YEAR 5 OF 5 MONITORING REPORT - FINAL

Five-Mile Branch Stream and Wetland Restoration, Iredell County
NCDMS IMS ID# 92185

DEQ Contract# 6036

USACE Permit Action ID# SAW-2010-00964

DWQ # 06-0200V2

North Carolina Department of Environmental Quality,

Division of Mitigation Services Raleigh North Carolina

March 2018

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ECOSYSTEM PLANNING & RESTORATION

Responses to Comments
Draft Year 5 Monitoring Plan
for
Five Mile Branch Stream and Wetland Restoration Site
NCDMS IMS ID # 92185
DEQ Contract# 6036

Comments and Responses

Comment Number	Comment	Response
001	Cover: Please include the USACE Permit Action ID and the DWR Project Number on the report cover page. USACE # SAW-2010-00964; DWQ # 06-0200V2	The USACE Permit Action ID and the NCDWR Project ID Number were added to the cover.
002	General: As was discussed during the January 30, 2018 site meeting, please assess the Swann Road bridge crossing (and associated ROW); the Swann Road ROW and dirt road access culvert on Reach 8 (UT @ Swann Road); and the Chimney Lane Bridge. Swann Road bridge crossing (and associated ROW) - Please remove stream credits beneath the Swann Road bridge and the associated DOT ROW. Please update Table 1 and all report text as necessary and add a foot note to Table 1 to explain the reduction. The area beneath the Swann road bridge ROW should be shown in red as "No Credit" in the Project Components Map. Swann Road ROW and dirt road access culvert on Reach 8 (UT @ Swann Road) - Please remove stream credits for culverted sections of the UT and sections of the UT with one sided buffers (a majority of the reach). Please update Table 1 and all report text as necessary and add a foot note to Table 1 to explain the reduction. Please also update project GIS files accordingly. Stream sections removed should be shown in red as "No Credit" in the Project Components Map. Chimney Lane – Although a ROW is shown on the site associated with Chimney Lane, DOT will not utilize this ROW for road building or future road maintenance. Based on previous discussions with DOT, they will likely remove the Chimney Lane bridge after project closeout. Please remove stream credits beneath the Chimney Lane bridge. Do not include the associated ROW. Please update Table 1 and all report text as necessary and add a foot note to Table 1 to explain the reduction.	The length of Fifth Creek within the Swann Road NCDOT right-of-way was removed from all restoration calculations. Tables and text in the report were updated to reflect this change. A footnote was added Table 1 explaining the reduction. The length of Fifth Creek within the Swann Road right of way was shown in red and relabeled as "No Credit" in the Project Component Map and Current Condition Plan View. The entire length of Reach 8 was removed from all preservation calculations. Reach 8 is labeled as "No Credit". The length of Beaver Creek under the Chimney Lane bridge was removed from credit calculation. The length within the NCDOT right of way was not. Tables and text in the report were updated to reflect this change. A footnote was added Table 1 explaining the reduction. The length of Beaver Creek under the Chimney Lane bridge was shown in red and relabeled as "No Credit" in the Project Component Map and Current Condition Plan View.

	The area beneath the Chimney Lane bridge should be shown in red as "No Credit" in the Project Components Map.	
003	General: MY4 vegetation data was collected in September and October 2017. The MY5 vegetation data was collected in May 2017. Per the IRT, vegetation data should be collected at the end of the growing season for the applicable monitoring year. Please note that this could be an issue at project closeout with the IRT.	Noted.
004	Section 1.3 – Vegetation: In the report text, please note that invasive species treatments have been conducted site wide in 2015, 2016, and 2017. Please also note that invasive treatment will continue in 2018 until project closeout. Invasive treatment logs are included. Please include the treatment logs as an appendix in the FINAL MY5 report.	A paragraph was added discussing the invasive treatment and the treatment log were included in Appendix G.
005	Section 1.4 – Stream: In the report text, please note that beaver have been trapped and dams removed as necessary during the monitoring term by USDA - APHIS. Beaver monitoring and removal will continue through project closeout.	A paragraph was added discussing beaver monitoring and removal.
006	Section 1.4 – Stream: Please incorporate discussion of the success criteria for channel dimension into this section. Please also provide discussion of the success criteria for bankfull events relative to the observations.	A discussion was added comparing channel dimension to success criteria.
007	Section 1.5 - Wetland: In the report text, please note that that wells 17 and 19 are located outside of the proposed wetland mitigation credit areas.	A statement that gauges 17 and 19 are not located in the proposed wetland area was added.
008	Section 1.5 Wetland: The section indicates that Gauge 3 did not meet the success criteria because it malfunctioned. Is it actually unknown if Gauge 3 met the success criteria but not documented due to the malfunction? Please update if appropriate.	A discussion about the performance of gauge 3 was added.
009	Table 2: Please include the January 2016 supplemental planting (due to encroachment) and all invasive treatments to the table. Invasive treatment logs are included for reference. Please include the treatment logs as an appendix in the FINAL MY5 report.	Supplemental planting and invasive treatment dates were added to Table 2.
010	Figure 1: Please update NCDENR to NCDEQ in the figure text.	The text in Figure 1 was updated.
011	Project Components Map: Please remove the "Year 4 Wetland Delineation" label from the map legend. The project wetlands should be shown/ shaded as "Wetland Restoration" & "Wetland Preservation" with different colors to represent each approach on the map and in the legend. Additionally, the project streams should be shown/ colored as "Stream Enhancement (Level II)", "Stream Preservation" and "No Credit" with different colors to represent each approach on the map and in the	The Project Components Map was updated as commented.

	legend. Please terminate stream shapes that are located outside of the project boundary to avoid confusion about project credits.	
012	CCPV Sheets: Please remove the "Year 4 Wetland Delineation" label from the map legend. The project wetlands should be shown/ shaded as "Wetland Restoration" & "Wetland Preservation" with different colors to represent each approach on the maps and in the legends.	The CCPV Sheets were updated.
013	CCPV Sheets: Please include the preservation streams on the CCPV sheets. Please also provide stream names and mitigation approaches (EII; Pres) on the CCPV sheets.	The CCPV Sheets were updated.
014	CCPV Sheets: Please update the aerial to the most recent available.	The CCPV Sheets were updated.
015	CCPV Sheets: If mapped invasive areas have been treated and are dead, please removed them from the CCPV sheets. If updated on the CCPV sheets, please make sure to update Table 6 as well.	The CCPV Sheets were updated.
016	Appendices: Please include the title on the intro sheet for each Appendix.	Title sheets were added to the Appendices
017	Appendix C – Vegetation Charts: The report text notes that plot 17 is installed in existing vegetation. The chart indicates that there are "0" stems in the plot. Please update the chart to include "total" stem data and species for vegetation plot 17.	The vegetation chart was updated to included plot 17 data.
018	Appendix C - Vegetation Charts: Please update EEP to DMS in the vegetation tables. The DMS project # is also incorrect in the tables. In the report text, please briefly explain why the Annual Mean planted stems increased each year from MY1 – MY4. It may be that additional planted stems were identified in later monitoring years. This has been an IRT concern on previous project closeouts so it should be addressed in the MY5 report.	The vegetation chart and text were updated.
019	Appendix C - Vegetation Photos: If possible, please include a photo of vegetation plot 14 to show the wetland herbaceous vegetation noted in the report text.	A photo of vegetation plot 14 is not available.
020	Appendix C - Vegetation Photos: If possible, please include a photo of vegetation plot 17 to show the existing vegetation noted in the report text.	A photo of vegetation plot 17 is not available.
021	Cross Sections / Cross Section Tables – A couple of methods are currently being utilized to calculate the BHR from year to year. To compare subsequent monitoring years to the As-built condition one can hold the bankfull depth static (denominator) while allowing the Low TOB max depth (numerator) to vary. Another method that has been proposed and is being evaluated is to hold the As-built cross sectional area static within each year's new cross section and allow that to determine the	Based on our 2/27/2018 discussion, this comment does not need to be incorporated into the report. For consistency through the monitoring period, the procedure to calculate BHR that has been used in the prior years will be used.

	max bankfull depth for each year. However; if there are large changes in the W/D ratio either method can make for somewhat distorted BHR values depending upon the direction and magnitude of the change in the W/D ratio. Please update the calculations to reflect changes observed in the overlays and explain in detail as a table footnote how the calculations were made. Be prepared to defend the method used during the 2018 project closeout and justify through context whether or not any changes observed in a cross section represent an issue.	
022	Cross Sections: On the cross-section sheets, please note if the cross section is located in a riffle or pool.	The stream feature was added to the cross sections.
023	Appendix E: Update the rainfall graph to include the title and label each axis.	The title and axis labels were added to the graph.
024	CD Deliverable: The draft MY5 CD deliverable provided did not include the required project support files. Per DMS monitoring template version 1.4 (11/07/11) please be sure to include all MY 05 project support files on the CD deliverable. This includes all project GIS shapefiles associated with MY5.	A CD with all MY 05 support files is included.

1. Project Summary

1.1 Goals and Objectives

The primary goals of this restoration project focus on the following:

- Increase bank stability, nutrient filtration and aquatic habitat
- Reduce soil disturbance and nutrient inputs to stream
- Improve soil physical and chemical properties in the near term
- Improve hydrologic connectivity with floodplain
- Attenuate site impacts of storm flows
- Restore ground water hydrology to pre-agricultural levels
- Restore wetland and riparian habitat

These goals were accomplished by:

- Establishing a minimum 50-foot buffer consisting of a mix of native species representative of piedmont/mountain bottomland hardwood forest. The planted species were selected by evaluation of adjacent reference sites and reviewing species listed in Classification of Natural Communities of North Carolina: Third Approximation (Schafale and Weakley 1990). A total of 1.9 acres of bottomland hardwood forest were preserved through land ownership or conservation easements. Land preservation reduced soil disturbance and nutrient input to the streams.

- Grading stream banks, installation of in-stream structures, and removal of an adjacent berm increased bank stability, improved in-stream habitat diversity and improved the hydrologic connectivity with the adjacent floodplain. Gently sloped, vegetated, stream banks in conjunction with in-stream structures increased bank stability. The in-stream structures all increased stream habitat diversity by establishing riffle-pool sequences and establishing stable woody debris. Removal of the berm reduced the water surface elevation required to reach the floodplain.

- Fill existing drainage ditches and excavating floodplain pools. Elimination of the drainage ditches and grading the floodplain restored groundwater hydrology to pre-agriculture conditions, in-turn restoring wetlands and riparian habitat.

- Ripping floodplain soil prior to planting to reduce ground compaction cause by past agricultural practice and allowing water infiltration.

1.2 Project History

The Five Mile Branch Mitigation Site was selected for stream and wetland restoration originally by the North Carolina Department of Transportation (NCDOT) then transferred to the North Carolina Division of Mitigation Services (NCDMS). The purpose of this restoration project was to restore, enhance and preserve streams and wetlands within the Site. Beaver and Fifth creeks are the primary stream within the Site. There are five unnamed tributaries that were preserved. The Site's original design was developed while the project was under NCDOT auspices and was a very sinuous, priority 2 stream restoration with a great deal of structure, which presented concerns in terms of cost and stability (risk/cost-benefit). The proposed alignment also led to retrospective concerns of hydrologic trespass by NCDOT for the I-40 right of way. Collectively, this prompted an enhancement approach to the stream channel through stabilization, improvement of the profile, and the removal of berms to provide additional floodplain connection. (NCEEP 2013)

The Five Mile Branch Site (Site) is east of Statesville in Iredell County, southeast of Interstate 40 (I-40) and northwest of US Route 64 in the South Yadkin Watershed (03040102). The Site is in the Township of Cool Springs on the Statesville East, NC, 7.5-minute U.S. Geological Survey (USGS) topographic quadrangle (Figure 1). The Site comprises 12 adjacent parcels totaling approximately 229 acres (92.67 ha). It is bordered to the north by I-40 and to the south, east, and west by various forested, pasture, and residential properties. Swann Road (SR 2167), running north and south, bisects the Site. Chimney Lane dead-ends on the Site west of Swann Road.

The drainage area at the downstream end of the Site (Reach 3) is 26.0 square miles. The drainage area for Beaver Creek (Reach 1) and Fifth Creek (Reach 2) at their confluence just west of Chimney Lane is 10.7 and 13.9 square miles respectively.

The restoration strategy implemented on Beaver and Fifth creeks consisted of Enhancement Level II. Both streams were stabilized in their current locations. Their north banks were re-graded to a flatter slope and boulder grade control structures were installed. No work was performed on the unnamed tributaries. They were preserved through conservation easements or property purchase. Wetland restoration was accomplished by filling in the drainage ditches, grading floodplain pools and replanting with native vegetation. Through these practices 11,676 linear feet if stream were enhanced, 1,537 feet of stream preserved, 27.7 acres of wetland restored and 1.9 acres of wetlands preserved. Due to the near systemic nature of the improvements to the channel cross section and the localized improvements to the profile/in-stream habitat, a credit ratio of 2:1 is being used.

Project components were recalculated during Year 3. Inconsistencies between the as-built survey and existing Site conditions were identified during monitoring Site visits.

Wetland delineations were conducted in November and December 2016 using procedures outlined in January 1987 Technical Report Y-87-1, Corps of Engineers Wetlands Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0), April 2012. The wetland boundary was mapped using handheld GPS units and ArcMap software. Wetland delineations identified a total of 29.6 acres of wetlands on the Site. Delineation have not been verified by the USACE. This is significantly less acreage than presented in the Baseline Monitoring Report. The reason for the reduction is due to an over estimation in the restored acreage and inaccuracies in the as-built topographic survey elevations. The proposed wetland line was estimated to be 1-2 feet higher than the ditch top of bank elevation. For the most part the proposed wetland line does follow as-built contour elevation. However, there

are areas where the as-built contours are a foot or greater lower than the delineated wetlands. These low areas were not observed in the field. There are also topographic breaks observed on the Site that are not reflected in the as-built topographical survey. The proposed wetland acreage was based on estimates that the wetlands would develop to a general topographic contour; however, it appears that the as-built topographic contours may not be completely accurate, and there are likely Site variabilities that are affecting wetland development.

The National Weather Service confirmed a tornado in the area on May 24, 2017. The tornado crossed the downstream end of the Site (approximate Sta. 67+00 FTH – Sta. 75+00 FTH). There are several downed trees in the channel and floodplain. See photo points 39 and 40.

1.3 Vegetation

Vegetation monitoring was conducted on May 16, 2017. Seven (Plots 1, 4, 6, 7, 9, 10 and 11) of the 23 vegetation plots are meeting the year five success criteria of 260 planted stems per acre. Including both planted and volunteer woody stems, 18 (Plots 1-12; 15, 16, 19, 20, 22 and 23) of the 23 plots are far exceeding the year five success criteria. Planted stem densities are low in Plots 8 and 12-23, ranging from 0–202 stems per acre. Plot 14 has no planted or volunteer trees and is dominated by wetland herbaceous vegetation. River birch (*Betula nigra*), willow oak (*Quercus phellos*) and cherrybark oak (*Q. pagoda*) remain to have the highest occurrences of planted stems. Other common planted species include silky dogwood (*Cornus amomum*), possumhaw (*Ilex decidua*), black walnut (*Juglans nigra*), black gum (Nyssa sylvatica), sycamore (*Platanus occidentalis*) and swamp chestnut oak (*Q. michauxii*). It should be noted that Plot 17 was not planted and was established in a stand of existing young woody vegetation.

Over the monitoring period the number of planted stem increased in several plots. The increase is due to identifying planted stems that were not located in prior years.

Herbaceous vegetation diversity and density is high throughout the Site. The only areas where vegetation is absent are on some of the streambanks that are eroding. Mowing has subsided, and vegetation continues to recover within the vicinity of Plot 1. Plot 1 was replanted in January 2016 with red maple (*Acer rubrum*), sycamore, and redbud (*Cercis canadensis*) bare root seedlings. Plot 1 is now meeting the success criteria. Mowing has also subsided on the east side of the project in the vicinity of groundwater monitoring Gauge 30, where a shooting lane was illegally created for hunting and the herbaceous vegetation is recovering.

Invasive vegetation is present throughout the Site. As with previous years observations, six invasive species were observed during the year five monitoring season; Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), Lespedeza (*Lespedeza cuneata*), multiflora rose (*Rosa multiflora*), Johnson grass (*Sorghum halapense*), and tree-of-heaven (*Ailanthus altissima*). Johnson grass, Lespedeza and honeysuckle continue to persist throughout the Site. Johnson grass and Lespedeza was observed within slightly dryer areas beyond the wetland boundaries and were most abundant north and adjacent of the main stem streams. Tree-of-heaven is very sparse throughout the floodplain; however, some dense patches were observed on the slopes near the NCDOT I-40 Right-of-Way (ROW) boundary. Some stems were observed in the understory within the undisturbed forested community on the south side of the main channel. Chinese privet was mainly observed in areas that were not disturbed during construction. Chinese Privet stems were dead from herbicidal treatments.

Invasive species have been conducted throughout the site in 2015, 2016 and 2017 and will continue through 2018 until project close out. Invasive species treatment logs are included in Appendix G.

The location of Johnson grass, Lespedeza, and honeysuckle are not shown on the CCPV. They occur throughout the planted areas of the Site. Depicting their locations would cover the majority of the Site. The location of well-defined stands of Chinese privet and multifora rose are depicted in the CCPV.

The National Weather Service confirmed a tornado in the area on May 24, 2017. The tornado crossed the downstream end of the Site (approximate Sta. 67+00 FTH – Sta. 75+00 FTH). There are several downed trees in the channel and floodplain. See photo points 39 and 40. Vegetation data was collected prior to the tornado occurrence.

1.4 Stream

There were no significant changes is the channel cross section dimensions or area. Cross sections 1 and 6 narrowed and decreased in area. Cross sections 5 and 8 widened and increased in area. The only significant change was cross section 12 filled. Cross section 12 is located upstream of the in-channel debris caused by the tornado which is causing backwater and sedimentation in the channel. These minor changes in bankfull dimension do not show a trend towards instability thereby meeting the established success criteria.

The discrepancies between the as-built cross sections and the following year's cross sections are the result of the as-built cross sections being generated from the surface contours created from the as-built field survey, which was not surveyed by ARCADIS staff. The annual monitoring surveys of the channel were generated using field surveys and accurately represent actual field conditions.

Beaver activity has been sporadic at the site. USDA – APHIS have trapped beaver and removed dams from the site as necessary during the monitoring period. Beaver monitoring and removal will continue through project closeout.

Several bank stress areas totaling approximately 1,055 feet (8.4% of the entire stream length) were identified in Year 5; 526 feet (9.0%) on Beaver Creek, 111 feet (6.9%) on Fifth Creek upstream of Beaver Creek and 418 feet (8.0%) on Fifth Creek downstream of Beaver Creek. Their locations are shown in the Current Condition Plan View. For the most part they are in the same areas as year previous years. However, some area increased in length, and some decreased. Areas that were identified as eroding in 2016 are now considered stable and a few new areas of erosion were identified in 2017. No areas are significant enough to warrant repairs.

Most boulder structures are functioning as designed. However, several structures are compromised due to boulders mobbing. Settling or dislodging. These structures are identified below. None of the structures appeared to be on the verge of failure and have been in the same or similar state for the past several years. Photographs of the structures are included in Appendix F.

Beaver Creek

Cross vane 25+15 Boulders in right arm settled. Directing main flow towards left arm. Portion of left arm has collapsed. Banks still appear stable.

Cross vane 32+25 Header boulder settled. Center of head is higher than sides. Banks are still stable.

Cross vane 37+10 Boulders in left arm dislodged. Some erosion around collapsed area.

Rock vane 65+50 Boulders in arm dislodged. Banks are still stable.

Fifth Creek Upstream Beaver

Cross vane 18+75 Boulders in left arm dislodged. Vegetated and stable around structure. Structure has been in this condition during the monitoring period.

Fifth Creek Downstream Beaver

Cross vane 32+50 Boulder in both arms settled. Banks appear stable. Pool still present

J-hook 46+10 Pool below structure filled.

Cross vane 60+25 Pool below structure filled as a result of channel debris from tornado.

Cross vane 72+50 Pool below structure filled as a result of channel debris from tornado.

Two bankfull events were recorded on Beaver Creek, Fifth Creek Upstream and Fifth Creek Downstream. Bankfull events occurred on January 23, and April 24, 2017. The cumulative total for the monitoring period is 13. The success criteria of a minimum of two bankfull occurrences in two separate years was met.

1.5 Wetland

Wetland hydrology was monitored for the entire growing season (April 17 – October 17) in the Year 5 monitoring term. Two gauges (17 and 19) of the 30 on Site gauges did not meet the established success criteria of saturation within 12 inches of the ground surface for 9 consecutive days of the growing season (5% of the 183-day growing season). Gauges 17 and 19 are located outside of the restored wetland areas and are not expected to meet the success criteria. Gauge 3 malfunctioned during 2017. There was insufficient data to determine if Gauge 3 would have meet the established success criteria. As with all previous years, gauges 22 and 23 had ground water within 12 inches of the ground surface for 100% of the 2017 growing season. Gauges 2, 18 and 28 barely meet the established success criteria.

As with previous years, the functionality of the gauges was very unpredictable. Some gauges functioned during one download event, not the next and then functioned properly at the next event. Batteries were replaced and historical data was deleted from most gauges to help improve their functionality. Sometime this was successful. During the 2017 monitoring period gauges 6, 7, 13, 16, 17 and 27 were replaced. Gauges 6 and 13 were damaged by the invasive vegetation management contractor in October 2016. Gauges 7, 16 and 17 just stopped working. Gauge 3 consistently downloaded; however, only partial data was obtained each time.

1.6 Note

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. Narrative background and supporting information 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 NCDMS' website. All raw data supporting the tables and figures in the appendices are available from NCDMS upon request.

2 Methodology

2.1 Vegetation

Vegetation monitoring followed Carolina Vegetative Survey Level 2. Vegetation monitoring was conducted on May 16, 2017 and all planted and volunteer stems were tallied.

2.2 Stream Hydrology

Stream water depth was measured and recorded with HOBO® pressure sensor gauges manufactured by onset®. Three HOBO® devises were installed at the Five Mile Branch Restoration Site, one on Beaver Creek upstream of Chimney Lane, one on Fifth Creek upstream of the confluence with Beaver Creek and one on Fifth Creek downstream of Swann Road. The dataloggers were downloaded periodically during the monitoring period.

2.3 Cross Section Surveys

Cross sectional surveys were conducted by ARCADIS staff on October 11, 2017 using a Topcon total station. The survey data was imported and plotted using AutoCAD 2013 software.

2.4 Wetland Hydrology

Wetland hydrology was monitored using RDS Ecotone® WM Water Level Instruments (gauges). The gauges were programmed to take one reading daily at 8:00 AM EST. Gauges were downloaded using a Meazura™ handheld device manufactured by ACEECA™. Data from the handheld device was then transferred to a Lenovo laptop computer and processed using Microsoft® Excel software.

3 References

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

North Carolina Department of Environment and Natural Resources (NCDENR). 2008. Yadkin Pee-Dee River Basinwide Water Quality Plan. Prepared by the North Carolina Division of Water Quality, Water Quality Section.

North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program (NCDENR) 2014. Annual Monitoring and Closeout Reporting Format, Data Requirements, and Content Guidance, February 2014.

North Carolina Ecosystem Enhancement Program (NCEEP). 2013. Letter dated February 28, 2013.

Schafale, M.P., and A. S. Weakley. 1990. Classification of the Natural Communities of North Carolina, A Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, Department of Environment, Health and Natural Resources, Raleigh, NC.

US Army Corps of Engineers (USACE) 2003. April 2003 Stream Mitigation Guidelines

United States Department of Agriculture, Natural Resources Conservation Service, 2011 Soil Survey of Iredell County, North Carolina. (Available online at http://soils.usda.goc/survey.printed_surveys/)

National Oceanic and Atmospheric Administration, National Weather Service webpage accesses 11/29/2017. http://www.weather.gov/gsp/20170524_Tornadoes

Appendix A

Project Vicinity Map and Background Tables

Table 1. Project Components and Mitigation Credits
Five Mile Branch Stream Restoration, DMS IMS ID# 92185

Mitigation Credits [A]

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	5,735.5	95.3	27.9	0.32	-	-	-	-	-

Project Components [A]

Project Component -or- Reach ID	Stationing/Location	Existing Footage/Acreage	Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio	Mitigation Credits
Reach 1 - Beaver Creek	Beaver Creek to Fifth Creek	5,794.1	E II	R	5,771.7 [B]	2:1 [D]	2885.8
Reach 2 - Fifth Creek upstream of Beaver Creek	I-40 to Beaver Creek	1,522.6	E II	R	1,522.6	2:1 [D]	761.3
Reach 3 - Fifth Creek downstream of Beaver Creek	Beaver Creek to End	5,175.4	E II	R	4,176.8 [C]	2:1 [D]	2088.4
Reach 4 - Beaver Creek (Upstream)	Property line to Beaver Creek	204.0	Pres.	RE	204.0	10:1	20.4
Reach 5 - UT to Beaver Creek (Upstream)	Property line to Beaver Creek	185.9	Pres.	RE	185.9	10:1	18.6
Reach 6 - UT	Property line to Beaver Creek	211.3	Pres.	RE	211.4	10:1	21.1
Reach 7 - UT at Chimney Lane	Property line to Beaver Creek	173.3	Pres.	RE	173.3	10:1	17.3
Reach 8 - UT at Swann Road	Property line to Fifth Creek	574.9	Pres.	RE	0.0	10:1	0.0
Reach 9 - UT at Freeze Property	Conservation Easement to Fifth Creek	178.9	Pres.	RE	179.0	10:1	17.9
Wetlands	Throughout the site	27.9	Rest.	R	27.9	1:1	27.9
Wetlands	Throughout the site	1.6	Pres.	RE	1.6	5:1	0.32

Component Summation [A]

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	N/A	27.9	N/A	N/A	N/A	N/A
Enhancement		N/A	N/A	N/A	N/A	N/A
Enhancement I	N/A					
Enhancement II	11,471.1					
Creation		N/A	N/A	N/A		N/A
Preservation	953.6	1.6	N/A	N/A		N/A
High Quality Preservation	N/A	N/A	N/A	N/A		N/A

[A] Areas and lengths differ from previous years due to updating parcel lines with Irdell County online GIS data updated 2/1/2018.

[B] Section of Beaver Creek under the Chimney Lane bridge not included in calculation.

[C] Section of Fifth Creek within the Swann Road right-of way and 858.7 linear feet at downstream end not included in calculation.

[D] Due to the near systemic nature of the improvement to the channel cross-section and the localized improvements to the profile/in-stream habitat, a credit ratio of 2:1 is being used.

Table 2. Project Activity and Reporting History
Five Mile Branch Stream Restoration, DMS IMS ID# 92185

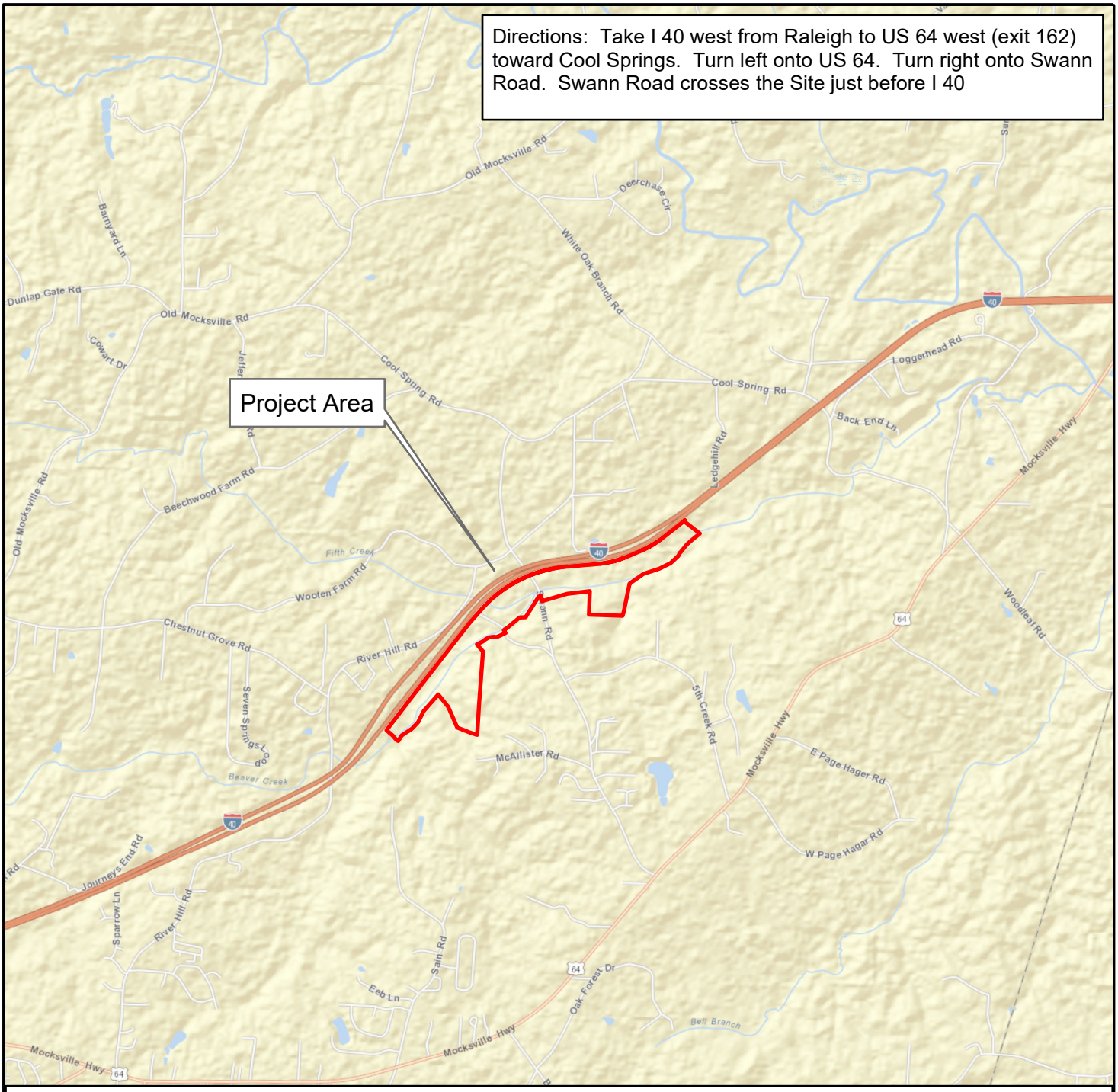
Activity or Deliverable	Data Collection Complete	Completion or Delivery
Restoration Plan	Dec-09	Dec-09
Final Design – Construction Plans	Nov-10	Nov-10
Construction	Apr-11	Apr-12
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	Jun-12	Mar-13
Year 1 Monitoring	Dec-13	Dec-13
Year 2 Monitoring	Oct-14	Dec-14
Invasive Vegetation Treatment	Nov-15	Nov-15
Year 3 Monitoring	Nov-15	Dec-15
Invasive Vegetation Treatment	Sep-16	Oct-16
Supplemental Planting near vegetation plot #1 due to encroachment	Jan-16	Jan-16
Year 4 Monitoring	Dec-16	Mar-17
Invasive Vegetation Treatment	Apr-17	Jun-17
Year 5 Monitoring	Oct-17	Mar-18

Table 3. Project Contacts Table Five Mile Branch Stream Restoration, DMS IMS ID# 92185	
Designer	ARCADIS G&M of NC, Inc.
	801 Corporate Center Dr., Suite 300, Raleigh NC 27607
Primary project design POC	Brian Whitaker 813-353-5753
Construction Contractor	North State Environmental
	2889 Lowery Street, Winston-Salem, NC 27101
Construction contractor POC	Michael Anderson 336-245-1253
Survey Contractor	North State Environmental
	2889 Lowery Street, Winston-Salem, NC 27101
Survey contractor POC	David K. Alley, PLS 336-250-9225
Planting Contractor	Southern Garden, Inc.
	PO Box 808, Apex, NC 27502
Planting contractor POC	Todd Laasko 919-362-1050
Seeding Contractor	Canady's Landscape and Erosion Control
	256 Fairview Acres Road, Lexington NC 27295
Contractor POC	336-236-1182
Seed Mix Sources	Green Resource, Colfax, NC 27235
	336-855-6363
Nursery Stock Suppliers	Foggy Mountain Nursery 336-384-5323
	Claridge Nursery 919-731-7988
	Brook Run Plantation 434-292-1677
Monitoring Performers	Arcadis U.S., Inc.
	801 Corporate Center Dr., Suite 300, Raleigh NC 27607
	Ecosystem Planning and Restoration LLC
	559 Jones Franklin Road, Suite 150 Raleigh NC 27606
	Three Oaks Engineering
	324 Blackwell St. #1200, Durham, NC 27701
Stream Monitoring POC	Brian Whitaker 813-353-5753
Vegetation Monitoring POC	Brian Whitaker 813-353-5753
Wetland Monitoring POC	Brian Whitaker 813-353-5753

Table 4. Attributes
Five Mile Branch Stream Restoration, DMS IMS ID# 92185

Project Information			
Project Name		Five Mile Branch Stream and Wetland Restoration	
County		Iredell	
Project Area (acres)		229	
Project Coordinates (latitude and longitude)		035° 50' 40.18" N	080° 46' 27.37" W
Project Watershed Summary Information			
Physiographic Province		Piedmont	
River Basin		Yadkin-Pee Dee	
USGS Hydrologic Unit 8-digit		3040102	
DWQ Sub-basin		03-07-06	
Project Drainage Area (square miles)		26	
Project Drainage Area Percentage of Impervious Area		10-20	
CGIA Land Use Classification		Heavily developed, cultivated, herbaceous and shrubland, forest land, water bodies	
Reach Summary Information			
Parameters	**Reach 1**	**Reach 2**	**Reach 3**
Length of reach (linear feet)	5,794.1	1,522.6	5,175.4*
Valley classification	VIII	VIII	VIII
Drainage area (square miles)	10.7	13.9	26.0
NCDWQ stream identification score	12-108-13-1	12-108-13	12-108-13
NCDWQ Water Quality Classification	Class C	Class C	Class C
Morphological Description (stream type)	E5	E5	E5
Evolutionary trend			
Underlying mapped soils	Codorus loam	Codorus loam	Codorus loam
Drainage class	somewhat poorly drained	somewhat poorly drained	somewhat poorly drained
Soil Hydric status	Yes	Yes	Yes
Slope	0-2%	0-2%	0-2%
FEMA classification	Zone AE	Zone AE	Zone AE
Native vegetation community	Bottomland hardwood	Bottomland hardwood	Bottomland hardwood
Percent composition of exotic invasive vegetation	<5	<5	<5
Wetland Summary Information			
Parameters	**Wetland 1**	**Wetland 2**	**Wetland 3**
Size of Wetland (acres)	29.6		
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Riparian riverine		
Mapped Soil Series	Codorus loam		
Drainage class	somewhat poorly drained		
Soil Hydric Status	Yes		
Source of Hydrology	groundwater, precipitation and overbank flooding		
Hydrologic Impairment	Ditching		
Native vegetation community	Bottomland hardwood		
Percent composition of exotic invasive vegetation	<5		
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States — Section 404	Yes	Yes	Restoration Plan
Waters of the United States — Section 401	Yes	Yes	Restoration Plan
Endangered Species Act	Yes	Yes	Restoration Plan
Historic Preservation Act	Yes	Yes	Restoration Plan
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	Restoration Plan
Essential Fisheries Habitat	No	N/A	N/A

* includes 858.7 linear feet of stream at downstream end without State ownership of both sides of stream.



The subject project site is an environmental restoration site of the NCDEQ Division of Mitigation Services (DMS) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activities requires prior coordination with DMS.

Prepared For NC Environmental Quality	0 0.5 1 2 Miles SCALE: 1:50,000 Source: USGS Quadrangle Maps Statesville East and Cool Springs, NC	N W E S
Prepared By: Ecosystem Planning & Restoration	**VICINITY MAP** Five Mile Branch Restoration Site Iredell County, North Carolina	**Figure No. 1**

Legend

- NCDOT Parcels
- NCDOT Easement

Components

- Stream Enhancement (Level II)
- Stream Preservation
- No Credit
- Wetland Restoration
- Wetland Preservation

Reach 8 - UT at Swann Road
No Credit due to lack of buffer on one side of the stream.

Reach 3
Fifth Creek downstream Beaver Creek

No Credit due to lack of buffer on one side of the stream.

Reach 2
Fifth Creek upstream Beaver Creek

Interstate 40

Reach 9 - UT at Freeze Property

Reach 1
Beaver Creek

Swann Road

Reach 7 - UT at Chimney Lane

Chimney Lane

Reach 1
Beaver Creek

Reach 4 - Beaver Creek
(Upstream)

Reach 6 - UT

Reach 5 - UT to Beaver Creek
(Upstream)

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Prepared For:
NC Environmental Quality

Prepared By:
EPR Ecosystem Planning & Restoration

N

PROJECT COMPONENTS MAP

FIVE MILE BRANCH RESTORATION SITE
IREDELL COUNTY, NORTH CAROLINA

0 750 1,500 Feet

1 inch = 750 feet

Figure No.
2

Appendix B

Visual Assessment Data

LEGEND

- NCDOT Parcels
- NCDOT Easement

Structure Condition

- Stable Structure
- Stressed Structure
- Erosion
- Invasives

Components

- Stream Enhancement (Level II)
- Stream Preservation
- No Credit
- Wetland Restoration
- Wetland Preservation
- Area Affected by Tornado

Monitoring Devices

- Vegetation Plot Not Meerting
- Vegetation Plot Meeting
- Vegetation Plot Existing Vegetation
- Ground Water Gauge Meeting
- Ground Water Gauge Malfunctioning
- Ground Water Gauge Not Meeting
- Rain Gauge
- Cross-Section
- Photo Point

Reach 8

Reach 3
Fifth Creek downstream Beaver Creek

Reach 2
Fifth Creek upstream Beaver Creek

858.7 FT excluded from restorartion calculation

Reach 9

3D

Interstate 40

3C

Reach 1
Beaver Creek

3B

Chimney Lane

Swann Road

Reach 7

Reach 1
Beaver Creek

3A

Reach 4

Reach 6

Reach 5

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Prepared For:
NC Environmental Quality

Prepared By:
EPR Ecosystem Planning & Restoration

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CURRENT CONDITION PLAN VIEW

FIVE MILE BRANCH RESTORATION SITE

IREDELL COUNTY, NORTH CAROLINA

0 750 1,500 Feet

1 inch = 750 feet

Figure No.

