

**Family:** *Equisetaceae*

**Taxon:** *Equisetum hyemale*

**Synonym:** NA

**Common Name:** common scouring rush  
great scouring rush  
rough horsetail  
scouring rush  
shave grass

**Questionnaire :** current 20090513  
**Status:** Assessor Approved

**Assessor:** Assessor  
**Data Entry Person:** Assessor

**Designation:** H(HPWRA)

**WRA Score 11.5**

101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?	y=1, n=-1	
103	Does the species have weedy races?	y=1, n=-1	
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	Low
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	y
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic	y=1, n=0	
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals	y=1, n=0	y
406	Host for recognized pests and pathogens	y=1, n=0	n
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	y
604	Self-compatible or apomictic	y=1, n=-1	
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	y
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	2
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	y
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	y
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	
708	Propagules survive passage through the gut	y=1, n=-1	
801	Prolific seed production (>1000/m <sup>2</sup> )	y=1, n=-1	y
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	
<b>Designation: H(HPWRA)</b>		<b>WRA Score</b>	<b>11.5</b>

## Supporting Data:

101	2013. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). Flora of China. Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Is the species highly domesticated? No] No evidence
102	2014. WRA Specialist. Personal Communication.	NA
103	2014. WRA Specialist. Personal Communication.	NA
201	2014. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). <a href="http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl">http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl</a>	[Species suited to tropical or subtropical climate(s) 0-Low] "ASIA-TEMPERATE Western Asia: Turkey Caucasus: Azerbaijan; Georgia; Russian Federation - Ciscaucasia Siberia: Russian Federation - Altay, Eastern Siberia, Western Siberia Middle Asia: Kazakhstan; Kyrgyzstan; Tajikistan Russian Far East: Russian Federation - Amur, Khabarovsk, Primorye China: China - Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Monggol, Ningxia, Qinghai, Shaanxi, Shanxi, Xinjiang Eastern Asia: Japan - Hokkaido, Honshu; Korea EUROPE Northern Europe: Denmark; Faroe Islands; Finland; Iceland; Ireland; Norway; Sweden; United Kingdom Middle Europe: Austria; Belgium; Czechoslovakia; Germany; Hungary; Netherlands; Poland East Europe: Belarus; Moldova; Russian Federation - European part; Ukraine [incl. Krym] Southeastern Europe: Albania; Bulgaria; Former Yugoslavia; Greece; Italy; Romania Southwestern Europe: France; Spain NORTHERN AMERICA (Check conservation status in U.S. & Canada in NatureServe Explorer database) Subarctic America: Canada - Northwest Territory [w.], Yukon Territory; United States - Alaska Eastern Canada: Canada - New Brunswick, Newfoundland, Nova Scotia, Ontario, Prince Edward Island, Quebec Western Canada: Canada - Alberta, British Columbia, Manitoba [s.], Saskatchewan Northeastern U.S.A.: United States - Connecticut, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia North-Central U.S.A.: United States - Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, Wisconsin Northwestern U.S.A.: United States - Colorado, Idaho, Montana, Oregon, Washington, Wyoming Southeastern U.S.A.: United States - Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia South-Central U.S.A.: United States - New Mexico, Texas Southwestern U.S.A.: United States - Arizona, California, Nevada, Utah Mexico SOUTHERN AMERICA Mesoamerica: El Salvador; Guatemala"
202	2014. USDA ARS National Genetic Resources Program. Germplasm Resources Information Network - (GRIN). <a href="http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl">http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl</a>	[Quality of climate match data 2-High]
203	2013. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). Flora of China. Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Broad climate suitability (environmental versatility)? Yes] "Forests, under bushes, valleys, roadsides; 1500–3700 m." [Elevation range exceeds 1000 m, demonstrating environmental versatility]
204	2013. NSW Department of Primary Industries. Weed Alert: Horsetails. <a href="http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails">http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails</a> [Accessed 07 Jan 2014]	[Native or naturalized in regions with tropical or subtropical climates?] "Horsetails naturally occur in cold to temperate regions with temperatures ranging from 5°C to 20°C and rainfall between 100 and 2000 mm."
205	2006. Ainsworth, N./Gunasekera, L./Bonillo, J.. Management of horsetail species using herbicides. Pp. 279-282 in Proceedings of the 15th Australian Weeds Conference.	[Does the species have a history of repeated introductions outside its natural range? Yes] "Horsetail species present in Australia are believed to have been imported for ornamental or medicinal horticulture and were widely sold at nurseries and markets until recently."

