19. *Combretum* wooded grassland (Wc)

19.1. Description

Trapnell and Langdale-Brown (1972 p. 133) describing *Combretum* wooded grasslands of Kenya, Tanzania and Uganda mention that various broad-leaved *Combretum* species (the most general species being *Combretum adenogonium* [synonym: *Combretum ghasalense*], *Combretum collinum* [synonym: *Combretum binderianum*], *Combretum molle* and *Combretum zeyheri*) are associated with larger-leaved species of *Terminalia* (another species of the Combretaceae botanical family)[6] in wetter areas - especially *Terminalia glaucescens* and *Terminalia mollis*. In drier areas, *Combretum* species are associated with smaller-leaved *Terminalia* species: *Terminalia brownii* in Kenya and Uganda and *Terminalia sericea* in the "monsoon sector" of Tanzania (*i.e.* areas with a one-season summer rainy season typically occupied by miombo woodland [Wm]). These authors further mentioned that *Combretum* wooded grasslands is the major East African wooded grassland vegetation type.

White (1983) does not refer to *Combretum* or *Combretum-Terminalia* vegetation in the main descriptions of the Zambezian, Somalia-Masai, Sudanian, Afromontane, Lake Victoria or Zanzibar-Inhambane regional centres of endemism.[7] However, in the description of the greater Serengeti region, White (1983) describes *Combretum-Terminalia* secondary wooded grassland as a vegetation type with an open overstorey that is dominated by *Combretum molle* (10 - 13 m) and *Terminalia mollis* (15 -17 m). This vegetation type is a fire climax community that has replaced dry evergreen forest on ridges tops and upper slopes in the northern part of the Serengeti national park (White 1983 p. 121). *Combretum molle* woodland is probably a fire-induced vegetation type that has replaced evergreen bushland (Be) or scrub forest on wetter upland areas of Marsabit district (White 1983 p. 121). "Ethiopian undifferentiated woodland" as described by White (1983 p. 107) is virtually equivalent to *Combretum-Terminalia* woodland and wooded grassland described in the atlas of potential natural vegetation types of Ethiopia (Friis *et al.* 2010 p. 170).

19.2. Species composition

(Please check the methodology and information from Volumes 2 - 5 for more details on how the information on species composition for the different manifestations of this potential natural vegetation type was compiled. In composition tables, "x" indicates that the species is expected to be present, "C" indicates that the species was identified as characteristic species and "f" indicates a species that was not listed in the documentation that we consulted although it is known to occur in the specific country).

6: Lind and Morrison (1974 p. 90) use the name of "Combretaceous wooded grassland and woodland" because the common occurrence of Combretum and Terminalia. Terminalia is similar in appearance to Combretum, but Terminalia can be recognized from its two-winged woody fruits whereas Combretum is characterized by four-winged woody fruits. These authors (p. 81) make the distinction between woodland and wooded grassland vegetation types with predominantly compound-leaved trees (miombo woodland and Acacia woodland) and vegetation with predominantly simple-leaved trees (Combretaceous woodland and wooded grassland, Vitellaria woodland and wooded grassland and Borassus palm grassland

7: This is probably because in many cases, these vegetation types are transitional or secondary (J. Timberlake, pers. comm.)

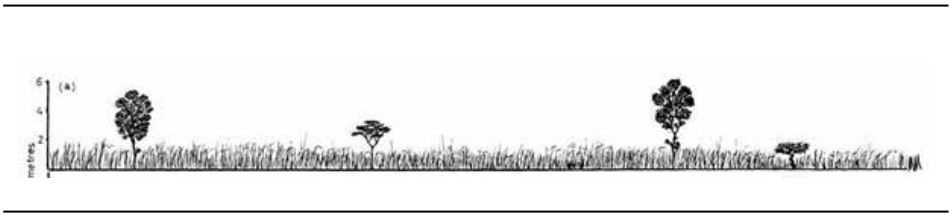

Figure 19.1. This type of *Combretum* wooded grassland vegetation was originally described as "tall *Hyparrhenia* – *Combretum* wooded grassland". Note that *Hyparrhenia* is a genus of grass species. Pratt *et al.* (1966, Fig. 5a). Image obtained from URL: http://www.jstor.org/stable/2401259.

Figure 19.2. *Combretum – Terminalia* woodland and wooded grassland on stony soil derived from the basement complex at the foothills of the western escarpment near Bumbadi (Ethiopia). The palm species *Hyphaene thebaica* can be seen in the foreground. Altitude approximately 750 m. Photograph by I. Friis and Sebsebe Demissew (October 2008). Reproduced from Biologiske Skrifter of the Royal Danish Academy of Sciences and letters, Vol. 58, Fig. 18A. 2010.

