UF IFAS UNIVERSITY of FLORIDA

Assessment of Non-native Plants in Florida's Natural Areas

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Assessment date 10 July 2017

	Actinidia deliciosa **ALL ZONES**	**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 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)	n	0
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	n	0
3.03	Weed of agriculture	unk	
3.04	Environmental weed	y	4
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	unk	-1
4.05	Toxic to animals	n	0
4.06	Host for recognised pests and pathogens	n	0
4.07	Causes allergies or is otherwise toxic to humans	unk	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.	n	0
4.11	Climbing or smothering growth habit	y	1
4.12	Forms dense thickets	unk	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	n	-1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	unk	-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	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	y	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	**3**	
	Implemented Pacific Second Screening	**Yes**	
	Risk Assessment Results	**EVAL**	

section	# questions answered	satisfy minimum?
A	10	yes
B	8	yes
C	18	yes
total	36	yes

	Reference	Source data
1.01		Cultivated widely, but insufficient evidence of selection for reduced weediness
1.02		Skip to 2.01
1.03		Skip to 2.01
2.01	1. Global Plant Hardiness Zones for Phytosanitary Risk Analysis. http://naldc.nal.usda.gov/download/36586/PDF (Accessed: 1 February 2017) 2. US National Plant Germplasm System. https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?311344 (Accessed: 1 February 2017) 3. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 4. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=275437&isprofile=0& (Accessed: 1 February 2017) 5. Dave's Garden. http://davesgarden.com/guides/pf/go/58337/ (Accessed: 1 February 2017) 6. Sullivan, J. J., Mather, J., & Stahel, W. (2007). Control of wild kiwifruit (Actinidia species) in Bay of Plenty, New Zealand. Acta Horticulturae, 753(2): 583 (Accessed: 1 February 2017)	1. Figure 3. Florida North Zone: Hardiness zones 8 and 9. Central Zone: Hardiness zones 9 and 10. South Zone: Hardiness zone 10. 2. Native to China (Fujian, - Hubei, - Jiangxi, - Sichuan, - Zhejiang) 3. "Native to China, mainly in the southern and central parts, in mountain forests at 800–1400 m." 4. "Native Range: China"; "Zone: 8 to 9" 5. USDA Zones 8a to 10b 6. Naturalized in New Zealand
2.02		Range is well known
2.03	1. The University of Melbourne. Köppen-Geiger Climate Map of the Wolrd. http://people.eng.unimelb.edu.au/mpeel/koppen.html (Accessed: 1 February 2017) 2. US National Plant Germplasm System. https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?311344 (Accessed: 1 February 2017) 3. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 4. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=275437&isprofile=0& (Accessed: 1 February 2017) 5. Sullivan, J. J., Mather, J., & Stahel, W. (2007). Control of wild kiwifruit (Actinidia species) in Bay of Plenty, New Zealand. Acta Horticulturae, 753(2): 583 (Accessed: 1 February 2017)	1. Native or naturalized to Köppen-Geiger Climate Zones: Cwa, Cfa 2. Native to China (Fujian, - Hubei, - Jiangxi, - Sichuan, - Zhejiang) 3. "Native to China, mainly in the southern and central parts, in mountain forests at 800–1400 m." 4. "Native Range: China" 5. Naturalized in New Zealand

