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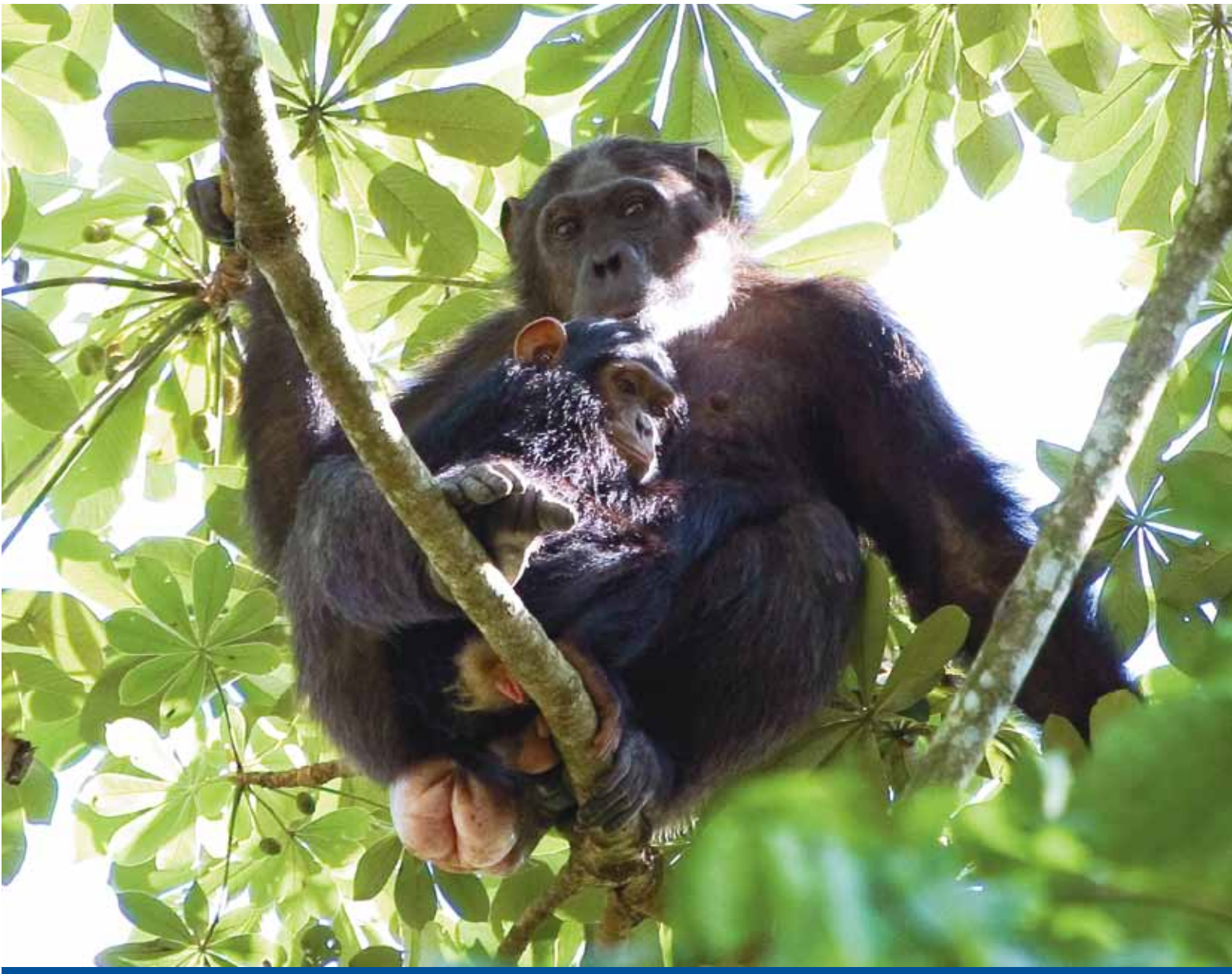
Eastern Chimpanzee (*Pan troglodytes schweinfurthii*)

Status Survey and Conservation Action Plan 2010–2020



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Eastern Chimpanzee (*Pan troglodytes schweinfurthii*)

Status Survey and Conservation Action Plan 2010–2020

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Executive Summary

The eastern chimpanzee (*Pan troglodytes schweinfurthii*) is classified as 'Endangered' and of global conservation concern. Numbers are declining because of hunting for bushmeat, killing of animals to capture infants for the pet trade, disease, loss of habitat to agriculture and mining, and fragmentation of habitat leading to the isolation of small populations which are likely to become genetically unviable in the long term. This species occurs at a low density wherever it occurs (less than 1/km² of forest on average across much of their range) and has a relatively slow reproductive rate, with one infant born every 4–5 years. Consequently, they need large areas of habitat to maintain viable populations, and take a long time to recover from any reduction in population from disease or hunting.

This conservation action plan was developed with the collaboration of scientists involved in research or conservation of chimpanzees, protected area authorities from each of the range states for this subspecies, and also some representatives of Conservation NGOs. Data on recent distributions of chimpanzees amounted to over 22,000 GPS locations for this subspecies and have since been deposited with the SSC A.P.E.S. database in Leipzig. These data were used in a Range-wide Priority Setting analysis (RWPS) that mapped historical distribution and current knowledge of chimpanzee presence in the last 10 years, identified contiguous chimpanzee populations, and agreed on 16 Chimpanzee Conservation Units (CCU), which, if successfully targeted, could conserve about 96% of known chimpanzee populations (about 50,000 individuals) across most of the ecoregions where they occur. Their conservation would therefore capture the range of ecological and, we hope, cultural variation that exists within this subspecies. The results of the RWPS are given in Section 3 of the plan.

There are large areas where there is little or no published knowledge of the presence or otherwise of chimpanzees. It was clear during the RWPS that there is a need to survey areas outside the current extent of knowledge and to identify other CCUs that may deserve conservation attention. A modelling analysis was used to predict where eastern chimpanzees are likely to occur in reasonable numbers outside our current area of knowledge but within their historical range. The model used land cover, physical factors (rainfall, temperature) and various GIS layers pertaining to human impact to estimate the most suitable locations for chimpanzees. The areas identified should be given priority for future surveys. The results of this modelling are given in Section 4, and predict that the total number of eastern chimpanzees is higher than previously estimated and may be 200–250,000.

In August 2009, a workshop was held in Kampala, Uganda, to develop a Vision and Goal for this Action Plan as follows:

Vision: Through international, national and local support, threats to eastern chimpanzees are minimised, ensuring the long-term survival of viable and functional populations of this iconic species across all range states, representing the full range of ecological and cultural diversity and, where possible, contributing to human well-being.

Goal: In 10 years the chimpanzee populations in the 16 CCUs selected are known, the threats identified and curtailed, and the populations are viable and not declining. All additional CCUs outside our current areas of knowledge are identified and actions taken to conserve them.

A problem-tree analysis was used to prioritise threats to the long-term survival of chimpanzees. This was done separately for East Africa and for the Congo Basin. Objectives to address these threats were identified and projects developed for each that together would contribute to their achievement. These objectives and their associated projects are summarized in Section 5. Priority projects for each range state are highlighted in Section 6 of this plan.

This 10-year plan, if fully implemented, will go a long way to ensuring the maintenance of viable populations of the eastern chimpanzee across much of its existing range. Implementation of the plan will be expensive, and funding is one of the specific objectives identified. However, chimpanzees are excellent flagship and umbrella species for conservation; protecting their populations and habitats protects innumerable other species intrinsically less able to attract funding. The focus on different ecoregions and cultures in the RWPS aims to ensure that the Chimpanzee Conservation Units (CCU) given priority will also cover as broad a biogeography as possible, contributing as such to biodiversity conservation region-wide.

1. Introduction

Eastern chimpanzees, *Pan troglodytes schweinfurthii* (Giglioli, 1872), range from southeastern Central African Republic (CAR) through northern Democratic Republic of Congo (DRC) north of the Congo River, to the western regions of the countries of East Africa and southeast Sudan (Fig. 1.1). This subspecies is probably the best known of any of the chimpanzee subspecies because of the long-term research in Tanzania at Gombe Stream National Park by Jane Goodall (Goodall 1986) and colleagues, in the Mahale Mountains National Park by Toshisada Nishida (Nishida 1990) and colleagues, in Uganda at Kibale Forest by Richard Wrangham and colleagues (Wrangham *et al.* 1986; Wrangham, Chapman and Chapman, 1994), and in Budongo Forest Reserve by Vernon Reynolds (Reynolds 2005) and colleagues.

The taxonomic definition of *P. t. schweinfurthii* has recently been under discussion. Groves (2005) showed that there are significant morphological differences in skull size and limb length between chimpanzees in northern DRC/CAR and those in East Africa and southeast DRC. As a result, he proposed that *P. t. schweinfurthii* be divided, with the name remaining for the larger northern DRC/CAR type and giving the name *P. t. marungensis* (Noack, 1877) to the East African type. This nomenclature remains to be accepted by the scientific community, primarily because of the lack of any obvious barrier between the two proposed taxa. For this same reason in this Action Plan we assess the distribution of *Pan troglodytes* without separating it into these two subspecies.

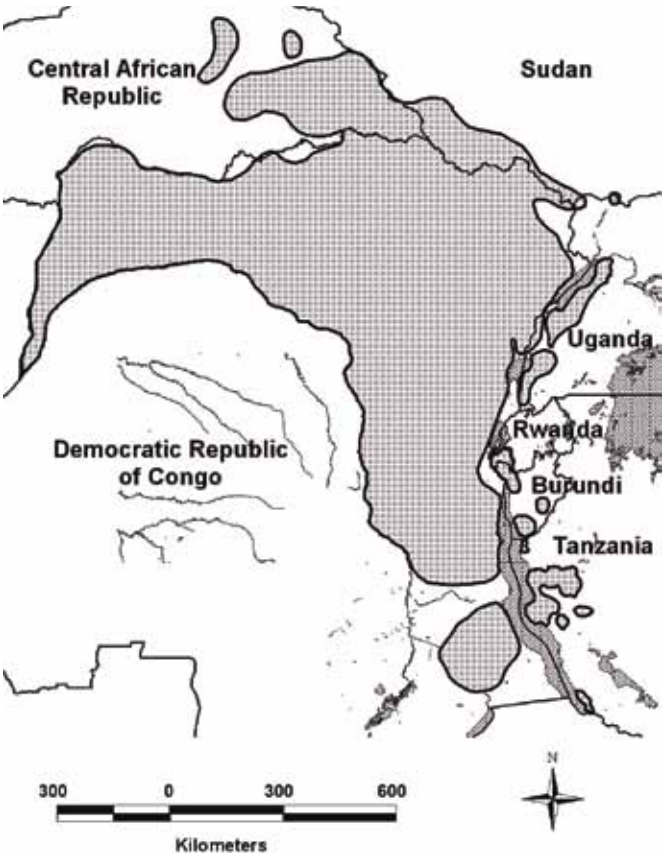

Figure 1.1. *Map of the historical distribution of the eastern chimpanzee (shaded area).*

Major threats to chimpanzees

Chimpanzees (*Pan troglodytes*) as a species are classified as Endangered (A4cd) by IUCN (Oates *et al.* 2009), as is the eastern subspecies, *P. t. schweinfurthii* (Wilson *et al.* 2009). The major threats to eastern chimpanzees include hunting for bushmeat, hunting for the trade in infants, habitat loss or fragmentation, and disease transmission. Populations are being hunted across their range, particularly in DRC and CAR, where they are targetted as bushmeat (chimpanzees are relatively large and provide a reasonable amount of meat compared with other primates). When mothers with infants are killed, the infants are often kept alive as pets and often traded. This illegal traffic in wildlife, from DRC through East Africa, remains high, despite efforts to control it (Hicks *et al.* 2010).

While the Congo Basin forest block remains fairly intact, it is gradually being subdivided by roads and human settlements, which is leading to increasing fragmentation of chimpanzee populations. Roads constructed either to link settlements or for removal of timber from logging concessions allow hunters to enter forests that were previously difficult to reach or inaccessible, which has increased the pressures on this species.

In East Africa (including Rwanda and Burundi) there is less killing for bushmeat (although it does occur), but chimpanzee populations are declining due to habitat loss and major fragmentation, as forest and woodland is converted to agriculture. Outside protected areas, habitat is fast being lost. Within them, however, natural habitats generally remain intact, emphasizing their importance for the conservation of chimpanzees, and highlighting the need to create more. There is a greater risk of disease transmission to chimpanzees in East Africa as many chimpanzee communities live in close proximity to people and regularly come into contact with human faeces and other waste. Studies in Kibale National Park show that human gut fauna are found in chimpanzees and other primates that live adjacent to human settlements and that the similarities between the gut fauna of people and primates increases with increasing forest fragmentation (T. Goldberg pers. comm.). Disease risks are exacerbated by tourism as people come within a few metres of the animals, enabling transmission of respiratory diseases. In addition, international tourists are more likely to be carrying novel diseases that the chimpanzees have never been exposed to.

Development of the Action Plan

This plan was developed using a participatory approach that involved the following steps:

1. Initially, anyone who we believed had data on eastern chimpanzee sightings, signs or vocalizations from the past 10 years was contacted and asked to participate in this planning process. All the authors of this plan shared their data, which produced 22,414 GPS locations of signs or sightings of eastern chimpanzees across their range, wherever surveys have taken place. The distribution of these data is incorporated into the maps for each of the range states in the status survey in Chapter 2.
2. Experts in different regions of the eastern chimpanzee's range were assembled for a two-day workshop in Kampala, Uganda, 17–18 August 2009, to identify priority populations for conservation. The workshop brought together 36 people from seven range states, including research scientists, policy makers from national government ministries, and protected area authority staff. Unfortunately there was no government representation from CAR due to an airline strike; every other *schweinfurthii* range state was represented by government delegates. The results of the priority setting are summarised in Chapter 3.
3. After the priority-setting exercise, it was clear that large areas of the chimpanzee's range have not been surveyed in the recent past, and that chimpanzee population data were lacking altogether for many of these areas. We worked with the Living Landscapes programme of WCS to model the distribution of chimpanzees and to predict where concentrations of the subspecies might occur in these unsurveyed areas so as to help target future surveys. The results of this modelling are given in Chapter 4.
4. The priority-setting workshop was followed by a two-day planning workshop with the same participants (19–20 August 2009) to develop the main elements of the conservation action plan. This included formulating a 10-year vision, goal and set of objectives, as well as specific projects that could be supported as part of the plan. The Action Plan is detailed in Chapter 5.
5. The final plan was then drafted and circulated to attendees of the workshop and to other experts in chimpanzee ecology and conservation for their input and feedback.

Aims of the Action Plan

The main goal of the Action Plan is to develop a strategy to reduce or halt the decline of eastern chimpanzees across their range. This will be achieved by identifying where the key populations occur and where resources would have maximum impact if invested, identifying the key threats to chimpanzees across their range, and developing specific actions that, if implemented, will halt or minimise loss of individual chimpanzees. As far as possible we have tried to develop a consensus between researchers and conservation practitioners who work on this subspecies by including representatives of both groups from all countries, either by inviting them to participate in Kampala, or through e-mail correspondence if they were unable to attend the meeting. The plan provides a synthesis of:

1. The current status and knowledge of the numbers of eastern chimpanzees (Chapter 2)
2. The locations of priority populations for conservation (Chapter 3)
3. The identification of key sites for future chimpanzee surveys where significant populations may occur (Chapter 4)
4. The main threats affecting eastern chimpanzees across their range (Chapter 5)
5. The projects identified that, if funded, could reduce or halt the decline in numbers of eastern chimpanzees (Chapter 5).
6. The priority projects identified for individual range states where eastern chimpanzees occur (Chapter 6).

Infant eastern chimpanzee, Kalinzu Forest, Uganda. Photo © T. Furuichi.

2. Status of Eastern Chimpanzees in Each Range State

This section summarises our knowledge of eastern chimpanzees in each of the range states where they occur. A map is provided of the historical distribution of this subspecies (range considered by the Great Apes Survival Partnership – GRASP) and also locations of any sightings of chimpanzees from surveys between 1998 and 2009 (information compiled specifically for this Action Plan). Locations where chimpanzees have been found to occur during this period but which lack GPS points or survey data are marked with a "+". Protected areas (PAs) registered in the UNEP-WCMC database are included on these maps. For most countries the information on PAs is considered to be relatively complete/accurate except for Sudan, where it is poor. The quality of information on chimpanzee populations across the seven range states is uneven. Where possible we give the latest estimates of chimpanzee numbers from surveys, but there are no recent data for CAR and Sudan. The final section pulls together recent numbers to estimate the minimum population size of eastern chimpanzees using these data.

Burundi

In Burundi, chimpanzees are confined to protected areas but use some plantations as corridors between them. The majority are in Kibira National Park, which is contiguous with Nyungwe National Park in Rwanda. Historical estimates of the numbers of chimpanzees in Burundi are 200–500 individuals (Butynski 2001). About 400 chimpanzees were estimated in a survey of Kibira in 2007 (Barakabuye *et al.* 2007), indicating that the population was then still relatively healthy, despite the fact that this National Park had been a rebel refuge for the previous 15 years. This number is close to an estimate obtained in 1989 by Peter Trenchard (D. Cox pers. comm.).

Chimpanzees also occur in Bururi, Rumonge and Vyanda forest reserves in the south of the country. The Warden of Bururi Forest indicates that chimpanzees still occur in these three reserves. However, given the fact none are larger than 20 km², the number of chimpanzees will not be high. Barakabuye *et al.* (2007) estimated a total of about 450 individuals for Kibira and these small forest reserves combined using a 1989 estimate of 50 individuals for Vyanda, Bururi and Rumonge.

It is clear that the Kibira National Park is the priority site for chimpanzee conservation in Burundi. At 400 individuals the population is smaller than that considered to be viable in the long term (500 is usually considered to be the minimum). However, the connectivity between Kibira and Nyungwe National Park in Rwanda ensures that the total chimpanzee population of this transboundary landscape is at least 700 individuals. Transboundary activities were initiated by the *Institut National de l'Environnement et Conservation de la Nature* (INECN), Rwanda Development Board (RDB) and WCS, to support the conservation of this Congo-Nile Divide landscape.

