

<b>Taxon:</b> <i>Ruta graveolens</i> L.	<b>Family:</b> Rutaceae
<b>Common Name(s):</b> common rue herb-of-grace rue	<b>Synonym(s):</b> <i>Ruta divaricata</i> Ten.

<b>Assessor:</b> Chuck Chimera	<b>Status:</b> Approved	<b>End Date:</b> 21 Jun 2024
<b>WRA Score:</b> 7.0	<b>Designation:</b> H(HPWRA)	<b>Rating:</b> High Risk

**Keywords:** Aromatic Subshrub, Naturalized (Maui), Weedy, Cause Dermatitis, Self-Seeds

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)	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	y = 1*multiplier (see Appendix 2), n = 0	y
303	Agricultural/forestry/horticultural weed	y = 2*multiplier (see Appendix 2), n = 0	n
304	Environmental weed		
305	Congeneric weed		
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	y
405	Toxic to animals	y = 1, n = 0	y
406	Host for recognized pests and pathogens	y = 1, n = 0	n
407	Causes allergies or is otherwise toxic to humans	y = 1, n = 0	y
408	Creates a fire hazard in natural ecosystems		
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	y
605	Requires specialist pollinators	y = -1, n = 0	n
606	Reproduction by vegetative fragmentation	y = 1, n = -1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	2
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
702	Propagules dispersed intentionally by people	y = 1, n = -1	y
703	Propagules likely to disperse as a produce contaminant	y = 1, n = -1	y
704	Propagules adapted to wind dispersal	y = 1, n = -1	n
705	Propagules water dispersed	y = 1, n = -1	n
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/m <sup>2</sup> )		
802	Evidence that a persistent propagule bank is formed (>1 yr)		
803	Well controlled by herbicides		
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
	<b>Source(s)</b>	<b>Notes</b>
	Dehgan, B. (2023). Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots). Springer Nature, Cham, Switzerland	[Long history of use, but not of domestication] "Of the 14 <i>Ruta</i> species the best known and long used for its narcotic and medicinal properties and cultivated in herb gardens is <i>R. graveolens</i> . It has been used since ancient times for various physical ailments as well as for remedy against witchcraft and evil, and sometimes for culinary purposes. Other species in cultivation include <i>R. angustifolia</i> , <i>R. bracteosa</i> , <i>R. chalepensis</i> (fringed rue), <i>R. montana</i> , <i>R. patavina</i> , and <i>R. suaveolens</i> . These are strongly aromatic perennial herbs or subshrubs with alternate, dissected, glandular-dotted leaves; yellow flowers in terminal corymbs or panicles; fruit a 4-5-lobed capsule. Native from Mediterranean region to western Asia. Leaves poisonous if ingested and may cause dermatitis in some people. Only a few cultivars reported: 'Blue Mound' (dwarf), 'Cruelly Girl' (may not be an actual cultivar but medicinal product of rue), 'Harlequin' (leaves variegated), 'Jackman' Blue' (dwarf mounding, compact), and 'Variegata' (yellow as well as blue-green leaves)."
102	Has the species become naturalized where grown?	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. (2024). Personal Communication	NA
103	Does the species have weedy races?	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. (2024). 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"	Intermediate
	<b>Source(s)</b>	<b>Notes</b>
	Dehgan, B. (2023). Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots). Springer Nature, Cham, Switzerland	"Native Habitat: Southeastern Europe, Balkan Peninsula; naturalized in northeastern United States." ... "Grows equally well in temperate North America as it does in tropical South America."
202	Quality of climate match data	High
	<b>Source(s)</b>	<b>Notes</b>
	Dehgan, B. (2023). Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots). Springer Nature, Cham, Switzerland	"Native Habitat: Southeastern Europe, Balkan Peninsula; naturalized in northeastern United States." ... "Grows equally well in temperate North America as it does in tropical South America."
203	Broad climate suitability (environmental versatility)	y
	<b>Source(s)</b>	<b>Notes</b>
	Dehgan, B. (2023). Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots). Springer Nature, Cham, Switzerland	"Hardiness Zone: 5A-11B. Grows equally well in temperate North America as it does in tropical South America."

