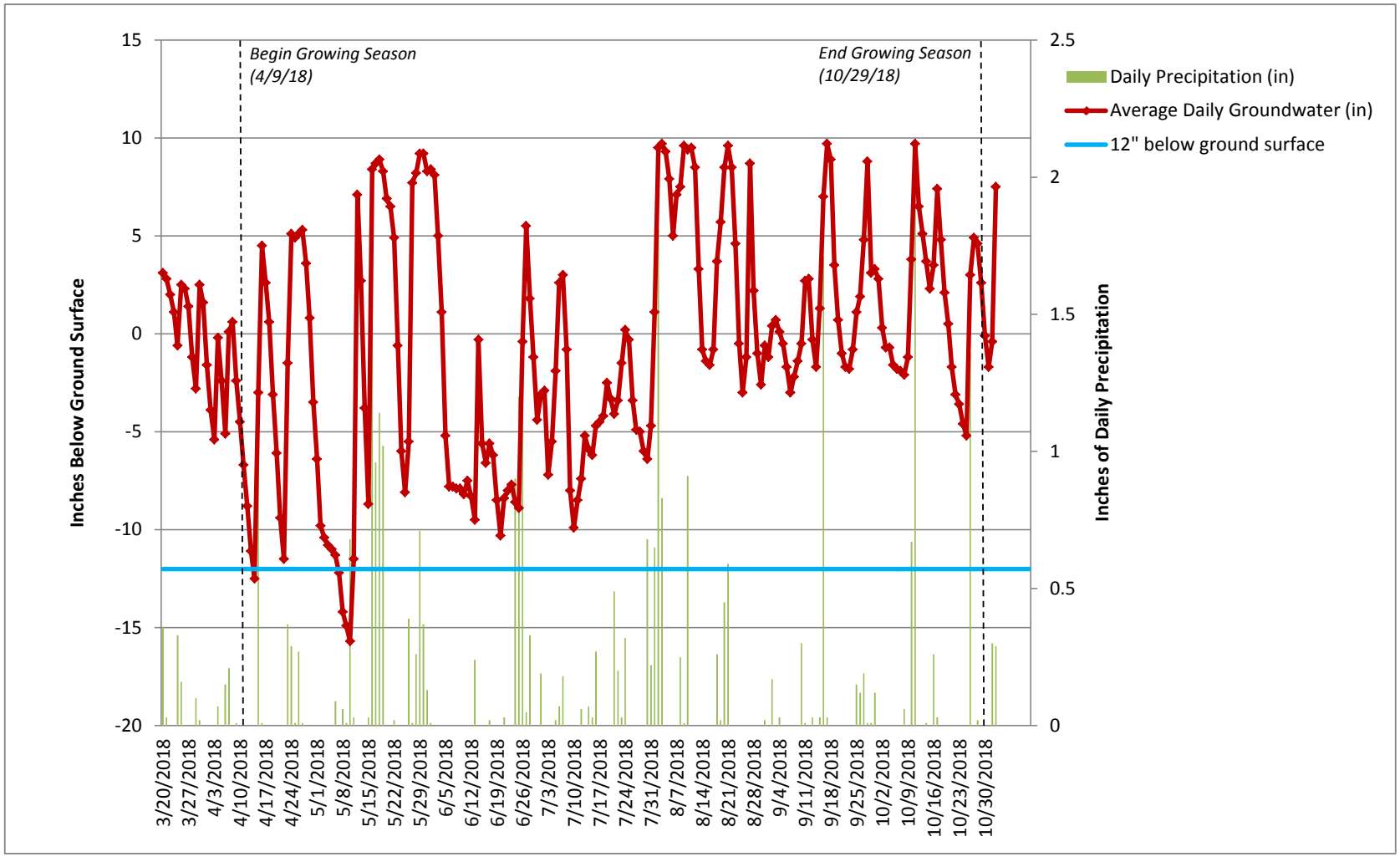

2015


2017

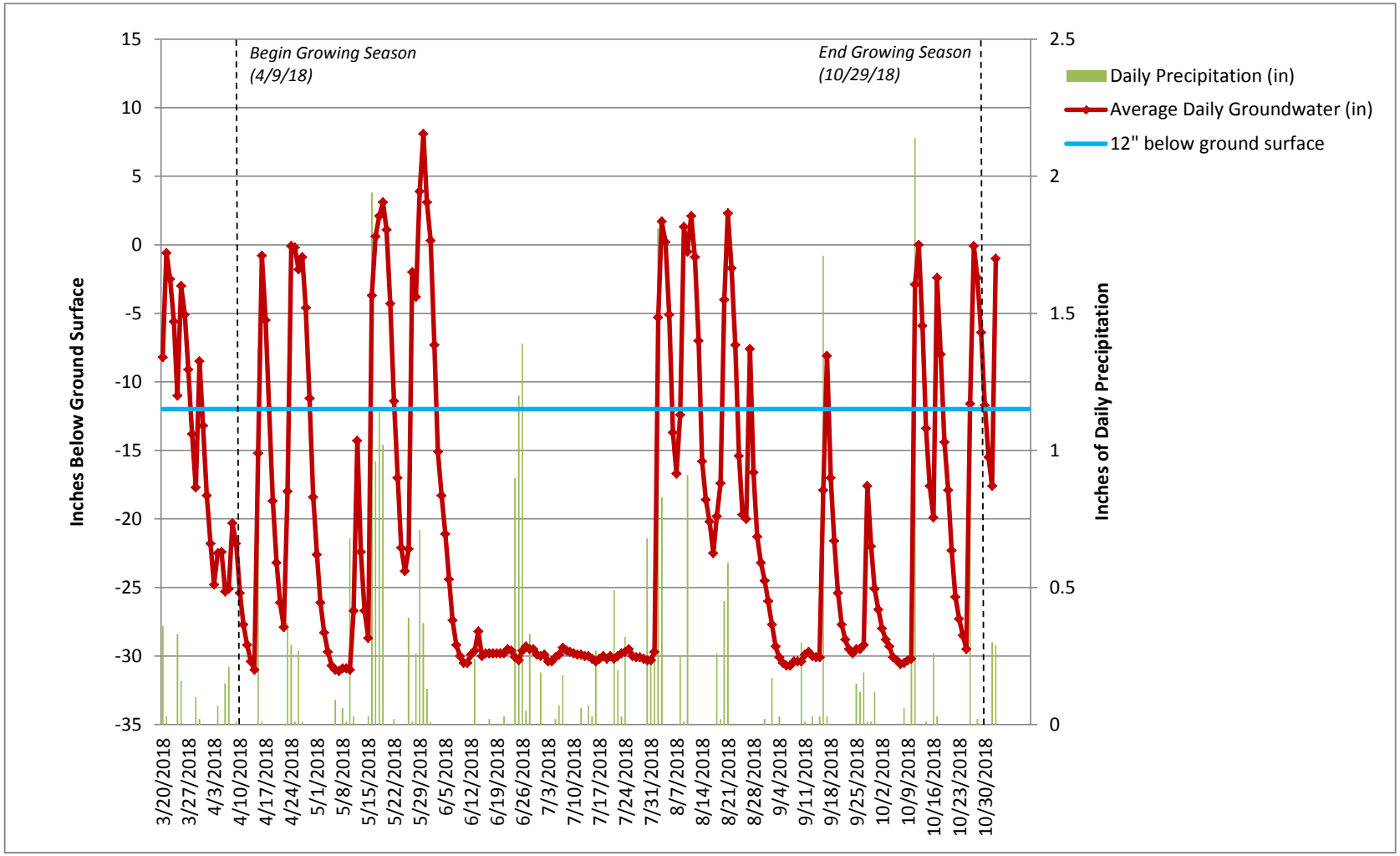

2016


2015
03/23/2015

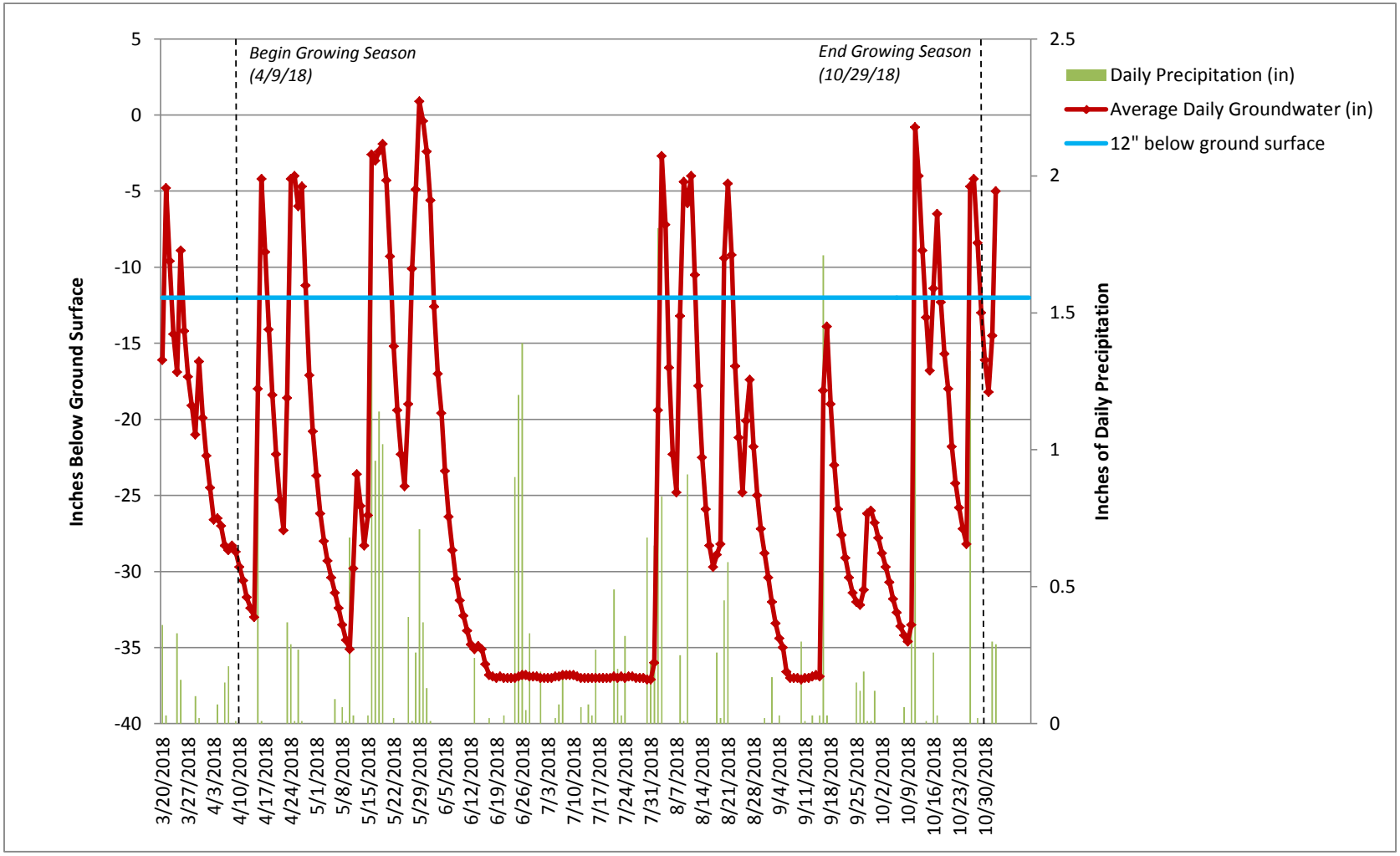
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	13D4CA2A
Gauge ID :	1



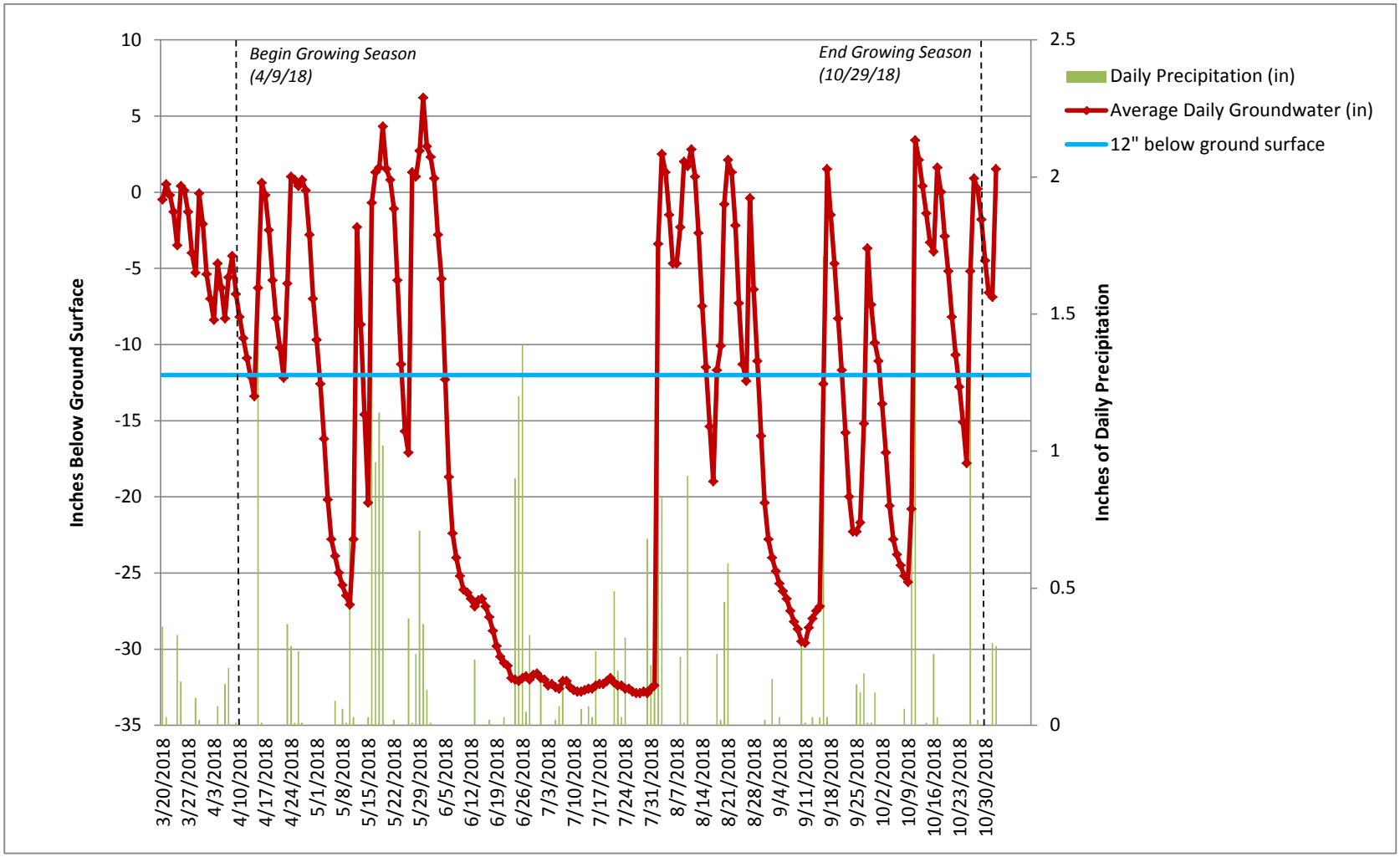
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
	11311987
Gauge ID :	2



