

Australia/New Zealand Weed Risk Assessment adapted for Florida.

Data used for analysis published in: Gordon, D.R., D.A. Onderdonk, A.M. Fox, R.K. Stocker, and C. Gantz. 2008. Predicting Invasive Plants in Florida using the Australian Weed Risk Assessment. *Invasive Plant Science and Management* 1: 178-195.

<i>Ceratonia siliqua (carob)</i>			
Question number	Question	Answer	Score
1.01	Is the species highly domesticated?	y	-3
1.02	Has the species become naturalised where grown?	y	1
1.03	Does the species have weedy races?		
2.01	Species suited to Florida's USDA climate 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)		
2.04	Native or naturalized in habitats with periodic inundation	n	0
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	y	0
3.02	Garden/amenity/disturbance weed	y	0
3.03	Weed of agriculture	n	0
3.04	Environmental weed	n	0
3.05	Congeneric weed	n	0
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	n	0
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals	n	-1
4.05	Toxic to animals	n	0
4.06	Host for recognised pests and pathogens	y	1
4.07	Causes allergies or is otherwise toxic to humans	y	1
4.08	Creates a fire hazard in natural ecosystems	n	0
4.09	Is a shade tolerant plant at some stage of its life cycle	n	0
4.1	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils)	y	1
4.11	Climbing or smothering growth habit	n	0
4.12	Forms dense thickets	n	0

5.01	Aquatic	n	0
5.02	Grass	n	0
5.03	Nitrogen fixing woody plant	n	0
5.04	Geophyte		
6.01	Evidence of substantial reproductive failure in native habitat		
6.02	Produces viable seed	y	1
6.03	Hybridizes naturally	n	-1
6.04	Self-compatible or apomictic	?	
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative fragmentation		
6.07	Minimum generative time (years)	4	-1
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)		
7.02	Propagules dispersed intentionally by people	y	1
7.03	Propagules likely to disperse as a produce contaminant	n	-1
7.04	Propagules adapted to wind dispersal	n	-1
7.05	Propagules water dispersed	n	-1
7.06	Propagules bird dispersed		
7.07	Propagules dispersed by other animals (externally)	n	-1
7.08	Propagules dispersed by other animals (internally)	y	1
8.01	Prolific seed production		
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	y	1
8.03	Well controlled by herbicides	y	-1
8.04	Tolerates, or benefits from, mutilation or cultivation		
8.05	Effective natural enemies present in Florida, or east of the continental divide		
Total Score			1

Outcome	Accept*
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*Used secondary screen from: Daehler, C. C., J.L. Denslow, S. Ansari, and H. Kuo. 2004. A risk assessment system for screening out harmful invasive pest plants from Hawaii's and other Pacific islands. *Conserv. Biol.* 18: 360-368.

section	# questions answered	satisfy minimum?
A	8	yes
B	12	yes
C	15	yes
total	35	yes

Data collected 2006-2007

Question number	Reference	Source data
1.01	Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	"The original distribution of <i>C. siliqua</i> is not clear as it has undergone extensive cultivation since ancient times. Hillcoat et al. (1980) suggested its range in the wild included Turkey, Cyprus, Syria, Lebanon, Israel, southern Jordan, Egypt, Arabia, Tunisia and Libya and that it moved westward at an early stage...Spontaneous carobs occur in many places around the western Mediterranean basin but they are regarded as feral derivatives of the fruit crop which probably evolved under domestication...Zohary (1996) suggested that similarly to most Old World fruit crops, domestication of <i>C. siliqua</i> was based on shifting from sexual reproduction (in the wild) to vegetative propagation (under cultivation)...The three main fruit traits that distinguish domesticated carobs from their wild relatives are larger bean size, more pulp and greater sugar content. Increase in the size and number of seeds is less evident. These pod features together with productivity and environmental adaptation seem to have been the most important selection criteria for growers."
1.02	Martin (2001) Weed Alert! <i>Ceratonia siliqua</i> L. The Nature Conservancy, Global Invasive Species Initiative (http://tncweeds.ucdavis.edu/alert/alertcer a.html).	" <i>C. siliqua</i> has recently been reported escaping from cultivation in California (3). <i>C. siliqua</i> rarely invades undisturbed habitats but escapes easily along washes and other moist areas. This species...is one of the worst weeds on the University of California, Riverside Botanic Gardens (3)."
1.03		
2.01	1. Batlle, I. and J. Tous (1997) Carob tree.	1. "It grows well in warm temperate and subtropical areas, and tolerates hot and