Management of Kibira National Park and the smaller forest reserves where chimpanzees occur falls under the jurisdiction of INECN. Civil conflict since the early 1990s has meant that there are limited resources for these protected areas to be managed effectively. These forests were often refuges and strongholds for rebel groups, and INECN has only recently been able to re-establish authority over them. As a result poaching has been relatively high and this has had an impact on ungulates and some monkeys (Barakabuye *et al.* 2007). However, the chimpanzees appear to have survived the civil war relatively untouched.

Young eastern chimpanzee, Kalinzu Forest, Uganda Photo © T. Furuichi.

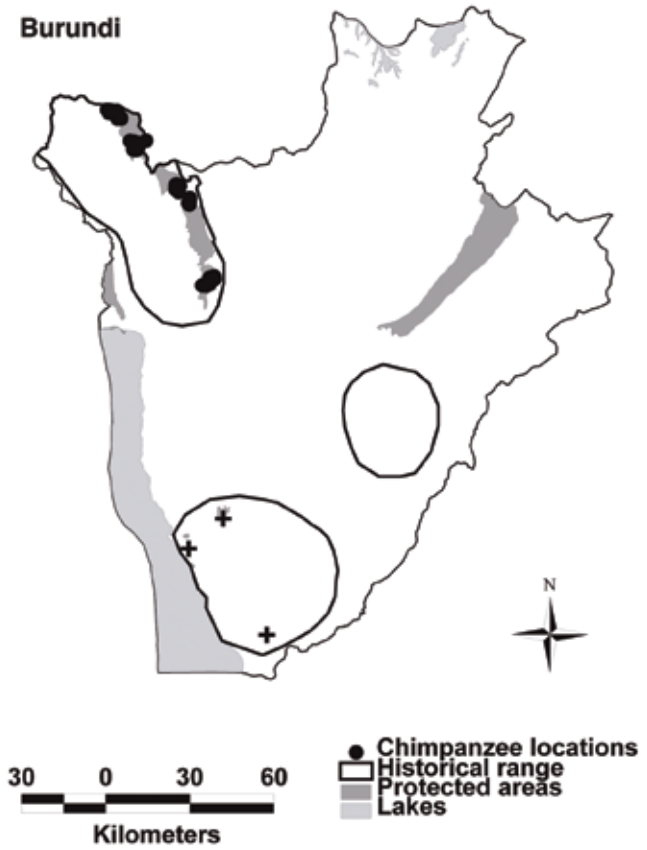

Figure 2.1. *Occurrence of the eastern chimpanzee in Burundi. The plus symbol ("+") indicates locations where chimpanzees have been found during 1998–2009 but which lack GPS information or survey data. Map by A.J. Plumptre/WCS.*

Central African Republic

There have been few recent surveys of chimpanzees in eastern CAR, partly because of insecurity along the border with DRC and partly because of the inaccessibility of this region. Historically, chimpanzees were distributed over much of southeast CAR in both forest and savanna-woodland habitats. Recent reports from safari hunters indicate that chimpanzees persist in this region but that much former chimpanzee habitat may have been lost to expanding human settlements. Historical estimates of chimpanzee population size for this country are very rough, and an estimate of the total population of African great apes makes no attempt to give numbers for CAR because of the paucity of information available (Butynski 2001).

Safari hunting operators indicate that chimpanzees exist in most large forest patches east of the small town of Djimbi and the Sudanese border, beneath the latitude where the Chinko and Vovodo rivers meet (E. Marary pers. comm.). Chimpanzee presence has been confirmed east of the Vovodo at increasingly northern latitudes (Roulet *et al.* 2007; E. Marary pers. comm.). However, no evidence of chimpanzees was found during CITES-MIKE surveys in the Bangassou forest (Williamson *et al.* 2004).

While the human population in eastern CAR remains comparatively low, illegal movements of well-armed Sudanese poachers and militia groups have been on the rise, as well as smaller-scale poaching by cattle herders and southern Sudanese refugees (primarily around Mboki) displaced by the turmoil in the south and southwest of Sudan (Roulet *et al.* 2007). The near absence of law and order in the region is the result of insufficient capacity and, to some extent, political will to ensure stability in the region. At any rate, the perceived need to address the human suffering supersedes the obligation to ensure effective law enforcement pertaining to wildlife crime, and this biodiversity-rich region is in urgent need of attention.

The only protected area in the region within current known chimpanzee range is the Zemongo Faunal Reserve (ZFR). Originally delineated as a 4,800 km² reserve to provide a sanctuary for the now extinct white and black rhinoceros, it has expanded to include 10,100 km² of some of the most diverse habitat in the region, marking the transition between Congolian rainforest and Sahelian grasslands. Despite the absence of conservation activities in the region, CAR's National Biodiversity Strategy and Action Plan proposes rehabilitation of ZFR. This objective is reiterated in CAR's National Operation Plan for COMIFAC. A relatively recent survey reported the presence of chimpanzees in ZFR (Roulet *et al.* 2007) from two nests and footprint. However, there is a clear need for surveys to determine the current status of chimpanzees in CAR and to identify priority populations.

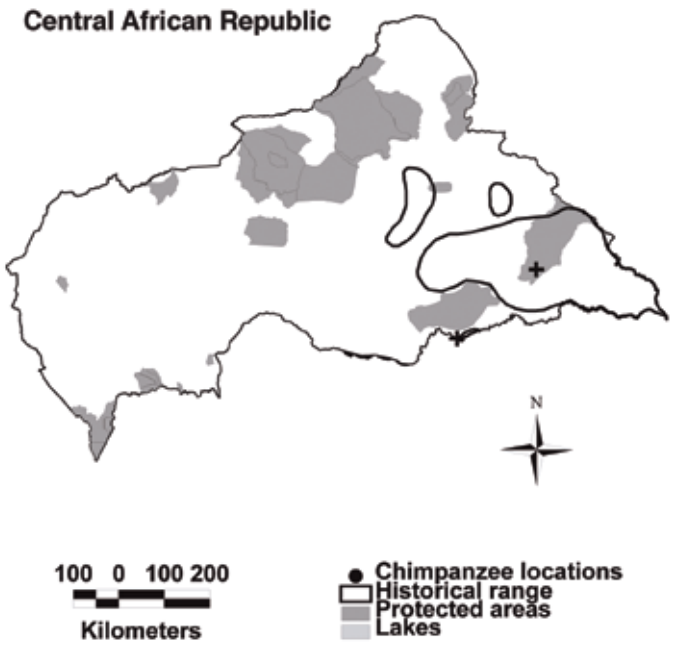

Figure 2.2. *Occurrence of the eastern chimpanzee in the Central African Republic (CAR). The plus symbol ("+") indicates locations where chimpanzees have been found during 1998–2009 but which lack GPS information or survey data. Map by A.J. Plumptre/WCS.*

Democratic Republic of Congo

The majority of the historic range of the eastern chimpanzee falls within the DRC, which is therefore the most important country for the conservation of this subspecies. There are no good estimates of chimpanzee population size for the DRC because survey coverage has been poor. Past estimates were made by extrapolating from a mean density of 0.3/km² to the range area to provide a crude estimate of 70,000 to 110,000 (Teleki 1989; Butynski 2001). If correct, the DRC harbours about 93% of the population of this subspecies throughout its range.

There are have been no chimpanzee surveys over large areas of the DRC in the last 10 years, so there are major gaps in our knowledge of chimpanzee distributions in the country. There have been surveys in the southeast, east and north of the historic range, but the northwestern region is poorly known. Most surveyed are the protected areas, including Virunga National Park, Tongo, Maiko National Park, Okapi Faunal Reserve, Kahuzi-Biega National Park, Bili Uele Reserve, Tayna Reserve, Usala Forest and the Itombwe Massif, and Misotshi-Kabogo. Many of these surveys provided only nest density or encounter rate of nests per km of transect or reconnaissance walks. Converting these to numbers (density estimates) of chimpanzees requires regular marked nest counts or nest decay rates. One option is to use the relationship found between nest encounter rates and chimpanzee density from surveys in Uganda (chimpanzee density = 0.471 × encounter rate of nests; see Plumptre and Cox 2005).

Such extrapolation has provided crude estimates of chimpanzee density that were then converted to population estimates for 13 sites of known size (Table 2.1). To estimate population size, we had first to estimate the area covered by some surveys in sites that have not been gazetted as PAs; likewise for surveys that covered an undefined portion of a protected area. These 13 sites were selected because data were collected on transects or reconnaissance walks that did not follow footpaths and could therefore be used to obtain reasonable estimates of encounter

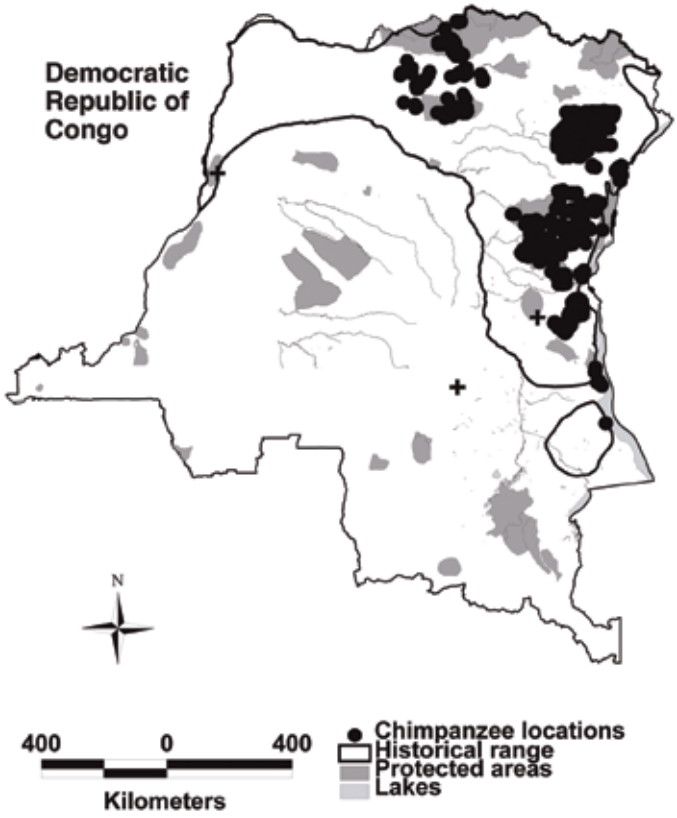

Figure 2.3. *Occurrence of the eastern chimpanzee in the Democratic Republic of Congo (DRC). The plus symbol ("+") indicates locations where chimpanzees have been found during 1998–2009 but which lack GPS information or survey data. Map by A.J. Plumptre/WCS.*

rate per km. The Bili Uele region was not surveyed thoroughly, but visits across much of an area of 36,000 km² indicated that chimpanzee nest encounter rates were roughly similar (C. Hicks pers. comm.). Data from the Bosobele-Lubengo region in the far west show very low nest encounter rates (Inogwabini *et al.* 2007).

Average density of chimpanzees in those survey sites is about 0.73/km² (Table 2.1). However, some of these sites (Itombwe, Misotshi-Kabogo, Kahuzi-Biega Highland, Virunga Highland, Tayna and Usala) are atypical in that they are at relatively high altitude compared to most of the DRC, which is lowland forest. We therefore calculated separate density estimates for chimpanzees in highland forest (1.12/km²) and in lowland forest (0.43/km²). The total area of chimpanzee historical range in DRC is about 792,000/km², and using the lowland estimate of chimp density gives an estimate of about 386,400 chimpanzees for the country. This is considerably higher than the previous estimate of 70,000 to 110,000 individuals (Butynski 2001), and can be partly explained by the fact that not all of the historic range is suitable for chimpanzees, but includes human settlements and other habitat types. On the other hand our estimate does not take into account the higher density of chimpanzees in the higher altitude forests, which form a large part of their range in DRC. In Chapter 4 we use modelling to predict probability of chimpanzee occurrence.

Table 2.1. *Eastern chimpanzee densities using encounter rate data converted to density using the equation developed by Plumptre and Cox (2005). Forest area and population size are also estimated for each region surveyed.*

Site	Density (ind./km²)	Area (km²)	Population size
Bili Uele region	0.60	35,000	21,000
Itombwe	0.63	10,000	6,302
Maganja Hills	0.40	500	199
Maiko	0.07	11,040	728
Misotshi-Kabogo	0.97	1,000	967
Okapi	0.62	14,157	8,802
Kahuzi-Biega Highland	1.23	680	835
Kahuzi-Biega Lowland	0.17	6,000	998
Virunga N.P. – Rwenzori	3.66	158	578
Watalinga Forest	0.29	2,256	645
Tayna Gorilla Reserve	1.19	906	1,080
Usala Forest	0.10	1,160	120
Rubi Tele	0.06	9,080	545
Grand Total	**0.73**	**91,937**	**42,798**
Lowland Forest average	0.43		
Highland Forest average	1.12		

Rwanda

Nearly all of Rwanda's chimpanzees are found in the Nyungwe National Park in the south west of the country. This 1,020-km² park includes the 4-km² forest patch of Cyamudongo, where there is a small population of habituated chimpanzees. The only other site with chimpanzees is the Gishwati Forest just south of the Volcanoes National park, which was drastically reduced in size to only 9 km² following the 1994 genocide.

WCS and Antioch University New England surveyed Nyungwe and Gishwati in 2004 and 2005, respectively, and estimated 380 chimpanzees in Nyungwe and 10–20 in Gishwati (Barakabuye *et al.* 2007). The Nyungwe survey estimated chimpanzee density at eight randomly selected sites across the forest and extrapolated from these to calculate the total population. Preliminary findings from a more robust census in 2009 of 41 transects across the forest indicated that the population size may be lower than the 2004 census, with an estimate of only 306 chimpanzees in Nyungwe (WCS unpublished data). This may be because large areas of the forest were burned in the early 2000s with an estimate of 13% of the forest lost by 2004 (Forrest 2004). Fires have been better controlled since that time and the forest is slowly regenerating. During the 2004 survey, few transects were placed in burned areas and this region was probably under-sampled in relation to its abundance. Nyungwe is a relatively high-altitude forest and chimpanzees range up to 2,900 m, one of the highest altitudes recorded in their range. These high altitudes and the corresponding vegetation associated with them may suppress chimpanzee population density.

Nyungwe, together with Rwanda's other national parks, is managed by the RDB. Gishwati used to be managed by the Forest Department but is now also managed by RDB. Rwanda's protected areas have been relatively well managed since the early 2000s and, as

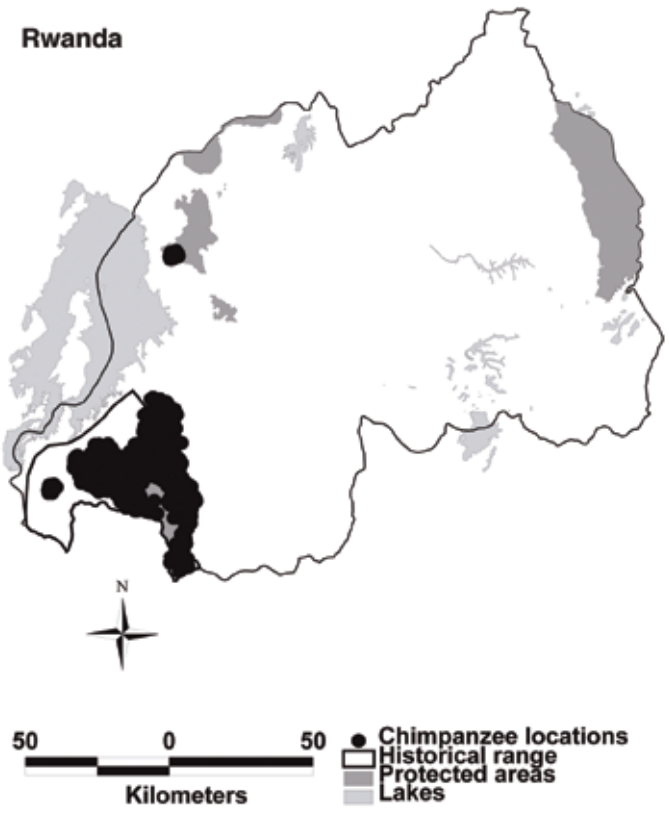

Figure 2.4. *Occurrence of the eastern chimpanzee in Rwanda. Map by A.J. Plumptre/WCS.*

a result, animal numbers appear to be recovering. Nyungwe is contiguous with the Kibira National Park in Burundi, thus the two forests harbour a single chimpanzee population, estimated at about 700. Transboundary collaboration of this Congo-Nile Divide landscape is essential for the conservation of Nyungwe's chimpanzees, given their low numbers. Recent agreement between the governments of Burundi and Rwanda to collaborate in the management of this landscape is very encouraging and will, we hope, ensure the long-term survival of chimpanzees in this landscape.

Chimpanzees have been partially habituated in Nyungwe and Cyamudongo, and tourists track them at both sites for a fee of US$ 90. At these sites, regulations are needed to avoid the spread of disease from tourists and park guards to chimpanzees, similar to those that have been established for mountain gorillas (Homsy 1999).

Nyungwe National Park is clearly the most important site for chimpanzees in Rwanda and conservation efforts should be focussed there.

Adult male eastern chimpanzee, Kalinzu Forest Reserve, western Uganda. Photo © T. Furuichi.

Sudan

There have been no surveys in Sudan for many years because of the fighting between the north and south of the country. Historically chimpanzees were recorded in the far southwest of the country on the border with Uganda, CAR and DRC. How much of this area still has chimpanzees is currently unknown. There are reports that chimpanzees are still present there, and anecdotal reports that chimpanzees occurred further north in the past 20–30 years than mapped in the historical range used here (Col. M. Lero pers. comm.). This is reflected in a revised historical range boundary in Chapter 3.

