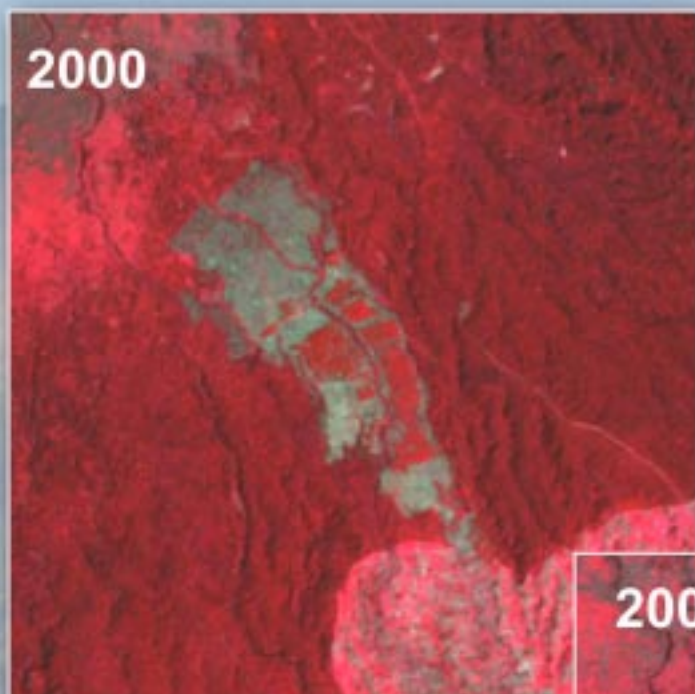


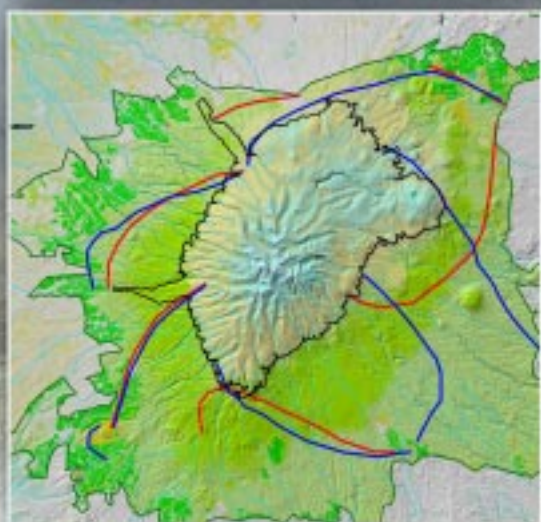
# Changes in the state of conservation of Mt. Kenya forests: 1999 - 2002



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An Interim Report  
February 2003

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# Change in the state of conservation of Mt. Kenya forests: 1999 - 2002

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## An Interim Report

### February 2003

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## FOREWORD

Forest ecosystems are critical natural assets that provide the nation with essential environmental services. As one of the five main “water towers” of Kenya, the forests of Mt. Kenya play a critical role in supporting key economic sectors, including electricity generation as well as subsistence and cash crop production.

In 1999, Kenya Wildlife Service, with support from UNEP, undertook a systematic aerial survey of the forests of Mt. Kenya. The findings of the survey revealed extensive forest destruction across the montane ecosystem. As a strategic response, Mt. Kenya forests were afforded the enhanced protection status of a National Reserve in July 2000 and placed under the management of Kenya Wildlife Service.

This report reviews the changes in the state of conservation of Mt. Kenya since 2000. I am very pleased to note that the situation in the mountain has improved significantly with drastic reduction in illegal logging, charcoal production and marijuana cultivation. The efforts made by Kenya Wildlife Service should be commended and serve as an example for other much threatened forest ecosystems.

Hon. Dr. Newton Kulundu,



Minister for Environment, Natural Resources and Wildlife

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## 1. INTRODUCTION

Public scrutiny and outcry over forest destruction, in particular on Mt. Kenya, called for a comprehensive assessment of the status of Mt. Kenya forests. The need was highlighted by a number of concerned parties, including institutions, NGOs, conservationists and community groups. Consequently Kenya Wildlife Service (KWS), with support from the United Nations Environment Programme (UNEP), responded to the call for a comprehensive assessment by undertaking an aerial survey of the entire forest belt of Mt. Kenya in 1999. The survey was to provide factual information on the type, extent and location of destructive activities in the forests.

The result of the 1999 survey established that the whole of Mt. Kenya forests were heavily impacted by extensive illegal activities leading to serious destruction below the bamboo/bamboo-podocarpus belt. Over 6,700 Camphor (*Ocotea usambarensis*) trees had been destroyed through logging out of a total of 14,662 indigenous trees that had been cut, most of them recent. Over 75 percent of clear-felled plantations had not been replanted with tree seedlings, although all these areas were under the 'shamba system' (non-residential cultivation). Encroachment into the fringes of indigenous forests were recorded, emanating from shamba-system cultivated areas. Most of the natural forest in the Lower Imenti had been destroyed and was under crop cultivation. In the lower part of the Upper Imenti, extensive charcoal production was observed throughout the area, leading to significant destruction of the indigenous forest. Marijuana (bhang, *Cannabis sativa*) cultivation was quite extensive, totalling 200 hectares, and was being grown in the indigenous forest from the edges to deep inside the forest. The Ngare Ndare forest was impacted by illegal logging of Cedar (*Juniperus procera*), livestock grazing and fires. However, pressure on that forest had not led to the same level of destruction as in many parts of Mt. Kenya and Imenti forests (Gathaara, 1999).

As a result of the survey report, a number of important policy measures were implemented by the Government in late 1999 and 2000. They include: the imposition of the country-wide ban on the commercial exploitation of all forest reserves in Kenya (December 1999); and the gazettelement of Mt. Kenya National Reserve to provide enhanced conservation status to the entire forest belt on the mountain. The newly established National Reserve was accompanied by a shift in management from Forest Department (FD) to KWS (Letter from Minister Nyenze dated 14 July 2000; Legal Notice 93 of 24 July 2000 – see Appendix I).

Pending new cooperation arrangements between KWS and FD, KWS has concentrated its efforts in protecting and managing the indigenous forest and FD in managing the plantations.

In order to determine the forest cover changes following the shift in management, an assessment of the changes in Mt. Kenya forests between 2000 and 2002 was required. Four organizations that had gathered information and expertise on Mt. Kenya agreed to cooperate for the undertaking: Durrell Institute for Conservation and Ecology of the University of Kent, KWS, UNEP and the Kenya Forests Working Group (KFWG).

## 2. OBJECTIVES

The objectives of monitoring the changes in Mt. Kenya forests are:

- To assess changes in the state of conservation of Mt. Kenya forests since 1999;
- To assess the effectiveness of the new management practices put in place on Mt. Kenya since 2000;
- To identify emerging or prevalent threats to conservation of the forests; and,
- To recommend interventions in support of the conservation of forests.

## 3. METHODOLOGY

Evaluation of vegetation cover changes is based on three types of analyses:

- 3.1. Time-series satellite image analyses;
- 3.2. Repeated aerial surveys;
- 3.3. Repeated ground surveys.

### 3.1. Time-series satellite image analyses

The objectives are:

- To assess changes over time in the status of forest plantation areas; and,
- To assess changes over time in location and status of degraded land, in particular encroachment, within the indigenous forest in the National Reserve.

Time-series analyses of four Landsat satellite images were carried out to establish vegetation cover changes, using the software ArcGIS 8.2. The results of the interpretation of the satellite images were validated by flying at very low elevation above the areas to be checked. Such “aerial truthing”, to compare with traditional “ground truthing”, proved to be very efficient as a large number of areas, some very remote, could be reached in a short period of time. The dates of the satellite images are February 1987, October 1995, February 2000 and February 2002. The 1987 image was acquired from Tropical Rainforest Information Centre. The 1995, 2000, and 2002 images were provided by United States Geological Survey/United Nations Environment Programme-Global Resource Information Database at Sioux-Falls. The four images have a resolution of 30 metres, meaning that each pixel represents 30 x 30 metres on the ground. The interpretation of the satellite images was made based on “true colour” compositions of bands 1 (blue), 2 (green) and 3 (red).

Two separate analyses were carried out: one for the forest plantations currently managed by FD, and the other for the indigenous forests under the management of KWS.