2.04	1. Climate Charts. World Climate Maps. http://www.climate-charts.com/World-Climate-Maps.html#rain (Accessed: 1 February 2017) 2. US National Plant Germplasm System. https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?311344 (Accessed: 1 February 2017) 3. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 4. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=275437&isprofile=0& (Accessed: 1 February 2017) 5. Sullivan, J. J., Mather, J., & Stahel, W. (2007). Control of wild kiwifruit (Actinidia species) in Bay of Plenty, New Zealand. Acta Horticulturae, 753(2): 583 (Accessed: 1 February 2017)	1. Native and naturalized in areas with rainfall within these ranges. 2. Native to China (Fujian, - Hubei, - Jiangxi, - Sichuan, - Zhejiang) 3. "Native to China, mainly in the southern and central parts, in mountain forests at 800–1400 m." 4. "Native Range: China" 5. Naturalized in New Zealand.
2.05	1. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 2. Dave's Garden. http://davesgarden.com/guides/pf/go/58337/ (Accessed: 1 February 2017) 3. US National Plant Germplasm System. https://npgsweb.ars-grin.gov/gringlobal/taxonomydetail.aspx?311344 (Accessed: 1 February 2017)	1. "Actinidia deliciosa is widely cultivated in many countries, including New Zealand, Brazil, Chile and Italy." 2. Said to grow in California, Florida, Georgia, Oregon, and Washington 3. Cultivated in China, Japan, Iran, New Zealand, Greece, Italy, France, the United States, and Chile for edible fruit
3.01	1. Sullivan, J. J., Mather, J., & Stahel, W. (2007). Control of wild kiwifruit (Actinidia species) in Bay of Plenty, New Zealand. Acta Horticulturae, 753(2): 583 (Accessed: 1 February 2017) 2. Howell, C. J., & Sawyer, J. W. (2006). New Zealand naturalised vascular plant checklist. New Zealand Plant Conservation Network, Wellington, NZ (Accessed: 1 February 2017) 3. Logan, D. P., & Xu, X. 2006. Germination of kiwifruit, Actinidia chinensis, after passage through Silvereyes, Zosterops lateralis. New Zealand Journal of Ecology, 30(3): 407-411 (Accessed: 1 February 2017)	1. "A large population of wild kiwifruit, mostly Actinidia deliciosa, has grown in the Bay of Plenty region of New Zealand over the past 30 years, fueled by the increasing commercial success of kiwifruit production. This fast-growing non-native woody vine has invaded native forest and scrub and commercial Pinus radiata plantations. The environmental impacts of wild Actinidia have led it to be listed as a Total Control Pest Plant in the Environment Bay of Plenty Regional Pest Management Strategy." 2. "Actinidia deliciosa - Naturalised plant status = Fully naturalized" 3. "All Actinidia species are perennial vines that fruit annually. Most naturalised or wild vines are A. deliciosa, but recently, wild A. chinensis and A. arguta, and the non-commercial species A. eriantha Benth. and A. polygama (Sieb. et Zucc.) Maxim., have been found growing wild."
3.02	1. Global Compendium of Weeds. http://www.hear.org/gcw/species/actinidia_deliciosa/ (Accessed: 2 February 2017)	1. Not classified as a weed
3.03	1. Global Compendium of Weeds. http://www.hear.org/gcw/species/actinidia_deliciosa/ (Accessed: 2 February 2017) 2. International Society for Horticultural Science. http://www.actahort.org/books/753/753_77.htm (Accessed: 2 February 2017)	1. Not classified as an agricultural weed 2. "This fast-growing non-native woody vine has invaded native forest and scrub and commercial Pinus radiata plantations."

3.04	1. Sullivan, J. J., Mather, J., & Stahel, W. (2007). Control of wild kiwifruit (Actinidia species) in Bay of Plenty, New Zealand. Acta Horticulturae, 753(2): 583 (Accessed: 2 February 2017) 2. Newstrom, L.E., Armstrong, T., Robertson, A. W., Lee, W. G., Heenan, P. B., Peltzer, D., Wilton, A. D., FitzJohn, R.G., Breitwieser, I. & Glenny, D. 2003. Environmental risks to the New Zealand flora from transgenic crops: the role of gene flow. Landcare Research, Lincoln, NZ (Accessed: 2 February 2017) 3. Bay of Plenty Regional Council. 2015. Case study - Many hands needed to control wild kiwifruit. https://www.boprc.govt.nz/environment/pest-management/case-study-many-hands-needed-to-control-wild-kiwifruit/ (Accessed: 2 February 2017) 4. Global Compendium of Weeds. http://www.hear.org/gcw/species/actinidia_deliciosa/ (Accessed: 2 February 2017) 5. International Society for Horticultural Science. http://www.actahort.org/books/753/753_77.htm (Accessed: 2 February 2017)	1. "A large population of wild kiwifruit, mostly Actinidia deliciosa, has grown in the Bay of Plenty region of New Zealand over the past 30 years, fueled by the increasing commercial success of kiwifruit production. This fast-growing non-native woody vine has invaded native forest and scrub and commercial Pinus radiata plantations. The environmental impacts of wild Actinidia have led it to be listed as a Total Control Pest Plant in the Environment Bay of Plenty Regional Pest Management Strategy." 2. "An example of a crop that has escaped from cultivation while in New Zealand is the recently domesticated kiwifruit, Actinidia deliciosa, which demonstrates the process of naturalization leading to an environmental weed (Sullivan & Williams 2002 unpubl. report). Kiwifruit vines were introduced to New Zealand in 1904 but the first plant found in the wild was not discovered until 54 years later, a lag time typical of many naturalisations. Sullivan & Williams (2002) report that naturalised kiwifruit has become a serious environmental weed with high scores in the Department of Conservations weed priority ranking system and the MAFs (Ministry of Agriculture and Forestry) NZ Weed Risk Assessment model." 3. "If left uncontrolled, wild kiwifruit forms a mound of tangled stems that can grow up and over trees, smothering and killing them. Without active control, areas of native bush would eventually disappear under a blanket of kiwifruit." 4. Not classified as an environmental weed 5. "A large population of wild kiwifruit, mostly Actinidia deliciosa, has grown in the Bay of Plenty region of New Zealand over the past 30 years, fueled by the increasing commercial success of kiwifruit production. This fast-growing