Qsn #	Question	Answer
204	Native or naturalized in regions with tropical or subtropical climates	y
	<b>Source(s)</b>	<b>Notes</b>
	Dehgan, B. (2023). Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots). Springer Nature, Cham, Switzerland	"Hardiness Zone: 5A-11B. Grows equally well in temperate North America as it does in tropical South America."
	Starr, F., Starr, K. & Loope, L.L. (2004). New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 79: 20-30	"Native to south eastern Europe (Brickell & Zuk, 1997), <i>R. graveolens</i> (common rue) is known from BISH specimens to have been first collected in Hawai'i on Maui in 1927 and was noted to be "locally common and naturalized in pastures". Today, this plant is still naturalized and locally common in pastures and along rock walls in Kula, Maui."

205	Does the species have a history of repeated introductions outside its natural range?	y
	<b>Source(s)</b>	<b>Notes</b>
	van Wyk, B.-E. & Wink, M. (2017). Medicinal Plants of the World. Second edition. CABI, Wallingford	"Origin Southern Europe; commonly cultivated in many parts of the world."

301	Naturalized beyond native range	y
	<b>Source(s)</b>	<b>Notes</b>
	Dehgan, B. (2023). Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots). Springer Nature, Cham, Switzerland	"Native Habitat: Southeastern Europe, Balkan Peninsula; naturalized in northeastern United States."
	USDA, Agricultural Research Service, National Plant Germplasm System. (2024). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch">https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch</a> . [Accessed 17 Jun 2024]	"Naturalized Africa REGION: Africa Europe REGION: Europe (s. & c.)"
	Starr, F., Starr, K. & Loope, L.L. (2004). New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 79: 20-30	[Maui] " <i>Ruta graveolens</i> L. New naturalized record Native to south eastern Europe (Brickell & Zuk, 1997), <i>R. graveolens</i> (common rue) is known from BISH specimens to have been first collected in Hawai'i on Maui in 1927 and was noted to be "locally common and naturalized in pastures". Today, this plant is still naturalized and locally common in pastures and along rock walls in Kula, Maui. This herb can be distinguished by the following characters. "Rounded to erect, evergreen shrub producing alternate, broadly ovate to rounded, 2-pinnatisect, aromatic, glaucous, blue-green leaves, to 6 in [15 cm] long, with numerous obovate lobes. Cymes of cup-shaped, 4-petaled, dull yellow flowers, 3/4 in [2 cm] across." (Brickell & Zuk). These collections represent a new naturalized record for the Hawaiian Islands. Material examined: MAUI: East Maui, Kula, Calasa Rd., below fire station, common on margins of pastures, 2650 ft [807 m], 15 Aug 2002, Starr & Starr 020815-5. Kula, locally common and naturalized in pastures, 30 Jun 1927, Degener 28138. Keōkea, Kula, rare, 27 Jan 1937, Hosaka 1757."

Qsn #	Question	Answer
302	Garden/amenity/disturbance weed	y
	<b>Source(s)</b>	<b>Notes</b>
	Wells, M. J., Balsinhas, A. A., Joffe, H., Engelbrecht, V.M., Harding, G. & Stirton, C.H. (1986). A Catalogue of problem plants in Southern Africa. Botanical Research Institute, Republic of South Africa	"Kind of Weed: Ruderal (general), agrestal (general), flora, health related (humans) Undesirable Characteristics: Competitive (space, light, water, nutriment), replacing preferred vegetation (indigenous), irritant (skin), contaminant (seed)"

303	Agricultural/forestry/horticultural weed	n
	<b>Source(s)</b>	<b>Notes</b>
	Wells, M. J., Balsinhas, A. A., Joffe, H., Engelbrecht, V.M., Harding, G. & Stirton, C.H. (1986). A Catalogue of problem plants in Southern Africa. Botanical Research Institute, Republic of South Africa	"Kind Of Weed: Ruderal (general), agrestal (general), flora, health related (humans) Undesirable Characteristics: Competitive (space, light, water, nutriment), replacing preferred vegetation (indigenous), irritant (skin), contaminant (seed)"
	Randall, R. (2001). Garden thugs, a national list of invasive and potentially invasive garden plants. Plant Protection Quarterly, 16(4), 138-171	Cited as an agricultural weed in Wells et al. (1986). Reference does not document significant damage to crops or other agricultural commodities.

