Taxon: Tragopogon porrifolius L. **Family:** Asteraceae

Common Name(s): goat's beard
oyster plant
salsify
vegetable-oyster

Synonym(s): Tragopogon porrifolius f. porrifolius
Tragopogon sativus Gaterau
Tragopogon sinuatus Avé-Lall.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 24 Feb 2016

WRA Score: 6.5 **Designation:** H(HPWRA) **Rating:** High Risk

Keywords: Biennial Herb, Temperate, Edible, Self-Compatible, Wind-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
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	y
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		
304	Environmental weed		
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		
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	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
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)		
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets		
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	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
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)		
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant		
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)		
708	Propagules survive passage through the gut		
801	Prolific seed production (>1000/m2)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire		
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	**Is the species highly domesticated?**	**n**
	Source(s)	**Notes**
	Dempewolf, H., Rieseberg, L. H., & Cronk, Q. C. (2008). Crop domestication in the Compositae: a family-wide trait assessment. Genetic Resources and Crop Evolution, 55(8), 1141-1157	"Table 2 Degree of domestication for some species in the Compositae that are suitable for human consumption" [Tragopogon porrifolius - Domestication category = Weak/no]
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	[No evidence of domestication] "Tragopogon porrifolius was commonly used as a food plant in northern Europe in the middle ages. It subsequently spread world-wide, being brought to North America by early settlers in the West (Clark 1973; Fritz et al. 1992). Not long after its introduction to North America, it escaped cultivation. The North American Indians used it for food and chewed the milky stems to cure indigestion (Clark 1973)."

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. 2016. Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. 2016. Personal Communication	NA

201	**Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"**	**Low**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 23 Feb 2016]	"Native: Africa Northern Africa: Algeria; Libya; Morocco; Tunisia Asia-Temperate Caucasus: Armenia; Azerbaijan Western Asia: Cyprus; Egypt - Sinai; Israel; Jordan; Lebanon; Syria; Turkey Europe Southeastern Europe: Bosnia and Herzegovina; Bulgaria; Croatia; Greece; Italy; Macedonia; Montenegro; Romania; Slovenia Southwestern Europe: France; Spain"

Qsn #	Question	Answer
202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed]	

203	**Broad climate suitability (environmental versatility)**	**y**
	Source(s)	**Notes**
	Floridata. 2015. Tragopogon porrifolius. http://floridata.com/Plants/Asteraceae/Tragopogon%20porrifolius/1105. [Accessed 23 Feb 2016]	"Hardiness: USDA Zones 4 - 9" [Occurs in 5+ hardiness zones]
	Dave's Garden. 2016. Vegetable Oyster Plant, Salsify, Wild Quinine - Tragopogon porrifolius. http://davesgarden.com/guides/pf/go/1363/. [Accessed 23 Feb 2016]	"Hardiness: USDA Zone 6a: to -23.3 °C (-10 °F) USDA Zone 6b: to -20.5 °C (-5 °F) USDA Zone 7a: to -17.7 °C (0 °F) USDA Zone 7b: to -14.9 °C (5 °F) USDA Zone 8a: to -12.2 °C (10 °F) USDA Zone 8b: to -9.4 °C (15 °F) USDA Zone 9a: to -6.6 °C (20 °F) USDA Zone 9b: to -3.8 °C (25 °F) USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F)"

204	**Native or naturalized in regions with tropical or subtropical climates**	**y**
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai‘i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i escaping cultivation at least in South Kohala District, Hawai'i."

205	**Does the species have a history of repeated introductions outside its natural range?**	**y**
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"Tragopogon porrifolius was commonly used as a food plant in northern Europe in the middle ages. It subsequently spread world-wide, being brought to North America by early settlers in the West (Clark 1973; Fritz et al. 1992). Not long after its introduction to North America, it escaped cultivation. The North American Indians used it for food and chewed the milky stems to cure indigestion (Clark 1973)."

