Cascade Metro Park Cuyahoga River Restoration Valley View Phase 2 (NA16NMF4630341)

Post-Construction Monitoring Report: Year 3 (2023)

April 2024

Prepared by:

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Describing the methods and results of multiple metrics for post-construction monitoring for the former Valley View golf course restoration project in The City of Akron, Summit County, Ohio.

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1 ACKNOWLEDGEMENTS

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2 INTRODUCTION

This report summarizes the post-construction and restoration monitoring efforts and results for the Cascade Metro Park Cuyahoga River Restoration Valley View Phase 2 Project (NA16NMF4630341) (*Project*), the methods for which are outlined in the Monitoring Plan for the Cascade Metro Park Cuyahoga River Restoration Valley View Phase 2 Project (NA16NMF4630341) (*Monitoring Plan*) **[1]**. Monitoring was conducted by Summit Metro Parks (*SMP*) biologists, United State Geologic Survey (USGS), EnviroScience, Inc., outside contractors, and other project partners.

Phase 1 Objectives:

The Project's Phase 1 Objectives were to restore 175 acres of the 200-acre property from a heavily altered golf course back to an ecologically well-functioning section of the Cuyahoga River and natural habitat by:

- Restoring approximately 33 acres of wetlands from former water hazard ponds
- Restoring approximate 4,500 linear feet of headwater stream
- Removing exotic species throughout the property
- Seeding approximately 200 acres with native seed mixes
- Reforesting approximately 116 acres of the property

Phase 2 Objectives:

Phase 2 Objectives, about which this report is concerned, were to restore approximately 5,000 feet of the Cuyahoga River to remove Area of Concern (AOC) Beneficial Use Impairments (BUI) by implementing the following Project goals measured by the following performance standards.

Table 1: AOC BUI Project Goals and Performance Goals

Project Goals	Performance Goals	Monitoring Method
Improve the in-stream habitat to primarily focus on removing BUIs for fish population, benthos, and loss of fish habitat	Attainment of WWH Criteria with IBI Narrative Range Scores of ≥ 40 or 36-39	Ohio EPA biological criteria for IBI
	Attainment of WWH Criteria with ICI Narrative Range Scores of ≥ 34 or 30-33	Ohio EPA biological criteria for ICI
	QHEI 74-84	Ohio EPA biological criteria for QHEI
Restore hydrologic connection to an accessible floodplain	Bank Height Ratio 1.0-1.2 in Tier I floodplain expansion areas	Morphologic Cross Section Survey
	Increase bankfull recurrence interval flood prone width by at least 2x in floodplain expansion areas	Morphologic Cross Section Survey
	Verify regular inundation / utilization of restored floodplain areas	Visual Observations / USGS Gage readings / On-site water level monitor

Funding was secured from the National Oceanic and Atmospheric Administration (NOAA), The Great Lakes Commission (GLC), and Ohio Public Works, Clean Ohio Conservation Fund (Clean Ohio). Project success and attainment is measured by several required metrics for reporting. Deviations from the monitoring plan, supplemental monitoring, and recommendations for further monitoring will be discussed in applicable sections in the body of this report.

These environmental data and related items of information have not been formally disseminated by NOAA, and do not represent, and should not be construed to represent, any agency determination, view, or policy**.**

Table 2: Monitoring Schedule

Monitoring Effort	Agency Reporting Requirements	Monitoring Year				
		Year 1 (2021)	**Year 2 (2022)**	**Year 3 (2023)**	**Year 4 (2024**	**Year 5 (2025)**
As-Built Survey	NOAA, AOC/Ohio EPA	X				
Stream Morphology	NOAA, AOC/Ohio EPA	X	X	X	X	X
IBI	AOC/Ohio EPA	X		X		X
QHEI	AOC/Ohio EPA	X		X		X
ICI	AOC/Ohio EPA	X		X		X
USGS Staff Gage	NOAA, AOC/Ohio EPA	X	X			
Wrack Line Photos	NOAA, AOC/Ohio EPA	X	X			
Reporting	NOAA, AOC/Ohio EPA	X	X	X	X	X

Instream habitat enhancements included boulder and cobble clusters, as well as woody debris placements. Boulder types are ODOT A+, A, B, C, and D sizes, arranged as per plan. Specified quantities are included below.

Table 3: Cuyahoga River Habitat Enhancement Structure Descriptions and Quantities

Habitat Item	Quantity
Boulder Structures	359
Woody Habitat Structures	117

3 METHODS

Monitoring methods listed below are derived directly from the Monitoring Plan **[1]**.

3.1 HABITAT METRICS

3.1.1 Qualitative Habitat Evaluation Index (QHEI)

The fish community habitat was evaluated at each fish sampling location using the QHEI **[2]**. Habitat assessments were conducted in conjunction with the fish community assessments. Data was recorded using the Ohio EPA QHEI form that is included in Attachment B. All habitat assessments will be conducted by personnel who have met the Ohio EPA Level 3 QDC requirements for habitat assessment (QHEI), fish community evaluation, or both. In addition, proposed biological and habitat data collection and evaluation methods will meet the quality criteria for Level 3 Credible Data under Ohio EPA's credible data program and will be conducted or directly overseen by staff who have received Level 3 QDC status for the various disciplines.

3.1.2 As-Built Survey / Stream Morphology / Hydrologic Reconnection

Per the Monitoring Report **[1]**: To satisfy NOAA Tier I monitoring requirements for hydrologic connectivity, as well as address the Ohio EPA BUI for hydrologic connectivity, EnviroScience completed an as-built survey with spatial coverage and resolution that is comparable to the level of detail and contours available from pre-design surveys as in the design drawings. The as-built drawings show the final elevations and cross sections of the channels, and land installed or altered by the project. Summit Metro Parks also evaluated morphologic cross sections following the approved QAPP and methods outlined within that document using sound surveying practices. Permanent cross-section pins were established to facilitate annual re-survey. Cross sections were established during the as-built phase of the project and marked with a start and end pin.

The cross-section locations identified in Attachment A are designed to evaluate the major work areas of the project and to demonstrate hydrologic reconnection of floodprone areas. These cross sections will be surveyed annually to evaluate changes each year for the duration of the monitoring period (five years). Data collection shall be performed by a qualified person that is trained in the identification and survey of morphologic features, as outlined in the approved QAPP.

The cross-sectional evaluation will identify key features annually at each cross section to facilitate comparison and analysis. Bankfull is a key feature that marks the active floodplain and provides a consistent reference point for use in comparing rivers. It is generally associated with the point prior to floodplain inundation. Correct identification is necessary for stream classification and description of morphological variables. Personnel performing the monitoring seek indicators in locations appropriate for stream types and use multiple indicators to reinforce bankfull estimates. Bankfull indicators should be generally consistent through an entire reach and at a consistent elevation above the water surface.

Each cross section begins on the top of the start pin called the "left end pin" (LEP) on the left bank of the river. The left and right banks are defined in a downstream direction. Cross-sectional data were recorded using specific notation to denote key features. Data recorded in-between key features were recorded with a "ground" or "g" note. The toe of the floodplain and top of bank on the grade out to the original terrace shall be identified. Bankfull (BKF) feature(s) were identified, at a minimum, on one bank right or left. The active channel begins below the bankfull

location. Recording of station and elevation will continued into the active channel with changes every 0.1-0.3 ft in elevation. All shots were recorded as stream bed (SB) unless they are the following required locations. The stations and elevation of the current left and right edges of water (LEW and REW), which is where the water level hits the side of the bank, were marked. The thalweg (THL) was identified in each section. The thalweg is deepest point in the channel.