3

LEGEND

- NCDOT Parcels
- NCDOT Easement

Structure Condition

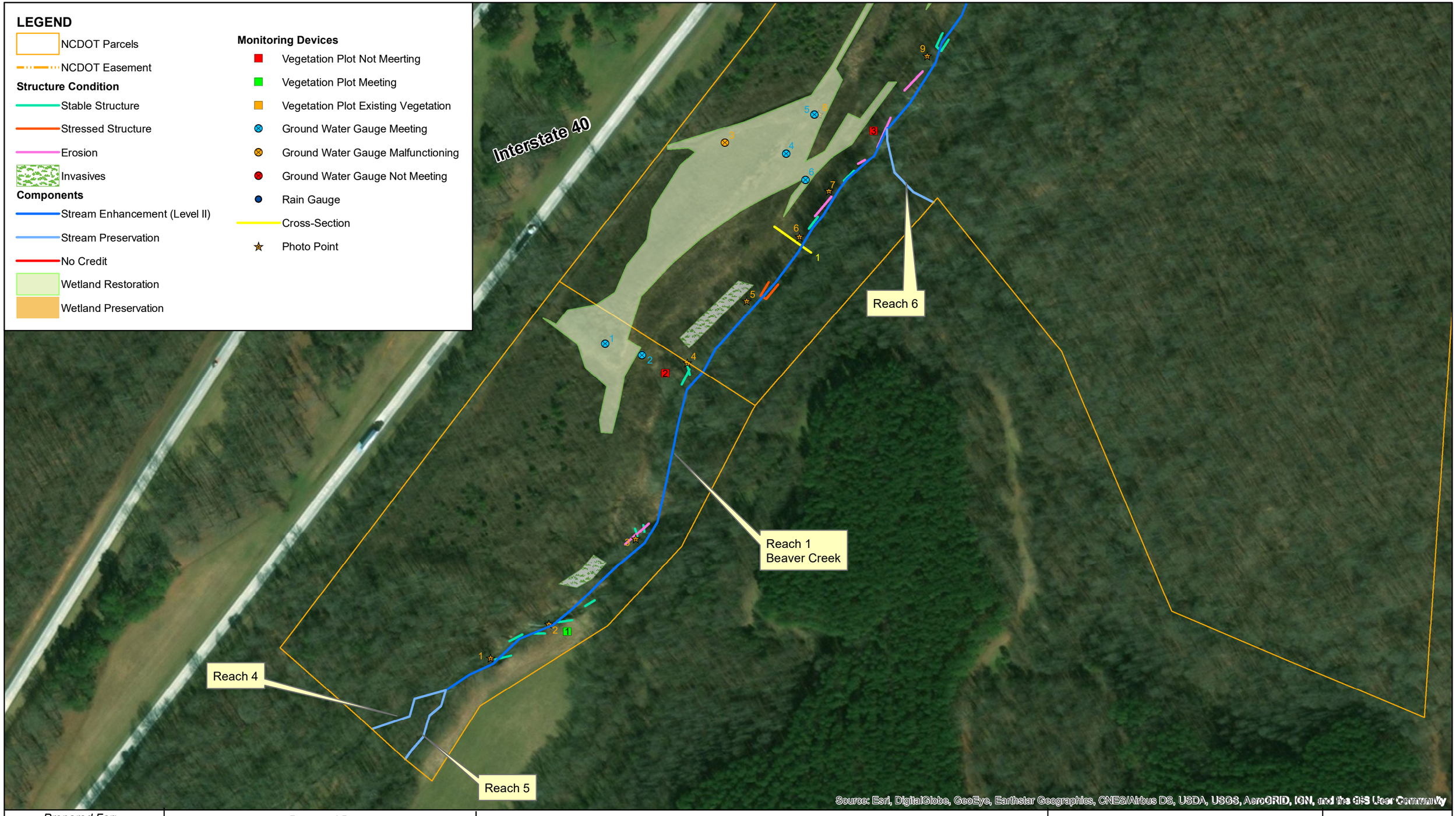
- Stable Structure
- Stressed Structure
- Erosion
- Invasives

Components

- Stream Enhancement (Level II)
- Stream Preservation
- No Credit
- Wetland Restoration
- Wetland Preservation

Monitoring Devices

- Vegetation Plot Not Meerting
- Vegetation Plot Meeting
- Vegetation Plot Existing Vegetation
- Ground Water Gauge Meeting
- Ground Water Gauge Malfunctioning
- Ground Water Gauge Not Meeting
- Rain Gauge
- Cross-Section
- Photo Point



Prepared For: NC Environmental Quality

Prepared By: EPR Ecosystem Planning & Restoration

N

CURRENT CONDITION PLAN VIEW

FIVE MILE BRANCH RESTORATION SITE

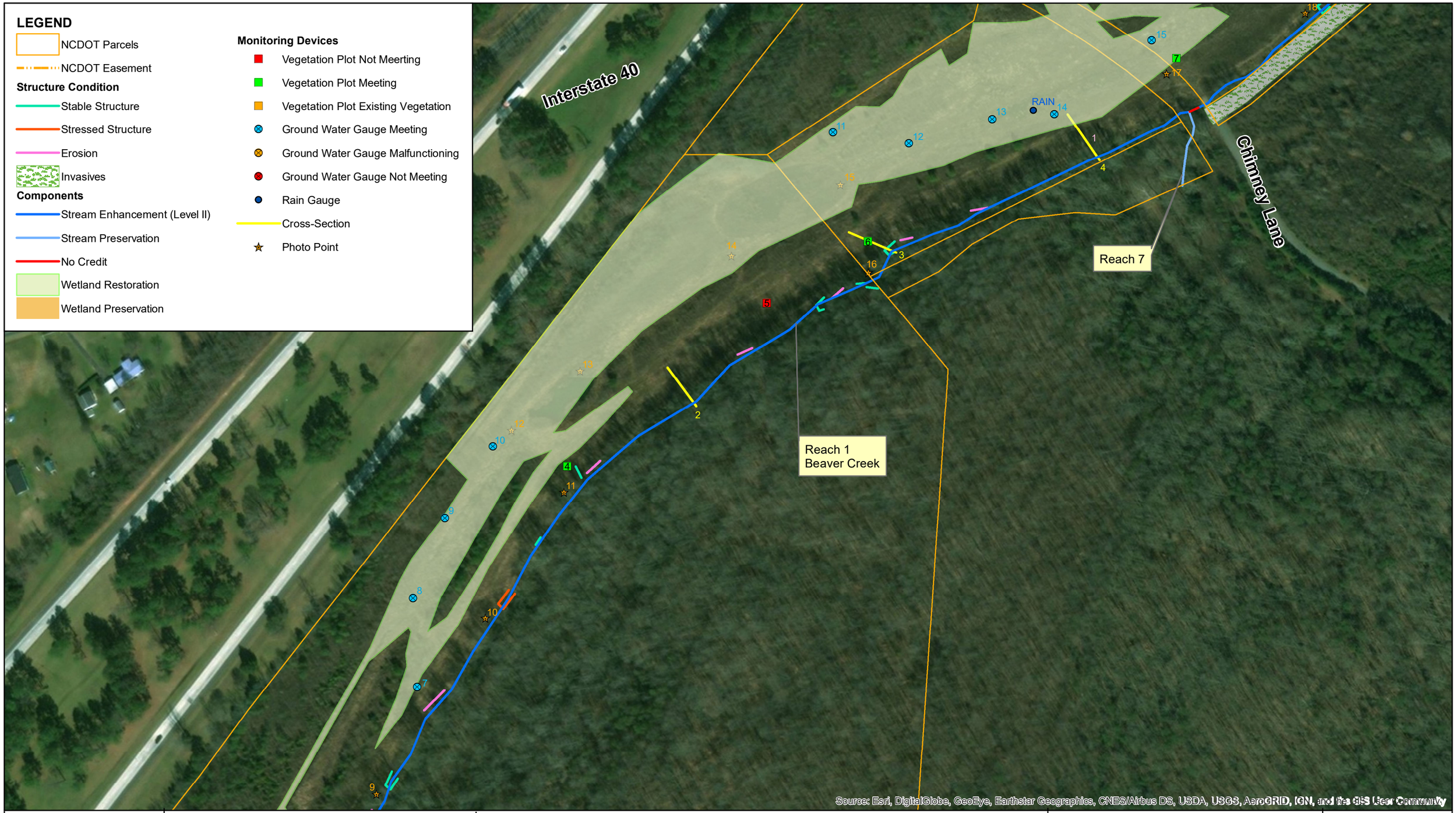
IREDELL COUNTY, NORTH CAROLINA

0 200 400 Feet

1 inch = 200 feet

Figure No.

3A



Prepared For:

Environmental Quality

Prepared By:

ECOSYSTEM PLANNING & RESTORATION

N

CURRENT CONDITION PLAN VIEW

FIVE MILE BRANCH RESTORATION SITE

IREDELL COUNTY, NORTH CAROLINA

0 200 400 Feet

1 inch = 200 feet

Figure No.

3B

LEGEND

- NCDOT Parcels
- NCDOT Easement

Structure Condition

- Stable Structure
- Stressed Structure
- Erosion
- Invasives

Components

- Stream Enhancement (Level II)
- Stream Preservation
- No Credit
- Wetland Restoration
- Wetland Preservation

Monitoring Devices

- Vegetation Plot Not Meerting
- Vegetation Plot Meeting
- Vegetation Plot Existing Vegetation
- Ground Water Gauge Meeting
- Ground Water Gauge Malfunctioning
- Ground Water Gauge Not Meeting
- Rain Gauge
- Cross-Section
- Photo Point

Interstate 40

Reach 8

Swann Road

Reach 2
Fifth Creek upstream Beaver Creek

Reach 3
Fifth Creek downstream Beaver Creek

Reach 1
Beaver Creek

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Prepared For:
NC Environmental Quality

Prepared By:
EPR Ecosystem Planning & Restoration

N

CURRENT CONDITION PLAN VIEW

FIVE MILE BRANCH RESTORATION SITE

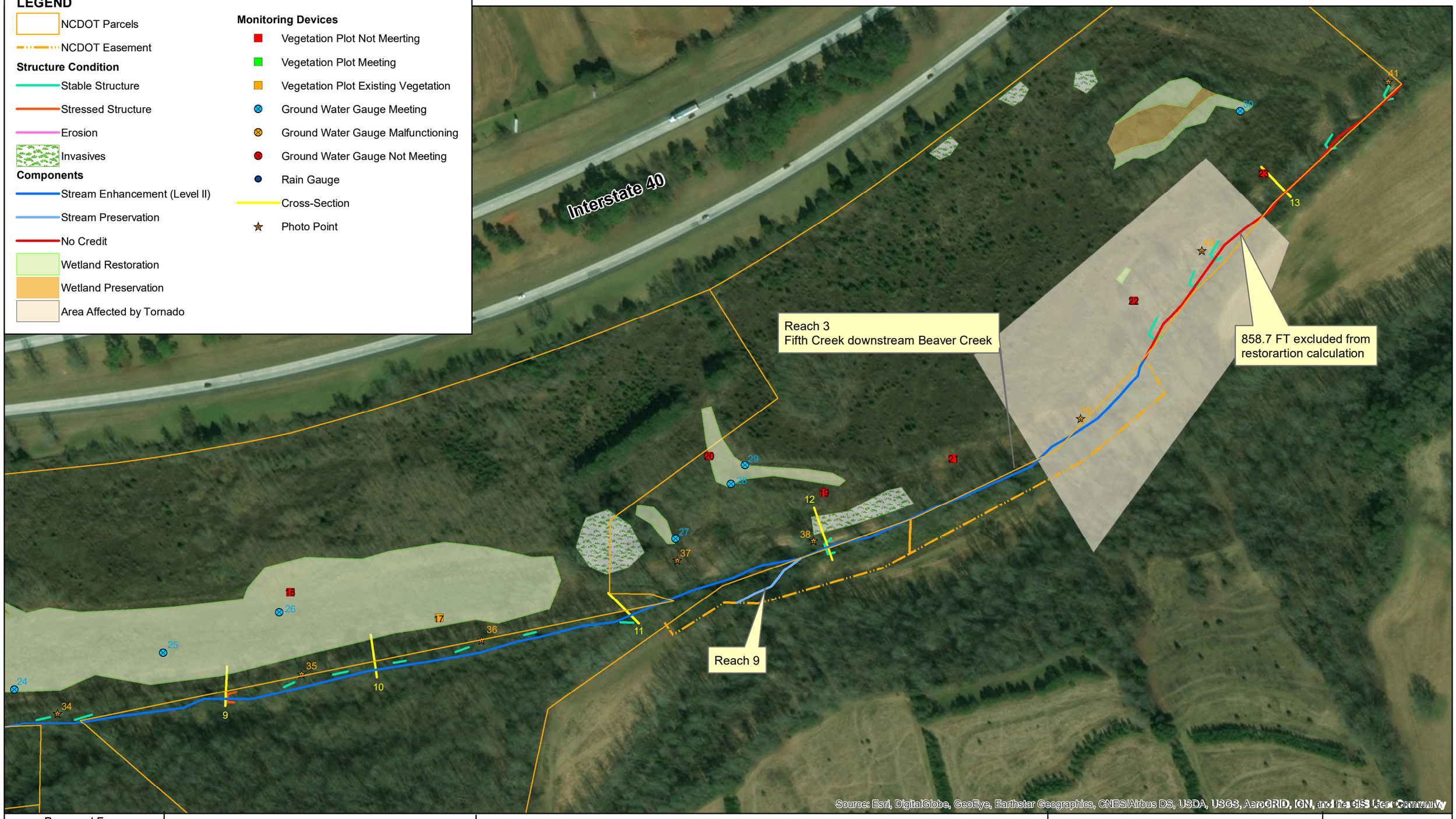
IREDELL COUNTY, NORTH CAROLINA

0 200 400 Feet

1 inch = 200 feet

Figure No.

3C



Prepared For:
NC Environmental Quality

Prepared By:
EPR Ecosystem Planning & Restoration

N

CURRENT CONDITION PLAN VIEW

FIVE MILE BRANCH RESTORATION SITE

IREDELL COUNTY, NORTH CAROLINA

0 200 400 Feet

1 inch = 200 feet

Figure No.

3D

Table 5a **Visual Stream Morphology Stability Assessment**

Reach ID Beaver Creek

Assessed Length 5,794.1

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
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not top include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition*	1. Texture/Substrate - Riffle maintains coarser substrate	N/A	N/A			N/A
	3. Meander Pool Condition**	1. Depth Sufficient (Max Pool Depth/Mean Bankfull Depth > 1.5)	N/A	N/A			N/A
		2. Length sufficient (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	N/A	N/A			N/A
	4. Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	N/A	N/A			N/A
		2. Thalweg centering at downstream of meander (Glide)	N/A	N/A			N/A
2. Bank	1. Scoured/Eroding	Bank lacks vegetative cover due to active scour and erosion			11	526	92%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected. Do NOT include undercuts that are stabilized by roots and are providing habitat.			0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%
				Totals	11	526	92%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	19	24			80%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	4	4			100%
3. Engineered Structures (cont'd.)	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms.	20	20			100%
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. See exhibit describing bank influenced by vane arms.	17	20			85%
	4. Habitat	Pool forming structures maintaining Max Pool Depth/Mean Bankfull Depth ratio > 1.5. Rootwads/logs providing some cover at low flow.	8	8			100%

* Stream is a sand bed stream. No substrate sorting is occurring

** The stream is not a meandering stream. No meander pools exist.

Table 5b **Visual Stream Morphology Stability Assessment**

Reach ID Fifth Creek upstream of Beaver Creek

Assessed Length 1,522.6

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
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not top include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition*	1. Texture/Substrate - Riffle maintains coarser substrate	N/A	N/A			N/A
	3. Meander Pool Condition**	1. Depth Sufficient (Max Pool Depth/Mean Bankfull Depth > 1.5)	N/A	N/A			N/A
		2. Length sufficient (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	N/A	N/A			N/A
	4. Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	N/A	N/A			N/A
		2. Thalweg centering at downstream of meander (Glide)	N/A	N/A			N/A
2. Bank	1. Scoured/Eroding	Bank lacks vegetative cover due to active scour and erosion			3	111	93%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected. Do NOT include undercuts that are stabilized by roots and are providing habitat.			0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%
				Totals	3	101	93%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	5	6			83%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	2	2			100%
3. Engineered Structures (cont'd.)	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms.	3	3			100%
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. See exhibit describing bank influenced by vane arms.	3	3			100%
	4. Habitat	Pool forming structures maintaining Max Pool Depth/Mean Bankfull Depth ratio > 1.5. Rootwads/logs providing some cover at low flow.	5	5			100%

* Stream is a sand bed stream. No substrate sorting is occurring

** The stream is not a meandering stream. No meander pools exist.

Table 5c **Visual Stream Morphology Stability Assessment**

Reach ID Fifth Creek downstream of Beaver Creek

Assessed Length 5,175.4

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
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not top include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition*	1. Texture/Substrate - Riffle maintains coarser substrate	N/A	N/A			N/A
	3. Meander Pool Condition**	1. Depth Sufficient (Max Pool Depth/Mean Bankfull Depth > 1.5)	N/A	N/A			N/A
		2. Length sufficient (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	N/A	N/A			N/A
	4. Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	N/A	N/A			N/A
		2. Thalweg centering at downstream of meander (Glide)	N/A	N/A			N/A
2. Bank	1. Scoured/Eroding	Bank lacks vegetative cover due to active scour and erosion			7	418	92%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected. Do NOT include undercuts that are stabilized by roots and are providing habitat.			0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%
				Totals	7	418	92%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	19	20			95%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	3	3			100%
3. Engineered Structures (cont'd.)	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms.	20	20			100%
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. See exhibit describing bank influenced by vane arms.	16	20			80%
	4. Habitat	Pool forming structures maintaining Max Pool Depth/Mean Bankfull Depth ratio > 1.5. Rootwads/logs providing some cover at low flow.	6	9			67%

* Stream is a sand bed stream. No substrate sorting is occutring

** The stream is not a meandering stream. No meander pools exist.

Appendix C

Vegetation Plot Data

DMS Project Code 92185. Project Name: Five Mile Branch

Scientific Name	Common Name	Species Type	92185-01-0001			92185-01-0002			92185-01-0003			92185-01-0004			92185-01-0005			92185-01-0006			92185-01-0007			92185-01-0008			92185-01-0009		
			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 negundo	boxelder	Tree						4			18			11			5			8			5			151			
Acer negundo var. negundo	boxelder	Tree			7																								7
Acer rubrum	red maple	Tree						8			9			20									2						
Acer rubrum var. rubrum	red maple	Tree			1																								
Ailanthus altissima	tree of heaven	Exotic																											
Alnus serrulata	hazel alder	Shrub																											
Asimina triloba	pawpaw	Tree																											
Baccharis	baccharis	Shrub																											
Baccharis halimifolia	eastern baccharis	Shrub																											
Betula nigra	river birch	Tree				1	1	1	2	2	2	1	1	2	1	1	1	2	2	2				2	2	2	2	2	2
Carpinus caroliniana	American hornbeam	Tree										2	2	2													1	1	1
Carya	hickory	Tree																											
Carya alba	mockernut hickory	Tree																											
Carya cordiformis	bitternut hickory	Tree																											
Celtis laevigata	sugarberry	Tree																											
Celtis occidentalis	common hackberry	Tree																											
Cephalanthus occidentalis	common buttonbush	Shrub																											
Cercis canadensis	eastern redbud	Tree	1	1	1																								
Cornus amomum	silky dogwood	Shrub										3	3	3				2	2	2									
Corylus americana	American hazelnut	Shrub																1	1	1			1						
Crataegus	hawthorn	Tree																											
Diospyros	diospyros	Tree																											
Diospyros virginiana	common persimmon	Tree																											
Fraxinus americana	white ash	Tree																											
Fraxinus pennsylvanica	green ash	Tree									1												2				1	1	1
Ilex decidua	possumhaw	shrub																											
Juglans nigra	black walnut	Tree							1	1	1	1	1	1	1	1	1												
Juniperus virginiana	eastern redcedar	Tree						2			2			1						2									
Juniperus virginiana var. vir	eastern redcedar	Tree																											3
Ligustrum sinense	Chinese privet	Exotic																											
Liquidambar styraciflua	sweetgum	Tree			1			30			168			55			29			8			7			48			3
Liriodendron tulipifera	tuliptree	Tree						1																					
Liriodendron tulipifera var. tu	Tulip-tree, Yellow Popla	Tree			1																								
Morus rubra	red mulberry	Tree																											
Nyssa sylvatica	blackgum	Tree										2	2	2				1	1	1	4	4	4						
Pinus taeda	loblolly pine	Tree																											
Pinus virginiana	Virginia pine	Tree																											
Platanus occidentalis	American sycamore	Tree	4	4	4	1	1	11			9									2			4	2	2	2			
Platanus occidentalis var. oc	Sycamore, Plane-tree	Tree																											1
Populus deltoides	eastern cottonwood	Tree									1																		
Pyrus calleryana	Callery pear	Exotic			1																								
Quercus michauxii	swamp chestnut oak	Tree	4	4	4																3	3	3						
Quercus pagoda	cherrybark oak	Tree				2	2	2	3	3	3				2	2	2	3	3	3							5	5	5
Quercus phellos	willow oak	Tree				1	1	1							1	1	1												
Rosa multiflora	multiflora rose	Exotic																											
Salix nigra	black willow	Tree																											
Sambucus canadensis	Common Elderberry	Shrub																								2			
Ulmus rubra	slippery elm	Tree																											
		Stem count	9	9	20	5	5	60	6	6	214	9	9	97	5	5	39	9	9	29	7	7	28	4	4	205	9	9	23
		size (ares)	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		
		Species count	3	3	8	4	4	9	3	3	10	5	5	9	4	4	6	5	5	9	2	2	8	2	2	5	4	4	8
		Stems per ACRE	364.2	364.2	809.4	202.3	202.3	2428	242.8	242.8	8660	364.2	364.2	3925	202.3	202.3	1578	364.2	364.2	1174	283.3	283.3	1133	161.9	161.9	8296	364.2	364.2	930.8

Color Code 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%

DMS Project Code 92185. Project Name: Five Mile Branch

Current Plot Data (MY5 2017)

Scientific Name	Common Name	Species Type	92185-01-0010			92185-01-0011			92185-01-0012			92185-01-0013			92185-01-0014			92185-01-0015			92185-01-0016			92185-01-0017			92185-01-0018		
			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 negundo	boxelder	Tree																							2			
Acer negundo var. negundo	boxelder	Tree			44			17			67			1								12							
Acer rubrum	red maple	Tree																										
Acer rubrum var. rubrum	red maple	Tree						1			6									1								
Ailanthus altissima	tree of heaven	Exotic																										
Alnus serrulata	hazel alder	Shrub																										
Asimina triloba	pawpaw	Tree																										
Baccharis	baccharis	Shrub																										
Baccharis halimifolia	eastern baccharis	Shrub																										
Betula nigra	river birch	Tree	2	2	2				1	1	1							2	2	3					20	1	1	1
Carpinus caroliniana	American hornbeam	Tree																										
Carya	hickory	Tree																										
Carya alba	mockernut hickory	Tree																							2			
Carya cordiformis	bitternut hickory	Tree																										
Celtis laevigata	sugarberry	Tree																										
Celtis occidentalis	common hackberry	Tree																										
Cephalanthus occidentalis	common buttonbush	Shrub																1	1	1								1
Cercis canadensis	eastern redbud	Tree																										
Cornus amomum	silky dogwood	Shrub	1	1	1				1	1	1										1	1	1					
Corylus americana	American hazelnut	Shrub																										
Crataegus	hawthorn	Tree																										
Diospyros	diospyros	Tree																										
Diospyros virginiana	common persimmon	Tree			1																							
Fraxinus americana	white ash	Tree																										
Fraxinus pennsylvanica	green ash	Tree				1	1	16												7	1	1	4					
Ilex decidua	possumhaw	shrub																										
Juglans nigra	black walnut	Tree	1	1	1				1	1	1																	
Juniperus virginiana	eastern redcedar	Tree									4																	
Juniperus virginiana var. vir	eastern redcedar	Tree																										
Ligustrum sinense	Chinese privet	Exotic																										
Liquidambar styraciflua	sweetgum	Tree						40						1						3								
Liriodendron tulipifera	tuliptree	Tree																										
Liriodendron tulipifera var. tu	Tulip-tree, Yellow Popla	Tree																										
Morus rubra	red mulberry	Tree																										
Nyssa sylvatica	blackgum	Tree				3	3	3																				
Pinus taeda	loblolly pine	Tree									1																	
Pinus virginiana	Virginia pine	Tree																										
Platanus occidentalis	American sycamore	Tree	1	1	1							1	1	1											31			
Platanus occidentalis var. oc	Sycamore, Plane-tree	Tree						14												2								1
Populus deltoides	eastern cottonwood	Tree																										
Pyrus calleryana	Callery pear	Exotic																										
Quercus michauxii	swamp chestnut oak	Tree	1	1	1																							
Quercus pagoda	cherrybark oak	Tree				1	1	1																				
Quercus phellos	willow oak	Tree	1	1	1	3	3	3													1	1	1		1	1	1	1
Rosa multiflora	multiflora rose	Exotic																										
Salix nigra	black willow	Tree																										
Sambucus canadensis	Common Elderberry	Shrub																										
Ulmus rubra	slippery elm	Tree																							6			
		Stem count	7	7	52	8	8	95	3	3	81	1	1	3	0	0	0	3	3	17	3	3	18	0	0	62	2	2	4
		size (ares)	1			1			1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.025			0.02			0.02			0.02			0.02			0.02		
		Species count	6	6	8	4	4	8	3	3	7	1	1	3	0	0	0	2	2	6	3	3	4	0	0	6	2	2	4
		Stems per ACRE	283.3	283.3	2104	323.7	323.7	3845	121.4	121.4	3278	40.47	40.47	121.4	0	0	0	121.4	121.4	688	121.4	121.4	728.4	0	0	2509	80.94	80.94	161.9

Color Code 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%

DMS Project Code 92185. Project Name: Five Mile Branch

Scientific Name	Common Name	Species Type	92185-01-0019			92185-01-0020			92185-01-0021			92185-01-0022			92185-01-0023		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree															
Acer negundo var. negundo	boxelder	Tree						2						6			15
Acer rubrum	red maple	Tree															
Acer rubrum var. rubrum	red maple	Tree						2						1			
Ailanthus altissima	tree of heaven	Exotic															
Alnus serrulata	hazel alder	Shrub															
Asimina triloba	pawpaw	Tree															
Baccharis	baccharis	Shrub															
Baccharis halimifolia	eastern baccharis	Shrub															
Betula nigra	river birch	Tree	2	2	10	2	2	2				1	1	1	1	1	1
Carpinus caroliniana	American hornbeam	Tree															
Carya	hickory	Tree															
Carya alba	mockernut hickory	Tree															
Carya cordiformis	bitternut hickory	Tree															
Celtis laevigata	sugarberry	Tree															
Celtis occidentalis	common hackberry	Tree						4									
Cephalanthus occidentalis	common buttonbush	Shrub				1	1	1									
Cercis canadensis	eastern redbud	Tree															
Cornus amomum	silky dogwood	Shrub															
Corylus americana	American hazelnut	Shrub															
Crataegus	hawthorn	Tree															
Diospyros	diospyros	Tree			7												
Diospyros virginiana	common persimmon	Tree															2
Fraxinus americana	white ash	Tree															
Fraxinus pennsylvanica	green ash	Tree						1						1			
Ilex decidua	possumhaw	shrub															
Juglans nigra	black walnut	Tree	1	1	1												
Juniperus virginiana	eastern redcedar	Tree															
Juniperus virginiana var. vir	eastern redcedar	Tree			1												
Ligustrum sinense	Chinese privet	Exotic			1												
Liquidambar styraciflua	sweetgum	Tree			27			1						36			
Liriodendron tulipifera	tuliptree	Tree															
Liriodendron tulipifera var. tu	Tulip-tree, Yellow Popla	Tree															
Morus rubra	red mulberry	Tree															
Nyssa sylvatica	blackgum	Tree										1	1	1			
Pinus taeda	loblolly pine	Tree															
Pinus virginiana	Virginia pine	Tree															
Platanus occidentalis	American sycamore	Tree							1	1	1						
Platanus occidentalis var. oc	Sycamore, Plane-tree	Tree						1									1
Populus deltoides	eastern cottonwood	Tree															
Pyrus calleryana	Callery pear	Exotic															
Quercus michauxii	swamp chestnut oak	Tree															
Quercus pagoda	cherrybark oak	Tree										2	2	2			
Quercus phellos	willow oak	Tree	1	1	2				1	1	1				2	2	2
Rosa multiflora	multiflora rose	Exotic															
Salix nigra	black willow	Tree															
Sambucus canadensis	Common Elderberry	Shrub						2									
Ulmus rubra	slippery elm	Tree	1	1	1												
		Stem count	5	5	50	3	3	16	2	2	2	4	4	48	3	3	21
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02		
		Species count	4	4	8	2	2	9	2	2	2	3	3	7	2	2	5
		Stems per ACRE	202.3	202.3	2023	121.4	121.4	647.5	80.94	80.94	80.94	161.9	161.9	1942	121.4	121.4	849.8

Color Code 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%

DMS Project Code 92185. Project Name: Five Mile Branch

			Annual Means																	
			MY5 (2017)			MY4 (2016)			MY3 (2015)			MY2 (2014)			MY1 (2013)			MY0 (2012)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree			204			326			442.6			372			182			1
Acer negundo var. negundo	boxelder	Tree			178															
Acer rubrum	red maple	Tree			39			74			12			24			22			
Acer rubrum var. rubrum	red maple	Tree			12															
Ailanthus altissima	tree of heaven	Exotic									1									
Alnus serrulata	hazel alder	Shrub																2	2	2
Asimina triloba	pawpaw	Tree												1						
Baccharis	baccharis	Shrub																		
Baccharis halimifolia	eastern baccharis	Shrub						1			1									
Betula nigra	river birch	Tree	23	23	53	25	25	53	25	25	57	22	22	62	16	16	67	19	19	50
Carpinus caroliniana	American hornbeam	Tree	3	3	3	3	3	4	2	2	2	2	2	4	2	2	2	4	4	4
Carya	hickory	Tree						2												
Carya alba	mockernut hickory	Tree			2			2			1			2						
Carya cordiformis	bitternut hickory	Tree									1			1						
Celtis laevigata	sugarberry	Tree													4	4	6	5	5	9
Celtis occidentalis	common hackberry	Tree			4						2									
Cephalanthus occidentalis	common buttonbush	Shrub	2	2	3	2	2	7	1	1	10	1	1	8			4			
Cercis canadensis	eastern redbud	Tree	1	1	1	1	1	1												
Cornus amomum	silky dogwood	Shrub	8	8	8	9	9	15	10	10	11	11	11	12	7	7	9	12	12	12
Corylus americana	American hazelnut	Shrub	1	1	2	1	1	2	1	1	1	1	1	1						
Crataegus	hawthorn	Tree						1												
Diospyros	diospyros	Tree			7															
Diospyros virginiana	common persimmon	Tree			3			15			21			25			11			
Fraxinus americana	white ash	Tree										1	1	1						
Fraxinus pennsylvanica	green ash	Tree	3	3	33	4	4	95	5	5	42	4	4	53	2	2	17	2	2	3
Ilex decidua	possumhaw	shrub				1	1	1	1	1	1	5	5	5	12	12	12	14	14	14
Juglans nigra	black walnut	Tree	6	6	6	6	6	6	7	7	8	6	6	13	3	3	7	15	15	15
Juniperus virginiana	eastern redcedar	Tree			11			15			2			1						
Juniperus virginiana var. vir	eastern redcedar	Tree			4															
Ligustrum sinense	Chinese privet	Exotic			1									2						
Liquidambar styraciflua	sweetgum	Tree			457			579			428			615			393			
Liriodendron tulipifera	tuliptree	Tree			1			6			3			2						
Liriodendron tulipifera var. tu	Tulip-tree, Yellow Popla	Tree			1															
Morus rubra	red mulberry	Tree													1	1	1	3	3	3
Nyssa sylvatica	blackgum	Tree	11	11	11	10	10	10	9	9	9	6	6	6	2	2	2	2	2	2
Pinus taeda	loblolly pine	Tree			1			2			1			1						
Pinus virginiana	Virginia pine	Tree												1						
Platanus occidentalis	American sycamore	Tree	10	10	66	10	10	116	6	6	128	6	6	117	6	6	159	5	5	37
Platanus occidentalis var. oc	Sycamore, Plane-tree	Tree			20															
Populus deltoides	eastern cottonwood	Tree			1			1			1			1						
Pyrus calleryana	Callery pear	Exotic			1															
Quercus michauxii	swamp chestnut oak	Tree	8	8	8	9	9	9	6	6	6	6	6	6	4	4	4	15	15	15
Quercus pagoda	cherrybark oak	Tree	18	18	18	19	19	19	19	19	19	20	20	20	22	22	24	24	24	24
Quercus phellos	willow oak	Tree	12	12	14	12	12	16	13	13	13	10	10	10	6	6	6	10	10	10
Rosa multiflora	multiflora rose	Exotic									1									
Salix nigra	black willow	Tree									1			1						
Sambucus canadensis	Common Elderberry	Shrub			4			4	1	1	10			4	3	3	28	5	5	5
Ulmus rubra	slippery elm	Tree	1	1	7	1	1	16	1	1	8	1	1	10						
		Stem count	107	107	1184	113	113	1398	107	107	1244	102	102	1381	90	90	956	137	137	206
		size (ares)	23			23			23			23			23			23		
		size (ACRES)	0.57			0.57			0.57			0.57			0.57			0.57		
		Species count	14	14	33	15	15	28	15	15	30	15	15	30	14	14	19	15	15	16
		Stems per ACRE	188.3	188.3	2083	198.8	198.8	2460	188.3	188.3	2188	179.5	179.5	2430	158.4	158.4	1682	241.1	241.1	362.5

Color Code 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%

Vegetation Monitoring Plot #1 5/16/2017

Vegetation Monitoring Plot #5 5/16/2017

Vegetation Monitoring Plot #2 5/16/2017

Vegetation Monitoring Plot #6 5/16/2017

Vegetation Monitoring Plot #3 5/16/2017

Vegetation Monitoring Plot #7 5/16/2017

Vegetation Monitoring Plot #4 5/16/2017

Vegetation Monitoring Plot #8 5/16/2017

Vegetation Monitoring Plot #9 5/16/2017

Vegetation Monitoring Plot #13 5/16/2017

Vegetation Monitoring Plot #10 5/16/2017

NO PHOTO AVAILABLE

Vegetation Monitoring Plot #14

Vegetation Monitoring Plot #11 5/16/2017

Vegetation Monitoring Plot #15 5/16/2017

Vegetation Monitoring Plot #12 5/16/2017

Vegetation Monitoring Plot #16 5/16/2017

NO PHOTO AVAILABLE

Vegetation Monitoring Plot #17

Vegetation Monitoring Plot #18 5/16/2017

Vegetation Monitoring Plot #19 5/16/2017

Vegetation Monitoring Plot #20 5/16/2017

Vegetation Monitoring Plot #21 5/16/2017

Vegetation Monitoring Plot #22 5/16/2017

Vegetation Monitoring Plot #23 5/16/2017

Table 6 **Vegetation Condition Assessment**
Five Mile Branch Stream and Wetland Restoration

Planted Acreage 67.3

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very Limited cover of both woody and herbaceous material.	0.1 acres	None	0	0	0%
2. Low Stem Density Areas*	Woody stem densities clearly below target levels based on MY 4, or 5 stem count criteria.	0.1 acres	None	0	0.35	<1%
			Total		0.35	<1%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	None	0	0	0%
			Cumulative Total		0.35	<1%

Easement Acreage 229

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000SF	Grassland/ Green	9	1.6	2.4%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	None	None	0	0	0.0%

* Acreage is combined acreage of 20 vegetation monitoring plots not meeting planted stem success criteria.

Appendix D

Stream Survey Data

River Basin:	Catawba
Watershed:	Beaver Creek
XS ID:	X-1 BVR
Drainage Area (sq. mi.)	10.7
Date:	10/11/217
Field Crew:	E. Toler

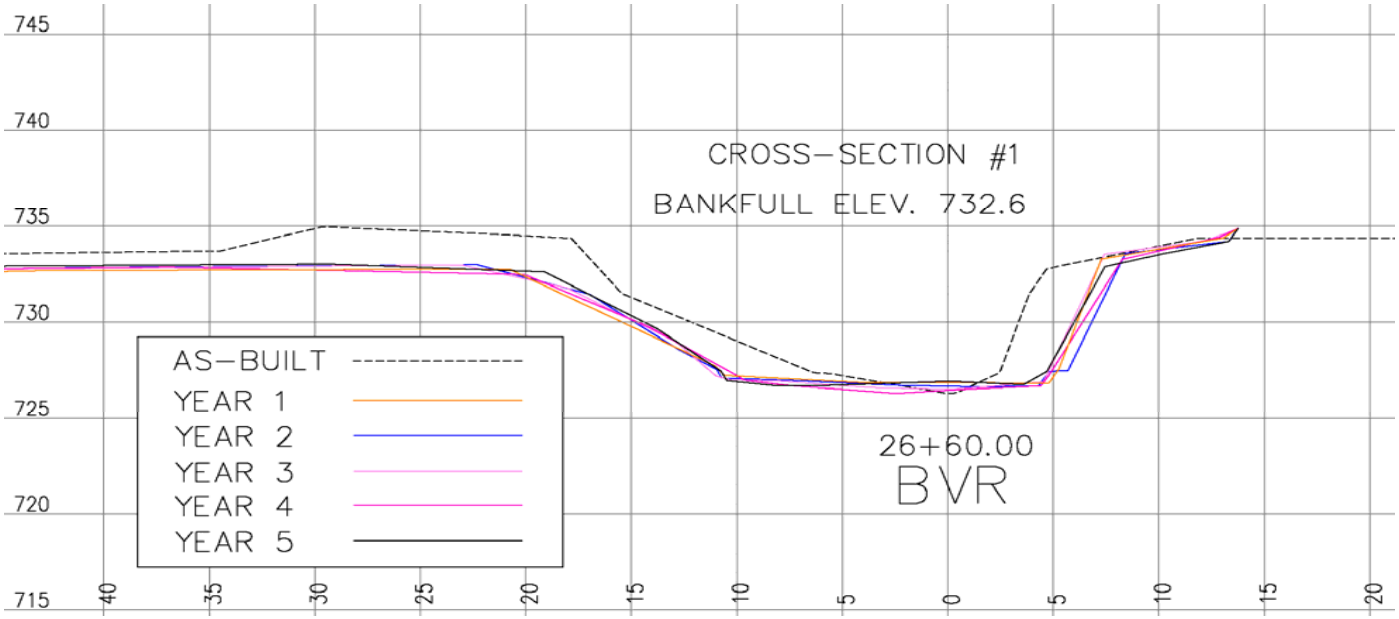
Section 1 Riffle

Northing	Easting	Elevation
764366.962	1472878.43	734.6578
764369.155	1472875.85	733.9309
764371.321	1472874.2	733.2746
764373.771	1472872.94	727.8294
764373.436	1472871.9	727.1539
764375.558	1472869.13	727.3249
764379.098	1472864.68	727.1179
764380.787	1472862.7	727.1038
764382.448	1472861.12	727.3572
764382.468	1472860.83	727.8533
764384.17	1472858.35	730.0442
764387.877	1472854.51	732.9992
764392.906	1472845.64	733.3977
764402.762	1472828.98	733.2732
764411.543	1472814.79	732.6685
764419.687	1472802.41	732.4222

SUMMARY DATA	
Bankfull Elevation:	731.6
Bankfull Cross-Sectional Area:	115.9
Bankfull Width:	26.4
Floodprone Area Elevation:	737.4
Floodprone Width:	200+
Max Depth at Bankfull	5.8
Mean Depth at Bankfull	4.4
W/D Ratio	6.0
Entrenchment Ratio:	7.6
Bank Height Ratio:	1.0

Stream Type:	E5

The discrepancies between the as-built cross sections and the following year's cross sections are the result of the as-built cross sections being generated from the surface contours created from the as-built field survey, which was not surveyed by ARCADIS staff. The annual monitoring surveys of the channel were generated using field surveys and accurately represent actual field conditions.