301	1995. Webb, C.J./Sykes, W.R./Garnock-Jones, P.J./Brownsey, P.J.. Checklist of dicotyledons, gymnosperms, and pteridophytes naturalised or casual in New Zealand: additional records 1988–1993. <i>New Zealand Journal of Botany</i> . 33(2): 151-182.	[Naturalized beyond native range? Casual] "Known from one site only, Linwood, Christchurch." ... "The origin of the colony is unknown, but may have escaped from cultivation; it spread actively but has now been eliminated."
301	2010. Department of Primary Industries and Regions SA. Declared Plant Policy horsetail ( <i>Equisetum</i> spp.). Government of South Australia, <a href="http://www.pir.sa.gov.au/_media/pdf/pirsa_internet/biosecurity/nrm_biosecurity/pest_weed_policies/declared_plants_2/Equ">http://www.pir.sa.gov.au/_media/pdf/pirsa_internet/biosecurity/nrm_biosecurity/pest_weed_policies/declared_plants_2/Equ</a>	[Naturalized beyond native range? Yes] "In Victoria, <i>Equisetum hyemale</i> has long persisted in a garden bed at the Melbourne Botanic Gardens, where <i>E. sylvaticum</i> is also grown in pots. An <i>Equisetum</i> species, probably <i>E. hyemale</i> , is grown at the Ballarat Botanic Gardens and has become naturalised nearby around a lake at Chewton."
301	2013. NSW Department of Primary Industries. Weed Alert: Horsetails. <a href="http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails">http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails</a> [Accessed 07 Jan 2014]	[Naturalized beyond native range? Yes] "Scouring rush horsetail also prefers moist environments and infestations have occurred in NSW in areas below altitudes of 620 metres with annual rainfalls of 1100 – 1500 mm."
301	2014. Australian Plant Name Index. Equisetaceae - <i>Equisetum hyemale</i> L.. Integrated Botanical Information System (IBIS) Australian National Botanic Gardens Australian National Herbarium, <a href="http://www.anbg.gov.au/cgi-bin/apni">http://www.anbg.gov.au/cgi-bin/apni</a> [Accessed 07 Jan 2014]	[Naturalized beyond native range? Yes] "NSW (sparingly naturalised)"
302	1980. Finnerty, D.W./Glaser, A.V.. Control of <i>Equisetum hyemale</i> with DPX 4189. Pp. 103-104 in <i>Proceedings North Central Weed Control Conference</i> . Volume 35.	[Garden/amenity/disturbance weed? Yes] " <i>Equisetum hyemale</i> is a problem in ditches and along roadsides and railways in the central USA."
302	2006. Ainsworth, N./Gunasekera, L./Bonillo, J.. Management of horsetail species using herbicides. Pp. 279-282 in <i>Proceedings of the 15th Australian Weeds Conference</i> .	[Garden/amenity/disturbance weed? Yes] "The two species of most concern in Australia are <i>E. hyemale</i> and <i>E. arvense</i> , both of which favour wet places and are considered to be of most threat in temperate Australia where annual rainfall exceeds 500 mm. Descriptions of these species and details of their occurrence in Australia are provided by DEH and CRCAWM (2003)."
