MS Defense Announcement
Lexi Sherman
Wednesday, August 23, at 10:00 a.m.

Lexi Sherman
MS Defense

August 23, 2023
10:00 a.m.

Defense
ATS Large Classroom (101 ATS) or Teams

Post Defense Meeting
ATS Teaching Lab (323 ATS)

Committee:
Kristen Rasmussen (Adviser)
Russ Schumacher
Steven Fassnacht (Ecosystem Science and Sustainability)

CHANGES IN THE SNOWPACK OF THE UPPER COLORADO RIVER BASIN IN A WARMER FUTURE CLIMATE

Water is a crucial factor to sustaining life on Earth. Snow acts as a reservoir for water, providing storage during the cold seasons and freshwater resources throughout the warmer months. Streamflow in the upper Colorado River Basin is primarily contributed by seasonal mountain snowmelt that provides critical freshwater resources to humans and wildlife, effectively connecting ecological, hydrological, and atmospheric systems. Global Climate Models (GCMs) and regional climate models do not represent the complex processes that can impact snowpack growth, evolution, and melting, thus they often rely on parameterizations to represent such processes. SnowModel is a high-resolution snowpack-evolution modeling system that can simulate processes such as blowing snow redistribution and sublimation, forest canopy interception, and snow-density evolution. To investigate how snowpack in the Upper Colorado Basin may change in a future warmer climate, high-resolution convection-permitting regional climate atmospheric model simulations at 4-km horizontal grid spacing are used to provide input conditions to drive SnowModel at 100-m in the current and future climate for 13 years. Results show that the average snow season will be shorter in the future, reducing the days that the snowpack can accumulate. In addition, analysis of the characteristics of precipitation in the simulations shows a ~150% increase in convective precipitation frequencies in the winter months, indicating shifts in the character of precipitation in a future climate. Liquid precipitation in winter increases ~200% in a future climate as a result of warmer air temperatures. In contrast, solid precipitation stays roughly the same in the winter, but decreases about 25 percent in the fall and spring. A case study analysis of the high-impact snowstorm on 17-19 March 2003 that delivered between 30-70 inches of snow along the Colorado Front Range in a current and future climate shows a shift from a snow-dominant to a rain-dominant event, as well as increases in moisture and convective precipitation frequencies. The simulated changes in the snowpack of the Upper Colorado River Basin will likely have detrimental impacts on freshwater resources and food production in a future climate that will undoubtedly impact a multitude of humans and ecosystems in the western United States.