

**Plant Propagation Protocol for *Castilleja angustifolia***

ESRM 412 – Native Plant Production

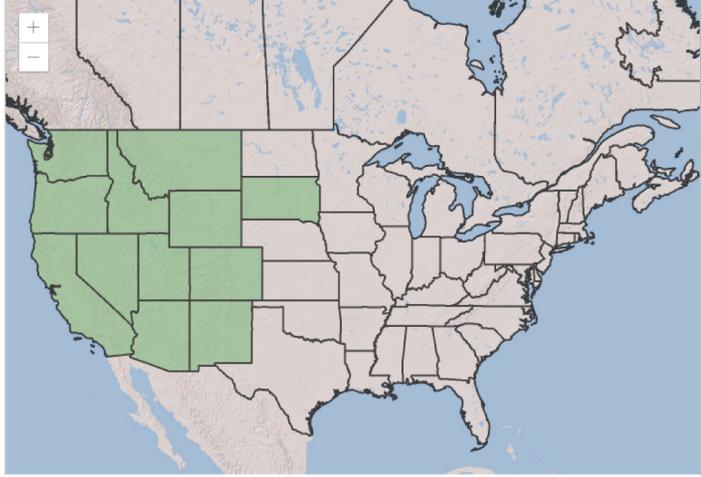
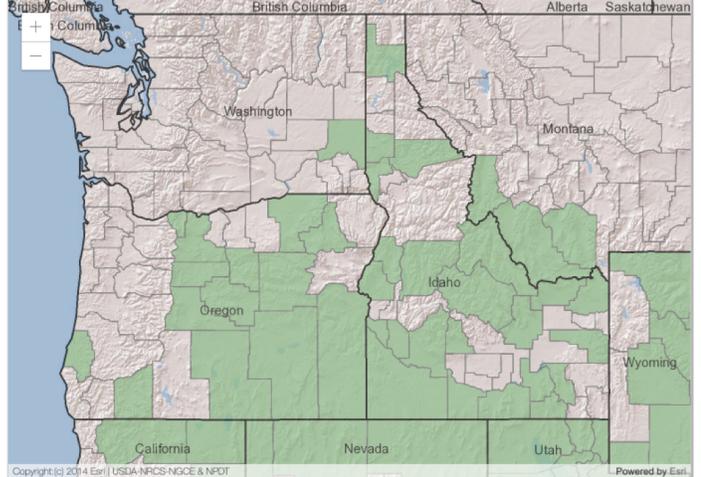
URL: <https://courses.washington.edu/esrm412/protocols/2021/CAAN7.pdf>



**TAXONOMY**

Plant Family	
Scientific Name	Scrophulariaceae
Common Name	Figwort
Species Scientific Name	
Scientific Name	<i>Castilleja angustifolia</i> (Nutt.) G. Don
Varieties	N/A
Sub-species	While there aren't subspecies for this <i>Castilleja</i> variety, the plants are known to freely hybridize with one another in areas where their ranges overlap. <sup>5</sup>
Cultivar	N/A
Common Synonym(s)	N/A
Common Name(s)	Northwestern Indian Paintbrush, <sup>1</sup> Desert Indian Paintbrush. <sup>9</sup>
Species Code (as per USDA Plants database)	CAAN7

**GENERAL INFORMATION**

<p>Geographical range</p>	 <p>Geographical Range in North America.<sup>1</sup></p>  <p>Geographical Range in the Pacific Northwest.<sup>1</sup></p>
<p>Ecological distribution</p>	<p>It usually occurs in desert scrub and the woodlands of western North America.<sup>9</sup></p>
<p>Climate and elevation range</p>	<p>Lives in areas with an annual precipitation in the range of 4.6-51.1 inches and an elevation between 1968-9478 ft.<sup>9</sup></p>
<p>Local habitat and abundance</p>	<p>Occurs in dry open soil, often with sagebrush.<sup>2</sup></p>
<p>Plant strategy type / successional stage</p>	<p>Paintbrushes are hemiparasitic, meaning they are capable of photosynthesis but also draw resources from the vascular tissue of their host plant. (ncbi) Therefore, they can survive without a host, however, they thrive when they have another plant to extract nutrients from.</p>
<p>Plant characteristics</p>	<p>Northwestern indian paintbrush is a herbaceous perennial wildflower/forb.<sup>8</sup> This species is under a half meter in height, and has bristly gray-green to purple-red leaves and herbage. It stands in clumps of</p>