The boundaries of the forest plantations were obtained from the plantation sheets at scale 1/10,000 provided by FD. These boundaries were overlaid on the satellite images to locate accurately the forest plantations. The total forest plantation area derived from the plantation sheets amounts to 18,617.6 ha.<sup>1</sup>

The status of forest plantations was identified from the interpretation of the satellite images.

The location and extent of degraded land within the indigenous forests in the National Reserve were also derived from the interpretation of the satellite images. Degraded land is understood in this report as forest land impacted by fire or illegal settlement or cultivation. Aerial truthing was undertaken to distinguish open areas that are naturally devoid of trees (i.e. grasslands) from degraded land.

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<sup>1</sup> There is a discrepancy between the total forest plantation area derived from the plantation sheets (18,617.6 ha) and the total acreage under forest plantation suggested by Matiru (2000) based on written records (21,450 ha). It is possible that some smaller plantation blocks had not been reflected on the plantation sheets, which could explain the difference.

### 3.2. Aerial surveys

The objective of using aerial survey data is:

- To assess the changes in type, extent and location of the damage or threats to the forests between 1999 and 2002.

The methodology for the stratified sampling aerial survey of the forests was derived from the long experience gained by East African wildlife departments in counting animals from aircraft following set transects, further adapted as a result of the first ever forest survey of its kind on Mt. Kenya in 1999 followed by Mt. Kilimanjaro in 2001 and the Aberdare Range in 2002.

To compare the current situation with the results of the 1999 aerial survey of destruction in Mt. Kenya, Imenti and Ngare Ndare forests, a sampling aerial survey was conducted in 2002. Using a stratified random sampling technique, 30 squares of 3 x 3 kilometres were selected and over-flown.

The stratification was based on the number of observations made in 1999 in each survey block. For example, if 10 percent of the total number of observations were found in block 'B' in 1999, the sampling effort in block 'B' in 2002 would be 10 percent out of the 30 squares. The squares in each block were then selected randomly.

During the selection, squares that partially covered areas above the tree line were rejected and redrawn since no damage or threat was observed at such a high altitude in 1999. The type of damage or threats recorded include:

- Logging of indigenous trees;
- Charcoal production;
- Cultivation of marijuana (bhang, *Cannabis sativa*);
- Fire occurrences;
- Landslides;
- Grazing of livestock.

The sampling survey required over seven hours of count time, with an average of 14 minutes per survey square (see Map 1 at Appendix III) and covered some 18 percent of the area surveyed in 1999.

### 3.3. Ground surveys

The objective of using data from ground surveys is:

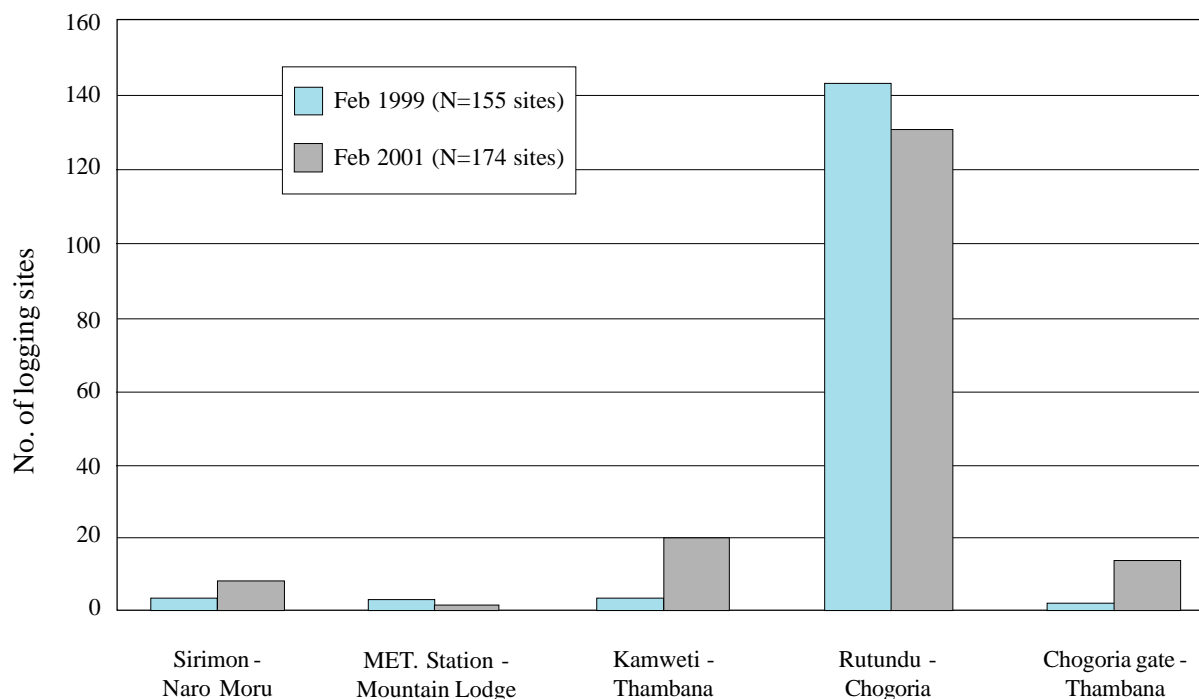
- To make a comparison of the intensity of illegal logging activities between 1999 and 2002.

Ground survey data is derived from the Mount Kenya Elephant Project, a research project conducted under KWS with funding from the United States Fish and Wildlife Service. The research aims to estimate elephant distribution and movement across the Mt. Kenya ecosystem, as well as to identify factors affecting them. As part of the project, a total of 150 kilometres of line-transects that run from the moorlands (3,500 metres) to the lower slopes and across all forest types, were walked in 1999 and 2001. Along the transects, data were recorded with regard to elephant presence (dung), forest type, altitude, slope, ground cover, and human activities. The latter include: logging and charcoal burning sites, marijuana cultivation, logging and/or poaching camps, campfires, snares and animal traps, injured animals and poached carcasses.

Logging sites remain visible for several years on the ground. As such all logging sites recorded in 1999 were still visible in 2001. The intensity of logging was assessed through recording the number of active sites vis-a-vis non-active sites. Non-active sites were categorized into 'abandoned recently' (no human activity and not yet overgrown with vegetation) or 'abandoned old' (no human activity and overgrown with vegetation). To evaluate the impact of new management practices put in place in 2000 on logging on M. Kenya, the data gathered in February 1999 were compared with those of February 2001.

The transects of the 2001 ground survey were not exactly at the same position as the 1999 transects. Both surveys therefore comprise a random sampled set of logging sites along transects that are located approximately at the same location. The similarity of proportional distribution of recorded sites between the two years (Fig 3.1) suggests that the survey data between years can be used for comparative analyses.

**Figure 3.1: Distribution of logging sites, 1999 vs. 2001**



## 4. RESULTS

### 4.1. Time series analysis of satellite images

Satellite imagery is an excellent remote sensing tool to study land-cover changes. Satellite images of Mt. Kenya area were obtained for 1987, 1995, 2000, and 2002.

#### 4.1.1. Forest plantations

Forest plantations on Mt. Kenya constitute approximately 20 percent of the forest area in the north and west as opposed to only four percent in the south and 0.1 percent in the east (Kohler, 1986). Changes in the forest plantations are analysed in this section.

Forest plantations are usually established through Non-residential Cultivation (NRC), commonly known as the “shamba-system”. This is an agro-forestry practice by which local farmers grow short rotation crops on forestland for three to four years while they tend intercropped tree seedlings. However, abuses of the shamba-system led to many clear-felled plantation areas left devoid of tree seedlings for excessively long periods.

The following types of changes over the past 15 years were studied: 1) from established forest plantation to shamba-system area (due to harvesting of forest plantation); 2) unchanged established forest plantation; 3) from shamba-system area to established forest plantation (successful establishment of forest plantation); and, 4) area remaining under the shamba-system. These changes as derived from interpretation of satellite images are given in Table 4.1.



Table 4.1: Land cover changes in the forest plantation areas\* (in hectare.)

From	To	1987 – 1995	1995 – 2000	2000 – 2002
Established forest plantation	Shamba-system	1,669	4,414	635
Established forest plantation	Established forest plantation	10,928	9,924	10,915
Shamba-system	Established forest plantation	2,737 yearly mean: 342	540 yearly mean: 108	4,150 yearly mean: 2075
Shamba-system	Shamba-system	3,285	3,741	2,421

\* The figures in the table are based on the plantation topo sheets provided by FD excluding the 2001 excision.

