FIRE MANAGEMENT MANUAL

WILDLIFE MANAGEMENT SERIES

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FIRE MANAGEMENT MANUAL

These guideline booklets are based on field experience and original research reports which are available from the WWF - SARPO in Harare. WWF wishes to acknowledge the important contribution made by the Rural District Councils and their constituent communities in the development of the series. The methods presented in the manual have been tested by the Support to CAMPFIRE Project over the last five years with different communities in a number of districts and wards.

In addition, WWF wishes to acknowledge the use of Lowveld Environmental Awareness Programme (LEAP) newsletter entitled “Veld Fires” which provided many useful ideas and diagrams for this manual.

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Editing, illustration, design and production: **Action**

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The use of a road as an effective fire break and/or as a fire break from which back-burning may be carried out.

INTRODUCTION

INTRODUCTION TO THE FIRE MANAGEMENT GUIDELINE MANUAL

What is the objective of this manual?

Under the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) rural communities participate and benefit from the management of their wildlife and other natural resources. Over time, fire has played an important role in shaping our natural **landscapes**. In rural areas, and especially in community wildlife areas, fire is still an important aspect of management.

The purpose of this manual is to explain how fire may be used by communities to improve the management of their wildlife areas. It provides some general background on wild fires in Zimbabwe and then shows how fire can be used as a management tool in wildlife production. The methods described are simple, reliable and easily implemented at little cost. Importantly these methods focus on preventing the damage caused by hot late season wild fires rather than trying to control or put them out once they have started. These methods can be refined and improved over time by the participants as they become more confident and experienced.

These methods have been designed and tested by producer communities and Rural District Councils as part of the first phase of the WWF Support to CAMPFIRE Project.

How is this manual organised?

Chapter 1: introduces fire as a natural agent, provides a background to the causes and effects of fire and outlines broad issues of fire management in Zimbabwe.

Chapter 2: describes the ways in which fire can be used as a management tool, with particular reference to CAMPFIRE.

Chapter 3: deals with some practical issues such as setting up a reporting system for fires and practical advice for putting out wild fires such as back burning.

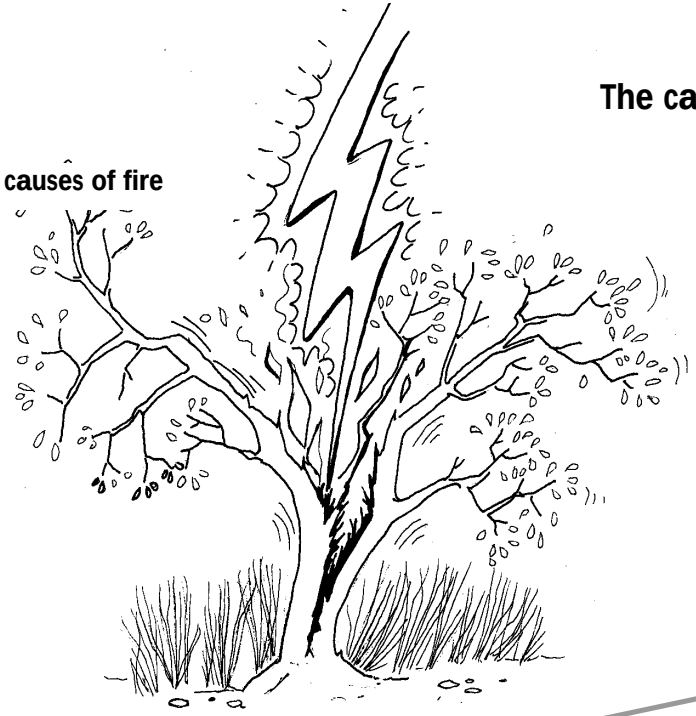
Chapter 4: covers the planning and implementation of early burning programmes.

Chapter 5: provides a case study of an early burning programme in Kanyurira Ward, Guruve District and the important lessons that can be learned from it.

In Appendix 1, there is a glossary which explains the technical words highlighted in the text. Appendix 2 gives the contact details of organisations which can assist with the development of fire management plans. Appendix 3 gives the vegetation characteristics of the three fire regions defined in the manual.

The causes of fires

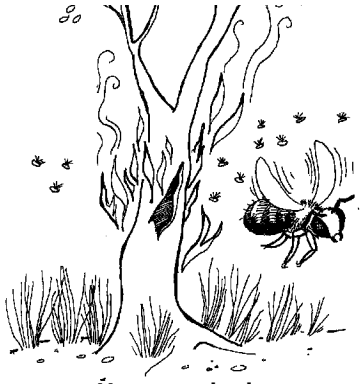
Natural causes of fire



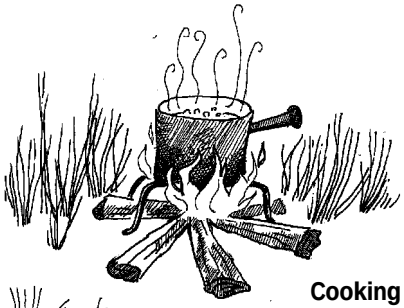
Lightning

Accidental causes of wild fires

Burning fields for agriculture



Honey gathering



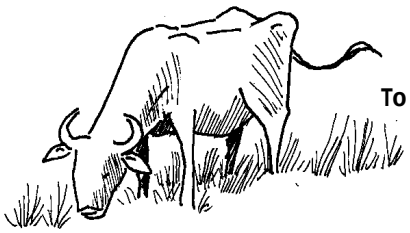
Cooking

Dumps

Deliberate fires

To smoke out bees

To hunt



To improve grazing

To create firebreaks

Carelessness

CHAPTER 1

BACKGROUND TO FIRE MANAGEMENT

Is fire a natural agent?

Wild fires, usually caused by man or lightning, have always been a part of the African landscape. Most of the natural vegetation that we see around us has been shaped by the effects of fire. For example, the characteristic mix of trees and grass found in most of Zimbabwe's natural vegetation often is the result of wild fire. For this reason, fire should be seen as a natural element, to be used for its beneficial effect, rather than eliminated altogether.

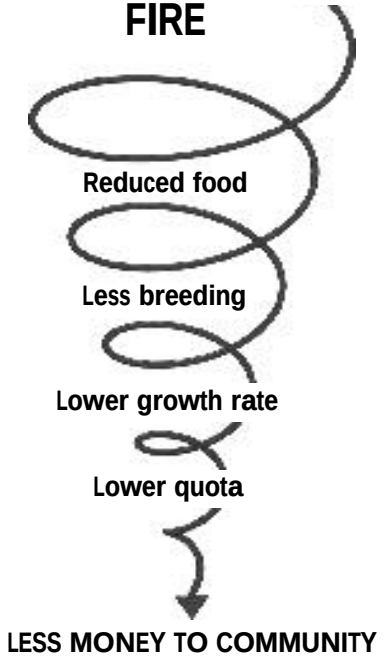
Why is fire important in wildlife management?

Wild fires are a common feature during the dry season throughout rural Zimbabwe. These wild fires can cause a severe reduction in wildlife habitat and production. In turn this can effect wildlife-based activities such as tourism and trophy hunting. This will reduce the revenue which are the incentives for Rural District Councils and wildlife producer communities to manage their wildlife and wildlife areas. On the other hand, it is also possible that total protection from fire can result in vegetation becoming less productive. This will also effect wildlife production and reduce the revenue earned from wildlife.

With a few relatively simple and inexpensive procedures, such as early burning, it is possible to:

- reduce the negative impact of fires, and
- enhance their positive effects.

This way fire can become a valuable tool in wildlife management.



How are fires caused?

There are several causes of wild fires.
Natural causes of fire are:

- lightning at the beginning of the rains

Accidental causes of fire are:

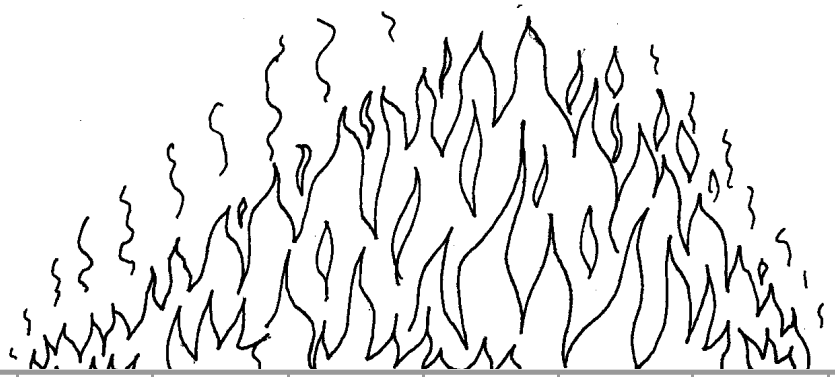
- cooking or camp fires at overnight stops, e.g., bus stops
- cigarettes carelessly thrown into the bush
- fires which escape during honey collection
- fires which escape during land preparation
- rubbish dumps around homesteads, hunting camps and mines

Fires are deliberately set to:

- improve grazing,
- clear land for cultivation,
- drive wild animals when hunting,
- make smoke in order to collect honey,
- reduce the negative impact of wild fires (early burning, back burning, burning fire breaks)

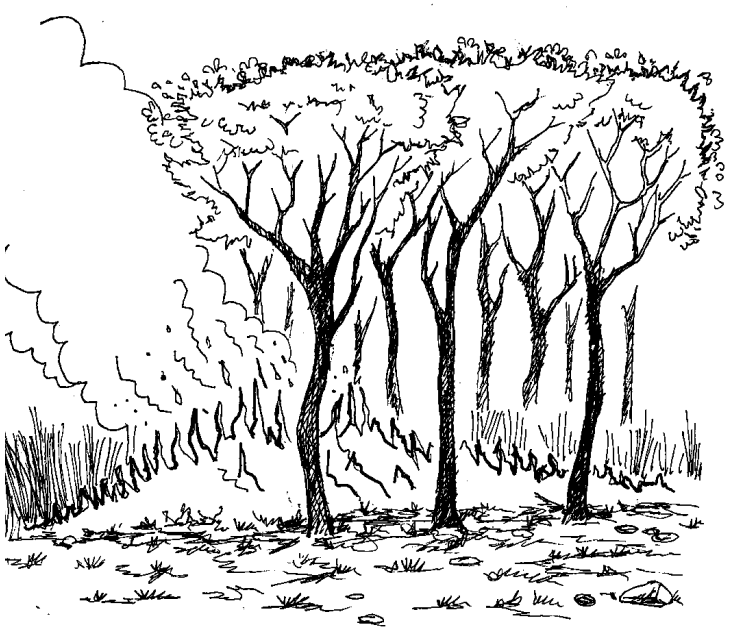
When do most wild fires occur?

Wild fires start early on in the dry season, in about May or June. Most fires however, occur between August and October and sometimes November. The exact time of year at which fires start and finish depends on the past rainy season and the start of the rains in the current season.

