# Mountain Goat Declines in Glacier National Park Associated with Early Summer Precipitation and Temperature

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A shifting climate poses threats to alpine-adapted species including mountain goats. We used a 12-year citizen science dataset and a Bayesian N-mixture model to examine population trend of mountain goats in Glacier National Park. Median goats per site declined by 45% (95% CRI = 32%, 57%) from 77.8 (95% CRI = 64.4, 95.1) in 2008 to 42.3 (95%CRI = 34.3, 52.2) in 2019, with detectable consistent declines from 2008 until 2015, when numbers stabilized. These declines exceed IUCN criteria for vulnerable, with >30% declines over only 2 generations. Climate variables had the greatest influence on population growth rate, particularly precipitation between May 15 and June 15 of the previous summer. Higher growth occurred with greater snow water equivalent, mean winter temperature, early summer temperature and early summer precipitation. In addition, the presence of permanent snow and glaciers strongly influenced initial abundance of goats. We are not able to determine the relative contribution of vital rates to this apparent decline. However, the patterns of decline are consistent with other data sources. Research to estimate the population size, evaluate genetic structure, assess changing habitat, human recreation and forage, and to forward project climate effects on persistence will be crucial to conserving this iconic, meta-population at the southern edge of the distribution of native mountain goats.