

Family: *Poaceae*

Taxon: *Cymbopogon nardus*

Synonym: *Andropogon confertiflorus* Steud.
Andropogon nardus L. (basionym)
Cymbopogon afronardus Stapf
Cymbopogon confertiflorus (Steud.) Stapf
Cymbopogon nardus var. *confertiflorus* (Steud.)
Cymbopogon validus (Stapf) Burt Davy

Common Name: citronella
citronella grass
giant turpentine grass

Questionnaire :	current 20090513	Assessor:	Assessor	Designation:	H(HPWRA)
Status:	Assessor Approved	Data Entry Person:	Assessor	WRA Score	8
101	Is the species highly domesticated?		y=-3, n=0		n
102	Has the species become naturalized where grown?		y=1, n=-1		
103	Does the species have weedy races?		y=1, n=-1		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"		(0-low; 1-intermediate; 2-high) (See Appendix 2)		High
202	Quality of climate match data		(0-low; 1-intermediate; 2-high) (See Appendix 2)		High
203	Broad climate suitability (environmental versatility)		y=1, n=0		n
204	Native or naturalized in regions with tropical or subtropical climates		y=1, n=0		y
205	Does the species have a history of repeated introductions outside its natural range?		y=-2, ?=-1, n=0		y
301	Naturalized beyond native range		y = 1*multiplier (see Appendix 2), n= question 205		y
302	Garden/amenity/disturbance weed		n=0, y = 1*multiplier (see Appendix 2)		n
303	Agricultural/forestry/horticultural weed		n=0, y = 2*multiplier (see Appendix 2)		y
304	Environmental weed		n=0, y = 2*multiplier (see Appendix 2)		n
305	Congeneric weed		n=0, y = 1*multiplier (see Appendix 2)		y
401	Produces spines, thorns or burrs		y=1, n=0		n
402	Allelopathic		y=1, n=0		
403	Parasitic		y=1, n=0		n
404	Unpalatable to grazing animals		y=1, n=-1		y
405	Toxic to animals		y=1, n=0		n
406	Host for recognized pests and pathogens		y=1, n=0		
407	Causes allergies or is otherwise toxic to humans		y=1, n=0		
408	Creates a fire hazard in natural ecosystems		y=1, n=0		n

409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	y
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	
604	Self-compatible or apomictic	y=1, n=-1	n
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	2
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	y
705	Propagules water dispersed	y=1, n=-1	n
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	
708	Propagules survive passage through the gut	y=1, n=-1	
801	Prolific seed production (>1000/m2)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: H(HPWRA)

WRA Score **8**

Supporting Data:

