UF IFAS UNIVERSITY of FLORIDA

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

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	Paspalum quadrifarium **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	y	2
3.03	Weed of agriculture	n	0
3.04	Environmental weed	y	4
3.05	Congeneric weed	y	2
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	y	1
4.05	Toxic to animals	unk	0
4.06	Host for recognised pests and pathogens	unk	0
4.07	Causes allergies or is otherwise toxic to humans	unk	0
4.08	Creates a fire hazard in natural ecosystems	y	1
4.09	Is a shade tolerant plant at some stage of its life cycle	n	0
4.10	Grows on infertile soils (oligotrophic, limerock, or excessively draining soils). North & Central Zones: infertile soils; South Zone: shallow limerock or Histisols.	y	1
4.11	Climbing or smothering growth habit	n	0
4.12	Forms dense thickets	y	1
5.01	Aquatic	n	0

5.02	Grass	y	1
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	unk	-1
6.05	Requires specialist pollinators	n	0
6.06	Reproduction by vegetative propagation	y	1
6.07	Minimum generative time (years)	1	1
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	?	
7.04	Propagules adapted to wind dispersal	unk	-1
7.05	Propagules water dispersed	y	1
7.06	Propagules bird dispersed	?	
7.07	Propagules dispersed by other animals (externally)	y	1
7.08	Propagules dispersed by other animals (internally)	n	-1
8.01	Prolific seed production	y	1
8.02	Evidence that a persistent propagule bank is formed (>1 yr)	unk	-1
8.03	Well controlled by herbicides	unk	1
8.04	Tolerates, or benefits from, mutilation or cultivation	unk	-1
8.05		?	
	Total Score	**19**	
	Implemented Pacific Second Screening	**no**	
	Risk Assessment Results	**High**	

section	# questions answered	satisfy minimum?
A	11	yes
B	9	yes
C	15	yes
total	35	yes

	Reference	Source data
1.01		cultivated, but no evidence of selection for reduced weediness
1.02		Skip to 2.01
1.03		Skip to 2.01
2.01	1. PERAL NAPPFAST Global Plant Hardiness (http://www.nappfast.org/Plant_hardiness/NAPPFAST%20Global%20zones/10-year%20climate/PLANT_HARDINESS_10YR%20lgnd.tif). 2. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?409896 (0-00-0000).	No computer analysis was performed. 1. Global hardiness zone: 8, 9, 10 ; equivalent to USDA Hardiness zones: USDA Zone 8a: to -12.2 °C (10 °F) USDA Zone 8b: to -9.4 °C (15°F) USDA Zone 9a: to -6.6 °C (20 °F) USDA Zone 9b: to -3.8 °C (25 °F) USDA Zone 10a: to -1.1 °C (30 °F) USDA Zone 10b: to 1.7 °C (35 °F). 2. Native to South America: Brazil and Southern South America: Argentina; Paraguay; Uruguay
2.02		
2.03	1. Köppen-Geiger climate map (http://www.hydrol-earth-syst-sci.net/11/1633/2007/hess-11-1633-2007.pdf).	1. Distribution in the native/cultivated range occurs in Cfa, Cfb. However, Cfa is ths climate zone that encompasses most of Florida
2.04	1. Climate Charts. World Climate Maps. http://www.climate-charts.com/World-Climate-Maps.html#rain (8-19-2015) 2. Perelman, S. B., S. E. Burkart, and R. J. C. Leon. "The role of a native tussock grass (Paspalum quadrifarium Lam.) in structuring plant communities in the Flooding Pampa grasslands, Argentina." Biodiversity and Conservation 12.2 (2003): 225-238. 3. Geoffrey A.J. Scott (1995) Canada's Vegetation: A World Perspective. McGill-Queen's University Press, Montreal, CA pp.154. 4. Weeds of Australia (https://keyserver.lucidcentral.org/weeds/data/media/Html/paspalum_quadrifarium.htm accessed 8/3/2017)	1. Native and naturalized in areas with rainfall within these ranges. rainfall ranging from 18.8 to 97.4 inches annually 2. Mean annual precipitation ranges from 850 to 900 mm (35 inches). 3. "where the climate is somewhat drier, dense tussocks of Paspalum quadrifarium dominate." 4. "A weed of warmer-temperate, sub-tropical and tropical regions that is mostly found in disturbed sites, rainforests, closed forests, open woodlands and forest margins."
2.05	1. Invasive Species South Africa http://www.invasives.org.za/legislation/item/850-tussock-paspalum-paspalum-quadrifarium (11-21-2016) 2. Riefner, R., Denham, S., & Columbus, J. (2010). PASPALUM PUBIFLORUM AND P. QUADRIFARIUM (POACEAE) NEW TO CALIFORNIA, WITH A KEY AND NOTES ON INVASIVE SPECIES. Journal of the Botanical Research Institute of Texas, 4(2), 761-770.	1. Introduced in South Africa as an ornamental and horticultural grass. 2. Introduced to Australia, Italy, and the United States
3.01	1. University of Georgia, Center for Invasive Species and Ecosystem Health https://www.se-eppc.org/wildlandweeds/pdf/Spring2010-Moorhead-pp6.pdf (11-14-2016) 2. Queensland Government https://keyserver.lucidcentral.org/weeds/data/media/Html/paspalum_quadrifarium.htm (11-30-2016)	1. Numerous infestations have been found in Tift County in the lower Coastal Plain of Georgia that are spreading east and west along major highway roadside ditches. 2. Naturalised in some parts of eastern Australia (i.e. south-eastern Queensland, some parts of eastern New South Wales and southern Victoria). Also naturalised elsewhere, including in south-eastern USA (i.e. Mississippi).