See the diagram below as a visual representation of the key features for each cross section. The number of points will vary for each section to capture the proper detail.

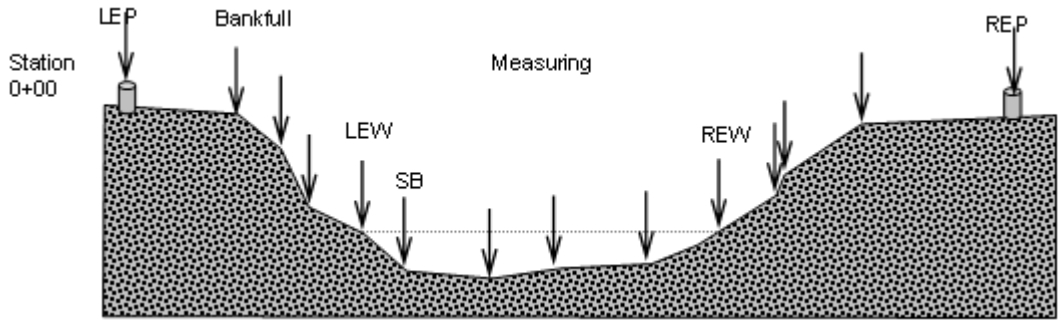


Figure 1: Key Features for Each Cross Section

3.1.3 USGS Staff Gage / Flood Monitoring

The USGS gage (USGS 04206000 Cuyahoga River at Old Portage OH) was used to determine major flooding events. Supplemental river level data was supplied by two Intellisense Systems, Inc. (20600 Gramery Place, Torrece, CA 90501; 310.320.1827) monitors installed at the southeast and northwest areas of the Project. Representative photos of river levels and debris were taken during flooding events where the Cuyahoga River has risen into the adjacent floodplain.

3.2 BIOTA METRICS

3.2.1 Index of Biotic Integrity (IBI)

Per the Monitoring Plan **[1]**: Fish sampling was conducted using a pulsed DC current electrofishing unit via the boat electrofishing method, which has been selected due to the stream size and drainage area exceeding 300 square miles. The drainage area at the site is approximately 402 square miles. Fish were collected and placed in a live well for identification and enumeration. Sampling consisted of shocking all available habitat types within a 500-meter zone from an upstream to downstream direction. Fish specimens were identified to species level in the field, counted, and examined for the presence of external anomalies, including DELTs (deformities, eroded fins, lesions, and tumors). The three sampling sites have a mix of water depths and current velocities, which create unique and, at times, hazardous electrofishing conditions. Samplers and crew leaders modified techniques to get a representative sample of the community. These techniques included, but were not limited to, multiple passes through high velocity areas, walking the boat using the boom as a modified "sport yak" method, using at least two netters, and being extra cautious to capture darter species that remain on the bottom between rocks.

Fish assessments were conducted on two dates (two passes). All fish assessments were conducted during the sampling season and occurred between the dates of June 15 through September 30.

Sampling passes at the project were separated by a period of 4-6 weeks. Photos were taken of each species collected and representatives from each species were preserved as a voucher for the verification of the field identifications. Endangered species and those too large for preservation were not be collected as voucher specimens, but were instead be photographed and returned to the stream. Photographed vouchers included features that permit definitive identification of the species. Fish were preserved in 10 percent formalin in the field.

Field water chemistry assessments were conducted at all the sampling sites at the time of each biological sampling event. Field measurements were taken using a portable YSI Pro DSS Multi-Parameter Water Quality Meter, or equivalent. Measurements were taken for water temperature, pH, specific conductance, and dissolved oxygen. The field meter was calibrated in accordance with the manufacturer's specifications prior to each sampling event.

One to two fish specimens of each species collected were preserved in the field using a 10 percent formalin solution. Upon receipt in the laboratory, specimens were processed for permanent storage using the following procedure:

- Allowed to set for 5 to 7 days.
- Soaked in tap water for 24 to 48 hours.
- Transfered to solutions of 30 and 50 percent ethanol for 5 to 7 days each.
- Transfered to a final preservative of 70 percent ethanol for long-term storage.

Specimens larger than six inches were slit along the right side and then soaked in formalin for approximately 10 to 14 days before being transferred to water and solutions consisting of 30, 50, and 70 percent ethanol. All identifications were conducted and confirmed by Level 3 QDC fish taxonomists.

For all sampling activities, stream flow conditions were assessed prior to travel to the facility for biological sampling to ensure that flood or drought conditions were not present that would hinder the collection of valid samples. This evaluation included the examination of National Weather Service data and forecasts, and USGS streamflow data from the nearby gauging station, Cuyahoga River at Old Portage (04206000). The site should be at base flow conditions, which are represented by a range of 100-300 cubic feet per second (cfs).

Fish community data was used to compute IBI scores in accordance with Ohio EPA protocols The Modified Index of Well Being (MIwb) was calculated for the boat sites. Attainment status will be summarized by comparing the results to the biological criteria listed in OAC 3745-1-07 and applicable Ohio EPA narrative scoring guidance."

3.2.2 Invertebrate Community Index (ICI)

Qualitative macroinvertebrate samples were collected by sampling all available habitats using a kick net and hand picking of organisms from in situ substrates, debris, and plant materials. Sampling was conducted for a minimum of thirty minutes or until no new qualitative taxa were observed. Field observations regarding the types of macroinvertebrates observed, their relative abundances, and habitat and water quality observations will be recorded on a Macroinvertebrate Field Data Sheet. Field voucher organisms from all discernable taxa collected were preserved in 85 percent ethanol and taken to the laboratory for examination and identification to the lowest practicable taxonomic level following Ohio EPA protocols. The biological criteria for evaluating qualitative macroinvertebrate data is based upon presence of Ephemeroptera, Plecoptera and Trichoptera

(EPT) and sensitive taxa (ST) **[3]**. Sensitive taxa are defined as those considered intolerant and moderately intolerant to pollution.

4 RESULTS: RESTORATION METRICS FOR PHASE 2

4.1 HABITAT METRICS

4.1.1 Qualitative Habitat Evaluation Index (QHEI)

QHEI evaluations were conducted concurrently with IBI surveys at the two Project sampling locations. Scores increased significantly post-restoration, most-notably in the Substrate, Instream Cover, and Riffle / Run metrics due to the placement of boulder clusters, woody debris, and the in-stream creation of riffles. Both sites are in attainment of the restoration performance goals. It should be noted that Site 3 (Ohio EPA) was sampled pre-project.