101	2006. Quattrocchi, U.. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymolog. CRC Press, Boca Raton, FL	[Is the species highly domesticated? No] No evidence
101	2007. Ssegawa, P.. Effects of Herbicide on the Invasive grass, <i>Cymbopogon nardus</i> (Franch.) Stapf (Tussocky Guinea grass) and Responses of Native Plants in Kikatsi subcounty, Kiruhura district, western Uganda.. Makerere University, Kampala	[Is the species highly domesticated?? Possibly a less invasive variety] "The cultivated form of <i>C. nardus</i> (L.) Rendle (citronella) is grown in Sri Lanka and the West Indies and is derived from an awnless variant (Phillips et al. 2003; Figure 1)."
102	2013. WRA Specialist. Personal Communication.	NA
103	2013. WRA Specialist. Personal Communication.	NA
201	2006. Quattrocchi, U.. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymolog. CRC Press, Boca Raton, FL	[Species suited to tropical or subtropical climate(s) 2-High] "Southeast Asia, Sri Lanka, South India, Nepal."
202	2006. Quattrocchi, U.. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymolog. CRC Press, Boca Raton, FL	[Quality of climate match data 2-High]
203	2013. Floridata. <i>Cymbopogon nardus</i> . http://www.floridata.com/ref/c/cymb_nar.cfm [Accessed 30 June 2013]	[Broad climate suitability (environmental versatility)? No] "Hardiness: USDA Zones 10 - 12. Citronella grass is perennial in USDA zones 10-12. It needs a long, warm growing season, and may not survive cool, damp winters. Citronella grass usually is replanted anew each spring after the ground has warmed. "
204	2006. Quattrocchi, U.. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymolog. CRC Press, Boca Raton, FL	[Native or naturalized in regions with tropical or subtropical climates? Yes] "Southeast Asia, Sri Lanka, South India, Nepal."
205	2006. Wu, Z.Y./Raven, P.H./Hong, D.Y. (eds.). Flora of China. Vol. 22 (Poaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Does the species have a history of repeated introductions outside its natural range? Yes] "Commonly cultivated. Fujian, Guangdong, Hainan, Taiwan, Yunnan [native to S India and Sri Lanka; introduced elsewhere as a crop plant]."
205	2013. Floridata. <i>Cymbopogon nardus</i> . http://www.floridata.com/ref/c/cymb_nar.cfm [Accessed 30 June 2013]	[Does the species have a history of repeated introductions outside its natural range? Yes] "It is widely naturalized in tropical Asia and grown as an ornamental in South Florida and southern California. "
301	2010. Wu, S.-H./Yang, T.Y.A./Teng, Y.-C./Chang, C.-Y./Yang, K.-C./Hsieh, C.-F.. Insights of the Latest Naturalized Flora of Taiwan: Change in the Past Eight Years. <i>Taiwania</i> . 55(2): 139-159.	[Naturalized beyond native range? Yes] "Appendix 1. List of naturalized species of Taiwan" [Includes <i>Cymbopogon nardus</i> . FR: Year of the first record = 1910]
301	2011. BioNET-EAFRINE. Keys and Fact Sheets - <i>Cymbopogon nardus</i> (Blue Citronella Grass). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cymbopogon_nardus_%28Blue_Citronella_Grass%29.htm [Accessed 30 June 2013]	[Naturalized beyond native range? Yes] "Locations within which <i>Cymbopogon nardus</i> is naturalised include southern, eastern and north-eastern tropical Africa." ... "Common in grassland and open woodland of <i>Acacia</i> and <i>Combretum</i> on the hills in Uganda. It is possible that it is a native species which is expanding its range due to overgrazing."
301	2013. Gann, G.D.. Floristic Inventory of the Bahama Archipelago Database Online (BETA). The Institute for Regional Conservation, Delray Beach, FL http://www.regionalconservation.org	[Naturalized beyond native range? Yes] "Native Status: Not Native, Naturalized "
302	2006. Quattrocchi, U.. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymolog. CRC Press, Boca Raton, FL	[Garden/amenity/disturbance weed? No] "invasive and very competitive..." [A pasture weed]
303	2004. NARO. Implementation of invasive plant prevention and control programmes in Uganda. Report submitted to the CAB International Africa Regional Centre. National Agricultural Research Organisation, Entebbe, Uganda	[Agricultural/forestry/horticultural weed? Yes] "The species is not desired by farmers. Management presently involves uprooting. It is mainly considered a problem in the ranches bordering the eastern part of the park. The species can cover wide areas suppressing other vegetation that is palatable to grazing animals." ... " <i>Cymbopogon nardus</i> is one of the most dreaded noxious grasses on Uganda's grazing lands. It is extensively distributed in rangelands of South western Uganda with indications that it is quickly spreading to other areas of the country."

