MALOTI DRAKENSBERG PARK
WORLD HERITAGE SITE

Joint Fire
MANAGEMENT PLAN

Lesotho
Ministry of Tourism,
Environment and
Culture

Maloti Drakensberg Transfrontier Programme

United Nations Educational, Scientific and Cultural Organisation

AMAFA OMHLABA · WORLD HERITAGE · PATRIMOINE MONDIAL

EZEMVELO KZN WILDLIFE

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GLOSSARY OF TERMS

Abiotic – Non-living things (*e.g*. rocks, soil and water).

Alpha diversity – The diversity at a point, usually in space, but also in time (*e.g.* the number of species in a quadrant) [also see Beta and Gamma diversity].

Arson fire – An unplanned fire intentionally started within the reserve boundary with malicious intent (MITP), or for grazing or hunting.

Accidental fire – An unplanned fire started by mistake within the reserve boundary (*e.g.* campfire that escapes, or a hiker trying to burn their toilet paper).

Autumn burn – Burns conducted before the first frosts.

Back fire – A fire burning down slope or against the wind (also see head fire).

Back Burn - A fire put in along an existing fire break or river or other suitable location (be it against the wind or with the wind) with the intention of widening an existing fire break (river or other feature) to stop a wild fire from jumping over the existing fire break or river or other feature (*e.g.* a trace line, ridge, road, cliff, stream and or path).

Bakkie Sakkies – A mobile fire fighting unit that is transported on the back of a bakkie.

Basal cover – Area of ground covered by the living basal portions of plants.

Beta diversity – The rate at which species composition changes across environmental gradients (*e.g.* altitude).

Biodiversity – All genes, species and ecological communities and the ecological and evolutionary processes that sustain them.

Biomass – Total amount of living material (animal and plant) present in a particular area at any given time (kg/ha).

Bioregion – A geographic region that contains whole or several nested ecosystems and is characterised by its landforms, vegetation cover, human culture and history.

Biotic – Living things (*e.g.* animals and plants).

Burning block – A block is composed of a number of compartments (see burning compartment) with the same alphabetical block letter followed by the various numerical compartment letters *e.g*. A1, A2, A3….*etc*, all belonging to Block A that can be burnt together for practical reasons on a rotational basis according to the management objectives for the block.

Burning compartment – A number of compartments make up a Burning Block (see above). A compartment is a practical unit based on natural features that allows for the controlled burning of an area in line with the management objectives for the area.

Compartment Attribute Table (CAT) - The CAT incorporates the basic information for each fire compartment required to implement the fire principles to protect the biological, cultural, infrastructural and research attributes (sensitive features).

Canopy – Cover of leaves and branches formed by the tops or crowns of plants

Canopy cover – Proportion of the ground area covered by the canopy of the sward (%).

Clean burn – Refers to a burn which completely reduces an area to a uniform state. The vegetation cover may be removed completely generally as a result of a hot fire. The result of a clean burn is opposite to that of a patchy burn.

Community – An assemblage of animals and/or plants growing together and interacting among themselves in a specific location.

Cool burn – A reference to the less intense fires and lower flame heights that are generated when burning under less intense weather conditions where humidity and moisture levels are at higher levels as apposed to dryer environmental conditions that burn more intensely and sometimes sparse vegetation biomass results in cooler burns.

Crown fire – A fire that burns in the canopies of trees or shrubs.

Ecosystem – A functional unit of plants and animals living and interacting with their environment and each other in a given area.

Ecotone – Transitional area of vegetation between two communities which has characteristics of both kinds of neighbouring vegetation as well as characteristics of its own.

Endemic – Animals and plants that are naturally found only in a particular and usually restricted geographic area or region.

Flexibility – In terms of burning flexibility refers to not following a strict burning regime and the need to adapt the burning programme as required in terms of the frequency, timing and type of fire in a particular area.

Firebreak – An area of sufficient width and length from which inflammable material capable of carrying a veldfire has been reduced/removed, to the extent that the area has a reasonable chance of preventing a veldfire from crossing it.

Fire frequency – How often fires occur expressed as the number of years elapsing between burns (*i.e.* time between fires or fire interval) [*e.g.* annual burn = burns every year, biennial burn = burns every second year, triennial burn = burns every third year]. *NB*: Not to be confused with the “time-since-last-burn”.

Fire intensity – Amount of heat energy released per unit time, per unit length of fire front (kJ/s/m or kW/m), *i.e.* how hot the fire is. *NB*: All fires are hot, but less intense burns are often referred to as “cool” and more intense burns as “hot”.

Fire regime – Frequency, intensity, season and type of fire.

Fire Reports – Are a legal requirement as per the requirement of the relevant Fire Protection Association in South Africa for annual submission to government in terms of Act 101 of 1998 and does not refer to institutional requirements.

Fire season – The time of year at which fires occur, usually described according to the season (*i.e.* winter, spring, summer, autumn), although sometimes according to the appearance of frost (*i.e.* pre-frost or post-frost).

Fire trap – The height below which woody plant canopies are exposed to damage by fire. Repeated fires often keep emerging woody plants within this zone by regularly removing new nodes/branches as they develop, so stunting the growth of the plant.

Fire type – This refers to a head versus back burn, fire intensity (*i.e.* "hot" versus "cool" fire), or the source of ignition (*i.e.* planned, natural [*e.g.* lightning strike or rock fall], or arson).

Fuel load – Mass of fuel per unit area that is available for combustion during a fire (kg/m^2) [*i.e.* how much fuel there is to burn].

Fuel moisture – Ratio of moisture to fuel expressed as a percentage on a dry matter basis (%) [*i.e.* how wet the fuel is].

Gamma diversity – The rate at which composition changes across geographical gradients (also sometimes referred to as Delta diversity).

Ground fire – A fire that burns below the surface of the ground in deep layers of organic material.

Habitat – The type of environment in which a plant or animal normally lives.

Head fire – A fire burning upslope or with the wind (also see Back fire).

Heat of combustion – Total amount of heat energy contained per unit mass of fuel (kJ/kg).

Heterogeneity – Variation of things which is represented by spatial and/or temporal patchiness in the environment.

Homogeneity – When things are similar. This is represented by spatial and/or temporal uniformity in the environment.

Hot burn – A reference to the generally more intense fires and greater flame heights that are generated through burning conditions that have lower humidity and moisture content and sometimes greater vegetation biomass.

Hydrology – Study of water related matters.

Intermediate Disturbance Hypothesis – A theory stating that species richness should be greatest at intermediate levels along a disturbance gradient. According to the theory, strong competitors should dominate at low disturbance levels, while only the most tolerant species should survive at high disturbance levels.

Invasive fire – A fire entering a management unit from surrounding areas.

Moribund sward – Refers to the accumulation of dead plant material to the point at which it reduces the vigour of plant growth.

Mosaic – A patchwork of areas of different burn status (*e.g.* areas of different "time-since-last-burn", areas burnt in different seasons). *NB*: This can be created by manipulating the fire regime and/or the way in which a regime is implemented (*e.g.*

by alternating the burning of two compartments on a biennial regime so that only one of the two compartments is burnt in any one year).

Natural fires – Refer to fires that are naturally ignited, such as those started by lightning.

Necromass – Total amount of dead biotic material (dead animals and plants) present in a particular area at any given time (kg/ha).

Patch size – The area burnt.

Patchy vs. clean burns – Patchy burns create an uneven matrix of areas burnt to different degrees or not at all, while clean burns completely reduce an area to a uniform state.

Phytomass – Total amount of living plant material present in a particular area at any given time (kg/ha).

Point ignition – When/where fires are started at a single point or series of points.

Processes (ecological, ecosystem and evolutionary) – The abiotic and biotic interactions that work indirectly or in combination to generate and maintain biodiversity (*e.g.* the weathering of rocks forms soil which sustains plants).

Productivity – The rate at which biomass is accumulated per unit area (kg/ha/time).

Recruitment – The germination and establishment of propagules (*e.g.* plant seedlings).

Re-seeder – Plants that are killed by a fire and rely on recruitment, from a seed bank stored in cones on the plant or in the soil, for recovery.

Resprouter – Plants that are generally not killed by fire and recover vegetative by re-growing from buds.

Relative humidity – The ratio between the amount of water vapour a unit of air contains at a given temperature and the amount of water vapour the unit of air can contain at the same temperature and pressure (*i.e.* the amount of water the air contains compared to the total amount it could contain).

Runaway fire – A fire intentionally started by Ezemvelo KwaZulu-Natal Wildlife, usually from a tracer line, firebreaks or scheduled burn that burns beyond its intended extent.

Spatial – Refers to how items (*e.g.* species) are located and distributed over an area (*e.g.* clumped, even or random distribution).

Species abundance – The number of individuals of a species (Pi) in relation to the total number of individuals of all organisms (Pt) in a given area (Pi/Pt).

Species composition – The species found in a particular area.

Species diversity – A complex measure taking into account the richness, abundance, evenness and composition of species.

Species evenness – The ratio of dominant to rare species in a community, where communities are considered to be entirely evenly distributed, when all species are equally abundant. *NB*: This does not refer to the spatial or temporal distribution of

species (see heterogeneity and homogeneity), but that the interpretation of abundance may be strongly influenced by the way in which diversity is sampled according to spatial or temporal distribution of species (*e.g.* clumped, even or random distribution).

Species frequency – The number of times a species is recorded across successive samples in space or time.

Species richness – The number of species present in a community.

Spot fire (spotting) – Refers to a fire that is ignited outside of the perimeter of the main fire or across a firebreak by flying sparks or embers that are transported by air currents, gravity or fire whirls.

Surface fire – A fire that burns in the surface fuels.

Surface fuels – All combustible material on the soil surface occurring as standing wild flowers, grass, seedlings, shrubs and fallen leaves, twigs and bark.

Sward – Above ground parts of a population of herbaceous plants characterised by a relatively short growth habit.

Temporal – Refers to how items (*e.g.* species) are located and distributed through time (*e.g.* clumped, even or random distribution).

Tiller – A vegetative unit of the grass plant, made up of leaves, a short stem and roots.

"Time-since-last-burn" – Time elapsed since the last fire at a point, not to be confused with fire frequency.

Tracer lines – Refers to the pre-emptive lines that will determine the width or border of a fire break or compartment burn that are first sprayed with Gramoxone in March/April, and then burned in May to assist with the containment of a fire during the burning of fire breaks and compartment burns.

Tractor PTO pump – Refers to a high pressure pump system with a high pressure nozzle that is driven by the power–take-off (PTO) of a tractor that is used in conjunction with water container pulled by the tractor exclusively for the purpose to fight or contained fires

Tree-line – The height on a mountain above which the climate is too cold for trees to grow.

Vegetative growth – When growth occurs asexually from any part of a plant (*i.e.* not from seed).

Venfire Pumps – Refer to a portable 15 to 20 litre back pack sprayer system with a dual action hand operated pump with a concentrated nozzle used to fight or control fires.

Variability – In terms of burning, variability refers to a non-rigid fire programme that changes over time. Fire managers must attempt to vary the seasons of burning and interval between burns as well as the type of fire.

1 INTRODUCTION

This management plan is intended to provide a background to fire management, synthesise current thinking and to function as a guide for protected area managers with regard to the application of fire in the Sehlabathebe National Park (SNP) and in the uKhahlamba Drakensberg Park World Heritage Site (UDP WHS).

2 PARK OBJECTIVES AND GOALS FOR FIRE MANAGEMENT

The application and management of fire in the Drakensberg area has been a contentious matter for decades. On the KwaZulu Natal side various principles have been applied by land users, ranging from the San hunter-gatherers, through settler pastoralists to present-day conservationists. In more recent times it has been argued that agricultural prescriptions do not meet the needs of biodiversity conservation and opinion has been divided on the best management options. This management plan is intended to synthesise current thinking and to function as a guide for Conservation Managers/Park Managers to the application of fire in the Maloti Drakensberg Park World Heritage Site at the beginning of the twenty-first century.

2.1 Vision of the Maloti Drakensberg Park World Heritage Site

To be a world renowned leader in the field of biodiversity conservation

2.2 Mission of the Maloti Drakensberg Park World Heritage Site

To ensure effective conservation and sustainable use of Maloti Drakensberg Transfrontier Programme's (MDTP) biodiversity in collaboration with stakeholders for the benefit of present and future generations. To manage and conserve the Park for its globally significant natural, cultural and Wilderness values and life support systems, through co-management with partners and all stakeholders and to provide a flow of benefits such as economic, recreation and spiritual benefits beyond the boundaries of the Park.

2.3 Park management objectives relevant to fire management:

- To perpetuate in as natural state as possible biotic communities, genetic resources and species to provide ecological stability and diversity.

- To secure and maintain habitat conditions necessary to protect significant species, biotic communities, physical features and to protect natural and scenic areas.
- Address security issues and illegal activities to ensure the integrity of the Park, in participation with stakeholders, security services and the justice system.
- Establish and maintain effective linkages with affected communities and other stakeholders in order to ensure collaborative management.
- Promote the conservation management and public appreciation of all cultural. Geological, Palaentological, archaeological and historical sites within the Park in accordance with statutory regulations.
- Ensure that those natural processes responsible for generating and maintaining biodiversity and ecosystems services continue to function.
- Develop a comprehensive plan for the effective management and sustainable use of Wilderness as an integral part of the integrated management plan for the Park.
- Demonstrate the value of ecosystem services to appropriate stakeholders and motivate for the integration of this value into the regional economy.
- Effectively manage consumptive use of natural resources on a sustainable basis and in partnership with relevant stakeholders.
- Develop and implement conservation strategies for species and ecosystems under threat.
- Address security issues and illegal activities to ensure the integrity of the Park, in participation with stakeholders, security services and the justice system.
- Establish and maintain effective linkages with affected communities and other stakeholders in order to ensure collaborative management.
- Promote the conservation management and public appreciation of all cultural resources within the Park in accordance with statutory regulations.
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- Demonstrate the value of ecosystem services to appropriate stakeholders and motivate for the integration of this value into the regional economy.
- Effectively manage consumptive use of natural resources on a sustainable basis and in partnership with relevant stakeholders.
- Develop and implement conservation strategies for species and ecosystems under threat.

2.4 Park fire management goals relevant to:

2.4.1 Biodiversity

- To maintain the natural community dynamics at both ecological and evolutionary scales, to prevent undesirable human-induced extinctions and retain the inherent adaptability of ecosystems to environmental change.
- Promote habitat heterogeneity (through the maintenance of a mosaic of areas with different fire regimes *i.e.* frequency, season, extent, intensity, type and time-since-last-burn).
- Ensure the long-term persistence of endemic, rare, or threatened species and their habitats (through manipulating/applying appropriate fire regimes).
- Maintain a similar composition, structure and extent of plant and animal communities at the landscape scale.
- Restore degraded animal and plant communities (where appropriate through manipulating fire regimes).
- Manage alien plant invasions (where possible by avoiding burning practices that encourage alien invasions).
- Facilitate alien plant control (where appropriate through applying appropriate fire regimes).

2.4.2 Water

- Maintain integrity of hydrological systems to support provision of good quality water for downstream users (by maintaining good basal cover through appropriate burning regimes)

2.4.3 Erosion

- Minimise erosion risk (by maintaining good vegetation cover and controlling the timing and extent of fires).

2.4.4 Cultural Heritage

- Manage cultural (archaeological, historical and living heritage) sites (by burning fire breaks around key sites, vegetation management, appropriate fire-proof structures)
- Protect/conserve living heritage where appropriate (by preventing burning of sacred forests).

2.4.5 Wilderness

- Maintain wilderness integrity and character (through minimising visual impact of firebreaks, and using wilderness-appropriate equipment).
- It is recognised that fire is an essential management activity in Wilderness.
- Where possible, block burns should take the place of firebreaks in Wilderness.
- Arson fires in Wilderness must be managed or controlled generally by using direct attack (beating). Back burns can only be used as a last resort.
- Lightning fires in Wilderness must be left to burn unless they threaten infrastructure, peoples' lives or plantations on the boundary of the Park.
- Exclusion compartments or infrequent burn compartments have high scientific value and are compatible with Wilderness principles, provided the minimum tool concept is applied.
- The equipment that is used in Wilderness must be assessed in terms of the Wilderness principles (no mechanised equipment in Wilderness areas). No vehicles may be used to access Wilderness for fire management. The use of Gramoxone/Paraquat (herbicide) on firebreaks to prepare tracer lines is considered minimum tool in the Drakensberg Wilderness.

2.4.6 Infrastructure

- Reduce threat to infrastructure (by managing fuel load and placement of firebreaks)
- Building design and layout should minimise impact on fire processes *e.g.* fire spread in landscape, need for additional firebreaks.

Note: Design infrastructure, especially roads, to minimise impact on natural fire behaviour and fire processes e.g. fire spread in landscape, the need for additional firebreaks and hence a larger portion of the Park burnt annually.

2.4.7 Research

- Maintain long-term research trials (by appropriate planning for arson fires and implementing scheduled burns).

2.4.8 Conservation Targets for the Park

Vegetation types and plant and animal species for which the Park is essential, in order to meet provincial and district conservation targets in South Africa and Lesotho respectively:

- Cool Moist Highland Sourveld

- Montane Podocarpus Forest
- Northern Cool Moist Transitional Tall Grassveld
- Northern Montane Veld
- Southern Cool Moist Transitional Tall Grassveld
- Southern Montane Veld
- Natal Spiny Reed Frog (*Afrixalus spinifrons intermedius*)
- Long-toed Tree Frog (*Leptopelis xenodactylus*)
- Wattled Crane (*Bugeranus carunculatus*)
- White-winged Flufftail (potential habitat) (*Sarothura ayresi*)
- Three-coloured Red Millipede (*Centrobolus tricolor*)
- Southern Black Millipede (*Doratogonus meridionalis*)
- Montane Black Millipede (*Doratogonus montanus*)
- Midlands Dwarf Chameleon (*Bradypodion thamnobates*)
- Cape Vulture (*Gyps coprotheres*)
- Drakensberg Cycad (*Encephalartos ghellinckii*)
- Cloud Protea (*Protea nubigena*)
- *Hesperantha woodii*
- *Kniphofia albomontana*
- *Kniphofia brachystachya*
- *Kniphofia breviflora*
- Alpine Montane Veld
- Wetlands
- Oribi (*Ourebia ourebi*)
- Cream-spotted Mountain Snake (*Montaspis gilvomaculata*)?
- Bearded Vulture (G*ypaetus barbatus)*
- Eland (*Taurotragus oryx*)
- Mountain reedbuck
- Grey Rhebuck

3 SUMMARY OF ECOLOGICAL IMPACTS OF FIRE

This section is a summary of the Fire Best Practice for the Maloti Drakensberg Bioregion (Uys *et al*. 2006), and readers are encouraged to read the full text thereof.

The reality of today's human dominated landscapes is that ecological processes need to be managed to ensure biodiversity conservation. Fire is one of the most important ecosystem drivers requiring management to maintain the biodiversity of the Drakensberg ecosystem. The fire requirements of the fauna and flora of the area are very diverse. This

poses an incredible challenge, because while single species management may be critical to ensuring the survival of a species of special concern, specialized management regimes may well negatively influence other species or ecosystem processes. Instead, we need to identify management strategies that are general enough to be easily applied and support the majority of species and ecosystem processes.

Fire is a natural feature of the bioregion and the fauna and flora appears to have either evolved to tolerate being burnt or avoid fire by making use of natural fire refugia. In line with this, current thinking suggests that we should aim to mimic “natural” fire effects as far as possible. This includes defending and promoting sufficient fire refugia to maintain representative populations of fire-sensitive species. Fire refugia need to be identified according to natural features of the landscape that would promote fire protection, so making them practical to maintain. Considering the difficulty in excluding fire from this landscape, refugia should also be selected for protection to fulfil specific, clearly stated, objectives. Despite their considerable management challenges, fire refugia are nevertheless essential for maintaining the full complement of diversity in this bioregion and need to be given a high priority.

Outside of fire refugia, we can only guess what the “natural” fire regime might have been across the broader landscape. Nevertheless, it is believed that we can get close to a “natural” fire regime if we generate heterogeneous, patchwork fire mosaics across the landscape. This means varying the frequency / time-since-last-burn, season and extent of burns to generate a wide enough range of burn conditions over varying areas to support the full complement of biodiversity in the bioregion. The range of frequencies, seasons and fire extents will vary according to the communities and environment, but still with the aim of generating a fire mosaic in space and time.

Under natural conditions, fire frequency is primarily determined by the rate of grass fuel / biomass accumulation. This differs with environmental conditions (mainly rainfall and available heat for growth), meaning that high production areas should be burnt more frequently. The season of burn is primarily determined by the availability of sources of ignition. Considerable speculation has gone into guessing when most fires occurred, but the general consensus seems to be that late winter / early spring would have been the peak fire season. This has long been recommended by agriculture and remains the preferred burning time. There are, however, some suggestions that limited “out-of-season” fires are required to maintain the full complement of biodiversity. Our understanding of the biology of most of the species in the bioregion (particularly the invertebrates) is

unfortunately too poor in many cases to provide informed recommendations of how extensive these “out-of-season” fires should be.

The extent of natural fires is primarily determined by the weather conditions and topography, although the amount and conditions of the fuel as well as the extent of ignitions play a leading role. In addition to requiring fire heterogeneity across time (*i.e.* a range of times-since-last-burn), organisms also require spatial heterogeneity in the extent of burns. As the fauna of the bioregion have a wide range of habitat requirements and dispersal abilities ranging from those of invertebrates to large antelope, a broad range of fire patch sizes is required to support their full range of diversity. While this is a far easier concept to write about than to achieve on the ground, we need to include patchiness into management strategies and targets at least at coarser landscape scales. Wherever possible patchy block burns should also be encouraged to create finer-scale patchiness.

In summary, management regimes need to be tailored according to the environment, risk management requirements and resources at hand. More importantly though, we need to work towards clearly identifying biodiversity objectives for the park, and then developing fire regimes to assist in meeting, or at least not compromising, these objectives. The success with which we meet these objectives needs to be monitored and fed back into developing adaptive management strategies. The starting point of this monitoring needs to include establishing baseline information against which to measure our conservation success. Considerable research is also required to improve our understanding of fire effects on the biodiversity and ecosystem process of the bioregion. This research needs to combine with the monitoring to revise objectives and update management interventions.

4 PRESENT PHILOSOPHY

Ecological processes need to be managed to ensure biodiversity conservation. Fire is one of the most important ecosystem drivers requiring management to maintain the biodiversity of the Drakensberg. The fire requirements of the fauna and flora of the Drakensberg are very diverse and this poses a challenge to managers. Management strategies need to be identified, which are general enough to be easily applied and support the majority of species and ecosystem processes.

The philosophy detailed below was developed in the late 1990s. A series of workshops was held to review the effects of fire on fauna and flora in the Drakensberg during 2005

(Uys, 2005) essentially confirmed the existing burning philosophy of the Park. This philosophy is detailed below.

Fire is a natural feature of the bioregion and the fauna and flora appears to have either evolved to tolerate being burnt or avoid fire by making use of natural fire refugia. Therefore fire management should ensure the protection of sufficient fire refugia to maintain representative populations of fire-sensitive species and should generate a patchwork of heterogeneous fire mosaics across the landscape. This means varying the frequency/"time-since-last-burn", season and extent of burns to generate a wide enough range of burn conditions over varying areas to support the full complement of biodiversity in the Park.

In order to achieve this, four principles have been adopted. These are:

- Variability
- Responsibility
- Flexibility
- Patchiness

It is generally agreed that burning at any time, when perennial grasses are dormant, is acceptable. Burning when grasses are in active growth is less acceptable, but a limited amount of early (pre-frost, autumn) burning to achieve specific objectives, provided it is not repeated successively in the same area, will be permitted under strict control. Where relevant, the frequency of burning should be decreased from every two years, to cater for plants and animals that are less fire tolerant.

4.1 Variability

It is argued that restriction of burning to a narrow window period *i.e.* late winter and early spring, cannot be 'natural' and that this restriction is unlikely to facilitate the long-term conservation of biodiversity. Here we recommend **variability**, the objective being to apply fire at different times and intervals rather than monotonously.

4.2 Responsibility

Accepting that burning outside of the prescribed period, particularly when grasses are not dormant, may have detrimental effects on water production, the **responsibility** watchword must apply. While occasional burns before frost induces dormancy may be justifiable for a number of reasons, frequent or repetitive burning during the growing season will not be permitted.

4.3 Flexibility

The general burning recommendations, which have been applied in recent years over much of the Drakensberg, include a biennial burning interval. Research into ground-nesting birds and small mammals supports this interval to a large extent, but make no allowance for short seasonal variation or longer cyclic variation. While a biennial system may well be the most practical to follow in most of the Drakensberg grasslands, this should not be done slavishly. Response to prevailing conditions and the likelihood of achieving burning objectives should introduce **flexibility** and enhance variability.

4.4 Patchiness

The patchiness principle applies to the landscape level (mosaic of burnt and unburnt compartments) and at a local scale within a compartment (mosaic of burnt and unburnt patches).

The more extensive the burn, the greater the impact on the availability of food and cover for animals, and the longer it will take to re-colonise from unburnt areas. By burning smaller areas and varying the seasons of burn, a mosaic of burnt and unburnt areas will be achieved, which will mitigate against the impact of large burnt areas.

With current financial and practical constraints in mind, managers should follow a guideline of achieving *patchiness*. "Clean" burns, covering hundreds or even thousands of hectares, should be avoided and the aim should be to leave refuge sites within the burnt areas. Patchiness is more likely to be achieved by a "cool" burn than a "hot" one. Cool burns are more likely when humidity is high, wind speed is low and the ground is moist.

4.5 Summary

In essence, research results indicate that "ideal" species composition and grass vigour are maintained by spring burning at regular intervals, usually taken to be biennial. Small mammal populations and species richness are also favoured by regular burning and both start to decline after about three years without fire. Ground-nesting birds are similarly affected. Small antelope (*e.g.* Oribi) are adversely affected by the winter bottleneck, whereby perennial grasses lose their palatability and nutritional value in winter and are favoured by an early (autumn) burn, which stimulates new growth just before grass dormancy. Insect fauna associated with *Protea* communities are adversely affected by frequent burning.

The cool moist grasslands should be burnt biennially in the dormant period, with spring burning being favoured. Grass dormancy is initiated by the onset of frost and broken when ground temperatures remain above freezing. Therefore it is acceptable to burn at any time between the onset of frost and the advent of warmer weather at the end of winter. It is not necessary to wait for rain or significant moisture prior to burning, especially as this is not a production system with a large biomass of grazers impacting on the grass re-growth. Many woody plant species are not fire tolerant and excessively frequent hot fires may eliminate whole communities. Less frequent burning benefits the evergreen communities. The Compartment Attribute Table for the Maloti Drakensberg Park World Heritage Site still needs to be developed.

5 HISTORY OF FIRE IN THE UKHAHLAMBA DRAKENSBERG PARK WORLD HERITAGE SITE

5.1 History

The fire-climax grasslands and fire adapted plants of the Drakensberg are evidence that fire has been a primary factor in shaping the biotic environment. Man has used fire in southern Africa for over 100,000 years and fire has been applied by the various land managers/users in the Park for the past few thousand years. Over the past 2,000 years, the land managers/users have been the San hunter-gatherers, the settler pastoralists, the Department of Forestry, to the present-day conservation authority (initially the Natal Parks Board and currently Ezemvelo KwaZulu-Natal Wildlife). Overall, the records suggest that fire was applied over an extended season and at greater frequency than what is currently scheduled.

The San were hunter-gatherers, who used fire to burn off dry grass and stimulate the growth of fresh green material to attract animals to suitable killing grounds. It is unknown how frequent or widespread the burning may have been. The use of fire by the settler pastoralists was more prevalent than that of the San, and they applied some fire in autumn to promote a green flush to carry their cattle though winter. The result would have been that larger areas were burnt than before.

In South Africa both the Department of Forestry and the Natal Parks Board tried to apply a natural fire regime. In the absence of man, the only natural source of fire is lightning. Although lightning strikes are very common in the Drakensberg, records indicate that very few veld fires are started by lightning and most of these are extinguished by the rain, which usually accompanies thunder storms. In the absence of a “natural” fire regime, both authorities based their fire management decisions on achieving the objectives of

maintaining the water supply coming from the mountains and conserving the biodiversity in the mountains. It was recognised that fire was a principle management tool to achieve these objectives.

