

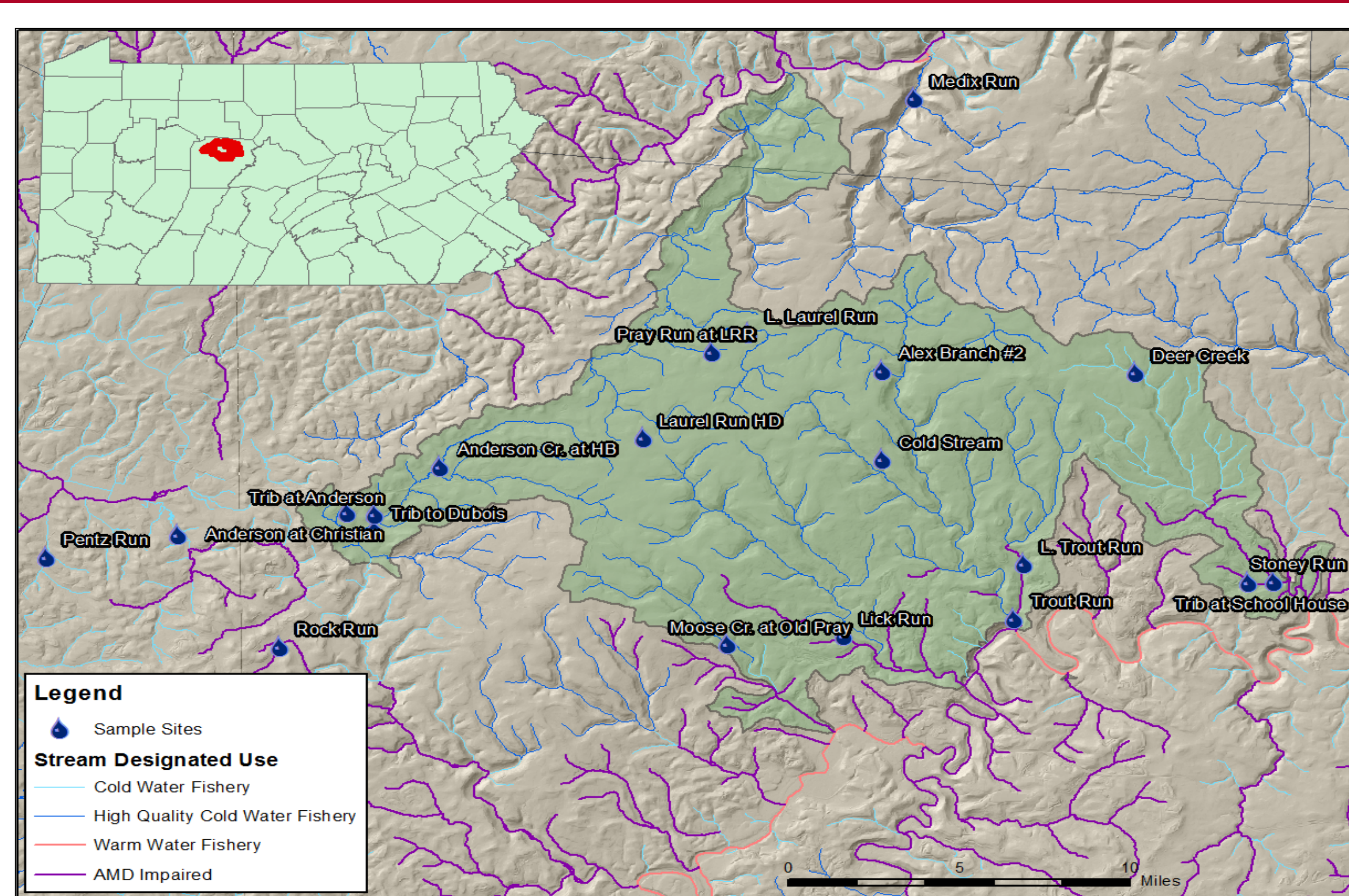
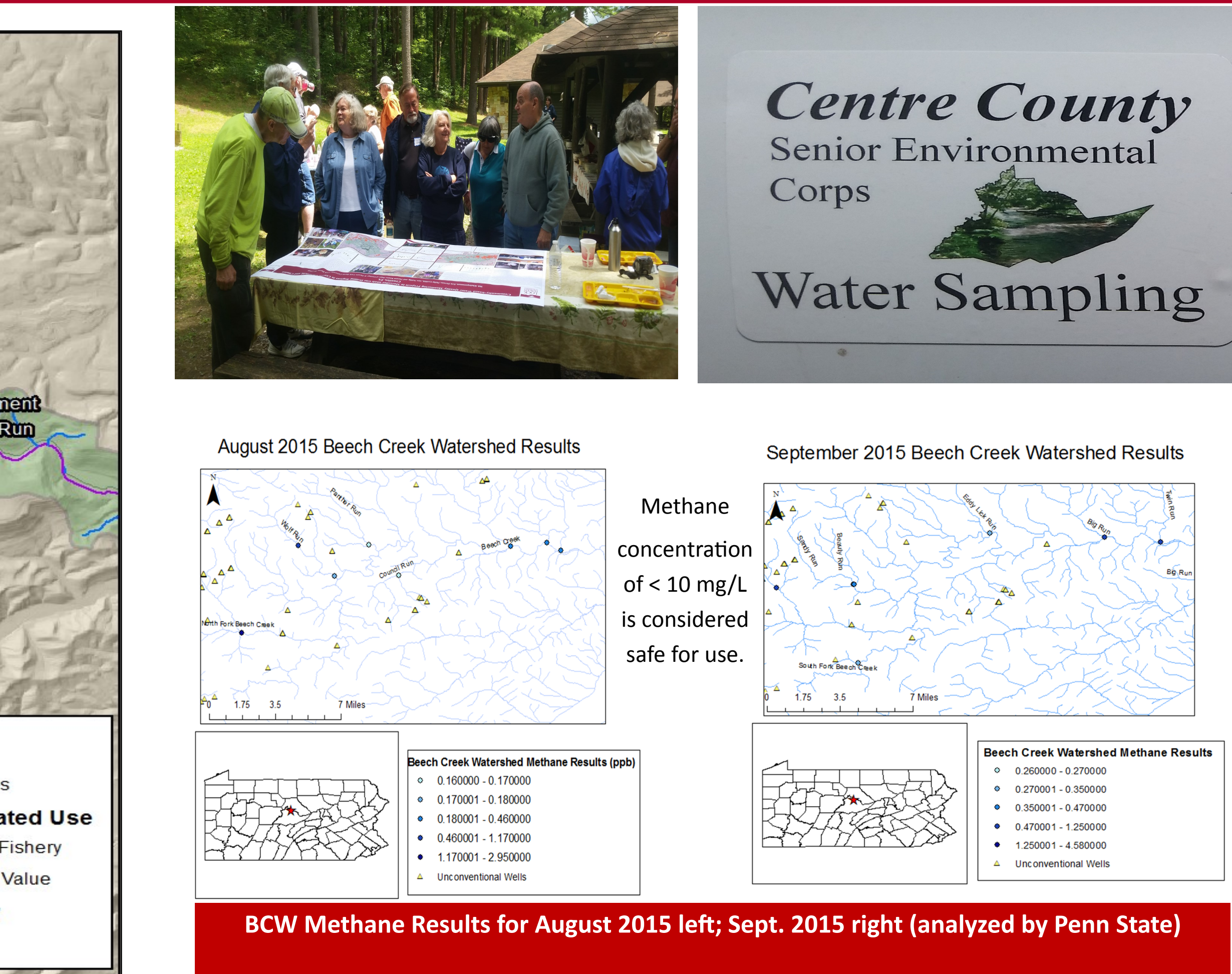
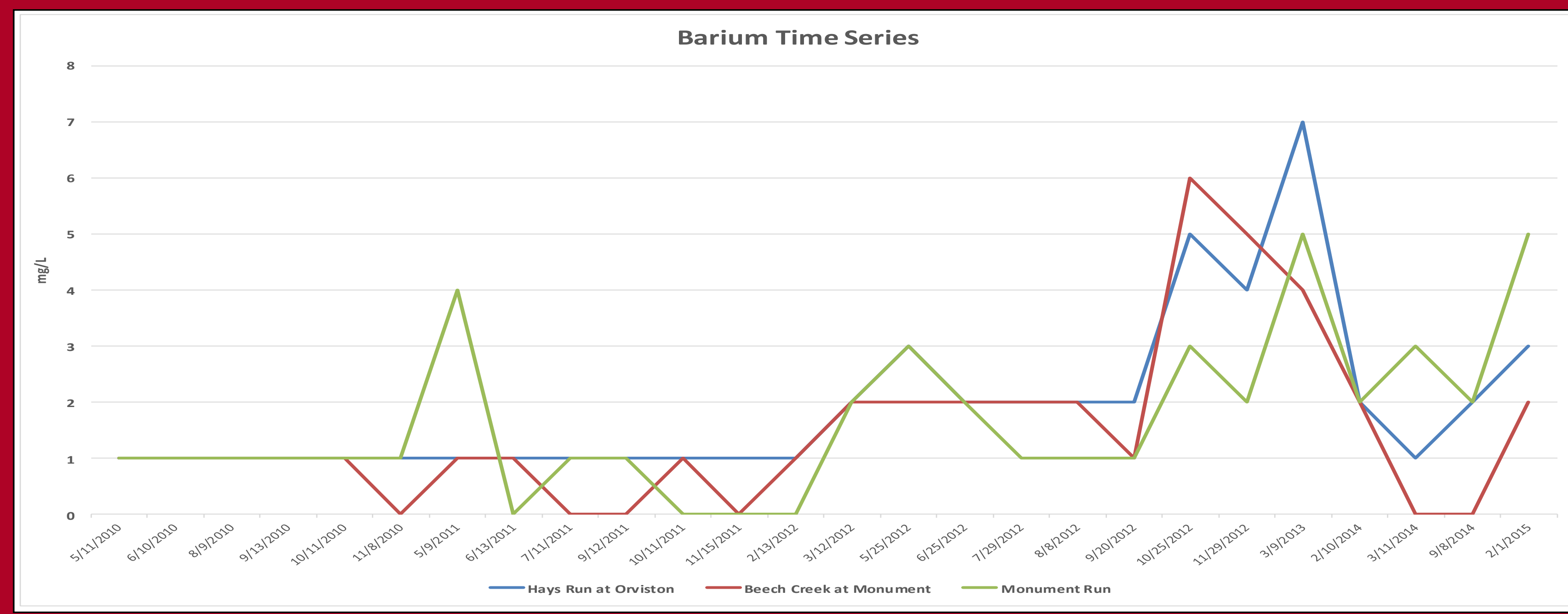
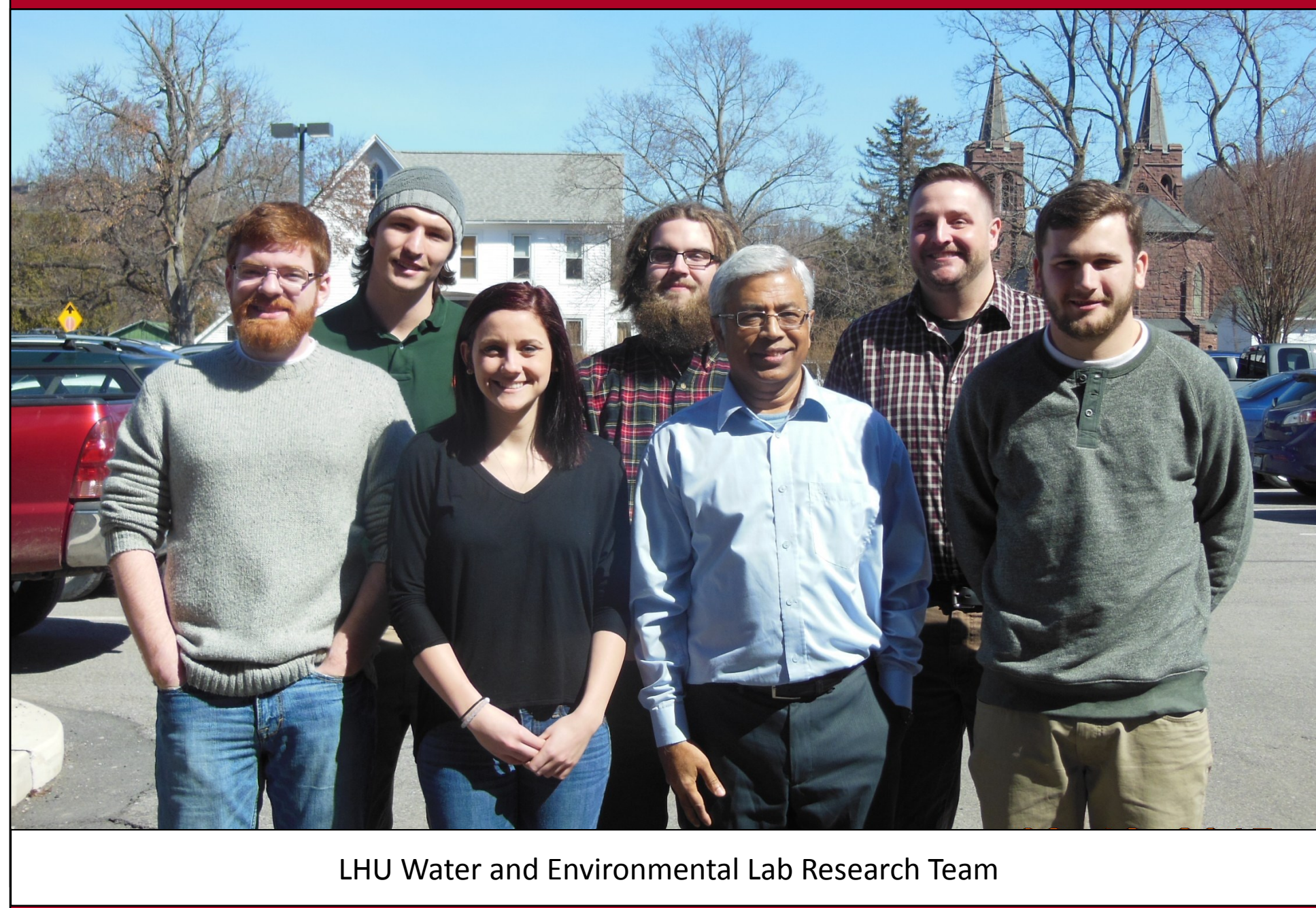
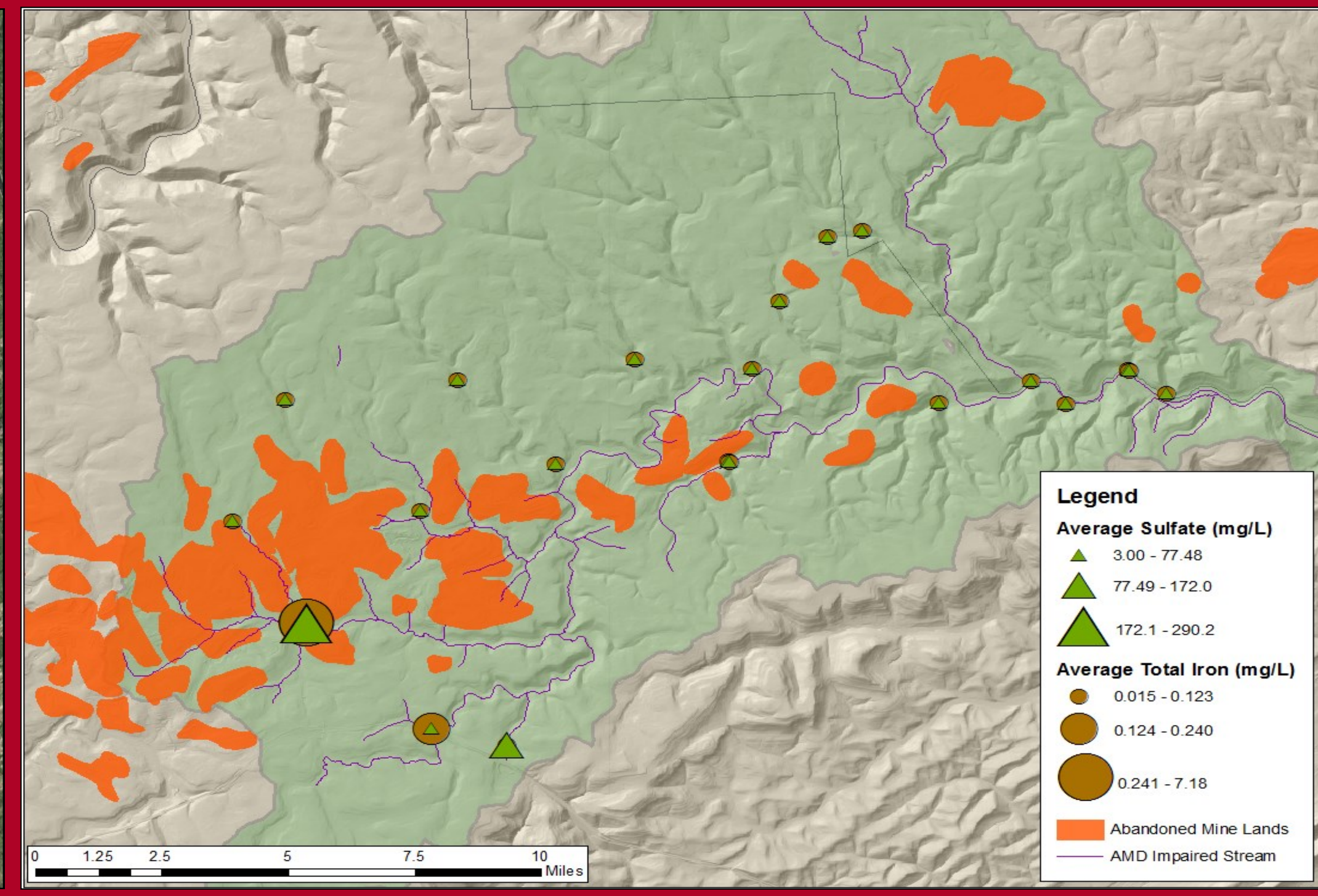
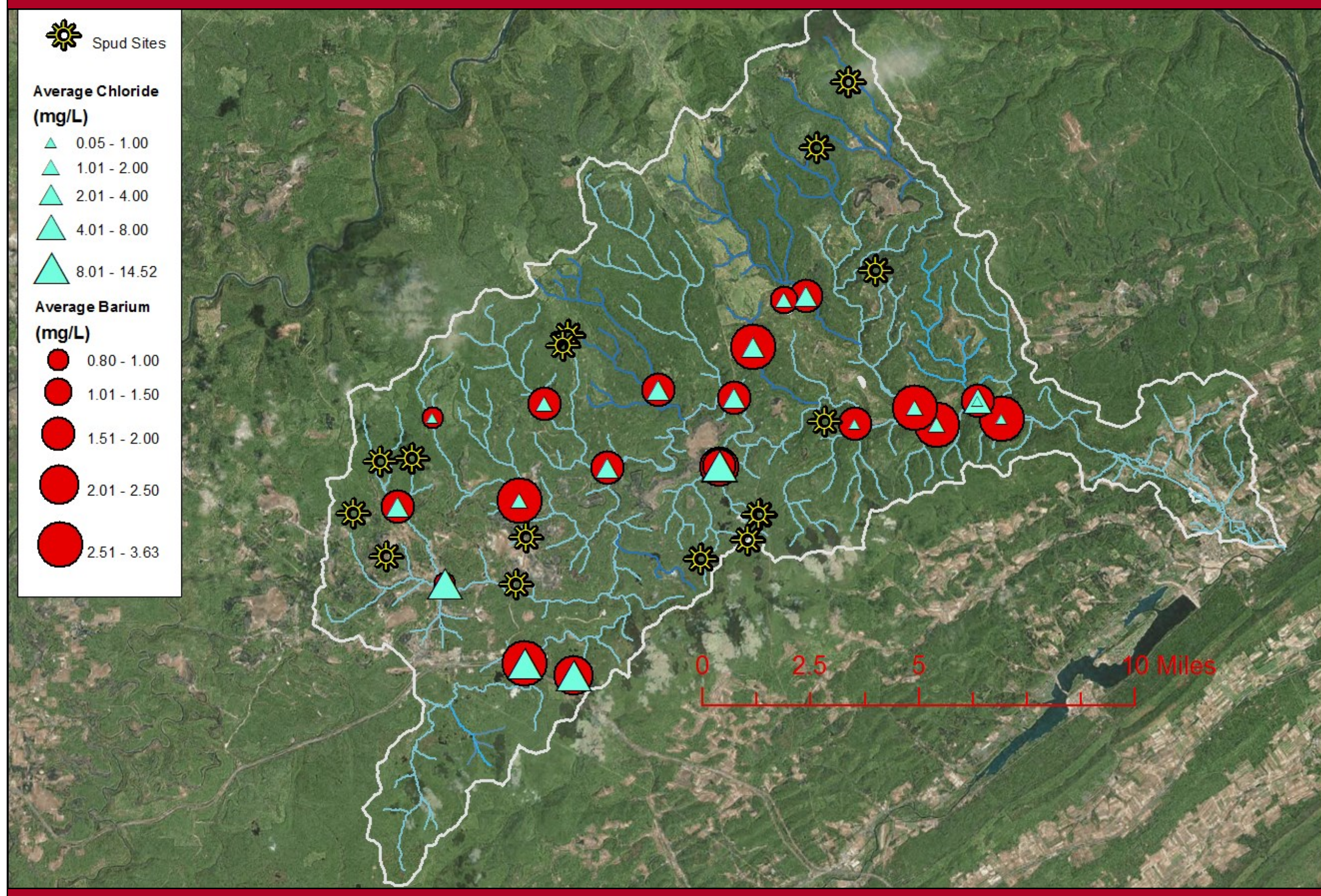
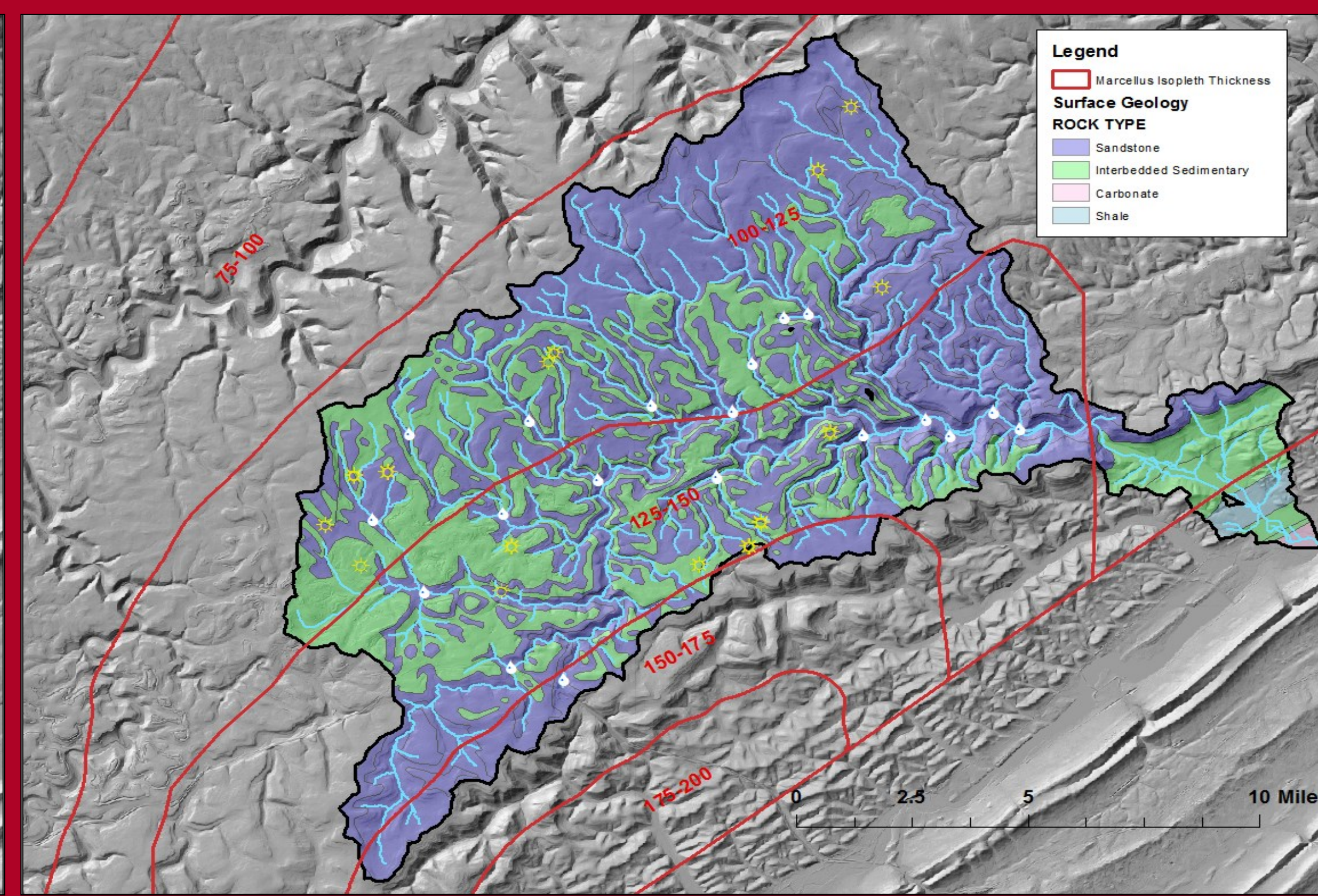
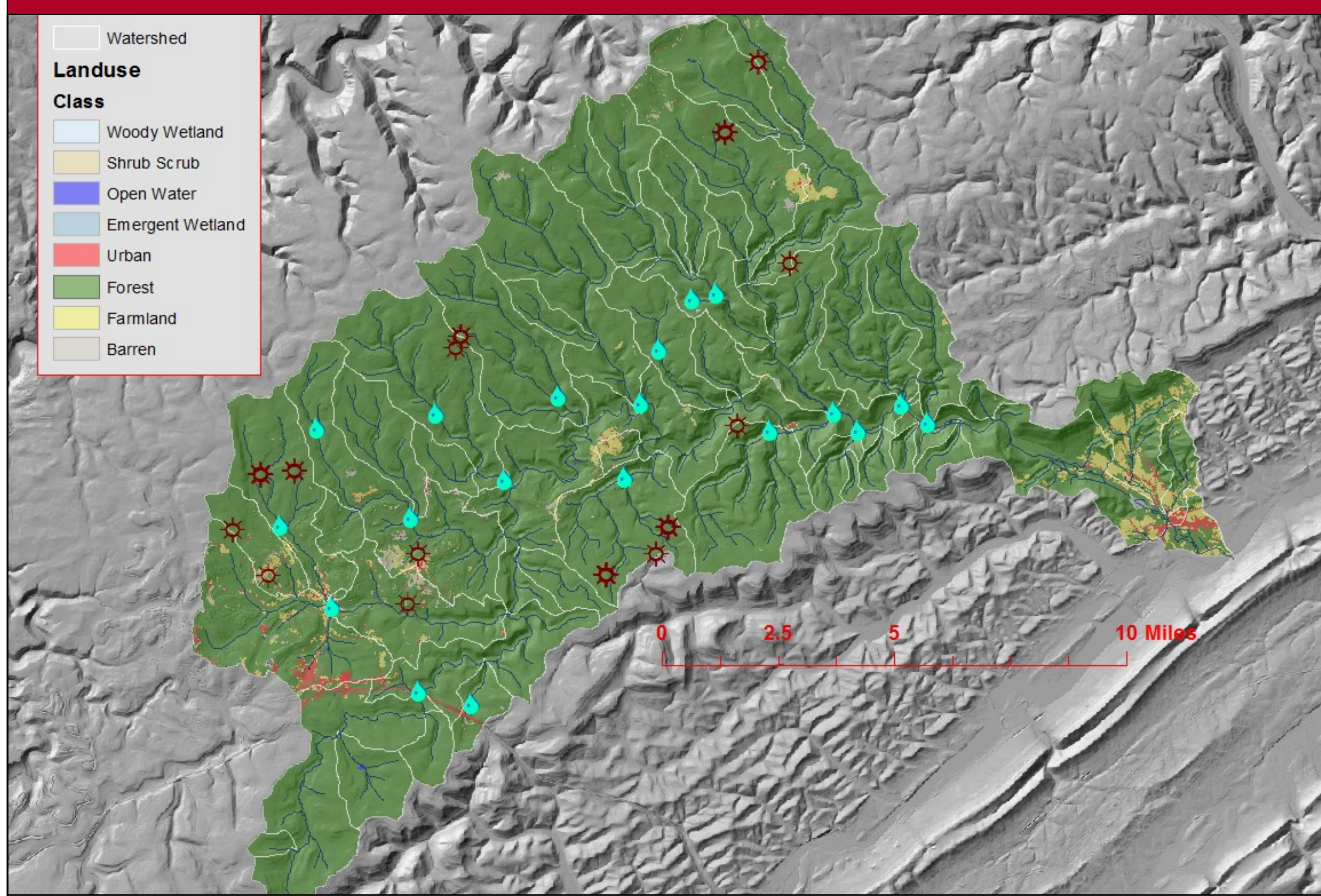
Abstract

Lock Haven University Water and Soil Resources Lab began its ongoing relationships with several community-based organizations in 2010 to monitor the quality of surface water in Centre, Clearfield, and Clinton Counties, PA. Participating organizations include