303	2007. Ssegawa, P.. Effects of Herbicide on the Invasive grass, <i>Cymbopogon nardus</i> (Franch.) Stapf (Tussocky Guinea grass) and Responses of Native Plants in Kikatsi subcounty, Kiruhuura district, western Uganda.. Makerere University, Kampala	[Agricultural/forestry/horticultural weed? Yes] "The grass, <i>Cymbopogon nardus</i> (Franch.) Stapf (Tussocky Guinea grass) is one of the most prevalent invasive plants in the pastoral lands of the Ankole region in western Uganda." ... "In western Uganda, particularly in Mbarara and Kiruhuura districts, the rangelands have been gradually taken over by the <i>Cymbopogon nardus</i> , also commonly known as the Tussocky Guinea grass. The grass, <i>Cymbopogon nardus</i> , which is indigenous to Uganda (Phillips et al., 2003) has established there and is perceived to be a problem by the local farmers." ... "Response to defoliation: Generally <i>C. nardus</i> is avoided in grazing. Light grazing encourages it, but heavy grazing pressure of one bullock per hectare prevented recolonization of the species (Harrington, 1974)." ... "Economics: <i>Cymbopogon nardus</i> is an unpalatable, unwanted invader of Ankole region pastures in Uganda. Removal of <i>C. nardus</i> from fully stocked pastures improved growth rates by about 30 percent, but the rate of recolonization can be extremely rapid." ... "Animal production: The invasion of a pasture by <i>C. nardus</i> always leads to a reduction in animal production."
303	2013. Conservation Strategy Fund. CSF Projects - Economic Impacts of Invasive Species. http://conservation-strategy.org/en/project/economic-impacts-invasive-species [Accessed 30 June 2013]	[Agricultural/forestry/horticultural weed? Yes] "Near Lake Mburo National Park in southern Uganda, the perennial grass <i>Cymbopogon nardus</i> has driven wild game from federal parklands and into competition with local livestock for grazing, severely impacted the health of the local cattle population, reduced land values, increased the presence of pests and predators in the area, and threatened the stability of the nascent poultry industry. "
303	2013. Food and Agriculture Organization of the United Nations. Grassland Species Profiles - <i>Cymbopogon nardus</i> . FAO, http://www.fao.org/ag/agp/AGPC/doc/Gbase/data/pf000206.htm [Accessed 30 June 2013]	[Agricultural/forestry/horticultural weed? Yes] "The invasion of a pasture by <i>C. nardus</i> always leads to a reduction in animal production."
304	2004. Wittenberg, R.. Instruments and tools for assessing the impact of invasive alien plant species in Africa. CABI Bioscience, Delémont www.necz.org.zm	[Environmental weed? No, according to hypothesis of study] "A plant of great concern in the rangeland surrounding the Lake Mburo National Park is the grass <i>Cymbopogon nardus</i> of Asian origin. Whereas studies are investigating its impact on the rangeland and livestock, it was decided to carry out an assessment of the species on native plant biodiversity in the NP." ... "It is also hypothesized that the invasive grass will probably not be able to invade the core of the park comprised of rather intact grass savannah, unless facilitated by disturbance."
304	2006. Quattrocchi, U.. CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymolog. CRC Press, Boca Raton, FL	[Environmental weed? No] "invasive and very competitive..." [A pasture weed]
304	2011. BioNET-EAFRINE. Keys and Fact Sheets - <i>Cymbopogon nardus</i> (Blue Citronella Grass). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cymbopogon_nardus_%28Blue_Citronella_Grass%29.htm [Accessed 30 June 2013]	[Environmental weed? No] "Not listed as a noxious weed by the state or governments in Kenya, Tanzania and Uganda."
305	2011. U.S. Fish and Wildlife Service. Species Assessment Form for <i>Ranunculus hawaiiensis</i> . http://ecos.fws.gov/docs/candidate/assessments/2012/r1/Q38H_P01.pdf .	[Congeneric weed? Yes] " <i>Ranunculus hawaiiensis</i> is threatened by introduced pasture grasses that degrade and destroy habitat and outcompete native plants (HBMP 2008)." ... "Nonnative plants which pose the greatest threats to <i>R. hawaiiensis</i> on the island of Maui are: <i>P. clandestinum</i> , <i>H. lanatus</i> , and <i>Cymbopogon refractus</i> (barbwire grass) (A. Medeiros, in litt. 1995)."
305	2013. USDA Natural Resources Conservation Service. Hawaii State-listed Noxious Weeds. http://plants.usda.gov/java/noxious?rptType=State&statefips=15	[Congeneric weed? Yes] <i>Cymbopogon refractus</i> is listed as a Hawaii State noxious weed
401	2006. Wu, Z.Y./Raven, P.H./Hong, D.Y. (eds.). Flora of China. Vol. 22 (Poaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Produces spines, thorns or burrs? No] "Perennial from a stout rootstock. Culms tufted, robust, up to 2.5 m tall, 1–2 cm in diam. Leaf sheaths reddish purple at base, smooth, glabrous; leaf blades dark green or dark brown when dry, drooping for 1/3 of their length, 30–100 × 1–2 cm, glabrous, abaxial surface scabrid, adaxial surface smooth, base narrow, apex long acuminate; ligule 2–3 mm. "
402	2013. Suwitchayanon, P./Pukclai, P./Kato-Noguchi, H.. Allelopathic Activity of <i>Cymbopogon nardus</i> (Poaceae): A Preliminary Study. Journal of Plant Studies. 2(2): 1-6.	[Allelopathic? Possibly Yes] "The results suggest that <i>C. nardus</i> may have allelopathic compounds and may be a candidate for isolation and identification of allelopathic compounds to develop an alternative weed management option."
403	2006. Wu, Z.Y./Raven, P.H./Hong, D.Y. (eds.). Flora of China. Vol. 22 (Poaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Parasitic? No] "Perennial from a stout rootstock." [Poaceae]