304	Environmental weed	
	<b>Source(s)</b>	<b>Notes</b>
	Starr, F., Starr, K. & Loope, L.L. (2004). New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 79: 20-30	[No environmental impacts documented] "Today, this plant is still naturalized and locally common in pastures and along rock walls in Kula, Maui."
	Randall, R. (2001). Garden thugs, a national list of invasive and potentially invasive garden plants. Plant Protection Quarterly, 16(4), 138-171	Categorized as an environmental weed, but no impacts have been described.
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	Cited as an environmental weed in 2 references. Impacts have not been corroborated

305	Congeneric weed	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. (2024). Personal Communication	Other than toxic properties and photodermatitis, impacts of <i>Ruta</i> species as weeds or otherwise invasive plants are ambiguous, or not explicitly documented in the literature.
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	<i>Ruta chalepensis</i> is cited as naturalized and/or a weed in a number of locations

Qsn #	Question	Answer
401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Dehgan, B. (2023). Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots). Springer Nature, Cham, Switzerland	[No evidence] "GROWTH HABIT Aromatic subshrub or suffrutescent (woody-based) herbaceous perennial, to 3 feet (1 m) high and as wide; fine texture; moderately rapid growth rate. STEM/BARK: much branched; woody at base. LEAVES: odd-pinnately compound; alternate, glaucous, distinctly bluish-green, glandular dotted, to about 6 inch (15 cm) long; segments oblong-spatulate, lobed, margins entire; disagreement as to the pungent aroma when crushed, exceedingly bitter to taste. FLOWERS: bisexual; about ½ inch (1 one third cm) in diameter, yellow, clustered in terminal flattened corymbs; 4 merous, except the central flower which is 5 merous; stamens 8-10; blooming from June through September. FRUIT: small globose dehiscent cap sule with 4 or 5 locules."

402	Allelopathic	
	Source(s)	Notes
	Fakhry, A., El-Kenany, E., & Khattab, K. (2015). Allelopathic Potential of <i>Ruta graveolens</i> L. on Seed Germination and Seedling Growth of two weed species <i>Panicum turgidum</i> Forssk. and <i>Phalaris minor</i> Retz. <i>Catrina: The International Journal of Environmental Sciences</i> , 13(1), 17-24	[Extracts exhibit allelopathic effects] " <i>Panicum turgidum</i> and <i>Phalaris minor</i> are invasive weeds of crop fields in Egypt. The main objective of the present study was to indicate the potentials for utilization of <i>Ruta graveolens</i> shoot aqueous extract and leachate at different concentrations (2.5%, 5.0%, 7.5% and 10.0%) to suppress the germination and growth of <i>P. turgidum</i> and <i>P. minor</i> in Petri dish experiment. Results indicated that the degree of inhibition on seed germination and growth of both the recipient species was largely dependent on the concentration of <i>R. graveolens</i> shoot aqueous extract and leachate. The allelopathic effect was statistically significant at $p \leq 0.05$ for most treatments. The results also showed that the plumule length of <i>P. turgidum</i> was more sensitive than that of <i>P. minor</i> and responds more strongly to the increase of concentration of <i>R. graveolens</i> shoot aqueous extract and leachate. On the contrary, radicle length of <i>P. minor</i> was the more sensitive to <i>R. graveolens</i> shoot aqueous extract and leachate. Therefore, <i>R. graveolens</i> extract and leachate may be offer promises for their usefulness as a tool for weed management."

403	Parasitic	n
	Source(s)	Notes
	Dehgan, B. (2023). Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots). Springer Nature, Cham, Switzerland	"Aromatic subshrub or suffrutescent (woody-based) herbaceous perennial, to 3 feet (1 m) high and as wide; fine texture; moderately rapid growth rate."

404	Unpalatable to grazing animals	y
	Source(s)	Notes
	NC State Extension. (2024). <i>Ruta graveolens</i> . <a href="https://plants.ces.ncsu.edu/plants/ruta-graveolens/">https://plants.ces.ncsu.edu/plants/ruta-graveolens/</a> . [Accessed 19 Jun 2024]	" It is a hardy plant that is deer resistant and tolerates drought and dry and rocky soil."
	Singer, C. (2006). <i>Deer in My Garden: Vol. 1: Perennials &amp; Subshrubs</i> . Garden Wisdom Press, Grass Valley, CA	[Recommended for a deer resistant garden] "The blue-green foliage of <i>Ruta graveolens</i> glows in the winter landscape. One of the most attractive of evergreen subshrubs, it is seldom seen in gardens. This wonderful perennial should be one of the most important plants in deer country."

