** Population Dynamics of Parnassius Clodius Butterflies Under a Changing Climate

J. Simone Durney*, Department of Ecology, Montana State University, Bozeman
Dr. Diane Debinski, Department of Ecology, Montana State University, Bozeman
Dr. Stephen Matter, Department of Biological Sciences, University of Cincinnati, Cincinnati

*Indicates Presenter

**Indicates Student Presentation

The Greater Yellowstone Ecosystem (GYE) is a relatively intact temperate ecosystem, home to over 120 species of butterflies. One species of interest is *Parnassius clodius*, a non-migratory butterfly specialized to montane meadows and dependent on a few flowering plant species in high-elevation and high-latitude environments. *Parnassius clodius* are an important climatic indicator because a) their lifecycle is dependent on environmental cues and changes in seasonality, b) they are well studied, c) they are widespread across the GYE, and d) they live in small populations with limited fecundity, making their populations susceptible to change. A *Parnassius* clodius population in Grand Teton National Park (GTNP) has been monitored since 2009 using mark-recapture methods to evaluate population change over time in response to their environment. The number of marked individuals has varied from 199 to 867 from 2009-2021. Rates of change in population size have fluctuated around zero, where zero signifies a stable population. In 2009, the rate of change was -0.4 indicating the largest population decline, while in 2011 the rate of change was 0.2 indicating the greatest population growth. We examined a suite of environmental variables associated with snow and temperature, as well as density-dependence, to test for correlations with interannual population changes. Extreme maximum air temperature during P. clodius' larva-pupa stage had the greatest effect on population change, where extreme maximum air temperatures led to declines in the next generation. *Parnassius clodius* butterflies in GTNP appear to be relatively stable, however, continued monitoring is needed to determine long-term trends.