Table 4.1 shows that between 1995 and 2000 the re-establishment of forest plantation was negligible with a yearly average as low as 108 hectares. A major change appeared between 2000 and 2002, with a nineteen-fold increase from an average of 108 to 2,075 hectares replanted annually. This increase cannot be attributed to immediate replanting following major plantation harvesting, since only a small area of established forest plantation changed status over the same period.

Some 3,285 hectares of clear-felled plantations remained under the shamba-system during the period 1987 - 1995. This exceeds by far the normal duration of the shamba-system, which is between three to four years. This continued during the five year period between 1995 and 2000, with some 3,741 hectares remaining under the shamba-system.

Figure 4.1: Location map for figures 4.2, 4.3, 4.4 and 4.5

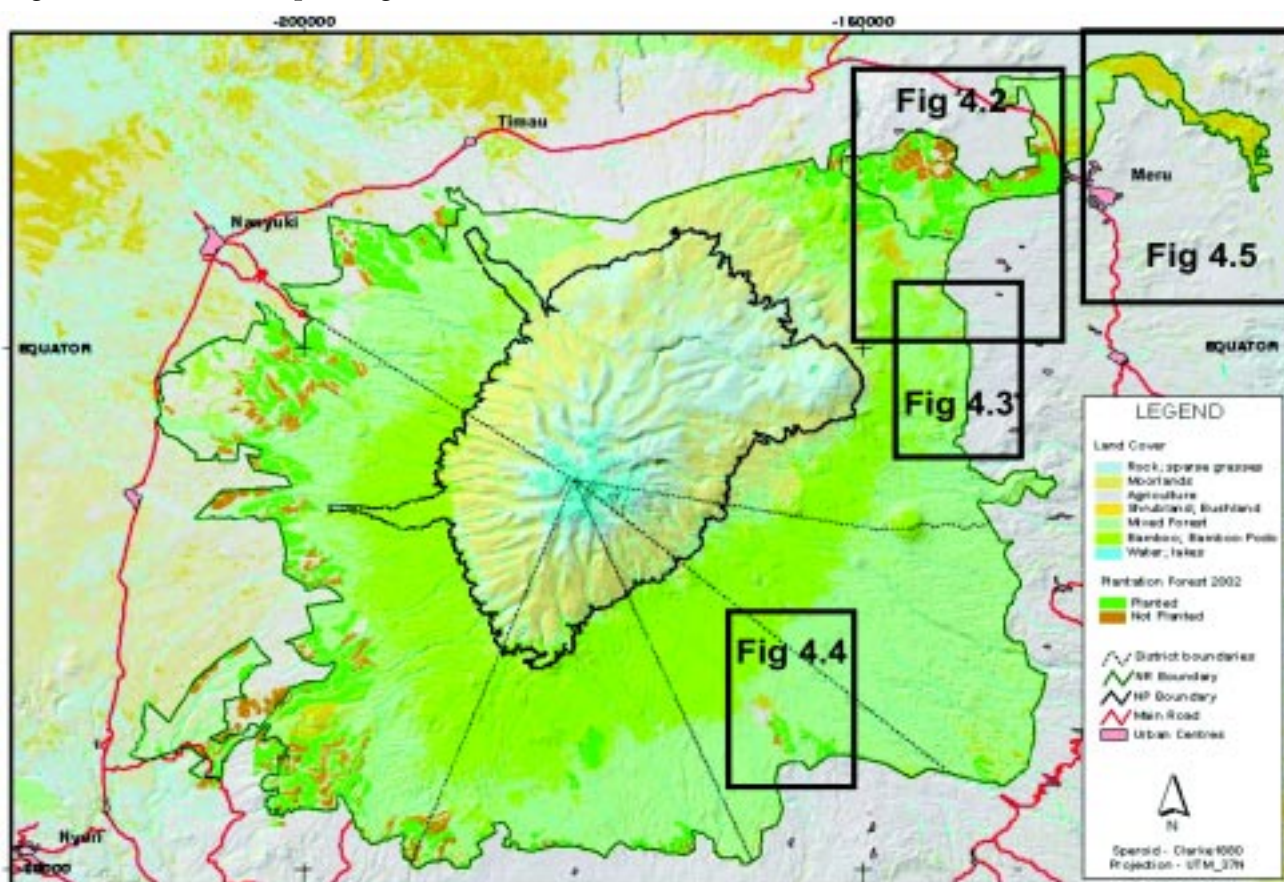
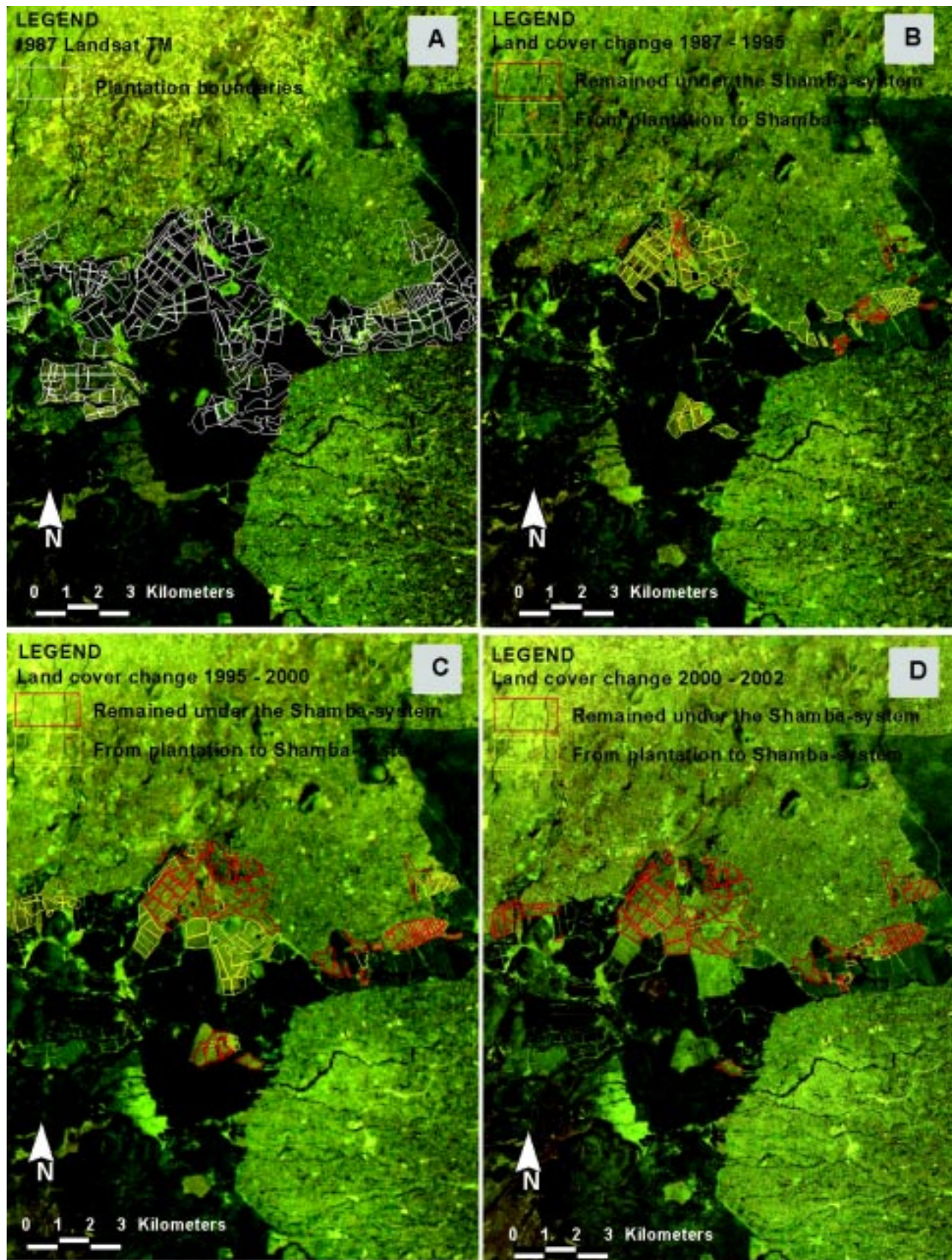


Figure 4.2: Forest plantations on the north-eastern slopes (Meru area)



LANDSAT TM: A) February 1987, B) October 1995, C) February 2000, D) February 2002

Figure 4.2 illustrates these changes in Meru area. Many forest plantation blocks clear-felled during the period 1987-1995 (B) were still under the shamba-system by 2000 (C). Replanting, however, occurred in 2000-2002 (D) (areas no longer marked).

