Year 2 of 5 Monitoring Report

FINAL

Five-Mile Branch Stream and Wetland Restoration, Iredell County

NCEEP IMS ID# 92185
DENR Contract # 6036

Prepared for:

North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program Raleigh, North Carolina

March 2015

Year 2 of 5 Monitoring Report

Five-Mile Branch Stream and Wetland Restoration

NC Engineering License # C-1869
NC Surveying License # C-1869

Prepared for:
NCDENR-EEP

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Our Ref.:
NC614002.0000
Project Manager:
Robert Lepsic
Date:
March 2015

Table of Contents

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 Ecosystem Enhancement Program (NCEEP). 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 12,085 linear feet if stream were

enhanced, 890 feet of stream preserved, 48.6 acres of wetland restored and 1.9 acres of wetlands preserved. Due to the near systemic mature 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.

1.3 Vegetation

Vegetation monitoring was conducted on August 14 and 15, 2014. After two growing seasons, four (Plots 3, 4, 6, and 9) of the 23 vegetation plots are meeting the year three success criteria of 320 stems per acre. On the whole, the site averages 179.5 planted stems/acre and 2,430 total woody stems/acre. River birch (*Betula nigra*), silky dogwood (*Cornus amomum*), willow oak (*Quercus phellos*) and cherrybark oak (*Q. pagoda*) have the highest occurrences. Other planted species include possumhaw (*Ilex decidua*), black walnut (*Juglans nigra*), black gum (*Nyssa sylvatica*), sycamore (*Platanus occidentalis*) and swamp chestnut oak (*Q. michauxii*).

Natural establishment of woody vegetation is prolific on site. The main source if woody stems are from the on-site seed bank and natural seed sources upstream that are being deposited by flood events. When considering these volunteer species the site averages 2,430 stems per acre, a density 10 time greater than the established year three success criteria. Over 20 volunteer species were identified during the monitoring surveys. The most abundant being box elder (*Acer negundo*), sweetgum (*Liquidambar styraciflua*), sycamore and river birch. Other common volunteer species include green ash (*Fraxinus pennsylvanica*), common persimmon (*Diospyros virginiana*), red maple (*Acer rubrum*), silky dogwood and slippery elm (*Ulmus rubra*).

No bare areas were observed within the floodplain. A few bare areas on stream banks associated with bank erosion were noted. Refer to CCPV map.

Mowing encroachment is not as extensive as in year 1. Mowing encroachment on the upstream parcel at veg plot 1 was reduced. Mowing encroachment is still occurring on only half the area as previously. It is obvious the person conducting the mowing is trying to stay off the site. They have mowed to what they thought was a property marker when it was a marker for the vegetation plot. Mowing encroachment on the Freeze easement has ceased.

Invasive vegetation is present throughout the site. Four invasive species were identified during the year two monitoring events, Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), and tree-

of-heaven (*Ailanthus altissima*). Honeysuckle were observed throughout the site. Tree-of-heaven is very sparse throughout the site, less than 10 individuals were observed. Privet is located in areas that were not disturbed by construction.

The location of tree-of-heaven and honeysuckle are not shown on the CCPV. They occur throughout the planted areas. Showing their locations would cover the majority of the site. The location of denser stands of privet and rose are depicted on the CCPV.

1.4 Stream

There were no significant changes in the riffle cross section between year 1 and year 2. One pool cross section deepen. The maximum depth of pool cross section #5 on Beaver Creek increase 2.2 feet.

Several bank stress areas were again identified in year 2. They are located in the same areas as year 1. There did not seem to be a significant increase in the length of stream bank affected.

The discrepancies between the as-built cross sections and the year 1 and year 2 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.

Based on field observations and the insignificant changes in the channels cross sections the project stream banks are stable and functioning properly. Thick stand of vegetation have established on the banks throughout the site. In some areas, sandy sediment has deposited on the banks, further encouraging the establishment of vegetation. Only small areas of localized erosion were observed.

Three bankfull events occurred during the 2014 monitoring period. Beaver Creek exceeded the bankfull stage on 1/11/2014, 3/7/2014 and 4/7/2014. Fifth Creek, upstream and downstream of Beaver Creek exceed bankfull stage on 1/11/2014. The cumulative total for the monitoring period is 6, with 3 occurring in 2013.

1.5 Wetland

Wetland hydrology was monitored for the entire growing season (April 17 – October 17) in the Year 2 monitoring term. Seven gauges (2, 7, 15, 16, 17, 19 and 27) of the

30 on site gauges did not meet the establish 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). Two gauges (22 and 23) had ground water within 12 inches of the ground surface for 100% of the growing season. Gauges 5, 6, 18 and 28 barely meet the established success criteria.

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. Several malfunctioning gauges were replaced with functioning gauges only to have the new gauge malfunction at the next download. Gauges 7, 15, 16, 17, 19, 27 and 28 malfunctioned during the 2014 monitoring year. Gauges 7, 16, and 19 were replaced with functioning gauges at the time of installation, only to have them malfunction during the next downloading event. Table 14 outlines the history of the gauges through the entire monitoring period.

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 EEP's website. All raw data supporting the tables and figures in the appendices are available from EEP upon request.

2. Methodology

2.1 Vegetation

Vegetation monitoring followed Carolina Vegetative Survey Level 2. Vegetation monitoring was conducted on August 14 and 15, 2014 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 during the groundwater gauge downloading events.

2.3 Cross Section Surveys

Cross sectional surveys were conducted by ARCADIS staff on September 30, 2014 using a Topcon total station. The survey data was imported and plotted using AutoCadd 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 approximately monthly 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/)

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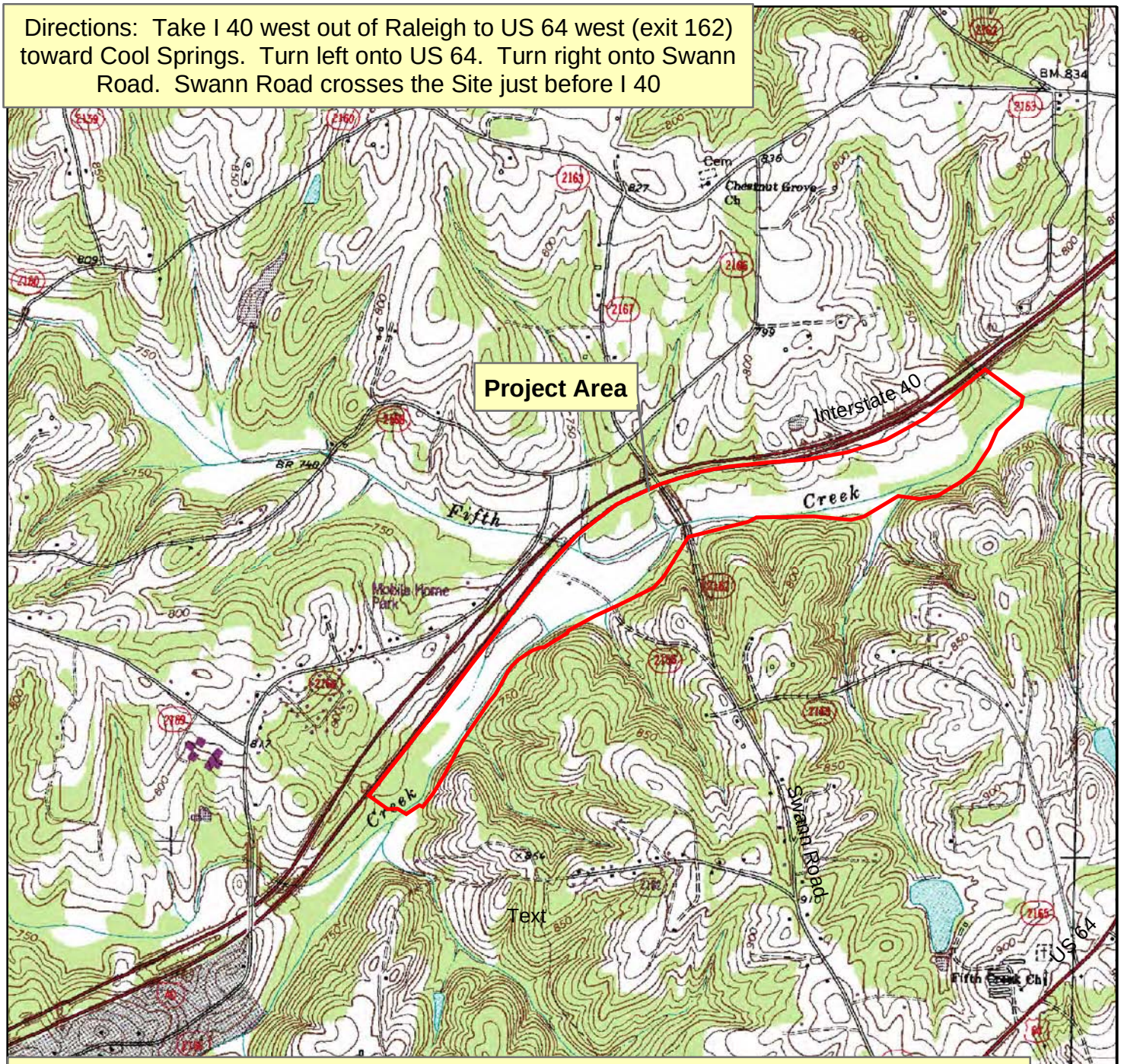
Appendix A

Project Vicinity Map and
Background Tables

Directions: Take I 40 west out of Raleigh to US 64 west (exit 162) toward Cool Springs. Turn left onto US 64. Turn right onto Swann Road. Swann Road crosses the Site just before I 40



The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) 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 EEP.

0 1,500 3,000 6,000 Feet

SCALE: 1:24,000

Source: USGS Quadrangle Maps Statesville East and Cool Springs, NC

N W E S

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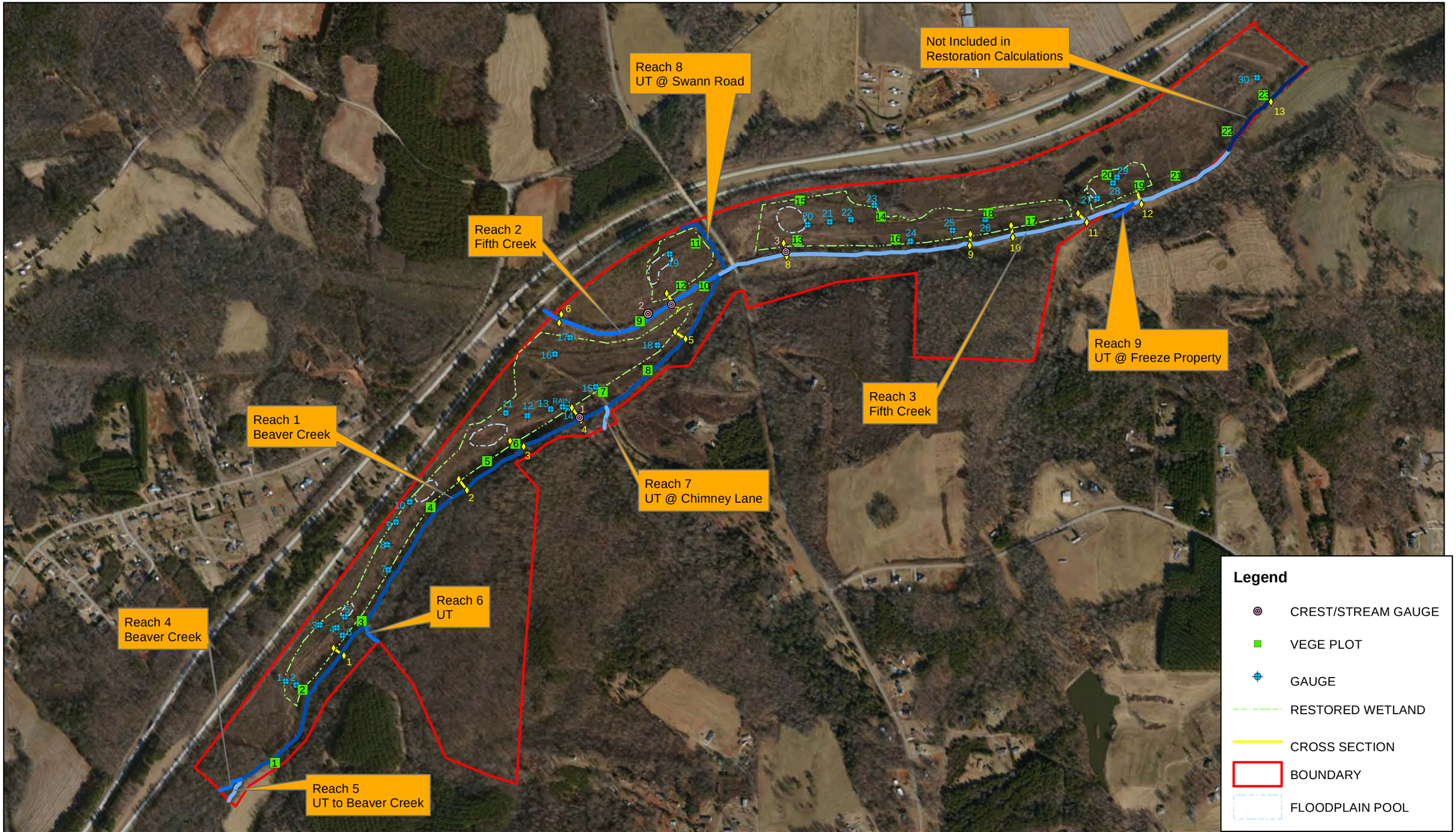
VICINITY MAP

Five Mile Branch
Stream and Wetland Restoration Site
Iredell County, North Carolina

Figure No.

1



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PROJECT COMPONENTS

FIVE MILE BRANCH RESTORATION SITE

IREDELL COUNTY, NORTH CAROLINA

Aerial: 2011 Bing Maps Aerial

675 337.5 0 675 Feet

1 inch = 729 feet

Figure No.

2

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

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	5,924.7	142.5	48.0	0.38	-	-	-	-	-

Project Components

Project Component -or- Reach ID	Stationing/Location	Existing Footage/Acreage	Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
Reach 1 - Beaver Creek	10+87.03 PRBVR to Fifth Creek	6,133.7	E II	R	5935.38*	2:1**
Reach 2 - Fifth Creek upstream of Beaver Creek	I-40 to Beaver Creek	1,526.7	E II	R	1,526.7	2:1**
Reach 3 - Fifth Creek downstream of Beaver Creek	Beaver Creek to 78+60.00 PRFTH	5,333.3	E II	R	4387.26*	2:1**
Reach 4 - Beaver Creek (Upstream)	Property line to 10+87.03 PRBVR	193.0	Pres.	RE	193.0	10:1
Reach 5 - UT to Beaver Creek (Upstream)	Property line to Beaver Creek	180.1	Pres.	RE	180.1	10:1
Reach 6 - UT	Property line to Beaver Creek	220.4	Pres.	RE	220.4	10:1
Reach 7 - UT at Chimney Lane	Property line to Beaver Creek	139.5	Pres.	RE	139.5	10:1
Reach 8 - UT at Swann Road	Property line to Fifth Creek	520.0	Pres.	RE	520.0	10:1
Reach 9 - UT at Freeze Property	Within the Conservation Easement	172.0	Pres.	RE	172.0	10:1
Wetlands	Throughout the site	48.0	Rest.	R	48.0	1:1
Wetlands	Throughout the site	1.9	Pres.	RE	1.9	5:1

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	N/A	48.0	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	11,849.3					
Creation		N/A	N/A	N/A		N/A
Preservation	1,425.0	1.9	N/A	N/A		N/A
High Quality Preservation	N/A	N/A	N/A	N/A		N/A

* Difference between existing and restoration footage is due to a section of stream preservation at the the upstream limit of the project and the absence of ownership of both side of the stream at the downstream limit of the project.

**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 2.0:1.0 is being used.

Table 2. Project Activity and Reporting History
Five Mile Branch Stream Restoration, EEP 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
Year 3 Monitoring	-	-
Year 4 Monitoring	-	-
Year 5 Monitoring	-	-

Table 3. Project Contacts Table Five Mile Branch Stream Restoration, EEP IMS ID# 92185	
Designer Primary project design POC	ARCADIS G&M of NC, Inc. 801 Corporate Center Dr., Suite 300, Raleigh NC 27607 Robert Lepsic 919-854-9812
Construction Contractor Construction contractor POC	North State Environmental 2889 Lowery Street, Winston Salem, NC 27101 Michael Anderson 336-245-1253
Survey Contractor Survey contractor POC	North State Environmental 2889 Lowery Street, Winston Salem, NC 27101 David K. Alley, PLS 336-250-9225
Planting Contractor Planting contractor POC	Southern Garden, Inc. PO Box 808, Apex, NC 27502 Todd Laasko 919-362-1050
Seeding Contractor Contractor point of contact	Canady's Landscape and Erosion Control 256 Fairview Acres Road,Lexington NC 27295 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 G&M of NC, Inc 801 Corporate Center Dr., Suite 300, Raleigh NC 27607
	The CATENA Group
	410-B Millstone Drive, Hillsborough, NC 27278
Stream Monitoring POC	Robert Lepsic 919-854-9812
Vegetation Monitoring POC	Robert Lepsic 919-854-9812
Wetland Monitoring POC	Robert Lepsic 919-854-9812

Table 4. Attributes

Five Mile Branch Stream Restoration, EEP 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)	6,134	1,527	5,333
Valley classification	VIII	VIII	VIII
Drainage area (square miles)	10.7	13.9	26
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)	48.0		
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Riparian riverine		
Mapped Soii 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

Appendix B

Visual Assessment Data

2D

2C

2B

2A

Interstate 40

Legend

- Photo Point
- Stream Gage
- Vegetation Plot Meeting
- Vegetation Plot Not Meeting
- Groundwater Gage Meeting
- Groundwater Gage Not Meeting
- Root Wads
- Cross-section
- Structures
- Study Area
- Mowing encroachment
- Invasive Population
- Bank Stress
- Boundary

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STREAM CURRENT CONDITION PLAN VIEW

FIVE MILE BRANCH RESTORATION SITE

IREDELL COUNTY, NORTH CAROLINA

Aerial: 2011 Bing Maps Aerial

Date: 8/19/14

0 800 1,600 Feet

1 inch = 800 feet

Figure No.

2

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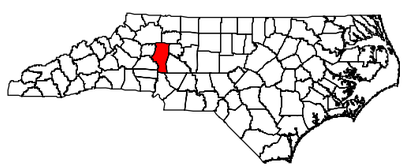

STREAM CURRENT CONDITION PLAN VIEW

FIVE MILE BRANCH RESTORATION SITE

IREDELL COUNTY, NORTH CAROLINA

Aerial: 2011 Bing Maps Aerial

0 200 400 Feet

1 inch = 200 feet

Figure No.

2A

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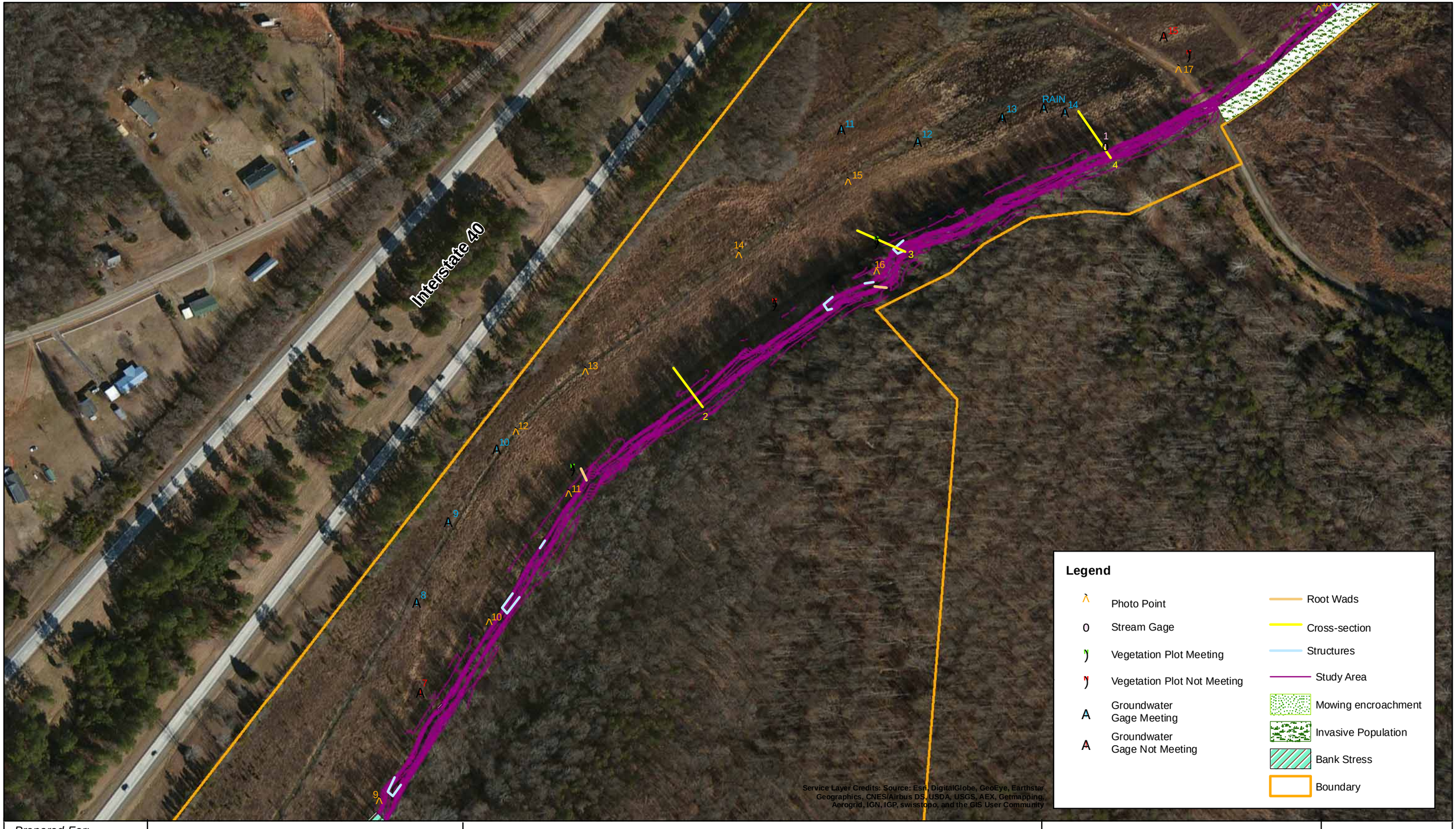

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STREAM CURRENT CONDITION PLAN VIEW

FIVE MILE BRANCH RESTORATION SITE

IREDELL COUNTY, NORTH CAROLINA

Aerial: 2011 Bing Maps Aerial

0 200 400 Feet

1 inch = 200 feet

Figure No.

2B

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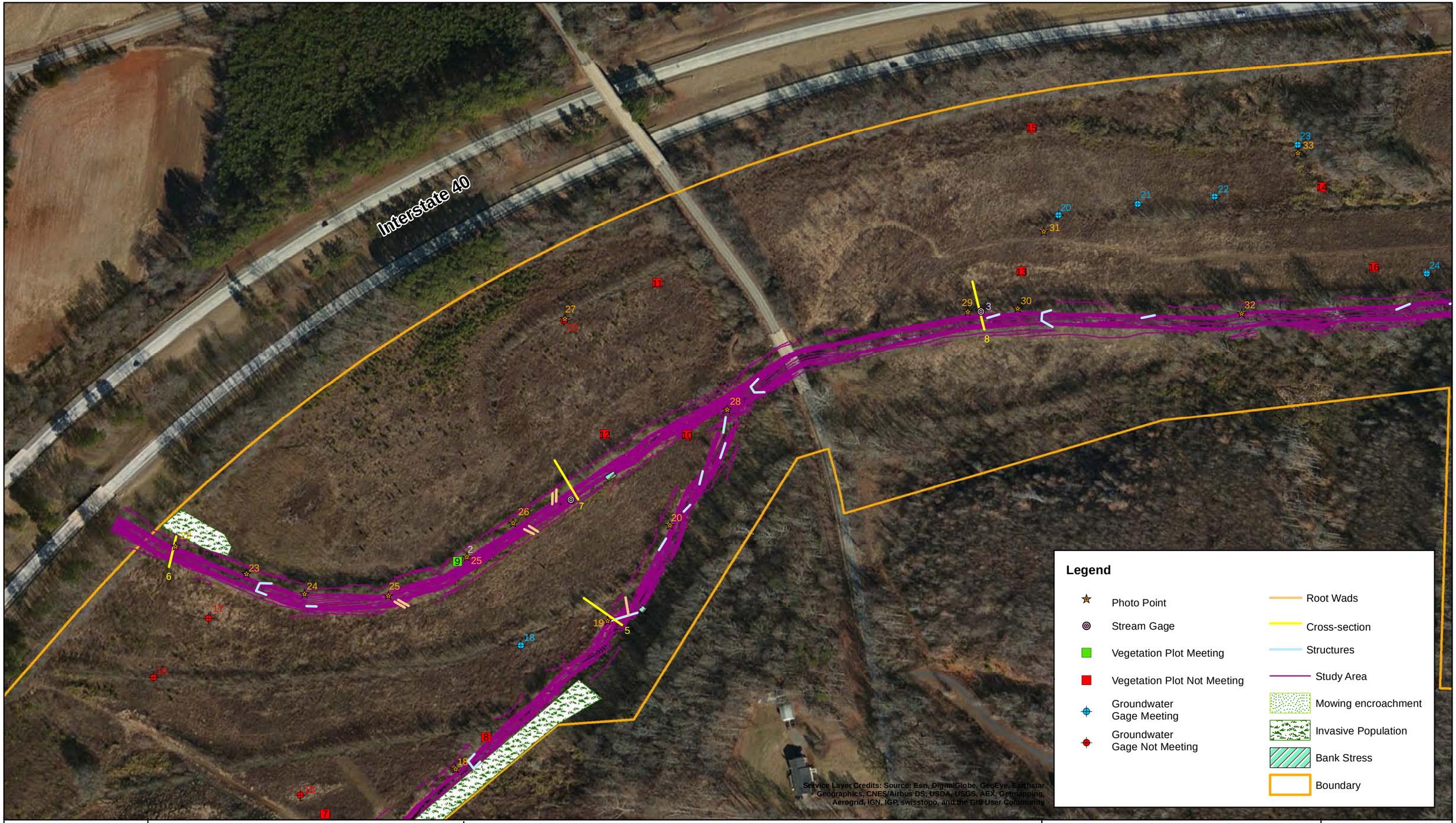

Legend

- Photo Point
- Stream Gage
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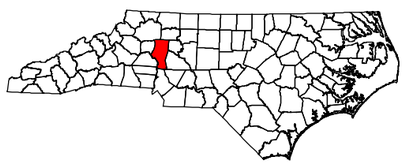

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STREAM CURRENT CONDITION PLAN VIEW

FIVE MILE BRANCH RESTORATION SITE

IREDELL COUNTY, NORTH CAROLINA

Aerial: 2011 Bing Maps Aerial

0 200 400 Feet

1 inch = 200 feet

Figure No.