301	**Naturalized beyond native range**	**y**
	Source(s)	**Notes**

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to Europe; in Hawai'i escaping cultivation at least in South Kohala District, Hawai'i. First collected in 1938 (Hosaka 2285, BISH)."
	Queensland Government. 2011. Weeds of Australia - Tragopogon porrifolius. http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Tragopogon_porrifolius.htm. [Accessed 23 Feb 2016]	"Naturalised Distribution: Widely naturalised in southern and eastern Australia (i.e. in southern Queensland, New South Wales, the ACT, Victoria, Tasmania, south-eastern and eastern South Australia and south western and southern Western Australia). Also naturalised on Norfolk Island. Naturalised in other temperate regions of the world, including in many parts of Canada and the USA."
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 23 Feb 2016]	"Naturalized: Africa, Macaronesia: Spain - Canary Islands. Southern Africa: Lesotho; South Africa. Asia-Temperate, China: China. Australasia, Australia: Australia, New Zealand: New Zealand. Europe, East Europe: Belarus; Moldova; Russian Federation-European part - European part; Ukraine, Middle Europe: Belgium; Netherlands, Northern Europe: Ireland; Sweden; United Kingdom, Southwestern Europe: Spain. Northern America, Eastern Canada: Canada - New Brunswick, - Nova Scotia, - Ontario, - Quebec, North-Central U.S.A.: United States - Illinois, - Iowa, - Kansas, - Missouri, - Oklahoma, - South Dakota, - Wisconsin, Northeastern U.S.A.: United States - Connecticut, - Indiana, - Maine, - Massachusetts, - Michigan, - New Hampshire, - New Jersey, - New York, - Ohio, - Pennsylvania, - West Virginia, Northern Mexico: Mexico - Baja Norte, Northwestern U.S.A.: United States - Colorado, - Idaho, - Montana, - Oregon, - Washington, - Wyoming, South-Central U.S.A.: United States - New Mexico, - Texas, Southeastern U.S.A.: United States - Arkansas, - Delaware, - Georgia, - Kentucky, - Maryland, - North Carolina, - Tennessee, - District of Columbia, Southwestern U.S.A.: United States - Arizona, - California, - Utah, Western Canada: Canada - Alberta, - British Columbia, - Manitoba. Pacific: North-Central Pacific: United States - Hawaii. Southern America: Southern South America: Argentina; Chile"
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"Tragopogon porrifolius tends to be more localized than the other two species in North America (Frankton and Mulligan 1970), yet naturalized populations are reported throughout southern Canada (Scoggan 1979). According to herbarium records, populations of T. porrifolius are clustered on Vancouver Island, throughout southern Ontario and in parts of southern Quebec (Fig. 3)."

302	Garden/amenity/disturbance weed	y
	Source(s)	**Notes**
	Royal Botanic Gardens Victoria. 2015. VicFlora Flora of Victoria - Tragopogon porrifolius. http://data.rbg.vic.gov.au/vicflora/flora/taxon/6fdf44fa-080b-40ba-988d-43dced676bc0. [Accessed 23 Feb 2016]	"An occasional but widespread weed of roadsides, pasture, wasteland and other disturbed sites."
	UC IPM. 2014. Common salsify (Tragopogon porrifolius). Agriculture and Natural Resources, UC Davis, CA. http://www.ipm.ucdavis.edu/PMG/WEEDS/common_salsify.html. [Accessed 23 Feb 2016]	"Habitat: Disturbed sites, fields, orchards, vineyards, perennial crop fields, roadsides, vacant urban lots, trail sides in woodlands and grass lands, open areas in coniferous forests, and other unmanaged, disturbed places."

Qsn #	Question	Answer
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"T. pratensis and T. porrifolius tend to be restricted to roadsides and waste places (Soltis and Soltis 1991)"

303	Agricultural/forestry/horticultural weed	
	Source(s)	**Notes**
	UC IPM. 2014. Common salsify (Tragopogon porrifolius). Agriculture and Natural Resources, UC Davis, CA. http://www.ipm.ucdavis.edu/PMG/WEEDS/common_salsify.html. [Accessed 24 Feb 2016]	[Documented as present with crops. Impacts unspecified] "Disturbed sites, fields, orchards, vineyards, perennial crop fields, roadsides, vacant urban lots, trail sides in woodlands and grass lands, open areas in coniferous forests, and other unmanaged, disturbed places."
	Randall, R.P. 2012. A Global Compendium of Weeds. 2nd Edition. Department of Agriculture and Food, Western Australia	Cited as a weed of agriculture. Impacts unspecified

304	Environmental weed	
	Source(s)	**Notes**
	Queensland Government. 2011. Weeds of Australia - Tragopogon porrifolius. http://keyserver.lucidcentral.org/weeds/data/03030800-0b07-490a-8d04-0605030c0f01/media/Html/Tragopogon_porrifolius.htm. [Accessed 23 Feb 2016]	"Salsify (Tragopogon porrifolius) is regarded as an environmental weed in Victoria, South Australia, Tasmania, Western Australia and the ACT. It was recently listed as a priority environmental weed in at least one Natural Resource Management region."

