

Mount Rainier National Park's water supply primarily depends on streams and lakes fed by snowmelt and perennial snowfields. Loss of perennial snowfields in the past 30 years combined with the potential for lower annual snowpack and increased air temperatures have profound implications for park water supplies. Warming temperatures correspond with shifts from solid to liquid precipitation resulting in earlier snowmelt. In response to increasing park visitation, multiple stressors on sensitive aquatic organisms and projected climate changes, Mount Rainier National Park is taking steps to develop a range of water supply options and park management strategies to adapt to climate change.

As a case study, warm winter temperatures in water year 2015 had a profound influence on snowpack in Mount Rainier National Park. During the months where most snow is deposited in our mountains (December to March), temperatures typically averaged more than 3° C above normal. Precipitation was near normal; however, the warmer temperatures caused much of this precipitation to fall as rain, resulting in an unusually low snowpack. These conditions stressed water supplies that are critical to park operations, and likely stressed sensitive aquatic species (e.g., cold-water fishes and insects) downstream of water supply intakes as a consequence of elevated stream temperatures and low stream flow. Conditions resembling historical droughts, including the recent 2015 event, are projected be more likely within this century as climates warm across the region. These changes are likely to coincide with increased park visitation and growing stresses on sensitive aquatic ecosystems.

Here, we summarized Mount Rainier's current water supply demands, history of development, issues, changes over time, and potential impacts to aquatic organisms. Focusing on key water supply systems within the park, we estimated the potential maximum use and storage capacity of existing water infrastructure and determined downstream impacts to assess the need for intensive in-stream flow monitoring. We then modeled potential visitor use and park operation water supply demands tied to projected regional climate models, and used these forecasts to evaluate future water supply scenarios within the park. Results directly inform current park planning efforts and potential management actions to adapt to changing visitation demands, infrastructure needs, and climate change.