3.02	1. Invasive Species South Africa http://www.invasives.org.za/legislation/item/850-tussock-paspalum-paspalum-quadrifarium (11-21-2016) 2. Riefner, R., Denham, S., & Columbus, J. (2010). PASPALUM PUBIFLORUM AND P. QUADRIFARIUM (POACEAE) NEW TO CALIFORNIA, WITH A KEY AND NOTES ON INVASIVE SPECIES. Journal of the Botanical Research Institute of Texas, 4(2), 761-770.	1. Tussock paspalum is an aggressive grass which forms extremely dense infestations. Rhizomes spread horizontally and send up suckers, which form a large dense clump, thus outcompeting native plants. Invades river banks, lake shores, roadsides, valleys and agricultural plantations. 2. Noxious weed in Australia
3.03		no evidence of crop yield damage
3.04	1. Australian Government http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=6390 (11-14-2-16) 2. Queensland Government http://keyserver.lucidcentral.org/weeds/data/media/Html/paspalum_quadrifarium.htm (11-14-2016) 3. Invasive Species South Africa http://www.invasives.org.za/legislation/item/850-tussock-paspalum-paspalum-quadrifarium (11-21-2016)	1. The plant can rapidly and aggressively invade bushland, displacing native flora, changing fire regimes and providing shelter for feral animals. 2.Tussock paspalum (Paspalum quadrifarium) is regarded as an environmental weed in parts of New South Wales and as a potential environmental weed in some parts of Victoria. It is also listed as a priority environmental weed in at least one Natural Resource Management region. This highly invasive species often establishes on road edges and in other disturbed sites, such as along drainage lines. It spreads from these areas into nearby bushland and along waterways. Tussock paspalum (Paspalum quadrifarium) grows in large clumps up to one square metre in size and puts pressure on bushland integrity and native species biodiversity. Once established, it has the ability to form extremely dense infestations that out-compete all other vegetation. 3. Tussock paspalum is an aggressive grass which forms extremely dense infestations. Rhizomes spread horizontally and send up suckers, which form a large dense clump, thus outcompeting native plants. Invades river banks, lake shores, roadsides, valleys and agricultural plantations.
3.05	1. Holm, LeRoy G. A Geographical Atlas of World Weeds. Malabar, FL: Krieger Pub., 1991. Print.	1. Paspalum commersonii; distichum; and dilatatumare serious weeds thtough temperate and subtropical zones of the globe.
4.01		no evidence of these features
4.02		no evidence
4.03		no evidence of these features
4.04	1. Laterra, P., & Solbrig, O. T. (2001). Dispersal strategies, spatial heterogeneity and colonization success in fire-managed grasslands. Ecological Modelling, 139(1), 17-29. 2. Franzese, J., & Ghermandi, L. (2012). Effect of fire on recruitment of two dominant perennial grasses with different palatability from semi-arid grasslands of NW Patagonia (Argentina). Plant Ecology, 213(3), 471-481.	1. It is an unpalatable species that usually forms monospecific stands 2. poor grass cover, unpalatable
4.05		no evidence
4.06		no evidence
4.07		no evidence

