



Performance Audit Report

PROTECTION OF FORESTS FROM WILDLAND FIRES BY DEPARTMENT OF FORESTRY AND RANGE RESOURCES (DFRR)



REPORT NO. 4 OF 2011

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2nd November 2011

Hon. K. O. Matambo
Minister of Finance and Development Planning
Private Bag 008
Gaborone

Dear Sir,

I have undertaken a performance audit on the "Protection of forests from wildland fires by the Department of Forestry and Range Resources" pursuant to Section 29 of the Finance and Audit Act, 1997.

As you are aware, the Finance and Audit Act provides the Auditor General to carry out performance audit in the public sector and that Performance Audit Reports are to be laid before the National Assembly, by the Minister responsible for Finance.

Accordingly, I submit the Performance Audit Report No. 4 of 2011 on the audit of "Protection of forests from wildland fires by the Department of Forestry and Range Resources" to be laid before the National Assembly in accordance with Section 36 of the Finance and Audit Act.

Yours faithfully,

R. B. Sebopeng

AUDITOR GENERAL

AUDITING FOR BOTSWANA GOVERNMENT

The Auditor General is the Head of the Office of the Auditor General, appointed under the Constitution. The Auditor General carries out his duties under the Finance and Audit Act 1997. He therefore, undertakes Performance Audits on the public sector bodies and submits reports to the National Assembly. The aim is to improve the public sector administration and accountability.

Auditor General's reports are available in the Office of the Auditor General and may be viewed in the Office Website; www.oag.org.bw

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Abbreviations

ARB - Agriculture Resources Board

BDF - Botswana Defence Force

BWP - Botswana Pula (Currency)

CBD - Convention on Biological Diversity

CBFiM - Community Based Fire Management

CBOs - Community Based Organisations

CITES - Convention on International Trade of Endangered Species

CTO - Central Transport Organisation

DC - District Commissioner

DDMC - District Disaster Management Plan

DFRR - Department of Forestry and Range Resources

DPSM - Department of Public Service Management

DWNP - Department of Wildlife and National Parks

EAC - Environmental Advisory Council

FAO - Food Agriculture Organisation

FDI - Fire Danger Index

FSMP - Fire Suppression Mobilisation Plan

GIS - Geographic Information System

GPS - Global Positioning System

HOORC - Harry Oppenheimer Okavango Research Centre

HQ - Head Quarters

IC - Incident Commander

ICS - Incident Command System

INTOSAI - International Organisation of Supreme Audit Institutions

NDMO - National Disaster Management Office

NGOs - Non Governmental Organisations

OAG - Office of the Auditor General

OP - Office of the President

SADC - Southern African Development Community

SFM - Sustainable Forest Management

UB - University of Botswana

UNCCD - United Nations Convention to Combat Desertification

UNFCCC - United Nations Framework Convention on Climate Change

VHF – Very High Frequency

WGEA - Working Group on Environmental Audit

Executive summary

Protection of forest from wildland fires is fundamentally important principle of sustainable forest management. Moreover, forests are critical for human life as they provide basic human needs as water, food, shelter, medicine, fuel wood and timber. As such their existence should be preserved and protected from the risk of wildland fires taking into consideration their negative impacts.

Despite the amount of money spent on the fire management initiatives, the economical and environmental impacts of wildland fires had not reduced country wide, as there is still major damage to the forests due to wildland fires. This therefore, calls for a systematic approach to manage wildland fires in order to reduce their negative consequences.

On account of these concerns, the Office of the Auditor-General carried out a performance audit at the DFRR to;

- Assess whether DFRR's administrative systems were effective to ensure efficient protection of forests from wildland fires.
- Make follow-up on whether DFRR had implemented the recommendations of the previous Performance Audit Report (2008) on the Management of Wildland fires.

The audit focused on the administrative systems and measures put in place by DFRR to effectively protect forests from wildland fires. Relevant data for the financial years 2007/08, 2008/09 and 2009/10 was gathered from seven (7) Districts out of 10.

Key findings, recommendations and Management comments

1. The Department had not investigated fire incidences nor carried out fire analysis to determine fuel characteristics and causes of fire in the country.

Recommendation

The OAG recommends that the Department should ensure that all fire incidences are investigated so that the DFRR can have complete understanding of the causes of fires in the country as this may assist the Department to decide on which fire preventive measures/ mechanisms to deploy during planning.

Management response

The DFRR concurred with the observation, however they pointed out that in the short term it would be difficult to implement the recommendation without adequate resources.

2. The Herbage Preservation Act (1977) was not adequately implemented or enforced by DFRR and Stakeholders in protecting forests and preventing bush and wildland fires.

Recommendation

The OAG recommends that DFRR should improve their approach to law enforcement by using the full range of powers the Parliament has provided where circumstances demand and committing resources to monitoring and enforcing compliance.

Management response

The DFRR Management agreed with the observation and the recommendation.

3. The current public awareness initiatives (Kgotla meetings and use of sign boards) deployed by DFRR, in order to convey message to the public were found to be inadequate, in that there had been less or no positive change with regard to the area of land burnt on annual basis.

In addition, there was no monitoring and surveillance to determine if message was sufficiently reaching the public.

Recommendation(s)

The OAG recommends that the DFRR should assess the adequacy and effectiveness of their current approach to public awareness initiatives, in light of their potential impact on the public's understanding of the importance of protecting the forest resource from wildland fires.

The OAG also recommends that the DFRR should continually undertake public awareness campaigns in order for the communities to understand the benefits of and potential harm caused by wildland fire. This will enhance their loyalty and commitment in the event.

Management response

The DFRR Management concurred with both the observation and recommendations.

4. The fire breaks were ineffective in that in most cases the fires crossed the firebreaks. That is, the fire breaks could not prevent the spread of wildland fire as intended.

Recommendation

The OAG recommends that the DFRR should conduct a research to assess the effectiveness and efficacy of the current fire breaks network in order to have a holistic idea about their cost-benefit relations. This may assist the

Department to come up with other preventive measures which might be cost - effective.

Management response

The DFRR Management agreed with the observation and recommendation but they highlighted that there is human and financial capacity to undertake the study on effectiveness and efficacy of the fire break network.

5. There was inadequate fire fighting equipment at all the DFRR District Offices. The Districts operated with neither specialised fire fighting vehicles nor protective clothing amongst the crucial fire fighting equipment.

Recommendation

The Department should incorporate its resource requirements into its planning process to enable them to measure the adequacy of the available resources. The OAG also recommend that the DFRR should replace the worn out or lost equipment and appropriately maintain those available.

Management response

DFRR Management agreed with the observation and indicated that planning was always done, but the critical issue was that the Department's budget had never been adequate to allow for procurement of resources, replacement of worn out or lost equipment and their appropriate maintenance.

6. Coordination of fire suppression activities was limited/ ineffective in that the suppression activities were not appropriately undertaken.

Recommendation

The OAG recommends that the DFRR Management should establish an effective Incident Command System to coordinate activities during fire suppression.

Management response

The DFRR concurred with both the observation and the recommendations.

7. Reporting during fire suppression was not adequately done, in that reports that could have assisted the DFRR HQ to make informed decisions as regards the needed resources were not always forthcoming. This resulted in DFRR HQ not getting imperative information regarding the changing fire situation at the fire scene. This may affect the DFRR's decision making concerning additional resources to support the fire crews.

Recommendation

The OAG recommends that the DFRR should develop a well defined reporting mechanism to facilitate an informed and prompt decision making process.

Management response

The DFRR agreed with the observation and the recommendations.

8. Communication between the fire crews at the fire scene, Districts and DFRR Headquarters was ineffective in that information regarding fire

situation at the fire scene was not reaching both the DFRR HQ and Districts.

Recommendation

The OAG recommends that the DFRR Management should devise an effective communication system to ensure efficient coordination of suppression activities.

Management response

The DFRR Management agreed with the observation but indicated that they were in the process of procuring radio communication equipment such as walkie talkies, vehicle – mounted and base station radios especially for Ghanzi, Ngamiland, Central and Chobe Districts as the most fire prone areas.

9. The DFRR was unable to achieve their proposed 10% reduction of land burnt as the related strategies put in place by DFRR yielded limited results with regard to reducing the land area burnt by 10%.

Recommendation

The OAG recommends that the DFRR should carry scientific study and analyse the natural fire trends in relation to climate change so that it may help in deploying the best strategies prior to a specific fire season.

Management response

DFRR Management concurred with the observation. They however, highlighted that the scientific research was a long term undertaking requiring massive financial and human (expertise) resources.

10. With regard to follow-up on the recommendations of the Auditor General's Performance Audit Report No; 8 of 2008 on Management of Wildland Fires by the DFRR, the audit revealed that the DFRR had implemented 31.25%, not implemented 50%, while 18.75% of the recommendations were in progress at the time of writing this report. (Refer to Appendix C of this report with regard to implementation of the recommendations and actions taken by DFRR).

Recommendation

The OAG recommends that the DFRR should expedite the review and finalisation of their legal instruments especially the Fire Management Strategy & Forest Policy as this may enhance the implementation of the recommendations.

Overall Conclusion

Notwithstanding the efforts by the DFRR to protect the forests from wildland fires, there are still some challenges which rendered the DFRR initiatives to protect forests from the wildland fires ineffective and inefficient.

However, the OAG is of the view that there can be scope for significant improvement, if the Department can have rigorous approach to ensuring that the forests are efficiently and effectively protected from the fire risk.

CHAPTER 1

1.0 BACKGROUND

1.1 INTRODUCTION

Forests are amongst the most diverse and widespread ecosystems on the earth. There are many definitions of forests, however Botswana like other countries uses values employed in the common FAO (2005) definition of forest to define its forests. That is, "Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It doesn't include land that is predominantly under agricultural or urban land use". In addition, Botswana's definition of forests includes the types of vegetation cover which is mainly shrub-like vegetation, sparse savanna, grassland, open woodlands and dry deciduous forests. The country has a total land area of 582 000 km² of which 60% is forests and rangelands. Furthermore, out of the 60%, only 1% is made up of forest reserves in Chobe District.

Forests are critical for human life as they provide basic human needs as water, food, shelter, medicine, fuel wood and timber. As such their existence should be preserved and protected from several environmental risks which result mainly from unsustainable forest management. These risks include amongst others; forest fires, illegal logging, revenue loss, livelihood loss, decreased carbon storage and shortage of raw materials for industry. Botswana forests, not being an exception, are also threatened by the risks of forest fires, illegal logging/harvesting of forest products, biodiversity and ecosystem loss. However, wildland fire continues to be a major threat to Botswana forests.

Wildland fires can be menace or beneficial in an ecological manner. The use of fire as a natural resource management tool in some communities can be seen as a livelihood strategy. The purposes of setting fires are quite varied, and

include amongst others; land clearing for cultivation, stimulating grass growth for grazing animals, hunting or for improving access to fishing grounds. In addition, fires can be used for improving the quality of thatching grass and reeds by removing plant debris after harvesting, and preparing firebreaks for safeguarding property.

However, wildland fires have negative impacts on the environment and socio-economy of the community thus contributing to their poor welfare. One of the negative impacts is damage to property; for example, houses, arable fields and kraals. Nowadays fire is accountable for the loss of habitat, property and forage for both livestock and wild animals. It is known that the loss of habitat is the proximate and underlying cause of the loss of biodiversity. Wildfires affect regeneration of the plants by destroying young saplings and mature trees. Additionally, income generating items such as raw material for weaving, items for wood carving, handicraft and thatching grass are destroyed by uncontrolled fires.

Fire also kills animals and birds through suffocations and burns, and it also destroys their habitats and their forage. Like in other parts of the world, incidences of loss of human lives have also been recorded in Botswana in 2008 and 2010 fire seasons (*refer to Table 5 at Appendix B*).

According to Reports approximately 46 % of Botswana (or 28 Million hectares (Mha)) has burnt many areas repeatedly during the last 10 years. Historically even a larger portion has burned because most of the ecology of Botswana belongs to a so called fire-adapted vegetation type. The main fire season in Botswana has been determined to be during the dry period between May and October. As lightning, the only natural ignition source in this region, does not occur between May and August, most of these fires have an anthropogenic origin. That is; they are caused by human activities while using fire as a

management tool. These fires may accidentally spread uncontrolled over the small areas and usually extend over many square kilometers. As the incidence of lightning increases from September to November, in advance of the coming rainy season, fires can then also be ignited by lightning. September is typically the period with the most and largest fires, especially on the dry lands, as the biomass has dried out completely and strong winds and frequent lightning strikes occur, often without any following rainfall, allowing the fires to spread extensively.

Taking into consideration the negative impacts of wildfires discussed above, it is imperative that forests are protected from fires to; prevent injuries or loss of human life, minimise property damage and protect other natural resources. This calls for a systematic approach to manage wildfires in order to reduce their negative consequences.

1.2 DEPARTMENT OF FORESTRY AND RANGE RESOURCES

In recognition of the national significance of natural resource management including forests, the Government of Botswana (through Ministry of Environment, Wildlife and Tourism) established the Department of Forestry and Range Resources (DFRR). The DFRR came into existence in 2005 following a decision to merge the former Agricultural Resources Board (ARB), Range Ecology and Department of Forestry from Ministry of Agriculture. The need for this Department emanated mainly from the absence of an independent department to effectively coordinate all issues pertaining to conservation, management, protection and encouragement of sustainable utilisation of forests and range resources.

The Department is mandated to conserve and manage the country's forests, range resources, other natural resources and other associated ecosystems. In order to achieve this, the Department functions with 4 Divisions, namely;

Conservation and Management, Extension services, Research and Monitoring, and Departmental Management. Each of these Divisions is tasked with specific responsibilities. The Division of Conservation and Management through the Fire Management Section is responsible for fire management in the country and specifically performs the following tasks;

- a. Compiles and analyses fire relevant data for detecting and monitoring vegetation fires, determining readiness levels, identifying fire risk areas and assessing the current and predicted fire situation (fire danger), and assessing burnt scars.
- b. Produces wildland fire maps.
- c. Develops the physical and institutional capacity to perform rapid initial fire suppression attack.
- d. Develops and carries out prescribed burning programmes.
- e. Constructs, assesses and maintains fire breaks.
- f. Develops and promotes Community Based Fire Management (CBFM) concepts.

Although, the DFRR is the leading agency, forest protection is a collaborative effort of this Department, other Government Agencies, Non-Governmental, Community Based, and International Organisations.

1.2.1 Organisational Structure

The DFRR is headed by the Director, who is assisted by the Deputy Director. The Department comprises of three (3) Technical Divisions (Conservation and Management, Extension Services, Research and Monitoring) and an Administrative Division (Departmental Management). These Divisions are headed by Chief Forestry and Range Resources Officers who report directly to Deputy Director. The operations at the District level are headed by District Coordinators, who administratively report to the Deputy-Director but report

through Heads of Divisions on technical issues. The DFRR's organisational structure is shown in *figure 1 at Appendix A*.

1.2.2 Vision, Mission Statement and Values

Vision

“To be a leader in the sustainable management and conservation of forest and range resources”.

Mission

“We exist to manage and conserve forest and range resources in order to ensure their sustainable use and improve the socio economic development of Botswana”.

