MY02 MONITORING REPORT

Hip Bone Creek Restoration Site
Chatham County
Cape Fear River Basin - 3030003

DMS Project #100059
DMS Contract #7528
DMS RFP #16-007331
USACE AID #: SAW 2018-01160 DWR #: 2018-0785
Monitoring Data Collected: 2022

Prepared for:
NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699

NORTH CAROLINA
Department of Environmental Quality

Monitoring and Design Firm

Prepared by:

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MEMORANDUM

Date: February 9, 2023
To: Jeremiah Dow, DMS Project Manager
From: Adam Spiller, Project Manager
KCI Associates of North Carolina, PA
Subject: MY-02 Monitoring Report Comments
Hip Bone Creek DMS#100059, Contract 007528
Cape Fear River Basin CU 03040101
Chatham County, North Carolina

Please find below our responses in italics to the MY-02 Monitoring Report comments from NCDMS received on January 31, 2023, for the Hip Bone Creek Restoration Site.

1. Please update the wetland credits in the CCPV Legend to match the project credits in Table 1.
   KCI Response: This error has been corrected.

2. VP 7 is colored red on the CCPV. Is this due to only having 3 species in the plot since it met the stem/acre interim success criteria? Please clarify.
   KCI Response: That is correct, VP7 is colored red due to having only 3 different species.

3. The wetland gauges on the CCPV are not colored correctly according to successful/not successful. For example, WM4, WM5, and WM8 are incorrectly shown as not meeting success and WM 7 is shown as meeting when it did not.
   KCI Response: This error has been corrected.

4. Please remove BHR calculations from pool cross sections in the cross-section plots and Table 9.
   KCI Response: BHR calculations have been removed from pool cross-section plots and Table 9.

5. For Table 13, recommend a Yes/No preceded the percentage (similar to Table 12) and/or color code the text red and blue to match the CCPV based on meeting success or not. This makes it much easier to visually see trends over the course of monitoring.
   KCI Response: This change has been made.

6. Would be useful to add hydroperiod percentage beside number of days on hydrographs, i.e., 50 Days/22.9% for WM-1, etc.
   KCI Response: This change has been made.

Please contact me if you have any questions or would like clarification concerning these responses.
Sincerely,

Adam Spiller
Project Manager

TABLE OF CONTENTS

Appendix A – Visual Assessment Data

Appendix B – Vegetation Plot Data

Appendix C – Stream Geomorphology Data

Appendix D – Hydrologic Data

Appendix E – Project Timeline and Contact Info

PROJECT SUMMARY

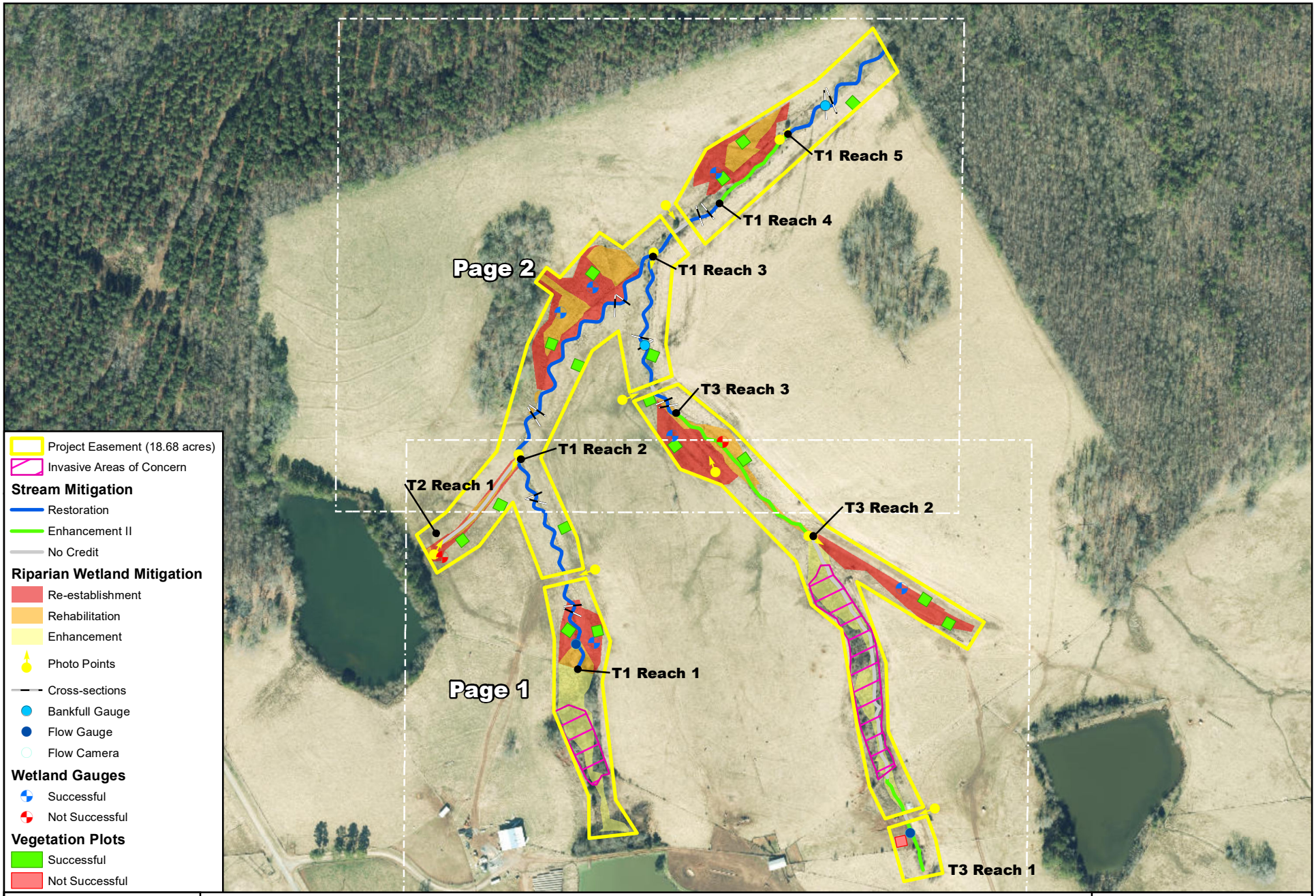
The Hip Bone Creek Restoration Site (HBCRS) is a full delivery project for the North Carolina Division of Mitigation Services (DMS). The site restored and enhanced a total of 4,026 linear feet of stream and 6.023 acres of riparian wetland. The HBCRS is a riparian system in the Cape Fear River Basin (03030003 8-digit cataloging unit) in Chatham County, North Carolina. The site's natural hydrologic regime had been substantially modified by relocation and straightening, impacts from cattle, installation of field ditches, and other anthropogenic impacts. This site restored impacted agricultural lands to a stable stream and wetland ecosystem with a functional riparian buffer, floodplain access, and riparian wetlands. Project planting and construction were completed in April 2021 and the monitoring components were installed in May 2021.

Table 1. Hip Bone Creek Restoration Site (ID-100059) Project Mitigation Quantities and Credits

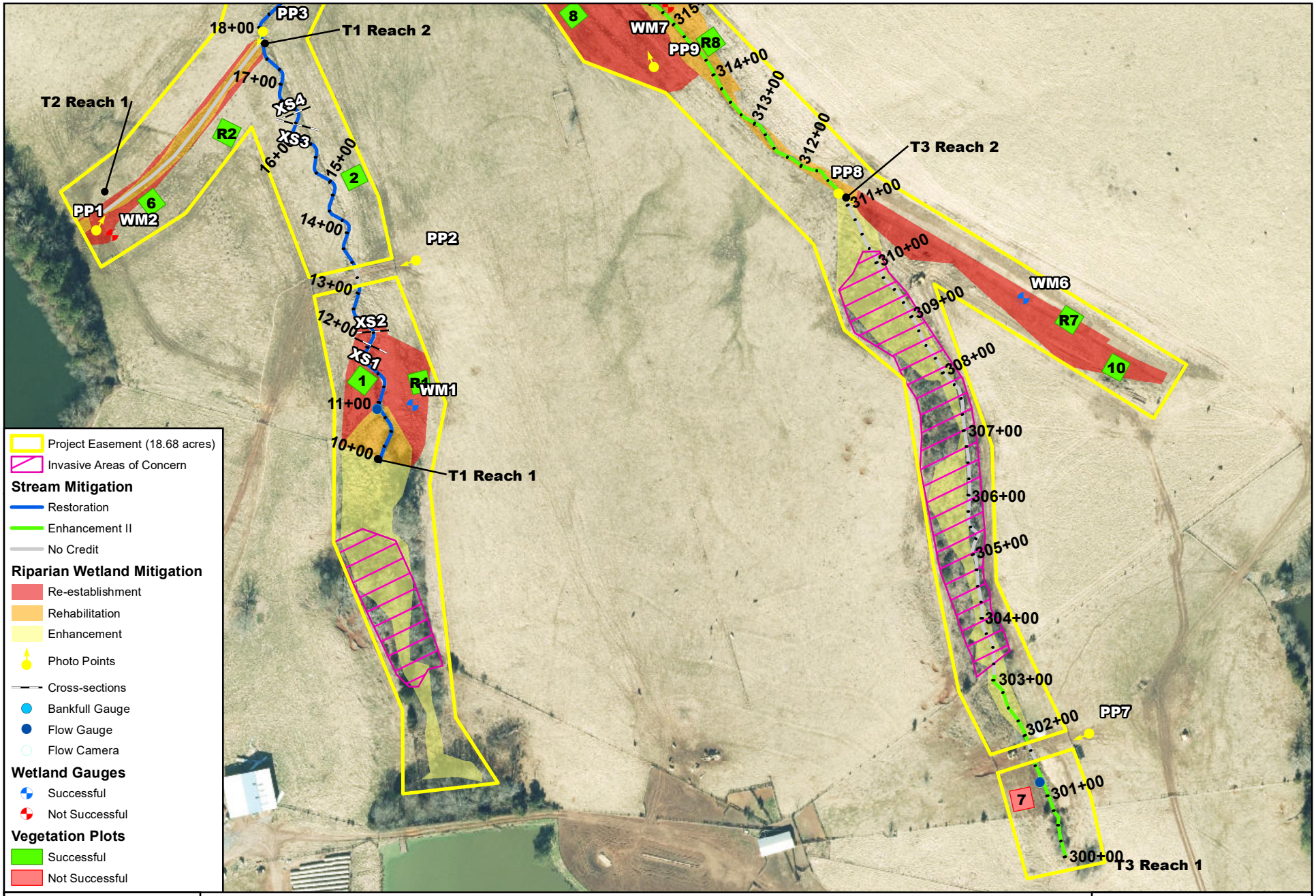
Project Segment	Original Mitigation Plan Ft/Ac	As-Built Ft/ Ac	Original Mitigation Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Credits		Comments
Stream								
T1 Reach 1	780	745	Warm	R	1.00000	750.000		30' exception STA 13+12 to 13+42
T1 Reach 2	906	890	Warm	R	1.00000	906.000		
T1 Reach 3	269	208	Warm	R	1.00000	209.000		60' exception STA 27+77 to 28+37
T1 Reach 4	295	295	Warm	EII	2.50000	118.000		
T1 Reach 5	452	447	Warm	R	1.00000	452.000		
T3 Reach 1	310	280	Warm	EII	2.50000	112.000		30' exception STA 301+57 to 301+87
T3 Reach 2	591	590	Warm	EII	2.50000	236.400		
T3 Reach 3	573	545	Warm	R	1.00000	543.000		30' exception STA 317+98 to 318+28
					Total:	**3,326.400**		
Wetland								
Riparian Enhancement	1.495	1.473	R	E	2.50000	0.598		
Riparian Re-establishment	3.040	3.04	R	REE	1.00000	3.040		
Riparian Rehabilitation	1.488	1.471	R	RH	1.50000	0.992		
					Total:	**4.630**		

Project Credits

Restoration Level	Stream			Riparian Wetland	Non-Riparian Wetland	Coastal Marsh
	Warm	Cool	Cold			
Restoration	2,860.000					
Re-establishment				3.040		
Rehabilitation				0.992		
Enhancement				0.598		
Enhancement I						
Enhancement II	466.400					
Creation						
Preservation						
Total	**3,326.400**			**4.630**		

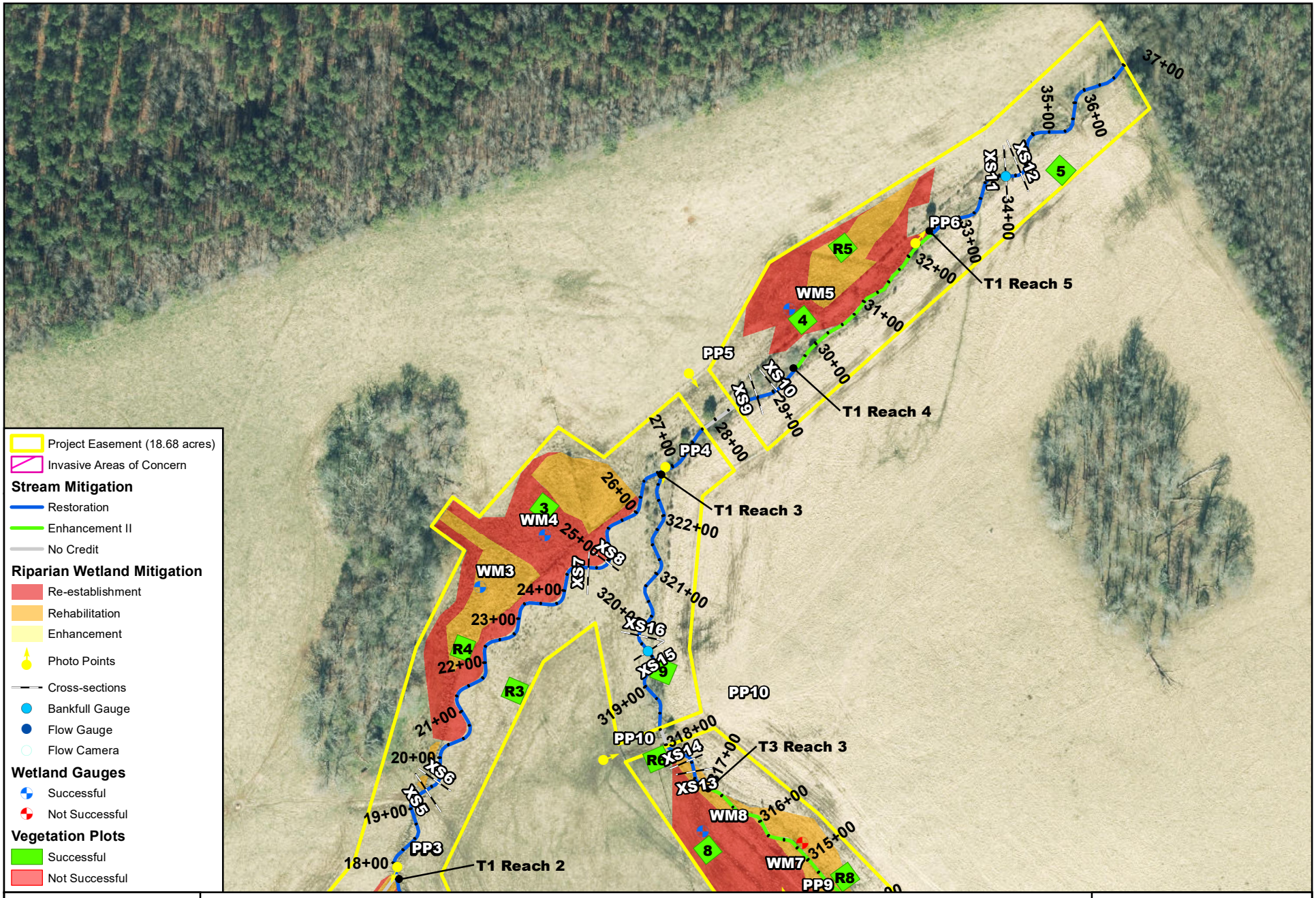


CURRENT CONDITIONS PLANVIEW PAGE
HIP BONE CREEK RESTORATION SITE
CHATHAM COUNTY, NC



CURRENT CONDITIONS PLANVIEW PAGE
HIP BONE CREEK RESTORATION SITE
CHATHAM COUNTY, NC

Image Source: Esri, Maxar, Earthstar Geographics, USDA FSA, USGS, Aerogrid, IGN, IGP, and the GIS User Community


Project Easement (18.68 acres)
Invasive Areas of Concern
Stream Mitigation
Restoration
Enhancement II
No Credit
Riparian Wetland Mitigation
Re-establishment
Rehabilitation
Enhancement
Photo Points
Cross-sections
Bankfull Gauge
Flow Gauge
Flow Camera
Wetland Gauges
Successful
Not Successful
Vegetation Plots
Successful
Not Successful
T1 Reach 2
T1 Reach 3
T1 Reach 4
T1 Reach 5
T3 Reach 3
PP3
PP4
PP5
PP6
PP9
PP10
WM3
WM4
WM5
WM7
WM8
R3
R4
R5
R6
R8
XS1
XS6
XS7
XS8
XS9
XS10
XS11
XS12
XS13
XS14
XS15
XS16
18+00
19+00
20+00
21+00
22+00
23+00
24+00
25+00
26+00
27+00
28+00
29+00
30+00
31+00
32+00
33+00
34+00
35+00
36+00
37+00
315+00
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317+00
318+00
319+00
320+00
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322+00
0
100
200
Feet
CURRENT CONDITIONS PLANVIEW PAGE
HIP BONE CREEK RESTORATION SITE
CHATHAM COUNTY, NC
N
Image Source: Esri, Maxar, Earthstar Geographics, USDA FSA, USGS, Aerogrid, IGN, IGP, and the GIS User Community

Table 2. Hip Bone Creek Restoration Site (ID-100059) Goals, Performance and Results

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Restore a channelized stream to a meandering C-type channel with a floodplain	-Relocate channelized streams to historic landscape positions -Install a bankfull-sized channel cross-section - Install bedform diversity with pools, riffles, and habitat strucures	Dispersion of high flows on the floodplain, increase in biogeochemical cycling within the system, and recharging of riparian wetlands.	BHR<1.2, ER>2.2, and no change >10% in BHR or ER between monitoring events; 4 bankfull events; continuous flow for at least 30 days each year	16 cross-section surveys, 4 pressure transducer stream gauges (measuring bankfull events on T1-5 and T3-3 and stream flow on T1-1 and T3-1), annual visual inspection	All 16 XS have BHR<1.2 and ER>2.2; 5 BKF event in 2022; T1-1 flow for 218 consecutive days, T3-1 flow for 242 consecutive days
Buffer and reduce sediment impacts to the project stream	Demarcate the project easement boundaries and fence out livestock	Reduction in sediment, nutrient, and fecal coliform inputs to.	Fence intact around entire easement, adequate signage present around easement boundary	Annual visual inspection	Fencing installation completed 10/4/21, fence and signs are in good condition
Restorea forested riparian community	Plant the site with native trees and shrubs and a herbaceous seed mix	Reduction in floodplain sediment inputs from runoff, increased bank stability, increased LWD and organic material in streams.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7; at least 4 native hardwood species in each plot	18 vegetation plots	All veg plots >320 stems/acre; 17 veg plots >4 native hardwood species
Restore a wetland hydroperiod to drained and/or livestock-impacted land	Reconnect streams to floodplain; redevelop wetland microtopography to slow the flow of surface and subsurface drainage	Increase in wetland hydroperiod and biogeochemical cycling within the system, decrease in sediment and nutrient inputs to streams.	Continuous saturation within 12" of the soil surface for 12% of the growing season (26 days)	8 pressure transducer gauges	6/8 gauges >12% continuous saturation in 2022

Table 3. Hip Bone Creek Restoration Site (ID-100059) Project Attribute Table

Project Name	Hip Bone Creek Restoration Site		
County	Chatham County		
Project Area (acres)	18.68		
Project Coordinates (latitude and longitude decimal degrees)	35.6804 N, -79.4018 W		
Project Watershed Summary Information			
Physiographic Province	Piedmont		
River Basin	Cape Fear		
USGS Hydrologic Unit 8-digit	3030003		
DWR Sub-basin	03-06-12		
Project Drainage Area (acres)	158		
Project Drainage Area Percentage of Impervious Area	1%		
Land Use Classification	Pasture/Farmland (85%), Forest (9%), Open Water (5%), and Rural Development (1%)		
Reach Summary Information			
Parameters	**Reach 1**	**Reach 3**	
Pre-project length (feet)	2,439	1,403	
Post-project (feet)	2,702	1,474	
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Unconfined	
Drainage area (acres)	158	43	
Perennial, Intermittent, Ephemeral	Intermittent	Intermittent	
NCDWR Water Quality Classification	C	C	
Dominant Stream Classification (existing)	G4	G4	
Dominant Stream Classification (proposed)	C4/C4b	C4	
Dominant Evolutionary class (Simon) if applicable	Channelized, Stage III	Channelized, Stage III	
Wetland Summary Information			
Parameters	**WA and WE**	**WB, WC, WD, WF, and WG**	
Pre-project (acres)	2.52	0.99	
Post-project (acres)	2.78	2.67	
Wetland Type (non-riparian, riparian)	Riparian	Riparian	
Mapped Soil Series	Georgeville	Chewacla/Wehadkee	
Soil Hydric Status	Non-hydric	Hydric	
Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	Yes	SAW-2018-01160
Water of the United States - Section 401	Yes	Yes	DWR# 18-0785
Endangered Species Act	Yes	Yes	USFWS
Historic Preservation Act	No	N/A	NCSHPO
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

MONITORING RESULTS

The second year of vegetation monitoring was conducted June 13 and 14, 2022. During the site's second growing season all 18 vegetation monitoring plots achieved the success criteria of 320 stems/acre and only one plot (Plot 7F, 3 species) had less than 4 woody species. Across all of the plots the site average 933 planted stems/acre. Including volunteers the site average 1,021 stems/acre. Two areas where Chinese privet is growing are present on the site. These areas are mainly in and around the wetland enhancement areas along T1 and T3 where there was existing tree cover prior to project construction. Scattered stems of Chinese privet are present throughout the understory of these areas. KCI treated these areas on July 28, 2022. Further treatment is planned for the spring of 2023. Overall the site is well vegetated with many planted and volunteer woody stems throughout the whole project and a robust and diverse herbaceous layer.