	erect stems, each topped with a flower cluster. These flowers are somewhat tubular, and are usually a bright orange to orange-red color (sometimes tinted with purple). The flowers are also usually fuzzy and have a thin coat of white hairs. The centimeter long capsule fruits contain honeycomb-patterned seeds. <sup>9</sup>
<b>PROPAGATION DETAILS: By Seed</b>	
Ecotype	Much of this information pertains to <i>Castilleja chromosa</i> , which is similar to <i>Castilleja angustifolia</i> , as not much information was available for the Northwestern Indian Paintbrush.
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container/Propagules
Stock Type	N/A
Time to Grow	About 3-4 months, depending on whether it is planted with a host species.
Target Specifications	No specific specifications were found.
Propagule Collection Instructions	<i>Castilleja angustifolia</i> flowers in the period from late May to early July. <sup>5</sup> In general the dry dehiscent seed capsules ripen 8 to 10 weeks following pollinator activity. <sup>10</sup>
Propagule Processing/Propagule Characteristics	There are many tiny seeds per capsule, which are grayish to tan in color with a slightly wrinkled or pitted surface. <sup>10</sup>
Pre-Planting Propagule Treatments	Paintbrush species, in general, are dormant at harvest and must undergo cold stratification for germination. Before stratification, one should imbibe the <i>Castilleja</i> seeds in water for 4-8 hours. <sup>5</sup> <i>Angustifolia</i> seeds should undergo cold moist stratification for 60-90 days at temperatures of 21-25 degrees Celsius during the days and 10-16 degrees Celsius at night. <sup>5</sup> Seeds of populations from warmer, drier, low-elevation habitats tend to respond to shorter chilling periods and germinate more quickly in chilling. <sup>5</sup>
Growing Area Preparation / Annual Practices for Perennial Crops	Should be planted in a relatively fast-draining potting medium in containers that produce a long, narrow root mass such as Conetainers. <sup>6</sup>
Establishment Phase Details	Place germinants in shallow depressions and cover with a thin (2-4mm) layer of soil, as paintbrush seeds are very small and shouldn't be planted too deeply. Do not let the surface dry out during emergence. <sup>6</sup> Pots

	should be misted daily, especially if the area is sunny, until emergence is complete. <sup>6</sup>
Length of Establishment Phase	8-12 weeks in cold stratification, seeds should be planted once they've germinated
Active Growth Phase	Water less often but more thoroughly, making sure that the soil is wetted to its full depth each time, as most young paintbrush plants in containers are not as drought hardy as those of most native plant species. <sup>6</sup> Paintbrushes, possibly due to their hemiparasitic nature, tend to have relatively little root biomass in relation to their shoot biomass. <sup>6</sup> During the active growth phase, seedlings can be fertilized with a very low concentration of complete fertilizer at ¼ the label recommended rate. <sup>5</sup>
Length of Active Growth Phase	3-4 months, depending on growing conditions and container volume. <sup>6</sup>
Hardening Phase	Instead of hardening paintbrush species on their own, pot the seedlings with a potential host plant, let the two plants grow together for 6-8 weeks. harden them off, and plant them as a unit. <sup>6</sup> In the wild, paintbrush is often associated with sagebrush, so that is a good host plant to pot it with. <i>Astragalus simplicifolius</i> , or little bun milkvetch, is another host that is compatible with <i>Castilleja angustifolia</i> . <sup>7</sup> If planting in a habitat other than one with sagebrush, pick a host plant that is small in stature with a non-aggressive or weakly rhizomatous root system so that it doesn't outcompete the paintbrush. <sup>5</sup> When picking a host, it is also important that the two plants have compatible horticulture requirements. <sup>7</sup>
Length of Hardening Phase	6-8 weeks with a host plant. <sup>6</sup>
Harvesting, Storage and Shipping	Should be hardened outside before outplanting.
Length of Storage	Hardening outside should take place for at least 4 weeks prior to outplanting and occur in midsummer. <sup>5</sup>
Guidelines for Outplanting / Performance on Typical Sites	Care should be given to make sure that the somewhat brittle paintbrush stems are not snapped off during extraction from containers. <sup>5</sup> Paintbrush species grown and outplanted with a host, such as sagebrush, have much higher survival than those planted on their own due to their hemiparasitic characteristics(npj). Survival

	after outplanting is high for paintbrushes, and they often flower after the first year. <sup>3</sup>
Other Comments	This information is for the propagation of general <i>Castilleja</i> species, with more specifics detailed wherever possible. Propagation by seed is the simplest and least labor-intensive way to reproduce <i>Castilleja</i> species, as long as there is adequate seed stock available. <sup>6</sup>