Figure 19.3. *Combretum – Terminalia* woodland and wooded grassland with tall underground of grasses (mainly *Hyparrhenia* species) on rocky outcrops east of Kurmuk (Ethiopia). Altitude approximately 1100 m. Photograph by I. Friis and Sebsebe Demissew (October 1998). Reproduced from Biologiske Skrifter of the Royal Danish Academy of Sciences and letters, Vol. 58, Fig. 18B. 2010.

Table 19. Species composition for *Combretum* wooded grassland (Wc)

SPECIES	Regional status	Ethiopia	dry Combretum (Kenya)	dry Combretum (Uganda)	moist Combretum (Kenya)	moist Combretum (Uganda)	WacU (Uganda subtype)
Acacia hockii	characteristic species for Sudanian undifferentiated woodland	C	x	C	x	f	x
Acacia nilotica	characteristic species for Sudanian undifferentiated woodland	f	x	x			
Acacia polyacantha	characteristic species for Sudanian undifferentiated woodland	x	x	x	x	x	x
Acacia senegal	characteristic species for Sudanian undifferentiated woodland	x	x	x			
Acacia seyal	characteristic species for Sudanian undifferentiated woodland	x	x	C	x	f	
Acacia sieberiana	characteristic species for Sudanian undifferentiated woodland	x	f	x	x	f	x
Annona senegalensis	characteristic species for Sudanian undifferentiated woodland	x	x	C	C	x	x
Anogeissus leiocarpa	characteristic species for Ethiopian undifferentiated woodland and for Sudanian undifferentiated woodland	C					
Balanites aegyptiaca	characteristic species for Ethiopian undifferentiated woodland and for Sudanian undifferentiated woodland	C	x	C	x	f	
Boscia salicifolia	characteristic species for Sudanian undifferentiated woodland	f	x	x			
Boswellia papyrifera	characteristic species for Ethiopian undifferentiated woodland	C	f	C			
Combretum adenogonium	characteristic species for Sudanian undifferentiated woodland	C	x	C	C	f	
Combretum collinum	characteristic species for Ethiopian undifferentiated woodland and for Sudanian undifferentiated woodland	C	C	C	C	x	C
Combretum hartmannianum	characteristic species for Ethiopian undifferentiated woodland	C					
Combretum molle	characteristic species for Sudanian undifferentiated woodland	C	C	C	C	C	C
Commiphora africana	characteristic species for Ethiopian undifferentiated woodland and for Sudanian undifferentiated woodland	f	x	C			
Crossopteryx febrifuga	characteristic species for Sudanian undifferentiated woodland	x	f	f			
Cussonia arborea	characteristic species for Sudanian undifferentiated woodland	x	x	x	x	f	
Dalbergia melanoxylon	characteristic species for Ethiopian undifferentiated woodland and for Sudanian undifferentiated woodland	C	x	C			
Dichrostachys cinerea	characteristic species for Sudanian undifferentiated woodland	x	x	f	x	f	
Diospyros mespiliformis	characteristic species for Sudanian undifferentiated woodland	x	x	f			
Ekebergia capensis	characteristic species for Sudanian undifferentiated woodland	f	f	x		f	
Erythrina abyssinica	characteristic species for Ethiopian undifferentiated woodland	x	x	x	x	x	x
Faurea saligna	characteristic species for Sudanian undifferentiated woodland		C	f	x	f	
Ficus glumosa	characteristic species for Sudanian undifferentiated woodland	x	x	f	x	f	
Ficus sycomorus	characteristic species for Sudanian undifferentiated woodland	f	x	f	x	f	
Gardenia ternifolia	characteristic species for Ethiopian undifferentiated woodland	x	x	x	x	f	
Lannea humilis	characteristic species for Sudanian undifferentiated woodland	f	f	C			
Lannea schimperi	characteristic species for Ethiopian undifferentiated woodland and for Sudanian undifferentiated woodland	x	x	C	x	f	
Parinari curatellifolia	characteristic species for Sudanian undifferentiated woodland		x	f	C	f	
Philenoptera laxiflora	characteristic species for Ethiopian undifferentiated woodland and for Sudanian undifferentiated woodland	C		C			
Piliostigma thonningii	characteristic species for Ethiopian undifferentiated woodland and for Sudanian undifferentiated woodland	C	x	C	C	x	
Pseudocedrela kotschyi	characteristic (Sudanian woodland and Guineo-Congolian secondary wooded grassland)	x		C			
Sclerocarya birrea	characteristic species for Sudanian undifferentiated woodland	C	x	C			
Steganotaenia araliacea	characteristic species for Sudanian undifferentiated woodland	x	x	x	x	f	
Stereospermum kunthianum	characteristic species for Ethiopian undifferentiated woodland and for Sudanian undifferentiated woodland	C	x	C	x	x	
Syzygium guineense	characteristic species for Sudanian woodland [*Syzygium guineense* ssp. *guineense*])	x	f	x	x	f	
Tamarindus indica	characteristic species for Sudanian undifferentiated woodland	f	x	x	x	x	
Terminalia brownii	characteristic species for Ethiopian undifferentiated woodland	C	C	C	x	f	
Terminalia laxiflora	characteristic species for Sudanian undifferentiated woodland	C		f			
Terminalia schimperiana	characteristic species for Sudanian undifferentiated woodland	f		C		C	x
Trichilia emetica	characteristic species for Sudanian undifferentiated woodland	f	x	f	x	f	
Vitellaria paradoxa	characteristic species for Sudanian undifferentiated woodland and Sudanian secondary grassland	x		x			
Vitex doniana	characteristic species for Sudanian undifferentiated woodland	C	f	f	C	f	
Ziziphus abyssinica	characteristic species for Sudanian undifferentiated woodland	x	x	C	x	f	
Ziziphus mauritiana	characteristic species for Sudanian undifferentiated woodland	f	x	f			
Ziziphus mucronata	characteristic species for Sudanian undifferentiated woodland	x	x	f	x	f	
Acacia brevispica		f	x	f	x	f	
Acacia drepanolobium		x	x	f	x	f	
Acacia gerrardii	not characteristic	x	x	x	x	f	
Acacia tortilis		x	x	f			
Acokanthera oppositifolia			x		x		
Acokanthera schimperi		f	x	f	x	f	
Adansonia digitata		C	x				
Albizia anthelmintica		x	x	C			
Albizia coriaria		x	f	C	x	x	x
Albizia malacophylla		x		x			
Albizia zygia			f	C	x	C	C
Allophylus africanus		x	f	f	x	f	
Allophylus rubifolius		x	x	f	x		
Antidesma venosum		f	x	f	x	f	
Apodytes dimidiata		f	x	f	x	f	

