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

Monitoring Report Year 4 of 5

Henderson County, North Carolina

Prepared for:

North Carolina Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
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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 2014 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 2014). 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 will be considered successful if a minimum of 260 planted stems/acre are surviving at the end of five years. The interim measure of vegetative success for the site will be the survival of a minimum of 320 planted stems/acre in Year 3. The Monitoring Year 4 (MY4) stem counts are located in Tables 7 and 9 in Appendix C. Currently, 14 of 17 vegetation plots are meeting the interim measures of success. 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 interim success criteria include two along the tributary which may not have been 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. No other invasive species were noted. This will be monitored in subsequent years due to the potential for invasives to develop.

There were no issues with access during the annual site reviews. In previous years there were signs of encroachment during the visits; however, Division of Mitigation Services (DMS) has installed new signs on the site where farming activities were encroaching on the easement and no new areas of encroachment were noted. In addition, during a visit to gather monitoring well data it was noted that a well had been destroyed due to vehicles driving over it along the western side of the tributary (within Wetland C area) at a farm access road that is not gated. The local group of model airplane enthusiasts continues to maintain the nearby grassed area and have been there often during our visits. A ditch which was cut in 2014 (adjacent to the conservation easement boundary near the proposed wetland on the Lower Reach) appears to be draining the proposed wetland and may be an issue for maintaining hydrology at this location.

The reaches of the restoration project were observed to be in stable condition. The channel accesses its floodplain and evidence of bankfull events were observed during Year 4 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 substrate to migrate into the system. This year, the Main Stem reaches indicate a more sandy substrate, but this is likely due to the amount of ponding due to the beaver dams throughout these reaches. Sediment transport analysis and shear stress fall within acceptable ranges and are similar to those of the baseline condition.

Notable areas of concern occur on all project reaches. The greatest of these is the number of beaver dam occurrences on the Main Stem reaches and the structure failures along the Tributary Reach. During the monitoring event the Upper Reach above the permanent crossing was mostly ponded due to the beaver dams; however, the majority of those dams have been removed with the exception of one noted in December of 2016 during the downloading of the hydrologic monitoring wells. Also, as noted in 2014, over half of the log structures along the Tributary Reach had been eroded or are completely undermined. These structures are still undermined or have erosion issues; however, water levels were higher during monitoring and it appeared water was going over every structure rather than under as noted in 2014. 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.

In the previous year a temporary crossing was located on the Lower Reach for utility line installation. This has since been removed and stream repairs have been made to the areas that were eroding, the log structure was replaced, and plantings were installed. In December 2016, it appeared that supplemental planting had also occurred at this location. This area appears to be stable; however, vegetation survivability should be reviewed again during the next monitoring event.

The Lower Reach has an excavated ditch just outside and along the conservation easement boundary that appears to be potentially draining the proposed Wetland D. The wetland area is of concern due to the potential lack of hydrology. Also, beaver activity was noted on the Lower Reach for the first time since monitoring began. The only active beaver dam noted on the project reaches during a December 2016 site review occurred on the Lower Reach, along the straight section just above the confluence with Cane Creek.

The permanent stream crossing near Sta. 24+00 on the Upper Reach has evidence of past erosion at the access road culvert (and floodplain pipes) due to debris blockages. Additional damage to this crossing could occur if debris continues to obstruct the pipes; however, the removal of the upstream beavers and their dams may limit some of the debris that reaches this area. In addition to the permanent crossing on the Upper Reach, the beaver activity on this reach appeared to be impacting channel morphology, specifically in the loss of riffles and increased ponding of the majority of the reach. With removal of the dams in 2016, the upcoming monitoring event in 2017 may illustrate recovery of the riffles which had been lost or obscured due to ponding.

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

Several factors have been determined to be worthy of future attention on the site. These include beaver activity onsite, backwater effects from Cane Creek during large precipitation events, and vegetation planted outside the planting window, as well as future plans by the Town that may impact the project area such as development of the park with multiple uses including the airplane enthusiast area.

Summary information/data related to the occurrence of items such as beavers or encroachments 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 is available from DMS upon request.

2.0 METHODOLOGY

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 22 and 23, 2016. This report details the results of Monitoring Year 4.

2.1 Morphometric Parameters and Channel Stability

2.1.1 Profile

The entire length of the reach was monitored by HDR using the VRS System. Multiple parameters were located including top of bank, thalweg, and water surface. In Year 4, the Upper Reach is still being impacted by beaver activity. As a result, there is a significant absence of riffle features as was the case in Year 3. The riffles observed, however, matched well with values from previous years.

Increased beaver activity was observed on the Lower Reach segment. This caused a decreased amount of riffle features observed due to water ponded by beaver dams. The water surface slope is also notably different than previous years due to beaver activity. Of the riffles and pools observed, the facet values were similar to the previous year. The overall profile facets are remaining stable.

The Tributary profile shows similar measurements compared with Year 3 but with a continuing trend of increased pool depths.

Bankfull and water surface slopes remain consistent for the Upper and Tributary channel segments when compared to previous years of monitoring. The Lower Reach bankfull slope remains consistent with previous years but water surface slope shows some increase. In Year 4 the Lower Reach was the reach most impacted by beaver activity, whereas in Year 3 it was the Upper Reach. The beaver activity in the Lower Reach caused water surface to change dramatically at dam locations and then stay flat through large sections of the reach.

2.1.2 Dimension

Nine cross sections were measured by HDR staff in March of 2016. The morphological data is presented in Tables 10 and 11 in Appendix D, along with the cross-sectional data. Riffles 1 and 3 in the Upper Reach remained consistent with the dimensions from the previous year; the same is true for cross section 2 (pool) in the Upper Reach.

Permanent riffle and pool sections for the Lower Reach are performing well and have changed little from previous years with respect to dimensions, despite the increased beaver activity noted on the Lower Reach in Year 4.

For the Tributary reach, the permanent riffles (XSC's 7&8) continue to show increasing depths from the previous year. The permanent pool section (XSC9) depth seems to have stabilized but has an increased bankfull width in Year 4.

2.1.3 Pattern

The pattern of the channels was obtained using VRS measurements. The location is illustrated on the current condition plan view map in Appendix B. No lateral movement in stream pattern was observed in Year 4 monitoring.

2.1.4 Substrate

Pebble counts were taken for Year 4 monitoring at permanent riffle cross sections on the Upper and Lower Reaches. The Wolman Pebble Count methodology was used to calculate the D50 and D84 to assess changes in particle size distributions. Pebble counts were not initially planned for this restoration and were not performed in baseline monitoring. However, due to changes in substrate seen during Year 1 monitoring, counts were performed to compare with future years. Counts were not performed on the Tributary reach due to the hard clay material making up the streambed.

The pebble counts from XSC1 and XSC2 show a decrease in the D50 from the previous year, with results showing sandy bed conditions. These results are not very surprising since both permanent riffles are located on the upstream end of the Upper Reach where beaver activity has been prevalent, causing water to back up and smaller sediment to deposit.

The Lower Reach cross sections, XSC4 and XSC6, show a smaller D50 in Year 4 compared to previous years. Deposition of finer material from beaver activity is the likely cause. The gravels seen in previous years are still present, as seen in the individual counts. However, enough smaller embedded material was seen this year that swayed the results toward more of a coarse sand.

2.1.5 Sediment Transport

Shear stress values were calculated using riffle cross section measurements obtained in Year 4 monitoring. In Year 4 the shear stress values for the Upper Reach again showed the ability to easily move the D50 particle obtained from Year 3 pebble counts (movable particle size predicted using Revised Shields Diagram, Rosgen, 2002). The predicted movable particle size for the Upper Reach riffle sections were 17mm and 22mm, as compared with D50 values of 0.9 mm and 0.3 mm, respectively. As discussed with the substrate observed for the Upper Reach riffles, more smaller particles were observed this year.

The Lower Reach values for predicted movable particle size versus the D50 from pebble counts are similar, indicating stable conditions. For cross-section XSC4, the predicted movable particle size is 11mm as compared to the observed D50 of 7mm. Riffle XSC6 has a predicted movable particle size of 9mm compared to an observed D50 of 7mm.

The Tributary reach has much higher shear stress values, mainly as a product of a high water surface slope. Predicted movable particle sizes, calculated at the two permanent riffles, indicate movable particle sizes of 50 to 60mm. The bed material is made up of hard, sticky clay that does not seem to move during high flows. Also, over the monitoring period thus far, there has been little evidence that sediment is being brought into the system from upstream. This makes sense given the land use in the Tributary catchment. This lack of sediment supply along with flashy storm events has impacted in-stream structures by lifting and transporting stream structure backfill material (No. 57 stone in particular). This backfill material has been deposited on interior meander bends and other places along the reach.

2.1.6 Photo Documentation

Photos were taken at the 52 stream photo stations and 17 vegetation plots on March 22 and 23 and June 28, 2016. The locations of the photos stations and vegetation plots are noted on Figure 3 in Appendix B. The photos for monitoring Year 4 are also provided in Appendix B.

2.2 Vegetation

The Carolina Vegetation Survey (CVS) Protocol Level 2 methodology was used to sample vegetation on June 28, 2016. Monitoring was conducted on seventeen vegetation plots (3 on the tributary, 7 on the main stem Upper Reach, and 7 on the main stream 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 409 stems/acre with the range from 162 to 809 stems/acre. The highest plant density occurred in plot 4 with over 800 stems/acre. Currently, 14 of the plots are meeting the interim 3-year vegetation success criteria of 320 stems/acre. Year 4 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 and the plot closest to the confluence with Cane Creek which has had backwater impacts numerous times since construction.

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 2016 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 12 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). Three other wells (Wells 12, 15, and 34) were close to meeting criteria. Eighteen wells are not meeting criteria across the site. None of the wells located in the proposed Wetland D are meeting the hydrology criteria; however, 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 year. This year was noted by the NC Drought Monitor as being “Abnormally Dry” to being in “Severe drought” in the project vicinity and 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.

3.0 REFERENCES CITED

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

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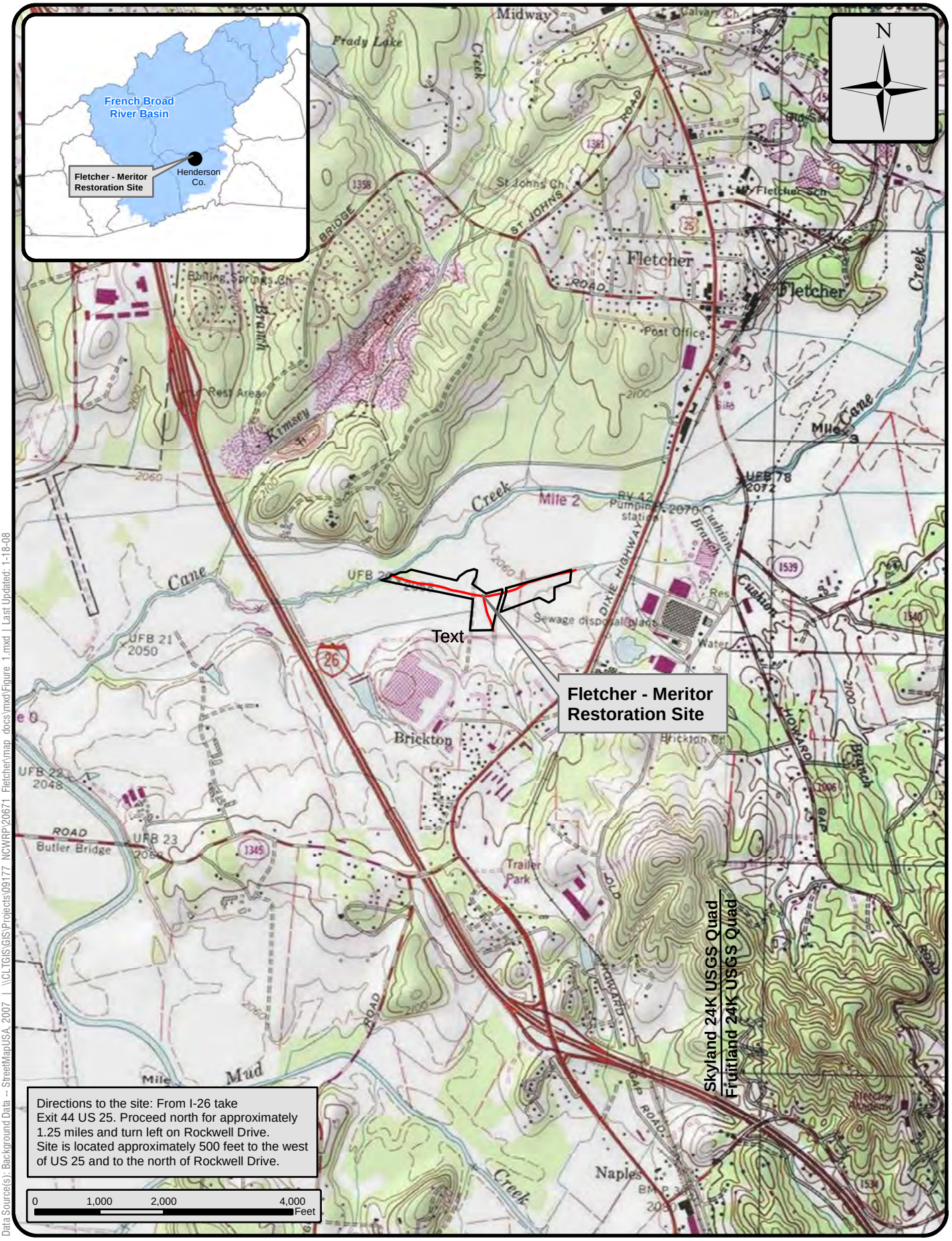
North Carolina Ecosystem Enhancement Program. 2014. Fletcher-Meritor Site (UT to Cane Creek) Stream and Wetland Restoration Monitoring Report Year 2 of 5.

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 3 Monitoring I Henderson County, NC
NC Ecosystem Enhancement Program | Project No. 138

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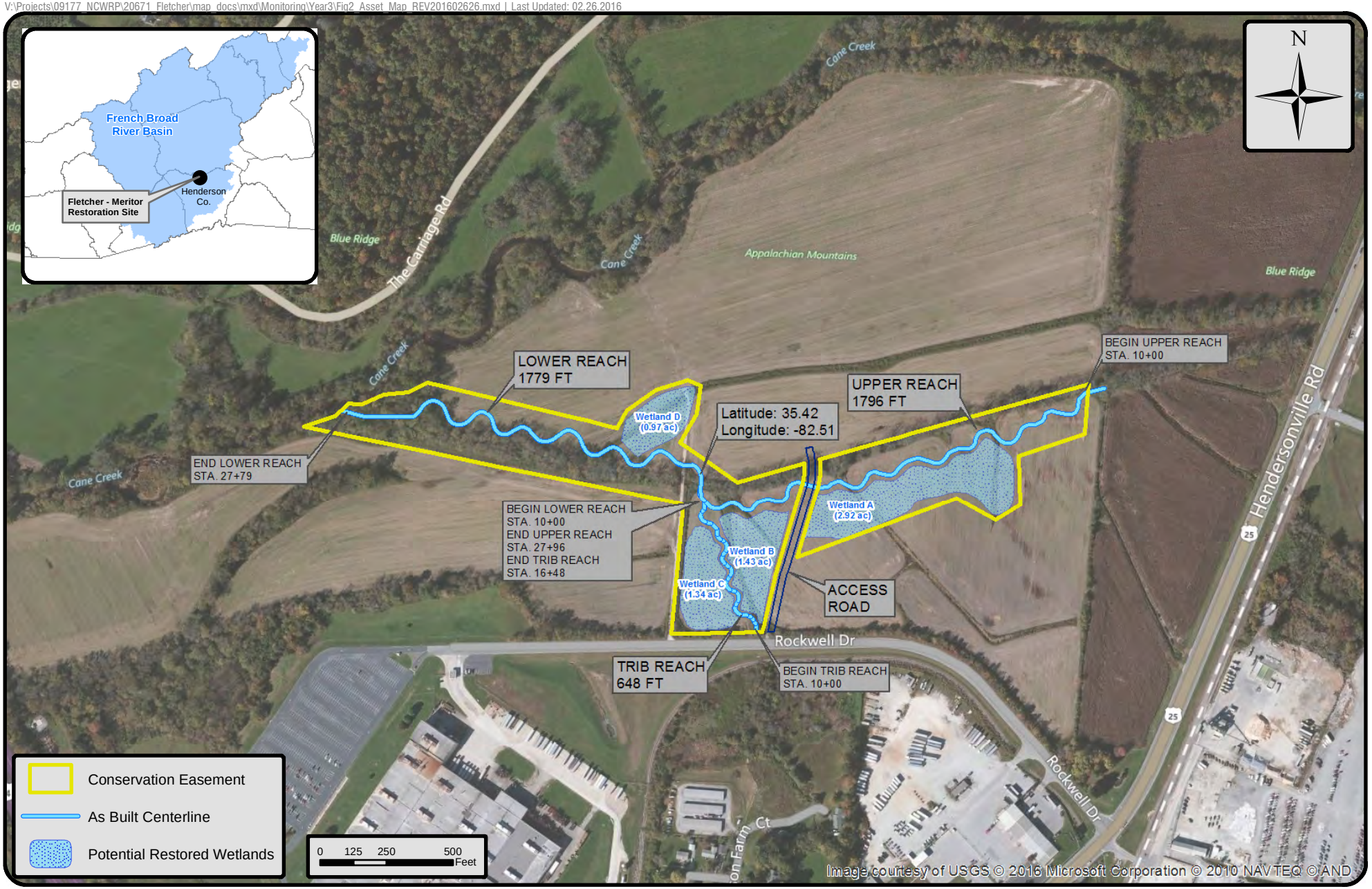


Asset Map

Figure 2

Fletcher-Meritor Site (UT to Cane Creek) Year 3 Monitoring I Henderson County, NC
NC Ecosystem Enhancement Program | 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: 3 yrs 0 months		
Elapsed Time Since Planting Complete: 3 yrs 0 Months		
Number of Reporting Years: 3		
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
Year 3 Monitoring	May 2015	January 2016
Year 4 Monitoring	March & June 2016	December 2016
Year 5 Monitoring		

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

LEGEND

- Monitoring Wells
- Rain Gauge
- Photo Points
- Crest Gauge
- Cross Section Pins
- Cross Sections
- Stations
- Structures
- Top of Bank
- Vegetation Plot
- Conservation Easement
- As Built Centerline
- Potential Restored Wetlands (A-D)

DATA SOURCE: NC OneMap Orthophotography

0 Feet 200

LOWER REACH
1779 FT

END LOWER REACH
STA. 27+79

LR Confluence

PERMANENT STREAM CROSSING
2-36" CMP
2-24" CMP FLOODPLAIN CULVERTS

DIRT ROAD
REMOVED

BEGIN LOWER REACH
STA. 10+00
END UPPER REACH
STA. 27+96
END TRIB REACH
STA. 16+48

ACCESS
ROAD

TRIB REACH
648 FT

BEGIN TRIB REACH
STA. 10+00

Wetland D
(0.97 ac)

Wetland A
(2.92 ac)

Wetland B
(1.43 ac)

Wetland C
(1.34 ac)

NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

FLETCHER-MERITOR SITE (UT TO CANE CREEK) MONITORING YEAR 4

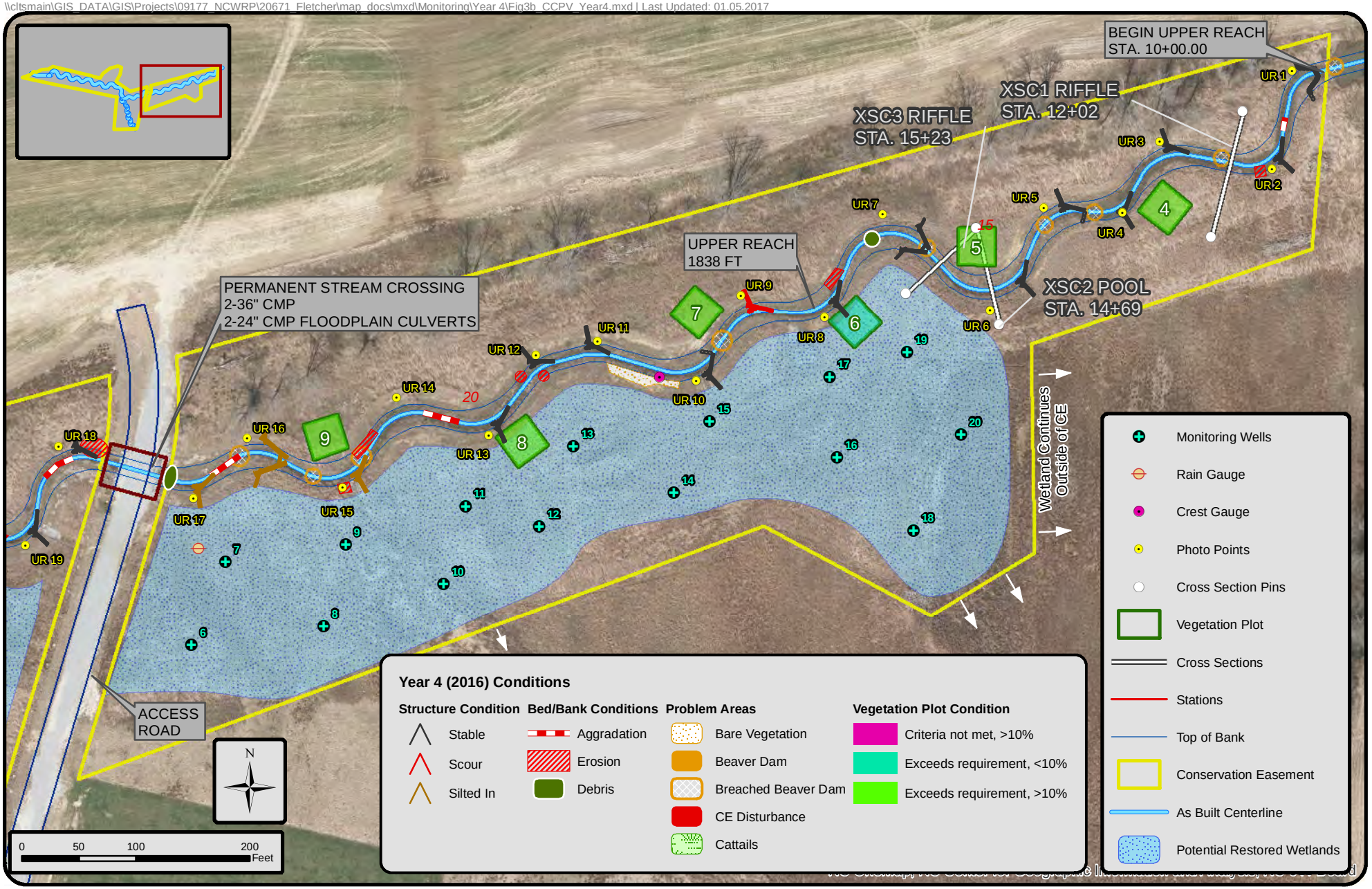
CURRENT CONDITIONS PLAN VIEW

FIGURE 3A

PATH: \\CLTSMAIN\GIS_DATA\GIS\PROJECTS\09177_NCWRP\20671_FLETCHER\MAP_DOCS\MXD\MONITORING\YEAR 4\FIG3A_MONITORINGLOCATIONS_YEAR4.MXD - USER: JJAMISON - DATE: 1/3/2017

NC ECOSYSTEM ENHANCEMENT PROGRAM | PROJECT NO. 138

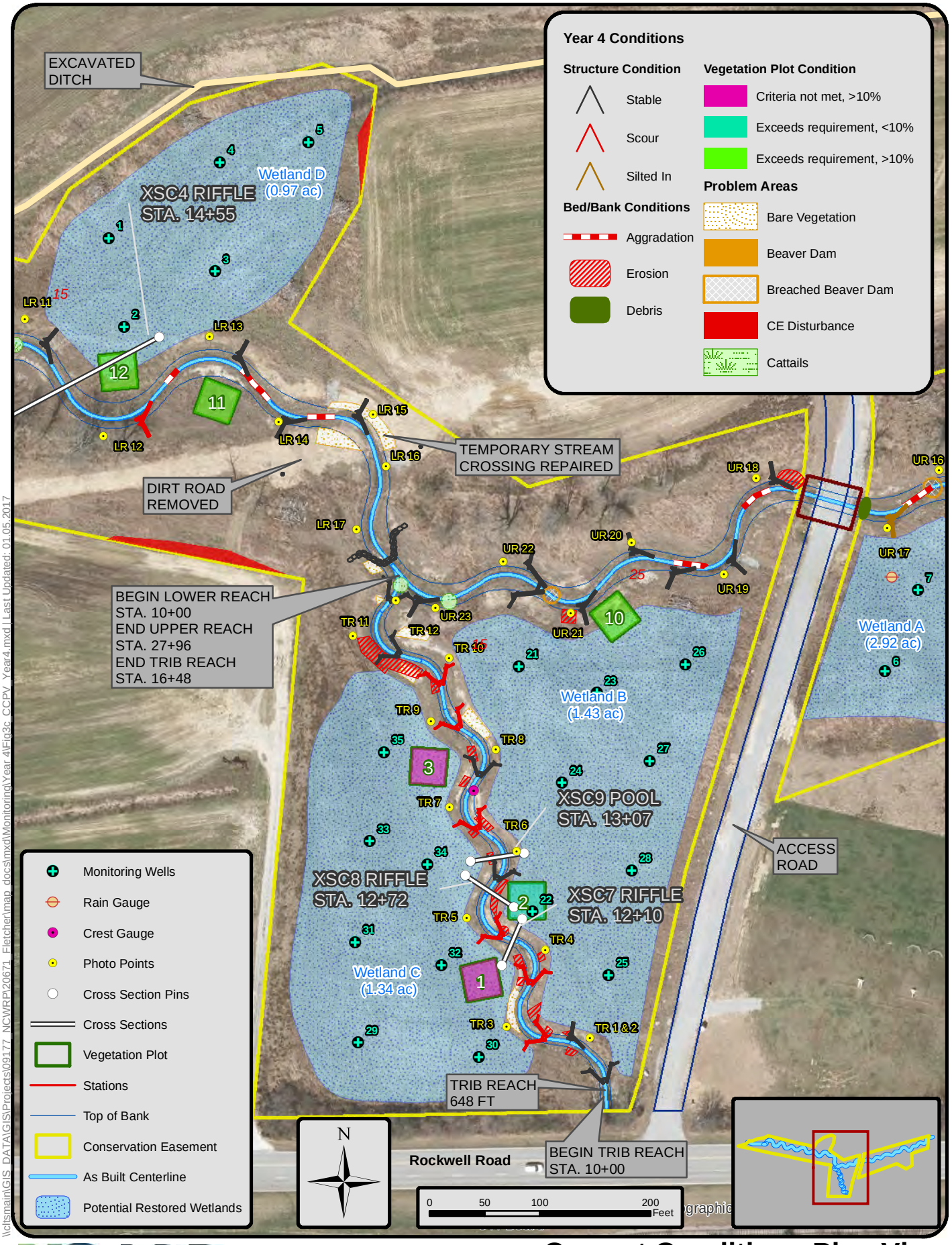
\\cltsmain\GIS_DATA\GIS\Projects\09177_NCWRP\20671_Fletcher\map_docs\mxd\Monitoring\Year 4\Fig3b_CCPV_Year4.mxd | Last Updated: 01.05.2017



Current Conditions Plan View

Figure 3b

Fletcher-Meritor Site (UT to Cane Creek) Year 4 Monitoring I Henderson County, NC
NC Ecosystem Enhancement Program | Project No. 138



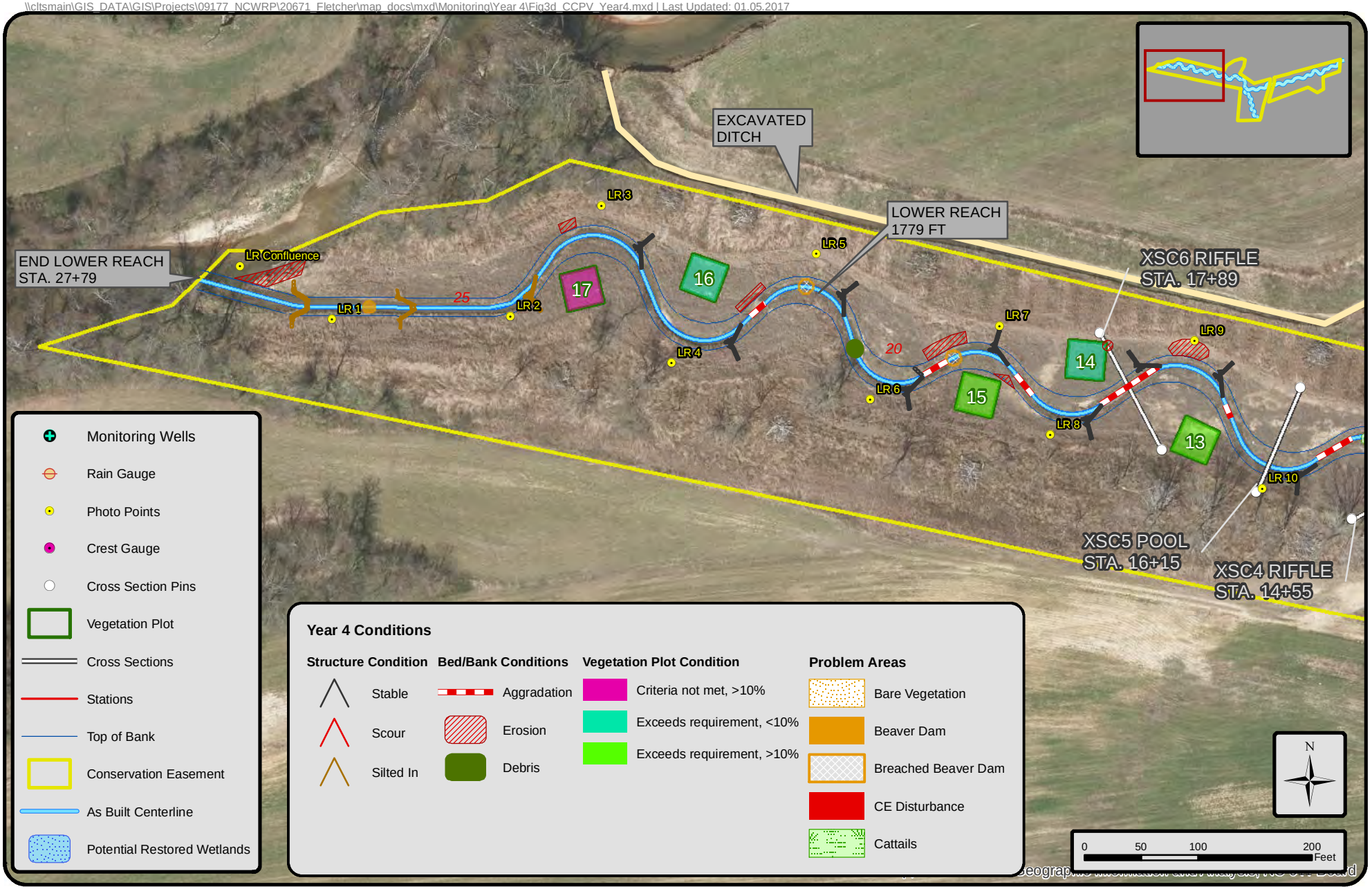
\\cl\smain\GIS_DATA\GIS\Projects\09177_NCWRP\20671_Fletcher\map_docs\mxd\Monitoring\Year 4\Fig3c_CCPV_Year4.mxd Last Updated: 01.05.2017

Current Conditions Plan View

Figure 3c

Fletcher-Meritor Site (UT to Cane Creek) Year 4 Monitoring I Henderson County, NC
NC Ecosystem Enhancement Program | Project No. 138

\\cltsmain\GIS_DATA\GIS\Projects\09177_NCWRP\20671_Fletcher\map_docs\mxd\Monitoring\Year 4\Fig3d_CCPV_Year4.mxd | Last Updated: 01.05.2017



Current Conditions Plan View

Figure 3d

Fletcher-Meritor Site (UT to Cane Creek) Year 4 Monitoring I Henderson County, NC
NC Ecosystem Enhancement Program | Project No. 138