With the proclamation of Giant's Castle Game Reserve, under the management of the Natal Parks Board in the early 1900s, the emphasis was to conserve eland and other antelope. Widespread autumn burning was practised to provide winter feed for the antelope and for the cattle and horses (which were kept by the staff) as well as to reduce damage to woody plant communities. In later years, burning in additional portions of the Drakensberg managed by the Natal Parks Board, was carried out at all times of the year. Spring burning, to remove moribund plant matter and stimulate an early flush, was widely practised. The scheduled guidelines in the Natal Parks Board areas in the 1980s were biennial autumn burns below the cave sandstone layer and biennial spring burns above the cave sandstone layer.

The philosophy of the Department of Forestry in the 1960s ranged from total protection of forest to the annual or biennial burning of grasslands. Compartments were given fuel reduction burns according to the requirements of the dominant vegetation. Burning took place in early winter, mid-winter and spring, based on the best available information constrained by the practical limitations of controlling fire. Research on the effects of fire on Montane and Sub-Alpine Grasslands in the 1980s greatly improved understanding with respect to the application of fire. There was a shift to later burning, with emphasis on spring burns. Fire frequency was generally annual or biennial and long intervals between burns were unusual. The earlier research on burning in the State Forest managed sections of the Drakensberg had a strong agricultural bias and was focused on the grassland component of the vegetation. Some research was done on the impact of fire on animal life in the Natal Parks Board managed sections of the Drakensberg. The above research has guided our present philosophy of fire management. There are in excess of 60 publications and reports arising from research into the effects of fire, which have been conducted wholly or partially within the boundaries of the Park.

Lesotho has distinctive wet and try season which favours regular fire. The wet season stimulates growth, while dry season provides ideal conditions for burning. The rangelands of Lesotho were burnt intentionally annually in late summer to increase the grazing potential of the grass and not as a conservation measure. In most parts of Lesotho, uncontrolled fires-started deliberately by livestock owners or herders or accidentally by travellers are common than managed burning of the grassland (Chakela, 1999). The

savages[1] were in the habit of setting fire to the grass with object of fertilizing the soil and thereby improving quality of grazing (Germond, 1967). Historically the use of fire in Lesotho was controlled by traditional authorities, who restricted its use to certain planned occasions and events such as hunting. According to FAO 2007, early human being and fire played significant role in shaping the environment in Africa, for hundreds of thousands of years ago. Therefore one could come to the conclusion that people are also in a way the natural cause of fire in Lesotho. Fires were often left unattended thus negligence is the most common cause of fire in Lesotho.

The **arson fire**[2] in Sehlabathebe national park was influenced by local population. They were not satisfied by the ownership of the park. Their belief was that the park belongs to the state and all profits never rich them.

5.2 Legislation

It is evident that the Park had a long history of varied fire treatments, before restrictions were imposed from 1983 by the Conservation of Agricultural Resources Act: No. 43 of 1983; the Forest Act: No. 122 of 1984; the National Veld and Forest Fire Act: No. 101 of 1998 and the National Environmental Management Act: No. 101 of 1998.

Historically, agricultural prescriptions were used to guide fire management decisions but more recently it has become clear that strict compliance with the regulations of the Conservation of Agricultural Resources Act: No 43 of 1983 and the National Veld and Forest Fire Act: No. 122 of 1984 do not meet the needs of biodiversity conservation. The Conservation of Agricultural Resources Act: No 43 of 1983 makes provision for regulations governing veld burning in various biomes in South Africa. For the Cool Moist Grasslands, in which the Park falls, the regulations permit burning only in the months of August and September. The National Environmental Management Act: No. 101 of 1998, however, makes allowances for conservation organisations to apply the necessary management actions to achieve biodiversity objectives. These actions include decisions to burn when necessary to achieve biodiversity conservation objectives.

5.3 Fire Management Application

[1] **Savage** is an uncivilized or feral human; a barbarian.

[2] **Arson fire** is the crime of intentionally or maliciously setting **fire** to structures or wildland areas

5.3.1 Firebreaks

In South Africa firebreaks were first burnt by the Department of Forestry and the Natal Parks Board. The Department of Forestry hoed their tracer lines, of which the scars are still visible. Only later did they switch to the use of Gramoxone, which is still used today to spray tracer lines demarcating the outer limits of the firebreaks. These tracer lines are burnt as soon as the grass becomes desiccated but prior to frosts drying out (curing) the rest of the grass. Pertaining to Lesotho, the burning of firebreaks was the responsibility of the Department of Conservation previously.

Currently in South Africa and Lesotho, firebreaks are burnt by Ezemvelo KZN Wildlife and the Department of Environment (Parks Division) respectively.

5.3.2 Fire exclusion compartments

The Department of Forestry and the Natal Parks Board set aside compartments, which were excluded permanently, in order to answer several research questions such as plant succession and species diversity in the absence of fire. There are a small number of fire exclusion compartments in the Park, dating back in some cases over 30 years. These are maintained as evidence or witness stands of plant succession in the absence of fire. Currently, on the Lesotho side there are no compartments excluded from fire, due to no research interest. However in SNP an area exists that is excluded from fire around the entrance gate, because of the presence of *Leucosidea* species.

5.3.3 Infrequent burn compartments

Some areas within the UDP WHS section of the TP, for example areas of Montane Fynbos that are naturally protected from frequent burning have been set aside as infrequent burn compartments, for the development and maintenance of such communities. These areas are further protected by strategic firebreaks, but management does not extend much beyond this. In general, only lightning-induced fire will be tolerated and all other fires will be extinguished.

These compartments were categorised as such in response to the lack of understanding of the dynamics of Montane plant succession in the absence of fire, but with the knowledge that it is unlikely that these communities would evolve or be maintained in the Drakensberg under a biennial spring burn regime. At this stage no specific areas have been set aside as infrequent burn compartments within the SNP area of the TP. Areas to for possible setting aside will be assessed.

5.3.4 Compartments containing sensitive features

Compartments containing sites or features which might warrant very specific fire management are identified in the Fire Compartment Register. Such sites include rock art, animal breeding sites, historical sites and particularly susceptible plant communities. Management may involve fire exclusion or careful application and this will vary from site to site. All sensitive sites must be described and fire management prescriptions detailed in the Compartment Attribute Table (CAT). The CAT with sensitive areas will be developed for the TP.

5.3.5 Information Management and Planning

Fire records are available from fire management during the Department of Forestry and Natal Parks Board management regime and are currently collected and maintained by Ezemvelo. Fire events are recorded in the field and captured into a Geographic Information System, which contains all available historical data and which will be updated annually from current fire forms. Joint annual fire workshops are held to plan the burning programme for the year and to review the management philosophy periodically. Records from these meetings are available. Historical fire management records are kept by the Department of Environment (Parks Division) and SNP. These include hard copy reports and maps with metadata. To enhance planning, the MALOTI DRAKENSBERG PARK WORLD HERITAGE SITE will investigate the incorporation of the SNP fire management data in the existing GIS systems used in planning by UDP WHS.

6 FIRE BEHAVIOUR

6.1 Principles of combustion

Controlling the elements (fuel, oxygen and heat) that give rise to fires is key to manipulating fire in order to achieve the desired goals and objectives of conservation management. Fires occur when the sun's energy fixed in plants through photosynthesis is released in the presence of oxygen and catalysed by an ignition temperature, to produce heat by combustion.

Photosynthesis: $CO_2 + H_2O + \text{Solar Energy} \rightarrow (C_6H_{10}O_5)n + O_2$

Combustion: $(C_6H_{10}O_5)n + O_2 + \text{Ignition Temperature} \rightarrow CO_2 + H_2O + \text{Heat}$

Three elements are therefore required for combustion to occur: **fuel** [$(C_6H_{10}O_5)n$], **oxygen** (O_2) and **a source of heat** (ignition temperature) [Figure 3].

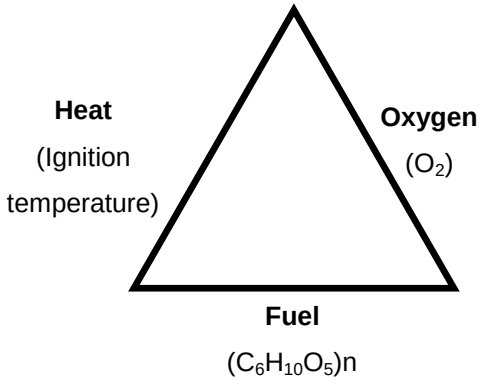

Figure 1. The fire triangle, showing the three essential elements necessary for combustion.

The ignition temperature serves a catalytic role, starting and maintaining the combustion process. The initial energy required to reach the ignition temperature is provided by an external source of ignition such as a glowing cigarette butt, flaming match, lightning strike or sparks from power lines or falling rocks colliding. Once enough heat has been provided to reach the ignition temperature of the fuel, the combustion of fuel produces further heat to maintain the fire. If the heat produced by the combustion of the fuel drops below the ignition temperature, the fire will go out. Putting *water* onto the fire reduces the amount of available heat being produced by combustion to maintain the ignition temperature and so can end the chemical reaction and extinguish the fire.

Once started, the chemical reaction of combustion relies on the presence of fuel and oxygen to continue. If either the fuel or oxygen is removed from the fire, there will be a break in the chemical reaction and the fire will be put out. Air contains 21% oxygen. By reducing this to 15%, the fire will be extinguished. This is what happens when we reduce the availability of oxygen to the fire by *beating the fire* or *throwing sand* on it.

To maintain the chain reaction of combustion, the fire needs to transfer enough heat energy to the adjacent plants to raise them up to their ignition temperature before they will ignite. This transfer of heat to plants and their subsequent combustion occurs in three phases (Figure 4):

- **Phase 1: Preheating Phase** – Fuels ahead of the flame front are heated to their ignition temperature, driving off of their moisture and in so doing generate flammable hydrocarbon gases.

- **Phase 2: Gaseous Phase** – The gases generated by the preheating phase ignite and *flaming combustion* occurs.

- **Phase 3: Combustion Phase** – The gases burn off and the remaining charcoal is consumed by *glowing combustion*, leaving a small amount of ash.

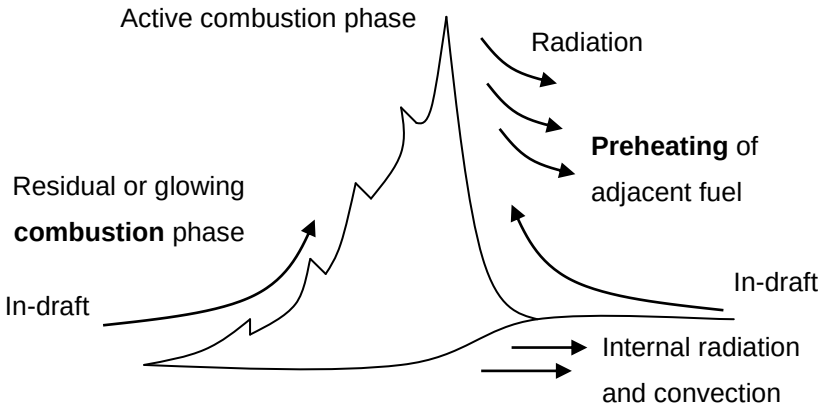

Figure 2. Flame profile of a fire on a horizontal surface with no wind, indicating the region of preheating, flaming combustion and glowing combustion.

The amount of heat energy released during the flaming and glowing phases of combustion is determined by the type of fuel being burnt. Heavy fuels with low flames generally release a large proportion of their heat energy, albeit at a slower rate, via glowing combustion. Conversely, light fuels (*e.g.* grass) release the majority of their heat energy during the flaming combustion.

These three phases of combustion overlap and occur simultaneously during a fire, but are easily recognised as three characteristic zones in a fire. In the first zone the leaves and other fine fuels curl and are scorched by the preheating of the oncoming flames. This is followed by the flaming zone of burning gases, which is followed by the third but less conspicuous zone of burning charcoal.

6.2 Fuel dynamics

The characteristics of the plant material being burnt influence the flammability (potential to burn) of the fuel, the intensity (heat energy released) of the fire, and the duration of the fire.

6.2.1 Particle size

Plant fuels may be divided into two broad types according to the ease with which they ignite, namely: fine fuels (plant material with a diameter ≤6mm) and heavy fuels (diameter >6 mm). Fine fuels include grass, small branches and thin leaves. These have a high surface to volume ratio and therefore dry very fast and need little heat to ignite. Fine fuels

burn very readily (*e.g.* grassland) while combustion of heavy fuels may be incomplete (*e.g.* tree trunks). If there is not enough fine fuel available, it may be difficult to achieve a successful burn. This emphasises the need for sufficient grass to achieve a hot enough fire to burn woody vegetation.

6.2.2 Fuel load

Fuel load (total mass of fuel per unit area) is a major contributor to fire behaviour accounting for between 30-60% of the variation in intensity between grassland fires. The total amount of heat energy available for release during a fire is related to the quantity of fuel - *i.e.* the greater the fuel available, the more intense the fire (Figure 5). The rate of accumulation of grassy fuels is linearly related to rainfall across southern Africa, but becomes limited by the colder climate at higher altitudes within the Park.

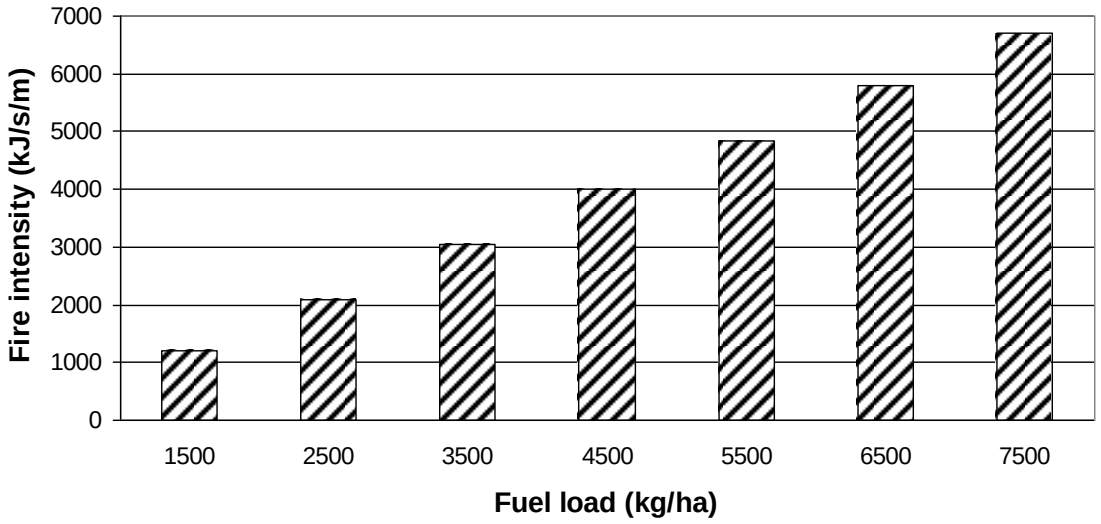

Figure 3. Effect of fuel load on fire intensity

6.2.3 Compaction

When fuel is tightly packed together (*e.g.* in a moribund grass sward) there is little space for air between the material. Compacted fuels therefore dry slower, retaining their moisture, and need greater preheating temperatures to get them to ignite. The reduced oxygen availability also means that compacted fuels burn slower. Combustion is optimized when the fuel is sufficiently loosely packed to allow adequate amounts of oxygen to reach the flame zone, but dense enough for efficient heat transfer to occur.

6.2.4 Distribution

The vertical distribution of plant fuels relates to the type of fire they support. There are three broad categories, namely:

- **Ground fuels** – which include all combustible material below the loose surface litter and comprise decomposed plant material (*e.g.* peat) that is often tightly compacted. These fuels support glowing combustion and although are very difficult to ignite, are very persistent once they get going.

- **Surface fuels** – that comprise standing grass swards, small shrubs, forbs and loose surface litter like fallen bark, leaves and twigs. These are generally fine fuels that support intense surface fires.

- **Aerial fuels** – that include all combustible material in the understorey and upper canopy of tree and shrub communities. This type of fuel can support crown fires, but the fires are generally less intense than ground fires as heavy fuels make up most of the aerial fuel.

6.2.5 Moisture

Fuel moisture affects the ease of ignition, the amount of fuel consumed, and the rate at which the fuel is consumed. Water vapour leaving the fuel dilutes the oxygen in the air surrounding the fuel and has a smothering effect on the fire. Thus the higher the moisture content of the fuel, the less intense the fire (Figure 6). A sustained flame is required to ignite dead grass with moisture content above 15%. Ignition becomes progressively easier as the moisture content drops and below 6%, and only very small embers and hot particles are capable of igniting dry grassy fuels. Maximum fuel combustion of dormant winter grass occurs with a fuel moisture content of less than 40%.

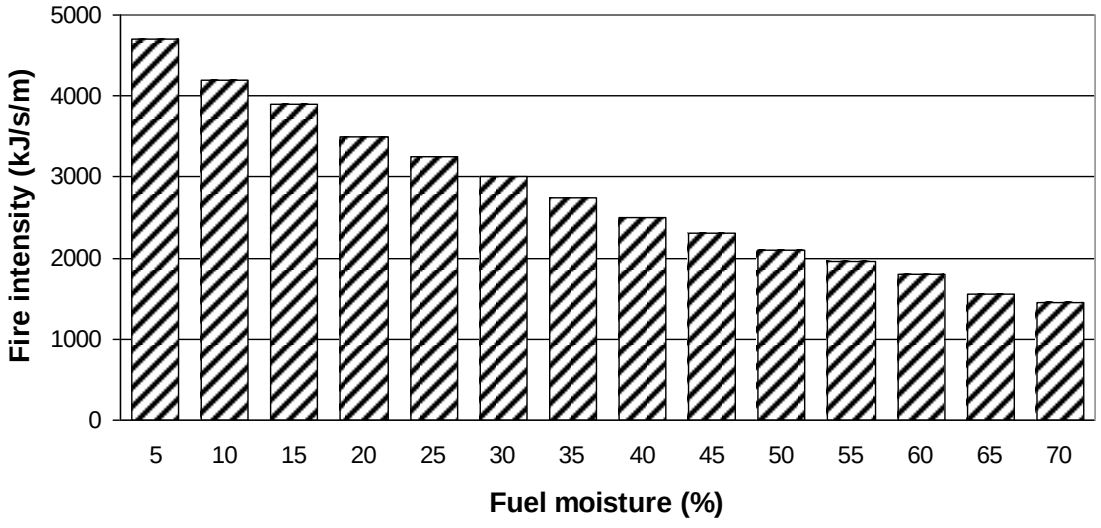

Figure 4. Effect of fuel moisture on fire intensity

6.3 Atmospheric and physiographic influences

6.3.1 Air temperature

Air temperature directly influences the fuel temperature and therefore the amount of heat energy required to raise the temperature of the fuel to its ignition point. Air temperature also influences the relative humidity of the air and therefore the evaporative moisture loss from fuels. Research has suggested that to ensure that fires are reasonably safe (≤ 3500 kJ/s/m), air temperatures should not exceed 30^{o}C at the time of burning.

6.3.2 Relative humidity

Relative humidity of the atmosphere influences the moisture content of the fuel when it is fully cured (dry) and therefore has a negative effect on fire intensity, especially when the fuel moisture content is <40% (Figure 7). Relative humidity is highest in the morning, around dawn, and lowest in the afternoon; meaning that it is safest to burn at night or early in the day. As a rule of thumb, relative humidity doubles with every 20^{o}C decrease in temperature and is halved with every 20^{o}C increase in temperature. Experience has shown that fires are more difficult to control when the relative humidity is less <30%.

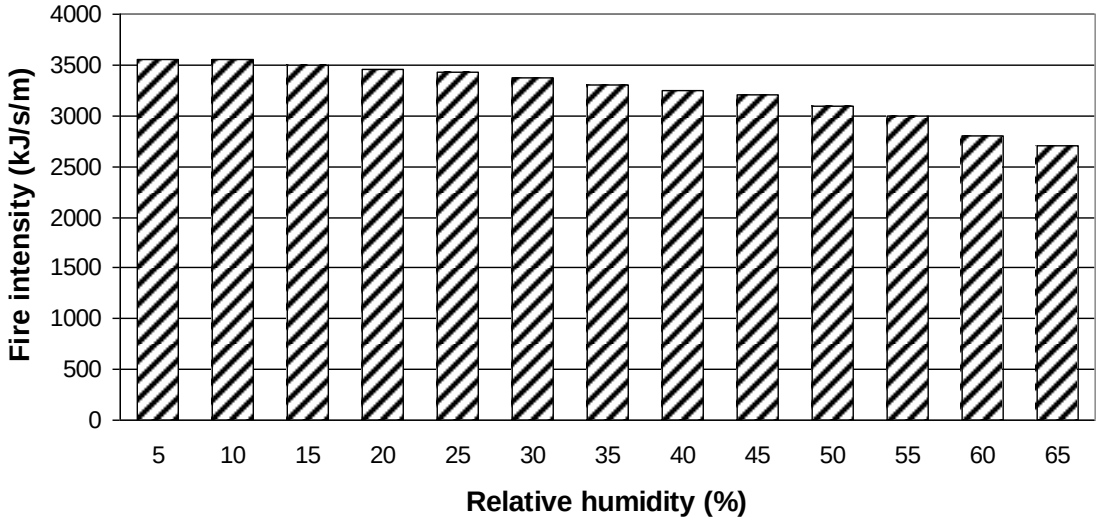

Figure 5. Effect of relative humidity on fire intensity

6.3.3 Precipitation

In Africa precipitation is mostly in the form of rain, but can also come as dew, heavy fog, or snow. Like the air humidity, precipitation increases the moisture in the fuel to levels at which fires will not burn. Conversely, dry winters and droughts increase the potential for fuel to ignite.

6.3.4 Wind

Wind increases the provision of oxygen to the fire front and thereby affects the rate at which fuel dries ahead of the fire front preparing it for ignition. Wind speeds ranging from 0m/s to 3.6m/s exponentially increase the rate of spread of head-fires by preheating the fuel to be burnt, but do not affect the rate of spread of back-fires. If the wind speed gets too strong (>50km/h or >13.9 m/s), however, it reduces the rate of spread (even of head-fires) possibly because the flames are blown out. Wind speed has a negative effect on flame height; stronger winds blowing the flames flatter along the ground. Consequently, intense fires burnt during high winds may not necessarily affect aerial fuels and this explains why crown fires do not always occur during high winds. Wind direction determines the direction in which the back and head-fires will spread. Particularly in stronger winds, flying sparks and burning embers can cause spot fire ahead of the main fire front, so increasing the rate of spread. Although wind plays a significant role in influencing the fire intensity, it does not appear to be the dominant factor in southern Africa's grass-dominated (grasslands and savannas) ecosystems. Wind speed is usually reaches its maximum between 12:00 and 15:00, but this can vary with frontal activities and terrain. Berg wind conditions, in particular, can reach their maximum wind speed at any time of the day or during the night.

6.3.5 Terrain slope

Slope has a marked effect on the forward rate of spread of fires burning up a slope by increasing the degree of preheating of unburnt fuel immediately in front of the flames. This occurs, as with wind, by creating flames that burn at a very low angle ahead of the fire front in fires moving up slopes exceeding 20^{o} preheating the fuel ahead of them. This effect doubles from a moderate (0^{o} to 22^{o}) to a steep slope (22^{o} to 35^{o}) and doubles again from a steep to a very steep slope (35^{o} to 45^{o}). Conversely, burning down a slope decreases the rate of spread of surface fires and when burning at low wind speeds a head-fire can be converted into a back fire.

6.3.6 Aspect

Aspect plays an important role in fuel flammability in the Park, especially at higher altitudes where the valley sides become steeper, so pronouncing the shading effect. In the southern hemisphere, the sun shines predominantly on north facing slopes, with south facing slopes typically being cooler and wetter. Both this increases in the moisture content

of the fuel and the lower temperatures make ignition more difficult and so slow the rate of spread of fires.

6.4 Types of Fire

Fires are described according to the vegetation layers in which they burn (ground, surface and crown fires), according to whether they burn with the wind (head fires) or into the wind (back fires) and according to their position along the fire perimeter (flank and spot fires).

Ground fires – These fires burn in the organic material under the surface litter or below the surface of the ground and spread very slowly. In the context of the Park, ground fires may occur in peat lands or at higher altitudes where the soil has a high organic content due to slow decomposition rates.

Surface fires – These are fires that burn on the surface of the ground including litter, grass and brush (*e.g.* a grassland fire). Most fires begin as surface fires.

Crown fires – These fires advance through the canopies of trees and shrubs, usually in conjunction with surface fires. The vertical arrangement of fuel, the type of fuel and volume, as well as the height of the tree crowns will determine how easily crown fires can develop. Crown fires can thus be classified according to how dependent they are on the surface fire phase, namely:

- **Passive crown fire (intermittent crown fire)** – A fire in which only some of the trees catch alight and the rate of spread is controlled by the surface fire.
- **Active crown fire (dependent crown fire)** – A fire that advances with a well defined wall of flame extending from the ground surface to above the crown fuel layer. The development of these fires requires a substantial surface fire and thereafter the surface and crown phases spread together.
- **Running crown fire (independent crown fire)** – A fire that only advances in the crown fuel layer.

Head fire – A surface fire driven by wind and/or assisted by slope, driving the flame towards the fuel. These fires spread rapidly, travelling up to seven and a half times faster than back fires. The spread of head fires is much more variable than that of back fires. Similarly, head fires have much higher flame heights than back fires but their flame height is also more variable than that of back fires. In grasslands, fuels can be pre-heated so rapidly that large volumes of flammable gases do not mix sufficiently with oxygen to permit complete combustion, resulting in compacted lower layers of fuel remaining unburnt.

Back fires – These are surface fires that burn against the wind and/or down slope, with flames leaning backwards over the already burnt ground. Burning slowly forward in this

way leaves little residue behind. At ground level, back fires are hotter than head fires. Temperatures in both fire types are hotter at grass canopy level than at ground level, resulting in the greater flame heights of head fires producing more heat one metre above the grass canopy than back fires. Back fires produce less smoke than head fires and are generally easier to bring under control.

Note: Head fires are often referred to as **hot burns** due to their heat extending further above the grass sward canopy than that of back fires (**cool burns**). This terminology is misleading as all fires are obviously "hot" and back fires are in fact usually hotter at ground level than head fires.

Flank fire – A surface fire burning at a diagonal angle to the direction of the wind, intermediate to a head and back fire. These fires form on the edges of the burn, heading in approximately the same direction as the fire front. Changes in wind direction can change a flank fire into either a head or back fire at any point along the fire perimeter.

Spot fire – A fire that is ignited outside of the perimeter of the main fire or across a firebreak by flying sparks or embers that are transported by air currents, gravity or fire whirls. As spot fires sometimes jump across firebreaks they are also referred to as "jump fires". In the case of long distance spotting, burning embers are carried several kilometres from the main fire front, to ignite new fires far ahead of the main burning fires.

7 FIRE MANAGEMENT OPERATIONS

7.1 Planning

7.1.1 Pre-burn Inspection

Pre-burn inspection will involve site visit by Park Manager, Natural Resources Officer and Range Ecologist to review block objectives and sensitive features, how these are doing, and how fire will affect the achievement of these objectives *e.g.* do we need fire and if so under what conditions to achieve objectives or look after sensitive features, or should fire be excluded to achieve objectives.

The CAT will highlight subset of compartments that require more detailed investigation (pre-burn inspection) and the reasons therefore.

It is the Conservation Manager's (CMs) responsibility to organise a pre-burn inspection for each compartment in January prior to the sub-regional fire planning meeting taking place in February. This is a field-based inspection where Ecological Advice staff and the Senior

Conservation Manager (SCM) can be asked to assist. This requires reference to the CAT to ensure that the objective of the compartment is understood and still relevant prior to the assessment. The CM or Ecological Advice staff may invite any other fire experts where this will add value to the decision making process. Decisions pertaining to burning agreed to at the pre-burn inspection must be documented on the Fire Management Form supplied (Appendix 1). The form will indicate the compartment to be burnt, the specific objectives of the compartment, the objective of the fire and the recommended burning conditions to achieve these objectives. When contentious issues cannot be resolved in the field then the Ecological Advice Coordinator and the Biodiversity Conservation Coordinator must be called in to assist.

7.1.2 Sub-regional fire workshops

To take place in January each year combined with southern UDP-WHS management units; should have a field component and Park Ecologists must be present; coordinated by Senior Conservation Manager South uKhahlamba and Park Manager SNP, and venue to alternate between South Africa and Lesotho.

Key agenda items:

- Re-evaluate location and effectiveness of fire breaks
- Report on costs of break
- Proposed versus actual burns for previous season
- Post mortem on wildfire incidents, including lessons learned
- Compartment register inspection
- Planning for next year based on fire history and objectives
- Discussion of relevant recent publication/new equipment/new methods/legislation

SCMs are to hold a sub-regional fire workshop prior to the Annual Fire Workshop, which is held in February of each year. At the sub-regional fire workshop, CMs are to present a report back on the previous fire season. The report back should be completed in the required format as indicated in Appendix 2. At this workshop, CMs are also required to present their proposed scheduled burns for the forthcoming year. Appendix 3 is the format for the submission of proposed burns at this workshop. The frequency and season of burns are discussed with reference to the management unit's Fire Compartment Register and the CAT.