404	1982. Pemadasa, M.A./Amarasinghe, L.. The Ecology of a Montane Grassland in Sri Lanka: I. Quantitative Description of the Vegetation. <i>Journal of Ecology</i> . 70(1): 1-15.	[Unpalatable to grazing animals? Yes] "Burning is almost inevitable during the dry period in February. Selective herbage- removal for cattle-fodder is frequent, especially at lower altitudes, throughout the year. The species most taken are <i>Panicum maximum</i> and <i>Themeda tremula</i> which are cut by hand sickle. The non-palatable <i>Cymbopogon nardus</i> is left. Cattle-grazing is rare." ... "More- over, selective forage-removal favours some species as a result of the elimination of others; for example, <i>Cymbopogon nardus</i> , a non-palatable grass increases as the fodder grass <i>Themeda tremula</i> decreases."
404	2004. NARO. Implementation of invasive plant prevention and control programmes in Uganda. Report submitted to the CAB International Africa Regional Centre. National Agricultural Research Organisation, Entebbe, Uganda	[Unpalatable to grazing animals? Yes] " <i>Cymbopogon nardus</i> is one of the least palatable rangeland constituents, for both domestic and wild game, except at the very young leaf stage. Cattle have been reported to starve to death when green <i>Cymbopogon</i> is plentiful (Harrington 1974). Buffalo will eat <i>C. nardus</i> sparingly (Field et al. 1973) while elephants will accept it during the dry season (Field 1971). <i>C. nardus</i> is regarded as an undesirable component in grazing land due to its unpalatability (Marshall et al. 1969)."
404	2007. Ssegawa, P.. Effects of Herbicide on the Invasive grass, <i>Cymbopogon nardus</i> (Franch.) Stapf (Tussocky Guinea grass) and Responses of Native Plants in Kikatsi subcounty, Kiruhura district, western Uganda.. Makerere University, Kampala	[Unpalatable to grazing animals? Yes] "Palatability: The grass is unpalatable to cattle and cattle have been known to die of starvation when an abundance of it, in green condition, was available (Harrington, 1974). Buffalo will eat it sparingly and elephants will accept it during the dry season (Field, 1971)."
404	2011. BioNET-EAFRINE. Keys and Fact Sheets - <i>Cymbopogon nardus</i> (Blue Citronella Grass). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cymbopogon_nardus_%28Blue_Citronella_Grass%29.htm [Accessed 30 June 2013]	[Unpalatable to grazing animals? Yes] " <i>Cymbopogon nardus</i> can take over rangelands where it lowers the yield and quality of the forage. It tends to increase where there has been overgrazing though grazing can be used as a management method (see below). The grass is unpalatable to cattle which have been known to die of starvation when it is available in abundance. Buffalo will eat it sparingly and elephants will accept it during the dry season. It has also been detected in national parks in Uganda and may constitute a threat to biodiversity."
405	2006. Quattrocchi, U.. <i>CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymolog.</i> CRC Press, Boca Raton, FL	[Toxic to animals? No] "feeding value low, browsed the young growth, unpalatable to cattle, generally is avoided in grazing, essential oil lemon-scented" [Oil and scent deter browsing, but no evidence of acute toxicity]