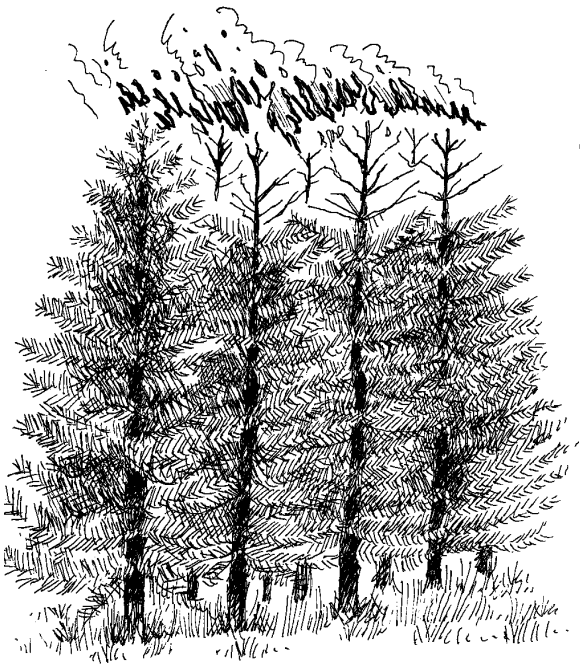


Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec

Ground fires occur in mixed mopane woodlands with little grass cover



Crown fires occur in the timber plantations of the Eastern Highlands



Ground and crown fires occur in typical savannah woodlands in many parts of the country

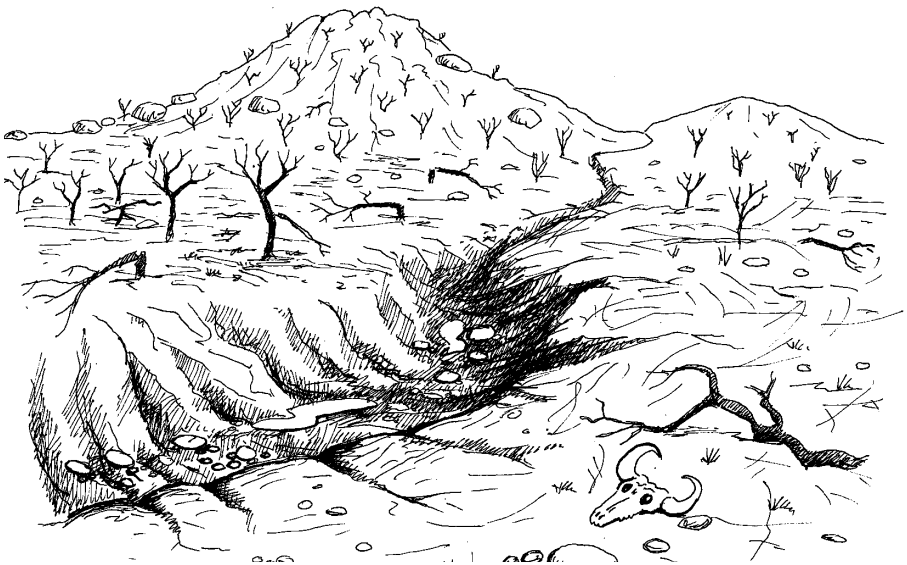
What are the different types of wild fires?

Wild fires are normally classified by where they are burning and the temperature of the fire.

- **Where they are burning:** There are two types of wild fires. These are surface fires which burn along the ground and crown fires which burn the upper parts of trees. Many late season hot fires are a combination of surface and crown fires.
- **The temperature at which they are burning:** More importantly in the Zimbabwean situation, wild fires are classified as either cool fires or hot fires. Cool fires usually occur early in the dry season when there is still moisture in the grass and leaves. Hot fires usually occur late in the dry season when the grass and trees are very dry. These fires are often made hotter and more destructive by the windy conditions in August, September and October.

Cool, early season fires produce a mosaic of burnt and unburnt areas which reduces the damaging effect of hot, late season fires

Hot, late season fires can remove most of the ground cover, leading to increased soil erosion



What are the general effects of wild fires?

The effects of a wild fire will depend on where it burns and at what temperature.

- **Cool, early season fires:** Earlier in the dry season (May to July), before the grass becomes completely dry, fires tend to be cooler and slow burning. This creates a patchwork of lightly burnt and unburnt areas. These fires are mostly ground fires.
- **Hot, late season fires:** Later in the season (August to October), just before the first rains, fires are hotter and may burn fiercely, covering vast areas and reducing everything to ashes. These fires tend to be combined ground and crown fires.

What are the effects of fire on wildlife?

The effects of wild fires on wildlife will depend on what kind of fire it was and the reaction of different species to the fire.

- The effect of cool, early season fires on wildlife: The patchwork of burnt and unburnt areas created by the cool early season fires generally has very little impact on wildlife populations as they will just move into the unburnt areas. After the first rains some species will be attracted to the new grass on the burnt areas.
- The effect of hot, late season fires on wildlife: After a large, hot late season fire most large mammals will move away from the burnt areas. Because these fires cover large areas, this might have a big impact on the use of wildlife for hunting or tourism purposes.

Different animal species respond to the effects of fire in different ways. For example:

- very selective grazers such as sable antelope may move to wetlands (**vleis or dambos**) where the growth of new green grass has been caused by fire;
- coarse roughage grazers, such as buffalo may move to unburnt stretches of land still good for grazing.

What factors determine the effect of fire?

There are many factors which determine the effects of wild fires, such as rainfall, vegetation types, the recent history of wild fires in the area, levels of settlement, cultivation and grazing. These factors, especially vegetation type, will determine a district or community's fire management strategy.

- **The rainfall and the vegetation type:** The type of vegetation and the amount of rain which falls in any given season have a marked influence upon the effects of fire. Not all vegetation types (habitats) will burn. In CAMPFIRE areas supporting wildlife, there are three broad environmental regions. In each area fire can be expected to behave differently:
    - **The Zambezi Valley, escarpment and foothills:** There are four main vegetation types found in this region. The incidence and effect of fire will vary between each vegetation type (see Appendix 3).

      Mopane woodlands are found in the low lying and low rainfall areas. They do not usually present major fire problems because they contain very little grass.

      Jesse thickets are found on the deep sandy soils. They do not usually present major fire problems because they contain very little grass.

      Riverine woodlands are found along the major rivers. The incidence and the effect of fire will depend upon the amount and condition of the grass they contain.

      Mixed woodlands are found in the higher rainfall, hilly escarpment areas of the Zambezi Valley. These well-grassed and wooded areas are most sensitive to hot late dry season fires. The negative effects of fire in these areas can be reduced by using early burning fire management strategies.
    - **The Lowveld and Matabeleland:** The two main vegetation types over much of the south-eastern lowveld and Matabeleland are Mopane woodland and the mixed Combretum / Acacia woodlands. In years of very low rainfall, wild fires in this region are less likely as there is little grass to burn. In better rainfall years when there is a lot of grass, there is a high risk of hot late season fires. Under these conditions it is important to protect this valuable food supply for wildlife, so prevention and fire control strategies may be very important. Early burning programmes are not recommended in these areas.

The Natural Regions (NR) of Zimbabwe are mainly defined by rainfall which is the main factor affecting landuse systems. The recommended landuse systems for each Natural Region are given in the Key (see map on page 13)				
	Rainfall	**Altitude**	**Temperature**	**Proportion of the country**
NR 1	>1,000mm	High	cool	2%
NR 2	750 - 1,000mm	high - medium	warm - hot	16%
NR 3	650 - 800mm	medium	hot	18%
NR 4	450 - 650mm	low	hot - very hot	37%
NR 5	<650mm	very low	very hot	27%

- **The Eastern Highlands:** In the Eastern Highlands there are three major vegetation types. These are the natural forests / woodlands, grasslands and the **exotic** timber plantations. The natural forests do not have enough dry vegetation to be a fire risk. The grasslands and the exotic timber plantations are extremely sensitive to fire. In these areas it is important to prevent fires. The natural forests can often be scorched and badly affected by the very hot fires on the grasslands. Firebreaks should never be made on the boundary between natural forests and grasslands.

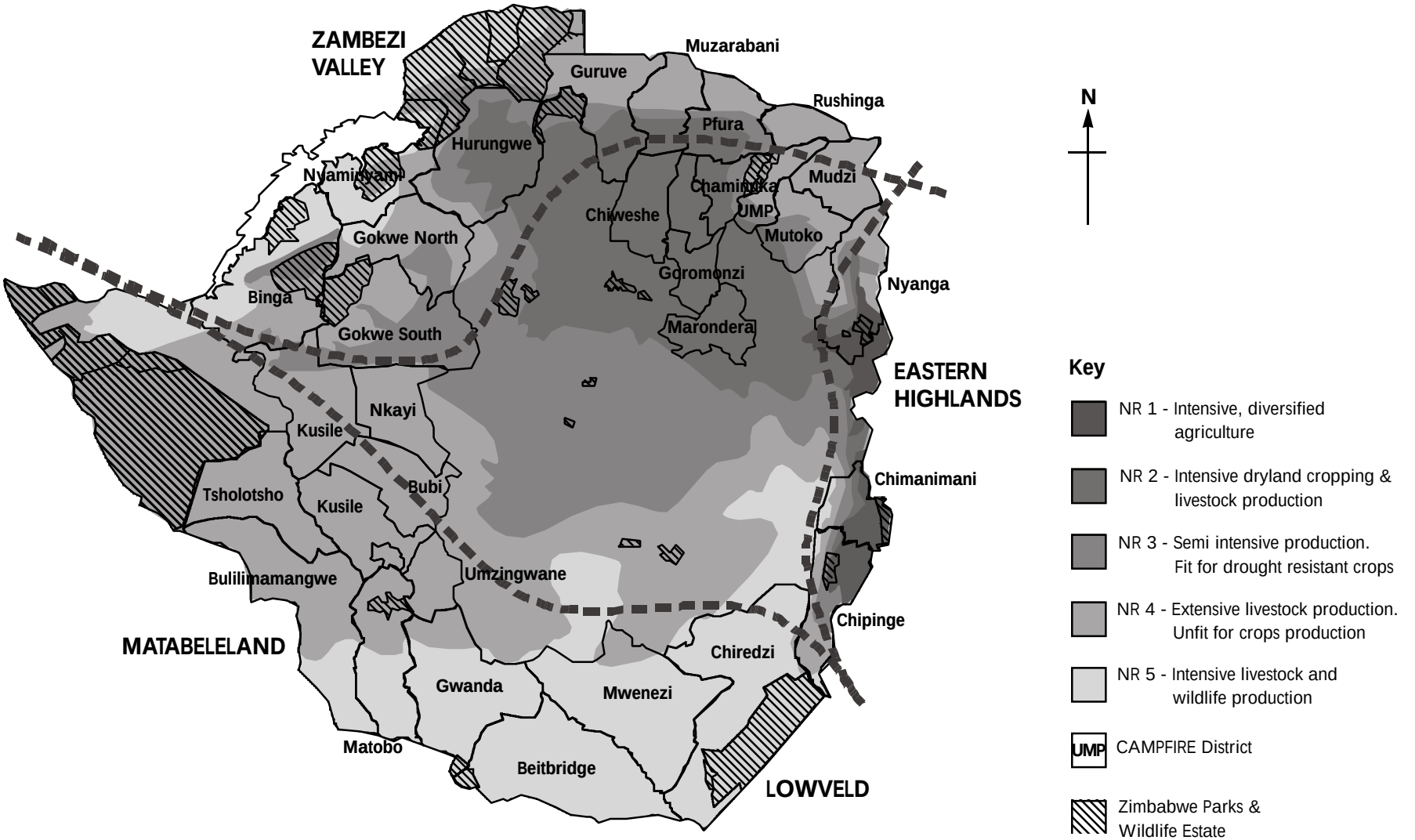
- **The previous seasons rainfall:** In Zimbabwe, the rainfall can vary greatly between seasons and this affects how much plant growth there is. After good rains, there will be more grass and more fuel for fires. After poor or bad rains, there will be less plant growth and less fuel for fires.
- **The incidence and severity of the previous season's fires:** If an area has recently experienced a hot, late season fire, there will be less fuel for a fire. This means that a late season fire will be cooler and have less impact.
- **The pattern of settlement and cultivation:** If an area is fragmented by settlement and cultivation, there will be less fuel for a fire. This will reduce the chances for large hot late season fires.
- **The impact of grazing:** If an area is heavily grazed either by domestic or wild animals, this will reduce the amount of fuel for a fire. This will reduce the chances of large hot late season fires.

What are the positive effects of fire?

The positive effects of fire are generally longer term and less easily seen than the negative effects. They include:

- the growth of green grass which provides grazing for animals in the dry season,
- the removal of old and normally less useful dry plant material,
- the control and reduction of **bush encroachment**,
- the stimulation of germination of some useful species of grass,
- the limitation of **animal parasites (e.g. ticks)**.