The only site for which we do have any recent data is Nimule National Park, where chimpanzees range from the Otze Forest Reserve in Uganda into the riverine forest that runs down the escarpment into the park. A survey is currently being carried out by the Jane Goodall Institute (JGI) to assess the occurrence of chimpanzees in Otze Forest Reserve, but numbers appear to be low, given the number of nests that have been encountered.

It is clear that surveys of the historical range are needed to assess whether any key populations remain in Sudan.

Figure 2.5. *Occurrence of the eastern chimpanzee in Sudan. The plus symbol ("+") indicates a location where chimpanzees were found between 1998 and 2009 but which lacks GPS information and survey data. Map by A.J. Plumptre/WCS.*

Tanzania

Tanzania has the longest history of chimpanzee research of any country. It was there that Jane Goodall established her research centre at Gombe Stream National Park and that Toshisada Nishida established a research site in Mahale Mountains National Park. Both projects have collected over 40 years of behavioural and ecological data. Over the years a number of surveys have been carried out outside these protected areas, notably by Kano in the 1970s (Kano 1971a, 1971b, 1972; Kano *et al*. 1999; 2005) and more recently by Ogawa (Ogawa *et al*. 1997, 1999a, 1999b, 2004).

Tanzania National Parks (TANAPA) manages the Mahale Mountains and Gombe Stream National Parks. It also manages Rubondo Island, where some orphaned chimpanzees were released in the 1960s, and their descendants still live on the island. The Forest Department manages Tongwe East and Loazi Forest Reserves, which also harbour chimpanzees.

Moyer *et al*. (2006) estimated 2,700 to 2,800 chimpanzees in western Tanzania by measuring densities in different areas of Mahale Mountains National Park and the area to the East where Kano and Ogawa recorded chimpanzees. Using satellite image analysis to classify vegetation types, these estimates were extrapolated to the whole of the Greater Mahale Ecosystem (GME) with suitable habitat. The result was 2,600 chimpanzees in this region. There are 100 chimpanzees in Gombe Stream National Park and about 140 in forests along the southern shore of Lake Tanganyika (Moyer *et al.* 2006). More recent surveys of the GME indicate that chimpanzee density varies from 0.01 to 0.12/km² and that they appear to have declined since Kano's surveys in the 1970s (Yoshikawa *et al.* 2008).

Moyer *et al.* (2006) estimated that 60% of western Tanzania's chimpanzees live outside protected areas and that there is a need to improve the conservation of this region. The GME, which includes the Mahale Mountains National Park, is home to a bird species endemic to the Albertine Rift, the Kungwe Apalis (*Apalis argentea*), as well as several endemic butterflies and plants, and is the priority landscape for the conservation of Tanzania's chimpanzees.

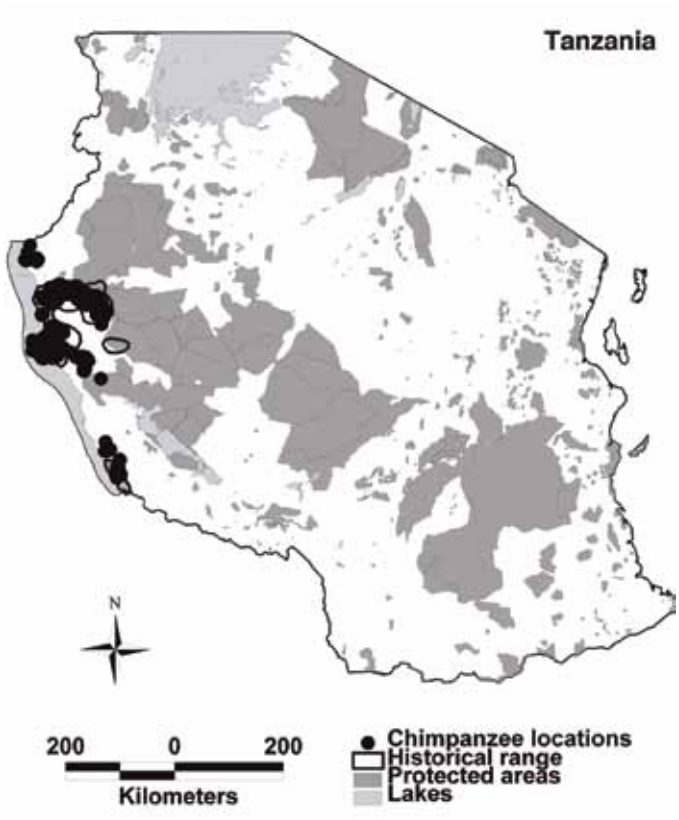

Figure 2.6. *Occurrence of the eastern chimpanzee in Tanzania. Map by A.J. Plumptre/WCS.*

Uganda

Uganda's chimpanzees have also been well studied, with long-term research in Budongo Forest Reserve (1960–61 and 1991–present, Reynolds 2005), Kibale National Park at Kanyawara (1982–present, Wrangham *et al*. 1986) and Ngogo (1992–present, Mitani, Struhsaker and Lwanga 2000), in Kalinzu Forest Reserve (1995–present, Hashimoto 1995), and in Bwindi Impenetrable National Park (1995–2001, Stanford and Nkurunungi 2003). These studies have focused on the ecology and behaviour of chimpanzees in their respective environments. Plumptre and Reynolds (1994, 1996, 1997) were the first to undertake a rigorous chimpanzee census in Budongo Forest Reserve, Uganda, and developed the technique of 'marked nest counts' to avoid the need to measure nest decay rates.

These methods were later used in a nationwide census of chimpanzees undertaken by WCS and JGI between 1999 and 2002 (Plumptre, Cox and Mugume 2003; Plumptre and Cox 2005). They estimated about 5,000 chimpanzees in Uganda, the four largest populations being Kibale and Rwenzori Mountains National Parks together with Budongo and Bugoma Forest Reserves (each having more than 500 individuals). Kibale National Park alone contains about 25% of Uganda's chimpanzees. The populations in Maramagambo, Kalinzu and Kasyoha-Kitomi forests were each less than 500 individuals but these three reserves are interconnected and form a single population numbering around 900 chimpanzees (Plumptre, Cox and Mugume 2003).

The Uganda Wildlife Authority (UWA) is responsible for the conservation of wildlife both inside and outside protected areas. As such it is responsible for the conservation of chimpanzees in parks and wildlife/community reserves and on private land. In practice the National Forest Authority manages forest reserves, including the chimpanzees. There is little active management on private lands. Chimpanzees are not commonly hunted for meat in Uganda but are at risk of being caught accidentally in snares set for antelopes. At least 25–35% of habituated chimpanzees suffer permanent injury from snares. Another major threat to chimpanzees is the loss of forest both inside forest reserves and to agriculture outside the forest reserves (McLennan 2008).

Forests not only provide important habitat for chimpanzees but regulate local climate. Photo © A.J. Plumptre/WCS.

Figure 2.7. *Occurrence of the eastern chimpanzee in Uganda. Map by A.J. Plumptre/WCS.*

Encroachment for agricultural land is leading to forest loss, particularly in East Africa. Photo © A.J. Plumptre/WCS.

A.P.E.S. – the Ape Populations, Environments and Surveys database

The A.P.E.S. database aims to provide an accurate and objective picture of the distribution and status of great apes, and thus inform long-term management and conservation strategies. The data presented here on the distribution of eastern chimpanzees across their range have been shared with the A.P.E.S. database—a collaboration between the Max Planck Institute in Leipzig, Germany, and the IUCN/SSC Primate Specialist Group. We hope that future surveys will refer to these archived data (for example, to assess status, to make comparisons and evaluate trends). Data access should be requested from the original data owners whose contact details are stored in the database (http://apes.eva.mpg.de).

Estimate of total known population

Estimates of total population size for eastern chimpanzees are still only very approximate because large areas of their range have never been surveyed. The most recent estimate (Kormos *et al*. 2003) is 76,400–119,600 eastern chimpanzees of an estimated 172,700–299,700 total for all subspecies.

Combining the data we gathered for this workshop, we can estimate the number of eastern chimpanzees where recent surveys have been carried out (Table 2.2). This minimum estimate of eastern chimpanzees omits the large areas not surveyed in CAR and DRC where there are likely to be significant numbers of individuals. In Chapter 4 we attempt to assess where chimpanzees may still occur within their historic range by modelling the factors that predict the existence of chimpanzees where they have been surveyed in the last decade.

Table 2.2. *Estimates of eastern chimpanzee numbers by country from surveys within the past 10 years. 'Known' sites do not cover the full range where this subspecies is likely to occur.*

Burundi	450
CAR	?
DRC	42,798
Rwanda	275
Sudan	?
Tanzania	2,750
Uganda	5,000
Total	**51,273**

3. Identification of Priority Populations

The identification of priority populations for chimpanzee conservation is necessary because many chimpanzees, particularly in East Africa, occur in small populations in small forest fragments. It would be impossible to protect all individuals in the wild. Given limited resources, it is important to identify key populations, and support and promote conservation measures for them with the aim of sustaining their numbers and by doing so save more individuals than could be saved by focusing on forest fragments where populations have a reduced or minimal long-term viability.

Process used to identify priority populations

A two-day workshop was held to identify priority populations across the range of the eastern chimpanzee. A Range-wide Priority-Setting approach was used; a method developed by WCS and applied to priority-setting exercises for many other species (Sanderson *et al.* 2002a). This process involved:

1. Identifying the potential or historical range of the eastern chimpanzee in the past 100 years
2. Identifying all areas where we know eastern chimpanzees exist — the area of knowledge
3. Identifying all locations surveyed in the past 10 years
4. Identifying current populations of eastern chimpanzees
5. Identifying Chimpanzee Conservation Units (CCUs) which we consider to be priority populations for conservation. This involves consideration of ecological variation in a species across its range. For example, chimpanzees will have different ecological adaptations to savanna or to forest, and to conserve the ecological variation of the taxon, we may choose to conserve populations in both habitat types, even if one of the populations is smaller than some others.

This process produced a short-list of populations considered important in conserving the ecological diversity of eastern chimpanzees across their range.

Historical range of the eastern chimpanzee

UNEP-WCMC recently consulted ape specialists across Africa and Asia to determine the range of each of the great apes (Caldecott and Miles 2005), and we elected to use the historical range polygon produced for eastern chimpanzees as a starting point (Fig. 1.1). This range encompasses where chimpanzee records have ever been made over the past 150 years. However, delegates at the Kampala workshop modified this range based on their experience, new sightings of chimpanzees, or better historical information on their distribution (Fig. 3.1). These modifications incorporated parts of southeast CAR, western Sudan and western Uganda as part of the range. The area in Uganda is known to have existing chimpanzees populations, while the areas added in Sudan and CAR still need to be confirmed as sites where chimpanzees occur; however, the delegates with knowledge of those areas were convinced that chimpanzees occurred there, or had in the recent past.

Area of knowledge about chimpanzee distributions

Workshop participants identified all areas where they, or a reliable third party, knew of the presence or absence of chimpanzees. The previously identified historical range of eastern chimpanzees was mapped in ARCGIS 9 over layers that included country boundaries, land cover, roads, settlements, and rivers. Workshop delegates drew boundaries of areas of knowledge on printed maps of portions of the range. The updated maps were then scanned and georeferenced using cross points and recognizable features on the original maps. The areas drawn by delegates were then digitized to produce polygons of areas of knowledge about chimpanzee distributions (Fig. 3.2). These are areas where workshop delegates were confident that they know that chimpanzees do or do not exist.

Identification of survey locations

The locations of chimpanzee nests, observations of chimpanzees and vocalizations recorded by survey teams over the past 10 years at sites across the range of the eastern chimpanzee were plotted in the various maps (Figs. 2.1 to 2.7). A total of 22,414 data points were compiled and plotted (Fig. 3.3). These cover most of the areas of knowledge of chimpanzee presence in Figure 3.2. It is clear that East Africa, Rwanda and Burundi have been better sampled than central Africa and Sudan.

Identification of chimpanzee populations and current range

Within the area of knowledge, separate populations of chimpanzees were identified by groups of experts for each country. These included animals that move between several protected areas and hence are part of the same population. This exercise produced a total of 53 polygons, of which four were either amalgamated with other polygons because they were transboundary and adjoining, or omitted due to insufficient certainty that chimpanzees occurred in them. The remaining 49 polygons are shown in Figure 3.4. They include a large region of swamp forest at the western edge of the chimpanzees' historical range, where they still occur. There are few people in this region because of the swamp and it is probable that chimpanzees occur across the whole area as one contiguous population (Inogwabini *et al.* 2007).

Data were collected concerning the factors that limit the ranging of chimpanzees beyond the boundaries of each polygon and the threats to chimpanzees inside each. We found that habitat transition, habitat degradation and human population density are the main factors determining the boundaries of the polygons in East Africa (including Sudan, Rwanda and Burundi) (Fig. 3.5). In the Congo Basin (CAR and DRC) lack of knowledge was the biggest factor in delimiting the polygon boundaries. Of the major factors identified, habitat transition and habitat degradation due to movements or the expansion of human populations ranked high, but, unlike in East Africa, hunting was also important (Fig. 3.5). A particular problem in this region is armed conflict, which means that, even if habitat is suitable, hunting by armed groups may have eliminated some chimpanzee populations.

Threats to chimpanzees were assessed in each polygon in two ways: the percentage of the area affected by the threat (Fig. 3.6), and the rank of the threat in terms of its impact on chimpanzees (Fig. 3.7). These figures show that the threats to chimpanzees differ considerably between East and Central African sites. In East Africa small population size, habitat degradation, and disease rank high, while in Central Africa

Artisinal gold mining in central Africa brings people into the forest and greatly increases the hunting of chimpanzees. Photo © A.J. Plumptre/WCS.

Figure 3.1. *Revised map of the historical range of the eastern chimpanzee.*

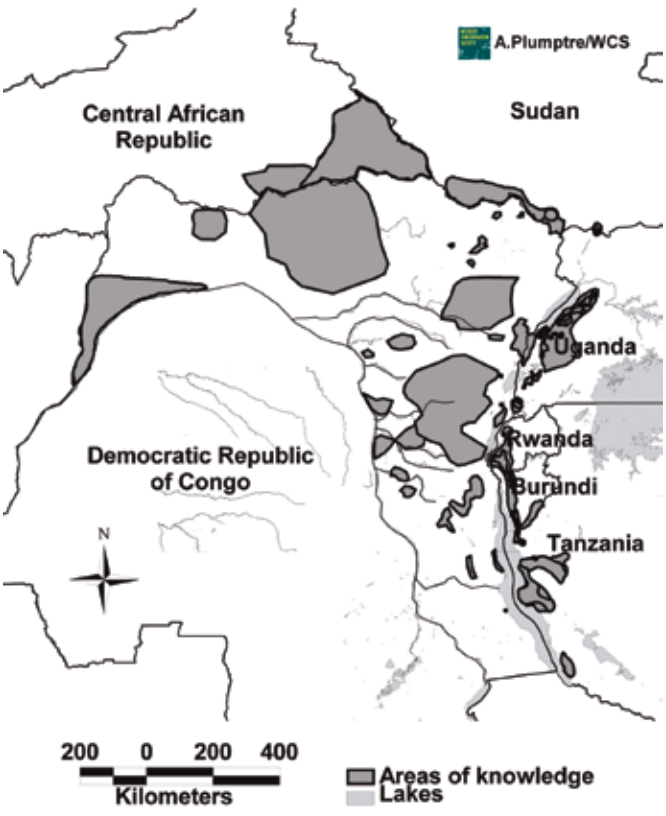

Figure 3.2. *Areas of knowledge about eastern chimpanzees where delegates could confirm presence or absence of eastern chimpanzees.*

Table 3.1. *Chimpanzee Conservation Unit (CCU) type and name with approximate chimpanzee population size and rank (1 = highest) based on criteria developed at the workshop (see text for an explanation of the ranking system).*

CAR	CA001	Zemongo	I	500–1,000	5
DRC	DR001	Greater Okapi landscape	I	>1,000	1
DRC	DR002	Kahuzi-Maiko-Tayna	I	>1,000	3
DRC	DR003	Bili-Rubi-Tele	I	>1,000	2
DRC/Uganda	DR004	Rwenzori-Semuliki-Hoyo	I	500–1,000	14
DRC	DR005	Misotshi-Kabogo	I	>1,000	7
DRC	DR006	Tongo/Nyiragongo	II	100–500	16
DRC	DR007	Itombwe	I	500–1,000	9
Rwanda/Burundi	NK003	Nyungwe-Kibira	I	500–1,000	10
Tanzania	TZ002	Greater Mahale	I	>1,000	6
Tanzania	TZ003	Masito-Ugalla	I	500–1,000	11
Uganda	UG001	Budongo	I	500–1,000	12
Uganda	UG002	Budongo-Bugoma corridor	III	100–500	15
Uganda	UG003	Bugoma	I	500–1,000	12
Uganda	UG004	Kibale-Itwara	I	>1,000	4
Uganda	UG005	Maramagambo-Kalinzu-Kashyoha-Kitomi	I	>1,000	8

hunting ranks highest, followed by habitat conversion and degradation. These differences influenced the development of the Action Plan (Chapter 5), and a separate threats analysis was carried out for each of the two regions.

Identification of Chimpanzee Conservation Units (CCUs)

Chimpanzee Conservation Units (CCUs) were identified among the 49 population polygons drawn by the delegates. Recognising that we have no information for large parts of DRC and CAR and that there may be additional areas that harbour important chimpanzee populations, we identified and ranked areas about which we had knowledge using the following criteria:

I. an area currently known or believed to contain a population of at least 100 breeding-age chimpanzees and adequate habitat;

or

II. an area containing fewer than 100 breeding-age chimpanzees, but with sufficient habitat such that chimpanzee numbers could increase if threats were alleviated;

or

III. an area of habitat important for connectivity (for example, a habitat corridor) potentially suitable for chimpanzees to move between areas with resident populations.

