

<b>Taxon:</b> <i>Avena sativa</i> L.	<b>Family:</b> Poaceae
<b>Common Name(s):</b> common oat oat	<b>Synonym(s):</b> <i>Avena byzantina</i> K. Koch <i>Avena diffusa</i> (Neilr.) Asch. & Graebn. <i>Avena distans</i> Schur <i>Avena orientalis</i> Schreb. <i>Avena praegravis</i> (Krause) Roshev. <i>Avena racemosa</i> Thuill. <i>Avena volgensis</i> (Vavilov) Nevski

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Assessor Approved	<b>End Date:</b> 16 Mar 2022
<b>WRA Score:</b> 12.0	<b>Designation:</b> H(HPWRA)	<b>Rating:</b> High Risk

**Keywords:** Annual Grass, Disturbance Weed, Fodder, Self-Fertile, Persistent Seedbank

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	y
102	Has the species become naturalized where grown?	y=1, n=-1	y
103	Does the species have weedy races?	y=1, n=-1	y
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)	Intermediate
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	y=1, n=0	y
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals		

Qsn #	Question	Answer Option	Answer
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		
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	n
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	y
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	1
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	n
705	Propagules water dispersed		
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m <sup>2</sup> )		
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?	y
	Source(s)	Notes
	Zohary, D., Hopf, M., & Weiss, E. (2012). Domestication of Plants in the Old World: The origin and spread of domesticated plants in Southwest Asia, Europe, and the Mediterranean Basin. Fourth Edition. Oxford University Press, Oxford	"The main oat crop, <i>A. sativa</i> , is very variable . It comprises numerous contrasting domesticated varieties, as well as weedy races and truly wild forms. All are inter-fertile with one another and share the same hexaploid genomic constitution ( Loskutov 2001 ). All are characterized by nonshattering panicles. According to their response to threshing, they are placed in three taxonomic 'species' that are actually only races of the same complex crop."
102	Has the species become naturalized where grown?	y
	Source(s)	Notes
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"frequently escaped and naturalized"
103	Does the species have weedy races?	y
	Source(s)	Notes
	Zohary, D., Hopf, M., & Weiss, E. (2012). Domestication of Plants in the Old World: The origin and spread of domesticated plants in Southwest Asia, Europe, and the Mediterranean Basin. Fourth Edition. Oxford University Press, Oxford	"The main oat crop, <i>A. sativa</i> , is very variable . It comprises numerous contrasting domesticated varieties, as well as weedy races and truly wild forms."
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	Intermediate
	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.	"Presumably native to southeastern Europe or western Asia, now cultivated throughout the world; in Hawai'i sparingly naturalized in disturbed places and occasionally in open pastures, 60-1,220 m, on O'ahu, Maui, and Hawai'i. Naturalized prior to 1871 (Hillebrand, 1888)."
202	Quality of climate match data	High
	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.	"Presumably native to southeastern Europe or western Asia, now cultivated throughout the world; in Hawai'i sparingly naturalized in disturbed places and occasionally in open pastures, 60-1,220 m, on O'ahu, Maui, and Hawai'i. Naturalized prior to 1871 (Hillebrand, 1888)."
203	Broad climate suitability (environmental versatility)	y

Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Zohary, D., Hopf, M., & Weiss, E. (2012). Domestication of Plants in the Old World: The origin and spread of domesticated plants in Southwest Asia, Europe, and the Mediterranean Basin. Fourth Edition. Oxford University Press, Oxford	"Avena sativa L., common oat, is a major cereal crop, in traditional Old World grain agriculture. It is a close companion of wheats and barley. The crop succeeds well in moist climates of temperate latitudes as well as in summer-dry Mediterranean conditions. In north-west Europe, oat frequently thrives better than wheat and is cultivated as a principal crop ( Leggett and Thomas 1995 )."
	Duke, J. A. (1983). Avena sativa. Handbook of Energy Crops. <a href="https://www.hort.purdue.edu">https://www.hort.purdue.edu</a> . [Accessed 15 Mar 2022]	"Ranging from Boreal Moist to Rain through Tropical Very Dry to Dry Forest Life Zones, common oat is reported to tolerate annual precipitation of 2 to 18 dm (mean of 151 cases = 7.7) annual temperature of 5 to 26°C (mean of 151 cases = 12.0) and pH of 4.5 to 8.6 (mean of 128 cases = 6.4). Oats are long-day plants, grown in cool climate in the Old and New World temperate zones variable conditions."

<b>204</b>	<b>Native or naturalized in regions with tropical or subtropical climates</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"Europe, Egypt to Morocco." ... "cultivated in many varieties, frequently escaped and naturalized"
	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.	"Presumably native to southeastern Europe or western Asia, now cultivated throughout the world; in Hawai'i sparingly naturalized in disturbed places and occasionally in open pastures, 60-1,220 m, on O'ahu, Maui, and Hawai'i. Naturalized prior to 1871 (Hillebrand, 1888)."

