Taxon: Linum flavum L. **Family:** Linaceae

Common Name(s): golden flax
yellow flax

Synonym(s): Linum flavum L. var. flavum
Xantholinum flavum (L.) Rchb.

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 25 May 2022

WRA Score: -4.0 **Designation:** L **Rating:** Low Risk

Keywords: Perennial Herb, Temperate Climate, Outcrossing, Insect-Pollinated, Autochory

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	n
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	n
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		
303	Agricultural/forestry/horticultural weed		
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
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		
406	Host for recognized pests and pathogens	y=1, n=0	n
407	Causes allergies or is otherwise toxic to humans		
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		

Qsn #	Question	Answer Option	Answer
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	n
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		
604	Self-compatible or apomictic	y=1, n=-1	n
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)	y=1, n=-1	n
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	n
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	y=1, n=-1	n
801	Prolific seed production (>1000/m2)	y=1, n=-1	n
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**
	Bojňanský, V. & Fargašová, A. (2007). Atlas of Seeds and Fruits of Central and East-European Flora: The Carpathian Mountains Region. Springer, Dordrecht, The Netherlands	"Native to central and southeastern Europe, in light, dry, calcareous stands, borders of xerotherme shrubberies and wooded slopes, in lowlands and uplands; rarely cultivated throughout the Carpathians in gardens as an ornamental." [No evidence]

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. (2022). Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2022). 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, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 23 May 2022]	"Native Asia-Temperate WESTERN ASIA: Turkey CAUCASUS: Russian Federation-Ciscaucasia [Ciscaucasia], Russian Federation [Dagestan] Europe MIDDLE EUROPE: Czechoslovakia, Austria, Germany, Hungary, Poland EASTERN EUROPE: Russian Federation-European part [European part], Belarus, Moldova, Ukraine SOUTHEASTERN EUROPE: Former Yugoslavia, Albania, Bulgaria, Italy, Romania"

202	**Quality of climate match data**	**High**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 23 May 2022]	

203	**Broad climate suitability (environmental versatility)**	**n**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Eker İ, Kaya A, Çelik A, Eker N. (2022). İbuflora (Bolu Abant İzzet Baysal Üniversitesi Kampüs Florası). http://ibuflora.com. [Accessed 24 May 2022]	"Habitat: Calcareous steppe, hillsides, fallow fields, and roadsides, 500–1000 m."
	Dave's Garden. (2022). Linum Species, Golden Flax, Yellow Flax. Linum flavum. https://davesgarden.com/guides/pf/go/53546/. [Accessed 24 May 2022]	"Hardiness: USDA Zone 5a: to -28.8 °C (-20 °F) USDA Zone 5b: to -26.1 °C (-15 °F) 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)"

204	**Native or naturalized in regions with tropical or subtropical climates**	**n**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 23 May 2022]	"Native Asia-Temperate WESTERN ASIA: Turkey CAUCASUS: Russian Federation-Ciscaucasia [Ciscaucasia], Russian Federation [Dagestan] Europe MIDDLE EUROPE: Czechoslovakia, Austria, Germany, Hungary, Poland EASTERN EUROPE: Russian Federation-European part [European part], Belarus, Moldova, Ukraine SOUTHEASTERN EUROPE: Former Yugoslavia, Albania, Bulgaria, Italy, Romania"
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"References: Japan-N-287, Japan-N-794, Serbia-W-1238, Japan-N-1278, Serbia-A- 1372, Turkey-A-87, Australia-N-1902, Australia-W-1977, Japan-W-1977."

205	**Does the species have a history of repeated introductions outside its natural range?**	**y**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Herbal, Ornamental Dispersed by: Humans, Water Weed of: Pastures References: Japan-N-287, Japan-N-794, Serbia-W-1238, Japan-N-1278, Serbia-A-1372, Turkey-A-87, Australia-N-1902, Australia-W-1977, Japan-W-1977."
	KewScience. (2022). Plants of the World Online - Linum flavum. http://powo.science.kew.org. [Accessed 24 May 2022]	"Native to: Albania, Austria, Bulgaria, Central European Rus, Czechoslovakia, Germany, Hungary, Italy, Krym, Poland, Romania, South European Russi, Turkey, Ukraine, Yugoslavia Introduced into: East European Russia"
	GBIF Secretariat (2022). Linum flavum L. GBIF Backbone Taxonomy. Checklist dataset. https://www.gbif.org/species/7293238. [Accessed 24 May 2022]	"Recorded as introduced in Japan" ... "Evidence of impact = No"