The MY02 cross-section survey was completed on July 12, 2022. The MY02 survey found that the stream was functioning as designed with no problem areas identified. All 16 cross-sections had bank height ratios less than 1.2 and entrenchment ratios greater than 2.2.

Based on the WETS table for Siler City 2 N Station in Siler City, NC, the growing season for the site extends from April 2 until November 5 (218 days). The daily rainfall data was obtained from an on-site rain gauge. In 2022, the months of March and November experienced average rainfall. February, April, June, July, August, September, and October experienced below average rainfall while January and May recorded above average rainfall. Overall the site experienced well below average rainfall during 2022. According to the USACE's Antecedent Precipitation Tool (APT), the site experienced drier than normal conditions for the month of February, before a large scale rain event at the beginning of March pushed it into wetter than normal conditions until April 15. At this point the site remained within normal or drier than normal conditions until November 12, except for a brief period at the beginning of June and a brief period at the beginning of October when the site experienced wetter than normal conditions. During this period from April 15 to November 12 (212 days), which roughly corresponds to the site's growing season, the site experienced drier than normal conditions for 92 days (43%) and normal conditions for 96 days (45%). The site experienced wetter than normal conditions for only 24 days (11%) during this period.

During the site's second growing season, 6 of the 8 gauges achieved the success criteria of 12% continuous saturation (26 days). Both of the stream flow gauges recorded greater than 30 consecutive day of flow. This data was further backed up by the flow cameras which also both showed greater than 30 consecutive days of flow despite being obscured by vegetation for a large portion of the summer. Five bankfull events were recorded in 2022.

REFERENCES

NCDENR, Ecosystem Enhancement Program. 2009. Cape Fear River Basin Restoration Priorities 2009. Raleigh, NC. https://files.nc.gov/ncdeq/Mitigation%20Services/Watershed_Planning/Cape_Fear_River_Basin/RBRP%20CapeFear%202009%20Revised%20032013.pdf

NCDEQ, Division of Mitigation Services. June 2017. "As-built Baseline Monitoring Report Format, Data and Content Requirement." https://files.nc.gov/ncdeq/Mitigation%20Services/Document%20Management%20Library/Guidance%20and%20Template%20Documents/6_AB_Baseline__Rep_Templ_June%202017.pdf

NCIRT. October 24, 2016. "Wilmington District Stream and Wetland Compensatory Mitigation Update." https://saw-reg.usace.army.mil/PN/2016/Wilmington-District-Mitigation-Update.pdf

USACE, Sprecher, S. W.; Warne, A. G. 2000. "Accessing and Using Meteorological Data to Evaluate Wetland Hydrology." https://ntrl.ntis.gov/NTRL/dashboard/searchResults/titleDetail/ADA378910.xhtml

USACE, Deters, J. C. 2021. "Antecedent Precipitation Tool." https://github.com/jDeters-USACE/Antecedent-Precipitation-Tool/releases/tag/v1.0.19

APPENDIX A

Visual Assessment Data

Table 4. Hip Bone Creek Resotration Site (ID-100059) Visual Stream Stability Assessment

Reach T1
Assessed Stream Length 2702
Assessed Bank Length 5404

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	Surface Scour/Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	16	16		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	16	16		100%

Reach T3
Assessed Stream Length 1,474
Assessed Bank Length 2,948

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	Surface Scour/Bare Bank	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
				Totals	0	100%
Structure	Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	7	7		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	7	7		100%

Table 5. Hip Bone Creek Restoration Site (ID-100059) Visual Vegetation Assessment

Planted acreage **17.4**

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10acres	0.00	0.0%
		Total	0.00	0.0%
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10 acres	0.00	0.0%
		Cumulative Total	0.00	0.0%

Easement Acreage **18.7**

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Species included in summation above should be identified in report summary.	0.10 acres	1.62	8.7%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	0	

Photo Reference Photos

PP1 – MY-00 – 5/24/21

PP1 – MY-02 – 11/18/22

PP2 – MY-00 – 5/24/21

PP2 – MY-02 – 11/18/22

PP3 – MY-00 – 5/24/21

PP3 – MY-02 – 11/18/22

PP4 – MY-00 – 5/24/21

PP4 – MY-02 – 11/18/22

PP5 – MY-00 – 5/24/21

PP5 – MY-02 – 11/18/22

PP6 – MY-00 – 5/24/21

PP6 – MY-02 – 11/18/22

PP7 – MY-00 – 5/24/21

PP7 – MY-02 – 11/18/22

PP8 – MY-00 – 5/24/21

PP8 – MY-02 – 11/18/22

PP9 – MY-00 – 5/24/21

PP9 – MY-02 – 11/18/22

PP10 – MY-00 – 5/24/21

PP10 – MY-02 – 11/18/22

Vegetation Monitoring Plot Photos

Vegetation Plot 1 – MY-00 – 5/14/21

Vegetation Plot 1 – MY-02 – 6/13/22

Vegetation Plot 2 – MY-00 – 5/13/21

Vegetation Plot 2 – MY-02 – 6/13/22

Vegetation Plot 3 – MY-00 – 5/13/21

Vegetation Plot 3 – MY-02 - 6/13/22

Vegetation Plot 4 – MY-00 – 5/13/21

Vegetation Plot 4 – MY-02 – 6/14/22

Vegetation Plot 5 – MY-00 – 5/13/21

Vegetation Plot 5 – MY-02 – 6/14/22

Vegetation Plot 6 – MY-00 – 5/14/21

Vegetation Plot 6 – MY-02 – 6/13/22

Vegetation Plot 7 – MY-00 – 5/13/21

Vegetation Plot 7 – MY-02 – 6/13/22

Vegetation Plot 8 – MY-00 – 5/13/21

Vegetation Plot 8 – MY-02 – 6/14/22

Vegetation Plot 9 – MY-00 – 5/13/21

Vegetation Plot 9 – MY-02 - 6/13/22

Vegetation Plot 10 – MY-00 – 5/13/21

Vegetation Plot 10 – MY-02 – 6/14/22

Vegetation Plot R1 – MY-02 – 6/13/22

Vegetation Plot R2 – MY-02 – 6/13/22

Vegetation Plot R3 – MY-02 – 6/13/22

Vegetation Plot R4 – MY-02 – 6/13/22

Vegetation Plot R5 – MY-02 – 6/14/22

Vegetation Plot R6 – MY-02 – 6/14/22

Vegetation Plot R7 – MY-02 – 6/14/22

Vegetation Plot R8 – MY-02 – 6/14/22

APPENDIX B

Vegetation Plot Data

Table 6. Vegetation Performance Standards Summary Table

Hip Bone Creek Restoration Site (ID-100059)

	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/ Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/ Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/ Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	1093	3	8	0	1012	3	6	0	810	2	6	0
Monitoring Year 1	1052	2	8	0	972	2	6	0	729	2	6	0
Monitoring Year 0	1093	1	8	0	1174	2	6	0	688	2	6	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	850	2	6	0	1012	2	4	0	1012	3	5	0
Monitoring Year 1	850	2	6	0	891	2	4	0	810	2	5	0
Monitoring Year 0	769	1	5	0	1012	1	4	0	810	2	5	0
	Veg Plot 7 F				Veg Plot 8 F				Veg Plot 9 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	1052	2	3	0	850	3	5	0	1214	2	5	0
Monitoring Year 1	1052	1	3	0	850	2	5	0	1093	2	4	0
Monitoring Year 0	1093	2	3	0	850	1	5	0	1174	1	5	0
	Veg Plot 10 F				Veg Plot Group 1 R				Veg Plot Group 2 R			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	1214	2	6	0	891	3	5	0	850	3	5	0
Monitoring Year 1	1255	2	7	0								
Monitoring Year 0	1498	2	7	0								
	Veg Plot Group 3 R				Veg Plot Group 4 R				Veg Plot Group 5 R			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	1133	2	5	0	769	4	4	5	931	2	6	0
Monitoring Year 1												
Monitoring Year 0												
	Veg Plot Group 6 R				Veg Plot Group 7 R				Veg Plot Group 8 R			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	931	2	6	0	2550	2	8	0	607	3	4	0
Monitoring Year 1												
Monitoring Year 0												

Table 7. Vegetation Plot Data

Hip Bone Creek Restoration Site (ID-100059)

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	*Betula nigra*	River Birch	Tree	FACW	11	11	6	6	3	3	5	5	14	14
	Cornus amomum	Silky Dogwood	Shrub	FACW										
	Diospyros virginiana	Persimmon	Tree	FACW	1	1	1	1	2	2	2	2		
	Platanus occidentalis	American Sycamore	Tree	FAC	7	7	12	12	4	4	6	6	8	8
	Quercus falcata	Southern Red Oak	Tree	FACU	1	1	1	1	3	3			1	1
	Quercus michauxii	Swamp Chestnut Oak	Tree	FACW	2	2					1	1		
	Quercus palustris	Pin Oak	Tree	FACW	2	2	1	1	5	5	2	2		
	Quercus phellos	Willow Oak	Tree	FAC	1	1	4	4	3	3	5	5	3	3
	Salix nigra	Black Willow	Tree	OBL	1	**2**								
	Salix sericea	Silver Willow	Tree	OBL										
Sum	Performance Standard				26	27	25	25	20	20	21	21	26	26
Post Mitigation Plan Species	*Acer rubrum*	*red maple*	*Tree*	*FAC*						**15**				
	Baccharis halimifolia	*eastern baccharis*	*Tree*	*FACW*										
	Cephalanthus occidentalis	*common buttonbush*	*Shrub*	*OBL*										
	Juglans nigra	*black walnut*	*Tree*	*FACU*										
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*						**11**				
	Liriodendron tulipifera	*tuliptree*	*Tree*	*FACU*						**2**				
	Pinus taeda	*loblolly pine*	*Tree*	*FAC*						**1**				
	Populus deltoides	*eastern cottonwood*	*Tree*	*FAC*										
	Rhus copallinum	*winged sumac*	*Tree*	*FACU*										
	Rhus glabra	*smooth sumac*	*Tree*											
	Ulmus alata	*winged elm*	*Tree*	*FACU*						**1**				
	Ulmus americana	*American elm*	*Tree*	*FACW*						**5**				
Sum	Proposed Standard				26	27	25	25	20	20	21	21	26	26
Invasives	*Ligustrum sinense*	*Chinese privet*	*Tree*	*FACU*										
Mitigation Plan Performance Standard	Current Year Stem Count					27		25		20		21		26
	Stems/Acre					1093		1012		810		850		1012
	Species Count					8		6		6		6		4
	Dominant Species Composition (%)					41		48		27		29		54
	Average Plot Height					3		3		2		2		2
	% Invasives					0		0		0		0		0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.

2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded), species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).

3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 7. Vegetation Plot Data

Hip Bone Creek Restoration Site (ID-100059)

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F		Veg Plot 9 F		Veg Plot 10 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	*Betula nigra*	River Birch	Tree	FACW	6	6	1	1	22	22	17	17		
	Cornus amomum	Silky Dogwood	Shrub	FACW										
	Diospyros virginiana	Persimmon	Tree	FACW	1	1					1	1		
	Platanus occidentalis	American Sycamore	Tree	FAC	14	**19**	11	11	2	2	5	5	10	10
	Quercus falcata	Southern Red Oak	Tree	FACU					1	1	2	2	5	5
	Quercus michauxii	Swamp Chestnut Oak	Tree	FACW										
	Quercus palustris	Pin Oak	Tree	FACW	1	1			3	3			2	2
	Quercus phellos	Willow Oak	Tree	FAC	1	1	17	17	1	1	6	6	13	13
	Salix nigra	Black Willow	Tree	OBL										
	Salix sericea	Silver Willow	Tree	OBL										
Sum	Performance Standard				23	28	29	29	29	29	31	31	30	30
Post Mitigation Plan Species	*Acer rubrum*	*red maple*	*Tree*	*FAC*		**3**								
	Baccharis halimifolia	*eastern baccharis*	*Tree*	*FACW*										**4**
	Cephalanthus occidentalis	*common buttonbush*	*Shrub*	*OBL*										
	Juglans nigra	*black walnut*	*Tree*	*FACU*		**1**						**1**		
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*										
	Liriodendron tulipifera	*tuliptree*	*Tree*	*FACU*										
	Pinus taeda	*loblolly pine*	*Tree*	*FAC*										
	Populus deltoides	*eastern cottonwood*	*Tree*	*FAC*										
	Rhus copallinum	*winged sumac*	*Tree*	*FACU*										
	Rhus glabra	*smooth sumac*	*Tree*											
	Ulmus alata	*winged elm*	*Tree*	*FACU*										
	Ulmus americana	*American elm*	*Tree*	*FACW*										
Sum	Proposed Standard				23	28	29	29	29	29	31	31	30	30
Invasives	*Ligustrum sinense*	*Chinese privet*	*Tree*	*FACU*										
Mitigation Plan Performance Standard	Current Year Stem Count					28		29		29		31		30
	Stems/Acre					1012		1052		850		1214		1214
	Species Count					5		3		5		5		6
	Dominant Species Composition (%)					59		59		76		53		38
	Average Plot Height					3		2		3		2		2
	% Invasives					0		0		0		0		0

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3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 7. Vegetation Plot Data

Hip Bone Creek Restoration Site (ID-100059)

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 1 R	Veg Plot 2 R	Veg Plot 3 R	Veg Plot 4 R	Veg Plot 5 R	Veg Plot 6 R	Veg Plot 7 R	Veg Plot 8 R
					Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	*Betula nigra*	River Birch	Tree	FACW	9	8	16	5	7	5	4	
	Cornus amomum	Silky Dogwood	Shrub	FACW							13	
	Diospyros virginiana	Persimmon	Tree	FACW	1			**1**	1	**2**	1	**2**
	Platanus occidentalis	American Sycamore	Tree	FAC	7	**8**	1	**6**	2	2	23	8
	Quercus falcata	Southern Red Oak	Tree	FACU		**2**	7		4	**7**		**1**
	Quercus michauxii	Swamp Chestnut Oak	Tree	FACW			3					
	Quercus palustris	Pin Oak	Tree	FACW	1	1	1		3	**4**	3	
	Quercus phellos	Willow Oak	Tree	FAC	4	2			6	3	11	4
	Salix nigra	Black Willow	Tree	OBL				**7**			7	
	Salix sericea	Silver Willow	Tree	OBL							1	
Sum	Performance Standard				22	21	28	19	23	23	63	15
Post Mitigation Plan Species	*Acer rubrum*	*red maple*	*Tree*	*FAC*				**13**				
	Baccharis halimifolia	*eastern baccharis*	*Tree*	*FACW*				**1**				
	Cephalanthus occidentalis	*common buttonbush*	*Shrub*	*OBL*					*3*			
	Juglans nigra	*black walnut*	*Tree*	*FACU*								**1**
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*				**2**	*1*			**1**
	Liriodendron tulipifera	*tuliptree*	*Tree*	*FACU*								
	Pinus taeda	*loblolly pine*	*Tree*	*FAC*								
	Populus deltoides	*eastern cottonwood*	*Tree*	*FAC*				**1**				
	Rhus copallinum	*winged sumac*	*Tree*	*FACU*			*2*					
	Rhus glabra	*smooth sumac*	*Tree*				*1*					
	Ulmus alata	*winged elm*	*Tree*	*FACU*								
	Ulmus americana	*American elm*	*Tree*	*FACW*			*3*	**7**		**2**		**1**
Sum	Proposed Standard				22	21	28	19	23	23	63	15
Invasives	*Ligustrum sinense*	*Chinese privet*	*Tree*	*FACU*				*1*				
Mitigation Plan Performance Standard	Current Year Stem Count				22	21	28	19	23	23	63	15
	Stems/Acre				891	850	1133	769	931	931	2550	607
	Species Count				5	5	5	4	6	6	8	4
	Dominant Species Composition (%)				41	38	47	30	26	28	37	44
	Average Plot Height				3	3	2	4	2	2	2	3
	% Invasives				0	0	0	5	0	0	0	0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.

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APPENDIX C

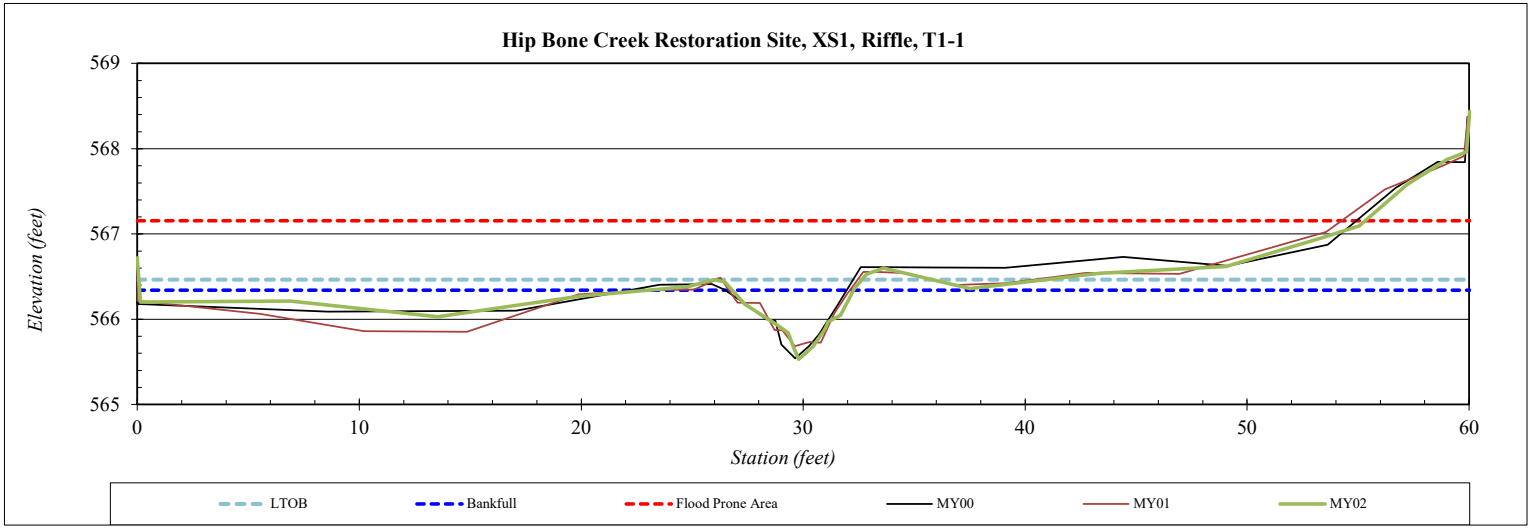
Stream Geomorphology Data

Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS1
Drainage Area (sq mi):	0.06
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	566.72
0.1	566.20
6.9	566.21
13.5	566.03
19.9	566.27
24.8	566.38
26.0	566.46
26.5	566.44
27.4	566.18
28.7	565.95
29.3	565.84
29.6	565.66
29.8	565.53
30.4	565.68
31.0	565.89
31.1	565.97
31.7	566.05
32.3	566.36
32.8	566.53
33.6	566.60
37.5	566.36
43.4	566.54
49.0	566.62
53.3	566.95
55.1	567.10
57.2	567.58
59.0	567.87
59.9	567.96
60.0	568.44

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	566.34
Bankfull Cross-Sectional Area (sq ft):	2.1
LTOB Cross-Sectional Area (sq ft):	2.8
Bankfull Width (ft):	5.5
Flood Prone Area Elevation (ft):	567.15
Flood Prone Width (ft):	55
Max Depth at Bankfull (ft):	0.8
Mean Depth at Bankfull (ft):	0.4
W / D Ratio (ft/ft):	14.1
Entrenchment Ratio (ft/ft):	10.1
Bank Height Ratio (ft/ft):	1.1
Thalweg Elevation (ft):	565.53

