

## **High elevation lakes in a changing climate**

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**Abstract.** High elevation/high latitude lakes are particularly sensitive to the effects of climate change. However, there has been relatively little work examining these effects on high elevation lakes in the Southern Rocky Mountains. Historical lake temperatures indicate that changes have already occurred here. Lake surface temperature changes are most evident, increasing by up to 4°C since the mid 1950's. There has also been a trend toward a warmer and deeper epilimnion in some lakes. In 2015 we studied 10 lakes in or near the Rawah Wilderness Area in north central Colorado to develop climate-lake temperature models that could be used to predict effects of future climate scenarios. We gathered high resolution bathymetry of each lake, and measured temperature profiles monthly. We also used temperature loggers to record hourly temperatures at the surface and bottom of each lake over the ice-free season, and installed a weather station that recorded air temperature, relative humidity, wind direction/speed, air pressure, solar radiation and rain every hour. Lake bathymetry data were processed in ArcGIS to determine lake volumes and surface areas at discrete depths. Measurements from 2015 were used to parameterize a mechanistic, one-dimensional lake thermal model in R: General Lake Model (GLM) v.2.1.8. The GLM was then used to predict changes to lake phenology under future climate scenarios. These results indicate that lake morphometry has a large effect on mixing and stratification responses to climate, and on habitat suitability for coldwater invertebrates and fish.