We do this through:

- generation of information on forest and range resources;
- promotion of regeneration of forest and range resources
- promotion of public awareness on forest and range resources
- promotion of income generating programmes for communities

Values

- Commitment
- Timeliness
- Integrity
- Team spirit
- Honesty
- Tolerance
- Compassionate
- Innovativeness

- Gender sensitiveness

1.3 STAFFING

The Department of Forestry and Range Resources has a staff compliment of 568 employees; which comprises of both Permanent and Pensionable and Industrial Class Employees at the Head-quarters and Districts.

1.4 FINANCES

The DFRR's funds are provided by the National Assembly appropriation. Therefore, the actual appropriation and expenditure for the three financial years under review (2007/08 -2009/10), are indicated below;

Table 1: Financial Spending of DFRR

Financial Years	Warranted Provision (BWP)	Actual Expenditure (BWP)	Difference (BWP)	Difference (%)
2007/2008	67, 500, 540.00	60, 263, 927.00	7, 236, 613.00	10.7
2008/2009	73, 129, 660.00	70, 465, 893.00	2, 663, 767.00	3.6
2009/2010	81, 283, 440.00	72, 479, 972.00	8, 805, 468.00	10.8

Source: DFRR Financial Statements

1.5 STAKEHOLDERS

In accordance with the objective of integrated forest management, the DFRR cooperates and collaborates with the following internal and external

stakeholders. Refer to figure 6 at Appendix A for the roles of some stakeholders as illustrated in a multi-stakeholder concept of fire management.

1.5.1 Internal stakeholders

- DFRR staff
- Agricultural Resource Board Members

1.5.2 External stakeholders

- Government Agencies
- Non-Governmental Organisations
- The Private Sector
- Community Based Organisations
- Political Leadership
- Traditional Leadership
- International Community

1.6 MOTIVATION OF THE AUDIT

The Government of Botswana spends millions of Pula annually in management of wildland fires throughout the country. The funds are utilised in purchasing fire suppression equipment, maintenance of firebreaks, payment of officers' allowances, feeding fire fighters, and other fire prevention and suppression activities. The Government allocates P30 million (on average) annually to enable the Department maintain a network of 10 000 Kilometers firebreaks, with an average width of 20 meters, throughout the country.

Despite the amount of money spent on the fire management initiatives, the economical and environmental impacts of wildfires had not reduced throughout the country, as there is still major damage to the forests due to wildland fires. The impacts of forest fires attracted national and to a certain

extent international attention, especially after wildland fires burned vast area of the country, 11.8 Mha and 13.5 Mha in 2008 and 2010 respectively (see *table 7 at Appendix B*). Unfortunately and on a sad note, loss of human lives (13 fire victims) was also recorded during the year 2010 (refer to *table 5 at Appendix B*). The impact of wildland fires have therefore, raised public concern as this has been a subject of discussion in different Media houses and fora (the local newspapers and the Botswana Television).

On account of these concerns, the Office of the Auditor-General carried out a performance audit at the DFRR to assess whether the administrative systems employed by the Department of Forestry and Range Resources were effective to ensure efficient protection of forests from wildland fires.

CHAPTER 2

2.0 AUDIT DESIGN

2.1 AUDIT STANDARD

The audit was conducted with reference to the INTOSAI Working Group on Environmental Auditing (WGEA) Forest Guidelines and the Office of the Auditor General's Performance Audit Manual.

2.2 OBJECTIVES OF THE AUDIT

The objectives of the audit were to;

1. To assess whether DFRR's administrative systems were effective to ensure efficient protection of forests from wildland fires.
2. To make follow-up on whether DFRR had implemented the recommendations of the previous Performance Audit Report (2008) on the Management of Wildland fires.

2.3 SCOPE OF THE AUDIT AND LIMITATION OF THE AUDIT

The audit focused on the processes, administrative systems and measures put in place by DFRR and Districts to effectively protect forests from wildland fires. Data relevant to the audit was gathered, compiled and analysed for the financial years 2007/08, 2008/09 and 2009/10. The DFRR operates within 10 District Offices throughout the country. Due to financial resource constraint, the audit covered seven (7) Districts, thus representing 70% of the total number of the Districts. The Districts visited were Kweneng (Molepolole), Kgalagadi South (Tsabong), Gantsi, Ngamiland (Maun), Chobe (Kasane), North East (Masunga) and Central District (Serowe).

2.4 DATA COLLECTION METHODOLOGY

2.4.1 Interviews Conducted

A total of 66 interviews were conducted during the audit. The key persons in the DFRR and Districts (refer to Table 1 at Appendix B) were interviewed to understand the measures/systems in place with regard to protection of forests against the risk of fires.

In addition, stakeholders at different entities both Public and Private (see Table 2 at Appendix B) were also interviewed to further understand issues related to protection of forests from wildland fires and also to ascertain the roles they play as well as to obtain relevant information for the audit.

2.4.2 Documents Reviewed

Documents listed in Table 3 at Appendix B were reviewed at both the DFRR Headquarters (Gaborone) and the Districts to gather more relevant information with regard to protection of forests from wildland fires.

2.4.3 Field visits/ Observations

Field visits were also made where possible in order to gather more information for audit evidence. The fire-fighting equipment and fire awareness sign- boards were visited to observe their condition. Direct field observations were also made to 11 proximate fire breaks in all the 7 Districts visited. The fire breaks listed in Table 4 at Appendix B were inspected to ascertain if they had been maintained.

CHAPTER 3

3.0 DESCRIPTION OF THE AUDIT OBJECT

3.1 FOREST PROTECTION

The protection of forests from fire is a major consideration for the DFRR. Fire is also a natural feature of the environment as a whole and is one of the most complex management issues in the Department. The forest protection from fire threats in the DFRR and the public at large is a current concern. Therefore, fire management is a good illustration for adaptive approaches to forest protection. Needs for protecting the forest vary according to season and other external circumstances. Forest is protected in order to protect life and property and maintain, conserve and enhance Botswana biodiversity species.

Protection of forests from wildland fires is fundamentally important principle of sustainable forest management, irrespective of the objectives. Sustainable forest management cannot be achieved in the absence of a firm and lasting commitment and appropriate action to effectively protect a forest management unit from the threats and activities that might impair the achievement of forest management objectives.

The DFRR has fire protection strategies along with significant resources and equipment (to be discussed in subsequent paragraphs) to respond to local outbreaks. As such, protection of forests from fire outbreaks is crucial as Botswana losses millions of hectares of forests and range resources annually.

In recognising the importance of forests and the call by international communities to protect forests, the Government developed, *inter alia* the under listed strategies to enhance the conservation and protection of forest resources;

- Formulation of a Fire Management Policy
- Continue annual maintenance of the 10 000 Km fire breaks

- Production of fire hazard maps as a basis for developing fire management plans
- Liaises with District Disaster Management Committees for annual fire suppression programmes (Contingency Plans)

3.1.1 Forest Protection Frameworks

In cognisance of the fact that Botswana was prone to fire threats, the country became signatory to and ratified to international and regional agreements and conventions related to forestry sector and multilateral agreements included among others; Southern African Development Community (SADC) Protocol on Forestry, Convention on International Trade on Endangered Species of flora and fauna (CITES), Convention on Biodiversity (CBD), the United Nations Convention to Combat Desertification (UNCCD), and the United Nations Framework Convention on Climate Change (UNFCCC).

Therefore, the Botswana Government promulgated pieces of legislation that are consistent with the above mentioned initiatives and conventions to enable it to protect natural resource; and secure the lives and property of the local communities and the national economy. The pieces of legislation include but are not limited to Forest Act (1968), and Herbage Preservation (Prevention of Fires) Act (1978). The Forest Act was enacted to provide for the better regulation and protection of forests in the country and to provide for matters incidental thereto. The Herbage Preservation Act was enacted to prevent and control bush and other fires. Additionally, the Forest Policy- Government Paper of 2010 (revised March 2010) was developed, “to provide guidance and facilitation in the management of forests and range resources of the country through conservation development and sustainable use.”

3.1.2 National Contingency/ Fire Suppression Mobilisation Plan

Fire Suppression Mobilisation Plan (FSMP) or Contingency Plan is part of the overall fire management strategy. It is a collective document prepared from the District Contingency Plans highlighting the roles, responsibilities and resources pledged by different stakeholders. The plans are so robust that they can be put into operation within 24 hours of incidence of fire outbreak. The primary purpose of the FSMP is to improve capability for effective and timely response to unwanted fire incidences hence protecting natural resources, lives and properties of the local communities.

CHAPTER 4

4.0 PROCESS DESCRIPTION

Forest protection against the risk of fire describes the measures purported to preserve and improve the forest that is threatened by the risk of fire. This chapter describes the procedures/ activities deployed by DFRR in mitigating and minimising the risks of wildland fires to the forests.

4.1 PREVENTION

Prevention encompasses such measures that reduce the likelihood and impact of fires. It involves proactive rather than reactive measures, and this include;

4.1.1 Law enforcement/legal framework

The DFRR is guided by the Herbage Preservation (prevention of fires) Act of 1978 to execute fire management activities. This Act regulates the use of fire on any vegetation or land. The DFRR and District Herbage Preservation Committees in collaboration with the law enforcement agencies (Botswana Police) enforce the laws prescribed in the Act to prevent any person to set fire on any vegetation or land without the permission of the Department of Forestry and Range Resources. Furthermore, the Law Enforcement Officers carry out fire-cause investigations to feedback prevention measures.

4.1.2 Public Education and Awareness

Prior to the onset of the fire season, the DFRR undertakes a series of activities to create awareness on the impending dangers of wildland fires. This is done through various tools such as Kgotla Meetings addressed by the Agricultural Resources Board, in collaboration with District Conservation and Herbage Preservation Committees. To complement the Kgotla Meetings, the DFRR also

develops and installs signboards bearing warning messages. These signs are placed adjacent to fire prone areas throughout the country.

4.1.3 Fuel Management

Fuel management is done by cutting and removing unwanted ignition sources (debris from dead plants). The DFRR uses prescribed burning method to reduce fuel loads prior to fire season. Reducing the fuel load from the forest land decreases the intensity of fires, while increasing the ability of DFRR to deal with fire and its disasters.

4.2 PREPAREDNESS

The DFRR ensures that fires do not come as a surprise. Therefore, as a preparedness measure, the Department undertakes the following activities prior to the fire season;

4.2.1 Maintenance of Firebreaks

The fire strategy of the Department of Forestry and Range Resources is mainly limited to the reliance on a national network of fire breaks of about 10 000km in total length and 20m wide. The maintenance of these fire breaks is carried out annually by private contractors on a 3 years contract. The DFRR Officer inspects each fire break to ensure that it has been maintained as per the specifications outlined in the inspection sheet (see figure 4 annexed at Appendix A). Inspection is done at intervals of 20 km along the fire break. If the Inspecting Officer is not satisfied with the maintenance work, the Contractor is ordered to re-do the work.

4.2.2 Readiness of fire fighting equipment

The DFRR implores a variety of fire fighting equipment which includes; fire beaters, drip torches, first-aid kit, boom sprayers and knapsack sprayers, fire engines, and fire fighting vehicles. The Department ensures that fire fighting equipment and vehicle are maintained and serviced before the beginning of the next fire season. The equipment is safely stored to protect them from damage from adverse weather conditions.

4.3 FIRE DETECTION

The DFRR uses a MODIS Satellite fire detective system operated at the headquarters in Gaborone. The satellite system is able to detect fire outbreaks in near real time based on temperature measurements. The information is directly reported to the respective District Offices by a telephone or fax. The report provides the coordinates and information of close-by landmarks in order to assist them in resources mobilisation and strategic crew deployment and placement. The Department continuously uses satellite information which has been processed to delineate burn scars to help track changes in the vegetation. Fire towers/ look-out points are also used to detect fires in areas that had poor accessibility. The towers are manned on a 24-hour basis and located strategically in fire prone areas country-wide to facilitate early detection of fires.

4.4 REPORTING OF FIRE INCIDENT

Fire can be reported indirectly or directly by local people or DFRR crews on patrols to DFRR, the Police, District Administration Offices, "*Kgotla*" or *Council Offices*. *Reporting is through* any mode of communication, for instance, by mobile phone, fax or in-person. Whichever Office receives the report first, notifies other Coordinating Offices, especially DFRR or other members of the

District Disaster Management Committee depending on the scale of fire. A general reporting and command line is shown in *figure 2 at Appendix A*.

4.5 MOBILISATION

Mobilisation is the process and procedure used by DFRR, for activating, assembling, and transporting all resources that have been requested to respond to or support a fire incident. The resources involve human resources, firefighting equipment and tools. The mobilisation process is done at different levels;

4.5.1 Village level mobilisation

Upon hearing of wildfire outbreak, and while awaiting size up crews from DFRR, the local Chiefs/ "Kgosi" and his Headman convene an emergency community gathering at the *Kgotla* to conduct initial attack to prevent fire from spreading. The Chief/ Headman then mobilises able-bodied members of the community to go out and help in distinguishing fires. At the same time the DFRR District Office mobilises their trained and equipped fire fighting resources to further initially attack the reported fire and assist the community.

4.5.2 Interagency mobilisation

The interagency mobilisation process (that is; implementation of contingency plans is when the fire is spreading and the local resources cannot suppress it). Based on technical report of the DFRR at District level, if the fire cannot be handled by DFRR and the local community resources, then additional resources are mobilised to help suppress the fire. The DFRR District Office then requests additional resources through other DFRR District Fighting Teams. If these resources are not available (in time) or still not adequate to suppress the fire in 48 hours after reinforcement, request for mobilisation of other agencies' resources (pledged during the preparation of the District Contingency Plan) is sourced through the District Commissioner's (DC) Office. The DC then instructs

critical resources identified under sectoral roles to assist DFRR in the suppression efforts under the command of the DFRR Incident Commander.

If the fire situation cannot be contained within the next 4 days with the help of the additional resources through activating the District Contingency Plan, the DC as the Chairperson of the District Disaster Management Committee (DDMC) or DFRR reports to the National Disaster Management Office (NDMO) depending on the nature, magnitude and severity of fire (disaster). The NDMO then notifies critical national players whose emergency support functions are required. The figure 3 at Appendix A shows a general fire suppression mobilisation structure starting with initial attack up-to large scale fire operation.

4.6 ACTUAL FIRE SUPPRESSION

Depending on the temperature, wind conditions and available fire fighting equipment, fire suppression directly at the fire line is carried throughout day and night. In case of limitations in fire fighting equipment, high day temperatures and strong winds, fires are mainly attacked during the night because of low temperatures and higher humidity that makes fires better controllable. Additionally, with fire tankers and boom sprayers, some fires are being contained during the day, depending on the assessment.

During suppression, the fire tanker is placed along a fire break, track or road. The boom sprayers draw water from the tanker to the incident site. The rest of the crew fights the fire using the fire beaters. During the fire suppression exercise, coordination of suppression activities, reporting procedure and clear communication are imperative for the success of the exercise. These aspects are described over-leaf;

4.6.1 Coordination of suppression activities during fire suppression

During the suppression exercise, DFRR through its trained Incident Commander (IC) Officers coordinate all the activities. Additional manpower and other resources are coordinated through the Incident Command System (ICS) and the respective functions. The DFRR Headquarters continuously monitor the fire growth and spread, through satellite mapping and informs respective parties on the ground.