the Clearfield and Centre County chapters of the Pennsylvania Senior Environmental Corps, Beech Creek Watershed Association, and the Centre County Conservation District. Watersheds located within the monitored counties contain AMD impacted streams as well as multiple Marcellus Shale drilling locations. The study was intended to monitor potential areas for contamination due to natural gas extraction, as well as surface run-off from abandoned mine land. Measured field parameters included temperature, pH, DO, TDS, conductance and salinity. Lab analyses were performed on samples to measure concentrations of several cations and anions, such as total iron, aluminum, manganese, copper, calcium, magnesium, barium, sulfate, and chloride. Other test parameters include TSS, bromine, total hardness, total Mg, and total Ca, as well as acidity and alkalinity. Soil and sediment samples collected from the Beech Creek watershed were analyzed for various metal concentrations. A set of water samples from this watershed were analyzed at Susquehanna University in order to cross check the results. Water samples were also analyzed for methane concentration at the Pennsylvania State University.

Multiple conclusions have been reached regarding the water quality. Samples collected from the Beech Creek watershed and Clearfield sub-watersheds typically exhibit values below the established MCLs of drinking water standards for various chemical parameters, which are related to natural gas extraction. However, multiple study locations exhibit pervasive AMD impairment, which is a direct result of legacy coal mining. Through active collaboration with community-based organizations, students have the opportunity to garner research experience, while providing a valuable service to the