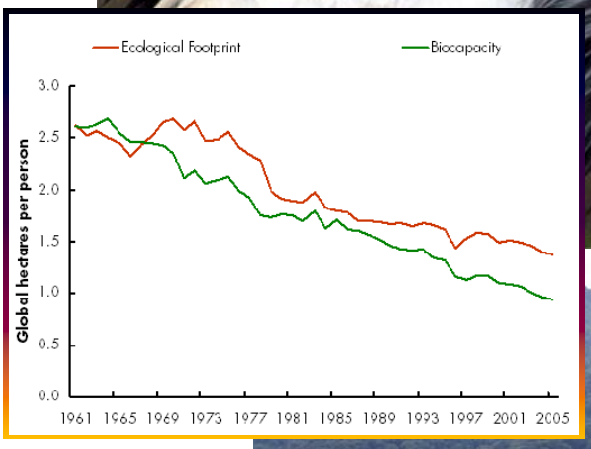
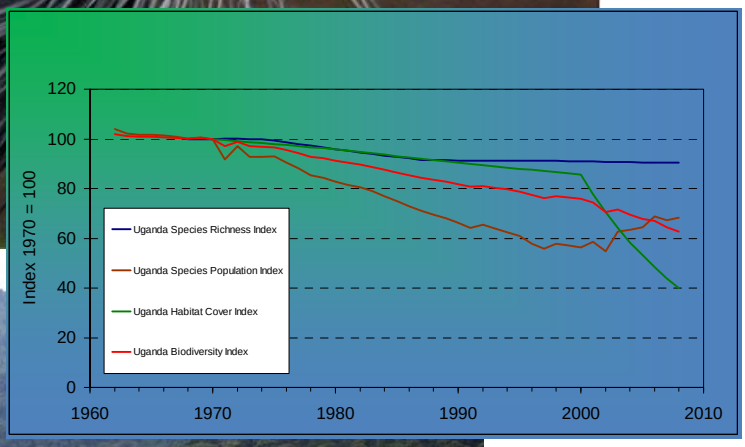
The **State of Uganda's**

BIODIVERSITY





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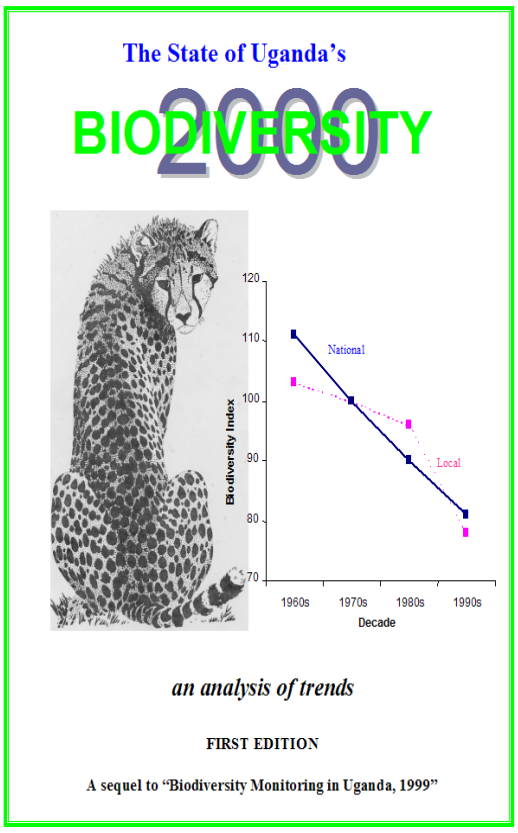
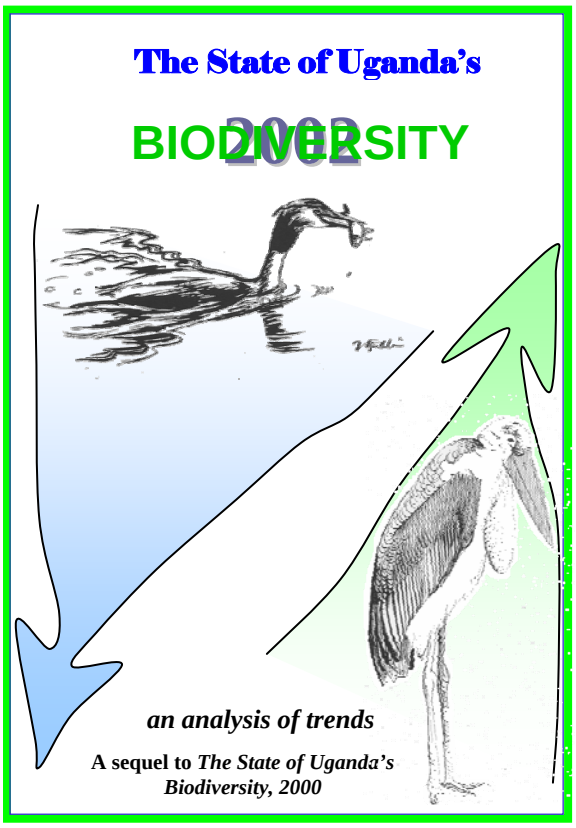
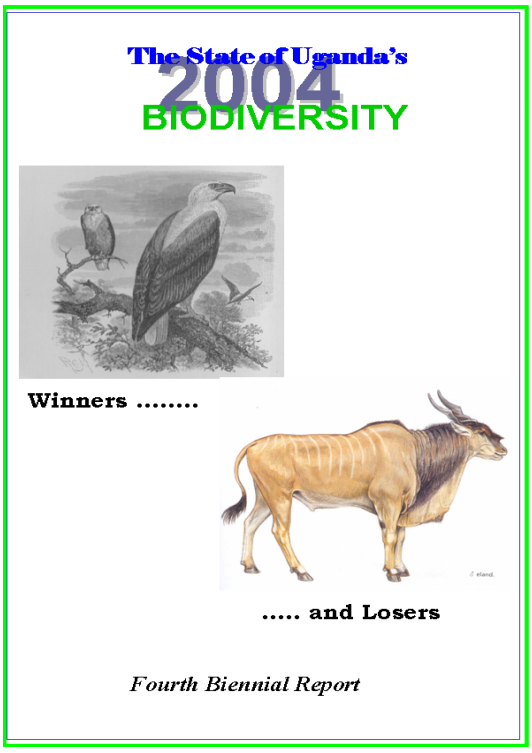
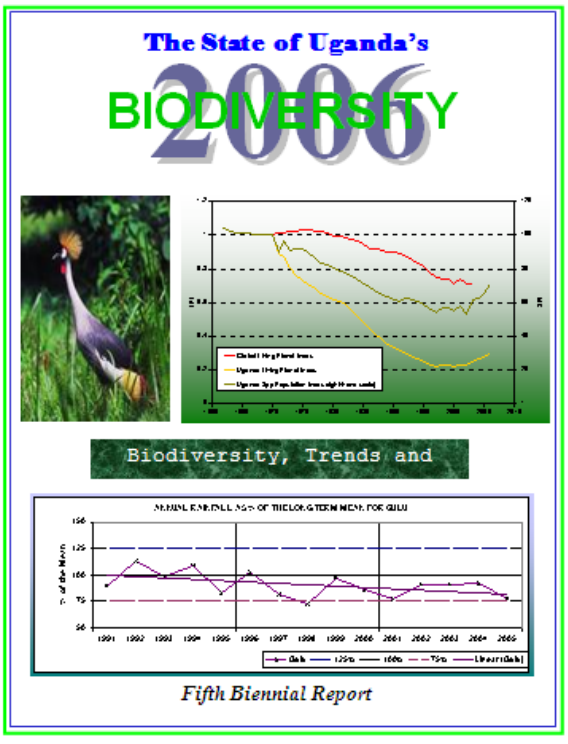








These *State of Uganda's Biodiversity* reports can be obtained from the National Biodiversity Data Bank (NBDB) at MUIENR (nbdb@muienr.mak.ac.ug).

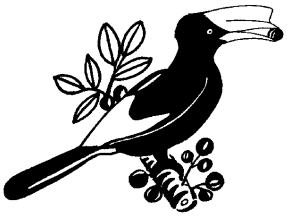
The State of Uganda's Biodiversity 2008

Edited By:

Derek Pomeroy** and **Herbert Tushabe

Guest Contributors:

Perpetra Akite, Dept of Zoology, MAK
Josephine Asasira, MUIENR & ARCOS
Gerald Eilu, FFNC, MAK
Nicola Harrison, Zoological Society of London
Julia Latham, Zoological Society of London
Jonathan Loh, WWF International
Jenny Martin, Zoological Society of London
Jimmy Muheebwa, NatureUganda
Concy Olanya, FFNC, MAK
Michael Opige, NatureUganda



NBDB - MUIENR

with support from

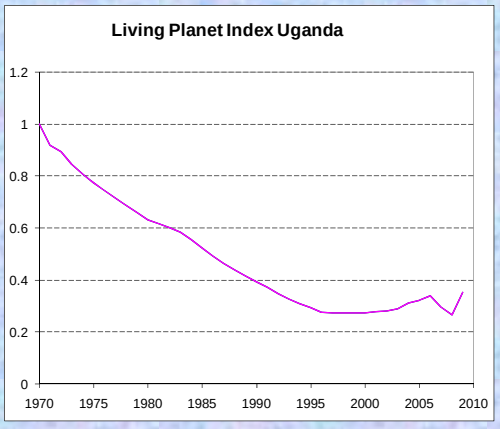
DANIDA – ENRECA

CONTENTS

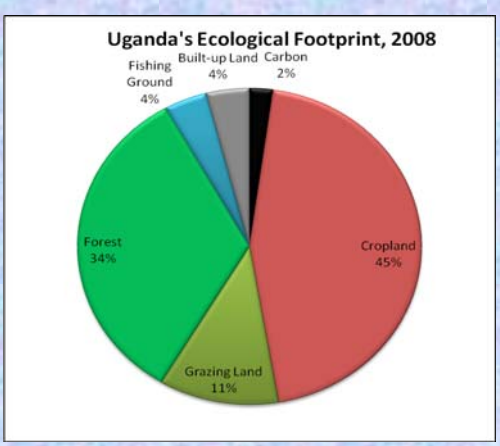
The State of Uganda' Biodiversity in 2008

SUMMARY

- With each successive report on the *State of Uganda's biodiversity*, it has become more clear that we are losing this major resource at a rate of about 1% per year, and that rate is probably increasing. This may sound alarmist, implying that by the end of this century we shall have nothing but concrete and rock – but the evidence is becoming increasingly certain.
- For some things the rates of loss are close to catastrophic – two-thirds of Uganda's forest cover since 1900, 60% of Crowned Cranes since 1970, a third of the species of fish in Lake Victoria, more than 90% of the once-famous Kampala bats.



- Some things are of course increasing, most obviously the Marabou Storks in Kampala but also birds of traditional farming areas. Birds as a whole, and birds of prey – a critical group – are holding their own.
- These and about 90 other data sets together allow us to take an overview of Uganda's biodiversity, thanks to the many individuals and institutions whose data have been freely provided.



- Uganda's 'ecological footprint' – a measure of its use of natural resources - has been negative for 40 years. All of these facts show that, overall, Uganda's use of these resources is well below the level of sustainability and, with the rapid rate of growth of the human population, it will be very hard to achieve anything like sustainability without major changes in policy – and its implementation.

PREFACE

In common with almost all of the world, Uganda is losing its biodiversity – plants, animals and the places where they live – at a rapid rate. We know something of the loss of fish (probably 200 species from Lake Victoria alone) and large mammals (five to ten species): these were reviewed in BD 2006. Many others will have gone without our knowledge because Uganda lacks experts in many groups – spiders, moths, worms and most other invertebrates – and has very few who are knowledgeable in, for example, fungi, algae, mosses or reptiles. We have no idea what is happening to any of these living things.

What we do know is that forests are being lost rapidly, as is clear from Chapter 3. The same is probably true of pastoral areas, although there are no data, so far as we know, about the state of Uganda's unprotected savannas, which cover about half of the country. At the same time, we read in newspapers almost every day of the degradation or complete loss of wetlands.

Some species are known to be doing badly – dramatically so in the case of Kampala's once-famous fruit bats (Chapter 5) but most species of birds seem to be doing quite well (Chapter 4). So overall, the picture is mixed.

So in this report, we present current knowledge in summary form, as an analysis of trends of various sorts of biodiversity and as indices of Uganda's biodiversity as a whole. We concluded BD 2006 (page 3) with the comment that many questions await future research and that remain true today.

ACRONYMS

BD 2000	The State of Uganda's Biodiversity 2002
BD 2002	The State of Uganda's Biodiversity 2002
BD 2004	The State of Uganda's Biodiversity 2004
BD 2006	The State of Uganda's Biodiversity 2006
CBM	Common Bird Monitoring
CFM	Community Forest Management
ENRECA	Enhancement of Research Capacity in Developing Countries
IBA	Important Bird Area
LPI	Living Planet Index
MUIENR	Makerere University Institute of Environment and Natural Resources
NBDB	The National Biodiversity Data Bank
NFA	National Forest Authority
NGO	Non-government Organisation
QENP	Queen Elizabeth National Park
RSPB	Royal Society for the Protection of Birds
SSG	Site Support Group
TSC	Timed Species Count
WR	Wildlife Reserve
WWF	WWF was formerly the Worldwide Fund for Nature

ACKNOWLEDGEMENTS

As with all earlier reports, this one owes much to many people, including those who contributed Chapters 3, 5 and 6. In no particular order, we would especially like to thank-

- the *Living Planet* team for the trend analyses which are core to Chapter 7. They include Jonathan Loh (WWF-International) and Nicola Harrison, Jenny Martin and Julia Letham from the Institute of Zoology at the Zoological Society of London.

- the Uganda Wildlife Authority for continued support and encouragement of research in National Parks.

- Bonnie Metherell of the Large Animal Research Group, Department of Zoology, University of Cambridge, for revising and updating the Banded Mangoose population data.

- Jimmy Muheebwa-Muhoozi (NatureUganda) for new data on Grey Crowned Cranes, Uganda's national bird.

- The Wildlife Conservation Society for new data on the lions of QENP.

- David Taylor for updating tree count data in Mpanga Forest.

- Lilian Twanza and others for counting nests and co-ordinating data on Marabou Storks and Pink-backed Pelicans

- ENRECA for continued financial support, including the publication of this report

- the Peregrine Fund, RSPB and DANIDA-ENRECA for supporting various kinds of bird counts

- MUIENR for its support of the NBDB, without which this report would not exist.

STATEMENT BY DR. ARYAMANYA-MUGISHA, EXECUTIVE DIRECTOR, NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY

AT THE LAUNCHING OF THE SIXTH STATE OF UGANDA'S BIODIVERSITY REPORT (2008) AT THE FACULTY OF FORESTRY AND NATURE CONSERVATION, MAKERERE UNVIVERSITY, KAMPALA

25TH MARCH 2009

The Director, Makerere University Institute
of Environment and Natural Resources,
Invited Guests,
Ladies and Gentlemen,

On behalf of the National Environment Management Authority (NEMA) and on my own behalf, let me begin by welcoming you all this morning to the launch of "The Sixth State of Uganda's Biodiversity Report (2008).

As most of you already know, biodiversity is the key foundation for human well-being and national development. Most of the Government development programmes in fisheries, agriculture, tourism, energy and poverty eradication generally are based on the goods and ecosystem services provided biodiversity. There is also the emerging opportunity for the business sector in wildlife trade which is gaining momentum nationally and internationally.

Over the years, increase in human population world wide has resulted into more pressure being put on biodiversity resources to meeting the increasing human needs for food, medicine, water among others. Uganda's population was 6.5 million people in 1959, by 1980 the population was 12.6 million and in 2002 it had reached 24.4 million. Current estimates put the population at about 31 million people.

Thus Uganda's population has more than quadrupled since 1959. Over 80% of this population is engaged in agriculture as the main economic activity. As the population increases there is need for more land. Consequently fragile ecosystems like wetlands, river banks, lakeshore, hilly and mountainous areas, and forests where much of the biodiversity is found are being destroyed.

The challenge therefore is not only to halt further loss of biodiversity but also to be able to know the status and trends of biodiversity overtime in order for Government to put in place appropriate interventions for biodiversity conservation.