Upper Reach Photo Station 1 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 1 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 2 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 2 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 3 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 3 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 4 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 4 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 5 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 5 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 6 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 6 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 7 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 7 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 8 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 8 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 9 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 9 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 10 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 10 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 11 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 11 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 12 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 12 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 13 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 13 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 14 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 14 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 15 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 15 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 16 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 16 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 17 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 17 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 18 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 18 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 19 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 19 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 20 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 20 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 21 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 21 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 22 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 22 Upstream (3/22/2016 Year 4)

Upper Reach Photo Station 23 Downstream (3/22/2016 Year 4)

Upper Reach Photo Station 23 Upstream (3/22/2016 Year 4)

Confluence with Cane Creek (3/22/2016 Year 4)

Looking upstream of Confluence with Cane Creek (3/22/2016 Year 4)

Lower Reach Photo Station 1 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 1 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 2 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 2 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 3 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 3 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 4 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 4 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 5 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 5 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 6 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 6 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 7 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 7 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 8 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 8 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 9 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 9 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 10 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 10 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 11 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 11 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 12 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 12 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 13 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 13 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 14 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 14 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 15 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 15 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 16 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 16 Upstream (3/22/2016 Year 4)

Lower Reach Photo Station 17 Downstream (3/22/2016 Year 4)

Lower Reach Photo Station 17 Upstream (3/22/2016 Year 4)

Tributary Reach Photo Station 1 Downstream (3/22/2016 Year 4)

Tributary Reach Photo Station 1 Upstream (3/22/2016 Year 4)

Tributary Reach Photo Station 2 Downstream (3/22/2016 Year 4)

Tributary Reach Photo Station 2 Upstream (3/22/2016 Year 4)

Tributary Reach Photo Station 3 Downstream (3/22/2016 Year 4)

Tributary Reach Photo Station 3 Upstream (3/22/2016 Year 4)

Tributary Reach Photo Station 4 Downstream (3/22/2016 Year 4)

Tributary Reach Photo Station 4 Upstream (3/22/2016 Year 4)

Tributary Reach Photo Station 5 Downstream (3/22/2016 Year 4)

Tributary Reach Photo Station 5 Upstream (3/22/2016 Year 4)

Tributary Reach Photo Station 6 Downstream (3/22/2016 Year 4)

Tributary Reach Photo Station 6 Upstream (3/22/2016 Year 4)

Tributary Reach Photo Station 7 Downstream (3/22/2016 Year 4)

Tributary Reach Photo Station 7 Upstream (3/22/2016 Year 4)

Tributary Reach Photo Station 8 Downstream (3/22/2016 Year 4)

Tributary Reach Photo Station 8 Upstream (3/22/2016 Year 4)

Tributary Reach Photo Station 9 Downstream (3/22/2016 Year 4)

Tributary Reach Photo Station 9 Upstream (3/22/2016 Year 4)

Tributary Reach Photo Station 10 Downstream (3/22/2016 Year 4)

Tributary Reach Photo Station 10 Upstream (3/22/2016 Year 4)

Tributary Reach Photo Station 11 Downstream (3/22/2016 Year 4)

Tributary Reach Photo Station 11 Upstream (3/22/2016 Year 4)

Tributary Reach Photo Station 12 Downstream (3/22/2016 Year 4)

Tributary Reach Photo Station 12 Upstream (3/22/2016 Year 4)

Table 5 **Visual Stream Morphology Stability Assessment**
Reach ID **Upper Reach**
Assessed Length **1796**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			5	135	92%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	**16**	**21**			76%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	**17**	**23**			74%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	**17**	**23**			74%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	**22**	**22**			100%			
		2. Thalweg centering at downstream of meander (Glide)	**21**	**21**			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			6	74	98%			98%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	6	74	98%	0	0	98%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	23	23			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	**6**	**6**			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	23	23			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	23	23			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	**6**	**6**			100%			

Table 5 **Visual Stream Morphology Stability Assessment**
Reach ID **Lower Reach**
Assessed Length **1779**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			9	250	86%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	**14**	**16**			88%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	**12**	**16**			75%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	**12**	**16**			75%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	**16**	**16**			100%			
		2. Thalweg centering at downstream of meander (Glide)	**16**	**16**			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			2	75	98%			98%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	2	75	98%	0	0	98%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	18	18			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	**4**	**4**			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	16	17			94%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	17	17			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	**4**	**4**			100%			

Table 5 **Visual Stream Morphology Stability Assessment**
Reach ID **Tributary**
Assessed Length **648**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	**7**	**11**			64%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	**10**	**11**			91%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	**10**	**11**			91%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	**11**	**11**			100%			
		2. Thalweg centering at downstream of meander (Glide)	**11**	**11**			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			16	232	82%	0	0	82%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	16	232	82%	0	0	82%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	**9**	**11**			82%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	12			33%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	7	12			58%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	11	11			100%			

Table 6 Vegetation Condition Assessment

Planted Acreage[1] **18.59**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.001 ac.	Pattern and Color	9	0.06	0.3%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.001 ac.	Pattern and Color	3	0.06	0.3%
			Total	12	0.12	0.6%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.1 ac.	Pattern and Color	**0**	**0.00**	0.0%
			Cumulative Total	12	0.12	0.6%

Easement Acreage[2] **20.3**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	**1**	**0.01**	0.0%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

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

2 = The acreage within the easement boundaries.

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

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

Appendix C

Fletcher-Meritor Site (#138)

Year 4 (28-Jun-2016)

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	4	0	0	33	**43**	0
2	n/a	8	0	0	9	**25**	0
3	n/a	4	0	0	3	**7**	0
4	n/a	20	0	0	0	**21**	0
5	n/a	14	0	0	15	**30**	0
6	n/a	8	0	0	32	**40**	0
7	n/a	18	0	0	23	**41**	1
8	n/a	11	0	0	18	**29**	0
9	n/a	9	0	0	3	**12**	0
10	n/a	10	0	0	21	**31**	0
11	n/a	12	0	0	305	**317**	0
12	n/a	9	0	0	138	**147**	0
13	n/a	10	0	0	142	**152**	0
14	n/a	8	0	0	90	**98**	0
15	n/a	15	0	0	151	**166**	0
16	n/a	8	0	0	101	**109**	0
17	n/a	4	0	0	156	**160**	0

Wetland/Stream Vegetation Totals

(per acre)

Plot #	Stream/ Wetland Stems[2]	Volunteers[3]	Total[4]	Success Criteria Met?
1	162	1335	1740	No
2	324	364	1012	Yes
3	162	121	283	No
4	809	0	850	Yes
5	567	607	1214	Yes
6	324	1295	1619	Yes
7	728	931	1659	Yes
8	445	728	1174	Yes
9	364	121	486	Yes
10	405	850	1255	Yes
11	486	12343	12829	Yes
12	364	5585	5949	Yes
13	405	5747	6151	Yes
14	324	3642	3966	Yes
15	607	6111	6718	Yes
16	324	4087	4411	Yes
17	162	6313	6475	No
Project Avg	**409**	**2952**	**3399**	**Yes**

Riparian Buffer Vegetation Totals

(per acre)

Plot #	Riparian Buffer Stems[1]	Success Criteria Met?
1	n/a	
2	n/a	
3	n/a	
4	n/a	
5	n/a	
6	n/a	
7	n/a	
8	n/a	
9	n/a	
10	n/a	
11	n/a	
12	n/a	
13	n/a	
14	n/a	
15	n/a	
16	n/a	
17	n/a	
Project Avg	**n/a**	

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.

Report Prepared By	Vickie Miller
Date Prepared	11/15/2016 11:32

database name	cvs-eep-entrytool-v2.3.1 Fletcher Year 4.mdb
database location	R:\EEP-WRP\20671 Fletcher\Monitoring\Year 4\Fletcher_Meritor_Site_138_2016_MY4\Support Files\Vegetation Plot Data
computer name	RAL-CND5304LNJ
file size	57245696

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

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

Curr

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		
Acer	maple	Tree																								
Acer negundo	boxelder	Tree							1	1	1				3	3	3				7	7	8			
Acer rubrum	red maple	Tree													1	1	1			1						1
Acer saccharinum	silver maple	Tree										1	1	1												
Alnus serrulata	hazel alder	Shrub																								
Betula nigra	river birch	Tree										7	7	7	2	2	2	1	1	1	3	3	4	4	4	4
Carya	hickory	Tree									1															
Cornus	dogwood	Shrub or Tree																								
Cornus amomum	silky dogwood	Shrub				2	2	2							2	2	2				1	1	1			
Fraxinus pennsylvanica	green ash	Tree	2	2	12	3	3	3	3	3	3	4	4	4				3	3	3	3	3	17	5	5	10
Juglans nigra	black walnut	Tree										3	3	3	3	3	3				1	1	1			
Liriodendron tulipifera	tuliptree	Tree																								
Platanus occidentalis	American sycamore	Tree	1	1	1	3	3	4				5	5	5	3	3	12	4	4	14	2	2	2	1	1	2
Platycladus orientalis	oriental arborvitae																						1			
Populus	cottonwood																									
Populus deltoides	eastern cottonwood	Tree																								
Prunus serotina	black cherry	Tree																			1	1	1			
Pyrus	pear	Tree	1	1	1						2															
Salix	willow	Shrub or Tree	6	6	29	8	8	16				1	1	1			6			21			6			8
Salix nigra	black willow	Tree																						1	1	4
Salix sericea	silky willow	Shrub																								
Sambucus canadensis	Common Elderberry	Shrub																								
Unknown		Shrub or Tree													1	1	1									
Unknown Prunus/Ilex																										
		Stem count	10	10	43	16	16	25	4	4	7	21	21	21	15	15	30	8	8	40	18	18	41	11	11	29
		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	4	4	4	4	2	2	4	6	6	6	7	7	8	3	3	5	7	7	9	4	4	6
		Stems per ACRE	404.7	404.7	1740	647.5	647.5	1012	161.9	161.9	283.3	849.8	849.8	849.8	607	607	1214	323.7	323.7	1619	728.4	728.4	1659	445.2	445.2	1174

rent Plot Data (MY4 2016)

138-01-0009			138-01-0010			138-01-0011			138-01-0012			138-01-0013			138-01-0014			138-01-0015			138-01-0016			138-01-0017		
1	1	1				2	2	2	2	2	4										1	1	1			
					1																					
						1	1	1				2	2	2			2	1	1	1						3
			1	1	1	3	3	303	2	2	52	2	2	142	3	3	88	3	3	153	1	1	74	1	1	151
						1	1	1	5	5	6	4	4	4	4	4	4	10	10	11	3	3	3	1	1	1
3	3	3	3	3	3	2	2	2			75				1	1	1						15	1	1	2
1	1	1						1															1	1	1	2
		1																								
4	4	6	5	5	6	3	3	7			9	2	2	4			2	1	1	1	3	3	15			
			1	1	1																					
																										1
					19						1															
																	1									
9	9	12	10	10	31	12	12	317	9	9	147	10	10	152	8	8	98	15	15	166	8	8	109	4	4	160
1			1			1			1			1			1			1			1			1		
0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
4	4	5	4	4	6	6	6	7	3	3	6	4	4	4	3	3	6	4	4	4	4	4	6	4	4	6
364.2	364.2	485.6	404.7	404.7	1255	485.6	485.6	12829	364.2	364.2	5949	404.7	404.7	6151	323.7	323.7	3966	607	607	6718	323.7	323.7	4411	161.9	161.9	6475

Annual Means														
MY4 (2016)			MY3 (2015)			MY2 (2014)			MY1 (2013)			MY0 (2012)		
								42						
17	17	20	20	20	37	22	22	68	27	27	27	22	22	22
1	1	4	2	2	11	2	2	30			9			
1	1	1												
4	4	9	1	1	1									
33	33	982	32	32	1110	31	31	1225	29	29	832	26	26	481
		1												
						1	1	1						
33	33	35	34	34	34	31	31	31	31	31	31	30	30	30
33	33	153	36	36	160	37	37	80	40	40	40	36	36	36
9	9	12	9	9	11	8	8	8	7	7	7	6	6	6
		1			1			1						
37	37	90	36	36	67	34	34	75	33	33	59	35	35	70
		1												
					5									
1	1	1	2	2	2	1	1	1						
1	1	1			2									
1	1	4												
15	15	107												
1	1	5	1	1	10	1	1	11						
						2	2	2						
												1	1	1
1	1	1	13	13	106	16	16	33	3	3	3	4	4	4
			1	1	1									
188	188	1428	187	187	1558	186	186	1608	170	170	1008	160	160	650
17			17			17			17			17		
0.42			0.42			0.42			0.42			0.42		
15	15	18	12	12	15	12	12	14	7	7	8	8	8	8
447.5	447.5	3399	445.2	445.2	3709	442.8	442.8	3828	404.7	404.7	2400	380.9	380.9	1547

Vegetation Plot 1 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 2 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 3 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 4 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 5 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 6 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 7 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 8 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 9 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 10 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 11 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 12 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 13 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 14 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 15 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 16 – 10m x 10m (6/28/2016 Year 4)

Vegetation Plot 17 – 10m x 10m (6/28/2016 Year 4)

Appendix D

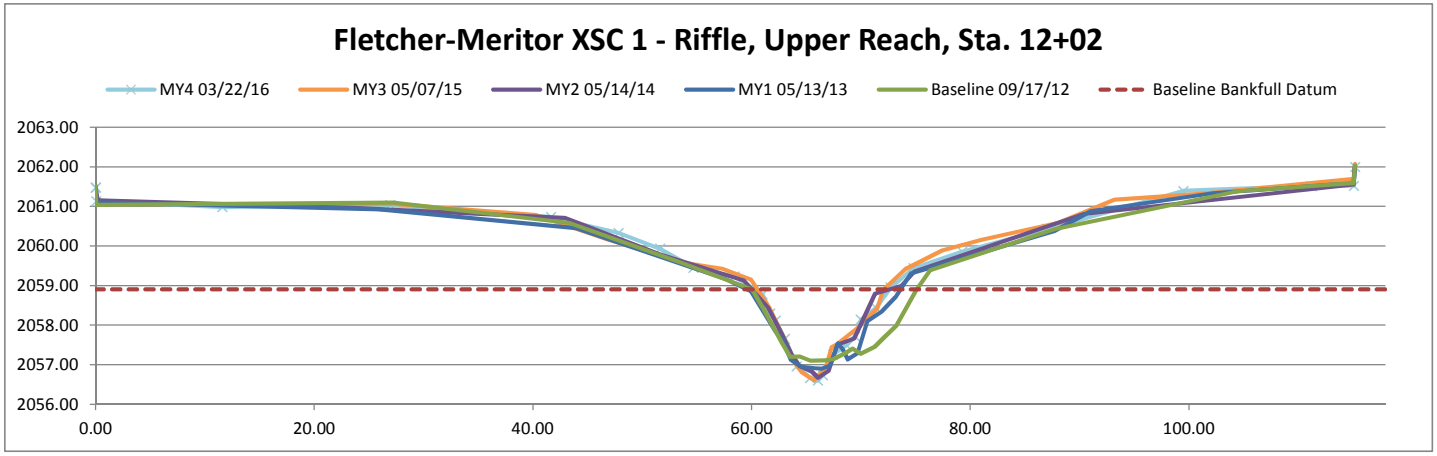
Station	Elevation
0.00	2061.47
0.05	2061.48
0.08	2061.13
11.59	2060.98
26.97	2061.03
41.66	2060.73
47.82	2060.33
51.64	2059.93
54.67	2059.45
58.45	2059.23
61.01	2058.78
61.72	2058.29
62.20	2058.11
63.04	2057.65
64.15	2056.96
65.35	2056.66
66.06	2056.60
66.53	2056.73
67.47	2057.26
68.68	2057.49
69.47	2057.72
70.00	2058.14
71.40	2058.43
72.72	2058.95
74.83	2059.44
79.26	2059.85
87.01	2060.43
99.48	2061.39
111.24	2061.51
115.10	2061.52
115.21	2061.99

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	3/22/2016
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	2058.90
Bankfull Cross Sectional Area, ft^2	14.70
Bankfull Width, ft	12.30
Max Depth at Bankfull, ft	2.30
Mean Depth at Bankfull, ft	1.20
Width/Depth Ratio	10.29
Flood Prone Width, ft	96.90
Flood Prone Area Elevation, ft	2061.20
Entrenchment Ratio	7.88
Bank Height Ratio	1.02

Stream Type	C/E4

Sta. 12+02 Looking Downstream



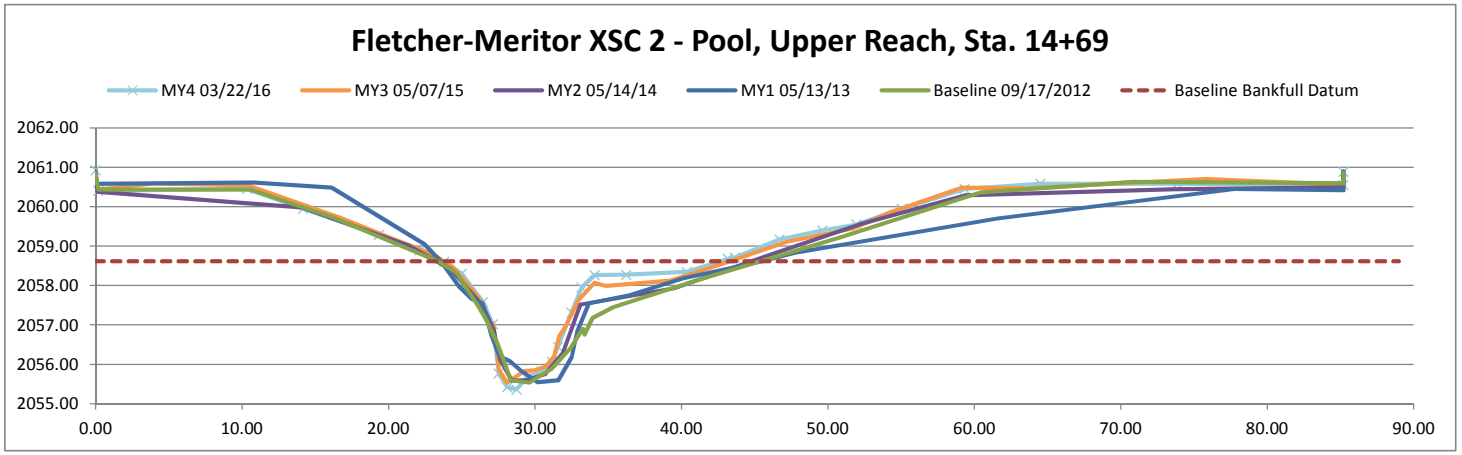
Station	Elevation
0.00	2060.92
0.17	2060.40
10.33	2060.45
14.16	2059.95
19.35	2059.28
22.13	2058.89
23.80	2058.60
25.00	2058.30
26.45	2057.58
27.12	2057.02
27.52	2055.77
28.11	2055.42
28.73	2055.36
29.44	2055.66
30.43	2055.82
31.16	2056.06
31.57	2056.44
32.49	2057.31
33.18	2057.95
34.06	2058.26
36.22	2058.27
40.36	2058.34
43.16	2058.68
43.64	2058.71
46.70	2059.17
49.62	2059.40
51.93	2059.55
55.05	2059.95
59.33	2060.45
64.51	2060.58
73.87	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	3/22/2016
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	2058.61
Bankfull Cross Sectional Area, ft^2	19.70
Bankfull Width, ft	18.80
Max Depth at Bankfull, ft	3.25
Mean Depth at Bankfull, ft	1.05
Width/Depth Ratio	17.94
Flood Prone Width, ft	>86.00
Flood Prone Area Elevation, ft	2061.86
Entrenchment Ratio	>4.00
Bank Height Ratio	0.90

Stream Type	C/E4

Sta. 14+69 Looking Downstream



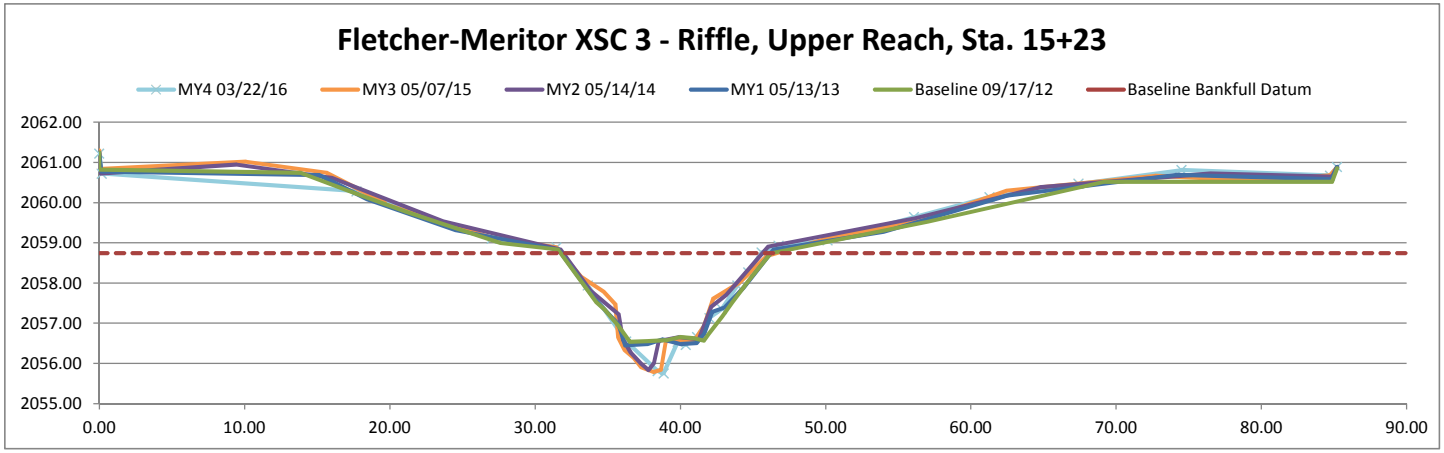
Station	Elevation
0.00	2061.22
0.18	2060.72
17.70	2060.28
26.99	2059.10
31.47	2058.89
33.62	2057.94
36.27	2056.55
38.44	2055.81
38.84	2055.75
39.82	2056.53
40.37	2056.46
41.13	2056.66
42.00	2057.13
42.86	2057.35
43.92	2057.94
44.66	2058.27
45.60	2058.76
46.75	2058.93
50.13	2059.06
56.08	2059.64
61.28	2060.14
67.39	2060.47
74.49	2060.81
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	3/22/2016
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	2058.74
Bankfull Cross Sectional Area, ft^2	21.60
Bankfull Width, ft	13.80
Max Depth at Bankfull, ft	2.99
Mean Depth at Bankfull, ft	1.57
Width/Depth Ratio	8.82
Flood Prone Width, ft	>86.00
Flood Prone Area Elevation, ft	2061.73
Entrenchment Ratio	>6.00
Bank Height Ratio	1.01

Stream Type	C/E4

Sta. 15+23, Looking Downstream



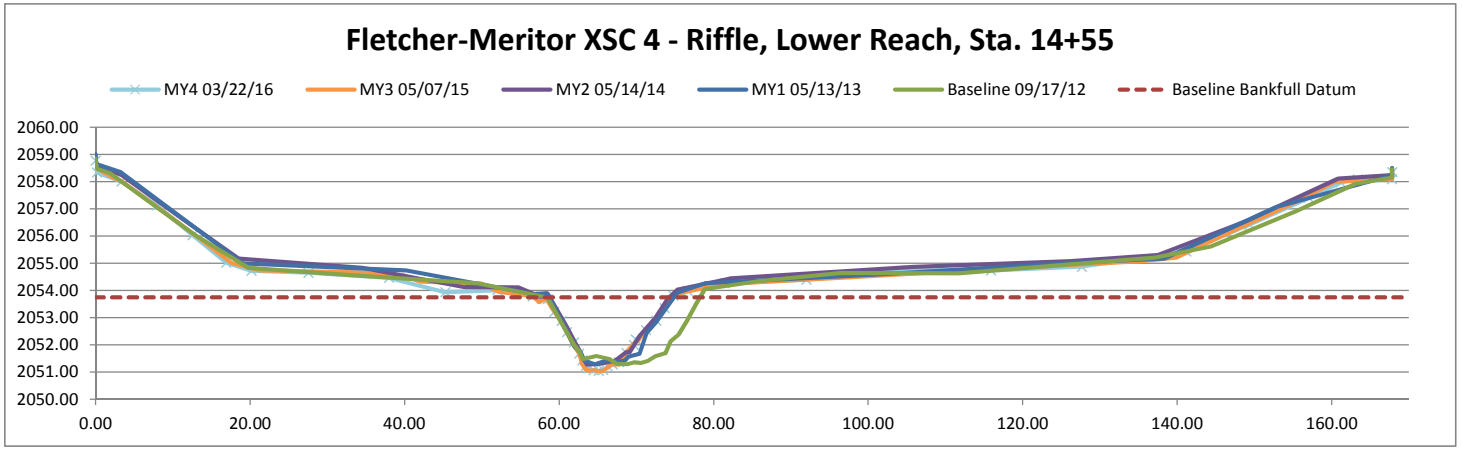
Station	Elevation
0.00	2058.77
0.19	2058.33
3.36	2058.00
7.93	2057.12
12.56	2056.03
16.91	2055.02
20.18	2054.72
27.54	2054.64
37.99	2054.46
45.27	2053.93
52.00	2054.00
56.58	2053.78
58.13	2053.69
58.52	2053.68
59.37	2053.21
60.33	2052.88
61.00	2052.47
61.91	2052.09
62.58	2051.67
63.00	2051.43
63.47	2051.23
63.80	2051.13
64.44	2051.06
65.10	2051.04
65.71	2051.08
66.32	2051.19
66.94	2051.27
67.73	2051.36
68.71	2051.70
69.69	2051.99
69.94	2052.19
71.24	2052.53
72.57	2052.89
73.67	2053.35
74.76	2053.80
76.62	2053.98
81.42	2054.26
91.98	2054.39
105.00	2054.74
115.91	2054.73
127.65	2054.87
141.16	2055.43
149.38	2056.42
157.02	2057.40
161.18	2057.97
163.36	2058.08
167.81	2058.09
167.84	2058.34

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	3/22/2016
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	2053.74
Bankfull Cross Sectional Area, ft^2	25.80
Bankfull Width, ft	17.30
Max Depth at Bankfull, ft	2.70
Mean Depth at Bankfull, ft	1.49
Width/Depth Ratio	11.60
Flood Prone Width, ft	138.70
Flood Prone Area Elevation, ft	2056.44
Entrenchment Ratio	8.02
Bank Height Ratio	1.01

Stream Type	C/E4

Sta. 14+55 Looking Downstream



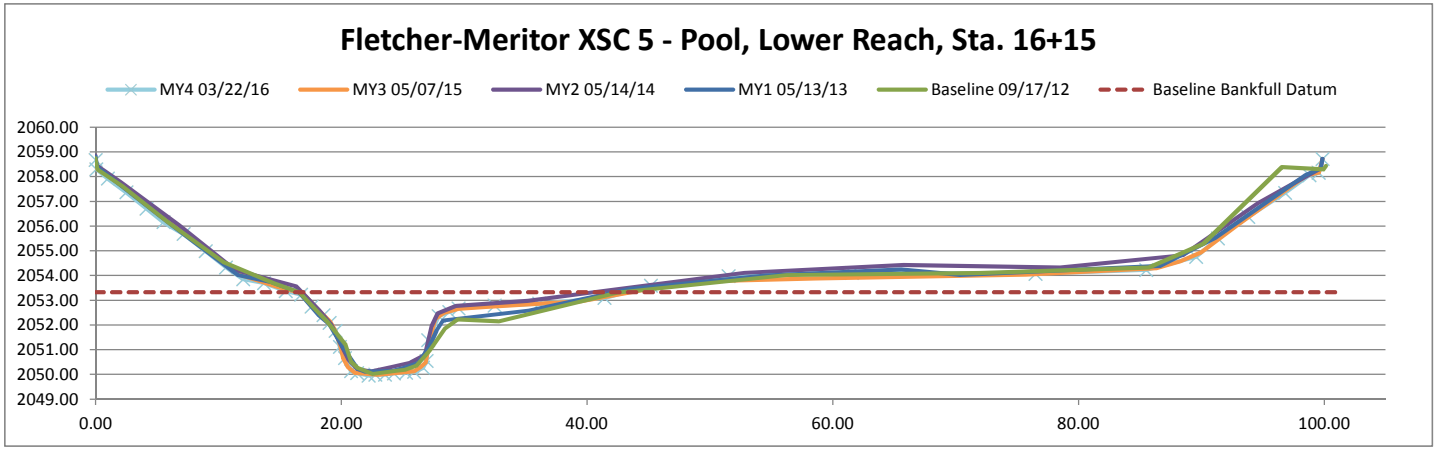
Station	Elevation
0.00	2058.67
0.07	2058.30
0.99	2057.92
2.50	2057.36
4.16	2056.70
5.53	2056.16
7.16	2055.68
8.97	2054.98
10.62	2054.33
12.01	2053.85
13.70	2053.69
15.49	2053.37
16.72	2053.23
17.60	2052.75
18.54	2052.40
19.05	2052.09
19.55	2051.76
19.88	2051.11
20.30	2050.66
20.78	2050.13
21.28	2050.05
22.21	2049.95
22.78	2049.99
23.56	2049.99
24.29	2050.04
25.27	2050.07
25.93	2050.11
26.64	2050.27
26.93	2050.55
27.08	2051.39
27.93	2052.36
28.78	2052.53
29.54	2052.67
32.49	2052.78
36.11	2052.86
41.42	2053.09
45.20	2053.59
51.53	2053.97
61.56	2054.11
76.50	2054.07
85.50	2054.22
89.57	2054.75
91.34	2055.50
93.81	2056.37
96.82	2057.34
98.79	2058.05
99.56	2058.15
99.85	2058.72

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	3/22/2016
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	2053.32
Bankfull Cross Sectional Area, ft^2	33.80
Bankfull Width, ft	27.20
Max Depth at Bankfull, ft	3.37
Mean Depth at Bankfull, ft	1.24
Width/Depth Ratio	21.89
Flood Prone Width, ft	85.60
Flood Prone Area Elevation, ft	2056.69
Entrenchment Ratio	3.15
Bank Height Ratio	1.01

Stream Type	C/E4

Sta. 16+15 Looking Downstream



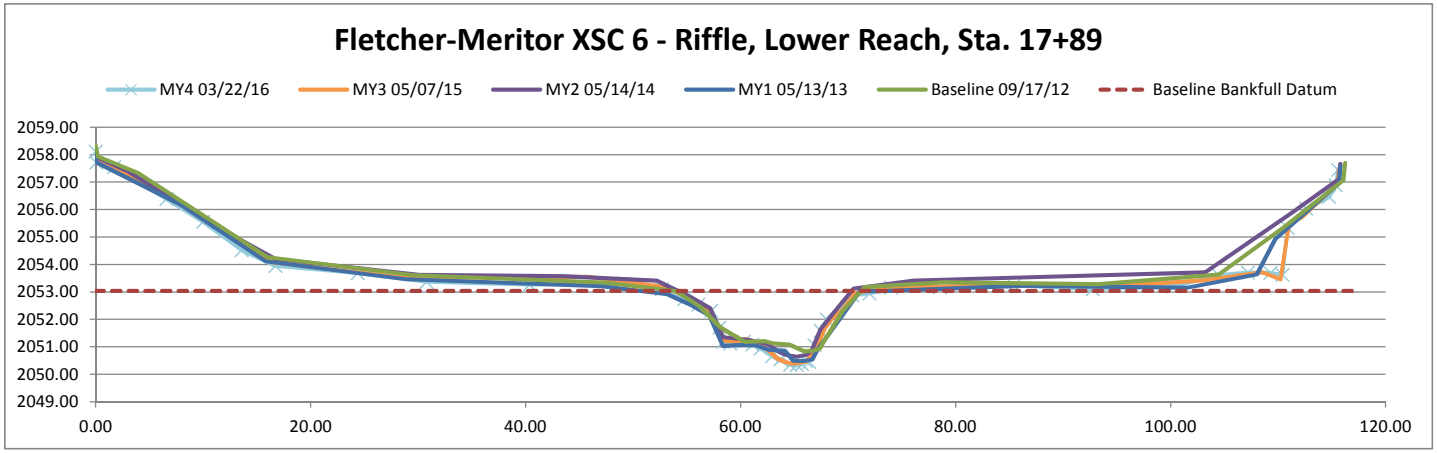
Station	Elevation
0.00	2058.11
0.08	2057.71
1.74	2057.55
6.59	2056.38
10.00	2055.55
13.59	2054.52
16.73	2053.95
24.39	2053.68
30.78	2053.37
40.38	2053.26
49.18	2053.30
52.66	2053.10
54.76	2052.73
56.05	2052.54
57.28	2052.32
58.01	2051.70
58.37	2051.19
59.03	2051.12
60.31	2051.18
61.09	2051.08
61.85	2050.94
62.94	2050.66
63.70	2050.54
64.59	2050.34
65.22	2050.33
65.70	2050.37
66.06	2050.49
66.37	2050.45
66.85	2051.06
67.46	2051.58
68.03	2051.99
70.36	2052.87
71.99	2052.95
74.00	2053.15
78.54	2053.17
85.41	2053.24
92.75	2053.10
100.30	2053.20
104.49	2053.60
107.18	2053.70
109.27	2053.69
110.40	2053.62
110.87	2055.33
112.60	2056.03
114.72	2056.46
115.36	2056.88
115.57	2057.44