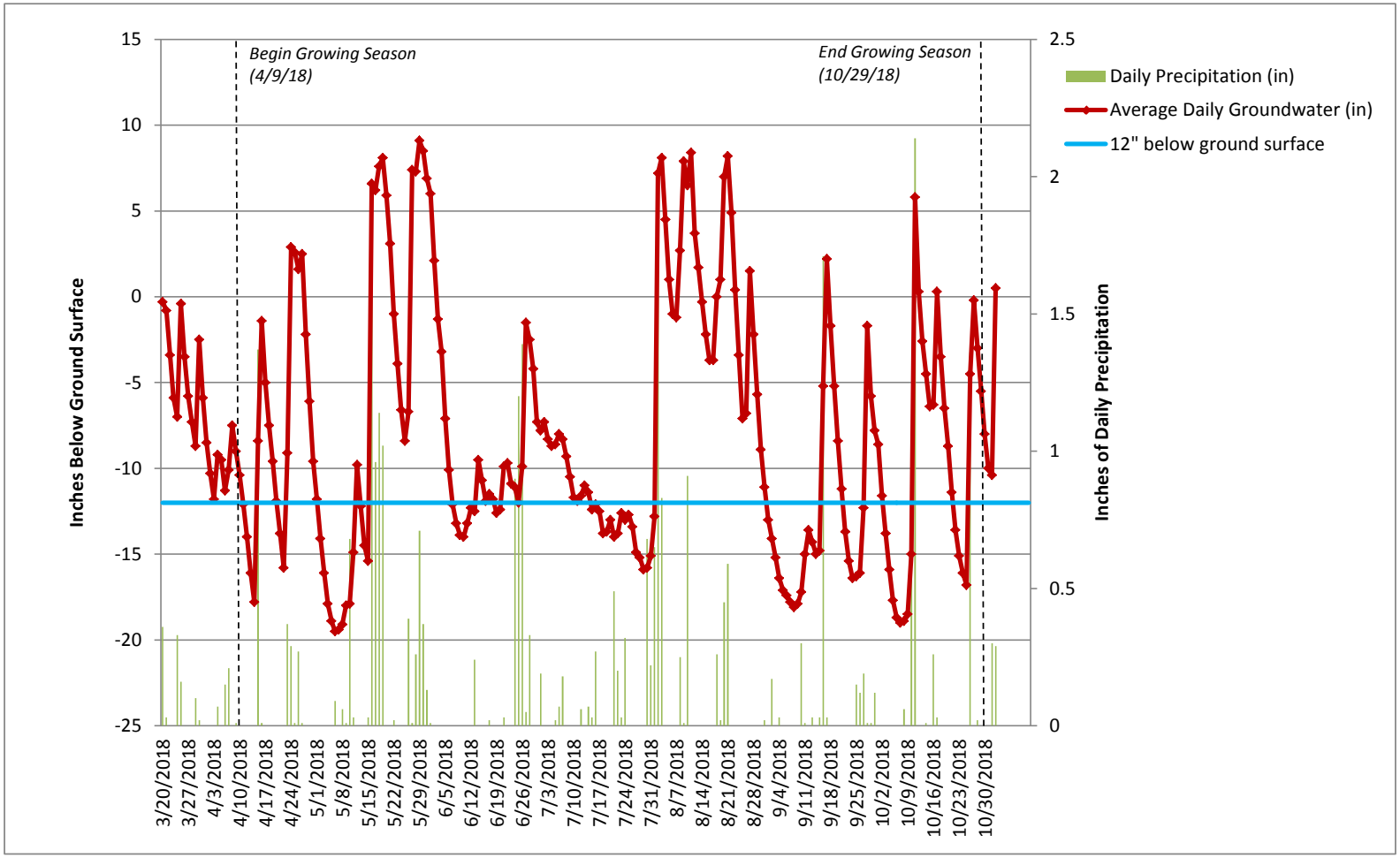
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	1130DD07
Gauge ID :	3



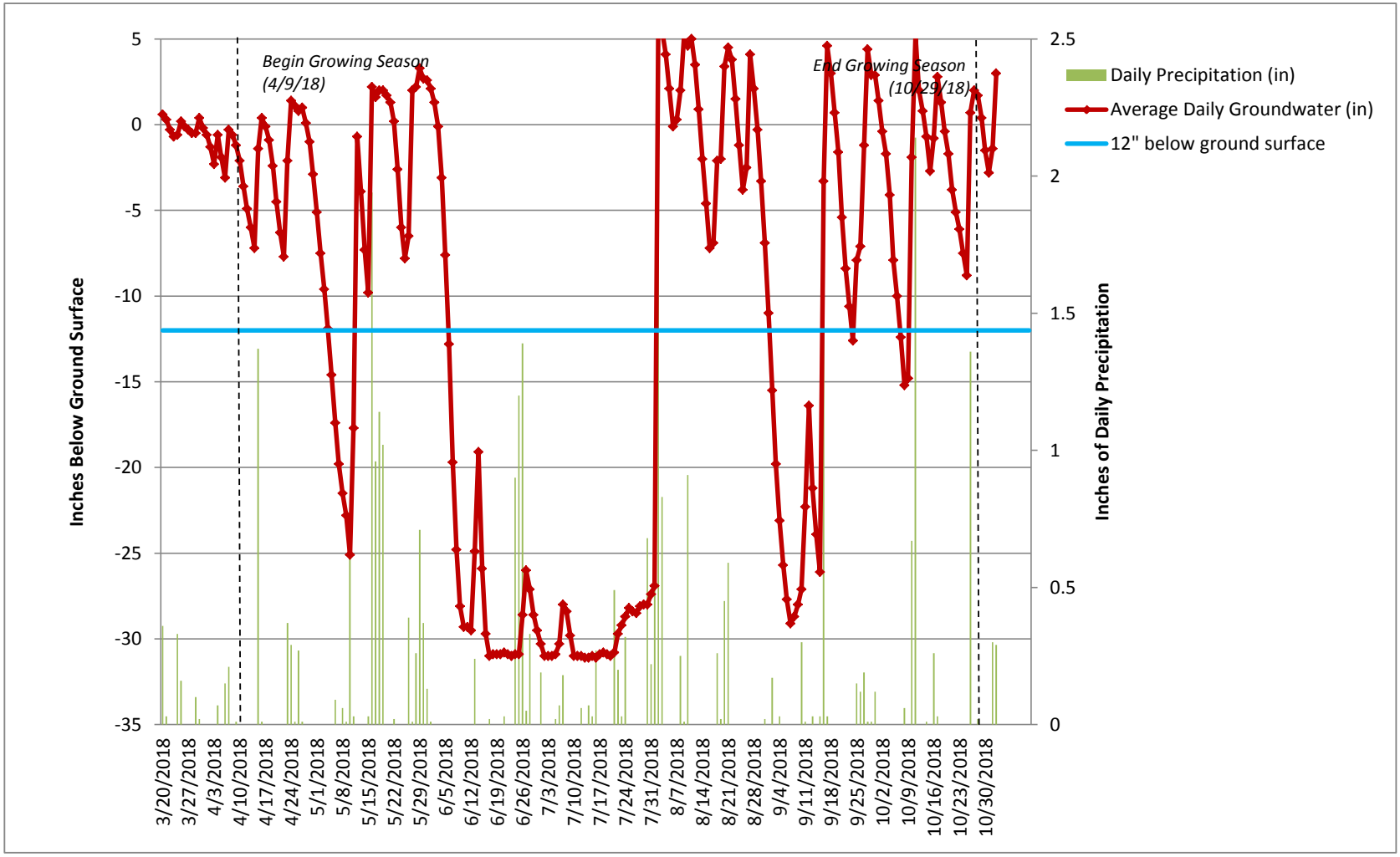
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	14E17875
Gauge ID :	4



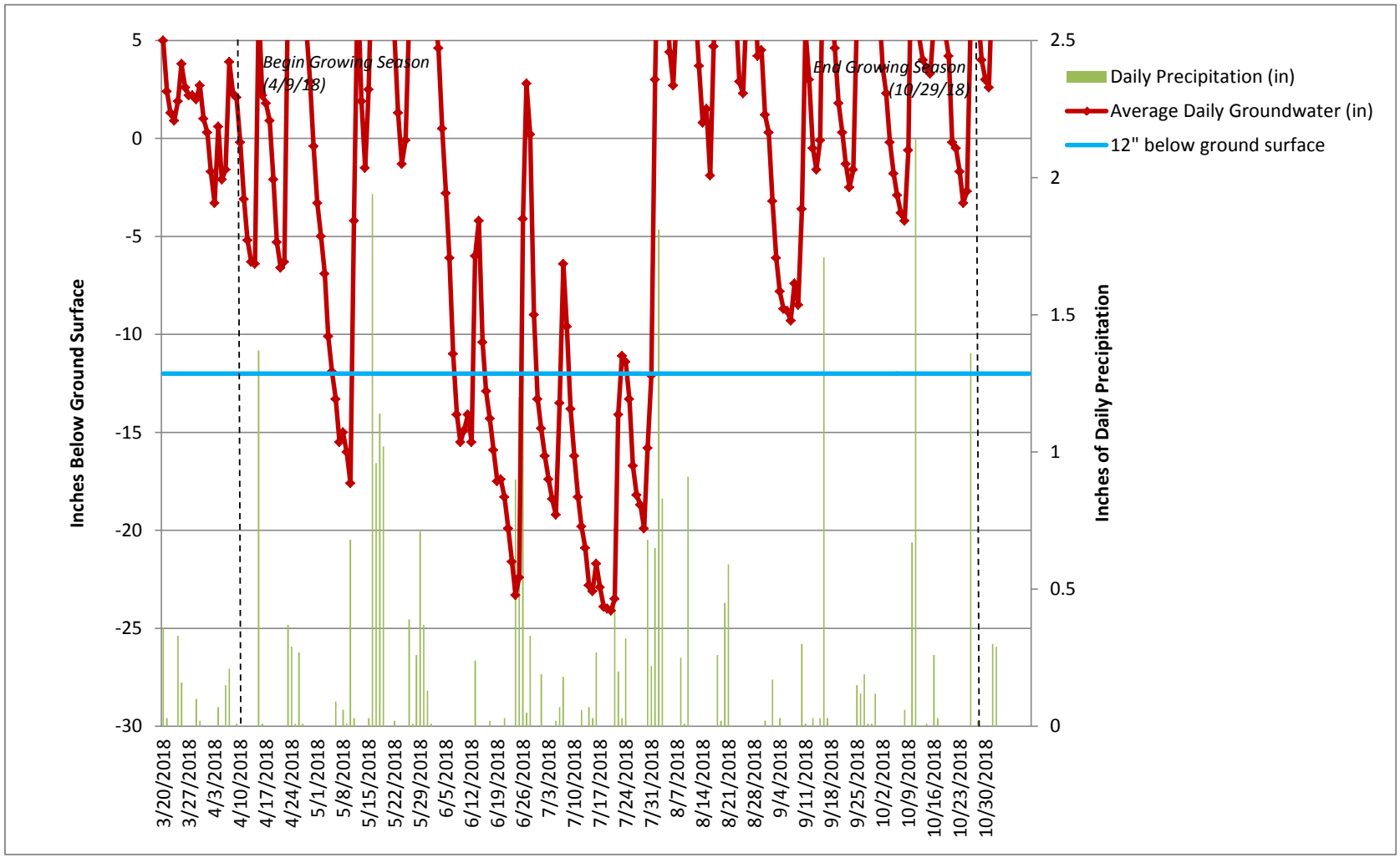
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	138BE816
Gauge ID :	5



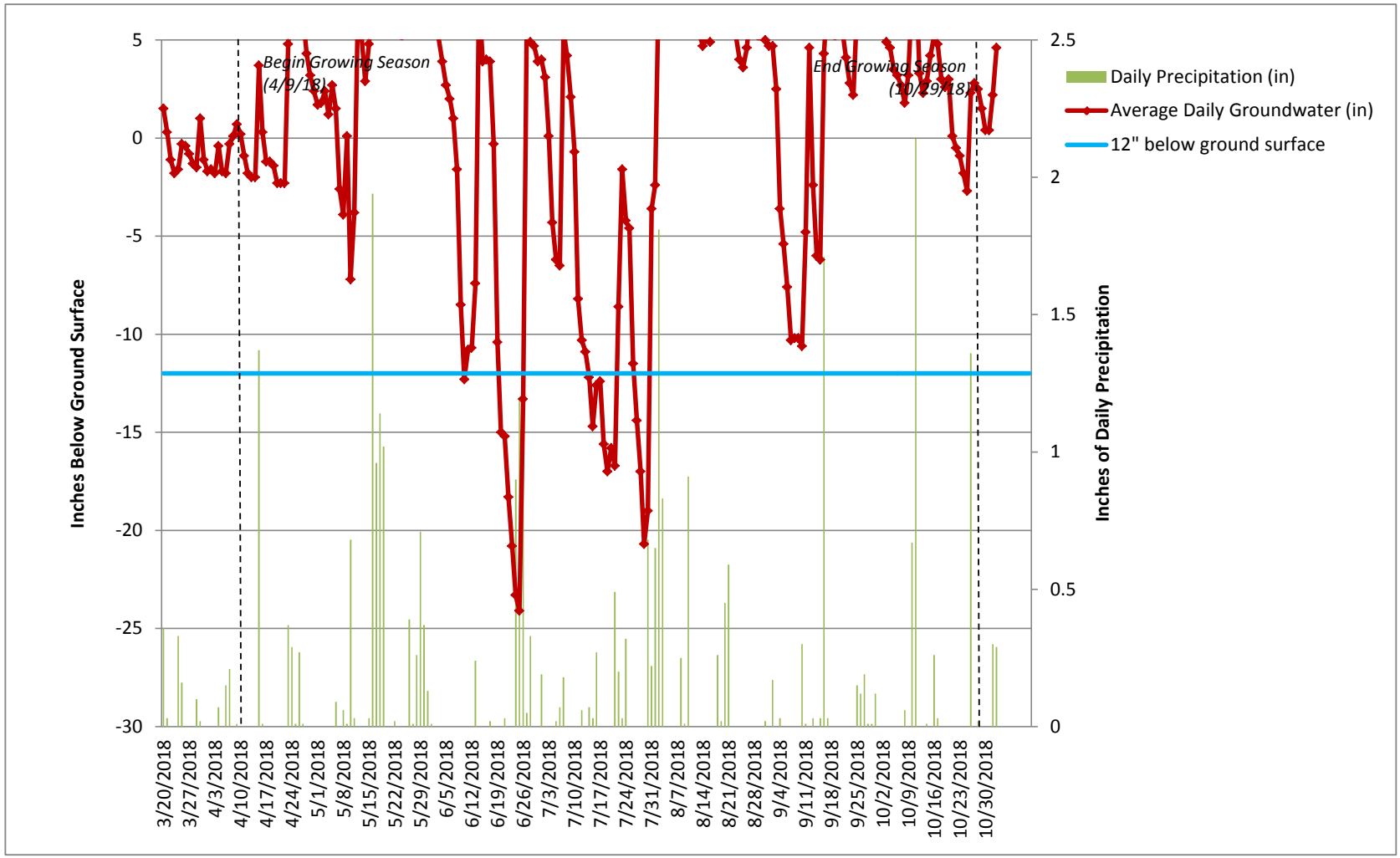
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	11313B57
Gauge ID :	6



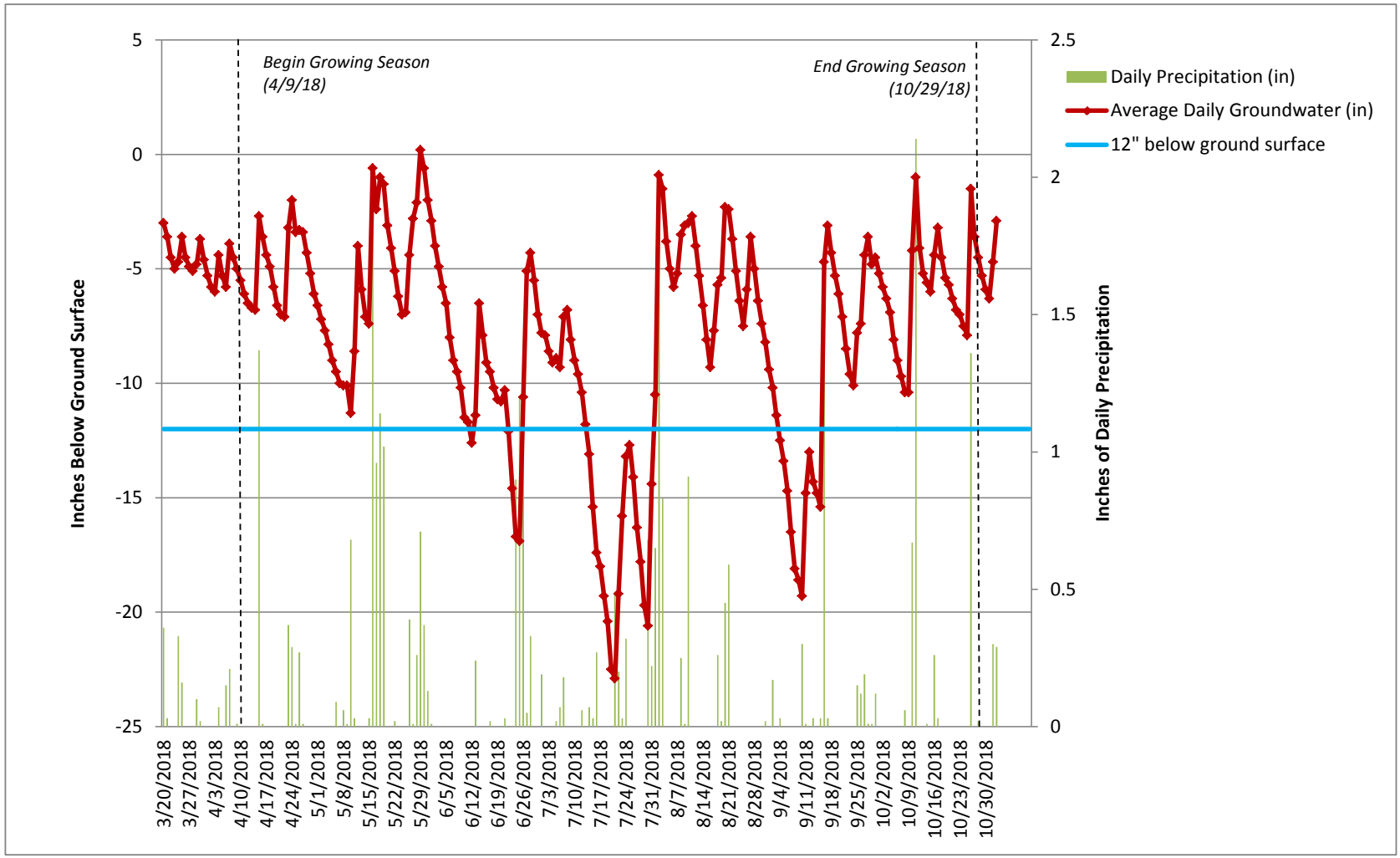
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9BEA475
Gauge ID :	7



Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9BEBF83
Gauge ID :	8



Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	EBD106E
Gauge ID :	9



Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
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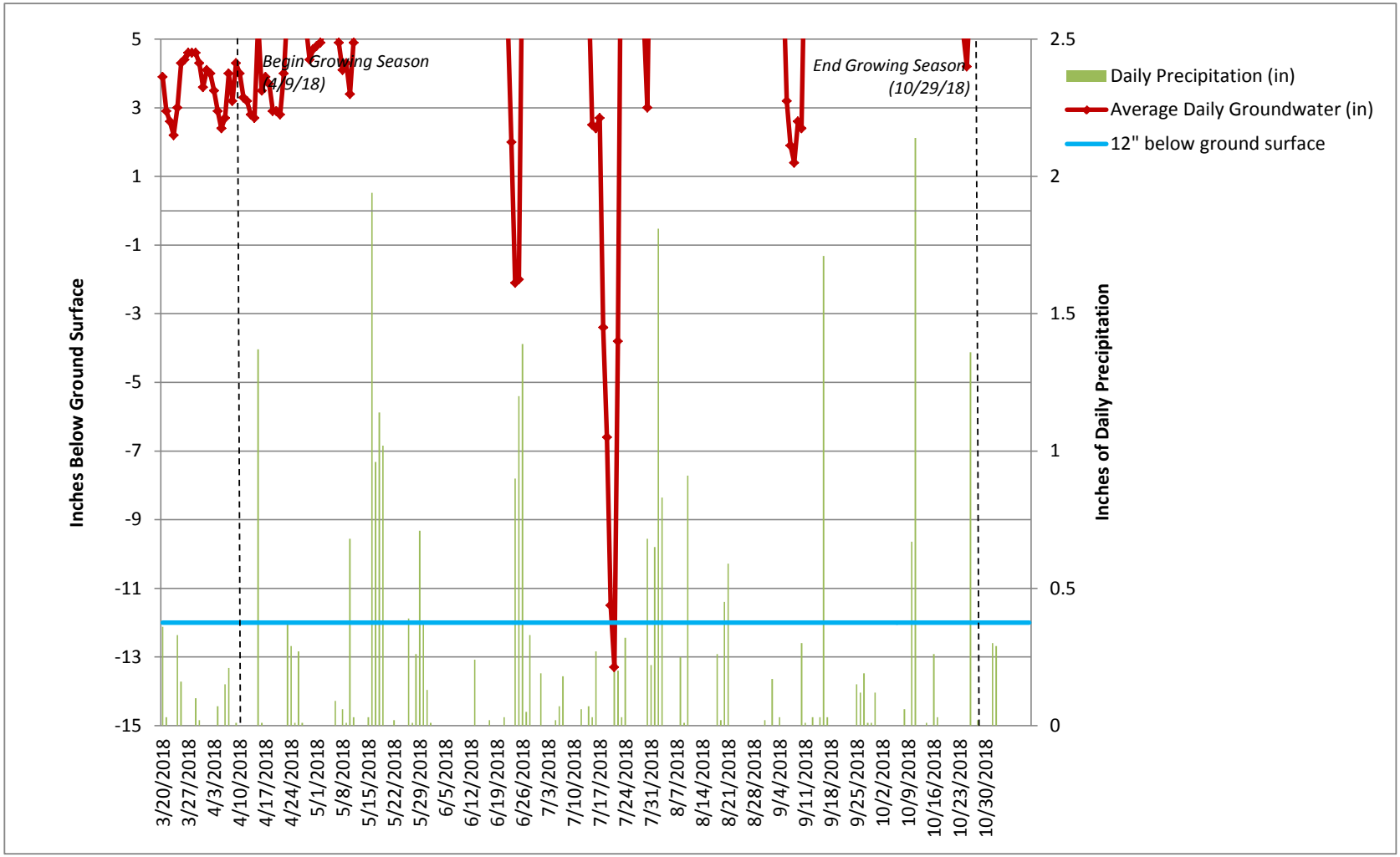
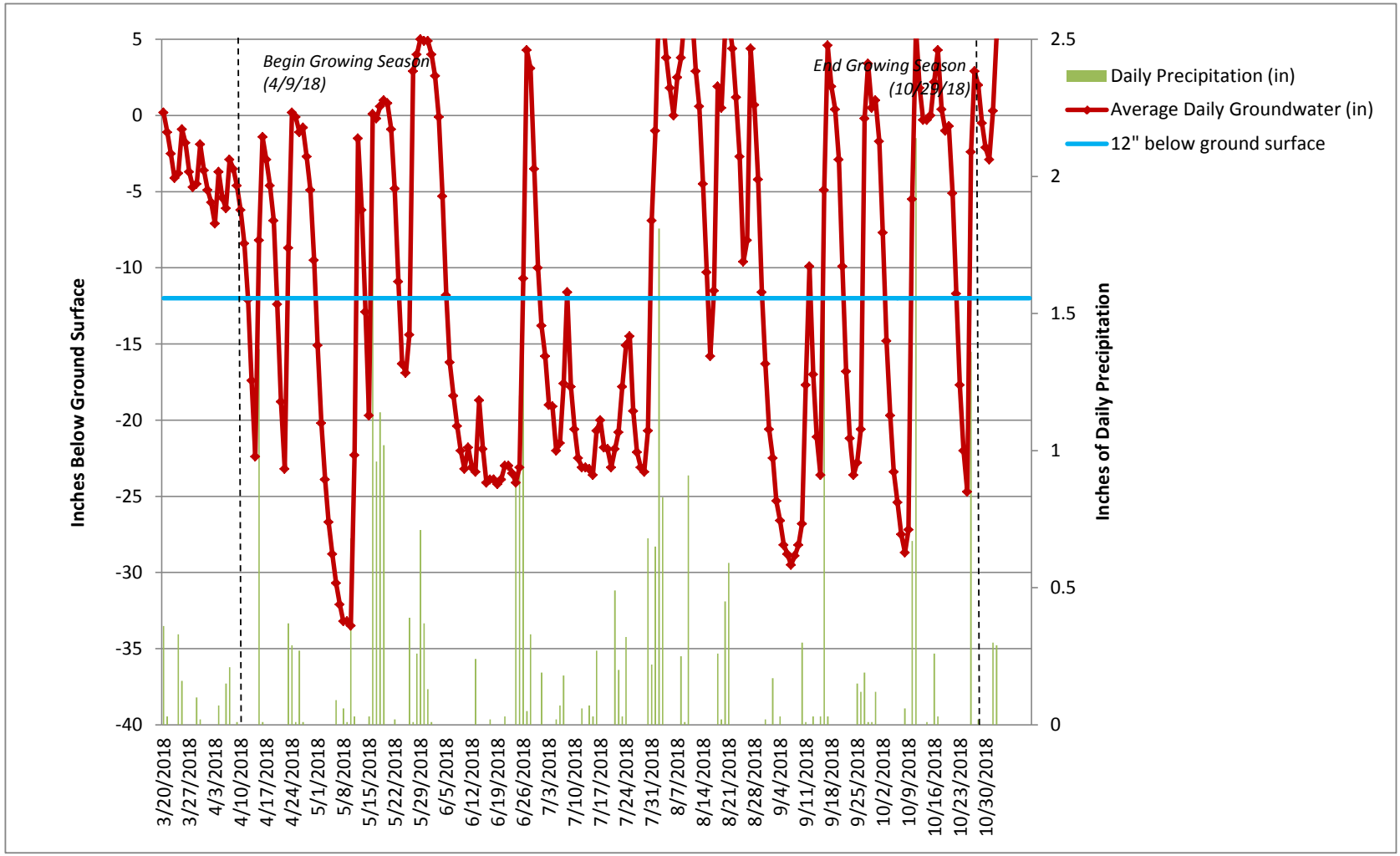
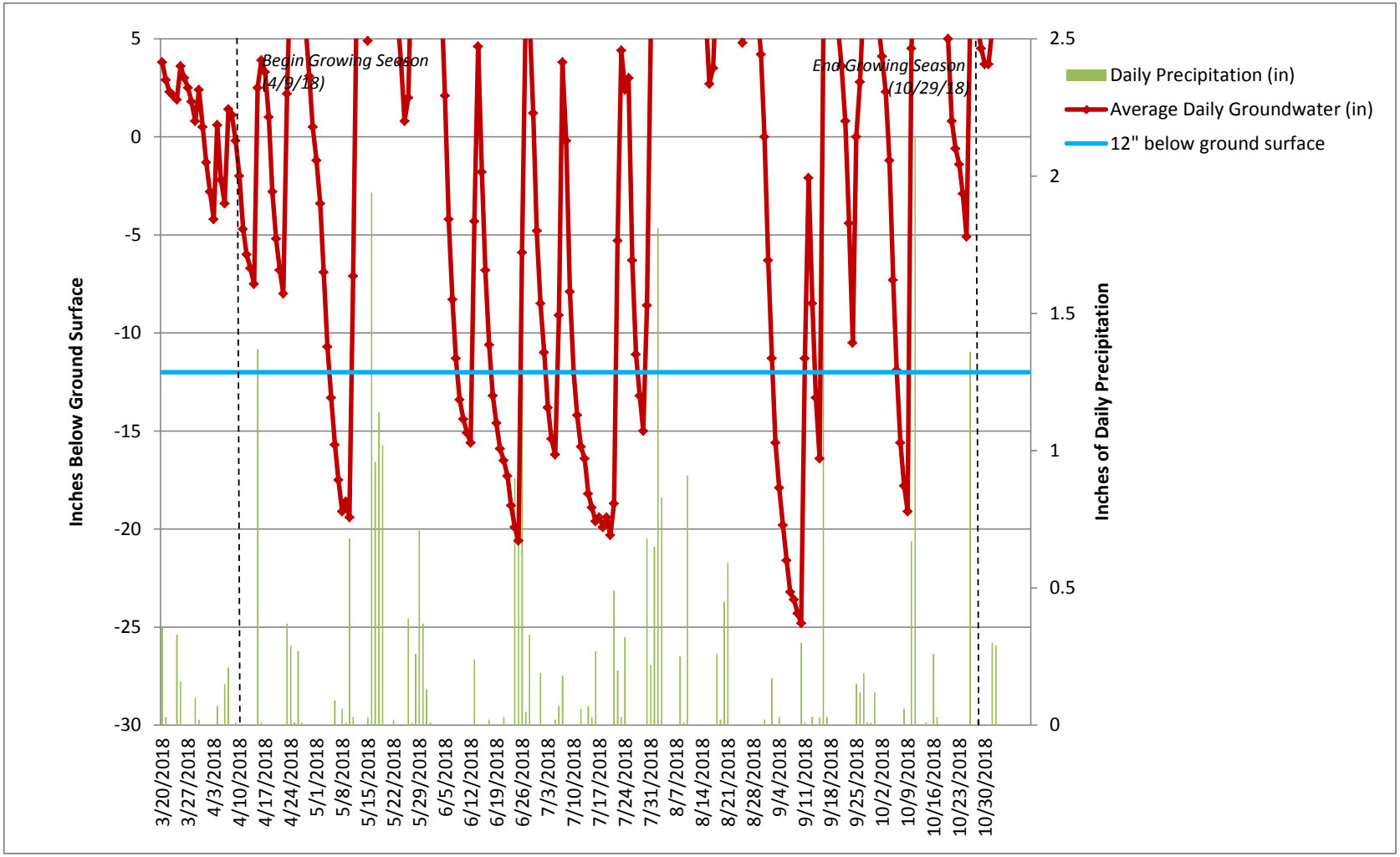
Gauge ID :	10



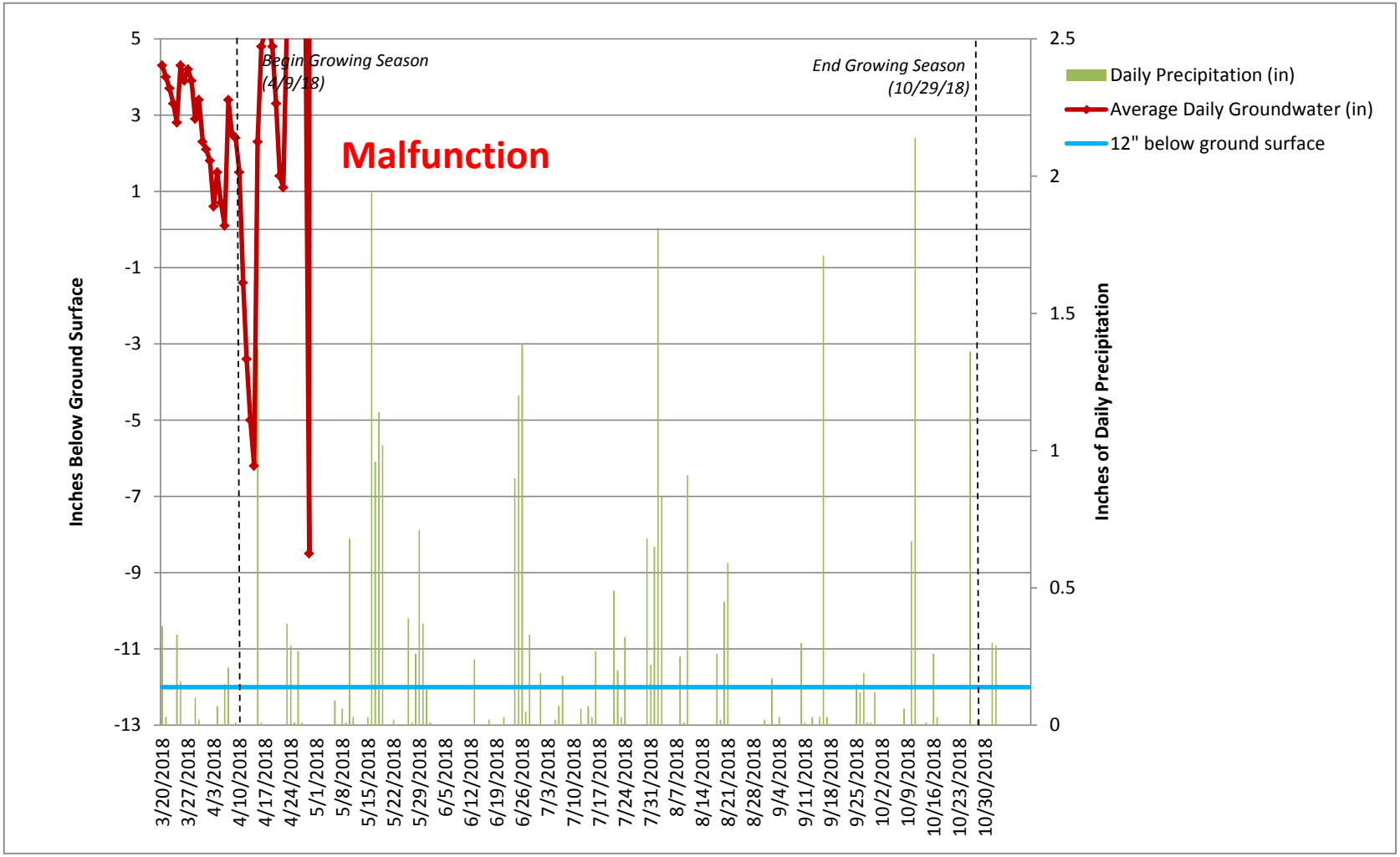
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	AB37304
Gauge ID :	11



