

Assessment date 2 November 2015

<i>Citrullus lanatus</i> ALL ZONES		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?	y	1
2.01	Species suited to Florida's USDA climate zones (0-low; 1-intermediate; 2-high) North Zone: suited to Zones 8, 9 Central Zone: suited to Zones 9, 10 South Zone: suited to Zone 10	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 habitats with periodic inundation North Zone: mean annual precipitation 50-70 inches Central Zone: mean annual precipitation 40-60 inches South Zone: mean annual precipitation 40-60 inches	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	unk	
3.04	Environmental weed	unk	
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic	unk	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	unk	0
4.07	Causes allergies or is otherwise toxic to humans	n	0
4.08	Creates a fire hazard in natural ecosystems	unk	0
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.	unk	0
4.11	Climbing or smothering growth habit	y	1
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	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	unk	-1
6.07	Minimum generative time (years)	1	1
7.01	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	n	-1
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	unk	-1
7.06	Propagules bird dispersed	unk	-1
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	unk	-1
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	unk	-1
8.05		?	
Total Score		2	
Implemented Pacific Second Screening		Yes	
Risk Assessment Results		Low	

section	# questions answered	satisfy minimum?
A		11 yes
B		8 yes
C		17 yes
total		36 yes

	Reference	Source data
1.01	<p>1. Kew Royal Botanical Gardens. http://www.kew.org/science-conservation/plants-fungi/citrullus-lanatus-watermelon (Accessed: 17 September 2015) 2. PlantZAfrica. http://www.plantzafrica.com/plantcd/citrullanat.htm (Accessed: 17 September 2015) 3. Biotechnology in Agriculture and Forestry. http://link.springer.com/chapter/10.1007%2F978-3-662-07774-0_5 (Accessed: 6 October 2015)</p>	<p>1. "Citrullus lanatus is widely cultivated for its edible fruits, which are also an important source of water in arid regions of Africa. It is thought that watermelon was first domesticated in central and southern Africa. Watermelon seeds and leaves have been found in ancient Egyptian tombs, suggesting it was cultivated there more than 5,000 years ago. Having been cultivated for so long, its origins are unknown, but it is thought that it may have been selected from <i>Citrullus colocynthis</i> (known as 'bitter colocynth'; a bitter, poisonous perennial) in early African agriculture."; "Watermelon is cultivated in all tropical and subtropical countries, as well as in temperate countries with a continental climate. It is widely naturalised." 2. "Watermelons have been cultivated in the Nile valley at least since the start of the second millennium BC."; "Both <i>C. colocynthis</i> and <i>C. lanatus</i> are mentioned in the Bible (Moldenke & Moldenke 1952)." 3. "Watermelon is grown worldwide and ranks sixth in world production of fruit crops... Current breeding objectives include resistance to race 2 anthracnose and fusarium wilt, smaller fruit with reduced numbers of smaller seeds, and longer shelf life."</p>
1.02	<p>1. Kew Royal Botanical Gardens. http://www.kew.org/science-conservation/plants-fungi/citrullus-lanatus-watermelon (Accessed: 2 September 2015) 2. PlantZAfrica. http://www.plantzafrica.com/plantcd/citrullanat.htm (Accessed: 17 September 2015) 2. Pacific Island Ecosystems at Risk. http://www.hear.org/pier/species/citrullus_lanatus.htm (Accessed: 17 September 2015) 3. Galapagos Species Checklist. http://www.darwinfoundation.org/datazone/checklists/403/ (Accessed: 17 September 2015)</p>	<p>1. "It is widely naturalised." 2. "Indigenous in tropical and subtropical Africa, early introduced into Mediterranean areas and India, and now widespread in cultivation and frequently naturalized" 3. "Taxon introduced for agricultural or domestic use; naturalized in the wild."</p>
1.03	<p>1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e455 (Accessed: 17 September 2015) 2. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015) 3. Global Compendium of Weeds. http://www.hear.org/gcw/species/citrullus_lanatus/ (Accessed: 2 October 2015)</p>	<p>1. "Notwithstanding the virtues of its fruits, this vine has become a common weed of roadsides and open ground some parts of the world." 2. "Habitat Preference: Aside from cultivated land, <i>C. lanatus</i> grows on disturbed sites, landfills, shores, and sewage plant fill." 3. Classified as a casual alien, garden thug, agricultural weed, environmental weed, and noxious weed.</p>
2.01	<p>1. PERAL NAPPFAST Global Plant Hardiness. http://www.nappfast.org/Plant_hardiness/2012/PHZ%20update%201230%20yr%20%20300dpi.tif (Accessed: 17 September 2015) 2. Plants for a Future. http://www.pfaf.org/user/Plant.aspx?LatinName=Citrullus+lanatus (Accessed: 17 September 2015) 3. USDA Germplasm Resources Information Network. http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?10675 (Accessed: 15 September 2015)</p>	<p>No computer analysis was performed. 1. Florida North Zone: Hardiness zones 8 and 9. Central Zone: Hardiness zones 9 and 10. South Zone: Hardiness zone 10. 2. "Zone: 8 to 11" 3. Native to Egypt, Sudan, and Kenya.</p>
2.02		Native range is well know
2.03	<p>1. The University of Melbourne. Köppen-Geiger Climate Map of the Wolrd. http://people.eng.unimelb.edu.au/mpeel/koppen.html (Accessed: 17 September 2015) 2. USDA Germplasm Resources Information Network. http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?10675 (Accessed: 15 September 2015)</p>	<p>1. Found in the following Köppen-Geiger Climate zones: BWh, BSh, Aw, Af, Am, Csb, Cwb, and Cfb. 2. Native to Egypt, Sudan, and Kenya.</p>