302	2014. Missouri Botanical Gardens. <i>Equisetum hyemale</i> . <a href="http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670">http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670</a> [Accessed 07 Jan 2014]	[Garden/amenity/disturbance weed? Yes] "Spreads to form large colonies in the wild. Homeowners are often more interested in learning how to eradicate this plant from the landscape than how to grow it. It is a very aggressive plant which, if not preemptively restrained, will spread aggressively by branched, creeping rhizomes."
303	2013. NSW Department of Primary Industries. Weed Alert: Horsetails. <a href="http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails">http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails</a> [Accessed 07 Jan 2014]	[Agricultural/forestry/horticultural weed? Potentially] "Common horsetail ( <i>Equisetum arvense</i> ) and scouring rush horsetail ( <i>Equisetum hyemale</i> ) are of most concern in Australia. In high densities they also reduce crop yields by producing inhibitory substances that depress the growth of neighbouring plants." [A number of other references list <i>E. arvense</i> as a major weed, and <i>E. hyemale</i> as a potential weed of agriculture]
304	2006. Ainsworth, N./Gunasekera, L./Bonillo, J.. Management of horsetail species using herbicides. Pp. 279-282 in <i>Proceedings of the 15th Australian Weeds Conference</i> .	[Environmental weed? On Alert Lists] "All <i>Equisetum</i> spp. are now declared noxious weeds in all Australian states and territories except the Northern Territory and are also included on the national Alert List for Environmental Weeds, a list of 28 non native plants that have potential to threaten biodiversity and cause other environmental damage, but which currently have a limited distribution so that they are suitable targets for eradication (DEH and CRCAWM 2003)."
305	2006. Ainsworth, N./Gunasekera, L./Bonillo, J.. Management of horsetail species using herbicides. Pp. 279-282 in <i>Proceedings of the 15th Australian Weeds Conference</i> .	[Congeneric weed? Yes] "All <i>Equisetum</i> spp. are now declared noxious weeds in all Australian states and territories except the Northern Territory..." ... "Overseas, <i>Equisetum</i> species are also significant weeds of pastures, crops and gardens (Parsons and Cuthbertson 2001)."
401	2013. Wu, Z.Y./Raven, P.H./Hong, D.Y. (eds.). <i>Flora of China</i> . Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Produces spines, thorns or burrs? No] "Plants large. Rhizome creeping or erect, blackish brown, nodes and roots with long yellowish brown trichomes. Aerial stem perennial, monomorphic, green, up to or more than 1 m tall, (3–)5–9 mm in diam. at middle, not branched or base with few erect lateral branches; internodes 5–8 cm. Aerial stem 16– 22-ridged; ridges arc-shaped abaxially or nearly rectangular, without conspicuous tubercles or with 2 rows of tubercles; sheath 0.7–1.1 cm, blackish brown or both distal portion and base with a blackish brown band, or only distal portion with a blackish brown band; sheath teeth 16–22, lanceolate, small, 0.3–0.5 cm, teeth of distal portion light brown, membranous, aristate, caducous, teeth of lower portion blackish brown, abaxially 3- or 4-ridged at base, thinly leathery, persistent or falling off early with sheath tube."

