July 20, 2023
22-0694-016

Ms. Erin Switala
The Mannik & Smith Group, Inc.
1800 Indian Wood Circle
Maumee, Ohio 43537

Re: Mussel Survey and Relocation
Jermain Park Ottawa River Restoration
Toledo, Lucas County, Ohio

Dear Ms. Switala

In accordance with our proposal, dated June 1, 2023, and authorization received from The Mannik & Smith Group, Inc. on June 2, 2023, STONE has completed a mussel survey and relocation for the above-referenced project. A report of our findings is herewith submitted.

If you have any questions about this report, please contact us at 614-865-1874.

Sincerely,
CAP-STONE & Associates, Inc., dba Stone Environmental Engineering & Science

Michael Hoggarth, PhD
Principal Ecologist

Scott Ross, PWS, CPESC
Ecological Services Manager

ENVIRONMENTAL, ENGINEERING & SCIENCE

MUSSEL SURVEY AND RELOCATION REPORT

Jermain Park Ottawa River Restoration
Toledo, Lucas County, Ohio

Prepared for:

The Mannik & Smith Group, Inc.
1800 Indian Wood Circle
Maumee, Ohio 43537

Prepared by:

CAP-STONE & Associates, Inc., dba
Stone Environmental Engineering and Science
748 Green Crest Drive
Westerville, Ohio 43081

July 20, 2023
22-0694-016

TABLE OF CONTENTS

Section Page

APPENDICES

ACRONYMS

ADI	Area of Direct Impact	**SA**	Salvage Area
LB	Lateral Buffer	**USFWS**	United States Fish and Wildlife Service
US	Upstream Buffer		
DS	Downstream Buffer	**Ohio EPA**	Ohio Environmental Protection Agency
NTU	Nephelometric Turbidity Unit		
ODNR	Ohio Department of Natural Resources	**OSUM**	Ohio State University Museum of Biological Diversity

1 INTRODUCTION

Stone Environmental Engineering & Science, Inc. (STONE) performed a mussel survey and relocation at two locations on the Ottawa River in Jermain Park in the City of Toledo in Lucas County, Ohio on June 12-16, 2023 (Figure 1). It is our understanding that two sections of the Ottawa River within Jermain Park are being proposed for stream restoration (Figure 2). According to the 2023 Ohio Mussel Survey Protocol, the Ottawa River in Lucas County is listed as a Group 1 stream. This survey was led by STONE Principal Ecologist Dr. Michael Hoggarth, an Ohio Department of Natural Resources (ODNR) and United States Fish and Wildlife Service (USFWS) approved mussel surveyor. Dr. Hoggarth was assisted by Matt Brehm (diver), Alex Brown, and Jordan Brennen (STONE).

No systematic survey of the mussels of the Ottawa River (of Toledo) has been performed and Watters et al. (2009) and the Ohio State University Museum of Biological Diversity (OSUM) only list a few, common species of mussels from the river. These records are from prior to 1980. However, the Maumee River and Swan Creek, both near the Ottawa River have been extensively surveyed for mussels and both support important mussel resources, suggesting that the Ottawa River likewise supports mussels. Surveys designed to identify the presence, numeric abundance, community structure, and current distribution of mussels in Ohio have become increasingly important, as the fauna has declined (reviewed in Watters *et al*. 2009). In fact, today, all mussels are protected in the state (ODNR and USFWS 2023). Neves (1993) was among the first to bring the peril faced by freshwater mussels to the forefront, although an examination of Ohio's, or any state's, endangered species lists demonstrate the plight of this fauna. In Ohio, for example, there are more listed species of mussels (endangered, threatened, and species of concern) as a percentage of the total number of species, than any other group of organisms, aquatic or terrestrial.

Many factors have contributed to this increasing problem for mussels, including the construction of impoundments, other types of instream construction, habitat degradation, competition with introduced species, and water pollution (Fuller 1974; Neves 1987; Starrett 1971; Watters *et al*., 2009). Some of these factors are less significant now than in the past (water pollution for example). Today, increased siltation (the substrate being buried by sediment) and increased flashiness in streamflow and its effects on bedload, are major contributors to the loss of mussels. However, since adult mussels are more-or-less sedentary, they have limited ability to move out of the way of danger including instream activities associated with construction projects. Therefore, when the impacts are predictable, as in the case of pending construction, relocation of mussels prior to these construction activities are performed (ODNR and USFWS, 2023). This document describes the results of just such a relocation project associated with the proposed stream restoration along the Ottawa River at two locations in Jermain Park.

2 PROJECT BACKGROUND

2.1 GENERAL

The Ottawa River in Jermain Park (Figure 1) is entrenched (see Photolog – Appendix B) and filled with woody debris. The banks have collapsed along much of its length in the park and there is evidence of active bank destabilization, which suggests that the two reaches surveyed for this report are good candidates for restoration. Figure 2 shows the extent of proposed stream restoration in conjunction with other upland restoration activities.

2.2 PROJECT LOCATION

Jermain Park is located in the City of Toledo, Lucas County, Ohio with our study area extending from the William A. Brower Bridge at 41.6701º, -83.5889º to the Auburn Avenue bridge at 41.6752º, -83.5802º. This portion of the Ottawa River is designated as a Group 1 stream in Ohio (ODNR and USFWS, 2023). A Project Location Map, Project Overview Map, and Mussel Survey and Relocation Maps illustrating the study areas are included as Figures 1 through 3 plus 3A and 3B in Appendix A.

3 METHODOLOGY

3.1 GENERAL

This survey work was led by Dr. Michael Hoggarth (Principal Ecologist, STONE) a state and federally qualified mussel surveyor, who has over 40 years of experience performing mussel surveys and relocations, with Mr. Matt Brehm, who has 20 years of experience diving for mussels, and two STONE ecologists (Alex Brown and Jordan Brennan) assisting.

3.2 SURVEY AREA

This mussel survey and relocation followed the 2023 Ohio Mussel Survey Protocols (ODNR and USFWS, 2023) for Group 1 streams. According to the protocols, Group 1 stream mussel surveys and relocation activities can occur under the same mobilization, and so both the survey and relocation were performed at the same time. The areas sampled for the mussel survey extended from the upstream end of the construction footprint of each reach to the downstream end of each construction reach (Figure 2). Twenty-five (25) meters downstream was added to each reach as the Downstream Buffer (DS), and 10 meters upstream of each section was added as the Upstream Buffer (US) (Figures 3, 3A, and 3B). The 2023 Ohio Mussel Survey Protocol for Group 1 streams was followed in the upstream reach (Area 1), potential upstream reach (Area 1a), and downstream reach (Area 2). Based on the Draft Stream Impact exhibit (Figure 2) provided by the client, the following dimensions describe these areas. Area 1 (including Area 1 and 1a) width is approximately 10-15 meters and the total length was 230 meters long for the Area of Direct Impact (ADI). In addition, the DS (25 meters) and US (10 meters) were added for a total length of 265 meters. Area 2 width is approximately 20 meters with the ADI estimated length is 200 meters, the DS buffer is 25 meters, and the US buffer is 10 meters for a total length of 235 meters.

3.1.1 SURVEY AREA

Both survey areas are illustrated on Figure 3 (Appendix A). Figure 3A is a closeup of Area 1 and Figure 3B is a closeup of Area 2. The data sheets (Appendix D) identify all the cells sampled during this survey and relocation. The data sheets also provide a visual representation of each cell. Tables 4.3 and 4.5 list all mussels collected (living and freshly dead) by cell locations, as well as the number of passes required to clear the cell during the relocation collecting portion of this survey and relocation.

3.1.2 RELOCATION AREA

The Salvage Area (SA) was a subsample of the survey area. The SA included all of the ADI plus 10 meters DS and 5 meters upstream in each project area. One reach of river (upstream of the Upton Road Bridge) was selected as the Relocation Area. This reach had species and substrate similarities to the best areas within both project areas. Photographs (Appendix B) include photographs of the relocation area. That area was located at 41.6698º -83.5896º.

3.3 MUSSEL SURVEY

Once arriving at the site, we began each survey at the DS end of the project area (20-25 DS). Within the upper area (Area 1) we delineated cells with lines that crossed the river. In the lower reach (Area 2) we marked the edge of the river in 10-meter increments as the absence of banks (entrenched stream banks) and abundance of woody debris prevented the establishment of cells in any other way. In both cases, the cells were no more than 100 meter^2 (cells ranged from 50-100 meter^2). All cells were initially surveyed for 20 minutes by SCUBA and hand collecting (total of 40 minutes/cell) with all dead shells and live mussels collected. All live mussels and freshly dead shells were used to trigger a second pass. If more than two live mussels had been found during the second pass an additional 30 minutes would have been added. In this case, however, the most live mussels found in any second pass was two so no additional sampling was necessary to clear a cell.

3.4 VISIBILITY AND FLOW CONDITIONS

Water level and water clarity were excellent throughout the time this survey and relocation was being done. There were two rain events that brought the river up but it fell quickly and other than delaying our work for a few hours, returned to acceptable conditions. In fact, all but one mussel (the living Lilliput), were found by sight. Figure 4 shows a stream gage immediately upstream of our survey area. This figure shows the two upward spikes in stream gage heights following the two rain events and the height of the stream (around 2.2 feet) during the time most of the collecting activities were performed. Table 4.0 shows these data and, although there was some silt in the water (see Appendix D – Data Sheets) it quickly moved downstream and did not affect collecting. There was one large reach in Area 2 (from ADI 90-150) where there was no flow, and this reach was more difficult to sample (it was also the deepest area) but as we were using extra time while sampling, we mitigated for extensive tactile sampling by extending the time. Substrate in this reach was also quite unfavorable for mussels.

4 RESULTS

Conditions on the five days of this survey were good with the water level low during this time and water clarity excellent. Environmental parameters were fine during the duration of the mussel survey and relocation. Water quality data collected onsite were relatively constant throughout the survey and relocation with low turbidity (6-15 NTU) and acceptable water and air

temperatures (Table 4.0). Visibility was greater than 20 inches throughout the survey although viewing tubes and diving was used to extend visibility to depth. All but one live mussel was collected by sight.

TABLE 4.0 – WATER QUALITY DATA
Jermain Park Ottawa River Restoration
Mussel Survey and Relocation
Toledo, Lucas County, Ohio
June 12-16, 2023

Water Quality Parameter	June 12	June 13	June 14	June 15	June 16	Units
Water Temperature	17	17	17	17	17	°C
Air Temperature	13-17	13-20	12-19	13-24	13-17	°C
Turbidity	11	10	15	8	6	NTU
Visibility	>20”	>20”	>20”	>20”	>20”	inches

Fifteen species of mussel were found, however only eight of these were found as live individuals or freshly dead shells, which indicate that these are the species still extant in this reach of river today. The white heelsplitter (*Lasmigona complanata*) dominated the fauna here, which is interesting in that this is the first record of that species for the Ottawa River, although it has been recently found in both Swan Creek and the Maumee River (Watters et al., 2009). The creek heelsplitter (*Lasmigona compressa*) was found as a freshly dead shell (not alive) and it is less common than its congener. Other species that were collected alive include *Pyganodon grandis* (common floater), *Amblema plicata* (threeridge), *Toxolasma parvum* (Lilliput), and *Potamilus alatus* (pink heelsplitter) (Table 4.1). Tables 4.2 and 4.3 show how many live mussels were relocated from Area 1 and where they, and the freshly dead shells (both of which trigger a second pass) were found within Area 1. Tables 4.4 and 4.5 show the same for Area 2. Note that all live mussels were found within the Salvage Area (SA) within both reaches and so all live mussels found were relocated upstream. The Photolog (Appendix B) shows photographs of all live mussels found followed by photographs of mussels only found as freshly dead shells, which are followed by photographs of the extirpated species found as weathered or subfossil shells including *Theliderma cylindrica* (rabbitsfoot) a federally threatened species, *Epioblasma triquetra* (snuffbox) a federally endangered species, and *Toxolasma lividum* (purple Lilliput) an Ohio endangered species. This river once supported an impressive community of mussels. In this case a total of 18 live mussels (10 from Area 1 and eight from Area 2) were relocated upstream. This total included 12 *L. complanata* (white heelsplitter), two each of *P. grandis* (common floater), and *P. alatus* (pink heelsplitter), and one each of *A. plicata* (threeridge), and *T. parvum* (Lilliput). The single specimen of *T. parvum* (Lilliput) was collected from the edge of the water by touch in what is typical habitat for that species.