405	Toxic to animals	y
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Amaral, A. C. F., Silva, J. D. A., Falcão, D. Q., Ferreirinha, L. G., Santos, A. D., Araújo, R. B., & Ferreira, J. L. P. (2011). Chemical analysis of toxic principles in preparations of <i>Ruta graveolens</i> and <i>Petiveria alliacea</i> . In <i>Poisoning by Plants, Mycotoxins and Related Toxins</i> (pp. 698-704). Wallingford UK: CABI	"However, <i>R. graveolens</i> has shown high toxic potential for both animals and humans. Several studies related the consumption of this plant to cases of intoxication which led to multi-organ damages and death (El Agra et al. 2002; Seak and Lin 2007)."
	Burrows, G. E., & Tyrl, R. J. (2013). <i>Toxic Plants of North America</i> . Second Edition. Wiley-Blackwell, Hoboken, NJ	"The possibility of species of <i>Ruta</i> causing reproductive effects in livestock is not known at present. However, continued ingestion of leaves by goats may cause serious intoxication effects. Experimentally, 1 mg/kg b.w./day of ground leaves of <i>Ruta graveolens</i> caused loss of appetite and condition and eventually collapse or death (El -Agra et al. 2002). Dosage of 5 mg/kg b.w./day resulted in tremor, ataxia, and death in 1 -7 days."
	Deerfield Veterinary Clinic. (2024). <i>Plants Poisonous to Your Pets</i> . <a href="https://deerfieldvetclinic.com/veterinarian/articles/plants-poisonous-to-your-pets/">https://deerfieldvetclinic.com/veterinarian/articles/plants-poisonous-to-your-pets/</a> . [Accessed 19 Jun 2024]	List includes <i>Ruta graveolens</i>

406	Host for recognized pests and pathogens	n
	<b>Source(s)</b>	<b>Notes</b>
	NC State Extension. (2024). <i>Ruta graveolens</i> . <a href="https://plants.ces.ncsu.edu/plants/ruta-graveolens/">https://plants.ces.ncsu.edu/plants/ruta-graveolens/</a> . [Accessed 21 Jun 2024]	"Diseases, Insects, and Other Plant Problems: No serious insect or disease problems. Root rot may occur, particularly in poorly drained soils."
	Dehgan, B. (2023). <i>Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots)</i> . Springer Nature, Cham, Switzerland	"no serious insect or disease problems reported."

407	Causes allergies or is otherwise toxic to humans	y
	<b>Source(s)</b>	<b>Notes</b>
	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	"Plant potentially toxic to lethal, irritant, skin irritation, blistering, phototoxic, phytophotodermatitis, dermatosis, erythema; ingestion may be fatal."
	van Wyk, B.-E. & Wink, M. (2017). <i>Medicinal Plants of the World</i> . Second edition. CABI, Wallingford	"Rue is traditionally used for a very wide range of ailments, including menstrual disorders, spasms, loss of appetite, dyspeptic complaints, circulatory disorders, fever, high blood pressure, heart palpitations, inflamed mucosa, toothache, hysteria, arthritis, sprains, injuries and skin diseases. It has been used as a uterine stimulant and for inducing abortion - a dangerous practice that has led to fatalities. Rue was formerly used to improve and stabilise wine of bad quality. Preparation and dosage Extreme care should be taken because rue can cause severe photodermatitis. It is toxic and abortive if taken in high doses. Bruised leaves may be placed on a tooth and in the ears to alleviate pain."
	Staples, G.W. & Herbst, D.R. (2005). <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"Rue plants should be handled with care for they cause allergic reactions in some people."
	Burrows, G. E., & Tyrl, R. J. (2013). <i>Toxic Plants of North America</i> . Second Edition. Wiley-Blackwell, Hoboken, NJ	"These same species of <i>Ruta</i> have also been known from ancient times for causing primary photodermatitis in humans following contact with leaves or stems. The response is quite variable among individuals, and even with significant contact there may be little or no reaction by some persons."

408	Creates a fire hazard in natural ecosystems	

Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. (2024). Personal Communication	Unlikely, No information found on fire ecology, or increase fire risk, associated with this species.