#### 4.1.2. Location and status of degraded land within the indigenous forest

This section focuses on changes in extent of degraded land, in particular encroachment, in the indigenous forest within the National Reserve as a result of the shift in management in July 2000. The analysis is based on interpretation of the 2000 and 2002 satellite images. The results of the interpretation were checked through aerial surveys undertaken in September 2002.

Degraded land into the indigenous forest, in particular due to encroachment - either illegal settlement or cultivation- was quite extensive in 2000 amounting to 11,021 hectares. However it decreased substantially, by 71 percent, between 2000 and 2002 to 3,152 hectares. This is well illustrated by the changes that occurred in, among other areas, the Lower Imenti forest (see Figure 4.5).

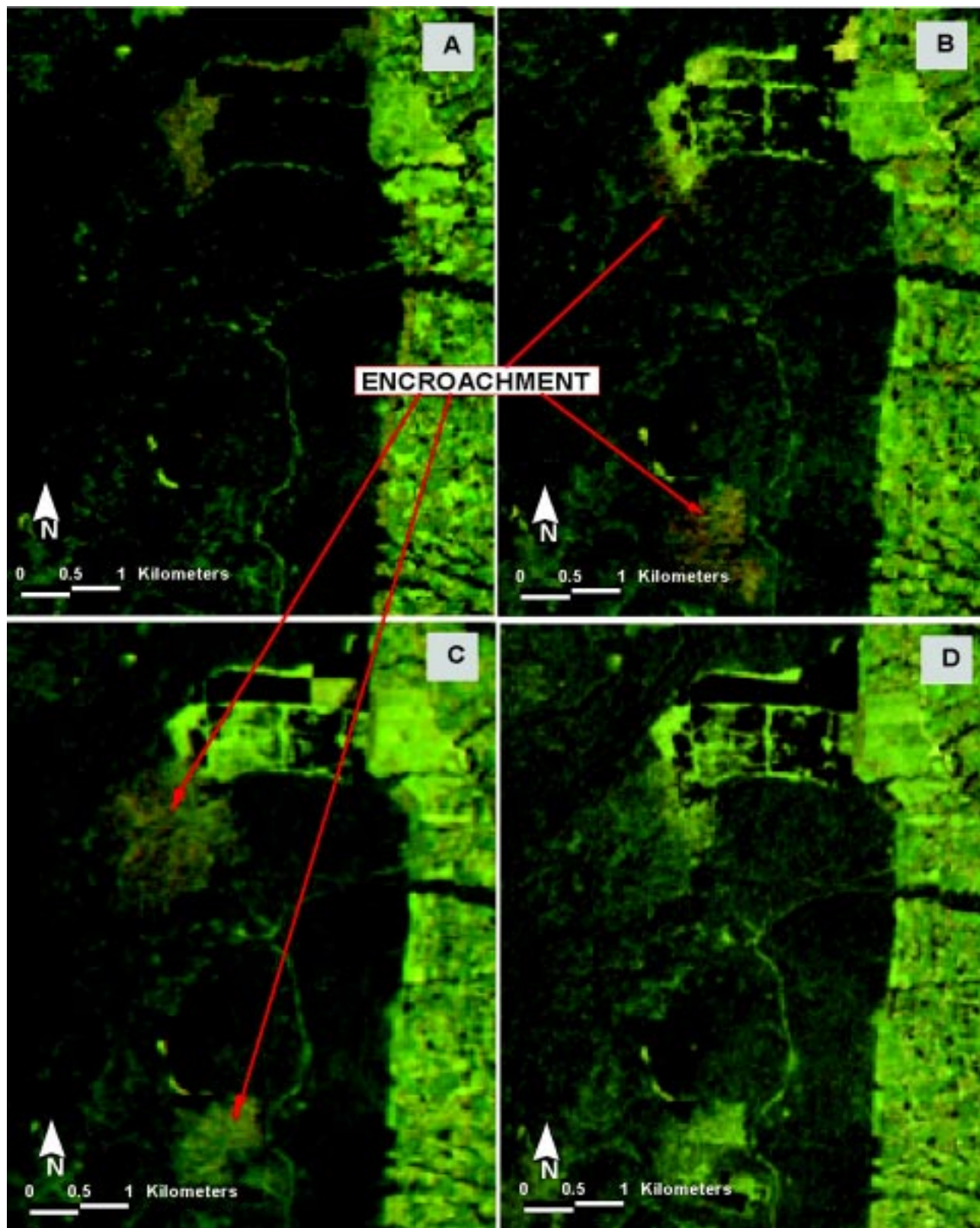
One area where encroachment continues to be high is located to the east of the Sirimon River. Squatters have been occupying three separate forest areas (Kiriti, Kienine, Karuri) since the 1980s. An excision of 796 hectares of forest land to the west of the Sirimon River was made in 2001 to enable the resettlement of these squatters (Legal Notice 29 of 16 February 2001). It is anticipated that the process of resettlement will be implemented as officially planned to recover the land and enable natural regeneration of the three illegal settlements.



Forest regeneration in Thambana area (February 2003)

**Figure 4.3: Encroachment into indigenous forest on the eastern slopes**

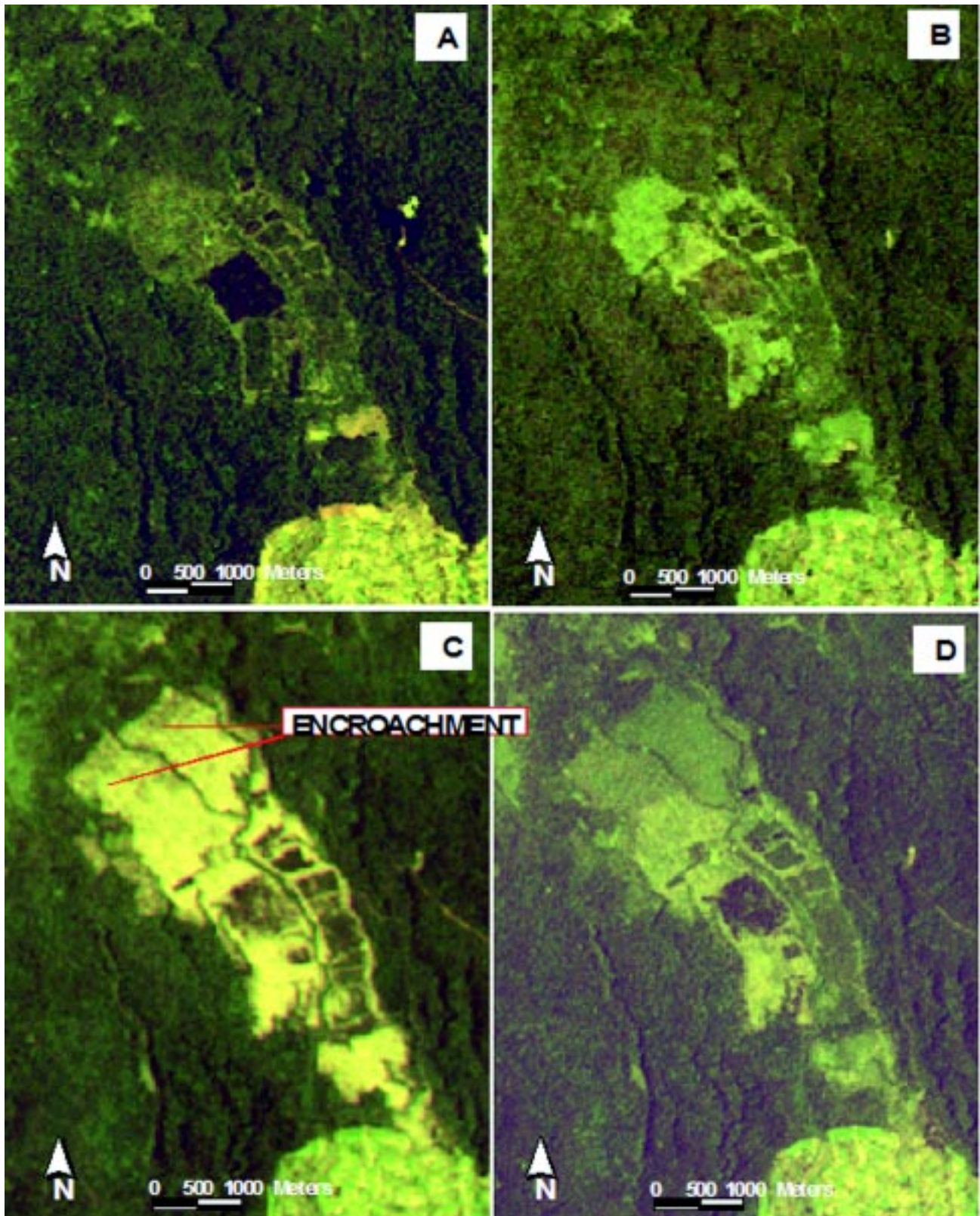
The encroachment that can be noticed in the 1995 image (B) significantly expanded by 2000 (C). The squatters were evicted between 2000 and 2002. Regenerating forest is appearing on the 2002 image (D).