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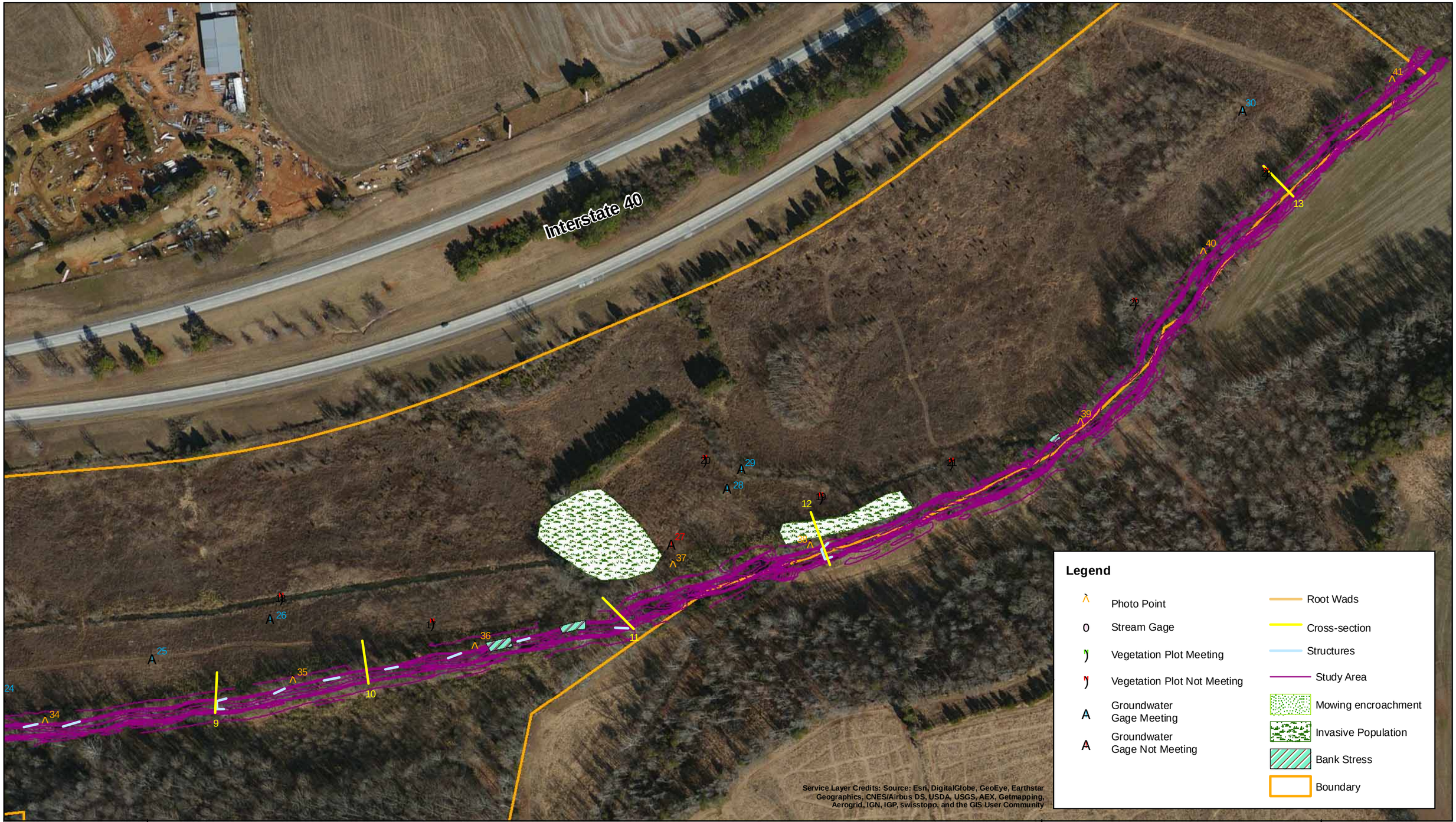

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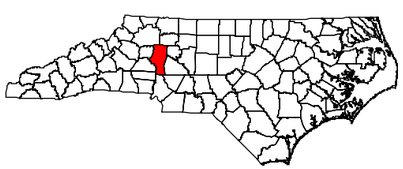

STREAM CURRENT CONDITION PLAN VIEW

FIVE MILE BRANCH RESTORATION SITE

IREDELL COUNTY, NORTH CAROLINA

Aerial: 2011 Bing Maps Aerial

0 200 400 Feet

1 inch = 200 feet

Figure No.

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

Reach ID Beaver Creek

Assessed Length 5,935 linear feet

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			6	280	95%
	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	6	280	95%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	24	23			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	4	4			100%
3. Engineered Structires (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.	20	18			90%
	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 occuring

** 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 1,526 linear feet

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			1	45	97%
	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	1	45	97%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	6	6			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	1	2			50%
3. Engineered Structires (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 occuring

** 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 4,387 linear feet

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	220	95%
	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	220	95%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	20	20			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	2	3			67%
3. Engineered Structires (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.	20	20			100%
	4. Habitat	Pool forming structures maintaining Max Pool Depth/Mean Bankfull Depth ratio > 1.5. Rootwads/logs providing some cover at low flow.	9	9			100%

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

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

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 MY3, 4, or 5 stem count criteria.	0.1 acres	None	0	0.38	<1%
			Total		0.38	<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		0.38	<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	6	2.87	4.0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	None	Open Pasture/Green	1	2.1	3.0%

* Acerage is combined acerage of 19 vegetation monitoring plots not meeting success criteria.

Appendix C

Vegetation PlotData

Vegetation Monitoring Plot #1 8/15/2014

Vegetation Monitoring Plot #4 8/15/2014

Vegetation Monitoring Plot #2 8/15/2014

Vegetation Monitoring Plot #5 8/15/2014

Vegetation Monitoring Plot #3 8/15/2014

Vegetation Monitoring Plot #6 8/15/2014

Vegetation Monitoring Plot #7 8/15/2014

Vegetation Monitoring Plot #10 8/15/2014

Vegetation Monitoring Plot #8 8/15/2014

Vegetation Monitoring Plot #11 8/15/2014

Vegetation Monitoring Plot #9 8/15/2014

Vegetation Monitoring Plot #12 8/15/2014

Vegetation Monitoring Plot #13 8/15/2014

Vegetation Monitoring Plot #16 8/15/2014

Vegetation Monitoring Plot #14 8/15/2014

Vegetation Monitoring Plot #18 8/14/2014

Vegetation Monitoring Plot #15 8/14/2014

Vegetation Monitoring Plot #19 8/14/2014

Vegetation Monitoring Plot #20 8/14/2014

Vegetation Monitoring Plot #23 8/14/2014

Vegetation Monitoring Plot #21 8/14/2014

Vegetation Monitoring Plot #22 8/14/2014

EEP Project Code 29185. Project Name: Five Mile Branch

Scientific Name	Common Name	Species Type	29185-01-0001			29185-01-0002			29185-01-0003			29185-01-0004			29185-01-0005			29185-01-0006			29185-01-0007			29185-01-0008		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree						2			1			9			15			7			1			72
Acer rubrum	red maple	Tree						2									3									
Alnus serrulata	hazel alder	Shrub																								
Asimina triloba	pawpaw	Tree																								
Betula nigra	river birch	Tree				1	1	1	3	3	3	1	1	1	1	1	1	1	1	1				2	2	2
Carpinus caroliniana	American hornbeam	Tree						1				2	2	2												
Carya alba	mockernut hickory	Tree																								
Carya cordiformis	bitternut hickory	Tree																								
Celtis laevigata	sugarberry	Tree																								
Cephalanthus occidentalis	common buttonbush	Shrub																								
Cornus amomum	silky dogwood	Shrub										3	3	3				2	2	2						
Corylus americana	American hazelnut	Shrub																1	1	1						
Diospyros virginiana	common persimmon	Tree																								
Fraxinus americana	white ash	Tree																								
Fraxinus pennsylvanica	green ash	Tree									1						1						1			
Ilex decidua	possumhaw	shrub				1	1	1				1	1	1				1	1	1						
Juglans nigra	black walnut	Tree							1	1	1	1	1	1	1	1	1									5
Juniperus virginiana	eastern redcedar	Tree																								
Ligustrum sinense	Chinese privet	Exotic																								
Liquidambar styraciflua	sweetgum	Tree						38			62			65			24			51			2			5
Liriodendron tulipifera	tuliptree	Tree						1			1															
Morus rubra	red mulberry	Tree																								
Nyssa sylvatica	blackgum	Tree										1	1	1							4	4	4			
Pinus taeda	loblolly pine	Tree																								
Pinus virginiana	Virginia pine	Tree																		1						
Platanus occidentalis	American sycamore	Tree				1	1	16			26			4						8			1	2	2	4
Populus deltoides	eastern cottonwood	Tree									1															
Quercus michauxii	swamp chestnut oak	Tree	2	2	2																3	3	3			
Quercus pagoda	cherrybark oak	Tree				2	2	2	4	4	4				2	2	2	3	3	3						
Quercus phellos	willow oak	Tree				1	1	1							1	1	1									
Salix nigra	black willow	Tree																								
Sambucus canadensis	Common Elderberry	Shrub																								3
Ulmus rubra	slippery elm	Tree												3						2						
Stem count			2	2	2	6	6	65	8	8	100	9	9	90	5	5	48	8	8	77	7	7	12	4	4	91
size (ares)			1			1			1			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
Species count			1	1	1	5	5	10	3	3	9	6	6	10	4	4	8	5	5	10	2	2	6	2	2	6
Stems per ACRE			80.94	80.94	80.94	242.8	242.8	2630	323.7	323.7	4047	364.2	364.2	3642	202.3	202.3	1942	323.7	323.7	3116	283.3	283.3	485.6	161.9	161.9	3683

EEP Project Code 29185. Project Name: Five Mile Branch

Current Plot Data (MY2 2014)

Scientific Name	Common Name	Species Type	29185-01-0009			29185-01-0010			29185-01-0011			29185-01-0012			29185-01-0013			29185-01-0014			29185-01-0015			29185-01-0016		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree			13			139			14			59			10						1			3
Acer rubrum	red maple	Tree									1			9									5			
Alnus serrulata	hazel alder	Shrub																								
Asimina triloba	pawpaw	Tree															1									
Betula nigra	river birch	Tree	3	3	4	2	2	2			6	1	1	1							2	2	3	1	1	2
Carpinus caroliniana	American hornbeam	Tree																					1			
Carya alba	mockernut hickory	Tree																								
Carya cordiformis	bitternut hickory	Tree						1																		
Celtis laevigata	sugarberry	Tree																								
Cephalanthus occidentalis	common buttonbush	Shrub																					1			
Cornus amomum	silky dogwood	Shrub				1	1	1				1	1	1										1	1	1
Corylus americana	American hazelnut	Shrub																								
Diospyros virginiana	common persimmon	Tree			1			7			1			1												
Fraxinus americana	white ash	Tree				1	1	1																		
Fraxinus pennsylvanica	green ash	Tree	1	1	6				1	1	12			2			6						10	1	1	3
Ilex decidua	possumhaw	shrub							2	2	2															
Juglans nigra	black walnut	Tree	1	1	1							1	1	1			2									
Juniperus virginiana	eastern redcedar	Tree			1																					
Ligustrum sinense	Chinese privet	Exotic																								
Liquidambar styraciflua	sweetgum	Tree			3						14			2									20			
Liriodendron tulipifera	tuliptree	Tree																								
Morus rubra	red mulberry	Tree																								
Nyssa sylvatica	blackgum	Tree																								
Pinus taeda	loblolly pine	Tree			1																					
Pinus virginiana	Virginia pine	Tree																								
Platanus occidentalis	American sycamore	Tree			1	1	1	1			13				1	1	1			1						
Populus deltoides	eastern cottonwood	Tree																								
Quercus michauxii	swamp chestnut oak	Tree				1	1	1																		
Quercus pagoda	cherrybark oak	Tree	5	5	5				1	1	1															
Quercus phellos	willow oak	Tree				1	1	1	3	3	3				1	1	1							1	1	1
Salix nigra	black willow	Tree																								
Sambucus canadensis	Common Elderberry	Shrub																								
Ulmus rubra	slippery elm	Tree									1															
Stem count			10	10	36	7	7	154	7	7	68	3	3	76	2	2	21	0	0	1	2	2	41	4	4	10
size (ares)			1			1			1			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
Species count			4	4	10	6	6	9	4	4	11	3	3	8	2	2	6	0	0	1	1	1	7	4	4	5
Stems per ACRE			404.7	404.7	1457	283.3	283.3	6232	283.3	283.3	2752	121.4	121.4	3076	80.94	80.94	849.8	0	0	40.47	80.94	80.94	1659	161.9	161.9	404.7

EEP Project Code 29185. Project Name: Five Mile Branch

Scientific Name	Common Name	Species Type	29185-01-0017			29185-01-0018			29185-01-0019			29185-01-0020			29185-01-0021			29185-01-0022			29185-01-0023			MY2 (2014)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree			1						3						8			1			13			372
Acer rubrum	red maple	Tree																		4						24
Alnus serrulata	hazel alder	Shrub																								
Asimina triloba	pawpaw	Tree																								1
Betula nigra	river birch	Tree			26				1	1	1	2	2	3				1	1	3			2	22	22	62
Carpinus caroliniana	American hornbeam	Tree																						2	2	4
Carya alba	mockernut hickory	Tree			2																					2
Carya cordiformis	bitternut hickory	Tree																								1
Celtis laevigata	sugarberry	Tree																								
Cephalanthus occidentalis	common buttonbush	Shrub										1	1	7										1	1	8
Cornus amomum	silky dogwood	Shrub						1							3	3	3							11	11	12
Corylus americana	American hazelnut	Shrub																						1	1	1
Diospyros virginiana	common persimmon	Tree									13			2												25
Fraxinus americana	white ash	Tree																						1	1	1
Fraxinus pennsylvanica	green ash	Tree							1	1	3									8				4	4	53
Ilex decidua	possumhaw	shrub																						5	5	5
Juglans nigra	black walnut	Tree							1	1	1													6	6	13
Juniperus virginiana	eastern redcedar	Tree																								1
Ligustrum sinense	Chinese privet	Exotic												2												2
Liquidambar styraciflua	sweetgum	Tree									33			1			192			93			10			615
Liriodendron tulipifera	tuliptree	Tree																								2
Morus rubra	red mulberry	Tree																								
Nyssa sylvatica	blackgum	Tree																1	1	1				6	6	6
Pinus taeda	loblolly pine	Tree																								1
Pinus virginiana	Virginia pine	Tree																								1
Platanus occidentalis	American sycamore	Tree			27						1			1	1	1	5			2			5	6	6	117
Populus deltoides	eastern cottonwood	Tree																								1
Quercus michauxii	swamp chestnut oak	Tree																						6	6	6
Quercus pagoda	cherrybark oak	Tree																2	2	2	1	1	1	20	20	20
Quercus phellos	willow oak	Tree							1	1	1				1	1	1							10	10	10
Salix nigra	black willow	Tree																		1						1
Sambucus canadensis	Common Elderberry	Shrub												1												4
Ulmus rubra	slippery elm	Tree			3				1	1	1													1	1	10
Stem count			0	0	59	0	0	1	5	5	57	3	3	17	5	5	209	4	4	115	1	1	31	102	102	1381
size (ares)			1			1			1			1			1			1			1			23		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.57		
Species count			0	0	5	0	0	1	5	5	9	2	2	7	3	3	5	3	3	9	1	1	5	15	15	30
Stems per ACRE			0	0	2388	0	0	40.47	202.3	202.3	2307	121.4	121.4	688	202.3	202.3	8458	161.9	161.9	4654	40.47	40.47	1255	179.5	179.5	2430

EEP Project Code 29185. Project Name: Five Mile Branch

			Annual Means					
			MY1 (2013)			MY0 (2012)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree			182			1
Acer rubrum	red maple	Tree			22			
Alnus serrulata	hazel alder	Shrub				2	2	2
Asimina triloba	pawpaw	Tree						
Betula nigra	river birch	Tree	16	16	67	19	19	50
Carpinus caroliniana	American hornbeam	Tree	2	2	2	4	4	4
Carya alba	mockernut hickory	Tree						
Carya cordiformis	bitternut hickory	Tree						
Celtis laevigata	sugarberry	Tree	4	4	6	5	5	9
Cephalanthus occidentalis	common buttonbush	Shrub			4			
Cornus amomum	silky dogwood	Shrub	7	7	9	12	12	12
Corylus americana	American hazelnut	Shrub						
Diospyros virginiana	common persimmon	Tree			11			
Fraxinus americana	white ash	Tree						
Fraxinus pennsylvanica	green ash	Tree	2	2	17	2	2	3
Ilex decidua	possumhaw	shrub	12	12	12	14	14	14
Juglans nigra	black walnut	Tree	3	3	7	15	15	15
Juniperus virginiana	eastern redcedar	Tree						
Ligustrum sinense	Chinese privet	Exotic						
Liquidambar styraciflua	sweetgum	Tree			393			
Liriodendron tulipifera	tuliptree	Tree						
Morus rubra	red mulberry	Tree	1	1	1	3	3	3
Nyssa sylvatica	blackgum	Tree	2	2	2	2	2	2
Pinus taeda	loblolly pine	Tree						
Pinus virginiana	Virginia pine	Tree						
Platanus occidentalis	American sycamore	Tree	6	6	159	5	5	37
Populus deltoides	eastern cottonwood	Tree						
Quercus michauxii	swamp chestnut oak	Tree	4	4	4	15	15	15
Quercus pagoda	cherrybark oak	Tree	22	22	24	24	24	24
Quercus phellos	willow oak	Tree	6	6	6	10	10	10
Salix nigra	black willow	Tree						
Sambucus canadensis	Common Elderberry	Shrub	3	3	28	5	5	5
Ulmus rubra	slippery elm	Tree						
		Stem count	90	90	956	137	137	206
		size (ares)	23			23		
		size (ACRES)	0.57			0.57		
		Species count	14	14	19	15	15	16
		Stems per ACRE	158.4	158.4	1682	241.1	241.1	362.5

Appendix D

Stream Survey Data

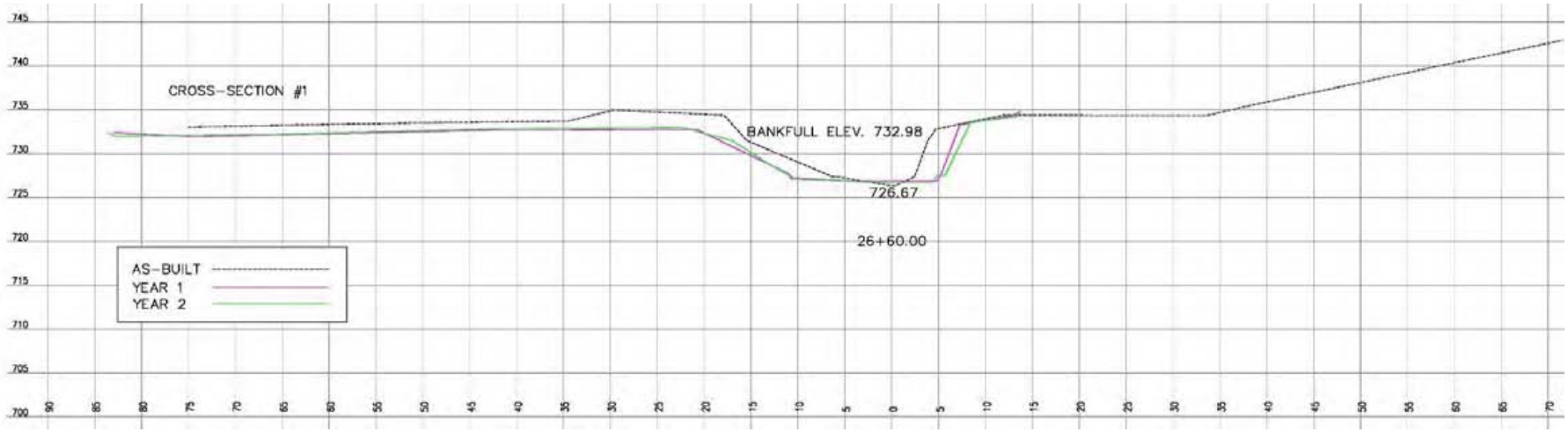
River Basin:	Catawba
Watershed:	Beaver Creek
XS ID:	X-1 BVR
Drainage Area (sq. mi.)	10.7
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Northing	Easting	Elevation
764421.6773	1472799.805	732.7755
764421.3083	1472800.334	732.3751
764411.2841	1472814.525	732.5933
764397.0888	1472833.858	733.2177
764386.4026	1472849.734	733.3646
764383.4433	1472854.157	731.8401
764380.8559	1472857.413	729.0092
764379.5344	1472858.749	727.931
764379.7477	1472858.806	727.4904
764377.7971	1472861.938	727.3533
764375.5108	1472865.845	727.1236
764373.4434	1472868.755	727.0457
764371.3857	1472871.24	727.065
764370.8669	1472871.225	727.8383
764370.6004	1472872.072	727.8677
764368.7515	1472874.067	733.954
764366.3274	1472878.334	734.585
764366.1339	1472878.666	735.2122

SUMMARY DATA	
Bankfull Elevation:	732.98
Bankfull Cross-Sectional Area:	134
Bankfull Width:	30.5
Floodprone Area Elevation:	739.29
Floodprone Width:	200
Max Depth at Bankfull	6.3
Mean Depth at Bankfull	4.4
W/D Ratio	6.9
Entrenchemnt Ratio:	6.6
Bank Height Ratio:	1

Stream Type:	E5

Section 1 Looking downstream



River Basin:	Catawba
Watershed:	Beaver Creek
XS ID:	X-2 BVR
Drainage Area (sq. mi.)	10.7
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Section 2 Looking downstream

Northing	Easting	Elevation
765773.6335	1473807.071	730.8371
765772.989	1473807.611	730.4926
765761.9093	1473816.271	730.3379
765740.5464	1473834.354	730.648
765721.8241	1473848.19	729.6751
765719.3039	1473849.467	728.5132
765716.0439	1473852.709	726.1953
765714.8684	1473853.576	725.1074
765714.5262	1473853.716	724.7465
765703.2945	1473863.51	724.6163
765711.1409	1473857.129	725.0047
765707.1892	1473860.191	724.7039
765704.1507	1473862.438	724.5189
765703.1696	1473863.906	724.6216
765702.5415	1473864.159	725.1775
765699.6965	1473864.792	730.5177
765691.8927	1473871.309	731.4065
765691.4414	1473871.742	731.8134

SUMMARY DATA	
Bankfull Elevation:	729.37
Bankfull Cross-Sectional Area:	103.9
Bankfull Width:	27.7
Floodprone Area Elevation:	734.52
Floodprone Width:	200
Max Depth at Bankfull	5.2
Mean Depth at Bankfull	3.8
W/D Ratio	7.4
Entrenchemnt Ratio:	7.2
Bank Height Ratio:	1

Stream Type:	E5

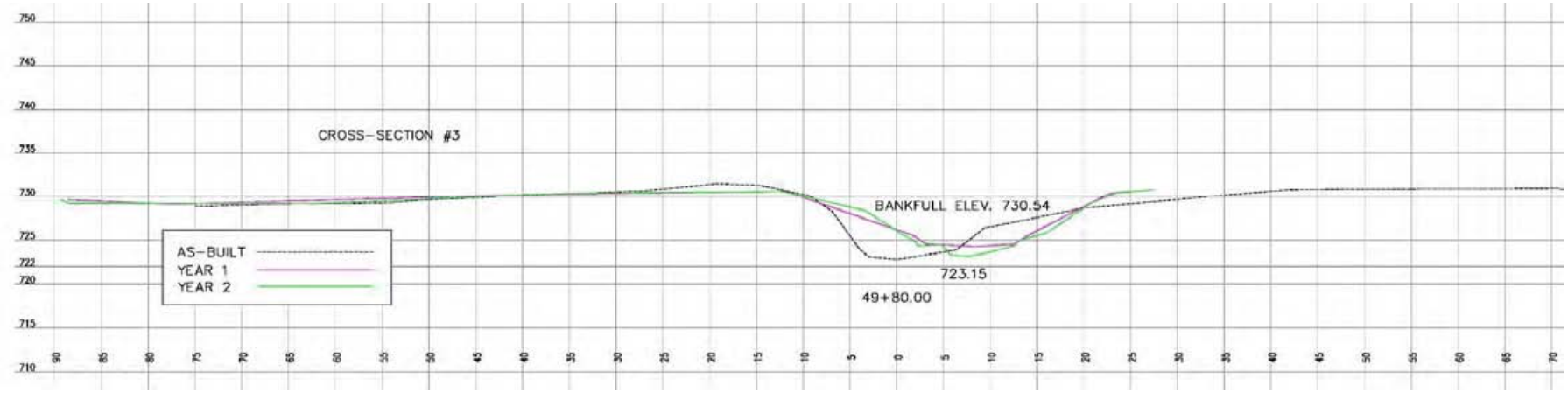
River Basin:	Catawba
Watershed:	Beaver Creek
XS ID:	X-3 BVR
Drainage Area (sq. mi.)	10.7
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Section 3 Looking downstream

Northing	Easting	Elevation
766078.5517	1474217.357	728.9319
766078.1263	1474218.15	728.5393
766067.817	1474242.054	728.4895
766056.8738	1474267.46	729.7233
766048.1	1474288.257	729.909
766044.0415	1474296.171	727.6629
766042.0234	1474299.512	724.9458
766041.6156	1474300.858	724.1703
766041.5506	1474300.637	723.6748
766041.4967	1474300.706	723.6718
766040.4662	1474302.997	723.8142
766039.8373	1474303.672	722.6318
766038.4757	1474305	722.4598
766037.3707	1474307.07	722.9564
766036.1562	1474309.52	723.7425
766035.9638	1474309.657	724.1924
766035.75	1474310.111	724.436
766035.0177	1474312.483	725.067
766032.7088	1474316.771	728.5782
766031.1986	1474319.232	729.8556
766030.0022	1474321.811	730.0081
766029.1936	1474322.344	730.2105

SUMMARY DATA	
Bankfull Elevation:	730.15
Bankfull Cross-Sectional Area:	137.1
Bankfull Width:	39.9
Floodprone Area Elevation:	737.93
Floodprone Width:	200
Max Depth at Bankfull	7.4
Mean Depth at Bankfull	3.4
W/D Ratio	11.6
Entrenchemnt Ratio:	5
Bank Height Ratio:	1

Stream Type:	E5



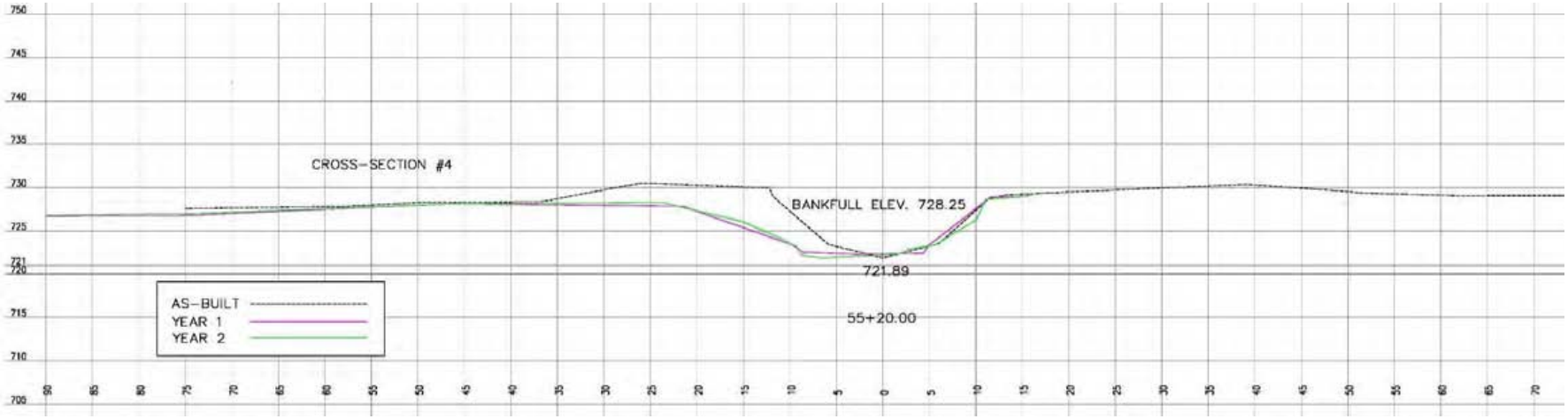
River Basin:	Catawba
Watershed:	Beaver Creek
XS ID:	X-4 BVR
Drainage Area (sq. mi.)	10.7
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Section 4 Looking downstream