Table 4: QHEI Scores for the Cuyahoga River within the Project Site 2021

Metric	Cuyahoga River 2021 (Year 1)			
	Max. Pts.	Site 1 (Upstream) RM 42.1	Site 2 (Downstream) RM 41.6	Site 3 (Ohio EPA) RM 41.4
Substrate	20	19	19	13
Instream Cover	20	14	14	10
Channel Morphology	20	16.5	17.5	9.5
Bank Erosion and Riparian Zone	10	6.75	5	8.5
Pool / Glide Quality	12	12	12	9
Riffle / Run Quality	8	7.5	7.5	0
Gradient	10	10	10	10
Total QHEI Score	100	85.75 (Excellent)	85 (Excellent)	60.5 (Good)

Table 5: QHEI Scores for the Cuyahoga River within the Project Site in 2023

Metric	Cuyahoga River 2023 (Year 3)			
	Max. Pts.	Site 1 (Upstream) RM 42.1	Site 2 (Downstream) RM 41.6	Site 3 (Ohio EPA) RM 41.4
Substrate	20	18	17	13
Instream Cover	20	12	11	10
Channel Morphology	20	16	16	9.5
Bank Erosion and Riparian Zone	10	7.5	7	8.5
Pool / Glide Quality	12	12	11	9
Riffle / Run Quality	8	6.5	6.5	0
Gradient	10	10	10	10
Total QHEI Score	100	82 (Excellent)	78.5 (Excellent)	60.5 (Good)

The pre and post restoration QHEI scores reflect a substantial improvement in the quality of habitat for both Sites with a 12.75- and 16.25-point increase for Site 1 and 2, respectively in 2021. Narrative habitat scores improved from Good to Excellent for both assessment sites. The cover metric was targeted specifically with the restoration approach by adding instream woody habitat, boulders, and rock clusters throughout the project area. Creating areas of flow diversity and

turbulence with the wood boulders and rock spurs creates numerous areas of microhabitats for fish and macroinvertebrates as a basis for improving cover. Flow diversity and bottom substrate diversity were two of the main limiting factors of the physical habitat within the project area. The riffle/run metric also saw a substantial increase due to the improvement to the substrates, stability, and quality of the riffles where improvements were directed. The bank erosion/riparian metric is one metric that saw a slight reduction or no immediate improvement due to the initial disturbance of construction activity associated with a riverfront access area. However, the foundation is set for that metric to improve in the years to come due to floodplain accessibility, live stakes, native seed, and tree plantings. The reduction in bank height and creation of an accessible floodplain saw substantial deposition of sandy bedload material in the floodplains that normally would have embedded the river substrates.

The improvement in the habitat quality within the project area is further demonstrated when habitat attributes are examined within the QHEI evaluation data. Ohio EPA assigns several sub-metric scores within the QHEI protocol as Warmwater Habitat (WWH), Low Influence Modified Warmwater Habitat (MWH), or High Influence MWH attributes (Ohio EPA, 1989). The number of each category of attributes can give insight to the types of impairments present within an evaluated stream reach. For example, streams with 2 or more High Influence MWH attributes rarely, if ever, attain the WWH biological criteria for fish.

Comparisons of the QHEI attributes present at Sites 1 and 2 during 2019 pre-project assessments are compared to the results of the 2021 and 2023 assessments in Table 5. In 2019, both sampling sites were found to have little functional fish cover (a High Influence MWH attribute) as well as several Moderate Influence MWH attributes. In comparison, the stream was found to have no MWH attributes of either category present during the post-restoration evaluations in 2021. The quality of the fish habitat can be expected to improve more in the coming years as the channel evolves as the result of improved floodplain condition and as riparian vegetation becomes re-established along the stream corridor.

Year 3 QHEI results in 2023 show a continuation of high-quality excellent habitat at the three sites post construction. Variability between the 2021 and 2023 score are likely due to individual scoring differences of the assessor**.**

Deviations from the Monitoring Plan: None

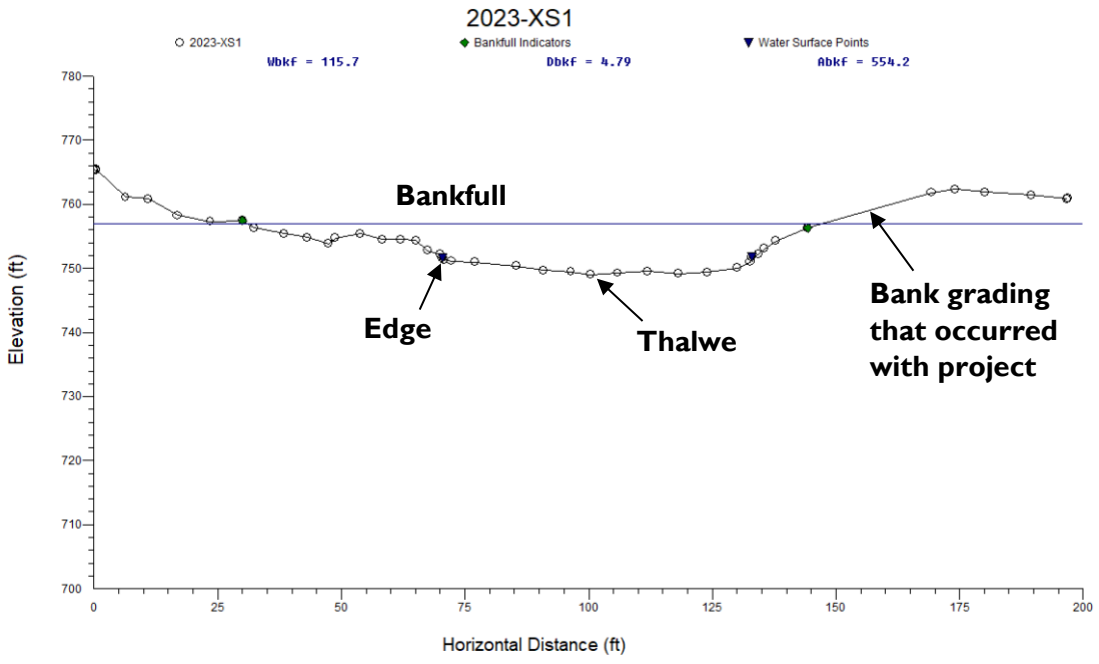
Recommendations for Continued Monitoring: None. QHEI evaluations will be conducted according to the Monitoring Plan again in Year 5 (2025)

4.1.2 As-Built Cross Sections / River Morphology

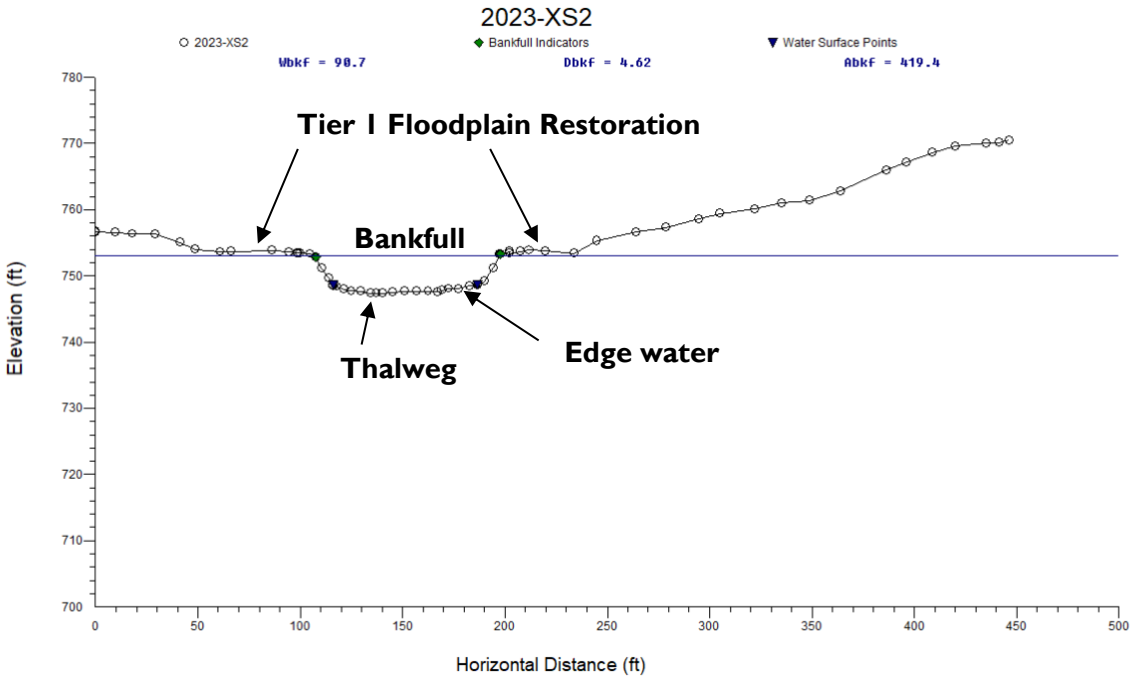
Four cross sections (XS1-XS4) were surveyed to document the post-construction condition (Attachment A, Sampling Locations). Each cross section should be evaluated with consideration of each respective X and Y axis scale, especially the X axis as some cross sections are considerably wider than others. Table 2 provides a morphologic summary of the cross-sectional data with respect to the bankfull (BKF) indicators. Width depth ratio (W/D) is a parameter to describe channel shape. The Cuyahoga River in this reach is characterized as a Type C channel by the Rosgen classification system. In other words, it is a meandering, low gradient (<2.0%) stream in a wide terraced alluvial valley.

