

Taxon: <i>Tillandsia bulbosa</i> Hook.	Family: Bromeliaceae
Common Name(s): bulbous air plant	Synonym(s): <i>Platystachys bulbosa</i> (Hook.) Beer <i>Platystachys erythraea</i> (Lindl. & Pourretia hanisiana E. Morren <i>Tillandsia erythraea</i> Lindl. & Paxton <i>Tillandsia pumila</i> Griseb.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 18 Feb 2022
WRA Score: 4.0	Designation: L	Rating: Low Risk

Keywords: Epiphyte, Naturalized (Oahu), Ornamental, Self-fertile, Wind-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	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	?
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)	n
303	Agricultural/forestry/horticultural weed	n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed	n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	n
402	Allelopathic		
403	Parasitic	y=1, n=0	n
404	Unpalatable to grazing animals		
405	Toxic to animals	y=1, n=0	n
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
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)		
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		
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	>3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	y
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)	y=1, n=-1	n
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m ²)		
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
	Source(s)	Notes
	Smith, L. B., & Downs, R. J. (1977). Tillandsioideae (Bromeliaceae). Flora Neotropica, 14(2), 663–1492	"Distribution. Epiphytic, from near sea level to 1350 m alt, Mexico and the West Indies to Ecuador and northern Brazil." [No evidence of domestication]
102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2022). Personal Communication	NA
103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2022). Personal Communication	NA
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	Smith, L. B., & Downs, R. J. (1977). Tillandsioideae (Bromeliaceae). Flora Neotropica, 14(2), 663–1492	"Distribution. Epiphytic, from near sea level to 1350 m alt, Mexico and the West Indies to Ecuador and northern Brazil."
202	Quality of climate match data	High
	Source(s)	Notes
	Smith, L. B., & Downs, R. J. (1977). Tillandsioideae (Bromeliaceae). Flora Neotropica, 14(2), 663–1492	"Distribution. Epiphytic, from near sea level to 1350 m alt, Mexico and the West Indies to Ecuador and northern Brazil."
203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes
	Smith, L. B., & Downs, R. J. (1977). Tillandsioideae (Bromeliaceae). Flora Neotropica, 14(2), 663–1492	"Epiphytic, from near sea level to 1350 m alt" [Broad elevation range. Could potentially establish in a range of habitats in the Hawaiian Islands or other Pacific islands]
	Dave's Garden. (2022). Tillandsia Bromeliad Species, Air Plant - Tillandsia bulbosa. https://davesgarden.com/guides/pf/go/63718/ . [Accessed 17 Feb 2022]	"Hardiness: USDA Zone 9a: to -6.6 °C (20 °F) USDA Zone 9b: to -3.8 °C (25 °F) USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F) USDA Zone 11: above 4.5 °C (40 °F)"
204	Native or naturalized in regions with tropical or subtropical climates	y

Qsn #	Question	Answer
	Source(s)	Notes
	Smith, L. B., & Downs, R. J. (1977). Tillandsioideae (Bromeliaceae). Flora Neotropica, 14(2), 663–1492	"Distribution. Epiphytic, from near sea level to 1350 m alt, Mexico and the West Indies to Ecuador and northern Brazil."
	Frohlich, D. & Lau, A. (2010). New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	[Oahu] "This species is apparently self-fertile, producing many plumose, easily wind-dispersed seeds. It was found establishing in one location, sparingly naturalized on Lagerstroemia, Plumeria, and rock walls. Material examined. O'AHU: Mānoa Valley (UTM 624203, 2357330), epiphyte with twisted, thick, green-and-maroon leaves, 17 oct 2008, A. Lau & D. Frohlich 2008101701."