Recommendations from the sub-regional fire workshops are consolidated by the SCMs and prepared for the Annual Fire Workshop for presentation and approval.

Fire Compartment Registers are to be maintained by the CM. Only the approved Fire Compartment Register format may be used (Appendix 4). The Fire Compartment Register must be completed prior to burning with the proposed burns for the year. After the burn has taken place, the actual fire event needs to be recorded and the Fire Management Form completed and inserted into the Fire Compartment Register as soon as possible after the fire event. Accuracy is important when compiling these returns particularly when mapping the extent of burns. Fire Compartment Registers will be audited and signed by the SCMs at their respective sub-regional fire workshops.

All returns are to be submitted to the relevant SCM by 30 November each year, to be with the Regional Ecologist by 7 December each year.

The SCM will check the fire data sheets and ensure that all relevant information and maps are attached.

7.1.3 Annual Fire Workshop

The Fire Workshop is held in February each year and is organised by the Biodiversity Conservation Coordinator West uKhahlamba. Attendees include:

- UDP WHS CMs
- UDP WHS SCMs
- Ecological Advice
- Officer in Charge of Sehlabathebe National Park and relevant Support Staff

The Fire Workshop is to be held over two days. On the first day, formal presentations are to be given by invited guests or staff. Presentations can include information on the results of any research or studies that have been carried out relating to fire or any other fire related issues such as legislation, new fire fighting techniques or equipment. All East uKhahlamba Region CMs, Community Conservation Officers and Nature Conservation Officers are invited to attend for the first day of presentations. Any other issues such as Fire Protection Associations and Working on Fire Programmes may be included on the agenda of the first day.

The second day will consist of a report back by SCMs on the previous year's fire season. This is followed by a report back by the Regional Ecologist West uKhahlamba on the previous year's burning programme for the Park and a proposal by the SCMs on the

following year's burning programme. After the workshop, Fire Compartment Registers are inspected by the Biodiversity Coordinator.

Once the burning programme has been finalised and approved, the CM is responsible for ensuring that the burning programme is carried out in accordance with the agreed plan. The Fire Management Plan will be reviewed as a standing agenda item at this meeting.

7.1.4 Mid-season Review

To take place in August each year combined with southern UDP WHS management units; may include a field component and Maloti Drakensberg Park World Heritage Site Ecologists must be present; coordinated by Senior Conservation Manager South uKhahlamba and Park Manager SNP, and venue to alternate between South Africa and Lesotho. If there are large differences between planned and actual burns then review and change plans for the remainder of the season, guided by Park and block objectives.

7.1.5 Ad hoc Meetings

If large unplanned area burnt, then convene ad hoc meeting of the management team and any other experts to re-consider planned burns.

7.1.6 Infrequent Burn Compartments

This is a relatively new concept which has developed in response to our lack of understanding of the dynamics of Montane plant succession in the absence of fire, with the focus presently being on fynbos communities in particular. Based on knowledge of the Cape fynbos, the principle is that it is unlikely that these communities would evolve or be maintained in the Drakensberg under a biennial spring or frequent burn regime. Good examples of Montane fynbos are found in areas naturally protected from frequent burning and the intention is to foster development and maintenance of such communities wherever naturally protected areas are found. Where possible these areas will be protected by strategic firebreaks.

A number of infrequent burn compartments have been identified and more might be added to promote biodiversity at the landscape scale. Wildfires threatening infrequent burn compartments, other than lightning induced fires, must be suppressed.

7.1.7 Fire Exclusion Compartments

In these compartments fire will be excluded permanently. Firebreaks to protect these compartments must be treated as priority breaks and must be prepared early in the season. Any fire threatening or burning in such an area must be suppressed. There are a small number of fire exclusion compartments in the Park, dating back in some cases more than 30 years. These will be maintained as evidence or witness stands of plant succession in the absence of fire.

7.1.8 Wilderness Burning

It is recognised that fire is an essential management activity in the Park's Wilderness areas. Where possible managers should adopt a holistic approach to burning in Wilderness and block burns should take the place of firebreaks in Wilderness areas. The resultant burns would look more “natural” than the unnatural appearance of linear firebreaks. This is important as firebreaks impact on the sense of place, especially in areas zoned as pristine Wilderness.

Wildfires in Wilderness will be suppressed. Minimum tool principle will be applied with regards to wildfire suppression in Wilderness. Lightning fires in Wilderness areas must be left to burn unless they threaten infrastructure, peoples’ lives or sensitive features and fire exclusion areas. The equipment that is used in Wilderness areas must be assessed in terms of the Wilderness principles (no mechanized equipment in Wilderness areas). No vehicles may be used in Wilderness. The use of Gramoxone or *Paraquat* (herbicides) on firebreaks to prepare tracer lines is considered minimum tool in the Wilderness areas.

Where aircraft are deemed necessary by the SCM, then this is considered minimum tool.

7.2 Preparedness

7.2.1 Pre fire season Equipment Check and Audit

Park, Conservation and Resort Managers are to conduct a full inspection of all fire fighting equipment on an annual basis, using a standardized checklist. This must be signed by the Park, Conservation and Resort Managers by the end of March each year.

Fire extinguishers must be serviced annually and extinguishers and hoses must be inspected regularly

Items to be checked include:

- Fire extinguishers and high pressure fire hoses, which must be installed and maintained according to the SABS 10400 regulations.
- Fire extinguishers and high pressure hoses, which must be serviced in accordance with the SABS 1475 regulations on an annual basis.
- Fire fighting equipment such as fire beaters, knapsack sprayers, bakkie sakkies and water pumps, which must be inspected, repaired and serviced during April every year.
- Test emergency alarms and drills.

Conservation Managers or Park Managers in the case of SNP (CMs/PMs) are to ensure that permanent and contract staff has been adequately equipped with fire fighting protective equipment. It is also essential that a combined fire drill is held between conservation and hospitality staff in preparation for fire season. All staff should be familiar with the requirements of the drill and items such as contact numbers and keys to access equipment should be readily available at all times.

The Health and Safety of the MALOTI DRAKENSBERG PARK WORLD HERITAGE SITEis underpinned by the South African Regulation 2 (3) (b) of the Occupation Health and Safety Act: No. 85 of 1993, which states that safety equipment shall include as may be necessary, waterproof clothing, fire retardant or flame-proof clothing or any similar safety equipment of a type that will protect the employee from any injury. Regulation 109 of Labour Code Order No. 24 of 1992 which is a Lesotho legislation underpinning Health and Safety states that where any process carried out at a place of work or where the nature of the workers employment or any substance used is likely to cause a person bodily injury or impaired if health and these occurrences cannot be prevented by other means, he or she shall be provided with suitable and appropriate personal protective clothing.

7.2.2 Fire Danger Index (FDI)

UDP WHS and SNP accept that there will always be two separate processes in both countries regarding this section of the Fire Management Plan. Below are details of the two processes.

On the Lesotho side, the CM Garden Castle receives a radio notification of the FDI at 07h00 every day. In addition he receives an SMS message at 08h00. The CM Garden Castle or representative will radio the FDI category to Sehlabathebe at 07h15 every day

during the fire season (April – October). If the FDI is code Yellow, then the Park Manager will burn at his discretion; no burning will take place on Orange or Red days.

With regards to the UDP WHS, Chapter Three of the National Veld and Forest Fire Act: No. 101 of 1998 provides for the prevention of veld fires through a fire danger rating system. The Minister sets up and maintains the system, although he/she delegates his/her powers and duties to do so to an organisation with the necessary expertise. The content of the system and the factors to be taken into account when preparing it, are set out. A prohibition on the lighting of fires in the open air comes into force when the Minister warns the media that the fire danger is high.

CMs are asked to refer to Chapter Three of the National Veld and Forest Act: No. 101 of 1998.

Before any burning takes place, the Weather Bureau (082 2311 611) must be contacted on the morning of the fire event for the Fire Danger Index. CMs must join “Fire Stop” (033 3308 421). Fire Stop will send a daily SMS and e-mail notifications every morning and afternoon informing you of the current and predicted Fire Danger Index. CMs have to register annually with Fire Stop to receive a text message and e-mail forecasts. In an area with no cell phone coverage, the Weather Bureau (082 2311 611) needs to be contacted for information pertaining to the Fire Danger Index. For a five day forecast for the UDP WHS, CMs can phone 082 2311 602.

CMs must be aware of the Fire Danger Index prior to burning on a particular day. No burning is to take place if the FDI is unknown, or if the Fire Danger Index is in the orange or red.

On 8 July 2005, the Director of Forestry Regulation published regulations in terms of the National Veld and Forest Fire Act: No. 101 of 1998 providing for a National Fire Danger Rating System, which applies to the entire country. The regulations provide for the structure and formula, fire danger rating, fire danger regions and threshold values and provides for the delegation of the communication of the fire danger rating to the Weather Bureau. It is important for Managers to be aware of the Fire Danger Rating System and to have a copy of these regulations for the purpose of Fire Management Operations (refer to 8.1.3). Burns are allowed during periods where the index colour is blue and green. No open-air fires are allowed during orange and red periods. During yellow periods only fires authorised by the Fire Protection Officer (where a Fire Protection Association exists) or the Chief Fire Officer are allowed, unless those fires are in designated fireplaces. The

National Veld and Forest Act: No. 101 of 1998, Section 10(2) is quite clear that where a warning has been published that fire danger is high, *no person* may light, use or maintain a fire in the open air. The Act does not make allowance for exceptions or exemptions.

With respect o burning firebreaks, Section 12(4) provides that a landowner may not burn a firebreak, if a warning has been published because the fire danger is high in the region. An exemption exists in Section 12(10), which provides for the possibility of a fire protection association making different rules for the burning of firebreaks if those rules are approved by the Minister (refer to 2.1.3 above).

7.2.3 Communications (Equipment & Protocols)

Effective communication is essential to the safety of staff during all fire management operations. Every CM/Park Manager is responsible for ensuring the maintenance of the management unit's radio equipment. All radio equipment will undergo an annual maintenance check. This will include the following; handheld, base and mobile radios and radio repeaters.

CMs/PMs are to ensure that:

- Handheld radio batteries are kept fully charged.
- A spare battery is kept fully charged.
- The aerial is in good condition.
- Mobile and base radios in vehicles and houses/offices are correctly installed, aerials are functional and aerial cables and connections are not damaged.
- Power units and back up batteries are fully functional.
- Radio repeater sites are inspected to ensure that aerial cables, aerials, battery connections and that batteries are fully functional.

In addition, CM/Park Manager must:

- Where applicable investigate cellular phone boosters at offices to improve telephonic communications.
- Report TELKOM/ Econet Telkom Lesotho (ETL) lines promptly if faults are detected. Faults are to be reported to 10217.
- Ensure that mobile radios are installed in Official vehicles and personal vehicles on the Motor Vehicle Allowance scheme.
- Have a handheld radio with them *at all times*.

- Adhere to radio protocol at all times. Radio communications have been established for the efficient transaction of official business between staff in the field.

7.2.4 Visitor safety

Notice to Visitors - Burning in Progress" signs are to be prominently displayed outside the reception area or offices informing visitors of scheduled burns that are due to take place and arson fires currently occurring. It is advisable to make a map available so that the visitors can see where the burning is taking place.

Overnight hikes: Hikers are asked to take time to complete the Mountain Rescue Register correctly and in detail. It is often the only information a rescue team has to refer to if there is an incident. Day walks: Hikers are to fill in the Day Walk Register where there are Conservation and Resort Managers available. The completion of both of these registers is important in the case of a wildfire, so that staff may react immediately to go in search of hikers in the vicinity of a wildfire. Conservation and Resort Managers are to ensure that these registers are checked on a daily basis, preferably late afternoon, to see if visitors have signed out or have not returned.

TAKE CARE IN THE MOUNTAINS: Brochures must be distributed at gates and must also be available at the Mountain Rescue Register as this contains vital information to visitors on the prevention of wild fires and actions to be taken when threatened by fires.

7.2.4.1 Radio Protocol

The following basic rules must be adhered to at all times.

- Radio transmissions should be short and concise.
- Confidentiality of radio transmissions must be respected at all times.
- Unofficial conversations between radio operators are not permitted.
- Radio communication should not be used for personal matters unless in an emergency.
- Radios, especially at outposts, are only to be used at pre-determined call-up times. This is to reduce radio traffic, for example: call-up times at 06h00 and 18h00.
- CM to supply a list of relevant call signs for his management unit.
- Call signs are to be used and not names.

- A temporary radio call sign will be allocated to each radio in use at the management unit being visited, *e.g.* for external researchers.
- Before transmitting, the radio operator shall ensure that no other radio conversations are in progress. If so, wait until the radio communication has been completed.
- The CM will provide any training that is required for radio users, whilst on his management unit.

7.3 Budget process

Fire is the key determinant of biodiversity and fire management is the most important management activity undertaken in the Park and is also a major safety issue. Therefore, budgets for fire management need to adequately provide for all components including planning, firebreaks, preparedness (staff, PPE, vehicle running costs and acquisition and maintenance of other fire fighting equipment), fire fighting and monitoring. Actual expenditure is inherently unpredictable because of weather conditions and the extent of arson fires, so it is important that there is a centralized budget to cover eventualities.

On the SNP side the Park Manager is responsible for calculating the budget required in September each year, and for submission of this information and associated motivation to the Deputy Director in Maseru who will submit the budget requirements in October. On the UD WHS side the Budgets are completed with the Financial Manager during January of each year.

7.4 Protective Equipment/Clothing

To ensure compliance with the South African Occupational Health and Safety Act: No. 85 of 1993 and the Lesotho Regulation 109 of Labour Code Order No. 24 of 1992, CM and PM are to ensure that all staff are issued with at least the minimum required appropriate PPE. The following is a list of the scheduled requirements to ensure compliance with the abovementioned Health and Safety regulations:

- 100% cotton overalls. No nylon or synthetics are allowed because these can melt and cause severe burns.
- Leather safety boots without steel cap (steel cap not necessary).
- Safety helmet with visor/goggles and a fire protective hood.
- 100% cotton t-shirt.
- 100% wool balaclava.
- Standard pigskin gloves.
- Torches for night visibility.

Burning

All staff must wear fire retardant overalls, cotton underwear, leather boots, and welding gloves. No member of the team is permitted to wear any synthetic clothing under the overall, including balaclavas.

Spraying Gramoxone

Gramoxone is a toxic chemical and dangerous if not used carefully and according to the manufacturers specifications.

- Wear long-sleeve chemical resistant gloves (gauntlet style), chemical resistant safety goggles, face shield, long-sleeved shirt and long pants or coveralls and chemical resistant apron when handling the concentrate, during mixing/loading and during application via handheld equipment.
- Wear long-sleeved shirt and long pants or coveralls, and chemical resistant goggles during application.
- Wear coveralls over a long-sleeved shirt and long pants during application with a backpack sprayer.
- Wear coveralls, chemical resistant gloves, chemical resistant footwear and chemical resistant goggles or face shield during clean up and repair.
- Most exposure to pesticides is by absorption through skin, especially from concentrated material handled at the time of mixing and loading. Since most of this exposure is on the hands and forearms, use of long-sleeve chemical resistant water proof gloves will reduce exposure to paraquat. Rolling down the sleeve end of the glove will prevent drips of liquid from running down the glove onto the arm.
- If concentrate splashes onto the side of the spray tank, and a person subsequently leans against the tank, the clothing and skin over the abdomen may be exposed to gramoxone concentrate. Use of a chemical resistant apron will reduce this likelihood. **Remove contaminated clothing as soon as possible**. Launder contaminated clothing prior to reuse and separate from household laundry,
- **Gramoxone** is corrosive to eyes, always use chemical resistant goggles and/or a face shield.

- **Avoid working in spray mist and contact with spray solution**.
- If ventilation is not adequate, wear an appropriate pesticide respirator. **DO NOT** re-enter treated areas within 24 hours.
- If required, individuals may re-enter treated areas within 24 hours for short-term tasks not involving hand labour if wearing a long-sleeved shirt and long pants provided at least 4 hours have passed since applications.

7.5 Fire fighting equipment and maintenance and Preparedness

- Appendix 5 lists equipment requirements and norms
- Food & Water rations must be kept available for emergencies.

Fire fighting equipment works under extreme conditions and need to be serviced and maintained regularly to ensure proper functioning and reliability. CMs and Park Managers are responsible to ensure that the management unit has the required fire fighting resources and, that these are maintained and serviced prior to fire season (March). CMs and Park Managers are responsible to ensure that the attached maintenance and preparedness checklist (Appendix 5) is completed and filed for inspection by SCMs in UDP WHS and Park Manager on the Lesotho.

7.6 Capacity Building, Training and Competency

The following skills should be available within staff members and fire teams (see Appendix 6):

Staff level	Competency required	Training Required	Notes
Fire Team Leader (Ranger, Senior Ranger, Park Manager)	Must have sufficient **First Aid** skills to be able to treat third degree burns, smoke inhalation, major breaks, bleeding, cardiac arrest	First Aid Level 1&2	Requires refresher course every three years
	Sufficient command of **English** to communicate with staff in the UDPWHS or elsewhere in an emergency	May require formal training in some circumstances	During the interview process preference should be given to candidates with a good command of English
	Must have strong **leadership** characteristics, and be able to **motivate** staff	Training in leadership and conflict resolution	Essential characteristics that should be actively looked for in the interview process; there is a limit as to how much these skills can be taught in the workplace
	Administrative skills – must be able to complete fire forms, draw	In house training by Ecologist on use of	

	maps, and effectively use a computer	forms; Map reading course and/or detailed in house training; Computer literacy, including spreadsheets and word processors	
	Must understand **fire behaviour** and the **theory and practice of setting and controlling fire**	WoF standard fire control management; Incident Commander qualification	
	Must understand and be able to implement **emergency procedures**	In house procedures to be learned and applied	
	Radio procedures and etiquette must be understood	In house protocols to be learned and applied	
	Must be able to use a **GPS** to provide location in emergencies and to map fire scars	GPS course, followed by in house refresher training	
	Must be able to **repair equipment** used by the fire team, such as knapsack sprayers	In house self training	
Fire Team (Labour)	Must understand the **objectives and plan** for each day	Senior staff to provide daily briefing	
	Must understand **emergency procedures**	Senior staff to provide training at the beginning of the season	
	Must be **physically fit and strong**		During the selection process preference should be given to candidates who are physically fit and strong
	Must be able to effectively **operate all equipment**	Senior staff to provide training at the beginning of the season	
	Selected staff must be able to **repair equipment** used by the fire team, such as knapsack	Senior staff to provide training at the beginning of the	

	sprayers	season	

All senior staff should have a copy of the Fire Management Plan and be familiar with the content.

7.7 Firebreaks

Firebreaks are essential to prevent fire spreading into areas which are not scheduled for burning. SNP consists of 4.4km and 40km internal and external firebreaks respectively. UDP WHS consists of a total of 1 103 km internal and external firebreaks. The total internal and external firebreaks in the Maloti Drakensberg Park World Heritage Site that need to be prepared each year before the end of June are 1147.4 km.

Figures 1 and 2 show the location of the external and internal firebreaks, with the compartment numbers and sizes.

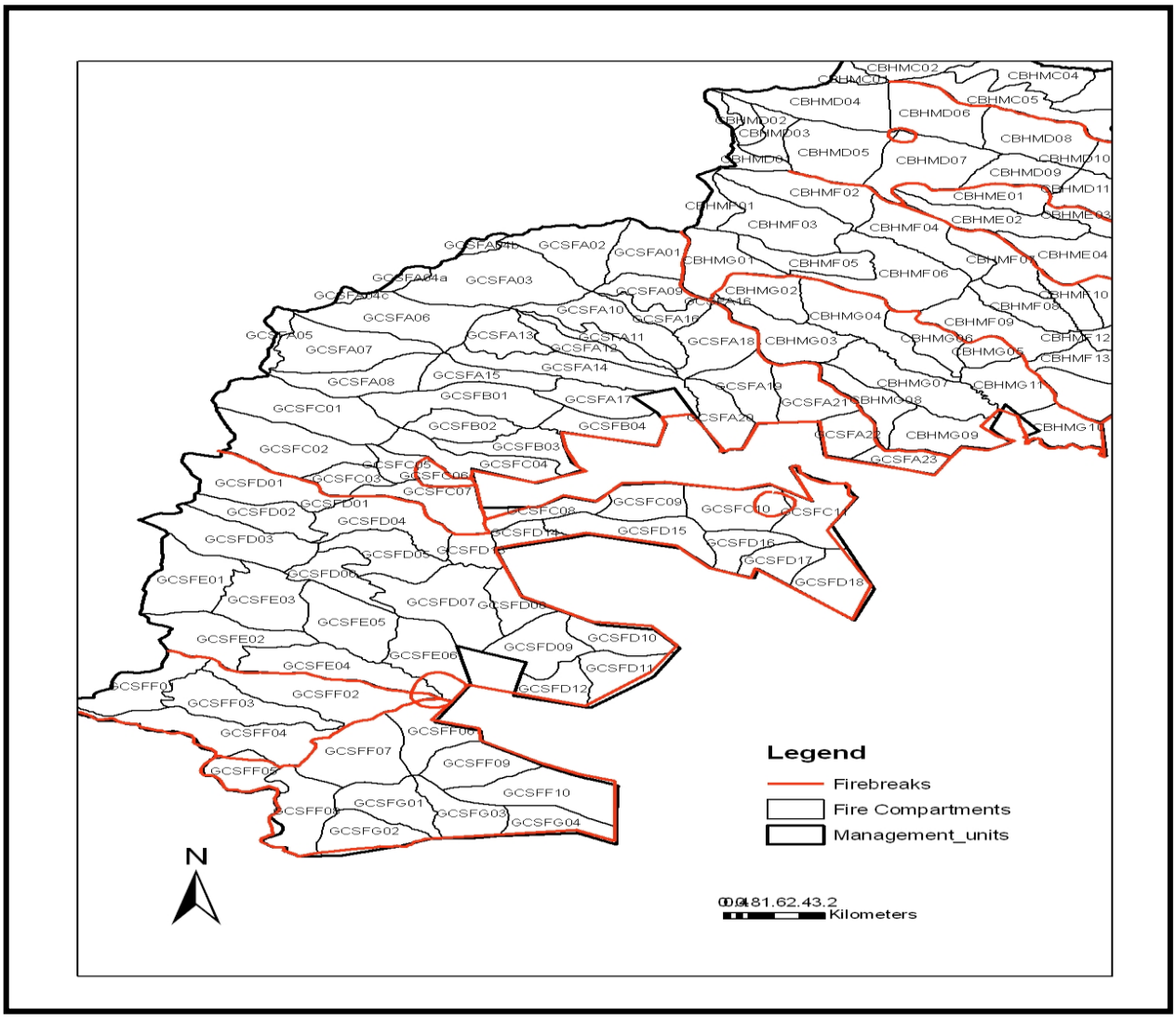

Figure 6: Fire management planning – Fire Breaks in UDP.

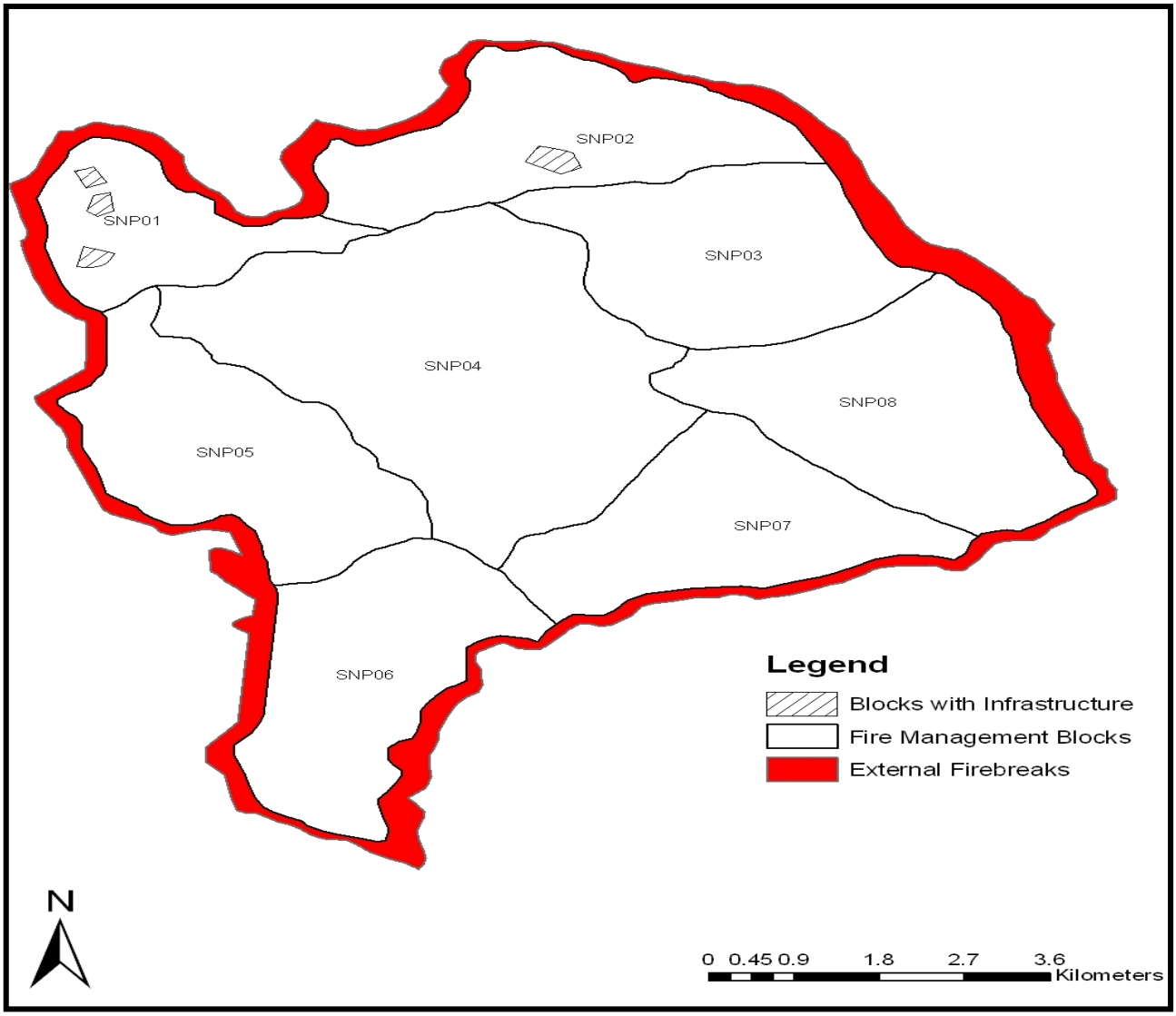

Figure 7: Fire management planning internal and external Fire Breaks in Sehlabathebe

More detailed maps depicting fire breaks within the UDP management units are indicated below.