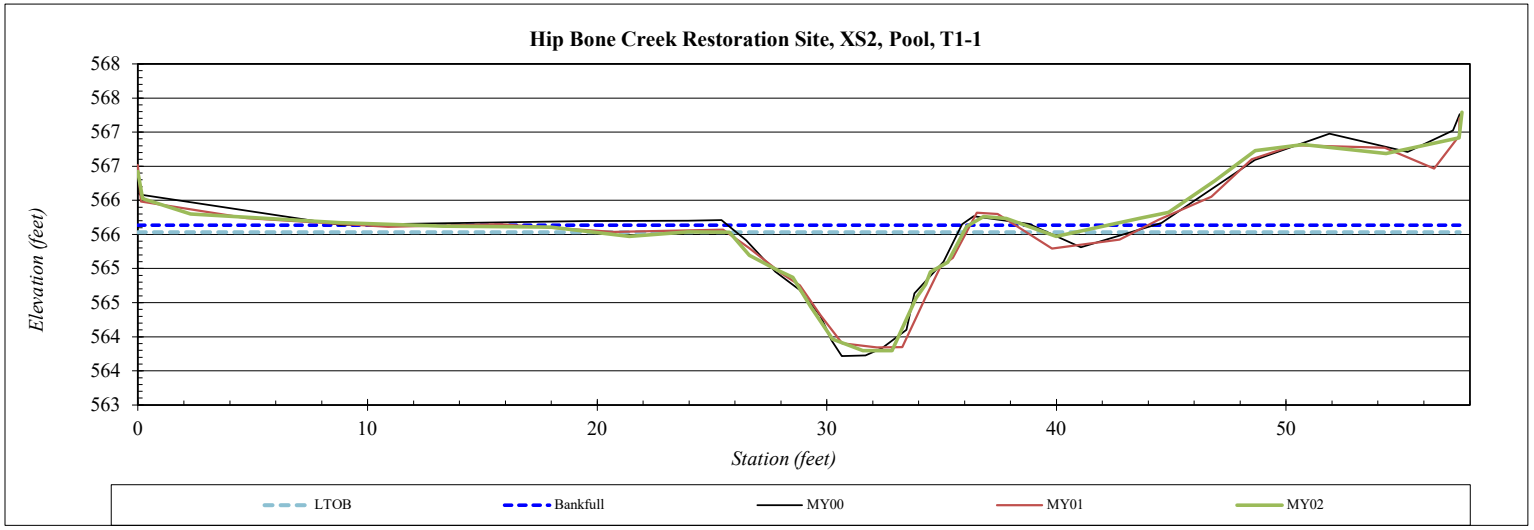


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS2
Drainage Area (sq mi):	0.06
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	566.42
0.2	566.02
2.3	565.80
8.8	565.67
13.3	565.62
18.0	565.61
21.4	565.47
23.9	565.54
25.8	565.53
26.6	565.19
27.8	564.98
28.5	564.87
29.3	564.44
30.2	563.97
31.6	563.79
32.8	563.79
33.9	564.56
34.3	564.77
34.5	564.95
35.3	565.09
36.1	565.62
36.8	565.76
37.8	565.74
40.0	565.47
43.7	565.74
44.9	565.83
46.9	566.29
48.6	566.73
50.7	566.82
54.4	566.69
57.5	566.92
57.7	567.29

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	565.63
Bankfull Cross-Sectional Area (sq ft):	10.9
LTOB Cross-Sectional Area (sq ft):	9.9
Bankfull Width (ft):	10.4
Flood Prone Area Elevation (ft):	---
Flood Prone Width (ft):	---
Max Depth at Bankfull (ft):	1.8
Mean Depth at Bankfull (ft):	1.0
W / D Ratio (ft/ft):	---
Entrenchment Ratio (ft/ft):	---
Bank Height Ratio (ft/ft):	---
Thalweg Elevation (ft):	563.79

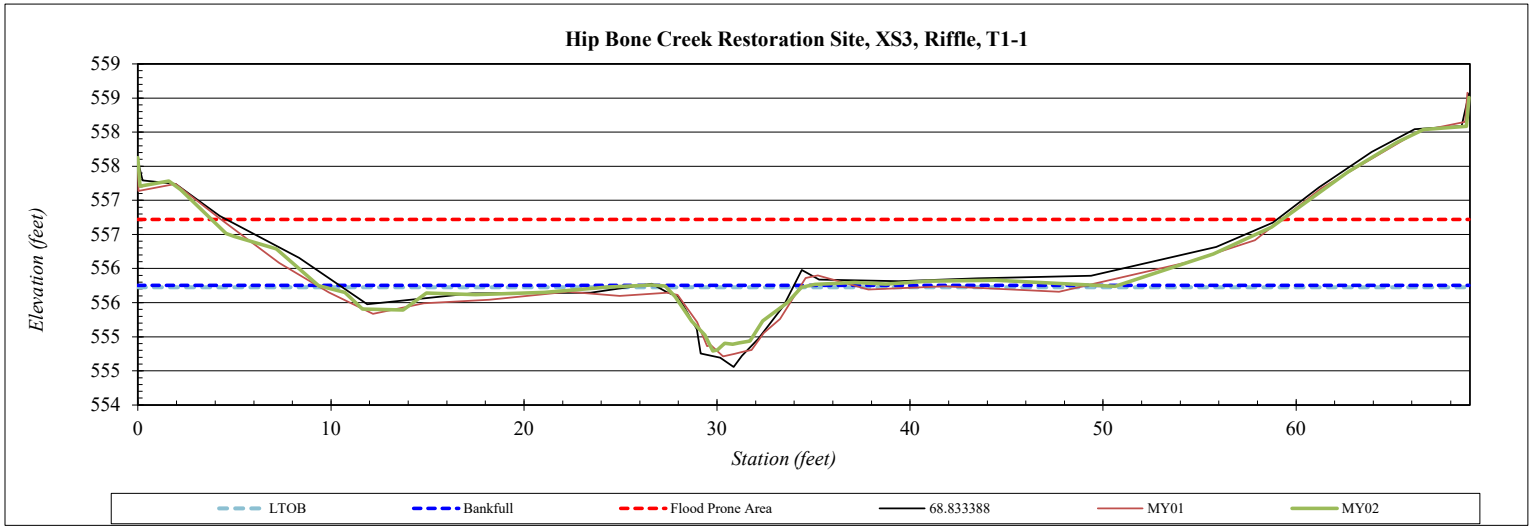


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS3
Drainage Area (sq mi):	0.08
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	557.62
0.1	557.21
1.6	557.28
2.2	557.16
4.6	556.51
5.0	556.47
7.2	556.29
9.4	555.75
10.7	555.65
11.6	555.40
13.7	555.39
14.9	555.64
17.5	555.62
21.0	555.65
24.4	555.73
26.6	555.76
27.3	555.74
27.8	555.59
28.7	555.23
29.4	555.03
29.8	554.79
30.0	554.81
30.4	554.91
30.8	554.89
31.1	554.91
31.7	554.94
32.4	555.23
33.6	555.50
34.4	555.73
35.1	555.77
37.1	555.79
38.8	555.77
40.9	555.82
44.4	555.83
50.6	555.74
55.7	556.21

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	555.75
Bankfull Cross-Sectional Area (sq ft):	3.9
LTOB Cross-Sectional Area (sq ft):	3.6
Bankfull Width (ft):	8.1
Flood Prone Area Elevation (ft):	556.72
Flood Prone Width (ft):	55
Max Depth at Bankfull (ft):	1.0
Mean Depth at Bankfull (ft):	0.5
W / D Ratio (ft/ft):	17.0
Entrenchment Ratio (ft/ft):	6.9
Bank Height Ratio (ft/ft):	1.0
Thalweg Elevation (ft):	554.79

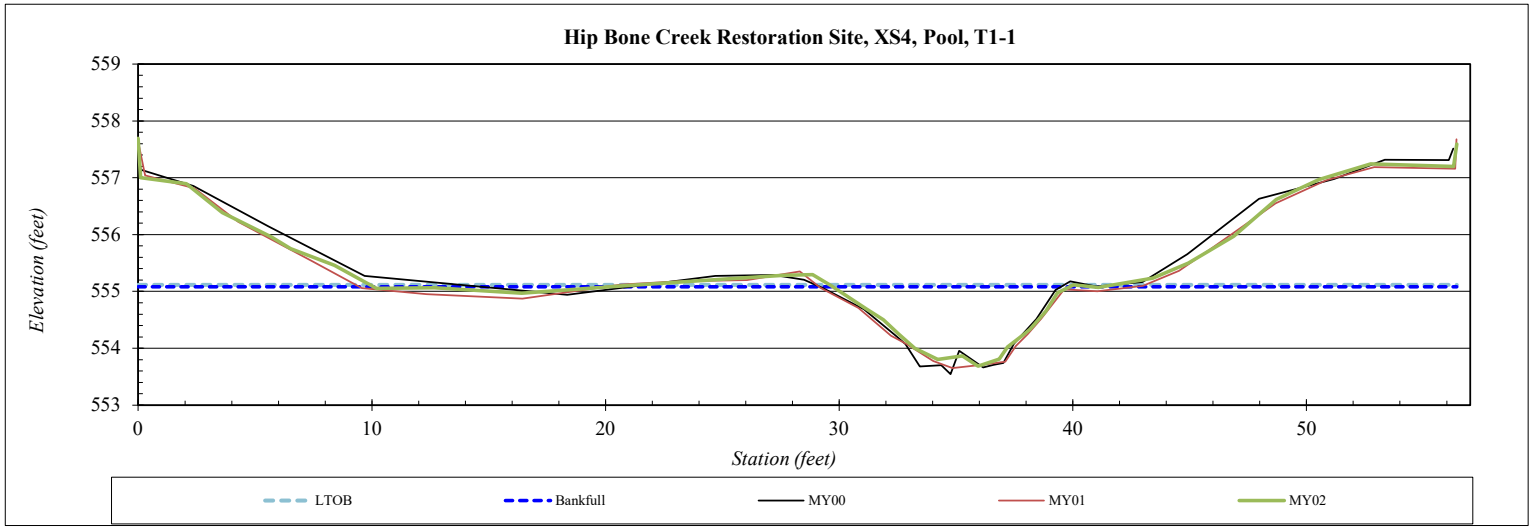


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS4
Drainage Area (sq mi):	0.08
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	557.69
0.1	557.00
2.1	556.89
3.6	556.39
5.7	555.96
6.5	555.75
8.4	555.46
10.2	555.06
12.7	555.07
16.4	554.97
20.8	555.10
25.1	555.22
27.6	555.28
28.9	555.30
29.7	555.09
31.1	554.70
31.9	554.50
32.5	554.25
33.2	554.00
34.2	553.80
35.3	553.87
35.9	553.68
36.9	553.81
37.2	554.02
37.9	554.25
38.2	554.33
38.8	554.65
39.3	554.97
40.0	555.11
41.1	555.07
43.4	555.24
44.9	555.50
46.9	555.97
48.7	556.62
50.5	556.97
52.7	557.24

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	555.08
Bankfull Cross-Sectional Area (sq ft):	8.1
LTOB Cross-Sectional Area (sq ft):	8.5
Bankfull Width (ft):	10.1
Flood Prone Area Elevation (ft):	---
Flood Prone Width (ft):	---
Max Depth at Bankfull (ft):	1.4
Mean Depth at Bankfull (ft):	0.8
W / D Ratio (ft/ft):	---
Entrenchment Ratio (ft/ft):	---
Bank Height Ratio (ft/ft):	---
Thalweg Elevation (ft):	553.68

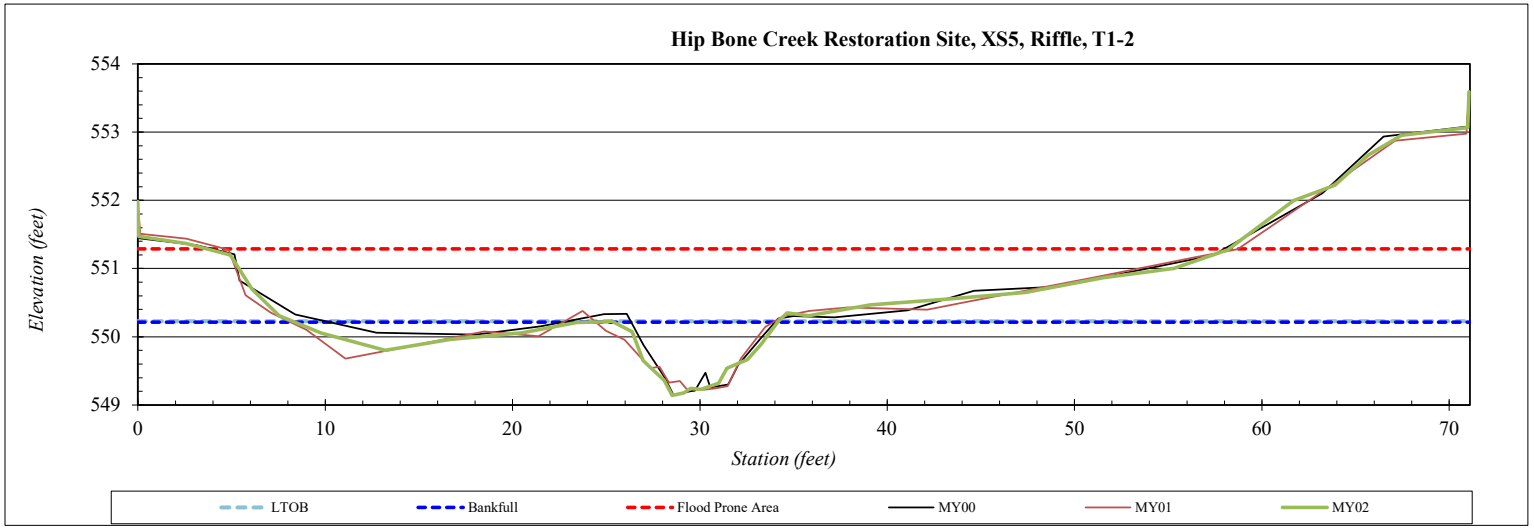


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS5
Drainage Area (sq mi):	0.13
Date:	
Field Crew:	

Station	Elevation
0.0	551.98
0.0	551.47
2.6	551.37
4.9	551.20
6.1	550.70
7.5	550.31
9.8	550.05
13.2	549.80
16.7	549.96
20.5	550.06
23.4	550.21
25.0	550.22
25.3	550.23
26.4	550.07
27.0	549.65
28.1	549.36
28.5	549.14
29.2	549.18
29.5	549.25
30.0	549.23
31.0	549.32
31.4	549.54
32.5	549.66
33.3	549.89
34.2	550.22
34.6	550.35
35.8	550.31
39.1	550.47
43.4	550.56
47.4	550.65
51.6	550.86
55.3	551.00
58.2	551.27
61.7	552.00
63.9	552.22
65.7	552.67

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	550.21
Bankfull Cross-Sectional Area (sq ft):	5.4
LTOB Cross-Sectional Area (sq ft):	5.5
Bankfull Width (ft):	8.7
Flood Prone Area Elevation (ft):	551.29
Flood Prone Width (ft):	55
Max Depth at Bankfull (ft):	1.1
Mean Depth at Bankfull (ft):	0.6
W / D Ratio (ft/ft):	14.1
Entrenchment Ratio (ft/ft):	6.2
Bank Height Ratio (ft/ft):	1.0
Thalweg Elevation (ft):	549.14

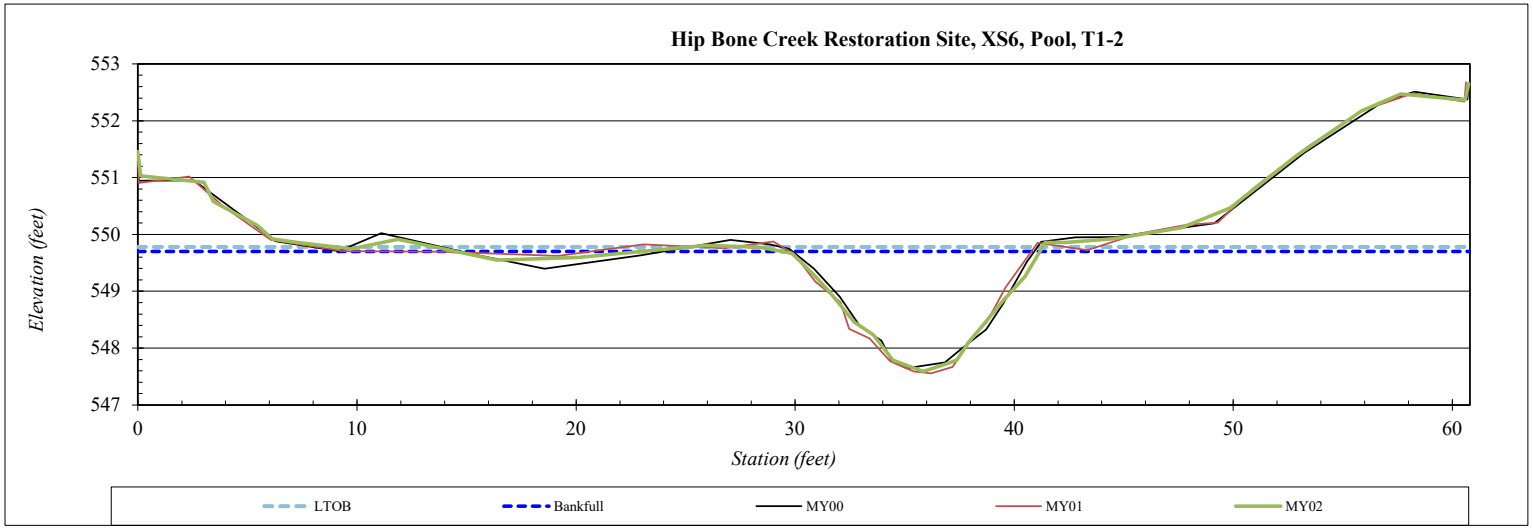


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS6
Drainage Area (sq mi):	0.13
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	551.46
0.1	551.03
3.0	550.92
3.4	550.58
5.4	550.15
6.1	549.92
7.3	549.86
9.7	549.75
11.9	549.91
16.4	549.55
20.1	549.59
25.9	549.81
28.4	549.78
29.8	549.67
30.7	549.33
31.5	549.02
32.7	548.46
33.6	548.24
34.5	547.79
35.8	547.59
36.7	547.70
37.4	547.79
37.9	548.10
38.8	548.49
39.5	548.83
40.5	549.26
41.4	549.86
42.4	549.86
44.6	549.93
47.6	550.12
49.9	550.47
52.8	551.37
55.9	552.17
57.7	552.47
60.6	552.36
60.8	552.65

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	549.70
Bankfull Cross-Sectional Area (sq ft):	14.0
LTOB Cross-Sectional Area (sq ft):	14.9
Bankfull Width (ft):	11.3
Flood Prone Area Elevation (ft):	---
Flood Prone Width (ft):	---
Max Depth at Bankfull (ft):	2.1
Mean Depth at Bankfull (ft):	1.2
W / D Ratio (ft/ft):	---
Entrenchment Ratio (ft/ft):	---
Bank Height Ratio (ft/ft):	---
Thalweg Elevation (ft):	547.59

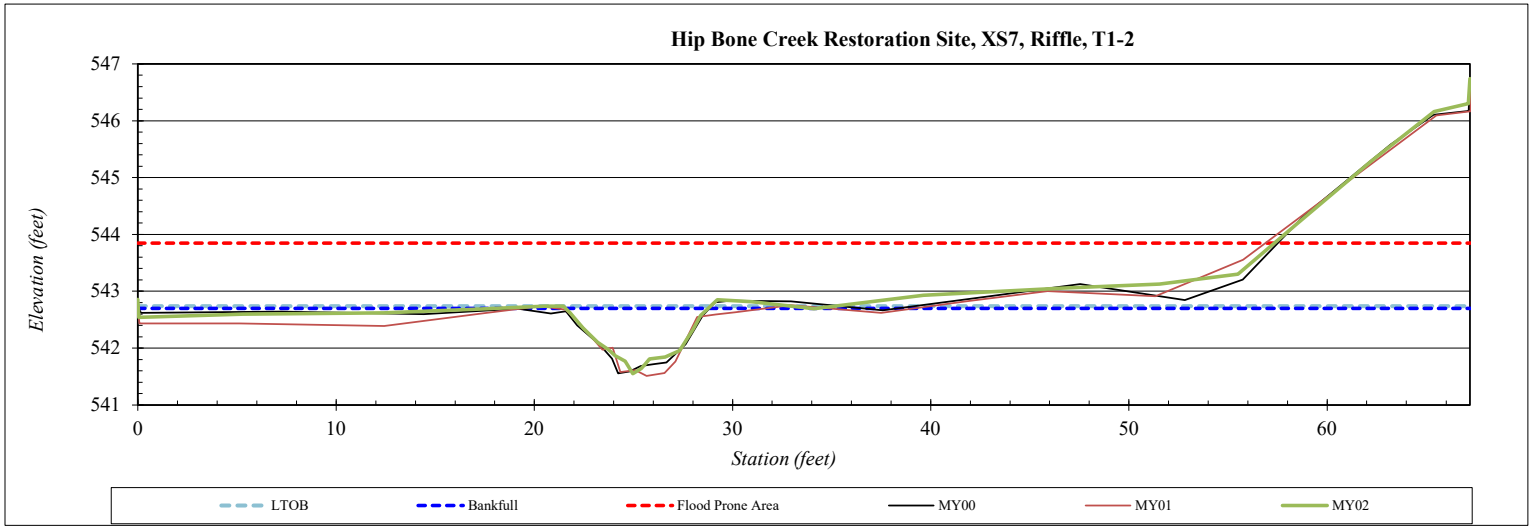


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS7
Drainage Area (sq mi):	0.14
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	542.86
0.0	542.54
5.3	542.60
12.4	542.62
17.2	542.69
20.5	542.74
21.5	542.74
21.8	542.62
22.5	542.35
23.2	542.10
23.7	541.97
24.1	541.87
24.6	541.77
25.0	541.55
25.4	541.64
25.6	541.71
25.8	541.81
26.6	541.84
27.3	541.95
28.0	542.33
28.4	542.58
29.2	542.85
30.9	542.82
34.1	542.69
39.6	542.93
46.5	543.06
51.6	543.12
55.5	543.30
58.5	544.19
62.2	545.28
65.4	546.16
67.1	546.30
67.2	546.74