305	Congeneric weed	y
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"Economic Importance (a) Detrimental — Both T. pratensis and T. dubius are increasingly a subject of concern for rangelands in British Columbia, competing with native species like blue-bunch wheatgrass, Agropyron spicatum (Pursh) Scribn. & Smith (Upadhyaya et al. 1993). Tragopogon species have been shown to reduce the leaf area and shoot/root ratio of bluebunch wheatgrass, an important component of BC grasslands (Upadhyaya et al. 1993). Dominance of T. pratensis and T. dubius in certain areas (e.g. Williams Lake, BC) can be attributed to an extensive root system and prolific reproduction from seed (Qi 1993; Upadhyaya et al. 1993). Tragopogon species may also form dense stands in some urban areas (Novak et al. 1991) although they tend to form only a minor constituent of disturbed areas and waste places."
	weedinfo.ca. 2016. Goat's-beard, Tragopogon dubius. Agriculture and Agri-Food Canada. http://www.weedinfo.ca/en/weed-index/view/id/TRODM. [Accessed 23 Feb 2016]	"Goat's-beard occurs throughout Ontario in pastures, meadows, roadsides and occasionally gardens." ... "In Ontario, goat's beard is considered to be a noxious weed." ... "Plants tend to be bitter, fibrous and strong. "

401	Produces spines, thorns or burrs	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Biennial herbs from a deep taproot, with milky sap; stems 1 to few, coarse and very tough, (2-)3-8 dm long, sparingly branched above." ... "Plants glabrous; stems 4-10 dm long. Leaves usually 10-30 cm long, 1-2 cm wide."

402	Allelopathic	
	Source(s)	**Notes**
	WRA Specialist. 2016. Personal Communication	Unknown

403	Parasitic	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Biennial herbs from a deep taproot, with milky sap; stems 1 to few, coarse and very tough, (2-)3-8 dm long, sparingly branched above. Leaves simple, alternate, linear, appearing grass-like, margins entire." [Asteraceae]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"Mammals — Flowering stalks and foliage of salsify species are utilized by a variety of mammals. In the prairies, pocket gophers (Geomys bursarius) feed frequently on Tragopogon roots (Behrend and Tester 1988), and may consume 20 to 80% of the primary root (Reichman and Smith 1991). Other mammals such as deer, squirrels or rabbits may bite off one or more flowering stalks. Mature plants tend to be grazed less, although deer have been observed to consume the flower heads (Reichman and Smith 1991)."
	UC IPM. 2014. Common salsify (Tragopogon porrifolius). Agriculture and Natural Resources, UC Davis, CA. http://www.ipm.ucdavis.edu/PMG/WEEDS/common_salsify.html. [Accessed 23 Feb 2016]	"The taproot and other plant parts are edible. Animals feed on its leaves and fruit."

405	Toxic to animals	n
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	[No evidence] "Tragopogon begins growth early in the season, and is heavily grazed by livestock at that time. Intensive but short-term early season removal of Tragopogon can reduce weed density by 25 to 50% after 3 yr of simulated grazing (D. E. Blumenauer, B.C. Ministry of Agriculture, Fisheries, and Food, personal communication)."
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"Microorganisms — Parmelee and Malloch (1972) reported the first known occurrence of the rust fungus Puccinia hysterium (Str.) Röhl. on T. pratensis in North America. In Canada it is found in southern Ontario and Quebec, and is widely distributed in Europe and western Asia (Parmelee and Malloch 1972). According to European information, other Tragopogon species, including T. dubius and T. porrifolius may also act as hosts of this fungus. Fritz et al. (1992) observed that greenhouse-grown T. porrifolius and T. pratensis were susceptible to mildew (Erysiphe cichoracearum) and white rust (Albugo candida)."
	Shoot Gardening. 2016. Tragopogon porrifolius. https://www.shootgardening.co.uk/plant/tragopogon-porrifolius. [Accessed 23 Feb 2016]	"Specific pests: Carrot fly , Slugs , Snails , Swift moth larvae , Wireworms Diseases: Extremely resistant to canker. Specific diseases: Black rot , Foot and root rot , Root rot , Rust , Soft rot , Verticillium wilt "