Table 6: Morphologic Cross Section Parameters Summary

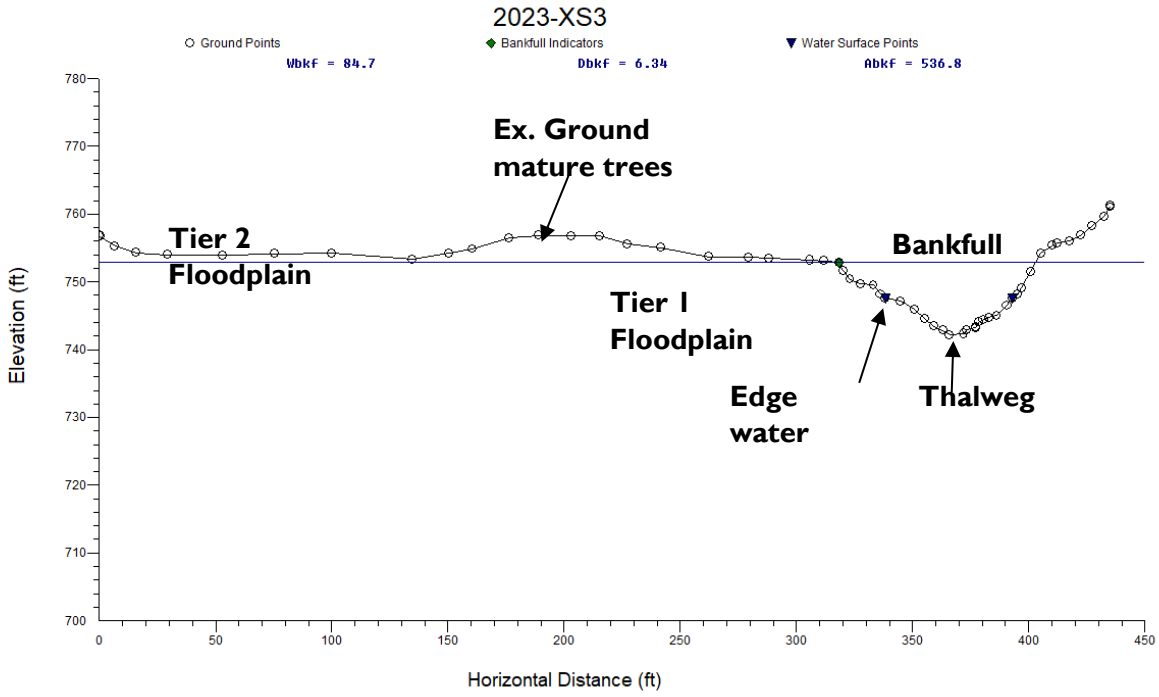
XS	BKFW (ft)	BKF Area (ft^2)	BKF mean depth (ft)	BKF max depth (ft)	W/D	Feature
1	115.75	554.17	4.79	7.85	24.16	Riffle
2	90.73	419.41	4.62	5.68	19.64	Riffle
3	82.54	536.83	6.3	10.69	13.36	Pool
4	95.22	586.98	6.16	8.73	15.46	Riffle



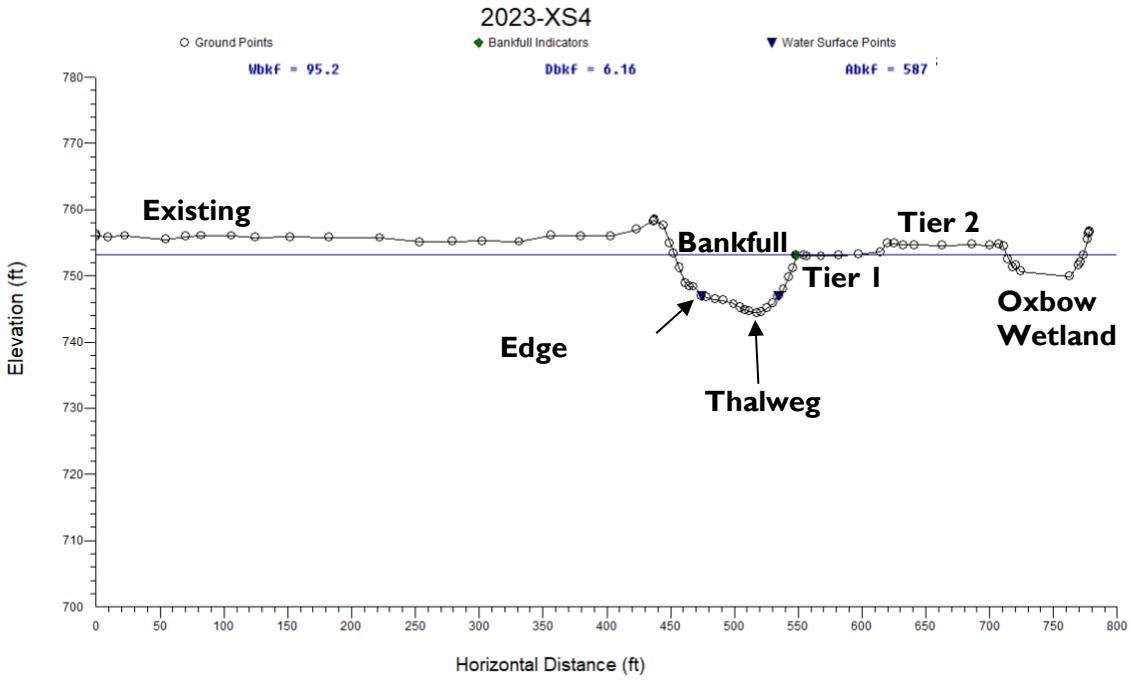
Cross Section 1 occurred at the upstream end of the project and captures the bank stabilization grading that occurred along the right descending bank. The slope was graded to approximately a 2:1 slope, treated with sandstone rip-rap, native seed and live stakes. No grading occurred on the left descending bank at this cross-section location.



Cross section 2 represents a reach where both the right and left banks of the river were excavated to create a new Tier 1 floodplain.



Cross section 3 represents an area where the left bank was excavated to create a Tier 1 floodplain. Station 10 to 150 on the section represents the Tier 2 floodplain area. The area between station 150 and 250 represents the existing ground elevation where a group of mature trees were preserved.



Cross section 4 represents the lower reach of the project where floodplain was created along the right descending bank. The cross section captures both the Tier 1 and 2 floodplain elevations as well as the former pond that was converted into an oxbow wetland.

The on-going recovery of the project area can be evaluated and compared to the baseline condition of cross sections 1-4. It is well documented that the created floodplains were cut to their proposed target grades accurately across the entire section as displayed by the flat consistent elevation through the floodplain tiers.