A subset of 16 polygons was selected as CCUs (Fig. 3.8). These sites include most protected areas that are known to contain significant populations of chimpanzees as well as large areas that are not protected (Table 3.1). Most CCUs were identified as type I (>100 breeding age chimpanzees), only one as type II (<100 with possibility of expansion) and one as type III (important corridor).

Summing population estimates for these 16 sites (as estimated in Chapter 2) gives a minimum total of 49,000 chimpanzees that would be protected with conservation efforts on their behalf. This is 96% of the total estimated chimpanzee population from areas with known density where we can estimate approximate numbers (Table 2.2). It is clear from Figure 3.8 that the CCUs in DRC and CAR are much larger than those in East Africa. CCUs were designated at country level and therefore represent the key sites for chimpanzee conservation within each range state. However, provided the criteria were applied correctly they should be comparable between countries.

CCUs were ranked using seven criteria, giving a value of '5' to units most favourable for chimpanzees, '3' to medium and '1' to low. Delegates assigned weights to each criterion based on their perceived importance for the long-term survival of chimpanzees. The criteria used (with weights in brackets) were:

1. Habitat quality: high, medium or low (21)
2. Size of CCU: > 2,000 km², 1,000–2,000 km² or < 1,000 km² (17)
3. Threat of illegal killing: low, medium or high (14)
4. Connectivity to other areas: well connected, limited connectivity, isolated (13)
5. Current level of management of chimpanzees: high, medium or low (12)
6. Human footprint: low, medium or high (11)
7. Numbers of chimpanzees: > 3,000, 1,000–3,000, < 1,000 (12)

The overall ranking of sites using these weighted values is given in Table 3.1. The exact values of the ranks are probably not useful, but we can group them into most important (ranks 1-5), medium importance (ranks 6-10) and lower importance (ranks 11-16).

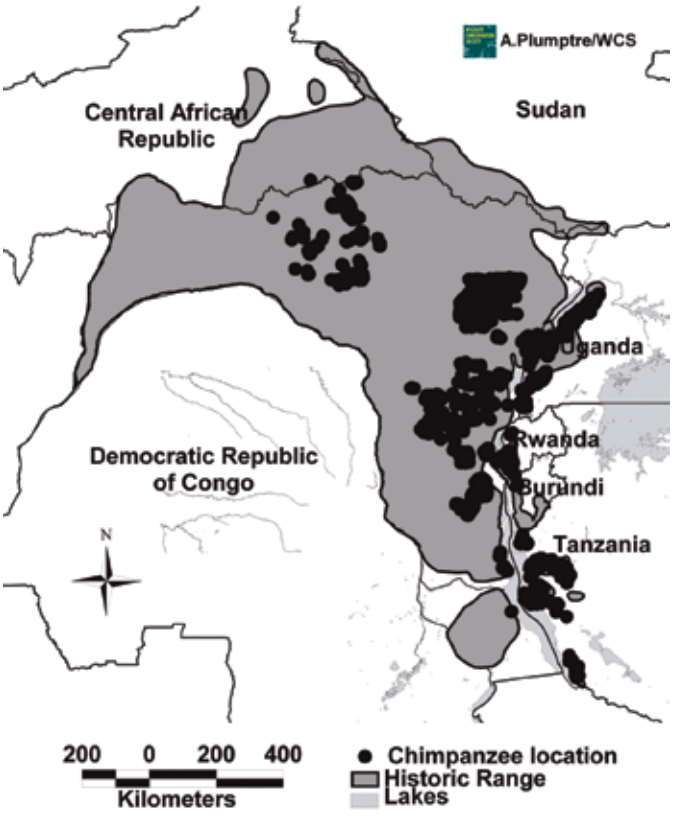

Figure 3.3. *GPS locations (black dots) of chimpanzee sightings, vocalizations and nests recorded during surveys over the past 10 years. The points are plotted over the revised historical range shown in Figure 3.1.*

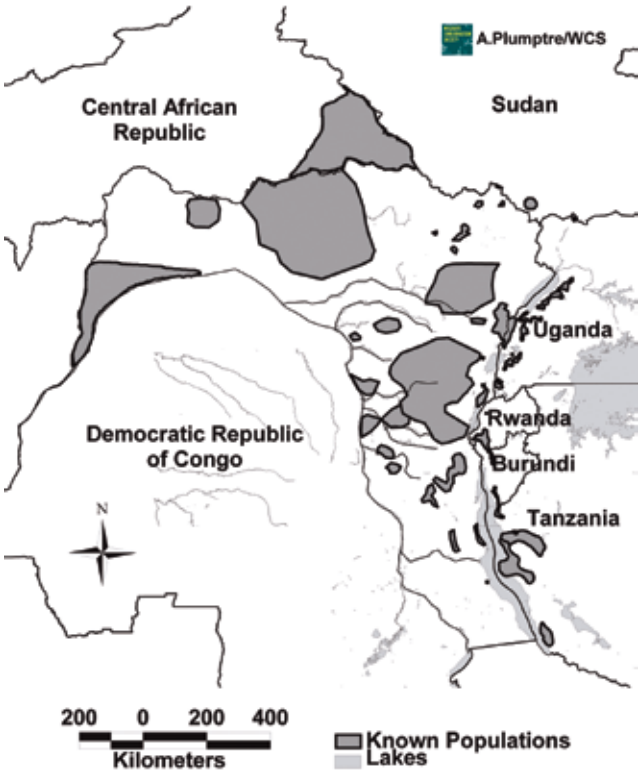

Figure 3.4. *Map of known populations of eastern chimpanzees where we are certain of their occurrence from field surveys or believe that they are likely to occur as continuous populations because human density is very low and there are no barriers to their movements. For example, the far western polygon is swamp forest with few people, and chimpanzees have been recorded there recently.*

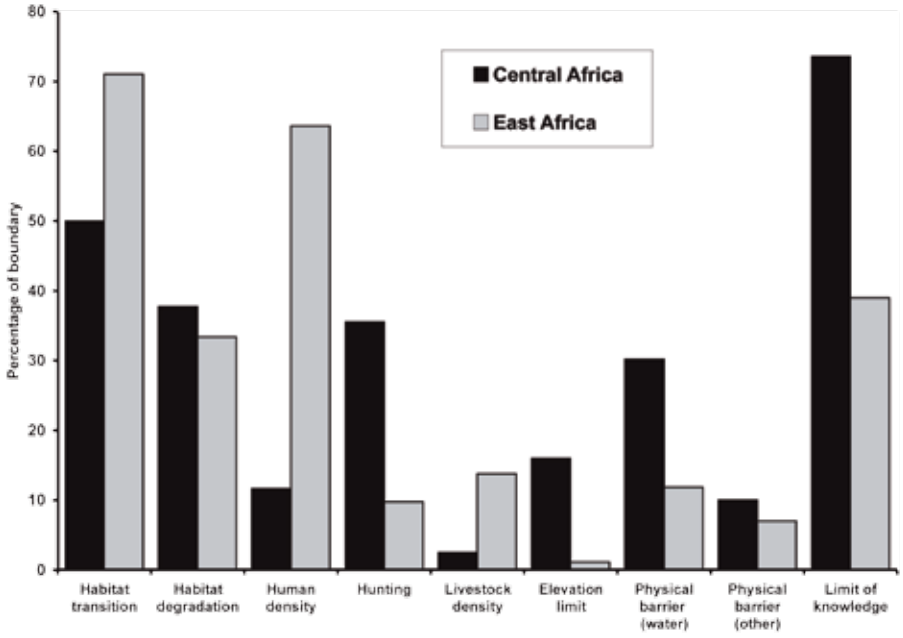

Figure 3.5. *Factors identified by delegates as limiting the boundaries of the population polygons shown in Figure 3.4. The average percentage of the polygon boundaries affected by each factor is plotted separately for East Africa and Central Africa.*

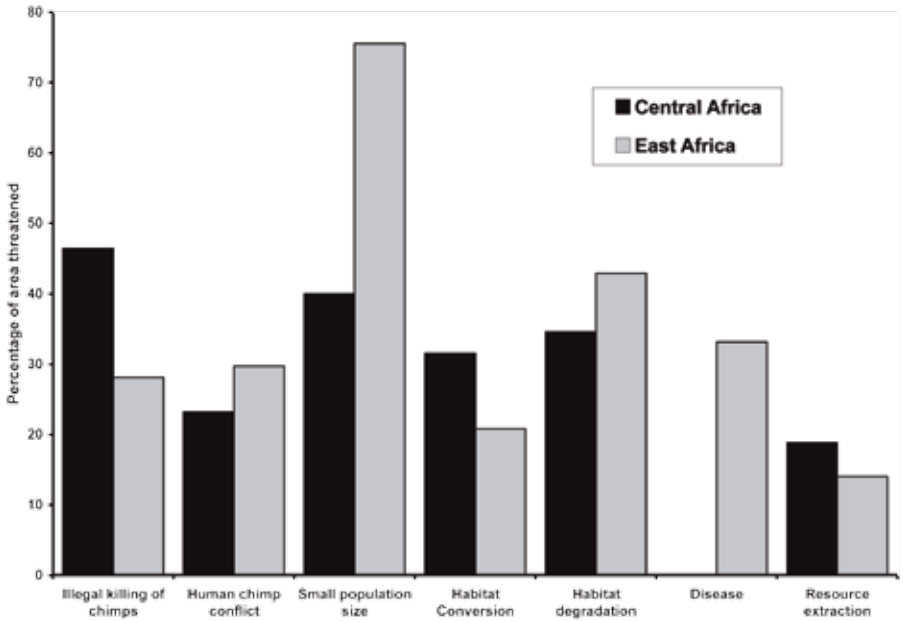

Figure 3.6. *The average percentage of polygon area affected by each threat to chimpanzee conservation (assessed by experts for each polygon) plotted separately for Central and East African sites.*

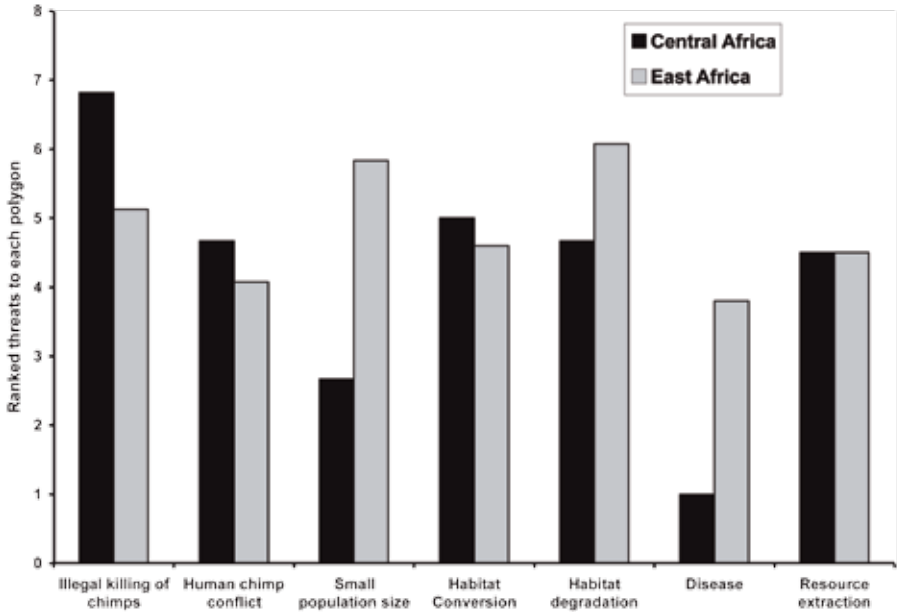

Figure 3.7. *The average rank of the different threats to chimpanzee conservation (as judged by experts for each polygon) plotted for Central and East African sites. Highest possible rank = 8, lowest = 1.*

Ecological and behavioural representativeness

In the conservation of any species, it is important to maintain ecological variation as well as high numbers of individuals (Sanderson *et al.* 2002a). Chimpanzees in savanna woodland habitat have a different ecology to those in forest, as do chimpanzees in lowland and montane forest. The differences are reflected in their densities. In addition, there is great cultural variation between chimpanzee populations (Whiten *et al.* 2001); some fish for termites with sticks while others do not; some crack nuts, large snails or even tortoises and eat them, while others do not. Conservation Action Plans should aim to maintain both the ecological and cultural variation within a taxon; we therefore assessed how well the CCUs retained both ecological and cultural variation across the eastern chimpanzee's range.

Ecological variation

We used WWF's classification of ecoregions to assess ecological variation across the historic range of eastern chimpanzees (Fig. 3.9). The area of each of 14 ecoregions was calculated for both the historic range and for all CCUs to estimate the percentage of each ecoregion that will be conserved if efforts focus on the CCUs (Table 3.2). More than 10% of the area of all but three of the 14 ecoregions is within the historic chimpanzee range represented within the 16 CCUs. We conclude that for these 11 ecoregions chimpanzees serve well as a flagship species for conservation efforts within them. For three ecoregions they do not:

1. The Rwenzori-Virunga montane moorlands are probably not inhabited by chimpanzees but are captured because CCU DR004 encompassed the Rwenzori Massif;
2. The Southern Congolian savanna-forest mosaic is in a region where it is unclear if there are many chimpanzees. No surveys of chimpanzees have taken place in this ecoregion.
3. A Western Congolian swamp forest is the one main ecoregion with a good likelihood of chimpanzee presence (Fig. 3.4) that does not contain a CCU or part of a CCU. We did not receive any survey data from this region although know it exists (Inogwabini *et al.* 2007) and nobody at the workshops knew about this region. It should be a priority area for future surveys and assessment for a CCU status.

Cultural variation

Data were compiled for sites where cultural observations had been made (Appendix 2); in most cases these were long-term field sites. We used the classification of Whiten *et al.* (2001), adding new behaviours that had been observed. Behaviours were classified as customary (C), habitual (H), present (+), absent (×), absent with environmental explanation (E) and possibly present (?). We recoded these classifications as numbers using

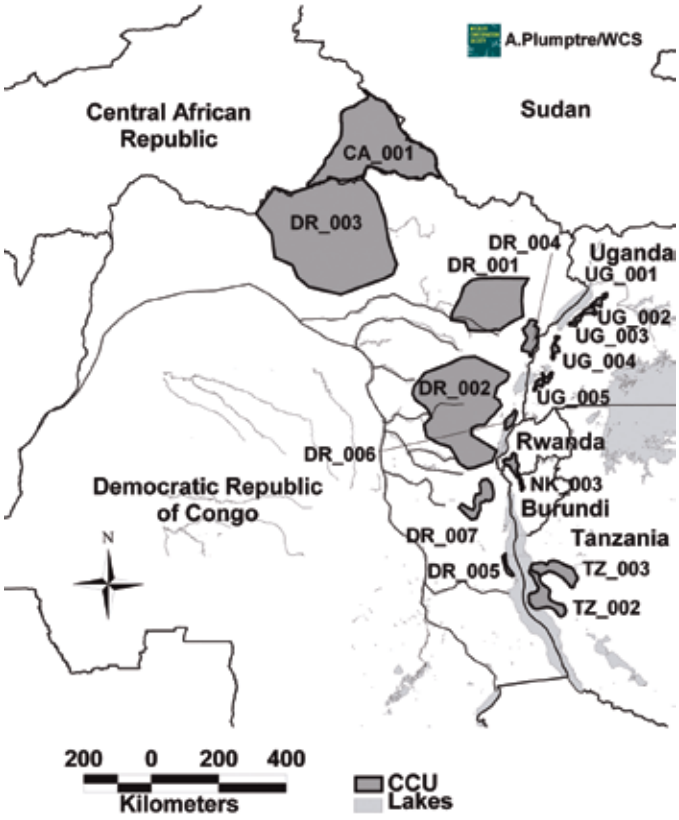

Figure 3.8. *Chimpanzee Conservation Units (CCUs) identified for each range state.*

Table 3.2. *Area of each ecoregion within the historic range of eastern chimpanzees and within CCUs. The percentage of the area within the historic range that is found within CCUs is also given.*

Ecoregion	Area in Historic Range (km²)	Area in CCUs (km²)	Percentage
Albertine Rift montane forests	73,555	17,330	23.6
Central Zambezian Miombo woodlands	66,150	8,553	12.9
East Sudanian savanna	34,996	4,718	13.5
Northeastern Congolian lowland forests	527,442	148,029	28.1
Northern Congolian forest-savanna mosaic	238,896	77,425	32.4
Rwenzori-Virunga montane moorlands	1,899	137	7.2
Southern Congolian forest-savanna mosaic	33,196	217	0.7
Victoria Basin forest-savanna mosaic	13,444	1,541	11.5
Western Congolian swamp forests	46,918	0	0.0

