

# Invasion in the Nation: How Does Temperature During Dormant Influence Germination Rates of *Humulus japonicus*

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## Introduction

- *Humulus japonicus* is an annual invasive species that can outcompete native species in riparian and floodplain habitats, altering ecosystem function. *H. japonicus* is currently found in the Eastern United States, and is migrating West.
- An invasive species can be any non native organism that causes harm to an ecosystem.
- Previous studies show that *H. japonicus* needs cold stratification before a warm summer to thrive in growing seasons.
- **Hypotheses:** If seeds are stored at cold (0°C) temperatures for six weeks then they will have a higher rate and percent germination.

## Methods

- **Seed collection:** Collect 360 seeds from various collection sites during the year 2017 for both trial 1 and trial 2
- **Conditions:** warm (26°C), room temperature (21°C), cold (0°C), freezing (-17°C), outside (varied).
- **Trial 1 Stratification:** 40 seeds placed in petri dishes with dirt for 30 days in each of the 5 conditions.
- **Trial 1 Germination:** Transfer seeds to warm conditions, with damp towel, and water until germination.
- **Trial 2 Stratification:** 40 seeds placed in empty petri dishes for 7 days in same conditions as trial 1 excluding outside condition.
- **Trial 2 Germination:** Transfer seeds to warm conditions, with soil, and water until germination.