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	**Notes**
	Plants for a Future. 2016. Tragopogon porrifolius. http://www.pfaf.org/user/plant.aspx?LatinName=Tragopogon+porrifolius. [Accessed 23 Feb 2016]	"Known Hazards: None known"
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	[No evidence. Edible] "Although the roots of all of the Tragopogon species found in North America are edible, T. porrifolius is the species widely cultivated as a vegetable (Frankton and Mulligan 1970; Warashina et al. 1991). The names “vegetable oyster” or “oyster plant” refer to the faint oyster-like flavor possessed by the roots of T. porrifolius (Splittstoesser 1984). The parsnip-like roots are harvested prior to flowering in the spring, but the flavor is enhanced if the roots are harvested after a freeze in the fall. It was more commonly consumed in the sixteenth century than in later centuries, and one botanist from the period described the taste as surpassing that of carrots or parsnips (Henslow 1912). The greens may also be eaten and have a sweet taste (Fritz et al. 1992). Thus uses for vegetable oyster range from use in soups, salads, as a coffee substitute or a dietetic medicine [Körber-Growhne (1987) cited in Fritz et al. (1992)]. Although use of vegetable oyster has declined it may have some potential to become a nutritious specialty vegetable (Fritz et al. 1992)."
	Wagstaff, D.J. 2008. International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

Qsn #	Question	Answer
408	**Creates a fire hazard in natural ecosystems**	**n**
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	[No evidence. Occurs in moist habitats] "Tragopogon pratensis favors slightly moister habitats than T. dubius (Hitchcock and Cronquist 1973). Still moister conditions are preferred by T. porrifolius (Hitchcock and Cronquist 1973; Parish et al. 1996) although once established its plants can withstand drought (Splittstoesser 1984)."

409	**Is a shade tolerant plant at some stage of its life cycle**	**y**
	Source(s)	**Notes**
	Dave's Garden. 2016. Vegetable Oyster Plant, Salsify, Wild Quinine - Tragopogon porrifolius. http://davesgarden.com/guides/pf/go/1363/. [Accessed 23 Feb 2016]	"Sun Exposure: Sun to Partial Shade"
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"Tragopogon porrifolius tended to prefer shade;"

410	**Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)**	
	Source(s)	**Notes**
	Dave's Garden. 2016. Vegetable Oyster Plant, Salsify, Wild Quinine - Tragopogon porrifolius. http://davesgarden.com/guides/pf/go/1363/. [Accessed 23 Feb 2016]	"Soil pH requirements: 6.6 to 7.5 (neutral) 7.6 to 7.8 (mildly alkaline)"
	Shoot Gardening. 2016. Tragopogon porrifolius. https://www.shootgardening.co.uk/plant/tragopogon-porrifolius. [Accessed 23 Feb 2016]	"Soil type: Loamy, Sandy Soil drainage: Moist but well-drained, Well-drained Soil pH: Acid, Neutral"
	Floridata. 2015. Tragopogon porrifolius. http://floridata.com/Plants/Asteraceae/Tragopogon%20porrifolius/1105. [Accessed 23 Feb 2016]	"The soil should be fertile and deeply cultivated. It should not be rocky or clayey."
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	[Other taxa occur on a variety of soils] "Tragopogon pratensis and T. dubius grow on a variety of soil types ranging from sandy to clay loam (Upadhyaya et al. 1993). In one area where T. pratensis has been observed thriving in central British Columbia, the soils are gravelly loams developed on moderately calcareous, gravelly clay loam till parent material (Agriculture Canada 1988). Seeds of both T. pratensis and T. dubius lose viabilty after prolonged exposure to anaerobiosis; after 12 days of anaerobiosis at 25°C, 100% of seeds tested were non-viable indicating that these species are best adapted to well-drained soils (Qi and Upadhyaya 1993)."