2.04	1. Climate Charts. World Climate Maps. http://www.climate-charts.com/World-Climate-Maps.html#rain (Accessed: 17 September 2015) 2. USDA Germplasm Resources Information Network. http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?10675 (Accessed: 15 September 2015)	1. Native to Kenya, which has rainfall in this range. 2. Native to Egypt, Sudan, and Kenya.
2.05	1. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015) 2. Pacific Islands Ecosystems at Risk. http://www.hear.org/pier/species/citrullus_lanatus.htm (Accessed: 16 September 2015)	1. "Native to southern Africa (1,8), <i>C. lanatus</i> was introduced to Mediterranean Africa, the Middle East, West Asia, and possibly India before 1000 BC. It arrived in China ca. 900 AD and Japan in the 1500's (8). It was taken to Brazil by Africans in the 1700's (14). In the United States it was introduced after colonization" 2. Introduced to Northern Mariana Islands, Cook Islands, Ecuador, Micronesia, Fiji, French Polynesia, Guam, Sawaii, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Palau, Philippines, Pitcarin Islands, Solomon Islands, China, and New Zealand.
3.01	1. Pacific Island Ecosystems at Risk. http://www.hear.org/pier/species/citrullus_lanatus.htm (Accessed: 8 September 2015) 2. Galapagos Species Checklist. http://www.darwinfoundation.org/datazone/checklists/403/ (Accessed: 17 September 2015)	1. "Indigenous in tropical and subtropical Africa, early introduced into Mediterranean areas and India, and now widespread in cultivation and frequently naturalized" 2. "Taxon introduced for agricultural or domestic use; naturalized in the wild."
3.02	1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e455 (Accessed: 17 September 2015) 2. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015) 3. Global Compendium of Weeds. http://www.hear.org/gcw/species/citrullus_lanatus/ (Accessed: 2 October 2015)	1. "Notwithstanding the virtues of its fruits, this vine has become a common weed of roadsides and open ground some parts of the world." 2. "Habitat Preference: Aside from cultivated land, <i>C. lanatus</i> grows on disturbed sites, landfills, shores, and sewage plant fill." 3. Classified as a casual alien, garden thug, and weed.
3.03	1. Global Compendium of Weeds. http://www.hear.org/gcw/species/citrullus_lanatus/ (Accessed: 2 October 2015)	1. Classified as an agricultural weed.
3.04	1. Global Compendium of Weeds. http://www.hear.org/gcw/species/citrullus_lanatus/ (Accessed: 2 October 2015)	1. Classified as an environmental weed and noxious weed.
3.05	1. Global Compendium of Weeds. http://www.hear.org/gcw/scientificnames/scinamec.htm (Accessed: 2 October 2015) 2. A Geographical Atlas of World Weeds. Holm, Pancho, Herberger, and Plucknett. Krieger Publishing Company. 1991. (Accessed: 2 October 2015)	1. <i>Citrullus colocynthis</i> is listed as an agricultural weed, environmental weed, and noxious weed. 2. <i>Citrullus colocynthis</i> is classified as a common weed of Australia and present as a weed in India and Pakistan.
4.01	1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e455 (Accessed: 17 September 2015) 2. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015)	1&2. These features are not listed in the description of the species.
4.02		No evidence
4.03		No evidence
4.04	1. Kew Royal Botanical Gardens. http://www.kew.org/science-conservation/plants-fungi/citrullus-lanatus-watermelon (Accessed: 17 September 2015)	1. "Bitter forms of watermelon and the cake left over after expressing the seed oil are used as cattle-feed. The leaves and fruit provide grazing for stock."; " <i>Citrullus lanatus</i> is widely cultivated for its edible fruits"