<b>205</b>	<b>Does the species have a history of repeated introductions outside its natural range?</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	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.	"Presumably native to southeastern Europe or western Asia, now cultivated throughout the world"

<b>301</b>	<b>Naturalized beyond native range</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"cultivated in many varieties, frequently escaped and naturalized"
	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 sparingly naturalized in disturbed places and occasionally in open pastures, 60-1,220 m, on O'ahu, Maui, and Hawai'i. Naturalized prior to 1871 (Hillebrand, 1888)."

<b>302</b>	<b>Garden/amenity/disturbance weed</b>	<b>y</b>
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Lucid Key Server. (2022). <i>Avena sativa</i> . <a href="https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm">https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm</a> . [Accessed 15 Mar 2022]	"Mainly a weed of roadsides, disturbed sites, waste areas, crops and fallows, and gardens. Occasionally also found growing in riparian vegetation, on floodplains, in pastures and in coastal environs."
	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 disturbed sites. Relatively innocuous] "in Hawai'i sparingly naturalized in disturbed places and occasionally in open pastures, 60-1,220 m, on O'ahu, Maui, and Hawai'i."
	Zohary, D., Hopf, M., & Weiss, E. (2012). Domestication of Plants in the Old World: The origin and spread of domesticated plants in Southwest Asia, Europe, and the Mediterranean Basin. Fourth Edition. Oxford University Press, Oxford	[Sterilis -type oats may be disturbance and/or crop weeds] "In addition to massive occupation of primary habitats, sterilis oats colonize abandoned cultivated ground all over the Mediterranean region aggressively, and they grow as a noxious weed in wheat and barley fields, orchards, and roadsides."

303	Agricultural/forestry/horticultural weed	
	<b>Source(s)</b>	<b>Notes</b>
	Zohary, D., Hopf, M., & Weiss, E. (2012). Domestication of Plants in the Old World: The origin and spread of domesticated plants in Southwest Asia, Europe, and the Mediterranean Basin. Fourth Edition. Oxford University Press, Oxford	"Fatua oat varieties are distinctively weedy. They are widely distributed over the whole belt of Old World agriculture where they infest cereal fields and grow at the edges of cultivation. Only rarely do they occupy primary habitats."
	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 sparingly naturalized in disturbed places and occasionally in open pastures, 60-1,220 m, on O'ahu, Maui, and Hawai'i. Naturalized prior to 1871 (Hillebrand, 1888)." [Long history of naturalization with no evidence of impacts in the Hawaiian Islands. Cultivated oats do not appear to have the same impacts as other weedy types present in other regions of the world]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Canola, Cereals, Orchards & Plantations, Pastures, Vegetables"

Qsn #	Question	Answer
304	<b>Environmental weed</b>	
	<b>Source(s)</b>	<b>Notes</b>
	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 sparingly naturalized in disturbed places and occasionally in open pastures, 60-1,220 m, on O'ahu, Maui, and Hawai'i. Naturalized prior to 1871 (Hillebrand, 1888)." [Long history of naturalization with no evidence of impacts in the Hawaiian Islands]
	White, M., Cheal, D., Carr, G. W., Adair, R., Blood, K. and Meagher, D. (2018). Advisory list of environmental weeds in Victoria. Arthur Rylah Institute for Environmental Research Technical Report Series No. 287. Department of Environment, Land, Water and Planning, Heidelberg, Victoria	[Although included in a list of environmental weeds of Victoria, impacts are currently insignificant] "Advisory list of environmental weeds in Victoria (abridged version April 2018)" [Includes <i>Avena sativa</i> classified as an environmental weed. Impact on natural systems = Currently insignificant; Potential for invasion = Currently non-invasive; Risk Rating = Lower]
	Lucid Key Server. (2022). <i>Avena sativa</i> . <a href="https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm">https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm</a> . [Accessed 15 Mar 2022]	[Possibly in Australia] "Oats ( <i>Avena sativa</i> ) is often cultivated as a forage crop, and sometimes spreads from these areas and becomes established in other habitats. It is usually a minor weed of roadsides, disturbed sites, gardens and crops. However, in recent years it has been recorded growing in disturbed natural vegetation in the Killarney area (i.e. on creek-banks and in open woodlands on floodplains). "