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	542.70
Bankfull Cross-Sectional Area (sq ft):	4.6
LTOB Cross-Sectional Area (sq ft):	4.9
Bankfull Width (ft):	7.0
Flood Prone Area Elevation (ft):	543.85
Flood Prone Width (ft):	57
Max Depth at Bankfull (ft):	1.1
Mean Depth at Bankfull (ft):	0.7
W / D Ratio (ft/ft):	10.5
Entrenchment Ratio (ft/ft):	8.2
Bank Height Ratio (ft/ft):	1.0
Thalweg Elevation (ft):	541.55

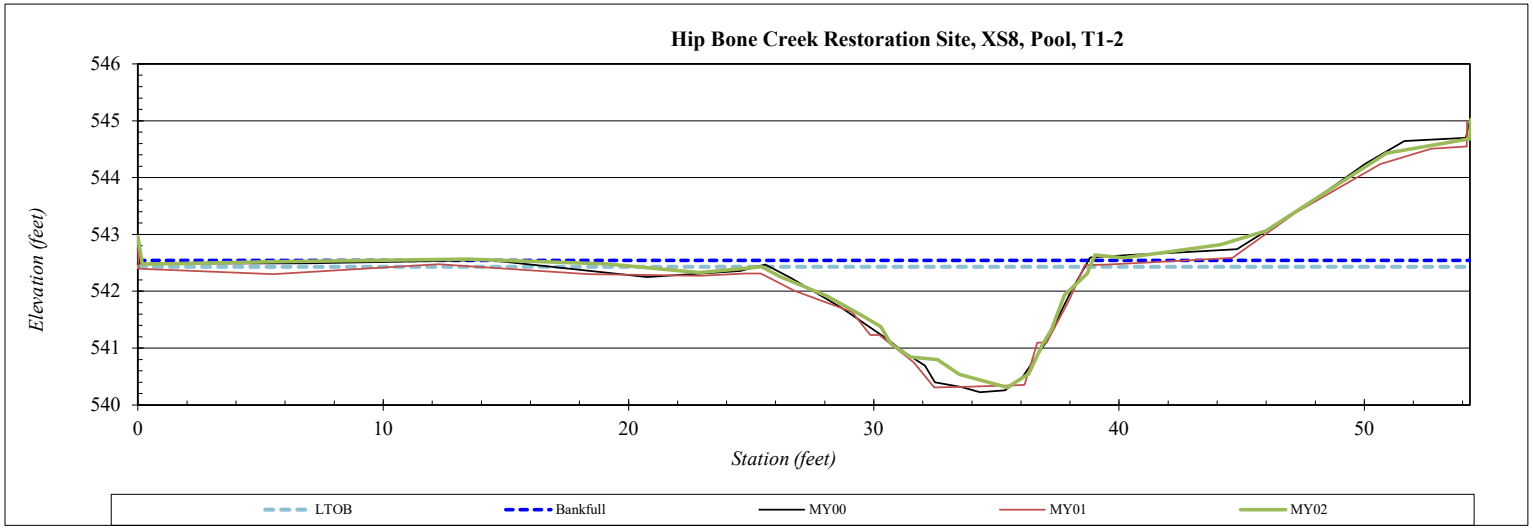


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS8
Drainage Area (sq mi):	0.14
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	542.97
0.2	542.47
5.6	542.52
13.4	542.57
19.1	542.48
22.9	542.33
25.4	542.43
26.2	542.25
28.1	541.92
29.5	541.59
30.3	541.38
30.7	541.08
31.5	540.84
32.6	540.80
33.5	540.54
35.4	540.31
36.3	540.54
36.9	541.05
37.2	541.33
37.8	541.94
38.7	542.31
39.0	542.64
40.2	542.59
41.7	542.67
44.1	542.82
46.0	543.06
48.2	543.67
50.9	544.43
54.3	544.68
54.3	545.02

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	542.54
Bankfull Cross-Sectional Area (sq ft):	16.7
LTOB Cross-Sectional Area (sq ft):	15.2
Bankfull Width (ft):	13.5
Flood Prone Area Elevation (ft):	---
Flood Prone Width (ft):	---
Max Depth at Bankfull (ft):	2.2
Mean Depth at Bankfull (ft):	1.2
W / D Ratio (ft/ft):	---
Entrenchment Ratio (ft/ft):	---
Bank Height Ratio (ft/ft):	---
Thalweg Elevation (ft):	540.31

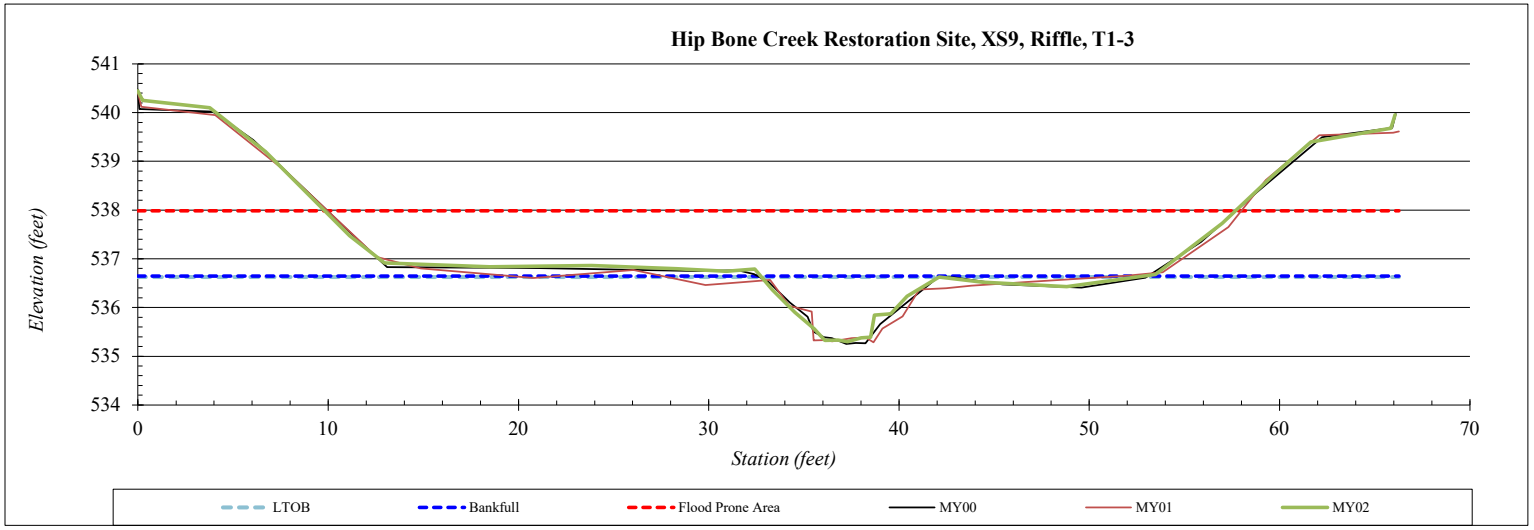


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS9
Drainage Area (sq mi):	0.19
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	540.45
0.2	540.25
3.8	540.10
6.7	539.20
11.1	537.48
13.0	536.91
18.5	536.84
23.8	536.86
28.3	536.80
30.9	536.74
32.4	536.79
33.3	536.37
34.5	535.91
35.6	535.56
36.1	535.32
36.8	535.33
37.3	535.30
38.0	535.38
38.5	535.39
38.7	535.84
39.6	535.87
40.4	536.23
42.1	536.63
44.4	536.52
48.8	536.43
53.5	536.68
57.0	537.73
59.7	538.72
61.7	539.40
65.9	539.68
66.1	539.96

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	536.64
Bankfull Cross-Sectional Area (sq ft):	7.2
LTOB Cross-Sectional Area (sq ft):	7.0
Bankfull Width (ft):	9.4
Flood Prone Area Elevation (ft):	537.99
Flood Prone Width (ft):	48
Max Depth at Bankfull (ft):	1.3
Mean Depth at Bankfull (ft):	0.8
W / D Ratio (ft/ft):	12.3
Entrenchment Ratio (ft/ft):	5.1
Bank Height Ratio (ft/ft):	1.0
Thalweg Elevation (ft):	535.30

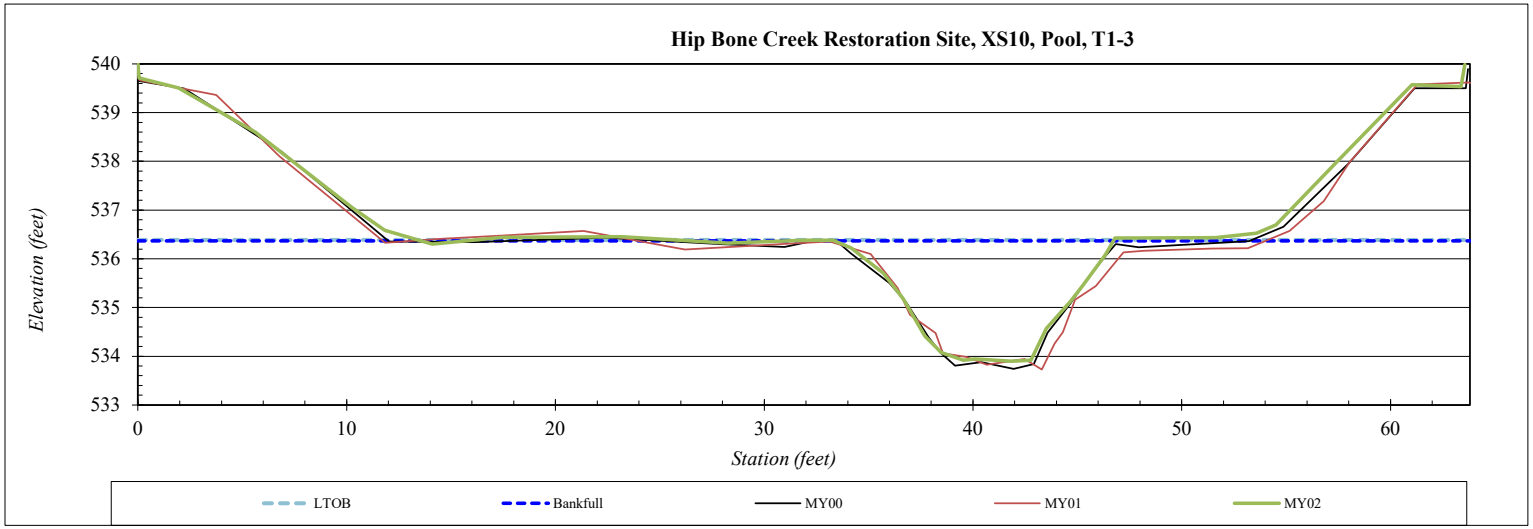


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS10
Drainage Area (sq mi):	0.19
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	540.03
0.1	539.71
1.9	539.50
5.6	538.60
10.3	537.04
11.8	536.58
14.1	536.30
17.5	536.44
23.2	536.45
28.3	536.32
31.9	536.38
33.3	536.38
34.2	536.22
35.7	535.71
36.7	535.18
37.7	534.41
38.5	534.07
39.5	533.92
40.1	533.94
41.8	533.90
42.8	533.92
43.5	534.57
44.7	535.12
45.3	535.47
46.3	536.08
46.8	536.43
47.7	536.43
51.6	536.43
53.6	536.53
54.5	536.70
57.5	538.00
61.0	539.57
63.4	539.53
63.6	539.99

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	536.37
Bankfull Cross-Sectional Area (sq ft):	20.0
LTOB Cross-Sectional Area (sq ft):	20.2
Bankfull Width (ft):	13.4
Flood Prone Area Elevation (ft):	---
Flood Prone Width (ft):	---
Max Depth at Bankfull (ft):	2.5
Mean Depth at Bankfull (ft):	1.5
W / D Ratio (ft/ft):	---
Entrenchment Ratio (ft/ft):	---
Bank Height Ratio (ft/ft):	---
Thalweg Elevation (ft):	533.90

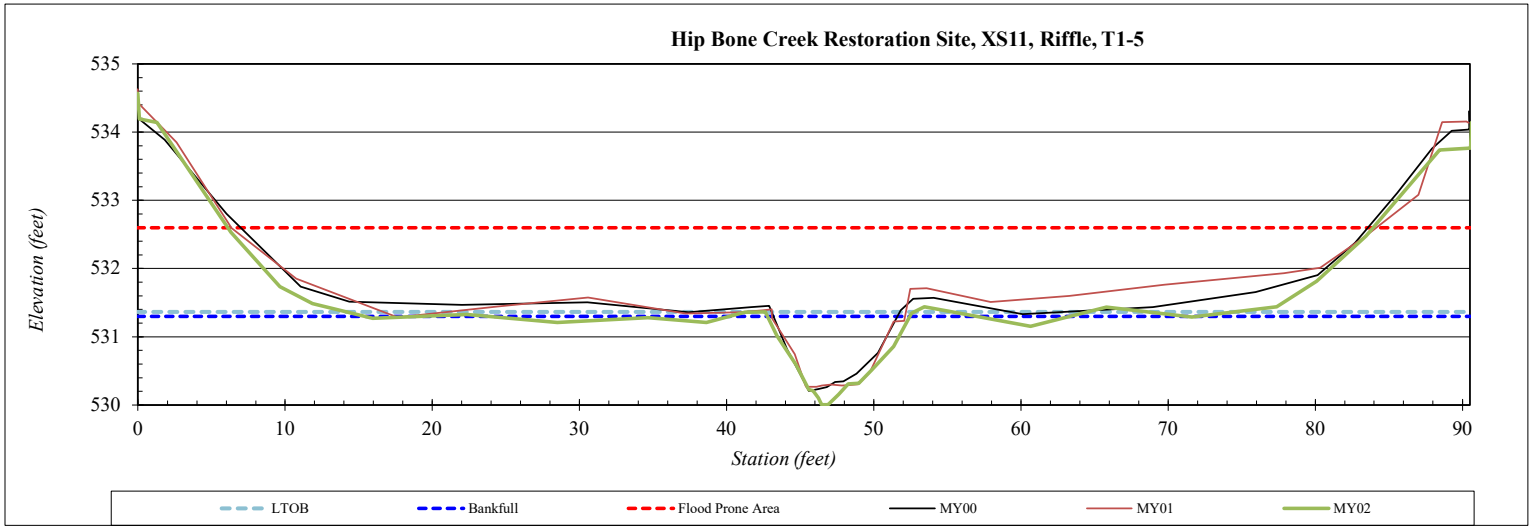


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS11
Drainage Area (sq mi):	0.25
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	534.57
0.1	534.19
1.3	534.14
6.3	532.53
9.6	531.74
11.9	531.48
15.9	531.27
22.3	531.33
28.5	531.21
34.7	531.28
38.6	531.21
41.2	531.36
42.6	531.36
43.4	531.02
44.7	530.59
45.6	530.23
45.9	530.21
46.2	530.10
46.5	530.00
46.9	530.00
47.6	530.15
48.3	530.31
49.0	530.32
49.8	530.51
51.4	530.86
52.6	531.35
53.4	531.44
56.5	531.32
60.7	531.15
65.8	531.43
71.6	531.29
77.4	531.44
80.1	531.81
83.5	532.48
88.4	533.74
90.6	533.77

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	531.30
Bankfull Cross-Sectional Area (sq ft):	7.3
LTOB Cross-Sectional Area (sq ft):	7.9
Bankfull Width (ft):	9.7
Flood Prone Area Elevation (ft):	532.60
Flood Prone Width (ft):	78
Max Depth at Bankfull (ft):	1.3
Mean Depth at Bankfull (ft):	0.8
W / D Ratio (ft/ft):	12.8
Entrenchment Ratio (ft/ft):	8.0
Bank Height Ratio (ft/ft):	1.1
Thalweg Elevation (ft):	530.00

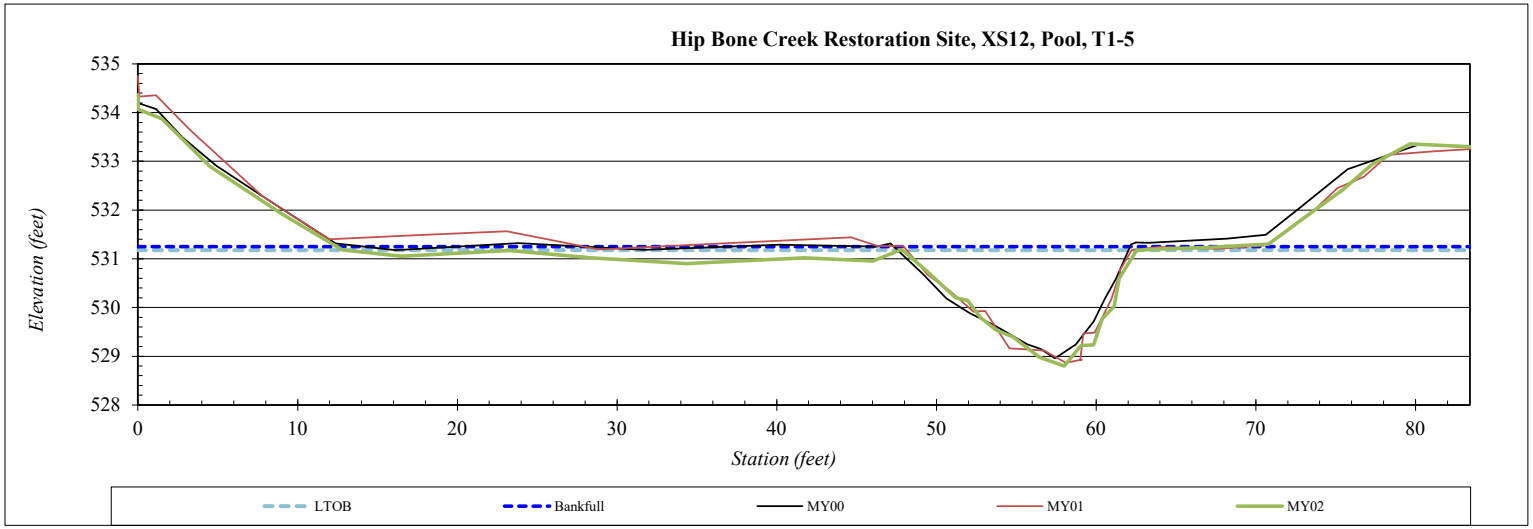


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS12
Drainage Area (sq mi):	0.25
Date:	7/21/2022
Field Crew:	TS, CK

Station	Elevation
0.0	534.37
0.0	534.07
1.5	533.87
4.5	532.90
9.0	531.93
12.8	531.18
16.5	531.05
23.2	531.17
28.4	531.02
34.3	530.90
41.7	531.02
46.0	530.96
47.8	531.19
49.4	530.77
51.2	530.20
51.9	530.14
52.8	529.79
53.8	529.53
54.8	529.40
56.5	528.98
58.0	528.80
59.1	529.22
59.8	529.23
60.4	529.77
61.1	530.02
61.5	530.60
62.5	531.17
63.6	531.20
66.9	531.23
70.8	531.30
73.4	531.94
75.4	532.42
77.3	532.94
79.7	533.36
86.9	533.25
87.0	533.70

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	531.25
Bankfull Cross-Sectional Area (sq ft):	20.8
LTOB Cross-Sectional Area (sq ft):	19.7
Bankfull Width (ft):	14.7
Flood Prone Area Elevation (ft):	---
Flood Prone Width (ft):	---
Max Depth at Bankfull (ft):	2.4
Mean Depth at Bankfull (ft):	1.4
W / D Ratio (ft/ft):	---
Entrenchment Ratio (ft/ft):	---
Bank Height Ratio (ft/ft):	---
Thalweg Elevation (ft):	528.80

