Preface

How can water resources best be managed for sustainability? How can the competing demands of agriculture, residents, and ecosystems be sustainably optimized?

The entirety of the United States faces various challenges related to these pressing questions. In the mid-Atlantic, the abundance of stormwater, coupled with human development, exacerbates strains on hydrologic systems. To investigate such stresses on natural systems, the University of Virginia's Stream Restoration Capstone team assessed an unnamed tributary stream in Charlottesville, Virginia. The remediation design incorporates a step pool conveyance system and grades incised banks to dissipate flow energy during intense storm events. If implemented, the proposed design may mitigate erosion and stress on the stream imposed by impervious surfaces in the area. Because the banks of the 5,000-foot stream contribute sediment and pollution all the way to Chesapeake Bay, the stream is an ideal candidate for restoration. To conduct the analysis and develop the design, the project team tested water quality, modeled existing conditions, modeled post-restoration conditions, and planned construction. Modeling was performed in ArcGIS Pro, HEC-HMS, and HEC-RAS. If implemented, the remediation design, composed in AutoCAD, may decrease annual eroded sediment by 70 tons per year.

The other extreme of water resources management and supply in the United States afflicts the arid Southwest. The region relies heavily on snowmelt from the Rocky Mountains to nourish its rivers and replenish underground aquifers. However, the delicate ecological equilibrium is outpaced by the rampant extraction of groundwater. Residents, farmers, and Native American tribes compete for scarce fresh water supplies. Through land ownership and legal maneuvering, certain groups have secured their supply, often at the expense of others.