4.08	1. Australian Government http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=6390 (11-14-2-16) 2. Sydney Weeds Committees Weed Risk Assessment for Paspalum quadrifarium. (http://sydneyweeds.org.au/wp-cms/wp-content/uploads/WRA-Tussock-Paspalum.pdf accessed 10/15/2018)	1. The plant can rapidly and aggressively invade bushland, displacing native flora, changing fire regimes and providing shelter for feral animals. 2. "Does the weed have major positive or negative effects on environmental health?--Fire regime?" was answered as "Major negative effect" but I cannot locate the referenced material to confirm (however this evidence may be used to corroborate other evidence referenced here).
4.09	1. Learn2Grow http://www.learn2grow.com/plants/paspalum-quadrifarium/ (11-21-2016) 2. Riefner, R., Denham, S., & Columbus, J. (2010). PASPALUM PUBIFLORUM AND P. QUADRIFARIUM (POACEAE) NEW TO CALIFORNIA, WITH A KEY AND NOTES ON INVASIVE SPECIES. Journal of the Botanical Research Institute of Texas, 4(2), 761-770.	1. full sun to partial shade. 2. Paspalum species prefer full to partial sun
4.10	1. Australian Government http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=6390 (11-14-2-16)	1. Tussock Paspalum is often found alongside streams, wetlands and drains and generally prefers neglected land of low fertility. It has the ability to grow on soils ranging from those that are very sandy through to compacted clay
4.11		no evidence, grass species
4.12	1. South African National Biodiversity Institute http://www.sanbi.org/information/infobases/invasive-alien-plant-alert/paspalum-quadrifarium (11-14-2016) 2. Australian Government http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=6390 (11-14-2-16) 3. Invasive Species South Africa http://www.invasives.org.za/legislation/item/850-tussock-paspalum-paspalum-quadrifarium (11-21-2016)	1. forms dense infestations. Rhizomes spread horizontally and produce suckers, which form a large dense clump, thus outcompeting native plants. 2. Tussock Paspalum can rapidly spread through either rhizomes or seeds and aggressively forms extremely dense infestations in a few years.3. Tussock paspalum is an aggressive grass which forms extremely dense infestations. Rhizomes spread horizontally and send up suckers, which form a large dense clump, thus outcompeting native plants. Invades river banks, lake shores, roadsides, valleys and agricultural plantations.
5.01		Family: Poaceae
5.02		Family: Poaceae
5.03		Family: Poaceae (herbaceous)
5.04	1. University of Georgia, Center for Invasive Species and Ecosystem Health https://www.se-eppc.org/wildlandweeds/pdf/Spring2010-Moorhead-pp6.pdf (11-14-2016) 2. Australian Government http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=6390 (11-14-2-16)	Forms rhizomes, but no evidence of the formation of geophytes
6.01		no evidence
6.02	1. Australian Government http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=6390 (11-14-2-16) 2. Queensland Government http://keyserver.lucidcentral.org/weeds/data/media/Html/paspalum_quadrifarium.htm (11-14-2016) 3. South African National Biodiversity Institute http://www.sanbi.org/information/infobases/invasive-alien-plant-alert/paspalum-quadrifarium (11-14-2016)	1. Tussock Paspalum can rapidly spread through either rhizomes or seeds and aggressively forms extremely dense infestations in a few years. Rhizomes move horizontally sending up suckers which form a large, dense tuft. Numerous seeds then drop from this large plant forming new plants close by, increasing the size of the tussock 2. This species reproduces by seed. 3. spreads rapidly through rhizomes and seeds.
6.03		no evidence
6.04	1. Norrmann, G. A., Quarin, C. L., & Burson, B. L. (1989). Cytogenetics and reproductive behavior of different chromosome races in six Paspalum species. Journal of Heredity, 80(1), 24-28.	1. Most Paspalum species are highly self-pollinated, but insufficient evidence for a "yes" answer