River Basin:	Catawba
Watershed:	Beaver Creek
XS ID:	X-2 BVR
Drainage Area (sq. mi.)	10.7
Date:	10/11/2017
Field Crew:	E. Toler

Section 2 Riffle

Northing	Easting	Elevation
765692.491	1473871.11	731.3913
765696.522	1473867.93	730.473
765700.294	1473864.94	730.4106
765702.534	1473863.84	725.2972
765702.85	1473863.81	724.7001
765704.972	1473861.48	724.4516
765707.207	1473859.32	724.695
765710.088	1473857.28	724.9016
765713.253	1473855.05	724.8169
765714.738	1473853.77	724.7038
765715.123	1473853.17	725.313
765718.581	1473850.89	727.9401
765722.854	1473847.79	730.2173
765732.552	1473839.2	730.3773
765745.253	1473828.64	730.8215
765758.344	1473818.15	730.3302
765771.33	1473808.64	730.4746

SUMMARY DATA	
Bankfull Elevation:	729.9
Bankfull Cross-Sectional Area:	119.4
Bankfull Width:	29
Floodprone Area Elevation:	735.6
Floodprone Width:	200+
Max Depth at Bankfull	5.7
Mean Depth at Bankfull	4.1
W/D Ratio	7.0
Entrenchment Ratio:	6.9
Bank Height Ratio:	1.0

Stream Type:	E5

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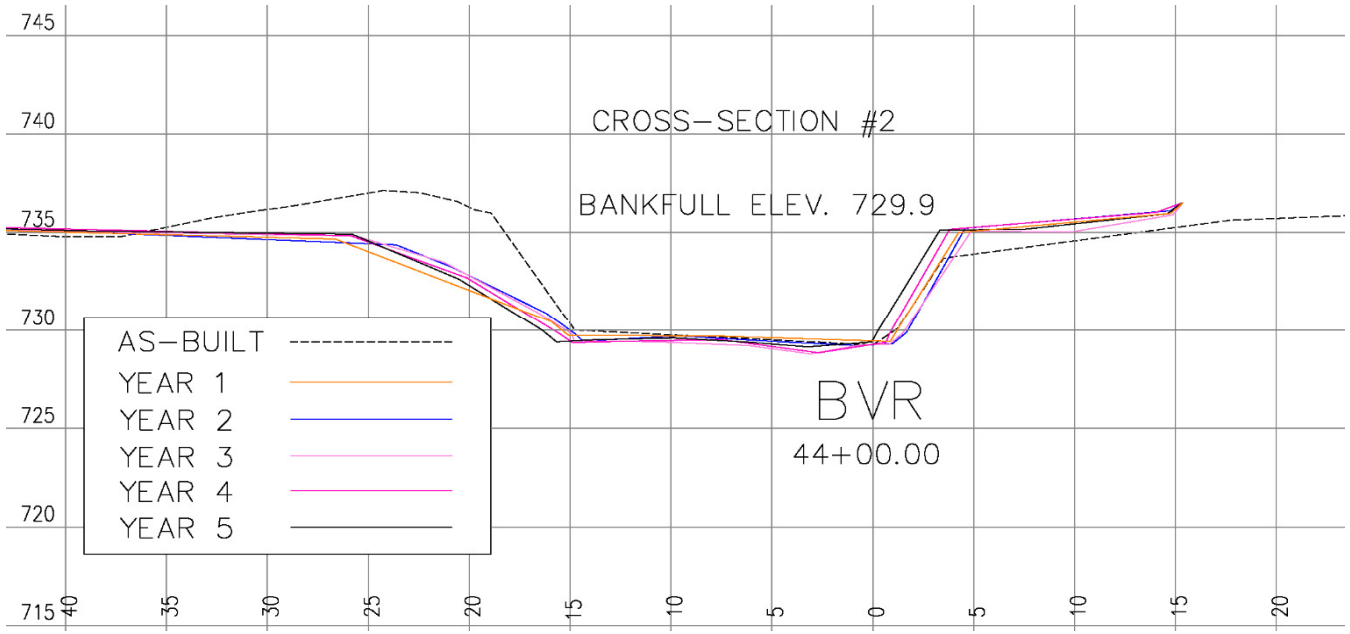


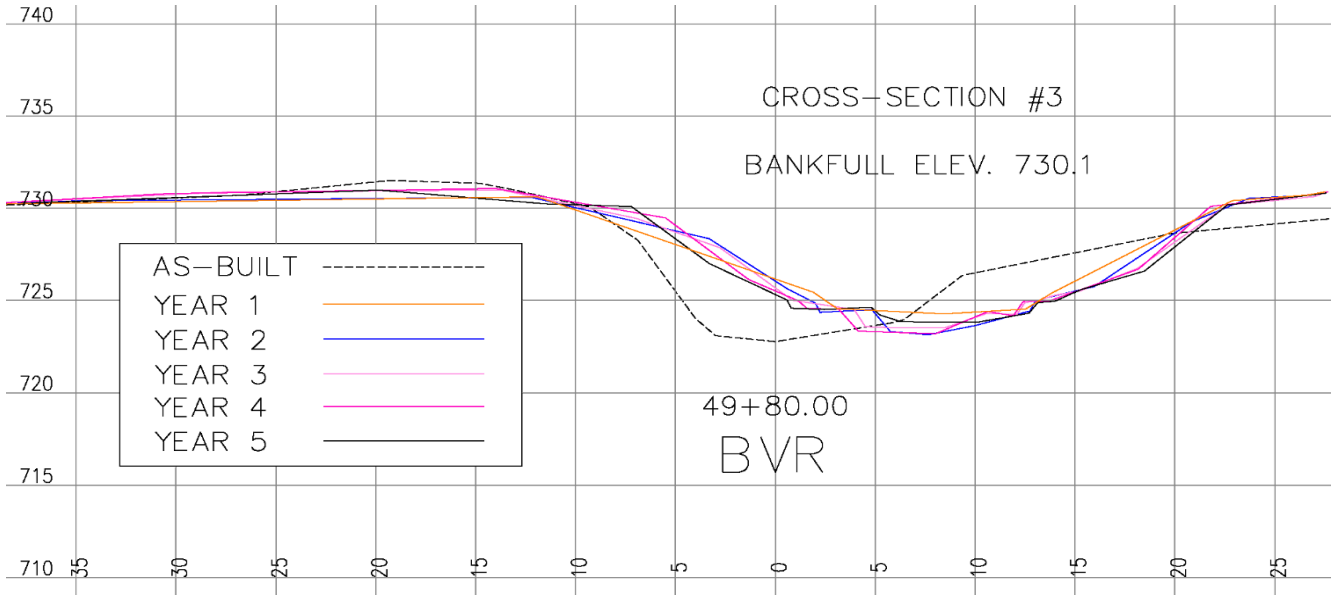
River Basin:	Catawba
Watershed:	Beaver Creek
XS ID:	X-3 BVR
Drainage Area (sq. mi.)	10.7
Date:	10/11/2017
Field Crew:	E. Toler

Section 3 Pool

Northing	Easting	Elevation
766029.8212	1474321.685	730.1352
766031.5889	1474318.031	729.7281
766033.3658	1474313.316	725.9063
766034.2289	1474310.237	724.8897
766034.2048	1474308.975	724.2825
766034.3251	1474308.718	724.25
766034.6044	1474308.197	724.2011
766034.6737	1474307.755	723.625
766035.8463	1474305.429	723.132
766039.0293	1474303.358	723.1597
766039.8806	1474302.702	723.5299
766040.2961	1474302.671	723.947
766039.7685	1474300.375	723.8294
766040.5084	1474298.9	723.8947
766040.5319	1474298.69	724.34
766041.7969	1474295.018	726.3148
766044.1714	1474291.921	729.4107
766045.4607	1474287.952	729.5449
766049.4698	1474280.472	730.3049
766057.2359	1474264.057	729.5699
766065.2429	1474246.864	728.6155
766071.9872	1474232.064	728.4438
766077.0617	1474220.127	728.4214

SUMMARY DATA	
Bankfull Elevation:	730.1
Bankfull Cross-Sectional Area:	124.0
Bankfull Width:	30.6
Floodprone Area Elevation:	737.0
Floodprone Width:	200+
Max Depth at Bankfull	6.9
Mean Depth at Bankfull	4.1
W/D Ratio	7.5
Entrenchment Ratio:	6.5
Bank Height Ratio:	1.0

Stream Type:	E5



The discrepancies between the as-built cross sections and the following year's cross sections are the result of the as-built cross sections being generated from the surface contours created from the as-built field survey, which was not surveyed by ARCADIS staff. The annual monitoring surveys of the channel were generated using field surveys and accurately represent actual field conditions.

River Basin:	Catawba
Watershed:	Beaver Creek
XS ID:	X-4 BVR
Drainage Area (sq. mi.)	10.7
Date:	10/11/2017
Field Crew:	E. Toler

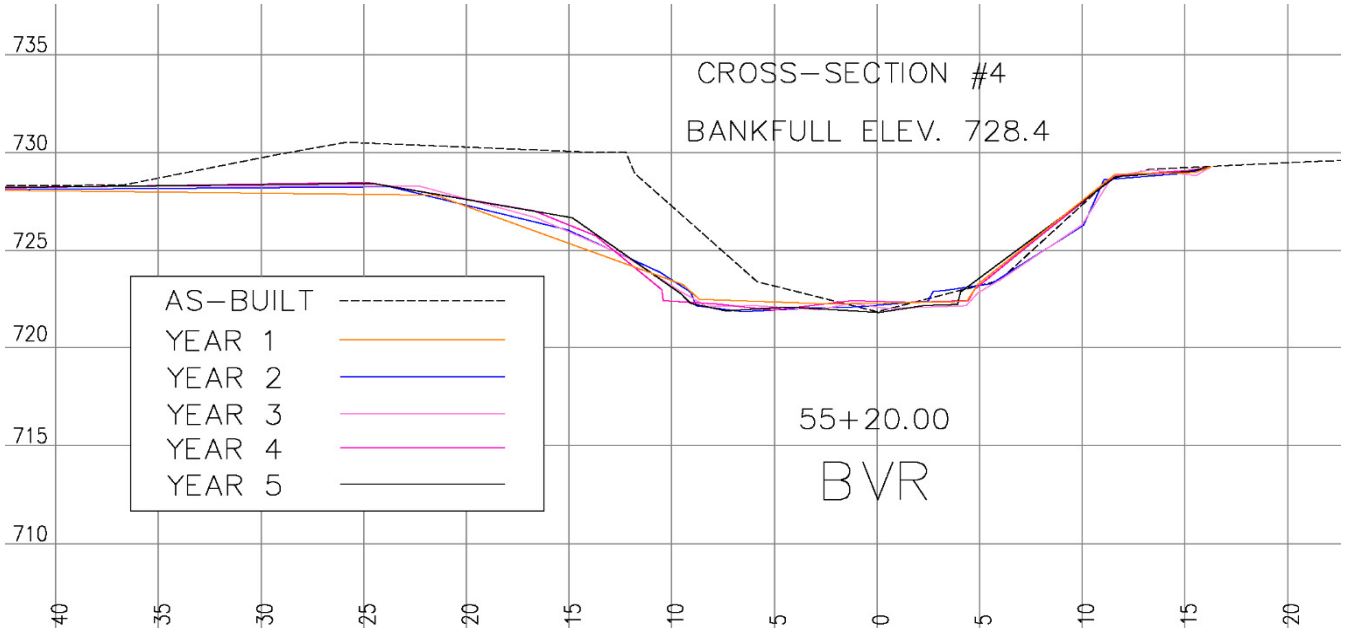
Section 4 Riffle

Northing	Easting	Elevation
766238.551	1474788.48	729.5909
766241.534	1474786.29	729.2756
766244.221	1474783.34	725.953
766246.945	1474782.46	723.5021
766247.088	1474782.2	722.9346
766249.244	1474780.19	722.8447
766251.738	1474779.06	722.9295
766255.196	1474777.39	722.4436
766257.182	1474775.72	722.7482
766259.609	1474774.44	722.9333
766259.559	1474774.38	723.4936
766261.759	1474772.04	726.2345
766264.409	1474770.6	727.5155
766270.712	1474765.55	728.9555
766285.049	1474755.33	728.6815
766299.381	1474745.66	728.4444
766315.342	1474733.34	727.2576
766332.716	1474721.77	727.2114
766344.198	1474714.67	727.3292

SUMMARY DATA	
Bankfull Elevation:	728.4
Bankfull Cross-Sectional Area:	134.4
Bankfull Width:	35.8
Floodprone Area Elevation:	735.0
Floodprone Width:	200+
Max Depth at Bankfull	6.6
Mean Depth at Bankfull	3.8
W/D Ratio	9.4
Entrenchment Ratio:	5.6
Bank Height Ratio:	1.0

Stream Type:	E5

The discrepancies between the as-built cross sections and the following year's cross sections are the result of the as-built cross sections being generated from the surface contours created from the as-built field survey, which was not surveyed by ARCADIS staff. The annual monitoring surveys of the channel were generated using field surveys and accurately represent actual field conditions.



River Basin:	Catawba
Watershed:	Beaver Creek
XS ID:	X-5 BVR
Drainage Area (sq. mi.)	10.7
Date:	10/11/2017
Field Crew:	E. Toler

Section 5 Pool

Northing	Easting	Elevation
766934.718	1475552.28	726.3149
766929.339	1475565.13	726.566
766925.141	1475579.92	727.2459
766921.245	1475590.91	726.807
766915.129	1475601.5	725.6441
766912.179	1475604.39	723.5344
766909.626	1475605.97	720.4437
766909.412	1475606.2	719.8509
766911.389	1475611.05	719.9581
766911.346	1475611.66	720.155
766910.857	1475613.12	720.0838
766910.73	1475613.74	719.3522
766909.718	1475614.78	718.8021
766908.707	1475622.23	719.6097
766908.601	1475622.82	720.5263
766902.79	1475623.46	726.6968
766899.702	1475624.96	727.4294

SUMMARY DATA	
Bankfull Elevation:	725.9
Bankfull Cross-Sectional Area:	118.2
Bankfull Width:	27.6
Floodprone Area Elevation:	733.2
Floodprone Width:	200+
Max Depth at Bankfull	7.3
Mean Depth at Bankfull	4.3
W/D Ratio	6.4
Entrenchment Ratio:	7.2
Bank Height Ratio:	1.0

Stream Type:	E5

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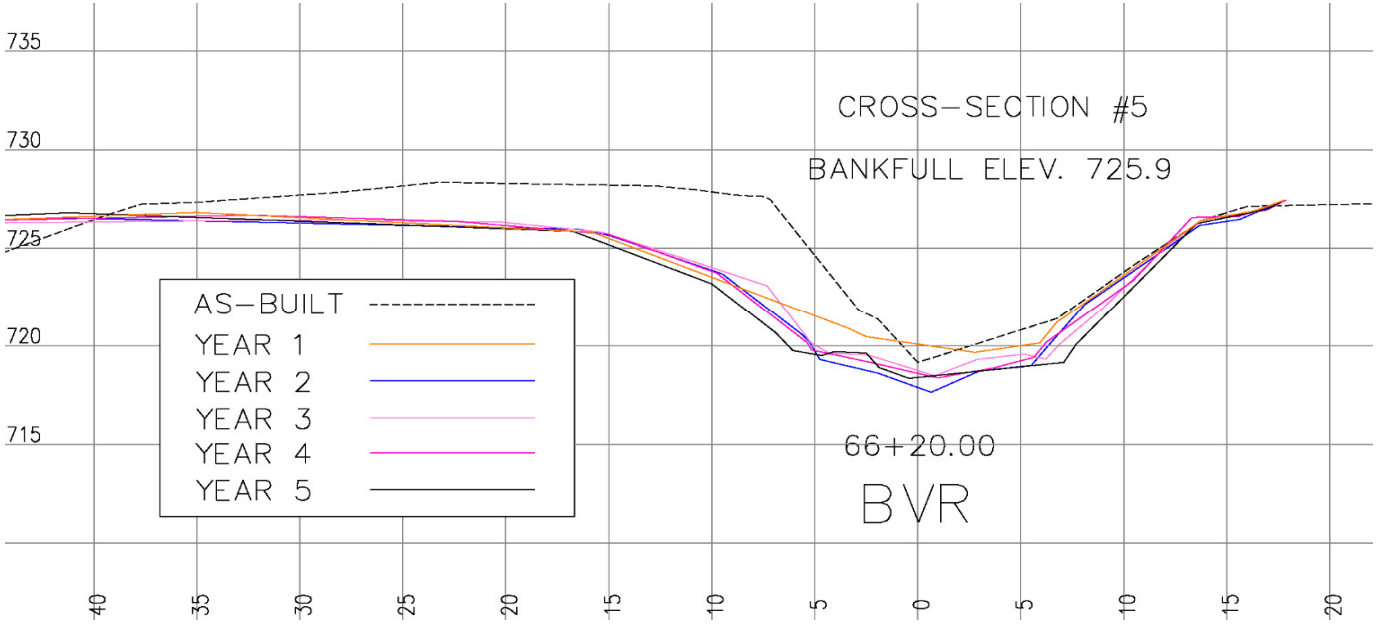

River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-6 FTH
Drainage Area (sq. mi.)	13.9
Date:	10/11/2017
Field Crew:	E. Toler

Section 6 Pool

Northing	Easting	Elevation
767092.328	1474624.34	728.5851
767085.807	1474622.87	729.3177
767078.519	1474621.36	729.3625
767070.988	1474619.51	727.8951
767064.197	1474617.53	725.2263
767062.15	1474617.3	722.3152
767062.022	1474617.24	721.8266
767058.359	1474616.14	721.422
767054.819	1474615.62	720.9866
767049.999	1474614.77	720.9421
767047.967	1474614.43	721.3267
767048.009	1474614.16	722.3299
767044.84	1474613.22	726.5361
767041.527	1474611.69	729.0079
767035.24	1474610.37	729.9346
767029.588	1474608.53	730.0507

SUMMARY DATA	
Bankfull Elevation:	729.4
Bankfull Cross-Sectional Area:	149.6
Bankfull Width:	33.8
Floodprone Area Elevation:	737.1
Floodprone Width:	200+
Max Depth at Bankfull	7.7
Mean Depth at Bankfull	4.4
W/D Ratio	7.7
Entrenchment Ratio:	5.9
Bank Height Ratio:	1.0

Stream Type:	E5

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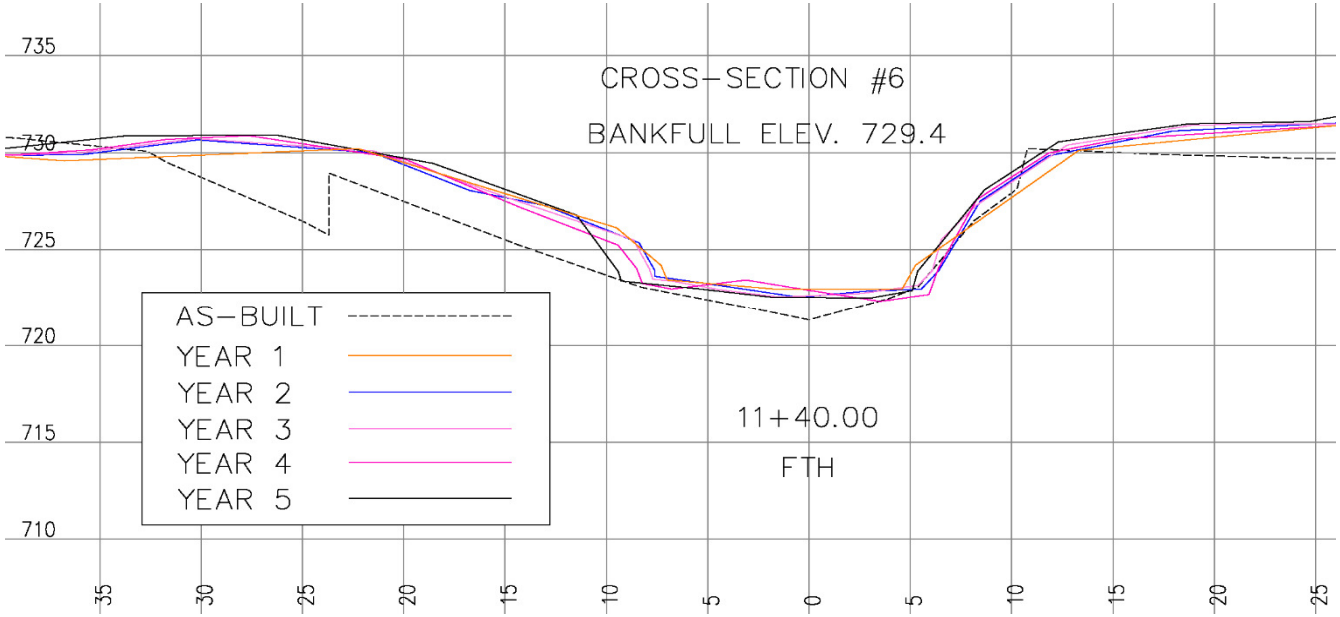

River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-7 FTH
Drainage Area (sq. mi.)	13.9
Date:	10/11/2017
Field Crew:	E. Toler

Section 7 Riffle

Northing	Easting	Elevation
767178.858	1475523.87	727.9314
767181.568	1475522.55	727.7151
767182.961	1475521.66	727.0303
767186.389	1475521.49	720.5501
767186.77	1475521.53	719.7902
767189.454	1475519.43	719.7915
767191.744	1475516.54	719.4912
767194.982	1475514.5	719.7585
767197.843	1475512.04	719.5671
767198.78	1475511.92	720.4892
767204.217	1475509.97	725.7025
767219.295	1475501.05	726.4204
767232.164	1475493.43	727.3837
767244.949	1475485.77	727.7807
767261.682	1475474.71	726.8964

SUMMARY DATA	
Bankfull Elevation:	726.8
Bankfull Cross-Sectional Area:	118.7
Bankfull Width:	25.7
Floodprone Area Elevation:	733.5
Floodprone Width:	200+
Max Depth at Bankfull	6.7
Mean Depth at Bankfull	4.6
W/D Ratio	5.6
Entrenchment Ratio:	7.8
Bank Height Ratio:	1.0

Stream Type:	E5

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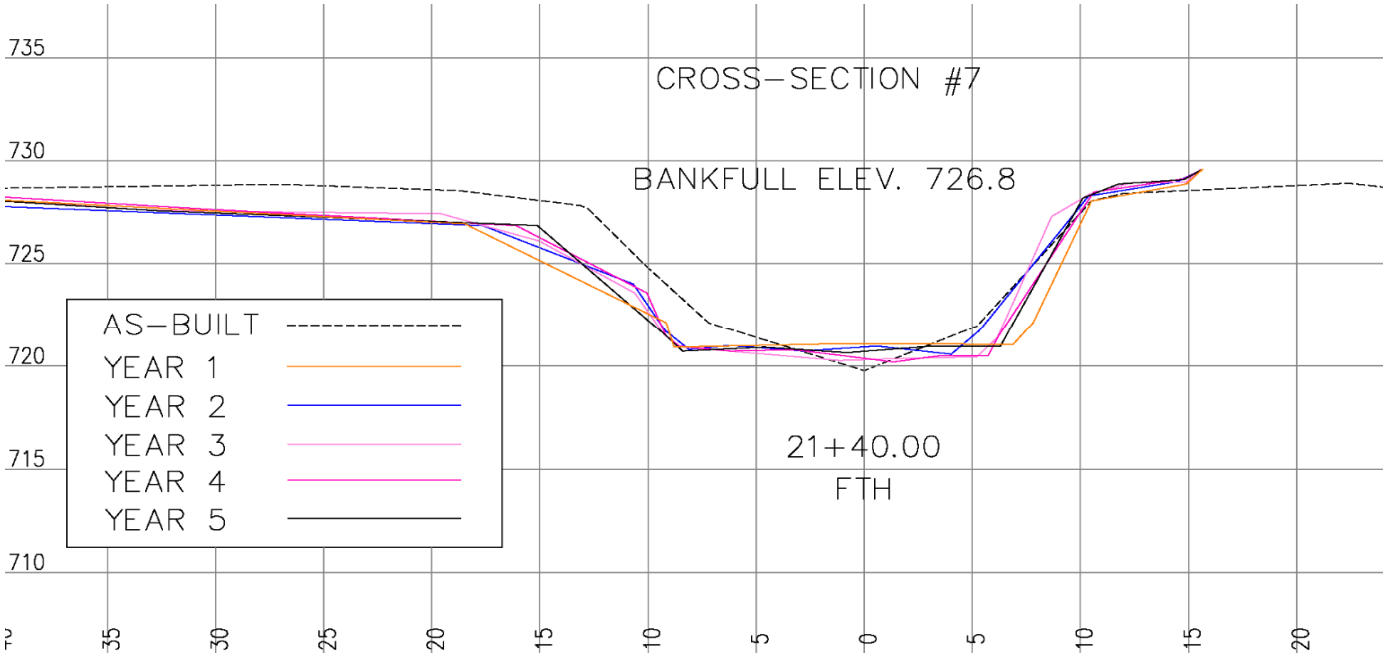

River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-8 FTH
Drainage Area (sq. mi.)	26.0
Date:	10/11/2017
Field Crew:	E. Toler

Section 8 Riffle

Northing	Easting	Elevation
767559.405	1476434	726.4499
767563.805	1476432.78	726.0701
767566.954	1476432.39	725.5152
767569.711	1476430.99	719.289
767569.522	1476431.17	718.767
767575.661	1476429.4	718.6547
767580.159	1476429.18	718.1941
767584.386	1476428.22	718.4138
767588.772	1476426.85	718.5046
767592.485	1476426.58	719.0778
767592.695	1476426.18	719.3116
767596.952	1476426.94	724.0035
767600.432	1476427.11	725.7384
767618.078	1476421.51	725.4765
767634.344	1476417.27	725.5151
767649.878	1476411.58	724.4721
767662.206	1476407.29	724.9541

SUMMARY DATA	
Bankfull Elevation:	726.5
Bankfull Cross-Sectional Area:	172.4
Bankfull Width:	32.2
Floodprone Area Elevation:	733.3
Floodprone Width:	200+
Max Depth at Bankfull	6.8
Mean Depth at Bankfull	5.4
W/D Ratio	6.0
Entrenchment Ratio:	6.2
Bank Height Ratio:	1.0

Stream Type:	E5

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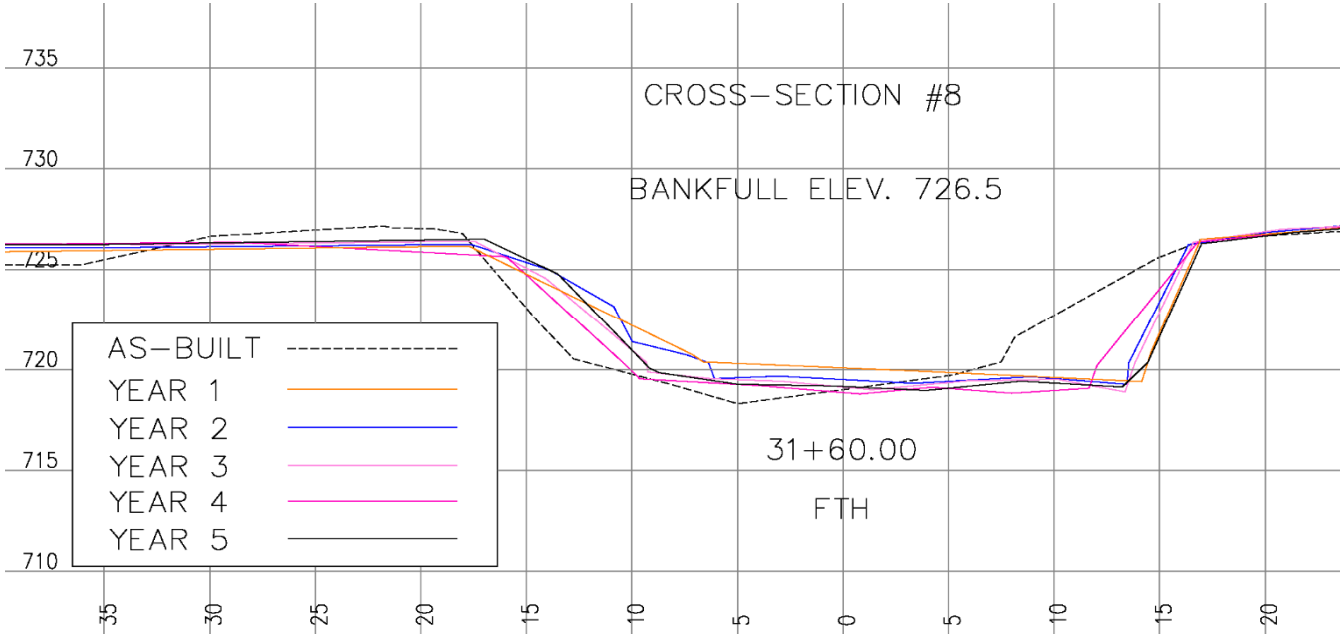


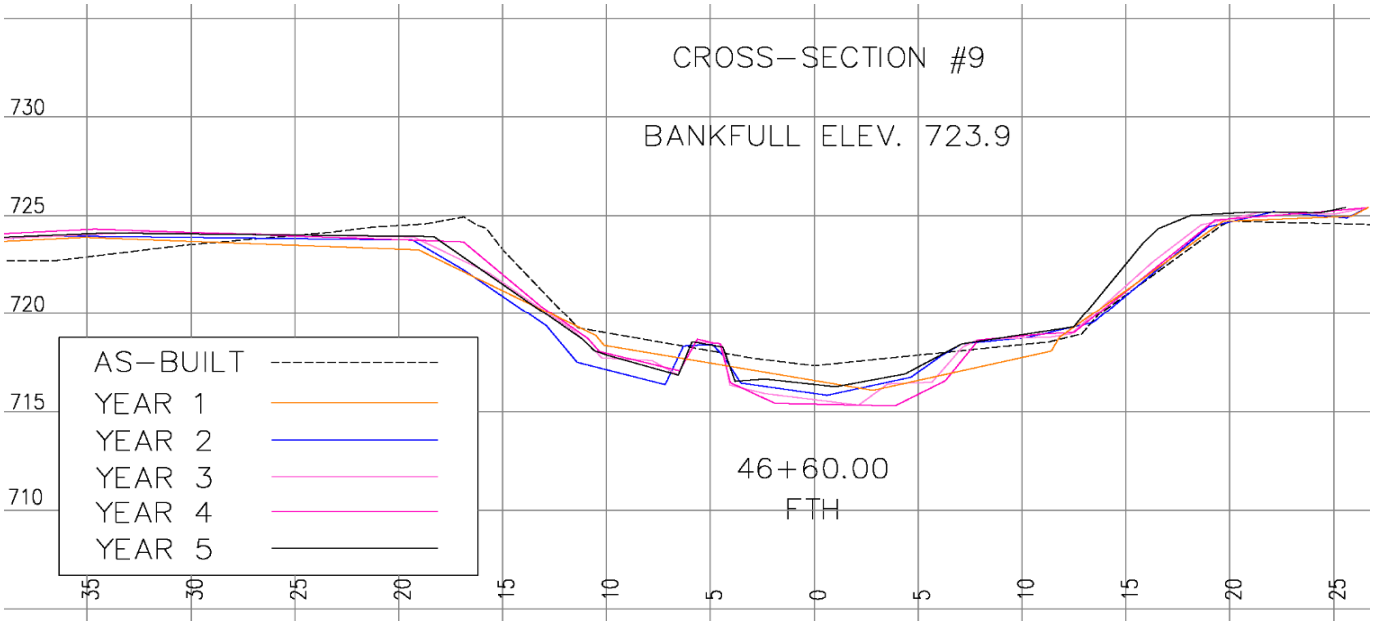
River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-9 FTH
Drainage Area (sq. mi.)	26.0
Date:	10/11/2017
Field Crew:	E. Toler

Section 9 Pool

Northing	Easting	Elevation
767644.241	1477906.51	724.3685
767647.601	1477906.25	724.3898
767651.142	1477906.14	723.6124
767655.417	1477906.77	725.1613
767658.569	1477906	723.8246
767661.295	1477906.25	723.5596
767661.601	1477906.44	723.2959
767664.04	1477906.17	716.131
767667.265	1477905.28	715.4822
767670.322	1477906.8	715.8713
767671.646	1477907.33	715.7558
767672.034	1477906.9	717.4843
767673.897	1477906.63	717.8321
767674.78	1477907.68	716.4446
767677.035	1477907.51	717.0595
767678.896	1477907.9	717.3115
767678.883	1477907.95	717.9516
767685.334	1477907.65	723.1507
767701.087	1477906.53	723.3243
767717.259	1477906.72	722.62
767734.022	1477906.77	721.9515

SUMMARY DATA	
Bankfull Elevation:	723.9
Bankfull Cross-Sectional Area:	183.2
Bankfull Width:	34.9
Floodprone Area Elevation:	732.3
Floodprone Width:	200+
Max Depth at Bankfull	8.4
Mean Depth at Bankfull	5.2
W/D Ratio	6.7
Entrenchment Ratio:	5.7
Bank Height Ratio:	1.0

Stream Type:	E5



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River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-10 FTH
Drainage Area (sq. mi.)	26.0
Date:	10/11/2017
Field Crew:	E. Toler

Section 10 Riffle

Northing	Easting	Elevation
767715.08	1478250.86	723.8489
767718.222	1478249.62	724.1158
767721.941	1478248.41	723.9679
767724.708	1478248.18	717.7075
767724.581	1478248.25	716.9232
767729.629	1478246.91	716.8468
767734.449	1478244.77	716.4765
767739.297	1478242.8	717.0638
767745.622	1478240.47	716.9237
767747.815	1478239.18	717.3044
767747.839	1478239.03	717.7181
767754.227	1478241.13	723.0505
767771.454	1478239.22	722.8604
767787.87	1478236.51	722.1448
767804.506	1478232.77	721.567

SUMMARY DATA	
Bankfull Elevation:	723.8
Bankfull Cross-Sectional Area:	186
Bankfull Width:	33.1
Floodprone Area Elevation:	731.0
Floodprone Width:	200+
Max Depth at Bankfull	7.2
Mean Depth at Bankfull	5.6
W/D Ratio	5.9
Entrenchment Ratio:	6.0
Bank Height Ratio:	1.0

Stream Type:	E5

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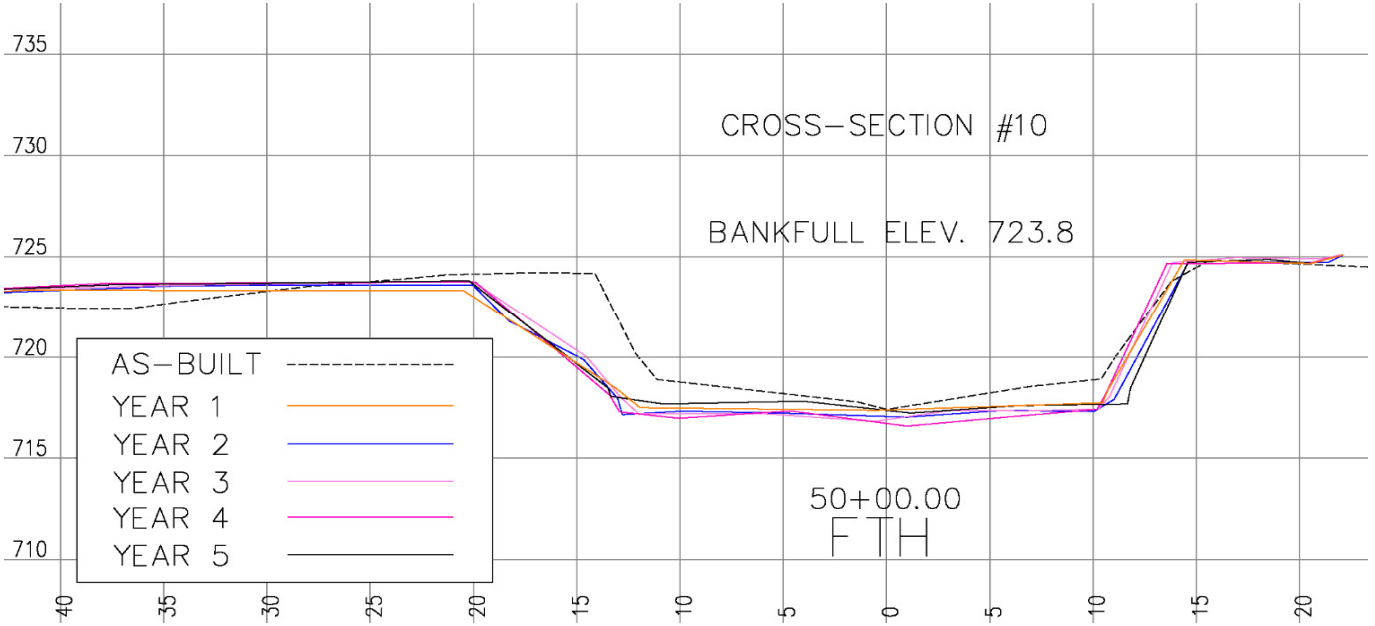


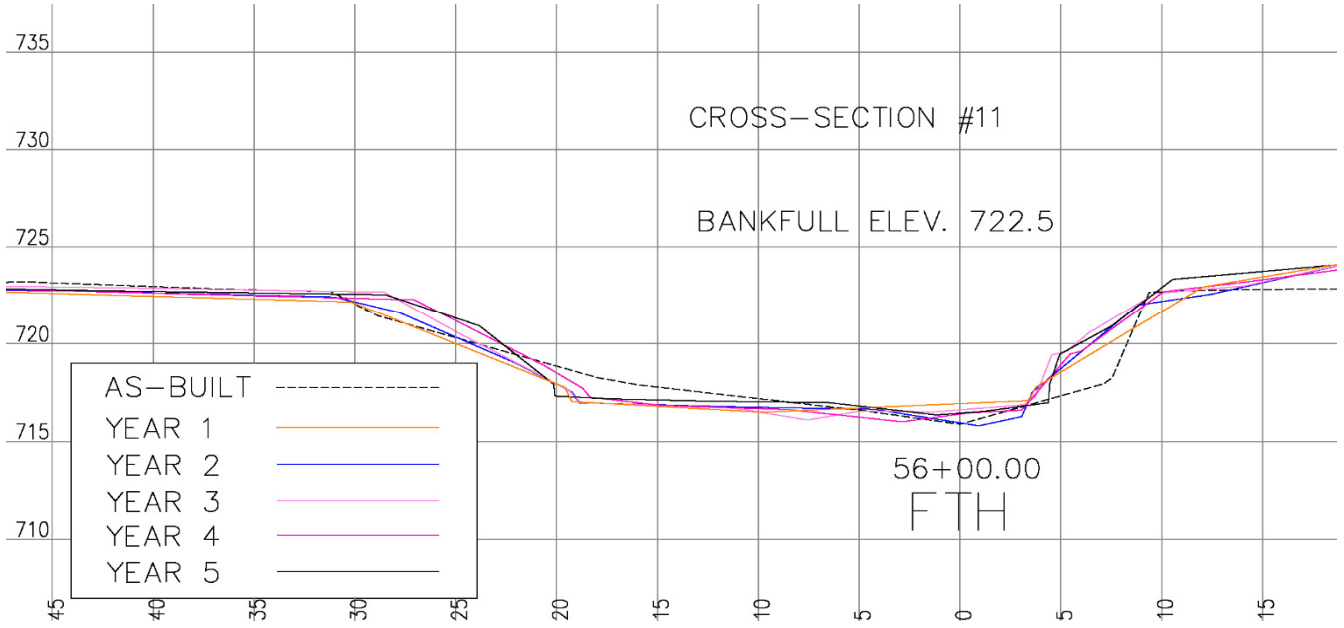
River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-11 FTH
Drainage Area (sq. mi.)	26.0
Date:	10/11/2017
Field Crew:	E. Toler

Section 11 Riffle

Northing	Easting	Elevation
767829.95	1478833.57	723.142
767833.117	1478830.51	722.731
767835.414	1478827.78	722.4078
767837.665	1478825.78	720.0002
767838.886	1478823.5	718.536
767839.34	1478823.7	717.0038
767839.286	1478823.67	716.0548
767841.737	1478821.63	715.6132
767843.979	1478820.88	715.4311
767848.1	1478817.48	716.0608
767852.98	1478813.64	716.1354
767855.83	1478809.92	716.2542
767857.958	1478808.29	716.3943
767857.961	1478808.34	716.9912
767861.451	1478807.14	719.9989
767864.712	1478803.82	721.6159
767875.214	1478794.17	721.8279
767886.951	1478783.32	722.1556
767898.517	1478771.62	721.8786

SUMMARY DATA	
Bankfull Elevation:	722.5
Bankfull Cross-Sectional Area:	158.7
Bankfull Width:	36.6
Floodprone Area Elevation:	726.8
Floodprone Width:	200+
Max Depth at Bankfull	6.3
Mean Depth at Bankfull	4.3
W/D Ratio	8.5
Entrenchment Ratio:	5.5
Bank Height Ratio:	1.0

Stream Type:	E5



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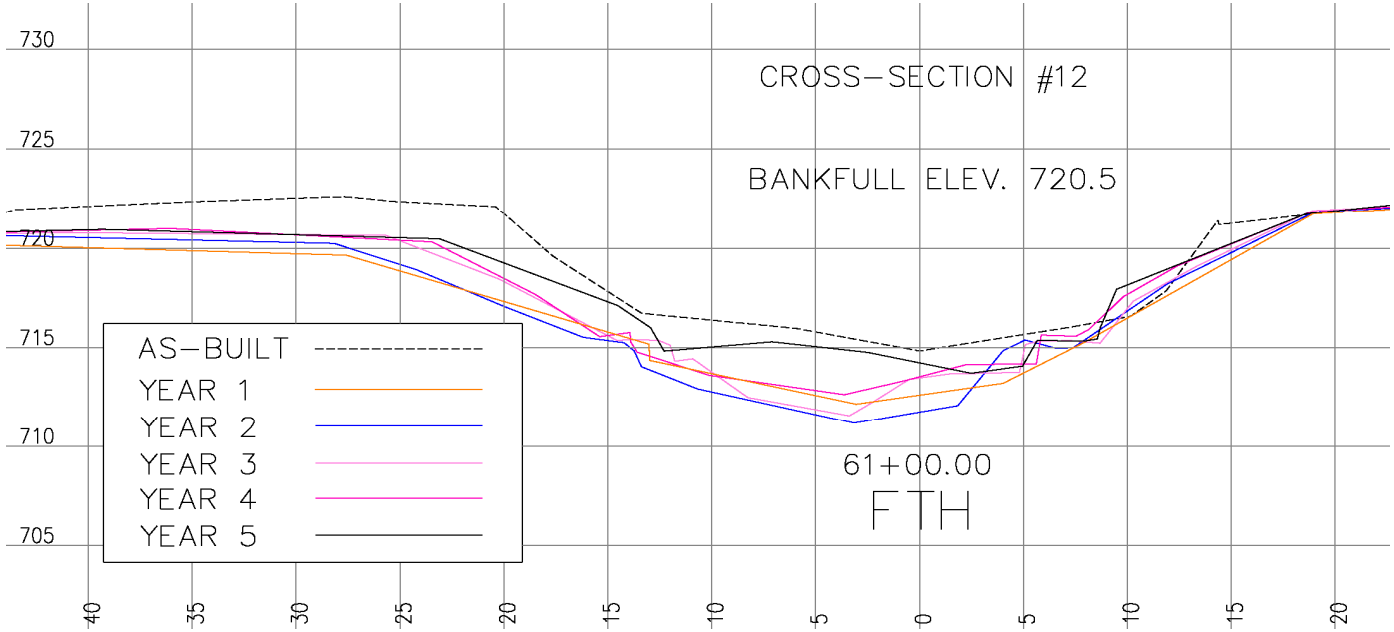
River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-12 FTH
Drainage Area (sq. mi.)	26.0
Date:	10/11/2017
Field Crew:	E. Toler