Northing	Easting	Elevation
766346.6997	1474713.492	727.5734
766345.5301	1474714.478	727.2957
766330.8276	1474723.945	727.1513
766311.4448	1474738.363	727.4373
766289.044	1474753.397	728.5488
766270.0309	1474767.53	728.7234
766262.977	1474772.5	726.5241
766259.4191	1474775.238	724.3723
766258.8455	1474776.623	723.348
766258.5852	1474776.699	722.6616
766256.8347	1474778.165	722.3579
766254.2224	1474780.137	722.537
766252.3362	1474781.317	722.5966
766249.3408	1474783.185	722.9026
766249.1685	1474783.309	723.3786
766248.6928	1474783.658	723.4425
766246.9618	1474785.097	723.7769
766242.4616	1474785.417	726.776
766241.4824	1474785.498	729.081
766238.22	1474787.946	729.4317
766237.7562	1474788.987	729.7508

SUMMARY DATA	
Bankfull Elevation:	728.25
Bankfull Cross-Sectional Area:	134.8
Bankfull Width:	34.6
Floodprone Area Elevation:	734.61
Floodprone Width:	200
Max Depth at Bankfull	6.4
Mean Depth at Bankfull	3.9
W/D Ratio	8.9
Entrenchemnt Ratio:	5.8
Bank Height Ratio:	1

Stream Type:	E5



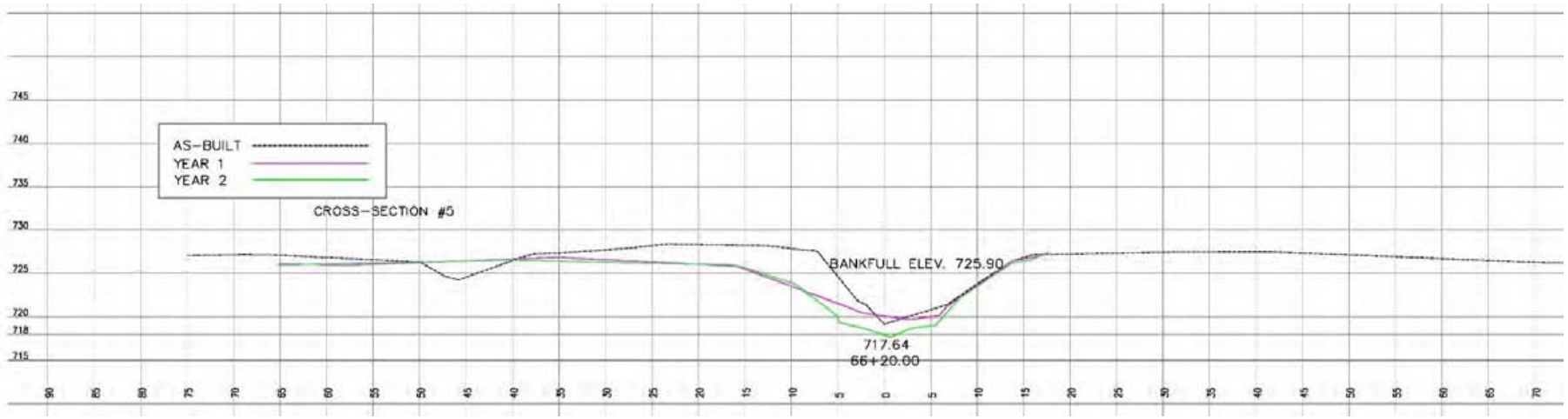
River Basin:	Catawba
Watershed:	Beaver Creek
XS ID:	X-5 BVR
Drainage Area (sq. mi.)	10.7
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Section 5 Looking downstream

Northing	Easting	Elevation
766934.9485	1475551.34	726.5147
766934.8385	1475551.652	726.3857
766925.6837	1475574.172	726.9752
766916.1938	1475596.537	726.4118
766915.6242	1475597.891	726.0902
766912.4218	1475602.315	724.1375
766910.1662	1475605.4	721.0666
766910.1882	1475605.776	720.6849
766909.9113	1475606.224	719.7593
766909.3826	1475608.999	719.0669
766908.3752	1475611.38	718.0957
766907.4659	1475613.532	719.1733
766906.0076	1475615.594	719.4579
766905.2794	1475616.237	720.6368
766904.638	1475617.741	722.584
766900.9835	1475621.94	726.6045
766899.9192	1475623.567	726.9115
766899.1931	1475625.599	727.8809

SUMMARY DATA	
Bankfull Elevation:	725.9
Bankfull Cross-Sectional Area:	127.5
Bankfull Width:	30.5
Floodprone Area Elevation:	734.16
Floodprone Width:	200
Max Depth at Bankfull	8.3
Mean Depth at Bankfull	4.3
W/D Ratio	7
Entrenchemnt Ratio:	6.7
Bank Height Ratio:	1

Stream Type:	E5



River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-6 FTH U-S
Drainage Area (sq. mi.)	13.9
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Northing	Easting	Elevation
767093.5733	1474624.936	728.3768
767092.7047	1474624.738	728.3011
767088.5133	1474623.782	728.3539
767082.989	1474622.59	729.1045
767074.5628	1474620.462	728.4396
767069.9463	1474619.38	726.4971
767066.3093	1474618.524	725.715
767061.8976	1474617.132	723.792
767061.1929	1474616.862	722.3975
767061.1824	1474616.86	722.0696
767058.6107	1474616.311	721.6799
767054.2313	1474615.286	720.9798
767050.9817	1474614.288	721.3046
767048.35	1474614.229	721.4054
767047.6685	1474613.72	722.344
767045.6639	1474613.224	725.9558
767042.5387	1474611.974	728.2817
767036.6902	1474610.171	729.5646
767028.7966	1474608.191	729.9779
767027.8935	1474607.921	730.496

SUMMARY DATA	
Bankfull Elevation:	729.99
Bankfull Cross-Sectional Area:	146.2
Bankfull Width:	34.1
Floodprone Area Elevation:	737.45
Floodprone Width:	200
Max Depth at Bankfull	7.5
Mean Depth at Bankfull	4.3
W/D Ratio	8
Entrenchemnt Ratio:	5.9
Bank Height Ratio:	1

Stream Type:	E5

Section 6 Looking downstream

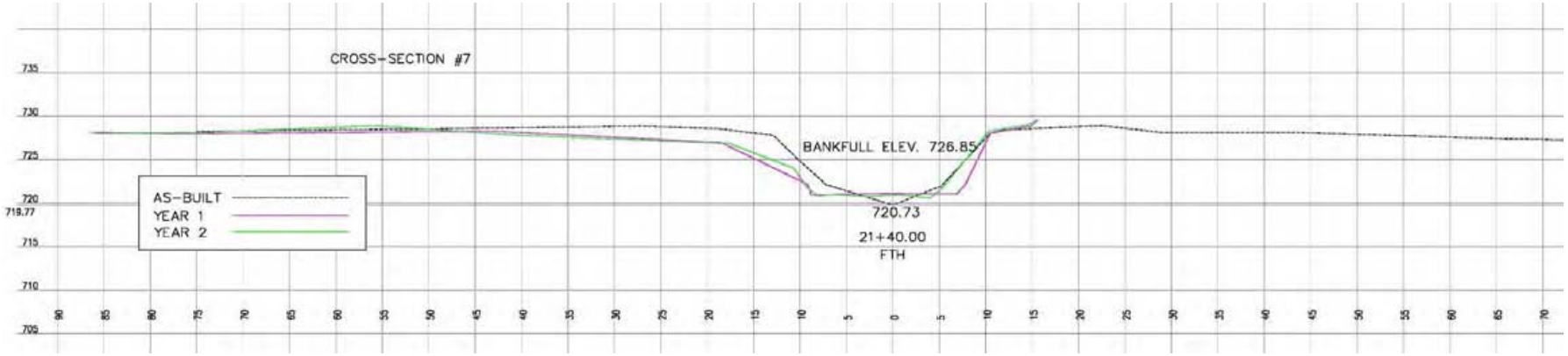
River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-7 FTH U-S
Drainage Area (sq. mi.)	10.7
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Section 7 Looking downstream

Northing	Easting	Elevation
767265.1125	1475472.87	726.9658
767264.2633	1475473.366	726.8477
767254.0984	1475479.312	726.9729
767238.5507	1475488.13	727.7371
767225.3461	1475496.533	726.634
767206.2664	1475508.495	725.6962
767200.4357	1475512.303	722.8548
767198.942	1475512.332	720.5563
767198.3565	1475513.238	719.6468
767196.5041	1475513.73	719.8464
767193.5342	1475515.335	719.566
767190.9386	1475517.545	719.8094
767188.2024	1475519.614	719.4121
767187.0055	1475520.096	720.561
767182.1571	1475521.561	727.1334
767178.7637	1475523.881	727.831
767177.9062	1475524.664	728.4311

SUMMARY DATA	
Bankfull Elevation:	726.85
Bankfull Cross-Sectional Area:	112.4
Bankfull Width:	26.9
Floodprone Area Elevation:	732.97
Floodprone Width:	200
Max Depth at Bankfull	6.1
Mean Depth at Bankfull	4.2
W/D Ratio	6.4
Entrenchemnt Ratio:	7.4
Bank Height Ratio:	1

Stream Type:	E5



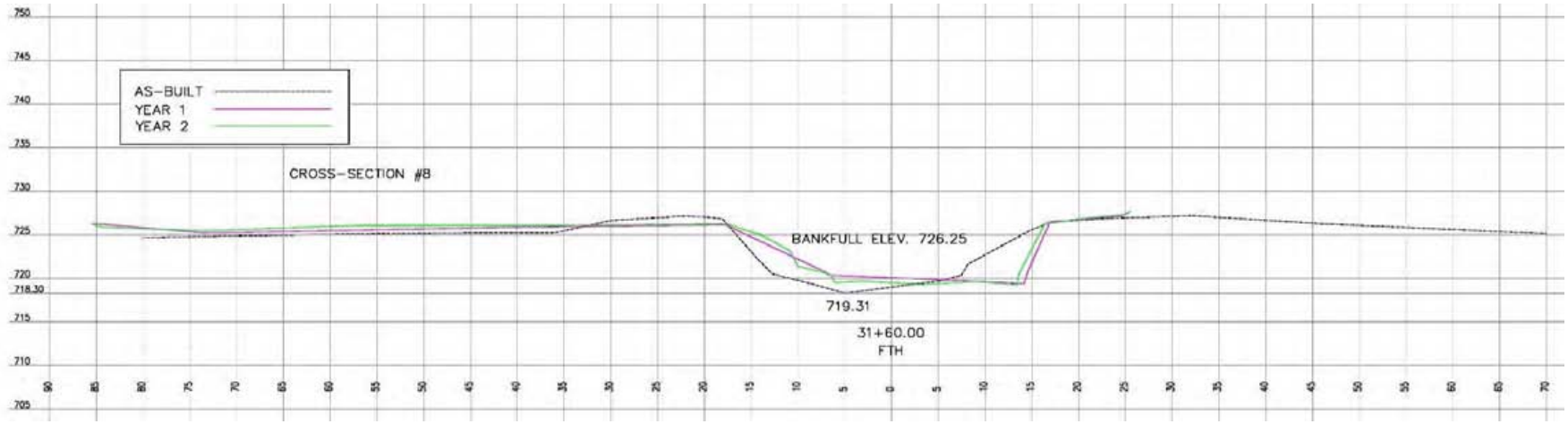
River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-8 FTH D-S
Drainage Area (sq. mi.)	26
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Section 8 Looking downstream

Northing	Easting	Elevation
767665.7104	1476406.533	725.539
767664.6441	1476406.778	725.119
767653.854	1476409.264	724.7142
767638.1075	1476414.055	725.322
767617.9847	1476419.909	725.309
767600.3495	1476424.758	725.4848
767596.7347	1476425.771	724.1911
767593.7288	1476425.929	722.3878
767592.8928	1476426.156	720.6244
767590.4881	1476427.112	719.96
767589.4781	1476427.31	719.5615
767589.2182	1476427.427	718.7748
767586.3373	1476428.433	718.9039
767580.1088	1476429.848	718.55
767574.5181	1476430.103	718.8727
767570.1784	1476431.319	718.4977
767570.1656	1476431.405	719.5709
767567.3465	1476431.627	725.4712
767563.8734	1476432.744	726.0703
767559.2798	1476434.035	726.5162
767558.4973	1476434.238	726.9218

SUMMARY DATA	
Bankfull Elevation:	726.25
Bankfull Cross-Sectional Area:	174.5
Bankfull Width:	34
Floodprone Area Elevation:	733.19
Floodprone Width:	200
Max Depth at Bankfull	6.9
Mean Depth at Bankfull	5.1
W/D Ratio	6.6
Entrenchemnt Ratio:	5.9
Bank Height Ratio:	1

Stream Type:	E5



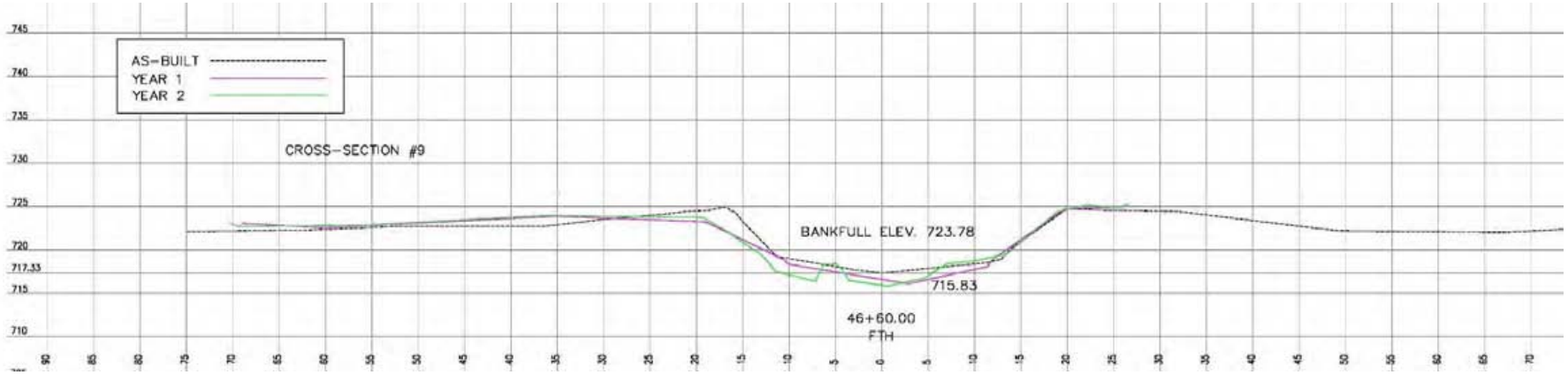
River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-9 FTH D-S
Drainage Area (sq. mi.)	26
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Northing	Easting	Elevation
767737.1606	1477906.656	722.2822
767736.4364	1477906.622	721.9381
767722.9618	1477905.988	722.0485
767703.5484	1477904.738	723.18
767686.3654	1477904.659	722.9717
767683.9205	1477904.937	721.4563
767679.9913	1477905.568	718.5859
767678.5671	1477905.983	716.7212
767674.4093	1477905.152	715.5845
767672.1583	1477906.037	717.0753
767673.8266	1477905.812	717.5443
767662.3444	1477905.282	717.0632
767672.4561	1477905.622	717.6203
767671.6958	1477905.3	715.6677
767667.6942	1477904.205	715.0504
767663.8207	1477905.332	715.9637
767662.4399	1477904.312	717.6527
767659.3115	1477904.523	717.9785
767656.1926	1477905.21	718.7468
767650.6961	1477905.843	723.6329
767647.5814	1477906.125	724.4081
767644.0907	1477906.637	724.0945
767643.0587	1477906.508	724.6259

SUMMARY DATA	
Bankfull Elevation:	723.78
Bankfull Cross-Sectional Area:	189.8
Bankfull Width:	37.6
Floodprone Area Elevation:	731.73
Floodprone Width:	200
Max Depth at Bankfull	7.9
Mean Depth at Bankfull	5
W/D Ratio	7.4
Entrenchemnt Ratio:	5.3
Bank Height Ratio:	1

Stream Type:	E5

Section 9 Looking downstream



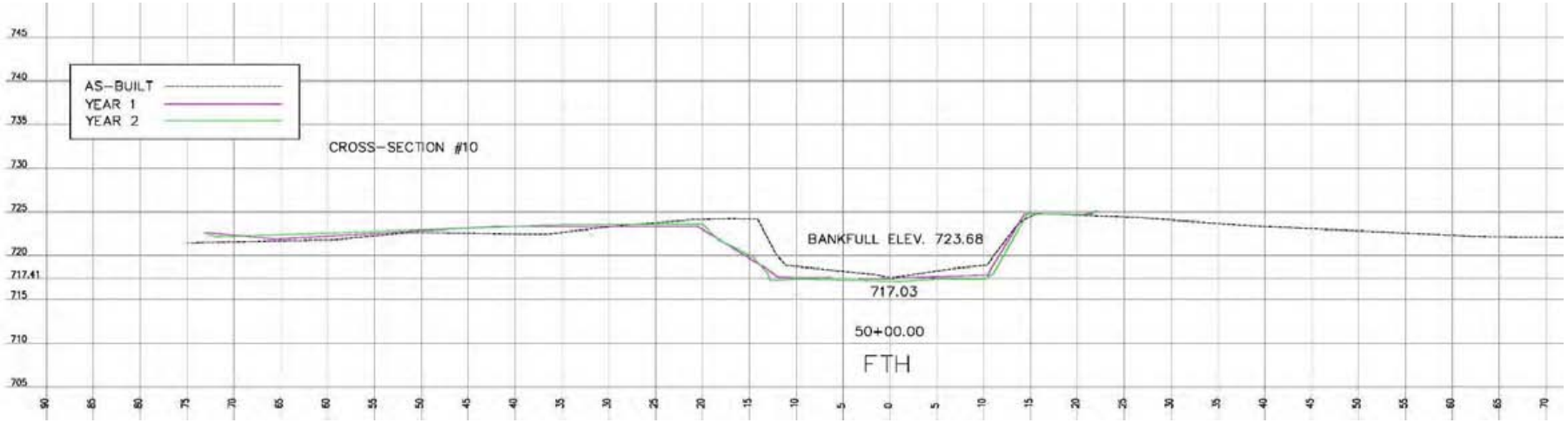
River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-10 FTH D-S
Drainage Area (sq. mi.)	26
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Northing	Easting	Elevation
767806.8198	1478232.148	721.897
767805.7043	1478232.286	721.376
767786.9339	1478234.599	722.0649
767768.2138	1478238.226	722.8212
767754.4228	1478240.624	722.854
767752.774	1478241.234	721.0513
767749.2419	1478242.008	719.1229
767747.6146	1478242.288	717.1961
767747.4069	1478242.19	716.3952
767744.7104	1478243.265	716.5727
767739.8547	1478243.83	716.4706
767734.0373	1478245.224	716.2745
767729.6477	1478246.369	716.5984
767725.1756	1478247.137	716.5613
767724.5327	1478247.858	717.1553
767721.0276	1478248.848	724.0582
767714.5982	1478250.721	723.9581
767713.8797	1478251.021	724.3456

SUMMARY DATA	
Bankfull Elevation:	723.68
Bankfull Cross-Sectional Area:	182.2
Bankfull Width:	34.1
Floodprone Area Elevation:	730.33
Floodprone Width:	200
Max Depth at Bankfull	6.6
Mean Depth at Bankfull	5.3
W/D Ratio	6.4
Entrenchemnt Ratio:	5.9
Bank Height Ratio:	1

Stream Type:	E5

Section 10 Looking downstream



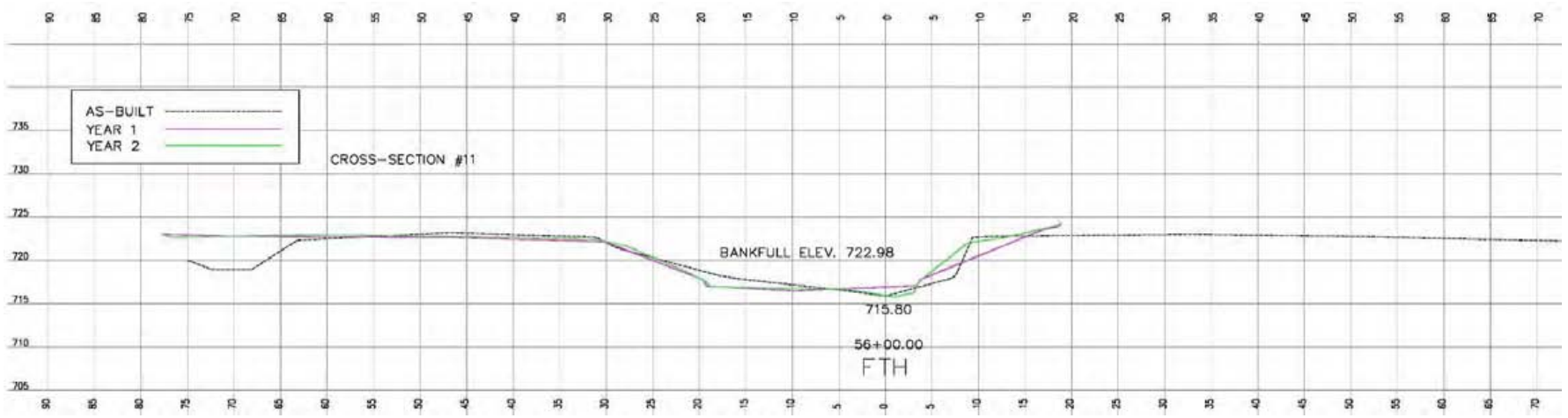
River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-11 FTH D-S
Drainage Area (sq. mi.)	26
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Northing	Easting	Elevation
767900.6523	1478770.228	722.0803
767899.8493	1478770.799	721.736
767888.7231	1478780.333	722.0227
767874.4553	1478791.681	721.8128
767864.5048	1478799.802	721.4984
767862.0907	1478801.902	720.6948
767857.8868	1478805.875	718.0859
767855.7276	1478807.664	716.5968
767855.4544	1478807.891	716.0527
767850.2019	1478812.799	715.8515
767844.9414	1478818.091	715.716
767841.5694	1478821.997	714.87
767839.5351	1478822.605	715.3435
767839.1542	1478822.979	716.6037
767835.8153	1478827.049	721.0885
767833.131	1478829.4	721.6385
767829.5342	1478833.828	722.9684
767828.9669	1478834.336	723.3442

SUMMARY DATA	
Bankfull Elevation:	722.98
Bankfull Cross-Sectional Area:	155.9
Bankfull Width:	38.2
Floodprone Area Elevation:	730 16
Floodprone Width:	200
Max Depth at Bankfull	7.2
Mean Depth at Bankfull	4.1
W/D Ratio	9.4
Entrenchemnt Ratio:	5.2
Bank Height Ratio:	1

Stream Type:	E5

Section 11 Looking downstream



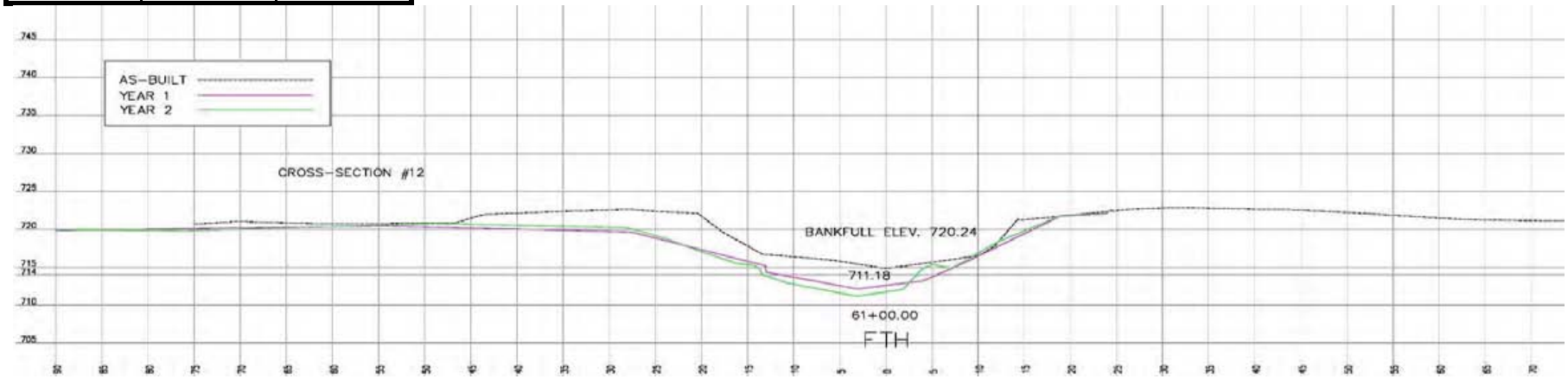
River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-12 Fth D-S
Drainage Area (sq. mi.)	26
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Section 12 Looking downstream

Northing	Easting	Elevation
768097.4647	1479235.298	721.0605
768096.3265	1479235.693	720.6207
768070.7112	1479244.596	720.3264
768044.9215	1479252.704	721.2757
768025.391	1479259.488	720.7567
768021.5331	1479260.313	719.4375
768017.3066	1479260.985	717.5687
768013.7615	1479262.284	716.031
768011.9319	1479262.969	715.76
768011.7987	1479263.438	715.3504
768011.8451	1479263.093	714.5502
768009.2014	1479263.693	713.4291
768003.001	1479267.954	711.6975
767997.1241	1479270.619	715.3609
767998.069	1479268.645	712.5854
767996.5251	1479269.752	715.8968
767995.1112	1479270.259	715.4748
767994.4956	1479270.79	715.5063
767990.4121	1479272.724	718.7102
767987.2311	1479273.619	720.4022
767983.754	1479275.212	722.3668
767979.4195	1479276.743	722.6035
767978.7308	1479277.223	723.1086

SUMMARY DATA	
Bankfull Elevation:	720.24
Bankfull Cross-Sectional Area:	216.6
Bankfull Width:	44.1
Floodprone Area Elevation:	729.3
Floodprone Width:	200
Max Depth at Bankfull	9.1
Mean Depth at Bankfull	4.9
W/D Ratio	9
Entrenchemnt Ratio:	4.5
Bank Height Ratio:	1

Stream Type:	E5



River Basin:	Catawba
Watershed:	Fifth Creek
XS ID:	X-13 FTH D-S
Drainage Area (sq. mi.)	26
Date:	9/30/2014
Field Crew:	E. Toler, C. Campbell, R. Lepsic

Northing	Easting	Elevation
768867.6655	1480245.732	718.0172
768866.9055	1480246.461	717.4756
768851.6125	1480260.295	718.0932
768839.3596	1480273.059	719.4068
768826.2078	1480286.255	719.6251
768824.3359	1480288.388	719.0655
768821.1942	1480290.751	716.6812
768819.1653	1480293.266	714.4318
768818.8444	1480293.58	713.7045
768816.4252	1480295.95	713.5744
768812.0451	1480299.518	713.362
768808.3255	1480302.867	712.6938
768804.7745	1480306.222	712.8873
768801.1143	1480310.596	713.1077
768801.1294	1480310.893	714.3757
768798.648	1480313.791	717.257
768797.4877	1480316.944	719.6317
768794.8979	1480319.615	720.1918
768794.7318	1480320.1	720.5905

