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February 17, 2025

Re: Independent Observer Report for Jabez Branch: Jun 2024-January 2025

To Whom It May Concern:

This document serves as a report of my activities as an Independent Observer of the Stream Monitoring Activities on Jabez Branch undertaken by Maryland Department of Natural Resources as part of a stream restoration effort.

Qualifications:

I hold PhD in Aquatic Ecology (2002) and an MS in Forest Ecology (1996) both from the University of Michigan, Ann Arbor. I have more than 28 years of field experience sampling and measuring streams and analyzing ecological data. Since 2008, I have been a Professor of Geography & Environmental Systems at UMBC. Prior to that I was an Assistant Professor of Watershed Sciences at Utah State University and a Research Ecologist at the Smithsonian Environmental Research Center. I have served as expert witness in federal and circuit court cases dealing with degradation and restoration of aquatic habitat and held appointments as a Research Professor with the USGS and as a Maryland Fellow with the National Socio-Ecological Research Center. I currently serve as a member of the Science and Technology Advisory Committee (STAC) to the Chesapeake Bay Program.

Initial Site Visit:

On June 5th, 2024 I visited the Jabez Branch restoration and was given a tour of the site. Jabez Branch rests within a narrow, steep-sided, U-shaped valley. Restoration efforts had involved a form of regenerative stormwater design, in which earthen, cobble and small boulder-reinforced berms had been constructed across the valley width, creating a series of low-head dams and slowing flow. The previously incised channel, which I had only observed in photos, appeared entirely filled in, with many mature trees left standing. The channel, as such, now largely existed as a series of shallow, standing or slow-flowing ponds with local zones of turbulent flow within short overflow channels or anastomosing rivulets. Many ponds showed high levels of turbidity consistent with very fine suspended sediment, others were sufficiently settled to be clear. All ponds showed extensive and prolonged turbidity following disturbance of fine sediments, in many cases these sediments included substantial fractions of oxidized iron floc, giving the water or the bed a rusty red color. In some cases, the berms or access roadways had created, or recreated valley bottom wetlands. In other cases, it was apparent that groundwater seepage from adjacent valley walls had previously sustained wetland soils and vegetation. There was woody debris in the form of downed trees or stumps distributed throughout both wetlands and ponds, in some cases it appeared as if they were steering flows, in other cases clumps of emergent herbaceous or shrubs contributed to minor variation in flow direction and velocity.

Although the access road had been topped with crushed gravel, its risers covered with organic soil, and seeded, it was apparent that work on the site was ongoing, and the project had yet to be substantially completed. In some cases, Environmental Consultant staff were planting wetland vegetation in the most downstream ponds, but in the middle and upper pods there was evidence of active earth movement and heavy machinery. I discussed the status of the construction with DNR staff as it was an issue of concern for monitoring. They were proceeding with installing monitoring equipment as directed even though the potential for redirection of flows from upstream manipulation of flow was a very real and even likely outcome.

Chief among the concerns of DNR staff at the time was how to distribute their monitoring equipment to obtain a representative sample of different environmental conditions. The challenge they faced was that if the equipment was placed in a stagnant pool, it could warm substantially throughout the summer and provide a biased indication of available habitat and recovery following the restoration. Perhaps of equal or greater concern was the potential for instrument fouling by sediment or iron floc. We discussed placing equipment in areas of higher flow (this being 'high' in a relative sense only). However, if the equipment was placed in a rivulet or riffle, not only would the flow often become too shallow for sampling with their gear, many appeared unlikely to remain in a fixed position for long. If such modifications to flow occurred, the continuous measurements, which were obtained by driving steel rods into bed sediments to anchor the sondes, could suddenly be in a backwater or out of the water entirely. We also discussed locating portions of pools that appeared to have a proximate groundwater source, as such locations would likely become refugia during warmer summer months and during periods of low flow. It was during these discussions that I observed that their initial equipment (YSI 6600s) did not seem well suited to the monitoring task at hand. I was informed that the equipment they were anticipating (EXO1) had a low profile to be able to obtain measurements in shallow water, including the low flow channels and riffles in between pools, but that they lacked the capacity to automatically remove fouling sediments. The older alternatives, sondes with built in wiper capability, had a higher profile and could only be useful in deeper water.