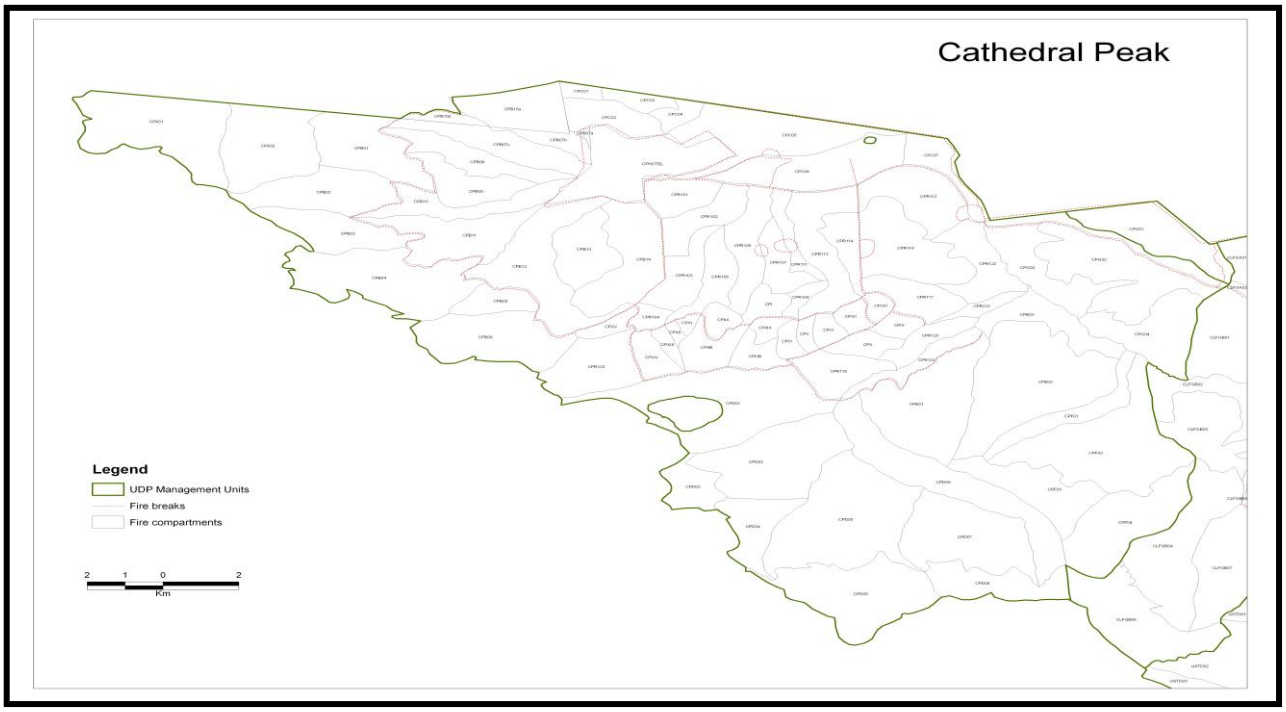

Figure 8: Fire management planning - Cathedral Peak Fire Breaks and Fire Compartments

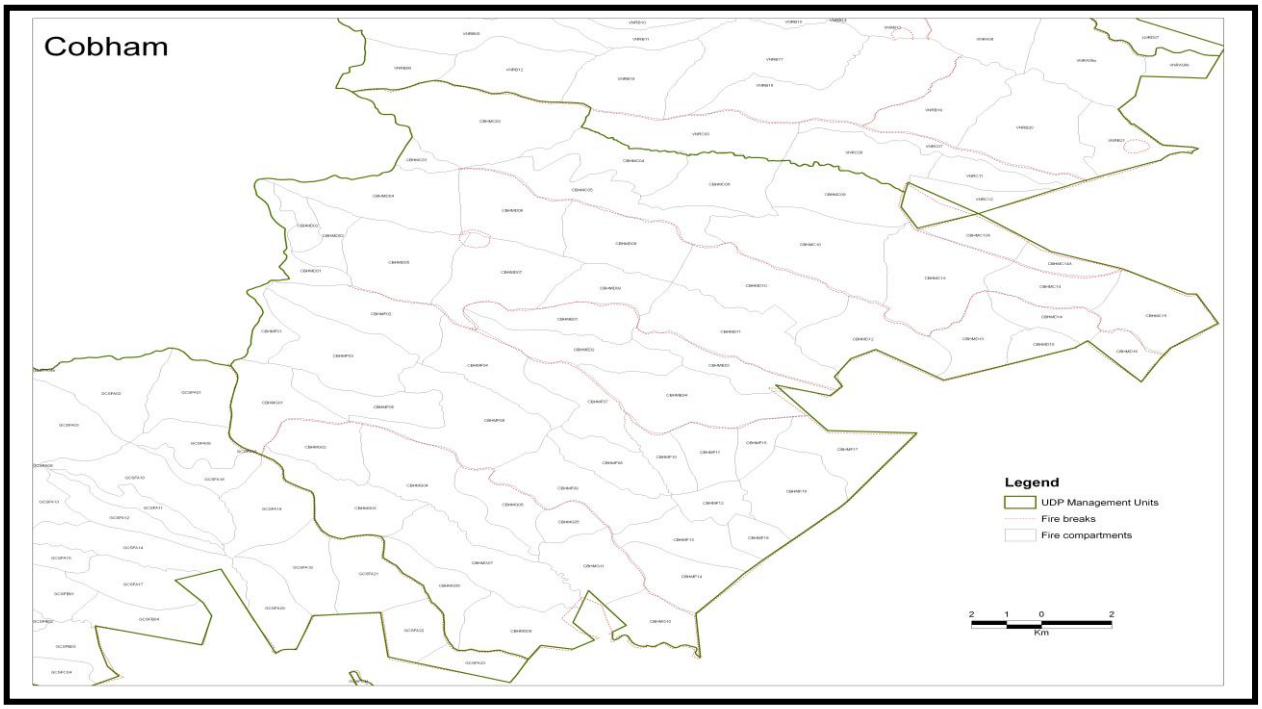

Figure 9: Fire management planning - Cobham Fire Breaks and Fire Compartments

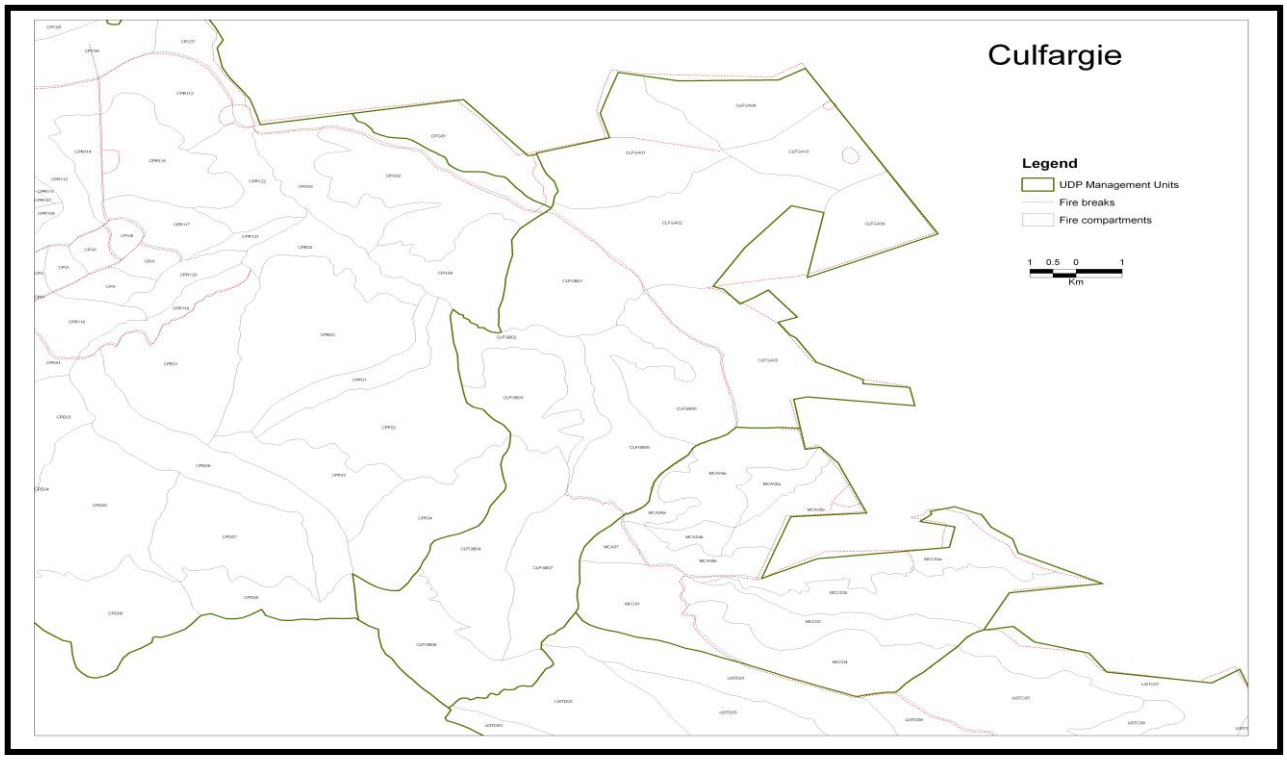

Figure 10: Fire management planning - Culfargie Fire Breaks and Fire Compartments

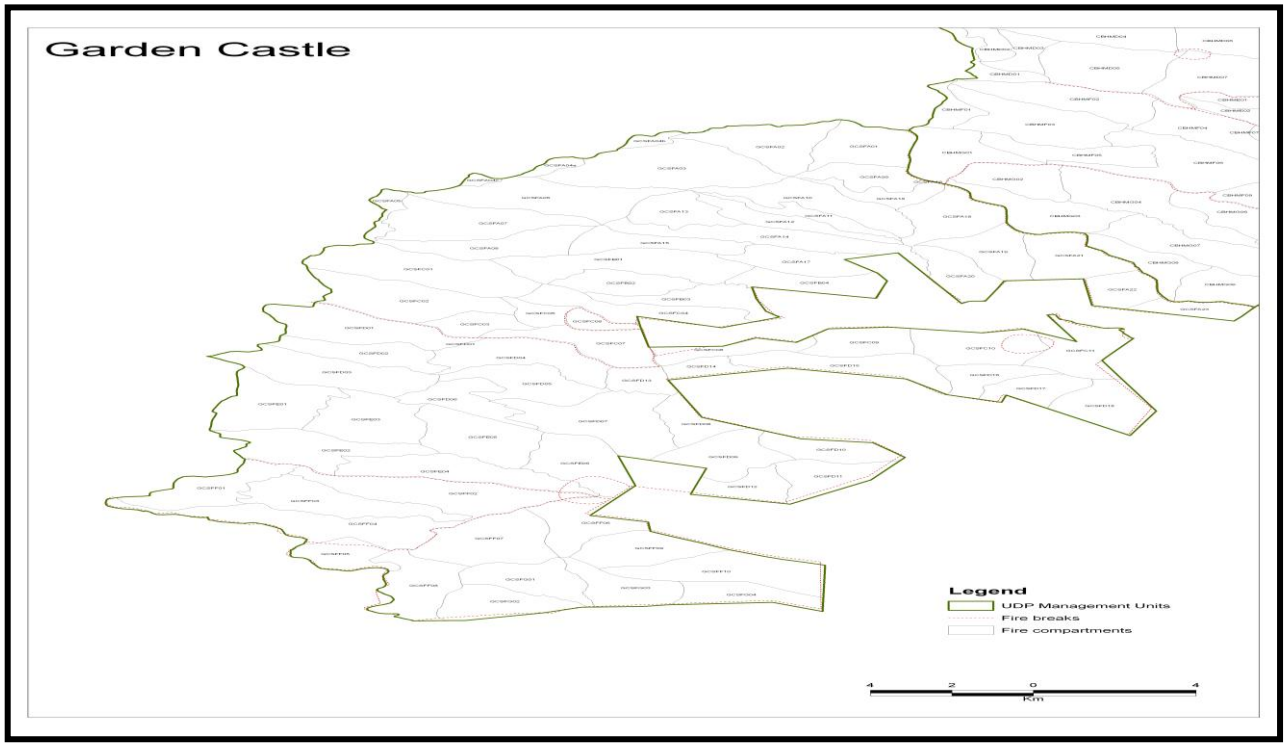

Figure 11: Fire management planning – Garden Castle Fire Breaks and Fire Compartments

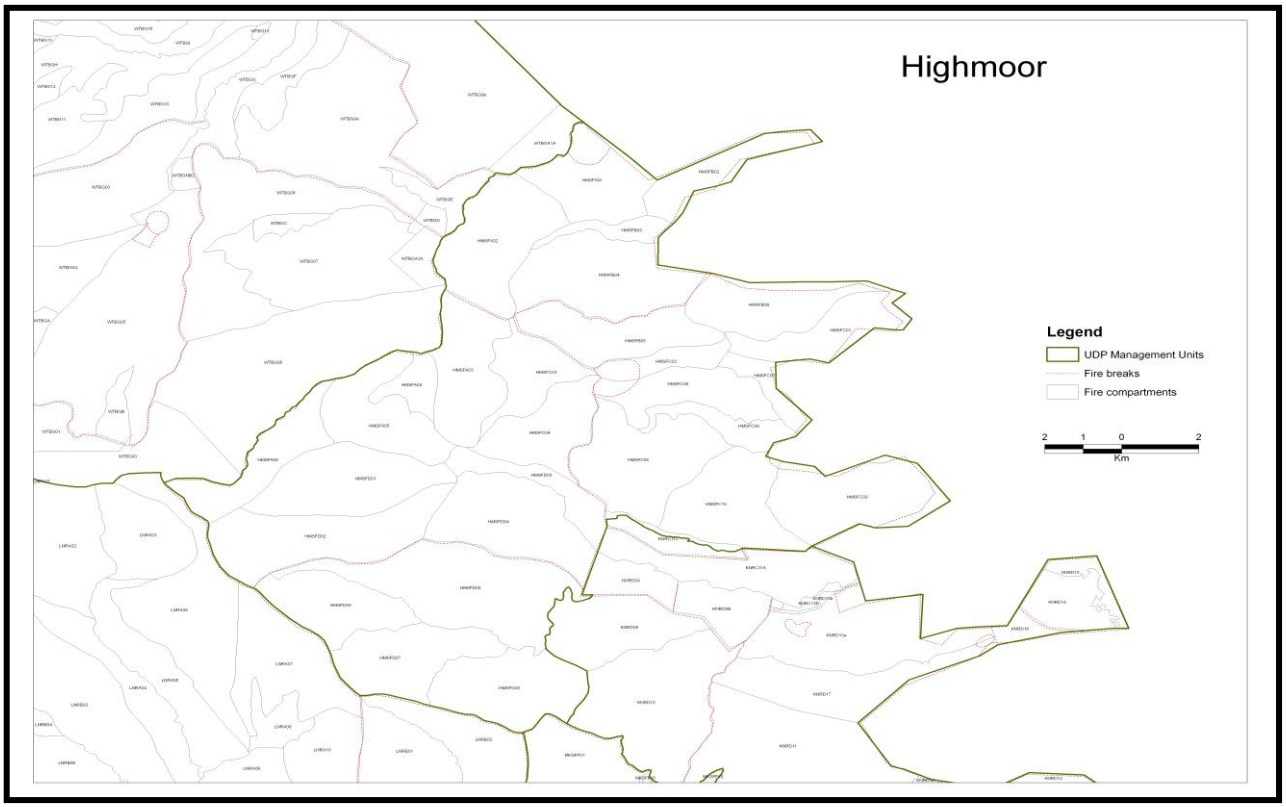

Figure 12: Fire management planning – Highmoor Fire Breaks and Fire Compartments

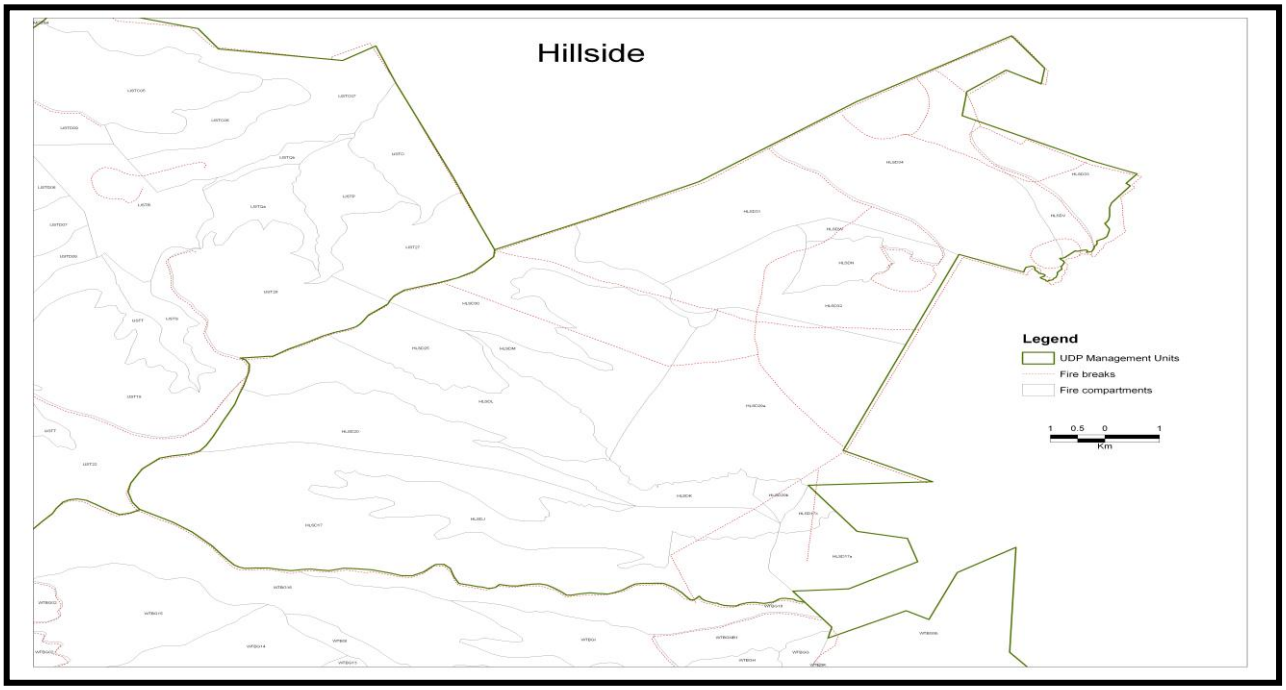

Figure 13: Fire management planning – Highmoor Fire Breaks and Fire Compartments

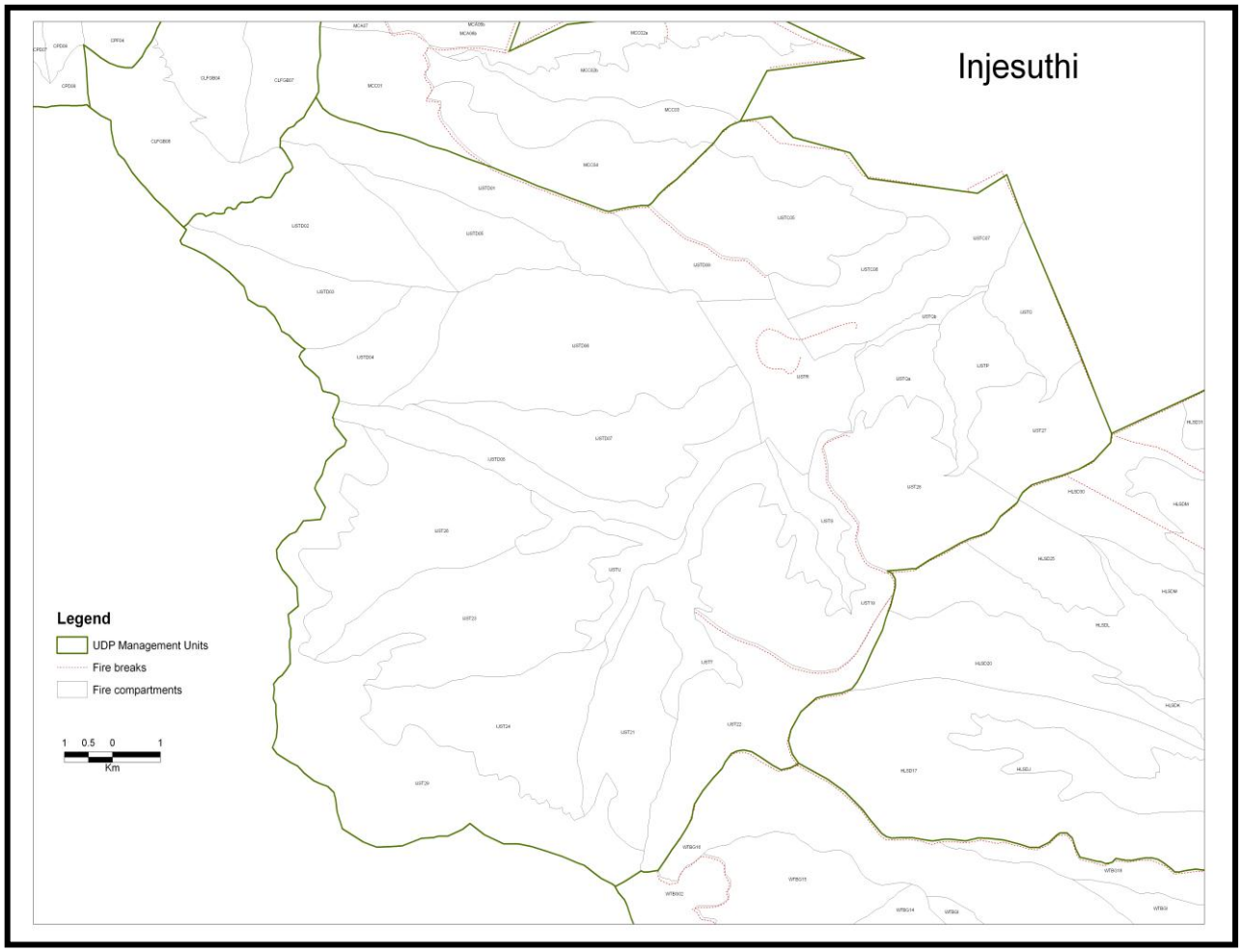

Figure 14: Fire management planning – Injesuthi Fire Breaks and Fire Compartments

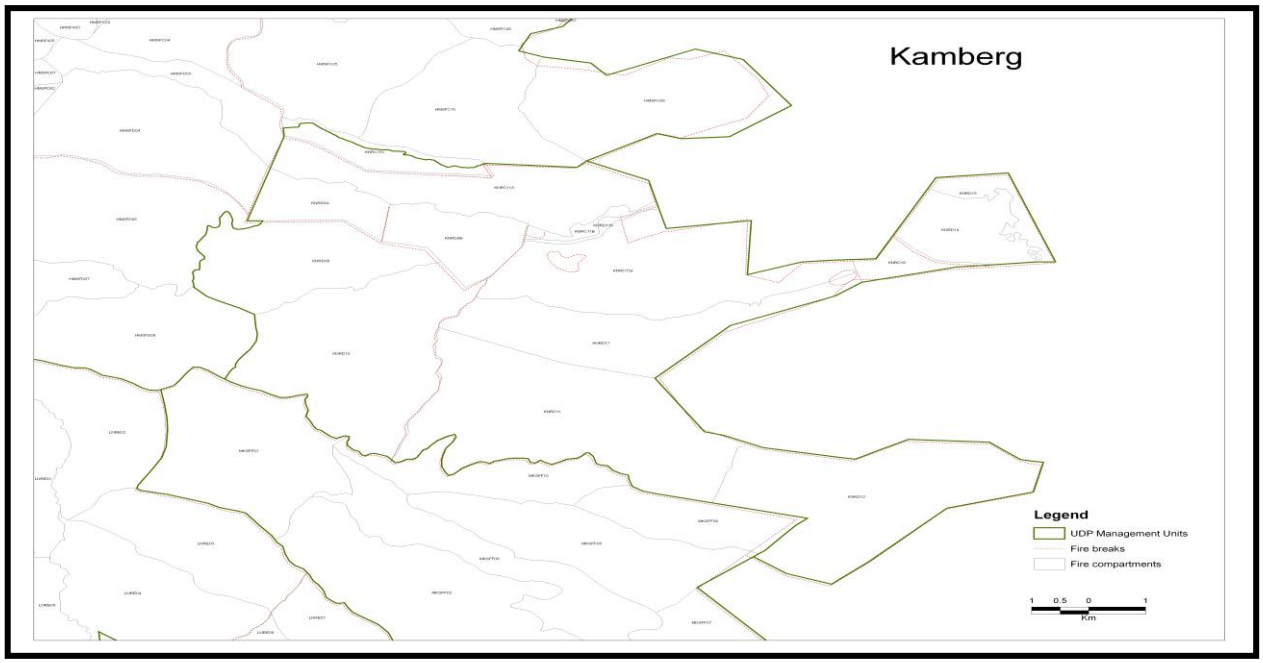

Figure 15: Fire management planning – Kamberg Fire Breaks and Fire Compartments

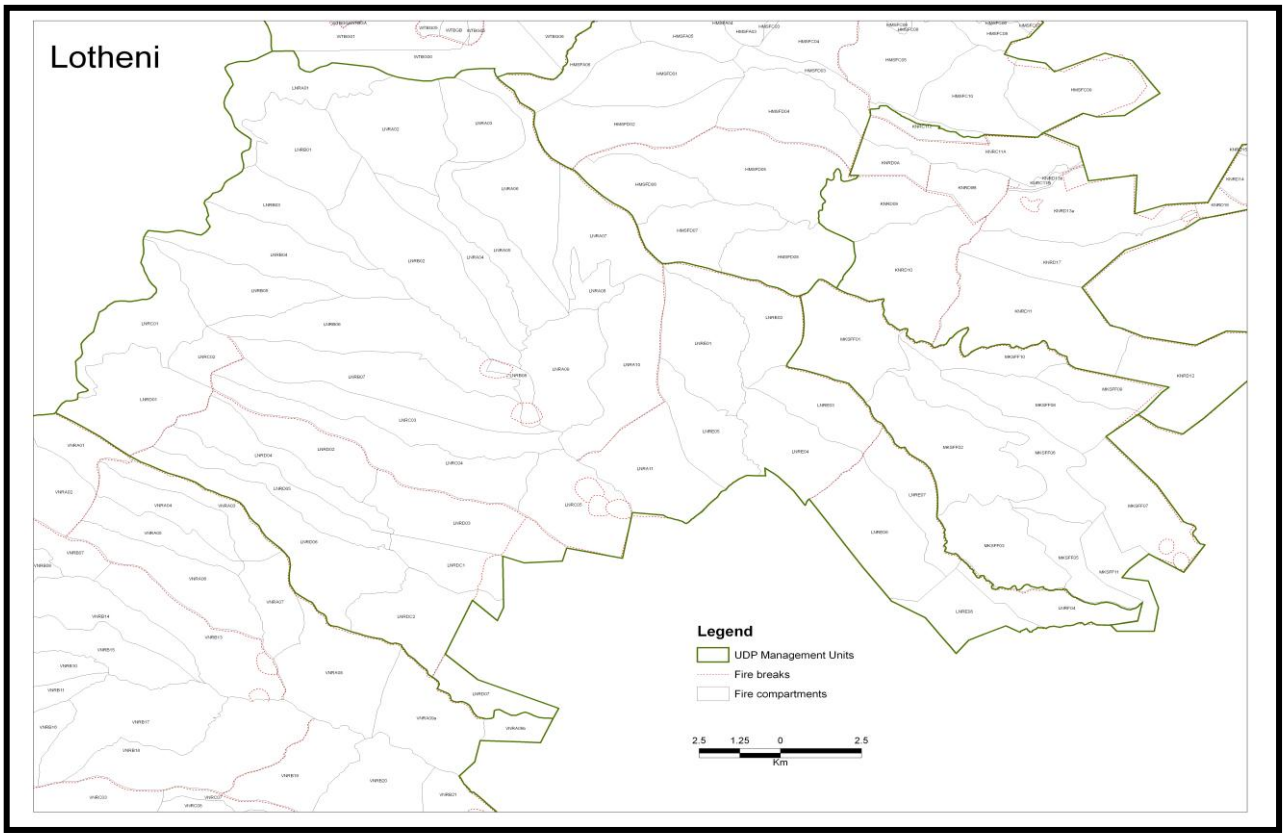

Figure 16: Fire management planning – Lotheni Fire Breaks and Fire Compartments

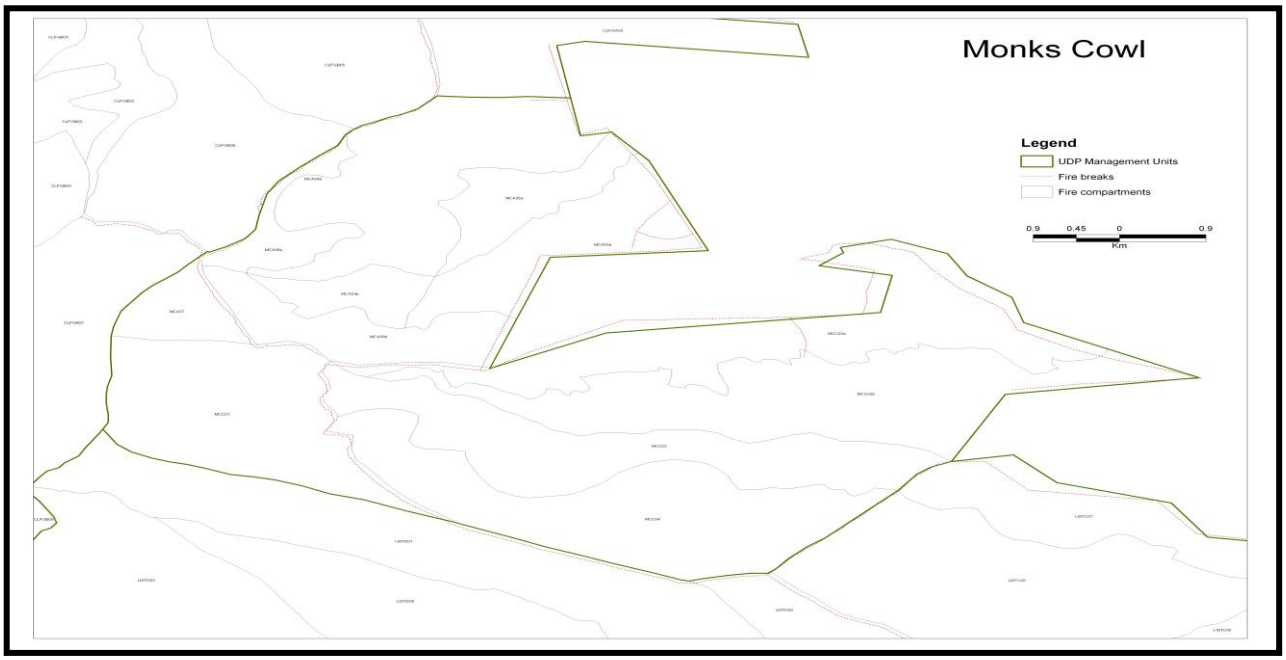

Figure 17: Fire management planning – Monks Cowl Fire Breaks and Fire Compartments

