Assessment of the mussel communities of Hellbranch Run, Franklin County, Ohio

Michael A. Hoggarth, Ph.D.

Otterbein University
Department of Biology and Earth Science
Westerville, Ohio 43021

Michael A. Hoggarth, PhD, LLC
4849 Woodhaven Drive
Galena, Ohio 43021

The Ohio Department of Natural Resources
Division of Natural Areas and Preserves
Scenic Rivers Program

Specimen of *Lampsilis fasciola* (Wavy-rayed Pocketbook) collected from Big Darby Creek immediately upstream of the confluence of Big Darby Creek and Hellbranch Run, 2009.

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Introduction

Watters (1986) was the first to identify the impact Hellbranch Run was having on the mussel fauna of Big Darby Creek. He noted that an outfall in the lower portion of the run produced effluent that pooled in the reach and that this pooled effluent periodically discharged into Big Darby Creek. This discharge greatly impacted the mussel fauna of Big Darby Creek at a location central to both downstream and upstream distributions of rare mussel species. Within Hellbranch Run itself he found numerous mussels upstream of this lower reach of the stream, although the community was not diverse. Hoggarth (2009), likewise, was unable to find living mussels downstream of the mouth of Hellbranch Run within the eastern channel around an island at this location (the eastern channel receives Hellbranch Run), although living mussels were found within the western channel and upstream of the mouth of the run along the eastern streambank (including the living specimen of *Lampsilis fasciola*, Wavy-rayed Pocketbook pictured on the title page). The importance of the water quality of Hellbranch Run on the mussel fauna of Big Darby Creek cannot be over emphasized.

In his second assessment of the mussel fauna of the Big Darby Creek System, Watters (1990:6) stated that, "Hellbranch Run has suffered a great loss of species…", which was not corrected by the time he performed his last faunal survey of the run (1996). In review, however, that loss (from 9 total species to 6 extant species) occurred prior to 1986 as he collected the same number of extant species in 1986 and 1990. There were far fewer specimens collected in 1990 than in 1986, but the number of extant species remained the same. That loss of species actually occurred between 1990 and 1996 when Watters reported only finding four (4) extant species in Hellbranch Run. Ohio EPA (2002) added two additional species, but it is unclear what condition the shells were in as they are not accessioned into the collection at The Ohio State University Museum of Biological Diversity (OSUM) and shell condition is not described in the text or tables in the report. Watters (1990) identified agricultural problems (sedimentation and nutrient pollution) as causes of the loss of species in the upper portion of the run, which were not remedied by the time the stream emptied into Big Darby Creek. In his report, he noted, "Several areas [on Big Darby Creek] have unusually low diversity. Hellbranch Run enters Big Darby Creek at ≈RM 26. Its impact can be seen for several miles downstream." He ends the 1996 narrative with the following paragraph (Watters, 1996:3):

> "Several tributaries no long support any mussels at their downstream sites. Buck Run historically has had severe problems with livestock-induced runoff and pollution. Hellbranch Run lack any evidence that mussels ever existed in its lowest stretch, where portions of the creek were buried under more than a foot of wastewater treatment effluent. The rare Pondhorn mussel, known in the system only from this tributary, apparently has been extirpated."

More recently, Ohio EPA (2018:136) confirmed the impact Hellbranch Run was having on the mussel fauna of Big Darby Creek. They stated:

> "Downstream from Hellbranch Run and upstream from St. Rt. 762 (RMs 26.1-23.8), there were declines in mussel diversity in the Big Darby mainstem between 2014 and 2001/2002 (zero species in 2014 and five in 2001/2002) (Table 13). In 2001/2002, field

observations noted substrates consisting of broken slab bedrock and gravel but with increased embedding sediment and sand; the source of the fines likely emanated from Hellbranch Run, the most urbanized Big Darby Creek sub-watershed and the one most affected by storm water and other urban influences."

Earlier in the same report, Ohio EPA (2018) noted that some of the wastewater treatment issues in Hellbranch Run had been fixed, or were in the process of being fixed, but they did identify urbanization, and especially flashiness and increased sedimentation, as more contemporary issues. The problems associated with these causes of impairment were be transported downstream into Big Darby Creek. They also noted that the overall health of the Darby Creek system mussel fauna seems to be following trends seen in other mussel fauna-diverse streams. These unfortunate trends are 1) lower diversity, 2) unexplained mussel die-offs, and 3) the replacement of one, more ecologically diverse mussel fauna, with a second, more resilient fauna. Hellbranch Run may never have had a diverse mussel fauna, as most small streams do not, but any reduction in the fauna here can be tied directly to anthropogenic causes that can persist even after the original impacts are eliminated. These impacts are transported downstream and old, no longer relative impacts, can be replaced with new impacts, even as future remedies are anticipated. This document attempts to focus attention on the water quality, habitat quality, and symbiosis necessary for the mussel community of Hellbranch Run as is displayed by the mollusk communities of this stream.

Materials and Methods

The assessment of the mussel communities of Hellbranch Run followed a three step approach: 1) a reach of stream was walked for a distance of 0.5 miles, 2) a "best area" based on substrate and habitat variability, was selected for concentrated examination (this reach was 200 meters in length and extended from bank to bank regardless of the width of the stream), and 3) 10, ¼ square meter quadrats were sampled within this 200 meter reach in the habitat mostly likely to support living mussels (Appendix 1 is a table with the a comparison of raw data from Watters, 1986, 1990 and 1996, OSUM records, and OEPA records). Prior to performing the field work, nine (9) locations were selected based on their importance to an understanding of the mussel fauna of the stream. Most of these locations had been sampled by Watters at least once but as many as three time, by other collectors since Watters 1996, and by Ohio EPA. These locations are listed below in Table 1. Field notes and QHEI (Qualitative Habitat Evaluation Index) forms are found in Appendix 2.

Table 1. Sample locations for the survey of the mussels of Hellbranch Run, 2025.

Site 77.	Hellbranch Run (RM 0.2) above the confluence with Big Darby Creek from 39.822290º -83.169048º (RM 0.0) to 39.824868º -83.160295º (RM 0.5) with quadrat sampling at 39.823467º -83.165589º (RM 0.2), Franklin County, Ohio. 18 July 2025. M.A. Hoggarth.

Site 78. Hellbranch Run (RM 1.1) above and below the Lambert Road Bridge from 39.825743º -83.158809º (RM 0.6) to 39.832749º -83.160321º (RM 1.1) with quadrat sampling at 39.827842º -83.159507º (RM 0.8), Franklin County, Ohio. 18 July 2025. M.A. Hoggarth.

Site 79. Hellbranch Run (RM 2.7) above the State Route 665 Bridge from 39.847880º -83.157090º (RM 2.7) to 39.853469º -83.158100º (RM 3.2) with quadrat sampling at 39.849105º -83.156178º (RM 2.8), Franklin County, Ohio. 6 June 2025. M.A. Hoggarth.

Site 80. Hellbranch Run (RM 3.7) above the Beatty Road Bridge from 39.860814º -83.156585º (RM 3.7) to 39.866177º -83.154653º (RM 4.2) with quadrat sampling at 39.861432º -83.157310º (RM 3.8), Franklin County, Ohio. 4 June 2025. M.A. Hoggarth.

Site 81. Hellbranch Run (RM 5.1) below the Grove City - Kropp Road Bridge from 39.870154º -83.156043º (RM 4.8) to 39.875402º -83.153765º (RM 5.2) with quadrat sampling at 39.873482º -83.154716º (RM 4.9), Franklin County, Ohio. 4 June 2025. M.A. Hoggarth.

Site 82. Hellbranch Run (RM 6.6) above and below the Johnson Road Bridge from 39.890155º -83.159945º (RM 5.8) to 39.895980º -83.160566º (RM 6.3) with quadrat sampling at 39.893005º -83.160710º (RM 6.6), Franklin County, Ohio. 4 June 2025. M.A. Hoggarth.

Site 83. Hellbranch Run (RM 7.5) above the Alkire Road Bridge from 39.903181º -83.165103º (RM 8.0) to 39.909805º -83.163677º (RM 7.5) with quadrat sampling at 39.904932º -83.164385º (RM 7.6), Franklin County, Ohio. 6 June 2025. M.A. Hoggarth.

Site 84. Hellbranch Run (RM 8.6) above the O'Harra Road Bridge from 39.913803º -83.170498º (RM 8.6) to 39.919719º -83.173724º (RM 9.1) with quadrat sampling at 39.915245º -83.172815º (RM 8.8), Franklin County, Ohio. 6 June 2025. M.A. Hoggarth.

Site 85. Hellbranch Run (RM 9.6) above the Hall Road Bridge from 39.928724º -83.180746º (RM 10.1) to 39.935412º -83.179947º (RM 10/6) with quadrat sampling at 39.929683º -83.180611º (RM 10.2), Franklin County, Ohio. 4 August 2025. M.A. Hoggarth.

Site # - Refer to site numbers in the larger Big Darby Creek watershed project.

Location of the 200 meter sample area showing the center point of quadrat sampling are shown in the Google Earth images in Appendix 3.

Note that the information presented in Appendix 1 (comparative mussel data) refer only to those reaches of Hellbranch Run from sites 77 – 85 above. Other data on the occurrence of mussels in this stream (OSUM records and OEPA data) are included for an assessment of species loss and retention (compare tables 2 and 3 in the results section) but not in the overall assessment of the current status of the mussels of Hellbranch Run. That assessment is based entirely on the historic

status of mussels at the sites listed in Table 1 compared to the current status of mussels at these same locations. Appendix 4 is a photolog that shows the stream and identifies some of the major issues facing Hellbranch Run, which also affect the mussels in this stream.

Results

Thirteen species of mussels have been reported from Hellbranch Run (Table 2). Of these, arguably, the most significant is *Uniomerous tetralasmus* (Pondhorn) as its population in the watershed was limited to Hellbranch Run (Watters, 1996) and its loss from the stream was a real loss to the entire system. This, mostly western species, is restricted to high quality, low gradient streams associated with prairie remnants in Ohio. It, and the headwaters species, attest to its original mussel species diversity. The headwaters species listed in Table 2 include *Anodontoides ferussacianus* (Cylindrical Papershell), and *Alasmidonta viridis* (Slippershell), while species found more generally in both headwaters and larger streams include *Utterbackia imbecillis* (Fragile Papershell), *Pygranodon grandis* (Common Floater), *Strophitus undulatus* (Creeper), *Toxolasma parvum* (Lilliput), and *Lampsilis siliquoidea* (Fat Mucket). The other species listed in Table 2 are more generally found in larger streams, or the larger portions of smaller streams. These species were lost prior to the 1960s (*Lasmigona costata*, Flutedshell) [continued on pg. 7]

Table 2. Historic chronology of the mussels of Hellbranch Run from OSUM, 1957, 1958, 1960, 1961, 1963, 1982, 1988, Watters, 1986, 1990, 1996, & OEPA 1993, 1997, 2001, 2002.

Species	1957	1958	1960	1961	1963	1982	1986	1988	1990	1993	1996	1997	2001	2002
1. *U. imbecillis*						live	live		dead		dead			
2. *P. grandis*	dead	live	live	live	dead	live	live	dead	live					
3. *A. ferussacianus*	dead	dead	live				live	weat	live	weat	live			
4. *S. undulatus*		live	dead	live	dead	dead	live		dead					weat
5. *A. viridis*		dead		weat				weat	weat					
6. *L. costata*		dead												
7. *F. flava*														weat
8. *U. tetralasmus*	weat						live		weat					
9. *T. parvum*	dead								live					
10. *C. iris*														weat
11. *L. siliquoidea*			live	dead					live		dead	dead	weat	
12. *L. cardium*									weat					
13. *L. fasciola*		dead					live				live			

live & dead = extant; weat = extirpated; blank = not recorded for that date

The status of OEPA shells were not possible to ascertain given the information available and so all were listed as weathered dead rather than freshly dead above. None of these shells were examined to make this assessment.

or may have been part of the mussel fauna of the lower portion of the stream, which was decimated prior to 1986. These species include *Fusconais flava* (Wabash Pigtoe), *Cambarunio iris* (Rainbow), and *Lampsilis cardium* (Plain Pocketbook). The only exception appears to be *L. fasciola* (Wavy-rayed Pocketbook), which held-on as late as 1995 (Watters, 1996).

Table 3 is a summary of the site-specific information found in Appendix 1. It demonstrates an unfortunate loss of mussels from first documentation of a stream's fauna to the present. Watters (1986) found good numbers of six (6) species of mussels from above the Beatty Road Bridge (RM 3.8) to the O'Hara Road Bridge (RM 8.6). *Pyganodon grandis* (Common Floater) and *A. ferussacianus* (Cylindrical Papershell) dominated the fauna. These two species, along with *U. imbecillis* (Fragile Papershell), *S. undulatus* (Creeper), and *L. siliquoidea* (Fat Mucket) are among the most abundant, and least sensitive, species of mussels found in the state. *Alasmidonta viridis* (Slippershell) appears to have been lost from the stream prior to 1986. Watters (1986) reported finding 93 living or recently dead specimens of six (6) species. Included in this total were six (6) individuals of *U. tetralasmus* (Pondhorn). By 1990, the number of extant species remained at six (6) but numbers of living and freshly dead were reduced to 53, even though the number of sites sampled had increased from five (5) in 1986 to eight (8) in 1990. *Uniomerous tetralasmus* had become extirpated by 1990 and *T. parvum* (Lilliput) was added. The number of extant populations of mussels continued to decrease after 1996, with the discovery of one freshly dead specimen of *A. ferussacianus* (Cylindrical Papershell) at the Johnson Road site (EnviroScience, 2015), and the continued decline to zero (0) in the current survey.

Table 3. Recent mussel community structure of Hellbranch Run.

Species	Watters, 86			Watters, 90			Watters 96			>96			Hoggarth, 25		
	L	D	W	L	D	W	L	D	W	L	D	W	L	D	W
1. *U. imbecillis*	0	11	0	0	4	0	0	1	0	0	0	0	0	0	0
2. *P. grandis*	14	36	0	6	21	2	6	9	0	0	0	0	0	0	1
3. *A. ferussacianus*	5	15	0	6	17	0	1	6	1	0	1	0	0	0	2
4. *S. undulatus*	0	4	0	0	2	4	0	0	0	0	0	0	0	0	1
5. *A. viridis*	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
6. *U. tetralasmus*	1	5	0	0	0	1	0	0	0	0	0	0	0	0	0
7. *T. parvum*	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1
8. *L. siliquoidea*	0	2	0	1	4	3	0	4	2	0	0	0	0	0	7
9. *L. cardium*	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Total	20	73	0	14	39	13	7	20	3	0	1	0	0	0	12
Total species			6			9			4			1			5
Extant species			6			6			4			1			0

Note: Dead specimens of *F. flava* and *C. iris* were collected by OEPA downstream of Timberlake WWTP in 2002 (not included in totals above) (see Table 2).

Other data that shed light on the complete absence of mussels in Hellbranch Run today are included in Appendix 1 (Site-specific data), and Appendix 2 (QHEI forms and Field Data sheets). Watters (1986, 1990, and 1996) did not collect data, or comment on, introduced species of mollusks other than noting that dreissenid mollusks (*Dreissena polymorpha* and *bugensis*, Zebra and Quagga Mussels) had not moved into the run. Furthermore, other collectors, other than OEPA (2018), did not identify the presence of any mollusks other than mussels in the reach. However, native fingernail clams (Sphaeriidae) (OEPA 2018) and one species of river snail (*Elimia livescens*, Liver Elimia) remain in Hellbranch Run. In addition to these native species, one introduced species of Viviparid snail (*Bellamya* [=*Cipangopaludina*] *chinensis maleatus*, Chinese Mystery Snail), and one species of introduced bivalve mollusk, *Corbicula fluminea*, (Asiatic Clam) occur in Hellbranch Run today (Appendix 1 and Appendix 2). These data suggest that although large-bodied mussels have been eliminated from Hellbranch Run, smaller-bodied mollusks (native fingernail clams and snails) were retained, and larger-bodied snails and bivalves, were subsequently added to the mollusk fauna of the stream.

Discussion

Status of the Mussels of Hellbranch Run

The mussel fauna of Hellbranch Run has been reduced dramatically since 1986, if not eliminated entirely. Watters (1986) noted the complete lack of any evidence that mussels ever occurred in the lower portion of the stream. He was unable to find any shells in any condition in the deep muck of this effluent-dominated reach. In addition, the data show that *A. viridis* (Slippershell) was lost between 1958 and 1961 and *L. costata* (Flutedshell) was lost sometime after 1958. More recently, Watters (1990, 1996) showed a steady decline in species diversity and numbers of individuals, while both recent surveys of the mussels of Hellbranch Run (OEPA, 2018) found that mussels were very few and far between. During the current survey, no living or freshly dead mussels (either of which would have indicated an extant population of that species in a reach) were found.

Causes for these declines in a fauna can be hard to determine, especially those before 1986 when four (4) of the 13 species known from the stream were lost. These four species are *A. viridis* (Slippershell), *L. costata* (Flutedshell), *F. flava* (Wabash Pigtoe) and *L. cardium* (Plain Pocketbook). The last three of these species are larger stream species and may have been lost due to uncontrolled wastewater deposit into the lower portion of the stream. The other (*A. viridis*, Slippershell) was probably a victim of agricultural runoff in the stream before its corridor became more developed. Excessive siltation leads to embedded substrate, which can interfere with habitat availability for small mussels and cause both reproductive and feeding problems for mussels. Appendix 2 (QHEI forms and Field Data sheets) documents that the most headwaters site sampled on Hellbranch Run during the current survey (Site # 85) still suffers from excessive siltation and deeply embedded substrate. In addition, Appendix (Photolog) and especially Photographs 11, 17, 24 & 26 show heavy silt covering the substrate. Early losses of species of mussels undoubtedly were the result of sedimentation and pollution.