TABLE 4.1 – SUMMARY OF MUSSELS COLLECTED (Any Condition)
Jermain Park Ottawa River Restoration
Mussel Survey and Relocation
Toledo, Lucas County, Ohio
June 12-16, 2023

Species	Common name	During the Survey/Relocation				
		Live	FD	WD	SF	Total
Pyganodon grandis	Common floater	2	5	6		13
Anodontoides ferussacianus	Cylindrical papershell		1		1	2
Lasmigona compressa	Creek heelsplitter		1			1
Lasmigona complanata	White heelsplitter	12	21	1		34
Amblema plicata	Threeridge	1		4	1	6
Theliderma cylindrica	Rabbitsfoot			1		1
Fusconaia flava	Wabash pigtoe			2	2	4
Pleurobema sintoxia	Round pigtoe			4		4
Eurynia dilatata	Spike			1	2	3
Leptodea fragilis	Fragile papershell		2			2
Potamilus alatus	Pink heelsplitter	2	1	1		4
Toxolasma parvum	Lilliput	1		1		2
Toxolasma lividum	Purple Lilliput			1		1
Lampsilis siliquoidea	Fatmucket			3		3
Epioblasma triquetra	Snuffbox			1		1
Total mussels		**18**	**31**	**26**	**6**	**81**

Live – Collected alive | **FD**– Collected as a freshly dead shell | **WD**– Collected as a weathered specimen | **SF** – Collected as a subfossil specimen

TABLE 4.2 – SUMMARY OF LIVE MUSSELS COLLECTED IN THE SALVAGE AREA FOR AREA 1
Jermain Park Ottawa River Restoration
Mussel Survey and Relocation
Toledo, Lucas County, Ohio
June 12-16, 2023

Species	Common name	During the Survey/Relocation			
		DS	ADI	US	Total
Pyganodon grandis	Common floater	0	1	0	1
Lasmigona complanata	White heelsplitter	0	7	0	7
Amblema plicata	Threeridge	0	1	0	1
Potamilus alatus	Pink heelsplitter	0	1	0	1
Total live mussels		**0**	**10**	**0**	**10**

DS – Downstream buffer | **ADI** – Area of Direct Impact | **US** – Upstream buffer

Table 4.3 – DISTRIBUTION OF LIVE MUSSELS AND DEAD SHELLS FOR AREA 1
Jermain Park Ottawa River Restoration
Mussel Survey and Relocation
Toledo, Lucas County, Ohio
June 12-16, 2023

Reach	Survey Area	Species	Number Live/Dead			Total Live
			Pass 1	Pass 2	Pass 3	
Downstream Buffer	20-25	No mussels	0	--	--	0
	10-20	No mussels	0	--	--	0
	0-10	No mussels	0	--	--	0
Area of Direct Impact	0-10	No mussels	0	--	--	0
	10-20	*P. grandis* *L. complanata* *A. ferussacianus*	3d 7d 1d	0 0 0	-- -- --	0 0 0
	20-30	*P. alatus*	1L	0	--	1
	30-40	No mussels	0	--	--	0
	40-50	No mussels	0	--	--	0
	50-60 A	*L. fragilis*	1d	0	--	0
	50-60 B	No mussels	0	--	--	0
	60-70 A	*L. complanata* *L. fragilis*	1L 1d	1d 0	--	1 0
	60-70 B	No mussels	0	--	--	0
	70-80	No mussels	0	--	--	0
	80-90	*P. grandis* *A. plicata*	1L 1L	0 0	--	1 1
	90-100	*L. complanata*	1L	0	--	1
	100-110	No mussels	0	--	--	0
	110-120	No mussels	0	--	--	0
	120-130	*L. complanata*	1L, 1d	1d	--	1
	130-140	*L. complanata*	1L	1d	--	1
	140-150	*L. complanata* *P. alatus*	1L 0	2L, 1d 1d	-- --	3 0
	150-160	No mussels	0	--	--	0
	160-170	No mussels	0	--	--	0
	170-180	No mussels	0	--	--	0
	180-190	No mussels	0	--	--	0
	190-200 A	No mussels	0	--	--	0
	190-200 B	No mussels	0	--	--	0
	200-210 A	*L. complanata*	4d	0	--	0
	200-210 B	No mussels	0	--	--	0
	210-220 A	*L. complanata*	1d	0	--	0
	210-220 B	No mussels	0	--	--	0

	220-230	*P. grandis*	1d	0	--	0
Upstream Buffer	0-5	No mussels	0	--	--	0
	5-10	No mussels	0	--	--	0

TABLE 4.4 – SUMMARY OF LIVE MUSSELS COLLECTED IN THE SALVAGE AREA FOR AREA 2
Jermain Park Ottawa River Restoration
Mussel Survey and Relocation
Toledo, Lucas County, Ohio
June 12-16, 2023

Species	Common name	During the Survey/Relocation			
		DS	ADI	US	Total
Pyganodon grandis	Common floater	0	0	1	1
Lasmigona complanata	White heelsplitter	0	6	0	6
Potamilus alatus	Pink heelsplitter	1	0	0	1
Total live mussels		**1**	**6**	**1**	**8**

DS – Downstream buffer | **ADI** – Area of Direct Impact | **US** – Upstream buffer

Table 4.5 – DISTRIBUTION OF LIVE MUSSELS AND DEAD SHELLS FOR AREA 2
Jermain Park Ottawa River Restoration
Mussel Survey and Relocation
Toledo, Lucas County, Ohio
June 12-16, 2023

Reach	Survey Area	Species	Number Live/Dead			Total Live
			Pass 1	Pass 2	Pass 3	
Downstream Buffer	20-25	No mussels	0	--	--	0
	10-20 A	No mussels	0	--	--	0
	10-20 B	No mussels	0	--	--	0
	0-10 A	*P. alatus*	1L	0	--	0
	0-10 B	No mussels	0	--	--	0
Area of Direct Impact	0-10 A	No mussels	0	--	--	0
	0-10 B	No mussels	0	--	--	0
	10-20 A	*L. complanata*	1L, 1d	1d	--	1
	10-20 B	No mussels	0	--	--	0
	20-30 A	No mussels	0	--	--	0
	20-30 B	No mussels	0	--	--	0
	30-40 A	No mussels	0	--	--	0
	30-40 B	*L. complanata*	1L	0	--	1
	40-50 A	No mussels	0	--	--	0
	40-50 B	*L. complanata*	1L	0	--	1
	50-60 A	*L. complanata*	1d	0	--	0

	50-60 B	*T. parvum*	1L	0	--	1
	60-70 A	*L. complanata*	1L	0	--	1
	60-70 B	No mussels	0	--	--	0
	70-80 A	No mussels	0	--	--	0
	70-80 B	No mussels	0	--	--	0
	80-90 A	No mussels	0	--	--	0
	80-90 B	No mussels	0	--	--	0
	90-100 A	No mussels	0	--	--	0
	90-100 B	No mussels	0	--	--	0
	100-110 A	No mussels	0	--	--	0
	100-110 B	No mussels	0	--	--	0
	110-120 A	No mussels	0	--	--	0
	110-120 B	No mussels	0	--	--	0
	120-130 A	*L. complanata*	1L	0	--	1
	120-130 B	No mussels	0	--	--	0
	130-140 A	No mussels	0	--	--	0
	130-140 B	No mussels	0	--	--	0
	140-150 A	No mussels	0	--	--	0
	140-150 B	No mussels	0	--	--	0
	150-160 A	No mussels	0	--	--	0
	150-160 B	No mussels	0			0
	160-170 A	No mussels	0	--	--	0
	160-170 B	No mussels	0	--	--	0
	170-180 A	*L. complanata*	1d	0	--	0
	170-180 B	No mussels	0	--	--	0
	180-190 A	No mussels	0	--	--	0
	180-190 B	No mussels	0	--	--	0
	190-200 A	*L. compressa*	1d	0	--	0
	190-200 B	No mussels	0	0	--	0
Upstream Buffer	0-5 A	*P. grandis*	1L	0	--	0
	0-5 B	No mussels	0	--	--	0
	5-10 A	No mussels	0	--	--	0
	5-10 B	No mussels	0	--	--	0

5 LISTED SPECIES

No listed species were collected alive. *Lasmigona compressa* (creek heelsplitter) is a Species of Concern in Ohio and although this species was not found alive, it may occur upstream, which would be more typical for this species. Other listed species were only collected as weathered and subfossil shells and are not part of the mussel fauna of this portion of the Ottawa River today. Of interest here, however, is that this is the first record of *T. cylindrica* (rabbitsfoot) for the Ottawa River. In addition, this species has not been recorded for any river system in Lucas County or the surrounding Ohio counties. The other federally listed species found as a single weathered valve

was *E. triquetra* (snuffbox). This species was widely distributed in both the Ohio River and Lake Erie drainages and has been recorded for Swan Creek, but this is a first record for the Ottawa River. Other listed species found only as weathered and subfossil shells are *P. sintoxia* (round pigtoe) (Ohio Species of Concern), and *T. lividum* (purple Lilliput) (Ohio Endangered).

6 SUMMARY

STONE performed a mussel survey and relocation at the aforementioned site in Jermain Park, City of Toledo, Lucas County, Ohio on June 12-16, 2023. Weather and water conditions were excellent throughout the period with two rain events that slowed, but did not stop, this survey. Both hand collection and SCUBA were employed to find mussels. Live mussels were widely scattered throughout the two areas surveyed during this study and were found in both the deeper water areas and shallow areas. Fifteen species of mussels were found, however only eight of these were determined to be extant in the reach, and only five of these were found alive. The community was dominated by *L. complanata* (white heelsplitter) with lesser numbers of *P. grandis* (common floater), *A. plicata* (threeridge), *P. alatus* (pink heelsplitter), and *T. parvum* (Lilliput) found alive and moved upstream. Eighteen live mussels were moved upstream to a reach that supported a similar mussel community and had substrate that was similar to the best areas downstream. As all of the live mussels found in the Salvage Area for this project have been relocated, this project as designed will not impact the mussel resources of the Ottawa River in this area.

7 REFERENCES

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APPENDIX A

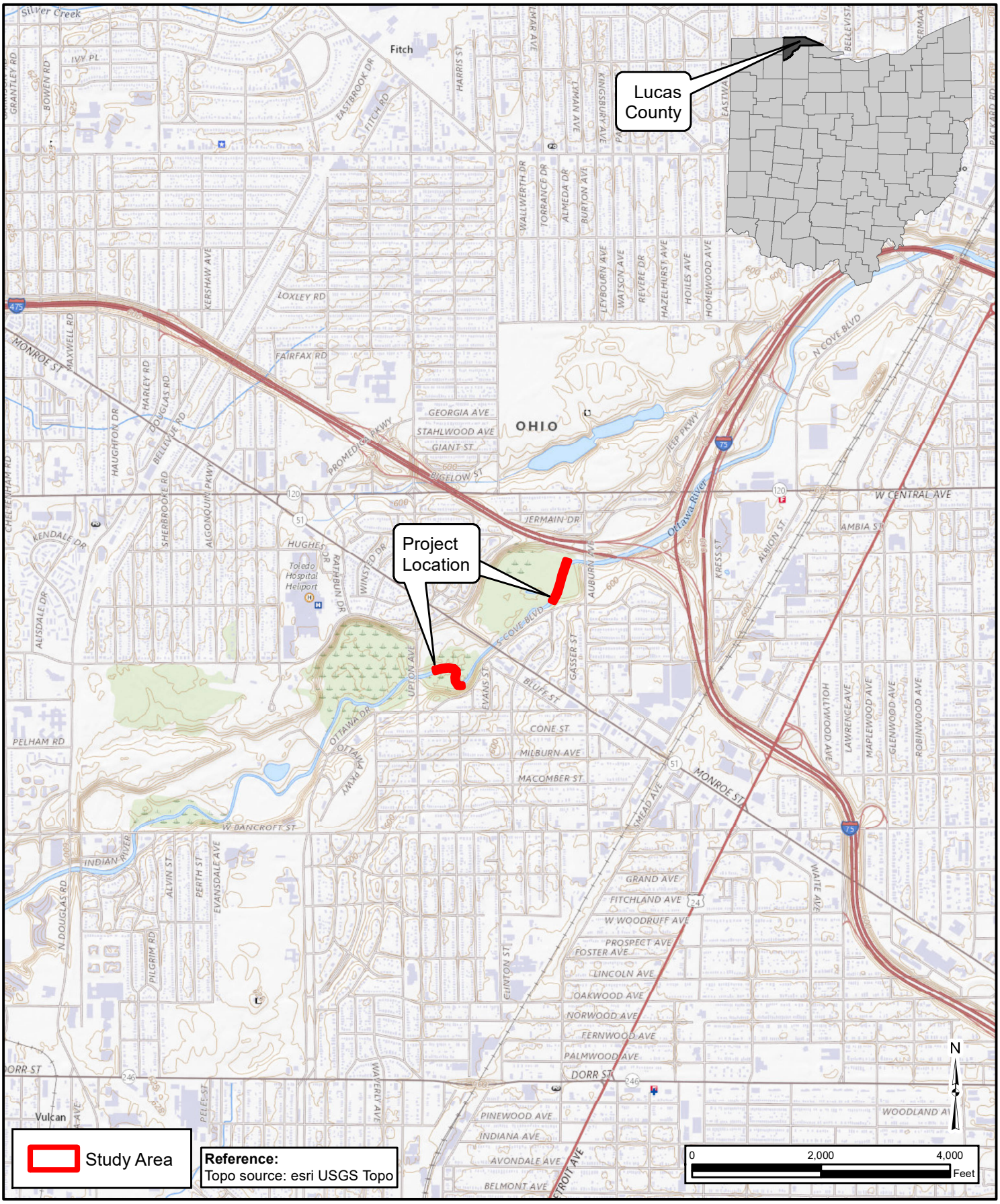

Figure 1

PROJECT LOCATION MAP

Jermain Park Ottawa River Restoration
Toledo, Lucas County, Ohio

STONE ENVIRONMENTAL, ENGINEERING & SCIENCE

Project: 22-0694-016

Date: June 30, 2023

Date Saved: 5/5/2023 4:47:39 PM

Legend

- Bank
- Old Bridge
- Pipe
- Sample Point
- Tree
- Bank
- Stream 1
- Swale
- OttawaRiver
- Wetland
- Subject Property

Area of in-stream impact #1 (bank stabilization): 560 LF

Potential area of in-stream impact (potential new outfall/riprap): 125 LF

Area of in-stream impact #2 (bank stabilization): 570 LF

Wetland A 0.055 Ac.

Wetland B 0.125 Ac.

Wetland C 4.219 Ac.

Wetland D 0.037 Ac.

Wetland E 0.122 Ac.

Wetland F 0.022 Ac.

Wetland F2 0.039 Ac.

Wetland G 0.227 Ac.

Wetland H 0.102 Ac.

Wetland I 0.053 Ac.

