Re.: Memo summarizing the 2016-2017 GLEC report on macroinvertebrates in the Boardman River

From: Nate Winkler, Biologist
To: Boardman River Dams Settlement Agreement Implementation Team (IT)

Introduction
In 2016 and 2017, Great Lakes Environmental Center (GLEC) sampled macroinvertebrate populations at various locations on the Boardman River. This work was in support of the Boardman River dam removal project (project) at the behest of the IT. GLEC took this effort over as the successful firm during a competitive bidding process instituted in 2016. Prior to 2016, the Au Sable Institute provided this service for several years.

The following are two key issues that arose during the 2016-2017 sample seasons:

Deviation from Methodology
During the 2016 sampling effort there was a very high number of organisms that GLEC had collected in their samples as opposed to the numbers Au Sable Institute had collected during their tenure. Between the two organizations, the sample locations were consistent with those from prior years as were the physical collection procedures. Due to the discrepancy, GLEC requested the option to identify a subsample of each sample as it would be cost-prohibitive to identify the entire sample. Subsampling was a deviation from the methodology used by Au Sable Institute but it was determined to be appropriate given the much higher numbers of organisms. This methodology was used in the analysis of the 2017 samples as well.

In an effort to explain the discrepancy in organism numbers, both CRA and Au Sable Institute were on hand for the 2017 sampling of the reference location (“Grasshopper Upper”) by GLEC. This resulted in the discovery of the very likely cause: the sampling location where the six subsamples* were acquired was not along a straight-line transect but instead focused on areas where prime macroinvertebrate habitat was evident. GLEC’s assertion was that methodology was in line with standard protocol for the use of a Surber sampler. Conversely, Au Sable Institute stood by their own methodology which was to sample along a straight-line transect at a given interval to obtain the six subsamples, regardless of the quality of the habitat (which they felt resulted in a truer representation of macroinvertebrate communities and habitat present at a given location).

New Zealand Mud Snail Occurrence
During the 2016-2017 macroinvertebrate sampling season, high numbers of invasive New Zealand Mud Snails (NZMS) were noted in all samples and in fact, made up the majority of the organisms in any given sample. Given this state of affairs, it is extremely difficult to tease out of the data an assessment of how the Boardman River is recovering from the removal of Brown Bridge Dam in 2012 (as far as how it relates to the effect on the macroinvertebrate community). The effects of the high number of NZMS on native macroinvertebrates is a relatively new issue in the Midwest and thus, not well documented.
Conclusions Drawn From 2016-2017 Data

The following are key takeaways from the GLEC report:

1) When compared to the reference location (“Grasshopper Upper”), all other locations sampled had higher percentages of Ephemeroptera, Plecoptera, and Trichoptera (collectively termed “EPT”) present, however, those percentages were lower in 2017 than 2016 with the exception of the site below Sabin Dam. EPT are commonly recognized as the three macroinvertebrate orders that, when present, indicate high water quality. Common names for the EPT are mayflies, stoneflies, and caddisflies, respectively.

2) The percent similarity between the reference location and the locations sampled both in 2016 and 2017 (only five were re-sampled in 2017) increased between the two years. Because the reference location exhibited the lowest percentage of EPT, this could mean the other locations are decreasing in quality as macroinvertebrate habitat.

3) Percentages of mid-tolerant organisms increased from 2016 to 2017 in all sampling locations that were sampled both years. “Mid-tolerant” refers to the tolerance a particular organism exhibits to some form of pollution and is bookended by both “sensitive” and “tolerant” types of organisms. This is attributed to the high number of NZMS present at each sampling location as they are a mid-tolerant organism.

4) Chironomidae and Gastropoda were not uniformly identified between years and therefore plays a role in the discrepancy in trends analysis due to assumptions having to be made during statistical analysis. The identification protocol was modified in 2016 as an additional cost saving measure.

The decline in EPTs between 2016 and 2017 may be related to the high numbers of NZMS present or it could be a decrease in habitat and/or water quality (or a combination). Given only the two years of data acquired using GLEC’s methodology, it’s not possible to make an accurate correlation. In the same vein, the percent similarity decrease between sites would also be impossible to accurately correlate for the same reason. Due to their numbers, and since their initial discovery in 2013, NZMS are confounding the data and masking the ability to determine whether or not the river is responding positively to dam removal.

Prior Years’ Survey Efforts

Au Sable Institute macroinvertebrate data from prior years showed a decline in macroinvertebrate community quality immediately after (spring 2013) the Brown Bridge Dam removal and the catastrophic release of impounded water due to the failure of the dewatering structure. However, between 2014 and 2015, the quality of the macroinvertebrate community improved and surpassed the quality of that found at the reference site. With special regard to the reference site, a decline in macroinvertebrate community quality was observed and attributed to two very hard winters in a row (2013 & 2014) as well as an increase in sediment loading to the site from upstream. However, researchers at the Au Sable Institute indicated that the trend they observed in the Boardman River was one of overall recovery given the data set they were working from which was derived between 2008 and 2015.

*Not to be mistaken with the subsamples used to identify a representative proportion of each sample. In this case, at each sampling location, six subsamples were taken and composited as one large sample.