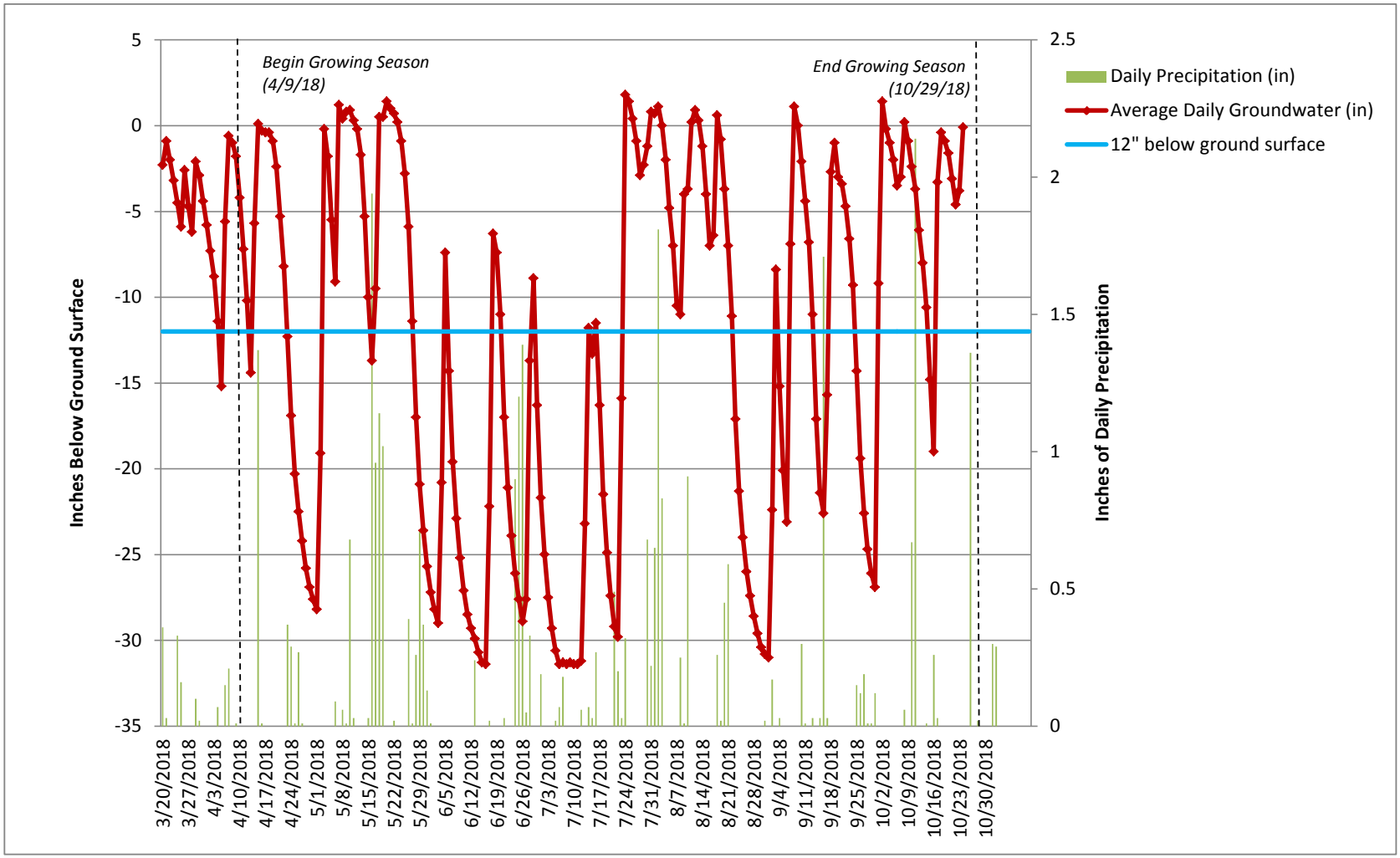
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	10FAA7C4
Gauge ID :	12



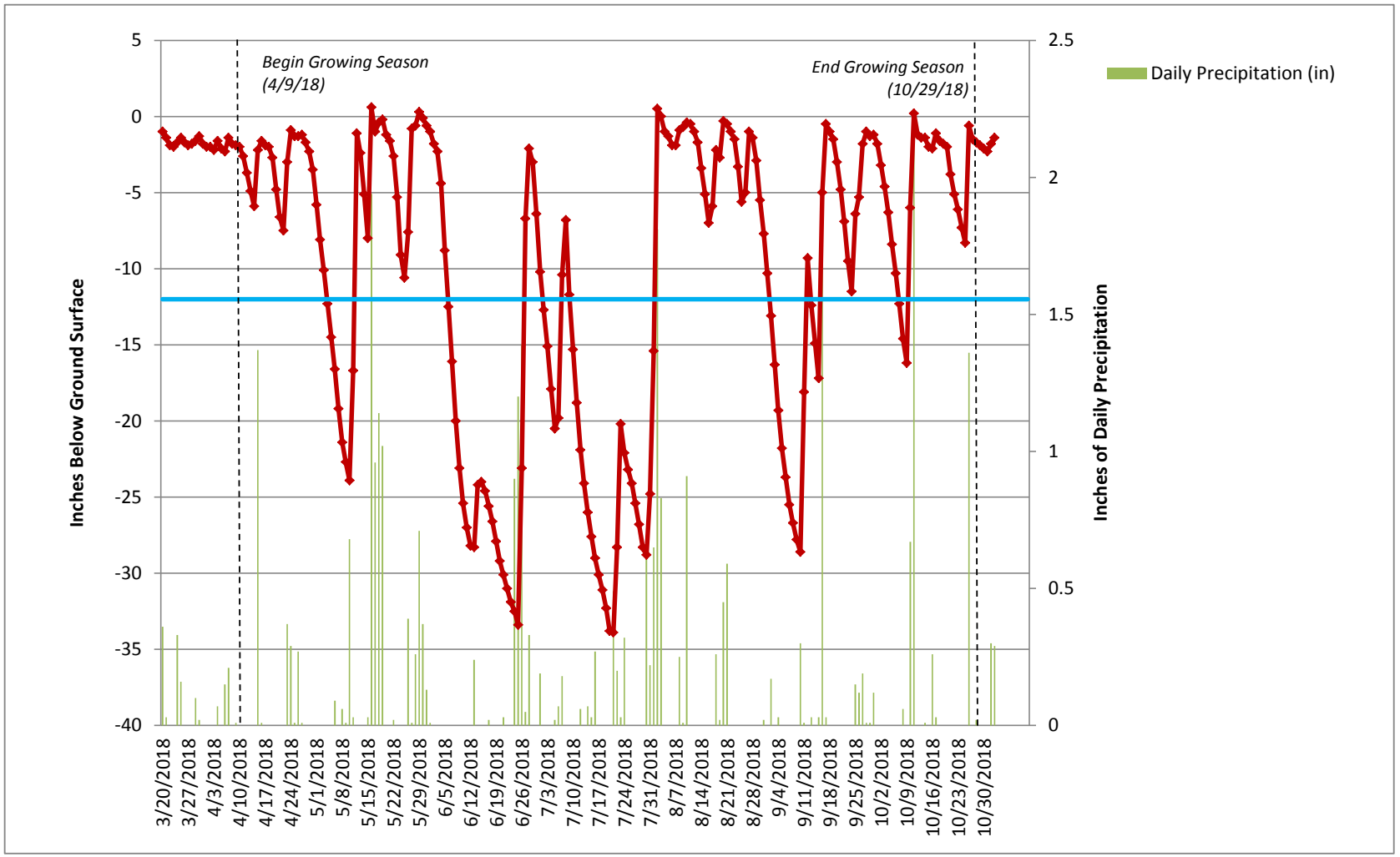
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	10FADD4C / A278DE1
Gauge ID :	13



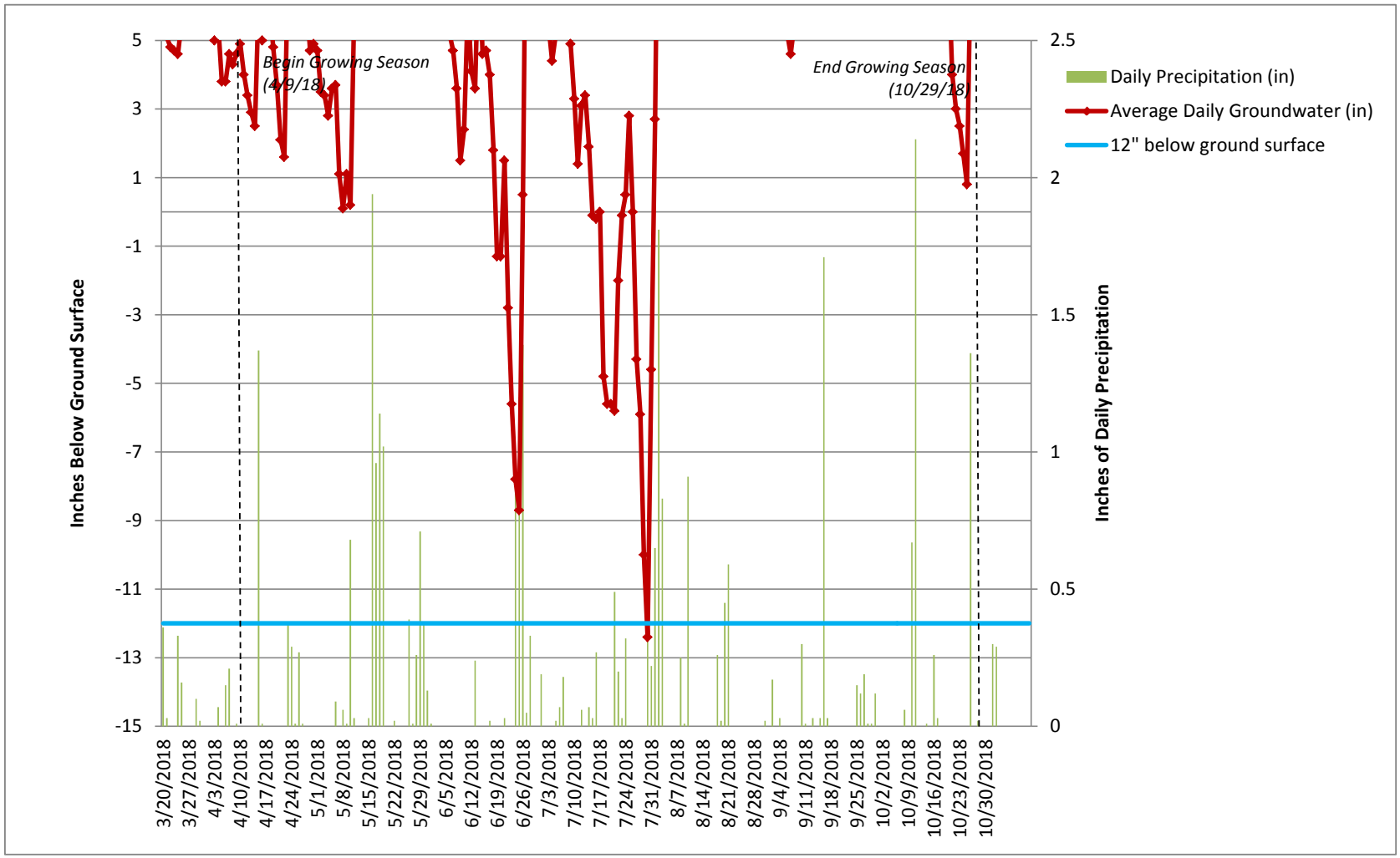
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	A28ABB0
Gauge ID :	14



Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9DE54F2
Gauge ID :	15



Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	138BD91E / 1130EA33
Gauge ID :	16



Project:	Fletcher-Meritor
EEP Projec	138
Wetland C	Project Riparian Wetlands
Growing Se	April 9-October 29
Units	Inches
Gauge Typ	Groundwater
Serial #	destroyed
Gauge ID :	17

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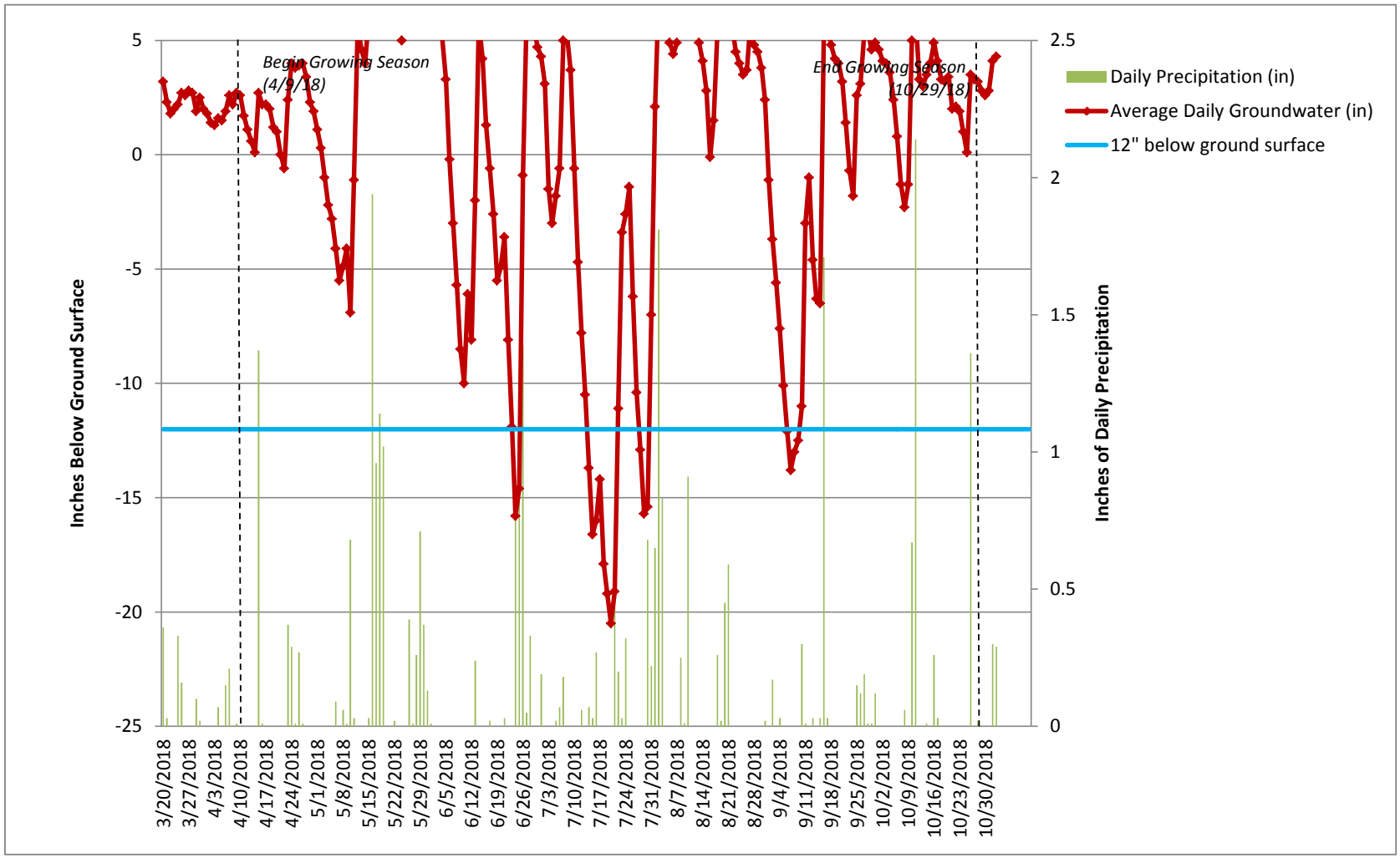
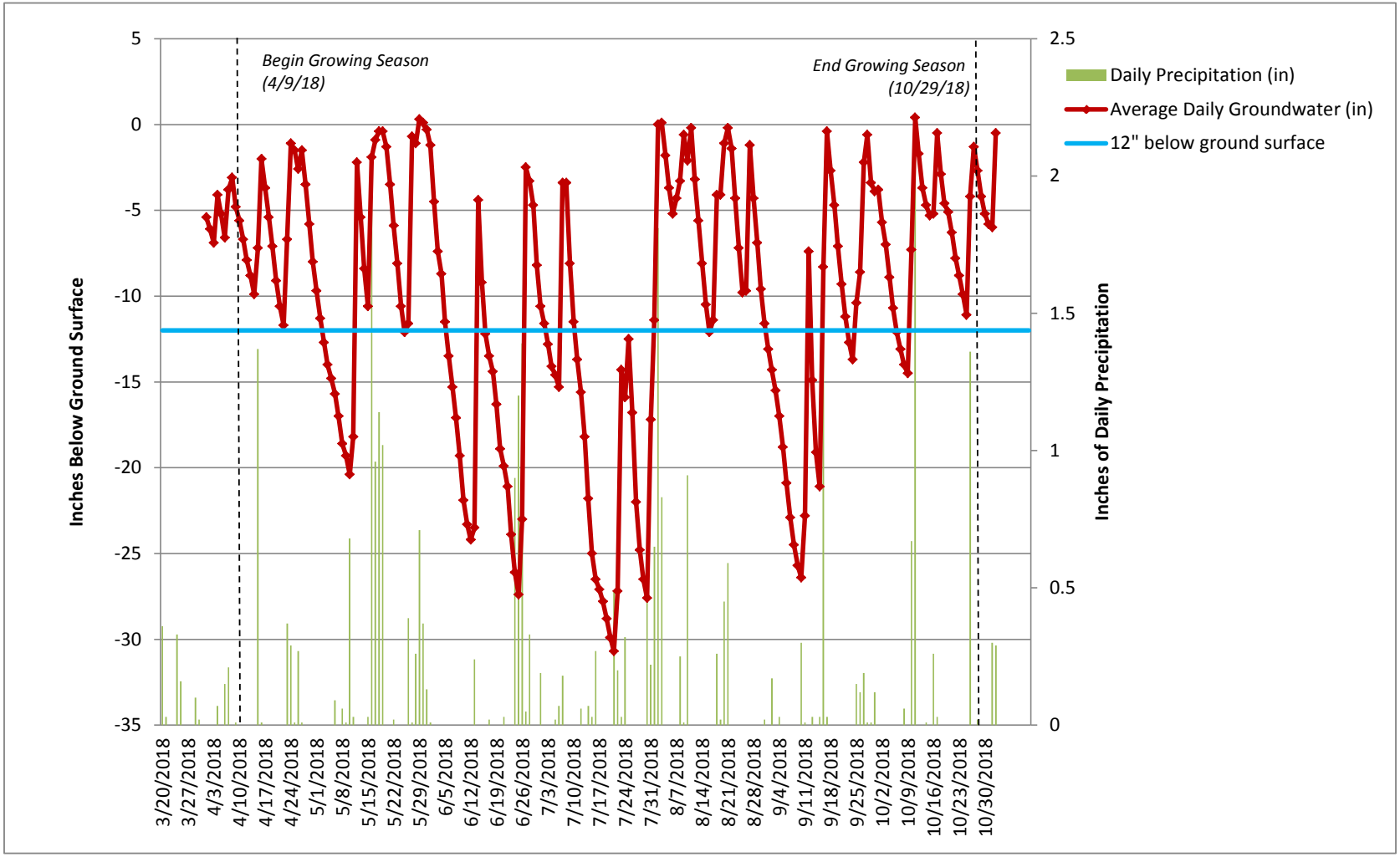
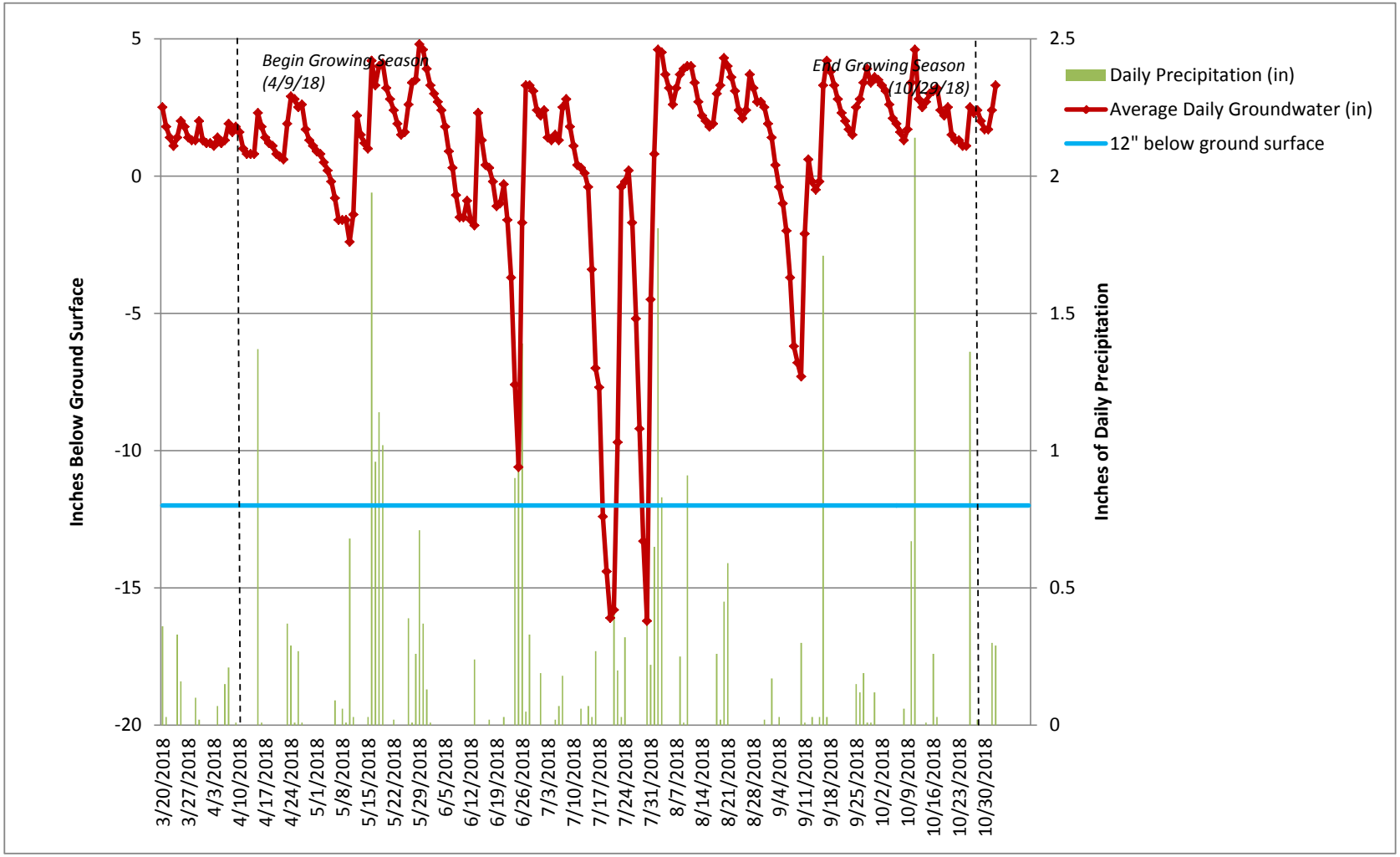
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9BEBCFO
Gauge ID :	18