Zimbabwe: Natural Regions, Parks & Wildlife Areas and CAMPFIRE Districts



Why has there been so much emphasis on preventing wild fires?

Although fire is part of the natural environment, attempts have often been made to prevent or control wild fires because of:

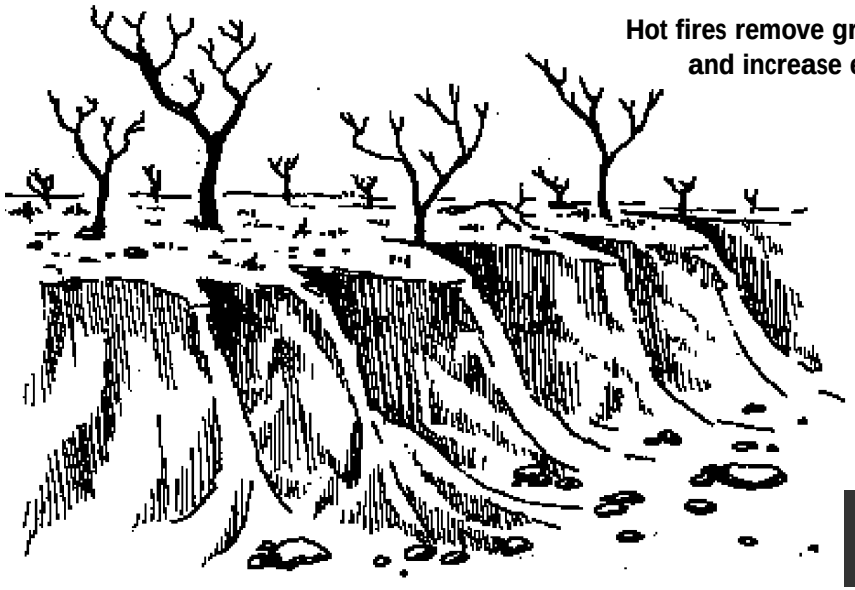
- the damage to the environment: All fires have the ability to damage the environment by removing important plant cover which leads to increased run-off, increased soil erosion and reduced soil moisture. This can also result in an increase in the rate of bush encroachment in some areas. This can have a negative effect on wildlife and wildlife-based businesses like tourism and safari hunting.
- people's limited understanding of fires: Many people do not understand that fires are an important and natural part of the environment.

As human settlement has expanded into wildlife areas, the frequency and the severity of fires has increased. This has damaged the environment but has also affected the people who use natural products harvested from woodlands.

How have attitudes towards fire changed?

Fire prevention policies were promoted in the commercial and communal farming areas by the Natural Resources Board. In the State protected areas, DNP&WLM adopted a similar approach between 1950 and the 1970's, when it was shown that the prevention of fires in large wildfire areas was not practical or cost effective.

Hot fires remove ground cover and increase erosion



In some cases fires can increase bush encroachment

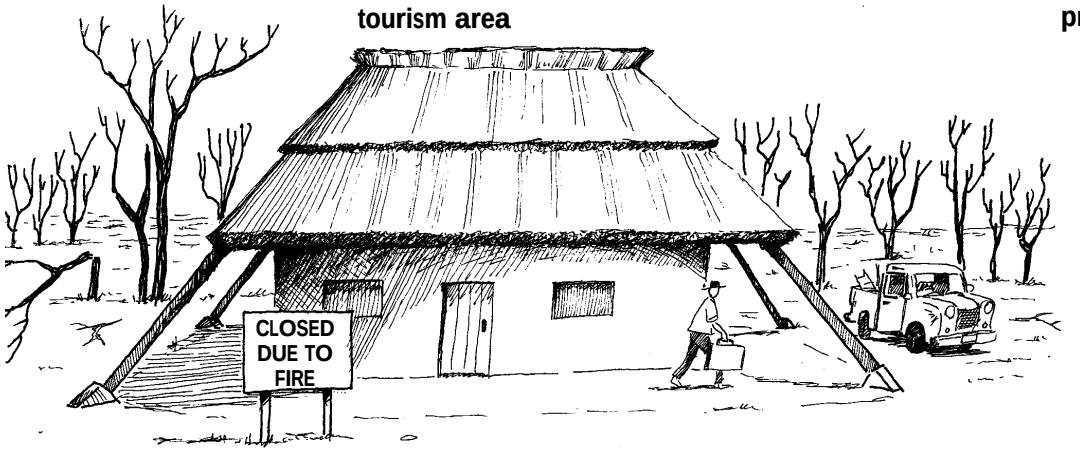
A number of lessons have been learned from the many years of experience gained in fire prevention, control and use in wildlife areas. These are:

- it is very difficult, if not impossible, to prevent wild fires,
- conventional prevention measures (vehicles and equipment) are in most cases not cost effective.
- fire plays an important and positive role in many Zimbabwean **ecosystems**.

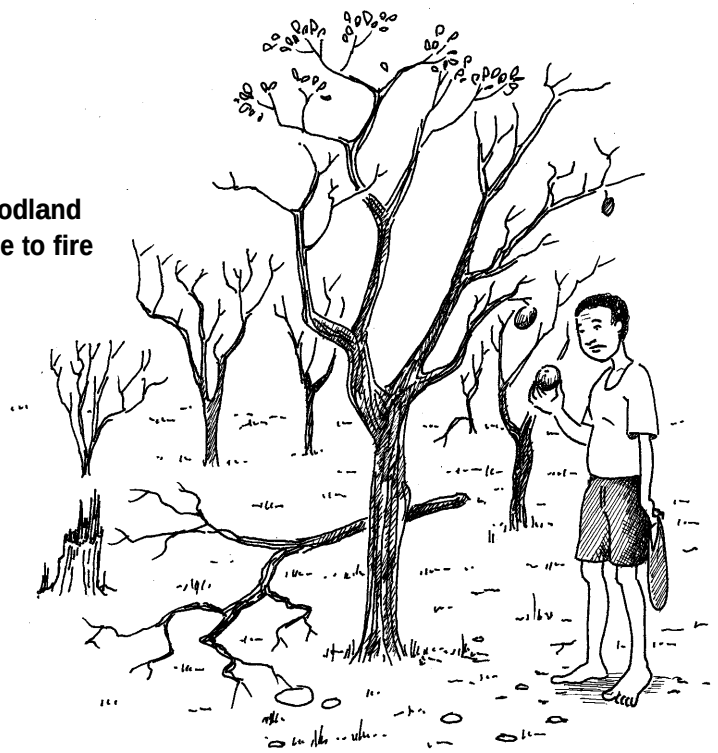
These results have forced people to change the way they think about fire. As a result, fire is now seen as a positive management tool as long as it is used carefully. It can be used as a cheap and effective tool to:

- control the negative effects of hot, late season fires,
- influence vegetation growth, and
- influence the distribution and productivity of wildlife populations.

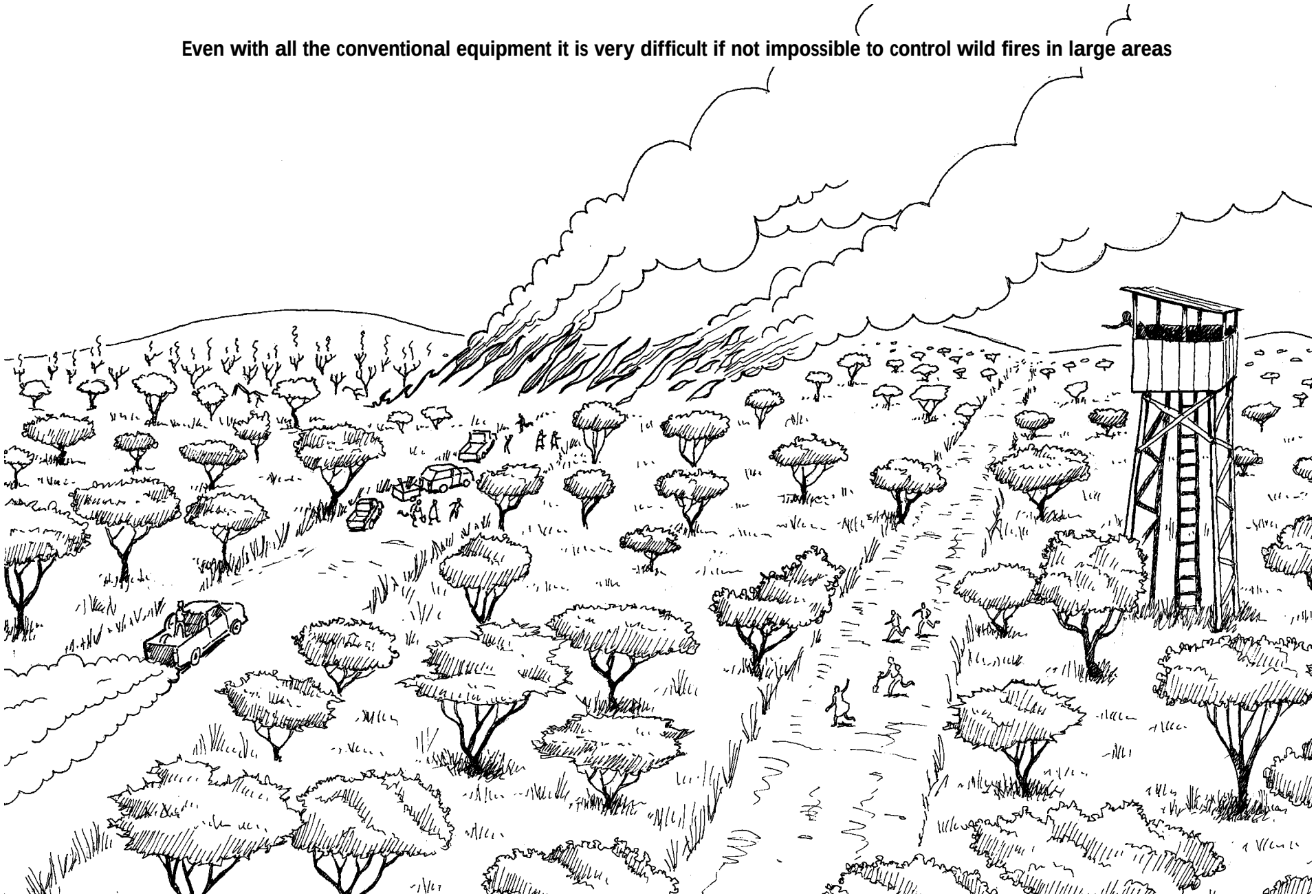
Loss of revenue from fire tourism area

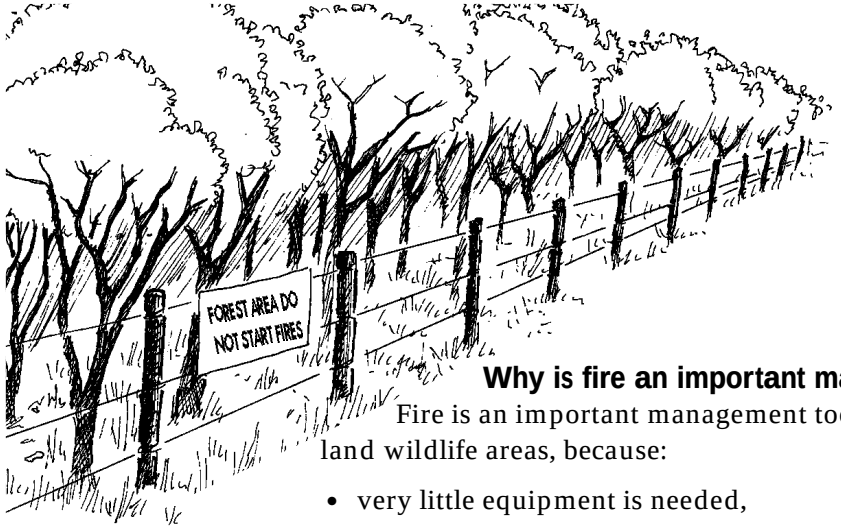


Loss of woodland products due to fire



Even with all the conventional equipment it is very difficult if not impossible to control wild fires in large areas





CHAPTER 2

FIRE AS A MANAGEMENT TOOL

Why is fire an important management tool?