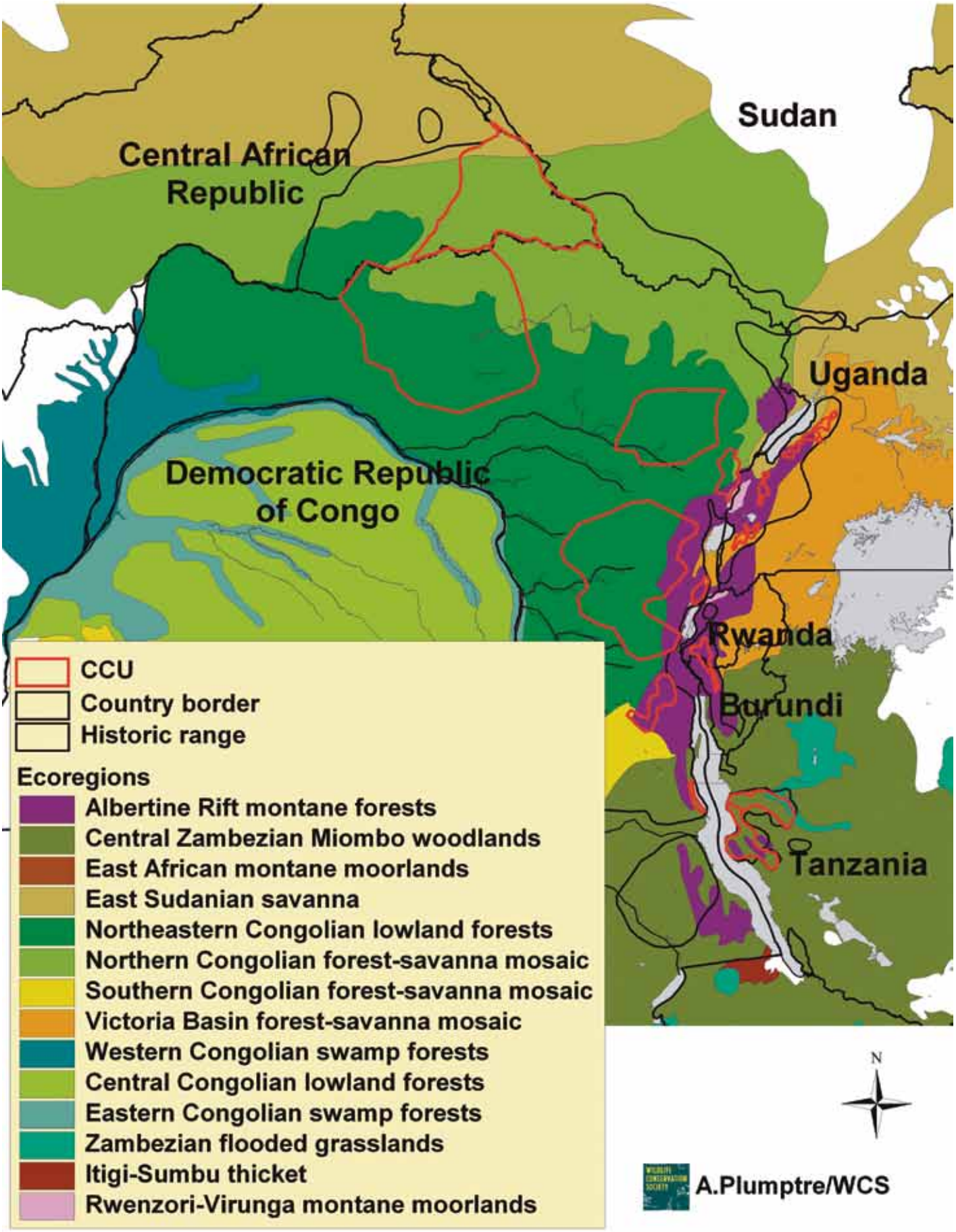

Figure 3.9. *Map of CCUs overlaid on the historic range of eastern chimpanzees, and showing ecoregions.*

the following conversions: C=10; H=7; +=4; ?=1; X and E and any missing data=0. Using these recoded data we carried out a principal components analysis with varimax rotation of the recoded behavioural data and the first two axes were plotted (Fig. 3.10). This analysis calculates the main variation between sites such that those sites plotted near each other in fig 3.10 are more similar in their behavioural repertoire than those further away.

These results show that chimpanzees at neighbouring sites such as Mahale (M and K groups) and Kibale (Kanyawara and Ngogo sites) tend to have similar behaviours. The one site in DRC (Bili Uele) is very different as are the behaviours of chimpanzees found in the narrow corridor forests between Budongo and Bugoma forests in Bulindi. Interestingly Kalinzu forest also is quite different to other Ugandan forests such as Budongo and Kibale. These three sites may seem to differ because data on the chimpanzees have been studied for shorter periods of time. If we exclude Bulindi and Bili Uele, which have been studied for the shortest time, the results do not differ greatly from Figure 3.10, where Kalinzu and Gombe separate from the other sites.

It is, therefore, difficult to conclude much about behavioural variation: sites in the same forest tend to cluster but there is no obvious correlation with how far apart these forests are from each other. Appendix 2 lists some behaviours seen only in Bili Uele (DRC) and it is likely that these are related to the environment in which chimpanzees find themselves. There appears to be a culture of ground nesting and smashing of giant snails as well as tortoises that occurs across to the Okapi Reserve and Maiko National Park but not elsewhere. Given the paucity of data on chimpanzee behaviours at some sites we can't use this as an additional filter in selecting CCUs, but it would be useful to record signs of chimpanzee tool use and culture in future surveys. We can only hope that by capturing the variation in ecology through ecoregions that we will also capture the variation in different behaviours that are likely to occur across the range of the eastern chimpanzee.

Conclusions

A set of 16 CCUs was selected that, if protected and well managed, would conserve about 96% of the current known population of eastern chimpanzees as well as capture much of the ecological variation found throughout the range of this subspecies. There is a need to identify a CCU in the western Congolian swamp forest ecoregion and possibly in the southern Congolian savanna-forest mosaic ecoregion to capture all of the ecological variation and these should be priority areas for future surveys. One well-known site is not captured in this priority-setting process: Gombe Stream National Park. Gombe is famous for its long history of pioneering research on the eastern chimpanzee but did not meet the criteria for a CCU because it has fewer than 100 chimpanzees and does not form part of a corridor to any other significant population. It may be worth making a special case for inclusion of Gombe as an important research site for monitoring small populations and the impacts of isolation on chimpanzee behaviour and ecology.

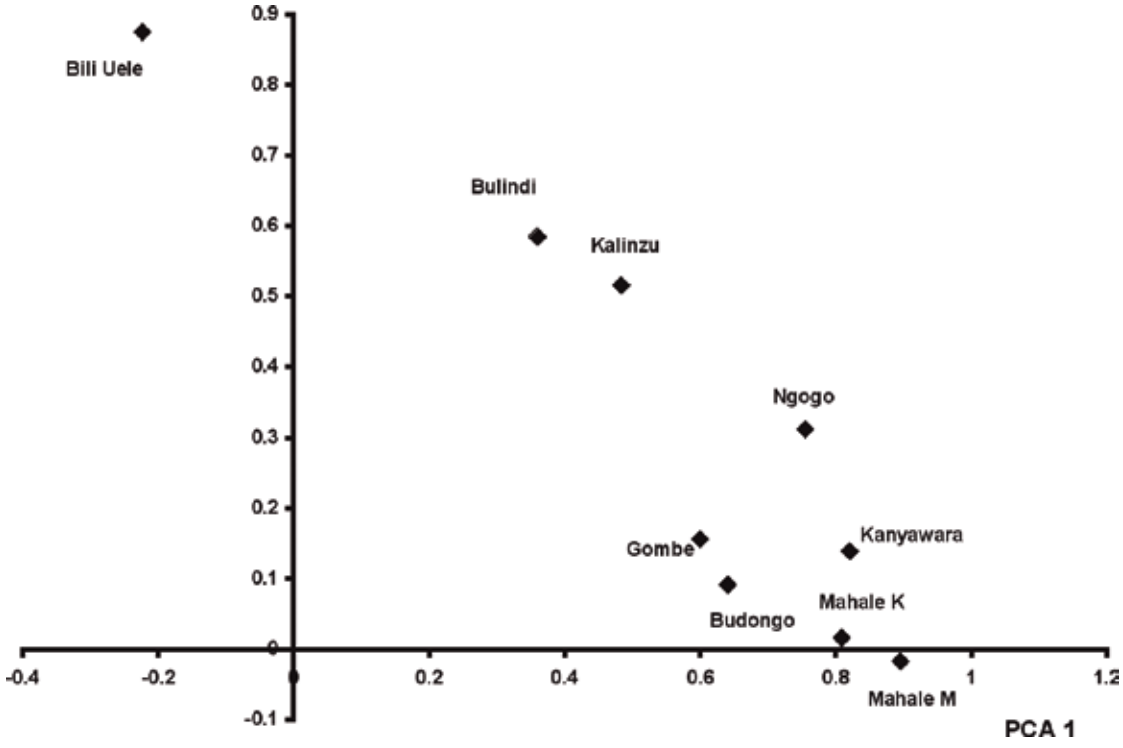

Figure 3.10. *Principal components analysis with varimax rotation of nine sites with data on behaviours of chimpanzees.*

4. Modelling the Occurrence of Chimpanzees to Identify Priority Areas for Surveys

The need to model chimpanzee distribution

Large areas of eastern chimpanzee range have not been explored in the past 10 to 20 years. As a result we have few data and only a very poor knowledge of where chimpanzees occur in DRC, Sudan and CAR. We decided that, given the large amount of distribution data available from the GPS locations that had been compiled, it would be reasonable to identify factors that predict where chimpanzees occur and, using the information from areas we know, then extrapolate to the Congo Basin forests that have not been explored to identify sites where chimpanzees could be abundant. The aim of the process was to:

1. Identify sites for future surveys and research; and
2. determine the total area where chimpanzees may occur. This area can then be used to arrive at a better estimate of the total population of eastern chimpanzees using density estimates from similar habitat types where they have been surveyed.

This analysis was carried out by Karl Didier (WCS Conservation Support) and Grace Nangendo (WCS Uganda Programme) after the workshop in Kampala.

Model inputs and methods used

For the modelling process we used the software MAXENT, appropriate for modelling presence data (Phillips, Duxent and Schapire 2004; Phillips, Anderson and Schapire 2006; Elith *et al.* 2006) when lacking absence data. The 22,414 GPS locations we compiled (Chapter 3) were used as point locations of distribution. Polygons were also constructed manually in ARCGIS 9.1 to show where surveys had been carried out around these locations (using GPS point data from the surveys) to highlight where chimpanzees were absent as well as present. The analyses were made using two conditions: Condition 1, with polygons drawn around each survey separately; and Condition 2, with surveys in similar areas combined (producing fewer polygons that covered larger areas). Both conditions were applied separately to clip underlying GIS layers that might be good predictors of chimpanzee distribution.

The following 23 input layers were selected as factors that possibly predict chimpanzee distributions:

1. Global Landcover – set 1 (LC-GLOB)
   Source: <https://lpdaac.usgs.gov/lpdaac/products/modis_products_table>
2. Global Landcover – set 2 (GLOBCOV2)
   Source: <https://lpdaac.usgs.gov/lpdaac/products/modis_products_table>
3. Regional Landcover (LC-REG)
   Source: <http://ionia1.esrin.esa.int/>
4. Enhanced Vegetation Index (MODIS) average for January 2004 (dry season)
   Source: <https://lpdaac.usgs.gov/lpdaac/products/modis_products_table>.
5. Enhanced Vegetation Index (MODIS) average for March 2004 (wet season)
   Source: as 4
6. Enhanced Vegetation Index (MODIS) average for October 2004 (wet season)
   Source: as 4
7. Altitude (from SRTM Digital Elevation Model data)
   Source: <http://srtm.usgs.gov/index.php>
8. Elevation CV – a measure of ruggedness was calculated from the DEM data
   Source: <http://srtm.usgs.gov/index.php>
9. Slope calculated from the DEM data
   Source: <http://srtm.usgs.gov/index.php>
10. Distance from roads
    Source: <http://www.mapability.com/index1.html?http&&&www.mapability.com/info/vmap1_index.html>
11. Distance from populated centres (large towns)
    Source: <http://www.mapability.com/index1.html?http&&&www.mapability.com/info/vmap1_index.html>
12. Distance from settlements
    Source: <http://sedac.ciesin.columbia.edu/gpw/global.jsp>
13. Cost distance. A measure of time taken to travel from main towns (uses roads to reduce time)
14. Human Footprint
    Source: Sanderson *et al.* 2002b
15. Annual mean precipitation
    Source: <http://www.worldclim.org>
16. Average daily temperature
    Source: <http://www.worldclim.org>
17. Average daily maximum temperature
    Source: <http:/www.worldclim.org>
18. Average daily minimum temperature
    Source: <http://www.worldclim.org>
19. Gridded population of the World
    Source: <http://sedac.ciesin.columbia.edu/gpw/global.jsp>
20. Population density
    Source:< http://sedac.ciesin.columbia.edu/gpw/global.jsp>
21. River density
    Source: <http://www.mapability.com/index1.html?http&&&www.mapability.com/info/vmap1_index.html>
22. Percentage vegetation cover from Modis Vegetation Continuous Fields
    Source: <https://lpdaac.usgs.gov/lpdaac/products/modis_products_table>
23. WWF Ecoregions
    Source: <http://www.worldwildlife.org/science/data/item1875.html>

By comparing values of the above 23 layers in cells where chimpanzees have been found to the values for the rest of region (i.e., a background or pseudo-absence region), MAXENT creates a maximum-likelihood statistical model to predict the probability of the occurrence of chimpanzees. From this statistical model, it then generates a map

Adult male chimpanzees on patrol close to human settlements. Photo © A.J. Plumptre/WCS.

showing the probability of chimpanzees being present in any one cell across their range. A cell size of 10 km² was used for all layers, averaging values across the layers where the resolution was higher. The model was run with different combinations of variables and under the two conditions described above.

Where polygons drawn around the exact locations of the survey sites were used as the background region (Condition 1), the results obtained were no better than random predictions and made little sense when looked at by experts. This effect was also found by VanDerWal *et al.* (2009), and in our case it is likely due to the polygons being too small to obtain good distance data from human settlements and roads; most surveys having been made away from human infrastructure. A larger background polygon (Condition 2) was therefore needed for the model to generate better relationships between such factors. We therefore focus the remainder of this chapter on reporting results from the analysis using Condition 2, in which larger and fewer polygons were used to identify the background region.

Initially, a MAXENT model was created using observations of chimpanzees from the whole historical range, including all range states in East Africa and the Congo Basin. However, it became clear that there were substantial differences in the 23 predictor layers between East and Central Africa and the chimpanzees' responses to them that confused the model's ability to predict chimpanzee distribution across the entire region. For example, in East Africa many chimpanzees are found near settlements and roads because the density of people is much higher there and they are not hunted. In DRC, on the other hand, the reverse is the case. We decided, therefore, that it would be best to create separate models for East and Central Africa. Here, we present the model produced using chimpanzee nest data from DRC to predict the probability of occurrence for chimpanzees in DRC, CAR and Sudan (there being no data available for CAR and Sudan).

Models were produced at a spatial resolution of 10 km². To avoid problems associated with lack of independence of chimpanzee observations when creating the statistical model, 10-km² cells were identified as either containing or not containing chimp observations (i.e., cells containing >1 chimp observation were treated no differently than cells containing only 1).

Several of the initial 23 factors were closely correlated. We removed those that had minimal impact on the model that were highly correlated with another factor (i.e., generally those with $r > 0.7$). These "removed factors" were the following:

- the two global land cover layers (Nos. 1 and 2) that correlated strongly with the regional land cover (No. 3);
- the Enhanced Vegetation Indices (EVI) for January (No. 4) and for March (No. 5) that were strongly correlated with the EVI for October (No. 6);
- the elevation CV (No. 8) and slope (No. 9) that were highly correlated with altitude (No. 7);
- the cost-distance (No. 13) that was highly correlated with other measures of distance (Nos. 10, 11 and 12); and
- the gridded population of the world (No. 19) that was strongly correlated with population density (No. 20).

The remaining 18 factors were entered, and then factors that had little influence on the model based on jackknife statistics were removed. MAXENT was then run with the most influential 10, six, and four factors separately in order to assess the performance of the relative models. Every time MAXENT was run, 80% of the cells containing nests ($n = 371$) were used to create the model, and 20% ($n = 92$) were held back to test model performance (AUC statistic). A total of 1,594 background/pseudo-absence locations were used.

Twenty separate versions of the model were produced for the final runs of the MAXENT using the 10, six, and four variables, each with a different set of randomly selected training and test samples. From these 20 different versions, MAXENT generated means and standard deviations around the model outputs, which included probability of occurrence, relationships between each factor and chimpanzee nest probability, and model accuracy statistics (e.g., AUC value).

Model outputs

The AUC value is calculated by MAXENT as a measure of the proportion of the variation explained by the model (like an R^2_{adj} value in a linear regression) and average AUC was similar for all three options: 10 factors AUC = 0.653; 6 Factors AUC = 0.667; 4 Factors AUC = 0.667. The factors selected and the average percentage contribution to the model show that maximum daily temperature and average annual rainfall was the factor that explained most of the variation (Table 4.1).

Given the very similar AUC values, the four-variable model should be selected because the three options are probably not statistically different. Figure 4.1 plots these four variables against the probability of chimpanzee nests being present as predicted by the model, with standard deviations around the prediction. The extreme ends of each plot are probably influenced by a few points in the prediction, which is why they may change dramatically; for example, the drop in probability above 2000 mm rainfall or the drop in probability after 80% vegetation cover. A Receiver Operating Characteristic (ROC) curve gives the performance of the model against random (Phillips, Duxent and Schapire 2004; Phillips, Anderson and Schapire 2006), and shows that for the 4-factor model the AUC is 0.667, with a standard deviation of 0.019, and is significantly different from random (Fig 4.2).

It should be noted that mapped outputs from MAXENT should not be treated as an *absolute* probability of presence, but a *relative* probability of presence amongst cells, based on the conditions in cells that are similar to those where chimpanzees have been observed elsewhere. Without true observations of absence (or estimates of survey effort), it is not possible to estimate the true probability of presence. Sources of error in this modelling include: 1) potential bias in chimp survey efforts relative to environmental and anthropogenic conditions (e.g., most surveys occur in protected areas); 2) error in predictor layers (e.g., roads may be missing from the layer used to calculate distance to roads); and 3) failure to include important factors affecting chimp distribution, such as presence of competitors or predators, diseases or distance to source populations (e.g., factors representing historical population dynamics).