SP1 SP2 SP3 SP4 SP6 SP7 SP8 SP9 SP10 SP11 SP12 SP13 SP20

475

Figure 2 - Proposed Stream Restoration Areas Map
Jermain Park Ottawa River Restoration
Toledo, Lucas County, Ohio

Path: W:\Projects\Projects P-T\TOLE0101\ENGAPPS\GIS\TOLE0101_SWD.mxd

Mannik Smith GROUP
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www.MannikSmithGroup.com

DRAFT

Figure 2: Surface Water Delineation
Jermain Park
Toledo, Ohio

Notes
The Lucas County photography, dated April 2017, is provided by OGRIP as part of the Ohio Statewide Imagery Program.

Feet
0 100 200

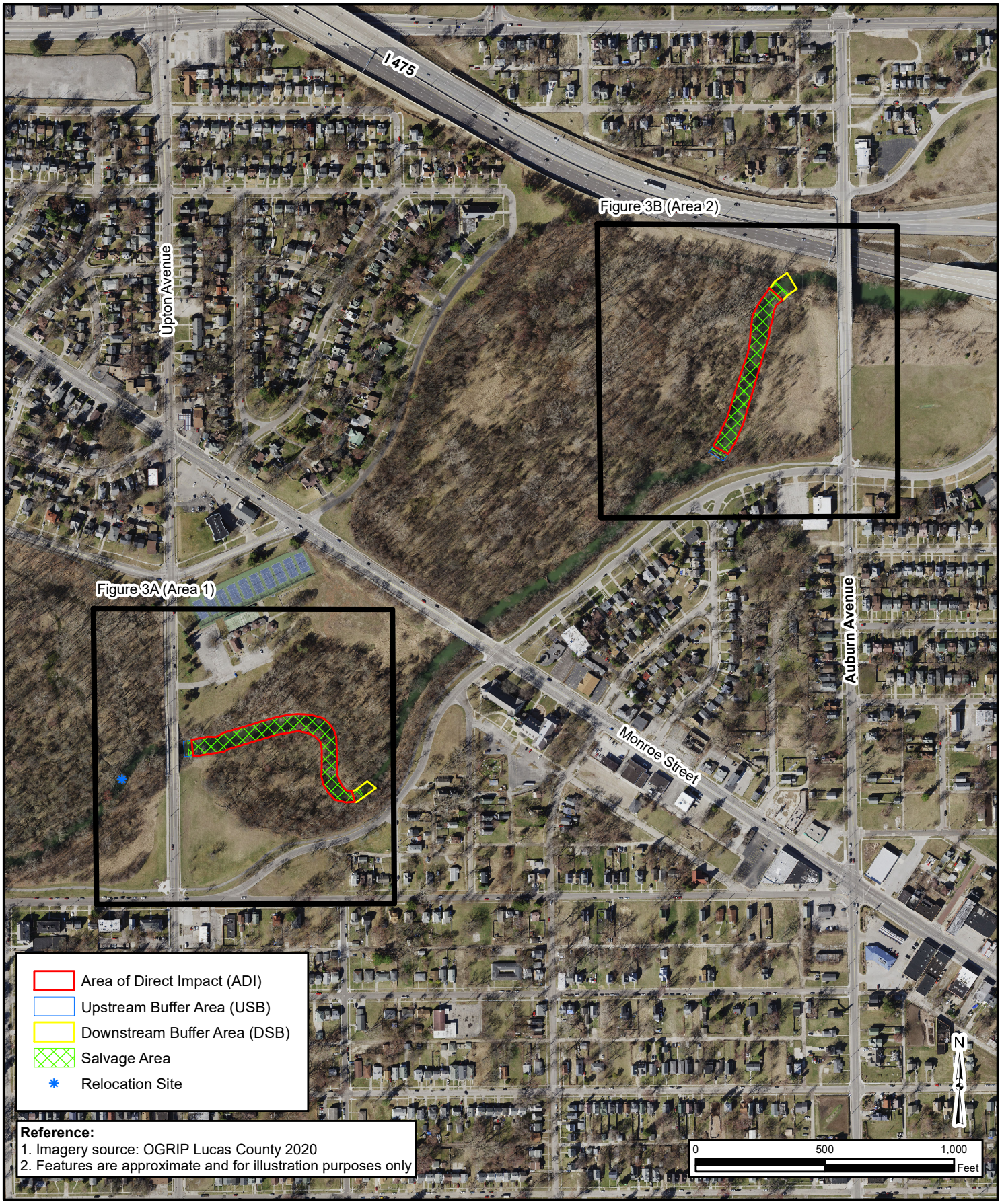


Figure 3

MUSSEL SURVEY AND RELOCATION MAP

Jermain Park Ottawa River Restoration
Toledo, Lucas County, Ohio

STONE ENVIRONMENTAL, ENGINEERING & SCIENCE

Project: 22-0694-016

Date: June 30, 2023

Figure 3A

MUSSEL SURVEY AND RELOCATION MAP - AREA 1

Jermain Park Ottawa River Restoration
Toledo, Lucas County, Ohio

STONE ENVIRONMENTAL, ENGINEERING & SCIENCE

Project: 22-0694-016

Date: June 30, 2023

Figure 3B

MUSSEL SURVEY AND RELOCATION MAP - AREA 2

Jermain Park Ottawa River Restoration
Toledo, Lucas County, Ohio

STONE ENVIRONMENTAL, ENGINEERING & SCIENCE

Project: 22-0694-016

Date: June 30, 2023

Ottawa River at University of Toledo, Toledo OH - 04177000

June 11, 2023 - June 18, 2023

Gage height, ft

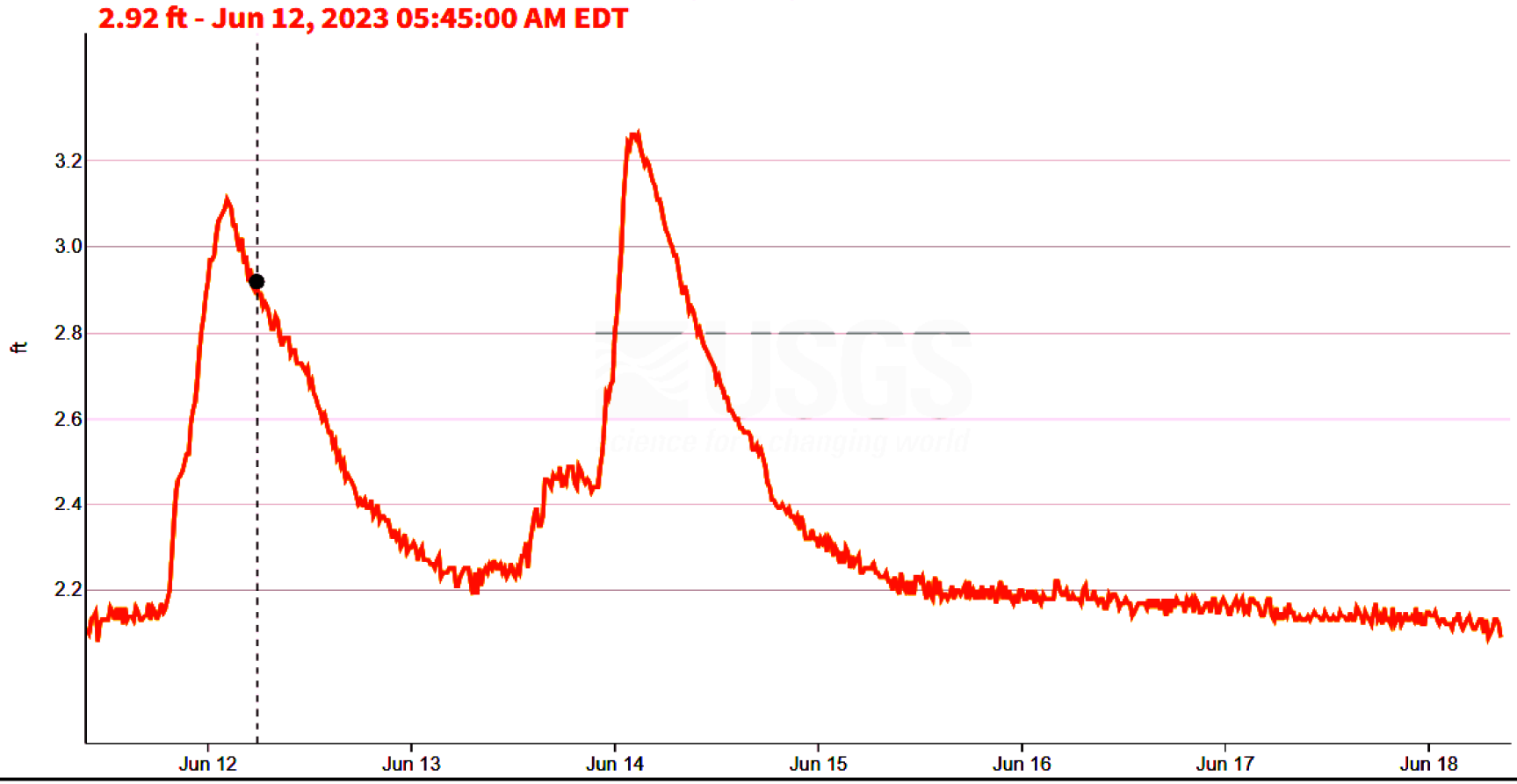


Figure 4	**Stream Gage Data** Jermain Park Ottawa River Restoration Toledo, Lucas County, Ohio	STONE ENVIRONMENTAL, ENGINEERING & SCIENCE
Project: 22-0694-016		Date: June 12, 2023

APPENDIX B

1 – Ottawa River at the downstream end of Area 1.

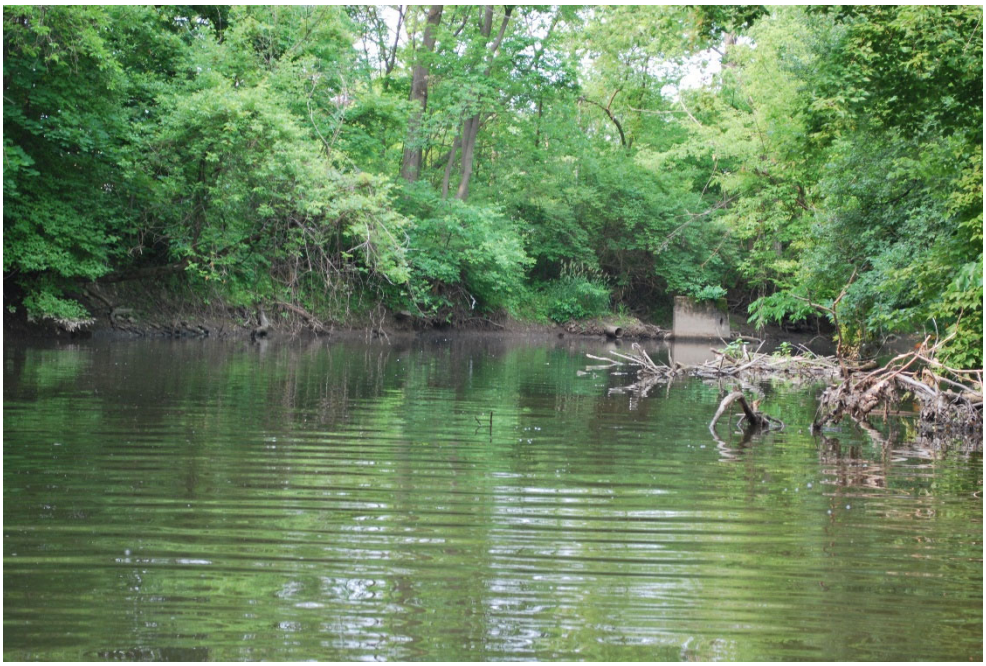
2 – Ottawa River looking upstream from the downstream end of Area 1.

3 – Ottawa River looking downstream at the upstream end of Area 1.

4 – Ottawa River at the upstream end of Area 1.

5 – Ottawa River looking toward the downstream of Area 2.

6 – Ottawa River looking upstream from the upstream end of Area 2.



7 – Ottawa River looking downstream from the downstream end of Area 2.

8 – Relocation area upstream of the Upton Road bridge.

9 – Relocation area upstream of the Upton Road bridge.

10 – Living specimen of common floater (Pyganodon grandis) from Area 2.

11 – Living specimens of white heelsplitter (Lasmigona complanata).

12 – Living specimen of threeridge (Amblema plicata) from Area 1.

13 – Living spcimen of pink heelsplitter (Potamilus alatus) from Area 2.

14 – Living specimen of Lilliput (Toxolasma parvum) from Area 2.

15 – Freshly dead shell of creek heelsplitter (Lasmigona compressa).

16 – Freshly dead shell of fragile papershell (Leptodea fragilis).

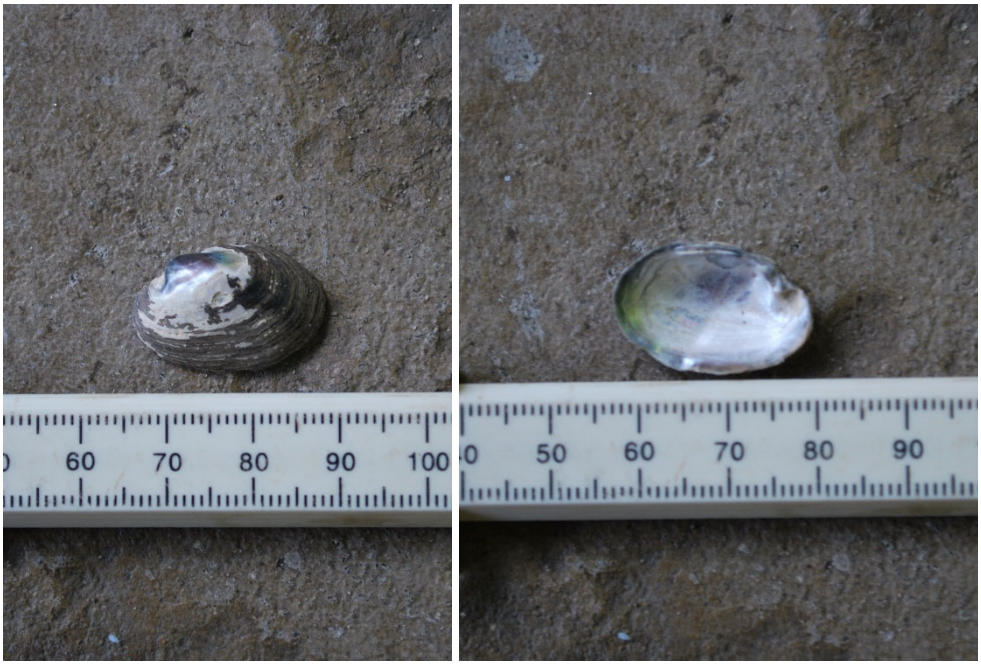
17 – Weathered shell of cylindrical papershell (Anodontoides ferussacianus).