SUMMARY DATA	
Bankfull Elevation:	719.53
Bankfull Cross-Sectional Area:	180.3
Bankfull Width:	38.9
Floodprone Area Elevation:	725.9
Floodprone Width:	200
Max Depth at Bankfull	6.4
Mean Depth at Bankfull	4.6
W/D Ratio	8.4
Entrenchemnt Ratio:	5.1
Bank Height Ratio:	1

Stream Type:	E5

Section 13 Looking downstream

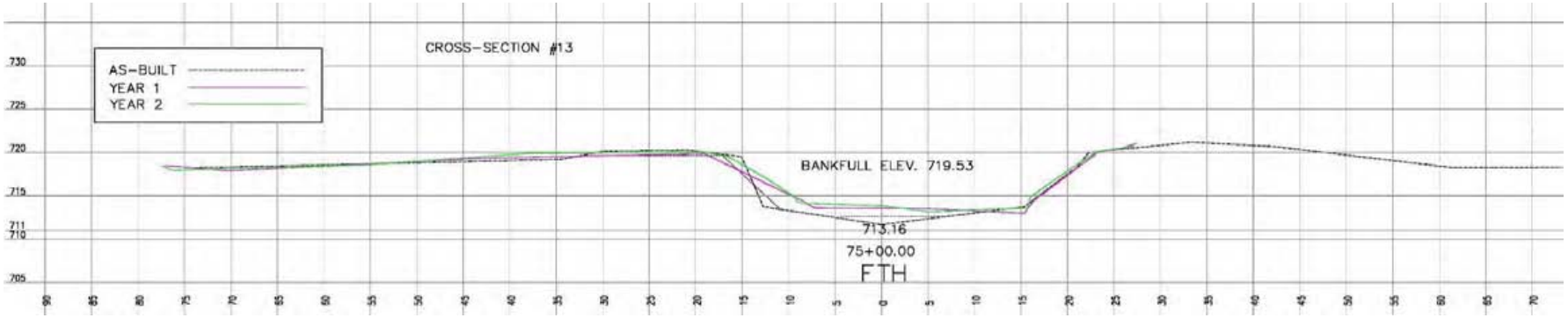


Exhibit Table 10a. Baseline Stream Data Summary
Five Mile Branch Stream Restoration, EEP IMS ID# 92185 Segment/Reach: Reach 1 Beaver Creek 5,622 feet

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^p / di^{sp} (mm)			> 2.0 mm						N/A														
Reach Shear Stress (competency) lb/f^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 Floodplane 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 singulare 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, EEP IMS ID# 92185 Segment/Reach: Reach 2 Fifth Creek upstream of Beaver Creek 1,251 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	0.0011	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	-	1566.0	-	-	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	-	3800.0	-	-	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	-	4771.0	-	-	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 / di^p / di^{sp} (mm)			> 2.0 mm						N/A														
Reach Shear Stress (competency) lb/ft^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 Floodplane 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 singulare 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, EEP IMS ID# 92185 Segment/Reach: Reach 3 Fifth Creek downstream of Beaver Creek 4.377 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 Floodplane 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 singulare 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, EEP IMS ID# 92185 Segment/Reach: Reach 1 Beaver Creek 5,622 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					38.1	30.7	27.7					28.7	34.2	39.9					24.1	31.8	34.6					52.1	28.8	29.8				
Floodprone Width (ft)	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				
Bankfull Mean Depth (ft)	4.7	4.4	4.4					3.5	3.7	3.8					2.6	3.7	3.4					4.4	3.7	3.9					1.8	3.6	4.3				
Bankfull Max Depth (ft)	7.1	5.9	6.3					6.4	5.2	5.2					4.3	6.1	7.4					7.0	5.5	6.4					4.3	6.1	8.3				
Bankfull Cross Sectional Area (ft^2)	124.5	123.7	134.0					133.4	115.0	103.9					74.4	125.8	137.1					105.4	117.4	134.8					95.3	102.6	127.5				
Bankfull Width/Depth Ratio	5.6	6.3	6.9					10.9	8.3	7.4					11.0	9.2	11.6					5.5	8.6	8.9					28.9	10.8	7.0				
Bankfull Entrenchment Ratio	7.6	7.2	6.6					5.2	6.5	7.2					7.0	5.8	5.0					8.3	6.3	5.8					3.8	6.9	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				
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						226	218						235.0	169						213	217.0						156	177				
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, EEP IMS ID# 92185 Segment/Reach: Reach 2 Fifth Creek upstream of Beaver Creek 1,251

	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					24.2	28.5	26.9																									
Floodprone Width (ft)	200.0	200.0	200.0					200.0	200.0	200.0																									
Bankfull Mean Depth (ft)	4.0	4.6	4.3					4.3	4.5	4.2																									
Bankfull Max Depth (ft)	7.2	7.2	7.5					7.7	6.0	6.1																									
Bankfull Cross Sectional Area (ft^2)	136.3	147.6	146.2					104.2	127.2	112.4																									
Bankfull Width/Depth Ratio	8.6	7.0	8.0					5.6	6.3	6.4																									
Bankfull Entrenchment Ratio	5.8	6.2	5.9					8.3	7.0	7.4																									
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)		203	197						247	232.0																									
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, EEP IMS ID# 92185 Segment/Reach: Reach 3 Fifth Creek downstream of Beaver Creek 4,377

	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	36.8	37.6					28.4	34.0	34.1					41.7	34.9	38.2					36.6	43.0	44.1				
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				
Bankfull Mean Depth (ft)	4.7	4.9	5.1					4.4	4.5	5.0					4.1	4.8	5.3					4.0	4.9	4.1					4.2	4.3	4.9				
Bankfull Max Depth (ft)	7.1	6.8	6.9					6.1	7.2	7.9					5.6	5.9	6.7					6.3	5.7	7.2					6.2	7.5	9.1				
Bankfull Cross Sectional Area (ft^2)	150.2	170.2	174.5					148.3	166.8	189.8					115.3	162.8	182.2					165.1	170.7	155.9					152.2	183.2	216.6				
Bankfull Width/Depth Ratio	6.9	7.0	6.6					7.7	8.2	7.4					6.9	7.1	6.4					10.4	7.1	9.4					8.8	10.0	9.0				
Bankfull Entrenchment Ratio	6.2	5.8	5.9					5.9	5.4	5.3					7.0	5.9	5.9					4.8	5.7	5.2					5.5	4.7	4.5				
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				
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						248	246						229	228						285	268						376	322				
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																																
Floodprone Width (ft)	200.0	200.0	200.0																																
Bankfull Mean Depth (ft)	5.2	4.9	4.6																																
Bankfull Max Depth (ft)	7.0	6.7	6.4																																
Bankfull Cross Sectional Area (ft^2)	209.2	206.4	180.3																																
Bankfull Width/Depth Ratio	7.7	8.6	8.4																																
Bankfull Entrenchment Ratio	5.0	4.8	5.1																																
Bankfull Bank Height Ratio	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																																
d50 (mm)	0.2																																		

Exhibit Table 12a. Monitoring Data - Stream Reach Data Summary
Five Mile Branch Stream Restoration, EEP IMS ID# 92185 Segment/Reach: Reach 1 Beaver Creek 5,622 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																		
Floodprone Width (ft)	200	200	200	200	0	3	200	200.0	200	200	0.0	3	200	200	200	200	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	3.9	4.4	0.3	3																		
[1]Bankfull Max Depth (ft)	6.4	6.8	7	7.1	4	3	5.2	5.5	5.5	5.9	0.4	3	5.1	5.9	6.3	6.4	0.7	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																		
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	3																		
Entrenchment Ratio	5.2	7	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																		
[1]Bank Height Ratio	**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																							
Channel Thalweg length (ft)	5,622						5622						5622																							
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, EEP IMS ID# 92185 Segment/Reach: Reach 2 Fifth Creek upstream of Beaver Creek 1,251

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]
Bankfull Width (ft)	-	24.2	-	-	-	1		28.5				1		26.9				1																	
Floodprone Width (ft)	-	>200.0	-	-	-	1		200				1		200				1																	
Bankfull Mean Depth (ft)	-	4.3	-	-	-	1		4.5				1		4.2				1																	
[1]Bankfull Max Depth (ft)	-	7.7	-	-	-	1		6				1		6.1				1																	
Bankfull Cross Sectional Area (ft[2])	-	104.2	-	-	-	1		127.2				1		112.4				1																	
Width/Depth Ratio	-	5.6	-	-	-	1		6.3				1		6.4				1																	
Entrenchment Ratio	-	8.3	-	-	-	1		7				1		7.4				1																	
[1]Bank Height Ratio	**-**	**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																						
Channel Thalweg length (ft)	1,251						1251						1251																						
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, EEP IMS ID# 92185 Segment/Reach: Reach 3 Fifth Creek downstream of Beaver Creek 4,377

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	34.5	34.5	34.9	0.5	3	34	35.4	34.1	38.2	2.4	3																		
Floodprone Width (ft)	200	200	200	200	0	3	200	200.0	200	200	0.0	3	200	200	200	200	0	3																		
Bankfull Mean Depth (ft)	4	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																		
[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																		
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																		
Width/Depth Ratio	6.9	8.1	6.9	10.4	2	3	7	7.1	7.1	7.1	0.1	3	6.4	7.5	6.6	9.4	1.7	3																		
Entrenchment Ratio	4.8	6	6.2	7	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																		
[1]Bank Height Ratio	**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																							
Channel Thalweg length (ft)	4377						4377						4,377																							
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																																				

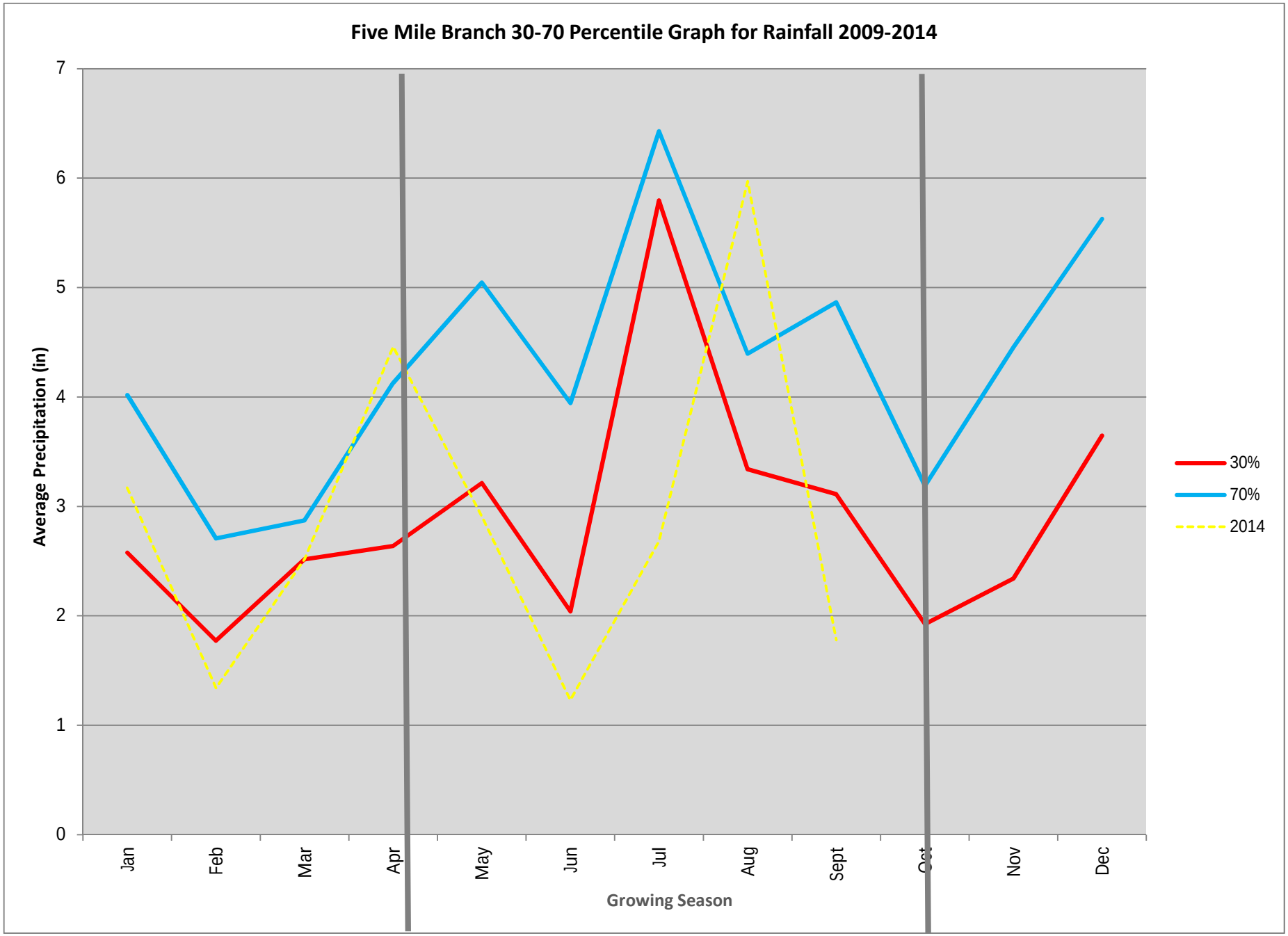
Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment 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

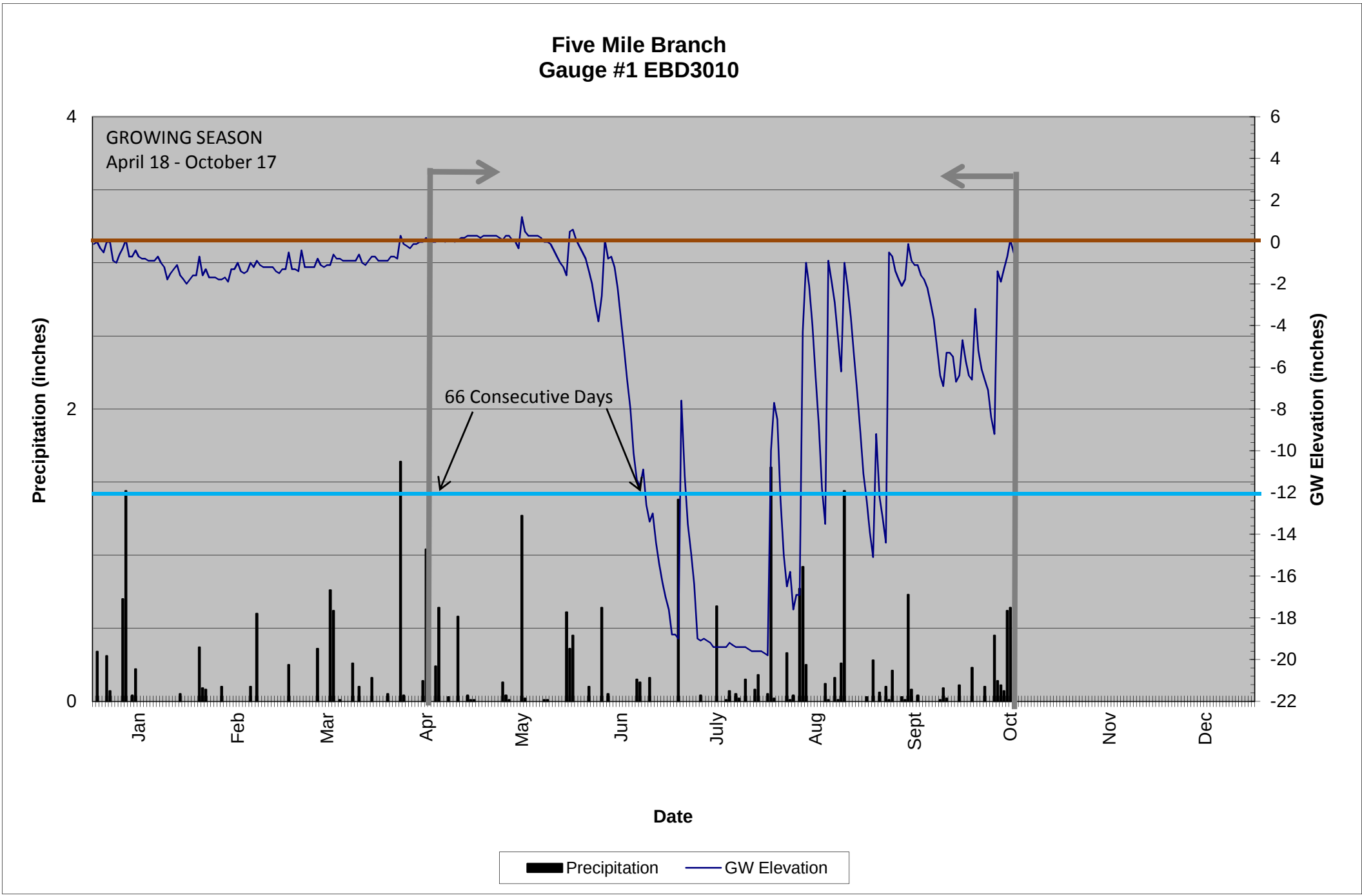
Appendix E

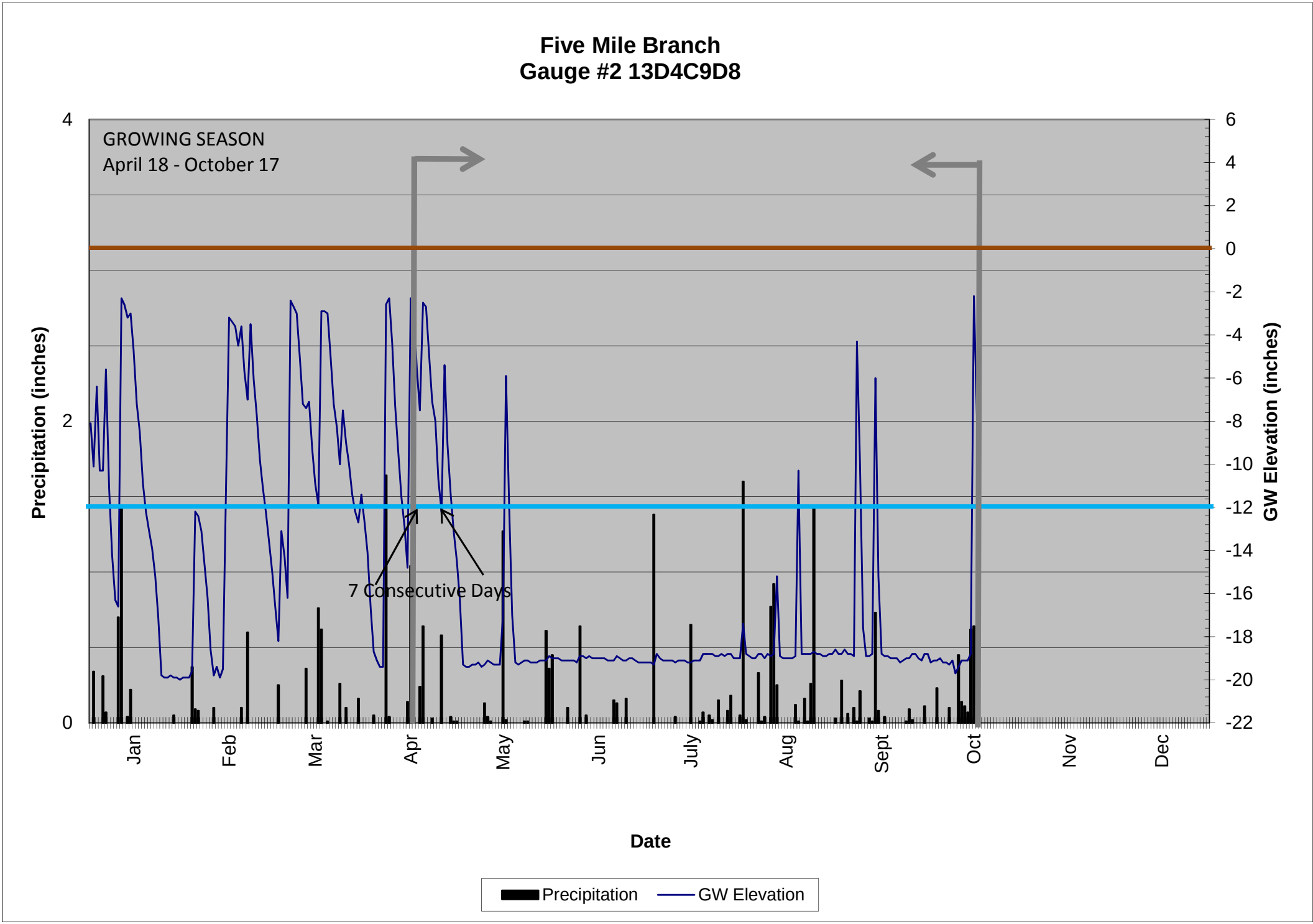
Hydrology Data

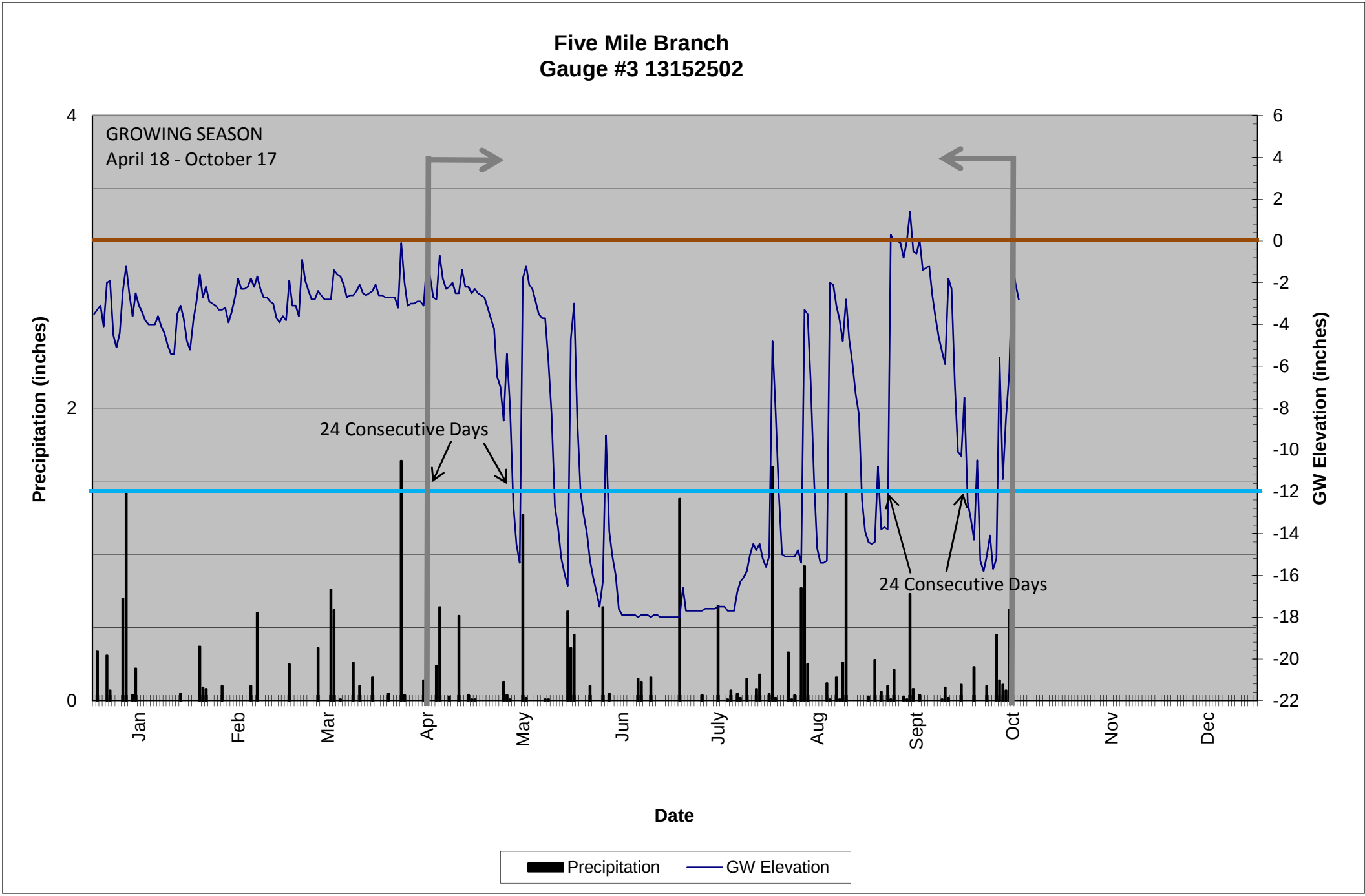
Table 12. Verification of Bankfull Events
Five Mile Branch Stream and Wetland Restoration
NCEEP # 92185

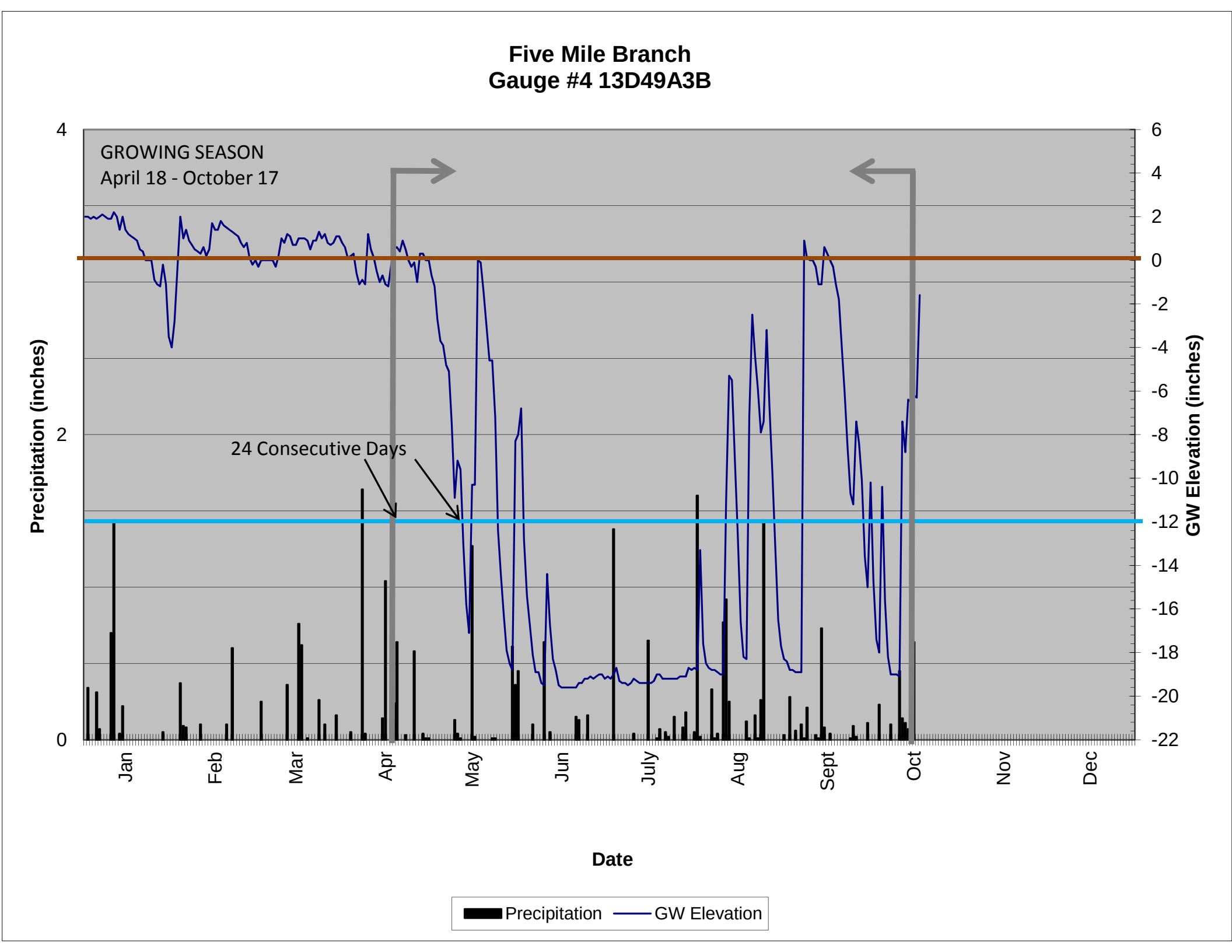
Date of Data Collection	Date of Occurance	Method	Greater than Qbkf Stage	Notes
7/18/2014	1/11/2014	On site Transducer	Y	Beaver Creek, Fifth Creek Upstream and Fifth Creek Downstream
7/18/2014	3/7/2014	On site Transducer	Y	Beaver Creek
7/18/2014	4/7/2014	On site Transducer	Y	Beaver Creek

