

**Plant Propagation Protocol for *Castilleja linariifolia***


ESRM 412 – Native Plant Production

URL: <https://courses.washington.edu/esrm412/protocols/2023/CALI4.pdf>



Source: TEXAS

TAXONOMY	
Plant Family	
Scientific Name	Scrophulariaceae
Common Name	Figwort family
Species Scientific Name	
Scientific Name	<i>Castilleja linariifolia</i>
Varieties	N/A
Sub-species	N/A
Cultivar	N/A
Common Synonym(s)	` <i>Castilleja linearis</i> Rydb ` <i>Castilleja linariifolia</i> Benth. var. <i>omnipubescens</i> (Pennell) Clokey ` <i>Castilleja trainii</i> Edwin
Common Name(s)	Wyoming Indian paintbrush
Species Code (as per USDA Plants database)	CALI4
GENERAL INFORMATION	

Geographical range	 <p>Source: USDA</p>
Ecological distribution	<p>`Intermountain Region in the U.S.<sup>6</sup></p> <p>`Moist to dry, open woods, brush area.</p>
Climate and elevation range	<p>`Annual Precipitation: 3.6" - 57.7"</p> <p>Summer Precipitation: 0.22" - 3.60"</p> <p>Coldest Month: 20.3" - 59.1"</p> <p>Hottest Month: 41.8" - 87.8"</p> <p>Humidity: 0.38" - 40.15"</p> <p>`Elevation: 2500-12,000 ft.</p>
Local habitat and abundance	<p>Native Habitat: Moist to dry, open woods &amp; brush areas.<sup>2</sup></p>
Plant strategy type / successional stage	<p>`A host is usually necessary for survival in the more stressful and competitive conditions occurring in native plant communities.<sup>7</sup></p>

Plant characteristics	<p>`Perennial, herb.</p> <p>`Grayish-green, pubescent perennial with several leafy stems to 3 ft. tall, or more. Linear leaves subtend the torch-like spikes of showy, bright-red bracts. These bracts are hiding small, green flowers.</p> <p>`Roots grow until they touch the roots of other plants, frequently grasses, then penetrate the roots of these host plants, obtaining a portion of their nutrients.</p> <p>Transplanting paintbrush plants usually kills them.<sup>2</sup></p>
<p style="text-align: center;"><b>PROPAGATION DETAILS</b></p> <p style="text-align: center;">(There is no information found of hardening phase for <i>Castilleja linariifolia</i>. I will use the information of hardening phase of <i>Castilleja rhexifolia</i> as reference.)</p>	
Ecotype	<p>`Colorado, Beaver Meadows<sup>3</sup></p> <p>` Freshwater marsh and Pinyon-juniper woodland in Garfield.<sup>4</sup></p>
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Plug + (container-field grown hybrids)
Stock Type	172ml conetainers
Time to Grow	Spring to fall
Target Specifications	Leaves 2–6 cm long.
Propagule Collection Instructions	`Shaking from pod. <sup>3</sup>
Propagule Processing/Propagule Characteristics	<p>`Seeds are hand cleaned at the nursery.</p> <p>Seed longevity is at least 3 years at 3 to 5C in sealed containers.</p>
Pre-Planting Propagule Treatments	<p>`Cleaned by screening and blowing, and seeds were stored in manila envelopes under laboratory conditions until the initiation of experiments 2 to 4 months later.<sup>4</sup></p>
Growing Area Preparation / Annual Practices for Perennial Crops	N/A
Establishment Phase Details	<p>`Seeds should be sown very shallowly into containers and lightly mulched with perlite or fine poultry grit to keep them in place.<sup>5</sup></p> <p>` Greenhouse, 65-70F day/55F night. Propagated on heating pad (set to 70F) under tent with misters set 8 am-8 pm, with 10 sec/15 min watering intervals.<sup>3</sup></p> <p>`Fafard Germinating Mix (superfine).</p>
Length of Establishment Phase	One week
Active Growth Phase	<p>`Develop 4 to 6 sets of true leaves</p> <p>`Unbranched haustoria roots will be well developed and will seek out host roots.</p> <p>`Fertilized with a very low concentration of complete fertilizer (20N:20P2O5:20K2O) at one-quarter the label recommended rate.</p>

