Taxon: Ambrosia artemisiifolia L.

Family: Asteraceae

Common Name(s): annual ragweed
bitterweed
common ragweed
ragweed
Roman wormwood
short ragweed

Synonym(s): Ambrosia elatior L.
Ambrosia paniculata Michx.
Ambrosia paniculata var. paniculata

Assessor: Chuck Chimera **Status:** Assessor Approved **End Date:** 29 Apr 2020

WRA Score: 28.0 **Designation:** H(Hawai'i) **Rating:** High Risk

Keywords: Annual Herb, Agricultural Weed, Allergenic, Self-Fertile, Persistent Seed Bank

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)	High
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		
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	y
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	y
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	y
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		
406	Host for recognized pests and pathogens		

Qsn #	Question	Answer Option	Answer
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	y
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	y
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	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	n
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	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m2)	y=1, n=-1	y
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	y=1, n=-1	y
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**
	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 the United States and southern Canada;" [No evidence of domestication]

102	**Has the species become naturalized where grown?**	
	Source(s)	**Notes**
	WRA Specialist. (2020). Personal Communication	NA

103	**Does the species have weedy races?**	
	Source(s)	**Notes**
	WRA Specialist. (2020). 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"**	**High**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 28 Apr 2020]	"Native Northern America EASTERN CANADA: Canada [Québec, Nova Scotia, Ontario, Prince Edward Island, New Brunswick, Newfoundland and Labrador] WESTERN CANADA: Canada [Saskatchewan, Alberta, Manitoba, British Columbia] NORTHEASTERN U.S.A.: United States [Connecticut, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia] NORTH-CENTRAL U.S.A.: United States [Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, Wisconsin] NORTHWESTERN U.S.A.: United States [Colorado, Montana, Wyoming] SOUTHEASTERN U.S.A.: United States [Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, District of Columbia] SOUTH-CENTRAL U.S.A.: United States [Texas] Southern America CARIBBEAN: Cuba, Hispaniola, Jamaica BRAZIL: Brazil WESTERN SOUTH AMERICA: Bolivia, Peru SOUTHERN SOUTH AMERICA: Argentina, Chile, Paraguay, Uruguay"

202	**Quality of climate match data**	**High**

Qsn #	Question	Answer
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 28 Apr 2020]	

203	Broad climate suitability (environmental versatility)	y
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"In its native range, annual ragweed is found from sea level to 1000 m elevation in a wide range of wet to dry soils (Flora of North America, 2014)."

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.	"Native to the United States and southern Canada; in Hawai'i naturalized in low elevation, dry, disturbed habitats, especially along roadsides and in pastures, 0-900 m, on O'ahu, Moloka'i, Maui, and Hawai'i. Naturalized at least since 1854 (Hillebrand, I 888).-"

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	**Notes**
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"A. artemisiifolia is an annual herb native to Central and Northern America. It has been accidentally introduced into a large number of countries as a contaminant of seed and grains."

301	Naturalized beyond native range	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 naturalized in low elevation, dry, disturbed habitats, especially along roadsides and in pastures, 0-900 m, on O'ahu, Moloka'i, Maui, and Hawai'i. Naturalized at least since 1854 (Hillebrand, I 888)."

Qsn #	Question	Answer
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 28 Apr 2020]	"Naturalized Africa MACARONESIA: Portugal [Madeira Islands] NORTHERN AFRICA: Egypt SOUTHERN AFRICA: South Africa WESTERN INDIAN OCEAN: Mauritius Asia-Temperate WESTERN ASIA: Turkey CAUCASUS: Armenia, Azerbaijan, Georgia CHINA: China EASTERN ASIA: Japan, Korea, Taiwan Asia-Tropical INDIAN SUBCONTINENT: India (n.e.) Australasia AUSTRALIA: Australia [New South Wales (e.), Queensland (e.), Western Australia (s.)] NEW ZEALAND: New Zealand Europe NORTHERN EUROPE: Denmark, Norway, United Kingdom MIDDLE EUROPE: Austria, Belgium, Czech Republic, Germany, Hungary, Netherlands, Poland, Slovakia, Switzerland EASTERN EUROPE: Belarus, Lithuania, Moldova, Russian Federation-European part, [European part] Ukraine SOUTHEASTERN EUROPE: Albania, Bulgaria, Greece, Italy, Romania, Serbia SOUTHWESTERN EUROPE: France, Portugal, Spain Pacific NORTH-CENTRAL PACIFIC: United States [Hawaii] Southern America CARIBBEAN: Bahamas"