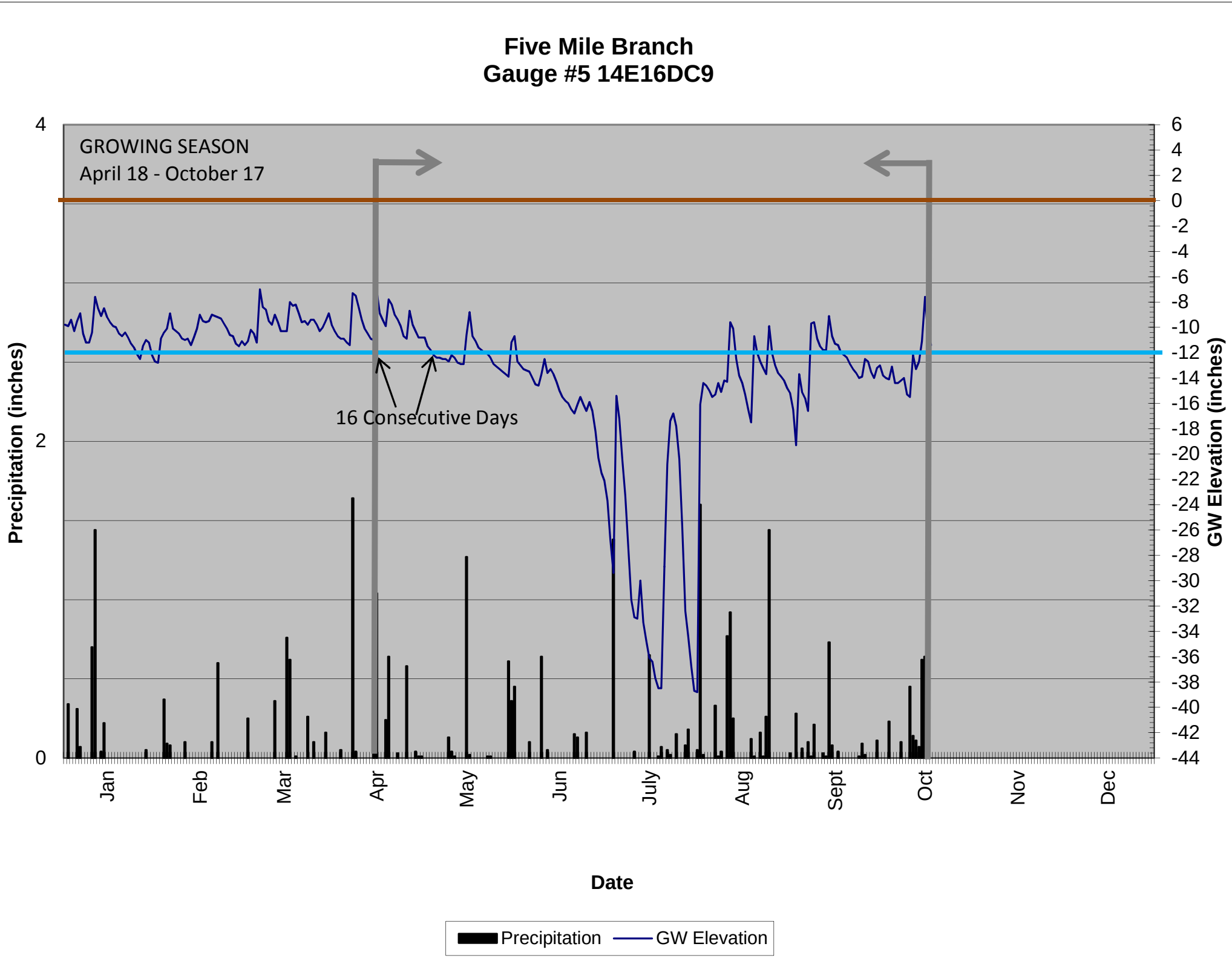

Five Mile Branch 30-70 Percentile Graph for Rainfall 2009-2014
Average Precipitation (in)
0
1
2
3
4
5
6
7
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Nov
Dec
Growing Season
30%
70%
2014

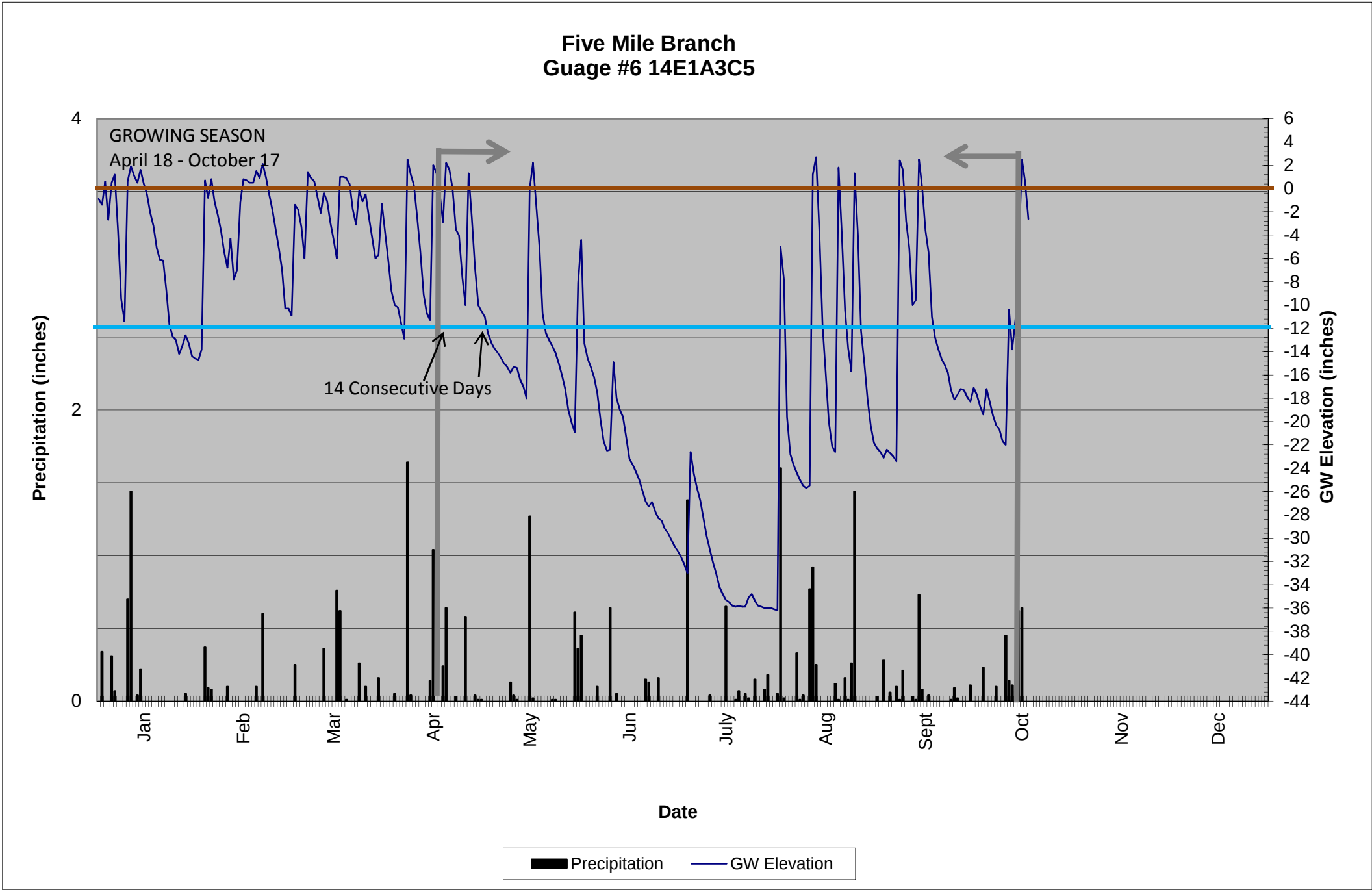

Five Mile Branch
Gauge #1 EBD3010
GROWING SEASON
April 18 - October 17
66 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

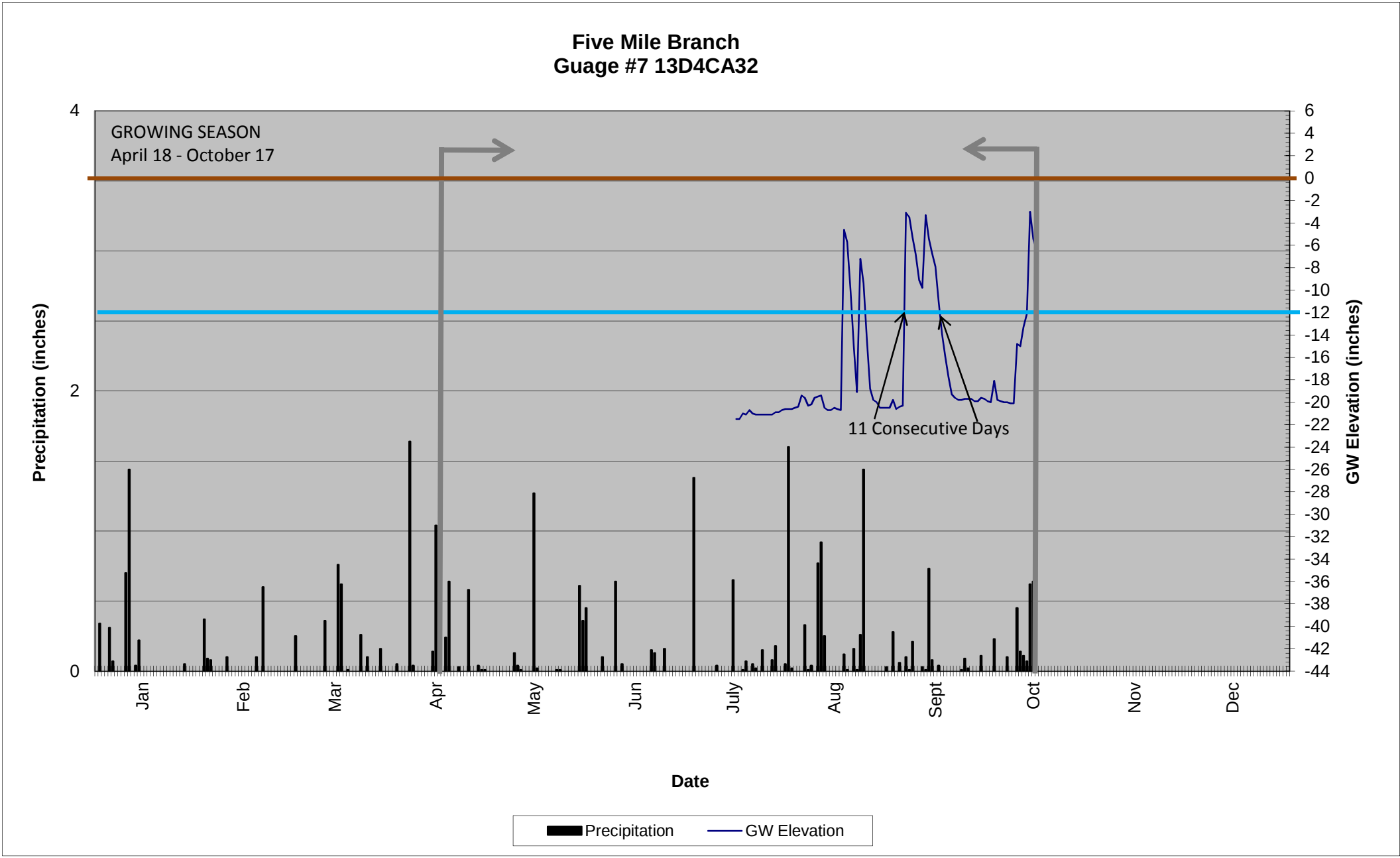

Five Mile Branch
Gauge #2 13D4C9D8
GROWING SEASON
April 18 - October 17
7 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
Date
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Precipitation
GW Elevation

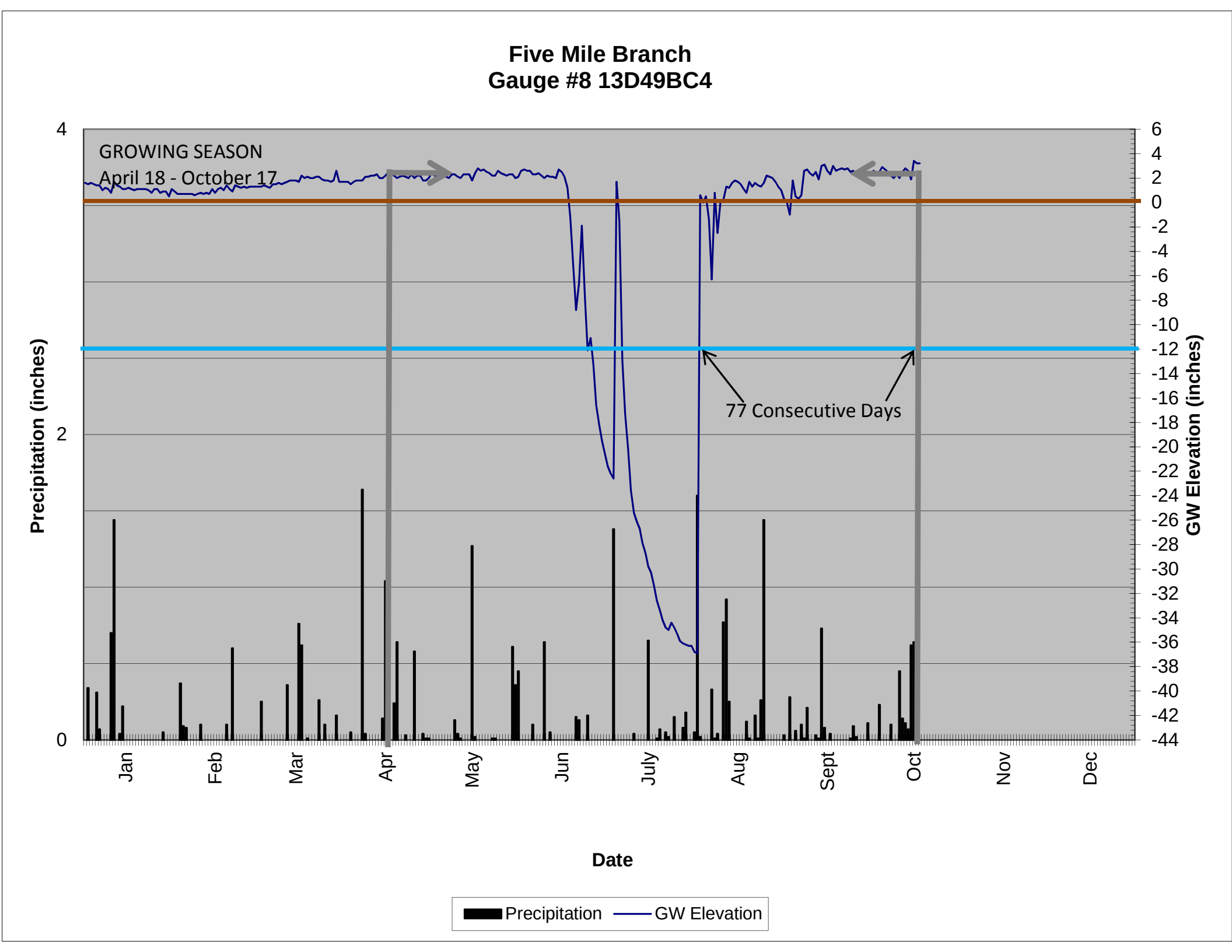

Five Mile Branch
Gauge #3 13152502
GROWING SEASON
April 18 - October 17
24 Consecutive Days
24 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

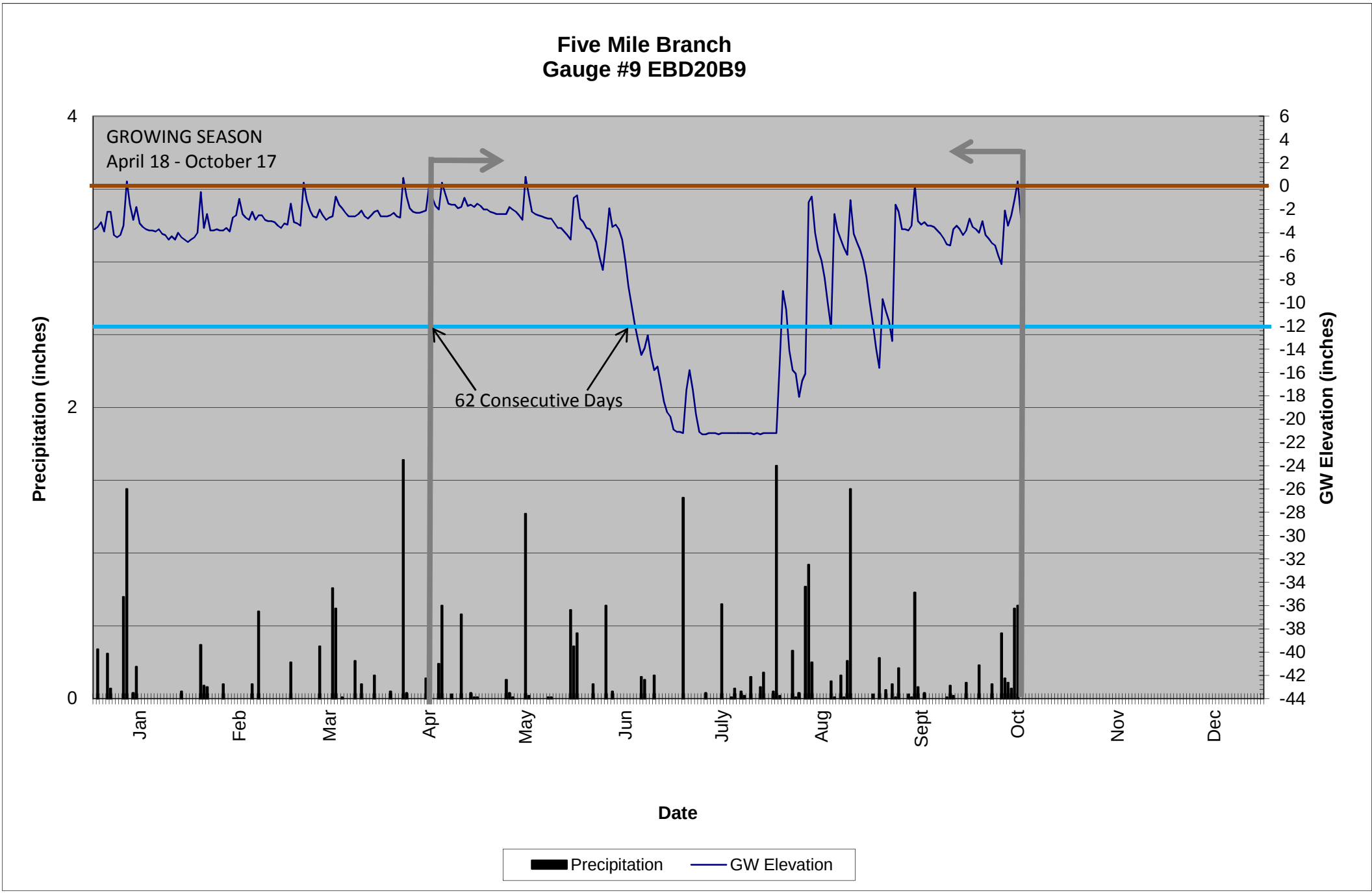

Five Mile Branch
Gauge #4 13D49A3B
GROWING SEASON
April 18 - October 17
24 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

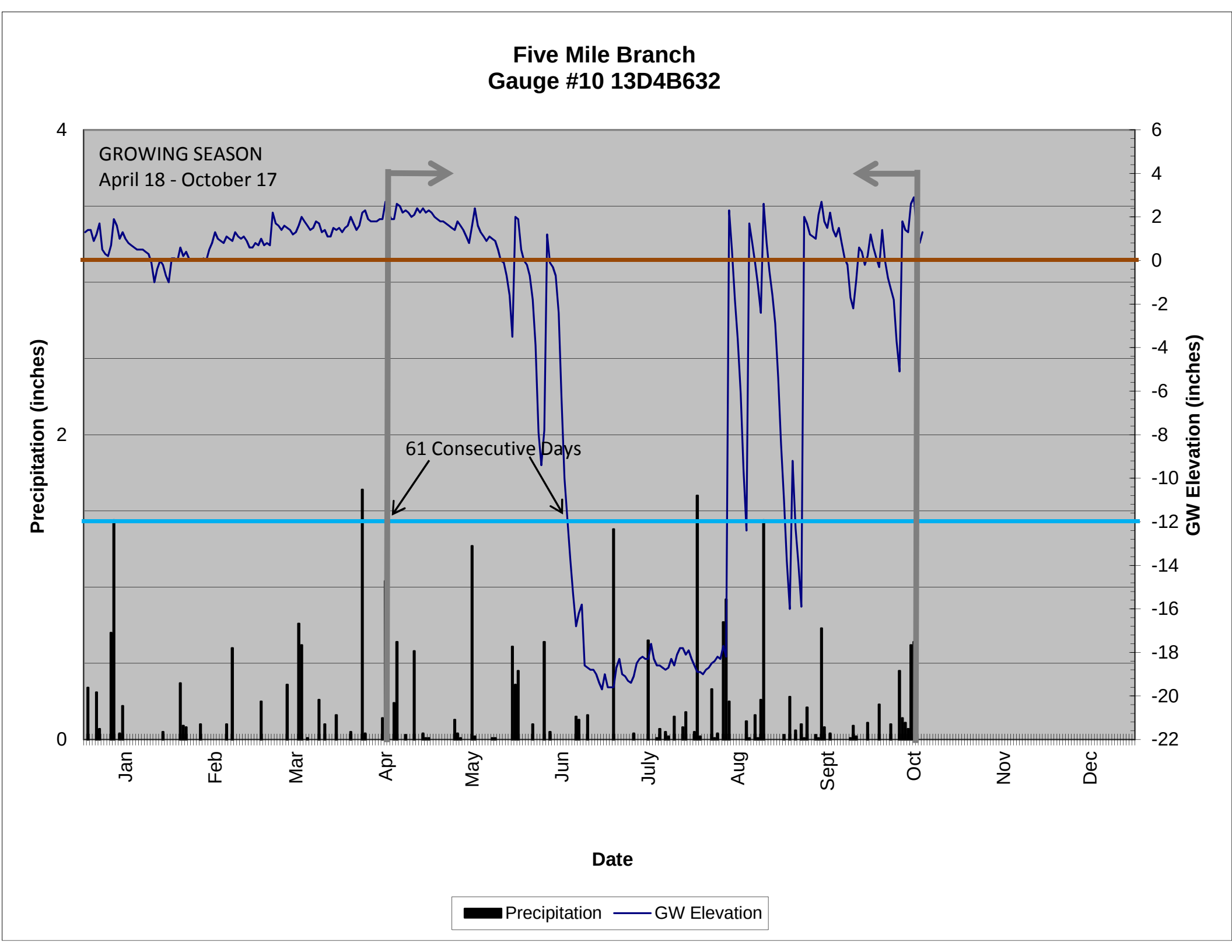

Five Mile Branch
Gauge #5 14E16DC9
GROWING SEASON
April 18 - October 17
16 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
Date
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Precipitation
GW Elevation

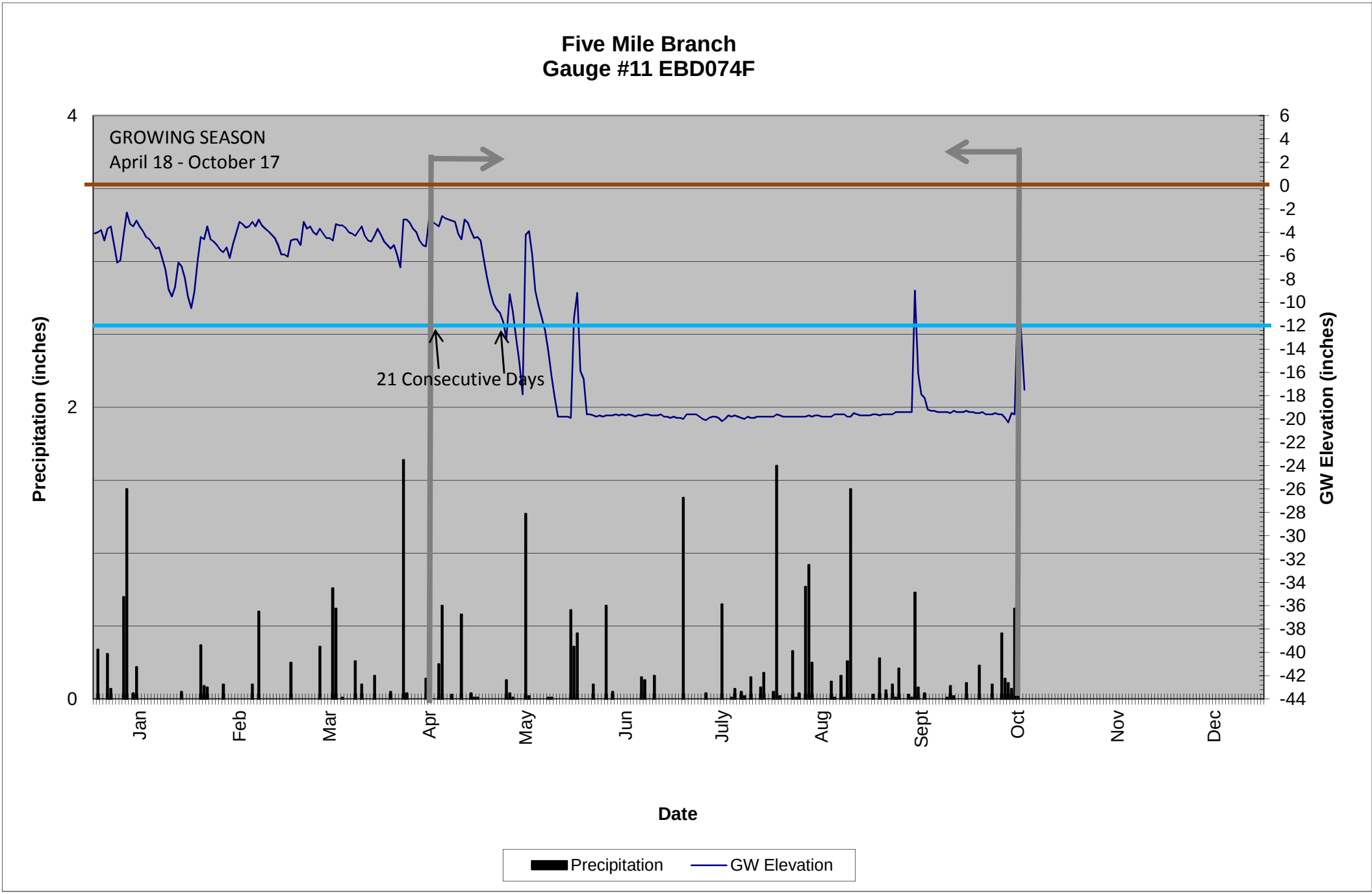

Five Mile Branch
Guage #6 14E1A3C5
GROWING SEASON
April 18 - October 17
14 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
Date
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Precipitation
GW Elevation