18 – Weathered shell of rabbitsfoot (Theliderma cylindrica).

19 – Weahtered shell of Wabash pigtoe (Fusconaia flava).

20 – Weathered shell of round pigtoe (Pleurobema sintoxia).

21 – Weathered shell of spike (Euryneura dilatata).



22 – Exterior and interior views of weathered shell of purple Lilliput (Toxolasma lividum).

23 – Weathtered shell of fatmucket (Lampsilis siliquoidea).

24 – Exterior and interior views of weathered shell of snuffbox (Epioblasma triquetra).

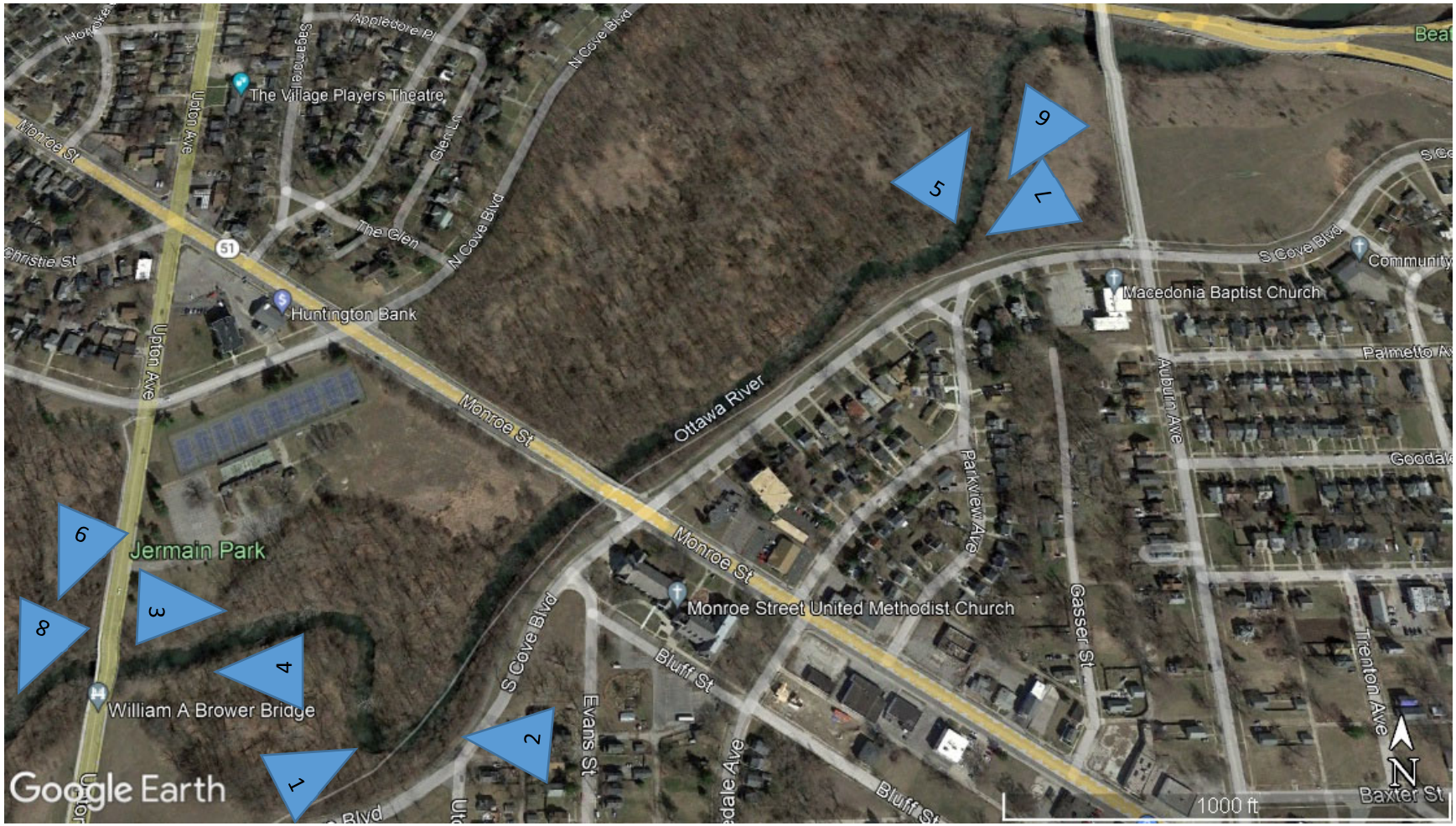


Photo map showing location of habitat photographs. All other photographs are of mussels collected from the reach.

APPENDIX C

DIVISION OF WILDLIFE

Ohio Department of Natural Resources

Division of Wildlife Headquarters
2045 Morse Road. Bldg. G
Columbus, Ohio 43229-6693
1-800-WILDLIFE

Chief: Kendra S. Wecker

Scientific Collection

License Number: SC220006

Effective Date: 03/07/2023
Expiration Date: 03/15/2026

Permit Holder:

MICHAEL HOGGARTH
4849 WOODHAVEN DR.
GALENA, OH 43021

OTTERBEIN UNIVERSITY
4849 WOODHAVEN DR.
GALENA, OH 43021
COUNTY: DELAWARE

Others authorized on permit: NO

The permittee is hereby granted permission to take, possess, and transport at any time and in any manner specimens of wild animals, subject to the conditions and restrictions listed below or any documents accompanying this permit.

The Chief of the Division of Wildlife will not issue permit for Dangerous Wild Animal (DWA) species (ORC 935.01) except native DWA, required for specific projects. The permit issued by the Chief does not relieve the permittee of any responsibility to obtain a permit pursuant to R.C. Chapter 935 except as specified for the animals and purposes permitted herein. The permittee must adhere to all additional requirements under R.C. Chapter 935.

THIS PERMIT IS RESTRICTED AS FOLLOWS:

All native freshwater mussels are protected in the State of Ohio (Section 1533.324 of the Ohio Revised Code). In addition, federally listed species are protected by the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). Impacts to all freshwater mussels, including State and Federally protected mussels, and their habitats should be avoided and minimized to the maximum extent practicable. If impacts cannot be avoided, all streams which contain mussels or potential mussel habitat must be surveyed prior to any proposed stream disturbance following the Ohio Mussel Survey Protocol - April 2022 (link below).

https://ohiodnr.gov/static/documents/wildlife/permits/dow-protocol-ohio-mussel-survey.pdf

Mussel surveys are based on stream size and the potential presence of Federally Listed Species (FLS). Accordingly, for purposes of determining survey efforts, Ohio streams have been divided into the five categories listed below and are specifically named in Appendix A of the Ohio Mussel Survey Protocol:

-Unlisted: Streams not listed in the protocol with watersheds >5 mi2 with the potential for mussels.
-Group 1: Small to mid-sized streams, FLS not expected.
-Group 2: Small to mid-sized streams, FLS expected.
-Group 3: Large Rivers, FLS not expected.
-Group 4: Large Rivers, FLS expected.

This permit authorizes you and those working under your direct on-site supervision to work with freshwater mussels in Group 1 and 3 streams, including work with state-list designated endangered or threatened species (state-listed species). For work in Group 2 and 4 streams, a current federal permit for working with mussels is also required. All mussel surveyors in Ohio are required to be certified by the state of Ohio, and you may only work in the systems that you have been approved for (link below):

https://ohiodnr.gov/static/documents/wildlife/permits/dow-list-approved-mussel-surveyors.pdf

This permit allows you to collect specimens of freshwater mussels, including state-listed species for survey and inventory purposes, to add dead specimens of mussels salvaged during fieldwork to an approved repository, to continue to monitor mussel beds of mussels in Ohio, and to locate additional populations of mussel in Ohio. This permit does not authorize the use of lethal means.

DIVISION OF WILDLIFE
Ohio Department of Natural Resources

Division of Wildlife Headquarters
2045 Morse Road. Bldg. G
Columbus, Ohio 43229-6693
1-800-WILDLIFE

This permit is conditioned on the following requirements:

1. At least 15 days prior to the initiation of a mussel survey in Group 1 & 3 systems, please provide John Navarro (john.navarro@dnr.ohio.gov) with a study plan specifying the objectives, location, dates, and all other details, for Division of Wildlife review and approval. For mussel surveys in Group 2 & 4 systems, contact the USFWS (Angela Boyer at angela_boyer@fws.gov).

2. May only work in the systems that you have been approved for (Reconnaissance, Groups 1 & 3, Groups 2 & 4).

3. If approved, may collect mussels, including listed species, for survey and inventory. May also collect non-endangered fish. Sportfish greater than six (>6) inches must be immediately released.

4. At least 24 hours prior to collection activities, the permittee must contact the local wildlife officer (attachment) to advise locations and sampling duration (messages are acceptable). Permission must be obtained from private landowners.

5. Any and all work conducted on federally listed mussels, as well as identification of mussels, must be conducted by federal permittees following restrictions of a current Federal permit. Assistants are only permitted to work under the direct, on-site supervision of federal permittees.

6. Specimens may be temporarily held per guidelines outlined in the mussel protocol and released within 3 hours to the collection location. Live specimens must be maintained at the Columbus Zoo's Freshwater Mussel Conservation and Research Center.

7. All voucher specimens collected are to be deposited at The Ohio State University Museum of Biological Diversity, Cleveland Museum of Natural History, or the Cincinnati Museum Center, unless otherwise specified in the permit.

8. Collection is prohibited on Division of Wildlife property without explicit written permission from the Division of Wildlife. Sampling is further restricted in streams that may have federally listed mussels. See Appendix A of the Ohio Mussel Survey Protocol for locations of federally listed mussels.

9. Please notify John Navarro by email or phone at 614-265-6346 within 24-hours if a new location for a state-listed species is found.

10. A report of your mussel survey findings for Group 1 and 3 systems should be sent to John Navarro (john.navarro@dnr.state.oh.us) and for Group 2 and 4 streams should be sent to Angela Boyer (angela_boyer@fws.gov).

11. An annual electronic report must be submitted in the Wildlife Diversity Database Excel spreadsheet format to the Permit Coordinator at wildlife.permits@dnr.ohio.gov by March 15th of each year. The file may be downloaded from wildohio.gov or obtained from the Permit Coordinator.

Note that a separate permit under Section 10 of the Endangered Species Act (ESA) is necessary in the case where you might hold live federally listed species longer than 45 days. Permit requests under Section 10 of the ESA should be directed to U.S. Fish and Wildlife Service (USFWS) at https://fwsepermits.servicenowservices.com/fws. If you have questions about whether any proposed activities are covered under this authority or need any other assistance, please contact Angela Boyer at the USFWS, at (614) 416-8993, ext. 122, or angela_boyer@fws.gov.

12. Permittee may collect and video fish, aquatic macroinvertebrates, reptiles and amphibians for research, survey and educational purposes. No threatened or endangered species or mussels may be collected under authority of this permit. All non-target specimens must be immediately released. Specimens must be immediately released after identification unless required as voucher specimens. Permittee may retain up to three (3) non-endangered bivalves per site as voucher specimens. Unless being relocated from an impact zone and relocated using DOW approved methods, all endangered species are to be released at site of capture.

13. At least 24 hours prior to collection activities, the permittee must contact the local wildlife officer (attachment) to advise locations and sampling duration (messages are acceptable). Permission must be obtained from private landowners.

14. Live sport fish >6 inches and live state-listed species must be immediately released. No mussels or State-listed

Division of Wildlife Headquarters
2045 Morse Road. Bldg. G
Columbus, Ohio 43229-6693
1-800-WILDLIFE

threatened or endangered species may be taken or possessed from the wild.

15. Biosecurity measures must be taken to minimize the potential transmission of diseases. Gloves, PPE, and equipment must be switched or disinfected between individuals to minimize the risk of potential disease transmission in the field. Please follow the recommendations of the Northeast PARC (included) for all work with reptiles and amphibians.

16. Permittee must contact the Division of Wildlife if previously undocumented aquatic invasive species are discovered. Contact John Navarro at (614) 265-6346 or john.navarro@dnr.ohio.gov with information. If grass carp, silver carp, big head carp or black carp are captured, please retain and contact Eric Weimer at (419)625-8062 or at eric.weimer@dnr.ohio.gov.

17. Collection is prohibited in the Killbuck, Big Darby, Little Darby, including their tributaries, the east branch of the Chagrin River above I-90, Fish Creek (Williams County) and Division of Wildlife property without explicit written permission from the Division of Wildlife. Sampling is further restricted in streams that may have federally listed mussels. See Appendix A of the Ohio Mussel Survey Protocol (April 2020 @ https://ohiodnr.gov/static/documents/wildlife/permits/dow-protocol-ohio-mussel-survey.pdf) for locations of federally listed mussels.

18. All cages or enclosures must prevent ingress or egress of wild animals, have appropriate food and water, maintain appropriate temperature and provide protection from the weather. Enclosures must allow the animal to maintain species-specific and/or taxa specific seasonal and biological functions (e.g. bats hibernating). No part of collection may be held at a private residence.