Fire is an important management tool in communal land wildlife areas, because:

- very little equipment is needed,
- it is cheap and simple to use,
- it can be used to improve wildlife production.

For each area, the stakeholders should jointly consider whether it is necessary to prevent fire, control fire or use fire. Importantly, fire can be used as a tool to both prevent and control wild fires as well as achieve certain management objectives.

Under what conditions should fire be prevented?

Preventing fire means that there should be no fires at all in a defined area. There are many situations when this is necessary. These are:

- in areas of settlement,
- in areas like the Eastern Highlands where there are **indigenous** and **exotic** forests which are highly sensitive to fire,
- in isolated, small areas with special plant and animal species that need to be protected,
- to protect or promote valuable grazing and **browsing** resources for livestock and wildlife.

Under what conditions should fire be controlled?

Controlling fire means limiting its use to very specific purposes. These include:

- controlled burning firebreaks to prevent entry of wild fires which are potentially harmful. Firebreaks are used in the commercial farming areas to protect valuable grazing resources for livestock.
- controlled burning of **crop residues** to reduce pests and diseases.

In community wildlife areas and other large wildlife areas, controlled burning requires very careful management, because extensive damage can result if fires escape. CAMPFIRE areas where such prevention and control measures are required include: Beitbridge, and parts of Chipinge and Chiredzi; Matabeleland South (Bulilima-Mangwe, Gwanda, Lupane, Matobo and Tsholotsho) and Matabeleland North (Binga and Hwange).

Under what conditions should fire be used?

Fire can be used to meet certain objectives or overcome certain problems. How fire is used will depend on the objectives for the wildlife area. There are two ways in which fire can be used with good effect. These are:

- **Using early burning to reduce the severity of wild fires**

  Objectives: The most important objective that can be achieved through early burning is to reduce the severity of wild late season hot fires. Early burning creates a patchwork effect of burnt, partially burnt and unburnt areas. This has several advantages:

  - substantial amounts of grass and browsing material remains intact, to support wildlife populations during the late dry season.
  - the ground is not left without **vegetative** cover, particularly if the burning is carefully timed.
  - when hot, late season fires start they are soon checked by the patchwork effect ("firebreaks") created by early burning.

  There are also several disadvantages which need to be considered before an early burning programme is started. These are:

  - fire, of any temperature, is not good for perennial grasses,
  - the soil will be exposed for long periods which can lead to erosion, and
  - fire can destroy or damage other natural resources such as thatching grass.

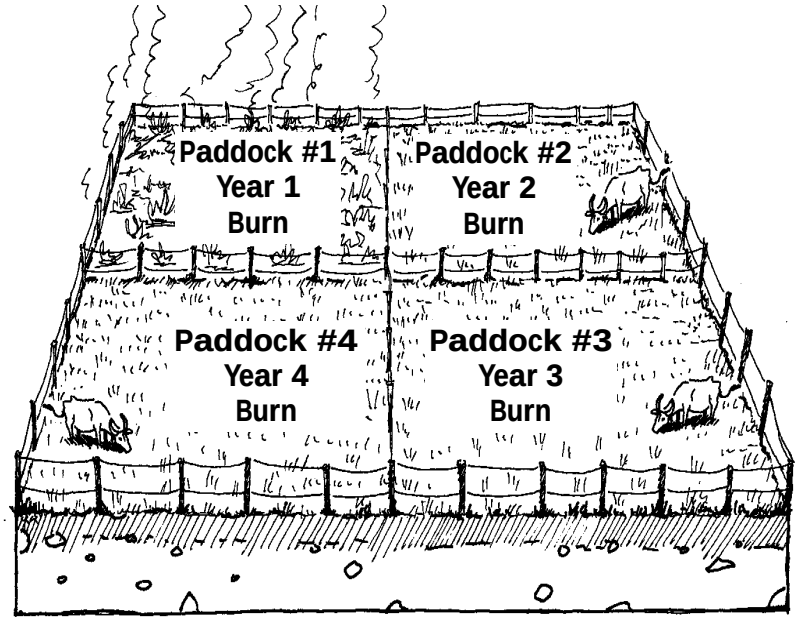
  Early burning has a very important role to play in the higher rainfall areas of the country including the Zambezi Valley escarpment areas. Areas which can use early burning are: Dande (Kanyurira, Chapoto, Chisunga); Muzarabani (Mavuradonha and adjacent wards); Nyaminyami (Sampakaruma, Negande, Nebiri and the Mapongola Hills); North Gokwe (Chireya, Madzivadzvido and Nenyunga); and parts of Binga.

- **Using late burning to improve the quality of grazing**

  Objective: The objective of late burning is to improve the quality of grazing. This is done by removing old plant material, reducing the number of woody plants (bush encroachment) and providing green grass. For example, the **rotational** burning of paddocks or wetland areas stimulates a green flush of new grass growth.

  The success depends on a number of factors, such as:

  - the amount of grass to burn,
  - the level of bush encroachment, and
  - the timing of the fire in relation both to the previous, and to the coming, rainy season.



The complex interaction of all these factors has meant that late burning probably has met with less, rather than more success, over the years.

In most CAMPFIRE areas, late burning should only be used if:

- there is a serious bush encroachment problem, and
- it is part of an integrated grazing strategy, for example, to promote the growth of grass at the end of the winter.

Because late season burning is more risky than early burning, it should only be considered as part of the fire management strategy once a community has gained experience in other areas of fire management, for example: early burning, setting up reporting systems, establishing a fire management committee, implementing community awareness programmes, and applying some of the more easily managed prevention and control strategies.

What are the legal requirements for burning programmes?

The Natural Resources Act and Regulations, which applies to all landholders, makes it a **legal requirement** to inform your neighbours of your intention to burn. So, when planning the implementation of any burning programme, do not forget to inform all those who should be aware of your intentions.

What institutional arrangements are necessary?

Institutional arrangements and associated organisational responsibilities are very important for any kind of burning programme to work properly. The implementation of a burning programme requires careful consideration, involving both logistical and budget planning. This is discussed in more detail in Chapter 4.

What technical support is there to assist with burning programmes?

There are a limited number of organisations who can assist districts and communities develop burning programmes. WWF has the capacity to assist districts and would be happy to do so. Other sources of information are AGRITEX, the Department of Research and Specialist Services and the Department of Biological Sciences at the University of Zimbabwe (see Appendix 2).

ACTION

CHAPTER 3

PRACTICAL FIRE MANAGEMENT

What are the main issues in practical wild fire management?

The main issue in practical fire management is to develop methods which prevent the environmental damage and potential economic losses resulting from hot, late season fires. For example, a fire that burns on a hot day in August or September, with a high wind and lots of dry material, can destroy up to 90% of the vegetation.

Preventing these late season wild fires needs a combination of strategies to:

- prevent fires from starting, and
- react to fires which have started

People who are involved in practical fire management should have:

- a working understanding of how fires burn, and
- some practical tips for putting out wild fires.

What are the best methods for preventing wild fires?

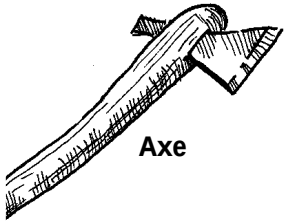
Any fire management strategy must make provision for the prevention of unwanted or uncontrolled fires. Fires can be prevented through:

- improved community awareness and publicity,
- education,
- co-operation between all stakeholders,
- building relations between land users and with the public,
- law enforcement,
- developing fire management strategies (to include fire breaks, reporting systems, early / late burning plans etc).

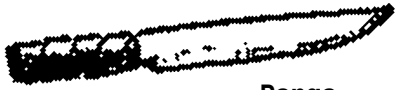
A lot of money has gone into fire prevention in some parts of Zimbabwe. The money has been used for equipment such as radio networks, vehicles, control towers and the development of firebreaks. This effort has not significantly reduced the incidence and severity of late season fires. Once a late hot fire is burning, it is very difficult, if not impossible, to put it out.

For RDCs and wildlife producer communities, buying equipment is not a cost effective fire management strategy. This is why low cost solutions such as early burning together with community awareness, education and co-operation are now preferred.

Common equipment used by fire fighters

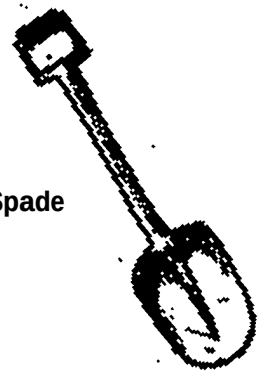


Axe



Panga

Wet tree branch



Shovel / Spade

What kind of reporting system is needed for wild fires?

The earlier a fire is reported, the sooner the necessary action can be taken. A reporting system for wild fires requires responsibility and judgement.

- **Responsibility:** Every person who sees or comes across a fire is responsible for taking some action.
- **Judgement:** The person who discovers a fire must use their judgement as to their reaction. Their reaction will depend on the size of the fire:

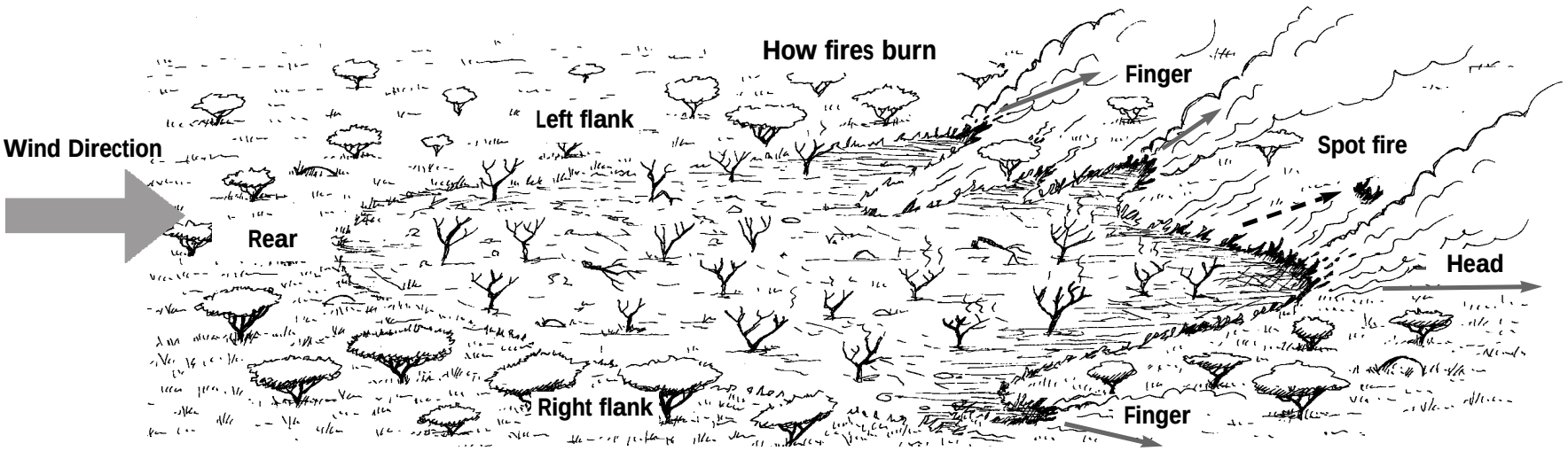
  Very small fire: A fire which has just started, from a carelessly discarded cigarette, can be easily be put out just be standing on it.

  Small fire: If a fire has been burning for a few minutes, it might be possible to mobilise people in the immediate area to put it out.

  Large and very large fires: With large and very large fires, coordinated action is usually needed to put them out. In this case, run to the nearest village to report the fire. In each village there should be one person who is responsible for reporting and one who is responsible for the organisation and management of fire-fighting.