4.6.2 Reporting procedure during fire suppression

During on-going fire suppression operations, reporting of the resource condition by participating agencies/stakeholders is done to monitor and coordinate the resource allocation and for request of information. The report includes all kinds of resources, direct suppression operation equipment, such as personnel, hand tools, machines, communication equipment, and indirect suppression equipment, such as medical facilities and transportation. The report is provided in each District and communicated/ sent to DFRR HQ. Meanwhile, movement and the changes in mobilisation resources are tracked and summarised in regular reports.

4.6.3 Communication during fire suppression

Communication has a significant role in fire suppression. Its success is defined by an effective communication system. Good communication supports the suppression efforts, to be more effective and efficient. Communication in mobilisation is performed through;

- Sending and requesting information related to fire size, location and spread.
- Sending and requesting resource assistance, both the main and the supporting resources.

- Giving and responding to instruction/ command.

4.7 DEMOBILISATION

Demobilisation procedure is activated after the mobilisation activities are completed. The activity is performed when there is no more fire incidences and weather conditions are in/ toward low of the Fire Danger Index¹. Demobilisation activities include; recounting the number of personnel, identifying health condition of the personnel, collecting the utilised equipment and then cleaning and repairing damaged equipment if any. The types and number of equipment are also checked before returning it to respective owners.

¹ Fire Danger Index (FDI) is a continuous reference scale for estimating the potential for a fire to start and require suppression action on any given day

CHAPTER 5

5.0 FINDINGS, RECOMMENDATIONS AND CONCLUSION

This chapter of the report presents the audit findings in two (2) parts. Part I discusses measures put in place at the DFRR to protect forests from the fire risks. The audit findings are discussed based mainly on the principles/ concepts of fire management cycle; Analysis, Prevention, Preparedness, Detection and Suppression.

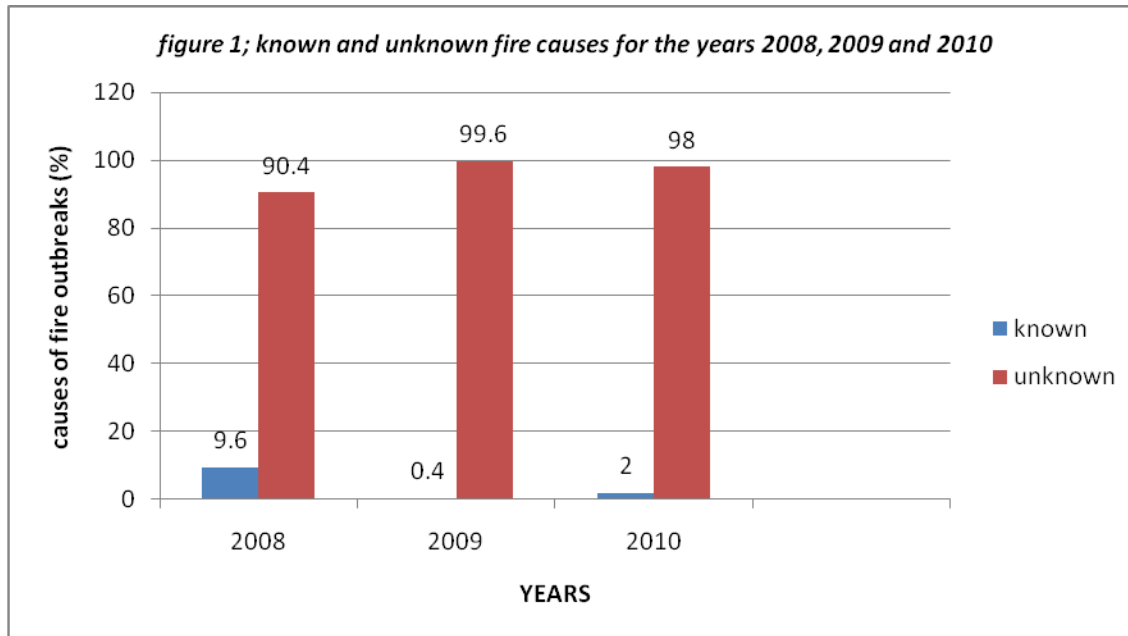
PART ONE (I)

5.1 FIRE ANALYSIS

Fire Analysis aims to provide complete understanding of fire and its causes. It also assists the organisations to clearly define the fire problem so that it can be effectively addressed using the resources most efficiently. Moreover, effective analysis is also imperative for the organisation to decide on which fire preventive measures/ mechanisms to deploy during planning.

Although the Department had some information on when most fires started, number, place, size, and location, it was observed during the audit that the Department did not carry out some fire analysis as it had no imperative fire information concerning fuel characteristics and causes of fire. Despite the assertions that 90 % of fires in Botswana are anthropogenic (human caused) the interview and document review revealed that the causes of the fires are almost not known. This was corroborated by Fire Reports for the years 2008, 2009 and 2010.

The reports revealed that out of the 592 fire outbreaks that occurred during these years, 96 % of fire causes of such incidences were unknown. Refer to Figure 1 over leaf and Table 8 at Appendix B for details.



Source: DFRR Fire Reports

From figure 1, it can be deduced that 9.6 %, 0.4 % and 2% causes of fire outbreaks for the years 2008, 2009 and 2010 respectively were known. This indicated that only 4% (on average) of fire causes were known while 96 % were unknown. The highest number of the unknowns was due to the fact that the Department had not investigated fire incidences nor carried out detailed researches to determine causes of fire in the country.

In addition, with regard to fuel management it came out during the audit that the DFRR had not put in place any initiatives to manage fuel in the forests to minimise the risk of fire ignition and fire intensity. DFRR Management highlighted that lack of fire investigations and fuel management was attributable to Departmental incapacity in terms of fire investigation skills and manpower constraints respectively. They further indicated that most fire incidents are reported by communities and by the time DFRR's staff and Law Enforcement Officers arrive at the fire scene, evidence would have been destroyed by trampling of community members who would have started initial attack.

According to documents review, to prevent wildfire, those concerned must know, who or what starts the fires and why. If fires are mostly anthropogenic (human made), then education campaigns might be most efficient. If too much fuel (stuff to burn) is the problem, then fuel management may be the priority. Fuel characteristics could also help the organisation to decide which fires are wanted/ beneficial, and which ones to suppress. The OAG is of the view that the DFRR needs to place more emphasis on investigating the causes of fires and minimising the fire outbreaks rather than marshalling resources at response/ during suppression.

Recommendation (s):

The OAG recommends that the Department should ensure that;

- All fire incidences are investigated so that the DFRR can have complete understanding of the causes of fires in the country as this may assist the Department to decide on which fire preventive measures/ mechanisms to deploy during planning.
- DFRR Officers and other stakeholders are equipped with fire investigation skills to be able to investigate the fire causes.

Management response

The DFRR concurred with the observation. They however pointed out that in the short-term, it would be difficult to implement the recommendations without adequate resources.

5.2 PREVENTIVE MEASURES

Fire prevention aims to reduce the incidence and extent of fires by preventing them from occurring. The DFRR as the leading agency in protecting forests has implemented a variety of prevention programmes, including activities as public

education (thorough kgotla meetings and use of signs) and law enforcement. However, the shortcomings observed during the audit with regard to preventive measures are highlighted below;

5.2.1 Implementation and Enforcement of Legal Frameworks

The DFRR has legal powers through the Herbage Preservation Act (1977) to protect forests, prevent and control bush and wild fires in Botswana.

However, it transpired during the audit that the Herbage Preservation Act was not adequately implemented or enforced. There had been reluctance on the part of Stakeholders to use the existing legislation to enforce the law in protecting forests and preventing bush and wildland fires. The DFRR in collaboration with the Law Enforcement Agency (Botswana Police) had not evoked some of the clauses of the Act, which prohibited illegal acts in the forest areas. For instance;

1. Section 6 (1) requires that "every person before burning vegetation shall give reasonable notice of his intention to do so, and as nearly as possible the time at which burning is to begin to all owners or occupiers of adjoining land and where reasonably practicable, to Police Officer or Headman". Moreover, according to interviews the DFRR Officer or District Herbage Committee Members should also be notified so that they could make assessment prior to burning of the land where the fire was to be set and advice accordingly or be present during the burning. It was revealed during the audit that in all the Districts visited, the community did not give notice prior to burning of the land. In few instances where the notice was given, the Herbage Preservation Committee Members indicated that they could not visit the areas for assessment due to shortage of transport.

Lack of land assessment prior to burning and proper monitoring may lead to spread of fires to adjoining lands. Hence, damage to forest and range resources.

2. Section 7 (1) gives powers to the Herbage Preservation Committee to "prohibit the burning of vegetation within its area of authority either generally or subject to such expectations as the order may specify". However, interviews with the Herbage Preservation Committee Chairpersons indicated that although the Act gave them powers, it was not practicable to implement it. The Committee Chairpersons contended that the Agricultural Resource Board in collaboration with DFRR did not adequately support them in terms of legal aspects especially implementation of the Herbage Preservation Act.

The failure to enforce the law may negate the effectiveness of regulating requirements and exacerbate to risks that may be caused by illegal burning activities leading to damage to vast areas of forests and destruction of property.

Recommendation(s)

1. The OAG recommends that the DFRR in collaboration with Agricultural Resource Board (ARB) should involve District Herbage Preservation Committees and other Law Enforcement Agencies (Botswana Police) to ensure adequate enforcement of the legislation and evoke such clauses that prohibit burning of vegetation under specific fire danger index.
2. The OAG also recommends that DFRR should improve their approach to law enforcement by;
 - committing resources to monitoring and enforcing compliance.

- using the full range of powers the Parliament has provided where circumstances demand.

Management response

The DFRR Management agreed with the observations and the recommendations. They however, highlighted that the Herbage Preservation Act was old (currently being reviewed) and had loop holes. They further indicated that certain prerequisites needed to be done before evoking relevant clauses of the Act. In addition, Management pointed out that unless and until resources were availed to enable DFRR to assess fuel load, determine land users who violated the said statutory instruments and facilitated issuing of Orders by ARB, then it would be a challenge for the DFRR to enforce relevant clauses of the legislation.

5.2.2 Burning Permits

The Herbage Preservation Act (Prevention of Fires) 1977, Section 4(1) states that “No person shall, without permission set fire to any vegetation on land of which he is not the owner or in lawful occupation”. To facilitate this, burning permits had to be acquired from DFRR Offices to control burning by the public so as to protect the forests and other natural resources from the damages of unwanted wildland fires.

However, contrary to these requirements, the public still burnt the vegetation without permission as enshrined in the Act. According to documents reviewed and interviews with DFRR Management and Herbage Preservation Committee Chairpersons acquisition of burning permits by the public was very minimal taking into consideration the number of fire outbreaks per year. Refer to Table 2 over leaf, which indicates the number of burning permits issued during the fire seasons 2008, 2009 and 2010.

Table 2; Burning Permits Issuance as per District per fire season

Districts	Fire season (s)		
	2008	2009	2010
1. Chobe	12	6	14
2. Gantsi	-	-	5
3. North East	-	-	-
4. Central	9	11	14
5. Ngamiland	12	-	-
6. Kweneng	2	2	8
7. Kgalagadi	-	-	-
Total	35	19	41
Average	5	3	6

Source; DFFR Savingram Ref No: 3/2/1 II dated 16/08/2011

Key; (-) signify no burning permits issued or not known

From the Table 2, it can be deduced that there were 5, 3 and 6 permits (on average) issued during the fire seasons 2008, 2009 and 2010 respectively. This indicated a relatively low number of burning permits issued per District per fire season. The low number of permits issued was highlighted to be perhaps due to centralisation of issuance of permits to the District Headquarters. Therefore, the community deemed it not cost effective to travel long distances to acquire a permit, hence they resorted to set fire on land without authorisation.

The OAG is of the view that, if burning permits are appropriately used, they could be an important tool in wildland fire prevention.

Recommendation(s)

The OAG recommends that the DFFR should;

- *decentralise the issuance of burning permits to proximate areas where the community could easily access them.*
- *Also intensify the measures in place to sensitise the community on the use and importance of burning permits.*

Management response

The DFRR Management agreed with the observations and the recommendations.

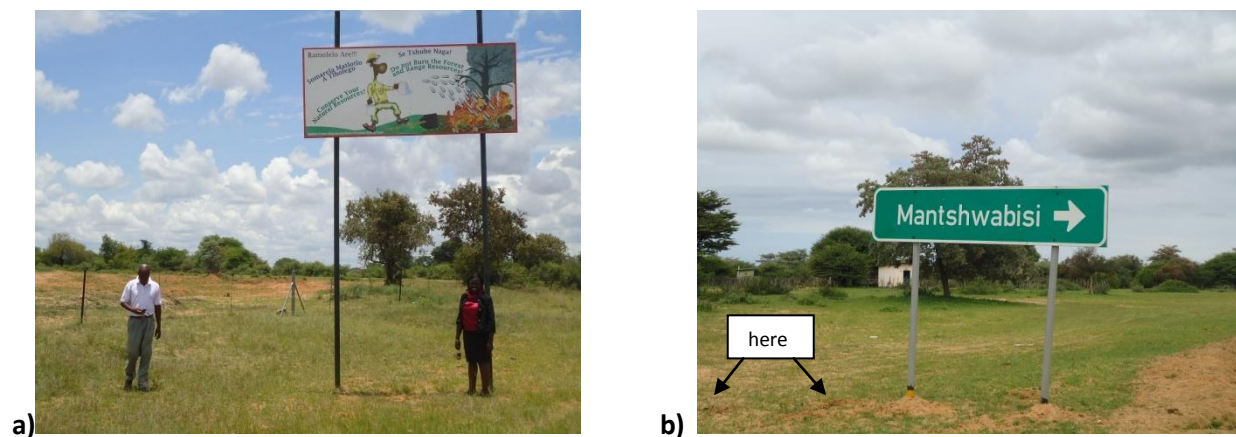
5.2.3 Public Education and Awareness

Public education is the key to protecting forests against wildland fires and prerequisite to the communities' involvement. The Department in their Strategic Plan 2006 – 2010 had a specific objective which stated "Promoting public awareness on forest and range resources." In order to achieve this objective the DFRR undertook Kgotla meetings and installation of sign boards bearing warning messages about forest fires to sensitise the public on the calamities associated with wildland fires.

Nonetheless, the OAG noticed that the current public awareness initiatives (Kgotla meetings and sign boards) deployed by DFRR, in order to protect the forests were found to be inadequate, in that there had been less or no positive change with regard to the amount of land burnt on annual basis. This could be an indication that the level at which message was conveyed to the public was low. In addition, there was no monitoring and surveillance to determine if message was sufficiently reaching the public.

Conversely, it was noticed during the audit that the DFRR and the Conservation Committees held meetings at village Kgotlas instead of cattle post, farms and fields where fire was mainly used as a management tool. Therefore, it was crucial that in organising these outreach programmes the Committees targeted communities in those areas as well as people residing adjacent to forested land. Furthermore, interviews with Conservation Committee Chairpersons highlighted that some of their scheduled tours were not undertaken due to transport and financial resources constraints.