409	Is a shade tolerant plant at some stage of its life cycle	
	<b>Source(s)</b>	<b>Notes</b>
	Singer, C. (2006). <i>Deer in My Garden: Vol. 1: Perennials &amp; Subshrubs</i> . Garden Wisdom Press, Grass Valley, CA	
	Dehgan, B. (2023). <i>Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots)</i> . Springer Nature, Cham, Switzerland	"Full sun to partial bright shade, in well-drained, somewhat dry but fertile soils; tolerates drought, rocky dry soils, and heat"
	NC State Extension. (2024). <i>Ruta graveolens</i> . <a href="https://plants.ces.ncsu.edu/plants/ruta-graveolens/">https://plants.ces.ncsu.edu/plants/ruta-graveolens/</a> . [Accessed 21 Jun 2024]	"It grows well in full sun to part shade, moderately fertile, moist, well-drained soil. "
	Staples, G.W. & Herbst, D.R. (2005). <i>A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places</i> . Bishop Museum Press, Honolulu, HI	"Propagated by seed or by division of mature clumps, rue is best grown in full sun in damp soil with periodic fertilization."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	<b>Source(s)</b>	<b>Notes</b>
	Dehgan, B. (2023). <i>Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots)</i> . Springer Nature, Cham, Switzerland	"Full sun to partial bright shade, in well-drained, somewhat dry but fertile soils; tolerates drought, rocky dry soils"
	NC State Extension. (2024). <i>Ruta graveolens</i> . <a href="https://plants.ces.ncsu.edu/plants/ruta-graveolens/">https://plants.ces.ncsu.edu/plants/ruta-graveolens/</a> . [Accessed 21 Jun 2024]	[Tolerates most soil types as long as they are not too wet] "Root rot may occur, particularly in poorly drained soils." "Soil Texture: Clay Loam (Silt) Sand Shallow Rocky Soil pH: Acid (<6.0) Alkaline (>8.0) Neutral (6.0-8.0) Soil Drainage: Good Drainage Occasionally Dry"

411	Climbing or smothering growth habit	n
	<b>Source(s)</b>	<b>Notes</b>
	van Wyk, B.-E. & Wink, M. (2017). <i>Medicinal Plants of the World</i> . Second edition. CABI, Wallingford	"Rue is a woody, strongly aromatic, perennial shrub (about 1 m), bearing irregularly divided, compound leaves covered with minute, translucent glands, clusters of small yellow flowers and four-lobed fruit capsules."

412	Forms dense thickets	n
	<b>Source(s)</b>	<b>Notes</b>
	Bojňanský, V. & Fargašová, A. (2007). <i>Atlas of Seeds and Fruits of Central and East-European Flora: The Carpathian Mountains Region</i> . Springer, Dordrecht, The Netherlands	"widely naturalized, in sunny open soils, waste places, nearly in all Carpathian territories."



Qsn #	Question	Answer
	Wells, M. J., Balsinhas, A. A., Joffe, H., Engelbrecht, V.M., Harding, G. & Stirton, C.H. (1986). A Catalogue of problem plants in Southern Africa. Botanical Research Institute, Republic of South Africa	[Competitive, but no evidence that it forms dense thickets that exclude other vegetation] "Undesirable Characteristics: Competitive (space, light, water, nutriment), replacing preferred vegetation (indigenous), irritant (skin), contaminant (seed)"
	Starr, F., Starr, K. & Loope, L.L. (2004). New plant records from the Hawaiian Archipelago. Bishop Museum Occasional Papers 79: 20-30	[No evidence] "Native to south eastern Europe (Brickell & Zuk, 1997), <i>R. graveolens</i> (common rue) is known from BISH specimens to have been first collected in Hawai'i on Maui in 1927 and was noted to be "locally common and naturalized in pastures". Today, this plant is still naturalized and locally common in pastures and along rock walls in Kula, Maui."

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 southeastern Europe, on sunny, alkaline soils; in the past cultivated in gardens as a medicinal and aromatic plant, widely naturalized, in sunny open soils, waste places, nearly in all Carpathian territories."

502	Grass	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2024). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch">https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch</a> . [Accessed 21 Jun 2024]	"Family: Rutaceae Subfamily: Rutoideae"

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2024). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch">https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomysearch</a> . [Accessed 21 Jun 2024]	"Family: Rutaceae Subfamily: Rutoideae"

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	van Wyk, B.-E. & Wink, M. (2017). Medicinal Plants of the World. Second edition. CABI, Wallingford	"Rue is a woody, strongly aromatic, perennial shrub (about 1 m), bearing irregularly divided, compound leaves covered with minute, translucent glands, clusters of small yellow flowers and four-lobed fruit capsules."

