# FIRE - A GOOD SERVANT BUT A BAD MASTER

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Fire is regarded as a natural ecological factor of the environment that has been occurring since time immemorial in the savanna and grassland areas of the African continent. It is estimated that human beings have used fire for more than a million years, and its use in Africa has extended the grasslands and the savannas at the expense of tropical forest. Africa is highly prone to lightning storms and has an ideal fire climate comprising dry and wet periods. It also has the most extensive area of tropical savanna on earth, characterised by a grassy understorey that becomes extremely inflammable during the dry season. The use of fire in the management of vegetation for both domestic livestock systems and in wildlife management is widely recognised. Research on the effects of fire has been conducted throughout the grassland and savanna areas of Africa since the early period of the twentieth century and focused on the effects of season and frequency of burning on the forage production potential of the grass sward and the ratio of bush to grass in African savannas.

Fire, however is a good servant but a bad master. On a global scale, man is the chief ignition agent, anthropogenic or man-made fires far exceed those initiated by lightning. Man not only uses fire for direct beneficial purposes such as cooking, heating and moulding the landscape or vegetation to his needs, but he uses it as an agent or weapon of discord to bring about political or economic change, usually in a manner that is destructive in the main, but that often has beneficial spin-offs for the perpetrator or perpetrators. There is increasing evidence worldwide that arson is an expression of political cynicism and distrust, or even just dissatisfaction with life in general. The current devastating wildfires in Australia are a case in point of fire being a bad master. At least 166 people have lost their lives thus far, properties have been razed to the ground and innumerable animals have also succumbed. This second largest natural disaster in Australia mirrors that of Ash Wednesday, the wildfire disaster a number of years back that totally destroyed vast areas of Southern and Eastern Australia. In 2003 Portugal experienced extensive wildfires, 21 lives were lost, hundreds of domestic houses and agricultural facilities were destroyed and 500 000 hectares of forest and shrubland were burnt to the ground. Many of the fires were arson fires; successive arson fires are used to overcome legal issues relating to land use, e.g. to force down the forestry profile of land into other uses, notably for urban or tourism development. It is reported that the direct and indirect costs of those 2003 fires on the Portuguese economy would be felt for many years to come and the delicate ecological balance will suffer long term damage. In recent years South Africa has suffered devastating fire seasons country-wide, both in the forestry and agricultural sectors. Many wildfires have been expressions of political dissatisfaction in the Sabie and Graskop areas as well as in Kwa-Zulu Natal more than a million trees have recently been lost to wildfires a huge loss to the economy, not to be overshadowed though by the loss of lives in these wildfires. The economic and ecological implications of devastating, uncontrolled wildfires play out in both the short term and the long term, often resulting in retrenchments and social hardships for those who can least afford it. Fire is definitely a bad master.

But, fire is also a good servant. 1971 was a turning point in fire research on the ecology of African grasslands and savannas and the study of fire behaviour broadened its scope to include type and intensity of fires. Research programmes in South Africa were extended to East Africa and the effects of not only season and frequency, but also type and intensity of fires on savanna and grassland ecosystems were characterised. This led to the development of more effective and practical guidelines for the fire regimes to be used in controlled burning, or prescribed fires, for the management of domestic livestock and wildlife systems. Research showed that fire intensity can best be used for describing the general behaviour of fires and their effects on vegetation. The variables that need to be considered when applying controlled burns as a range management practice are fuel load, fuel moisture, relative humidity, temperature, wind speed and slope. These factors are major role players in whether fire is a good servant or rapidly becomes a bad master!

Grasslands and savannas have been shaped by fire through the millennia, grass is however more sensitive to back fires than head fires as critical threshold temperatures are maintained for 20 seconds longer in back fires. It has been shown that in many instances, frequent fires can be used to increase the abundance of palatable grass species like Themeda triandra (Rooigras). However, the management of grazing after a fire is critical as it can have a highly significant effect on the botanical composition and structure of the vegetation. Burning for a "green bite" in summer or late autumn is an unacceptable practice as it reduces the vigour and basal cover of the grass sward and increases the runoff of rainwater resulting in accelerated soil erosion. There are basic ecological criteria that should be considered when using prescribed burning - generally the condition of the grass sward determines whether rangeland or veld should be considered for burning. Prescribed burning should not be considered if the grass sward is in a pioneer condition, dominated by Increaser II grass species (e.g. Aristida congesta, Eragrostos rigidior, forbs or weeds) caused by overgrazing. This is in order to allow it to develop to the more productive stage dominated by Decreaser grass species (Themeda triandra, Setaria sp., Digitaria eriantha etc). Conversely, when the grass sward is in an undergrazed condition, dominated by Increaser I species (e.g. Hyperthelia dissoluta and Hyparrhenia species etc.), it needs to be burnt to increase the fire-adapted and more productive Decreaser species. Finally, prescribed burning is necessary when the grass sward has become moribund or overgrown, excessive self shading occurs when the standing crop of grass exceeds 4 tons/hectare. A Disc Pasture Meter can be used to easily and quickly measure the rate of grass accumulation. Long term experimental data

shows that burning in late winter consistently resulted in a significantly better recovery in the grass sward during the first growing season after the burn, than burning at other times of the year. Burning in summer has a highly detrimental effect on the composition and density of the grass sward.