301	**Naturalized beyond native range**	**y**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[N = naturalized. Reported naturalized in Japan, and Australia] "References: Japan-N-287, Japan-N-794, Serbia-W-1238, Japan-N-1278, Serbia-A-1372, Turkey-A-87, Australia-N-1902, Australia-W-1977, Japan-W-1977."
	Imada, C. (2019). Hawaiian Naturalized Vascular Plants Checklist (February 2019 update). Bishop Museum Technical Report 69. Bishop Museum, Honolulu, HI	No evidence

302	Garden/amenity/disturbance weed	
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[Possibly. The listed references that designate this species as a weed provide no descriptions of impacts] "Weed of: Pastures References: Japan-N-287, Japan-N-794, Serbia-W-1238, Japan-N-1278, Serbia-A-1372, Turkey-A-87, Australia-N-1902, Australia-W-1977, Japan-W-1977."

303	Agricultural/forestry/horticultural weed	
	Source(s)	**Notes**
	Kojić, M., Vrbničanin, S., Dajić, Z., & Mrfat-Vukelić, S. (2001). Weed flora of natural grasslands in Serbia. Acta Herbologica, 10(1), 1-22	"Table 1. Grassland weeds of Serbia" [Includes Linum flavum]
	Nestorović, M., & Konstantinovic, B. (2011). Overview of the weed flora in the Serbia. Contemporary Agriculture, 60(1-2): 215-230	[Classified as a former weed, possibly due to management actions] "Table 2 – Plant species that used to be considered weeds." [Includes Linum flavum] "Table 2 includes 227 species that used to be considered weeds. The species included in Table 2 are currently considered to be rare or threatened species. This all indicates that the activity of herbicides, as well as other chemical and agrotechnical measures, has led to impoverishment and large-scale quantitative and qualitative changes in weed flora of Serbia."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[Possibly. The listed references that designate this species as a weed provide no descriptions of impacts] "Weed of: Pastures References: Japan-N-287, Japan-N-794, Serbia-W-1238, Japan-N-1278, Serbia-A-1372, Turkey-A-87, Australia-N-1902, Australia-W-1977, Japan-W-1977."

304	Environmental weed	n
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	No evidence

305	Congeneric weed	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Queensland Government. (2022). Weeds of Australia. Linum trigynum. https://keyserver.lucidcentral.org. [Accessed 24 May 2022]	"French flax (Linum trigynum) is regarded as an environmental weed in Tasmania, Victoria and Western Australia. This garden escape has become widely naturalised in open areas in Australia, particularly in grasslands and open woodlands. It is seen as a potential threat to one or more vegetation formations in Victoria and appears on some local and regional environmental weeds lists in this state (e.g. in Knox city and the Goulburn Broken Catchment). French flax (Linum trigynum) has also been recorded in Phillip Island Nature Park in Victoria and numerous conservation areas in South Australia (i.e. Marino Conservation Park, Angove Conservation Park, Para Wirra Recreation Park, Morialta Conservation Park, Watts Gully Native Forest Reserve, Kyeema Conservation Park, Sturt Gorge Recreation Park, Belair National Park and Little Mount Crawford Native Forest Reserve). In Tasmania, French flax (Linum trigynum) is widespread in grasslands and grassy woodlands and in south-western Western Australia it grows mainly in damp sites. In New South Wales it is chiefly found south from the Bulahdelah district, and is a weed of woodlands, grasslands and roadsides at Mount Annan Botanic Gardens south-west of Sydney."
	Canadian Food Inspection Agency. (2019). The Biology of Linum usitatissimum L. (Flax). Biology Document BIO1994-10. Plant Biosafety Office, Ottawa, Canada. http://www.inspection.gc.ca/. [Accessed 24 May 2022]	"Volunteer flax is a common weed in fields where flax crop is grown in western Canada and it had been ranked as the 26th most abundant weed (Leeson et al. 2005). Volunteer flax emerges over an extended period of time during the growing season with 50% emergence occurring after the in-crop herbicide application (Dexter et al. 2010a). The population densities of volunteer flax ranged from 31 to 4,597 plants m-2 in 20 commercial fields surveyed in the Canadian Prairies. Naked seeds and flax seed bolls can be lost before or after harvest and are the primary contributor to the seed bank and the reason for volunteer persistence over time. In a study conducted in 10 commercial fields in Alberta, Dexter et al. (2011) reported higher seed losses associated with direct harvesting methods when compared to the windrow harvest methods. The maximum yield loss was found to be 44 kg ha-1 or 2.3% of the estimated crop yield. With respect to seed persistence in the soil, it varied with years and the burial depth (longer seed persistence at 10 cm). In a survey of 20 Western Canadian fields following flax production, volunteers continued to emerge in some fields for three growing seasons at low densities (Dexter et al. 2010a). Cultural, mechanical, chemical, and integrated strategies can be used to control volunteer flax." [Can be a weed with poor management practices, but otherwise apparently a weed of minor significance]

