

INDEX OF BIOTIC INTEGRITY STUDY ABOVE AND BELOW A DAM TO BE REMOVED ON THE DARBY CREEK, DREXEL HILL, PENNSYLVANIA

Kathryn Goddard, Adam DiCaprio, and Rachael Vietheer.

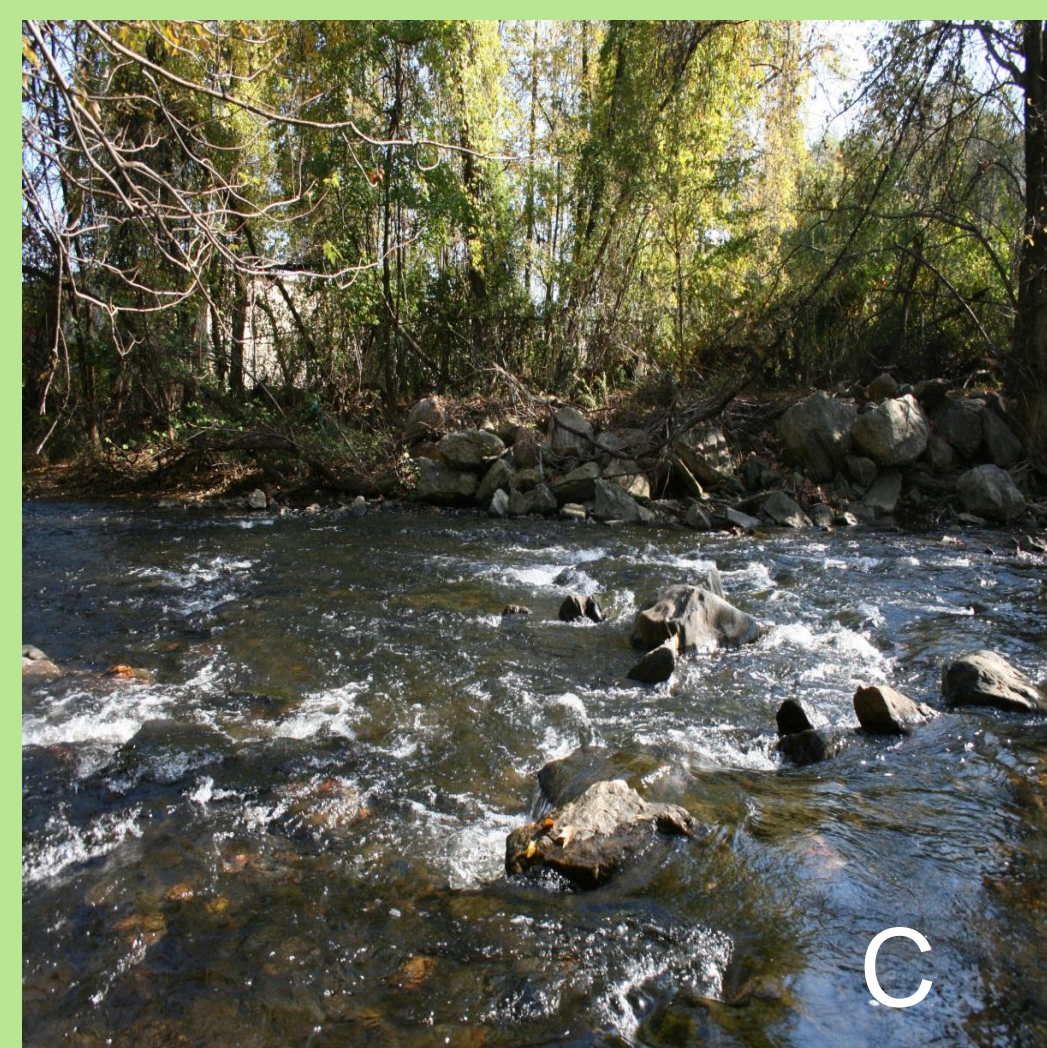
Department of Biology, Ursinus College, Main Street, Collegeville, PA 19426, kgoddard@ursinus.edu.

- Dams alter aquatic ecosystem and cause flooding during heavy rains that is dangerous and also allows pollutants from flooded areas to enter the aquatic ecosystem.
- In Fall 2012 American Rivers, NOAA, and PA Fish and Boat Commission removed the dam at Kent Park, Drexel Hill, Delaware, Co., PA on the Darby Creek. The dam had been in place since at least 1919.
- We studied the benthic macroinvertebrates at sites above and below the dam before and after dam removal.



Figure 1.

- A. Water above dam was 4-5 ft. deep with soft, silty bottom.
- B. Dam of several rows of large boulders, rapid turbulent flow through breach on the left side facing downstream.
- C. Downstream of dam was boulder and cobble substrate with low embeddedness (bottoms of rocks exposed and provide habitat) with riffles, runs, and pools.



Photos by A. DiCaprio

- We sampled macroinvertebrates with a 500 um D-frame net in two riffle and run areas above the dam and two riffle and run areas below the dam three times prior to dam removal and three times after using a PA State DEP protocol (Chalfant, 2007) for an invertebrate index of biotic integrity (IBI).
- This IBI is calculated from Shannon diversity index, counts of mayflies, stoneflies and caddisflies (EPT) and four other indices; the combined IBI ranges from 0-100, the higher the score the healthier the community.
- All invertebrates were identified to the lowest taxonomic level required by Chalfant (2007).

LOCATION PRIOR TO DAM REMOVAL	SEPT 16, 2011	Oct 25, 2011	Sept 6, 2012
ABOVE DAM	28.4	20.5	23.0
RIFFLE BELOW	48.0	42.7	30.4
RUN BELOW	53.4	16.5*	31.6

*Heavy rain prior to this date may have swept away organisms and account for this low score.

- All above-dam samples prior to dam removal were characterized by high percentages of taxa tolerant of stream impairment such as worms (oligochaetes), midge larvae (chironomids) and amphipods and a lack of intolerant organisms such as caddisflies, stoneflies and mayflies.
- The below dam scores were generally higher as indicative of a healthier habitat and stream community; no doubt the availability of rocky habitat in which to live was a factor.

- After dam removal the IBI score for the above dam site rose to 35.5. The number of EPT taxa and percent taxa intolerant of stream impairment increased, number of taxa was unchanged.
- Vermiform organisms, mollusks, and zooplankton vanished, while riffle beetles, mayflies, and caddisflies have appeared.
- We will analyze the remaining post-dam removal samples and continue to monitor this site over time for additional changes.
- Rapid recovery to a healthier stream seems to be occurring.



Photo credit: American Rivers



Photo Credit: S. Polekoff

Figure 2.

- A. Rolls of coconut fiber used to create "soil lifts" filled with soil and loose rock to stabilize the bank, then seeded. Looking upstream from former dam site.
- B. Arrow indicates site of former dam. Rocks from dam supplement rocks re-exposed in stream bed after sediments flushed away --creating macroinvertebrate and small fish habitat.

Bibliography:

Chalfant, D. 2007. A Benthic Index of Biotic Integrity for Wadeable Freestone Streams in Pennsylvania. Pennsylvania DEP.

Acknowledgements:

Sarah Polekoff and Maria Abutuno contributed data. Emily Short, Olivia McGrath and Melonie Phillips helped with sample collections. This research was funded by WGUR and Van Sant grants from Ursinus College and was conducted under Type I and Type IV permit no. 254 from the PA Fish and Game Commission. Thank you to Laura Craig of American Rivers for facilitating this study.