

**Australia/New Zealand Weed Risk Assessment adapted for United States (see Gordon and Gantz 2008)**

Data used for analysis published in: Gordon, D.R., K.J. Tancig, D.A. Onderdonk and C.A. Gantz. In press. Assessing the invasive potential of biofuel species proposed for Florida and the United States using the Australian weed risk assessment. Biomass and Bioenergy. doi:10.1016/j.biombioe.2010.08.029.

<i>Eucalyptus amplifolia</i> -- United States test			
	Question	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 U.S. 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)	n	0
2.04	Native or naturalized in regions with an average of 11-60 inches of annual precipitation	n	0
2.05	Does the species have a history of repeated introductions outside its natural range?	y	
3.01	Naturalized beyond native range	n	-2
3.02	Garden/amenity/disturbance weed	n	0
3.03	Weed of agriculture	n	0
3.04	Environmental weed	n	0
3.05	Congeneric weed	y	2
4.01	Produces spines, thorns or burrs	n	0
4.02	Allelopathic		
4.03	Parasitic	n	0
4.04	Unpalatable to grazing animals		
4.05	Toxic to animals	n	0
4.06	Host for recognised pests and pathogens		
4.07	Causes allergies or is otherwise toxic to humans	n	0
4.08	Creates a fire hazard in natural ecosystems		

4.09	Is a shade tolerant plant at some stage of its life cycle		
4.10	Grows on one or more of the following soil types: alfisols, entisols, or mollisols	y	1
4.11	Climbing or smothering growth habit	n	0
4.12	Forms dense thickets		
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	y	1
6.04	Self-compatible or apomictic		
6.05	Requires specialist pollinators		
6.06	Reproduction by vegetative fragmentation		
6.07	Minimum generative time (years)		
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	?	
7.05	Propagules water dispersed		
7.06	Propagules bird dispersed		
7.07	Propagules dispersed by other animals (externally)	n	-1
7.08	Propagules dispersed by other animals (internally)		
8.01	Prolific seed production		
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	n	-1
8.03	Well controlled by herbicides		
8.04	Tolerates, or benefits from, mutilation or cultivation	y	1

8.05	Effective natural enemies present in U.S.		
<b>Total Score</b>			<b>2</b>

<b>Outcome</b>	<b>Evaluate</b>
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section	# questions answered	satisfy minimum?
A	11	Yes
B	6	Yes
C	12	Yes
total	29	Yes

Data collected 2008

Question number	Reference	Source data
1.01		Cultivated, but no evidence of selection for reduced weediness.
1.02		
1.03		
2.01	<p>1. PERAL NAPPFAST Global Plant Hardiness (<a href="http://www.nappfast.org/Plant_hardiness/NAPPFAST%20Global%20zones/10-year%20climate/PLANT_HARDINESS_10YR%20lnd.tif">http://www.nappfast.org/Plant_hardiness/NAPPFAST%20Global%20zones/10-year%20climate/PLANT_HARDINESS_10YR%20lnd.tif</a>). 2. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?401104">http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?401104</a> (02 June 2008). 3. Rockwood, DL, et al. (1987) Development of <i>Eucalyptus amplifolia</i> for woody biomass production. Australian Forest Research 17 (2): 173-178. 4. Rockwood, DL, DeValerio, JT (1986) Promising species for woody biomass production in warm-humid environments. Biomass 11: 1-17. 5. Rockwood, D L, et al. (1991) Genetic improvement of <i>Eucalyptus</i></p>	<p>1. Global plant hardiness zones 9-10. 2. "Distributional range: Native: Australasia: Australia- New South Wales, Queensland". 3. "<i>Eucalyptus amplifolia</i> has potential for short-rotation intensive culture in the warm, humid, summer rainfall conditions of Florida under winter freezes as low as -12°C."; "<i>Eucalyptus amplifolia</i>...is a minor species with a limited distribution in Australia, primarily in New South Wales (Hall 1971)." 4. "<i>Eucalyptus amplifolia</i>, with frost resiliency apparently greater than other eucalypts tested in northern Florida." 5. "Exceptional frost-resilience". 6. Present in New South Wales and Queensland; "NSW subdivisions: NC, CC, SC, NT, CT, ST".</p>

