



Lions River Fire Protection Association
By Landowners - For Landowners

FIRE MANAGEMENT GUIDELINES – Part 1

Compiled by Bobby Hoole

1. Fire Management - Overview

Fire management on agricultural land is important to protect the safety and well-being of people and communities and to protect agricultural industries that are vital to the Midlands. These guidelines ' provide practical fire management advice for people living and working on cropping, grazing, plantation timber and rural lifestyle properties, particularly those who are undertaking property planning or are new to farming.

This document will be a useful reference for anyone involved in planning or promoting fire management on agricultural land in the Midlands.

All public and private landowners and managers in Kwazulu Natal have legislated responsibilities regarding fire management and fire extinguishment. Most of these responsibilities arise from the *National Veld and Forest Fire Act 101 of 1998*. This document integrates the legal responsibilities arising from relevant fire management legislation with advice to help landowners and managers form an overall picture of what is needed to achieve fire safety on rural properties. It is designed to be used for a number of purposes, such as planning fire management, as a tool in information or training courses and improving general community knowledge about fire management.

This document provides general advice that may not be relevant in all circumstances. Landowners and managers are always encouraged to seek additional expert advice about fire management on their property where required.

2. Agricultural Fire Management Guidelines

People can minimise the risk of fire to achieve improved personal and community safety, protect assets including the environment, and meet legal requirements by addressing the following objectives and guidelines:

Objective 1: Plan for and undertake fire safety, asset protection and asset recovery activities, with safety as a priority

All individuals have a responsibility for their own personal fire safety. Landowners and managers have an additional responsibility for the safety of all people living or working on or visiting their property.

When planning and undertaking fire management, landowners and managers are advised to:

- consider safety, practical, environmental and legal issues and the long-term sustainability of the property, with safety as a priority;
- take into account that it may not be possible to protect all assets from fire or have fire suppression services available in all circumstances;
- consult and work with adjacent public and private landowners, managers and users, where practical, to achieve fire safety benefits for all properties; and

Landowners and managers are advised to develop and implement a fire management plan that identifies and removes or reduces fire risks on their property and addresses recovery from a fire.

Objective 2: Take reasonable steps to prevent unplanned fires starting and planned fires escaping

- All individuals and authorities have a responsibility to minimise the risk that they may start an unplanned fire, particularly when they are operating machinery, vehicles and equipment or using fire.
- Landowners and managers are advised to consider fire risk before harvesting, grinding and welding, slashing and mowing, or driving vehicles and motorbikes through dry grass or crop. Consider avoiding these activities at times of extreme fire danger.
- Landowners and managers have a responsibility to ensure that private powerlines (electric fencing, overhead electric wires for pastures etc) will not start a fire.

Objective 3: Take reasonable steps to limit the spread of unplanned fire

- During the Fire Danger Period, landowners and managers have a responsibility to extinguish unplanned fire on their property and to report the fire if it appears that they will be unable to extinguish it.
- Anyone finding a fire burning in the Fire Danger Period must report it to Firehawk as soon as possible.
- Landowners and managers are required by law to have strategic fire breaks for their property. They are required to implement fire prevention works as set out in legislation.
- Anyone operating machinery and equipment in rural areas is advised to have access to appropriate fire fighting equipment.

Objective 4: Take reasonable steps to provide access to property and assets and to water for Fire fighting

- Landowners and managers are obliged to provide access to property, assets and water for fire fighting. They must provide this access under all circumstance.

Objective 5: Participate in community-based groups to minimise the impact of fire

- People living and working in the area are encouraged to join LRFPA and other community groups to help improve fire safety on their property and in their community.

3. Understanding Fire Management & Fire Break Planning

Fire management involves fire protection and using fire for land management purposes such as stubble burning, weed control or the management of native / indigenous vegetation. Fire behaviour is how fire spreads and burns given differences in fuel, weather and topography (shape of the land). This section provides general information that may be useful when considering and planning fire management.

