

## Background

One of the most comprehensive methods for assessing water quality conditions is evaluating the benthic macroinvertebrate community (i.e., bottom-dwelling animals that lack a backbone) and fish community. The IN Department of Environmental Management (IDEM) evaluates streams by using macroinvertebrate community data to calculate the Macroinvertebrate Index of Biotic Integrity (mIBI) and fish community data to calculate the Index of Biotic Integrity (IBI), which are developed specifically for IN streams. The mIBI and IBI calculate a score (0-60) that is used to assign a rating based on the size and location of the stream. Ratings are (in order of decreasing stream health): Excellent, Good, Fair, Poor, and Very Poor.

## Methods

Five of the primary inflows and the tailwater of Harden Lake (Figure 1) were sampled in the summer of 2017. Macroinvertebrates were collected using IDEM's multi-habitat collection method and fish were collected using IDEM's backpack electrofishing method. Habitat was assessed using IDEM's Qualitative Habitat Evaluation Index (QHEI) and measured separately for macroinvertebrate and fish reaches; QHEI ranges from 0-100. Some of the metrics used in calculating mIBI and/or IBI include: taxa richness – number of taxa (i.e., types of organisms); EPT richness – number of taxa from the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) which are organisms sensitive to poor water quality; sensitive species richness – number of species that are sensitive to poor water quality; and % tolerant – percentage of the total number of fish that were a species tolerant of poor water quality. Generally, good water quality is associated with higher values in mIBI, IBI, taxa richness, EPT richness, sensitive species richness, and QHEI, and lower values of % tolerant.

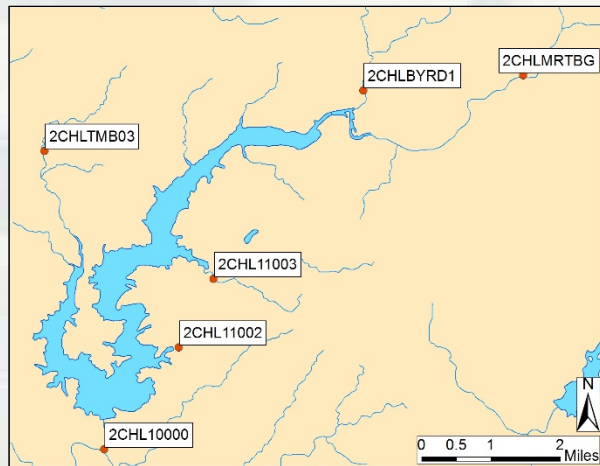


Figure 1. Map of site locations for the Harden Lake watershed.

# Cecil M. Harden Lake Watershed 2017 Biological Study



Figure 2. Logperch (*Percina caprodes*) from Troutmans Branch (2CHLTMB03).

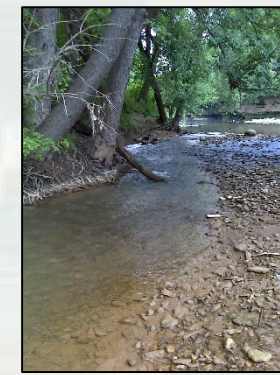


Figure 4. Big Raccoon Creek (2CHLMRTBG).

Site	Stream	Macroinvertebrate					Fish					
		mIBI	Rating	Taxa Richness	EPT Richness	QHEI	IBI	Rating	Taxa Richness	Sensitive Species Richness	% Tolerant	QHEI
2CHL10000	Big Raccoon Creek (tailwater)	34	Poor	15	3	75	46	Good	20	8	9.2	83
2CHL11002	Unknown tributary	46	Good	30	7	39	42	Fair	10	2	46.94	43
2CHL11003	Unknown tributary	46	Good	21	9	44.5	38	Fair	13	2	49.54	36
2CHLBYRD1	Byrd Branch	38	Fair	23	9	54	40	Fair	12	2	44.72	56
2CHLMRTBG	Big Raccoon Creek	28	Poor	17	9	76	46	Good	17	9	14.57	84
2CHLTMB03	Troutmans Branch	40	Fair	24	8	36	38	Fair	12	4	56.98	41.5
<b>Average</b>	--	38.7	--	21.7	7.5	54.1	41.7	--	14.0	4.5	37.0	57.3
<b>Min</b>	--	28	--	15	3	36.0	38	--	10	2	9.2	36.0
<b>Max</b>	--	46	--	30	9	76.0	46	--	20	9	57.0	84.0

Table 1. Results of mIBI and IBI scores, ratings, and other metrics.