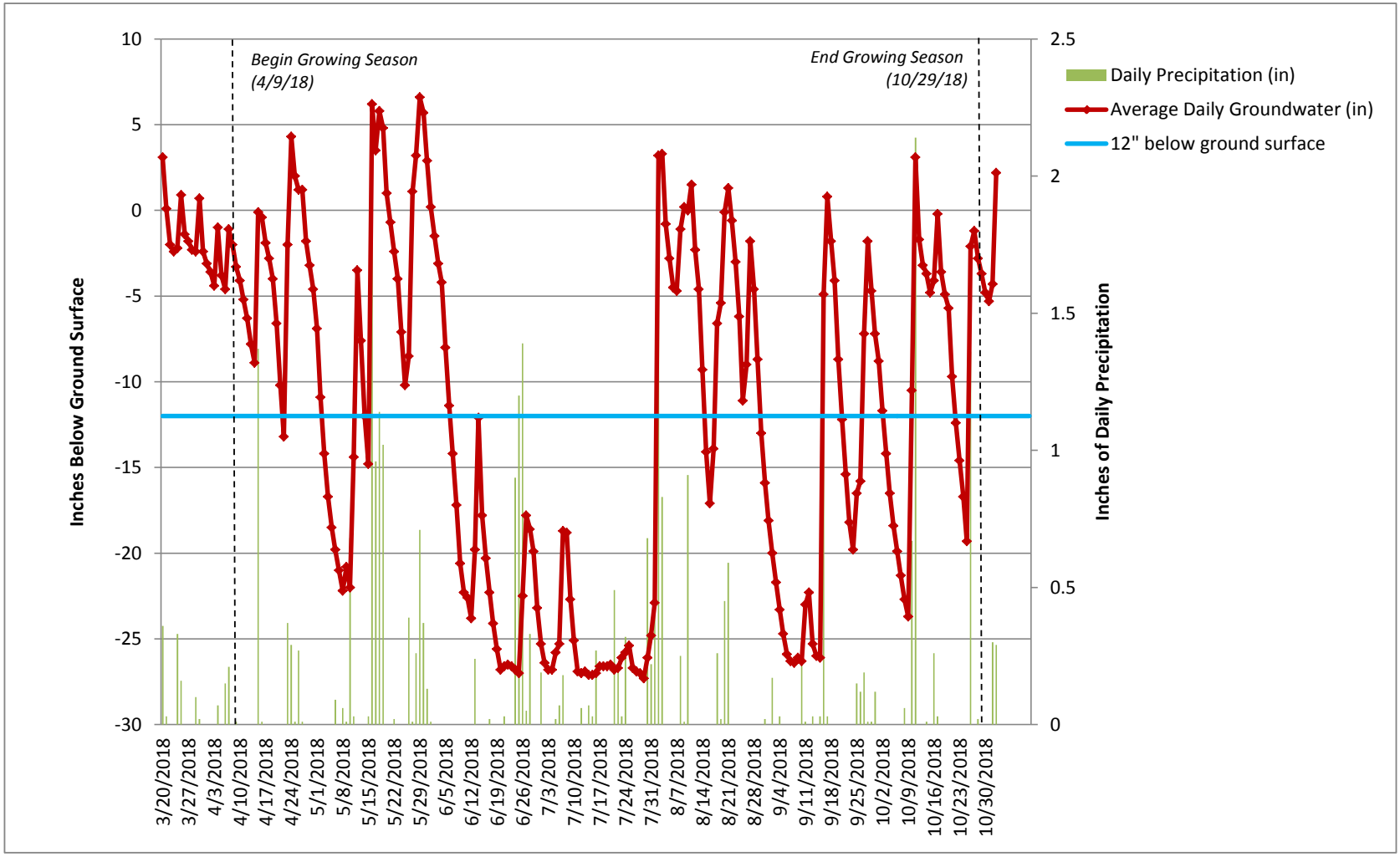
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	136ACA3C
Gauge ID :	19



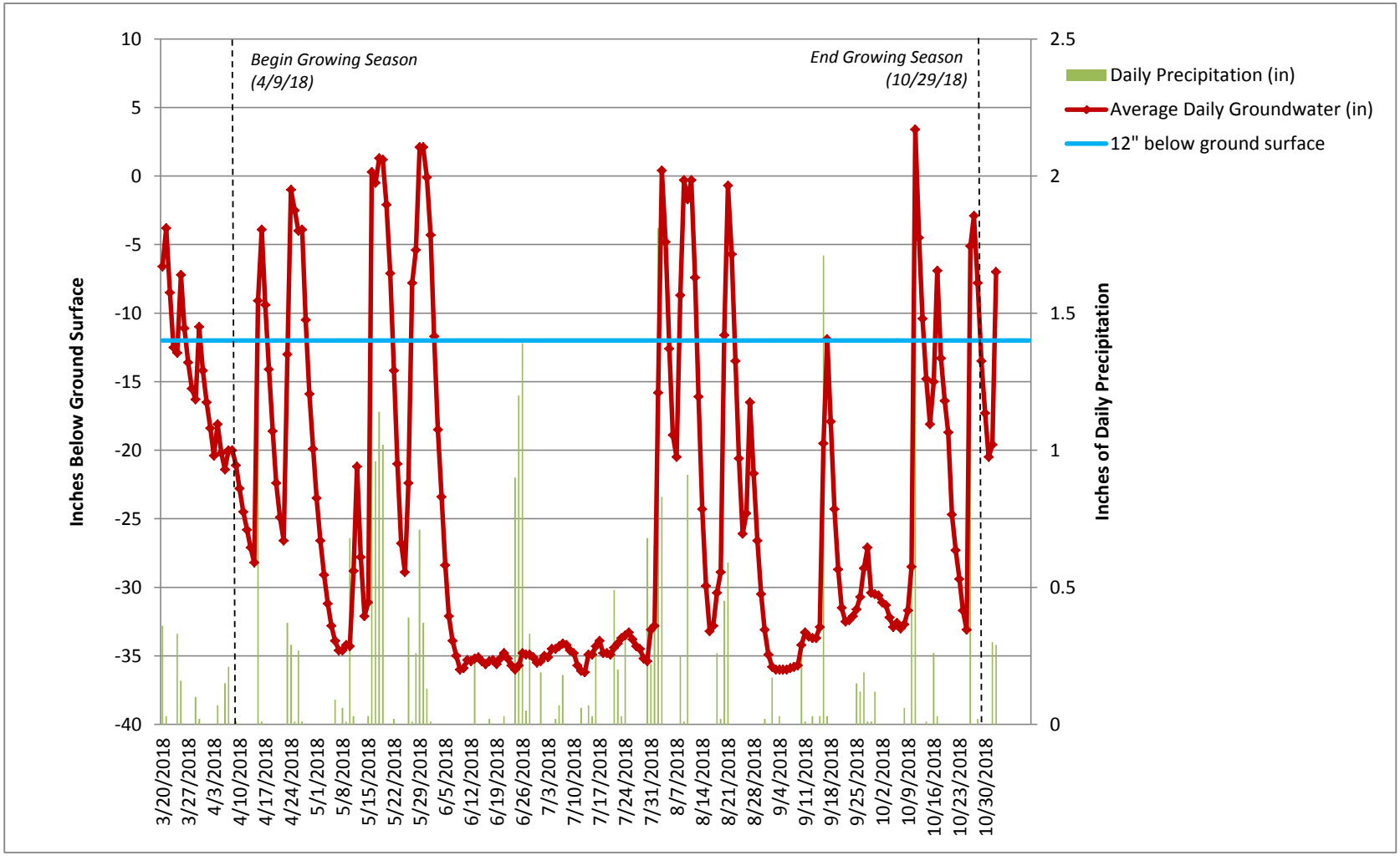
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	B651924
Gauge ID :	20



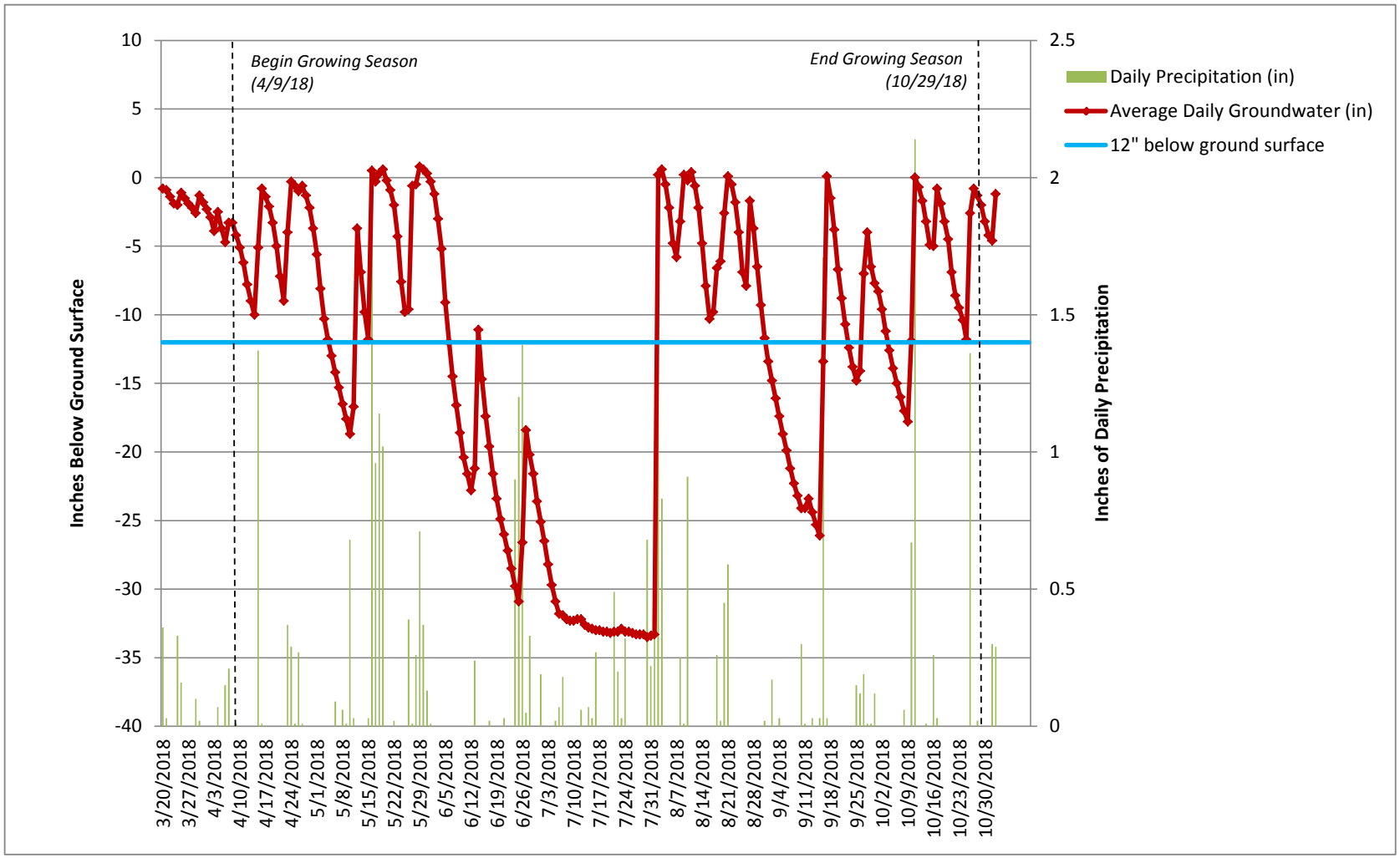
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	138BB5AA
Gauge ID :	21