Spread of Fire

Fire spreads in three main ways:

- direct flame contact,
- heat transfer, and
- from embers.

Heat is transferred through hot air currents and as radiant heat. The role of embers is sometimes underestimated in the spread of fire. Embers can be carried forward by wind and air currents. These start new spot fires well ahead of the main fire front (spotting). Embers can easily carry fire across a fire break.

Embers can also land on fine fuels such as leaf litter near buildings and start small fires that can grow and ignite heavier building materials. Indeed, most houses that burn down during a fire ignite from ember attack. Trees, shrubs and tall grasses can produce embers and should be considered when planning fire management.

Some trees with fibrous bark, such as blue gum, pine trees (if crowning), certain large weed types) may cause significant short-distance spotting, while trees with ribbons of bark may cause long-distance spotting under some circumstances.

The impact of radiant heat is also important when considering how fire spreads. Radiant heat can preheat unburnt material so that ignition by embers or flames is easier. The amount of radiant heat people or objects receive varies with distance from the fire. If this distance is halved the amount of heat received will increase by approximately four times.

While heavy fuels do not contribute to the heat of the initial fire front, they do need to be put out after the fire front has passed to prevent them being a continuing source of fire.

Drought conditions

When planning fire management, consider the impact of drought and dry conditions. While grass paddocks tend to be heavily grazed in these situations, fire management still needs to be undertaken as fire can still travel across paddocks with very short grass.

During very dry conditions trees often shed leaves and the leaf litter dries out, increasing the amount of fuel available to burn in timbered areas, including plantations. Dry soil conditions associated with drought also increase the chance of tree roots igniting. These fires are difficult to suppress.

Fire behaviour

Fire behaviour is influenced by three main factors. These are fuel, weather and topography. Consideration of these factors is important when considering fire management. Fire can occur in any type of vegetation, such as grasslands, trees, crops or shrubs. How hot a fire burns and how quickly it spreads depend on the size, quantity, type, arrangement and moisture content of the fuel being burnt.

Fuel load

The fuel load is the quantity of fuel per unit area. It is commonly expressed as tonnes per hectare. Reducing fuel loads can help to protect assets from fire and make fires easier to suppress.

Fuel size

Fine fuels (less than 6 mm in diameter), such as leaves, twigs, grass and bark, dry out rapidly and burn quickly. Because fine fuels burn easily, they contribute most to the heat of a fire front. Consequently, minimise the quantities of fine fuels near key assets to minimise the risk of radiant heat and direct flame contact.

Heavier fuels like branches and logs (greater than 25 mm in diameter) can also provide fuel for fires. However, they are slower to ignite than fine fuels and give off heat more slowly.

Weather

Weather is a major factor in the ignition and spread of fire. Preparing for common weather patterns, as well as unusual weather events, will assist landowners to minimise fire risk.

Temperature and humidity

Temperature and humidity impact on fire fuels, especially fine fuels, which more rapidly gain and lose moisture than heavy fuels. The higher the air temperature and the lower the humidity the more easily fuel will burn.

Wind speed

Wind influences fire behaviour significantly. As wind becomes stronger, a fire can burn hotter because the wind makes the flames lean forward, increasing flame contact with dry fuel. This makes the fire spread faster.

Wind direction

In the LRFPA area of operation hot dry winds often come from the north and northwest and are often followed by a easterly and south-easterly wind changes. In this situation the side of the fire can quickly become a much larger fire front (head of the fire). Given these common wind patterns, it is often important to give priority to fire management on the northern and western sides of your property and assets. However, as fire can come from any direction, preparation for fire is still needed for the whole property.

Topography

The shape of the land needs to be considered when planning fire management. Fire travels faster upslope than down-slope because when it is moving upslope the flames are closer to the unburnt fuel. This preheats the fuels, making them easier to ignite. The rate of fire spread upslope approximately doubles for every 10 degrees of slope. Consequently, greater distances may be required between key assets and vegetation when building on a slope.