402	1994. Burrill, L.C./Parker, R.. Field Horsetail and Related Species Equisetaceae. PNW 105. Pacific Northwest Cooperative Extension, <a href="http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/20760/pnw105.pdf?sequence=3">http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/20760/pnw105.pdf?sequence=3</a>	[Allelopathic? Unknown. E. arvense shows allelopathic properties] "Field horsetail may inhibit surrounding vegetation (allelopathy) because of its alkaloid content. Researchers in Russia studied the effects of water extracts taken from field horsetail on seed germination and early growth of meadow grasses. Of 13 species tested, field horsetail displayed the strongest inhibitory effect on seed germination and seedling vigor after it had been applied to 30 species of grasses."
403	2013. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). Flora of China. Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Parasitic? No] "Plants small to medium-sized. Rhizome erect and creeping, blackish brown, nodes and roots with long yellowish brown trichomes." [Equisetaceae]
404	2009. Bryson, C.T./DeFelice, M.S.. Weeds of the South. University of Georgia Press, Athens, GA	[Unpalatable to grazing animals? No] "...they are usually eaten during winter months by cattle, sheep, and horses."
405	2007. DiTomaso, J.. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	[Toxic to animals? Yes] "Both species..." (Equisetum arvense * Equisetum hyemale) "contain alkaloids that destroy thiamine and are toxic to livestock, especially horses, when ingested."
405	2009. Bryson, C.T./DeFelice, M.S.. Weeds of the South. University of Georgia Press, Athens, GA	[Toxic to animals? Yes] "Equisetum species contain a neurotoxin leading to muscle weakness, trembling, and collapse but rarely consumed in quantities sufficient to cause toxicity; they are usually eaten during winter months by cattle, sheep, and horses."
406	2014. Missouri Botanical Gardens. Equisetum hyemale. <a href="http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670">http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670</a> [Accessed 07 Jan 2014]	[Host for recognized pests and pathogens? No] "No serious insect or disease problems."
407	2013. NSW Department of Primary Industries. Weed Alert: Horsetails. <a href="http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails">http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails</a> [Accessed 07 Jan 2014]	[Causes allergies or is otherwise toxic to humans? Toxic, but unlikely to be consumed by humans] "All except the common horsetail are toxic to livestock."
408	2007. DiTomaso, J.. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	[Creates a fire hazard in natural ecosystems? No evidence] "Moist, sandy sites, riparian areas, marshy places, and ditches." [Fire not listed among potential impacts]
408	2011. Stafford, K.. Firewise Plant List - Texas. <a href="http://txrng.wpengine.netdna-cdn.com/ellis/files/2012/03/Texas-Plant-Flammability-List.pdf">http://txrng.wpengine.netdna-cdn.com/ellis/files/2012/03/Texas-Plant-Flammability-List.pdf</a>	[Creates a fire hazard in natural ecosystems? No evidence] "Equisetum hyemale - Flammability - Firewise = Low"
409	2014. Missouri Botanical Gardens. Equisetum hyemale. <a href="http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670">http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670</a> [Accessed 07 Jan 2014]	[Is a shade tolerant plant at some stage of its life cycle? Yes] "Tolerate: Heavy Shade"
410	2014. Missouri Botanical Gardens. Equisetum hyemale. <a href="http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670">http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670</a> [Accessed 07 Jan 2014]	[Tolerates a wide range of soil conditions? Yes] "Tolerates an extremely wide range of soils, however."
411	2014. Missouri Botanical Gardens. Equisetum hyemale. <a href="http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670">http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670</a> [Accessed 07 Jan 2014]	[Climbing or smothering growth habit? No] "Scouring rush (also commonly called rough horsetail) is a non-flowering, rush-like, rhizomatous, evergreen perennial which typically grows 3-5' tall and is native to large portions of Eurasia, Canada and the U.S., including Missouri."
412	2013. NSW Department of Primary Industries. Weed Alert: Horsetails. <a href="http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails">http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails</a> [Accessed 07 Jan 2014]	[Forms dense thickets? Possibly] "Common horsetail (Equisetum arvense) and scouring rush horsetail (Equisetum hyemale) are of most concern in Australia. In high densities they also reduce crop yields by producing inhibitory substances that depress the growth of neighbouring plants."
501	2007. DiTomaso, J.. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	[Aquatic? No] "Moist, sandy sites, riparian areas, marshy places, and ditches." [Occurs in and around aquatic habitats, but not a truly aquatic species]
501	2013. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). Flora of China. Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Aquatic? No] "Forests, under bushes, valleys, roadsides"