Qsn #	Question	Answer
411	**Climbing or smothering growth habit**	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Biennial herbs from a deep taproot, with milky sap; stems 1 to few, coarse and very tough, (2-)3-8 dm long, sparingly branched above. Leaves simple, alternate, linear, appearing grass-like, margins entire."

412	**Forms dense thickets**	
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"Tragopogon species may also form dense stands in some urban areas (Novak et al. 1991) although they tend to form only a minor constituent of disturbed areas and waste places." [Possibly, although taxa unspecified]

501	**Aquatic**	n
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	[Terrestrial herb] "...T. pratensis and T. porrifolius tend to be restricted to roadsides and waste places (Soltis and Soltis 1991)." ... "...T. porrifolius was limited to meadow steppe vegetation zones in Washington and coniferous forest zones in Idaho."

502	**Grass**	n
	Source(s)	**Notes**
	USDA, ARS, Germplasm Resources Information Network, 2016. National Plant Germplasm System [Online Database]. http://www.ars-grin.gov/npgs/index.html. [Accessed 23 Feb 2016]	"Family: Asteraceae (alt.Compositae) Subfamily: Cichorioideae Tribe: Cichorieae Subtribe: Scorzonerinae"

503	**Nitrogen fixing woody plant**	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Biennial herbs from a deep taproot" [Asteraceae]

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Biennial herbs from a deep taproot,..."

601	**Evidence of substantial reproductive failure in native habitat**	n

Qsn #	Question	Answer
	Source(s)	**Notes**
	Roose, M. L., & Gottlieb, L. D. (1976). Genetic and biochemical consequences of polyploidy in Tragopogon. Evolution, 30(4): 818-830.	[No evidence] "The three diploid species, Tragopogon dubius, T. porrifolius and T. pratensis are widespread in the Old World and have become widely naturalized in the United States. In southeastern Washington and adjacent."

602	Produces viable seed	y
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Achenes 2.5-4 cm long, the body 1-1.6 cm long, abruptly contracted into ' a long slender beak."
	UC IPM. 2014. Common salsify (Tragopogon porrifolius). Agriculture and Natural Resources, UC Davis, CA. http://www.ipm.ucdavis.edu/PMG/WEEDS/common_salsify.html. [Accessed 23 Feb 2016]	"Reproduces by seed."
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"Sowing of fresh T. porrifolius seeds is recommended because stored seeds remain viable for only one year (Splittstoeser 1984)."

603	Hybridizes naturally	y
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"Tetraploid hybrids resulting from crosses amongst the three diploid Tragopogon species have been studied extensively. Hybridization in the natural environment has been observed to result from crosses between T. dubius and T. pratensis, and between T. dubius and T. porrifolius, but not between T. pratensis and T. porrifolius (Novak et al. 1991)."

604	Self-compatible or apomictic	y
	Source(s)	**Notes**
	Roose, M. L., & Gottlieb, L. D. (1976). Genetic and biochemical consequences of polyploidy in Tragopogon. Evolution, 30(4): 818-830.	"The species are biennial, germinating and forming leaf rosettes one year and flowering stems the following year. They are self-compatible and capable of self-pollination."

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Heads solitary, terminating the branches, florets all of ray type; involucre cylindrical or campanulate, the bracts in a single equal series; receptacle naked; ray florets perfect and fertile, rays yellow or purple, 5-toothed; pappus of plumose bristles."
	Roose, M. L., & Gottlieb, L. D. (1976). Genetic and biochemical consequences of polyploidy in Tragopogon. Evolution, 30(4): 818-830.	"The species are biennial, germinating and forming leaf rosettes one year and flowering stems the following year. They are self-compatible and capable of self-pollination."

Qsn #	Question	Answer
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"Tragopogon species are insect pollinated. In the formation of hybrids, the more abundant diploid species usually acts as the pollen donor, as facilitated by pollinators (Soltis and Soltis 1989)."

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	UC IPM. 2014. Common salsify (Tragopogon porrifolius). Agriculture and Natural Resources, UC Davis, CA. http://www.ipm.ucdavis.edu/PMG/WEEDS/common_salsify.html. [Accessed 23 Feb 2016]	"Reproduces by seed."
	Roose, M. L., & Gottlieb, L. D. (1976). Genetic and biochemical consequences of polyploidy in Tragopogon. Evolution, 30(4): 818-830.	[No evidence] "The species are biennial, germinating and forming leaf rosettes one year and flowering stems the following year."