Government has put in place the necessary legal, policy and institutional frameworks to guide conservation which includes the Constitution of the Republic of Uganda, the National Environment Act, the Wildlife Act, the National Forestry and Tree Planting Act, the Access to Genetic Resources and Benefit Sharing Regulations, the National Environment Management Policy, the Wildlife Policy and the Forestry Policy and National Biodiversity and Action Plan just but to mention a few.

The policy and legal frameworks have established relevant Government agencies and departments to manage on behalf of Government and people of Uganda the country's biodiversity resources. One of the challenges faced by these institutions is information upon which to base decision making in the area of biodiversity conservation.

A number of programmes have been put in place by Government to create incentives for the private sector and local communities in biodiversity conservation for example wildlife farming, wildlife trade, ranching, sport hunting and biotrade. These programmes help to create positive attitudes on the need for biodiversity conservation.

In Lake Mburo National Park, the population of wildlife has increased as result of pilot sporting hunting of wildlife that was initiated by Uganda Wildlife Authority in June 2001 with Game Trails (U) Ltd. A total of US $ 181,510 was generated from animal fees within a 5-year period and the local community earned US $ 117,981.5 (65% community share).

Crocodile Farming by Uganda Crocs Ltd in Buwama along Kampala – Masaka Road, Ostrich Farms in Kakuto (Rakai) and Kamuli, Butterfly farming in Kampala and around Zika forests, export of birds and reptiles and the establishment of a snake park in Kajjansi further demonstrates economic benefits that can be derived from biodiversity.

The above biodiversity-based enterprises will depend on the status of biodiversity in the wild and especially biodiversity outside protected areas in the long term. The future of these enterprises is at risk without adequate and reliable information on the status of biodiversity in the country. The effort by Makerere University Institute of Environment and Natural Resources (MUIENR) in preparing and disseminating information on the status of biodiversity in the country is therefore very relevant and timely.

The biodiversity status report for 2008 for example indicates that there is a decline in area of some of the important bird areas (IBAs) especially Lutembe Bay due to increased pressure for development while in other IBAs like Echuya Forest Central Reserve the report observes that the status of the IBA has improved due to increased conservation effort by Government. In management terms, this means Government has to put in more effort and resources to protect the biodiversity and ecosystem at Lutembe Bay among others.

From a study carried out on butterflies in Sango Bay and Iriiri, the 2006 report indicates that decline in species richness was observed in savanna ecosystems in Sango Bay than in forest ecosystems while in Iriiri, there was greater decline in species richness in open savanna than in agro-ecosystems. In the later, more management effort would be needed to conserve butterflies in open savanna for both ecosystems and thefore sustainable use of butterflies would be more appropriate in the forest ecosystems (in the case of Sango Bay) and the agro-ecosystems (for Iriiri).

The biodiversity status report for 2006 notes the positive trend in the recovery of species and predicts that the country could achieve its target of reducing further biodiversity loss by 2010. Information from Uganda Wildlife Authority (UWA) also indicates that the population of large mammals (like elephants, buffalos, antelopes, giraffes) is steadily increasing since peace returned to most parts of the country in 1986.

As illustrated by few examples above, information on the status of biodiversity is very important for institutions charged with the responsibility of managing biodiversity. The National Environment Management Authority (NEMA) therefore commends MUIENR through its National Biodiversity Data Bank for collecting, analyzing and disseminating information on the status of biodiversity in the country.

Ladies and gentlemen before I conclude, I would like to point out the following:

First, in order for these reports to be used by the different stakeholders, I would like to propose that MUIENR prepares a brief summary for decision makers who may not have the time to read through the entire report but also may not easily understand some of the terms used in the report.

Second, sharing of information still needs to be improved. NEMA has on behalf of Government applied for financial assistance from GEF (in September 2008) for establishing a Clearing House Mechanism (CHM) in NEMA. This will help to strengthen information sharing on biodiversity among institutions (like MUIENR).

Third, biodiversity is national heritage for this country. Most of the cultural activities and rituals are associated with biodiversity for example in Bugisu, the skin of a black and white colobus monkey are worn during the circumcision ceremonies. In Buganda clans are associated and identified with species of biodiversity. During the coronation of kings in Uganda, skins of animals such as leopards and lions form part of the regalia. Loss of biodiversity would therefore distort the cultural beliefs. The crested crane (grey crown crane) is a national bird for Uganda.

Fourth, biodiversity provides a gene pool of genetic resources some of which yet to be discovered. More research is therefore needed to document the biodiversity resources in the country. New discoveries on species in Uganda would greatly enrich the biodiversity status reports. I would like to call up on universities to train more taxonomists. Without taxonomists, it will be very difficult to collect accurate information on biodiversity.

Fifth, during 6th meeting of the Conference of the Parties which took place at the Hague in the Netherlands in 2002 the **2010 biodiversity target** was adopted under the Strategic Plan of Convention on Biological Diversity (CBD). The 2010 biodiversity target calls on all Contracting Parties to achieve by 2010 a significant reduction of the current rate of loss of biodiversity as a contribution to poverty alleviation and for the benefit of all life on earth. As you may all know, Uganda signed and ratified the CBD on 12th June 1992 and 8th September 1993.

Being a signatory to CBD, Uganda is bound by all the COP Decisions and is required to implement them. Regular information of the status of biodiversity will contribute to the achievement of the 2010 biodiversity target. As pointed out in the 2006 report, more data is needed for Uganda to assess its progress towards the 2010 biodiversity target. 2010 is just about 9 months away.

Sixth, biodiversity indicators are very important for monitoring the health of ecosystems as well as the impact of climate change. A change in the status of indicator species (for example pollinators) clearly signals that something is going wrong in the environment and immediately calls for intervention. Climate change has direct impact on biodiversity diversity and ecosystems and is therefore a real threat to existence of biological diversity. It has been predicted that an average global temperature of 1.4 to 5.8 ^{0}C will be registered by the year 2100 and this will come along with associated adverse impacts including a further rise in global mean sea level of between 9-88cm (global mean sea level is estimated to have arose by 10 to 20 cm during the 20th century), more precipitation in temperate regions and Southeast Asia hence more floods to be experienced, less precipitation in Africa resulting into more droughts, more frequent and powerful extreme events such as heat waves, storms and hurricanes, an expanded range of disease vectors especially for malaria..

At the regional level, it is estimated that Mount Kenya has lost 92% of its ice mass while Kilimanjaro lost 82% of its ice mass during the 20th century. The ice caps on Rwenzori Mountains have been estimated to have receded by 40% from the recorded cover of 1955

and there is now growing concern that the ice caps on Rwenzori Mountains could disappear in the next 20 years. But what are the consequences of all this changes being brought about by climate change to biological diversity and human survival as well as national development?

Climate change will broadly result into changes in species distribution (already there are indications that migratory birds are being affected by change in climate), increase rate of species extinction, changes in reproduction and changes in length of growing seasons for plants mainly due to increase exposure to heat stress and changes in rainfall patterns, leading to loss of agricultural biodiversity. It is therefore important we start monitoring the impact of climate change on biodiversity.

Seventh, Invasive Alien Species (IAS) have been identified as one of the factors leading to biodiversity loss world wide. IAS as you may already know are species that becomes established in a new environment, then proliferates and spreads in ways that are destructive to native ecosystems, human health and ultimately human welfare.

IAS have been spread by human activities in the form of International introduction of species for use in biological production systems, e.g. agriculture, forestry, fisheries and landscaping, as well as recreational and ornamental purposes and for biological control of pests or through unintentional introduction of species through pathways involving transport, trade, travel or tourism. The most vivid IAS in Uganda is the Water hyacinth (*Eichhornia crassipes*), which was introduced as an ornamental by the pet industry for fish aquaria.

The Water hyacinth was first reported on Lake Victoria in December 1989, having entered the Lake from River Kagera, and then on Lake Kyoga in May 1998. The plant is native to South America where it occurs harmlessly in streams and seasonally flooded environments. Given its high proliferation rate, the weed spread rapidly over to the shores of Lake Kyoga, the banks of the Nile River and most of the northern tip of Lake Albert. By the end of 1996, up to 70,000 and 20,000 hectares of the weed covered Lake Victoria and Lake Kyoga, whose surface areas are 28,655 and 2,047 sq km, respectively.

At the height of the water hyacinth control programme in Uganda, mechanical operations around Owen Falls Dam required the purchase of three harvesters at a total cost of US$ 2.5 million. The water hyacinth affected water transport on the Uganda open water bodies and hydropower power generation. Shutting down of turbines at Owen Falls Hydropower Station (now Kiira) meant not only loss of revenue to the country but also a black-out for consumers. Frequent and massive electricity load shedding due to infestation of the water hyacinth resulted in an estimated loss in energy sales amounting to about US$ 150,000 per month (US $1.8 million per year). Both the mechanical and manual removal of the weed by the former Uganda Electricity Board (UEB) was estimated at US$ 12,000 per month.

A new IAS *Parthenium hysterophorus* has been reported to have invaded Uganda from the east and is spreading to other parts of country. The plant, whose origin is Latin

America, eliminates other biodiversity and is known to cause allergies in humans including skin rush as well as bronchitis and asthma. There is therefore need collect information on the IAS in Uganda and there impact on the status of biodiversity to enable proper management decision on management of IAS. This is an area that should be included in the status reports.

Eighth, the use of Genetically Modified Organisms (GMOs) is gaining momentum in some parts of the world. Although GMOs have been widely viewed as having the potential to address some of the pressing global problems like food security and biofuel, there is limited knowledge on the impact of GMOs on a country's indigenous biodiversity and human health as well. Globally, there is concern that the introduction of genetically modified trees may find their way into developing countries in the disguise of fast growing trees for biofuel production. This is a new and challenging area which I would like to call upon universities and research institutions to take interest in.

Lastly I would like to thank all of you for coming to participate in the launch of The State of Uganda's Biodiversity (2008). I thank MUIENR for organizing this function which is held biennially and for preparing the biodiversity status reports. I call upon MUIENR to include issues on IAS and impact of climate change on biodiversity in future reports. The biodiversity status reports are very useful to stakeholders involved in biodiversity conservation and this therefore calls for wider dissemination of the reports through CDs and electronic means to stakeholders.

With these few remarks, it is now my singular duty to declare The State of Uganda's Biodiversity Report (2008) launched.

I thank you.

For God and My Country.

CHAPTER ONE

General Introduction

Each successive edition of the report – and this is the sixth – reflects the losses and gains in he biodiversity of this biodiverse-rich country. This in turn reflects the contributions of many different people and, for most of them, the organisations where they work. The National Biodiversity Data Bank at Makerere University Institute of Environment and Natural Resources does generate some data itself (for example, on Common Birds as described in Chapter 4), but most come from elsewhere. These freely-given data are available to all who need them for non-commercial purposes (nbdb@muienr.mak.ac.ug), subject only to due acknowledgment.

The human population of Uganda is now about 30 million, of whom some nine million people are below the poverty line in the sense of having few if any choices as to how they live. With its exceptionally high rate of population growth (about 3.5% every year), the demand for natural resources is already exceeding the supply, as we show in Chapter 2 on Uganda's footprint. The government has policies on the conservation of natural resources, but it is hard to see how the National Forest Authority (NFA) and the Uganda Wildlife Authority (UWA) together with the Wetlands Division of the Ministry of Water, Lands and Environment can hope to manage this alone. As Gerald Eilu and Concy Olanya show in this report, the NFA themselves have been documenting the rapid rate of forest loss – and therefore the loss of the plants and animals that live in those forests. Independent observations suggest that forest loss may be even higher than the NFA recognizes. The same is true of woodlands which, somewhat confusingly, are sometimes included with forests. (The usual distinction is that woodlands have a low, open canopy and the understorey is often dominated by grass: in contrast, forests have a high canopy, often closed, and a fairly open understorey in which grasses are relatively common).

The loss of forest cover is one of the most striking, and sad, aspects of how biodiversity is changing in Uganda. It remains very difficult to get agreed expert opinion on the actual amounts, but Figure 3.1 (Chapter 3) shows five points based upon data which are considered to be fairly reliable. Current losses are particularly high on some of the Lake Victoria islands and in western Uganda.

New data

Completely new data sets have been acquired for several sets of counts of birds of prey (stimulated and partly funded by the Peregrine Fund), and for two species of nightjars in Murchison Falls National Park (with support from ENRECA). A more general set of data on Common Birds (based upon more than 100 species) has also entered our database for the first time (see Chapter 4). This is planned to develop into Uganda's first scheme involving the public, through a joint NatureUganda-NBDB programme with experienced volunteers.

Many of the other existing data sets have also received new data. In previous reports they have been listed individually but this year they simply contributed to the overall calculation of trends (Chapter 4). Most are also included in our list of Acknowledgements (page iii).

CHAPTER TWO

Uganda's Ecological Footprint, Biocapacity and Ecological Deficit

Herbert Tushabe

The *Ecological Footprint*, a measure for humanity's demand on the biosphere (Global Footprint Network, 2008; WWF, 2008) in terms of the area of *biologically productive* land and sea we need to provide us with resources we need and absorb the waste we produce, reflects the pressure we put on our planet. In other words, the Ecological Footprint can be described as per person resource demand. *Biocapacity* on the other hand, refers to per person resource supply. Both Ecological Footprint and Biocapacity are measured in global hectares (gha), i.e. a hectare with world-average ability to produce resources and absorb waste. The Ecological Footprint is calculated annually by the Global Footprint Network (GFN), and is an indicator of biologically productive land and sea required to renew the resource throughput of a defined population in a given year, with the prevailing technology and resource management of that year.

The National Ecological Footprint is the sum of all biologically productive land and sea required by a particular country (in our case Uganda) for crops and grazing; forest and fishing areas; and infrastructure required to supply the country's resource demand and to absorb the waste generated. Biocapacity is the sum of all available land and sea for cropland, grazing, forestry and fishing grounds; to provide resources a population consumes and absorb waste.

Thus, if a country's Total Ecological Footprint is higher than the Total Biocapacity, then it is an *ecological debtor*, and if the converse is true, it is an *ecological creditor*. In simple terms, the footprint can be considered as resource demand whereas Biocapacity would refere to resources supply. Therefore the situation where a countery is an ecological debtor, is where *demand exceeds supply*. Uganda's current Total Ecological Footprint is 1.38 gha per person, whereas the Biocapacity stands at 0.94 gha per person, leaving an ecological deficit of -0.44 gha/person. In fact, Uganda has been in deficit since the 1960s (Figure 6.3). As expected, the largest part of the deficit is accounted for by forest land, followed by cropland. This calls for attention to these components. Since the Ecological Footprint also factors in population, there is need to note the high population growth rate and reconsider policies related to population growth. These figures are shown in Table 2.1 and Figure 2.1.

Table 2.2 is a comparison of Uganda's deficit with other African countries, showing that only five countries have greater deficits, and emphasising the need for greater concern on sustainability. At present, Uganda's deficit is increasing (Figure 2.2) – we are mining natural resources unsustainably.

Table 2.1. Uganda's Ecological Footprint and Biocapacity

Component	Ecological Footprint (gha/person)	Biocapacity (gha/person)	Ecological Deficit or Reserve (gha/person)
Carbon	0.03		
Cropland	0.62	0.57	-0.05
Grazing Land	0.15	0.24	+0.09
Forest	0.46	0.02	-0.44
Fishing Ground	0.06	0.06	+0.01
Built-up Land	0.06	0.06	+0.00
TOTALS	**1.38**	**0.94**	**-0.43**

Source: Global Footprint Network, 2008.