406	2013. WRA Specialist. Personal Communication.	[Host for recognized pests and pathogens? Unknown]
407	2013. Dave's Garden. PlantFiles: Citronella Grass, <i>Nardus</i> , Capím Santo - <i>Cymbopogon nardus</i> . http://davesgarden.com/guides/pf/go/62172/ [Accessed 30 June 2013]	[Causes allergies or is otherwise toxic to humans? Possibly] "Danger: Handling plant may cause skin irritation or allergic reaction"
407	2013. FloridaData. <i>Cymbopogon nardus</i> . http://www.floridata.com/ref/c/cymb_nar.cfm [Accessed 30 June 2013]	[Causes allergies or is otherwise toxic to humans? Possibly to susceptible individuals] "Some individuals experience dermatitis from contact with citronella grass or lemongrass, particularly the concentrated oils from these grasses. Inhaling the essential oils of citronella may increase heart rate in some people."
408	2006. Quattrocchi, U.. <i>CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymolog.</i> CRC Press, Boca Raton, FL	[Creates a fire hazard in natural ecosystems? No] "very resistant to fire"
408	2011. BioNET-EAFRINE. Keys and Fact Sheets - <i>Cymbopogon nardus</i> (Blue Citronella Grass). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cymbopogon_nardus_%28Blue_Citronella_Grass%29.htm [Accessed 30 June 2013]	[Creates a fire hazard in natural ecosystems? No] " <i>C. nardus</i> is very resistant to fire and too frequent burning is one of the main causes of its increase. However, Harrington and Pratchett (1974) found that a late burn in the long dry season (usually late August in Uganda) carried out every third year reduced the biomass of <i>C. nardus</i> and encouraged the somewhat better, associated grasses of <i>Brachiaria decumbens</i> , <i>Themeda triandra</i> and <i>Hyparrhenia filipendula</i> . The burn should be against the wind and in weather which would minimise fire temperatures. This would prune the undesirable associated shrub <i>Acacia hockii</i> . Annual burning reduces the size of the <i>C. nardus</i> plants, but does not improve the sward." [By itself, <i>C. nardus</i> does not appear to increase fire risk, but benefits from fires by outcompeting less fire tolerant species]
409	2011. Fynn, R./Morris, C./Ward, D./Kirkman, K.. Trait–environment relations for dominant grasses in South African mesic grassland support a general leaf economic model. <i>Journal of Vegetation Science</i> . 22(3): 528–540.	[Is a shade tolerant plant at some stage of its life cycle? Possibly] "... <i>Themeda triandra</i> was quickly replaced by more shade-tolerant grasses such as <i>Aristida junciformis</i> , <i>Tristachya leucothrix</i> and <i>Cymbopogon nardus</i> when regular burning or mowing of grassland was discontinued"
409	2013. FloridaData. <i>Cymbopogon nardus</i> . http://www.floridata.com/ref/c/cymb_nar.cfm [Accessed 30 June 2013]	[Is a shade tolerant plant at some stage of its life cycle? Possibly No] "Light: Does best in full sun."

