Controlled Burning in the Kruger National Park– History and Development of a Veld Burning Policy

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To those who are not familiar with the general features of the Kruger National Park, a very brief description of the situation, topography, rainfall, animal life and vegetation is given below:

Situation

The Park is situated in the Eastern Transvaal Lowveld and occupies the area between 22° 25′ to 25° 32′ latitude south and 30° 50′ to 32° 2′ longitude east. It extends approximately 200 miles (322 km) in length with an average width of about 40 miles (64 km), covering a total area of 7340 square miles (19,010 km^2).

Topography

Topographically the Kruger National Park presents an undulating aspect, although it appears rather flat generally. The highest altitudes are attained in the south-west [2,750 feet (838 m) above sea level] and the country declines towards the Lebombo flats on the east, which are only 600–800 feet (183–244 m) above sea level. The Le-

bombo Mountain range on the eastern boundary reaches its highest level at Shilowa-poort in the North [1,628 feet (496 m)]. The Park is traversed from west to east by five perennial rivers, and drained by numerous dongas, dry water courses, and seasonal rivers. The rolling plains are frequently interrupted by small hills and koppies formed by weather-resistant rocks belonging to the Swaziland system, archaic granite and dolerite. Although high mountains are not found in the Park, the Malelane area, the Lebombo range on the eastern boundary and the Punda Milia area may be described as mountainous.

Rainfall

The Park is situated in the summer rainfall area of Southern Africa, with the highest rainfall occurring between November and February. Thundershowers are especially common during the onset of the rainy season and are frequently accompanied by severe lightning. The mean annual rainfall varies, from 27.8 inches (70.6 mm) around Pretoriuskop in the south-west to 15.67 inches (39.8 mm) in the extreme north-east at Pafuri.

Animal life

The total number of mammalian species known to occur in the Park amounts to 122 (this figure includes the smaller mammals). 435 species of birds have been recorded, 47 of fish, 32 of amphibians and 102 of reptiles (Figs 1–8).

Vegetation

A very comprehensive collection of plants occurring in the Kruger National Park has been undertaken, and although this may not yet be complete, more than 2,000 species have so far been collected within the Park's boundaries.

A good general description of the vegetation of the semi-arid summer rainfall areas of Africa, and one equally applicable to the bushveld vegetation of the Park, is given by West (1955):

> "In semi-arid summer rainfall Africa, the undisturbed virgin veld is typically perennial, tufted or bunch grassland, studded with various woody plants in the shape of trees, shrubs and bushes. The

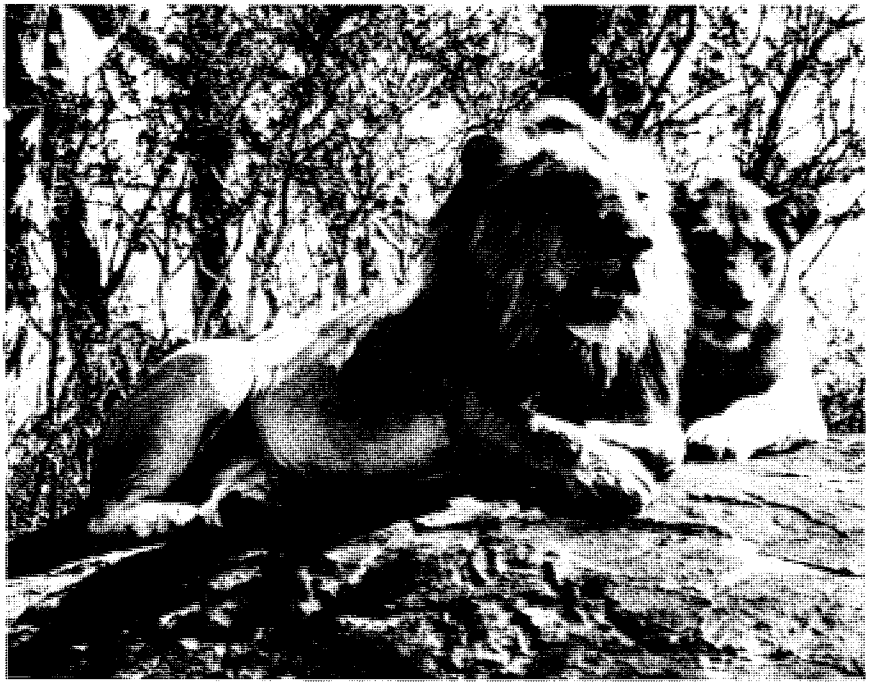

FIG. 1. Lions. Kruger National Park.