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	3/22/2016
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	2053.03
Bankfull Cross Sectional Area, ft^2	25.20
Bankfull Width, ft	19.70
Max Depth at Bankfull, ft	2.70
Mean Depth at Bankfull, ft	1.28
Width/Depth Ratio	15.40
Flood Prone Width, ft	102.60
Flood Prone Area Elevation, ft	2055.73
Entrenchment Ratio	5.21
Bank Height Ratio	0.94

Stream Type	C/E4

Sta. 17+89 Looking Downstream



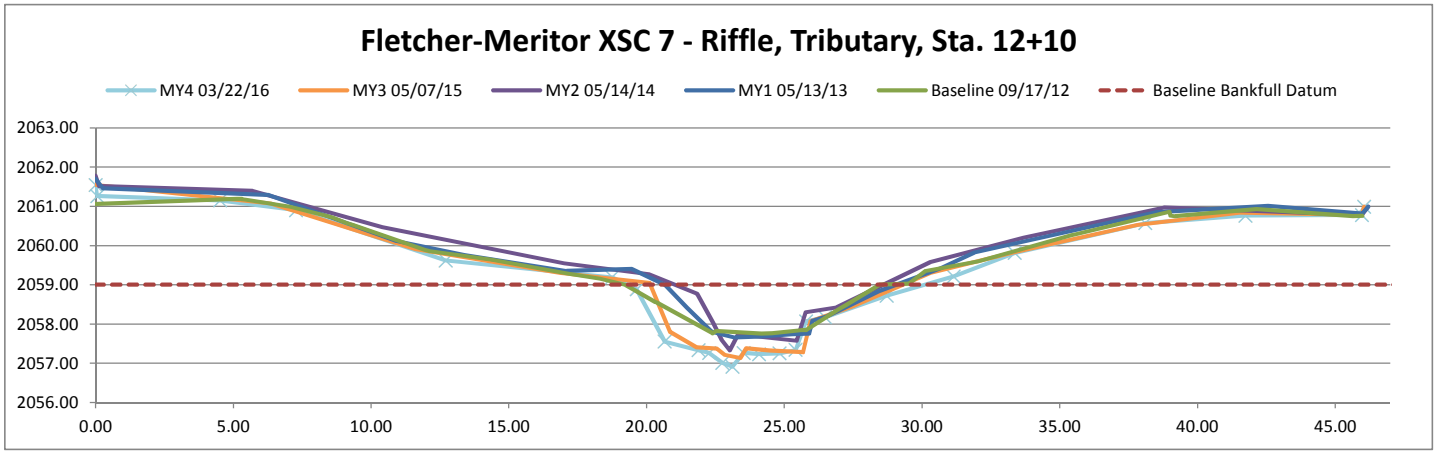
Station	Elevation
0.00	2061.55
0.06	2061.26
4.52	2061.15
7.28	2060.90
12.71	2059.62
18.75	2059.19
19.64	2058.88
20.66	2057.55
21.89	2057.33
22.27	2057.26
22.75	2057.01
23.12	2056.91
23.52	2057.26
24.08	2057.23
24.82	2057.25
25.41	2057.34
25.79	2058.07
26.48	2058.17
28.72	2058.72
31.14	2059.21
33.36	2059.81
38.10	2060.57
41.74	2060.76
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	3/22/2016
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	2059.00
Bankfull Cross Sectional Area, ft^2	11.60
Bankfull Width, ft	10.80
Max Depth at Bankfull, ft	2.09
Mean Depth at Bankfull, ft	1.07
Width/Depth Ratio	10.06
Flood Prone Width, ft	37.22
Flood Prone Area Elevation, ft	2061.09
Entrenchment Ratio	3.45
Bank Height Ratio	1.09

Stream Type	C/E4

Sta. 12+10 Looking Downstream



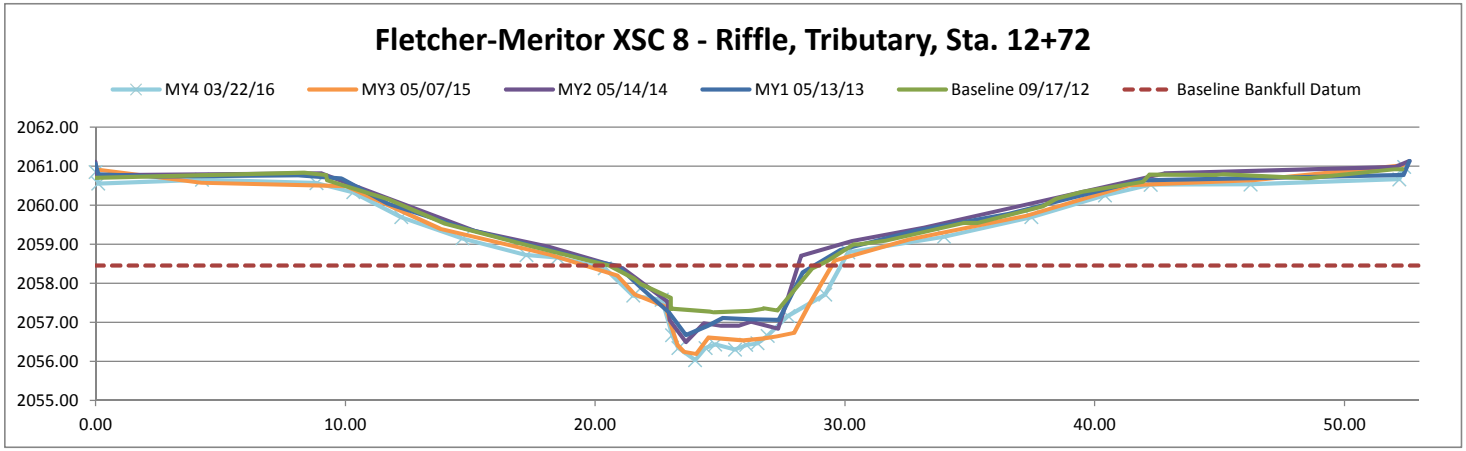
Station	Elevation
0.00	2060.85
0.11	2060.55
4.26	2060.65
8.84	2060.56
10.31	2060.33
12.24	2059.69
14.68	2059.15
17.24	2058.72
18.50	2058.65
20.39	2058.38
21.53	2057.68
22.67	2057.58
23.08	2056.67
23.33	2056.34
24.00	2056.03
24.42	2056.34
24.81	2056.43
25.60	2056.30
26.05	2056.42
26.49	2056.46
26.90	2056.65
27.72	2057.16
29.21	2057.71
30.13	2058.79
33.96	2059.19
37.46	2059.69
40.41	2060.25
42.24	2060.52
46.24	2060.53
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	3/22/2016
Observers	V. Miller, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	2058.45
Bankfull Cross Sectional Area, ft^2	13.00
Bankfull Width, ft	9.90
Max Depth at Bankfull, ft	2.42
Mean Depth at Bankfull, ft	1.31
Width/Depth Ratio	7.54
Flood Prone Width, ft	52.00
Flood Prone Area Elevation, ft	2060.87
Entrenchment Ratio	5.25
Bank Height Ratio	0.97

Stream Type	C/E4

Sta. 12+72 Looking Downstream



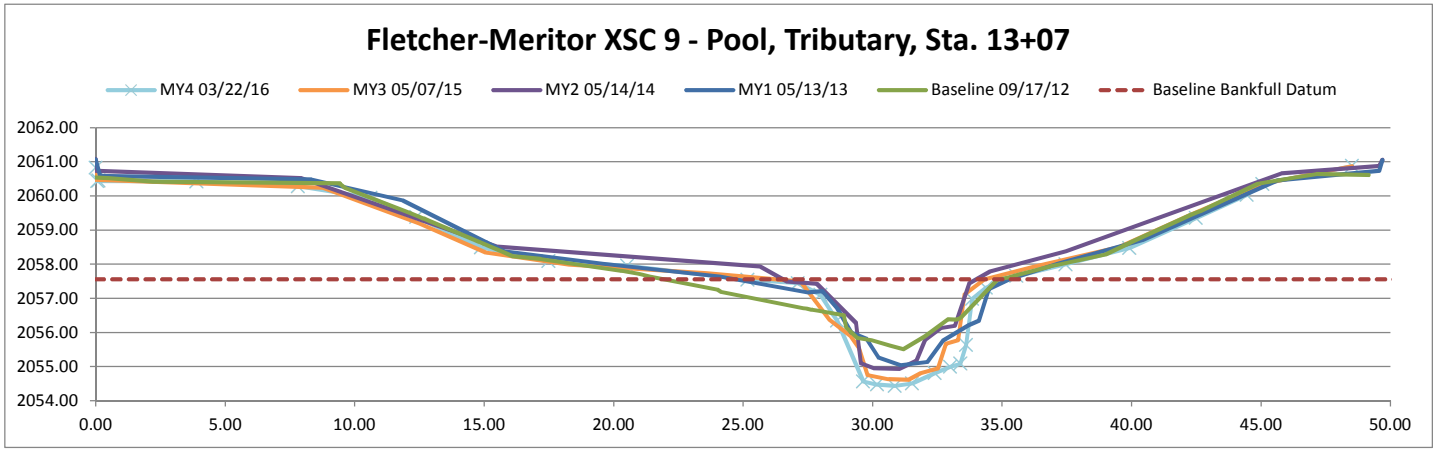
Station	Elevation
0.00	2060.82
0.11	2060.45
0.07	2060.43
3.89	2060.42
7.81	2060.28
10.62	2059.94
12.38	2059.38
14.88	2058.49
17.49	2058.08
20.53	2057.95
25.18	2057.54
27.12	2057.44
27.99	2057.10
28.63	2056.34
29.64	2054.56
30.18	2054.47
30.86	2054.43
31.53	2054.50
32.40	2054.80
33.00	2054.99
33.39	2055.08
33.61	2055.63
33.85	2056.98
34.38	2057.31
35.55	2057.65
37.46	2057.99
39.91	2058.47
42.49	2059.35
44.45	2060.03
45.05	2060.35
48.52	2060.88

Reach	Fletcher-Meritor, Tributary
River Basin	French Broad
Cross Section ID	XSC-9, Pool, Tributary, 13+07
Drainage Area (Sq Mi)	0.32
Date	3/22/2016
Observers	V. Miller, W. Yelverton

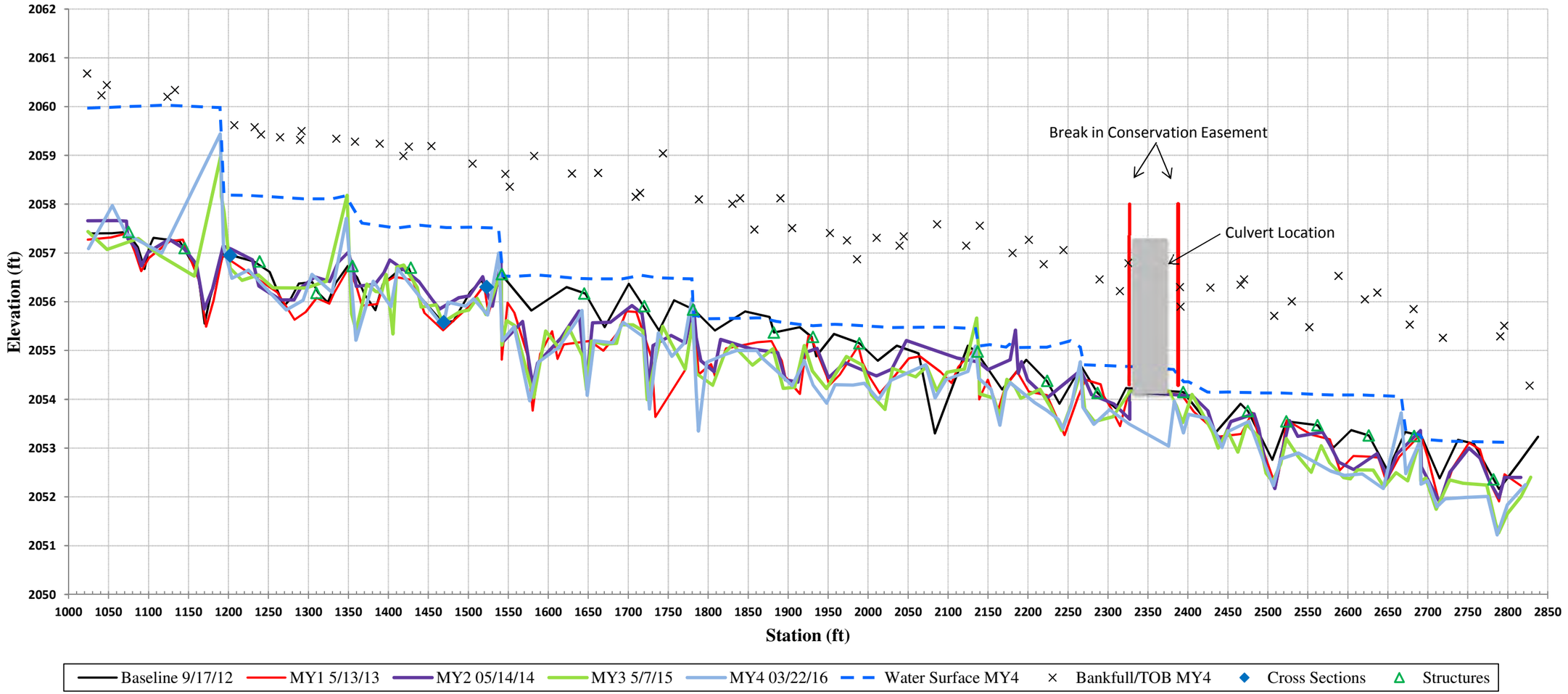
SUMMARY DATA	
Bankfull Elevation, ft	2057.55
Bankfull Cross Sectional Area, ft^2	15.00
Bankfull Width, ft	10.10
Max Depth at Bankfull, ft	3.12
Mean Depth at Bankfull, ft	1.49
Width/Depth Ratio	6.80
Flood Prone Width, ft	35.30
Flood Prone Area Elevation, ft	2060.67
Entrenchment Ratio	3.50
Bank Height Ratio	0.96

Stream Type	C/E4

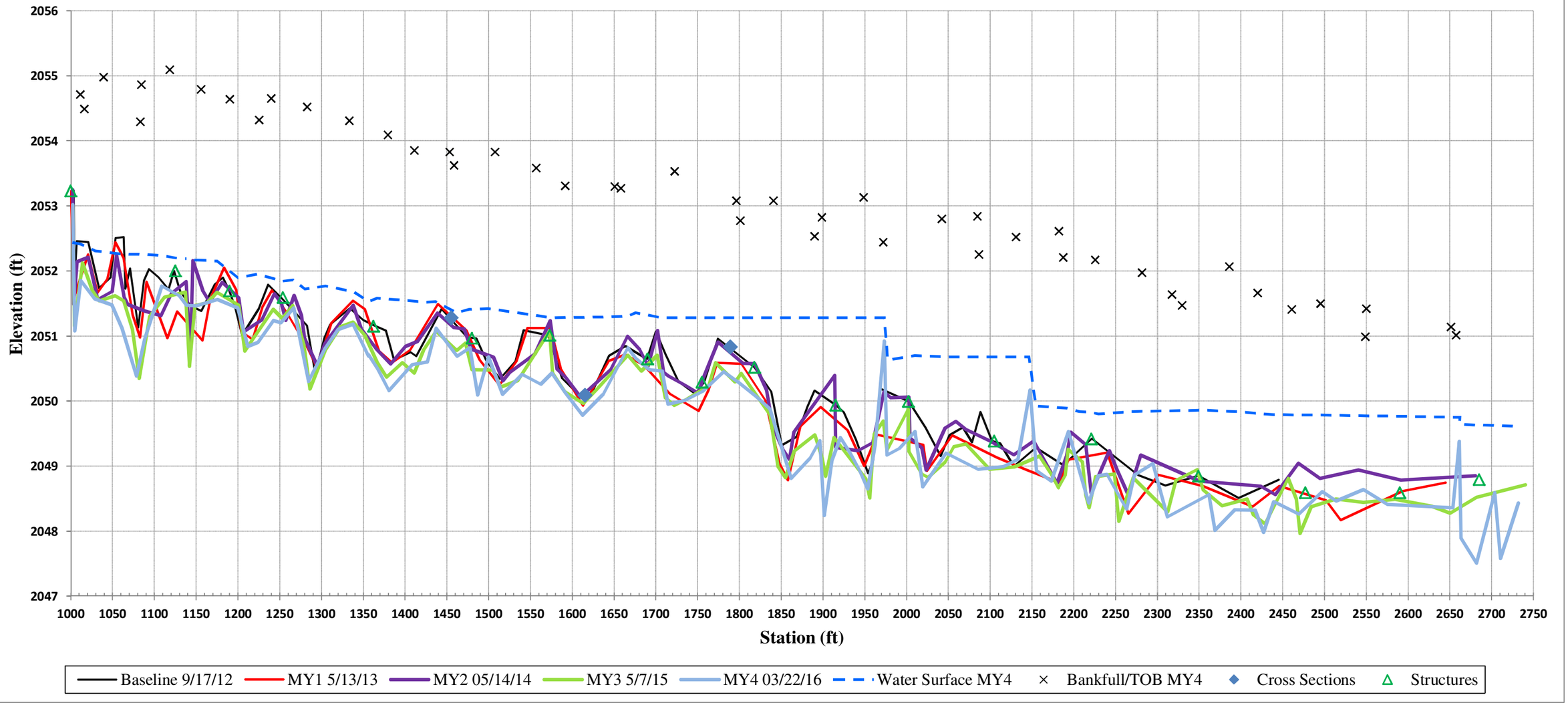
Sta. 13+07 Looking Downstream



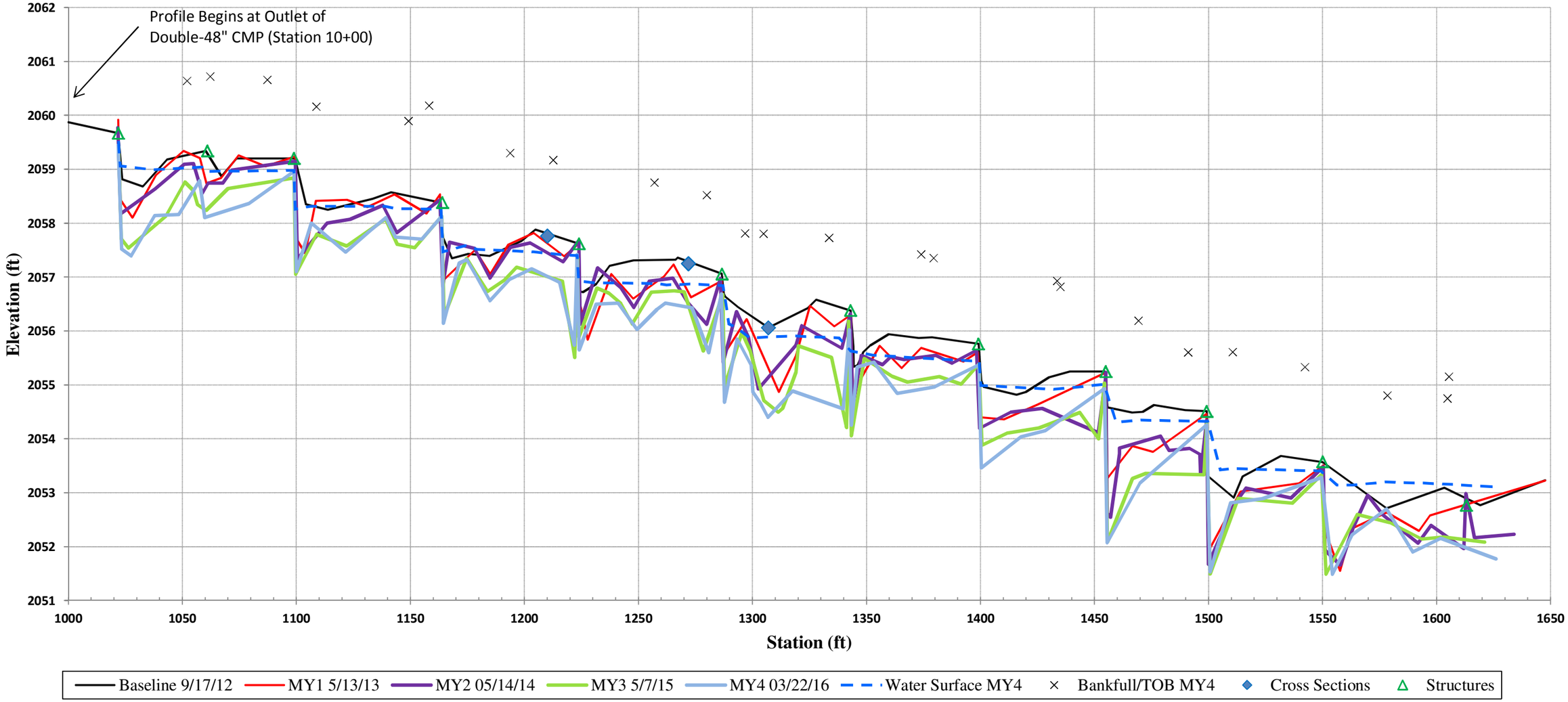
Longitudinal Profile
Fletcher - Upper Reach
Project Number - 138
Station 10+25.00 - 28+37.86



Longitudinal Profile
Fletcher - Lower Reach
Project Number - 138
Station 10+00.00 - 26+45.00



Longitudinal Profile
Fletcher - Tributary
Project Number - 138
Station 10+00.00 - 1647.65

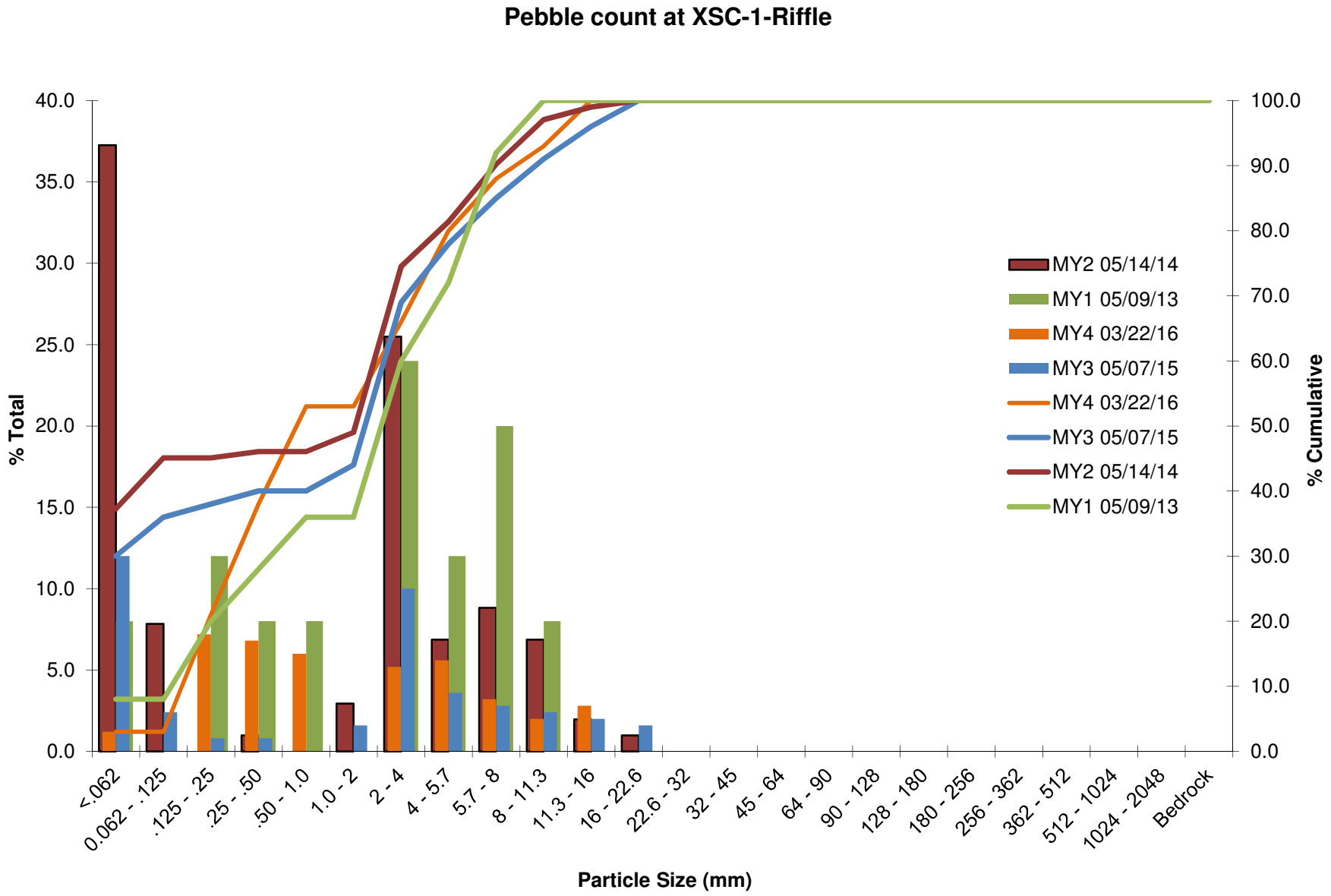


Fletcher - Upper Reach XSC-1 Riffle-Pebble Count

Location: STA 12+02

Inches	Particle	Millimeters		Count	%Total	% Cum.
	Silt/Clay	<.062	SILT/CLAY	3	3.0	3.0
	Very Fine	0.062 - .125	SAND	0	0.0	3.0
	Fine	.125 - .25		18	18.0	21.0
	Medium	.25 - .50		17	17.0	38.0
	Coarse	.50 - 1.0		15	15.0	53.0
.04 - .08	Very Coarse	1.0 - 2		0	0.0	53.0
.08 - .16	Very Fine	2 - 4	GRAVEL	13	13.0	66.0
.16 - .22	Fine	4 - 5.7		14	14.0	80.0
.22 - .31	Fine	5.7 - 8		8	8.0	88.0
.31 .44	Medium	8 - 11.3		5	5.0	93.0
.44 - .63	Medium	11.3 - 16		7	7.0	100.0
.63 - .89	Coarse	16 - 22.6		0	0.0	100.0
.89 - 1.26	Coarse	22.6 - 32		0	0.0	100.0
1.26 - 1.77	Very Coarse	32 - 45		0	0.0	100.0
1.77 - 2.5	Very Coarse	45 - 64		0	0.0	100.0
2.5 - 3.5	Small	64 - 90	COBBLE	0	0.0	100.0
3.5 - 5.0	Small	90 - 128		0	0.0	100.0
5.0 - 7.1	Large	128 - 180		0	0.0	100.0
7.1 - 10.1	Large	180 - 256		0	0.0	100.0
10.1 - 14.3	Small	256 - 362	BOULDER	0	0.0	100.0
14.3 - 20	Small	362 - 512		0	0.0	100.0
20 - 40	Medium	512 - 1024		0	0.0	100.0
40 - 80	Large - Very Lg	1024 - 2048		0	0.0	100.0
	Bedrock	Bedrock		0	0.0	100.0
			Total Counted	100		

Summary Data	MY4	MY3	MY2	MY1
D50	0.9	2.4	2.1	3
D84	6.9	7.7	6.5	7
D95	12	15	10	9

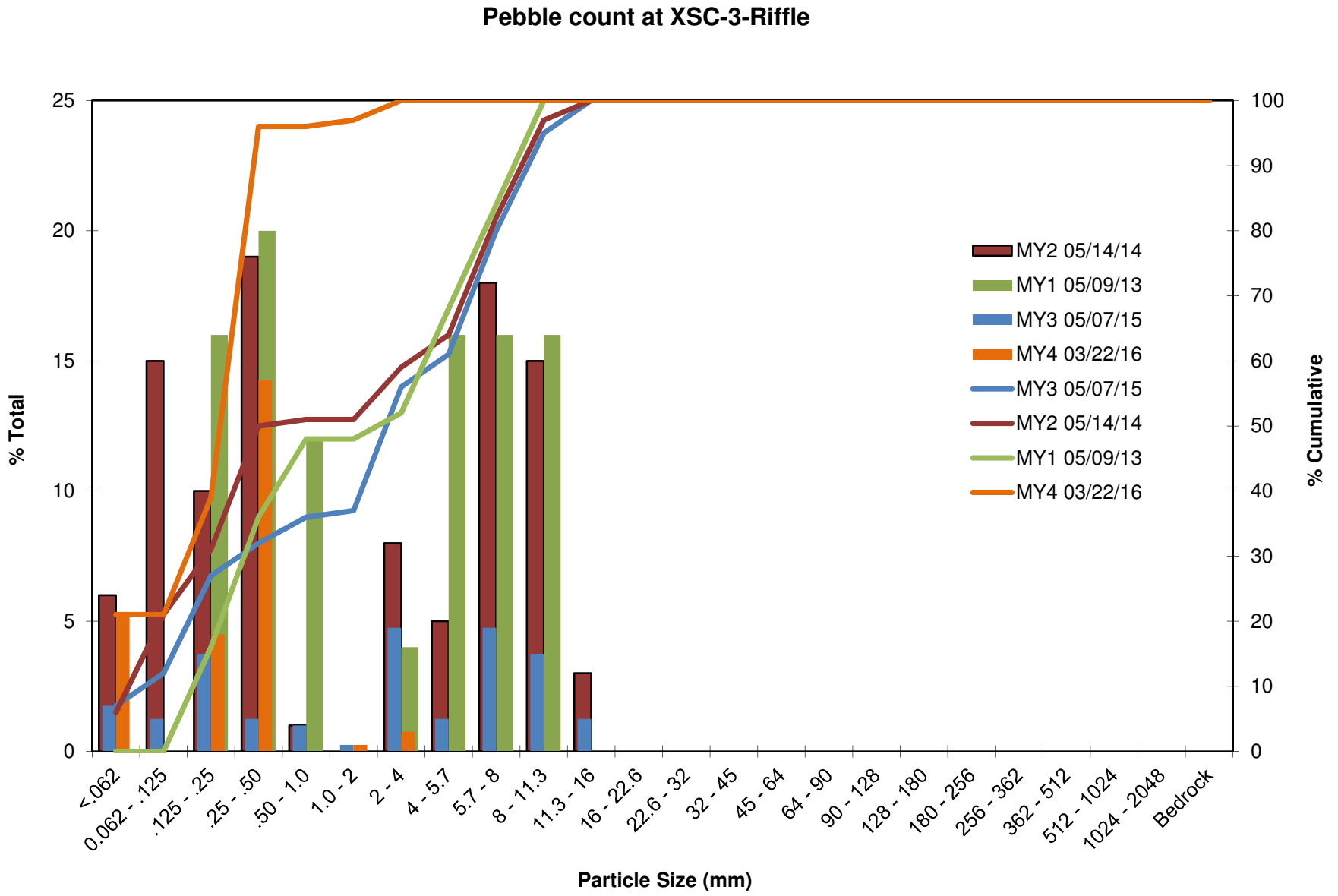

Pebble count at XSC-1-Riffle
% Total
% Cumulative
Particle Size (mm)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
<.062
0.062 - .125
.125 - .25
.25 - .50
.50 - 1.0
1.0 - 2
2 - 4
4 - 5.7
5.7 - 8
8 - 11.3
11.3 - 16
16 - 22.6
22.6 - 32
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock
MY2 05/14/14
MY1 05/09/13
MY4 03/22/16
MY3 05/07/15
MY4 03/22/16
MY3 05/07/15
MY2 05/14/14
MY1 05/09/13