205	Does the species have a history of repeated introductions outside its natural range?	?
	Source(s)	Notes
	Frohlich, D. & Lau, A. (2010). New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"It is not well documented as naturalized anywhere else in the world and is rare in cultivation, including in Hawai'i."
	Dave's Garden. (2022). Tillandsia Bromeliad Species, Air Plant - Tillandsia bulbosa. https://davesgarden.com/guides/pf/go/63718/ . [Accessed 17 Feb 2022]	Reported to be cultivated in California, Florida, Tennessee and Texas, but unclear if grown indoors or outside

301	Naturalized beyond native range	y
	Source(s)	Notes
	Frohlich, D. & Lau, A. (2010). New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	[Oahu] "This epiphyte is known to grow from sea level to 1350 m, and its native range includes much of tropical and subtropical America. It is not well documented as naturalized anywhere else in the world and is rare in cultivation, including in Hawai'i." ... "This species is apparently self-fertile, producing many plumose, easily wind-dispersed seeds. It was found establishing in one location, sparingly naturalized on Lagerstroemia, Plumeria, and rock walls. Material examined. O'AHU: Mānoa Valley (UTM 624203, 2357330), epiphyte with twisted, thick, green-and-maroon leaves, 17 oct 2008, A. Lau & D. Frohlich 2008101701."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence outside the Hawaiian Island of Oahu

302	Garden/amenity/disturbance weed	n
	Source(s)	Notes
	Frohlich, D. & Lau, A. (2010). New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"It is not well documented as naturalized anywhere else in the world and is rare in cultivation, including in Hawai'i." [No evidence of negative impacts reported]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

303	Agricultural/forestry/horticultural weed	n
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Qsn #	Question	Answer
	Source(s)	Notes
	Frohlich, D. & Lau, A. (2010). New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"It is not well documented as naturalized anywhere else in the world and is rare in cultivation, including in Hawai'i." [No evidence of negative impacts reported]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

304	Environmental weed	n
	Source(s)	Notes
	Frohlich, D. & Lau, A. (2010). New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"It is not well documented as naturalized anywhere else in the world and is rare in cultivation, including in Hawai'i." [No evidence of negative impacts reported]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

305	Congeneric weed	y
	Source(s)	Notes
	Johnson, J. D.; Halliwell, R. S. (1973) Compounds for the control of ball moss. Plant Disease Reporter 57(1): 81-83	"In field trials in south-west Texas in 1970-71, good control of <i>Tillandsia recurvata</i> on the evergreen <i>Quercus virginiana</i> was obtained by spring with Cu(OH) ₂ (Kocide 101) at 4-8 lb/100 gal water."
	Cardenas, C. H. (1971) Observations on <i>Tillandsia recurvata</i> and its control by means of herbicides. Revista de la Facultad de Agronomia, Universidad Central de Venezuela 6(2): 43-72	"In parts of Venezuela the epiphyte <i>Tillandsia recurvata</i> is sufficiently abundant to kill whole trees or their main branches. Its mode of propagation is described. In the laboratory detached plants were readily killed by submergence in various herbicidal solutions."

401	Produces spines, thorns or burrs	n
	Source(s)	Notes
	Smith, L. B., & Downs, R. J. (1977). Tillandsioideae (Bromeliaceae). Flora Neotropica, 14(2), 663-1492	"Plant stemless, usually densely aggregated, 7-22 cm high, very variable in size and color. Leaves 8-15, often exceeding the inflorescence, covered with fine, closely appressed, cinereous scales; sheaths orbicular, abruptly contracted into the blades, greatly inflated, 2-5 cm long, forming a dense ovoid pseudobulb (long-fusiform in some nonpersistent sports), green or greenish-white, often with a narrow red or purple marginal band; blades involute-subulate, attenuate, contorted, spreading and at least the outer ones making a sharp angle with the apex of the sheath, to 3 dm long, 2-7 mm in diameter."