There are some basic principles for a reporting system to fight wild fires. It is ESSENTIAL that:

- one person is in control of the fire fighting team. This person is responsible for mobilising the fire management team and actually trying to put the fire out.
- one person is in control of the reporting team. They must ensure that all the neighbours are informed. This may also mean obtaining additional support from neighbours to help fight the fire. Reporting can be done by the quickest means available: telephone (if available), radio, running, bicycle, or motorcycle. Once a fire has been extinguished, the neighbours should be informed.
- the fire management team should have some basic training in fire fighting techniques (back-burning, etc.) and some basic first aid knowledge. They should also have some basic equipment for fighting fires (beaters, wet sacks, shovels / spades, buckets, pangas, axes and DRINKING WATER).



How does a wild fire burn?

Anyone involved in planning and implementing a fire management programme should understand how a bush fire burns. All fires start very small. It then moves in the direction of the prevailing wind, spreading forwards and outwards in a characteristic way. There are five parts to a typical fire. They are:

- The HEAD is the most rapidly forward-spreading edge of the fire, usually directly ahead of the wind.
- FINGERS are more rapidly burning projections of the fire, usually reaching forwards or sideways behind the head.
- The FLANKS lie behind the head, spreading (usually more slowly) to either side.
- The REAR is the burnt-out back line of the fire, usually opposite the head.
- SPOT FIRES may occur, usually ahead of the main fire when sparks or burning materials are carried by the wind.

Once a fire has started it can generate its own wind, by sucking air into the burning area from around it. By knowing and being able to recognise the different parts of a fire, the person in-charge of the fire-fighting team will be able to:

- estimate how fast the fire might move,
- identify where it might be appropriate to start back burns,
- identify what natural barriers (such as a river) might assist the fire-fighting team,
- determine the width of fire breaks and barriers to stop spot fires from starting,
- avoid wasting resources by fighting the fire in unimportant areas such as the rear.

Fires which are burning up steep slopes or towards the head of a valley can be extremely dangerous and unpredictable. Nobody should ever place themselves above a fire on a steep slope or get trapped in a valley with a fire travelling towards them.

How can a wild fire be put out?

Putting out a wild fire before it does too much damage to the environment requires:

- **an effective reporting and communications system:** Each community (ideally at the village level) should establish a Fire Management Committee to take responsibility for preventing, reporting and organising fire-fighting.
- **a quick and effective reaction to the fire:** Reacting quickly to a fire will increase the chances of putting it out and reducing the damage to the environment. Reacting quickly and effectively to a wild fire needs organisation. People with the right skills need to react and be transported to the site of the fire. Once at the site of the fire their work needs to be directed and coordinated.
- **practical fire-fighting techniques:** It has been shown that buying expensive equipment such as tractors, mowers, water bowsers and watch towers is not cost effective in large wildlife areas. More appropriate, useful and cost effective equipment are axes and pangas which can be used to cut green bushes for beaters.

What are the common methods of fire-fighting that are used?

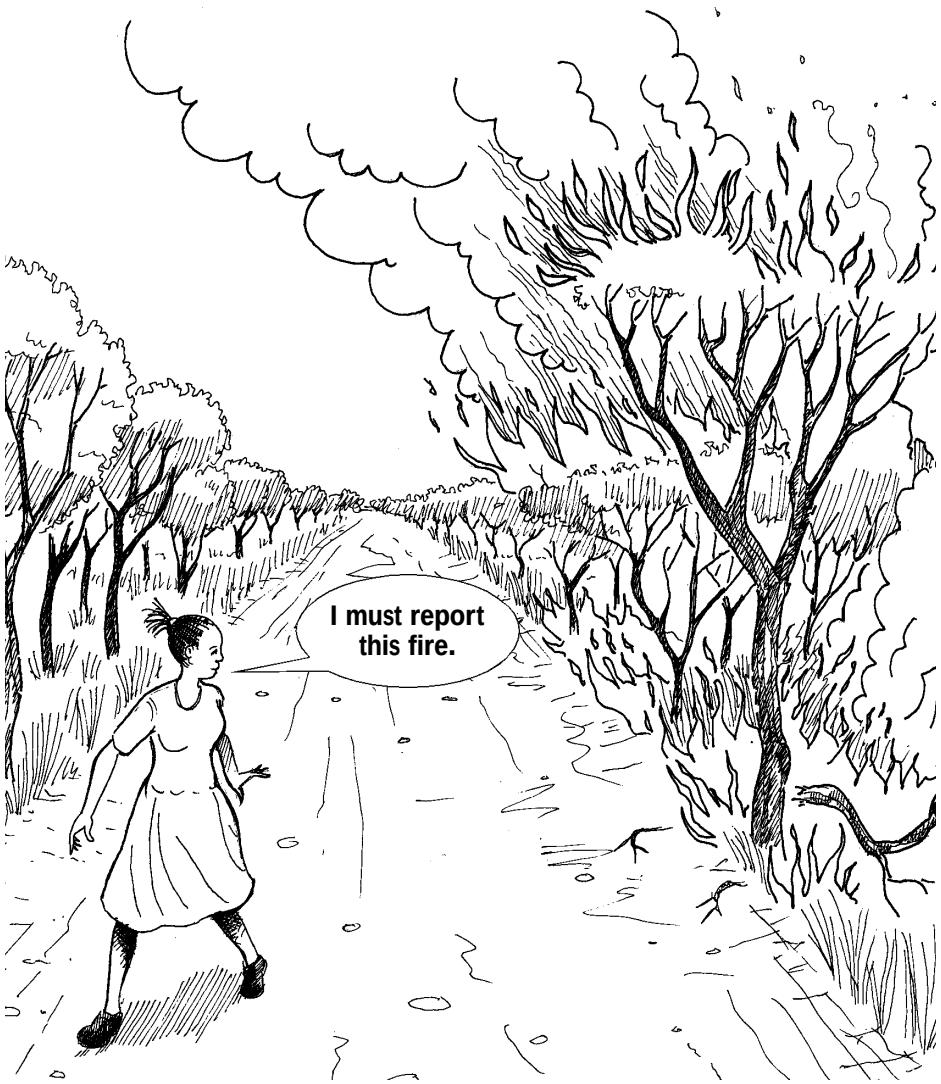
There are three common methods for fighting fires. These are firebreaks, beating and smothering the fire and back burning.

- Firebreaks: Firebreaks can be used either to stop a wild fire entering an area or as a starting point for a back burns to put out a wild fire. Roads, fencelines and rivers can be used as firebreaks, or as their starting point. A firebreak should be no less than 4m wide, in settled or populated farming areas where the area to be protected is small. In extensive, sparsely populated wildlife areas, they should be much wider, possibly up to 100m. It is important that firebreaks are maintained annually. Neighbouring land holders must be informed if the center of the firebreak is going to be burnt.

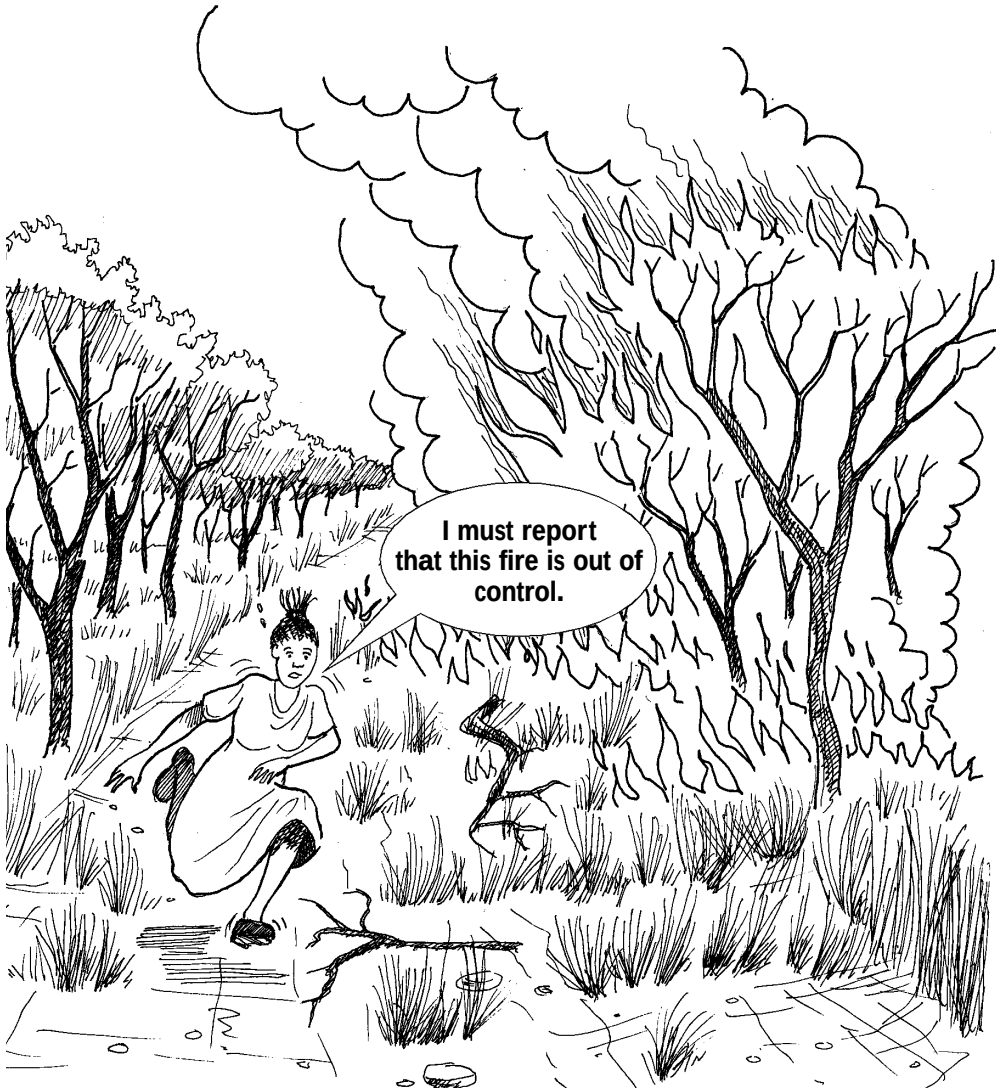
  When planning firebreaks for a wildlife area, the following points must be considered:

  - the location of the firebreaks. In any wildlife area, the exact location of firebreaks will be determined by the geography, the existing road network and the direction of the prevailing wind. Firebreaks should be located on watersheds to avoid problems with erosion. If possible firebreaks should be planned so that they are diagonal to the direction of the prevailing wind. In large wildlife areas, firebreaks can be placed around the edges to prevent fires entering. Firebreaks can also be used to divide the area into blocks to reduce the area which might be burnt by a wild fire.