Aspect is the direction that a feature, such as a building or slope, faces. Northern and westerly aspects usually receive more sun and will therefore usually be warmer and drier and tend to burn more easily than other aspects.

Topography can also influence how the wind behaves. As wind passes over an object, such as a hill or windbreak, the wind can tumble, creating turbulence. Wind turbulence produces erratic winds, causing unpredictable fire behaviour.

Valleys and gullies can channel and strengthen winds, increasing the rate of spread of a fire and its intensity. Be aware of local wind conditions. New landowners should ask neighbours and previous owners about local winds when planning fire management on their property.

4. Protecting the environment

To help secure the long-term sustainability of a property, all fire management planning needs to include consideration of fire safety, legal requirements, economic and environmental issues. Protecting and improving the environment is an important part of sound fire management planning. This is increasingly being recognised in the management of rural land. For example, fire management is often part of agricultural quality assurance systems.

Looking after the environment when undertaking fire management includes:

- identifying environmental assets (air, water, land and vegetation) and how they might be affected by fire and fire management activities;
- avoiding environmental harm;

- minimising harm where it cannot be avoided;
- repairing environmental harm if it occurs; and
- considering the use of fire to improve the health of native vegetation (ecological burning).

Care needs to be taken to ensure that fire management does not cause unintended consequences such as a loss of vegetation, wildlife and scenic quality, weed invasion, erosion and water quality problems.

As part of helping to protect the environment, permits are required to remove indigenous vegetation. There are some exemptions for fire safety. More information about these permits and exemptions is available at DAEA.

5. Fire danger terms

The following terms are commonly used when considering fire safety issues.

Fire Bans

Total Fire Bans are declared on all land (both public and private land) in different regions of Kwazulu Natal on days when the fire danger index is extremely high. The use of fire during a Total Fire Ban is prohibited and failure to adhere to the ban carries hefty penalties.

Fire Danger Rating / Fire Danger Index

Fire danger refers to how difficult a fire will be to control given certain weather and fuel conditions. Fire danger is expressed as a Fire Danger Index (FDI). Because they burn differently, separate fire danger rating systems have been developed for forests and grasslands, however, FDI's are normally issued for an area taking all factors of that particular area into consideration. Hence it may be Orange 65 on the South Coast and a Yellow 46 in the Midlands – no burning on the South Coast, cautious burning in the Midlands, with a likely change upwards of the FDI later in the day. Fires in extreme fire danger conditions are very difficult to control, even by well-equipped fire fighters.

The likelihood of a fire being successfully suppressed depends on the tools and people available and the weather and fuel conditions. Even where the fire danger rating is moderate, a fire will still be difficult to control without enough people and adequate fire fighting equipment.

Fire danger information is available from the South African Weather Service website (www.saweather.co.za) for all Kwazulu Natal districts during the Fire Danger Period.

Fire Alert Stages	BLUE	GREEN	YELLOW	ORANGE	RED
Fire Danger Index	0 - 20	21 - 45	45 - 60	61 - 75	76 - 100
Fire Behaviour	SAFE	MODERATE	DANGEROUS	VERY DANGEROUS	EXTREMELY DANGEROUS
Flame Lengths (m)	0 - 1	1 - 1.2	1.2 - 1.8	1.8 - 2.4	2.4 +
Fire Control Guide Contact LRFA or Fire Hawk to attain the latest information regarding fire danger rating application	Low fire hazard Controlled burning operations can normally be executed with a reasonable degree of safety	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	Controlled burning is not recommended when the FDI exceeds 45. Aircraft should be called in at the early stages of a fire.	NO CONTROLLED BURNING OF ANY NATURE should take place. Careful note should be taken of any sign of smoke anywhere - especially on the up-wind side of any plantation. Any fire that occurs should be attacked with the maximum force at hand, including all available aircraft at the time.	ABSOLUTELY NO BURNING - All personnel and equipment should be removed from field. Fire teams, labour and equipment are to be placed on full stand-by. At the first sign of smoke, every possible measure should be taken in order to bring fire under control in the shortest possible time. All available aircraft are to be called without delay.