19. All voucher specimens collected are to be deposited at The Ohio State University Museum of Biological Diversity, Cleveland Museum of Natural History, or the Cincinnati Museum Center, unless otherwise specified in the permit.

20. An annual electronic report must be submitted in the Wildlife Diversity Database Excel spreadsheet format to the Permit Coordinator at wildlife.permits@dnr.ohio.gov by March 15th of each year. The file may be downloaded from wildohio.gov or obtained from the Permit Coordinator.

Locations of Collecting:

statewide, Statewide

Equipment and method used in collection:

Hand Collection; SCUBA, Hand Collection; video, Hester-Dendy plates, hand collecting, Seine, electrocking

Name and number of each species to be collected:

Fishes (Determined), Macroinvertebrates (Determined), Reptiles and Amphibians (varies with project), Unionidae (Determined)

NO ENDANGERED SPECIES OR AQUATIC NUISANCE SPECIES MAY BE TAKEN WITHOUT WRITTEN PERMISSION FROM THE CHIEF

NATIVE ENDANGERED & THREATENED SP. RECOVERY
ENDANGERED & THREATENED WILDLIFE

Permit Number: TE194099-5

Effective: 10/01/2020 Expires: 12/31/2025

Issuing Office:

Department of the Interior
U.S. FISH & WILDLIFE SERVICE
Endangered Species Permit Office
5600 American Boulevard, West, Suite 990
Bloomington, MN 55437-1458
permitsR3ES@fws.gov

ALISA SHULL Digitally signed by ALISA SHULL Date: 2020.10.06 15:36:37 -05'00'

Chief - Endangered Species

Permittee:

MICHAEL A. HOGGARTH
4849 WOODHAVEN DRIVE
GALENA, OH 43021
U.S.A.

Authority: Statutes and Regulations: 16 USC 1539(a), 16 USC 1533(d); 50 CFR 17.22, 50 CFR 17.32, 50 CFR 13.

Location where authorized activity may be conducted:

Indiana, Kentucky, Michigan, Ohio, Pennsylvania, and West Virginia.

Reporting requirements:

ANNUAL REPORT DUE: 01/31
See permit conditions for reporting requirements

Authorizations and Conditions:

A. General Conditions set out in Subpart B of 50 CFR 13, and specific Conditions contained in Federal regulations cited above, are hereby made a part of this permit. All activities authorized herein must be carried out in accord with and for the purposes described in the application submitted. Continued validity, or renewal of this permit is subject to complete and timely compliance with all applicable Conditions, including the filing of all required information and reports.

B. The validity of this permit is also conditioned upon strict observance of all applicable foreign, state, local, tribal, or other Federal law.

C. Valid for use by Michael A. Hoggarth.

C.1. Unnamed assistants may work on permitted activities under the direct and on-site supervision of Dr. Hoggarth. "On-site supervision" is defined as having the Permittee at a distance close enough to enable immediate assistance to a supervised individual, as needed, while the supervised individual conducts an authorized activity.

D. Acceptance of this permit serves as evidence that the Permittee and its authorized agents understand and agree to abide by the terms of this permit and all sections of Title 50 Code of Federal Regulations, Parts 13 and 17, pertinent to issued permits (https://www.fws.gov/permits/ltr/ltr.html). Section 11 of the Endangered Species

Act of 1973, as amended, provides for civil and criminal penalties for failure to comply with permit Conditions.

A request for permit renewal using Application Form 3-200-59 and the $100 application processing fee must be received **at least 30 days prior to the expiration date** of this permit to continue conducting authorized activities under the expired permit while your application is being processed (subject to compliance with 50 CFR, Parts 13.21 and 13.22: https://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&sid=a1d34199d1ab36c8b78ecd06a7fa5180&tpl=/ecfrbrowse/Title50/50cfr13_main_02.tpl). When these requirements are not met, this permit becomes invalid on the expiration date. *Unless otherwise instructed within the Authorizations and Conditions*, **annual reports** are due by January 31 following each year your permit is in effect and shall be submitted to all offices identified in the permit Conditions, as appropriate. The following website link provides the permit application Form 3-200-59 and the mailing address to the Bloomington, MN - U.S. Fish and Wildlife Service, Endangered Species Office: https://www.fws.gov/endangered/permits/how-to-apply.html.

E. Permittee is authorized to take (only in the context of harass by survey - capture, handle, collect non-intrusive data/measurements, temporary hold, release; capture, transport, relocate) freshwater mussel species identified below for scientific research aimed at recovery of the species: presence/absence surveys, studies to document habitat use, population monitoring, and to evaluate potential impacts. This permit does **not** authorize the collection of voucher specimens.

Issuance of this permit does not constitute permission to conduct these activities on National Wildlife Refuges or any other public or private lands; such permission must be obtained separately from the appropriate landowner or land manager before beginning these authorized activities. This permit, neither directly nor by implication, grants the right of trespass.

A copy of this permit must be physically present on any person(s) conducting authorized activities. NOTE: This permit is limited to the activities and identified species authorized herein.

The following species are authorized:

- clubshell (*Pluerobema clava*)
- cracking pearlymussel (*Hemistena lata*)
- Cumberland bean (pearlymussel) (*Villosa trabalis*)
- Cumberland elktoe (*Alasmidonta atropurpurea*)
- Cumberlandian combshell (*Epioblasma brevidens*)
- Dromedary pearlymussel (*Dromus dromas*)
- dwarf wedgemussel (*Alasmidonta heterodon*)
- fanshell (*Cyprogenia stegaria*)
- fat pocketbook (*Potamilus capax*)
- James spinymussel (*Pleurobema collina*)
- littlewing pearlymussel (*Pegias fabula*)
- northern riffleshell (*Epioblasma torulosa rangiana*)
- orangefoot pimpleback (pearlymussel) (*Plethobasus cooperianus*)
- oyster mussel (*Epioblasma capsaeformis*)
- pink mucket (pearlymussel) (*Lampsilis abrupta*)
- purple cat's paw pearlymussel (*Epioblasma obliquata obliquata*)
- rabbitsfoot (*Quadrula cylindrica cylindrica*)
- rayed bean (*Villosa fabalis*)
- ring pink (mussel) (*Obovaria retusa*)

- rough pigtoe (*Pleurobema plenum*)
- scaleshell mussel (*Leptodea leptodon*)
- sheepnose mussel (*Plethobasus cyphyus*)
- slabside pearlymussel (*Lexingtonia dolabelloides*)
- snuffbox mussel (*Epioblasma triquetra*)
- spectaclecase (mussel) (*Cumberlandia monodonta*)
- tan riffleshell (*Epioblasma florentina walkeri*)
- tubercled blossom (pearlymussel) (*Epioblasma torulosa torulosa*)
- white catspaw (pearlymussel) (*Epioblasma obliquata perobliqua*)
- white wartyback (pearlymussel) (*Plethobasus cicatricosus*)
- winged mapleleaf (*Quadrula fragosa*)

F. Activities are authorized at the following locations:

F.1. Within the U.S. Fish and Wildlife Service (USFWS) Regional Minnesota office States: Indiana, Michigan, and Ohio upon receipt of written concurrence from the Field Supervisor, as outlined in Condition G.

F.2. Within the USFWS Regional Georgia office State: Kentucky upon receipt of written concurrence from the Field Supervisor, as outlined in Condition G.

F.3. Within the USFWS Regional Massachusetts office States: New York, Pennsylvania, and West Virginia upon receipt of written concurrence from the Field Supervisor, as outlined in Condition G.

G. Permittee shall notify and request approval from the USFWS Field Supervisor at least 15 days prior to conducting any activities. Contact information is available at: https://www.fws.gov/midwest/endangered/permits/index.html. Your request for this site-specific approval must be in writing and must indicate:

G.1. Species for which proposed activities are being conducted.

G.2. Location of proposed activities, including project site, county, and state.

G.3. A complete description of activities (i.e., proposed project plan, including purpose and need, surveys, methods, etc.). A copy of the specific site study plan must be included when the purpose includes relocation.

G.4. Dates when the project is proposed to take place.

G.5. Evidence that Permittee has received any required contracts to complete the activities.

G.6. Whether all annual reporting requirements have been fulfilled.

You may proceed with only the activities described in your written concurrence letter, upon receipt from the applicable USFWS Field Supervisor. ***Your concurrence letter must be carried with this permit to authorize site-specific activities.***

H. Capture and relocation shall be authorized only upon written approval and concurrence by the USFWS Field Supervisor within the geographic location of study areas in which the activity is proposed as required by Condition G., and in accordance with the following handling protocol:

H.1. Take (remove from the substrate by hand via wading, snorkeling, or diving) freshwater mussels identified in Condition E.

H.2. Collection of live mussel specimens shall be done only when the air temperature is above 32° Fahrenheit (F) and the water temperature is above 40° F. ***No*** *collection or transportation activities shall be conducted when air temperature is above 90° F.*

H.3. Specimens may be measured, sexed, and checked for gravidity prior to replacement into study cells. Other non-intrusive data may be collected as required to assess relocation success.

H.4. Permittee may temporarily hold specimens in mesh bags, either suspended in the water or held in a container containing river water, while awaiting identification and data collection. Specimens shall be held for up to three (3) hours in the water in bags that allow free movement of water from which the mussels were taken or held in containers of water that is changed every hour (every half-hour when air temperatures are at or above 80° F) and replaced with water freshly taken from where the mussels were collected. When practicable, specimens held in containers must remain in the shade. Live specimens that cannot be identified at the site must be photographed for identification purposes.

H.5. The shells of all live specimens collected must be thoroughly inspected for the presence of zebra mussels (*Dreissena polymorpha*). Unionids with zebra mussels attached must be cleaned by scrubbing prior to returning the specimens to the substrate. Permittee shall also document the incidence of zebra mussels and Asiatic clams (*Corbicula fluminea*) at project sites.

H.6. Specimens shall be photographed, and tagged prior to transporting them to relocation sites. The locations for replanting must have a stable substrate and have characteristics (i.e., temperature and water chemistry) conducive to survival of specimens. Permittee shall return the mussels to the substrate by diving. Permittee shall return the specimens to the substrate by hand, placing them on their side and allowing them to burrow on their own. Where the substrate is very compacted cobble, the substrate shall be loosened, excavating a circular area just large enough to receive the animal to a depth of 3/4 of its length and the mussel placed into it with the siphon (posterior) end up and pointing upstream. Placement and handling of gravid mussels shall be in accordance with instructions from the USFWS Field Supervisor as required by Condition G.

H.7. For transportation purposes, Permittee may temporarily hold specimens in either river water within aerated holding tanks or in ice chests draped in damp burlap and may move specimens to relocation site(s) as authorized in writing by the USFWS Field Supervisor as required by Condition G. In all cases, handling and exposure shall be kept to a minimum during relocation effort.

H.8. Equipment used to capture and handle mussel species shall be cleaned and decontaminated, including personal gear such as boots and gloves. Use of felt sole waders must be avoided whenever possible. Decontamination protocols, including use of felt sole waders, shall be reviewed and approved by the appropriate USFWS Field Supervisor as required by Condition G.

I. Permittee shall adhere to the following involving annual capture and release of freshwater mussel species for quantitative assessment of survival, growth, reproduction, and population-level measures. Annual monitoring of specimens at the study site shall comply with the following handling protocol:

I.1. Take (remove from the substrate by hand via wading, snorkeling, or diving) freshwater mussels identified in Condition E. to conduct presence/absence studies and surveys to monitor mussel communities.

I.2. Collection of live mussel specimens shall be done only when the air temperature is above 32° Fahrenheit

(F) and the water temperature is above 40° F. **No** collection activities shall be conducted when air temperature is above 90° F.

I.3. Specimens shall be returned to the substrate unharmed within three (3) hours to the locality where taken as follows:

a. For surveys at water temperatures at or above 50° F, mussels may be dropped back into the water after identification;

b. For surveys conducted at water temperatures between 40° F and 49° F, Permittee shall return the mussels to the substrate by diving. Permittee shall return the specimens to the substrate by hand, placing them on their side and allowing them to burrow on their own. Where the substrate is very compacted cobble, the substrate shall be loosened, excavating a circular area just large enough to receive the animal to a depth of 3/4 of its length and the mussel placed into it with the siphon (posterior) end up and pointing upstream.

I.4. Permittee may temporarily hold specimens in mesh bags, either suspended in the water or held in a container containing river water, while awaiting identification and data collection. Specimens shall be held for up to three (3) hours in the water in bags that allow free movement of water from which the mussels were taken or held in containers of water that is changed every hour (every half-hour when air temperatures are at or above 80° F) and replaced with water freshly taken from where the mussels were collected. When practicable, specimens held in containers must remain in the shade. Live specimens that cannot be identified at the site must be photographed for identification purposes. Specimens shall be returned to substrate at the locality from which they were removed.

I.5. All live mussels shall be measured (length and height) and, if possible, sexed and aged. No intrusive activities are authorized. Data collected will include descriptions of external morphometry and reproductive status. All federally listed mussels or a representative sample for each species shall be photographed prior to return to the substrate.

I.6. No live specimens may be removed from the survey sites, except for specimens encountered in circumstances which would reasonably be expected to result in stranding due to low or receding water. Such specimens may be moved into deeper water at the survey site, to a suitable location near the survey site, or to an alternative location coordinated with, and approved by the appropriate USFWS Field Supervisor as required by Condition G.

I.7. The shells of all live specimens collected must be thoroughly inspected for the presence of zebra mussels (*Dreissena polymorpha*). Unionids with zebra mussels attached must be cleaned by scrubbing prior to returning the specimens to the substrate. Permittee shall also document the incidence of zebra mussels and Asiatic clams (*Corbicula fluminea*) at project sites.