3.05	1. Newstrom, L.E., Armstrong, T., Robertson, A. W., Lee, W. G., Heenan, P. B., Peltzer, D., Wilton, A. D., FitzJohn, R.G., Breitwieser, I. & Glenny, D. 2003. Environmental risks to the New Zealand flora from transgenic crops: the role of gene flow. Landcare Research, Lincoln, NZ (Accessed: 2 February 2017) 2. Global Compendium of Weeds. http://www.hear.org/gcw/species/actinidia_arguta/ (Accessed: 2 February 2017) 3. PennState Extension. http://extension.psu.edu/plants/tree-fruit/news/2013/hardy-kiwifruit-invasive-plant-or-throwback-to-the-gilded-age (Accessed: 2 February 2017)	1. "Other kiwifruit species (Actinidia arguta and A. polygama) have also escaped, but are so recently introduced (1970s) that they have not had the time to spread or revert to the wild state." 2. Actindia arguta is classified as an environmental weed 3. "In 2012, the Massachusetts Audubon Society published an Invasive Plant Pest Alert on hardy kiwifruit, Actinidia arguta, also called "tara vine", strongly urging people not to grow or propagate this plant. The apparently rampant growth of vines had been documented at three particular locations: 1) at Kennedy Park and the Pleasant Valley Wildlife Sanctuary in Lenox, MA where there is significant area covered with large vines that are overtopping trees, plus a population of seedlings nearby; 2) near Stockbridge, MA; and 3) at Coffin Woods on Long Island, NY, where the issue is thought to be a remnant of an estate planting. These sites stand in marked contrast to observations of the behavior of commercial and research plantings in PA, OR, MN, NY, ME and many other locations, where planted specimens have stayed in place and seedlings have extremely rarely germinated from fallen berries. The disparity in experiences with this plant has prompted many questions"; "So far, A. arguta has failed to meet the criteria required for classification as invasive by several non-federal groups as well."; "The U.S. Forest Service, following evaluation of hardy kiwifruit, placed it in Category 4 "Plants – Local Concern and Monitoring"
4.01	1. Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York (Accessed: 2 February 2017) 2. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 3. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=275437&isprofile=0& (Accessed: 1 February 2017)	No evidence of these features

4.02	1. Nakamura, Y., Umemiya, Y., Masuda, K., Inoue, H., Fujii, Y., & Moriguchi, T. 2004. Impact assessment of transgenic kiwifruit [Actinidia deliciosa] on allelopathic effect and soil microflora. Horticultural Research (Japan) 3(4) (Accessed: 2 February 2017)	1. "The influences of transformed kiwifruit with glucanase or chitinase genes on the non-rhizosphere and rhizosphere soil were investigated to accumulate basic information in terms of allelopathic effects and soil microflora. When the allelopathic effects were evaluated using lettuce sprouts that are sensitive to allelopathic substances, there was no detectable difference in the growth of the lettuce sprouts with root and shoot tissue of both transformants and non- transformants. There was also no difference on the soil microflora of pot soil between transformants and non-transformants, in which the number of mold fungi, actinomycetes and bacteria in the nonrhizosphere and rhizosphere were not significantly different from transformants and non-transformants. Kanamycin-resistant bacteria were present in soils from both transformants and non - transformants. To identify the origin of kanamycin-resistance, PCR using primer combinations corresponding to transformant-specific marker genes were carried out. The results showed that the kanamycin-resistant bacteria were not due to horizontal gene transfer of transgenic from transformants to micro-organism, indicating that these bacteria were present in the soil regardless of transformants or non-transformants. Collectively, these results suggested that the influences of transformed kiwifruit with glucanase or chitinase genes on the non-rhizosphere and rhizosphere soil are substantially the same as those of non-transformants. "
4.03		No evidence
4.04	1. Bay of Plenty Regional Council. 2013. Wild kiwifruit Actinidia spp. Pest Plant Control 18. http://www.boprc.govt.nz/media/321627/PP18-Wild- kiwifruit.pdf (Accessed: 2 February 2017)	1. "On the farm: If reject fruit is being used for stockfeed, ensure piles of fruit are well covered with windbreak cloth or similar. Only feed out quantities of fruit from the stockpile which can be eaten quickly by the stock. This avoids large quantities of fruit being available for mass feeding by birds."
4.05	1. Bay of Plenty Regional Council. 2013. Wild kiwifruit Actinidia spp. Pest Plant Control 18. http://www.boprc.govt.nz/media/321627/PP18-Wild- kiwifruit.pdf (Accessed: 2 February 2017) 2. Bay of Plenty Regional Council. 2015. Case study - Many hands needed to control wild kiwifruit. https://www.boprc.govt.nz/environment/pest-management/case-study-many-hands-needed-to-control-wild-kiwifruit/ (Accessed: 2 February 2017)	1. "On the farm: If reject fruit is being used for stockfeed, ensure piles of fruit are well covered with windbreak cloth or similar. Only feed out quantities of fruit from the stockpile which can be eaten quickly by the stock. This avoids large quantities of fruit being available for mass feeding by birds." 2. "Wild kiwifruit is spread predominantly by birds, rats and possums that have eaten waste fruit and transported many tiny seeds in their droppings, often across many kilometres."