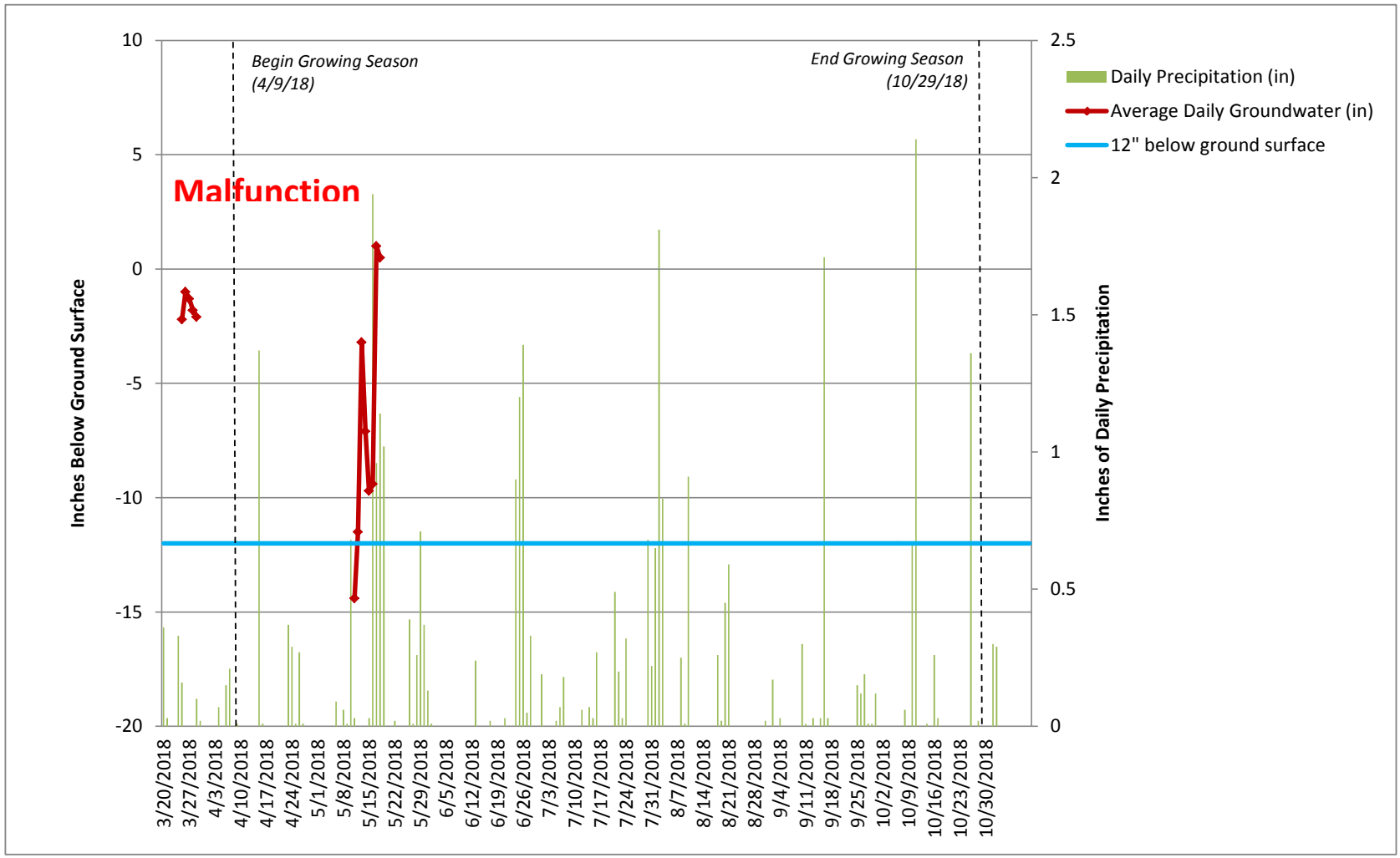
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	11312837
Gauge ID :	22



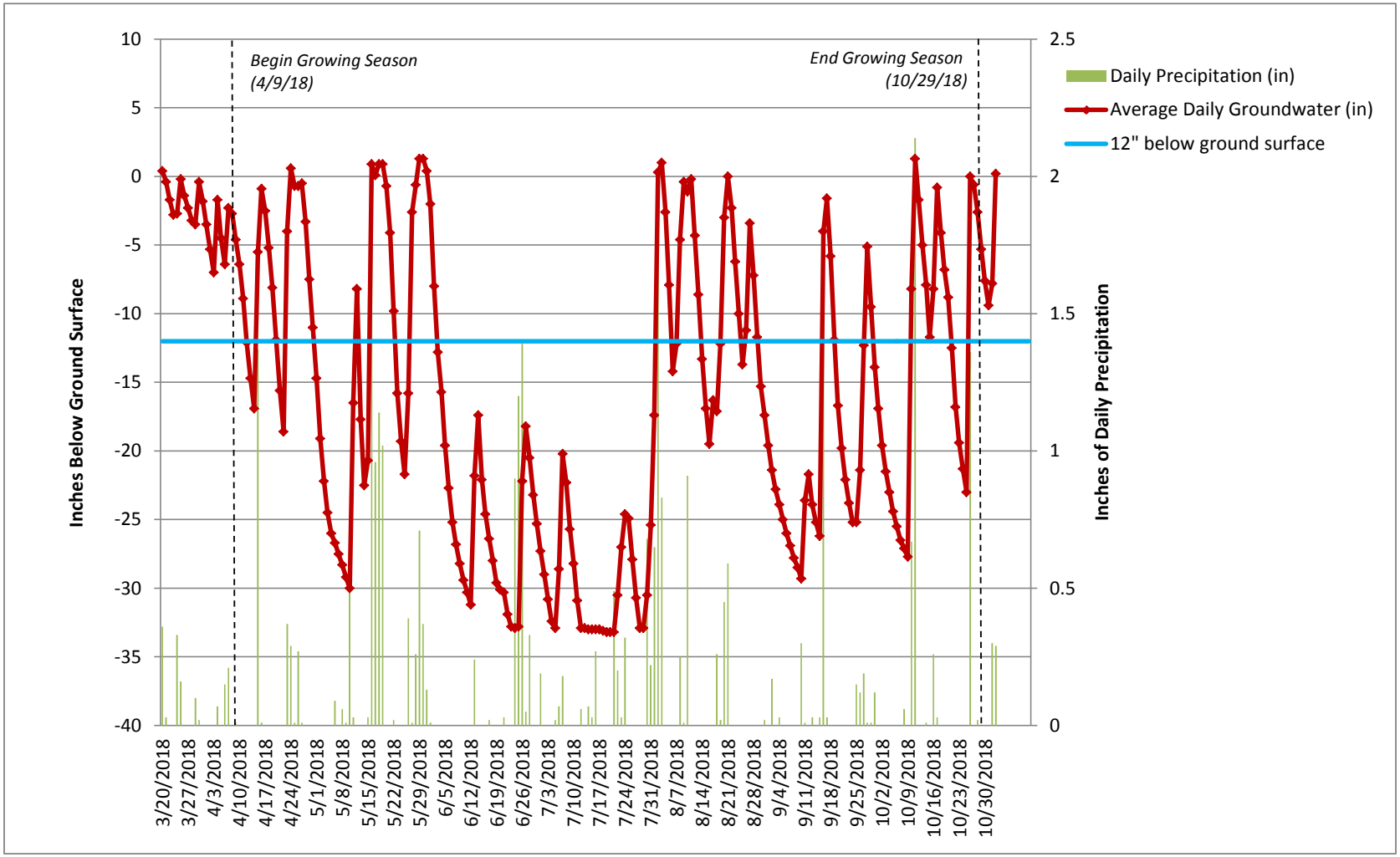
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	182727 / EDB96D7
Gauge ID :	23



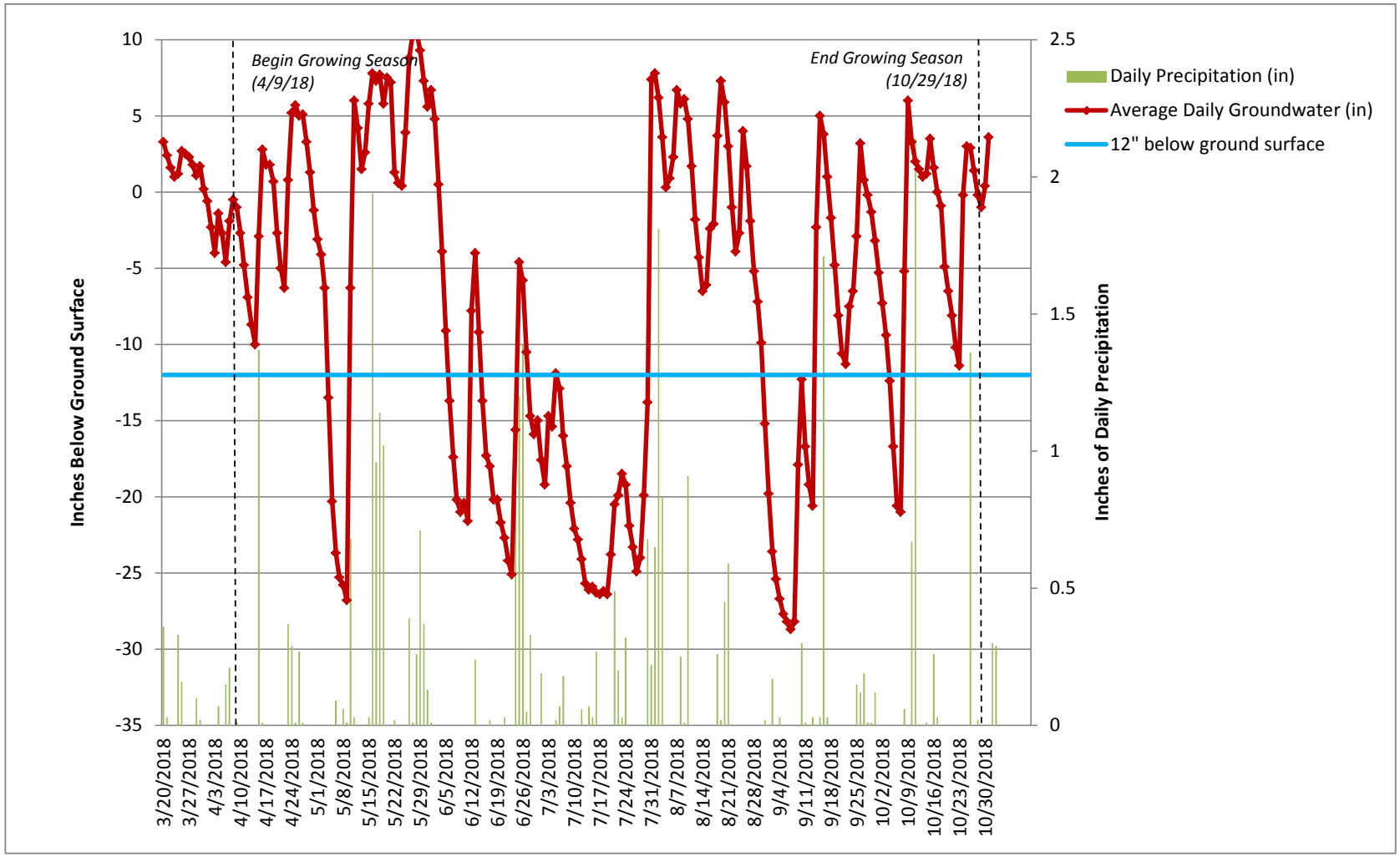
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	1314D206
Gauge ID :	24



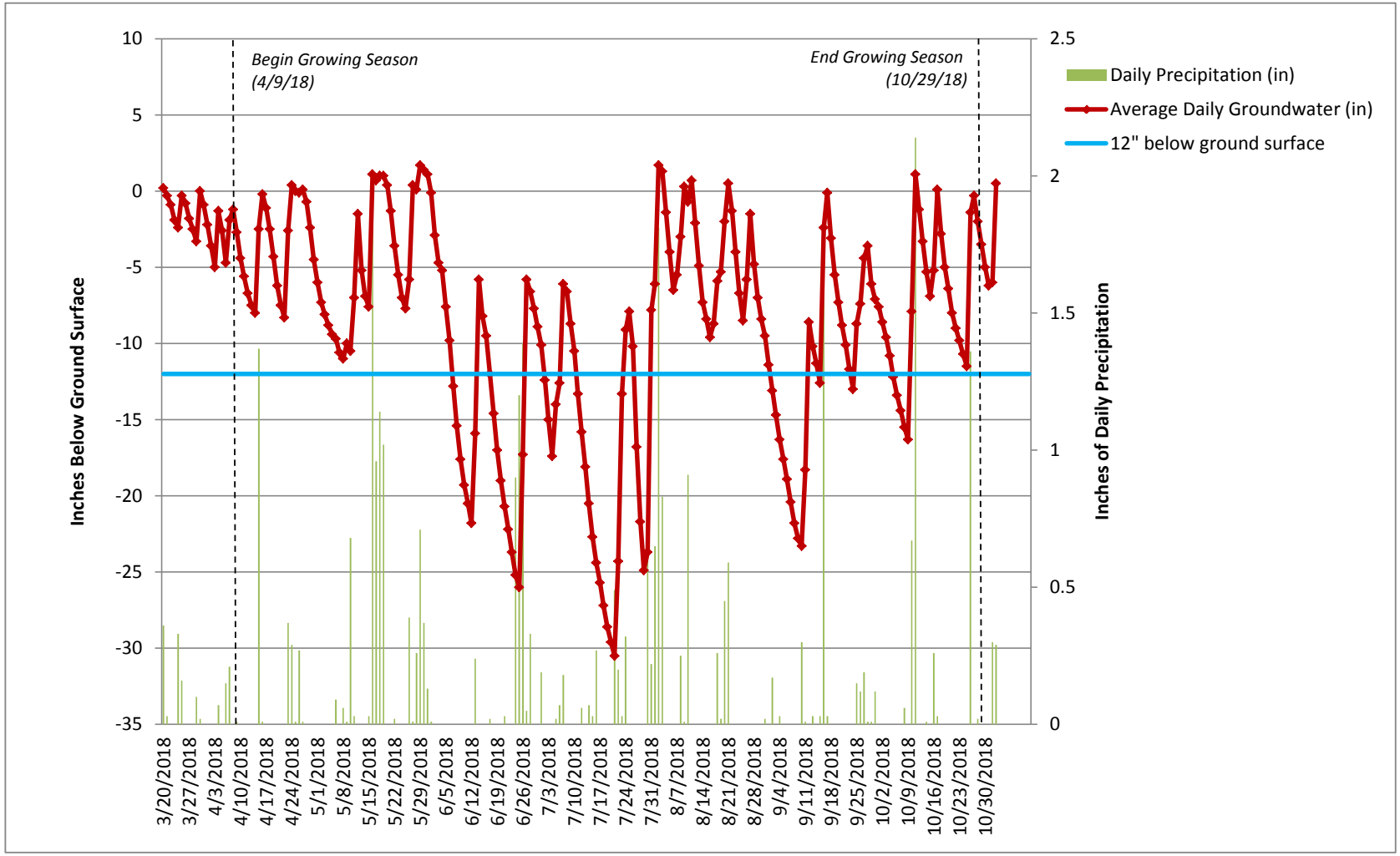
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9BEBF22 / 13D4B149
Gauge ID :	25



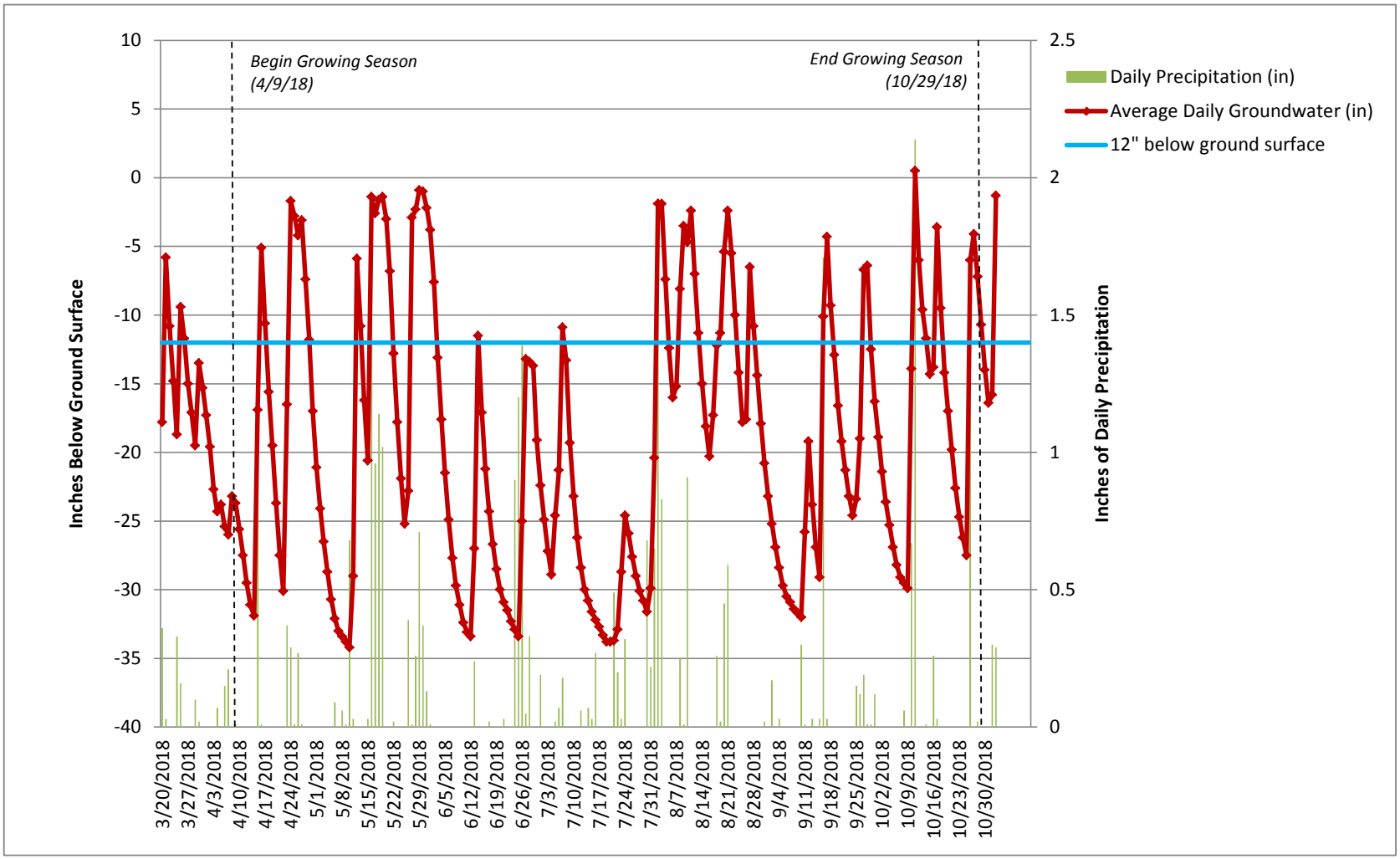
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	1314D1F1 / 1130FAA2
Gauge ID :	26