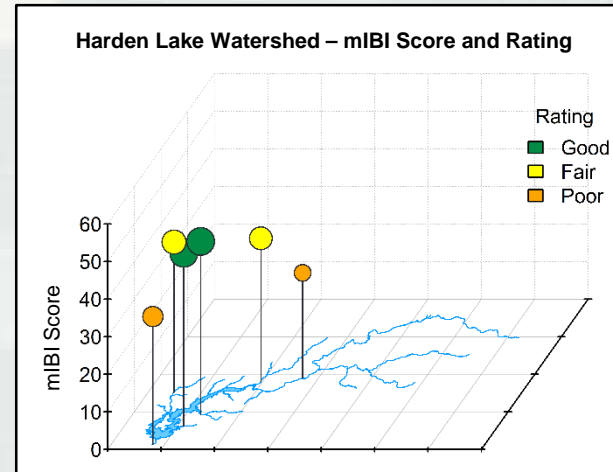


Figure 3. Lollipop chart of macroinvertebrate community mIBI scores and ratings. Lollipop height and circle size corresponds to mIBI score. Circle color corresponds to mIBI rating.

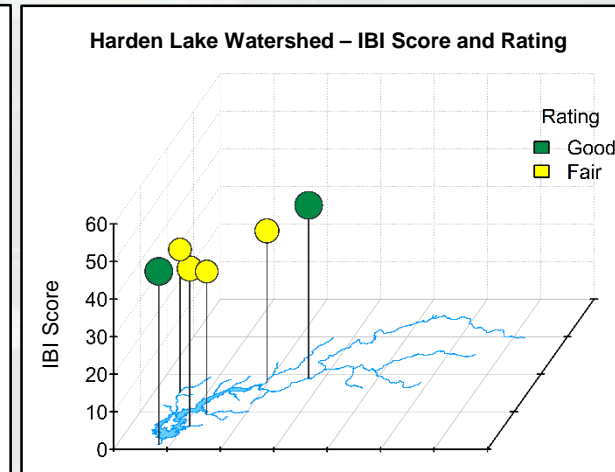


Figure 5. Lollipop chart of fish community IBI scores and ratings. Lollipop height and circle size corresponds to IBI score. Circle color corresponds to IBI rating.

## Results

Table 1 and Figures 3 and 5 show that mIBI ratings were either Good (33%), Fair (33%), or Poor (33%), and IBI ratings were either Good (33%) or Fair (67%). The average mIBI was 38.7 (range: 28-46) and the average IBI was 41.7 (range: 38-46), which would both have a rating of Fair.

## Conclusions

The low proportion of Poor mIBI and IBI ratings (and average ratings of Fair) suggest the watershed has some level of impact from human disturbance but overall has fair stream health. Although the tailwater (2CHL10000) had a Poor mIBI rating, the IBI rating was Good and had the greatest fish taxa richness, one of the richest in sensitive fish species, lowest % tolerant, and had one of the highest QHEI scores for both macroinvertebrates and fish. Assessment of dam discharge data suggests that flow could have played a role on the composition of the macroinvertebrate community, with notable discharge events near the time of sample collection. The largest inflow to the reservoir (2CHLMRTBG) also had a Poor mIBI and a Good IBI. It's worth noting 2CHLMRTBG was one of the richest sites for sensitive species of both macroinvertebrates (EPT) and fish, meaning the water quality may not be as poor as indicated in the mIBI score. The remaining streams had either Fair or Good ratings, indicating decent water quality. Fair ratings do not indicate severe impacts; however, the relatively low proportion of Good ratings and lack of Excellent ratings can be concerning for the water quality of the watershed as a whole.