I.8. Equipment used to capture and handle mussel species shall be cleaned and decontaminated, including personal gear such as boots and gloves. Use of felt sole waders must be avoided whenever possible. Decontamination protocols, including use of felt sole waders, shall be reviewed and approved by the appropriate USFWS Field Supervisor as required by Condition G.

J. Upon determination that endangered or threatened freshwater mussel species are present at previously undocumented sites, Permittee shall notify the following USFWS offices within 48 hours: the Regional Minnesota office Recovery Permit Coordinator (Condition M.) and the USFWS Field Supervisor within the geographic location of study areas (https://www.fws.gov/midwest/endangered/permits/index.html). No voucher specimens may be collected. Any newly identified mussel species sites shall be vouchered with photographs

and/or video recordings.

K. Accidental injury or mortality of federally listed freshwater mussel species may not exceed two (2) specimens. In the event that any accidental injury or mortality occurs, all activities must cease. The Permittee shall notify the applicable USFWS Field Supervisor in the state in which the incident occurred (contact information provided at: https://www.fws.gov/midwest/endangered/permits/index.html) in writing of any mussel mortality or injury within 24 hours. Written notification shall also be made within 48 hours to the Regional Minnesota office Recovery Permit Coordinator (Condition M.). The Permittee's statement must document the cause of the injury or mortality, and identify all remedial measures employed by the Permittee to eliminate future mortality or injury events. Based on consultation between the USFWS offices, decisions will be made regarding remedial measures that will be implemented and whether and/or when any of the authorized activities may continue. The USFWS Field Supervisor within the geographic location in which the incident occurred will provide a decision within five (5) business days concerning the disposition of any injured or dead specimen. Permitted activities may resume upon receipt of written approval from the USFWS Field Supervisor within the geographic location in which the incident occurred.

Any specimens that are moribund or freshly-dead and contain soft tissue shall be preserved according to standard museum practices, properly identified and indexed (collection site, UTM coordinates or lat/long, site conditions when collected, date collected, and permit authorizing collection). All specimens shall be maintained at the Department of Life and Earth Sciences, Otterbein College, the Museum of Zoology, Ohio State University, or a public scientific museum in the state where collection occurred. All specimens retained under this permit remain the property of the United States Government and must clearly be identified as such. Any mussels that are not authorized for retention are to be chilled and promptly transferred to the USFWS Field Supervisor within the geographic location of study areas for potential necropsy and/or contaminants analysis.

L. An Annual Report of all activities conducted under the authority of this permit is due by January 31 following **each year** this permit is in effect. In addition, copies of all publications and reports resulting from work conducted under this permit must be submitted as they become available. Failure to furnish any reports required by this permit is cause for permit revocation and/or denial of future permit applications. At a minimum, your report shall include:

L.1. A complete discussion of field procedures, data collection methods, results, and conclusions.

L.2. The date, time, and locations (state, county, locality, UTM coordinates or GIS data with projection information) where each listed and/or candidate species was encountered and the location it was returned.

L.3. The locations of the surveyed sites where no listed species were located.

L.4. Habitat conditions at sites where *E. o. obliquata* were collected and at sites where they were replanted, including: water depth, substrate composition, sedimentation, and any other relevant data.

L.5. Habitat conditions at sites where threatened or endangered specimens were collected, including: water depth, substrate composition, sedimentation, and any other relevant data.

L.6. The size, age, sex and condition (if determinable) of any individuals encountered.

L.7. Any identification numbers or marks added to live specimens.

L.8. An assessment of the success of relocation and its use as a conservation and management tool.

L.9. A complete description of injuries and/or mortalities to listed species while in your possession, the dates of

occurrence, location where incident occurred, disposition of the species, any circumstances surrounding the incidents, and a description of any steps taken to reduce the likelihood that such injuries and/or mortalities will occur in the future.

L.10. A list of any salvaged specimens, locations where salvaged, their disposition, and where they are being maintained.

L.11. Any other data you may have collected for individual naiads, such as evidence of damage or injury, and observations of zebra mussel (*D. polymorpha*) and/or Asiatic clam (*C. fluminea*) infestation.

L.12. Copies of any separate reports and/or publications resulting from work conducted under the authority of this permit.

L.13. Photographs of the identifying characteristics for each individual federally-listed species captured are encouraged. The Permittee may be requested to provide individual photographs after submittal of annual reporting data.

L.14. Data for all mussels surveyed and include, but not be limited to, the data requested in any automated or species-specific data form provided by the USFWS. If a form is not provided by the USFWS, submit legible photocopies of all field data sheets for all species collected and a digital copy of any photographs of mussel specimens taken for species identification during your surveys.

L.15. Copies of all site specific authorization letters required under Condition G.

IF NO ACTIVITIES OCCURRED OVER THE COURSE OF THE YEAR, INDICATION OF SUCH SHALL BE SUBMITTED AS AN ANNUAL REPORT.

M. Copies of your reports shall be sent to **all applicable offices** indicated below. Your transmittal letter (or email) must cite your Federal permit number. Electronic copies shall be submitted in MS Word, Portable Document Format, Rich Text Format, or other file format that is compatible with the receiving office (**thumb drives/flash drives cannot be accepted**).

M.1. Regional Recovery Permit Coordinator
U.S. Fish and Wildlife Service
Ecological Services - Endangered Species
5600 American Blvd. W., Suite 990
Bloomington, Minnesota 55437-1458
(612/713-5343; fax 612/713-5292)
permitsR3ES@fws.gov

M.2. Regional Recovery Permit Coordinator
U.S. Fish and Wildlife Service
Endangered Species Permits
1875 Century Blvd.
Atlanta, Georgia 30345-3301
(404/679-7097; fax 404/679-7081)
permitsR4ES@fws.gov

M.3. Regional Recovery Permit Coordinator
U.S. Fish and Wildlife Service

Endangered Species Division
300 Westgate Center Drive
Hadley, Massachusetts 01035-9589
(413/253-8212; fax 413/253-8482)
permitsR5ES@fws.gov

N. Additionally, based on geographic areas, reports and publications shall be submitted to the applicable offices under "For Fish and Wildlife Permit Holders" at: https://www.fws.gov/midwest/endangered/permits/index.html.

cc: FWS/Regional Offices - Georgia and Massachusetts (Attn: Regional Recovery Permit Coordinator)
FWS, TE Coordinator: Illinois/Iowa, Indiana, Michigan, Minnesota/Wisconsin, Missouri, Ohio
DNR/DOC, TE Coordinator: Indiana, Michigan, Ohio

END

2021 sent report to 3 and email stating no collecting occurred in 4+5
on 14 Jan. 2022

From: Dr. Michael Hoggarth
To: Scott Ross (STONE)
Subject: FW: Authorization for a mussel survey
Date: Thursday, June 8, 2023 1:53:38 PM

From: John.Navarro@dnr.ohio.gov <John.Navarro@dnr.ohio.gov>
Sent: Monday, June 05, 2023 11:05 AM
To: Dr. Michael Hoggarth <michaelhoggarth@stoneenvironmental.com>
Subject: RE: Authorization for a mussel survey

Please proceed.

John Navarro
Aquatic Stewardship Program Administrator
Ohio Department of Natural Resources
Division of Wildlife
2045 Morse Rd, Columbus, Ohio 43229
614-265-6346
John.navarro@dnr.state.oh.us

From: Dr. Michael Hoggarth <michaelhoggarth@stoneenvironmental.com>
Sent: Monday, June 5, 2023 7:19 AM
To: Navarro, John <John.Navarro@dnr.ohio.gov>
Subject: Authorization for a mussel survey

Hi John,

I've attached a scope for a mussel survey of the Ottawa River in Jermain Park in Toledo where bank stabilization and reconstruction is proposed. Please review and authorize. Our plan will be to do the work next week.

Thanks, Mike

APPENDIX D

STONE
ENVIRONMENTAL, ENGINEERING & SCIENCE

Ohio Mussel Survey Data Sheet

PROJECT INFORMATION:

Project name: Ottawa River Restoration Jermain Park (project specific client number, ODOT PID, etc.) Date: 06/12/2023 mm/dd/yyyy

Nearest city: Toledo County: Lucas Township: NA

Latitude (DD.DDDD): 41.669775 Longitude (DD.DDDD): -83.586529

Stream name: Ottawa River Stream group number (1-4 or NA): 1

PERSONNEL:

Project lead: MA Hoggarth Ohio Permit #: SC220006 Federal Permit #: TE194099-5

Other personnel: Matt Brehm and Alex Brown

Survey type: Surface Survey Survey description: Typical

Deviation from survey methods: Hand collecting in shallow water and SCUBA in deep water

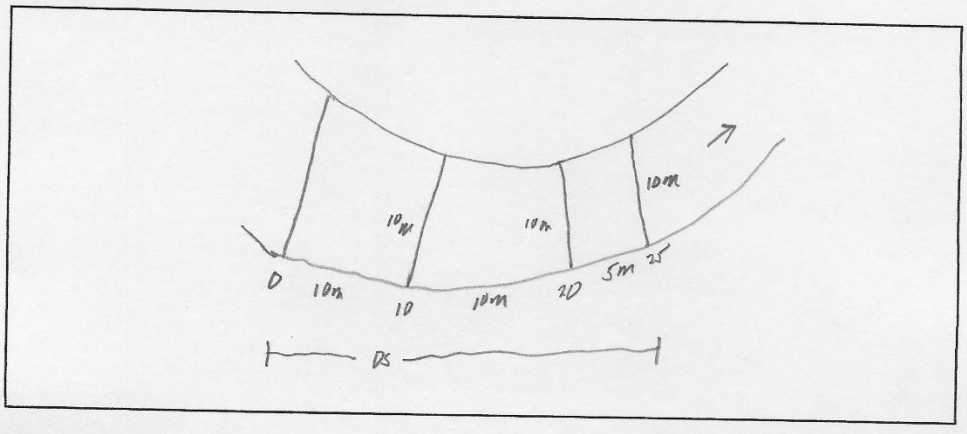
Mussel handling procedures: No live mussels found. Dead shells collected as vouchers.

QA/QC: three collectors per cell with time added above minimum

SITE SPECIFIC INFORMATION:

Location within the DS ☑, ADI ☐, US ☐: 0-25 Cell size: 50-100 m^2 Transect length:

Diagram showing location of cell or transect:



RESULTS:

Water Temperature (°C): 17 Air Temperature (°C): 13-17 (55-62°F) Water Level: low

Visibility (cm): to bottom* Conductivity (uS/cm): — Turbidity (NTU): 11 pH: —

Substrate Type

☐ Boulder % ____ ☐ Gravel % 10 ☐ Bedrock % ____ ☐ Detritus % 30 ☐ Silt % 10

☐ Cobble % 10 ☐ Sand % 30 ☐ Hardpan % ____ ☐ Muck % 10 ☐ Artificial % ____

Ave Depth (cm): Riffle NA Run 2' Pool 8' Max Depth (cm): Riffle NA Run 2' Pool 8'

SPECIES SPECIFIC DATA:

Species	Live P1	P2	P3	P4	P5	Dead P1	P2	P3	P4	P5	Weathered P1	P2	Subfossil P1	P2	Total Live	Relocated Yes	Relocated No
20-25 DS no mussels																	
10-20 DS no mussels																	
0-10 DS																	
A. Plicata	0					0					0		75				

P1 = Pass 1, etc., Live = collected alive, Dead = collected freshly dead, Weathered and Subfossil.
If more than 5 passes are required, move to second page and include page number here ____

Notes:

*Visibility was excellent for hand collecting with viewer and SCUBA

*Not kept.

STONE
ENVIRONMENTAL, ENGINEERING & SCIENCE

Ohio Mussel Survey Data Sheet

PROJECT INFORMATION:

Project name: Ottawa River Restoration Jermain Park (project specific client number, ODOT PID, etc.) Date: 06/12/2023 mm/dd/yyyy

Nearest city: Toledo County: Lucas Township: NA

Latitude (DD.DDDD): 41.669688 Longitude (DD.DDDD): -83.586176

Stream name: Ottawa River Stream group number (1-4 or NA): 1

PERSONNEL:

Project lead: MA Hoggarth Ohio Permit #: SC220006 Federal Permit #: TE194099-5

Other personnel: Matt Brehm and Alex Brown

Survey type: Surface Survey Survey description: Typical

Deviation from survey methods: Hand collecting in shallow water and SCUBA in deep water

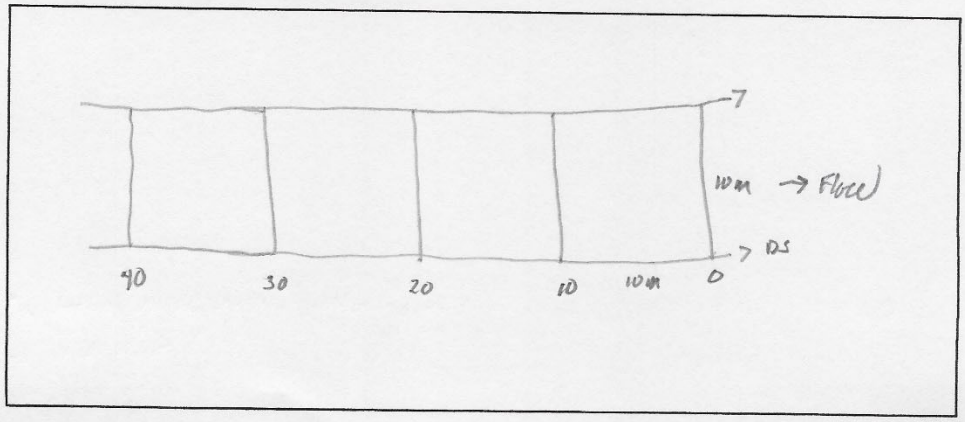
Mussel handling procedures: Live mussel stored in mesh bag in water for relocation.

QA/QC: Three collections / cell with time added above minimum.