401	Produces spines, thorns or burrs	n
	Source(s)	**Notes**
	Bojňanský, V. & Fargašová, A. (2007). Atlas of Seeds and Fruits of Central and East-European Flora: The Carpathian Mountains Region. Springer, Dordrecht, The Netherlands	[No evidence] "Linum flavum L. – Perennial, stems robust, erect, 20-60 cm, sharply up to wingly, angular. Seeds obovoid, strong flattish, 2.4-2.8 x 1.5-1.7 mm. Surface smooth, lustreless, fine wrinkly, palebrown."

402	Allelopathic	

Qsn #	Question	Answer
	Source(s)	**Notes**
	WRA Specialist. (2022). Personal Communication	Unknown. No evidence found

403	Parasitic	n
	Source(s)	**Notes**
	Bojňanský, V. & Fargašová, A. (2007). Atlas of Seeds and Fruits of Central and East-European Flora: The Carpathian Mountains Region. Springer, Dordrecht, The Netherlands	"Linum flavum L. – Perennial, stems robust, erect, 20-60 cm, sharply up to wingly, angular." [No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Aydın, İ., Pak, B., Algan, D., & Ocak, N. (2020). Floristic Patterns and Qualities of Forage Species from Mountainous Rangeland in the Middle Black Sea Region of Turkey. Turkish Journal of Agriculture-Food Science and Technology, 8(3), 733-740	"Table 4. The Family, growth form (GF), preference by grazing animals (PGA) and response to grazing (RG) of species related to other botanical families" [Linum flavum L. subsp. flavum L. - preference by grazing animals (PGA) = Preferable]

405	Toxic to animals	
	Source(s)	**Notes**
	The Tortoise Table. (2022). Flax (Linum, Linseed). https://www.thetortoisetable.org.uk. [Accessed 24 May 2022]	[Generic description. Possibly for L. flavum] "Most parts of this plant are TOXIC, but the seed contains cyanogenic glycosides, which release toxic hydrogen cyanide in the presence of water, so it is not wise to grow this plant near the tortoise enclosure, in case the seed pods fall into it. Although most Linums have blue flowers, there is a red-flowered variety of Linum grandiflorum, a violet variety of Linum bienne, and a yellow variety of Linum flavum. Linum bienne has a very pale blue flower."
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Unknown. Related plant, Linum usitatissimum, is toxic] "All parts poisonous, toxic if large quantities eaten."

406	Host for recognized pests and pathogens	n
	Source(s)	**Notes**
	live-native.com. (2022). Golden flax – planting, care and tips. https://www.live-native.com/golden-flax-planting-care-tips/#Diseases_and_pests. [Accessed 24 May 2022]	"Golden flax is largely free from plant diseases and pests."
	Gardenia. (2022). Linum flavum 'Compactum' (Golden Flax). https://www.gardenia.net/plant/linum-flavum-compactum. [Accessed 24 May 2022]	"No serious insect or disease issues. Keep an eye out for slugs, snails and aphids."

