*Vitex rotundifolia (*Beach vitex)		Answer	Score
1.01	Is the species highly domesticated?	n	0
1.02	Has the species become naturalised where grown?		
1.03	Does the species have weedy races?		
2.01	Species suited to FL climates (USDA hardiness zones; 0-low, 1-intermediate, 2-high)	2	
2.02	Quality of climate match data (0-low; 1-intermediate; 2-high)	2	
2.03	Broad climate suitability (environmental versatility)	y	1
2.04	Native or naturalized in regions with an average of 11-60 inches of annual precipitation	y	1
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	y	2
3.02	Garden/amenity/disturbance weed	y	2
3.03	Weed of agriculture	n	0
3.04	Environmental weed	y	4
3.05	Congeneric weed	n	0
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	y	1
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals		
4.05	Toxic to animals		
4.06	Host for recognised pests and pathogens	n	0
4.07	Causes allergies or is otherwise toxic to humans		
4.08	Creates a fire hazard in natural ecosystems		
4.09	Is a shade tolerant plant at some stage of its life cycle	n	0
4.10	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils). North & Central Zones: infertile soils; South Zone: shallow limerock or Histisols.	y	1
4.11	Climbing or smothering growth habit	y	1
4.12	Forms dense thickets	y	1
5.01	Aquatic	n	0
5.02	Grass	n	0
5.03	Nitrogen fixing woody plant		
5.04	Geophyte	n	0
6.01	Evidence of substantial reproductive failure in native habitat	n	0
6.02	Produces viable seed	y	1
6.03	Hybridizes naturally	unk	-1
6.04	Self-compatible or apomictic	y	1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	y	1
6.07	Minimum generative time (years)	3	0
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y	1
7.02	Propagules dispersed intentionally by people		
7.03	Propagules likely to disperse as a produce contaminant	unk	-1
7.04	Propagules adapted to wind dispersal	n	-1
7.05	Propagules water dispersed	y	1
7.06	Propagules bird dispersed	y	1
7.07	Propagules dispersed by other animals (externally)		
7.08	Propagules dispersed by other animals (internally)	y	1

8.01	Prolific seed production	y	1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	y	1
8.03	Well controlled by herbicides	unk	1
8.04	Tolerates, or benefits from, mutilation or cultivation		
8.05	Effective natural enemies present in U.S.		
	Total Score	**21**	
	Implemented Pacific Second Screening	**n/a**	
	Risk Assessment Results	**High Risk**	

	Reference	Source data
1.01	Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1999. Manual of the Flowering Plants of Hawai'i (Revised ed., vols 1 & 2). University of Hawaii Press & Bishop Museum Press, Hawaii, U.S.A. 1919 pp.	Cultivated in some areas as a sand binder. No evidence that cultivation has led to new traits.
1.02		
1.03		
2.01	1. PERAL NAPPFAST Global Plant Hardiness (http://www.nappfast.org/Plant_hardiness/NAPPFAST%20Global%20zones/10-year%20climate/PLANT_HARDINESS_10YR%20lgnd.tif). 2. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?409896 (00 Month 0000).	No computer analysis was performed. 1. Global hardiness zone: 6, 7, 8, 9, 10, 11, 12, 13; equivalent to USDA Hardiness zones: 6a: to -23.3 °C (-10 °F) USDA Zone 6b: to -20.5 °C (-5 °F) USDA Zone 7a: to -17.7 °C (0 °F) USDA Zone 7b: to -14.9 °C (5 °F) USDA Zone 8a: to -12.2 °C (10 °F) USDA Zone 8b: to -9.4 °C (15°F) 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 11a: to USDA Zone (40 °F) USDA Zone 11b: to (45 °F) USDA Zone 12a: to (50 °F) USDA Zone 12b: to (55 °F). 2. Native to AFRICA Western Indian Ocean: Mauritius; Reunion, ASIA-TEMPERATE China: China - Anhui, Fujian, Guangdong, Hebei, Jiangsu, Jiangxi, Liaoning, Shandong, Zhejiang Eastern Asia: Japan - Honshu, Kyushu, Ryukyu Islands, Shikoku; Taiwan, ASIA-TROPICAL Indian Subcontinent: India [s.]; Sri Lanka North Indian Ocean: India - Andaman and Nicobar Indo-China: Cambodia; Myanmar; Thailand; Vietnam Malesia: Indonesia; Malaysia; Papua New Guinea; Philippines, AUSTRALASIA Australia: Australia - North ern Territory [n.], Queensland [n.], Western Australia [n.], PACIFIC North-Central Pacific: United States – Hawaii