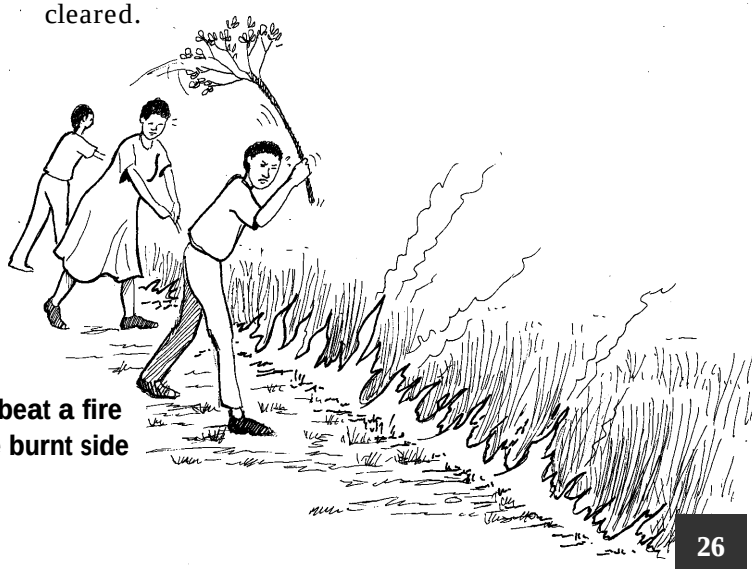
A well maintained and effective firebreak



A badly maintained and ineffective firebreak



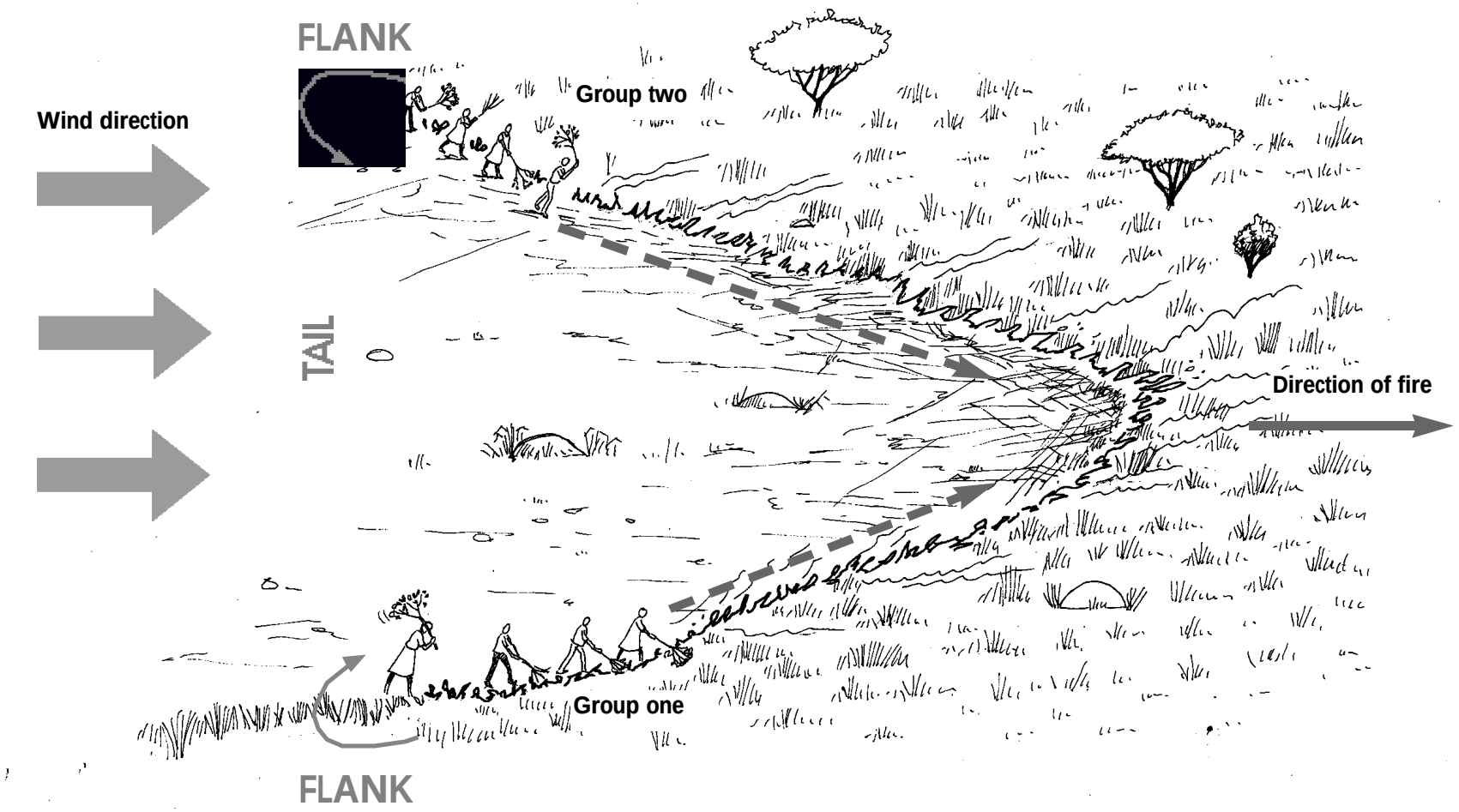
- the type of firebreaks. Most firebreaks are made by clearing two strips of vegetation and then burning the center. Normally this is done using a grader, a tractor drawing a **harrow** or a mower. Sometimes the vegetation at the edges is cleared by hand. The danger with these methods is that they can sometimes lead to erosion.
- the maintainance of the firebreaks. Firebreaks need to be maintained annually. Maintenance should be done after the rains and before the onset of wild fires. If the center of the firebreak needs to be burnt, this will have to be done when most of the vegetation is dry. Unlike an early burning programme which will leave vegetation standing, the centre of the firebreak should be quite well cleared.



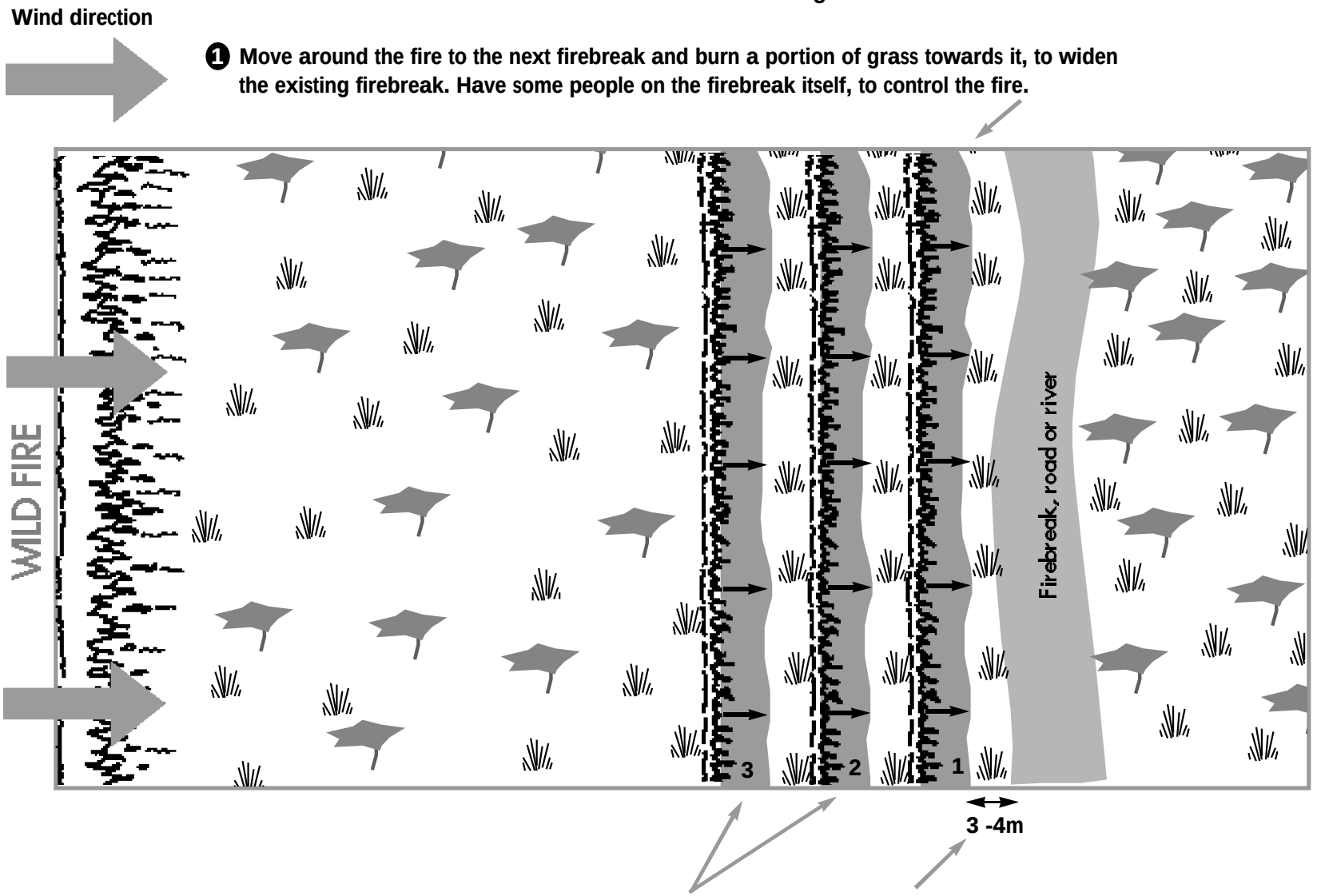
Always beat a fire from the burnt side

    - the responsibility for the firebreaks.
      The maintenance of firebreaks is expensive due to the equipment needed. Before an RDC and producer communities start making a network of firebreaks it must be very clear who will pay for the maintenance.
- beating and smothering the fire. Fires can be put out using beaters. Sand can also be shovelled or thrown onto a fire. Putting out large fires can be dangerous so people using beaters and sand should stand on the burnt area and never on the side that the fire is going to. Beaters should try and work together to put out complete sections of the fire. It is always easier to beat out a fire along its flanks rather than trying to put out the head of the fire.
    - making beaters. Beaters are easy to make and every homestead, and every member of the fire management team should have one. A sack or piece of old rubber inner tube can be attached to a sturdy two-metre pole, about the thickness of a broom handle. When fighting a fire with a sack, it needs to be wet, otherwise it may catch fire itself!
- Back-burning: In hot late season fires, back-burning is used to create or widen firebreaks to prevent the wild fire spreading. Back-burning will promote a cooler fire which reduces the impact of strong winds and abundant fuel (see diagram on page 28).

How to beat and smother a fire



Procedures for back-burning



CHAPTER 4

PLANNING AND IMPLEMENTING AN EARLY BURNING PROGRAMME

Why use early burning?

For districts and wildlife producer communities, the most important reason for using early burning is to reduce the environmental damage and the potential financial losses which can result from hot late season wild fires. A well planned early burning programme will remove about 25% of the vegetation compared with a hot wild fire which can destroy between 60% and 90% of the vegetation.

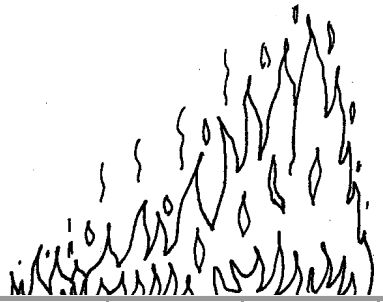
Where should early burning be done?

Early burning is used mostly in the woodlands in the hilly escarpment areas of the Zambezi Valley. These well-grassed and wooded areas are very sensitive to hot, late season fires. Implementing early burning will help conserve plant and animal resources in these woodlands. Early burning should not be used in the Lowveld, Matabeleland or Eastern District areas.

When is the best time for early burning?

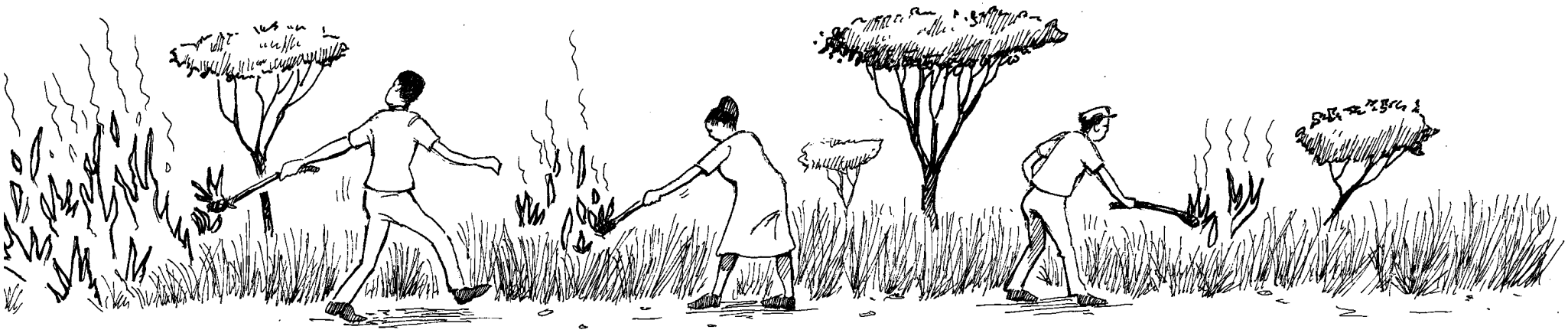
This will vary from year to year and depends mostly on the previous season's rainfall. From around the month of May onwards, efforts should be made to start fires that will achieve a cool burn. This causes minimal damage and prevents late and hot wild fires from doing further damage.