Section 12 Pool

Northing	Easting	Elevation
767980.379	1479276.96	722.7214
767984.299	1479275.51	722.2678
767993.324	1479274.06	718.4477
767994.044	1479273.72	716.5069
767993.903	1479273.73	715.948
767994.525	1479273.58	715.8429
767996.761	1479273.41	715.8747
767997.449	1479273.22	714.584
767999.918	1479273.17	714.2242
768004.65	1479271.63	715.2738
768008.869	1479269.78	715.8044
768013.64	1479267.73	715.3396
768014.178	1479267.36	716.5165
768015.706	1479266.99	717.6271
768023.941	1479264.54	720.9896
768039.347	1479259.43	721.4697
768053.488	1479254.61	721.1052
768069.626	1479248.7	720.3366
768084.817	1479241.24	720.3733
768095.041	1479236.38	720.4996

SUMMARY DATA	
Bankfull Elevation:	720.5
Bankfull Cross-Sectional Area:	181.2
Bankfull Width:	38.7
Floodprone Area Elevation:	728.2
Floodprone Width:	200+
Max Depth at Bankfull	7.7
Mean Depth at Bankfull	4.7
W/D Ratio	8.2
Entrenchment Ratio:	5.2
Bank Height Ratio:	1.0

Stream Type:	E5



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River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-13 FTH
Drainage Area (sq. mi.)	26.0
Date:	10/11/2017
Field Crew:	E. Toler

Section 13 Pool

Northing	Easting	Elevation
768795.157	1480319.36	720.2689
768797.542	1480316.75	719.9971
768802.196	1480312.76	714.2385
768802.562	1480312.3	713.2931
768803.908	1480309.9	713.066
768806.14	1480307.63	712.835
768810.811	1480302.43	713.5142
768815.531	1480297.33	713.6605
768819.257	1480292.72	713.4937
768819.486	1480292.38	714.2183
768822.793	1480290.54	717.8084
768825.574	1480288.36	719.8713
768835.332	1480279.1	719.7813
768846.224	1480268.13	718.8897
768856.702	1480258.1	717.7249
768865.616	1480248.01	717.5684

SUMMARY DATA	
Bankfull Elevation:	720.3
Bankfull Cross-Sectional Area:	191.1
Bankfull Width:	38.6
Floodprone Area Elevation:	727.0
Floodprone Width:	200+
Max Depth at Bankfull	6.7
Mean Depth at Bankfull	4.9
W/D Ratio	7.9
Entrenchment Ratio:	5.2
Bank Height Ratio:	1.0

Stream Type:	E5

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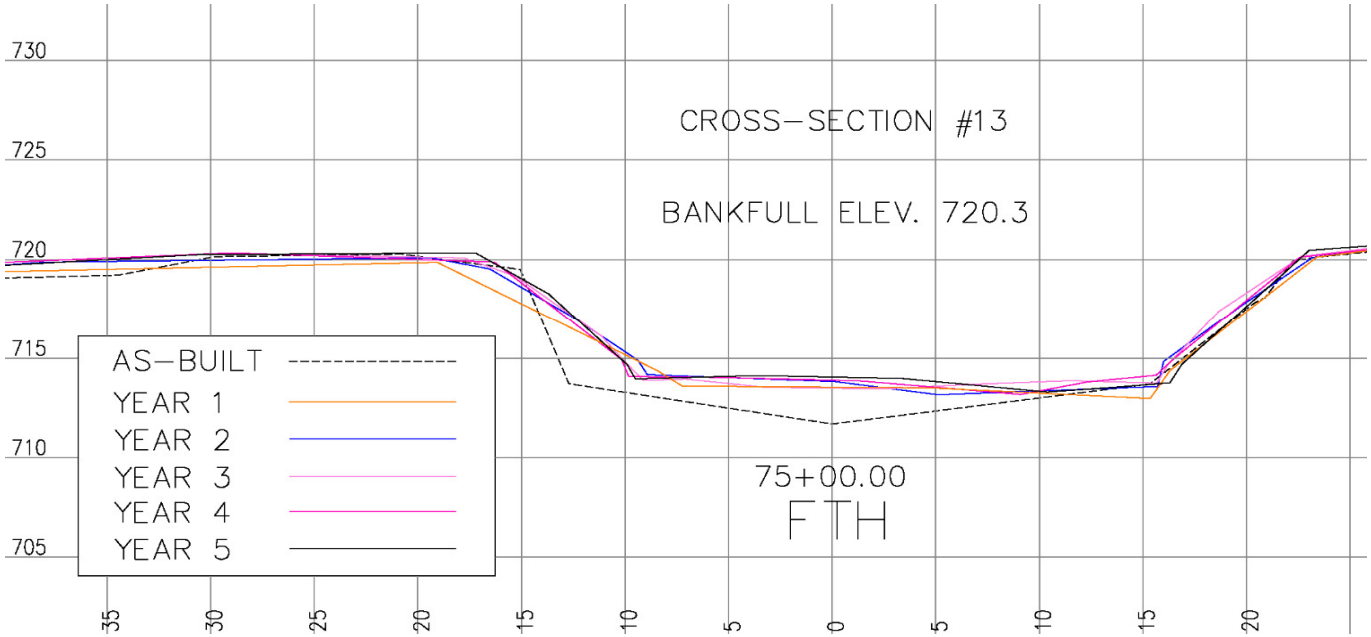


Exhibit Table 10a. Baseline Stream Data Summary
Five Mile Branch Stream Restoration, DMS IMS ID# 92185 Segment/Reach: Reach 1 Beaver Creek 5,794.1 feet

Parameter	Gauge[3]	Regional Curve	Pre-Existing Condition						References Reach(es) Data[1]						Design			As-Built / Baseline[2]					
Dimension and Substrate - Riffle		**Equation**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	51.0	41.9*	20.2	26.7	26.3	35.2	4.3	48	N/A	N/A	N/A	N/A	N/A		20.7	27.6	38.8	24.1	29.5	26.3	38.1	7.5	3
Floodprone Width (ft)			100.0	180.0	-	250.0	-	-	N/A	N/A	N/A	N/A	N/A		100.0	180.0	250.0	-	>200	-	-	0.0	3
Bankfull Mean Depth (ft)	2.7	2.2*	3.3	4.5	4.5	5.9	0.5	48	N/A	N/A	N/A	N/A	N/A		3.3	4.2	5.0	3.5	4.2	4.4	4.7	0.6	3
Bankfull Max Depth (ft)	3.3		5.0	6.9	6.9	8.1	0.7	48	N/A	N/A	N/A	N/A	N/A		4.6	5.9	7.2	6.4	6.8	7.0	7.1	4.0	3
Bankfull Cross Sectional Area (ft^2)	139.3	92.9**	79.7	119.4	116.9	176.0	22.9	48	N/A	N/A	N/A	N/A	N/A		75.0	115.5	163.2	105.4	121.1	124.5	133.4	14.3	3
Width/Depth Ratio	18.8		4.4	6.0	5.9	9.1	1.2	48	N/A	N/A	N/A	N/A	N/A		5.1	6.6	9.5	5.5	7.3	5.6	10.9	3.1	3
Entrenchment Ratio	1.4		4.6	8.2	-	10.9	-	-	N/A	N/A	N/A	N/A	N/A		3.6	6.4	9.0	5.2	7.0	7.6	8.3	1.6	3
Bank Height Ratio	1.4		1.0	1.2	-	1.5	-	-	N/A	N/A	N/A	N/A	N/A		-	1.0	-	-	1.0	-	-	0.0	3
d50 (mm)			-	0.2	-	-	-	-	N/A	N/A	N/A	N/A	N/A										
Profile																							
Riffle Length (ft)			-	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A		-	-	-	-	-	-	-	-	-
Riffle Slope (ft)			0.0	0.0020	0.0014	0.0094	0.003	26	N/A	N/A	N/A	N/A	N/A		0.0	0.0020	0.0094	-	-	-	-	-	-
Pool Length (ft)			5.5	25.7	19.1	161.9	27.5	34	N/A	N/A	N/A	N/A	N/A		5.5	25.7	161.9	-	-	-	-	-	-
Pool Max Depth (ft)			4.7	6.7	6.6	7.8	0.9	13	N/A	N/A	N/A	N/A	N/A		4.7	6.7	7.8	4.3	4.3	4.3	4.3	0	2
Pool Spacing (ft)			20.6	176.7	19.1	748.9	27.5	34	N/A	N/A	N/A	N/A	N/A		20.6	176.7	748.9	-	-	-	-	-	-
Pool Cross Sectional Area (ft2			80.9	100.6	-	119.8	-	-	N/A	N/A	N/A	N/A	N/A		80.9	100.6	119.8	74.4	40.4	40.4	52.1	16.5	2
Pattern																							
Channel Beltwidth (ft)			47.0	235.0	-	443.0	-	-	N/A	N/A	N/A	N/A	N/A		47.0	235.0	443.0	47.0	235.0	-	443.0	-	-
Radius of Curvature (ft)			60.0	3527.0	-	14000.0	-	-	N/A	N/A	N/A	N/A	N/A		60.0	3527.0	14000.0	60.0	3527.0	-	14000.0	-	-
Rc: Bankfull Width (ft/ft)			2.7	161.8	-	642.2	-	-	N/A	N/A	N/A	N/A	N/A		2.2	127.8	507.2	2.2	127.8	-	507.2	-	-
Meander Wavelength (ft)			575.0	1380.0	-	2132.0	-	-	N/A	N/A	N/A	N/A	N/A		575.0	1380.0	2132.0	575.0	1380.0	-	2132.0	-	-
Meander Width Ratio			26.3	63.3	-	97.8	-	-	N/A	N/A	N/A	N/A	N/A		20.8	50.0	77.2	20.8	50.0	-	77.2	-	-
Substrate, bed and transport parameters																							
Ri% / Ru% / P% / G% / S%			-						N/A									-	-	-	-	-	-
SC% / Sa% /G.% / C% / B% / Be%			-						N/A														
d16 / d35 / d50 / d84 / d95 / di^2 / di^{sp} (mm)			> 2.0 mm						N/A														
Reach Shear Stress (competency) lb/ft^2			0.43												0.35			0.31					
Max part size (mm) mobilized at bankfull			33.0												24.0			22.7					
Stream power (transport capacity) W/m^2			1.58												1.3			1.29					
Additional Reach Parameters																							
Drainage Area (SM)			10.76						N/A														
Impervious cover estimate (%)			10-20						N/A														
Rosgen Classification	B		E5						N/A						E5			E5					
Bankfull Velocity (fps)	3.9	4.1***	3.8												3.7			3.6					
Bankfull Discharge (cfs)	539.9	379.2**	453.7																				
Valley length (ft)			-						N/A														
Channel Thalweg length (ft)			-						N/A						-			-					
Sinuosity (ft)			1.07						N/A						1.07			1.07					
Water Surface Slope (Channel) (ft/ft)	0.0032		0.0016						N/A						0.0016			0.0014					
BF slope (ft/ft)	-		-						N/A						-			-					
Bankfull Floodplain Area (acres)			-						N/A						-			-					
Additional Reach Parameters																							
Proportion over wide (%)			-						N/A														
Entrenchment Class (ER Range)			-						N/A														
Incision Class (BHR Range)			-						N/A														
BEHI VL% / L% / M% / H% / VH% / E%			-						N/A														
Channel Stability or Habitat Metric			-						N/A														
Biological or Other			-						N/A														

* NC Rural Mountain and Piedmont Regional Curve, Surry County NRCS, Draft 1/27/2010

** NC Rural Mountain and Piedmont Regional Curve, Surry County NRCS, Draft 3/16/2006

***Bankfull Discharge/Bankfull Cross Sectional Area

1 A singular reference stream was not used to design the Enhancement Level II project.

2 As built profile parameters not calculated for Enhancement Level II

Exhibit Table 10b. Baseline Stream Data Summary
Five Mile Branch Stream Restoration, DMS IMS ID# 92185 Segment/Reach: Reach 2 Fifth Creek upstream of Beaver Creek 1,522.6 feet

Parameter	Gauge[3]	Regional Curve			Pre-Existing Condition						References Reach(es) Data[1]						Design			As-Built / Baseline[2]					
Dimension and Substrate - Riffle		Equation			Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Max	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	51.0	46.0*			23.9	30.7	30.3	40.3	4.8	11	N/A	N/A	N/A	N/A	N/A	N/A	25.1	29.0	33.0	-	24.2	-	-	-	1
Floodprone Width (ft)					-	>200.0	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	-	>200.0	-	-	>200.0	-	-	-	1
Bankfull Mean Depth (ft)	2.7	2.3*			3.8	4.2	4.2	5.0	0.4	11	N/A	N/A	N/A	N/A	N/A	N/A	3.8	4.1	4.6	-	4.3	-	-	-	1
Bankfull Max Depth (ft)	3.3				6.7	7.8	7.9	9.1	0.6	11	N/A	N/A	N/A	N/A	N/A	N/A	6.4	7.4	8.3	-	7.7	-	-	-	1
Bankfull Cross Sectional Area (ft^2)	139.3	112.5**			94.0	130.1	128.2	176.4	4.8	11	N/A	N/A	N/A	N/A	N/A	N/A	104.5	119.7	144.7	-	104.2	-	-	-	1
Width/Depth Ratio	18.8				5.3	7.0	7.1	8.4	1.0	11	N/A	N/A	N/A	N/A	N/A	N/A	5.5	7.0	8.6	-	5.6	-	-	-	1
Entrenchment Ratio	1.4				-	6.5	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	-	6.5	-	-	8.3	-	-	-	1
Bank Height Ratio	1.4				1.1	1.1	-	1.2	-	-	N/A	N/A	N/A	N/A	N/A	N/A	1.0	1.0	1.0	-	1.0	-	-	-	1
d50 (mm)					-	0.2	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A									
Profile																									
Riffle Length (ft)					-	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	-	-	-	-	-	-	-	-	-
Riffle Slope (ft)					0.0009	0.0010	0.0010	#####	0.0001	2	N/A	N/A	N/A	N/A	N/A	N/A	0.0009	0.0010	0.0011	-	-	-	-	-	-
Pool Length (ft)					-	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	81.2	112.8	144.3	-	-	-	-	-	-
Pool Max Depth (ft)					-	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	7.5	7.8	8.0	-	7.2	-	-	-	1
Pool Spacing (ft)					-	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	272.0	297.0	322.0	-	-	-	-	-	-
Pool Cross Sectional Area (ft2)					-	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	104.5	119.7	144.7	-	136.3	-	-	-	1
Pattern																									
Channel Beltwidth (ft)					48.0	639.0	-	#####	-	-	N/A	N/A	N/A	N/A	N/A	N/A	48.0	639.0	1566.0	48.0	639.0	-	1566.0	-	-
Radius of Curvature (ft)					1275.0	2693.0	-	#####	-	-	N/A	N/A	N/A	N/A	N/A	N/A	1275.0	2693.0	3800.0	1275.0	2693.0	-	3800.0	-	-
Rc: Bankfull Width (ft/ft)					49.6	104.8	-	147.8	-	-	N/A	N/A	N/A	N/A	N/A	N/A	49.6	104.8	147.8	49.6	104.8	-	147.8	-	-
Meander Wavelength (ft)					4464.0	4618.0	-	#####	-	-	N/A	N/A	N/A	N/A	N/A	N/A	4464.0	4618.0	4771.0	4464.0	4618.0	-	4771.0	-	-
Meander Width Ratio					173.7	179.7	-	185.6	-	-	N/A	N/A	N/A	N/A	N/A	N/A	173.7	179.7	185.6	173.7	179.7	-	185.6	-	-
Substrate, bed and transport parameters																									
Ri% / Ru% / P% / G% / S%					-						N/A									-	-	-	-	-	-
SC% / Sa% /G.% / C% / B% / Be%					-						N/A														
d16 / d35 / d50 / d84 / d95 / d^p / di^{sp} (mm)					> 2.0 mm						N/A														
Reach Shear Stress (competency) lb/f^2					0.38												0.3			0.37					
Max part size (mm) mobilized at bankfull					28.0												17.0			27.9					
Stream power (transport capacity) W/m^2					1.36												1.46			1.79					
Additional Reach Parameters																									
Drainage Area (SM)					13.93						N/A														
Impervious cover estimate (%)					10-20						N/A														
Rosgen Classification	B				E5						N/A						E5			E5					
Bankfull Velocity (fps)	3.9	4.1***			3.4												3.4			3.9					
Bankfull Discharge (cfs)	539.9	466.8**			442.3																				
Valley length (ft)					-						N/A														
Channel Thalweg length (ft)					-						N/A						-			-					
Sinuosity (ft)					1.04						N/A						1.04			1.04					
Water Surface Slope (Channel) (ft/ft)	0.0032				0.0013						N/A						0.0013			0.00171					
BF slope (ft/ft)	-				-						N/A						-			-					
Bankfull Floodplain Area (acres)					-						N/A						-			-					
Additional Reach Parameters																									
Proportion over wide (%)					-						N/A														
Entrenchment Class (ER Range)					-						N/A														
Incision Class (BHR Range)					-						N/A														
BEHI VL% / L% / M% / H% / VH% / E%					-						N/A														
Channel Stability or Habitat Metric					-						N/A														
Biological or Other					-						N/A														

* NC Rural Mountain and Piedmont Regional Curve, Surry County NRCS, Draft 1/27/2010

** NC Rural Mountain and Piedmont Regional Curve, Surry County NRCS, Draft 3/16/2006

***Bankfull Discharge/Bankfull Cross Sectional Area

1 A singular reference stream was not used to design the Enhancement Level II project.

2 As built profile parameters not calculated for Enhancement Level II

Exhibit Table 10c. Baseline Stream Data Summary
Five Mile Branch Stream Restoration, DMS IMS ID# 92185 Segment/Reach: Reach 3 Fifth Creek downstream of Beaver Creek 5,175.4 feet

Parameter	Gauge[3]	Regional Curve	Pre-Existing Condition						References Reach(es) Data[1]						Design			As-Built / Baseline[2]					
Dimension and Substrate - Riffle		**Equation**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	51	58*	27.9	35.6	34.7	44.1	3.9	27	N/A	N/A	N/A	N/A	N/A	N/A	26.3	33.4	40.8	28.4	34.1	32.2	41.7	6.9	3
Floodprone Width (ft)			250	316.7	-	400.0	-	-	N/A	N/A	N/A	N/A	N/A	N/A	-	>200.0	-	-	>200.0	-	-	-	-
Bankfull Mean Depth (ft)	2.7	2.8*	4.5	5.3	5.1	6.8	0.5	27	N/A	N/A	N/A	N/A	N/A	N/A	4.0	4.7	5.7	4.0	4.3	4.1	4.7	0.4	3
Bankfull Max Depth (ft)	3.3		5.8	7.6	7.2	9.3	0.7	27	N/A	N/A	N/A	N/A	N/A	N/A	5.1	6.5	7.8	5.6	6.3	6.3	7.1	0.8	3
Bankfull Cross Sectional Area (ft^2)	139.3	179.2**	192.6	202.5	175.5	222.2	22	27	N/A	N/A	N/A	N/A	N/A	N/A	120.3	157.8	202.7	115.3	143.5	150.2	165.2	25.6	3
Width/Depth Ratio	18.8		4.7	6.6	6.8	8.2	1.0	25	N/A	N/A	N/A	N/A	N/A	N/A	5.2	7.1	8.8	6.9	8.1	6.9	10.4	2	3
Entrenchment Ratio	1.4		7.1	8.6	-	10.8	-	-	N/A	N/A	N/A	N/A	N/A	N/A	-	>6.5	-	4.8	6.0	6.2	7.0	1.1	3
Bank Height Ratio	1.4		1.3	1.5	-	1.7	-	-	N/A	N/A	N/A	N/A	N/A	N/A	-	1.0	-	1.0	1.0	1.0	1.0	0	3
d50 (mm)			-	0.2	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A									
Profile																							
Riffle Length (ft)			-	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	-	-	-	-	-	-	-	-	-
Riffle Slope (ft)			0.0	0.0017	0.002	0.004	0	18	N/A	N/A	N/A	N/A	N/A	N/A	0.0022	0.0026	0.003	-	-	-	-	-	-
Pool Length (ft)			15.2	30	27.5	69.8	15	19	N/A	N/A	N/A	N/A	N/A	N/A	81.2	112.8	144.3	-	-	-	-	-	-
Pool Max Depth (ft)			8	9.4	9.5	11.4	1.1	15	N/A	N/A	N/A	N/A	N/A	N/A	7.5	7.8	8.0	6.1	6.4	6.2	7.0	0.5	3
Pool Spacing (ft)			62.3	256.3	150.6	1206	298	18	N/A	N/A	N/A	N/A	N/A	N/A	272.0	297.0	322.0	-	-	-	-	-	-
Pool Cross Sectional Area (ft2)			-	199.0	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	120.3	157.8	202.7	148.3	169.9	152.2	209.2	34.1	3
Pattern																							
Channel Beltwidth (ft)			48	639	-	1556	-	-	N/A	N/A	N/A	N/A	N/A	N/A	48	639	1556	48	639	-	1556	-	-
Radius of Curvature (ft)			1275	2693	-	3800	-	-	N/A	N/A	N/A	N/A	N/A	N/A	1275	2693	3800	1275	2693	-	3800	-	-
Rc: Bankfull Width (ft/ft)			34.7	73.4	-	103.5	-	-	N/A	N/A	N/A	N/A	N/A	N/A	49.6	73.4	113.8	38.2	80.6	-	113.8	-	-
Meander Wavelength (ft)			4464	4618	-	4771	-	-	N/A	N/A	N/A	N/A	N/A	N/A	4464	4618	4771	4464	4618	-	4771	-	-
Meander Width Ratio			121.6	125.8	-	130	-	-	N/A	N/A	N/A	N/A	N/A	N/A	173.7	125.8	46.9	1.4	19.1	-	46.9	-	-
Substrate, bed and transport parameters																							
Ri% / Ru% / P% / G% / S%			-						N/A									-	-	-	-	-	-
SC% / Sa% /G.% / C% / B% / Be%			-						N/A														
d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)			> 2.0 mm						N/A														
Reach Shear Stress (competency) lb/ft^2			0.46												0.35			0.36					
Max part size (mm) mobilized at bankfull			35												20			27.1					
Stream power (transport capacity) W/m^2			2.76												1.06			1.49					
Additional Reach Parameters																							
Drainage Area (SM)			26.05						N/A														
Impervious cover estimate (%)			10-20						N/A														
Rosgen Classification	B		E5						N/A						E5			E5					
Bankfull Velocity (fps)	3.9	4.3***	5.2												3.9			3.7					
Bankfull Discharge (cfs)	539.9	772.1**	1166.3																				
Valley length (ft)			-						N/A														
Channel Thalweg length (ft)			-						N/A						-			-					
Sinuosity (ft)			1.04						N/A						1.04			1.04					
Additional Reach Parameters																							
BF slope (ft/ft)	-		-						N/A						-			-					
Bankfull Floodplain Area (acres)			-						N/A						-			-					
Proportion over wide (%)			-						N/A														
Entrenchment Class (ER Range)			-						N/A														
Incision Class (BHR Range)			-						N/A														
BEHI VL% / L% / M% / H% / VH% / E%			-						N/A														
Channel Stability or Habitat Metric			-						N/A														
Biological or Other			-						N/A														

* NC Rural Mountain and Piedmont Regional Curve, Surry County NRCS, Draft 1/27/2010

** NC Rural Mountain and Piedmont Regional Curve, Surry County NRCS, Draft 3/16/2006

***Bankfull Discharge/Bankfull Cross Sectional Area

1 A singular reference stream was not used to design the Enhancement Level II project.

2 As built profile parameters not calculated for Enhancement Level II

Exhibit Table 11a. Morphology and Hydraulic Monitoring Summary (Dimensional Parameters -- Cross Section)
Five Mile Branch Stream Restoration, DMS IMS ID# 92185 Segment/Reach: Reach 1 Beaver Creek 5794.1 feet

	Cross Section 1 (Riffle)							Cross Section 2 (Riffle)							Cross Section 3 (Pool)							Cross Section 4 (Riffle)							Cross Section 5 (Pool)						
Dimension and substrate	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+
Based on fixed baseline bankfull elevation																																			
Bankfull Width (ft)	26.3	27.9	30.5	30.3	27.9	26.4		38.1	30.7	27.7	28.6	29.5	29.0		28.7	34.2	39.9	37.8	30.6	29.7		24.1	31.8	34.6	33.3	35.8	35.7		52.1	28.8	29.8	29.3	27.6	29.9	
Floodprone Width (ft)	200.0	200.0	200.0	200.0	200.0	200.0		200.0	200.0	200.0	200.0	200.0	200.0		200.0	200.0	200	200.0	200.0	200.0		200.0	200.0	200.0	200.0	200.0	200.0		200.0	200.0	200.0	200.0	200.0	200.0	
Bankfull Mean Depth (ft)	4.7	4.4	4.4	4.3	4.3	4.4		3.5	3.7	3.8	3.8	4.1	4.1		2.6	3.7	3.4	3.7	4.1	4.3		4.4	3.7	3.9	4.1	3.8	3.8		1.8	3.6	4.3	4.0	4.3	4.5	
Bankfull Max Depth (ft)	7.1	5.9	6.3	6.4	6.2	5.8		6.4	5.2	5.2	5.6	6.0	5.7		4.3	6.1	7.4	7.0	6.9	6.2		7.0	5.5	6.4	6.3	6.6	6.6		4.3	6.1	8.3	7.4	7.3	7.5	
Bankfull Cross Sectional Area (ft^2)	124.5	123.7	134.0	130.1	119.5	115.9		133.4	115.0	103.9	108.9	119.9	119.4		74.4	125.8	137.1	138.1	124.0	126.6		105.4	117.4	134.8	135.1	134.4	134.4		95.3	102.6	127.5	118.5	118.2	135.6	
Bankfull Width/Depth Ratio	5.6	6.3	6.9	7.0	6.5	6.0		10.9	8.3	7.4	7.5	7.2	7.0		11.0	9.2	11.6	10.2	7.5	7.0		5.5	8.6	8.9	8.1	9.4	9.5		28.9	10.8	7.0	7.3	6.4	6.6	
Bankfull Entrenchment Ratio	7.6	7.2	6.6	6.6	7.2	7.6		5.2	6.5	7.2	7.0	6.8	6.9		7.0	5.8	5.0	5.3	6.5	6.7		8.3	6.3	5.8	6.0	5.6	5.6		3.8	6.9	6.7	6.0	7.2	6.7	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	
Based on current/developing bankfull feature																																			
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)		219	218	208	219	208			226	218	225	212	212			235	169	179	180	179			213	217	168	161	161			156	177	168	169	192	
d50 (mm)	0.2							0.2							0.2							0.2							0.2						

	Cross Section # (##)							Cross Section # (##)							Cross Section # (##)							Cross Section # (##)							Cross Section # (##)						
Based on fixed baseline bankfull elevation	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+
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																																			
Based on current/developing bankfull feature																																			
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)																																			

Exhibit Table 11b. Morphology and Hydraulic Monitoring Summary (Dimensional Parameters -- Cross Section)
Five Mile Branch Stream Restoration, DMS IMS ID# 92185 Segment/Reach: Reach 2 Fifth Creek upstream of Beaver Creek 1,522.6

	Cross Section 6 (Pool)							Cross Section 7 (Riffle)							Cross Section # (##)							Cross Section # (##)							Cross Section # (##)						
Dimension and substrate	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+
Based on fixed baseline bankfull elevation																																			
Bankfull Width (ft)	34.2	32.3	34.1	33.4	33.8	29.1		24.2	28.5	26.9	26.1	25.7	24.5																						
Floodprone Width (ft)	200.0	200.0	200.0	200.0	200.0	200.0		200.0	200.0	200.0	200.0	200.0	200.0																						
Bankfull Mean Depth (ft)	4.0	4.6	4.3	4.4	4.4	4.4		4.3	4.5	4.2	4.6	4.6	4.8																						
Bankfull Max Depth (ft)	7.2	7.2	7.5	7.4	7.7	6.9		7.7	6.0	6.1	6.6	6.7	6.2																						
Bankfull Cross Sectional Area (ft^2)	136.3	147.6	146.2	145.3	149.6	129.0		104.2	127.2	112.4	119.1	118.7	118.1																						
Bankfull Width/Depth Ratio	8.6	7.0	8.0	7.6	7.7	6.6		5.6	6.3	6.4	5.7	5.6	5.1																						
Bankfull Entrenchment Ratio	5.8	6.2	5.9	6.0	5.9	6.9		8.3	7.0	7.4	7.7	7.8	8.2																						
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0																						
Based on current/developing bankfull feature																																			
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)		203	197	142	204	198			247	232	229	227	233																						
d50 (mm)	0.2							0.2																											

	Cross Section # (##)							Cross Section # (##)							Cross Section # (##)							Cross Section # (##)							Cross Section # (##)						
Based on fixed baseline bankfull elevation	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+
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																																			
Based on current/developing bankfull feature																																			
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)																																			

Exhibit Table 11c. Morphology and Hydraulic Monitoring Summary (Dimensional Parameters -- Cross Section)
Five Mile Branch Stream Restoration, DMS IMS ID# 92185 Segment/Reach: Reach 3 Fifth Creek downstream of Beaver Creek 5,175.4

	Cross Section 8 (Riffle)							Cross Section 9 (Pool)							Cross Section 10 (Riffle)							Cross Section 11 (Riffle)							Cross Section 12 (Pool)						
Dimension and substrate	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+
Based on fixed baseline bankfull elevation																																			
Bankfull Width (ft)	32.2	34.5	34.0	33.7	32.2	35.7		33.7	36.8	37.6	36.8	34.9	34.5		28.4	34.0	34.1	33.3	33.1	34.4		41.7	34.9	38.2	38.1	36.6	38.0		36.6	43.0	44.1	40.3	38.7	38.7	
Floodprone Width (ft)	200.0	200.0	200.0	200.0	200.0	200.0		200.0	200.0	200.0	200.0	200.0	200.0		200.0	200.0	200.0	200.0	200.0	200.0		200.0	200.0	200.0	200.0	200.0	200.0		200.0	200.0	200.0	200.0	200.0	200.0	
Bankfull Mean Depth (ft)	4.7	4.9	5.1	5.6	5.4	5.6		4.4	4.5	5.0	5.0	5.2	5.1		4.1	4.8	5.3	5.3	5.6	5.3		4.0	4.9	4.1	4.5	4.3	4.3		4.2	4.3	4.9	4.7	4.7	4.0	
Bankfull Max Depth (ft)	7.1	6.8	6.9	7.3	6.8	7.5		6.1	7.2	7.9	7.4	8.4	7.7		5.6	5.9	6.7	6.9	7.2	6.6		6.3	5.7	7.2	6.5	6.3	6.2		6.2	7.5	9.1	8.7	7.7	6.8	
Bankfull Cross Sectional Area (ft^2)	150.2	170.2	174.5	188.1	172.4	199.3		148.3	166.8	189.8	185.2	183.2	177.6		115.3	162.8	182.2	177.7	186.0	180.6		165.1	170.7	155.9	172.9	158.7	163.5		152.2	183.2	216.6	190.5	181.2	154.5	
Bankfull Width/Depth Ratio	6.9	7.0	6.6	6.1	6.0	6.4		7.7	8.2	7.4	7.4	6.7	6.7		6.9	7.1	6.4	6.3	5.9	6.6		10.4	7.1	9.4	8.5	8.5	8.8		8.8	10.0	9.0	8.6	8.2	9.7	
Bankfull Entrenchment Ratio	6.2	5.8	5.9	5.9	6.2	5.6		5.9	5.4	5.3	5.4	5.7	5.8		7.0	5.9	5.9	6.0	6.0	5.8		4.8	5.7	5.2	5.2	5.5	5.3		5.5	4.7	4.5	5.0	5.2	5.2	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	
Based on current/developing bankfull feature																																			
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)		284	271	279	287	285			248	246	236	237	218			229	228	215	222	214			285	268	252	254	244			376	322	293	271	243	
d50 (mm)	0.2							0.2							0.2							0.2							0.2						

	Cross Section 13 (Pool)							Cross Section # (##)							Cross Section # (##)							Cross Section # (##)							Cross Section # (##)						
Based on fixed baseline bankfull elevation	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+
Bankfull Width (ft)	40.1	42.1	38.9	38.0	38.6	40.1																													
Floodprone Width (ft)	200.0	200.0	200.0	200.0	200.0	200.0																													
Bankfull Mean Depth (ft)	5.2	4.9	4.6	4.7	4.9	5.2																													
Bankfull Max Depth (ft)	7.0	6.7	6.4	6.0	6.7	7.0																													
Bankfull Cross Sectional Area (ft^2)	209.2	206.4	180.3	176.9	191.1	209.4																													
Bankfull Width/Depth Ratio	7.7	8.6	8.4	8.1	7.9	7.7																													
Bankfull Entrenchment Ratio	5.0	4.8	5.1	5.3	5.2	5.0																													
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0																													
Based on current/developing bankfull feature																																			
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)		246	240	238	239	242																													
d50 (mm)	0.2																																		

Exhibit Table 12a. Monitoring Data - Stream Reach Data Summary
Five Mile Branch Stream Restoration, DMS IMS ID# 92185 Segment/Reach: Reach 1 Beaver Creek 5,794.1 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)	24.1	29.5	26.3	38.1	7.5	3	27.9	30.1	30.7	31.8	2.0	3	27.7	30.9	30.5	34.6	3.6	3	28.6	30.7	30.3	33.3	2.4	3	27.9	31.1	29.5	35.8	4.2	3	26.4	30.4	29.0	35.7	4.8	3
Floodprone Width (ft)	200	200	200	200	0.0	3	200	200	200	200	0.0	3	200	200	200	200	0.0	3	200	200	200	200	0.0	3	200	200	200	200	0.0	3	200	200	200	200	0.0	3
Bankfull Mean Depth (ft)	3.5	4.2	4.4	4.7	0.6	3	3.7	3.9	3.7	4.4	0.4	3	3.8	4.0	3.9	4.4	0.3	3	3.8	4.1	4.1	4.3	0.3	3	3.8	4.1	4.1	4.3	0.3	3	3.8	4.1	4.1	4.4	0.3	3
[1]Bankfull Max Depth (ft)	6.4	6.8	7.0	7.1	4.0	3	5.2	5.5	5.5	5.9	0.4	3	5.1	5.9	6.3	6.4	0.7	3	5.6	6.1	6.3	6.4	0.4	3	6	6.3	6.2	6.6	0.3	3	5.7	6.0	5.8	6.6	0.5	3
Bankfull Cross Sectional Area (ft^2)	105.4	121.1	124.5	133.4	14.3	3	115	118.7	117.4	123.7	4.5	3	103.9	124.2	134	134.8	17.6	3	108.9	124.7	130.1	135.1	13.9	3	119.5	124.6	119.9	134.4	8.5	3	115.9	123.2	19.4	134.4	9.8	3
Width/Depth Ratio	5.5	7.3	5.6	10.9	3.1	3	6.3	7.7	8.3	8.6	1.3	3	6.9	7.7	7.4	8.9	1.0	3	7.0	7.5	7.5	8.1	0.6	3	6.5	7.7	7.2	9.4	1.5	3	6.0	7.5	7.0	9.5	1.8	3
Entrenchment Ratio	5.2	7.0	7.6	8.3	1.6	3	6.3	6.7	6.5	7.2	0.5	3	5.8	6.5	6.6	7.2	0.7	3	6.0	6.5	6.6	7.0	0.5	3	5.6	6.5	6.8	7.2	0.8	3	5.6	6.7	6.9	7.6	1.0	3
[1]Bank Height Ratio	1	1	1	1	0	3	1	1	1	1	0	3	1	1	1	1	0	3	1	1	1	1	0	3	1	1	1	1	0	3	1	1	1	1	0	3
Profile																																				
Riffle Length (ft)																																				
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																																				
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	E5						E5						E5						E5						E5						E5					
Channel Thalweg length (ft)	2,794.1						2,794.1						2,794.1						2794.1						2794.1						2794.1					
Sinuosity (ft)																																				
Water Surface Slope (Channel) (ft/ft)																																				
BF slope (ft/ft)																																				
[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																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 12b. Monitoring Data - Stream Reach Data Summary
Five Mile Branch Stream Restoration, DMS IMS ID# 92185 Segment/Reach: Reach 2 Fifth Creek upstream of Beaver Creek 1,522.6 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)	-	24.2	-	-	-	1	-	28.5	-	-	-	1	-	26.9	-	-	-	1	-	26.1	-	-	-	1	-	25.7	-	-	-	1		24.5				1
Floodprone Width (ft)	-	>200	-	-	-	1	-	200	-	-	-	1	-	200	-	-	-	1	-	200	-	-	-	1	-	200	-	-	-	1		200				1
Bankfull Mean Depth (ft)	-	4.3	-	-	-	1	-	4.5	-	-	-	1	-	4.2	-	-	-	1	-	4.6	-	-	-	1	-	4.6	-	-	-	1		4.8				1
[1]Bankfull Max Depth (ft)	-	7.7	-	-	-	1	-	6.0	-	-	-	1	-	6.1	-	-	-	1	-	6.6	-	-	-	1	-	6.7	-	-	-	1		6.2				1
Bankfull Cross Sectional Area (ft^2)	-	104.2	-	-	-	1	-	127.2	-	-	-	1	-	112.4	-	-	-	1	-	119.1	-	-	-	1	-	118.7	-	-	-	1		118.1				1
Width/Depth Ratio	-	5.6	-	-	-	1	-	6.3	-	-	-	1	-	6.4	-	-	-	1	-	5.7	-	-	-	1	-	5.6	-	-	-	1		5.1				1
Entrenchment Ratio	-	8.3	-	-	-	1	-	7.0	-	-	-	1	-	7.4	-	-	-	1	-	7.7	-	-	-	1	-	7.8	-	-	-	1		8.2				1
[1]Bank Height Ratio	-	1	-	-	-	1	-	1	-	-	-	1	-	1	-	-	-	1	-	1	-	-	-	1	-	1	-	-	-	1		1				1
Profile																																				
Riffle Length (ft)																																				
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																																				
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				