	<i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy. 2. Hortiocopia 4.0.	humid coastal areas. Carob and orange trees have similar temperature requirements but carob tolerates poorer soils and needs much less water." 2. hardy range: 9A to 11
2.02		
2.03		
2.04	Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	"they cannot withstand waterlogging"
2.05	Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	"Carob is widely planted as an ornamental and shade tree on the streets of California, Australia and elsewhere".
3.01	Martin (2001) Weed Alert! <i>Ceratonia siliqua</i> L. The Nature Conservancy, Global Invasive Species Initiative (http://tncweeds.ucdavis.edu/alert/alrtcera.html).	" <i>C. siliqua</i> has recently been reported escaping from cultivation in California (3). <i>C. siliqua</i> rarely invades undisturbed habitats but escapes easily along washes and other moist areas. This species...is one of the worst weeds on the University of California, Riverside Botanic Gardens (3)."
3.02	Martin (2001) Weed Alert! <i>Ceratonia siliqua</i> L. The Nature Conservancy, Global Invasive Species Initiative (http://tncweeds.ucdavis.edu/alert/alrtcera.html).	" <i>C. siliqua</i> has recently been reported escaping from cultivation in California (3)...This species...is one of the worst weeds on the University of California, Riverside Botanic Gardens (3)."
3.03		no evidence
3.04	Martin (2001) Weed Alert! <i>Ceratonia siliqua</i> L. The Nature Conservancy, Global Invasive Species Initiative (http://tncweeds.ucdavis.edu/alert/alrtcera.html).	" <i>C. siliqua</i> has recently been reported escaping from cultivation in California (3). <i>C. siliqua</i> rarely invades undisturbed habitats but escapes easily along washes and other moist areas. This species...is one of the worst weeds on the University of California, Riverside Botanic Gardens (3)." [seems to be a problem only in disturbed areas]
3.05		no evidence
4.01	Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the	no description of these traits

	conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	
4.02		no evidence
4.03	Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	no description of this
4.04	1. Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy. 2. Morton (1987) Fruits of Warm Climates. Julia F. Morton, Miami. 3. Kaitho, Umunna, Nsahlai, Tamminga, Bruchem, Hanson, and Wouw (1996) Palatability of multipurpose tree species: effect of species and length of study on intake and relative palatability by sheep. <i>Agroforestry Systems</i> 33: 249-261.	1. "Carob pods provide fodder for ruminants (Louca and Papas 1973) and nonruminants (Sahle et al. 1992). In the wild, carob shelter, foliage and beans attract browsing animals." 2. "The pods are relished by horses, cattle, pigs, goats, and rabbits." BUT 3. <i>C. siliqua</i> was found to have poor palatability for sheep.
4.05	1. Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy. 2. Morton (1987) Fruits of Warm Climates. Julia F. Morton, Miami.	1. "Carob pods provide fodder for ruminants (Louca and Papas 1973) and nonruminants (Sahle et al. 1992). In the wild, carob shelter, foliage and beans attract browsing animals." 2. "the tree is valued mostly as providing great amounts of pods as feed for livestock"
4.06	1. Athar, M. (2005) Infestation of olive fruit fly, <i>Bactrocera oleae</i> , in California and taxonomy of its host trees. <i>Agriculturae Conspectus Scientificus</i> 70: 135-138. 2. Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy. 3. <i>Horticopia</i> 4.0.	1. Carob was found to be a host of the olive fruit fly in California. BUT 2. "The carob tree is normally free from severe insect and disease troubles and is a crop which traditionally has not been sprayed." 3. No serious pests, diseases, or damaging agents.