As a rule of thumb, the longer and the wetter, the previous rainy season, the later the early burning will need to be. Most early burning is successfully accomplished during the month of June. The date of the last rains can provide a good indicator for planning when to start early burning. Early burning must not extend beyond the middle of July. During an early burning programme, the fires should be put out by the cold night air and the dew. If the fires burn through the night it is already too late for early burning.



Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec

Team moving in the bush starting fires with sticks with rag soaked in diesel



How is early burning done?

Early burning fires are simply started by teams of workers or volunteers going into the wildlife area and trying to set fire to the surrounding bush. They should follow roads and tracks in the areas to be burnt. They should start on higher ground, which is generally drier than valleys and depressions. It is important not to give up if at first the vegetation fails to burn. If the grass is too green or moist, they should try again a week or so later. This procedure must be repeated until the early burning is achieved.

With an early burning programme it is not necessary to try and burn the entire area. Ideally, the burning should either be planned so that:

- it removes about 25% to 30% of the dry vegetation over a widespread area, or
- it creates a patchwork effect which will help prevent fires from entering and spreading through the area later in the season.

When doing early burning from roads, participants must walk into the bush (3 - 5m) to start their fires. This is because the vegetation along the edge of the road stays greener from the water running off the road.

What needs to be considered before starting an early burning programme?

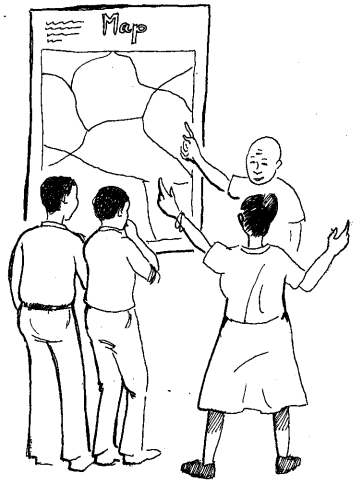
As wild fire can spread easily across many wards of a district, early burning programmes should be planned at a district level. Before any early burning starts, it is essential to have well-planned co-ordination, good communication and clearly defined responsibilities. The CAMPFIRE Coordinator or Manager with the involvement of the Wildlife Committees (WWCs) should take primary responsibility for fire management. In some cases, it may not be possible for individual wards to implement a burning programme in isolation. Good planning, well in advance of the burning, is essential. This could be done during the rainy season when not much wildlife work is going on in the field.

Early burning mark in the wildlife calendar

ACTIVITIES	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Fence maintenance	•	•	•	•	•	•	•	•	•	•	•	•
Wildlife patrols	•	•	•	•	•	•	•	•	•	•	•	•
Wildlife counts						•						
Early burning					●	●	●					
Monitoring / hunting				•	•	•	•	•	•			

Detailed early burning calendar

ACTIVITIES	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Planning		•	•	•								
Test burn					•	•	•					
Burn					●	●	●					
Monitor									•	•		
Report										•	•	



The following major steps need to be taken before starting an early burning programme:

- **Determine the major vegetation types in the district:**
  Use a vegetation map to identify areas of mixed woodland vegetation (msasa / mfuti, mukweza / mugoro and mukonono). These are areas which are most suitable for early burning. Mopane, jesse and riverine vegetation types should not be burnt. District level vegetation maps can be obtained from Forestry Commission or WWF.
- **Decide which roads and tracks can be used in the area to be burnt:**
  The size of the area to be burnt and the network of the roads and tracks will determine whether the burning can be done by people on foot and / or by vehicle. Community wildlife areas which are used for hunting normally have enough tracks to use as access for an early burning programme. Decide which roads or tracks are going to be used in the programme.
- **Decide who will do what and when in the early burning programme:**

  It is important to decide well ahead:

  - who will do the burning,
  - what they will need do the work (manpower, transport, finance)
  - who will be in charge of the programme
  - what role the safari operator will play

  The Safari Operator should be involved in the early burning programme to avoid any conflicts and misunderstandings especially if the hunting starts early. The operator might also be able to assist with transport and communications. If the wildlife area is next to Parks and Wildlife Land, it is important to involve the local Warden in the planning and execution of the burning programme.
- **Decide what equipment is needed:**
  Very little equipment is needed for early burning. The decision of how to get to the areas will determine what transport is needed. If the area is large vehicles might be needed to carry the people to their starting points. Most early burning should be done on foot, once patrols have been put in place by vehicle. If the early burning programme is extensive it is important to make plans for overnight stops for the participants.

An early burning plan

Activity	Responsibility	Timing	Costs	Other resources	Comment
Planning	CAMPFIRE Unit and WWC	February - March	meeting costs only	maps	include all stakeholders
Test burning	Game Guards (RDC or WWC)	April	transport, allowances, matches	vehicles, camping equipment	try, try and try again
Early burning	Game guards, community volunteers	May - July	transport, allowances, matches	vehicles, camping equipment	notify neighbours
Monitoring	CAMPFIRE Coordinator	August - September	transport		
Reporting	CAMPFIRE Coordinator	October	stationary		

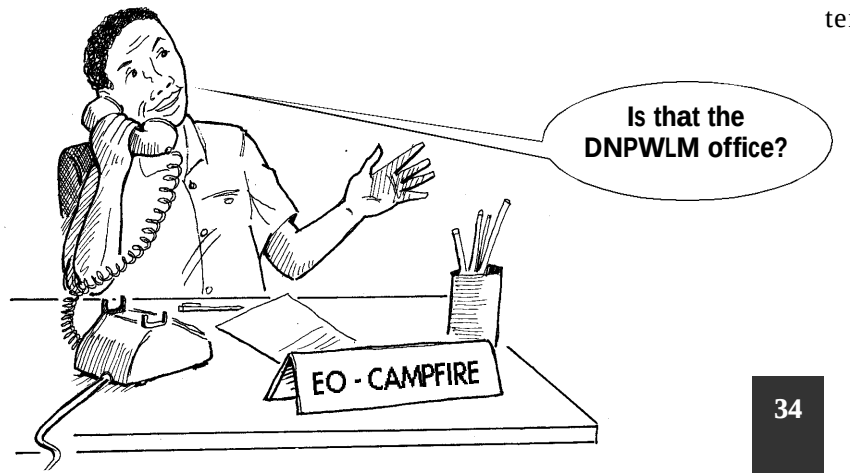
- **Decide how many people will be needed:**
  Early burning should be done by people who know the wildlife area. Most districts have game guards and wildlife monitors who can do this task. They can also do their normal patrol duties at the same time, such as law enforcement and wildlife reporting. If there are not enough game guards then volunteers from the community can be used.
- **Determine how much the early burning programme will cost:**
  An early burning programme should not be a costly activity. A budget should be drawn up for the entire burning programme, which will meet all the expected expenses. Ideally the programme should be paid for by both the wards and the district. It must be clear before the early burning programme starts who will pay for which costs.
- **Determine how long the early burning programme will take:**
  The time taken to implement an early burning programme will depend on the size of the area. There is usually an opportunity when conditions for early burning are perfect, i.e. there is some dry vegetation and no wind. This usually occurs in May and June. During this time those who will be involved should be ready at short notice to start the programme.

How is an early burning programme implemented?

The following steps are given as a guide to implementing an early burning programme:

Step One. Test the vegetation: Once the early burning plan is in place, its implementation will depend on the state of the vegetation. Use a local patrol from the nearest ward involved to examine the bush and vegetation. Does it look as though it would burn or is it still too wet? Try burning a small patch experimentally. If it does not burn because it is still too wet, wait a week or so, then try again. Make sure you do so at the same time of day on each occasion. The ideal fire will burn slowly and will not be too hot, so that:

- the grass cover should only partially be removed, and
- the flames from the fire should reach only the lower leaves of the surrounding shrubs, bushes and small trees. Higher up, above one metre or so, the leaves and branches should remain untouched by fire.



Step Two. Inform neighbours: Remember, it is a legal requirement to inform your neighbours of your intention to burn. So, when planning the implementation of the early burning programme, do not forget to inform all those who should be aware of your intentions.

Step Three. Start burning: When the vegetation is ready, the teams of burners need to be taken to their starting points. They must then walk through the bush starting fires. They should:

- start as many fires as possible in a given area
- let the fires go and do not make any attempt to control them or put them out
- record some basic information about the fires (time, ease of lighting, impact)

Step Four. Burn the selected area: Over a few days, and not usually any longer than a week to 10 days, it should be possible to have set alight much of the selected area. If the timing is correct, the fires will be put out by the low temperatures and dew at night.

Step Five. Implement the monitoring programme:
All management activities should be followed by some form of monitoring and evaluation. For an early burning programme the following information should be collected:

- the area burned - using a 1:50 000 map, calculate the percentage (%) of the total wildlife area burnt.
- the type of fire - was the fire hot or cool; what was the height of flames; how was the vegetation effected; was it easy to start the fires; did they go out easily?
- the climatic conditions - was it calm or windy, was it hot or cold, was there dew at night?
- who was involved - who were the people who did the burning, game guards or volunteers, what training were they given?
- what was the impact later in the year - was there much bare ground, was there still some ground cover, was there sufficient browse towards the end of the dry season?

If this information is accumulated each year and compiled into a simple report, it will assist in the planning and implementation of the following season's burning.

With an early burning programme, remember the following:

✓ **DO** develop the confidence necessary to go ahead and implement what may appear initially to be a drastic activity

✓ **DO** notify your neighbours that you intend to conduct an early burning programme