305	Congeneric weed	y
	<b>Source(s)</b>	<b>Notes</b>
	Beckie, H. J., Francis, A., & Hall, L. M. (2012). The biology of Canadian weeds. 27. <i>Avena fatua</i> L. (updated). Canadian Journal of Plant Science, 92(7), 1329-1357	"An updated review of biological information is provided for <i>Avena fatua</i> . A widespread species originating in Eurasia, <i>A. fatua</i> is one of the 10 worst annual weeds of temperate agricultural regions of the world. Key weediness traits of this highly selfing species include fecundity, seed shatter, and a large and persistent seed bank with variable degrees of primary seed dormancy. The species occurs in all Canadian provinces and most states in the USA. In Canada, it is most troublesome as a weed in the prairies, where it has spread throughout crop areas in all climatic zones. Depending upon plant density and relative time of emergence, <i>A. fatua</i> competition may reduce annual crop yields by as much as 70%. First cohort emergence of <i>A. fatua</i> coincides with planting and emergence of spring-seeded crops, although additional cohorts can emerge throughout the growing season. <i>Avena fatua</i> is more abundant in zerothan intensive-tillage systems; the former regime promotes earlier and greater emergence because of a shallower and less persistent seed bank. Despite the introduction of highly efficacious herbicides in the 1970s and 1980s, abundance of the species has not declined across the Canadian prairies or elsewhere. The continual evolution of herbicide-resistant <i>A. fatua</i> populations, seed spread via farm machinery, and limited herbicide modes of action for its control threaten sustained annual field crop production in many temperate agricultural areas. Further adoption and integration of multiple non-herbicide weed management practices, such as enhanced crop seeding rate, competitive crops and cultivars, and precision fertilizer placement, should help mitigate <i>A. fatua</i> interference. The species has some beneficial uses as an alternative feed and food constituent or industrial feedstock, as well as potential in cultivated oat ( <i>Avena sativa</i> L.) improvement."

Qsn #	Question	Answer
401	Produces spines, thorns or burrs	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.	[No evidence] "Stout annuals; culms (2.5-)4-8(-12.5) dm tall. Sheaths glabrous, with margins overlapping; ligule 2-5.5 mm long, obtuse, puberulent, finely erose-ciliate; blades (4-) 5-10(-17) mm wide. Inflorescences paniculate, 12-30 cm long, open; spikelets 2 (3)flowered, rachilla glabrous or sparsely hirsute, not readily disarticulating above glumes and between florets; glumes usually exceeding florets, 9-11 (-13)-nerved, first glume (17-)18-26 mm long, second glume (18-)20-28 mm long; lemmas (12-)14-20 mm long, glabrous to sometimes scabrous, 3-7-nerved, the nerves obscure on the indurate, yellowish brown lower part and prominent on the herbaceous upper 1/3, apex entire or very shallowly bilobed, callus naked or only sparsely bearded, awns, when ± present, on first floret, (15-)22-35 mm long, not geniculate; palea firm, the 2 keels ciliate. Caryopsis pale brown, ellipsoid, ca. 1 cm long, ca. 2.5 mm wide, appressed pubescent."

402	Allelopathic	y
	Source(s)	Notes
	Valenzuela, H. & Smith, J. (2002). Common Oats. Sustainable Agriculture Green Manure Crops, SA-GM-5. College of Tropical Agriculture and Human Resources (CTAHR), University of Hawaii at Manoa, Honolulu, Hawaii. <a href="https://www.ctahr.hawaii.edu">https://www.ctahr.hawaii.edu</a> . [Accessed 15 Mar 2022]	"Common oats provides several alternative methods of weed control, reducing the need for chemical weed control. Oats germinate very quickly and are able to smother out emerging weed species. In addition, oats release allelopathic compounds, plant-made chemicals that hinder weed growth for several weeks. However, these same compounds can hinder the growth of subsequent crops such as lettuce, watercress, rice, wheat, and peas, so this allelopathic trait should be taken into consideration when planning the timing and sequence of a crop-rotation program on the farm. The allelopathic compounds tend to break down in about three weeks."
	Kato-Noguchi, H., Kosemura, S., Yamamura, S., Mizutani, J., & Hasegawa, K. (1994). Allelopathy of oats. I. Assessment of allelopathic potential of extract of oat shoots and identification of an allelochemical. <i>Journal of Chemical Ecology</i> , 20(2), 309-314	"The allelopathic potential of oat ( <i>Avena sativa</i> L.) extracts was investigated under laboratory conditions. The ethyl ether-, acetone-, and water-soluble fractions obtained from the extract of oat shoots inhibited the germination and growth of roots and hypocotyls of lettuce ( <i>Lactuca sativa</i> L.). The inhibitory activity of the water-soluble fraction was maximum, followed by that of ethyl ether-soluble and acetone-soluble fraction. An active principle of the water-soluble fraction was isolated and its structure was determined by spectral data as l-tryptophan. l-Tryptophan inhibited the growth of hypocotyls and roots of lettuce seedlings at concentrations greater than 0.03 and 0.1 mM, respectively. These results suggested that l-tryptophan may be an allelochemical which affects the growth or germination of different plant species."