302	Garden/amenity/disturbance weed	
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[A disturbance adapted weed that impacts crops and potentially the natural environment] "Although annual ragweed is mainly confined to disturbed sites and crop fields, it threatens near natural grasslands in Hungary that are subject to natural disturbances, and conservation areas aiming at protecting rare segetal species (Szigetvári and Benkö, 2008)."

303	Agricultural/forestry/horticultural weed	y
	Source(s)	**Notes**
	Haselwood, E.L., Motter, G.G., & Hirano, R.T. (eds.). 1983. Handbook of Hawaiian Weeds. University of Hawaii Press, Honolulu, HI	"A weed in cultivated areas and along roadsides." … "Declared noxious in Regulation 2. Often confused with false ragweed;"

Qsn #	Question	Answer
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"A. artemisiifolia (common ragweed) is weedy in grain fields, cultivated fields, open disturbed habitats, and along roadsides, particularly in southern Ontario and Quebec. Alex (1964) listed this annual species along with five other taxa as the most widespread and abundant of the 103 weedy species found in 88 fields of tomatoes (Lycopersicon esculentum Mill.) and sweet corn (Zea mays L.) surveyed in Prince Edward, Essex, and Kent counties of Ontario. Vengris (1953) estimated that common ragweed was in 69% of the corn fields, 50% of the potato (Solanum tuberosum L.), 24% of the onion (Allium cepa L.), and 18% of the tobacco (Nicotiana tabacum L.) fields in the Connecticut River Valley, U.S.A. The prevalance of common ragweed in all types of crops is well known, yet precise values of losses are difficult if not impossible to obtain (Dickerson 1968)."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"In addition, annual ragweed is a serious agricultural weed of crops such as soybean and sunflower."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Cereals, Cotton, Grapevines, Nursery Production, Orchards & Plantations, Pastures, Pome Fruits, Potatoes, Sunflowers, Vegetables"

304	Environmental weed	y
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Although annual ragweed is mainly confined to disturbed sites and crop fields, it threatens near natural grasslands in Hungary that are subject to natural disturbances, and conservation areas aiming at protecting rare segetal species (Szigetvári and Benkö, 2008). Spread of annual ragweed may interfere with restoration programmes for re-establishing native grasslands (Szigetvári and Benkö, 2008). The overall impact is a strong reduction in plant species richness, likely coupled with a decline in invertebrate species richness."

305	Congeneric weed	y
	Source(s)	**Notes**
	Parsons, W.T. & Cuthbertson, E.G. 2001. Noxious Weeds of Australia. Second Edition. CSIRO Publishing, Collingwood, Australia	[Ambrosia psilostachya] "Perennial ragweed is a strongly competitive plant, often growing densely to the detriment of crop and pasture...It is not palatable to stock, dense infestations thus reducing pasture productivity considerably."

Qsn #	Question	Answer
401	**Produces spines, thorns or burrs**	**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.	"Erect, taprooted annual herbs; stems 3-10 dm long, branched at least above, ± hirsute. Leaves pinnatifid or bipinnatifid, the lobes lanceolate, blades narrowly to broadly ovate or elliptic, 4-10 (-30) cm long, 4-7 (-15) cm wide, upper surface hirsutulous, lower surface strigose and often hirsute on the veins. Staminate involucre 1.5-2 mm high; pistillate involucre 3-5 mm high in fruit with a single series of short, sharp, erect spines near or above the middle." [Small spines on achenes]