607	Minimum generative time (years)	2
	Source(s)	**Notes**
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. 1999. Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Biennial herbs from a deep taproot..."
	Roose, M. L., & Gottlieb, L. D. (1976). Genetic and biochemical consequences of polyploidy in Tragopogon. Evolution, 30(4): 818-830.	"The species are biennial, germinating and forming leaf rosettes one year and flowering stems the following year."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"T. pratensis and T. porrifolius tend to be restricted to roadsides and waste places (Soltis and Soltis 1991)" [Occurs in heavily trafficked areas]
	UC IPM. 2014. Common salsify (Tragopogon porrifolius). Agriculture and Natural Resources, UC Davis, CA. http://www.ipm.ucdavis.edu/PMG/WEEDS/common_salsify.html. [Accessed 23 Feb 2016]	[Possibly. Occurs in heavily trafficked areas such as roadsides & trail sides. Hairs may aid in attachment to clothing, or mud on vehicles] "Habitat: Disturbed sites, fields, orchards, vineyards, perennial crop fields, roadsides, vacant urban lots, trail sides in woodlands and grass lands..." ... "Mature fruiting heads look like those of dandelion puffballs. The tiny, oblong to narrowly football-shaped fruit is about 1 to 1-3/5 inches (2.5–4 cm) long, and has a thin projection that ends in a tuft of soft white hairs. Each fruit contains one seed."

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Victory Seed Company. 2016. Salsify - Tragopogon porrifolius. http://www.victoryseeds.com/salsify.html. [Accessed 23 Feb 2016]	"Each packet contains two grams or approximately 200 seeds." [Seeds sold commercially]

Qsn #	Question	Answer
703	**Propagules likely to disperse as a produce contaminant**	
	Source(s)	**Notes**
	Mangold, J. 2011. Western salsify. MT201113AG. MSU Extension, Bozeman, MT. www.msuextension.org	[Related taxa documented as seed contaminant. T. porrifolius, with a similar biology, might also become a contaminant] "Tragopogon dubius" ... "Western salsify can be a seed contaminant, so buying weed-free, high quality seed can help prevent introductions on cropland, pasture and conservation seedings."

704	**Propagules adapted to wind dispersal**	**y**
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"The large, broad, flat pappus of Tragopogon species has ideal aerodynamic characteristics for aerial dispersal. Gross and Werner (1982) measured wind dispersal of salsify seeds over distances exceeding 250 m. The dark colored peripheral seeds exhibit a terminal velocity approximately 1.3 times greater than that of central seeds, which results in lower dispersal potential (McGinley 1989; McGinley and Brigham 1989). However, due to geometrical constraints, the terminal velocity does not increase linearly with either the area or the mass of the pappus (McGinley and Brigham 1989). Therefore, pappus size may not be a direct indicator of parental investment in dispersal ability."

705	**Propagules water dispersed**	
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	[Pappus may aid in buoyancy if achenes land on water] "The large, broad, flat pappus of Tragopogon species has ideal aerodynamic characteristics for aerial dispersal."

706	**Propagules bird dispersed**	**n**
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	[No evidence] "The large, broad, flat pappus of Tragopogon species has ideal aerodynamic characteristics for aerial dispersal."

707	**Propagules dispersed by other animals (externally)**	
	Source(s)	**Notes**
	Römermann, C., Tackenberg, O., & Poschlod, P. (2005). How to predict attachment potential of seeds to sheep and cattle coat from simple morphological seed traits. Oikos, 110(2), 219-230	[Tragopogon pratensis may attach to sheep wool. It may be possible that the pappus of T. porrifolius may aid in adherence to animals as well] "Appendix 1. Species list of the 130 investigated species. Given are attachment potentials of seeds in sheep wool (AtP (%) sheep) and cattle hair (AtP(%) cattle) and the seed traits mass, length, width, height, shape and main morphological type"

708	**Propagules survive passage through the gut**	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	[Consumed by animals. Unknown if viable seeds survive ingestion] "Mammals — Flowering stalks and foliage of salsify species are utilized by a variety of mammals. In the prairies, pocket gophers (Geomys bursarius) feed frequently on Tragopogon roots (Behrend and Tester 1988), and may consume 20 to 80% of the primary root (Reichman and Smith 1991). Other mammals such as deer, squirrels or rabbits may bite off one or more flowering stalks. Mature plants tend to be grazed less, although deer have been observed to consume the flower heads (Reichman and Smith 1991)."