402	Allelopathic	
	Source(s)	Notes

Qsn #	Question	Answer
	Valencia-Díaz, S., Flores-Palacios, A., Rodruíguez-López, V., & Jimenez-Aparicio, A. R. (2012). Effects of <i>Tillandsia recurvata</i> extracts on the seed germination of <i>Tillandsia</i> spp. <i>Allelopathy Journal</i> , 29(1): 125-135	[Unknown. No evidence, but allelopathic chemicals documented in other species] "Abstract: Epiphytes associate intraspecifically, but it is unclear whether the dominant species exerts a negative effect on its competitors through allelopathy. <i>Tillandsia recurvata</i> is the dominant epiphyte in the tropical dry forest of central Mexico. It has phytotoxic properties, therefore inhibits the seed germination of other epiphytic bromeliads, which may effect its associations. Nearest neighbor (NN) distance from each bromeliad was measured and the bromeliad associations were characterized as intra or interspecific. Leachates and organic extracts from <i>T. recurvata</i> were used in seed germination trials of <i>Tillandsia</i> . All species have a conspecific as their NN, but interespecific associations indicate that <i>T. recurvata</i> was less frequent NN for all <i>Tillandsia</i> . <i>T. recurvata</i> leachates and organic extracts inhibited the germination of all <i>Tillandsia</i> species. This research demonstrates the inhibitory potential of <i>T. recurvata</i> on its competitors; however its association patterns were not explained. Other ecological factors may account for its dominance and associations."

403	Parasitic	n
	Source(s)	Notes
	Acevedo-Rodríguez, P. & Strong, M.T. (2005). Monocotyledons and Gymnosperms of Puerto Rico and the Virgin Islands. <i>Contributions from the United States National Herbarium</i> 52: 1-415	"Epiphytic, acaulescent herb, variable in size, usually forming clumps." [No evidence]

404	Unpalatable to grazing animals	
	Source(s)	Notes
	Smith, L. B., & Downs, R. J. (1977). <i>Tillandsioideae</i> (Bromeliaceae). <i>Flora Neotropica</i> , 14(2), 663–1492	"Epiphytic, from near sea level to 1350 m alt" [Unknown, but epiphytic habit may keep plants out of reach of most browsing animals]
	Guarçoni, E. A., Sousa, J. D., Ferreira, A. W., Junior, W. R., Oliveira, M. S., & Silva, E. O. (2020). New occurrence records of Bromeliaceae for the state of Maranhão, northeastern Brazil. <i>Check List</i> 16(6): 1575–1580	[Monkeys feed on leaves in native range] "Capuchin monkeys (<i>Sapajus</i> sp.) were observed feeding on the leaf bases of <i>T. bulbosa</i> . These associations have also been verified by Fiorato (2009) and (Benzing) 1990."
	Smith, J.G. (1896). <i>Fodder and Forage Plants: Exclusive of the Grasses</i> . Government Printing Office, Washington, D.C.	[<i>Tillandsia usneoides</i> palatable to cattle] "An epiphyte belonging to the Pineapple family, abundant in Florida and the Gulf States, where it is a characteristic feature of the forests with its long stems hanging in festoons from the tree trunks and branches. Cattle eat it, and it adds considerable value to the woodland pastures."

405	Toxic to animals	n
	Source(s)	Notes
	Houseplant Central. (2022). <i>Tillandsia bulbosa</i> care & info <i>Bulbosa</i> air plant. https://houseplantcentral.com/bulbosa-air-plant-tillandsia-bulbosa-care-info/ . [Accessed 17 Feb 2022]	"Luckily, <i>Tillandsias</i> like <i>Tillandsia bulbosa</i> aren't toxic to cats and dogs. They do, like all plants, cause an upset stomach. Try keeping your air plants away from your pets, because they are the perfect size for a chewing toy!"

Qsn #	Question	Answer
	Quattrocchi, U. (2012). CRC World Dictionary of Medicinal and Poisonous Plants: Common Names, Scientific Names, Eponyms, Synonyms, and Etymology. CRC Press, Boca Raton, FL	No evidence
	Wagstaff, D.J. (2008). International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	Central Ohio Cactus and Succulent Society. (2022). <i>Tillandsia bulbosa</i> "Air Plant". https://www.columbuscactusclub.com/tillandsia-bulbosa--air-plant-.html . [Accessed 17 Feb 2022]	"It has proven to be very resistant to insect pests: even when other plants in my collection fell prey to white flies and mealy bugs, I have never seen evidence of these pests on this plant. "
	Grow Plants. (2022). <i>Tillandsia Bulbosa</i> . https://www.growplants.org/growing/tillandsia-bulbosa . [Accessed 17 Feb 2022]	"Pests and diseases: Aphids, fungal, slugs, snails,"