I followed DNR staff from the initial restoration site, around an active construction zone where the Consultant had apparently decided to extend the restoration upstream at his own cost, to an upstream, unrestored monitoring location. Here the channel was clearly incised, though not as deeply as I had seen in photos of the restoration site. I observed DNR staff collected their monitoring data using the sondes and mobile probes. Here again we engaged in a long discussion about the potential for fouling. DNR staff engaged in some experimentation to understand how much channel bed disturbance it would take to disrupt measurements and how long such disruptions would last.

Early Synthesis:

I left my initial site visit with the distinct impression that obtaining accurate and continuous measures of environmental conditions in and around the restoration would prove challenging for any monitoring protocol. DNR staff were experienced and more than competent, yet it was clear that they were concerned about interruptions in the continuous observations. I viewed such challenges as part and parcel of environmental monitoring in variable environmental conditions, but I was reasonably confident that the approaches being considered would prove sufficient to the task of characterizing the site. Of greater concern to me at the time, was that the whole process seemed unnecessarily rushed. Equipment had been ordered and purchased before the site conditions were fully evaluated and understood, but that seemed to be driven by a desire to capture environmental conditions as early as possible, even before construction of the restoration site had fully wrapped, and certainly while construction of the upstream restoration extension was underway. This seemed premature, when the real monitoring questions were going to be about how the system functioned once the restoration had time to settle in.

Dam Breach:

In the last week of July 2024, an intense rainstorm occurred and during the subsequent high flow event, one of the earthen berms that pooled water in the regenerative stormwater conveyance breached, sending a flood of water through the restoration reach. In addition to sedimentation, the flows redirected channels and made some of the monitoring locations ineffective. This even was a great example of why monitoring in June may have been somewhat premature, but DNR staff responded by relocating their monitoring locations to use the newer (EXO1) sondes in riffles between pools and ponds.

Monitoring Challenges:

On or about November 6th, 2024 I received a document from DNR staff detailing experimental data collection they had engaged in to understand the degree of biofouling caused by sedimentation on their monitoring equipment. The original sondes that had been purchased and installed (i.e., EXO1) did not have wipers, so DNR staff had temporarily replaced them with older units (YSI 6600) and a newer model (EXO2) that had a wiper to remove accumulated silt and floc. They had rotated the older units and one of the new units to different sites to assess the effect that wipers had on the precision and accuracy of the turbidity and dissolved oxygen data collection. The results made it quite apparent that without wipers in many of the pools and ponds, the sondes were not capable of maintaining accurate turbidity and dissolved oxygen measurements for more than a few hours into the subsequent observation period. After compiling more data from the initial six months of monitoring, DNR staff reached out again on December 9th, 2024, while I was at the AGU meetings, and I had reviewed their data by December 23rd. Our first sit down meeting occurred in early January 2025. At this point, the monitoring team and I discussed resulting Fish IBI scores, an iron floc monitoring protocol, and physical/chemical monitoring results from the sondes. My conclusions were that the data collection up until that point had been reasonable if not entirely successful.

The fish data were consistent with a slow-moving sand bed coastal plain stream and the chemical data indicated slow moving waters that were at times and places somewhat warm but not unexpected given the physical conditions at the site. At this time, new sondes with wipers had been ordered to better capture environmental conditions.

Initial Conclusions:

The Jabez site has posed significant monitoring challenges for DNR staff and equipment in the early stages of project monitoring. However, the staff have responded reasonably and diligently to the difficulties, and their data is effectively capturing site conditions. Many of the challenges stemmed from premature initiation of the monitoring effort, but the effort did provide opportunity to adjust to site challenges and revise the approach. As active construction on the initial restoration has wrapped and completion of the extension has followed suit, data collection has proceeded with greater efficacy and improved precision. It is my view that efforts are currently adequate for capturing site conditions.

Sincerely,

Matthew Baker
Professor