407	Causes allergies or is otherwise toxic to humans	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Unknown. Related plant, Linum usitatissimum, is toxic] "All parts poisonous, toxic if large quantities eaten."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	**Notes**
	Pladias. (2022). Linum flavum. Database of the Czech Flora and Vegetation. https://pladias.cz/en/taxon/data/Linum%20flavum. [Accessed 24 May 2022]	No evidence
	WRA Specialist. (2022). Personal Communication	No evidence of increased fire risk found where native or cultivated

409	Is a shade tolerant plant at some stage of its life cycle	
	Source(s)	**Notes**
	Gardenia. (2022). Linum flavum 'Compactum' (Golden Flax). https://www.gardenia.net/plant/linum-flavum-compactum. [Accessed 24 May 2022]	"Exposure Full Sun"
	Backyard Gardener. (2021). Linum flavum (Yellow Flax). https://www.backyardgardener.com. [Accessed 24 May 2022]	"Light Range: Part Shade to Full Sun"
	Dave's Garden. (2022). Linum Species, Golden Flax, Yellow Flax. Linum flavum. https://davesgarden.com/guides/pf/go/53546/. [Accessed 24 May 2022]	"Sun Exposure: Full Sun"

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Backyard Gardener. (2021). Linum flavum (Yellow Flax). https://www.backyardgardener.com. [Accessed 24 May 2022]	"pH Range: 5.5 to 7.5 Soil Range: Some Sand to Sandy Loam Water Range: Dry to Normal "
	Gardenia. (2022). Linum flavum 'Compactum' (Golden Flax). https://www.gardenia.net/plant/linum-flavum-compactum. [Accessed 24 May 2022]	"Soil Type Chalk, Loam, Sand Soil pH Acid, Alkaline, Neutral Soil Drainage Well-Drained"

411	Climbing or smothering growth habit	n
	Source(s)	**Notes**
	Bojňanský, V. & Fargašová, A. (2007). Atlas of Seeds and Fruits of Central and East-European Flora: The Carpathian Mountains Region. Springer, Dordrecht, The Netherlands	"Linum flavum L. – Perennial, stems robust, erect, 20-60 cm, sharply up to wingly, angular."

412	Forms dense thickets	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	Eker İ, Kaya A, Çelik A, Eker N. (2022). İbuflora (Bolu Abant İzzet Baysal Üniversitesi Kampüs Florası). http://ibuflora.com. [Accessed 24 May 2022]	"Habitat: Calcareous steppe, hillsides, fallow fields, and roadsides, 500–1000 m." [No evidence]
	Bojňanský, V. & Fargašová, A. (2007). Atlas of Seeds and Fruits of Central and East-European Flora: The Carpathian Mountains Region. Springer, Dordrecht, The Netherlands	[No evidence] "Native to central and southeastern Europe, in light, dry, calcareous stands, borders of xerotherme shrubberies and wooded slopes, in lowlands and uplands; rarely cultivated throughout the Carpathians in gardens as an ornamental."

501	Aquatic	n
	Source(s)	**Notes**
	Bojňanský, V. & Fargašová, A. (2007). Atlas of Seeds and Fruits of Central and East-European Flora: The Carpathian Mountains Region. Springer, Dordrecht, The Netherlands	[Terrestrial] "Native to central and southeastern Europe, in light, dry, calcareous stands, borders of xerotherme shrubberies and wooded slopes, in lowlands and uplands; rarely cultivated throughout the Carpathians in gardens as an ornamental."

502	Grass	n
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 24 May 2022]	"Genus: Linum Family: Linaceae Subfamily: Linoideae"

503	Nitrogen fixing woody plant	n
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 24 May 2022]	"Genus: Linum Family: Linaceae Subfamily: Linoideae"

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	**Notes**
	Pladias. (2022). Linum flavum. Database of the Czech Flora and Vegetation. https://pladias.cz/en/taxon/data/Linum%20flavum. [Accessed 24 May 2022]	"Storage organ: pleiocorm" [pleiocorm – a system of compact, perennial shoots at the proximal end of the persistent primary root; the innovation shoots arise from the buds in the axils of basal leaves, and the connections between the shoots and the primary root are persistent]

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	**Notes**

Qsn #	Question	Answer
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 24 May 2022]	"Native Asia-Temperate WESTERN ASIA: Turkey CAUCASUS: Russian Federation-Ciscaucasia [Ciscaucasia], Russian Federation [Dagestan] Europe MIDDLE EUROPE: Czechoslovakia, Austria, Germany, Hungary, Poland EASTERN EUROPE: Russian Federation-European part [European part], Belarus, Moldova, Ukraine SOUTHEASTERN EUROPE: Former Yugoslavia, Albania, Bulgaria, Italy, Romania"