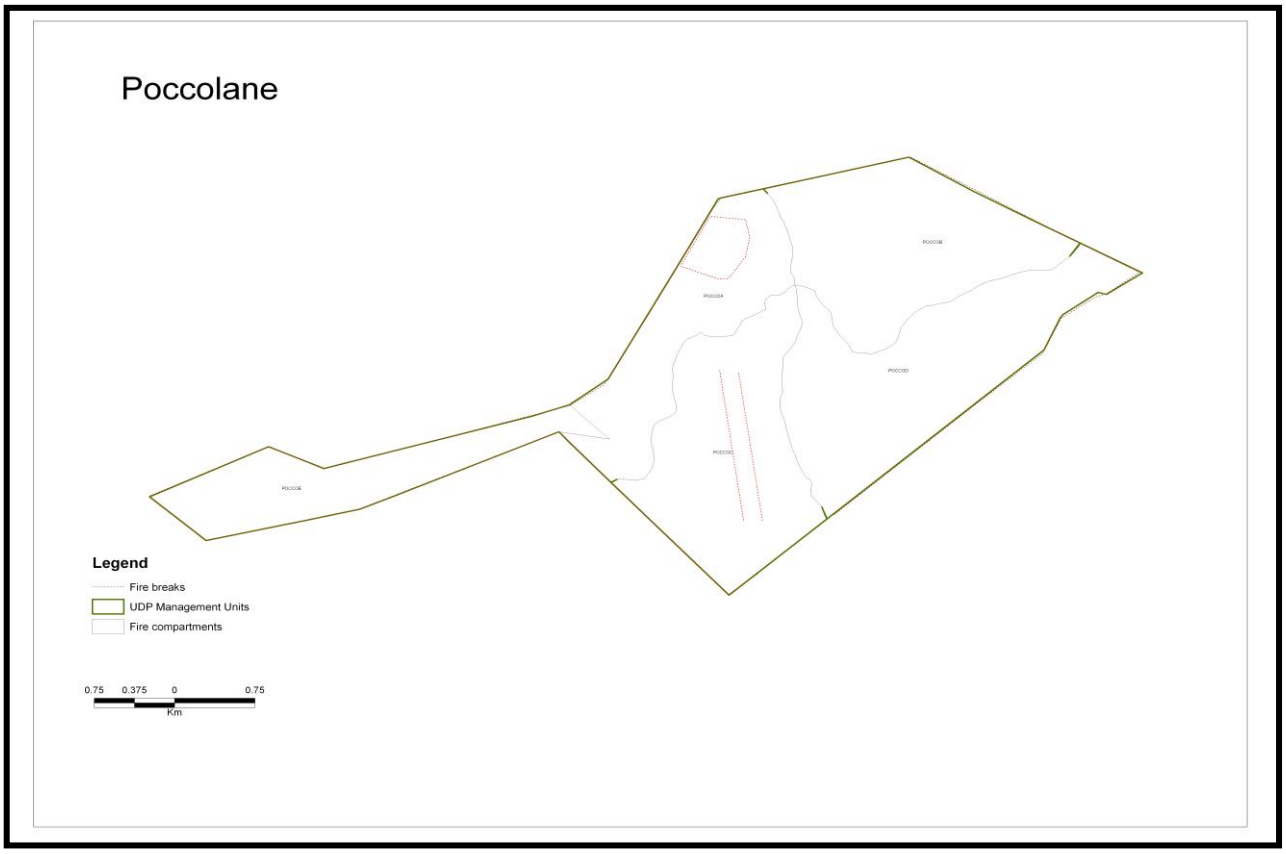

Figure 18: Fire management planning – Poccolane Fire Breaks and Fire Compartments

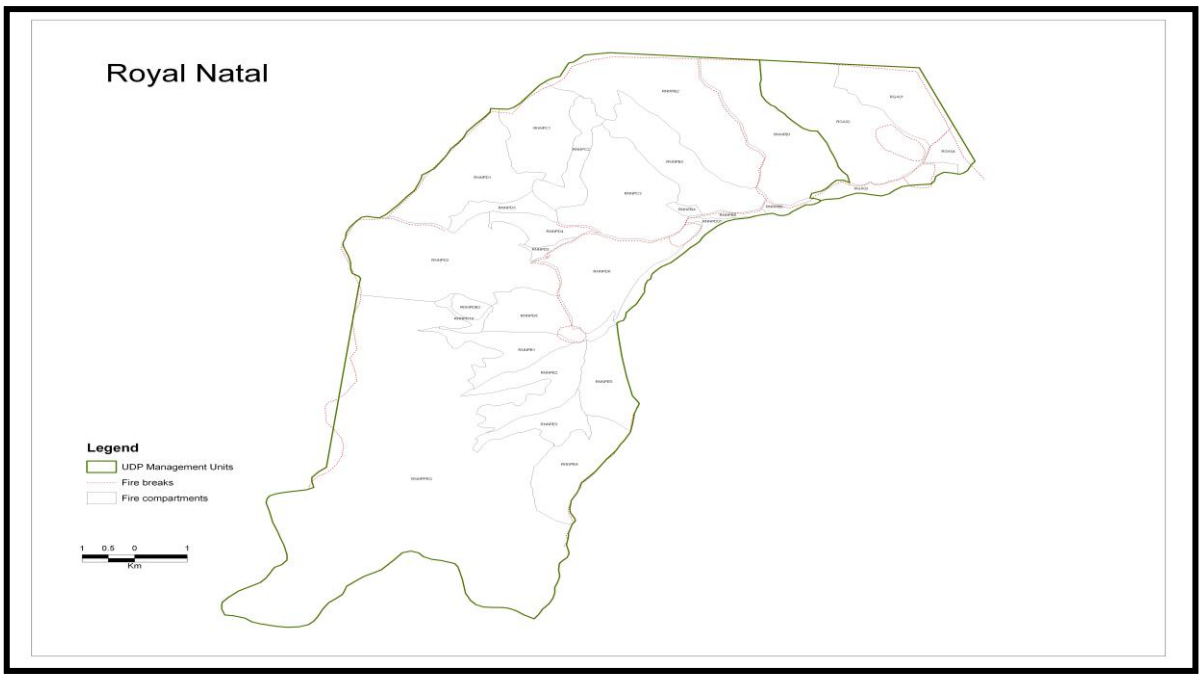

Figure 19: Fire management planning – Royal Natal Fire Breaks and Fire Compartments

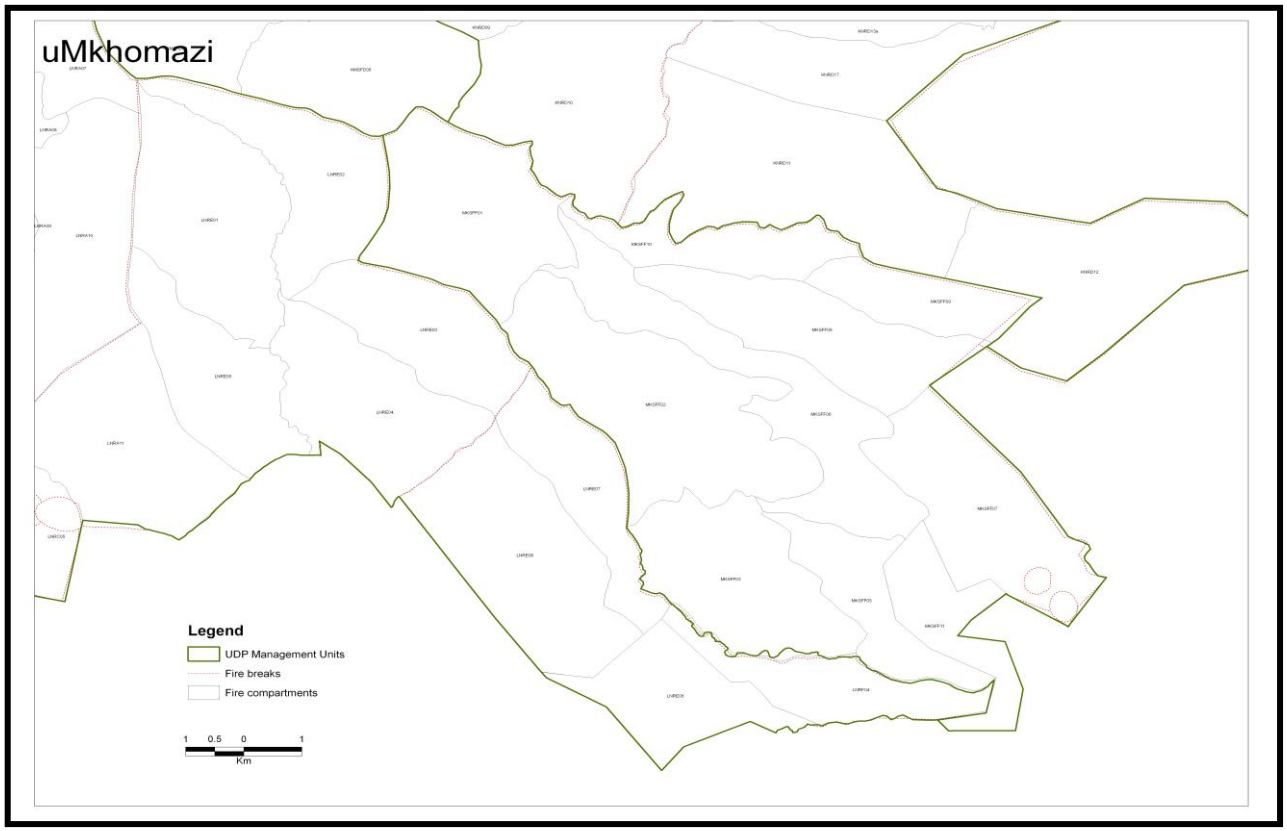

Figure 20: Fire management planning – Royal Natal Fire Breaks and Fire Compartments

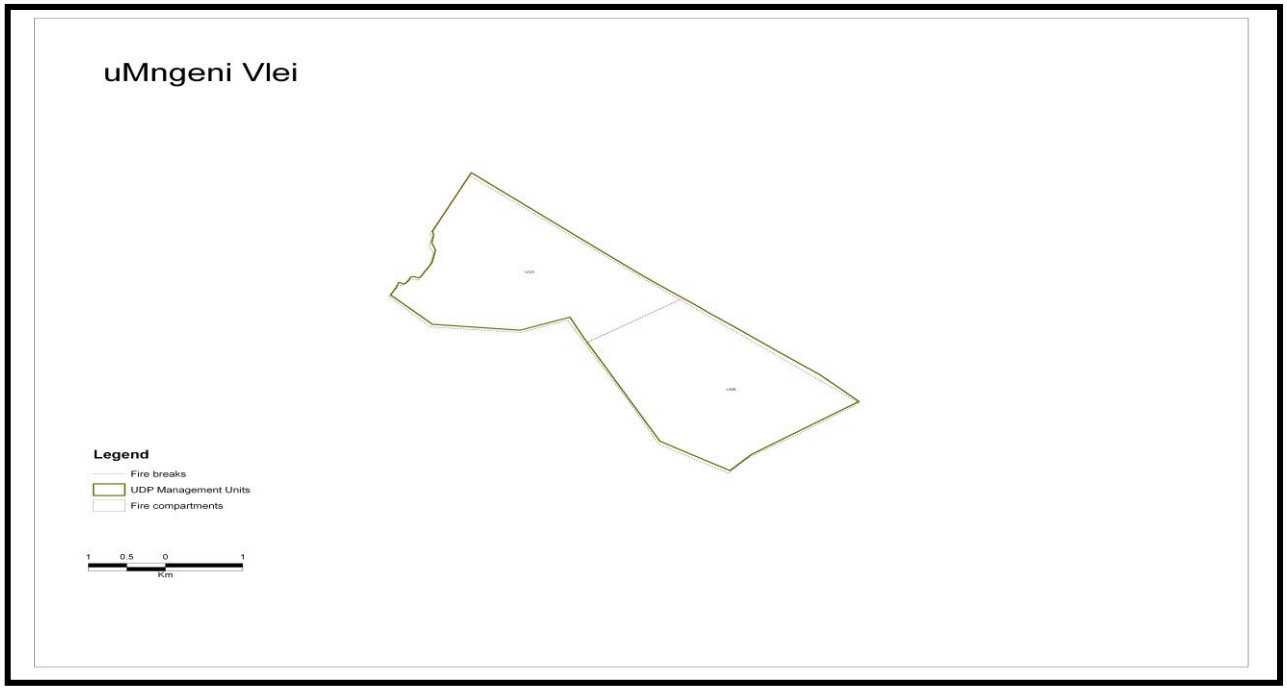

Figure 21: Fire management planning – uMngeni Vlei Fire Breaks and Fire Compartments

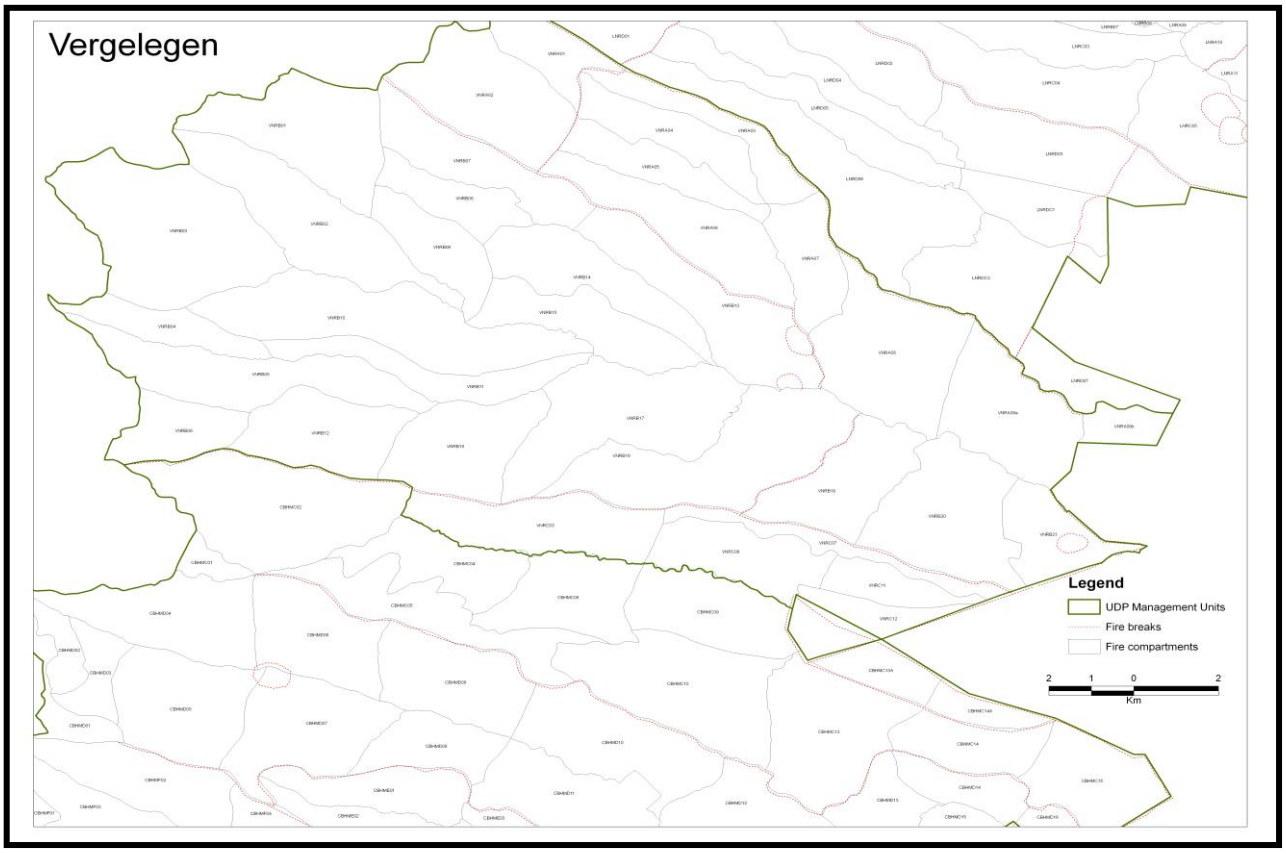

Figure 22: Fire management planning – Vergelegen Fire Breaks and Fire Compartments

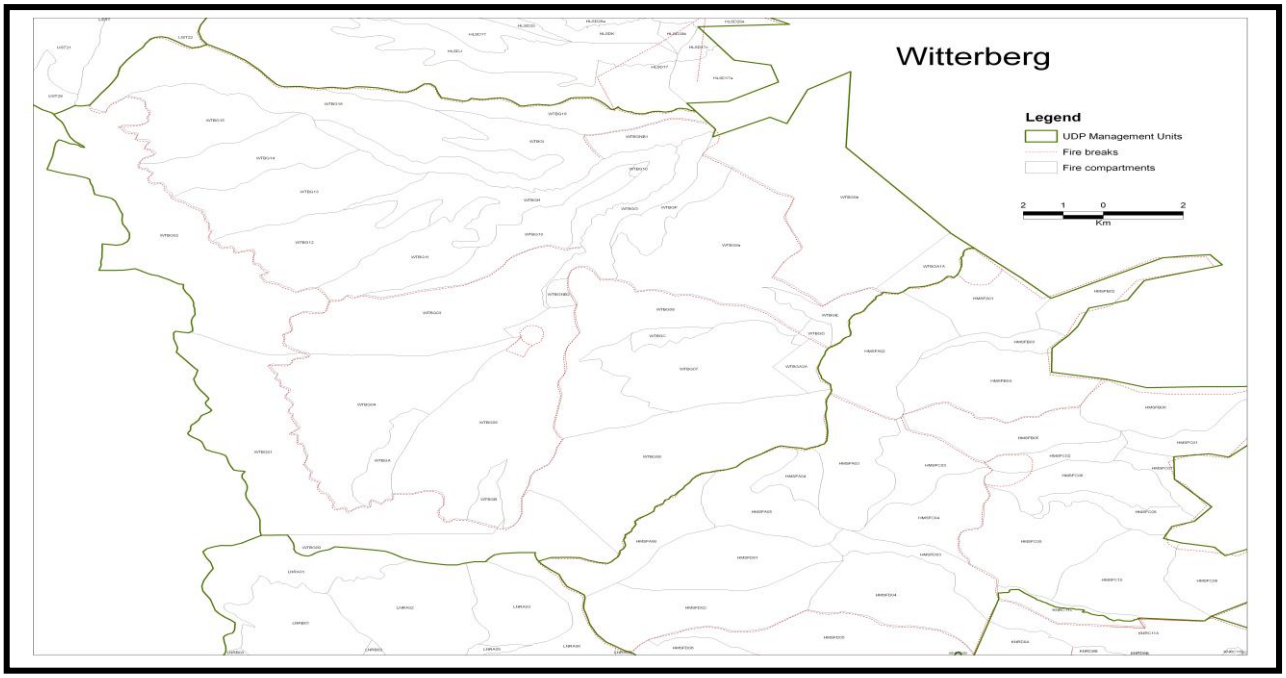

Figure 23: Fire management planning – Witterberg Fire Breaks and Fire Compartments

Firebreak preparation begins in mid-March with the spraying of trace lines using Gramoxone or Paraquat to demarcate the outer limits of the firebreak. The trace lines are burnt as soon as the sprayed grass has dried out, but before the adjacent grass dries out. Burning of the firebreaks must commence after the first frosts and should be completed by the end of June each year.

Firebreaks on the boundaries of the Park are non-negotiable. These protect from both invasive fires from outside and prevent fires from within which may threaten neighbours' farms or installations and which could result in expensive litigation. Firebreaks are also mandatory around installations, research sites and special management areas within the Park. All boundary breaks must be the subject of a legally binding agreement with the relevant neighbour and the effort and cost of burning the break should be shared. The Chief Park Ranger/ CM must be present at the burning of all boundary breaks and those protecting major Park infrastructure such as camps. The Chief Park Ranger/ CM should also be present at the burning of any 'difficult' internal breaks and must be on station when any other break is burnt. Internal management firebreaks may vary from year to year depending on burning plans, but certain strategic breaks are likely to be permanent.

External/boundary firebreaks must be wide enough to ensure that, with due regard to the weather, climate, terrain and vegetation of the area, it is wide enough and long enough to have a reasonable chance of preventing a fire from spreading to or from neighbouring land; it does not cause soil erosion; and it is reasonably free of flammable material capable of carrying a fire across it.

Traces and fire breaks should be, as far as practically possible, alternated so as not to be burnt on exactly the same area in consecutive years.

Appropriate safety equipment must be provided to, and used by, all staff handling potentially dangerous chemicals or equipment.

Tall grass around infrastructure should be cut and removed prior to burning of firebreaks. Reduce fuel load around infrastructure by mowing where appropriate. Thatch roofs should be wetted prior to burning of firebreaks.

Pre-fire briefings must take place so that every person on the fire operation fully understands his/her job. This can be done by the Chief Park Ranger or Park Ranger leading the fire team.

Firebreaks must also comply with the minimum requirements set by the Fire Protection Association (FPA) in the South African context and on the Lesotho side the firebreaks have to comply with the fire legislation. It is also recommended that firebreaks must be alternated where possible, for instance different sides of a boundary, to provide a "rest

period" for the burnt area and in doing so preventing the negative impacts of repeated burning on the same areas.

- By law, firebreaks on the borders of the Republic of South Africa must be prepared and maintained as close as possible to that border.
- FPAs may prescribe minimum widths for its members: Where these become municipal by-laws then this is binding on all landowners within that municipality.
- Tracer lines and breaks should be, as far as practically possible, alternated so as not to be burnt on the same area in consecutive years.
- Appropriate PPE must be provided to, and used by, all staff handling potentially dangerous chemicals or equipment.
- Tall grass around infrastructure should be cut and removed prior to burning firebreaks. Reduce fuel load around infrastructure by mowing and removing the fuel load where appropriate.
- Thatch roofs should be wet prior to burning of firebreaks around the infrastructure concerned.

A minimum firebreak team consists of 25 people whilst for burning trace lines requires10 people. A suggested breakdown of the responsibilities are divided as follows when burning internal breaks where the team is split into two (one team on each tracer line):

- 1 x Crew Boss or Labour Supervisor.
- 4 x Fire Pullers (two leading and two opening up or as determined by wind direction where the wind ward side might need three fire pullers).
- 4 x Venfire pumps.
- 4 x Water carriers (can be Venfire pumps as well to be rotated with the above).
- 10 x Beaters.
- 2 x Sweepers.

A minimum radio quota per team is:

- Conservation Manager/Park Manager; 1 radio.
- Supervisor/Chief Park Ranger; 1 radio.
- 2 Fire pullers; 2 radios (one per each side of firebreak).
- 2 Sweepers/"tail-end Charlie's"; 2 radios (one per each side of firebreak).
- First Aid delegate; 1 radio.

If the delegated first-aid staff member is not one of the listed persons then he/she should have his/her own radio, which makes a total of 7 radios per fire team.

Pre-fire briefings must take place so that every person on the fire operation fully understands his/her job. This can be done by the CM or the Supervisor leading the fire team.

7.7.1 Risk Management around the Burning of Fire Breaks

The burning of fire breaks, especially boundary breaks, poses a serious risk to the TP. In recognition of this, the mitigation of risk is an important part in the planning and in the preparation of fire breaks. To address this, Conservation Managers/Park Managers are advised to complete the Standard Operating Procedures for the Burning of Fire Breaks form to be completed before and during the scheduled burn (Appendix 13). Once the fire break is completed, the completed form should be filed in E 9/1.

7.8 Medical emergencies

Refer to Mountain Rescue Protocol

Working with fire is extremely dangerous and requires stringent controls to ensure compliance in terms of the Occupational Health and Safety Act: No. 85 of 1993. As the chances of medical emergencies are a real threat, managers must ensure that all possible precautions are taken. It is crucial that all staff are familiar with the appropriate medical responses.

CMs must ensure that they are fully conversant with the Mountain Rescue Protocol, as well as IOD procedures and requirements (refer to section 10 of the Occupational Health and Safety Act: No. 85 of 1993 and the Compensation for Occupational Injuries and Diseases Act: No. 130 of 1993 (COIDA). It is also required that each CM should have a valid First Aid certificate (Level 2) as well as at least one first aid staff member per fire team. The CM is also responsible for ensuring that all first aid kits are checked annually and re-filled. It is also required to have at least one first aid kit per fire team with the necessary equipment to address burn related injuries.

On the Lesotho side an emergency is referred to the Parks Division who will make appropriate arrangements which could include arranging a helicopter)

7.9 Communication and Fire Notification Procedure

7.9.1 Notification of intention to burn firebreaks

The CM/PM must send out notifications of the planned fire programme a month prior to burn dates. The following people need to be notified:

(a) traditional and local authorities and Community Conservation Forums
(b) EKZNW CM at Garden Castle, SNP PM
(c) Community Watch/Underberg FPA and hence other neighbours on the South African side through EKZNW CM at Garden Castle

7.9.2 Fire Danger Rating

The Park Manager must:

(a) Obtain the FDI (fire danger rating) from Garden Castle and Sehlabathebe every morning at 07h15 during fire season

CMs/Park Managers must sign approved firebreak burning agreements available from the Legal Officer with all landowners adjoining his/her management unit (Appendix 7). These must be filed in the Fire Compartment Registers and copies should be kept on the management unit file (File H 1/1). The firebreak burning agreement is a once-off agreement, which is valid from one year to another unless a new landowner takes over the neighbouring property. In this case, a new firebreak burning agreement has to be drawn up and signed by both parties.

One month prior to the fire season, CMs/Park Managers need to notify their neighbours in writing of their intention to burn/maintain firebreaks (Legal Notification of Intention to Burn - Appendix 8). The notification may be issued in one of two ways:

1. It must be sent by registered post. Keep the registered postage slips as proof of the notification being posted.
2. It may be hand delivered to the landowner. Ensure that the landowner has acknowledged receipt of the notification by signing the copy of the notice.

Confirm with your neighbours whether the date is suitable prior to the fire break being burnt.

If there are firebreaks under telephone or power lines, advise TELKOM/ETL or ESKOM/LEC of the intention to burn. In some cases, long grass, especially under

TELKOM fibre optic lines, needs to be cut to reduce the incidence of lines being burnt and destroyed.

In the case of internal firebreaks, communicate with the neighbouring CMs/Park Managers. In the case of compartment burns, inform your neighbours, whether private or MALOTI DRAKENSBERG PARK WORLD HERITAGE SITEmanagement unit, SCM/PM and local the Fire Protection Officer (FPO on the South African side) and Fire Brigade on the Lesotho side of the intention to burn.

If burning along public roads, contact the Road Traffic Inspectorate on the South African side of the intention to burn. They may deploy Traffic Inspectors to control the traffic, depending on how busy the road is. Fire warning signs are available from the Department of Transport.

7.10 Ignition

Prior to ignition consider the following questions:

What is the Fire Danger Index?

FDI category	**Action**
Green, Blue	Proceed with planned burns (firebreaks, blocks)
Yellow	Carefully consider decision to burn, but local knowledge and experience will dictate final decision; if decision is to proceed with burn then ensure neighbours are fully aware
Orange, Red	No burning

Has relevant infrastructure (e.g. power lines, buildings) been adequately protected with fire breaks or through fuel load reduction?

Are all domestic animals (e.g. horses) accounted for and secured in a safe area?

Are all tourists accounted for and in a safe area?

Will the firebreaks be effective, or has there been some re-growth and subsequent frosting of grass?

Is the Fire Team at full strength and properly equipped?