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	No evidence
	Wagstaff, D.J. (2008). International poisonous plants checklist: an evidence-based reference. CRC Press, Boca Raton, FL	No evidence

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Croat, T.B. (1978). Flora of Barro Colorado Island. Stanford University Press, Stanford, CA	"Occasional, in the forest, usually rather high in trees." [No evidence. Unlikely to increase fire risk due to epiphytic habit, although may add to fuel load if forest burns]

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Wagner, K., Bogusch, W., & Zotz, G. (2013). The role of the regeneration niche for the vertical stratification of vascular epiphytes. <i>Journal of Tropical Ecology</i> , 29(4), 277-290	"Pittendrigh (1948), in his classic study of bromeliads on Trinidad, placed <i>Catopsis sessiliflora</i> into the exposure group, <i>Tillandsia bulbosa</i> into the sun group and <i>Tillandsia anceps</i> into the shade-tolerant group."
	Dave's Garden. (2022). <i>Tillandsia Bromeliad Species, Air Plant - Tillandsia bulbosa</i> . https://davesgarden.com/guides/pf/go/63718/ . [Accessed 17 Feb 2022]	"Sun Exposure: Light Shade Partial to Full Shade"

Qsn #	Question	Answer
	Benzing, D. H. (2000). Bromeliaceae: Profile of an Adaptive Radiation. Cambridge University Press. Cambridge, UK	"Tillandsia bulbosa and T. butzii sometimes reproduce in considerable shade, equipped in part for dark habitats by at, rigid trichome shields that, uncharacteristically for a Type Five bromeliad, transmit instead of scatter photons whether wet or dry (Benzing et al. 1978; Fig. 4.23F,G)."
	Houseplant Central. (2022). Tillandsia bulbosa care & info! Bulbosa air plant. https://houseplantcentral.com/bulbosa-air-plant-tillandsia-bulbosa-care-info/ . [Accessed 17 Feb 2022]	"Tillandsia bulbosa is often found growing on trees, where it gets plenty of light but direct sun is usually blocked out."
	The Spruce. (2022). How to Grow the Bulbous Air Plant (Tillandsia bulbosa). https://www.thespruce.com/growing-tillandsia-bulbosa-5083009 . [Accessed 17 Feb 2022]	"Tillandsia bulbosa is very adaptable to light and partial shade. It does not particularly like bright sun and would prefer indirect light and partial shade, but it is a flexible plant."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	
	Source(s)	Notes
	Smith, L. B., & Downs, R. J. (1977). Tillandsioideae (Bromeliaceae). <i>Flora Neotropica</i> , 14(2), 663–1492	"Epiphytic, from near sea level to 1350 m alt"
	The Spruce. (2022). How to Grow the Bulbous Air Plant (Tillandsia bulbosa). https://www.thespruce.com/growing-tillandsia-bulbosa-5083009 . [Accessed 17 Feb 2022]	"Placing the plant in soil is actually going to harm it as it will cause moisture to remain in its hollow bulb and create the opportunity for rot. "

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Acevedo-Rodríguez, P. & Strong, M.T. (2005). Monocotyledons and Gymnosperms of Puerto Rico and the Virgin Islands. <i>Contributions from the United States National Herbarium</i> 52: 1-415	"Epiphytic, acaulescent herb, variable in size, usually forming clumps." [Epiphytic, not climbing]

412	Forms dense thickets	n
	Source(s)	Notes
	Acevedo-Rodríguez, P. & Strong, M.T. (2005). Monocotyledons and Gymnosperms of Puerto Rico and the Virgin Islands. <i>Contributions from the United States National Herbarium</i> 52: 1-415	"Distribution in Puerto Rico: Thickets, slopes, ridges and woods, from semi-xeric scrub forest to moist forest, from about 100-800 m. Uncommon, recorded from: Arecibo, Desecheo Is., Maricao, Mayagüez, and San German."
	Croat, T.B. (1978). <i>Flora of Barro Colorado Island</i> . Stanford University Press, Stanford, CA	"Epiphyte; usually growing in dense clusters." ... "Occasional, in the forest, usually rather high in trees."

