

The Origins Kakamega Forest Grasslands: A Critical Review

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ABSTRACT The Kakamega Forest is dotted with twenty five grasslands (glades) that vary in size, structure and composition. There are further five in the nearby Kisere Forest. Variation in structure and composition is a function of the use to which these grasslands have been subjected to. Their origins have been a subject of intense debate without a consensus. Earlier theories pointed to soils as the main cause. Other theories have proposed fires and grazing as the main causes of these grasslands. This study proposes a new theory that incorporates some of these earlier theories. It proposes that large wild herbivores - elephants and buffaloes, that were resident in the Kakamega Forest long before the coming of Europeans, were solely responsible for the formation and maintenance of these grasslands. These herbivores were later exterminated by European hunters, while the few that remained emigrated to Mt. Elgon forest in the 1920s. Humans only became a factor that maintained the grasslands following the population decline of the herbivores through cattle rearing and burning. The use of fire to stimulate grass growth, grazing by domestic herds and the cutting of grass for roofing replaced the role of wild herbivores. These activities have maintained these grasslands to the present. Evidence that mitigates human role in the maintenance of forest grasslands can be seen in the newly established Kakamega Forest Reserve. This reserve is under the management of Kenya Wildlife Service. Grasslands in this reserve are quickly being re-colonized by forest because of absence of large wild herbivores and the abolishment of grazing and burning.

INTRODUCTION

In areas where forest constitutes most of the vegetation, the existence of small islands of grasslands inside the forest presents a problem of origin and maintenance. This problem attracted the interest of geologists, geographers and botanists in middle of the twentieth century (Bourlerie 1982). Several theories were proposed to explain the origins. They include Climatic, Edaphic, Hydrological, Historical and Anthropogenic theories (Huber 1978). Earlier studies were carried out on the forest grasslands of the lower Amazon forest (Sarmiento 1984; Huntley and Walker 1982). Grasslands inside the forest are not unique to the Amazon. Furley et al. (1992) has elaborated on grasslands that occur inside and are contiguous with forests.

Kakamega Forest has numerous grasslands many of which are enveloped by forest. They vary in structure and composition and their origins remain unknown to date. Some of these grasslands have scattered trees, some have termite mounds, others are devoid of trees, yet others combine these characteristics in various degrees (Tsingalia 1988, 1990).

Kakamega Forest grasslands do not appear

to correlate with any obvious habitat characteristics. Although many of them tend to be discrete and isolated, some are joined by narrow corridors of forest. There are over 25 grasslands in the Kakamega Forest alone. They range in area from 10ha to 200ha although their exact hectareage has not been determined. Most of the grasslands occur in the north and north-eastern parts of the forest. Collectively, they represent about 35 percent of the total forest area. Kakamega forest grasslands do not show physiognomic characteristics similar to those of African savannas (Bourlerie 1982; Stott 1994). Their current appearance and species composition seem to be a function of the intensity and frequency of grazing and burning, and the interaction with the surrounding forest (Crutzen and Goldammer 1993). In grasslands that are subjected to minimal burning, regardless of the intensity and frequency of grazing, invasion by the forest proceeds rapidly. Grasslands that are subjected to frequent burning and grazing are open and show no signs of forest invasion, except for scattered clumps of fire-resistant shrubs and trees (Tsingalia in Press). Most of these trees and shrubs have morphological features that are similar to those of the forest edge species. Spatially, plants within the

grasslands appear to follow closely the forest edge. Such species include *Acanthus arboreus* which is recognized by the Forest Department as an important buffer species against fires that originate from grasslands.

The role of soils as determinants is only speculative, for Tsingalia (1988) found no major differences in soil nutrient composition between forest and grasslands.

The relevance of theories that attempt to explain the origin of forest grasslands have not been assessed for Kakamega Forest. This paper examines critically the relevance of these theories as applied to Kakamega forest grasslands and proposes a new theory.