Figures from Global Footprint Network, 2008

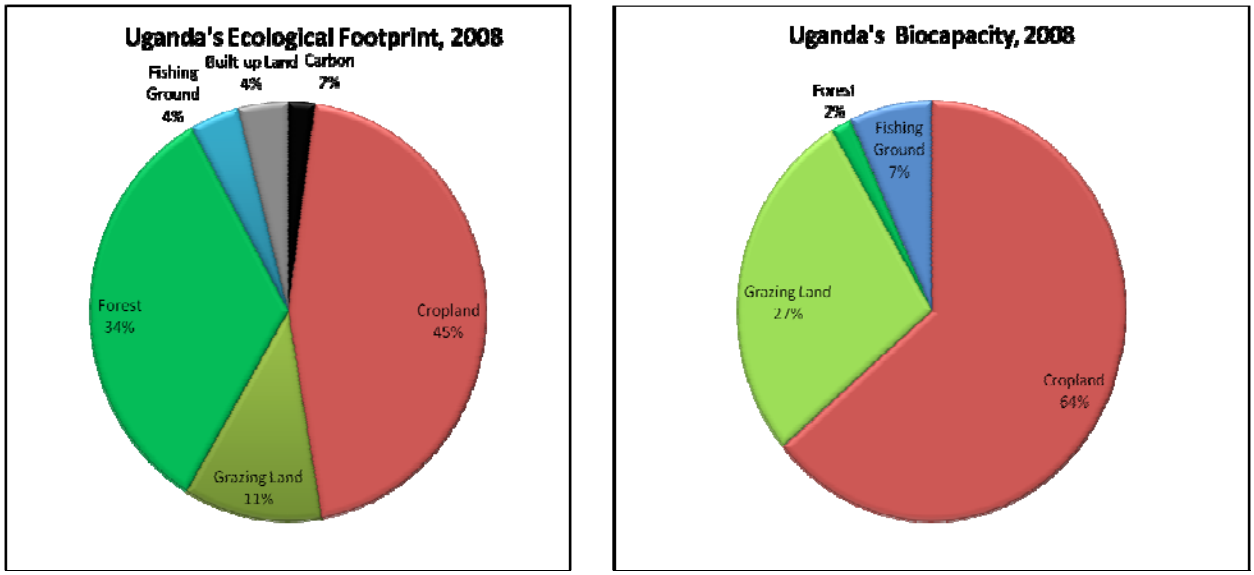


Figure 2.1. Uganda's Ecological Footprint and Biocapacity

Table 2.2. A comparison of Uganda's Ecological Deficit with other African countries

(The figures in red are ecological deficits)

Country	Ecological Deficit or Reserve	Country	Ecological Deficit or Reserve
Africa	**0.4**	Libya	3.3
Algeria	0.7	Madagascar	2.7
Angola	2.3	Malawi	0.0
Benin	0.5	Mali	0.9
Botswana	4.8	Mauritania	4.5
Burkina Faso	0.4	Mauritius	1.5
Burundi	0.1	Morocco	0.4
Cameroon	1.8	Mozambique	2.5
Central African Rep.	7.8	Namibia	5.3
Chad	1.3	Niger	0.2
Congo	13.3	Nigeria	0.4
Congo, Dem. Rep.	3.6	Rwanda	0.3
Côte d'Ivoire	1.3	Senegal	0.2
Egypt	1.3	Sierra Leone	0.2
Eritrea	0.9	Somalia	0.0
Ethiopia	0.3	South Africa, Rep.	0.1
Gabon	23.7	Sudan	0.4
Gambia	0.0	Swaziland	0.9
Ghana	0.3	Tanzania, United Rep.	0.1
Guinea	1.8	Togo	0.3
Guinea-Bissau	2.5	Tunisia	0.6
Kenya	0.1	***Uganda***	***0.4***
Lesotho	0.0	Zambia	2.1
Liberia	1.6	Zimbabwe	0.4

Source: Global Footprint Network, 2008.

Globally, Uganda is at the lower end of Biocapacity. The global average for 2005 was 2.1 gha/person, well above Uganda's 0.94. While there are countries whose Biocapacity is more than 150% of the Ecological Footprint, Uganda falls within the range where the Ecological Footprint is up to 50% greater than Biocapacity (Figure 2.2).

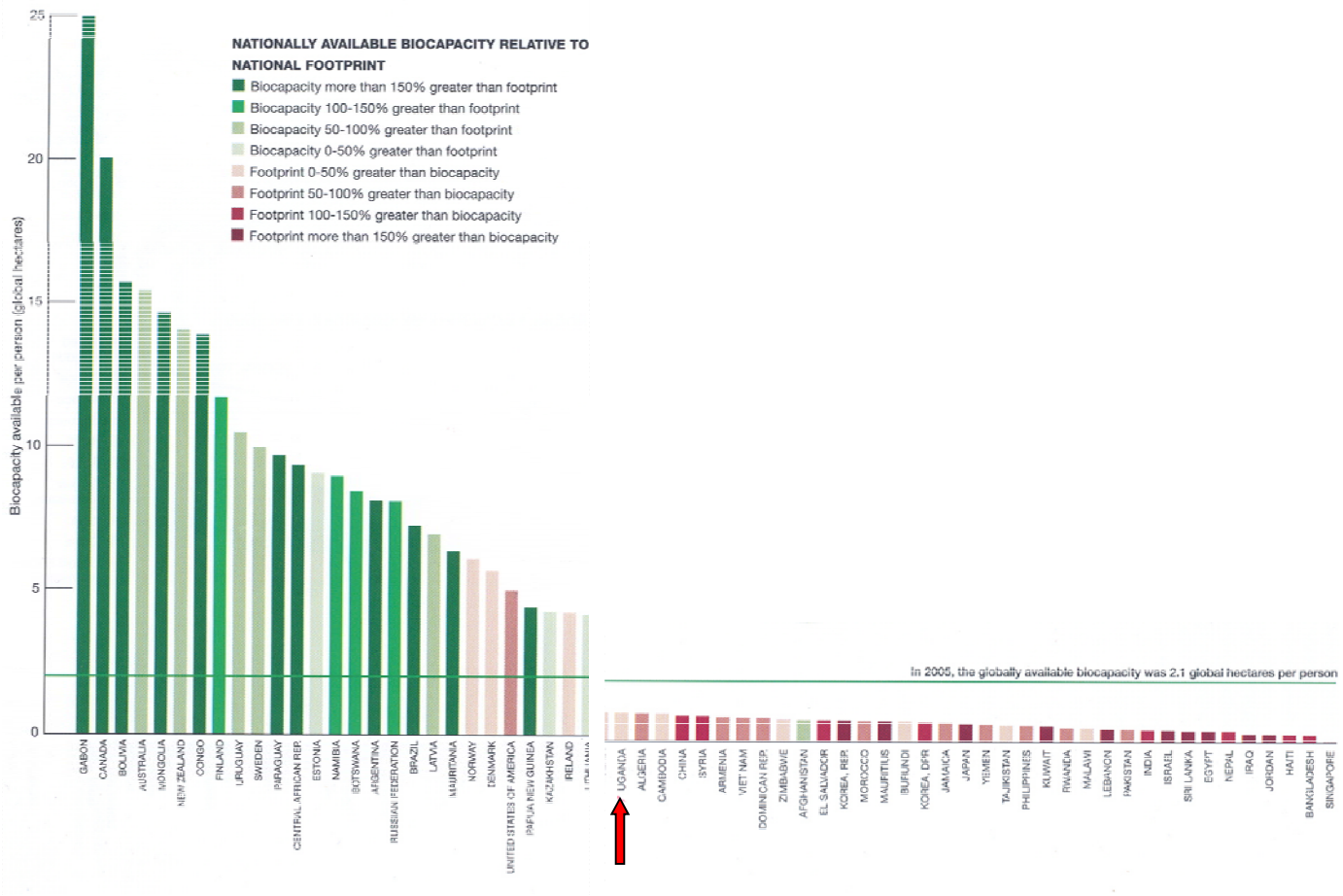


Figure 2.2. Uganda's Biocapacity as compared to some other countries and the global average. The countries shown are from the two ends of the spectrum of 150 countries (Adapted from WWF, 2008).

Though Africa, as a region, has one of the lowest levels of Biocapacity compared to the rest of the globe, it is among the only three regions with an ecological reserve (Figure 2.3). It is worth noting, rather sadly though, that Uganda's Biocapacity is much lower compared to the whole of Africa (1.8 gha/person), albeit the fact that Uganda is much greener than many African countries. Uganda's Ecological Footprint is also close to the total African footprint (1.4 gha/person).

(Adapted from Global Footprint Network, 2008)

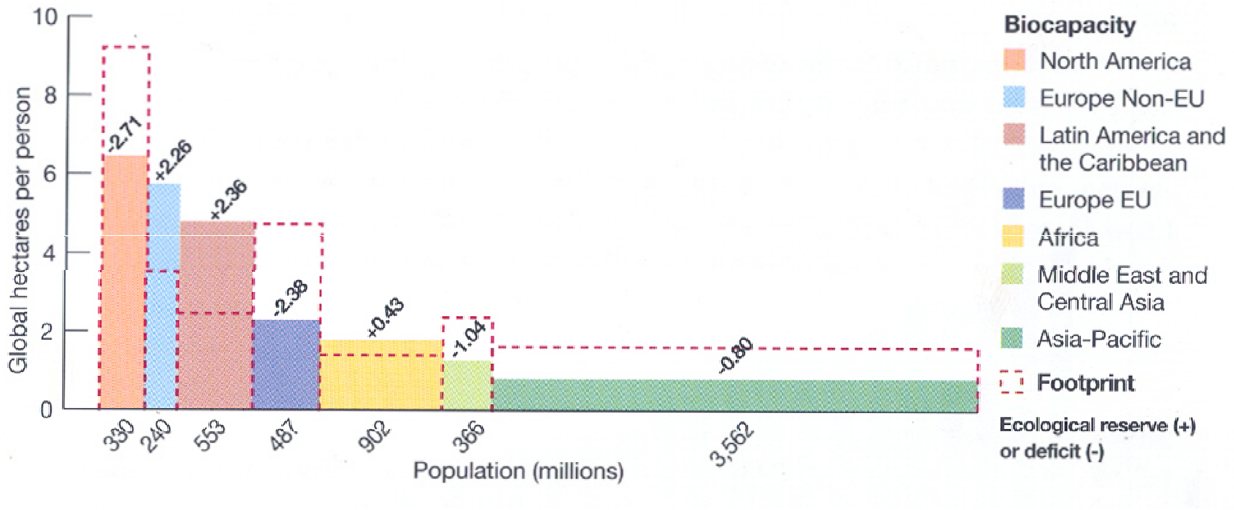
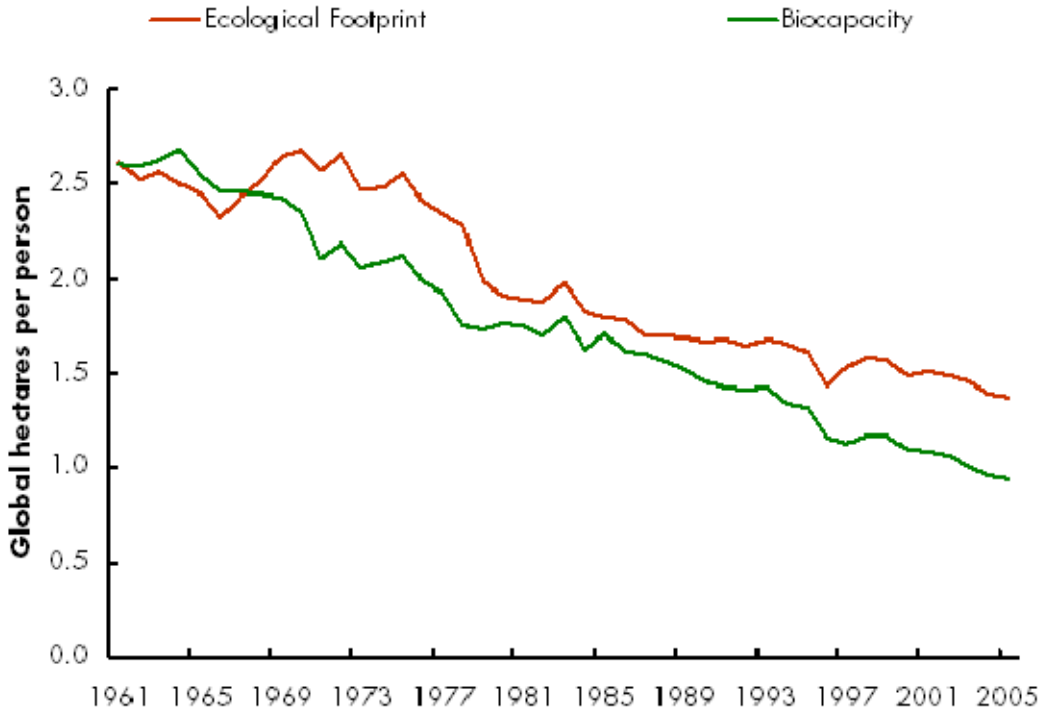


Figure 2.3. Ecological Footprint and Biocapacity by region in 2005.

Global trends in the Ecological Footprint since 1961 show a gradual decrease both in the Footprint and Biocapacity, but the Ecological Footprint remains well above Biocapacity, and also in Uganda (Figure 2.4).



Source: Global Footprint Network, 2008.

Figure 2.4. Trends in Uganda's Ecological Footprint and Biocapacity

CHAPTER THREE

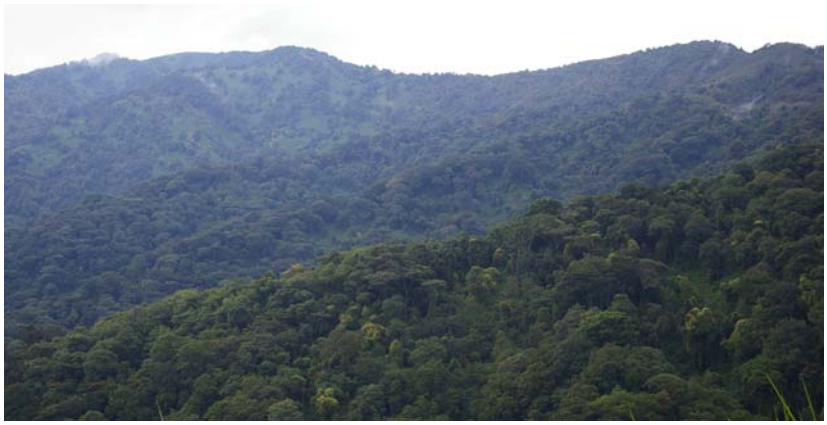
Forests in Uganda: an overview of the current status

G. Eilu and C. Olanya

Introduction

Ecosystems are difficult to define universally because they differ in different parts of the world, but the term 'ecosystem' is useful and its use is widespread. In Uganda, three broad groups of ecosystems (or biomes) are recognized: savannas, wetlands and forests (Arinaitwe *et al* 2000). The forests are considered to be perhaps the richest in terms of biodiversity, but the word 'forest' means different things to different people. Based on the ecosystem areas approach, six land use types are recognized (Appendix I). Five of these could represent forest. Uganda's forests, however, fall into two broad categories namely the Natural/ Tropical high forests (THF) and the Plantations. These two types can be further categorised into five types by FAO as Primary forest, Modified Natural Forest, Semi-Natural Forest, Productive Forest Plantation and Protective Forest Plantation (Appendix II).

The global forest research assessment by FAO (2005) defines a forest as "land spanning more than 0.5 ha with trees higher than 5 m and a canopy cover of more than 10%, or a group of trees able to reach these thresholds *in-situ*". This definition does not include land that is predominantly under agricultural or urban land use but includes areas with bamboo, palms, forest roads, fire breaks and plantations for production or protection purposes. This classification is closely related to that based on the ecosystem areas approach. A forest can also be described in ecosystem terms– as a community of plants (including trees) and animals interacting with one another and with the physical environment.



Montane Forest on the slopes of Mt Rwenzori **(Photo: G.Eilu)**

The definitions are, however, interpreted differently to suit local contexts. Langdale-Brown *et al.* (1964), for example, classified the vegetation of Uganda into 22 types. This includes natural

forests which are classified into three main categories namely: High Altitude Forest, Medium Altitude Moist Evergreen Forest and Medium Altitude Moist Semi-Deciduous Forest (i.e. Langdale-Brown types B, C and D). Other forest types classified include: Forest/ Savanna mosaic (F); and Swamp Forest (Y). Two types of forest, riparian and dry forests, are not large enough to have been mapped, for example by Langdale-Brown *et al* (1964) as well as the National Biomass Survey. In this classification the forest vegetation in Uganda is restricted to the following areas: 1) The high rainfall belt north-west of Lake Victoria, 2) The high rainfall belt along the eastern side of the Western Rift Valley, 3) A medium rainfall belt between the above two, where some young forests exist, 4) The mountains (above about 2000 m asl) where orographic rainfall occurs.