Qsn #	Question	Answer
601	<b>Evidence of substantial reproductive failure in native habitat</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	van Wyk, B.-E. & Wink, M. (2017). Medicinal Plants of the World. Second edition. CABI, Wallingford	[No evidence] "Southern Europe; commonly cultivated in many parts of the world"
602	<b>Produces viable seed</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Staples, G.W. & Herbst, D.R. (2005). A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Propagated by seed or by division of mature clumps, rue is best grown in full sun in damp soil with periodic fertilization."
	Dehgan, B. (2023). Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots). Springer Nature, Cham, Switzerland	"Propagation: seed, cuttings from basal wood or tip cuttings."
	Wells, M. J., Balsinhas, A. A., Joffe, H., Engelbrecht, V.M., Harding, G. & Stirton, C.H. (1986). A Catalogue of problem plants in Southern Africa. Botanical Research Institute, Republic of South Africa	"Reproduction Via: Seeds"
603	<b>Hybridizes naturally</b>	
	<b>Source(s)</b>	<b>Notes</b>
	WRA Specialist. (2024). Personal Communication	Unknown. No evidence found
604	<b>Self-compatible or apomictic</b>	<b>y</b>
	<b>Source(s)</b>	<b>Notes</b>
	Tang, J. Y., & Ren, M. X. (2011). Sex allocation and functional bias of quaternary and quinary flowers on same inflorescence in the hermaphrodite <i>Ruta graveolens</i> . Acta Oecologica, 37(5), 449-454	" <i>R. graveolens</i> has a mixed mating system, it's self-compatible but pollinators were needed for seed production (Fig. 3). The dichogamy (protandry) in this hermaphroditic flower was obvious (Fig. 2) and seemed responsible for the observed low level of autogamous pollination."
605	<b>Requires specialist pollinators</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	Tang, J. Y., & Ren, M. X. (2011). Sex allocation and functional bias of quaternary and quinary flowers on same inflorescence in the hermaphrodite <i>Ruta graveolens</i> . Acta Oecologica, 37(5), 449-454	"During experimental periods, the most common visitor to <i>R. graveolens</i> flowers was one species of honeybees ( <i>Apis</i> sp.), while one species of halictid bees ( <i>Lasioglossum</i> sp.), one species of vespid wasps ( <i>Vespa</i> sp.), one species of ants ( <i>Camponotus</i> sp.), and some species of hoverflies ( <i>Syrphidae</i> ) and flesh flies ( <i>Sarcophagidae</i> ) also frequently visited the flowers. The quinary flower was mainly frequently visited by honeybees and hoverflies, while the frequent visitors of lateral quaternary flowers were honeybees and halictid bees. Using a dissecting microscope (I200), all these frequent floral visitors were found normally carrying pollen grains on their bodies after visiting the flowers, but ants and wasps carried much fewer pollen grains (Table 2). The ants mainly sought nectar, while the other pollinators collected both nectar and pollen. The pollinators collected pollen grains mainly from the anthers locating at the right center position of flower because anthers only begin to dehisce when they positioning at the center of flower."
606	<b>Reproduction by vegetative fragmentation</b>	<b>n</b>

Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	Dehgan, B. (2023). Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots). Springer Nature, Cham, Switzerland	"Propagation: seed, cuttings from basal wood or tip cuttings." [No evidence of natural vegetative spread]
	Wells, M. J., Balsinhas, A. A., Joffe, H., Engelbrecht, V.M., Harding, G. & Stirton, C.H. (1986). A Catalogue of problem plants in Southern Africa. Botanical Research Institute, Republic of South Africa	"Reproduction Via: Seeds"
	Singer, C. (2006). Deer in My Garden: Vol. 1: Perennials & Subshrubs. Garden Wisdom Press, Grass Valley, CA	"Take vegetative cuttings from terminal buds beginning in spring. Because these cuttings are slow to root, take vegetative cuttings through the summer months, but not in fall. It is difficult for unrooted cuttings to winter-over even in a protected location such as a cold frame."

607	<b>Minimum generative time (years)</b>	2
	<b>Source(s)</b>	<b>Notes</b>
	NC State Extension. (2024). <i>Ruta graveolens</i> . <a href="https://plants.ces.ncsu.edu/plants/ruta-graveolens/">https://plants.ces.ncsu.edu/plants/ruta-graveolens/</a> . [Accessed 21 Jun 2024]	"Although it is short-lived (around 5 years), it will self-seed to replace itself." ... "Growth Rate: Medium" [Probably 1-2 years]

701	<b>Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	PictureThis. (2024). Rue - <i>Ruta graveolens</i> . <a href="https://www.picturethisai.com/wiki/Ruta_graveolens.html">https://www.picturethisai.com/wiki/Ruta_graveolens.html</a> . [Accessed 21 Jun 2024]	[Possibly. Occurs along roads, which could facilitate unintentional dispersal] "Rue is a shrub-like weed that grows in the eastern and central United States and from Texas to California and throughout Europe. This species does not appear on any state or national invasive species lists and is not considered aggressive, but it has weedy qualities. For example, rue may self-seed and thrives in fields, disturbed areas, and along roads."