With regard to the use of sign boards, documents review and field observations made revealed that not all the allocated 10 sign boards were erected at the Districts (refer to Table 3 over-leaf for evidence). Moreover, the OAG was informed that the design and quality of the sign boards were questionable. For instance, during the audit in January-February 2011, the OAG observed that the painting and writing on some of the sign boards which were erected around August 2009 was already peeling off and fading out. Moreover, DFRR Management also indicated that some of sign boards were knocked down by animals and blown off by wind.



Pictures a & b; fire sign board (a) used by DFRR to warn the public not to burn the forest, picture (b) shows a site where a sign board had been erected (it is suspected to have been knocked down by a car or blown off by the wind). Both pictures captured at Kweneng District.

This situation had left some Districts with fewer signboards standing as shown in the Table 3 over -leaf.

Table 3; Number of Sign Boards standing, installed and not installed per District

District	Sign Boards Installed	Sign boards not installed	Sign boards standing	Remarks
Gantsi	9	1	8	<i>1 suspected to have been knocked down by a vehicle</i>
North East	10	0	10	<i>All standing</i>
Central	9	1	8	<i>1 returned to HQ for reprinting</i>
Chobe	6	4	6*	<i>*the number of signboards standing may be lower than the indicated figure as Management were not certain about the figures</i>
Kgalagadi	4	5	4	<i>1 blown off by wind</i>
Ngamiland	10	0	-	<i>- DFRR Management was not certain about the figures although they indicated that not all some sign boards were standing.</i>
Kweneng	10	0	6	<i>4 fell down</i>

Source; Documents review & interviews

From Table 3 above, it can be deduced that only one (1) District had all the 10 signboards standing by the time of audit while the rest had various numbers of signboards standing. This situation may hamper the chances that the message could reach the public.

Additionally, the DFRR had intended to disseminate information on fires to communities through Village Conservation Groups as one way to convey forest protection messages to the communities at grass root level. The anecdotal evidence was that these peer groups had not been established. This initiative might have enhanced positive response and common understanding where peers were actively involved and hence the likelihood of commitment and compliance.

Moreover, the use of the local Daily Newspapers and other Media Fora, to continually sensitise communities within forests' proximity and the nation at large

about the dangers of fire and its effect on forests and ecosystem as a whole was lacking or minimal.

Inadequate public education may lead to decreased participation by the public in the fire suppression exercise as they have not understood and appreciated the concept of "forest management" with regard to wildfire as a risk. Non participation by the community may also lead to million hectares of forest land being ravaged by fire every year as some of the fires took long to be contained. Inadequate public awareness may also aggravate the incidence of fire outbreaks which in turn may threaten the country's forest resources and its ecological balance.

The OAG is of the view that there was still much to be done to bring the public awareness to the desired levels country wide by all stakeholders.

Recommendation(s)

The OAG recommends that the DFRR should:

- Assess the adequacy and effectiveness of their current approach to public awareness initiatives, in light of their potential impact on the public's understanding of the importance of protecting the forest resource from wildfires.
- Continually undertake public awareness campaigns in order for the communities to understand the benefits of and potential harm caused by wildfire. This will enhance their loyalty and commitment in the event.

Management response

The DFFR Management concurred with both the observations and recommendations. They however, highlighted that substantial financial resources would be required to undertake the study to assess the

adequacy and effectiveness of the current approach to public awareness initiatives.

5.3 FIRE DETECTION MEASURES

5.3.1 MODIS Satellite

The DFRR uses a MODIS Satellite fire detection system operated at the Headquarters in Gaborone. The detected information is directly reported to the respective District Offices by a telephone or fax. The report provides the coordinates and information of close-by landmarks in order to assist them in resources mobilisation and strategic crew deployment and placement.

Despite the MODIS satellite being able to detect fires in near real time, the OAG noticed that there was a lapse on fire detection information during weekends and public holidays, when GIS technicians were not on duty. As such; information on fires detected over the weekends reached the Districts on Mondays. Moreover, documents review revealed that the satellite did not pick/detect small hot spots. This may result in delays in reporting some fire outbreaks to the Districts.

Consequently, this may lead to escalated suppression costs and increased damage in terms of hectares ravaged by fires especially under windy conditions.

Recommendation

The OAG recommends that the DFRR Management should make arrangements to ensure that during fire seasons, there is always an officer on duty to analyse the data from MODIS satellite. This will enhance timely reporting of fire information.

5.3.2 Fire Towers

Detection devices such as fire towers have to be appropriately equipped to provide the DFRR with adequate information to enable them estimate the fire levels and the fire fighting force in areas that have poor accessibility. However, document reviewed and interviews with DFRR Management highlighted that seven (7) and two (2) fire towers/ look-out points which were located in Chobe District and Central District respectively to detect fires, were not operational.



During the audit the OAG observed that the fire towers were not equipped with complimentary accessories such as binoculars. Moreover, they were not manned on a 24-hour basis as anticipated. Management highlighted that this was due to budgetary constraints and shortage of skilled personnel.

Picture (c) Un-equipped fire tower at Chobe District

This situation had rendered the fire towers ineffective in executing their purpose of detecting fires. If the fire towers were operational, they could facilitate early detection and effective suppression of wildfires and thus enhancing forest protection efforts/ initiative.

Recommendation

The OAG recommends that the DFRR Management should ensure that the fire towers are equipped with appropriate accessories and manned with skilled personnel, to facilitate timely fire detection.

5.3.3 Response to reported fire incidents

Response to reported cases of fire outbreak is critical for ensuring that fire is contained before it could spread or cause more damage to the forests.

Despite the DFRR's effort of having a set standard of 24 hours to respond to reported fire incidents, this standard had never been achieved. The DFRR Management indicated that there had been incidences where reported fire outbreaks were responded to after approximately 3 to 5 days. This extremely exceeded the set time frame. According to DFRR Management this anomaly occurred mostly during the weekend, when Officers were not on duty. However, there were no documents to substantiate this contention. According to Management, difficulties in mobilising the resources (transport, fire fighters and fire fighting equipment) was one of the contributing factors to late response to fire outbreaks.

Delayed response to fire out breaks may increase the intensity of the fires and resultant in severe damage to the forest resources.

Recommendation

The OAG recommends that the DFRR Management should put strategy in place to ensure that fire fighting resources are always ready and placed strategically for easier mobilisation in case of a fire outbreak.

5.4 MOBILISATION

5.4.1 Village level mobilisation

Mobilisation of resources at different levels (village, interagency and national) is important to ensure readiness at any given time prior to and during fire outbreaks. At village level, the Tribal Leaders mobilise able-bodied members of the community to go out and help in extinguishing fires.

Nonetheless, according to anecdotal evidence there had been inadequate mobilisation priority attached in persuading and encouraging the communities to assist in the fight of bush and wildland fires that may ravage forest resources.

For instance, volunteers had not been insured when they had to partake in the fire suppression activity although that exercise was risky. This resulted in communities being reluctant to assist or respond to calls by Tribal Leaders in the event that there were fire outbreaks and disasters which needed extensive fire fighting force. This was contrary to the requirements of the Heritage Preservation Act (Section 11) which calls for any member of the community to help in putting out fires and empowering the Tribal Leaders to take to task those who did not partake in suppressing fires.

If the volunteers and other resources cannot be mobilised to conduct initial attack to prevent fire from spreading, this may lead to fires spreading and causing more damage to peoples' properties, forests and range resources.

Recommendation

The OAG recommends that the DFRR Management should liaise with the District Commissioners and Tribal Leaders in their effort to encourage communities to assist in fire suppression activities.

5.5 PREPAREDNESS

Maintaining high level of preparedness requires adequate resources, maintenance of firebreaks, equipment, machinery and materials and reserves of stocks. Preparedness also provides stakeholders with sufficient information to enable them to estimate the activity levels that the DFRR personnel and stakeholders may undertake during fire suppression in the event there is fire outbreak.

Conversely, the OAG noticed that the DFRR's preparedness methodology did not provide adequate mechanism for ensuring that fire breaks and equipment were maintained and that appropriate fire fighting and specialised equipment, transport and human resource were available as discussed below;

5.5.1 Firebreaks

Maintenance of fire breaks prior to fire seasons is crucial for ensuring that wildland fires are prevented from spreading in the forests. As an important aspect of preparedness, fire breaks can also be used as anchor points or access roads to monitor and control the spread of wildland fires hence protecting forests.

1. Maintenance of contracted out fire breaks

During the period under review (2008, 2009 and 2010) maintenance of all the contracted out fire breaks had been carried out.



Picture (d); showing one of the maintained fire break at Kweneng District

Nonetheless, OAG discovered that there were instances when the maintenance work was carried out during the fire season while in actual fact it was supposed to be completed before the start of fires. This was corroborated by Firebreaks Maintenance Reports which indicated that maintenance work was completed in August for 2008 and June for both 2009 and 2010. Moreover, the Reports revealed that in 2010 some Districts (Southern and Kgalagadi) recorded their first fire outbreaks in February which was before the completion of maintenance work. Refer to Table 6 at Appendix B which shows the time when fires started and ended for various Districts in 2010.

If maintenance of firebreak is not completed on time, a vast area of forests may be extremely damaged by fires that could have been contained before spreading.

2. Maintenance of Internal *fire breaks*

With regard to the fire breaks which were supposed to be maintained by the DFRR District Offices, it was observed that they were not maintained in all the Districts visited for the period under review (2007 – 2010).



Picture (e); showing one of the internal fire break which had not been maintained at Chobe District

DFRR Management attributed non-maintenance of the internal fire breaks mainly to lack of equipment and machinery (tractors, graders and bulldozers) at the Districts.

Non-maintenance and delays in maintenance of the firebreaks may hamper fire suppression operations, as the fire breaks are also used as strategic access routes to the fire points.

3. Effectiveness of the firebreaks

Despite the annual maintenance of the firebreaks by the DFRR to safeguard the forests from the fire risk, it was observed that the fire breaks were ineffective in that in most cases the fires crossed the firebreaks. That is, the fire breaks could not prevent the spread of wildland fire as intended. Moreover, the documents revealed that the DFRR spent P30 million (on average) annually in maintenance of these fire breaks. However, the OAG is of the view that the amount of money spent on maintenance of fire breaks compared to their benefits is questionable.

If the fire breaks cannot effectively serve the purpose they were intended, the wildland fires will continue to spread and damage more forests and other natural resources.

Recommendation(s)

The OAG recommends that the DFRR should conduct a research to assess the effectiveness and efficacy of the current fire breaks network in order to have a holistic idea about their cost-benefit relations. This may assist the Department to come up with other preventive measures which might be cost - effective.

Management response

The DFRR Management agreed with the observation and recommendation but highlighted that they did not have adequate human and financial capacity to undertake the study on effectiveness and efficacy of the fire break network.

5.5.2 Fire Fighting Equipment

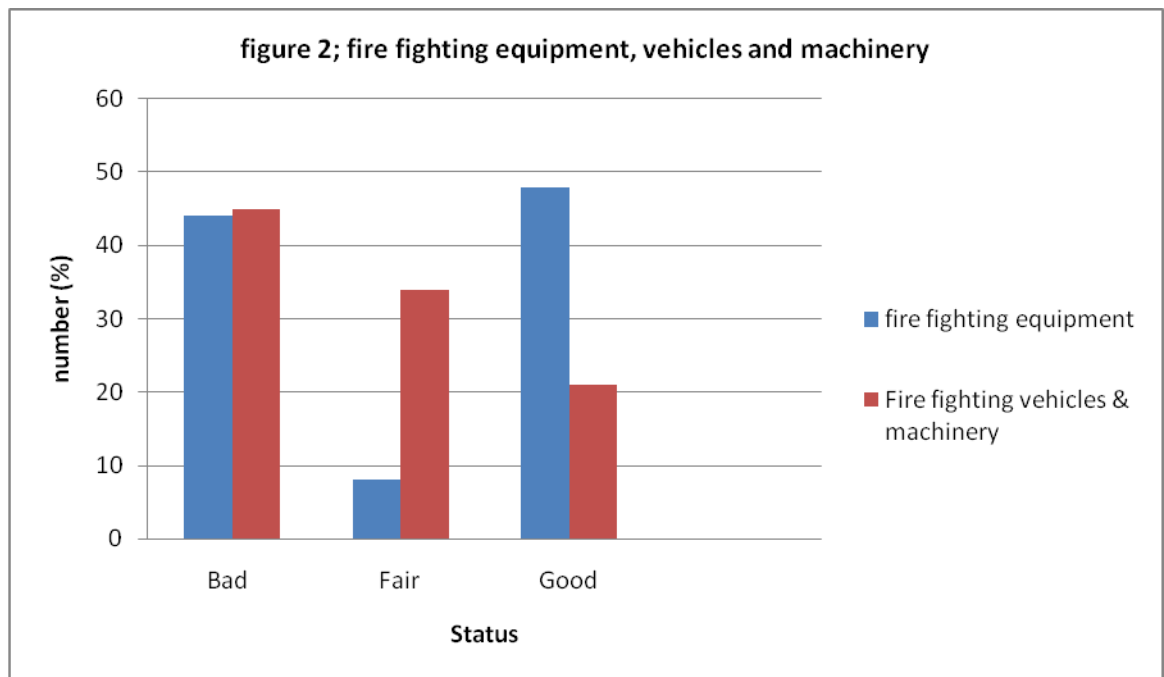
Wildland fire fighting operations require adequate and unique equipment for the fire fighters to efficiently and effectively carry out the suppression activity. This equipment also needs to be available and suitable for the intended purpose to enhance the efficiency and effectiveness of the fire suppression activities. In addition, the fire fighting equipment need to be maintained and serviced prior to the next fire season for preparedness measures. The equipment need to be safely stored to protect them from damage caused by adverse weather conditions.

However, notwithstanding adverse comments made in the Office of the Auditor General's Performance Audit Report No; 8 of 2008, on the Management of

Wildland fires, the OAG still observed the following anomalies regarding fire fighting equipment.

1. Inadequate fire fighting equipment

One of the interventions for preparedness is to have adequate fire fighting equipment and vehicles. However during visits made at the Districts, interviews with District Management revealed that there was inadequate fire fighting equipment, even the commonly used fire beaters, knapsack sprayers, and drip torches in all the Districts. Refer to figure 2 below and table 9 at Appendix B which shows the number and status of the fire fighting equipment, vehicles and machinery.



source; DFRR fire fighting equipment, vehicles and machinery inventory

During the audit, it was observed that the DFRR had a total of 1433 fire fighting equipment of which 44% was in bad state while 8% was in a fair condition as

shown in figure 2. A proportion of only 48% was in a good condition. In addition, 45% of the DFRR's fire fighting machinery was found in a bad state at the time of audit. A proportion of 34% was in a fair condition, (that is, the machinery was in a serviceable state) and only 21% of the machinery was in a good state. This therefore, indicated that the DFRR had inadequate fire fighting equipment to carry out the fire suppression activities. Moreover, the Districts operated with neither specialised fire fighting vehicles nor protective clothing amongst the crucial fire fighting equipment.

