Background

The Au Sable Institute has carried out macroinvertebrate surveys on the Boardman River for the past seven years. Among the more significant findings are: confirmation that, for most of the stream channel, the dominant organisms are characteristic of high water quality; reservoirs can have a negative impact on the typical riverine biota with mayflies predominating above the Brown Bridge Dam and mollusks and net-spinning caddisflies below; documentation of significant recovery of the macroinvertebrate community to a more natural state at the newly formed riffle sites located above the Boardman Dam; invertebrate communities downstream after dam removal were greatly reduced in EPT, sensitive organisms and numbers of organisms; and, finally, work this year has confirmed a significant recovery in the macroinvertebrate community downstream from the previous Brown Bridge Dam site. This work suggests that removing the existing dams will likely result in a fairly rapid return of the stream to pre-disturbance (i.e. before dams) conditions.

As per the request of Conservation Resources Alliance, the foci of the 2014 study were: to continue the macroinvertebrate data set above and below the old Brown Bridge Dam site; to assess the macroinvertebrate communities and the impact of dam removal; to determine the status of the macroinvertebrate community in the newly constructed channel through the old reservoir site; to continue the assessment of the recovering Lone Pine site; and to continue to collect macroinvertebrate data downstream from Garfield Road. The more complete results of this work by the staff of the Au Sable Institute are found in the accompanying papers of Guebert, et al., Betts, et al, Shoaff, et al. and Scheres, et al. Because the best sampling locations to track impact and recovery of the removal of the Brown Bridge Dam upon the stream macroinvertebrates are found in the Guebert and Mahan study, the most detailed discussion of our results in this report will center on that study.

Guebert and Mahan, Results Summary for 2014 – samples above and below Brown Bridge Road

Macroinvertebrates – As noted in our 2013 report, the structural removal of Brown Bridge Dam negatively impacted downstream insect communities. A reduction in organism numbers, organism diversity, and key community indices like %EPT, EPT/C ratio, and sensitive/tolerant ratio all indicated a decline in downstream water quality as measured by macroinvertebrates.

In contrast, results from this year offer strong support for macroinvertebrate community recovery after dam removal. A key piece of support is provided by the similarity in the number of organisms and % EPT (most sensitive organisms) at sites A (upstream control) and D (14 Ponds below Garfield Road). Our samples from this year were much like those from 2012, prior to dam removal, with these sites again very similar in 2014. And while the total number of organisms at intermediate sites B and C’s
are still low in comparison to A and D, %EPT and organism tolerance ratios at site C (just below old dam site) are similar to A and D, indicating a relatively high quality macroinvertebrate community again exists immediately below the old dam site.

Analyses of trends from 2013 to 2014 also confirmed positive changes in the macroinvertebrate communities. The index of similarity between all sites increased from 72% to 80% over the course of one year. Additionally, diversity (as estimated by H and ENS values) in 2014 more than doubled at sites C and D. Between years 2013 and 2014, all dam-impacted sites (B, C, D) increased in %EPT and % sensitive and decreased in % tolerant organisms, indicating the overall presence of more high quality organisms.

Further indication of recovery is demonstrated by the total number of macroinvertebrates collected and their associated biotic indices over the four years of study. At the upstream control site macroinvertebrate numbers and indices remained high and relatively constant during this period while the other locations exhibited declines in numbers and quality of indices following dam removal. As reported last year, overall organisms and biotic indices like %EPT and percent sensitive organisms decreased from 2012 to 2013 after dam removal, however, both organism numbers and sensitive organisms increased from 2013 to 2014. Also, %EPT and sensitive/tolerant ratios at sites B, C and D in 2014 were very similar to 2012 pre-disturbance levels. As suggested in 2013 the most likely explanation for the decrease in organisms and their indices was dam removal.

To summarize our data from these above/below dam site locations, results from our 2014 study indicate that macroinvertebrate numbers and trends in their indices give strong evidence that macroinvertebrate communities downstream are recovering following dam removal.
sites continue to be more similar from 2010 through this year. The long term trend demonstrates increased similarity between sites and, therefore, continued recovery at Lone Pine, though the dam removal makes interpretation of these results more difficult.

Shoaff and Mahan, Results Summary for 2014 – samples intermediate between Brown Bridge Road and Shumsky

Macroinvertebrates – For this analysis, two sites were chosen at intermediate locations between those of Guebert below Brown Bridge Road and upstream from those of Scheeres. In contrast to the upstream control site (see Guebert and Mahan above), these two sites demonstrated lower numbers in 2012 and 2013 and significant declines in sensitive organisms as measured by % EPT and EPT/C between 2012 and 2013. This decrease in macroinvertebrate community quality was also supported by the decline in diversity (ENS) at both sites. However, 2014 results showed significant improvement in total #’s, EPT numbers and diversity from 2013 to 2014, indicating recovery was occurring. Sensitive organisms (EPT/C and % EPT) remained higher at the control site all three years. Analysis of community similarity also shows these same trends between the three sites, with the highest similarity found in 2014.

Summary of 2014 Results

The most important observation from this years’ work is the overall trend of macroinvertebrate community recovery that we observed at virtually all locations. (The only location that is not recovering is located above Brown Bridge Pond {site B} and still experiencing downcutting as the river finds its natural elevation.) While the total number of organisms and their biotic indices from this year, when compared to 2013, confirmed that the removal of Brown Bridge Dam negatively impacted the insect communities, it appears that the stream is well on the way to recovery. The %EPT, EPT/C ratio, and sensitive/tolerant ratio all indicate higher water quality at Grasshopper Ranch Upper upstream control site than all other sites (Fig. 6 – Fig. 8). Thus, while we have confirmed that macroinvertebrate community recovery is occurring downstream from the old dam site, the impact of the major influx of sediment deposited downstream following dewatering the reservoir is still negatively impacting downstream organisms.