Annual Monitoring Report

Monitoring Year 6 of 7

FINAL

North Fork Mountain Creek Stream and Wetland Restoration Site

NCDMS Contract No.: 002024

NCDMS Project No.: 94151

Catawba County, NC

Data Collected: April 2017 – November 2017

Prepared for:

Division of Mitigation Services

North Carolina Department of Environment and Natural Resources
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February 2018

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February 1, 2018

Matthew Reid
NC DEQ Division of Mitigation Services
5 Ravenscroft Drive, Suite 102
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RE: North Fork Mountain Creek Stream and Wetland Restoration Site: MY6 Monitoring Report (NCDMS ID 94151)

Listed below are comments provided by DMS on January 16, 2018 regarding the North Fork Mountain Creek Stream and Wetland Restoration Site: Year 6 Monitoring Report and RES' responses.

General:

There are many areas of aggradation, degradation, scour and a several stressed structures identified at the site. Does RES plan to implement a maintenance plan to address these issues? At a minimum, it seems some hand work and plantings could help stabilize these areas and allow time to heal before closing the project out. Please consider implementing some sort of maintenance plan to address the problem areas.
RES will develop a maintenance plan to address these issues and it will be implemented in 2018. This has been added to the report.

The wells not meeting success criteria have failed to make success criteria for several years in a row (NFMCS1, NFMCS2, NFMCS3 and NFMC5). As indicated in the MY5 monitoring report comments, if wetland hydrology does not appear to be trending towards success in MY6, payment will be withheld until the site shows improvement. The area surrounding these wells is approximately .20 acres. The MY6 invoice should reflect a payment deduction of $17,800 (.20 acres x $89,000/ac). The invoice amount for Task 12 should be $38,152.70 ($55,952.70-$17,800.00). Please acknowledge this reduction in the cover letter attached to the invoice.
Changes to the MY6 invoice have been made and acknowledged in the cover letter.

North Fork Mountain Creek
Catawba County, North Carolina
DMS Project ID 94151

Catawba River Basin
HUC 03050101150030

Prepared by:

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Raleigh, NC 27605
919-209-1061

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1.0 PROJECT SUMMARY

1.1. Project Setting and Background

The North Fork Mountain Creek Stream and Wetland Mitigation Site (NFMC) was identified and developed through the North Carolina Division of Mitigation Services (NCDMS) full delivery process. The site is located approximately six miles south of Catawba, North Carolina in southeastern Catawba County (**Figure 1**). The project lies within the Piedmont physiographic region (NCGS 2004) and USGS (2002) Level III ecoregion. The North Fork Mountain Creek watershed is within Catawba River Basin 14-digit Hydrologic Unit Code 03050101150030 and the North Carolina Division of Water Quality (NCDWQ) sub-basin 03-08-32 (NCDWQ 2010).

The mitigation site encompasses 17.2 acres containing 5,299 linear feet (LF) of stream channel and 4.44 acres of wetlands. The project consists of four reaches; reach 1 is on the mainstem of North Fork Mountain Creek, whereas reaches 2, 3, and 4 are on primary and secondary unnamed tributaries (UT1 and UT2) of North Fork Mountain Creek (**Figure 2**). An additional 0.97 acre of existing wetlands were preserved on the site; however, no mitigation credit is being claimed for this wetland preservation acreage per RFP 16-001117.

Prior to restoration the stream channels and wetlands were highly disturbed due to the presence of livestock that had unrestricted access to the riparian areas and stream channels. The riparian vegetation was decimated by overgrazing and trampling. The subsequently bare banks were then subject to severe erosion that was only exacerbated by hooves of the cattle.

The locations of credited wetlands within the project was reorganized in 2015 to account for changing hydrological function during restoration efforts. Data collected from monitoring wells showed portions of the wetland restoration area failing to meet minimum hydrologic criteria, while other areas not originally proposed as wetland restoration were returning to wetland conditions. These newly recognized wetlands would continue to be monitored for groundwater hydrology for the duration of the monitoring period, being subject to the same standards of performance as other wetland restoration areas on the site (**Appendix E**).

1.2. Project Approach

Channel restoration involving improved pattern, dimension, and profile was completed on all four stream reaches. Priority I and II approaches were applied to the mainstem North Fork Mountain Creek (Rosgen 1996; NCSRI 2004), whereas only a Priority II approach was used on the tributary reaches. A total of 1.17 acres of wetlands were restored along reaches 1, 2, 3, and 4, while 3.27 acres of wetlands were created along reaches 2 and 4 (**Figure 2**).

1.3. Project Goals

The primary and secondary project goals, as outlined in the 2011 restoration plan, are as follows:

Primary goals:

- Provide stable stream channels throughout 5,180 linear feet of channel restoration
- Restore riparian buffers throughout the project site
- Restore 1.16 acres of riparian wetland
- Create 3.03 acres of riparian wetland
- Provide permanent protection through conservation easement for the entire floodplain of North Fork Mountain Creek and its tributaries within the project area.

- Improve water quality by significantly reducing sediment loads from bank erosion and fencing out cattle.

Secondary goals:

- Increase the diversity and quantity of macrobenthos, salamanders, and fish by improving habitat and coarsening of the stream bed
- Improve vegetative communities and terrestrial habitat diversity
- Improve hydrology by increasing groundwater recharge, groundwater and surface water storage, and groundwater/surface water interaction.

1.4. Success Criteria

1.4.1. Stream

Success criteria pertain to the stability of the restored channel's dimension, pattern, and sediment transport. The restored channel must demonstrate the general maintenance of a stable cross-section and have hydrologic access to the floodplain over the monitoring period. The restoration reach should mimic reference reach conditions and the channel will be considered stable if there are little or insignificant changes from the as-built dimensions. Some change in stream dimension is natural and expected.

Traditionally, the success of a stream's pattern and dimension is determined utilizing the dimensionless ratios of reference reaches. The range of values for the dimensionless ratios of the reference reaches are applied to the design reaches. In this case, design reaches are deemed successful if the variability of its pattern and dimension remain within the range of the dimensionless ratios taken from the reference reaches, plus or minus one-half the value of that range. For the North Fork Mountain Creek restoration project, dimensionless ratios of the design reaches vary slightly from the dimensionless ratios of the reference reaches. As a result, the restoration will be determined to be successful if the dimensionless ratios of the pattern and dimension of the restoration reaches remain within their 'as-built' range, plus or minus one-half the value of the range of the dimensionless ratios of the reference reaches. Pattern features (bedform distributions and riffle/pool lengths and slopes) should demonstrate little adjustment within the 7-year monitoring period. In terms of sediment transport, no significant trend in the aggradational or depositional potential of the restoration reaches should occur over the monitoring period. A minimum of two bankfull events must be documented by crest gage [data] within the standard monitoring period.

1.4.2. Wetland

As per USACE (2003) guidelines, wetlands exhibiting water within 12 inches of the surface consecutively between 5% and 12.5% of the growing season in most years may be considered functional wetlands. The growing season at the North Fork Mountain Creek site extends from March 21 to November 11, a total of 236 days (NRCS 2012). Restored wetland hydrology is being compared to reference wetland hydrology both on-site and at the South Fork project (NCNCDMS Project No. 346, unpublished data). Based on data collected on-site, an 8% hydroperiod will be used as success criteria for this project.

1.5. Project Performance

This report presents the results of the Monitoring Year 6 (MY6) visual, hydraulic, vegetative, and groundwater data collected by two crest gauges, 16 automated groundwater monitoring stations, one automated rain gauge, 14 vegetative monitoring plots, and 31 photographic reference locations: as specified in the approved Restoration Plan and Baseline Report (EBX 2009, 2012).

Visual assessment of the site consisted of re-visiting 31 photographic reference locations (**Appendix B**), visually assessing the integrity of the channel and structures, assessing the establishment of planted

and volunteer vegetation, and documenting the presence of invasive plant species. Stream problem areas consist of stream bed degradation and aggradation, bank scour, and stressed structures (**Figure 2, Table 4a**). RES will address any areas of severe aggradation, degradation, and scour throughout the site that presents a stream stability problem. Remedial work would include adding riffle material, adding live stakes along the banks, and if necessary installing grade control structures in the riffles where degradation is present. A maintenance plan will be developed and implemented in 2018. Vegetation problem areas consist of small, localized pockets of poor growth/vigor and invasive species (**Figure 2, Table 4b**). Representative photos of problem areas are located in Appendix B. Representative photos of problem areas can be accessed through the digital e-submission file submitted to NCDMS. Numerous stream problem areas that were noted in MY5 have improved or become stable and therefore are not considered problem areas in MY6. In particular, several areas of bed degradation from MY5 appeared to re-establish riffle bedform in MY6, while several bank erosion areas from MY5 have stabilized as woody vegetation on the banks have matured. Numerous vegetation problem areas from MY5 have also improved and are not considered problem areas in MY6. In particular, one low stem density area from MY5 has been reclassified as area of poor growth rate/vigor for MY6 as it contains substantial woody vegetation, though with less vigorous growth as compared to the surrounding easement vegetation.

As per the approved Restoration Plan and Baseline Report (EBX 2009, 2012), geomorphological parameters were not monitored in MY6. Geomorphology monitoring will continue in Monitoring Year 7.

Vegetation data collected during MY6 indicate that all 14 permanent vegetation monitoring plots are currently meeting the seven-year vegetative success criteria of 210 stems per acre (**Table 5**). Average stem density across all plots was 864 stems per acre with an average height of 678 centimeters during MY6 (**Table 5**). A total of 20 woody plant species were documented within the vegetation plots (**Table 7**). Although, a few small areas of poor growth were noted (**Figure 2**), herbaceous vegetation is well established throughout the easement.

Precipitation at NFMC was mostly average for the growing season with the exception of April being wetter than the 70th percentile and mid-July being drier than the 30th percentile for precipitation in Catawba County (**Table 9, Chart 1**). During MY6, eight of the ten original monitoring wells met the 8% hydroperiod success criteria (**Table 10**). Hydroperiods for the original wells (NFMC-1 through NFMC-10) ranged from 3.6% to 51.3%. For MY6, data was not recorded at NFMC-10 due to a broken HOBO transducer, but a replacement was installed on November 14, 2017. NFMC-5 did not meet success for MY6, while NFMC-4 was successful. The four supplemental gauges in the vicinity of NFMC-5 located on the right descending bank (south eastern portion) of reach 2 were again monitored to determine wetland success. NFMC-S4 met hydrology success criteria with a hydroperiod of 8.1%, however NFMC-S1, NFMC-S2, and NFMC-S3 located closest to the lacking NFMC-5 gauge, did not meet the success criteria during MY6 with hydroperiods of 0.8%, 2.1%, and 0.8%, respectively.

On February 4, 2015, RES, IRT, and DMS conducted an onsite meeting to review and discuss non-performing areas within the restored wetland that were failing to meet wetland criteria based on the Restoration Plan. Based on monitoring well data, portions of the constructed wetland area appeared not to be meeting the minimum hydrology standard, while other areas that were not proposed for restoration did appear to be returning to wetland conditions. RES requested the areas be swapped so that mitigation credit could be obtained for the areas that were returning to wetland in lieu of the area not meeting criteria; to which the IRT agreed. This new area is subject to the same performance standards as the other wetlands restored on the site. Two supplemental wells were installed in this area at the upper end of Reach 2, NFMC-S5 and NFMC-S6, and both met success criteria for MY6 with 41.5% and 19.1% hydroperiods, respectively.

Since project completion in June 2012, six bankfull events have occurred at the project site. An initial bankfull event occurred in August 2012, which registered 0.58 foot above bankfull on UT1- Reach 2. The crest gauge on North Fork Mountain Creek- Reach 1 was damaged from the event and, consequently, the water level above bankfull could not be determined; however, the event was photo documented. A second event was documented using wrack lines in January 2013. The third event registered on the Reach 1 crest gauge as 0.33 foot above bankfull. The Reach 2 crest gauge did not register a bankfull event; however, photo-documentation of wrack lines along the reach indicated that a bankfull event did occur on this reach as well. During MY4, crest gauge data and wrack line observations on both Reach 1 and Reach 2 indicated a bankfull event had occurred. During MY5, one bankfull event was noted on Reach 1 with the crest gauge recording a water level 0.10 foot above bankfull. During MY6, one bankfull event was noted on Reach 1 with the crest gauge recording a water level 0.24 foot above bankfull (**Table 8**).

Summary information/data related to the occurrence of such things as beaver or encroachment, and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Additional background and supporting information can be found in the Baseline Monitoring Report (EBX 2012) and in the Mitigation Plan (EBX 2011) documents.

2.0 METHODS

This report presents the results of the MY6 visual and hydrologic data from 2 crest gauges, 16 automated groundwater monitoring stations, 1 automated rain gauge, 14 vegetation monitoring plots, and 31 photographic reference locations; as specified in the approved Restoration Plan and Baseline Report (EBX 2011, 2012).

Visual assessment of the stream was performed quarterly. Permanent photo station photos at 31 photographic reference locations were collected during the final visual assessment of the monitoring year in November, toward the end of the growing season. Additional photos of stream problem areas were documented with photographs and included in the electronic data submittal.

Geomorphological measurements were not taken during MY6 as per the approved Restoration Plan and Baseline Report (EBX 2011, 2012).

Vegetation success is being monitored using 14 permanent monitoring plots. Vegetation monitoring follows the CVS-EEP Level 2 Protocol for Recording Vegetation, Version 4.2 (Lee et al. 2008) and includes analysis of composition and density of planted species. Data is processed using the CVS data entry tool. In the field, the four corners of each plot were permanently marked with rebar and photos of each plot are taken from the origin each monitoring year.

Precipitation data was collected using an Onset HOBO Data Logging Rain Gauge. Groundwater for hydrologic success of the restored wetlands was monitored using 16 Onset HOBO U20 Water Level Loggers. An additional logger was installed on site, above ground, for use as a barometric reference. Data loggers collected depth to groundwater daily and all data were processed using HOBOware and analyzed using Microsoft Excel.

Bankfull events were documented with crest gauges located on Reaches 1 and 2. During quarterly visits to the site, the height of the corkline in each gauge was recorded.

3.0 REFERENCES

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USGS (U.S. Geological Survey). 2002. Ecoregions of North Carolina and South Carolina. Color poster with map, descriptive text, summary tables, and photographs. Reston, Virginia.

Appendix A

General Tables and Figures

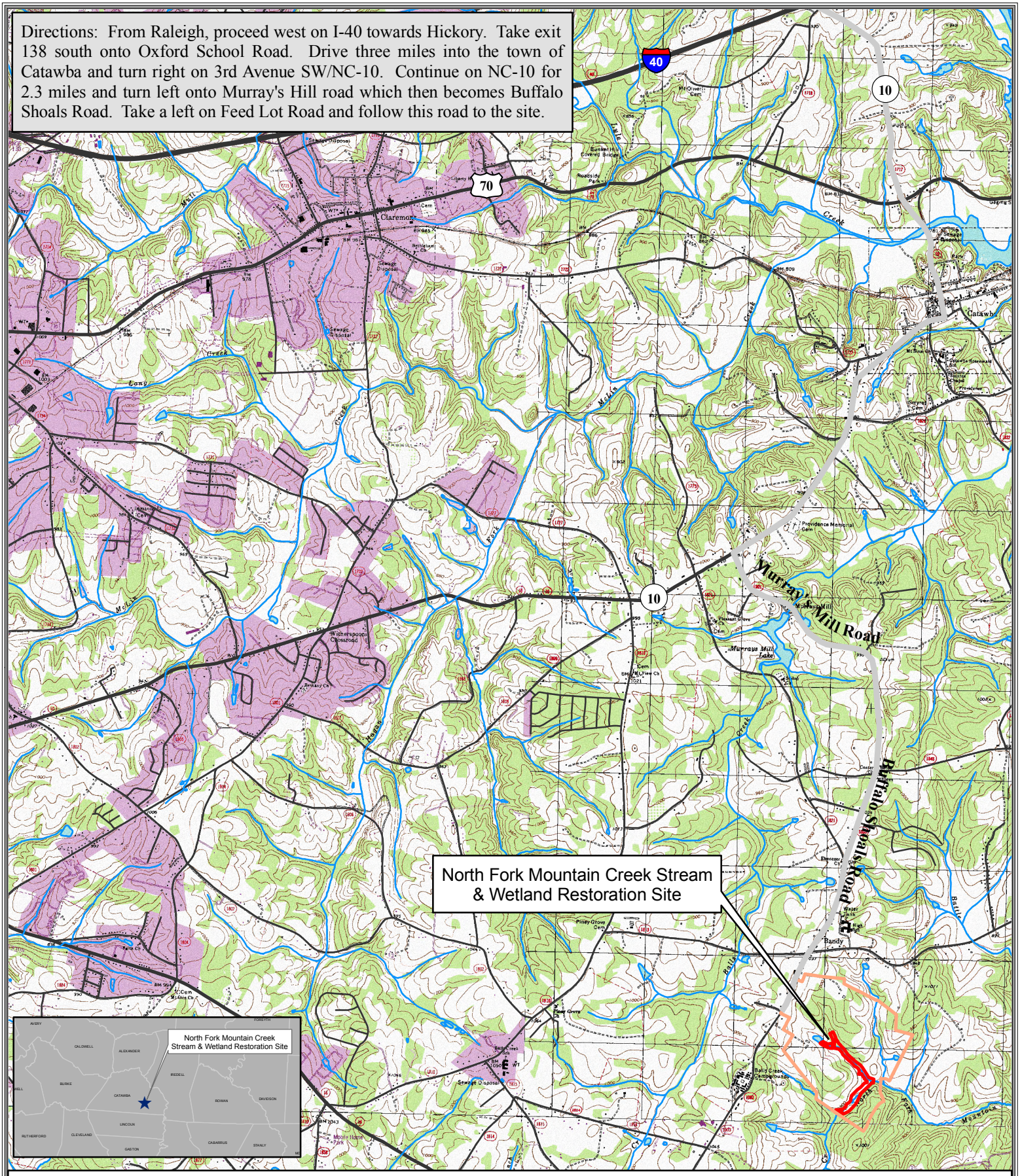

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Figure 1. Vicinity and Topographic Features Map
North Fork Mountain Creek Mitigation Site