Ohio EPA (2018) noted that the majority of the wastewater impacts on Hellbranch Run were fixed, or in the process of being fixed. The authors of that report, however, identify the fact that

other problems associated with urbanization are now affecting Hellbranch Run, and, undoubtedly, the mussels in this stream. They identify flashiness of the stream caused by the quick release of water from impervious surfaces and increased intensity of rainfall events as the primary cause of erosion of the streambanks and transport of sediments downstream. Appendix 4 (Photolog, especially Photographs 15, 16, 21 & 22) show the effect of excessive high stream flows on the banks of the run. In addition, OEPA (2018) identify nutrient loading from runoff from urban development along the run as an issue moving forward. Increased nutrients can cause algal growth in the water, which can help embed substrates and cause Oxygen depletion if the algae become too dense (See Appendix 4, Photolog, especially Photographs 2, 3, 34 & 35). Nutrient loading, whether from agricultural sources or urban sources, has essentially the same effects. Nutrient loading from agricultural sources undoubtedly caused Oxygen concentration problems that eliminated the larger mollusks (mussels) during the first wave of the loss of species, but allowed the other smaller species to continue to be present (*E. livescens*, Liver Elimia, and Sphaeriidae, Fingernail Clams). It is possible, and even probable, that *C. fluminea* (Asiatic Clam) and *B. c. maleatus* (Chinese Mystery Snail) were introduced after agricultural nutrient loading was eliminated as both rely on gills for respiration (like mussels) and both are larger than the native species of mollusks that have remained in the stream. The fact that *B. c. maleatus* (Chinese Mystery Snail) were only found at the Alkire Road site (Appendix 2, QHEI forms and Field Notes, Page XX) suggests larval snails (veliger) were introduced when water supporting bait fish was dumped into the run. *Corbicula fluminea* (Asiatic Clam) were probably introduced once the stream had recovered from the effects of agricultural nutrient loading as well. It should be noted that QHEI scores (Appendix 1 and Appendix 2), other than the top two sites (Sites 84 & 85) ranged in the 62-69 with most sites fairing very well on substrate type (also see Appendix 4, Photolog, Photographs 14 & 33) and lost out mostly with the absence of instream cover and channel morphology, both disproportionally effected by excessive erosion and modified flow regimes. Still scores in the mid-60s are sufficient to suggest that habitat is sufficient to support mussels. The fact that *C. fluminea* (Asiatic Clam) are abundant throughout most of the stream further indicates that the quality of habitat is not the primary cause of the absence of mussels.

The fact that *C. fluminea* (Asiatic Clam) and *B. c. maleatus* (Chinese Mystery Snail) occur today in Hellbranch Run suggests that mussels could live in the stream as well. Three problems must be overcome for this to happen:

1) access,
2) competition for space and food with *C. fluminea* (Asiatic Clam), and
3) water and sediment quality within the downstream reaches of the run.

It is not entirely clear why mussels have not returned to the lower portion of the run. It is probable that modifications to the stream channel, flow regime, and substrate have made the lower reaches of the stream unsuitable for bivalve mollusks. Very few *C. fluminea* (Asiatic Clam) were found at the two lowermost sites on Hellbranch Run, while beginning with the third site upstream, population densities of *C. fluminea* increased from 20 clams/meter^2 at Site 79 to a peak of 284 clams/meter^2 at Site # 81 (Appendix 1). In fact, it is probably a combination of factors from sediment quality/chemistry (whatever caused the initial elimination of mussels from this reach prior to 1986), to lack of flow and extreme low water conditions (OEPA ,2018). Access may be an issue here, but there is good fish community development in the lower portion of

Hellbranch Run and although a source for mussels may not exist within proximity downstream, due to the impacts of Hellbranch Run on Big Darby Creek, there are still mussels upstream of the mouth of Hellbranch Run that could be transported into the creek.

The bigger issue in the upper reaches, however, does appear to be access, and to a lesser extent, competition with *C. fluminea* (Asiatic Clam). As Hellbranch Run enters Big Darby Creek in its downstream section, there is no good access to headwaters species of mussels within a reasonable distance within the Darby Creek watershed. If a glochidium of *A. viridis* (Slippershell) were to make it to one of the former higher diversity sites, it would be in direct competition with anywhere between 68 to 120 or more *C. fluminea* (Asiatic Clam)/meter^2.

Impacts of Hellbranch Run on the Mussel Fauna of Big Darby Creek

Watters (1996) was the first to document the decline in species richness and abundance of individual mussels in Big Darby Creek downstream of the mouth of Hellbranh Run. He had one site at the mouth (his site # 48, RM 26.2-26.5), one site above the Ohio Route 62 Bridge (his site # 46, RM 25.4-25.7), and another site above the Ohio Route 762 Bridge (his site # 47, RM 23.7-24.1). In 1986 he documented 16 extant species of mussels at his site # 48 (mouth of Hellbranch Run), 20 extant species at the next site downstream (his site # 46), and 13 extant species at his site # 47 (at route 762 bridge). By 1990, the number of extant species at these three sites had decreased to 2, 3, and 8, respectively, and though he did not sample the site at the mouth of Hellbranch Run or the next site downstream (his site # 46) in 1996, he did add one extant species to his list for site # 47. In addition, Hoggarth (2009) was unable to find living or freshly dead mussels downstream of the confluence of Hellbranch Run and Big Darby Creek, and OEPA (2018) went from 5 extant species in this reach (from RM 26.2 to 23.7) in 2001/2 to none in 2014. Clearly, water coming from Hellbranch Run impacts the mussel resources of Big Darby Creek. And as Watters (1990) points out, these impacts are occurring at a particularly significant place on the creek where rare upstream species, such as *Theliderma cylindrica* (Rabbitsfoot) and *Pleurobema clava* (Clubshell), meet their downstream limit and downstream species, such as *Epioblasma rangiana* (Northern Riffleshell) and *Obovaria subrotunda* (Round Hickorynut) meet their upstream limit of distribution. There are a suite of potential causes for these effects, but certainly among them are the same issues that are causing impairment in Hellbranch Run: sediment transport from Hellbranch Run that covers substrates, embeds buried mussels and clogs their gills, nutrification that causes excessive algal growth ultimately leading to reduced Oxygen concentrations in the water, and modification of the flow regime, which increases the severity of flood events (increasing erosion, and sediment transport) and alternates extreme high flows with extreme low flows. These low flows accentuate the problems with Oxygen availability.

Summary and Conclusions

Our understanding of the mussels of Hellbranch Run began after the stream had already suffered significant loss of species. Even as early as 1957 and 1958 (Stansbery's first collecting trips into the stream) the lower portion of the creek had already suffered loss and the headwaters species, especially *A. viridis* (Slippershell), was in decline. Big Darby Creek at that time would have been a source of distribution back into Hellbranch Run for common species as well as the mid-sized stream species that once occupied Hellbranch Run, but as Watters discovered in 1986, pollution

in the lower portion of the stream blocked recolonization and no doubt had a negative affect on mussel transport upstream by interfering with fish migration through this toxic reach. That problem has been solved (although it is still unclear why mussels and even introduced species such as *C. fluminea* (Asiatic Clam) have not reinhabited these areas) while new problems have arisen. Agricultural development was mostly replaced by urban development, both of which can increase the intensity of high flows and the prolonged impacts of low flows. Climate change has exacerbated alternating extreme precipitation events with extreme drought as the last two years in Central Ohio have demonstrated. The extreme precipitation events lead to greater erosion (evident in much of Hellbranch Run), increased sediment transport, and substrate embeddedness. Low flow can cause pooling of water, which if long enough, can lead to Oxygen depletion, beaching of mussels in a reach, and increased predation if mussels occur in a reach.

It is apparent from the historical data as well as the data provided herein that our actions within Hellbranch Run have not been protective of the mussel communities there. Our assault on these animals in this stream has a long history as has our actions to reverse these impacts. Our actions, however, have failed to protect the mussel communities of Hellbranch Run.

Hellbranch Run connects to Big Darby Creek at a biologically significant location. The original presence of *U. tetralasmus* (Pondhorn) suggests that this tributary was a significant source of high quality water into its receiving stream. Beginning even before 1986, pollution in the lower portion of the run had not impacted water quality in Big Darby Creek, while just three years later and then beyond, it had made a significant impact on water quality and the mussels in Big Darby Creek. That impact has not been reduced and might even be greater today than it was before as a reduction of mussel species from 20 (Watters, 1990) to 5 (OEPA, 2001/2) to none (OEPA, 2013) occurred downstream of the mouth of Hellbranch Run. Both Hellbranch Run and Big Darby Creek at, and downstream of the mouth of Hellbranch Run, meet their Designated Uses, however it obvious that these uses are not protective of the mussels in Hellbranch Run or downstream of its confluence with Big Darby Creek.

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Appendix 1: Comparative Mussel Data

Site 77. Hellbranch Run (RM 0.2) above confluence with Big Darby Creek from 39.822290° -83.169048° (RM 0.0) to 39.824868° -83.160295° (RM 0.5) with quadrat sampling at 39.823467° -83.165589° (RM 0.2), Franklin County, Ohio. 18 July 2025. M.A. Hoggarth.

Data:		Turbidity: 25 NTU				pH: 8.82			Stream gage: 4.44 feet, 10.3 cfs, Hellbranch Run near Harrisburg OH (03230450)											
		Water temperature: 22.5°C				Access: Bridge			Oxygen Concentration: 7.39 mg/L (89% Saturation)						QHEI: 67					
	Mussel data									Previous Surveys								Current Survey			
			Watters 86				Watters 90				Watters 96				Other >96*				Hoggarth 25		
	Species	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T
	No mussels observed																	0	0	0	0
	Total																	0	0	0	0
	Total Species																				0
	Extant Species																				0

2025 Quadrat Data – 0 mussels/2.5m^2 or 0.0 mussels/ m^2 and 5 *C. fluminea* /2.5m^{2}or 2.0/ m^2.

*>96 none – not a Watters site or previously collected.

Site 78. Hellbranch Run (RM 1.1) above and below Lambert Road Bridge from 39.825743o -83.158809o (RM 0.6) to 39.832749° -83.160321° (RM 1.1) with quadrat sampling at 39.827842° -83.159507° (RM 0.8), Franklin County, Ohio. 18 July 2025. M.A. Hoggarth.

Data:		Turbidity: 25 NTU				pH: 8.82			Stream gage: 4.44 feet, 10.3 cfs, Hellbranch Run near Harrisburg OH (03230450)											
		Water temperature: 22.5°C				Access: Bridge			Oxygen Concentration: 7.39 mg/L (89% Saturation)						QHEI: 68					
	Mussel data									Previous Surveys								Current Survey			
			Watters 86				Watters 90				Watters 96				Other >96*				Hoggarth 25		
	Species	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T
1	*A. ferussacianus*					0	0	1	1									0	0	0	0
2	*S. undulatus*					0	0	1	1									0	0	0	0
3	*L. siliquoidea*					0	0	1	1									0	0	0	0
4	*L. cardium*					0	0	1	1									0	0	0	0
	Total					0	0	4	4									0	0	0	0
	Total Species								4												0
	Extant Species								0												0

2025 Quadrat Data – 0 mussels/2.5m^2 or 0.0 mussels/ m^2 and 5 *C. fluminea* /2.5m^{2}or 2.0/ m^2.

*>96 none – Watters site in 1990 only.

Site 79. Hellbranch Run (RM 2.7) above the State Route 665 Bridge from 39.847880o -83.157090o (RM 2.7) to 39.853469° -83.158100° (RM 3.2) with quadrat sampling at 39.849105° -83.156178° (RM 2.8), Franklin County, Ohio. 6 June 2025. M.A. Hoggarth.

Data:		Turbidity: 4.2 NTU				pH: not taken			Stream gage: 4.49 feet, 12.6 cfs, Hellbranch Run near Harrisburg OH (03230450)											
		Water temperature: not taken				Access: Bridge			Oxygen Concentration: not taken						QHEI: 65					
	Mussel data									Previous Surveys								Current Survey			
			Watters 86				Watters 90				Watters 96				Other >96*				Hoggarth 25		
	Species	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T
1	*P. granids*					0	0	1	1									0	0	0	0
2	*A. ferussacianus*					5	6	0	11									0	0	0	0
3	*S. undulatus*					0	0	1	1									0	0	0	0
4	*A. viridis*					0	0	1	1									0	0	0	0
5	*L. siliquoidea*					0	0	1	1									0	0	0	0
6	*L. cardium*					0	0	1	1									0	0	0	0
	Total					0	0	4	17									0	0	0	0
	Total Species								6												0
	Extant Species								1												0

2025 Quadrat Data – 0 mussels/2.5m^2 or 0.0 mussels/ m^2 and 50 *C. fluminea* /2.5m^{2}or 20/ m^2.

*>96 none – Watters site in 1990 only.

Site 80. Hellbranch Run (RM 3.7) above the Beatty Bridge from 39.860814o -83.156585o (RM 3.7) to 39.866177° -83.154653° (RM 4.2) with quadrat sampling at 39.861432° -83.157310° (RM 3.8), Franklin County, Ohio. 4 June 2025. M.A. Hoggarth.

Data: Turbidity: 3.8 NTU; pH: not taken; Stream gage: 4.29 feet, 10.3 cfs, Hellbranch Run near Harrisburg OH (03230450)
Water temperature: not taken; Access: Bridge; Oxygen Concentration: not taken; QHEI: 62

	Mussel data	Previous Surveys																Current Survey			
		Watters 86				Watters 90				Watters 96				Other >96*				Hoggarth 25			
	Species	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T
1	*P. granids*	1	2	0	3	0	1	0	1	0	2	0	2					0	0	0	0
2	*A. ferussacianus*	4	5	0	9	0	2	0	2	0	1	0	1					0	0	1	1
3	*S. undulatus*	0	0	0	0	0	1	0	1	0	0	0	0					0	0	0	0
4	*L. siliquoidea*	0	1	0	1	0	2	0	2	0	2	0	2					0	0	2	2
	Total	5	8	0	13	0	6	0	6	0	5	0	5					0	0	3	3
	Total Species				4				4				3								2
	Extant Species				4				4				3								0

2025 Quadrat Data – 0 mussels/2.5m^2 or 0.0 mussels/ m^2 and 400 *C. fluminea* /2.5m^{2}or 160/ m^2.

*>96 none.

Site 81. Hellbranch Run (RM 5.1) below the Grove City - Kropp Road Bridge from 39.870154o -83.156043o (RM 4.8) to 39.875402° -83.153765° (RM 5.2) with quadrat sampling at 39.873482° -83.154716° (RM 4.9), Franklin County, Ohio. 4 June 2025. M.A. Hoggarth.

Data: Turbidity: 5.6 NTU; pH: not taken; Stream gage: 4.29 feet, 10.3 cfs, Hellbranch Run near Harrisburg OH (03230450)
Water temperature: not taken; Access: Bridge; Oxygen Concentration: not taken; QHEI: 69

	Mussel data	Previous Surveys																Current Survey			
		Watters 86				Watters 90				Watters 96				Other >96*				Hoggarth 25			
	Species	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T
1	*P. granids*					0	0	1	1	0	0	0	0					0	0	0	0
2	*A. ferussacianus*					0	2	0	2	0	1	0	1					0	0	0	0
3	*S. undulatus*					0	0	1	1	0	0	0	0					0	0	0	0
4	*T. parvum*					1	0	0	1	0	0	0	0					0	0	0	0
5	*L. siliquoidea*					0	0	0	0	0	0	1	1					0	0	1	1
	Total					1	2	2	5	0	1	1	2					0	0	1	1
	Total Species								4				2								1
	Extant Species								2				1								0

2025 Quadrat Data – 0 mussels/2.5m^2 or 0.0 mussels/ m^2 and 710 *C. fluminea* /2.5m^{2}or 284/ m^2.

*>96 none, and not sampled by Watters in 1986.

Site 82. Hellbranch Run (RM 6.6) above and below the Johnson Road Bridge from 39.890155o -83.159945o (RM 5.8) to 39.895980° -83.160566° (RM 6.3) with quadrat sampling at 39.893005° -83.160710° (RM 6.6), Franklin County, Ohio. 4 June 2025. M.A. Hoggarth.

Data: Turbidity: 4.5 NTU; pH: not taken; Stream gage: 4.29 feet, 10.3 cfs, Hellbranch Run near Harrisburg OH (03230450)
Water temperature: not taken; Access: Bridge; Oxygen Concentration: not taken; QHEI: 62

	Mussel data	Previous Surveys																Current Survey			
		Watters 86				Watters 90				Watters 96				Other >96*				Hoggarth 25			
	Species	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T
1	*U. imbecillis*	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	*P. granids*	3	7	0	10	0	2	0	2	1	1	0	2	0	0	0	0	0	0	0	0
3	*A. ferussacianus*	1	7	0	8	0	3	0	3	1	2	0	3	0	1	0	1	0	0	0	0
4	*S. undulatus*	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	*U. tetralasmus*	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	*L. siliquoidea*	0	1	0	1	0	0	1	1	0	1	0	1	0	0	0	0	0	0	1	1
	Total	4	20	0	24	0	5	1	5	2	4	0	6	0	1	0	1	0	0	1	1
	Total Species				6				3				3				1				1
	Extant Species				6				2				3				1				0

2025 Quadrat Data – 0 mussels/2.5m^2 or 0.0 mussels/ m^2 and 300 *C. fluminea* /2.5m^{2}or 120/ m^2.

*>96 OEPA (1993, RM 6.6).

Site 83. Hellbranch Run (RM 7.5) above the Beatty Road Bridge from 39.903181o -83.165103o (RM 8.0) to 39.909805° -83.163677° (RM 7.5) with quadrat sampling at 39.904932° -83.164385° (RM 7.6), Franklin County, Ohio. 6 June 2025. M.A. Hoggarth.