## Methods Cont'd

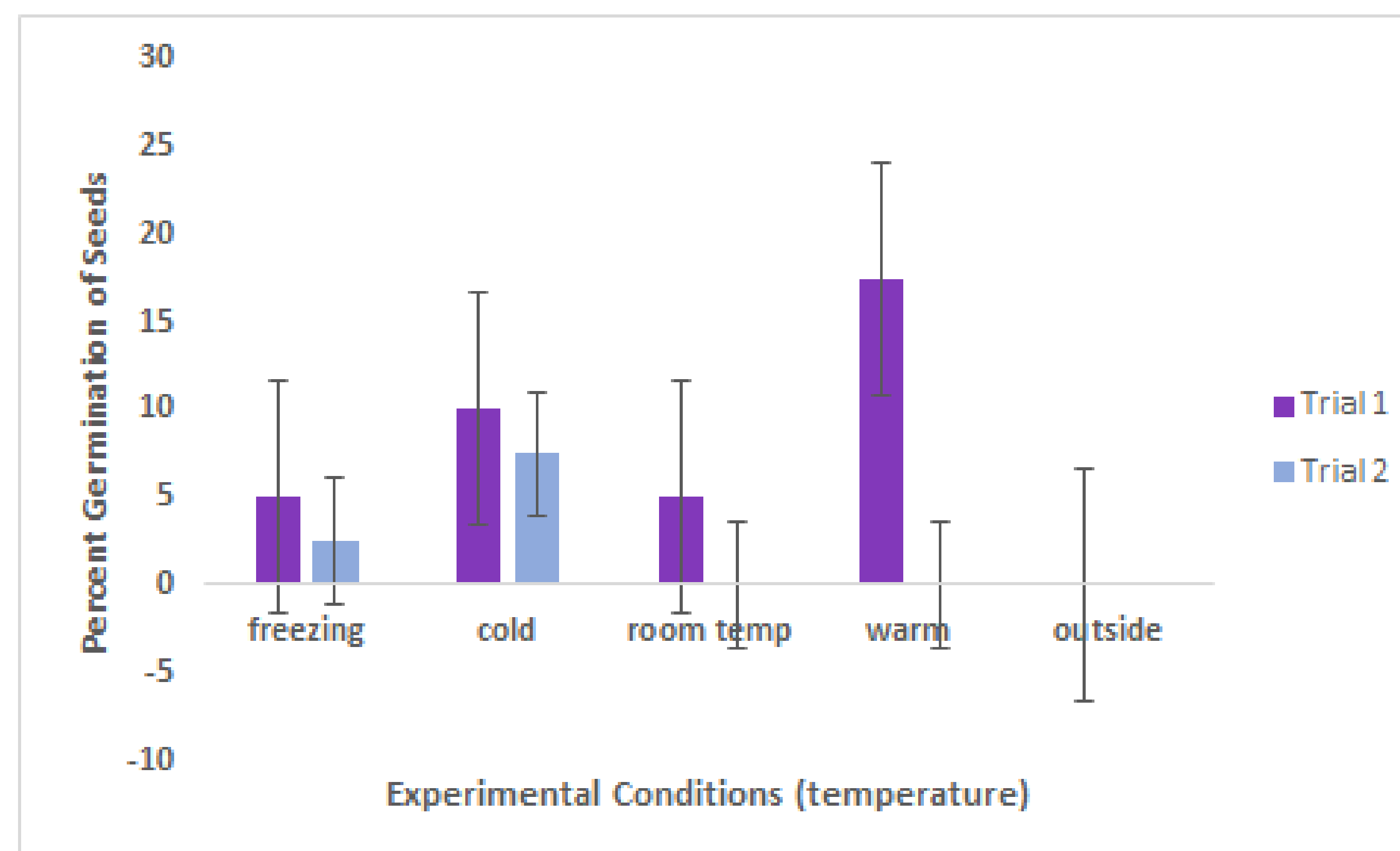


**Figure 1:** Trial 1 seeds post temperature condition. Seeds in outside condition seen here.



**Figure 2:** Trial 2 seeds post temperature condition. Includes freezing, cold, room temperature, and warm.

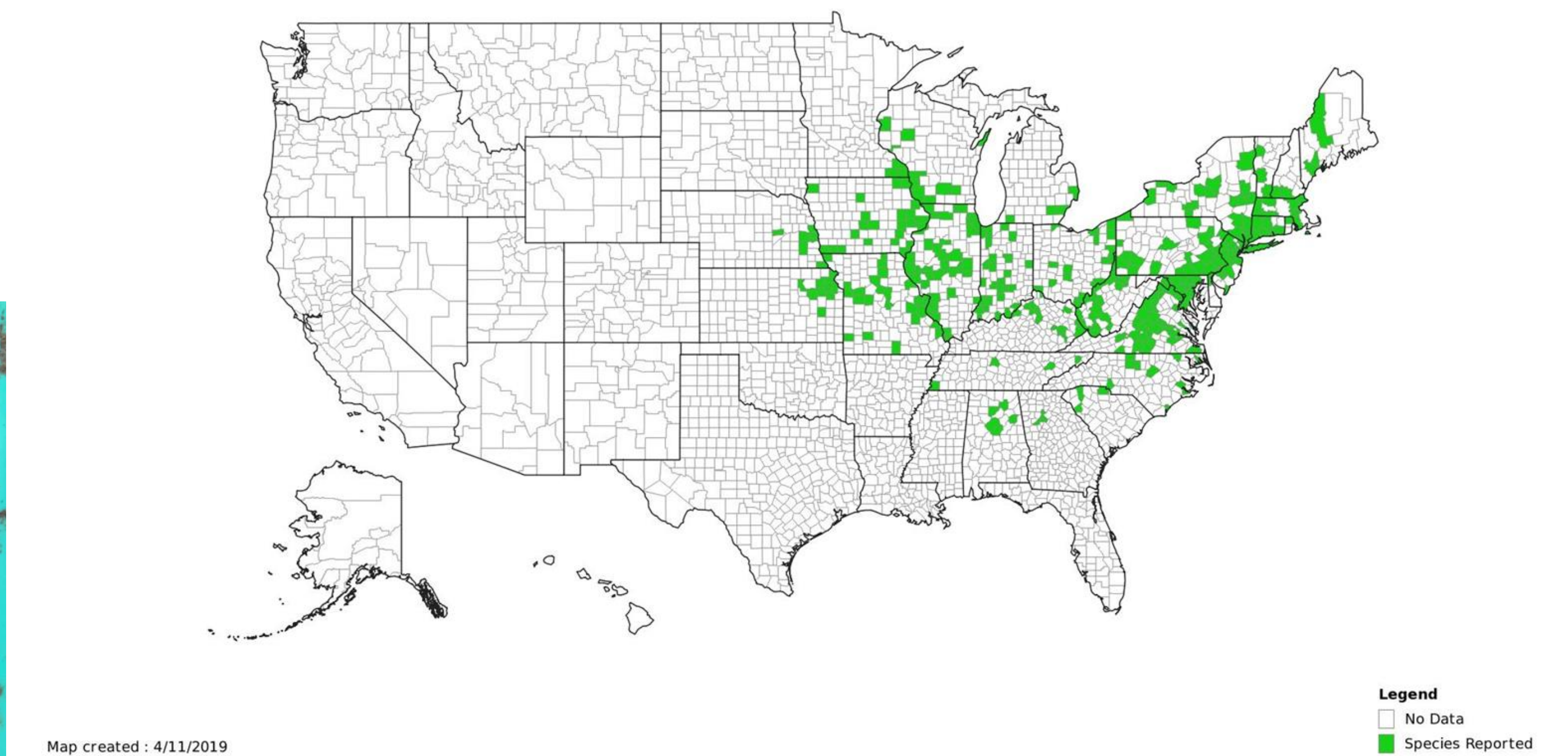
## Results



**Figure 4.** The total percentage of seeds that germinated for trials 1 and 2.

- Between 8 and 10% of seeds in the cold treatment group germinated in both trial 1 and 2.
- When seeds were in the outside treatment group no germination was observed.
- Both room and warm conditions gave inconclusive germination results.

Japanese hop (*Humulus japonicus*)



**Figure 3:** Current location and spread of *H. japonicus* in the United States.

## Conclusions

- Collectively, our findings suggest our hypothesis is correct, that cold exposure would increase *H. japonicus* germination
- *H. japonicus* prefer colder temperatures prior to germination, but tolerate a range of temperatures.
- Future Directions: Increasing air flow and decreasing water to prevent mold growth.
- Future Questions: how to soil pathogens contribute to mold and fungus growth on *H. japonicus*?

## Future Implications

- When *H. japonicus* has an adequate amount of water and sunlight and has a chance to dry out, more seeds germinated
- If Montana sees warmer winters due to climate change, then *H. japonicus* may not thrive due to a lack of cold stratification.



**Figure 5.** Small *H. japonicus* plant from a fellow classmate

## Acknowledgements

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