> amount of bush in relation to grass varies enormously from open veld in which the woody growth is absent, through parkland, where the trees and shrubs are sparsely scattered in grassland, to dense bush or thicket in which the grasses are quite unimportant. To the ecologist it is clear that this 'bushveld' represents a stage in plant succession where two competing communities exist together in a state of delicate balance, a maelstrom in which the wave of population dominated by grasses and their associated forbs has met and is clashing with the wave of trees to which it will in the natural course eventually give way."

The vegetation of the Kruger National Park may be classified into the following six major veld types:

1) Large-leafed deciduous woodland with tall grass;
2) Combretum veld;
3) Knobthorn-Marula parkland;

FIG. 2. Elephant Bull. Kruger National Park.

4) Mopane woodland;
5) Communities of dolerite dykes;
6) Sandveld communities of Punda Milia and Nwambia (Classification according to van der Schyff (1958).

THE HISTORY OF VELD BURNING AND THE DEVELOPMENT OF A VELD BURNING POLICY IN THE KRUGER NATIONAL PARK

For the purposes of this paper three phases in the history of veld burning in the Kruger National Park may be considered:

1) Fires up to the beginning of the present century;
2) From the proclamation of the Sabie Game Reserve 1898 until 1926;
3) From the proclamation of the Kruger National Park (1926) to the present day.

Fires up to the beginning of the present century:—Very little is known and can be said about fires occurring in the Transvaal Lowveld before the advent of man. It is probable that the Bushmen, the earliest intelligent human inhabitants of this area, occasionally fired the veld to assist them during hunting. Bantu tribes were met with on the east coast of Africa at the beginning of the sixteenth century, and later established themselves in the Transvaal Lowveld. The penetration of this region by the first Voortrekkers, in 1838, introduced a new era in its history, and white settlements soon developed. Native tribes and white hunters frequently burnt the vegetation and used fire to entice game to favourite hunting areas.

From the proclamation of the Sabie Game Reserve (1898) until the proclamation of the Kruger National Park (1926):—The Sabie Game Reserve was established in 1898 with Col. James Stevenson-Hamilton (appointed in 1902) as its first Warden; this was followed by the proclamation of the Shingwidzi Game Reserve in 1903.

Although Stevenson-Hamilton wrote on several occasions about the detrimental effect of veld fires on the vegetation, and also described the dessication that followed in their wake, there was very little he could do to alleviate the situation; both these Game Reserves

FIG. 3. Sable Antelope. One of the most beautiful but rare species of the Kruger National Park.

FIG. 4. White Rhinoceros. Kruger National Park.

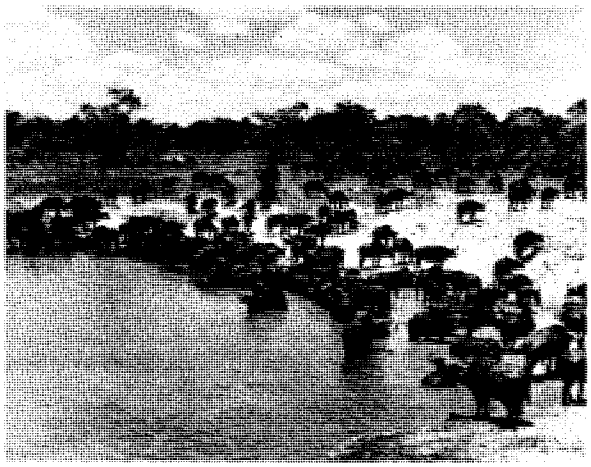

FIG. 5. A herd of buffalo. Kruger National Park.

FIG. 6. Burchel's zebra drinking. Kruger National Park.

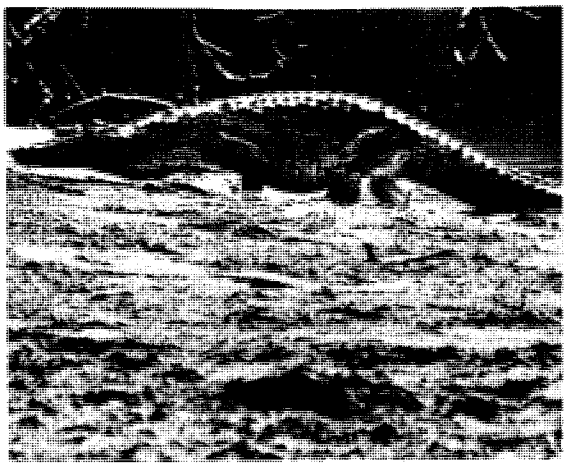

FIG. 7. The crocodile. One of the many reptile species—Kruger National Park.

FIG. 8. Cheetah feeding on an impala. Kruger National Park.

were almost annually harassed by devastating fires crossing the borders from outside where they were started by natives, hunters and stock farmers. Accidental and deliberate burning of the vegetation also occurred frequently within the Reserves.