Several flood events have accessed the created floodplains since construction. Evidence of floods was observed by the presence of debris lines, bent herbaceous vegetation, and deposition of sand in the floodplain. Cross section 2 showed approximately 0.5 ft of sand deposition in the floodplain in 2022 and has remained consistent in 2023.

4.2 BIOTA METRICS

Caveat: Sampling results and scores from agency partners have not been fully QA'd, and therefore may be subject to later revision.

4.2.1 Index of Biotic Integrity (IBI)

Fish monitoring in 2023 was a combined effort between Summit Metro Park, EnviroScinece, and the United States Geologic Survey (USGS). The USGS has been conducting fish work in the area related to the future removal of the Gorge Dam. Their work involves extensive fish sampling and it was felt that the combined work of both projects might overly stress the fish community and affect results. The first round of sampling was performed by EnviroScience and data for the second round was provided by the USGS. Table 7 indicates the ecoregional biocriteria for the boat survey method. Table 3 provides a summary of IBI sampling locations, numerical scores, narrative scores, as well as attainment statuses. See Appendix C for photos of fish sampled during the events.

Table 7: EOLP Biological Criteria for Boat Method (Fish)

Narrative	IBI	Miwb	Note
Exceptional	≥48	≥9.6	
Very Good	44 - 47	9.1 - 9.5	
Good	40 - 43	8.7 - 9.0	Bold = Biological Criterion
Marginally Good	36 - 39	8.2 - 8.6	Non-Significant Departure Range
Fair	26 - 35	6.4 - 8.1	
Poor	16 - 25	5.0 - 6.3	
Very Poor	<16	<5.0	

Fish community assessments were conducted during the 2023 sampling season by EnviroScience on June 28th at RM 42.1 (Site 1), 41.6 (Site 2) and 41.4 (Site 3). Projects partners (US EPA, USACE, and USGS) sampled on July 14th and August 30th. Field data forms for the fish collection events are provided in Appendix A. Prior to 2023, sampling methodologies differed slightly between 2021 and 2019. First, two rounds of fish collection were conducted in 2021 vs. a single round in 2019. In addition, in 2021 the sampling of riffles within both sites was aided by using long-line wading electrofishing equipment in the shallows vs. wading in the proximity of the boat during the 2019 effort (use of Ohio EPA Method C in 2021 vs. Method B in 2019). In 2023, only one round of sampling was conducted on June 28th at Sites 1 and 2 as well as Site 3 which is just downstream of the project area. Only one round of sampling was performed in 2023 due to timing of other electrofishing work being conducted in the park associated with a USGS study for the Gorge Dam Removal project.

Table 8 provides an overall summary of all fish species captured during all sampling events. Complete fish species lists, including relative numbers and relative weights for fish captured, as well as the number of deformity(s), eroded fin, lesion, and tumor (DELT) anomalies observed at each location, are provided in Appendix A. Detailed scoring results for Index of Biotic Integrity

(IBI) metrics, total IBI scores, and Modified Index of Well-Being (MIwb) values for the sites are presented in Attachment E.

In 2019, there were 18 species collected cumulatively between Sites 1 and 2. The number of fish species collected in 2021 increased to 26 cumulative species between the two site sites (Table 1). In 2021, there was a drop in species richness and abundance noted in the late summer (i.e., the second round) samples, but the number of species capture still exceeded the 2019 sample. Overall, the increase in species diversity and particularly abundance was an improvement over the baseline sample.

A total of 31 fish species were noted for the project area. This (2024) is an off-year for fish monitoring and these data were collected by the USGS as part of their work related to the nearby Gorge dam removal project.

Notably, one of the species that was collected in 2021 was a Flathead Catfish (*Pylodictis olivaris*). This species is not indigenous within the Lake Erie drainage and had not previously been collected as far upstream from Lake Erie. However, the removal of the Route 82 dam downstream of Valley View Park may have allowed this species to move upstream from Lake Erie, as it is known to have become established there. This is the first record of its capture in a scientific sample from the Cuyahoga River in the vicinity. It should be noted that it is also possible that this species may have migrated downstream from the Tuscarawas River via the Summit Lake - Ohio Canal connection of the Tuscarawas River to the Little Cuyahoga River. This route presents a danger for the Cuyahoga River and Lake Erie for the migration of Asian carp from the Ohio River basin to the Great Lakes that could affect Valley View Park in the future. A large Northern Pike (*Esox lucius*) was also captured during the sampling of Site 1 during both rounds of sampling in 2021 which was a new and desirable species for the site. This species was not present in 2023 sample.

In 2023, a total of 32 species were captured within the project area with the number of species present at sites varied from 15-16 species. Relative abundance was lower than the 2021 samples but higher than the pre-construction values in 2019. Dominant species at all three sites were Northern Hog Sucker and River Chub which are both desirable native species.

Table 8: Fish Species Detected During Sampling

Species	2019	2021	2022	2023	2024	2025
Bigmouth Buffalo			X	X		
Black Bullhead			X			
Bluegill Sunfish	X	X	X	X		
Black Crappie		X		X		
Blacknose Dace		X				
Bluntnose Minnow	X	X	X	X		
Bowfin			X			
Brook Silverside			X			
Channel Catfish			X	X		
Central Stoneroller	X	X	X	X		
Common Carp			X	X		
Common Shiner	X	X	X	X		
Creek Chub		X				

Species	2019	2021	2022	2023	2024	2025
Fantail Darter	X	X		X		
Flathead Catfish		X				
Gizzard Shad		X	X	X		
Goldfish				X		
Grass Carp				X		
Green Sunfish	X	X	X	X		
Greenside Darter	X	X	X	X		
Largemouth Bass		X	X	X		
Johnny Darter	X	X		X		
Logperch Darter		X	X	X		
Northern Hog Sucker	X	X	X	X		
Northern Pike		X	X	X		
Pumpkinseed Sunfish			X	X		
Quillback Carpsucker			X			
Rainbow Darter	X	X	X	X		
Rainbow Trout				X		
River Chub	X	X	X	X		
Rock Bass			X			
Sand Shiner	X	X		X		
Silver Redhorse				X		
Silverjaw Minnow	X	X				
Smallmouth Bass	X	X	X	X		
Spotfin Shiner	X	X	X	X		
Spotted Sucker			X	X		
Suckermouth Minnow			X			
Warmouth Sunfish			X	X		
White Perch	X		X			
White Sucker	X	X	X	X		
Yellow Bullhead	X	X	X	X		
Yellow Perch		X	X	X		
Total Number of Species	18	26	31	32		

Table 9: IBI Sampling Locations, Scores, and Attainment Status

Year/RM	Date	Drainage (mi^2)	Sampler Type	QHEI	IBI	MIwb	Narrative	Attainment
2019 (Baseline)								
42.1 (Site 1)	10/4/2019	401	A	73.5	34	6.93	F[[1]1]/F	NON
41.6 (Site 2)	10/4/2019	402	A	68.75	30	5.07	F/P[2]	NON
41.4 (OEPA)	10/3/2019	402	A	60.5	38	7.51	MG[3]/F	PARTIAL
2021 (Year 1)								
42.1 (Site 1)	8/6/2021	401	C		*36*	*8.39*	*MG/MG*	*FULL*
	9/29/2021	401	C		*38*	*7.83*	*MG^N/F*	*PARTIAL*
	Average			85.75	37	8.11	MG/MG	FULL
41.6 (Site 2)	8/6/2021	402	C		*38*	*7.83*	*MG/F*	*PARTIAL*
	9/29/2021	402	C		*30*	*6.27*	*F/P*	*NON*
	Average			85	34	7.05	F/F	NON
2023 (Year 3)								
42.1 (Site 1)	6/28/2023	401	C		44	7.7	VG/F	*PARTIAL*
	7/14/2023[1]	401	C		36	6.7	MG/F	*FULL*
	8/30/2023[1]	401	C		36	7.9	MG/F	*FULL*
	Average			82	36	7.3	MG/F	FULL
41.6 (Site 2)	6/28/2023	402	C		38	7.6	MG/F	*PARTIAL*
	7/14/2023[1]	402	C		34	6.9	MG/F	*PARTIAL*
	8/30/2023[1]	402	C		40	8.1	G/F	*FULL*
	Average			78.5	37	7.5	MG/F	PARTIAL