	`Regularly inspected to ensure that the host plant is not shading the seedling, and host leaves can be trimmed to ensure adequate light is available. <sup>5</sup>
Length of Active Growth Phase	4 to 6 weeks
Hardening Phase	(There is no information found of hardening phase for <i>Castilleja linariifolia</i> . I will use the information of hardening phase of <i>Castilleja rhexifolia</i> as reference.)  Irrigation is gradually reduced in September and October. Plants are leached with clear water once before winterization. <sup>9</sup>
Length of Hardening Phase	4 weeks
Harvesting, Storage and Shipping	Total Time to Harvest: 5 months. Harvest Date: September. Storage Conditions: Overwinter in outdoor nursery under insulating foam cover and snow. Length of Storage: 5 months. <sup>9</sup>
Length of Storage	At least 4 weeks prior to outplanting. <sup>5</sup>
Guidelines for Outplanting / Performance on Typical Sites	flowered the second year after germination. <sup>5</sup>
Other Comments	`One-month cold moist stratification appears to be necessary for germination. <sup>3</sup> `The high-elevation collection also germinated much more slowly in the cold. <sup>4</sup>

### INFORMATION SOURCES

References	<ol style="list-style-type: none"> <li>1. USDA plants database. (n.d.-a). <a href="https://plants.usda.gov/home/plantProfile?symbol=CALI4">https://plants.usda.gov/home/plantProfile?symbol=CALI4</a></li> <li>2. Plant database. Lady Bird Johnson Wildflower Center - The University of Texas at Austin. (n.d.-a). <a href="https://www.wildflower.org/plants/result.php?id_plant=CALI4">https://www.wildflower.org/plants/result.php?id_plant=CALI4</a></li> <li>3. Native Plant Network — reforestation, nurseries and genetics resources. (n.d.). <a href="https://nnp.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=scrophulariaceae-castilleja-835">https://nnp.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=scrophulariaceae-castilleja-835</a></li> <li>4. Meyer, S. E., &amp; Carlson, S. L. (2004). Comparative seed germination biology and seed propagation of eight Intermountain species of Indian paintbrush. <i>USDA Forest Serv Proc</i>, 125-130.</li> <li>5. Luna, T. (2005). PROPAGATION PROTOCOL FOR Indian Paintbrush CASTILLEJA SPECIES. <i>Native Plants Journal</i>,</li> </ol>
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	<p>6(1), 62–68.  <a href="https://doi.org/10.2979/NPJ.2005.6.1.62">https://doi.org/10.2979/NPJ.2005.6.1.62</a></p> <p>6. Program, M. N. H. (2023, May 31). MTNHP. Wyoming Indian Paintbrush.  <a href="https://fieldguide.mt.gov/speciesDetail.aspx?elcode=PDSCR0D1T0">https://fieldguide.mt.gov/speciesDetail.aspx?elcode=PDSCR0D1T0</a></p> <p>7. Lesica, P. (2020, July 17). Paintbrush: The prettiest parasite on the prairie?. YPR.  <a href="https://www.ypradio.org/2017-04-25/paintbrush-the-prettiest-parasite-on-the-prairie">https://www.ypradio.org/2017-04-25/paintbrush-the-prettiest-parasite-on-the-prairie</a></p> <p>8. Wyoming paintbrush, <i>Castilleja linariifolia</i>. California Native Plant Society. (n.d.).  <a href="https://calscape.org/Castilleja-linariifolia-()">https://calscape.org/Castilleja-linariifolia-()</a></p> <p>9. <i>Castilleja (rhexiifolia)</i> - RNGR. (n.d.-a).  <a href="https://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=scrophulariaceae-castilleja-215">https://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=scrophulariaceae-castilleja-215</a></p> <p>10. Panter, K. L. (2000). 445 Production of <i>Castilleja</i> as a Greenhouse Crop in Wyoming. <i>HortScience</i>, 35(3), 470–470.  <a href="https://doi.org/10.21273/HORTSCI.35.3.470D">https://doi.org/10.21273/HORTSCI.35.3.470D</a></p>
Other Sources Consulted	
Protocol Author	Diya Li
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