### INFORMATION SOURCES

References	<ol style="list-style-type: none"> <li>1. "Castilleja Angustifolia (Nutt.) G. Don." <i>USDA Plants</i>, United States Department of Agriculture, <a href="http://plants.usda.gov/home/plantProfile?symbol=CAAN7">plants.usda.gov/home/plantProfile?symbol=CAAN7</a>.</li> <li>2. "Castilleja Angustifolia." <i>Lady Bird Johnson Wildflower Center</i>, The University of Texas at Austin, <a href="http://www.wildflower.org/plants/result.php?id_plant=CAAN7">www.wildflower.org/plants/result.php?id_plant=CAAN7</a>.</li> <li>3. Indian Paintbrush, Utah Native Plant Society, <a href="http://www.unps.org/plant%20data%20base/plant%20sheets/castchrom.html">www.unps.org/plant%20data%20base/plant%20sheets/castchrom.html</a>.</li> <li>4. Love, Stephen L, and Tony A McCammon. "Compatible Host/Parasite Pairs Enhance Propagation of Paintbrush (<i>Castilleja</i> Spp.)." <i>Native Plants Journal</i>, vol. 18, no. 3, 2017, pp. 252–266., doi:10.3368/npj.18.3.252.</li> <li>5. Luna, Tara. "Propagation Protocol for Indian Paintbrush (<i>Castilleja</i> Species)." <i>Native Plants Journal</i>, vol. 6, no. 1, 2005, pp. 62–68., doi:10.1353/npj.2005.0026.</li> <li>6. Meyer, Susan E., and Stephanie L. Carlson. "Comparative Seed Germination Biology and Seed Propagation of Eight Intermountain Species of Indian Paintbrush." <i>USDA Forest Service Proceedings</i>, 2004, pp. 125–130.</li> <li>7. Nelson, David, and David E. Joyner. "Techniques for Growing <i>Castilleja</i> in the Garden." <i>Rock Garden Quarterly</i>, vol. 65, no. 3, 2007, pp. 279–283., doi:<a href="https://nargs.org/sites/default/files/free-rgq-downloads/VOL_65_NO_3.pdf">https://nargs.org/sites/default/files/free-rgq-downloads/VOL_65_NO_3.pdf</a>.</li> <li>8. "Northwestern Indian Paintbrush (<i>Castilleja Angustifolia</i>) ." <i>Northwestern Indian Paintbrush (Castilleja Angustifolia) - Garden.org</i>, The National Gardening Association, <a href="http://garden.org/plants/view/80821/Northwestern-Indian-Paintbrush-Castilleja-angustifolia/">garden.org/plants/view/80821/Northwestern-Indian-Paintbrush-Castilleja-angustifolia/</a>.</li> <li>9. "Northwestern Paintbrush, <i>Castilleja Chromosa</i>." <i>California Native Plant Society</i>, <a href="http://calscape.org/Castilleja-chromosa-()">calscape.org/Castilleja-chromosa-()</a>.</li> </ol>
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	<p>10. Tesitel, Jakub, et al. "Interactions between Hemiparasitic Plants and Their Hosts." <i>Plant Signaling and Behavior</i>, vol. 5, no. 9, 1 Sept. 2010, pp. 1072–1076., doi:<a href="https://www.tandfonline.com/doi/full/10.4161/psb.5.9.12563">https://www.tandfonline.com/doi/full/10.4161/psb.5.9.12563</a>.</p>
Other Sources Consulted	<p>1. "Northwestern Indian-Paintbrush (<i>Castilleja Angustifolia</i>)." <i>Northwestern Indian-Paintbrush (Castilleja Angustifolia)</i>   <i>Idaho Fish and Game</i>, Idaho Fish and Game, <a href="http://idfg.idaho.gov/species/taxa/43296">idfg.idaho.gov/species/taxa/43296</a>.</p>
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