410	2013. Plant Database. <i>Cymbopogon validus</i> . http://www.plantdatabase.co.uk/Cymbopogon_validus [Accessed 30 June 2013]	[Tolerates a wide range of soil conditions? Yes] " <i>Cymbopogon nardus</i> grows in soils ranging from a pH of 5 (extremely acidic ranges from 0 to 5.1) to 9 (very alkaline ranges from 8.6 to 9). It is adapted to chalk, clay loam, loam, loamy sand, sandy clay, sandy clay loam and sandy loam soils."
411	2006. Wu, Z.Y./Raven, P.H./Hong, D.Y. (eds.). <i>Flora of China</i> . Vol. 22 (Poaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Climbing or smothering growth habit? No] "Perennial from a stout rootstock. Culms tufted, robust, up to 2.5 m tall, 1–2 cm in diam. Leaf sheaths reddish purple at base, smooth, glabrous; leaf blades dark green or dark brown when dry, drooping for 1/3 of their length, 30–100 x 1–2 cm, glabrous, abaxial surface scabrid, adaxial surface smooth, base narrow, apex long acuminate; ligule 2–3 mm."
412	2004. NARO. Implementation of invasive plant prevention and control programmes in Uganda. Report submitted to the CAB International Africa Regional Centre. National Agricultural Research Organisation, Entebbe, Uganda	[Forms dense thickets? Possibly Yes. May impede movement and outcompete other vegetation in overgrazed areas] " <i>Cymbopogon nardus</i> (Plates 2.1 and 2.2) is a tussock grass that establishes naturally from seed with leaves that contain aromatic oils, which impart a bitter taste. The foliage has a rough texture, grows fast and quickly builds up thick coarse vegetation where both humans and cattle find difficulty traversing areas dominated by the grass. The canopy of one plant can cover an area of up to 2 m in diameter. Because of its high competitiveness, the species establishes quickly in overgrazed places. After a fire, <i>Cymbopogon</i> will quickly form new shoots earlier than the other plants allowing it to maintain dominance over the others, in terms of light, water and nutrient resources."
501	2006. Quattrocchi, U.. <i>CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymolog</i> . CRC Press, Boca Raton, FL	[Aquatic? No] "grows well in sandy soils with adequate drainage, semi-deserts, savannah, in clearings, sunny warm and humid conditions..."
502	2006. Quattrocchi, U.. <i>CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymolog</i> . CRC Press, Boca Raton, FL	[Grass? Yes] Poaceae
503	2006. Quattrocchi, U.. <i>CRC World Dictionary of Grasses: Common Names, Scientific Names, Eponyms, Synonyms, and Etymolog</i> . CRC Press, Boca Raton, FL	[Nitrogen fixing woody plant? No] Poaceae
504	2006 (onwards). Clayton, W.D./Vorontsova, M.S./Harman, K.T./Williamson, H.. <i>GrassBase - The Online World Grass Flora</i> . http://www.kew.org/data/grasses-db.html	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "Perennial; caespitose. Butt sheaths persistent and investing base of culm. Culms 75–300 cm long. Ligule an eciliate membrane; 3–9 mm long. Leaf-blades drooping; flat; 20–60 cm long; 3–15 mm wide; aromatic. Leaf-blade surface smooth, or scaberulous"
601	2008. Gunatilleke, N./Pethiyagoda, R./Gunatilleke, S.. <i>Biodiversity of Sri Lanka</i> . Journal of the National Science Foundation of Sri Lanka. 36 Special Issue: 25-62.	[Evidence of substantial reproductive failure in native habitat? No] "The dry patana grasslands, located between 500 – 1000 m elevation, are relatively widespread, occurring in the Uva basin, and around Gampola, Nawalapitiya, Hantana and Rakwana. These grasslands have resulted from the removal of tree vegetation for agriculture and subsequent abandonment (Figure 10). The dominant grass species in them are <i>Cymbopogon nardus</i> and <i>Themeda tremula</i> , both forming tussocks."
602	1982. Pemadasa, M.A./Amarasinghe, L.. <i>The Ecology of a Montane Grassland in Sri Lanka: III. Germination of Three Major Grasses</i> . Journal of Ecology. 70(2): 483-490.	[Produces viable seed? Yes] "Under field conditions, the natural patana species <i>Cymbopogon nardus</i> , <i>Eulalia trispicata</i> and <i>Themeda tremula</i> flower and set seeds during November-December only and no germination occurs until March."
602	2011. BioNET-EAFRINE. Keys and Fact Sheets - <i>Cymbopogon nardus</i> (Blue Citronella Grass). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cymbopogon_nardus_%28Blue_Citronella_Grass%29.htm [Accessed 30 June 2013]	[Produces viable seed? Yes] " <i>Cymbopogon nardus</i> establishes naturally from seed, which are known to germinate prolifically after fire. Too-frequent burning is one of the main causes of its increase."
603	2004. Nayak, S./Debata, B.K./Srivastava, V.K./Sangwan, N.S.. Evaluation of agronomically useful somaclonal variants in <i>Jamrosa</i> (a hybrid <i>Cymbopogon</i>) and detection of genetic changes through RAPD. <i>Plant Science</i> . 164(6): 1029-1035.	[Hybridizes naturally? Artificial hybrid. Unknown if natural hybrids can develop] " <i>Jamrosa</i> , a hybrid <i>Cymbopogon</i> [<i>Cymbopogon nardus</i> var. <i>Confertiflorus</i> (Steud) Stapf ex Bor X <i>Cymbopogon jwarancusa</i> (Jones) Schult] developed by Sobti et al. [1] is an essential oil yielding plant commercially cultivated in several parts of India."
604	1979. Connor, H.E.. Breeding systems in the grasses: a survey. <i>New Zealand Journal of Botany</i> . 17(4): 547-574.	[Self-compatible or apomictic? No] "Table 6 Genera with self-incompatible species. or principally cross-fertilised species"
605	1994. Zomlefer, W.B.. <i>Guide to Flowering Plant Families</i> . The University of North Carolina Press, Chapel Hill & London	[Requires specialist pollinators? No] " <i>The reduced flowers are anemophilous...</i> " [Poaceae]