2.02		No computer analysis was performed. Native range is well known; refer to 2.01 source data.
2.03	1. Köppen-Geiger climate map (http://www.hydrol-earth-syst-sci.net/11/1633/2007/hess-11-1633-2007.pdf).	1. Distribution in the native/cultivated range occurs in Cwa, Cfa, Af, Aw, AM, Dfa, Dwa
2.04	United States Department of Agriculture, Animal Plant Health Inspection Service, Weed Risk Assessment for Vitex rotundifolia L. f. (Lamiaceae) – Beach vitex, June 4, 2013	The native range includes precipitation averages from 20in to 100in.
2.05	1. Matthew M. Cousins, Jeanne Briggs, Chuck Gresham, Jack Whetstone, and Ted Whitwell (2010) Beach Vitex (Vitex rotundifolia): An Invasive Coastal Species. Invasive Plant Science and Management: September-November, Vol. 3, No. 3, pp. 340-345. 2. Olsen, R.T. and A.C. Bell. 2005. History of Beach Vitex Cultivation: A Potential Invasive Ornamental. SNA Research Conference. Vol. 50. p. 531-533	1. Beach vitex was first introduced into the United States as early as 1955, with at least five subsequent introductions. 2. Beach vitex was introduced to the United States by the U.S. National Arboretum as long ago as 1955. Beach vitex was then introduced at least six more times
3.01	1. Kaufman, S. R., and W. Kaufman. 2007. Invasive Plants: Guide to Identification and the Impacts and Control of Common North American Species. Stackpole Books, Mechanisburg, PA. 182 pp. 2. Matthew M. Cousins, Jeanne Briggs, Chuck Gresham, Jack Whetstone, and Ted Whitwell (2010) Beach Vitex (Vitex rotundifolia): An Invasive Coastal Species. Invasive Plant Science and Management: September-November, Vol. 3, No. 3, pp. 340-345.	1. Introduced to South Caralina during the 1980s and first noticed replacing native plants during monitoring a beach stabalization project. 2. Beach vitex is a salt-tolerant, perennial, invasive shrub that has naturalized in coastal areas of the southeastern United States.

3.02	Matthew M. Cousins, Jeanne Briggs, Chuck Gresham, Jack Whetstone, and Ted Whitwell (2010) Beach Vitex (Vitex rotundifolia): An Invasive Coastal Species. Invasive Plant Science and Management: September-November, Vol. 3, No. 3, pp. 340-345.	The landfall of Hurricane Hugo just north of Charleston, SC, on September 22, 1989, served as the primary driving force for the planting of beach vitex in the Carolinas. The hurricane's 217 km h21 (135 mi h21) winds and large storm surge caused severe beach erosion in the form of lost or damaged frontal dunes. These dunes were rebuilt, but there was a shortage of planting stock for native dune species. It was believed that beach vitex would serve to maintain dune integrity while showcasing its attractive foliage and floral characteristics in the landscape (Raulston 1993). Unfortu- nately, beach vitex has proved to be highly invasive and now constitutes a major threat to the fragile coastal dune ecosystems of the southeastern United States
3.03	United States Department of Agriculture, Animal Plant Health Inspection Service, Weed Risk Assessment for Vitex rotundifolia L. f. (Lamiaceae) – Beach vitex, June 4, 2013	It is extremely unlikely that it would establish in any production system, given its narrow niche.
