# Report Draft

## Introduction

Aquatic ecosystems are adapted to specific temperature ranges, and many ecological problems arise when waters get too warm or too cold. In the freshwater streams of Colorado, aquatic species such as plankton, insects, and fish depend on very cool waters. The Greenback Cutthroat Trout, the state fish of Colorado and a threatened species under the Endangered Species Act, depends on waters as cold as 45 – 55 C. There are many environmental conditions that influence stream temperature.

Wildfires can affect stream temperature in several ways. Fires can directly heat waters, but they can also destroy riparian zones, bands of lush vegetation that tend to line rivers and streams, which provide cooling shade.^[] With climate change projected to cause increased wildfire activity, it is important to understand how this will affect water quality.

## Data Acquisition

The United States Geological Survey (USGS) operates water quality monitoring sites across the nation which collect data on numerous environmental variables. ^[] USGS developed the R package *dataRetrieval* to allow researchers to easily access water quality data. Using this package, data was collected from the time period of 2000-2018 on the variables listed in Table 1. River discharge, or flow rate, measures the total volume of water moving through the stream per second. All things equal, a larger mass of water takes more energy to heat up. Basin drainage area is a measure of the land area that feeds a stream water through precipitation drainage. Major river basin boundaries, geographic areas that have connected streamflow and groundwater patterns, come from the Colorado Department of Natural Resources.^[] Table 2 below lists the number of unique USGS sites per major river basin. In total, data was collected from 34 sites in 6 different river basins. The observations were then averaged over the season of the observation date.

Climate data from the PRISM Climate Group was collected using the R package *climateR*. The daily maximum air temperature and precipitation in millimeters was extracted at the locations of the USGS sites over the relevant time period. The climate data was combined with the water quality data by location and time. Air temperature strongly influences water temperature, and rainfall can have a warming affect on streams.

The National Interagency Fire Center (NIFC) provides spatial data for the locations, dates, and sizes of wildfires in America from 2000-2018. ^[] Colorado had 953 recorded wildfires over this time period. Then, the total number of fires and total acres burned in a season was calculated for each major river basin. This data was then combined with the water quality data, with year, season, and basin used as the variables to combine the data.

## Data Exploration