According to Management, inadequacy of the equipment had been attributed to by financial constraints at the DFRR. It was indicated that the budget for fire management is mainly channelled towards maintenance of fire breaks as they were of priority. This had therefore, left DFRR with less or no funds to purchase new equipment to replace unserviceable equipment.

The OAG was of the view that the criterion "one size fits all" adopted by DFRR in allocating equipment was inappropriate and also exacerbated the inadequacy of equipment. For instance, it was observed that the DFRR allocated same number of equipment to various Districts, not considering the vastness and vegetation type of the area. Consequently, all District Offices had remained incapacitated in terms of equipment to fight fires in the country.

2. Lack of maintenance/ servicing of equipment

During the fire fighting exercise most equipment (tools and machinery) get broken down and some subjected to defective factors. This renders them to be serviced and maintained at the end of the fire suppression exercise to enhance their functionality. However, at all the Districts visited, the OAG observed that there was lack of maintenance of equipment in that fire fighting equipment

such as fire beaters and boom sprayers (commonly used equipment) were piled and parked at the end of fire season without being serviced. Despite the several efforts by the DFRR Headquarters reminding the District Offices to service the equipment, the audit team observed that the equipment were still not maintained. In addition, it was observed that DFRR had not put up a service or maintenance plan for the fire fighting equipment. Lack of servicing and maintaining the equipment had led to District Offices operating with inadequate equipment during fire suppression exercise.

3. Storage and Safety of equipment

The Government Supplies Regulations requires that all Government property be appropriately stored and secured as an effort to minimise their loss and damage. Contrary to this requirement, the OAG observed that the equipment (especially the boom sprayers and the fire beaters) were piled and parked on the open space exposed to adverse weather conditions. This situation was observed in all the Districts visited except Kasane, North East and Maun where there were shelters to store and safeguard the equipment. The safety of the equipment was compromised as it was also observed that some equipment such as the boom sprayers had engines missing while some were not in good condition. The water tanks for some boom sprayer deteriorated due to the exposure to the sun and other weather conditions. See the pictures over-leaf for evidence.



f)



g)

Pictures f & g; Some of the boom sprayers (f) and fire beaters (g) kept in the open at Kgalagadi and Gantsi Districts respectively.

4. Under-utilisation of fire fighting equipment and machinery

It was observed during the audit that there was fire fighting equipment which had been under-utilised in all the Districts visited. The equipment included; a 23 000 litres - fire engine bought in 2004 at P1350 000.00 and allocated to Kasane District , 500 and 1000 litres boom sprayers which were bought in 2002 at the then unit prices of P7 595.00 and P16 500.00 respectively for all the Districts.

According to interviews and document review it transpired that when procuring fire fighting equipment, the DFRR did not make proper-needs assessment on the type of equipment to be purchased for fire suppression with regard to the type of terrain and vegetation in various Districts.



h)



i)

Pictures h & i; 23 000 litres - fire engine (h) allocated to Kasane District, and 1000 litres boom sprayer (i) at Gantsi District.

Moreover, Management at the Districts indicated that there were some challenges in using the purchased equipment. These challenges included amongst others;

- Lack of manpower to load the 500 litres boom sprayers on the vehicles.
- Lack of skilled manpower to operate the generators mounted on these sprayers.
- The 1000 litres (vehicle-drawn boom sprayers) and the fire engine were problematic as they could not easily traverse difficult terrain and high-gradient roads in the bush to reach the fire point during the fire suppression.
- The vehicle-drawn boom sprayers had proved heavy to be drawn by the available vehicles (4x4 Land cruisers) during fire suppression.

Notwithstanding the adverse comments made by the OAG's Performance Audit Report No; 8 of 2008 on the Management of Wildland fires and Reports from the Districts regarding the under-utilisation of these boom sprayers, the DFRR Management had not been proactive to ensure that the equipment is fully utilised. The under- utilisation of fire fighting equipment had left fire fighters with no choice but to resort to using the primitive method of using tree branches, which is ineffective and inefficient. Hence, fire fighters may take long to put off the fire which could have been contained within a short period.

Recommendation (s):

1. The DFRR should in future assess resources required to undertake preparedness activity in order to achieve their overall objective of "To conserve, protect and sustainably manage the country's forest and rangeland resources." This will assist the Department to ensure that

resources are available, allocated and maintained in the most effective manner.

2. The Department should incorporate its resource requirements into its planning process to enable them to;
 - Measure the adequacy of the available resources
 - Replace the worn out or lost equipment and appropriately maintain those available.

Management response

DFRR Management agreed with the observation and the recommendation. They however, emphasised that resources allocated to DFRR were not primarily for protection of forests and range resources against fire. There were several activities that DFRR had to undertake. The Management further indicated that while planning was always done, the critical issue was that the Department's budget had never been adequate to allow for procurement of resources, replacement of worn out or lost equipment and their appropriate maintenance.

5.6 ACTUAL FIRE SUPPRESSION

Fire suppression is a complex and dangerous exercise that requires coordination and teamwork. These management functions need to be properly carried out for efficient and effective fire suppression. However, it emerged during the audit that there were some efficiency gaps in contingency planning, coordination, reporting as well as communication.

5.6.1 Contingency Planning

Contingency planning is most effective when it is a participatory process that involves all stakeholders to work together in the event of a fire outbreak.

According to the DFRR, a contingency plan is prepared on an annual basis, indicating the roles, responsibilities and resources pledged by different stakeholders. The contingency plan is intended to be robust so that it can be put into operation within 24 hours of incidence of fire break.

However, interviews and documents reviewed highlighted that the plans could not be executed within 24 hrs of incidence of fire outbreak as anticipated. Some of the reasons advanced were that, the stakeholders (including Government Departments) did not honour their obligations as per the agreements made during the planning meetings. The DFRR Management at the Districts further indicated that stakeholders did not budget for fire suppression activities contending that such activities were not part of their core business.

This was a challenge for the DFRR District Offices to mobilise adequate resources (the personnel, transport and fire fighting equipment) to suppress fires which could have been contained before burning large areas. Agreements and commitments with each stakeholder are essential and need to be always reviewed and improved periodically in order to have a better mobilisation mechanism.

Recommendation

The DFRR should come up with measures/ mechanisms that will ensure that the contingency plans are executed within 24 hours of incidence of fire outbreak.

5.6.2 Coordination of suppression activities during fire suppression

Effective coordination of fire suppression activities is a key factor to ensuring that related responsibilities are efficiently performed, in order to achieve the desired outcome.

It was highlighted that coordination was limited in that the suppression activities were not appropriately undertaken. The District Coordinators/ Incident Command (IC) Officers had not appropriately allocated responsibilities as expected. The Coordinators' capacity to coordinate all activities even at the grass root level was overstretched. Resultantly, the coordination system proved to be ineffective. The contributory factors for this anomaly were that;

- The Incident Command System (ICS) that could have ensured mobilisation of resources and directed prevention, preparedness measures before outbreak and its aftermath and response; to increase continuity during fire suppression was not working entirely. This therefore, meant that procedures for selecting and forming of temporary management hierarchies to control funds, personnel, activities, equipment and communication were lacking to a certain extent. The ineffectiveness of the ICS resulted from inadequate manpower in terms of skills and number of personnel to assume the control, operations, planning and logistics functions.
- The radio communication system which was to assist coordination at the ground crew level was poor, due to the radios being out of service or non-existent, or communication between the District and ground crew not clear. This therefore, required travelling from the fire scene which would be far due to distances, between the District Offices and fire scenes.
- Majority of stakeholders who participated in fire suppression were volunteers but not necessarily trained fire fighters.

Ineffective coordination of suppression activities may negatively impact on chances that fires could have been contained before it could spread to other areas. Furthermore, ineffective coordination may also contribute to low success rate in fire containment.

Recommendation

The OAG recommends that the DFRR Management should establish an effective Incident Command System to coordinate activities during fire suppression.

Management response

The DFRR Management concurred with both the observation and the recommendation.

5.6.3 Reporting during fire suppression

Reporting during fire suppression by participating agencies/stakeholders is done to monitor and coordinate the resource allocation and for requesting information from DFRR HQ. The fire reports give feedback on amongst others; all kinds of resources (personnel and suppression equipment), location of the wildfire (sketch map), prevailing weather conditions, vegetation type, cause of fire and to some extent the size of area burnt.

However, it transpired during the audit that reporting was not adequately done in that reports that could have assisted the DFRR HQ to make informed decisions as regards the needed resources were not always forthcoming. The DFRR Management at the Districts pointed out that it was not possible to prepare the reports during the suppression due to time constraints, as they were always preoccupied with physically putting off the fire. Furthermore, Management indicated that reporting to the DFRR HQ was also hampered by the poor communication system between the DFRR Office and those at the fire scene.

Lack of reporting to the DFRR HQ and District Offices may result in DFRR HQ not getting imperative information with regard to the changing situation at the fire point. This may affect the DFRR's decision making concerning additional

resources to support the fire crews. This may consequently lead to fire crews fighting the wildland fires with inadequate resources.

Recommendation

The OAG recommends that the DFRR should develop a well defined reporting mechanism to facilitate an informed and prompt decision making process.

Management response

The DFRR agreed with the observation and the recommendations. They however, indicated that the reporting mechanism was in place but the challenge was that there were areas where communication between ground crews and District HQ might be difficult due to insufficient network coverage or unavailability of long range radio communication.

5.6.4 Communication during fire suppression

Effective communication is essential in planning for and responding to fire outbreaks or emergency situations, to protect the forests and vegetations as a whole. As such the establishment of clear and effective communication networks at DFRR HQ and District levels is integral part in ensuring that preparedness, prevention measures and ground crews' response operations are well coordinated.

Despite the communication structure being available, it came to light during the audit that relay of information between the fire crews at the fire scene, Districts and DFRR Headquarters with regard to fire situation (size, direction, location and spread), and requesting resource assistance was ineffective. According to Districts Management, it was difficult to communicate with the various crews at fire fronts as well as relaying information, due to lack of communication equipment (VHF stationed and mobile radios) and poor telecommunication

coverage at the fire points. This situation was found to be exacerbated by malfunction of radios which were installed at the Districts Offices prior to 2009 fire season.

Lack of effective communication between the fire crews, the DFRR HQ and District Offices may result in DFRR HQ not getting imperative information with regard to the changing situation at the fire point. This may affect the DFRR's decision making concerning additional resources to support the fire crews. This may consequently lead to fire crews fighting the wildland fires with inadequate resources. Effective communication is thus, crucial in coordinating fire crews, equipment movement, and maintaining the effectiveness and safety of crews on ground.

Recommendation

The OAG recommends that the DFRR Management should devise an effective communication system to ensure efficient coordination of suppression activities.

Management response

The DFRR Management agreed with the observation and indicated that they were in the process of procuring radio communication equipment such as walkie talkies, vehicle – mounted and base station radios especially for Ghanzi, Ngamiland, Central and Chobe Districts as the most fire prone areas.

5.6.5 Safety/ Security of fire fighters

As stated at paragraph 5.6, fire suppression is a complex and dangerous exercise that may cause death and injury. Therefore stringent precautionary measures have to be taken during this activity. These measures include proper

fire fighting safety and protective clothes like helmets, masks, hand gloves, fire resistant boots/shoes.

However, during the audit it was observed that currently Government and volunteer firefighters were not provided with adequate and appropriate personal protective clothing. It was observed that fire fighters used their own clothes during fire suppression. Moreover, they suppressed fires without their mouths and noses protected from heavy smoke.

Lack of personal protective clothes and protective equipment exposed firefighters to injuries and health hazards which may result to death due to the fact that their clothes can easily catch fire.

Recommendation

The DFRR should provide fire fighters with appropriate protective clothing and equipment to protect them from the hazards they are likely to be exposed to. This will enable the fire fighters to carry out the fire suppression activities efficiently and effectively.

Management response

DFRR Management concurred with the observation. They however, highlighted that this recommendation could only be implemented as and when financial resources permitted.

5.7 TARGET FOR REDUCING BURNT LAND (FORESTS)

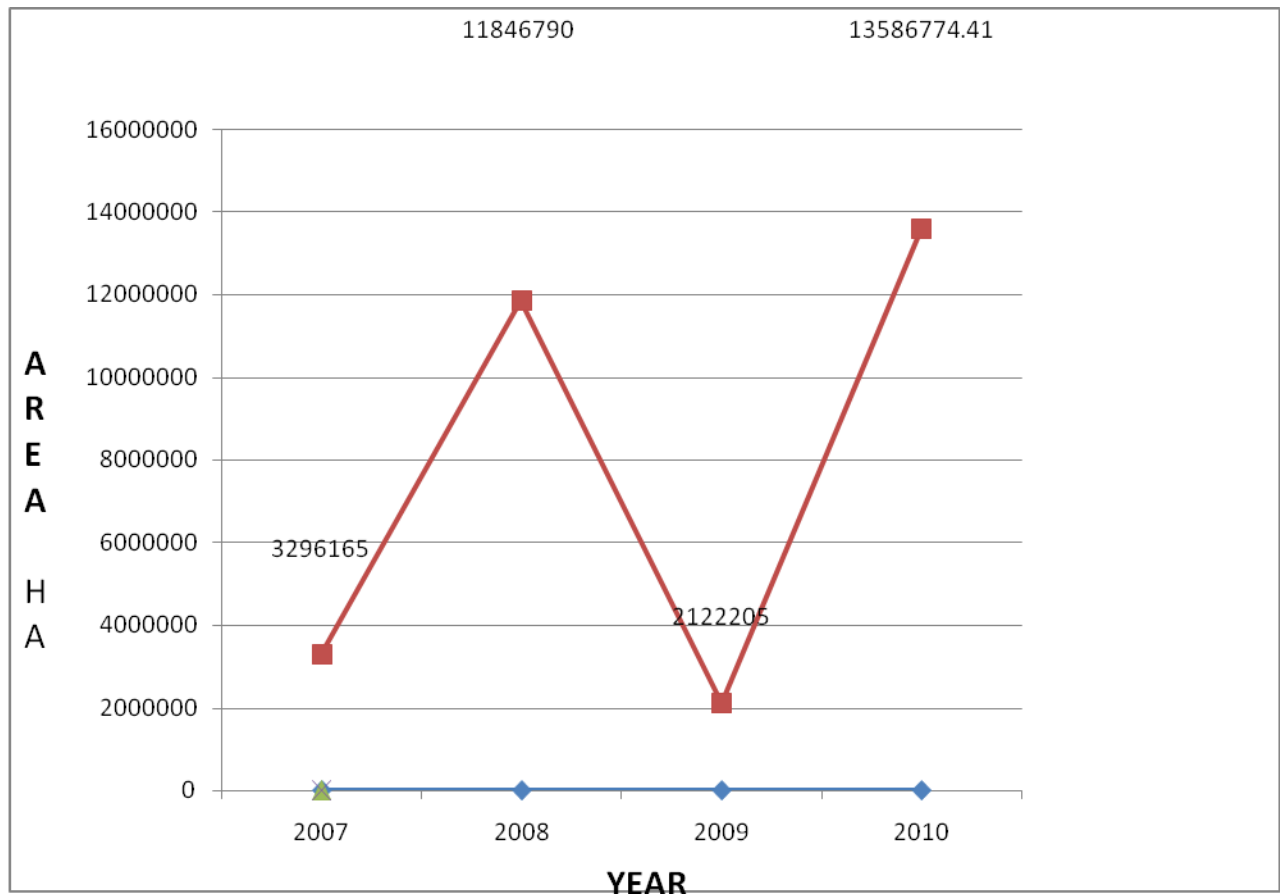
Like other Government Departments the DFRR adopted the Balanced Score Card as a tool for monitoring and reporting progress of their activities. The Department prepared a five (5) year Strategic Plan (2006 – 2010) to guide them in executing their mandate. According to the Strategic Plan, the DFRR set itself an objective “to promote sound management of forest and range resources by

conducting resources assessments, managing wildland fires, intensifying tree planting, rehabilitating degraded areas and enforcing relevant legislation and standard practices."