501	2014. Missouri Botanical Gardens. <i>Equisetum hyemale</i> . <a href="http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670">http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670</a> [Accessed 07 Jan 2014]	[Aquatic? No] "It typically occurs in wet woods, moist hillsides and peripheries of water bodies (lakes, rivers, ponds)."
502	2013. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). <i>Flora of China</i> . Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Grass? No] Equisetaceae
503	2013. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). <i>Flora of China</i> . Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Nitrogen fixing woody plant? No] Equisetaceae
504	2010. Gordon, D.R./Mitterdorfer, B./Pheloung, P.C. et al.. Guidance for addressing the Australian Weed Risk Assessment questions. <i>Plant Protection Quarterly</i> . 25(2): 56-74.	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "This question addresses taxa that have specialized organs and should not include plants with just rhizomes/ stolons"
504	2013. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). <i>Flora of China</i> . Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No. Rhizomatous] "Plants small to medium-sized. Rhizome erect and creeping, blackish brown, nodes and roots with long yellowish brown trichomes. Aerial stem perennial."
601	2007. DiTomaso, J.. <i>Weeds of California and Other Western States</i> , Volume 1. UCANR Publications, Oakland, CA	[Evidence of substantial reproductive failure in native habitat? No evidence]
601	2013. Wu, Z.Y./Raven,P.H./Hong, D.Y. (eds.). <i>Flora of China</i> . Vol. 2-3 (Lycopodiaceae through Polypodiaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Evidence of substantial reproductive failure in native habitat? No evidence]
602	2009. Bryson, C.T./DeFelice, M.S.. <i>Weeds of the South</i> . University of Georgia Press, Athens, GA	[Produces viable seed? Yes. Spores] "Sporangia conelike structure at tip of stem, 0.5-2.4 cm long, jointed, short peduncle to sessile, producing spores. Spores numerous, microscopic."
603	. Moran, R.C.. <i>Equisetum X ferrissii</i> (Equisetaceae) in Illinois. <i>Castanea</i> . 48(2): 79-82.	[Hybridizes naturally? Yes] " <i>Equisetum X ferrissii</i> Clute (Equisetaceae) is the sterile hybrid between <i>E. hyemale</i> L. var. <i>affine</i> (Engelm.) A. A. Eaton and <i>E. laevigatum</i> A. Br. A herbarium and field study of <i>E. X ferrissii</i> was undertaken to determine the range and abundance of this hybrid in Illinois. The hybrid occurs in a wide variety of habitats in the state but is most frequent in moist, open, disturbed habitats especially in sandy soils and along railroads. <i>Equisetum X ferrissii</i> is much more widespread and abundant than previously realized."
604	2002. Guillon, J.M./Raquin, C.. Environmental sex determination in the genus <i>Equisetum</i> : Sugars induce male sex expression in cultured gametophytes. <i>International Journal of Plant Sciences</i> . 163(5): 825-830.	[Self-compatible or apomictic? Unknown if gametophytes from the same sporophyte are self-compatible] "Studies of genetic diversity in <i>E. arvense</i> and <i>Equisetum hyemale</i> populations, as well as high fertilization rates found in wild gametophyte populations, indicate that sexual reproduction occurs and cannot be dismissed as marginal in <i>Equisetum</i> (Duckett and Duckett 1980; Soltis et al. 1988; Korpelainen and Kolkkala 1996)."
605	2007. DiTomaso, J.. <i>Weeds of California and Other Western States</i> , Volume 1. UCANR Publications, Oakland, CA	[Requires specialist pollinators? No, but requires water for fertilization] "Plants produce large numbers of spores, but few spores survive because they are short-lived and grow best on mud that has recently been flooded and is rich in nutrients. Haploid gametophytes develop from the spores. These produce gametes that need water for fertilization. The transition through these vulnerable stages limits the survival of young plants."
606	2006. Ainsworth, N./Gunasekera, L./Bonillo, J.. Management of horsetail species using herbicides. Pp. 279-282 in Proceedings of the 15th Australian Weeds Conference.	[Reproduction by vegetative fragmentation? Yes] " <i>Equisetum</i> spp. can grow well on infertile soils and are frost tolerant. The rhizome system can reach depths of several metres and extend horizontally for long distances before producing new shoots (Williams 1979)."
606	2007. DiTomaso, J.. <i>Weeds of California and Other Western States</i> , Volume 1. UCANR Publications, Oakland, CA	[Reproduction by vegetative fragmentation? Yes] "Reproduce vegetatively from rhizomes and tubers, and less importantly by spores. Rhizome fragments and tubers can develop into new plants."
606	2014. Missouri Botanical Gardens. <i>Equisetum hyemale</i> . <a href="http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670">http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670</a> [Accessed 07 Jan 2014]	[Reproduction by vegetative fragmentation? Yes] "It is a very aggressive plant which, if not preemptively restrained, will spread aggressively by branched, creeping rhizomes."