LANDSAT TM: A) February 1987, B) October 1995, C) February 2000, D) February 2002

**Figure 4.4: Encroachment into indigenous forest on the southern slopes (Thambana)**

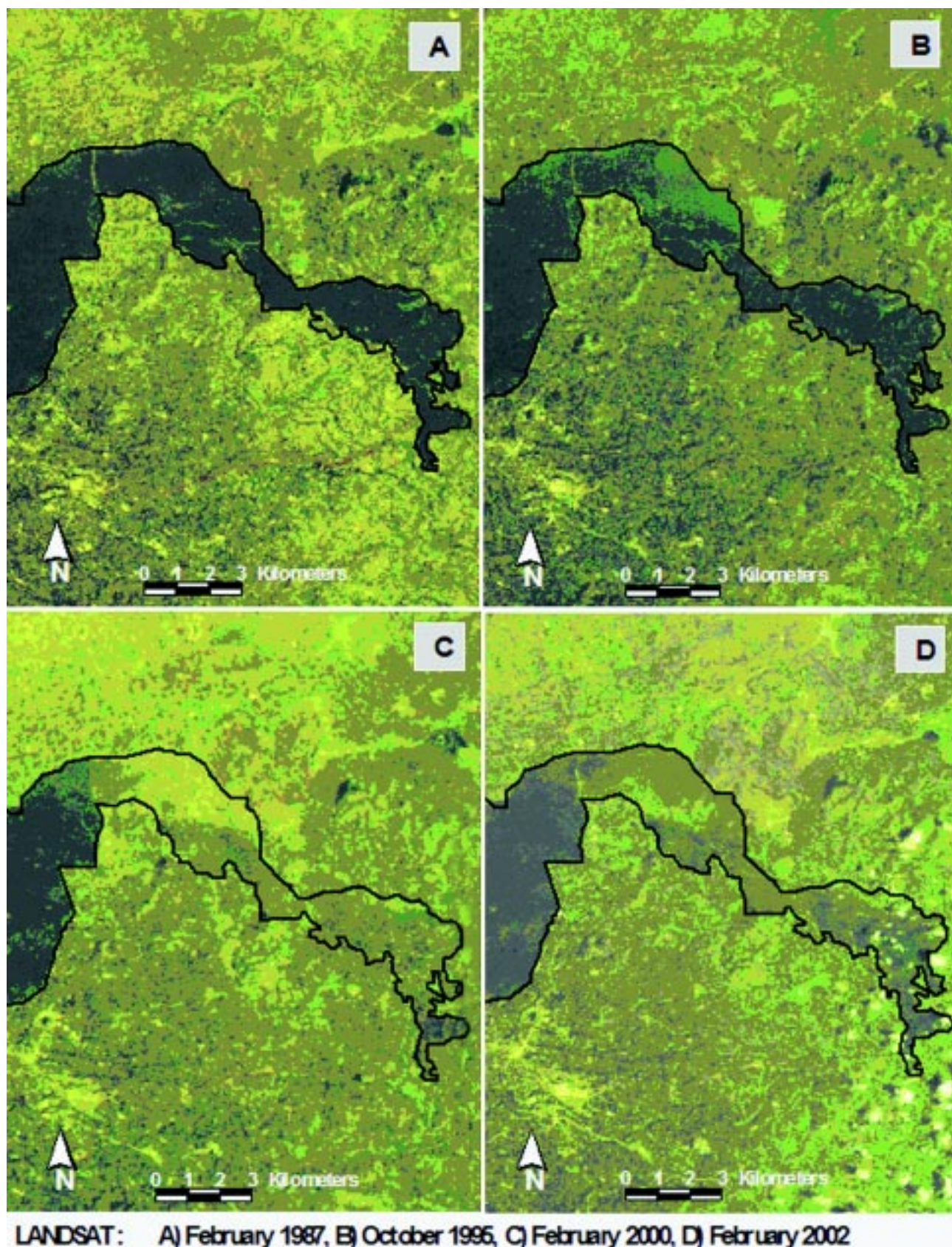
Between 1987 (A) and 1995 (B), much of the forest plantation was clear-felled. Encroachment well beyond the forest plantation area occurred by 2000 (C). The squatters were evicted between 2000 and 2002. Regenerating forest is appearing on the 2002 image (D).



**LANDSAT: A) February 1987, B) October 1995, C) February 2000, D) February 2002**

**Figure 4.5: Changes in the Lower Imenti forest**

The forest thinned between 1987 (A) and 1995 (B), and almost entirely disappeared by 2000 (C). By 2002 (D), forest regeneration is occurring in the entire area following eviction of squatters.



## 4.2. An aerial survey comparison

### 4.2.1. General comparison

The level of destructive activities, in particular logging of indigenous trees, decreased substantially between 1999 and 2002. In the 30 sampling squares, logging went down from 2,690 indigenous trees individually counted in 1999 to 186 in 2002 (see maps 2 and 3 at Appendix III). In addition there were 2,453 hectares where heavy logging made it impractical to count felled trees individually in 1999, whilst no such fresh clear-felled areas were found in 2002.

Charcoal production has also been reduced significantly from 547 charcoal kilns in 1999 to 205 in 2002. Marijuana cultivation has decreased from 31 hectares in 1999 to 5.8 hectares in 2002 and now occurs mainly in the bamboo zone and no longer in the dense mixed broadleaf forest.

However, there is an increase in livestock grazing from 763 animals in 1999 to 1,120 in 2002.

### 4.2.2. Illegal logging of indigenous trees

During the 1999 survey, illegal logging was identified as the main threat to the integrity of the forests, in particular in the moist *Ocotea* forest on the southern and south-eastern slopes and in the *Juniperus* forest on the drier northern slopes.

Although illegal logging still occurs, the 2002 sampling survey shows a substantial decrease of over 93 percent between 1999 and 2002 (see Table 4.2). In addition, the sampling survey did not find any area where intensive logging made individual tree counting impractical (see Table 4.3).

Table 4.2: Level and changes in logging activities between 1999 and 2002

Tree species	Number of logged trees 1999	Number of logged trees 2002	Changes in percent
Camphor ( <i>Ocotea usambarensis</i> )	1,525	55	- 96
Cedar ( <i>Juniperus procera</i> )	208	55	- 73
Other indigenous trees	957	76	- 92

Table 4.3: Level and changes in areas heavily impacted by logging, 1999 vs 2002

Forest type	Number of hectares heavily impacted 1999	Number of hectares heavily impacted 2002	Changes in percent
<i>Ocotea</i> forest	2,112	0	- 100
<i>Juniperus</i> forest	0	0	0
Other broadleaf forests	341	0	- 100

### 4.2.3. Charcoal production

In 1999, 547 charcoal kilns were counted in the 30 sampling squares. They were all located in indigenous forest neighbouring settlements or shamba-system areas. The 2002 sampling survey recorded a net decrease in charcoal production from 547 to 205 kilns. Nevertheless, charcoal production still remains a threat to the indigenous forest, in particular in Thegu and Imenti forests and many areas between shamba-system areas and settlements (see Table 4.4). Some badly affected areas, such as Burguret / Gathiuru, were not covered by the random selection of survey squares.

Table 4.4: Level and changes in charcoal production between 1999 and 2002

Location	Number of charcoal kilns 1999	Number of charcoal kilns 2002	Changes in percent
Thegu, Imenti forests	496	139	- 72
Other forest areas	51	66	+ 29
Total	547	205	- 62

### 4.2.4. Marijuana fields

In the sampled areas, 22 marijuana fields were recorded during the 1999 survey, all of which were located in mixed broadleaf forest on the south-eastern slopes along the Ruguti and Thuchi rivers. The average size of these fields was approximately 1.4 hectares.