403	Parasitic	n
	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.	"Stout annuals; culms (2.5-)4-8(-12.5) dm tall." [No evidence. Poaceae]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	Wiersema, J.H. & León, B. (2013). World Economic Plants: A Standard Reference. Second Edition. CRC Press, Boca Raton, FL	"ECON: Environ. (soil improver); Food (beverage base, cereal, starch). Forage (fodder, forage); Medic. (folklore); Poison (mammals)"
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"fodder, forage, grain crop, a very nutritious source of food, crushed grain and straw for feeding horses, under some circumstances capable of poisoning livestock"

Qsn #	Question	Answer
405	Toxic to animals	
	Source(s)	Notes
	Burrows, G. E., & Tyrl, R. J. (2013). <i>Toxic Plants of North America</i> . Second Edition. Wiley-Blackwell, Hoboken, NJ	[Possibly under certain conditions] "Avena sativa produces two disease problems of potential concern: (1) photosensitization from fresh forage following grazing for 1 to several weeks, and (2) acute nitrate intoxication, primarily from consumption of hay. Aspects of each are described below. Photosensitization Disease Problems and Genesis—Photosensitization caused by <i>A. sativa</i> is typical of that caused by most other grasses; it is the primary uncomplicated type not accompanied by icterus or other evidences of hepatic dysfunction (Schmidt 1931). Although there may be extensive areas of skin necrosis and sloughing, causing considerable discomfort, the disease is usually not a serious problem other than causing a temporary setback in productivity. The skin changes respond readily to elimination of the offending forage from the animals' diet. The specific photodynamic agent or the factors involved in its formation are unknown." ... "Disease Problems and Genesi —Like other cereal grain forages, <i>A. sativa</i> is capable of accumulating excess concentrations of nitrates under certain circumstances. Because of the use of heavy nitrogen fertilization to promote high grain yields, its hay or straw may have especially high levels. For example, up to 4.4%, or 44,000ppm, NO <sub>3</sub> has been reported as associated with severe death losses (Newsom et al. 1937; Thorp 1938; Bradley et al. 1939). In one instance, 4 adult alpacas died and 1 aborted after consuming <i>A. sativa</i> hay with 3.2% KNO <sub>3</sub> equivalents dm (Mckenzie et al. 2009). Aqueous humor nitrate levels were 25 mg NO <sub>3</sub> /L in 2 adults and 10mg in the fetus. A more complete discussion of nitrate as a toxicant is presented in the treatment of Sorghum (in this chapter)."
	Quattrocchi, U. (2012). <i>CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology</i> . CRC Press, Boca Raton, FL	[Possibly under certain conditions] "Moderate toxicity, under some circumstances capable of poisoning livestock. Can cause nitrate toxicity in livestock. Cattle are more prone to toxicity, but swine and turkeys have been poisoned on oat stubble. Grass tetany also occurs during periods of lush growth when ruminants suffer from a mineral imbalance. Oat hay is a common source of plant poisoning by nitrates."

406	Host for recognized pests and pathogens	
	Source(s)	Notes

Qsn #	Question	Answer
	Brink, M. & Belay, G. (Editors). (2006). Plant Resources of Tropical Africa. Volume 1. Cereals and pulses. PROTA Foundation. Wageningen, Netherlands	"Diseases and pests. Leaf (crown) rust ( <i>Puccinia coronata</i> f.sp. <i>avenae</i> ) and stem rust ( <i>Puccinia graminis</i> f.sp. <i>avenae</i> ) are the most important diseases of oat. Systemic fungicides such as triazoles and morpholines are effective in controlling them, but this is seldom economical. The use of cultivars resistant to rust is recommended. Septoria leaf spot ( <i>Septoria avenae</i> ), barley yellow dwarf virus (BYDV, also called 'red leaf'), halo blight ( <i>Pseudomonas coronafaciens</i> ), loose smut ( <i>Ustilago avenae</i> ) and covered smut ( <i>Ustilago hordei</i> ) are other common diseases of oat. Major pests include grasshoppers, army worms and cut worms. Various aphid species are vectors of BYDV. At later stages of maturity birds and rats are important pests. Weevils ( <i>Sitophilus granarius</i> ) and some other beetles attack stored oat grain."
	Valenzuela, H. & Smith, J. (2002). Common Oats. Sustainable Agriculture Green Manure Crops, SA-GM-5. College of Tropical Agriculture and Human Resources (CTAHR), University of Hawaii at Manoa, Honolulu, Hawaii. <a href="https://www.ctahr.hawaii.edu">https://www.ctahr.hawaii.edu</a> . [Accessed ]	"Pest problems When grown for grain or forage, oats tends to have more insect problems (such as armyworms, grain aphids and mites, wireworms, cutworms, thrips, leafhoppers, grubs, and billbugs). Cultivars resistant to rust, smut, and blight have been developed; consult seed dealers for the latest information. Rust resistance may be a useful consideration in some areas of Hawaii."
	Plants for a Future. (2022). <i>Avena sativa</i> . <a href="https://pfaf.org">https://pfaf.org</a> . [Accessed 15 Mar 2022]	"The plants are also reported to tolerate aluminium, disease, frost, fungus, herbicides, hydrogen fluoride, mycobacterium, nematode, rust, SO <sub>2</sub> , smut, and virus"

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Potentially to animals under certain circumstances] "Used in Ayurveda. Antiinflammatory, tonic, antidepressant, diuretic, depurative, cardiac, antioxidant, laxative, emollient, anticholesterolemic, nervine, uterine tonic, aphrodisiac, antispasmodic, sedative, stimulant, vulnerary, repellent. Moderate toxicity, under some circumstances capable of poisoning livestock. Can cause nitrate toxicity in livestock. Cattle are more prone to toxicity, but swine and turkeys have been poisoned on oat stubble. Grass tetany also occurs during periods of lush growth when ruminants suffer from a mineral imbalance. Oat hay is a common source of plant poisoning by nitrates."