THE KAKAMEGA FOREST

The Kakamega Forest is located in western Kenya, about 45km northwest of Lake Victoria (Fig. 1). At 1580m above sea level, Lind and Morrison (1974) have classified it as a moist semi-montane semi-deciduous forest. Today, this forest stands as an island in a densely populated area with a human density that exceeds 300 per km². The forest is bounded to the south and west by a maize-growing belt, and sugarcane growing belt to the north. To the east are the Nandi Escarpments which rise to 2100m above sea level. The Nandi Escarpments form a major barrier and are an important water catchment

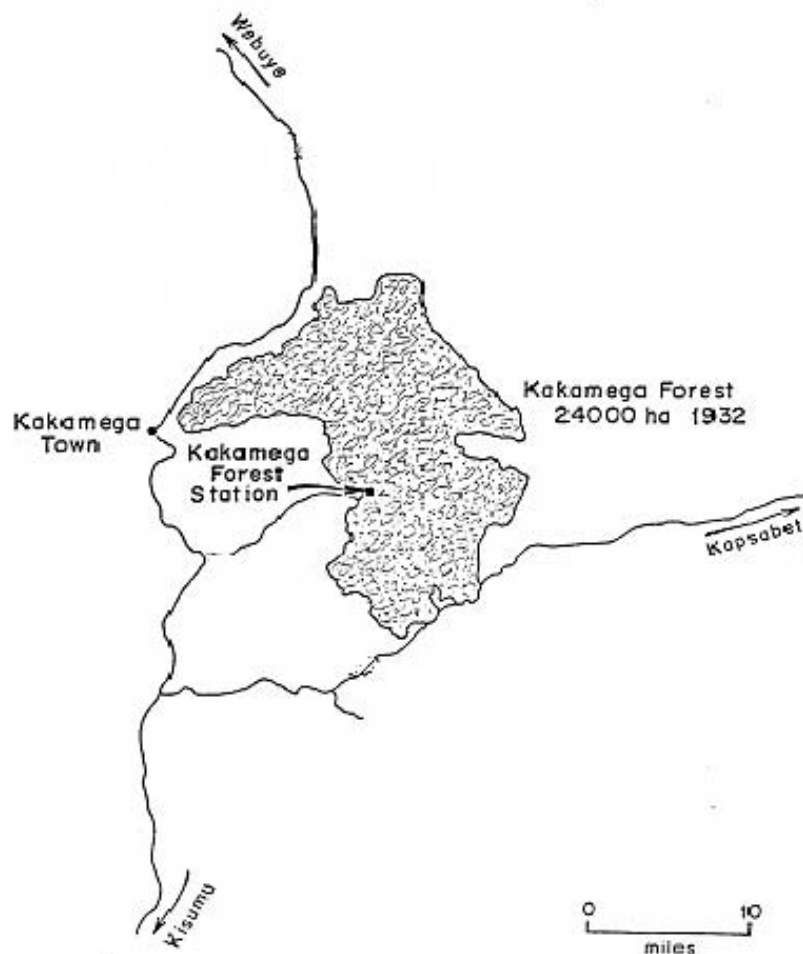


Fig. 1. The map of Kakamega Forest showing its hectareage and its relationship to the nearby major towns

region that is the source of important rivers like the Isiukhu and the Yala Rivers that drain into Lake Victoria through the Kakamega Forest.

Before human settlement of the 1940s, the Nandi Escarpments formed a major corridor through which Kakamega forest was enjoined to the North and South Nandi forests to form the Kakamega–Nandi Forest Complex (Delson et al. 1987, Doute et al. 1981, Fig. 2) covering 56,000ha. Human settlement on the Nandi Escarpments has cut off this continuity and has also disrupted water flow to the foot lands. The Nandi Escarpments also mark the beginning of The Great Rift Valley. This past continuity explains the great floristic similarities between the two forest blocks.

Administratively, Kakamega Forest is a complex of several forests that includes Bunyala Forest (825ha), Kakamega forest (24000ha), Malava Forest (719ha), Kisere Forest (484ha), Kaimosi Forest (720ha) (Doute et al. 1981). It is yet to be ascertained whether these forest fragments were once connected or have always been separated.

The Kakamega Forest complex represents about 4 per cent of the total indigenous natural forest area cover in Kenya but 2 percent of the total administrative forest area.

The Forest Edge

The change from grasslands into the forest



ie Nandi Escarpments
(1981)

Figure 2. The Kakamega-Nandi Forest Complex showing the Nandi

appears to be a function of the interaction between grasslands on one hand, and people and cattle on the other hand. In grasslands that have been subjected to frequent fires, grazing and cutting of grass for thatching, the forest edge shows a sharp ecotone of 10m-20m. This reduction in the ecotone has been brought about frequent use of fires. A notable characteristic of such forest edges is the presence of a buffer zone of *Acanthus* sp. Well – developed sections of such Forest edges have established poles of forest trees. These include *Albizia gummifera*, *Albizia grandibracteata*, *Harungana madascariensis*, and *Bridelia micrantha*.