The 2002 sampling survey indicates major changes with regard to marijuana cultivation. Whilst the number of fields has increased from 22 in 1999 to 29 in 2002, the size of the fields has decreased from an average of 1.4 hectares to 0.2 hectares (see Table 4.5). Consequently, the area under cultivation decreased from 31 hectares to 5.8 hectares. In addition, the location of the fields has shifted from the dense mixed broadleaf forest to the bamboo belt, in particular where bamboo has died naturally and left open areas easily convertible into fields.

Table 4.5: Level and changes in marijuana cultivation between 1999 and 2002

Marijuana fields	1999	2002
Number of fields	22	29
Location	Mixed broadleaf forest	Bamboo belt (dead stand)
Average area	1.4 hectares	0.2 hectares
Total area	31 hectares	5.8 hectares



#### 4.2.5. Other threats

Other threats to the forest recorded in the 30 sampling squares include: fire occurrences, livestock grazing, and landslides.

Livestock grazing has increased from 763 animals in 1999 to 1,120 animals in 2002. Fires decreased from 3 occurrences in 1999 to one in 2002 whilst landslides have increased from 7 to 12. However, the few fire and landslide events recorded in the 30 sampling squares made it difficult to draw any definite conclusion (see Table 4.6)

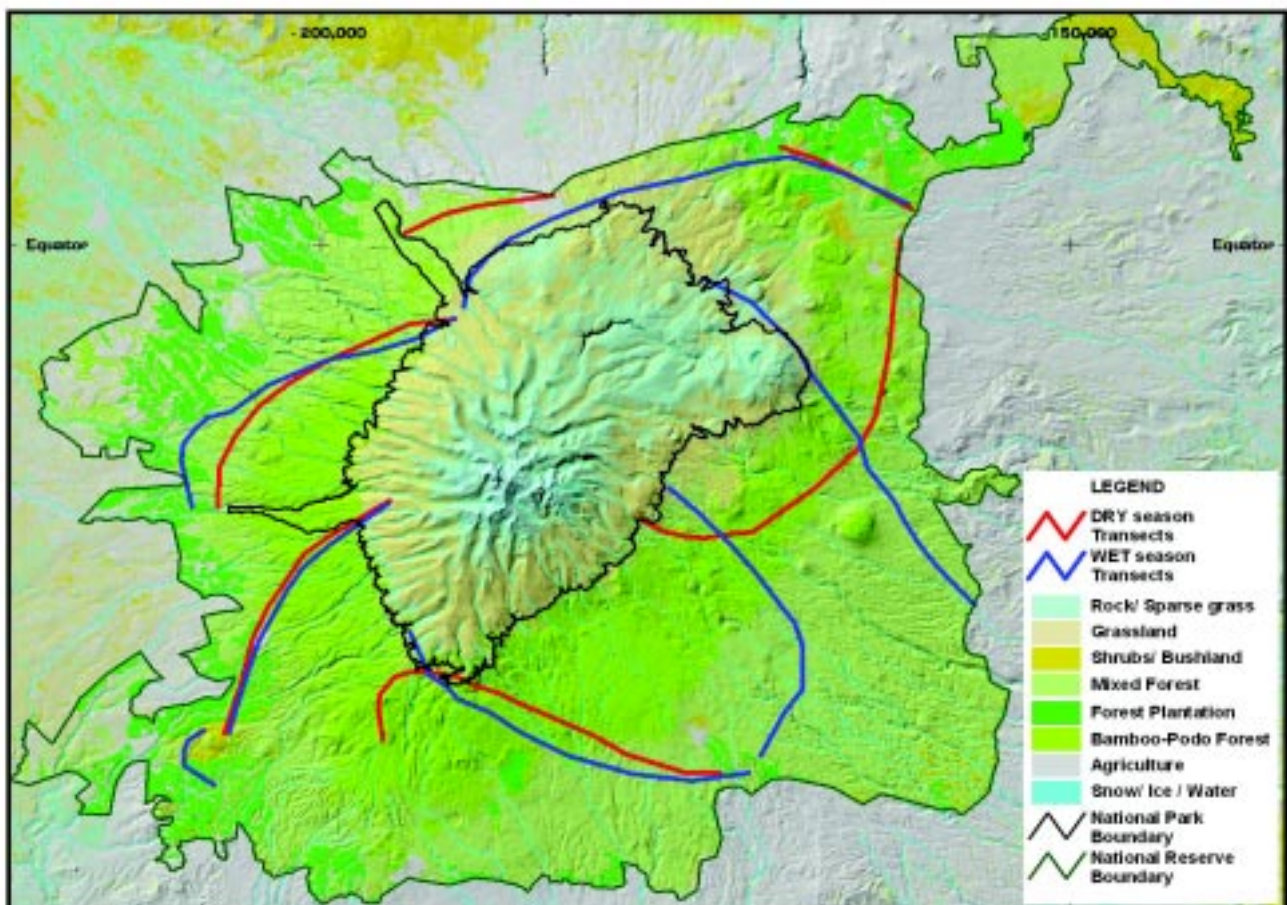
Table 4.6: Level and changes in other threats between 1999 and 2002

Other threats	1999	2002
Livestock (head)	763	1,120
Fire (occurrence)	3	1
Landslides (number)	7	12

#### 4.3. A ground survey comparison

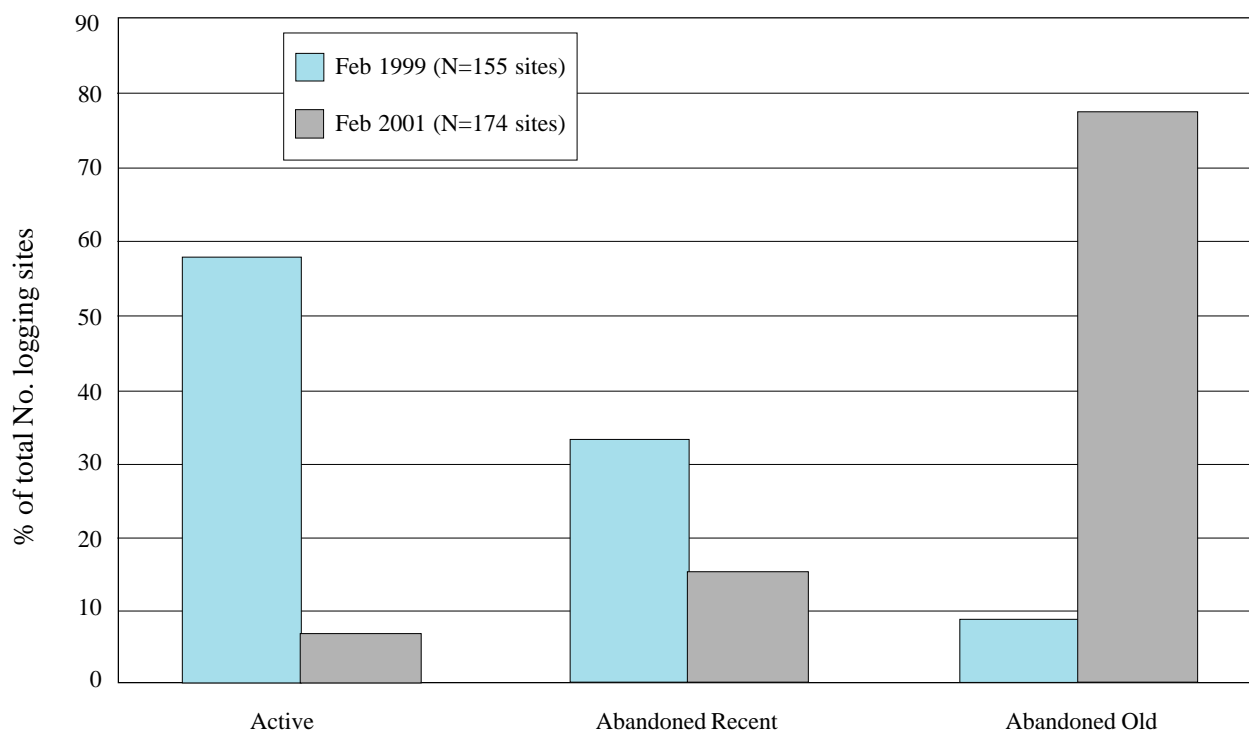
Along the line transects walked in 1999 and 2001, logging sites, among other observations, and their level of activity were recorded (Fig 4.6).

