The Compass: Earth Science Journal of Sigma Gamma Epsilon

Volume 85 | Issue 2 Article 4

9-17-2013

# 2012 Sigma Gamma Epsilon National Council Best Poster Award

Aaron D. Hiday
*Albion College*, adh10@albion.edu

# 2012 Sigma Gamma Epsilon National Council Best Poster Award


Sigma Gamma Epsilon President Erika Elswick with Aaron Hiday from Albion College, the National Council Best Poster Award winner.

## INVESTIGATION OF BIOTURBATION AND GROUNDWATER SAPPING AS POSSIBLE CAUSES OF DIEL TURBIDITY CYCLES IN RICE CREEK, KALAMAZOO WATERSHED, MI

**HIDAY, Aaron D.**, LINCOLN, Timothy N., and WILCH, Thomas I., Geological Sciences, Albion College, Albion, MI 49224, adh10@albion.edu

Our past research described diel turbidity cycles in Rice Creek, with NTU increases of 2-4 times at night. Cycles are roughly anti-phase with cycles of DO and pH, compatible with a biological control. Turbidity cycles are in-phase with groundwater levels in adjacent wetlands, compatible with groundwater sapping as a cause of turbidity. Levels also have a weaker correlation with stage; data in the fall of 2011 show stage and groundwater cycles die out in early November.

This summer, we monitored turbidity cycling at 15-minute intervals in Rice Creek and Cold Creek of the adjacent St. Joseph River watershed. Rice Creek has extensive adjacent wetlands, typically 5-200 meters wide. Cold Creek has insignificant adjacent wetlands, 0-3 meters wide. During an 18-day stream stage recession, Rice Creek had strong (5-15 NTU), regular turbidity cycles while Cold Creek had very weak (4-6 NTU), irregular daily turbidity fluctuations. Because the creeks have similar faunas, the lack of turbidity cycles in Cold Creek suggests nocturnal bioturbation is not the cause of turbidity cycles. To further test this, we isolated crayfish (*Orconectes rusticus*) in a tank with stream sediment, and observed only small, irregular turbidity changes similar to those observed in Cold Creek.

Because the water table adjacent to Rice Creek cycles with higher amplitude than the creek stage, we postulated that water seeping into the creek at a higher rate at night causes increased turbidity. However, rates measured with a seepage meter placed in fine grained sediment recorded virtually identical day ($1.62*10^{-4}$cm/sec) and night ($1.60*10^{-4}$cm/sec) seepage rates. We speculate that seepage rates do vary in coarser sediments. An in-lab uniform seepage experiment was conducted with seepage through a layer of stream sediment overlain by a thin layer of fine mud. Starting with the above seepage rate, the rate was increased in steps to 100x that rate. No change in turbidity was observed until 100x the stream's measured seepage rate. At this rate, seepage was no longer uniform, and localized sand boils formed, causing a turbidity increase.

This work suggests that bioturbation and uniform seepage variations in fine sediment are unlikely causes of the turbidity cycles. Localized sapping due to higher adjacent water tables at night remains a possible cause.