FINAL
MY5 (2023) MONITORING REPORT

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, North Carolina
Cape Fear River Basin
Cataloging Unit 03030002

DMS Project ID No. 100014
Full Delivery Contract No. 7192
RFP No. 16-006990
USACE Action ID No. SAW-2017-01471
DWR Project No. 17-0920

Data Collection: January 2023 – October 2023
Submission: January 2024

Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NORTH CAROLINA 27699-1652

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ENVIRONMENTAL QUALITY

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Response to DMS Comments – MY 5 (2023)

Heron Stream and Wetland Mitigation Site (DMS #100014)
Cape Fear River Basin 03030002, Alamance County
Contract No. 7192

Comments Received (Black Text) & Responses (Blue Text)

Report & Site Visit:

1. Appendix A – Project Activity and Reporting History Table does not match the summary Table titled "Site Permitting/Monitoring Activity and Reporting History".
   Response: These tables have been updated to match.

2. Mature privet was observed along UT-5A, UT-5B, UT-4 and UT-6. Please continue treatment. Overall the site looks good.
   Response: RS will continue to spot treat for privet throughout the project. It should be noted that the observed privet, though mature, is scattered in nature and does not pose a risk to planted vegetation. As such, RS feels it does not meet the requirements to be included on the CCPV or listed in Table 6, Item 4 – Invasive Areas of Concern.

Digital Review:

1. The digital data submission is missing summary tables 2, 15 and 16 included in the PDF report submission, please submit missing tables and photos if dedicated photo points other than veg plots and cross sections exist.
   Response: A "Background Tables" folder was added to the digital submittal. This folder contains an excel file with Tables 1-4. Additionally, an excel file containing tables 15 and 16 has been added to the "Hydrologic Data" folder.

Heron Year 5, 2023 Monitoring Summary

General Notes

- No encroachment was identified in Year 5
- No evidence of nuisance animal activity (i.e., beaver, heavy deer browsing, etc.) was observed.

Streams

- Stream measurements were conducted on May 17, 2023, 37 cross sections were measured across the site and results indicate streams are functioning as designed.

- Multiple visual assessments throughout the year indicate that across the Site, all in-stream structures are intact and functioning as designed and that channel geometry compares favorably with the proposed conditions outlined in the Detailed Restoration Plan and as constructed. No stream areas of concern were identified during year 5 (2023) monitoring. Tables for year 5 (2023) data and annual quantitative assessments are included in Appendix D.

- Two bankfull events were documented during year 5 (2023) monitoring for a total of 10 bankfull events to-date during the monitoring period (Table 14, Appendix E).

- Channel formation was evident in all site tributaries during year 5 (2023). The UT1 streamflow gauge captured 237 days of consecutive flow. The UT2 and UT3 stream gauges captured 110 days and 73 days respectively. The UT5 upstream and downstream gauges captured 165 and 154 days respectively. UT6 exhibited 282 consecutive days of flow. The upstream and downstream gauges on UT7 captured 154 days and 141 days respectively, and the UT7 middle gauge captured 229 days of flow. The UT8 gauge captured 250 consecutive days of flow. Channel formation tables and graphs are in Appendix E.

- In accordance with the monitoring schedule, year 5 (2023) benthic macroinvertebrate sampling occurred on June 13, 2023. Stream conditions were dry during the benthic macroinvertebrate sampling. UT-1 recorded zero (0) EPT Taxa due to hydrology being isolated to pools. Samples were not collected for UT-5 due to the lack of water in the entire stream channel. See the table below for a summary of benthic macroinvertebrate results. Year 5 (2023) results and habitat forms are in Appendix F.

Summary of Benthic Macroinvertebrate Data by Year

Sampling Station	Preconstruction		Year 3 (2021)		Year 5 (2023)*		Year 7 (2025)	
	# EPT Taxa	Biotic Index	# EPT Taxa	Biotic Index	# EPT Taxa	Biotic Index	# EPT Taxa	Biotic Index
UT-1	0	7.94	2	8.11	0	9.31		
UT-5	0	7.40	0	8.85	NA	NA		

*Site streams were unusually dry during the year 5 (2023) sampling effort. The UT-1 sampling reach was dry except for pools, and the UT-5 benthic sampling reach was completely dry at the time of sampling. No samples were collected in UT-5.

Wetlands

- All six groundwater gauges met success for the Year 5 (2023) monitoring period. Wetland hydrology data and graphs are in Appendix E.

Vegetation

- Vegetation plot monitoring for monitoring year 5 (2023) was performed on September 20, 2023. Thirteen of the 14 vegetation plots were found to be meeting success criteria with an average stem density of 373 stems per acre. In addition, 6 temporary plots were surveyed for an average stem density of 513 stems per acre.

- Continued treatment of invasive species and other thick herbaceous vegetation is planned for the remainder of the projects life.

Summary of Monitoring Period/Hydrology Success Criteria by Year

Year	Soil Temperatures/Date Bud Burst Documented	Monitoring Period Used for Determining Success	10 Percent of Monitoring Period
2019 (Year 1)	March 28, 2019*	March 28-October 22 (209 days)	21 days
2020 (Year 2)	March 2, 2020#	March 2-October 22 (235 days)	23 days
2021 (Year 3)	March 1, 2021^	March 1-October 22 (236 days)	24 days
2022 (Year 4)	March 1, 2022%	March 1-October 22 (236 days)	24 days
2023 (Year 5)	March 1, 2023~	March 1-October 22 (236 Days)	24 days

*Based on documented bud burst and soil temperature of 50.06°F on March 28, 2019.

Based on bud burst documented March 2, 2020 and soil temperature of 46.82°F on March 1, 2020.

^Based on bud burst documented on March 1, 2021. The soil temperature logger was damaged and stopped recording February 16, 2021, however at the time of the failure, the soil temperature had dropped below 41°F just twice in 2021 (January 5th and 31st) and exceeded thereafter.

%Based on bud burst documented February 28, 2022 and soil temperature of 45.97°F on March 1, 2022.

~Based on bud burst documented February 28, 2023 and soil temperature of 55.16°F on February 8, 2023

Site Maintenance Report (2023)

Invasive Species Work	Maintenance work
05/16/2023 Nodding thistle, Privet, Multiflora Rose, Russian Olive (Scattered treatment sitewide) 09/12/2023 Japanese Knotweed (UT8, see Figure 2D, Appendix B) Privet, Multiflora rose, Russian Olive (Scattered treatment sitewide)	6/19/2023 Fence repair, no encroachment documented 7/26/2023 Fence repair, no encroachment documented

Groundwater Hydrology Data

Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)	Year 6 (2024)	Year 7 (2025)
1	Yes/33 days (15.8%)	Yes/23 days (9.8%)	Yes /46 days (19.5%)	Yes /45 days (19.1%)	Yes/50 days (21.3%)		
2	Yes/26 days (12.4%)	Yes/27 days (11.5%)	Yes/47 days (19.9%)	Yes/66 days (28.1%)	Yes/73 days (31.1%)		
3	Yes/35 days (16.7%)	Yes/28 days (12.0%)	Yes/36 days (15.2%)	Yes/66 days (28.1%)	Yes/71 days (30.2%)		
4	Yes/69 days (33.0%)	Yes/51 days (21.8%)	Yes/60 days (25.4%)	Yes/56 days (23.8%)	Yes/96 days (40.9%)		
5	Yes/52 days (24.9%)	Yes/45 days (19.2%)	Yes/50 days (21.2%)	Yes/52 days (22.1%)	Yes/71 days (30.2%)		
6	Yes/54 days (25.8%)	Yes/46 days (19.7%)	Yes/52 days (22.0%)	No/13 days (5.5%)	Yes/92 days (39.1%)		

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Site Permitting/Monitoring Activity and Reporting History

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Technical Proposal (RFP No. 16-006990)	January 11, 2017	January 11, 2017
Institution Date (NCDMS Contract No. 100014)	--	May 22, 2017
404 Permit	--	October 10, 2018
Mitigation Plan	--	July 2018
Construction Plans	--	July 17, 2018
Site Construction	--	November 27, 2018-February 11, 2019
Planting	--	February 21, 2019
As-built Baseline Stream Data Collection	February 25-26, 2019	--
As-built Baseline Vegetation Data Collection	February 25, 2019	--
As-built Baseline Monitoring (MY0)	February-March 2019	May 2019
Monitoring Year 1 (2019) Stream Data Collection	August 13-14, 2019	--
Monitoring Year 1 (2019) Vegetation Data Collection	September 30, 2019	--
Monitoring Year 1 (MY1)	March-October 2019	November 2019
Invasive Species Treatment - Privet, Rose, Tree-of-Heaven, Microstegium, Johnson Grass	NA	June 12, 2020
Monitoring Year 2 (2020) Stream Data Collection	May 16-24, 2020	--
Monitoring Year 2 (2020) Vegetation Data Collection	July 1-6, 2020	--
Monitoring Year 2 (MY2)	March-October 2020	January 2021
Supplemental Planting	NA	April 8, 2021
Invasive Species Treatment - Johnson Grass, Privet, Tree-of-Heaven, Multi-flora Rose, Japanese Knotweed, Catttail and Fescue	NA	September 7 - October 7, 2021
Monitoring Year 3 (2021) Stream Data Collection	February 16, 2021	--
Monitoring Year 3 (2021) Vegetation Data Collection	July - October, 2021	--
Monitoring Year 3 (MY3)	January - October 2021	December 2021
Invasive Species Treatment - Cattail, Privet, Johnson Grass, Multiflora Rose, Sweetgum, Tree-of-Heaven, Princess Tree	NA	June 15, 2022
Invasive Species Treatment - Japanese Knotweed (UT8), Tree-of-Heaven, Privet, Multiflora rose	NA	August 29, 2022
Monitoring Year 4 (2022) Stream Data Collection	NA	--
Monitoring Year 4 (2022) Vegetation Data Collection	NA	--
Monitoring Year 4 (MY4)	January - October 2022	February 2023
Invasive Species Treatment - Nodding thistle, Privet, Multiflora Rose, Russian Olive	--	May 15, 2023
Invasive Species Treatment - Japanese Knotweed (UT8), Privet, Multiflora rose, Russian Olive	--	September 12, 2023
Monitoring Year 5 (2023) Stream Data Collection	May 17, 2023	--
Monitoring Year 5 (2023) Vegetation Data Collection	September 20, 2023	--
Monitoring Year 5 (MY5)	January - October 2023	January 2024

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APPENDICES

1.0 PROJECT SUMMARY

Restoration Systems, LLC has established the North Carolina Division of Mitigation Services (NCDMS) Heron Stream and Wetland Restoration Site (Site).

1.1 Project Goals & Objectives

Project goals were based on the *Cape Fear River Basin Restoration Priorities* (RBRP) report (NCEEP 2009) and on-site preconstruction data collection of channel morphology and function observed during field investigations. The Site is located within Targeted Local Watershed (TLW) 03030002050050. The RBRP report documents benthic ratings vary between "Fair" and "Good-Fair" possibly due to cattle, dairy, and poultry operations. The project is not located in a Regional or Local Watershed Planning Area; however, RBRP goals addressed by project activities are as follows with Site specific information following the RBRP goals in parenthesis.

1. Reduce and control sediment inputs (sediment input reduction of 67.3 tons/year);
2. Reduce and manage nutrient inputs (livestock removed from streams, elimination of fertilizer application, installation of marsh treatment areas; and a direct reduction of 893.2 pounds of nitrogen and 47.0 pounds of phosphorus per year);

Site specific mitigation goals and objectives were developed through the use of North Carolina Stream Assessment Method (NC SAM) and North Carolina Wetland Assessment Method (NC WAM) analyses of preconstruction and reference stream systems at the Site (NC SFAT 2015 and NC WFAT 2010) (see Table 1).

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Stream/Wetland Targeted Functions, Goals, and Objectives

Targeted Functions	Goals	Objectives	Compatibility of Success Criteria
(1) HYDROLOGY			
(2) Flood Flow (Floodplain Access) (3) Streamside Area Attenuation (4) Floodplain Access (4) Wooded Riparian Buffer (4) Microtopography	• Attenuate flood flow across the Site. • Minimize downstream flooding to the maximum extent possible. • Connect streams to functioning wetland systems.	• Construct new channel at historic floodplain elevation to restore overbank flows and restore jurisdictional wetlands • Plant woody riparian buffer • Remove livestock • Deep rip floodplain soils to reduce compaction and increase soil surface roughness • Protect riparian buffers with a perpetual conservation easement	• BHR not to exceed 1.2 • Document four overbank events in separate monitoring years • Livestock excluded from the easement • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria • Conservation Easement recorded
(3) Stream Stability (4) Channel Stability (4) Sediment Transport	• Increase stream stability within the Site so that channels are neither aggrading nor degrading.	• Construct channels with proper pattern, dimension, and longitudinal profile • Remove livestock • Construct stable channels with cobble/gravel substrate • Plant woody riparian buffer •	• Cross-section measurements indicate a stable channel with cobble/gravel substrate • Visual documentation of stable channels and structures • BHR not to exceed 1.2 • ER of 1.4 or greater • < 10% change in BHR and ER in any given year • Livestock excluded from the easement • Attain Vegetation Success Criteria
(1) WATER QUALITY			
(2) Streamside Area Vegetation (3) Upland Pollutant Filtration (3) Thermoregulation (2) Indicators of Stressors Wetland Particulate Change Wetland Physical Change	• Remove direct nutrient and pollutant inputs from the Site and reduce contributions to downstream waters.	• Remove livestock and reduce agricultural land/inputs • Install marsh treatment areas • Plant woody riparian buffer • Restore/enhance jurisdictional wetlands adjacent to Site streams • Provide surface roughness through deep ripping/plowing • Restore overbank flooding by establishing proper channel dynamics • Cessation of municipal land application	• Livestock excluded from the easement • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria

Stream/Wetland Targeted Functions, Goals, and Objectives (Continued)

(1) HABITAT			
(2) In-stream Habitat (3) Substrate (3) Stream Stability (3) In-Stream Habitat (2) Stream-side Habitat (3) Stream-side Habitat (3) Thermoregulation Wetland Landscape Patch Structure Wetland Vegetation Composition	• Improve instream and stream-side habitat.	• Construct stable channels with cobble/gravel substrate • Plant woody riparian buffer to provide organic matter and shade • Construct new channel at historic floodplain elevation to restore overbank flows and plant woody riparian buffer • Protect riparian buffers with a perpetual conservation easement • Restore/enhance jurisdictional wetlands adjacent to Site streams	• Cross-section measurement indicate a stable channel with cobble/gravel substrate • Visual documentation of stable channels and in-stream structures. • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria • Conservation Easement recorded

1.2 Project Background

The Heron Stream and Wetland Mitigation Site (hereafter referred to as the "Site") encompasses a 17.64-acre easement along warm water, unnamed tributaries to Pine Hill Branch and unnamed tributaries to South Fork Cane Creek. The Site is located approximately 4 miles southeast of Snow Camp and 4.5 miles north of Silk Hope in southern Alamance County near the Chatham County line (Figure 1, Appendix A).

Prior to construction, Site land use consisted of disturbed forest and agricultural land used for livestock grazing and hay production. Livestock had unrestricted access to Site streams, which had been cleared, dredged of cobble substrate, straightened, trampled by livestock, eroded vertically and laterally, and received extensive sediment and nutrient inputs from stream banks and adjacent pastures. Approximately 62 percent of the stream channel had been degraded contributing to sediment export from the Site resulting from mechanical processes such as livestock hoof shear. In addition, streamside wetlands were cleared and drained by channel downcutting and land uses. Preconstruction Site conditions resulted in degraded water quality, a loss of aquatic habitat, reduced nutrient and sediment retention, and unstable channel characteristics (loss of horizontal flow vectors that maintain pools and an increase in erosive forces to channel bed and banks). Site restoration activities restored riffle-pool morphology, aided in energy dissipation, increased aquatic habitat, stabilized channel banks, and greatly reduced sediment loss from channel banks.

1.3 Project Components and Structure

Proposed Site restoration activities generated 5293 Stream Mitigation Units (SMUs) and 0.66 Wetland Mitigation Units (WMUs) as the result of the following.

- 4068 linear feet of Priority I stream restoration
- 1184 linear feet of stream enhancement (Level I)
- 1090 linear feet of stream enhancement (Level II)
- 0.35 acre of riparian wetland restoration
- 0.61 acre of riparian wetland enhancement

Additional activities that occurred at the Site included the following.

- Installation of six marsh treatment areas throughout the Site.
- Fencing the entire conservation easement by leaving some pre-existing fencing, removing fencing, and installing additional fencing.
- Planting 12.05 acres of the Site with 15,625 stems (planted species and densities by zone are included in Table 7 [Appendix C]).

Deviations from the construction plans included realignment of UT 1B (adding 20 linear feet to the alignment) due to conflicts with a gas line crossing. The realignment resulted in the reduction of a log vane and alterations to pipe configurations within the crossing. Gas line realignment also affected the length of UT 2 in its lower reaches (shortening the Restoration reach). UT 2 also has minor deviations in the enhancement II reach due to profile elevation alterations to tie to the invert of UT 1B. These profile alterations were included in construction plans, but not included in table updates of the detailed plan. Profile alterations resulted in the Enhancement (level II)/Restoration initiation point migrating upstream, and thus the length of the Enhancement (Level II) reach (UT 2A) decreased by 39 feet, and the length of the restoration reach (UT 2B) increased by 17 feet.

Minor easement deviations after construction plan development resulted in some stationing changes, most notable at the upper reaches of UT 1A (adding 5 linear feet to the alignment) and UT 8A & UT 8B (reducing the alignments by a total of 4 linear feet). The easement variations also affected channel lengths across gas lines, which do not generate mitigation credit. Eight log cross-vanes were not constructed due to contact with bed rock, or conflicts with the gas line. In addition, a marsh treatment area was added to the right bank of UT 6 at a draw that was concentrating surface drainage and scouring the valley walls. No other deviations of significance occurred between construction plans and the as-built condition. In addition, no issues have arisen since construction occurred.

Site design was completed in July 2018. Construction started on November 27, 2018 and ended within a final walkthrough on February 11, 2019. The Site was planted on February 21, 2019. Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 1-4 (Appendix A).

1.4 Success Criteria

Project success criteria have been established per the October 24, 2016 NC Interagency Review Team *Wilmington District Stream and Wetland Compensatory Mitigation Update*. Monitoring and success criteria relate to project goals and objectives. From a mitigation perspective, several of the goals and objectives are assumed to be functionally elevated by restoration activities without direct measurement. Other goals and objectives will be considered successful upon achieving success criteria. The following table summarizes Site success criteria.

Success Criteria

Streams
• All streams must maintain an Ordinary High-Water Mark (OHWM), per RGL 05-05. • Continuous surface flow must be documented each year for at least 30 consecutive days. Surface water monitoring gauges will be installed in the upper third of all intermittent channels, unless otherwise requested by the IRT. • Bank height ratio (BHR) cannot exceed 1.2 at any measured cross-section. • Entrenchment ratio (ER) must be no less than 2.2 for E- and C-type channels at any measured riffle cross-section. Note: B-type channels may have an ER less than 1.4. • BHR and ER at any measure riffle cross-section should not change by more than 10% from baseline condition during any given monitoring period. • The stream project shall remain stable and all other performance standards shall be met through four separate bankfull events, occurring in separate years, during the monitoring years 1-7.
Wetland Hydrology
• Saturation or inundation within the upper 12 inches of the soil surface for, at a minimum, 10 percent of the growing season, during average climatic conditions. Note: Soil temperature for growing season establishment will be measured daily utilizing a continuous monitoring soil probe. Soil temperature will be measured from mid-February through the end of April (at a minimum).
Vegetation
• Within planted portions of the site, a minimum of 320 stems per acre must be present at year 3; a minimum of 260 stems per acre must be present at year 5; and a minimum of 210 stems per acre must be present at year 7. • Trees must average 7 feet in height at year 5, and 10 feet in height at year 7 in each plot. • Planted and volunteer stems are counted, provided they are included in the approved planting list for the site; natural recruits not on the planting list may be considered by the IRT on a case-by-case basis.

2.0 METHODS

Monitoring requirements and success criteria outlined in this plan follow the October 24, 2016 NC Interagency Review Team *Wilmington District Stream and Wetland Compensatory Mitigation Update*. Monitoring will be conducted by Axiom Environmental, Inc. Annual monitoring reports of the data collected will be submitted to the NCDMS by Restoration Systems no later than December 31 of each monitoring year data is collected. The monitoring schedule is summarized in the following table.

Monitoring Schedule

Resource	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Streams	X	X	X		X		X
Wetlands	X	X	X	X	X	X	X
Vegetation	X	X	X		X		X
Macroinvertebrates			X		X		X
Visual Assessment	X	X	X	X	X	X	X
Report Submittal	X	X	X	X	X	X	X

2.1 Monitoring

The monitoring parameters are summarized in the following table.

Monitoring Summary

Stream Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Stream Profile	Full longitudinal survey	As-built (unless otherwise required)	All restored stream channels	Graphic and tabular data.
Stream Dimension	Cross-sections	Years 1, 2, 3, 5, and 7	Total of 37 cross-sections on restored channels	Graphic and tabular data.
Channel Stability	Visual Assessments	Yearly	All restored stream channels	Areas of concern to be depicted on a plan view figure with a written assessment and photograph of the area included in the report.
	Additional Cross-sections	Yearly	Only if instability is documented during monitoring	Graphic and tabular data.
Stream Hydrology	Continuous monitoring surface water gauges and/or trail camera	Continuous recording through monitoring period	Total of 10 surface water gauges	Surface water data for each monitoring period as depicted in Figures 10A-10D.
Bankfull Events	Continuous monitoring surface water gauges and/or trail camera	Continuous recording through monitoring period	Total of 10 surface water gauges: One gauge on UT1, 2, 3, 6 and 8. Two gauges on UT 5. Three gauges on UT 7	Surface water data for each monitoring period
	Visual/Physical Evidence	Continuous through monitoring period	All restored stream channels	Visual evidence, photo documentation, and/or rain data.
Benthic Macroinvertebrates	"Qual 4" method described in *Standard Operating Procedures for Collection and Analysis of Benthic Macroinvertebrates, Version 5.0* (NCDWR 2016)	Pre-construction, Years 3, 5, and 7 during the "index period" referenced in *Small Streams Biocriteria Development* (NCDWQ 2009)	2 stations (one at the lower end of UT1 and one at the lower end of UT5)	Results* will be presented on a site-by-site basis and to include a list of taxa collected, an enumeration of *Ephemeroptera, Plecoptera,* and *Trichoptera* taxa as well as Biotic Index.
Wetland Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Wetland Restoration	Groundwater gauges	As-built, Years 1, 2, 3, 4, 5, 6, and 7 throughout the year with the growing season defined as March 1-October 22	6 gauges spread throughout restored wetlands	Soil temperature at the beginning of each monitoring period to verify the start of the growing season, groundwater and rain data for each monitoring period

Monitoring Summary (Continued)

Vegetation Parameters				
Parameter	**Method**	**Schedule/Frequency**	**Number/Extent**	**Data Collected/Reported**
Vegetation establishment and vigor	Permanent vegetation plots 0.0247 acre (100 square meters) in size; CVS-EEP Protocol for Recording Vegetation, Version 4.2 (Lee et al. 2008)	As-built, Years 1, 2, 3, 5, and 7	14 plots spread across the Site	Species, height, planted vs. volunteer, stems/acre
	Annual random vegetation plots, 0.0247 acre (100 square meters) in size	As-built, Years 1, 2, 3, 5, and 7	4 plots randomly selected each year	Species and height

*Benthic Macroinvertebrate sampling data will not be tied to success criteria; however, the data may be used as a tool to observe positive gains to in-stream habitat

Stream Summary

Stream measurements for monitoring year 5 (2023) were performed on May 17, 2023. A visual assessment indicates that across the Site, all in-stream structures are intact and functioning as designed and that channel geometry compares favorably with the proposed conditions outlined in the Detailed Restoration Plan and as constructed. No stream areas of concern were identified during year 5 (2023) monitoring. Tables for year 5 (2023) stream measurement data and annual quantitative assessments are included in Appendix C.

Two bankfull events were documented during year 5 (2023) monitoring for a total of 10 bankfull events to-date during the monitoring period (Table 14, Appendix E).

Channel formation was evident in all site tributaries during year 5 (2023). The UT1 streamflow gauge captured 237 days of consecutive flow. The UT2 and UT3 stream gauges captured 110 days and 73 days respectively. The UT5 upstream and downstream gauges captured 165 and 154 days respectively. UT6 exhibited 282 consecutive days of flow. The upstream and downstream gauges on UT7 captured 154 days and 141 days respectively, and the UT7 middle gauge captured 229 days of flow. The UT8 gauge captured 250 consecutive days of flow. Channel formation tables and graphs are in Appendix E.

In accordance with the monitoring schedule, year 5 (2023) benthic macroinvertebrate sampling occurred on June 13, 2023. Stream conditions were dry during the benthic macroinvertebrate sampling. UT-1 recorded zero (0) EPT Taxa due to hydrology being isolated to pools. Samples were not taken for UT-5 due to the lack of water in the entire stream channel. See the table below for a summary of benthic macroinvertebrate results. Year 5 (2023) results and habitat forms are in Appendix F.

Summary of Benthic Macroinvertebrate Data by Year

Sampling Station	Preconstruction		Year 3 (2021)		Year 5 (2023)*		Year 7 (2025)	
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*Site streams were unusually dry during the year 5 (2023) sampling effort. The UT-1 sampling reach was dry except for pools, and the UT-5 benthic sampling reach was completely dry at the time of sampling. No samples were collected in UT-5.

Wetland Summary

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Year	Soil Temperatures/Date Bud Burst Documented	Monitoring Period Used for Determining Success	10 Percent of Monitoring Period
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2023 (Year 5)	March 1, 2023~	March 1-October 23 (236 days)	24 days

*Based on documented bud burst and soil temperature of 50.06°F on March 28, 2019.

Based on bud burst documented March 2, 2020 and soil temperature of 46.82°F on March 1, 2020.

^Based on bud burst documented on March 1, 2021. The soil temperature logger was damaged and stopped recording February 16, 2021, however at the time of the failure, the soil temperature had dropped below 41°F just twice in 2021 (January 5th and 31st) and exceeded thereafter.

%Based on bud burst documented February 28, 2022 and soil temperature of 45.97°F on March 1, 2022.

~Based on bud burst documented February 28, 2023 and soil temperature of 55.16°F on March 1, 2023.

All six groundwater gauges met success for the Year 5 (2023) monitoring period. Wetland hydrology data and graphs are in Appendix E.

Vegetation Summary

Vegetation plot monitoring for monitoring year 5 (2023) was performed on September 20, 2023. Thirteen of the 14 vegetation plots were found to be meeting success criteria with an average stem density of 373 planted stems per acre. In addition, 6 temporary plots were surveyed for an average stem density of 513 stems per acre.

Supplemental planting of 3.87 acres was conducted in 2021 in previously identified areas of poor growth rates or vigor using 1,290 plants to improve the Site's overall stem density. These areas are identified on Figures 2A, 2B, and 2C (Appendix B) and are outside vegetation plots. Planting occurred at a rate of approximately 330 bare root stems per acre of the following species: river birch (*Betula nigra*), green ash

(*Fraxinus pennsylvanica*), tulip poplar (*Liriodendron tulipifera*), red bud (*Cercis canadensis*), sycamore (*Platanus occidentalis*), white oak (*Quercus alba*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), and red oak (*Quercus rubra*).

3.0 REFERENCES

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Appendix A
Background Tables

Table 1. Project Components and Mitigation Credits: Heron Site

Reach ID	Stream Stationing/ Wetland Type	Existing Footage/ Acreage	Mitigation Plan Footage/ Acreage	Restoration Footage/ Acreage	Restoration Level	Restoration or Restoration Equivalent	Mitigation Ratio	Mitigation Credits	Comment
UT 1A	(-)0+05 to 04+70	475	470	475	Enhancement (Level I)	475	1.5:1	317	
UT 1B	04+70 to 13+26	753	836	856	Restoration	856-57= 799	1:1	799	57 lf of UT1 is located outside of the conservation easement and therefore is not generating credit
UT 2A	00+00 to 03+04	304	343	304	Enhancement (Level II)	304	2.5:1	122	
UT 2B	03+04 to 03+67	19	46	63	Restoration	63	1:1	63	
UT 3	00+00 to 02+79	269	279	279	Restoration	279	1:1	279	
UT 4	00+00 to 04+50	485	450	450	Restoration	450	1:1	450	
UT 5A	00+00 to 09+52	422	952	952	Restoration	952-52= 900	1:1	900	52 lf of UT5 is located outside of the conservation easement and therefore is not generating credit
UT 5B	09+52 to 14+90	538	538	538	Enhancement (Level II)	538	2.5:1	215	
UT 6	00+00 to 07+81	683	781	781	Restoration	781	1:1	781	
UT 7A	00+00 to 02+32	0	232	232	Restoration	232-41= 191	1:1	191	41 lf of the UT7 restoration reach is located outside of the conservation easement and therefore is not generating credit
UT 7B	02+32 to 09+96	764	764	764	Enhancement (Level I)	764-55= 709	1.5:1	473	55 lf of the UT7 enhancement reach is located outside of the conservation easement and therefore is not generating credit
UT8A	00+04 to 06+09	549	607	605	Restoration	605	1:1	605	
UT 8B	06+09 to 08+57	248	250	248	Enhancement (Level II)	248	2.5:1	99	
Wetland R	Riparian Riverine	--	0.35	0.35	Restoration	0.35	1:1	0.35	Wetland Restoration
Wetland E	Riparian Riverine	0.61	0.61	0.61	Enhancement	0.61	2:1	0.31	Wetland Enhancement

Table 1. Project Components and Mitigation Credits: Heron Site (continued)

Length & Area Summations by Mitigation Category		
Restoration Level	**Stream (linear footage)**	**Riparian Wetland (acreage)**
Restoration	4068*	0.35
Enhancement (Level I)	1184**	--
Enhancement (Level II)	1090	--
Enhancement	--	0.61

*An additional 150 linear feet of stream restoration is located outside of the conservation easement and is therefore not included in this total or in mitigation credit calculations.

**An additional 55 linear feet of stream enhancement (level I) is located outside of the conservation easement and is therefore not included in this total or in mitigation credit calculations.

Overall Assets Summary	
Asset Category	**Overall Credits**
Stream	5293.334
Riparian Riverine Wetland	0.655

Table 2. Project Activity and Reporting History: Heron Site

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Technical Proposal (RFP No. 16-006990)	January 11, 2017	January 11, 2017
Institution Date (NCDMS Contract No. 100014)	--	May 22, 2017
404 Permit	--	October 10, 2018
Mitigation Plan	--	July 2018
Construction Plans	--	July 17, 2018
Site Construction	--	November 27, 2018-February 11, 2019
Planting	--	February 21, 2019
As-built Baseline Stream Data Collection	February 25-26, 2019	--
As-built Baseline Vegetation Data Collection	February 25, 2019	--
As-built Baseline Monitoring (MY0)	February-March 2019	May 2019
Monitoring Year 1 (2019) Stream Data Collection	August 13-14, 2019	--
Monitoring Year 1 (2019) Vegetation Data Collection	September 30, 2019	--
Monitoring Year 1 (MY1)	March-October 2019	November 2019
Invasive Species Treatment - Privet, Rose, Tree-of-Heaven, Microstegium, Johnson Grass	NA	June 12, 2020
Monitoring Year 2 (2020) Stream Data Collection	May 16-24, 2020	--
Monitoring Year 2 (2020) Vegetation Data Collection	July 1-6, 2020	--
Monitoring Year 2 (MY2)	March-October 2020	January 2021
Supplemental Planting	NA	April 8, 2021
Invasive Species Treatment - Johnson Grass, Privet, Tree-of-Heaven, Multi-flora Rose, Japanese Knotweed, Catttail and Fescue	NA	September 7 - October 7, 2021
Monitoring Year 3 (2021) Stream Data Collection	February 16, 2021	--
Monitoring Year 3 (2021) Vegetation Data Collection	July - October, 2021	--
Monitoring Year 3 (MY3)	January - October 2021	December 2021
Invasive Species Treatment - Cattail, Privet, Johnson Grass, Multiflora Rose, Sweetgum, Tree-of-Heaven, Princess Tree	NA	June 15, 2022
Invasive Species Treatment - Japanese Knotweed (UT8), Tree-of-Heaven, Privet, Multiflora rose	NA	August 29, 2022
Monitoring Year 4 (2022) Stream Data Collection	NA	--
Monitoring Year 4 (2022) Vegetation Data Collection	NA	--
Monitoring Year 4 (MY4)	January - October 2022	February 2023
Invasive Species Treatment - Nodding thistle, Privet, Multiflora Rose, Russian Olive	--	May 15, 2023
Invasive Species Treatment - Japanese Knotweed (UT8), Privet, Multiflora rose, Russian Olive	--	September 12, 2023
Monitoring Year 5 (2023) Stream Data Collection	May 17, 2023	--
Monitoring Year 5 (2023) Vegetation Data Collection	September 20, 2023	--
Monitoring Year 5 (MY5)	January - October 2023	January 2024

Table 3. Project Contacts Table: Heron Site

Full Delivery Provider Restoration Systems 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 Worth Creech 919-755-9490	**Construction Contractor** Land Mechanic Designs 780 Landmark Road Willow Spring, NC 27592 Lloyd Glover 919-639-6132
Designer Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693	**Planting Contractor** Carolina Silvics, Inc. 908 Indian Trail Road Edenton, NC 27932 Mary-Margaret McKinney 252-482-8491
Construction Plans and Sediment and Erosion Control Plans Sungate Design Group, PA 915 Jones Franklin Road Raleigh, NC 27606 Joshua G. Dalton, PE 919-859-2243	**As-built Surveyor** K2 Design Group 5688 US Highway 70 East Goldsboro, NC 27534 John Rudolph 919-751-0075
	Baseline & Monitoring Data Collection Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693

Table 4. Project Attribute Table: Heron Site

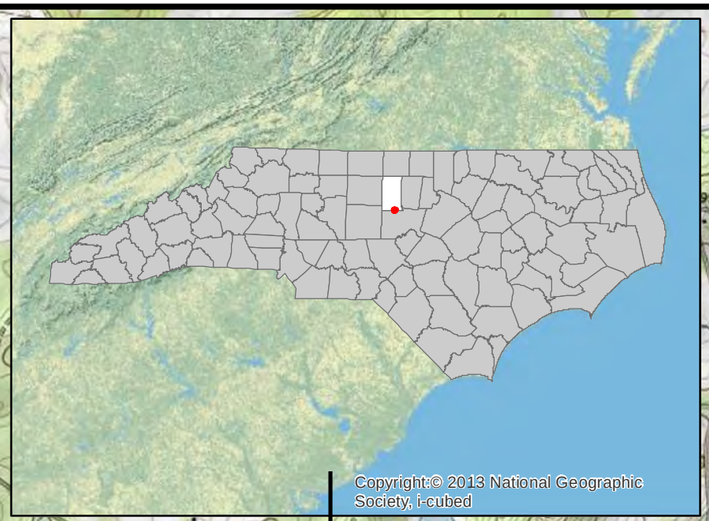
Project Information	
Project Name	Heron Stream and Wetland Mitigation Site
Project County	Alamance County, North Carolina
Project Area (acres)	17.64
Project Coordinates (latitude & latitude)	35.853955ºN, -79.363458ºW
Planted Area (acres)	12.05
Project Watershed Summary Information	
Physiographic Province	Piedmont
Project River Basin	Cape Fear
USGS HUC for Project (14-digit)	03030002050050
NCDWR Sub-basin for Project	03-06-04
Project Drainage Area (acres)	14 to 96
Percentage of Project Drainage Area that is Impervious	<2%
CGIA Land Use Classification	Managed Herbaceous Cover & Mixed Upland Hardwoods

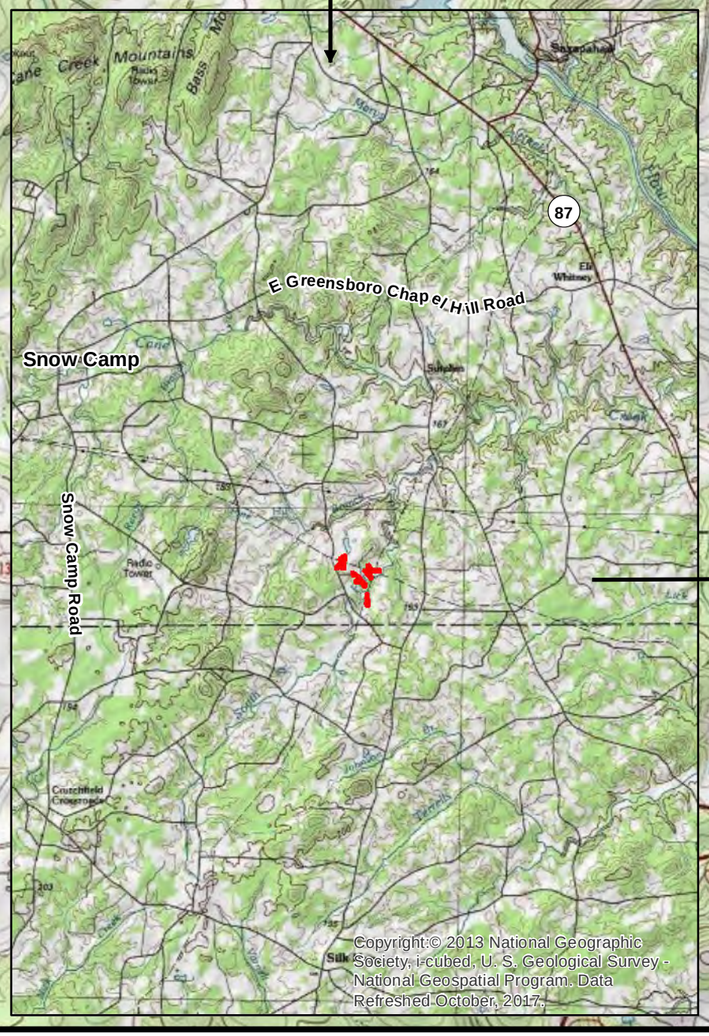
Table 4. Project Attribute Table: Heron Site (Continued)

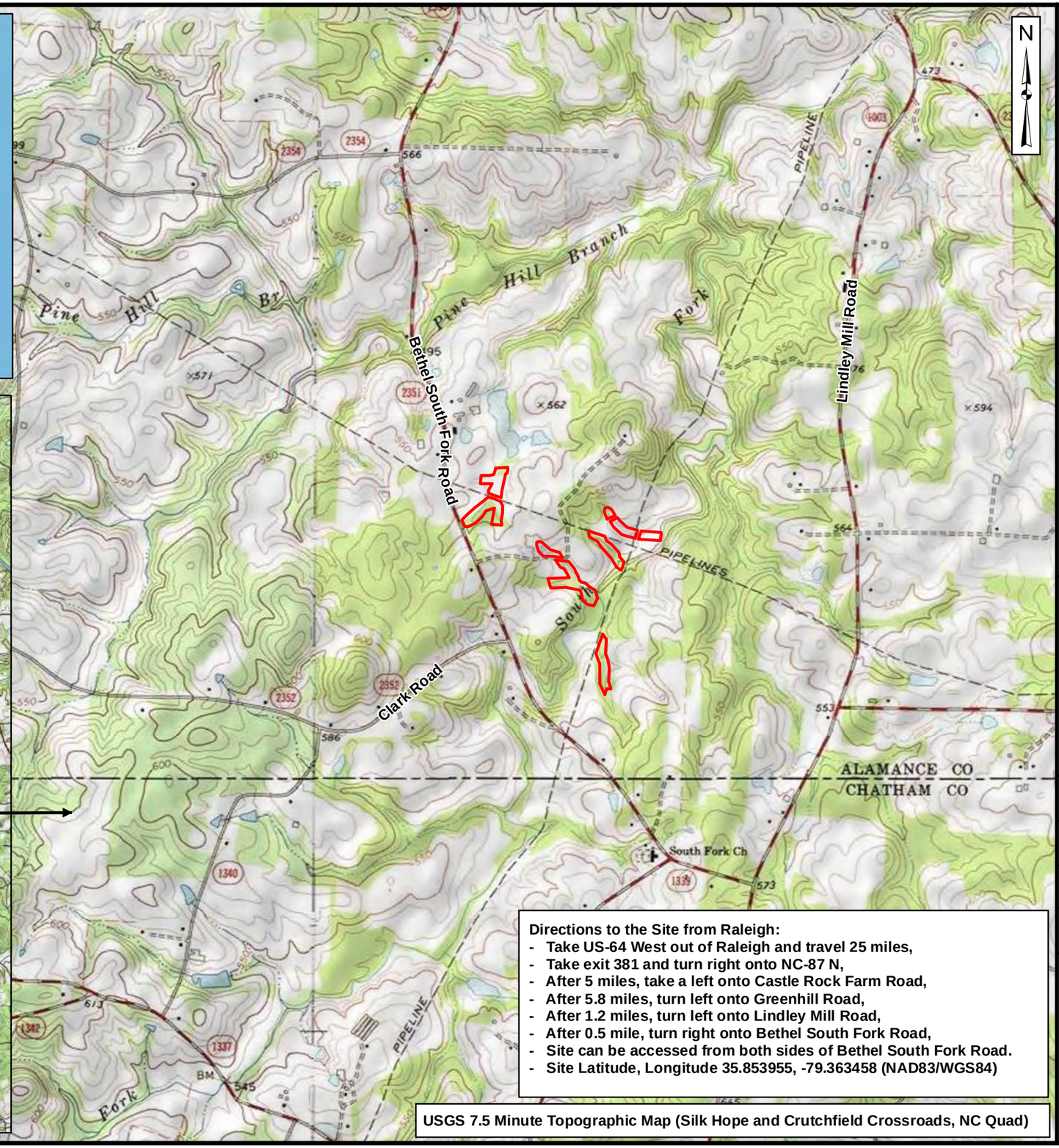
Reach Summary Information								
Parameters	**UT1**	**UT2**	**UT 3**	**UT4**	**UT 5**	**UT6**	**UT 7**	**UT 8**
Length of reach (linear feet)	1155	363	269	485	907	683	202	1221
Valley Classification & Confinement	Alluvial, confined							
Drainage Area (acres)	96.4	7.1	11.7	17.2	38.1	14.1	20.9	30.8
NCDWR Stream ID Score	30.5	22.5	28.5	33.5	27.5	23.5	24.5	27.5
Perennial, Intermittent, Ephemeral	Perennial	Intermittent	Perennial/ Intermittent	Perennial	Perennial/ Intermittent	Perennial/ Intermittent	Intermittent	Perennial
NCDWR Water Quality Classification	WS-V, NSW							
Existing Morphological Description (Rosgen 1996)	Cg5	Gf5	Cg5	Eg5	Eg5	Cg5	Cg5	Eg5
Proposed Stream Classification (Rosgen 1996)	C/E 4	Gf 5	C/E 4	C/E 4	C/E 4	C/E 4	Eb4	C/E 4
Existing Evolutionary Stage (Simon and Hupp 1986)	III/IV	I/III/IV	III/IV	II/III	II/III	III/IV	III/IV	II/III
Underlying Mapped Soils	Alamance silt loam, Georgeville silt loam, Goldston slaty silt loam, Herndon silt loam, Orange silt loam, Worsham sandy loam, Local Alluvial Land,							
Drainage Class	Well-drained, well-drained, well-drained, well-drained, well drained, poorly-drained, poorly-drained							
Hydric Soil Status	Nonhydric, nonhydric, nonhydric, nonhydric, nonhydric, hydric, hydric, respectively							
Valley Slope	0.0074	0.0270	0.0222	0.0244	0.0358	0.0300	0.0255	0.0218
FEMA Classification	NA							
Native Vegetation Community	Piedmont Alluvial Forest/Dry-Mesic Oak-Hickory Forest							
Watershed Land Use/Land Cover (Site)	43% forest,55% agricultural land, <2% low density residential/impervious surface							
Watershed Land Use/Land Cover (Cedarock Reference Channel)	65% forest, 30% agricultural land, <5% low density residential/impervious surface							
Percent Composition of Exotic Invasive Vegetation	<5%							

Appendix B
Visual Assessment Data

Figure 1. Project Location
Figure 2, 2A-D. Current Conditions Plan View
Tables 5A-5H. Visual Stream Morphology Stability Assessment
Table 6. Vegetation Condition Assessment







Directions to the Site from Raleigh:
- **Take US-64 West out of Raleigh and travel 25 miles,**
- **Take exit 381 and turn right onto NC-87 N,**
- **After 5 miles, take a left onto Castle Rock Farm Road,**
- **After 5.8 miles, turn left onto Greenhill Road,**
- **After 1.2 miles, turn left onto Lindley Mill Road,**
- **After 0.5 mile, turn right onto Bethel South Fork Road,**
- **Site can be accessed from both sides of Bethel South Fork Road.**
- **Site Latitude, Longitude 35.853955, -79.363458 (NAD83/WGS84)**

USGS 7.5 Minute Topographic Map (Silk Hope and Crutchfield Crossroads, NC Quad)