0 0.5 1 2 Miles

N

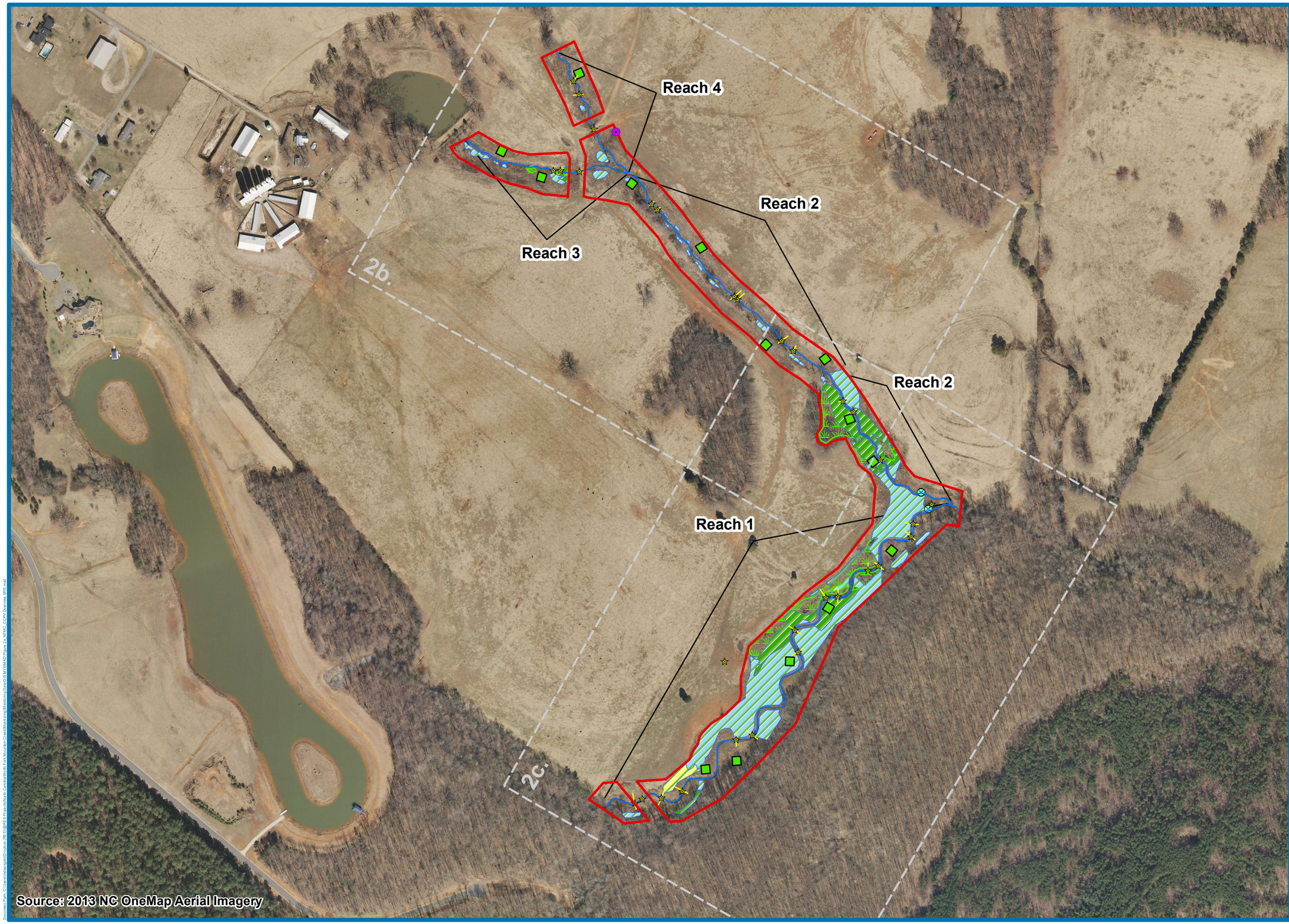
Property Boundary
Easement
Streams
Roads

Table 1. Project Components North Fork Mountain Creek Stream & Wetland / Project No. 94151							
Project Component or Reach ID	**Existing Feet/ Acres**	**Restoration Level**	**Approach**	**Restoration or Restoration Equivalent**	**Footage or Acreage**	**Mitigation Ratio**	**Mitigation Credits (WMUs/ SMUs)**
NFMC-4	2,245	R	R (P1/P2)	R	2,231	1:1	2,231
UT1-1	698	R	R (P1)	R	698	1:1	698
UT1-2	1,542	R	R (P1)	R	1,756	1:1	1,756
UT2-3	598	R	R (P1)	R	614	1:1	614
						Total SMUs	5,299
Wetland-R	-	R	R	R	1.2	1:1	1.17
Wetland-C	-	C	C	RE	3.27	2:1	1.64
Wetland-P	0.97	P	-	-	0.97	-	-
						Total WMUs	2.81

[1]W-R = wetlands restoration; W-C = wetlands creation; W-P = wetlands preservation.
[2]Wetland creation mitigation ratio was 2:1 as agreed upon with the USACE during the 401/404 permitting process (EBX 2012).
[3]Existing wetlands were preserved on the site, but no WMUs were credited to the project.

Table 2. Project Activity and Reporting History North Fork Mountain Creek Stream & Wetland Restoration Site		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Restoration Plan	Jul - 2011	Jul - 2011
Final Design - Construction Plans	N/A	Oct - 2011
Construction	N/A	May - 2012
Temporary S&E Mix Applied to Entire Project Area	N/A	May - 2012
Live Stakes and Bare Root Plantings for Entire Project Area	N/A	May - 2012
Mitigation Plan / As-Built (Year 0 Monitoring - Baseline)	Jun - 2012	Aug - 2012
Exotic Invasive Plant Control	Jun - 2012	Jun - 2012
Year 1 Monitoring - 2012	Dec - 2012	Jan - 2013
Year 2 Monitoring - 2013	Nov - 2013	Nov - 2013
Year 3 Monitoring - 2014	Nov - 2014	Dec - 2014
Mitigation Plan Addendum	Feb - 2015	May - 2015
Beaver Dam Removal	-	Sep - 2015
Year 4 Monitoring - 2015	Nov - 2015	Dec - 2015
Year 5 Monitoring - 2016	Nov - 2016	Dec - 2016
Year 6 Monitoring - 2017	Stream: N/A Vegetation: Nov - 2017	Feb-2018
Year 7 Monitoring - 2018		

Table 3. Project Contacts (NCDMS Project No. 94151)	
Contact	**Provider Information**
Designer Primary Project Design POC	Stantec Consulting, Inc. 801 Jones Franklin Rd. Suite 300 Raleigh, NC 27606 David Bidelspach (919) 218-0864
Construction Contractor Construction Contractor POC	North State Environmental, Inc. 2889 Lowery St. Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2010 Nate Martin (336) 725-2010
Planting Contractor 1 Planting Contractor 1 POC	New Forest Services 313 Condon Road Manistee, MI 49660 Brian Jarvinen (231) 590-9198
Planting Contractor 2 Planting Contractor 2 POC	Strader Farms, LLC Kenneth Strader
Seed Mix Sources	Green Resource 5204 Highgreen Court Colfax, NC 27235
Nursery Stock Suppliers	ArborGen (Trees and Livestakes) Blenheim, SC Strader Farms (Livestakes)
Baseline Monitoring Performers (Year 0)	Stantec Consulting Services, Inc. 801 Jones Franklin Rd Suite 300 Raleigh, NC 27606
Stream Monitoring POC	Tim Taylor (704) 329-0900
Vegetation Monitoring POC	N/A
Wetland Monitoring POC	N/A
Annual Monitoring Performers (Year 1-5)	Equinox Environmental Consultation and Design, Inc. 37 Haywood St. Suite 100 Asheville, NC 28801
Stream Monitoring POC	Drew Alderman (828) 253-6856
Vegetation Monitoring POC	Drew Alderman (828) 253-6856
Wetland Monitoring POC	Drew Alderman (828) 253-6856
Annual Monitoring Performers (Year 6)	Resource Environmental Solutions, LLC 302 Jefferson St. Suite 110 Raleigh, NC 27605
Stream Monitoring POC	Ryan Medric (919) 741-6268
Vegetation Monitoring POC	Ryan Medric (919) 741-6268
Wetland Monitoring POC	Ryan Medric (919) 741-6268



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N
W E
S
0 175 350
Feet

1 inch = 350 feet

Figure 2a.
NFMC
Stream & Wetland
Restoration Project
MY6 2017

Current Conditions
Overview Map

Date: 12/1/2017 | Drawn by: RTM

LEGEND

- Conservation Easement
- Stream Restoration
- Cross Section
- Photo Station
- Crest Gauge
- Rain Gauge

Wetland Type

- Creation
- Restoration
- Existing
- Expansion (MY4)

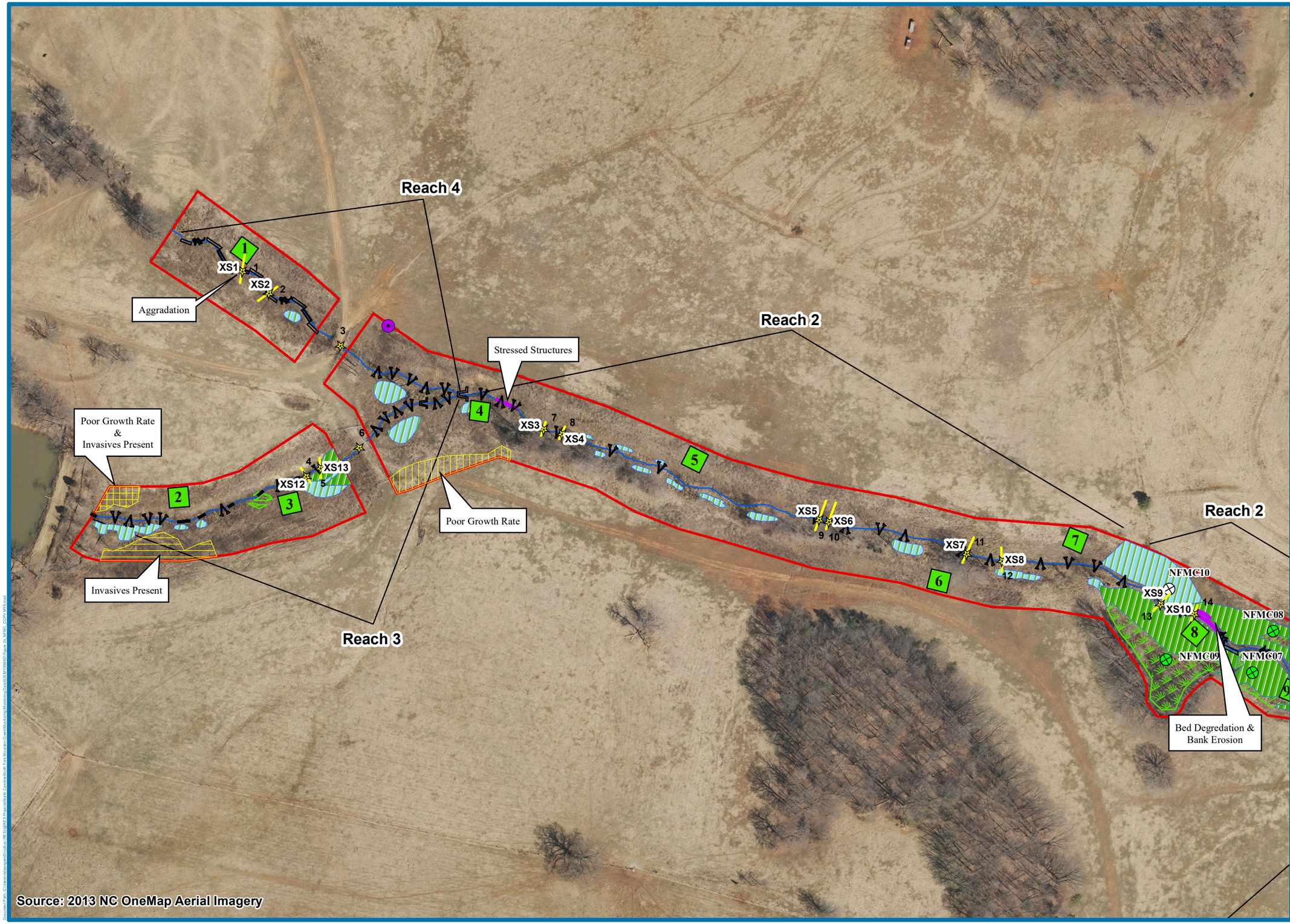
Vegetation Plots

- Success Criteria Met

Riparian Buffer Conditions

Invasive Species	Target Community: Present	Marginal	Absent
Absent	No Fill		
Present			
Common			

Document Path: C:\Users\rtmeadows\Dropbox (RES)\RES 5 Projects\North Carolina\North Fork Mountain Creek\Monitoring\Maps\mxd\Data\GIS\MY6\MXD\Figure 2a_NFMC_CCPV Overview_MY6.mxd



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N E S W

0 75 150

Feet

1 inch = 150 feet

Figure 2b. NFMC Stream & Wetland Restoration Project MY6 2017

Current Conditions Plan View

Date: 12/4/2017 | Drawn by: RTM

LEGEND

- Conservation Easement
- Stream Restoration
- Cross Section
- Stream Problem Areas
- Rain Gauge
- Photo Station
- Crest Gauge

Wetland Type

- Creation
- Restoration
- Existing
- Expansion (MY4)