Data: Turbidity: 4.2 NTU | pH: not taken | Stream gage: 4.49 feet, 12.6 cfs, Hellbranch Run near Harrisburg OH (03230450)
Water temperature: not taken | Access: Bridge | Oxygen Concentration: not taken | QHEI: 65

	Mussel data	Previous Surveys															Current Survey			
		Watters 86				Watters 90				Watters 96				Other >96*				Hoggarth 25			
	Species	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T
1	*U. imbecillis*	0	1	0	1	0	2	0	2	0	0	0	0					0	0	0	0
2	*P. granids*	2	8	0	10	1	3	0	4	2	1	0	3					0	0	0	0
3	*A. ferussacianus*	0	1	0	1	1	2	0	3	0	2	0	2					0	0	0	0
4	*S. undulatus*	0	0	0	0	0	1	0	1	0	0	0	0					0	0	1	1
5	*T. parvum*	0	0	0	0	0	0	0	0	0	0	0	0					0	0	1	1
6	*L. siliquoidea*	0	0	0	0	1	1	0	2	0	1	0	1					0	0	3	3
	Total	2	19	0	12	3	9	0	12	2	5	0	7					0	0	5	5
	Total Species				3				5				3								3
	Extant Species				3				5				3								0

2025 Quadrat Data – 0 mussels/2.5m^2 or 0.0 mussels/ m^2 and 200 *C. fluminea* /2.5m^{2}or 80/ m^2.
*>96 none.

Site 84. Hellbranch Run (RM 8.6) above the O'Harra Road Bridge from 39.913803o -83.170498o (RM 8.6) to 39.919719° -83.173724° (RM 9.1) with quadrat sampling at 39.915245° -83.172815° (RM 8.8), Franklin County, Ohio. 6 June 2025. M.A. Hoggarth.

Data: Turbidity: 6.5 NTU | pH: not taken | Stream gage: 4.49 feet, 12.6 cfs, Hellbranch Run near Harrisburg OH (03230450)
Water temperature: not taken | Access: Bridge | Oxygen Concentration: not taken | QHEI: 56

	Mussel data	Previous Surveys															Current Survey			
		Watters 86				Watters 90				Watters 96				Other >96*				Hoggarth 25			
	Species	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T
1	*U. imbecillis*	0	8	0	8	0	2	0	2	0	1	0	1					0	0	0	0
2	*P. granids*	8	15	0	23	5	13	0	18	3	3	0	6					0	0	1	1
3	*A. ferussacianus*	0	2	0	2	0	2	0	2	0	0	1	1					0	0	1	1
4	*S. undulatus*	0	2	0	2	0	0	1	1	0	0	0	0					0	0	0	0
5	*U. tetralasmus*	1	4	0	5	0	0	1	1	0	0	0	0					0	0	0	0
6	*T. parvum*	0	0	0	0	0	1	0	1	0	0	0	0					0	0	0	0
7	*L. siliquoidea*	0	0	0	0	0	1	0	1	0	0	1	1					0	0	0	0
	Total	9	41	0	40	5	19	2	26	3	4	2	9					0	0	2	2
	Total Species				5				7				4								2
	Extant Species				5				5				2								0

2025 Quadrat Data – 0 mussels/2.5m^2 or 0.0 mussels/ m^2 and 170 *C. fluminea* /2.5m^{2}or 68/ m^2.
*>96 none.

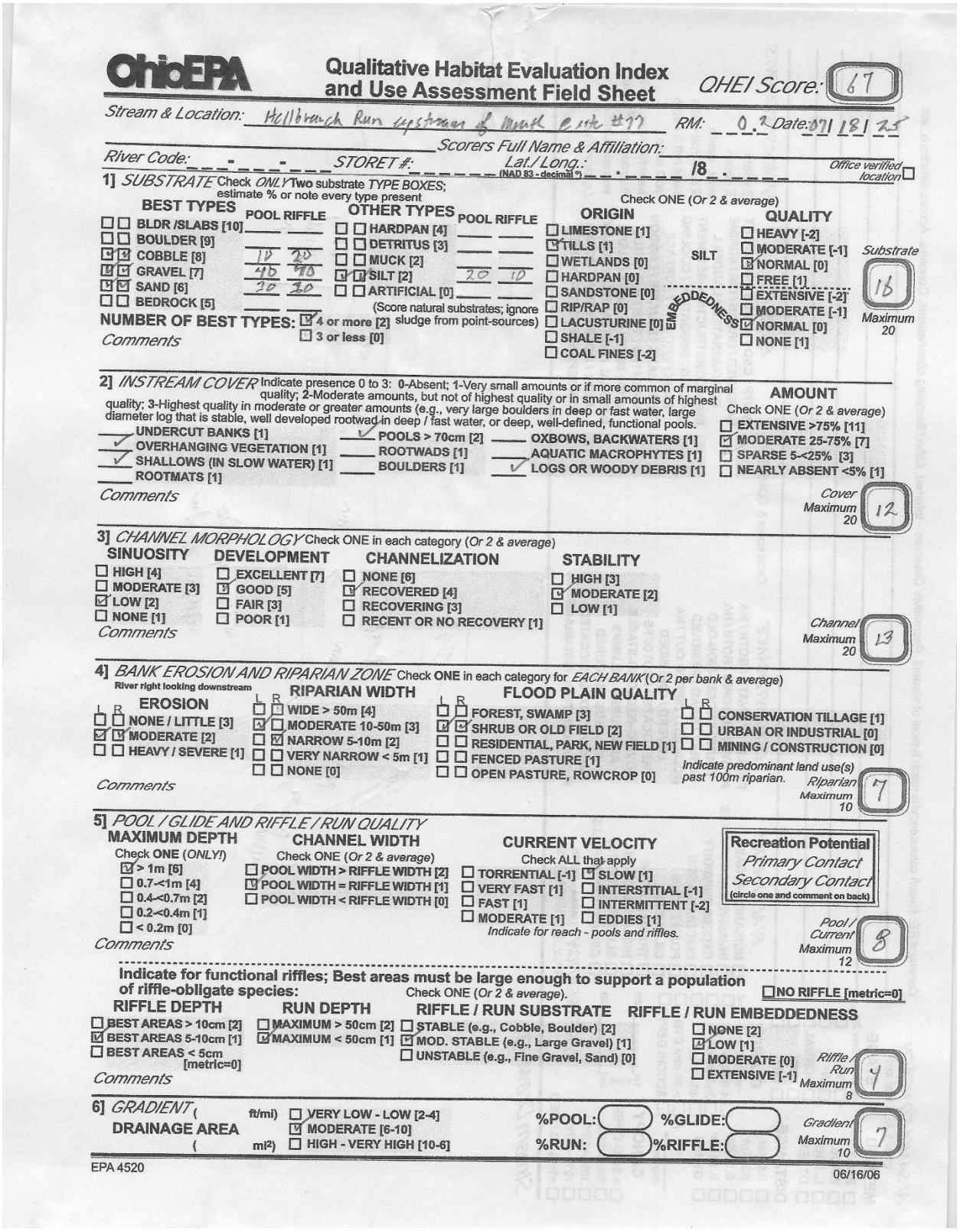
Site 85. Hellbranch Run (RM 9.6) above the Hall Road Bridge from 39.928724o -83.180746o (RM 10.1) to 39.935412° -83.179947° (RM 10/6) with quadrat sampling at 39.929683° -83.180611° (RM 10.2), Franklin County, Ohio. 4 August 2025. M.A. Hoggarth.

Data: Turbidity: 12.1NTU | pH: 8.99 | Stream gage: 4.27 feet, 4.1 cfs, Hellbranch Run near Harrisburg OH (03230450)
Water temperature: 19.3°C | Access: Bridge | Oxygen Concentration: 7.67 mg/L (88% Saturation) | QHEI: 38

	Mussel data	Previous Surveys															Current Survey			
		Watters 86				Watters 90				Watters 96				Other >96*				Hoggarth 25			
	Species	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T	L	D	W	T
1	*P. granids*	0	4	0	4	0	2	0	2	0	2	0	2					0	0	0	0
	Total	0	4	0	4	0	2	0	2	0	2	0	2					0	0	0	0
	Total Species				1				1				1								0
	Extant Species				1				1				1								0

2025 Quadrat Data – 0 mussels/2.5m^2 or 0.0 mussels/ m^2 and 30 *C. fluminea* /2.5m^{2}or 12/ m^2.
*>96 none.

Appendix 2: QHEI forms



OhioEPA **Qualitative Habitat Evaluation Index and Use Assessment Field Sheet** QHEI Score: 67

Stream & Location: Hellbranch Run upstream of Mouth at site #17 RM: 0.2 Date: 07/18/25

Scorers Full Name & Affiliation:

River Code: - - STORET #: Lat./Long.: (NAD 83 - decimal °) 18 . Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]			☐ ☐ HARDPAN [4]		
☐ ☐ BOULDER [9]			☐ ☐ DETRITUS [3]		
☑ ☑ COBBLE [8]	10	20	☐ ☐ MUCK [2]		
☑ ☑ GRAVEL [7]	40	40	☑ ☑ SILT [2]	20	10
☑ ☑ SAND [6]	20	30	☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

Check ONE (Or 2 & average)

ORIGIN	SILT	QUALITY	EMBEDDEDNESS
☐ LIMESTONE [1]		☐ HEAVY [-2]	
☑ TILLS [1]		☐ MODERATE [-1]	
☐ WETLANDS [0]		☑ NORMAL [0]	
☐ HARDPAN [0]		☐ FREE [1]	
☐ SANDSTONE [0]		☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]		☐ MODERATE [-1]	
☐ LACUSTURINE [0]		☑ NORMAL [0]	
☐ SHALE [-1]		☐ NONE [1]	
☐ COAL FINES [-2]			

Comments

Substrate 16 Maximum 20

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

___ UNDERCUT BANKS [1]	✓ POOLS > 70cm [2]	___ OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (Or 2 & average))
✓ OVERHANGING VEGETATION [1]	___ ROOTWADS [1]	✓ AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
✓ SHALLOWS (IN SLOW WATER) [1]	___ BOULDERS [1]	✓ LOGS OR WOODY DEBRIS [1]	☑ MODERATE 25-75% [7]
___ ROOTMATS [1]			☐ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 12

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☑ GOOD [5]	☑ RECOVERED [4]	☑ MODERATE [2]
☑ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 13

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average) River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]	☐ ☐ CONSERVATION TILLAGE [1]
☑ ☑ MODERATE [2]	☑ ☐ MODERATE 10-50m [3]	☑ ☑ SHRUB OR OLD FIELD [2]	☐ ☐ URBAN OR INDUSTRIAL [0]
☐ ☐ HEAVY / SEVERE [1]	☐ ☑ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐ ☐ MINING / CONSTRUCTION [0]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]	
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 7

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))	CHANNEL WIDTH (Check ONE (Or 2 & average))	CURRENT VELOCITY (Check ALL that apply)	
☑ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☑ SLOW [1]
☐ 0.7-<1m [4]	☑ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☐ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.	

Recreation Potential: Primary Contact, Secondary Contact (circle one and comment on back)

Comments

Pool / Current Maximum 12: 8

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☑ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 4

6] GRADIENT (ft/mi) ☐ VERY LOW - LOW [2-4] ☑ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (mi²)

%POOL: %GLIDE: %RUN: %RIFFLE:

Gradient Maximum 10: 7

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

STAGE

1st -sample pass- 2nd	
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

CLARITY

1st --sample pass-- 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

1st pass _____ cm

2nd _____ cm

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

D] MAINTENANCE

Circle some & *COMMENT*

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

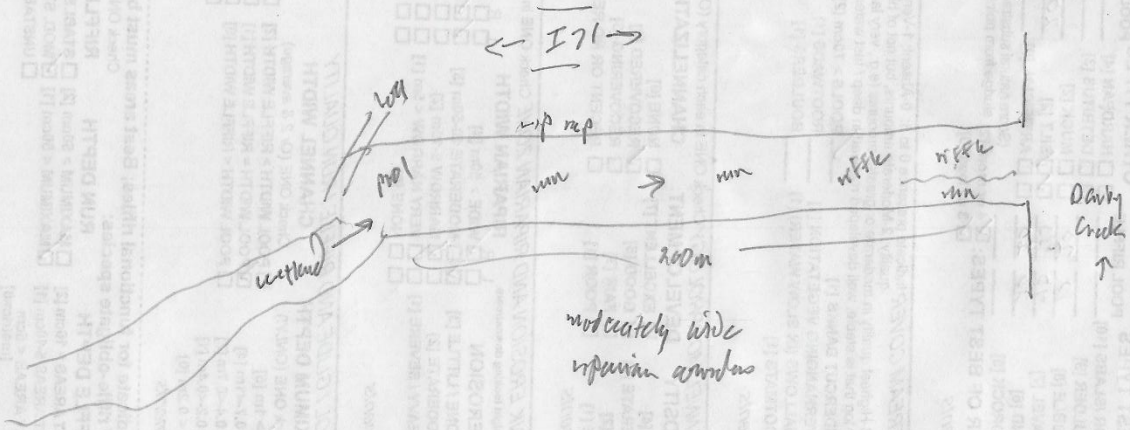
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 68

Stream & Location: Hellbranch Run downstream of Lambert Road TB RM: 1.1 Date: 07/18/25

Scorers Full Name & Affiliation:

River Code: ___-___-___ STORET #: _____ Lat./Long.: (NAD 83 - decimal °) ___.____ / 8_.____ Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]			☐ ☐ HARDPAN [4]		
☐ ☐ BOULDER [9]			☐ ☐ DETRITUS [3]		
☑ ☑ COBBLE [8]	10	20	☑ ☑ MUCK [2]	5	1
☑ ☑ GRAVEL [7]	HD	30	☑ ☐ SILT [2]	15	5
☐ ☐ SAND [6]	30	50	☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

Comments

Check ONE (Or 2 & average)

ORIGIN	SILT	QUALITY	EMBEDDEDNESS
☐ LIMESTONE [1]		☐ HEAVY [-2]	
☑ TILLS [1]		☐ MODERATE [-1]	
☐ WETLANDS [0]		☑ NORMAL [0]	
☐ HARDPAN [0]		☐ FREE [1]	
☐ SANDSTONE [0]		☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]		☐ MODERATE [-1]	
☐ LACUSTURINE [0]		☐ NORMAL [0]	
☐ SHALE [-1]		☐ NONE [1]	
☐ COAL FINES [-2]			

Substrate 18 Maximum 20

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

✓ UNDERCUT BANKS [1]	✓ POOLS > 70cm [2]	___ OXBOWS, BACKWATERS [1]
✓ OVERHANGING VEGETATION [1]	___ ROOTWADS [1]	___ AQUATIC MACROPHYTES [1]
___ SHALLOWS (IN SLOW WATER) [1]	___ BOULDERS [1]	✓ LOGS OR WOODY DEBRIS [1]
___ ROOTMATS [1]		

AMOUNT (Check ONE (Or 2 & average))
☐ EXTENSIVE >75% [11]
☑ MODERATE 25-75% [7]
☐ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 13

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☑ GOOD [5]	☑ RECOVERED [4]	☑ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☑ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 12

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]
☑ ☑ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☑ ☑ SHRUB OR OLD FIELD [2]
☐ ☐ HEAVY / SEVERE [1]	☑ ☑ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]
		☐ ☐ CONSERVATION TILLAGE [1]
		☐ ☐ URBAN OR INDUSTRIAL [0]
		☐ ☐ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 6

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH (Check ONE (ONLY!))	CHANNEL WIDTH (Check ONE (Or 2 & average))	CURRENT VELOCITY (Check ALL that apply)
☑ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1] ☑ SLOW [1]
☐ 0.7-<1m [4]	☑ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1] ☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1] ☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☐ MODERATE [1] ☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 8

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☑ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0] ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 4

6] GRADIENT (ft/mi) DRAINAGE AREA (mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: %GLIDE: %RUN: %RIFFLE:

Gradient Maximum 10: 7

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

DISTANCE
- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CANOPY
- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

STAGE

1st -sample pass- 2nd	
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

CLARITY

1st --sample pass-- 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

1st pass _____ cm

2nd _____ cm

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

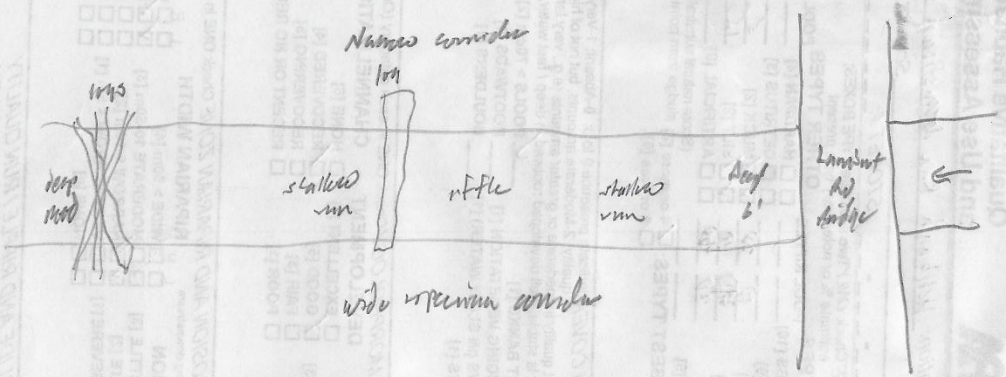
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 65

Stream & Location: Hellbranch Run at Rt. 665 Bridge @ site #99 RM: 2.7 Date: 6/06/25

Scorers Full Name & Affiliation:

River Code: - - STORET #: Lat./Long.: (NAD 83 - decimal °) . /8 . Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]			☐ ☐ HARDPAN [4]		
☐ ☐ BOULDER [9]	10	10	☐ ☐ DETRITUS [3]		
☐ ☐ COBBLE [8]	10	10	☐ ☐ MUCK [2]		
☐ ☑ GRAVEL [7]	30	30	☐ ☐ SILT [2]	10	10
☑ ☐ SAND [6]	30	40	☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN	SILT	QUALITY
☐ LIMESTONE [1]		☐ HEAVY [-2]
☑ TILLS [1]		☐ MODERATE [-1]
☐ WETLANDS [0]		☑ NORMAL [0]
☐ HARDPAN [0]		☐ FREE [1]
☐ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]
☐ RIP/RAP [0]		☐ MODERATE [-1]
☐ LACUSTURINE [0]		☐ NORMAL [0]
☐ SHALE [-1]		☐ NONE [1]
☐ COAL FINES [-2]		

Substrate 18 Maximum 20

Comments

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

___ UNDERCUT BANKS [1]	___ POOLS > 70cm [2]	___ OXBOWS, BACKWATERS [1]
✓ OVERHANGING VEGETATION [1]	___ ROOTWADS [1]	✓ AQUATIC MACROPHYTES [1]
✓ SHALLOWS (IN SLOW WATER) [1]	✓ BOULDERS [1]	✓ LOGS OR WOODY DEBRIS [1]
___ ROOTMATS [1]		

AMOUNT (Check ONE (Or 2 & average))
☐ EXTENSIVE >75% [11]
☐ MODERATE 25-75% [7]
☑ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 8

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☑ GOOD [5]	☑ RECOVERED [4]	☑ MODERATE [2]
☑ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 14

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)
☐ ☐ NONE / LITTLE [3]	☐ ☑ WIDE > 50m [4]	☑ ☑ FOREST, SWAMP [3]
☑ ☑ MODERATE [2]	☑ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]
☐ ☐ HEAVY / SEVERE [1]	☐ ☐ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]
	☐ ☐ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]
		☐ ☐ CONSERVATION TILLAGE [1]
		☐ ☐ URBAN OR INDUSTRIAL [0]
		☐ ☐ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 10

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH	CHANNEL WIDTH	CURRENT VELOCITY
Check ONE (ONLY!)	Check ONE (Or 2 & average)	Check ALL that apply
☐ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1] ☑ SLOW [1]
☐ 0.7-<1m [4]	☑ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1] ☐ INTERSTITIAL [-1]
☑ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1] ☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☐ MODERATE [1] ☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 4

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: ☐ NO RIFFLE [metric=0]

Check ONE (Or 2 & average).

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☑ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☑ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0] ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 5

6] GRADIENT (ft/mi)

DRAINAGE AREA (mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: %GLIDE:
%RUN: %RIFFLE:

Gradient Maximum 10: 6

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass- 2nd	
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass-- 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

1st pass _____ cm

2nd _____ cm

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

Circle some & *COMMENT*

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

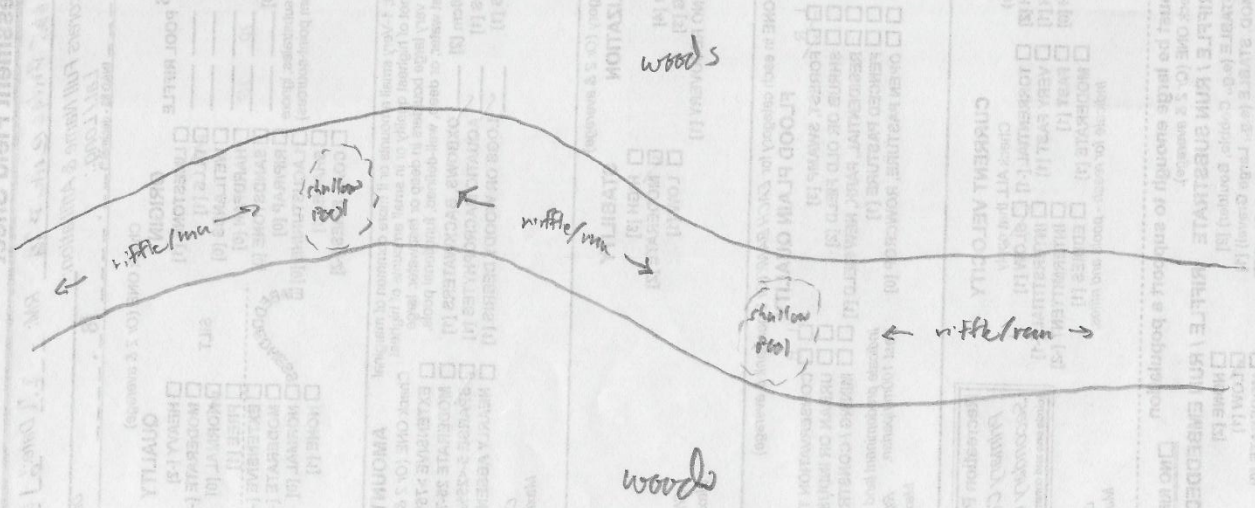
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 62

Stream & Location: Hellbranch Run @ Beatty Road Bridge (#80) RM: 3.7 Date: 06/04/25

Scorers Full Name & Affiliation: Michael A. Hoggarth

River Code: - - - STORET #: Lat./Long.: (NAD 83 - decimal °) 18 . Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR /SLABS [10]			☐☐ HARDPAN [4]		
☐☐ BOULDER [9]	10	0	☐☐ DETRITUS [3]		
☐☐ COBBLE [8]	20	20	☐☐ MUCK [2]		
☑☐ GRAVEL [7]	20	50	☐☐ SILT [2]	10	10
☐☑ SAND [6]	40	10	☐☐ ARTIFICIAL [0]		
☐☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN	SILT	QUALITY	EMBEDDEDNESS
☐ LIMESTONE [1]		☐ HEAVY [-2]	
☑ TILLS [1]		☐ MODERATE [-1]	
☐ WETLANDS [0]		☑ NORMAL [0]	
☐ HARDPAN [0]		☐ FREE [1]	
☐ SANDSTONE [0]		☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]		☑ MODERATE [-1]	
☐ LACUSTURINE [0]		☐ NORMAL [0]	
☐ SHALE [-1]		☐ NONE [1]	
☐ COAL FINES [-2]			

Comments

Substrate Maximum 20: 15

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

			AMOUNT
___ UNDERCUT BANKS [1]	✓ POOLS > 70cm [2]	✓ OXBOWS, BACKWATERS [1]	Check ONE (Or 2 & average)
✓ OVERHANGING VEGETATION [1]	___ ROOTWADS [1]	✓ AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
✓ SHALLOWS (IN SLOW WATER) [1]	✓ BOULDERS [1]	✓ LOGS OR WOODY DEBRIS [1]	☐ MODERATE 25-75% [7]
___ ROOTMATS [1]			☑ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 10

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☑ GOOD [5]	☑ RECOVERED [4]	☑ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☑ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 12

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION L	EROSION R	RIPARIAN WIDTH L	RIPARIAN WIDTH R
☐ NONE / LITTLE [3]	☐ NONE / LITTLE [3]	☐ WIDE > 50m [4]	☐ WIDE > 50m [4]
☑ MODERATE [2]	☑ MODERATE [2]	☐ MODERATE 10-50m [3]	☑ MODERATE 10-50m [3]
☐ HEAVY / SEVERE [1]	☐ HEAVY / SEVERE [1]	☐ NARROW 5-10m [2]	☐ NARROW 5-10m [2]
		☑ VERY NARROW < 5m [1]	☐ VERY NARROW < 5m [1]
		☐ NONE [0]	☐ NONE [0]

FLOOD PLAIN QUALITY L	FLOOD PLAIN QUALITY R
☐ FOREST, SWAMP [3]	☐ CONSERVATION TILLAGE [1]
☐ SHRUB OR OLD FIELD [2]	☐ URBAN OR INDUSTRIAL [0]
☑ RESIDENTIAL, PARK, NEW FIELD [1]	☐ MINING / CONSTRUCTION [0]
☐ FENCED PASTURE [1]	
☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 10

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH	CHANNEL WIDTH	CURRENT VELOCITY
Check ONE (ONLY!)	Check ONE (Or 2 & average)	Check ALL that apply
☐ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]
☑ 0.7-<1m [4]	☑ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]
☐ 0.2-<0.4m [1]		☐ MODERATE [1]
☐ < 0.2m [0]		☑ SLOW [1]
		☐ INTERSTITIAL [-1]
		☐ INTERMITTENT [-2]
		☐ EDDIES [1]
		Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 6

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 3

6] GRADIENT (ft/mi)

DRAINAGE AREA (mi²)

☑ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 20 %GLIDE: 10
%RUN: 10 %RIFFLE: 50

Gradient Maximum 10: 6

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

STAGE

1st -sample pass- 2nd		
☐ HIGH		☐
☐ UP		☐
☐ NORMAL		☐
☐ LOW		☐
☐ DRY		☐

CLARITY

1st --sample pass-- 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

1st pass _____ cm

2nd _____ cm

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

Comment RE: *Reach consistency/* Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

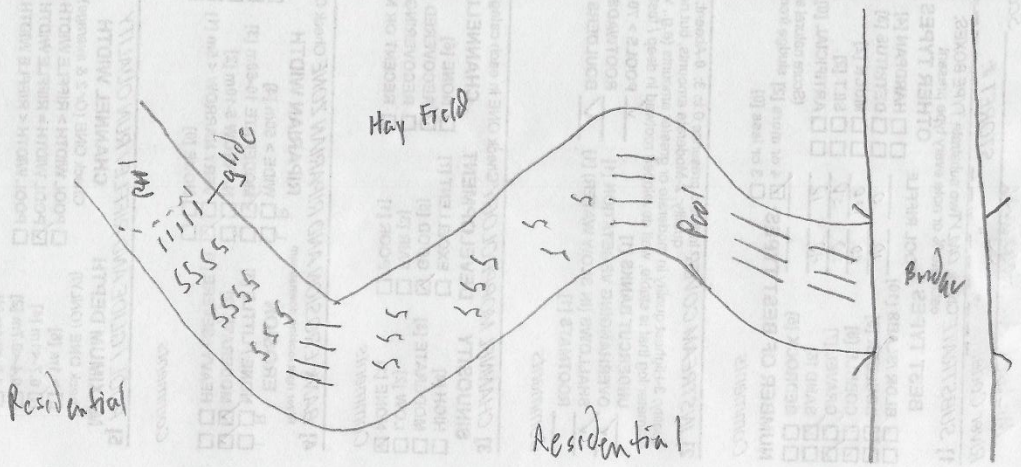
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 69

Stream & Location: Hallowell Run @ site #81 RM: 5.1 Date 06/04/25

Scorers Full Name & Affiliation:

River Code: - - STORET #: Lat./Long.: (NAD 83 - decimal °) 18 . Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR /SLABS [10]			☐☐ HARDPAN [4]		
☐☐ BOULDER [9]	40	5	☐☐ DETRITUS [3]		
☑☑ COBBLE [8]	40	40	☐☐ MUCK [2]		
☐☐ GRAVEL [7]		10	☐☐ SILT [2]		5
☐☐ SAND [6]		10	☐☐ ARTIFICIAL [0]		
☐☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN		QUALITY	
☐ LIMESTONE [1]		☐ HEAVY [-2]	
☑ TILLS [1]	SILT	☐ MODERATE [-1]	
☐ WETLANDS [0]		☑ NORMAL [0]	
☐ HARDPAN [0]		☐ FREE [1]	
☐ SANDSTONE [0]		☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]	EMBEDDEDNESS	☐ MODERATE [-1]	
☐ LACUSTURINE [0]		☑ NORMAL [0]	
☐ SHALE [-1]		☐ NONE [1]	
☐ COAL FINES [-2]			

Substrate 20 Maximum 20

Comments

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

___ UNDERCUT BANKS [1]	✓ POOLS > 70cm [2]	___ OXBOWS, BACKWATERS [1]	
✓ OVERHANGING VEGETATION [1]	___ ROOTWADS [1]	___ AQUATIC MACROPHYTES [1]	
✓ SHALLOWS (IN SLOW WATER) [1]	✓ BOULDERS [1]	✓ LOGS OR WOODY DEBRIS [1]	
___ ROOTMATS [1]			

AMOUNT — Check ONE (Or 2 & average)

☐ EXTENSIVE >75% [11]
☐ MODERATE 25-75% [7]
☑ SPARSE 5-<25% [3]
☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 9

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☑ GOOD [5]	☑ RECOVERED [4]	☑ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☑ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 12

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☑☑ CONSERVATION TILLAGE [1]
☑☑ MODERATE [2]	☐☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☑☑ NARROW 5-10m [2]	☐☑ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	
	☐☐ NONE [0]	?☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 10

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH — Check ONE (ONLY!)

☑ > 1m [6]
☐ 0.7-<1m [4]
☐ 0.4-<0.7m [2]
☐ 0.2-<0.4m [1]
☐ < 0.2m [0]

CHANNEL WIDTH — Check ONE (Or 2 & average)

☐ POOL WIDTH > RIFFLE WIDTH [2]
☑ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY — Check ALL that apply

☐ TORRENTIAL [-1] ☑ SLOW [1]
☐ VERY FAST [1] ☐ INTERSTITIAL [-1]
☐ FAST [1] ☐ INTERMITTENT [-2]
☐ MODERATE [1] ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 8

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☑ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0] ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 4

6] GRADIENT (ft/mi)

DRAINAGE AREA (mi²)

☐ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: %GLIDE: %RUN: %RIFFLE:

Gradient Maximum 10: 6

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

DISTANCE

- ☐ 0.5 Km
- ☑ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☑ 10%-<30%
- ☐ <10%- CLOSED

STAGE

1st -sample pass-		2nd
☐	HIGH	☐
☐	UP	☐
☑	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

CLARITY

1st --sample pass--		2nd
☑	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

1st pass _____ cm

2nd _____ cm

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

Comment RE: *Reach consistency*/ Is reach typical of steam?, *Recreation*/ Observed - Inferred, *Other*/ Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

D] MAINTENANCE

Circle some & COMMENT

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES

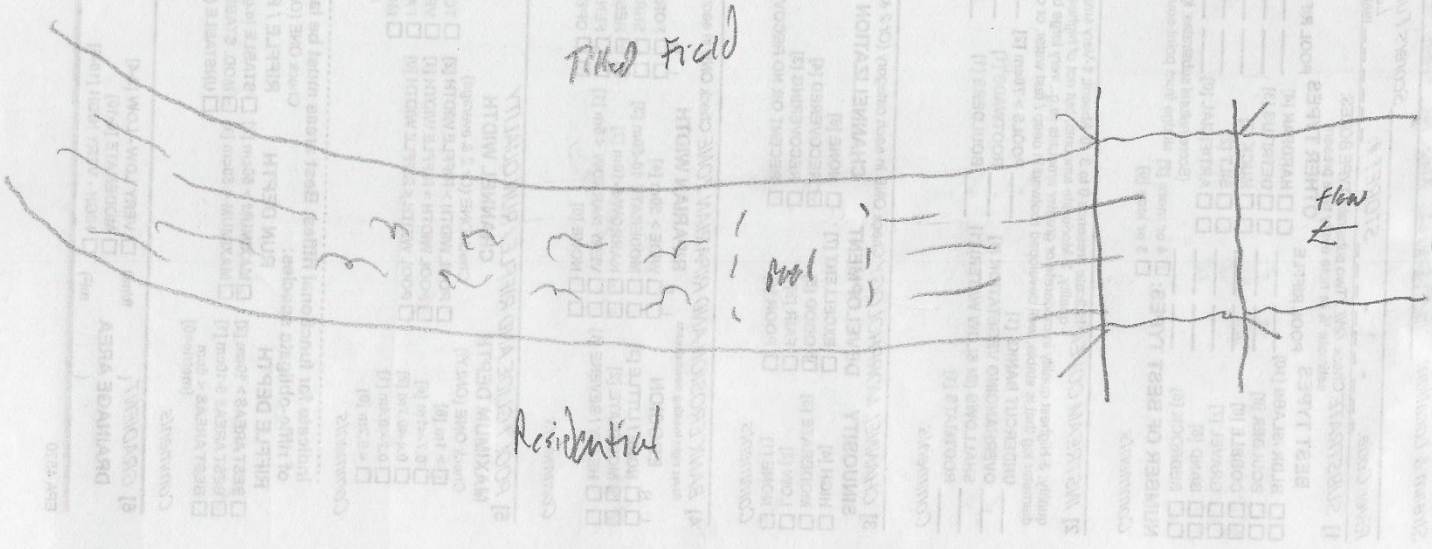
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 62

Stream & Location: Hellbranch Run @ Johnson Road @ Site #82 RM: 6.6 Date: 06/04/25

Scorers Full Name & Affiliation: Michael A. Haggard

River Code: ___-___-___ STORET #: _____ Lat./Long.: (NAD 83 - decimal °) ___.____ / 8___.____ Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR /SLABS [10]			☐☐ HARDPAN [4]		
☐☐ BOULDER [9]	5	10	☐☐ DETRITUS [3]		
☐☐ COBBLE [8]	15	15	☐☐ MUCK [2]		10
☐☑ GRAVEL [7]		15	☐☐ SILT [2]		10
☑☐ SAND [6]		30	☐☐ ARTIFICIAL [0]		
☐☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☑ 4 or more [2] ☐ 3 or less [0]

ORIGIN		QUALITY	
☐ LIMESTONE [1]	SILT	☐ HEAVY [-2]	Substrate
☑ TILLS [1]		☐ MODERATE [-1]	18
☐ WETLANDS [0]		☐ NORMAL [0]	
☐ HARDPAN [0]		☐ FREE [1]	
☐ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]	Maximum 20
☐ RIP/RAP [0]		☐ MODERATE [-1]	
☐ LACUSTURINE [0]		☑ NORMAL [0]	
☐ SHALE [-1]		☐ NONE [1]	
☐ COAL FINES [-2]			

Comments

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

___ UNDERCUT BANKS [1]	___ POOLS > 70cm [2]	___ OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (Or 2 & average))
✓ OVERHANGING VEGETATION [1]	___ ROOTWADS [1]	✓ AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
✓ SHALLOWS (IN SLOW WATER) [1]	✓ BOULDERS [1]	✓ LOGS OR WOODY DEBRIS [1]	☐ MODERATE 25-75% [7]
___ ROOTMATS [1]			☑ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 8

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☑ GOOD [5]	☑ RECOVERED [4]	☑ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☑ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 12

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	(L R)
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
☑☑ MODERATE [2]	☐☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☑☑ NARROW 5-10m [2]	☑☑ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 10

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH	CHANNEL WIDTH	CURRENT VELOCITY	
Check ONE (ONLY!)	Check ONE (Or 2 & average)	Check ALL that apply	
☐ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☑ SLOW [1]
☐ 0.7-<1m [4]	☑ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☑ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☐ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.	

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 4

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☑ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☑ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 3

6] GRADIENT (ft/mi) DRAINAGE AREA (mi²)

☐ VERY LOW - LOW [2-4] ☑ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

%POOL: 0 %GLIDE: 0 %RUN: 70 %RIFFLE: 30

Gradient Maximum 10: 7

EPA 4520 06/16/06

A] SAMPLED REACH
Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE
1st -sample pass- 2nd
- ☐ HIGH ☐
- ☐ UP ☐
- ☐ NORMAL ☐
- ☐ LOW ☐
- ☐ DRY ☐

DISTANCE
- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY
1st --sample pass-- 2nd
- ☐ < 20 cm ☐
- ☐ 20-<40 cm ☐
- ☐ 40-70 cm ☐
- ☐ > 70 cm/ CTB ☐
- ☐ SECCHI DEPTH ☐

CANOPY
- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

pass: 1st _____ cm; 2nd _____ cm

C] RECREATION AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS
- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

D] MAINTENANCE
PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

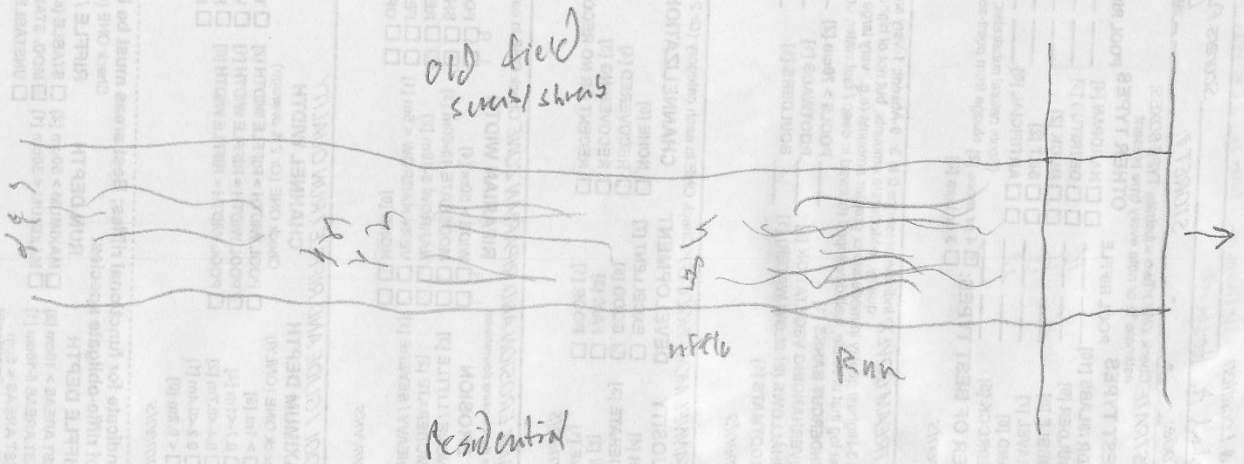
Circle some & *COMMENT*

E] ISSUES
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS
- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 65

Stream & Location: Hellbranch Run @ Alkire Road Bridge @ #83 RM: 7.5 Date: 06/06/25

Scorers Full Name & Affiliation: Michael A. Hoggarth

River Code: - - - STORET #: Lat./Long.: (NAD 83 - decimal °) 18 . Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE	ORIGIN	QUALITY
☐☐ BLDR/SLABS [10]			☐☐ HARDPAN [4]			☐ LIMESTONE [1]	☐ HEAVY [-2]
☐☐ BOULDER [9]			☐☐ DETRITUS [3]			☑ TILLS [1]	☐ MODERATE [-1]
☐☐ COBBLE [8]	20	20	☐☐ MUCK [2]			☐ WETLANDS [0]	SILT ☑ NORMAL [0]
☐☑ GRAVEL [7]	40	30	☐☐ SILT [2]	10	10	☐ HARDPAN [0]	☐ FREE [1]
☑☐ SAND [6]	30	40	☐☐ ARTIFICIAL [0]			☐ SANDSTONE [0]	EMBEDDEDNESS ☐ EXTENSIVE [-2]
☐☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)			☐ RIP/RAP [0]	☐ MODERATE [-1]
NUMBER OF BEST TYPES:	☑ 4 or more [2]					☐ LACUSTURINE [0]	☐ NORMAL [0]
	☐ 3 or less [0]					☐ SHALE [-1]	☐ NONE [1]
						☐ COAL FINES [-2]	

Comments

Substrate 18 Maximum 20

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

___ UNDERCUT BANKS [1]	✓ POOLS > 70cm [2]	___ OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (Or 2 & average))
___ OVERHANGING VEGETATION [1]	___ ROOTWADS [1]	✓ AQUATIC MACROPHYTES [1]	☐ EXTENSIVE >75% [11]
✓ SHALLOWS (IN SLOW WATER) [1]	___ BOULDERS [1]	✓ LOGS OR WOODY DEBRIS [1]	☐ MODERATE 25-75% [7]
___ ROOTMATS [1]			☑ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 8

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☑ RECOVERED [4]	☑ MODERATE [2]
☑ LOW [2]	☑ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 11

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
☑☑ MODERATE [2]	☐☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☑☑ NARROW 5-10m [2]	☑☑ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 10

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH	CHANNEL WIDTH	CURRENT VELOCITY	
Check ONE (ONLY!)	Check ONE (Or 2 & average)	Check ALL that apply	
☑ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☑ SLOW [1]
☐ 0.7-<1m [4]	☑ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☐ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		Indicate for reach - pools and riffles.	

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 8

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☑ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☑ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 4

6] GRADIENT (ft/mi) DRAINAGE AREA (mi²)

☑ VERY LOW - LOW [2-4]
☐ MODERATE [6-10]
☐ HIGH - VERY HIGH [10-6]

%POOL: 10 %GLIDE: 0
%RUN: 40 %RIFFLE: 50

Gradient Maximum 10: 6

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

STAGE

1st -sample pass-		2nd
☐	HIGH	☐
☐	UP	☐
☐	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

CLARITY

1st --sample pass--		2nd
☐	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

pass
1st _____ cm
2nd _____ cm

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

Comment RE: *Reach consistency/* Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

D] MAINTENANCE

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

Circle some & *COMMENT*

E] ISSUES

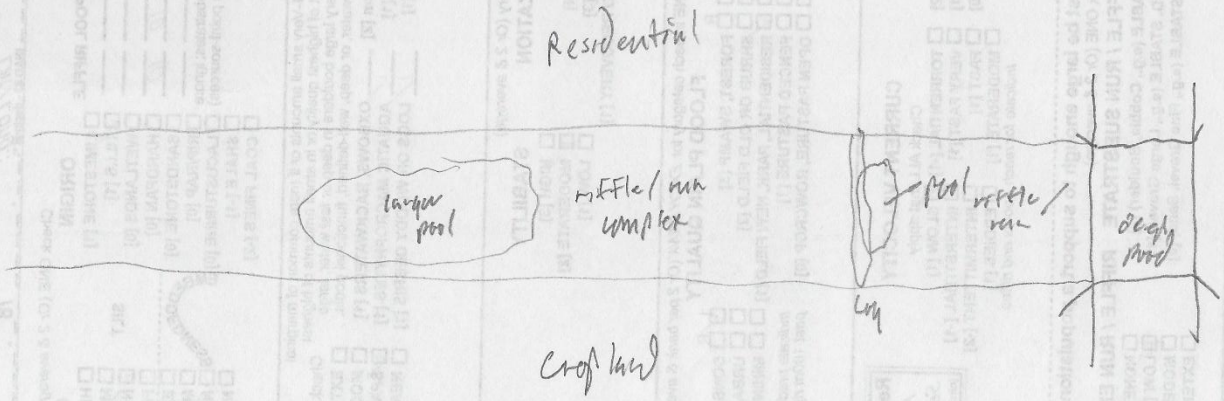
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: 56

Stream & Location: Hellbranch Run @ Ottawa Rd @ site #84 RM: 8.6 Date: 06/01/25

Michael A. Hoggarth Scorers Full Name & Affiliation:

River Code: - - STORET #: Lat./Long.: (NAD 83 - decimal °) 18 . Office verified location ☐

1] SUBSTRATE Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present

Check ONE (*Or 2 & average*)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐ ☐ BLDR /SLABS [10]			☐ ☐ HARDPAN [4]		
☐ ☐ BOULDER [9]			☐ ☐ DETRITUS [3]		
☐ ☐ COBBLE [8]	10	10	☐ ☐ MUCK [2]		
☐ ☑ GRAVEL [7]	50	40	☐ ☐ SILT [2]	25	25
☑ ☐ SAND [6]	40	50	☐ ☐ ARTIFICIAL [0]		
☐ ☐ BEDROCK [5]			(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☐ 3 or less [0]

ORIGIN: ☐ LIMESTONE [1] ☑ TILLS [1] ☐ WETLANDS [0] ☐ HARDPAN [0] ☐ SANDSTONE [0] ☐ RIP/RAP [0] ☐ LACUSTURINE [0] ☐ SHALE [-1] ☐ COAL FINES [-2]

QUALITY — SILT: ☐ HEAVY [-2] ☐ MODERATE [-1] ☑ NORMAL [0] ☐ FREE [1]

EMBEDDEDNESS: ☐ EXTENSIVE [-2] ☐ MODERATE [-1] ☑ NORMAL [0] ☐ NONE [1]

Comments

Substrate: 18 Maximum 20

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

AMOUNT — Check ONE (*Or 2 & average*): ☐ EXTENSIVE >75% [11] ☐ MODERATE 25-75% [7] ☑ SPARSE 5-<25% [3] ☐ NEARLY ABSENT <5% [1]

___ UNDERCUT BANKS [1]	___ POOLS > 70cm [2]	___ OXBOWS, BACKWATERS [1]
___ OVERHANGING VEGETATION [1]	___ ROOTWADS [1]	✓ AQUATIC MACROPHYTES [1]
✓ SHALLOWS (IN SLOW WATER) [1]	___ BOULDERS [1]	✓ LOGS OR WOODY DEBRIS [1]
___ ROOTMATS [1]		

Comments

Cover Maximum 20: 6

3] CHANNEL MORPHOLOGY Check ONE in each category (*Or 2 & average*)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☑ RECOVERED [4]	☑ MODERATE [2]
☐ LOW [2]	☑ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☑ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 10

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for *EACH BANK* (*Or 2 per bank & average*) River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)
☐ ☐ NONE / LITTLE [3]	☐ ☐ WIDE > 50m [4]	☐ ☐ FOREST, SWAMP [3]
☑ ☑ MODERATE [2]	☐ ☐ MODERATE 10-50m [3]	☐ ☐ SHRUB OR OLD FIELD [2]
☐ ☐ HEAVY / SEVERE [1]	☐ ☐ NARROW 5-10m [2]	☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]
	☑ ☑ VERY NARROW < 5m [1]	☐ ☐ FENCED PASTURE [1]
	☐ ☐ NONE [0]	☐ ☐ OPEN PASTURE, ROWCROP [0]

☑ ☑ CONSERVATION TILLAGE [1] ☐ ☐ URBAN OR INDUSTRIAL [0] ☐ ☐ MINING / CONSTRUCTION [0]

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 8

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (*ONLY!*)
☐ > 1m [6] ☐ 0.7-<1m [4] ☑ 0.4-<0.7m [2] ☐ 0.2-<0.4m [1] ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (*Or 2 & average*)
☐ POOL WIDTH > RIFFLE WIDTH [2] ☑ POOL WIDTH = RIFFLE WIDTH [1] ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply
☐ TORRENTIAL [-1] ☑ SLOW [1] ☐ VERY FAST [1] ☐ INTERSTITIAL [-1] ☐ FAST [1] ☐ INTERMITTENT [-2] ☑ MODERATE [1] ☐ EDDIES [1]
Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 7

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or 2 & average*). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☑ MAXIMUM < 50cm [1]	☑ MOD. STABLE (e.g., Large Gravel) [1]	☑ LOW [1]
☑ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0] ☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 3

6] GRADIENT (ft/mi) ☑ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (mi²)

%POOL: 5 %GLIDE: 0 %RUN: 25 %RIFFLE: 70

Gradient Maximum 10: 6

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD

- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

DISTANCE

- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CANOPY

- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

STAGE

1st -sample pass-		2nd
☐	HIGH	☐
☐	UP	☐
☐	NORMAL	☐
☐	LOW	☐
☐	DRY	☐

CLARITY

1st --sample pass--		2nd
☐	< 20 cm	☐
☐	20-<40 cm	☐
☐	40-70 cm	☐
☐	> 70 cm/ CTB	☐
☐	SECCHI DEPTH	☐

pass: 1st_____ cm; 2nd_____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

Circle some & COMMENT

E] ISSUES

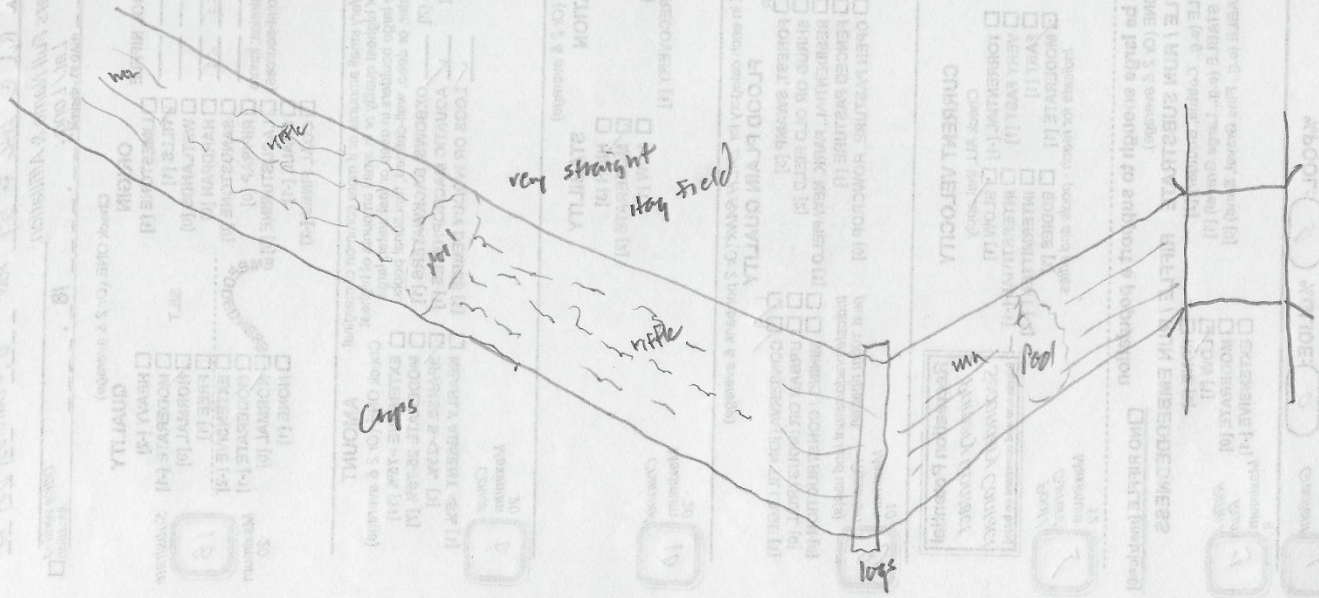
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:



OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

OHEI Score: 38

Stream & Location: Hellbranch Run @ uppermost site @ site #B5 RM: ___ Date: 8/04/25

Scorers Full Name & Affiliation: Michael A. Hoggarth

River Code: ___-___-___ STORET #: ___ Lat./Long.: (NAD 83 - decimal °) ___.___ / 8 .____ Office verified location ☐

1] SUBSTRATE Check ONLY Two substrate TYPE BOXES; estimate % or note every type present

Check ONE (Or 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR /SLABS [10]	___	___	☐☐ HARDPAN [4]	___	___
☐☐ BOULDER [9]	___	___	☐☐ DETRITUS [3]	20	20
☐☐ COBBLE [8]	70	20	☐☐ MUCK [2]	___	___
☐☐ GRAVEL [7]	___	___	☑☑ SILT [2]	10	60
☐☐ SAND [6]	___	___	☐☐ ARTIFICIAL [0]	___	___
☐☐ BEDROCK [5]	___	___	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☑ 3 or less [0]

ORIGIN: ☐ LIMESTONE [1] ☑ TILLS [1] ☐ WETLANDS [0] ☐ HARDPAN [0] ☐ SANDSTONE [0] ☐ RIP/RAP [0] ☐ LACUSTURINE [0] ☐ SHALE [-1] ☐ COAL FINES [-2]

QUALITY: ☑ HEAVY [-2] ☐ MODERATE [-1] ☐ NORMAL [0] ☐ FREE [1]

SILT / EMBEDDEDNESS: ☑ EXTENSIVE [-2] ☐ MODERATE [-1] ☐ NORMAL [0] ☐ NONE [1]

Comments

Substrate Maximum 20: 1

2] INSTREAM COVER Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

✓ UNDERCUT BANKS [1]	✓ POOLS > 70cm [2]	___ OXBOWS, BACKWATERS [1]	AMOUNT (Check ONE (Or 2 & average))
✓ OVERHANGING VEGETATION [1]	___ ROOTWADS [1]	___ AQUATIC MACROPHYTES [1]	☑ EXTENSIVE >75% [11]
✓ SHALLOWS (IN SLOW WATER) [1]	___ BOULDERS [1]	✓ LOGS OR WOODY DEBRIS [1]	☐ MODERATE 25-75% [7]
___ ROOTMATS [1]			☐ SPARSE 5-<25% [3]
			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20: 17

3] CHANNEL MORPHOLOGY Check ONE in each category (Or 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☑ LOW [1]
☑ NONE [1]	☑ POOR [1]	☑ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20: 4

4] BANK EROSION AND RIPARIAN ZONE Check ONE in each category for EACH BANK (Or 2 per bank & average)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	(L R)
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
☑☑ MODERATE [2]	☐☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☑☑ NARROW 5-10m [2]	☑☑ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Indicate predominant land use(s) past 100m riparian.

Comments

Riparian Maximum 10: 5

5] POOL / GLIDE AND RIFFLE / RUN QUALITY

MAXIMUM DEPTH Check ONE (ONLY!)
- ☑ > 1m [6]
- ☐ 0.7-<1m [4]
- ☐ 0.4-<0.7m [2]
- ☐ 0.2-<0.4m [1]
- ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average)
- ☐ POOL WIDTH > RIFFLE WIDTH [2]
- ☑ POOL WIDTH = RIFFLE WIDTH [1]
- ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply
- ☐ TORRENTIAL [-1]
- ☐ VERY FAST [1]
- ☐ FAST [1]
- ☐ MODERATE [1]
- ☑ SLOW [1]
- ☐ INTERSTITIAL [-1]
- ☐ INTERMITTENT [-2]
- ☐ EDDIES [1]

Indicate for reach - pools and riffles.

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12: 8

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (Or 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☑ BEST AREAS < 5cm [metric=0]	None	☑ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☑ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8: 0

6] GRADIENT (ft/mi) DRAINAGE AREA (mi²)

- ☑ VERY LOW - LOW [2-4]
- ☐ MODERATE [6-10]
- ☐ HIGH - VERY HIGH [10-6]

%POOL: ___ %GLIDE: ___ %RUN: ___ %RIFFLE: ___

Gradient Maximum 10: 3

EPA 4520 06/16/06

A] SAMPLED REACH

Check ALL that apply

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

DISTANCE
- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CANOPY
- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

STAGE

1st -sample pass- 2nd	
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

CLARITY

1st --sample pass-- 2nd	
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

1st pass _____ cm

2nd _____ cm

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

B] AESTHETICS

- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

C] RECREATION

POOL: AREA ☐ >100ft² DEPTH ☐ >3ft

D] MAINTENANCE

PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

Circle some & *COMMENT*

E] ISSUES

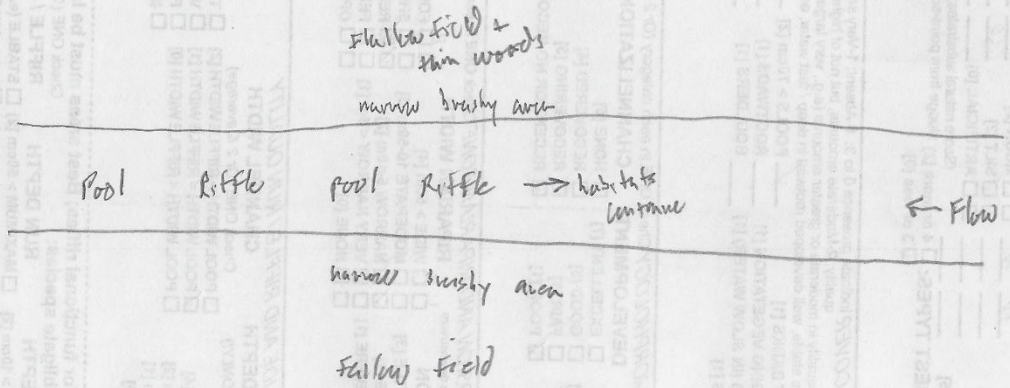
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS

- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

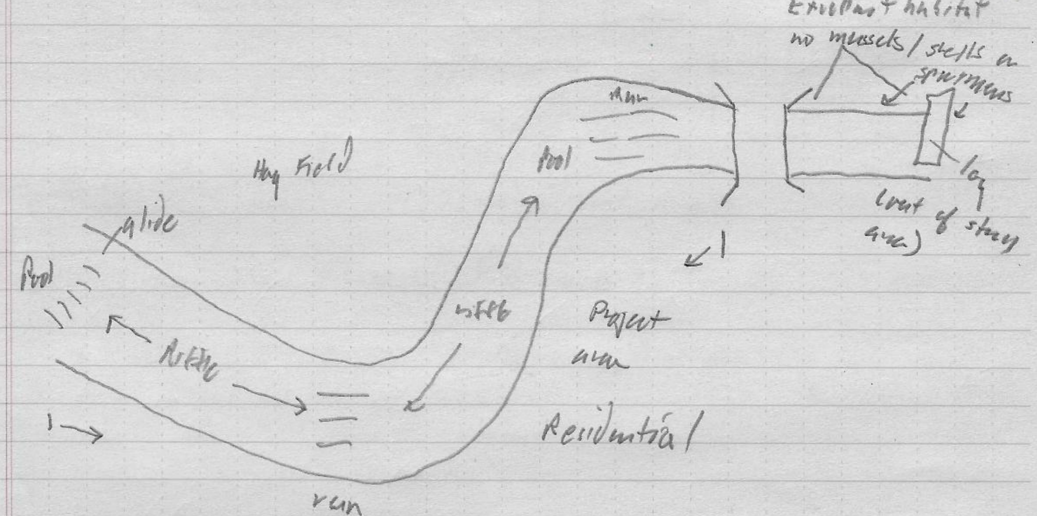
Stream Drawing:



Site #80

Hellbranch Run @ Beatty Road (site #80) 4 June 2025

The creek is low and clear with a substrate seemingly ideal for mussels. There are large matches of gravel and sand substrates with good flow. 160 C. fluminea were found per m² in these best habitats. There was excellent visibility even in the deeper areas where boulders and cobble dominated the substrate. It would have been easy to observe any mussel siphoning. The creek is deeply entrenched at this location but the stream itself has recovered with good habitat diversity and substrate distribution. There is an embeddedness problem here due to algal growth on firm substrate.



A. ferussacianus 1/2 wd
L. siliquoidea 1 1/2 wd
C. fluminea 2d

Excavations (10)
No mussels or shells
x̄ - 40 C. fluminea / 1/4 m²
= 160 / m²

3.8 NTU

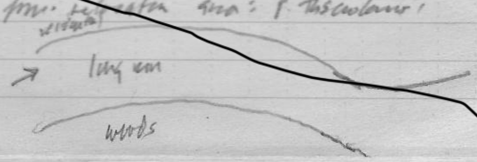
Photo of snapping turtle in deepest pool area

E. lividus common

Big Darby Creek at Rt. 316 in Darbydale (Harrisburg-Georgesville Rd.) @ site #21 3 June 2025

5.8 NTU

see TRC report on mussel salvage and relocation. No mussels or C. fluminea were collected from the quadrats. The following were found alive: E. dilatata[3], P. alatus[1], T. donaciformis[1], & L. cardium[1] & L. siliquoidea[1] & from relocation area: P. fasciolaris[1], S. undulatus[1], L. fasciola[1] & T. verrucosa[1].

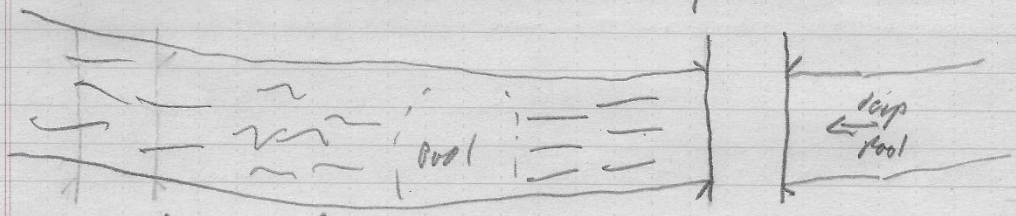


Rite in the Rain

Site #81

Hellbranch Run below Grove City - Kropp Rd. @ site #81 4 June 2025

The creek here is much like downstream except that the substrate is mostly cobble + boulders. Few were small patches of sand and gravel but much of this area is unstable. The riffles/runs here are narrow and the creek is embedded. It has recovered at this lower level but deeply trenched at the bottom of some riffles. The only shells that were abundant was C. Flaminea and Sphaeriids. Live E. livescens + C. Flaminea found. 5.6 NTU Turbidity.

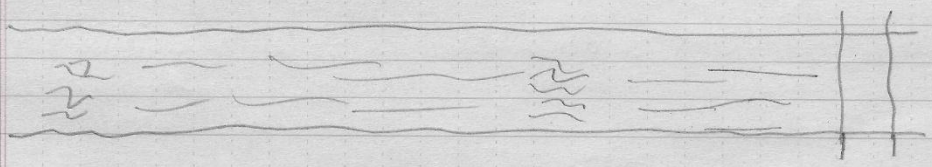


L. siliquoidea ½ wd
C. Flaminea 2d 7/¼ m² in best areas

Hellbranch Run above Johnson Road @ site #82 4 June 2025

Site #82

The stream is much like site #80 with sand + gravel substrates dominated by run habitats. No pools were found in this reach. Fewer E. livescens but more C. Flaminea (~30/¼ m²). Stream entrenched and recovered. 4.5 NTU Turbidity



L. siliquoidea ½ wd
C. Flaminea 2 d 30/¼ m² = 120/m²

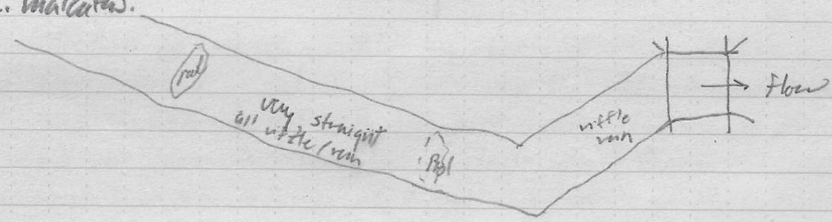
Site #84

Hellbranch Run @ Ottawa Road Bridge @ site #84 6 June 2025

This is the furthest upstream site on Hellbranch Run. It was similar to other sites with about the same width ~10m and same mostly riffle/run habitat with very short, in-stream pools, about 50 cm deep. Abundant C. fluminea shells + 17/¼ m² alive. A few E. livescens and many C.c. malleatus (Chinese Mystery snails). No live or freshly dead mussels were found. 6.5 MTM.

P. grandis ½ fragment wd
A. ferussacianus ½ wd
C. fluminea 2 d   17/¼ m² on average

Took photos of reach, substrate covered with C. fluminea shells + of C.c. malleatus.

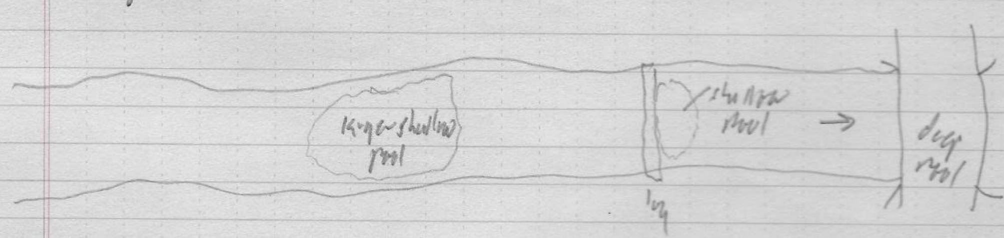


Site #83

Hellbranch Run @ Alkire Road Bridge @ site 83 6 June 2025

This site is much like upstream with predominately riffle/run habitat but with one deep pool under bridge and other shallow pools upstream. Corbicula fluminea, E. livescens + C.c. malleatus on site + alive with C. fluminea density of 20/¼ m². No living or freshly dead specimens. Took photos of stream and one eroded wall to 10' - stream entrenched us above + below.

S. undulatus ½ wd
T. parvum ½ wd   Doug Buttrick
C. fluminea 2 d.
L. siliquoidea 3 wd

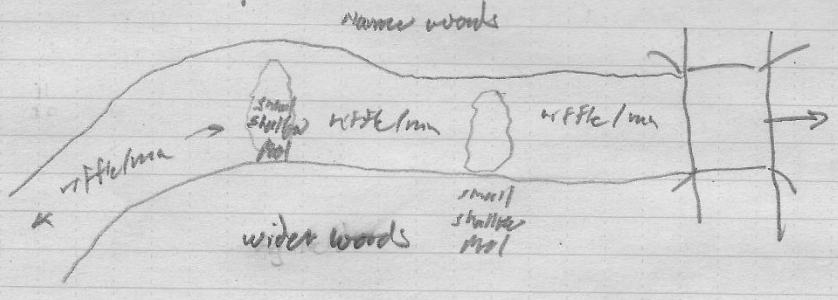


Rite in the Rain

6

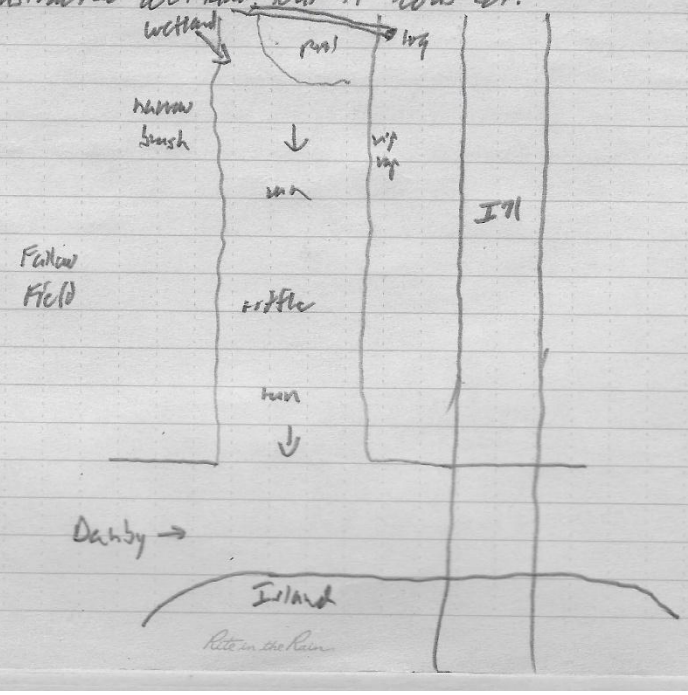
Site #79

Hellbranch Run @ Rt. 665 Bridge @ site # 79 6 June 2025
Similar to site # 80 with predominately riffle/run habitat with algae covering all hard surfaces. Live C. Flexuosa (5/½ m²) and E. hiversens (many) but no live mussels or dead shells. No shells of any species collected. Water was very clear (4.2 NTU) and relatively low. Collecting conditions are ideal.



Site #77

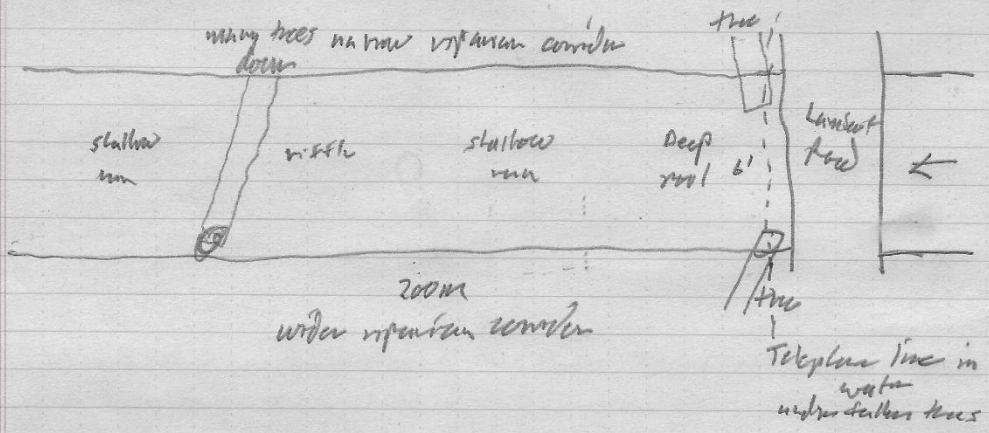
@ site 77 18 July 2025
Hellbranch Run @ mouth with Big Darby Creek + 200 m upstream. Walked from Lambert Road Bridge to mouth. Habitat was excellent with a good mix of substrate and good riffle, run + pool development but still no mussels. Freshly dead shells of C. Flexuosa seen and a few live ones collected (2/m²) and a few E. hiversens observed. No shells or live mussels found. Recent rains had increased turbidity (25 NTU) but except in deepest pools, the bottom was visible throughout the reach. Thought, if the problem is chemistry, the stream mussel fauna would have been better downstream of the constructed wetland, but it was not.



Rite in the Rain

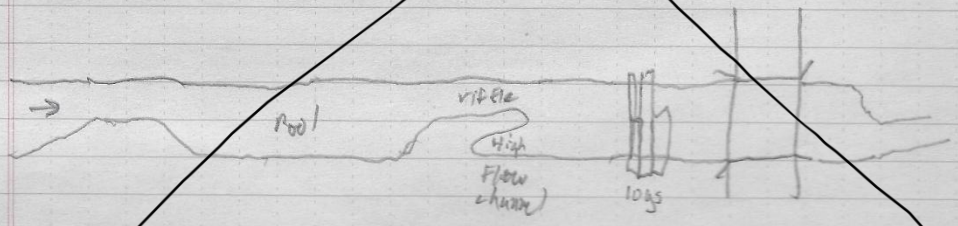
Site #78

Hellbranch Run @ Lambert Road Bridge @ site 78 18 July 2025
Stream like downstream with excellent habitat but only live C. flemmea (2 m²) and E. virescens found. One fragment of an unidentified mussel was collected along with 3 fd shells of C. flemmea. Turbidity 25 NTU, 22.5°C water Temp, 8.82 pH & 7.39 mg/L O_2 (88.5% saturation).



Sugar Run @ site #86 22 July 2025
Turbidity 14 NTU pH 8.46 Oxygen 6.76 mg/L 80.2% Sat. 22.2°C

Sugar Run at this location is a series of wide shallow pools separated by narrow shallow riffles. Lots of trees in the water in the pool areas and a few boulders and scattered water willow in the riffle areas. A few fragments and often subfossil shells were found (P. grandis & L. siligvoidea) but no live mussels or Corbicula were found during general or qualitative sampling. The stream carries a heavy silt load (all segregated twigs + leaves covered in silt) and the substrate is embedded in the pool and covered in silt. The only relatively good/soft substrate was near the riffles (up the run + downstream) but no mussels or living Corbicula seen.



P. grandis ½ fragment wd C. Flumminea 3d
L. siligvoidea ½ sf
fragments of shells

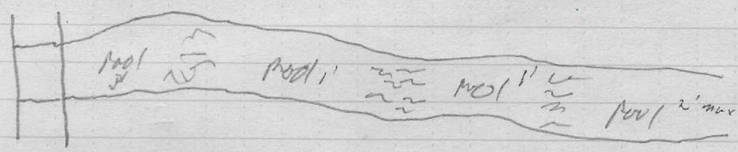
Rain in the Rain 8

Site #85

Hellbranch Run @ uppermost site @ Hall Road @ site #85 4 Aug. 2025

12.1 NTU 8.99 pH 7.67 mg/L O_2 86% sat. 14.3°C

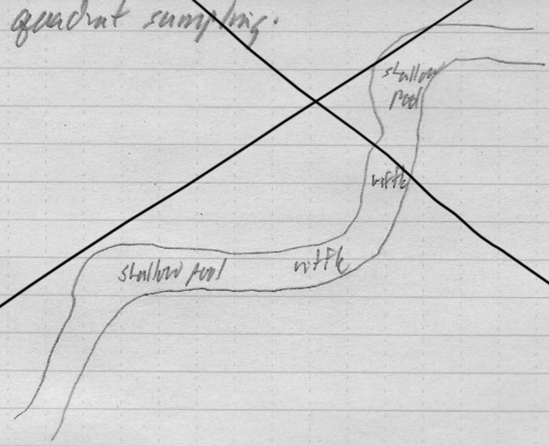
The water is clear but cloudy. Not sure why it is discolored. A series of shallow/deep pools separated by shallow riffles. The bottom is covered with 1" of silt: 20% rock, 20% woody debris + 60% silt. When there is light, algae covers the bottom. Only living mollusks found were C. fluminea: 12/m² in quadrats. No C. fluminea shells collected other than 3 fd shells.



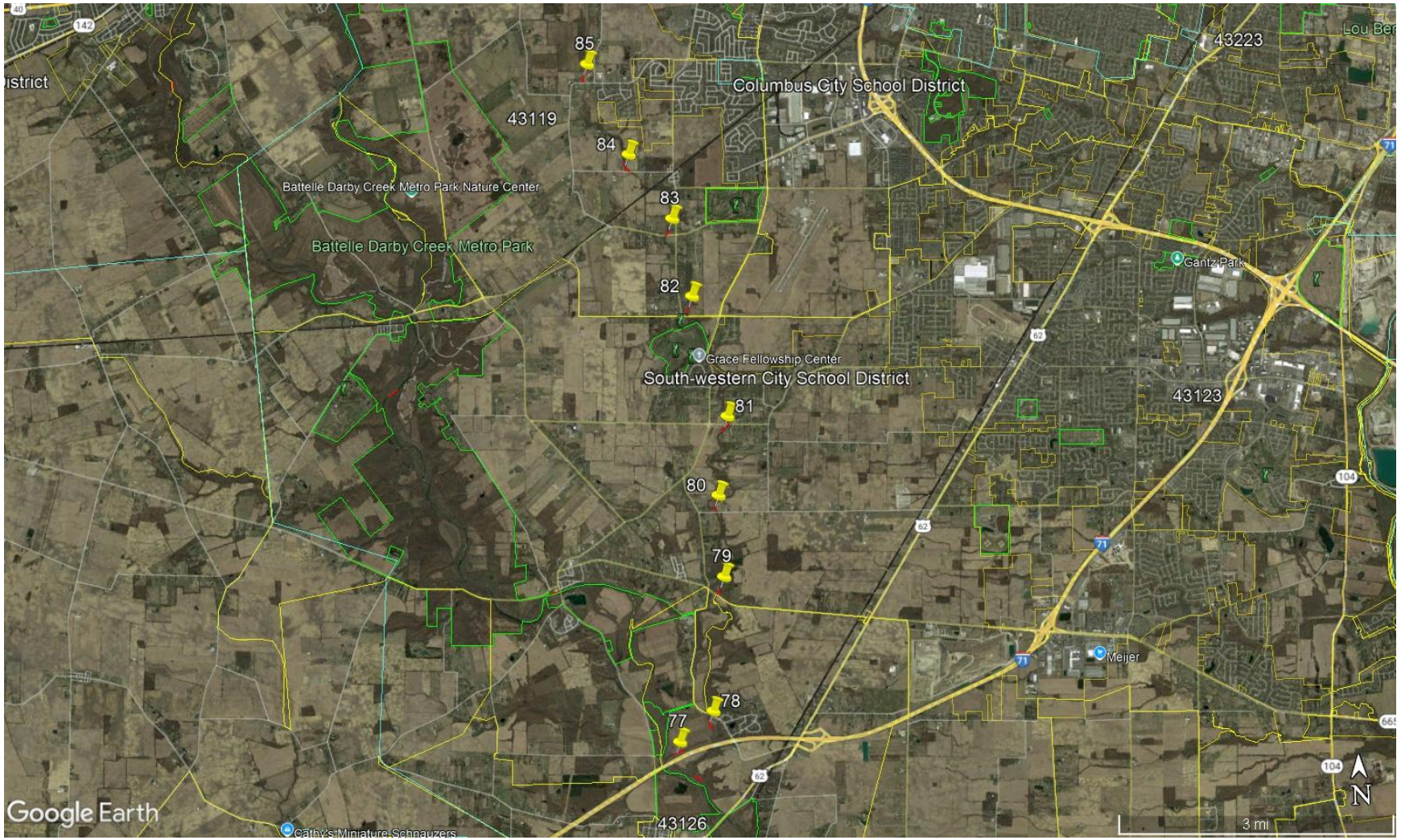
[illegible] Run @ McMahill Rd @ site #100 4 Aug. 2025

4.71 NTU 8.92 pH 7.57 mg/L O_2 87.5% sat. 21.1°C

The creek is clear and clean with very little silt. It was once surrounded by farm field (before 1994) with the two upstream properties developed by 1994 and the downstream properties by 2008. An old weathered shell of A. ferrussacianus and 2 fd shells of C. fluminea collected. No mollusks were collected during the quadrat sampling.



Appendix 3. Google Earth Images



Google Earth Image 1. Distribution of sites # 77 – 85 on Hellbranch Run.

Google Earth Image 2. Study area of 200 meters (red line) at Site # 77.

Google Earth Image 3. Study area of 200 meters (red line) at Site # 78.

Google Earth Image 4. Study area of 200 meters (red line) at Site # 79.

Google Earth Image 5. Study area of 200 meters (red line) at Site # 80.

Google Earth Image 6. Study area of 200 meters (red line) at Site # 81.

Google Earth Image 7. Study area of 200 meters (red line) at Site # 82.

Google Earth Image 8. Study area of 200 meters (red line) at Site # 83.

Google Earth Image 9. Study area of 200 meters (red line) at Site # 84.

Google Earth Image 10. Study area of 200 meters (red line) at Site # 85.

Appendix 4: Photographs

Photograph 1. Hellbranch Run (Site 77) showing mouth of constructed secondary channel.

Photograph 2. Hellbranch Run (Site 77) from mouth of constructed secondary channel upstream.

Photograph 3. Hellbranch Run (Site 77) showing mouth of constructed secondary channel.

Photograph 4. Hellbranch Run (Site 77) at its confluence with Big Darby Creek.

Photograph 5. Hellbranch Run (Site 77) within 200 meter sample area.

Photograph 6. Hellbranch Run (Site 78) near the Lambert Road Bridge.

Photograph 7. Hellbranch Run (Site 78) downstream of the Lambert Road Bridge.

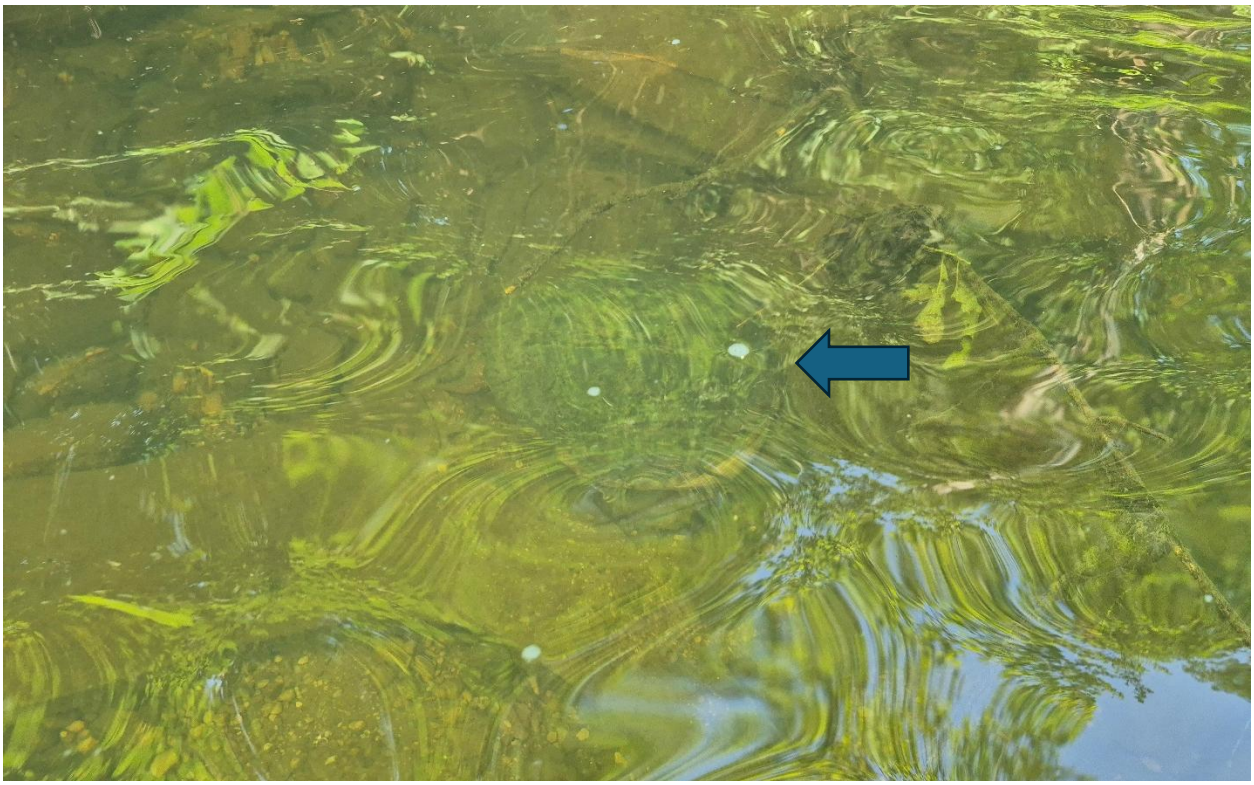
Photograph 8. Hellbranch Run (Site 78) within the 200 meter sample area.

Photograph 9. Hellbranch Run (Site 79) showing clear water with good substrate.

Photograph 10. Hellbranch Run (Site 79) within the 200 meter sample area.

Photograph 11. Hellbranch Run (Site 80) showing the silt and vegetation covering the substrate.

Photograph 12. Hellbranch Run (site 80) showing the pool-like habitat at the bridge.



Photograph 13. Hellbranch Run (Site 80) showing the snapping turtle (at arrow).

Photograph 14. Hellbranch Run (Site 80) showing the favorable substrate for mussels here.

Photograph 15. Hellbranch Run (Site 80) within the 200 meter sample area.

Photograph 16. Hellbranch Run (Site 80) within the 200 meter sample area.

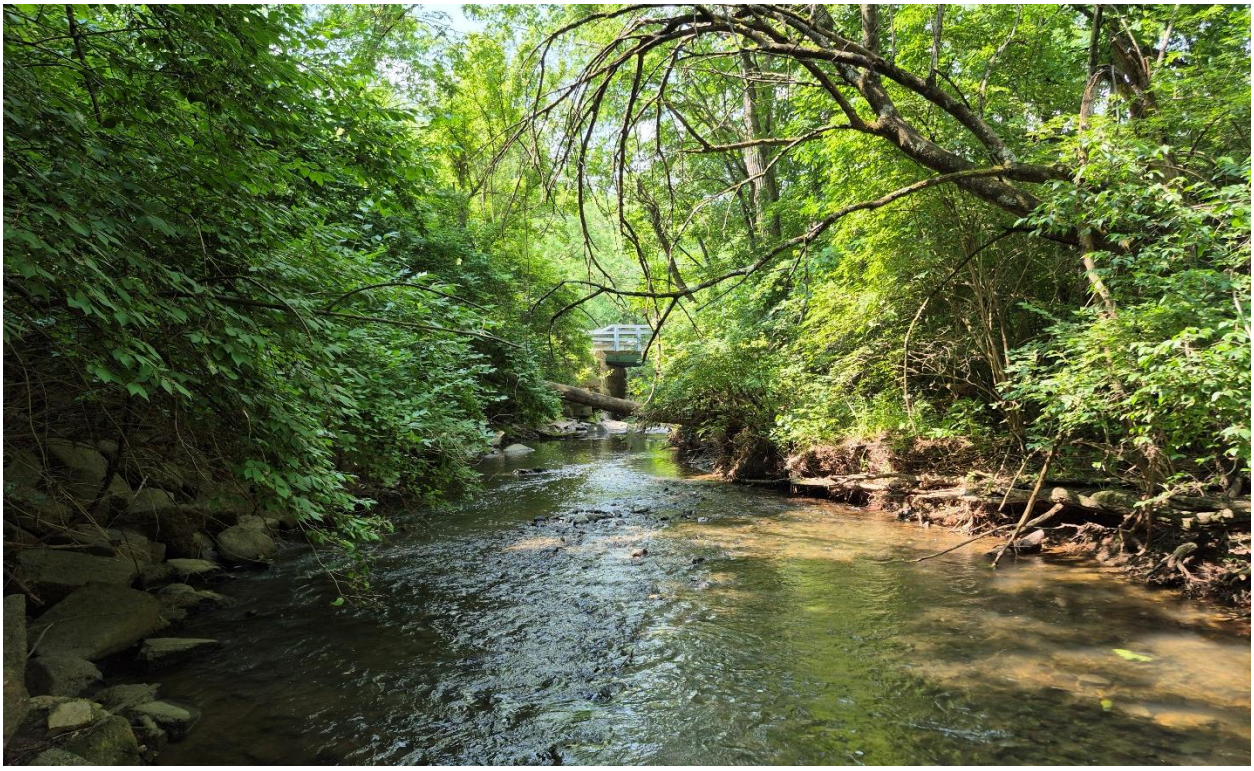
Photograph 17. Hellbranch Run (Site 81) showing the excessive siltation on the substrate.

Photograph 18. Hellbranch Run (Site 81) downstream of the Grove City – Kropp Road Bridge.

Photograph 19. Hellbranch Run (Site 81) within the 200 meter sample area.

Photograph 20. Hellbranch Run (Site 81) showing a long, shallow pool.

Photograph 21. Hellbranch Run (Site 81) showing the quality of the stream at this location,



Photograph 22. Hellbranch Run (Site 82) showing the natural appearance of the stream.

Photograph 23. Hellbranch Run (Site 82) showing the abundance of *Corbicula fluminea* shells.

Photograph 24. Hellbranch Run (Site 82) showing heavy silt cover over the substrate.

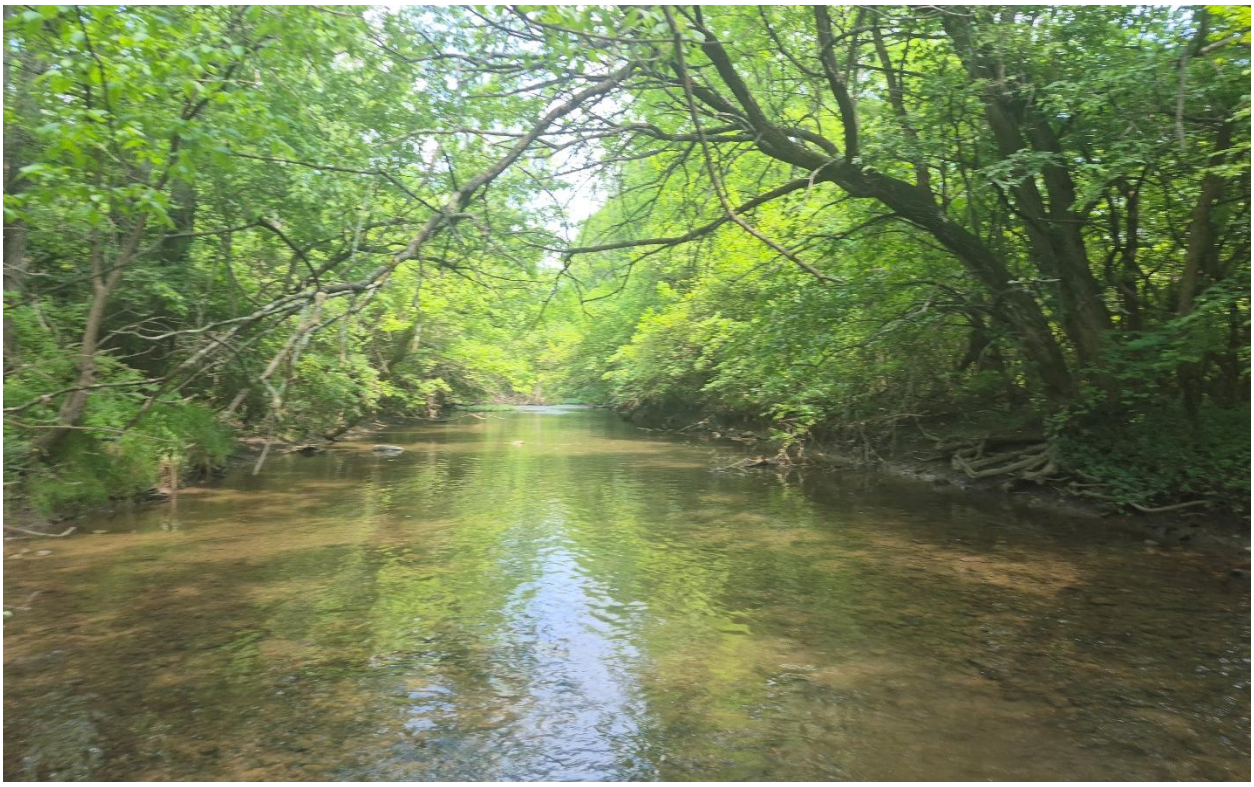
Photograph 25. Hellbranch Run (Site 82) showing the degree of embeddedness of the substrate.

Photograph 26. Hellbranch Run (Site 83) showing the embedded substrate.

Photograph 27. Hellbranch Run (Site 83) shows the embedded substrate and good mix of habitat.

Photograph 28. Hellbranch Run (Site 83) showing good habitat development.

Photograph 29. Hellbranch Run (Site 83) within the 200 meter sample area.



Photograph 30. Hellbranch Run (Site 84) showing the good development of the stream.

Photograph 31. Hellbranch Run (Site 84) showing the scour areas along the banks.

Photograph 32. Hellbranch Run (Site 84) showing excessive treefall in the reach.

Photograph 33. Hellbranch Run (Site 84) showing the good substrate and abundant *C. fluminea*.

Photograph 34. Hellbranch Run (Site 85) showing the discolored water and heavy silt deposition.

Photograph 35. Hellbranch Run (Site 85) showing the vegetative banks, thick silt deposition, and abundant pool-like channelization.

Appendix 5: Permits and authorizations

NATIVE ENDANGERED & THREATENED SP. RECOVERY

Permit Number: ES194099

Version Number: 6

Effective: 2024-05-24 **Expires:** 2025-12-31

Issuing Office:

Department of the Interior

U.S. FISH AND WILDLIFE SERVICE

ES Bloomington Permit Office
5600 American Boulevard, West, Suite 990
Bloomington, Minnesota 55437-1458
permitsR3ES@fws.gov

Leslie Lueckenhoff

Digitally signed by
Leslie Lueckenhoff
2024-05-23 08:42:56

Acting Midwest Region
Ecological Services
Program Lead

Permittee:

MICHAEL HOGGARTH
4849 WOODHAVEN DRIVE
GALENA, OH 43021
US

Authority: Statutes and Regulations: 16 U.S.C. 1539 (a), 16 U.S.C. 1533 (d) 50 CFR 17.22, 50 CFR 17.32, 50 CFR 13

Location where authorized activity may be conducted:

On lands specified in the conditions below.

Reporting requirements:

Reports are due 1/31 following each year this permit is in effect.

See terms and conditions for reporting requirements.

NATIVE ENDANGERED & THREATENED SP. RECOVERY

Permit Number: ES194099

Version Number: 6

Effective: 2024-05-24 **Expires:** 2025-12-31

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 understands and agrees to abide by the terms of this permit and all sections of Title 50 Code of Federal Regulations (CFR), Parts 13 and 17, pertinent to issued permits (https://fwsepermits.servicenowservices.com/fws). 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 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). Please use https://fwsepermits.servicenowservices.com/fws to obtain specific information regarding the new ePermitting process to apply for and submit your digital recovery permit application and application processing fee. 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.

NATIVE ENDANGERED & THREATENED SP. RECOVERY

Permit Number: ES194099

Version Number: 6

Effective: 2024-05-24 **Expires:** 2025-12-31

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 (*Pleurobema 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*)
- Longsolid (*Fusconaia subrotunda*)
- Northern rifffleshell (*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*)

NATIVE ENDANGERED & THREATENED SP. RECOVERY
Permit Number: ES194099
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Effective: 2024-05-24 **Expires:** 2025-12-31

- Ring pink (mussel) (*Obovaria retusa*)
- Round Hickorynut (Obovaria subrotunda)
- 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*)
- 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) Region 3 States: Indiana, Michigan, and Ohio upon receipt of written concurrence from the Field Supervisor, as outlined in Condition G.

F.2. Within the USFWS Region 4 State: Kentucky upon receipt of written concurrence from the Field Supervisor, as outlined in Condition G.

F.3. Within the USFWS Region 5 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/service/3-200-59-scientific-purposes-enhancement-propagation-or-survival-permits-recovery-permits. . 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.

NATIVE ENDANGERED & THREATENED SP. RECOVERY
Permit Number: ES194099
Version Number: 6
Effective: 2024-05-24 **Expires:** 2025-12-31

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. Permittee shall adhere to the following conditions regarding the capture, handling, tagging and relocation/release of mussels:

H.1. Permittee may take (remove from the substrate, by hand, for identification and data collection) mussels via wading, snorkeling, or diving and temporarily hold healthy specimens.

H.2. 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 may be held for up to three hours if they are held in the water in bags that allow free movement of water in the river 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° Fahrenheit (F)] and replaced with water freshly taken from the water where the mussels were collected. When practicable, specimens held in containers must remain in the shade. Specimens must be returned to the locality from which they were taken. Live specimens that cannot be identified at the site must be photographed for identification purposes.

H.3. Collection of live mussel specimens must be done only when the water temperature is above 40° F. Mussels must be returned by hand to suitable habitat, by divers if necessary. When air temperatures are below 32° F or above 90° F, specific details regarding collection and handling activities as well as how mussels should be placed (i.e., reburying instructions) shall be coordinated with the field office(s) where activities are occurring (Condition P.)

H.4. All live mussels shall be measured (length and height) and, if possible, sexed and aged. No intrusive activities are permitted. Data collected shall include descriptions of external morphometry and reproductive status. All specimens of federally listed species

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– or a representative sample for each species – must be photographed prior to release.

H.5. Capture and relocation shall be authorized under this permit only under special circumstances when listed mussels are anticipated to be harmed by dewatering and/or stranding and only with written approval from the USFWS Field Supervisor for the state(s) in which the activity is proposed and in accordance with the conditions described below. 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 within the same HUC 12 watershed, coordinated with and approved by the appropriate U.S. Fish and Wildlife Field office. Capture and relocation under other circumstances shall be authorized under this permit only in Michigan and requires written approval from the USFWS Field Supervisor for the state(s) in which the activity is proposed. In Michigan, any relocation would also be conducted in accordance with the Michigan Freshwater Mussel Survey Protocols and Relocation Procedures.

H.5.a. Take (remove from the substrate by hand) the species via wading, snorkeling or diving.

H.5.b. 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 U.S. Fish and Wildlife Service Field Office. In all cases, handling and exposure shall be kept to a minimum during relocation effort.

H.5.c. Specimens shall be measured, photographed, and tagged prior to transporting them to approved relocation sites. Tagging of mussels may be omitted under special circumstances, such as emergency salvage, when time does not allow for adherence to established tagging procedures. The locations for replanting must have a stable substrate and characteristics (temperature and water chemistry) conducive to survival of specimens.

H.5.d. 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 may be held for up to 3 hours provided that they are held in the water in bags that allow free movement of water in the water body from which the mussels were taken from or held in buckets/containers of water that is changed every hour [every half-hour when air temperatures are at or above 80o Fahrenheit (F)] and replaced with water freshly

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taken from the water 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.e. Collection of live mussel specimens for prior approved relocation must be done only when the water temperature is above 40° Fahrenheit. When air temperatures are below 32° F or above 90 ° F, specific details regarding collection and handling activities as well as how mussels should be placed (i.e., reburying instructions) shall be coordinated with the field office(s) where activities are occurring (Condition P.)

H.5.f. Specimens must be returned to a suitable locality. A suitable location for replanting of specimens shall be determined prior to taking mussels from the original site. The location for replanting must have a stable substrate and have characteristics similar to the substrate from which the specimens are collected (and approved by the Field Office as explained in Condition G.).

H.5.g. The permittee shall obtain, record, and report the geographic coordinates of the specific relocation site(s) using a GPS receiver. In addition to GPS data, the permittee shall describe the general relocation area using unique river or bank identifiers to provide a general location of the site using triangulation. Live mussels must be returned unharmed to the substrate within three hours of collection. Divers should follow the protocol in H.3., above to position the relocated specimens in the substrate by hand.

H.5.h. The USFWS Field Supervisor for the state(s) in which the activity is proposed will specify in writing whether all listed mussels shall be marked or etched with a unique identifier and will also describe in writing the nature of marking (e.g., shellfish tag vs. etching) to be used. This USFWS field office may convey this in any site-specific authorization provided or in writing separately.

H.6. The shells of all live specimens collected or captured temporarily 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 to the substrate. Document the incidence of zebra mussels and Asiatic clams (*Corbicula fluminea*) at project sites.

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H.6.a. Equipment used in multiple waterbodies to capture and handle freshwater mussels shall be cleaned and decontaminated, including personal gear such as boots and gloves, sediment screens, buckets, boats, or other sampling equipment. Current data on nonindigenous aquatic species (NAS) distribution should be checked prior to surveying to be aware of known occurrences of NAS (https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=5 (https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=5)).

H.7. Any dead endangered or threatened mussel shells and any specimens accidentally killed or that are moribund or freshly-dead and contain soft tissue are to be preserved according to standard museum practices, properly identified and indexed (collection site, UTM coordinates, site conditions when collected, date collected, and permit authorizing collection). All dead specimens shall be sent to a public scientific or educational facility or museum in the state the individuals were collected along with a copy of the permit(s) under which they were collected. All specimens retained under this permit remain the property of the United States Government and must clearly be identified as such.

H.8. Permittee shall notify the U.S. Fish and Wildlife Service Field Supervisor(s) in writing of any newly discovered species locations (previously undocumented sites only) within 48 hours of discovery unless otherwise specified by the Field Supervisor(s). Notification shall be provided in writing with a copy to the office identified in Condition N. No voucher specimens may be collected. Any newly identified mussel sites shall be vouchered with photographs and/or video recordings.

H.9. Accidental injuries and/or mortalities of listed species may not exceed two (2) specimens of a permitted species. In the event this number is met, all permitted activities must cease. The Permittee must report any mortality or serious injury to the USFWS Midwest Regional Permit Coordinator (Condition N.1.) and the USFWS Field Office within the geographic location of study areas (https://www.fws.gov/service/3-200-59-scientific-purposes-enhancement-propagation-or-survival-permits-recovery-permits) within 48 hours. Your initial contact may be made by telephone, however, a written explanation must be provided within five (5) days of the incident. Following mortality or injury of two specimens of a permitted species, you may not resume activities authorized by this permit without written permission of the U.S. Fish and Wildlife Service, Regional office in Bloomington, Minnesota (Condition N.1.).

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I. 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/service/3-200-59-scientific-purposes-enhancement-propagation-or-survival-permits-recovery-permits). No voucher specimens may be collected. Any newly identified mussel species sites shall be vouchered with photographs and/or video recordings.

J. 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/service/3-200-59-scientific-purposes-enhancement-propagation-or-survival-permits-recovery-permits) 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.

K. This permit is non-transferable.

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L. Permittee must carry a copy of this permit at all times when conducting the authorized activities. Shipments of collected biological materials should also be accompanied by a copy of this permit. Note that this permit is limited to the above activities and identified species.

M. 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.

N. Upon locating a dead, injured, or sick federally listed species, under circumstances not addressed in this authorization, initial notification must be made immediately to the USFWS Field Office in the State in which the specimen is found (https://www.fws.gov/service/3-200-59-scientific-purposes-enhancement-propagation-or-survival-permits-recovery-permits). Notification should also be made by the next business day to the USFWS' Regional Minnesota Office Recovery Permit Coordinator identified below. Those offices will confer with the USFWS' Division of Law Enforcement as appropriate and determine next steps. Care should be taken in handling sick, injured, or dead specimens to ensure effective treatment or to preserve biological materials for later analysis. In conjunction with the care of sick or injured endangered or threatened species, and the preservation of biological materials from a dead individual, the finder should take responsible steps to ensure that the site is not unnecessarily disturbed.

O. 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:

O.1. The "3-2523_USFWS Freshwater Mussel Reporting Form" is required for reporting data in Region 3 and can be found on the FWS Midwest Permits website (https://www.fws.gov/media/mussel-reporting-spreadsheet-recovery-permits). Prior to reporting, check the permits website to ensure you are using the most up to date form. Using the reporting form will help standardize data collection and increase efficiency in reporting.

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O.2. A complete discussion of field procedures, data collection methods, results, and conclusions.

O.3. 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.

O.4. The locations of the surveyed sites where no listed species were located.

O.5. 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.

O.6. Habitat conditions at sites where threatened or endangered specimens were collected, including: water depth, substrate composition, sedimentation, and any other relevant data.

O.7. The size, age, sex and condition (if determinable) of any individuals encountered.

O.8. Any identification numbers or marks added to live specimens.

O.9. An assessment of the success of relocation and its use as a conservation and management tool.

O.10. 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.

O.11. A list of any salvaged specimens, locations where salvaged, their disposition, and where they are being maintained.

O.12. 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.

O.13. Copies of any separate reports and/or publications resulting from work conducted under the authority of this permit.

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O.14. 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.

O.15. 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.

O.16. 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.

P. 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**).

P.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

P.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

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P.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

P.4. Additionally, based on geographic area, **reports and publications shall be submitted to** the applicable offices at https://www.fws.gov/service/3-200-59-scientific-purposes-enhancement-propagation-or-survival-permits-recovery-permits

P.5. For mussels, please send reports to the applicable species leads in Region 4 for those species that were found: https://www.fws.gov/media/recovery-leads-southeast

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

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.

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Ohio Department of Natural Resources

Division of Wildlife Headquarters
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Columbus, Ohio 43229-6693
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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

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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

Outlook

[External Email] Re: [EXTERNAL] Authorization to proceed on a mussel survey within the Darby Creek watershed

From Boyer, Angela <angela_boyer@fws.gov>
Date Tue 9/3/2024 1:54 PM
To Hoggarth, Michael <mhoggarth@otterbein.edu>; Navarro, John <john.navarro@dnr.ohio.gov>
Cc Bob Gable <Bob.Gable@dnr.state.oh.us>; Heather.Doherty@dnr.ohio.gov <heather.doherty@dnr.ohio.gov>; Chris Yoder <cyoder@mwbinst.com>

Mike,

This is in response to your September 2, 2024, request for an amendment to your Federal Fish and Wildlife Permit Number ES194099-6 to perform mussel surveys in Ohio in Big Darby Creek, Little Darby Creek, and Treacle Creek for the Darby Mussel Survey and Integrated Prioritization System Development Project.

This notification serves as written concurrence that Michael Hoggarth is authorized to proceed with the surveys as described in the request. The surveys should take place between May 1 and September 30 in years 2024, 2025, and 2026. Upon completion of the surveys, we request that you submit an electronic copy of the results to this office.

If any additional freshwater mussel species occurring in these streams become official listed under the Endangered Species Act prior to the completion of the surveys, you must seek and receive a permit amendment adding the species to your permit before proceeding further with the surveys.

Please carry a copy of this site-specific authorization and your Federal permit while conducting the work. Please contact me if you have questions.

Sincerely,
Angela Boyer
Endangered Species Coordinator for Ohio
U.S. Fish and Wildlife Service
4625 Morse Road, Suite 104
Columbus, Ohio 43230

From: Hoggarth, Michael <mhoggarth@otterbein.edu>
Sent: Monday, September 2, 2024 10:50 AM
To: Navarro, John <john.navarro@dnr.ohio.gov>; Boyer, Angela <angela_boyer@fws.gov>
Cc: Bob Gable <Bob.Gable@dnr.state.oh.us>; Heather.Doherty@dnr.ohio.gov <heather.doherty@dnr.ohio.gov>; Chris Yoder <cyoder@mwbinst.com>
Subject: [EXTERNAL] Authorization to proceed on a mussel survey within the Darby Creek watershed

Hello Angie & John,

I am writing to get authorization from the two of you (Group 1 authorization from John and Group 2 authorization from Angie) to perform the survey work described in the two attached documents. One attachment (Darby Mussel Survey and IPS Development) is Exhibit 1 of the contract to MBI, which described the nature of the entire project and the mussel survey work that I am requesting authorization for. The second document (excel file) is a list of sites where I intend to collect mussel data. I will also complete a QHEI for each site. The methods I intend to use are the same as I have recently done in the Little Miami, Olentangy, and Stillwater rivers with the addition of collecting mussel length data on all live mussels found.

Anyway, this is all happening much more slowly than I had anticipated and so I am a bit behind given the end of the 2024 field season is quickly approaching. My hope is to begin the work this coming Thursday if you all can give me authorization by then.

I am making this request to both of you as some sites are Group 1 streams while others are Group 2 streams. Most of the sites are those formerly sampled by Tom, but there are some others too where we have some more recent mussel and/or water quality data. So, if you each could review and provide authorization for your specific jurisdiction, I would appreciate it.

If you have any questions about the mussel survey methods, please contact me. If you have any questions about the Integrated Prioritization System (IPS), please contact Heather or Chris.

Thanks, Mike

Michael A. Hoggarth, Ph.D.

Department of Biology and Earth Science
Otterbein University
614.823.1667 (office)
614.374.7724 (cell)

otterbein.edu/175