3.04	1.Matthew M. Cousins, Jeanne Briggs, Chuck Gresham, Jack Whetstone, and Ted Whitwell (2010) Beach Vitex (Vitex rotundifolia): An Invasive Coastal Species. Invasive Plant Science and Management: September-November, Vol. 3, No. 3, pp. 340-345. 2. 1. Gresham, C. A., and A. Neal. 2005. An evaluation of the invasive potential of beach vitex (Vitex rotundifolia). Clemson University, Georgetown, SC., U.S.A. 22 pp 3. 1. True, S. L. 2009. The biology and control of beach vitex (Vitex rotundifolia) and common reed (Phragmites australis). MS Thesis, North Carolina Univ., Raleigh, NC. 83 pp	1.Beach vitex creates near-monocultures by reducing the prevalence of native species. Additionally, it damages the environment by causing intense substrate hydrophobicity that persists for several years following beach vitex removal. Sea turtle enthusiasts have raised concerns that thick stands of beach vitex might impede sea turtle nesting efforts. 2. BV communities are practically monocultures, indicating they have displaced native beach dune species that were probably present when the BV was planted. 3. It outcompetes native dune plant species and dominates dune ecology. The dense mats interfere with native water bird and loggerhead sea turtle (Caretta caretta L.) nesting and hinder expensive beach renourishment projects
3.05	United States Department of Agriculture, Animal Plant Health Inspection Service, Weed Risk Assessment for Vitex rotundifolia L. f. (Lamiaceae) – Beach vitex, June 4, 2013	Vitex trifolia and V. agnus-castus are sometimes considered invaders in the southeastern United States and elsewhere, but there is no evidence that these should be considered significant weeds (i.e., weeds with demonstrated impacts).
4.01	Encyclopedia of Life http://eol.org/pages/484253/details (2-6-2015)	Not a feature of the description of the species.
4.02	1. Gresham, C. A., and A. Neal. 2005. An evaluation of the invasive potential of beach vitex (Vitex rotundifolia). Clemson University, Georgetown, SC., U.S.A. 22 pp 2. Global Invasive Species Database http://www.issg.org/database/species/ecology.asp?si=1110& (2-6-2015) 3. Hauser, C., E.L. Rosenberg and J.E. Perry. 2010 FIRST RECORD OF THE INVASIVE VITES ROTUNDIFOLIA (VERBENACEAE) IN VIRGINIA. Banisteria, Number 34, Virginia Institute of Marine Science, School of Marine Science, College of William and Mary http://www.vims.edu/people/perry_je/pubs/2010%20Beach%20Vitex.pdf (2-6-2015)	1. BV appears to release allelopathic compounds from the root system that decreased the growth of corn seedlings. 2.In addition it has been suggested from scientific observations that the plant releases some allelopathic compounds that have actions in the soil to make it hydrophobic, causing drought stress to less tolerant native species 3. Native plants are excluded locally due to shading by the V. rotundifolia growth mat and the plant's release of allelopathic compounds that make the soil hydrophobic
4.03		No evidence that V. rotundifolia is parasitic. Neither Verbenaceae nor Lamiaceae is known to contain parasitic plants.
4.04		no evidence
4.05		no evidence
4.06	Missouri Botanical Gardens http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e529 (2-6-2015)	No serious insect or disease problems.

4.07		no evidence
4.08		no evidence
4.09	1. Missouri Botanical Gardens http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e529 (2-6-2015) 2. Kaufman, S. R., and W. Kaufman. 2007. Invasive Plants: Guide to Identification and the Impacts and Control of Common North American Species. Stackpole Books	1. Requires full sun 2. Full sun plant that grows on coastal dunes
4.10	Missouri Botanical Gardens http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e529 (2-6-2015) 2. Kaufman, S. R., and W. Kaufman. 2007. Invasive Plants: Guide to Identification and the Impacts and Control of Common North American Species. Stackpole Books, Mechanisburg, PA. 182 pp.	Best grown in loose, medium moisture, well-drained soils in full sun. Prefers sandy soils in coastal areas in full sun. Tolerates low fertility soils (it is native to sandy/rocky nutrient poor coastal areas).