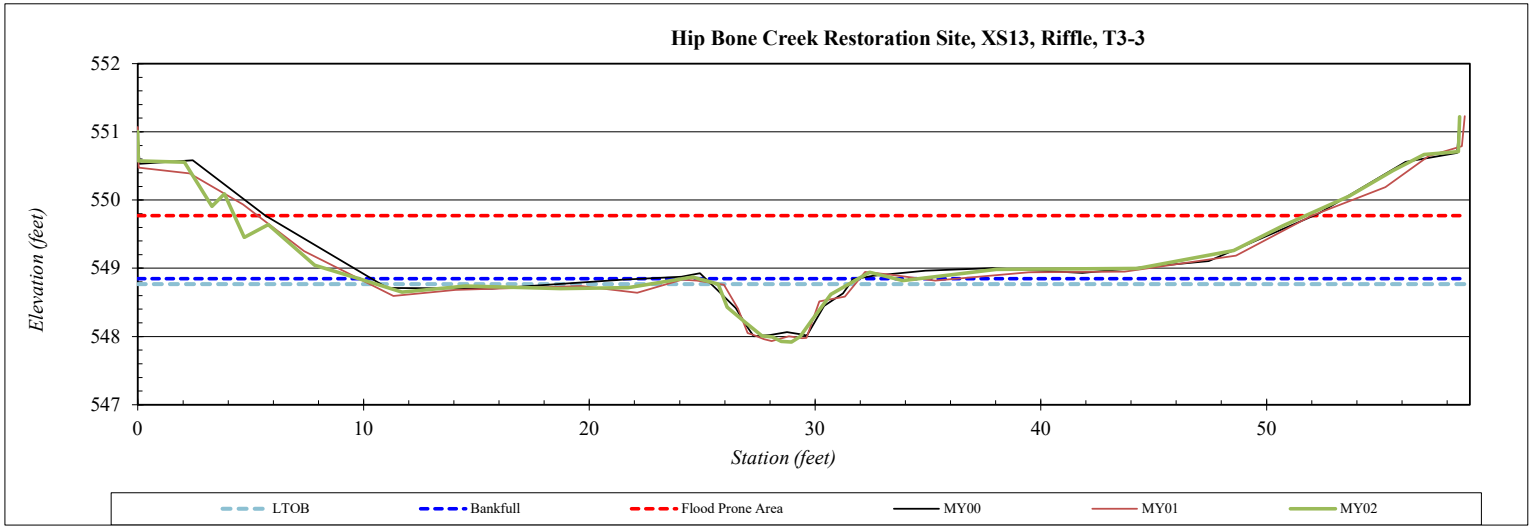


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS13
Drainage Area (sq mi):	0.05
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	551.01
0.0	550.57
2.1	550.56
3.3	549.91
3.8	550.09
4.7	549.45
5.8	549.64
7.8	549.05
10.1	548.82
11.7	548.65
14.5	548.74
18.7	548.70
21.7	548.71
24.6	548.87
25.7	548.77
26.1	548.43
26.9	548.21
27.7	548.01
28.1	547.99
28.5	547.93
29.0	547.92
29.3	548.00
29.8	548.23
30.7	548.62
32.4	548.94
33.9	548.82
38.0	548.98
44.3	549.00
48.6	549.26
50.7	549.62
53.7	550.06
55.6	550.43
57.0	550.67
58.5	550.71
58.5	551.22

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	548.84
Bankfull Cross-Sectional Area (sq ft):	3.4
LTOB Cross-Sectional Area (sq ft):	3.0
Bankfull Width (ft):	6.2
Flood Prone Area Elevation (ft):	549.77
Flood Prone Width (ft):	47
Max Depth at Bankfull (ft):	0.9
Mean Depth at Bankfull (ft):	0.6
W / D Ratio (ft/ft):	11.2
Entrenchment Ratio (ft/ft):	7.7
Bank Height Ratio (ft/ft):	0.9
Thalweg Elevation (ft):	547.92

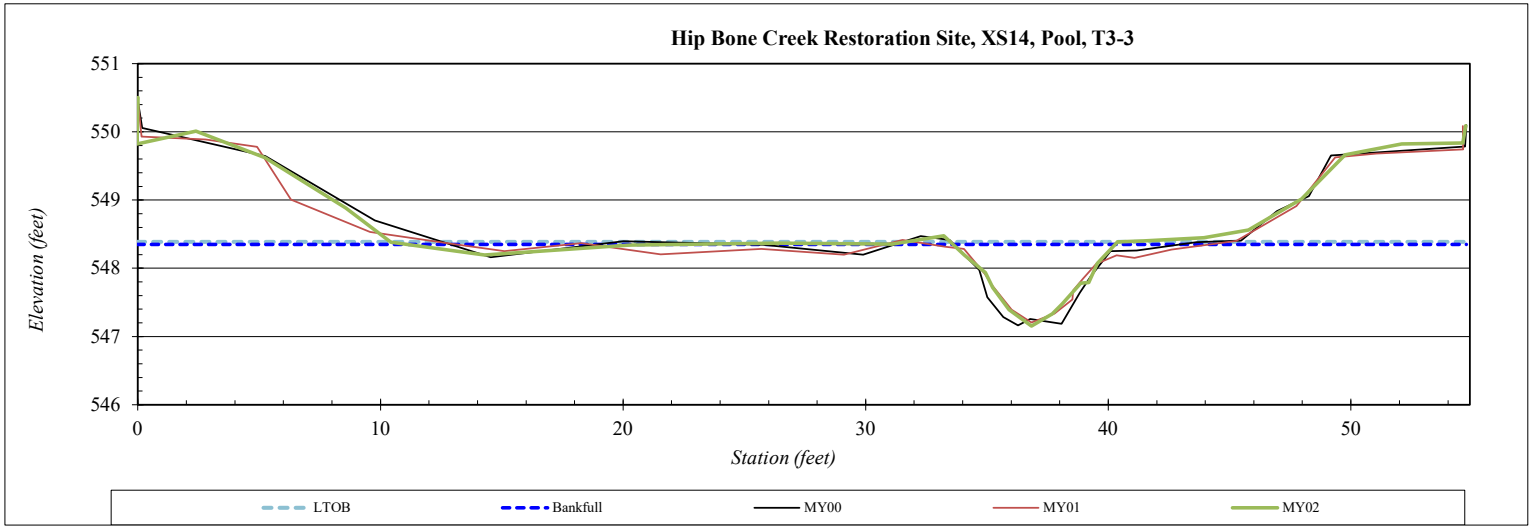


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS14
Drainage Area (sq mi):	0.05
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	550.50
0.0	549.82
2.4	550.01
5.2	549.62
8.6	548.89
10.4	548.38
14.3	548.20
20.3	548.34
26.4	548.37
31.1	548.35
33.2	548.48
34.1	548.19
34.9	547.94
35.2	547.72
35.9	547.39
36.8	547.15
37.7	547.33
38.1	547.48
38.9	547.78
39.2	547.79
39.6	548.07
40.4	548.39
41.5	548.40
43.9	548.45
45.8	548.56
48.0	549.02
49.8	549.66
52.1	549.82
54.6	549.84
54.7	550.09

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	548.35
Bankfull Cross-Sectional Area (sq ft):	4.3
LTOB Cross-Sectional Area (sq ft):	4.5
Bankfull Width (ft):	6.7
Flood Prone Area Elevation (ft):	---
Flood Prone Width (ft):	---
Max Depth at Bankfull (ft):	1.2
Mean Depth at Bankfull (ft):	0.6
W / D Ratio (ft/ft):	---
Entrenchment Ratio (ft/ft):	---
Bank Height Ratio (ft/ft):	---
Thalweg Elevation (ft):	547.15

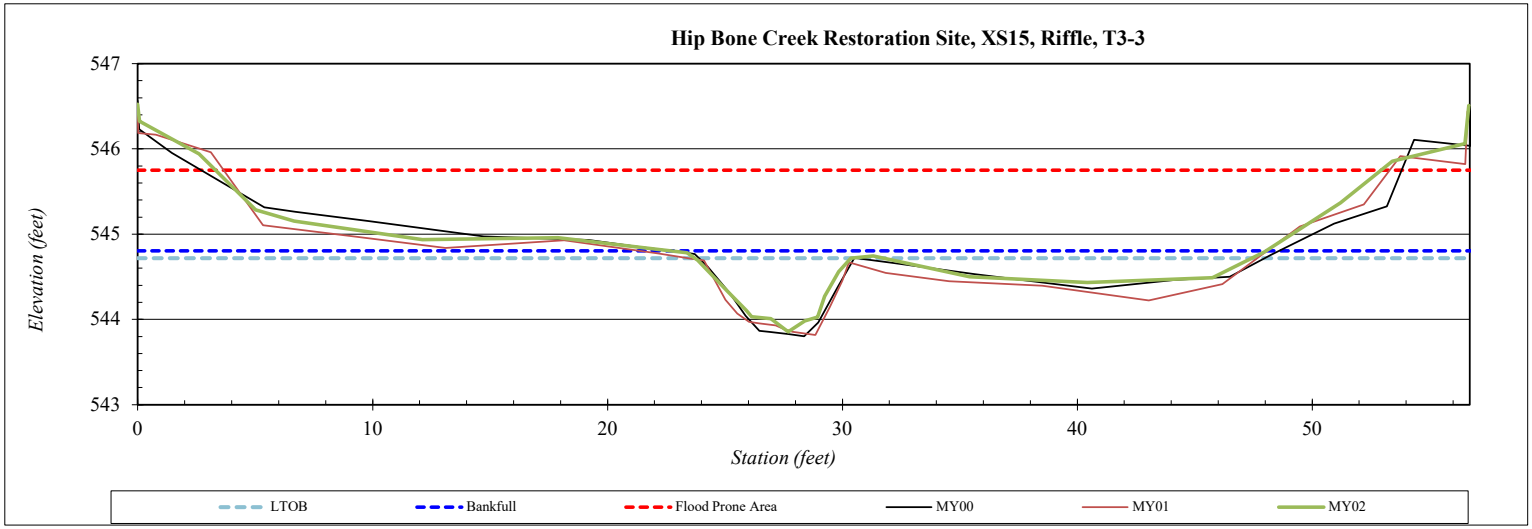


Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS15
Drainage Area (sq mi):	0.06
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	546.52
0.1	546.33
2.6	545.94
5.0	545.29
6.7	545.15
12.1	544.94
17.9	544.96
22.2	544.82
23.4	544.78
23.8	544.70
25.1	544.33
25.9	544.10
26.1	544.03
27.0	544.01
27.7	543.86
28.4	543.98
28.9	544.03
29.2	544.27
29.8	544.56
30.4	544.72
31.3	544.75
35.4	544.50
40.4	544.43
45.8	544.49
48.0	544.79
51.2	545.37
53.4	545.85
56.5	546.06
56.7	546.51

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	544.80
Bankfull Cross-Sectional Area (sq ft):	3.9
LTOB Cross-Sectional Area (sq ft):	3.3
Bankfull Width (ft):	6.5
Flood Prone Area Elevation (ft):	545.75
Flood Prone Width (ft):	50
Max Depth at Bankfull (ft):	0.9
Mean Depth at Bankfull (ft):	0.6
W / D Ratio (ft/ft):	11.0
Entrenchment Ratio (ft/ft):	7.6
Bank Height Ratio (ft/ft):	0.9
Thalweg Elevation (ft):	543.86



Cross-Section Plots

River Basin:	Cape Fear River
Site:	Hip Bone Creek Restoration Site
XS ID	XS16
Drainage Area (sq mi):	0.06
Date:	7/12/2022
Field Crew:	TS, CK

Station	Elevation
0.0	545.85
0.0	545.44
3.0	545.43
8.1	545.31
12.1	545.11
15.3	545.29
17.7	544.76
19.8	544.34
21.4	544.28
22.9	544.20
24.0	544.03
24.6	543.78
24.9	543.61
25.5	543.19
26.2	542.89
27.1	542.68
28.0	542.68
29.5	542.79
30.8	543.27
31.8	543.65
32.3	543.80
33.3	544.14
34.0	544.32
35.7	544.32
40.1	544.37
44.8	544.28
50.6	544.26
55.0	544.38
58.0	544.49
59.5	544.84
61.0	545.02
62.2	545.47
64.7	545.48
66.5	545.86
66.5	546.30

SUMMARY DATA	
Bankfull Elevation (ft) - Based on AB-Bankfull Area	544.13
Bankfull Cross-Sectional Area (sq ft):	8.6
LTOB Cross-Sectional Area (sq ft):	9.3
Bankfull Width (ft):	9.9
Flood Prone Area Elevation (ft):	---
Flood Prone Width (ft):	---
Max Depth at Bankfull (ft):	1.4
Mean Depth at Bankfull (ft):	0.9
W / D Ratio (ft/ft):	---
Entrenchment Ratio (ft/ft):	---
Bank Height Ratio (ft/ft):	---
Thalweg Elevation (ft):	542.68

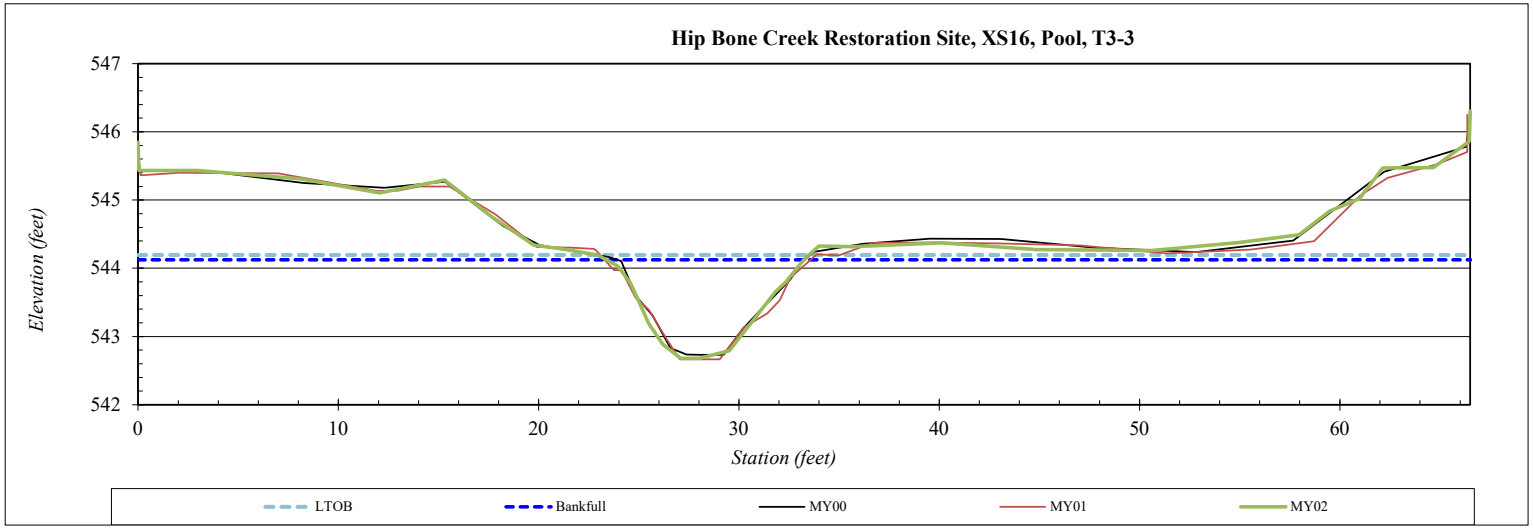


Table 8a. Baseline Stream Data Summary, Hip Bone Creek (ID-100059), Reach T1-1										
Parameter	**Pre-Existing Condition**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	5.2	6.3	6.3	7.3	2	5.4		5.5	6.4	2
Floodprone Width (ft)	12	13.4	13.4	14.8	2	35	42	54.8	54.9	2
Bankfull Mean Depth (ft)	0.3	0.4	0.4	0.5	2	0.4		0.4	0.6	2
Bankfull Max Depth (ft)	0.9	1.1	1.1	1.3	2	0.7		0.8	1.1	2
Bankfull Cross Sectional Area (ft^2)	2.4	2.5	2.5	2.5	2	2.2		2.1	3.9	2
Width/Depth Ratio	11	16.4	16.4	21.8	2	13		10.7	14.5	2
Entrenchment Ratio	1.6	2.3	2.3	2.9	2	6.5	7.8	8.5	9.9	2
Bank Height Ratio	1	1.1	1.1	1.2	2	1		1	1	2
Max part size (mm) mobilized at bankfull	30					29		42		
Rosgen Classification	G4c/G4					C4b		C4b		
Bankfull Discharge (cfs)	8.1 – 8.6					8		5.6 – 13.5		
Sinuosity (ft)	1					1.2		1.2		
Water Surface Slope (Channel) (ft/ft)	0.003 – 0.025					0.024		0.0249		
Other										

Table 8b. Baseline Stream Data Summary, Hip Bone Creek (ID-100059), Reach T1-2										
Parameter	**Pre-Existing Condition**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	4.4	7.3	7.3	10.2	2	7		6.5	7.9	1
Floodprone Width (ft)	12.6	20.4	20.4	28.2	2	42	56	56.7	57.2	1
Bankfull Mean Depth (ft)	0.4	0.7	0.7	1	2	0.6		0.7	0.7	1
Bankfull Max Depth (ft)	1.4	1.4	1.4	1.5	2	0.9		1.1	1.1	1
Bankfull Cross Sectional Area (ft^2)	4.2	4.2	4.2	4.2	2	4		4.6	5.4	1
Width/Depth Ratio	4.5	14.7	14.7	24.8	2	12.2		9.3	11.7	1
Entrenchment Ratio	2.8	2.8	2.8	2.9	2	6	8	7.1	8.7	1
Bank Height Ratio	1	1	1	1	2	1		1	1	1
Max part size (mm) mobilized at bankfull	33					25		29		
Rosgen Classification	G4c/G4					C4		C4		
Bankfull Discharge (cfs)	14.1 – 14.6					13.6		13.7 – 15.6		
Sinuosity (ft)	1					1.2		1.2		
Water Surface Slope (Channel) (ft/ft)	0.003 – 0.025					0.015		0.014		
Other										

Table 8c. Baseline Stream Data Summary, Hip Bone Creek (ID-100059), Reach T1-3 and 5										
Parameter	**Pre-Existing Condition**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	4.6	11.8	11.6	19.3	4	8.6		9.3	9.4	1
Floodprone Width (ft)	12.5	28.3	25.4	49.9	4	30	58	47.8	77.5	1
Bankfull Mean Depth (ft)	0.4	0.7	0.6	1.3	4	0.7		0.8	0.8	1
Bankfull Max Depth (ft)	1.1	1.7	1.8	1.9	4	1.1		1.2	1.4	1
Bankfull Cross Sectional Area (ft^2)	5.8	6.6	6	8.8	4	6		7.2	7.3	1
Width/Depth Ratio	3.6	24.2	25.6	42.1	4	12.4		11.8	12.3	1
Entrenchment Ratio	2	2.5	2.6	2.7	4	3.5	6.7	5.1	8.3	1
Bank Height Ratio	1	1.1	1	1.5	4	1		1	1	1
Max part size (mm) mobilized at bankfull	18					17		23		
Rosgen Classification	G4c/G4					C4		C4		
Bankfull Discharge (cfs)	15.3 – 22.7					19.8		19.3 – 20.0		
Sinuosity (ft)	1					1.14		1.14		
Water Surface Slope (Channel) (ft/ft)	0.003 – 0.025					0.0082		0.0101		
Other										

Table 8d. Baseline Stream Data Summary, Hip Bone Creek (ID-100059), Reach T3										
Parameter	**Pre-Existing Condition**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	4.6	11.8	11.6	19.3	3	5.8		6.5	7.2	2
Floodprone Width (ft)	12.5	28.3	25.4	49.9	3	30	40	45.2	50.3	2
Bankfull Mean Depth (ft)	0.4	0.7	0.6	1.3	3	0.5		0.5	0.5	2
Bankfull Max Depth (ft)	1.1	1.7	1.8	1.9	3	0.7		0.8	0.9	2
Bankfull Cross Sectional Area (ft^2)	5.8	6.6	6	8.8	3	2.7		3.4	3.9	2
Width/Depth Ratio	3.6	24.2	25.6	42.1	3	12.7		12.3	13.3	2
Entrenchment Ratio	2	2.5	2.6	2.7	3	5.2	6.9	7	7	2
Bank Height Ratio	1	1.1	1	1.5	3	1		1	1	2
Max part size (mm) mobilized at bankfull	39					23		29		
Rosgen Classification	G4					C4		C4		
Bankfull Discharge (cfs)	2.7 – 9.0					8.7		9.7 – 11.1		
Sinuosity (ft)	1					1.13		1.13		
Water Surface Slope (Channel) (ft/ft)	0.02 – 0.039					0.017		0.0183		
Other										

Table 9. Cross Section Dimensional Morphology Summary
Hip Bone Creek Restoration Site (ID-100059)