408	Creates a fire hazard in natural ecosystems	
	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 sparingly naturalized in disturbed places and occasionally in open pastures, 60-1,220 m, on O'ahu, Maui, and Hawai'i." [Could possibly increase to fuel load in fire prone areas, but probably not an important fuel source relative to other non-native grasses]

Qsn #	Question	Answer
	Fusco, E. J., Finn, J. T., Balch, J. K., Nagy, R. C., & Bradley, B. A. (2019). Invasive grasses increase fire occurrence and frequency across US ecoregions. <i>Proceedings of the National Academy of Sciences</i> , 116(47), 23594-23599	[ <i>Avena sativa</i> - Fire Promoter = No] "Supplemental Table S1: A list of 176 non-native invasive grass and other graminoid species as listed by the Invasive Plant Atlas of the United States (1). For each species, we conducted a Web of Science (WOS) search and recorded whether there was literature suggesting the species altered fire regimes (Yes/No). For each fire promoting species in WOS, we supplemented our determination of whether that species was a fire promoter using the Fire Effects Information System (FEIS; 2). For each species designated as a fire promoter, we searched for available spatial data, and kept only species that were both fire-promoting with spatial data for our analysis. Final species used are highlighted in yellow."

409	Is a shade tolerant plant at some stage of its life cycle	n
	Source(s)	Notes
	Plants for a Future. (2022). <i>Avena sativa</i> . <a href="https://pfaf.org">https://pfaf.org</a> . [Accessed 15 Mar 2022]	"It cannot grow in the shade." ... "Oats are an easily grown crop that succeeds in any moderately fertile soil in full sun" ...

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	Valenzuela, H. & Smith, J. (2002). Common Oats. Sustainable Agriculture Green Manure Crops, SA-GM-5. College of Tropical Agriculture and Human Resources (CTAHR), University of Hawaii at Manoa, Honolulu, Hawaii. <a href="https://www.ctahr.hawaii.edu">https://www.ctahr.hawaii.edu</a> . [Accessed 15 Mar 2022]	"Oats thrives in cool, moist climates on well drained soils, but this crop is adapted to many soil types. It tolerates soil pH levels from 5.5 to 7.0, but some varieties can tolerate soil pH as low as 4.5. It has a wider pH adaptability than wheat or barley, and it has a low lime requirement."
	Duke, J. A. (1983). <i>Avena sativa</i> . Handbook of Energy Crops. <a href="https://www.hort.purdue.edu">https://www.hort.purdue.edu</a> . [Accessed 15 Mar 2022]	"They thrive on a wide range of soils of ample, but not excessive, fertility. Well-drained neutral soils in regions where annual rainfall is 7.7 dm or more are best. Loam soils are best, especially silt and clay loams."

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.	"Stout annuals; culms (2.5-)4-8(-12.5) dm tall."

412	Forms dense thickets	n
	Source(s)	Notes
	Lucid Key Server. (2022). <i>Avena sativa</i> . <a href="https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm">https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm</a> . [Accessed 15 Mar 2022]	"Oats ( <i>Avena sativa</i> ) is often cultivated as a forage crop, and sometimes spreads from these areas and becomes established in other habitats. It is usually a minor weed of roadsides, disturbed sites, gardens and crops. However, in recent years it has been recorded growing in disturbed natural vegetation in the Killarney area (i.e. on creek-banks and in open woodlands on floodplains)."

Qsn #	Question	Answer
	Brink, M. & Belay, G. (Editors). (2006). Plant Resources of Tropical Africa. Volume 1. Cereals and pulses. PROTA Foundation. Wageningen, Netherlands	[No evidence] "Avena sativa is only known in cultivation and its exact origin is unclear. Oat was not cultivated as early as wheat and barley and probably it persisted as a weed in fields of these cereals for centuries before it was taken into cultivation."
	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.	[No evidence] "in Hawai'i sparingly naturalized in disturbed places and occasionally in open pastures, 60-1,220 m, on O'ahu, Maui, and Hawai'i."
	Duke, J. A. (1983). Avena sativa. Handbook of Energy Crops. <a href="https://www.hort.purdue.edu">https://www.hort.purdue.edu</a> . [Accessed 15 Mar 2022]	[No evidence] "Oats are only known as a cultigen, of uncertain origin, but known to Lake Dwellers of Europe. They are now cultivated throughout the temperate zones of the Old and New Worlds."