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

PROJECT LOCATION

Drawn by: KRJ

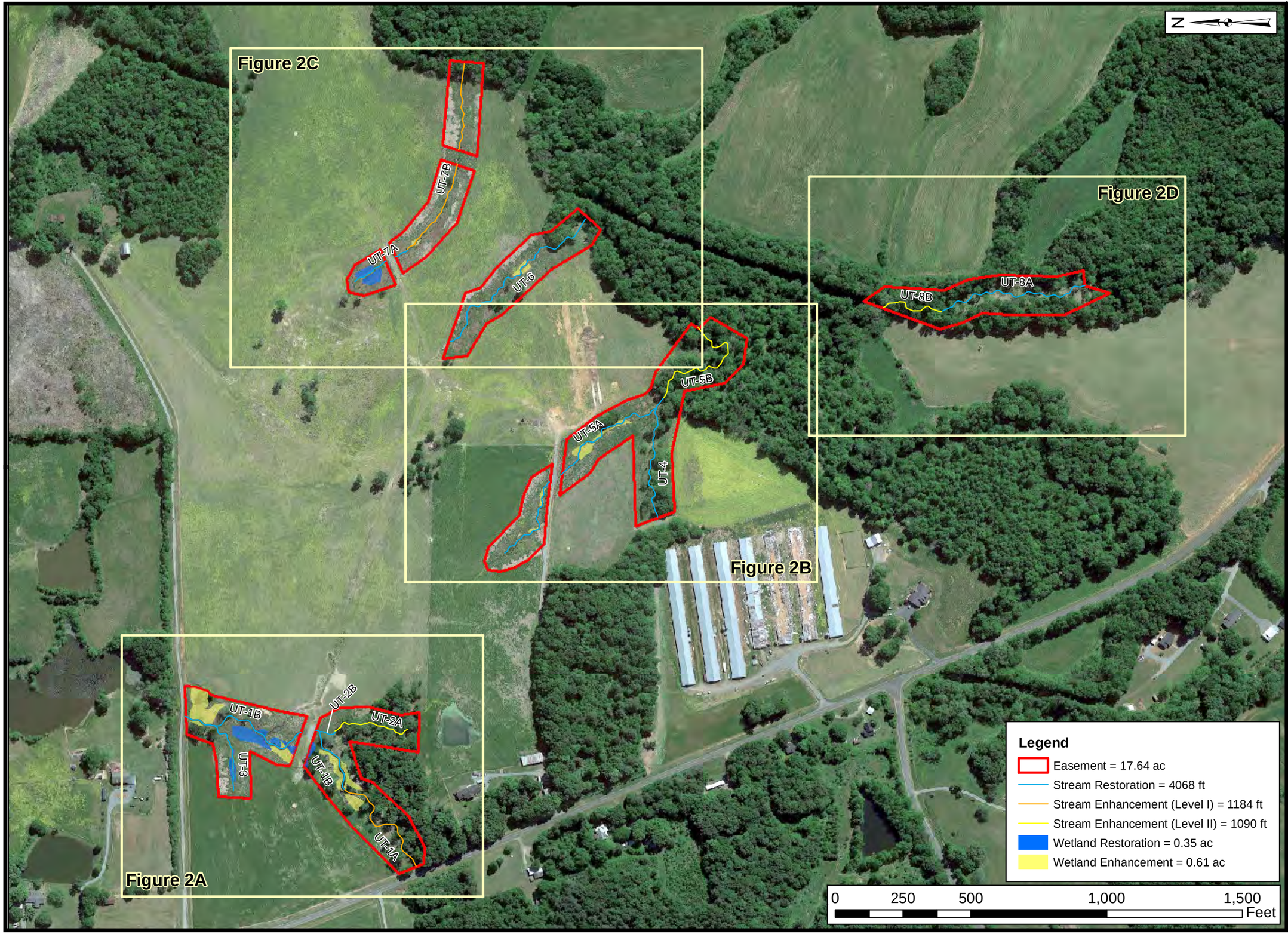
Date: DEC 2017

Scale: 1:20000

Project No.: 17-008

FIGURE

1



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

Date: OCT 2023

Scale: 1:4000

Project No.: 17-008

FIGURE

2

Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

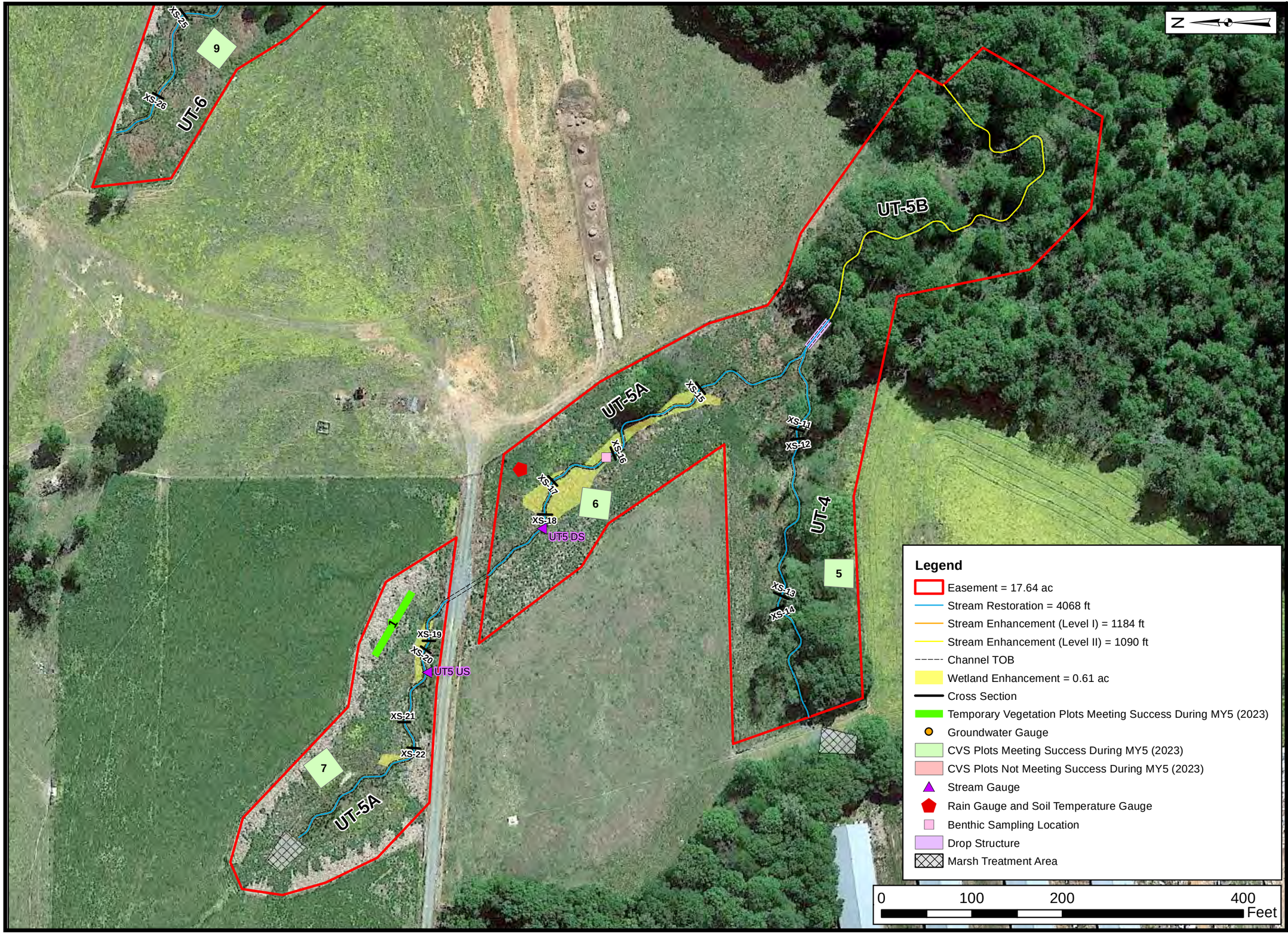
Date: OCT 2023

Scale: 1:1200

Project No.: 17-008

FIGURE

2A



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

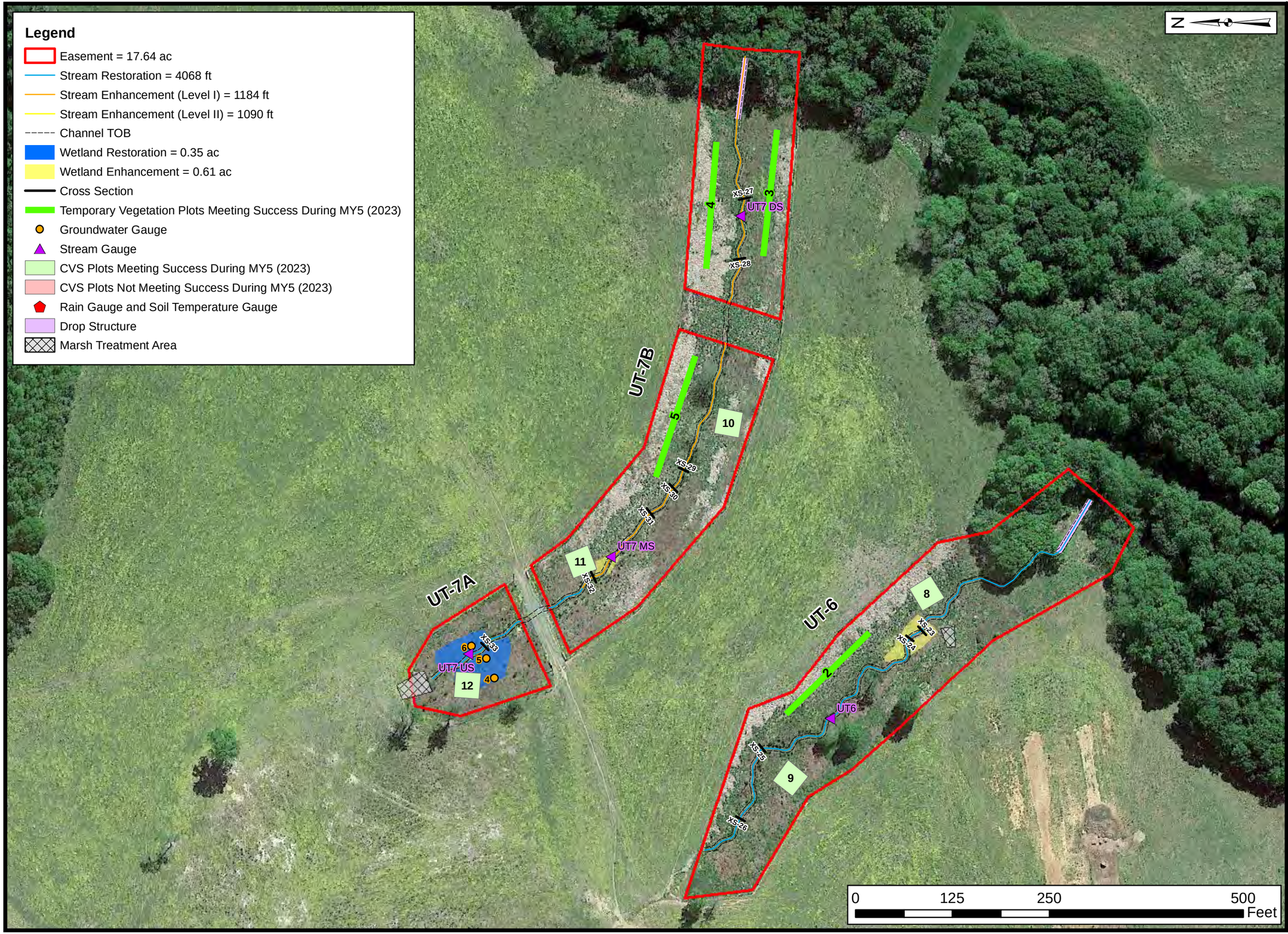
Date: OCT 2023

Scale: 1:1200

Project No.: 17-008

FIGURE

2B



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

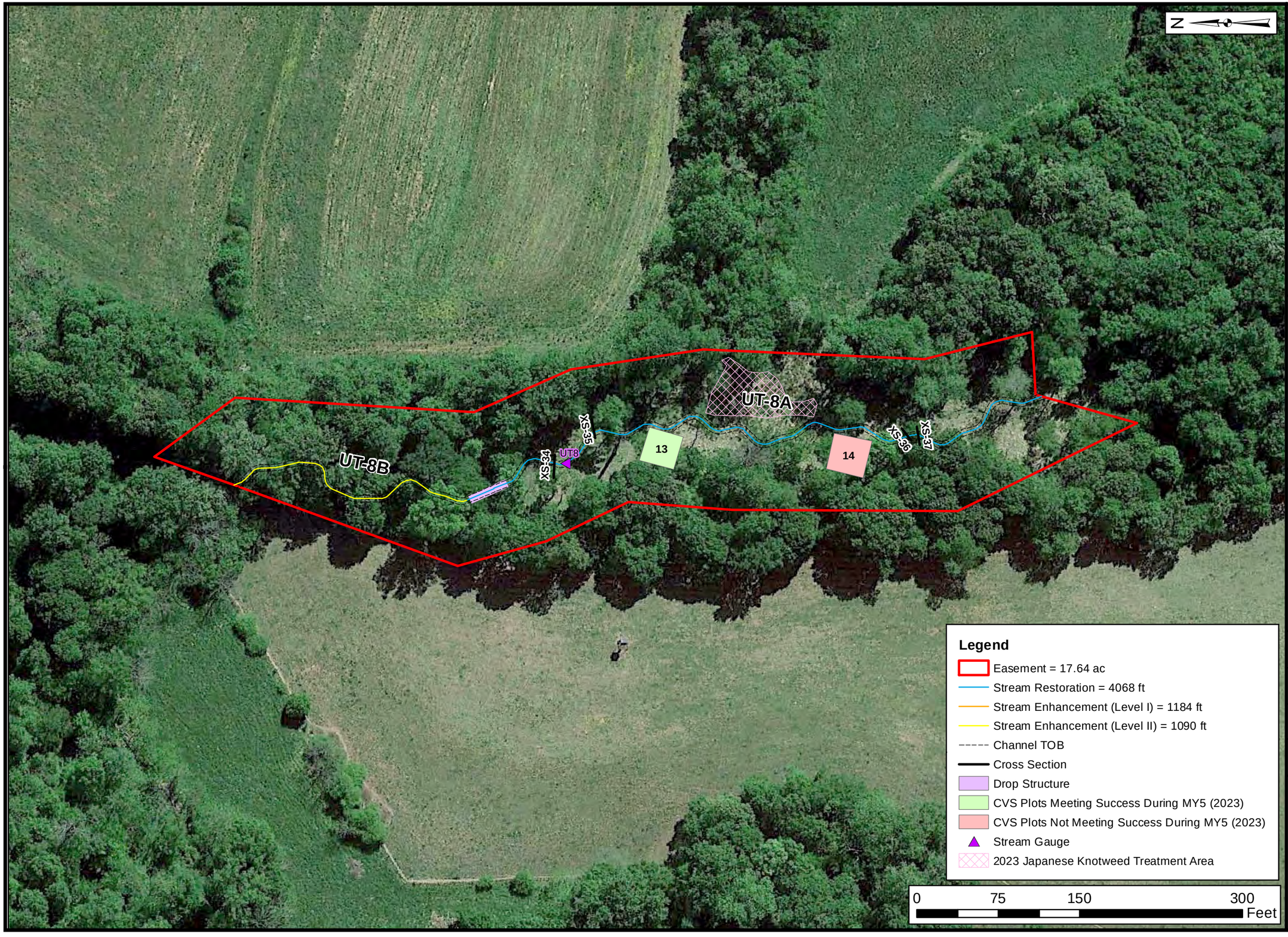
Date: OCT 2023

Scale: 1:1400

Project No.: 17-008

FIGURE

2C



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

HERON STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: KRJ

Date: OCT 2023

Scale: 1:1000

Project No.: 17-008

FIGURE

2D

Table 5A **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-1**
Assessed Length **1331**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	35	35			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	34	34			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	34	34			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	34	34			100%			
		2. Thalweg centering at downstream of meander (Glide)	34	34			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	15	15			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	15	15			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	15	15			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	15	15			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	15	15			100%			

Table 5B **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-2**
Assessed Length **63**

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

Table 5C **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-3**
Assessed Length **279**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	14	14			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	13	13			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	13	13			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	13	13			100%			
		2. Thalweg centering at downstream of meander (Glide)	13	13			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	5	5			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	5	5			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	5	5			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	5	5			100%			

Table 5D **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-4**
Assessed Length **450**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	22	22			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	21	21			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	21	21			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	21	21			100%			
		2. Thalweg centering at downstream of meander (Glide)	21	21			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	10	10			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	10	10			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	10	10			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	10	10			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	10	10			100%			

Table 5E **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-5**
Assessed Length **952**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	44	44			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	43	43			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	43	43			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	43	43			100%			
		2. Thalweg centering at downstream of meander (Glide)	43	43			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	25	25			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	25	25			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	25	25			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	25	25			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	25	25			100%			

Table 5F **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-6**
Assessed Length **781**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	34	34			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	33	33			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	33	33			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	33	33			100%			
		2. Thalweg centering at downstream of meander (Glide)	33	33			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	8	8			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	8	8			100%			

Table 5G **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-7**
Assessed Length **996**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	44	44			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	44	44			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	44	44			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	44	44			100%			
		2. Thalweg centering at downstream of meander (Glide)	44	44			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	19	19			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	19	19			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	19	19			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	19	19			100%			

Table 5H **Visual Stream Morphology Stability Assessment**
Reach ID **Heron UT-8**
Assessed Length **605**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	24	24			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	23	23			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	23	23			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	23	23			100%			
		2. Thalweg centering at downstream of meander (Glide)	23	23			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	9	9			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	9	9			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	9	9			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	9	9			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	9	9			100%			

Table 6 — Vegetation Condition Assessment

Heron

Planted Acreage[1] **12.05**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	None	0.1 acres	none	0	0.00	0.0%
2. Low Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
2B. Low Planted Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor		0 acres	none	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%

Easement Acreage[2] **17.64**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	A patch of Japanese knotweed was observed along the left bank of UT-8. It was treated in September 2023 and will continue to be monitored for signs of vitality.	1000 SF	none	1	0.07	0.4%
5. Easement Encroachment Areas[3]	None	none	none	0	0.00	0.0%

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

2 = The acreage within the easement boundaries.

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

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

Appendix C
Vegetation Data

Table 7. Planted Bare Root Woody Vegetation
Table 8. Total stems by Plot and Species
Table 9. Temporary Vegetation Data
Vegetation Plot Photographs
Height Data

Table 7. Planted Bare Root Woody Vegetation: Heron Site

Species	Total*
Acres	**12.05**
Alnus serrulata	500
Asimina triloba	100
Betula nigra	400
Carpinus caroliniana	800
Cephalanthus occidentalis	25
Cercis canadensis	500
Cornus amomum	2500
Diospyros virginiana	350
Fraxinus americana	100
Fraxinus pennsylvanica	2500
Liriodendron tulipifera	125
Nyssa sylvatica	500
Platanus occidentalis	2400
Quercus lyrata	900
Quercus nigra	2000
Quercus phellos	1900
Sambucus canadensis	25
TOTALS	**15,625***
Average Stems/Acre	**1297**

*Live stakes of *Salix nigra* were planted, but are not included in this table.

Table 8. Total stems by plot and species
Project Code 17.008. Project Name: Heron Stream and Wetland

			Current Plot Data (MY5 2023)																												
			17.008-01-0001			17.008-01-0002			17.008-01-0003			17.008-01-0004			17.008-01-0005			17.008-01-0006			17.008-01-0007			17.008-01-0008			17.008-01-0009			17.008-01-0010		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	red maple	Tree																													
Alnus serrulata	hazel alder	Shrub																													
Asimina triloba	pawpaw	Tree																						1	1	1			1	1	1
Betula nigra	river birch	Tree																											1	1	1
Carpinus	hornbeam	Tree																													
Carpinus caroliniana	American hornbeam	Tree	2	2	2	1	1	1				5	5	5																	
Carya	hickory	Tree																													
Celtis occidentalis	common hackberry	Tree																													
Cephalanthus occidentalis	common buttonbush	Shrub																													
Cercis canadensis	eastern redbud	Tree	1	1	1	4	4	4													2	2	2	2	2	2					
Cornus amomum	silky dogwood	Shrub																						1	1	1					
Diospyros virginiana	common persimmon	Tree	7	7	7										1	1	1	2	2	2	1	1	1				2	2	2			
Fraxinus americana	white ash	Tree																									3	3	3			
Fraxinus pennsylvanica	green ash	Tree													1	1	1	5	5	5							1	1	1			
Liquidambar styraciflua	sweetgum	Tree																											10			3
Liriodendron	tuliptree																															
Liriodendron tulipifera	tuliptree	Tree				1	1	1																							
Nyssa sylvatica	blackgum	Tree																			1	1	1				1	1	1			
Platanus occidentalis	American sycamore	Tree	1	1	1				3	3	3				5	5	5							2	2	2				2	2	2
Populus deltoides	eastern cottonwood	Tree																													
Quercus	oak	Tree							4	4	4													1	1	1					
Quercus lyrata	overcup oak	Tree							1	1	1																2	2	2			
Quercus nigra	water oak	Tree				2	2	2				1	1	1	1	1	1				1	1	1	3	3	3	3	3	3			
Quercus pagoda	cherrybark oak	Tree							1	1	1																					
Quercus phellos	willow oak	Tree	2	2	2							2	2	2				1	1	1	2	2	2							4	4	4
Quercus rubra	northern red oak	Tree																			1	1	1				1	1	1			
Salix nigra	black willow	Tree																													
Sambucus canadensis	Common Elderberry	Shrub																													
Ulmus americana	American elm	Tree																													
Ulmus rubra	slippery elm	Tree																													
Unknown		Shrub or Tree																													
		Stem count	13	13	13	8	8	8	9	9	9	8	8	8	8	8	8	8	8	8	8	8	8	10	10	10	13	13	23	8	8	11
		size (ares)	1			1			1			1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	5	5	5	4	4	4	4	4	4	3	3	3	4	4	4	3	3	3	6	6	6	6	6	6	7	7	8	4	4	5
		Stems per ACRE	526.1	526.1	526.1	323.7	323.7	323.7	364.2	364.2	364.2	323.7	323.7	323.7	323.7	323.7	323.7	323.7	323.7	323.7	323.7	323.7	323.7	404.7	404.7	404.7	526.1	526.1	930.8	323.7	323.7	445.2

Color for Density

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

Table 8. Total stems by plot and species
Project Code 17.008. Project Name: Heron Stream and Wetland

			Current Plot Data (MY5 2023)												Annual Means													
			17.008-01-0011			17.008-01-0012			17.008-01-0013			17.008-01-0014			MY5 (2023)			MY3 (2021)			MY2 (2020)			MY1 (2019)			MY0 (2019)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree																					7			4			
Alnus serrulata	hazel alder	Shrub	1	1	1										1	1	1	1	1	1	1	1	1	1	1	1	4	4	4
Asimina triloba	pawpaw	Tree													2	2	2	2	2	2	2	2	2	14	14	14	21	21	21
Betula nigra	river birch	Tree				1	1	1	2	2	2				4	4	4	3	3	3	4	4	4	4	4	4	2	2	2
Carpinus	hornbeam	Tree									12						12												
Carpinus caroliniana	American hornbeam	Tree													8	8	8	7	7	7	8	8	8	7	7	7	13	13	13
Carya	hickory	Tree																		4									
Celtis occidentalis	common hackberry	Tree																		3									
Cephalanthus occidentalis	common buttonbush	Shrub																									1	1	1
Cercis canadensis	eastern redbud	Tree													9	9	9	9	9	9	9	9	9	10	10	10	10	10	10
Cornus amomum	silky dogwood	Shrub	2	2	2	2	2	2			1				5	5	6	5	5	6	6	6	6	5	5	5	6	6	6
Diospyros virginiana	common persimmon	Tree													13	13	13	14	14	20	14	14	17	13	13	15	19	19	19
Fraxinus americana	white ash	Tree	1	1	1										4	4	4	4	4	4	5	5	5	3	3	3	5	5	5
Fraxinus pennsylvanica	green ash	Tree	3	3	3	5	5	5							15	15	15	13	13	14	12	12	12	13	13	13	15	15	15
Liquidambar styraciflua	sweetgum	Tree															13			5						3			
Liriodendron	tuliptree										3						3												
Liriodendron tulipifera	tuliptree	Tree													1	1	1	1	1	3	1	1	1	1	1	1	2	2	2
Nyssa sylvatica	blackgum	Tree	1	1	1				3	3	3				6	6	6	8	8	8	12	12	12	13	13	13	10	10	10
Platanus occidentalis	American sycamore	Tree	4	4	4	1	1	1	2	2	4				20	20	22	19	19	26	17	17	18	15	15	17	11	11	11
Populus deltoides	eastern cottonwood	Tree																					6			4			
Quercus	oak	Tree				1	1	1							6	6	6	8	8	8	10	10	10	13	13	13	31	31	31
Quercus lyrata	overcup oak	Tree													3	3	3	2	2	2	1	1	1	5	5	5	8	8	8
Quercus nigra	water oak	Tree				2	2	2	1	1	1	1	1	1	15	15	15	10	10	10	13	13	13	18	18	18	19	19	19
Quercus pagoda	cherrybark oak	Tree													1	1	1	1	1	1	1	1	1						
Quercus phellos	willow oak	Tree										3	3	3	14	14	14	15	15	15	13	13	13	12	12	12	11	11	11
Quercus rubra	northern red oak	Tree													2	2	2	2	2	2	2	2	2	3	3	3	1	1	1
Salix nigra	black willow	Tree																		1									
Sambucus canadensis	Common Elderberry	Shrub																		1				1	1	1	2	2	2
Ulmus americana	American elm	Tree																		10			11						
Ulmus rubra	slippery elm	Tree																								9			
Unknown		Shrub or Tree																						1	1	1	5	5	5
		Stem count	12	12	12	12	12	12	8	8	26	4	4	4	129	129	160	124	124	165	131	131	159	152	152	176	196	196	196
		size (ares)	1			1			1			1			14			14			14			14			14		
		size (ACRES)	0.02			0.02			0.02			0.02			0.35			0.35			0.35			0.35			0.35		
		Species count	6	6	6	6	6	6	4	4	7	2	2	2	18	18	21	18	18	24	18	18	21	19	19	23	20	20	20
		Stems per ACRE	485.6	485.6	485.6	485.6	485.6	485.6	323.7	323.7	1052	161.9	161.9	161.9	372.9	372.9	462.5	358.4	358.4	477	378.7	378.7	459.6	439.4	439.4	508.7	566.6	566.6	566.6

Color for Density

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

Table 9. Temporary Vegetation Plot Data: Heron Site

Species	50m x 2m Temporary Plot (Bearing)					
	T-1 (130°)	T-2 (319°)	T-3 (319°)	T-4 (285°)	T-5 (10°)	T-6 (344°)
Betula nigra				2	3	
Carpinus caroliniana	5					5
Cercis canadensis	3					2
Cornus ammomum						
Diospyros virginiana		3	5	6		
Fraxinus pennsylvanica			3		3	
Liriodendron tulipifera	1	1				
Platanus occidentalis	4	4	3	1	3	0
Quercus lyrata	2	2	2			
Quercus phellos	2	2		1	1	5
Quercus alba				2		
Total Stems	**17**	**12**	**13**	**10**	**12**	**12**
Total Stems/Acre	**688**	**486**	**526**	**405**	**486**	**486**

MY-05 HEIGHT DATA: Stems ranged in height from 100 cm to 375 cm.

Plot	SCIENTIFIC NAME	X	Y	Height (cm)	DBH	Vigor	Height (ft)	Plot Ave Height (ft)	Plot Ave Height (ft) - 7 tallest stems* (>260 stems/ac)
1	Carpinus caroliniana	2.6	3.0	220	0.1	4	7.22	6.61	7.92
1	Diospyros virginiana	0.4	2.2	190	0.1	4	6.23		
1	Diospyros virginiana	9.0	1.9	210	0.4	4	6.89		
1	Diospyros virginiana	6.3	4.5	245	0.5	4	8.04		
1	Diospyros virginiana	7.8	5.7	164	0.05	4	5.38		
1	Cercis canadensis	5.9	7.0	99		3	3.25		
1	Platanus occidentalis	7.7	9.6	235	0.5	4	7.71		
1	Diospyros virginiana	4.0	8.1	260	0.4	4	8.53		
1	Diospyros virginiana	1.7	7.7	170	0.3	4	5.58		
1	Diospyros virginiana	5.5	5.2	245	0.8	4	8.04		
1	Carpinus caroliniana	5.1	1.9	98		4	3.22		
1	Quercus phellos	9.2	8.7	260	0.5	4	8.53		
1	Quercus phellos	0.5	9.0	225	0.2	4	7.38		
2	Quercus nigra	0.9	2.2	118		4	3.87	5.48	5.91
2	Carpinus caroliniana	2.8	2.4	190	0.2	4	6.23		
2	Quercus nigra	8.6	0.0	135		4	4.43		
2	Cercis canadensis	6.4	5.4	330	0.3	4	10.83		
2	Cercis canadensis	3.7	7.4	110		4	3.61		
2	Cercis canadensis	1.6	7.0	170	0.2	4	5.58		
2	Liriodendron tulipifera	1.4	8.2	208	0.3	4	6.82		
2	Cercis canadensis	4.9	5.3	75		4	2.46		
3	Quercus	4.1	1.5	230	1	4	7.55	9.75	10.52
3	Quercus	4.9	3.4	220	0.5	4	7.22		
3	Quercus	9.2	1.6	220	0.8	4	7.22		
3	Quercus	5.5	0.5	225	0.5	4	7.38		
3	Platanus occidentalis	8.8	6.0	430	1.3	4	14.11		
3	Platanus occidentalis	6.6	7.2	340	1	4	11.15		
3	Quercus pagoda	8.3	9.4	280	1.5	4	9.19		
3	Platanus occidentalis	4.3	7.4	520	2.5	4	17.06		
3	Quercus lyrata	6.9	3.4	210	0.5	4	6.89		
4	Carpinus caroliniana	1.6	0.4	200	0.2	4	6.56	5.25	5.61
4	Carpinus caroliniana	3.8	0.7	98		4	3.22		
4	Carpinus caroliniana	0.5	2.7	250	0.5	4	8.20		
4	Carpinus caroliniana	2.4	2.7	175	0.1	4	5.74		
4	Carpinus caroliniana	6.4	1.1	222	0.1	4	7.28		
4	Quercus nigra	9.1	2.5	85		4	2.79		
4	Quercus phellos	3.7	4.2	140	0.05	4	4.59		
4	Quercus phellos	1.5	5.0	111		4	3.64		
5	Platanus occidentalis	1.7	2.5	600	4	4	19.69	15.83	17.34
5	Platanus occidentalis	8.7	3.3	610	5.2	4	20.01		
5	Fraxinus pennsylvanica	9.7	0.6	380	3.3	4	12.47		
5	Platanus occidentalis	5.9	5.6	610	4.5	4	20.01		
5	Platanus occidentalis	7.6	5.9	580	4	4	19.03		
5	Diospyros virginiana	9.9	6.1	290	2.2	4	9.51		
5	Quercus nigra	0.4	5.0	160	0.3	4	5.25		
5	Platanus occidentalis	3.9	2.2	630	4	4	20.67		
6	Diospyros virginiana	0.8	1.1	300	2.5	4	9.84	9.42	10.09
6	Fraxinus pennsylvanica	2.0	2.4	320	2.5	4	10.50		
6	Diospyros virginiana	3.4	4.4	222	2.1	4	7.28		
6	Fraxinus pennsylvanica	5.2	5.9	280	2	4	9.19		
6	Fraxinus pennsylvanica	6.6	7.8	340	3	4	11.15		
6	Fraxinus pennsylvanica	9.2	5.0	360	3	4	11.81		
6	Quercus phellos	7.5	6.3	144	1	4	4.72		
6	Fraxinus pennsylvanica	4.4	9.7	330	3	4	10.83		
7	Nyssa sylvatica	2.8	0.9	21		4	0.69	5.30	5.96
7	Quercus phellos	1.4	3.6	224	0.2	4	7.35		
7	Diospyros virginiana	7.7	1.9	159	0.1	4	5.22		
7	Cercis canadensis	7.0	4.9	285	0.2	4	9.35		
7	Cercis canadensis	7.9	9.5	112		4	3.67		
7	Quercus rubra	5.2	7.0	122		4	4.00		
7	Quercus nigra	3.0	6.7	199	0.2	4	6.53		
7	Quercus phellos	1.5	9.3	170	0.1	4	5.58		

* Where applicable. For plots that contain <7 stems, this number represents the average of all stems in the plot.

Plot	SCIENTIFIC NAME	X	Y	Height (cm)	DBH	Vigor	Height (ft)	Plot Ave Height (ft)	Plot Ave Height (ft) - 7 tallest stems* (>260 stems/ac)
8	Cercis canadensis	1.5	1.6	69		4	2.26	6.71	8.52
8	Platanus occidentalis	0.1	9.8	420	3	4	13.78		
8	Quercus nigra	5.0	0.2	56		3	1.84		
8	Quercus	10.0	1.2	126		4	4.13		
8	Asimina triloba	9.2	8.6	115		3	3.77		
8	Cornus amomum	2.1	8.8	175	0.5	4	5.74		
8	Quercus nigra	2.5	5.8	295	2.5	4	9.68		
8	Cercis canadensis	0.0	0.3	101		4	3.31		
8	Platanus occidentalis	0.3	4.7	435	4	4	14.27		
8	Quercus nigra	0.0	8.1	252	1	4	8.27		
9	Quercus lyrata	1.1	1.6	110		4	3.61	5.92	7.42
9	Fraxinus americana	1.8	3.7	160	0.5	4	5.25		
9	Fraxinus americana	0.2	4.8	235	1	4	7.71		
9	Quercus nigra	6.5	3.7	270	3	4	8.86		
9	Fraxinus americana	7.9	0.9	116		4	3.81		
9	Nyssa sylvatica	9.5	2.2	115		4	3.77		
9	Quercus nigra	7.6	5.1	185	1	4	6.07		
9	Quercus nigra	7.1	7.3	180	0.5	4	5.91		
9	Quercus rubra	8.8	8.9	134	0.2	4	4.40		
9	Diospyros virginiana	4.2	7.6	215	1	4	7.05		
9	Quercus lyrata	3.6	5.0	325	2	4	10.66		
9	Diospyros virginiana	2.4	9.4	173	0.2	4	5.68		
9	Fraxinus pennsylvanica	4.0	2.3	129		4	4.23		
10	Betula nigra	1.2	1.7	175	0.2	4	5.74	10.82	12.06
10	Asimina triloba	0.7	0.5	600	7	4	19.69		
10	Platanus occidentalis	2.1	0.3	615	10	4	20.18		
10	Quercus phellos	3.9	3.3	66		4	2.17		
10	Quercus phellos	1.5	3.9	230	1	4	7.55		
10	Platanus occidentalis	9.9	0.8	550	7	4	18.04		
10	Quercus phellos	7.8	3.0	153	1	4	5.02		
10	Quercus phellos	10.0	3.2	250	1.5	4	8.20		
11	Nyssa sylvatica	2.7	1.8	25		2	0.82	10.19	12.92
11	Cornus amomum	9.0	0.3	206	1	4	6.76		
11	Cornus amomum	9.8	7.5	360	3	4	11.81		
11	Fraxinus pennsylvanica	5.4	7.3	306	2	2	10.04		
11	Fraxinus americana	1.1	8.4	360	2	4	11.81		
11	Platanus occidentalis	1.4	7.9	500	10	4	16.40		
11	Fraxinus pennsylvanica	3.6	7.8	295	1.5	4	9.68		
11	Alnus serrulata	3.3	9.8	235	0.2	4	7.71		
11	Platanus occidentalis	4.0	6.7	380	4	4	12.47		
11	Platanus occidentalis	8.7	9.6	450	8	4	14.76		
11	Platanus occidentalis	7.0	0.2	400	4	4	13.12		
11	Fraxinus pennsylvanica	0.5	8.0	210	0.5	4	6.89		
12	Quercus	3.1	1.5	162	0.2	4	5.31	10.37	11.72
12	Platanus occidentalis	6.4	0.3	480	3	4	15.75		
12	Fraxinus pennsylvanica	0.3	9.8	300	2	4	9.84		
12	Cornus amomum	9.1	2.4	300	2	4	9.84		
12	Fraxinus pennsylvanica	5.5	6.7	355	2	4	11.65		
12	Fraxinus pennsylvanica	7.4	8.1	345	3	4	11.32		
12	Quercus nigra	1.7	7.3	285	3	4	9.35		
12	Fraxinus pennsylvanica	2.3	4.3	370	5	4	12.14		
12	Cornus amomum	6.3	4.2	290	2	4	9.51		
12	Fraxinus pennsylvanica	5	4.3	350	7	4	11.48		
12	Betula nigra	7	6.3	300	3	4	9.84		
12	Quercus nigra	4.8	9.8	255	1	4	8.37		
13	Betula nigra	2.4	4.4	215	0.1	4	7.05	8.65	9.37
13	Betula nigra	0	2.4	335	2	4	10.99		
13	Quercus nigra	4.8	5	110		4	3.61		
13	Nyssa sylvatica	6.9	1.9	118		4	3.87		
13	Platanus occidentalis	8.9	2.8	500	4	4	16.40		
13	Nyssa sylvatica	6	8.8	121		4	3.97		
13	Nyssa sylvatica	8.3	9	161	0.1	4	5.28		
13	Platanus occidentalis	3.3	8	550	5	4	18.04		
14	Quercus phellos	9.4	7.2	95		4	3.12	3.05	3.05
14	Quercus phellos	6.8	6.9	55		3	1.80		
14	Quercus nigra	3.7	9.6	92		4	3.02		
14	Quercus phellos	1.9	6.1	130		4	4.27		
							Site Average	8.10	9.17

* Where applicable. For plots that contain <7 stems, this number represents the average of all stems in the plot.

Appendix D
Stream Geomorphology Data

Tables 10A-G. Baseline Stream Data Summary
Tables 11A-G. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Table 12A-F. MY3 Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Table 13A-G. MY3 Monitoring Data - Stream Reach Data Summary
Cross Section Report

Table 10a. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 1 (856 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					4.7	8.5		11.1			8	8.1	12.1	10.7	11	11.3	7.8	8.4	9	8.3	11		13		4
Floodprone Width (ft)					13	20		30			15	18	25	122	131	140	10	75	100	25	100		100		4
Bankfull Mean Depth (ft)					0.5	0.7		1.1			0.8	0.8	1	1.3	1.4	1.4	0.6	0.6	0.7	0.4	0.5		0.6		4
[1]Bankfull Max Depth (ft)					0.8	1.1		2			1.1	1.4	1.4	1.9	2	2	0.7	0.8	1	0.6	0.8		1.1		4
Bankfull Cross Sectional Area (ft^2)						5.1						8			14.7		5.1	5.1	5.1	3.7	5.4		7.2		4
Width/Depth Ratio					4.3	14.6		22			8	10.1	15.1	8	9	9	12	14	16	17.4	18.7		36.7		4
Entrenchment Ratio					1.6	2.5		4.3			1.9	2.1	2.2	11	12	13	5.1	8.9	11.1	3	8.3		9.3		4
[1]Bank Height Ratio					1.4	1.9		2.5			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		4
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															2.7	19	16	53	11	31
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.007	0.009	0.01	0	0.013	0.012	0.048	0.01	31
Pool Length (ft)																				6	23	20	80	12.9	34
Pool Max depth (ft)											1.5	1.8	2.1		2.7		0.8	1.1	1.3	1.5	1.6		2.1		4
Pool Spacing (ft)											25	37	69	22	44	81	25	34	68	25	34		68		34
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	25	34	68	25	34		68		
Radius of Curvature (ft)											11	16	27	9	31	113	17	25	85	17	25		85		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	51	72	101	51	72		101		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					0.61												0.19			0.24					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Cg 5						Eb 4			E5			E/C 4			C 4					
Bankfull Velocity (fps)					3.8												3.8			3.6					
Bankfull Discharge (cfs)					19.3																				
Valley length (ft)					1067																				
Channel Thalweg length (ft)					1433												856			856					
Sinuosity (ft)					1.3						1.2			1.46			1.3			1.3					
Water Surface Slope (Channel) (ft/ft)					0.0057						0.0258			0.0053			0.0057			0.0087					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					61						0			0											
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 measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10b. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 3 (279 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					3.2	4.5		5.9			8	8.1	12.1	10.7	11	11.3	4.1	4.4	4.7	7.7	7.7		7.7		1
Floodprone Width (ft)					9	14		21			15	18	25	122	131	140	20	40	60	18	18		18		1
Bankfull Mean Depth (ft)					0.2	0.3		0.4			0.8	0.8	1	1.3	1.4	1.4	0.3	0.3	0.3	0.6	0.6		0.6		1
[1]Bankfull Max Depth (ft)					0.5	0.6		0.7			1.1	1.4	1.4	1.9	2	2	0.4	0.4	0.5	1	1		1		1
Bankfull Cross Sectional Area (ft^2)						1.4						8			14.7		1.4	1.4	1.4	4.5	4.5		4.5		1
Width/Depth Ratio					8	17.4		29.5			8	10.1	15.1	8	9	9	12	14	16	13.2	13.2		13.2		1
Entrenchment Ratio					1.4	2.2		3.8			1.9	2.1	2.2	11	12	13	4.9	9	12.7	2.3	2.3		2.3		1
[1]Bank Height Ratio					1.7	2.2		2.4			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		1
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															4	11	10	19	4.3	14
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.023	0.031	0.035	0.011	0.029	0.027	0.736	0.017	14
Pool Length (ft)																				4	9	8	21	4.9	13
Pool Max depth (ft)											1.5	1.8	2.1		2.7		0.4	0.6	0.7	1	1	1	1	0	1
Pool Spacing (ft)											25	37	69	22	44	81	13	18	35	13	18		35		14
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	13	18	27	13	18		27		
Radius of Curvature (ft)											11	16	27	9	31	113	9	13	44	9	13		44		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	26	37	53	26	37		53		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					1.42												0.34			0.56					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Cg 5						Eb 4			E5			E/C 4			C 4					
Bankfull Velocity (fps)					3.6												3.6			1.1					
Bankfull Discharge (cfs)					5																				
Valley length (ft)					229																				
Channel Thalweg length (ft)					247												279			279					
Sinuosity (ft)					1.07						1.2			1.46			1.15			1.15					
Water Surface Slope (Channel) (ft/ft)					0.0207						0.0258			0.0053			0.0193			0.0176					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					100						0			0											
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 measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10c. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 4 (450 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					3.1	3.8		4.9			8	8.1	12.1	10.7	11	11.3	4.6	5	5.4	6.5	7.3		8		2
Floodprone Width (ft)					6	15		30			15	18	25	122	131	140	25	50	75	40	40		40		2
Bankfull Mean Depth (ft)					0.4	0.5		0.6			0.8	0.8	1	1.3	1.4	1.4	0.3	0.4	0.4	0.3	0.4		0.5		2
[1]Bankfull Max Depth (ft)					0.7	0.8		0.9			1.1	1.4	1.4	1.9	2	2	0.4	0.5	0.6	0.5	0.7		0.8		2
Bankfull Cross Sectional Area (ft^2)						2						8			14.7		1.8	1.8	1.8	2.2	3		3.7		2
Width/Depth Ratio					5.2	7.7		12.3			8	10.1	15.1	8	9	9	12	14	16	17.3	18.3		19.2		2
Entrenchment Ratio					1.3	3.9		6.1			1.9	2.1	2.2	11	12	13	5.4	10	14	5	5.6		6.2		2
[1]Bank Height Ratio					1.3	2.3		4.0			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		2
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															4	9	9	20	3.5	23
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.037	0.05	0.056	0	0.021	0.017	0.061	0.014	23
Pool Length (ft)																				4	10	10	18	3.5	22
Pool Max depth (ft)											1.5	1.8	2.1		2.7		0.5	0.7	0.8	1.1	1.3		1.4		2
Pool Spacing (ft)											25	37	69	22	44	81	15	20	40	15	20		40		22
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	15	20	30	15	20		30		
Radius of Curvature (ft)											11	16	27	9	31	113	10	15	50	10	15		50		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	30	43	60	30	43		60		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					2.79												0.6			0.59					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Eg 5						Eb 4			E5			E/C 4			C 4					
Bankfull Velocity (fps)					3.7												4			2.4					
Bankfull Discharge (cfs)					7.3																				
Valley length (ft)					391																				
Channel Thalweg length (ft)					428												450			450					
Sinuosity (ft)					1.09						1.2			1.46			1.15			1.15					
Water Surface Slope (Channel) (ft/ft)					0.0283						0.0258			0.0053			0.3111			0.0254					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					56						0			0											
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 measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10d. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 5 (952 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					2.5	3.7		6			8	8.1	12.1	10.7	11	11.3	4.6	5	5.4	4.9	6.9		8.1		4
Floodprone Width (ft)					4	12		30			15	18	25	122	131	140	25	50	75	40	40		40		4
Bankfull Mean Depth (ft)					0.3	0.5		0.6			0.8	0.8	1	1.3	1.4	1.4	0.3	0.4	0.4	0.3	0.4		0.5		4
[1]Bankfull Max Depth (ft)					0.5	0.8		0.9			1.1	1.4	1.4	1.9	2	2	0.4	0.5	0.6	0.5	0.7		0.8		4
Bankfull Cross Sectional Area (ft^2)						1.6						8			14.7		1.8	1.8	1.8	1.9	2.4		3.7		4
Width/Depth Ratio					3.6	8.8		20			8	10.1	15.1	8	9	9	12	14	16	12.6	18.3		20.9		4
Entrenchment Ratio					1.4	3.1		7.3			1.9	2.1	2.2	11	12	13	5.4	10	14	4.9	5.9		8.2		4
[1]Bank Height Ratio					1.3	1.5		2.0			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		4
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															3	11	9	49	8.4	41
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.037	0.05	0.056	0.004	0.028	0.027	0.051	0.01	41
Pool Length (ft)																				4	12	10	59	8.5	41
Pool Max depth (ft)											1.5	1.8	2.1		2.7		0.5	0.7	0.8	0.8	1		1.1		4
Pool Spacing (ft)											25	37	69	22	44	81	15	20	40	15	20		40		41
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	15	20	30	15	20		30		
Radius of Curvature (ft)											11	16	27	9	31	113	10	15	50	10	15		50		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	30	43	60	30	43		60		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					2.79												0.6			0.5					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Eg 5						Eb 4			E5			E/C 4			E/C 4					
Bankfull Velocity (fps)					3.9												4			2.3					
Bankfull Discharge (cfs)					5.5																				
Valley length (ft)					579																				
Channel Thalweg length (ft)					605												952			952					
Sinuosity (ft)					1.04						1.2			1.46			1.15			1.15					
Water Surface Slope (Channel) (ft/ft)					0.0372						0.0258			0.0053			0.3111			0.0256					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					50						0			0											
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 measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10e. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 6 (781 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					4.6	6.4		9.6			8	8.1	12.1	10.7	11	11.3	4.2	4.6	4.9	6.1	6.5		6.8		2
Floodprone Width (ft)					7	16		46			15	18	25	122	131	140	25	50	75	40	40		40		2
Bankfull Mean Depth (ft)					0.2	0.3		0.3			0.8	0.8	1	1.3	1.4	1.4	0.3	0.3	0.4	0.4	0.4		0.5		2
[1]Bankfull Max Depth (ft)					0.4	0.5		0.8			1.1	1.4	1.4	1.9	2	2	0.4	0.5	0.5	0.6	0.8		0.9		2
Bankfull Cross Sectional Area (ft^2)						1.5						8			14.7		1.5	1.5	1.5	2.2	2.9		3.5		2
Width/Depth Ratio					15.3	26.7		48			8	10.1	15.1	8	9	9	12	14	16	13.2	15.1		16.9		2
Entrenchment Ratio					1.1	2.4		4.8			1.9	2.1	2.2	11	12	13	5.9	10.9	15.3	5.9	6.2		6.6		2
[1]Bank Height Ratio					3.7	5.0		7.5			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		2
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															2	10	7	47	8.8	33
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.031	0.042	0.047	0.001	0.028	0.024	0.126	0.021	33
Pool Length (ft)																				4	12	12	18	3.7	33
Pool Max depth (ft)											1.5	1.8	2.1		2.7		0.4	0.6	0.7	1	1.2		1.3		2
Pool Spacing (ft)											25	37	69	22	44	81	13.7	18.3	36.7	14	18		37		33
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	13.7	18.3	36.7	14	18		37		
Radius of Curvature (ft)											11	16	27	9	31	113	9	14	46	9	14		46		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	27	39	55	27	39		55		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					14.18												0.47			0.56					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Cg 5						Eb 4			E5			E/C 4			C 4					
Bankfull Velocity (fps)					3.5												3.5			1.8					
Bankfull Discharge (cfs)					5.2																				
Valley length (ft)					486																				
Channel Thalweg length (ft)					522												781			781					
Sinuosity (ft)					1.07						1.2			1.46			1.15			1.15					
Water Surface Slope (Channel) (ft/ft)					0.028						0.0258			0.0053			0.0261			0.0225					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					68						0			0											
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 measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10f. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 7 (232 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					4.1	5.3		6.7			8	8.1	12.1	10.7	11	11.3	4.9	5.3	5.7	6.2	6.6		7.8		4
Floodprone Width (ft)					7	13		29			15	18	25	122	131	140	25	50	75	10	20		20		4
Bankfull Mean Depth (ft)					0.3	0.4		0.5			0.8	0.8	1	1.3	1.4	1.4	0.4	0.4	0.4	0.3	0.4		0.5		4
[1]Bankfull Max Depth (ft)					0.4	0.6		0.8			1.1	1.4	1.4	1.9	2	2	0.5	0.5	0.6	0.5	0.6		0.7		4
Bankfull Cross Sectional Area (ft^2)						2						8			14.7		2	2	2	1.8	2.7		3.3		4
Width/Depth Ratio					8.2	14.5		22.3			8	10.1	15.1	8	9	9	12	14	16	12.8	18.5		24.2		4
Entrenchment Ratio					1.7	2.4		5.2			1.9	2.1	2.2	11	12	13	5	9	13	1.6	2.8		3.1		4
[1]Bank Height Ratio					1.8	2.5		4.1			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		4
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															3	13	10	75	13	42
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.027	0.036	0.04	0.006	0.029	0.029	0.056	0.011	42
Pool Length (ft)																				3	9	9	14	2.6	41
Pool Max depth (ft)											1.5	1.8	2.1		2.7		1.3	1.9	2.1	1	1.1		1.5		3
Pool Spacing (ft)											25	37	69	22	44	81	16	21	42	16	21		42		42
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	16	21	32	16	21		32		
Radius of Curvature (ft)											11	16	27	9	31	113	10	16	53	10	16		53		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	31	45	64	31	45		64		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					2.36												0.45			0.61					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Cg 5						Eb 4			E5			Eb 4			Cb 4					
Bankfull Velocity (fps)					3.5												3.5			2.6					
Bankfull Discharge (cfs)					7																				
Valley length (ft)					755																				
Channel Thalweg length (ft)					778												232			232					
Sinuosity (ft)					1.03						1.2			1.46			1.15			1.15					
Water Surface Slope (Channel) (ft/ft)					0.0248						0.0258			0.0053			0.0222			0.0268					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					76						0			0											
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 measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10g. Baseline Stream Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 8 (605 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Cedarock Park Ref			Causey Ref			Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Max	Min	Mean	Max	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					4.2	5.1		6.1			8	8.1	12.1	10.7	11	11.3	5.5	5.9	6.3	6.5	7.9		9.3		2
Floodprone Width (ft)					5	15		30			15	18	25	122	131	140	25	50	75	20	30		40		2
Bankfull Mean Depth (ft)					0.4	0.5		0.6			0.8	0.8	1	1.3	1.4	1.4	0.4	0.4	0.5	0.4	0.4		0.4		2
[1]Bankfull Max Depth (ft)					0.6	0.8		1			1.1	1.4	1.4	1.9	2	2	0.5	0.6	0.7	0.7	0.7		0.7		2
Bankfull Cross Sectional Area (ft^2)						2.5						8			14.7		2.5	2.5	2.5	2.6	3.2		3.7		2
Width/Depth Ratio					7	11.3		15.3			8	10.1	15.1	8	9	9	12	14	16	16.3	19.8		23.4		2
Entrenchment Ratio					1.1	2.7		4.9			1.9	2.1	2.2	11	12	13	4.6	8.5	11.9	2.2	4.2		6.2		2
[1]Bank Height Ratio					1.4	2.3		3.7			1.0	1.8			1.4		1.0	1.0	1.3	1.0	1.0		1.0		2
Profile																									
Riffle Length (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.															5	11	11	19	3.4	23
Riffle Slope (ft/ft)											0.01	0.0316	0.0576	0.002	0.01	0.012	0.023	0.03	0.034	0.007	0.02	0.017	0.041	0.009	23
Pool Length (ft)																				6	15	15	24	4.8	23
Pool Max depth (ft)											1.5	1.8	2.1		2.7		0.5	0.8	0.9	0.9	1.3		1.6		2
Pool Spacing (ft)											25	37	69	22	44	81	17	24	47	17	24		47		23
Pattern																									
Channel Beltwidth (ft)					No distinct repetitive pattern of riffles and pools due to straightening activities.						20	23	38	17	30	36	17	24	36	17	24		36		
Radius of Curvature (ft)											11	16	27	9	31	113	11	18	59	11	18		59		
Rc:Bankfull width (ft/ft)											1.4	2	3.3	0.8	2.8	10.3	2	3	10	2	3		10		
Meander Wavelength (ft)											44	68	116	10	63	91	35	50	71	35	50		71		
Meander Width Ratio											2.4	2.8	4.7	1.5	2.7	3.5	3	4	6	3	4		6		
Transport parameters																									
Reach Shear Stress (competency) lb/f^2					1.85												0.44			0.32					
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification					Eg 5						Eb 4			E5			E/C 4			C 4					
Bankfull Velocity (fps)					3.6												3.6			2.8					
Bankfull Discharge (cfs)					9.1																				
Valley length (ft)					520																				
Channel Thalweg length (ft)					543												605			605					
Sinuosity (ft)					1.04						1.2			1.46			1.15			1.15					
Water Surface Slope (Channel) (ft/ft)					0.0218						0.0258			0.0053			0.019			0.0138					
BF slope (ft/ft)																									
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks					80						0			0											
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 measurements and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing XS measurement data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 11a. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 1 (856 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						60	13	14	13				43	19	19	19			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.12	4.1	9.8	161	2568			0.32	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10		29	71						33			66						50	50												25	75			
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0		14	43	43				66		33						100													100						