Distribution of forests

In total, there are 506 Central Forest Reserves and Local Forest Reserves. These have been categorised by the National Forestry Authority (NFA) according to their major functions as CFRs of ecological value (watershed protection, protection of water bodies and river courses), biodiversity importance, for conservation of THFs, for industrial purposes (especially timber and plywood), and others. In many parts of the country, forests are confined to valleys owing to easier burning and preferential clearing of intervening ridges, but such forest (unless swampy) do not differ significantly from forests of more extensive areas nearby. True riparian forest (or gallery forest) is found in drier areas where it is confined to river banks and is dependent of the river for its water supplies; the intervening county (if fire is excluded) would either remain savanna or develop into woodland, thicket or direr types of forest. These types occur mainly in northern Uganda. The riparian species in these forests include *Khaya grandifolia, Syzygium guineenee, Trichilia* sp. and *Ficus* spp. In Karamoja *Terminalia brownii* and *Tamarindus indica* are common. On the northern part of Mt Elgon, *Syzygium cordatum*, characteristic of swamp forest elsewhere, occupies stream beds in areas where the climax is dry montane forest or thicket. *Acacia kirkii* subsp. *mildbraedii* is very characteristic of lake shores and rivers of alluvial plains. Fires have reduced the probably once extensive dry forest to remnants. *Strychnos mitis, Warburgia ugandensis* and *Diospyros abyssinica* occur on dry ridges and hill tops in several semi-deciduous forests, probably representing a form of dry evergreen forest. This may be the climax, for example, in Zoka forest. Dry deciduous forest is represented only by *Terminalia brownii* on rocky hills and steep scarps. Some important climax species in the tropical rainforests of Uganda include *Cynometra alexandri* and *Parinari excelsa.*

Loss of forest cover

Tropical high forest (THF) quality has declined over time with loss of productive capacity and biodiversity. Over 30% of THF in Uganda is now degraded and private forests are shrinking very rapidly many of them replaced by plantations of exotic species or agricultural crops. Conservation of biodiversity has not been given priority in establishment of plantations whose aim is to provide raw material to forest industries (Falkenberg *et al.,* 2000).

Over the last 100 years, Uganda's forests have faced severe pressure mainly from agricultural conversion, urban demand for charcoal, over grazing, uncontrolled timber harvesting and policy failures. The annual cost of deforestation in Uganda has been conservatively estimated at US$ 3.8 –5.7 million per year (Falkenberg et al, 2000). Recently, the threat has mainly been from

plantations of Palmoil, Sugarcane and Tobacco as well as encroachment by local people with the support of politicians.

Forest cover in Uganda has therefore halved during the past century. Currently 35% of the population of 31, 367, 972 (CIA, 2008) depends on forest resources leading to massive deforestation. The FAO estimated natural forest cover (including woodlands) in 1890 to be about 10.8 million ha, covering 52% of the surface area of the country but this has shrunk immensely. Langdale-Brown *et al.* (1964) estimated the area of natural forest in Uganda to be about 4% of the total land surface (close to the National Biomass estimate of 5% for the period 1989-1991). It is estimated that deforestation in Uganda occurs at a rate of 55, 000 ha year $^{-1}$ (FAO, 2000). Other authors estimate the forest clearance rate between 70 000 to 200 000 ha per year. These estimates imply deforestation rate is between 0.9 and 3.15% year^{-1}. The Commonwealth Forestry Association (CFA) estimated deforestation rate to be 2.2% (during the period between 2000 and 2005, while the State of Uganda's Biodiversity Report (Pomeroy *et al.* 2004) gives a rate of loss of about 12% between 1970 and 2000.

Estimates for the rate of loss of forest cover have been made by various authors (Langdale-Brown, 1960; Langdale-Brown *et al* 1964 and Pomeroy *et al.*, 2002), the former Forest Department (FD 2001) and the National Biomass Study (National Biomass Study, 2003). Though the figures are not similar, they are quite close and all point to the rapid loss of forest cover within the last decades, the most rapid being between the 1920s and early 60s. Figure 3.1 combines these figures to give an overview of the trend of forest loss since 1900.

The vegetation in the forested areas of Uganda is, however, currently comprised of 81% woodland, 19% THF and less than 1% plantations (Table 3.1). Distribution and coverage of the forest vegetation differs between the different parts of the country. The woodlands are common in the northern region while the THF are common in the western region. The THF covers 5% of Uganda's land area, holds 35% of country's total biomass and produces net growth of 15 tonnes of wood/ha/year. There are also substantial forest resources on farm (agro-forests) but these are usually not be defined as forest.

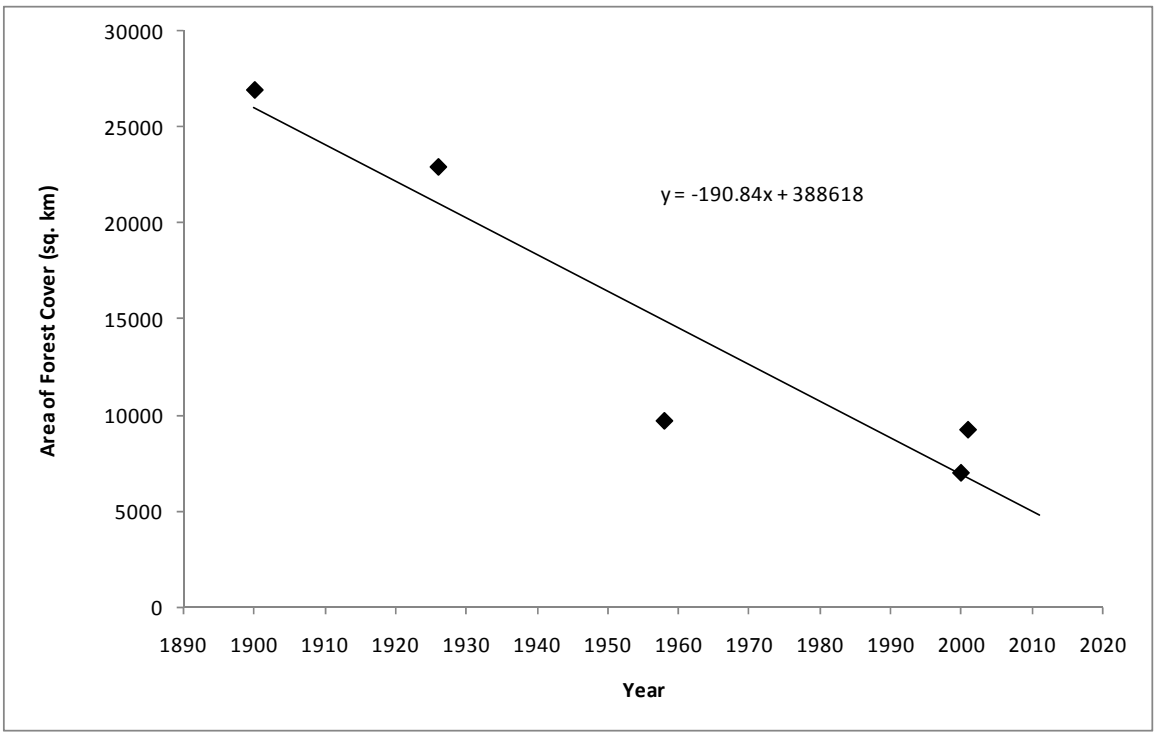


Figure 3.1. Estimates of the extent of tropical high forest in Uganda. At the present rate of loss, there would be none by 2027 (See Chapter 3, Appendix 6 and Table 2 for the figures).

Table 3.1: Land cover types in Uganda

Land cover	Area (Ha)	Percentage %
Plantation of soft and hard wood	35 000	0.2
Tropical high forest (intact and degraded)	924 000	5
Woodland	3 974 000	19
Total forest	**4 933 000**	
Bushland (stunted woodland and farm/ fallow)	1 422 000	7
Subsistence farmland	8 401 000	41
Other land use types	5 709 000	28
Total	**20 465 000**	

Source: modified from National Biomass study (2002)

Legal status of forests in Uganda

A total 70% of Uganda's 'natural forests' are found on private lands and managed by individual while 30% occur on government land. This estimate includes also the woodlands under 'natural forest'. Up to 15% of forest on government land are central forest reserves (CFRs) managed by National Forest Authority (NFA). Uganda Wildlife Authority (UWA) manages about 15% while 5000ha are managed by districts as local forest reserves.

Table 3/2: Estimates of forest and woodlands in Uganda, from FD 2003

Land cover	Government land		Private land	Total
	NFA and LGs	NPs and UWA		Total
THF	3060	2670	3510	9,240
Woodland	4110	4620	31020	39,750
Plantations	200	20	11 0	330
Total forest	**7370**	**7310**	**3 4640**	**49,320**
Other cover types	4140	1 1670	139010	
Total land	**1 1510**	**1 8980**	**1 7 3650**	

Source: National biomass study (1999); Arinaitwe *et al* (2000); and Pomeroy *et al* (2002)

Table 3.3: Principal Forest Reserves and National Parks in Uganda

Reserve/National Park	***Location***	***Area Km²***
Budongo	Masindi	793
Bugoma	Hoima	365
Kalinzu-Maramagambo	Bushenyi/Rukungiri	580
Kasyoha-Kitomi	Bushenyi/Mbarara	399
Kibale	Kabarole	560
Mabira	Mukono	306
Sango Bay	Rakai	151
Bwindi NP	Kabale/Kanungu	331
Mt.Elgon NP	Kapchorwa/Mbale	1,145
Rwenzori NP	Kasese/Kabarole/Bundibugyo	996
Semliki NP	Bundibugyo	212

Source: Forestry Department

Appendices

Appendix I. Land use types based on the ecosystem areas approach

The Global Land Cover Characteristics project (GLCC study) classifies vegetation and other land cover types into one of18 categories, originally defined by the International Geosphere-Biosphere Programme (IGBP). The categories are:

Category	Description
Forests	Includes all areas dominated by evergreen or deciduous trees with a canopy cover of greater than 60% and a height exceeding 2 meters. Both broadleaf and needleleaf trees are included
Shrublands, savannah and grasslands	Includes lands dominated by woody vegetation less than 2 meters tall and with shrub canopy cover greater than 10%. The shrub foliage can be either evergreen or deciduous. This category also includes savannas and grasslands with herbaceous and other understory systems. These lands may have a tree or shrub cover of less than 60%.
Cropland and crop/natural vegetation mosaic	Croplands are lands covered with temporary crops followed by harvest and a bare soil period (e.g., single and multiple cropping systems). Perennial woody crops are classified as forest or shrub land cover. Cropland/natural vegetation mosaics are lands with a mosaic of croplands, forests, shrublands, and grasslands in which no one component comprises more than 60% of the landscape
Sparse or barren vegetation	Are lands of exposed soil, sand, rocks, or snow and never have more than 10% vegetated cover during any time of the year. Snow and ice covered areas are lands under snow and/or ice cover throughout the year such as on the peak of the Rwenzori.
Wetlands and water bodies	Permanent wetlands are lands with a permanent mixture of water and herbaceous or woody vegetation that cover extensive areas. The vegetation can be present in either salt, brackish, or fresh water. Water bodies are oceans, seas, lakes, reservoirs, and rivers. They can be either fresh or salt water bodies
Urban and built-up areas	Are covered by buildings and other man-made structures.

Appendix II. Categories of forests identified by FAO

Forest Type	Description
Primary forest	Forests with native tree species. Evidence of human activities is not visible and the forest's ecological processes are not widely disturbed
Modified Natural Forest	Forests with native tree species that have grown naturally. There is evidence of human activities.
Semi-Natural Forest	Forests with native tree species that have grown because humans have either sown seeds or planted seedlings, or have otherwise assisted the growth of native tree species
Productive Forest Plantation	Man-made forests with mostly non-native (and in some cases native) tree species purposely planted by humans for production of forest products.
Protective Forest Plantation	Man-made forests with mostly non-native (and in some cases native) tree species that have been purposely planted by humans for environmental services.

Appendix III. Definitions Relating to Forest Area and Change

Category	Description
Total forest area	Land with tree crown cover of more than 10 percent of the ground and area of more than 0.5 hectares. It includes both natural forests and plantations). Tree height at maturity should exceed 5 meters.
Natural forest area	total area of forest composed primarily of indigenous (native) tree species. Natural forests include closed forest, where trees cover a high proportion of the ground and where grass does not form a continuous layer on the forest floor (e.g., broadleaved forests, coniferous forests, and bamboo forests), and open forest, which the Food and Agriculture Organization of the United Nations (FAO) defines as mixed forest/grasslands with at least 10 percent tree cover and a continuous grass layer on the forest floor. Tree height at maturity should exceed 5 meters.
Plantations area	describes forest stands established artificially by afforestation and reforestation for industrial and non-industrial usage. Reforestation does not include regeneration of old tree crops (through either natural regeneration or forest management). Many trees are also planted for non-industrial uses, such as village wood lots. Non-industrial plantations include those established for fuelwood production, soil protection, amenity or other purposes. They do not include plantations of agro-forestry crops, such as rubber and oil palm. Tree height at maturity should exceed 5 meters.
Total dryland land area	Total terrestrial area falling within three of the world's six aridity zones—the arid, semi-arid, and dry sub-humid zones. These areas are especially vulnerable to land degradation. In drylands, the ratio of average precipitation to average evapotranspiration, called the aridity index, is between .05 and .65 (excluding polar and sub-polar regions).
Change in forest area	Total percent change in both natural forests and plantations over a specified period. Total forest is defined as land with tree crown cover of more than 10 percent of the ground and area of more than 0.5 hectares. Tree height at maturity should exceed 5 meters.
Original forest as a percent of land area	Refers to the estimate of the percent of land that would have been covered by closed forest about 8,000 years ago assuming current climatic conditions, before large-scale disturbance by human society began.
Forest Area by Canopy Cover	Canopy cover is the vertical projection of a tree's outermost perimeter, including small openings in the crown (i.e. % covered by the crown of a woody species)

Appendix IV. Forest Certification and Protection

The Forest Stewardship Council (FSC) certifies forests and plantations in accordance with the 10 FSC principles and criteria. FSC recognizes 15 different tropical and 11 non-tropical forest types for the globe. Tropical forests include all forests located between the Tropics of Cancer and Capricorn. All other forests are non-tropical categories. Sparse trees and parkland are natural forests in which the tree canopy cover is between 10-30%, such as in the savannah and steppe regions of the world.

Forest Type	Description
Natural forests	Forests where most of the principal characteristics and key elements of the native ecosystems, such as complexity, structure and diversity are present.
Plantations	Areas which result from the human activities of planting, sowing or intensive silvicultural treatments, and lack most of the principal characteristics and key elements of native ecosystems. According to FSC, certified plantations should decrease the pressures on natural forests, have diversity in composition in species and age classes, preferentially choose native over exotic species, serve to improve soil function, fertility and structure, and have some proportion of their area managed for the restoration of natural forest cover.
Mixed natural forest and plantations	Include large areas certified as one block that contains both natural forests and plantations. Semi-natural areas are forests that have some elements of both natural forests and plantations.

Appendix V. Forest Area and Change Uganda

Description	Year	Area (000 ha)
Total forest area	2000	4,190
Natural forest area	2000	4,147
Plantations area	2000	43
Total dryland area	1950-1981	3,934
Change in Forest Area		
Total	1990-2000	-18%
Natural	1990-2000	-18%
Plantations	1990-2000	4%
Original forest as a percent of total land area		70%
Forest area in 2000 as a percent of total land area		17%

Description	1890	1900	1926	1958	2000
Total forest cover (including moist thickets – Category G of Langdale-Brown 1964)		30,900 km^2	26,300 km^2	11, 200km^2	
Forest	10.8 million ha	26,900	22,900	9,700	7000**
% of Uganda's Total area	52%	13.7%	11.6%	4.9%	3.6%
B High Altitude Forest					3095*
C Medium Altitude Evergreen Forest					3235*
D Medium Altitude Semi-deciduous Forest					5279*
Y Swamp Forest					260*
F Forest Savanna Mosaic					4923*
Total					*16792*

Source: Langdale-Brown 1960 in Hamilton 1984; *Arinaitwe *et a,l* 2000; ** Arinaitwe *et al*, 2000 gives a total estimate of 7000 km^2

Forest Area by Crown Cover (000 ha), 2000

Crown Cover (%)	Area (ha)
>10	18,717
>25	11,739
>50	3,516
>75	1,371
Ecosystem Areas by Type	
Total land area	24,104
Percent of total land area covered by:	
Forests	4%
Shrublands, savanna, and grasslands	44%
Cropland and crop/natural vegetation mosaic	35%
Urban and built-up areas	0.0%
Sparse or barren vegetation; snow and ice	1%
Wetlands and water bodies	16%

Source: © EarthTrends 2003. *Note: Crown cover data are gathered using different methodologies than the forest area calculated above. The two estimates may differ substantially.*

Footnotes:

a. Areas are presented as long-term average covering the years from 1950 to 1981.

b. Original forest refers to estimated forest cover about 8,000 years ago assuming current climatic conditions.

c. "Forest area in 2000 as a percent of total land area" and "Original forest as a percent of total land area" are not directly comparable; data are from two different sources.