A cost effective method of controlling bush encroachment, whether it be Slangbos, Harpius, Acacia karroo or many other species, is prescribed burning. High intensity fires need to be applied with adequate grass fuel loads under specific weather conditions. Adequate fire breaks need to be in place prior to burning and a high degree of pre-preparation (checking on weather forecasts, notifying your neighbours in writing according to the requirements of the Forest Fire Act, labour well prepared and equipped with personal protective clothing etc.) with sufficient, functioning fire fighting equipment on standby, is recommended. Under these extreme conditions required for controlling bush encroachment, fire can easily jump from being a good servant to a bad master in a matter of minutes if due caution is not applied, so be "fire-wise"!

It is recommended that everyone becomes "fire-wise" rather than "fire-unwise". Working on Fire South Africa has developed an easy, effective method of assessing fire danger called the Fire Danger Rating System for Controlled Burning and Fire Suppression which encompasses a Fire Danger Index (FDI). In the FDI system weather conditions are divided into colour coded categories for easy reference. On a blue day the FDI is low, fire intensities will be <500kJ/s/m and it will be too cold and wet for burning. At the opposite end of the scale is a red day extremely dangerous with a high FDI of 76 - 100 resulting in fire intensities of >3000kJ/s/m. It is definitely too dangerous under these conditions for burning as the rate of spread of a fire is extremely high and has a long range spotting potential i.e. burning embers are being blown by the wind ahead of the fire front to initiate new wildfires. Fire whorls are prevalent and it is too dangerous for fire fighting personnel to come within 10 metres of the fire because of the fire intensity and flame lengths in excess of 2,4 meters. The recommendation is that all personnel be withdrawn from frontal attack on the fire and that aerial fire fighting assistance be called for. It is usually on red or orange days that devastating wildfires occur. Temperatures are high, relative humidities are low and wind speeds can be excessive, all making for very difficult conditions in which to attempt to control or suppress fires.

Green days, where the FDI is 21 - 40, the fire danger is moderate and flame lengths are 1 - 1,5 meters in length, are good days for prescribed burning for removing moribund and/or unpalatable grass. As the fire danger escalates into a yellow day where flame lengths increase up to 1,8 meters, prescribed burning is still possible but more care needs to be exercised. With the FDI >55 and heading into an upper yellow day and orange day (FDI 61 - 75), weather conditions significantly increase extreme fire behaviour. Therefore greater care must be taken under these conditions when applying prescribed burning as a management practice. Weather conditions play a critical role in fire behaviour which is why it is so important to study the 6-day weather forecast before any prescribed burning. Is a cold front on the way? If so, it indicates that berg wind conditions with low humidities and high temperatures will develop prior to the arrival of the front this all being conducive to high FDI's and dangerous burning conditions. But what about type of ignition?

There is an untested hypothesis prevalent in wildlife circles that perimeter or block burns homogenise the landscape and reduce habitat diversity and so negatively impact on biodiversity. However, it is dangerous to use point ignitions (drop a match and leave the fire to do its thing) especially where people and expensive infrastructure is involved. A large scale, co-operative, multiphase experiment is being conducted in 4 different landscapes in the Kruger National Park to test whether point ignitions create greater fire mosaics than perimeter or block burns. It was initially thought that areas above a critical threshold size would result in the fire fragmenting and resulting in diverse fire mosaics similar to point ignitions thereby promoting biodiversity. The experiment is in its 3rd phase and results to date indicate that size is not the controlling factor in developing fire mosaics, but rather weather conditions influencing fire behaviour. The results have shown that it is possible to burn areas as small as 500 hectares using a perimeter ignition and achieve a high diversity of fire mosaics of varying sizes and intensities provided the air temperature is <25°C and the humidity is above 50% and wind speeds do not exceed 15km/hour. From the aforegoing information it is clear numerous factors must be considered when using fire as a veld management practice, whether it be for domestic livestock or wildlife systems.
Fire is not just fire it is a complex beast that can so easily be a good servant but a bad master! Being "fire-wise" can help to minimise the impacts on our environment and our pockets.

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