501	<b>Aquatic</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	[Terrestrial] "open grass plain, common in waste places, fallow fields, along roadsides, disturbed areas, dry soil, occasionally in damp ground"

502	<b>Grass</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 14 Mar 2022]	"Family: Poaceae (alt. Gramineae) Subfamily: Pooideae Tribe: Poeae Subtribe: Aveninae"

503	<b>Nitrogen fixing woody plant</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/">https://npgsweb.ars-grin.gov/</a> . [Accessed 14 Mar 2022]	Poaceae

504	<b>Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	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.	"Stout annuals; culms (2.5-)4-8(-12.5) dm tall."

601	<b>Evidence of substantial reproductive failure in native habitat</b>	<b>n</b>
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Quattrocchi, U. (2006). CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	"cultivated in many varieties, frequently escaped and naturalized"
	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.	"Presumably native to southeastern Europe or western Asia, now cultivated throughout the world"

602	Produces viable seed	y
	<b>Source(s)</b>	<b>Notes</b>
	Valenzuela, H. & Smith, J. (2002). Common Oats. Sustainable Agriculture Green Manure Crops, SA-GM-5. College of Tropical Agriculture and Human Resources (CTAHR), University of Hawaii at Manoa, Honolulu, Hawaii. <a href="https://www.ctahr.hawaii.edu">https://www.ctahr.hawaii.edu</a> . [Accessed 15 Mar 2022]	"Establishment Broadcast 110–140 lb pure live seed per acre (3.5–4.5 bu/acre), or drill 80–110 lb pure live seed per acre (2.5–3.5 bu/acre). Broadcast and cover or drill to a depth of 1/2–2 inches and disk lightly. If the soil is sufficiently moist, shallow seeding promotes rapid seedling emergence with reduced root rot disease."
	Duke, J. A. (1983). <i>Avena sativa</i> . Handbook of Energy Crops. <a href="https://www.hort.purdue.edu">https://www.hort.purdue.edu</a> . [Accessed 15 Mar 2022]	"Well treated viable seed will give 80–90% germination."

603	Hybridizes naturally	y
	<b>Source(s)</b>	<b>Notes</b>
	Baldanzi, M., Macchia, M., & Machetti, M. (2003). Bulk and pedigree selection on natural hybrids between <i>Avena sativa</i> and <i>A. sterilis</i> . <i>Sementi Elette</i> 49(6): 40-46	"Spontaneous hybrid forms between cultivated oat and wild oats can occur in the fields. This work relates about description and performance of F6 and F7 lines obtained using two selection methods, bulk and pedigree, from <i>Avena sativa</i> x <i>A. sterilis</i> natural crosses. In F6, the lines from bulk resulted different for tiller habit, phenology and plant height respect to the lines from pedigree. In F7, the lines were compared to cultivars for tiller habit, phenology, plant height, grain yield, seed lipid and protein content: some lines performed better than the best cultivated varieties. This work confirms that the bulk method can reduce too much the variability and shows that the natural hybrids <i>A. sativa</i> x <i>A. sterilis</i> found during the purity maintenance of oat cultivars can represent a source of new useful variability "

604	Self-compatible or apomictic	y
	<b>Source(s)</b>	<b>Notes</b>

Qsn #	Question	Answer
	Nirmalakumari, A., Thamodaran, G., Sellammal, R., Ezhilarasi, T., & Ravikesavan, R. (2013). Efficient crossing techniques in oats ( <i>Avena sativa</i> L). <i>International Journal of Agricultural Science and Research</i> , 3(2), 331-336	"Oats is a self pollinated crop classified under chasmogamous species. Inflorescence of oats is a determinate panicle consisting of many spikelets, each of which contains two or three florets. During anthesis, the lodicules in each floret swell after water uptake and cause the lemma to diverge and establish a wide angle between it and the palea. The essential organs in the floret are exposed to the environment and subsequently the anthers dehisce releasing pollen. The pollen grains are dropped on the stigmatic branches, thus effecting self-pollination. Following pollination, the floret closes because of the collapsing of lodicules." [Possibly. Although some plant species possess self-fertilizing chasmogamous flowers, most chasmogamous flowers are cross-pollinated by biotic (e.g. insects) or abiotic (e.g. wind) agents]
	Duke, J. A. (1983). <i>Avena sativa</i> . <i>Handbook of Energy Crops</i> . <a href="https://www.hort.purdue.edu">https://www.hort.purdue.edu</a> . [Accessed 15 Mar 2022]	"Self-pollination is normal, but cross-pollination by wind also occurs."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Kellogg, E. A. (2015). <i>The Families and Genera of Vascular Plants. Volume XIII. Flowering Plants. Monocots. Poaceae</i> . Springer International Publishing, Switzerland	"Most grasses are wind-pollinated."
	Duke, J. A. (1983). <i>Avena sativa</i> . <i>Handbook of Energy Crops</i> . <a href="https://www.hort.purdue.edu">https://www.hort.purdue.edu</a> . [Accessed 15 Mar 2022]	"Self-pollination is normal, but cross-pollination by wind also occurs."