CHAPTER FOUR

Monitoring Uganda's Important Bird Areas

Michael Opige

Important Bird Areas monitoring framework

A simple global monitoring framework for IBAs has been designed. From this, an IBA monitoring form for Uganda was adopted. This is a simple and easy to use form with an annex of guidelines. The variables there are State, Pressure and Response. These three variables (SPR) complement each other and all contribute to the resultant trend analyses. *State* means the condition of the IBA. The status of the IBAs is assessed either by obtaining the population of the trigger species and relating them to the habitat, or by using habitat as proxy, as long as one has a sound basis for using habitat. The most thing important to know is the relationship between habitat area and quality and bird numbers. *Pressures* on IBAs refer to threats within them. This is measured using three attributes namely time, scope and severity. And *response* refers to conservation efforts that are being taken to either reduce the threats or improve on the condition of the IBAs.

The framework was applied to the data gathered for 2001 and 2008 reporting periods and comparisons were made. The overall status in 2001 was marginally shared between favourable (40.9%) and near favourable (36.4%), the remainder being in unfavourable condition. These however, changed in 2008 with a majority (70.8%) of IBAs being 'near favourable', 20.9% being 'favourable' and 8.3% in 'unfavourable' condition (Figure 4.1). Five of the 24 assessed IBAs have remained in stable conditions (favourable), two new IBAs (Kasyoha-Kitomi Forest Reserve and Nabajjuzi wetlands) being assessed for the first time.

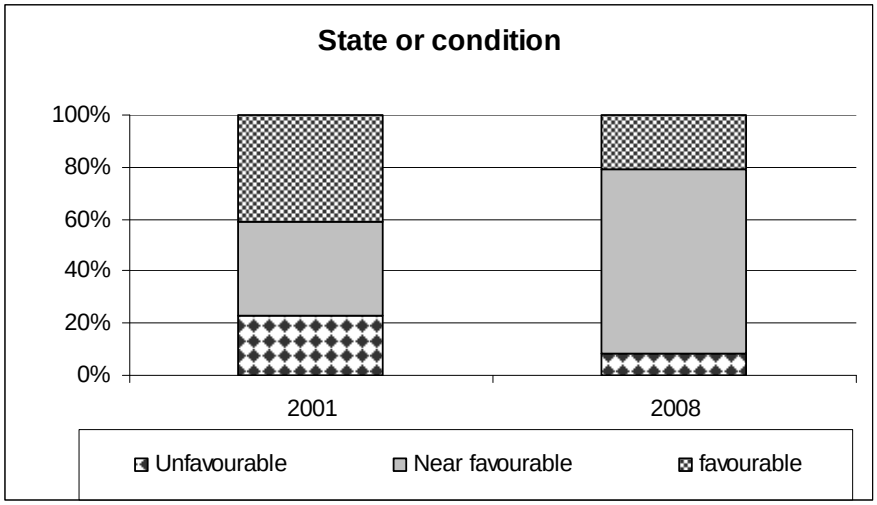


Figure 4.1. The overall trend in status of the IBAs in 2001 and 2008 for 24 IBAs in Uganda.

General status and trends

The overall State-Pressure–Response for the IBAs has changed from the 2001 analyses. There is a general slight decline in condition in 2008, 2.13±0.11 (Mean ± SEM) compared to 2001, 2.18±0.17. The pressure is described as 'medium' (-1.21±0.16) and response as 'high' (2.42±0.17) compared to 2001 with pressures of -1.11±0.15 and response of 1.81±0.19. The analyses done here are based on data collected from 13 protected area IBAs, 8 wetland IBAs and 3 forests reserve IBAs. It is important to note that the overall decline in status does not reflect decline in status of all the IBAs. The status across the individual IBAs may vary. For example, the condition of Echuya FR has improved whereas that of Lutembe Bay has declined. This is due to increased conservation efforts at Echuya whereas there is continued increase in pressures at Lutembe bay. This sample (24/32), 75%, however, leaves out the majority of the forest IBAs. In total, 8 (25%) of the IBAs are not assessed.

The mean score for pressures (Figure 4.2) has increased showing an increased disturbance on most IBAs. This can be attributed to both increased reporting processes and the actual escalation in threats in different IBAs. The previous analyses (2001) showed fewer reported threats compared to now (2008), with typically 6–10 threats in each IBA. However, this is likely to reflect the differences in the way in which data were collected in the two years. But when comparing the mean scores for the highest threats in the two years, favourable comparison can be derived. This therefore has a bearing on the general trend of the mean status score of the IBA. In areas where the threats have persisted, the resultant effect has continued to make the conditions unfavourable, for example, Semliki Reserves and Nyamuriro swamp. Worse still, escalating threats lead to decline in conditions as in Lutembe Bay, Kidepo valley NP and Ajai WR.

The conservation efforts or responses have increased. The responses signify the designation status, management plan availability and active conservation interventions. The general trend has shown a steep shift in designation status. Additional to already gazetted protected areas as of 2001, nine wetland IBAs have been listed as Ramsar sites. Most IBAs have either had their management plan finalized or the production being initiated. This should however, be consolidated with active intervention either to reduce the current threats or improve the conditions of the IBAs. The community protected area initiatives have been good drivers towards effective and sustainable management by UWA. The involvement of conservation partners in the protection and implementation of conservation projects across priority sites have been timely. The involvement of local communities through CFM negotiations and provision of income generating activities are areas where NGOs are strong.

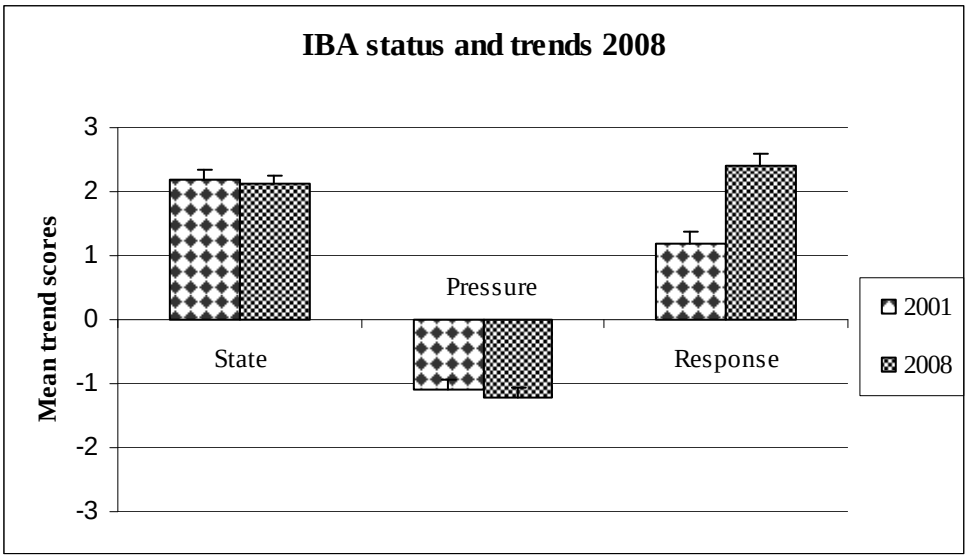


Figure 4.2. The overall mean trend scores for IBAs in Uganda (N=24) where N is the total number of IBAs reported on

State of protected area IBAs

The mean score for the status or condition of the 13 IBAs that are protected areas remained stable in 2008 (2.07±0.14) compared to 2001 (2.07±0.24), Mean ± SEM (Figure 4.3). However, pressures have continued to increase from (-0.92±0.21) in 2001 to (-1.53±0.19) in 2008. The conservation efforts by UWA have also increased in terms of production of management planning and as far as improved site protection and management are concerned. There has been improvement in protected area community awareness programs by UWA and general ranger based patrols. Responses in protected areas have improved from 1.54±0.14 to 2.77±0.12.

The general trend in protected areas looks good but there are instances where management needs to intervene, for example to deal with the continued community settlements in Ajai WR, domestic animal incursions in Queen Elizabeth NP and Murchison Falls NP and intensive and extensive fires in Kidepo Valley NP and Murchison Falls NP. The process of relocating reserve settlers has, however, started with the formation of a team to oversee the process which has already moved forward. The District Steering committee has been very supportive, the communities have been very positive while the UWA management remains committed to facilitating the process.

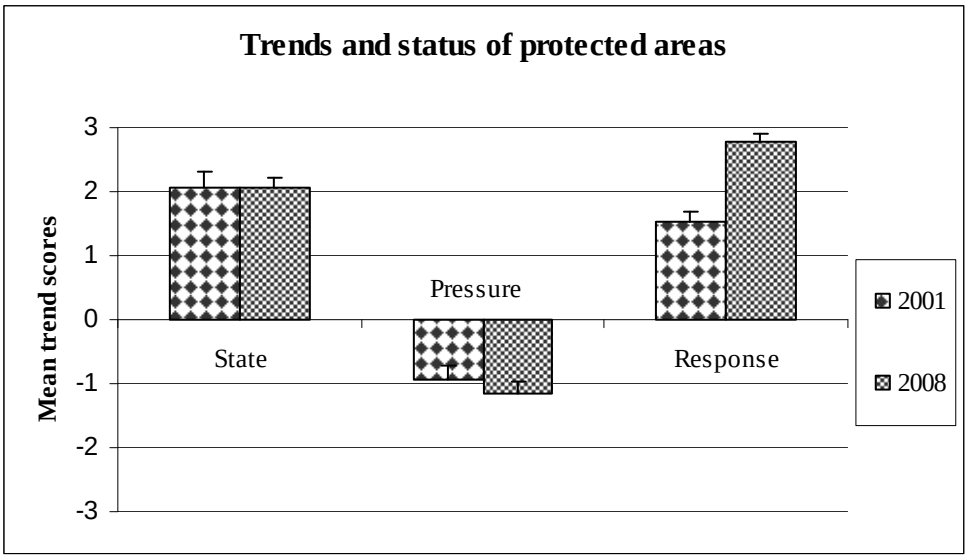


Figure 4.3 The mean scores for the 13 protected area IBAs .

State of forest IBAs

Only three forest IBAs have been assessed, whilst Kasyoha-Kitomi is being assessed for the first time. The Status of Mabira Forest remained stable while there is an improvement in the conditions in Echuya Forest, attributed to reduced incidences of illegal activities as a result of increased community awareness and CFM interventions. There has been a general improvement in Grauer's Swamp Warblers in Muchuya swamp, with the population reportedly doubled (Ellison, 2008).

State of wetland IBAs

The mean score for the status of the eight wetland IBAs has reduced from 2.43±0.30 in 2001 to (2.13±0.23), (Mean ± SEM), hence poor conditions. There is an overall reduction in pressures from -1.43±0.20 to -1.38±0.32 in 2008 (Figure 4.4). The designation of all wetland IBAs as Ramsar sites was one major conservation intervention that helped raise the profile of wetland IBAs both locally and internationally. Six sites have management plans but are with very minimal active conservation initiatives. The site actions such as conservation through livelihood improvement in Musambwa Island, environmental education in Nabajjuzi and various activities of SSGs in Lutembe, Mabamba, Musambwa and Opeta contribute to the overall improved trend in responses.

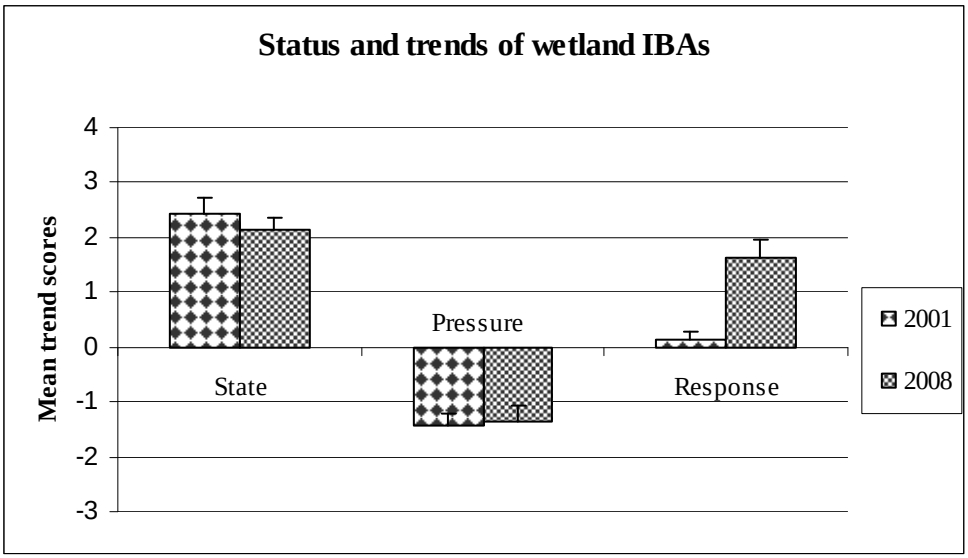


Figure 4.4. The mean trend scores of eight wetland IBAs.

CHAPTER FIVE

Common Bird Monitoring

Derek Pomeroy and Josephine Asasira

Landbirds have been counted at about 70 sites in Uganda from 1983 onwards, although not all sites have been counted regularly. Currently, 40 sites form the basis of a monitoring programme which, however, is planned to expand from 2009 and to become one of the first of a series of such schemes in Africa, with partial support from the RSPB. The enlarged scheme will be a joint NBDB-NatureUganda programme. The scheme which currently covers 107 common species is described in more detail by Pomeroy and Asasira (in press).

Data from earlier years were not collected systematically, and these years have therefore been arranged into four groups but since 2004, each site has been counted twice a year. In the graphs, regressions for the two periods have been calculated separately. The sites have a wide geographic spread, and represent three main forms of land-use: natural, semi-natural (mainly pastoral) and agricultural, and they occur in areas which have, or used to have, one of four main vegetation categories (Langdale-Brown *et al*., 1964), namely forest, moist savanna, dry savanna and impeded drainage. The last category is widespread in Uganda, and is subject to seasonal flooding in some years; hence it is rarely cultivated.

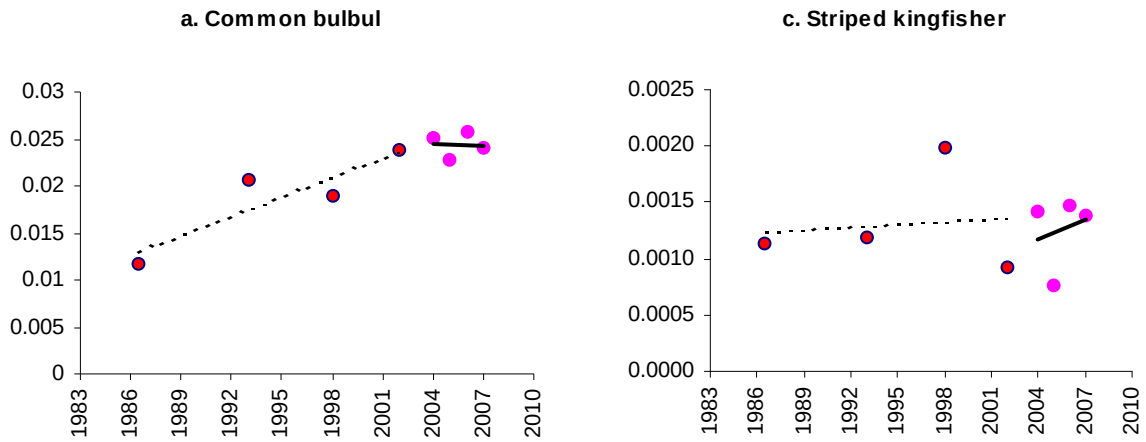
Currently, Timed Species Counts (TSCs, Freeman *et al*., 2003) are used at all sites, to maximize the numbers of species recorded: the 107 'common' species represent less than a quarter of the total number now in the database at the NBDB. The TSC data are converted to frequencies, or encounter rates, and these transformed values form the basis of the monitoring records, represented by the statistic lambda.