	<i>amplifolia</i> for frost-frequent areas. Australian Forestry: The Journal of the Institute of Foresters of Australia 54 (4): 212-218. 6. New South Wales Flora Online ( <a href="http://plantnet.rbg Syd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&amp;lv=sp&amp;name=Eucalyptus~amplifolia">http://plantnet.rbg Syd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&amp;lv=sp&amp;name=Eucalyptus~amplifolia</a> . Accessed July 15, 2008.)	
2.02		
2.03	<p>1. Köppen-Geiger climate map (<a href="http://www.hydrol-earth-syst-sci.net/11/1633/2007/hess-11-1633-2007.pdf">http://www.hydrol-earth-syst-sci.net/11/1633/2007/hess-11-1633-2007.pdf</a>).</p> <p>2. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?401104">http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?401104</a> (02 June 2008).</p> <p>3. Rockwood, DL, et al. (1987) Development of <i>Eucalyptus amplifolia</i> for woody biomass production. Australian Forest Research 17 (2): 173-178. 4. New South Wales Flora Online (<a href="http://plantnet.rbg Syd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&amp;lv=sp&amp;name=Eucalyptus~amplifolia">http://plantnet.rbg Syd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&amp;lv=sp&amp;name=Eucalyptus~amplifolia</a>. Accessed July 15, 2008.)</p>	<p>1. Probably only two climatic groups. 2. "Distributional range: Native: Australasia: Australia- New South Wales, Queensland". 3. "<i>Eucalyptus amplifolia</i>...is a minor species with a limited distribution in Australia, primarily in New South Wales (Hall 1971)." 4. Present in New South Wales and Queensland; "NSW subdivisions: NC, CC, SC, NT, CT, ST".</p>
2.04	Australian Government, Bureau of Meteorology ( <a href="http://www.bom.gov.au/cgi-bin/climate/cgi_bin_scripts/annual-monthly-rainfall.cgi">http://www.bom.gov.au/cgi-bin/climate/cgi_bin_scripts/annual-monthly-rainfall.cgi</a> ).	For SE Queensland and Eastern New South Wales, the average annual precipitation is up to 2000 mm (78.7 inches/year).
2.05	<p>1. Johnson, LAS, Hill, KD (1990) <i>Eucalyptus amplifolia</i>. Telopea 4: 51. 2. Rockwood, DL, et al. (1987) Development of <i>Eucalyptus amplifolia</i> for woody biomass production. Australian Forest Research 17 (2): 173-178. 3. FAO (1979) Eucalypts for Planting. FAO Forestry Series No. 11. Rome.</p>	<p>1. "Type: Five specimens collected by Naudin from various localities in France and Italy and now housed at P may be regarded as Syntypes (n.v.)." 2. "It has received little attention worldwide, with the few available reports documenting its unsuitability for Uruguay and its success in Libya (FAO 1979)." 3. "Other well-grown eucalypts seen in Libya by Pryor in 1964 were...<i>E. amplifolia</i>".</p>
3.01		No evidence.
3.02		No evidence.
3.03		No evidence.
3.04		No evidence.

3.05	Holm, L, et al. (1979) A Geographical Atlas of World Weeds. John Wiley and Sons, New York.	<i>Eucalyptus cambageana</i> is a Principal weed of agriculture in Australia.
4.01		No description of these traits.
4.02		
4.03		No description of parasitism.
4.04		
4.05		No evidence.
4.06		
4.07		No evidence.
4.08		
4.09		
4.10	1. USDA, National Resources Conservation Services (NRCS), Soil Survey Division, World Soil Resources ( <a href="http://soils.usda.gov/use/worldsoils/mapindex/order.html">http://soils.usda.gov/use/worldsoils/mapindex/order.html</a> ). 2. FAO (1979) Eucalypts for planting. FAO Forestry Series No. 11. 3. Rockwood, DL, et al. (1991) Genetic improvement of <i>Eucalyptus amplifolia</i> for frost-frequent areas. Australian Forestry: The Journal of the Institute of Foresters of Australia 54 (4): 212-218. 4. New South Wales Flora Online ( <a href="http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&amp;lvl=sp&amp;name=Eucalyptus~amplifolia">http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&amp;lvl=sp&amp;name=Eucalyptus~amplifolia</a> . Accessed July 15, 2008.)	1. SE Australia: mostly alfisols with some entisols, inceptisols, mollisols, and ultisols (and also possibly small amounts of oxisols and spodosols). 2. " <i>E. amplifolia</i> ...occurs on poor soils." BUT 3. "Growth on good or amended sites is excellent, but the species may not do well on relatively infertile or acidic sites or in competition with other vegetation." 4. "Loamy soils."
4.11	1. Wu, Z, Raven, PH, eds. (1994) <i>Eucalyptus amplifolia</i> . Flora of China. 13: 323-325. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 2. New South Wales Flora Online ( <a href="http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&amp;lvl=sp&amp;name=Eucalyptus~amplifolia">http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&amp;lvl=sp&amp;name=Eucalyptus~amplifolia</a> . Accessed July 15, 2008.) 3. George, AS, ed. (1980) Flora of Australia. Vol. 19, <i>Myrtaceae-Eucalyptus, Angophora</i> . Australian Government Publishing Service, Canberra.	1. "Trees." 2. "Tree to 30 m high." 3. "Tree to 30m."
4.12		
5.01		Terrestrial.
5.02	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/cgi-">http://www.ars-grin.gov/cgi-</a>	<i>Myrtaceae</i>