402	**Allelopathic**	**y**
	Source(s)	**Notes**
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"A. artemisiifolia contains phenolic compounds and terpenes (Beres et al., 2002). The allelopathic influences of A. artemisiifolia were tested in bioassays on soyabean, black gram, rice and maize. Aqueous extracts of dried fresh leaves of the weed significantly suppressed the germination, plumule and radicle length of all crops tested. Toxicity increased with the increase in concentration of extracts. The effect of the extracts was greater on the germination of black gram and rice compared to soyabean and maize. A chloroform extract from A. artemisiifolia inhibited the growth and decreased the chlorophyll a concentrations of two green algae (Chlorella vulgaris and Chlamydomonas sp.) (Bruckner et al., 2001)."
	Vidotto, F., Tesio, F., & Ferrero, A. (2013). Allelopathic effects of Ambrosia artemisiifolia L. in the invasive process. Crop Protection, 54, 161-167	"Ambrosia artemisiifolia (common ragweed), an annual native to North America, is now present in many European countries where it causes summer hay fever and interferes with several important crops. We investigated if common ragweed invasiveness could be explained by its leaf tissue and root exudate allelopathic potential on indicator crops (alfalfa, barley, maize, lettuce, tomato, and wheat), weeds (Echinochloa crus-galli, Solanum nigrum, Portulaca oleracea, and Digitaria sanguinalis), and common ragweed itself in laboratory and greenhouse conditions. Different residue substrates were prepared for soil incorporation and trials were conducted under both laboratory (1, 2, and 3 g residues/Parker dish) and greenhouse conditions (1.28 g residues/pot). The effect of the preparations on the germination and growth of the indicator crops and weeds were evaluated relative to soil previously used to grow A. artemisiifolia. Results showed tomato was the most sensitive indicator crop species as growth was reduced by more than 50% in both laboratory and greenhouse experiments. Lettuce root and shoot growth were also inhibited, but only when common ragweed residues, and not root exudates, were added to the substrate. Among the weeds, E. crus-galli was not affected by common ragweed while D. sanguinalis suffered a large germination reduction (90%) after incorporation of 3 g of residues. If common ragweed occurred as weed in a field, the cultivation of a less sensitive crop such as winter wheat should be considered before the cultivation of a more susceptible crop."

403	**Parasitic**	**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.	"Erect, taprooted annual herbs; stems 3-10 dm long, branched at least above, ± hirsute." [Asteraceae. No evidence]

404	Unpalatable to grazing animals	n
	Source(s)	**Notes**
	Simmonds, H., Holst, P. & Bourke, C. 2000. The palatability, and potential toxicity of Australian weeds to goats. Rural Industries Research and Development Corporation, Barton, Australia	[Moderate palatability, but potentially toxic] "Palatability: Moderate … In pastures it has a nutrient composition similar to high grade lucerne, and is eaten at flowering and seeding, but not when dried off. Cattle eat it in the early stages, but may get sore mouths. It is unpalatable to horses."
	Marten, G. C., & Andersen, R. N. (1975). Forage Nutritive Value and Palatability of 12 Common Annual Weeds. Crop Science, 15(6), 821-827	[Palatability varies among sheep] "Our objective was to determine whether or not some broadleaf (forb) and grass weeds that commonly are found in newly established stands of perennial forage crops have sufficient quality to be considered satisfactory forages." … "Two species, common ragweed (Ambrosia artemisiifolia L.) and velvetleaf (Abutilon theophrasti Medic.) were classed as interacters; i. e. some sheep found them palatable, whereas other sheep refused to graze them."

