The Shoshone River is an important water source for the Big Horn Basin, supplying freshwater and irrigation to the region around Cody, WY. In 2012, the United States Department of Agriculture identified the Shoshone National Forest as susceptible to the effects of climate change. In particular, the USDA noted the lack of information regarding hydrology in this region. In this work, we collected water samples from low elevation portions of the river up to the eastern boundary of Yellowstone National Park. Field work associated key water quality indicators as measured on-site with important chemical characteristics of the water elucidated through laboratory analyses. In particular, we analyzed nitrate and total dissolved oxidized nitrogen in our samples. High concentrations of oxidized nitrogen may indicate pollution by fertilizers or the presence of harmful nitrifying bacteria. Determination of nitrate alone was made by an ultraviolet spectroscopy technique. To determine the combined concentration, first any nitrate in a solution was reduced to nitrite using a reduction column. Then nitrite was complexed with an organic dye and analyzed by spectral absorbance at 543 nm. Considering GPS coordinates and time-of-year, the results gained can help to determine the water quality in the Big Horn Basin.