	bin/npgs/html/taxon.pl?401104 (02 June 2008).	
5.03	USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?401104">http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?401104</a> (02 June 2008).	<i>Myrtaceae</i>
5.04	1. Wu, Z, Raven, PH, eds. (1994) <i>Eucalyptus amplifolia</i> . Flora of China. 13: 323-325. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 2. New South Wales Flora Online ( <a href="http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&amp;lvl=sp&amp;name=Eucalyptus~amplifolia">http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&amp;lvl=sp&amp;name=Eucalyptus~amplifolia</a> . Accessed July 15, 2008.) 3. George, AS, ed. (1980) Flora of Australia. Vol. 19, <i>Myrtaceae-Eucalyptus, Angophora</i> . Australian Government Publishing Service, Canberra.	1. "Trees." 2. "Tree to 30 m high." 3. "Tree to 30m."
6.01		No evidence.
6.02	1. Carr, DJ, et al. (1984) Initiation, development and anatomy of lignotubers in some species of <i>Eucalyptus</i> . Australian Journal of Botany 32: 415-417. 2. Rockwood, DL, et al. (1987) Development of <i>Eucalyptus amplifolia</i> for woody biomass production. Australian Forest Research 17 (2): 173-178. 3. Rockwood, DL, et al. (1991) Genetic improvement of <i>Eucalyptus amplifolia</i> for frost-frequent areas. Australian Forestry: The Journal of the Institute of Foresters of Australia 54 (4): 212-218.	1. "Seedlings of the following species...were raised from seeds of the stated provenances" [includes <i>E. amplifolia</i> ]. 2. "A seed source from Dungog, New South Wales (R.E. Snow, Florida, and G. Althofer, N.S.W., personal communications) grown in northern Florida averaged 1.6 m in height as 8-month-old seedlings." 3. "In late May 1986, seeds were sown...After six weeks, each container was thinned to the largest seedling, and the seedlings were maintained in the greenhouse until mid-August."
6.03	Williams, JE and JCZ Woinarski, eds (1997) <i>Eucalypt Ecology: Individuals to Ecosystems</i> . Cambridge University Press, Cambridge, UK.	distributions of 2 hybrids involving <i>E. amplifolia</i> ( <i>E. amplifolia</i> x <i>robusta</i> and <i>E. amplifolia</i> x <i>tereticornis</i> ) are described [so must be natural hybrids]
6.04		
6.05		
6.06		
6.07		
7.01		
7.02	1. Johnson, LAS, Hill, KD (1990) <i>Eucalyptus amplifolia</i> . <i>Telopea</i> 4:51. 2. Rockwood, DL, et	1. "Type: Five specimens collected by Naudin from various localities in France

