SPECIAL-STATUS PLANTS OF THE PINE HILL PRESERVE: 
SEED TREATMENT AND PLANTING SUCCESS

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BACKGROUND

The Pine Hill Preserve (PHP) in El Dorado County, CA, is a site of national significance for species diversity and presents rich botanical research opportunities. The PHP managed lands:
- occupy 7.7-square miles within 47-square miles of unique Rescue soils (classified within gabbro);
- contain many special-status plants and unusual plant communities; and
- were established in 2001 to protect special-status plants, many of which were described in the last 50 years.

Fires burned in several sites of the PHP in 2016. The Bureau of Land Management is working to restore these areas and ensure they are not colonized by invasive, non-native plants. One three-acre site was chosen as a candidate site for re-introduction of two special-status species. Planting in the burned area began in 2018.

Lands managed under the PHP include federal, state, and county parcels that are important to the conservation of many special-status plants associated with unique Rescue soils. Rescue soils support >10% of California’s native plants.

REFERENCES


SEED TREATMENT

Based on results of a literature review and coordination with species’ experts, treatments were selected to maximize germination rates and fill in data gaps. Multiple rounds of treatments were conducted for both species over the past two years and the treatment methods were adjusted to achieve higher success rates.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Description</th>
<th>Ceanothus roderickii</th>
<th>Wyethia reticulata</th>
<th>Adjustments for continued Wyethia reticulata treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1 Heat scarification</td>
<td>Boil water, cool to 190°F and leave immersed for 24 hours</td>
<td>Ayres 2011, Boyd 1987</td>
<td>Not applied</td>
<td>N/A</td>
</tr>
<tr>
<td>Treatment 2 Heat scarification followed by cold stratification</td>
<td>Boil water, cool to 190°F and leave immersed for 24 hours, stratify in a refrigerator at approximately 40 °F for 5 weeks</td>
<td>Boyd 2007, James 1996, Ayres 2016*</td>
<td>Applied to fill data gap</td>
<td>Treatment 2b: decreased heat to ~66°C, and increased the stratification period to 6 weeks or first emergence of the radicle</td>
</tr>
<tr>
<td>Treatment 3 Cold stratification</td>
<td>Stratify in a refrigerator at approximately 40 °F for 5 weeks</td>
<td>Ayres 2011, Ayres 2016*</td>
<td>Not applied</td>
<td>Treatment 3: increased the stratification period to 6 weeks or first emergence of the radicle</td>
</tr>
<tr>
<td>Treatment 4a Hudson method</td>
<td>Boil water, cool to 190°F, add liquid smoke and leave immersed for 24 hours, stratify in a refrigerator at approximately 40 °F for 5 weeks</td>
<td>Hudson 2017**</td>
<td>Initially not applied, then added in</td>
<td>Treatment 3c: decreased the stratification period to 3 weeks to compare against 6 week stratification</td>
</tr>
<tr>
<td>Treatment 5 Control</td>
<td>No treatment</td>
<td>Ayres 2011</td>
<td>Not applied</td>
<td>Treatment 3d: added a growth chamber stratification to compare against refrigerator method***</td>
</tr>
</tbody>
</table>

TREATMENT RESULTS

Germination results were lower than expected based on previous studies, and varied even within identical treatments on different trial dates. Results of some treatments (e.g., 2c) are not yet available.

<table>
<thead>
<tr>
<th>Treatment type</th>
<th>Percentage of germination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>52%</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>48%</td>
</tr>
<tr>
<td>Treatment 3</td>
<td>44%</td>
</tr>
<tr>
<td>Treatment 4a</td>
<td>40%</td>
</tr>
<tr>
<td>Treatment 5</td>
<td>42%</td>
</tr>
</tbody>
</table>

PLANTING LESSONS LEARNED

Planting has been challenging for both seeds and container plants; methods of planting and maintenance procedures have been reviewed and adjusted over time. In winter 2018, treated seeds were directly sown on site. Germination either failed or seeds were subsequently predated. In fall 2018, UC Santa Cruz Arboretum implemented CNPS Best Management Practices to reduce likelihood of introduction Phytophthora spp. (Swiecki and Bernhardt 2016 a, b) and treated seeds were grown in batches of greenhouse and grown up to planting size. In March 2019 and December 2019 container plants were planted on site.

- Direct sow
- Unsuccessful germination
- Herbivory
- Non-native competition

Treatment seeds, greenhouse grown, non-native competition

FIGURE 1. SEED TREATMENT AND PLANTING SUCCESS: SPECIAL-STATUS PLANTS OF THE PINE HILL PRESERVE

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