4.06	1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=275437&isprofile=0& (Accessed: 1 February 2017) 2. Janick, J.& Paull, R.E. 2008. The Encyclopedia of Fruit & Nuts. CABI Publishing, Wallingford, UK (Accessed: 2 February 2017)	No evidence that Actinidia deliciosa is a significant primary or alternate host 1. "No serious disease or insect problems." 2. "Similar types of pests occur on kiwifruit in the countries in which they are grown and all tend to be generalists affecting a broad range of plants. Armoured scales are generally the most serious but although the species involved are cosmopolitan, the abundance of a particular species varies according to country. The other main group of pests, the leafrollers, tend to be specific to each country and are therefore a quarantine problem as well as damaging the fruit. Nematodes are a problem in some countries. Kiwifruit are also susceptible to bacterial and fungal diseases. Pseudomonas species cause bacterial canker, bacterial necrosis and, potentially most serious, bacterial blossom blight. Sclerotinia can also affect fruit on the vine but the other serious fungal diseases are those that develop while the fruit is in storage (mainly Botrytis cinerea) or after the fruit is taken from storage (e.g. Botryosphaeria dothidea). When kiwifruit were domesticated, they were freed of many of the pests and diseases to which they are prone in China. However, as plantings have increased so too have the problems. Fortunately, the number of pests on kiwifruit is still fairly limited and they can be well controlled by integrated pest management systems. Organic production is realistic."
4.07	1. Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York (Accessed: 2 February 2017)	1. "On the down side, kiwi fruit can cause allergy and its oxalate content is an antinutrient. Allergy to kiwi fruit was first described in 1981, and there have since been reports of the allergy presenting a wide range of symptoms from localized oral allergy syndrome (OAS) to life-threatening anaphylaxis (Lucas et al. 2003)."
4.08	1. Logan, D. P., & Xu, X. 2006. Germination of kiwifruit, Actinidia chinensis, after passage through Silvereyes, Zosterops lateralis. New Zealand Journal of Ecology, 30(3): 407-411 (Accessed: 2 February 2017)	1. Often grows in damp conditions
4.09	1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=275437&isprofile=0& (Accessed: 1 February 2017) 2. Dave's Garden. http://davesgarden.com/guides/pf/go/58337/ (Accessed: 1 February 2017) 3. Top Tropicals. http://toptropicals.com/catalog/uid/actinidia_deliciosa.htm (Accessed: 1 February 2017) 4. Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York (Accessed: 2 February 2017)	1. "Sun: Full sun"; "Tolerates light shade." 2. "Sun Exposure: Sun to Partial Shade, Light Shade" 3. Full sun 4. "The vine does best in full sun although young vines require partial shade."
4.10	1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=275437&isprofile=0& (Accessed: 1 February 2017) 2. Morton, J.F. 1987. Fruits of warm climates. J.F. Morton, Miami, FL (Accessed: 2 February 2017)	1. "Grow in average, medium moisture, well-drained soil" 2. "For good growth, the vine needs deep, fertile, moist but well- drained soil, preferably a friable, sandy loam. Heavy soils subject to water logging are completely unsuitable. In Kiangsi Province, China, the wild plants flourish in a shallow layer of "black wood earth" on top of stony, red subsoil."
4.11	1. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 2. Top Tropicals. http://toptropicals.com/catalog/uid/actinidia_deliciosa.htm (Accessed: 1 February 2017) 3. Bay of Plenty Regional Council. 2015. Case study - Many hands needed to control wild kiwifruit. https://www.boprc.govt.nz/environment/pest-management/case-study-many-hands-needed-to-control-wild-kiwifruit/ (Accessed: 2 February 2017)	1. Climber 2. "This lovely twiner with its fuzzy leaves, is ideal for trellis growing. The plant is a vigorous, woody vine (liana) or climbing shrub." 3. "If left uncontrolled, wild kiwifruit forms a mound of tangled stems that can grow up and over trees, smothering and killing them. Without active control, areas of native bush would eventually disappear under a blanket of kiwifruit."