4.07	1. Hortocopia 4.0. 2. Morton (1987) Fruits of Warm Climates. Julia F. Morton, Miami.	1. "Pollen from male trees causes serious allergy problems in at least some people." BUT 2. "In the Mediterranean region, peasants have virtually lived on the pods in times of famine".
4.08		no evidence
4.09	1. Hortocopia 4.0. 2. Huxley (1992) The New Royal Horticultural Society Dictionary of Gardening. The MacMillan Press, London.	full sun (1, 2)
4.1	1. Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy. 2. Morton (1987) Fruits of Warm Climates. Julia F. Morton, Miami.	1. "Carob trees can adapt to a wide range of soil types from poor sandy soils and rocky hillsides to deep soils". 2. "The tree flourishes in widely divergent soils, from rocky hillsides to deep sand or heavy loam".
4.11	Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	"The carob tree grows as a sclerophyllous evergreen shrub or tree up to 10 m high".
4.12		no evidence
5.01		terrestrial
5.02	USDA, NRCS. 2005. The PLANTS Database, Version 3.5 (http://plants.usda.gov). Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.	Fabaceae
5.03	Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	"Although the carob tree is a legume, like most Caesalpinioideae it does not nodulate and thus is unable to fix nitrogen (Martins-Loução and Rodríguez-Barrueco 1982; Martins-Loução 1985)."
5.04		
6.01		
6.02	Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	"Wild and escaped carobs reproduce by seed".

6.03	Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	"Thus hybridization between both species [<i>Ceratonia siliqua</i> and its only congener <i>C. oreoethauma</i>] is only feasible artificially."
6.04	1. Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy. 2. Morton (1987) Fruits of Warm Climates. Julia F. Morton, Miami.	1. "The carob is a dioecious species with some hermaphroditic forms...As a predominantly dioecious tree, carob includes about 50% males and 1% hermaphrodites". [mostly dioecious] 2. Some hermaphroditic varieties are self-fertile.
6.05	Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	"Pollen transport from staminate to pistillate flowers is effected by insects, mainly bees, flies, wasps and night-flying moths (Retana et al. 1990, 1994; Ortiz et al. 1996) but also by wind (Passos de Carvalho 1988; Tous and Batlle 1990)."
6.06		
6.07	1. Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy. 2. Morton (1987) Fruits of Warm Climates. Julia F. Morton, Miami.	1. "In plantations located in marginal areas, the nonbearing period is long, from 6 to 8 years, while in others, where the conditions are better, cropping starts 3 or 4 years after budding...Goor et al. (1958) reported that carob trees start to bear fruit in the 5th to 6th year when budded trees are planted and in the 7th or 8th year when seedlings are used for planting and later budded." 2. "Budded trees begin to bear in the 6th year from planting." [time to fruiting likely longer without budding]
7.01		
7.02	Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	"Carob is widely planted as an ornamental and shade tree on the streets of California, Australia and elsewhere".
7.03		no evidence
7.04	Batlle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research,	"The fruit is an indehiscent pod...10-30 cm long". [no evidence of adaptations to wind dispersal]

	Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	
7.05		no evidence
7.06		
7.07	Battle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	"The fruit is an indehiscent pod...10-30 cm long". [no evidence of any means of attachment]
7.08	1. Battle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy. 2. Martin (2001) Weed Alert! <i>Ceratonia siliqua</i> L. The Nature Conservancy, Global Invasive Species Initiative (http://tncweeds.ucdavis.edu/alert/alrtcer a.html).	1. "In the wild, carob shelter, foliage and beans attract browsing animals. The pods contain indigestible and valuable seeds." 2. "Coyotes frequently consume carob fruits and disperse the seeds in their scat (3)."
8.01	Morton (1987) Fruits of Warm Climates. Julia F. Morton, Miami.	10-13 seeds per pod
8.02	Battle, I. and J. Tous (1997) Carob tree. <i>Ceratonia siliqua</i> L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy.	"Carob seeds germinate easily, but as the coat is very hard they require scarification with acid or hot water treatment." [legume with a hard seed coat]
8.03	Bosco (1974) Chemical weed control in tree crops: advantages and disadvantages. <i>Informatore Agrario</i> 30: 16857-16858.	Carobs are very sensitive to uracil herbicides.
8.04		
8.05		