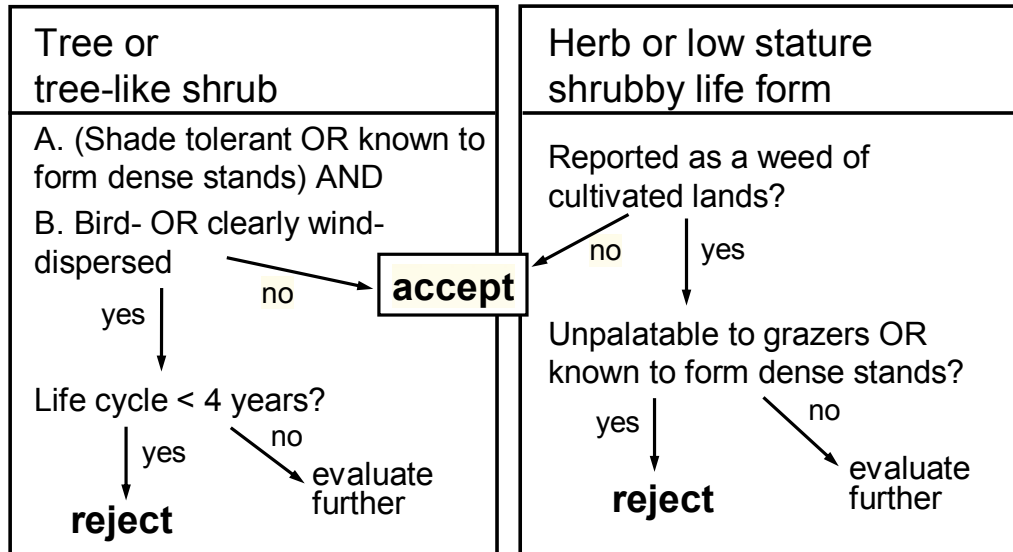
4.05	1. Kew Royal Botanical Gardens. http://www.kew.org/science-conservation/plants-fungi/citrullus-lanatus-watermelon (Accessed: 17 September 2015)	1. "Bitter forms of watermelon and the cake left over after expressing the seed oil are used as cattle-feed. The leaves and fruit provide grazing for stock."; "Citrullus lanatus is widely cultivated for its edible fruits"
4.06	1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e455 (Accessed: 17 September 2015)	1. "Anthracnose, blossom end rot, fusarium wilt, bacterial wilt, downy mildew and powdery mildew may appear. Watch for cucumber beetles which should be removed immediately by hand. Additional potential insect pests include aphids, squash bugs, stink bugs, cutworms, pickleworm and squash vine borers. Watch for mites. Spray for insects at night when bees (needed for cross-pollination) are less active."--- However, there is no evidence that watermelon is a significant primary or alternate host
4.07	1. Biotechnology in Agriculture and Forestry. http://link.springer.com/chapter/10.1007%2F978-3-662-07774-0_5 (Accessed: 6 October 2015)	1. "Watermelon is grown worldwide and ranks sixth in world production of fruit crops"; widely consumed by humans
4.08		No evidence
4.09	1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e455 (Accessed: 17 September 2015) 2. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015)	1. "Sun: Full sun" 2. "is shade intolerantæ
4.10	1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e455 (Accessed: 17 September 2015) 2. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015)	1. "This annual vine can easily be grown from seed. It is best grown in fertile, organically rich, consistently moist, well-drained loams in full sun. Thrives in long hot summers. Intolerant of wet soils. Avoid compacted soils. Vines spread out over the ground." 2. "It thrives in well-drained, sandy loam soils"--- insufficient information
4.11	1. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015) 2. Plantz Africa. http://www.plantzafrika.com/plantcd/citrullanat.htm (Accessed: 2 October 2015)	1. "Climbing Mechanism: The watermelon uses its tendrils to climb over structures or other vegetation (8,11)." 2. "Citrullus lanatus is a prostrate or climbing annual"
4.12		No evidence
5.01	1. Go Botany. https://gobotany.newenglandwild.org/species/citrullus/lanatus/ (Accessed: 2 October 2015)	1. "Habitat: terrestrial, wetlands"
5.02	1. USDA Plants Database. http://plants.usda.gov/core/profile?symbol=CILA3 (Accessed: 2 October 2015)	1. "Growth Habit: Forb/herb, vine"
5.03	1. BioWeb. https://bioweb.uwlax.edu/bio203/s2012/montesin_elis/classification.htm (Accessed: 2 October 2015)	1. "The family Cucurbitaceae has plants with sprawling herbaceous vines and melons."
5.04	1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e455 (Accessed: 17 September 2015) 2. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015)	1&2. These specialized structures are not listed in the description of the species.
6.01	1. PlantZAfrica. http://www.plantzafrika.com/plantcd/citrullanat.htm (Accessed: 17 September 2015)	1. "Conservation status: Citrullus lanatus is not threatened and its status is described as 'Least Concern' by Raimondo et al . 2009. This means that the species is not at risk of extinction or under threat."