4.12	1. Bay of Plenty Regional Council. 2015. Case study - Many hands needed to control wild kiwifruit. https://www.boprc.govt.nz/environment/pest-management/case-study-many-hands-needed-to-control-wild-kiwifruit/ (Accessed: 2 February 2017)	1. "If left uncontrolled, wild kiwifruit forms a mound of tangled stems that can grow up and over trees, smothering and killing them. Without active control, areas of native bush would eventually disappear under a blanket of kiwifruit."
5.01	1. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 2. Janick, J.& Paull, R.E. 2008. The Encyclopedia of Fruit & Nuts. CABI Publishing, Wallingford, UK (Accessed: 2 February 2017)	1, "Family: Actinidiaceae" 2. "Wild A. chinensis and A. deliciosa occur mostly on steep hills and mountain slopes."
5.02	1. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 2. Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York (Accessed: 2 February 2017)	1, "Family: Actinidiaceae" 2. "A vigorous, climbing, woody, deciduous, dioecious vine with whitish to brown, large, lamellate pith."
5.03	1. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 2. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid	No evidence of nitrogen fixation 1. "Family: Actinidiaceae" 2. "woody vine"
5.04	1. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 2.Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=275437&isprofile=0& (Accessed: 1 February 2017)	No evidence of these specialized structures 1. "Family: Actinidiaceae"
6.01		No evidence
6.02	1. Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York (Accessed: 2 February 2017) 2. Bay of Plenty Regional Council. 2015. Case study - Many hands needed to control wild kiwifruit. https://www.boprc.govt.nz/environment/pest-management/case-study-many-hands-needed-to-control-wild-kiwifruit/ (Accessed: 2 February 2017) 3. Bay of Plenty Regional Council. 2012. Landowners urged to help halt spread of wild kiwifruit. Tuesday, 22 May 2012 10:45 a.m. https://www.boprc.govt.nz/news-centre/media-releases/media-releases-2012/may-2012/landowners-urged-to-help-halt-spread-of-wild-kiwifruit/ (Accessed: 2 February 2017)	1. "The flesh is firm until fully ripe, juicy, sweet to subacid, bright-green with white, succulent center surrounded by numerous tiny, purplish- black seeds" 2. "Wild kiwifruit is spread predominantly by birds, rats and possums that have eaten waste fruit and transported many tiny seeds in their droppings, often across many kilometres." 3. "A single kiwifruit contains about 1000 seeds. Half of those have the potential to produce a growing vine. When you consider that one 30-year-old vine can smother 1000 square metres of native bush, then you begin to comprehend the potential for problems."

6.03	1. Liu, Y., Liu, Y., & Huang, H. 2010. Genetic variation and natural hybridization among sympatric Actinidia species and the implications for introgression breeding of kiwifruit. Tree Genetics & Genomes, 6(5): 801-813 (Accessed: 2 February 2017)	1. "For example, A. chinensis generally occur in the central-eastern China with an altitude range of 200-1.900 m whereas A. deliciosa is colder hardy distributing in central-western China and the distribution upper limit can reach altitude 2,000 m (Cui et al. 2002). Therefore, gene flow occurring in geographical proximity suggests the presence of hybridization through secondary contact of the two species, albeit possibly in combination with some level of ancestral polymorphism." ... "For example, the numerous hybrids or introgressed lineages of A. chinensis and A. deliciosa detected in the HX, SN, WF, and ZY populations are new pools with different levels of variation, termed □hybrid swarms.□□They are enriched with diverse genetic compositions, together with improved or new adaptive or morphological attributes. Thus, for kiwifruit that have been subjected to little selection pressure and are still similar to wild-type plants (Ferguson 2007), introgression breeding is a process to directly select the materials that contain the desirable traits from these hybrid zones. Our study thus provides the first step to understand the genetic basis and gene flow dynamics of sympatric Actinidia species in the wild and gives a model system for further studying the theoretical basis and methodologies of introgression breeding for fruit trees."
6.04	1. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 2.Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=275437&isprofile=0& (Accessed: 1 February 2017) 3. University of California. The California Backyard Orchard. http://homeorchard.ucanr.edu/Fruits_&_Nuts/Kiwifruit/ (Accessed: 1 February 2017)	1. "Self-fertile cultivars have been bred." 2. "This species is dioecious (separate male and female plants), so both male and female plants must be grown in order for proper pollination and fruiting to occur." 3. "Kiwis are functionally dioecious. Successful fruit production requires a female cultivar and a male with viable pollen when the female is receptive."
6.05	1. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 2. Top Tropicals. http://toptropicals.com/catalog/uid/actinidia_deliciosa.htm (Accessed: 1 February 2017) 3. Miñarro, M., & Twizell, K. W. 2014. Pollination services provided by wild insects to kiwifruit (Actinidia deliciosa). Apidologie, 1-10. DOI: 10.1007/s13592-014-0321-2 (Accessed: 2 February 2017)	1. "pollinated by bees" 2. "Bees are normally used by commercial orchards, although the more labor intensive hand pollination is sometimes employed. Male flowers are gathered and processed to extract their pollen. This is then sprayed back on to the female flowers." 3. "Managed bees are used to transfer pollen from male to female flowers in kiwifruit, but the contribution of wild insects has been long overlooked. We approached such contribution with multiple criteria (pollinator abundance, foraging behavior, pollinating efficiency, and response to weather conditions) in the absence of imported colonies. An abundant and rich community of pollinators (57% were non-Apis insects) visited kiwifruit flowers and assured a fruit set and size not different from those obtained by optimal hand pollination. Honeybees were more abundant and visited more flowers per time but bumblebees were more efficient on a per visit basis. Other taxa are expected to contribute less because of their lower numbers (hoverflies, wild bees, butterflies, beetles) or their passive behavior (non-syrphid flies). Visitation patterns of pollinators were complementary. Our results highlight the important contribution of wild insects to the pollination of kiwifruit."