Figure 4.6: Mt. Kenya transects (February 1999 and February 2001)



Logging sites were categorized as ‘active’, ‘abandoned recent’ (no human activity and not yet overgrown with vegetation), or ‘abandoned old’ (no human activity and overgrown with vegetation). The result of the 1999-2001 comparison is given in Figure 4.7.

**Figure 4.7: Changes in logging activity 1999 vs. 2001**



Active logging decreased by 88 percent from 1999 to 2001 (see Figure 4.7). Only 6.9 percent of the logging sites encountered in 2001 were active as opposed to 57.4 percent in 1999. Most of the logging sites (77 percent) recorded in 2001 were classified as abandoned old and 16.1 percent as abandoned recent. At the time of the February 2001 ground survey, KWS had been managing the forests for approximately seven months. Although logging had not entirely stopped, the changes recorded are significant, and are most likely the result of KWS law enforcement operations.

The 2001 ground survey in the Rutundu-Chogoria area occurred some three weeks after the area had been patrolled by KWS. Although very limited in number, some recent activities were found in that area, suggesting relapses in logging soon after KWS patrols leave an area.

## 5. DISCUSSION

In accordance with the objectives of the study, changes in the state of conservation of Mt. Kenya forests since 1999, including the positive changes and the remaining threats, are assessed and illustrated in this report. Time series analysis of satellite imagery, and comparative analysis of two aerial surveys and two ground surveys, show an overall improvement in the state of conservation of Mt. Kenya forests since the change in management in 2000.

### 5.1. Forest plantations and the shamba-system

Through time series analysis of satellite images it was found that most of the areas clear-felled in 1987 and 1995 had not been replanted by 2000, resulting in significant planting backlogs. Between 2000 and 2002, replanting increased nineteen-fold as compared with the period between 1995 and 2000.

The positive change after 2000 can be attributed to a crash replanting programme by FD, assisted by local community groups, and increased enforcement of shamba-system regulations.

### 5.2. Encroachment in indigenous forest

Through time-series analysis of satellite imagery it was found that land under illegal cultivation or settlement within the National Reserve's indigenous forest decreased drastically in all areas except for three illegal settlements situated along the northern boundary of the National Reserve.

Encroachment was often a result of the abuse of the shamba-system, whereby expansion into adjacent indigenous forest occurred unchecked. Another form of encroachment was direct settlement of people in the indigenous forest, allowed to spread through local political expediency or corruption.

Effective monitoring and enforcement resulted in encroached areas being vacated in 2000 as National Reserve status does not provide for forest cover to be converted into settlement – legal or otherwise.

### 5.3. Illegal logging of indigenous trees

Aerial surveys revealed that logging decreased by 93 percent between 1999 and 2002. Significantly, logging of Cedar went down by 73 percent and Camphor by 96 percent. Intensive logging leading to loss of canopy as was observed in 1999 is no longer occurring. The ground survey showed that the number of active logging sites decreased by 88 percent from 1999 to 2001.

Such a major decrease indicates that the new management and protection measures put in place by KWS to protect the indigenous forests are effective, especially since these measures have only been applied for two years.

The decrease in logging activities is not due to past depletion of some tree species, since this decrease has been recorded for all affected species and good stands of indigenous trees still exist.

The ability of KWS to induce such changes relate to the capacity to regularly monitor the forest and conduct effective enforcement patrols. The capacity of KWS includes:

- A number of operational vehicles and an aircraft that enable regular monitoring of the National Reserve.
- Radio equipment in all stations. All vehicles are also equipped with radios, and rangers have handheld radios on patrols.

- Rangers are armed and trained. Confronting hostile law breakers and wild animals without any form of protection is dangerous. KWS rangers receive para-military training, are uniformed and armed and are deployed as fully equipped mobile patrols
- KWS is relatively well funded and maintains credibility to attract additional support.

#### 5.4. Charcoal production

Charcoal production sites decreased by 62 percent, from 547 kilns counted in 1999 to 205 kilns counted in the same area in 2002. The number of charcoal kilns went down by 72 percent in the Thegu and Imenti forests, but increased by 29 percent in other forested areas, especially close to the forest edge.

The difficulty in addressing charcoal production as effectively as logging seems, *inter alia*, to be because charcoal, once removed outside the National Reserve, cannot be easily intercepted, since proof of origin is difficult to determine.

#### 5.5. Marijuana (bhang) cultivation

The decrease in Marijuana cultivation and the shift in strategy by the growers of establishing much smaller fields well away from settlement adjacent areas indicates successful law enforcement efforts by KWS and other Government bodies. Ultimately, eradication of the vice depends not just on further KWS operations within the forest but also increased follow-up of drug trafficking outside it by the relevant arms of Government.

#### 5.6. Livestock grazing

The number of grazing livestock increased by 47 percent, from 763 animals counted in 1999 to some 1,120 heads in 2002. KWS believes this to be a result of the severe drought of 2000 during which pastoralists were authorised by the Government to bring their livestock temporarily into the Mt. Kenya forests. Although the pastoralists vacated the area after the onset of the rains, many local farmers gathered abandoned livestock and formed large herds of their own. It is doubtful that this significant increase of livestock has been formalised by FD with the issuance of grazing permits. Such numbers may be detrimental to forest regeneration as well as increasing pressure on wildlife range.



## 6. CONCLUSIONS AND RECOMMENDATIONS

The 1999 aerial survey established comparable baseline information on the ongoing extensive destruction of Mt. Kenya forests. This has proved crucial for comparing the trends taking place in selected areas. The Government's move in placing the forests of Mt. Kenya under KWS management was fully justified, as protection measures were put in place and a significant reduction in forest damage and improvement in forest cover was observed. This improvement, however, is relative to the critical situation assessed in 1999. There are still some persistent threats to the forests of Mt. Kenya, and strengthening KWS capacity to protect and manage the ecosystem will ensure a bright future for the conservation of the mountain and the invaluable environmental services it provides to the country.

The recommendations contained in the 1999 aerial survey report are reproduced in italics in Appendix II, annotated with comments on the status of implementation since 1999.

Towards the sustainable management of Mt. Kenya forests, further recommendations are proposed:

- 1) To strengthen KWS capacity, as a priority, to enforce protection of the Mt. Kenya ecosystem from persistent threats, in particular charcoal production, illegal logging and unregulated livestock grazing.
- 2) To bring under control the transit of illegal forest produce through coordinated actions by all Government arms.
- 3) To formalize the modalities for jurisdiction and management hand-over from FD to KWS.
- 4) To secure the commitment of the Government to preserve the entire protected ecosystem from any reduction to its total area.
- 5) To finalize the Mt. Kenya Ecosystem Management Plan in consultation with the appropriate stakeholders, and prepare a nomination file for an extended World Heritage site to be submitted to the World Heritage Committee.
- 6) To establish a research station for ecological monitoring of the Mt. Kenya ecosystem, in particular areas that have been heavily impacted by illegal activities.
- 7) To use a Geographical Information System (GIS) for effective monitoring of changes in the ecosystem using, among others, aerial surveys and satellite imagery.

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## 7. REFERENCES

Gathaara, N.G. (1999): "Aerial Survey of the destruction of Mount Kenya, Imenti and Ngare Ndare Forest Reserves". Nairobi, Forest Conservation Programme/Kenya Wildlife Service.

Kohler (1986): "Mount Kenya : The forest belt and its utilization" in Winiger, M., "Mount Kenya Area: Contributions to Ecology and Socio-economy". African Studies Series. Geographica Bernensia, University of Berne, Institute of Geography. (Vol A1; pp91-104).

Lambrechts, C., *et al.* (2002): "Aerial Survey of the Threats to Mt. Kilimanjaro Forests". UNDP, UNEP, UNEP, KWS, University of Bayreuth, Wildlife Conservation Society of Tanzania.