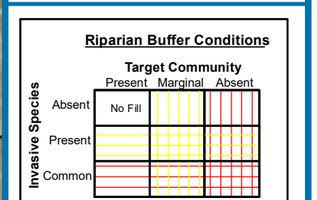
Vegetation Plots

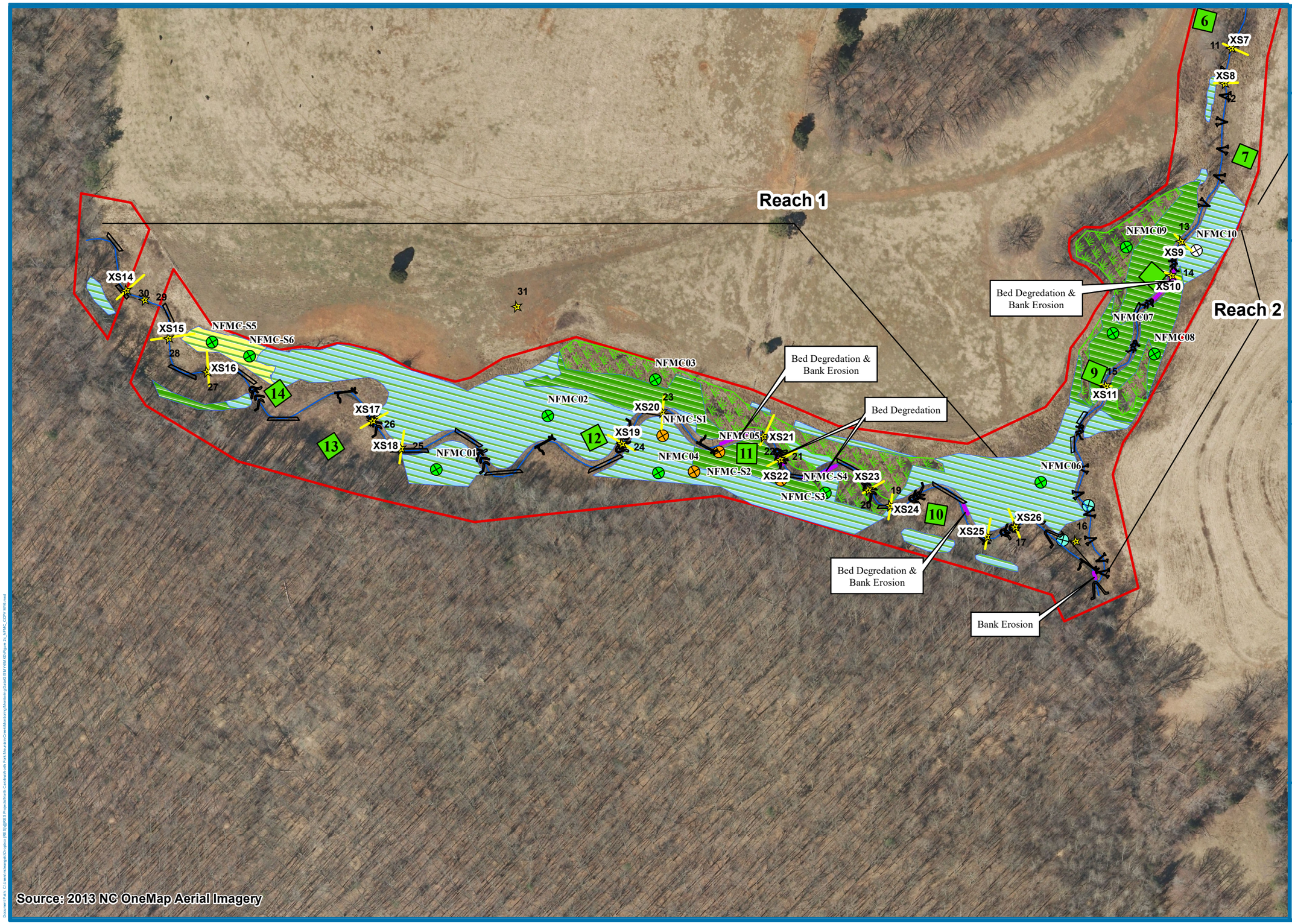
- Success Criteria Met

Wetland Gauges

- >8% Hydroperiod
- <8% Hydroperiod
- No Data

Riparian Buffer Conditions





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0 75 150
Feet

1 inch = 150 feet

Figure 2c. NFMC Stream & Wetland Restoration Project MY6 2017

Current Conditions Plan View

Date: 12/4/2017 | Drawn by: RTM

LEGEND

- Conservation Easement
- Stream Restoration
- Cross Section
- Stream Problem Areas
- Photo Station
- Crest Gauge

Wetland Type

- Creation
- Restoration
- Existing
- Expansion (MY4)

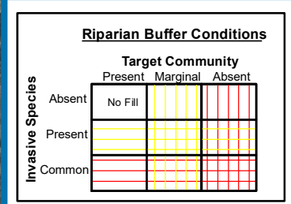
Vegetation Plots

- Success Criteria Met

Wetland Gauges

- >8% Hydroperiod
- <8% Hydroperiod
- No Data

Riparian Buffer Conditions



Appendix B

Visual Assessment Data

Table 4a. Visual Stream Morphology Stability Assessment
Table 4b. Vegetation Condition Assessment
MY6 – Permanent Photo Station Photos
MY6 – Representative Photos of Stream Problem Areas

Table 4a. Stream Problem Areas Table North Fork Mountain Creek Stream and Wetland / Project No. 94151				
Reach	**STA**	**Feature**	**Description**	**Notes**
1	314+00, 318+60	Bed/Bank	Degradation/Erosion	
	315+00, 315+75	Bed	Degradation	
	321+50	Bank	Erosion	
2	118+50	Bed/Bank	Degradation/Erosion	
	106+00	Structures	Stressed Structures	Multiple
4	101+60	Bed	Aggradation	

Table 4b. Vegetation Problem Areas Table North Fork Mountain Creek Stream and Wetland / Project No. 94151				
Reach	**STA**	**Feature**	**Description**	**Notes**
3	200+00	Easement	Poor Growth Rate & Invasives Present	*Lonicera japonica*; 0.04 acre
	200+50	Easement	Invasives Present	*Lonicera japonica*, *Rosa multiflora;* 0.12 acre
	205+50	Easement	Poor Growth Rate	0.12 acre

MY6 – 2017 Permanent Photo Points

Reach 4 – Permanent Photo Point 1
Downstream
November 14, 2017

Reach 4 – Permanent Photo Point 2
Downstream
November 14, 2017

Reach 4 – Permanent Photo Point 3
Downstream
November 14, 2017

Reach 4 – Permanent Photo Point 3
Upstream
November 14, 2017

Reach 3 – Permanent Photo Point 4
Downstream
November 14, 2017

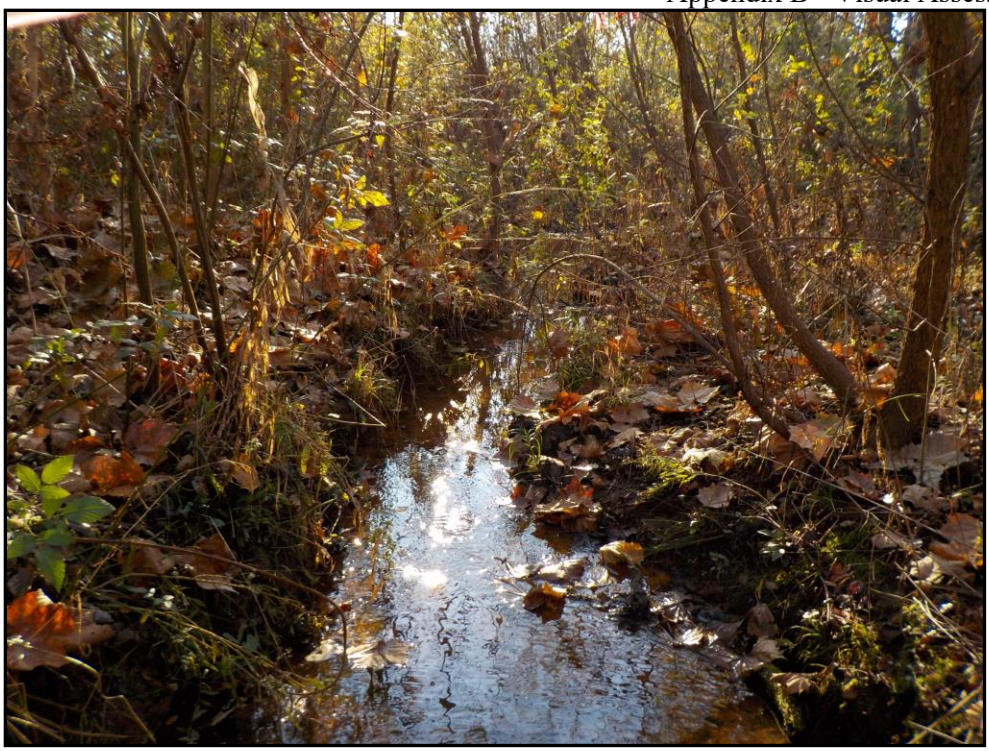
Reach 3 – Permanent Photo Point 5
Downstream
November 14, 2017

Reach 3 – Permanent Photo Point 6
Downstream
November 14, 2017

Reach 3 – Permanent Photo Point 6
Upstream
November 14, 2017

Reach 2 – Permanent Photo Point 7
Downstream
November 14, 2017

Reach 2 – Permanent Photo Point 8
Downstream
November 14, 2017



Reach 2 – Permanent Photo Point 9
Downstream
November 15, 2017

Reach 2 – Permanent Photo Point 10
Downstream
November 15, 2017

Reach 2 – Permanent Photo Point 11
Downstream
November 15, 2017

Reach 2 – Permanent Photo Point 12
Downstream
November 15, 2017

Reach 2 – Permanent Photo Point 13
Downstream
November 15, 2017

Reach 2 – Permanent Photo Point 14
Downstream
November 15, 2017

Reach 2 – Permanent Photo Point 15
Downstream
November 15, 2017

Reach 2 – Permanent Photo Point 16
North
November 15, 2017

Reach 2 – Permanent Photo Point 16
Northwest
November 15, 2017

Reach 2 – Permanent Photo Point 16
Southwest
November 15, 2017

Reach 1 – Permanent Photo Point 17
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 18
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 19
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 20
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 21
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 22
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 23
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 24
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 25
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 26
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 27
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 28
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 29
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 30
Downstream
November 15, 2017

Reach 1 – Permanent Photo Point 31
Northeast
November 15, 2017

Reach 1 – Permanent Photo Point 31
Southeast
November 15, 2017

Reach 1 – Permanent Photo Point 31
South
November 15, 2017

MY6 – Representative Photos of Stream Problem Areas

Reach 1 Sta. 314+00 – Bed Degradation
November 15, 2017

Reach 1 Sta. 318+60 – Bed Degradation & Bank Erosion
November 15, 2017

Reach 2 Sta. 118+50 – Bed Degradation & Bank Erosion
November 15, 2017

Reach 2 Sta. 106+00 – Stressed Structure
November 14, 2017

Reach 4 Sta. 101+60 – Bed Aggradation
November 14, 2017

Appendix C

Vegetation Plot Data

Table 5. Vegetation Plot Mitigation Success Summary
Table 6. CVS Vegetation Metadata
Table 7. Total Planted Stem Counts
Vegetation Plot Photos

Table 5. MY6 Vegetation Plot Criteria Attainment

Plot #	Stream/ Wetland Stems per Acre	Volunteer Stems per Acre	Total Stems per Acre	Success Criteria Met?	Average Tree Height (cm)*
1	567	647	1214	Yes	573
2	728	202	931	Yes	571
3	769	0	769	Yes	728
4	1174	486	1659	Yes	596
5	1012	81	1093	Yes	950
6	728	2307	3035	Yes	529
7	1335	40	1376	Yes	863
8	1012	162	1174	Yes	794
9	769	40	809	Yes	669
10	850	405	1255	Yes	794
11	890	728	1619	Yes	684
12	931	1093	2023	Yes	828
13	567	1659	2226	Yes	380
14	769	81	850	Yes	528
Project Avg	**864**	**567**	**1431**	**Yes**	**678**

* The tallest eight trees were averaged, representing 320 stems/acre.

Table 6. CVS Vegetation Plot Metadata North Fork Mountain Creek Stream and Wetland Restoration Site	
Report Prepared By	Matt DeAngelo
Date Prepared	11/21/2017 11:44
database name	NFMC_MY6_2017.mdb
database location	C:\Users\mdeangelo\Dropbox (RES)\@RES Projects\North Carolina\North Fork Mountain Creek\Monitoring\Monitoring Data\MY6_2017\Vegetation Data
computer name	DESKTOP-F4AI5MT
file size	48173056
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	171300307
project Name	North Fork Mountain Creek
Description	
River Basin	Catawba
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	14

Table 7. Total Planted Stem Counts

			Current Plot Data (MY6 2017)																												
			171300307-01-0001			171300307-01-0002			171300307-01-0003			171300307-01-0004			171300307-01-0005			171300307-01-0006			171300307-01-0007			171300307-01-0008			171300307-01-0009			171300307-01-0010		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree																		2												1
Acer rubrum var. rubrum	red maple	Tree																														
Alnus serrulata	hazel alder	Shrub										1	1	1												1						5
Betula nigra	river birch	Tree																						4	4	4	2	2	2	5	5	5
Carpinus caroliniana	American hornbeam	Tree																												1	1	1
Carpinus caroliniana var.	Coastal American Ho	Tree																												1	1	1
Cephalanthus occidentali	common buttonbush	Shrub																														
Cornus amomum	silky dogwood	Shrub	1	1	1				1	1	1																					
Diospyros virginiana	common persimmon	Tree																														
Fraxinus pennsylvanica	green ash	Tree	1	1	1	4	4	4	1	1	1	9	9	9				1	1	1	4	4	4	2	2	2	5	5	5	2	2	2
Juglans nigra	black walnut	Tree							3	3	3	1	1	1																1	1	1
Juniperus virginiana	eastern redcedar	Tree			1			1																								
Liquidambar styraciflua	sweetgum	Tree			8															48												2
Liriodendron tulipifera	tuliptree	Tree	3	3	8	2	2	2	5	5	5	2	2	5	9	9	9	6	6	12			1							4	4	5
Liriodendron tulipifera va	Tulip-tree, Yellow Po	Tree																														
Nyssa sylvatica	blackgum	Tree																														
Pinus taeda	loblolly pine	Tree																														
Platanus occidentalis	American sycamore	Tree	1	1	1	3	3	3	2	2	2	10	10	10	4	4	4	1	1	1	16	16	16	13	13	13	10	10	10	3	3	3
Platanus occidentalis var.	Sycamore, Plane-tre	Tree																														
Prunus serotina	black cherry	Tree			2			2						1			2			1												
Prunus serotina var. sero	black cherry	Tree																														
Prunus serrulata	Japanese flowering cherry																															
Quercus	oak	Tree																														
Quercus alba	white oak	Tree	5	5	5	1	1	1	1	1	1				6	6	6	4	4	4	3	3	3									
Quercus phellos	willow oak	Tree	1	1	1	7	7	8	6	6	6	6	6	6	4	4	4	5	5	5	8	8	8	6	6	6	2	2	2	4	4	4
Quercus rubra	northern red oak	Tree	2	2	2	1	1	1							2	2	2	1	1	1	2	2	2									
Quercus rubra var. rubra	northern red oak	Tree																														
Rhus	sumac	shrub																														
Rhus aromatica var. arom	fragrant sumac	Shrub																														
Rhus glabra	smooth sumac	shrub																														
Rhus typhina	Staghorn Sumac	shrub																														
Salix nigra	black willow	Tree						1						8															1			1
Unknown		Shrub or Tree																								1						
Stem count			14	14	30	18	18	23	19	19	19	29	29	41	25	25	27	18	18	75	33	33	34	25	25	29	19	19	20	21	21	31
size (ares)			1			1			1			1			1			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
Species count			7	7	10	6	6	9	7	7	7	6	6	8	5	5	6	6	6	9	5	5	6	4	4	7	4	4	5	8	8	12
Stems per ACRE			566.56	566.56	1214.06	728.434	728.434	930.777	768.903	768.903	768.903	1173.59	1173.59	1659.21	1011.71	1011.71	1092.65	728.434	728.434	3035.14	1335.46	1335.46	1375.93	1011.71	1011.71	1173.59	768.903	768.903	809.371	849.84	849.84	1254.53

			Current Plot Data (MY6 2017)												Annual Means																
			171300307-01-0011			171300307-01-0012			171300307-01-0013			171300307-01-0014			MY6 (2017)			MY5 (2016)			MY3 (2014)			MY2 (2013)			MY1 (2012)			MY0 (2012)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree			2			9									14			15												
Acer rubrum var. rubrum	red maple	Tree																					9			2						
Alnus serrulata	hazel alder	Shrub			11	1	1	1	2	2	3				4	4	22	4	4	29	4	4	58	4	4	56	3	3	19	3	3	3
Betula nigra	river birch	Tree				7	7	7				3	3	3	21	21	21	21	21	21	21	21	26	21	21	21	24	24	24	25	25	25
Carpinus caroliniana	American hornbeam	Tree	3	3	4	1	1	1							5	5	6	5	5	11	5	5	5	7	7	7	7	7	7	8	8	8
Carpinus caroliniana var.	Coastal American Ho	Tree													1	1	1	1	1	1	1	1	1	1	1	1						
Cephalanthus occidentali	common buttonbush	Shrub				2	2	2	1	1	1	1	1	1	4	4	4	3	3	3	4	4	4	4	4	8	4	4	4	4	4	4
Cornus amomum	silky dogwood	Shrub									2			2	2	2	6	2	2	19	4	4	14	4	4	8	3	3	3			
Diospyros virginiana	common persimmon	Tree																		7			7			5						
Fraxinus pennsylvanica	green ash	Tree	3	3	3	1	1	1	1	1	1	7	7	7	41	41	41	39	39	41	39	39	41	40	40	40	41	41	41	44	44	44
Juglans nigra	black walnut	Tree	1	1	1				1	1	1	2	2	2	9	9	9	10	10	10	11	11	11	11	11	17	10	10	10	11	11	11
Juniperus virginiana	eastern redcedar	Tree															2			3												
Liquidambar styraciflua	sweetgum	Tree			2			14			22						96			149			78			17			12			
Liriodendron tulipifera	tuliptree	Tree	2	2	2			1	3	3	4	2	2	2	38	38	56	38	38	62	39	39	39	40	40	40	41	41	47	47	47	47
Liriodendron tulipifera va	Tulip-tree, Yellow Po	Tree																					7			15						
Nyssa sylvatica	blackgum	Tree																											6			
Pinus taeda	loblolly pine	Tree			2						15						17															
Platanus occidentalis	American sycamore	Tree	9	9	9	8	8	8	2	2	2	1	1	1	83	83	83	81	81	81	84	84	84	86	86	86	86	86	86	91	91	91
Platanus occidentalis var.	Sycamore, Plane-tre	Tree																					10			4						
Prunus serotina	black cherry	Tree															8															
Prunus serotina var. sero	black cherry	Tree																					10			6						
Prunus serrulata	Japanese flowering cherry																			20												
Quercus	oak	Tree																									3	3	3	28	28	28
Quercus alba	white oak	Tree													20	20	20	21	21	23	20	20	20	19	19	19	5	5	5			
Quercus phellos	willow oak	Tree	4	4	4	3	3	3	4	4	4	3	3	3	63	63	64	63	63	63	62	62	64	67	67	67	62	62	62	49	49	49
Quercus rubra	northern red oak	Tree													8	8	8	8	8	8	10	10	10	11	11	11	23	23	23	31	31	31
Quercus rubra var. rubra	northern red oak	Tree																					4									
Rhus	sumac	shrub																											7			
Rhus aromatica var. arom	fragrant sumac	Shrub																								9						
Rhus glabra	smooth sumac	shrub																					11			2						
Rhus typhina	Staghorn Sumac	shrub																		33												
Salix nigra	black willow	Tree						3									16			23			22			10			4			
Unknown		Shrub or Tree															1													1	1	1
Stem count			22	22	40	23	23	50	14	14	55	19	19	21	299	299	495	296	296	622	304	304	535	315	315	451	312	312	363	342	342	342
size (ares)			1			1			1			1			14			14			14			14			14			14		
size (ACRES)			0.02			0.02			0.02			0.02			0.35			0.35			0.35			0.35			0.35			0.35		
Species count			6	6	10	7	7	11	7	7	10	7	7	8	13	13	20	13	13	20	13	13	22	13	13	22	13	13	17	12	12	12
Stems per ACRE			890.308	890.308	1618.74	930.777	930.777	2023.43	566.56	566.56	2225.77	768.903	768.903	849.84	864.293	864.293	1430.85	855.621	855.621	1797.96	878.746	878.746	1546.48	910.543	910.543	1303.67	901.871	901.871	1049.29	988.589	988.589	988.589