Fletcher -Upper Reach - XSC-3 Riffle Pebble Count

Location: STA 15+23

Inches	Particle	Millimeters		Count	%Total	% Cum.
	Silt/Clay	<.062	SILT/CLAY	21	21.0	21.0
	Very Fine	0.062 - .125	SAND	0	0.0	21.0
	Fine	.125 - .25		18	18.0	39.0
	Medium	.25 - .50		57	57.0	96.0
	Coarse	.50 - 1.0		0	0.0	96.0
.04 - .08	Very Coarse	1.0 - 2		1	1.0	97.0
.08 - .16	Very Fine	2 - 4	GRAVEL	3	3.0	100.0
.16 - .22	Fine	4 - 5.7		0	0.0	100.0
.22 - .31	Fine	5.7 - 8		0	0.0	100.0
.31 .44	Medium	8 - 11.3		0	0.0	100.0
.44 - .63	Medium	11.3 - 16		0	0.0	100.0
.63 - .89	Coarse	16 - 22.6		0	0.0	100.0
.89 - 1.26	Coarse	22.6 - 32		0	0.0	100.0
1.26 - 1.77	Very Coarse	32 - 45		0	0.0	100.0
1.77 - 2.5	Very Coarse	45 - 64		0	0.0	100.0
2.5 - 3.5	Small	64 - 90	COBBLE	0	0.0	100.0
3.5 - 5.0	Small	90 - 128		0	0.0	100.0
5.0 - 7.1	Large	128 - 180		0	0.0	100.0
7.1 - 10.1	Large	180 - 256		0	0.0	100.0
10.1 - 14.3	Small	256 - 362	BOULDER	0	0.0	100.0
14.3 - 20	Small	362 - 512		0	0.0	100.0
20 - 40	Medium	512 - 1024		0	0.0	100.0
40 - 80	Large - Very Lg	1024 - 2048		0	0.0	100.0
	Bedrock	Bedrock		0	0.0	100.0
			Total Counted	100		

Summary Data	MY4	MY3	MY2	MY1
D50	0.3	3.2	0.5	3
D84	0.4	8.7	8.3	8
D95	0.5	11	11	10

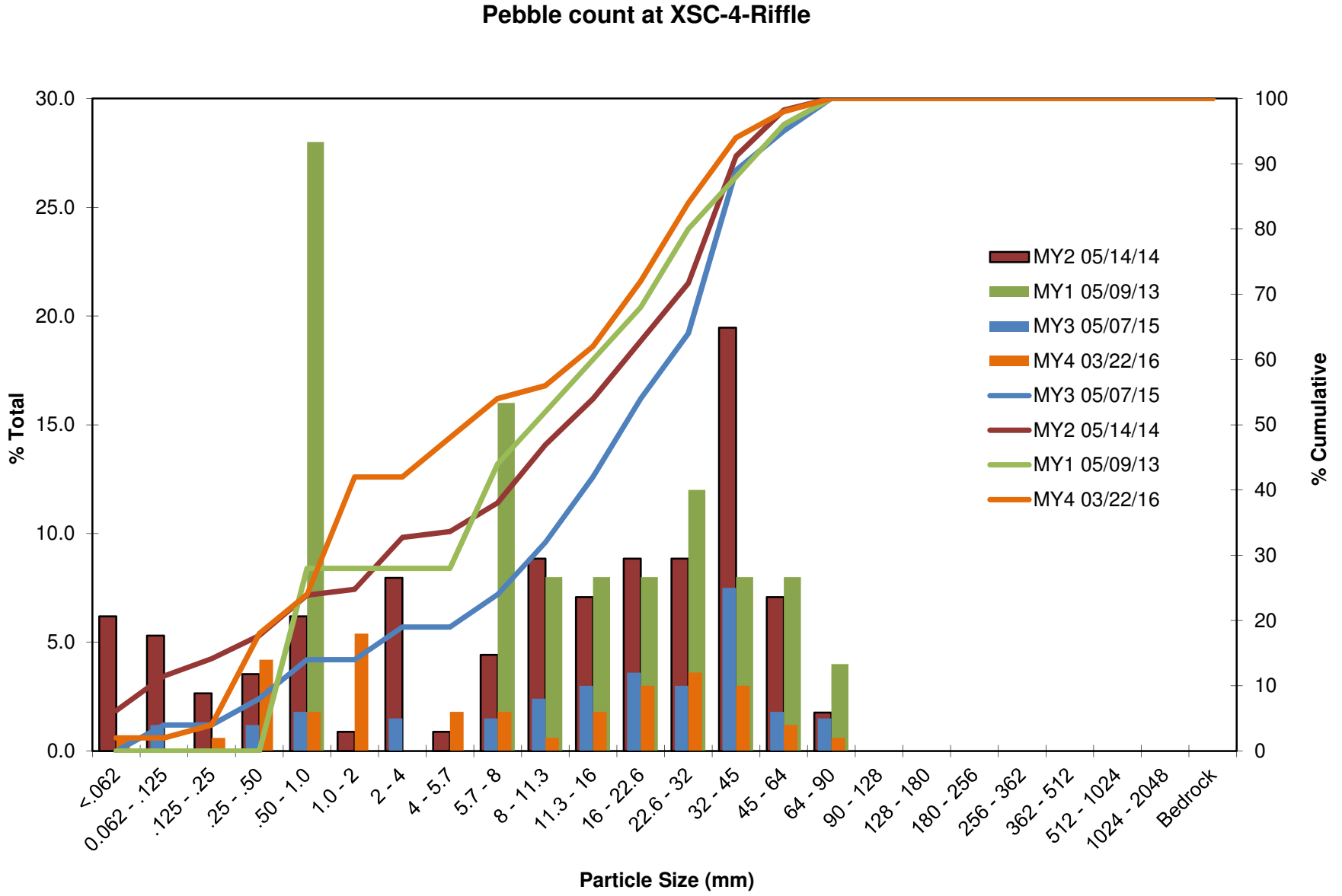

Pebble count at XSC-3-Riffle
% Total
% Cumulative
Particle Size (mm)
MY2 05/14/14
MY1 05/09/13
MY3 05/07/15
MY4 03/22/16
MY3 05/07/15
MY2 05/14/14
MY1 05/09/13
MY4 03/22/16
0
5
10
15
20
25
0
10
20
30
40
50
60
70
80
90
100
<.062
0.062 - .125
.125 - .25
.25 - .50
.50 - 1.0
1.0 - 2
2 - 4
4 - 5.7
5.7 - 8
8 - 11.3
11.3 - 16
16 - 22.6
22.6 - 32
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock

Fletcher -Lower Reach - XSC-4 Riffle Pebble Count

Location: STA 14+55

Inches	Particle	Millimeters		Count	%Total	% Cum.
	Silt/Clay	<.062	SILT/CLAY	2	2.0	2.0
	Very Fine	0.062 - .125	SAND	0	0.0	2.0
	Fine	.125 - .25		2	2.0	4.0
	Medium	.25 - .50		14	14.0	18.0
	Coarse	.50 - 1.0		6	6.0	24.0
.04 - .08	Very Coarse	1.0 - 2		18	18.0	42.0
.08 - .16	Very Fine	2 - 4	GRAVEL	0	0.0	42.0
.16 - .22	Fine	4 - 5.7		6	6.0	48.0
.22 - .31	Fine	5.7 - 8		6	6.0	54.0
.31 .44	Medium	8 - 11.3		2	2.0	56.0
.44 - .63	Medium	11.3 - 16		6	6.0	62.0
.63 - .89	Coarse	16 - 22.6		10	10.0	72.0
.89 - 1.26	Coarse	22.6 - 32		12	12.0	84.0
1.26 - 1.77	Very Coarse	32 - 45		10	10.0	94.0
1.77 - 2.5	Very Coarse	45 - 64		4	4.0	98.0
2.5 - 3.5	Small	64 - 90	COBBLE	2	2.0	100.0
3.5 - 5.0	Small	90 - 128		0	0.0	100.0
5.0 - 7.1	Large	128 - 180		0	0.0	100.0
7.1 - 10.1	Large	180 - 256		0	0.0	100.0
10.1 - 14.3	Small	256 - 362	BOULDER	0	0.0	100.0
14.3 - 20	Small	362 - 512		0	0.0	100.0
20 - 40	Medium	512 - 1024		0	0.0	100.0
40 - 80	Large - Very Lg	1024 - 2048		0	0.0	100.0
	Bedrock	Bedrock		0	0.0	100.0
			Total Counted	100		

Summary Data	MY4	MY3	MY2	MY1
D50	7	20	13	10
D84	32	42	40	38
D95	49	64	54	61


Pebble count at XSC-4-Riffle
% Total
% Cumulative
Particle Size (mm)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
100
90
80
70
60
50
40
30
20
10
0
MY2 05/14/14
MY1 05/09/13
MY3 05/07/15
MY4 03/22/16
MY3 05/07/15
MY2 05/14/14
MY1 05/09/13
MY4 03/22/16
<.062
0.062 - .125
.125 - .25
.25 - .50
.50 - 1.0
1.0 - 2
2 - 4
4 - 5.7
5.7 - 8
8 - 11.3
11.3 - 16
16 - 22.6
22.6 - 32
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock

Fletcher -Lower Reach - XSC-6 Riffle Pebble Count

Location: STA 17+89

Inches	Particle	Millimeters		Count	%Total	% Cum.
	Silt/Clay	<.062	SILT/CLAY	0	0.0	0.0
	Very Fine	0.062 - .125	SAND	0	0.0	0.0
	Fine	.125 - .25		2	2.0	2.0
	Medium	.25 - .50		10	10.0	12.0
	Coarse	.50 - 1.0		24	24.0	36.0
.04 - .08	Very Coarse	1.0 - 2		4	4.0	40.0
.08 - .16	Very Fine	2 - 4	GRAVEL	2	2.0	42.0
.16 - .22	Fine	4 - 5.7		4	4.0	46.0
.22 - .31	Fine	5.7 - 8		6	6.0	52.0
.31 .44	Medium	8 - 11.3		6	6.0	58.0
.44 - .63	Medium	11.3 - 16		16	16.0	74.0
.63 - .89	Coarse	16 - 22.6		22	22.0	96.0
.89 - 1.26	Coarse	22.6 - 32		2	2.0	98.0
1.26 - 1.77	Very Coarse	32 - 45		2	2.0	100.0
1.77 - 2.5	Very Coarse	45 - 64		0	0.0	100.0
2.5 - 3.5	Small	64 - 90	COBBLE	0	0.0	100.0
3.5 - 5.0	Small	90 - 128		0	0.0	100.0
5.0 - 7.1	Large	128 - 180		0	0.0	100.0
7.1 - 10.1	Large	180 - 256		0	0.0	100.0
10.1 - 14.3	Small	256 - 362	BOULDER	0	0.0	100.0
14.3 - 20	Small	362 - 512		0	0.0	100.0
20 - 40	Medium	512 - 1024		0	0.0	100.0
40 - 80	Large - Very Lg	1024 - 2048		0	0.0	100.0
	Bedrock	Bedrock		0	0.0	100.0
			Total Counted	100		

Summary Data	MY4	MY3	MY2	MY1
D50	7	19	17	0.6
D84	18	28	26	16
D95	22	34	31	20

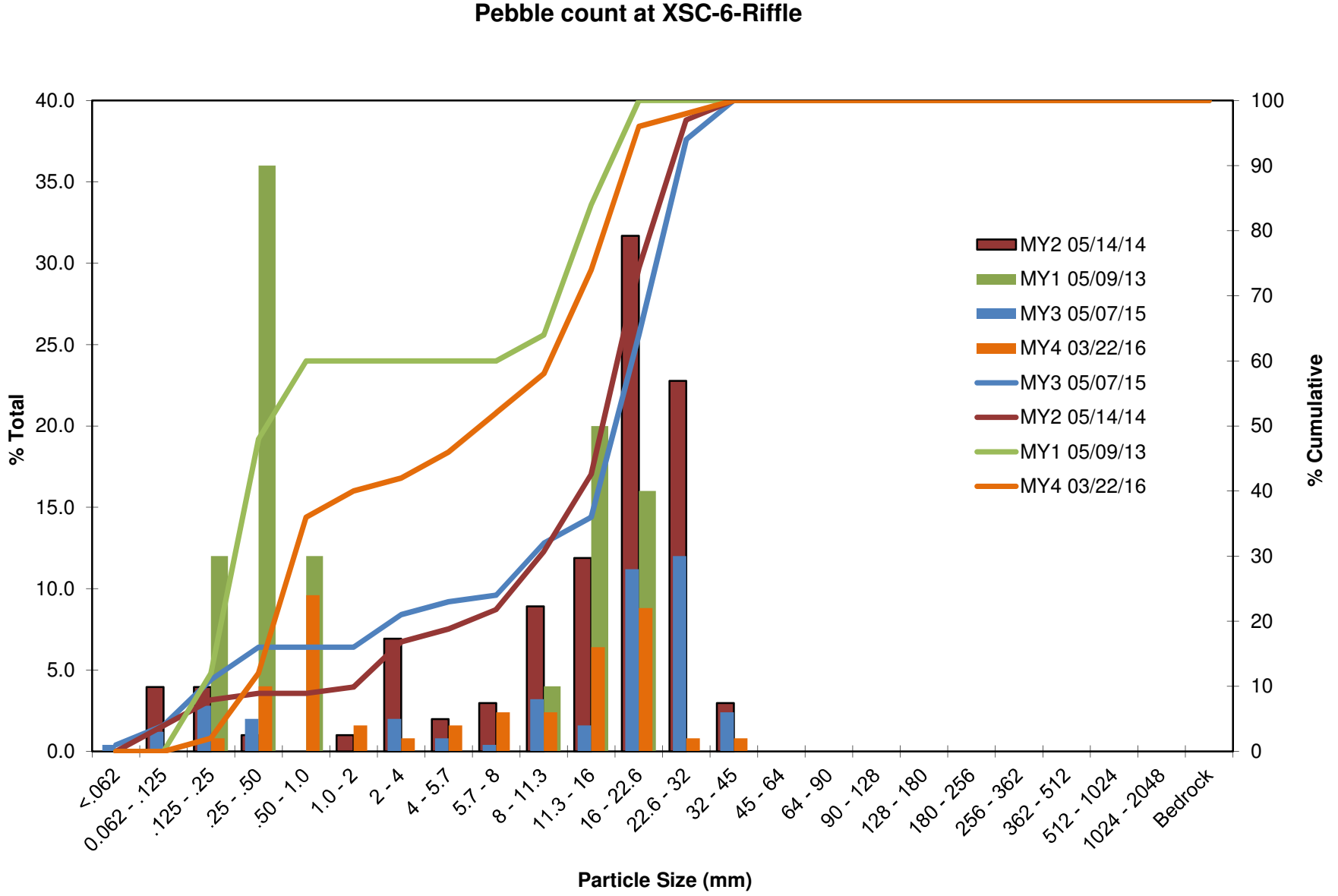

Pebble count at XSC-6-Riffle
% Total
% Cumulative
Particle Size (mm)
MY2 05/14/14
MY1 05/09/13
MY3 05/07/15
MY4 03/22/16
MY3 05/07/15
MY2 05/14/14
MY1 05/09/13
MY4 03/22/16
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
100
90
80
70
60
50
40
30
20
10
0
<.062
0.062 - .125
.125 - .25
.25 - .50
.50 - 1.0
1.0 - 2
2 - 4
4 - 5.7
5.7 - 8
8 - 11.3
11.3 - 16
16 - 22.6
22.6 - 32
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock

Exhibit Table 10a. Monitoring Data - Stream Reach Data Summary
Fletcher-Meritor (UT to Cane Creek) Stream and Wetland Restoration/Proj. No. 138 - Upper Reach (1838 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	14.50	14.80		15.10		2	14.00	14.20		14.40		2	12.60	13.15		13.70		2	11.60	13.20		14.80		2	12.30	13.05		13.80		2						
Floodprone Width (ft)	53.00			>86.00		2	65.20			>86.00		2	>86.00			98.40		2	>86.00			94.40		2	>86.00			96.90		2						
Bankfull Mean Depth (ft)	1.26	1.37		1.47		2	1.19	1.33		1.47		2	1.13	1.30		1.47		2	1.22	1.31		1.39		2	1.20	1.39		1.57		2						
[1]Bankfull Max Depth (ft)	1.80	2.00		2.20		2	2.01	2.15		2.29		2	2.23	2.57		2.91		2	2.29	2.62		2.95		2	2.30	2.65		2.99		2						
Bankfull Cross Sectional Area (ft^2)	19.10	20.20		21.30		2	16.70	18.95		21.20		2	14.20	17.15		20.10		2	14.20	14.50		14.80		2	14.70	18.15		21.60		2						
Width/Depth Ratio	9.87	10.91		11.94		2	9.78	10.76		11.74		2	9.34	10.26		11.18		2	9.48	10.08		10.68		2	8.82	9.56		10.29		2						
Entrenchment Ratio	3.50			>6.00		2	4.70			>6.00		2	>6.00			7.81		2	>6.00			8.14		2	>6.00			7.88		2						
[1]Bank Height Ratio	1.00	1.00		1.00		2	0.99	1.01		1.03		2	0.95	0.99		1.03		2	0.99	1.02		1.05		**2**	1.01	1.02		1.02		2						
Profile																																				
Riffle Length (ft)	11.48	25.61	23.29	45.54	14.93	6	5.05	15.63	15.69	30.45	6.75	16	6.09	12.22	10.87	21.75	5.02	12	7.76	15.12	14.70	26.01	6.29	6	6.57	12.38	11.29	24.39	7.02	5						
Riffle Slope (ft/ft)	0.0025	0.0075	0.0040	0.0203	0.7100	6	0.0014	0.0069	0.0056	0.0143	0.0039	16	0.0027	0.0126	0.0092	0.0266	0.0087	12	0.0065	0.0150	0.0145	0.0264	0.0066	6	0.0018	0.0091	0.0084	0.0220	0.0078	5						
Pool Length (ft)	14.20	28.75	21.87	63.10	18.63	6	16.08	26.33	26.06	45.58	7.52	22	18.83	37.53	32.47	72.47	17.89	12	11.42	27.82	28.01	42.64	9.34	14	13.02	26.97	27.34	50.92	9.85	17						
Pool Max depth (ft)	2.63	2.93	2.83	3.56	0.36	6	2.89	3.48	3.40	5.08	0.50	22	2.50	3.32	3.32	3.94	0.49	12	3.12	3.63	3.52	4.68	0.44	14	3.14	3.81	3.56	5.02	0.57	17						
Pool Spacing (ft)	61.00	70.58	68.71	89.47	21.50	5	48.97	72.69	72.45	139.12	20.52	18	54.28	96.85	92.86	153.10	30.88	10	54.52	72.12	71.04	88.50	10.68	10	44.79	78.29	76.80	121.81	23.01	14						
Pattern																																				
Channel Beltwidth (ft)	33.00	48.40	44.80	75.00	11.08	22																														
Radius of Curvature (ft)	30.00	37.70	40.00	40.00	4.30	22																														
Rc:Bankfull width (ft/ft)	2.03	2.55	2.70	2.70	0.29	22																														
Meander Wavelength (ft)	101.00	129.70	130.00	180.00	16.68	21																														
Meander Width Ratio	2.22	3.27	3.03	5.03	0.75	22																														

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Additional Reach Parameters																																				
Rosgen Classification	C/E4						C/E4						C/E4						C/E5						C/E4											
Channel Thalweg length (ft)	1838						1838						1838						1838						1838											
Sinuosity (ft)	1.18						1.18						1.18						1.18						1.18											
Water Surface Slope (Channel) (ft/ft)	0.0025						0.0025						0.0027						0.0033						0.0034											
BF slope (ft/ft)	0.0027						0.0025						0.0028						0.0028						0.0029											
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks							4						3						3						2											
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Exhibit Table 10b. Monitoring Data - Stream Reach Data Summary
Fletcher-Meritor (UT to Cane Creek) Stream and Wetland Restoration/Proj. No. 138 - Lower Reach (1779 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	17.20	18.49		19.77		2	16.10	19.35		22.60		2	15.50	15.80		16.10		2	17.70	17.75		17.80		2	17.30	18.50		19.70		2						
Floodprone Width (ft)	97.90	117.63		137.36		2	101.50	117.20		132.80		2	98.50	115.50		132.50		2	102.00	120.15		138.30		2	102.60	120.65		138.70		2						
Bankfull Mean Depth (ft)	1.36	1.56		1.75		2	1.21	1.41		1.61		2	1.39	1.46		1.53		2	1.40	1.44		1.48		2	1.28	1.39		1.49		2						
[1]Bankfull Max Depth (ft)	2.20	2.34		2.47		2	2.46	2.51		2.56		2	2.39	2.43		2.47		2	2.65	2.68		2.71		2	2.70	2.70		2.70		2						
Bankfull Cross Sectional Area (ft^2)	23.40	28.95		34.50		2	26.00	26.65		27.30		2	22.40	23.05		23.70		2	25.00	25.60		26.20		2	25.20	25.50		25.80		2						
Width/Depth Ratio	11.32	11.99		12.65		2	9.97	14.34		18.71		2	10.14	10.86		11.57		2	11.96	12.32		12.67		2	11.60	13.50		15.40		2						
Entrenchment Ratio	5.69	6.32		6.95		2	4.50	6.35		8.20		2	6.12	7.34		8.55		2	5.73	6.77		7.81		2	5.21	6.62		8.02		2						
[1]Bank Height Ratio	1.00	1.00		1.00		2	1.00	1.02		1.04		2	1.04	1.05		1.05		2	0.97	0.98		0.99		**2**	0.94	0.98		1.01		2						
Profile																																				
Riffle Length (ft)	7.73	23.60	24.49	43.50	11.37	10	9.66	20.98	19.59	33.68	8.34	8	7.10	13.65	12.21	30.00	6.29	14	7.98	16.62	14.15	34.20	7.57	14	8.76	16.65	16.75	25.37	6.23	9						
Riffle Slope (ft/ft)	0.0035	0.0094	0.0094	0.0172	0.4000	10	0.0013	0.0099	0.0080	0.0309	0.0096	8	0.0036	0.0115	0.0090	0.0267	0.0070	14	0.0010	0.0087	0.0080	0.0142	0.0035	14	0.0022	0.0061	0.0060	0.0111	0.0032	9						
Pool Length (ft)	22.25	37.41	38.04	56.23	11.18	10	16.53	36.61	37.07	57.69	11.80	12	19.43	39.46	42.71	64.25	14.61	10	11.13	31.06	25.58	62.56	17.33	14	11.53	39.30	37.24	65.91	17.95	13						
Pool Max depth (ft)	3.13	3.44	3.42	3.85	0.22	10	3.39	3.74	3.66	4.22	0.26	12	3.11	3.45	3.47	3.85	0.23	10	3.06	3.78	3.76	4.52	0.40	14	3.48	3.93	3.94	4.58	0.34	13						
Pool Spacing (ft)	44.30	74.46	82.61	90.34	16.55	7	53.27	90.62	89.29	130.65	23.89	12	75.37	102.42	94.74	139.50	26.67	8	34.23	84.98	74.46	139.12	36.67	12	59.93	99.33	98.43	143.64	28.58	11						
Pattern																																				
Channel Beltwidth (ft)	36.00	65.30	69.00	83.00	13.68	16																														
Radius of Curvature (ft)	35.00	42.20	45.00	45.00	3.64	16																														
Rc:Bankfull width (ft/ft)	1.89	2.28	2.43	2.43	0.20	16																														
Meander Wavelength (ft)	128.00	167.70	172.00	193.00	18.30	12																														
Meander Width Ratio	1.95	3.53	3.73	4.49	0.74	16																														

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Additional Reach Parameters																																				
Rosgen Classification	C/E4						C/E4						C/E4						C/E5						C/E4											
Channel Thalweg length (ft)	1779						1779						1779						1779						1779											
Sinuosity (ft)	1.23						1.23						1.23						1.23						1.23											
Water Surface Slope (Channel) (ft/ft)	0.0027						0.0022						0.0021						0.0021						0.0017											
BF slope (ft/ft)	0.0024						0.0026						0.0023						0.0025						0.0023											
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks							14						3						3						2											
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Exhibit Table 10c. Monitoring Data - Stream Reach Data Summary
Fletcher-Meritor (UT to Cane Creek) Stream and Wetland Restoration/Proj. No. 138 - Tributary (648 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	8.33	8.79		9.24		2	7.90	8.15		8.40		2	7.40	7.50		7.60		2	9.20	9.55		9.90		2	9.90	10.40		10.80		2						
Floodprone Width (ft)	22.32	23.62		24.91		2	25.20	26.70		28.20		2	27.40	28.30		29.20		2	34.02	39.51		45.00		2	37.22	44.61		52.00		2						
Bankfull Mean Depth (ft)	0.82	0.83		0.83		2	0.86	0.96		1.06		2	0.80	0.98		1.15		2	1.12	1.20		1.27		2	1.07	1.19		1.31		2						
[1]Bankfull Max Depth (ft)	1.19	1.22		1.25		2	1.34	1.56		1.78		2	1.67	1.82		1.96		2	1.87	2.07		2.26		2	2.09	2.26		2.42		2						
Bankfull Cross Sectional Area (ft^2)	6.80	7.22		7.63		2	7.20	7.80		8.40		2	6.10	7.30		8.50		2	10.30	11.45		12.60		2	11.60	12.30		13.00		2						
Width/Depth Ratio	10.21	10.70		11.19		2	7.43	8.67		9.90		2	6.44	7.96		9.47		2	7.78	8.00		8.22		2	7.54	8.80		10.06		2						
Entrenchment Ratio	2.68	2.69		2.70		2	3.00	3.30		3.60		2	3.61	3.78		3.95		2	3.70	4.13		4.55		2	3.45	4.35		5.25		2						
[1]Bank Height Ratio	1.00	1.00		1.00		2	1.00	1.15		1.30		2	0.97	1.07		1.16		2	0.89	0.96		1.03		2	0.97	1.03		1.09		2						
Profile																																				
Riffle Length (ft)	13.84	18.32	18.80	21.90	2.89	9	7.12	11.92	11.85	18.65	4.00	7	4.10	8.67	6.61	17.57	5.14	7	3.68	7.60	4.76	20.13	6.22	8	4.21	8.37	9.61	12.19	3.40	7						
Riffle Slope (ft/ft)	0.0087	0.0142	0.0144	0.0220	0.5800	9	0.0043	0.0168	0.0164	0.0365	0.0110	6	0.0117	0.0223	0.0224	0.0307	0.0064	7	0.0048	0.0226	0.0168	0.0612	0.0199	8	0.0029	0.0101	0.0042	0.0304	0.0102	7						
Pool Length (ft)	13.03	22.26	17.58	36.76	9.30	10	11.93	19.42	18.89	30.90	5.52	11	11.47	15.70	13.06	27.45	5.25	9	10.90	15.36	13.72	25.08	4.70	8	6.64	15.50	15.12	28.12	6.71	10						
Pool Max depth (ft)	1.45	1.89	1.93	2.40	0.32	10	2.38	2.88	2.90	3.39	0.39	8	2.31	2.81	2.72	3.44	0.37	9	2.69	3.28	3.24	4.22	0.54	9	2.72	3.49	3.43	4.12	0.51	10						
Pool Spacing (ft)	36.53	52.91	56.00	60.11	9.09	9	27.34	55.55	57.06	78.07	15.28	10	35.86	54.00	53.54	77.56	12.96	8	31.53	51.44	52.94	63.56	12.03	6	28.46	53.88	53.95	76.54	15.15	7						
Pattern																																				
Channel Beltwidth (ft)	26.00	39.20	38.00	55.00	8.33	10																														
Radius of Curvature (ft)	25.00	25.00	25.00	25.00	0.00	12																														
Rc:Bankfull width (ft/ft)	2.84	2.84	2.84	2.84	0.00	12																														
Meander Wavelength (ft)	77.00	92.90	96.00	102.00	8.63	10																														
Meander Width Ratio	2.96	4.46	4.32	6.26	0.95	10																														

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Additional Reach Parameters																																				
Rosgen Classification	C/E4						C/E4						C/E4						C/E4						C/E4											
Channel Thalweg length (ft)	648						648						648						648						648											
Sinuosity (ft)	1.22						1.22						1.22						1.22						1.22											
Water Surface Slope (Channel) (ft/ft)	0.0114						0.0118						0.0119						0.0112						0.0112											
BF slope (ft/ft)	0.0118						0.0120						0.0116						0.0116						0.0112											
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks							3						19						19						18											
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	2058.90	2058.90	2058.90	2058.90	2058.90			2058.61	2058.61	2058.61	2058.61	2058.61			2058.74	2058.74	2058.74	2058.74	2058.74			2053.74	2053.74	2053.74	2053.74	2053.74			2053.32	2053.32	2053.32	2053.32	2053.32		
Bankfull Width (ft)	15.10	14.00	12.60	11.60	12.30			21.90	21.90	21.40	19.50	18.80			14.50	14.40	13.70	14.80	13.80			19.77	16.10	15.50	17.70	17.30			26.16	25.70	23.60	27.10	27.20		
Floodprone Width (ft)	53.00	65.20	98.40	94.40	96.90			>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			83.70	84.30	83.00	84.90	85.60		
Bankfull Mean Depth (ft)	1.26	1.19	1.13	1.22	1.20			1.25	1.18	1.17	1.08	1.05			1.47	1.47	1.47	1.39	1.57			1.75	1.61	1.53	1.48	1.49			1.45	1.38	1.23	1.25	1.24		
Bankfull Max Depth (ft)	1.80	2.01	2.23	2.29	2.30			3.10	3.07	3.03	3.08	3.25			2.20	2.29	2.91	2.95	2.99			2.47	2.46	2.47	2.71	2.70			3.31	3.22	3.19	3.34	3.37		
Bankfull Cross Sectional Area (ft^2)	19.10	16.70	14.20	14.20	14.70			27.40	25.80	25.10	21.00	19.70			21.30	21.20	20.10	20.50	21.60			34.50	26.00	23.70	26.20	25.80			37.88	35.50	29.00	33.80	33.80		
Bankfull Width/Depth Ratio	11.94	11.74	11.18	9.48	10.29			17.50	18.59	18.25	18.11	17.94			9.87	9.78	9.34	10.68	8.82			11.32	9.97	10.14	11.96	11.60			18.07	18.61	19.21	21.73	21.89		
Bankfull Entrenchment Ratio	3.50	4.70	7.81	8.14	7.88			>4.00	>4.00	>4.00	>4.00	>4.00			>6.00	>6.00	>6.00	>6.00	>6.00			6.95	8.20	8.55	7.81	8.02			3.20	3.30	3.52	3.13	3.15		
Bankfull Bank Height Ratio	1.00	0.99	0.95	0.99	1.02			1.00	1.15	0.94	1.06	0.90			1.00	1.03	1.03	1.05	1.01			1.00	1.04	1.05	0.99	1.01			1.00	1.00	1.08	0.98	1.01		
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	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	2053.03	2053.03	2053.03	2053.03	2053.03			2059.00	2059.00	2059.00	2059.00	2059.00			2058.45	2058.45	2058.45	2058.45	2058.45			2057.55	2057.55	2057.55	2057.55	2057.55									
Bankfull Width (ft)	17.20	22.60	16.10	17.80	19.70			9.24	8.40	7.60	9.20	10.80			8.33	7.90	7.40	9.90	9.90			12.81	10.50	7.40	8.10	10.10									
Floodprone Width (ft)	97.90	101.50	98.50	102.00	102.60			24.91	25.20	27.40	34.02	37.22			22.32	28.20	29.20	45.00	52.00			25.89	31.00	32.60	34.70	35.30									
Bankfull Mean Depth (ft)	1.36	1.21	1.39	1.40	1.28			0.83	0.86	0.80	1.12	1.07			0.82	1.06	1.15	1.27	1.31			0.93	1.13	1.32	1.60	1.49									
Bankfull Max Depth (ft)	2.20	2.56	2.39	2.65	2.70			1.25	1.34	1.67	1.87	2.09			1.19	1.78	1.96	2.26	2.42			2.04	2.51	2.62	2.94	3.12									
Bankfull Cross Sectional Area (ft^2)	23.40	27.30	22.40	25.00	25.20			7.63	7.20	6.10	10.30	11.60			6.80	8.40	8.50	12.60	13.00			11.96	11.90	9.80	13.00	15.00									
Bankfull Width/Depth Ratio	12.65	18.71	11.57	12.67	15.40			11.19	9.90	9.47	8.22	10.06			12.21	7.43	6.44	7.78	7.54			13.71	9.26	5.59	5.05	6.80									
Bankfull Entrenchment Ratio	5.69	4.50	6.12	5.73	5.21			2.70	3.00	3.61	3.70	3.45			2.68	3.60	3.95	4.55	5.25			2.02	2.90	4.41	4.28	3.50									
Bankfull Bank Height Ratio	1.00	1.00	1.04	0.97	0.94			1.00	1.30	1.16	1.03	1.09			1.00	1.00	0.97	0.89	0.97			1.00	0.89	0.95	0.98	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)																																			