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	Lucid Key Server. (2022). <i>Avena sativa</i> . <a href="https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm">https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm</a> . [Accessed 15 Mar 2022]	"This species reproduces only by seed, which are most commonly spread in contaminated agricultural produce (i.e. grain and fodder). They may also be dispersed by slashers, vehicles and in contaminated soil."

607	Minimum generative time (years)	1
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Stout annuals; culms (2.5-)4-8(-12.5) dm tall."

Qsn #	Question	Answer
701	<b>Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Lucid Key Server. (2022). <i>Avena sativa</i> . <a href="https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm">https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm</a> . [Accessed 15 Mar 2022]	"This species reproduces only by seed, which are most commonly spread in contaminated agricultural produce (i.e. grain and fodder). They may also be dispersed by slashers, vehicles and in contaminated soil."
702	<b>Propagules dispersed intentionally by people</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	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.	"Presumably native to southeastern Europe or western Asia, now cultivated throughout the world"
703	<b>Propagules likely to disperse as a produce contaminant</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Contaminant, Crop, Herbal, Ornamental, Pasture"
	Lucid Key Server. (2022). <i>Avena sativa</i> . <a href="https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm">https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm</a> . [Accessed 15 Mar 2022]	"This species reproduces only by seed, which are most commonly spread in contaminated agricultural produce (i.e. grain and fodder). They may also be dispersed by slashers, vehicles and in contaminated soil."
704	<b>Propagules adapted to wind dispersal</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Animals, Flyers, Cattle, Horse, Livestock, Vehicles, Escapee"
	Lucid Key Server. (2022). <i>Avena sativa</i> . <a href="https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm">https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm</a> . [Accessed 15 Mar 2022]	"This species reproduces only by seed, which are most commonly spread in contaminated agricultural produce (i.e. grain and fodder). They may also be dispersed by slashers, vehicles and in contaminated soil."
705	<b>Propagules water dispersed</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Animals, Flyers, Cattle, Horse, Livestock, Vehicles, Escapee"
	Cappers, R. T. (1993). Seed dispersal by water: a contribution to the interpretation of seed assemblages. <i>Vegetation History and Archaeobotany</i> , 2(3), 173-186	"Table 2: Macro-remains transported by water." [1 diaspore of <i>Avena sativa</i> identified. Water may be a rare mode of dispersal]
	Lucid Key Server. (2022). <i>Avena sativa</i> . <a href="https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm">https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm</a> . [Accessed 15 Mar 2022]	"This species reproduces only by seed, which are most commonly spread in contaminated agricultural produce (i.e. grain and fodder). They may also be dispersed by slashers, vehicles and in contaminated soil."

Qsn #	Question	Answer
706	Propagules bird dispersed	y
	Source(s)	Notes
	Green, A. J. (2016). The importance of waterbirds as an overlooked pathway of invasion for alien species. <i>Diversity and Distributions</i> . 22(2): 239–247	"Gillham (1956) identified gulls as major vectors of cereal grains and annual weeds to coastal islands, establishing oats <i>Avena sativa</i> and barley <i>Hordeum vulgare</i> at sites up to 12 miles away from the nearest source of these seeds. He identified seeds of 14 native weeds in the regurgitated pellets of gulls, but cited five alien species he considered to be established in gull feeding grounds via pellets."
	Kitowski, I., Sandor, A. D., Czarnecka, J., & Grzywaczewski, G. (2017). Diet of Rooks <i>Corvus frugilegus</i> and potential seed dispersal in urban and agricultural habitats of Romania and Poland. <i>North-Western Journal of Zoology</i> , 13(1): 94-100	"Table 1. Composition of the seed pool in pellets; AP – agricultural habitat in Poland, UP – urban habitat in Poland, AR– agricultural habitat in Romania, UR – urban habitat in Romania." [ <i>Avena sativa</i> seeds in pellets in agricultural habitat in Poland]

707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Jaroszewicz, B., & Pirożnikow, E. (2008). Diversity of plant species eaten and dispersed by the European bison <i>Bison bonasus</i> in Białowieża Forest. <i>European Bison Conservation Newsletter</i> , 1, 14-29	"Only a few species of plants endozoochorically dispersed by bison were featured by relatively large seeds (over 3 mm long): <i>Avena sativa</i> , <i>Hordeum vulgare</i> , <i>Malus domestica</i> , <i>Millium effusum</i> and <i>Triticum aestivum</i> ."
	WRA Specialist. (2022). Personal Communication	Possibly, but apparently primarily dispersed internally by grazing animals