With regard to management of wildland fires, the Department set a target to suppress 80% of fire outbreaks while reducing the average area burnt by 10% every year. However, the overall report for this strategic plan did not indicate the progress of the Department regarding management of wildland fires. Therefore, there was no evidence to form an opinion on how much the DFRR was able to suppress the fire outbreaks. From the interviews conducted with DFRR Management, at the time the strategy was developed, the Department was still not conversant with the Balanced Score Card reporting format, hence absence of a detailed report on the progress of the Department in relation to this objective.

Furthermore, documents reviewed revealed that despite the target DFRR had set to reduce burnt area by 10 % for the period 2006 to 2010, the target could not be achieved as planned. The analysis is depicted by the graphical presentation over-leaf (graph 1); which shows the fluctuations of area of land burnt during the years under review.

Graph 1: Comparison of total burnt area in hectares per year (between the periods of 2007-2010)



Source: Extracted from the Annual Wildland Fire and Firebreak Maintenance Report by DFRR (2010)

From the analysis of the graph above, it could be deduced that the total area of land burnt showed an undulating trend. That is, it shows an annual alternating rise and fall of the total area of land burnt. When a small area was burnt the previous year, the receding year would record a relatively larger area of land burnt and the following year would record a decrease in the total area burnt.

For instance, in 2007, 3 296 165 Ha were burnt due to wildland fires and in 2008 the area burnt increased by 8 550 626 Ha representing 259% of the total land burnt. In 2009 the total hectares of land burnt declined by 9 724 585 Ha (82.1%), while in 2010, more hectares were burnt thus recording 11 464 569.41 Ha (540%

increase was observed). This therefore, indicates that the years 2008 and 2010 were the worst years affected in terms of total hectares lost due to wild fires.

According to interviews with DFRR Management and review of documents, the underlying cause for the angulations was that during the year when there were less fires, more fuel load was accumulated, resulting in the following year experiencing more fires due to the combustible material that accumulated the previous year. Hence more hectares lost and the preceding year would experience less area burnt.

In this regard, it can be concluded that the DFRR was unable to achieve their proposed 10% reduction of land burnt. It is clear that the related strategies put in place by DFRR every year yielded limited results with regard to reducing the land area burnt by 10%. The OAG is of the view that the reductions experienced during the years 2007 and 2009 were just due to a natural trend without the DFRR's efforts. That is, the trend emanated from the relationship between intensity of fires and rainy seasons with regard to accumulation of combustible material.

Recommendation(s)

- The OAG recommends that the DFRR should in future report against their proposed target in order to enable them to track and give feedback on their progress. This will help the Department to monitor, evaluate and improve their ability to make decisions with regard to improving the strategies/ measures put in place to manage forest fires.
- The OAG also recommends that the DFRR should carry scientific study and analyse the natural fire trends in relation to climate change so that it may help in deploying the best strategies prior to a specific fire season.

Management response

DFRR Management concurred with the observation. They however, highlighted that the scientific study was a long-term undertaking, requiring massive financial and human (expertise) resources.

PART TWO (II)

This part of the chapter draws attention to follow-up on the Recommendations of the Auditor General's Performance Audit Report No; 8 of 2008 on Management of Wildland Fires by the Department of Forestry and Range Resources (DFRR).

The main objective of the initial audit was to assess how the Department managed wildland fires taking into consideration the level of adherence to procedures, standards, guidelines and policy instruments used in the management of wildland fires. Therefore, as part of the current audit, the OAG made a follow-up on the recommendations of the previous report in order to ascertain the level at which the Department had implemented the recommendations. The follow-up was imperative in view of the fact that management of wildland fires is an integral part in protection of forests from wildland fires, hence it was crucial to establish whether implementation of the recommendations had made any positive impact.

Nonetheless, it transpired during the audit that the DFRR had still not implemented most of the recommendations, as indicated in Table 4 overleaf which shows the number of previous recommendations which have been implemented, not implemented as well as the ones in progress.

Table 4; Status on implementation of the recommendations

Number of recommendations implemented	Number of recommendations not implemented	Number of recommendations in progress
10	16	6
31.25%	50%	18.75%

Source; DFRR Savingram Ref No; DFRR 3/2/1 II (4)

Table 4 depicts that the DFRR had implemented 31.25%, not done 50% of the recommendations, while 18.75% are currently in progress. The DFRR Management indicated that the highest number of recommendations not implemented was due to financial constraints while some were to be implemented after the finalisation of the Fire Management Strategy and Forest Policy which were in progress of being finalised at the time of writing this report. For instance, the Department had also not established the District Fire Fighting Teams on the assertions that the National Fire Management Strategy that was still being finalised will facilitate establishment of the teams. Moreover, DFRR Management also highlighted that some recommendations would be implemented after the establishment of the Rural Fire Brigades which will be operational this year (2011). Refer to Table 1 at Appendix C for more details on some of the actions taken by DFRR on other recommendations.

Absence of important documents such as the Forest Policy, the Fire Management Strategy and other cohesive legal framework had in turn hindered implementation of other recommendations, hence the negative impacts on the operations of the Department regarding forest protection from the wildland fires.

However, the OAG is of the view that the DFRR Management need to make forest protection from the risk of fire a priority, hence it is imperative for the

Department to expedite implementation of the recommendations particularly finalisation of Forest Policy and the Fire Management Strategy. These tools will assist sustainable forest management in as far as the fire risk is concerned.

OVERALL CONCLUSION

Protection of the forest from wildland fires is fundamentally important principle of sustainable forest management. Moreover, it cannot be achieved in the absence of a firm and lasting commitment and appropriate actions to effectively protect forests from the threats and activities that may impair the achievement of the management objectives.

The protection of forests from fire is a major consideration for the DFRR and is one of the most complex management issues in the Department. Notwithstanding the efforts by the DFRR to protect the forests from wildland fires, there were challenges regarding the strategies/ initiatives put in place by the Department. These challenges included; lack of adaptive approaches to wildland fires by the Department, inadequate fire fighting equipment and protective clothing, lack of fire investigation skills, low participation of the public in fire suppression, difficulties in mobilisation and coordination of resources (equipment, human, funds and transport) to respond to fire out breaks. The above-mentioned challenges rendered the DFRR initiatives to protect forests from the wildland fires ineffective and inefficient. However, it is inconceivable that the Department in some instances indicated financial resources as one of their constraints. This contention is not convincing because in all the years under review, the budget had never been exceeded (refer to paragraph 1.4 Finances- Table 1; Financial Spending by DFRR).

In addition, the Department had not implemented most of the recommendations of the Auditor General's Performance Audit Report No; 8 of 2008 on Management of Wildland Fires. However, the OAG appreciates the plans by DFRR to establish the Rural Fire Brigades and develop the Forest Policy

and Fire Management Strategy which may aid the Department in improving the initiatives to protect the forests from the wildfires.

APPENDIX A

Figure 1; DFRR's Organisational Structure

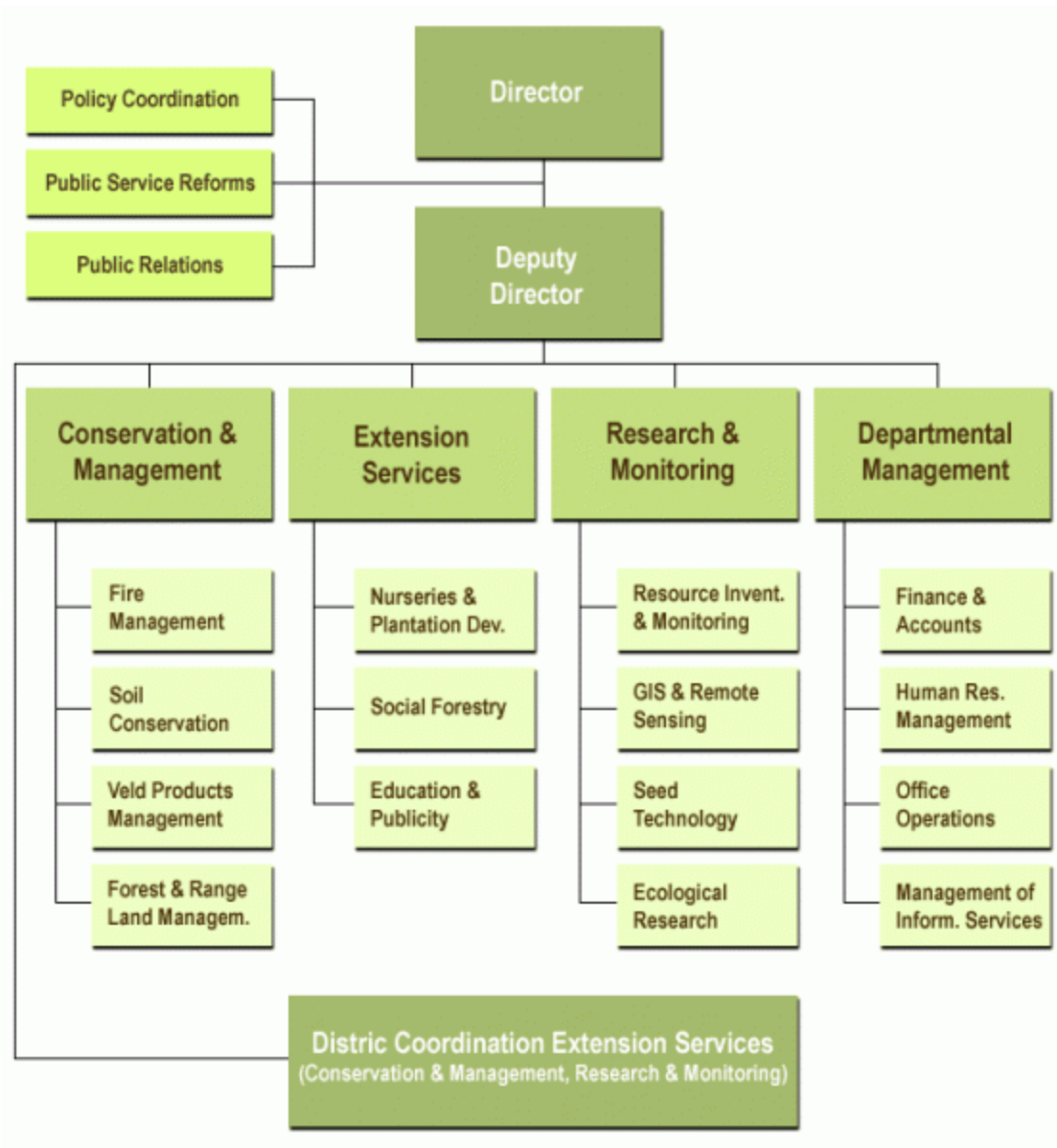
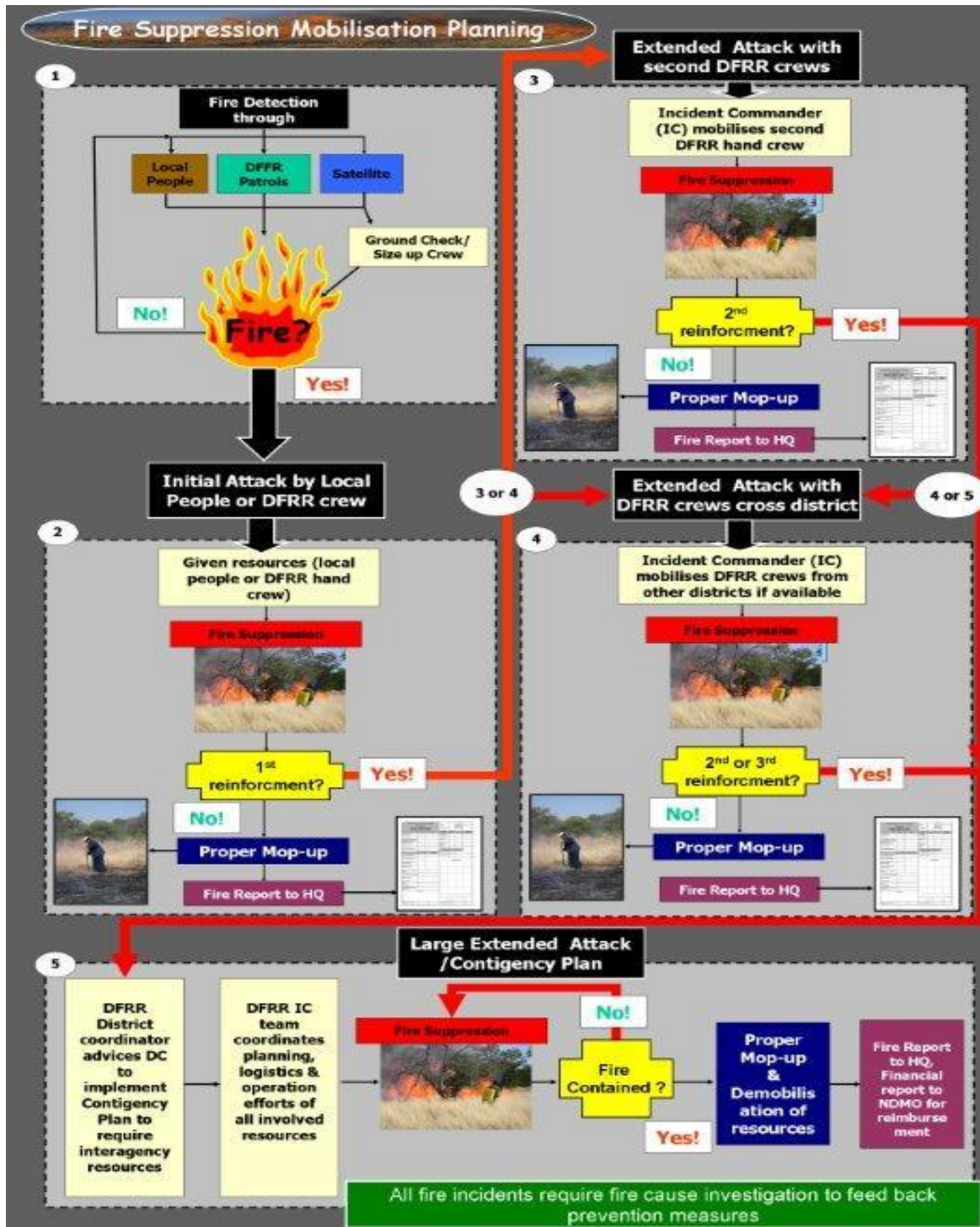


Figure 2; Reporting and command line in case of a fire event



Figure 3; Fire suppression mobilisation flow



Quality Management
FIREBREAK INSPECTION CHECKLIST

DFRR\DCM\FM\001



District:		Name of inspector	
Inspection period (from till)		Name of contractor / representative	
Name of firebreak		Length of firebreak	
1. Inspected km (from to) and date of inspection		GPS co. of starting point	
2. Inspected km (from to) and date of inspection		GPS co. of starting point	
3. Inspected km (from to) and date of inspection		GPS co. of starting point	
4. Inspected km (from to) and date of inspection		GPS co. of starting point	
5. Inspected km (from to) and date of inspection		GPS co. of starting point	

Please, take a record every 20 km covering all of the 5 criteria. Criteria 2 – 5 should be checked constantly on the way as well. Use the remarks column or the back of the sheet (give GPS coordinates and sign the back too).