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

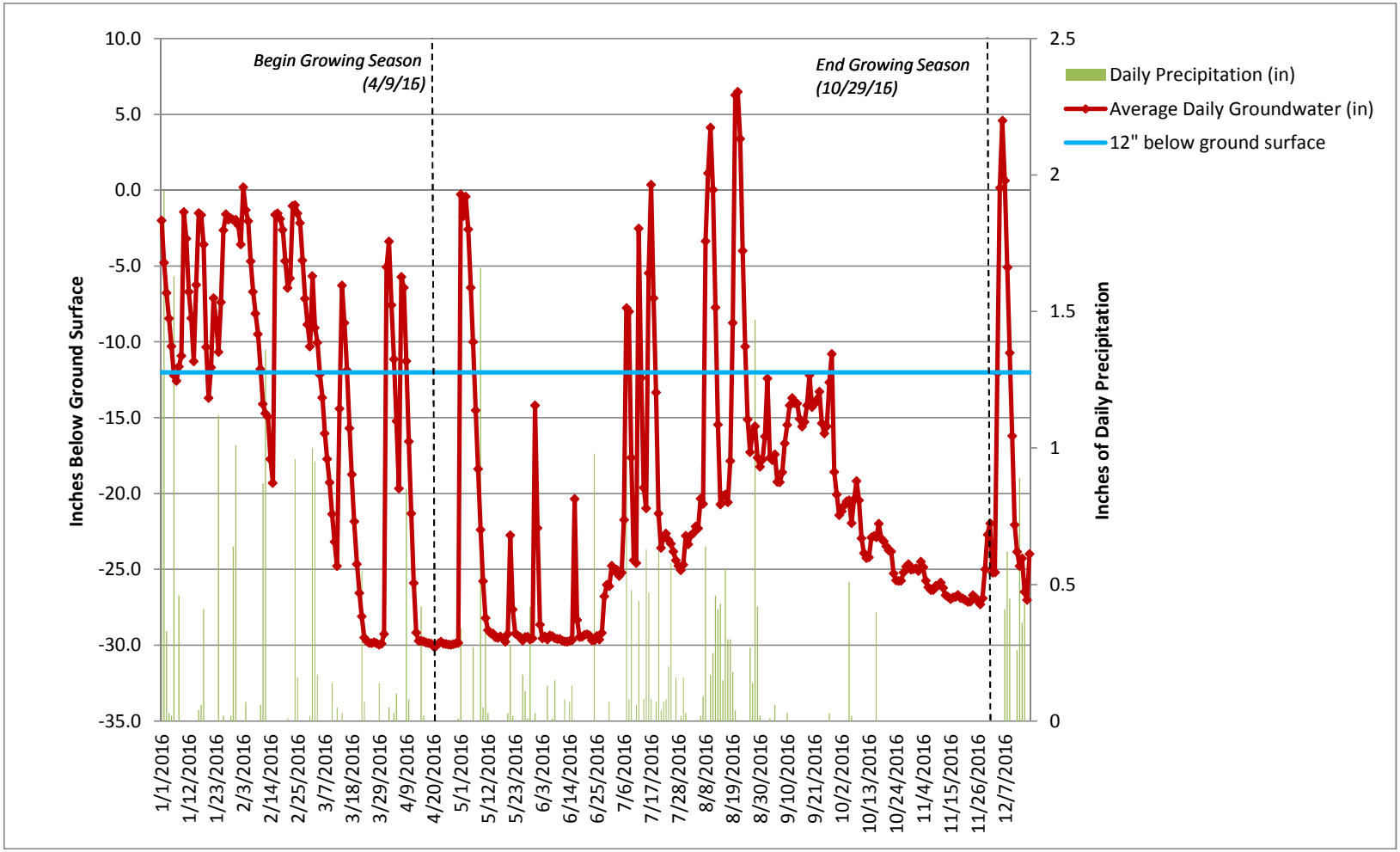
Hydrologic Monitoring Well Comparison							
Well ID No.	**Serial Number**	**New Serial Number**	**MY 1**	**MY2**	**MY3**	**MY4**	**MY5**
1	13D4CA2A			N	Y	N	
2	11311987			N	Y	N	
3	1130DD07			N	N	N	
4	*	14E17875			N	N	
5	138BE816		Y	N	N	N	
6	11313B57			Y	Y	Y	
7	9BEA475			Y	Y	Y	
8	9BEBF83		Y	Y	Y	Y	
9	EBD106E			Y	Y	Y	
10	10FACBB4		Y	Y	Y	Y	
11	AB37304		N	N	Y	N	
12	10FAA7C4			Y	Y	N	
13	10FADD4C	A278DE1			Y	Y	
14	A28ABBO		N	Y	Y	N	
15	*	9DE54F2			Y	N	
16	138BD91E	1130EA33			Y	Y	
17	*						
18	9BEBCFO		Y	Y	Y	Y	
19	136ACA3C			Y	Y	N	
20	B651924		Y	Y	Y	Y	
21	138BB5AA		Y	Y	Y	N	
22	11312837			N	N	N	
23	*	EDB96D7			Y	N	
24	1314D206			Y	Y	N	
25	9BEBF22			Y	Y	N	
26	1314D1F1	1130FAA2		Y	Y	N	
27	113118F8	14E1603B		Y	Y	Y	
28	*	9BEA426			N	N	
29	9DE69AB		Y	N			
30	138BE066			Y	Y	N	
31	*	13D4CFD5			Y	Y	
32	EBDD9BO			Y	Y	N	
33	EBDCF48			Y	Y	N	
34	EBDB81A		Y	Y	Y	N	
35	*	14E153D2			Y	Y	

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

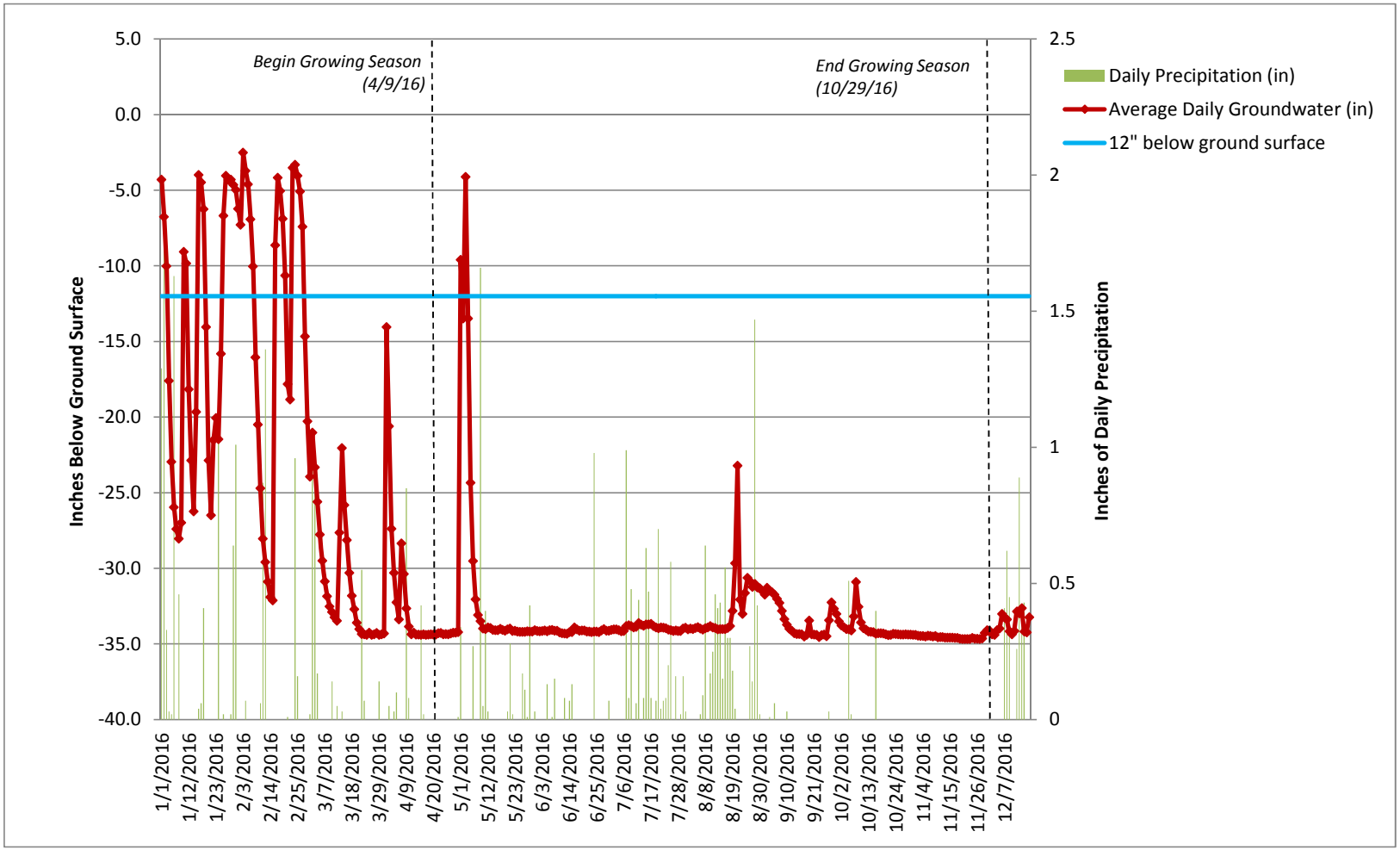
N indicates that the well was not meeting the hydrology criteria.

Y indicates that the well was meeting the hydrology criteria.

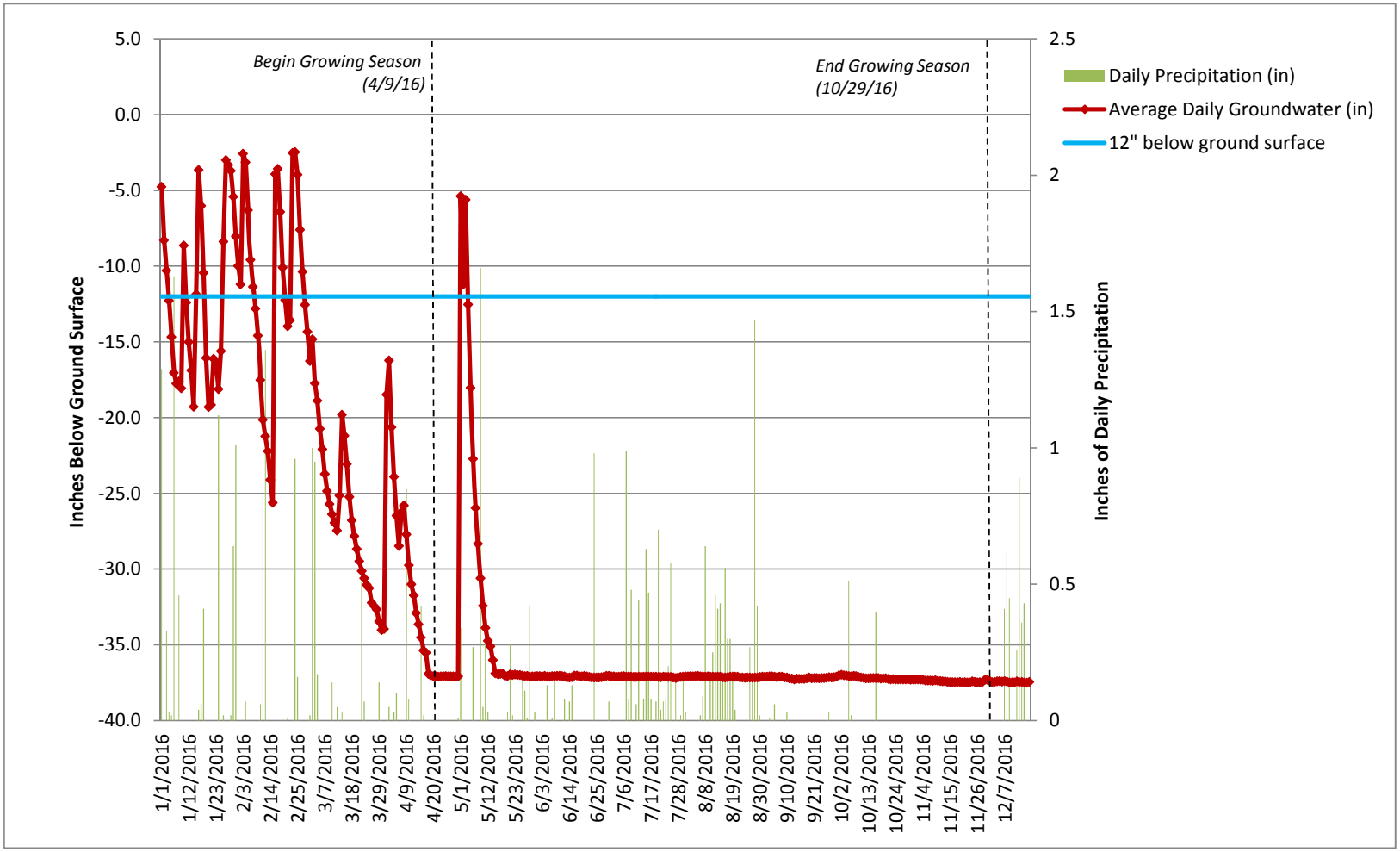
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	13D4CA2A
Gauge ID :	1



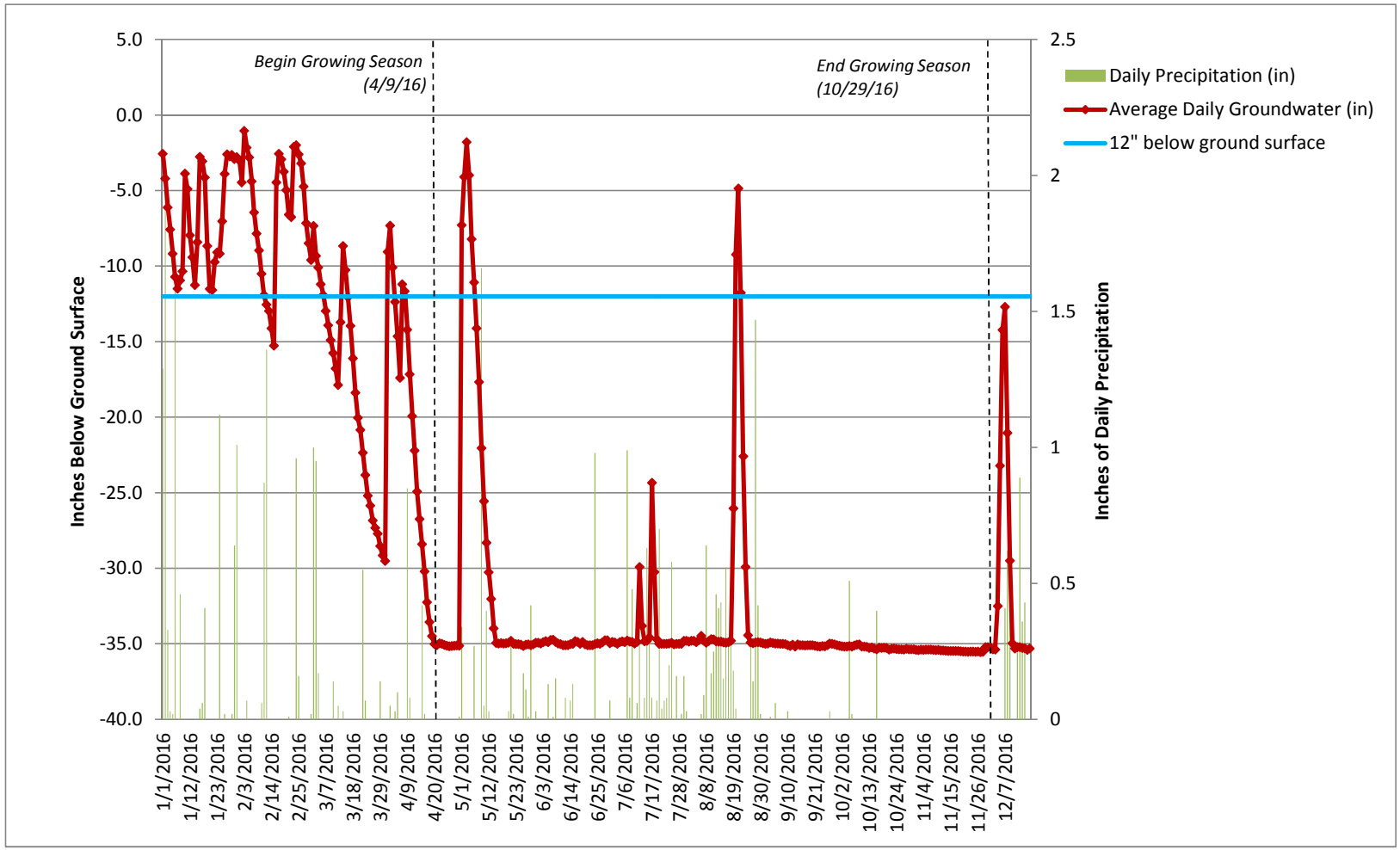
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	11311987
Gauge ID :	2



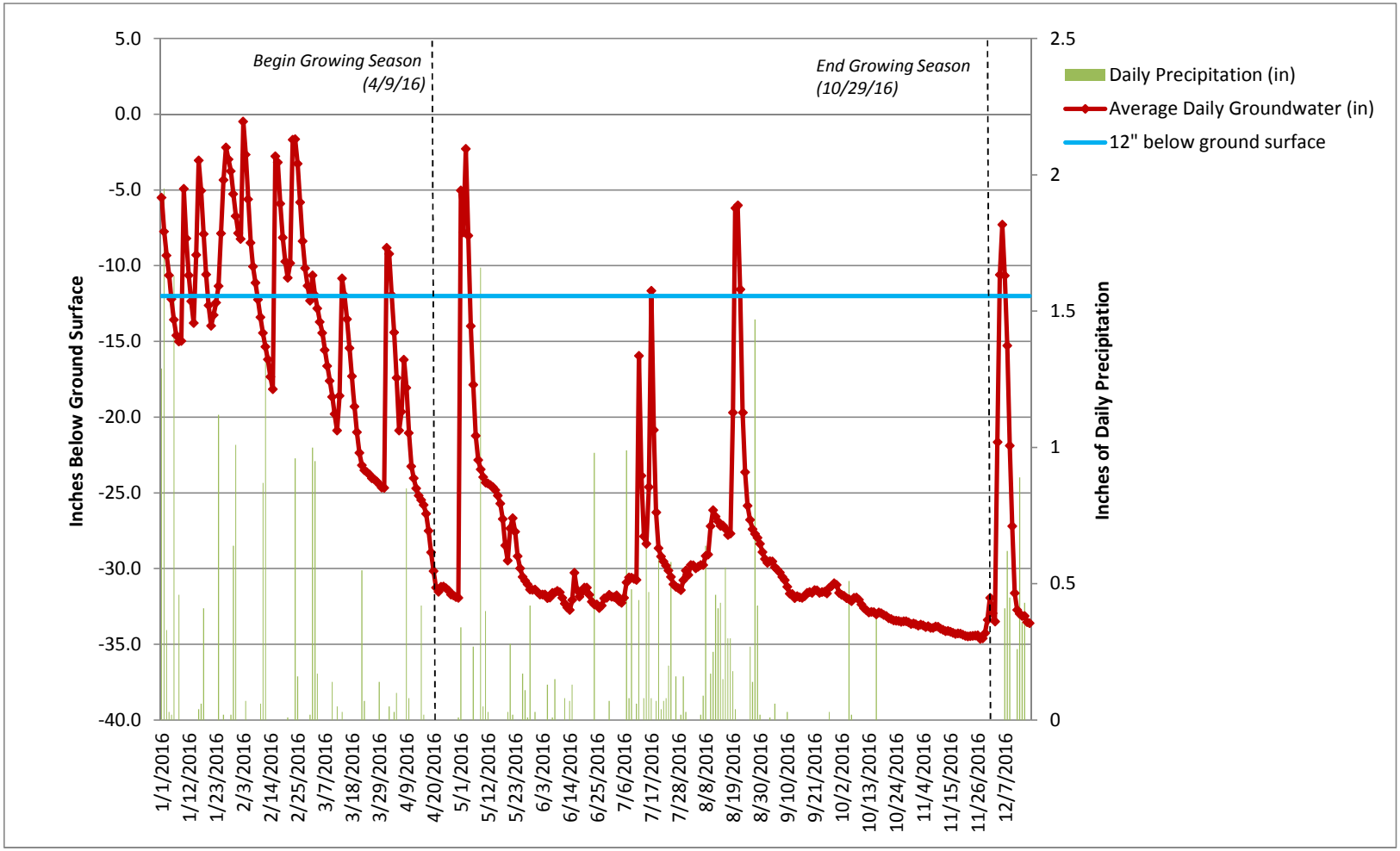
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	1130DD07
Gauge ID :	3



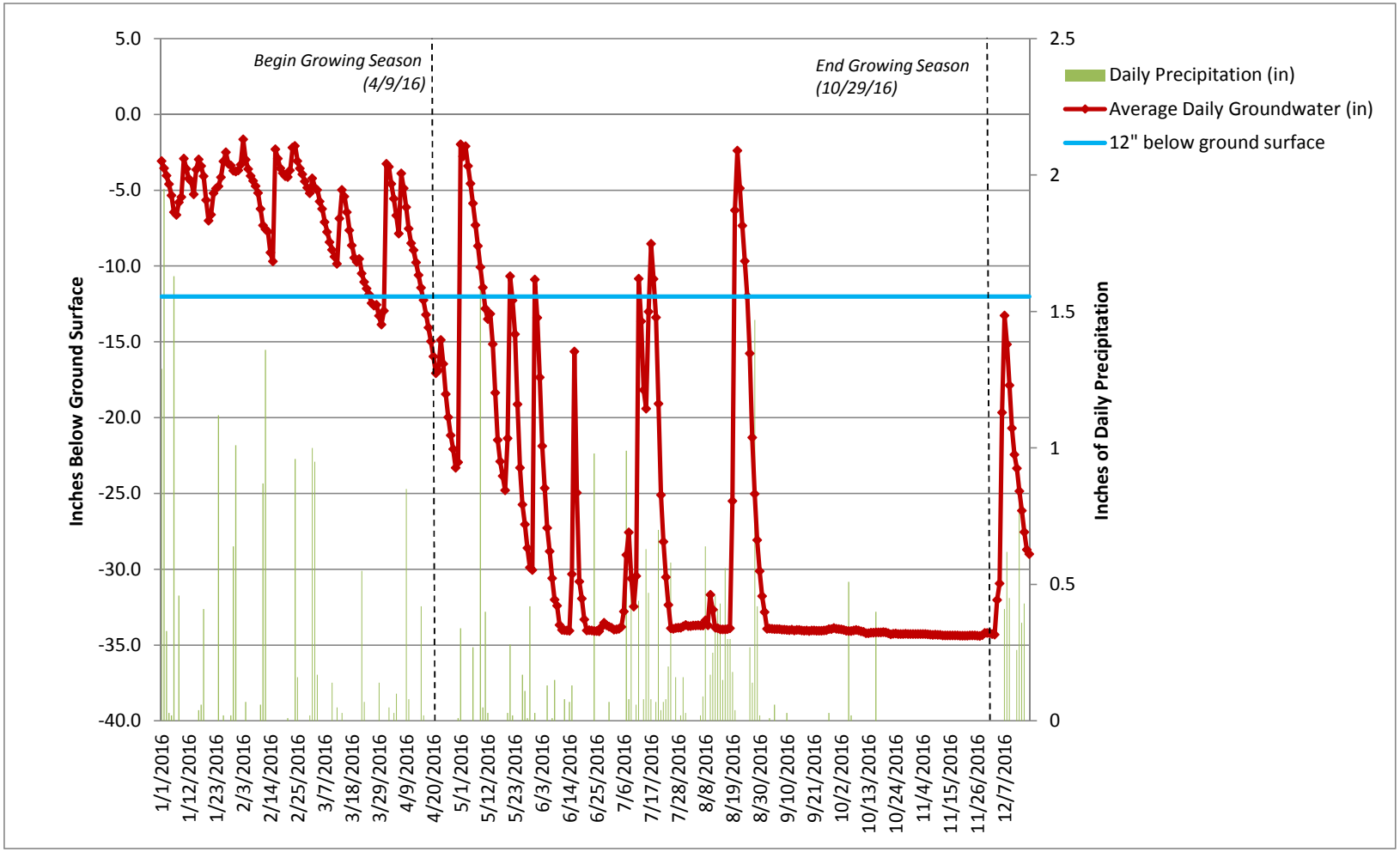
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	14E17875
Gauge ID :	4



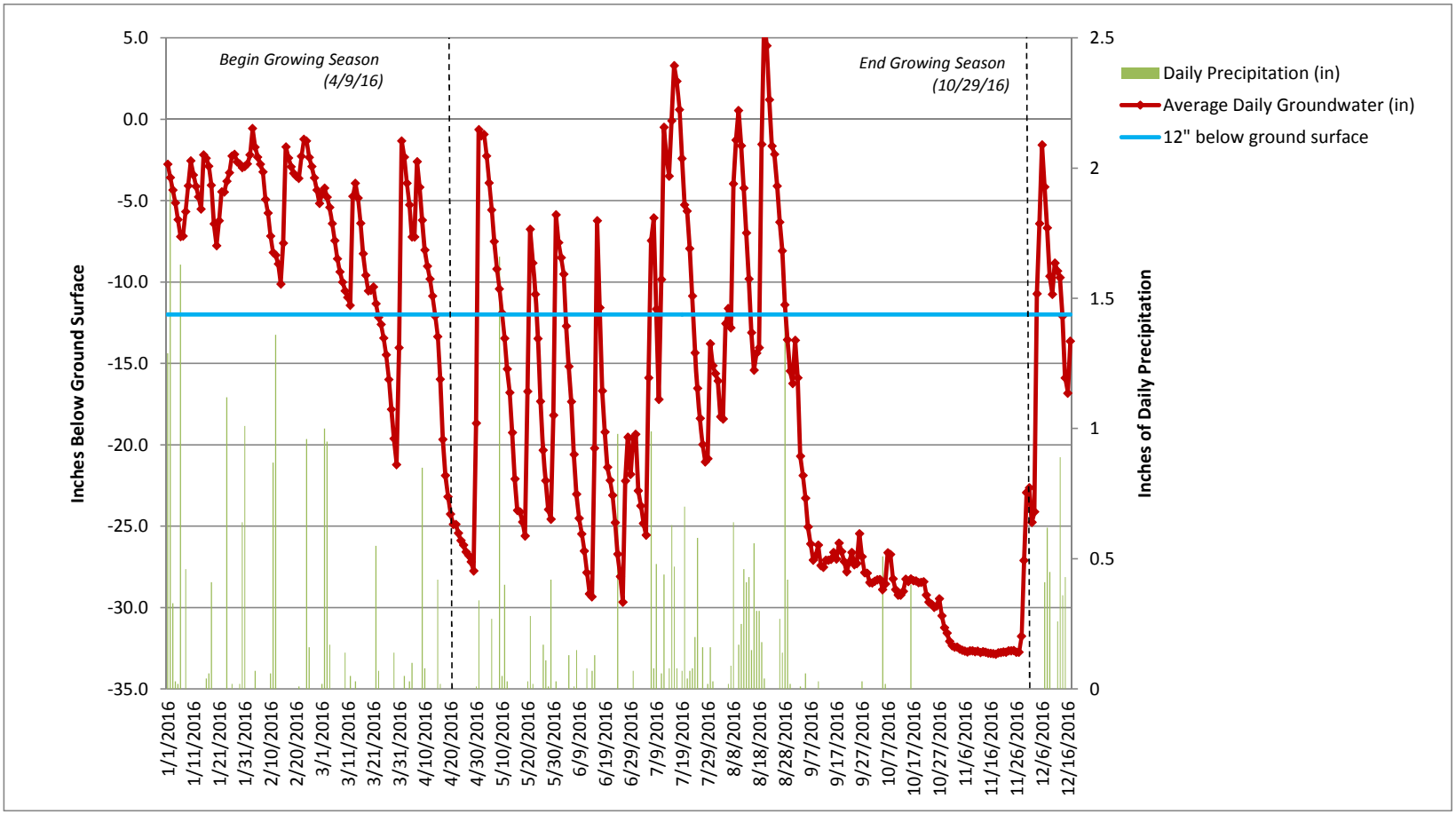
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	138BE816
Gauge ID :	5



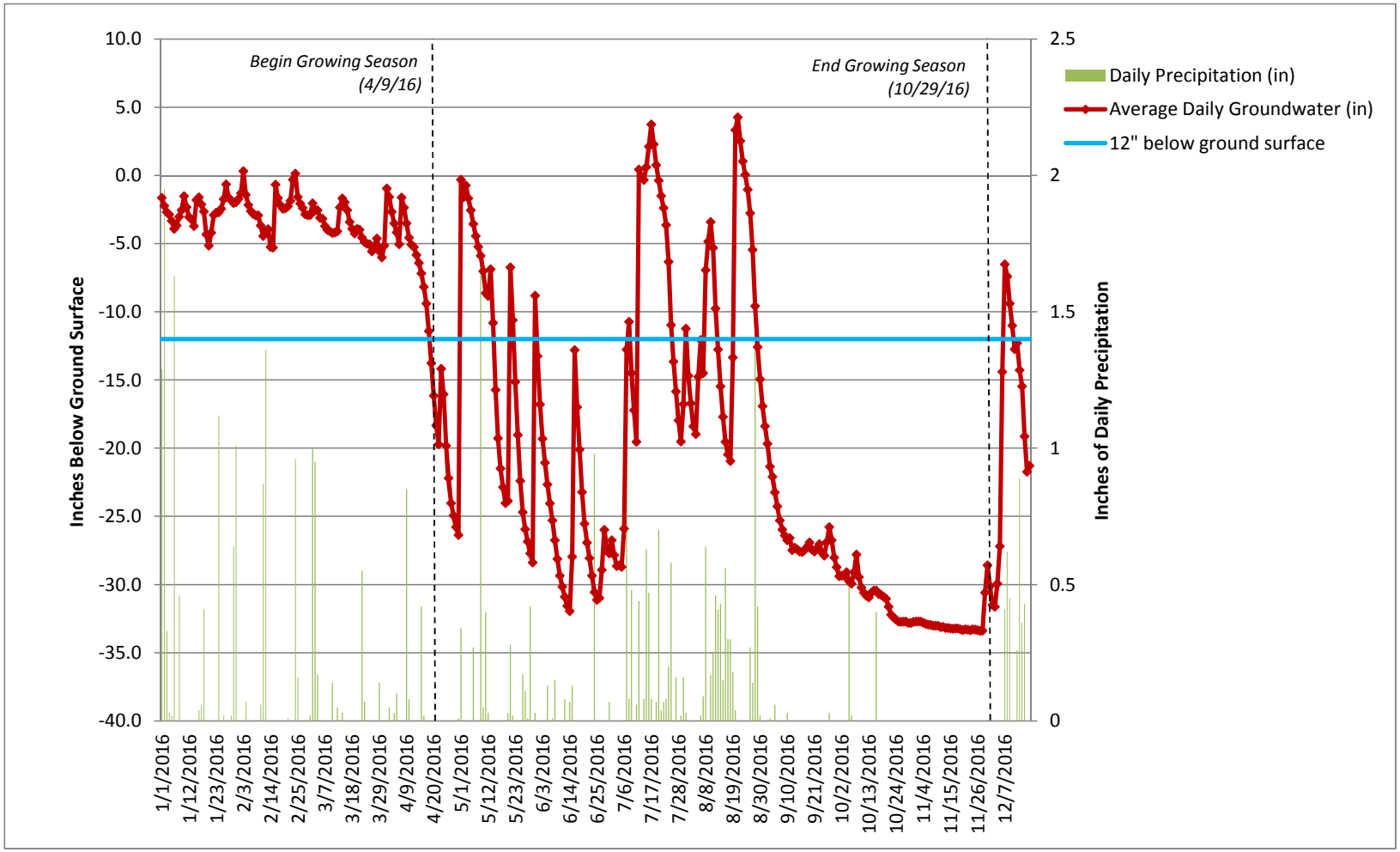
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	11313B57
Gauge ID :	6