Table 4.1. *The factors used and their percentage contribution to each model in the three options used with 10, 6 and 4 factors. In the 6- and 4-factor versions, variables were iteratively removed based on their percentage contribution and jackknife statistics indicating how the variable affected model performance. The AUC values of the model versions are also given.*

Factor	10 Factor	6 Factor	4 Factor
Average AUC value	*0.653*	*0.667*	*0.667*
Maximum daily temperature	35.2	37.3	43.6
Annual rainfall	25.8	30.0	30.4
Percentage vegetation cover	11.5	14.2	15.1
Distance to settlements	8.9	10.4	10.9
River density	4.3		
Elevation	4.1		
Enhanced Vegetation Index October	3.8	5.3	
Distance to road	3.6		
Cost distance from settlements	2.0	2.9	
Human footprint	0.9		

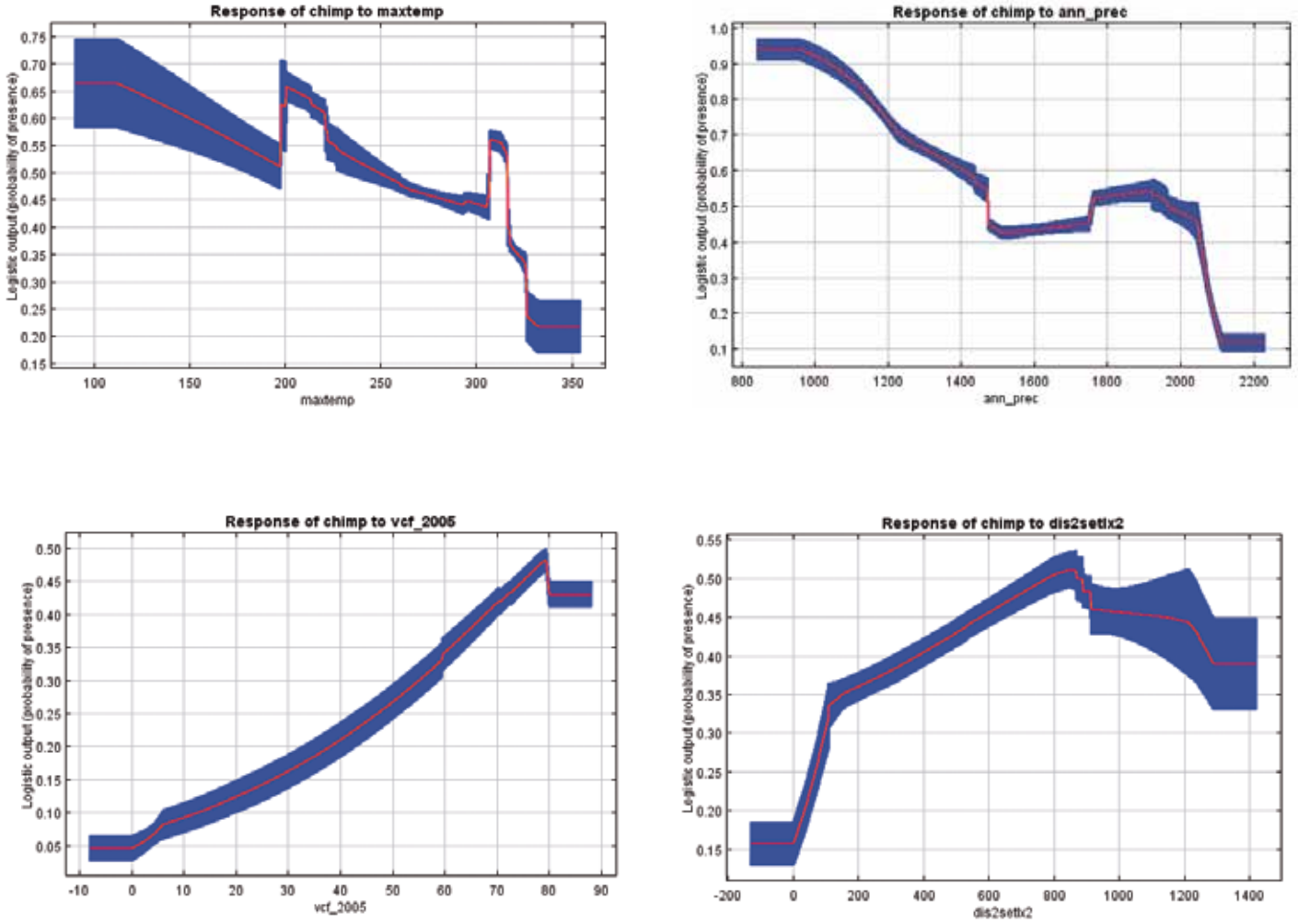

Figure 4.1. *The relationship between each of the four variables and the probability of chimpanzee nests: Maximum daily temperature in 0.1°C (top left); Annual rainfall in mm (top right); Percentage vegetation cover (bottom left) and Distance to settlements in km (bottom right). The blue shades encompass ± one standard deviation.*

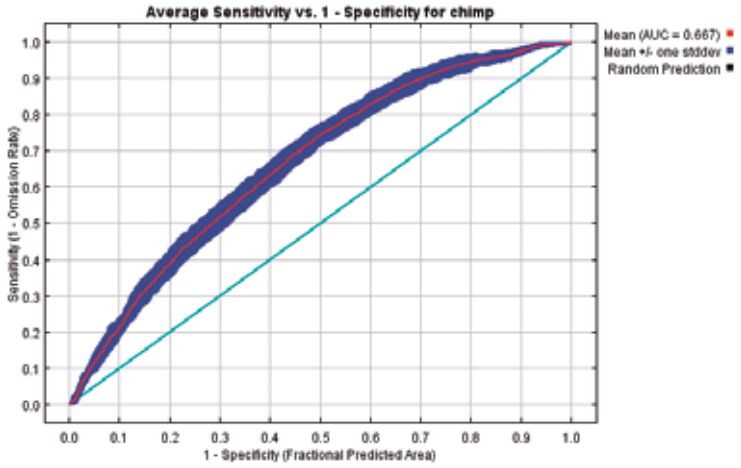

Figure 4.2. *ROC curve for the 4-variable model with blue ± one standard deviation shading. It can be seen that the curve is significantly better than a random prediction (straight line).*

The predicted probability distributions of chimpanzee nests from the 4-factor model show that most of the rainforest block has medium to high probability of chimpanzee presence, while the savanna-forest interface at the northern end of DRC into CAR and Sudan has much lower probabilities (Fig. 4.3). The site with very high probability in the southeast is an area where WCS has confirmed chimpanzees are present (at least in the east) and contains gallery forest and dense woodland with grassland savanna in between. It is surprising that it comes out as high probability though, as it is on the border between forest and savanna. This area is very remote and at fairly high altitude (1,000–1,500 m) and deserves more attention. The boundaries delimited here are crude and chimpanzees may occur around this region also.

The model was run again without Temperature as a factor, and MAXENT selected Rainfall as the main variable explaining about 41% of the predicted model with Percentage vegetation cover (15.9%), Distance to settlements (12.8%) and Altitude (11.8%) as the other most significant factors. The overall result was very similar to Figure 4.3, and the high probability area in the southeast of Congo was identified under this model also. It would appear, therefore, that different factors are predicting similar patterns of eastern chimpanzee distribution across the Congo Basin.

Priority areas for further survey

Areas that come out with a high probability of chimpanzee presence, and where we know little about chimpanzees are the following (see Fig. 4.4).

1. The area in the southeast of the historic range. This isolated polygon may be connected to the main block above but is separated by the Lukuga River, which exits Lake Tanganyika and links up to the Congo River. It has some of the highest probability predictions for chimpanzees.
2. The area to the east of Rubi Tele appears to be good for chimpanzees, and may link up to Okapi Reserve.
3. The larger area south of Rubi Tele, northwest of Maiko and northeast of Kisangani city also looks promising, despite its proximity to this city.
4. In CAR, the only promising area appears to be the region north of the western part of Bili Uele Reserve.
5. An area west of Rubi Tele and southwest of the Bili Uele area.

The model presented here obviously needs to be tested, and is more of a 'straw man' to encourage surveys in areas that are outside current knowledge areas. The extrapolation from a few sites in the east and north to the whole of the Congo Basin range is also ambitious, and assumes chimpanzees in the unknown areas respond to these four variables in the same manner. The results are plausible, however, and although they may improve with more data we believe they are useful in guiding where future surveys could focus their efforts.

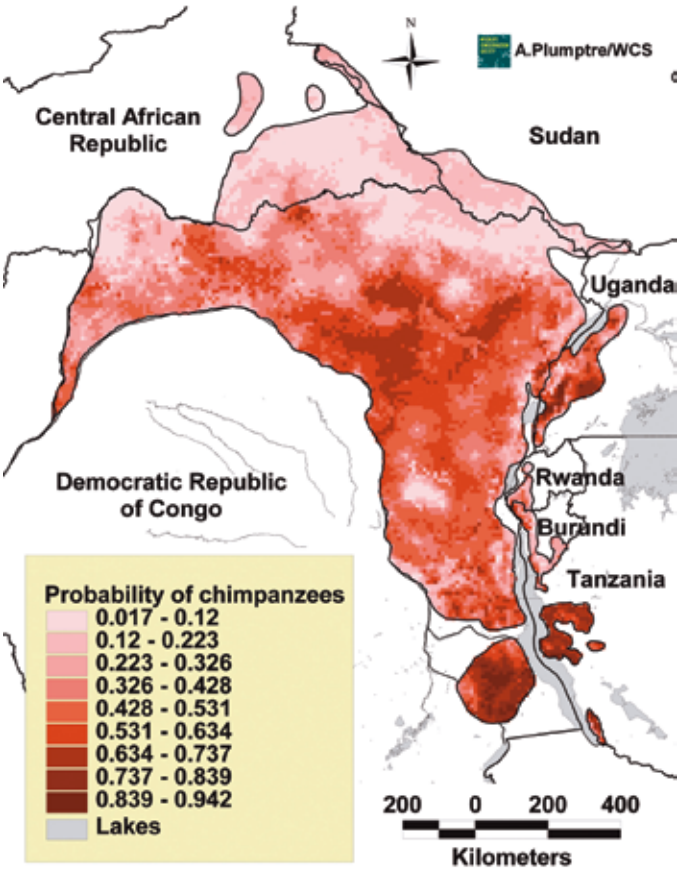

Figure 4.3. *Predicted probability of chimpanzee presence across the historic range of chimpanzees in DRC, CAR and Sudan.*

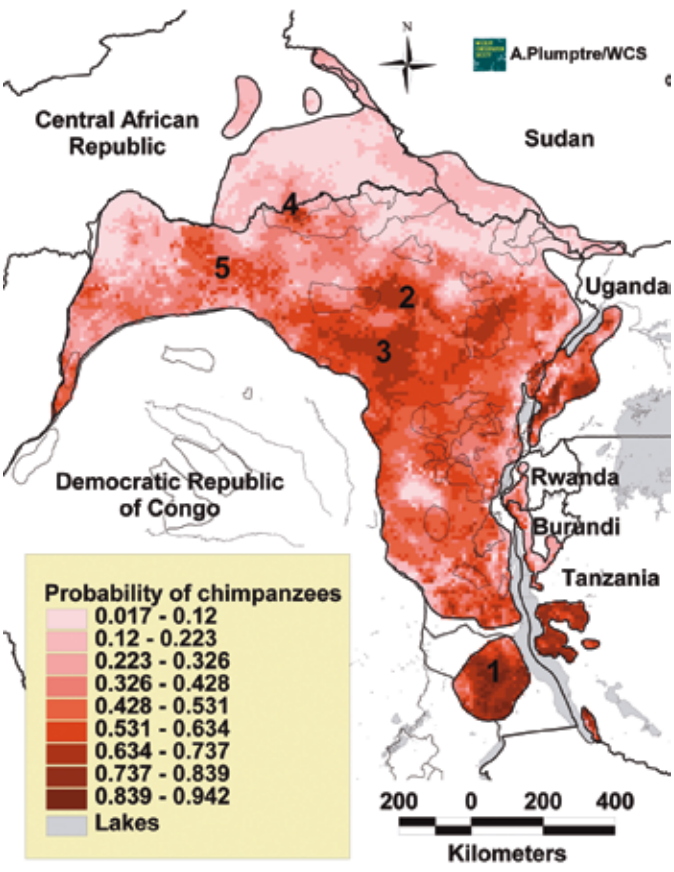

Figure 4.4. *Locations of priority areas for further surveys.*

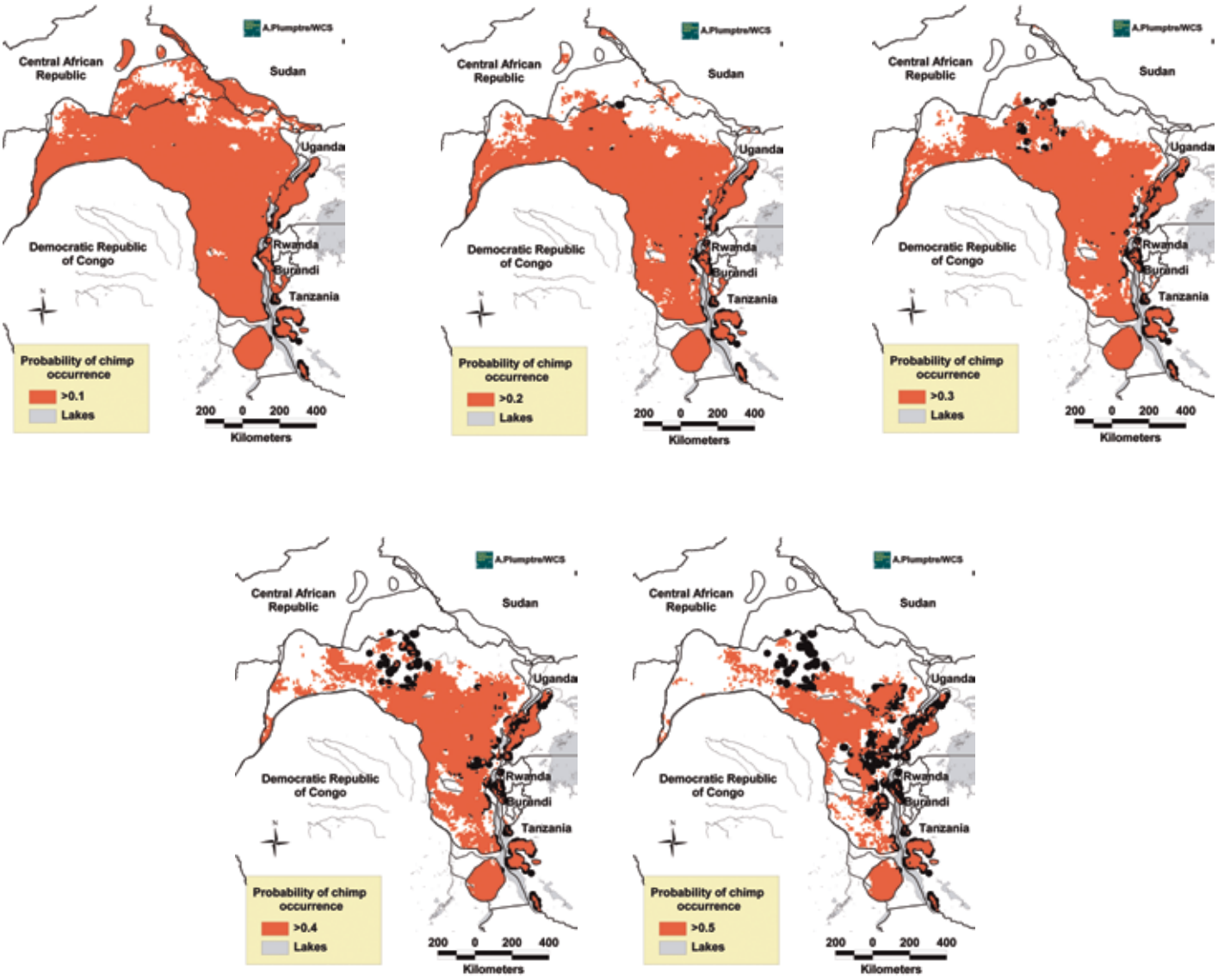

Figure 4.5. *Coverage of different probabilities of chimpanzee presence (Top: >0.1; >0.2; >0.3 and Bottom: >0.4; >0.5). Black circles are locations of nests/sightings that were in our database but placed under the predicted distribution layer (red) so that they only show if not predicted at that probability.*

Estimates of chimpanzee numbers across their range

We can take the results of the model and estimate approximate total numbers of chimpanzees across their historic range using the average density obtained from DRC in Chapter 2 for lowland forest (0.43/km²) and also the density used by Teleki (0.3/km²) to extrapolate across the Congo Basin (Teleki 1989). We calculated the area of habitat that were assigned different probability values in DRC, CAR and Sudan and multiplied these areas by these two density estimates (Table 4.2).

The model predicts chimpanzees at different probability levels from 0–1.0. We selected the range 0.5–1.0 down to 0.1–1.0 as the coverage of these levels of probability in Table 4.2 because they included most of the sightings of chimpanzees we had in our database. In fact all true sightings were only included in all cells with a probability greater than 0.2 (Fig. 4.5).

If we use the 0.3 probability level to be conservative (because most points of known sightings are included in this level) we estimate that 170,000–250,000 chimpanzees may occur in DRC, CAR and Sudan, depending on the real density of chimpanzees across DRC. In addition, in Chapter 2 we estimated about 8,475 chimpanzees in East Africa (including Rwanda and Burundi). These total figures are considerably higher than the previous estimates for eastern chimpanzees (Kormos *et al.* 2003). While there may be factors excluding chimpanzees from some of this region, the density across the whole region would have to drop to 0.2 chimpanzees per km² to obtain estimates similar to the previous ones. Where fairly extensive surveys have been made in Bili Uele and Okapi Reserve densities are around 0.6/km². Recce encounter rates in Maiko National Park and Rubi Tele Reserve are much lower at 0.06–0.07/km² but recces often give lower encounter rates than transects and there is a need to evaluate these and other areas to obtain better estimates of chimpanzee densities in the Congo Basin. We believe, given the data we have from areas where censuses have occurred, that eastern chimpanzee numbers have probably been underestimated in the past, and may be nearer 200,000–250,000 at a minimum. There is a need to carry out more census estimates in the Congo basin to confirm whether this is so.