702	<b>Propagules dispersed intentionally by people</b>	y
	<b>Source(s)</b>	<b>Notes</b>
	Staples, G.W. & Herbst, D.R. (2005). A Tropical Garden Flora - Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Bishop Museum Press, Honolulu, HI	"Rue is native to southwestern Asia and was spread from there throughout Europe and Asia as a medicinal and culinary herb. It has been planted in Hawai'i primarily by the Portuguese, who use the leaves in cooking and to brew tea."
	van Wyk, B.-E. & Wink, M. (2017). Medicinal Plants of the World. Second edition. CABI, Wallingford	"Southern Europe; commonly cultivated in many parts of the world."

703	<b>Propagules likely to disperse as a produce contaminant</b>	y
	<b>Source(s)</b>	<b>Notes</b>
	Wells, M. J., Balsinhas, A. A., Joffe, H., Engelbrecht, V.M., Harding, G. & Stirton, C.H. (1986). A Catalogue of problem plants in Southern Africa. Botanical Research Institute, Republic of South Africa	"Competitive (space, light, water, nutriment), replacing preferred vegetation (indigenous), irritant (skin), contaminant (seed)"
	FloraVeg.EU. (2024). Database of European Vegetation, Habitats and Flora. <a href="http://www.floraveg.eu">www.floraveg.eu</a>	"Dispersal mode: Local non-specific dispersal, Anthropochory"

704	<b>Propagules adapted to wind dispersal</b>	n
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Qsn #	Question	Answer
	<b>Source(s)</b>	<b>Notes</b>
	FloraVeg.EU. (2024). Database of European Vegetation, Habitats and Flora. www.floraveg.eu	"Dispersal mode: Local non-specific dispersal, Anthropochory"
705	<b>Propagules water dispersed</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	FloraVeg.EU. (2024). Database of European Vegetation, Habitats and Flora. www.floraveg.eu	"Dispersal mode: Local non-specific dispersal, Anthropochory" [Possible, but not common in riparian or near aquatic habitats. Water unlikely to be an important dispersal vector]
706	<b>Propagules bird dispersed</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	FloraVeg.EU. (2024). Database of European Vegetation, Habitats and Flora. www.floraveg.eu	"Dispersal mode: Local non-specific dispersal, Anthropochory"
	Dehgan, B. (2023). Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots). Springer Nature, Cham, Switzerland	"Fruit: small globose dehiscent capsule with 4 or 5 locules." [Not fleshy-fruited]
707	<b>Propagules dispersed by other animals (externally)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Bojňanský, V. & Fargašová, A. (2007). Atlas of Seeds and Fruits of Central and East-European Flora: The Carpathian Mountains Region. Springer, Dordrecht, The Netherlands	"Seeds reniform, lateral rooflike and slight compressed, dorsal side convex, ventral concave, 2-2.2 x 1.5-1.7 mm. Surface humped, lustreless, blackish." [Possibly. Seeds lack means of external attachment, but the small size could aid in attachment to animals]
708	<b>Propagules survive passage through the gut</b>	<b>n</b>
	<b>Source(s)</b>	<b>Notes</b>
	FloraVeg.EU. (2024). Database of European Vegetation, Habitats and Flora. www.floraveg.eu	" Dispersal mode: Local non-specific dispersal, Anthropochory" [Unlikely. Fruit and seeds not fleshy-fruited or adapted for frugivory, and plant chemicals may deter browsing and incidental dispersal]
801	<b>Prolific seed production (&gt;1000/m2)</b>	
	<b>Source(s)</b>	<b>Notes</b>
	Bojňanský, V. & Fargašová, A. (2007). Atlas of Seeds and Fruits of Central and East-European Flora: The Carpathian Mountains Region. Springer, Dordrecht, The Netherlands	[Unknown] "Shrub, 15-40 cm high, leaves oval or ovoid, leaflets oblong lanceolate, plant faint aromatic. Seeds ellipsoid, lateral slight flattish, dorsal side convex, ventral concave or flat, with a large hilum, 2.6-2.9 x 1.4-1.6 mm. Surface verrucate, dull, dark-greyish to black."
802	<b>Evidence that a persistent propagule bank is formed (&gt;1 yr)</b>	
	<b>Source(s)</b>	<b>Notes</b>