8 MANAGEMENT OF FIRE

There are two types of fires: wildfire and scheduled fires. Wildfires refer to any natural fire or a fire unintentionally lit by humans (Goldammer and de Ronde, 2004). A scheduled fire refers to a fire that is intentionally ignited to accomplish specific objectives. The following two sections aim to describe the procedures adopted specifically for the application and control of both wild and scheduled fires.

8.1 Scheduled Burning

8.1.1 Planning and Approval of Scheduled Burns

The application of scheduled burns is crucial in achieving the biodiversity objectives of the Park. The implementation of schedule burns thus requires careful consideration and planning. The planning of scheduled burns is reliant on the accuracy of the records kept in the Fire Compartment Registers. Fire data requirements are discussed under Section 9.

CMs are responsible for the planning of proposed scheduled burns each year. These proposed burns are provisionally approved at a sub-regional meeting organised by the SCM. Subsequently these proposed burns are presented for approval at the Annual Fire Workshop. After the Fire Workshop, the CM must meet with his Labour Supervisor to discuss the approved scheduled burns and the placement of firebreaks. At this meeting the Labour Supervisor must be informed of the requirements of the CAT (Appendix 9) and be made aware of any sensitive features that require protective measures.

Scheduled compartment burns must not be undertaken until such time as all the boundary breaks or additional required internal breaks are in place. This, however, is not required for autumn burns, but managers should exercise the utmost care to ensure that these burns do not pose any threat of running away.

Changing of Scheduled Burns: A special management team consisting of the Regional Ecologist, the sub regional SCM and the CM must be convened should any changes need to be made in the approved fire plan after the fire workshop.

8.1.2 Pre-Burn Inspections

After reviewing the Fire Compartment Register to identify possible compartments for scheduled burning, managers are responsible to do a pre-burn inspection for each

compartment. This is a field inspection and the Pre-Burn section of the Fire Management Form should be completed before the sub-regional fire planning meeting. Ecological Advice staff can be asked to assist. The management team may invite any other fire experts where this will add value to the decision making process. Decisions pertaining to burning agreed to at the pre-burn inspection must be captured on the Fire Management Form.

Once the burning programme has been finalised and approved, the CM is responsible for ensuring that scheduled burns are implemented according to the approved plan. The approved scheduled burns will also dictate the placement of firebreaks or additional tracer lines to ensure burns can be implemented safely.

8.1.3 Weather Conditions

Weather patterns must be studied before a scheduled burn is initiated. Weather patterns should be stable. Wind speed and direction should get special attention.

All climatic data must be recorded on the day of the fire event on the Fire Management Form. Weather forecasts and Fire Danger Index must be monitored.

Predicted weather parameters should preferably fall within the following guideline limits before a burning operation can be initiated, however this to some extent is dependent on the desired objectives of the compartment as stated in the CAT.

During the application of scheduled burns, on site weather conditions should be monitored frequently and a recording kept of all readings. Local knowledge and weather measurements should confirm the suitability of the day. Fire danger ratings must be assessed daily during the fire season. No scheduled burning may take place when the index is indicated as either orange or red (Appendix 10). Weather forecasts can be assessed on the internet; *www.weathersa.co.za* or by phoning the Weather Bureau; *082 2311 611* for the Fire Danger Index in your area.

8.1.4 Notification to Burn Scheduled Compartments

It is essential that all neighbours and the relevant authorities are notified telephonically of the intention to burn a day before it is intended to implement a scheduled burn as per the Pre Scheduled Burn Checklist (Appendix 11). This is to ensure that there is no miscommunication, which might lead to neighbours unnecessarily responding to what might be perceived as a wildfire. The CM must inform the relevant Resort Managers of all

scheduled burns to ensure that visitors are aware of the date and area being burnt. The area scheduled to be burnt should also be indicated on the hiking map.

Also refer to section 7.9 – “Notice to Burn”.

Scheduled Burns: It is essential for CMs to ensure that visitors are made aware of compartments that are scheduled to be burnt and that these areas are closed off to overnight hikers.

8.1.5 Burning Prohibitions

The Forest Act: No. 122 of 1984 empowers the Director-General to declare a prohibition on fires in the open air when required as an extraordinary precaution. Burning prohibitions are communicated annually and managers are to take note of the agreed burning period.

Fire Protection Association rules notwithstanding, **no** planned fires are permitted over weekends or from 12:00 on a Friday or the day before a public holiday and on Public Holidays. The burning of firebreaks after 12:00 on a Friday is thus not recommended due to the lack of staff available over weekends to assist in the case of a wild or runaway fire.

Note: No burning may be carried out on Weekends or Public Holidays.

8.1.6 Application of Scheduled Burns - Methods

The application of scheduled burns to achieve the required objectives is a science that requires an understanding of the various factors that influence fire behaviour. The scope of this plan does not allow for the description of the various application methods to achieve the required objectives, however, CMs are to familiarise themselves with the various factors and application methods that can influence the outcome of the scheduled fires. Section 6 of this plan provides a brief overview of the various factors influencing fire behaviour.

The present burning philosophy (Section 4) emphasises flexibility, variability and patchiness in achieving a mosaic pattern of burnt and unburnt areas throughout the Park. Achieving patchiness in large compartments together with variability plays an important role in providing important refugia for fauna. This also promotes a heterogeneous plant community and assists in achieving the objective for increased biodiversity.

The application of fire to achieve these objectives requires understanding and experience. CMs need to take note of the different applications of fire to achieve these objectives:

- Point source ignition versus burning from breaks and natural features.
- Crown versus surface fires.
- Head versus back fires.
- Uphill versus downhill burns.
- Day versus night burns *etc*.
- Wet versus dry conditions
- Hot verses cool burns

Animal populations must be taken into consideration, in that an escape path must be left in the burning compartment so that animals can escape from the fire.

Night burns must be conducted with sufficient torches to allow for the safe return of staff and staff must be instructed to stay together so that no-one is left behind.

8.1.7 Risk Management around the implementation of Scheduled Burns

The implementation of scheduled burns poses a serious risk to Ezemvelo. In recognition of the abovementioned factors that need to be considered in the implementation of scheduled burns, the mitigation of risk in the application of scheduled burns is an important part in the planning and implementation of scheduled burns. To address this, Conservation Managers is advised to complete the Standard Operating Procedures for Scheduled Burns form to be completed before and during the scheduled burn (Appendix 14). Once the burn is completed, the completed form should be filed in E 9/1.

8.1.8 Post Burn Inspections

Post-burn inspections will be done approximately one month after the fire event and the information must be recorded on the Fire Management Form (Appendix 1). All CMs must mark the fire boundaries on a map as accurately as possible for each of the fire events. The recommended way to do this is to GPS the boundaries of the burn where possible. It is also advisable to take photos, where possible, as they can provide good references for when managers are capturing these burns on maps. CMs may also fly their areas, to assist in mapping their burns towards the end of October or early November.

8.2 Prescribed burning

Avoid encircling entire block so that animals have an opportunity to escape.
Arson fires throughout the Park must be managed or controlled generally by using a back burn technique.

8.3 Wildfire Suppression

Wildfires refer to any natural fire or a fire unintentionally lit by humans that is not part of either preparations for firebreaks or scheduled burns. Causes can be lightning fires, Malicious Injury to Property (MITP), commonly referred to as arson, runaways or invasive fires.

8.3.1 Principles

Attack as early as possible before winds get up and fuel dries out, and before flame front gets too big.

The preferred option, depending on the weather conditions, using the fire teams on hand, is to put out the fire without putting in large back burns.

Note: The layout of the blocks in SNP was done to ensure, as far as practically possible, that each block has natural features (rivers, cliffs) or roads within them that can be used to start a back burn from within the block, thus potentially saving a large proportion of the block from burning in the process of fighting a wild fire using backburns.

8.3.2 Decision tree

When a fire that is not a planned management fire is detected implement the following measures depending on situation:

When a fire is detected outside the Park:

- Check that is not a prescribed burn in neighbouring station or landowner
- If prescribed, check that it is under control
- Check current FDI and predicted FDI; check local weather conditions
- Keep staff at an appropriate level of preparedness and availability
- Park Manager and Senior Park Ranger to remain contactable at all times
- Check station burning plan and block attributes (sensitive features) to understand options if fire spreads

If fire is a wild fire and is outside the Park:

- Offer assistance in controlling the fire, and in this way reduce the risk of fire reaching the Park boundary.
- In principle help neighbours suppress wildfires, priority where lives and/or infrastructure at risk, and especially where risk of fire entering park and becoming an 'invasive' fire.

If fire is a wild fire and is in the Park:

- Ascertain where the fire is and what it may be threatening: If threatening life or research plots than the Fire Team must be dispatched; if it is threatening sensitive features (cultural, biodiversity) or infrastructure then the Fire Team should be dispatched unless not possible for some reason.
- Determine what the current and predicted FDI/weather conditions are for planning purposes
- Determine the condition of fuel and hence the spread potential
- Determine what is required to contain the fire – related to weather, size, accessibility
- Are sufficient resources available to safely attack the fire? And is it safe to go and fight the fire? – enough staff given circumstances, equipment, other resources. If Yes, then go; if No look at alternative options.
- Plan attack with scenarios with relevant staff prior to departure (equipment needed, possible overnight deployment)
- If go, can it be controlled by beating or is there a need for a back burn? Where a wildfire is fanned by strong winds, the fire team must not attempt to put out the fire by beating it, but rather back burns using natural features such as rivers and cliffs. Firebreaks can also be used and can also be widened to prevent the fire from jumping the firebreak.

When do you ask for help?

- Moderate risk of spread
- Err on side of calling for help, having standby

Rules for disengagement:

- If lives of fire fighters threatened, or withdraw
- When fire completely extinguished
- Leave observer(s) behind with communications and equipment for at least two hours

- Go back and check as soon as possible

8.3.3 Methods

Use of Back-Burns

Beating

Use of Aircraft

8.3.4 Post fire debriefing and review

An informal analysis of the cause of the fire, the control approach, and implementation of control measures should be undertaken by the whole Fire Team. This will allow the Fire Team to learn from mistakes and become more effective.

8.3.5 Preparedness

In order to effectively minimise losses in the event of a wildfire, it is crucial that all fire fighting operations aim to suppress, contain or extinguish the fire as soon as possible. Preparedness to react to wildfires is of the utmost importance and it is the responsibility of the CM to ensure that:

- Communications systems are working and staff are contactable.
- Standby teams are in place, adequately trained and informed of the required procedures and protocols (Appendix 12).
- Equipment is checked and maintained in good working condition.
- Equipment is stored in such a manner that it can be easily accessed in the case of an emergency.

To ensure that Conservation Managers conform to the Fire Protocol, a minimum of eight sufficiently trained and issued temporary staff must be employed as 6 day workers from the 1st of June until the end of 31st of October. This has to include Sundays and due regard must be given to the Overtime and Standby Policies. This will be in addition to the permanent staff that is on standby during fire season. Managers are to ensure that this is sufficiently budgeted for.

Fire fighting primarily involves the organisation and supervision of people. Thus it requires strong leadership. In the event of a wildfire, the CM must assess each wildfire as they occur and direct the appropriate response as required. If in doubt, consult with the Senior CM on how to proceed.

8.3.6 Suppression Tactics

In order to suppress a wildfire, it is crucial to gain control of its perimeter and to prevent the further spread of the fire by containing it. This can be achieved by either of two methods; i) direct attack or ii) indirect attack. The method selected is determined by the various factors affecting the fire behaviour and includes weather conditions, fuel loads, access, terrain, personnel availability and safety.

8.3.6.1 Direct Attack

This is the preferred option for the Park and involves the use of fire teams to contain the fire by beating it, to try and minimise the area burnt. This method is mainly used under the following circumstances:

- Small fires.
- Fires that are burning with light fuel loads.
- At night when cooler conditions reduce the fire intensity.
- Ground fires.
- On the flanks or rear of large fires where the fire intensity is less severe.

The direct attack may also involve the use of aerial attack and support. This, however, is rarely available due to cost and requires the direction of a qualified Incident Commander to direct operations. It is an extremely effective means of fire fighting if implemented correctly and is primarily aimed at assisting ground crews in containing the spread of the fire.

8.3.6.2 Indirect Attack

This method is a control action that is conducted from a variable distance which aims to deprive the advancing fire of fuel to stop its progress. Commonly referred to as *back burning*, this method is used when:

- A wildfire is fanned by strong winds.
- Fire fighting conditions are too extreme for direct attack.
- Too few personnel available to attack the fire directly.
- Where the safety of personnel is at risk.
- Where buildings and structures, protected by firebreaks, are threatened.
- Where direct attack will take too long, and by leaving the fire head running you will burn a bigger area as opposed to putting in a back burn in the first place

The use of appropriate natural features such as rivers and cliffs or man-made features such as roads and firebreaks can also be used.

8.3.7 Responding to Wildfires

The first principle in fighting wildfires is an early attack before the flame front becomes too big. A quick response should never compromise safety. Thus, during fire season, fire standby teams, staff and equipment must be kept in a state of readiness. When responding to any situation, the following suggested procedure can guide a manager as how to best respond:

- Fire is observed.
- Notify the CM.
- CM notifies;
    - Standby team, and
    - FPA.
- Determine origin/cause of the fire:
    - If it is *fire from a neighbour;*
        - confirm the fire is under control, and
        - if so, inform standby team to stand down and maintain communication.
    - If it is a *wildfire* within your management unit perform the following checks;
        - current and future FDIs,
        - Mountain Rescue Register for hikers in the vicinity of the fire,
        - Fire Compartment Register for when last it was burnt (indication of fuel loads and intensity),
        - CAT for sensitive features, and
        - location- lightning fires in Wilderness areas are left unless they threaten lives, sensitive features or have the possibility to threaten infrastructure.
- Inform the FPA of the status of the fire and inform your neighbours.
- Leave observer(s) behind with communications and equipment to keep an eye on the fire.

Note: Fire fighting teams are not allowed to withdraw or leave the fire unattended until it is extinguished or safely contained. To ensure a safe and effective fire fighting operation, teams must be rotated on the fire front before they become exhausted.

8.3.8 Staff management and rotation on Wildfires

Though it is of utmost importance to extinguish a wildfire to minimise risk, staff safety remains a priority. An important consideration in the management of staff on wildfires is the Basic Conditions of Employment Act (BCEA). This guides managers in determining how long staff can fight a wildfire before they need to be rotated.

It is generally accepted that wildfire suppression in the Park is most favourable at night due to climatic conditions. The reality is however that management unit does not have sufficient staff to allow for the regular rotation of fire fighters on wildfires. It is also the case that where wildfires occur at night, fire fighters have already worked a full day. Various factors come into play in these circumstances which managers need to be mindful of and include overtime, fatigue and rations. Where an initial attack on a wildfire turns into an extended operation, the general guideline is that a fire fighter should not work for more than a maximum of 24 hours before fatigue becomes a serious factor. Ideally, fire fighters should be rotated every 12 hours.

During normal working hours, fire fighters should provide their own rations that should be sufficient for 12 hours. In these circumstances “dry rations” (i.e. no drinks supplied) should suffice. After the first 12 hours rations should be provided and should consist of a minimum of half a loaf of bread, one tin of bully beef and a good energy drink (no fizzy drinks). However it is preferable that management units should budget for, and procure, the standard ration pack as used by Working on Fire teams. Fire fighters should be supplied with a cooked meal after an extended operation shift and be allowed 12 hours to recuperate before being deployed to the fire line again.

Managers should take note of these requirements and should manage staff as they are the primary fire fighting resource in the Park. In extended operations, managers, as incident commanders, should not be involved in actual fire fighting and they should concentrate on managing the operations with the fire fighters as their utmost priority. As such, communication with neighbouring management units is crucial where additional teams are required to rotate staff as well as the manager as the incident commander. Remember, fatigue affects your judgement and your ability to make the correct decisions under high pressure situations.

8.3.9 Wildfire Investigation Report

A Wildfire Investigation Report is to be compiled in addition to the Incident Report when critical losses are experienced (*i.e.* the burning of fire exclusion or infrequent burn

compartments, damage to infrastructure, assets, fatality or serious injury, or where the possibility of litigation may arise). In the case of arson fires, the CM must submit a report to the Logistics Manager and the Legal Officer. The Logistics Manager will notify the Ezemvelo insurers, who will assess the damages. The Wildfire Investigation Report should preferably be completed by the CM or SCM, who have successfully undergone accredited wildfire investigation training. Further information should be obtained from a fire debriefing. The investigation should be carried out as soon as possible after the fire.

A memorandum including the following information should be completed in addition to the standard Incident Report:
Date and time – when the fire started.
Cause of fire – establish how the fire was started.
Origin of fire – determine where the fire started.
Actions taken - a chronological description of what actions were taken to control the fire. List the resources that were applied in reacting to the fire, detailing the incident from the time the call was received/the fire was noted.
What losses were incurred - listing the extent of the damage/loss caused by the fire.
Conclusions – given the evidence uncovered in the foregoing, indicate how the fire behaved and what actions were taken and by whom.
Recommendations – indicate where the liability lies and what steps can be taken to prevent future occurrences.

8.3.9.1 Fire Debriefing/Analysis

The relevant Incident Commander (*i.e.* CM or FPO) is responsible for the fire debriefing with all the role players as soon as possible after a major fire event. It is recommended that the following aspects must be dealt with for inclusion in the Wildfire Report:

- Cause of fire, date, time and location.
- Immediate reaction by whom and the reaction time.
- Deployment, suppression and guarding of fire.
- Logistics.
- Communication – personnel, media and public.
- Equipment and rations.
- Weather conditions – during fire and accuracy of forecasts.
- Co-operation and support – contractors, District Municipalities, disaster management.
- Ecological implications of burns.
- Shortcomings and resolutions.

- Injuries and losses.
- Recommendations.
- Incident Report with SAPS Case Number.
- Compilation of the Incident and Wildfire Report.

Where someone is injured the CM must report the incident to the Department of Labour within 24 hours. Record the time of the accident, contact details of person spoken to and complete the required IOD forms as well as an accident report.

8.3.10 Calls for Assistance

8.3.10.1 Responding to Calls for Assistance

Fire is a natural phenomenon and does not recognise man made entities and boundaries. Fire is a serious concern and therefore requires a good working relationship with relevant stakeholders and proper co-ordination of available resources. In the absence of FPAs the Local Fire Warden acts as the FPO and can take control of any fire within the Local Municipality.

When responding to calls for assistance, the CM must be aware of the possibility of litigation when assisting outside their area of responsibility. It is preferable that assistance should only be given to immediate neighbours to the Park. The CM must consult with the Fire Warden or relevant land owner/authority. CMs must ensure that their team is fully equipped and well rested. Where possible, assistance may be provided outside this parameter on request from the FPO.

Neighbouring management units should be informed when there is a wildfire. All neighbours and the relevant authorities should be informed telephonically or by radio.

8.3.10.2 Lives at Risk – drop everything and go

In a case where a fire threatens lives, priority must be given to save lives; however, this should not be at the cost of further lives.
In medical emergencies, *e.g.* where life is at risk, the Mountain Rescue Protocol must be followed.

8.3.10.3 Delegation of Authority

When a wildfire occurs inside the Park, the relevant CM is the Incident Commander unless where the FPO takes over command. All instructions related to fire are given by the Incident Commander. When assisting with wildfires outside the Park, the Ezemvelo fire team falls under the command of the land owner FPO/Fire Warden.

8.3.11 Media Relations

According to the Communication Policy, public have a right to know what is happening in the Park. The purpose of this policy is to ensure that communications across the Ezemvelo are well co-coordinated, effectively managed and responsive to the diverse information needs of the public and stakeholders of the organization. It is policy to provide the public and stakeholders with timely, accurate, clear, objective and complete information. Neighbours need to be informed of the objectives of the UDP WHS Fire Management Plan and the associated burning strategies. It is essential therefore that information provided to the media, be consistent, truthful and accurate. This will minimise speculation or sensationalist reporting by the media. The Media Relations Officer once notified of major fire incidents will subsequently prepare a press release in conjunction with the relevant CM.

On the instruction from the Ezemvelo Chief Executive Officer (CEO) no staff member will communicate or make comments to the media without a written authority from the CEO or otherwise delegated to do so.

In the event of a media release the Director of Environment will be contacted, he/she will be responsible for delegating the responsible division to respond to the media.

8.3.11.1 When being Interviewed by the Media

Prepare a selection of appropriate questions and answers to give the reporter beforehand. This includes information on the location of the fire, the size of the burnt area, the number of people involved in controlling the fire and the type of vegetation that is being burnt. The following points are important:

- Do not speculate on the origin of the fire, unless you have confirmation on the information received.
- Do research on the topic prior to the interview, so that you understand your topic completely.
- Be mentally prepared for the interview, positive and relaxed. Try to schedule an interview to suit yourself, with regards to time and place.

- Deal with the most important points first.
- If you do not know the answer to a question, do not lie, as this can lead to negative publicity. The media will want to establish a basis of trust and this can be ruined. If it is important information that cannot be divulged then say so. State it's confidential and explain why.
- Never make statements that are "off the record". There is no such thing with a reporter. The chances are very good that you will be quoted.
- Keep your answers short.
- Always look at the reporter.
- Don't get too technical and don't use jargon, slang or abbreviations.
- Be serious, don't try to be funny – your humour is not necessarily easily interpreted.
- Always assume the microphone is on. Don't make remarks that can be used later in a negative way.
- Try not to sound defensive when replying to a question. Always be positive.
- Fires are a good photo opportunity as they provide dramatic visuals of the work that Ezemvelo carries out.
- Always use the fire event as an educational opportunity.
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8.3.11.2 Providing Information for a Featured Article

At times, the media may request information regarding UDP WHS Fire Management Plan or fires in general, which may be featured in a published article. All requests for featured articles must go through the Media Liaison Officer.

9 MONITORING, DATA MANAGEMENT AND AUDITING

9.1 Forms

- Every fire event must be recorded immediately after the fire event on the prescribed form (Appendix 1).
- Each form (event) must be accompanied by a map (1:50 000 scale or larger) showing boundaries of burns; each burn must link unambiguously and uniquely to a single form (Map 1)
- Forms must be submitted to uKhahlamba Ecological Advice for data capture by 30 November at the latest.
- Copies of all submissions must be kept on station.

9.2 Mapping standards

- Actual boundaries of the fire must be recorded, not just the block number

- Boundaries of burns should be mapped to within 50 m of actual
- Any unburnt patches greater than approximately 200m x 200m (or 4 ha) within a fire event should be indicated
- Mapping should take place within one month of the fire event, but preferably immediately after the fire

9.3 Responsibilities

- The Park Manager is responsible for filling in the forms and for submitting the completed and checked forms to uKhahlamba Ecological Advice by 30 November.
- Ecological Advice/Range Ecologist is responsible for accurately capturing the data into the fire database and the spatial data into GIS; hard copy submissions must be filed appropriately.
- Ecological Advice Range Ecologist is responsible for producing maps of planned versus actual burns, and calculating basic statistics such as total area burnt, area burnt by season, area burnt by cause; these must be provided to the Park Manager prior to the January Fire Planning meeting.

9.4 Research plots

- It is the joint responsibility of the Park Manager and the Natural Resources Officer and Range Ecologist to ensure that the prescribed fire protection and treatments are carried out.

9.5 Reporting

Reporting to the police

- All arson fires must be reported to the police.

Annual report

Annual report of the fire season must be prepared by the CM/Park Manager and submitted to the Natural Resources Officer/Ecological Advice in Lesotho and South Africa respectively by 30th November each year. The same report must be submitted by the Director Parks to the Ezemvelo KZN Wildlife Ecologist for consolidation.

9.6 Fire Compartment Registers

The Fire Compartment Register is a CMs/Park Managers most important tool in planning scheduled burns. It is thus of the utmost importance that these registers are diligently kept

up to date by the CMs/Park Managers. Only the approved MALOTI DRAKENSBERG PARK WORLD HERITAGE SITEJoint Fire Compartment Register may be used.

The Fire Compartment Register must be updated twice annually; firstly in February to record the scheduled burns approved at the Annual Fire Management Workshop, and secondly at the end of fire season to record the actual burns that took place. Accuracy is of the utmost importance when compiling these returns. It is advisable to record fire data as soon as possible after the event whilst, memory is still fresh.

9.7 Fire Management Forms

All Fire management Forms are to be completed and submitted to the relevant SCM and Director Parks on the Lesotho side by the 15 November each year. The SCM/Director Parks will check the forms and ensure that all the relevant information and maps are attached and in the correct format. The forms will be submitted to the Regional Ecologist on the UDP WHS side and the Director Parks on the SNP side by the 30 November each year. Copies of submitted reports should be kept on file in the Fire Compartment Register.

The required forms that are to be completed consist of the collated Fire Management Forms with the Fire Season Report Back forming the covering memo, as well as prescribed map with all the fire events clearly mapped. The accurate recording of this information is crucial for future budgeting and operational planning of the Park. This is to ensure that expenditure on fire management operations is auditable.

Only management maps supplied by the Regional Ecologist on the UDP WHS an the Natural Resource Officer on the SNP side are to be used for recording and submitting fire returns. It is crucial that burns are mapped accurately and where possible, CMs/Park Managers are encouraged to use a Global Positioning System to record the perimeter of the burns. It is also advisable to take pictures of the actual burns to assist in mapping the burns. CMs/Park Managers are also to take note of the completion of the required returns as per the Fire Protection Association (on the South African side) reporting requirements.

9.8 Risk Management Strategies

Fire and the management thereof pose a significant risk to the TP. To ensure that the objectives of the fire management programme are achieved whilst minimising the risk involved, it is essential that the fire management programme is reviewed, audited and that specific risk management strategies are implemented and complied with.

Specific objectives of this review include the following:

- To minimise the risk of fire management through the provision of appropriate strategies.
- To provide self-assessment and auditing tools for the ongoing evaluation of the quality of fire management in the organisation.
- To ensure that problems and shortfalls with regards to fire management in the organisation are identified and rectified timeously.
- To enhance accountability with regards to fire management.

9.8.1 Station Handovers

The history of fire in the management unit plays an important role in the management of the risk that fire poses. The management unit handover in the event of a change of Conservation Manager thus need to include a section on the history and special needs of fire management pertaining to the unit. These special needs should be included in the CAT, however it is essential that all relevant registers, files and agreements are handed over and signed for.

9.8.2 Audits

To ensure that the objectives of the MALOTI DRAKENSBERG PARK WORLD HERITAGE SITEJoint Fire Management Plan are met, it is important that a range of practical, measurable and quality control processes are in place. These will be in the form of an audit and will be implemented at management unit level. The purpose of the audit is to identify and rectify any shortfalls that may exist.

9.8.2.1 Fire Season Preparedness Audit

CMs/Park Managers are responsible for the quality control at a management unit level. It is essential that the CM/Park Managers conducts self-assessments to determine the preparedness for fire management operations. The focus of this audit is the identification and correction of any shortfalls regarding fire preparedness prior to the fire season. CMs/Park Managers should ensure that the following aspects are addressed and are auditable, *i.e.* that documented proof exits:

- Approved scheduled burns with the CATs completed.
- Proof that all fire fighting equipment has been maintained and is working.
- Vehicle service records (logbook and inspection sheet).
- Human Resource requirements – temporary staff contracts, proof of required training.
- PPE issued.

- Fire emergency drills conducted.

Note:

- Fire Reports are a legal requirement.
- The submission of Fire Reports is a measurable Key Performance Activity and non-compliance will be investigated.
- The accurate completion of Fire Management Forms is a priority and must be completed on time.

9.9 Reporting to the South African Police Services and the Lesotho Mounted Police.

All MDTP/invasive fires, irrespective of cause or location, are to be reported to the South African Police Services (SAPS) and the Lesotho Mounted Police within 24 hours of commencing a suppression operation. A statement reflecting the available evidence with regards to the cause of the fire is to be made. Case Numbers are to be recorded in the incident registers.

10 LEGAL ASPECTS

Legislation regulating fire management in South Africa, KZN and Lesotho is comprehensive and it is the managers' responsibility to familiarise themselves with this legislation. This includes the spraying and burning of tracer lines, firebreaks as well as planned burns and the prevention and combating of wild fires.The following pieces of legislation are relevant to fire management in the Park:

- Environment Act 2008 (Lesotho)
- Labour Code Order 1992 (Lesotho)
- National Veld and Forest Fire Act: No. 101 of 1998 (South Africa)
- Forest Act: No. 122 of 1984 (South Africa)
- Occupational Health and Safety Act: No. 85 of 1993 (South Africa)
- Compensation for Occupational Injuries and Diseases Act: No. 130 of 1993 (South Africa)
- Criminal Procedure Act: No. 51 of 1977 (South Africa)
- Fire Brigade Services Act: No. 99 of 1987 (South Africa)
- Conservation of Agricultural Resources Act: No. 43 of 1983 (South Africa)
- Disaster Management Act: No. 57 of 2002 (South Africa)
- National Environmental Management Act: No. 107 of 1998 (South Africa)
- National Environmental Management: Biodiversity Act: No. 10 of 2003 (South Africa)

- National Environmental Management: Protected Areas Act: No. 31 of 2004 (South Africa)

11 REVIEW

Review of the Joint Fire Management Plan will take place at the Annual Fire Workshop as a standing item. Proposed changes must be submitted as agenda items for discussion.