405	Toxic to animals	
	Source(s)	**Notes**
	Simmonds, H., Holst, P. & Bourke, C. 2000. The palatability, and potential toxicity of Australian weeds to goats. Rural Industries Research and Development Corporation, Barton, Australia	"Toxicity to Goats: Toxic, low risk" Toxicity to Other Species: Potentially toxic to cattle and sheep"… "Poisonous Principle: Nitrates" "Effects: Signs and symptoms; Nitrate poisoning causes respiratory distress and darkening of the gums. Health and production problems; Affected animals may be just found dead, or die very quickly. Some may recover."
	WRA Specialist. (2020). Personal Communication	Potentially toxic to certain browsing and grazing animals

Qsn #	Question	Answer
406	**Host for recognized pests and pathogens**	
	Source(s)	**Notes**
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"A. artemisiifolia may also serve as an alternative host for crop diseases such as Meloidogyne arenaria race 2 (Tedford and Fortnum, 1988), M. incognita race 3 (Tedford and Fortnum, 1988), Erysiphe cichoracearum (Bassett and Crompton, 1975), Albugo tragopogonis (Bassett and Crompton, 1975), Plasmopara halstedii (Bassett and Crompton, 1975), Entyloma compositarum (Bassett and Crompton, 1975), Entyloma polysporum (Bassett and Crompton, 1975), Puccinia xanthii (Bassett and Crompton, 1975), Aster yellow virus (Bassett and Crompton, 1975), Cucumber mosaic virus (Kazinczi et al., 2001), Cuscuta gronovii (Bassett and Crompton, 1975), Protomyces gravidus (Cartwright and Templeton, 1988), Septoria sp. (Bohár and Schwarczinger, 1999), Phoma sp. (Briere et al., 1995) and Sclerotinia sclerotiorum of sunflower (Bohár and Kiss, 1999). " [Importance as an alternative host unknown]

407	**Causes allergies or is otherwise toxic to humans**	**y**
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Annual ragweed is a wind-pollinated plant and pollen production is high. The highly allergenic pollen causes serious health problems where the plant has become widespread (Simard and Benoit, 2010)."
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"Common ragweed is the most abundant of the ragweeds and the most important cause of hay fever in eastern North America (Bassett and Frankton 1971). The plant or its pollen may produce a dermatitis in some people who are not necessarily sufferers from hay fever (Frankton and Mulligan 1970). Ragweed oil dermatitis commonly affects male outdoor workers over 40 years of age (Promer and Burrage 1953)."
	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 allergenic sesquiterpene lactones. Dermatitis, a contact dermatitis to oleoresins."

408	**Creates a fire hazard in natural ecosystems**	**n**
	Source(s)	**Notes**
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Increased fire risk not listed among impacts] "A. artemisiifolia is an annual herb native to Central and Northern America. It has been accidentally introduced into a large number of countries as a contaminant of seed and grains. A. artemisiifolia typically colonises disturbed land where it produces a large number of seeds which can remain viable in the soil for 40 years or more. The pollen produced by species of Ambrosia is highly allergenic and can induce allergic rhinitis, fever, or dermatitis. As a result, high medical costs have been reported in areas with large infestations in both its native and introduced range. A. artemisiifolia can also invade agricultural land where it acts as a weed in a number of crops (in particular in sunflower, maize, soybean and cereals) and can cause significant decreases in yields."

Qsn #	Question	Answer
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	[Not listed among impacts] "Although annual ragweed is mainly confined to disturbed sites and crop fields, it threatens near natural grasslands in Hungary that are subject to natural disturbances, and conservation areas aiming at protecting rare segetal species (Szigetvári and Benkö, 2008)."

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"The plant is a light-demanding pioneer species of disturbed sites."
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	[Grows in shaded conditions, but does better in high light environments] "In shade experiments , common ragweed was found to grow as well as sweet corn or dry beans (Vicia spp.), in 30% shade but much poorer in 73% shade."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	**Notes**
	Hilty, J. (2019). Weedy Wildflowers of Illinois - Ambrosia artemisiifolia (Common Ragweed). http://www.illinoiswildflowers.info. [Accessed 29 Apr 2020]	"This plant is rather indifferent to soil type, and will thrive in soil containing high amounts of clay, gravel, or sand– in fact, it prefers sterile soil because of the reduced competition from other plants."
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"Turner (1928) states that common ragweed grows most successfully on soils from pH 6.0-7.0; its optimum soil type is silt loam and silt clay loam. Plants growing at an optimum pH are vigorous, very abundant, and range in height from 30 to 90 cm. Plants growing in a strongly acid soil are less vigorous, fairly abundant and range in height from 7 .5 to 15.0 cm."