607	2007. DiTomaso, J.. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	[Minimum generative time (years)? Potentially able to reproduce vegetatively within 1-2 years] "Reproduce vegetatively from rhizomes and tubers, and less importantly by spores. Rhizome fragments and tubers can develop into new plants."
701	2013. NSW Department of Primary Industries. Weed Alert: Horsetails. <a href="http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails">http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails</a> [Accessed 07 Jan 2014]	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? Yes] "New infestations can result when garden waste containing rhizomes is dumped or when plants are sold illegally for ornamental or medicinal purposes."
702	2006. Ainsworth, N./Gunasekera, L./Bonillo, J.. Management of horsetail species using herbicides. Pp. 279-282 in Proceedings of the 15th Australian Weeds Conference.	[Propagules dispersed intentionally by people? Yes] "Horsetail species present in Australia are believed to have been imported for ornamental or medicinal horticulture and were widely sold at nurseries and markets until recently."
703	2006. Large, M.F./Blanchon, D.J./Angus, M.L.. Devitalisation of imported horsetail ( <i>Equisetum hyemale</i> ). New Zealand Journal of Crop and Horticultural Science. 34(2): 151-153.	[Propagules likely to disperse as a produce contaminant? Yes] "The arrival of <i>E. arvense</i> in New Zealand, along with a second species <i>E. hyemale</i> L., has variously been attributed to spores or rhizome portions being attached to other plants, and to importation of material for garden cultivation."
704	2009. Bryson, C.T./DeFelice, M.S.. Weeds of the South. University of Georgia Press, Athens, GA	[Propagules adapted to wind dispersal? Yes] "Sporangia conelike structure at tip of stem, 0.5-2.4 cm long, jointed, short peduncle to sessile, producing spores. Spores numerous, microscopic."
705	2007. DiTomaso, J.. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	[Propagules water dispersed? Yes] "Fragments and tubers disperse with water, soil movement, and human activities."
706	2007. DiTomaso, J.. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	[Propagules bird dispersed? No evidence] "Fragments and tubers disperse with water, soil movement, and human activities."
707	2009. Bryson, C.T./DeFelice, M.S.. Weeds of the South. University of Georgia Press, Athens, GA	[Propagules dispersed by other animals (externally)? Unknown] "Sporangia conelike structure at tip of stem, 0.5-2.4 cm long, jointed, short peduncle to sessile, producing spores. Spores numerous, microscopic." [It may be possible that spores could adhere to mud on feet of animals]
708	2009. Bryson, C.T./DeFelice, M.S.. Weeds of the South. University of Georgia Press, Athens, GA	[Propagules survive passage through the gut? Unknown] "...usually eaten during winter months by cattle, sheep, and horses." [Unknown if viable spore or stem fragments survive consumption and gut passage]
801	2009. Bryson, C.T./DeFelice, M.S.. Weeds of the South. University of Georgia Press, Athens, GA	[Prolific seed production (>1000/m <sup>2</sup> )? Yes] "Sporangia conelike structure at tip of stem, 0.5-2.4 cm long, jointed, short peduncle to sessile, producing spores. Spores numerous, microscopic."
802	2007. DiTomaso, J.. Weeds of California and Other Western States, Volume 1. UCANR Publications, Oakland, CA	[Evidence that a persistent propagule bank is formed (>1 yr)? No. Short-lived spores] "Plants produce large numbers of spores, but few spores survive because they are short-lived and grow best on mud that has recently been flooded and is rich in nutrients."