6.06	1. Bay of Plenty Regional Council. 2013. Wild kiwifruit Actinidia spp. Pest Plant Control 18. http://www.boprc.govt.nz/media/321627/PP18-Wild- kiwifruit.pdf (Accessed: 2 February 2017) 2. San Marcos Growers. http://www.smgrowers.com/products/plants/plantdisplay.asp?plant_id=42 (Accessed: 2 February 2017) 3. Dave's Garden. http://davesgarden.com/guides/pf/go/58337/#b (Accessed: 2 February 2017)	1. "How does it spread? Seed is spread by birds, especially waxeyes, eating the fruit left on vines in orchards. It□s also spread by humans dropping fruit remains. Many plants spread from reject fruit being transported and dumped for use as stockfood." 2. "can spread to 30 feet wide" 3. Propagated by cuttings
6.07	1. Janick, J.& Paull, R.E. 2008. The Encyclopedia of Fruit & Nuts. CABI Publishing, Wallingford, UK (Accessed: 2 February 2017)	1. "Flowers are borne either singly (as in most female cultivars) or in small inflorescences of five to seven flowers (as in most male cultivars). In general, vines do not flower until 3 or 4 years old, but A. chinensis is noticeably more precocious than A. deliciosa."
7.01	1. Bay of Plenty Regional Council. 2012. Landowners urged to help halt spread of wild kiwifruit. Tuesday, 22 May 2012 10:45 a.m. https://www.boprc.govt.nz/news-centre/media-releases/media-releases-2012/may-2012/landowners-urged-to-help-halt-spread-of-wild-kiwifruit/ (Accessed: 2 February 2017) 2. Bay of Plenty Regional Council. 2013. Wild kiwifruit Actinidia spp. Pest Plant Control 18. http://www.boprc.govt.nz/media/321627/PP18-Wild- kiwifruit.pdf (Accessed: 2 February 2017) 3. Logan, D. P., & Xu, X. 2006. Germination of kiwifruit, Actinidia chinensis, after passage through Silvereyes, Zosterops lateralis. New Zealand Journal of Ecology, 30(3): 407-411 (Accessed: 2 February 2017)	1. "Members of the public: - Be careful with the disposal of kiwifruit, particularly while out in the bush." 2. "It□s also spread by humans dropping fruit remains. Many plants spread from reject fruit being transported and dumped for use as stockfood." 3. "Kiwifruit are thought to have become naturalised after dumping of vines, vine prunings and reject fruit and by dispersal of kiwifruit seed by birds and other frugivores (Sullivan and Williams, 2002)."; "Dumping reject fruit and prunings in bush in the Bay of Plenty is probably now rare but dispersal of seed is likely to remain an on-going source of new plants."
7.02	1. Kew Royal Botanical Garden. http://www.kew.org/science-conservation/plants-fungi/actinidia-deliciosa-kiwi-fruit (Accessed: 1 February 2017) 2. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=275437&isprofile=0& (Accessed: 1 February 2017) 3. Rareexoticseeds. http://www.rarexoticseeds.com/en/actinidia-deliciosa-seeds-kiwifruit-seeds.html (Accessed: 1 February 2017)	1. "Key Uses: Ornamental, edible fruits, medicine."; commercial fruit 2. "This fast growing vine can be grown both for its beautiful foliage and its fruit. Rapid growth habit makes it suitable for a variety of cover-type uses such as trellises, arbors, patio overheads, fences, or walls." 3. Seeds available for purchase online
7.03		No evidence
7.04	1. Lim, T.K. 2012. Edible Medicinal and Non-Medicinal Plants. Volume 1, Fruits. Springer, New York (Accessed: 2 February 2017) 2. Top Tropicals. http://toptropicals.com/catalog/uid/actinidia_deliciosa.htm (Accessed: 2 February 2017)	1. "Fruit is subglobose to cylindric or ovoid... densely hispid even when mature. The flesh is firm until fully ripe, juicy, sweet to subacid, bright-green with white, succulent center surrounded by numerous tiny, purplish-black seeds" 2. See photos. No evidence of adaptation for wind dispersal.
7.05	1. Wildland Consultants. 2010. State of the Environment Assessment for the Catchments of the Kaimai Range and Northern Mamaku Plateau. Report No. 2075. Crown Copyright: Department of Conservation Te Papa Atawhai, Environment Bay of Plenty, Environment Waikato (Accessed: 2 February 2017) 2. Top Tropicals. http://toptropicals.com/catalog/uid/actinidia_deliciosa.htm (Accessed: 2 February 2017)	1. "The general pattern of weed invasion is replicated in gully remnants throughout the Tauranga Harbour catchment. At the lower end of forested gullies heavy infestations of weeds including Chinese privet (Ligustrum sinense), tree privet (Ligustrum lucidum), kiwifruit (Actinidia deliciosa), and Taiwan cherry (Prunus campanulata) have become numerically dominant and have replaced indigenous vegetation in some places. Further up gullies, the edges may be heavily invaded in places but they retain intact indigenous canopies (Wildland Consultants 2008). In upper catchments, the level of weed invasion around forest edges is generally low." 2. See photo. No evidence that dense fruit will float and seeds are heavily embedded within the fruit.