Dimension and Substrate	Cross-Section 1 (Riffle) Station 12+00, T1-1							Cross-Section 2 (Pool) Station 12+25, T1-1							Cross-Section 3 (Riffle) Station 16+25, T1-1						
	MY00	MY01	MY02	MY03	MY05	MY07		MY00	MY01	MY02	MY03	MY05	MY07		MY00	MY01	MY02	MY03	MY05	MY07	
Bankfull Elevation (ft) - Based on AB-Bankfull1 Area	566.3	566.4	566.3					565.6	565.6	565.6					555.7	555.7	555.8				
Bank Height Ratio_Based on AB Bankfull1 Area	1.0	1.2	1.1					---	---	---					1.0	1.0	1.0				
Thalweg Elevation	565.5	565.7	565.5					563.7	563.8	563.8					554.6	554.7	554.8				
LTOB Elevation	566.3	566.5	566.5					565.6	565.6	565.5					555.7	555.6	555.7				
LTOB Max Depth (ft)	0.8	0.8	0.9					1.9	1.7	1.7					1.1	0.9	0.9				
LTOB Cross Sectional Area (ft2)	2.1	2.1	2.8					10.9	10.9	9.9					3.9	3.9	3.6				
	Cross-Section 4 (Pool) Station 16+37, T1-1							Cross-Section 5 (Riffle) 19+37 Station, T1-2							Cross-Section 6 (Pool) Station 19+62, T1-2						
	MY00	MY01	MY02	MY03	MY05	MY07		MY00	MY01	MY02	MY03	MY05	MY07		MY00	MY01	MY02	MY03	MY05	MY07	
Bankfull Elevation (ft) - Based on AB-Bankfull1 Area	555.0	555.0	555.1					550.3	550.2	550.2					549.7	549.7	549.7				
Bank Height Ratio_Based on AB Bankfull1 Area	---	---	---					1.0	0.9	1.0					---	---	---				
Thalweg Elevation	553.5	553.7	553.7					549.1	549.2	549.1					547.6	547.6	547.6				
LTOB Elevation	555.0	555.0	555.1					550.3	550.1	550.2					549.7	549.6	549.8				
LTOB Max Depth (ft)	1.5	1.4	1.4					1.1	0.9	1.1					2.1	2.1	2.2				
LTOB Cross Sectional Area (ft2)	8.1	8.1	8.5					5.4	5.4	5.5					14.0	14.0	14.9				
	Cross-Section 7 (Riffle) Station 24+62, T1-2							Cross-Section 8 (Pool) Sation 25+00, T1-2							Cross-Section 9 Riffle) Station 28+75, T1-4						
	MY00	MY01	MY02	MY03	MY05	MY07		MY00	MY01	MY02	MY03	MY05	MY07		MY00	MY01	MY02	MY03	MY05	MY07	
Bankfull Elevation (ft) - Based on AB-Bankfull1 Area	542.6	542.6	542.7					542.5	542.4	542.5					536.6	536.6	536.6				
Bank Height Ratio_Based on AB Bankfull1 Area	1.0	1.0	1.0					1.0	0.9	---					1.0	0.9	1.0				
Thalweg Elevation	541.6	541.5	541.6					540.2	540.3	540.3					535.3	535.3	535.3				
LTOB Elevation	542.6	542.6	542.7					542.5	542.3	542.4					536.6	536.4	536.6				
LTOB Max Depth (ft)	1.1	1.1	1.2					2.2	2.0	2.1					1.4	1.1	1.3				
LTOB Cross Sectional Area (ft2)	4.6	4.6	4.9					16.7	16.7	15.2					7.2	7.2	7.0				
	Cross-Section 10 (Pool) Station 29+00, T1-4							Cross-Section 11 (Riffle) Station 34+00, T1-4							Cross-Section 12 (Pool) Station 34+37, T1-4						
	MY00	MY01	MY02	MY03	MY05	MY07		MY00	MY01	MY02	MY03	MY05	MY07		MY00	MY01	MY02	MY03	MY05	MY07	
Bankfull Elevation (ft) - Based on AB-Bankfull1 Area	536.3	536.3	536.4					531.5	531.4	531.3					531.3	531.3	531.2				
Bank Height Ratio_Based on AB Bankfull1 Area	---	---	---					1.0	0.9	1.1					---	---	---				
Thalweg Elevation	533.7	533.7	533.9					530.2	530.3	530.0					529.0	528.9	528.8				
LTOB Elevation	536.3	536.1	536.4					531.5	531.3	531.4					531.3	531.2	531.2				
LTOB Max Depth (ft)	2.6	2.4	2.5					1.2	1.0	1.4					2.4	2.3	2.4				
LTOB Cross Sectional Area (ft2)	20.0	20.0	20.2					7.3	7.3	7.9					20.8	20.8	19.7				

Table 9. Cross Section Dimensional Morphology Summary
Hip Bone Creek Restoration Site (ID-100059)

Dimension and Substrate	Cross-Section 13 (Riffle) Station 317+37, T3-3							Cross-Section 14 (Pool) Station 317+50, T3-3							Cross-Section 15 (Riffle) Station 319+62, T3-3						
	MY00	MY01	MY02	MY03	MY05	MY07		MY00	MY01	MY02	MY03	MY05	MY07		MY00	MY01	MY02	MY03	MY05	MY07	
Bankfull Elevation (ft) - Based on AB-Bankfull1 Area	548.8	548.8	548.8					548.3	548.4	548.4					544.7	544.7	544.8				
Bank Height Ratio_Based on AB Bankfull1 Area	1.0	0.9	0.9					---	---	---					1.0	1.0	0.9				
Thalweg Elevation	548	547.9	547.9					547.2	547.2	547.2					544	543.8	543.9				
LTOB Elevation	548.8	548.8	548.8					548.3	548.2	548.4					544.7	544.7	544.7				
LTOB Max Depth (ft)	0.8	0.8	0.8					1.1	1.0	1.2					0.9	0.9	0.9				
LTOB Cross Sectional Area (ft2)	3.4	3.4	3.0					4.3	4.3	4.5					3.9	3.9	3.3				

	Cross-Section 16 (Pool) Station 319+87, T3-3						
	MY00	MY01	MY02	MY03	MY05	MY07	
Bankfull Elevation (ft) - Based on AB-Bankfull1 Area	544.2	544.1	544.1				
Bank Height Ratio_Based on AB Bankfull1 Area	---	---	---				
Thalweg Elevation	542.7	542.7	542.7				
LTOB Elevation	544.2	544.2	544.2				
LTOB Max Depth (ft)	1.4	1.5	1.5				
LTOB Cross Sectional Area (ft2)	8.6	8.6	9.3				

APPENDIX D

Hydrologic Data

Hip Bone Creek Restoration Site
30-70 Percentile Graph
WETS Station Name: Siler City 2N

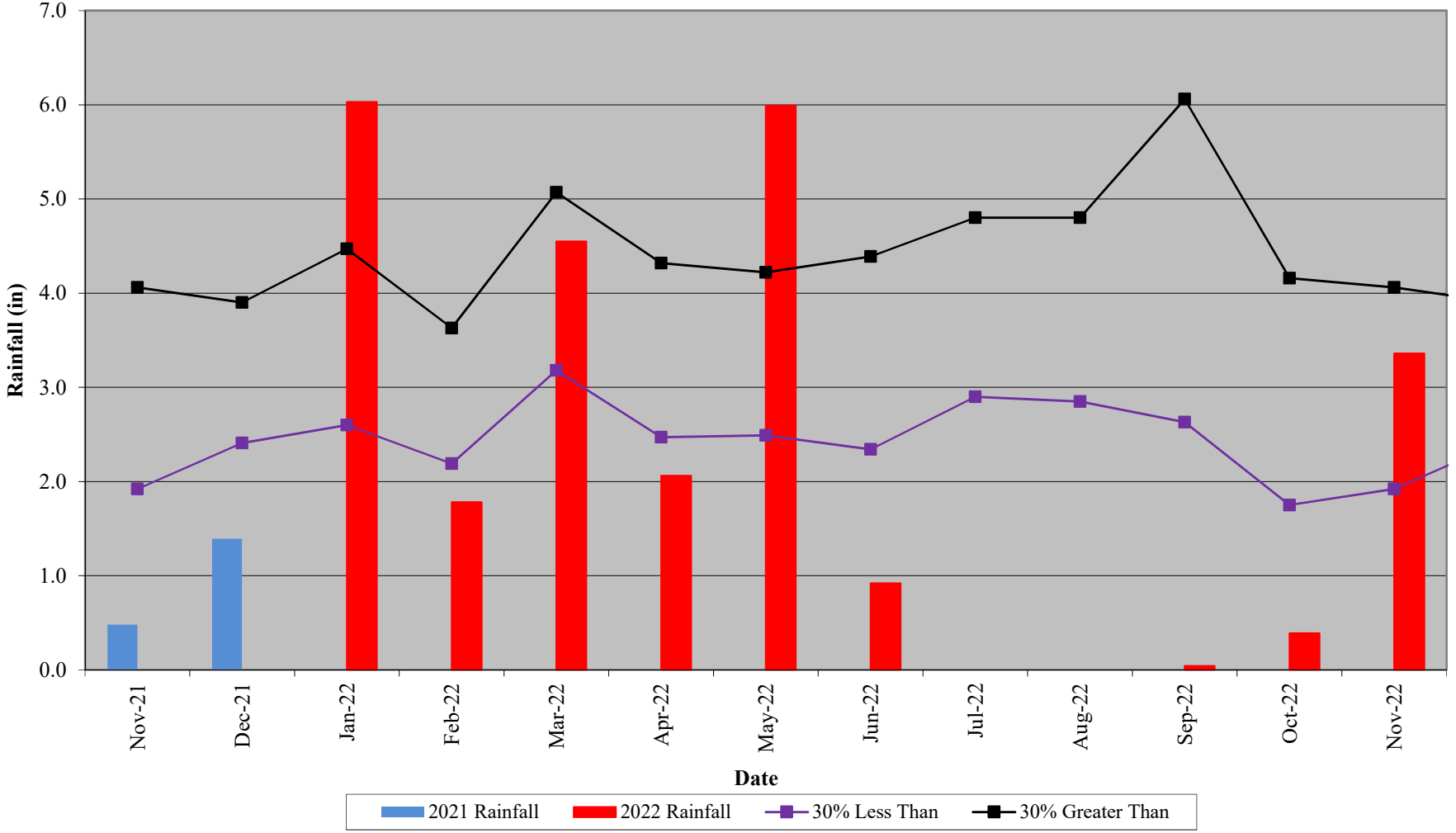


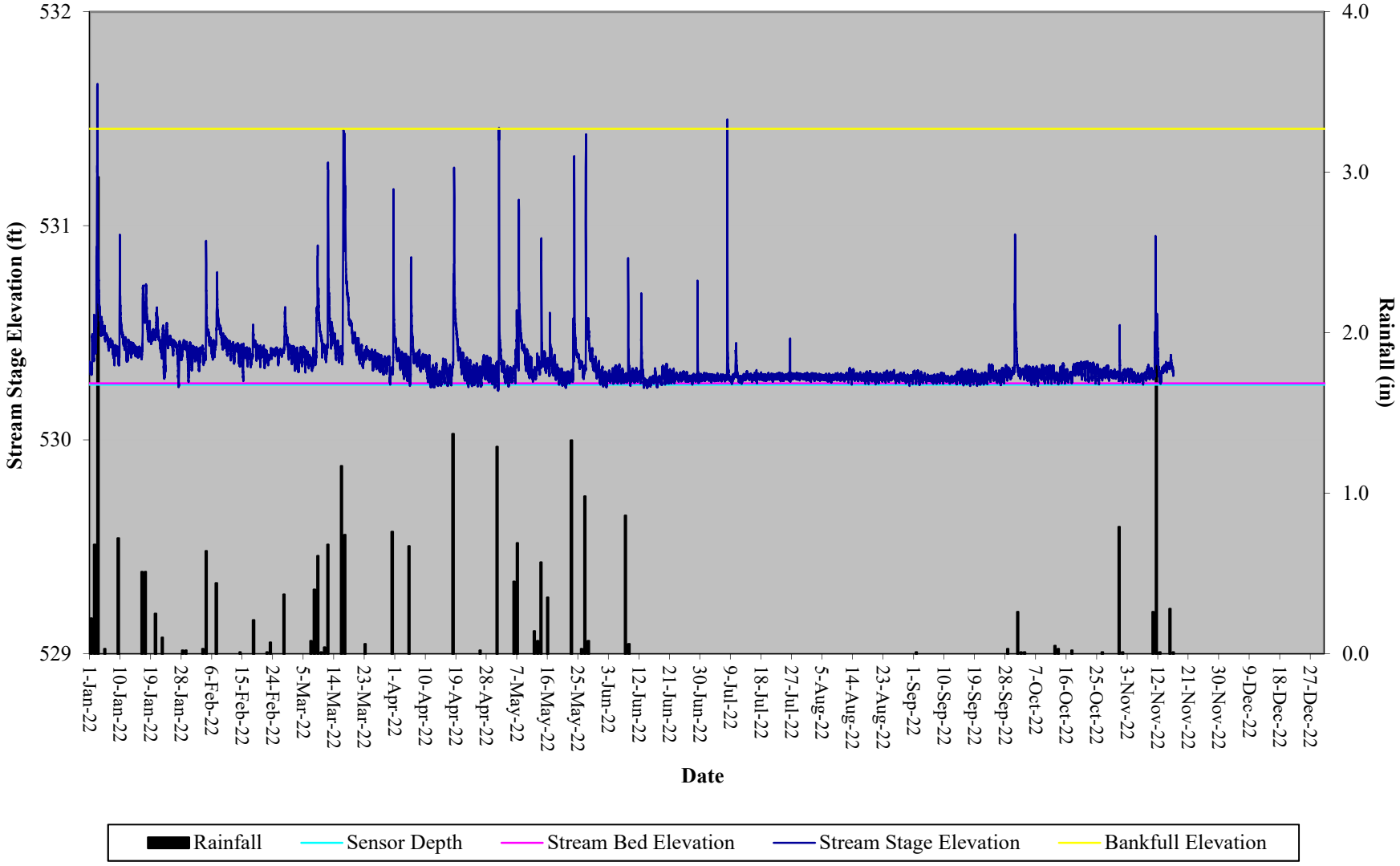
Table 10. Rainfall Summary, Hip Bone Creek Restoration Site (ID-100059)							
	MY1 2021	MY2 2022	MY3 2023	MY4 2024	MY5 2025	MY6 2026	MY7 2027
Annual Precip Total	38.49	21.76					
WETS 30th Percentile	29.73	29.73					
WETS 70th Percentile	53.88	53.88					
Normal	Y	N					

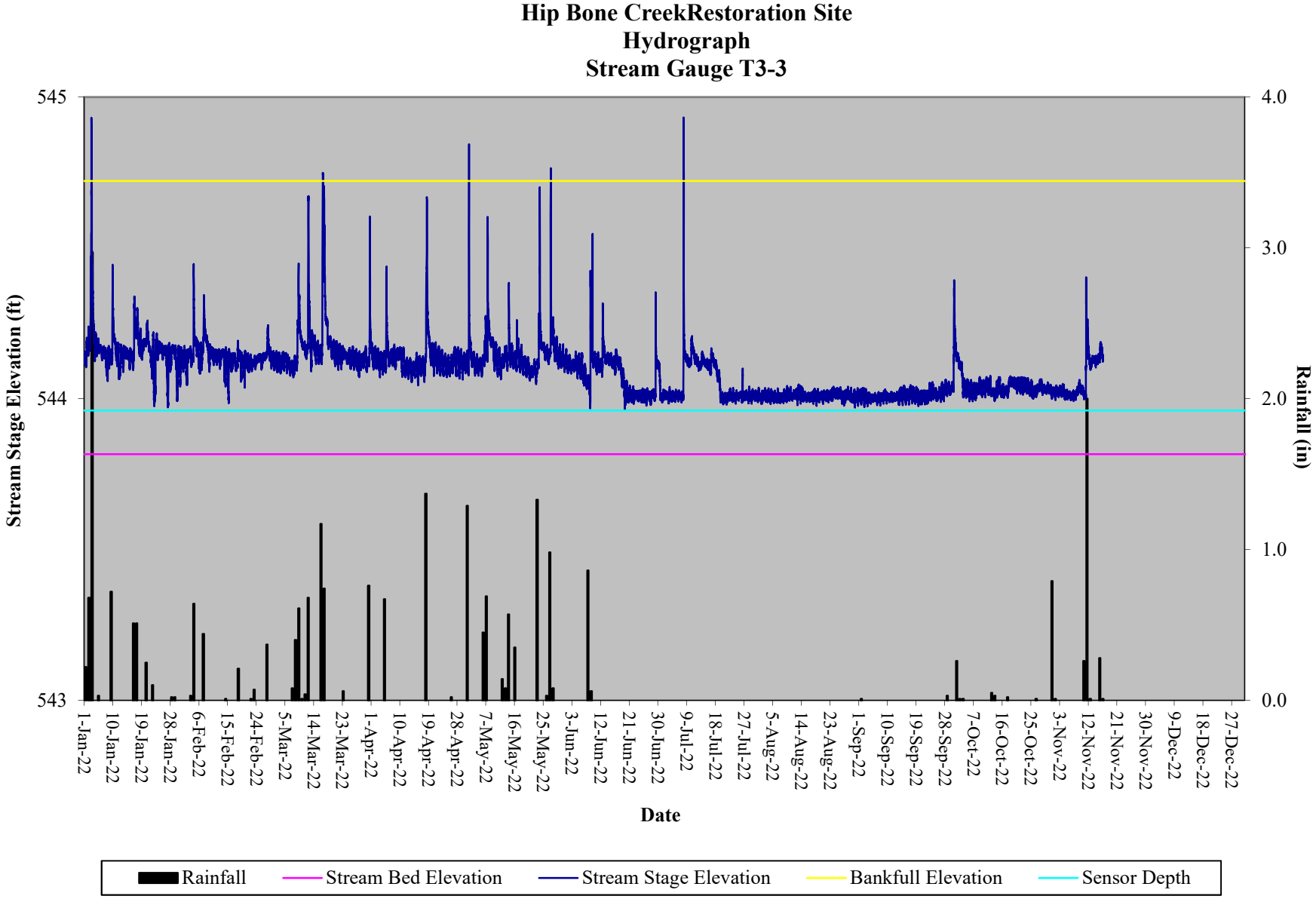
Table 11. Overbank Events , Hip Bone Creek Restoration Site (ID-100059)							
Gage ID	MY1 2021	MY2 2022	MY3 2023	MY4 2024	MY5 2025	MY6 2026	MY7 2027
T1-5	none	3					
T3-3	none	5					

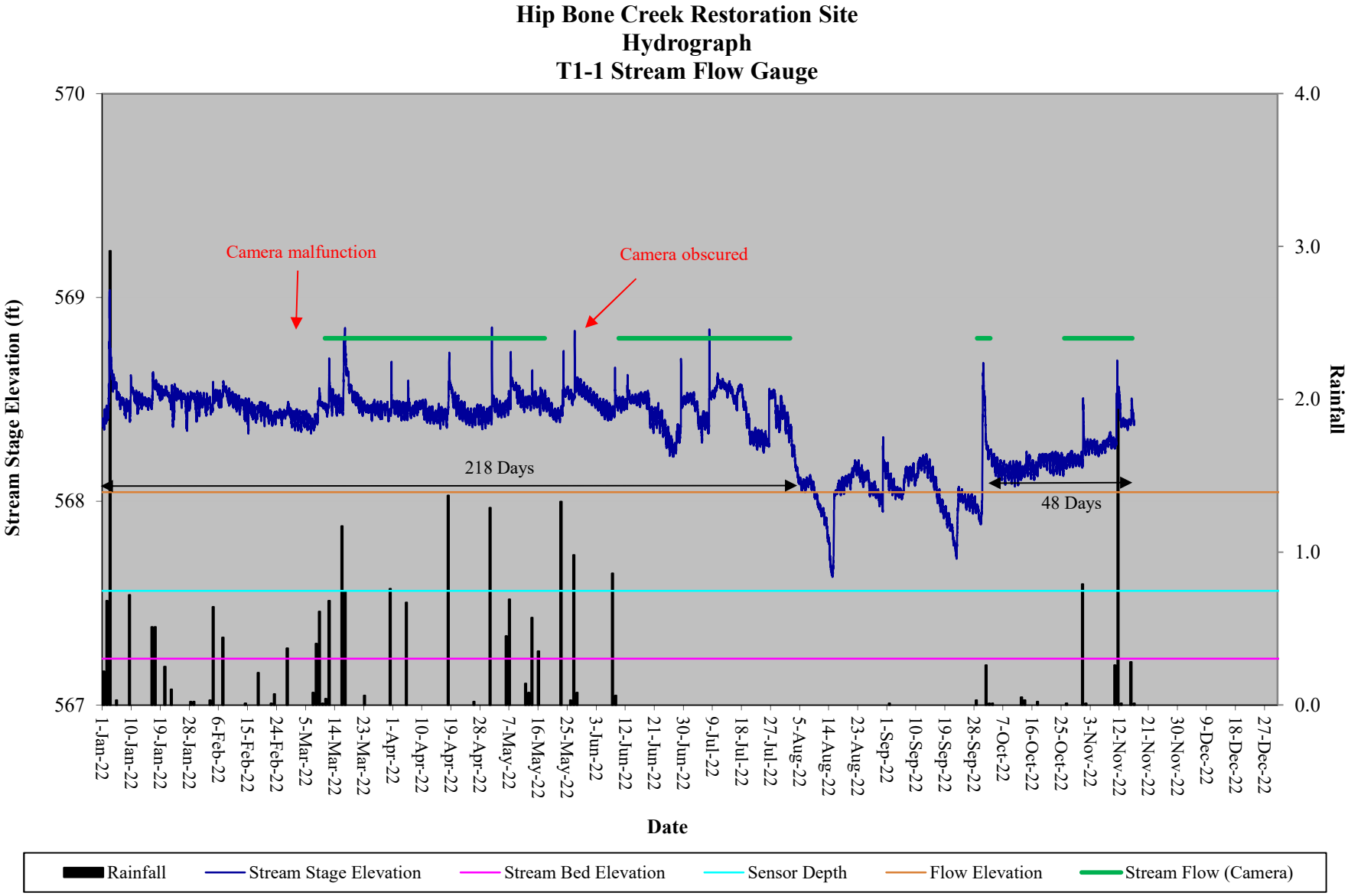
Table 12. Stream Flow Criteria Attainment, Hip Bone Creek Restoration Site (ID-100059)							
	Greater than 30 Days of Flow/Max Consecutive Days						
Reach	MY1 2021	MY2 2022	MY3 2023	MY4 2024	MY5 2025	MY6 2026	MY7 2027
T1-1 (Gauge)	Yes/105	Yes/218					
T1-1 (Camera)	Yes/90	Yes/69					
T3-1 (Gauge)	Yes/205	Yes/242					
T3-1 (Camera)	Yes/39	Yes/108					