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Welch, D. (1985). Studies in the grazing of heather moorland in north-east Scotland. IV. Seed dispersal and plant establishment in dung. <i>Journal of Applied Ecology</i> , 22(2): 461-472	"Additional species rooted in the dung, but not elsewhere listed in this paper as being transmitted by cattle, were <i>Alopecurus pratensis</i> , <i>Avena sativa</i> , <i>Festuca rubra</i> , <i>Holcus mollis</i> , <i>Phleum pratense</i> , <i>Achillea ptarmica</i> , <i>Cirsium vulgare</i> , <i>Erica cinerea</i> , <i>E. tetralix</i> , <i>Genista anglica</i> , <i>Leontodon autumnalis</i> , <i>Polygala serpyllifolia</i> , <i>Trientalis europaea</i> , <i>Trifolium pratense</i> and <i>Viola</i> "

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Brink, M. & Belay, G. (Editors). (2006). <i>Plant Resources of Tropical Africa. Volume 1. Cereals and pulses</i> . PROTA Foundation. Wageningen, Netherlands	[Typically cultivated. Seed densities from wild populations unknown] "Oat seeds start to germinate 7 days after sowing. Seedlings start tillering 35–45 days after sowing. Up to 12 leaves are produced per stem. The time from sowing to flowering depends on sowing time, e.g. in north-western Europe it is 100 days for spring-sown crops to 270 days for autumn-sown crops. Oat is largely self-pollinated with up to 1% outcrossing. The time from flowering to harvesting is about 60 days in north-western Europe. The total crop duration is 3–6 months in Ethiopia and Kenya, and 6–11 months in temperate regions. Shattered seeds remain viable in the soil for a long time, which may result in weedy growth in subsequent crops"

Qsn #	Question	Answer
802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	Brink, M. & Belay, G. (Editors). (2006). Plant Resources of Tropical Africa. Volume 1. Cereals and pulses. PROTA Foundation. Wageningen, Netherlands	"Shattered seeds remain viable in the soil for a long time, which may result in weedy growth in subsequent crops."
	Nagel, M., & Börner, A. (2010). The longevity of crop seeds stored under ambient conditions. Seed Science Research, 20(1), 1-12	"Table 3. Comparison of seed longevity values (in years) for each species as represented by absolute longevities, analysed P50 results and P50 values by Ellis's viability equations, Priestley et al. (1985) and Walters et al. (2005)" [ <i>Avena sativa</i> - Absolute longevity = 15 years]

803	Well controlled by herbicides	y
	Source(s)	Notes
	CABI. (2022). Invasive Species Compendium. Wallingford, UK: CAB International. <a href="http://www.cabi.org/isc">www.cabi.org/isc</a>	[Herbicides to control <i>A. fatua</i> would presumably be effective on <i>A. sativa</i> ] "Herbicide weed control of <i>A. fatua</i> has been found to be more effective than cultural control (Stevenson et al., 2000a) and many herbicides have been successfully used (Milne, 1997). Good levels of control are given by herbicides belonging to the urea family (e.g. isoproturon or chlorotoluron) and phenoxypropionates (e.g. diclofop-methyl). In a review by Fisher and May (2000), advice is given for the chemical control of <i>A. fatua</i> , along with a list of new herbicide registrations for 2000. Zahradnicek and Kohout (1996) also examined various graminicides for use against wild oats in sugarbeet crops."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	Lucid Key Server. (2022). <i>Avena sativa</i> . <a href="https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm">https://keys.lucidcentral.org/demo/js_player/sew2/text/avena_sativa.htm</a> . [Accessed 15 Mar 2022]	"A short-lived (i.e. annual), tufted, grass usually growing 0.4-1.5 m tall, but occasionally reaching up to 1.8 m in height." [Possibly, but may reestablish from persistent seed bank]

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	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.	[Unknown] "Presumably native to southeastern Europe or western Asia, now cultivated throughout the world; in Hawai'i sparingly naturalized in disturbed places and occasionally in open pastures, 60 -1,220 m, on O'ahu, Maui, and Hawai'i. Naturalized prior to 1871 (Hillebrand, 1888)."

**Summary of Risk Traits:**

## High Risk / Undesirable Traits

- Broad climate suitability
- Naturalized on Oahu, Maui, and Hawaii (Hawaiian Islands) and elsewhere worldwide
- A disturbance-adapted weed that may impact agriculture and the natural environment (in Australia)
- Other *Avena* species are invasive weeds
- Allelopathic
- May cause photosensitization or nitrate poisoning under certain conditions
- Tolerates many soil types
- Reproduces by seeds
- Hybridizes with other *Avena* species
- Self-fertile
- Reaches maturity in one growing season
- Seeds dispersed by a produce and soil contaminant, by vehicles, animals, birds and possibly water, as well as through intentional cultivation
- Seeds can form a persistent seed bank

## Low Risk Traits

- Cultivated oats are domesticated and pose less risk of invasiveness than weedy races present elsewhere in the world
- Used as a palatable pasture species in the Hawaiian Islands, with no negative impacts reported, despite long history of cultivation
- Unarmed (no spines, thorns, or burrs)
- Palatable
- Grows best in high light environments (dense shade may inhibit spread)
- Herbicides may provide effective control