Shaded cells indicate that these will typically not be filled in.
1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates
3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtions distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 11b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 3 (279 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						74	8	9	8				55	15	15	15			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.12	4.1	9.8	161	2568			0.32	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	33	33	33						33			66						50	50												100				
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0			33	66				66		33						100													100						

Shaded cells indicate that these will typically not be filled in.
1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates
3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtions distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 11c. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 4 (450 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						63	12	13	12				48	17	18	17			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.12	4.1	9.8	161	2568			0.32	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10		25	25	50					33			66						50	50												100				
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0		25	25	50				66		33						100													100						

Shaded cells indicate that these will typically not be filled in.
1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates
3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtions distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 11d. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 5 (952 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						58	14	14	14				50	17	17	16			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.12	4.1	9.8	161	2568			0.32	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	20	20	40	20					33			66						50	50														100			
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0		20	20	60				66		33						100													100						

Shaded cells indicate that these will typically not be filled in.
1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates
3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtin distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 11e. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 6 (781 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						64	12	12	12				46	18	18	18			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.12	4.1	9.8	161	2568			0.32	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	40	20	20	20					33			66						50	50														100			
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0				100				66		33						100													100						

Shaded cells indicate that these will typically not be filled in.
1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates
3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtin distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 11f. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 7 (232 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						76	7	8	7				60	13	14	13			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.12	4.1	9.8	161	2568			0.32	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10		57	29	14					33			66						50	50												25	75			
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0			29	71				66		33						100													100						

Shaded cells indicate that these will typically not be filled in.
1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates
3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtin distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 11g. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Project Name/Number (Heron/100014) - Segment/Reach: UT 8 (605 feet)

Parameter	Pre-Existing Condition							Cedarock Reference Reach Data							Causey Reference Reach Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%																						60	13	14	13				41	20	20	19			
[1]SC% / Sa% / G% / C% / B% / Be%								9	22	39	18	11			4	54	28	11	1	2															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)								0.12	4.1	9.8	161	2568			0.32	0.5	0.9	24	116																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10	25	25	50						33			66						50	50												50	50			
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0		50		50				66		33						100													100						

Shaded cells indicate that these will typically not be filled in.

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary.
The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions.
ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design measurements), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtin distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section measurements and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a more complete sample distribution for these parameters, thereby providing the distribution/coverage necessary to provide meaningful comparisons.

Table 12a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 1 (856 feet)

	Cross Section 1 (Pool)							Cross Section 2 (Riffle)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)							Cross Section 5 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																				
Bankfull Width (ft)	9.2	8.5	8.5	11.5		9.7		10.7	14.7	15.3	16.0		14.1		13.0	14.4	17.7	13.0		16.2		8.9	9.7	9.1	10.0		11.5		8.3	9.0	10.7	12.4		8.3	
Floodprone Width (ft)	NA	NA	NA	NA		NA		100	100	100	100		100		100	100	100	100		100		NA	NA	NA	NA		NA		25	25	25	25		25	
Bankfull Mean Depth (ft)	1.1	1.2	1.2	0.9		1.1		0.6	0.4	0.4	0.4		0.4		0.4	0.3	0.3	0.4		0.3		0.8	0.7	0.7	0.7		0.6		0.4	0.4	0.3	0.3		0.4	
Bankfull Max Depth (ft)	2.1	2.2	2.2	2.3		2.1		0.9	0.8	0.9	1.0		0.9		0.7	0.7	0.7	0.6		0.6		1.6	1.6	1.5	1.6		1.4		0.6	0.6	0.7	0.6		0.7	
Bankfull Cross Sectional Area (ft^2)	10.5	10.5	10.5	10.5		10.5		6.1	6.1	6.1	6.1		6.1		4.6	4.6	4.6	4.6		4.6		6.8	6.8	6.8	6.8		6.8		3.7	3.7	3.7	3.7		3.7	
Bankfull Width/Depth Ratio	NA	NA	NA	NA		NA		18.8	35.4	38.4	40.0		32.5		36.7	45.1	68.1	36.8		57.4		NA	NA	NA	NA		NA		18.6	21.9	30.9	41.9		18.5	
Bankfull Entrenchment Ratio	NA	NA	NA	NA		NA		9.3	6.8	6.5	6.3		7.1		7.7	6.9	5.6	7.7		6.2		NA	NA	NA	NA		NA		3.0	2.8	2.3	2.0		3.0	
Low Bank Height (ft)	2.1	2.2	2.1	2.2		1.9		0.9	0.7	0.9	1.0		0.9		0.7	0.7	0.7	0.6		0.6		1.6	1.6	1.5	1.6		1.4		0.6	0.6	0.7	0.6		0.6	
Bankfull Bank Height Ratio*	1.00	1.00	0.95	0.96		0.91		1.00	0.88	1.00	1.00		1.05		1.00	1.00	1.00	1.00		0.89		1.00	1.00	1.00	1.00		1.04		1.00	1.00	1.00	0.96		0.97	
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				
	Cross Section 6 (Pool)							**Cross Section 7 (Pool)**							**Cross Section 8 (Riffle)**																							
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+															
Record elevation (datum) used																																				
Bankfull Width (ft)	12.8	13.2	15.7	13.1		17.1		9.6	10.4	10.5	15.4		11.2		11.2	12.0	11.4	13.8		13.5																
Floodprone Width (ft)	NA	NA	NA	NA		NA		NA	NA	NA	NA		NA		100	100	100	100		100																
Bankfull Mean Depth (ft)	0.7	0.7	0.6	0.7		0.5		0.8	0.8	0.8	0.5		0.7		0.6	0.6	0.6	0.5		0.5																
Bankfull Max Depth (ft)	1.6	1.7	1.6	1.7		1.7		1.5	1.7	1.5	1.6		1.5		1.1	1.0	1.1	1		1.1																
Bankfull Cross Sectional Area (ft^2)	9.4	9.4	9.4	9.4		9.4		8.0	8.0	8.0	8		8		7.2	7.2	7.2	7.2		7.2																
Bankfull Width/Depth Ratio	NA	NA	NA	NA		NA		NA	NA	NA	NA		NA		17.4	20.0	18.1	26.45		25.3																
Bankfull Entrenchment Ratio	NA	NA	NA	NA		NA		NA	NA	NA	NA		NA		8.9	8.3	8.8	7.25		7.4																
Low Bank Height (ft)	1.6	1.7	1.6	1.7		1.6		1.5	1.7	1.5	1.6		1.5		1.1	1.0	1.1	1.1		1.0																
Bankfull Bank Height Ratio*	1.00	1.00	1.00	1.00		0.92		1.00	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.10		0.96																
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 12b. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 3 (279 feet)

	Cross Section 9 (Pool)							Cross Section 10 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used														
Bankfull Width (ft)	4.2	5.6	5.8	5.8		6.7		7.7	7.0	7.0	7.4		7.5	
Floodprone Width (ft)	NA	NA	NA	NA		NA		18	18	18	18		18	
Bankfull Mean Depth (ft)	0.7	0.5	0.5	0.5		0.4		0.6	0.6	0.6	0.6		0.6	
Bankfull Max Depth (ft)	1.0	0.8	0.8	0.7		0.7		1.0	1.1	1.0	1.0		1.1	
Bankfull Cross Sectional Area (ft^2)	2.9	2.9	2.9	2.9		2.9		4.5	4.5	4.5	4.5		4.5	
Bankfull Width/Depth Ratio	NA	NA	NA	NA		NA		13.2	10.9	10.9	12.3		12.5	
Bankfull Entrenchment Ratio	NA	NA	NA	NA		NA		2.3	2.6	2.6	2.4		2.4	
Low Bank Height (ft)	1.0	0.3	0.8	0.5		0.4		1.0	1.1	1.0	1.1		1.1	
Bankfull Bank Height Ratio*	1.00	0.38	1.00	0.79		0.63		1.00	1.00	1.00	1.10		0.95	
Cross Sectional Area between end pins (ft^2)														
d50 (mm)														
Based on fixed baseline bankfull elevation[1]														
Record elevation (datum) used														
Bankfull Width (ft)														
Floodprone Width (ft)														
Bankfull Mean Depth (ft)														
Bankfull Max Depth (ft)														
Bankfull Cross Sectional Area (ft^2)														
Bankfull Width/Depth Ratio														
Bankfull Entrenchment Ratio														
Low Bank Height (ft)														
Bankfull Bank Height Ratio*														
Cross Sectional Area between end pins (ft^2)														
d50 (mm)														

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 12c. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 4 (450 feet)

	Cross Section 11 (Pool)							Cross Section 12 (Riffle)							Cross Section 13 (Riffle)							Cross Section 14 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																												
Bankfull Width (ft)	6.0	7.9	9.4	9.6		7.9		6.5	7.4	10.6	11.2		8.2		8.0	7.9	11.3	7.8		8.0		9.1	11.0	10.9	11.3		11.7	
Floodprone Width (ft)	NA	NA	NA	NA		NA		40	40	40	40		40		40	40	40	40		40		NA	NA	NA	NA		NA	
Bankfull Mean Depth (ft)	0.8	0.6	0.5	0.5		0.6		0.3	0.3	0.2	0.2		0.3		0.5	0.4	0.3	0.4		0.4		0.7	0.6	0.6	0.6		0.6	
Bankfull Max Depth (ft)	1.1	1.1	1.3	1.2		1.2		0.5	0.6	0.5	0.5		0.7		0.8	0.8	0.8	0.8		0.8		1.4	1.4	1.4	1.4		1.4	
Bankfull Cross Sectional Area (ft^2)	4.8	4.8	4.8	4.8		4.8		2.2	2.2	2.2	2.2		2.2		3.7	3.5	3.5	3.5		3.5		6.8	6.8	6.8	6.8		6.8	
Bankfull Width/Depth Ratio	NA	NA	NA	NA		NA		19.2	24.9	51.1	57.0		30.6		17.3	17.8	36.5	17.4		18.3		NA	NA	NA	NA		NA	
Bankfull Entrenchment Ratio	NA	NA	NA	NA		NA		6.2	5.4	3.8	3.6		4.9		5.0	5.1	3.5	5.1		5.0		NA	NA	NA	NA		NA	
Low Bank Height (ft)	1.1	0.9	1.3	1.2		1.1		0.5	0.5	0.5	0.5		0.6		0.8	0.8	0.8	0.7		0.8		1.4	1.4	1.4	1.4		1.4	
Bankfull Bank Height Ratio*	1.00	0.82	1.00	1.00		0.92		1.00	0.83	1.00	1.00		0.96		1.00	1.00	1.00	0.88		0.97		1.00	1.00	1.00	1.00		1.02	
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												
Based on fixed baseline bankfull elevation[1]																												
Record elevation (datum) used																												
Bankfull Width (ft)																												
Floodprone Width (ft)																												
Bankfull Mean Depth (ft)																												
Bankfull Max Depth (ft)																												
Bankfull Cross Sectional Area (ft^2)																												
Bankfull Width/Depth Ratio																												
Bankfull Entrenchment Ratio																												
Low Bank Height (ft)																												
Bankfull Bank Height Ratio*																												
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."
*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 12d. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 5 (952 feet)

	Cross Section 15 (Pool)							Cross Section 16 (Riffle)							Cross Section 17 (Pool)							Cross Section 18 (Riffle)							Cross Section 19 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																				
Bankfull Width (ft)	4.7	9.4	8.7	10.4		8.3		6.3	5.7	9.4	11.0		9.7		5.4	5.7	5.9	5.9		9.9		8.1	9.2	12.2	12.7		9.9		7.8	8.7	11.4	14.2		12.6	
Floodprone Width (ft)	NA	NA	NA	NA		NA		40	40	40	40		40		NA	NA	NA	NA		NA		40	40	40	40		40		NA	NA	NA	NA		NA	
Bankfull Mean Depth (ft)	0.5	0.3	0.3	0.2		0.3		0.3	0.3	0.2	0.2		0.2		0.6	0.6	0.6	0.6		0.4		0.5	0.4	0.3	0.3		0.4		0.4	0.4	0.3	0.2		0.3	
Bankfull Max Depth (ft)	0.8	0.5	0.6	0.7		0.5		0.5	0.6	0.6	0.6		0.7		1.1	1.2	1.3	1.3		1.2		0.8	0.7	0.8	0.8		0.8		0.9	0.8	0.7	0.7		0.7	
Bankfull Cross Sectional Area (ft^2)	2.4	2.4	2.4	2.4		2.4		1.9	1.9	1.9	1.9		1.9		3.4	3.4	3.4	3.4		3.4		3.7	3.7	3.7	3.7		3.7		3.3	3.3	3.3	3.3		3.3	
Bankfull Width/Depth Ratio	NA	NA	NA	NA		NA		20.9	17.1	46.5	64.7		48.2		NA	NA	NA	NA		NA		17.7	22.9	40.2	42.3		24.8		NA	NA	NA	NA		NA	
Bankfull Entrenchment Ratio	NA	NA	NA	NA		NA		6.3	7.0	4.3	3.7		4.1		NA	NA	NA	NA		NA		4.9	4.3	3.3	3.1		4.0		NA	NA	NA	NA		NA	
Low Bank Height (ft)	0.8	0.5	0.6	0.6		0.6		0.5	0.6	0.6	0.6		0.7		1.1	1.2	1.3	1.4		1.2		0.8	0.6	0.8	0.7		0.8		0.9	0.8	0.7	0.7		0.7	
Bankfull Bank Height Ratio*	1.00	1.00	1.00	0.86		1.05		1.00	1.00	1.00	1.00		0.99		1.00	1.00	1.00	1.07		1.02		1.00	0.86	1.00	0.88		1.02		1.00	1.00	1.00	1.00		1.05	
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				
	Cross Section 20 (Riffle)							Cross Section 21 (Pool)							Cross Section 22 (Riffle)																							
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+															
Record elevation (datum) used																																				
Bankfull Width (ft)	4.9	6.2	5.3	5.9		5.4		5.0	5.8	5.8	5.3		6.7		7.4	7.2	8.5	7.7		7.5																
Floodprone Width (ft)	40	40	40	40		40.0		NA	NA	NA	NA		NA		40	40	40	40		40																
Bankfull Mean Depth (ft)	0.4	0.3	0.4	0.3		0.3		0.6	0.5	0.5	0.6		0.5		0.4	0.4	0.3	0.4		0.4																
Bankfull Max Depth (ft)	0.6	0.6	0.6	0.6		0.6		1.1	1.0	1.1	1.1		1.1		0.7	0.8	0.7	0.8		0.8																
Bankfull Cross Sectional Area (ft^2)	1.9	1.9	1.9	1.9		1.9		3.1	3.1	3.1	3.1		3.1		2.9	2.9	2.9	2.9		2.9																
Bankfull Width/Depth Ratio	12.6	20.2	14.8	18.5		15.7		NA	NA	NA	NA		NA		18.9	17.9	24.9	20.4		19.2																
Bankfull Entrenchment Ratio	8.2	6.5	7.5	6.8		7.4		NA	NA	NA	NA		NA		5.4	5.6	4.7	5.2		5.3																
Low Bank Height (ft)	0.6	0.6	0.6	0.6		0.6		1.1	1.0	1.1	1.2		1.1		0.7	0.8	0.7	0.7		0.8																
Bankfull Bank Height Ratio*	1.00	1.00	1.00	1.11		1.02		1.00	1.00	1.00	1.06		0.94		1.00	1.00	1.00	0.88		0.99																
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."
*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 12e. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 6 (781 feet)

	Cross Section 23 (Pool)							Cross Section 24 (Riffle)							Cross Section 25 (Pool)							Cross Section 26 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																												
Bankfull Width (ft)	5.6	5.7	6.4	8.8		6.7		6.1	5.8	5.7	5.4		5.8		5.2	10.0	10.3	10.8		10.6		6.8	4.7	4.8	4.3		4.7	
Floodprone Width (ft)	NA	NA	NA	NA		NA		40	40	40	40		40		NA	NA	NA	NA		NA		40	40	40	40		40	
Bankfull Mean Depth (ft)	0.6	0.6	0.6	0.4		0.5		0.4	0.4	0.4	0.4		0.4		0.6	0.3	0.3	0.3		0.3		0.5	0.7	0.7	0.8		0.7	
Bankfull Max Depth (ft)	1.0	0.9	1.0	1.0		0.9		0.6	0.5	0.6	0.6		0.6		1.3	0.8	0.8	0.7		0.7		0.9	1.0	1.2	1.2		1.2	
Bankfull Cross Sectional Area (ft^2)	3.6	3.6	3.6	3.6		3.6		2.2	2.2	2.2	2.2		2.2		3.2	3.2	3.2	3.2		3.2		3.5	3.5	3.5	3.5		3.5	
Bankfull Width/Depth Ratio	NA	NA	NA	NA		NA		16.9	15.3	14.8	13.4		15.2		NA	NA	NA	NA		NA		13.2	6.3	6.6	5.3		6.3	
Bankfull Entrenchment Ratio	NA	NA	NA	NA		NA		6.6	6.9	7.0	7.5		7.0		NA	NA	NA	NA		NA		5.9	8.5	8.3	9.3		8.6	
Low Bank Height (ft)	1.0	0.9	1.0	1.1		0.9		0.6	0.7	0.6	0.6		0.6		1.3	0.6	0.7	0.6		0.6		0.9	1.4	1.5	1.2		1.1	
Bankfull Bank Height Ratio*	1.00	1.00	1.00	1.10		1.03		1.00	1.40	1.00	1.07		1.07		1.00	0.75	0.88	0.86		0.79		1.00	1.40	1.25	1.02		0.96	
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												
Based on fixed baseline bankfull elevation[1]																												
Record elevation (datum) used																												
Bankfull Width (ft)																												
Floodprone Width (ft)																												
Bankfull Mean Depth (ft)																												
Bankfull Max Depth (ft)																												
Bankfull Cross Sectional Area (ft^2)																												
Bankfull Width/Depth Ratio																												
Bankfull Entrenchment Ratio																												
Low Bank Height (ft)																												
Bankfull Bank Height Ratio*																												
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."
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Table 12f. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 7 (232 feet)

	Cross Section 27 (Pool)							Cross Section 28 (Riffle)							Cross Section 29 (Pool)							Cross Section 30 (Riffle)							Cross Section 31 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																				
Bankfull Width (ft)	7.1	11.4	12.4	12.5		12.6		7.8	6.9	7.5	7.0		7.6		4.1	4.1	4.1	4.1		4.8		6.2	5.6	6.3	6.2		6.2		5.3	6.1	5.8	5.8		6.4	
Floodprone Width (ft)	NA	NA	NA	NA		NA		20	20	20	20		20		NA	NA	NA	NA		NA		10	11	11	11		11		NA	NA	NA	NA		NA	
Bankfull Mean Depth (ft)	0.9	0.6	0.5	0.5		0.5		0.4	0.4	0.4	0.4		0.4		0.8	0.8	0.8	0.8		0.7		0.4	0.4	0.4	0.4		0.4		0.6	0.5	0.5	0.5		0.5	
Bankfull Max Depth (ft)	1.5	1.1	0.9	1.0		1.0		0.6	1.1	0.9	1.1		1.0		1.1	1.3	1.2	1.2		1.3		0.5	0.5	0.5	0.6		0.6		1.0	0.7	0.7	0.7		0.8	
Bankfull Cross Sectional Area (ft^2)	6.3	6.3	6.3	6.3		6.3		3.0	3.0	3.0	3.0		3.0		3.4	3.4	3.4	3.4		3.4		2.3	2.3	2.3	2.3		2.3		3.0	3.0	3.0	3.0		3.0	
Bankfull Width/Depth Ratio	NA	NA	NA	NA		NA		20.3	15.9	18.8	16.3		19.4		NA	NA	NA	NA		NA		16.7	13.6	17.3	16.7		16.7		NA	NA	NA	NA		NA	
Bankfull Entrenchment Ratio	NA	NA	NA	NA		NA		2.6	2.9	2.7	2.9		2.6		NA	NA	NA	NA		NA		1.6	2.0	1.7	1.8		1.8		NA	NA	NA	NA		NA	
Low Bank Height (ft)	1.5	0.8	0.8	0.9		0.9		0.6	1.1	0.9	1.1		0.9		1.1	1.2	1.2	1.3		1.3		0.5	0.5	0.5	0.6		0.6		1.0	0.6	0.8	0.8		0.7	
Bankfull Bank Height Ratio*	1.00	0.73	0.89	0.90		0.93		1.00	1.00	1.00	1.00		0.99		1.00	0.92	1.00	1.08		1.04		1.00	1.00	1.00	1.04		0.96		1.00	0.86	1.14	1.01		0.94	
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				
	Cross Section 32 (Riffle)							Cross Section 33 (Riffle)																														
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+																						
Record elevation (datum) used																																				
Bankfull Width (ft)	6.5	7.6	7.9	8.1		9		6.6	5.8	6.2	7.4		8.2																							
Floodprone Width (ft)	20	20	20	20		20		20	20	20	20		20																							
Bankfull Mean Depth (ft)	0.5	0.4	0.4	0.4		0.4		0.3	0.3	0.3	0.2		0.2																							
Bankfull Max Depth (ft)	0.7	0.8	0.8	0.9		0.8		0.5	0.6	0.6	0.6		0.5																							
Bankfull Cross Sectional Area (ft^2)	3.3	3.3	3.3	3.3		3.3		1.8	1.8	1.8	1.8		1.8																							
Bankfull Width/Depth Ratio	12.8	17.5	18.9	19.8		24.2		24.2	18.7	21.4	30.7		38.3																							
Bankfull Entrenchment Ratio	3.1	2.6	2.5	2.5		2.2		3.0	3.4	3.2	2.7		2.4																							
Low Bank Height (ft)	0.7	0.8	0.8	0.9		0.8		0.5	0.5	0.7	0.5		0.5																							
Bankfull Bank Height Ratio*	1.00	1.00	1.00	1.00		1.06		1.00	0.83	1.17	0.90		0.91																							
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."
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Table 12g. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Project Name/Number (Heron/100014) Segment/Reach: UT 8 (605 feet)

	Cross Section 34 (Riffle)							Cross Section 35 (Pool)							Cross Section 36 (Riffle)							Cross Section 37 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																												
Bankfull Width (ft)	6.5	5.2	4.8	5.3		5.9		7.5	6.9	7.1	6.4		6.0		9.3	9.0	9.3	9.7		9.9		9.5	8.7	10.5	8.6		9.7	
Floodprone Width (ft)	40	40	40	40		40		NA	NA	NA	NA		NA		20	20	20	20		20		NA	NA	NA	NA		NA	
Bankfull Mean Depth (ft)	0.4	0.5	0.5	0.5		0.4		0.5	0.6	0.6	0.6		0.7		0.4	0.4	0.4	0.4		0.4		0.8	0.8	0.7	0.8		0.7	
Bankfull Max Depth (ft)	0.7	0.7	0.8	0.7		0.7		0.9	1.0	0.9	0.9		1.0		0.7	0.7	0.8	0.8		0.9		1.6	1.6	1.6	1.6		1.6	
Bankfull Cross Sectional Area (ft^2)	2.6	2.6	2.6	2.6		2.6		4.1	4.1	4.1	4.1		4.1		3.7	3.7	3.7	3.7		3.7		7.2	7.2	7.2	7.2		7.2	
Bankfull Width/Depth Ratio	16.3	10.4	8.9	10.7		13.3		NA	NA	NA	NA		NA		23.4	21.9	23.4	25.5		26.4		NA	NA	NA	NA		NA	
Bankfull Entrenchment Ratio	6.2	7.7	8.3	7.6		6.7		NA	NA	NA	NA		NA		2.2	2.2	2.2	2.1		2.0		NA	NA	NA	NA		NA	
Low Bank Height (ft)	0.7	0.8	0.8	0.8		0.8		0.9	1.0	0.9	0.9		1.0		0.7	0.7	0.8	0.8		0.8		1.6	1.6	1.6	1.5		1.4	
Bankfull Bank Height Ratio*	1.00	1.14	1.00	1.14		1.18		1.00	1.00	1.00	1.01		1.00		1.00	1.00	1.00	1.07		0.92		1.00	1.00	1.00	0.94		0.89	
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												
Based on fixed baseline bankfull elevation[1]																												
Record elevation (datum) used																												
Bankfull Width (ft)																												
Floodprone Width (ft)																												
Bankfull Mean Depth (ft)																												
Bankfull Max Depth (ft)																												
Bankfull Cross Sectional Area (ft^2)																												
Bankfull Width/Depth Ratio																												
Bankfull Entrenchment Ratio																												
Low Bank Height (ft)																												
Bankfull Bank Height Ratio*																												
Cross Sectional Area between end pins (ft^2)																												
d50 (mm)																												

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Exhibit Table 13a. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 1 (856 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	8.3	11		13		4	9	13.2		14.7		4	10.7	13.4		17.7		4	12.4		13.4	16		4							8.3		13.8	16.2		4
Floodprone Width (ft)	25	100		100		4	25	100		100		4	25	100		100		4	25		100	100		4							25.0		100.0	100.0		4
Bankfull Mean Depth (ft)	0.4	0.5		0.6		4	0.3	0.4		0.6		4	0.26	0.37		0.63		4	0.30		0.41	0.52		4							0.3		0.4	0.5		4
[1]Bankfull Max Depth (ft)	0.6	0.8		1.1		4	0.6	0.8		1		4	0.7	0.8		1.1		4	0.62		0.82	1.04		4							0.6		0.8	1.1		4
Bankfull Cross Sectional Area (ft^2)	3.7	5.4		7.2		4	3.7	5.4		7.2		4	3.7	5.4		7.2		4	3.7		5.4	7.2		4							3.7		5.4	7.2		4
Width/Depth Ratio	17.4	18.7		36.7		4	20	28.7		45.1		4	18.1	34.7		68.1		4	26.7		39.3	41.9		4							18.5		28.9	57.4		4
Entrenchment Ratio	3	8.3		9.3		4	2.8	6.9		8.3		4	2.34	6.09		8.77		4	2.01		6.74	7.68		4							3.0		6.6	7.4		4
Low Bank Height (ft)	0.6	0.8		1.1		4	0.6	0.7		1		4	0.7	0.8		1.1		4	0.62		0.82	1.04		4							0.6		0.8	1.0		4
[1]Bank Height Ratio	1.0	1.0		1.0		4	0.9	1		1		4	1.0	1.0		1.0		4	**0.9**		**0.9**	**1.0**		4							**0.9**		**1.0**	**1.1**		4
Profile																																				
Riffle Length (ft)	2.7	19	16	53	11	31																														
Riffle Slope (ft/ft)	0	0.01	0.01	0.05	0.01	31																														
Pool Length (ft)	6	23	20	80	12.9	34																														
Pool Max depth (ft)	1.5	1.6		2.1		4																														
Pool Spacing (ft)	25	34		68		34																														
Pattern																																				
Channel Beltwidth (ft)	25	34		68																																
Radius of Curvature (ft)	17	25		85																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	51	72		101																																
Meander Width Ratio	3	4		6																																

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

Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	856																																			
Sinuosity (ft)	1.3																																			
Water Surface Slope (Channel) (ft/ft)	0.0087																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	43	19	19	19																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	0																																			
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 measurements 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 13b. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 3 (279 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)	7.7	7.7		7.7		1	7	7		7		1	7	7		7		1	7.4		7.4	7.4		1							7.5		7.5	7.5		1
Floodprone Width (ft)	18	18		18		1	18	18		18		1	18	18		18		1	18		18	18		1							18.0		18.0	18.0		1
Bankfull Mean Depth (ft)	0.6	0.6		0.6		1	0.6	0.6		0.6		1	0.6	0.6		0.6		1	0.6		0.6	0.6		1							0.6		0.6	0.6		1
[1]Bankfull Max Depth (ft)	1	1		1		1	1.1	1.1		1.1		1	1	1		1		1	1.1		1.1	1.1		1							1.1		1.1	1.1		1
Bankfull Cross Sectional Area (ft^2)	4.5	4.5		4.5		1	4.5	4.5		4.5		1	4.5	4.5		4.5		1	4.5		4.5	4.5		1							4.5		4.5	4.5		1
Width/Depth Ratio	13.2	13.2		13.2		1	10.9	10.9		10.9		1	10.9	10.9		10.9		1	12.3		12.3	12.3		1							12.5		12.5	12.5		1
Entrenchment Ratio	2.3	2.3		2.3		1	2.6	2.6		2.6		1	2.6		2.6			1	2.4		2.4	2.4		1							2.4		2.4	2.4		1
Low Bank Height (ft)	1	1		1		1	1.1	1.1		1.1		1	1	1		1		1	1.1		1.1	1.1		1							1.1		1.1	1.1		1
[1]Bank Height Ratio	1.0	1.0		1.0		1	1	1.0		1.0		1	1	1.0		1.0		1	**1.1**		**1.1**	**1.1**		1							**0.9**		**0.9**	**0.9**		1
Profile																																				
Riffle Length (ft)	4	11	10	19	4.3	14																														
Riffle Slope (ft/ft)	0.01	0.03	0.03	0.74	0.02	14																														
Pool Length (ft)	4	9	8	21	4.9	13																														
Pool Max depth (ft)	1	1	1	1	0	1																														
Pool Spacing (ft)	13	18		35		14																														
Pattern																																				
Channel Beltwidth (ft)	13	18		27																																
Radius of Curvature (ft)	9	13		44																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	26	37		53																																
Meander Width Ratio	3	4		6																																

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

Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	279																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0176																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	55	15	15	15																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	**0**																																			
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 measurements 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 13c. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 4 (450 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)	6.5	7.3		8		2	7.4	7.7		7.9		2	10.6	11		11.3		2	7.8		7.9	7.9		2							8.0		8.1	8.2		2
Floodprone Width (ft)	40	40		40		2	40	40		40		2	40	40		40		2	40		40	40		2							40.0		40.0	40.0		2
Bankfull Mean Depth (ft)	0.3	0.4		0.5		2	0.3	0.4		0.4		2	0.2	0.3		0.3		2	0.3		0.4	0.4		2							0.3		0.4	0.4		2
[1]Bankfull Max Depth (ft)	0.5	0.7		0.8		2	0.6	0.7		0.8		2	0.5	0.7		0.8		2	0.5		0.7	0.8		2							0.7		0.7	0.8		2
Bankfull Cross Sectional Area (ft^2)	2.2	3		3.7		2	2.2	2.9		3.5		2	2.2	2.9		3.5		2	2.2		2.9	3.5		2							2.2		2.9	3.5		2
Width/Depth Ratio	17.3	18.3		19.2		2	17.8	21.4		24.9		2	36.5	43.8		51.1		2	17.7		23.2	28.7		2							18.3		24.4	30.6		2
Entrenchment Ratio	5	5.6		6.2		2	5.1	5.2		5.4		2	3.5	3.7		3.8		2	5		5.1	5.1		2							4.9		4.9	5.0		2
Low Bank Height (ft)	0.5	0.7		0.8		2	0.5	0.7		0.8		2	0.5	0.7		0.8		2	0.5		0.6	0.7		2							0.6		0.7	0.8		2
[1]Bank Height Ratio	1.0	1.0		1.0		2	0.8	0.9		1		2	1.0	1.0		1.0		2	**0.9**		**0.9**	**1**		**2**							**1.0**		**1.0**	**1.0**		2
Profile																																				
Riffle Length (ft)	4	9	9	20	3.5	23																														
Riffle Slope (ft/ft)	0	0.02	0.02	0.06	0.01	23																														
Pool Length (ft)	4	10	10	18	3.5	22																														
Pool Max depth (ft)	1.1	1.3		1.4		2																														
Pool Spacing (ft)	15	20		40		22																														
Pattern																																				
Channel Beltwidth (ft)	15	20		30																																
Radius of Curvature (ft)	10	15		50																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	30	43		60																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	450																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0195																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	48	17	18	17																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	**0**																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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

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 measurements 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 13d. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 5 (952 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)	4.9	6.9		8.1		4	5.7	6.7		9.2		4	5.3	9		12.2		4	5.9		7.5	12.7		4							5.4		8.6	9.9		4
Floodprone Width (ft)	40	40		40		4	40	40		40		4	40	40		40		4	40		40	40		4							40.0		40.0	40.0		4
Bankfull Mean Depth (ft)	0.3	0.4		0.5		4	0.3	0.4		0.4		4	0.2	0.3		0.4		4	0.3		0.3	0.4		4							0.2		0.3	0.4		4
[1]Bankfull Max Depth (ft)	0.5	0.7		0.8		4	0.6	0.7		0.8		4	0.6	0.7		0.8		4	0.6		0.7	0.8		4							0.6		0.7	0.8		4
Bankfull Cross Sectional Area (ft^2)	1.9	2.4		3.7		4	1.9	2.4		3.7		4	1.9	2.4		3.7		4	1.9		2.4	3.7		4							1.9		2.4	3.7		4
Width/Depth Ratio	12.6	18.3		20.9		4	17.1	19.1		22.9		4	14.8	32.6		46.5		4	18.5		24.6	43.2		4							15.7		22.0	48.2		4
Entrenchment Ratio	4.9	5.9		8.2		4	4.3	6.0		7.0		4	3.3	4.5		7.5		4	3.2		5.4	6.8		4							4.0		4.7	7.4		4
Low Bank Height (ft)	0.5	0.7		0.8		4	0.6	0.6		0.8		4	0.6	0.6		0.7		4	0.6		0.7	0.7		4							0.6		0.7	0.8		4
[1]Bank Height Ratio	1.0	1.0		1.0		4	0.9	1.0		1.0		4	1	0.8		1		4	**1**		**1**	**1.2**		4							**1.0**		**1.0**	**1.0**		4
Profile																																				
Riffle Length (ft)	3	11	9	49	8.4	41																														
Riffle Slope (ft/ft)	0	0.03	0.03	0.05	0.01	41																														
Pool Length (ft)	4	12	10	59	8.5	41																														
Pool Max depth (ft)	0.8	1		1.1		4																														
Pool Spacing (ft)	15	20		40		41																														
Pattern																																				
Channel Beltwidth (ft)	15	20		30																																
Radius of Curvature (ft)	10	15		50																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	30	43		60																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	E/C 4																																			
Channel Thalweg length (ft)	952																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0256																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	50	17	17	16																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	**0**																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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

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 measurements 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 13e. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 6 (781 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)	6.1	6.5		6.8		2	4.7	5.3		5.8		2	4.8	5.3		5.7		2	4.3		4.8	5.4		2							4.7		5.3	5.8		2
Floodprone Width (ft)	40	40		40		2	40	40		40		2	40	40		40		2	40		40	40		2							40.0		40.0	40.0		2
Bankfull Mean Depth (ft)	0.4	0.4		0.5		2	0.4	0.6		0.7		2	0.4	0.6		0.7		2	0.4		0.6	0.8		2							0.4		0.6	0.7		2
[1]Bankfull Max Depth (ft)	0.6	0.8		0.9		2	0.5	0.8		1		2	0.6	0.9		1.2		2	0.6		0.9	1.2		2							0.6		0.9	1.2		2
Bankfull Cross Sectional Area (ft^2)	2.2	2.9		3.5		2	2.2	2.9		3.5		2	2.2	2.9		3.5		2	2.2		2.9	3.5		2							2.2		2.9	3.5		2
Width/Depth Ratio	13.2	15.1		16.9		2	6.3	10.8		15.3		2	6.6	10.7		14.8		2	5.3		9.4	13.4		2							6.3		10.8	15.2		2
Entrenchment Ratio	5.9	6.2		6.6		2	6.9	7.7		8.5		2	7	7.7		8.3		2	7.4		8.4	9.3		2							7.0		7.8	8.6		2
Low Bank Height (ft)	0.6	0.8		0.9		2	0.7	1.1		1.4		2	0.7	1.1		1.5		2	0.6		0.9	1.2		2							0.6		0.9	1.1		2
[1]Bank Height Ratio	1.0	1.0		1.0		2	1.4	1.4		1.4		2	1.1	1.2		1.3		2	**1.0**		**1.0**	**1.1**		2							**1.0**		**1.0**	**1.1**		2
Profile																																				
Riffle Length (ft)	2	10	7	47	8.8	33																														
Riffle Slope (ft/ft)	0	0.03	0.02	0.13	0.02	33																														
Pool Length (ft)	4	12	12	18	3.7	33																														
Pool Max depth (ft)	1	1.2		1.3		2																														
Pool Spacing (ft)	14	18		37		33																														
Pattern																																				
Channel Beltwidth (ft)	14	18		37																																
Radius of Curvature (ft)	9	14		46																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	27	39		55																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	781																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0225																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	46	18	18	18																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	**0**																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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

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 measurements 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 13f. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 7 (232 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)	6.2	6.6		7.8		4	5.6	6.4		7.6		4	6.2	6.9		7.9		4	6.2		7.5	9.2		4							6.2		7.9	9.0		4
Floodprone Width (ft)	10	20		20		4	11	20		20		4	11	20		20		4	11		20	20		4							11.0		20.0	20.0		4
Bankfull Mean Depth (ft)	0.3	0.4		0.5		4	0.3	0.4		0.4		4	0.3	0.4		0.4		4	0.2		0.4	0.4		4							0.2		0.4	0.4		4
[1]Bankfull Max Depth (ft)	0.5	0.6		0.7		4	0.5	0.7		1.1		4	0.5	0.7		0.9		4	0.6		0.8	1.1		4							0.5		0.7	1.0		4
Bankfull Cross Sectional Area (ft^2)	1.8	2.7		3.3		4	1.8	2.7		3.3		4	1.8	2.7		3.3		4	1.8		2.7	3.3		4							1.8		2.7	3.3		4
Width/Depth Ratio	12.8	18.5		24.2		4	13.6	16.7		18.7		4	17.3	18.8		21.4		4	16.3		18.3	46.4		4							16.7		21.8	38.3		4
Entrenchment Ratio	1.6	2.8		3.1		4	2	2.8		3.4		4	1.7	2.6		3.2		4	1.8		2.3	2.9		4							1.8		2.3	2.6		4
Low Bank Height (ft)	0.5	0.6		0.7		4	0.5	0.7		1.1		4	0.5	0.7		0.9		4	0.5		0.8	1.1		4							0.5		0.7	0.9		4
[1]Bank Height Ratio	1.0	1.0		1.0		4	0.8	1		1		4	1.0	1.0		1.0		4	**0.9**		**1**	**1.1**		4							**0.9**		**1.0**	**1.1**		4
Profile																																				
Riffle Length (ft)	3	13	10	75	13	42																														
Riffle Slope (ft/ft)	0.01	0.03	0.03	0.06	0.01	42																														
Pool Length (ft)	3	9	9	14	2.6	41																														
Pool Max depth (ft)	1	1.1		1.5		3																														
Pool Spacing (ft)	16	21		42		42																														
Pattern																																				
Channel Beltwidth (ft)	16	21		32																																
Radius of Curvature (ft)	10	16		53																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	31	45		64																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	Cb 4																																			
Channel Thalweg length (ft)	232																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0268																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	60	13	14	13																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	**0**																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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