The baseline assessment in 2019 found low species richness and fish biomass ultimately leading to Non-Attainment of Sites 1 and 2 and Partial Attainment at the Ohio EPA site, Site 3. The data was collected slightly later in the season in early October as compared to 2021, and therefore would be most comparable to the second round of the post-construction 2021 data. Furthermore, the RM 41.4 data was collected by the Ohio EPA and represented data collected at the downstream limit of the site and a portion slightly outside the project area. Nonetheless, the 2019 data showed less species and lower biomass than the 2021 post-construction samples. The White Sucker (*Catostomus commersonii*) was the most abundant species present both numerically and in terms of biomass at all locations sampled in 2019. The White Sucker is a pollution-tolerant fish species, and dominance of tolerant species negatively impacts score for both the IBI and MIwb.

The post-construction 2021 samples showed a positive shift in the number of individuals captured both in terms of total fish captured and the relative numbers minus pollution tolerant and non-

[1] Sampling conducted by agency partners

native species that positively affect the IBI scores. Overall attainment of the Ohio EPA biocriteria improved at both sites with Site 1 found to be in attainment and Site 2 found to be in Partial Attainment for one of the 2021 sampling passes. Comparison of overall catch indicators is provided in Table 4. Data sheets provide a site-by-site summary of these results, but for example Site 1 in 2019 had only 113 individuals captured which corresponds to a total relative number of 226 individuals per km (198 per km when tolerant and non-indigenous fish are removed). In comparison, the 2021 sampling resulted in an increase to an average relative number of 806 individuals per km for the two passes at Site 1 (696 individuals per km when tolerant and non-indigenous species are removed). This equates to an increase in abundance of 2.5 times the number observed in 2019. The results for Site 2 were similar as the overall catch increased from 90 individuals per km to 303 per km between 2019 and 2021 (roughly a 3-fold increase in fish abundance).

A notable shift in the fish community was the change in dominance of biomass between White Suckers as compared to Northern Hog Suckers (*Hypentelium nigricans*) observed when comparing data from 2019 to the 2021 surveys. This change was particularly evident during the first round of sampling in August of 2021 but holds true for the 2021 averaged data as well. At both sampling sites, the relative numbers and relative biomass of White Suckers showed little change between years, but four and nine-fold increases in numbers and biomass of Hog Suckers between the 2019 and 2021 assessments. The Northern Hog Sucker is an insectivorous species listed by Ohio EPA as a sensitive species that does not tolerate pollution well. Increases in the abundance of this species is a good indicator of ecological recovery. It is anticipated that as time passes, additional round bodies sucker species such as Redhorse (several possible species) and Spotted Sucker (*Minytrema melanops*) will migrate up the Cuyahoga River to become reestablished within the Valley View Park. The recent removal of the last dam between Valley View Park and Lake Erie bodes well for this to occur in the near future.

It is also notable to see a substantial increase in River Chub (*Nocomis micropogon*), as they became the most abundant fish species numerically in 2021 at both sampling locations (Figure 1). In 2019, River Chub were only represented by 10 individuals between the two sites while in 2021 they were represented by 342 individuals in the first round of sampling. It is also notable that Smallmouth Bass (*Micropterus dolomieu*) abundance and biomass appear to be unaffected by the restoration work, as both measures remained stable at both sampling locations.

In 2023, the overall communities were improved from the 2021 sampling events, but the abundance and numbers of individuals were less than 2021. Northern hog sucker and river chub were still dominant or in the top percentage of the populations. Three fewer species were also collected in 2023 compared to 2021. Northern pike, flathead catfish, silverjaw minnow, yellow perch, gizzard shard and largemouth bass were not collected but added species in 2023 included the warmouth sunfish and unfortunately common carp and goldfish. However, the carp and goldfish were collected at Site 3 which is near the end of the project and much lower gradient predominantly pool habitat.

Table 9 shows the improving trend of IBI scores at the sites since 2019. Site 1 at RM 42.1 and Site 2 at RM 41.6 indicate an 8–10-point increase in IBI score going from a narrative rating of "fair" to "Very Good" and "Good". Despite these community improvements the sites still fall short in terms of abundance and specifically the modified index of well-being score (MIwb).

These scores fell in the "fair" range which puts the sites in Partial Attainment of warmwater habitat criteria.

Table 10: Comparison in Relative Numbers of Fish, % Tolerant Fish, and Relative Biomass, Valley View to Date

Station ID and Year	Site 1 2019	Site 1 YR 1 2021	Site 2 2019	Site 2 YR 1 2021	Site 2 YR 3 2023
Indiv./km (Total)	226	806	90	303	294
Indiv./km (Excl. Tolerant & Non-Native)	198	696	46	298	266
Percent Tolerant (by Weight)	12.4	10.4	46.7	16.8	7.7
Rel. Weight (kg/km)	8.89	25.86	9.99	6.9	15.99

4.2.2 Invertebrate Community Index (ICI)

Qualitative macroinvertebrate sampling was conducted at Sites 1 and 2 during the sampling season. A fine mesh seine net was used to capture organisms dislodged from various substrates for a period of at least 30 minutes per sample. Field observations regarding water and substrate conditions as well as types of macroinvertebrates captures, and relative abundances were recorded using a Summit Metro Parks Stream Assessment form (standard form for all stream assessments conducted by SMP volunteers and staff). Specimens were preserved in ethanol for further taxonomic analysis **[4]**. Macroinvertebrate samples are evaluated for the presence of *Ephemeroptera* (mayfly), *Plecoptera* (stonefly), and *Trichoptera* (caddisfly) (EPT) taxa as well as pollution sensitive taxa (ST) to determine qualitative stream health. Table 5 lists the ranges for determining WWH / CWH or Exceptional WWH (EWH) for qualitative macroinvertebrate sampling. Table 6 lists the results of macroinvertebrate sampling with narrative results to date.

