

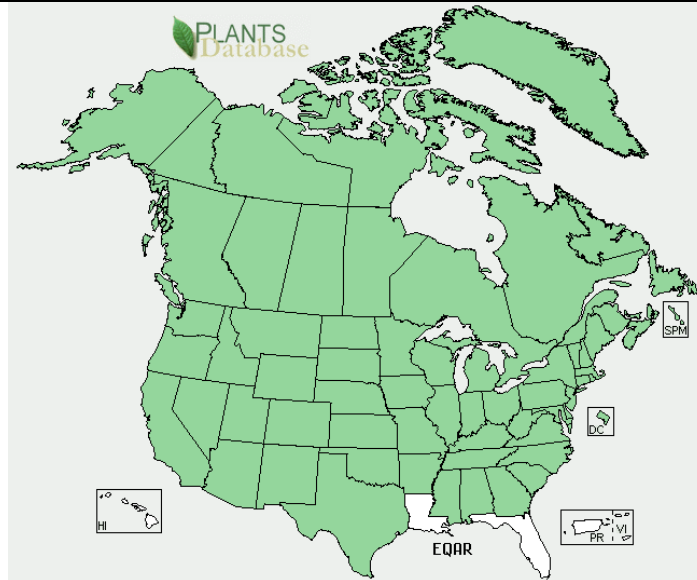
**Plant Propagation Protocol for *Equisetum arvense***

ESRM 412 – Native Plant Production

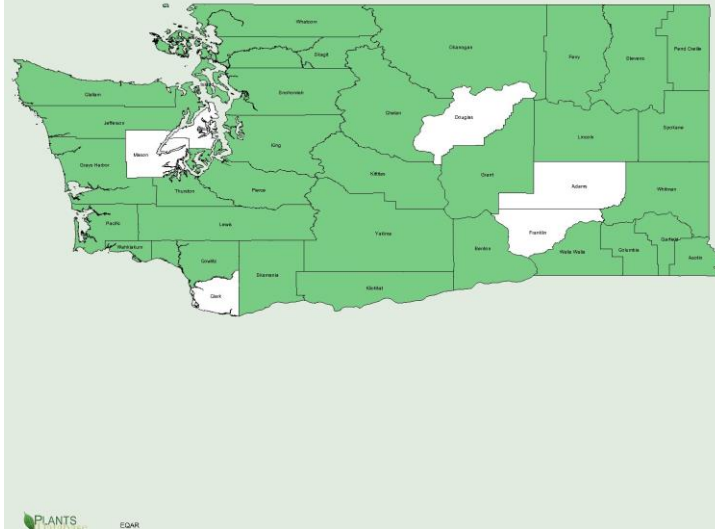
Protocol URL: <https://courses.washington.edu/esrm412/protocols/EQAR.pdf>

<b>TAXONOMY</b>	
Plant Family	
Scientific Name	Equisetaceae
Common Name	Horsetail family
Species Scientific Name	
Scientific Name	<i>Equisetum arvense</i> L.
Varieties	var. <i>campestre</i> (EQARC), var. <i>alpestre</i> (EQARA), var. <i>riparium</i> (EQARR), var. <i>borale</i> (EQARB)
Sub-species	None listed in USDA plants database at time of writing
Cultivar	
Common Synonym(s)	<i>Equisetum caldera</i> B. Boivin (EQCA)
Common Name(s)	Field horsetail
Species Code (as per USDA Plants database)	EQAR

**GENERAL INFORMATION**



Above: Known *E. arvense* distribution in the continental United States.



Distribution in Washington State. Maps from USDA Plant Database, 5/19/2014.

Ecological distribution:	Throughout North America. More abundant in North than South. Also found in Europe, Asia, and New Zealand (3)
Climate and elevation range:	Primarily temperate, low elevation.
Local habitat and abundance:	Very abundant, particularly in swamps and wet places although also unlike most horsetails, <i>Equisetum arvense</i> is capable of tolerating dry, gravelly soils. Can be weedy and very difficult to control. Identified in some areas as a noxious weed (2).
Plant strategy type / successional stage:	Spreads and persists with a “deep, ropelike rhizome” that is very difficult to fully pull up. (2) Also spreads via sporangia. (5)(8).
Plant characteristics:	Rhizome described above. Light colored fertile stems in spring with appearance like asparagus sprouts. After these die back, hollow, ribbed sterile stems emerge with feathery leaves of a “bottle brush” appearance. (5)(8).