501	Aquatic	n
	Source(s)	Notes
	Smith, L. B., & Downs, R. J. (1977). Tillandsioideae (Bromeliaceae). <i>Flora Neotropica</i> , 14(2), 663–1492	"Epiphytic, from near sea level to 1350 m alt"

Qsn #	Question	Answer
502	Grass	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 17 Feb 2022]	Family: Bromeliaceae Subfamily: Tillandsioideae Tribe: Tillandsieae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2022). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 17 Feb 2022]	Family: Bromeliaceae Subfamily: Tillandsioideae Tribe: Tillandsieae

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	Acevedo-Rodríguez, P. & Strong, M.T. (2005). Monocotyledons and Gymnosperms of Puerto Rico and the Virgin Islands. Contributions from the United States National Herbarium 52: 1-415	"Epiphytic, acaulescent herb, variable in size, usually forming clumps. Leaves several, densely fasciculate, finely appressed cinereous-lepidote; sheaths conspicuous, suborbicular, 3-5 cm broad, abruptly contracted into the blades, inflated, imbricate, forming a dense ovoid pseudobulb;"

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes
	Tropicos.org. (2022). Tropicos v3.3.2. Missouri Botanical Garden. http://www.tropicos.org/ . [Accessed 17 Feb 2022]	"Conservation Status: LC - Least Concern - National"
	Guarçoni, E. A., Sousa, J. D., Ferreira, A. W., Junior, W. R., Oliveira, M. S., & Silva, E. O. (2020). New occurrence records of Bromeliaceae for the state of Maranhão, northeastern Brazil. Check List 16(6): 1575–1580	" <i>Tillandsia bulbosa</i> is widely distributed, occurring from Mexico to Brazil. In Brazil it occurs in the Amazon and Atlantic domains, in the North (Amazonas, Amapá, Pará), Northeast (Alagoas, Bahia, Paraíba, Pernambuco, Rio Grande do Norte, Sergipe), and Southeast (Espírito Santo) regions (Flora of Brazil 2020). Our new records are the first occurrences from Maranhão (Flora of Brazil 2020). We found this species in the municipality of Cândido Mendes, in an area of Amazon domain area."

602	Produces viable seed	y
	Source(s)	Notes
	Frohlich, D. & Lau, A. (2010). New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"This species is apparently self-fertile, producing many plumose, easily wind-dispersed seeds. It was found establishing in one location, sparingly naturalized on <i>Lagerstroemia</i> , <i>Plumeria</i> , and rock walls."

Qsn #	Question	Answer
	Houseplant Central. (2022). <i>Tillandsia bulbosa</i> care & info! Bulbosa air plant. https://houseplantcentral.com/bulbosa-air-plant-tillandsia-bulbosa-care-info/ . [Accessed 17 Feb 2022]	" <i>Tillandsia bulbosa</i> does occasionally flower in the home and you can actually grow these guys from seed. You'd have to pollinate the flower and wait for the seeds to form. Air plant seeds look a little like dandelion fluff, little parachutes ready to be taken away by wind or rain."

603	Hybridizes naturally	
	Source(s)	Notes
	Smith, L. B., & Downs, R. J. (1977). <i>Tillandsioideae</i> (Bromeliaceae). <i>Flora Neotropica</i> , 14(2), 663–1492	"In <i>Tillandsia</i> interspecific hybrids are rare except in the advanced subgenus <i>Diaphoranthema</i> . Most of these hybrids are natural and thus without vouchers except as the supposed parents are found in the vicinity."