Additional Reach Parameters																																				
Rosgen Classification	E5						E5						E5						E5						E5						E5					
Channel Thalweg length (ft)	1,522.6						1,522.6						1,522.6						1,522.60						1,522.60						1,522.60					
Sinuosity (ft)																																				
Water Surface Slope (Channel) (ft/ft)																																				
BF slope (ft/ft)																																				
[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																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 12c. Monitoring Data - Stream Reach Data Summary
Five Mile Branch Stream Restoration, DMS IMS ID# 92185 Segment/Reach: Reach 3 Fifth Creek downstream of Beaver Creek 5,175.4 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)	28.4	34.1	32.2	41.7	6.9	3	34.0	34.5	34.5	34.9	0.5	3	34.0	35.4	34.1	38.2	2.4	3	33.3	35.0	33.7	38.1	2.7	3	32.2	34.0	33.1	36.6	2.3	3	34.4	36.0	35.7	38.0	1.8	3
Floodprone Width (ft)	200	200	200	200	0.0	3	200	200	200	200	0.0	3	200	200	200	200	0.0	3	200	200	200	200	0.0	3	200	200	200	200	0.0	3	200	200	200	200	0.0	3
Bankfull Mean Depth (ft)	4.0	4.3	4.1	4.7	0.4	3	4.8	4.9	4.9	4.9	0.1	3	4.1	4.9	5.1	5.3	0.7	3	4.5	5.1	5.3	5.6	0.6	3	4.3	5.1	5.4	5.6	0.7	3	4.3	5.0	5.3	5.6	0.7	3
[1]Bankfull Max Depth (ft)	5.6	6.3	6.3	7.1	0.8	3	5.7	6.1	5.9	6.8	0.6	3	6.6	6.9	6.9	7.2	0.3	3	6.5	6.9	6.9	7.3	0.4	3	6.3	6.8	6.8	7.2	0.5	3	6.2	6.8	6.6	7.5	0.7	3
Bankfull Cross Sectional Area (ft^2)	115.3	143.5	150.2	165.2	25.6	3	162.8	167.9	170.2	170.7	4.4	3	155.9	170.9	174.5	182.2	13.5	3	172.9	179.6	177.7	188.1	7.8	3	158.7	172.4	172.4	186.0	13.7	3	163.5	181.1	180.6	199.3	17.9	3
Width/Depth Ratio	6.9	8.1	6.9	10.4	2.0	3	7.0	7.1	7.1	7.1	0.1	3	6.4	7.5	6.6	9.4	1.7	3	6.1	7.0	6.3	8.5	1.3	3	5.9	6.8	6.0	8.5	1.5	3	6.4	7.3	6.6	8.8	1.4	3
Entrenchment Ratio	4.8	6.0	6.2	7.0	1.1	3	5.7	5.8	5.8	5.9	0.1	3	5.2	5.7	5.9	5.9	0.4	3	5.2	5.7	5.9	6.0	0.4	3	5.5	5.9	6.0	6.2	0.4	3	5.3	5.6	5.6	5.8	0.3	3
[1]Bank Height Ratio	1	1	1	1	0	3	1	1	1	1	0	3	1	1	1	1	0	3	1	1	1	1	0	3	1	1	1	1	0	3	1	1	1	1	0	3
Profile																																				
Riffle Length (ft)																																				
Riffle Slope (ft/ft)																																				
Pool Length (ft)																																				
Pool Max depth (ft)																																				
Pool Spacing (ft)																																				
Pattern																																				
Channel Beltwidth (ft)																																				
Radius of Curvature (ft)																																				
Rc:Bankfull width (ft/ft)																																				
Meander Wavelength (ft)																																				
Meander Width Ratio																																				
Additional Reach Parameters																																				
Rosgen Classification	E5						E5						E5						E5						E5						E5					
Channel Thalweg length (ft)	5,175.4						5,175.4						5,175.4						5,175.40						5,175.40						5,175.40					
Sinuosity (ft)																																				
Water Surface Slope (Channel) (ft/ft)																																				
BF slope (ft/ft)																																				
[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																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

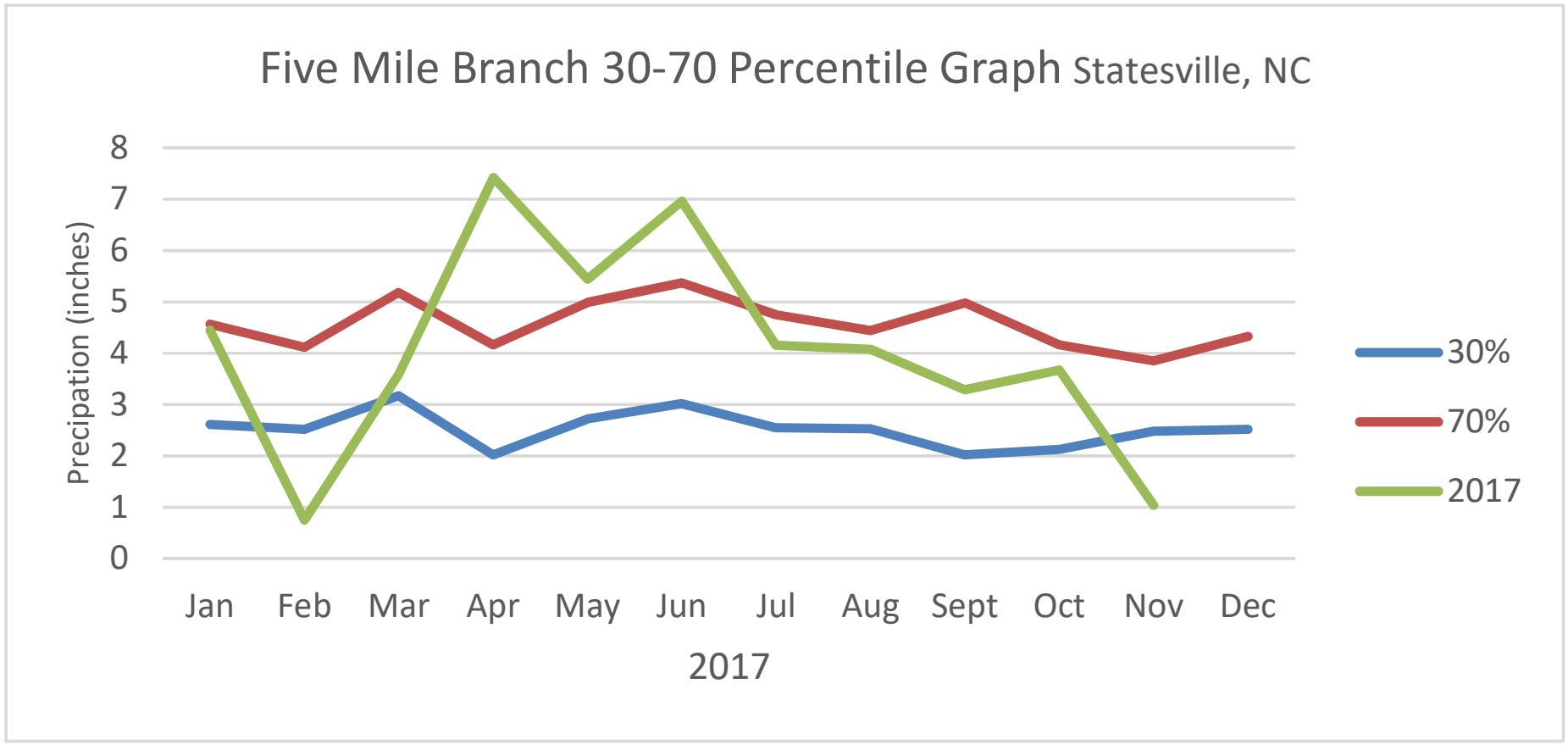
Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

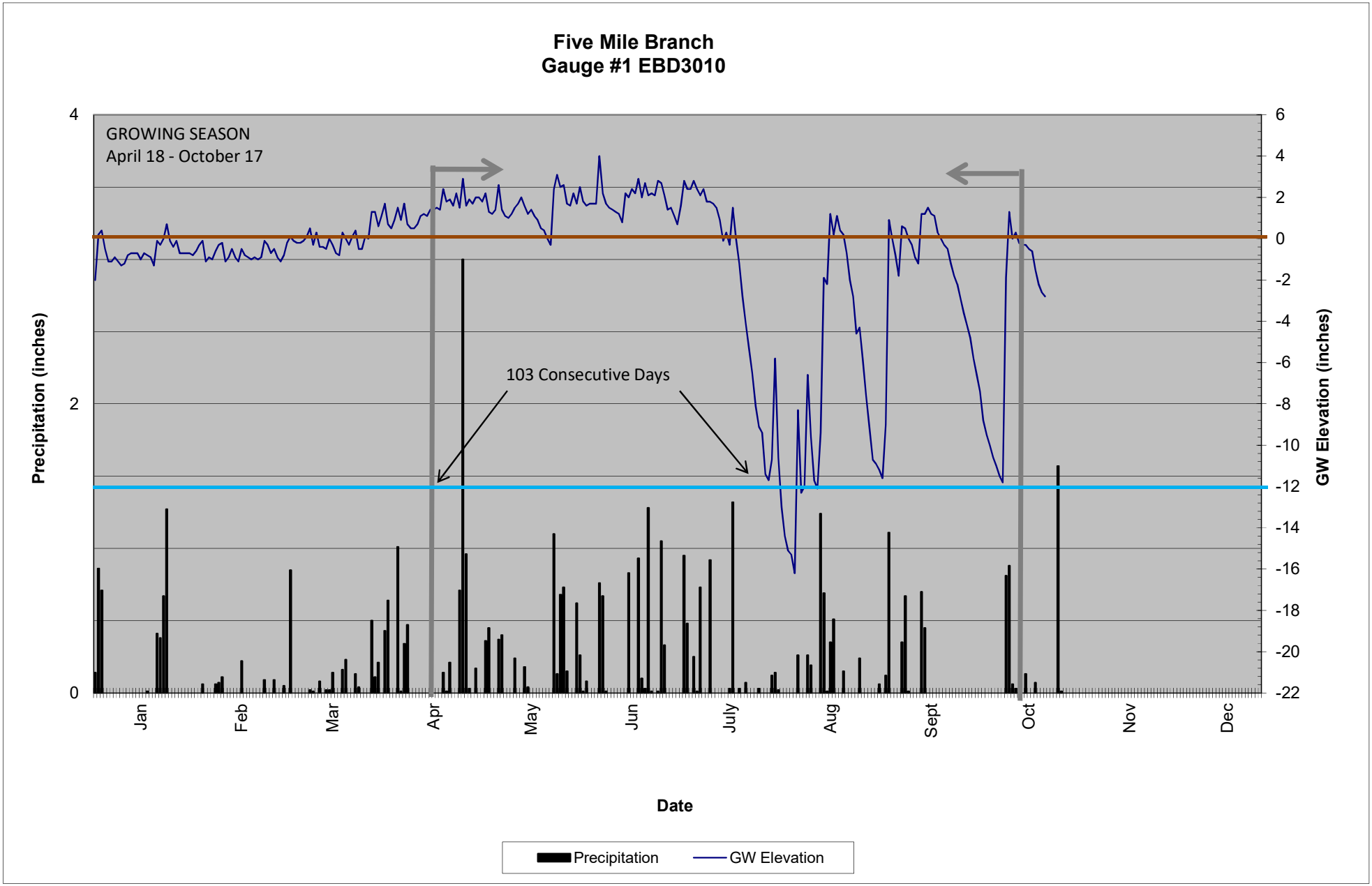
Appendix E

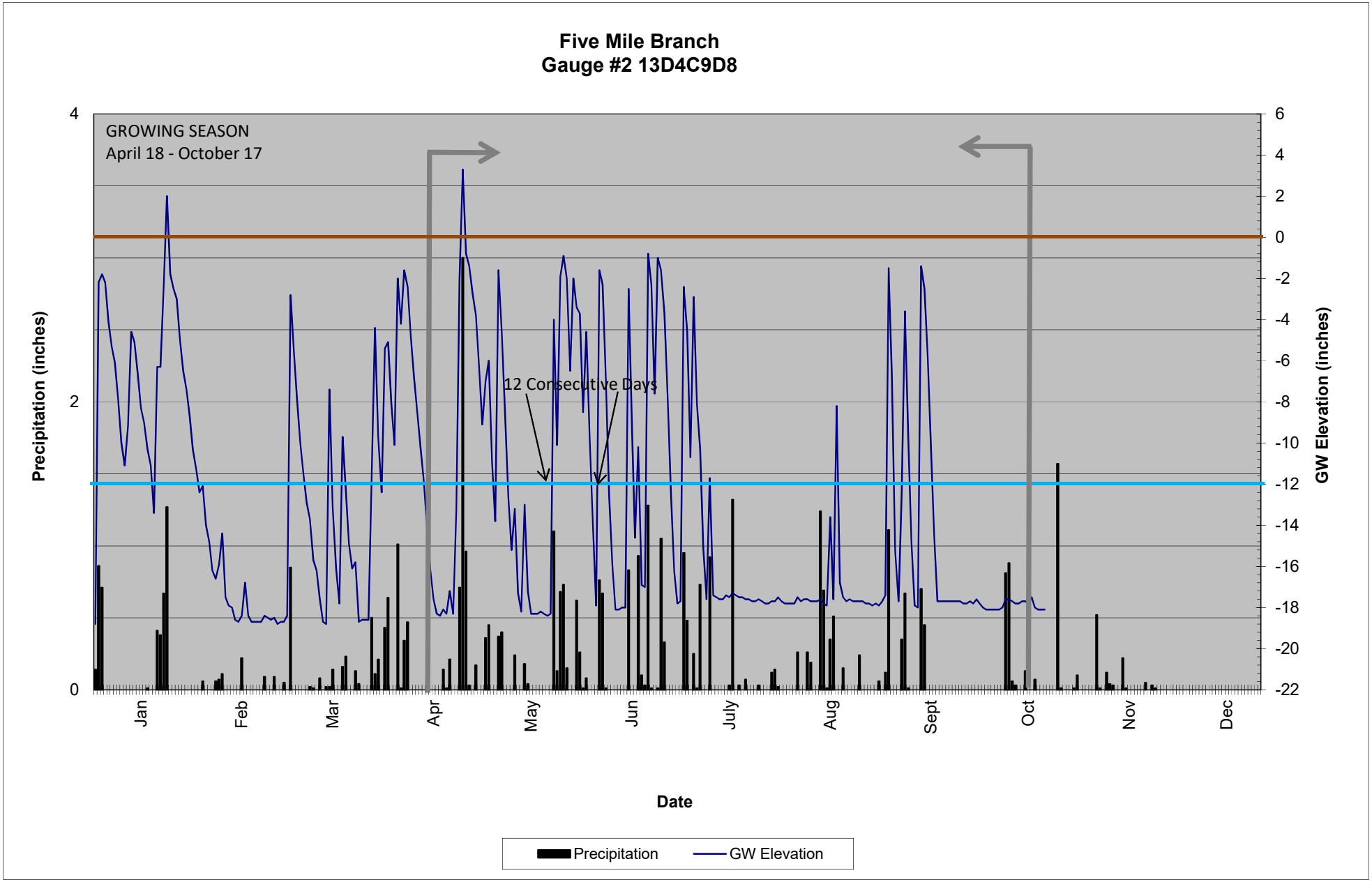
Hydrology Data

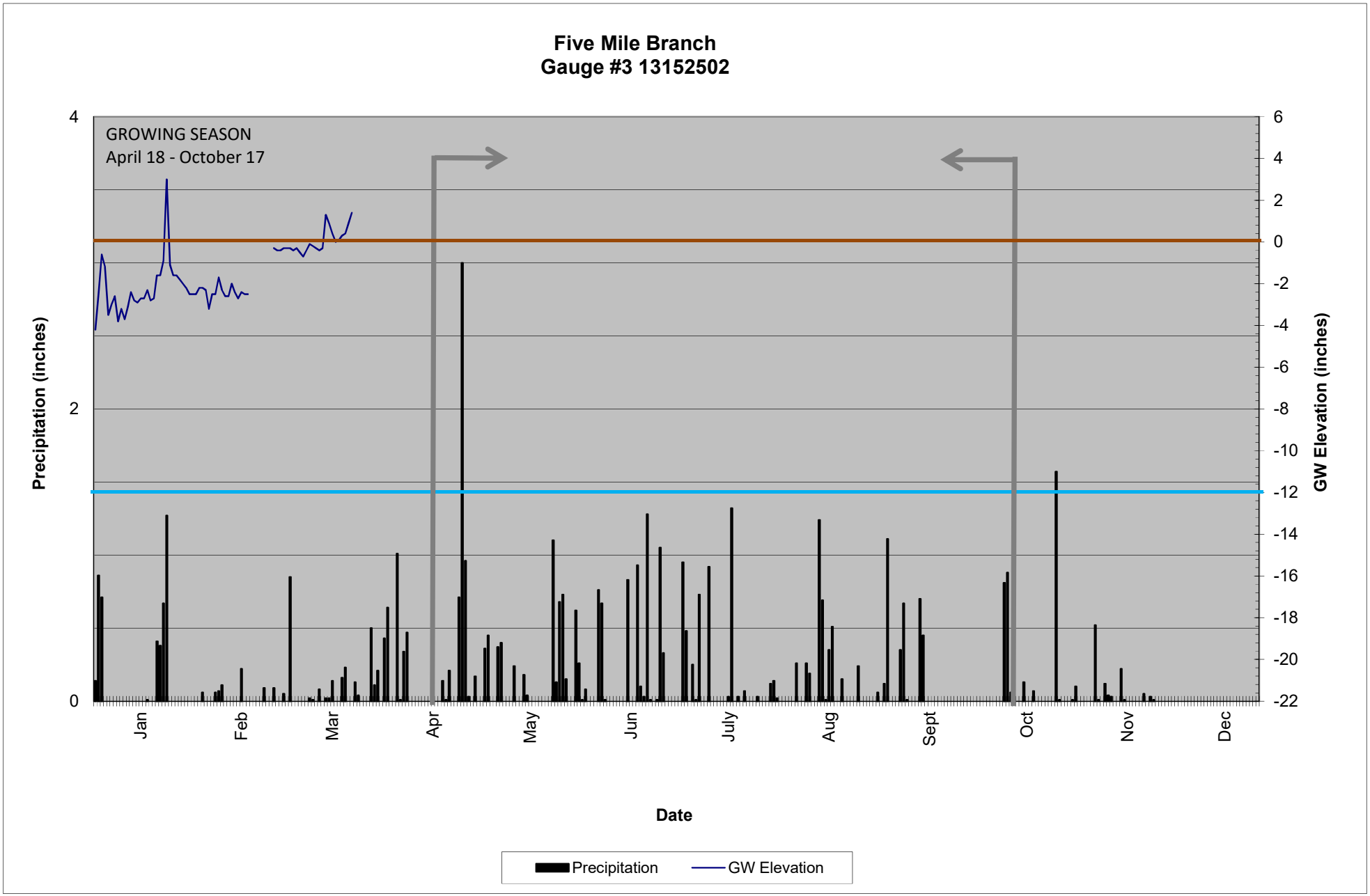
Table 12. Verification of Bankfull Events
Five Mile Branch Stream and Wetland Restoration
NCDMS # 92185

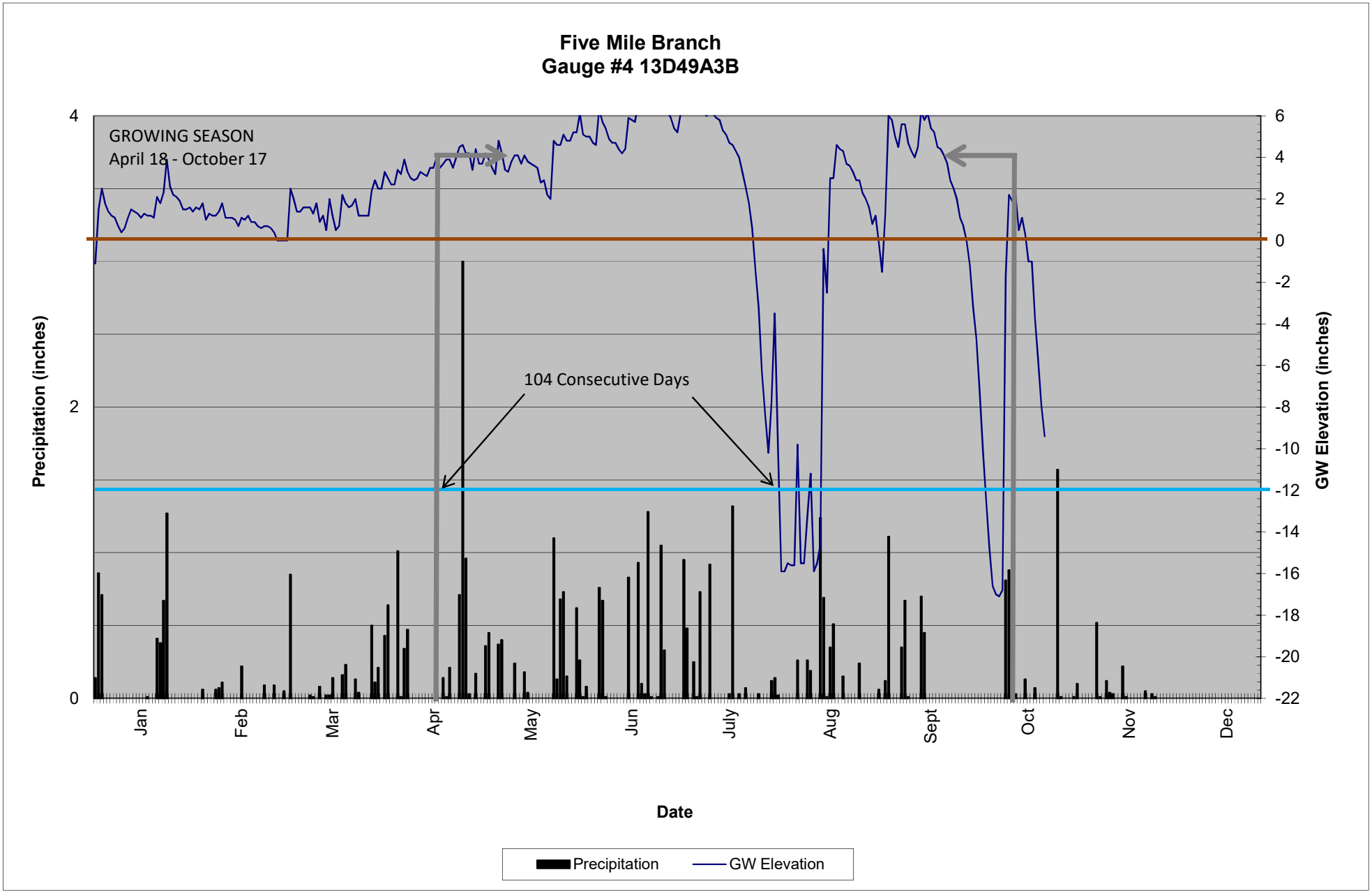
Date of Data Collection	Date of Occurrence	Method	Greater than Qbkf Stage	Notes
5/30/2012	Unknown	Debris on floodplain	Y	
10/8/2013	7/6/2013	On-site transducer/data logger	Y	
10/8/2013	7/27/2013	On-site transducer/data logger and silt inside rain gauge. 3.71 inches of rain.	Y	
12/5/2013	11/27/2013	On-site transducer/data logger	Y	
7/18/2014	1/11/2014	On site Transducer	Y	Beaver Creek, Fifth Creek Upstream and Fifth Creek Downstream
7/18/2014	3/7/2014	On site Transducer	Y	Beaver Creek
7/18/2014	4/7/2014	On site Transducer	Y	Beaver Creek
4/18/2015	3/15/2015	On site Transducer	Y	Beaver Creek and Fifth Creek Upstream
4/21/2016	2/3/216	On site Transducer	Y	Beaver Creek
10/25/2016	5/3/2016	On site Transducer	Y	Beaver Creek, Fifth Creek Upstream and Fifth Creek Downstream
10/25/2016	8/3/2016	On site Transducer	Y	Beaver Creek
4/7/2017	1/23/2017	On site Transducer	Y	Beaver Creek, Fifth Creek Upstream and Fifth Creek Downstream
8/31/2017	4/24/2017	On site Transducer	Y	Beaver Creek, Fifth Creek Upstream and Fifth Creek Downstream

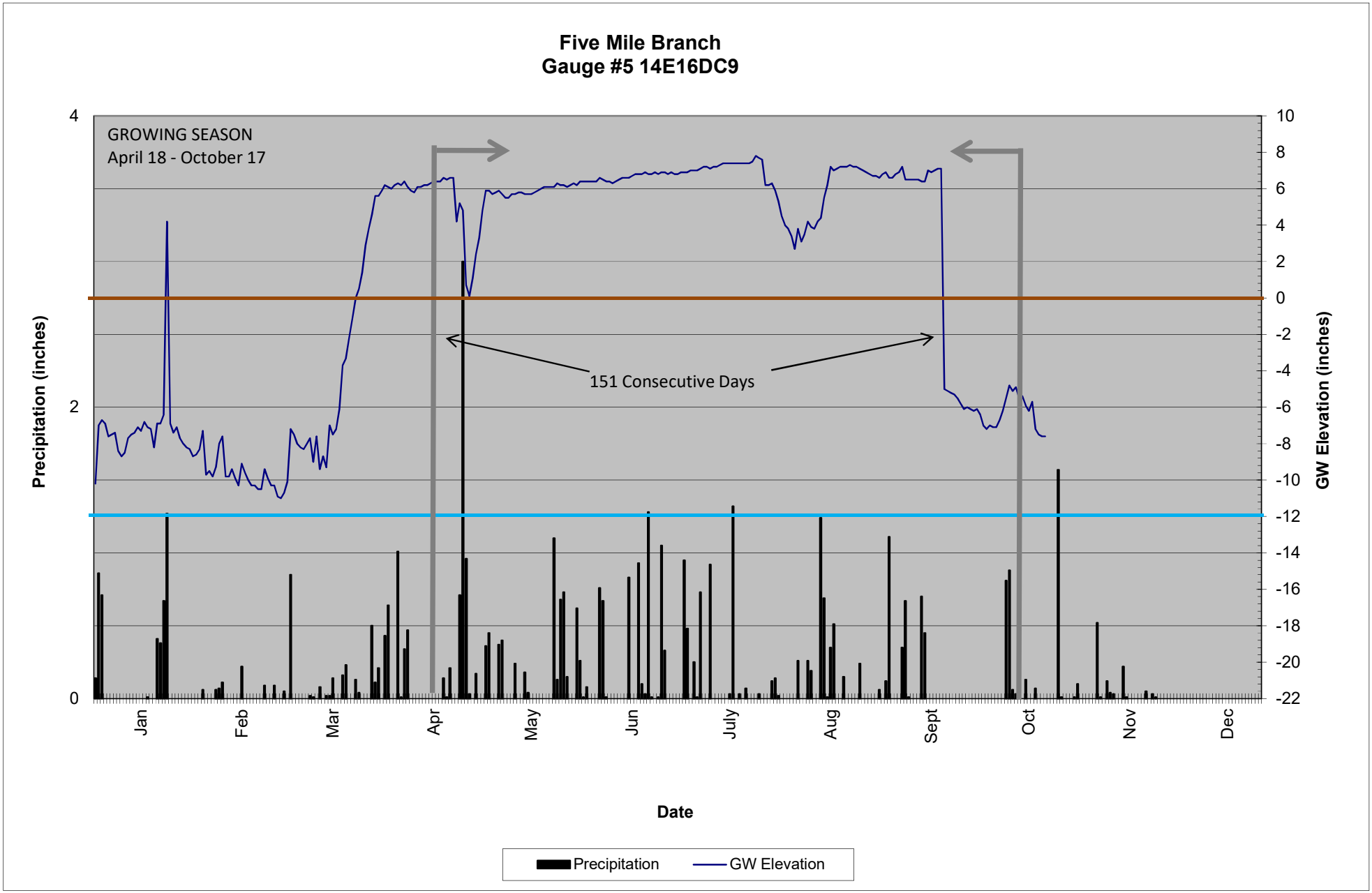

Five Mile Branch 30-70 Percentile Graph Statesville, NC
Precipation (inches)
8
7
6
5
4
3
2
1
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Nov
Dec
2017
30%
70%
2017

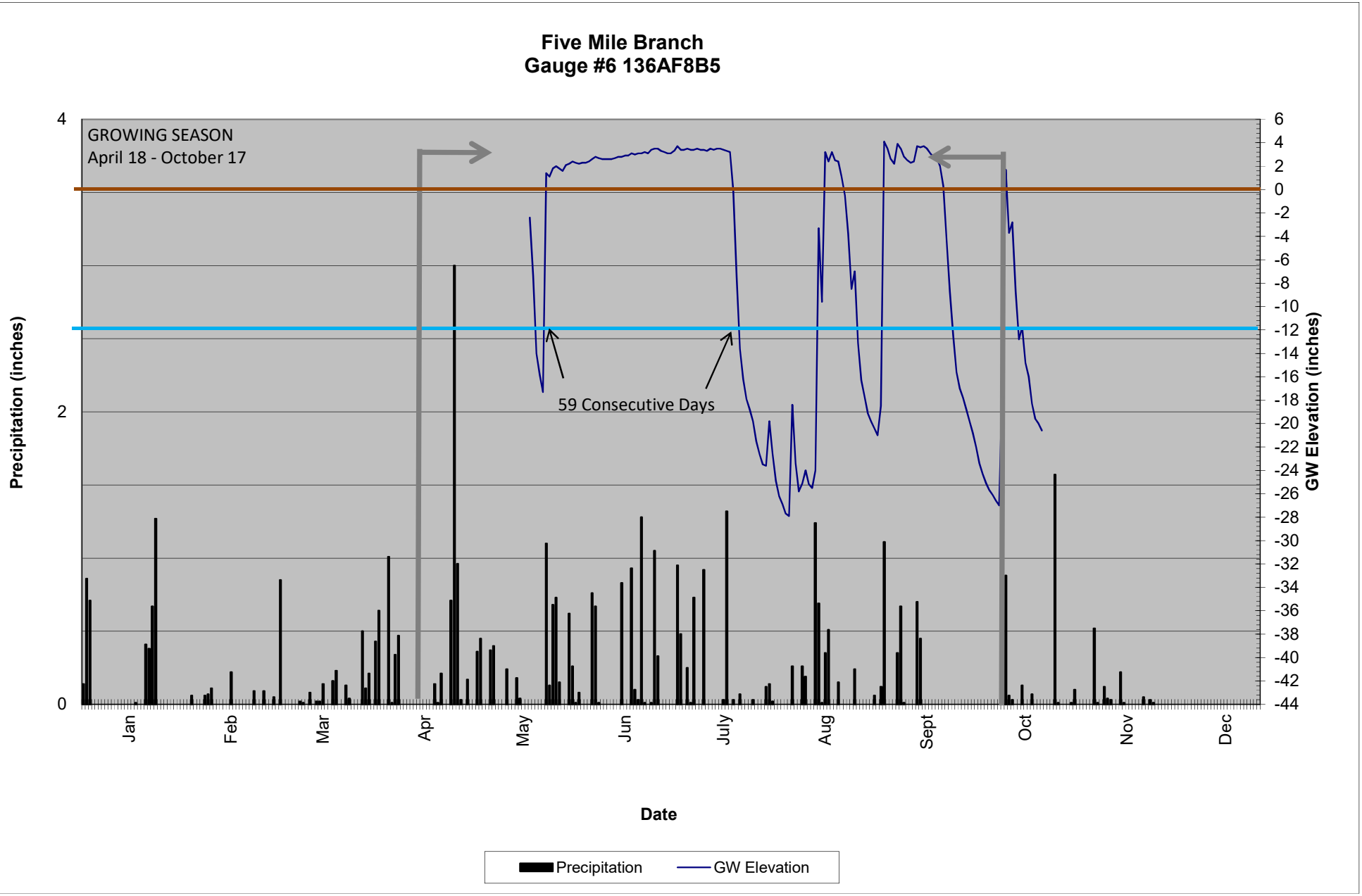

Five Mile Branch
Gauge #1 EBD3010
GROWING SEASON
April 18 - October 17
103 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

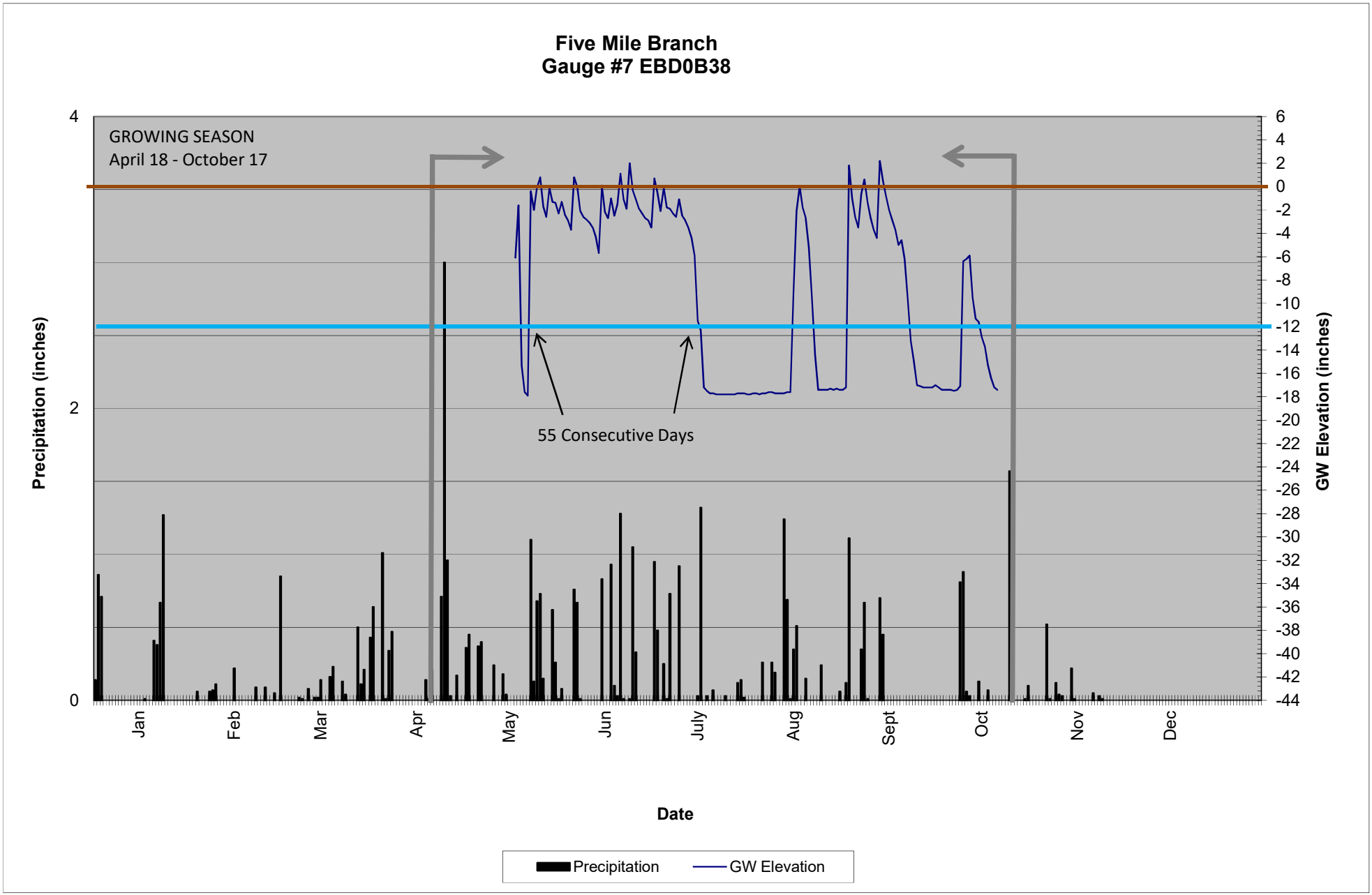

Five Mile Branch
Gauge #2 13D4C9D8
GROWING SEASON
April 18 - October 17
12 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

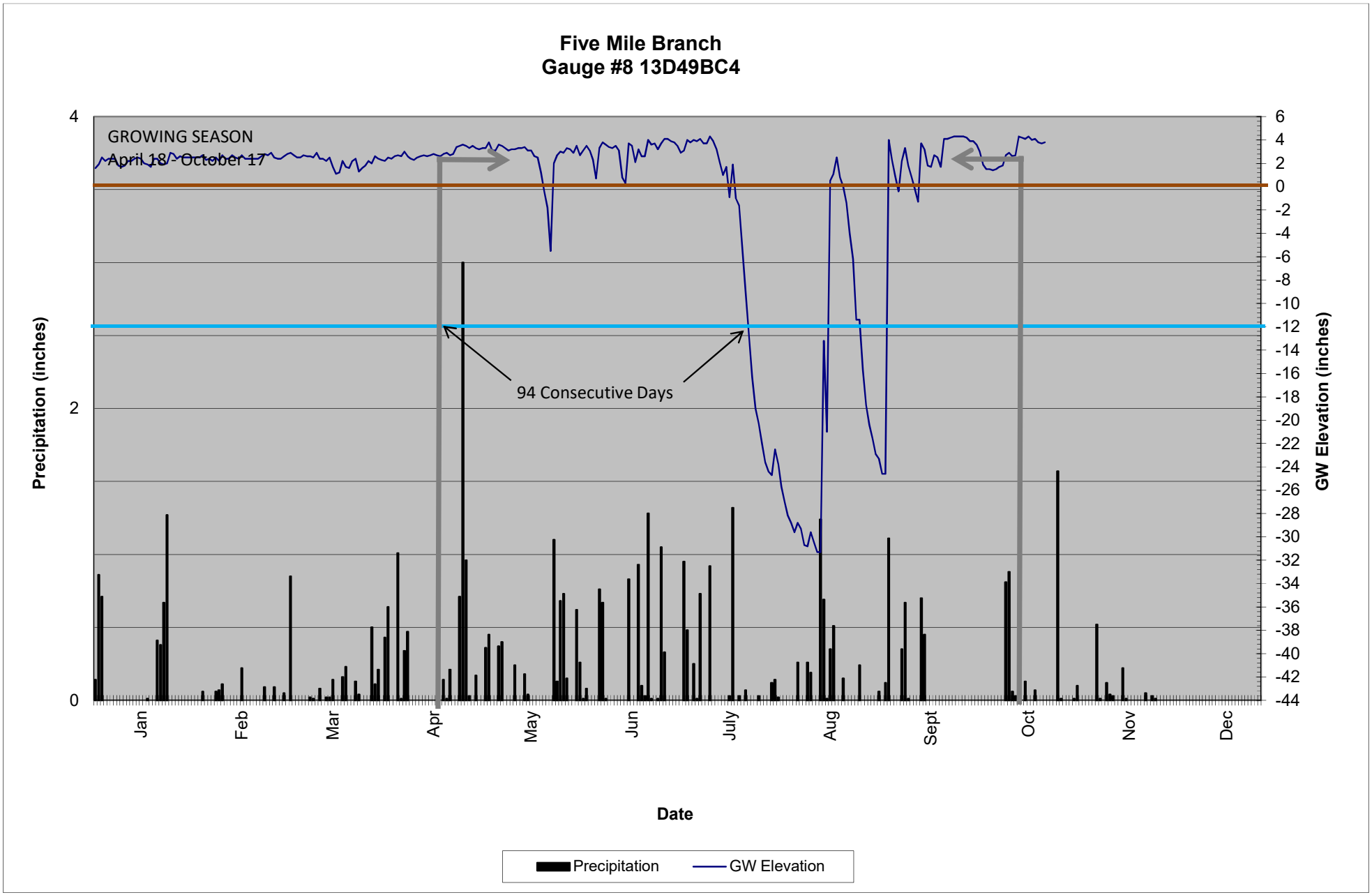

Five Mile Branch
Gauge #3 13152502
GROWING SEASON
April 18 - October 17
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

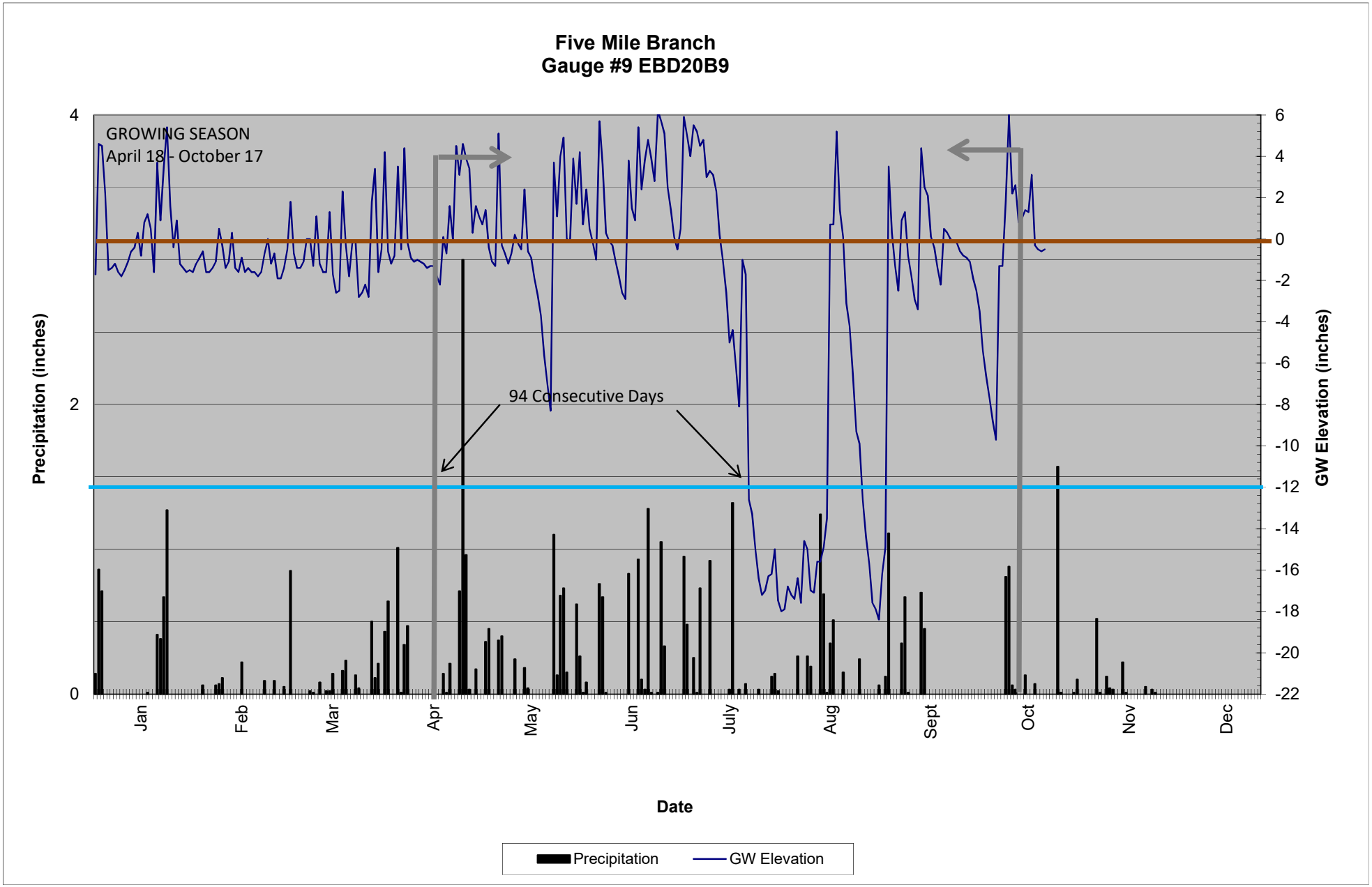

Five Mile Branch
Gauge #4 13D49A3B
GROWING SEASON
April 18 - October 17
104 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