**PROPAGATION DETAILS**

Ecotype:	Primarily temperate, very adaptable.
Propagation Goal:	Generally not recommended for propagation (3). Unless contained, plants will spread very aggressively.
Propagation Method:	Moderately easy from spore. Very easy from division. (2)(3) Multisheathed stem cuttings may also root when placed in moist sand (3)

Product Type:	Individual plants, which will generally expand into a colony.
Time to Grow:	One season.
Propagule Collection Instructions:	Divide rhizomes in early spring or fall. (2) Alternately, collect spores in early spring and sow on moist soil.
Propagule Processing/Propagule Characteristics:	Cut rhizomes into 6 – inch lengths. (2)
Pre-Planting Propagule Treatments:	None necessary for rhizomes. Moisten spores and release on damp soil. (2) There are separate gametophytes for male and female, so both must be present for successful propagation from spores. (3)
Growing Area Preparation / Annual Practices for Perennial Crops:	Ensure adequate moisture and spring / summer warm temperatures. Spores must germinate within a few days of release. If they dry out, they will die. (2) No other preparation necessary for either spores or rhizomes.
Establishment Phase Details:	Rhizomes will begin to root quickly in the spring or early summer. Planting with spores will establish more slowly. (2)
Length of Establishment Phase	One season for rhizomes. 18 months – 2 seasons for spores depending on moisture and temperature. (2)
Active Growth Phase:	The active growth phase will be limited in the first year, but aggressive and fast after establishment. (2)
Length of Active Growth Phase:	2-4 weeks (est.)
Hardening Phase:	The hardening phase does not appear to be a consideration in <i>Equisetum</i> propagation based on available literature.
Length of Hardening Phase	The complete growth cycle occurs over the summer into the fall, at which point the plant will die back to the rhizome. (1)
Harvesting, Storage and Shipping:	Rhizomes can be refrigerated and stored (or shipped). However the spores cannot dry out (2).
Guidelines for Outplanting / Performance on Typical Sites:	Containing <i>Equisetum arvense</i> is a very strong consideration. Once established, it is very difficult to eradicate, although it may be possible to remove in localized areas by repeatedly pulling out the plant as it emerges, before it sporulates (2).
Other Comments:	<i>Equisetum</i> are closely related to tree-sized horsetails that existed in the carboniferous period and whose biomass accumulated much of the coal that exists in the world today. (1)

	<p>Long thought to be Fern allies, Equisetum are now considered true ferns. (3)</p> <p><i>Equisetum arvense</i> were among the first pioneer plants to colonize the Mount Saint Helens after the eruption in 1980. (3)</p>
<b>INFORMATION SOURCES</b>	
References:	<p>1) <u>Armitage's Native Plants for North American Gardens</u>. Alan Armitage, Timber Press Inc, Portland OR, 2006.</p> <p>2) <u>Native Ferns Moss &amp; Grasses</u>. William Cullina. Houghton Mifflin Company, New York, 2008.</p> <p>3) <u>Encyclopedia of Garden Ferns</u>. Sue Olsen. Timber Press. Portland, Oregon, 2007.</p> <p>4) USDA Plant List: <a href="http://plants.usda.gov/core/profile?symbol=EQAR">http://plants.usda.gov/core/profile?symbol=EQAR</a></p> <p>5) <u>Paleobotany and the evolution of plants</u>. Wilson N. Stewart, Cambridge University Press, 1983.</p> <p>8) Penn State Extension: <a href="http://extension.psu.edu/plants/green-industry/news/2012/weed-of-the-month-field-horsetail-equisetum-arvense">http://extension.psu.edu/plants/green-industry/news/2012/weed-of-the-month-field-horsetail-equisetum-arvense</a></p>
Other Sources Consulted:	<p>For general information:</p> <p>6) <u>Biology of Plants</u>, Peter H. Raven et al, 5<sup>th</sup> ed., 1992.</p> <p>7) Calflora: <a href="http://www.calflora.org/cgi-bin/species_query.cgi?where-taxon=Equisetum+arvense">http://www.calflora.org/cgi-bin/species_query.cgi?where-taxon=Equisetum+arvense</a></p> <p>9) Field Guide to Noxious and Other Selected Weeds of British Columbia: <a href="http://www.agf.gov.bc.ca/cropprot/weedguid/horsetl.htm">http://www.agf.gov.bc.ca/cropprot/weedguid/horsetl.htm</a></p>
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