602	Produces viable seed	y
	Source(s)	**Notes**
	Pladias. (2022). Linum flavum. Database of the Czech Flora and Vegetation. https://pladias.cz/en/taxon/data/Linum%20flavum. [Accessed 24 May 2022]	"Reproduction type: only by seed/spores"

603	Hybridizes naturally	
	Source(s)	**Notes**
	WRA Specialist. (2022). Personal Communication	Unknown. No evidence found

604	Self-compatible or apomictic	n
	Source(s)	**Notes**
	Pladias. (2022). Linum flavum. Database of the Czech Flora and Vegetation. https://pladias.cz/en/taxon/data/Linum%20flavum. [Accessed 24 May 2022]	"Generative reproduction type: allogamy" [allogamy, self-incompatibility]

605	Requires specialist pollinators	n
	Source(s)	**Notes**
	Pladias. (2022). Linum flavum. Database of the Czech Flora and Vegetation. https://pladias.cz/en/taxon/data/Linum%20flavum. [Accessed 24 May 2022]	"Pollination syndrome: insect-pollination"

606	Reproduction by vegetative fragmentation	n
	Source(s)	**Notes**
	Pladias. (2022). Linum flavum. Database of the Czech Flora and Vegetation. https://pladias.cz/en/taxon/data/Linum%20flavum. [Accessed 24 May 2022]	"Reproduction type: only by seed/spores "

607	Minimum generative time (years)	2
	Source(s)	**Notes**

Qsn #	Question	Answer
	Bojňanský, V. & Fargašová, A. (2007). Atlas of Seeds and Fruits of Central and East-European Flora: The Carpathian Mountains Region. Springer, Dordrecht, The Netherlands	[Probably 1-2 years] "Perennial, stems robust, erect, 20-60 cm, sharply up to wingly, angular."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	**Notes**
	Pladias. (2022). Linum flavum. Database of the Czech Flora and Vegetation. https://pladias.cz/en/taxon/data/Linum%20flavum. [Accessed 24 May 2022]	"Dispersal unit (diaspore): seed Dispersal strategy: Allium (mainly autochory)"
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Water"

702	Propagules dispersed intentionally by people	y
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Herbal, Ornamental Dispersed by: Humans, Water"
	WRA Specialist. (2022). Personal Communication	Promoted for cultivation on a number of commercial and popular websites

703	Propagules likely to disperse as a produce contaminant	
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Herbal, Ornamental Dispersed by: Humans, Water"
	WRA Specialist. (2022). Personal Communication	Possibly. A cultivate crop, although direct evidence has not been found

704	Propagules adapted to wind dispersal	n
	Source(s)	**Notes**
	Pladias. (2022). Linum flavum. Database of the Czech Flora and Vegetation. https://pladias.cz/en/taxon/data/Linum%20flavum. [Accessed 25 May 2022]	"Dispersal strategy: Allium (mainly autochory)" [Allium type – mainly autochory, less frequently anemochory, endozoochory and epizoochory. This is the most common dispersal strategy, including about 56% taxa of the Czech flora. About half of the included taxa are dispersal generalists lacking a clear morphological indication of anemochory or zoochory. Most myrmecochorous or probably myrmecochorous species are also assigned to this category.]

705	Propagules water dispersed	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Pladias. (2022). Linum flavum. Database of the Czech Flora and Vegetation. https://pladias.cz/en/taxon/data/Linum%20flavum. [Accessed 25 May 2022]	"Dispersal strategy: Allium (mainly autochory)" [Allium type – mainly autochory, less frequently anemochory, endozoochory and epizoochory. This is the most common dispersal strategy, including about 56% taxa of the Czech flora. About half of the included taxa are dispersal generalists lacking a clear morphological indication of anemochory or zoochory. Most myrmecochorous or probably myrmecochorous species are also assigned to this category.]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Water" [Possibly. No other supporting evidence of water dispersed seeds was found]

706	Propagules bird dispersed	n
	Source(s)	**Notes**
	Pladias. (2022). Linum flavum. Database of the Czech Flora and Vegetation. https://pladias.cz/en/taxon/data/Linum%20flavum. [Accessed 25 May 2022]	"Dispersal strategy: Allium (mainly autochory)"

707	Propagules dispersed by other animals (externally)	
	Source(s)	**Notes**
	Pladias. (2022). Linum flavum. Database of the Czech Flora and Vegetation. https://pladias.cz/en/taxon/data/Linum%20flavum. [Accessed 25 May 2022]	"Myrmecochory: probably non-myrmecochorous"