604	Self-compatible or apomictic	y
	Source(s)	Notes
	Gouda, E. J. (2020). <i>Tillandsia</i> Bromeliaceae. Pp. 1107-1164 in U. Eggli, R. & Nyffeler (eds.), <i>Illustrated Handbook of Succulent Plants: Monocotyledons</i> . Springer-Verlag, GmbH Germany	"Most species of <i>Tillandsia</i> are self-incompatible and are dependent on pollinating animals for reproduction. The flowers of monocarpic species, however, are autogamous when not pollinated." [<i>Tillandsia bulbosa</i> is monocarpic and presumably autogamous]
	Orozco-Ibarrola, O. A., Flores-Hernández, P. S., Victoriano-Romero, E., Corona-López, A. M., & Flores-Palacios, A. (2015). Are breeding system and florivory associated with the abundance of <i>Tillandsia</i> species (Bromeliaceae)? <i>Botanical Journal of the Linnean Society</i> , 177(1), 50-65	[Self-compatible and self-incompatible breeding systems documented in <i>Tillandsia</i>] "In a community of bromeliads from the Atlantic rainforest of Brazil, Matallana et al. (2010) found that the most abundant species were self-compatible. Experimental studies conducted in 88 species of bromeliads showed that 66% are self-compatible (58 species), 8% are self-compatible but pollinator dependent and 25% are self-incompatible."
	Frohlich, D. & Lau, A. (2010). New plant records from O'ahu for 2008. <i>Bishop Museum Occasional Papers</i> 107: 3-18	[Suspected of being self-fertile] "This species is apparently self-fertile, producing many plumose, easily wind-dispersed seeds. It was found establishing in one location, sparingly naturalized on <i>Lagerstroemia</i> , <i>Plumeria</i> , and rock walls."

605	Requires specialist pollinators	n
	Source(s)	Notes
	Gouda, E. J. (2020). <i>Tillandsia</i> Bromeliaceae. Pp. 1107-1164 in U. Eggli, R. & Nyffeler (eds.), <i>Illustrated Handbook of Succulent Plants: Monocotyledons</i> . Springer-Verlag, GmbH Germany	"Most species of <i>Tillandsia</i> are self-incompatible and are dependent on pollinating animals for reproduction. The flowers of monocarpic species, however, are autogamous when not pollinated." [<i>Tillandsia bulbosa</i> is monocarpic and presumably autogamous]

606	Reproduction by vegetative fragmentation	
	Source(s)	Notes
	The Spruce. (2022). How to Grow the Bulbous Air Plant (<i>Tillandsia bulbosa</i>). https://www.thespruce.com/growing-tillandsia-bulbosa-5083009 . [Accessed 18 Feb 2022]	"It is also so easy to create new plants in this species. They put out offsets, called pups, at the base of the original plant. When these form to around half the size of the mother plant, you can easily remove them to mount them in a separate position." [Unknown if sprouts can detach and form new plants]

Qsn #	Question	Answer
607	Minimum generative time (years)	>3
	Source(s)	Notes
	Benzing, D. H. (2000). Bromeliaceae: Profile of an Adaptive Radiation. Cambridge University Press. Cambridge, UK	"Many dry-growing tillandsias (e.g., <i>T. stricta</i> , <i>T. recurvifolia</i> , <i>T. streptophylla</i> , <i>T. bulbosa</i> , <i>T. caput-medusae</i>) require on average 4–6 years to flower from seed in cultivation, and for the exceptionally slow growing types (e.g., <i>T. xiphioides</i> , <i>T. xerographica</i>) this number probably more closely approaches a full decade (Dimmitt 1984, 1990, unpublished data)."
	Two Peas In A Condo. (2022). 25 Interesting Tillandsia bulbosa Care Tips You Should Take To Heart. https://twopeasinacondo.com/growing-guides/tillandsia-bulbosa-care/#Growth_Rate . [Accessed 18 Feb 2022]	"The growth rate of a <i>Tillandsia bulbosa</i> is slow. At a mature height, it will only grow to about 4-7 inches tall. That said, it can produce small clones of itself, called pups, which you can either separate and propagate or leave on the mother plant." ... "The <i>Tillandsia bulbosa</i> produce significant red tubular flowers only once in their life, but they can grow baby plants (pups), which each have their air plant blooms. This erect flower shape is beautiful to see."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n
	Source(s)	Notes
	Croat, T.B. (1978). Flora of Barro Colorado Island. Stanford University Press, Stanford, CA	"seeds ca 2.5 cm long, comose, the coma white, very fine, fused and refolded midway."
	Frohlich, D. & Lau, A. (2010). New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"This species is apparently self-fertile, producing many plumose, easily wind-dispersed seeds. It was found establishing in one location, sparingly naturalized on <i>Lagerstroemia</i> , <i>Plumeria</i> , and rock walls." [A wind-dispersed epiphyte]