606	2013. Floridata. <i>Cymbopogon nardus</i> . http://www.floridata.com/ref/c/cymb_nar.cfm [Accessed 30 June 2013]	[Reproduction by vegetative fragmentation? No] "It does not spread by runners, as some grasses do, but the clump increases in size as the plant matures. "
607	2006. Wu, Z.Y./Raven, P.H./Hong, D.Y. (eds.). Flora of China. Vol. 22 (Poaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Minimum generative time (years)? 2+] "Perennial from a stout rootstock." [Based on biology of related species and perennial growth habit]
607	2013. Shoot Gardening. <i>Cymbopogon flexuosus</i> (Lemon grass). http://www.shootgardening.co.uk/plant/cymbopogon-flexuosus [Accessed 01 July 2013]	[Minimum generative time (years)? 2+] " <i>Cymbopogon flexuosus</i> (Lemon grass)" ... "2-5 years to maturity" [Based on biology of related species]
701	2004. NARO. Implementation of invasive plant prevention and control programmes in Uganda. Report submitted to the CAB International Africa Regional Centre. National Agricultural Research Organisation, Entebbe, Uganda	[Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)? No] "Dispersal by winds in the dry season was mentioned as a possible cause of spread." [Possibly, but wind appears to be the primary dispersal vector]
702	2006. Wu, Z.Y./Raven, P.H./Hong, D.Y. (eds.). Flora of China. Vol. 22 (Poaceae). Science Press & Missouri Botanical Garden Press, Beijing & St. Louis	[Propagules dispersed intentionally by people? Yes] "Commonly cultivated. Fujian, Guangdong, Hainan, Taiwan, Yunnan [native to S India and Sri Lanka; introduced elsewhere as a crop plant]."
702	2011. BioNET-EAFRINE. Keys and Fact Sheets - <i>Cymbopogon nardus</i> (Blue Citronella Grass). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cymbopogon_nardus_%28Blue_Citronella_Grass%29.htm [Accessed 30 June 2013]	[Propagules dispersed intentionally by people? Yes] " <i>Cymbopogon nardus</i> is commonly grown for citronella, an essential oil. It can also be used for thatching, mulching and erosion control."
703	2013. Leon, A.. Citronella Propagation. SFGate, http://homeguides.sfgate.com/citronella-propagation-76553.html	[Propagules likely to disperse as a produce contaminant? No] "Citronella grass seldom sets seed, so it is most commonly propagated through vegetative methods" [Possibly within native range if seed set is higher, but presumably no outside native range]
704	2004. NARO. Implementation of invasive plant prevention and control programmes in Uganda. Report submitted to the CAB International Africa Regional Centre. National Agricultural Research Organisation, Entebbe, Uganda	[Propagules adapted to wind dispersal? Yes] "Dispersal by winds in the dry season was mentioned as a possible cause of spread."
705	2004. NARO. Implementation of invasive plant prevention and control programmes in Uganda. Report submitted to the CAB International Africa Regional Centre. National Agricultural Research Organisation, Entebbe, Uganda	[Propagules water dispersed? No] "Dispersal by winds in the dry season was mentioned as a possible cause of spread." [Although water may move seeds, the primary dispersal vector is presumably wind]
706	2004. NARO. Implementation of invasive plant prevention and control programmes in Uganda. Report submitted to the CAB International Africa Regional Centre. National Agricultural Research Organisation, Entebbe, Uganda	[Propagules bird dispersed? No] "Dispersal by winds in the dry season was mentioned as a possible cause of spread." [Although birds may occasionally move seeds, the primary dispersal vector is presumably wind]
707	2004. NARO. Implementation of invasive plant prevention and control programmes in Uganda. Report submitted to the CAB International Africa Regional Centre. National Agricultural Research Organisation, Entebbe, Uganda	[Propagules dispersed by other animals (externally)? Possibly Yes] "Observed patterns of spread of <i>Cymbopogon</i> seem to indicate a movement further into the park, possibly due to seed dispersal by wildlife from high density areas."
708	2008. Samansiri, K.A.P./Weerakoon, D.K.. A study on the seed dispersal capability of Asian elephants in the northwestern region of Sri Lanka. Gajah. 28: 19-24.	[Propagules survive passage through the gut? Possibly] "Table 1. List of non-cultivated plant species whose seeds were observed in elephant dung (n=145)." [Includes <i>Cymbopogon nardus</i> , but with no information on viability of seeds]
801	2013. Leon, A.. Citronella Propagation. SFGate, http://homeguides.sfgate.com/citronella-propagation-76553.html	[Prolific seed production (>1000/m ²)? No] "Citronella grass seldom sets seed, so it is most commonly propagated through vegetative methods" [In cultivation, does not frequently set seed]
802	2008. Royal Botanic Gardens Kew. Seed Information Database (SID). Version 7.1. http://data.kew.org/sid/	[Evidence that a persistent propagule bank is formed (>1 yr)? Unknown] Several related <i>Cymbopogon</i> species have orthodox seeds