4.11	1. Kaufman, S. R., and W. Kaufman. 2007. Invasive Plants: Guide to Identification and the Impacts and Control of Common North American Species. Stackpole Books, Mechanisburg, PA. 182 pp 2. Gresham, C. A., and A. Neal. 2005. An evaluation of the invasive potential of beach vitex (Vitex rotundifolia). Clemson University, Georgetown, SC., U.S.A. 22 pp	1. Shrub/vine that can sprawl over 60 feet. 2. Its dense canopy reduces light levels to 2% of full sun .
4.12	1. Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1999. Manual of the Flowering Plants of Hawai'i (Revised ed., vols 1 & 2). University of Hawaii Press & Bishop Museum Press, Hawaii, U.S.A. 1919 pp. 2. True, S. L. 2009. The biology and control of beach vitex (Vitex rotundifolia) and common reed (Phragmites australis). MS Thesis, North Carolina Univ., Raleigh, NC. 83 pp	1. The vine-like runners often root at the nodes, forming mats several meters in diameter 2. The dense mats interfere with native water bird and loggerhead sea turtle (Caretta caretta L.) nesting and hinder expensive beach renourishment projects.
5.01	Wagner, W. L., D. R. Herbst, and S. H. Sohmer. 1999. Manual of the Flowering Plants of Hawai'i (Revised ed., vols 1 & 2). University of Hawaii Press & Bishop Museum Press, Hawaii, U.S.A. 1919 pp.	Terrestrial shrub of sand dunes and coastal strands
5.02	Encyclopedia of Life http://eol.org/pages/484253/details (2-6-2015)	Family: Lamiaceae
5.03		No evidence. Not a member of a family known to fix nitrogen
5.04	Encyclopedia of Life http://eol.org/pages/484253/details (2-6-2015)	Geophyte characteristics are not listed in the species description
6.01		no evidence
6.02	1. Matthew M. Cousins, Jeanne Briggs, Ted Whitwell, Chuck Gresham, and Jack Whetstone (2010) Reestablishment Potential of Beach Vitex (Vitex rotundifolia) after Removal and Control Efforts. Invasive Plant Science and Management: September-November, Vol. 3, No. 3, pp. 327-333. 2. 1. True, S. L. 2009. The biology and control of beach vitex (Vitex rotundifolia) and common reed (Phragmites australis). MS Thesis, North Carolina Univ., Raleigh, NC. 83 pp	1. Studies of fruit lots from three consecutive years (2003 to 2005) found that the average fruit contained 1.39 seeds, and more than 76% of fruits contained at least one viable seed. 2. Each fruit produces on average 1.25 viable seeds.
6.03		no evidence found
6.04	Courtney J. Murren, Kelly Grant Purvis, Dawn Glasgow, Jason Messervy, Megan Penrod, and Allan E. Strand (2014) Investigating Lag Phase and Invasion Potential of Vitex rotundifolia: A Coastal Dune Exotic. Journal of Coastal Research: Volume 30, Issue 4: pp. 815 – 824.	In the present study, we demonstrated self-compatibility and apomixis. These results suggest that if vitex seeds are established in novel habitats, they will be able to produce viable seed, also allowing quick adaption to new environmental conditions.
6.05	United States Department of Agriculture, Animal Plant Health Inspection Service, Weed Risk Assessment for Vitex rotundifolia L. f. (Lamiaceae) – Beach vitex, June 4, 2013	Visited by a variety of pollinators.