SITE SPECIFIC INFORMATION:

Location within the DS ☐, ADI ☑, US ☐: 0 - 40m Cell size: 100 m^2 Transect length:

Diagram showing location of cell or transect:



RESULTS:

Water Temperature (°C): 17 Air Temperature (°C): 13-17 Water Level: low

Visibility (cm): to bottom *a Conductivity (uS/cm): ✓ Turbidity (NTU): 11 pH: ✓

Substrate Type

☐ Boulder % ____ ☐ Gravel % 10 ☐ Bedrock % ____ ☐ Detritus % 30 ☐ Silt % 10

☐ Cobble % 10 ☐ Sand % 30 ☐ Hardpan % ____ ☐ Muck % 10 ☐ Artificial % ____

Ave Depth (cm): Riffle NA Run 2' Pool 8' Max Depth (cm): Riffle NA Run 2' Pool 8'

SPECIES SPECIFIC DATA:

	Species	Live P1	Live P2	Live P3	Live P4	Live P5	Dead P1	Dead P2	Dead P3	Dead P4	Dead P5	Weathered P1	Weathered P2	Subfossil P1	Subfossil P2	Total Live	Relocated Yes	Relocated No
ADI	0-10 E. Dilatata						0							1 *b				
ADI	10-20 P. Grandis						2½	0										
	L. umbilicata	0					6½	0										
	A. fossisocians	0					½							1 *b				
	E. Dilatata	D					0					½		1 *b				
20-30	P. Alatus	1	0															
	F. fluvia	0	0									½						
30-40	L. siliquoidea	0	0									½						
30-40	NO mussels																	

P1 = Pass 1, etc., Live = collected alive, Dead = collected freshly dead, Weathered and Subfossil.
If more than 5 passes are required, move to second page and include page number here ____

Notes:

*a bottom visible for hand collecting + SCUBA

*b not kept

STONE
ENVIRONMENTAL, ENGINEERING & SCIENCE

Ohio Mussel Survey Data Sheet

PROJECT INFORMATION:

Project name: Ottawa River Restoration Jermain Park (project specific client number, ODOT PID, etc.) Date: 06/13/2022 mm/dd/yyyy

Nearest city: Toledo County: Lucas Township: NA

Latitude (DD.DDDD): 41.669855 Longitude (DD.DDDD): -83.586571

Stream name: Ottawa River Stream group number (1-4 or NA): 1

PERSONNEL:

Project lead: MA Hoggarth Ohio Permit #: SC220006 Federal Permit #: TE194099-5

Other personnel: Matt Brehm and Alex Brown

Survey type: Surface Survey Survey description: Typical

Deviation from survey methods: Hand collecting in shallow water and SCUBA in deep water

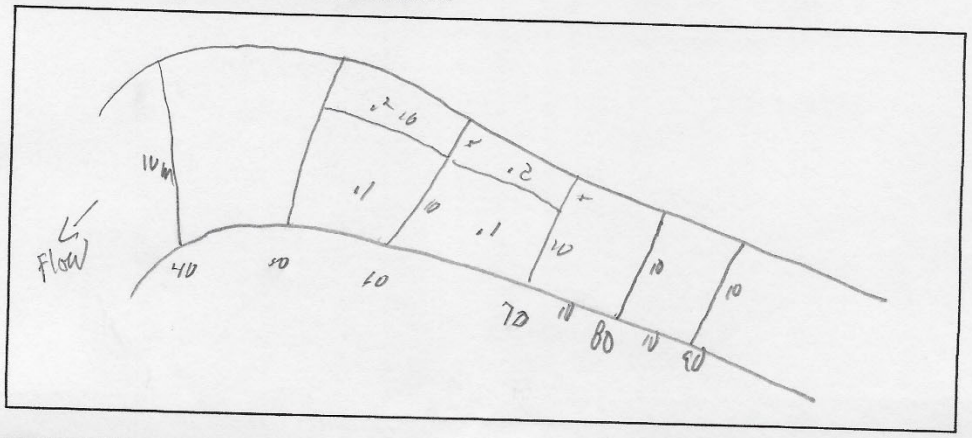
Mussel handling procedures: Live mussels returned in flowing water for relocation.

QA/QC: Three collectors per cell with extra time / cell.

SITE SPECIFIC INFORMATION:

Location within the DS ☐, ADI ☑, US ☐: 40 - 90 Cell size: 80-100 m² Transect length: /

Diagram showing location of cell or transect:



RESULTS:

Water Temperature (°C): 17 Air Temperature (°C): 13-20 Water Level: low

Visibility (cm): to bottom* Conductivity (uS/cm): — Turbidity (NTU): 10 pH: —

Substrate Type

☐ Boulder % ____ ☑ Gravel % 10 ☐ Bedrock % ____ ☑ Detritus % 20 ☑ Silt % 10

☑ Cobble % 10 ☑ Sand % 30 ☐ Hardpan % ____ ☑ Muck % 20 ☐ Artificial % ____

Ave Depth (cm): Riffle NA Run 2' Pool 10' Max Depth (cm): Riffle NA Run 2' Pool 12'

SPECIES SPECIFIC DATA:

	Species	Live P1	Live P2	Live P3	Live P4	Live P5	Dead P1	Dead P2	Dead P3	Dead P4	Dead P5	Weathered P1	Weathered P2	Subfossil P1	Subfossil P2	Total Live	Relocated Yes	Relocated No
40-50 AD1	no mussel																	
50-60 AD1.1 10x10	L. gracilis	0	0				0	0				1/2						
	L. Fragilis	0	0				1/2	0				0						
	L. ventricosa	0	0				0	0				1/2		1				
	E. triquetra	0	0				0	0				1/2						
50-60 AD1.2 5x10	no mussels																	
60-70.1 10x10	L. complanata	1	0				0	1										
	L. Fragilis	0	0				1	0										
60-70.2 5x10	no mussels																	
70-80	no mussels																	

P1 = Pass 1, etc., Live = collected alive, Dead = collected freshly dead, Weathered and Subfossil.
If more than 5 passes are required, move to second page and include page number here ____

Notes:

STONE
ENVIRONMENTAL, ENGINEERING & SCIENCE

Ohio Mussel Survey Data Sheet

PROJECT INFORMATION:

Project name: Ottawa River Restoration Jermain Park (project specific client number, ODOT PID, etc.) Date: 06/15/2025 mm/dd/yyyy

Nearest city: Toledo County: Lucas Township: NA

Latitude (DD.DDDD): 41.670452 Longitude (DD.DDDD): -83.587103

Stream name: Ottawa River Stream group number (1-4 or NA): 1

PERSONNEL:

Project lead: MA Hoggarth Ohio Permit #: SC220006 Federal Permit #: TE194099-5

Other personnel: Matt Brehm and Alex Brown

Survey type: Surface Survey Survey description: Typical

Deviation from survey methods: Hand collecting in shallow water and SCUBA in deep water

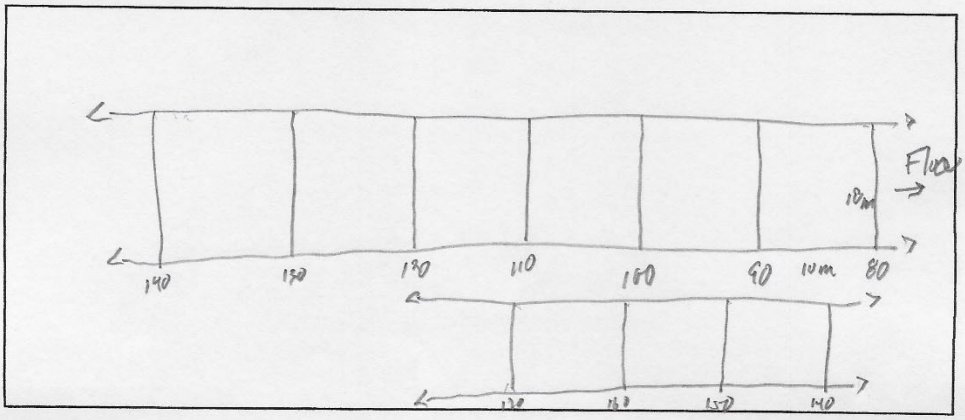
Mussel handling procedures: live mussels retained and relocated upstream.

QA/QC: Three collectors (end with time added.

SITE SPECIFIC INFORMATION:

Location within the DS ☐, ADI ☑, US ☐: 80-170 Cell size: 110 m² Transect length:

Diagram showing location of cell or transect:



RESULTS:

Water Temperature (°C): 17 Air Temperature (°C): 12-17 Water Level: low

Visibility (cm): to bottom Conductivity (uS/cm): / Turbidity (NTU): 11 pH: /

Substrate Type

☐ Boulder % ___ ☑ Gravel % 10 ☐ Bedrock % ___ ☑ Detritus % 20 ☑ Silt % 20

☑ Cobble % 10 ☑ Sand % 20 ☐ Hardpan % ___ ☑ Muck % 20 ☐ Artificial % ___

Ave Depth (cm): Riffle NA Run 2' Pool 7' Max Depth (cm): Riffle NA Run 3' Pool 10'

SPECIES SPECIFIC DATA:

	Species	Live P1	Live P2	Live P3	Live P4	Live P5	Dead P1	Dead P2	Dead P3	Dead P4	Dead P5	Weathered P1	Weathered P2	Subfossil P1	Subfossil P2	Total Live	Relocated Yes	Relocated No
80-90	P. Grandis	1	0															
	A. Plicata	1	0															
90-100	L. Complanata	1	0															
100-110	P. sintoxia	0					0					2						
	T. cylindrica	0					0					1						
110-120	NO mussels																	
120-130	L. complanata	1	0				1	1										
	T. donaca	0	0				0	0				1						
130-140	L. complanata	1	0				1	0										
140-150	L. complanata	1	2				0	1										
	P. alatus	0	0				0	1										
150-160	NO mussels																	
160-170	NO mussels																	

P1 = Pass 1, etc., Live = collected alive, Dead = collected freshly dead, Weathered and Subfossil.
If more than 5 passes are required, move to second page and include page number here ___

Notes:

STONE ENVIRONMENTAL, ENGINEERING & SCIENCE

STONE
ENVIRONMENTAL, ENGINEERING & SCIENCE

Ohio Mussel Survey Data Sheet

PROJECT INFORMATION:

Project name: Ottawa River Restoration Jermain Park (project specific client number, ODOT PID, etc.) Date: 06/14/2023 mm/dd/yyyy

Nearest city: Toledo County: Lucas Township: NA

Latitude (DD.DDDD): 41.670264 Longitude (DD.DDDD): -83.587973

Stream name: Ottawa River Stream group number (1-4 or NA): 1

PERSONNEL:

Project lead: MA Hoggarth Ohio Permit #: SC220006 Federal Permit #: TE194099-5

Other personnel: Matt Brehm and Alex Brown

Survey type: Surface Survey Survey description: Typical

Deviation from survey methods: Hand collecting in shallow water and SCUBA in deep water

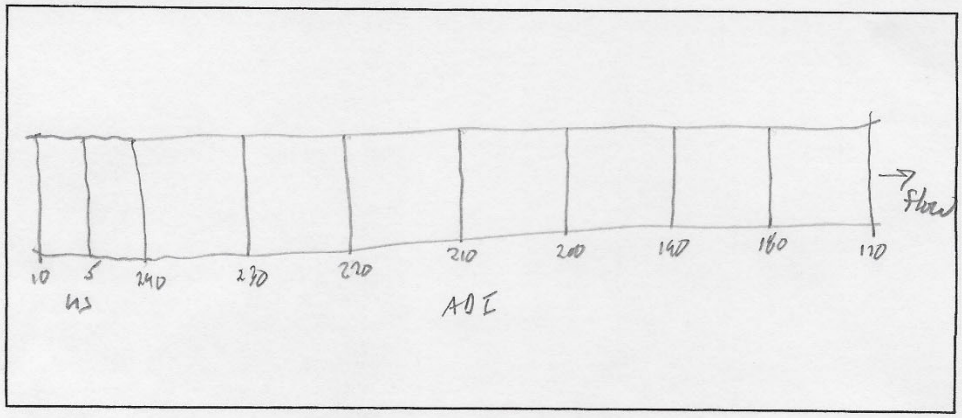
Mussel handling procedures: No live mussels collected

QA/QC: Three collectors / cell

SITE SPECIFIC INFORMATION:

Location within the DS ☐, ADI ☑, US ☑: 170-220 (0-5 + 5-10) Cell size: 100 m² (50m²) Transect length:

Diagram showing location of cell or transect:



RESULTS:

Water Temperature (°C): 17 Air Temperature (°C): 12-19 Water Level: moderate to low

Visibility (cm): to bottom Conductivity (uS/cm): / Turbidity (NTU): 15 pH: /

Substrate Type

☐ Boulder % ____ ☑ Gravel % 10 ☐ Bedrock % ____ ☑ Detritus % 30 ☑ Silt % 10

☑ Cobble % 10 ☑ Sand % 20 ☐ Hardpan % ____ ☑ Muck % 20 ☐ Artificial % ____

Ave Depth (cm): Riffle NA Run 1' Pool 6' Max Depth (cm): Riffle NA Run 2' Pool 6'

SPECIES SPECIFIC DATA:

	Species	Live P1	P2	P3	P4	P5	Dead P1	P2	P3	P4	P5	Weathered P1	P2	Subfossil P1	P2	Total Live	Relocated Yes	Relocated No
170-180	F. flava	0					0					1						
	L. complinata	0					0					1						
180-190	L. siliquoidea	0					0					1						
	Grandis	0					0					1						
190-200.1	no mussel																	
190-200.2	no mussel																	
200-210.1	L. complinata	0	0				4	0										
200-210.2	No mussels																	
210-220.1	L. complanata	0	0				1	0										
.2	T. truncatum	0	0				0	0						1				
220-230	L. gracilis	0	0				1	0										
Relocation	L. gracilis	0	0				1	0										

P1 = Pass 1, etc., Live = collected alive, Dead = collected freshly dead, Weathered and Subfossil.
If more than 5 passes are required, move to second page and include page number here ____

Notes:

STONE
ENVIRONMENTAL, ENGINEERING & SCIENCE

Ohio Mussel Survey Data Sheet

PROJECT INFORMATION:

Project name: Ottawa River Restoration Jermain Park (project specific client number, ODOT PID, etc.) Date: 06/15/2023 mm/dd/yyyy

Nearest city: Toledo County: Lucas Township: NA

Latitude (DD.DDDD): 41.625207 Longitude (DD.DDDD): -83.580219

Stream name: Ottawa River Stream group number (1-4 or NA): 1

PERSONNEL:

Project lead: MA Hoggarth Ohio Permit #: SC220006 Federal Permit #: TE194099-5

Other personnel: Matt Brehm and Alex Brown

Survey type: Surface Survey Survey description: Typical

Deviation from survey methods: Hand collecting in shallow water and SCUBA in deep water

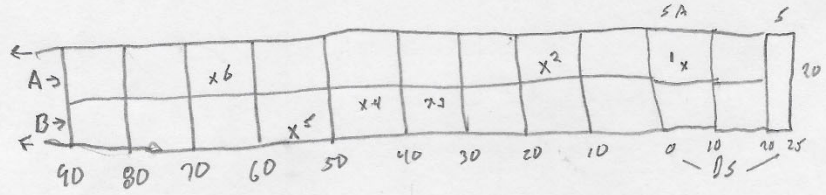
Mussel handling procedures: live mussels retained in flowing water for relocation

QA/QC: Two collectors / cell with added time.