Table 4.2. *Estimates of total chimpanzee numbers in DRC, CAR and Sudan for different probability levels and two density estimates.*

Probability level	Area (km²)	Density = 0.43/km²	Density = 0.3/km²
>0.5	253,100	108,800	75,900
>0.4	425,300	182,900	127,600
>0.3	576,800	248,000	173,000
>0.2	685,200	294,600	205,600
>0.1	886,200	381,100	265,900

Eastern chimpanzees are found up to about 2,900 metres altitude in montane forest and coexist with both Grauer's and mountain gorillas in these forests. Photo © A.J. Plumptre/WCS.

5. Conservation Action Plan

Process used to develop the conservation action plan

A two-day meeting was held immediately after the range-wide priority-setting meeting to develop an action plan for the conservation of the eastern chimpanzee. The process used was similar to one BirdLife International has developed for its species' action plans (Sande and Hoffmann 2002). This process develops a Vision, a 10-year Goal and a set of Objectives, and Projects to attain the objectives.

Problem tree

The main tool used to develop objectives and projects is the analysis of a problem tree or threats analysis. The method BirdLife International developed is to create the problem tree starting with the biology of the species before any consideration of the threats that result from human activities, which often underlie the biological threats. In many conservation target threats analyses conservation practitioners jump to the threats they know about, which are usually the human-caused ones, rather than considering first the biology of the species. The basic logic of the problem tree is as follows:

1. Assume that the population of chimpanzees is either stable or declining. If stable then we do not really need a plan and there is not much that can be added to what is already being done to conserve them. We have few data on trends at individual sites but as a whole we believe chimpanzee populations are declining across their range (indicated by many sources of data on forest loss, trade in chimpanzee infants, etc.).
2. If declining, then the direct causes of decline must be due to either high adult mortality or low productivity of the species.
3. Low productivity could be due to a low birth rate or high infant/juvenile mortality.

This is the starting point for the development of problem trees, and delegates work to tease out the underlying causes of the three main factors: a) low birth rate; b) high infant/juvenile mortality and c) high adult mortality. In many cases, the immediate causes of the factors affecting population growth are biological, and influenced by underlying changes in habitat, hunting and other human-caused threats. This focus encourages delegates to think about biology as well as human impacts. It often encourages the planners to include components of animal health to minimize disease issues or stress and also can assess the effects of the species' ecology on its long-term survival.

Stakeholder analysis

The stakeholders are identified by brainstorming in small groups. Each stakeholder is analysed to assess which (or who) potentially influences chimpanzee conservation, and whether the influence is positive or negative. The stakeholders are then ranked in terms of the scale of impact they have (high, medium or low).

Vision, Goal and Objectives

A vision of what conservationists need to achieve over the next 30–40 years is developed in plenary, usually early on in the proceedings and then revisited when the plan has begun to take shape. A 10-year goal for the plan is also developed in plenary. The aim in this case is to describe what can realistically be achieved in the first 10 years.

The objectives of the plan are developed from the problem tree. Initially the threats identified in the problem tree that result from human activities are ranked and grouped into similar themes, and objectives for the action plan are then "phrased out" of these grouped threats. For the eastern chimpanzee, it was necessary to first combine objectives between sites, and problem trees were developed separately for the Congo Basin and for the East African countries.

Project development

In most action plans activities are developed for each objective identified. However, BirdLife International prefers instead to identify individual projects that can be marketed to potential donors. Groups were formed to develop projects that considered the following themes related to the objectives:

a. Habitat conservation
b. Illegal killing of chimpanzees
c. Involving local communities in conservation
d. Raising awareness
e. Health
f. Monitoring and research
g. Sustainable financing

Several of these themes overlap. For instance awareness-raising can be used to help tackle both habitat conservation and illegal killing of chimpanzees. If as a result there was some overlap in projects identified, they were combined into one. Projects were ranked in terms of priority and cost and ordered by start date within the time frame of the action plan. As chimpanzees are an endangered species and on CITES Appendix I, hunting anywhere they occur is illegal if the country is a signatory of CITES.

The results of the planning process are presented in this chapter, forming the core of the action plan. While developing this plan delegates had in mind the 16 CCUs selected in the range-wide priority setting (Chapter 3), and the focus of the plan is on those areas.

Intensive surveys across most east African forests and many central African sites provided the data presented in this report. Photo © A.J. Plumptre/WCS.

Problem trees

Two problem trees were developed because delegates judged that the situation faced by chimpanzees in East Africa (including Sudan, Rwanda and Burundi) is very different to the situation in the Congo Basin (i.e., in DRC and CAR). In East Africa, chimpanzees are found in forest fragments that are isolated or connected only by very narrow corridors, and there are many small populations. In the Congo Basin, chimpanzees are hunted for meat and to obtain infants for trade. In contrast to East Africa, logging and mining are having a major impact on chimpanzees. The two problem trees developed reflected these differences (Figs. 5.1 and 5.2). Civil unrest, military action and political instability (insecurity) were also major underlying causes of threats to chimpanzees in the Congo Basin countries (Fig. 5.1). Human demographic growth was identified as an important underlying cause of many of the threats to chimpanzees in both regions.

Threats were prioritised in each problem tree (Table 5.1) according to votes cast by the delegates. Ranks of the top threats were similar for both regions. Logging is likely to increase in importance in DRC in the future as logging concessions start to be operationalised.

Nest counts are used to census chimpanzees — occasionally one is seen still in the nest. Photo © A.J. Plumptre/WCS.

Vision, goal and objectives

The vision and goal of the action plan were developed by all participants at the workshop and accepted as follows:

> ***Vision:*** Through international, national and local support, threats to eastern chimpanzees are minimised, ensuring the long-term survival of viable and functional populations of this iconic species across all range states, representing the full range of ecological and cultural diversity and, where possible, contributing to human well-being.
>
> ***Goal:*** In 10 years the chimpanzee populations in the 16 CCUs selected are known, the threats identified and curtailed, and the populations are viable and not declining. All additional CCUs outside our current areas of knowledge are identified and actions taken to conserve them.

The following seven objectives were identified from the problem trees and the prioritisation of threats (the threats addressed are identified in parentheses):

Objectives for 10 year plan:

1. By 2020, stop decline in chimpanzee populations due to hunting in protected areas, and reduce illegal killing and trafficking of chimpanzees by 50% in CCUs outside protected areas (Hunting).
2. By 2020, support for the conservation of chimpanzees and enforcement of laws in CCUs improved through the promotion of their conservation at international, national and local levels (Poor promotion of conservation).
3. By 2020, the rate of forest loss is reduced to 50% of current levels in CCUs in the Congo Basin and 90% of current habitat remains intact in CCUs in East Africa (Habitat loss).
4. Fill major knowledge gaps in chimpanzee distribution, status, and threats across their estimated range within seven years, and implement a monitoring strategy in all CCUs within 10 years (Need for research and monitoring).
5. Improve understanding and halt decline in chimpanzee populations due to human transmitted diseases in CCUs (Health risks).
6. Halt decline of chimpanzee populations by increasing community support for conservation and ensuring community participation and benefits (Poor community support).
7. Investigate and where possible establish sustainable financing for CCUs (Poor financing).

Table 5.1. *Prioritisation of the human-caused threats (direct and indirect) to chimpanzees for the two regions.*

Congo Basin	East Africa
1. Illegal hunting — bushmeat and preference for bushmeat (vote = 10)	1. Habitat degradation (vote = 11)
2. Habitat loss and degradation (vote = 8)	2. Illegal hunting (vote = 11)
3. Poor law enforcement (vote = 7)	3. Habitat loss (vote = 9)
4. Policies that omit to include conservation (vote = 6)	4. Low conservation education awareness (vote = 9)
5. Logging (vote = 2)	5. Poor law enforcement (vote = 9)
6. Mining (vote = 1)	6. Disease (vote = 6)
7. Infant trade (vote = 1)	7. High level of poverty (vote = 3)
8. Insecurity (vote = 1)	8. Increasing human population (vote = 2)
	9. Resource extraction (vote = 1)

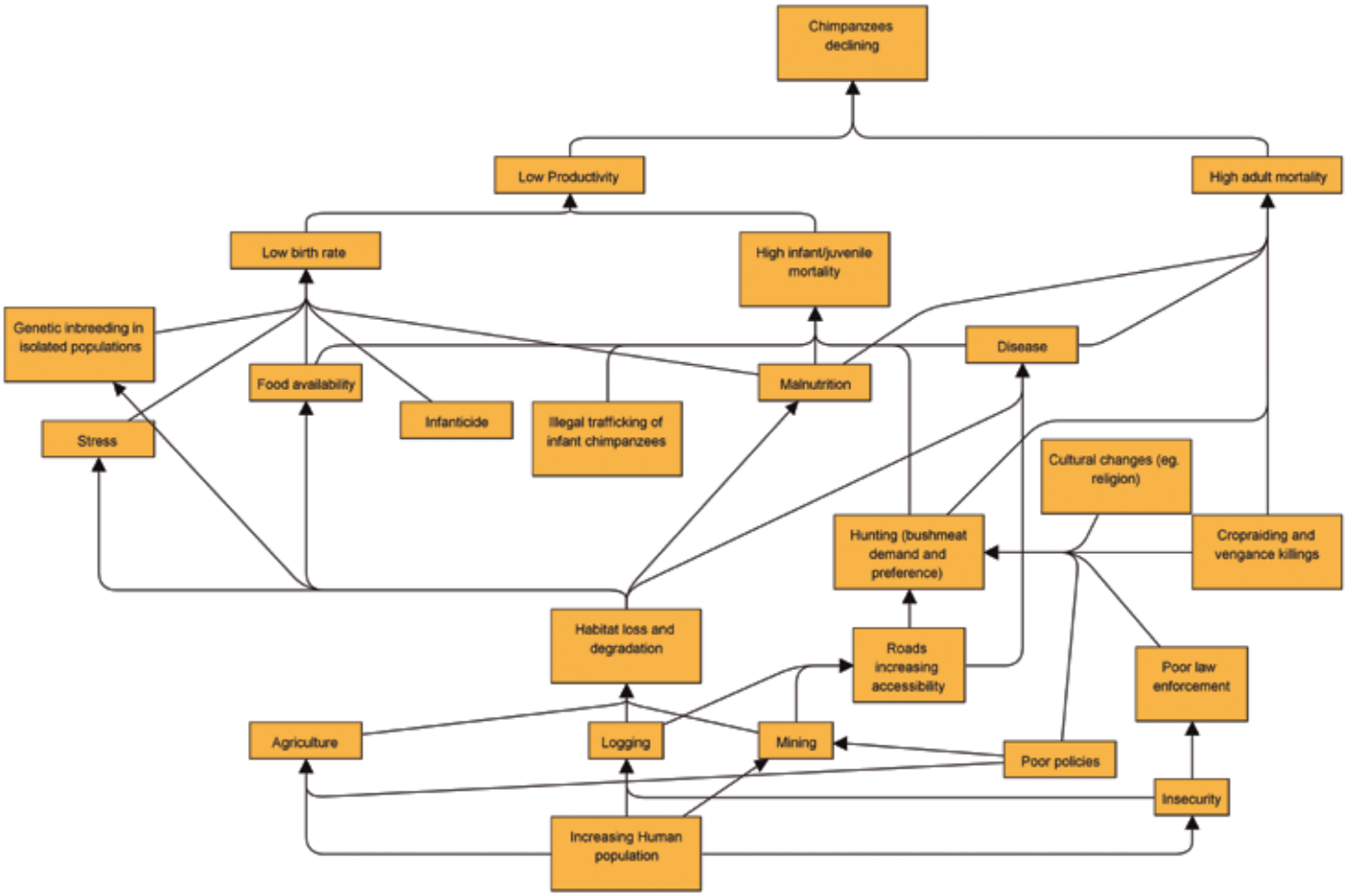

Figure 5.1. *Problem tree for the Congo Basin countries (DRC and CAR)*

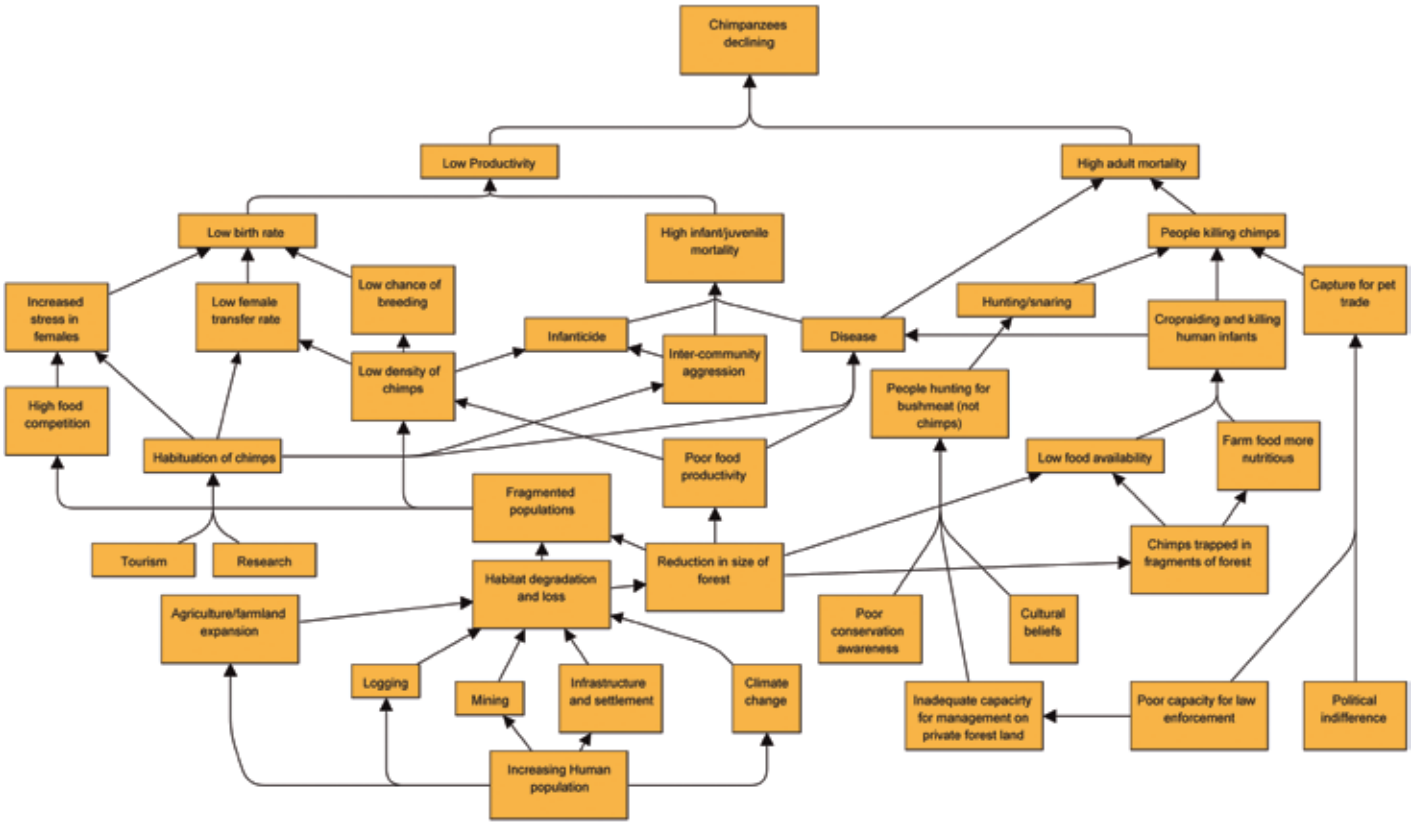

Figure 5.2. *Problem tree for the East African Countries (Sudan, Uganda, Rwanda, Burundi and Tanzania)*

Projects identified

Projects were identified for each of these seven objectives. They are summarized in the following table, which lists the main objective under which the project falls, the priority, who could implement the project, the time scale and a rough estimation of cost. The costs are high when projected over 10 years in seven countries but would be considerably lower calculated at a country level.