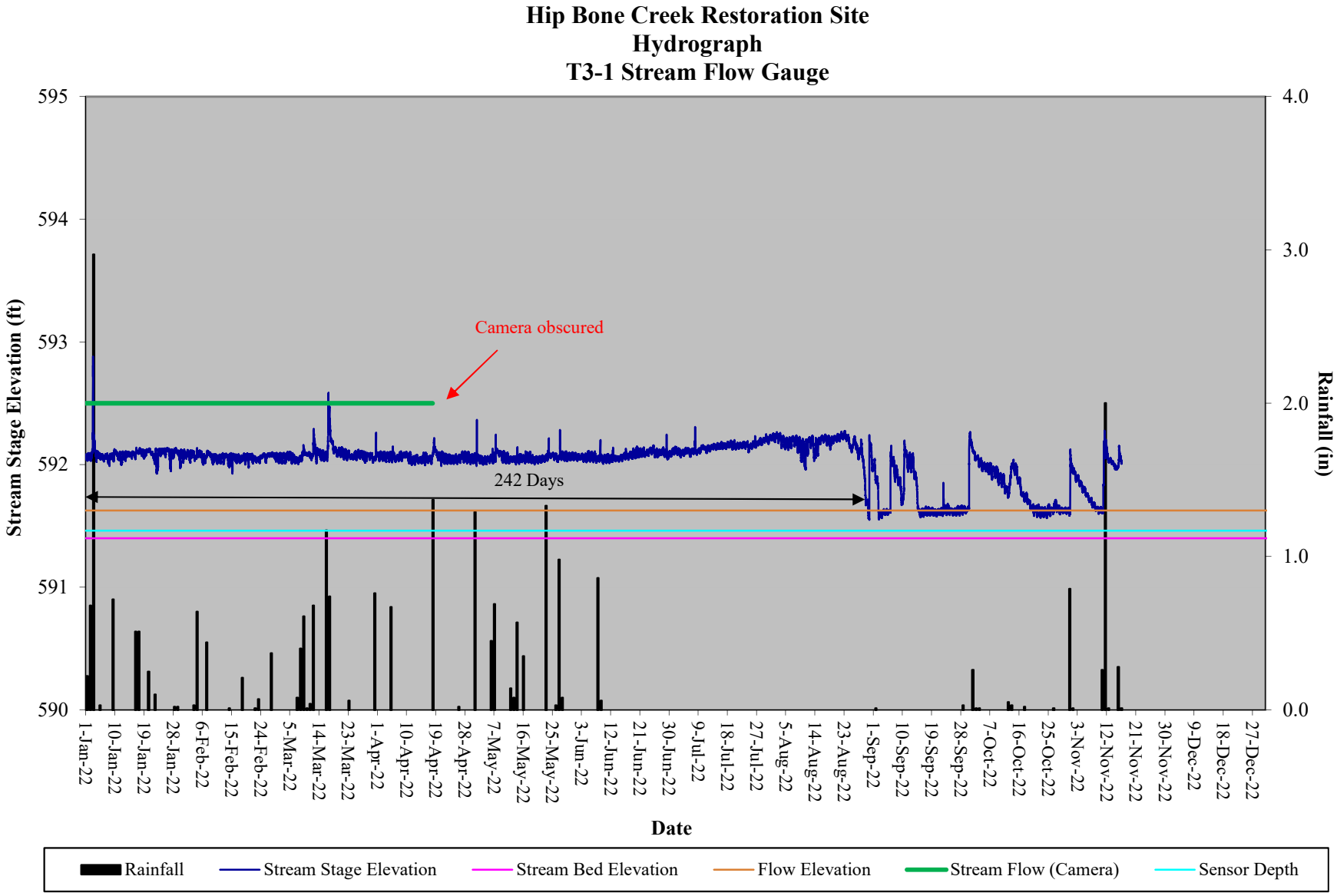
Table 13. Wetland Hydrology Criteria Attainment, Hip Bone Creek Restoration Site (ID-100059)							
	Performance Standard: **12 %** WETS Station: **Siler City 2N** Growing Season: **4/2 to 11/5 (217 days)**						
	Max. Consecutive Hydroperiod (%)						
Monitoring Gauge	MY1 2021	MY2 2022	MY3 2023	MY4 2024	MY5 2025	MY6 2026	MY7 2027
WM-1	5.5%	22.9%					
WM-2	6.0%	6.4%					
WM-3	30.9%	38.5%					
WM-4	5.1%	12.4%					
WM-5	3.2%	23.4%					
WM-6	19.8%	38.5%					
WM-7	28.1%	9.6%					
WM-8	2.3%	22.9%					

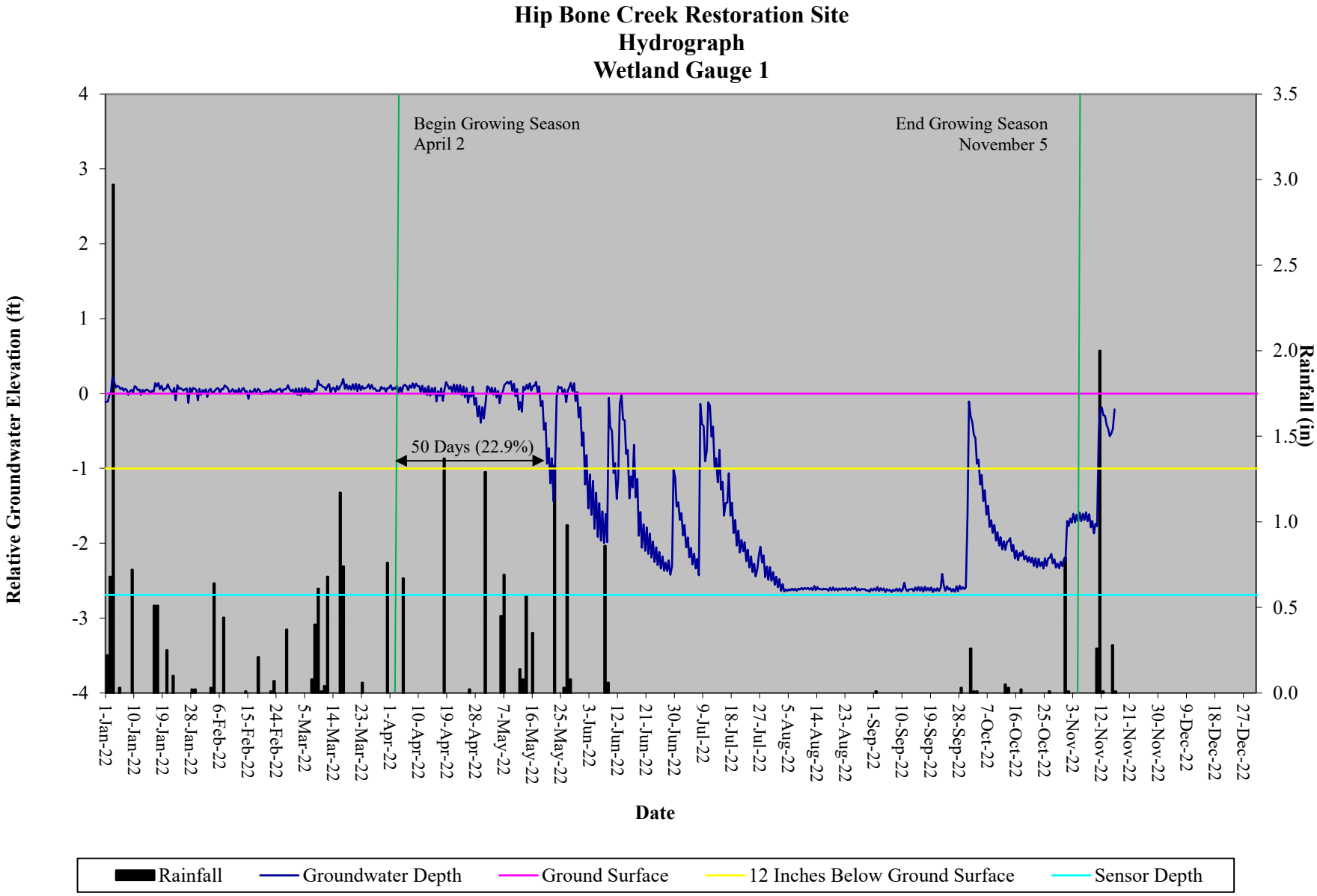
Hip Bone CreekRestoration Site
Hydrograph
Stream Gauge T1-5



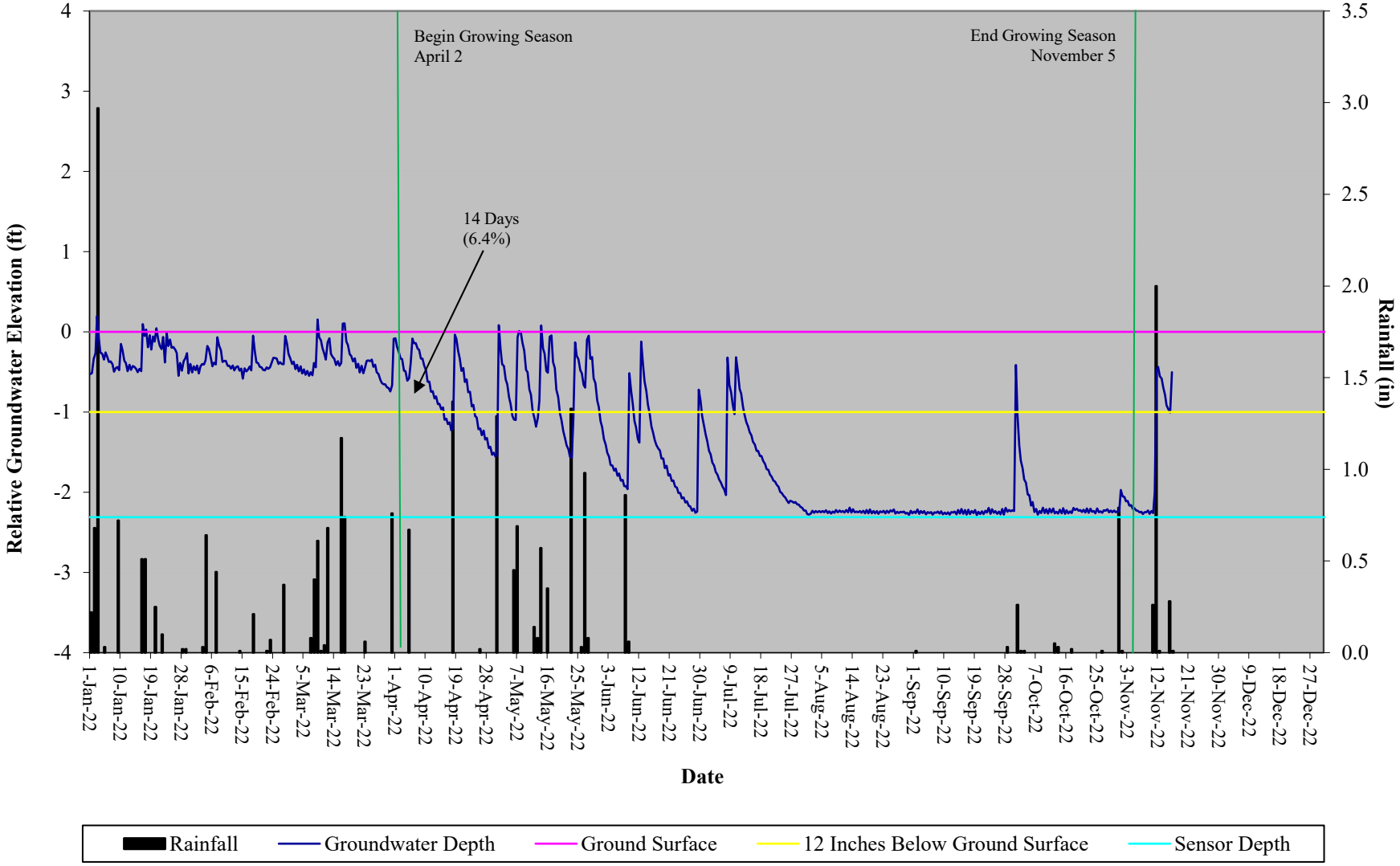

Hip Bone CreekRestoration Site
Hydrograph
Stream Gauge T3-3
Stream Stage Elevation (ft)
545
544
543
Rainfall (in)
4.0
3.0
2.0
1.0
0.0
1-Jan-22
10-Jan-22
19-Jan-22
28-Jan-22
6-Feb-22
15-Feb-22
24-Feb-22
5-Mar-22
14-Mar-22
23-Mar-22
1-Apr-22
10-Apr-22
19-Apr-22
28-Apr-22
7-May-22
16-May-22
25-May-22
3-Jun-22
12-Jun-22
21-Jun-22
30-Jun-22
9-Jul-22
18-Jul-22
27-Jul-22
5-Aug-22
14-Aug-22
23-Aug-22
1-Sep-22
10-Sep-22
19-Sep-22
28-Sep-22
7-Oct-22
16-Oct-22
25-Oct-22
3-Nov-22
12-Nov-22
21-Nov-22
30-Nov-22
9-Dec-22
18-Dec-22
27-Dec-22
Date
Rainfall
Stream Bed Elevation
Stream Stage Elevation
Bankfull Elevation
Sensor Depth


Hip Bone Creek Restoration Site
Hydrograph
T1-1 Stream Flow Gauge
Stream Stage Elevation (ft)
Rainfall
Date
Camera malfunction
Camera obscured
218 Days
48 Days
570
569
568
567
4.0
3.0
2.0
1.0
0.0
1-Jan-22
10-Jan-22
19-Jan-22
28-Jan-22
6-Feb-22
15-Feb-22
24-Feb-22
5-Mar-22
14-Mar-22
23-Mar-22
1-Apr-22
10-Apr-22
19-Apr-22
28-Apr-22
7-May-22
16-May-22
25-May-22
3-Jun-22
12-Jun-22
21-Jun-22
30-Jun-22
9-Jul-22
18-Jul-22
27-Jul-22
5-Aug-22
14-Aug-22
23-Aug-22
1-Sep-22
10-Sep-22
19-Sep-22
28-Sep-22
7-Oct-22
16-Oct-22
25-Oct-22
3-Nov-22
12-Nov-22
21-Nov-22
30-Nov-22
9-Dec-22
18-Dec-22
27-Dec-22
Rainfall
Stream Stage Elevation
Stream Bed Elevation
Sensor Depth
Flow Elevation
Stream Flow (Camera)

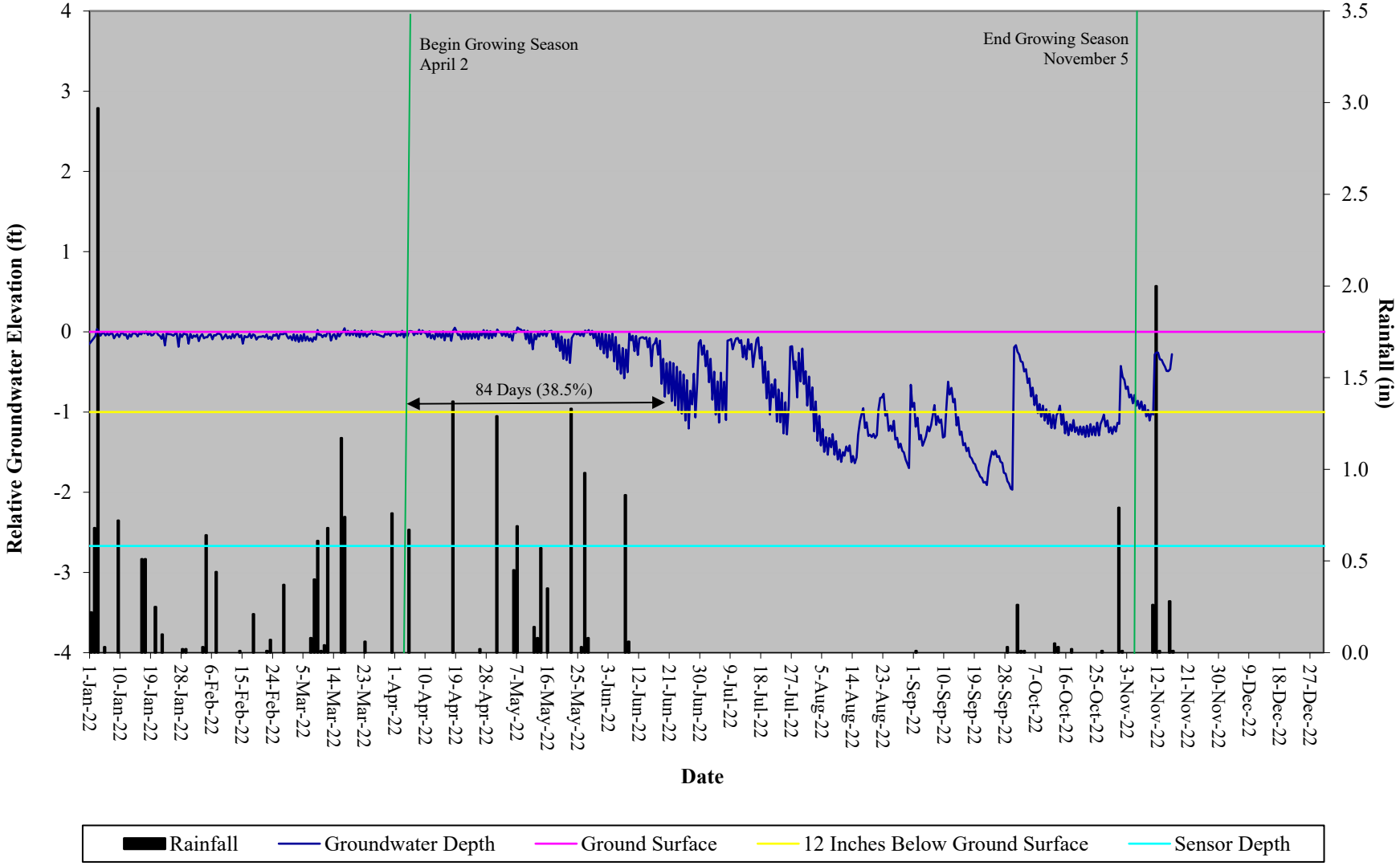

Hip Bone Creek Restoration Site
Hydrograph
T3-1 Stream Flow Gauge
Stream Stage Elevation (ft)
Rainfall (in)
595
594
593
592
591
590
4.0
3.0
2.0
1.0
0.0
Camera obscured
242 Days
1-Jan-22
10-Jan-22
19-Jan-22
28-Jan-22
6-Feb-22
15-Feb-22
24-Feb-22
5-Mar-22
14-Mar-22
23-Mar-22
1-Apr-22
10-Apr-22
19-Apr-22
28-Apr-22
7-May-22
16-May-22
25-May-22
3-Jun-22
12-Jun-22
21-Jun-22
30-Jun-22
9-Jul-22
18-Jul-22
27-Jul-22
5-Aug-22
14-Aug-22
23-Aug-22
1-Sep-22
10-Sep-22
19-Sep-22
28-Sep-22
7-Oct-22
16-Oct-22
25-Oct-22
3-Nov-22
12-Nov-22
21-Nov-22
30-Nov-22
9-Dec-22
18-Dec-22
27-Dec-22
Date
Rainfall
Stream Stage Elevation
Stream Bed Elevation
Flow Elevation
Stream Flow (Camera)
Sensor Depth


Hip Bone Creek Restoration Site
Hydrograph
Wetland Gauge 1
Begin Growing Season
April 2
End Growing Season
November 5
50 Days (22.9%)
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth