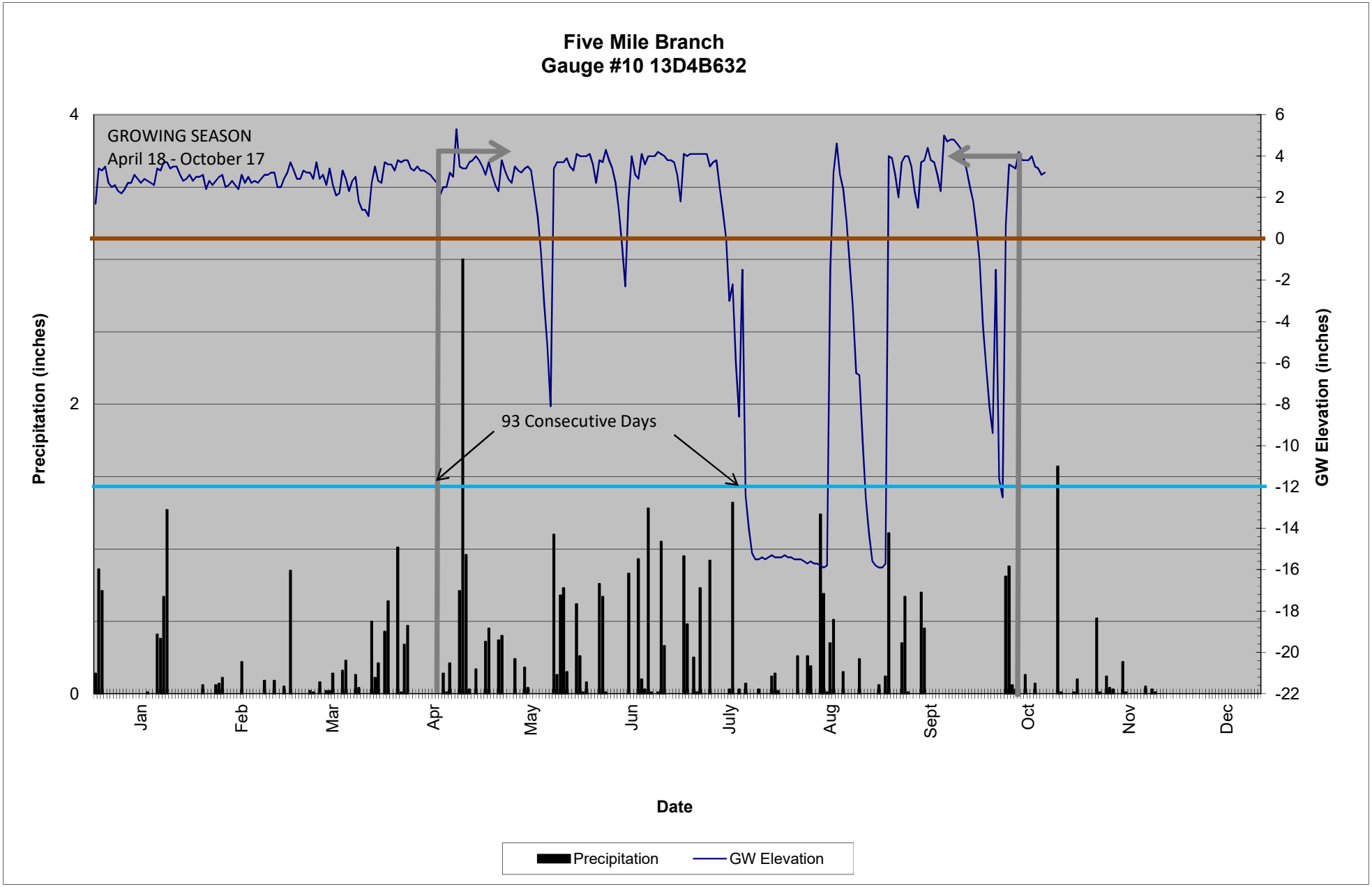

Five Mile Branch
Gauge #5 14E16DC9
GROWING SEASON
April 18 - October 17
151 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

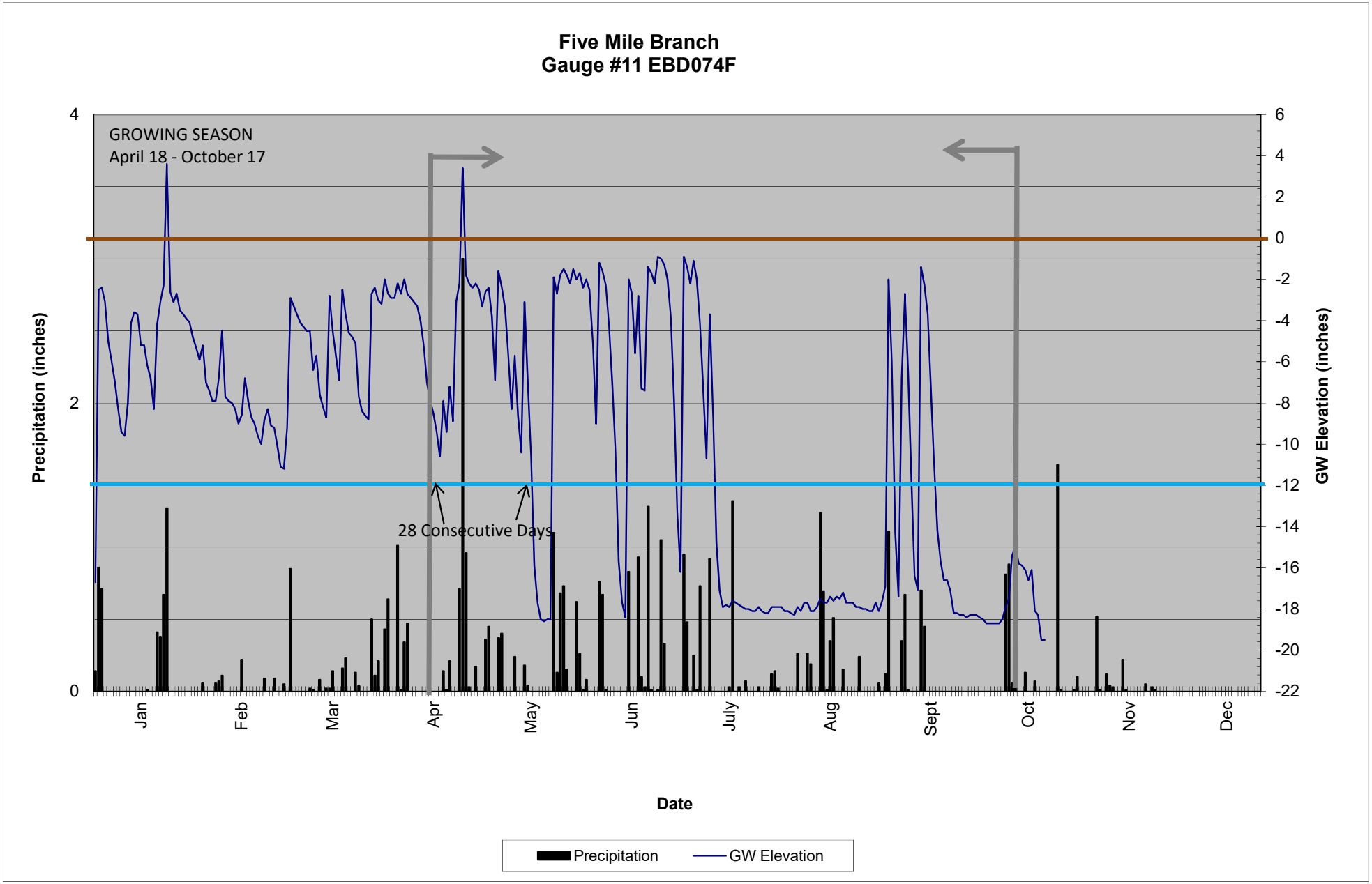

Five Mile Branch
Gauge #6 136AF8B5
GROWING SEASON
April 18 - October 17
59 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
-42
-44
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

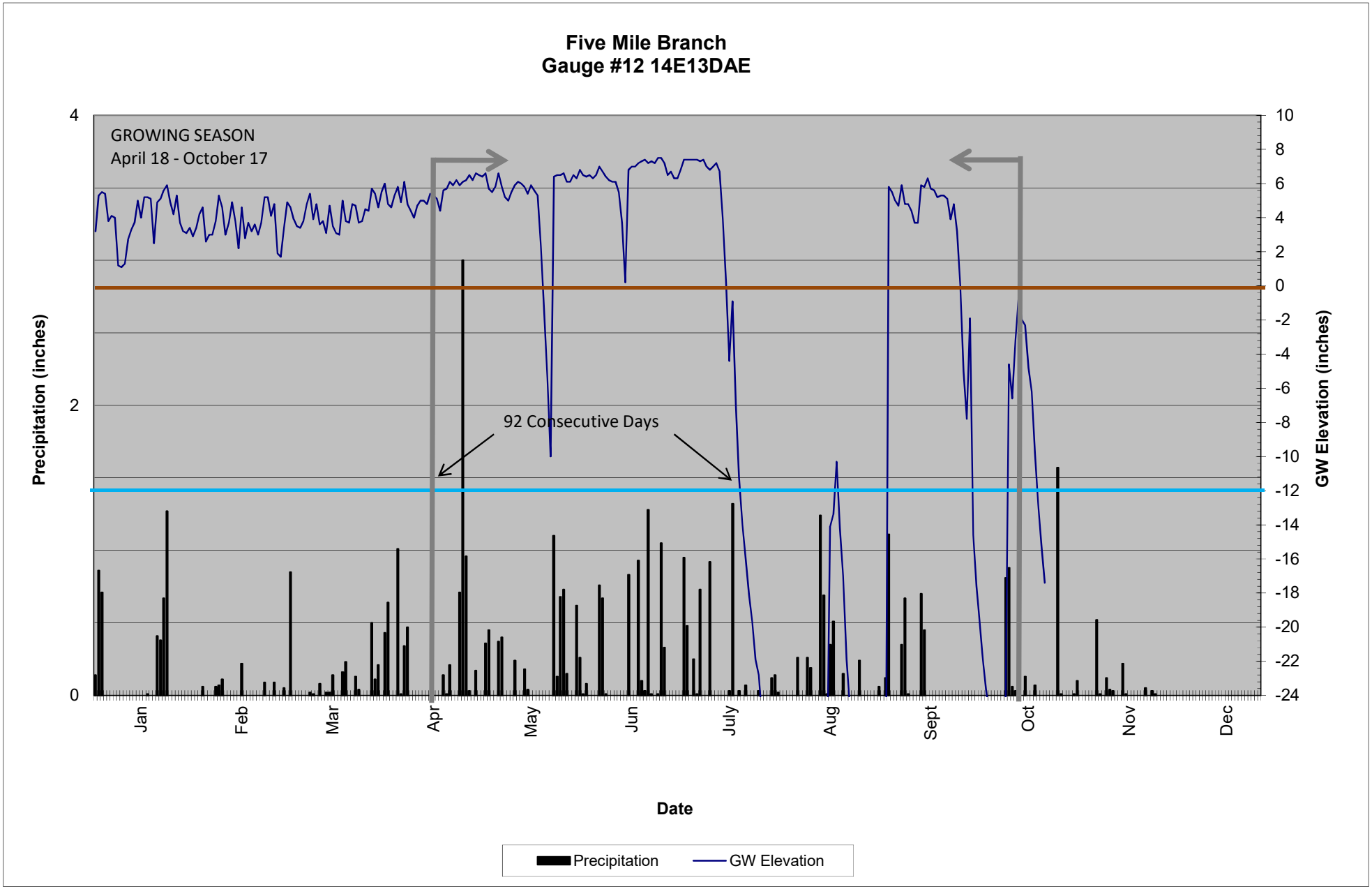

Five Mile Branch
Gauge #7 EBD0B38
GROWING SEASON
April 18 - October 17
55 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
-42
-44
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

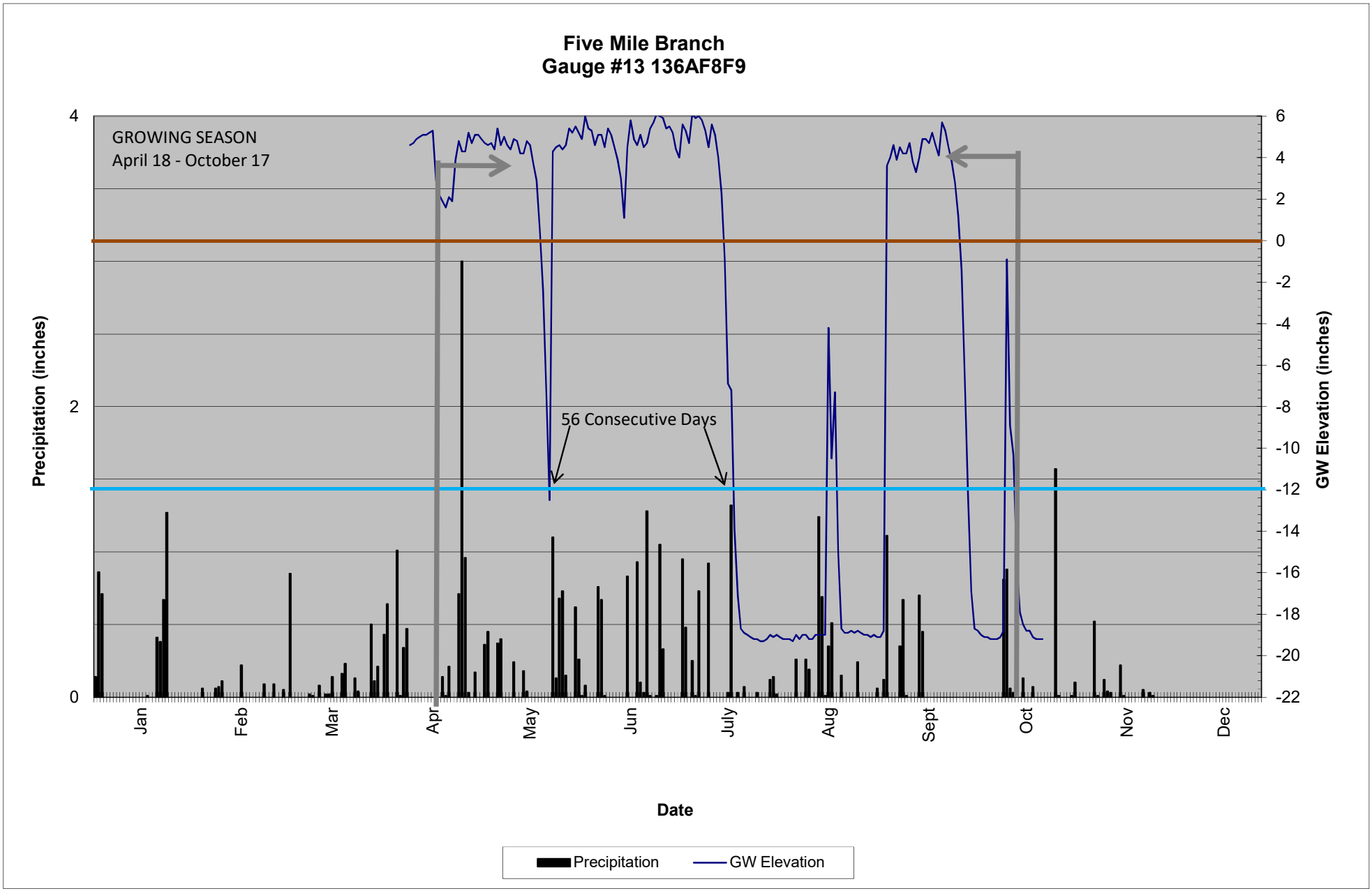

Five Mile Branch
Gauge #8 13D49BC4
GROWING SEASON
April 18 - October 17
94 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
Date
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Precipitation
GW Elevation

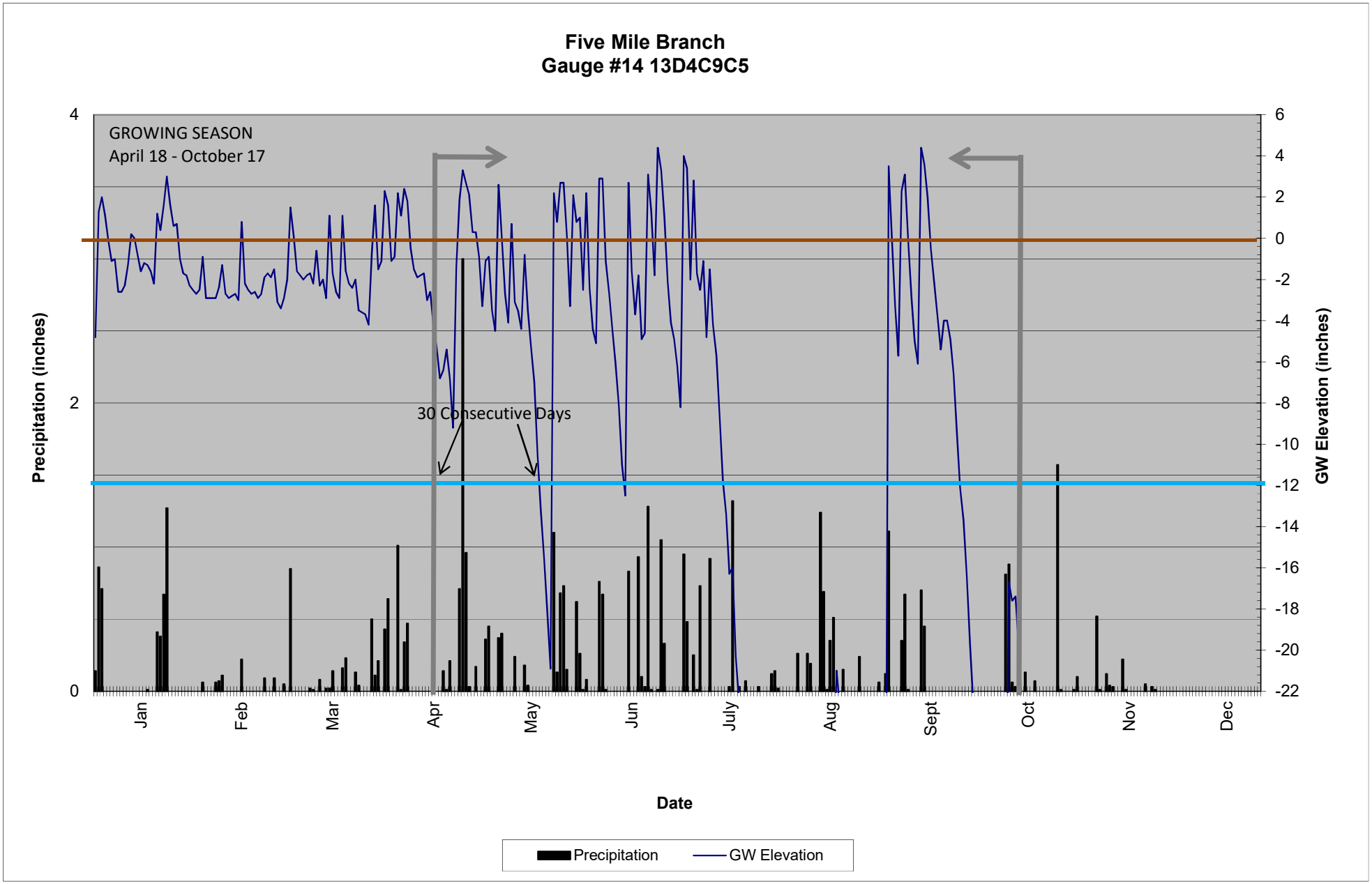

Five Mile Branch
Gauge #9 EBD20B9
GROWING SEASON
April 18 - October 17
94 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

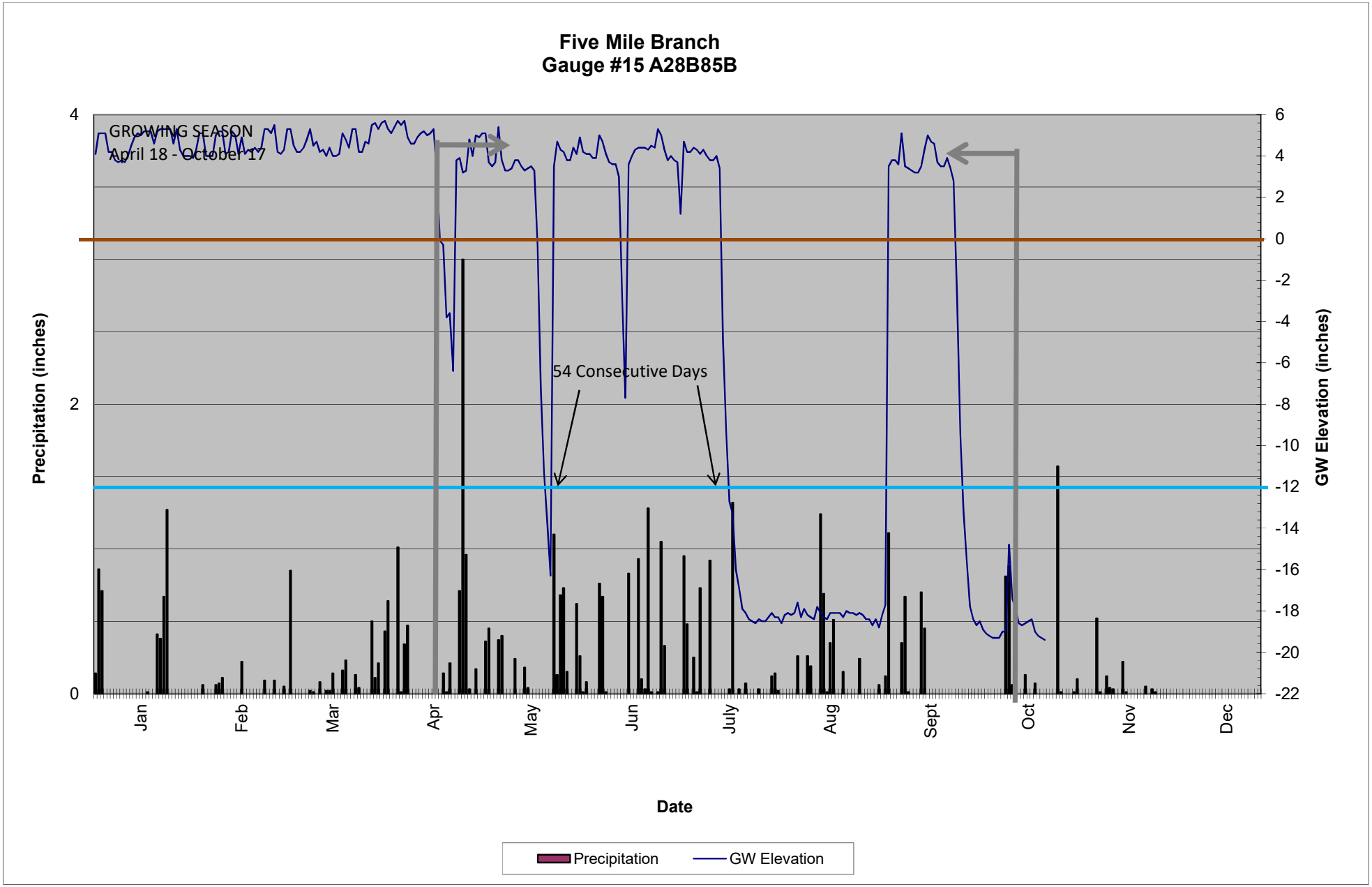

Five Mile Branch
Gauge #10 13D4B632
GROWING SEASON
April 18 - October 17
93 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

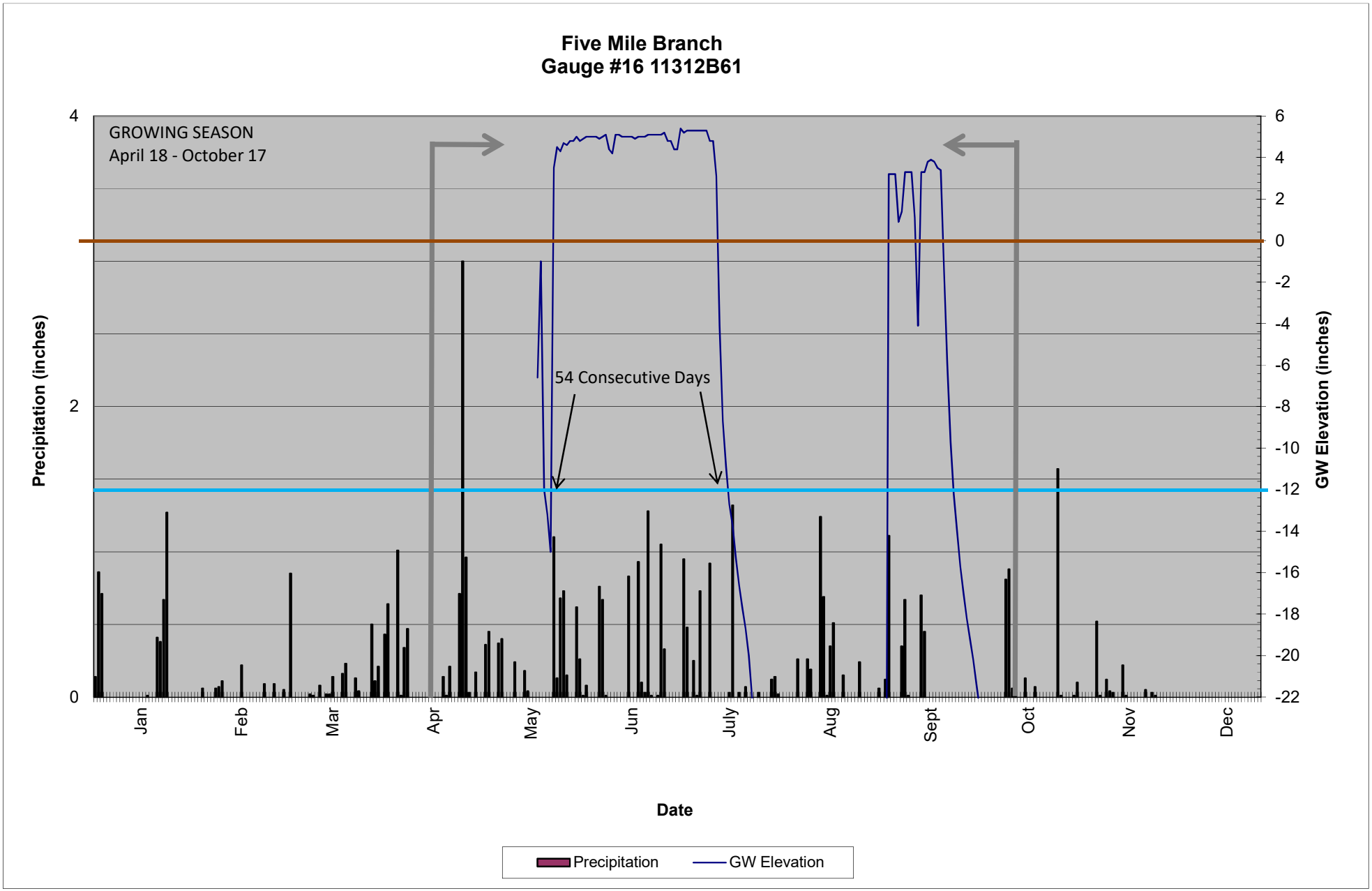

Five Mile Branch
Gauge #11 EBD074F
GROWING SEASON
April 18 - October 17
28 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

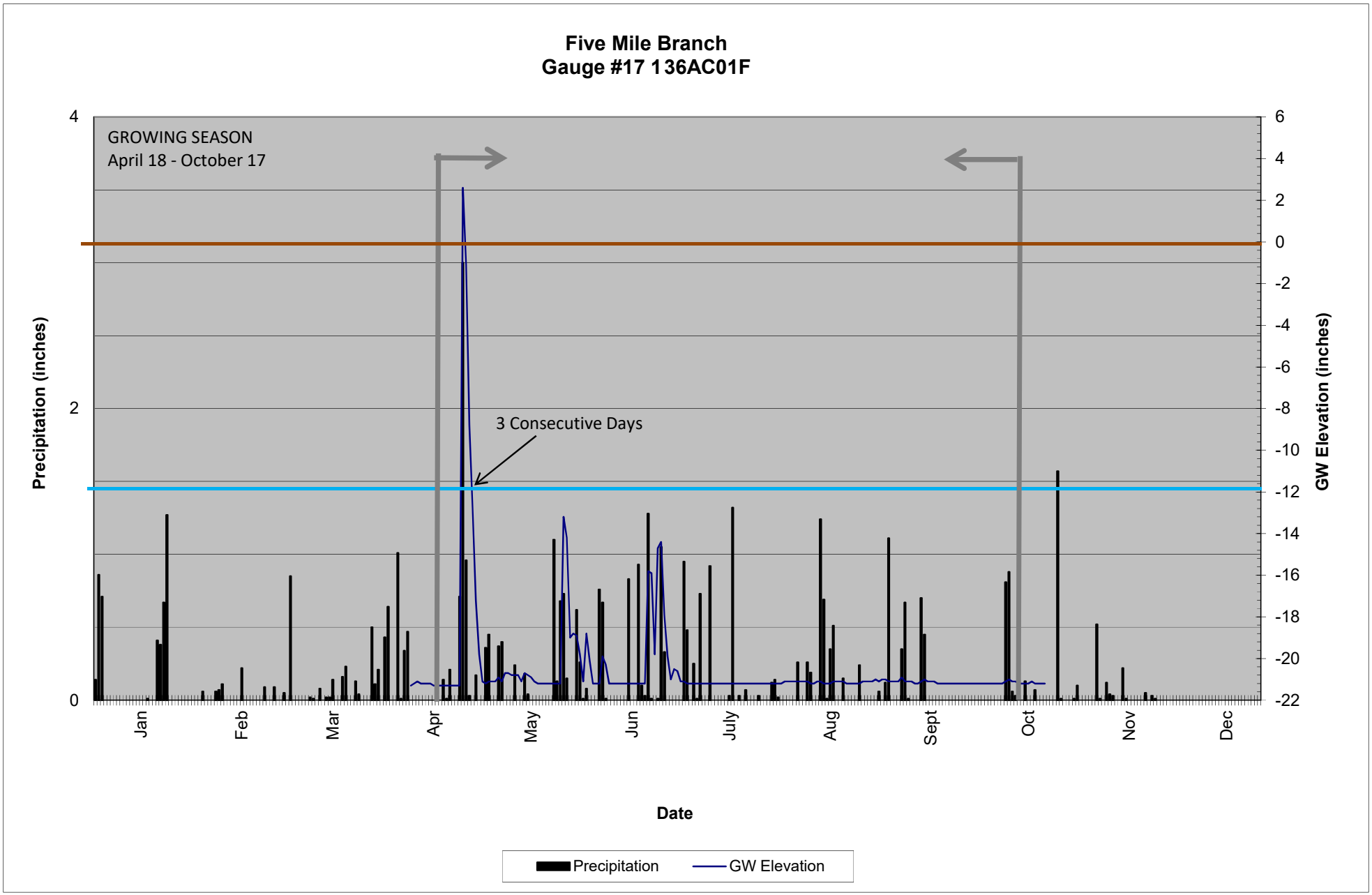

Five Mile Branch
Gauge #12 14E13DAE
GROWING SEASON
April 18 - October 17
92 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

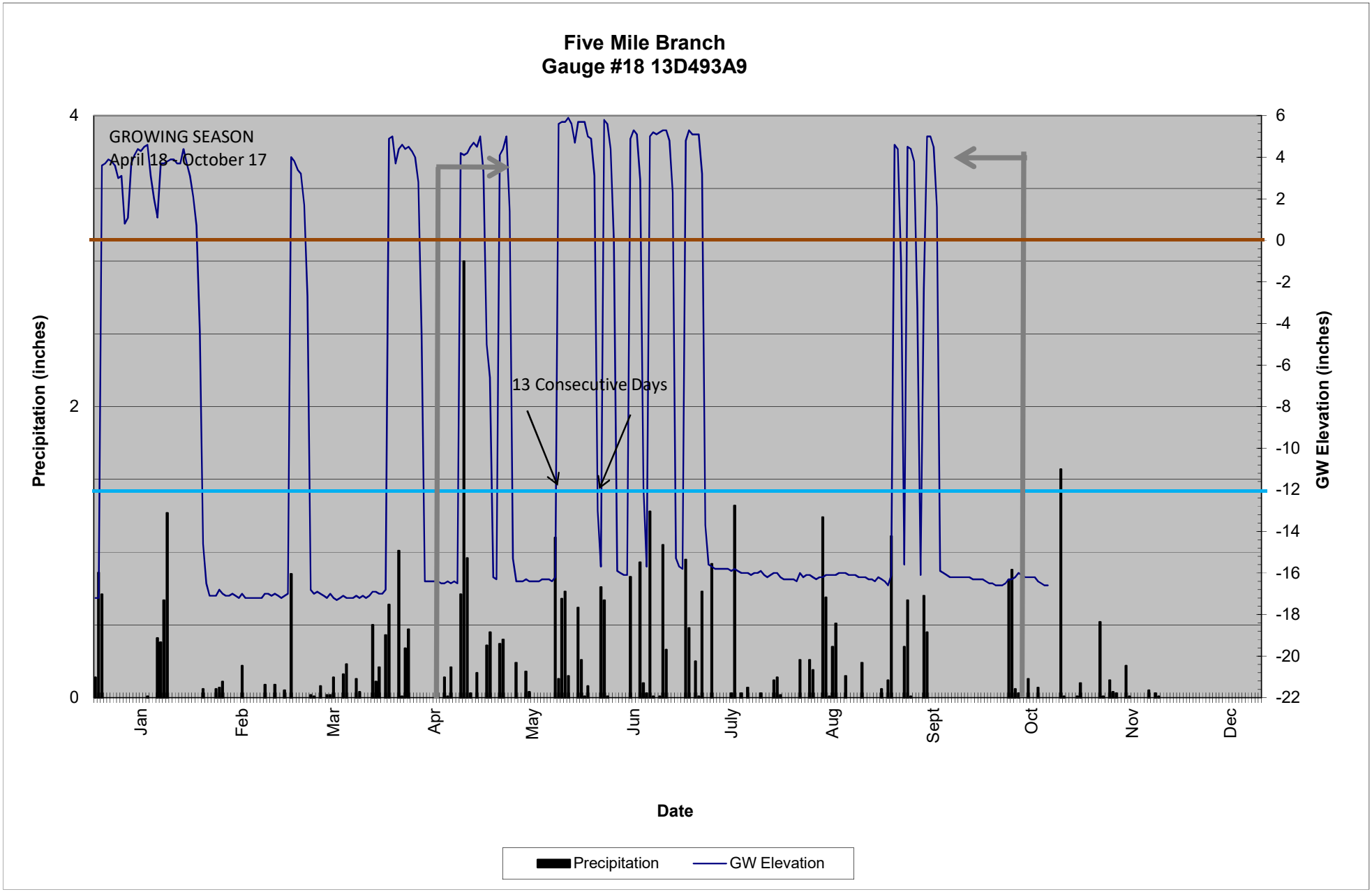

Five Mile Branch
Gauge #13 136AF8F9
GROWING SEASON
April 18 - October 17
56 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

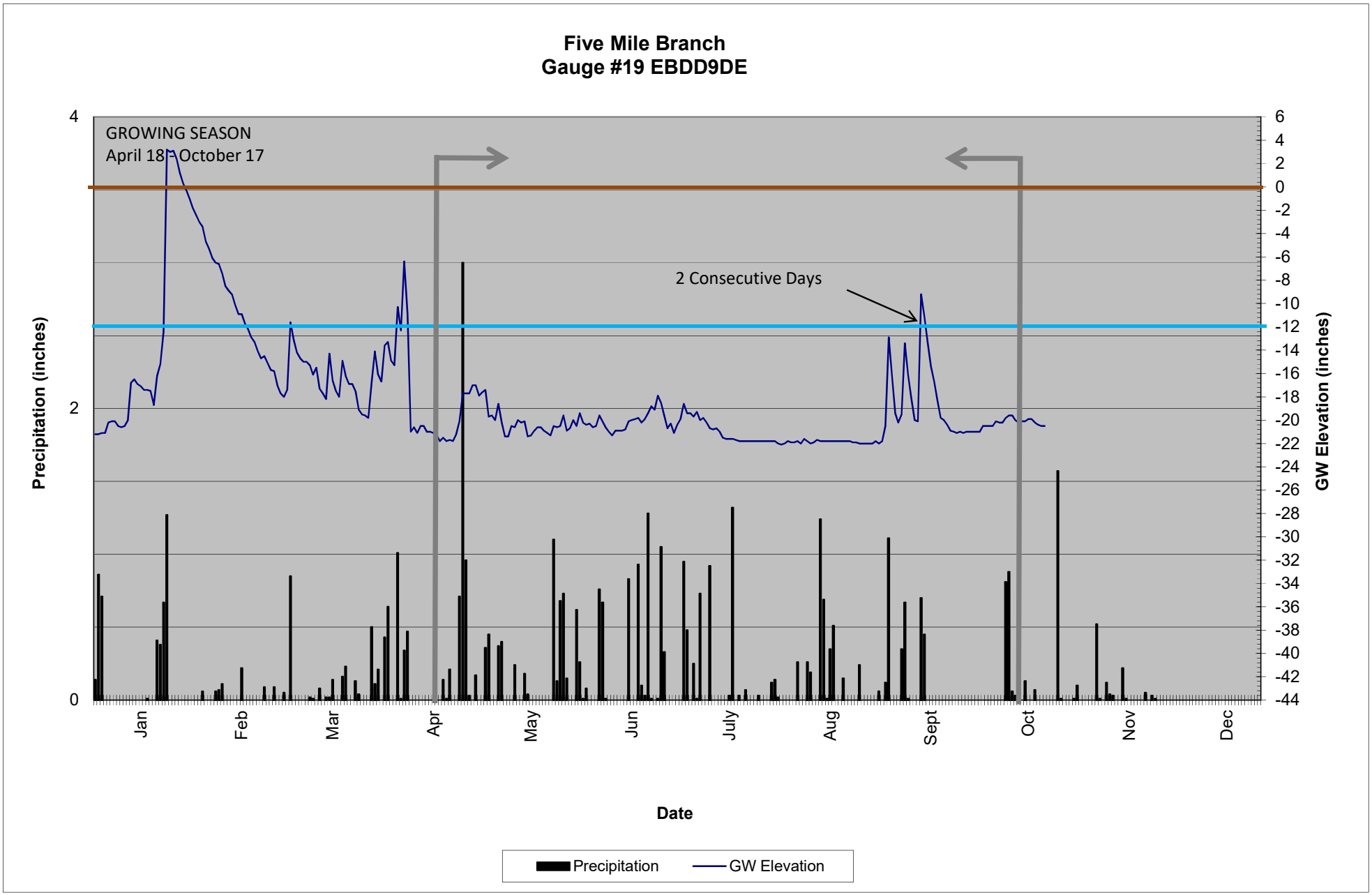

Five Mile Branch
Gauge #14 13D4C9C5
GROWING SEASON
April 18 - October 17
30 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