6.06	1. True, S. L. 2009. The biology and control of beach vitex (Vitex rotundifolia) and common reed (Phragmites australis). MS Thesis, North Carolina Univ., Raleigh, NC. 83 pp 2. Missouri Botanical Gardens http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e529 (2-6-2015) 3. Gresham, C. A., and A. Neal. 2005. An evaluation of the invasive potential of beach vitex (Vitex rotundifolia). Clemson University, Georgetown, SC., U.S.A. 22 pp	1. Also produces long runners that root at multiple nodes, and reproduction via stem fragmentation. 2. It can spread aggressively by (1) runners that root at the nodes 3. Because runners root at stem nodes, each section has the potential to establish a new plant if separated from the parent plant
6.07	United States Department of Agriculture, Animal Plant Health Inspection Service, Weed Risk Assessment for Vitex rotundifolia L. f. (Lamiaceae) – Beach vitex, June 4, 2013	Three to four years for sexual reproduction (two years in the greenhouse), and two years for vegetative reproduction. Under the right conditions, perhaps one year for stems and two years for sexual reproduction. Not more than five years based on the spread of a plant in Virginia after it was planted.
7.01	United States Department of Agriculture, Animal Plant Health Inspection Service, Weed Risk Assessment for Vitex rotundifolia L. f. (Lamiaceae) – Beach vitex, June 4, 2013	Plants have established from yard clippings that are inappropriately dumped.
7.02	1. Courtney J. Murren, Kelly Grant Purvis, Dawn Glasgow, Jason Messervy, Megan Penrod, and Allan E. Strand (2014) Investigating Lag Phase and Invasion Potential of Vitex rotundifolia: A Coastal Dune Exotic. Journal of Coastal Research: Volume 30, Issue 4: pp. 815 – 824. 2. Hauser, C., E.L. Rosenberg and J.E. Perry. 2010 FIRST RECORD OF THE INVASIVE VITES ROTUNDIFOLIA (VERBENACEAE) IN VIRGINIA. Banisteria, Number 34, Virginia Institute of Marine Science, School of Marine Science, College of William and Mary http://www.vims.edu/people/perry_je/pubs/2010%20Beach%20Vitex.pdf (2-6-2015)	1. Initial populations on the southeastern United States coastline were established by direct planting and the horticulture trade. 2. At least one nursery located near the barrier islands of Virginia provided the plant for public sale as recently as 2008
7.03	1. Kaufman, S. R., and W. Kaufman. 2007. Invasive Plants: Guide to Identification and the Impacts and Control of Common North American Species. Stackpole Books, Mechanisburg, PA. 182 pp.	Fruits have been used since the middle ages as spice and medicine and an oil named rotundinal, extracted from the leaves, has shown promise as a mosquito repellent.
7.04	Encyclopedia of Life http://eol.org/pages/484253/details (2-6-2015)	No evidence of wind dispersal, fruit and seed traits do not indicate wind dispersal.
7.05	1. Hauser, C., E.L. Rosenberg and J.E. Perry. 2010 FIRST RECORD OF THE INVASIVE VITES ROTUNDIFOLIA (VERBENACEAE) IN VIRGINIA. Banisteria, Number 34, Virginia Institute of Marine Science, School of Marine Science, College of William and Mary http://www.vims.edu/people/perry_je/pubs/2010%20Beach%20Vitex.pdf (2-6-2015) 2. True, S. L. 2009. The biology and control of beach vitex (Vitex rotundifolia) and common reed (Phragmites australis). MS Thesis, North Carolina Univ., Raleigh, NC. 83 pp 3. Westbrooks, R. 2005. Draft Ecological Assessment for Beach Vitex (Vitex rotundifolia L. f.) - New Invader of the Carolina Coast. July, 2005. United States Geological Service, Whiteville, NC, U.S.A.	1. Transportation to new areas is accomplished via floating of vegetation in water currents and the subsequent deposition. 2. These reproductive methods allow dissemination by humans, animals, and even floating. 3.Fruits readily float and are dispersed by ocean currents
7.06	1. United States Department of Agriculture, Animal Plant Health Inspection Service, Weed Risk Assessment for Vitex rotundifolia L. f. (Lamiaceae) – Beach vitex, June 4, 2013 2. Missouri Botanical Gardens http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e529 (2-6-2015)	1. Seeds were determined to be bird dispersed. 2. It can spread aggressively by bird consumption of plant seeds that are eliminated elsewhere.