Table 11: EPT and ST Taxa Qualitative Sampling Expectation Ranges

Ohio EPA Small River Qualitative Criteria	WWH / CWH	EWH
Qualitative EPT	**12**	**18**
Qualitative ST	**13**	**20**

Table 12: Macroinvertebrate Sampling; Number of EPT, ST, and Narrative Range Results

Sampling Year	River Mile	Stream Site	Qualitative Taxa	EPT Taxa	Sensitive Taxa	Tolerant Taxa	Narrative WWH / CWH Result
2018 (EPA)	41.4	RM 42.6[2]	51	14	12	6	Marginally Good[3]
2019 (Baseline)	42.1	Site 1	28	10	7	3	Marginally Good
	41.6	Site 2	25	9	4	5	Fair[4]

[2] Data collected by Ohio EPA, 2018
[3] Non-significant departure from ecoregional biocriterion (considered to be in attainment)
[4] Significant departure from ecoregional biocriterion

2021 (Year 1)	42.1	Site 1	16	6	8	4	Fair
	41.6	Site 2	19	7	9	4	Fair
2023 (Year 3)	42.1	Site 1	16	5	9	4	Fair
	41.6	Site 2	20	6	9	4	Marginally Good

Based upon Ohio EPA **[3]** scoring ranges, the Project site falls within the "Marginally Good" and "Fair" categories and partially attain the WWH narrative criterion. Scores are anticipated to increase based on river restoration methods, including substrate enhancement, decrease in scouring events by added floodplain capacity, and installed habitat features. Ohio EPA site (RM 42.6) is upstream from Sites 1 and 2 and the confluence with the Little Cuyahoga River, which is heavily modified and flows through the city of Akron before joining the Cuyahoga River. Discrepancies in Qualitative Taxa, Sensitive Taxa, and EPT taxa may be explained by this hydrologic input.

Recommendations for Continued Monitoring: None. Macroinvertebrate Sampling will continue as prescribed in Monitoring Year 5 (2025).

4.2.3 Citizen Science Stream Survey

In addition to the required monitoring, SMP welcomes volunteer efforts to monitor aquatic macroinvertebrates throughout the park district, including the Valley View area. Our Citizen Science program uses a slightly different form as listed below.

Macroinvertebrate Count			**Estimated Count Letter Code A=1 to 9 B=10 to 99 C=100 or more**		
Sensitive (Group 1)	**Letter Code**	**Somewhat Sensitive (Group 2)**	**Letter Code**	**Pollution Tolerant (Group 3)**	**Letter Code**
Water penny larvae		Damselfly nymphs		Blackfly larvae	
Mayfly Nymphs		Dragonfly nymphs		Aquatic worms	
Stonefly Nymphs		Cranefly larvae		Midge larvae	
Dobsonfly larvae		Beetle larvae		Pouch snails	
Caddisfly larvae		Crayfish		Leeches	
Riffle beetle adult		Scuds		Planaria	
Other snails		Clams			
Native mussels		Sowbugs			
		Alderfly larvae			
		Watersnipe larvae			
		Fishfly larvae			
Number of Taxa	***0***	***Number of Taxa***	***0***	***Number of Taxa***	***0***
x Index Value 3	0	x Index Value 2	0	x Index Value 1	0
Final Score	**0**				

With the scoring system being applied:

- Poor (<11)
- Fair (11-16)
- Good (17-22)
- Excellent (>22)

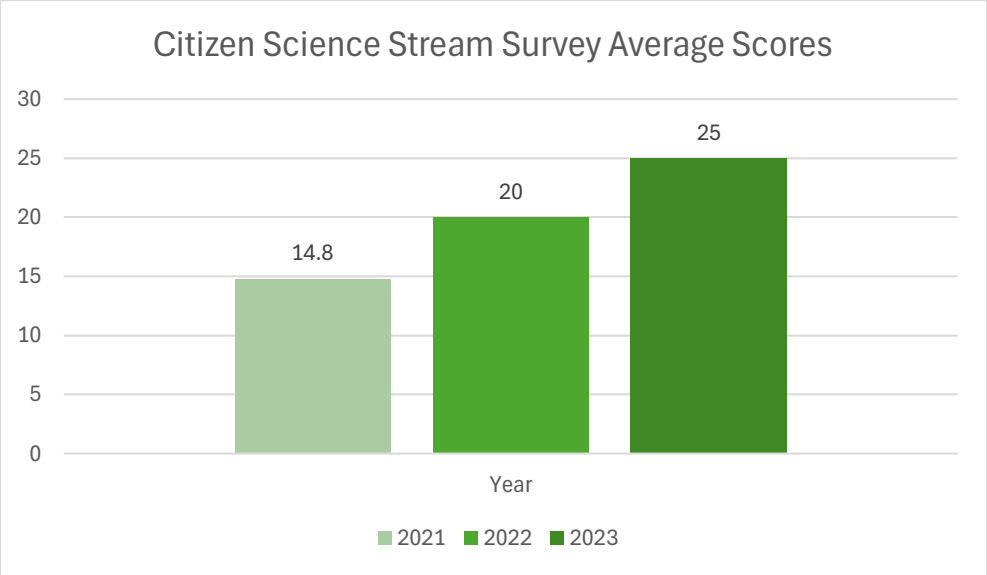


Figure 2: SMP Citizen Science Stream Survey Results, VV 2021-2023

Average stream scores (3-6 sampling events per year) have been consistently rising post-restoration. Of note is an increase in species abundance and diversity. Water penny beetle larvae have been recorded as much more abundant than in previous years.

5 PROPERTY ACQUISITION

5.1 VALLEY VIEW BLUFFS

Abutting the existing Valley View area of Cascade Valley Metro Park, the Valley View Bluffs property was secured in 2023 and planned to be added to the park in 2024. The 19.79-acre site is topographically variable, with steep slopes leading from a level bluff down to Cuyahoga Street and Valley View Metro Park. The site supports small wetlands and headwater streams. There is an approximately 100-foot wide utility corridor running roughly NW / SE across the northern section of the Property.

Two wetlands were identified on site; a mature forested wetland on the northern side of the Property and a forested / emergent wetland to the south. ORAMs were conducted; the northern wetland scored a 65 (Category 3) with 5 points added for the mature wetland special status. The southern wetland scored a 38 (Category 2) with the score lowered primarily for prior disturbance of an access road for the former golf course.

One headwater stream was identified at the outflow of the northern wetland, where it leaves the Property and connects to a larger stream and wetland complex on Valley View Metro Park.

Photo 1: Valley View Bluffs; upland forest

6 SOCIOECONOMIC METRICS

6.1.1 Annual Operating and Maintenance Costs: Four-Year Estimation

Summit Metro Parks is estimating the costs for maintenance, alteration, and reporting for the first three to five years until the Project site becomes established and reaches a self-sustaining trajectory toward full ecological restoration. Estimated costs include annual invasive species treatment (~ $4,500), additional / replacement vegetation (~ $6,500), and annual monitoring and reporting (~ $12, 500). These tasks will be accomplished by a cooperative of SMP staff / volunteers and outside contractors**.**

6.1.2 Public Safety: Hazard Diminished or Eliminated

Prior to purchase and restoration by Summit Metro Parks, the Valley View property posed no public safety issue because it was, in fact, not available for public use. In order to be made available and safe for public use, existing steeply entrenched, and highly erodible banks of the Cuyahoga River was reshaped to allow for river access. This task fit neatly with reshaping the banks to allow for floodplain access, greater ecosystem services, and hydrologic connection.

6.1.3 Community Enhancement: Changes to Infrastructure, Utilities, or Recreational Facilities

As previously mentioned, prior to purchase and restoration, the former Valley View golf course had no community potential in its pay-to-play exclusively private state. Now, as public land, the property will benefit from passive recreational opportunities such as a connection to the Ohio and Erie Towpath Trail, access to / from the proposed Cuyahoga River water trail, improved opportunities to view wildlife, and improved (from non-existent) recreational fishing opportunities.

Photo 2: Recreational paddlers enjoying a restored Cuyahoga River through Valley View.

The recreational fishing opportunities are a direct result of ecological restoration of the Cuyahoga River by placement of boulders, rootwads, and woody debris. Noteably, northern pike (*Esox lucius*) were sampled, as well as an observed increase in smallmouth bass (*Micropterus dolomieu)* abundance.