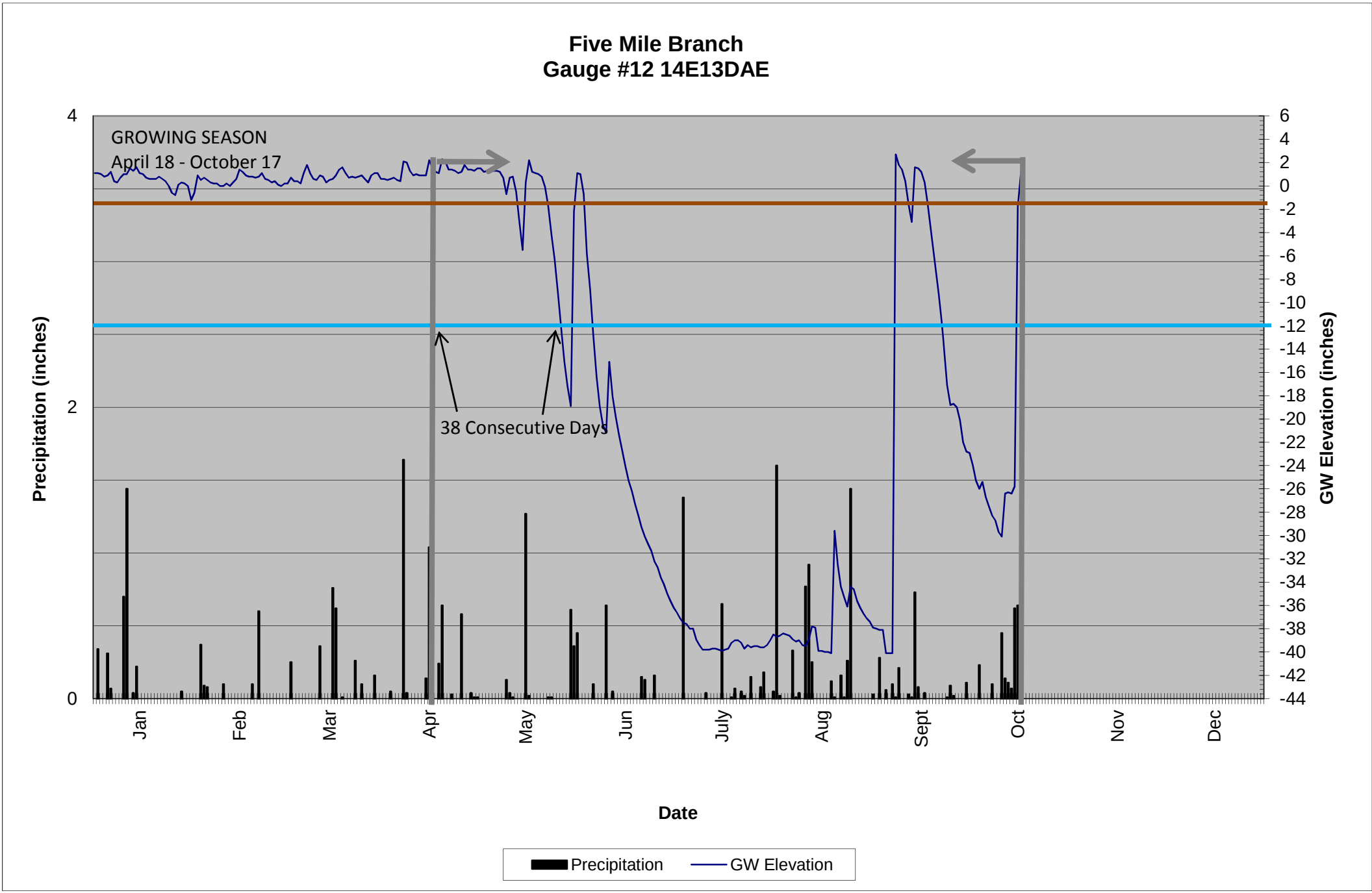

Five Mile Branch
Guage #7 13D4CA32
GROWING SEASON
April 18 - October 17
11 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
-42
-44
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

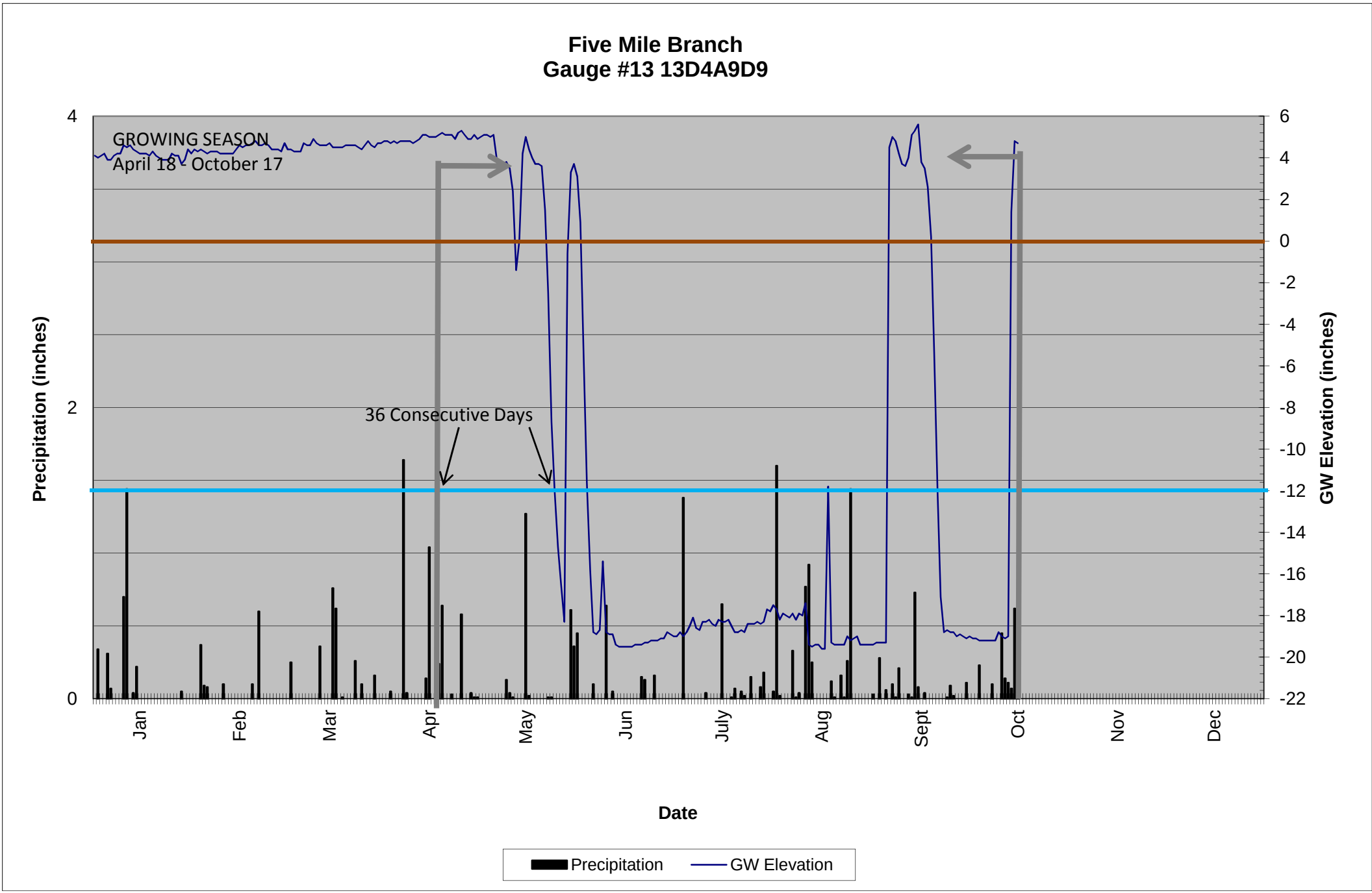

Five Mile Branch
Gauge #8 13D49BC4
GROWING SEASON
April 18 - October 17
77 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
Date
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Precipitation
GW Elevation

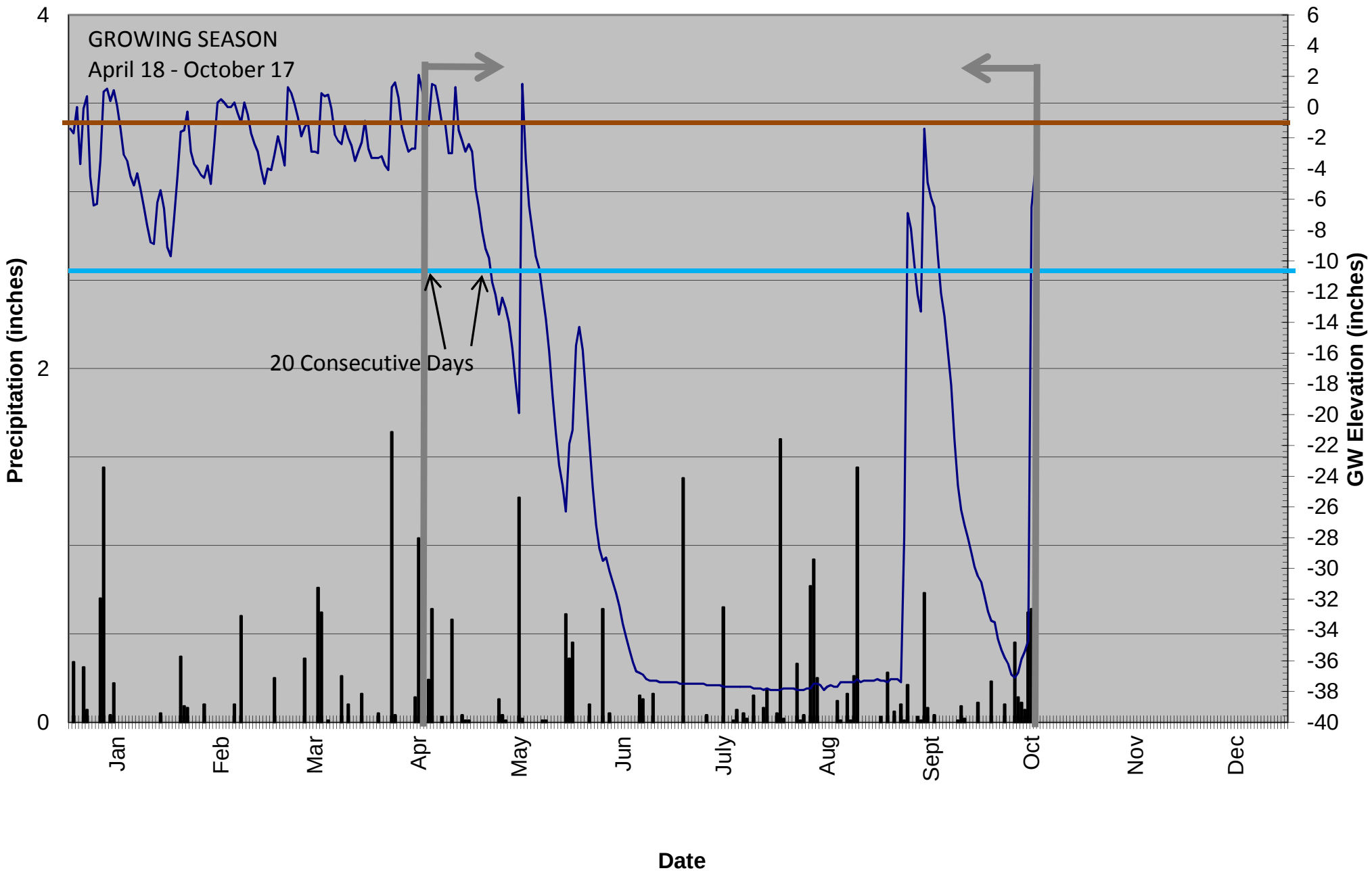

Five Mile Branch
Gauge #9 EBD20B9
GROWING SEASON
April 18 - October 17
62 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
Date
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Precipitation
GW Elevation

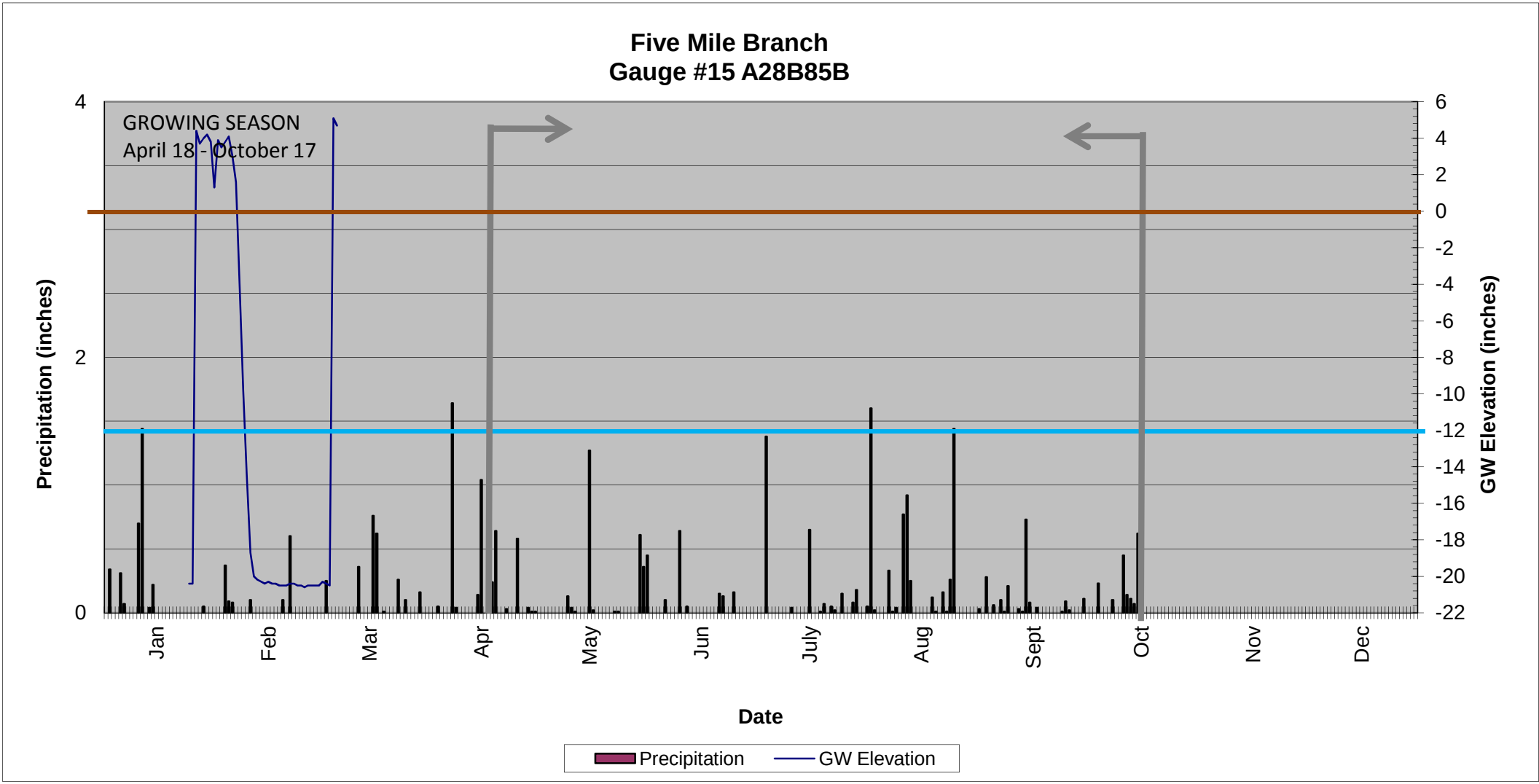

Five Mile Branch
Gauge #10 13D4B632
GROWING SEASON
April 18 - October 17
61 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

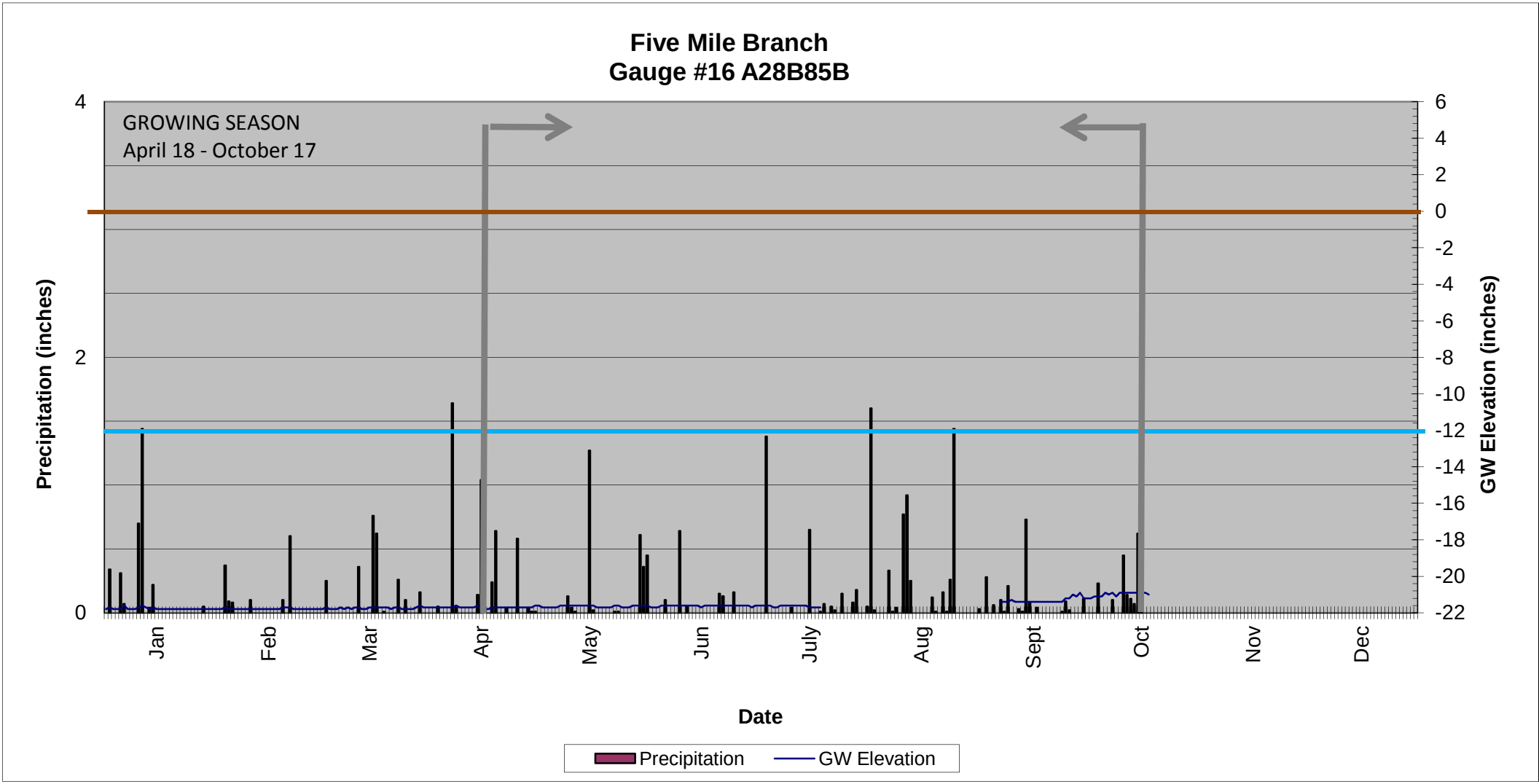

Five Mile Branch
Gauge #11 EBD074F
GROWING SEASON
April 18 - October 17
21 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
Date
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Precipitation
GW Elevation


Five Mile Branch
Gauge #12 14E13DAE
GROWING SEASON
April 18 - October 17
38 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

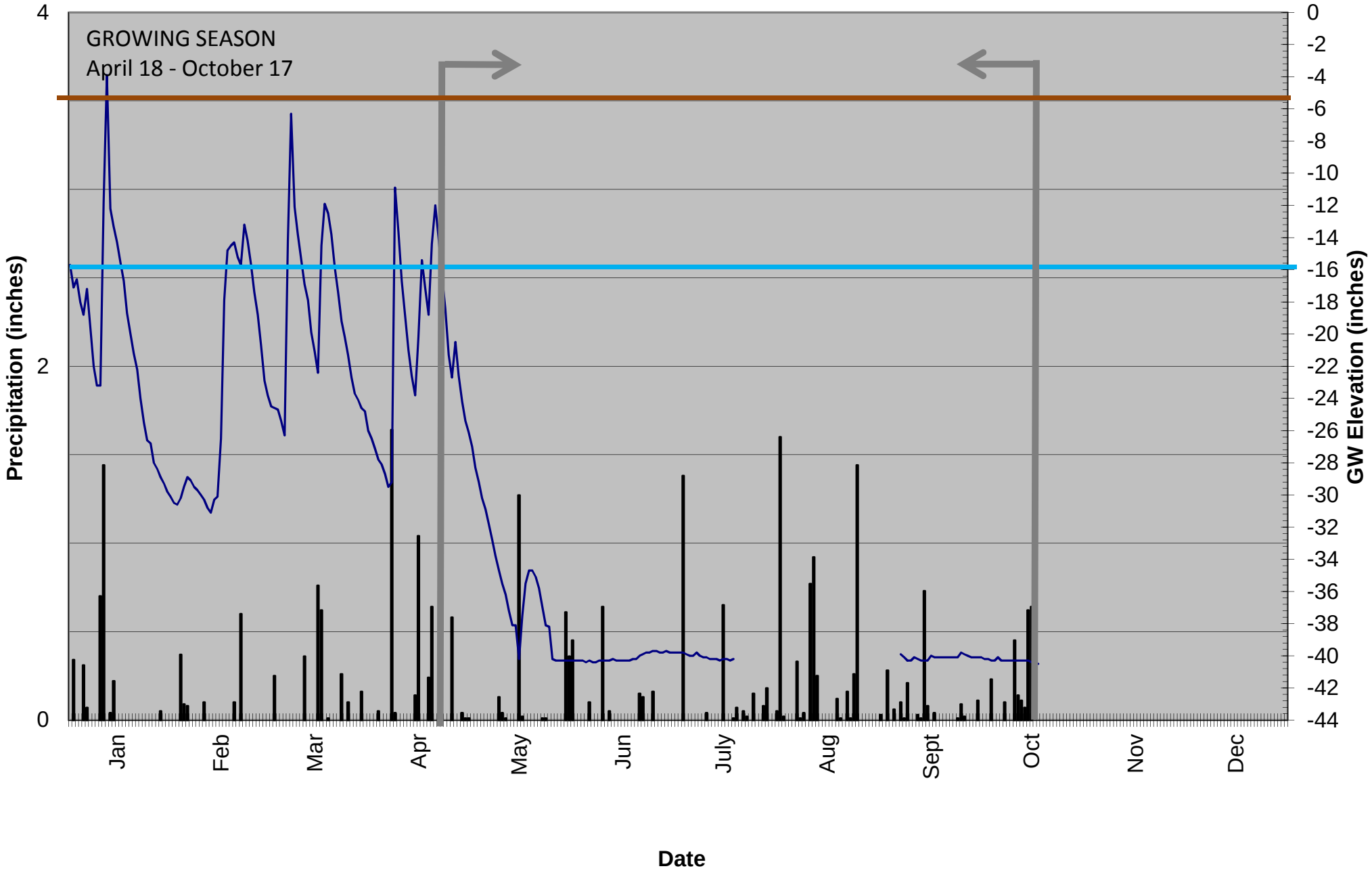

Five Mile Branch
Gauge #13 13D4A9D9
GROWING SEASON
April 18 - October 17
36 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

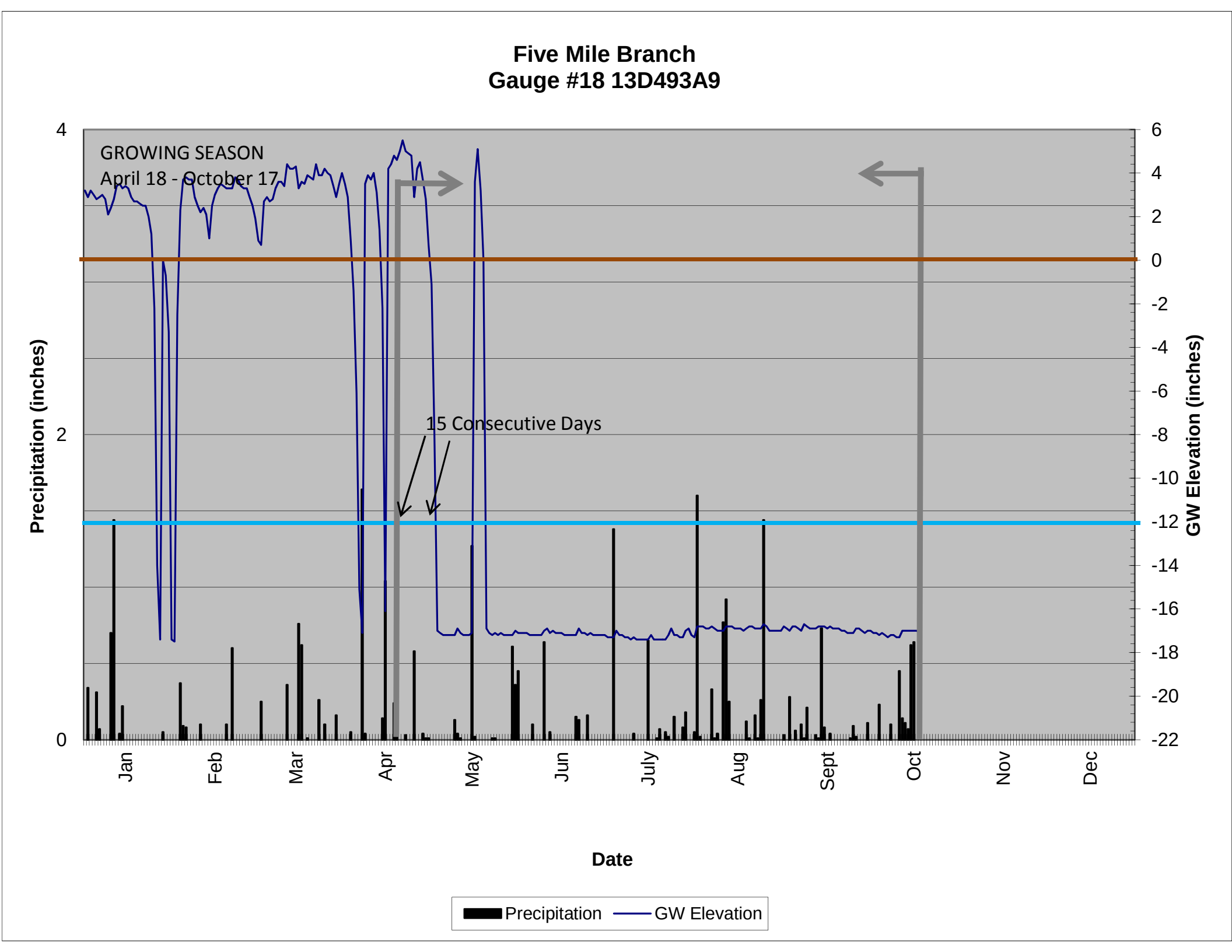

Five Mile Branch
Gauge #14 13D4C9C5
GROWING SEASON
April 18 - October 17
20 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
Date
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Precipitation
GW Elevation