Grasslands that have been subjected to grazing without burning and cutting of grass have a much wider ecotone (20m-40m). *Acanthus* sp. is largely absent except for scattered individual shrubs of *Acanthus* sp. that grows into large shrubs with a diameter at breast height (Dbh) of 3cm-10cm, and are interspersed with poles of forest trees.

Forest edges are therefore very diverse and dynamic. No species can be described as typical of the forest edge, but of forest edge that is subjected to defined regimes burning and grazing.

THE SIGNIFICANCE OF FOREST GRASSLANDS

Forest grasslands are traditional grazing grounds for communities that live around the forest. Because the status of these people was determined by the number of cattle one had, these grasslands became vital cattle grazing areas. Information obtained from elders of these communities suggests that Kakamega Forest grasslands have maintained their current physiognomy for a long period of time. Some grasslands are said to have remained unchanged since the 1900s. These accounts also indicate that most of the grasslands have changed through time. Some reports pointed out that some of the smaller grasslands at present were quite large during the early part of last century.

To facilitate efficient use, all grasslands were named. Among the most interesting grasslands are Kalunya, located behind the forest station, Shirovani, Shikusa and Khasali. These are still fairly large and open and remain important grazing grounds. They appear to have changed least since the beginning of the century.

Origins of Kakamega Forest Grasslands

Kakamega forest grasslands have been used initially by large wild herbivores and later by cattle. It is yet to be established whether cattle and people preceded wild animals or vice versa. It is, however, reasonable to assume that wild ungulates preceded people. Among the big game of the forest were elephants and buffaloes. Considering known interactions between elephants, buffaloes and their habitats (Laws 1970b; Laws et al. 1970; Leuthold 1972; Leuthold and Sale 1973; Sinclair 1973a, McNaughton et al. 1988), it is probable that grasslands may have resulted from the interactions between these herbivores and the forest. Interestingly, most grasslands taper off into a river. This appears to suggest that these grasslands originated as rest areas after drinking bouts by the wild herbivores (McNaughton and Sabuni 1988). Besides, human population density in the 19th and early 20th centuries was very low, that they were least unlikely to open up as many large grassy areas as can be seen today and to maintain them in their present form. During the late 19th century, East Africa suffered from the scourge of rinderpest and sleeping sickness (Mark 1970; Provost 1981). Rinderpest killed a lot of cattle while sleeping sickness killed many people. The last quarter of the 19th century was also a period of other plagues like dysentery and small pox in East Africa (Mark 1970). The effects of these plagues on both human and animal populations may in part explain the rapid forest succession in the grasslands that are reported to have been large early in the century, but have dwindled in size.

Large open grassy areas without a mechanism to maintain them (even if people had managed to open them up) would have quickly been colonized by the succeeding forest sooner or later. There is no collaborative evidence that practices such as shifting cultivation early in the century extended deep into forest. It appears to have been limited to the forest edge (ecotone). Besides, lack of proper technology for clearing large forest trees and destruction of crops by wild animals would have limited cultivation inside the forest.

Until 1900, there are tales of big herds of buffaloes and elephants in the Kakamega Forest. The residency of the elephants is unclear but may have been herds both resident and migratory from the nearby Mt. Elgon forest which is now a National Park. Then, the area between Kakamega

forest and the Mt. Elgon forest (about 120km further north) was dominated by savanna woodlands that would have made possible free movement of these animals to and from Mt. Elgon. Local people are categorical that large herds of buffaloes and elephants were resident in a number of forest grasslands.

The coming of Europeans with guns and chain saws initiated a massive reduction in forest area that led to the disappearance of virtually all the large herbivores. By 1920, most of these large wild herbivores had either been shot dead or had emigrated to Mt. Elgon Forest where some, like elephants and buffaloes are resident to date. Although Zimmerman (1972) reports that the last elephant was shot in 1912, majority of elderly citizens affirm that the last elephants left by 1920. While non-migratory herbivores might have been exterminated, it is unlikely that the migratory species like elephants and buffaloes suffered a similar fate. Other wild ungulates such as Thompson's gazelles (*Gazella thomsonii*), warthogs (*Phacochoerus aethiopicus*), eland (*Tragelaphus oryx*), waterbucks (*Kobus ellipsiprymnus*), and scrub rabbits (*Lepus capensis*) of the grasslands and bushpigs (*Potamochoerus porcus*), bushbucks (*Tragelaphus scriptus*), blue duikers (*Cephalophus monticola*), red duikers (*Cephalophus rufiatus*), and the giant forest hog (*Hylochoerus meinertzhagen*) were either exterminated or their populations were drastically reduced. River Isiukhu had a hippo population (*Hippopotamus amphibius*) that no longer exists while carnivores such as lions (*Panthera leo*), leopards (*Panthera pardus*) and the spotted hyena (*Crocuta crocuta*) that were present before the arrival of the Europeans today exists in trace numbers.