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.	"Erect, taprooted annual herbs; stems 3-10 dm long, branched at least above, ± hirsute."

Qsn #	Question	Answer
412	**Forms dense thickets**	**y**
	Source(s)	**Notes**
	Stinson, K. A., Tran, J. H., Petzold, J. L., & Bazzaz, F. A. (2006). Architectural and physiological mechanisms of reduced size inequality in CO2-enriched stands of common ragweed (Ambrosia artemisiifolia). Global Change Biology, 12(9), 1680-1689	"A. artemisiifolia is a monoecious, herbaceous annual weed commonly found in disturbed habitats, old-fields, and roadsides throughout most of North America (Bassett & Crompton, 1975). An early-successional dominant, it forms dense monospecific stands during recolonization of old fields and other disturbed habitats (Abulfatih et al., 1979)."
	CABI. (2020). Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"In corn, season-long interference from dense populations of A. artemisiifolia in Illinois was found to reduce yields by 74% in two years."

501	**Aquatic**	**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.	[Terrestrial] "Erect, taprooted annual herbs… naturalized in low elevation, dry, disturbed habitats, especially along roadsides and in pastures, 0-900m"

502	**Grass**	**n**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 28 Apr 2020]	Family: Asteraceae (alt.Compositae) Subfamily: Asteroideae Tribe: Heliantheae

503	**Nitrogen fixing woody plant**	**n**
	Source(s)	**Notes**
	USDA, Agricultural Research Service, National Plant Germplasm System. (2020). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/. [Accessed 28 Apr 2020]	Family: Asteraceae (alt.Compositae) Subfamily: Asteroideae Tribe: Heliantheae

504	**Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)**	**n**
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"Ambrosia artemisiifolia L. is an erect annual herb 5-70 (-200) cm high with a tap root."

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

Qsn #	Question	Answer
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	[No evidence] "Seed production and dispersal. - I. A. artemisiifolia: Plants produce one seed per flowering head; the number per small plant averages slightly more than 3 ,000 seeds while large plants produce up to 62,000 seeds (Dickerson and Sweet 1971)."

602	Produces viable seed	y
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"A. artemisiifolia: Plants produce one seed per flowering head; the number per small plant averages slightly more than 3 ,000 seeds while large plants produce up to 62,000 seeds (Dickerson and Sweet 1971)."

603	Hybridizes naturally	y
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"The first interspecific hybrid described was a cross between A. artemisiifolia and A. trifida L. (Wylie 1915). The F 1 hybrids between these two plants resemble A . trifida with their coarsely lobed leaves, and are completely sterile. A. artemisiifolia x A. psilostachya (A. intergradiens Wagner) has been found in several locations in Michigan by Wagner and Beals (l 958) but has not yet been discovered in Canada. Wagner and Beals state that this hybrid often forms clonal populations that persist for many years. It is not known whether viable seeds are produced in these patches. Somatic chromosome counts from three localities of this hybrid were 2n =54. Payne (1962) developed a fertile artificial hybrid between A. artemisiifolia and A. acanthicarpa in the greenhouse at Ann Arbor, Michigan. The leaves of the F 1 hybrid are larger and more finely divided than either of the parents . The seeds resemble those of A. artemisiifolia except that they have longer beaks and more spines. The staminate flowers of the hybrid are similar to those of A. artemisilfolia."

604	Self-compatible or apomictic	y
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"Greenhouse studies at Ottawa indicate that the plant produces viable seed autogamously and allogamously. There is no evidence that agamospermy or vivipary takes place (Bassett and Crompton , unpublished)."

Qsn #	Question	Answer
605	**Requires specialist pollinators**	**n**
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"Common ragweed is primarily anemophilous (wind-pollinated). If insects ever visit the flowers it is only to eat the pollen (Wodehouse 1971)."

606	**Reproduction by vegetative fragmentation**	**n**
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"Vegetative reproduction - I. A. artimisiifolia: No vegetative reproduction is known."