Fire Danger Period

The Fire Danger Period is declared at the beginning of each winter in Kwazulu Natal and stays in place until 31 October, unless otherwise stated. During this time there are restrictions on fire use in the open and the operation of machinery and equipment.

6. Fire breaks

The use of fire breaks is often an important part of fire management on rural properties and a necessity for the Midlands in terms of the National Veld & Forest Fire Act 101, of 1998. Fire breaks are any natural or constructed breaks in fuel used to stop or control the spread of fire. There are different types of fire breaks. Some stop fire spreading horizontally at or near ground level; others stop fire spreading vertically into trees. An understanding of the likelihood of a fire break being effective is an important part of planning fire management.

The effectiveness of fire breaks

The effectiveness of fire breaks depends on the weather conditions, the width of the break and whether embers are being produced. In grasslands, wider fire breaks will stop a greater range of fires than narrow ones. Narrow breaks (under 10 m) are ineffective except under the mildest of conditions. It is recommended that 10 - 25m fire breaks are burnt on either side of a common boundary and the width of internal fire breaks dependent on the fuel load / topography etc. Most fire breaks can have some effect at slowing the progress of a fire, in particular if the break:

- is close to the source of fire ignition so that the fire has not built to its maximum potential;
- is approached by the side (flank) of the fire, because the flank has lower fire intensity than the front (head) of the fire (hence plan strategic breaks relative to prevailing winds for the area);
- effectively disrupts the vertical and/or horizontal continuity of the fuel, thereby reducing fire intensity and making the fire easier to suppress; or

- provides access for suppression.

Fire breaks may help increase the effectiveness of fire fighting and be used to protect key assets from fire.

a. Creating fire breaks along road servitudes

Contact the fire protection officer about roadside fire management planning issues.

b. Perimeter breaks

Where practical and environmentally responsible, landowners and managers are encouraged to have a natural or constructed perimeter (boundary) fire break between neighbouring properties including neighbouring public land such as roadsides.

Landowners and managers are encouraged to have perimeter breaks that reflect fire risk factors such as aspect, slope, local weather conditions and fuel loads on adjoining land. Standard 15 - 25m boundary breaks on each side of the common boundary is recommended. Consider whether these breaks can be used as access tracks as well as fire breaks.

With agreement between neighbours or LRFPA, perimeter fire breaks could be located all or in part on a neighbouring property.

c. Internal breaks

Consider the use of internal fuel breaks to minimise the travel of fire across the property, as well as when block burning is carried out in order to reduce risk. Consider whether these breaks can incorporate an access track. Consider having internal fire breaks between different enterprises, such as farm forestry and cropping.

d. Existing features

Where available, consider using existing features such as water bodies or green crops, as fuel breaks.

e. Fuel reduction in fenced-off areas

Landowners and managers are encouraged to manage weeds in fenced-off areas to minimise fuel loads, particularly if they are near key assets. Options include strategic grazing, slashing and herbicide use.

f. Fuel management in planted timber areas

Fuel reduction in and around timbered areas such as timber plantation, woodlots, farm forestry, windbreaks and shelter belts may help prevent fires moving to the crowns of trees. Options to reduce fuel loads include:

- slashing, ploughing and grazing in early spring in and around timbered areas;
- mulching or chopper rolling of waste thinning, pruning or harvesting material to keep it low to the ground and help the decomposition process;
- burning waste material; and
- managing weeds.

Options to break the continuity of fuel from the surface to the treetops include:

- pruning lower branches to around 2 to 2.5 m;
- bark management for some types of trees (usually only practical on a small scale);
- management of the shrub layer; and
- grazing and slashing.

Consider pruning and thinning the first few rows of trees to increase the effectiveness of fuel

breaks, especially on fire prone aspects.