Color for Density

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

MY6 – 2017 Vegetation Plot Photos

NFMC - Vegetation Monitoring Plot 1
November 14, 2017

NFMC - Vegetation Monitoring Plot 2
November 14, 2017

NFMC - Vegetation Monitoring Plot 3
November 14, 2017

NFMC - Vegetation Monitoring Plot 4
November 14, 2017

NFMC - Vegetation Monitoring Plot 5
November 14, 2017

NFMC - Vegetation Monitoring Plot 6
November 15, 2017

NFMC - Vegetation Monitoring Plot 7
November 15, 2017

NFMC - Vegetation Monitoring Plot 8
November 15, 2017

NFMC - Vegetation Monitoring Plot 9
November 15, 2017

NFMC - Vegetation Monitoring Plot 10
November 15, 2017

NFMC - Vegetation Monitoring Plot 11
November 15, 2017

NFMC - Vegetation Monitoring Plot 12
November 15, 2017

NFMC - Vegetation Monitoring Plot 13
November 15, 2017

NFMC - Vegetation Monitoring Plot 14
September 20, 2016
**No photo for MY6*

Appendix D

Hydrology Data

Table 8. Verification of Bankfull Events during MY6

Reach	Method	Number of Bankfull Events	Maximum Bankfull Height (ft.) (feet above bankfull)
Reach 1	Crest Gauge	1	0.24
Reach 2	Crest Gauge	0	N/A

Photo Verification of Bankfull Events

Crest Gauge @ Reach 1 – 0.79 ft. = 0.24 ft. above bankfull

Table 9. 2017 Rainfall Summary

Month	Average	Normal Limits		Hickory Station Precipitation	On-Site Auto Rain Gauge[1]
		30 Percent	70 Percent		
January	3.90	2.64	5.04	4.10	---
February	3.42	2.33	4.41	1.12	---
March	4.27	3.12	5.17	4.16	---
April	3.37	2.06	4.57	8.02	---
May	3.77	2.50	4.68	2.72	---
June	4.27	2.73	5.41	4.59	---
July	3.92	2.43	4.45	2.09	---
August	4.00	2.73	4.71	3.63	---
September	3.75	2.39	5.20	3.29	---
October	3.40	1.96	3.98	4.93	---
November	3.47	2.33	4.30	1.83*	---
December	3.21	2.17	3.96	---	---
Total	**44.75**	**29.39**	**55.88**	**40.49**	---

[1] On-Site Rain Gauge malfunction in 2017; data unavailable.
* Data reported up until 11/22.

Chart 1. 2017 Precipitation Data for North Fork Mountain Creek Site

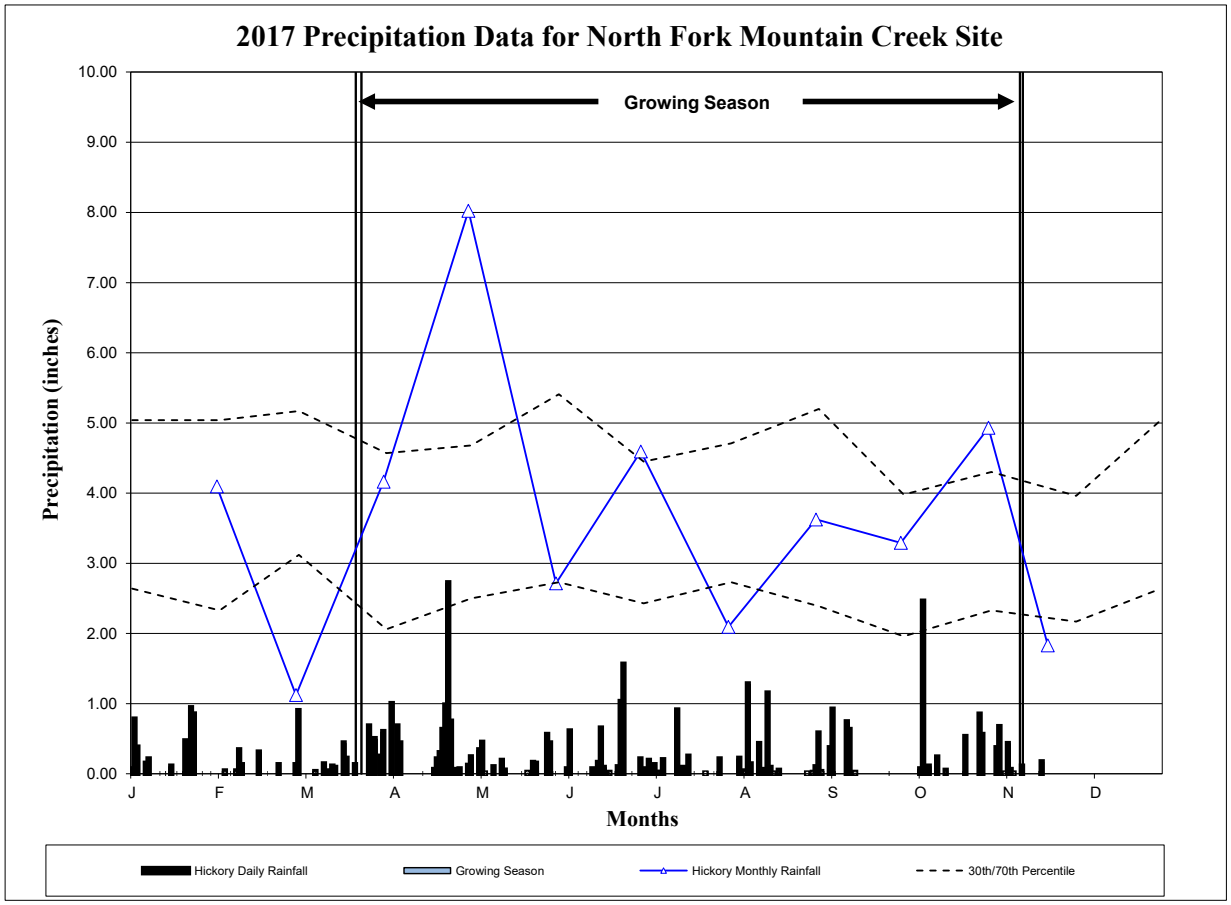


Table 10. Wetland Gauge Attainment Data
Summary of Groundwater Monitoring Results
North Fork Mountain Creek Stream & Wetland / Project No. 94151

Gauge ID	Success Criteria Achieved; Percent of Growing Season						
	Year 1 (2012)	Year 2 (2013)	Year 3 (2014)	Year 4 (2015)	Year 5 (2016)[1]	Year 6 (2017)	Year 7 (2018)
NFMC 1	No/4 1.7%	Yes/32 13.6%	Yes/43 18.2%	No/10 4.2%	No/10 4.2 %	Yes/24.5 10.4 %	
NFMC 2	Yes/86 36.4%	Yes/67 28.4%	Yes/67 28.4%	Yes/52 22.0%	Yes/82 34.7%	Yes/28 11.7 %[2]	
NFMC 3	Yes/57 24.2%	Yes/127 53.8%	Yes/91 38.6%	Yes/60 25.4%	Yes/43 18.2%	Yes/134.5 57.0 %	
NFMC 4	No/5 2.1%	No/10 4.2%	No/5 2.1%	No/10 4.2%	No/7 3.0%	Yes/23.5 10.0 %	
NFMC 5	No/1 0.4%	No/4 1.7%	No/2 0.8%	No/3 1.3%	No/2 0.8%	No/9.5 3.6 %	
NFMC 6	Yes/87 36.9%	Yes/127 53.8 %	Yes/67 28.4%	Yes/51 21.6%	Yes/40 16.9%	Yes/57.5 24.4 %	
NFMC 7	Yes/171 72.5%	Yes/127 53.8%	Yes/119 50.4%	Yes/89 37.7%	Yes/131 55.5%	Yes/121 51.3 %	
NFMC 8	Yes/57 24.2%	Yes/127 53.8%	Yes/68 28.8%	Yes/59 25.0%	Yes/81 34.3%	Yes/81 34.3 %	
NFMC 9	Yes/102 43.2%	Yes/127 53.8%	Yes/92 39.0%	Yes/60 25.4%	Yes/90 38.1%	Yes/37.5 15.9 %	
NFMC 10	No/12 5.1%	Yes/36 15.3%	Yes/43 18.2%	No/15 6.4%	No/10 4.2%	Unavailable[3]	
NFMC S1	N/A	N/A	Yes/39 16.5%	No/15 6.4%	No/7 3.0%	No/2 0.8 %	
NFMC S2	N/A	N/A	Yes/21 8.9%	No/12 5.1%	No/8 3.4%	No/5 2.1 %	
NFMC S3	N/A	N/A	Yes/30 12.7%	Yes/26 11.0%	No/11 4.7%	No/2 0.8 %	
NFMC S4	N/A	N/A	Yes/99 41.9%	Yes/75 31.8%	Yes/36 15.3%	Yes/19 8.1 %	
NFMC S5	N/A	N/A	N/A	Yes/59 25.0%	Yes/99 41.9%	Yes/98 41.5 %	
NFMC S6	N/A	N/A	N/A	Yes/235 99.6%	Yes/204 86.4%	Yes/45 19.1 %	
SF Reference	N/A	N/A	N/A	Yes/111 47.0%	Yes/235 100.0%	--[4]	

N/A - Information does not apply.

Hydrology Success Criteria = 8%

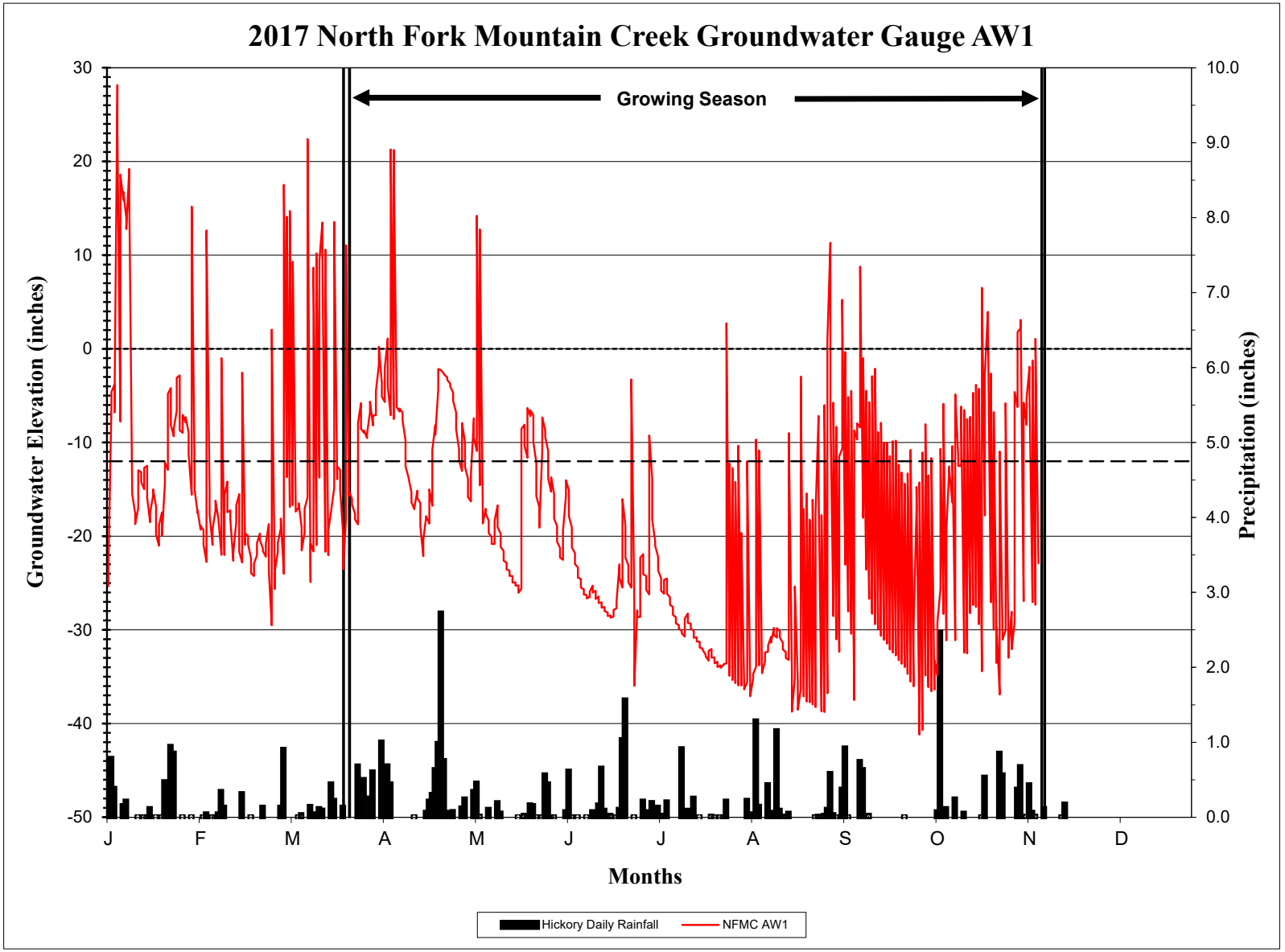
[1] Dates 10/10-10/12, 10/23, 11/6-11/8 removed due to inconsistent barometric reference data