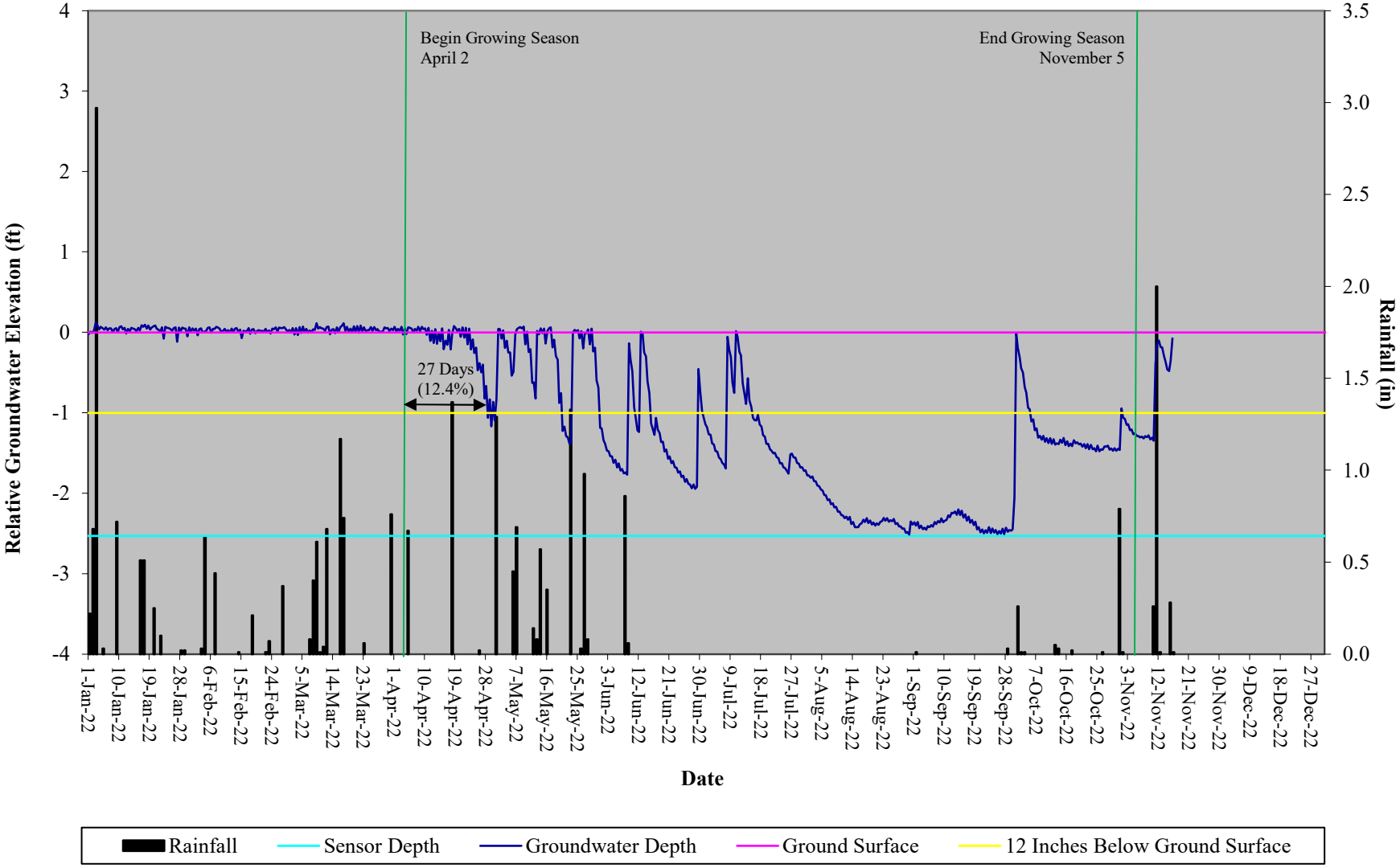
Hip Bone Creek Restoration Site
Hydrograph
Wetland Gauge 2



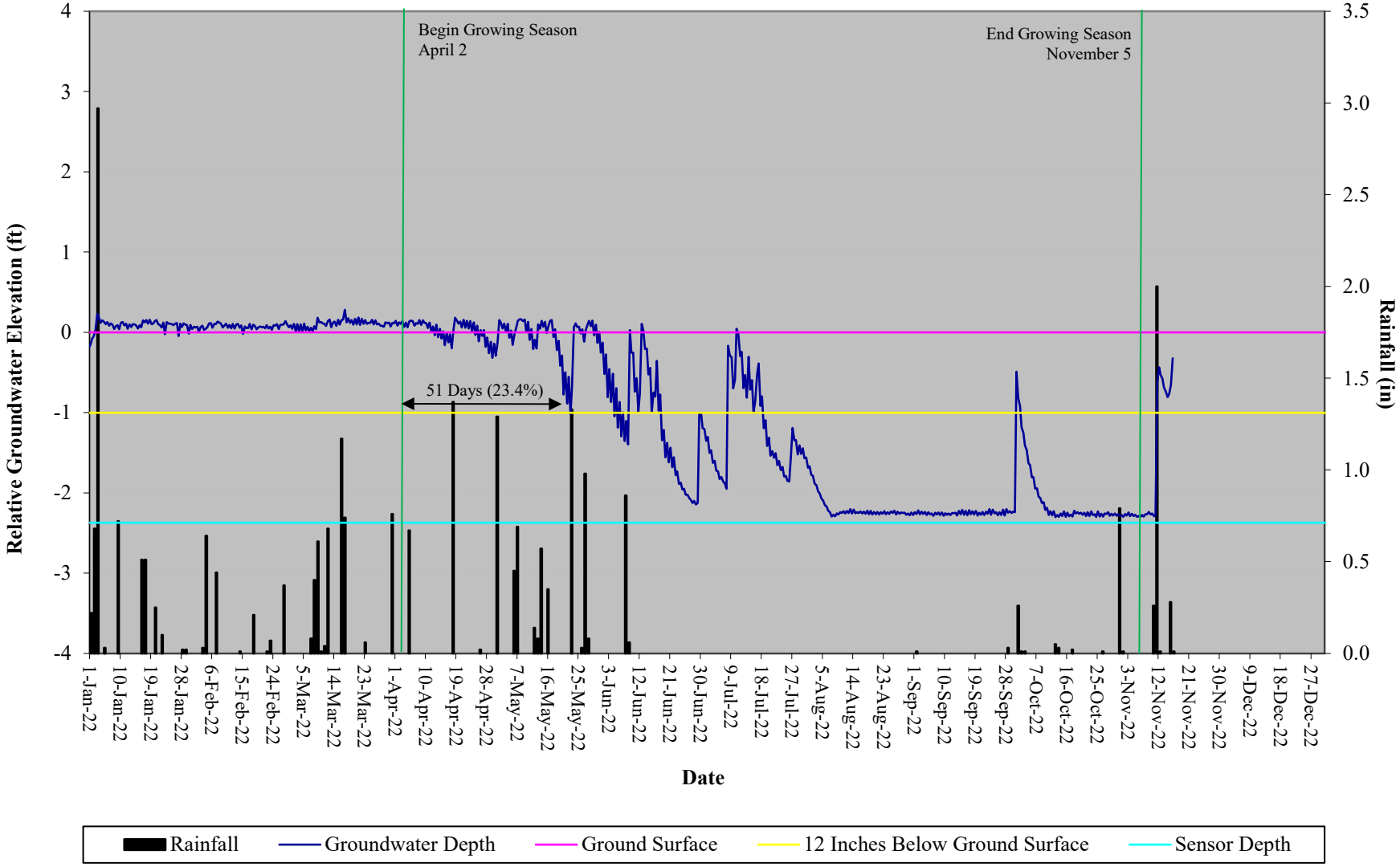
Hip Bone Creek Restoration Site
Hydrograph
Wetland Gauge 3



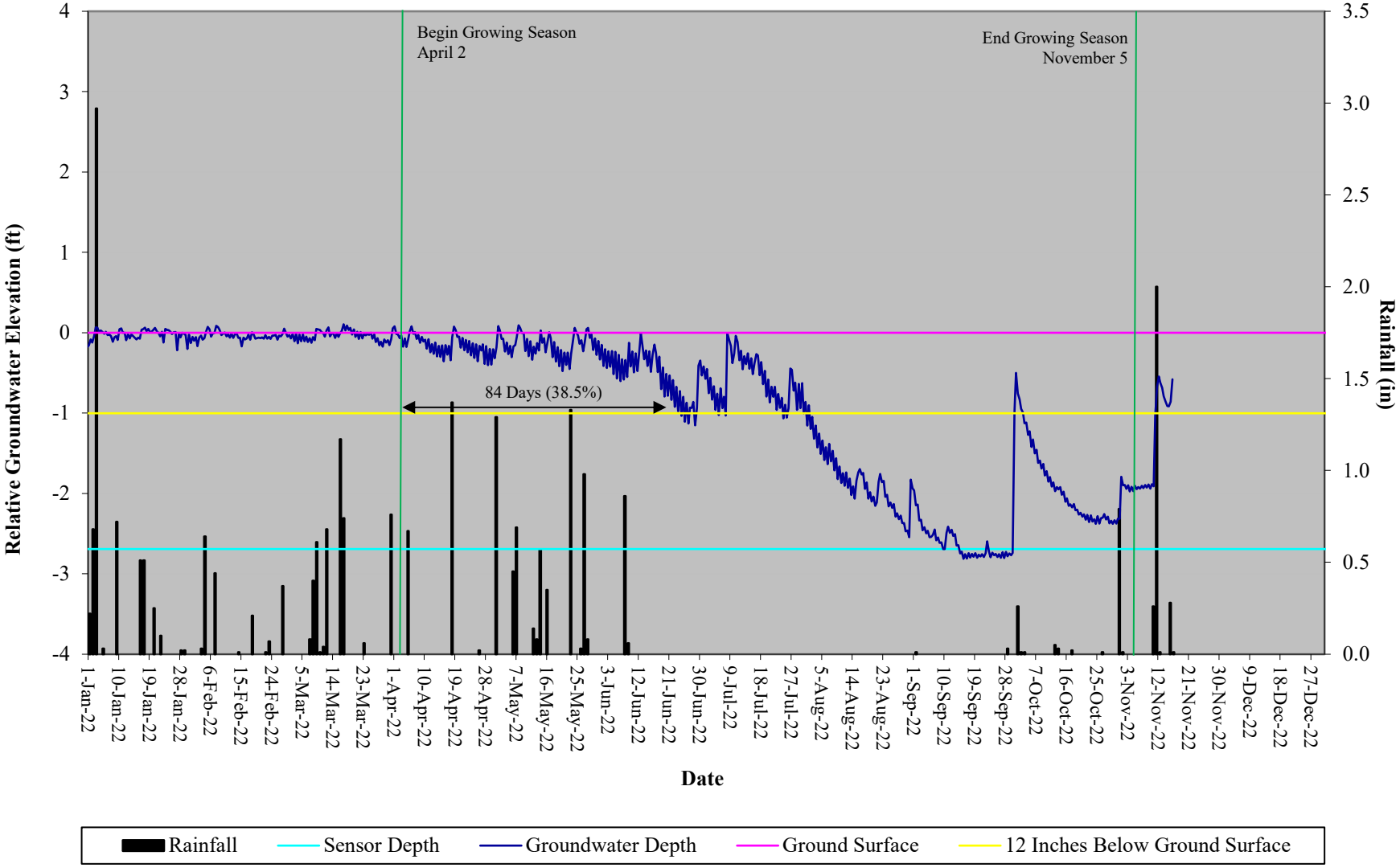
Hip Bone Creek Restoration Site
Hydrograph
Wetland Gauge 4

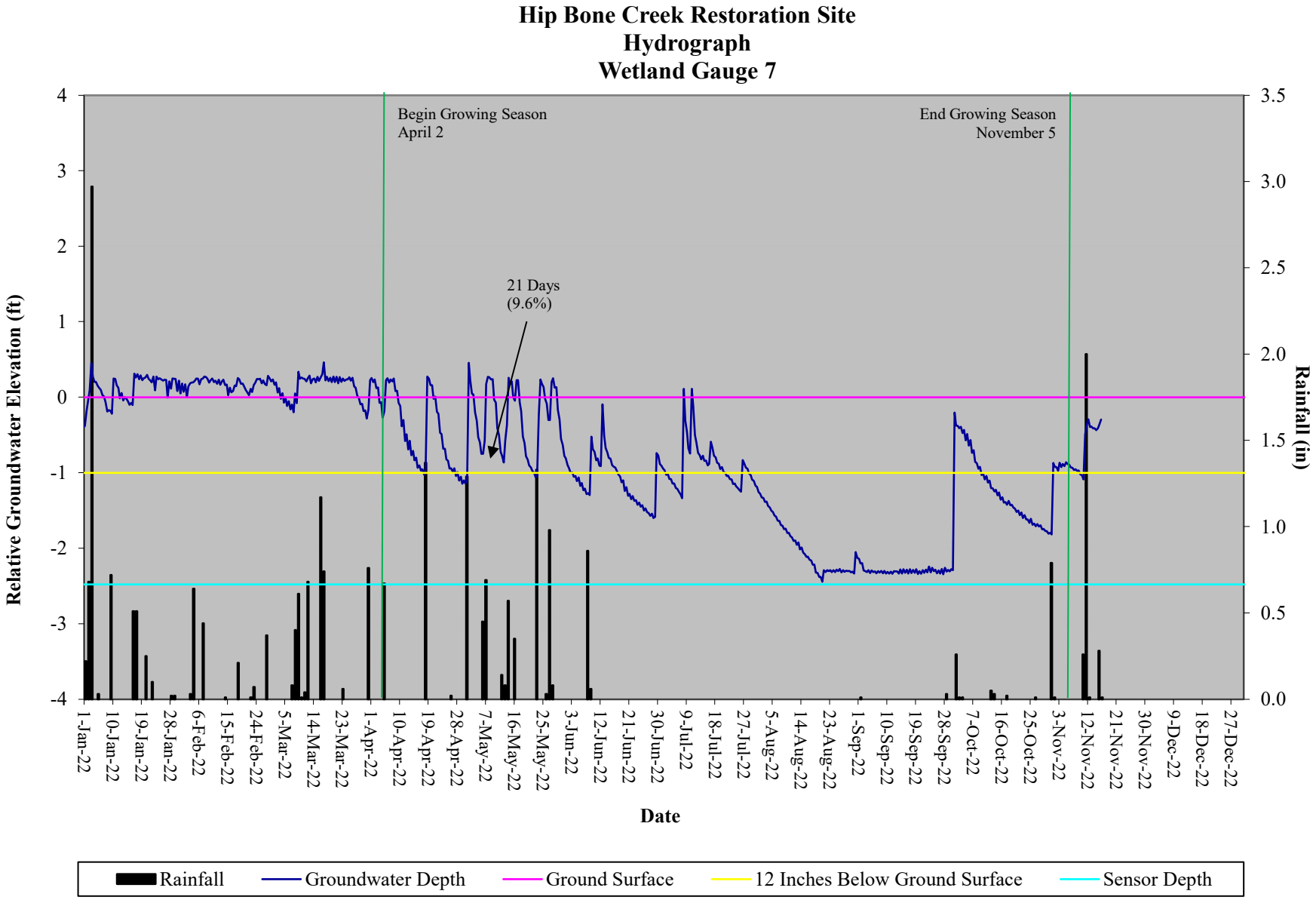


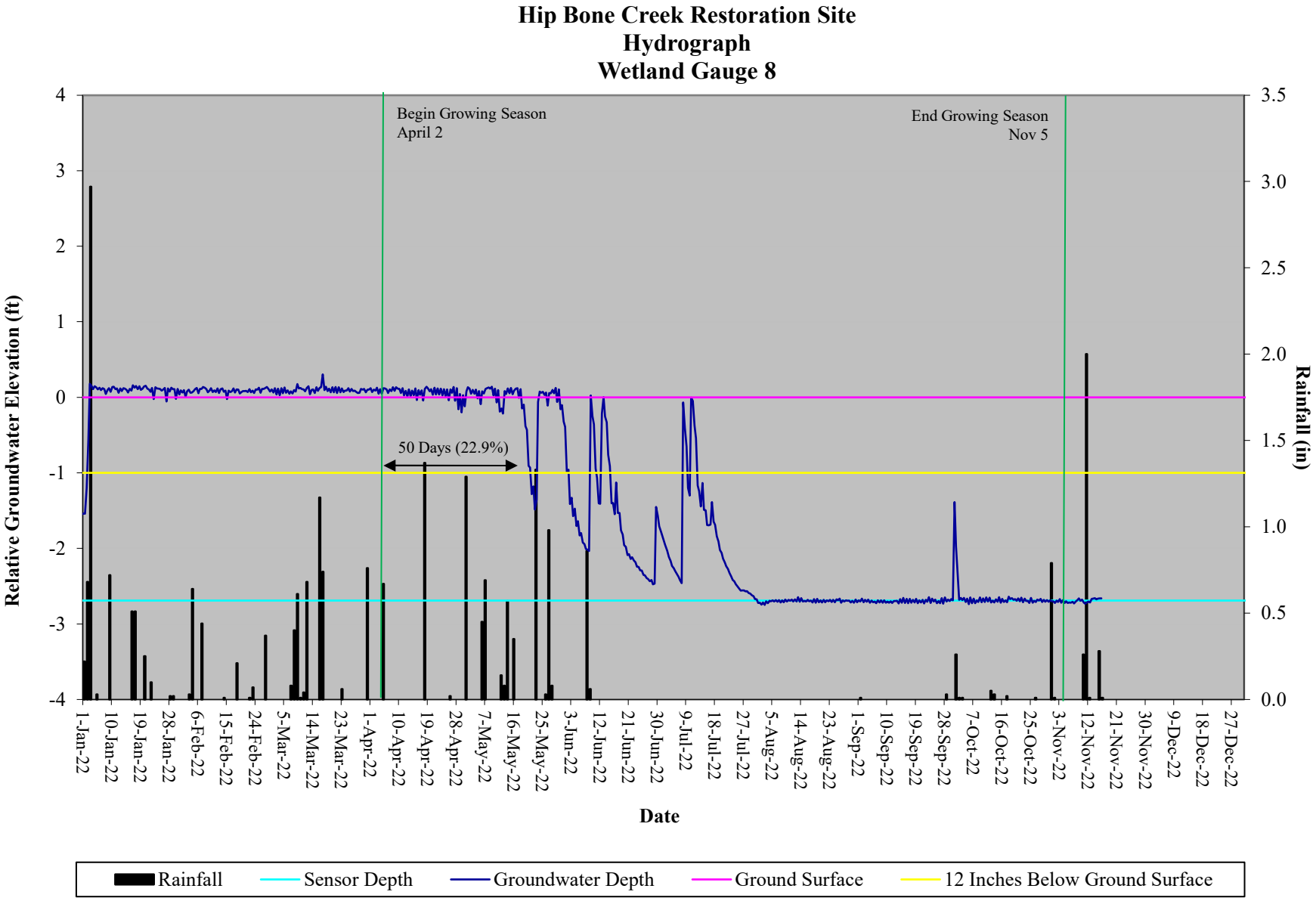
Hip Bone Creek Restoration Site
Hydrograph
Wetland Gauge 5



Hip Bone Creek Restoration Site
Hydrograph
Wetland Gauge 6




Hip Bone Creek Restoration Site
Hydrograph
Wetland Gauge 7
Begin Growing Season
April 2
End Growing Season
November 5
21 Days
(9.6%)
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
Rainfall
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth


Hip Bone Creek Restoration Site
Hydrograph
Wetland Gauge 8
Begin Growing Season
April 2
End Growing Season
Nov 5
50 Days (22.9%)
Relative Groundwater Elevation (ft)
Rainfall (in)
Date
4
3
2
1
0
-1
-2
-3
-4
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1-Jan-22
10-Jan-22
19-Jan-22
28-Jan-22
6-Feb-22
15-Feb-22
24-Feb-22
5-Mar-22
14-Mar-22
23-Mar-22
1-Apr-22
10-Apr-22
19-Apr-22
28-Apr-22
7-May-22
16-May-22
25-May-22
3-Jun-22
12-Jun-22
21-Jun-22
30-Jun-22
9-Jul-22
18-Jul-22
27-Jul-22
5-Aug-22
14-Aug-22
23-Aug-22
1-Sep-22
10-Sep-22
19-Sep-22
28-Sep-22
7-Oct-22
16-Oct-22
25-Oct-22
3-Nov-22
12-Nov-22
21-Nov-22
30-Nov-22
9-Dec-22
18-Dec-22
27-Dec-22
Rainfall
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface

APPENDIX E

Project Timeline and Contact Info

Table 14. Project Activity & Reporting History Hip Bone Creek Restoration Site (ID-100059)		
Activity or Report	**Data Collection Complete**	**Actual Completion or Delivery**
Project Instituted		April 23, 2018
Mitigation Plan		March 17, 2020
Final Design - Construction Plans		March 17, 2020
Construction Grading Completed		April 16, 2021
Planting Completed		April 30, 2021
Baseline Monitoring/Report	May 2021	July 2021
Vegetation Monitoring	May 14, 2021	
Stream Survey	May 21,2021	
Year 1 Monitoring	December 2021	January 2022
Vegetation Monitoring	November 17, 2021	
Stream Survey	December 13, 2021	
Invasive Treatment		July 28, 2022
Year 2 Monitoring	November 2022	December 2022
Vegetation Monitoring	August 22, 2022	
Stream Survey	July 15, 2022	

Table 15. Project Contacts Hip Bone Creek Restoration Site (ID-100059)	
Design Firm	KCI Associates of North Carolina, PC 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266
Construction Contractor	Chatham Civil Contracting 811 Archie Johnson Road Siler City, NC 27344 Contact: Mr. Stephen James Phone: (919)704-4442
Planting Contractor	Shenandoah Habitats 1983 Jefferson Highway Waynesboro, VA 22980 Contact: Mr. David Coleman Phone: (540) 941-0067
Monitoring Performers	
	KCI Associates of North Carolina, PC 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266