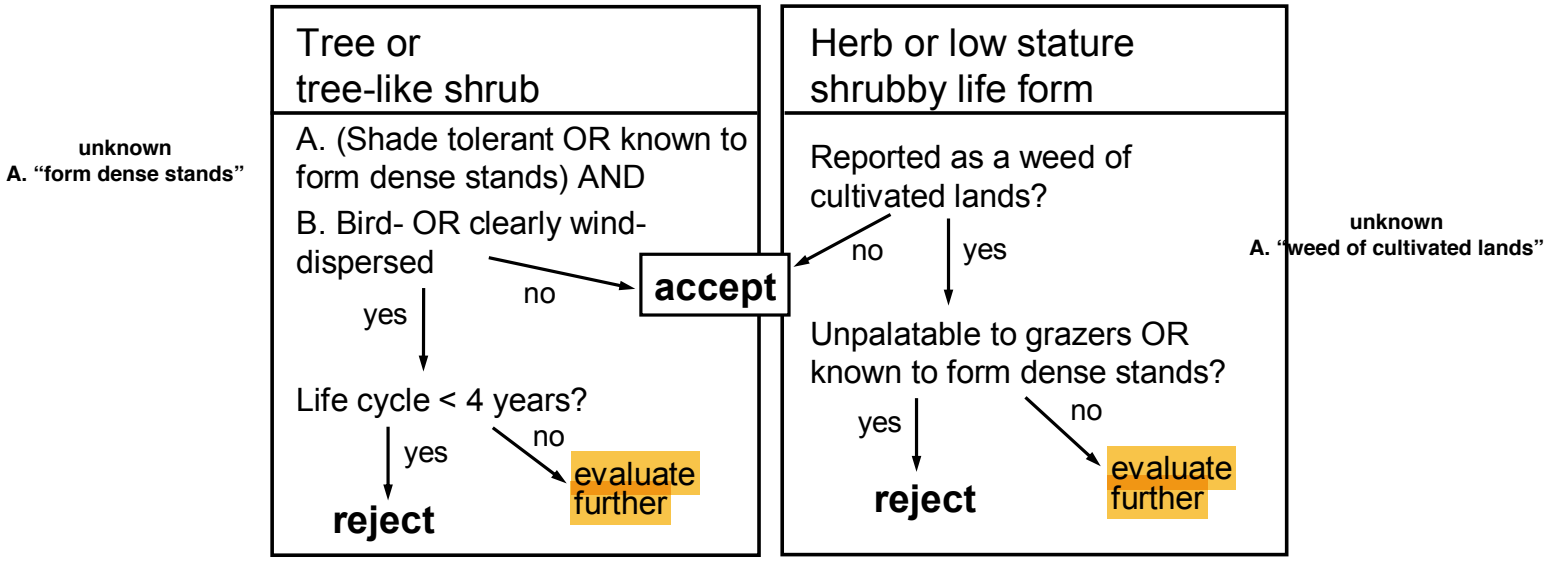
7.06	1. Bay of Plenty Regional Council. 2015. Case study - Many hands needed to control wild kiwifruit. https://www.boprc.govt.nz/environment/pest-management/case-study-many-hands-needed-to-control-wild-kiwifruit/ (Accessed: 2 February 2017) 2. Sullivan, J. J., Mather, J., & Stahel, W. (2007). Control of wild kiwifruit (Actinidia species) in Bay of Plenty, New Zealand. Acta Horticulturae, 753(2): 583 (Accessed: 2 February 2017)	1. "Wild kiwifruit is spread predominantly by birds, rats and possums that have eaten waste fruit and transported many tiny seeds in their droppings, often across many kilometres." 2. "This is complicated by continued recruitment into the wild population from commercial crops, principally via birds feeding on reject kiwifruit fed out to farm stock. We suggest that other countries that commercially propagate wild kiwifruit outside of its native range take care to prevent wild populations from establishing in surrounding vegetation."
7.07	1. Top Tropicals. http://toptropicals.com/catalog/uid/actinidia_deliciosa.htm (Accessed: 2 February 2017)	1. Photos indicate no evidence of mechanism of attachment.
7.08	1. Bay of Plenty Regional Council. 2015. Case study - Many hands needed to control wild kiwifruit. https://www.boprc.govt.nz/environment/pest-management/case-study-many-hands-needed-to-control-wild-kiwifruit/ (Accessed: 2 February 2017) 2. Logan, D. P., & Xu, X. 2006. Germination of kiwifruit, Actinidia chinensis, after passage through Silvereyes, Zosterops lateralis. New Zealand Journal of Ecology, 30(3): 407-411 (Accessed: 2 February 2017)	1. "Wild kiwifruit is spread predominantly by birds, rats and possums that have eaten waste fruit and transported many tiny seeds in their droppings, often across many kilometres." 2. "Gut-passage accelerated the germination rate compared with enzyme-extracted seed. This study supports the view that Z. lateralis is involved in dispersing kiwifruit seed into native and exotic forest."
8.01	1. Bay of Plenty Regional Council. 2012. Landowners urged to help halt spread of wild kiwifruit. Tuesday, 22 May 2012 10:45 a.m. https://www.boprc.govt.nz/news-centre/media-releases/media-releases-2012/may-2012/landowners-urged-to-help-halt-spread-of-wild-kiwifruit/ (Accessed: 2 February 2017)	1. "A single kiwifruit contains about 1000 seeds. Half of those have the potential to produce a growing vine. When you consider that one 30-year-old vine can smother 1000 square metres of native bush, then you begin to comprehend the potential for problems." No evidence of fruit abundance and seed production outside of cultivation.
8.02	1. Newstrom, L.E., Armstrong, T., Robertson, A. W., Lee, W. G., Heenan, P. B., Peltzer, D., Wilton, A. D., FitzJohn, R.G., Breitwieser, I. & Glenny, D. 2003. Environmental risks to the New Zealand flora from transgenic crops: the role of gene flow. Landcare Research, Lincoln, NZ (Accessed: 2 February 2017) 2. Overdyck, E. 2014. Thresholds for sustainable regeneration in urban restoration plantings in Hamilton City, New Zealand (Accessed: 2 February 2017)	1. "It has a short-lived seed bank 3-5□years) and late age to reproduction (5 years) making control options practical for some areas, but monitoring will be needed to detect new populations." 2. "The smothering lianes Lonicera japonica and Hedera helix were widespread in seed rain, while Leycesteria formosa, Rubus fruticosus and Actinidia deliciosa were found to form persistent soil seed banks"
8.03	1. Bay of Plenty Regional Council. 2013. Wild kiwifruit Actinidia spp. Pest Plant Control 18. http://www.boprc.govt.nz/media/321627/PP18-Wild- kiwifruit.pdf (Accessed: 2 February 2017) 2. Sullivan, J. J., Mather, J., & Stahel, W. (2007). Control of wild kiwifruit (Actinidia species) in Bay of Plenty, New Zealand. Acta Horticulturae, 753(2): 583 (Accessed: 2 February 2017)	1. "Spraying: Individual vines are often difficult to trace to the roots in which case spraying is an effective treatment. Spray from November to March with brushkiller (e.g. Tordon Brushkiller, Agpro Tricloram brushkiller) With knapsack or CDAX unit use 60 ml per 10 L of water. With handgun use 600 ml per 100 L of water." 2. "Wild vines can be reliably killed with any of sprayed Tordon® Brushkiller (picloram/triclopyr), Grazon® (triclopyr) and stump treatment with Vigilant□□gel (picloram)."
8.04	1. California Rare Fruit Growers. https://www.crfg.org/pubs/ff/kiwifruit.html (Accessed: 2 February 2017)	1. "If a plant is killed to the ground, a cutting grown plant that survives will regrow from the roots and thus maintain its known characteristics." Plants grown from a cutting will regrow, but plants grown from seed may not.