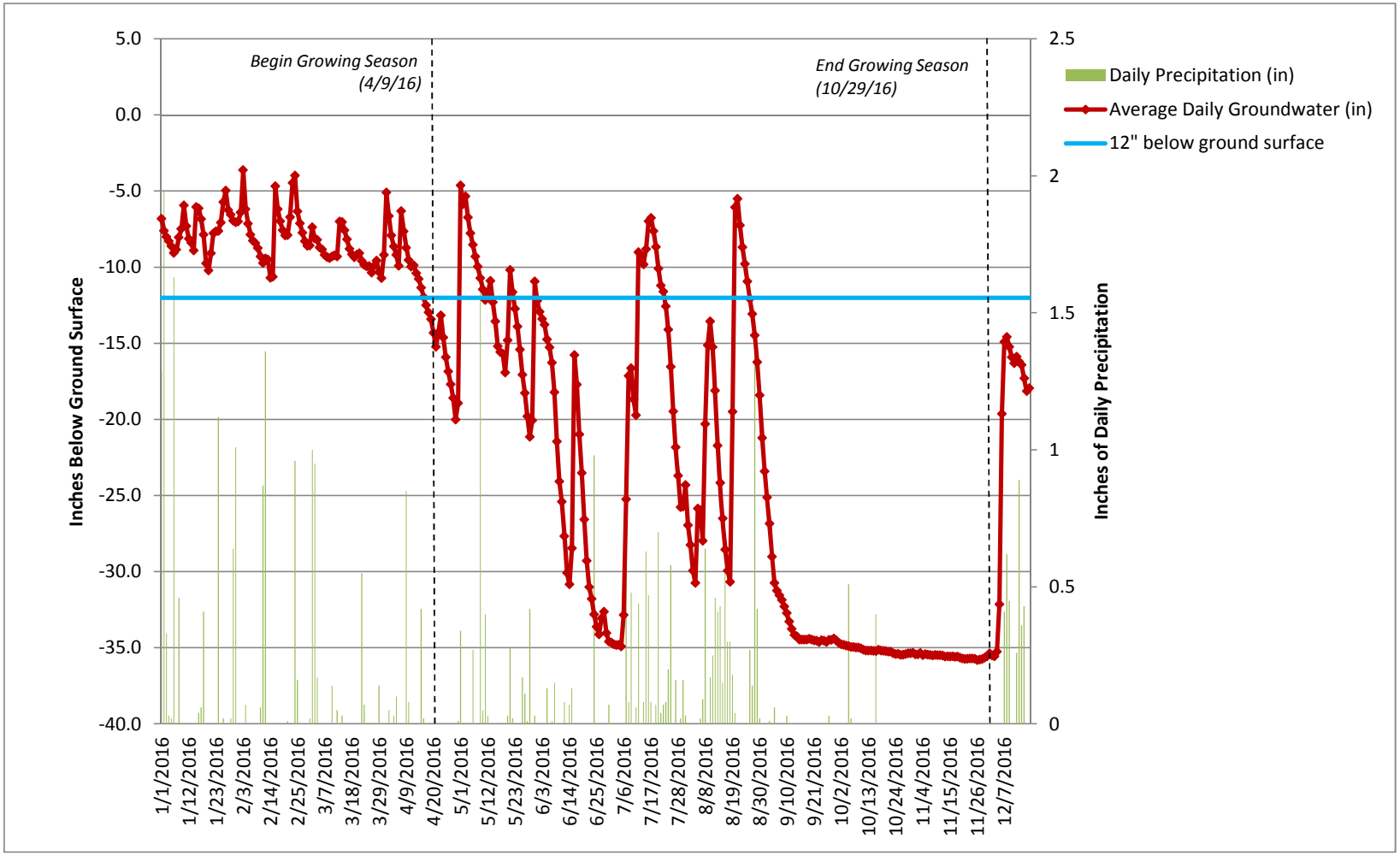
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9BEA475
Gauge ID :	7



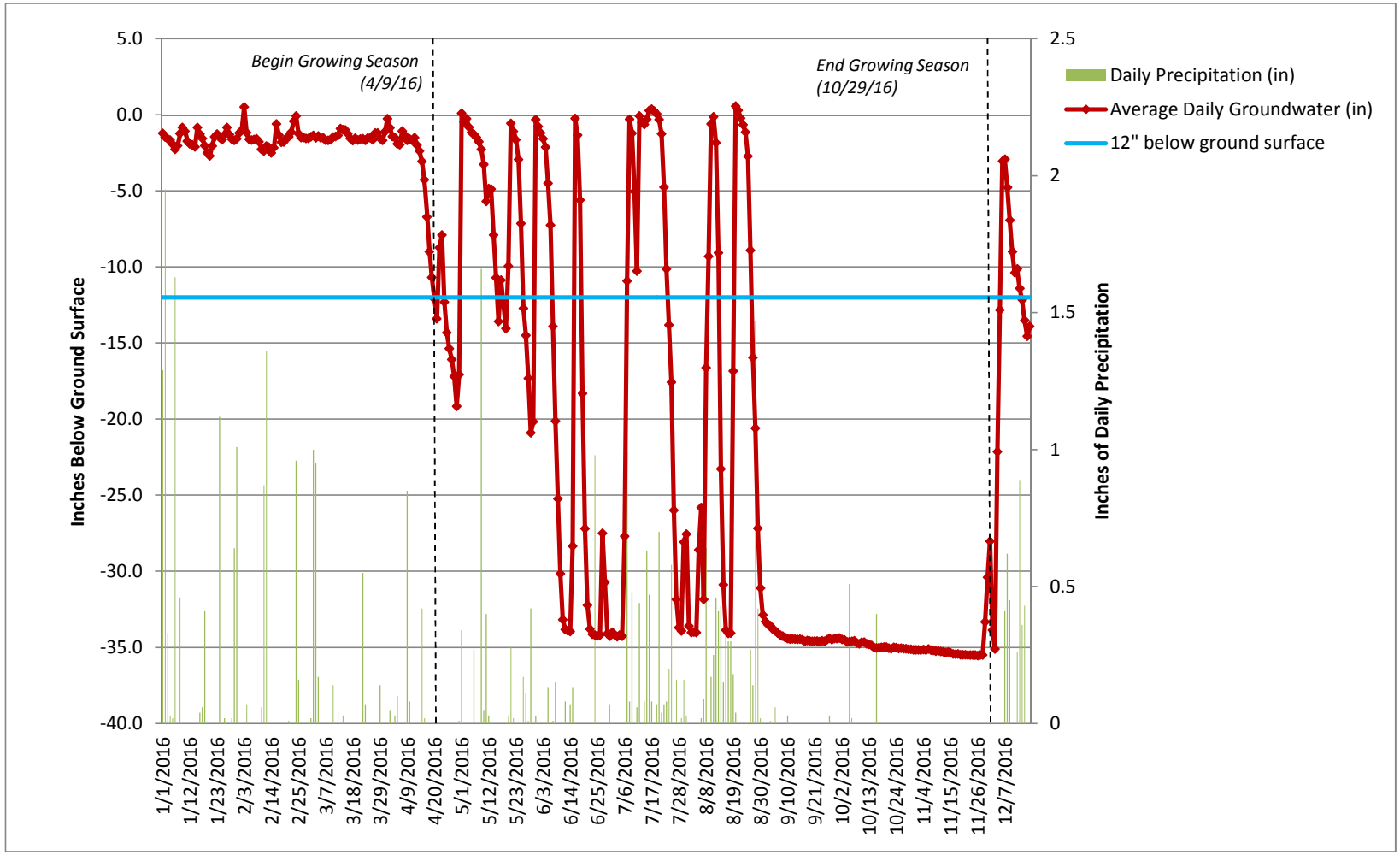
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9BEBF83
Gauge ID :	8



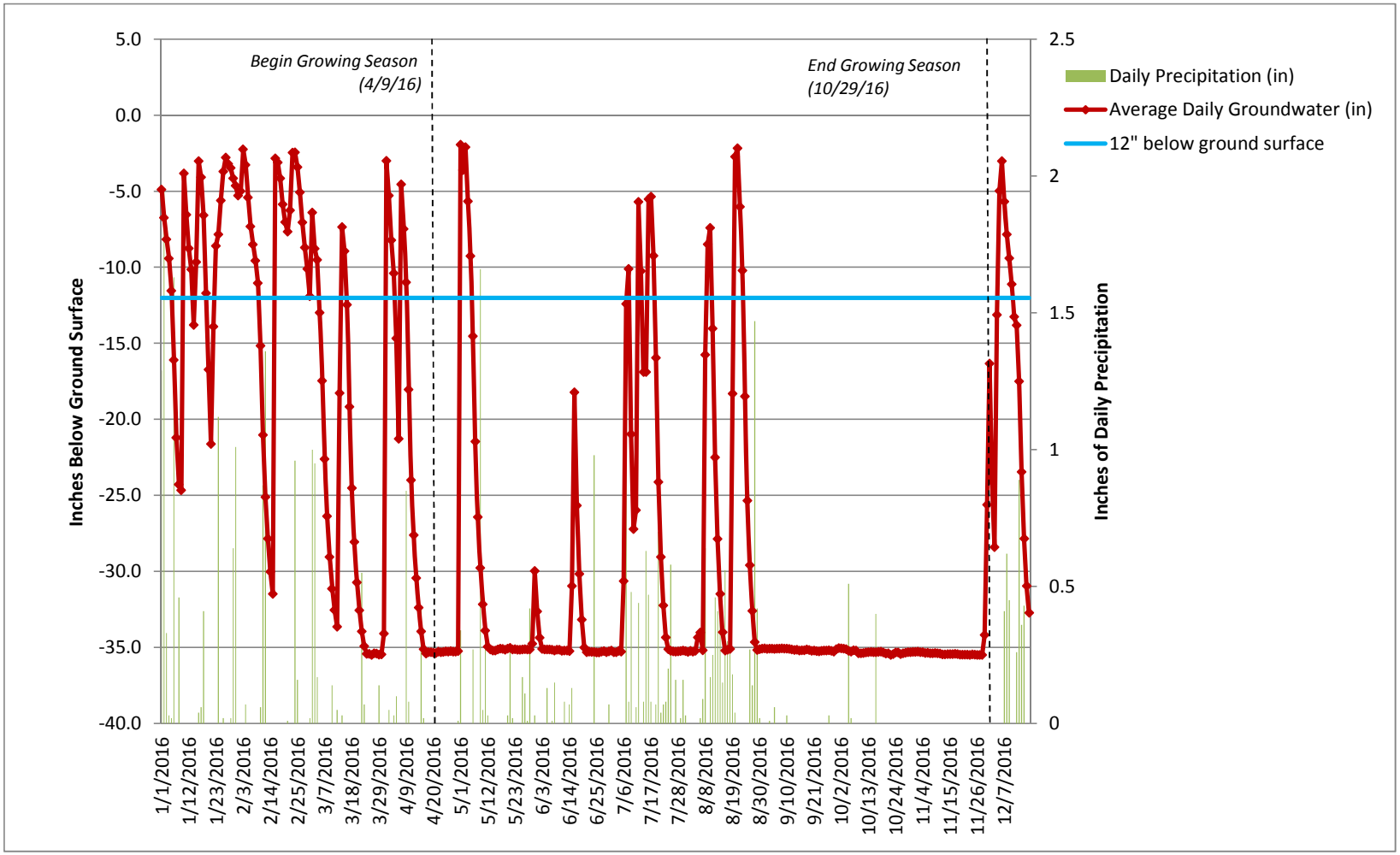
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	EBD106E
Gauge ID :	9



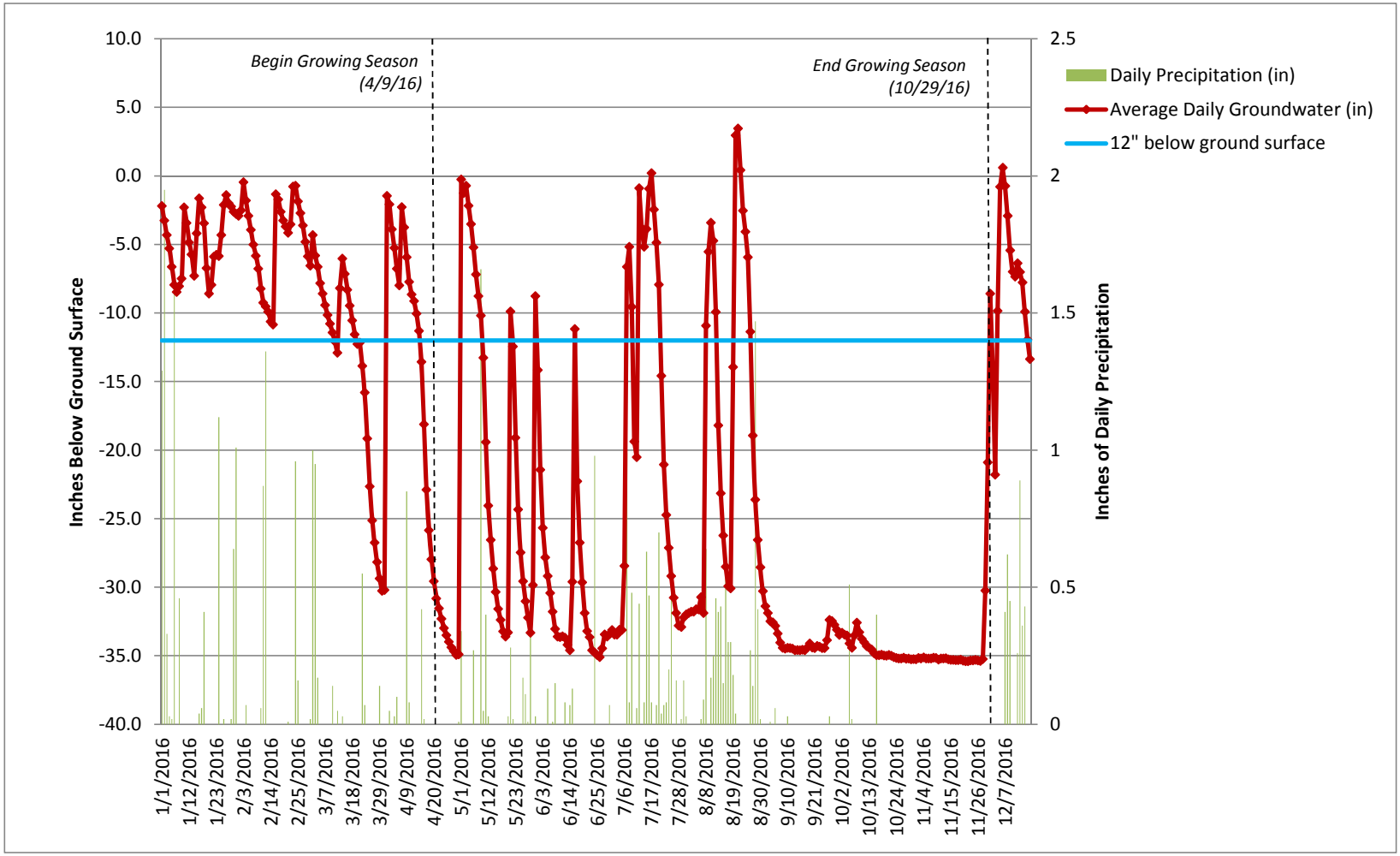
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	10FACBB4
Gauge ID :	10



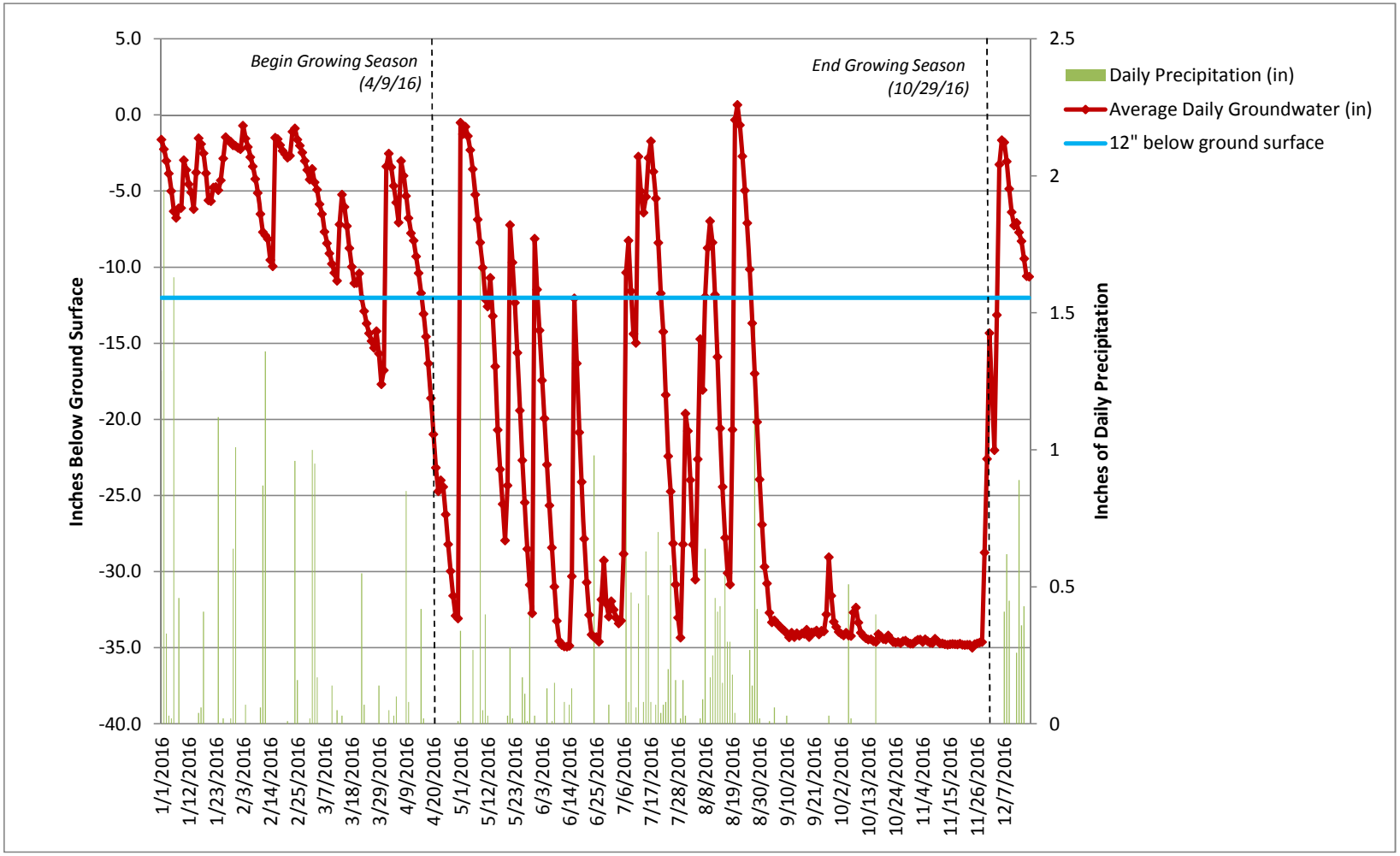
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	AB37304
Gauge ID :	11



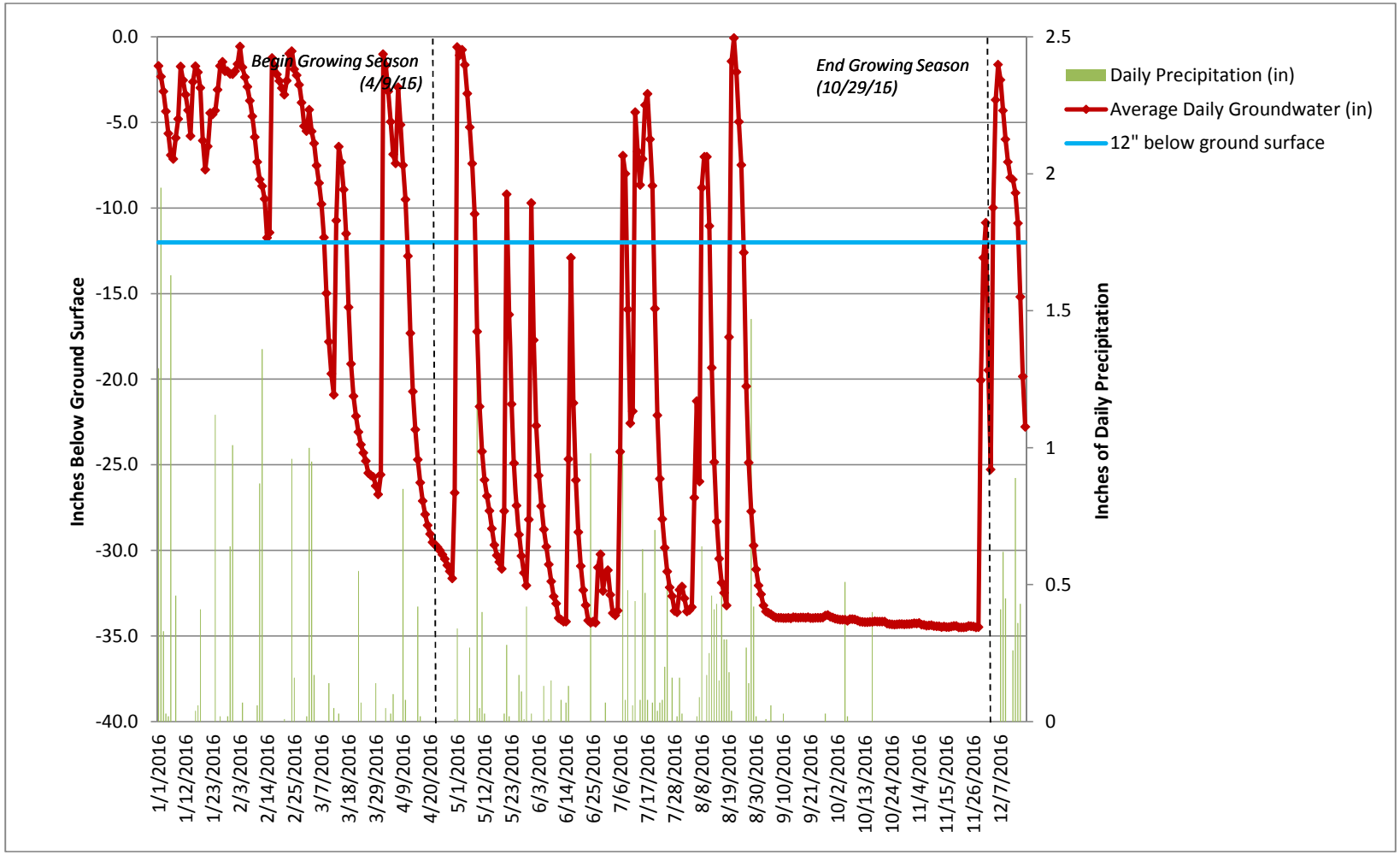
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	10FAA7C4
Gauge ID :	12



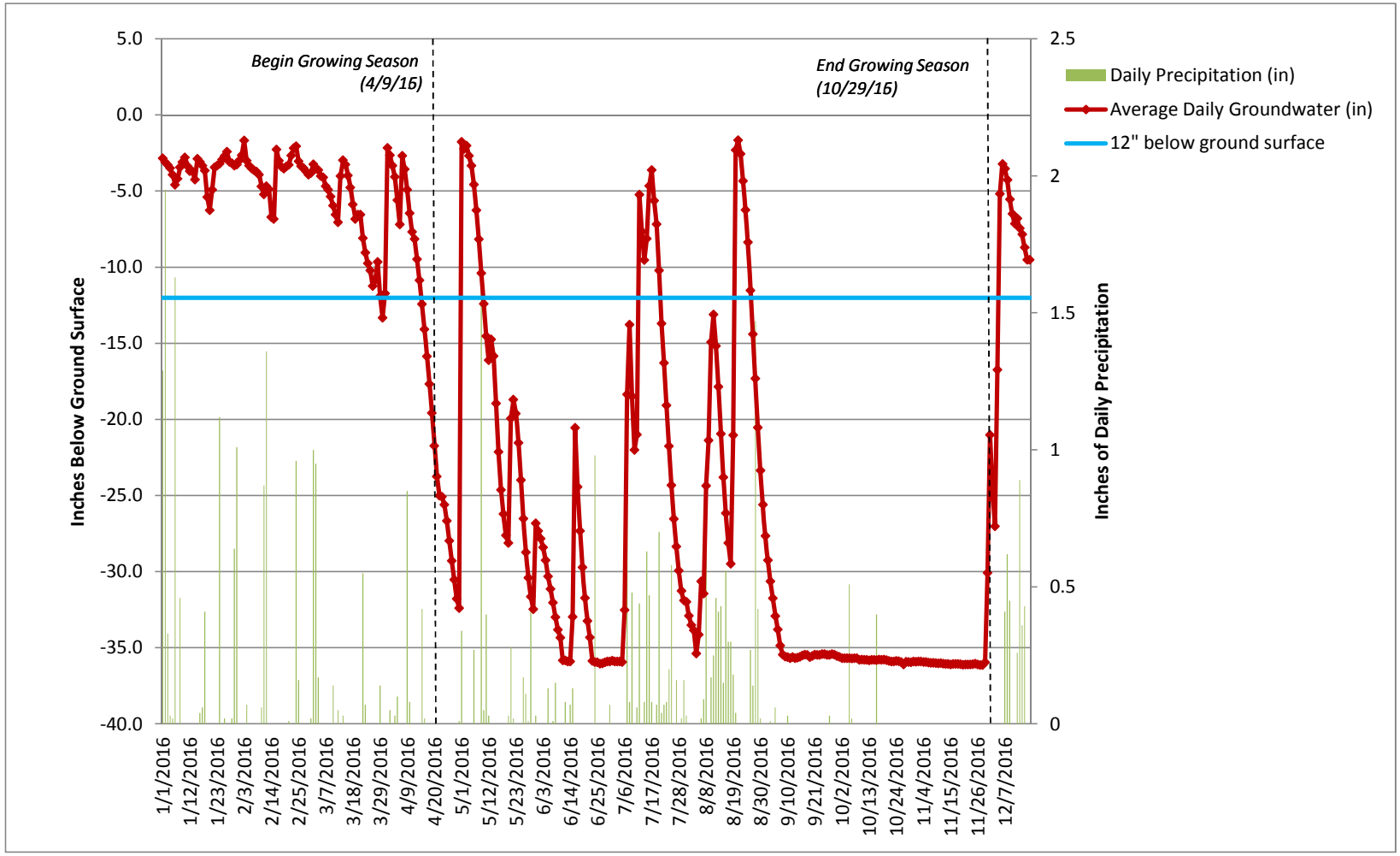
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	10FADD4C / A278DE1
Gauge ID :	13



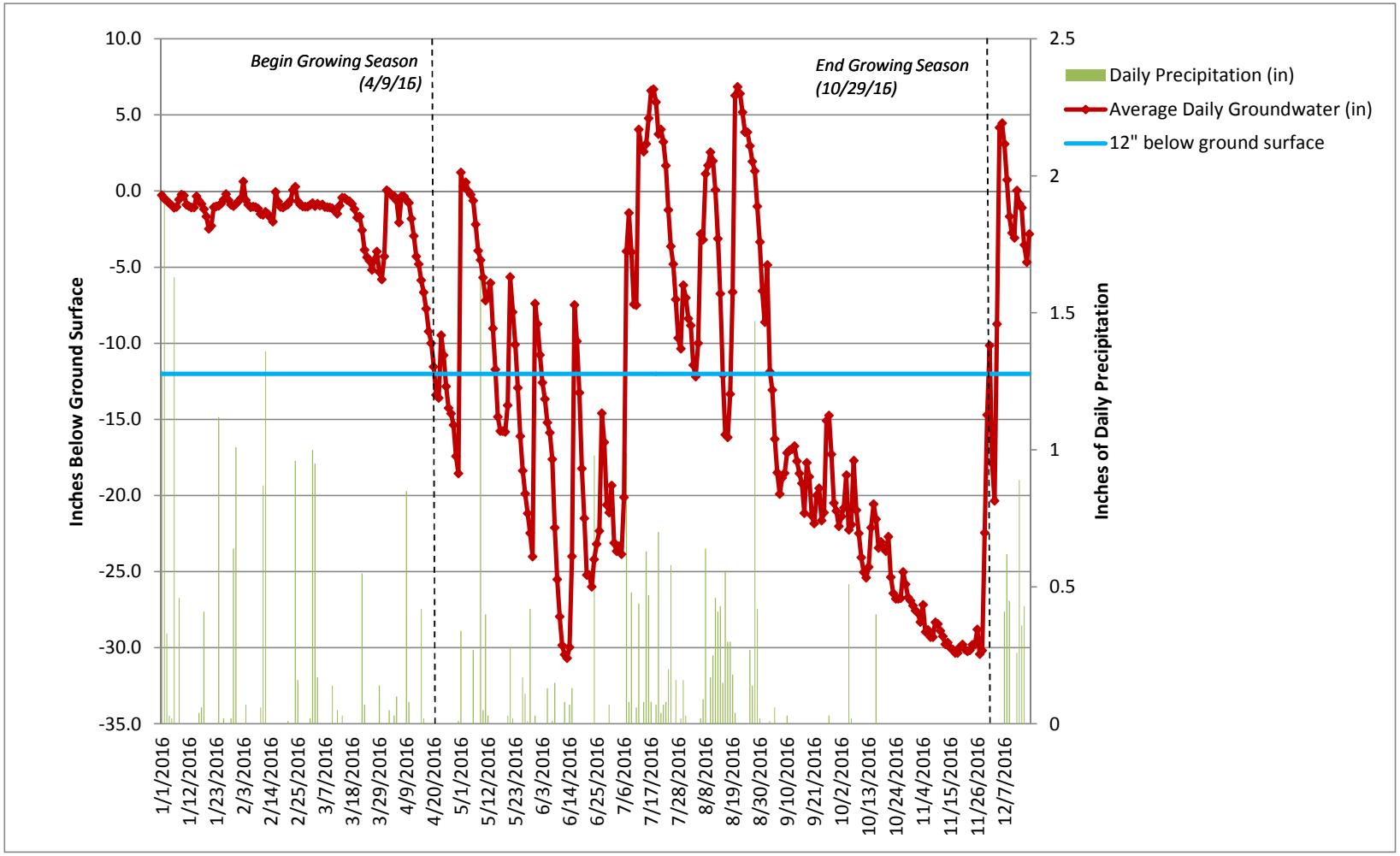
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	A28ABB0
Gauge ID :	14