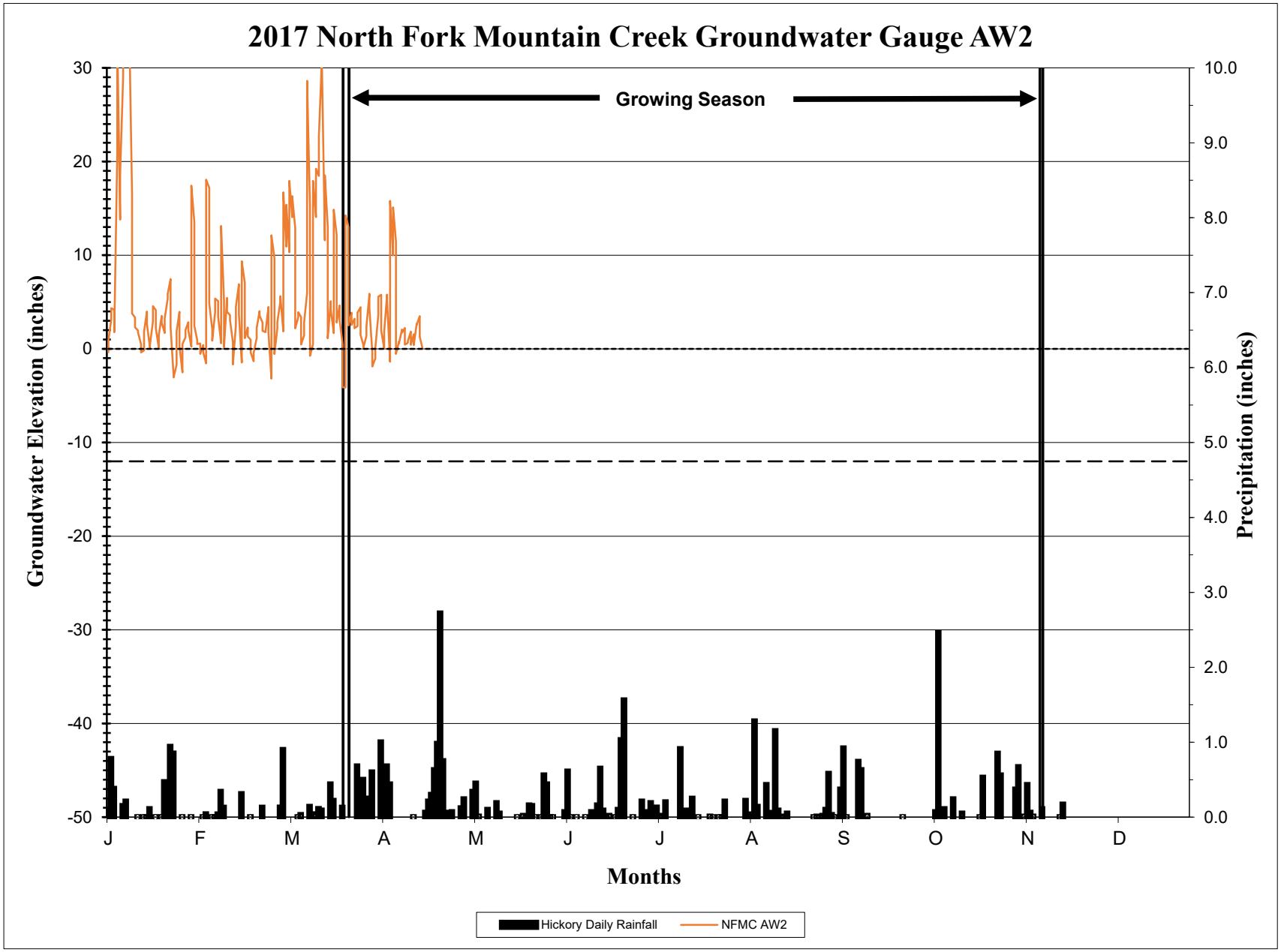
[2] Represents data collected through 4/17: invalid data after 4/17

[3] Broken HOBO transducer. A replacement was installed on 11/14

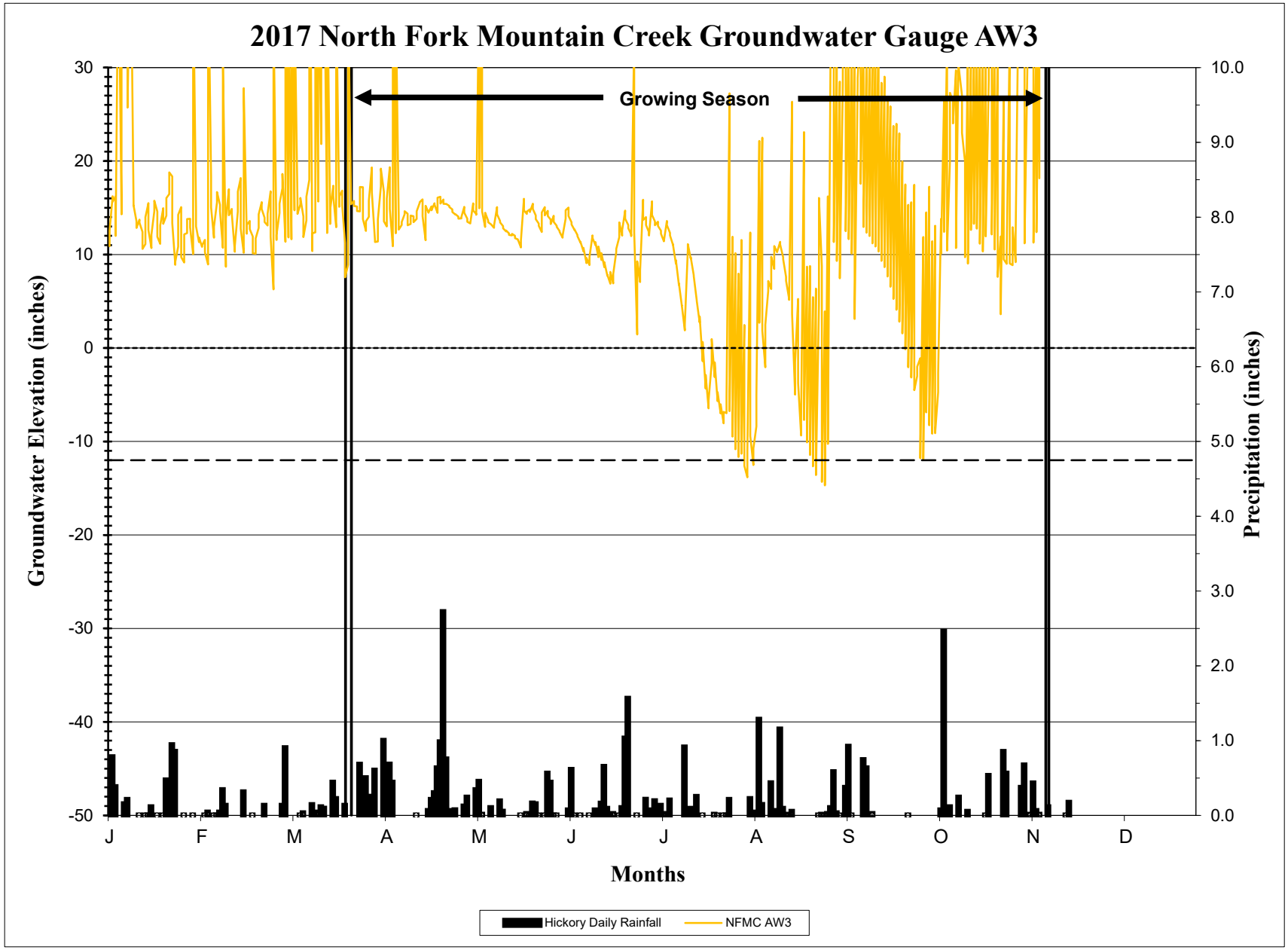
[4] Data not yet retrieved

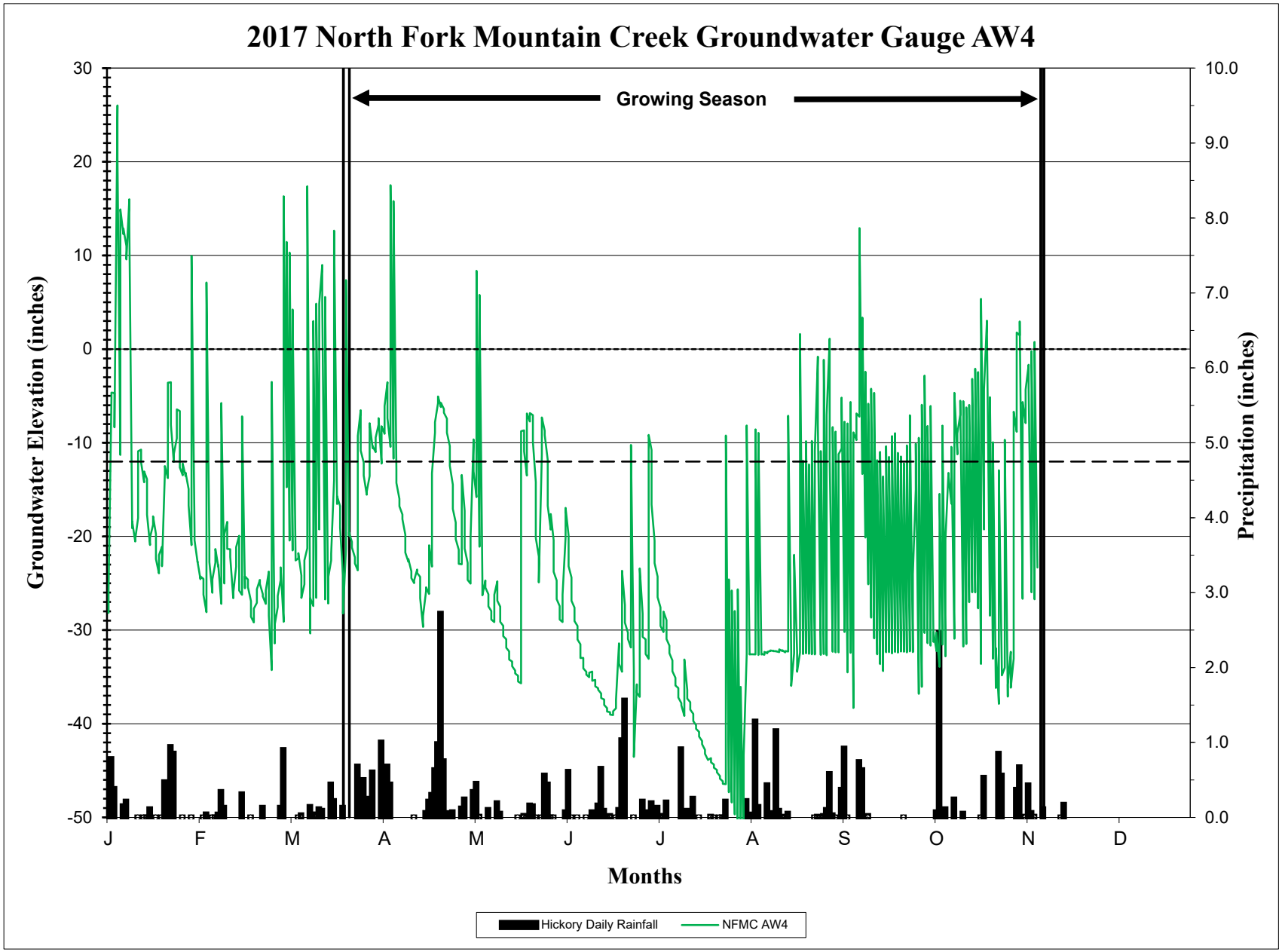
Chart 2. 2017 North Fork Mountain Creek Site Groundwater Monitoring Gauge Hydrographs

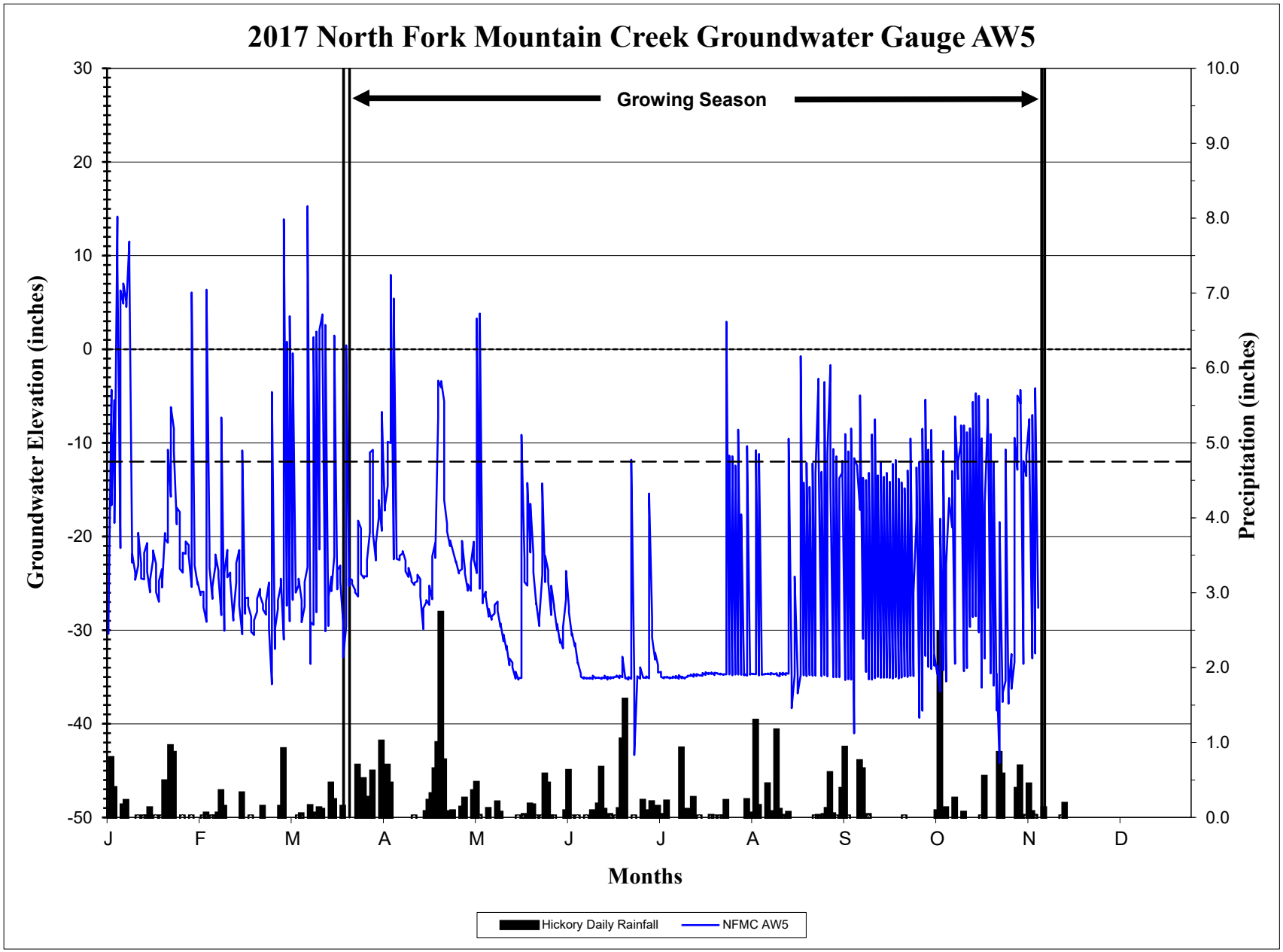


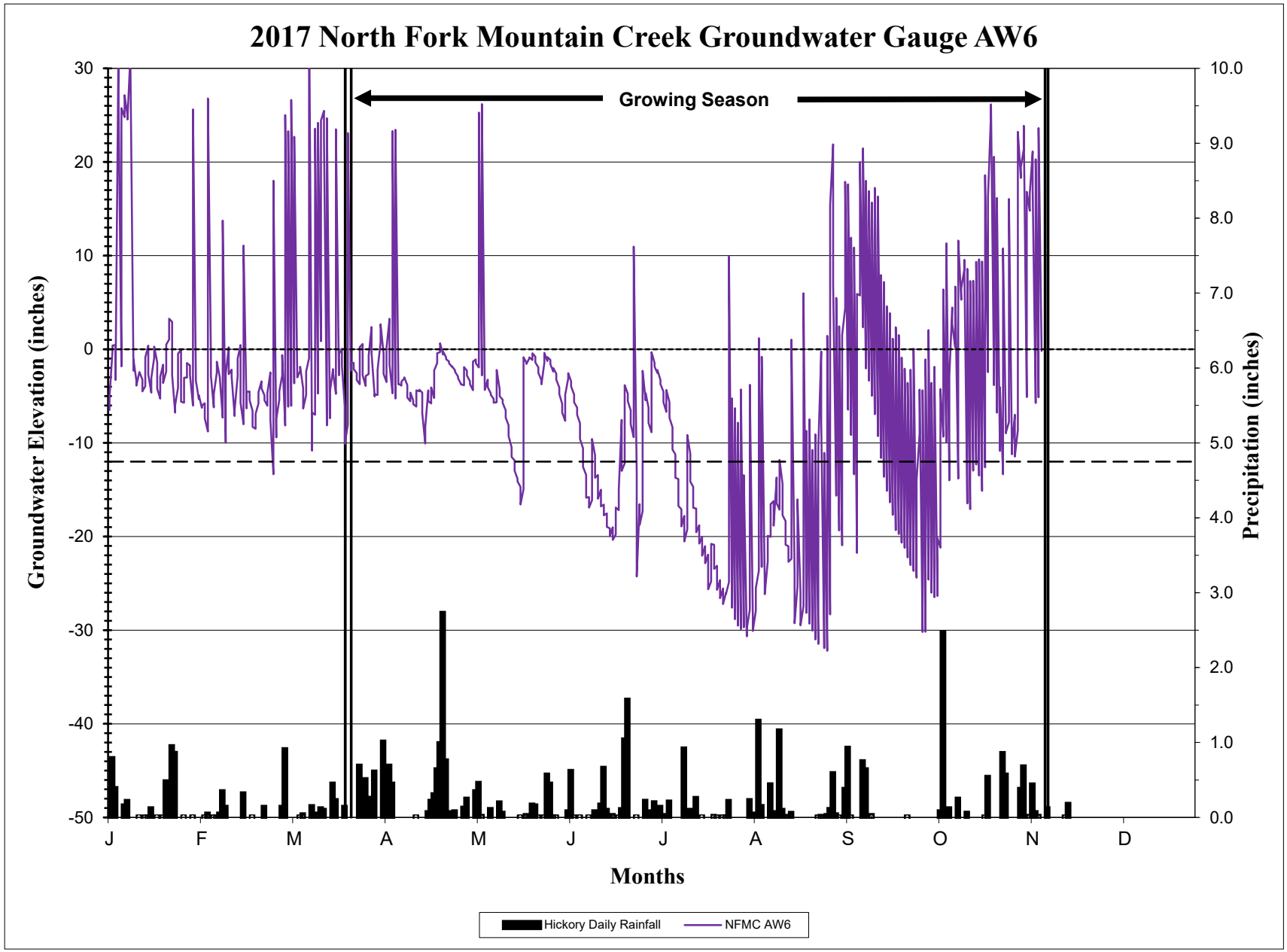


*No data after April 17, 2017. Gauge found removed from well in November


2017 North Fork Mountain Creek Groundwater Gauge AW3
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
J
F
M
A
M
J
J
A
S
O
N
D
Months
Hickory Daily Rainfall
NFMC AW3