Because of the high species richness in the tropics, few species are common enough to be analysed satisfactorily by themselves. Two: however, are shown in Figure 5.1, from which it can be seen that the Common Bulbul, undoubtedly Uganda's commonest bird, has increased – roughly in line with the human population. Bulbuls are common in towns and villages. In contrast, the numbers of Striped Kingfishers, common birds in many open habitats, but usually away from human habitation, have stayed about the same.

Our remaining examples consist of groups of species (each of which is individually quite common). The groups vary in size from 7 to 43 species: a few species qualify for more than one group (e.g. the Barn Swallow is an aerial-feeding Palearctic migrant). Figure 5.2 shows ten such groups, most of which are of conservation concern in one way or another. During the years from 2004, *Palearctic migrants* have shown a significant decline, and species characteristic of *farmland* hence increased significantly ($P<0.05$ in each case). With only two degrees of freedom available for this recent period, it may not be surprising to have so few significant results as yet. However, for some groups the trends in both periods are similar: *flycatchers*, *tree species* and those of *conservation concern* all tending to increase and none showing consistent declines. We wondered whether the general increase in the earlier years was due to a systematic

improvement in data collection, but there is no evidence for this and for two groups – tree species and raptors – there is independent evidence of increases. For the more recent period, from 2004, four groups show noticeable increases, three are apparently declining and two show no clear trend.

Figure 5.1. Trends in relative abundance of the commonest species (a) and three less common but highly conspicuous species, convention as for figure 3.



Considering the three major forms of land use (Figure 5.3), and particularly since the early 1990s, numbers in both natural and semi-natural ecosystems have changed little, but the increase at the agricultural sites seems likely to be real. This could well be a reflection of improved agricultural production over this period, which remains organic to a very large extent. Farmers may not intend it, but they have been increasing the food available to birds!

Figure 5.2. Population trends for various groups of birds (mean lambda values and standard errors). Regression statistics refer to periods to 2003, and 2004 – 2007, respectively.

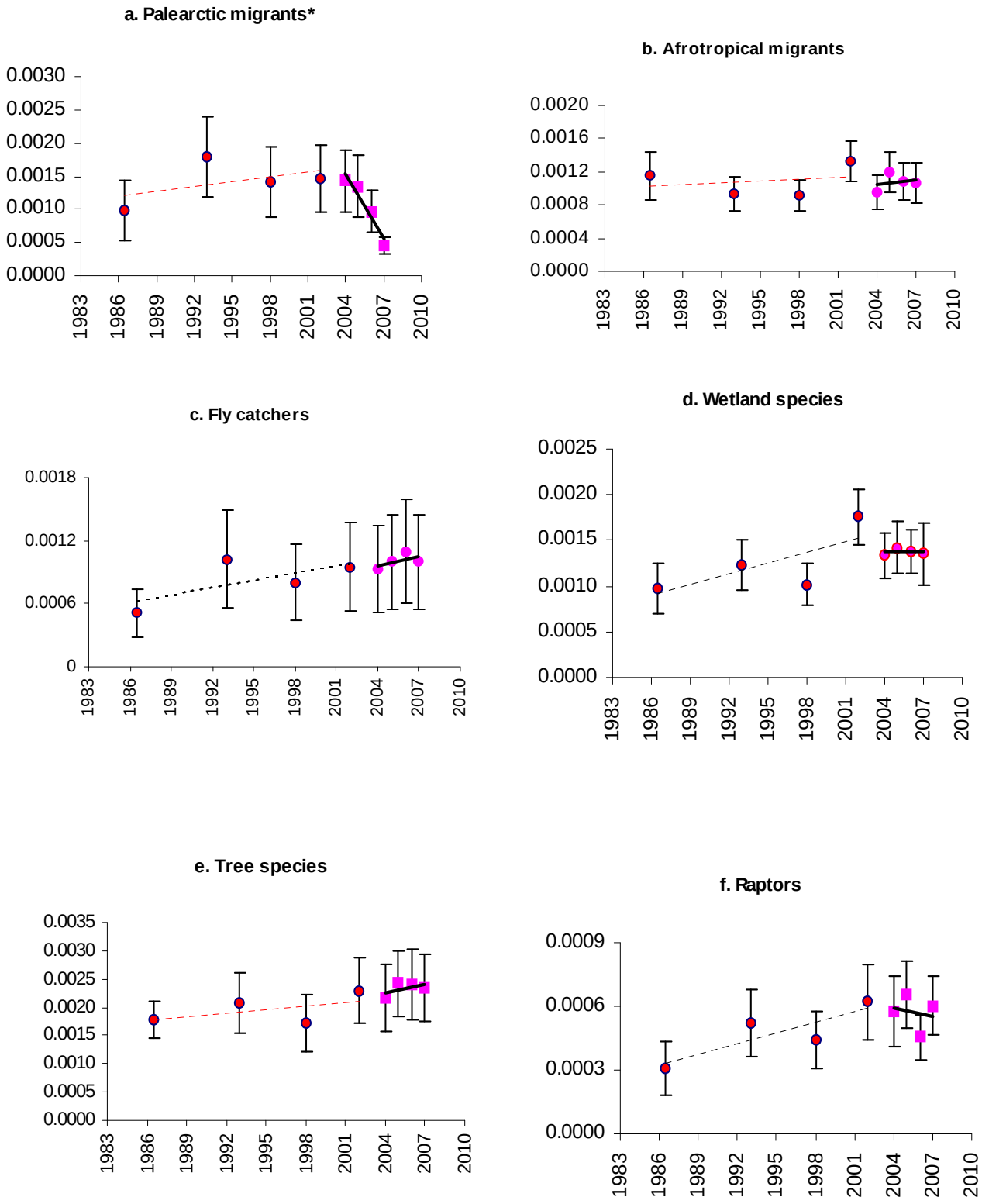


Figure 5.2 (continued)

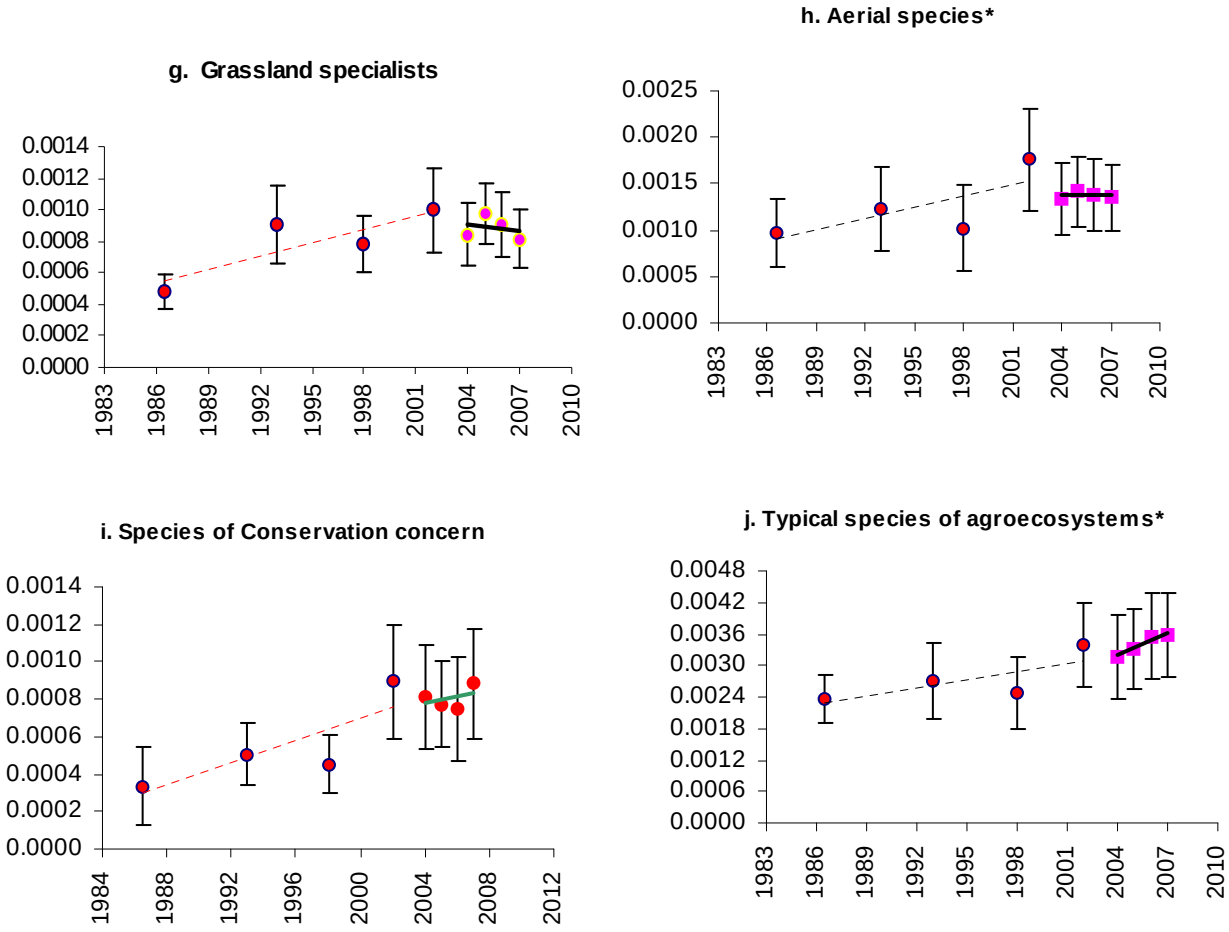
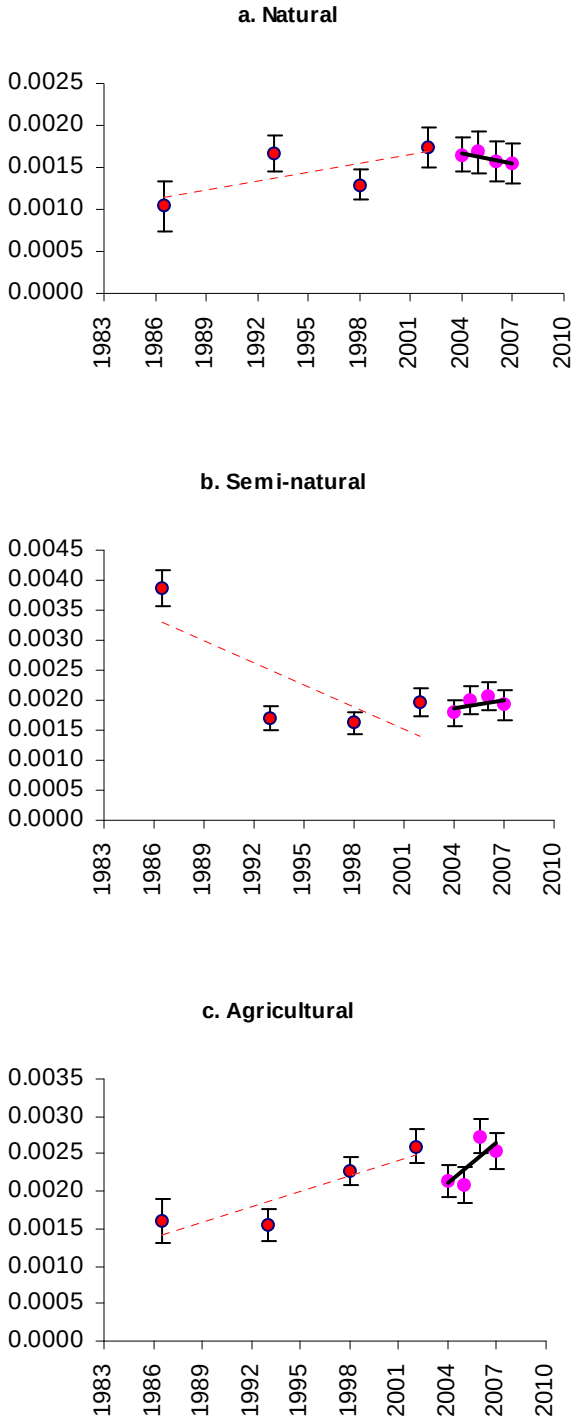


Figure 5.3. Trends in overall estimates of mean relative abundance, with sites arranged by type of land use. Conventions as for figure 3.



CHAPTER SIX

Straw-coloured fruit bat (*Eidolon helvum)* populations in Kampala

Perpetra Akite

The population study of the straw-coloured fruit bat, *Eidolon helvum* has been done on and off for the last 47 years in Kampala and the surrounding suburbs. Over the years, there have been marked variations in both the numbers of bats roosting in different sites as well as the conditions of present day roost sites.

By January 2009, there was only one occupied site in Kampala, in a residential area along Sir Apollo Kaggwa Road. In January 2009, it had an estimated 3982 bats. This is however few compared to counts done at different sites in the past, when populations were as high as 200,000 bats. It has also become noticeable that one can barely see these fruits bats flying about in the evenings in search of food. In the 2003-2006 counts, it was very easy to locate the roosts simply by sitting in strategic positions in Kampala and watching the directions from which the bats were flying.

A combination of factors is thought to influence this decline in the population of bats in Kampala. However it is not possible to conclusively say which factor is taking the lead. Habitat destruction of previous roost sites can be said to have led to the break-up of the original bigger roosts, causing the bats to find alternative sites. As a result, there are pockets of roost sites spread all over the Kampala area. Although *Eidolon helvum* does not fall in any of the IUCN threat categories (Mickleburgh *et al*., 2002; Huston *et al*., 2002), it has been noted to be very vulnerable to habitat loss causing declines of roost trees that also provided a source of food.

When grouped by decade, Figure 6.1 shows a significant decline in numbers of bats over the past 47 years for the different periods when counts were done. Data are from counts between October and April. Although there were more counts in some years, it does not seem to affect the population estimates. This can be seen in Figure 6.2 when the individual counts are plotted. It now seems likely that the next few years will see extinction of the species in Kampala, given the current trend in both distribution and numbers of *Eidolon helvum*.

The 2008 population estimate is the lowest ever. This is in contrast with the more recent counts (Engola, 2001, Akite & Kityo, 2003-2007-unpublished). The current bat population is far below the estimates in the earlier years, for example December 1968 registered the highest ever count with a total of 205,000 bats compared to that of December 2008 that registered the lowest ever estimate with a total of only 2,674 bats. This is also true for other months like January that recorded a total of 126,000 bats in 1964 unlike January 2009 that only had 4,163 bats.

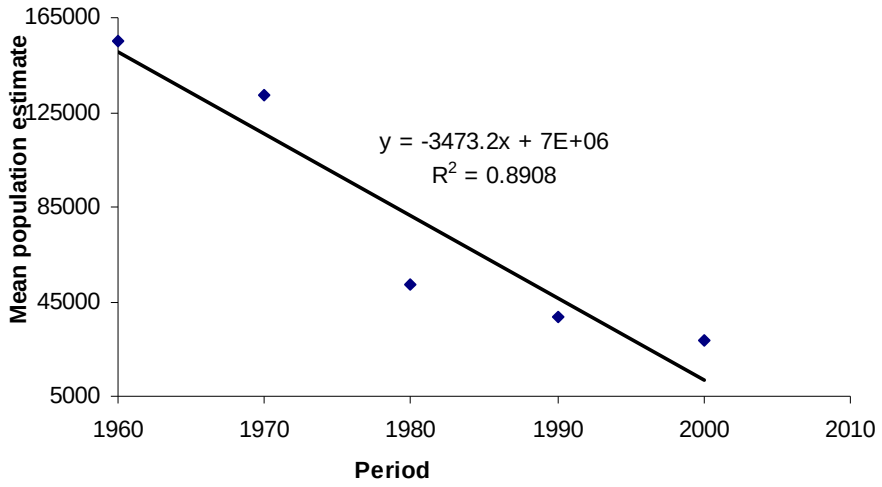


Figure 6.1. Mean population estimates of bat population over the past 47 years, by decade

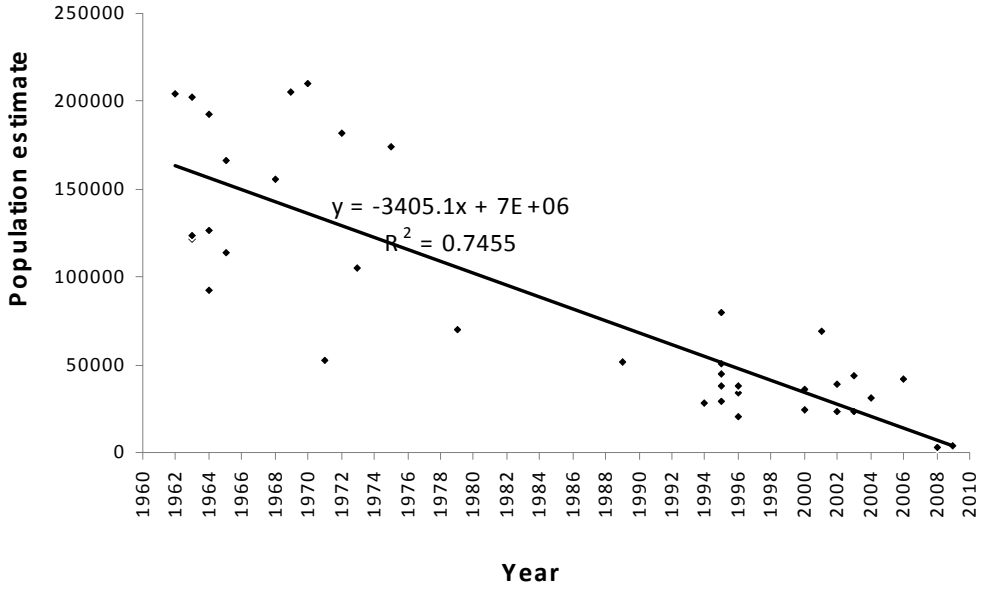


Figure 6.2. Bat population estimates in Kampala over the past 47 years (October-April counts)

The numbers of bats in the Kampala area has been steadily decreasing from the early 1960s till the early 1990s. However, the late 1990s and the 2000s show a more steeper decline with numbers falling to the current lowest estimate recorded in December 2008. The number of roost sites in Kampala has equally reduced with bats chosing to roost in rather small isolated trees, avoiding the many previous bigger sites like Makerere University, National Forest Authority Headquarters, and Nakulabye among the others.

