This project outlines a comprehensive assessment of water quality for the Shoshone River, focusing on the impact of urban runoff from the town of Cody, Wyoming, and the long term effects of agricultural sedimentation from topsoil and fertilizer runoff. Waterways play a vital role as sources of fresh water, sewage removal, economic development, and recreation. Our research aims to inform future water management practices and conservation efforts in the region. In the study, we measured various water quality parameters that include the flow rate, turbidity, NPK, and pH across an approximately 37-mile distance by water downstream of the Buffalo Bill reservoir Dam to just past the Willwood Dam. The methodologies included collecting and analyzing water and soil samples, assessing riparian buffers, macro-invertebrates, as well as diatom populations, to identify the changes in ecological communities downstream from potential contaminant sources. Statistical analysis using a two way / multiple ANOVA was applied to determine the significance of changes in water quality due to urban and agricultural runoff. This research is significant as it fills a gap in knowledge regarding the unmeasured effects of urban and agricultural water runoff on the Shoshone river, which is essential for municipalities relying on the river for freshwater, as well as recreational hunting and fishing.