802	2013. NSW Department of Primary Industries. Weed Alert: Horsetails. <a href="http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails">http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles/horsetails</a> [Accessed 07 Jan 2014]	[Evidence that a persistent propagule bank is formed (>1 yr)? No] "Horsetails also produce spores that require prolonged periods of moist conditions to germinate successfully. Most spores die from moisture stress."
803	1980. Finnerty, D.W./Glaser, A.V.. Control of <i>Equisetum hyemale</i> with DPX 4189. Pp. 103-104 in Proceedings North Central Weed Control Conference. Volume 35.	[Well controlled by herbicides? Yes] " <i>Equisetum hyemale</i> is a problem in ditches and along roadsides and railways in the central USA. In the present study, DPX 4189 (chlorsulfuron) applied at 0.0625, 0.125 and 0.25 lb/acre in the autumn or at 0.03125, 0.0625 and 0.125 lb/acre in the spring gave 99%, 100%, 100%, 80%, 90% and 93% control of <i>E. hyemale</i> , respectively, on assessment the following September. In other studies, chlorsulfuron also showed promise for the control of <i>Cirsium arvense</i> , <i>Taraxacum officinale</i> and <i>Rosa</i> spp."
803	2006. Ainsworth, N./Gunasekera, L./Bonillo, J.. Management of horsetail species using herbicides. Pp. 279-282 in Proceedings of the 15th Australian Weeds Conference.	[Well controlled by herbicides? Yes] "Eleven herbicide treatments were tested on two species of horsetail <i>Equisetum hyemale</i> L. (scouring rush) and <i>Equisetum arvense</i> L. (field or common horsetail) to provide additional information on control options, in the context of ongoing efforts to eradicate early infestations." ... "Results are discussed in relation to previous trials and to recent experiences in the eradication program for <i>Equisetum</i> spp. In Victoria. Glyphosate wiping, amitrole and MCPA all appear to be treatments that may be useful additions to current control practice in particular circumstances."
804	2006. Ainsworth, N./Gunasekera, L./Bonillo, J.. Management of horsetail species using herbicides. Pp. 279-282 in Proceedings of the 15th Australian Weeds Conference.	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "Control of <i>Equisetum</i> spp. By cultivation is ineffective, due the extensive rhizome and tuber network, which also causes them to be resistant to repeated mowing, slashing or burning."

---

804	2014. Missouri Botanical Gardens. <i>Equisetum hyemale</i> . <a href="http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670">http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=c670</a> [Accessed 07 Jan 2014]	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "It is a very aggressive plant which, if not preemptively restrained, will spread aggressively by branched, creeping rhizomes. Once established, it can be extremely difficult to remove by digging because its rhizomes spread wide and deep, and any small section of rhizome left behind can sprout a new plant. Consider using soil barriers to restrict growth."
805	2014. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown. No Equisetaceae native or known to be naturalized in the Hawaiian Islands]

---



## **Summary of Risk Traits**

### **High Risk / Undesirable Traits**

- Elevation range exceeds 1000 m
- Naturalized
- Weedy and difficult to remove
- A potential agricultural and environmental weed
- Related Equisetum species have become invasive
- Toxic to cattle and other grazing animals
- Tolerates many soil types
- Shade tolerant
- May hybridize with other Equisetum species
- Spread by spores and vegetatively by rhizomes
- Can resprout if only aboveground vegetative material is removed

### **Low Risk Traits**

- Thrives in temperate climates, so may only threaten higher elevation ecosystems in the tropics
- Unarmed (no spines, thorns, or burrs)
- Short-lived spores
- Herbicides may provide effective control