CHAPTER SEVEN

Analysis of Trends and the Living Uganda Index

Analyses by Jonathan Loh, Nicola Harrison, Julia Latham and Jenny Martin

The earlier reports in this series – BD 2000 to 2004 – used very simple indices to track changes in Uganda's biodiversity. A major development in BD 2006 was that trend analyses were undertaken for us by the team who produce the *Living Planet* reports (the most recent being 2008). These use time-series data for about 3000 populations of over 1100 species of vertebrates from all over the world (Loh *et al*., 2005). In contrast, we have only 93 time series, but of a wider range of biodiversity measures, since we include small amounts of data from plants (in fact, only trees) and one invertebrate group (butterflies). In addition, we have some data on numbers of species, and on the extent of wetland and forest ecosystems. All of these have been used by the Living Planet team for the indices in this chapter: they reflect different aspects of Uganda's biodiversity.

In this chapter, we update some of the trend analyses first shown in BD 2006 and also show several new ones, and revised versions of the overall indices. The way in which these overall indices have been calculated is shown in Box 7.1.

Species richness is a reflection of the total number of species in Uganda; those for which we have data are shown in Table 7.1. The numbers of species in local communities can go up or down : but nationally the index can only go down, as a result of extinctions (e.g. of Lake Victoria fish) unless any new species arrive, or extinct ones are re-introduced. Trends are shown as an index of Uganda's species richness (Figure 7.1). Between 1970 and 2008, this index shows a decline of some 10% of known species.

Trends in *Habitat cover* of natural forests and wetlands are shown in Figure 7.2. The decline from 1970 to 2000 is about 60%, mainly due to extensive deforestation (Chapter 3). There is a need for future reports to assess changes in the area of natural savannas, for which we have no data at present.

Table 7.1. Taxa for which trends in number of species have been recorded.

	Weight	Contribution
Forest trees in PAs	2.5	24%
Butterflies	2	19%
Lake Victoria fish	2	19%
Terrestrial vertebrates species	4	38%
Total	10.5	100%

Note: The weightings reflect the extent to which data sets are national rather than local, and their level of reliability see note to Box 7.1. These determine the relative contributions of each data set.

BOX 7.1. Indices used in this report (adopted from BD 2006)

Index name and abbreviations	No of	Data included

		data sets	
Uganda Species Richness Index (Fig. 7.1)	USRI	5	Numbers of species e.g fish in Lake Victoria, terrestrial birds and mammals, trees in Kibale forest, birds of Makerere Hill (NB: birds of Makerere Hill are excluded form the SRI to avoid double counting)
Uganda Habitat Cover Index (Fig. 7.2)	UHCI	2	Extent of forests and wetlands
Uganda Species Population Index (Fig. 7.3)	SPI	18	Weighted population data (numbers of individuals) for groups, e.g. of land birds or mammals, mostly made up of more than one species[a]
UGANDA BIODIVERSITY INDEX (Fig. 7.4)	UBI	25	USRI + UHCI + USPI combined
Living Planet indices for Uganda	ULPI		Unweighted data for all Ugandan vertebrate species (terrestrial and freshwater) with population data, for direct comparison with the global LPI

[a] Weighted as follows: two for broadly national data, one for local data; add on two for good quality data, one for medium, zero for low quality, so overall range = 1 to 4.

All 18 data sets with species populations contribute to the *Uganda Species Population Index* (Table 7.1 Figure 7.3). These show that, overall, the known populations of trees, crocodiles, birds and mammals have declined by some 40% between 1970 and 1995 to 2008, with a partial recovery in the last ten years (Figure 7.3). Individual populations, however, show very different trends with bats declining by more than 30% in that period (Chapter 6) and Grey Crowned Cranes by about 80% (Figure 7.4). This is close to being catastrophic for Uganda's national bird and has resulted from extensive conversion of their preferred habitat (shallow wetlands) and, in all probability, ever-increasing human disturbance (J. Muheebwa, pers. comm.). The bats now seem likely to become extinct in the Kampala area within the next few years. But birds as a whole are doing quite well (Figure 7.5) including the key bird-of-prey group (Figure 7.6), whilst birds inhabiting agricultural lands have increased by about 50% size the 1980s (Figure 7.5).

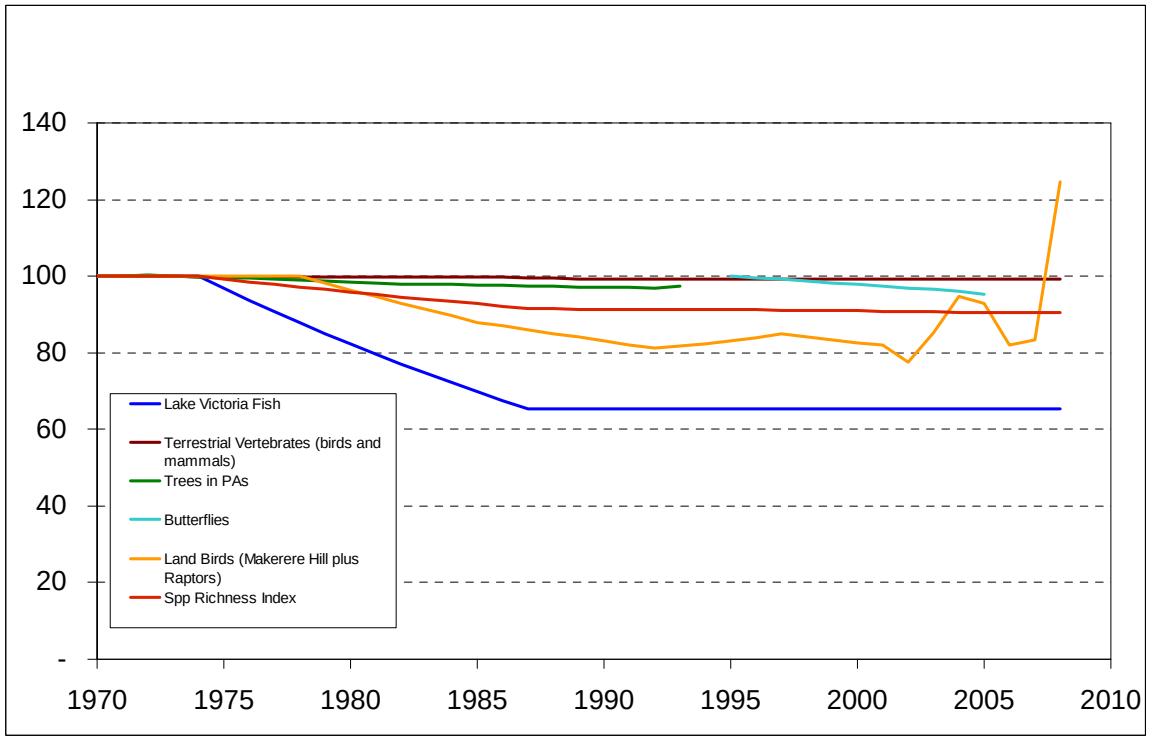


Figure 7.1 Uganda's Species Richness Index (USRI)

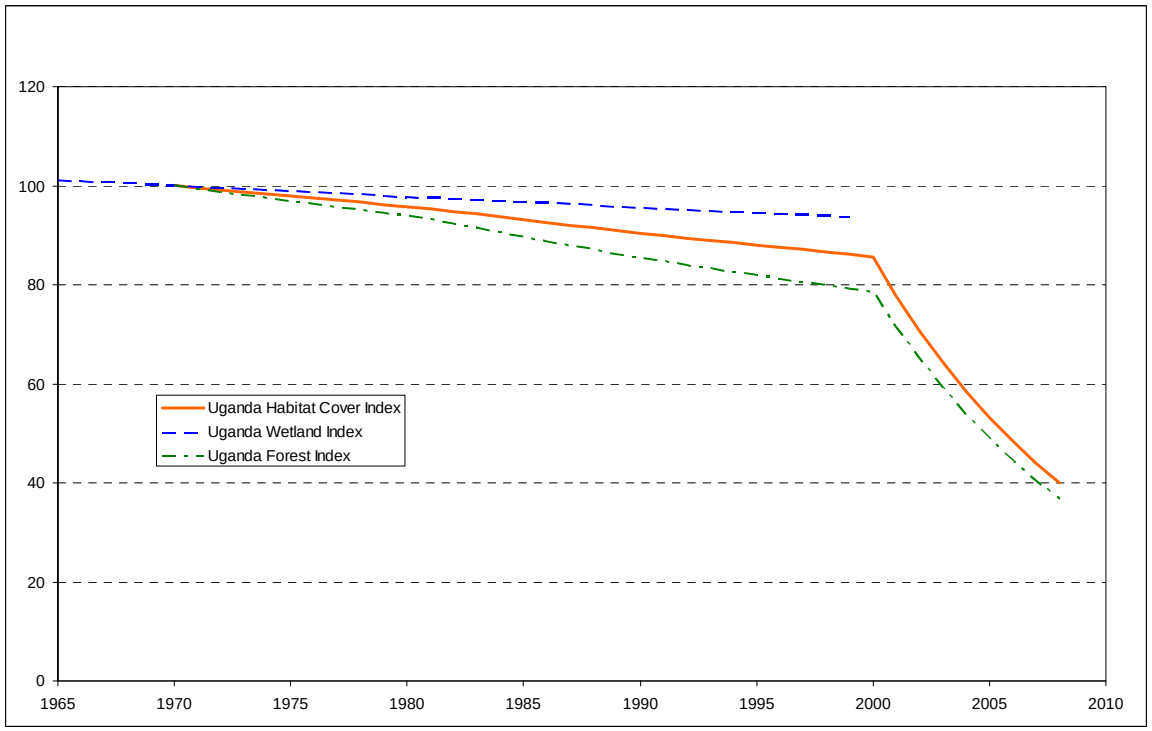


Figure 7.2 The Uganda Habitat Cover Index (UHCI), based upon the extent of forests (see chapter 3) and wetlands (for which there are no recent data).

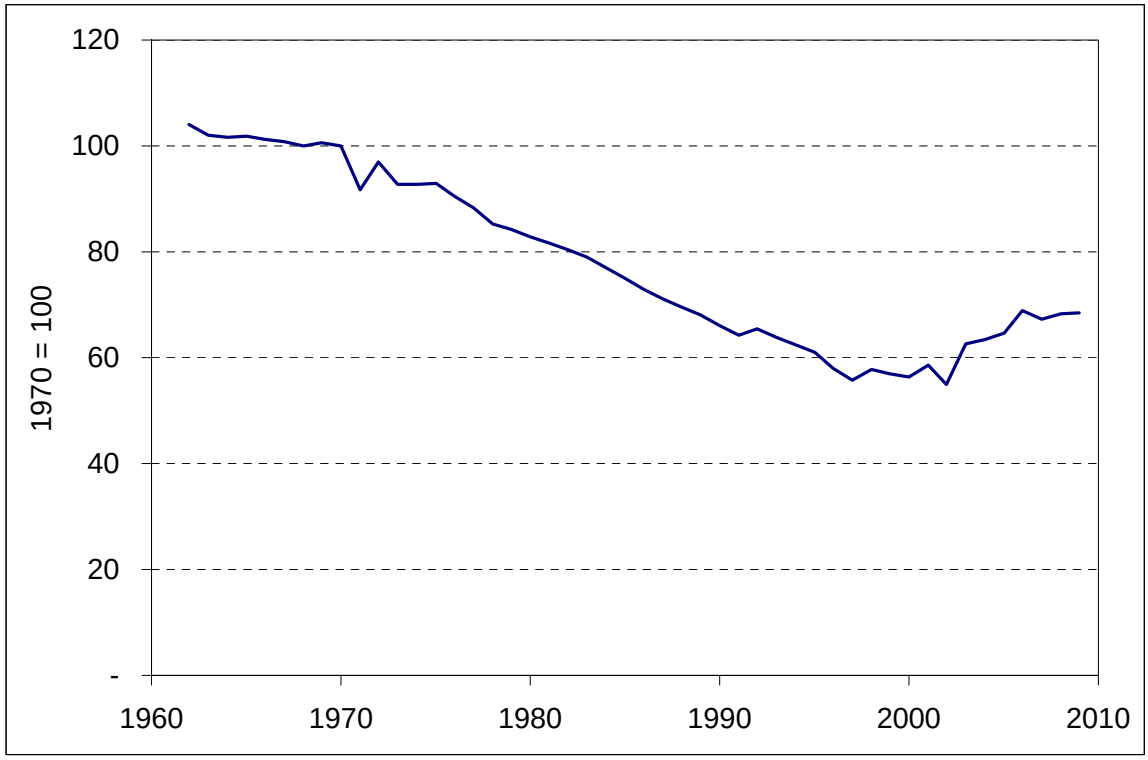


Figure 7.3. The Uganda Species Population Index, showing trends in population sizes, based upon the data in Table 7.2.

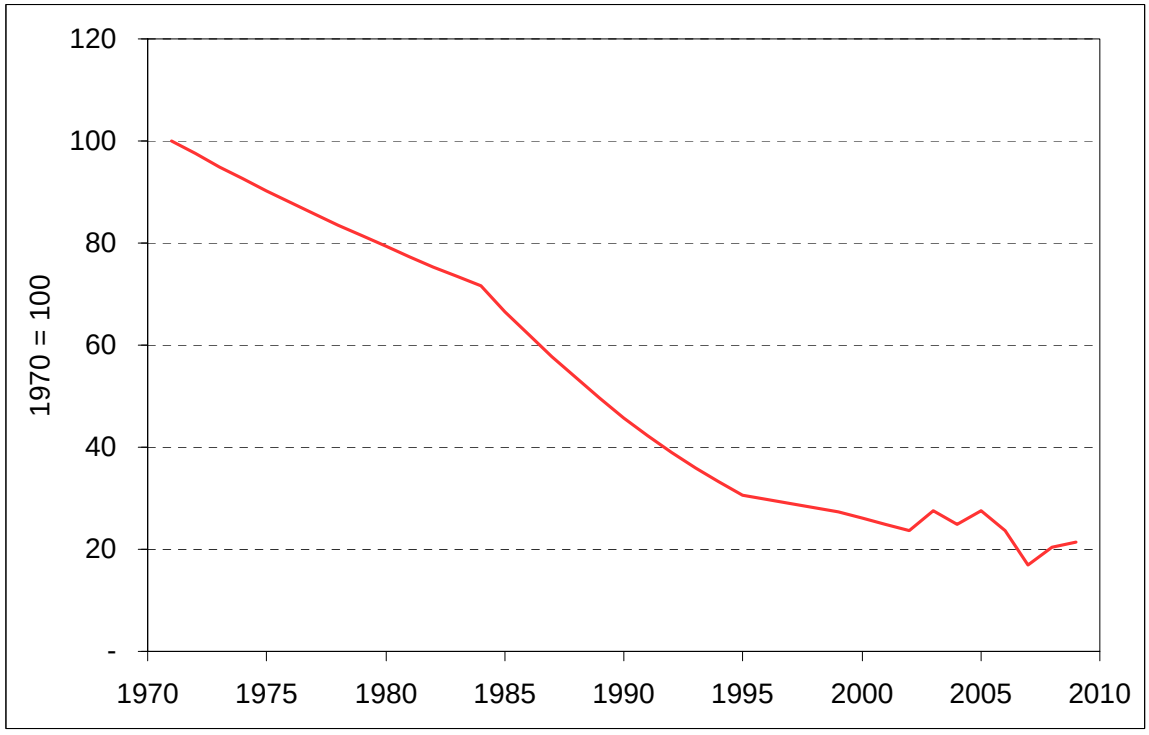


Figure 7.4. An index of the Ugandan population of the national bird, the Grey Crowned Crane.