The effectiveness of windbreaks (shelterbelts) in regards to wind protection may be reduced when lower branches are removed or pruned. For windbreaks, consider options such as increasing the size of fuel breaks and reducing fuel loads adjacent to windbreaks rather than pruning or thinning.

g. Fuel breaks in timber plantations

In addition to the advice for all properties regarding perimeter breaks, while the width of perimeter breaks will vary depending on fire management needs (minimum 25m), as a general guide landowners and managers are encouraged to have perimeter breaks in timber plantations free of trees for at least 50 m and incorporating an access track. Consider modifying and/or reducing fuel loads in plantations and on adjacent land to increase the effectiveness of fuel breaks.

Consider developing a mosaic of compartments of different ages to avoid heavy continuous fuel accumulation.

Types of fire breaks

Bare earth breaks

Bare earth breaks:

- can be ploughed, graded, burnt and/or sprayed to ensure they are clear of fuel;
- may stop a fire under low fire danger conditions without anyone being present to fight the fire;
- will behave more like slashed breaks if there is some fuel left sitting on the surface. Fire will often move across slashed or mown breaks unless someone actively puts it out;
- are less effective if nearby trees are producing embers that can be blown across the break; and
- may require a permit if they remove native vegetation.

Fuel reduction burning – grass and brush burning

Properly conducted fuel reduction burning can be effective in providing a fire break. Fuel reduction burning should only be carried out wetter months, with consideration of environmental issues and by people with experience in burning operations.

Slashing and mowing

Slashing and mowing are common ways to reduce fire hazards – however do not act as fire breaks. The rate of fire spread in dry slashed grass is about the same as in dry standing grass. However, the flame height is approximately halved in the slashed grass, making a fire in slashed grass slightly easier to control. Once again, slashing and mowing do not constitute a fire break but can be carried out where a fire break is to be burnt in order to reduce risk.

Vertical breaks in timbered areas

In plantations and farm forestry, gaps can be made in the vertical continuity of fuel by pruning and slashing. This minimises the risk of fire moving to the crowns of trees, thereby reducing the risk of embers being produced. Crown fires are intense and difficult to suppress.

While fire breaks inside timber plantations and farm forestry plantations can limit the spread of a low-intensity fire and the spread of the sides of higher-intensity fires, they might increase the fire activity near these gaps by increasing the speed of the wind near these gaps.

Despite these limitations, internal breaks in timber plantations and farm forestry plantations are still useful to help access fire when it is small and to assist in fire control.

Herbicide use

Herbicide can be used to prepare a fire break. This could be a bare earth break or a break where dry fuel is still present but the fuel load has been reduced. Herbicide can also be used to reduce fuel loads to make fuel reduction burning safer and to keep fences, including electric fences, clear of weeds and grass.

The most effective time to apply herbicide is in early autumn when grasses are still green and have moisture (burning of tracer lines). Take care with the use of herbicides that weeds do not become herbicide resistant.

7. Personal safety

The most important aspect of fire management is the safety of people.

a. Fire survival plan

While all individuals have a responsibility for their own safety, landowners and managers have an additional responsibility for the safety of people living on, working on and visiting their property and are encouraged to develop a fire survival plan

During fire, a significant threat to personal safety is radiant heat. Radiant heat cannot penetrate through solid objects, so the best way to avoid the dangers of radiant heat is to shelter inside a building as the fire front passes. You are also advised to wear appropriate protective clothing made of natural fibres.

Radiant heat from fire kills people who are caught out in the open. Often the people most at risk are those who undertake last-minute actions, such as moving livestock. When working in locations without easy access to buildings or homes, people are encouraged to have a fire blanket, suitable wire cutters, water and a simple plan about where they would shelter if they were caught in a fire. Cars do not provide adequate shelter from radiant heat; however, sheltering in a car is better than being caught without any shelter at all.

b. Maintaining communication

For safety reasons, it is important for those working on rural properties to stay in contact with others. Individuals are encouraged to carry communication equipment, such as a UHF / VHF radio or mobile phone (very limited), when undertaking any farming activities and to tune to a relevant local radio on days of high fire danger.

c. Private fire fighting

People are advised to be well prepared when undertaking private fire fighting activities.