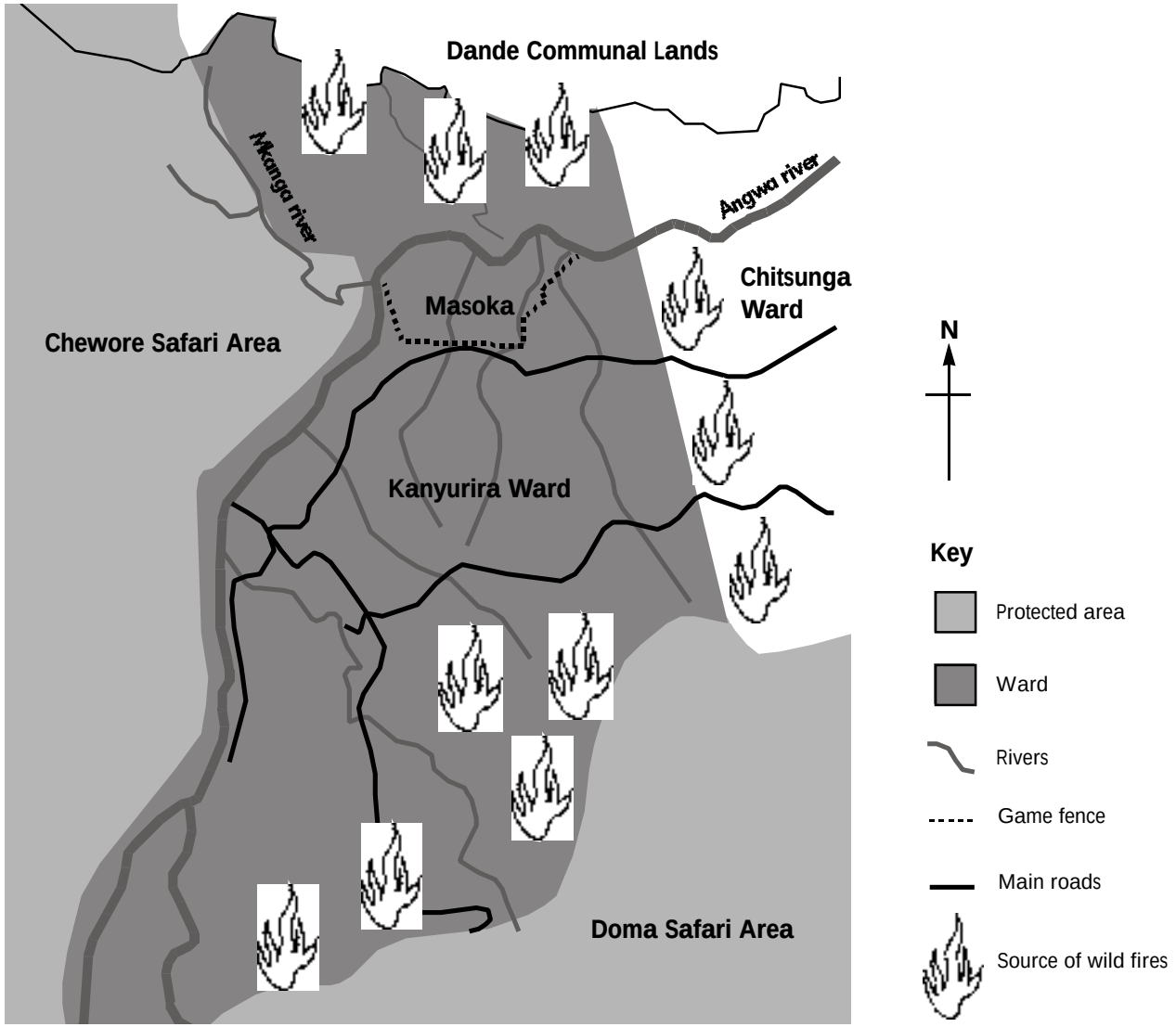
✓ **DO** manage the fire, because early burning is far less disastrous than waiting passively for damaging hot fires that will occur later in the dry season

✓ **DO** discuss fire as part of the environment and as a management tool

✗ **DO NOT** ignore the potential danger of fire and its mismanagement

✗ **DO NOT** undertake early burning after mid July

Map of Kanyurira Ward, Guruve District showing sources of wild fires



CHAPTER 5

A CASE STUDY OF EARLY BURNING IN KANYURIRA WARD

This case study outlines how Kanyurira Ward in Guruve District, has planned and implemented an early burning programme for its wildlife area.

What were the sources of wild fires in the Ward?

An aerial survey facilitated by WWF showed that each year the area north of the Angwa river, together with the southern hilly escarpment areas, were burnt by late hot fires (see map). Local information indicated that fires often came in from the adjacent Chitsungo ward close to the escarpment, when fields were cleared.

What solutions were proposed?

The Ward Wildlife Committee (WWC) proposed the following solutions:

- people would burn their fields at the end of the rainy season. It was agreed that the ward game guards would encourage people to do this and ensure that it was done,
- firebreaks would be made around the settled areas to protect people, their possessions and crops,
- there would be an early burning programme in the foothills of the escarpment and the area north of the Angwa River.

The WWC also proposed that if there was a wild fire, then:

- back burning should be used to prevent the fire spreading to the ward, and
- if a fire started close to the village, then the villagers should try and put it out with beaters.

How was the early burning programme implemented?

Step One. Identifying the major vegetation types: The WWC used their participatory resource survey to confirm if the vegetation in the ward was suitable for an early burning programme. The ward is situated close to the Zambezi escarpment and foothills where the vegetation is mixed msasa / mfuti trees and shrubs. For the fire management plan, they divided the ward into four blocks:

Block 1: This is the fenced area of the ward. The fenceline is cleared, and controlled burning is carried out along the outside of the fenceline. Within the fence, the ward wildlife constitution has a by-law which prohibits the random lighting of fires.

Blocks 2 - 4: These were the northern, central and southern wildlife areas of the ward. They planned to early burn the edges of each block first, followed by the central areas.

Step Two. Using the network of roads and tracks: The committee decided that the existing road and track network was good enough for their programme.

Step Three. Who will do what and when: The WWC planned that the early burning would be done by the game guards, fence minders and some volunteers from the community and that they would be incharge of the programme. Technical advice was to be provided by WWF. Initially there was no plan to involve the safari operator.

Step Four. What equipment was needed: There was no special equipment needed for the early burning programme. The ward's tractor provided transport.

Step Five. How many people were needed: The WWC planned to use about 25 people for the early burning programme.

Step Six. Budgeting for the early burning: The first time there was an early burning programme, no budget was drawn up. In the second year, a budget for the early burning programme was included in the ward's annual budget.

Step Seven. Time needed: The WWC estimated that when the time was right to start the early burning programme, it would take 5 days.

What were the results of the early burning programme?

There are four years of experience with early burning in Kanyurira Ward.

Year 1, 1995: The early burning programme was initiated in 1995 with technical input from WWF and the involvement of the ward game guards, fence minders, WWC members and the community. The plan outlined above and indicated on the map was followed. Reasonable success was obtained.

Year 2, 1996: The exercise was planned and budgeted for by the WWC. Letters of notification were sent to the police, Department of National Parks and Wildlife Management, as well as neighbouring communities (wards) and the resident safari operator.

There appeared to be a conflict of interest. The safari operator was busy hunting and for this reason the WWC felt that early burning could not be undertaken. The safari operator, however did early burning of areas along the escarpment, which were more susceptible to wild fires.

Year 3, 1997: Although some burning was done by the safari operator, nothing was planned for by the ward. As a result, there were a number of uncontrolled wild fires which did a lot of damage.

Year 4, 1998: Early burning in certain escarpment areas was successfully undertaken in May by the game guards working with the safari operator.

Summary of the early burning programme in Kanyurira, Guruve District

Year	Outline of Plan	Involvement	Outcome
Year 1: 1995	Fire management plan developed and initiated according to plan	Technical input: WWF; WWC, game guards, fence minders and community responsible for implementation	Reasonable success
Year 2: 1996	Early burning planned as previously but to include support of safari operator; conflicts of interest arose with safari operator not available except to undertake burning in susceptible escarpment areas	Planned and budgeted for by WWC; Police, National Parks, neighbouring wards and safari operator all informed	Important lesson learned was that all stakeholders had to be involved in the planning and commit themselves fully to actual implementation
Year 3: 1997	No planning done by the ward; some early burning implemented by the safari operator	No meaningful involvement of key stakeholders	A number of uncontrolled wild fires which caused a lot of damage
Year 4: 1998	Early burning planned with safari operator	WWC organised for game guards to work with safari operator	Early burning in escarpment areas undertaken successfully in May

What lessons can be learned from the early burning programme?

There were three important lessons which were learned by all the stakeholders. These were:

- Involve all stakeholders: In the second year, there was a conflict of interest which constrained the early burning programme. This occurred because not all the stakeholders were involved in planning the programme.
- Early burning prevented hot late season fires: In those years and those areas where the early burning was carried out, the incidence and severity of late hot season fires was reduced.
- Long term benefits: The long term benefits will only be achieved if early burning programmes are implemented regularly every year.

Hot fires remove ground cover and increase erosion.

APPENDIX ONE

Glossary of words and phrases

Word / phrase	Meaning	Example
bush encroachment	refers to an increase in the number and density of undesirable woody species	In Matabeleland bush encroachment, caused by overgrazing has reduced the quality of grazing for livestock and wildlife
ecosystems	refers to the interaction of all living organisms and their physical environment	The Mana Pools Flood Plain, with its plants and animals, is a unique ecosystem
crop residues	refers to the remaining plant material after the crop has been harvested	By law, all farmers must destroy their cotton (crop) residues
landscapes	refers to an area of the earth's surface which has a certain type of scenery	The escarpment of the Zambezi Valley is a rugged, but beautiful landscape
vleis or dambos	refers to the shallow wet depressions at the head of the drainage system	Vleis or dambos should be protected because they are an important source of water and grazing in the dry season
indigenous	refers to a species which belongs naturally to a certain area or place	The products harvested from indigenous species of trees are important to communal land farmers. exotic
exotic	refers to a species which has been introduced to the current area from another area or place	The pine and gum trees grown in plantations are both exotic species to Zimbabwe

Continued on page 42..

Word / phrase	Meaning	Example
browsing	refers to animals eating the leaves and the woody plant material	Browsing by elephants can damage woodlands
vegetative	refers to the something which is made up of plants	In Zimbabwe, the long dry winters mean that nearly all vegetation is easily damaged by fire
rotational	refers to moving an activity from one area to another on a regular and managed basis	Some commercial farmers use rotational grazing systems to improve the productivity of the grasslands
harrow	is an an agricultural implement used to break up the soil surface	A disk harrow is used to prepare fields for planting after ploughing or ripping
legal requirement	refers to an action which is required by law	It is a legal requirement to stop at a red traffic light
animal parasites	are organisms which live on or in a live host animal	An infestation of animal parasites (such as ticks or worms) can cause the host animals to loose condition
Natural Regions	these are agro-climatic zones determined by rainfall. They are used to determine primary landuse	There are five Natural Regions in zimbabwe. Natural Region 1 receives the highest annual rainfall and Natural Region 5 the lowest annual rainfall

APPENDIX TWO

Sources of information on burning programmes

Organisation	Department	Telephone numbers
Government of Zimbabwe	AGRITEX	Harare 707311
	Department of Research and Specialist Services	Harare 704531
The University of Zimbabwe	The Department of Biological Services	Harare 303211
	Institute of Environmental Studies	Harare 302603
Non-governmental organisations	WWF - Southern African Programme Office	Harare 252533 or 252534

APPENDIX THREE

Characteristics of vegetation types

Fire region	Vegetation type	Major species (proper names)	Major species (common names)
Zambezi Valley	1. Mopane woodland	Colophospermum mopane Combretum spp. Terminalia spp.	Mopane Combretum Terminalia
	2. Jesse thickets	Vangueria infausta Holmskioldia tettensis Pteleopsis spp.	Chinese hat
	3. Riverine areas	Trichilia emetica Diospyros mespiiliformis Kigelia africana	Mahogany Ebony Sausage tree
	4. Savannah woodlands	Brachystegia speciformis Brachystegia boehmii	Msasa Mfuti
Lowveld and Matebeleland	1. Mopane woodlands	Colophospermum mopane Combretum spp. Terminalia spp.	Mopane Combretum Terminalia
Eastern highlands	1. Woodlands	Brachystegia speciformis	Msasa
	2. Grasslands	Elyonurus argenteus Themeda triandra Uapaca kirkianna	
	2. Exotic plantations	Pinus spp.	Pine trees

Booklets in the Wildlife Management Series include:

1. Problem Animal Reporting
2. Electric Fencing Projects
3. Marketing Wildlife Leases
4. Managing Safari Hunting
5. Quota Setting Manual
   District Quota Setting Toolbox
6. Maintaining Electric Fences
7. Counting Wildlife Manual
8. Fire Management Manual

This booklet is the eighth in a series of guides on wildlife management and examines various aspects of fire management. It provides background information and guidance to Rural District Councils and should be read along with the other booklets in this series. The WWF Wildlife Management Series provides information and guidance to members of villages, wards and Rural District Councils involved in the management of CAMPFIRE. These booklets are linked to training programmes being undertaken by members of the CAMPFIRE Collaborative Group.

WWF is a member of the CAMPFIRE Collaborative Group supporting CAMPFIRE in Zimbabwe and has provided support and training to communities for the establishment of wildlife management systems.

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