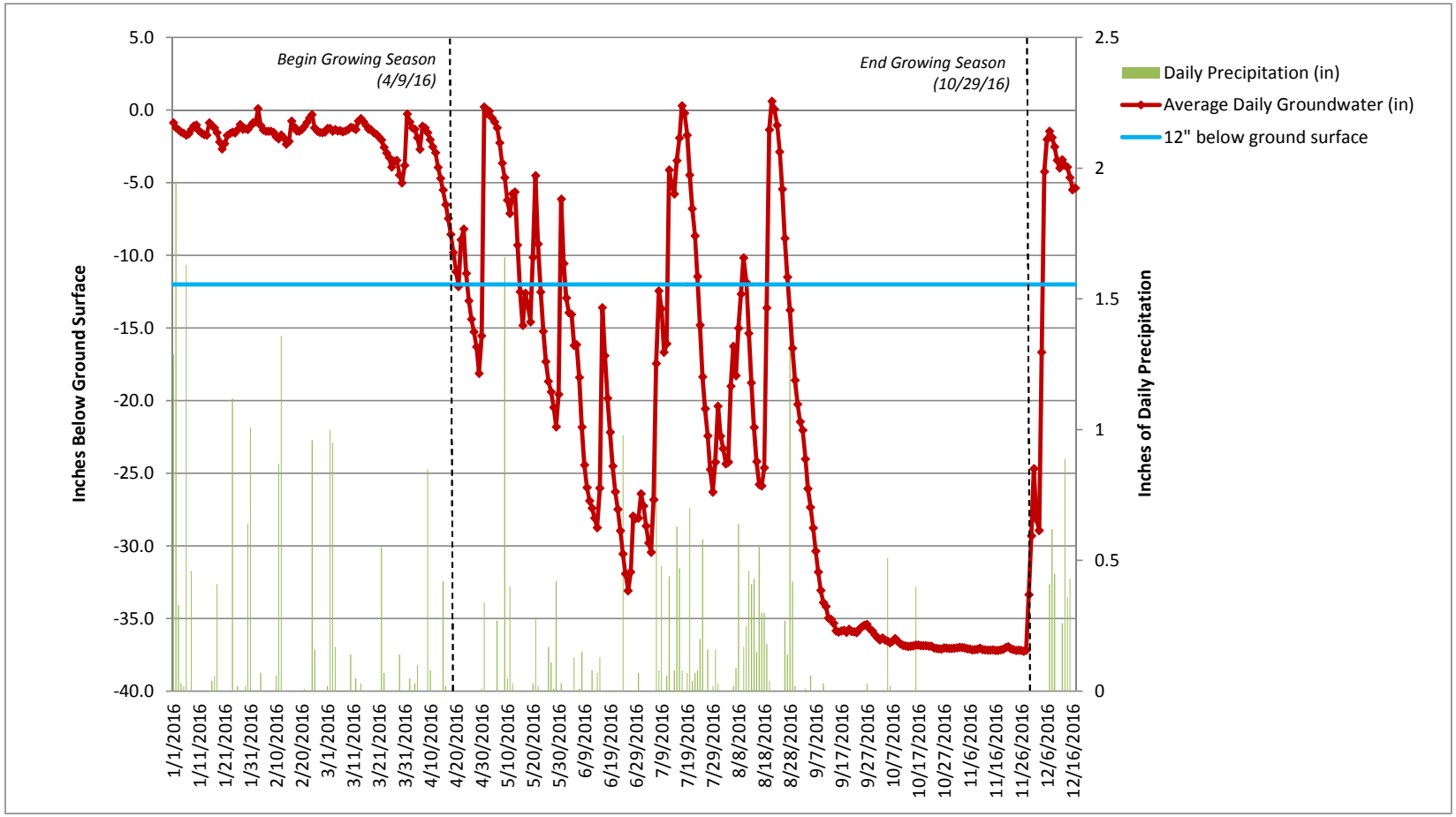
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9DE54F2
Gauge ID :	15



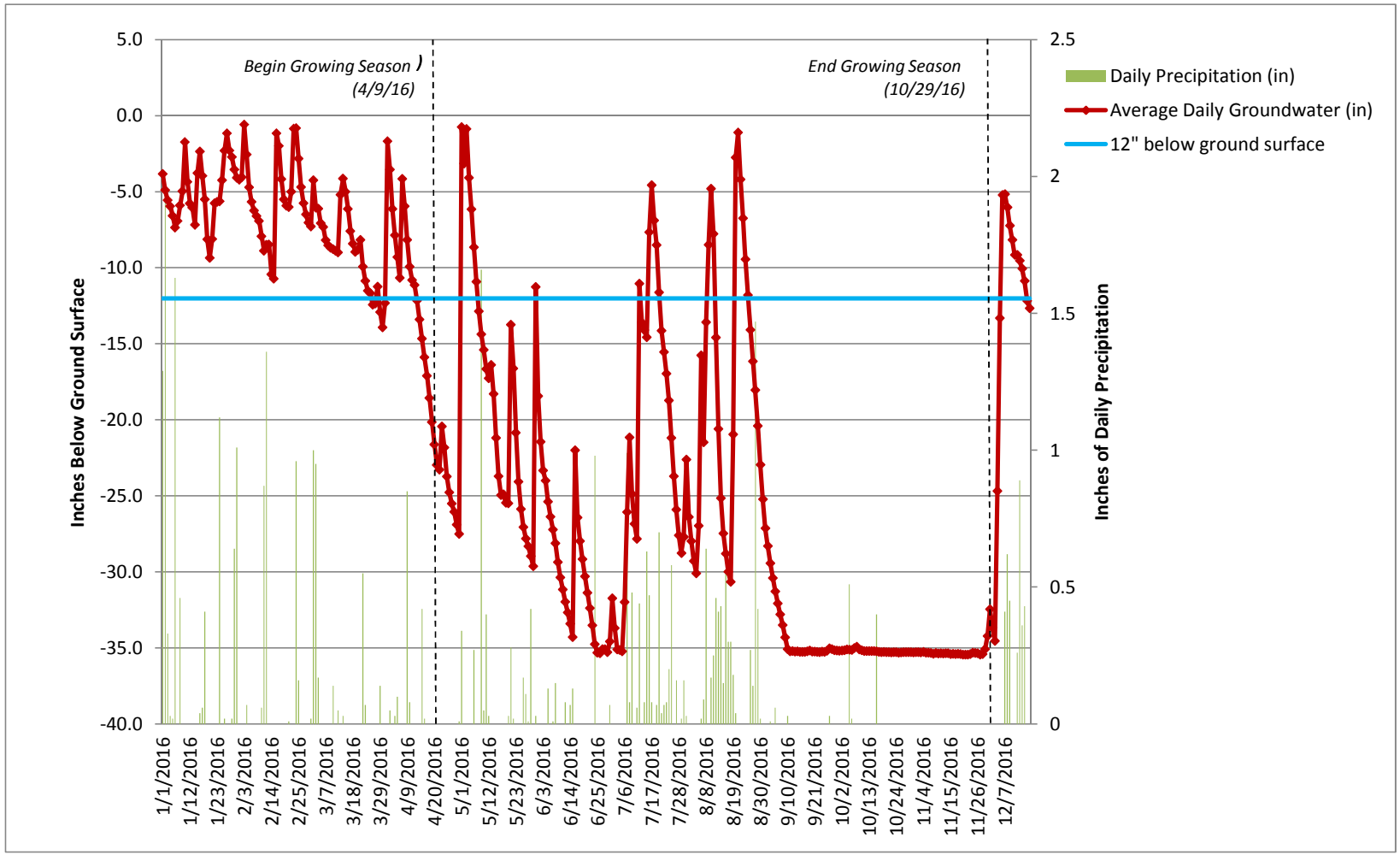
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	138BD91E / 1130EA33
Gauge ID :	16



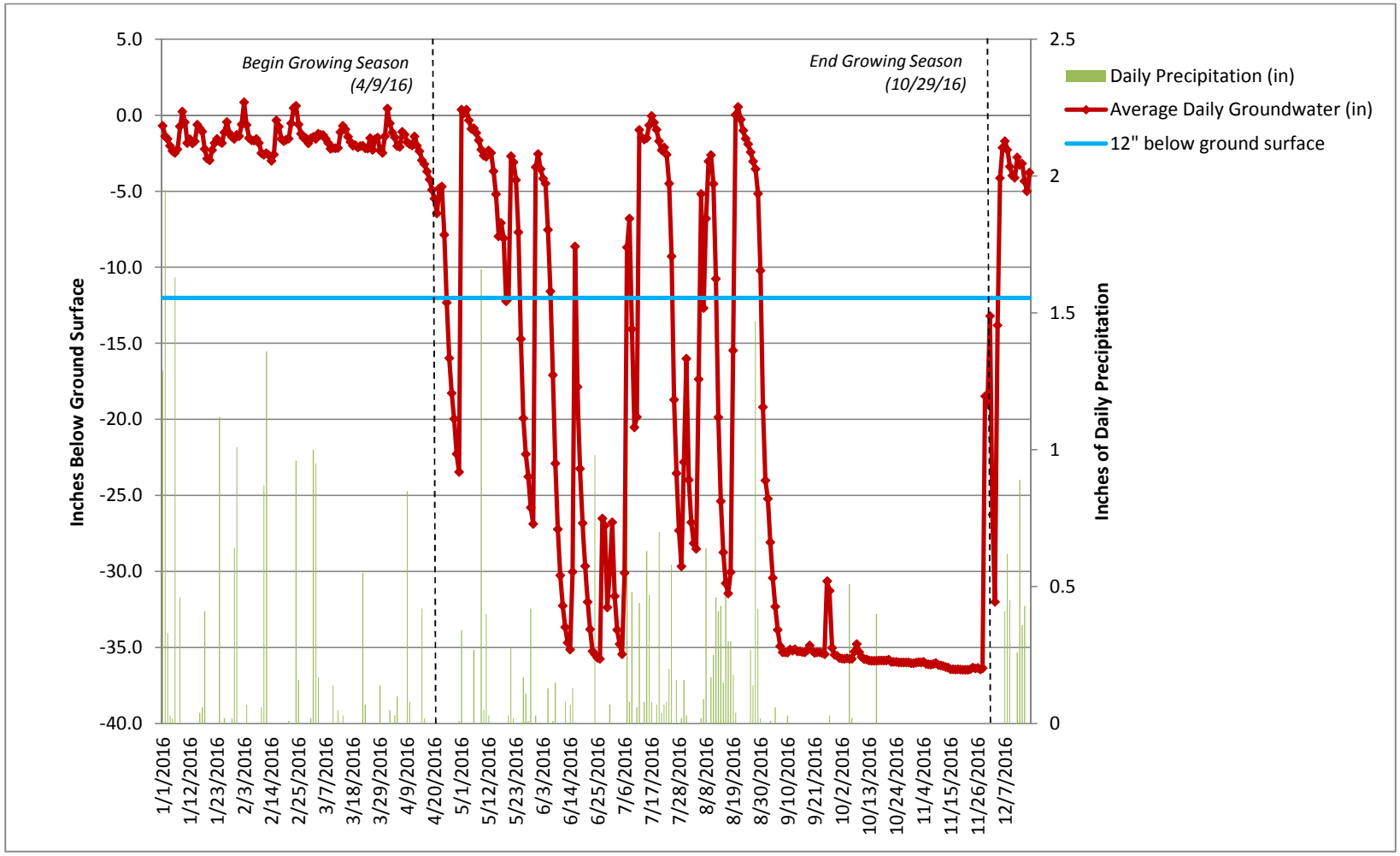
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9BEBCFO
Gauge ID :	18



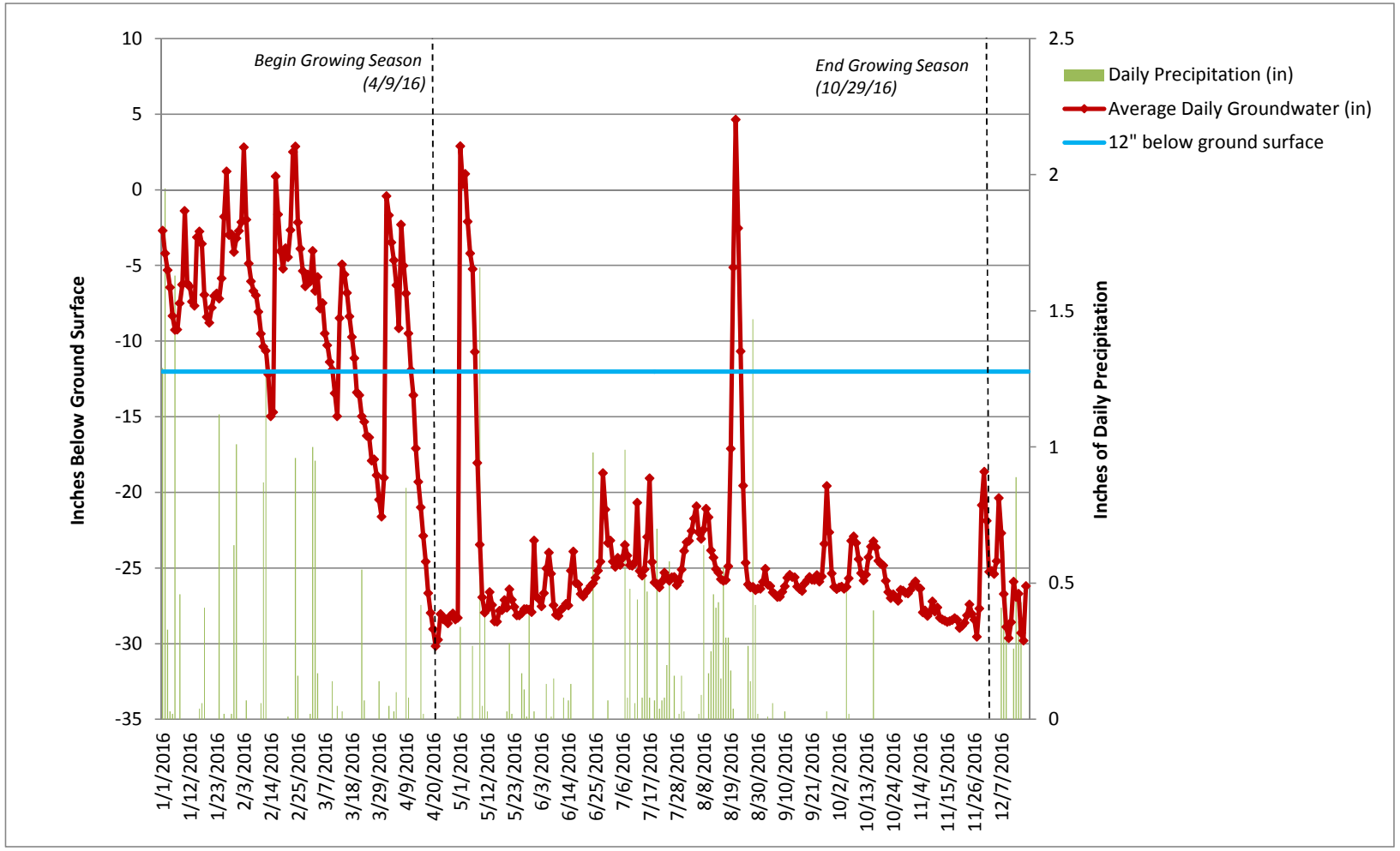
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	136ACA3C
Gauge ID :	19



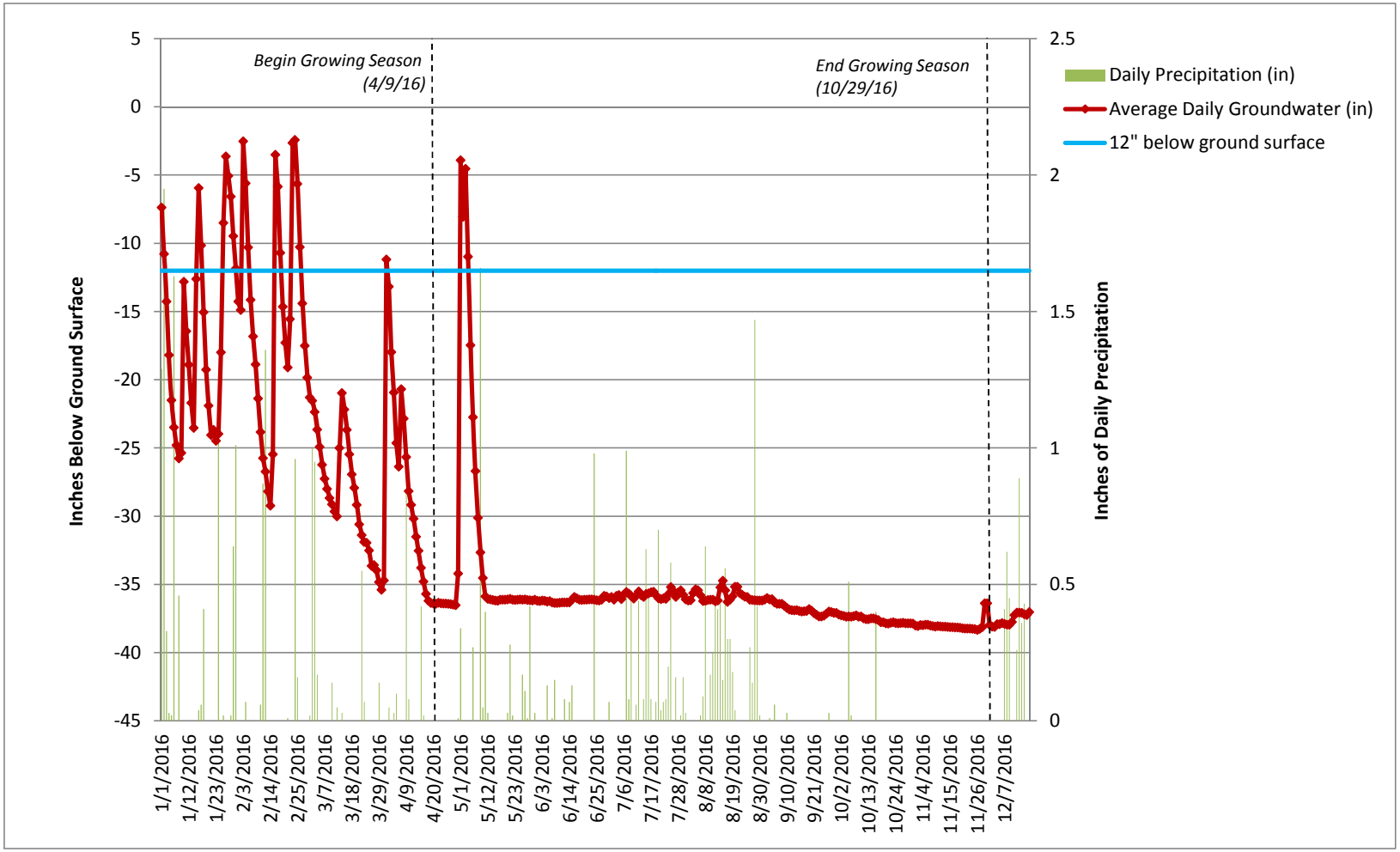
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	B651924
Gauge ID :	20



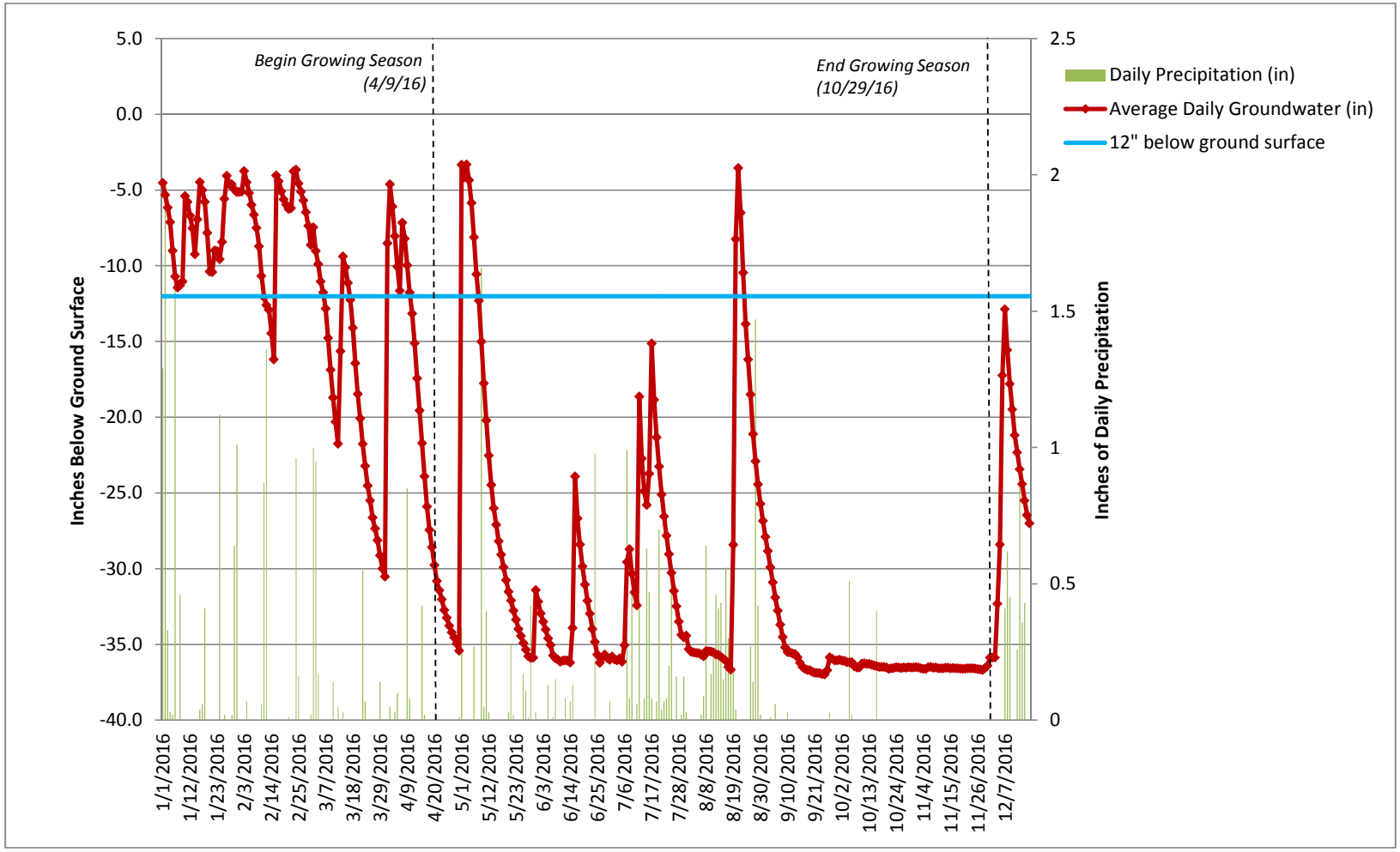
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	138BB5AA
Gauge ID :	21



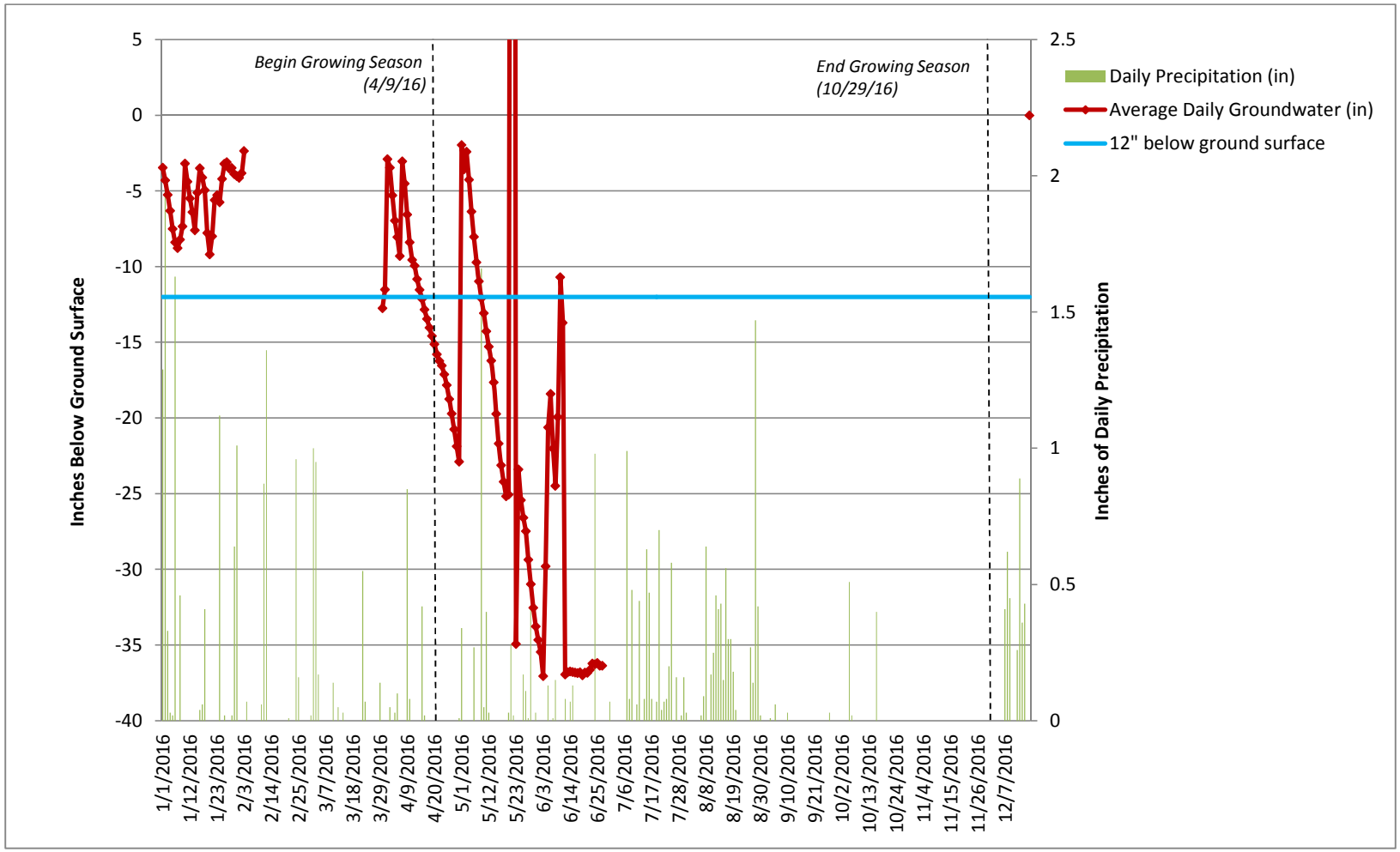
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	11312837
Gauge ID :	22



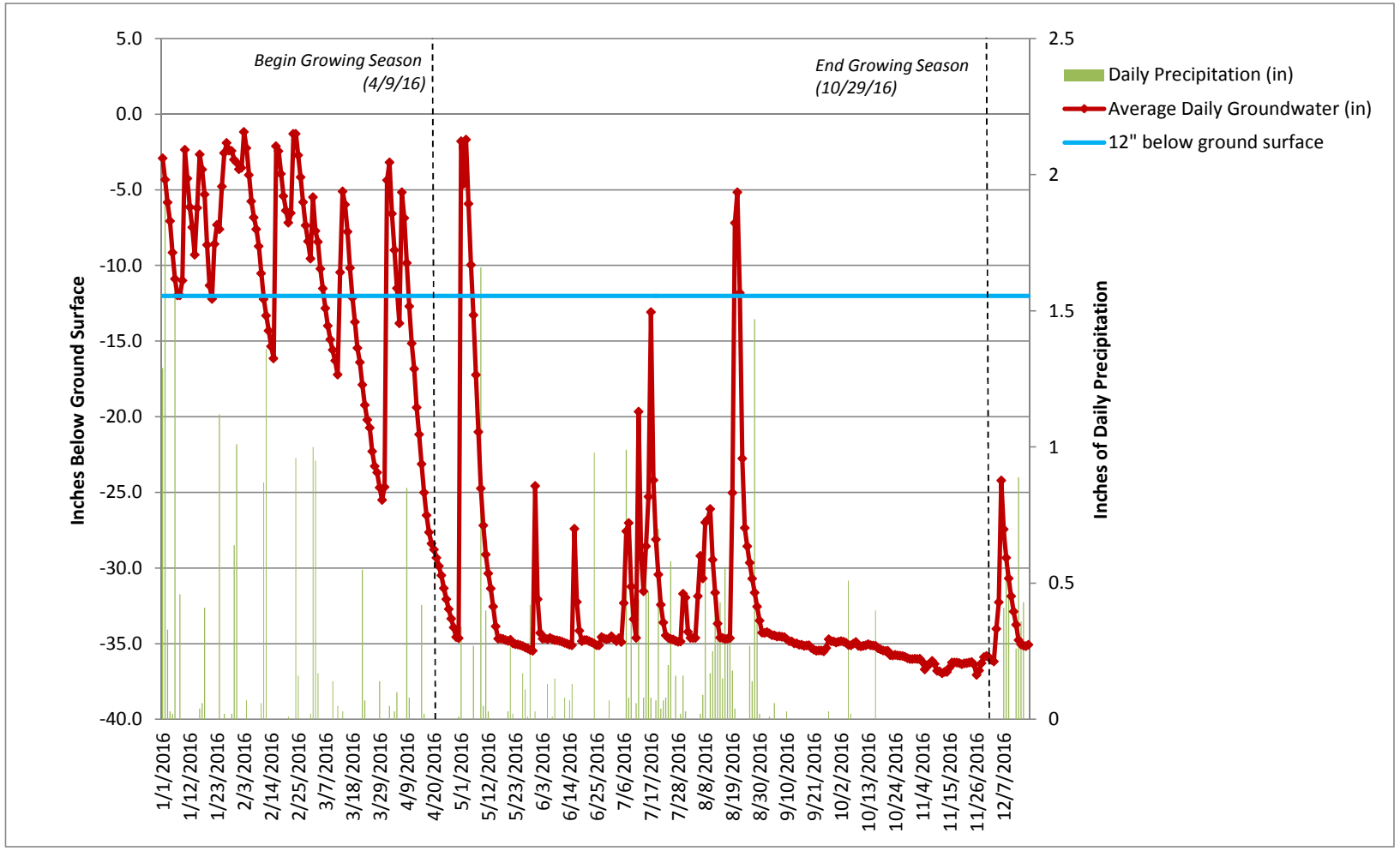
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	182727 / EDB96D7
Gauge ID :	23



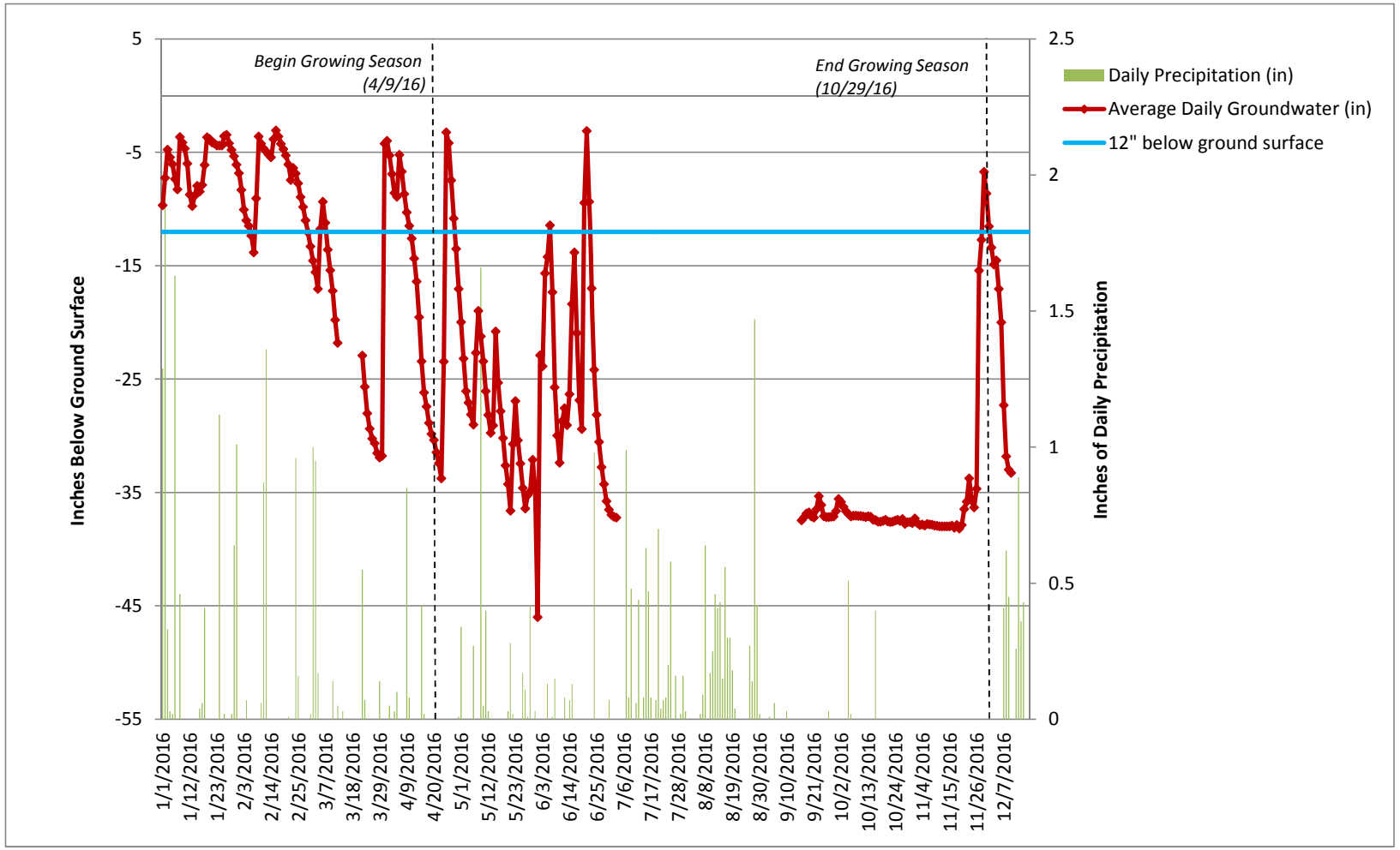
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	1314D206
Gauge ID :	24



