# How Population of Origin and Spring Temperature Impact Germination Rate and Timing of an Alpine Plant

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## Introduction

- As average temperatures increase with climate change, spring weather in alpine areas can become colder as snow melts earlier and no longer insulates the plants (Briceño et al., 2015).
- As alpine ecosystems warm and weather becomes less predictable, it becomes harder for endemic species to live there.
- With this research, we are trying to identify how alpine plants will react to colder spring temperatures by analyzing the growth of *Androsace septentrionalis* or pygmy flower rock jasmine.

Fig. 1 (Below)
*A. septentrionalis* in bloom

## Methods

*A. septentrionalis* Seeds were taken from 21 micro sites across three latitudes within Colorado and Wyoming.

7968 of these seeds were planted in 40 seeding trays using a random design.

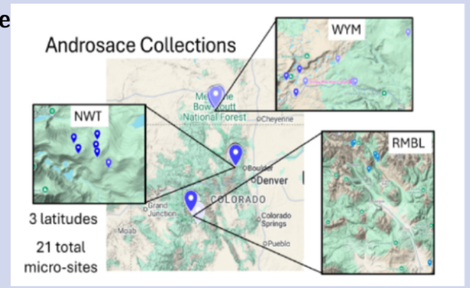



Fig. 2 (above)
The individual micro sites seeds were taken from.

Fig. 3 (above)
An ambient bench of seeding trays.

All trays were kept in an "alpine greenhouse." Half of the trays were placed on chilled benches meant to mimic early snow melt temperatures, while the other half were put in ambient conditions meant to mimic late snow melt temperatures.

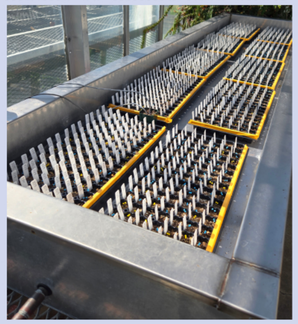


Fig. 4 (above)
A chilled bench of seeding trays.

These trays were watered twice a day and rotated positions each morning.

Germination of each plant was recorded when two leaves were visible. Temperatures were logged every 60 minutes by temperature sensors called ibuttons buried in eight of the trays.

## Results

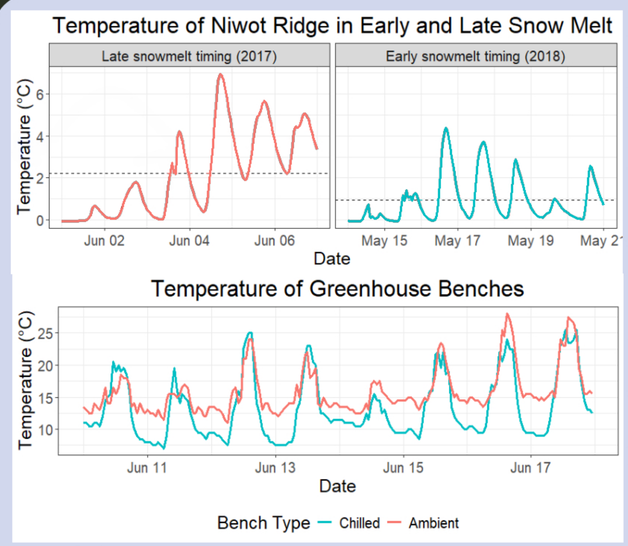
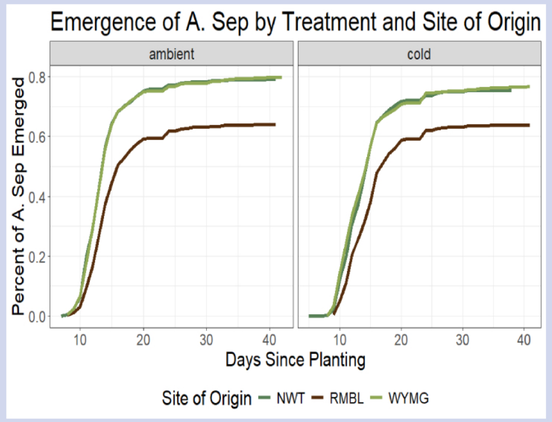



Fig. 5 (Left)
The temperatures on Niwot Ridge in an early and late snow melt year (top) and temperatures on our warm and cold benches (bottom) (Morse 2025). It shows that Niwot Ridge had more extreme temperatures, but that the difference in temperatures between an early and late snow melt year do roughly coincide with the difference between our benches.

Fig. 6 (Right)
The cumulative emergence of *A. sep* seperated between cold and warm benches and site of origin. It shows that seeds on cold benches experienced earlier period of germination and lower germination rate. It also shows that seeds taken from the RMBL site had a lower germination than either the Niwot or Wyoming site which had near identical germination rates to each other.



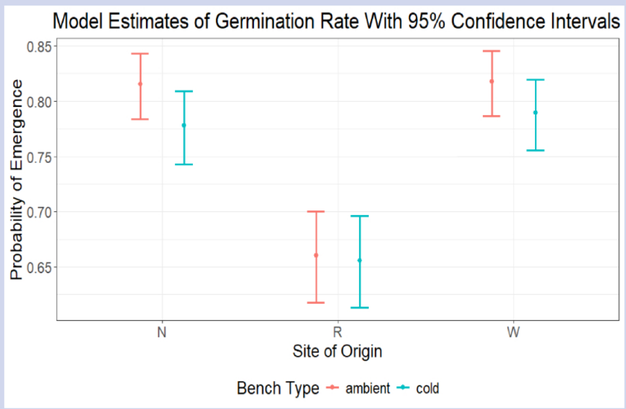




Fig. 7 (Left)
Model estimates of germination rate and 95% confidence intervals in relation to probability of emergence and site of origin. It shows that the only variables that were statistically significant were treatment on the Niwot samples and site of origin on the RMBL samples.

## Discussion

### Key Findings:

- Site of origin appeared to have a large impact on germination rate.
- Differences between germination rate and timing due to temperature treatments were largely found to be statistically insignificant.
- Much of the research into alpine plant germination has found that alpine areas are experiencing earlier and increased germination which our research did not show (Briceño et al., 2015).

### Limitations:

- This study was only able to observe the trays for just over seven weeks and could not analyze how the whole life cycle is affected.
- This study was unable to analyze many factors surrounding seed sample sites for how they might contribute to germination rate and timing.

### Future Work:

- Continue observing trays to monitor germination, growth, and mortality.
- Further analyze data to find what factors may be influencing germination between sample sites.
- Further analyze growth conditions to see how temperature affects the whole life cycle of *A. septentrionalis* and not just germination.

## References & Acknowledgements

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### References