Qsn #	Question	Answer
	Aghilian, S., Khajeh-Hosseini, M., & Anvarkhah, S. (2014). Evaluation of seed storage potential in forty medicinal plant species. <i>International Journal of Agriculture and Crop Sciences</i> , 7(10), 749-759	[Possibly. Under storage and uncontrolled conditions, seeds continue to germinate after 12 months] "To monitoring the effect of storage on germination all species seed lots divided to two groups; one group kept under controlled conditions in refrigerator, and the other one kept under uncontrolled conditions at room temperature. For both groups, seed germination tests were monitored 9 months as well as 12 months after the storage." ... "In <i>Amaranthus annuus</i> , <i>Citrus colocynthis</i> , <i>Foeniculum vulgare</i> , <i>Hypericum perforatum</i> , <i>Linum usitatissimum</i> , <i>Oenothera biennis</i> , <i>Origanum majurana</i> , <i>Plantago ovate</i> , <i>Ricinus communis</i> , <i>Ruta graveolens</i> , <i>Sesamum indicum</i> and <i>Silybum marianum</i> species their germination in primary test was high (over 70%) and during storage period no remarkable changes were occurred (table 3). Therefore, besides beneficial germination, they had acceptable storage potential and they were not sensitive to storage conditions like moisture or temperature."

803	Well controlled by herbicides	
	Source(s)	Notes
	PictureThis. (2024). Rue - <i>Ruta graveolens</i> . <a href="https://www.picturethisai.com/wiki/Ruta_graveolens.html">https://www.picturethisai.com/wiki/Ruta_graveolens.html</a> . [Accessed 21 Jun 2024]	"Gardeners wearing gloves can cut off the flower heads to prevent such self-seeding, or apply an herbicide to eliminate the plant." [Efficacy unspecified]

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	NC State Extension. (2024). <i>Ruta graveolens</i> . <a href="https://plants.ces.ncsu.edu/plants/ruta-graveolens/">https://plants.ces.ncsu.edu/plants/ruta-graveolens/</a> . [Accessed 21 Jun 2024]	"Prune back plants to old wood in early spring."
	Singer, C. (2006). <i>Deer in My Garden: Vol. 1: Perennials &amp; Subshrubs</i> . Garden Wisdom Press, Grass Valley, CA	" <i>Ruta graveolens</i> needs little maintenance. A light shearing at the end of winter will stimulate new growth and define the shape of this subshrub. Deadheading consists of removing a few stalks with fading flower sprays."
	WRA Specialist. (2024). Personal Communication	Tolerates pruning, and may be able to resprout if cut back or physically controlled. Herbicide treatments may be necessary.

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	Dehgan, B. (2023). <i>Garden Plants Taxonomy: Volume 2: Angiosperms (Eudicots)</i> . Springer Nature, Cham, Switzerland	"no serious insect or disease problems reported." [Unknown in Hawaiian Islands]

**Summary of Risk Traits:**

*Ruta graveolens* (common rue), is an aromatic, perennial herb or subshrub (woody-based) to 3 feet (1 m) high, native to Southeastern Europe. It is commonly cultivated in herb gardens in many parts of the world for its narcotic and medicinal properties and has become naturalized in several locations including the island of Maui, Hawaiian Islands. With its ability to self-seed, it can easily spread from cultivation, and may become weedy in some locations. Plants should be handled with care, as they can cause an allergic reaction, and severe dermatitis, when in contact with bare skin.

**High Risk / Undesirable Traits**

- Broad climate suitability (temperate to tropical)
- Naturalized on Maui (Hawaiian Islands), North America, Africa and possible elsewhere
- A disturbance and garden weed that competes with other vegetation for space, light, water and nutrients
- Unpalatable to deer and probably other browsing animals
- Toxic and allergenic to animals and people
- Contact with skin can cause skin irritation, blistering, and photodermatitis
- Tolerates many soil types
- Reproduces by seeds
- Self-compatible (capable of producing seeds through self-pollination)
- Seeds dispersed by gravity, as a crop contaminant, through intentional cultivation, and possibly by other means.
- Tolerates pruning, and may resprout if cut back

**Low Risk Traits**

- Intentionally cultivated and regarded as desirable in herb gardens
- Unarmed (no spines, thorns, or burrs)
- Grows best in high light environments (dense shade may inhibit spread)