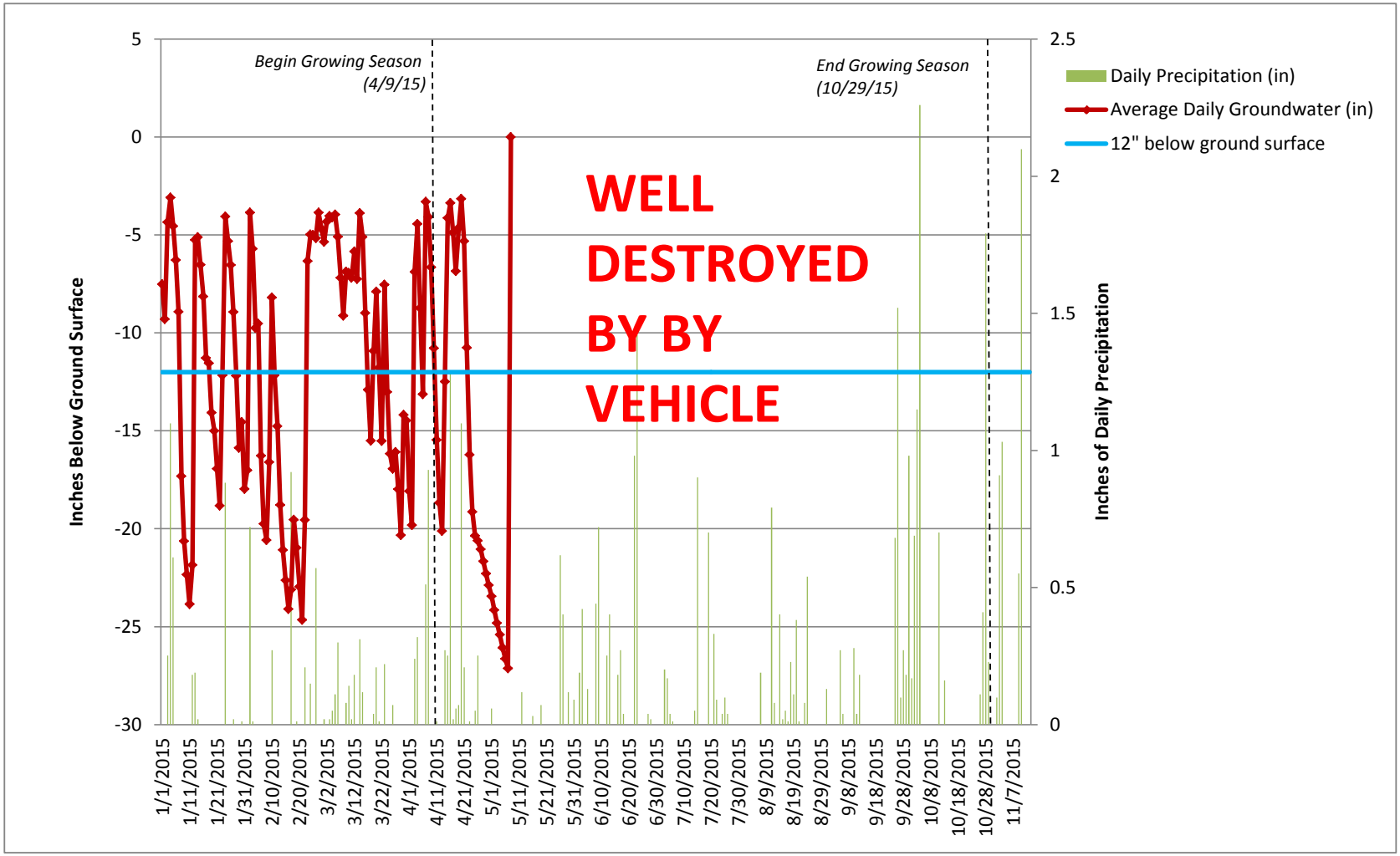
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	113118F8 / 14E1603B
Gauge ID :	27



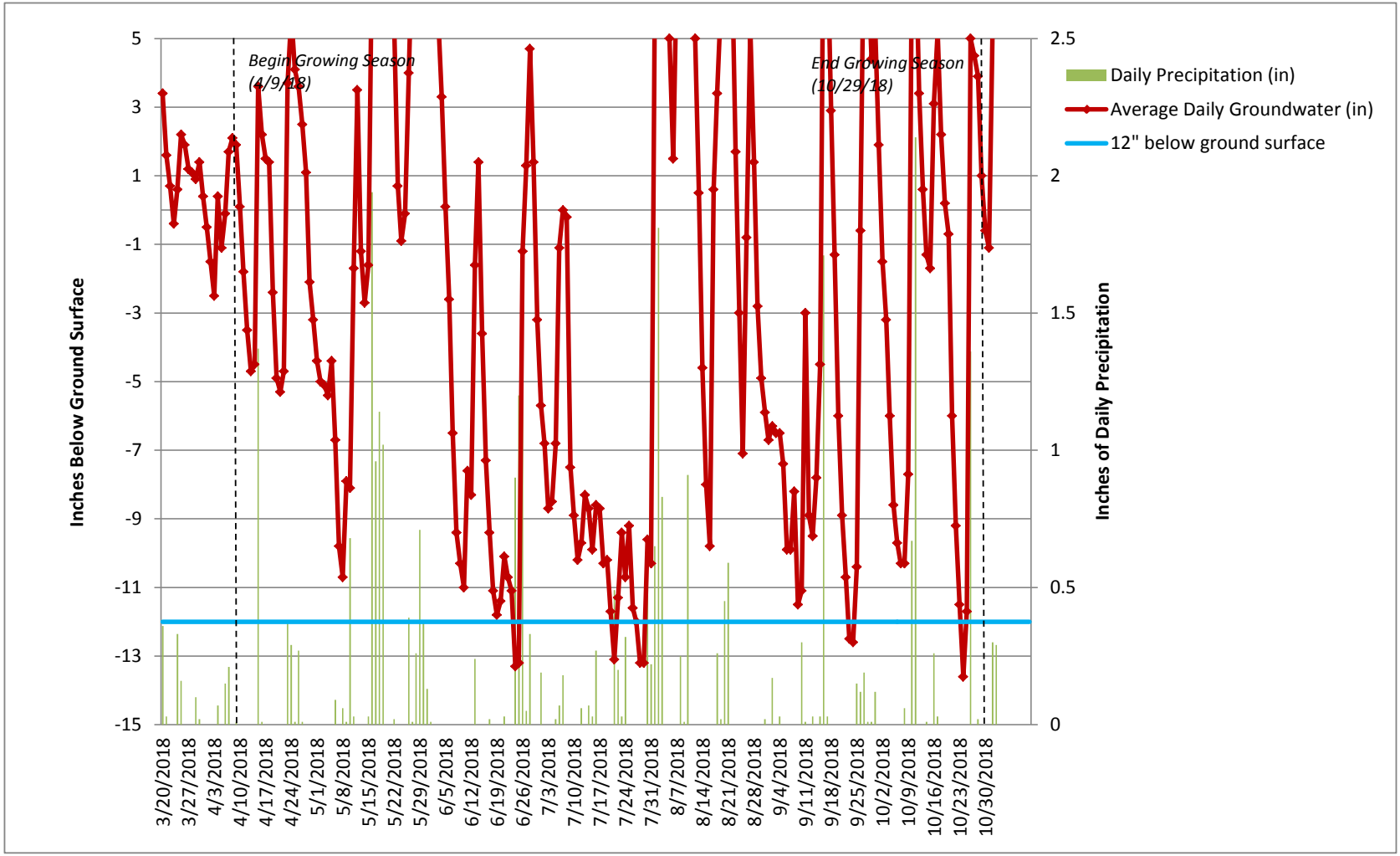
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9BEA4DB / 9BEA426
Gauge ID :	28



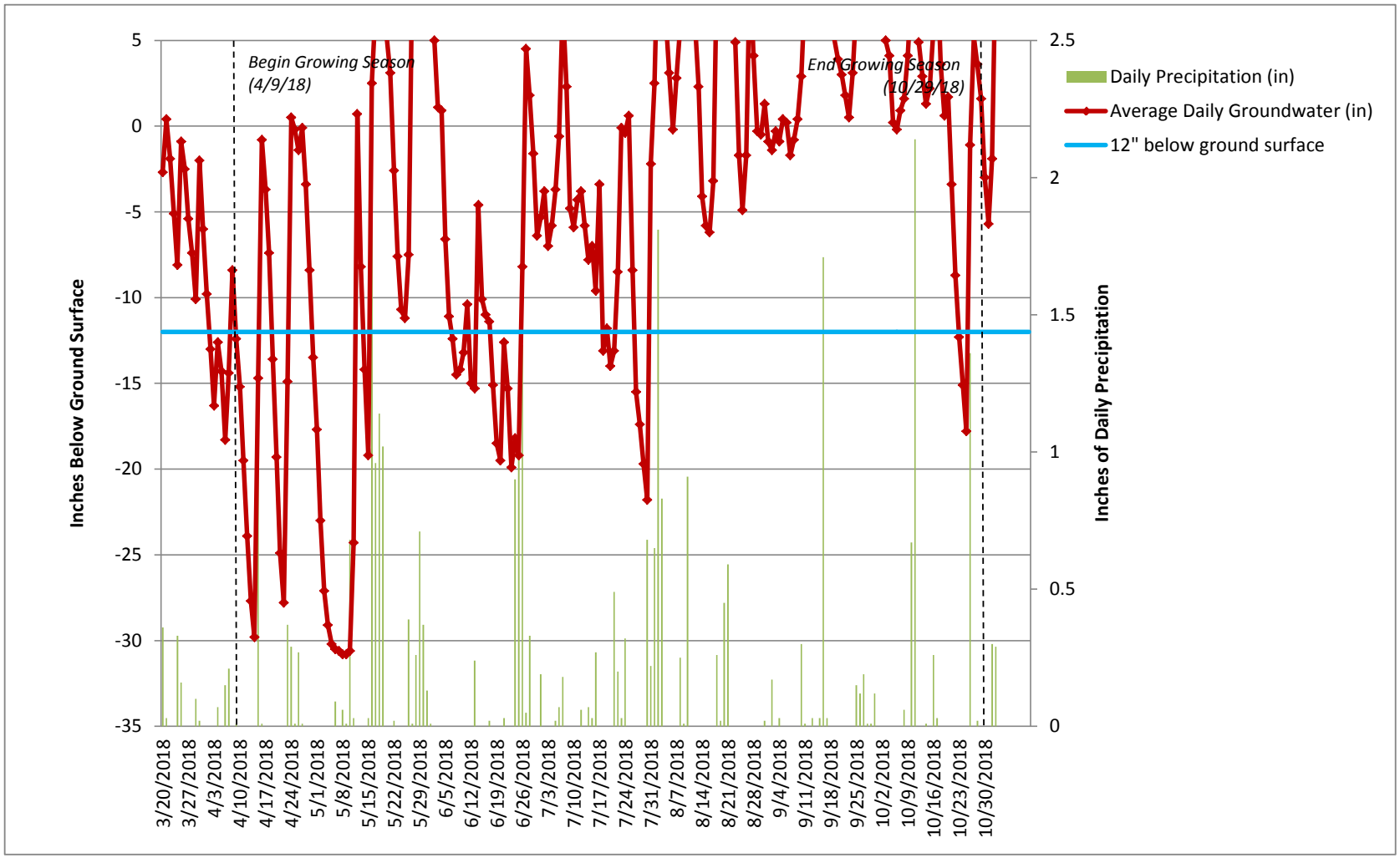
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9DE69AB
Gauge ID :	29



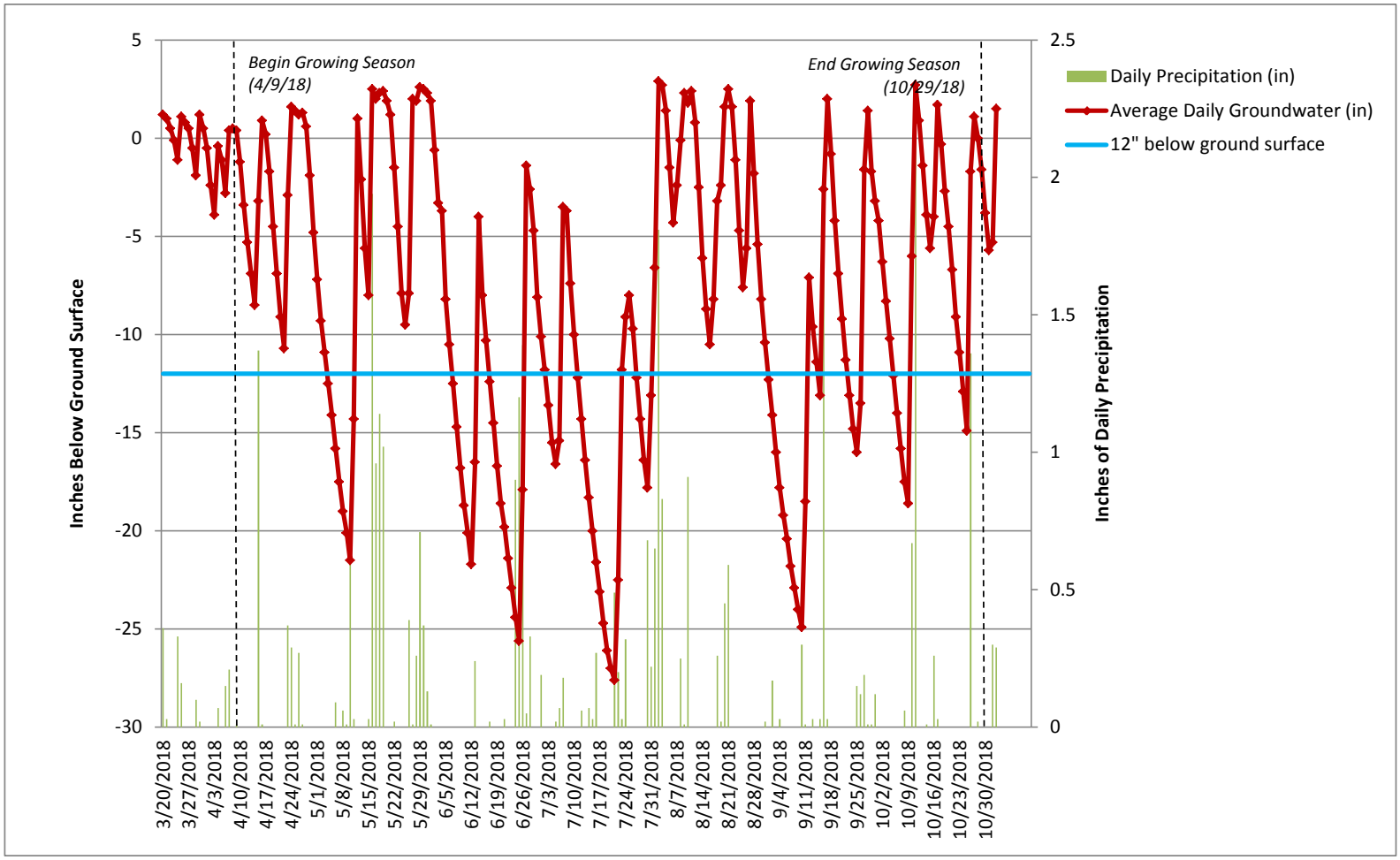
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	138BEO66
Gauge ID:	30