SPECIES	Regional status	Ethiopia	dry Combretum (Kenya)	dry Combretum (Uganda)	moist Combretum (Kenya)	moist Combretum (Uganda)	WacU (Uganda subtype)
Borassus aethiopum		x	f	f	x	f	
Bridelia micrantha		f	x	f	x	f	
Bridelia scleroneura		x	x	C	x	x	x
Calotropis procera		f	x	f	x	f	
Capparis tomentosa		f	x	f	x	f	
Carissa spinarum		f	x	f	x	f	
Catha edulis		f	x	f	x	f	
Clausena anisata		f	x	f	x	f	
Clerodendrum myricoides		x	x	f	x	f	
Combretum aculeatum	(Combretaceae)	f	x	f			
Combretum schumannii	(Combretaceae)		x				
Combretum zeyheri	(Combretaceae)		C		x		
Commiphora habessinica		f	x	x			
Cordia africana		x	x	f			
Cordia monoica		f	x	f	x	f	
Croton macrostachyus		x	x	x	x	f	
Cussonia holstii		f	x	f	x	f	
Dodonaea viscosa		f	x	f	x	f	
Dombeya buettneri		x					
Dombeya rotundifolia		f	x	C	x	f	
Elaeodendron buchananii		f	x	f	x	f	
Entada abyssinica		x	f	x	x	f	
Erythrina burttii			x				
Euclea divinorum		f	x	f	x	f	
Euclea racemosa		f	x	x	C	f	
Euphorbia candelabrum		x	x	f	x	f	
Euphorbia tirucalli		f	x	f	x	f	
Faurea rochetiana		x	f	f	C	f	
Ficus natalensis			x	f	x	f	
Flacourtia indica		f	x	f	x	f	
Flueggea virosa		x	x	f	x	f	
Gardenia volkensii		x	x	f	x	f	
Grewia bicolor		x	x	f	x	f	
Grewia mollis		x	x	f	x	f	
Grewia similis		f	x	f	x	f	
Grewia tembensis		f	x		x		
Grewia villosa		f	x	f	x	f	
Harrisonia abyssinica		x	x	C	x	f	
Indigofera swaziensis			x	f	x	f	
Jatropha curcas			x	f	x	f	
Kigelia africana		f	x	x	x	f	
Lannea barteri		C		x			C
Lannea fulva					x	f	
Lannea schweinfurthii		x	x	f	x	f	
Lannea triphylla		f	x	C			
Lecaniodiscus fraxinifolius		f	x	f	x	f	
Lippia kituiensis			x		x		
Maerua decumbens		f	x	f	x	f	
Markhamia lutea					x	x	
Maytenus arbutifolia		f	x	f	x	f	
Maytenus senegalensis	not characteristic	x	x	C	C	f	
Maytenus undata		f	x	f	x	f	
Meyna tetraphylla		x	x	f			
Milicia excelsa		f	x	f	x	x	
Mussaenda arcuata					x	f	
Oncoba spinosa		x	x	f	x	f	
Ormocarpum kirkii			x				
Ormocarpum trichocarpum		f	x	x	x	f	
Oxytenanthera abyssinica	(lowland bamboo species)	C		C			
Ozoroa insignis		x	x	C	x	x	
Pappea capensis		x	x	x	x	f	
Pavetta crassipes		x	x	x	x	f	
Pavetta oliveriana		x	f	f	x	f	
Phytolacca dodecandra		f	x	f	x	f	
Pittosporum viridiflorum		f	x	f	x	f	
Plectranthus barbatus		f	x	f	x	f	
Premna resinosa		f	x	f	x	f	
Psydrax schimperiana		x	x	f	x	f	
Pterolobium stellatum		f	x	f	x	f	
Rauvolfia caffra			x	f	x	f	
Rhamnus staddo		f	x	f	x	f	
Rhoicissus revoilii		x	x	f	x	f	
Rhoicissus tridentata		x	x	f	x	f	