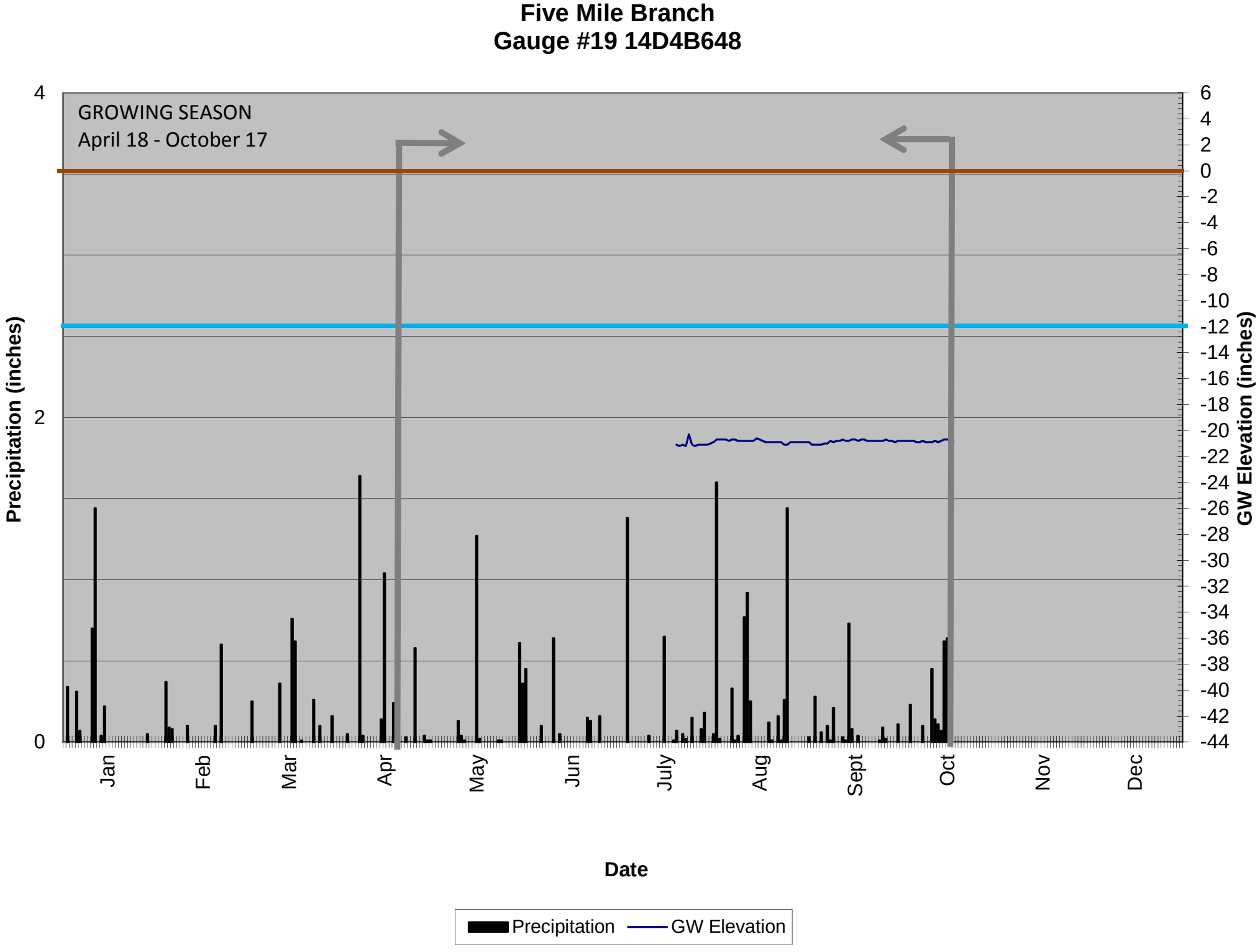

Five Mile Branch
Gauge #15 A28B85B
GROWING SEASON
April 18 - October 17
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

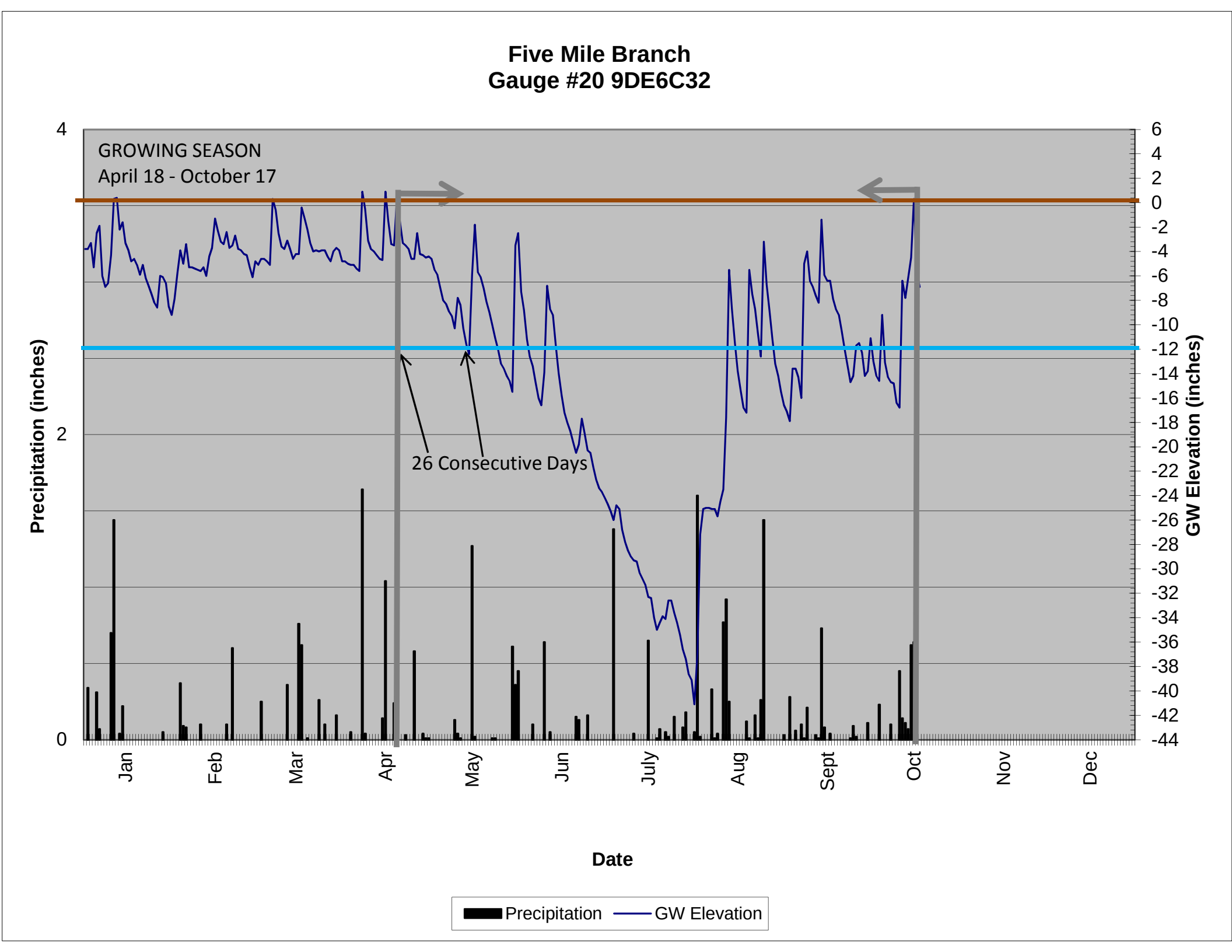

Five Mile Branch
Gauge #16 A28B85B
GROWING SEASON
April 18 - October 17
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

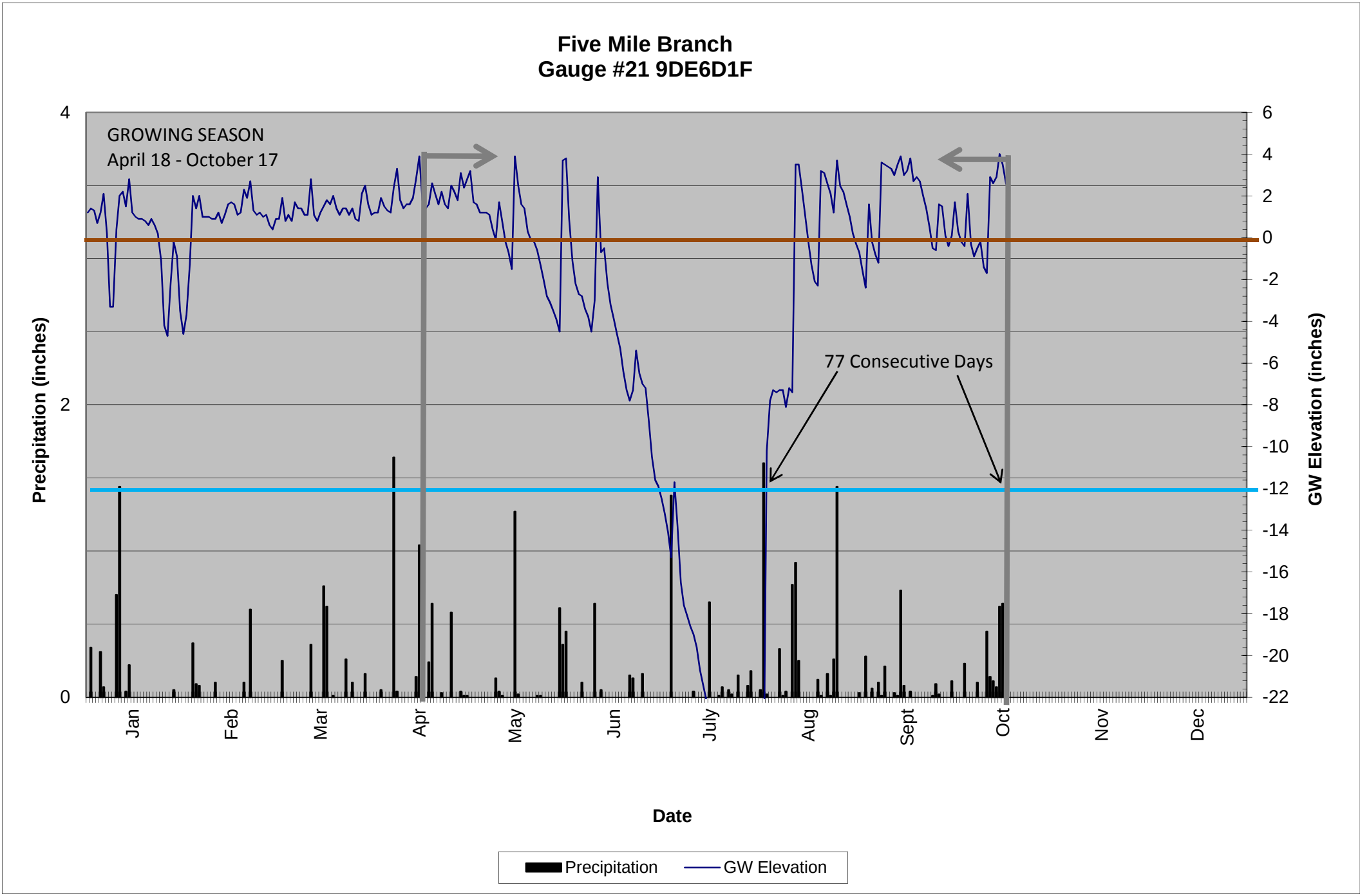
Five Mile Branch
Gauge #17 14E16DE5

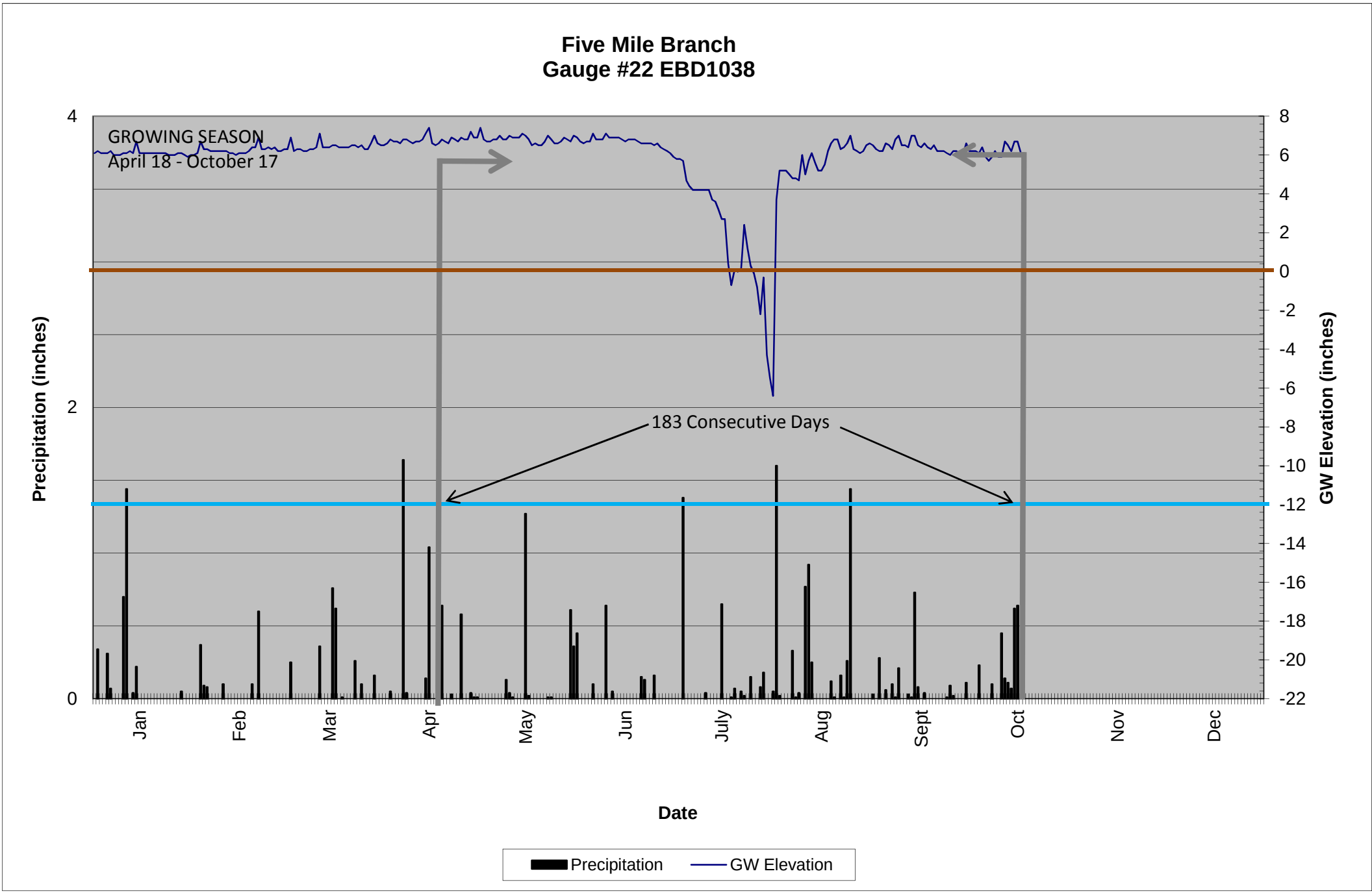


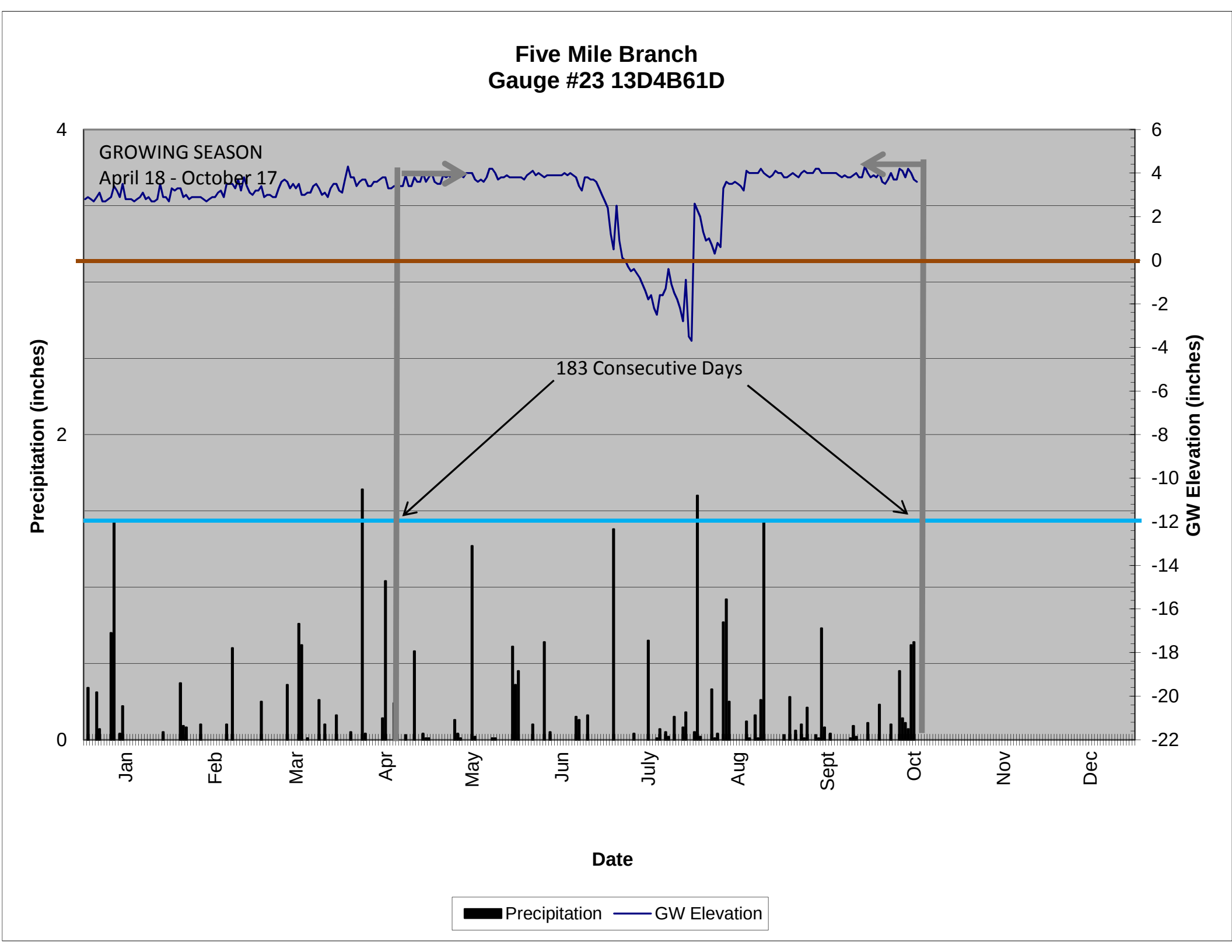

Five Mile Branch
Gauge #18 13D493A9
GROWING SEASON
April 18 - October 17
15 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

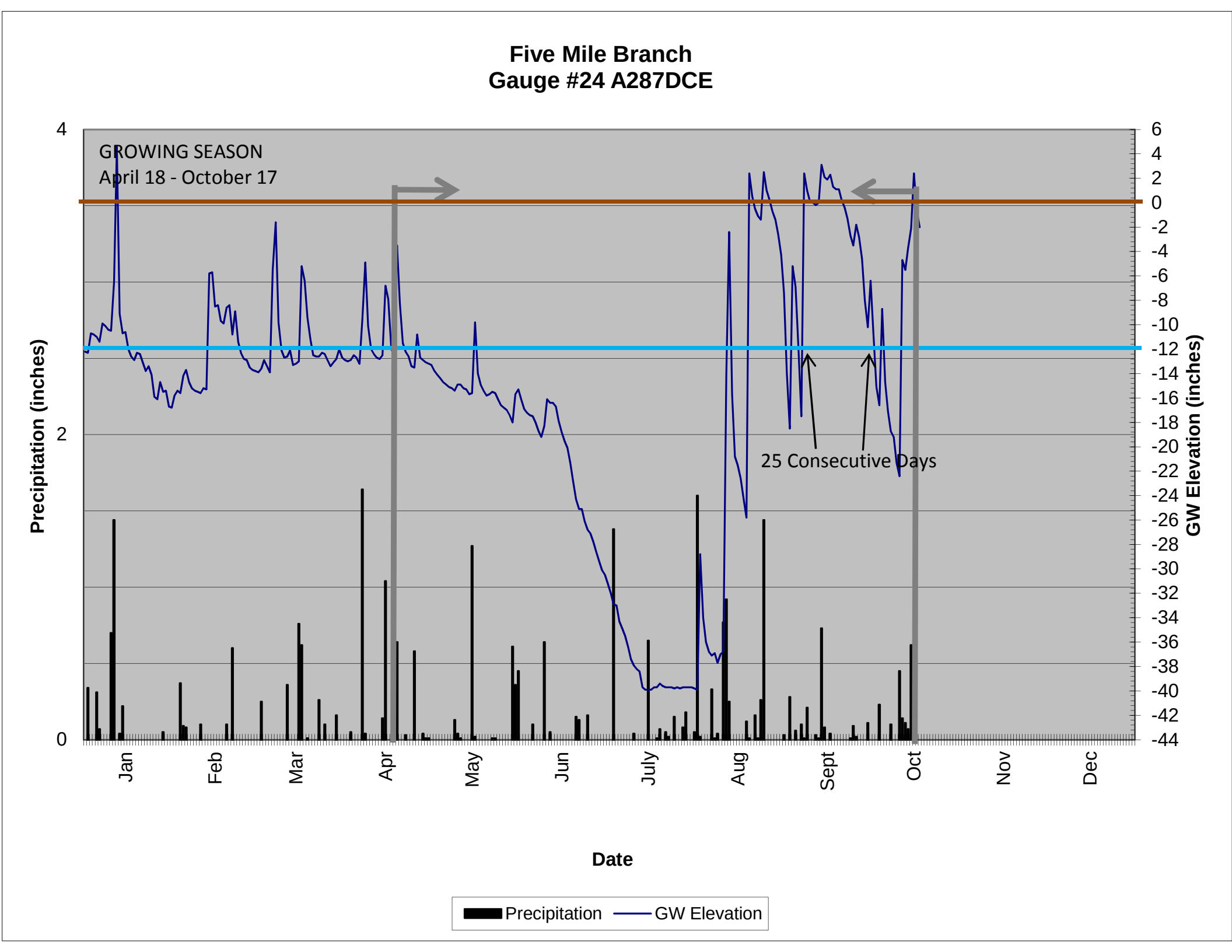

Five Mile Branch
Gauge #19 14D4B648
GROWING SEASON
April 18 - October 17
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
-42
-44
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

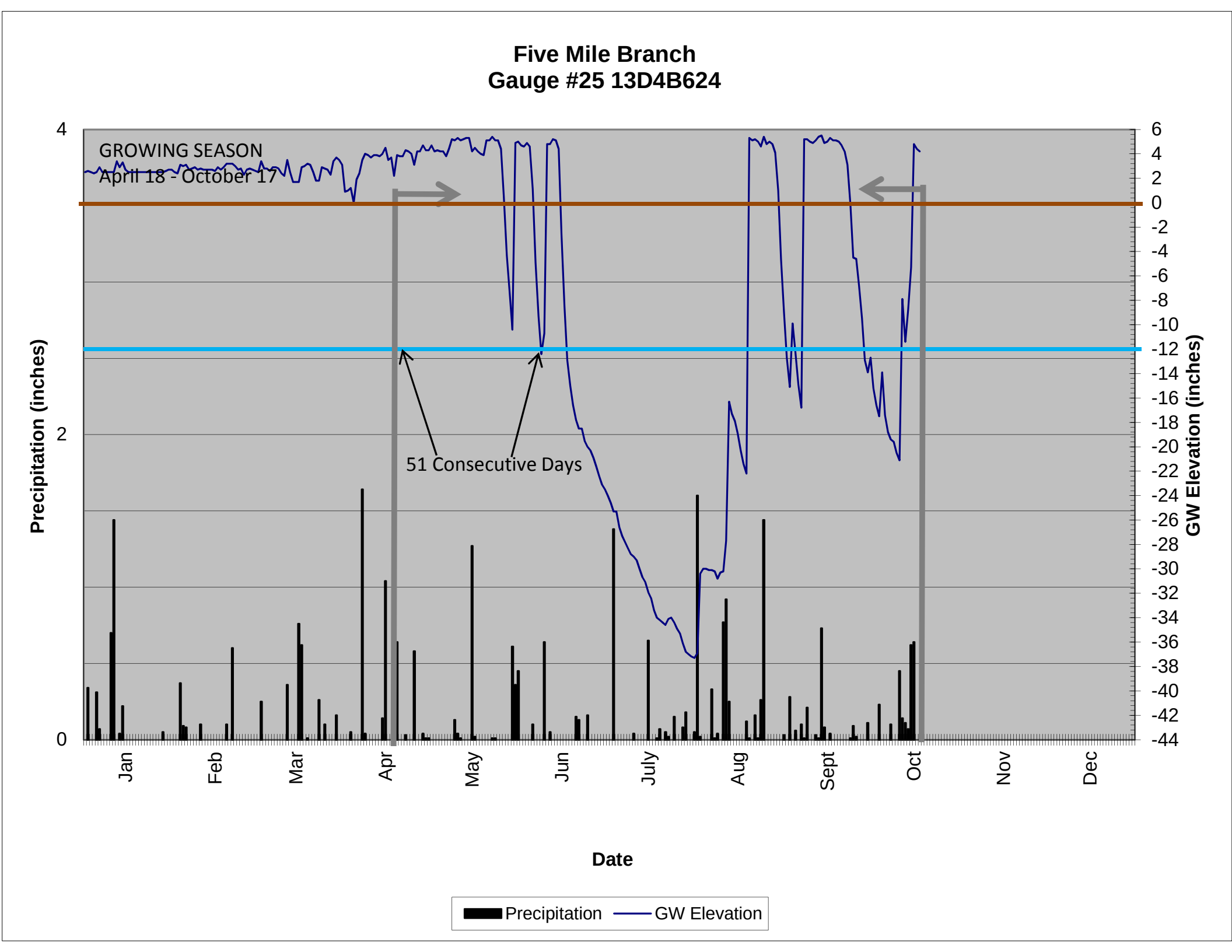

Five Mile Branch
Gauge #20 9DE6C32
GROWING SEASON
April 18 - October 17
26 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
-42
-44
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