The vegetation, particularly that of the Pretoriuskop area, was burnt regularly when it became unpalatable, which in this area meant being burnt annually. Burning was carried out mainly during February, March and April in order to provide short green growth for game and sheep during the winter months when the palatability and feeding value of plants are low. Sheep farmers held grazing rights in this area up to 1924, and Stevenson-Hamilton (Report 1941) wrote of sheep farmers during those years coming down from the highveld in about February to burn as much grass as possible with a view to having fresh green veld for their stock all through winter.

From the proclamation of the Kruger National Park (1926) to the present day:—At the time of the proclamation of the Kruger National Park veld fires still swept the Transvaal Lowveld annually. No means then existed of preventing fires started outside the Park from crossing the boundaries, and Stevenson-Hamilton wrote of disastrous fires, fanned by strong winds, burning deep into the Park and lasting very often for fourteen days or longer (Report 1930).

No official policy of veld burning existed during the early part of the period under discussion. A "policy" of controlled burning was followed by the Warden and his staff whereby old grass, which escaped accidental fires, was burnt annually. This was done mainly in the autumn in order to stimulate growth out of season, thus providing short green grass for game during the winter months, and also to prevent the disastrous effects of accidental fires. It was believed that only by controlled burning could an effective system of fire-breaks be established to guard against the huge blazes of the later months. (Report, 1930).

The "policy" of burning annually during the autumn did not always prove feasible, because the material was still too green to burn effectively and this created a dangerous situation with regard to accidental fires during later months. There were no means of preventing accidental fires from crossing the boundaries of the Park until 1934, when border fire-breaks were prepared for the first

time. However, in 1937 Stevenson-Hamilton remarked after some disastrous conflagration crossed the boundaries: "Once a bush fire, late in the spring has caught good hold, especially with a following wind, no human effort can suffice to stop it. The lesson learnt is that border fire-breaks alone are of little use and that old grass should be burnt in the autumn at least every second year. Only by some such means may disastrous conflagration be avoided."

During 1940 Stevenson-Hamilton expanded further on his earlier views and made the following statement:

> "It should be well understood that old, long grass is anathema to grazing animals. Not only can they find no nourishment in it, but the danger of being taken by surprise is so insistent that they refuse to enter it, and miles of veld which may otherwise be found well stocked are in consequence completely deserted by the larger game animals. Old grass is also a natural fosterer of ticks which the game try to avoid, when possible. In a sanctuary for wild life, therefore, it is essential to burn old long grass, but this must be done methodically, at the right time of the year and with due regard to the requirements of the following year."

In 1946 Col. J. A. B. Sandenbergh succeeded Stevenson-Hamilton as Warden of the Kruger National Park. He opposed veld burning in all its forms, and felt convinced (Report, 1950) that the earlier policy of burning had caused a change for the worse in the vegetation, and that this had a profound influence on the distribution and breeding rate of the wildlife of the Park. He felt that deliberate burning in an area which should be kept in its natural state, must upset the natural balance.

Almost all controlled burning was abandoned during his first years in office and in 1949 a Board Resolution stipulated:

> "that no veld shall be burnt more often than once every five years; that all such burning shall only be done after the first good spring rains; and that by every means at our disposal accidental fires must be avoided."

This new policy deviated completely from the earlier policies followed by Stevenson-Hamilton and his staff. The time of burning was now switched from autumn to spring after the first good rains and the period between burns was extended considerably from once

every year or at the most every two years to "not more often than once every five years".

During this period (1948–1954) a great deal has been said and written about the advantages and disadvantages of veld burning in the Kruger National Park, and apart from carnivora control, became the most controversial subject in the Park. There were those who fiercely opposed veld burning in all its forms, and on the other hand there were those who were in favour of a policy which allows for more regular controlled burning.

At this stage it became clear, and realized by all concerned, that no realistic burning policy could be formulated without being based on sound scientific grounds.

This led to the appointment of the Board's first scientific staff and soon afterwards (1954) the first burning experiments were undertaken in the four most important veld types of the Park, viz. the large-leafed deciduous woodland with tall grass, the combretum veld, the knobthorn-marula parkland and the mopani woodland.

In the meantime, as a result of the very lenient burning policy that had been followed since 1948, a tremendous accumulation and build-up of old, decaying material took place over the whole of the Park. This had a very serious adverse effect on the animal populations as many of them moved out of the Park in search of short grazing. This happened especially in the Pretoriuskop area where *Hyparrhenia dissoluta* (the dominant grass species) soon became long and rank, and the majority of animals, unable to adapt themselves, steadily declined in numbers. They were forced to move into adjoining areas, especially into the better-watered Trust area where grass was still burned regularly and where they were slaughtered in their hundreds.