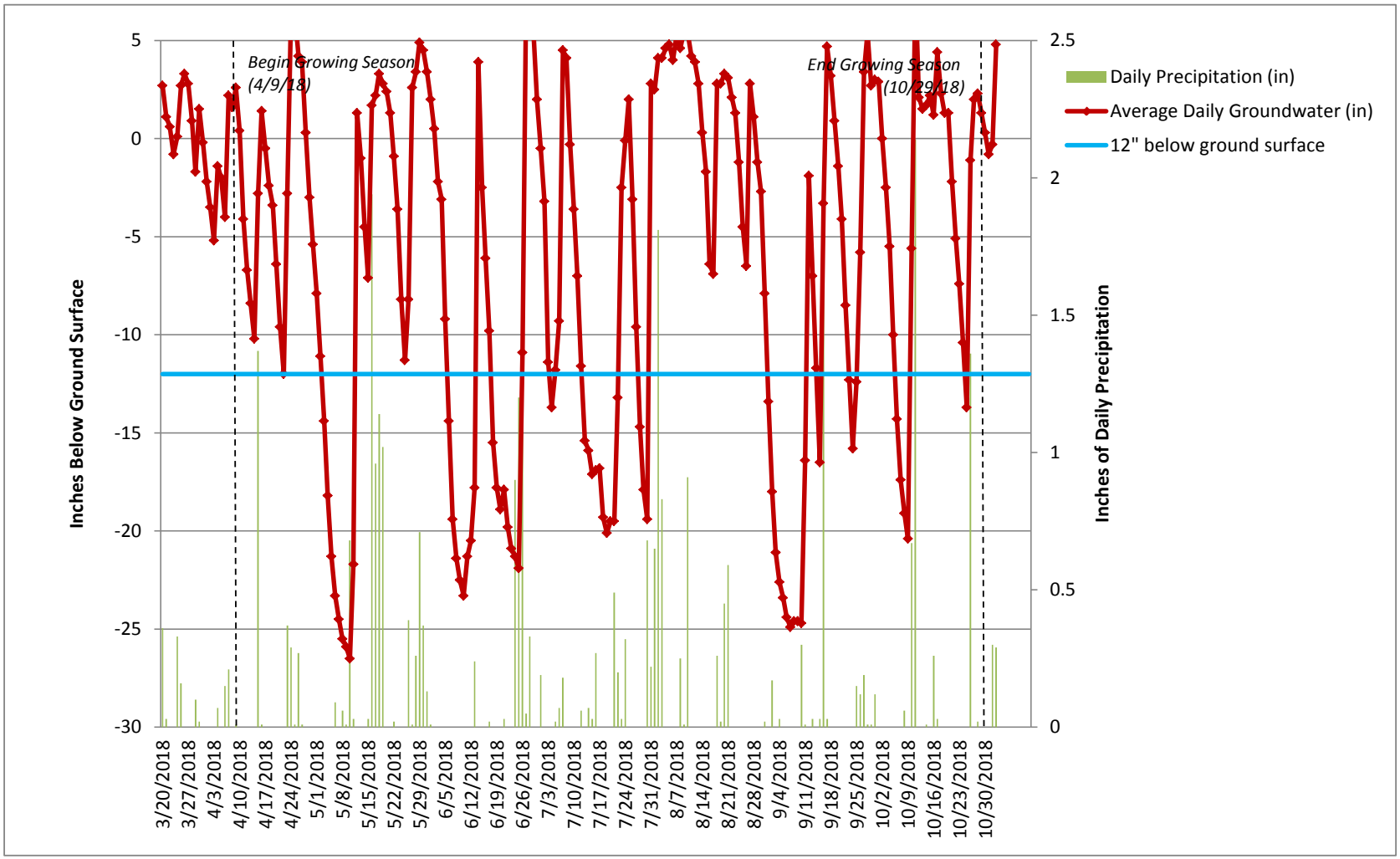
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	182724 / 13D4CFD5
Gauge ID:	31



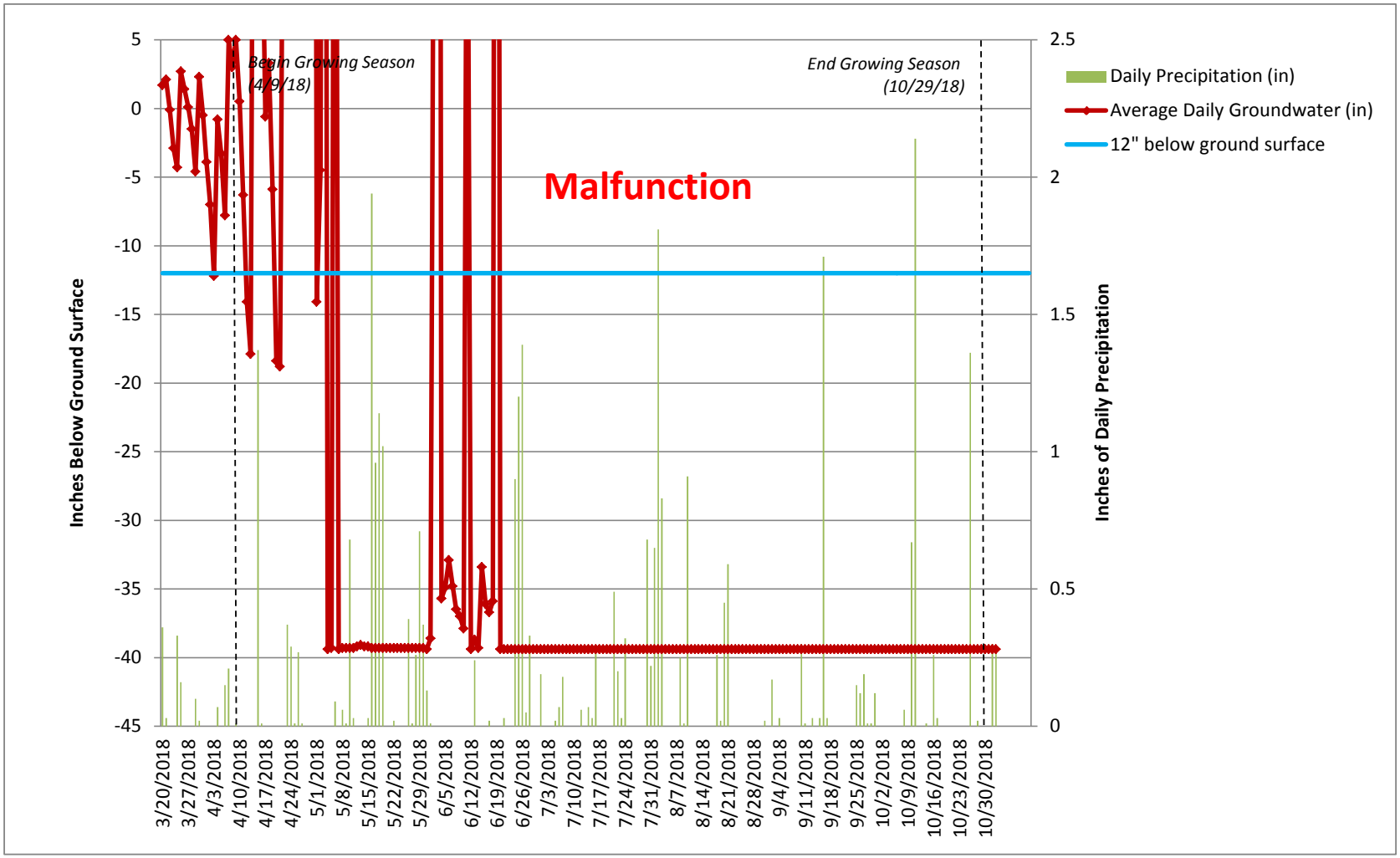
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	EBDD9BO
Gauge ID:	32



Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	EBDCF48
Gauge ID:	33



Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	EBDB81A
Gauge ID:	34



Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	174146 / 14E153D2
Gauge ID:	35

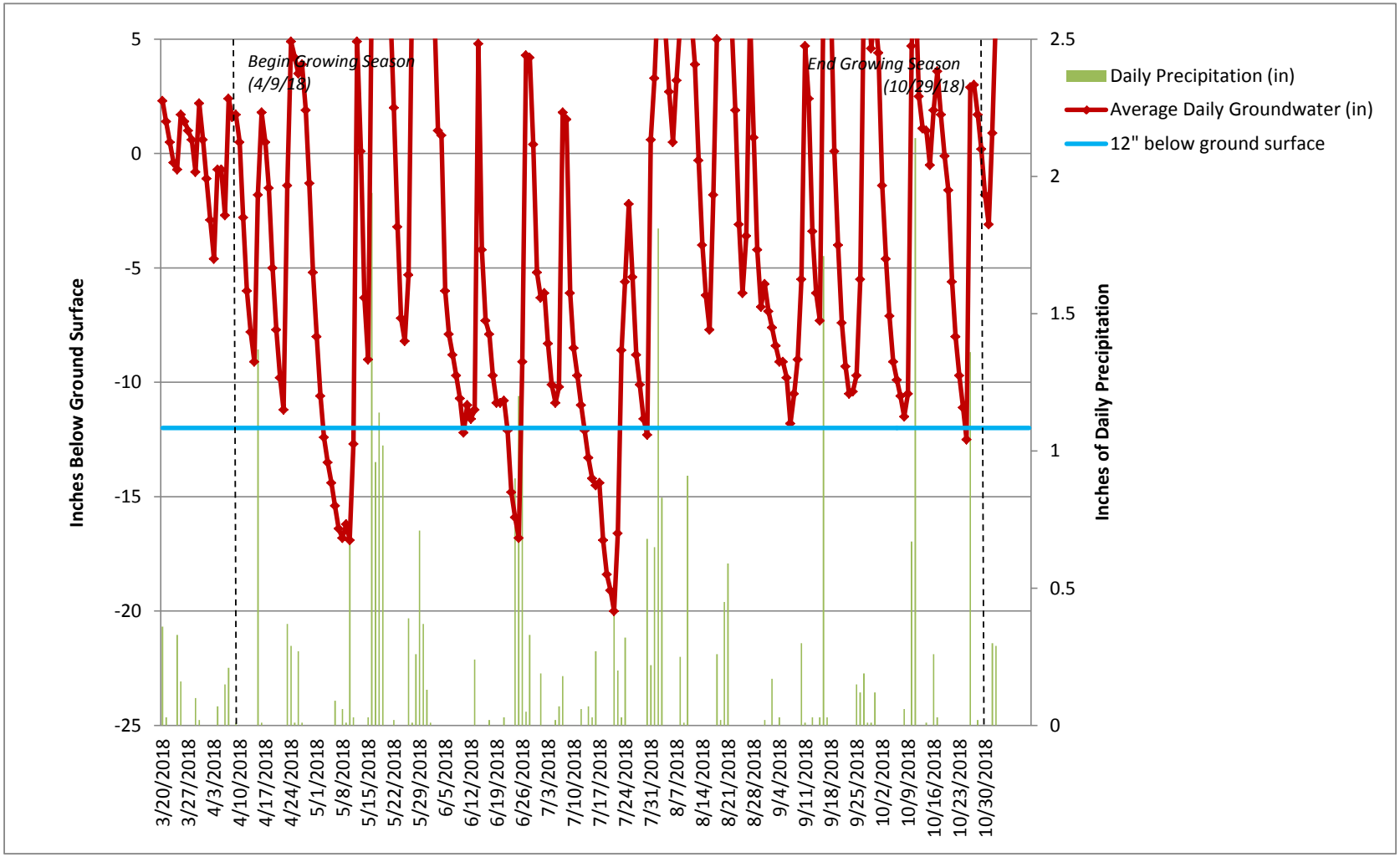


	Table 13. Wetland Gauge Attainment Data						
	Summary of Groundwater Gauge Results for Years 1 to 6						
	Success Criteria Achieved / Max Consecutive Days During Growing Season						
	(Percentage)						
Gauge	Wetland ID	Year 1 (2013)	Year 2 (2014)	Year 3 (2015)	Year 4 (2016)	Year 5 (2017)	Year 6 (2018)
1	D	-	No / 9 4%	Yes / 14 7%	No / 6 3%	Yes / 29 14%	Yes / 172 84%
2	D	-	Yes / 18 9%	Yes / 17 8%	No / 1 1%	No / 8 4%	No / 7 3%
3	D	-	No / 4 2%	No / 7 3%	No / 3 2%	Yes / 11 5%	No / 6 3%
4	D	-	-	Yes / 10 5%	No / 6 3%	Yes / 23 11%	Yes / 14 7%
5	D	Yes / 19 9%	No / 3 2%	No / 8 4%	No / 4 2%	Yes / 10 5%	Yes / 30 15%
6	A	-	Yes / 26 13%	Yes / 22 11%	Yes / 10 5%	Yes / 36 18%	Yes / 31 15%
7	A	-	Yes / 26 13%	Yes / 76 37%	Yes / 13 6%	Yes / 38 19%	Yes / 90 44%
8	A	Yes / 63 31%	Yes / 19 9%	Yes / 31 15%	Yes / 14 7%	Yes / 55 27%	Yes / 91 44%
9	A	-	Yes / 18 9%	Yes / 22 11%	Yes / 11 5%	Yes / 41 20%	Yes / 64 31%
10	A	Yes / 17 8%	Yes / 29 14%	Yes / 34 17%	Yes / 17 8%	Yes / 116 57%	Yes / 103 50%
11	A	-	No / 6 3%	Yes / 13 6%	No / 5 2%	Yes / 22 11%	Yes / 16 8%
12	A	-	Yes / 26 13%	Yes / 23 11%	No / 9 4%	Yes / 29 14%	Yes / 35 17%
13	A	-	Yes / 17 8%	Yes / 25 12%	Yes / 10 5%	Yes / 30 15%	Yes / 21 10%
14	A	-	Yes / 18 9%	Yes / 25 12%	No / 8 4%	Yes / 25 12%	Yes / 30 15%
15	A	-	Yes / 17 8%	Yes / 27 13%	No / 9 4%	Yes / 25 12%	Yes / 31 15%
16	A	-	Yes / 20 10%	Yes / 34 17%	Yes / 28 14%	Yes / 176 86%	Yes / 112 55%
17	A	-	-	-	-	-	
18	A	Yes / 24 12%	Yes / 28 14%	Yes / 34 17%	Yes / 14 7%	Yes / 62 30%	Yes / 76 37%
19	A	-	Yes / 16 8%	Yes / 22 11%	No / 7 3%	Yes / 37 18%	Yes / 24 12%
20	A	Yes / 25 12%	Yes / 33 16%	Yes / 36 18%	Yes / 18 9%	Yes / 64 31%	Yes / 100 49%

	Table 13. Wetland Gauge Attainment Data						
	Summary of Groundwater Gauge Results for Years 1 to 6						
	Success Criteria Achieved / Max Consecutive Days During Growing Season						
	(Percentage)						
Gauge	Wetland ID	Year 1 (2013)	Year 2 (2014)	Year 3 (2015)	Year 4 (2016)	Year 5 (2017)	Year 6 (2018)
21	B	Yes / 40 20%	Yes / 12 6%	Yes / 20 10%	No / 7 3%	Yes / 24 12%	Yes / 22 11%
22	B	-	No / 4 2%	No / 3 2%	No / 4 2%	No / 5 2%	No / 7 3%
23	B	-	-	Yes / 10 5%	No / 7 3%	Yes / 24 12%	Yes / 30 15%
24	B	-	Yes / 26 13%	Yes / 20 10%	No / 8 4%	-	-
25	B	-	Yes / 13 6%	No / 9 4%	No / 5 2%	Yes / 13 6%	Yes / 11 5%
26	B	-	Yes / 28 14%	Yes / 10 5%	No / 4 2%	-	Yes / 31 15%
27	B	-	Yes / 29 14%	Yes / 23 11%	Yes / 11 5%	Yes / 31 15%	Yes / 59 29%
28	B	-	-	No / 8 4%	No / 4 2%	Yes / 13 6%	No / 7 3%
29	C	Yes / 19 9%	No / 5 2%	-	-	-	-
30	C	-	Yes / 26 13%	Yes / 23 11%	No / 6 3%	Yes / 30 15%	Yes / 76 37%
31	C	-	-	Yes / 10 5%	Yes / 69 34%	Yes / 28 14%	Yes / 84 41%
32	C	-	Yes / 16 8%	Yes / 22 10%	No / 6 3%	Yes / 23 11%	Yes / 31 15%
33	C	-	Yes / 18 9%	Yes / 21 10%	No / 7 3%	Yes / 24 12%	Yes / 32 16%
34	C	Yes / 16 8%	Yes / 15 7%	Yes / 21 10%	No / 8 4%	Yes / 94 46%	-
35	C	-	Yes / 38 19%	Yes / 29 14%	Yes / 10 5%	Yes / 32 16%	Yes / 86 42%

A blank cell indicates that there was not enough data to determine if the well was meeting the hydrology criteria for that year.