6.05	1. Learn2Grow http://www.learn2grow.com/plants/paspalum-quadrifarium/ (11-21-2016) 2. Norrmann, G. A., Quarin, C. L., & Burson, B. L. (1989). Cytogenetics and reproductive behavior of different chromosome races in six Paspalum species. Journal of Heredity, 80(1), 24-28.	1. Wind pollinated 2. Most Paspalum species are highly self-pollinated
6.06	1. Australian Government http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=6390 (11-14-2-16) 2. South African National Biodiversity Institute http://www.sanbi.org/information/infobases/invasive-alien-plant-alert/paspalum-quadrifarium (11-14-2016)	1. Tussock Paspalum can rapidly spread through either rhizomes or seeds and aggressively forms extremely dense infestations in a few years. Rhizomes move horizontally sending up suckers which form a large, dense tuft. Numerous seeds then drop from this large plant forming new plants close by, increasing the size of the tussock 2. spreads rapidly through rhizomes and seeds.
6.07	Sydney Weeds Committees Weed Risk Assessment for Paspalum quadrifarium. (http://sydneyweeds.org.au/wp-cms/wp-content/uploads/WRA-Tussock-Paspalum.pdf accessed 10/15/2018)	"One year or less"
7.01	1. Australian Government http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=6390 (11-14-2-16) 2. Queensland Government http://keyserver.lucidcentral.org/weeds/data/media/Html/paspalum_quadrifarium.htm (11-14-2016) 3. Brisbane City Council http://weeds.brisbane.qld.gov.au/weeds/paspalum (11-29-2016)	1. Tussock Paspalum is found in neglected areas along roadsides, streams, wetlands and drains. 2. The seeds are most likely dispersed by water, animals, machinery and other vehicles. 3. A very common weed of gardens, lawns, footpaths, parks, roadsides, disturbed sites, waste areas, closed forests, open woodlands, crops and pastures in tropical, sub-tropical and temperate regions.
7.02	1. South African National Biodiversity Institute http://www.sanbi.org/information/infobases/invasive-alien-plant-alert/paspalum-quadrifarium (11-14-2016) 2. University of Georgia, Center for Invasive Species and Ecosystem Health https://www.se-eppc.org/wildlandweeds/pdf/Spring2010-Moorhead-pp6.pdf (11-14-2016)	1. Tussock paspalum was probably introduced in South Africa as an ornamental and horticultural grass. 2. sold as an ornamental grass in the United States
7.03	Sydney Weeds Committees Weed Risk Assessment for Paspalum quadrifarium. (http://sydneyweeds.org.au/wp-cms/wp-content/uploads/WRA-Tussock-Paspalum.pdf accessed 10/15/2018)	Contaminated produce listed as "occasional" in Weed Risk Assessment, but I cannot locate the referenced material to confirm.
7.04		no evidence
7.05	1. Australian Government http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=6390 (11-14-2-16) 2. Queensland Government http://keyserver.lucidcentral.org/weeds/data/media/Html/paspalum_quadrifarium.htm (11-14-2016)	1. A downhill run of water is ideal for the transmission of seeds and enables the plant to spread rapidly from disturbed edges into native bushland. 2. The seeds are most likely dispersed by water, animals, machinery and other vehicles.
7.06	Sydney Weeds Committees Weed Risk Assessment for Paspalum quadrifarium. (http://sydneyweeds.org.au/wp-cms/wp-content/uploads/WRA-Tussock-Paspalum.pdf accessed 10/15/2018)	"Flying animal" dispersal listed as "occasional" in Weed Risk Assessment, but I cannot locate the referenced material to confirm.
7.07	1. Australian Government http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=6390 (11-14-2-16) 2. Queensland Government http://keyserver.lucidcentral.org/weeds/data/media/Html/paspalum_quadrifarium.htm (11-14-2016)	1. Seeds may be spread much further afield, by water, on animal fur, on clothing, in mud-encrusted boots, vehicle tyres and mowing machinery… The seeds are sticky at one point in their development and this aids their transfer to animals, people and machinery 2. The seeds are most likely dispersed by water, animals, machinery and other vehicles.
7.08		no evidence

8.01	1. Invasive Plant Atlas (https://www.invasiveplantatlas.org/subject.html?sub=14214 accessed 10/15/2018) 2. Weeds of Australia (https://keyserver.lucidcentral.org/weeds/data/media/Html/paspalum_quadrifarium.htm Accessed 10/15/2018). 3. Sydney Weeds Committees Weed Risk Assessment for Paspalum quadrifarium. (http://sydneyweeds.org.au/wp-cms/wp-content/uploads/WRA-Tussock-Paspalum.pdf accessed 10/15/2018)	1. Paspalum quadrifarium flowers and produces seeds at least twice a year 2. The elongated seed-heads (10-25 cm long) have many (15-25) side-branches (i.e. a panicle of racemes). Each of these branches (i.e. racemes) is 3-10 cm long and bears numerous (50-100) small flower spikelets. These flower spikelets (2-2.8 mm long) are paired on either side of the branch (i.e. rachis), giving the branches a four-rowed appearance. They are oval (i.e. elliptic) in shape with surfaces that are usually slightly hairy (i.e. pubescent). Flowering occurs throughout the year, but is most abundant from spring through to early autumn. 3. Annual seed production listed as HIGH on Weed Risk assessment but I cannot locate the referenced material to confirm (however this evidence may be used to corroborate other evidence referenced here).
8.02		no evidence
8.03	1. Australian Government http://www.environment.gov.au/cgi-bin/biodiversity/invasive/weeds/weeddetails.pl?taxon_id=6390 (11-14-2-16) 2. University of Georgia, Center for Invasive Species and Ecosystem Health https://www.se-eppc.org/wildlandweeds/pdf/Spring2010-Moorhead-pp6.pdf (11-14-2016)	1. The most common method of control is to brush-cut the plant and spray with herbicide. 2. Little is published on control of tussock paspalum other than hand pull- ing of small clumps, and foliar applications of a glyphosate herbicide. Information on herbicides used in the control of other Pasaplum spp. does not currently include tussock paspalum.
8.04		no evidence
8.05		no evidence