2017 North Fork Mountain Creek Groundwater Gauge AW4
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
J
F
M
A
M
J
J
A
S
O
N
D
Months
Hickory Daily Rainfall
NFMC AW4


2017 North Fork Mountain Creek Groundwater Gauge AW5
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
J
F
M
A
M
J
J
A
S
O
N
D
Months
Hickory Daily Rainfall
NFMC AW5


2017 North Fork Mountain Creek Groundwater Gauge AW6
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
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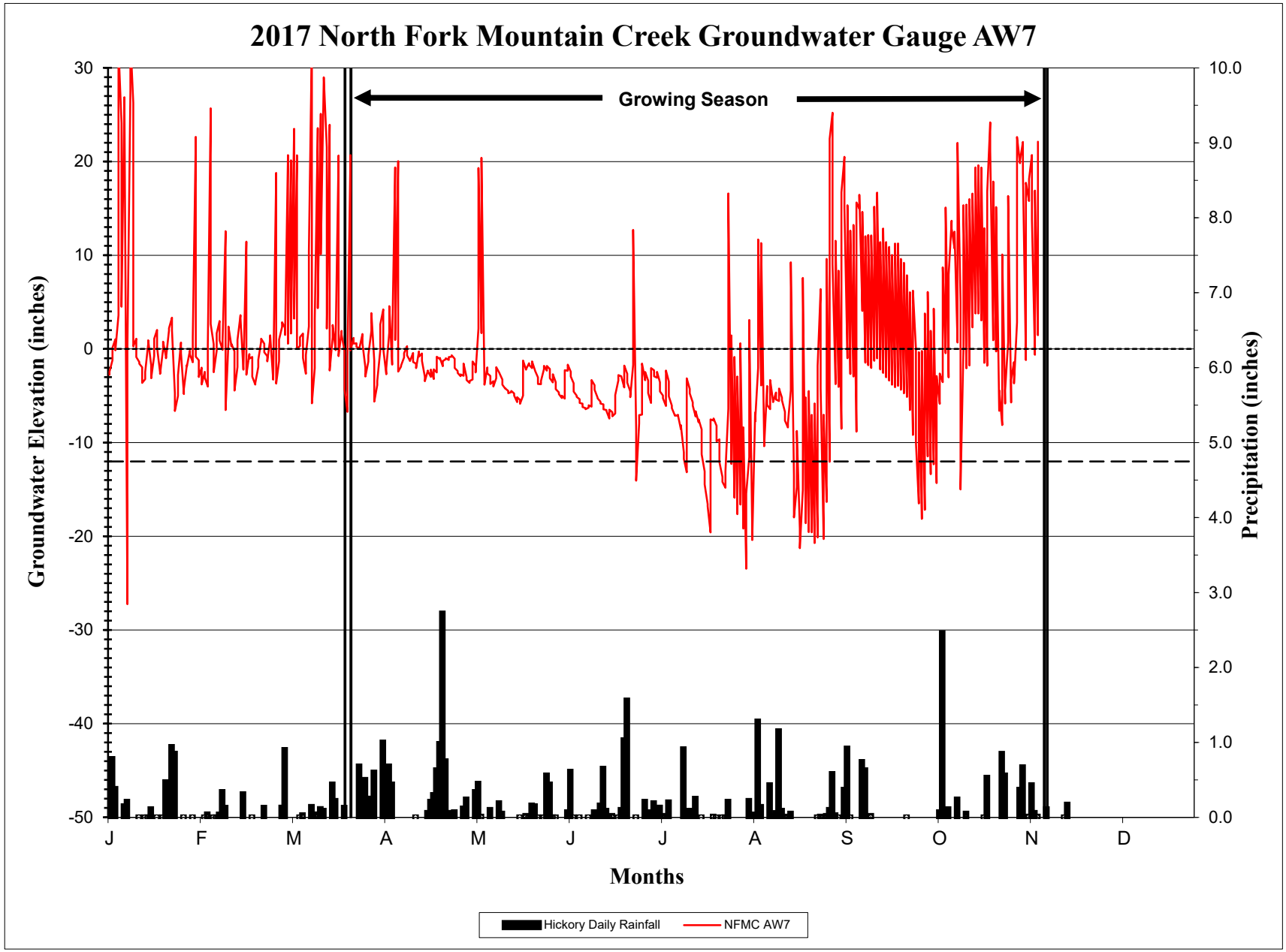
Months
Hickory Daily Rainfall
NFMC AW6


2017 North Fork Mountain Creek Groundwater Gauge AW7
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
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J
F
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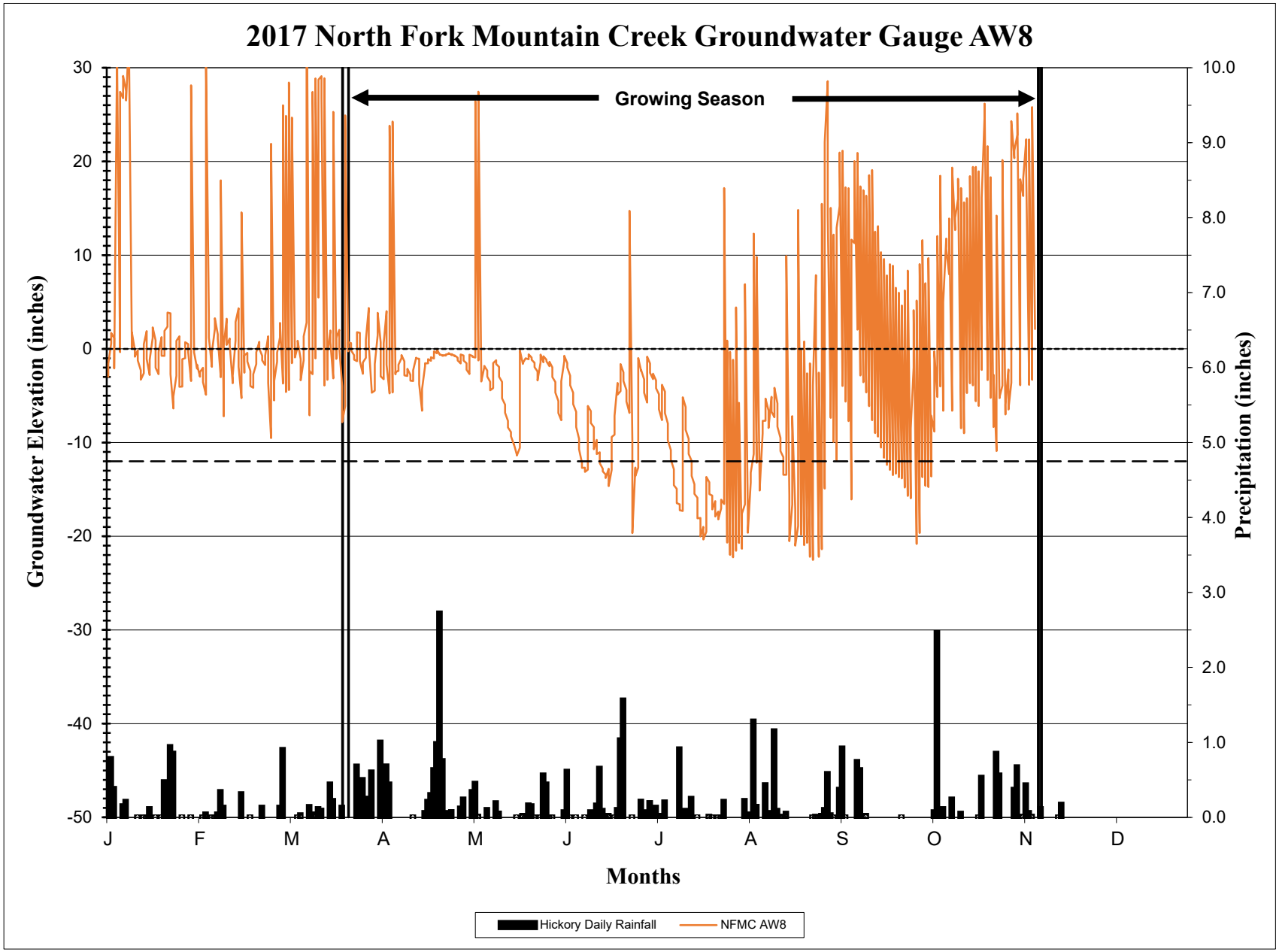
D
Months
Hickory Daily Rainfall
NFMC AW7


2017 North Fork Mountain Creek Groundwater Gauge AW8
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
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J
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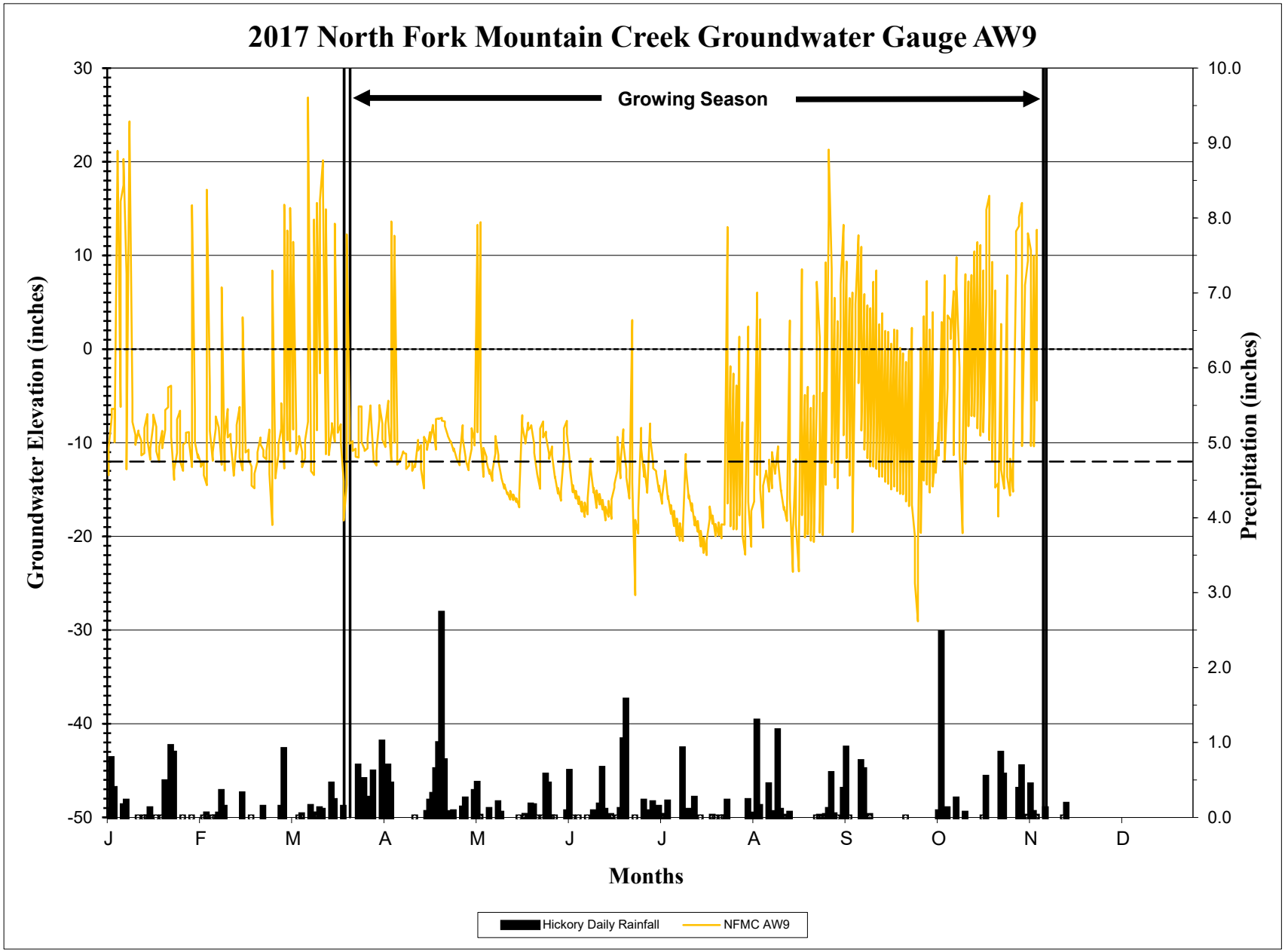
Months
Hickory Daily Rainfall
NFMC AW8


2017 North Fork Mountain Creek Groundwater Gauge AW9
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
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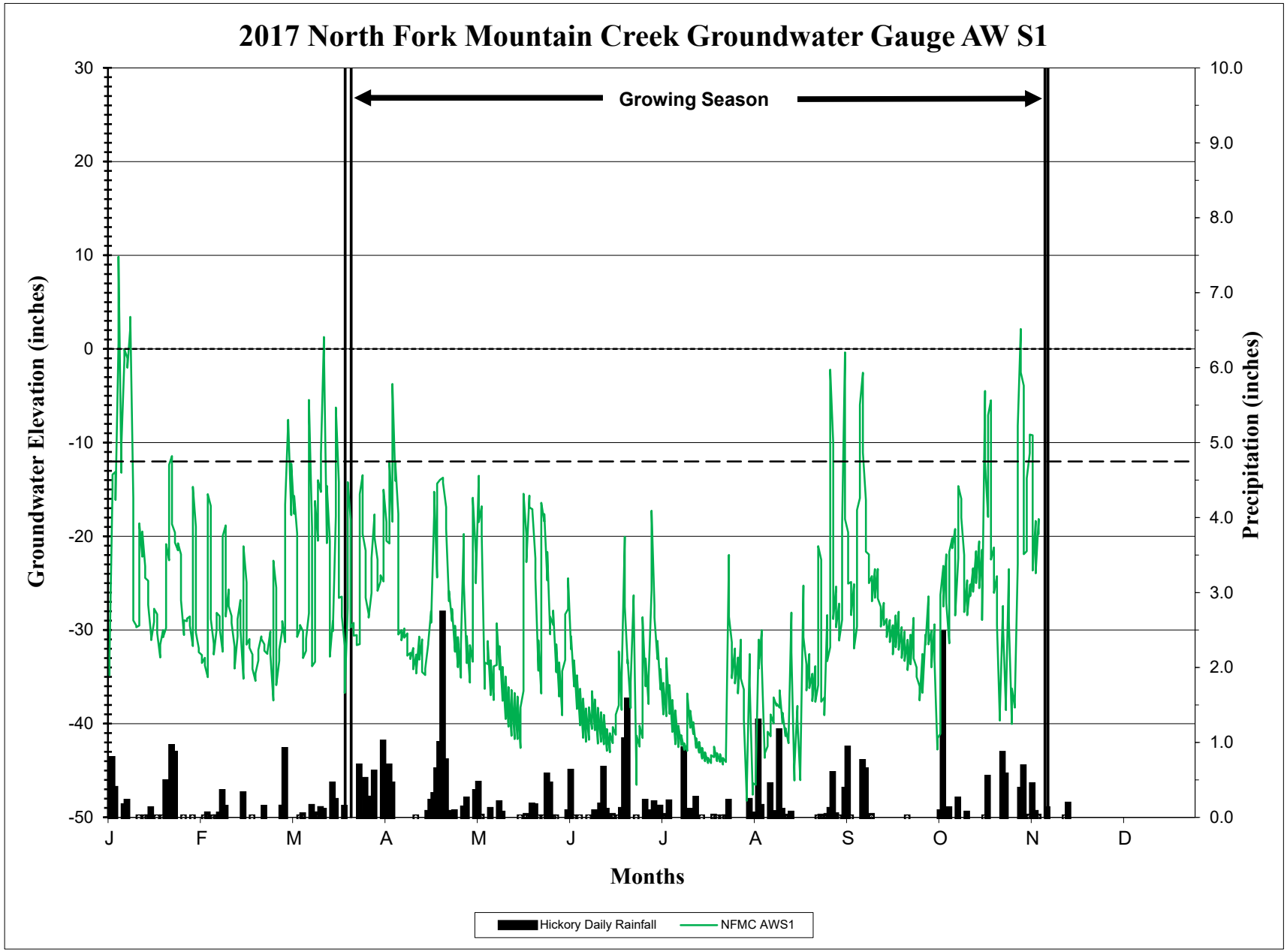
D
Months
Hickory Daily Rainfall
NFMC AW9


