

Brian Yellen

Water Isotope Sampling in the Deerfield River Watershed

Summary

The area below streams where surface water and groundwater mix mediates many processes essential to maintaining river ecosystem functions. This area is also where rivers gain or give up water to the adjacent aquifer. My past research has focused on the downstream alterations to surface water-groundwater interactions as a result of hydropeaking – increasing and decreasing discharge from hydroelectric dams according to energy demand cycles.

“Hydropeaking causes rivers to lose water!” That was the headline from my masters research. As a PhD student, my focus has changed slightly, and I have a new advisor and new funding. But, I can’t give up questions that remained from my previous work. Departmental funding has enabled me to continue this work on weekends and evenings. The main costs associated with continuing this research are gas and water sampling vials and filters.

Here’s what I am doing: I have a hypothesis that riverbank trees are taking up excess moisture that is made available during hydropeaking cycles as the high river water soaks into bank soils. I have been collecting water samples from different parts of the hydrologic system – groundwater, tree tissue water, river water, and soil water – to see if isotopic composition alone can distinguish these different sources. I hope to show that Deerfield River trees have a larger portion of river water in their tissues than trees along natural streams.

Results from this research will inform hydroelectric operations about unknown tradeoffs associated with hydropeaking. Besides well documented ecosystem damage, hydropeaking also makes less water available for downstream electric generation. Furthermore, if successful, this research will provide a useful new tool for understanding surface water-groundwater interactions and how riparian vegetation mediates these phenomena.

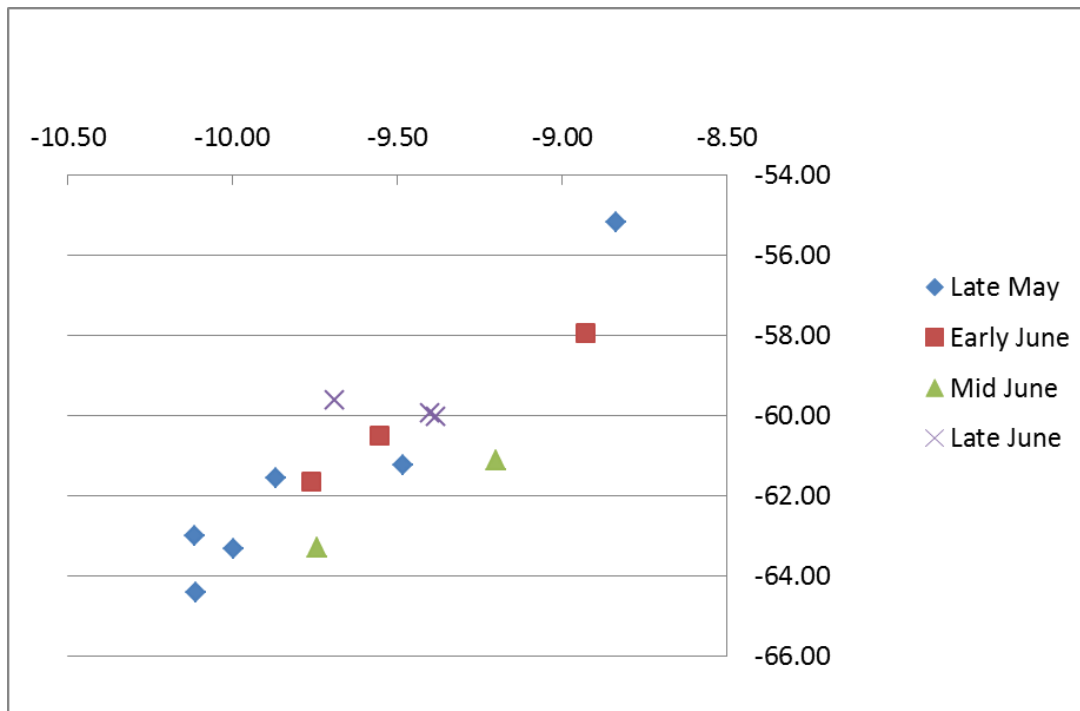


Figure 1 – Preliminary results showing seasonal trends in isotopic signatures of precipitation in the Deerfield River Watershed.