708	Propagules survive passage through the gut	n
	Source(s)	**Notes**
	Pladias. (2022). Linum flavum. Database of the Czech Flora and Vegetation. https://pladias.cz/en/taxon/data/Linum%20flavum. [Accessed 25 May 2022]	"Dispersal strategy: Allium (mainly autochory)" [mainly autochory, less frequently anemochory, endozoochory and epizoochory. This is the most common dispersal strategy, including about 56% taxa of the Czech flora. About half of the included taxa are dispersal generalists lacking a clear morphological indication of anemochory or zoochory.]

801	Prolific seed production (>1000/m2)	n
	Source(s)	**Notes**
	Czarnecka, J. (2004). Seed longevity and recruitment of seedlings in xerothermic grassland. Polish Journal of Ecology, 52(4), 505-521	"Table 1. Species and number of seeds (m–2) recorded in the seed bank in three patches dominated by: Brachypodium pinnatum, Aster amellus and Senecio macrophyllus in 1999–2001" [Seed densities up to 765 m–2 recorded for Linum flavum in patches dominated by Brachypodium pinnatum]
	Grzybowska, B., & Loster, S. (2009). The role of soil seed bank in maintaining calcareous grasslands in the Wyżyna Miechowska upland (S Poland). Rare, relict and endangered plants and fungi in Poland. W. Szfer Institute of Botany, Polish Academy of Sciences, Krakow, 208-218	"Table 3. Seed density in soil (seeds m−2) of species characteristic for the Inuletum ensifoliae association. Data based on all samples analyzed by seedling emergence and seed extraction methods (N = 62)." [Highest seed density for Linum flavum = 24.7 seeds m−2 in Well developed grassland]

802	Evidence that a persistent propagule bank is formed (>1 yr)	y

Qsn #	Question	Answer
	Source(s)	**Notes**
	Czarnecka, J. (2004). Seed longevity and recruitment of seedlings in xerothermic grassland. Polish Journal of Ecology, 52(4), 505-521	"Carex flacca, C. transsilvanica, Linum flavum and probably Scabiosa ochroleuca and Origanum vulgare. These species create persistent seed bank; seed rain exceeds seed pool in soil, seeds keep germination ability longer than 1 year, they were detected in soil deeper than 5 cm below the ground level and diaspores were permanently present in soil (which was confirmed by the observations throughout one vegetative season, as well as in a few year cycle)"

803	Well controlled by herbicides	y
	Source(s)	**Notes**
	Canadian Food Inspection Agency. (2019). The Biology of Linum usitatissimum L. (Flax). Biology Document BIO1994-10. Plant Biosafety Office, Ottawa, Canada. http://www.inspection.gc.ca/. [Accessed 25 May 2022]	[Herbicides that control flax would likely be effective] "Because flax is a broadleaf species, control of volunteer flax in field crops is particularly difficult to achieve. However, the Saskatchewan Flax Development Commission (2018) recommends the use of quinclorac herbicide which provides excellent control of volunteer flax in wheat. Products or mixtures that contain dichlorprop will provide some suppression of volunteer flax in cereal crops. Use the maximum recommended rates. Products that include 2,4-D LV ester will have slightly more effect on the flax than 2,4-D amine or MCPA."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	**Notes**
	WRA Specialist. (2022). Personal Communication	Unknown

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	**Notes**
	WRA Specialist. (2022). Personal Communication	Unknown

Summary of Risk Traits:

High Risk / Undesirable Traits
• Reported to be naturalized in Japan and Australia (no reports from the Hawaiian Islands to date)
• Other Linum species are weeds
• Seeds and parts of related species reported to contain toxins
• Tolerates many soil types
• Reproduces by seeds
• Seeds dispersed by cultivation, and possibly water. Otherwise, no special adaptations for dispersal (autochory)
• Seeds may form a persistent seed bank (at least 1 year)

Low Risk Traits
• No confirmed reports of detrimental impacts where cultivated
• Unarmed (no spines, thorns, or burrs)
• Palatable to some grazing animals
• Grows best in high light environments (dense shade may inhibit spread)
• Self-incompatible
• Not reported to spread vegetatively
• Herbicides may provide effective control if needed