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## ACRONYMS

<b>BCP</b>	Biodiversity Conservation Programme of the European Union
<b>CITES</b>	Convention on International Trade in Endangered Species of Wild Fauna and Flora
<b>DICE</b>	Durrell Institute for Conservation and Ecology, University of Kent
<b>FD</b>	Forest Department
<b>GEF</b>	Global Environment Facility
<b>IFAD</b>	International Fund for Agricultural Development
<b>KFWG</b>	Kenya Forests Working Group
<b>KWS</b>	Kenya Wildlife Service
<b>NGOs</b>	Non Governmental Organizations
<b>UNDP/GEF-COMPACT</b>	United Nations Development Programme / Global Environment Facility – Community Management of Protected Areas Conservation
<b>UNEP</b>	United Nations Environment Programme
<b>UNESCO</b>	United Nations Education, Scientific and Cultural Organization
<b>UNF</b>	United Nations Foundation
<b>USAID</b>	United States Agency for International Development

## APPENDIX I



### MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES

Telegrams: "MAJT" Nairobi  
Telephone: Nairobi 243088

OFFICE OF THE MINISTER FOR ENVIRONMENT  
BRUCE HOUSE

STANDARD STREET  
P.O. Box 67839  
NAIROBI

Ref. No. MENR 04/1A

Date:

14<sup>TH</sup> July 2000

Hon. Major (Rtd) Marsden H. Madoka EGH. MP  
Minister of State  
Office of the President  
P.O. Box 30510  
NAIROBI

Dear *Marsden,*

#### MT. KENYA FOREST AREA

Following the decision of the Government that the whole of the Mt. Kenya gazette forest area, which is currently managed under the Forests Act (CAP 385), be placed under Kenya Wildlife Service and protected under the Wildlife (Conservation and Management) Act, Cap. 376, I am formally releasing the entire area to you so that the necessary gazettment process can be effected

It is envisaged that Kenya Wildlife Service will immediately take over full responsibility over the area and manage it as a National Reserve, so as to ensure maximum protection of the valuable resources in the area.

Kindly take the necessary steps to place the area under the full management and control of Kenya Wildlife Service

Hon. Francis M. Nyenze. EGH. MP  
MINISTER FOR ENVIRONMENT

## APPENDIX I

### Gazettement of Mt. Kenya National Reserve

Kenya Gazette Supplement No. 48

24th July, 2000

(Legislative Supplement No. 32)

LEGAL NOTICE NO. 93

**THE WILDLIFE (CONSERVATION AND MANAGEMENT) ACT**  
(Cap. 376)

IN EXERCISE of the powers conferred by section 18 (1) of the Wildlife (Conservation and Management) Act, the Minister of State for the time being responsible for matters relating to wildlife, after consultations with the relevant competent authorities, makes the following Order:—

**THE WILDLIFE (CONSERVATION AND MANAGEMENT)  
(MT. KENYA NATIONAL RESERVE) ORDER, 2000**

1. This Order may be cited as the Wildlife (Conservation and Management) (Mt. Kenya National Reserve) Order, 2000.
2. The area of land described in the Schedule hereto is declared to be Mt. Kenya National Reserve.
3. The Mt. Kenya National Reserve shall fall under and be managed by Kenya Wildlife Service.

SCHEDULE

**MT. KENYA NATIONAL RESERVE**

All that area of land measuring approximately 2,124 square kilometres situated in Central and Eastern Provinces, the boundaries of which are more particularly delineated and edged purple on Boundary Plan No. 216/65, which is signed, sealed and deposited at the Survey Records Office, Survey of Kenya, Nairobi, and a copy of which may be inspected at the Office of the Director, Kenya Wildlife Service, Nairobi.

Made on the 20th July, 2000.

**MARSDEN MADOKA,**  
*Minister of State.*



## APPENDIX II

### Review of the implementation of the recommendations contained in the 1999 aerial survey report

#### 1) SHORT-TERM MEASURES

- a) *Similar aerial surveys should be carried out for all other threatened forests;*

Aerial survey is a useful methodology to rapidly assess forest destruction and has been conducted in other major forest ecosystems in East Africa including Mt. Kilimanjaro (2001) and the Aberdare Range (2002).

- b) *Best means to destroy all marijuana growing fields in the forests should be identified immediately through concerted and well coordinated efforts of all government arms;*

Concerted efforts by KWS and other Government arms have resulted in regular operations to destroy marijuana fields. Whilst virtually all the large fields observed in 1999 have since been abandoned, smaller fields deep in the bamboo belt have emerged. Operations continue.

- c) *All Shamba-system areas encroaching into indigenous forests should be stopped forthwith;*

Shamba-system management has improved and most areas are no longer encroaching.

- d) *Special operations should be carried out in the forests to round up illegal material and bring to law those apprehended;*

Operations were mounted by KWS on 25<sup>th</sup> July 2000 – the day following the gazettelement of the National Reserve – and are ongoing to date. Over 1,200 arrests have been conducted and forest produce impounded, including over 3,000 beams of Camphor. The Government has itself provided considerable financial resources under its catchment protection programme initiative.

- e) *The Government should provide support documentation with specific instructions and guidelines on all Presidential directives, other measures that have been issued, and those that will be issued in future, focusing on improved forest conservation and protection. This measure would facilitate harmonised and coordinated implementation of the directives, such as the 1986 Presidential ban on cutting of indigenous trees and the 1997 Presidential statement on management of indigenous and plantation forests.*

A countrywide moratorium on all commercial activities in all forests was put in place on 5 December 1999. The Government gazetted Mt. Kenya National Reserve on 24<sup>th</sup> July 2000 and placed the entire former Forest Reserve (including Thunguru Hill and Imenti forests) under KWS protection and management. FD, however, remained in place to continue to take responsibility for the plantation areas pending modalities for future management.

#### 2) SHORT/LONG-TERM MEASURES

- a) *The Shamba-system should be restricted to sites designated for tree planting within the year under plan and supervision should be stepped up. If the abuse of the Shamba-system persists, the system should be suspended;*

The shamba-system (Non-residential Cultivation) still requires further rationalization and enforcement. Existing constraints within FD still hamper effective management of the system.

- b) *Crash replanting programme should be embarked upon in all clear-felled areas;*

A crash replanting has successfully taken place in most plantation areas under the shamba-system.

- c) *Intervention measures should be identified and put in place to intercept transit illegal forest products and to address control in the local market of targeted indigenous tree species. This should involve all government arms and also seek support from the Lusaka Agreement Task Force;*

Transit of illegally acquired forest produce continues unabated. This recommendation still urgently needs to be addressed since forests other than Mt. Kenya would also greatly benefit.

- d) *The applied methodology should be developed further to enable its wide application as a rapid monitoring tool;*

The aerial survey methodology was further developed from total survey to sampling survey and applied to Mt. Kenya with meaningful results as used in this report.

- e) *Further focused and detailed studies should be undertaken on, among others, the root causes of forest destruction and corresponding intervention measures, including the promotion of stakeholder participation (including local communities) in forest management and protection;*

In the preparatory stages of large projects, including those funded by UNDP/GEF-COMPACT, IFAD/UNEP/GEF, BCP, USAID, studies were conducted on, among others, the root causes of forest destruction. According to KWS, the root causes include a combination of opportunism, lack of enforcement of regulations, poverty and increased need for forest products.

- f) *All concerned stakeholders should actively seek political goodwill and support for the sustainable management and conservation of the remaining Kenya forests.*

A groundswell of public support, lobbying by local NGOs, and international pressure, may hopefully encourage the Government to afford other water catchment areas and forests protection similar to that accorded to Mt. Kenya.

### 3) LONG-TERM MEASURES

- a) *Kenya should provide a comprehensive list of rare, endemic, endangered flora and fauna species and critical habitats and should develop long-term strategic intervention measures both at the local and international levels;*

Kenya's commitment to the protection of endangered fauna species is well recognized globally, particularly in fora such as CITES. However, many flora species also deserve similar attention.

- b) *Forest areas destroyed should be rehabilitated;*

Natural regeneration of indigenous forest has been observed from both aerial survey and satellite imagery. Further research and monitoring may be required to identify the most successful rehabilitation practices.

- c) *The boundaries of Mt. Kenya World Heritage Site should be revised in order to, inter alia, include all non-disturbed natural forests;*

A preliminary zonation proposal which includes an extended World Heritage Site was undertaken and produced in the UNESCO/UNF-funded Mt. Kenya Ecosystem Management Plan.

- d) *Integrated management plans for the World Heritage Site and the overall ecosystem should be developed using the zoning concept, followed by implementation;*

A draft Management Plan has been prepared (see 3(c)). Once finalised in consultation with the relevant stakeholders and approved by KWS, the zonation proposal will be submitted to the World Heritage Committee. The extension includes all indigenous forests that should be part of the core zone where all commercial activities are to be curtailed.

- e) *The revised forest policy should be assigned with a parliamentary sessional paper number and the revision of the legislation should be finalised forthwith, accompanied by requisite restructuring.*

The gazettelement of the National Reserve placed management and protection of the ecosystem with KWS. The revised draft forest bill and requisite restructuring of FD would be of more benefit to other threatened forests.