SPECIES	Regional status	Ethiopia	dry Combretum (Kenya)	dry Combretum (Uganda)	moist Combretum (Kenya)	moist Combretum (Uganda)	WacU (Uganda subtype)
Rhus longipes		x	x	f	x	f	
Rhus natalensis		x	x	C	x	f	
Rhus tenuinervis		x	x				
Rhus vulgaris		x	x	f	x	f	
Rubus volkensii		f	x	f	x	f	
Salvadora persica		f	x	f	x	f	
Sarcocephalus latifolius	not characteristic	x	f	f	x	f	
Scutia myrtina		f	x	f	x	f	
Securidaca longipedunculata	not characteristic	x	x	x	x	f	
Senna didymobotrya		f	x	f	x	f	
Senna septemtrionalis			x	f	x	f	
Senna singueana		f	x	x	x	f	
Sterculia africana		x	x				
Strychnos henningsii		x	x	f	x	f	
Strychnos innocua	not characteristic	x	f	C			x
Strychnos spinosa	not characteristic	x	x	f	x	f	
Tarenna graveolens		f	x	f	x	f	
Tephrosia vogelii			x	f	x	f	
Terminalia mollis	(Combretaceae)		x	x	C	f	
Terminalia prunioides	(Combretaceae)	f	x				
Terminalia spinosa	(Combretaceae)	f	x	C			
Tetradenia riparia		f	x		x		
Vangueria apiculata		f	x	f	x	f	
Vangueria infausta			x	f	x	f	
Vangueria madagascariensis		f	x	f	x	f	
Vepris nobilis		f	x	f	x	f	
Warburgia ugandensis		f	x	f	x	f	
Ximenia americana		x	x	x	x	f	
Zanthoxylum chalybeum		f	x	f	x	f	
Zanthoxylum usambarense		f	x		x		
Ziziphus pubescens		f	x	f	x	f	

20. *Acacia-Commiphora* deciduous wooded grassland (synonym: deciduous wooded grassland, Wd)

20.1. Description

Throughout volumes 2 to 5, we use "deciduous wooded grassland (Wd)" as a synonym of "*Acacia-Commiphora* deciduous wooded grassland (Wd)".

Although grasses are inconspicuous in typical Somalia-Masai *Acacia-Commiphora* deciduous bushland and thicket (Bd), *Acacia-Commiphora* deciduous wooded grassland communities exist such as the wooded grasslands from the greater Serengeti region (Tanzania). The wooded grasslands from the greater Serengeti region are different from typical deciduous bushland communities (Bd) by the insignificance of bushy plants other than *Acacia* and *Commiphora* and by the relative abundance of grasses (especially perennial grass species). The extent to which these features might be a result from prevalent grass fires or a large ungulate population is uncertain, but rainfall is too high in most places of the greater Serengeti region for typical deciduous bushland to occur (except along the drier eastern fringe; White 1983 pp. 125 and 128).