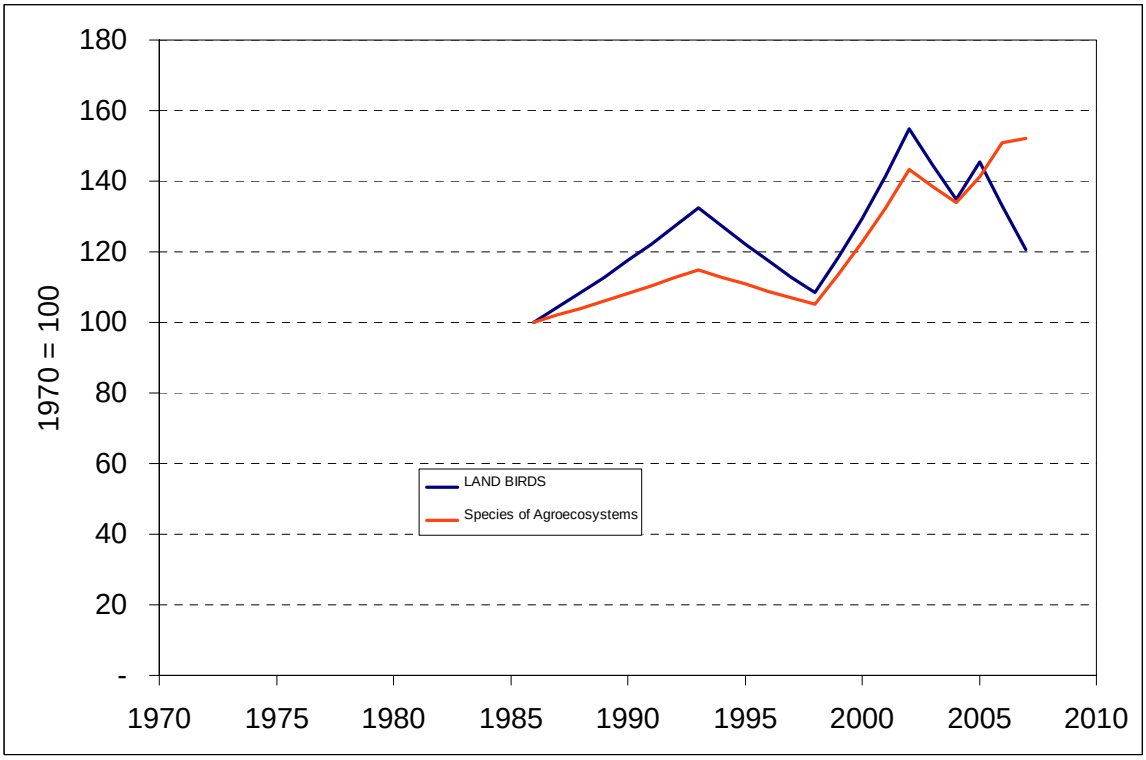


Figure 7.5. Monitoring data from Common Land Birds, which began in the 1970s, and of a major subset, birds that are typical of agricultural areas.

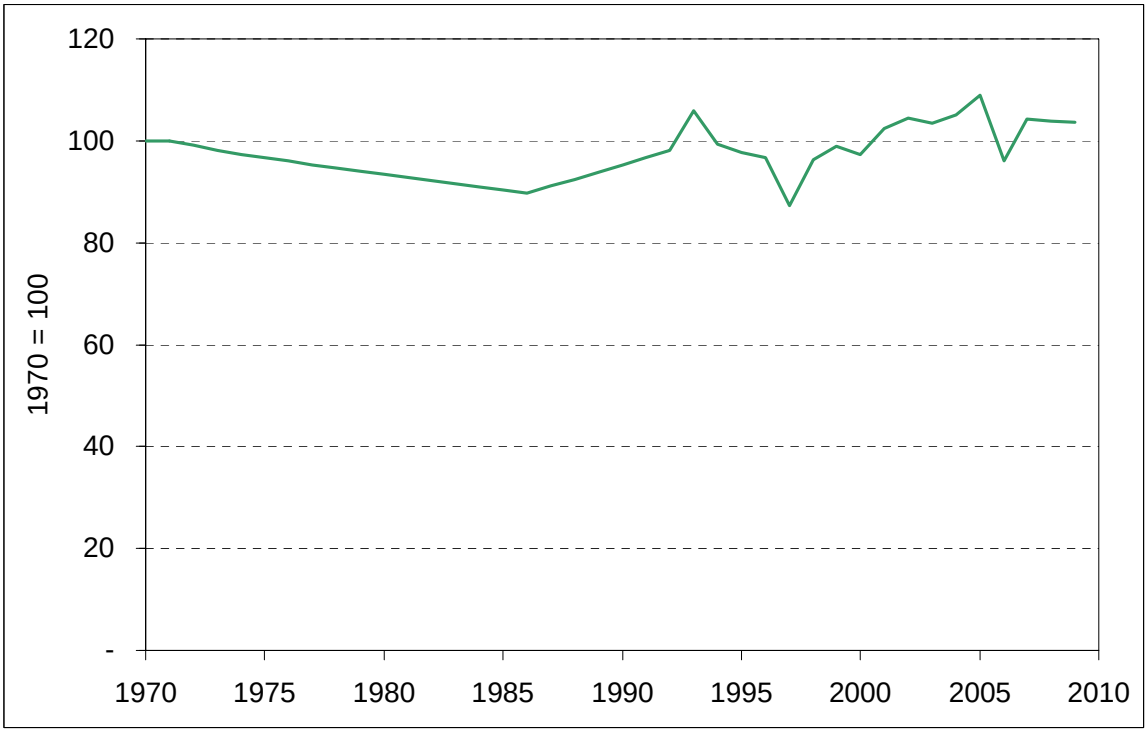


Figure 7.6. Trends in the status of birds-of-prey (raptors) based upon several sets of data, including both populations and numbers of species.

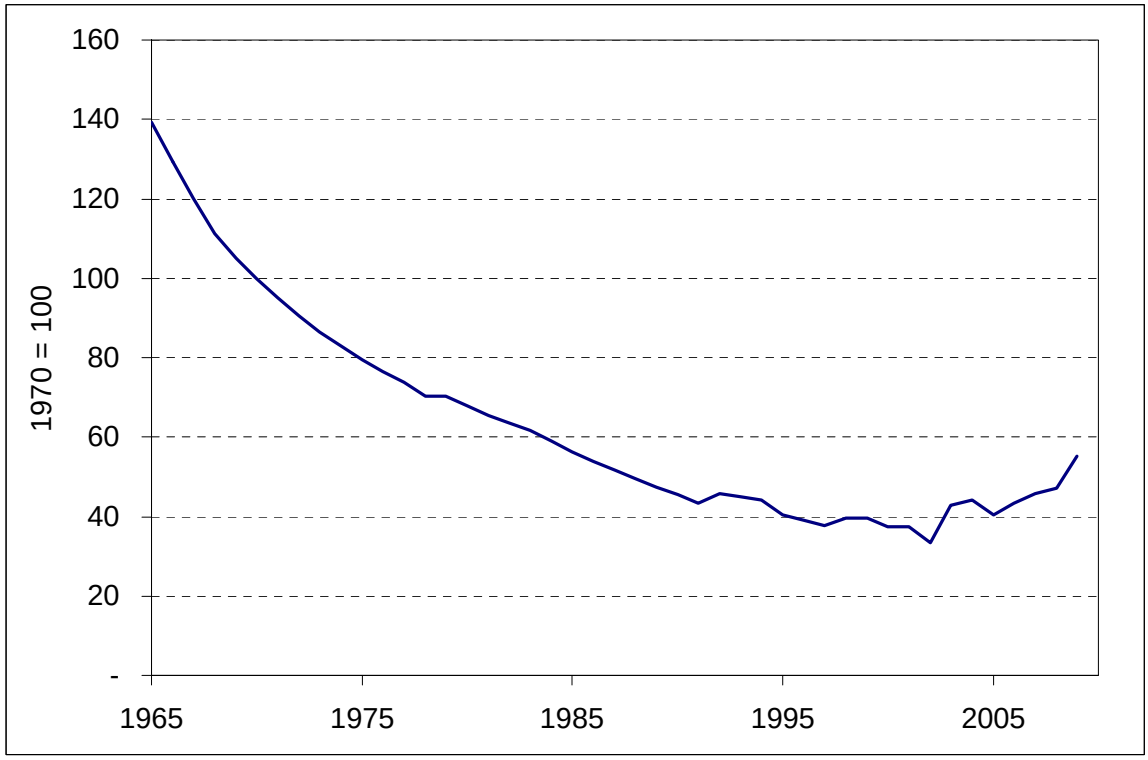


Figure 7.7. The Uganda Protected Areas Index combine information from all taxa with data sets in PAs, including large mammals.

A number of data sets came from Protected Areas – principally National Parks and Forest Reserves - and Figure 7.7 suggests that there has been a partial recovery since the 1990s. Species of large mammals, including primates, contribute strongly to this index (although there are other data too); they were discussed in detail in BD 2006.

Synthesis

Figure 7.8 shows the *Living Planet Index – Uganda.* It is calculated in the same way as the global LPI, being based upon all individual species with time series data, and all species contribute equally. As before, it is dominated by he steep declines in large mammals during the 1970s and 1980s.

The three intermediate indices, seen in Figure 7.1, 7.2 and 7.3 are shown together in Figure 7.9, and combined to represent *Uganda's Biodiversity Index*. This shows an overall decline of some 35% between 1970 and 2008. In other words, there has been an annual loss of about 1% per year, and this appears to be accelerating.

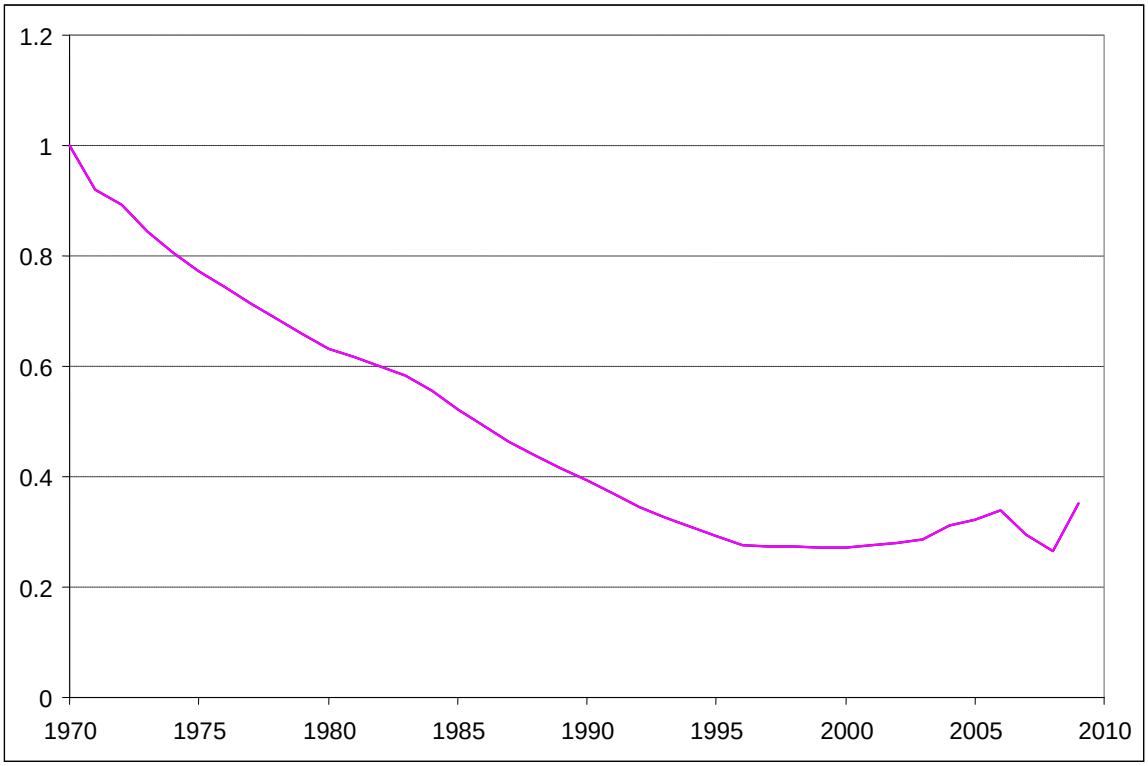


Figure 7.8. The Living Planet Index-Uganda is calculated in the same way as the global LPI, combining all data for species populations.

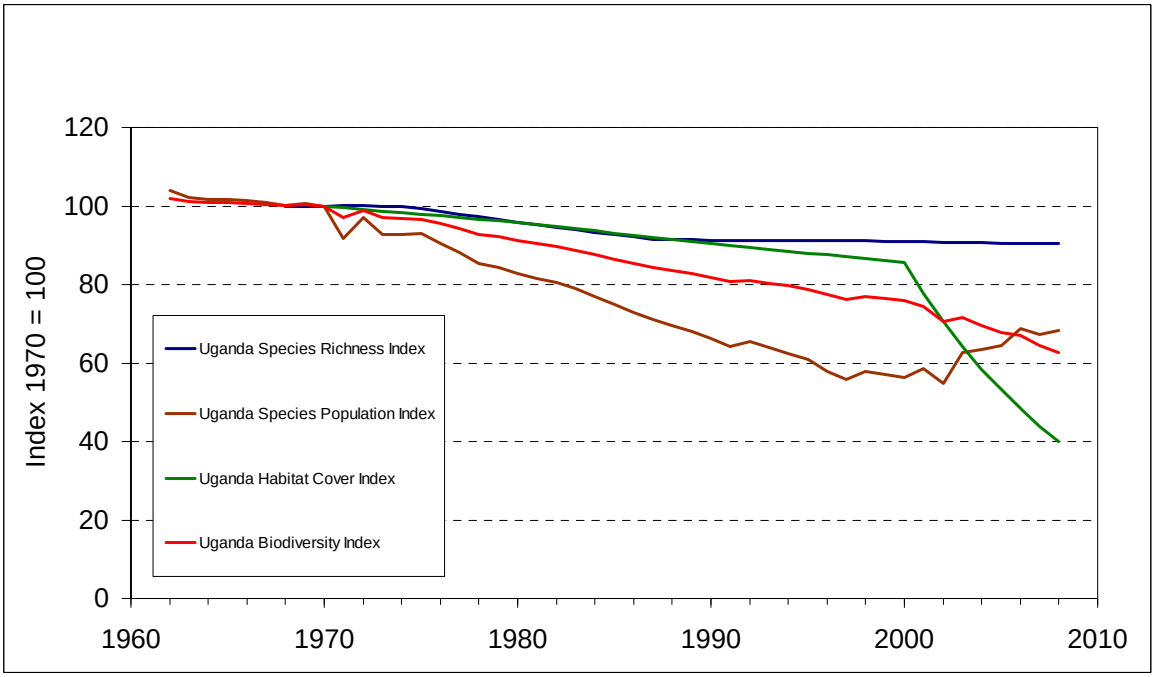


Figure 7.9. Uganda's overall biodiversity trends, 1962-2008, combining four different kinds of information.

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