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 measurements 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 13g. Monitoring Data - Stream Reach Data Summary
Project Name/Number (Heron/100014) - Segment/Reach: UT 8 (605 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)	6.5	7.9		9.3		2	5.2	7.1		9		2	4.8	7.1		9.3		2	5.3		7.5	9.7		2							5.9		7.9	9.9		2
Floodprone Width (ft)	20	30		40		2	20	30		40		2	20	30		40		2	20		30	40		2							20.0		30.0	40.0		2
Bankfull Mean Depth (ft)	0.4	0.4		0.4		2	0.4	0.5		0.5		2	0.4	0.5		0.5		2	0.4		0.4	0.5		2							0.4		0.4	0.4		2
[1]Bankfull Max Depth (ft)	0.7	0.7		0.7		2	0.7	0.7		0.7		2	0.8	0.8		0.8		2	0.7		0.7	0.8		2							0.7		0.8	0.9		2
Bankfull Cross Sectional Area (ft^2)	2.6	3.2		3.7		2	2.6	3.2		3.7		2	2.6	3.2		3.7		2	2.6		3.2	3.7		2							2.6		3.2	3.7		2
Width/Depth Ratio	16.3	19.8		23.4		2	10.4	16.1		21.9		2	8.9	16.1		23.4		2	10.7		18.1	25.5		2							13.3		19.9	26.4		2
Entrenchment Ratio	2.2	4.2		6.2		2	2.2	5		7.7		2	2.2	5.2		8.3		2	2.1		4.8	7.5		2							2.0		4.4	6.7		2
Low Bank Height (ft)	0.7	0.7		0.7		2	0.7	0.8		0.8		2	0.8	0.8		0.8		2	0.8		0.8	0.8		2							0.8		0.8	0.8		2
[1]Bank Height Ratio	1.0	1.0		1.0		2	1	1.1		1.1		2	1.0	1.0		1.0		2	**1.1**		**1.1**	**1.1**		2							**0.9**		**1.1**	**1.2**		2
Profile																																				
Riffle Length (ft)	5	11	11	19	3.4	23																														
Riffle Slope (ft/ft)	0.01	0.02	0.02	0.04	0.01	23																														
Pool Length (ft)	6	15	15	24	4.8	23																														
Pool Max depth (ft)	0.9	1.3		1.6		2																														
Pool Spacing (ft)	17	24		47		23																														
Pattern																																				
Channel Beltwidth (ft)	17	24		36																																
Radius of Curvature (ft)	11	18		59																																
Rc:Bankfull width (ft/ft)	2	3		10																																
Meander Wavelength (ft)	35	50		71																																
Meander Width Ratio	3	4		6																																
Additional Reach Parameters																																				
Rosgen Classification	C 4																																			
Channel Thalweg length (ft)	605																																			
Sinuosity (ft)	1.15																																			
Water Surface Slope (Channel) (ft/ft)	0.0138																																			
BF slope (ft/ft)																																				
[3]Ri% / Ru% / P% / G% / S%	41	20	20	19																																
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks	**0**																																			
Channel Stability or Habitat Metric																																				
Biological or Other																																				

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

Shaded cells indicate that these will typically not be filled in.
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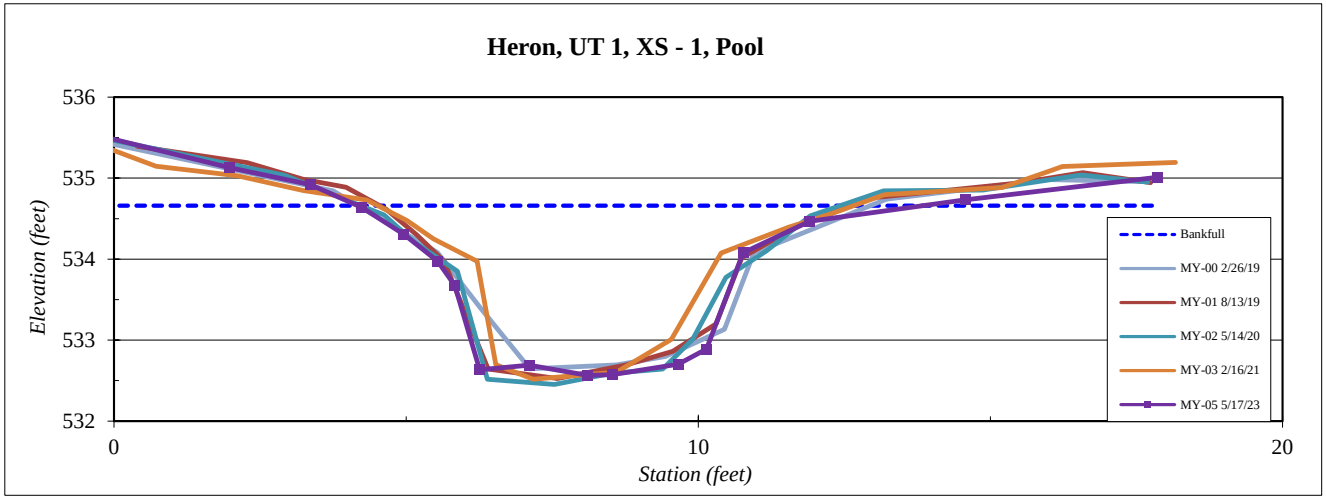
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 1, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Adams, Fleming, Perkinson, Smith

Station	Elevation
-0.2	535.5
2.0	535.1
3.4	534.9
4.2	534.6
5.0	534.3
5.5	534.0
5.8	533.7
6.3	532.6
7.1	532.7
8.1	532.6
8.5	532.6
9.7	532.7
10.1	532.9
10.8	534.1
11.9	534.5
14.6	534.7
17.9	535.0

SUMMARY DATA	
Bankfull Elevation:	534.7
LTOB Elevation:	534.5
Bankfull Cross-Sectional Area:	10.5
Bankfull Width:	9.7
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.1
Low Bank Height:	1.9
Mean Depth at Bankfull:	1.1
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.91

Stream Type	C/E

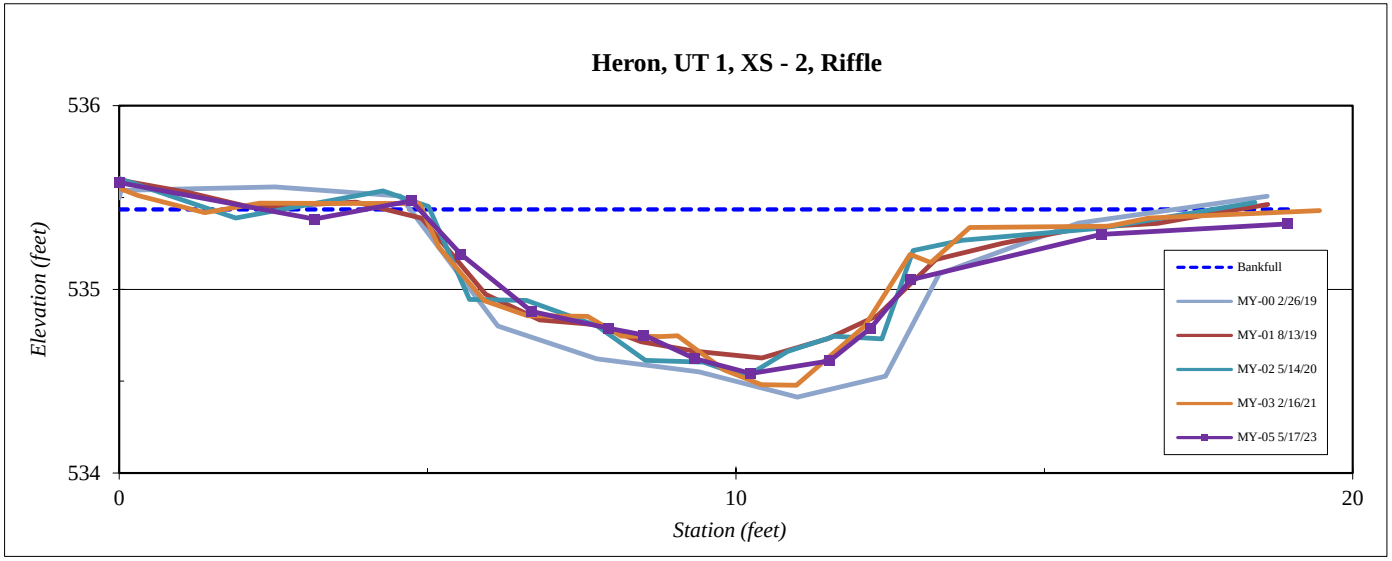


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 2, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Adams, Fleming, Perkinson, Smith

Station	Elevation
0.0	535.58
3.2	535.38
4.7	535.48
5.5	535.19
6.7	534.88
7.9	534.79
8.5	534.75
9.3	534.62
10.2	534.54
11.5	534.61
12.2	534.79
12.8	535.05
15.9	535.30
19.0	535.36

SUMMARY DATA	
Bankfull Elevation:	535.4
LTOB Elevation:	535.5
Bankfull Cross-Sectional Area:	6.1
Bankfull Width:	14.1
Flood Prone Area Elevation:	536.3
Flood Prone Width:	100.0
Max Depth at Bankfull:	0.9
Low Bank Height:	0.9
Mean Depth at Bankfull:	0.4
W / D Ratio:	32.5
Entrenchment Ratio:	7.1
Bank Height Ratio:	1.05

Stream Type	C/E

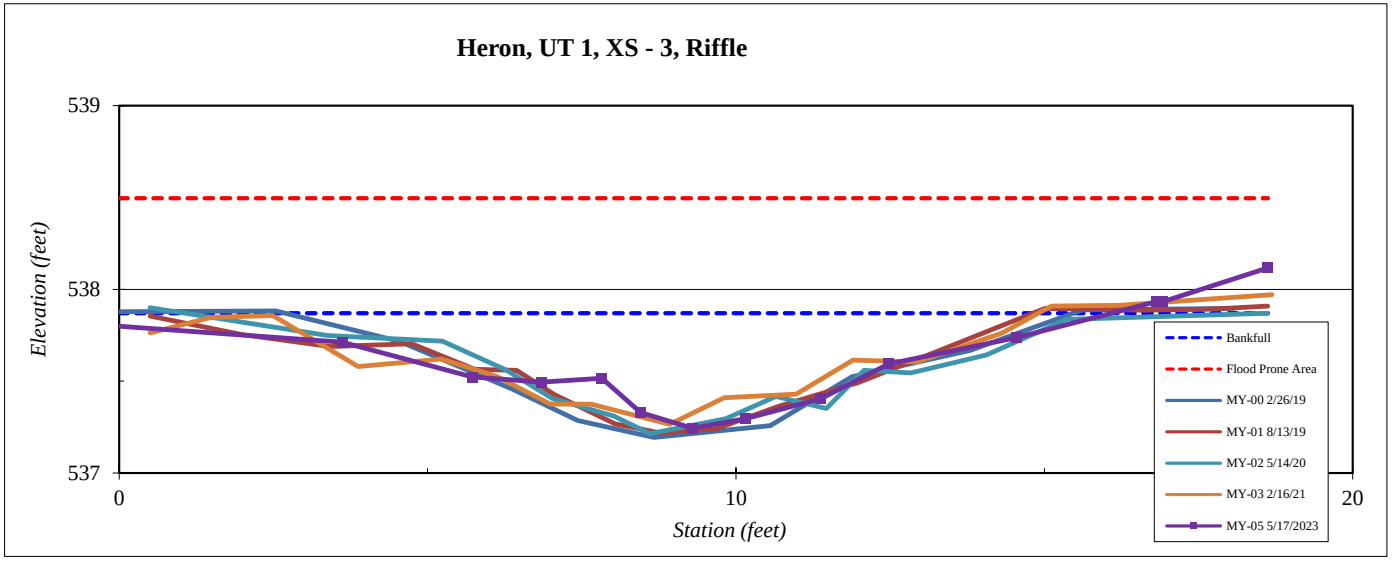


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 3, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Adams, Fleming, Perkinson, Smith

Station	Elevation
-0.1	537.30
3.6	537.21
5.7	537.02
6.8	537.00
7.8	537.02
8.5	536.83
9.3	536.74
10.2	536.80
11.4	536.91
12.5	537.09
14.6	537.24
16.8	537.43
16.9	537.43
18.6	537.62

SUMMARY DATA	
Bankfull Elevation:	537.4
LTOB Elevation:	537.3
Bankfull Cross-Sectional Area:	4.6
Bankfull Width:	16.2
Flood Prone Area Elevation:	538.0
Flood Prone Width:	100.0
Max Depth at Bankfull:	0.6
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.3
W / D Ratio:	57.4
Entrenchment Ratio:	6.2
Bank Height Ratio:	0.89

Stream Type	C/E

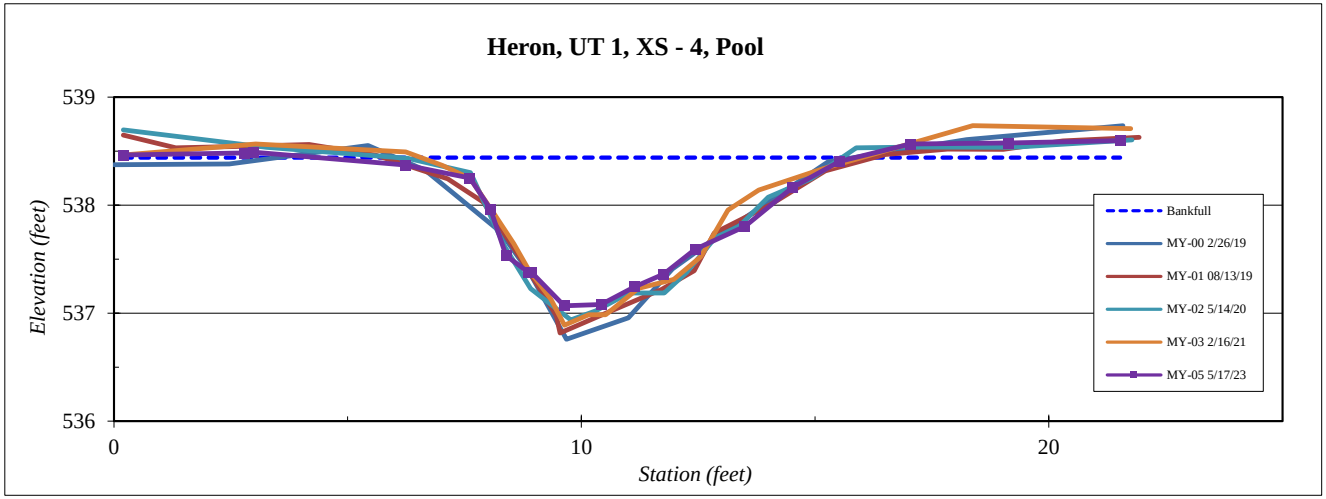


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 4, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Adams, Fleming, Perkinson, Smith

Station	Elevation
0.2	538.5
2.8	538.5
3.0	538.5
6.2	538.4
7.6	538.3
8.1	538.0
8.4	537.5
8.9	537.4
8.9	537.4
9.6	537.1
10.4	537.1
11.1	537.2
11.8	537.4
12.4	537.6
13.5	537.8
14.5	538.2
15.5	538.4
17.0	538.6
19.1	538.6
21.5	538.6

SUMMARY DATA	
Bankfull Elevation:	538.4
LTOB Elevation:	538.5
Bankfull Cross-Sectional Area:	6.8
Bankfull Width:	11.5
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.4
Low Bank Height:	1.4
Mean Depth at Bankfull:	0.6
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.04

Stream Type	C/E

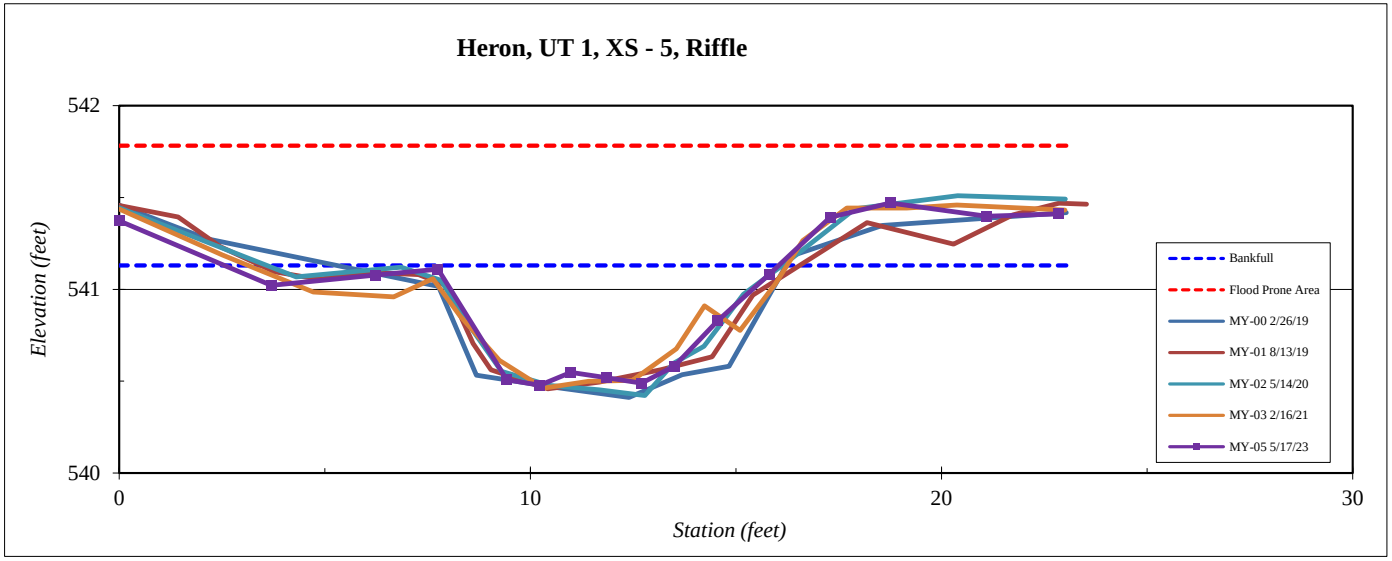


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 5, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Adams, Fleming, Perkinson, Smith

Station	Elevation
0.0	541.37
3.7	541.02
6.2	541.08
7.8	541.11
9.4	540.51
10.2	540.48
11.0	540.55
11.9	540.52
12.7	540.49
13.5	540.58
14.6	540.83
15.8	541.08
17.3	541.39
18.8	541.47
21.1	541.40
22.8	541.41

SUMMARY DATA	
Bankfull Elevation:	541.1
LTOB Elevation:	541.1
Bankfull Cross-Sectional Area:	3.7
Bankfull Width:	8.3
Flood Prone Area Elevation:	541.8
Flood Prone Width:	25.0
Max Depth at Bankfull:	0.7
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.4
W / D Ratio:	18.5
Entrenchment Ratio:	3.0
Bank Height Ratio:	0.97

Stream Type	C/E

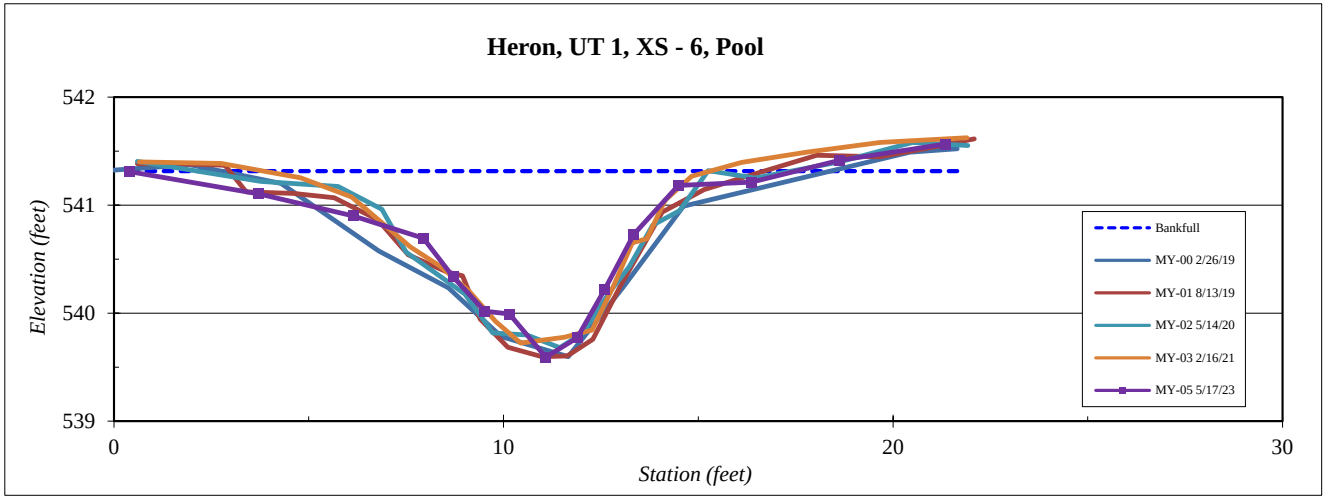


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 6, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Adams, Fleming, Perkinson, Smith

Station	Elevation
0.4	541.3
3.7	541.1
6.1	540.9
7.9	540.7
8.7	540.3
9.5	540.0
10.1	540.0
11.1	539.6
11.9	539.8
12.6	540.2
13.3	540.7
14.5	541.2
16.4	541.2
18.6	541.4
21.4	541.6

SUMMARY DATA	
Bankfull Elevation:	541.3
LTOB Elevation:	541.2
Bankfull Cross-Sectional Area:	9.4
Bankfull Width:	17.1
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.7
Low Bank Height:	1.6
Mean Depth at Bankfull:	0.5
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.92

Stream Type	C/E

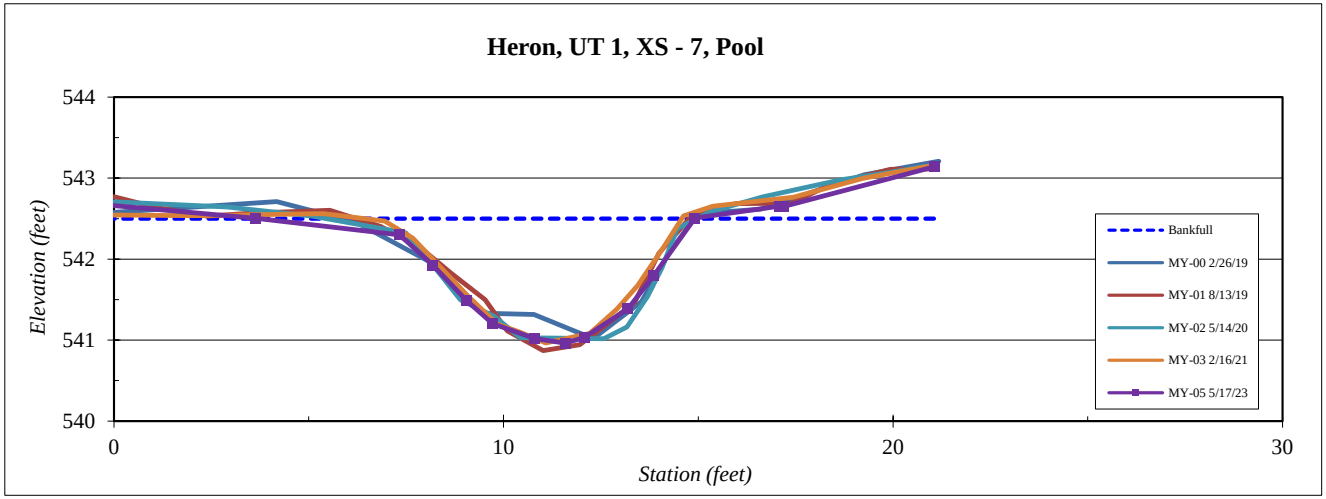


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 7, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Adams, Fleming, Perkinson, Smith

Station	Elevation
-0.2	542.7
3.6	542.5
7.3	542.3
8.2	541.9
9.1	541.5
9.7	541.2
10.8	541.0
11.6	541.0
12.1	541.0
13.2	541.4
13.9	541.8
14.9	542.5
17.1	542.7
17.2	542.7
21.1	543.1

SUMMARY DATA	
Bankfull Elevation:	542.5
LTOB Elevation:	542.5
Bankfull Cross-Sectional Area:	8.0
Bankfull Width:	11.2
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.5
Low Bank Height:	1.5
Mean Depth at Bankfull:	0.7
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.00

Stream Type	C/E

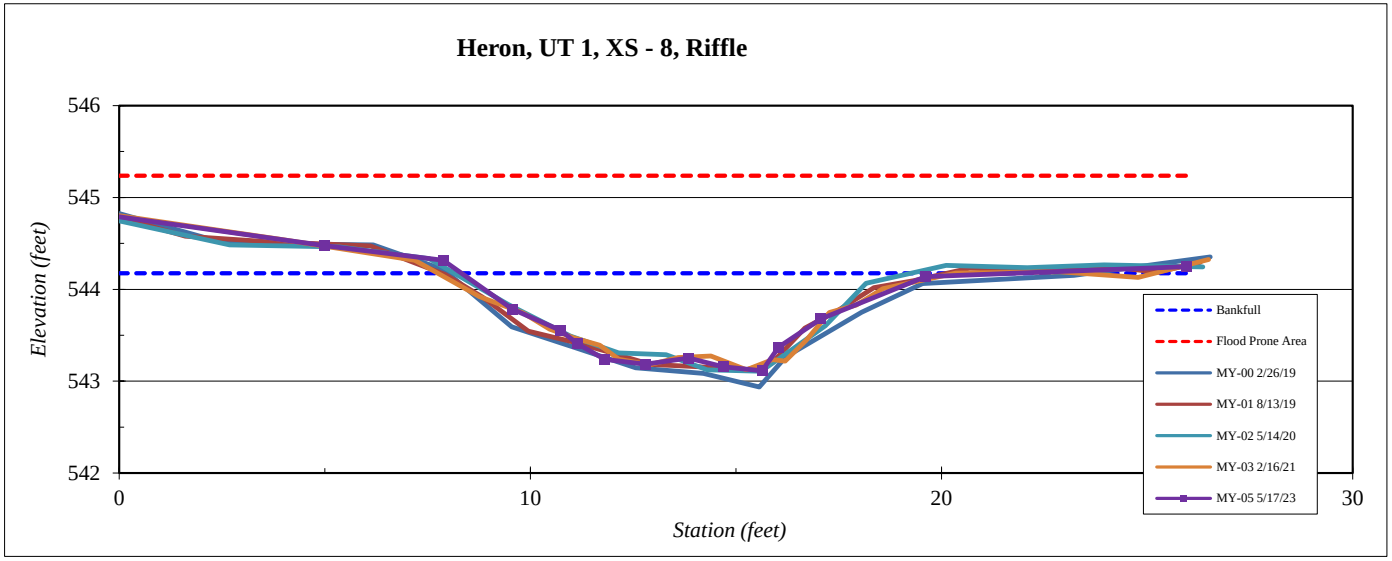


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 8, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Adams, Fleming, Perkinson, Smith

Station	Elevation
-0.5	544.82
5.0	544.48
7.9	544.32
9.6	543.78
10.7	543.55
11.1	543.41
11.8	543.24
12.8	543.18
13.9	543.25
14.7	543.16
15.6	543.11
16.0	543.37
17.1	543.68
19.6	544.14
25.9	544.25

SUMMARY DATA	
Bankfull Elevation:	544.2
LTOB Elevation:	544.1
Bankfull Cross-Sectional Area:	7.2
Bankfull Width:	13.5
Flood Prone Area Elevation:	545.2
Flood Prone Width:	100.0
Max Depth at Bankfull:	1.1
Low Bank Height:	1.0
Mean Depth at Bankfull:	0.5
W / D Ratio:	25.3
Entrenchment Ratio:	7.4
Bank Height Ratio:	0.96

Stream Type	C/E

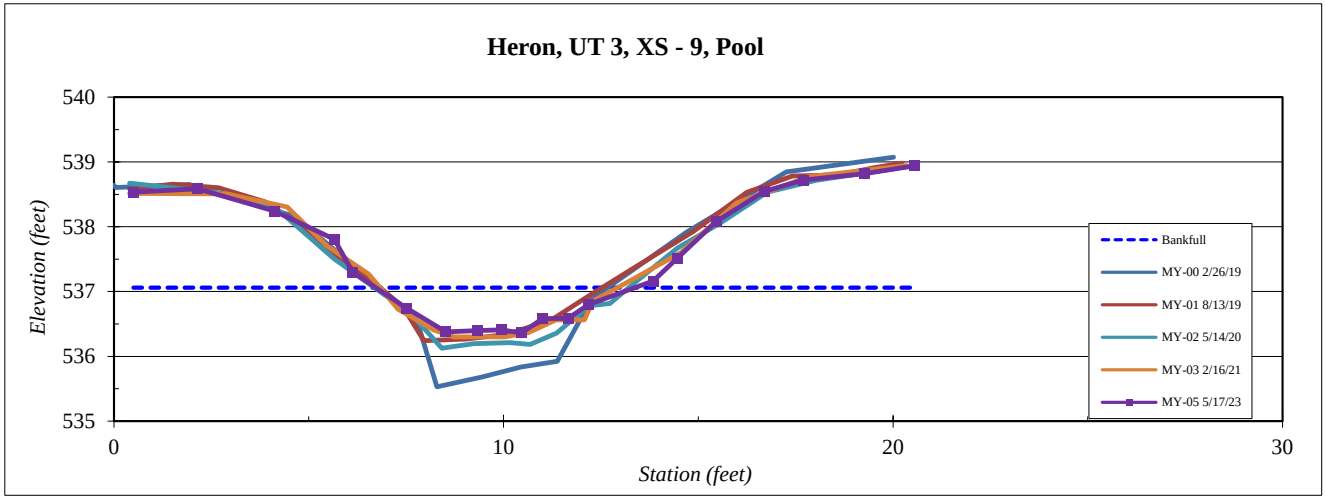


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 3, XS - 9, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Adams, Fleming, Perkinson, Smith

Station	Elevation
0.5	538.5
2.1	538.6
4.1	538.2
5.7	537.8
6.1	537.3
7.5	536.7
8.5	536.4
9.3	536.4
10.0	536.4
10.5	536.4
11.0	536.6
11.7	536.6
12.2	536.8
13.8	537.2
14.5	537.5
15.5	538.1
16.7	538.5
17.7	538.7
19.3	538.8
20.5	538.9

SUMMARY DATA	
Bankfull Elevation:	537.1
LTOB Elevation:	537.2
Bankfull Cross-Sectional Area:	2.9
Bankfull Width:	6.7
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	0.7
Low Bank Height:	0.4
Mean Depth at Bankfull:	0.4
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.63

Stream Type	C/E



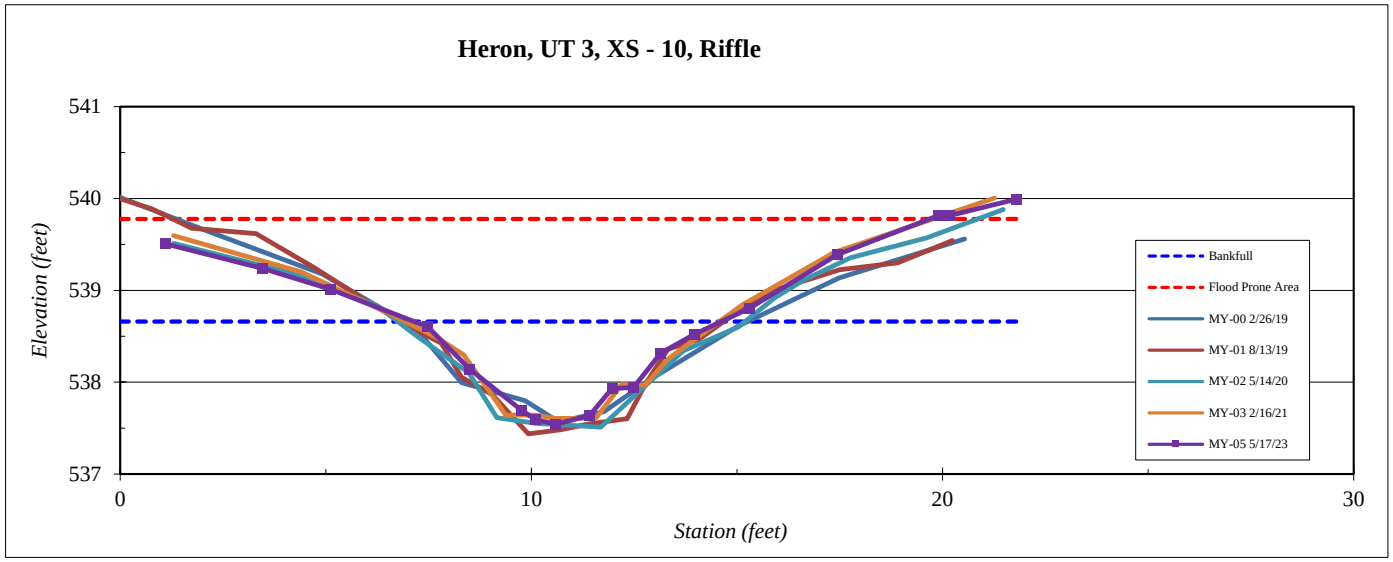
Sediment deposition in pool is natural and is exaggerated by the small size of the channel. This is not considered an area of concern.

Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 3, XS - 10, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Adams, Fleming, Perkinson, Smith

Station	Elevation
1.1	539.51
3.5	539.24
5.1	539.01
7.5	538.60
8.5	538.14
9.8	537.70
10.1	537.59
10.6	537.54
11.4	537.64
12.0	537.93
12.5	537.94
13.1	538.32
14.0	538.52
15.3	538.81
17.4	539.39
19.9	539.82
20.2	539.81
21.8	539.99

SUMMARY DATA	
Bankfull Elevation:	538.7
LTOB Elevation:	538.6
Bankfull Cross-Sectional Area:	4.5
Bankfull Width:	7.5
Flood Prone Area Elevation:	539.8
Flood Prone Width:	18.0
Max Depth at Bankfull:	1.1
Low Bank Height:	1.1
Mean Depth at Bankfull:	0.6
W / D Ratio:	12.5
Entrenchment Ratio:	2.4
Bank Height Ratio:	0.95

Stream Type	C/E

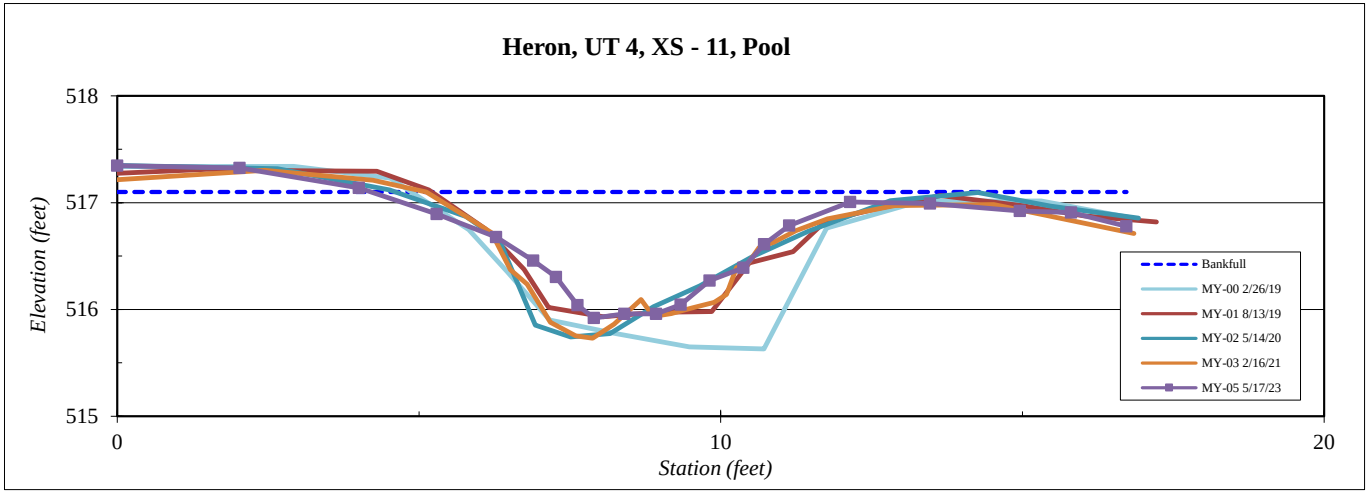


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 4, XS - 11, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Fleming

Station	Elevation
0.0	517.3
2.0	517.3
4.0	517.1
5.3	516.9
6.3	516.7
6.9	516.5
7.3	516.3
7.6	516.0
7.9	515.9
8.4	516.0
8.9	516.0
9.3	516.0
9.8	516.3
10.4	516.4
10.7	516.6
11.1	516.8
12.1	517.0
13.5	517.0
15.0	516.9
15.8	516.9
16.7	516.8

SUMMARY DATA	
Bankfull Elevation:	517.1
LTOB Elevation:	517.0
Bankfull Cross-Sectional Area:	4.8
Bankfull Width:	7.9
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.2
Low Bank Height:	1.1
Mean Depth at Bankfull:	0.6
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.92

Stream Type	C/E

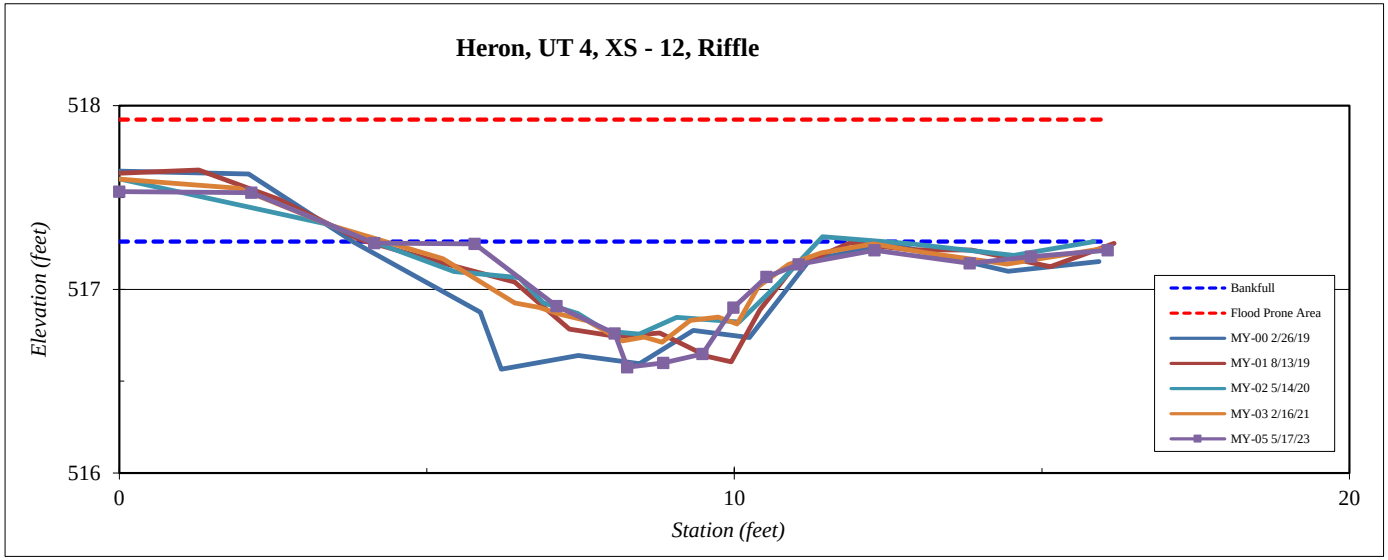


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 4, XS - 12, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Fleming

Station	Elevation
0.0	517.53
2.1	517.53
4.1	517.25
5.8	517.25
7.1	516.91
8.1	516.76
8.3	516.58
8.8	516.60
9.5	516.65
10.0	516.90
10.5	517.07
11.0	517.14
12.3	517.21
13.8	517.14
14.8	517.18
16.1	517.21

SUMMARY DATA	
Bankfull Elevation:	517.3
LTOB Elevation:	517.2
Bankfull Cross-Sectional Area:	2.2
Bankfull Width:	8.2
Flood Prone Area Elevation:	517.9
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.7
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.3
W / D Ratio:	31.1
Entrenchment Ratio:	4.9
Bank Height Ratio:	0.96

Stream Type	C/E

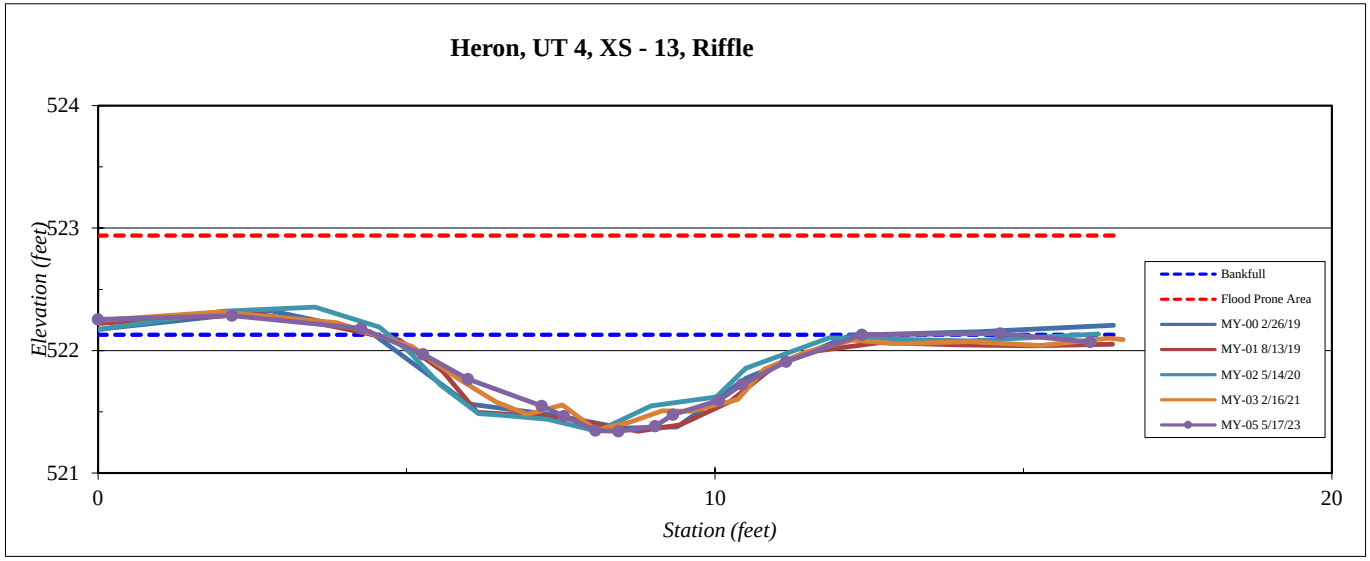


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 4, XS - 13, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Fleming

Station	Elevation
0.0	522.25
2.2	522.29
4.3	522.18
5.3	521.97
6.0	521.77
7.2	521.55
7.6	521.47
8.1	521.35
8.4	521.34
9.0	521.38
9.3	521.48
10.1	521.59
10.4	521.72
11.2	521.91
12.4	522.13
14.6	522.14
16.1	522.07

SUMMARY DATA	
Bankfull Elevation:	522.1
LTOB Elevation:	522.1
Bankfull Cross-Sectional Area:	3.5
Bankfull Width:	8.0
Flood Prone Area Elevation:	522.9
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.8
Low Bank Height:	0.8
Mean Depth at Bankfull:	0.4
W / D Ratio:	18.1
Entrenchment Ratio:	5.0
Bank Height Ratio:	0.97

Stream Type	C/E

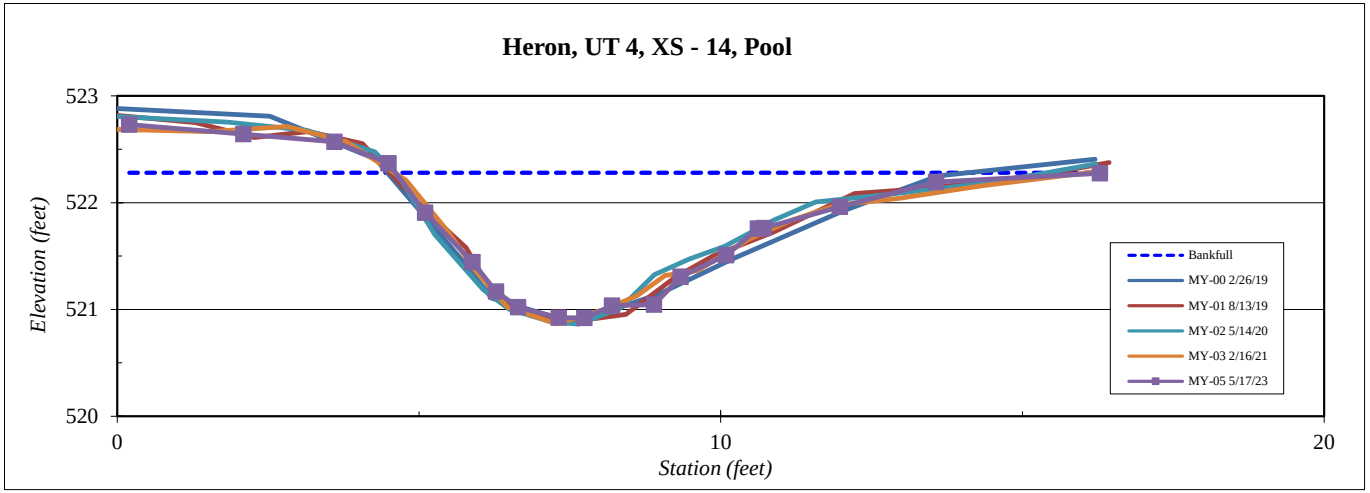


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 4, XS - 14, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Fleming

Station	Elevation
0.2	522.7
2.1	522.6
3.6	522.6
4.5	522.4
5.1	521.9
5.9	521.4
6.3	521.2
6.6	521.0
7.3	520.9
7.7	520.9
8.2	521.0
8.9	521.0
9.3	521.3
10.1	521.5
10.6	521.8
10.7	521.8
12.0	522.0
13.6	522.2
16.3	522.3