In addition to populations of cattle, Kakamega grasslands have supported a significant biomass of ungulates and their predators. On the basis of this account, the role of people in Kakamega forest grasslands appears to have mainly been that of facilitation. The use of fire was and has remained instrumental in preventing forest succession in these grasslands to date. Support for the role of fire can be seen in grasslands that have been subjected to infrequent burning but intense grazing within the last twenty years in the nearby Kisere forest Reserve. Most of the grasslands have been colonized by the forest.

In contrast, grasslands that have been subjected to regular burning, like those in Kakamega

Forest remain unchanged and show no signs of forest invasion. Burning of these grasslands has been carried out regularly on an annual or biennial cycle during the dry season just before the onset of rains. Burning stimulates growth of new grass for use in thatching of huts and for cattle to graze (Deshmukh 1986; Rundel 1981; Whelan 1995). With increasing herds of cattle, stimulation of new growth of grass for fodder became the major impetus for burning.

DISCUSSION

What created the Kakamega forest grasslands? It is clear that the Low human population densities around the forest coupled with the absence of human settlements inside the forest are some of the factors that explain the low impact on the structure of the Kakamega Forest. Besides, the large size of trees coupled with lack of technology for clearing them made shifting cultivation inside the forest difficult until only recently. Besides, destruction of crops by forest wildlife would have made shifting cultivation difficult. These factors rule out people as a major factor in the opening up of patches of forest that later become grasslands. Most of these people used non-destructive methods to extract non-domesticated resources from the forest. Areas under extraction were determined by the availability of the desired species and partially perhaps by the problem of access (Cobalan 1968). The interaction of people and the forest varied with time and by periodic demand for and availability of various forest resources. Most forest products were collected within a fairly short radius of the village which explains why most contemporary forest grasslands are near villages. This tendency to forage nearer the villages may have led to the depletion of the non-domesticated resources that were closer to established villages around the forest (Ellen 1985; Vickers 1988). This may have led to the utilization of grasslands that now occur deep inside the forest.

All these events lend credibility to the theory that it is the wild animals mainly elephants and buffaloes that may have been responsible for opening up grasslands inside the forest. It is highly probable that large herds of wild herbivores preceded human settlements near the forest. Once bare areas of the forest had been opened up, the sustained use of these areas by wild herbivores changed them into forest grasslands. As the

population of wild herbivores decreased and human population density increased, there was a shift in the use of grasslands – to grazing by domestic herds and thatching of local huts. As the population of large herbivores decreased further and was eventually eliminated, the use of fire was employed to (i) maintain the grasslands and to prohibit forest invasion (ii) to stimulate new growth of grass for cattle (Norton-Griffiths 1979; Sala et al. 1986; Sinclair 1973a). The use of fire appears to have altered the structure of many of the grasslands as reflected in the composition of the ecotone. The use of fire is perhaps reflected in the differences in the hectareage of different grasslands which appear to have fluctuated in size over time: decreasing during times of plagues that killed both people and domestic herds and increasing when these populations recovered (Normile 2008; Laws 1970).

The expansion and contraction of grasslands had significant effects on forest regeneration and succession. The interaction between the forest, people and grasslands remains vital in forest regeneration at the present (Tsingalia 1988, 2008 in press). Analysis of information collected about grasslands clearly demonstrates the importance of human interaction in the regeneration of the forest.

This study recommends that future studies be carried out to determine the historical ecology of the Kakamega forest more so, its relationship with Mt. Elgon forest and when early human settlements were established around the forest. This will help to determine the presence or absence of large herbivores in the forest and possibly their roles in the forest. Data on early human settlements will help determine the intensity of use of the forest and their exact role in opening up or maintaining grassland.

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