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	The Spruce. (2022). How to Grow the Bulbous Air Plant (<i>Tillandsia bulbosa</i>). https://www.thespruce.com/growing-tillandsia-bulbosa-5083009 . [Accessed 18 Feb 2022]	"For people with a notoriously black thumb, who want to grow a plant in the worst way, air plants are the most sensible option, and <i>Tillandsia bulbosa</i> is really the best bet in succeeding with air plants." [Promoted for cultivation on a number of websites]
	Benzing, D. H. (2000). Bromeliaceae: Profile of an Adaptive Radiation. Cambridge University Press. Cambridge, UK	"Table 15.1. Most heavily traded <i>Tillandsia</i> species in the United States" [Includes <i>T. aeranthos</i> (all nursery-grown) <i>T. bergeri</i> (all nursery-grown) <i>T. brachycaulos</i> <i>T. bulbosa</i> <i>T. butzii</i> <i>T. caput-medusae</i> <i>T. fuchsii</i> (<i>Sargentea</i>) <i>T. ionantha</i> <i>T. juncea</i> <i>T. kolbii</i> (<i>Sionantha scaposa</i>) <i>T. magnusiana</i> <i>T. tectorum</i> (? not more than 15000 per year) <i>T. tricolor</i> <i>T. xerographica</i>]

Qsn #	Question	Answer
703	Propagules likely to disperse as a produce contaminant	n
	Source(s)	Notes
	Frohlich, D. & Lau, A. (2010). New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"This species is apparently self-fertile, producing many plumose, easily wind-dispersed seeds. It was found establishing in one location, sparingly naturalized on Lagerstroemia, Plumeria, and rock walls." [An epiphyte, and unlikely to establish unless deposited in suitable substrate]
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	No evidence

704	Propagules adapted to wind dispersal	y
	Source(s)	Notes
	Croat, T.B. (1978). Flora of Barro Colorado Island. Stanford University Press, Stanford, CA	"Capsules narrowly cylindrical, 3-4 cm long, the valves 3, roughened outside, brown and shiny inside; seeds ca 2.5 cm long, comose, the coma white, very fine, fused and refolded midway."
	Frohlich, D. & Lau, A. (2010). New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"This species is apparently self-fertile, producing many plumose, easily wind-dispersed seeds. It was found establishing in one location, sparingly naturalized on Lagerstroemia, Plumeria, and rock walls."

705	Propagules water dispersed	n
	Source(s)	Notes
	Frohlich, D. & Lau, A. (2010). New plant records from O'ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"This species is apparently self-fertile, producing many plumose, easily wind-dispersed seeds. It was found establishing in one location, sparingly naturalized on Lagerstroemia, Plumeria, and rock walls." [Plumose, wind-dispersed seeds. Primarily epiphytic, so secondary dispersal by water would presumably not disperse seeds into a suitable substrate]

706	Propagules bird dispersed	n
	Source(s)	Notes
	Croat, T.B. (1978). Flora of Barro Colorado Island. Stanford University Press, Stanford, CA	"Capsules narrowly cylindrical, 3-4 cm long, the valves 3, roughened outside, brown and shiny inside; seeds ca 2.5 cm long, comose, the coma white, very fine, fused and refolded midway."
	Benzing, D. H. (2000). Bromeliaceae: Profile of an Adaptive Radiation. Cambridge University Press. Cambridge, UK	"Tillandsioideae disperse among arboreal and lithic substrates via small, wind-transported seeds structured according to a single aerodynamic design"

Qsn #	Question	Answer
707	Propagules dispersed by other animals (externally)	n
	Source(s)	Notes
	Croat, T.B. (1978). Flora of Barro Colorado Island. Stanford University Press, Stanford, CA	"Capsules narrowly cylindrical, 3-4 cm long, the valves 3, roughened outside, brown and shiny inside; seeds ca 2.5 cm long, comose, the coma white, very fine, fused and refolded midway."
	Benzing, D. H. (2000). Bromeliaceae: Profile of an Adaptive Radiation. Cambridge University Press. Cambridge, UK	"Tillandsioideae disperse among arboreal and lithic substrates via small, wind-transported seeds structured according to a single aerodynamic design"