SUMMARY DATA	
Bankfull Elevation:	522.3
LTOB Elevation:	522.3
Bankfull Cross-Sectional Area:	6.8
Bankfull Width:	11.7
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.4
Low Bank Height:	1.4
Mean Depth at Bankfull:	0.6
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.02

Stream Type	C/E

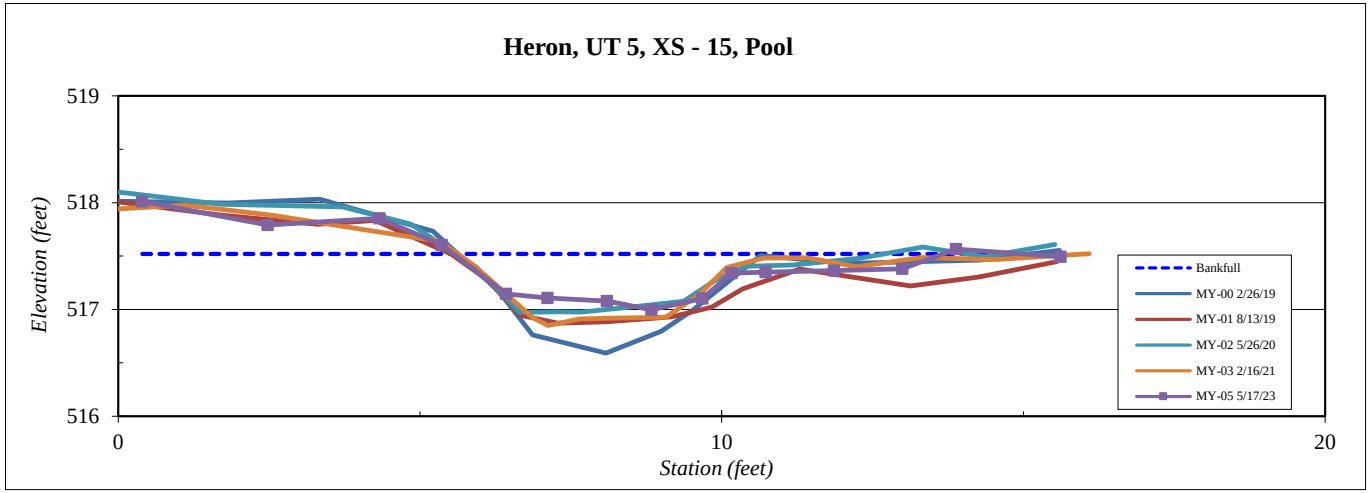


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 15, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Fleming

Station	Elevation
0.4	518.0
2.5	517.8
4.3	517.9
5.4	517.6
6.4	517.1
7.1	517.1
8.1	517.1
8.8	517.0
9.7	517.1
10.2	517.3
10.7	517.4
11.9	517.4
13.0	517.4
13.9	517.6
15.6	517.5

SUMMARY DATA	
Bankfull Elevation:	517.5
LTOB Elevation:	517.6
Bankfull Cross-Sectional Area:	2.4
Bankfull Width:	8.3
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	0.5
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.3
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.05

Stream Type	C/E

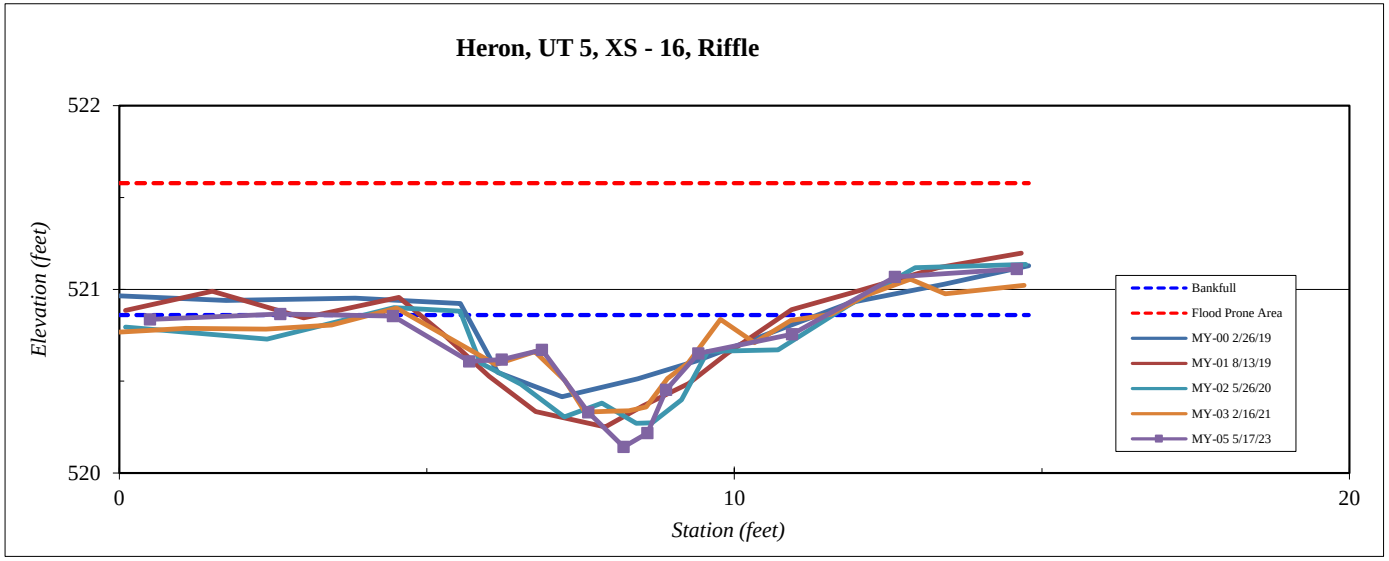


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 16, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Fleming

Station	Elevation
0.5	520.84
2.6	520.87
4.5	520.85
5.7	520.61
6.2	520.62
6.9	520.67
7.6	520.33
8.2	520.14
8.6	520.22
8.9	520.45
9.4	520.65
10.9	520.76
12.6	521.07
14.6	521.11

SUMMARY DATA	
Bankfull Elevation:	520.9
LTOB Elevation:	520.9
Bankfull Cross-Sectional Area:	1.9
Bankfull Width:	9.7
Flood Prone Area Elevation:	521.6
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.7
Low Bank Height:	0.7
Mean Depth at Bankfull:	0.2
W / D Ratio:	48.2
Entrenchment Ratio:	4.1
Bank Height Ratio:	0.99

Stream Type	C/E

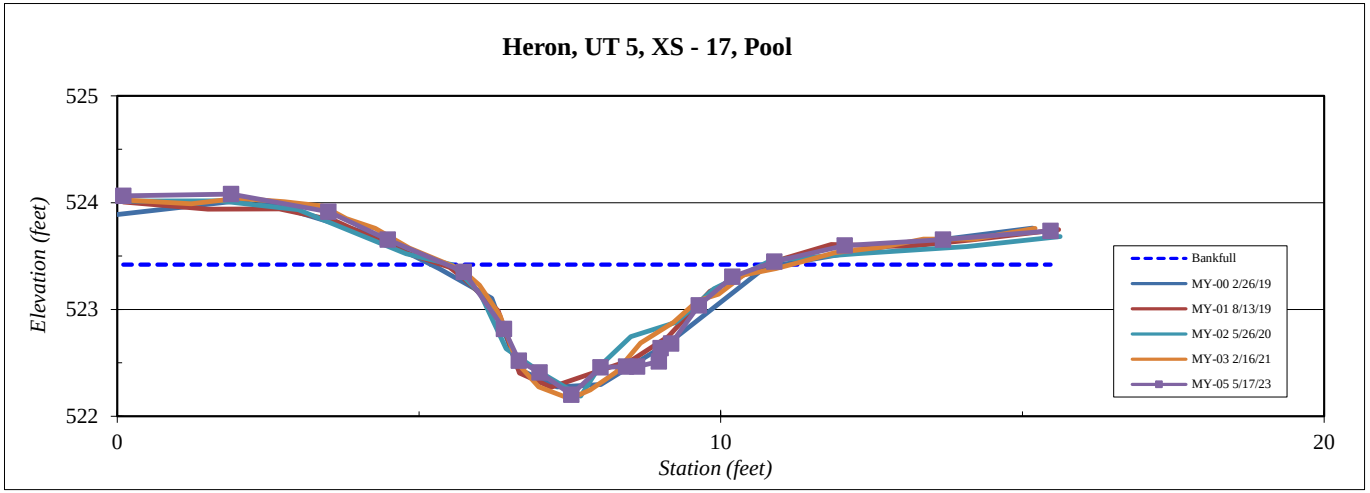


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 17, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Fleming

Station	Elevation
0.1	524.1
1.9	524.1
3.5	523.9
4.5	523.7
5.7	523.4
6.4	522.8
6.7	522.5
7.0	522.4
7.5	522.2
8.0	522.5
8.4	522.5
8.6	522.5
9.0	522.5
9.0	522.6
9.2	522.7
9.6	523.0
10.2	523.3
10.9	523.4
12.1	523.6
13.7	523.7
15.5	523.7

SUMMARY DATA	
Bankfull Elevation:	523.4
LTOB Elevation:	523.4
Bankfull Cross-Sectional Area:	3.4
Bankfull Width:	5.3
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.2
Low Bank Height:	1.2
Mean Depth at Bankfull:	0.6
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.02

Stream Type	C/E

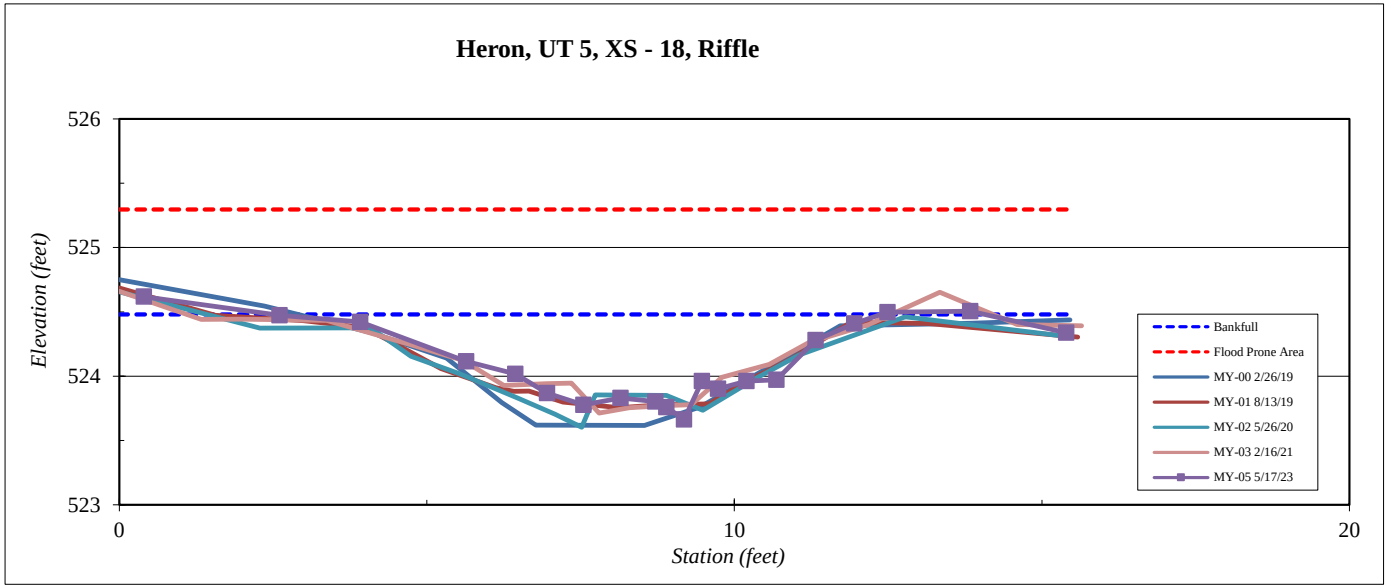


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 18, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Fleming

Station	Elevation
0.4	524.62
2.6	524.47
3.9	524.42
5.6	524.12
6.4	524.02
7.0	523.87
7.5	523.78
8.1	523.83
8.7	523.80
8.9	523.76
9.2	523.66
9.5	523.96
9.7	523.90
10.2	523.96
10.7	523.97
11.3	524.28
12.0	524.41
12.5	524.50
13.8	524.51
15.4	524.34

SUMMARY DATA	
Bankfull Elevation:	524.5
LTOB Elevation:	524.5
Bankfull Cross-Sectional Area:	3.7
Bankfull Width:	9.9
Flood Prone Area Elevation:	525.3
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.8
Low Bank Height:	0.8
Mean Depth at Bankfull:	0.4
W / D Ratio:	26.4
Entrenchment Ratio:	4.0
Bank Height Ratio:	1.02

Stream Type	C/E

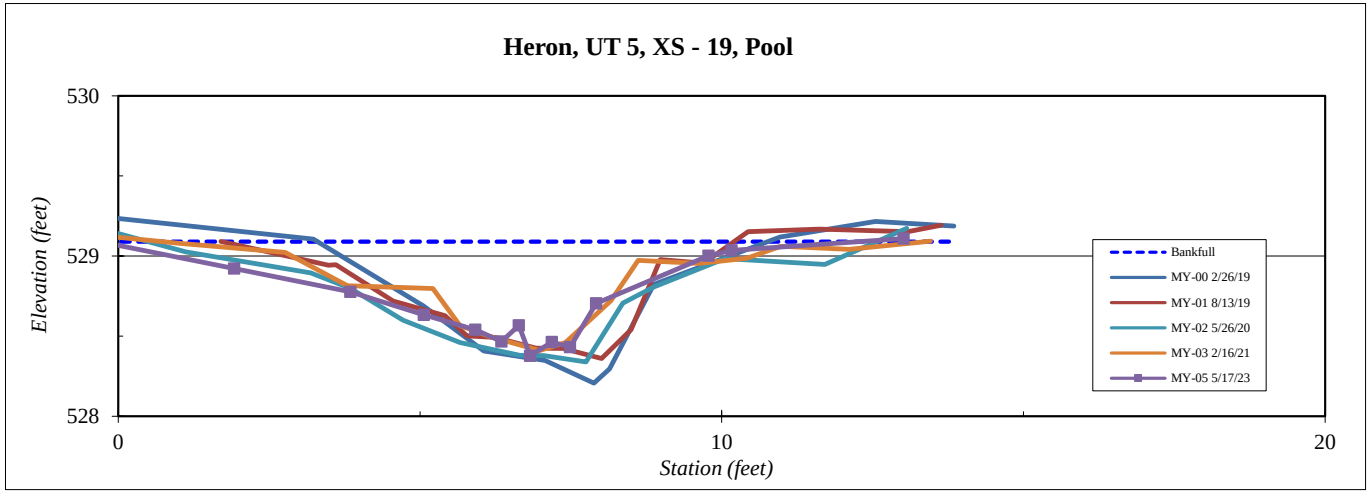


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 19, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Fleming

Station	Elevation
-0.8	529.1
1.9	528.9
3.8	528.8
5.1	528.6
5.9	528.5
6.4	528.5
6.6	528.6
6.8	528.4
7.2	528.5
7.5	528.4
7.9	528.7
9.8	529.0
10.2	529.0
13.0	529.1

SUMMARY DATA	
Bankfull Elevation:	529.1
LTOB Elevation:	529.1
Bankfull Cross-Sectional Area:	3.3
Bankfull Width:	12.6
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	0.7
Low Bank Height:	0.7
Mean Depth at Bankfull:	0.3
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.05

Stream Type	C/E

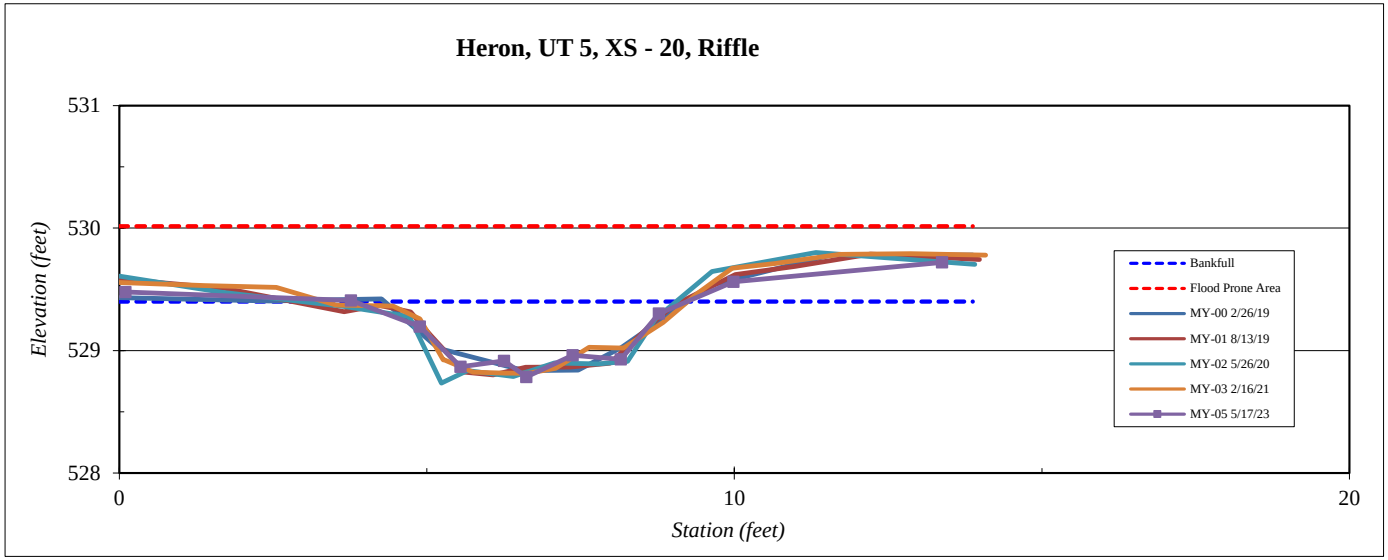


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 20, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Fleming

Station	Elevation
0.1	529.48
3.8	529.41
4.9	529.20
5.5	528.87
6.3	528.92
6.6	528.79
7.4	528.96
8.2	528.93
8.8	529.30
10.0	529.56
13.4	529.72

SUMMARY DATA	
Bankfull Elevation:	529.4
LTOB Elevation:	529.4
Bankfull Cross-Sectional Area:	1.9
Bankfull Width:	5.4
Flood Prone Area Elevation:	530.0
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.6
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.3
W / D Ratio:	15.7
Entrenchment Ratio:	7.4
Bank Height Ratio:	1.02

Stream Type	C/E

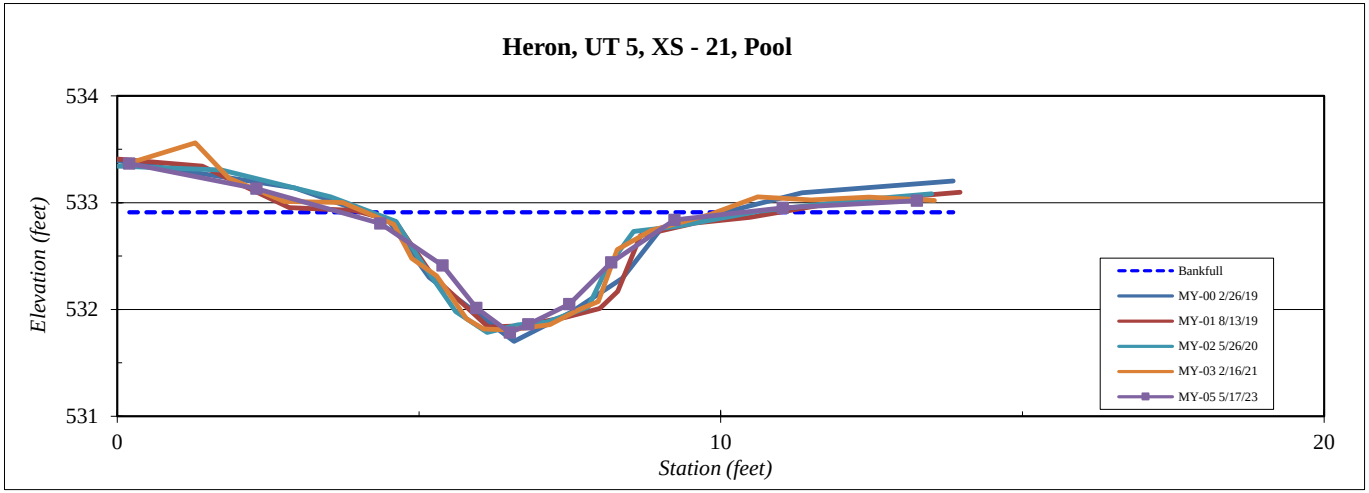


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 21, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Fleming

Station	Elevation
0.2	533.4
2.3	533.1
4.4	532.8
5.4	532.4
6.0	532.0
6.5	531.8
6.8	531.9
7.5	532.0
8.2	532.4
9.2	532.8
11.0	533.0
13.3	533.0

SUMMARY DATA	
Bankfull Elevation:	532.9
LTOB Elevation:	532.8
Bankfull Cross-Sectional Area:	3.1
Bankfull Width:	6.7
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.1
Low Bank Height:	1.1
Mean Depth at Bankfull:	0.5
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.94

Stream Type	C/E

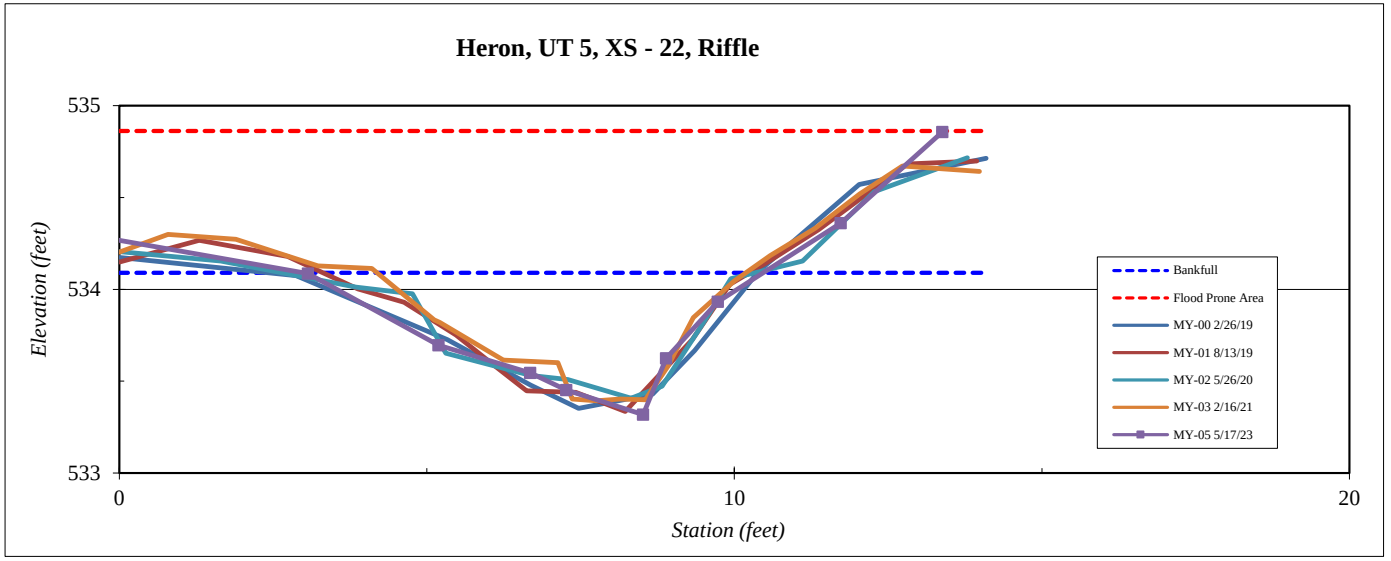


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 5, XS - 22, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Fleming

Station	Elevation
-0.5	534.30
3.1	534.09
5.2	533.70
6.7	533.55
7.3	533.45
8.5	533.32
8.9	533.63
9.7	533.93
11.7	534.36
13.4	534.86

SUMMARY DATA	
Bankfull Elevation:	534.1
LTOB Elevation:	534.1
Bankfull Cross-Sectional Area:	2.9
Bankfull Width:	7.5
Flood Prone Area Elevation:	534.9
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.8
Low Bank Height:	0.8
Mean Depth at Bankfull:	0.4
W / D Ratio:	19.2
Entrenchment Ratio:	5.4
Bank Height Ratio:	0.99

Stream Type	C/E

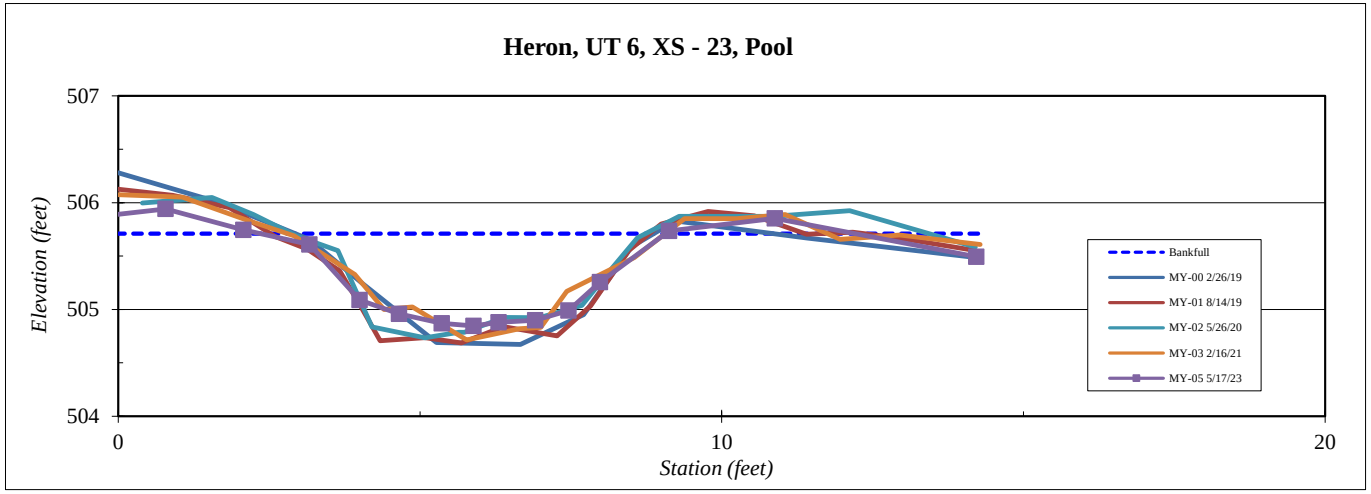


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 6, XS - 23, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
-0.6	505.9
0.8	505.9
2.1	505.7
3.2	505.6
4.0	505.1
4.7	505.0
5.4	504.9
5.9	504.8
6.3	504.9
6.9	504.9
7.5	505.0
8.0	505.3
9.1	505.7
10.9	505.9
14.2	505.5

SUMMARY DATA	
Bankfull Elevation:	505.7
LTOB Elevation:	505.7
Bankfull Cross-Sectional Area:	3.6
Bankfull Width:	6.7
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	0.9
Low Bank Height:	0.9
Mean Depth at Bankfull:	0.5
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.03

Stream Type	C/E

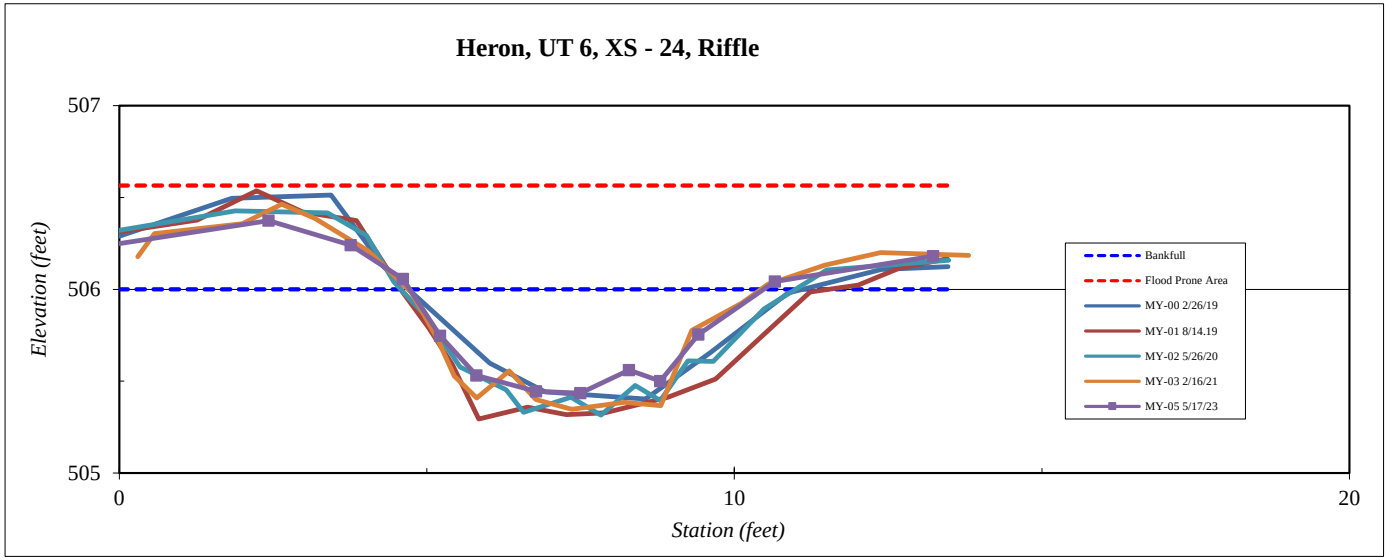


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 6, XS - 24, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
-0.3	506.23
2.4	506.37
3.8	506.24
4.6	506.06
5.2	505.75
5.8	505.53
6.8	505.45
7.5	505.44
8.3	505.56
8.8	505.50
9.4	505.75
10.7	506.04
13.2	506.18

SUMMARY DATA	
Bankfull Elevation:	506.0
LTOB Elevation:	506.0
Bankfull Cross-Sectional Area:	2.2
Bankfull Width:	5.8
Flood Prone Area Elevation:	506.6
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.6
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.4
W / D Ratio:	15.2
Entrenchment Ratio:	7.0
Bank Height Ratio:	1.07

Stream Type	C/E

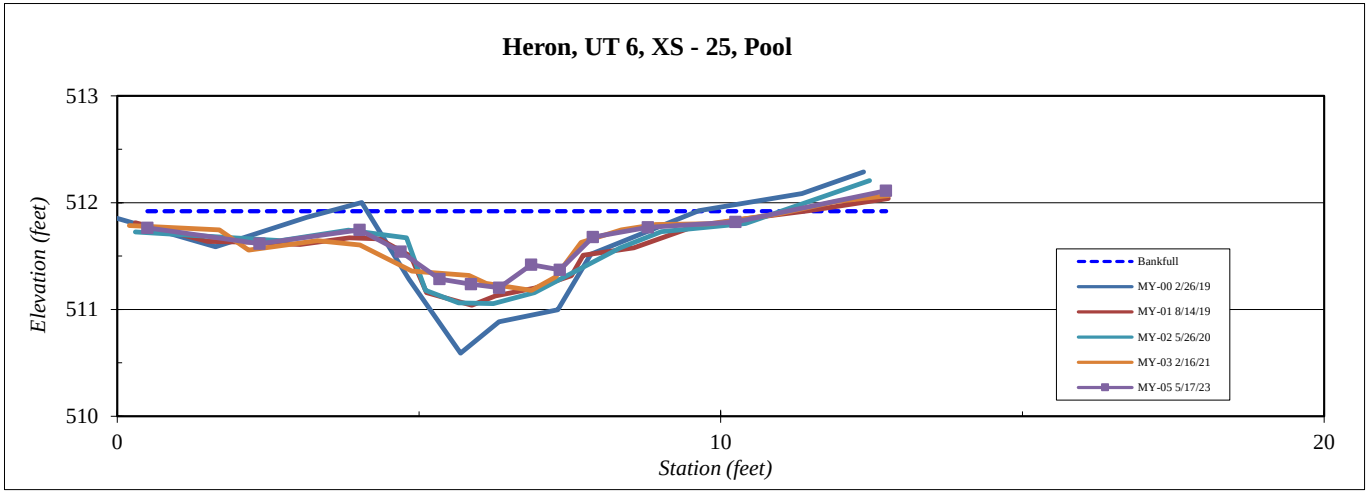


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 6, XS - 25, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
0.5	511.8
2.4	511.6
4.0	511.7
4.7	511.5
5.3	511.3
5.9	511.2
6.3	511.2
6.9	511.4
7.3	511.4
7.9	511.7
8.8	511.8
10.2	511.8
12.7	512.1

SUMMARY DATA	
Bankfull Elevation:	511.9
LTOB Elevation:	511.8
Bankfull Cross-Sectional Area:	3.2
Bankfull Width:	10.6
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	0.7
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.3
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.79

Stream Type	C/E

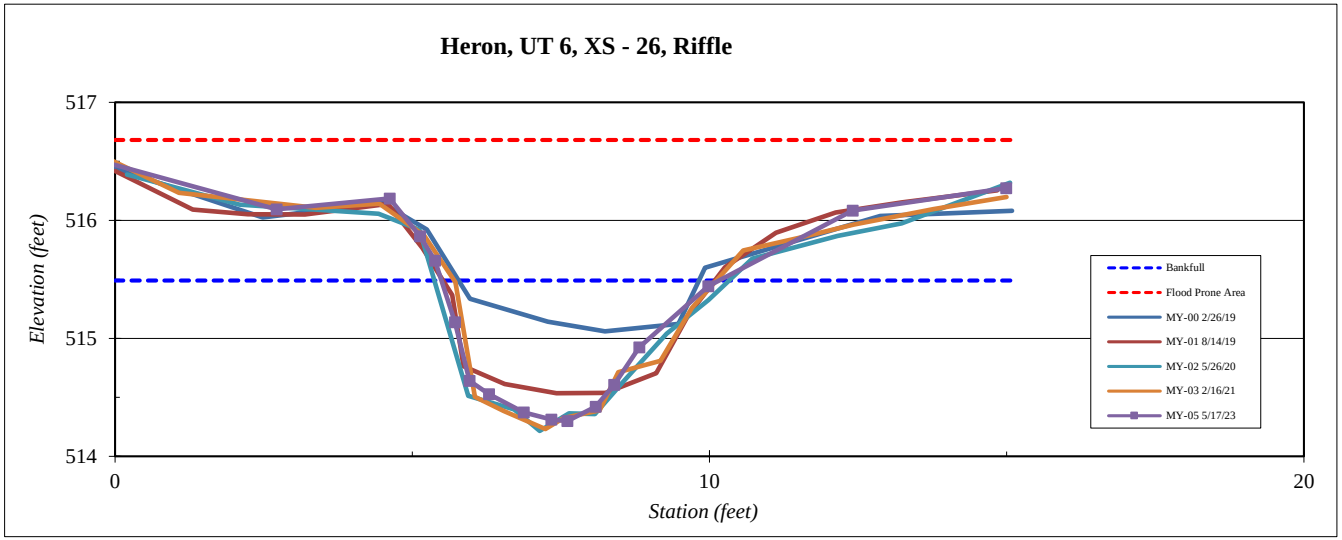


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 6, XS - 26, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
-0.1	516.48
2.7	516.09
4.6	516.19
5.1	515.87
5.4	515.66
5.7	515.14
6.0	514.64
6.3	514.53
6.9	514.37
7.3	514.31
7.6	514.30
8.1	514.42
8.4	514.61
8.8	514.93
10.0	515.44
12.4	516.08
15.0	516.27

SUMMARY DATA	
Bankfull Elevation:	515.5
LTOB Elevation:	515.4
Bankfull Cross-Sectional Area:	3.5
Bankfull Width:	4.7
Flood Prone Area Elevation:	516.7
Flood Prone Width:	40.0
Max Depth at Bankfull:	1.2
Low Bank Height:	1.1
Mean Depth at Bankfull:	0.7
W / D Ratio:	6.3
Entrenchment Ratio:	8.6
Bank Height Ratio:	0.96

Stream Type	C/E



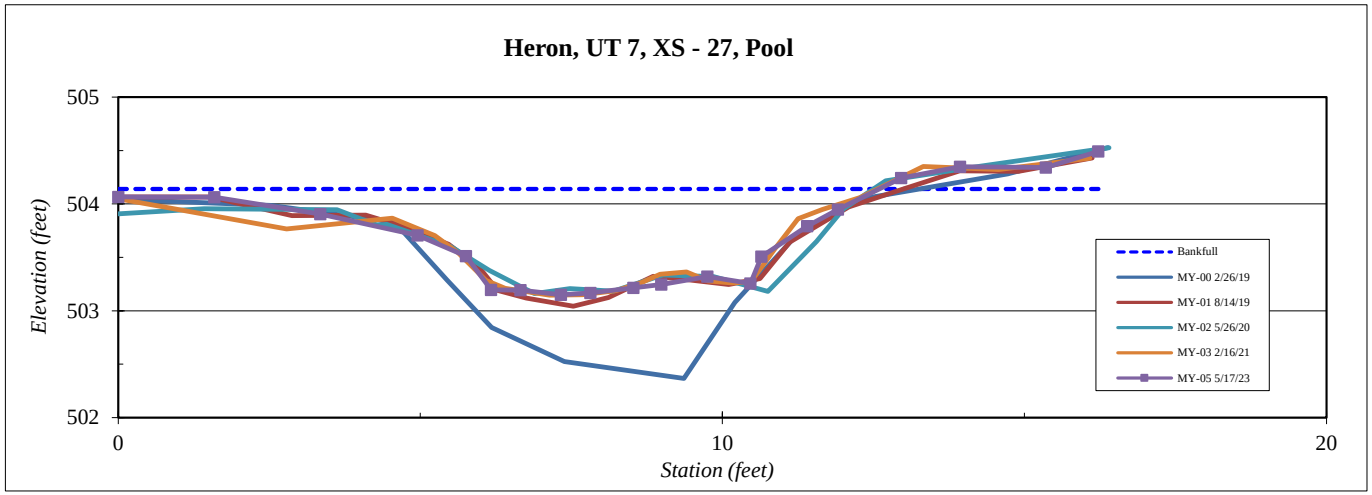
Note: Riffle degradation is likely a result of direct, flashy flows from upstream land-use just after construction. It appears to have stabilized during years 2-5.

Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 7, XS - 27, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
0.0	504.1
1.6	504.1
3.3	503.9
5.0	503.7
5.8	503.5
6.2	503.2
6.7	503.2
7.3	503.2
7.8	503.2
8.5	503.2
9.0	503.2
9.8	503.3
10.5	503.3
10.6	503.5
11.4	503.8
11.9	503.9
13.0	504.2
13.9	504.3
15.4	504.3
16.2	504.5

SUMMARY DATA	
Bankfull Elevation:	504.1
LTOB Elevation:	504.1
Bankfull Cross-Sectional Area:	6.3
Bankfull Width:	12.6
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.0
Low Bank Height:	0.9
Mean Depth at Bankfull:	0.5
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.93

Stream Type	C/E



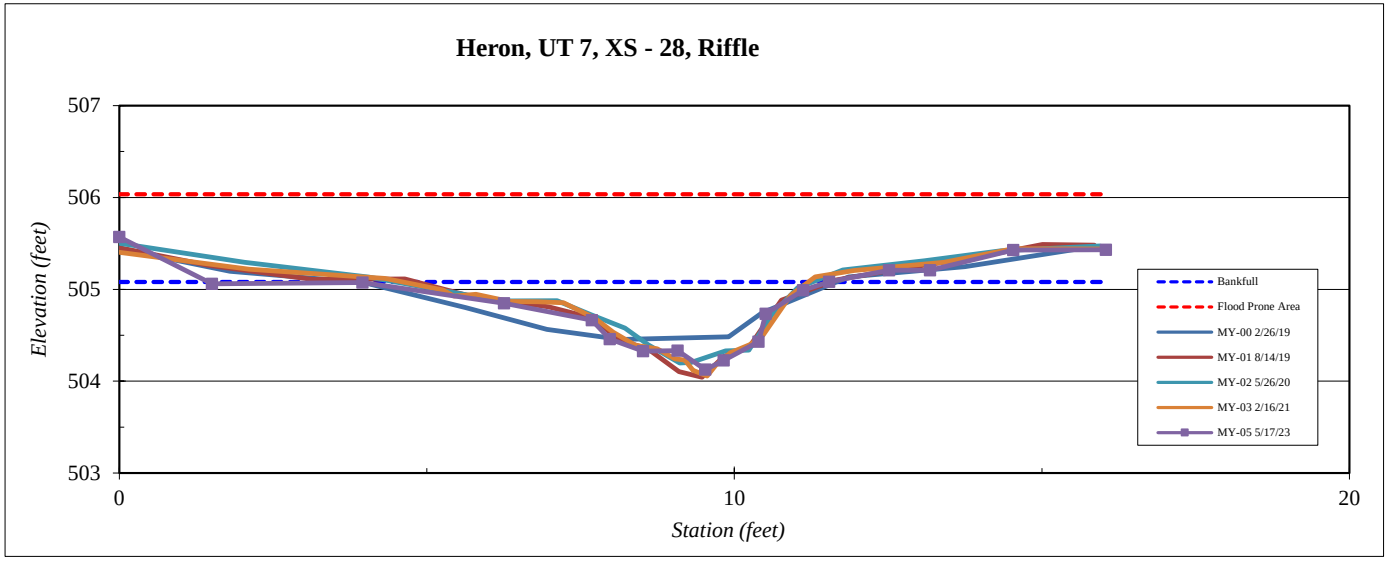
Note: The sediment deposition in this pool occurred shortly after construction and has stabilized during Years 1-5. It is not expected to lead to further instability.

Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 7, XS - 28, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
0.0	505.57
1.5	505.06
4.0	505.08
6.3	504.85
7.7	504.66
8.0	504.46
8.5	504.33
9.1	504.33
9.5	504.13
9.8	504.23
10.4	504.43
10.5	504.74
11.1	504.99
11.5	505.08
12.5	505.21
13.2	505.21
14.5	505.43
16.0	505.43

SUMMARY DATA	
Bankfull Elevation:	505.1
LTOB Elevation:	505.1
Bankfull Cross-Sectional Area:	3.0
Bankfull Width:	7.6
Flood Prone Area Elevation:	506.0
Flood Prone Width:	20.0
Max Depth at Bankfull:	1.0
Low Bank Height:	0.9
Mean Depth at Bankfull:	0.4
W / D Ratio:	19.4
Entrenchment Ratio:	2.6
Bank Height Ratio:	0.99

Stream Type	C/E

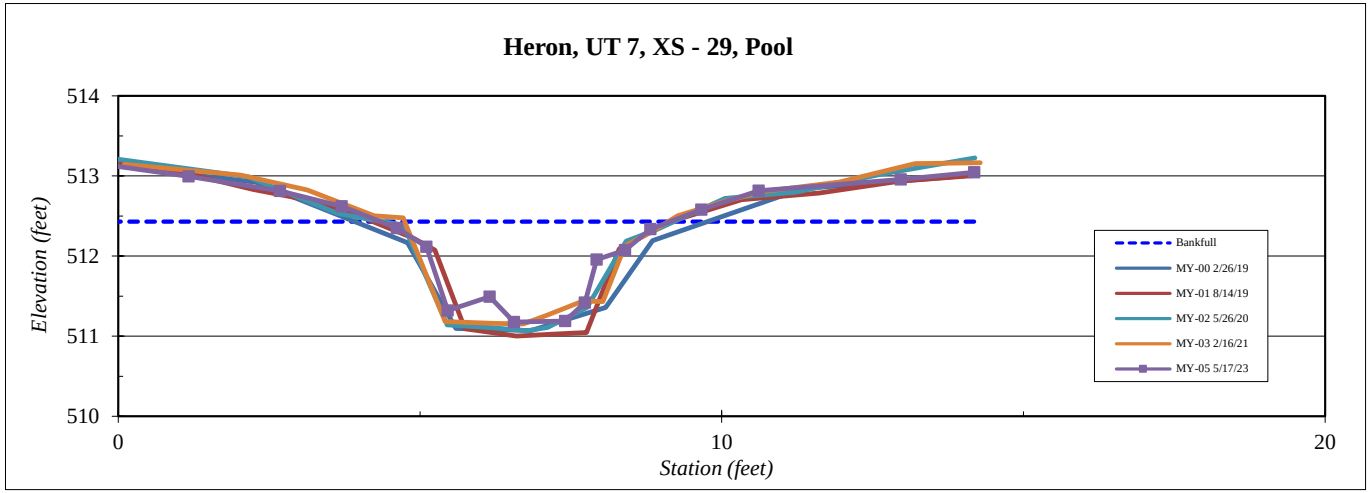


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 7, XS - 29, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
-0.1	513.1
1.2	513.0
2.7	512.8
3.7	512.6
4.6	512.3
5.1	512.1
5.5	511.3
6.2	511.5
6.6	511.2
7.4	511.2
7.7	511.4
7.9	512.0
8.4	512.1
8.8	512.3
9.7	512.6
10.6	512.8
13.0	513.0
14.2	513.0

SUMMARY DATA	
Bankfull Elevation:	512.4
LTOB Elevation:	512.5
Bankfull Cross-Sectional Area:	3.4
Bankfull Width:	4.8
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.3
Low Bank Height:	1.3
Mean Depth at Bankfull:	0.7
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.04

Stream Type	C/E

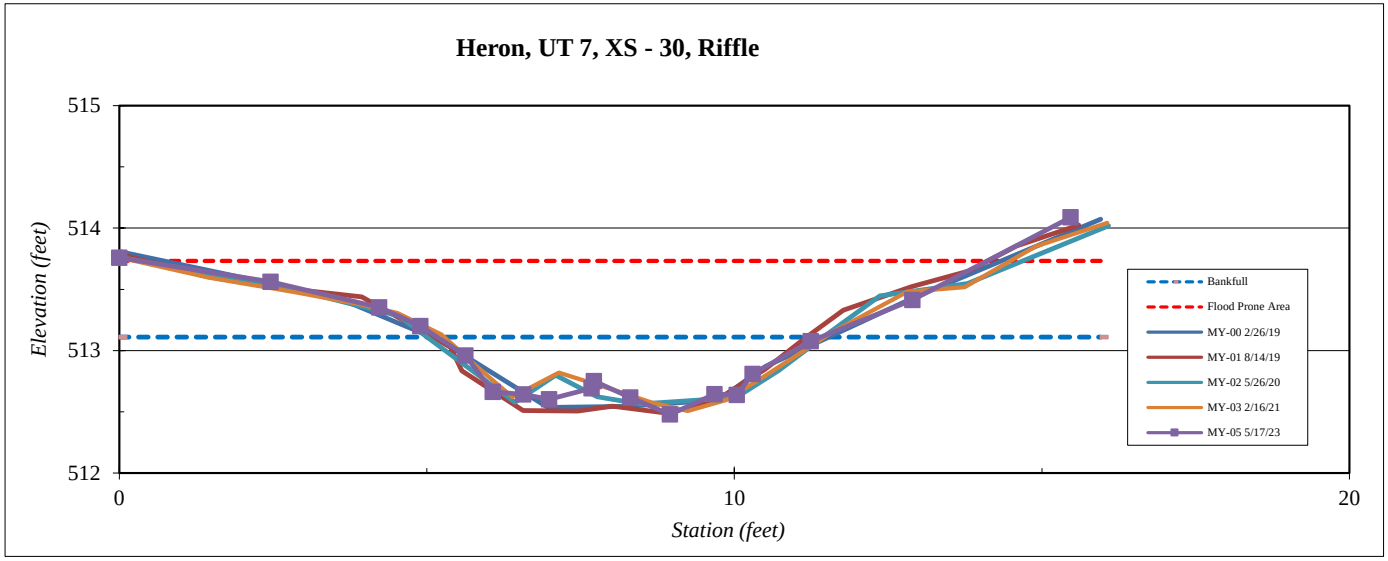


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 7, XS - 30, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
0.0	513.76
2.5	513.56
4.2	513.35
4.9	513.20
5.6	512.96
6.1	512.66
6.6	512.64
7.0	512.60
7.7	512.69
7.7	512.75
8.3	512.62
9.0	512.48
9.7	512.65
10.0	512.64
10.3	512.81
11.2	513.08
12.9	513.41
15.5	514.09

SUMMARY DATA	
Bankfull Elevation:	513.1
LTOB Elevation:	513.1
Bankfull Cross-Sectional Area:	2.3
Bankfull Width:	6.2
Flood Prone Area Elevation:	513.7
Flood Prone Width:	11.0
Max Depth at Bankfull:	0.6
Low Bank Height:	0.6
Mean Depth at Bankfull:	0.4
W / D Ratio:	16.7
Entrenchment Ratio:	1.8
Bank Height Ratio:	0.96

Stream Type	C/E

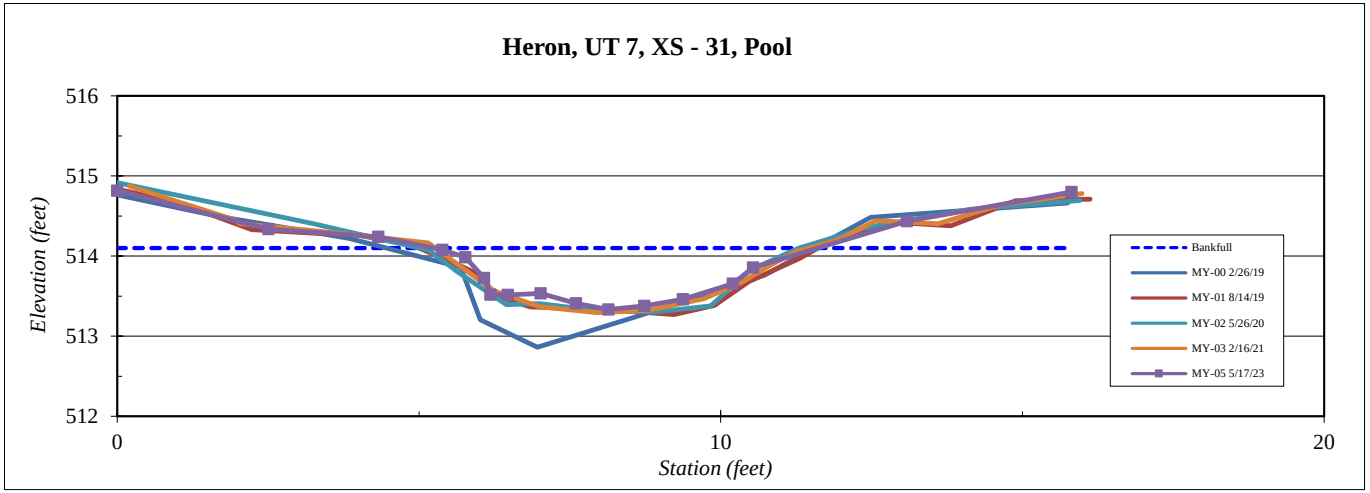


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 7, XS - 31, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
0.0	514.8
2.5	514.3
4.3	514.2
5.4	514.1
5.8	514.0
6.1	513.7
6.2	513.5
6.5	513.5
7.0	513.5
7.6	513.4
8.1	513.3
8.7	513.4
9.4	513.5
10.2	513.7
10.5	513.9
13.1	514.4
15.8	514.8

SUMMARY DATA	
Bankfull Elevation:	514.1
LTOB Elevation:	514.1
Bankfull Cross-Sectional Area:	3.0
Bankfull Width:	6.4
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	0.8
Low Bank Height:	0.7
Mean Depth at Bankfull:	0.5
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.94

Stream Type	C/E

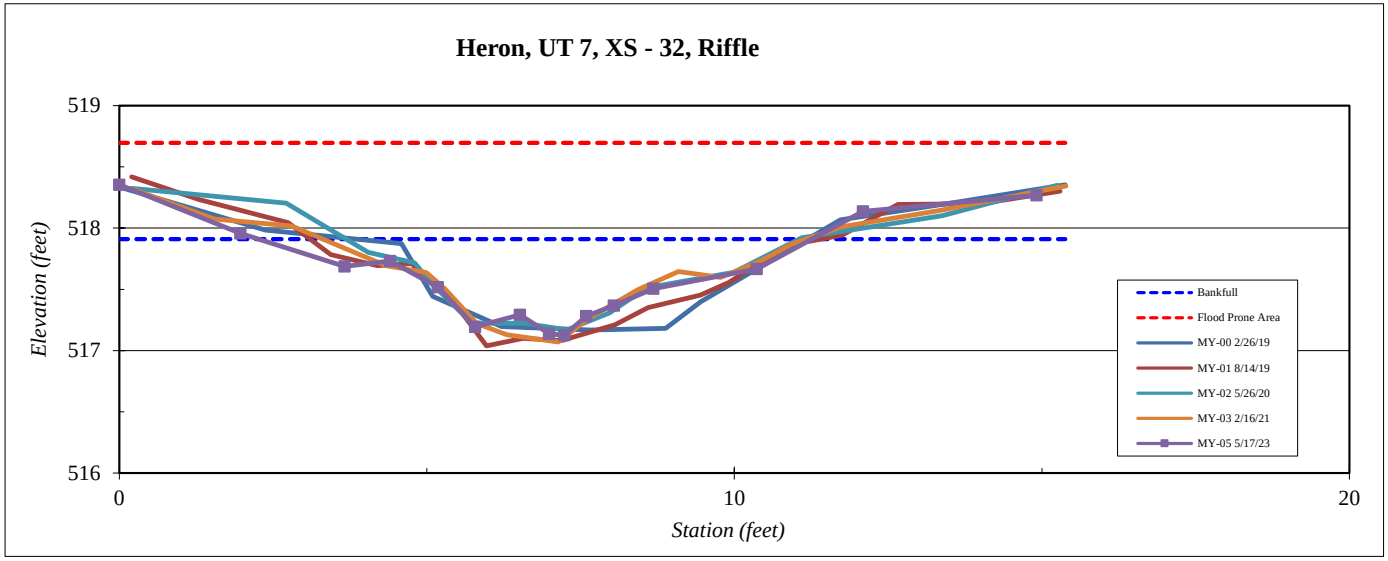


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 7, XS - 32, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
0.0	518.36
2.0	517.96
3.7	517.69
4.4	517.73
5.2	517.52
5.8	517.19
6.5	517.29
7.0	517.14
7.2	517.12
7.6	517.28
8.0	517.37
8.7	517.51
10.4	517.67
12.1	518.14
14.9	518.27

SUMMARY DATA	
Bankfull Elevation:	517.9
LTOB Elevation:	518.0
Bankfull Cross-Sectional Area:	3.3
Bankfull Width:	9.0
Flood Prone Area Elevation:	518.7
Flood Prone Width:	20.0
Max Depth at Bankfull:	0.8
Low Bank Height:	0.8
Mean Depth at Bankfull:	0.4
W / D Ratio:	24.2
Entrenchment Ratio:	2.2
Bank Height Ratio:	1.06

Stream Type	C/E

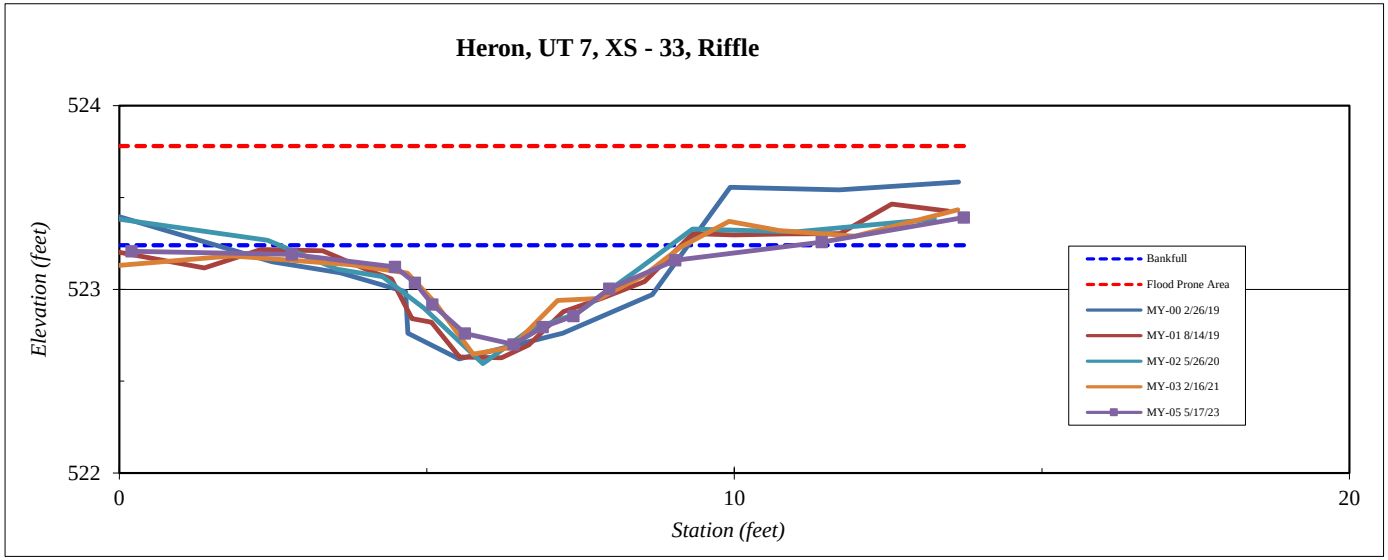


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 7, XS - 33, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
0.2	523.21
2.8	523.19
4.5	523.12
4.8	523.04
5.1	522.92
5.6	522.76
6.4	522.70
6.9	522.79
7.4	522.86
8.0	523.00
9.0	523.16
11.4	523.26
13.7	523.39

SUMMARY DATA	
Bankfull Elevation:	523.2
LTOB Elevation:	523.2
Bankfull Cross-Sectional Area:	1.8
Bankfull Width:	8.2
Flood Prone Area Elevation:	523.8
Flood Prone Width:	20.0
Max Depth at Bankfull:	0.5
Low Bank Height:	0.5
Mean Depth at Bankfull:	0.2
W / D Ratio:	38.3
Entrenchment Ratio:	2.4
Bank Height Ratio:	0.91

Stream Type	C/E

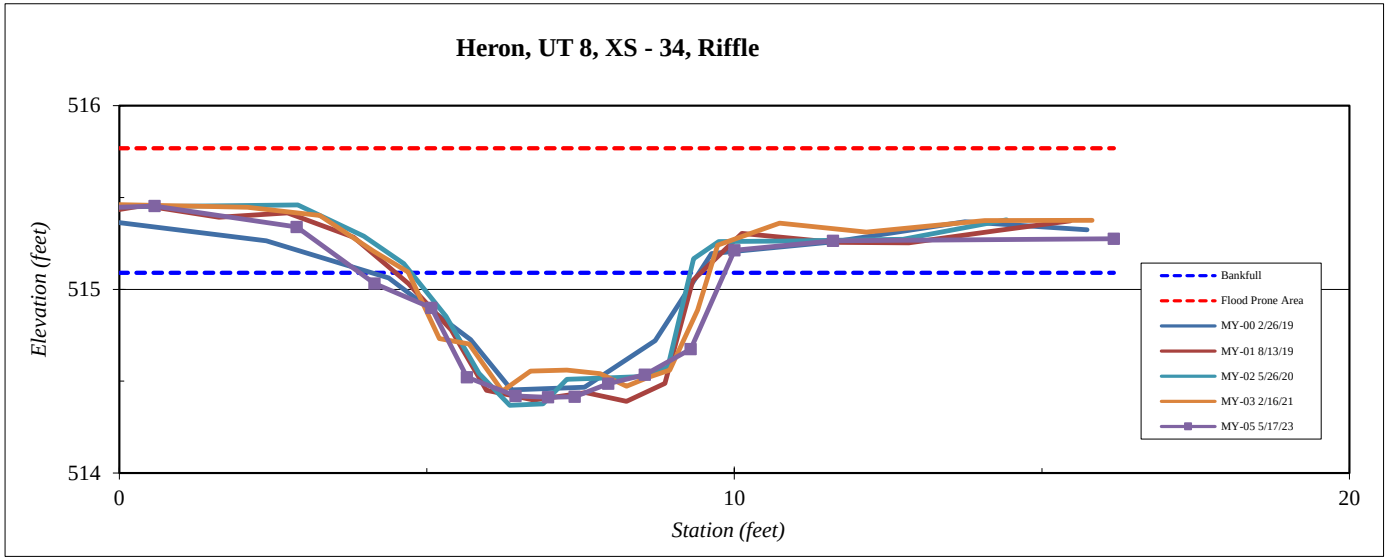


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 8, XS - 34, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
-2.9	515.42
0.6	515.45
2.9	515.34
4.2	515.03
5.1	514.90
5.7	514.52
6.4	514.42
7.0	514.41
7.4	514.42
8.0	514.49
8.5	514.54
9.3	514.67
10.0	515.21
11.6	515.26
16.2	515.28

SUMMARY DATA	
Bankfull Elevation:	515.1
LTOB Elevation:	515.2
Bankfull Cross-Sectional Area:	2.6
Bankfull Width:	5.9
Flood Prone Area Elevation:	515.8
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.7
Low Bank Height:	0.8
Mean Depth at Bankfull:	0.4
W / D Ratio:	13.3
Entrenchment Ratio:	6.7
Bank Height Ratio:	1.18

Stream Type	C/E

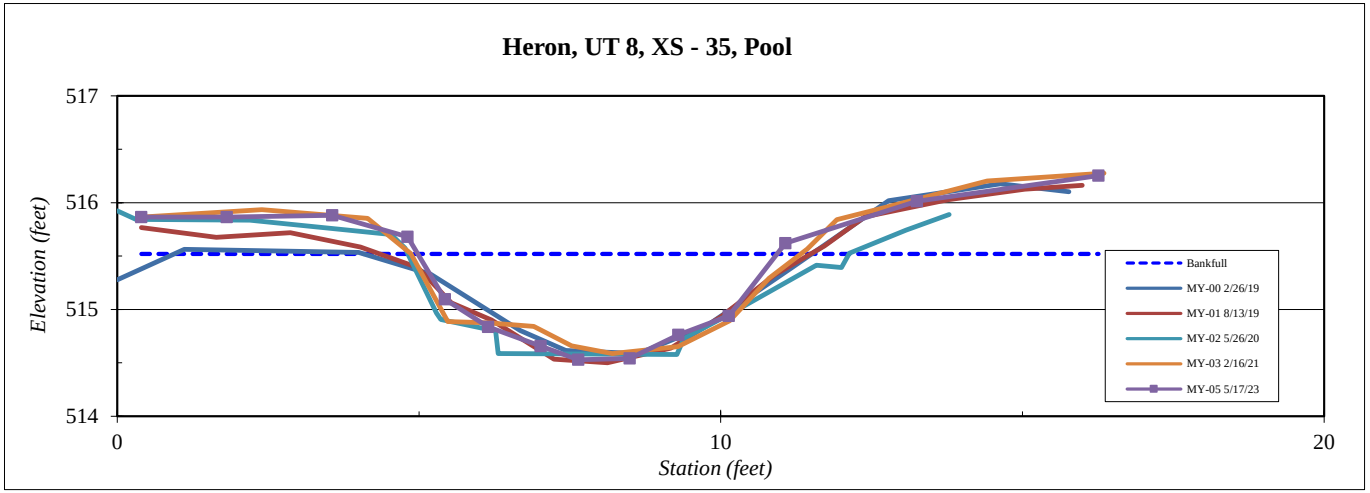


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 8, XS - 35, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
0.4	515.9
1.8	515.9
3.6	515.9
4.8	515.7
5.4	515.1
6.1	514.8
7.0	514.7
7.6	514.5
8.5	514.5
9.3	514.8
10.1	514.9
11.1	515.6
13.3	516.0
16.3	516.3

SUMMARY DATA	
Bankfull Elevation:	515.5
LTOB Elevation:	515.5
Bankfull Cross-Sectional Area:	4.1
Bankfull Width:	6.0
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.0
Low Bank Height:	1.0
Mean Depth at Bankfull:	0.7
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.00

Stream Type	C/E

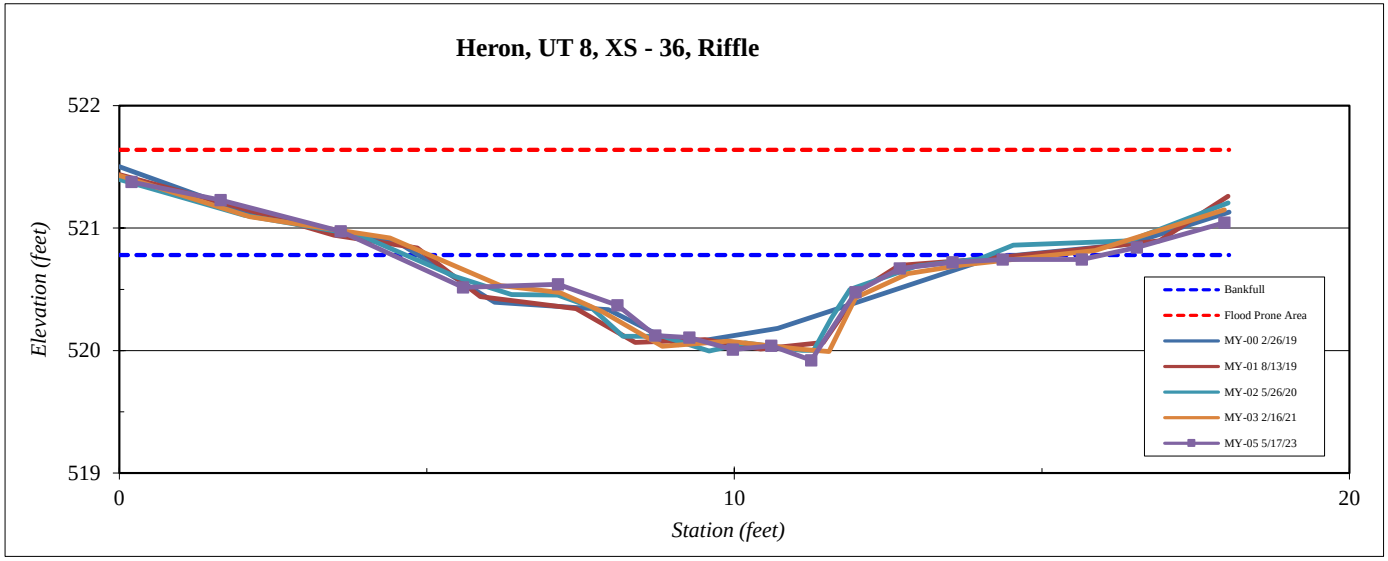


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 8, XS - 36, Riffle
Feature	Riffle
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
0.2	521.38
1.6	521.23
3.6	520.97
5.6	520.52
7.1	520.54
8.1	520.37
8.7	520.12
9.3	520.11
10.0	520.01
10.6	520.04
11.3	519.92
12.0	520.48
12.7	520.67
13.5	520.72
14.4	520.74
15.6	520.74
16.5	520.84
18.0	521.04

SUMMARY DATA	
Bankfull Elevation:	520.8
LTOB Elevation:	520.7
Bankfull Cross-Sectional Area:	3.7
Bankfull Width:	9.9
Flood Prone Area Elevation:	521.6
Flood Prone Width:	20.0
Max Depth at Bankfull:	0.9
Low Bank Height:	0.8
Mean Depth at Bankfull:	0.4
W / D Ratio:	26.4
Entrenchment Ratio:	2.0
Bank Height Ratio:	0.96

Stream Type	C/E

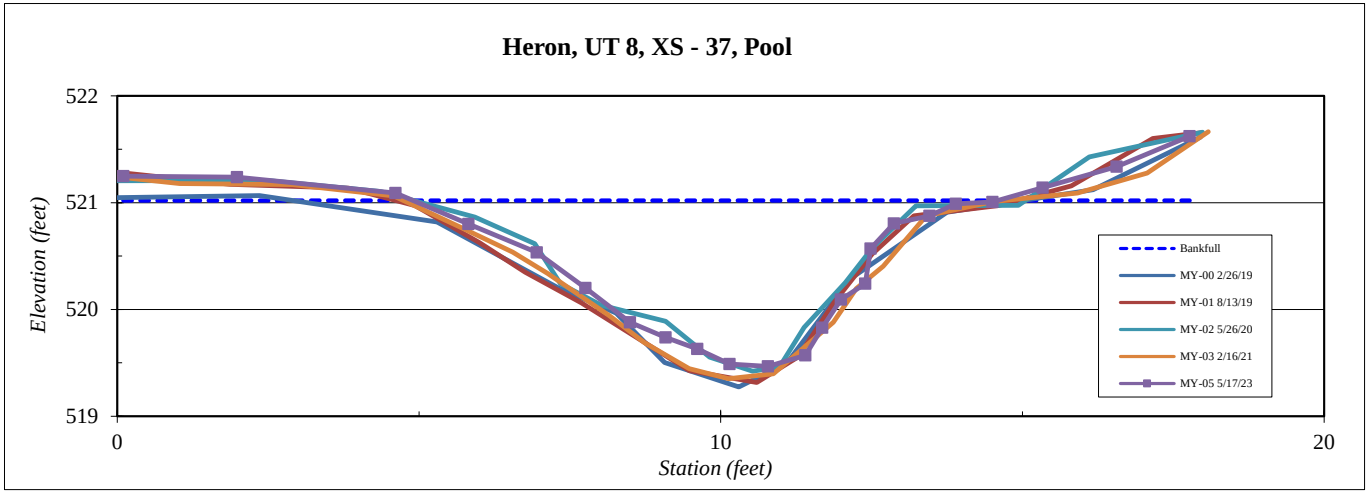


Site	Heron
Watershed:	Cape Fear, 0303002
XS ID	UT 8, XS - 37, Pool
Feature	Pool
Date:	5/17/2023
Field Crew:	Perkinson, Adams, Smith, Flemming

Station	Elevation
0.1	521.2
2.0	521.2
4.6	521.1
5.8	520.8
7.0	520.5
7.8	520.2
8.5	519.9
9.1	519.7
9.6	519.6
10.1	519.5
10.8	519.5
11.4	519.6
11.7	519.8
12.0	520.1
12.4	520.2
12.5	520.6
12.9	520.8
13.5	520.9
13.9	521.0
14.5	521.0
15.3	521.1
16.6	521.34
17.8	521.622

SUMMARY DATA	
Bankfull Elevation:	521.0
LTOB Elevation:	520.9
Bankfull Cross-Sectional Area:	7.2
Bankfull Width:	9.7
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.6
Low Bank Height:	1.4
Mean Depth at Bankfull:	0.7
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	0.91

Stream Type	C/E



Appendix E.
Hydrology Data

Tables 14A-J. Channel Evidence
Stream Gauge Graphs
Table 15. Verification of Bankfull Events
Table 16. Groundwater Hydrology Data
Groundwater Gauge Graphs
Soil Temperature Graph
Figure E-1. 30-70 Percentile Graph for Rainfall

Table 14A. UT1 Channel Evidence

UT1 Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
Max consecutive days channel flow	103	162	289	89	237
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No	No
Other:					

Table 14B. UT2 Channel Evidence

UT2 Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
Max consecutive days channel flow	85	126	116	61	110
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No	No
Other:					

Table 14C. UT3 Channel Evidence

UT3 Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
Max consecutive days channel flow	142	166	120	131	73
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No	No
Other:					

Table 14D. UT5 Downstream Channel Evidence

UT5 Downstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
Max consecutive days channel flow	134	152	135	130	154
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No	No
Other:					

Table 14E. UT5 Upstream Channel Evidence

UT5 Upstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
Max consecutive days channel flow	167	158	60	201	165
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No	No
Other:					

Table 14F. UT6 Channel Evidence

UT6 Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
Max consecutive days channel flow	131	187	288	118	282
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No	No
Other:					

Table 14G. UT7 Downstream Channel Evidence

UT7 Downstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
Max consecutive days channel flow	237	68	144	59	141
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No	No
Other:					

Table 14H. UT7 Middle Channel Evidence

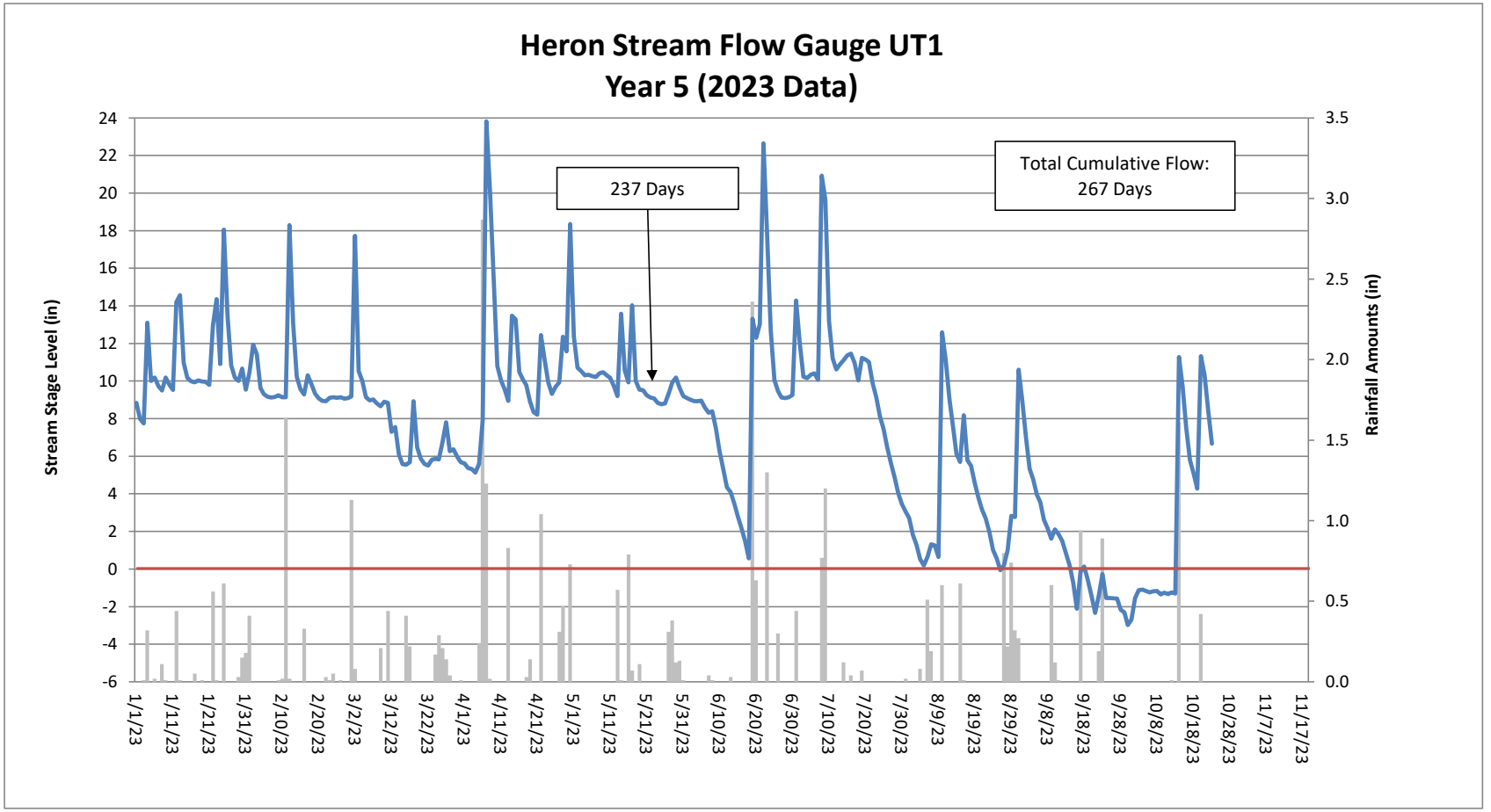
UT7 Middle Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
Max consecutive days channel flow	151	106	157	209	229
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No	No
Other:					

Table 14I. UT7 Upstream Channel Evidence

UT7 Upstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
Max consecutive days channel flow	237	248	107	36	154
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No	No
Other:					

Table 14J. UT8 Channel Evidence

UT8 Downstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
Max consecutive days channel flow	49	89	69	108	250
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	No	No	No	No
Other:					


Heron Stream Flow Gauge UT1
Year 5 (2023 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
237 Days
Total Cumulative Flow:
267 Days
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
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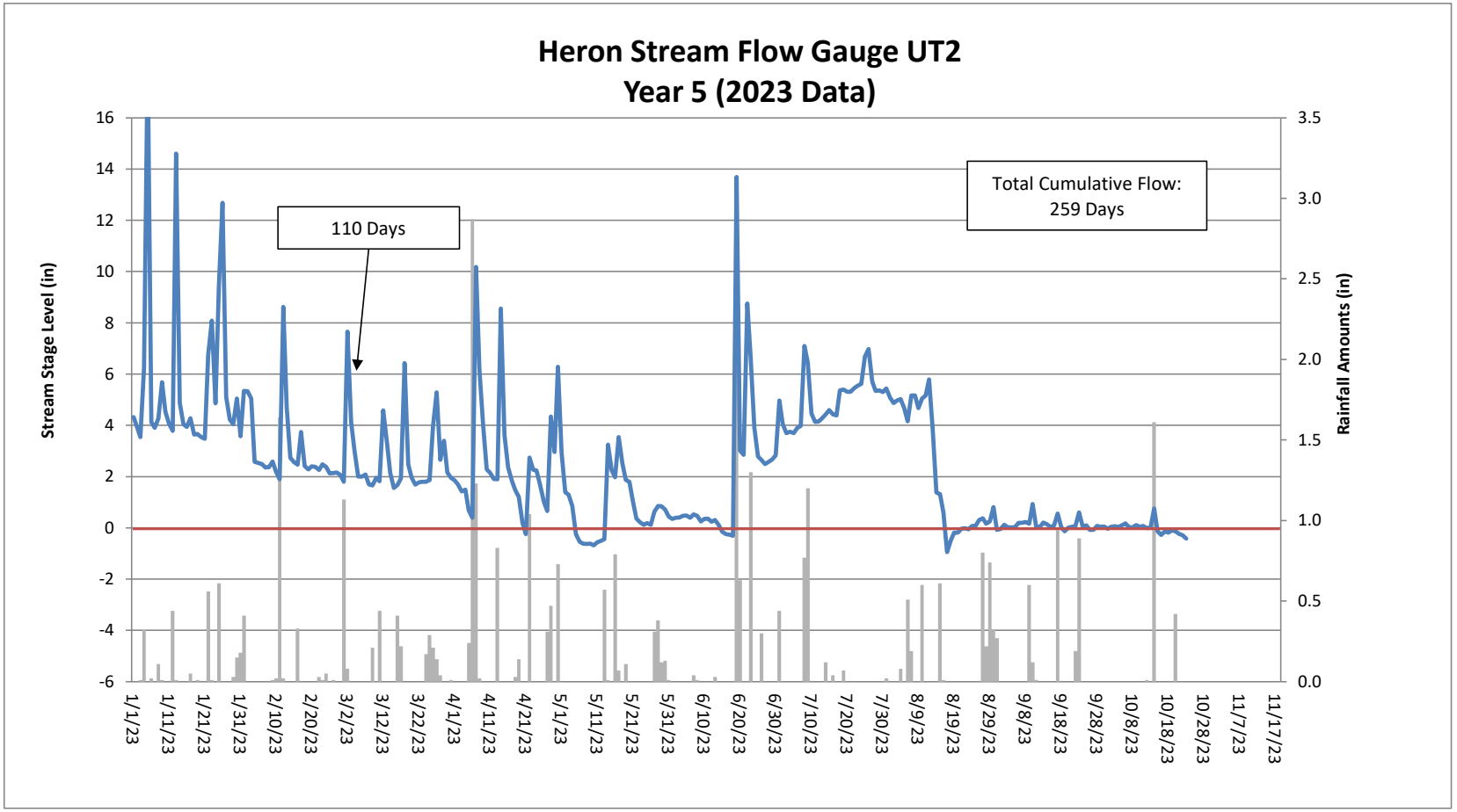
10/28/23
11/7/23
11/17/23


Heron Stream Flow Gauge UT2
Year 5 (2023 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
110 Days
Total Cumulative Flow:
259 Days
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
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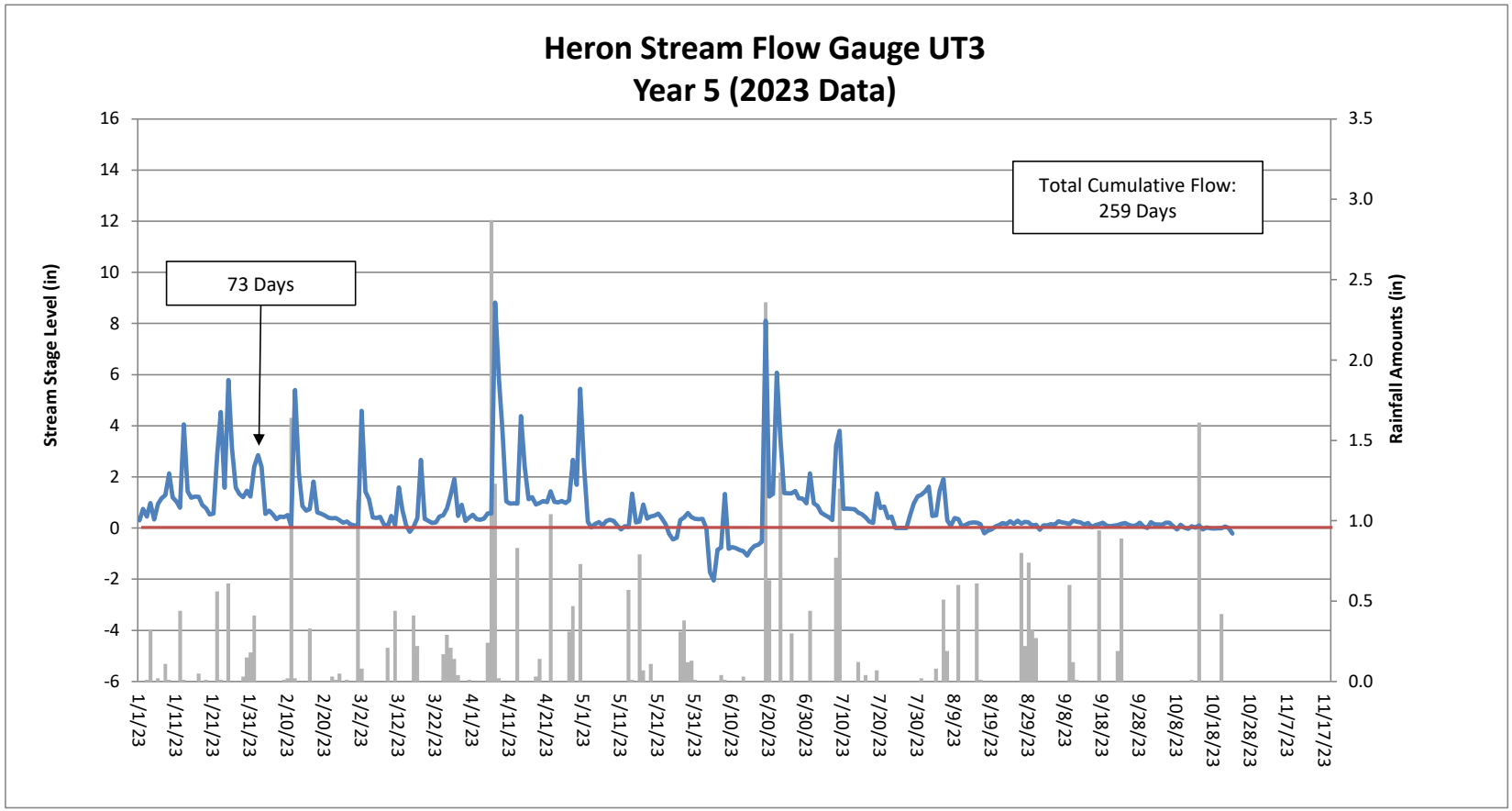
10/18/23
10/28/23
11/7/23
11/17/23


Heron Stream Flow Gauge UT3
Year 5 (2023 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
73 Days
Total Cumulative Flow:
259 Days
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
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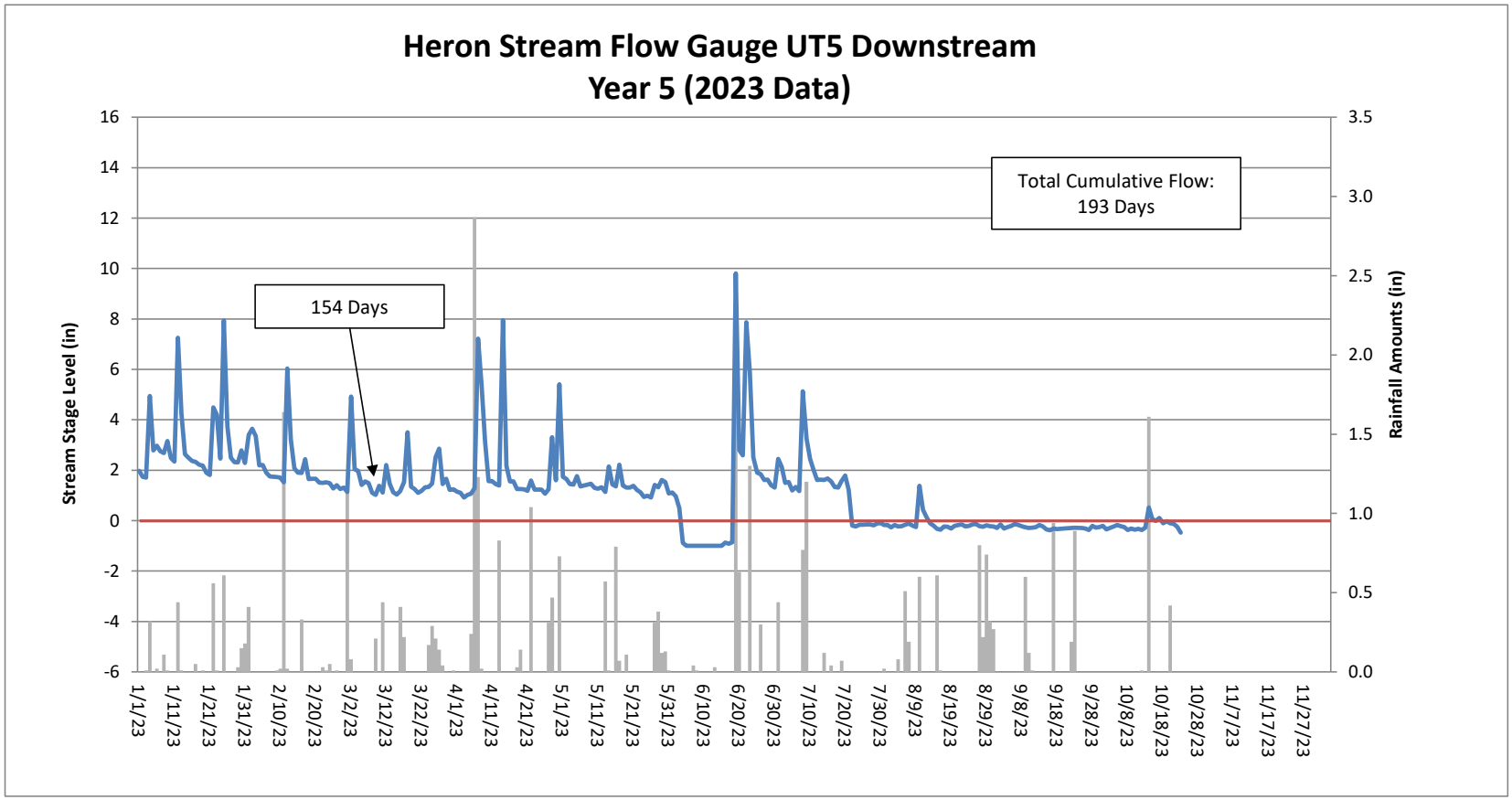
10/18/23
10/28/23
11/7/23
11/17/23


Heron Stream Flow Gauge UT5 Downstream
Year 5 (2023 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
Total Cumulative Flow:
193 Days
154 Days
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
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4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
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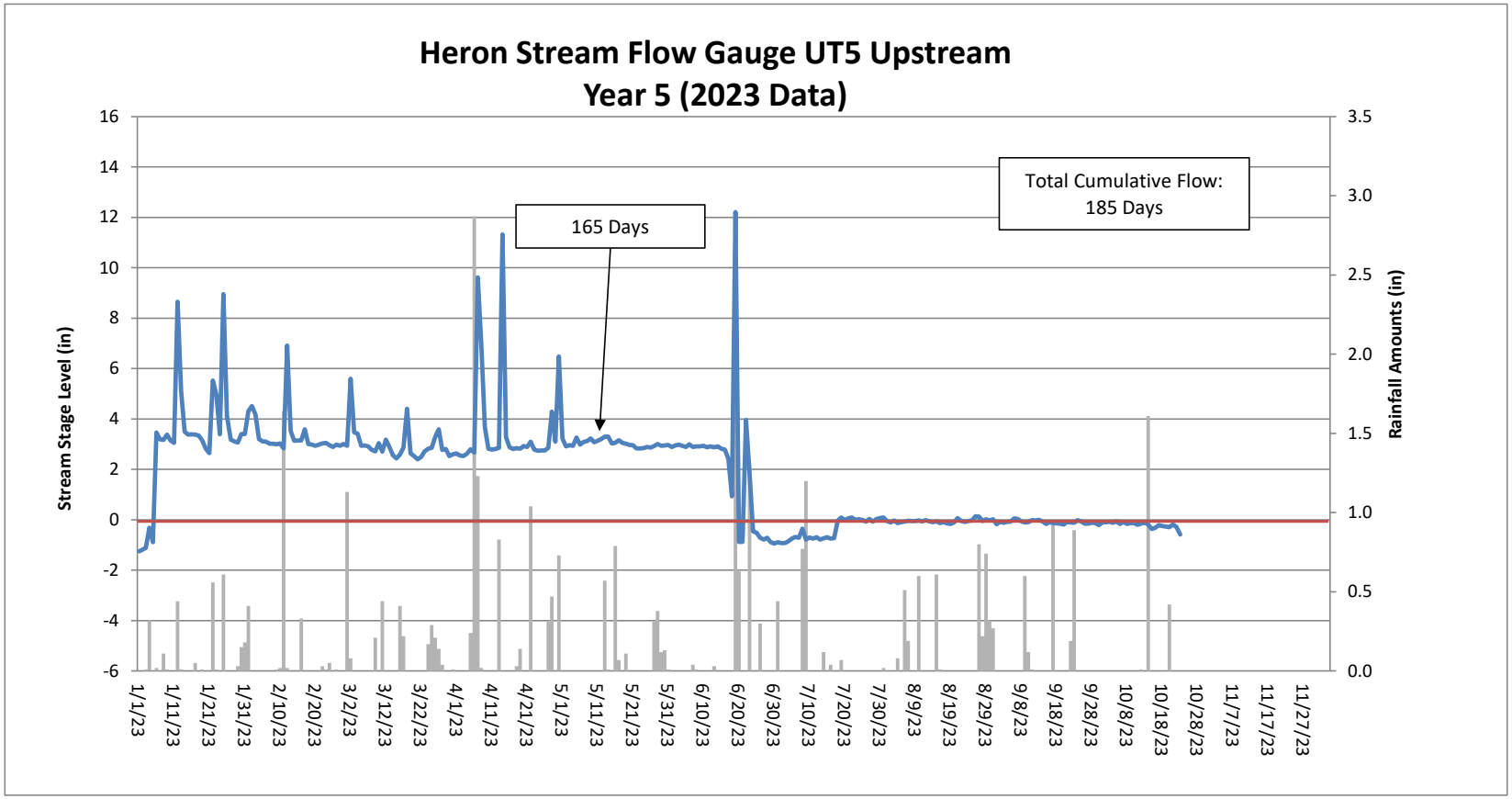
11/27/23