greater community. This study has far-reaching implications for policy-making in regards to the development of Marcellus Shale as a resource while protecting the environment and preserving human health.

Methods

Starting in May 2010, Lock Haven University's Water and Soil Lab established a program to monitor 45 sample sites in both the Beech Creek Watershed (BCW) and Clearfield County through collaboration with the Centre County chapter of Pennsylvania Senior Environmental Corps, Beech Creek Watershed Association, and Centre County Conservation District. Locations were selected due to their proximity to Marcellus Shale gas drilling activities or acid mine lands. Every month volunteers collected water samples, measured field parameters, and then delivered them to LHU for further laboratory analyses. Lab analyses were conducted using a DR6000 Mass Spectrophotometer for various ions. Chemical titration was used to analyze for total hardness, calcium, and magnesium. Additionally, stream sediment samples from select BCW locations were analyzed using an XRF device.



Conclusions

- *Samples collected from the Beech Creek watershed and Clearfield sub-watersheds generally exhibit low concentrations Barium and Bromine, however several study locations in Clearfield County (Pentz Run, Cold Stream, Tributary to DuBois, Bilgers Run) exhibited concentrations outside of the range for natural fresh waters. Sources for these anomalies remain unidentified and warrant further investigation.
- *Parameters related to Acid Mine Drainage (pH, Total Iron, Aluminum, Manganese, Sulfate) remain dominant and pervasive in the Beech Creek Watershed and several sub-watersheds in Clearfield County.
- *The findings of this project provided community partners with the opportunity to act as citizen-naturalists in an effort to safeguard their environment through vigilance and monitoring.
- *This ongoing community-based water quality monitoring project provided students a hands-on experience with field/lab methods and equipment in a real-world application, while involving and benefiting the greater community.
- *All Methane concentrations were found to be under the appropriate level for safe use.
- *The results of analyses carried by Susquehanna University were compatible with those of LHU results.

Special Thanks/Sponsors

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