	al. (1987) Development of <i>Eucalyptus amplifolia</i> for woody biomass production. Australian Forest Research 17 (2): 173-178. 3. FAO (1979) Eucalypts for Planting. FAO Forestry Series No. 11. Rome.	and Italy and now housed at P may be regarded as Syntypes (n.v.)." 2. "It has received little attention worldwide, with the few available reports documenting its unsuitability for Uruguay and its success in Libya (FAO 1979)." 3. "Other well-grown eucalypts seen in Libya by Pryor in 1964 were... <i>E. amplifolia</i> ".
7.03		No evidence.
7.04	1. Wu, Z, Raven, PH, eds. (1994) <i>Eucalyptus amplifolia</i> . Flora of China. 13: 323-325. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 2. Brooker, MIH, AV Slee, JR Connors, and SM Duffy (2002) Euclid: Eucalypts of Southern Australia ( <a href="http://www.anbg.gov.au/cpbr/cd-keys/Euclid/sample/html/AMP_AMP.htm">http://www.anbg.gov.au/cpbr/cd-keys/Euclid/sample/html/AMP_AMP.htm</a> ). 3. Williams, JE and JCZ Woinarski, eds (1997) Eucalypt Ecology: Individuals to Ecosystems. Cambridge University Press, Cambridge, UK.	1. "Capsule semiglobose to truncate capitate globose, 4-6 x 5-7 mm; disk broad; valves 3-5, strongly exerted from hypanthium." 2. "Seed dark brown, black or grey, 0.7-1.5 mm long, pyramidal or cuboid, dorsal surface pitted, hilum terminal." 3. "it is thought that wind may be the most important agent of dispersal"; "The passive release of seed is aided by wind and results in a generally low dispersal distance."; "Seed is mainly dispersed by wind and gravity following release from canopy-stored capsules...Virtually all seed [is] deposited within a radius of twice the tree or canopy height" [genus level - wind is the main dispersal agent, but dispersal is still not far from parent tree]
7.05		
7.06		
7.07	1. Wu, Z, Raven, PH, eds. (1994) <i>Eucalyptus amplifolia</i> . Flora of China. 13: 323-325. Science Press (Beijing) and Missouri Botanical Garden (St. Louis). 2. New South Wales Flora Online ( <a href="http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&amp;lvl=sp&amp;name=Eucalyptus~amplifolia">http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&amp;lvl=sp&amp;name=Eucalyptus~amplifolia</a> . Accessed July 15, 2008.) 3. George, AS, ed. (1980) Flora of Australia. Vol. 19, <i>Myrtaceae-Eucalyptus, Angophora</i> . Australian Government Publishing Service, Canberra. 4. Brooker, MIH, AV Slee, JR Connors, and SM Duffy (2002) Euclid: Eucalypts of Southern Australia ( <a href="http://www.anbg.gov.au/cpbr/cd-keys/Euclid/sample/html/AMP_AMP.htm">http://www.anbg.gov.au/cpbr/cd-keys/Euclid/sample/html/AMP_AMP.htm</a> ).	1. "Capsule semiglobose to truncate capitate globose, 4-6 x 5-7 mm; disk broad; valves 3-5, strongly exerted from hypanthium. 2. "Fruit globose or ovoid, 4-6 mm long, 5-8 mm diam.; disc raised; valves exerted." 3. "Fruits hemispherical or ovoid, 3-5 mm long, 3-6 mm wide; disc broad, ascending; valves 3-5, strongly exerted." 4. "Seed dark brown, black or grey, 0.7-1.5 mm long, pyramidal or cuboid, dorsal surface pitted, hilum terminal." [No evidence of adaptations to external dispersal]
7.08		
8.01		

8.02	1. Williams, JE and JCZ Woinarski, eds (1997) <i>Eucalypt Ecology: Individuals to Ecosystems</i> . Cambridge University Press, Cambridge, UK. 2. Water for a Healthy Country. Taxon Attribute Profiles: <i>Eucalyptus camaldulensis</i> Dehnh. ( <a href="http://www.csiro.au/files/files/pbsl.pdf">http://www.csiro.au/files/files/pbsl.pdf</a> ).	1. "there is no dormancy barrier to the germination of eucalypt seed" 2. "Eucalyptus species store little or none of their seed in the soil."
8.03		
8.04	1. Rockwood, DL, et al. (1987) Development of <i>Eucalyptus amplifolia</i> for woody biomass production. <i>Australian Forest Research</i> 17 (2): 173-178. 2. Rockwood, DL, et al. (1991) Genetic improvement of <i>Eucalyptus amplifolia</i> for frost-frequent areas. <i>Australian Forestry: The Journal of the Institute of Foresters of Australia</i> 54 (4): 212-218.	1. "Coppicing through four rotations in northern Florida has been vigorous, with annual yields reaching 23 dry t/ha in 2 years." 2. "Superior coppice survival and vigor in northern Florida".
8.05		