Inspection point (km)	Firebreak width (m)	Grass and roots removed?			Shrubs and trees cleared?			Windrows leveled?			Worker campsites cleaned?			Remarks			
		①			②			③			④				⑤		
		yes	minor	critical	yes	minor	critical	yes	minor	critical	yes	minor	critical				
20																	
40																	
60																	
80																	
100																	
120																	
140																	
160																	
180																	
200																	
220																	
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260																	
280																	
300																	
320																	
340																	
360																	
380																	
400																	
420																	
440																	

Signature and date:
 (Inspector) (Contractor) the contractor refused to sign

The form has to be submitted to DFRR with the full digital GPS track record of the mission.

Figure 5; Fire Management Cycle

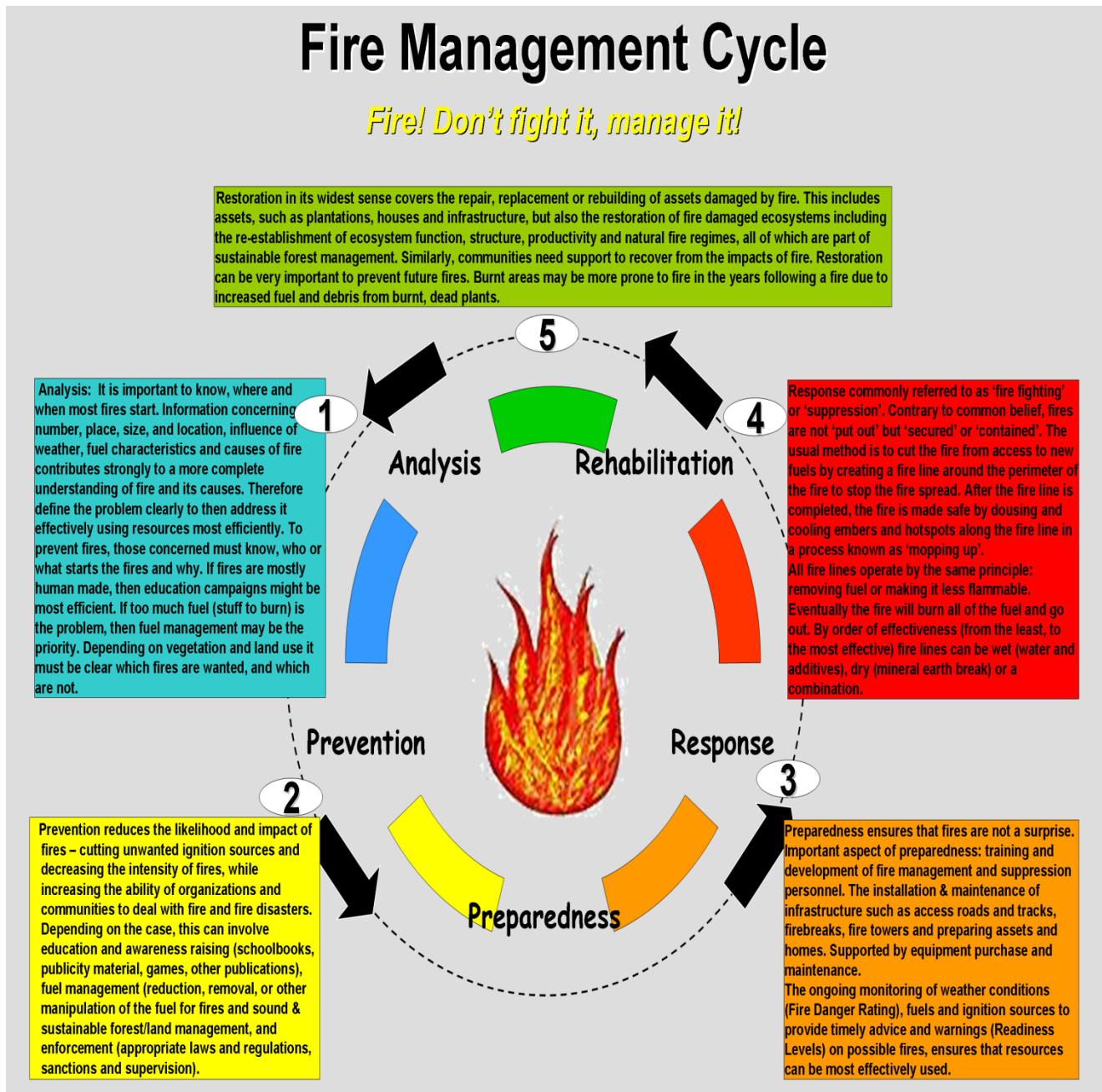
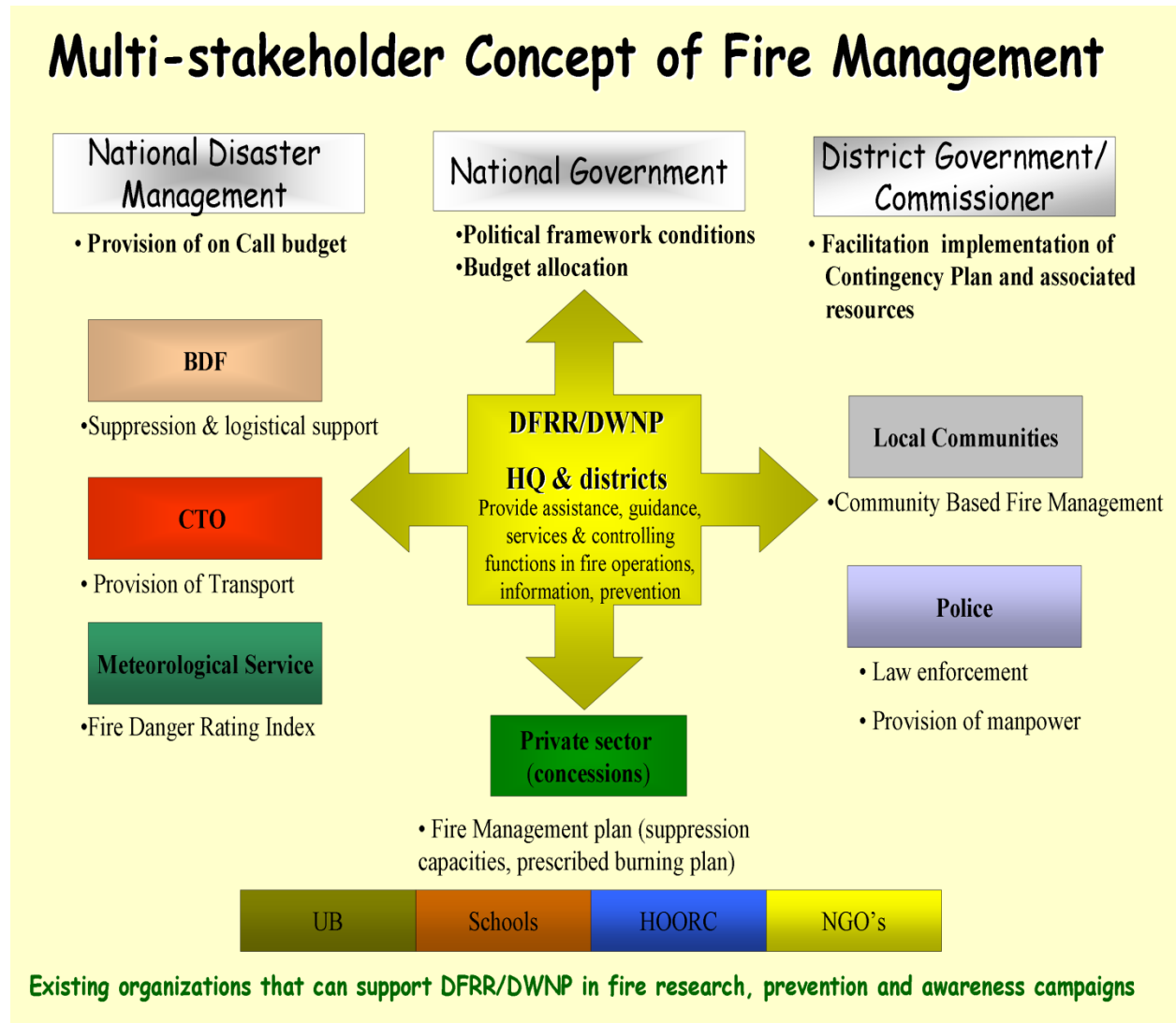


Figure 6; Multi-Stakeholder Concept of Fire Management



APPENDIX B

Table 1; Key Persons interviewed at DFRR Headquarters and Districts

Director – DFRR	Field Assistants (10)
Deputy Permanent Secretary (Natural Resources) – Ministry of Environment, Wildlife and Tourism.	Chief Forestry and Range Resources Officer – Head of Conservation and Management Division
Secretary - Agricultural Resource Board	Supplies Officers (7)
District Coordinators (7)	Forest Guard – Kasane
Tribal Leader “Kgosi” – Makopong	

Table 2; Stakeholders interviewed at different Entities

Director - Department of Meteorological Services	Chief Executive Officer – Forest Conservation Botswana
Community Trust Managers (5)	District Herbage Preservation Committee Chairperson (5)
Station Commanders – Botswana Police Service (7)	Harry Oppenheimer Okavango Research Centre(HOORC)
Botswana Defence Force (BDF)	Heads – Department of Wildlife and National Parks (7)
District Commissioners – (7)	Chief Executive Officer-Kalahari Conservation Society

Table 3; Documents reviewed at DFRR Headquarters and Districts

Forest Act (1968)	Southern African Development Community (SADC) Protocol on Forestry
Agricultural Resources Conservation Act (1974)	District Veldt Fire Management Files
A Fire Management Plan for the Okavango Delta Ramsar Site in Botswana (2006)	District Herbage Preservation Committee Files
Fire Season Reports(2007/08-2009/10)	District Contingency Plans(2007/08-2009/10)
National and Districts Fire Contingency Plan	Chobe Forest Reserves Report (Volume 1)
National Action Programme to Combat Desertification and Drought (Revised July 2003)	Herbage Preservation Act (Prevention of Fires) – 1978

Table 4; List of fire breaks inspected at the Districts

Mmashoro East	Botswana – Zimbabwe Boarder
Sibuyu Forest Reserve boundary	Kasane Forest Reserve Extension
Kazuma Forest Reserve	Tsau – Xaxa
Makoro – Kaka	Kuke – Makalamabedi
Mabuasehube Easterly	Khudumelapye – Mosetsanamontle
Kweneng – Kgalagadi boundary	

Table 5; Some of the fire damages recorded during the year 2010

People	13
Goats	53
Ranches / Farms	58
Cattle	220
Calves	36
Hartebeest	2
Steenbuck	3
Donkeys	6
Horses	2

Table 6: The total area burnt and time when fire started and ended for various Districts in 2010

District	Start	Last recorded	Total Area Burnt (HA)
Central	June	October	2,757,523.08
Chobe	August	October	534,789.14
Gantsi	May	October	5,291,407.21
Kgalagadi	February	November	901,539.55
Kgatleng	July	October	122,938.51
Kweneng	June	November	683,658.14
Ngamiland	June	October	2,408,697.23
Southeast	August	September	1,502.67
Southern	February	October	884,225.21
Northeast	June	September	493.68
Total			13,586,774.42

Table 7: Area (%) burnt by wildland fires per Districts from 2007 to 2010

District	2007	2008	2009	2010	District Size
Central	(0.4%) 56,820	(10%) 1,460,431	(1.22%) 179,136	(18.84%) 2,757,523.08	14,637,419
Chobe	(14.72%) 309,390	(32.52%) 683,599	(21.25%) 446,677	(25.44%) 534,789.14	2,101,920
Ghanzi	(9.67%) 1,109,580	(45.69%) 5,241,479	(2.08%) 238,065	(46.12%) 5,291,407.21	11,472,587
Kgalagadi	(7.04%) 738,995	(3.79%) 397,478	(3.40%) 357,151	(8.59%) 901,539.55	10,491,604
Kgatleng	(0%) 0	(14.63%) 111,452	(0.34%) 2,571	(16.13%) 122,938.51	761,943
Kweneng	(4.52%) 167,010	(34.82%) 1,287,104	(0.25%) 9,336	(18.50%) 683,658.14	3,696,345
Ngamiland	(7.68%) 854,680	(23.04%) 2,565,514	(7.57%) 842,762	(21.63%) 2,408,697.23	11,134,421
North East	(0.21%) 1,070	(0.37%) 1,910	(0.11%) 554	(0.10%) 493.68	514,619
South East	(0%) 0	(11.52%) 9,888	(0%) 0	(1.75%) 1,502.67	85,800
Southern	(2.15%) 58,620	(3.23%) 87,933	(1.69%) 45,953	(32.47%) 884,225.21	2,723,320
Grand Total	(5.72%) 3,296,165	(20.56%) 11,846,790	(3.68%) 2,122,205	(23.58%) 13,586,774.41	57,619,978

Table 8; Summary of wildfires outbreaks and their causes per District for the years 2008, 2009 and 2010

District	Number of fire out breaks		
	2008	2009	2010
Kweneng	48	5	52 (2)
North East	6	5	1
Central	82 (11)	78	55
Ngamiland	41	20	31 (1)
Gantsi	39 (2)	11	28
Kgalagadi	24	9	26
Chobe	12	8 (1)	11 (1)
Total	136 (13)	252 (1)	204 (4)
(%) of unknown fire causes	90.4	99.6	98

Source; DFRR fire Reports

NB; figures in brackets indicate the number of fire causes known

Table 9 (a); Fire fighting equipment inventory at DFFR

ITEM	NUMBER	CONDITION		
		Bad	Fair	Good
Water tank/Sprayers 1000l (wheeled)	34	9	2	23
Water tank/Sprayers 500l	37	12	10	15
Knapsack Sprayers	28	10	7	11
Fire Beaters	1145	592	39	514
Drip Torches	99	-	-	99
GPS	16	3	7	6
Walkie Talkies	4	-	-	4
Fire Rake Hoe	39	3	20	16
Helmets	20	-	16	4
First Aid Kit	1	-	1	-
Goggles	9	-	9	-
Binoculars	1 set	1	-	-
TOTAL	1433	630 (44%)	111 (8%)	692 (48%)

Table 9 (b): Status of Vehicles and Machinery

ITEM	NUMBER	CONDITION		
		Bad	Fair	Good
Land Cruiser Station Wagon	16	5	8	3
Nissan Patrol	3	-	1	2
Bakkie	9	4	5	-
Double Cab 2.4	2	1	-	1
Bull Dozers	3	3	-	-
Tractors	9	7	-	2
Fire Engine Tanker Truck 22000l	1	-	-	1
Caterpillar Grader	2	2	-	-
Field Generator	2	1	1	-
Disk Harrow	2	1	-	1
Buoy Temporary Wall Dams (400l and 7500l)	2	-	-	2
Disk Plough	2	1	1	-
Tractor Trailer	3	1	2	-
Trucks	6	2	3	1
TOTAL	62	28 (45%)	21 (34%)	13 (21%)

APPENDIX C

ACTIONS UNDERTAKEN BY DFRR TO IMPLEMENT RECOMMENDATIONS OF THE REPORT NO; 8 OF 2008 OF THE AUDITOR GENERAL ON THE MANAGEMENT OF WILDLAND FIRES BY THE DEPARTMENT OF FORESTRY AND RANGE RESOURCES

5.1 Fire Management Policy

Recommendation

The DFRR should expedite the development and implementation of a unified and cohesive Departmental Policy.