607	**Minimum generative time (years)**	**1**
	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.	"Erect, taprooted annual herbs"

701	**Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)**	**y**
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Annual ragweed spreads rapidly as a result of human activities, e.g. as a contaminant of crops and bird seed, and via agricultural machines, vehicles and soil movement. The main dispersal corridors are roadsides (Simard and Benoit, 2010; Chauvel and Cadet, 2011)."

702	**Propagules dispersed intentionally by people**	**n**
	Source(s)	**Notes**
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Animals, Cattle, Horse, Livestock, Sheep, Vehicles, Water, Wind, Escapee" [Primarily dispersed unintentionally]

703	**Propagules likely to disperse as a produce contaminant**	**y**
	Source(s)	**Notes**
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Annual ragweed spreads rapidly as a result of human activities, e.g. as a contaminant of crops and bird seed, and via agricultural machines, vehicles and soil movement. The main dispersal corridors are roadsides (Simard and Benoit, 2010; Chauvel and Cadet, 2011)."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Major Pathway/s: Contaminant, Crop, Herbal, Ornamental"

704	**Propagules adapted to wind dispersal**	**n**

Qsn #	Question	Answer
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"The fruit possesses no obvious dispersal mechanism. Gebben (1965) states that seed dispersal by water, birds, and man are important for the spread of common ragweed. Apparently wind plays a minor role in dispersal as no seeds were found beyond 2 m from experimental plants (Dickerson 1968)."

705	Propagules water dispersed	y
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"The fruit possesses no obvious dispersal mechanism. Gebben (1965) states that seed dispersal by water, birds, and man are important for the spread of common ragweed. Apparently wind plays a minor role in dispersal as no seeds were found beyond 2 m from experimental plants (Dickerson 1968)."

706	Propagules bird dispersed	y
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"The fruit possesses no obvious dispersal mechanism. Gebben (1965) states that seed dispersal by water, birds, and man are important for the spread of common ragweed. Apparently wind plays a minor role in dispersal as no seeds were found beyond 2 m from experimental plants (Dickerson 1968)."

707	Propagules dispersed by other animals (externally)	y
	Source(s)	**Notes**
	Rosas, C. A., Engle, D. M., Shaw, J. H., & Palmer, M. W. (2008). Seed dispersal by Bison bison in a tallgrass prairie. Journal of Vegetation Science, 19(6), 769-778	[Dispersed in hair of grazing animals] "Two of the dominant prairie grasses (Andropogon gerardii, Sorghastrum nutans) and abundant fall-blooming forbs (Solidago spp, Vernonia baldwinii, Ambrosia artemisiifolia, Aster spp.) also predominate in hair samples."

708	Propagules survive passage through the gut	y
	Source(s)	**Notes**
	Farmer, J. A., Webb, E. B., Pierce, R. A., & Bradley, K. W. (2017). Evaluating the potential for weed seed dispersal based on waterfowl consumption and seed viability. Pest Management Science, 73(12), 2592-2603	"Table 5. Recovery, viability, and retention time of 13 agronomically important weed species fed to captive mallards" [Viable seeds of Ambrosia artemisiifolia were recovered]

801	Prolific seed production (>1000/m2)	y
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"A. artemisiifolia: Plants produce one seed per flowering head; the number per small plant averages slightly more than 3 ,000 seeds while large plants produce up to 62,000 seeds (Dickerson and Sweet 1971)."

Qsn #	Question	Answer
802	**Evidence that a persistent propagule bank is formed (>1 yr)**	**y**
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"Viability of seeds and germination - I. A. artemisiifolia: Durvel 's (1905) study of buried seed vitality , initiated in the fall of 1902 at the Arlington Experimental Station near Baltimore , Maryland, involved seed · burial at three depths in a heavy clay soil. These depths were: (I) 15 30 cm below the surface , (2) 4 5-55 cm (below the frost line at that latitude) , and (3) 90-105 cm; where conditions of moisture , temperature , and oxygen were assumed to be nearly constant. The seeds were dug up and germination was attempted under laboratory conditions from 1903 to 1941 by Toole and Brown (1946). Their germination tests showed that ragweed seeds can remain viable for 39 yr or more when buried in the soil."