The lack of regular burning was probably also responsible for the onset of a period of bush encroachment in the Park—an insiduous process which until today has not yet been properly assessed, and which is still going on.

Above all, the accumulation of old and decaying plant material created a very serious situation with regard to accidental fires. This became abundantly clear during the spring of 1954 when a series of disastrous conflagrations occurred inside the Park area, laying waste a total of 2,000 square miles (5,180 km^2) (one-fourth of the total

area of the Park) of valuable grazing. In two fires that raged through the northern part of the Park during October 1954 a total of 40 animals were found killed or had to be destroyed as a result of these fires. These were: six elephant, two lion, 12 impala, 10 kudu, three waterbuck, three steenbuck, two roan antelope, one duiker and one warthog.

Needless to say that over such a large area many more animals, which were never found, must have succumbed to the flames.

These disastrous fires came as a shock to everybody concerned. It was obvious that large areas of old grass, even in sweet veld areas, were extremely dangerous, and that it was preferable to burn this at regular intervals after the first spring rains, which ensures a "cool fire" causing little damage to the flora and none to the fauna.

This led to the formulation of the following interim policy of the National Parks Board of Trustees in December 1954:

> "That until it is proved to be wrong, it be laid down by the Board as an interim policy that the whole of the Kruger National Park be divided into sections, separated by properly constructed fire-breaks, and that all grass which has become long and rank be burnt every three years on the understanding that only one third of each section be burnt annually and as late as possible in the spring after the first rains."

On the whole this policy has proved to be sound and workable, and is regarded as a great improvement on the burning policies of the past. Hundreds of miles of fire-breaks have been and are still being constructed, which divide the Park into a number of blocks which facilitate the execution of the three-year rotational burning programme.

The policy showed one main shortcoming, namely that the whole of the Park with its diversity of veld types, was treated alike. Thus in the Pretoriuskop area where the veld is sour, a biennial, rotational burning programme, whereby half of the area is burnt every two years in autumn and the other half during spring, was put into operation during 1957.

During 1958 the above policy was further amended and provision was made for the exclusion of certain areas, temporarily or permanently, from the burning programme. Areas excluded temporarily

were those where the plant cover was damaged by droughts, indiscriminate burning or overgrazing, and those infested by *Bothriochloa insculpta.*

For obvious reasons the following areas were withdrawn permanently from the three-year rotational burning programme: the catchment areas of all permanent and semi-permanent springs, of "vleis" and valleys, of the larger rivers which originate in the Park, and the banks of all rivers in order to protect the riparian vegetation. Also excluded were all mountain slopes and mountainous parts of the Park, vulnerable areas with shallow, stony soils on which the plant cover is very sparse and comprises mainly annuals; the sandveld areas of Punda Milia and Nwambia, in view of their interesting and unique flora which is extremely vulnerable to veld fires and which has been seriously damaged in the past, and the mopane forest occurring south-east of Punda Milia.

In essence, the amended policy provided for the ultimate division of all burning sections (blocks) to a size of 25 square miles (64.75 km^2). It was further stipulated that controlled burning should not commence before the latter half of October and then only after at least two inches (50 mm) of rain had fallen. All the burning blocks situated in the combretum veld and mopane woodlands are to be examined during the year that they are due for controlled burning; if the condition of the vegetation is such that fire may do harm, they should not be burnt. Finally with controlled burning, such weather conditions should be chosen when the least damage would be done to the vegetation.

Since a few years ago a new policy has been followed in certain botanical reserves and in parts of the most important mountainous areas in an effort to counteract the ever-present menace of accidental fires started by poachers. As has already been mentioned, these parts are protected against fire mainly on account of their unique and interesting flora, and as they comprise a relatively small portion of the whole area and thus are not of cardinal importance for grazing, any treatment must be aimed primarily at the protection of the species that grow there. The areas concerned here are all situated along the Park's boundaries, and most of the fires that occur annually in winter or spring are deliberately started by poachers in order to

entice game to these areas. Sometimes these fires are noticed in time and put out, albeit at great expense of money and effort. More often than not a whole block, perhaps even more, has to be sacrificed.

Fires caused by lightning are sometimes also responsible for the destruction of the plants of such reserved areas, and when they start in areas where old grass has accumulated over a long period, especially if the weather happens to be dry and warm as is experienced so often before the rains in October, large, established trees are burnt to death. In order to prevent such drastic damage to the upper strata, a preventive policy by which all superfluous combustible material is removed in late summer by means of "cool" fires, has been started with reasonable success in a few of these areas.

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