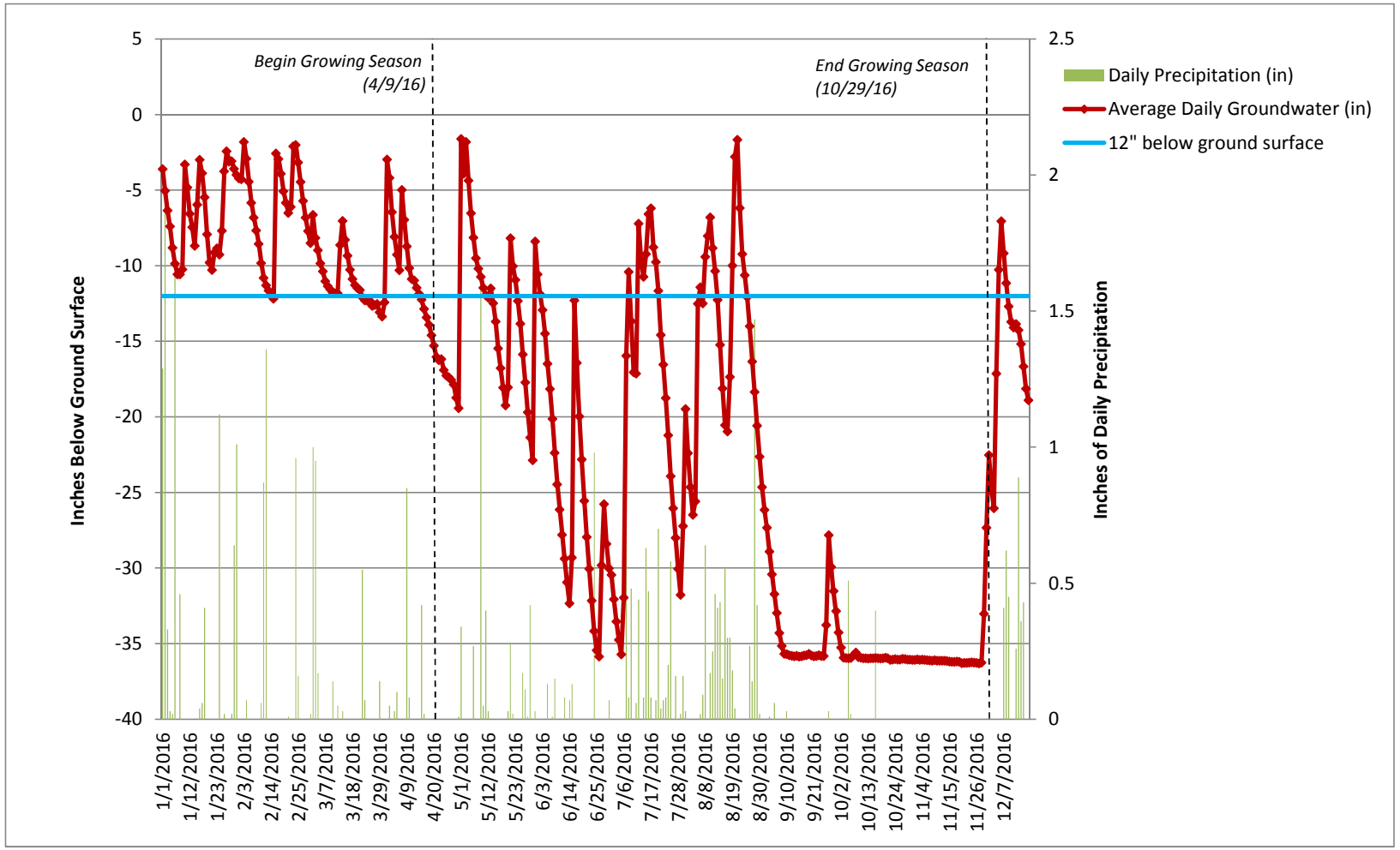
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9BEBF22 / 13D4B149
Gauge ID :	25



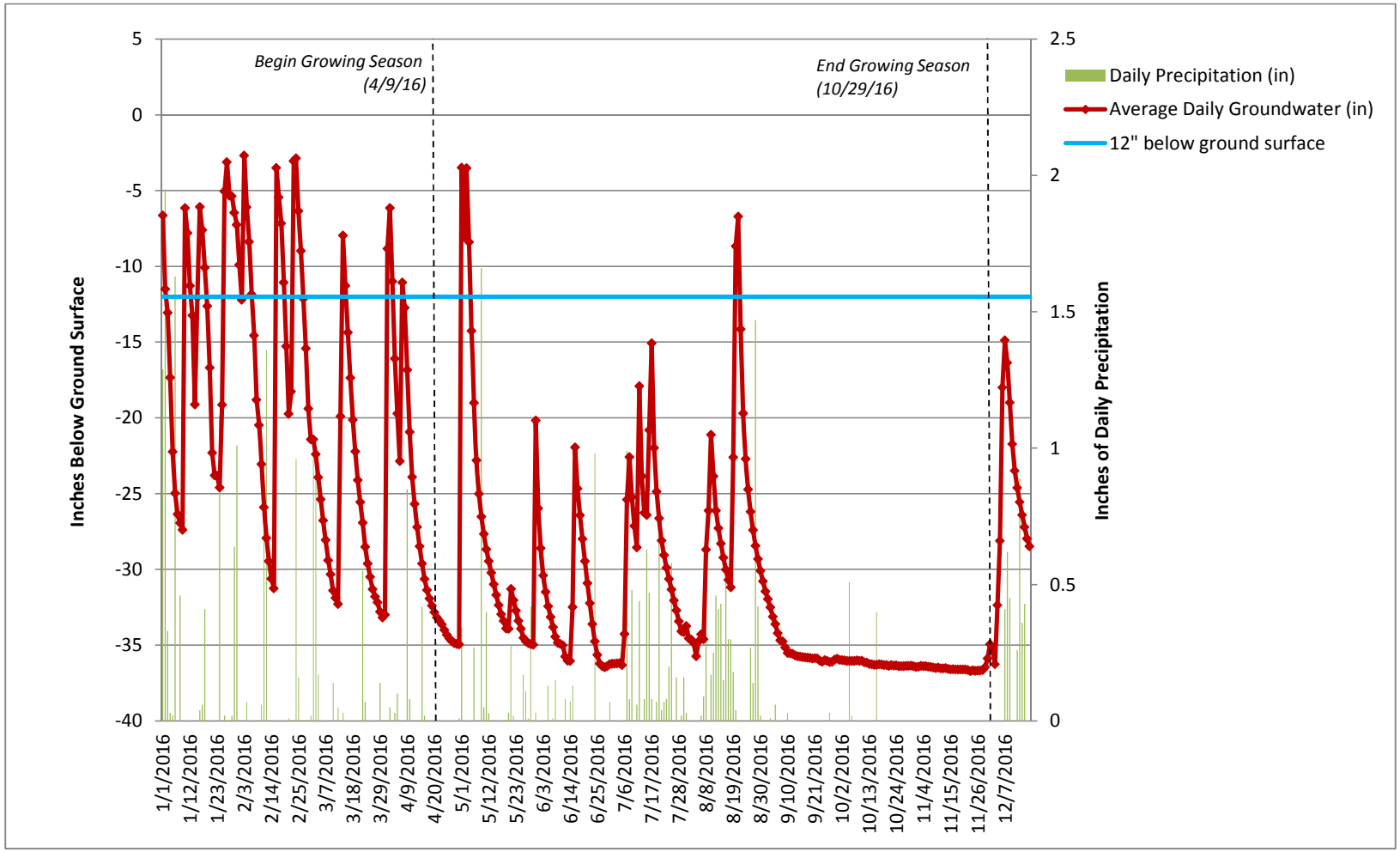
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	1314D1F1 / 1130FAA2
Gauge ID :	26



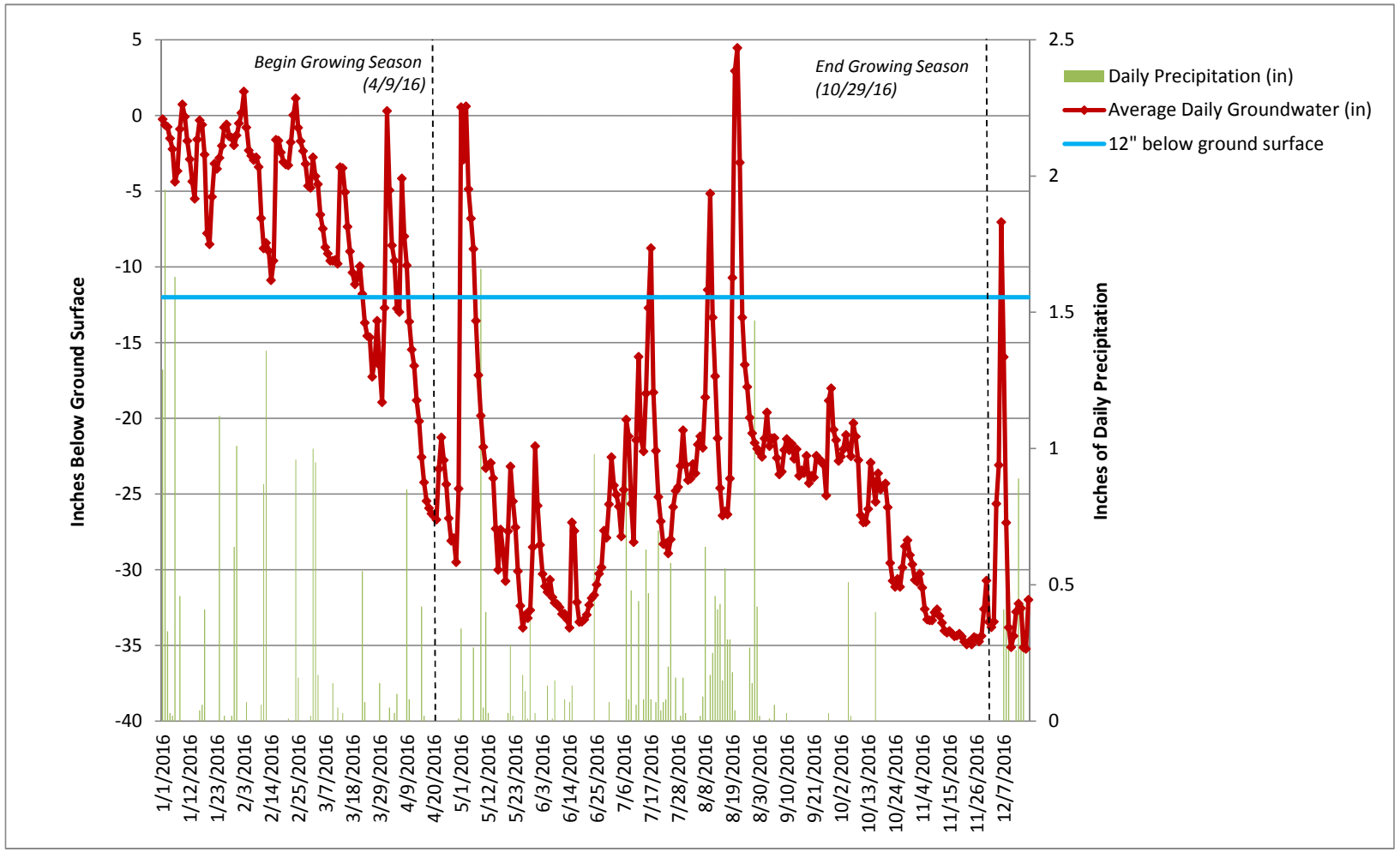
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	113118F8 / 14E1603B
Gauge ID :	27



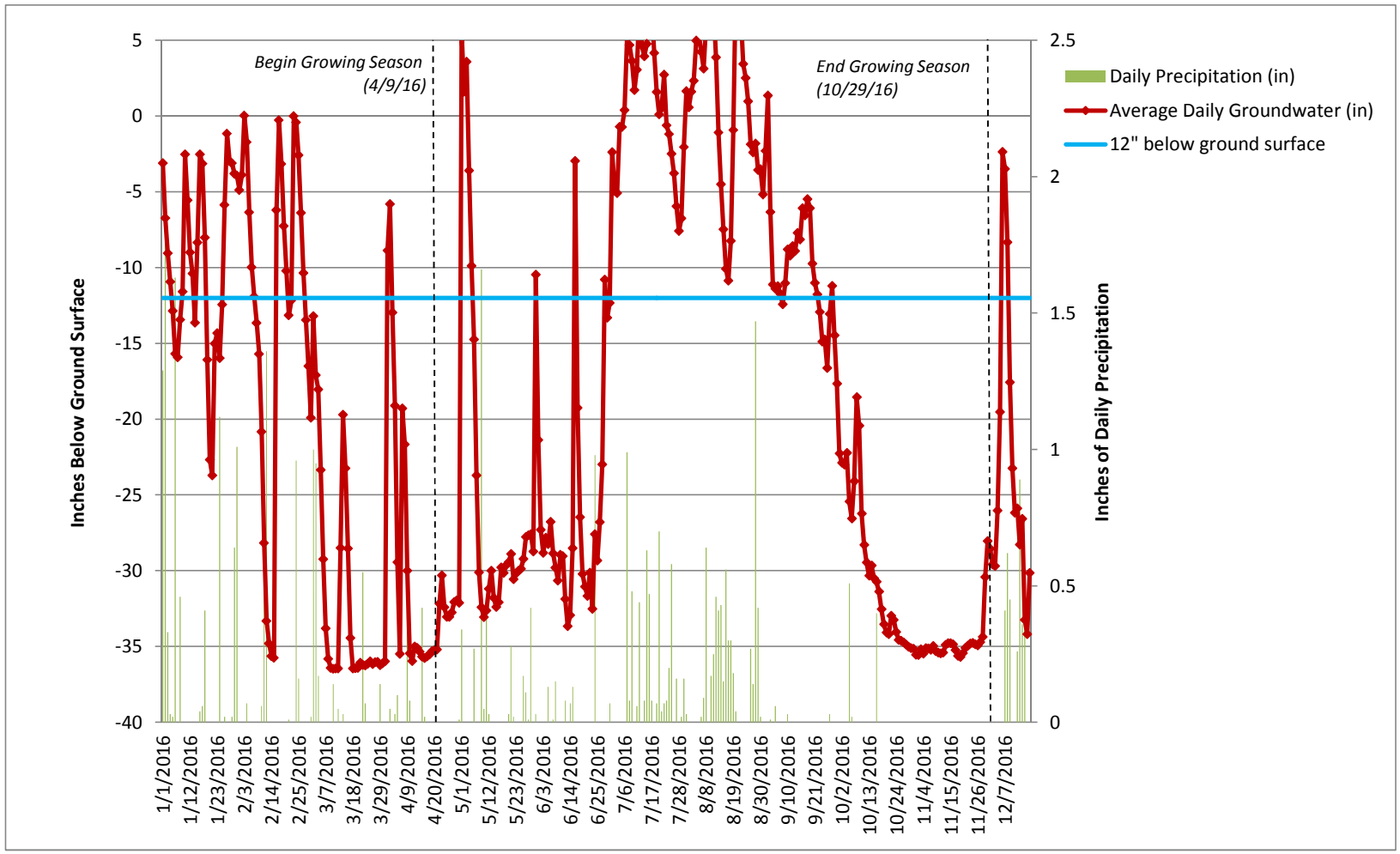
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	9BEA4DB / 9BEA426
Gauge ID :	28



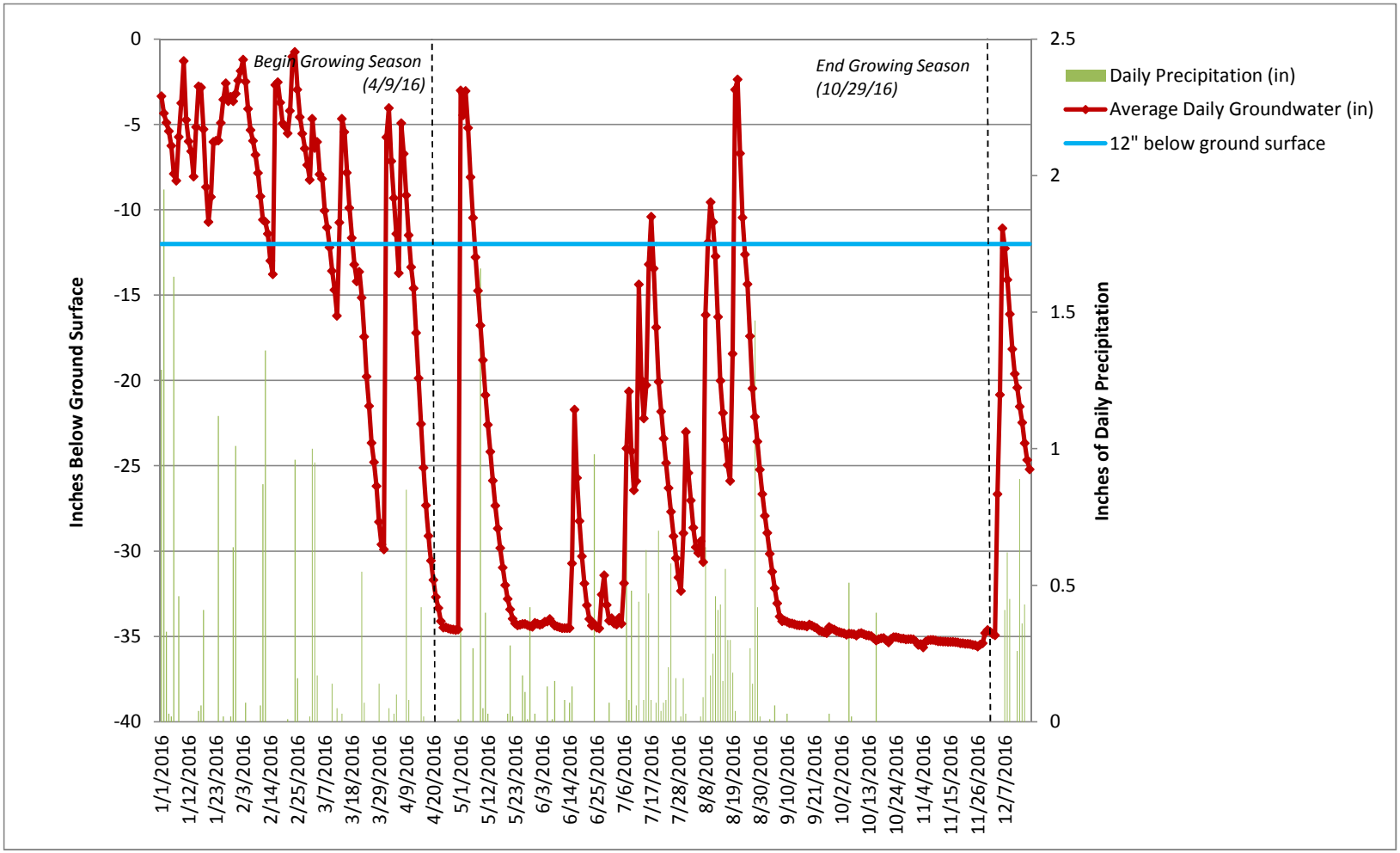
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	138BEO66
Gauge ID:	30



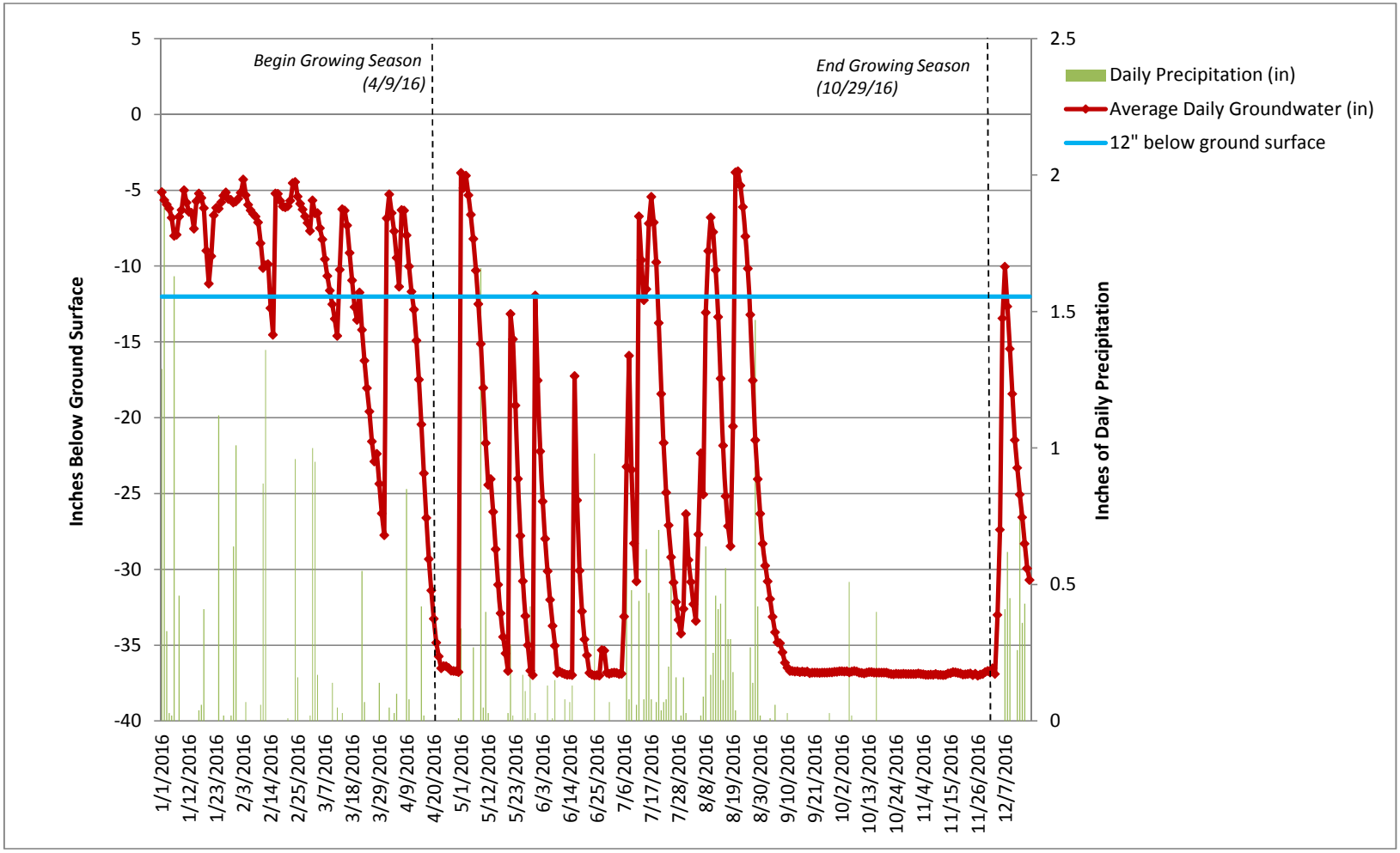
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	182724 / 13D4CFD5
Gauge ID:	31



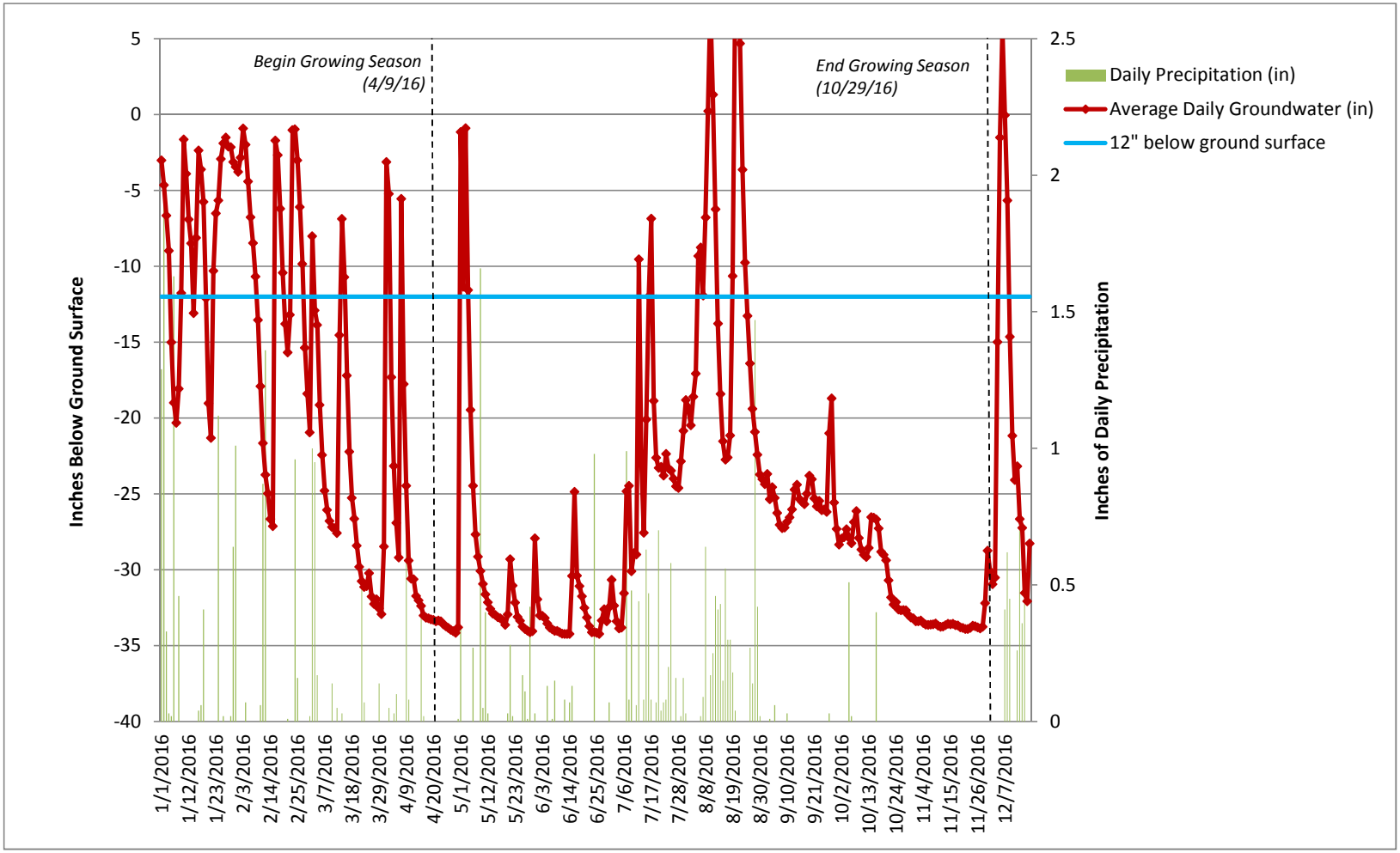
Project:	Fletcher-Meritor
EEP Project ID:	138
Wetland Component:	Project Riparian Wetlands
Growing Season:	April 9-October 29
Units	Inches
Gauge Type	Groundwater
Serial #	EBDD9BO
Gauge ID:	32



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

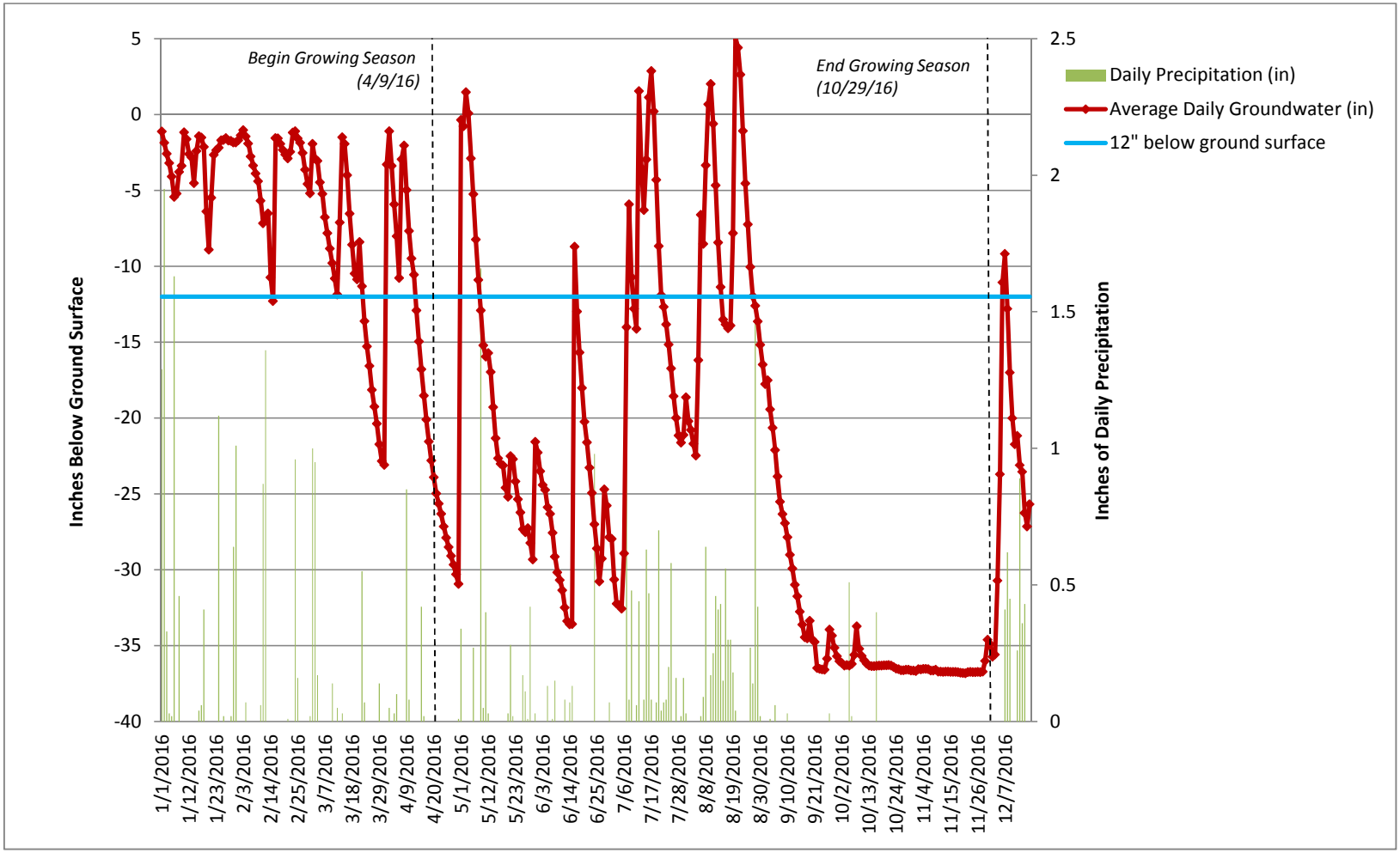


Table 12. Verification of Bankfull Events			
Fletcher Meritor Site (UT to Cane Creek)/ 138 Segment/Reach: feet			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo**
9/18/2012	9/18/2012	Visual observation of bankfull event during monitoring	
5/7/2013	5/6/2013 - 5/7/2013	Visual observation 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)	
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