Heron Stream Flow Gauge UT5 Upstream
Year 5 (2023 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
Total Cumulative Flow:
185 Days
165 Days
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
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2/10/23
2/20/23
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3/22/23
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4/11/23
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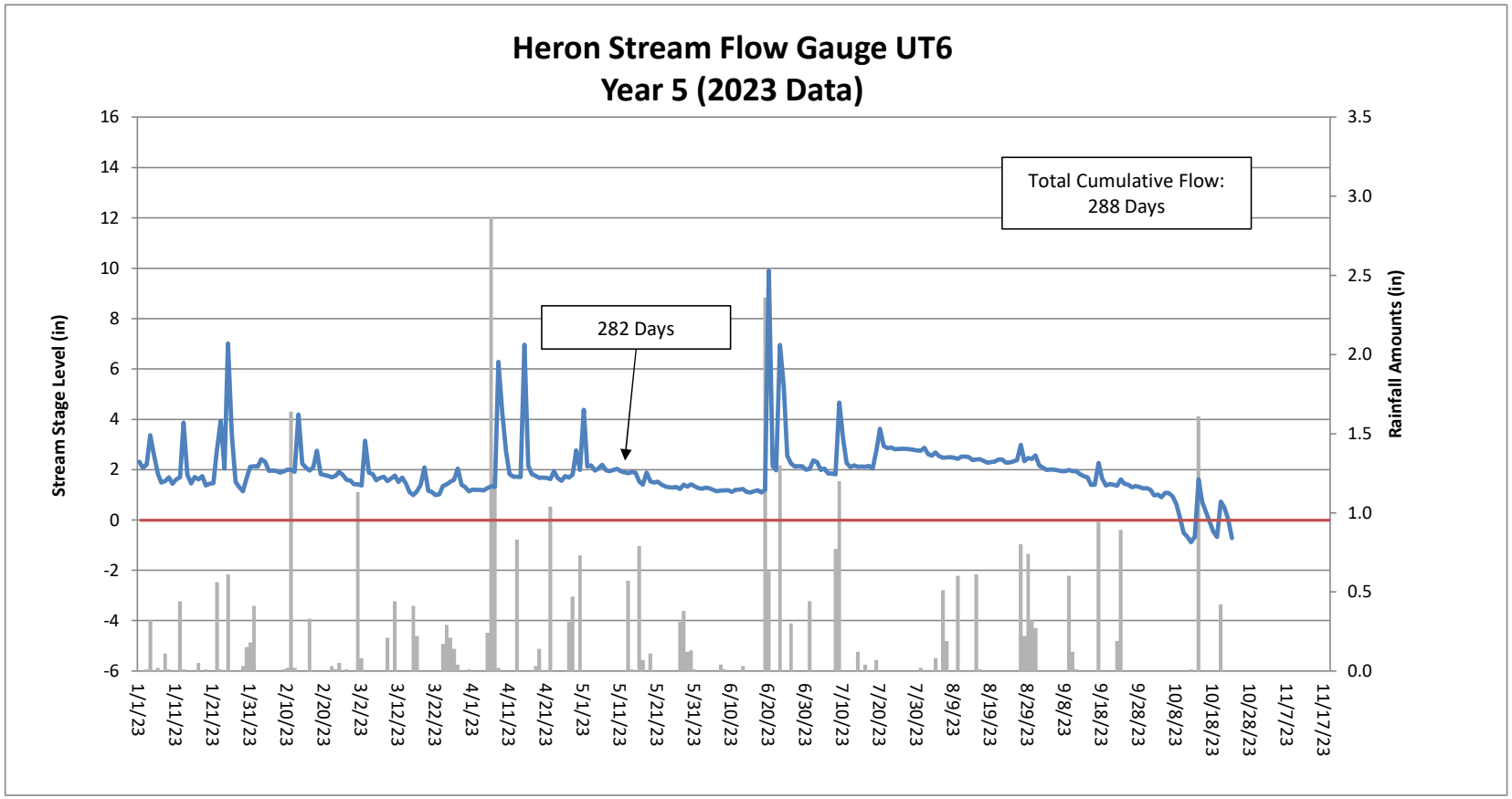
11/17/23
11/27/23


Heron Stream Flow Gauge UT6
Year 5 (2023 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
Total Cumulative Flow:
288 Days
282 Days
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
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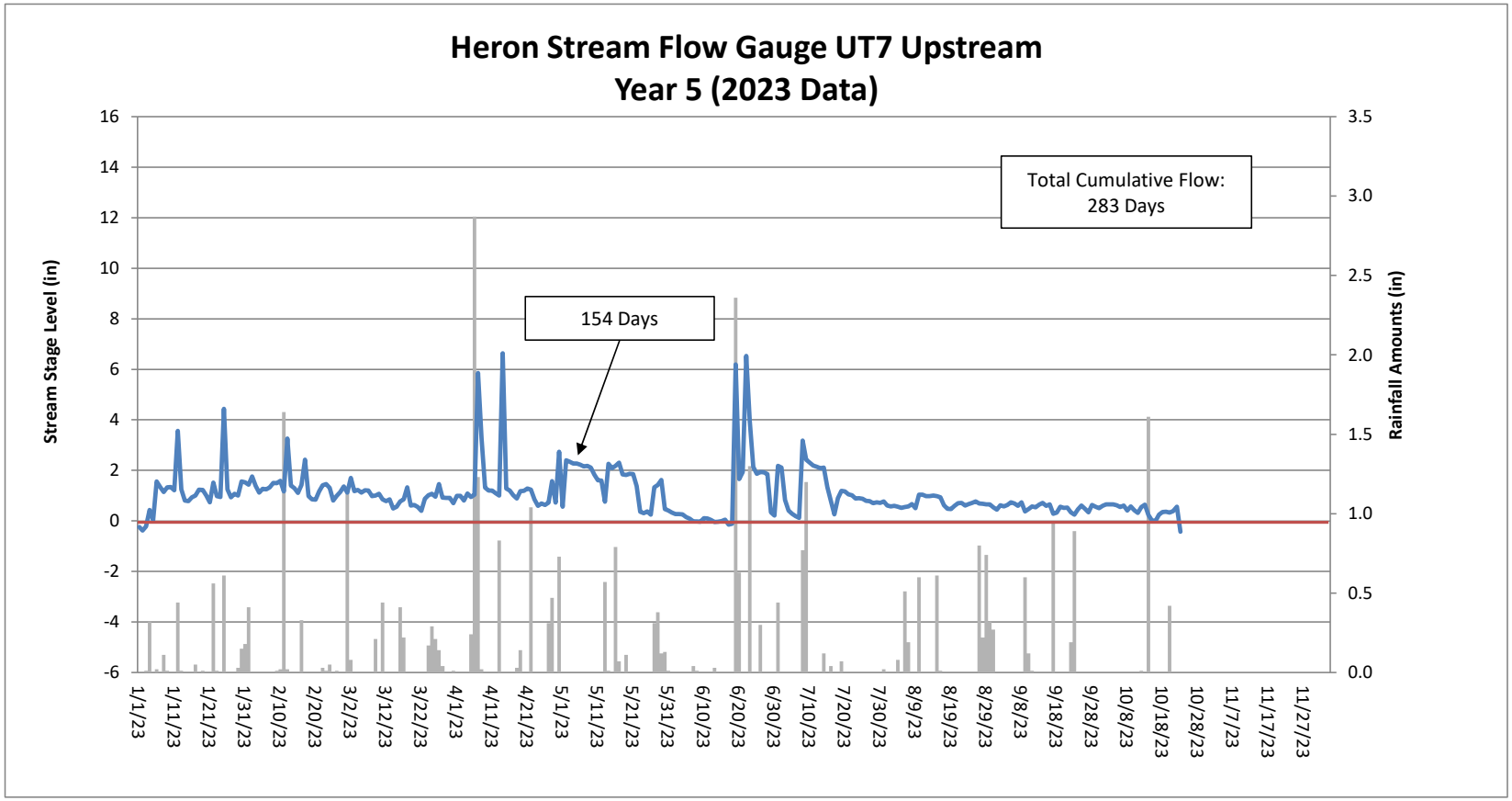
10/18/23
10/28/23
11/7/23
11/17/23


Heron Stream Flow Gauge UT7 Upstream
Year 5 (2023 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
Total Cumulative Flow:
283 Days
154 Days
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
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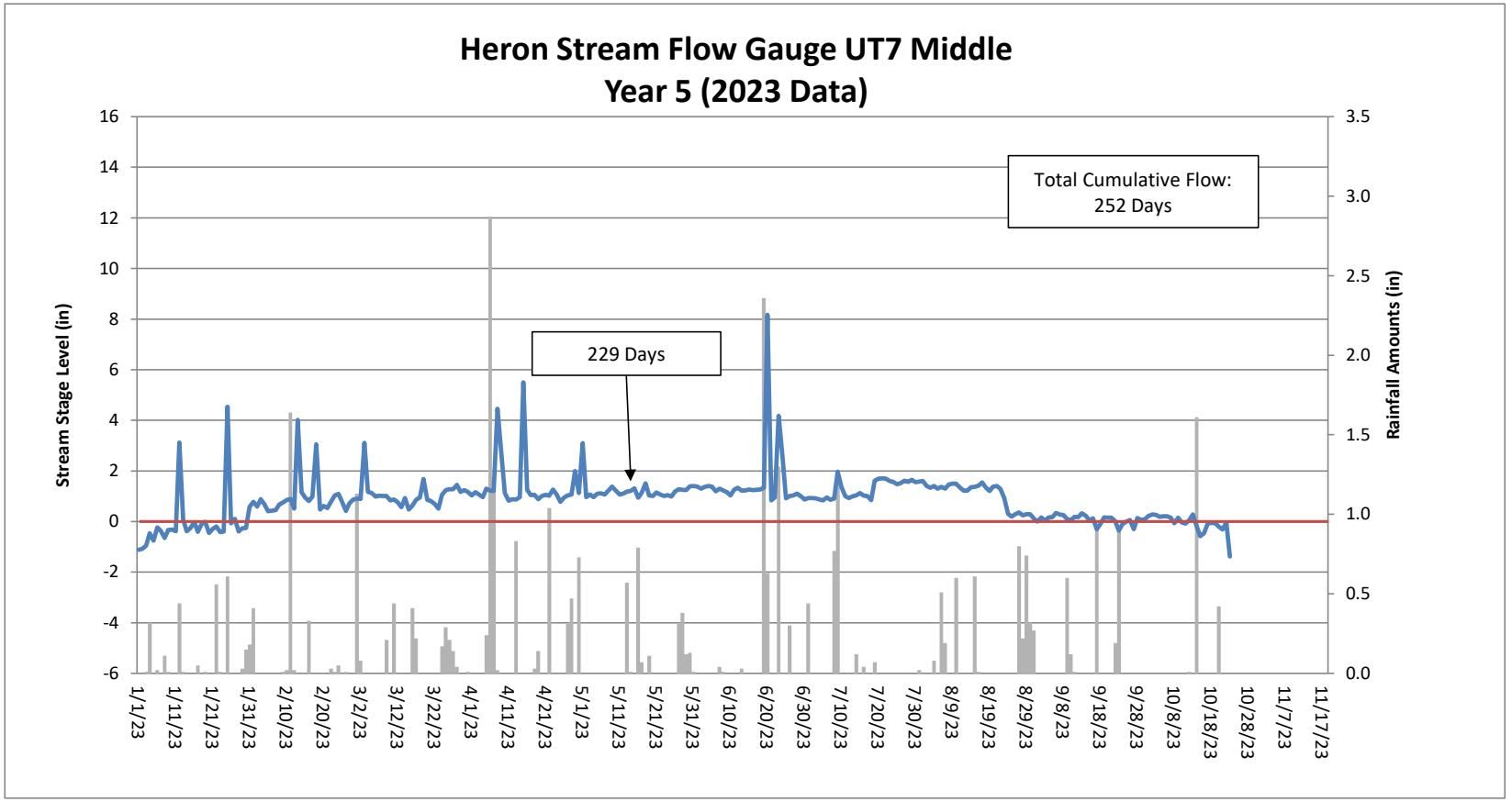
11/27/23


Heron Stream Flow Gauge UT7 Middle
Year 5 (2023 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
Total Cumulative Flow:
252 Days
229 Days
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
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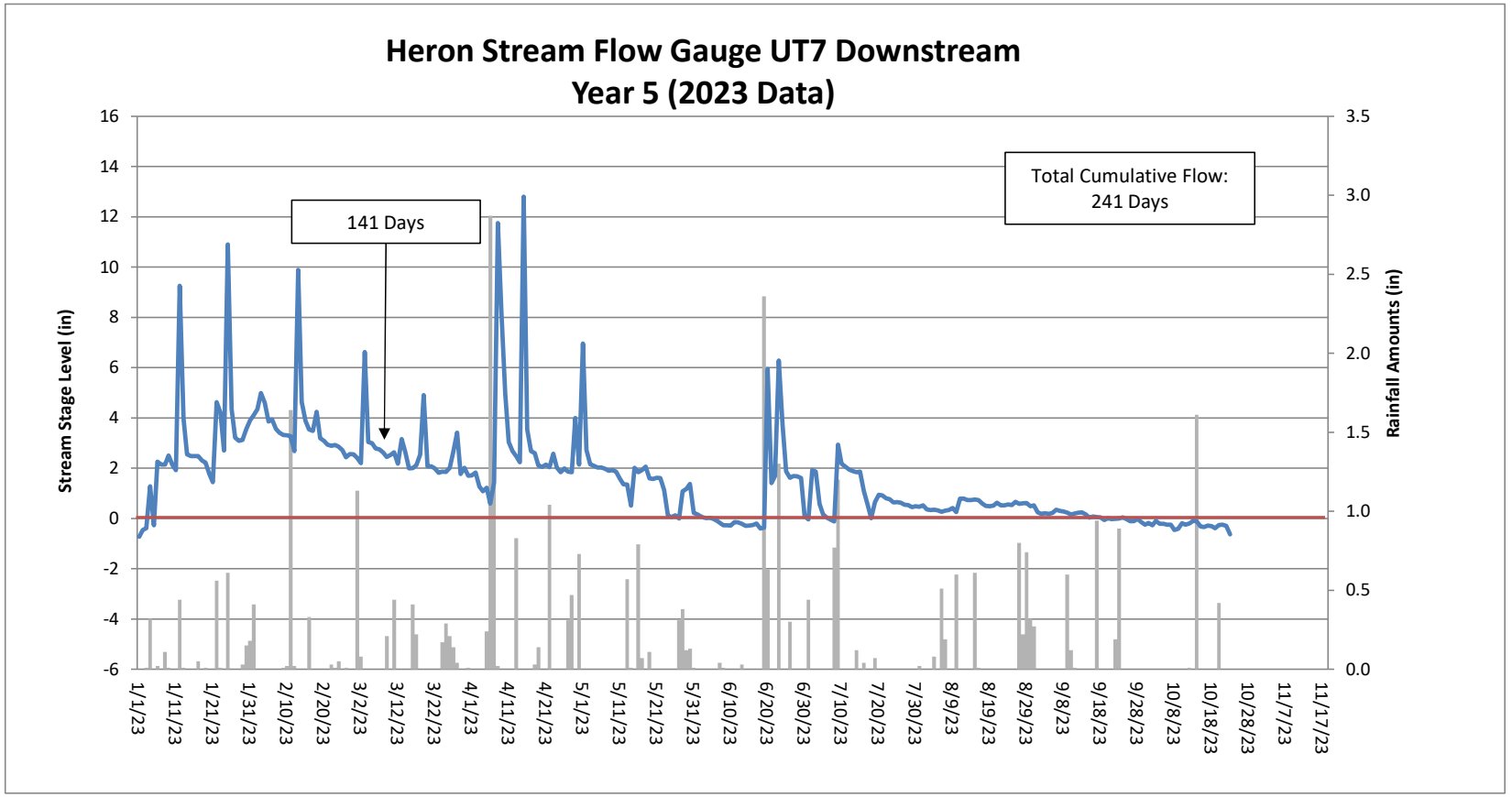
11/17/23


Heron Stream Flow Gauge UT7 Downstream
Year 5 (2023 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
141 Days
Total Cumulative Flow:
241 Days
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
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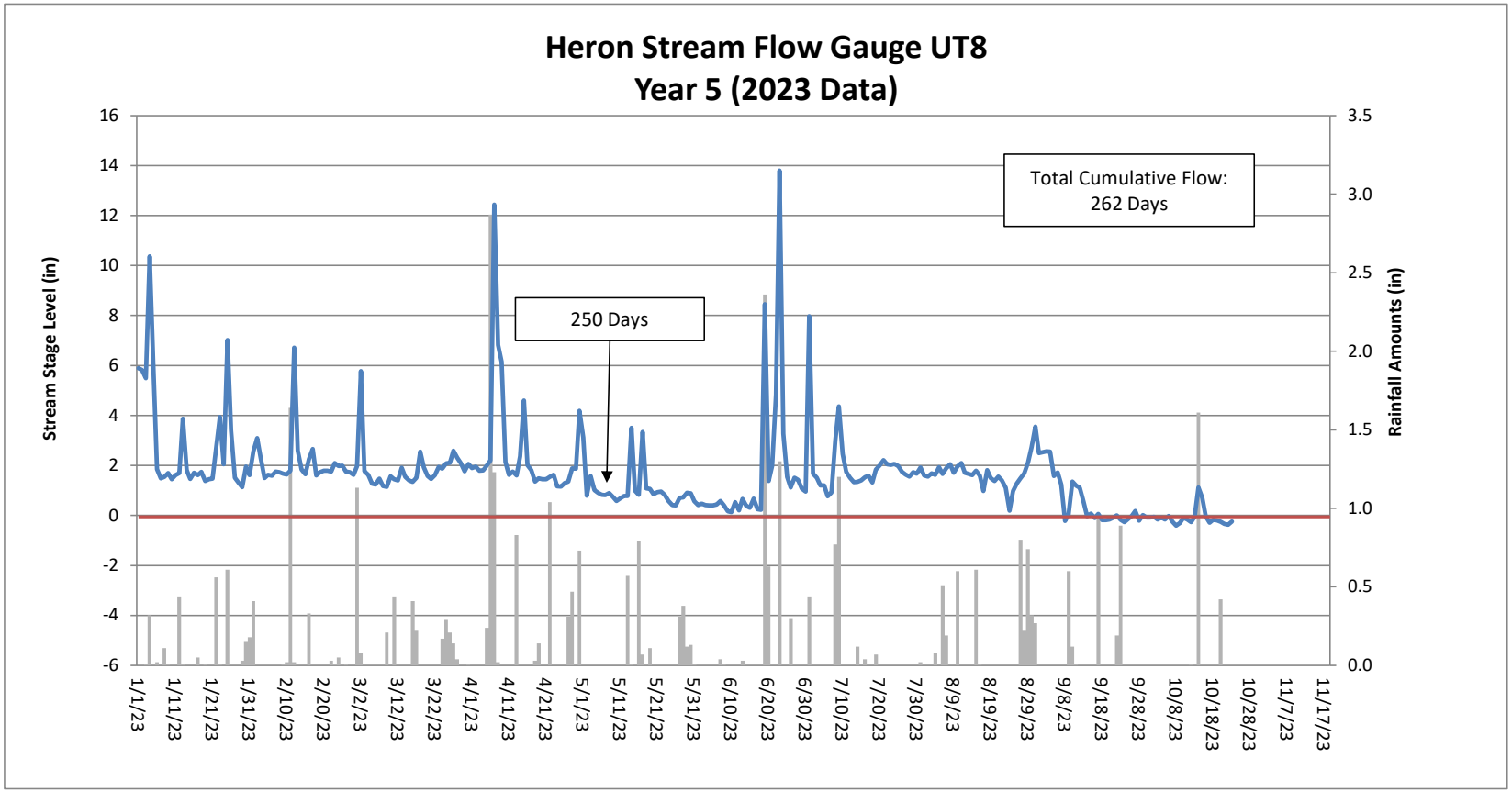
Heron Stream Flow Gauge UT8
Year 5 (2023 Data)
Stream Stage Level (in)
Rainfall Amounts (in)
Total Cumulative Flow:
262 Days
250 Days
16
14
12
10
8
6
4
2
0
-2
-4
-6
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
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1/31/23
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2/20/23
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8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
10/8/23
10/18/23
10/28/23
11/7/23
11/17/23

Table 15. Verification of Bankfull Events

Date of Data Collection	Date of Occurrence	Method	Photo (if available)
August 26, 2019	July 7, 2019	Stream gauge data indicates a bankfull event occurred after 4.06 inches of rain was documented on July 7, 2019 at an onsite rain gauge	--
August 26, 2019	August 22, 2019	A bankfull event likely occurred after 7.16 inches of rain was documented between August 20-22, 2019 at an onsite rain gauge	--
July 1, 2020	May 21, 2020	Wrack and laid-back vegetation were observed on the TOB of UT4 after 3.03 inches of rain was documented between May 19 and 21, 2020 at an onsite rain gauge.	1
November 16, 2020	November 12, 2020	Wrack and laid-back vegetation were observed on the TOB of UT1 after 3.13 inches of rain was documented between November 11 and 12, 2020 at an onsite rain gauge.	2
December 14, 2020	December 14, 2020	A bankfull event was documented on UT8 by trail camera and stream gauge evidence after 0.82 inches of rain were captured at an onsite rain gauge.	3
January 31. 2021	January 31. 2021	A bankfull was documented on UT3 by trail camera and stream gauge evidence after 0.56 inches of rain were captured by an onsite rain gauge between January 25-28.	4
February 16, 2021	February 13-16, 2021	A bankfull event was documented on UT1B during a site visit after 1.38 inches of rain were captured by an onsite rain gauge between February 13-16, 2021.	5
April 20, 2022	April 19, 2022	A bankfull event was documented during a site visit after 1.76 inches of rain were captured by an onsite rain gauge on April 18-19, 2022.	6-10
May 22, 2023	March 2, 2023	A bankfull event was documented on UT5 by a trail camera and stream gauge after 1.13 inches of rain were captured by an onsite rain gauge.	11
May 22, 2023	April 7, 2023	A bankfull event was documented on UT5 and UT8 by a trail camera and stream gauge after 4.1 inches of rain were captured by an onsite rain gauge over 2 days.	12, 13

Photo 1: Wrack and laid-back vegetation along the TOB of UT4 after a bankfull event.

Photo 2: Wrack and laid-back vegetation along the TOB of UT1 after a bankfull event.

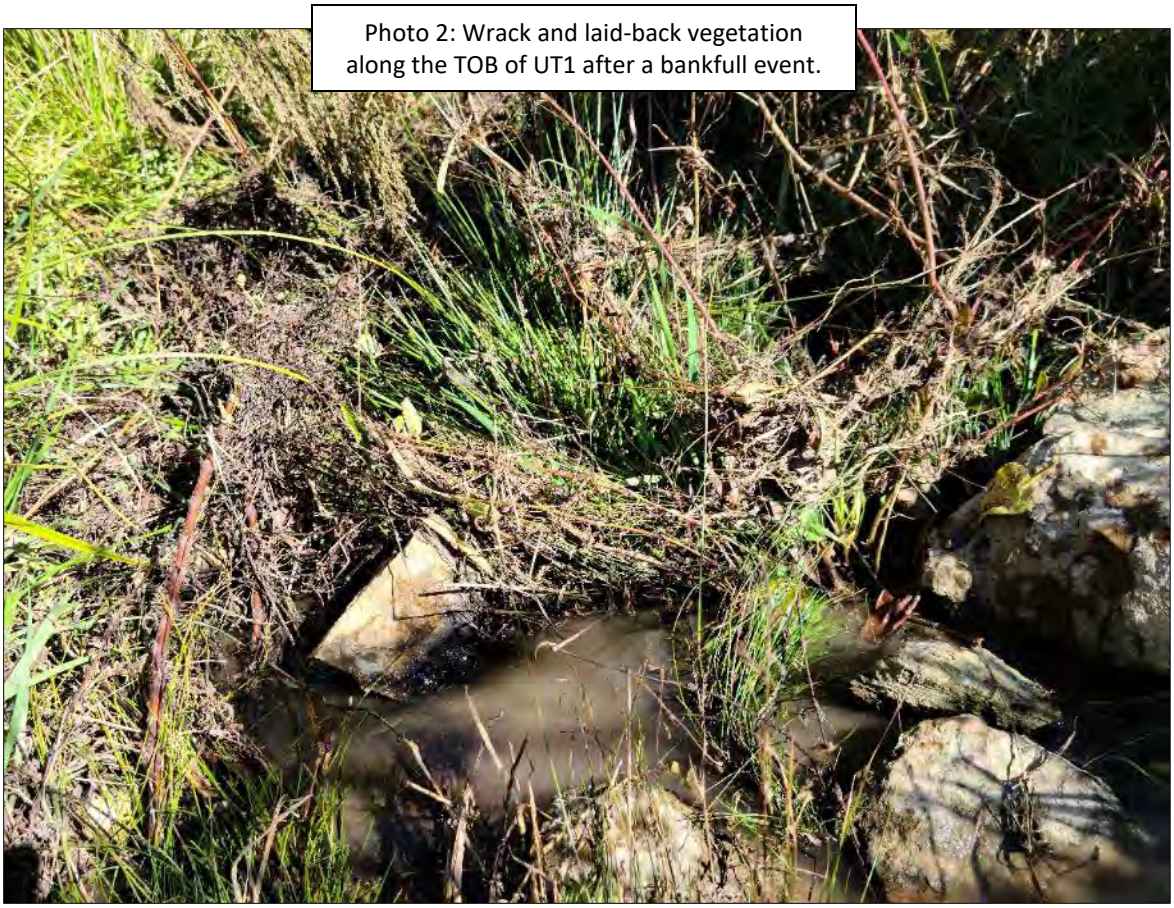


Photo 3: UT8 bankfull event documented on December 14, 2020 after 0.82 inches of rain.

Photo 4: UT3 bankfull event documented on January 31, 2020 after 0.56 inches of rain.

Photo 5: Bankfull event on UT1B on February 16 after 1.38 inches fell between February 13 – 16, 2021.

Photo 6: Bankfull event on UT5 during 1.76 inch rain event on April 18-19, 2022.

Photo 7: Wrack after a bankfull event on UT1 following 1.76 inch rain event on April 18-19, 2022.

Photo 8: Wrack after a bankfull event on UT4 following 1.76 inch rain event on April 18-19, 2022.

Photo 9: Wrack after a bankfull event on UT7 following 1.76 inch rain event on April 18-19, 2022.

Photo 10: Wrack after a bankfull event on UT8 following 1.76 inch rain event on April 18-19, 2022.

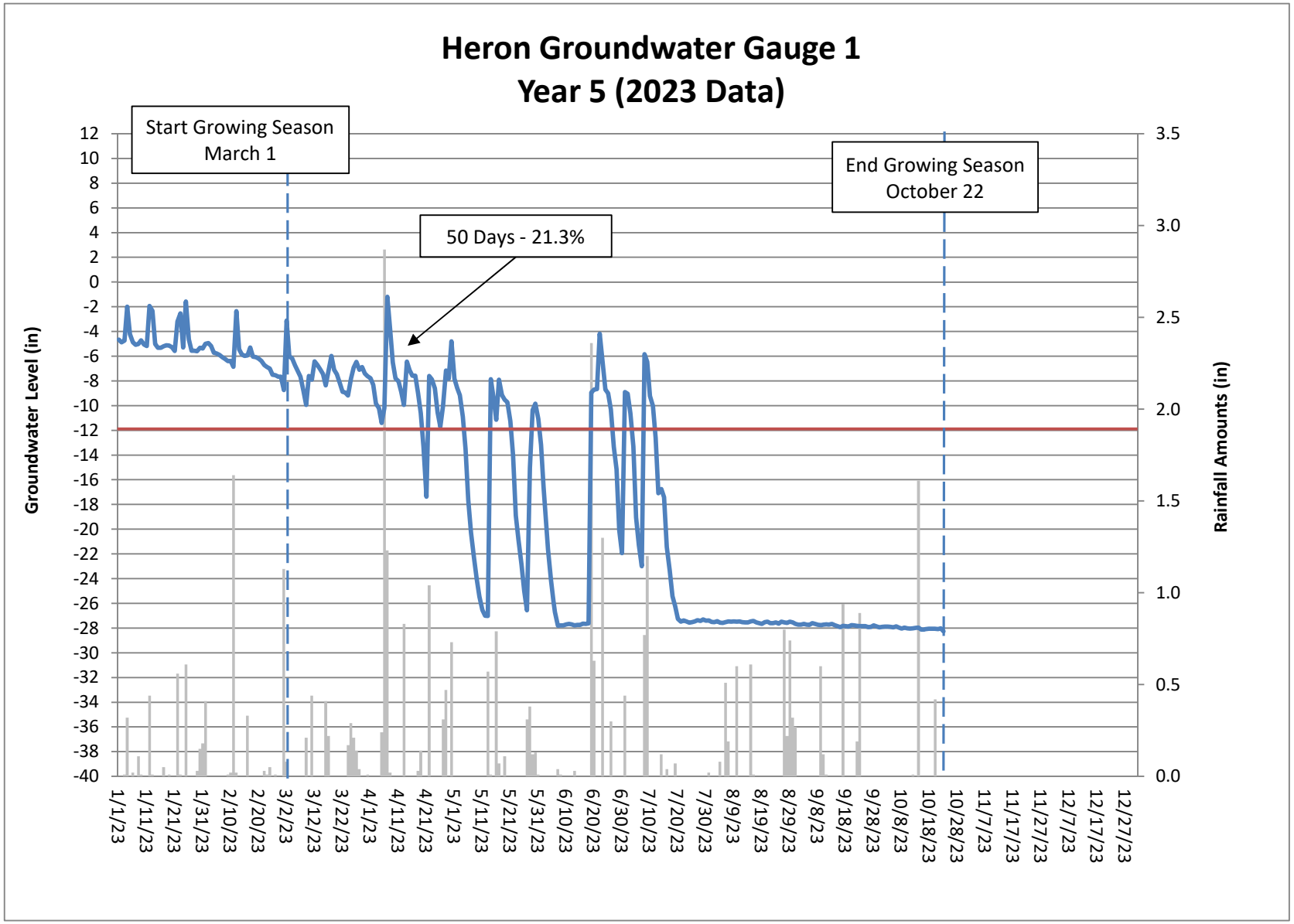
Photo 11: Bankfull event on UT5 documented on March 2, 2023 after 1.13 inches of rain.

Photo 12: Bankfull event on UT5 documented on April 7, 2023 after 4.10 inches of rain.

Photo 13: Bankfull event on UT8 documented on April 7, 2023 after 4.10 inches of rain.

Table 16. Groundwater Hydrology Data

Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)	Year 6 (2024)	Year 7 (2025)
1	Yes/33 days (15.8%)	Yes/23 days (9.8%)	Yes /46 days (19.5%)	Yes /45 days (19.1%)	Yes/50 days (21.3%)		
2	Yes/26 days (12.4%)	Yes/27 days (11.5%)	Yes/47 days (19.9%)	Yes/66 days (28.1%)	Yes/73 days (31.1%)		
3	Yes/35 days (16.7%)	Yes/28 days (12.0%)	Yes/36 days (15.2%)	Yes/66 days (28.1%)	Yes/71 days (30.2%)		
4	Yes/69 days (33.0%)	Yes/51 days (21.8%)	Yes/60 days (25.4%)	Yes/56 days (23.8%)	Yes/96 days (40.9%)		
5	Yes/52 days (24.9%)	Yes/45 days (19.2%)	Yes/50 days (21.2%)	Yes/52 days (22.1%)	Yes/71 days (30.2%)		
6	Yes/54 days (25.8%)	Yes/46 days (19.7%)	Yes/52 days (22.0%)	No/13 days (5.5%)	Yes/92 days (39.1%)		


Heron Groundwater Gauge 1
Year 5 (2023 Data)
Start Growing Season
March 1
End Growing Season
October 22
50 Days - 21.3%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
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9/28/23
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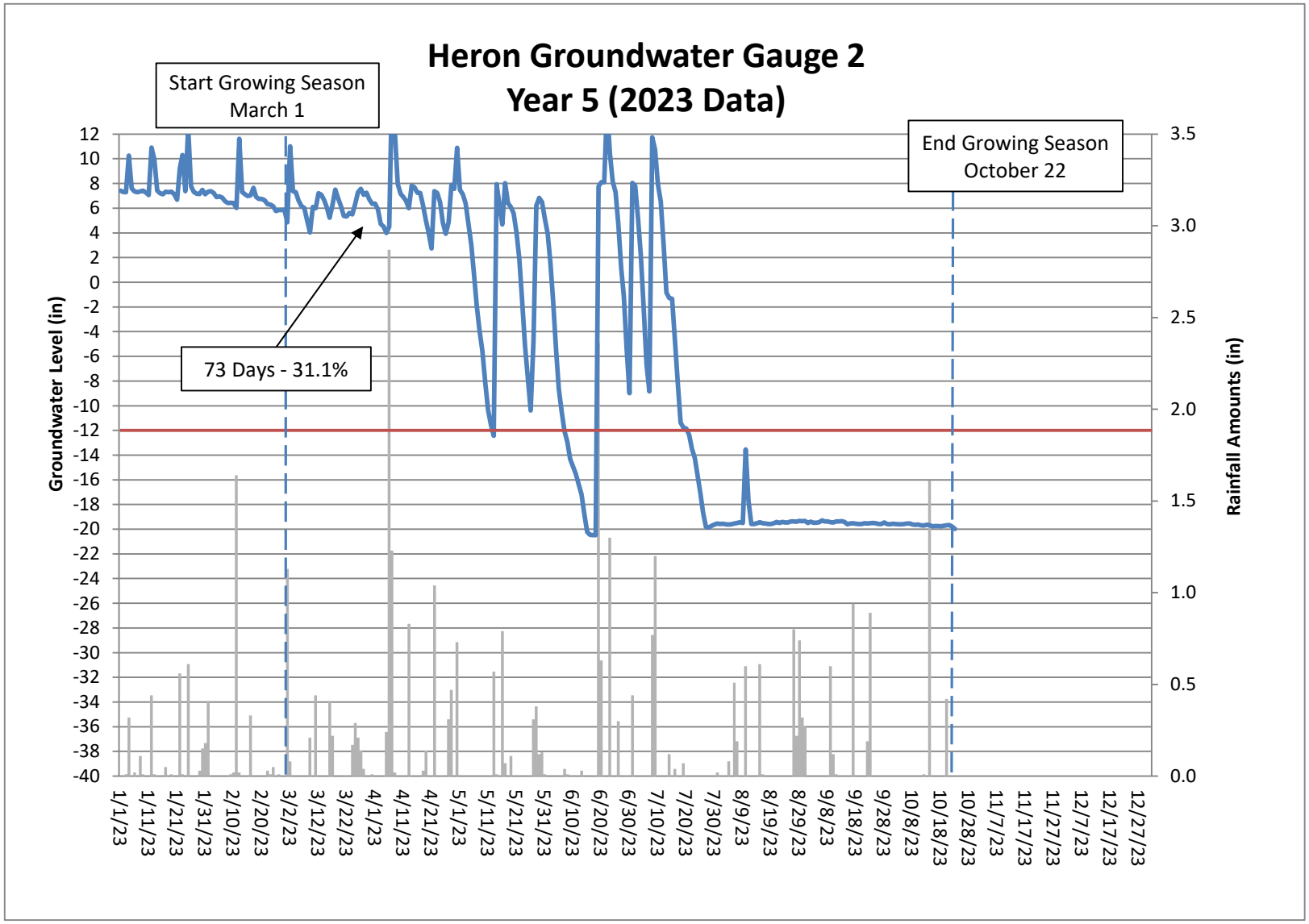
10/18/23
10/28/23
11/7/23
11/17/23
11/27/23
12/7/23
12/17/23
12/27/23


Heron Groundwater Gauge 2
Year 5 (2023 Data)
Start Growing Season
March 1
End Growing Season
October 22
73 Days - 31.1%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
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7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
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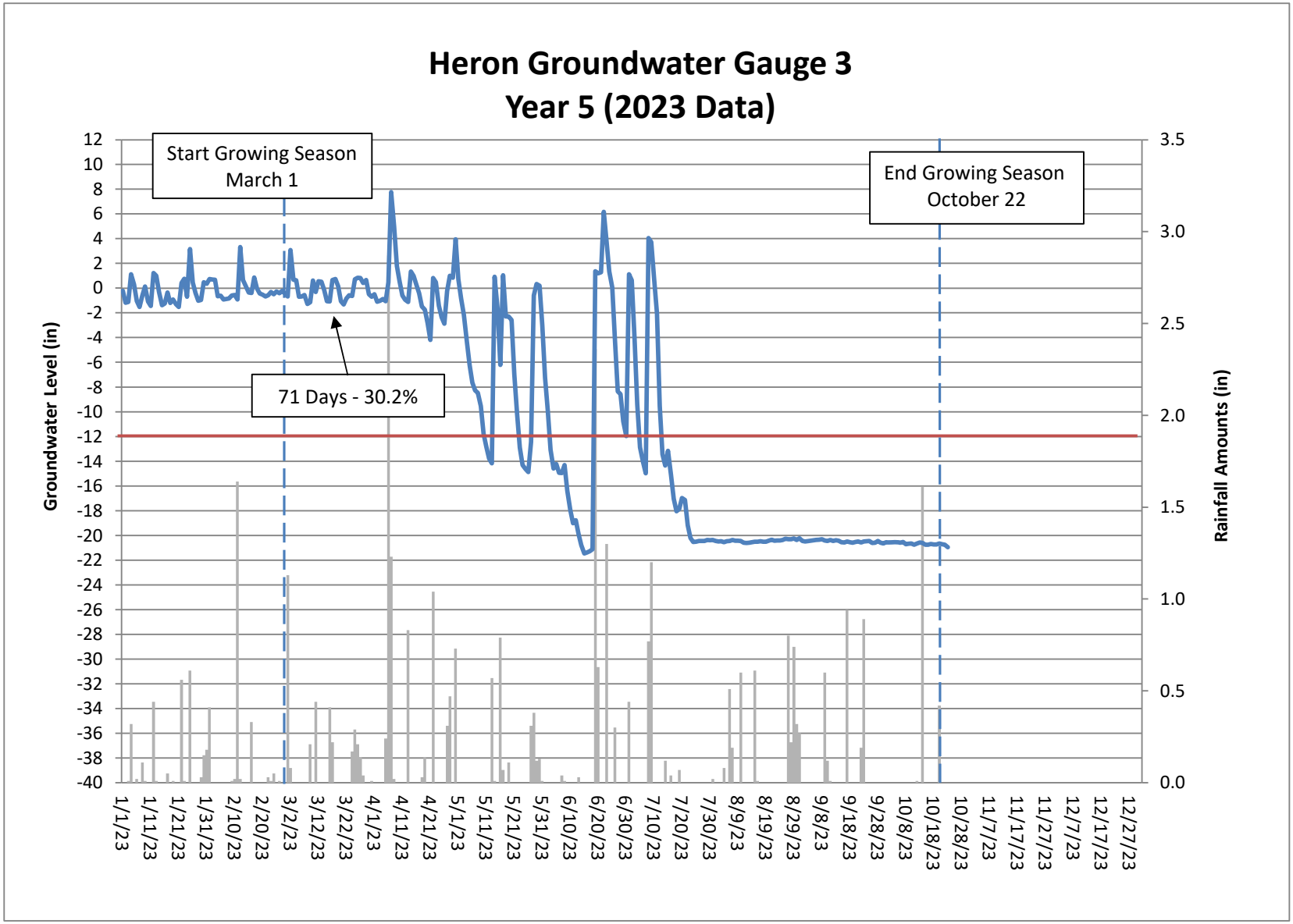
11/27/23
12/7/23
12/17/23
12/27/23


Heron Groundwater Gauge 3
Year 5 (2023 Data)
Start Growing Season
March 1
End Growing Season
October 22
71 Days - 30.2%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
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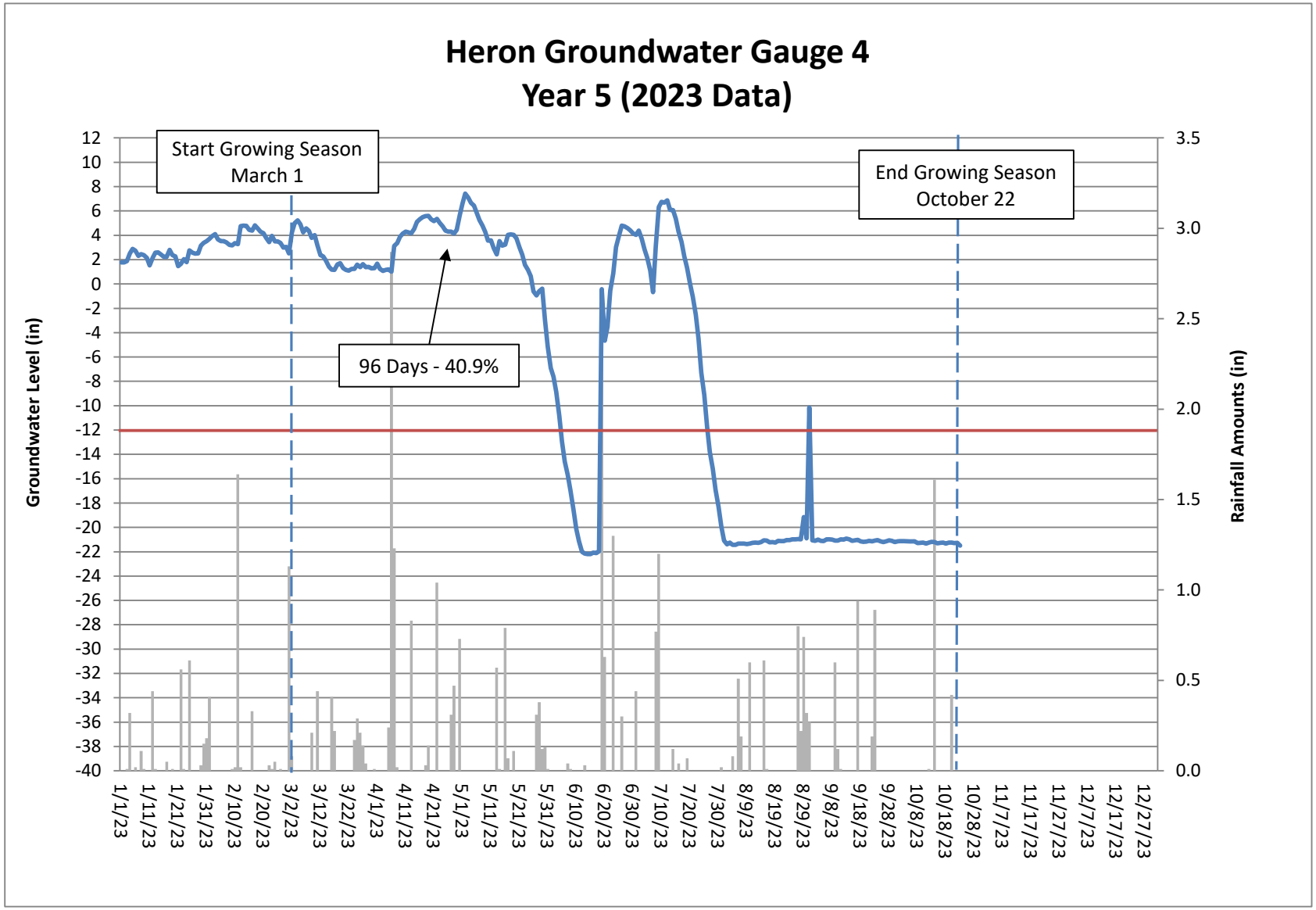
11/27/23
12/7/23
12/17/23
12/27/23


Heron Groundwater Gauge 4
Year 5 (2023 Data)
Start Growing Season
March 1
End Growing Season
October 22
96 Days - 40.9%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
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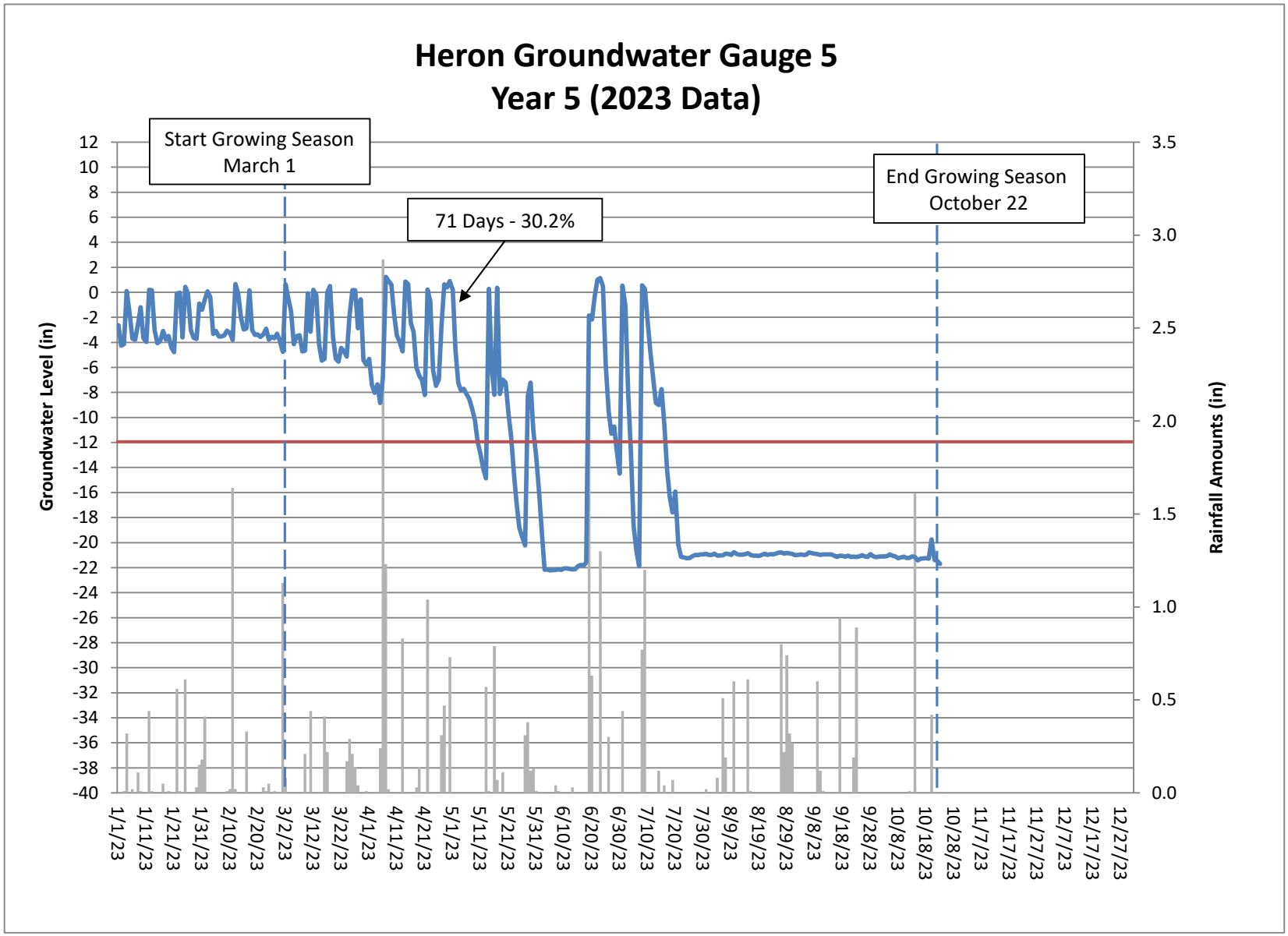
11/27/23
12/7/23
12/17/23
12/27/23