12 REFERENCE LIST

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13 APPENDICES

Appendix 1: Fire Management Form

Fire Management Form (One form per fire event)

Management Unit: **Year:**

1. Pre-Burn Inspection/Fire Event Report back

Compartment number:	Compartment size (ha)	Area burnt (%)	Date last burnt	Date inspected:	Inspected by:
Compartment objective:					
Fire objective:					
Recommended burning conditions: (Season, weather conditions etc.)					

2. Fire Details

Completed by:							
Ignition cause:	Scheduled/ Controlled	Arson	Accidental	Runaway	Invasive	Lightning	Unknown
Ignition date:				time:			
Extinction cause:	Rain	Dew	Natural barrier	Firebreak/ road	Management intervention	Other: specify	
Extinction date:				time:			
Last rain:	date:			amount:			

3. Fuel Conditions

Greenness:	Very dry	Slightly green	Green	Very green
Mean height (m):				
Density:	Very sparse	Sparse	Moderately sparse	Moderately dense	Dense
Uniformity:	Uniform	Moderately uniform	Patchy	Very patchy

4. Management Data

Labour units:	Permanent	Casual

5. Meteorological Conditions

Weather condition:	Hot and dry	Hot and moist	Cool and dry	Cool and moist
Temperature:	Maximum:		Minimum:	
Relative humidity:	%			
Wind speed:	1 (calm, smoke vertical)	2 (wind felt on face)	3 (≤ wind raises dust)	

Wind condition:	Constant speed and direction		Constant speed and fluctuating direction		Constant direction and fluctuating speed		Gusty	
Wind direction:	N	NE	E	SE	S	SW	W	NW

6. Post-burn Inspection at ± 4 weeks:

Date of post-burn inspection:				Inspected by:	
Area burnt (record on map overleaf):				Map reference no.:	
Patchiness	Herbaceous layer:	Clean		Patchy	Very patchy
	Woody layer:	Clean		Patchy	Very patchy
Intensity:		Cool	Moderate	Hot	Very hot
Average singe height (woodies) in metres:					
Maximum singe height (woodies) in metres:					
Assessment of achievement of fire objectives:					
Assessment of achievement of compartment objectives:					
Notes (*e.g*. Why were fire objectives not achieved?)					

- Refer to explanatory notes before filling out forms.
- Please tick the relevant boxes when filling out forms.
- When mapping the burns on the attached map, please map as accurately as possible, showing which portions of the compartment(s) were burnt and indicate whether the area was mapped directly in the field or done from memory as a “desktop exercise” at a later stage.
- All completed fire data to be submitted by the 30 November of each year to Ecologist.

Captured by:	**Date:**
Checked by:	**Date:**

MANAGEMENT UNIT NAME

INTERNAL MEMO

DATE :		**FILE NR :**	**E 9/1**
TO :	**REWU**	**FROM :**	**NAME DESIGNATION**
VIA:	**SCM**		

SUBJECT: FIRE SEASON REPORT BACK

1. Introduction

The 2011 fire season was a relatively quite/busy fire season. A total of 28 fire events were experienced burning 18 000 ha or 28% of Management unit Name. Of the 20 scheduled compartments burns that were approved, only 17 took place which account for 6 075 ha of Management unit name. 25 MDMALOTI DRAKENSBERG PARK WORLD HERITAGE SITEfire events were recorded and accounted for 500 ha. Four (4) Runaway fires accounted for 497 ha. Invasive fires accounted for 1052 ha, and Unknown fires accounted for 337 ha being burnt. The research catchments were burnt as scheduled as were the Brotherton Plots. One experimental night burn was implemented successfully. Table 1 is a summary of these statistics

Preparation for the fire season went well and an awareness exercises was undertaken with the neighbouring community. Unfortunately a hiker was tragically killed as a result of an unknown fire event.

Standby teams no longer proved a challenge as the additional budget that was allocated addressed the concerns that were raised. As a result, even though there were a substantial number of MDMALOTI DRAKENSBERG PARK WORLD HERITAGE SITEand Invasive fires, the improved response resulted a relatively small percentage of the management unit succumbing to these threats. **Thus in brief, an overview of the past fire season highlighting successes and challenges *etc*. ....**

Table 1: Summary Burnt Statistics

NAME OF MANAGEMENT UNIT AND SIZE (ha)			
	No. of fires	**Total area burnt**	**% of Management Unit**
Scheduled Fires			
MDTP/Arson Fires			
Invasive Fires			
Runaway Fires			
Accidental Fires			
Natural Fires			
Total			

2. Report back on actual fire events

The following section (Table 2) is a report back of the breakdown on the actual fire events that took place for the fire season.

Table 2: Report of actual fire event statistics

Event No	**Date**	**Fire Event Type**	**Comp**	**Comp size**	**% of compartment**	**Area burnt** *(ha)*

3. Report back on actual fire events

The following section is a record and quantification of the cost of fire management operations for the past year.

Table 3: Tracer Line Information

	Spraying of tracer lines	**Burning of tracer lines**
Date started		
Date completed		
Litres of Gramoxone used*		
Number of people employed		
Cost of temporary staff		
Cost of PPE**		
Total Kms of Tracer lines		
Km driven in vehicles to transport staff to and from destinations***		

* Please ensure that this can be substantiated by your chemicals issue register.
** Please ensure that this can be substantiated by your PPE orders placed.
*** Please ensure that drivers indicate and log fire related trips.

Table 3: Fire Break Information

Total Km of breaks	
Date started	
Date completed	
Number of days to complete	
Average number of people employed	
Number of teams	
Cost of PPE**	
Working on Fire teams	
Cost of temporary staff	
Km driven in vehicles to transport staff to and from destinations***	

** Please ensure that this can be substantiated by your PPE orders placed.
*** Please ensure that drivers indicate and log fire related trips.

Table 4: Compartment Burns and additional Wildfire related costs

Number of scheduled burns completed	
Total hectares of scheduled burns done	
Number of days to complete scheduled burns	
Average number of people employed	
Cost of temporary staff	
Km driven in vehicles to transport staff to and from destinations***	
Cost of Standby Teams for fire season	
Additional cost of rations	
Combined overtime for permanent staff	
Combined overtime for temp staff	
Other additional Costs (specify)	

4. Conclusion

Brief concluding remarks as to

- why objectives were not achieved,
- what challenges were experienced, what mitigating measures will be adopted to address these *etc*.
- What were successes; recognition to staff *etc*…
- Injury on duties
- etc

APPENDICES: (can include photos and graphs, charts or maps to better illustrate events and results)

Signature
Name and Designation

MANAGEMENT UNIT NAME

INTERNAL MEMO

DATE :		**FILE NR :**	**E 9/1**
TO :		**FROM :**	**NAME DESIGNATION**

SUBJECT: PROPOSED BURNS

Introduction:
Below is a summary of proposed burns for MANAGEMENT UNIT NAME.

MANAGEMENT UNIT NAME (SIZE ha)													
COMP. NUMBER	**DATE LAST BURNED & PERCENTAGE BURNT***										**PROPOSED MONTH**	**TOTAL ha TO BE BURNED**	**COMP. ATTRIBUTES**
	Date	%	Date	%	Date	%	Date	%	Date	%			
TOTAL PERCENTAGE OF MANAGEMENT UNIT:													

* This should be for the past five fire events and should indicate the actual date of the burn and not just the year, as well as the percentage that was burned for that particular year.

Managers can include additional information to motivate for the proposed burns, but the above table should be used to summarize the proposed scheduled burns.

Conclusion

Signature
Name and Designation

SETTING OUT THE CONTENTS OF THE FIRE COMPARTMENT REGISTER

The order of data sheets in the Fire Compartment Register are as follows:-

File index folder: **EXPLANATIONS**
Under this folder the following documents should be displayed:
i) Explanation of the Fire Compartment Register *(This document).*
ii) Notes from the 1999 Drakensberg Park Fire Workshop held at Midmar Conference Centre On March 18, 1999.
iii) Lowveld fire danger rating system *(how to work it out).*
iv) A copy of the "Fire contract for neighbours" form.
v) A copy of the "Clearance and maintenance of a fire belt" form.

File index folder: **COMPARTMENTS of BLOCK A**
Under this folder the following data sheets should be displayed:
ii) *(Management Unit)* Fire Compartment Register (For Block A).
iii) Fire Management Forms *(data sheets which follow each other in year order).*

File index folder: **COMPARTMENTS of BLOCK B**
Under this folder the following data sheets should be displayed:
i) *(Management Unit)* Fire Compartment Register (For block B).
ii) Fire Management Forms (data sheets which follow each other in year order).

File index folder: **COMPARTMENTS of BLOCK C – the end**
As above

File index folder: **MAPS**
Each year's fire events are recorded on a map and submitted to Ecological Advice. These maps are filed here and follow each other in year order.

File index folder: **REPORTS**
Each year a fire report is submitted to Ecological Advice. These reports are filed here and follow each other in year order.

File index folder: **SENSITIVITY**
This section of the Fire Compartment Register is used for the "flagged" or shaded compartments as indicated in the Fire Compartment Register data sheet. The sensitivity of a compartment "flags" all sensitive features of a compartment so that those sensitive features are taken into consideration before the compartment is burnt.

EXPLANATION OF THE FIRE COMPARTMENT REGISTER

An example of a Fire Compartment Register is provided below:

KAMBERG FIRE COMPARTMENT REGISTER

BLOCK A (1492 Ha)

COMP HA	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
A1 620										
A2 890										
A3 460										

1. Notice that the heading above the page reads “Block A (1492 Ha)”. “A Block” comprises of a number of compartments namely; A1, A2 and A3. You will note that the sum of all the compartments = 1492 Ha, thus the block is 1492 Ha.
2. The first row acts as a header for all the tables below it and indicates the compartment number and the year that the fire took place in.
3. From the second row downwards, each individual compartment number and its size in hectares are indicated in the first column. From the second column onwards, is the working part of the table for each year.

A1 240	PROPOSED			
	25%	50%	75%	100%

1. The first column shows the compartment number “A1” and the area of the compartment in ha “240".
2. The top half of the second column shows the proposed compartment to be burnt.
3. The bottom half of the second column is divided into four sections. Each section indicates the percentage of the compartment that was actually burnt that year.
4. When filling in the percentage burnt, take the area to the nearest quarter %. For example, if 80% of the compartment was burnt then fill in the 75% and if 90% was burnt then fill in 100%.

A1 240	7			
	7	7	7	

1. The first column shows the compartment number “A1" and the area in ha “240".
2. The top half of the second column proposes that the fire will be burnt in the 7th month of the year (July).
3. The bottom half of the second column shows that the actual burn took place in the 7th month (July) but only 75% of the compartment was burnt. If the Proposed burn and the actual burn have the same number indicated in the column as is the case here (Indicated by the “7" in both top and bottom half of the column) than you have met your burning objective as far as planning your burns is concerned.

B5	5 (2)			
380	5	5	5	8

1. The first column shows the compartment number “B5" and the area in ha “380".
2. The top half of the second column proposes that the fire will be burnt in the 5th month of the year (May). The (2) indicates that two fires occurred in this compartment and that your burns did not go according to plan.
3. The bottom half of the second column shows that two fires actually took place. The first fire burnt 75% of the compartment in the 5th month (May) as planned. The second fire burned 25% of the compartment in the 8th month (August) which was not planned.

B7	9 (2)			
980	9	9	9	9

1. The first column shows the compartment number “B7" and the area in ha “980".
2. The top half of the second column proposes that the fire will be burnt in the 9th month of the year (September). The (2) indicates that two fires occurred in this compartment and that your burning did not go according to plan.
3. The bottom half of the second column shows that 100% of the compartment was burnt in the 9th month (September) but the (2) in the top column tells you that two separate fires occurred in this compartment during the same month. Two fires were not planned for, so you did not meet your objective. If you want to find out what percentage was burnt by each fire, turn to your fire data sheet and look it up.

C3	5 7 (2)			
1084	5	7	7	

1. The first column shows the compartment number “C3" and the area in ha “1084".
2. The top half of the second column proposes that the fire was scheduled to be burnt in the 5th month (May) and in the 7th month (July). The (2) shows that the two fires actually occurred.
3. Note: Very seldom will a fire be scheduled for burning in two different months. In this case the (2) will indicate a planned fire. This situation could occur if you want a cool fire to burn vegetation around a wattle plantation and a hot fire to burn the wattle plantation at a later date.
4. The bottom half of the second column shows that a fire occurred in the 5th month (May) and burnt 25% of the compartment. A second fire occurred in the 7th month (July) and burnt 50% of the compartment. In this case your objective was achieved as indicated by the “5 7 (2)” in the top half of the column.

C8				
400	7	7	7	

1. The first column shows the compartment number “C8" and the area in ha “400".
2. The top half of the second column is not filled in which means that no fires are proposed to be burnt that year.
3. The bottom half of the second column shows that 75% of the compartment was burnt in the 7th month (July). Note: This fire was not planned as the proposed half of the column is empty. The fire could be an arson, run away, invasive, or accidental fire. For fire details look at the fire data sheet.

D6	(3)			
50	6	6	6	6

1. The first column shows the compartment number “D6" and the area in ha “50".

2. The top half of the second column shows a (3). This predicts that no scheduled fire was planned but three fires actually took place.
3. The bottom half of the second column shows that three individual unplanned fires occurred in the 6th month (June) and burnt 100% of the compartment. For details of the three fires look at the fire data sheet. The (3) in the proposed section of the column indicates that three unplanned fires took place.

D1	8			
309	6	6	6	6

1. The first column shows the compartment number “D1" and the area in ha “309".
2. The top half of the second column shows an “8". This predicts that a scheduled fire has been planned for the 8th month (August).
3. In the bottom half of the second column, an unplanned fire burnt 100% of the compartment in the 6th month (June). You did not meet your objective as a early fire took place in the compartment. For details of this fire look at the fire data sheet.

D1				
309				

1. The first column shows the compartment number “D1" and the area in ha “309".
2. The top half of the second column is empty which indicates that no fires were planned to be burnt that year in the compartment.
3. In the bottom half of the second column is empty which indicates that no fires occurred that year. No fire was proposed and no fire occurred so your objective was achieved.

E3				
160				

1. The first column shows the compartment number “E3" and the area in ha “160". **Note:** The first column is **“Flagged”** or shaded which indicates that there is a sensitive feature in this compartment that needs to be taken into consideration before the compartment is burnt. To find out what the sensitivity is, look it up in the CAT **Before Burning**. Sensitivity of a compartment could be features such as specially protected fauna, bushman paintings, sensitive vegetation, forest margins, fire exclusion plots, experimental plots, buildings etc. It is imperative to look up this feature before burning the compartment.
2. No information is found in the top or bottom half of the second column. This predicts that no fire was planned or took place in this compartment that year.

E8				
831	6			

1. The first column is “Flagged” so there is a sensitive feature in the compartment which must be looked up in the CAT before burning. The “E8" and “831" indicates the compartment number and its area in ha.
2. The top half of the second column is empty which indicates that there was no burn proposed for that year.
3. The bottom half of the second column indicates that an unplanned burn occurred in the 6th month (June) and burnt 25% of the compartment.

Appendix 5: Fire Fighting Equipment, Maintenance and Preparedness Checklist

MANAGEMENT UNIT NAME

Note: It is the responsibility of the CM to annually perform the checks below and to sign and file this form for inspection by the Supervisor. Please ensure that proof is kept of the actions that were done as required.

1. Vehicles

- Vehicles to be serviced prior to the fire season.
- All NCS vehicles are to be serviced prior to the fire season and kept in good mechanical condition.
- All NCS vehicles are to be kept with full tanks of fuel after a day's work, so that the vehicle may respond to a fire without any unnecessary delays being incurred.

2. Maintenance of Equipment Checklist

Equipment	Number	Date Serviced	Cost
Knap Sack Sprayers			
Beaters			
Bakkie Sakkies			
Fire Extinguishers			
Fire Hoses and Reels			
Tractor PTO pump			
First Aid Kits			
Radios			

3. General Preparedness Checklist

Is equipment accessible at all times?	**YES**	**NO**
Do staff members have access to keys and are they on standby and contactable?	**YES**	**NO**
Do the required staff have First Aid training?	**YES**	**NO**
Fire drill with hospitality staff done?	**YES**	**NO**
Annual re-training: permanent and temporary staff done?	**YES**	**NO**
Are extinguishers appropriately marked?	**YES**	**NO**
Do staff know how to use fire extinguisher?	**YES**	**NO**

4. PPE Requirement for Spraying and Burning of Tracer Lines

Equipment	No. Issued	Cost
Aprons		
Chemical Gloves		
Masks		
Cotton Overalls		
Leather Boots		
Leather Gloves		
First Aid Kits		

5. PPE Requirement for Burning of Firebreaks

Equipment	No. Issued	Cost
Masks		
Cotton Overalls		
Leather Boots		
Leather Gloves		
Headlamps / Torches		
First Aid Kits		

Signed **Date**

Level 1: Fire Line Fire Fighting Crew

Target Group: General Assistants and Contract Personnel and Field Rangers.
Goal: To equip fire fighting crews with the basic knowledge to extinguish a fire quickly but safely.
Physical: Minimum fitness standard is required.
Required Training:

- Fire behaviour and types of fires.
- Fire suppression methods.
- Mopping up operations.
- Fire safety.
- Communication procedures.
- Fire fighting equipment and their uses.
- Use of fire units and pumps.
- Standard certificate of competency must be obtained.

Level 2: Crew Leader

Target Group: Labour Supervisors, Senior Field Rangers, Conservation Managers and Senior Conservation Managers.
Goal: To obtain those basic skills, knowledge and attitudes vital to supervising a team, or a combination of skills, in order to attain fire objectives effectively and efficiently.
Physical: Minimum fitness standard is required.
Required training:

- Identify, understand and describe fire behaviour in a range of conditions.
- Understand and apply fire suppression tactics to a range of fire problems. Use fire tools and equipment efficiently.
- Communicate in appropriate fire terminology.
- Apply fire safety practices.
- Apply general supervising principles to the crew and the fire problem.
- Communication, briefing and debriefing of crews.
- First Aid level 2.

Practical training:

- Minimum of 5 fires with not more than 2 prescribed fires under the supervision of a qualified crew boss is required.
- Standard A grading of 80% is required for the theory and practical.
- Pre-requisites Grade 7-education level.

Level 3: Fire Boss I (Sector Boss)

Target Group: Senior Conservation Managers and Conservation Managers.
Goal: To obtain critical knowledge, skills and aptitude necessary to maintain preparations and suppress small to medium fires and to control a sector of a large fire.
Physical: None. High resistance to stress.
Required training:

- Introduction to fire management.
- Communication.
- Mapping of fire behaviour.
- Assessment and planning of suppression operation.
- Initiating an attack and extinguishing it to debrief stage.
- Establishment of a command and control structure.
- Initiating and controlling external support.
- Pre-requisite crew boss certificate.
- Standard A grading of 90% in theory and simulations.
- Practical of 3 fires under the supervision of a qualified fire boss.

Level 4 Fire Boss II

Target Group: Conservation Managers and Senior Conservation Managers.
Goal: To obtain critical knowledge, skills and aptitude necessary to suppress large conflagrations, and competence to plan and execute prescribed burns.
Physical: None. Extremely high resistance to stress.
Required training:

- Introduction to fire management.
- Communication.
- Mapping of fire behaviour.
- Assessment and planning of suppression operation.
- Initiating an attack and extinguishing it to debrief stage.
- Establishment of a command and control structure.
- Initiating and controlling external support.

- Pre-requisite Fire Boss I.
- Standard A grading of 90% in theory and simulations.
- Practical of 3 fires under the supervision of a qualified Fire Boss II.

Physical fitness:
Physical fitness is critical in fire management. Fighting wildfires is physically and mentally demanding and can entail long hours. The ability to make good split-second decisions is thus dependant on a person's fitness, which can make the difference in life and death situations.

Physical fitness and work capacity test:
The United States Forest Service began studying job performance requirements in 1965 in order to define minimum fitness standards for its fire-fighters. Based on results of a study conducted by the United States Forest Service, the following tests focused on aerobic measurements were developed:

- Step Test

Involves stepping up and down a box of a specific height for 5 minutes. It is a sub-maximal test of cardiovascular performance, so is less risky for individuals who may not have an optimal fitness level. The score is based on post-exercise pulse rate, adjusted for age, weight and gender.

- Run Test

The participants must run 2.4 km over a flat terrain in a given time.

- Pack Test

The pack test consists of walking a flat course of 5km carrying a weighted pack.

Type of test distance/time result:
Step 5 minutes minimum pulse rate = 45
Run 2.4 km in 11 min 40 sec
Pack/Walk 5 km, 20 kg pack in 45 min

Annual Refresher Training

All personnel, who are involved in wild and prescribed fires, shall complete a minimum of eight hours of fire refresher training and a fitness test annually. At completion of the refresher training and fitness test a competency certificate will be issued. No person will be allowed to fight any fire without this certificate.
Refresher training:

- Fire Behaviour and types of fires
- Fire suppression methods.
- Mopping up operations.
- Fire safety.
- Communication procedures.
- Fire fighting equipment and their uses.
- Use of fire units and pumps.
- Aircraft deployment and water bombing.

AGREEMENT FOR CLEARING AND MAINTENANCE OF A FIREBREAK

in the

uKhahlamba Drakensberg Park World Heritage Site

MEMORANDUM OF AGREEMENT entered into between:

THE KWAZULU-NATAL NATURE CONSERVATION SERVICE duly constituted in terms of the KZN Nature Conservation Management Act (Act No. 9 of 1997) by the Conservation Manager

……

NAME OF CONSERVATION MANAGER/PARK MANAGER

……

MANAGEMENT UNIT NAME

(Hereinafter referred to as "the Service")

and

the neighbouring landowner to the abovementioned property -

……

NAME OF OWNER/OCCUPIER

……

PROPERTY NAME

(Hereinafter referred to as "the NEIGHBOUR"), it being duly and lawfully represented by:

owner/occupier - name: ...……..

WHEREAS the above parties desire to enter into an agreement concerning the clearing and maintenance of a fire break for fire protection services as is legislatively required,

IT IS AGREED AS FOLLOWS:

The parties will annually clear and thereafter maintain, fire breaks along the common boundary between their respective properties or along the agreed route as described hereunder:

(a) SERVICE……

……

……

……

……(INSERT PROPERTY DESCRIPTION)

and

(b) NEIGHBOUR……..

……

……

……(INSERT PROPERTY DESCRIPTION)

on the following terms and conditions:

1. The said fire breaks will be cleared of all combustible material, including logs and where possible also tree stumps, to a width of …… as prescribed by the rules and regulations of the Fire Protection Association on each side of the boundary as indicated on the annexed sketch plan (Annexure A). This must be done by the use of one or more of the following methods:

    *a. Hoes
    *b. Rakes
    *c. Herbicides
    *d. Discs/Ploughs
    *e. Graders or other appropriate equipment
    *f. Burning using the following ……...
    *g. Slashing
    *h. Other (specify) ……

    (* Delete where not applicable)

2. (a) I intend to start work on the firebreak no later than (date)……

    (b) Manner of clearing ……

    (c) Manner of maintenance …….

    (d) i) Location of work ……

        ii) Length and width of fire belt …….

iii) Position of affected public road ……

(SEE ATTACHED SKETCH MAP - ANNEXURE B)

(e) Nature of the SERVICE'S assistance:

i) Number of personnel ……

ii) Tools available …….. …….

iii) Other equipment …… ……

(f) Public Road Reserve precautionary measures (if any) ……

……...

3. The cost of clearing and thereafter maintaining, the said firebreaks will be borne by the two parties in proportion to be agreed upon, which will be effected by one or more of the following means:

*3.1. By each party clearing and maintaining the fire break on his side of the said boundary.

*3.2. By the parties each clearing and maintaining ……. meter wide breaks along those sectors of the boundary, of approximately equal length, as indicated on the attached sketch plan (Annexure A)

*3.3. By one party, namely …… clearing and maintaining the said fire break along the entire common boundary or along the route and by the other party, namely …… paying half share of the costs of such clearance and maintenance of an invoice by the said ……

*3.4. By one party, namely …… making …… labourers available to the other party, namely …… for the clearing and maintenance of the said fire break under the supervision of the said …… or his representative.

(* Delete where not applicable)

4. Not later than the …….. (date) in every year the parties shall, by agreement, set a future date on which, weather permitting, fire break clearance as set out above will commence and alternate date(s) of commencement in the event of weather conditions being unfavourable. Should the parties fail to reach such agreement by …….. (date) in the year, then either party will be entitled to give the other party FOURTEEN (14) DAYS written notice of such commencement dates.

5. Should either party fail to carry out its obligations, then the other party will be entitled, in its discretion, to carry out the clearing and/or maintenance work on behalf of the defaulting party.

6. Where any part of the fire break which is to be cleared and maintained shown in the attached sketch plan (Annexure A) falls within or adjoining a road reserve of a public road, the party responsible for the supervision of that part of the fire break shall take the necessary precautions for the protection of any members of travelling public using the said road. The measures to be taken shall be recorded each year as part of the supplementary agreement mentioned in paragraph 3 above to the satisfaction of the Road Traffic Inspectorate.

FOR THE SERVICE

THUS DONE AND SIGNED AT ……this ……. day

of …… (month) 20……..

AS WITNESSES

…….. 1. ……

Conservation Manager

2. ……

FOR THE NEIGHBOUR

THUS DONE AND SIGNED AT ……this ……. day

of …… (month) 20……..

AS WITNESSES

……. 1. ……

NEIGHBOUR

(Description of Title and print name of owner) 2. ……

Appendix 8: Legal Notification of Intention to Burn

UDP WHS – SNP MALOTI DRAKENSBERG PARK WORLD HERITAGE SITE

MANAGEMENT UNIT NAME

For Attention:

(To be delivered by hand or registered mail)

RE: NOTICE IN TERMS OF SECTION 12 OF THE NATIONAL VELD AND FOREST FIRE ACT No. 101 of 1998

In terms of the National Veld and Forest Fire Act No. 101 of 1998, we are obliged by law to burn firebreaks. We propose to burn firebreaks on our property, that borders your property on the ....., weather permitting.

We hereby give you notice in terms of Section 12 of the National Veld and Forest Fire Act No 101 of 1998 that we will be burning firebreaks on the said days and would advise that in terms of Section 12(3) of the Act you are obliged to:-

a) burn your firebreak on the boundary concerned on the same day or days;
b) be present at such burning or have your agent attend; and
c) ensure that a sufficient number of persons are present on your side of the boundary to prevent any spread of fire when the firebreak is burned.

(CM signature)…….

For CEO : EZEMVELO KZN WILDLIFE

DATE:……

Appendix 9: Compartment Attribute Table (CAT)

UKHAHLAMBA DRAKENSBERG PARK WORLD HERITAGE SITE

FIRE COMPARTMENT ATTRIBUTE TABLE *EXAMPLE*

All the information contained in the CAT will be used to determine the reasons for burning which, in turn, will influence how that compartment is burnt to achieve the broader goals of fire management in the UDP WHS.

Management Unit: …….. Prepared by: …… Date: ……..

COMP. NO. and SIZE	COMPARTMENT OBJECTIVES	FIRE TYPE and STRATEGY	FIRE FREQUENCY	COMPARTMENT ATTRIBUTES	FIRE MANAGEABILITY (includes access, topography, weather)	NEIGHBOUR INFLUENCE ON STRATEGY
HMSF A01 567 ha	Fire used as alien plant control. Or Manage for *Protea* woodland. Or Buffer to surrounding communities (prevention of arson fire).	Hot fires in winter. Or Cool fires in cool weather conditions in Autumn. Or Manage with A02 and A03.	Biennial. Or Every 3-4 years.	**1. Biological** Good mountain reedbuck habitat. Large eland herds. Aloe communities (10%), forest patches common (30%), grassland (70%). **2. Cultural** None. **3. Infrastructure** Field Ranger outpost. **4. Research** Fixed point photo site standards. Weather station.	**1. Remoteness** Difficult to get to. 4 hours walk. **2. Controllability** Flat area with predictable winds. Difficult to control runaway fires. **3. Staffing requirements** Team of minimum 25 required. **4. Environmental conditions** Predictable wind patterns. **5. Animal escape routes** Yes. **6. Specific guidelines for attribute protection** Burn firebreak around outpost and weather station. **7. Relationship to adjoining compartment** Manage together with A02 and A03.	**1. Arson history** History of regular arson. Invasive fires are possible. **2. Record of assistance** Neighbours not co-operative. No agreement for joint breaks. **3. Assets nearby** Plantation on 500m of boundary. **4. Harvesting programmes** Harvesting programmes active.