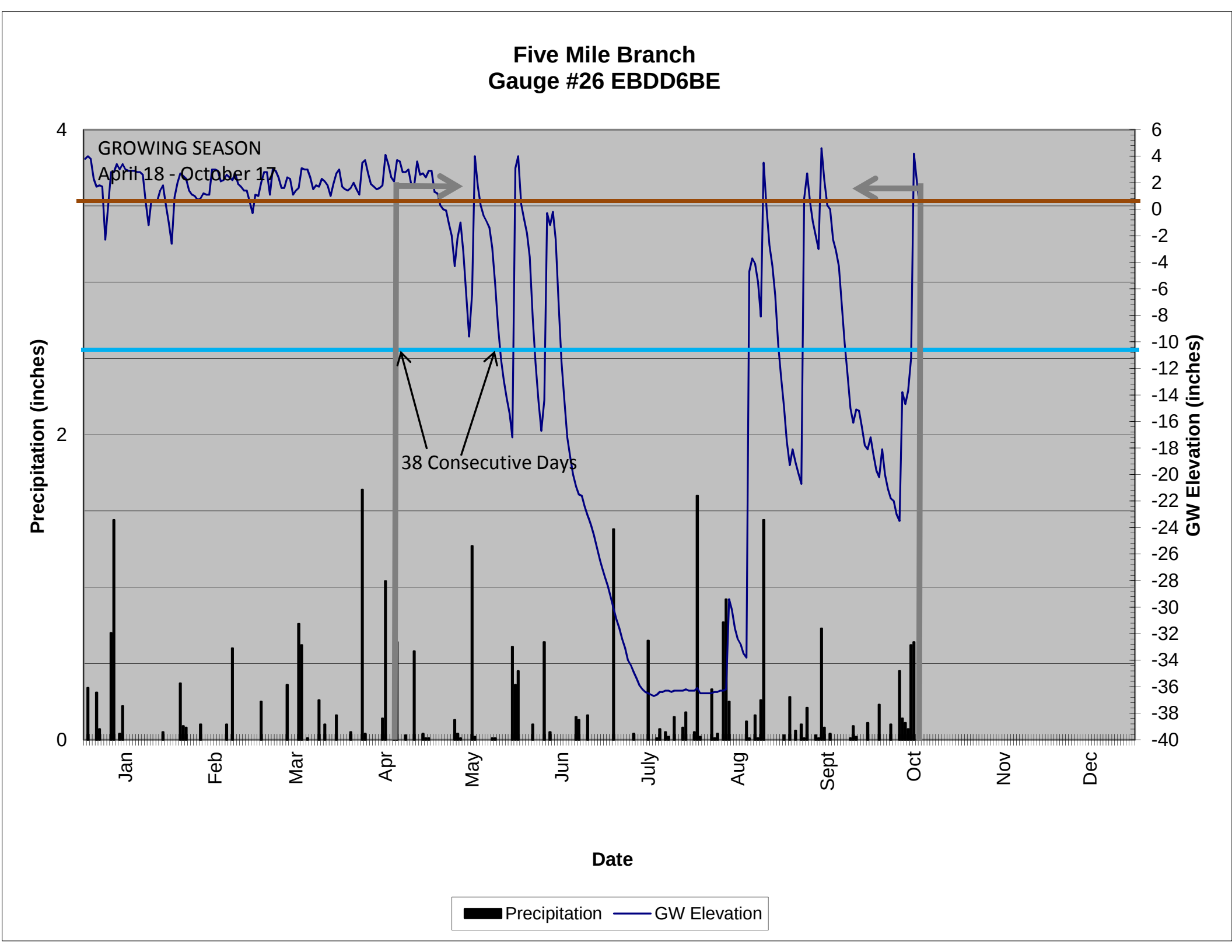

Five Mile Branch
Gauge #21 9DE6D1F
GROWING SEASON
April 18 - October 17
77 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

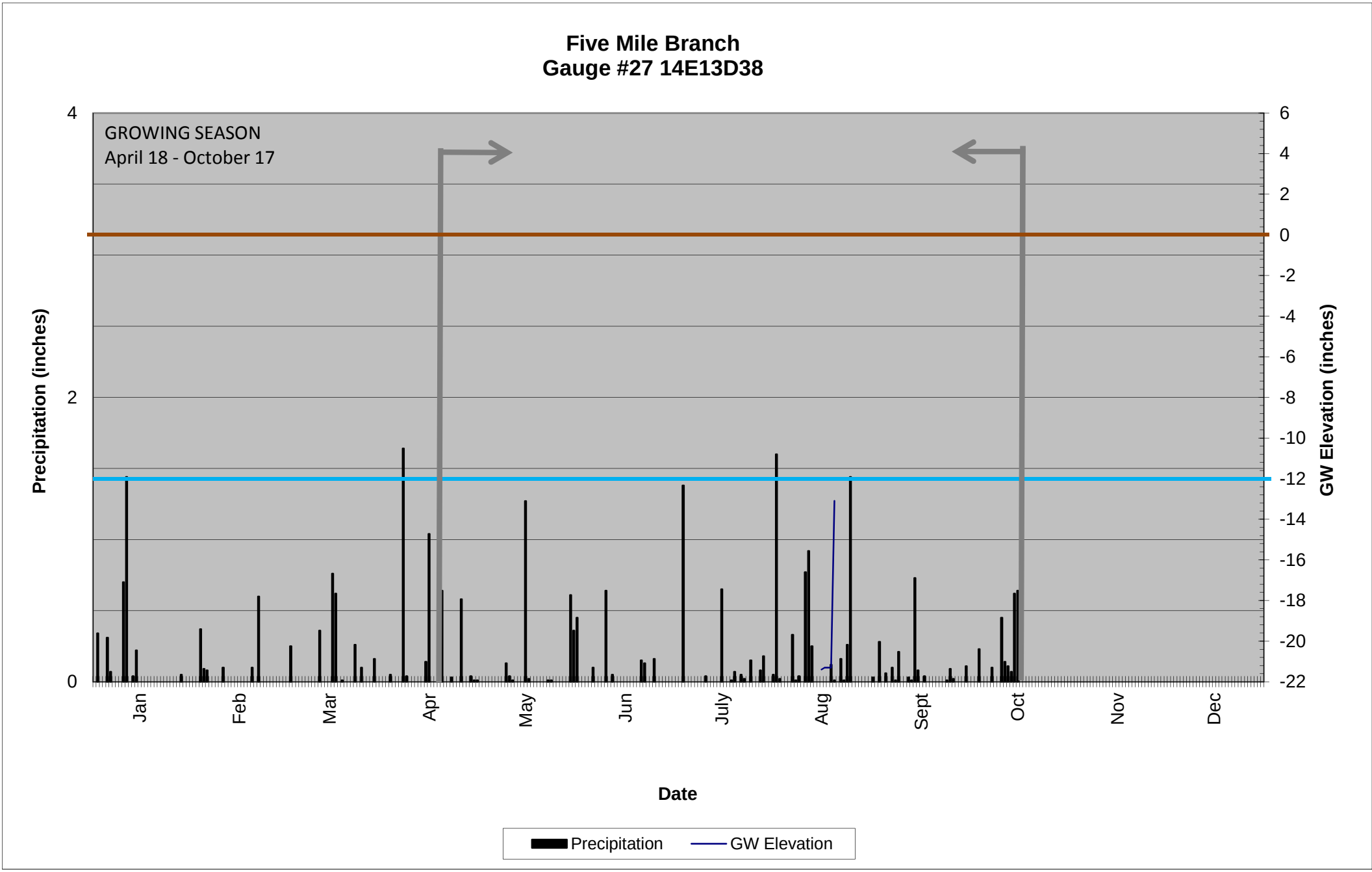

Five Mile Branch
Gauge #22 EBD1038
GROWING SEASON
April 18 - October 17
183 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

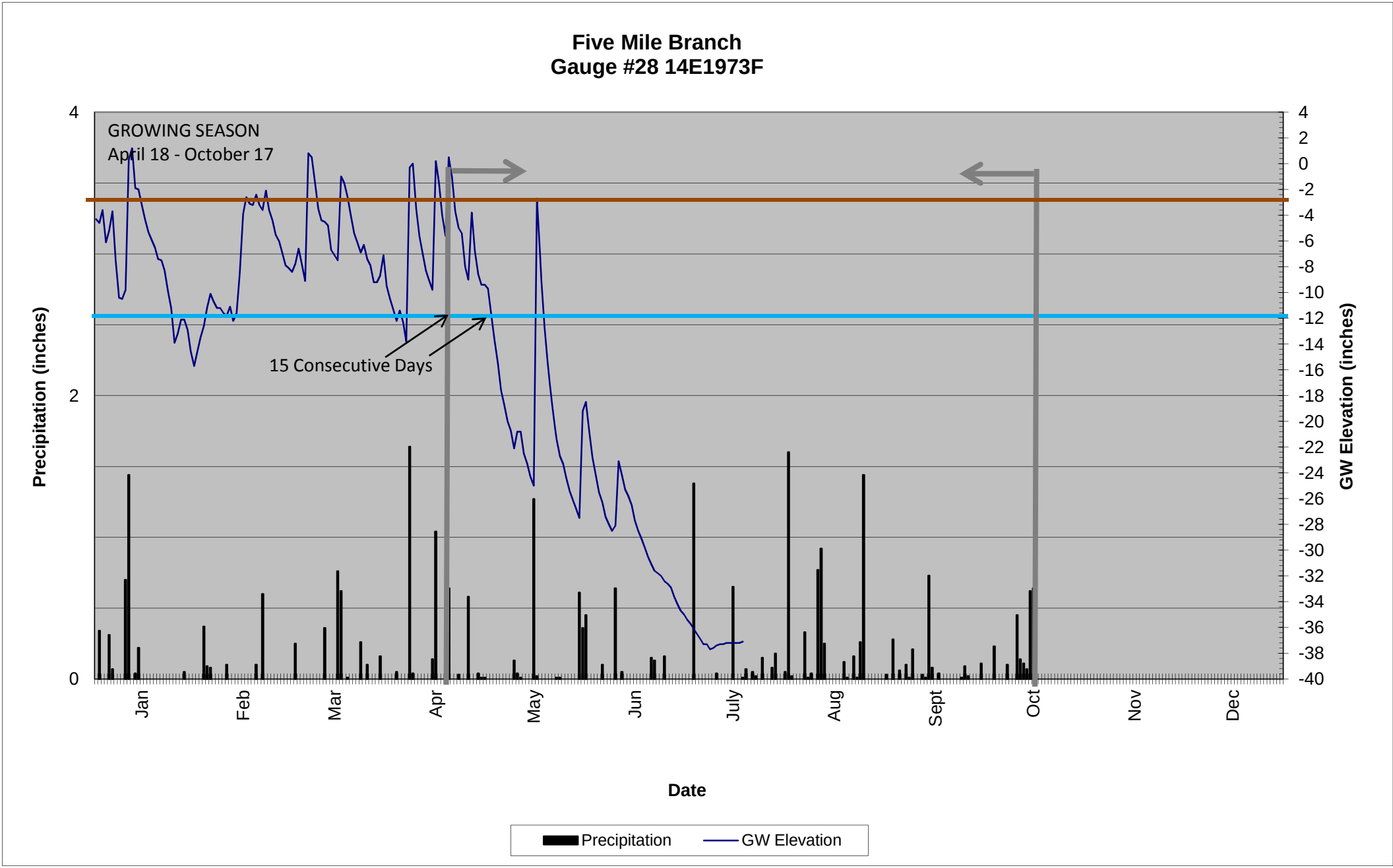

Five Mile Branch
Gauge #23 13D4B61D
GROWING SEASON
April 18 - October 17
183 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation

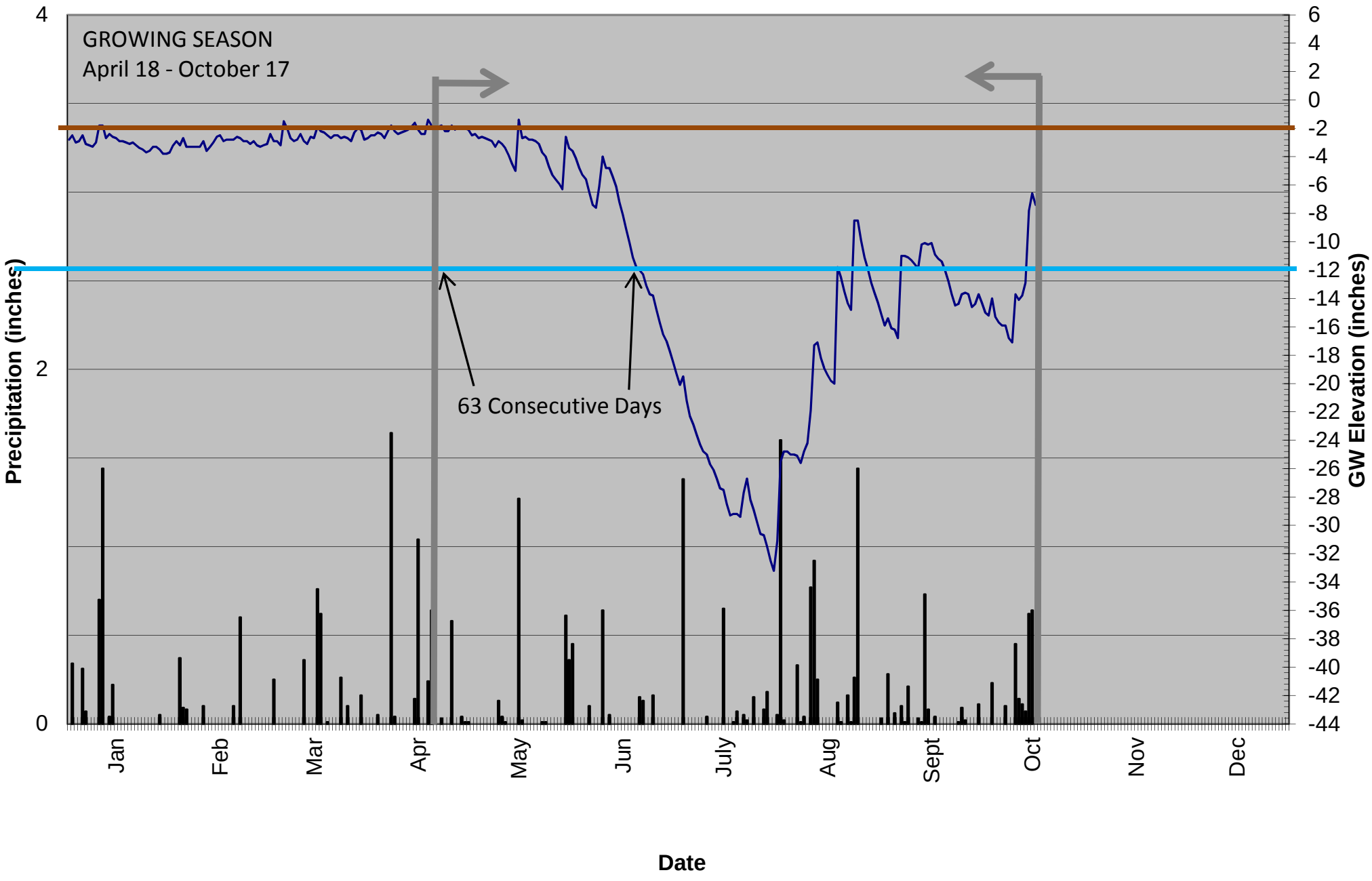

Five Mile Branch
Gauge #24 A287DCE
GROWING SEASON
April 18 - October 17
25 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
Date
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Precipitation
GW Elevation


Five Mile Branch
Gauge #25 13D4B624
GROWING SEASON
April 18 - October 17
51 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
Date
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
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
Precipitation
GW Elevation


Five Mile Branch
Gauge #26 EBDD6BE
GROWING SEASON
April 18 - October 17
38 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 #27 14E13D38
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 #28 14E1973F
GROWING SEASON
April 18 - October 17
15 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
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 #29 14E177C0
GROWING SEASON
April 18 - October 17
63 Consecutive Days
Precipitation (inches)
GW Elevation (inches)
4
2
0
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
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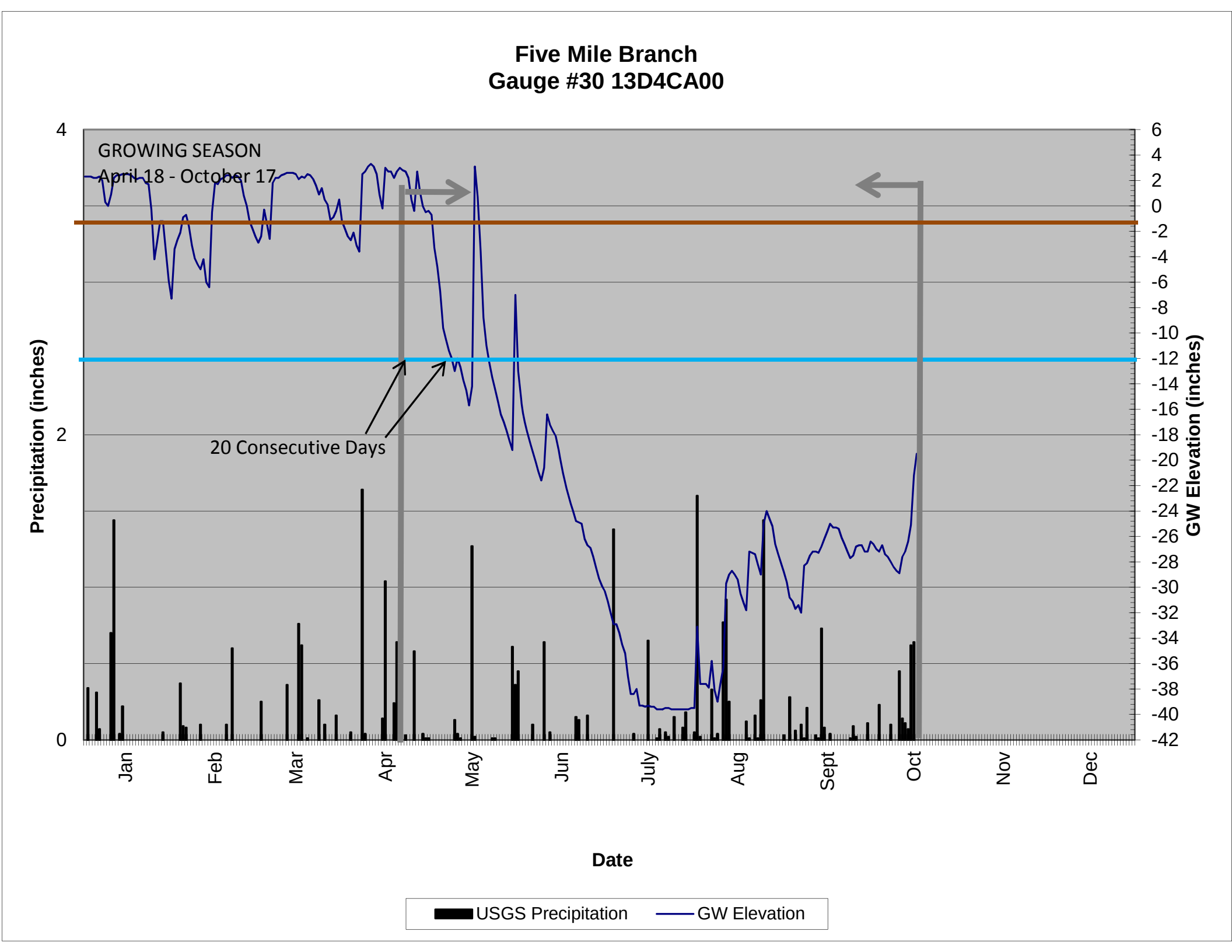
-40
-42
-44
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sept
Oct
Nov
Dec
Date
Precipitation
GW Elevation


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

Monitoring Gauge Number	Max Consecutive Hydroperiod: Saturation within 12 Inches of Soil Surface (Percent of Growing Season) WETS Station: USGS 354822080521501 Growing Season: 4/18 - 10/17						
	2013	2014	2015	2016	2017	2018	Mean
1	68.3	36.1					**52.2**
2	23.0	3.8					**13.4**
3	23.0	13.1					**18.1**
4	54.1	13.1					**33.6**
5	48.6	8.7					**28.7**
6	16.9	7.7					**12.3**
7[M]	16.4	3.0					**9.7**
8	100.0	42.1					**71.1**
9	22.4	33.9					**28.2**
10	100.0	33.3					**66.7**
11	16.4	11.5					**14.0**
12	42.6	20.8					**31.7**
13	44.3	19.7					**32.0**
14	37.2	10.9					**24.1**
15[M]	23.0	0.0					**11.5**
16[M]	23.5	0.0					**11.8**
17[M]	2.2	0.0					**1.1**
18	9.8	8.2					**9.0**
19[M]	34.4	0.0					**17.2**
20	20.8	14.2					**17.5**
21	100.0	42.1					**71.1**
22	100.0	100.0					**100.0**
23	100.0	100.0					**100.0**
24	16.9	13.7					**15.3**
25	53.6	27.9					**40.8**
26	100.0	20.8					**60.4**
27[M]	16.4	0.0					**8.2**
28	7.7	8.2					**8.0**
29	67.2	34.4					**50.8**
30	20.2	10.9					**15.6**

Annual Precip Total	57.6
WETS 30th Percent	34.9
WETS 70th Percent	51.5
Normal	Y

M Malfunction, Data Overwritten or Unretrievable

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

		Download Event Date								
Number	Initial Gauge Seriel 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
1	13D4B648	ok	ok	Failed	No attempt.	ok	Replaced with EBD3010.	No attempt.	OK. Deleted old data.	ok
2	14E14322	Reprogrammed due to inconsistent logging interval	Replaced with 12D4C9D8.	ok	No attempt.	ok	failed	No attempt.	OK. Deleted old data.	ok
3	1314FC9A	Failed	ok	ok	No attempt.	Failed	Replaced with 13152502.	No attempt.	OK. Deleted old data.	ok
4	13D49A3B	ok	ok	ok	No attempt.	ok	ok	No attempt.	Ok. Replaced battery. Deleted old data.	ok
5	14E16DC9	ok	ok	ok	No attempt.	ok	ok	No attempt.	OK. Deleted old data.	ok
6	14E1A3C5	Reprogrammed due to not downloading.	ok	ok	No attempt.	Failed	ok	No attempt.	Ok. Replaced battery. Deleted old data.	ok
7	13D4CA32	ok	ok	ok	No attempt.	ok	ok	No attempt.	Replaced with 1314FC9A	Partial data
8	13D49BC4	ok	ok	ok	No attempt.	ok	ok	No attempt.	OK. Deleted old data.	ok
9	136B6377	ok	ok	ok	No attempt.	Failed	Replaced with EBD20B9.	No attempt.	OK. Deleted old data.	ok
10	13D4B632	ok	ok	ok	No attempt.	ok	ok	No attempt.	OK. Deleted old data.	ok
11	14E178FC	ok	ok	ok	No attempt.	Failed	Replaced with EBD074F.	No attempt.	OK. Deleted old data.	ok
12	14E13DAE	ok	ok	ok	No attempt.	ok	ok	No attempt.	OK. Deleted old data.	ok
13	13D4A9D9	ok	ok	ok	No attempt.	ok	ok	No attempt.	Ok. Reprogrammed. Deleted old data.	ok
14	13D4C9C5	ok	ok	ok	No attempt.	Failed	ok	No attempt.	OK. Deleted old data.	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
16	11312B9E	ok	Failed	ok	No attempt.	No attempt due to malfunctioning handheld.	No attempt. Submerged	No attempt.	Replaced with EBCFF2F	Partial data
17	14E16DE5	ok	ok	ok	No attempt.	No attempt due to malfunctioning handheld.	ok	No attempt.	Ok. Replaced battery. Deleted old data.	Partial data
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
19	14E15453	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	Replaced with 13D4B648	Partial 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
21	9DE6D1F	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	Failed	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
23	13D4B61D	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	OK. Deleted old data.	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

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

		Download Event Date								
Number	Initial Gauge Seriel 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
25	13D4B624	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	OK. Deleted old data.	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
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
28	14E1973F	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	Failed	Partial data
29	14E177C0	ok	ok	No attempt due to accident.	ok	No attempt due to malfunctioning handheld.	No attempt.	ok	OK. Deleted old data.	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
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

Appendix F

Photographs

Photo Point 1. Boulder Vane 10/17/14

Photo Point 3. Looking downstream 10/17/14

Photo Point 1. Looking downstream 10/17/14

Photo Point 4. Floodplain looking east 10/17/14

Photo Point 2. Looking downstream 10/17/14

Photo Point 4. Boulder Vane 10/17/14

Photo Point 5. Cross Vane 10/17/14

Photo Point 7. Floodplain looking east 10/17/14

Photo Point 6. Boulder Vane 10/17/14

Photo Point 7. Floodplain looking west 10/17/14

Photo Point 7. Boulder Vane 10/17/14

Photo Point 8. Floodplain pool looking east 10/17/14

Photo Point 9. Beaver dam at Cross Vane 10/17/14

Photo Point 10. Floodplain looking west 10/17/14

Photo Point 10. Cross Vane 10/17/14

Photo Point 11. Looking downstream 10/17/14

Photo Point 10. Floodplain looking east 10/17/14

Photo Point 12. Floodplain looking west 10/17/14

Photo Point 12. Floodplain pool looking east 10/17/14

Photo Point 14. Floodplain pool looking east 10/17/14

Photo Point 13. Floodplain pool looking west 10/17/14

Photo Point 15. Floodplain pool looking west 10/17/14

Photo Point 13. Floodplain looking east 10/17/14

Photo Point 15. Floodplain looking east 10/17/14

Photo Point 16. Looking downstream 10/17/14

Photo Point 17. Floodplain looking north 10/17/14

Photo Point 16. Looking upstream 10/17/14

Photo Point 17. Floodplain looking east 10/17/14

Photo Point 17. Floodplain looking west 10/17/14

Photo Point 18. Cross Vane 10/17/14

Photo Point 19. Boulder Vanes 10/17/14

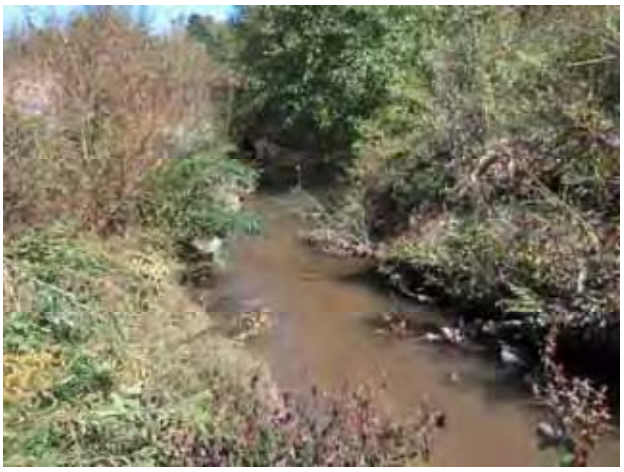


Photo Point 20. Looking downstream 10/17/14

Photo Point 20. Looking upstream 10/17/14

Photo Point 21. Rootwads 10/17/14

Photo Point 23. Boulder Vane 10/17/14

Photo Point 21. Looking downstream 10/17/14

Photo Point 23. Fallen tree 10/17/14

Photo Point 22. Cross Vane 10/17/14

Photo Point 24. Rootwads 10/17/14

Photo Point 24. Looking downstream 10/17/14

Photo Point 26. Rootwads 10/17/14

Photo Point 25. Cross Vane 10/17/14

Photo Point 26. Floodplain looking downstream 10/17/14

Photo Point 25. Cross Vane. Left arm scour. 10/17/14

Photo Point 27. Floodplain pool looking west 10/17/14

Photo Point 28. Floodplain looking west 10/17/14

Photo Point 28. Confluence looking east 10/17/14

Photo Point 30. Cross Vane 10/17/14

Photo Point 29. Looking downstream 10/17/14

Photo Point 31. Floodplain pool looking northwest 10/17/14

Photo Point 29. Floodplain looking east 10/17/14

Photo Point 31. Floodplain looking east 10/17/14

Photo Point 32. Looking downstream 10/17/14

Photo Point 34. Boulder Vane 10/17/14

Photo Point 33. Floodplain looking west 10/17/14

Photo Point 35. Boulder Vane 10/17/14

Photo Point 34. Boulder Vane 10/17/14

Photo Point 35. Boulder Vane 10/17/14

Photo Point 36. Looking downstream 10/17/14

Photo Point 37. Floodplain looking east 10/17/14

Photo Point 36. Looking upstream 10/17/14

Photo Point 38. Cross Vane 10/17/14

Photo Point 37. Floodplain pool looking north 10/17/14

Photo Point 38. Looking south 10/17/14

Photo Point 39. Looking upstream 10/17/14

Photo Point 40 Cross Vane 10/17/14

Photo Point 39. Looking downstream 10/17/14

Photo Point 40. Looking downstream 10/17/14

Photo Point 39. Floodplain looking east 10/17/14

Photo Point 41. Floodplain looking west 10/17/14