708	Propagules survive passage through the gut	n
	Source(s)	Notes
	Benzing, D. H. (2000). Bromeliaceae: Profile of an Adaptive Radiation. Cambridge University Press. Cambridge, UK	"Tillandsioideae disperse among arboreal and lithic substrates via small, wind-transported seeds structured according to a single aerodynamic design"

801	Prolific seed production (>1000/m ²)	
	Source(s)	Notes
	Guarçoni, E. A., Sousa, J. D., Ferreira, A. W., Junior, W. R., Oliveira, M. S., & Silva, E. O. (2020). New occurrence records of Bromeliaceae for the state of Maranhão, northeastern Brazil. Check List 16(6): 1575–1580	"Fruit capsular, 3.6–3.9 × 0.3 cm, cylindrical; seeds elongate, 0.2 cm long, dark brown, feathery appendages 2.0–2.5 cm long." [Numbers unknown]
	Frohlich, D. & Lau, A. (2010). New plant records from O’ahu for 2008. Bishop Museum Occasional Papers 107: 3-18	"This species is apparently self-fertile, producing many plumose, easily wind-dispersed seeds. It was found establishing in one location, sparingly naturalized on Lagerstroemia, Plumeria, and rock walls." [Numbers unspecified]

802	Evidence that a persistent propagule bank is formed (>1 yr)	
	Source(s)	Notes
	Royal Botanic Gardens Kew. (2022) Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/ . [Accessed 18 Feb 2022]	"Storage Behaviour: No data available for species. Of 4 known taxa of genus Tillandsia, 100.00% Orthodox(p/?)"
	Flores-Palacios, A., Bustamante-Molina, A. B., Corona-López, A. M., & Valencia-Díaz, S. (2015). Seed number, germination and longevity in wild dry forest Tillandsia species of horticultural value. Scientia Horticulturae, 187, 72-79	[Unknown, but seeds of some species are capable of being stored for at least 478 days] "The seeds of all Tillandsia species were capable to germinate in light and dark conditions. Seed longevity in all species was at least 478 days after collection and improved under cool temperatures(7-11°C)."

803	Well controlled by herbicides	
	Source(s)	Notes

Qsn #	Question	Answer
	Arny, N.P. (1996). Spanish Moss and Ball Moss. FOR52. University of Florida IFAS Extension, Gainesville, FL http://edis.ifas.ufl.edu . [Accessed 17 Feb 2022]	[Unknown. Chemical control of <i>Tillandsia usneoides</i> is effective] "Chemical control of <i>Tillandsia</i> is possible. As of 1996, the following materials are licensed for control of Spanish moss and/or ball moss: TC Tribasic Copper Sulphate, Blue Shield, Basic Copper 53, Micro Flo Basic Copper 53, Micro Flo Copper 3 FL. It should be noted that there is evidence that copper-based herbicides and fungicides may cause damage to tender growth on oak trees. As with all herbicides, when using these materials read and follow label directions carefully."

804	Tolerates, or benefits from, mutilation, cultivation, or fire	
	Source(s)	Notes
	WRA Specialist. (2022). Personal Communication	Unknown. Possibly may resprout after damage to offsets

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

Summary of Risk Traits:

High Risk / Undesirable Traits

- Broad climate suitability and elevation range
- Thrives and spreads in regions with tropical climates
- Naturalized in Oahu
- Other *Tillandsia* species have become invasive
- Shade tolerant
- May hybridize with other species
- Reproduces by wind-dispersed seeds, and intentionally cultivated by people
- Reported to be self-fertile and autogamous
- Propagated by offsets; may be able to spread vegetatively

Low Risk Traits

- No evidence of negative impacts where introduced or cultivated
- Unarmed (no spines, thorns, or burrs)
- Non-toxic
- Reaches maturity in 4-6 years

Second Screening Results for Herbs or Low Stature Shrubby Life Forms

(A) Reported as a weed of cultivated lands? No
Outcome = Accept (Low Risk)