Heron Groundwater Gauge 5
Year 5 (2023 Data)
Start Growing Season
March 1
End Growing Season
October 22
71 Days - 30.2%
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
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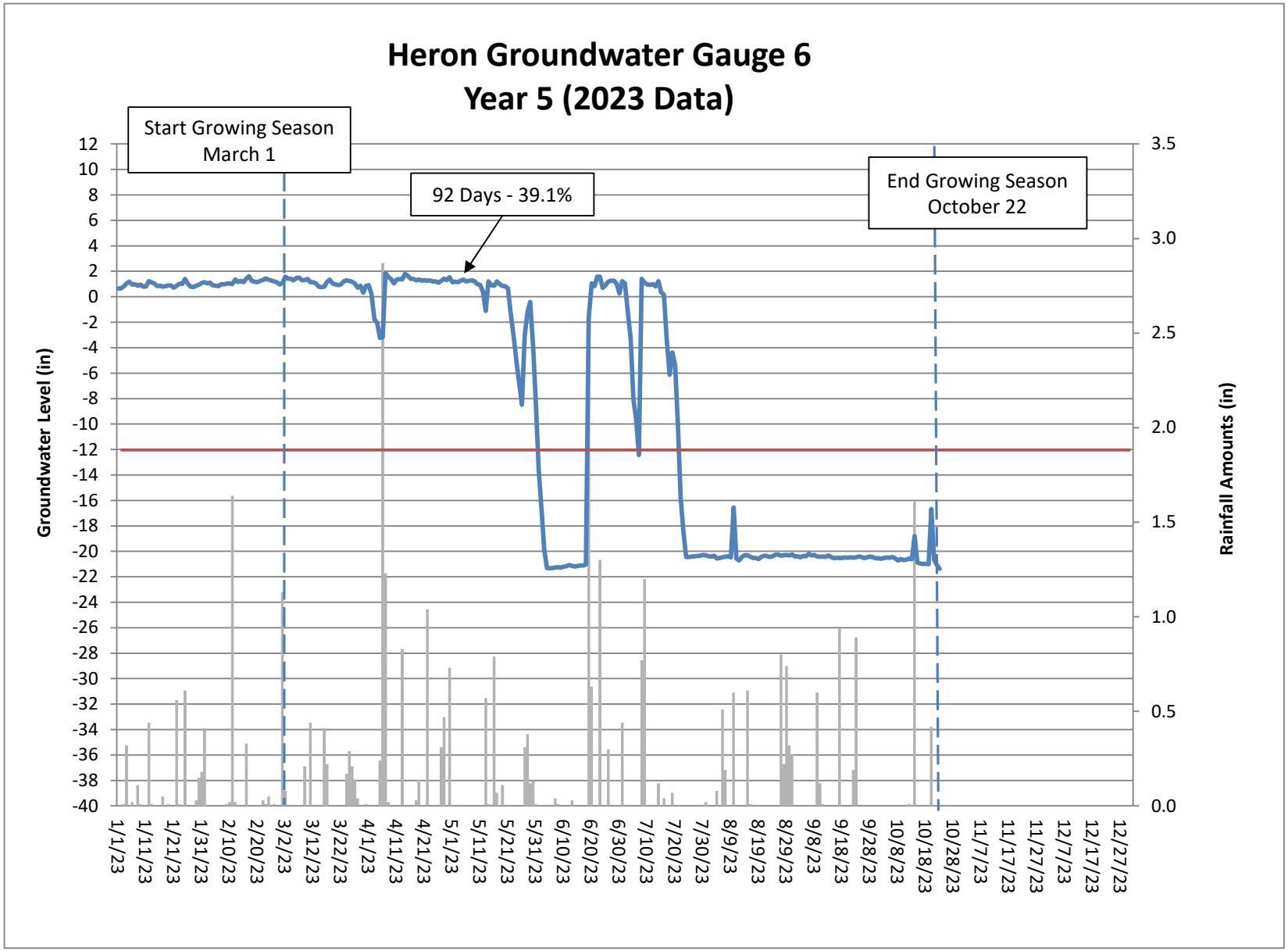
11/27/23
12/7/23
12/17/23
12/27/23


Heron Groundwater Gauge 6
Year 5 (2023 Data)
Start Growing Season
March 1
92 Days - 39.1%
End Growing Season
October 22
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
10/8/23
10/18/23
10/28/23
11/7/23
11/17/23
11/27/23
12/7/23
12/17/23
12/27/23

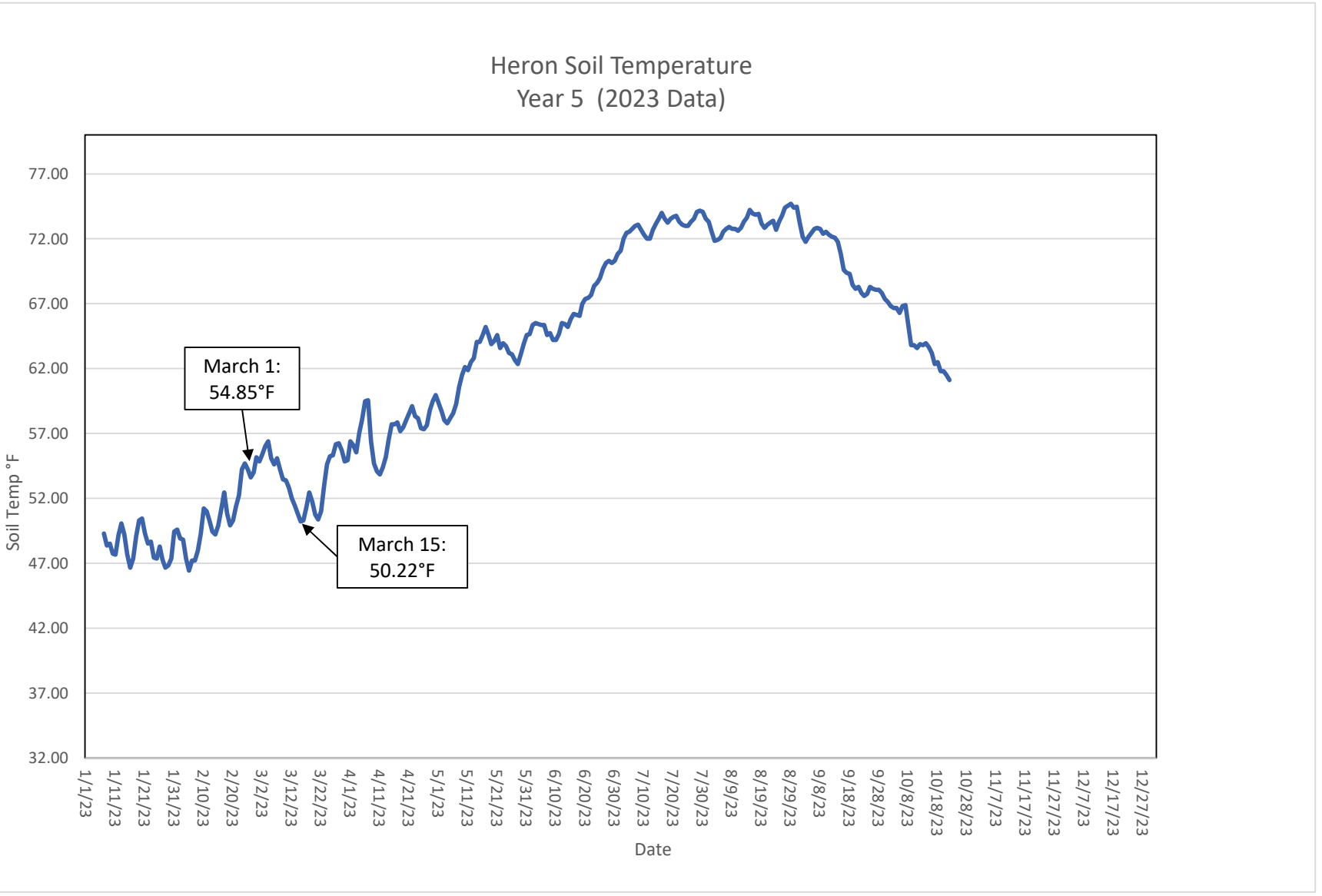
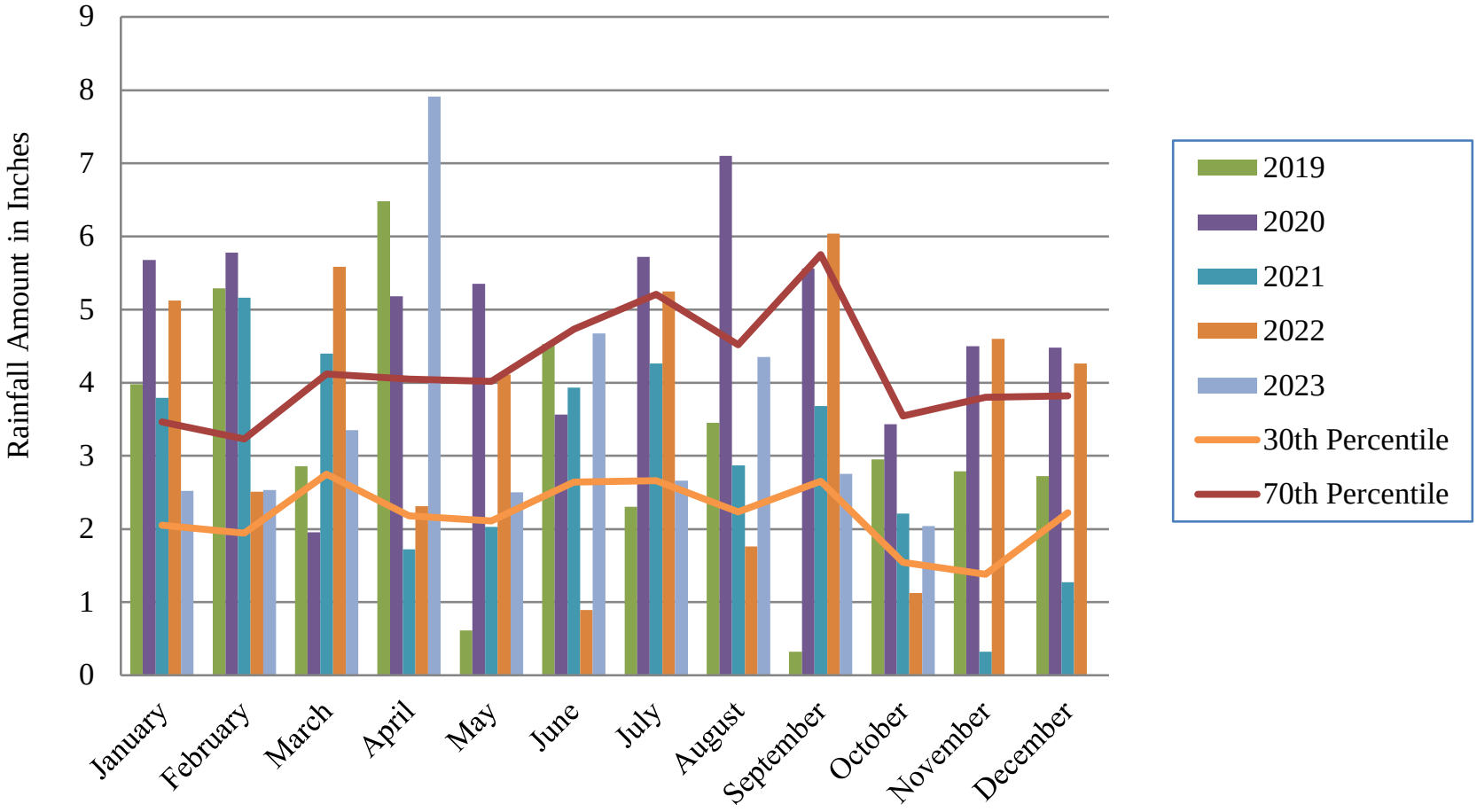

Heron Soil Temperature
Year 5 (2023 Data)
Soil Temp °F
77.00
72.00
67.00
62.00
57.00
52.00
47.00
42.00
37.00
32.00
March 1:
54.85°F
March 15:
50.22°F
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
10/8/23
10/18/23
10/28/23
11/7/23
11/17/23
11/27/23
12/7/23
12/17/23
12/27/23
Date

Figure E1: Heron
30-70 Percentile Graph for Rainfall

Current year data from onsite rain gauge

30-70th percentile data from WETS Station: Burlington Alamance Regional Airport, NC



Appendix F.
Benthic Data

Benthic Results
Habitat Data Forms

PA ID NO			**56920**
STATION			**Heron**
			UT1
DATE			**6/13/2023**
SPECIES	**T.V.**	**F.F.G.**	
PLATYHELMINTHES			
MOLLUSCA			
Bivalvia			
Veneroida			
Sphaeriidae		**FC**	
Musculium lacustre		**FC**	
Pisidium sp.	6.6	**FC**	2
Gastropoda			
Basommatophora			
Physidae			
Physella sp.	8.7	**CG**	
ANNELIDA			
Clitellata			
Oligochaeta		**CG**	
Lumbriculida			
Lumbriculidae		**CG**	
Lumbriculus sp.		**CG**	
Hirudinea		**P**	
Arhynchobdellida			
Erpobdellidae		**P**	
Rhynchobdellida			
Glossiphoniidae		**P**	
Helobdella sp.		**P**	
ARTHROPODA			
Cladocera			
Daphnidae			
Ceriodaphnia sp.			1
Copepoda			
Cyclopoida			
Cyclopidae			
Mesocyclops edax			1
Isopoda			
Asellidae		**SH**	
Caecidotea sp.	8.4	**CG**	10
Amphipoda		**CG**	
Crangonyctidae			
Crangonyx sp.	7.2	**CG**	14
Insecta			
Ephemeroptera			
Baetidae		**CG**	

PA ID NO			**56920**
STATION			**Heron**
			UT1
DATE			**6/13/2023**
SPECIES	**T.V.**	**F.F.G.**	
Odonata			
Aeshnidae		**P**	
Aeshna umbrosa		**P**	
Anax junius		**P**	1
Coenagrionidae		**P**	3
Corduliidae			
Somatochlora sp.	8.9	**P**	
Libellulidae		**P**	
Libellula vibrans	9.4	**P**	
Pachydiplax longipennis	9.6		3
Plecoptera			
Perlidae		**P**	
Perlesta sp.	2.9	**P**	
Hemiptera			
Belostomatidae			
Belostoma sp.	9.5	**P**	3
Corixidae		**PI**	
Hesperocorixa sp.		**PI**	1
Notonectidae			
Notonecta sp.		**P**	1
Megaloptera			
Corydalidae		**P**	
Chauliodes rastricornis		**P**	
Sialidae		**P**	
Sialis sp.	7	**P**	
Trichoptera			
Hydropsychidae		**FC**	
Cheumatopsyche sp.	6.6	**FC**	
Limnephilidae			
Pycnopsyche sp.	2.5	**SH**	
Coleoptera			
Dytiscidae		**P**	
Neoporus sp.	5		
Thermonectus sp.		**P**	1
Hydrophilidae		**P**	
Tropisternus sp.	*9.3*	**P**	
Diptera			
Chaboridae			
Chaoborus albatus		**P**	1
Chironomidae			
Ablabesmyia mallochi	*7.4*	**P**	

PA ID NO			**56920**
STATION			**Heron**
			UT1
DATE			**6/13/2023**
SPECIES	**T.V.**	**F.F.G.**	
Chironomus sp.	*9.3*	**CG**	1
Conchapelopia sp.	8.4	**P**	
Cryptochironomus sp.	*6.4*	**P**	
Microtendipes pedellus gp.	*3.9*	**CG**	
Natarsia sp.	*9.6*	**P**	
Paratendipes albimanus/duplicatus	*5.6*		
Procladius sp.	*8.8*	**P**	
Psectrotanypus dyari	*10*	**P**	1
Tanytarsus sp.	*6.6*	**FC**	
Zavrelimyia sp.	*8.6*	**P**	
Culicidae		**FC**	
Anopheles sp.	*8.6*	**FC**	4
Culex sp.		**FC**	13
Psychodidae		**CG**	
TOTAL NO. OF ORGANISMS			**61**
TOTAL NO. OF TAXA			**17**
EPT INDEX			**0**
BIOTIC INDEX Assigned Values			**9.31**

H-UT1

3/06 Revision 6

17-008 Heron

Habitat Assessment Field Data Sheet
Mountain/ Piedmont Streams

Biological Assessment Unit, DWQ

TOTAL SCORE 40

Directions for use: The observer is to survey a **minimum of 100 meters with 200 meters preferred** of stream, preferably in an **upstream** direction starting above the bridge pool and the road right-of-way. The segment which is assessed should represent average stream conditions. To perform a proper habitat evaluation the observer needs to get into the stream. To complete the form, select the description which best fits the observed habitats and then circle the score. If the observed habitat falls in between two descriptions, select an intermediate score. A final habitat score is determined by adding the results from the different metrics.

Stream Heron UT-1 Location/road: Snow Camp (Road Name Bethel South Fork) County Alamance

Date 2/20/13 **CC#** 03030002 Basin Cape Fear Subbasin 03-06-04

Observer(s) PHP Type of Study: ☐ Fish ☑ Benthos ☐ Basinwide ☐ Special Study (Describe) _____

Latitude 35.856480 Longitude 79.365480 Ecoregion: ☐ MT ☑ P ☑ Slate Belt ☐ Triassic Basin

Water Quality: Temperature ~ °C DO ~ mg/l Conductivity (corr.) ~ µS/cm pH ~

Physical Characterization: Visible land use refers to immediate area that you can see from sampling location - include what you estimate driving thru the watershed in watershed land use.

Visible Land Use: 20 %Forest 5 %Residential 70 %Active Pasture _____% Active Crops
_____%Fallow Fields _____% Commercial _____%Industrial _____%Other - Describe: _____

Watershed land use : ☐ Forest ☑ Agriculture ☐ Urban ☐ Animal operations upstream

Width: (meters) Stream 1-2.5 Channel (at top of bank) 1 **Stream Depth:** (m) Avg .5 Max ____
☐ Width variable ☐ Large river >25m wide

Bank Height (from deepest part of riffle to top of bank-first flat surface you stand on): (m) .2

Bank Angle: 125 ° or ☐ NA (Vertical is 90°, horizontal is 0°. Angles > 90° indicate slope is towards mid-channel, < 90° indicate slope is away from channel. NA if bank is too low for bank angle to matter.)

☐ Channelized Ditch
☐ Deeply incised-steep, straight banks ☐ Both banks undercut at bend ☐ Channel filled in with sediment
☐ Recent overbank deposits ☐ Bar development ☐ Buried structures ☐ Exposed bedrock
☐ Excessive periphyton growth ☐ Heavy filamentous algae growth ☐ Green tinge ☐ Sewage smell
Manmade Stabilization: ☐ N ☑ Y: ☐ Rip-rap, cement, gabions ☐ Sediment/grade-control structure ☐ Berm/levee
Flow conditions : ☐ High ☐ Normal ☑ Low
Turbidity: ☐ Clear ☐ Slightly Turbid ☑ Turbid ☐ Tannic ☐ Milky ☐ Colored (from dyes)
Good potential for Wetlands Restoration Project?? ☐ YES ☐ NO **Details** 5 year old stream; yellow

Channel Flow Status

Useful especially under abnormal or low flow conditions.

A. Water reaches base of both lower banks, minimal channel substrate exposed	☐
B. Water fills >75% of available channel, or <25% of channel substrate is exposed	☐
C. Water fills 25-75% of available channel, many logs/snags exposed	☐
D. Root mats out of water	☐
E. Very little water in channel, mostly present as standing pools	☒

→ water only in pools

Weather Conditions: Warm **Photos:** ☐ N ☐ Y ☐ Digital ☐ 35mm

Remarks: D-4

H-4T1

I. Channel Modification

	Score
A. channel natural, frequent bends	(5)
B. channel natural, infrequent bends (channelization could be old)	4
C. some channelization present	3
D. more extensive channelization, >40% of stream disrupted	2
E. no bends, completely channelized or rip rapped or gabioned, etc	0

☐ Evidence of dredging ☐Evidence of desnagging=no large woody debris in stream ☐Banks of uniform shape/height

Remarks _____ Subtotal 5

II. Instream Habitat: Consider the percentage of the reach that is favorable for benthos colonization or fish cover. If >70% of the reach is rocks, 1 type is present, circle the score of 17. Definition: leafpacks consist of older leaves that are packed together and have begun to decay (not piles of leaves in pool areas). Mark as Rare, Common, or Abundant.

✓ **Rocks** ___ **Macrophytes** ✓ **Sticks and leafpacks** ___ **Snags and logs** ✓ **Undercut banks or root mats**

AMOUNT OF REACH FAVORABLE FOR COLONIZATION OR COVER

	>70% Score	40-70% Score	20-40% Score	<20% Score
4 or 5 types present	20	16	12	8
3 types present	19	15	11	7
2 types present	18	14	10	6
1 type present	17	13	9	5
No types present	0			

☐ No woody vegetation in riparian zone Remarks _____ Subtotal 11

III. Bottom Substrate (silt, sand, detritus, gravel, cobble, boulder) Look at entire reach for substrate scoring, but only look at riffle for embeddedness, and use rocks from all parts of riffle-look for "mud line" or difficulty extracting rocks.

	Score
A. substrate with good mix of gravel, cobble and boulders	
1. embeddedness <20% (very little sand, usually only behind large boulders)	15
2. embeddedness 20-40%	12
3. embeddedness 40-80%	8
4. embeddedness >80%	3
B. substrate gravel and cobble	
1. embeddedness <20%	14
2. embeddedness 20-40%	11
3. embeddedness 40-80%	(6)
4. embeddedness >80%	2
C. substrate mostly gravel	
1. embeddedness <50%	8
2. embeddedness >50%	4
D. substrate homogeneous	
1. substrate nearly all bedrock	3
2. substrate nearly all sand	3
3. substrate nearly all detritus	2
4. substrate nearly all silt/ clay	1

Remarks _____ Subtotal 6

IV. Pool Variety Pools are areas of deeper than average maximum depths with little or no surface turbulence. Water velocities associated with pools are always slow. Pools may take the form of "pocket water", small pools behind boulders or obstructions, in large high gradient streams, or side eddies.

	Score
A. Pools present	
1. Pools Frequent (>30% of 200m area surveyed)	
a. variety of pool sizes	(10)
b. pools about the same size (indicates pools filling in)	8
2. Pools Infrequent (<30% of the 200m area surveyed)	
a. variety of pool sizes	6
b. pools about the same size	4
B. Pools absent	0

Subtotal 10

☐ Pool bottom boulder-cobble=hard ☐ Bottom sandy-sink as you walk ☐ Silt bottom ☐ Some pools over wader depth

Remarks _____

Page Total 32

H-4T1

V. Riffle Habitats

Definition: Riffle is area of reaeration-can be debris dam, or narrow channel area.

	Riffles **Frequent** Score	Riffles **Infrequent** Score
A. well defined riffle and run, riffle as wide as stream and extends 2X width of stream....	(16)	12
B. riffle as wide as stream but riffle length is not 2X stream width	14	7
C. riffle not as wide as stream and riffle length is not 2X stream width	10	3
D. riffles absent.....	0	

Channel Slope: ☑Typical for area ☐Steep=fast flow ☐Low=like a coastal stream Subtotal 16

VI. Bank Stability and Vegetation

FACE UPSTREAM	Left Bank Score	Rt. Bank Score
A. Banks stable		
1. little evidence of erosion or bank failure(except outside of bends), little potential for erosion.	(7)	7
B. Erosion areas present		
1. diverse **trees**, shrubs, grass; plants healthy with good root systems.....	6	6
2. few trees or small trees and **shrubs**; vegetation appears generally healthy.....	5	5
3. sparse **mixed** vegetation; plant types and conditions suggest poorer soil binding.....	3	3
4. mostly **grasses**, few if any trees and shrubs, high erosion and failure potential at high flow..	2	2
5. little or no bank vegetation, mass erosion and bank failure evident.....	0	0
		Total 14

Remarks_____

VII. Light Penetration Canopy is defined as tree or vegetative cover directly above the stream's surface. Canopy would block out sunlight when the sun is directly overhead. Note shading from mountains, but not use to score this metric.

	Score
A. Stream with **good** canopy with some breaks for light penetration	(10)
B. Stream with **full canopy** - breaks for light penetration absent.....	8
C. Stream with **partial** canopy - sunlight and shading are essentially equal.....	7
D. Stream with **minimal** canopy - full sun in all but a few areas.....	2
E. **No canopy** and no shading.....	0

Remarks_____ Subtotal 10

VIII. Riparian Vegetative Zone Width

Definition: Riparian zone for this form is area of natural vegetation adjacent to stream (can go beyond floodplain). Definition: A break in the riparian zone is any place on the stream banks which allows sediment or pollutants to directly enter the stream, such as paths down to stream, storm drains, uprooted trees, otter slides, etc.

FACE UPSTREAM Dominant vegetation: ☐ Trees ☐ Shrubs ☐ Grasses ☐ Weeds/old field ☐Exotics (kudzu, etc)	Lft. Bank Score	Rt. Bank Score
A. Riparian zone **intact** (no breaks)		
1. width > 18 meters.....	5	5
2. width 12-18 meters.....	(4)	(4)
3. width 6-12 meters.....	3	3
4. width < 6 meters.....	2	2
B. Riparian zone **not intact** (breaks)		
1. breaks rare		
a. width > 18 meters.....	4	4
b. width 12-18 meters.....	3	3
c. width 6-12 meters.....	2	2
d. width < 6 meters.....	1	1
2. breaks common		
a. width > 18 meters.....	3	3
b. width 12-18 meters.....	2	2
c. width 6-12 meters.....	1	1
d. width < 6 meters.....	0	0
		Total 8

Remarks_____

Page Total 48

☐ Disclaimer-form filled out, but score doesn't match subjective opinion-atypical stream. **TOTAL SCORE** 80

*Bone Dry - no samples

H-QT5

3/06 Revision 6

17-088 Heron

Habitat Assessment Field Data Sheet
Mountain/ Piedmont Streams

Biological Assessment Unit, DWQ

TOTAL SCORE 57

Directions for use: The observer is to survey a **minimum of 100 meters with 200 meters preferred** of stream, preferably in an **upstream** direction starting above the bridge pool and the road right-of-way. The segment which is assessed should represent average stream conditions. To perform a proper habitat evaluation the observer needs to get into the stream. To complete the form, select the description which best fits the observed habitats and then circle the score. If the observed habitat falls in between two descriptions, select an intermediate score. A final habitat score is determined by adding the results from the different metrics.

Stream Heron UT-5 Location/road: Snow Camp (Road Name Before South Fork) County Alamance

Date 4/13/23 **CC#** 03030002 **Basin** Cape Fear **Subbasin** 03-06-04

Observer(s) BF DM Type of Study: ☐ Fish ☑ Benthos ☐ Basinwide ☐ Special Study (Describe) _____

Latitude 35.852756 Longitude -79.361977 Ecoregion: ☐ MT ☑ P ☑ Slate Belt ☐ Triassic Basin

Water Quality: Temperature _____ °C DO _____ mg/l Conductivity (corr.) _____ µS/cm pH _____

Physical Characterization: Visible land use refers to immediate area that you can see from sampling location - include what you estimate driving thru the watershed in watershed land use.

Visible Land Use: 10 %Forest 0 %Residential 80 %Active Pasture 0 % Active Crops
10 %Fallow Fields 0 % Commercial 0 %Industrial 0 %Other - Describe: —

Watershed land use : ☑Forest ☑Agriculture ☐Urban ☐ Animal operations upstream

Width: (meters) Stream 2' Channel (at top of bank) 5' **Stream Depth:** (m) Avg 0 Max 0
☐ Width variable ☐ Large river >25m wide

Bank Height (from deepest part of riffle to top of bank-first flat surface you stand on): (m) 1'

Bank Angle: _____ ° or ☒ NA (Vertical is 90°, horizontal is 0°. Angles > 90° indicate slope is towards mid-channel, < 90° indicate slope is away from channel. NA if bank is too low for bank angle to matter.)

☐ Channelized Ditch
☐Deeply incised-steep, straight banks ☐Both banks undercut at bend ☐Channel filled in with sediment
☐ Recent overbank deposits ☐Bar development ☐Buried structures ☑Exposed bedrock
☐ Excessive periphyton growth ☐ Heavy filamentous algae growth ☐Green tinge ☐ Sewage smell
Manmade Stabilization: ☒N ☐Y: ☐Rip-rap, cement, gabions ☐ Sediment/grade-control structure ☐Berm/levee
Flow conditions : ☐High ☐Normal ☒Low Absent
Turbidity: ☐Clear ☐ Slightly Turbid ☐Turbid ☐Tannic ☐Milky ☐Colored (from dyes)
Good potential for Wetlands Restoration Project?? ☑ **YES** ☐**NO Details** _____

Channel Flow Status

Useful especially under abnormal or low flow conditions.

A. Water reaches base of both lower banks, minimal channel substrate exposed	☐
B. Water fills >75% of available channel, or <25% of channel substrate is exposed	☐
C. Water fills 25-75% of available channel, many logs/snags exposed	☐
D. Root mats out of water	☐
E. Very little water in channel, mostly present as standing pools	☒ Dry

Weather Conditions: 71° sunny clouds **Photos:** ☐N ☑Y ☐ Digital ☐35mm

Remarks: _____

I. Channel Modification

	Score
A. channel natural, frequent bends	(5)
B. channel natural, infrequent bends (channelization could be old)	4
C. some channelization present	3
D. more extensive channelization, >40% of stream disrupted	2
E. no bends, completely channelized or rip rapped or gabioned, etc	0

☐ Evidence of dredging ☐Evidence of desnagging=no large woody debris in stream ☐Banks of uniform shape/height

Remarks _____ Subtotal 5

II. Instream Habitat: Consider the percentage of the reach that is favorable for benthos colonization or fish cover. If >70% of the reach is rocks, 1 type is present, circle the score of 17. Definition: leafpacks consist of older leaves that are packed together and have begun to decay (not piles of leaves in pool areas). Mark as Rare, Common, or Abundant.

C Rocks C Macrophytes C Sticks and leafpacks R Snags and logs R Undercut banks or root mats

AMOUNT OF REACH FAVORABLE FOR COLONIZATION OR COVER

	>70% Score	40-70% Score	20-40% Score	<20% Score
4 or 5 types present	20	16	12	8
3 types present	19	15	11	7
2 types present	18	14	10	6
1 type present	(17)	13	9	5
No types present	0			

☐ No woody vegetation in riparian zone Remarks _____ Subtotal 17

III. Bottom Substrate (silt, sand, detritus, gravel, cobble, boulder) Look at entire reach for substrate scoring, but only look at riffle for embeddedness, and use rocks from all parts of riffle-look for "mud line" or difficulty extracting rocks.

A. substrate with good mix of gravel, cobble and boulders	**Score**
1. embeddedness <20% (very little sand, usually only behind large boulders)	15
2. embeddedness 20-40%	(13)
3. embeddedness 40-80%	8
4. embeddedness >80%	3
B. substrate gravel and cobble	
1. embeddedness <20%	14
2. embeddedness 20-40%	11
3. embeddedness 40-80%	6
4. embeddedness >80%	2
C. substrate mostly gravel	
1. embeddedness <50%	8
2. embeddedness >50%	4
D. substrate homogeneous	
1. substrate nearly all bedrock	3
2. substrate nearly all sand	3
3. substrate nearly all detritus	2
4. substrate nearly all silt/ clay	1

Remarks _____ Subtotal 12

IV. Pool Variety Pools are areas of deeper than average maximum depths with little or no surface turbulence. Water velocities associated with pools are always slow. Pools may take the form of "pocket water", small pools behind boulders or obstructions, in large high gradient streams, or side eddies.

A. Pools present	Score
1. Pools Frequent (>30% of 200m area surveyed)	
a. variety of pool sizes	(10)
b. pools about the same size (indicates pools filling in)	8
2. Pools Infrequent (<30% of the 200m area surveyed)	
a. variety of pool sizes	6
b. pools about the same size	4
B. Pools absent	0

Subtotal 10

☐ Pool bottom boulder-cobble=hard ☐ Bottom sandy-sink as you walk ☐ Silt bottom ☐ Some pools over wader depth

Remarks _____

Page Total 44

V. Riffle Habitats

Definition: Riffle is area of reaeration-can be debris dam, or narrow channel area.

	Riffles **Frequent** Score	Riffles **Infrequent** Score
A. well defined riffle and run, riffle as wide as stream and extends 2X width of stream....	16	12
B. riffle as wide as stream but riffle length is not 2X stream width	14	7
C. riffle not as wide as stream and riffle length is not 2X stream width	10	3
D. riffles absent.....	0	

Channel Slope: ☒Typical for area ☐Steep=fast flow ☐Low=like a coastal stream Subtotal 14

VI. Bank Stability and Vegetation

FACE UPSTREAM	Left Bank Score	Rt. Bank Score
A. Banks stable		
1. little evidence of erosion or bank failure(except outside of bends), little potential for **erosion**..	7	7
B. Erosion areas present		
1. diverse **trees**, shrubs, grass; plants healthy with good root systems.....	6	6
2. few trees or small trees and **shrubs**; vegetation appears generally healthy.....	5	5
3. sparse **mixed** vegetation; plant types and conditions suggest poorer soil binding.....	3	3
4. mostly **grasses**, few if any trees and shrubs, high erosion and failure potential at high flow..	2	2
5. little or no bank vegetation, mass erosion and bank failure evident.....	0	0

Total 14

Remarks _____

VII. Light Penetration Canopy is defined as tree or vegetative cover directly above the stream's surface. Canopy would block out sunlight when the sun is directly overhead. Note shading from mountains, but not use to score this metric.

	Score
A. Stream with **good** canopy with some breaks for light penetration	10
B. Stream with **full canopy** - breaks for light penetration absent.....	8
C. Stream with **partial** canopy - sunlight and shading are essentially equal.....	7
D. Stream with **minimal** canopy - full sun in all but a few areas.....	2
E. **No canopy** and no shading.....	0

Remarks _____ Subtotal 7

VIII. Riparian Vegetative Zone Width

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d. width < 6 meters.....	1	1
2. breaks common		
a. width > 18 meters.....	3	3
b. width 12-18 meters.....	2	2
c. width 6-12 meters.....	1	1
d. width < 6 meters.....	0	0

Remarks _____ Total 6

Page Total 43

☐ Disclaimer-form filled out, but score doesn't match subjective opinion-atypical stream. **TOTAL SCORE** 87

Appendix G.
Site Photo Log

Heron
MY-05 (2023) Photo Log

Photo 1: Easement Fencing and Buffer Vegetation along UT 2

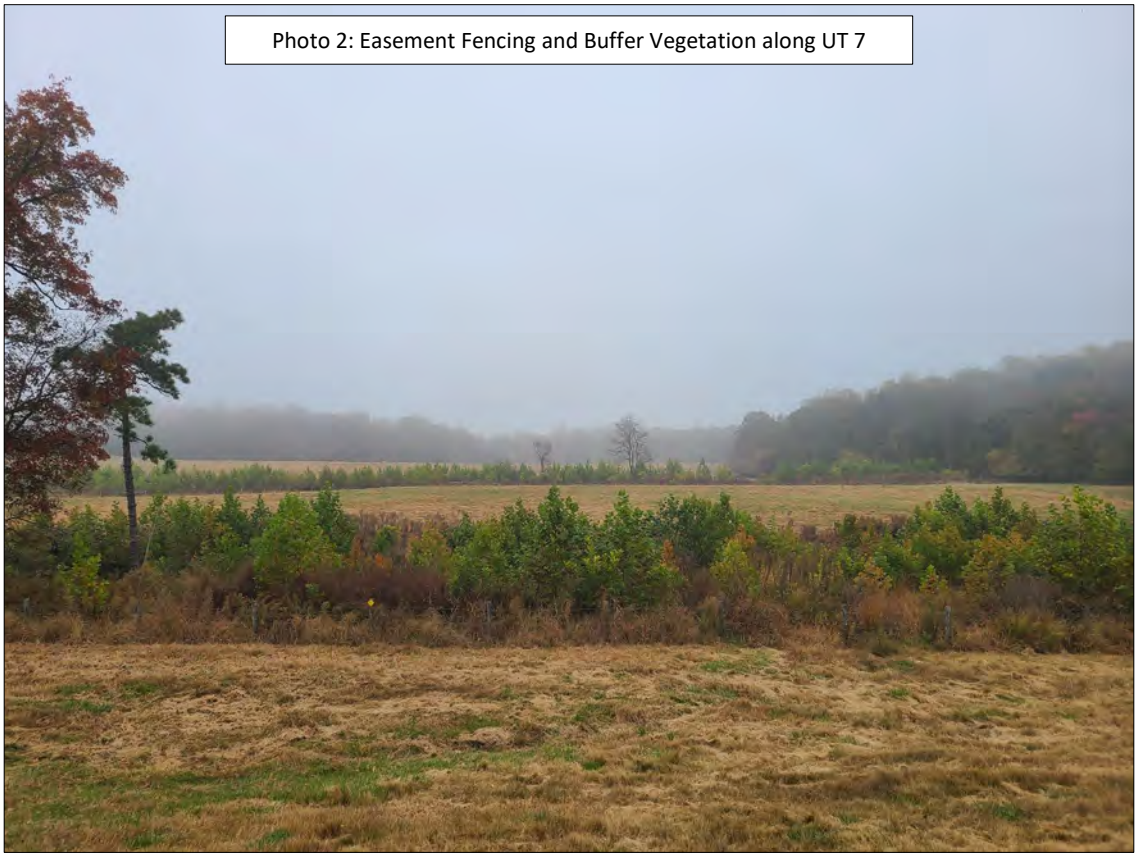


Photo 2: Easement Fencing and Buffer Vegetation along UT 7

Heron
MY-05 (2023) Photo Log

Photo 3: Easement Fencing along UT 5

Photo 4: Easement Fencing along UT 4

Heron
MY-05 (2023) Photo Log

Photo 5: UT 1B Piped Crossing – Upstream End

Photo 6: UT 1B Piped Crossing – Downstream End

Heron
MY-05 (2023) Photo Log

Photo 7: UT 4 Piped Crossing – Upstream End

Photo 8: UT 4 Piped Crossing – Downstream End

Heron
MY-05 (2023) Photo Log

Photo 9: UT 5A Piped Crossing – Upstream End

Photo 10: UT 5A Piped Crossing – Downstream End

Heron
MY-05 (2023) Photo Log

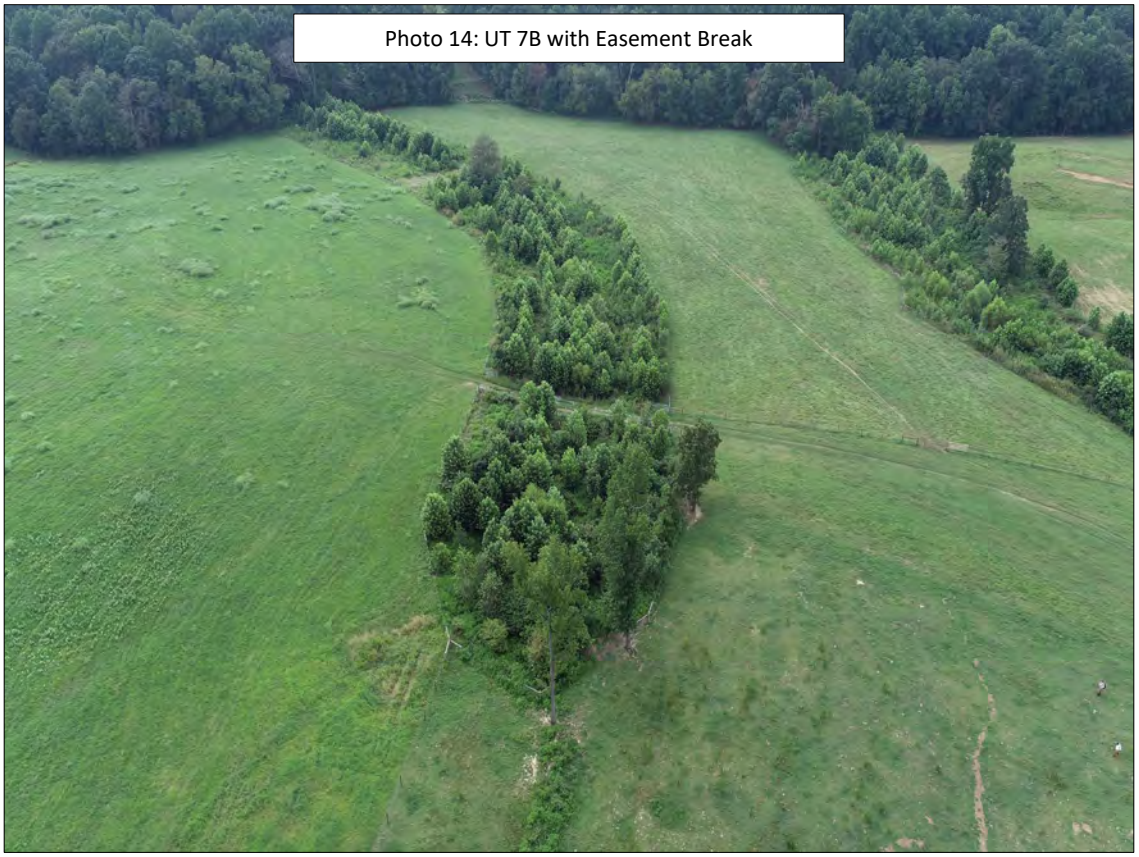
Photo 11: UT 7A Piped Crossing – Upstream End

Photo 12: UT 7A Piped Crossing – Downstream End

Heron
MY-05 (2023) Photo Log

Photo 13: UT5A with Easement Break

Photo 14: UT 7B with Easement Break



Heron
MY-05 (2023) Photo Log

Photo 15: Bud Burst of Ulmus americana
Photo Taken 2/28/23

Photo 16: Bud Burst of Betula nigra
Photo Taken 2/28/23

Heron
MY-05 (2023) Photo Log

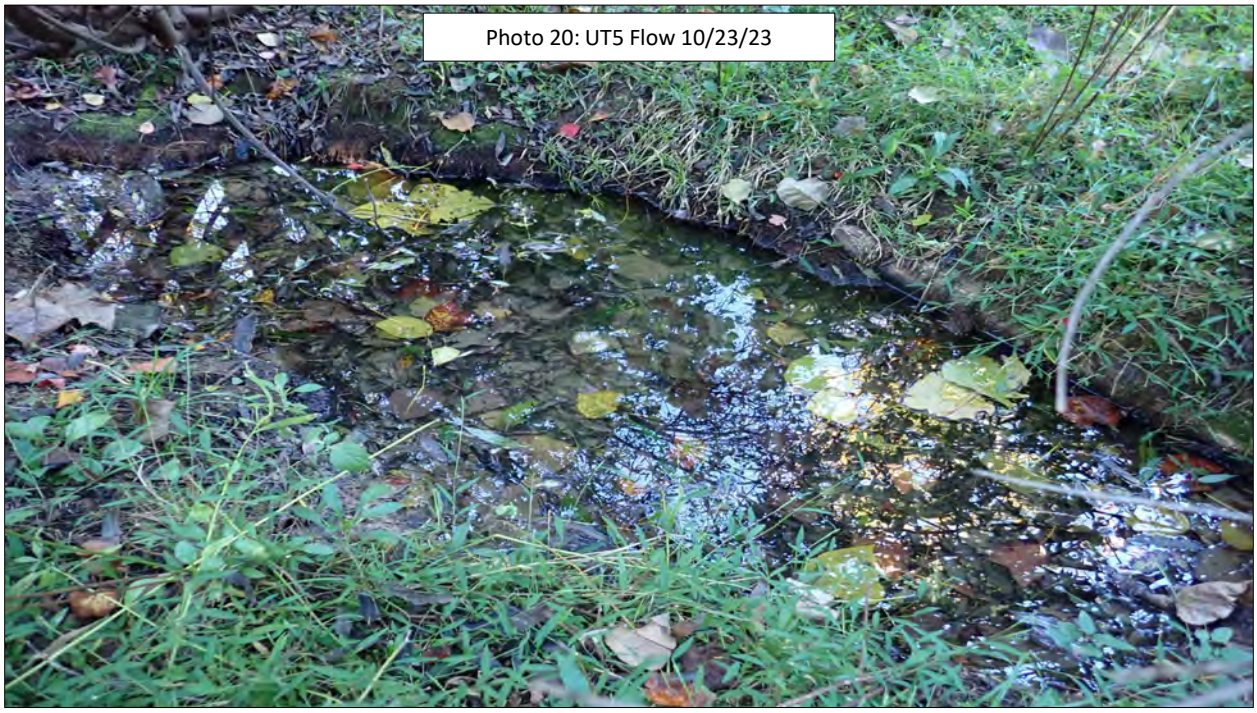
Photo 17: UT1 Flow 1/30/23

Photo 18: UT1 Flow 10/23/23

Heron
MY-05 (2023) Photo Log

Photo 19: UT5 Flow 3/19/23

Photo 20: UT5 Flow 10/23/23



Heron
MY-05 (2023) Photo Log

Photo 21: UT6 Flow 1/06/23


Photo 22: UT6 Flow 10/23/23

Heron
MY-05 (2023) Photo Log

Photo 23: UT7 Flow 1/15/23

Photo 24: UT7 Flow 3/29/23

Heron
MY-05 (2023) Photo Log

Photo 25: UT8 Flow 1/30/2023

Photo 26: UT8 Flow 4/22/23