Several species of fish are anticipated to reestablish in this section of river due to habitat improvements: (*Esox masquinongy*), and lake sturgeon (*Acipenser fulvescens*). The timing of the IBI surveys precluded sampling of steelhead, which are known to occasionally use the Cuyahoga River in spawning migration. However, SMP biologists conducted a secondary sampling event in November 2021, in conjunction with interviewing recreational fishing to determine presence and usage within the Project area.

7 SUMMARY AND DISCUSSION

During the summer field season of 2023, Year 3 of restoration monitoring, Summit Metro Parks staff and volunteers, along with qualified biologists and restoration specialists from EnviroScience, USGS, and the ACOE monitored the success and attainment of the Cascade Metro Park Cuyahoga River Restoration Valley View Phase 2 Project (NA16NMF4630341). Please see Table 12 for Project attainment status in 2023 using the average scores from the two rounds of sampling. The Project area is in partial attainment due to the Mg / F qualitative macroinvertebrate scores and MG /F fish community scores. The habitat adjacent to the river has been reduced due to capital improvement projects located within the riparian zone of the Cuyahoga River. The instream habitat scores remain high. As the restoration project continues to age and near bank woody species, in-stream boulders, woody structures continue to mature and provide stable habitat it is estimated the site is anticipated to continue to improve.

Table 12 indicates the pre-and post-restoration attainment status for the sampling sites. Site 1 reached attainment in the first year following restoration. In Year 3 (2023), Site 2 reached attainment, while Site 1 was Partial, likely due to a combination of factors, including abiotic (water quality in the Little Cuyahoga River directly upstream of the sites) and riparian encroachment.

Table 13: Attainment Contrast Pre-and Post-Restoration Efforts for Year 1 (2021)

Year/RM	Date	Drainage (mi^2)	Sampler Type	QHEI	IBI	MIwb	Narrative	Attainment
2019 (Baseline)								
42.1 (Site 1)	10/4/2019	401	A	73.5	34	6.93	F/F	NON
41.6 (Site 2)	10/4/2019	402	A	68.75	30	5.07	F/P	NON
41.4 (OEPA)	10/3/2019	402	A	60.5	38	7.51	MG/F	PARTIAL
2021 (Year 1)								
42.1 (Site 1)	8/6/2021	401	C		36	8.39	MG/MG	FULL
	9/29/2021	401	C		38	7.83	MG/F	PARTIAL
	Average			85.75	37	8.11	MG/MG	FULL
41.6 (Site 2)	8/6/2021	402	C		38	7.83	MG/F	PARTIAL
	9/29/2021	402	C		30	6.27	F/P	NON
	Average			85	34	7.05	F/F	NON
2023 (Year 3)								
42.1 (Site 1)	6/28/2023	401	C		44	7.7	VG/F	PARTIAL
	7/14/2023[5]	401	C		36	6.7	MG/F	FULL
	8/30/2023[5]	401	C		36	7.9	MG/F	FULL
	Average			82	36	7.3	MG/F	FULL
41.6 (Site 2)	6/28/2023	402	C		38	7.6	MG/F	PARTIAL
	7/14/2023[5]	402	C		34	6.9	MG/F	PARTIAL
	8/30/2023[5]	402	C		40	8.1	G/F	FULL
	Average			78.5	37	7.5	MG/F	PARTIAL

[5] Sampling conducted by agency partners

Phase 1 – Funded by Clean Ohio (1.14 million dollars)

Complete - A total of 120 acres of former golf course restored to natural area including:

- *Wetlands (wooded wetlands, open marsh, emergent wetlands (28-acrtes)*
- *Headwater stream habitat (2,500 linear feet)*
- *Upland meadow (that will transition to forest (90-acres)*

Phase 2 – Funded by NOAA and GLC (2.5 million dollars)

Riparian/Floodplain Habitat Restored:

Complete - A total of 55.03 acres of riparian/floodplain habitats have been restored as detailed below:

- *Floodplain Reforestation (non excavated) = 15 AC*
  - *These areas were existing floodplains that had been seeded with a native mix during the Phase 1 project and reforested as part of the Phase 2 project.*
- *Tier 1 Floodplain Forest (excavated) = 3.10 AC*
  - *Tier 1 floodplain was designed to be flooded by the 1.1-1.5 year storm, sand deposition and deep floodwaters are anticipated within these areas.*
- *Tier 2 Floodplain Forest (excavated) = 4.10 AC*
  - *Tier 2 floodplain was designed to be flooded by the (approx.) 1.5 – 2-year storm, and is on average 1.5-2 feet higher than the Tier 1 floodplain. To promote woody tree recruitment and limit competition from herbaceous species, topsoil was not replaced within this tier.*
- *Forested Wetland/Marsh = 4.2 AC*
  - Two existing golf course ponds were filled to create wetland areas; minimal grading was completed in adjacent areas to create wetlands and allow additional flows to cross behind the floodplain tiers and outlet at the downstream end of the project area.
- *Upland Area (Meadow/Savannah) Restored: 7 AC*
  - *This rare upland habitat was established in a small area around the proposed river access point and in association with the future access road*
- *Riverine Habitat = 13.63 AC*
  - *The surface area of the Cuyahoga River (bank to bank) was included as part of the proposed restoration area. The full extent of the riverine habitat was restored and is detailed in the section "Stream Habitat Made Available or Restored" (below).*
- *Post-COVID Public Reforestation Area – 8 AC*
  - *A small portion of the northwest project area is currently a mix of native meadow that was established during the Phase 1 project. It was not planted with trees during the Phase 2 project and is set aside for a future post-COVID volunteer/public tree planting.*

Stream Habitat Made Available or Restored

Complete – A total of_ *4750 LF of mainstem of Cuyahoga River has been restored.*

- *Begin Construction @ Sta. 11+00 (N:533472.16, E: 2234087.36) – End Construction @ Sta. 58+50 (N:530872.45, E: 2235940.98)*
  - *Coordinates are in NAD83 OH-N, FT*
- *Within this stream habitat restoration area, approximately 4300 LF of floodplain was restored and 1946 LF of bank was stabilized. See planting, seeding, and habitat installation metrics below which also occurred within this 4750 LF reach.*

Socioeconomic factors include decreased public hazard by reshaping steeply eroded and potentially hazardous banks to restore floodplain connectivity and protect existing infrastructure with the added benefit of making river access safer and easier, total conversion from private, exclusive land access to public greenspace, and connectivity to the Cuyahoga River water trail.

Monitoring efforts will continue for Year 2 (2022) with notable modifications to the methodologies used in 2021, including more thorough flood event records, operational on-site flood monitors, and sample security.

8 WORKS CITED

[1] EnviroScience, "Monitoring Plan for Cascade Metro Park Cuyahoga River Restoration Valley View Phase 2 Project (NA16NMF4630341)," 2020.

[2] Ohio EPA, "Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)," Ohio Environmental Protection Agency, Columbus, OH, 2006.

[3] Ohio EPA, "Volume III Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities," Ohio Environmental Protection Agency, Columbus, OH, 2015.

[4] J. R. Voshell, Jr., Ph.D, A Guide to Common Freshwater Invertebrates of North America, Granville, OH: The McDonald & Woodward Publishing Company, 2011.

[5] Ohio EPA, "2015 Updates to Biological Criteria for the Protection of Aquatic Life: Volume II and VOlume II Addendum. User's Manual for the Biological Field Assessment of Ohio Surface Waters," Columbus, OH, 2015.

[6] Ohio EPA, "The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application.," Columbus, OH, 1989.

[7] Ohio EPA, "Biological Criteria for the Protection of Aquatic Life: Volume I," Columbus, OH, 1987.