Action: A consultant was engaged to develop National Fire Management Policy, which did extensive community consultations and produced a draft policy. However, the Ministry took a decision that the fire management policy actions should be incorporated into and form part of the Forest Policy. The draft Forest Policy is ready for presentation to Parliament in July 11, 2011.

Recommendation:

The DFRR should take reasonable steps to review the existing Acts.

Action: The draft of the revised and consolidated Acts is ready and has been submitted to AG's Chambers for final drafting.

5.2 REORGANISATION OR ORGANISATIONAL RESTRUCTURING

Recommendation:

DFRR should revisit and Act upon its current organisational setting.

Action: The DFRR has produced recommendations for the operationalisation of the Division of Technical Support Services which has since been submitted to DPSM.

Recommendation:

DFRR should reconcile the idea of revocation of the Board with the establishment of the Environmental Advisory Council (EAC).

Action: The revocation of the Board has not yet been done as the Review of the Acts is still ongoing. Also the Environmental Management Act has not yet been approved hence the Environmental Advisory Council has not been established. In the meantime, the Board is the decision making body on the implementation of the two Acts of the Herbage Preservation Act and the Agricultural Conservation

Act until they are repealed. The staff of DFRR, which is fully rationalised and incorporated, however puts such decisions into action by implementing.

5.3 CONTINGENCY PLANS

Recommendation:

DFRR Management Strategy ensures that the Districts Fire Contingency Plans are developed.

Action: Districts Fire Contingency Plans are now produced as a component of District Disaster Reduction Preparedness Plans. In addition, a National Fire Management Strategy is currently being finalised, which when fully operational will facilitate better implementation of plans and actions geared towards fire management at District level.

Recommendation:

Management should consider developing uniform guidelines on the compilation and submission of Fire Contingency Plans.

Action: As already indicated, the Fire Management Strategy will facilitate implementable district-based fire management actions.

5.4 COORDINATION

Recommendation:

Management should develop comprehensive Fire Management Policy.

Action: The comprehensive fire management policy was incorporated into the Forest Policy.

Recommendation:

DFRR Management should have an improved level of coordination that will ensure that fires are responded to well in time and that any unnecessary loss is averted.

Action: Training of fire fighters and other stakeholders, coupled with the development and implementation of a comprehensive fire management strategy will lead to an improved level of coordination that will ensure that fires are responded to well in time and that any unnecessary loss is averted.

Recommendation:

DFRR should develop a coordinated network system for pooling and developing resources for effective initial attack while fires are still small.

Action: DFRR, in collaboration with the Australian Government, is piloting the establishment of rural fire brigades, which will facilitate the development of a coordinated network system for pooling and developing resources for effective initial attack while fires are still small.

Recommendation:

Management should establish Fire Fighting Teams at the Districts and should ensure that teams are on standby during the fire season to avoid delays in mobilisation.

Action: The establishment of rural fire brigades starting in 2011, will ensure rapid mobilisation of resources during fire suppression.

Recommendation:

Management should ensure that specific roles and responsibilities of the team are defined and clearly outlined.

Action: Rural Fire Brigades will ensure that specific roles and responsibilities of crew members are defined and clearly outlined, as this is part of training.

Recommendation:

Management should ensure that financial plans are put in place for immediate provisions during fire season so as to enhance quick response.

Action: The current global recession made it impossible for the increase of the Departmental financial ceiling; hence it has not been feasible to provide adequate funds for fire suppression. However, efforts will be made to fully utilise the available meagre resources.

5.5 RESPONSE TO FIRES

5.5.1 Response Time

Recommendation

DFRR should develop an effective Incident Command System (ICS) for fire management at District and National Levels.

Action: The training undertaken in collaboration with the Australian Government is developing a comprehensive system to be followed by all stakeholders; hence Incident Command System is an

integral component. The Fire Management Strategy will also incorporate this aspect.

Recommendation:

Management should revise the response time to a more reasonable and achievable target.

Action: This will be realised as soon as fire brigades, which are to be piloted in Chobe, Gantsi, Central and Ngamiland district start operating this year. However, if funds are permitting, it would be more effective if crews were placed in fire prone areas instead of District HQ prior to commencement of fire season so that response time can be achieved within an hour of reporting of fire incident.

5.5.2 Personal Protective Clothing

Recommendation

DFRR should acquire and distribute suitable protective clothing to fire fighters.

Action: The rural fire brigades would be the first to get the protective clothing, and then, funds permitting, more fire fighters will be provided with suitable clothing for fire suppression.

Recommendation

Management should ensure that better mechanisms are in place to provide protective clothing to people helping in suppression of fires.

Action: Due to the current budgetary constraints, this aspect will be considered for the future.

5.6 FIREBREAKS

5.6.1 Construction of Firebreaks

a) Size

Recommendation:

DFRR Management should ensure that effective mechanisms are in place to monitor and supervise performance of contractors.

Action: An inspection datasheet has been designed. Inspection or assessment of adherence to work specifications is done every 50km along a firebreak.

b) Interference

Recommendation:

The DFRR Management should consider the policy of compensating for fields and farms that are normally found within firebreaks.

Action: A proposal is under consideration and would form part of the fire management strategy. Caution is however being taken to ensure that no abuse of the system occurs.

Recommendation: Management should ensure that firebreaks are gazetted to avoid the risk of encroachment of the development undertakings.

Action: An in-house process is underway to identify fire breaks for gazettment, while others are to be considered for re-alignment.

c) Direction of Firebreaks

Recommendation

- The DFRR Management should re-consider the realignment of firebreaks across the country.
- Management should construct firebreaks in such a way that they cut across the local wind direction.
- Management should take advantage of some of the firebreaks that run parallel to the main tarred roads as a means of a cost saving measure, during maintenance of such firebreaks, thus opting them out.
- Management should zone the country according to the value of the resources found in any area, and they should prioritize construction of the firebreaks basing on the zones.

Action: All four recommendations not yet done due to budgetary constraints but as soon as the economy improves, the recommendations will be implemented.

5.6.2 Maintenance of fire breaks

a) Award of Tenders

Recommendation: Management should invite and award tenders for maintenance of firebreaks before the start of the fire season so that the contractors can complete their work well before start of the season. This will ensure that the firebreaks serve their purpose of guarding against any fires.

Action: Recommendation done as for the years 2008, 2009 and 2010, where contractors were given three-year contracts. Therefore fire breaks were maintained before fire season began. For 2011 however, there has been a slight change off approach in order to save funds to establish the district fire brigades.

b) Maintenance of fire breaks by land occupiers

Recommendation: The DFRR Management should enforce Section 9(1) of the Herbage Preservation Act of 1977. There should be absolutely no justification as

to why land Occupiers should not maintain boundaries around their ranches or contribute part of the cost or labour necessary to construct and maintain the boundaries.

Action: This recommendation is an on going process of enforcing the Agricultural Conservation Act, by compelling land occupiers to construct and maintain fire breaks.

5.7 INSPECTION OF FIREBREAKS

Recommendation

DFRR should establish guidelines and standards to be followed during inspection.

Action: Done through development and implementation of an inspection sheet.

Recommendation:

Management should encourage officers at the Districts to prepare Progress Reports.

Action: Done, reports are submitted to DFRR Headquarters.

5.8 RESOURCES

5.8.1 Human Resources

a) Staff adequacy

Recommendation:

- The DFRR Management should ensure that all the divisions are represented at the Districts and that there is adequate skilled personnel to enhance decision making.
- Management should ensure that the rationalisation of staff, which is currently taking place is made with due regard to the available skills and expertise both at the operational and management levels.

Action: Proposal for new posts are made but hampered by the current freeze on creation of new posts in government. The high staff turnover is also a problem. Consequently the situation has not changed.

b) Staff Capacity

Recommendation

- The Department Management should strengthen its staff capacity to ensure quality service delivery. There is need to improve the human technical capacity and capabilities to effectively lead major elements of the fire management such as fire information, prevention and suppression.

- Management should train Officers, including those at Management level in fire related courses and programmes in order to perform fire management duties diligently and enhance good decision- making.

Action: Recommendations done as training at Diploma, BSc and MSc has been on-going within SADC, USA and Australia. In addition, Collaboration with Australia has led to development and implementation of a Basic Fire Management Programme for Botswana, where officers and communities have been trained in fire suppression techniques, crew leader and ICS.

c) Training

Recommendation

- The DFRR Management should develop a customised and practical training plan that is geared towards the core competencies of staff. The training structure should be effective enough to meet the emerging challenges of fire regimes.

Action: Short term training has been undertaken though not yearly due to shortage of funds. However, this year a few courses have been identified for heads of Divisions and head of districts.

5.8.2 Fire Fighting Equipment

Recommendation

- Underutilisation of fire fighting equipment
 - The DFRR should take stock of all the fire-fighting equipment distributed across the country and assess the degree to which the equipment is utilised. Where necessary, the Department should consider the option of re-distributing the equipment based on the thorough needs assessment.
 - It is also recommended that the DFRR Management acts swiftly on what needs to be done with the 1000 litres tankers, which have never been utilised since the time they were purchased.

Action: All these recommendations have been done.

Recommendation

- Inadequate servicing of equipment
 - Management should ensure that the fire-fighting equipment are serviced, before the start of the fire season or after every fire outbreak to ensure that they are always in a good condition and ready for another outbreak.
 - The DFRR Headquarters should provide the service kit for all the tankers and any other

electronic equipment distributed to the Districts.

Action: An attempt to service equipment has been done but hampered by low budget.

5.8.3 Transport

a) Allocation

Recommendation

The Department Management should allocate vehicles and drivers to the District Offices on a rational basis. The ratio of vehicles to drivers should balance to avoid under-utilisation of vehicles and to also make sure that all drivers have duties and do not stay idle. The different geographical locations and characteristics of the regions should be considered so as to allocate the right models of vehicles to those areas.

Action: Recommendations done, but still not adequate.

c) Suitability

Recommendation

The DFRR Management should make sure that they provide specialised vehicles that are fitted with tow bars and are suitable for pulling mobile tankers. Management should avail vehicles of the right model, with the necessary features.

Action: Some specialised vehicles have been acquired, and should the economy improve then more specialised fire fighting equipment will be acquired.

5.9 STORAGE FACILITIES

Recommendation

The DFRR Management should take reasonable steps to construct storage facilities in all the Districts, to ensure that Department's equipment and other valuables are safeguarded against natural hazards.

Action: Recommendation not done due to financial constraints for construction of shelters.

5.10 Reporting

Recommendation

- Management should encourage all the District Officers to generate the different forms of reports as required from time to time. These reports should be comprehensive and contain all required information, in order to enable

informed decisions, Nationally and Regionally. The reports should be submitted within a stipulated time frame and at a suitable venue.

- Management should also compile Minutes of the Herbage Preservation Committee and send them to the rightful authority on time.

Action: Recommendations were done and reports are prepared accordingly

Source; Performance Audit Report NO. 8 of Report of the Auditor General on the Management of wildfires by DFFR & DFRR Savingram REF No; 3/2/1 II(4)

GLOSSARY

Community-based Fire Management: *fire management approach based on the inclusion of local communities in the proper application of fire, fire prevention, and wildfire preparedness.*

Firebreak: *Any natural or constructed discontinuity in vegetation which is used to stop or control the spread of fire.*

Fire Danger Index: *A relative number indicating the severity of wildland fire danger as determined from burning conditions and other variable factors of fire danger.*

Fire dependent ecosystems: *Ecosystems that need a specific regime of fire and are characterized by plant species that respond positively to fire and facilitate its spread.*

Fire Management: *Activities required for the protection of land from fire and the use of prescribed fire to meet land management objectives.*

Fire Management plan: *A programme to manage wildland fires (wildfires, prescribed fires, and wildland fire use)*

Fire Prevention: *All measures in fire, fuel and forest management, and concerning land users and the general public, including law enforcement that may prevent the outbreak of fires or reduce their severity and spread.*

Fire protection: *All actions taken to limit the adverse environmental, social, political, cultural and economic effects of fire.*

Fire Regime: *A generalized description, of the pattern of fire occurrence in a given area or ecosystem in terms of frequency, size, severity and seasonality.*

Fire Risk: *The chance of fire starting, as determined by the presence and activity of causative agents.*

Fire season: *Period (s) of the year during which wildland fires are likely to occur, spread, and affect resources to an extent warranting organized fire management activities.*

Fire Suppression: *All work and activities connected with control and fire-extinguishing operations, from discovery until the fire is completely extinguished.*

Fuel: *Any combustible material, which in wildlands consists of primarily of dry or senescent vegetation.*

Incident Command System: *A standardized on-scene emergency management procedure providing an integrated organizational structure that identifies in advance lines of authority so that complex or multiple fire incidents can be addressed without being hindered by jurisdictional boundaries.*

Integrated Fire Management: *Integration of prescribed fires and natural or anthropogenic wildfires into land-use systems in accordance with the management objectives, including the use of the capabilities of the rural populations, government agencies, NGOs, and private organizations, to meet the overall objectives of land management, including CBFiM activities.*

Prescribed (or controlled) burning: *Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist prior to ignition.*

Rehabilitation: *Efforts undertaken within three years of a wildland fire to repair or improve fire-damaged lands unlikely to recover to desired conditions without intervention.*

Restoration: *The continuation of rehabilitation beyond the initial three years or the repair or replacement of major facilities damaged by the fire.*

Risk: *The chance of fire starting as determined by the presence and activity of causative agents.*

Veld fire: Any fire occurring in natural vegetation (that is not classified as forest) used for grazing and or browsing by livestock or wildlife.

Wild fire: An unplanned, unwanted wildland fire including unauthorized anthropogenic fires, escaped wildland fire use events, escaped prescribed fires, and all other wildland fires where the objective is to put the fire out.

Wildland: An area in which development is minimal, except for roads, railroads, power lines and similar transportation facilities.

Wildland fire: Any non-structure fire that occurs in the wildland. Three distinct types of wildland fire have been defined: wild fire, wildland fire use, and prescribed fire.