7.07		no evidence

7.08	1.Hauser, C., E.L. Rosenberg and J.E. Perry. 2010 FIRST RECORD OF THE INVASIVE VITES ROTUNDIFOLIA (VERBENACEAE) IN VIRGINIA. Banisteria, Number 34, Virginia Institute of Marine Science, School of Marine Science, College of William and Mary http://www.vims.edu/people/perry_je/pubs/2010%20Beach%20Vitex.pdf (2-6-2015). 2. Missouri Botanical Gardens http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e529 (2-6-2015	1. Transportation to new areas is accomplished via consumption and excretion of seeds by fauna. 2. It can spread aggressively by bird consumption of plant seeds that are eliminated elsewhere
8.01	1. True, S. L. 2009. The biology and control of beach vitex (Vitex rotundifolia) and common reed (Phragmites australis). MS Thesis, North Carolina Univ., Raleigh, NC. 83 pp 2. Gresham, C. and A. Neal. 2004. An evaluation of the invasive potential of beach vitex (Vitex rotundifolia). Bell W. Baruch Institute of Coastal Ecology and Forest Science. Clemson University. Georgetown, SC. In publication.	1. Copious seed production- one study reported an average of 2,730 fruits per square meter, with a maximum of 5,580 fruits per square meter; with each fruit produces on average 1.25 viable seeds. Also produces long runners that root at multiple nodes, and reproduction via stem fragmentation. 2. BV also had large seed crops in 2004. Over the nine study areas, BV produced an average of 2,730 fruits/m2 of middle site area. There are four cells per fruit and one seed per cell (Wagner et al. 1999). If all four cells produced a viable seed, the BV middle site populations would produce a 2004 seed crop of 10,920 seed/m2. The most productive area had an estimated 2004 seed crop of 22,325 seed/m2
8.02	1. Matthew M. Cousins, Jeanne Briggs, Ted Whitwell, Chuck Gresham, and Jack Whetstone (2010) Reestablishment Potential of Beach Vitex (Vitex rotundifolia) after Removal and Control Efforts. Invasive Plant Science and Management: September-November, Vol. 3, No. 3, pp. 327-333. 2. True, S. L. 2009. The biology and control of beach vitex (Vitex rotundifolia) and common reed (Phragmites australis). MS Thesis, North Carolina Univ., Raleigh, NC. 83 pp	1. A substantial soil seed bank was discovered that contained viable seeds 4 yr after vegetation removal. Results indicate that beach vitex has physical (fruit coat) and physiological (seed) dormancy mechanisms that are capable of delaying germination for multiple seasons, allowing development of a soil seed bank. Beach vitex can reestablish from seed after vegetation removal. 2. The soil seed bank of beach vitex is persistent and will repopulate cleared areas
8.03	Matthew M. Cousins, Jeanne Briggs, Chuck Gresham, Jack Whetstone, and Ted Whitwell (2010) Beach Vitex (Vitex rotundifolia): An Invasive Coastal Species. Invasive Plant Science and Management: September-November, Vol. 3, No. 3, pp. 340-345.	A method employing repeated applications of imazapyr over multiple seasons has been effective, but this method is costly and labor intensive.
8.04	1. Gresham, C. A., and A. Neal. 2005. An evaluation of the invasive potential of beach vitex (Vitex rotundifolia). Clemson University, Georgetown, SC., U.S.A. 22 pp	1. Because runners root at stem nodes, each section has the potential to establish a new plant if separated from the parent plant
8.05		no evidence