Somalia-Masai deciduous wooded grassland is the most extensive woody vegetation type (88 percent) in the Serengeti National Park. It consists of a single open stratum of *Acacia* or *Commiphora* thorn trees mostly 3 to 7 m high, but 9 to 20 m in a few species. This vegetation is wooded grassland since canopy cover is less than 40 percent in most places. The grass stratum is 0.5 to 1.5 m high and is dominated by *Digitaria macroblephara*, *Eustachys paspaloides*, *Pennisetum mezianum* (on poorly drained soils) and *Themeda triandra*.

The wooded grasslands of the greater Serengeti region can be mapped by one mapping unit that is dominated by ***Commiphora schimperi*** and 38 mapping units that contain one or several of 11 *Acacia* species (including ***Acacia drepanolobium, Acacia gerrardii, Acacia hockii, Acacia nilotica, Acacia robusta, Acacia senegal, Acacia seyal, Acacia sieberiana, Acacia tortilis, Acacia polyacantha*** and ***Acacia xanthophloea***; White 1983 p. 126). Several of these species are also characteristic of biotic *Acacia* wooded grassland [We; especially *Acacia gerrardii* and *Acacia hockii*], Somalia-Masai edaphic grassland [we; especially *Acacia drepanolobium* and *Acacia xanthophloea*]), riparian communities (wr; especially *Acacia xanthophloea*) or Undifferentiated woodland (Wn; especially *Acacia polyacantha* and *Acacia sieberiana*; within the greater Serengeti region these species occur as riparian species). Rather than attempting to subdivide these wooded grasslands, we classified all woody grasslands within the Somalia-Masai region and Tanzania as "*Acacia-Commiphora* deciduous wooded grassland (Wd)" except where vegetation modelling suggested that ever-

green bushland (Be) could occur (we mapped these specific areas as biotic *Acacia* wooded grassland [We]; see Volume 6). We thus think that it is probable that the areas of biotic Acacia wooded grassland (We) and Somalia-Masai edaphic grassland (we) are underestimated in Tanzania. It is also likely that vegetation types similar to Undifferentiated Woodland (Wn) and that can possibly be classified as *Combretum* wooded grassland (Wc) cross the floristic boundary between the Zambezian and Somalia-Masai regions; this seems especially a possible scenario in the southern part of the area that we mapped as *Acacia-Commiphora* deciduous wooded grassland (Wd).

Figure 20.1. *Acacia tortilis* woodland in Isiolo District (Kenya) was classified in VECEA as subtype WdK. Since this vegetation type does not occur near (seasonal) rivers, it was not classified as riverine vegetation. Photograph by F. Gachathi (2008).

20.2. Species composition

(Please check the methodology and information from Volumes 2 - 5 for more details on how the information on species composition for the different manifestations of this potential natural vegetation type was compiled. In composition tables, "x" indicates that the species is expected to be present, "C" indicates that the species was identified as characteristic species and "f" indicates a species that was not listed in the documentation that we consulted although it is known to occur in the specific country).

Table 19. Species composition for *Acacia-Commiphora* deciduous wooded grassland (synonym: deciduous wooded grassland, Wd)

SPECIES	Regional status	Tanzania	WdK (Kenya subtype)
Acacia mellifera	indicator species	f	C
Acacia nilotica	indicator species	C	C
Acacia reficiens	indicator species		C
Acacia tortilis	indicator species	C	C
Commiphora schimperi	indicator species	C	f
Cordia monoica	indicator species	x	f
Grewia arborea	indicator species	x	f
Salvadora persica	indicator species	f	C
Acacia drepanolobium		C	f
Acacia gerrardii		C	f
Acacia hockii		C	f
Acacia oerfota		f	C
Acacia polyacantha	riparian species in the Serengeti ecosystem	C	f
Acacia senegal		C	C
Acacia seyal		C	f
Acacia sieberiana	riparian species in the Serengeti ecosystem	C	f
Acacia xanthophloea	riparian species in the Serengeti ecosystem	C	f
Albizia amara	not characteristic	f	C
Balanites aegyptiaca		f	C
Croton dichogamus	not characteristic	f	C
Terminalia brownii		f	C