803	**Well controlled by herbicides**	**y**
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"I. A. artemisiifolia: Common ragweed is killed by one application of 2,4-D; 2, 4, 5-T; MCPA; Fenoprop (Silvex) or Mecoprop at concentrations of 1 80 ml/l)a (16 oz/acre) or by 2 28 ml (20 oz) or less of 2,4-D B or MCPB or with one application of Dicamba at 24 ml/ha (6 oz/acre) (Anonymous 1973b). Spraying is effective during the months of June, July, and August."
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"Other strategies recommend mowing in mid-July, followed by spraying glyphosate in August. In some areas, glyphosate-resistant biotypes of annual ragweed have been identified. Other effective herbicides include glufosinate and herbicides containing 2,4-D, bromoxynil, ioxynil, florasulam, fluroxypyr or mecoprop-P."

804	**Tolerates, or benefits from, mutilation, cultivation, or fire**	**y**
	Source(s)	**Notes**
	Bassett, I. J., & Crompton, C. W. (1975). The Biology of Canadian Weeds.: 11. Ambrosia artemisiifolia L. and A. psilostachya DC. Canadian Journal of Plant Science, 55(2), 463-476	"A. artemisiifolia : Common ragweed is able to adapt to mowing, trampling, and grazing. In an experiment carried out at Ottawa, 48 plants grown in a waste lot and averaging 5 cm high at the end of May were cut slightly above the cotyledon leaves. A week later 40 of the 48 plants were growing quite normally. Also, in surveying several grain fields near Ottawa, it was observed that ragweed plants cut in July developed several new stems and flowered about 10 days later than adjacent uncut plants. Several cuttings, therefore, are required in August to prevent flowering and seed development (Bassett and Crompton, unpublished)."

805	**Effective natural enemies present locally (e.g. introduced biocontrol agents)**	
	Source(s)	**Notes**

Qsn #	Question	Answer
	Weber, E. 2017. Invasive Plant Species of the World, 2nd Edition: A Reference Guide to Environmental Weeds. CABI Publishing, Wallingford, UK	"In Japan and China, the specialist herbivore Ophraella communa (Coleoptera: Chrysomelidae) was accidentally introduced and has recently become naturalized. It is considered as a promising candidate for biocontrol. The beetle Zygogramma suturalis (Coleoptera: Chrysomelidae) was released in Croatia in 1985 (Igrc et al., 1995)."
	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 but unlikely given wide distribution] "in Hawai'i naturalized in low elevation, dry, disturbed habitats, especially along roadsides and in pastures, 0-900 m, on O'ahu, Moloka'i, Maui, and Hawai'i. Naturalized at least since 1854 (Hillebrand, I 888)."

Summary of Risk Traits:

High Risk / Undesirable Traits
• Broad climate suitability
• Naturalized on Kauai, Oahu, Molokai, Maui and Hawaii (Hawaiian Islands), and widely naturalized elsewhere
• A disturbance-adapted weed that can impact agriculture and the natural environment
• Other Ambrosia species are invasive
• Achenes with small, sharp spines
• Allelopathic
• Potentially toxic to browsing and grazing animals
• Highly allergenic pollen, and may cause contact dermatitis
• Tolerates shade (but thrives in full sun)
• Tolerates many soil types
• Able to form dense stands that may exclude other vegetation and reduce species richness
• Reproduces through prolific seed production
• Hybridizes with other Ambrosia species
• Autogamous
• Reaches maturity in <1 year
• Seeds dispersed as a contaminant of crops and bird seed, via agricultural machines, vehicles and soil movement, by water, and internally and externally by birds and other animals
• Capable of forming a persistent seed bank (up to 40 years)
• Tolerates mowing, trampling and grazing

Low Risk Traits
• Primarily a weed of disturbance and roadsides in the Hawaiian Islands
• Palatable to goats and cattle, despite potential toxicity
• Not reported to spread vegetatively
• Herbicides can provide effective control