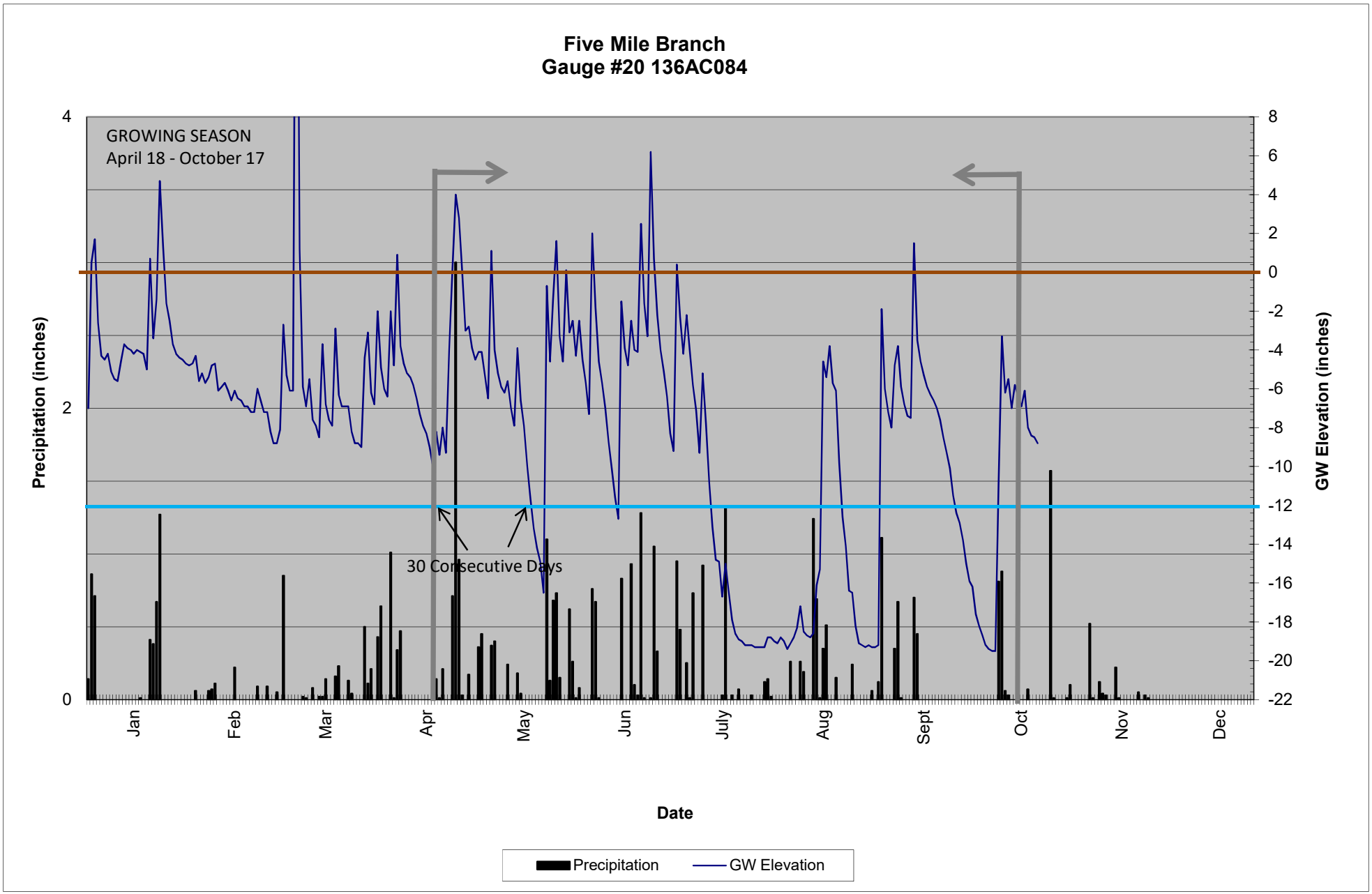

Five Mile Branch
Gauge #15 A28B85B
GROWING SEASON
April 18 - October 17
54 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

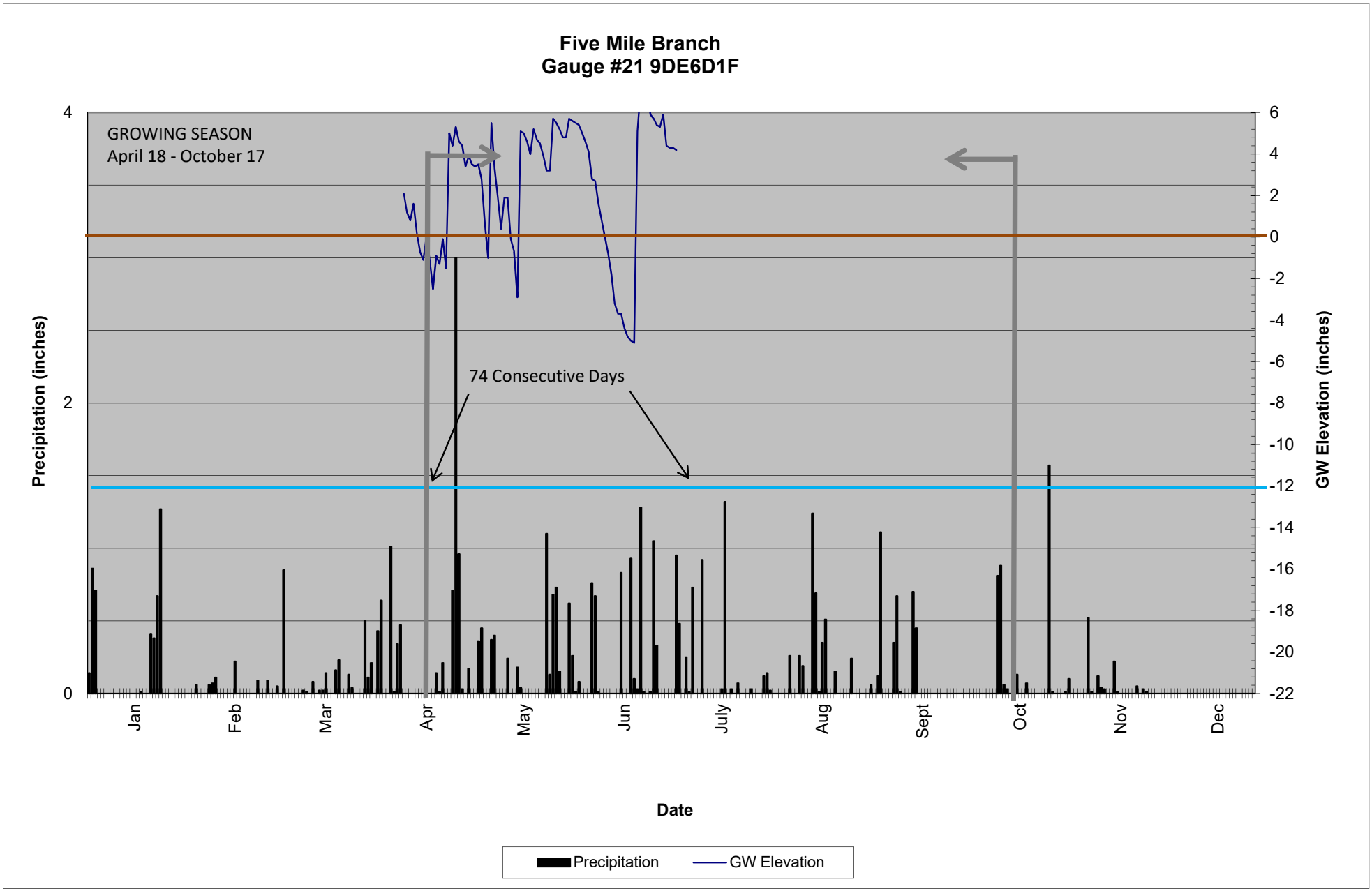

Five Mile Branch
Gauge #16 11312B61
GROWING SEASON
April 18 - October 17
54 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

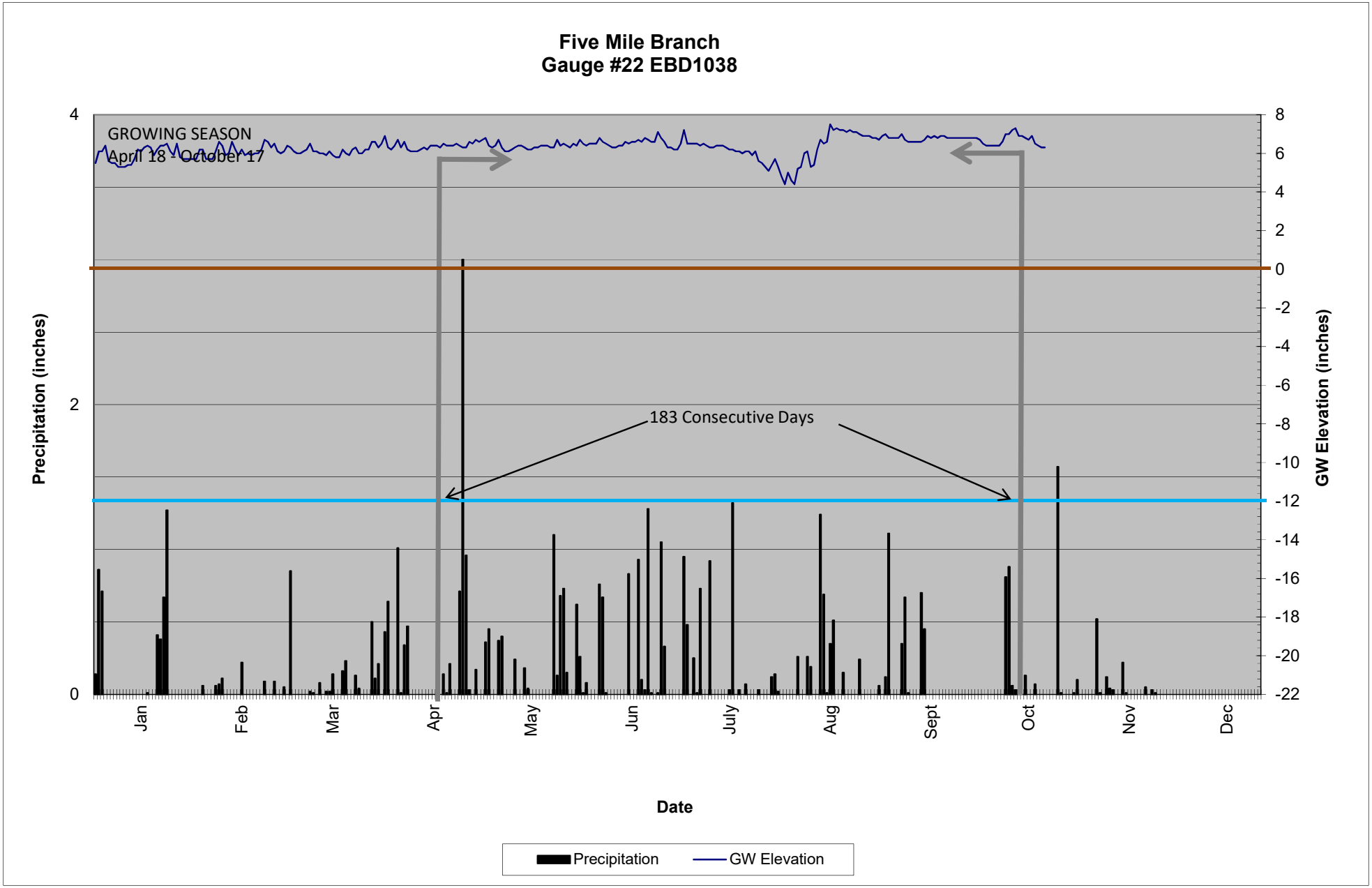

Five Mile Branch
Gauge #17 136AC01F
GROWING SEASON
April 18 - October 17
3 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

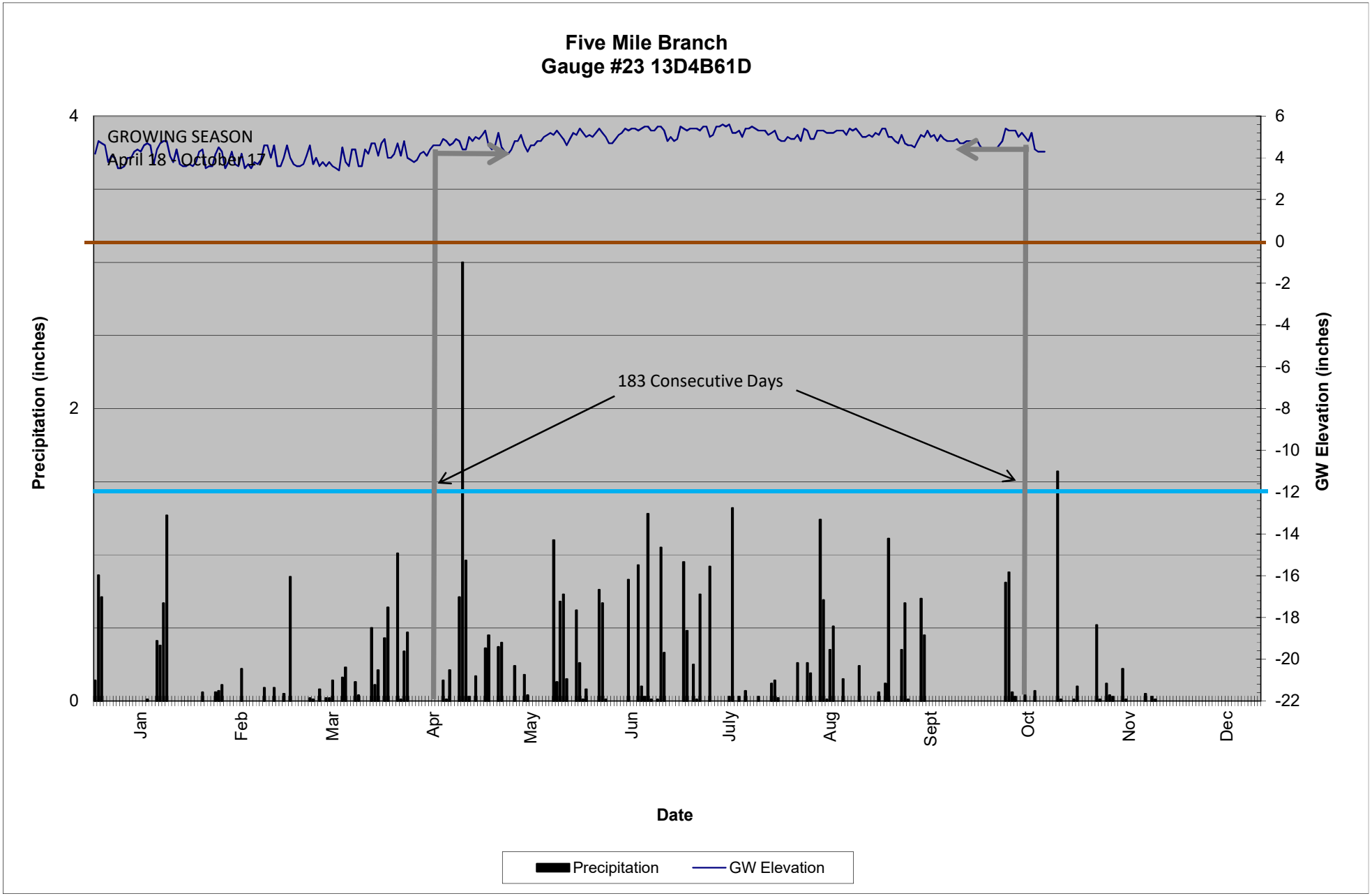

Five Mile Branch
Gauge #18 13D493A9
GROWING SEASON
April 18 - October 17
13 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

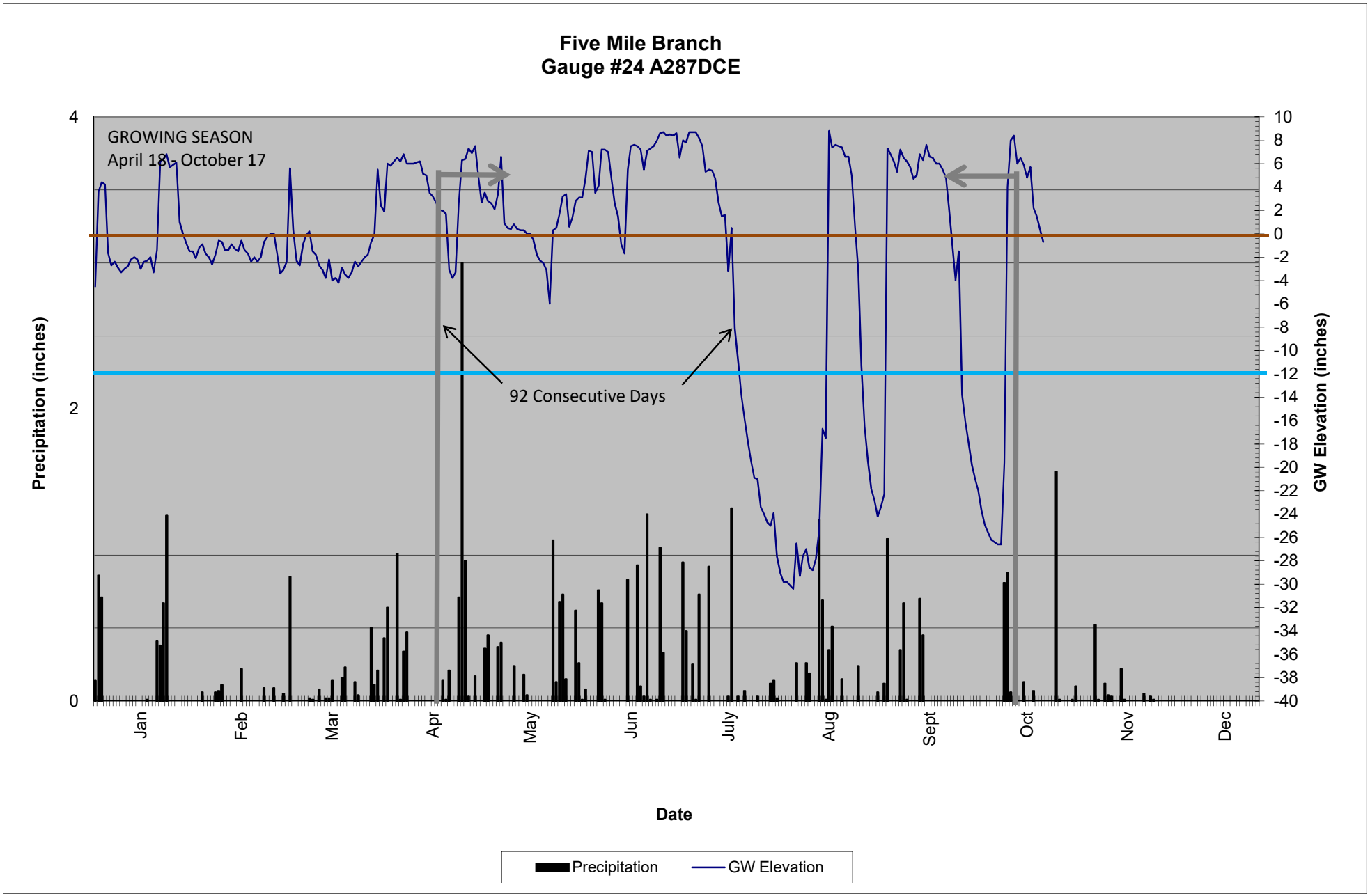

Five Mile Branch
Gauge #19 EBDD9DE
GROWING SEASON
April 18 - October 17
2 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
-42
-44
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

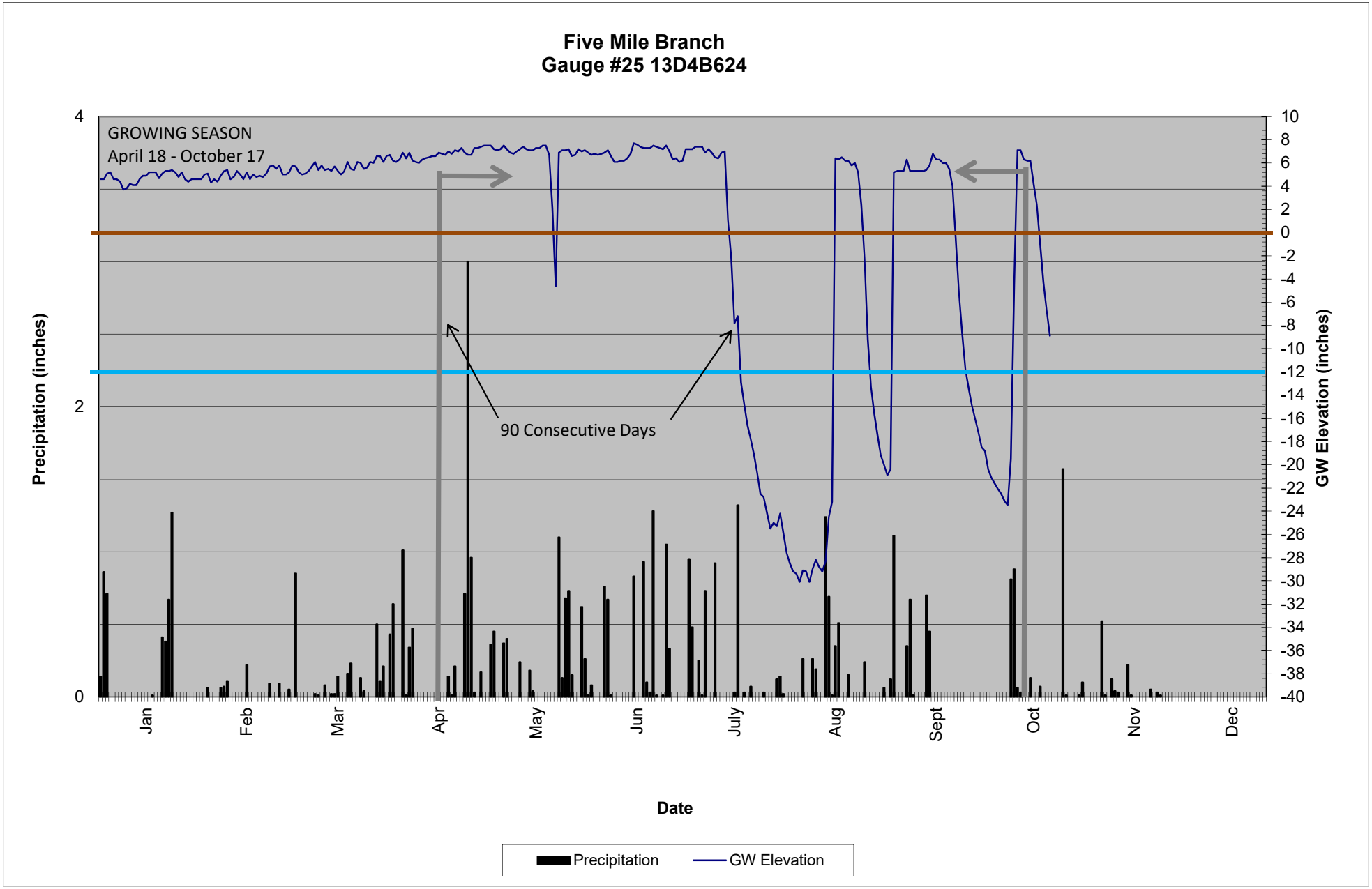

Five Mile Branch
Gauge #20 136AC084
GROWING SEASON
April 18 - October 17
30 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

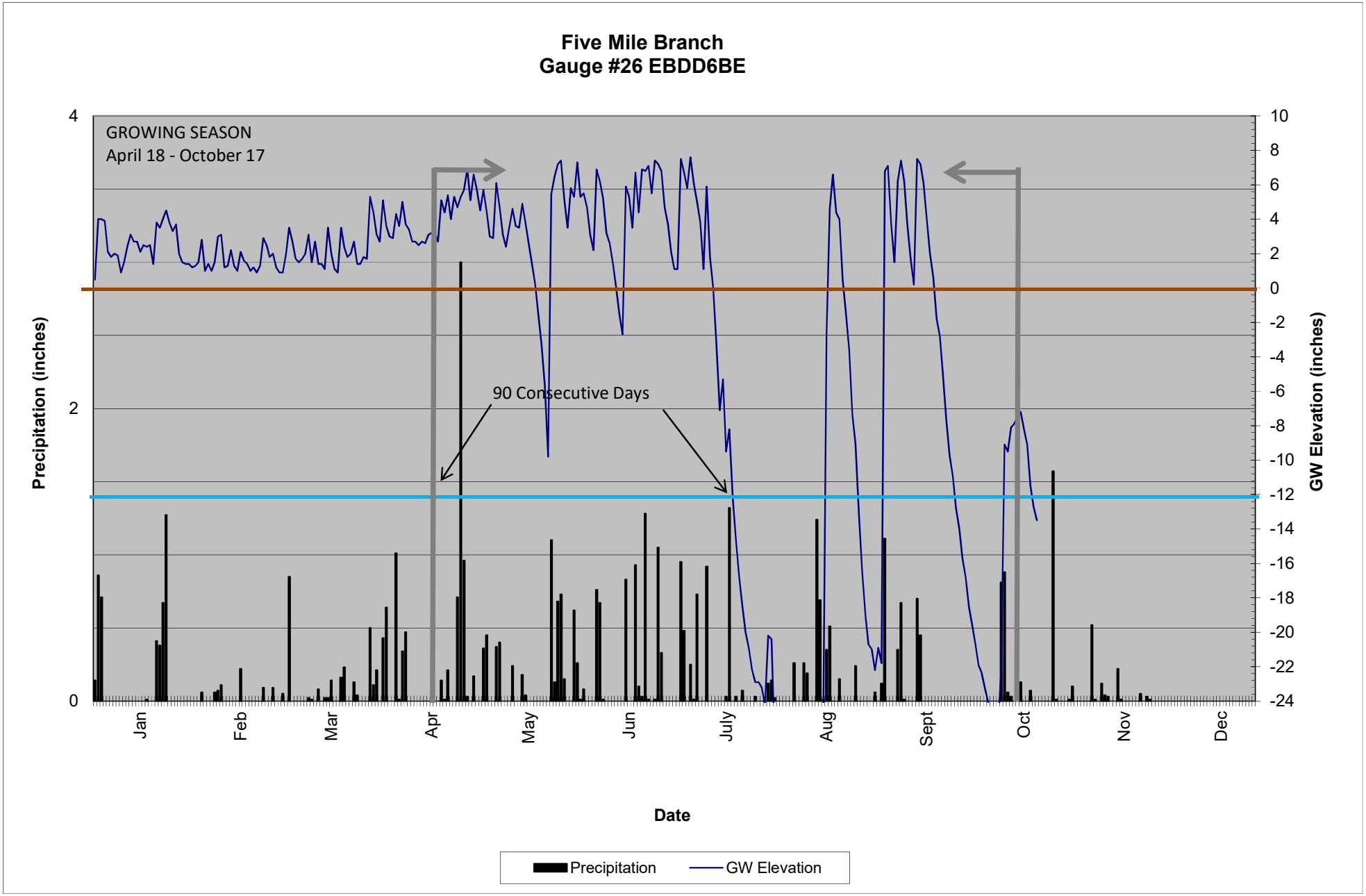

Five Mile Branch
Gauge #21 9DE6D1F
GROWING SEASON
April 18 - October 17
74 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

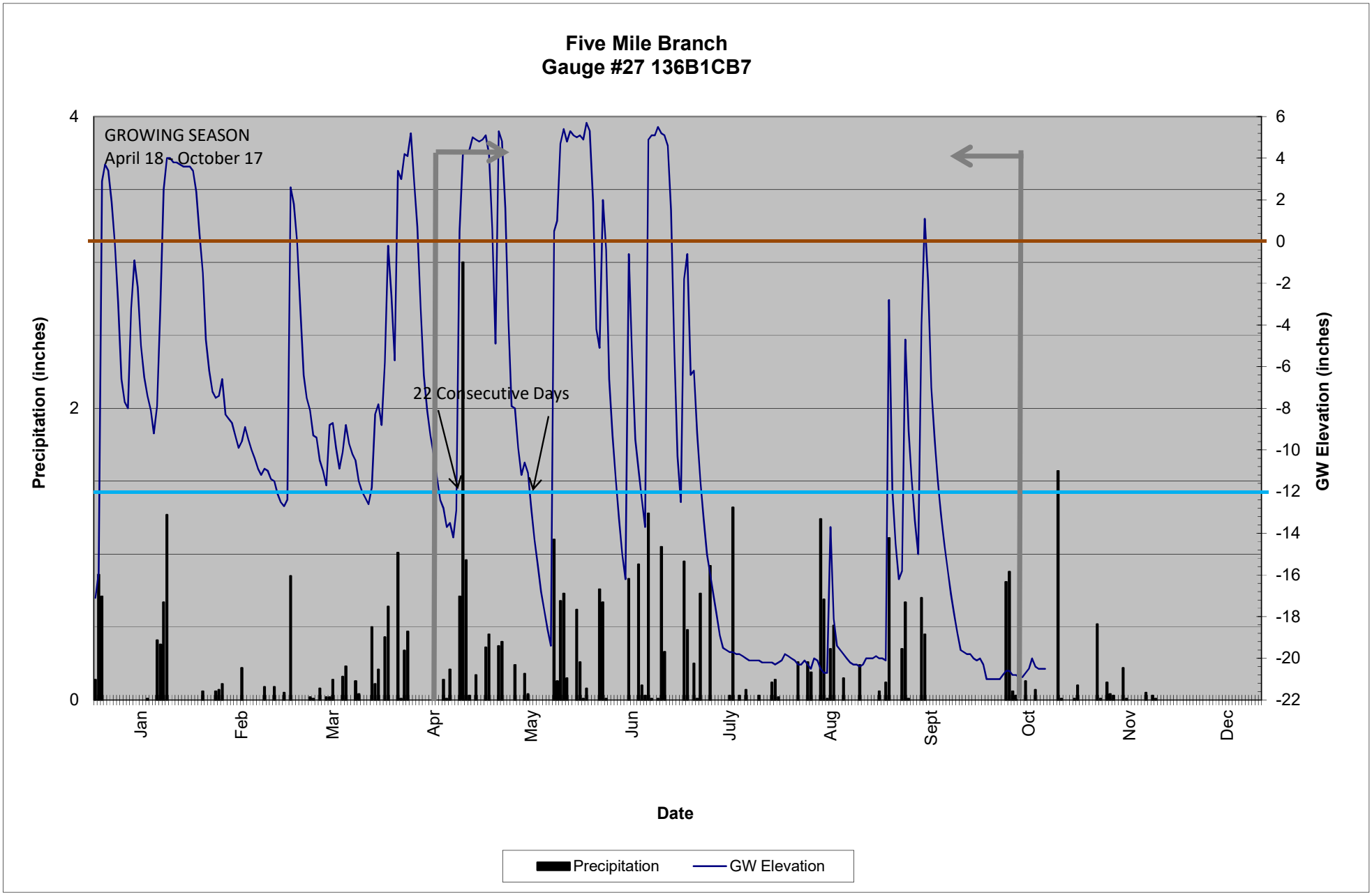

Five Mile Branch
Gauge #22 EBD1038
GROWING SEASON
April 18 - October 17
183 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

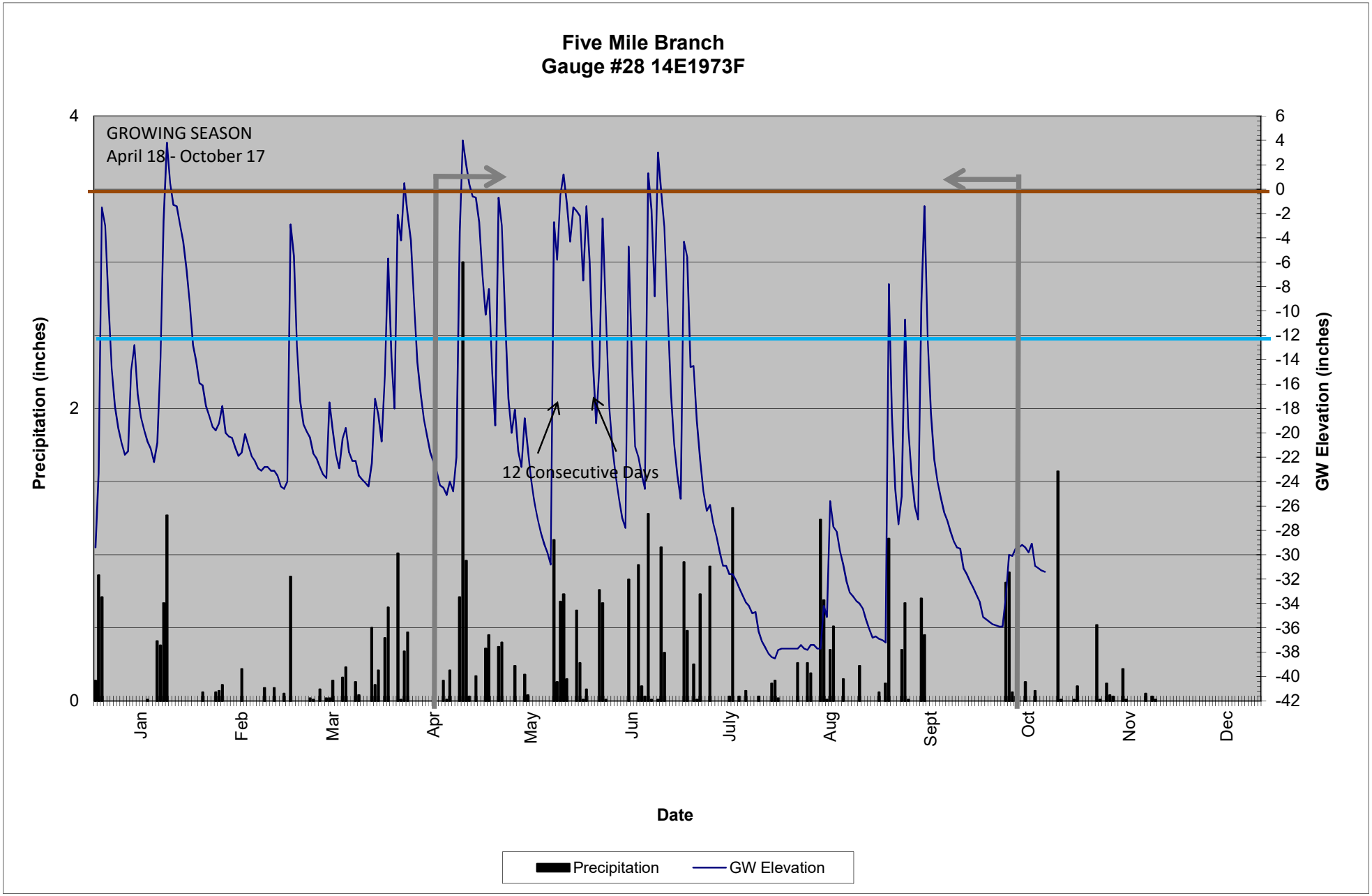

Five Mile Branch
Gauge #23 13D4B61D
GROWING SEASON
April 18 - October 17
183 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

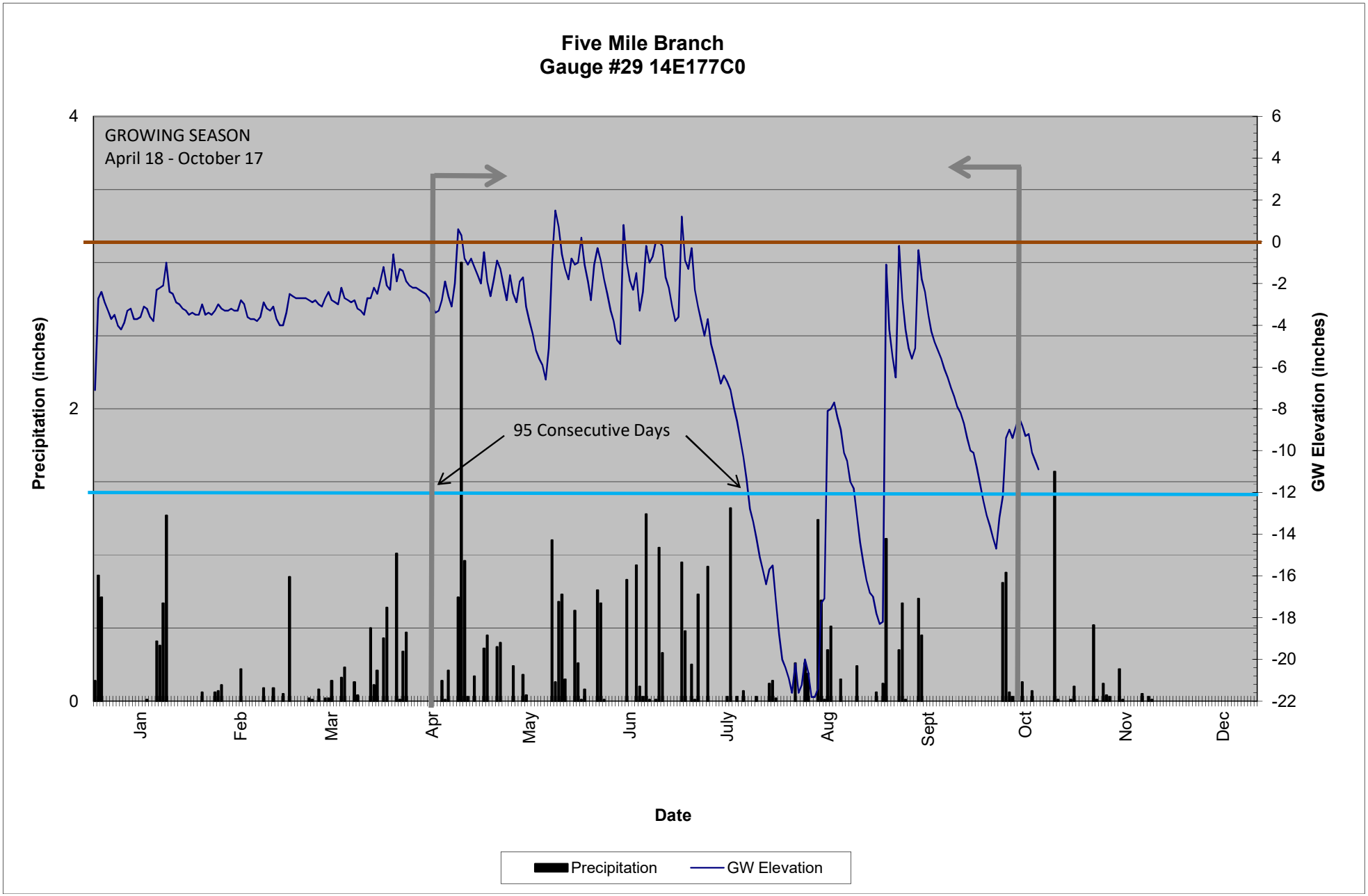

Five Mile Branch
Gauge #24 A287DCE
GROWING SEASON
April 18 - October 17
92 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation


Five Mile Branch
Gauge #25 13D4B624
GROWING SEASON
April 18 - October 17
90 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation


Five Mile Branch
Gauge #26 EBDD6BE
GROWING SEASON
April 18 - October 17
90 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation


Five Mile Branch
Gauge #27 136B1CB7
GROWING SEASON
April 18 - October 17
22 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation


Five Mile Branch
Gauge #28 14E1973F
GROWING SEASON
April 18 - October 17
12 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
Date
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Precipitation
GW Elevation


Five Mile Branch
Gauge #29 14E177C0
GROWING SEASON
April 18 - October 17
95 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

