CHANGING OUR PERSPECTIVE TO INCREASE OUR UNDERSTANDING OF BASIC AQUATIC ECOSYSTEM FUNCTION

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Abstract. Aquatic ecosystems are dynamic mixtures of physical, chemical, biological, geological, and meteorological elements. Understanding how that mixture produces the observed water quality at a given location is one of our greatest challenges. To a large degree, our understanding has been limited by the availability of tools and by our research approach. Advances within the last two decades have allowed us to go beyond synoptic sampling (data collection from many sites without regard to travel time) to multiple site, continuous sampling efforts (high frequency data from multiple fixed locations). While those data are important for assessing regulatory water quality, fixed position sampling (Eulerian perspective) falls short of providing a true understanding of aquatic ecosystem function because of the significant spatiotemporal gaps between data collection sites. Continuous data from multiple locations increases data resolution but connecting those data within the context of advective transport requires simulation; this results in far more simulated than measured data. Continuous measurements while following the same parcel of water as it is advectively transported (Lagrangian perspective) is another important approach to understanding aquatic ecosystem function. This approach allows for better spatiotemporal resolution and can lead to better understanding of ecosystem function. The Lagrangian perspective is however limited by the costs and time associated with conducting this type of data collection effort and data sets may be limited in the range of seasonal and stochastic conditions. For six years, Southeastern Natural Sciences Academy has been collecting water quality data with Eulerian data collection methods throughout the Middle and Lower Savannah River Basins. In June 2012, we launched our first Lagrangian research expedition along 233 kilometers (145 miles) of the Middle Savannah River Basin. The goal of this paper is to discuss some of the differences between our Eulerian and Lagrangian data sets and the challenges that lie ahead.