803	2007. Ssegawa, P.. Effects of Herbicide on the Invasive grass, <i>Cymbopogon nardus</i> (Franch.) Stapf (Tussocky Guinea grass) and Responses of Native Plants in Kikatsi subcounty, Kiruhuura district, western Uganda.. Makerere University, Kampala	[Well controlled by herbicides? Yes] "In comparison with the control plots, spot application of the Round-up® reduced the density of the <i>C. nardus</i> by 55%."
803	2011. BioNET-EAFRINE. Keys and Fact Sheets - <i>Cymbopogon nardus</i> (Blue Citronella Grass). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cymbopogon_nardus_%28Blue_Citronella_Grass%29.htm [Accessed 30 June 2013]	[Well controlled by herbicides? Yes] "Spot spraying with a suitable herbicide reduces <i>C. nardus</i> without negatively impacting indigenous species and indigenous species respond positively to <i>C. nardus</i> reduction (Ssegawa 2007)."
804	2004. NARO. Implementation of invasive plant prevention and control programmes in Uganda. Report submitted to the CAB International Africa Regional Centre. National Agricultural Research Organisation, Entebbe, Uganda	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "After a fire, <i>Cymbopogon</i> will quickly form new shoots earlier than the other plants allowing it to maintain dominance over the others, in terms of light, water and nutrient resources."
804	2007. Ssegawa, P.. Effects of Herbicide on the Invasive grass, <i>Cymbopogon nardus</i> (Franch.) Stapf (Tussocky Guinea grass) and Responses of Native Plants in Kikatsi subcounty, Kiruhuura district, western Uganda.. Makerere University, Kampala	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "These results indicate that spot spraying with glyphosate reduces <i>C. nardus</i> without negatively impacting indigenous species and that indigenous species respond positively to <i>C. nardus</i> reduction. Future research and management perspectives are also given."
804	2011. BioNET-EAFRINE. Keys and Fact Sheets - <i>Cymbopogon nardus</i> (Blue Citronella Grass). http://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Cymbopogon_nardus_%28Blue_Citronella_Grass%29.htm [Accessed 30 June 2013]	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] " <i>C. nardus</i> is very resistant to fire and too frequent burning is one of the main causes of its increase. However, Harrington and Pratchett (1974) found that a late burn in the long dry season (usually late August in Uganda) carried out every third year reduced the biomass of <i>C. nardus</i> and encouraged the somewhat better, associated grasses of <i>Brachiaria decumbens</i> , <i>Themeda triandra</i> and <i>Hyparrhenia filipendula</i> . The burn should be against the wind and in weather which would minimise fire temperatures. This would prune the undesirable associated shrub <i>Acacia hockii</i> . Annual burning reduces the size of the <i>C. nardus</i> plants, but does not improve the sward."
805	2013. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown]

Summary of Risk Traits

High Risk / Undesirable Traits

- Thrives in tropical climates
- Naturalized in Taiwan, the Bahamas and possibly elsewhere
- Pasture weed that replaces desirable forage species
- Unpalatable to cattle
- Tolerates many soil types
- Seeds are wind-dispersed
- Tolerates fire and benefits from frequent fire regime

Low Risk / Desirable Traits

- Unarmed (no spines, thorns or burrs)
- Source of essential oils
- Does not spread by runners
- May have limited seed set within introduced range