8.05	1. Missouri Botanical Garden. http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?taxonid=275437&isprofile=0& (Accessed: 1 February 2017) 2. Janick, J.& Paull, R.E. 2008. The Encyclopedia of Fruit & Nuts. CABI Publishing, Wallingford, UK (Accessed: 2 February 2017)	1. "No serious disease or insect problems." 2. "Similar types of pests occur on kiwifruit in the countries in which they are grown and all tend to be generalists affecting a broad range of plants. Armoured scales are generally the most serious but although the species involved are cosmopolitan, the abundance of a particular species varies according to country. The other main group of pests, the leafrollers, tend to be specific to each country and are therefore a quarantine problem as well as damaging the fruit. Nematodes are a problem in some countries. Kiwifruit are also susceptible to bacterial and fungal diseases. Pseudomonas species cause bacterial canker, bacterial necrosis and, potentially most serious, bacterial blossom blight. Sclerotinia can also affect fruit on the vine but the other serious fungal diseases are those that develop while the fruit is in storage (mainly Botrytis cinerea) or after the fruit is taken from storage (e.g. Botryosphaeria dothidea). When kiwifruit were domesticated, they were freed of many of the pests and diseases to which they are prone in China. However, as plantings have increased so too have the problems. Fortunately, the number of pests on kiwifruit is still fairly limited and they can be well controlled by integrated pest management systems. Organic production is realistic."

Actinidia deliciosa

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

(from Daehler *et al*. 2004)



Vines must pass both tests