2017 North Fork Mountain Creek Groundwater Gauge AW S1
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
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J
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M
A
M
J
J
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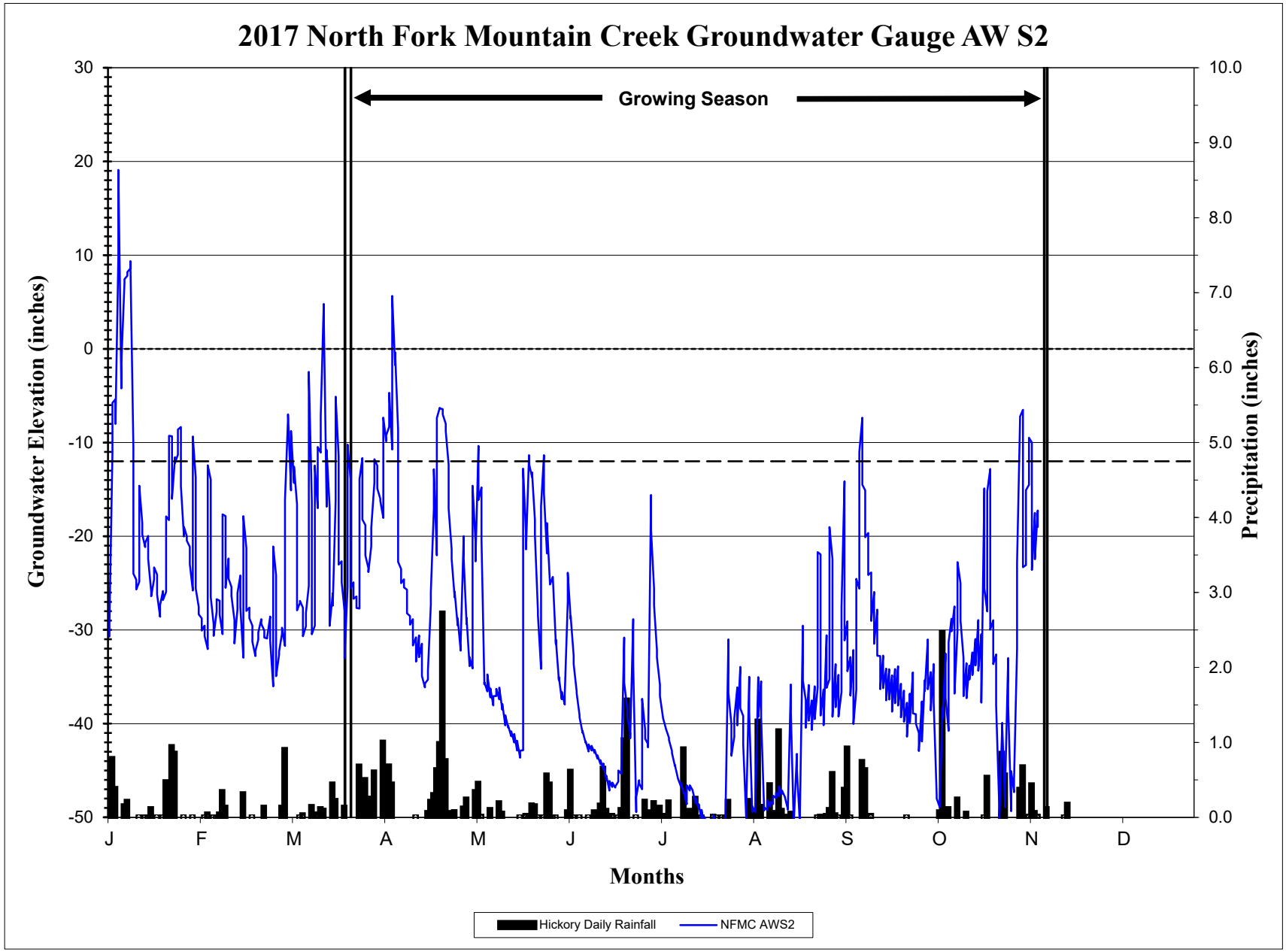
S
O
N
D
Months
Hickory Daily Rainfall
NFMC AWS1


2017 North Fork Mountain Creek Groundwater Gauge AW S2
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
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A
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J
J
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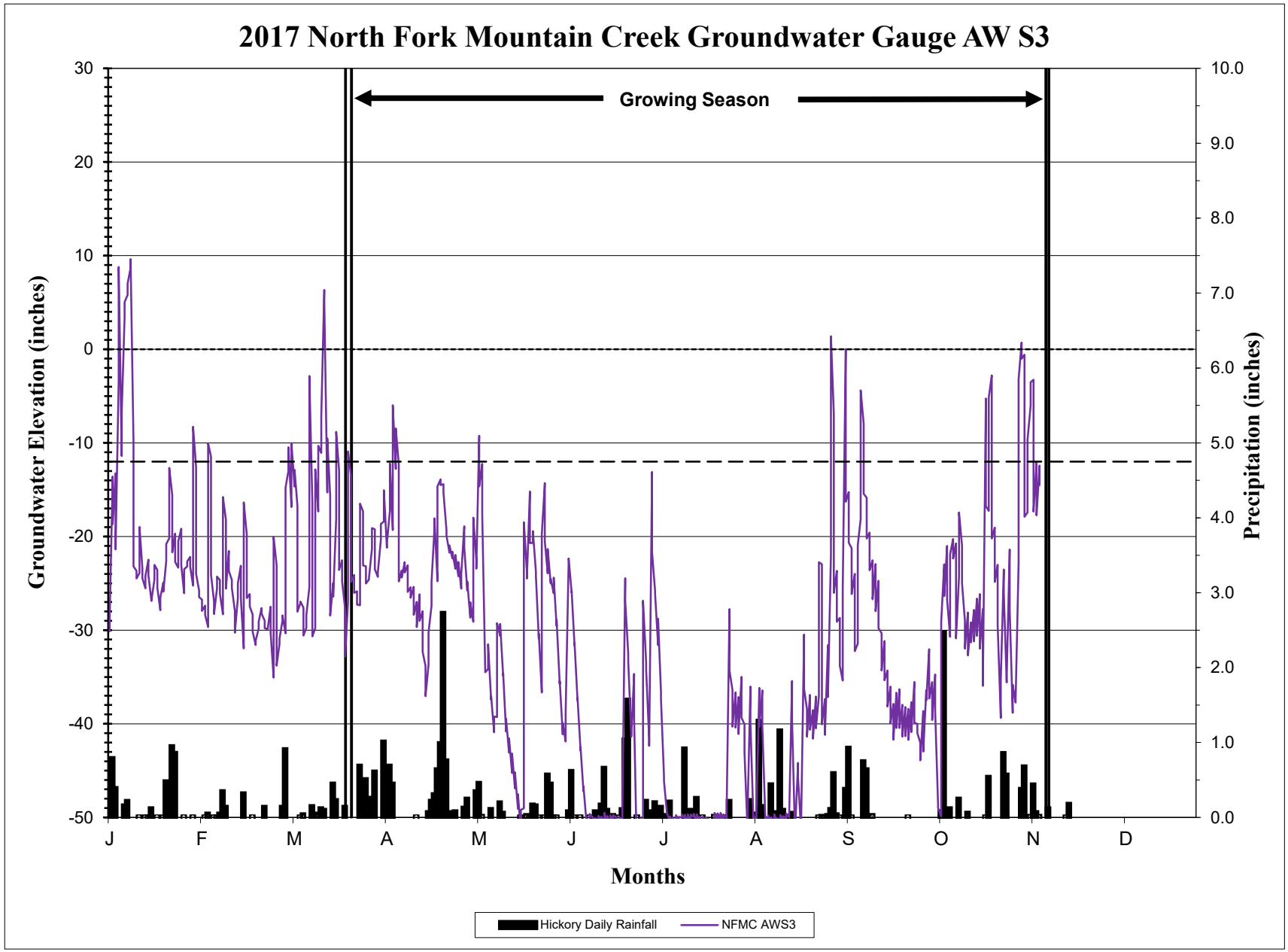
S
O
N
D
Months
Hickory Daily Rainfall
NFMC AWS2


2017 North Fork Mountain Creek Groundwater Gauge AW S3
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
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J
J
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S
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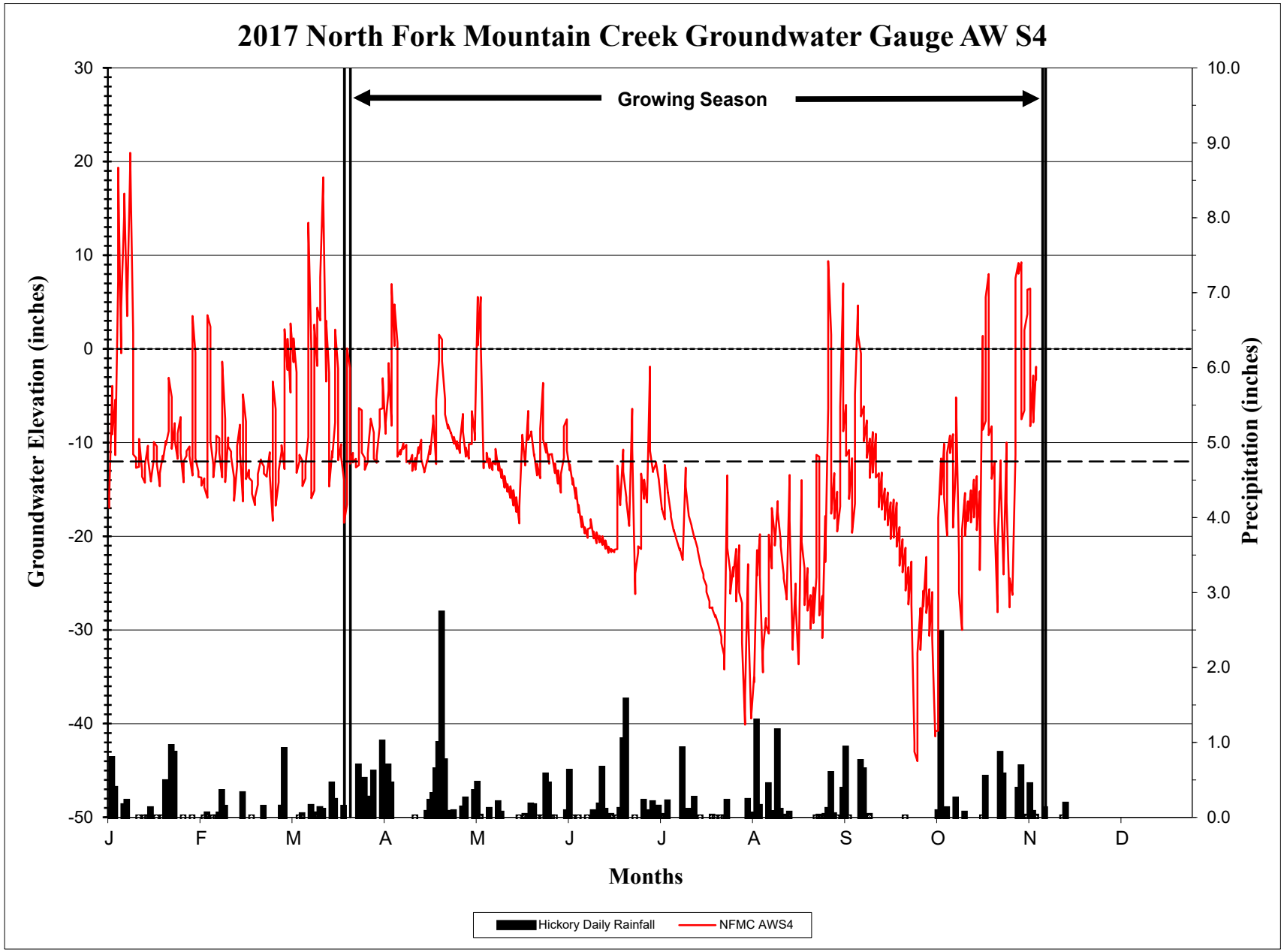
N
D
Months
Hickory Daily Rainfall
NFMC AWS3


2017 North Fork Mountain Creek Groundwater Gauge AW S4
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
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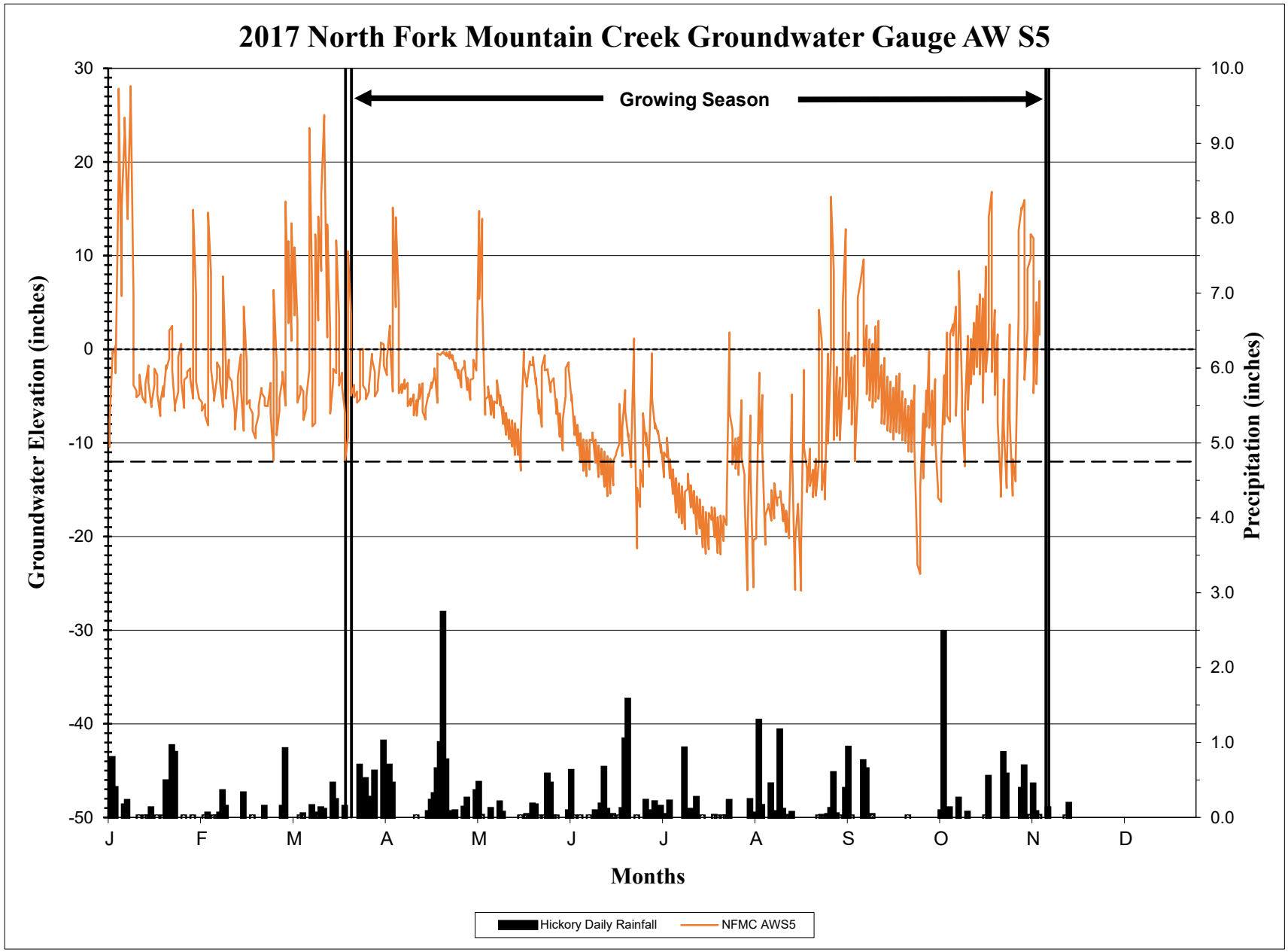
Months
Hickory Daily Rainfall
NFMC AWS4