6.02	1. Pacific Island Ecosystems at Risk. http://www.hear.org/pier/species/citrullus_lanatus.htm (Accessed: 17 September 2015) 2. Dave's Garden. http://davesgarden.com/guides/pf/go/1190/#b (Accessed: 16 September 2015)	1. "Propagation: Seed" 2. "Propagation Methods: From seed; direct sow after last frost"
6.03		No evidence
6.04	1. Learn2grow. http://www.learn2grow.com/plants/citrullus-lanatus/ (Accessed: 16 September 2015) 2. Vegetables. Plant Resources of Tropical Africa. https://books.google.com/books?id=6jrlyOPfr24C&pg=PA190&lp=PA190&dq=%22Citrullus+lanatus%22+self+compatible&source=bl&ots=DqAgtMOt1_&sig=jSl3siD7835nd4Ho9kmvmcDCSpQ&hl=en&sa=X&ved=0CCQQ6AEwAWoVChMIkXJO_Y6lyAIVCuKACH16vAoj#v=onepage&q=%22Citrullus%20lanatus%22%20self%20compatible&f=false (Accessed: 2 October 2015)	1. "Self-Sowing: Yes" 2. "Citrullus lanatus is self-compatible but outcrossing is more common."
6.05	1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e455 (Accessed: 2 September 2015) 2. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015)	1. "Spray for insects at night when bees (needed for cross-pollination) are less active." 2. "Pollinator: C. lanatus is autogamous as well as open-pollinated by insects (7,8). In the U.S., watermelon crops are mostly pollinated by honey bees (<i>Apis mellifera</i>), but also by wild bees, flies, and beetles that are attracted by the nectar produced in both male and female flowers."
6.06		No evidence
6.07	1. Dave's Garden. http://davesgarden.com/guides/articles/view/1517/#b (Accessed: 6 October 2015) 2. SF Gate. http://www.sfgate.com/homeandgarden/article/Moon-Stars-watermelon-Citrullus-lanatus-2655005.php (Accessed: 6 October 2015)	1. "Watermelons require a long growing season--about 3 months from planting to harvest" 2. "Most varieties take about 100 days to mature"
7.01	1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=e455 (Accessed: 17 September 2015) 2. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015)	1. "Notwithstanding the virtues of its fruits, this vine has become a common weed of roadsides and open ground some parts of the world." 2. "Habitat Preference: Aside from cultivated land, C. lanatus grows on disturbed sites, landfills, shores, and sewage plant fill." --- However, seeds are embedded in large fruits with no mechanism of attachment.
7.02	1. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015) 2. Biotechnology in Agriculture and Forestry. http://link.springer.com/chapter/10.1007%2F978-3-662-07774-0_5 (Accessed: 6 October 2015)	1. "Since C. lanatus is a widely cultivated species, its spread throughout the world is credited to its agricultural acceptance" 2. "Watermelon is grown worldwide and ranks sixth in world production of fruit crops."
7.03		No evidence
7.04	1. BioWeb. https://bioweb.uwlax.edu/bio203/s2012/montesin_elis/classification.htm (Accessed: 2 October 2015)	1. See photo. Seed is embedded in a very large fruit.
7.05	1. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015)	1. "also dispersed by water"
7.06	1. SF Gate. http://homeguides.sfgate.com/wild-animals-eat-watermelons-garden-40477.html (Accessed: 6 October 2015)	Evidence birds will eat fruit but no evidence the seeds are moved or are viable after gut1. "Crows are the primary bird enemies of watermelons. They don't just settle for one melon. They poke a hole in one, extract some of the interior flesh and then move on to another and another. During dry periods, pheasants also may poke holes in your watermelons in their quest for moisture for survival."

7.07	1. BioWeb. https://bioweb.uwlax.edu/bio203/s2012/montesin_elis/classification.htm (Accessed: 2 October 2015)	1. See photo. Seed is embedded in a very large fruit with no mechanism of attachment.
7.08	1. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015)	1. "The fruit is consumed by animals that then spread its seeds"
8.01		No evidence
8.02	1. University of Michigan. http://climbers.lsa.umich.edu/?p=248 (Accessed: 16 September 2015)	1. "They do not require a dormancy period, remain viable for up to 10 years, and germinate epigeally (8,10,11)."
8.03	1. University of Florida Institute of Food and Agricultural Sciences. https://edis.ifas.ufl.edu/wg029 (Accessed: 6 October 2015)	1. Many herbicides are listed for use in managing watermelon.
8.04		No evidence
8.05		Unknown if enemies are present that substantially reduce growth and reproduction

Pacific second screening: decision rules for species with WRA scores between 1 and 6

(from Daehler *et al.* 2004)



Vines must pass both tests