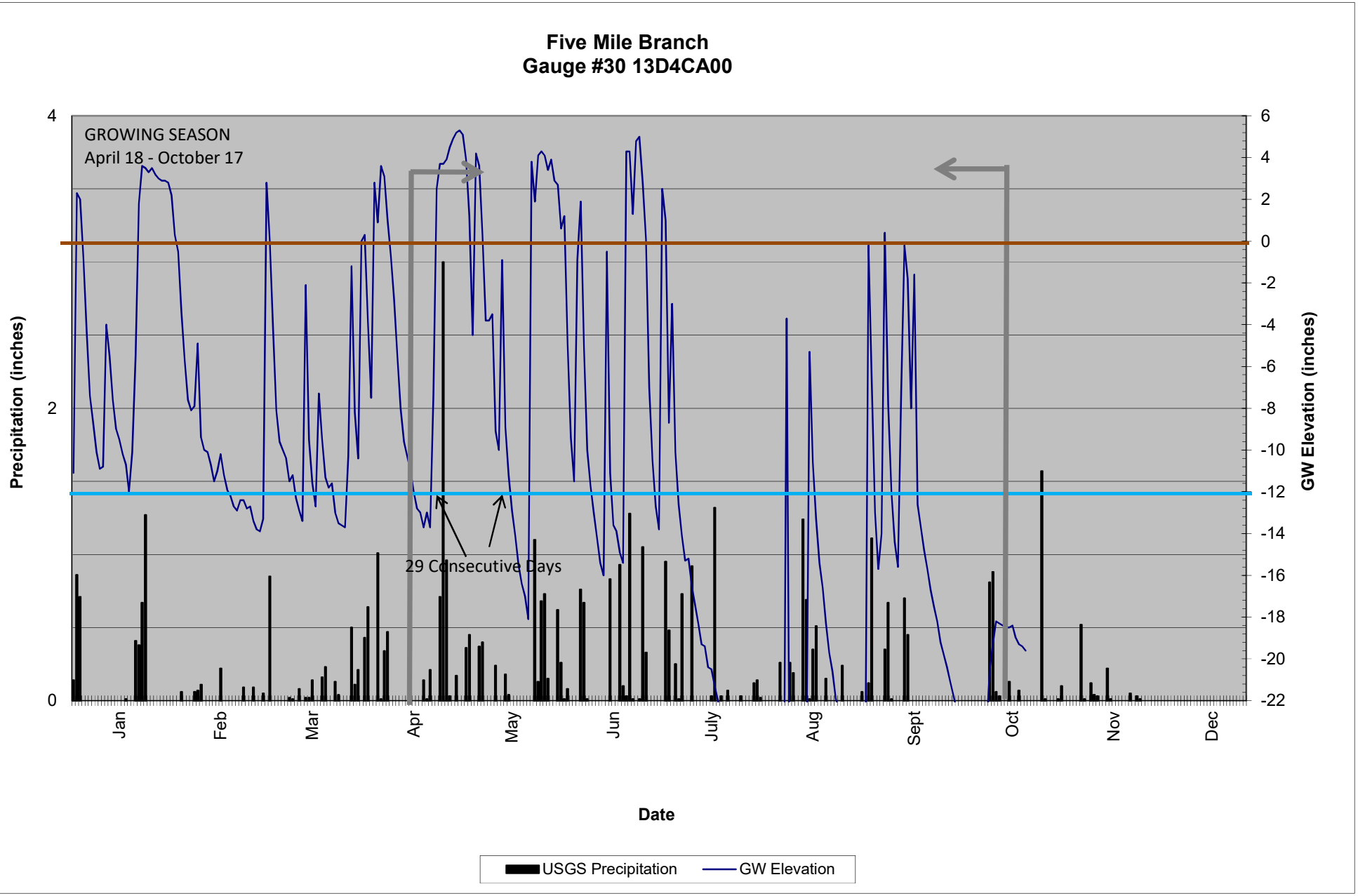

Five Mile Branch
Gauge #30 13D4CA00
GROWING SEASON
April 18 - October 17
29 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
Date
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
USGS Precipitation
GW Elevation

Table 13. Wetland Gauge Attainment Data
Five Mile Branch Stream and Wetland Restoration
NCDMS # 92185

Gauge	Max Consecutive Hydroperiod: Saturation within 12 Inches of Soil Surface (Percent of Growing Season) WETS Station: USGS 354822080521501 Growing Season: April 18 - Oct 17					
	Year 1 (2013)	Year 2 (2014)	Year 3 (2015)	Year 4 (2016)	Year 5 (2017)	Mean
1	68.3	36.1	32.8	31.1	56.3	44.9
2	23.0	3.8	5.5	4.9	6.6	8.8
3	23.0	13.1	13.7	21.3	M	17.8
4	54.1	13.1	13.7	20.7	56.8	31.7
5	48.6	8.7	9.3	82.5	82.5	46.3
6	16.9	7.7	8.2	7.7	32.2	14.5
7	16.4	3.0	6.0	M	30.1	13.9
8	100.0	42.1	32.8	31.1	51.4	51.5
9	22.4	33.9	20.7	30.6	51.4	31.8
10	100.0	33.3	19.1	30.6	50.8	46.8
11	16.4	11.5	8.2	6.0	15.3	11.5
12	42.6	20.8	12.6	26.2	50.3	30.5
13	44.3	19.7	12.6	18.6	30.6	25.2
14	37.2	10.9	10.4	14.8	16.4	17.9
15	23.0	0.0	11.5	17.5	29.5	16.3
16	23.5	0.0	12.6	19.1	29.5	16.9
17	2.2	0.0	1.6	M	1.6	1.4
18	9.8	8.2	6.0	4.9	7.1	7.2
19	34.4	0.0	11.4	15.3	1.1	12.4
20	20.8	14.2	11.4	18.6	16.4	16.3
21	100.0	42.1	36.6	81.4	40.4	60.1
22	100.0	100.0	100.0	100.0	100.0	100.0
23	100.0	100.0	100.0	100.0	100.0	100.0
24	16.9	13.7	13.7	30.0	50.3	24.9
25	53.6	27.9	14.7	29.0	49.2	34.9
26	54.6	20.8	13.7	27.9	49.2	33.2
27	16.4	0.0	8.7	15.8	12.0	10.6
28	7.7	8.2	6.0	5.5	6.6	6.8
29	67.2	34.4	19.1	30.6	51.9	40.6
30	20.2	10.9	9.3	15.8	15.8	14.4
Annual Precip Total	39.0	33.5	45.4	44.1	44.8*	
WETS 30th Percentile	31.8	32.0	32.8	41.9	30.2	
WETS 70th Percentile	40.4	40.2	41.1	49.4	54.9	
Normal	Y	Y	H	Y	Y	

* as of 11/28/2017

Table 14. Groundwater Gauge Downloading History
Five Mile Branch Stream and Wetland Restoration
NCDMS # 92185

		Download Event Date											
Number	Initial Gauge Serial Number	3/20/2013	4/3/2013	5/29/2013	6/4/2013	8/20/2013	12/5/2013	12/15/2013	7/18/2014	10/17/2014	4/17/2015*	8/28/2015	11/4/2015
1	13D4B648	ok	ok	Failed	No attempt.	ok	Replaced with EBD3010.	No attempt.	OK. Deleted old data.	ok	OK. Deleted old data.	No attempt due to weather.	ok
2	14E14322	Reprogrammed due to inconsistent logging interval.	Replaced with 12D4C9D8.	ok	No attempt.	ok	failed	No attempt.	OK. Deleted old data.	ok	OK. Deleted old data. Replaced battery.	No attempt due to weather.	OK. Missing 6/5 - 8/24 data.
3	1314FC9A	Failed	ok	ok	No attempt.	Failed	Replaced with 13152502.	No attempt.	OK. Deleted old data.	ok	OK. Deleted old data.	No attempt due to weather.	ok
4	13D49A3B	ok	ok	ok	No attempt.	ok	ok	No attempt.	Ok. Replaced battery. Deleted old data.	ok	OK. Deleted old data.	No attempt due to weather.	ok
5	14E16DC9	ok	ok	ok	No attempt.	ok	ok	No attempt.	OK. Deleted old data.	ok	OK. Deleted old data. Replaced battery.	No attempt due to weather.	OK. Missing 6/5 - 6/12 data.
6	14E1A3C5	Reprogrammed due to not downloading.	ok	ok	No attempt.	Failed	ok	No attempt.	Ok. Replaced battery. Deleted old data.	ok	OK. Deleted old data.	No attempt due to weather.	ok
7	13D4CA32	ok	ok	ok	No attempt.	ok	ok	No attempt.	Replaced with 1314FC9A	Partial data	OK. Deleted old data.	No attempt due to weather.	ok
8	13D49BC4	ok	ok	ok	No attempt.	ok	ok	No attempt.	OK. Deleted old data.	ok	OK. Deleted old data.	No attempt due to weather.	ok
9	136B6377	ok	ok	ok	No attempt.	Failed	Replaced with EBD20B9.	No attempt.	OK. Deleted old data.	ok	OK. Deleted old data.	No attempt due to weather.	ok
10	13D4B632	ok	ok	ok	No attempt.	ok	ok	No attempt.	OK. Deleted old data.	ok	OK. Deleted old data.	No attempt due to weather.	ok
11	14E178FC	ok	ok	ok	No attempt.	Failed	Replaced with EBD074F.	No attempt.	OK. Deleted old data.	ok	OK. Deleted old data. Replaced battery.	No attempt due to weather.	ok
12	14E13DAE	ok	ok	ok	No attempt.	ok	ok	No attempt.	OK. Deleted old data.	ok	OK. Deleted old data.	No attempt due to weather.	OK. Missing 6/5 - 6/11 data.
13	13D4A9D9	ok	ok	ok	No attempt.	ok	ok	No attempt.	Ok. Reprogrammed. Deleted old data.	ok	OK. Deleted old data. Replaced battery.	ok	Wrong logging dates. Reprogrammed.
14	13D4C9C5	ok	ok	ok	No attempt.	Failed	ok	No attempt.	OK. Deleted old data.	ok	OK. Deleted old data. Replaced battery.	ok	ok
15	A28B85B	ok	ok	ok	No attempt.	No attempt due to malfunctioning handheld.	No attempt.	No attempt.	Ok. Replaced battery. Deleted old data.	failed	OK. Deleted old data.	ok	ok
16	11312B9E	ok	Failed	ok	No attempt.	No attempt due to malfunctioning handheld.	No attempt. Submerged	No attempt.	Replaced with EBCFF2F	Partial data	OK. Deleted old data.	No attempt due to weather.	ok
17	14E16DE5	ok	ok	ok	No attempt.	No attempt due to malfunctioning handheld.	ok	No attempt.	Ok. Replaced battery. Deleted old data.	Partial data	OK. Deleted old data. Replaced battery.	No attempt due to weather.	OK. No data after 6/27. Reprogrammed.
18	13153397	Failed	Replaced with 13D493A9.	No attempt due to accident.	No attempt. Could not locate.	No attempt due to malfunctioning handheld.	ok	No attempt.	OK. Deleted old data.	ok	OK. Deleted old data.	No attempt due to weather.	ok
19	14E15453	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	Replaced with 13D4B648	Partial data	OK. Deleted old data.	ok	OK. Missing 10/29 - 11/7 data.
20	9DE6C32	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	OK. Deleted old data.	ok	OK. Deleted old data.	ok	ok
21	9DE6D1F	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	Failed	ok	OK. Deleted old data.	ok	ok
22	EBD1038	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	OK. Deleted old data.	ok	OK. Deleted old data.	ok	ok
23	13D4B61D	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	OK. Deleted old data.	ok	OK. Deleted old data.	ok	ok
24	A287DCE	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	OK. Deleted old data.	ok	OK. Deleted old data.	ok	ok
25	13D4B624	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	OK. Deleted old data.	ok	OK. Deleted old data.	ok	ok
26	EBDD6BE	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	OK. Deleted old data.	ok	OK. Deleted old data.	ok	ok
27	14E13D38	Reprogrammed due to no data.	ok	No attempt due to accident.	Reprogrammed due to inconsistent logging interval.	No attempt due to malfunctioning handheld.	No attempt.	ok	Failed	Partial data	Replaced with 136B1CB7	ok	ok
28	14E1973F	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	Failed	Partial data	OK. Deleted old data.	ok	ok
29	14E177C0	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	OK. Deleted old data.	ok	OK. Deleted old data.	ok	ok
30	13D4CA00	ok	ok	No attempt due to accident.	No attempt.	No attempt due to malfunctioning handheld.	No attempt.	ok	OK. Deleted old data.	ok	OK. Deleted old data.	ok	ok
RAIN	13D4BAF9	ok	ok	ok full of ants	No attempt.	Failed. Silt in gauge from flooding.	Failed	Failed	No attempt. Wasp nest on gauge.	No attempt	No attempt	No attempt	No attempt

* Batteries replaced in several gauges.

Table 14. Groundwat
Five Mile Branch Stre
NCDMS # 92185

Number	Initial Gauge Serial Number	4/12/2016*	9/23/2016*	11/16/2016*	12/15/2016*	04/07/2017*	8/31/2017	10/20/2017
1	13D4B648	OK. Deleted old data.	ok	ok	ok	ok	ok	ok
2	14E14322	OK. Deleted old data.	ok	ok	ok	ok	ok	ok
3	1314FC9A	OK. Deleted old data.	ok	ok	ok	ok - only data to 2/17/2017	ok - Replace battery Partial data	Only partial data
4	13D49A3B	OK. Deleted old data.	ok	ok	ok	ok	ok	ok
5	14E16DC9	OK. Deleted old data.	OK. Missing 8/26 - 8/28 and 9/19 - 9/23 data.	ok	ok	ok	ok - Replace battery	ok
6	14E1A3C5	OK. Deleted old data.	ok	Failed. Damaged	Failed	Damaged - Not replaced	ok Replaced 5/16/2017 with 136AF8B5	ok
7	13D4CA32	OK. Deleted old data.	ok. Partial Data. Reprogrammed.	ok. Partial Data. Reprogrammed.	ok. Partial Data. Reprogrammed.	Failed - Replaced - Replacement Failed	ok Replaced 5/16/2017 with EBD0B38	ok
8	13D49BC4	OK. Deleted old data.	ok	ok	ok	ok	ok	ok
9	136B6377	OK. Deleted old data.	ok	ok	ok	ok	ok - Replace battery	ok
10	13D4B632	OK. Deleted old data.	ok	ok	ok	ok	ok	ok
11	14E178FC	OK. Deleted old data.	ok	ok	ok	ok	ok	ok
12	14E13DAE	OK. Deleted old data.	ok	ok	ok	ok	ok	ok
13	13D4A9D9	OK. Deleted old data.	ok	Failed. Damaged	Failed	Replaced with 136AF8F9	ok	ok
14	13D4C9C5	OK. Deleted old data.	ok	ok	ok	ok	ok	ok
15	A28B85B	OK. Deleted old data.	ok	ok	ok	ok	ok	ok
16	11312B9E	OK. Deleted old data.	ok	ok	ok	Damaged by rodents - Not replaced	ok Replaced 5/16/2017 with 11312B61	ok
17	14E16DE5	ok. Partial Data. Reprogrammed.	ok. Partial Data. Reprogrammed.	ok. Partial Data. Reprogrammed.	ok. Partial Data. Reprogrammed.	Replaced with 136AC01F	ok	ok
18	13153397	OK. Deleted old data.	ok	ok	ok	ok	ok	ok
19	14E15453	Missing. Replaced with EBDD9DE	ok	ok	ok	ok	ok	ok
20	9DE6C32	Missing. Replaced with 136AC084	ok	ok	ok	ok	ok	ok
21	9DE6D1F	OK. Deleted old data.	ok	OK. Missing 9/23 - 9/30 data.	OK. Missing 9/23 - 9/30 data.	Replaced Battery No recent data	ok - Replaced battery. Ants	ok - no new data
22	EBD1038	ok	ok	ok	ok	ok - Replaced battery	ok	ok
23	13D4B61D	OK. Deleted old data.	ok	ok	ok	ok	ok	ok
24	A287DCE	ok	ok	ok	ok	ok	ok	ok
25	13D4B624	ok	ok	ok	ok	ok	ok	ok
26	EBDD6BE	ok	ok	ok	ok	ok	ok - Replaced battery	ok
27	14E13D38	ok	ok	ok	ok	ok	ok Replaced 5/16/2017 with 136B1CB7	ok
28	14E1973F	ok	ok	ok	ok	ok	ok Ants	ok
29	14E177C0	ok	ok	ok	ok	ok - Replaced battery	ok	ok
30	13D4CA00	ok	ok	ok	ok	ok	No Attempt	ok
RAIN	13D4BAF9	No attempt	No attempt	No attempt	No attempt	Installed rain gauge S/N 20073947	ok	failed

* Batteries replaced in several

Appendix F

Photographs

Photo Point 1. Boulder Vane 10/20/2017

Photo Point 3. Looking downstream 10/20/2017

Photo Point 1. Looking downstream 10/20/2017

Photo Point 4. Floodplain looking east 10/20/2017

Photo Point 2. Looking downstream 10/20/2017

Photo Point 4. Boulder Vane 10/20/2017

Photo Point 5. Cross Vane 10/20/2017

Photo Point 7. Floodplain looking east 10/20/2017

Photo Point 6. Boulder Vane 10/20/2017

Photo Point 7. Floodplain looking west 10/20/2017

Photo Point 7. Boulder Vane 10/20/2017

Photo Point 8. Floodplain pool looking east 10/20/2017

Photo Point 9. Cross Vane 10/20/2017

Photo Point 10. Floodplain looking west 10/20/2017

Photo Point 10. Cross Vane 10/20/2017

Photo Point 11. Looking downstream 10/20/2017

Photo Point 10. Floodplain looking east 10/20/2017

Photo Point 12. Floodplain looking west 8/31/2017

Photo Point 12. Floodplain pool looking east
8/31/2017

Photo Point 14. Floodplain pool looking east
8/31/2017

Photo Point 13. Floodplain pool looking west
8/31/2017

Photo Point 15. Floodplain pool looking west
8/31/2017

Photo Point 13. Floodplain looking east 08/31/2017

Photo Point 15. Floodplain looking east 8/31/2017

Photo Point 16. Looking downstream 10/20/2017

Photo Point 17. Floodplain looking north 8/31/2017

Photo Point 16. Looking upstream 10/20/2017

Photo Point 17. Floodplain looking east 8/31/2017

Photo Point 17. Floodplain looking west 8/31/2017

Photo Point 18. Cross Vane 10/20/2017

Photo Point 19. Boulder Vanes 10/20/2017

Photo Point 20. Looking downstream 10/20/2017

Photo Point 20. Looking upstream 10/20/2017

Photo Point 21. Rootwads 10/20/2017

Photo Point 23. Boulder Vane 10/20/2017

Photo Point 21. Looking downstream 10/20/2017

Photo Point 23. Looking downstream 10/20/2017

Photo Point 22. Cross Vane 10/20/2017

Photo Point 24. Rootwads 10/20/2017

Photo Point 24. Looking downstream 10/20/2017

Photo Point 26. Rootwads 10/20/2017

Photo Point 25. Cross Vane 10/20/2017

Photo Point 26. Looking downstream 10/20/2017

Photo Point 25. Cross Vane. Left arm scour. 10/20/2017

Photo Point 27. Floodplain pool looking west 10/20/2017

Photo Point 28. Floodplain looking west 10/20/2017

Photo Point 28. Confluence looking east 10/20/2017

Photo Point 30. Cross Vane 10/20/2017

Photo Point 29. Looking downstream 10/20/2017

Photo Point 31. Floodplain pool looking northwest 8/31/2017

Photo Point 29. Floodplain looking east 10/20/2017

Photo Point 31. Floodplain looking east 8/31/2017

Photo Point 32. Looking downstream 10/20/2017

Photo Point 34. Boulder Vane 12/08/2016

Photo Point 33. Floodplain looking west 8/31/2017

Photo Point 35. Boulder Vane 10/20/2017

Photo Point 34. Boulder Vane 10/20/2017

Photo Point 35. Boulder Vane 10/20/2017

Photo Point 36. Looking downstream 10/20/2017

Photo Point 37. Floodplain looking east 08/31/2017

Photo Point 36. Looking upstream 10/20/2017

Photo Point 38. Cross Vane 10/20/2017

Photo Point 37. Floodplain pool looking north 8/31/2017

Photo Point 38. Looking south 10/20/2017

Photo Point 39. Looking upstream 10/20/2017

Photo Point 40 Cross Vane 10/20/2017

Photo Point 39. Looking downstream 10/20/2017

Photo Point 40. Looking downstream 10/20/2017

Photo Point 39. Floodplain looking east 10/20/2017

Photo Point 41. Floodplain looking west 10/20/2017

Appendix G

Invasive Vegetation Treatment Logs

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0440

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	06-01-2017		
Start Time	7:30	**End Time**	15:00
Only PAL for Site for This Day?	No	**If NO, this is PAL # of ##**	2 of 2
Sky Cover	Clear	**Temp (F)**	81
Wind Direction	WNW	**Wind Speed**	1-5 mph
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612) Sebastian Kimlinger (NC 026-34613)		
Application Method	Cut and Stump Spray		
Herbicide	Other (see comments)		
Herbicide Rate (%)	50	**Total Concentrate**	26 fl oz
Surfactant or Adjuvant (1)			
Surfactant/Adjudivant 1 Rate (%)			
Other			
Other Rate/Amt			
Diluent	Water		
Total Solution	51 fl oz		
Species Controlled	Jap. Honeysuckle Privet spp. Tree-of-Heaven		
Area Description	Privet is located within the undisturbed areas of the easements. Some stems privet were found throughout the easement. Multiflora rose was scattered throughout the easement. Mimosa's were located near one of the entrances. Honeysuckle did not seem to be that big of an issue on site. Trumpet Cripper was found growing on a lot of trees but that plant is considered native to the region. Tree of Heaven is localized in patches throughout the easement.		
Additional Comments	Refuge (Glyphosate) was the chemical used for applications.		

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0439

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	06-01-2017		
Start Time	7:30	**End Time**	15:00
Only PAL for Site for This Day?	No	**If NO, this is PAL # of ##**	1 of 2
Sky Cover	Clear	**Temp (F)**	81
Wind Direction	WNW	**Wind Speed**	1-5 mph
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612) Sebastian Kimlinger (NC 026-34613)		
Application Method	Foliar Spray (Backpack)		
Herbicide	Other (see comments)		
Herbicide Rate (%)	4	**Total Concentrate**	41 fl oz
Surfactant or Adjuvant (1)	Hel-fire®		
Surfactant/Adjudivant 1 Rate (%)	.5		
Other	Blue Dye		
Other Rate/Amt	1 fl oz		
Diluent	Water		
Total Solution	8 Gallons		
Species Controlled	Johnson Grass Privet spp. Cattail		
Area Description	Cattail stems were found scattered throughout the site within the most saturated soils. Johnson grass was scattered throughout the site with no serious concentration.		
Additional Comments	Refuge (Glyphosate) was the chemical used for applications.		

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0438

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	05-31-2017		
Start Time	7:30	**End Time**	16:00
Only PAL for Site for This Day?	No	**If NO, this is PAL # of ##**	2 of 2
Sky Cover	Partly Cloudy	**Temp (F)**	79
Wind Direction	SW	**Wind Speed**	1-5 mph
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612) Sebastian Kimlinger (NC 026-34613)		
Application Method	Foliar Spray (Backpack)		
Herbicide	Other (see comments)		
Herbicide Rate (%)	4	**Total Concentrate**	16 fl oz
Surfactant or Adjuvant (1)	Hel-fire®		
Surfactant/Adjudivant 1 Rate (%)	.5		
Other	Blue Dye		
Other Rate/Amt	1 fl oz		
Diluent	Water		
Total Solution	3 gal		
Species Controlled	Johnson Grass Cattail		
Area Description	Cattail stems were found scattered throughout the site within the most saturated soils. Johnson grass was scattered throughout the site with no serious concentration.		
Additional Comments	Refuge (Glyphosate) was the chemical used for applications.		

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0437

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	05-31-2017		
Start Time	7:30	**End Time**	14:00
Only PAL for Site for This Day?	No	**If NO, this is PAL # of ##**	1 of 2
Sky Cover	Partly Cloudy	**Temp (F)**	78
Wind Direction	SW	**Wind Speed**	1-5 mph
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612) Sebastian Kimlinger (NC 026-34613)		
Application Method	Cut and Stump Spray		
Herbicide	Other (see comments)		
Herbicide Rate (%)	50	**Total Concentrate**	51 fl oz
Surfactant or Adjuvant (1)			
Surfactant/Adjudivant 1 Rate (%)			
Other			
Other Rate/Amt			
Diluent	Water		
Total Solution	102 fl oz		
Species Controlled	Jap. Honeysuckle Mimosa Privet spp. Multiflora Rose		
Area Description	Privet is located within the undisturbed areas of the easements. Some stems privet were found throughout the easement. Multiflora rose was scattered throughout the easement. Mimosa's were located near one of the entrances. Honeysuckle did not seem to be that big of an issue on site. Trumpet Cripper was found growing on a lot of trees but that plant is considered native to the region.		
Additional Comments	Refugee (Glyphosate was chemical used for applications.		

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0436

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	05-30-2017		
Start Time	10:30	**End Time**	17:00
Only PAL for Site for This Day?	Yes	**If NO, this is PAL # of ##**	
Sky Cover	Partly Cloudy	**Temp (F)**	82
Wind Direction	ENE	**Wind Speed**	1-5 mph
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612) Sebastian Kimlinger (NC 026-34613)		
Application Method	Foliar Spray (Backpack)		
Herbicide	Other (see comments)		
Herbicide Rate (%)	4	**Total Concentrate**	144 fl oz
Surfactant or Adjuvant (1)	Hel-fire®		
Surfactant/Adjudivant 1 Rate (%)	.5		
Other	Blue Dye		
Other Rate/Amt	1 fl oz		
Diluent	Water		
Total Solution	27 gallons		
Species Controlled	Johnson Grass Cattail		
Area Description	Cattail stems were found scattered throughout the site within the most saturated soils. Johnson grass was scattered throughout the site with no serious concentration.		
Additional Comments	Chemical used was Refuge (Glyphosate) with an Aquatic Label		

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0417

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	04-27-2017		
Start Time	9:00	**End Time**	16:00
Only PAL for Site for This Day?	Yes	**If NO, this is PAL # of ##**	
Sky Cover	Cloudy	**Temp (F)**	70
Wind Direction	S	**Wind Speed**	1-5 mph
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612)		
Application Method	Basal Bark		
Herbicide	Garlon® 4 (triclopyr)		
Herbicide Rate (%)	15	**Total Concentrate**	228 fl oz
Surfactant or Adjuvant (1)			
Surfactant/Adjudivant 1 Rate (%)			
Other			
Other Rate/Amt			
Diluent	Diesel fuel		
Total Solution	12 gallons		
Species Controlled	Privet spp. Tree-of-Heaven Multiflora Rose		
Area Description	Large patch of Tree of Heaven downstream near the highway. Privet and multiflora common throughout.		
Additional Comments			

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0414

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	04-20-2017		
Start Time	10:30	**End Time**	16:30
Only PAL for Site for This Day?	No	**If NO, this is PAL # of ##**	3 of 3
Sky Cover	Cloudy	**Temp (F)**	75
Wind Direction	W	**Wind Speed**	6-10 mph
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612) Sebastian Kimlinger (NC 026-34613)		
Application Method	Cut and Stump Spray		
Herbicide	Roundup® Custom (glyphosate)		
Herbicide Rate (%)	50	**Total Concentrate**	10 fl oz
Surfactant or Adjuvant (1)			
Surfactant/Adjudivant 1 Rate (%)			
Other			
Other Rate/Amt			
Diluent	Water		
Total Solution	20 fl oz		
Species Controlled	Jap. Honeysuckle Privet spp. Multiflora Rose		
Area Description	Privet and multiflora prevalent upstream, honeysuckle vines on trees common		
Additional Comments			

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0413

Client	NC Division of Mitigation Services		
Project SIte	Five Mile Branch (NCDMS #92185)		
Date	04-20-2017		
Start Time	10:30	**End Time**	16:30
Only PAL for Site for This Day?	No	**If NO, this is PAL # of ##**	2 of 3
Sky Cover	Cloudy	**Temp (F)**	75
Wind Direction	W	**Wind Speed**	6-10 mph
Applicators	Joshua G Merritt (NC 026-33717) Sebastian Kimlinger (NC 026-34613)		
Application Method	Foliar Spray (Backpack)		
Herbicide	Roundup® Custom (glyphosate)		
Herbicide Rate (%)	5	**Total Concentrate**	65 fl oz
Surfactant or Adjuvant (1)	Hel-fire®		
Surfactant/Adjudivant 1 Rate (%)	.5		
Other			
Other Rate/Amt			
Diluent	Water		
Total Solution	10 gallons		
Species Controlled	Privet spp.		
Area Description	Privet prevalent in upstream corner of site		
Additional Comments			

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0412

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	04-20-2017		
Start Time	10:30	**End Time**	16:30
Only PAL for Site for This Day?	No	**If NO, this is PAL # of ##**	1 of 3
Sky Cover	Cloudy	**Temp (F)**	75
Wind Direction	W	**Wind Speed**	6-10 mph
Applicators	Joshua G Merritt (NC 026-33717) Sebastian Kimlinger (NC 026-34613)		
Application Method	Basal Bark		
Herbicide	Garlon® 4 (triclopyr)		
Herbicide Rate (%)	15	**Total Concentrate**	117 fl oz
Surfactant or Adjuvant (1)			
Surfactant/Adjudivant 1 Rate (%)			
Other			
Other Rate/Amt			
Diluent	Diesel fuel		
Total Solution	6 gallons		
Species Controlled	Privet spp. Multiflora Rose		
Area Description	Privet and multiflora prevalent upstream		
Additional Comments			

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0405

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	04-17-2017		
Start Time	12:10	**End Time**	17:30
Only PAL for Site for This Day?	No	**If NO, this is PAL # of ##**	1 of 2
Sky Cover	Cloudy	**Temp (F)**	82
Wind Direction	NNE	**Wind Speed**	6-10 mph
Applicators	Joshua G Merritt (NC 026-33717) Sebastian Kimlinger (NC 026-34613)		
Application Method	Basal Bark		
Herbicide	Garlon® 4 (triclopyr)		
Herbicide Rate (%)	15	**Total Concentrate**	114
Surfactant or Adjuvant (1)			
Surfactant/Adjudivant 1 Rate (%)			
Other	Blue Dye		
Other Rate/Amt	1 fl oz		
Diluent	Diesel fuel		
Total Solution	6 gallons		
Species Controlled	Jap. Honeysuckle Privet spp. Tree-of-Heaven Multiflora Rose		
Area Description	We worked the western portion of the easement along the stream, within the hardwood area. Not much was there except for honey suckle and a couple patches of privet that were still hanging on.		
Additional Comments			

Carolina Silvics, Inc. Pesticide Application Log CarSilv - 0128

Client	NC Division of Mitigation Services			
Project Site	Five Mile Branch (92185)			
Date	11-11-2015			
Start Time	9:00	**End Time**	17:00	
Only PAL for Site for This Day?	No	**If NO, this is PAL # of ##**	1 of 2	
Temp (F)	75	**Sky Cover**	Clear	
Wind Direction		**Wind Speed**	Calm	
Terrain: Flat (1) to Steep (5)	1	**Vegetation Density: Sparse (1) to Dense (5)**		3
Applicators	William A Skinner (NC 026-32003/VA 129456) Todd Watson			
Application Method	Foliar Spray (ATV - Broadcast)			
Herbicide	Rodeo® (glyphosate)			
Herbicide Rate (%)	3			
Total Concentrate	76 oz.			
Surfactant	Agri-Dex®			
Surfactant Rate (%)	1			
Other (Dye, Marking Agent, etc.)				
Other Rate/Amt				
Diluent	Water			
Total Solution	20 gallons			
Species Controlled	Callery Pear Jap. Honeysuckle Privet spp. Multiflora Rose			
Area Description	Treated area west of Swan Road			

Additional Comments

Carolina Silvics, Inc. Pesticide Application Log CarSilv - 0129

Client	NC Division of Mitigation Services			
Project Site	Five Mile Branch (92185)			
Date	11-11-2015			
Start Time	9:00	**End Time**	17:00	
Only PAL for Site for This Day?	No	**If NO, this is PAL # of ##**	2 of 2	
Temp (F)	75	**Sky Cover**	Clear	
Wind Direction		**Wind Speed**	Calm	
Terrain: Flat (1) to Steep (5)	1	**Vegetation Density: Sparse (1) to Dense (5)**		3
Applicators	William A Skinner (NC 026-32003/VA 129456) Todd Watson			
Application Method	Foliar Spray (Backpack)			
Herbicide	Rodeo® (glyphosate)			
Herbicide Rate (%)	3			
Total Concentrate	23.4 ounce			
Surfactant	Agri-Dex®			
Surfactant Rate (%)	1			
Other (Dye, Marking Agent, etc.)				
Other Rate/Amt				
Diluent	Water			
Total Solution	6 gallons			
Species Controlled	Callery Pear Jap. Honeysuckle Privet spp. Fescue			
Area Description	Treated the most western extent of of site.			

Additional Comments

Carolina Silvics, Inc. Pesticide Application Log CarSilv - 0130

Client	NC Division of Mitigation Services			
Project Site	Five Mile Branch (92185)			
Date	11-12-2015			
Start Time	14:00	**End Time**	17:30	
Only PAL for Site for This Day?	Yes	**If NO, this is PAL # of ##**		
Temp (F)	65	**Sky Cover**	Clear	
Wind Direction		**Wind Speed**	Calm	
Terrain: Flat (1) to Steep (5)	1	**Vegetation Density: Sparse (1) to Dense (5)**		3
Applicators	William A Skinner (NC 026-32003/VA 129456) Todd Watson			
Application Method	Foliar Spray (ATV - Broadcast)			
Herbicide	Rodeo® (glyphosate)			
Herbicide Rate (%)	3			
Total Concentrate	38.4 oz			
Surfactant	Agri-Dex®			
Surfactant Rate (%)	1			
Other (Dye, Marking Agent, etc.)				
Other Rate/Amt				
Diluent	Water			
Total Solution	10 gallons			
Species Controlled	Callery Pear Jap. Honeysuckle Privet spp.			
Area Description	Treated aera east of Swan Road.			

Additional Comments

Carolina Silvics, Inc. Pesticide Application Log CarSilv - 0131

Client	NC Division of Mitigation Services			
Project Site	Five Mile Branch (92185)			
Date	11-13-2015			
Start Time	7:00	**End Time**	12:20	
Only PAL for Site for This Day?	Yes	**If NO, this is PAL # of ##**		
Temp (F)	50	**Sky Cover**	Clear	
Wind Direction		**Wind Speed**	Calm	
Terrain: Flat (1) to Steep (5)	1	**Vegetation Density: Sparse (1) to Dense (5)**		3
Applicators	William A Skinner (NC 026-32003/VA 129456)			

Application Method	Foliar Spray (Backpack)
Herbicide	Rodeo® (glyphosate)
Herbicide Rate (%)	2
Total Concentrate	46 ounces
Surfactant	Agri-Dex®
Surfactant Rate (%)	1
Other (Dye, Marking Agent, etc.)	
Other Rate/Amt	
Diluent	Water
Total Solution	12 gallons
Species Controlled	Jap. Honeysuckle Privet spp.

Area Description Treated west of Swan Rd in preservation area.

Additional Comments

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0298

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	09-21-2016		
Start Time	7:30	**End Time**	13:30
Only PAL for Site for This Day?	Yes	**If NO, this is PAL # of ##**	
Sky Cover	Partly Cloudy	**Temp (F)**	78
Wind Direction	NNE	**Wind Speed**	11-15mph
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612) Sebastian Kimlinger (NC 026-34613)		
Application Method	Foliar Spray (Backpack)		
Herbicide	Roundup® Custom (glyphosate)		
Herbicide Rate (%)	3	**Total Concentrate**	56 fl oz
Surfactant or Adjuvant (1)	Hel-fire®		
Surfactant/Adjudivant 1 Rate (%)	.5		
Other			
Other Rate/Amt			
Diluent	Water		
Total Solution	12 Gallons		
Species Controlled	Autumn Olive Jap. Honeysuckle Privet spp. Tree-of-Heaven Multiflora Rose Wysteria		
Area Description	Treated the forested area of five mile. Did not make to the patch of tree of heaven. There is a few areas of Cattail that should be treated.		
Additional Comments			

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0308

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	10-10-2016		
Start Time	13:00	**End Time**	16:00
Only PAL for Site for This Day?	Yes	**If NO, this is PAL # of ##**	
Sky Cover	Clear	**Temp (F)**	70
Wind Direction	ENE	**Wind Speed**	Calm
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612) Sebastian Kimlinger (NC 026-34613)		
Application Method	Basal Bark		
Herbicide	Garlon® 4 (triclopyr)		
Herbicide Rate (%)	15	**Total Concentrate**	114 fl oz
Surfactant or Adjuvant (1)			
Surfactant/Adjudivant 1 Rate (%)			
Other			
Other Rate/Amt			
Diluent	Diesel fuel		
Total Solution	6 gallons		
Species Controlled	Mimosa Privet spp.		
Area Description	Baselbarked large privet upstream in forested area.		
Additional Comments	Foliar treatment should be done on smaller privet		

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0309

Client	NC Division of Mitigation Services		
Project SIte	Five Mile Branch (NCDMS #92185)		
Date	10-11-2016		
Start Time	9:00	End Time	15:30
Only PAL for Site for This Day?	No	If NO, this is PAL # of ##	1 of 2
Sky Cover	Clear	Temp (F)	68
Wind Direction	ENE	Wind Speed	Calm
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612) Sebastian Kimlinger (NC 026-34613)		
Application Method	Basal Bark		
Herbicide	Garlon® 4 (triclopyr)		
Herbicide Rate (%)	15	Total Concentrate	190 fl oz
Surfactant or Adjuvant (1)			
Surfactant/Adjudivant 1 Rate (%)			
Other			
Other Rate/Amt			
Diluent	Diesel fuel		
Total Solution	10 gallons		
Species Controlled	Privet spp. Tree-of-Heaven Multiflora Rose		
Area Description	Large patch of Tree of Heavan		
Additional Comments			

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0310

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	10-11-2016		
Start Time	13:00	**End Time**	15:30
Only PAL for Site for This Day?	No	**If NO, this is PAL # of ##**	2 of 2
Sky Cover	Clear	**Temp (F)**	68
Wind Direction	ENE	**Wind Speed**	Calm
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612) Sebastian Kimlinger (NC 026-34613)		
Application Method	Foliar Spray (Backpack)		
Herbicide	Roundup® Custom (glyphosate)		
Herbicide Rate (%)	3	**Total Concentrate**	32 fl oz
Surfactant or Adjuvant (1)	Hel-fire®		
Surfactant/Adjudivant 1 Rate (%)	.5		
Other			
Other Rate/Amt			
Diluent	Water		
Total Solution	8 gallons		
Species Controlled	Privet spp. Multiflora Rose Cattail		
Area Description	Large patch of tree of heaven downstream next to I-40 about 3/4 of the way down the site. Tree of heaven seemed to already be dead, we treated it anyways.		
Additional Comments			

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0311

Client	NC Division of Mitigation Services		
Project Site	Five Mile Branch (NCDMS #92185)		
Date	10-12-2016		
Start Time	8:30	End Time	12:30
Only PAL for Site for This Day?	No	If NO, this is PAL # of ##	1 of 2
Sky Cover	Clear	Temp (F)	67
Wind Direction	ENE	Wind Speed	Calm
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612) Sebastian Kimlinger (NC 026-34613)		
Application Method	Foliar Spray (Backpack)		
Herbicide	Roundup® Custom (glyphosate)		
Herbicide Rate (%)	3	Total Concentrate	56 fl oz
Surfactant or Adjuvant (1)	Hel-fire®		
Surfactant/Adjudivant 1 Rate (%)	.5		
Other			
Other Rate/Amt			
Diluent	Water		
Total Solution	14 gallons		
Species Controlled	Privet spp. Multiflora Rose Cattail		
Area Description	Significant amount of privet upstream that will need to be foliar treated.		
Additional Comments			

Carolina Silvics, Inc. Pesticide Application Log

CarSilv - 0312

Client	NC Division of Mitigation Services		
Project SIte	Five Mile Branch (NCDMS #92185)		
Date	10-12-2016		
Start Time	10:30	End Time	12:30
Only PAL for Site for This Day?	No	If NO, this is PAL # of ##	2 of 2
Sky Cover	Clear	Temp (F)	67
Wind Direction	ENE	Wind Speed	Calm
Applicators	Joshua G Merritt (NC 026-33717) Grainger Coughtrey (NC 026-34612) Sebastian Kimlinger (NC 026-34613)		
Application Method	Basal Bark		
Herbicide	Garlon® 4 (triclopyr)		
Herbicide Rate (%)	15	Total Concentrate	38 fl oz
Surfactant or Adjuvant (1)			
Surfactant/Adjudivant 1 Rate (%)			
Other			
Other Rate/Amt			
Diluent	Diesel fuel		
Total Solution	2 gallons		
Species Controlled	Privet spp. Multiflora Rose		
Area Description			
Additional Comments			