2017 North Fork Mountain Creek Groundwater Gauge AW S5
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
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J
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A
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J
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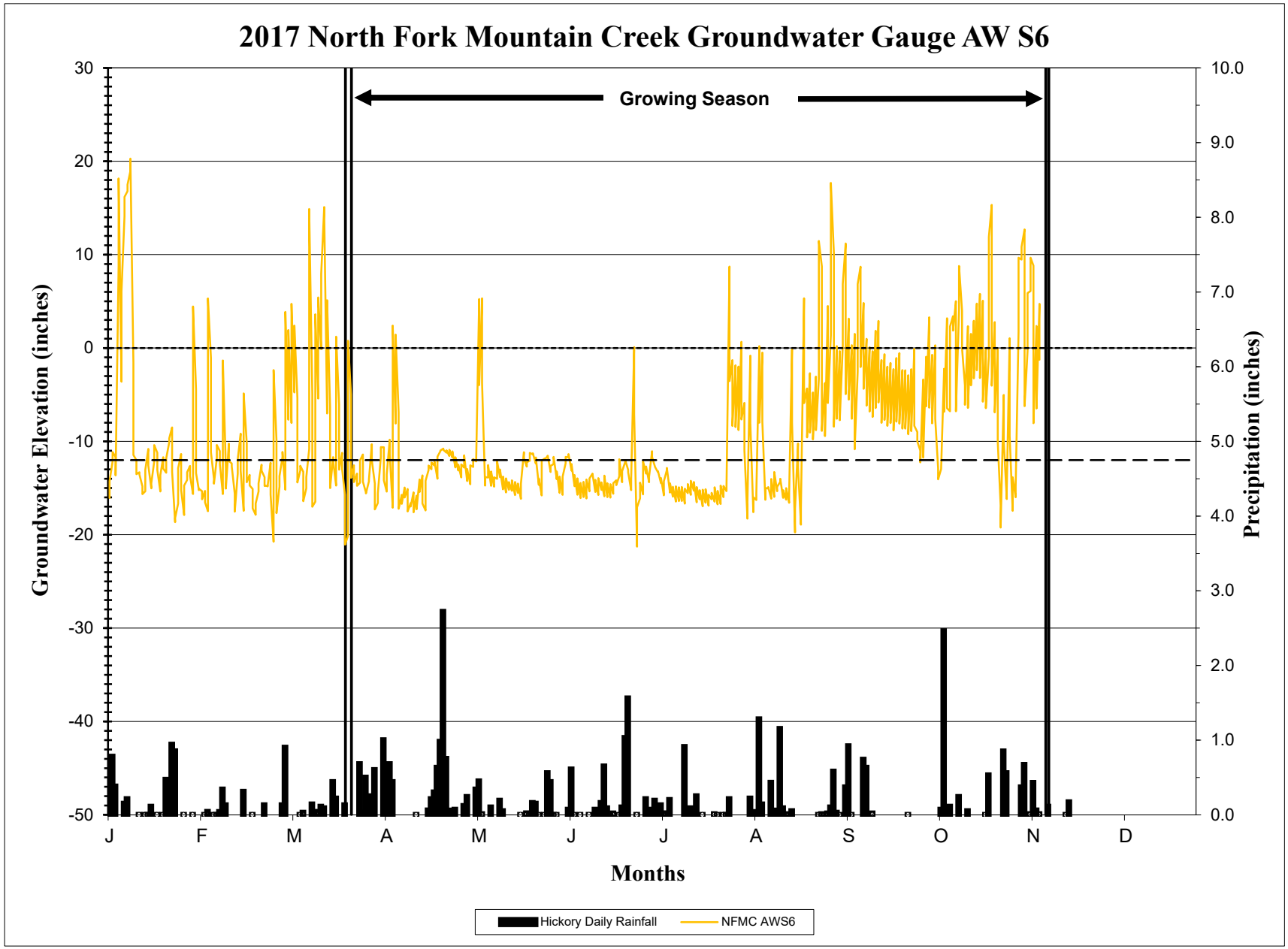
Months
Hickory Daily Rainfall
NFMC AWS5


2017 North Fork Mountain Creek Groundwater Gauge AW S6
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
30
20
10
0
-10
-20
-30
-40
-50
10.0
9.0
8.0
7.0
6.0
5.0
4.0
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2.0
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J
J
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N
D
Months
Hickory Daily Rainfall
NFMC AWS6

Appendix E

Addendum

Addendum Correspondences
Exhibit A – Project Site Map 2015 Plan Addendum
Exhibit B – 2015 Wetland Determination Data Forms

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF:

May 4, 2015

Regulatory Division

Re: Request for Modification to the North Fork Mountain Creek Mitigation Site (USACE AID 2010-01537)

Mr. Tim Baumgartner
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Dear Mr. Baumgartner:

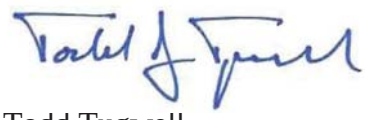
Please reference the on-site meeting of February 4, 2015, and the North Carolina Interagency Review Team (IRT) meeting of March 18, 2015, during which we discussed the North Fork Mountain Creek mitigation project, located east of Buffalo Shoals Road, in Catawba County, North Carolina. The discussion dealt with a request by NCEEP to the U.S. Army Corps of Engineers, Wilmington District (District) to modify a section of project due to conditions that have developed following construction of the site.

During the meeting of February 4th, members of the IRT met with NCEEP and the project providers (RES, Inc.) to review conditions within the restored wetlands that have developed since the construction of the site. Based on monitoring well data, portions of the constructed wetland area appeared not to be meeting the minimum hydrology standard, while other areas that were not proposed to be restored to wetland did appear to be returning to wetland conditions. NCEEP and the provider requested that the areas be swapped out so that mitigation credit could be obtained for the areas that were returning to wetland in lieu of those areas that were not meeting the criteria. The area to be added would be monitored for wetland hydrology for the duration of the monitoring period, and would be subject to the same performance standards as other wetlands restored on the site.

All comments received during the IRT review period are attached for your reference. Additionally, the IRT discussed the proposed changes During the IRT meeting of March 18th, and no objections were noted. Accordingly, we concur with the proposed changes. Maps that depict the changes made to the credit-generating wetland portions of the site should be provided with the next monitoring report to document the revisions to the mitigation plan. Also, please keep a copy of this letter with the file to document IRT approval of the proposed change.

Thank you for working with us to address this issue. Please contact me if you have any questions about this letter, or if there is any additional information you need. I can be contacted at telephone (919) 846-2564.

Sincerely,



TUGWELL.TODD.JASON.1048429293
2015.05.04 08:34:54 -04'00'

Todd Tugwell
Special Projects Manager

Enclosures

Electronic Copies Furnished:
Mr. Daniel Ingram, RES, Inc.
NCIRT Distribution List

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

MEMORANDUM

TO: Todd Tugwell, Special Projects Manager
Wilmington District, USACE

FROM: Travis Wilson, Highway Project Coordinator
Habitat Conservation Program

DATE: March 23, 2015

SUBJECT: North Fork Mountain Creek Mitigation Plan Revision

EBX and the Ecosystem Enhancement Program are proposing modifications to the North fork Mountain Creek Stream and Wetland project mitigation plan; these modifications were presented at the March 18, 2015 IRT meeting. After reviewing the proposal the NCWRC does not object to the modification request.

Thank you for the opportunity to review and comment on this project. If you need further assistance or information on NCWRC concerns please contact me at (919) 707-0370.

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

Tugwell, Todd SAW

From: Karoly, Cyndi [cyndi.karoly@ncdenr.gov]
Sent: Friday, April 03, 2015 12:11 PM
To: Tugwell, Todd J SAW
Cc: Tugwell, Todd SAW; bowers.todd@epa.gov; Wilson, Travis W.; Sollod, Steve; Marella Buncick; Fritz Rohde; Kathryn Matthews; emily_jernigan@fws.gov; Homewood, Sue; Baker, Virginia
Subject: [EXTERNAL] North Fork Mountain Creek Stream comments

Todd, please see below comment from DWR on the North Fork Mountain Creek project. Thank you.

North Fork Mountain Creek Stream (DOMS project) NC DWR approves the modification request for the additional wetland area which will offset the wetland area around wells NFMC04 and NFMC05 that are not meeting the 8% hydroperiod success criteria. The 8% success criteria for the new wells installed February 19th, 2015 should be met for the remainder of the project during normal precipitation years.

Sent from my iPad

On Apr 3, 2015, at 11:57 AM, Jernigan, Emily <emily_jernigan@fws.gov> wrote:

> Hi Todd,
>
> Attached are the Selma Mill comments from our office. Please let us know if there are any questions.
>
> ~Emily
>
> --
> Emily Jernigan Wells
> U.S. Fish and Wildlife Service
> PO Box 33726
> Raleigh, NC 27363-3726
> (919) 856-4520 ext. 25
>
> <20150403_IRT_SelmaMillcomments_BMP.pdf>

U.S. Army Corps of Engineers
Todd Tugwell
Special Projects Manager
11405 Falls of Neuse Rd.
Wake Forest, NC 27587

Re: North Fork Mountain Creek Stream and Wetland
Catawba County
Action ID#: 2010-01537
EEP Project #: 94151

Mr. Tugwell,

EBX, an RES company, along with the U.S. Army Corps of Engineers (USACE) and North Carolina Ecosystem Enhancement Program (NC EEP) met at the North Fork Mountain Creek Stream and Wetland Restoration Site in Catawba County on Wednesday, February 4th, 2015 to discuss the non-preforming areas that were failing to meet wetland criteria based on the Restoration Plan.

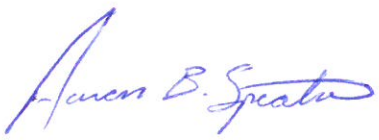
The North Form Mountain Creek Stream and Wetland Restoration site is located in the lower Catawba watershed USGS 14-digit HUC 03050101150030 of the Catawba River basin and the North Carolina Division of Water Quality (NCDWQ) sub-basin 03-08-32. This HUC was designated as a targeted local watershed by NC EEP at the time of project award. North Fork Mountain Creek is classified as WS-IV (water supply watershed) by NCDWQ and is part of a watershed protection area designated by Catawba County. North Fork Mountain Creek will deliver 5,180 linear feet of restored stream channel and 4.19 acres of wetlands with a hydroperiod success criteria of 8% of the growing season.

Monitoring began in 2012, at the completion of Monitoring Year 3 indication of projected wetland restoration area around groundwater monitoring wells NFMC04 and NFMC05 were not meeting the success criteria of the 8% hydroperiod. During Monitoring Year 3, four supplemental wells (NFMC-S1 to NFMC-S4) were installed to collect supplemental data in the mapped wetland area around the two nonperforming wells, all four supplemental wells have been meeting the hydroperiod success criteria since their installation. Micro topography around well (NFMC04) and the proximity of the groundwater monitoring well (NFMC05) to the stream channel as seen on the February 2015 site visit are thought to be the reason for the two monitoring wells not meeting hydrology success criteria.

An additional wetland area that was not initially accounted for in the Restoration Plan is being proposed to offset the areas around monitoring wells NFMC04 and NFMC05 (data will continue to be collected from the non-preforming areas). This additional area of wetlands has been delineated and additional groundwater monitoring wells were installed February 19th, 2015. (Exhibit A) The additional delineated wetland area will offset the non-preforming areas, see wetland data forms (Exhibit B).

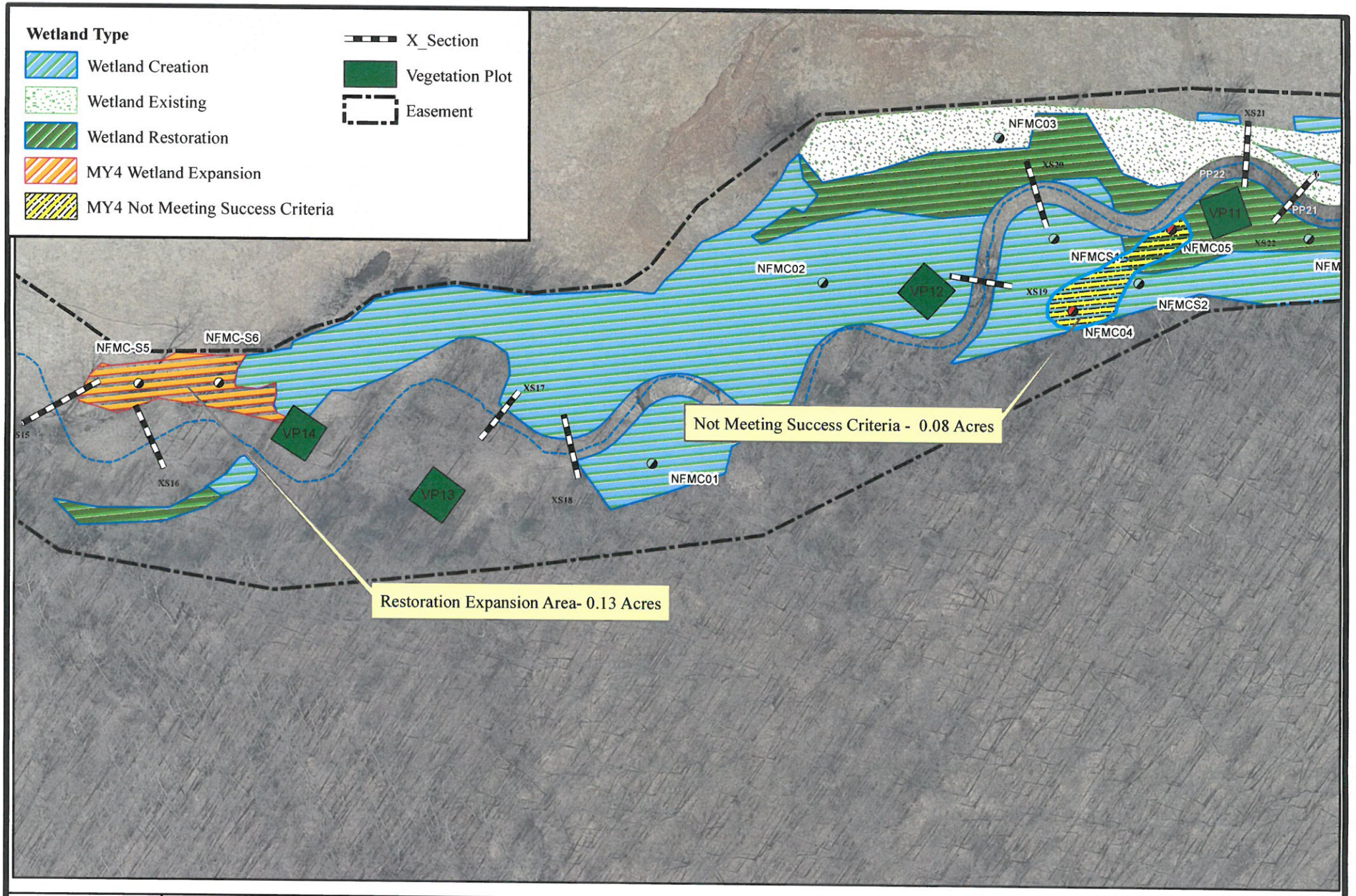
We appreciate the opportunity to work with you to make modifications to the plan to allow for a successful project. If there are any questions or concerns, please do not hesitate to call me.

Sincerely,



Aaron B. Speaks
Field Operations
EBX, an RES Company
909 Capability Drive, Suite 3100
Raleigh NC 27606
Dir: 919.829.9909 ext 25
Cell: 919.608.5725
Aspeaks @res.us

Exhibit A



Prepared for	**Project:** North Fork Mountain Creek Stream and Wetland Restoration 2015 Mitigation Plan Addendum Catawba County, North Carolina	Notes: 1) 2010 Aerial Photo 2) Base Map Data Provided by Stantec.	Prepared by
	Sheet 1 of 1		
	Date	Project Number	
	February 2015	NCEEP # 94151	

Exhibit B

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: North Fork Mtn Creek City/County: Catawba Sampling Date: 2/15/2016

Applicant/Owner: EBX/RES State: NC Sampling Point: 01

Investigator(s): JHT, AS Section, Township, Range:

Landform (hillslope, terrace, etc.): Bottom Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR or MLRA): LRR N Lat: 35.626447 Long: -81.085585 Datum: WGS 84

Soil Map Unit Name: Chewacla NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ~, Soil Y, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ~, Soil Y, or Hydrology ~ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:
Monitoring wells will be installed to monitor groundwater hydrology during growing season

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 5
Saturation Present? (includes capillary fringe)	Yes ____	No ____	Depth (inches): ____

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point:_____

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
50% of total cover: ____	20% of total cover: ____		
Sapling/Shrub Stratum (Plot size: 15')			
1. Platanus occidentalis	5	X	FacW
2. Fraxinus pennsylvanica	5	X	FacW
3. Salix nigra	1		
4. Betula nigra	1		
5.			
6.			
7.			
8.			
9.			
	12 = Total Cover		
50% of total cover: 6	20% of total cover: 3		
Herb Stratum (Plot size: _____)			
1. Juncus effusus	50	X	FacW
2. Carex lurida	25	X	OBL
3. Polygonum spp.	10		
4. Ludwigia alternifolia	5		
5. Aster spp.	5		
6. Solidago canadensis	5		
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover: ____	20% of total cover: ____		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/3	100						
4-12	10YR 4/4	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Very Shallow Dark Surface (TF12)
- ✓ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes X No ____

Remarks:

Disturbance from construction/restoration activities have altered the soil profile. Considerable mixing was noted throughout area w/ inconsistent soil profiles w/in the sampled area.