SITE SPECIFIC INFORMATION:

Location within the DS ☑, ADI ☑, US ☐: 0-25 ft 0-40 ADI Cell size: 100 m² Transect length:

Diagram showing location of cell or transect:



1- A. alatus 3 - L. amplanata 5- T. perversa
2- L. complanata 4- L. amplanata 6 - L. amplanata

RESULTS:

Water Temperature (°C): 16 Air Temperature (°C): 13-24 Water Level: low

Visibility (cm): to bottom Conductivity (uS/cm): / Turbidity (NTU): 8 pH: /

Substrate Type

☐ Boulder % ___ ☑ Gravel % 20 ☐ Bedrock % ___ ☑ Detritus % 20 ☑ Silt % 20

☐ Cobble % ___ ☑ Sand % 10 ☑ Hardpan % 10 ☑ Muck % 20 ☐ Artificial % ___

Ave Depth (cm): Riffle NA Run 3' Pool 10' Max Depth (cm): Riffle NA Run 3' Pool 14'

SPECIES SPECIFIC DATA:

	Species	Live P1	Live P2	Live P3	Live P4	Live P5	Dead P1	Dead P2	Dead P3	Dead P4	Dead P5	Weathered P1	Weathered P2	Subfossil P1	Subfossil P2	Total Live	Relocated Yes	Relocated No
20-25 DS	NO mussels																	
10-20 DS A	No mussels																	
10-20 DS B	No mussels																	
0-10 DS A	A. alatus	1	0				0	1										
0-10 DS B	No mussels																	
0-10 AOS A	No mussels																	
0-10 AOS B	No mussels																	
10-20 AOS A	P. gracilis	0	0				0	0										
	L. complanata	1	0				1	1				1						
10-20 AOS B	No mussels																	
20-30 AOS A	No mussels																	
20-30 AOS B	No mussels																	
30-40 AOS A	No mussels																	
30-40 AOS B	L. complanata	1	0															
	F. flava	0	0				0	0						1				
	P. dilatata	0	0				0	0				1						
40-50 AOS A	No mussels																	
40-50 AOS B	L. complanata	1	0				0	0										
	A. plicata	0	0				0	0				2						
	P. sintoxia	0	0				0	0				1						

P1 = Pass 1, etc., Live = collected alive, Dead = collected freshly dead, Weathered and Subfossil.
If more than 5 passes are required, move to second page and include page number here 1 of 2

Notes:

STONE ENVIRONMENTAL, ENGINEERING & SCIENCE

RESULTS:

Water Temperature (°C): _____ Air Temperature (°C): _____ Water Level: _____

Visibility (cm): _____ Conductivity (uS/cm): _____ Turbidity (NTU): _____ pH: _____

Substrate Type

☐ Boulder % _____ ☐ Gravel % _____ ☐ Bedrock % _____ ☐ Detritus % _____ ☐ Silt % _____

☐ Cobble % _____ ☐ Sand % _____ ☐ Hardpan % _____ ☐ Muck % _____ ☐ Artificial % _____

Ave Depth (cm): Riffle ___ Run ___ Pool___ Max Depth (cm): Riffle ___ Run ___ Pool___

SPECIES SPECIFIC DATA:

	Species	Live					Dead					Weathered		Subfossil		Total	Relocated	
		P1	P2	P3	P4	P5	P1	P2	P3	P4	P5	P1	P2	P1	P2	Live	Yes	No
SD-6DAMIA	L. complanata	0	0				1	0										
	A. plicata	0	0				0	0				1						
SD-6DAMIB	T. parvum	1	0															
6D-7DAMIA	P. grandis	0	0				0	0				1						
	L. complanata	1	0				0	0										
6D-7DAMIB	No mussels																	
7D-8DAMIA	No mussels																	
7D-8DAMIB	P. grandis	0					0					1						
	A. plicata	0					0					1						
8D-9DAMIA	F. fluva	0					0							1				
8D-9DAMIB	No mussels																	

P1 = Pass 1, etc., Live = collected alive, Dead = collected freshly dead, Weathered and Subfossil.
If more than 5 passes are required, move to second page and include page number here 2 of 2

Notes:

STONE
ENVIRONMENTAL, ENGINEERING & SCIENCE

Ohio Mussel Survey Data Sheet

PROJECT INFORMATION:

Project name: Ottawa River Restoration Jermain Park (project specific client number, ODOT PID, etc.) Date: 06/15/2023 mm/dd/yyyy

Nearest city: Toledo County: Lucas Township: NA

Latitude (DD.DDDD): 41.674260 Longitude (DD.DDDD): -83.580717

Stream name: Ottawa River Stream group number (1-4 or NA): 1

PERSONNEL:

Project lead: MA Hoggarth Ohio Permit #: SC220006 Federal Permit #: TE194099-5

Other personnel: Matt Brehm and Alex Brown

Survey type: Surface Survey Survey description: Typical

Deviation from survey methods: Hand collecting in shallow water and SCUBA in deep water

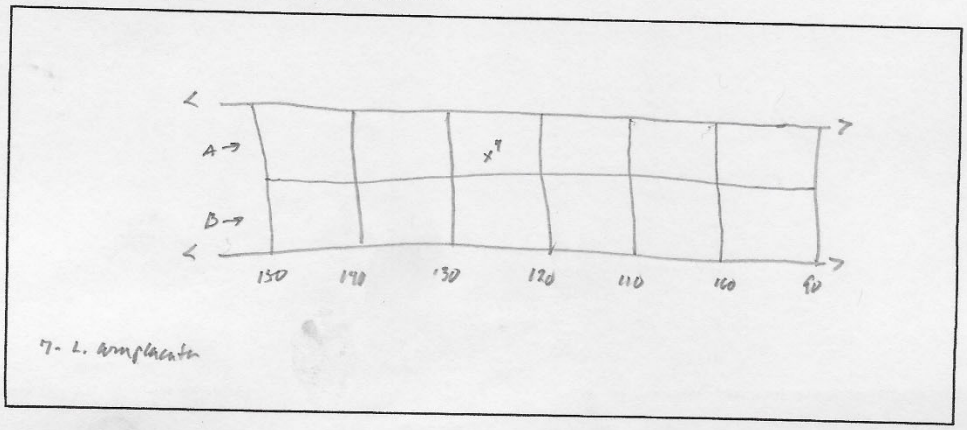
Mussel handling procedures: one live mussel collected and relocated

QA/QC: Two volunteers / cell + time added.

SITE SPECIFIC INFORMATION:

Location within the DS ☐, ADI ☑, US ☐: 90-150 Cell size: 160m² Transect length:

Diagram showing location of cell or transect:



7- 2. amplicata

RESULTS:

Water Temperature (°C): 16 Air Temperature (°C): 13-24 Water Level: low

Visibility (cm): to bottom Conductivity (uS/cm): ~ Turbidity (NTU): 8 pH: ~

Substrate Type

☐ Boulder % ___ ☑ Gravel % 10 ☐ Bedrock % ___ ☑ Detritus % 20 ☑ Silt % 20

☑ Cobble % 10 ☑ Sand % 10 ☑ Hardpan % 20 ☑ Muck % 10 ☐ Artificial % ___

Ave Depth (cm): Riffle NA Run 3' Pool 6' Max Depth (cm): Riffle NA Run 3 Pool 12

SPECIES SPECIFIC DATA:

	Species	Live P1	P2	P3	P4	P5	Dead P1	P2	P3	P4	P5	Weathered P1	P2	Subfossil P1	P2	Total Live	Relocated Yes	No
ADS 60-70 A	No mussels																	
ADS 40-120 B	No mussels																	
ADS 100-110 A	No mussels																	
ADS 100-110 B	No mussels																	
ADS 110-120 A	No mussels																	
ADS 110-120 B	No mussels																	
ADS 120-120 A	L. complanata	1	0															
ADS 120-120 D	No mussels																	
ADS 130-140 A	No mussels																	
ADS 130-140 B	No mussels																	
ADS 140-150 A	No mussels																	
ADS 140-150 B	No mussels																	

P1 = Pass 1, etc., Live = collected alive, Dead = collected freshly dead, Weathered and Subfossil.
If more than 5 passes are required, move to second page and include page number here ___

Notes:

STONE ENVIRONMENTAL, ENGINEERING & SCIENCE

STONE
ENVIRONMENTAL, ENGINEERING & SCIENCE

Ohio Mussel Survey Data Sheet

PROJECT INFORMATION:

Project name: Ottawa River Restoration Jermain Park (project specific client number, ODOT PID, etc.) Date: 06/16/2023 mm/dd/yyyy

Nearest city: Toledo County: Lucas Township: NA

Latitude (DD.DDDD): 41.673763 Longitude (DD.DDDD): -83.580420

Stream name: Ottawa River Stream group number (1-4 or NA): 1

PERSONNEL:

Project lead: MA Hoggarth Ohio Permit #: SC220006 Federal Permit #: TE194099-5

Other personnel: Matt Brehm and Alex Brown

Survey type: Surface Survey Survey description: Typical

Deviation from survey methods: Hand collecting in shallow water and SCUBA in deep water

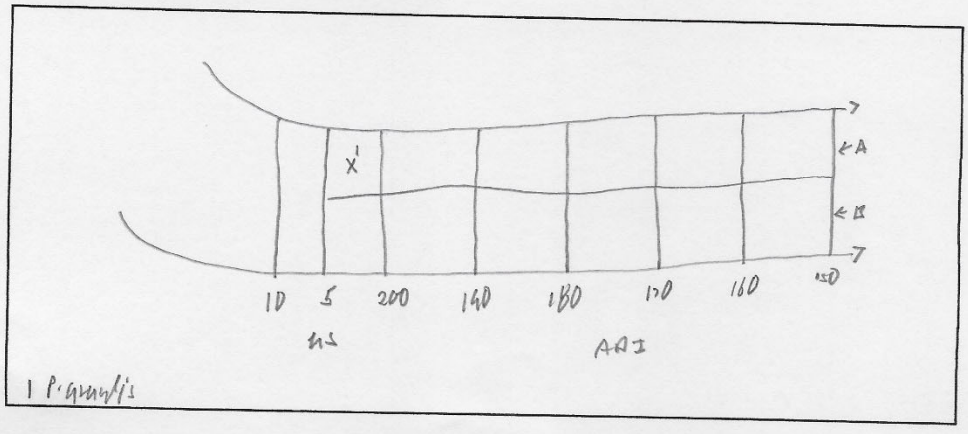
Mussel handling procedures: live mussel relocated

QA/QC: Two collectors / cell + extra time

SITE SPECIFIC INFORMATION:

Location within the DS ☐, ADI ☑, US ☑: 150-200 6-10 ws Cell size: 100 m² Transect length:

Diagram showing location of cell or transect:



RESULTS:

Water Temperature (°C): 13 (60) Air Temperature (°C): 13-17 (60-72) Water Level: low

Visibility (cm): ✓ Conductivity (uS/cm): ✓ Turbidity (NTU): 6 pH: ✓

Substrate Type

☐ Boulder % ____ ☑ Gravel % 20 ☐ Bedrock % ____ ☑ Detritus % 20 ☑ Silt % 10

☐ Cobble % ____ ☑ Sand % 20 ☑ Hardpan % 10 ☑ Muck % 20 ☐ Artificial % ____

Ave Depth (cm): Riffle NA Run 3' Pool 8' Max Depth (cm): Riffle NA Run 3' Pool 12'

SPECIES SPECIFIC DATA:

	Species	Live P1	P2	P3	P4	P5	Dead P1	P2	P3	P4	P5	Weathered P1	P2	Subfossil P1	P2	Total Live	Relocated Yes	No
150-160 ADI	No mussels																	
160-170 ADI	P. alatus	0					0					1						
170-180 ADI	L. complanata	0	0				1	0										
180-190 ADI	No mussels																	
190-200 ADI	P. grandis	0	0				0	0				1	0					
	L. compressa	0	0				½	0										
0-5 ds	P. grandis	1	0															
5-10 ds	No mussels																	

P1 = Pass 1, etc., Live = collected alive, Dead = collected freshly dead, Weathered and Subfossil.
If more than 5 passes are required, move to second page and include page number here _____

Notes: