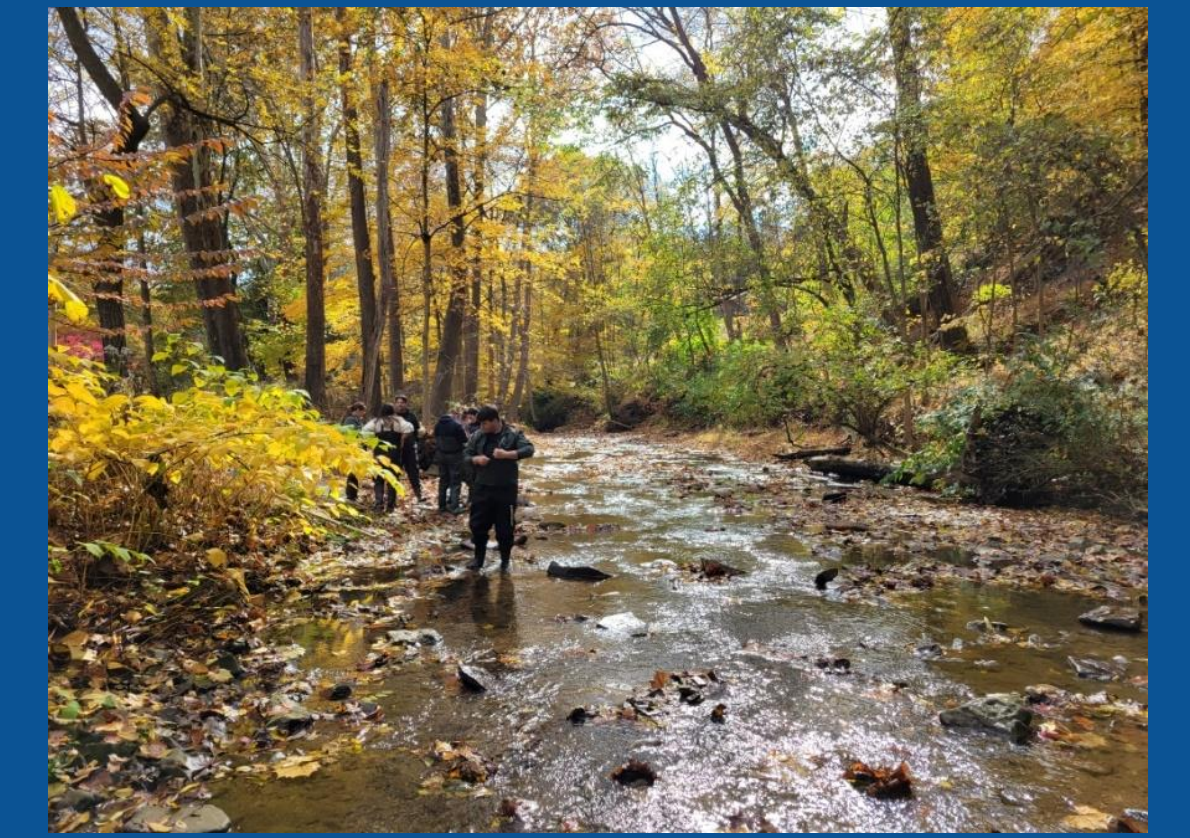


Recovery of fish community structure following removal of the

Woodland Dam on Little Sewickley Creek

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Abstract

Little Sewickley Creek is a small fourth order tributary to the Ohio River. Despite its close proximity to Pittsburgh, the 25 km² watershed has limited urban development, 70% forested landcover, and is the only designated High Quality stream in Allegheny County. Decades of trout stocking have supported natural reproduction by Brown Trout, *Salmo trutta*. In 2013 a petition to elevate the stream's designation to Exceptional Value was declined by the PA DEP, in part due to poor fish diversity above the century-old Woodland Dam near its mouth that prevented fish migration from the Ohio River. Prior to the dam removal in 2015, there were 41 documented fish species downstream of the dam, but only a handful of species upstream, and these residents were mostly comprised of pollution-tolerant omnivores. Students in the Stream Field Biology course at Duquesne University assisted with annual backpack electrofishing surveys to document the recovery following the dam removal. Fishes were sorted, identified and enumerated at three sites above the dam in order to examine changes in fish community structure through use of the Ohio Headwater Index of Biodiversity (IBI). IBI scores ranging from "poor" to "fair" all steadily increased to "exceptional" over the past eight years as the fish community diversified. The Central Stoneroller, *Campostoma anomalum*, and Spottin Shiner, *Cyprinella spiloptera*, were some of the first species to colonize upstream habitats. Our most upstream monitoring site, 4.4 km above the dam, now supports a diverse coolwater assemblage of minnows, suckers, trout, darters, and sculpin.

Introduction

- Little Sewickley Creek is designated as a High Quality 4th order tributary to the Ohio River in Allegheny County, Pennsylvania (Ch 93 PA Code).
- The Woodland Dam was constructed in the 1920s but was becoming an erosional hazard and prevented upstream fish passage.
- In 2013, a petition to elevate Little Sewickley Creek to Exceptional Value was declined by PA DEP, in part due to the poor fish diversity above the dam (Reinhart 2013).
- The Woodland Dam was removed in August 2015 through a cooperative effort between American Rivers, Western Pennsylvania Conservancy, and the Little Sewickley Creek Watershed Association (LSCWA).
- This project monitored the recovery of the fish community structure from 2012 through 2023 using backpack electrofishing surveys and the Ohio Headwater Index of Biotic Integrity (Ohio EPA 1988).

Methods

- The Stream Field Biology class at Duquesne University has conducted weekend field trips in late September since 2011 to monitor fish communities in Little Sewickley Creek.
- Four sites were surveyed in Little Sewickley Creek: Beaver Street bridge (below dam), Woodland Swim Club (2.50 km upstream of dam), Backbone Road pull-off (2.88 km upstream of dam), Fern Hollow Creek at confluence with Little Sewickley Creek (4.42 km upstream of dam).
- 38 backpack electrofishing surveys were conducted on 100 m stream reaches with dip nets and seine following EPA Rapid Bioassessment Protocol for wadable streams (Ohio EPA 1988).
- Fish specimens were identified, sorted, and enumerated.
- Ohio Headwaters Index of Biotic Integrity was corrected for drainage size at each site.

Results

- Little Sewickley Creek (LSC) at the Beaver Street bridge (below the dam) has a long-term stable fish community averaging an IBI of 51.5 exceptional (Table 1, Figure 2).
- Prior to 2015, the fish community upstream of the Woodland Dam was comprised of five native species, four of which are pollution tolerant generalists or omnivores (Figure 3, first column).
- Before the dam removal, the three sites above the dam ranged from poor to fair, with two highly tolerant minnow species and no darters (Table 1).
- By 2022, seven years after dam removal, all three sites had obtained exceptional IBI scores.

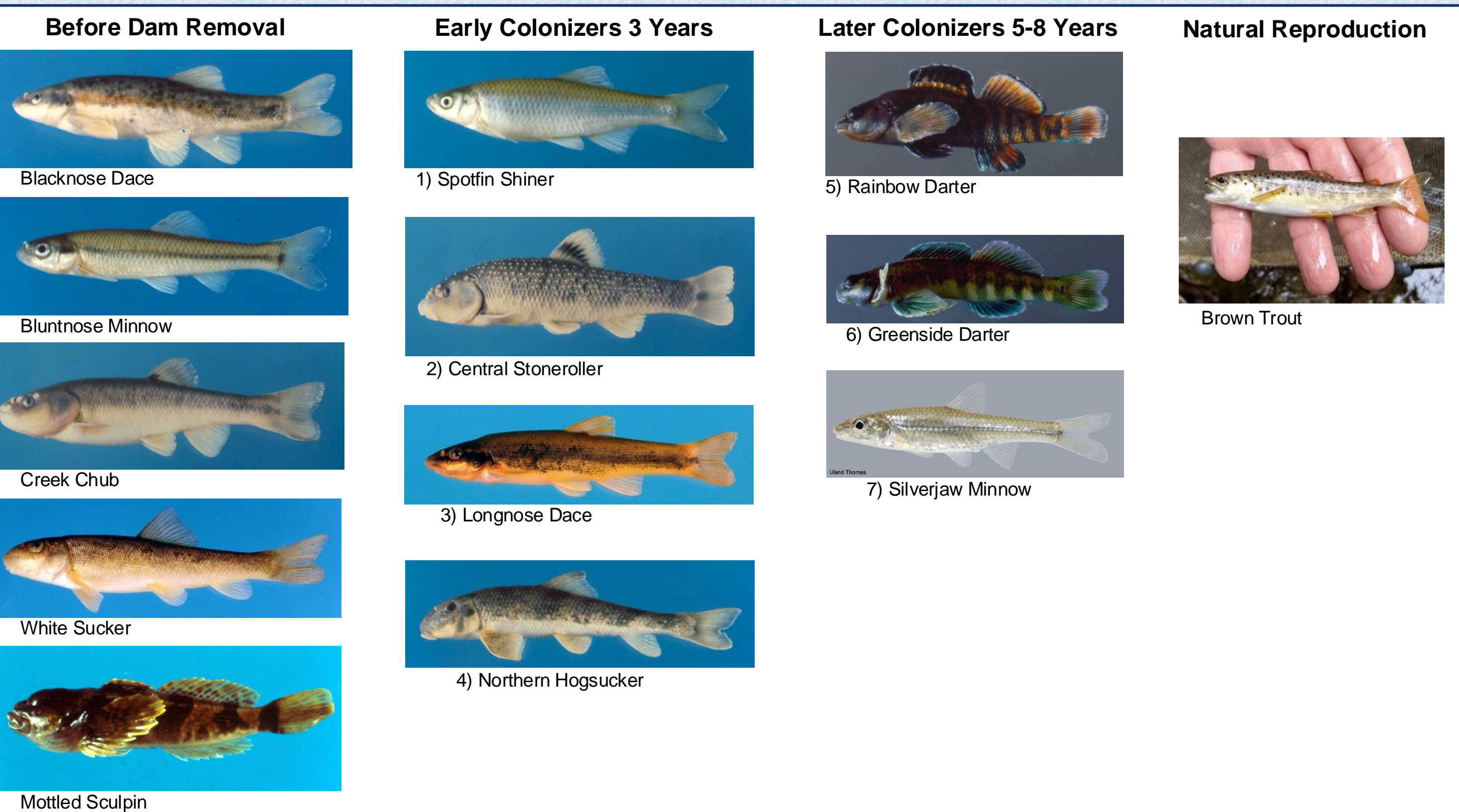


Figure 3: Fish community before and after the removal of the Woodland Dam showing the species colonization sequence as fish moved upstream.

Discussion

- The Woodland Dam prevented upstream fish passage, resulting in a poor fish community for most of Little Sewickley Creek.
- After removal of the dam in 2015, fish community structure rapidly improved as measured by Ohio Headwaters Index of Biotic Integrity scores.
- By 2022, seven years after the dam removal, sites up to 4.42 km upstream were restored to IBI scores above 50, indicating exceptional fish community structure.
- All four sites now support a diverse coolwater assemblage of minnows, suckers, trout, darters, and sculpin.
- Spottin Shiner and Central Stoneroller were the first species to move upstream to colonize Little Sewickley Creek. These two species also appear to be pioneers following the restoration of Nine Mile Run.
- Decades of trout stocking have produced a naturally reproducing Brown Trout fishery throughout the watershed, with Fern Hollow Creek acting as a consistent nursery.
- This decade-long study has served Duquesne students with experiential learning opportunities and valuable training in stream field biology.

Acknowledgments

This project is dedicated to Ed Schroth (1941-2023), Biology Teacher at Quaker Valley High School who led the "Up the Creek" stream club and taught Stream Field Biology as an Associate Professor of Environmental Science at Duquesne University from 1999 to 2015, using Little Sewickley Creek as a natural classroom to introduce generations of students to stream biology. Reclamation would not have been possible without the coordinated efforts of American Rivers (Lisa Hollingsworth-Segedy), The Western Pennsylvania Conservancy (Eric Chapman), and The Little Sewickley Creek Watershed Association (April Claus). We also thank Nate Reinhart, students in the Stream Field Biology course at Duquesne University, and members of the Porter Lab for their assistance with fieldwork. Funding was provided by Duquesne University, and grants from the West Virginia Water Research Institute and Three Rivers QUEST project partners.



References

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Table 1: Site characteristics and fish communities before and after the Woodland Dam removal.

	LSC Beaver Street bridge	LSC Woodland Swim Club	LSC Backbone Road pull-off	Fern Hollow Creek confluence of LSC
Drainage Area (sq km)	24.6	23.8	18.1	5.7
Stream Order	4th	4th	4th	3rd
Position from Dam (km)	- 0.5 downstream	+ 0.25 upstream	+ 2.88 upstream	+ 4.42 upstream
Fish Community Before Dam	Exceptional (IBI=50)	Poor (IBI=24)	Poor (IBI=26)	Fair (IBI=39)
Removal	11 minnow sp., 4 darter sp.	2 tolerant minnows, 0 darter sp.	2 tolerant minnows, 0 darter sp.	2 tolerant minnows, 0 darter sp.
Fish Community After Dam Removal	Exceptional (IBI=51.5 avg.) no change in fish community.	Exceptional (IBI=51.8) since 2018. 8 minnow, 3 darter sp.	Exceptional (IBI=50.7) since 2021. 7 minnow, 2 darter sp.	Exceptional (IBI=55) since 2022. 6 minnow, 2 darter sp., Brown Trout

Little Sewickley Creek Index of Biotic Integrity

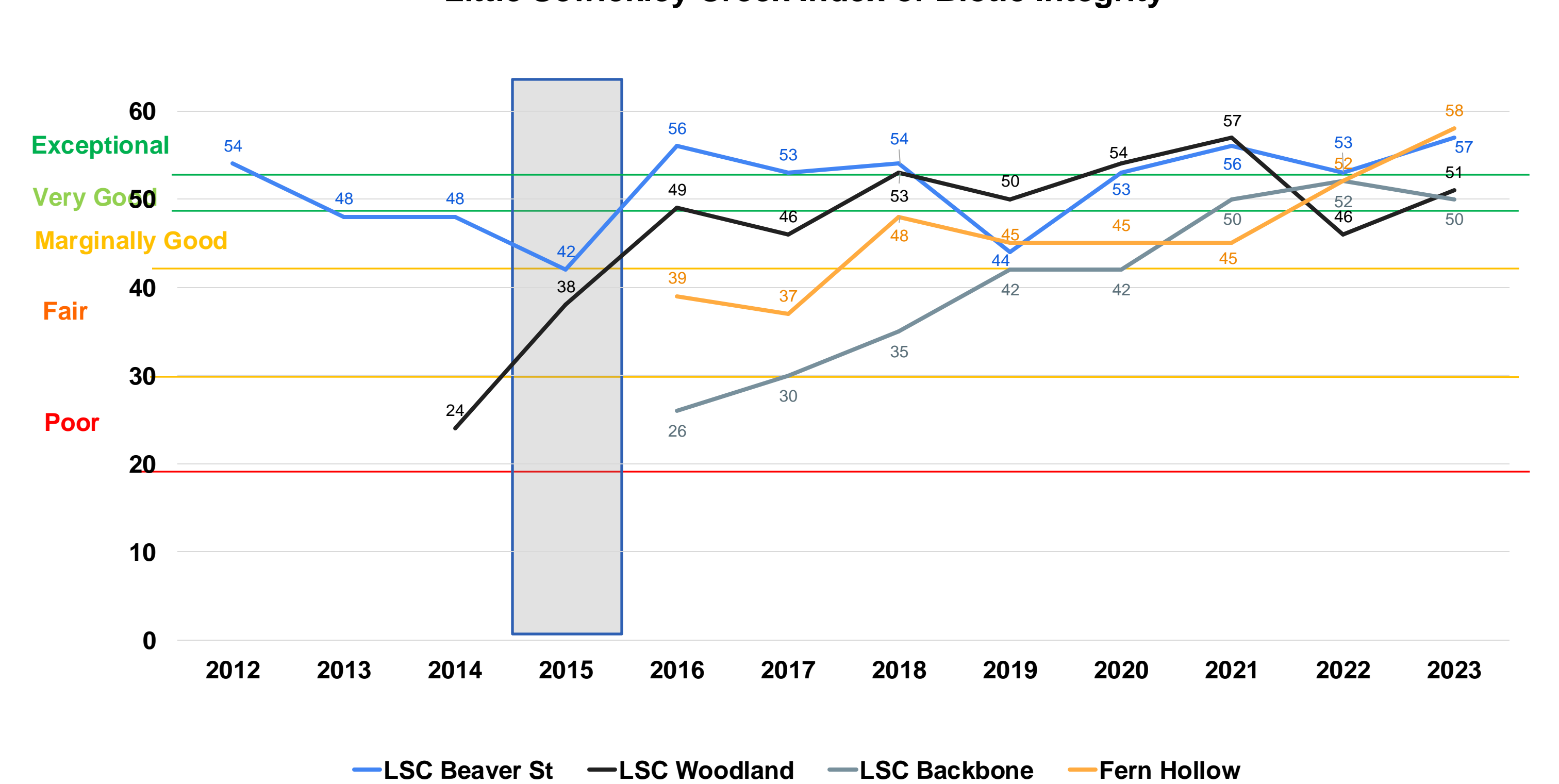


Figure 2: Ohio Headwater IBI scores from four sites on Little Sewickley Creek from 2012 through 2023, colored horizontal lines referring to the IBI quality of the fish community (poor, fair, marginally good, very good, and exceptional). The shaded box indicates 2015, the removal year for the Woodland Dam.

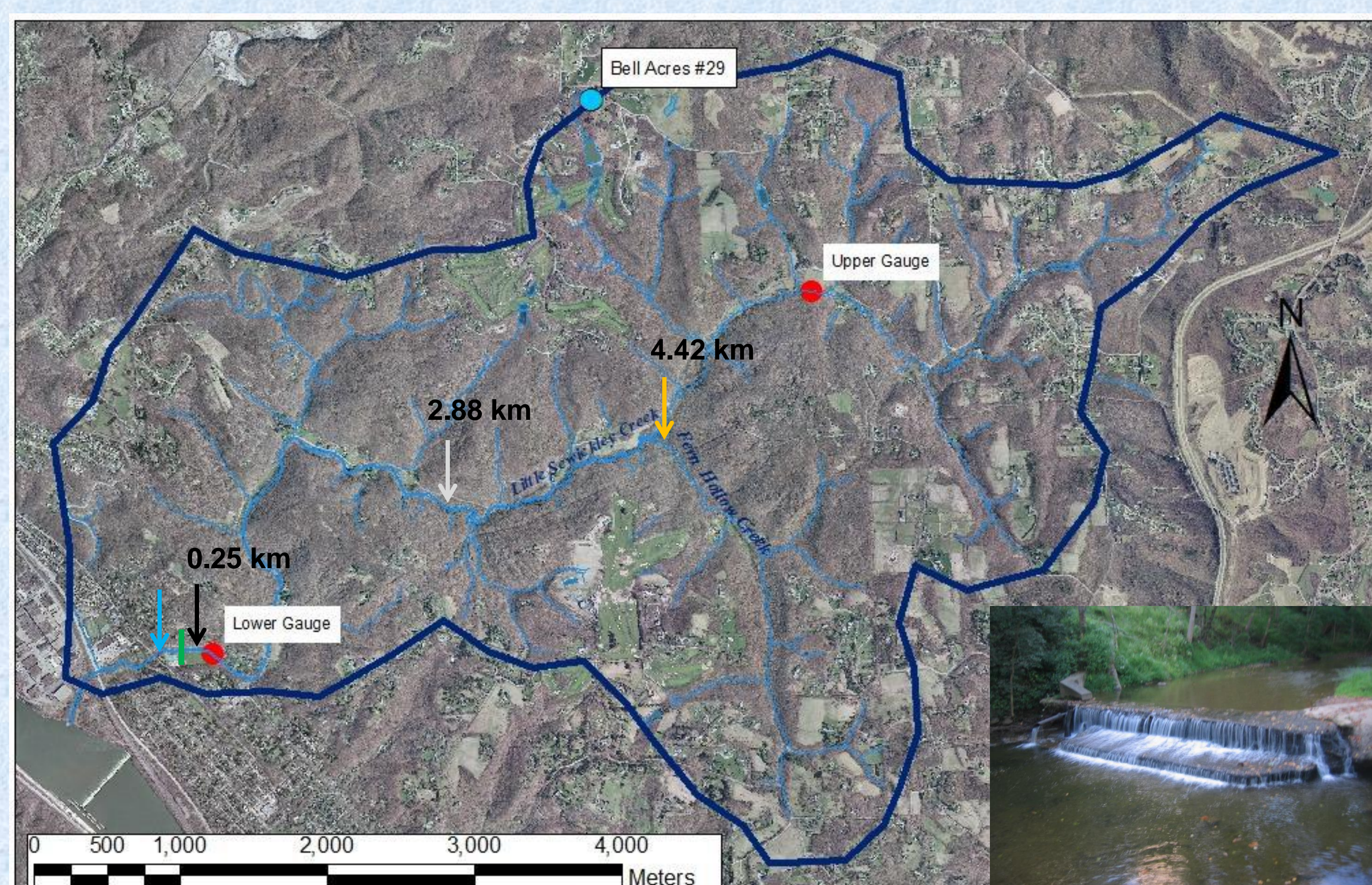


Figure 1: Satellite image of the Little Sewickley Creek watershed (dark blue outline) with arrows indicating electrofishing sites and their distance upstream of the Woodland Dam (in green). Inset is the Woodland Dam in October 2013.