802	**Evidence that a persistent propagule bank is formed (>1 yr)**	**y**
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"Sowing of fresh T. porrifolius seeds is recommended because stored seeds remain viable for only one year (Splittstoeser 1984)."
	Royal Botanic Gardens Kew. (2016) Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/. [Accessed 23 Feb 2016]	"Storage Behaviour: Orthodox Storage Conditions: 13% germination following 15 years open storage in a warehouse (Stevens et al., 1981); p50= 2.6 years for seeds stored under open storage in a temperate climate (Priestley, 1986); long-term storage underIPGRI preferred conditions at RBG Kew, WP. Oldest collection 13 years; germination change 100 to 100%, 12 years, 1 collection"
	Haubensak, K. & Smyth, A. 1999. Tragopogon porrifolius. Prepared for Channel Islands National Park. http://sbsc.wr.usgs.gov/research/projects/swepic/factsheets/Tragopogon_porrifolius.pdf. [Accessed 23 Feb 2016]	[<3% remain viable after 1 year] "The seed bank was found to be short lived, with more than 60% of the seed population depleted due to germination on the soil surface in late fall of 1989; it was also nearly depleted in 1990. In both years fewer than 3% of all seed remained after 1 year of burial. The impact of these remaining seeds on long term persistence of the population remains to be explored."

803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	[Methods may be effective against. T. porrifolius] "Long-term (4-yr) control of T. pratensis may be achieved with picloram at rates as low as 0.28 and 0.56 kg ha–1 (Cranston et al. 1986). Short term (1 year) control is possible with dicamba at 1.00 kg ha–1. In British Columbia trials, use of picloram and dicamba herbicides led to a more than fourfold increase in grass forage weight due to reduced T. pratensis competition. 2,4-D amine at 0.68 and 1.63 kg ha–1, and MCPA amine at 1.40 and 2.10 kg ha–1 gave poor control (Cranston et al. 1986). Herbicides such as picloram are most effective at the seedling stage. Destruction of seedlings in the spring, affecting both fall and spring germinants can be a particularly effective management strategy to deplete Tragopogon seed banks (Qi et al. 1996b)."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	

Qsn #	Question	Answer
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	[Possibly. Taproot may allow plants to persist prior to bolting] "Mowing or controlled fire after bolting but before seed setting may effectively be used to reduce Tragopogon seed production (Qi 1993)."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**
	Clements, D. R., Upadhyaya, M. K., & Bos, S. J. (1999). The biology of Canadian weeds. 110. Tragopogon dubius Scop., Tragopogon pratensis L., and Tragopogon porrifolius L. Canadian Journal of Plant Science, 79(1), 153-163	"One potential biological control agent for Tragopogon is the fungus Puccinia hysterium (Parmelee and Malloch 1972). Seed-eating insects, or other organisms that feed on seeds, would be good candidates for biological control because of the limited persistence of Tragopogon seeds in soil. Gross and Werner (1982) reported 73% predation within 24 h when T. dubius seeds were set out in petri dishes. Post-dispersal seed predation therefore is potentially a large source of mortality."
	WRA Specialist. 2016. Personal Communication	[Unknown] "Native to Europe; in Hawai'i escaping cultivation at least in South Kohala District, Hawai'i. First collected in 1938 (Hosaka 2285, BISH)."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Broad climate suitability (>5 hardiness zones)
• Naturalized on Hawaii island, & widely naturalized elsewhere
• Disturbance-adapted with potential negative effects on agriculture & the natural environment
• Other Tragopogon species have become invasive
• Shade-tolerant, although typically grows in high light environments
• Reproduces by seed
• Hybridizes with other Tragopogon species
• Self-compatible
• Biennial. Reaches maturity in second growing season
• Seeds dispersed by wind & intentionally by people
• Some seeds may persist in the soil seed bank for >1 year

Low Risk Traits
• Unarmed (no spines, thorns or burrs)
• Palatable to animals
• Non-toxic
• Edible to humans
• Not reported to spread vegetatively
• Herbicides, mowing & fire may provide effective control