UKHAHLAMBA DRAKENSBERG PARK WORLD HERITAGE SITE
FIRE COMPARTMENT ATTRIBUTE TABLE

Gavin Shaw, Roger Uys and Sonja Krüger

February 2008

A Compartment Attribute Table (CAT) has been developed to be used for all the fire management compartments in the UDP WHS. The purpose of the table is to incorporate all the basic information for each compartment. This information is required to implement the fire principles in each management compartment to protect the attributes of the compartment and thereby achieve the fire management goals and objectives of the UDP WHS.

When completing the CAT for each compartment in a management unit, the Conservation Manager of that Management Unit, should add their name and date, *e.g.* (Gavin Shaw, 2004), to specific entries to place them into context.

The CAT for each management unit will be reviewed at the annual sub-regional fire workshops.

Explanation of the CAT columns (see attached table)

1. Compartment number and size:
   The full name (alpha numeric) of the compartment and its size in ha.

2. Compartment objectives:
   These are the objectives of the compartment that will achieve the goals and objectives of fire management in the UDP WHS (see Fire Management Plan) or will address specific management objectives of the management unit (*e.g.* control of alien plants, Oribi management).

3. Fire type and strategy:

A fire type and strategy should be developed with the compartment objectives (see 2) and the compartment attributes (see 5) in mind. For example, if the compartment has *Protea* communities and the objective is to protect these, then a cool fire would be required. The type of fire and required strategy to burn, will dictate the season of burn. If there is a particular strategy that is followed when burning that compartment, then state what it is (*e.g.* burn A03 with A04). If the strategy changes on an annual basis or depends on the weather *etc.* then state that it varies.

4. Fire frequency:

The proposed burning frequency of the compartment based on the compartment objectives and attributes.

5. Compartment attributes:

These include four categories of attributes, which are of significance:

Biological - The following should be taken into consideration:

a. Vegetation classes – This is the percentage of each major vegetation type (*e.g.* grassland, forest, wetland, *etc.*) that is represented in the compartment. The percentage and type (species, maturity and density) of alien plants and transformed lands should also be recorded.
b. Priority plants – These include species of special concern that have particular fire requirements (*e.g. Widdringtonia* communities).
c. Priority animals and their breeding and foraging sites– these include; Eland, Oribi, Grey Rhebuck, Mountain Reedbuck, Klipspringer, Vultures, Bald Ibis, Blue Crane, Wattled Crane, Game birds and Reptiles (particularly the Cream Coloured Mountain Snake and Chameleons).

Cultural – These features will include things like the best practise actions to be taken when burning in compartments that contain shelters with rock art, archaeological sites and living heritage sites.

Infrastructure – The following infrastructural features should be considered: visitor camps; ranger outposts (including staff accommodation); repeater sites; electrical and

telephone boxes/poles/wires; pipelines (*e.g.* aboveground PVC pipes); water tanks/reservoirs; fuel tanks; signage/trail structures; gates/booms; fences/paddocks; visitor sites/car parks/caves; walkways/bridges and tar roads.

Research - The following research features should be considered:

Long term research sites – *i.e.* the Brotherton Burning Trial and Cathedral Peak Catchments at Cathedral Peak, Burgess Plots at Royal Natal and Giant's Castle No Burn Compartments at Witteberg. The monitoring document for each research site will guide the burning practises in that compartment and in adjacent compartments.

Short term research sites – These would include sites where the equipment (such as weather stations) or treatments will be in place for ≤ 5 years. The management actions for these will be determined by the requirements of the research being conducted and should be detailed in the research proposal.

6. <u>Fire manageability</u>

This information is required to help implement the necessary fire type and strategy.

Basic information on the compartment should be provided based on the CMs experience from burning that compartment.

The following information has been identified as being useful to implement the suggested fire type and objectives for that compartment:

i) Remoteness – This should include information on:
    a. Whether the compartment is accessible by road or whether you have to walk in.
    b. Approximate distance.
    c. Time to reach the compartment by road and by foot.
ii) Controllability of burning in that compartment (*e.g.* relatively easy due to predictable wind patterns or topography).
iii) Staffing requirement – how many staff and their suggested placement.
iv) Environmental conditions of compartment, including; wind patterns, presence of natural firebreaks (*e.g.* rivers or roads), topography/aspect (*e.g.* fire races up steep dry slope), wetness (related to aspect) and accessibility to water.
v) Escape routes for animals (*i.e.* burning in such a manner that animals do not get trapped).

vi) Specific guidelines to protect an attribute (as general principles will not always hold, special actions may be required in some instances to protect certain attributes).

vii) Relation to adjoining compartments (it might be worth making a note of a special attribute in an adjoining compartment that needs to be considered when burning the compartment in question).

7. Neighbour influence on strategy:

This column has been included to recognise the importance of neighbouring influences from outside the reserve on implementing the suggested fire objective and strategy for that compartment:

i) Arson history, including the relationship with neighbouring communities and where the arson fires usually come from.

ii) Record (history) of assistance stating incident, circumstances, assistance rendered and by whom.

iii) Neighbours assets (*e.g.* timber plantations).

iv) Community harvesting requirements- list any that are in place which may impact on the fire type and strategy.

STAGES	FIRE BEHAVIOUR	FDI
BLUE	**SAFE** **flame length: 0 - 1 m** Low fire hazard. Usually to cold or wet to burn, however, controlled burn operations can be executed with a reasonable degree of safety.	**00 - 20**
GREEN	**MODERATE** **flame length: 1 - 1.2 m** Suitable for controlled burning to remove moribund grass material. Although controlled burning operations can be done without creating a fire hazard, care must be taken when burning on exposed, dry slopes. Keep a constant watch, for unexpected wind speed and direction changes.	**21 - 45**
YELLOW	**DANGEROUS** **flame length: 1.2 - 1.8m** Suitable for controlled burning, however not recommended when fire danger index exceeds 55. Remove moribund grass material. Fire and weather conditions should be closely monitored.	**46 - 60**
ORANGE	**VERY DANGEROUS** **flame length: 1.8 - 2.4m** No controlled burning of any nature should take place. Careful note should be taken of any sign of smoke anywhere, especially on the upwind side of any mountain slope. Any fire should be attacked with maximum, force at hand.	**61- 74**
RED	**EXTREMELY DANGEROUS** **flame length: > 2.4m** All personnel and equipment should be removed from the field. Fire teams, labour and equipment are to be placed on full stand-by. At first sign of smoke, every possible measure should be taken in order to bring the fire under control in the shortest possible time.	***75 - 100***

Appendix 11: Pre-Scheduled Burn Checklist

UDP WHS PRE-SCHEDULED BURN CHECKLIST

1. Are the firebreaks in place and sufficient to contain the fire? - look specifically at re-growth in breaks where the scheduled burn is in late spring. YES/NO

2. HAVE YOU CONSULTED THE CAT? YES/NO
   What are the sensitive features? _____

   _____

   _____

3. Identify structures and geographical features and vegetation *e.g.* roads, footpaths, krantzes, rivers, young veld *etc*. that can be used to contain the fire.
   a. Inside compartment: _____

      ___
   b. Bordering compartment: _____

      ___
   c. Have you discussed this with the Labour Supervisor? YES/NO

   What preventative measures are in place? _____

   _____

   _____

4. Notification of Neighbouring Land Owners and Authorities

Name	**Farm name**	**Contact number**	**Date of notification**
(Mr Landowner)			

Notification to FPA, SAPS, District Councils and Local Municipalities

Name	**Institution**	**Contact number**	**Date of notification**
Fire Protection Officer	*FPA*		

General comments

_____

Signed

_____ _____

Conservation Manager: Labour Supervisor

Date:

Appendix 12: Fire Protocol for the uKhahlamba Drakensberg Park World Heritage Site

uKhahlamba Drakensberg Park World Heritage Site

Fire Management Protocol - 2010

1. Trace line preparation Fire Management in the uKhahlamba Drakensberg Park World Heritage Site

Fire is one of the most important tools for the management of protected areas. Conversely, if this tool is improperly applied this can have negative impacts on the conservation objectives of protected areas. Given the importance of ensuring that fire is used to achieve the objectives it is essential to ensure that careful consideration be given to the planning and execution of annual burning programme. Fire management was discussed at the uKhahlamba Regional Operations Committee on 7 April 2003, and the following was agreed to:

"***Decisions on burning must be linked to the objectives of the protected area as listed in the Management Plan (not all PA's have management plans yet), and specifically to the Fire Management Plan where these exist. Where neither of these documents exists then priority should be given to producing these***".

2. Legal Requirements

Every station must to join a Fire Protection Association (FPA) in their respective municipal district and abide by the rules and regulations of the Fire Protection Association. This is a statutory requirement of the NF&FFA. MUs that span 2 Fire Protection Associations must join both. CMs must take an active role in their local Fire Protection Associations. They must have constructive input in the Fire Protection Association meetings.

Conservation managers must sign agreements pertaining to the maintenance of fire breaks with all landowners adjoining his/her reserve. These agreements must be kept on file. These are once-off agreements, which are used from year to year unless a new landowner takes over the property, where after a new agreement must be signed. The fire break agreement may only be signed by duly authorised agents on behalf of the landowner. This does not apply to the change over of Conservation Managers as these are signed on behalf of the organisation. Any CM management change must include a full fire history and special needs handover. Ally neighbours,

difficult ones, history of firebreak spotting / slopping through, signed agreements, pending agreements, basically every firebreak gets a full debrief. The EKZNW legal department has already drawn up the format of this agreement. CMs are only allowed to use the said agreement and cannot draw up their own agreements.

Weather permitting, one month before the fire season; CMs need to send out a fire notification (Notification of intent to burn) to all their neighbouring landowners and copy the FPO / FPA, notifying them in writing of their attention to burn. Early frosts may allow breaks to be completed in late May but be advised that these breaks may green up and burn through by the end of the fire season. The format of this notification is also obtainable from our legal department and should not be altered by a CM. If the notification is posted to the landowner it must be posted by registered mail and the slip kept as proof of notification. If the notification is hand delivered, a copy with the landowner's signature on the notification should be kept as proof of the notification.

No fires of any kind are allowed to be burnt from 12:00 on a Friday, unless with agreement of the FPO and within the FPA members rules and regulations. Fire Protection Association rules notwithstanding, **No** planned fires are permitted over weekends or from 12:00 on the day before a public holiday and on Public Holidays.

However, where a reserve falls within and is part of a FPA that allows burning of fire breaks on Fridays after 12:00, stations that deem it necessary in terms of operational requirements can continue to burn after 12:00. Note however that this is deemed inappropriate and even though provision is made for this, stations where this is allowed should endeavour to finish burning on Fridays by 12:00 at the latest.

Before a compartment or a firebreak is burnt the CM's MUST inform the affected neighbours telephonically. It is not only common courtesy, but legislatively required to inform you neighbour of your intention to burn. This is CRITICAL. This includes your EKZNW neighbours / surrounding CMs. This is to ensure that reserve bordering you is full aware of your intention to burn.

Before any burning takes place the weather bureau must be contacted on the morning of the fire event to enquire about the forecast fire danger rating. If the forecasted danger rating is Blue, Green or yellow you may plan to burn. The planning must include very careful consideration to temperature and humidity forecasts, and the subsequent BI (Burning Index). A BI of above 44 would be considered dangerous. Forecasted average wind speeds of above 15km/hr are considered dangerous. FDI forecasts are just those…forecasts. Actual FDI's worked out on the burn site and at regular intervals during the burn, every 30 minutes, must be the final deciding

factor weather to commence the burn and when to stop the event. If the forecasted or actual index is orange or red you may not burn under any circumstance. SCMs and CMs must subscribe managers to “Fire Stop” by telephoning 033-3308421. Fire Stop will require information from you before they put you on their system. This system must include the FDI emails. You will receive a detailed daily SMS on your cell phone every morning and afternoon informing you of the actual and forecasted weather conditions. If you are in an area with no cell phone coverage you can phone the weather bureau at 082 2311 611 for the fire danger index in your area. To help you plan your week, phoning 082 2311 602 can obtain a general Berg forecast over a five-day period. It is a standing order that the forecast and actual fire danger rating is known for the particular day you intend to burn. No burning is to take place if you are unsure what the forecast or actual fire danger-rating index is or if the forecasted or actual index is in the orange or red.

Note

An FDI indicator, as the ‘be all and end all’ criterion to burn is also a very fallible indicator and common sense must be applied at all times. For example you can get an FDI of 57 yellow with very little wind and high temperatures, which could be safe to burn under, but you can get the same FDI at very cold temperatures but high wind conditions which would be dangerous. The wind driven fire will be the worst as wind is the single most influencing factor on fire behaviour after fire fuel conditions.

Before the burn is commenced the pre burn check sheet must be filled in. Local Fire Protection Association systems must be followed with reference to notification. For example the LRFPA requires that there electronic fire detection base is notified.

During the burn the burning check sheet must be followed and then kept as part of the burn records.

An investigation into any fire related incident will be carried out if it took place during orange or red conditions. This could lead to disciplinary actions if found staff is found negligent.

CMs are to make sure that a notice board is displayed at all reception areas and resorts informing visitors that burning is taking place and at what location the burn will take place. Visitors can obtain this information from the reception office and during extreme fire warnings, visitors should be made aware of the dangers, and in extreme cases staff can advise visitors against hiking in high risk areas. CM’s are to make sure that they **always inform front office desk staff where they are burning** and preferably supply them with a map so that visitors can see exactly where the fire will be.

SUPERVISORY PRESENCE

! **Conservation Managers** must be physically present, for the entire duration of the burn, on firebreaks where a break adjoins neighbouring properties. CMs will also be physically present on firebreaks that protect any infrastructure in the reserve.

! **Conservation Managers** must be physically present, until the fire is totally contained and there is no chance that the fire will spread onto the neighbouring property, on compartment burns where a compartment burn borders onto neighbouring properties.

! **Conservation Managers** have to be on the reserve, for the entire duration of the burn, when internal breaks or compartments are burnt.

There are no exceptions to these instructions!

Fire retardant overalls and leather boots are to be worn by all personnel on trace line burns, firebreaks and compartment block burns. No non fire retardant undergarments or synthetics are permitted to be worn under the overalls or on the person's body at any time. Leather gloves and fire retardant headwear are to be worn at all times. All PPE must be as stipulated as per the Fire Management Plan.

A person who is trained in first aid must carry at first aid kits all times at all fire events. The first aider must carry a radio. Radio communications must be checked and verified before the burn commences. Check for battery levels, spare batteries, frequencies to be used, backup plans etc. Radio communications must also be periodically checked as the burn progresses (moves further from the base) to ensure immediate reaction in the event of an emergency radio call. The 1st-aider and crew leaders should also carry cell phones. Even if there are no cellular phone communications exactly where they are they can move to areas of cell signal if needed. First aid kit must contain burn treatment equipment as well as basic first aid equipment for other injuries. No compressed vessels such as oxygen cylinders are permitted anywhere near the fire.

Each person on the fire must carry a box of matches. This is used to clear a safety area for you to stand in should you be trapped inside a fire threatened area.

Pre-fire season briefings and training must be given to fire teams consisting of permanent and contract staff. This will include relevant sections of the fire management protocol, safety aspects, radio protocols, chemical application and effective fire control in firebreaks and during run-away fires. In case of emergencies, the Mountain Rescue Protocol must be followed. This is absolutely critical. Everyone must have been inducted on the fire management protocol.

3. Budgeting for fire season

CMs must include the following items when preparing their annual budget:

It is critical all staff are trained in fire fighting and fire behaviour. This includes informal fire protection staff.

- The cost of Personal Protective Equipment for both permanent and local labour (PPE)
- The cost of chemicals to spray the trace lines.
- The cost of contract labour to burn the trace lines.
- The cost of labour to burn firebreaks, compartment burns and research plots.
- CM's are to estimate any standby or overtime allowances that may be paid to staff. Budgets for standby should extend for a minimum of 6 months.
- Transport costs must be budgeted for the transportation of staff to carry out firebreaks and compartment burns.
- CMs are to estimate the contract labour wage bill for the fire season. This includes taking on additional staff to prepare the trace lines during March and April. Wages are often confirmed at the annual fire workshop or by the Extended Public Works Programme, which lays down the prescribed wage.
- Staff are to inspect and budget for any repairs or replacement to fire fighting equipment such as beaters, water knapsacks sprayers as well as bakkie sakkies and water tankers. All water points must also be inspected and made serviceable. All fire equipment must be inspected and made serviceable in February / March.
- CMs are to estimate the costs and budget for fire fighting ration packs.
- CMs are to estimate and budget for FPA membership fees and any other associated FPA costs.

4. Trace line preparation

Trace lines will alternate in positioning from year to year and there must be non-consecutive spraying of chemical on the same line to avoid erosion. For this same reason, the burning of firebreaks must alternate between the two sides of a boundary fence from year to year, where possible.

Concentrations of Gramoxone will under no circumstances exceed 75 ml per 16 litres water for short grass (*Themeda*) and 110 ml per 16 litres water for tall thatch type grass (*Cymbopogon*.). It is recommended to brush-cut where possible the really tall stands of grass as a trace line as the tall species of grass do not always burn clean especially early in the season.

Trace lines must be sprayed during March and April each year. Die-off of the grass takes approximately 2 weeks. Four hours of soaking must be allowed for the chemical to work. In expectant rainfall periods, the spraying must be terminated at least four hours before a shower. Early morning spraying must be delayed until the dew has burned off the grass.

Trace lines must be burned in late April and early May before the grass has frosted off. Fire teams must be increased when a delay is expected in the burning of the trace lines to reduce the risk of run-away fires.

A minimum team of six staff per trace line is recommended. These teams must be increased when burning trace lines in rank areas or under dry conditions.

All permanent and contract staff must be supplied with the following required safety equipment:.

Protective waterproof over trousers, plastic aprons, gumboots, plastic coated gloves and respirators must be worn by staff whilst spraying trace lines. Soap must be supplied by CMs so that staff can wash their hands after spraying and before eating. Staff are to be made aware of the dangers of Gramoxone and the consequences of non-compliance.

5. Firebreaks

The breaks may only be burned after the first frost. This is normally around about the 1st of June, however should heavy frost occur earlier and the chance of wildfires increase, teams can start burning firebreaks earlier. It should also be noted that if breaks are burnt too early, this may lead to the greening of these breaks rendering them ineffective later in the season. A firebreak team consist of a minimum of 25 people per fire break event.

A minimum radio quota per team is:

CM	1 radio
Supervisor	1 radio
2 x Fire leaders	2 radios (one per each side of firebreak)
2 x “Tail-end-Charlies”	2 radios

If the first-aider is not one of the listed persons then he/she should have his/her own radio, which makes the total 7 radios.

Pre-fire briefings and training must take place so that every person on the fire operation fully understands his/her job. This must be done by the CM or the Supervisor leading the fire team.

6. Fire Compartment Burns

Fire compartment registers must be maintained by CM. (Only the approved UDP fire compartment register may be used).

The Fire Compartment Register must be filled in prior to burning with the proposed burns for the year. After the burn has taken place the actual fire event needs to be recorded and the Fire Management Forms inserted into the Fire Compartment Register. Accuracy is important when compiling these returns. It is ideal to record fire data on the day of the fire so that you can record the events of the fire while your memory is still fresh.

All returns are to be submitted to the Regional Ecologist, via the SCM, by the 30th November each year. The Senior Conservation Manager will check the fire data sheets and ensure that all relevant information and maps are attached.

Lightning fires are to be left alone to self extinguish or burn to existing firebreaks. The only exception to the rule is when these fires threaten infrastructure or neighbouring properties in which incidences, the fire must be extinguished.

At the Annual Fire Workshop decisions as to which areas are to be burnt will be discussed, agreed upon and documented. Field visits must be undertaken prior to the Fire Workshop to reserves/areas where CM’s and/or Eco-Advice staff believe that there are problems or issues that need to be resolved in the field.

It is the CMs responsibility to organize a pre-burn inspection for each compartment prior to burning. This should be a field-based inspection, and Eco-Advice staff can be asked to assist. The CM or Eco-Advice staff may invite any other fire experts where this will add value to the

decision making process. Decisions pertaining to burning agreed to at the pre-burn inspection must be documented on the fire data form supplied. The form will indicate the compartment to be burnt, under what conditions and time of year the burn will take place, and the specific objectives of the burn. Where contentious issues cannot be resolved in the field, the relevant Ecological Advice Co-ordinator and the Senior Conservation Manager must be called in to assist and decision taken should be in consultation with the CAT.

Once the burning programme has been finalized and approved at the Annual Fire Workshop, the CM is responsible for ensuring that scheduled burns are carried out according to the agreed plan. Any proposed deviation from this plan must be discussed and agreed upon by the relevant Senior Conservation Manager and Regional Ecologist prior to making any changes.

All climatic data must be recorded on the day of the fire event on the fire data sheet supplied, to ensure the accurate reflection of actual conditions on the day. CMs are to use their Kestrels to continuously record the relevant information for reporting purposes.

Post-burn inspection after schedules burns will be done within one month after the fire event, where practical, and within the desired and required data protocols. All CM's must mark the fire boundaries on a map as accurately as possible for each of the fire events. The recommended way to do this is with a GPS. Google Earth is also a useful tool to graphically present the burn data.

The sensitivity section of the compartment must be adequately assessed before commencing the burn. Advice from Eco-Advice is advisable should the CM be unsure. Compartment burns must not be undertaken until such time as the boundary breaks are in place. In the case of very early burns, April /May, boundary breaks need not be in place as the season is not conducive to burn protective burns. Adequate staff must be provided.

Animal populations must be taken into consideration (e.g. nesting Wattled cranes). A flight path must be left in the burning compartment so that animals can escape from the fire. Do not surround the animals with fire and burn them. Night burns must be conducted with sufficient torches to allow for the return of staff safely and staff must be instructed to stay together so that no staff member is left behind.

7. Standby teams

Standby teams should be in place by the 1st of June each year until 31st October. Under extreme dry years/periods the Park Manager must make a decision to extend the standby period. This

decision must be made by no later than 25 September. Standby duties will cease at the end of the fire season. A minimum of 8 fire team members are to be on standby throughout the fire season, this includes weekends (Saturday & Sunday), pay days and public holidays. Permanent and contract staff are to be paid the Standby rate approved by Human Resources Division. Standby teams should be observant while on standby especially during the night and weekends. They must notify the CM immediately if there is a fire or a suspicion of a fire. The suspected fire then needs to be investigated and the fire then needs to be suppressed and made safe as per guidelines in section 8 below.

Where non-compliance to the standard minimum fire standby crew strength may occur, due to operational or budget challenges, this must be communicated to the SCM and/or Park Manager

Standby teams must be provided with one headlamp each to be able to combat fires at night and ensure their safety, i.e. not walking off the edge of cliffs etc due to them not be able to see in the dark.

8. Wildfires

The CM must assess each and every wildfire as they occur, and base the decisions made on that particular fire, not on previous history of fires in that area. Even if you are sure of the actions to be taken speak to your senior conservation manager. 2 heads are always better than 1. If in doubt, you must consult with your Senior Conservation Manager on how to proceed. The preferred option, depending on the weather conditions, using the fire standby teams on hand, is to put out the fire without putting in large back burns. Each and every wildfire must be communicated to the Senior CM of the effected MU, the senior CM of the MU's on either side of the effected MU, the Fire Protection Officer of the local Fire Protection Association and any immediately or possibly threatened neighbouring landowners. Take into account that a wind change could landowners in a different sector.

Where a wildfire is fanned by strong winds, the fire team must not attempt to put out the fire by beating it, but rather do back burns / burn outs using natural features, such as rivers, cliffs. Firebreaks can also be used and can also be widened to prevent the fire from jumping the firebreak. If the need arises, fire teams from neighbouring stations must be called on as well as your neighbours, local Fire Protection Association, local municipality and through Disaster Management.

The Fire Protocol must form part of each stations Standing Orders and must be adhered to by all CM's and Hospitality Managers. A copy of this protocol must be inserted into your stations Fire Compartment Register.

Appendix 13: Standard Operating Procedures Checklist for Fire Breaks

STANDARD OPERATING PROCEDURES CHECKLIST FOR FIRE BREAKS **Management Unit:** _____ **Description of Break: From** _____ **to** _____	COMPLIES	
	Yes	**No**
1. If the firebreak is underneath a power line, contact Escom where required to switch off the line before commencing with the burning operation.		
2. The person in charge of the burning operations shall either be an appropriately qualified manager with at least 3 years experience of control burning in conjunction with the labour supervisor with at least 5 years experience of burning breaks.		
3. If it is a firebreak on the boundary, ensure that the relevant neighbour(s) has been notified in writing. The neighbour or his authorised representative should be present when burning a boundary break.		
4. Ensure all relevant stakeholders and neighbours are notified before commencing with the burning operations.		
5. Before commencing with the burning operations, the person in charge shall ensure that proper radio communications are in place.		
6. The burning operations manager shall check the Compartment Attribute Table to ensure that all the relevant details with regards to the burning of the specific break are known (e.g. dangers, recommended time of burning, etc.)		
7. Ensure that the FDI does not exceed 55.		
8. The manager must ensure that sufficient resources are available. The minimum requirement is 1 bakkie-sakkie or fire teak consisting of a minimum of 25 trained crewmembers.		
9. The manager or supervisor must ensure that all the trace lines are to the required standard before commencing burning.		
10. No burning will be allowed on a public holiday or weekend.		
11. The manager must be present on boundary breaks. For internal breaks, the manager must be on station.		
12. Ensure a minimum additional 50% of resources are available immediately if required.		
13. When burning, the FDI shall be measured infield (and recorded) every hour, or as soon as the weather conditions start changing. ***Stop when FDI exceeds permissible limits!***		
14. Always ensure that sufficient resources are guarding and mopping up the rear while burning breaks.		
15. After completion of the burning operations, ensure that the burned area is properly mopped-up before leaving the area. ***If in any doubt, leave sufficient resources to guard the burned area!***		
16. Notify all relevant stakeholders when the burning is completed.		

FDI Readings

Time	RH	Temp	Wind Speed	FDI	Time	RH	Temp	Wind Speed	FDI

Signature of Person in Charge		**Date**	

Appendix 14: Standard Operating Procedures for Conducting Control Burns

STANDARD OPERATING PROCEDURES FOR CONDUCTING CONTROL BURNS **Management Unit:** _____ **Compartment No:** _____	COMPLIES	
	Yes	**No**
1. The person in charge of the burning operations shall either be an appropriately qualified manager with at least 3 years experience of control burning in conjunction with the labour supervisor with at least 5 years experience of control burning.		
2. The burning operations manager shall check the Compartment Attribute Table to ensure that all the relevant details with regards to the burning objectives are known (e.g. dangers, recommended time of burning, etc.)		
2. If a compartment is on the boundary of the management unit, ensure that the boundary breaks will be effective in controlling the fire and that the relevant neighbour(s) has been notified in writing as well as on the day of the actual burn and the day before. The neighbour or his authorised representative should be present when burning a boundary break.		
3. Ensure all relevant stakeholders are notified before commencing with the burning operations.		
4. Before commencing with the burning operations, the person in charge shall ensure that proper radio communications are in place.		
5. Ensure that the FDI does not exceed 54. If it is necessary to burn with a higher FDI, ensure written permission has been obtained from the Department. ***No burning will be allowed if the FDI > 54.***		
6. Ensure that sufficient resources are available. The minimum requirement is 1 bakkie-sakkie or strike unit with 15 trained crew members.		
7. No burning will be allowed on the day before a public holiday or weekend.		
8. Ensure a minimum additional 50% of resources are available immediately if required.		
9. When burning, the FDI shall be measured infield (and recorded) every hour, or as soon as the weather conditions start changing. ***Stop when FDI exceeds permissible limits!***		
10. Always ensure that sufficient resources are guarding and mopping up previously burned compartments.		
14.After completion of the burning operations, ensure that the burned area is properly mopped-up before leaving the area. ***If in any doubt, leave sufficient resources to guard the burned area!***		
15.Notify all relevant stakeholders when the burning is completed.		

FDI Readings

Time	RH	Temp	Wind Speed	FDI	Time	RH	Temp	Wind Speed	FDI

Signature of Person in Charge _____ **Date** _____