

# Don't put all your eggs in one basket:

## Can behavioral responses mitigate the effects of climate change?

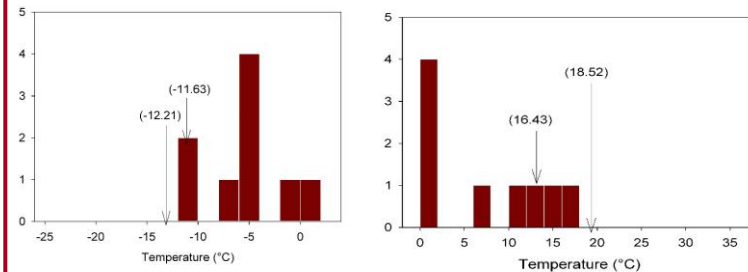
### Background

Animal species' behavior is often the first response to climate change. Thus, investigating behavior can help predict how animal populations may fare in the future (Wong and Candolin 2015).

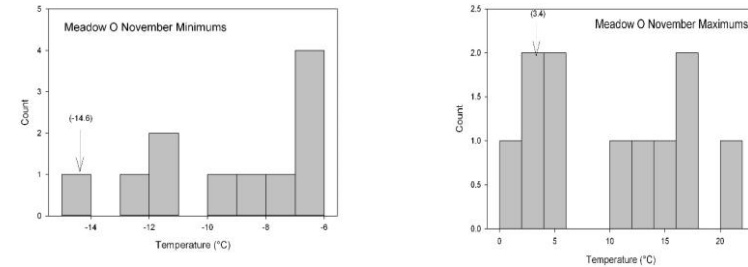
In my research, I am examining the oviposition tactics of the alpine butterfly *Parnassius smintheus* in three alpine meadows as a possible example of a behavioral response that modifies the effects of climate change on population size.

One way this could be occurring is by *Parnassius* selectively ovipositing in snowy overwintering sites which shield eggs from harsh temperatures.

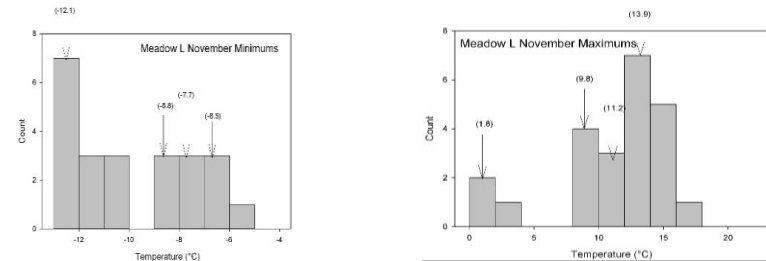
### Meadow G November Temperatures



### Meadow O November Temperatures



### Meadow L November Temperatures



November is a key time in the overwintering period because abnormal high and low temperatures in that month have the greatest effect on population size. I have chosen to showcase the November temperature data for that reason.

The height of each bar on the histograms represents the count of monitored sites that had a minimum or maximum temperature within the range of that bar. The arrows and their labels indicate the temperature of oviposition sites.

### Methods

Data for this analysis was conducted in three alpine meadows in Alberta, Canada in the Summer of 2015.

Researchers followed mated *Parnassius smintheus* butterflies to observe oviposition events. The temperature of oviposition sites and control sites in the meadows were measured periodically until Summer 2016.

I compared temperature data observed at oviposition sites to what is available at large, looking for patterns to indicate what type of sites may be preferential for oviposition to occur.

### Conclusions

In all three meadows, most oviposition site temperatures are at the extremes of the range. This suggests that *Parnassius* are not selecting snowy overwintering sites which would keep temperatures close to 0 for the overwintering period.

Snowy sites protect eggs against extreme warm and cold weather events which threaten their viability. Therefore, the lack of this behavior indicates that *Parnassius* populations may be vulnerable to extreme weather events and a variable climate, which is becoming more and more of an imminent threat due to the progression of global climate change.