Project table: The projects and the potential agencies that should be involved, as identified by the group.

a) Policy and legislation

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Regional projects					
Habitat loss	Create PAs in CCUs lacking them	♦♦♦♦	National government	4 years	500,000–1,000,000
Habitat loss	Review EIA laws in each country — ensure chimpanzee conservation is integrated in practices	♦♦♦	National government, PAA	2 years	200,000
Health	Implement recommendations from Great Ape Health workshop 2009 and IUCN guidelines (Leendertz *et al.* in prep.) at each CCU	♦♦♦♦	PAA, NGOs, researchers, external expertise as required	Within 5 years	100,000–250,000
Health	Develop rapid response protocols and mechanisms for disease outbreaks in each CCU, including lines of communication and partner collaborations, establishment of rapid response teams and emergency interventions	♦♦♦♦	PAA, NGOs, researchers, external expertise as required	Within 2 years	500,000–1,000,000
Health	Implement IUCN guidelines for regulations with habituated chimpanzees (researchers, tourism, PA staff) (Macfie 2010)	♦♦♦♦	PAA, NGOs, researchers	Within 3 years	<50,000
Country specific projects					
Habitat loss	Issue limited charcoal permits in each chef de territoire within 50 km of CCUs (DRC) to control charcoal trade	♦♦	ICCN, Ministry of Environment, local government	6 years	100,000–250,000
Habitat loss	Revision of land-use plans for forest reserves (Uganda; CCU 1,3,5)	♦♦♦♦	NFA, JGI, KFP, BCFS, Makerere University	3 years	50,000–100,000
Habitat loss	Clarify how chimpanzee conservation is represented in the Forestry Code in DRC	♦♦	ICCN, NGOs	1 year	10,000
Habitat loss	Support land-use planning in Congo and landscape planning within CCU	♦♦♦	ICCN, NGOs, local government	5 years	500,000
Habitat loss	Enforce the certification/permit issuance for charcoal (TZ)	♦♦	NEMC, local government	3 years	50,000–100,000
Habitat loss	Support implementation for village land use plans (TZ 2 and TZ3)	♦♦♦♦	JGI, FZS-MEMP, local government, TaNaPa	10 years	50,000–100,000
Habitat loss	Review forestry law (Burundi)	♦♦	Government, IUCN	3 years	100,000–250,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

b) Species and habitat

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Regional projects					
Hunting	Law Enforcement: Protection and monitoring to stop the hunting (indirect and direct) of chimpanzees in CCUs (increasing surveillance–ecoguards–judiciary efficiency)	♦♦♦♦	Government wildlife protection agencies, international NGOs, police, judiciary	Begins in 2010, lasts 10 years	5,000,000
Hunting	Reduction of human-chimpanzee conflict (barriers, compensation, ecoguards) by implementing IUCN guidelines (Hockings and Humle 2009)	♦♦ (but high in Rwanda, Burundi, Tanzania, Uganda)	Government protection agencies, international and local NGOs	Begins in 2011–2020	1,000,000
Country specific projects					
Habitat loss	Patrol for illegal activities in all CCUs (Uganda; CCU 1–5)	♦♦♦♦	KFP, BCFS, JGI	10 years	50,000–100,000
Habitat loss	Promote recovery of degraded vegetation in protected areas (Uganda; CCUs 1–5)	♦♦♦	NFA, UWA, JGI, KFP, BCFS, Makerere University	10 years	500,000–1,000,000
Habitat loss	Restoration of degraded habitat in Nyungwe/ Kibira CCU	♦♦♦♦	RDB, INECN, WCS	5 years	250,000–500,000
Habitat loss	Restoration of degraded habitat and corridors through forest regeneration (TZ-CCU 2 and 3)	♦♦♦	JGI, FZS-MEMP, local government	10 years	50,000–100,000
Habitat loss	Purchase private land in CCU2 to connect CCU 1 to CCU 3 (Uganda)	♦♦♦	NFA, JGI, BCFS	10 years	100,000–250,000
Habitat loss	Mining impacts in DRC assessed and mitigated (TZ in future?)	♦♦♦	PAA, NGOs, local government	10 years	500,000–750,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

c) Monitoring and research

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Regional projects					
Hunting	Study the distribution and drivers of hunting on chimpanzees in CCUs (including direct and indirect hunting, i.e., snares). Study hunting methods and frequencies in different CCUs, and traditional hunting patterns	♦♦♦♦ (particularly DRC, CAR)	PAA, international and local NGOs, university (PhD projects)	Begins in 2011, lasts 3 years	500,000–1,000,000
Habitat loss	Research the dietary needs and ranging of chimpanzees in CCUs in DRC and CAR where little known	♦♦♦	ICCN, NGOs, universities	10 years	100,000–250,000
Habitat loss	Monitor habitat fragmentation and loss across chimp range	♦♦♦	NASA, WHRC, NGOs	10 years	500,000
Research and monitoring	Conduct preliminary spatial analysis using available data to identify potential chimpanzee habitat and predict areas that may support important populations across the known range of the eastern chimpanzee–building on model in Chapter 4	♦♦♦♦	NGOs, universities	Completed end 2010	50,000–100,000
Research and monitoring	Hold workshop on survey and monitoring standards based on IUCN guidelines (Kühl *et al.* 2008). Disseminate results widely–include surveys of cultural artefacts	♦♦♦♦	Experts, NGOs, universities, government agencies	Completed first half of 2011	100,000–150,000
Research and monitoring	Training to build capacity in survey and monitoring methodology	♦♦♦♦	NGOs, universities, government agencies	Completed 2011	100,000–250,000
Research and monitoring	Conduct standardised exploratory surveys in Central Africa to fill knowledge gaps in chimpanzee (and other large mammal) distributions, status and threats within and beyond CCUs	♦♦♦♦	NGOs, government agencies	Start second half of 2011 completed 2017	3,000,000
Research and monitoring	Implement standardised long-term population and management monitoring initiatives in all CCUs and PAs within CCUs	♦♦♦♦	NGOs	Start 2012 completed 2020	3,000,000
Health	Standardise health monitoring methods and implement across region of habituated groups–implement some protocols for areas with no habituation/unhabituated chimpanzees	♦♦♦♦	PAA, NGOs, researchers	Within 3 years	50,000–100,000
Country specific projects					
Habitat loss	Research charcoal/fuelwood needs around Maiko, Tayna, Kahuzi-Biega and Ituri (DRC)	♦♦♦♦	WCS, DFGFI, UNDP	2 years	100,000–250,000
Habitat loss	Research charcoal/fuelwood needs around Tanzania CCUs and nearby large towns which rely on fuel from them	♦♦♦♦	JGI, local government, Forest and Beekeeping Department (FBD)	5 years	100,000–250,000
Habitat loss	Monitor success of Virunga briquette project and research other alternatives (DRC)	♦♦♦	Ministry of Commerce, ICCN, NGOs	3 years	100,000–250,000
Habitat loss	Research and promote connectivity of populations in fragmented/proximal CCUs in East Africa (TZ)	♦♦♦	JGI, FZS, WD (Wildlife Division), TaWiRi	10 years	250,000–500,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

d) Public awareness and training

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Regional projects					
Promotion of conservation	Development of teacher's environment materials (guides, posters, DVDs, etc.)	♦♦♦♦	Ministry of Education (national and provincial policy) and school representatives	Continuous	2,000,000
Promotion of conservation	Produce and disseminate materials that strengthen community awareness and inform people about the existing laws regarding the importance of chimpanzees and their habitat conservation (theatre troupes, CBDAs, tourism, agricultural service, etc.)	♦♦♦♦	Institution in charge of conservation or wildlife, partnership NGOs, and local authorities and leaders	Continuous	500,000–1,000,000
Promotion of conservation	Training in agricultural sustainable practices that support conservation of chimpanzees and their habitat	♦♦♦	NGOs, government and agriculture experts	10 years	2,000,000
Promotion of conservation	Training programmes that improve local CBO skills to implement projects relative to conservation of chimpanzees and their habitat	♦♦♦	Institution in charge of conservation or wildlife, partnership NGOs, and local authorities and leaders	5 years	250,000–500 000
Promotion of conservation	Meetings/workshops to educate about existing laws (national and international) and importance of chimpanzees and their habitat conservation. Produce material that contains provision of the law about natural resources and chimpanzees and their habitat conservation	♦♦♦♦	Ministry of Environment, PAA, NGO partners	5 years	500,000–1,000,000
Promotion of conservation	Field visits to educate politicians (parliament, government and opposition members) and local people in authority (church, police, traditional chiefs, etc.) about issues on the ground, and lobbying to get them to take action	♦♦♦♦	Ministry of Environment, PAA, NGO partners	5 years	500,000–1,000,000
Promotion of conservation	Field visits to show international donors/ development NGOs issues on the ground and lobby them to take action. Include training of NGOs on methods that allow them to implement activities that respect chimpanzees and their habitat	♦♦	Ministry of Foreign Affairs, Ministry of Environment, PAA, NGO partners	5 years	500,000–1,000,000
Health	Establish a communication network for disseminating information about chimpanzee diseases and deaths across the region, including a shared database. Link to human health monitoring that already exists	♦♦♦♦	PAA, NGOs, researchers, local communities	Within 3 years	<50,000
Health	Establish and enhance veterinary capacity and equipment (laboratory and equipment) to manage/monitor disease in CCUs or across the region	♦♦♦	PAA, NGOs, researchers	Within 10 years	500,000–1,000,000
Community support	Education campaigns directed at school children, including nature clubs, twinning programmes, placing conservation into school curricula	♦♦♦♦ Long-term	Education-focused conservation NGOs), government education depts., churches and mosques, international zoo community	Start within 3 years	1,000,000
Community support	Development of a broad-based education campaign to inform people about the importance and rarity of chimpanzees. Programmes should identify multipliers for cost-effective dissemination of conservation messages, e.g., through health workers, CBOs, women's groups, churches, local authorities	♦♦♦♦	Local NGOs, RARE, community wardens, CBOs, conservation NGOs	3 years	500,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

e) Community involvement

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Regional projects					
Health	Implement health and hygiene education programmes with staff and communities around CCUs (including waste management, food storage, and reducing impact of other animals in transmitting diseases)	♦♦♦	PAA, NGOs, researchers, local communities, health organizations	Within 5 years	50,000–100,000
Health	Implement employee health programme for staff working with habituated chimpanzees across CCUs	♦♦♦	PA authorities, NGOs, researchers	Within 3 years	50,000–100,000
Community support	Development of tourism and ecotourism projects, ensuring employment and benefit sharing with local communities, following site-specific feasibility study and market assessment. Include monitoring	♦♦♦♦	Governments with conservation NGO partners, international and local tourism agencies and companies	10 years	5,000,000
Community support	Explore opportunities and develop programmes for "snare ware" handicrafts to sell to tourists, following site-specific feasibility studies (an "add on" to appropriate tourism programmes)	♦♦	Agencies involved in the tourism programme, with local women's crafts cooperatives.	3 years	500,000
Community support	CCU management programmes to incorporate local community employment, e.g., as ecoguards, for monitoring, research programmes	♦♦♦♦	Government agencies, NGOs, researchers	5 years	5,000,000
Community support and Hunting	Extension programmes for alternative protein supplies to replace bushmeat, following site-specific needs assessment	♦♦♦♦	Agriculture extension agencies (government and NGO) with conservation agencies and NGO partners	5 years	3,000,000
Community support	Development of chimp-friendly certified commercial products (wildlife friendly) such as coffee, honey, tea, other crops, briquettes, following site-specific feasibility study. Include monitoring	♦♦	Conservation NGOs in partnership with development NGOs, businesses, local producer groups, marketing experts	10 years	4,000,000
Community support	Disseminate IUCN guidelines on how to address chimpanzee-human conflict (Hocking and Humle 2009). Research to explore effective barriers/deterrents	♦♦	PAA and conservation NGOs	3 years	100,000
Community support	Integrate local communities into land planning processes and tenure to ensure that people's needs are met without encroaching on chimpanzee habitats, including situations of immigration and displaced peoples	♦♦	Government agencies, PAA, international donors, forestry companies, NGOs working with local communities	5 years and ongoing	1,000,000
Country specific projects					
Habitat loss	Establish bamboo plantations to reduce cutting in parks (Burundi–Nyungwe/Kibira CCU)	♦♦♦	RDB, INECN, IUCN	5 years	250,000–500,000
Habitat loss	Promoting regeneration of natural trees and training of local communities (TZ; CCU 2 and 3)	♦♦♦	JGI, FZS-MEMP, FBD, local government	10 years	200,000
Habitat loss	Encourage agroforestry (for fuelwood) around Kibira/Nyungwe CCU	♦♦♦♦	INECN, UNDP, local government	5 years	250,000–500,000
Habitat loss	Encourage agroforestry and plantations in eastern DRC sites	♦♦♦♦	ICCN, development NGOs, WWF	5 years	250,000–500,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

f) Sustainable financing

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Regional projects					
Financing	A business plan is developed for each CCU, focusing on assessing recurring costs of managing areas for chimpanzees in line with ECAP objectives	♦♦♦♦	Varies by CCU; likely to be one or more NGOs working in the CCU	1 year	50,000–100,000
Financing	ECAP Working Group will be established to: – Monitor progress of ECAP objectives – Partner with IUCN Primate Specialist Group, A.P.E.S. database and others to consolidate chimpanzee data and information on activities within each CCU, and facilitate dissemination of information. – Agree to joint fundraising actions to meet the ECAP monitoring objective and other range-wide priorities	♦♦♦♦	ECAP Working Group	1 year	500,000
Financing	Assessment completed for potential of each CCU to access carbon (REDD+) and other new financing opportunities (ecosystem services, biodiversity offsets). Findings are promoted to governments and entities within the carbon and other markets. Ensure chimpanzees are conserved	♦♦♦	Lead NGO or ECAP Working Group hires third party (e.g., EcoSecurities)	2 years	1,000,000
Financing	A feasibility assessment is conducted for the establishment of a central long-term financing mechanism. Mechanism would likely represent major donors and stakeholders on a board of directors but maintain minimum overhead/administration in order to focus on fundraising and annual grant making for ECAP cross-CCU objectives/projects, data consolidation, and emergencies	♦♦♦	ECAP Working Group	3 years	<50,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

The estimate for the total budget to implement all of these projects is about US$ 50,000,000 or US$ 5 million per year, or US$ 315,000 per CCU per year. These costs, to us, seem to be realistic and feasible even though they were generated in a workshop with little time for planning on each project.

Developing detailed proposals and budgets for these projects will necessarily involve working at a country level or in some cases at a transboundary level (where two protected areas fall within the same CCU across an international boundary, e.g., NK-003 and DR-004). Some of the projects proposed are site-specific and others require implementation at all CCUs, including those that will be identified following implementation of the projects to survey possible areas where chimpanzees may occur outside the current area of knowledge. It was not possible, however, with the scale of this action plan, to develop specific projects for all of the possible chimpanzee sites or CCUs. Many of these site- specific actions can be found in National Great Ape Survival Plans (NGASPs) produced for GRASP. It is unlikely that US$ 50 million will be found for chimpanzee conservation alone; however, we believe that funding can be obtained for the CCUs and conservation of the biodiversity that occurs within them. Chimpanzees will be a good flagship species to promote the conservation of these areas and will be key conservation targets for most of them.

Stakeholder analysis

An analysis of the principal stakeholders in both Central and East Africa produced a long list of those who have positive and/or negative impacts on chimpanzees and their habitat (Appendix 3). Many are common to both lists, such as national and local government, protected area authorities, conservation NGOs, business interests such as logging and mining companies, development and humanitarian organisations and the local communities living in and around the CCUs; at times they can have negative as well as positive impacts. For instance, the promotion of tourism by a protected area authority can potentially have an negative impact while for the most part the authority has a positive one. These stakeholders were identified prior to the analysis of the problem tree so that their impacts could be incorporated in the objectives and projects. When detailed projects are developed at a site level, a more detailed stakeholder analysis will be required that includes how each is impacting chimpanzee conservation.

6. Priority Projects In Range Countries

A plan such as this will be implemented largely at a country level rather than at a regional level, except where regional threats to chimpanzees occur and are tackled through a transboundary collaborative process. Here we select some key projects for each of the range states to focus on. We also drew upon the national action plans for chimpanzees that have been developed for Uganda, Rwanda and Tanzania, to list the priority projects for each country.

Burundi

Burundi's main chimpanzee population is in Kibira National Park, which is in CCU NK003. This park contains at least half, and possibly as many as two-thirds, of Burundian chimpanzees in a single CCU. Threats to the park at present include: few resources for management of the park; poor capacity of INECN staff to carry out their duties; and threats from agricultural encroachment and mining. Priority actions to address these threats are proposed below.

Priority actions

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Habitat loss	Restoration of degraded habitat in NK003 CCU	♦♦♦♦	INECN, NGOs	5 years	250,000–500,000
Habitat loss	Establish bamboo plantations to reduce cutting in parks	♦♦♦	INECN, NGOs	5 years	250,000–500,000
Habitat loss	Encourage agroforestry (for fuelwood)	♦♦♦♦	INECN, UNDP, local government	5 years	250,000–500,000
Hunting	Law enforcement: Protection and monitoring to stop hunting (indirect and direct) of chimpanzees in CCUs (increasing surveillance–ecoguards–judiciary efficiency)	♦♦♦♦	INECN, NGOs, police, judiciary	Begins in 2010, lasts 10 years	1,000,000
Hunting	Capacity building of INECN staff to improve their ability to manage	♦♦♦♦	INECN, NGOs	2010–2015	50,000
Hunting and habitat loss	Transboundary collaboration between Burundi and Rwanda	♦♦♦♦	INECN, RDB, NGOs	2010–2020	600,000
Community support	Development of tourism and ecotourism projects, ensuring employment and benefit sharing with local communities, following site-specific feasibility study and market assessment. Include monitoring	♦♦♦♦	Governments, plus conservation NGOs in partnership, international and local tourism agencies and companies	10 years	800,000
Community support	Development of a broad-based education campaign to inform people about the importance and rarity of chimpanzees	♦♦♦♦	Local NGOs, RARE, CBOs, conservation NGOs	3 years	500,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

Central African Republic

The CAR has no recent data on chimpanzee presence except for reports from safari hunting companies. A priority for this country is to find out where the main populations of chimpanzees occur. A start should be made in the Zemongo Faunal Reserve. These surveys should also assess the threats to chimpanzees, both through interviews with local people and by recording human impacts in the field. Once surveys have been undertaken there will be a need to develop a chimpanzee conservation action plan based on the threats identified.

Priority projects

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Research and monitoring	Hold workshop to agree survey and monitoring standards and disseminate results widely–include surveys of cultural artefacts	♦♦♦♦	NGOs, experts, universities, government agencies	Completed first half of 2011	50,000
Research and monitoring	Training to build capacity in survey and monitoring methodology	♦♦♦♦	NGOs, universities, government agencies	Completed 2011	20,000
Research and monitoring	Conduct standardized exploratory surveys in CAR to fill knowledge gaps in chimpanzee (and other large mammal) status, distribution and threats within and outside CCUs	♦♦♦♦	NGOs, government agencies	Start second half of 2011 completed 2017	300,000
Promotion of conservation	Meetings/workshops to educate about existing laws (national and international) and importance of chimpanzees and the conservation of their habitat	♦♦♦♦	Ministry of Environment, institution in charge of conservation or wildlife, and partnership NGOs	2 years	100,000
Promotion of Conservation	Develop a conservation action plan for chimpanzees in CAR	♦♦♦♦	Ministry of Environment, institution in charge of conservation or wildlife, and partnership NGOs	By 2015 after surveys	100,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

Democratic Republic of Congo

The chimpanzee populations in eastern DRC are best known in parks and reserves such as Okapi, Maiko, Kahuzi-Biega, Tayna, Virunga, Itombwe and Misotshi-Kabogo. We have data on distributions as well as some measures of abundance in these localities. In the north, we know where chimpanzees occur in parts of Bili Uele and Rubi-Tele and the un-gazetted forests between. In the west, there is some information on chimpanzee distributions around the Bosobele-Lubengo region. Elsewhere there are large gaps in our knowledge of chimpanzee distributions. Chapter 4 identifies some promising sites for future chimpanzee surveys. Surveys are therefore an important component of actions in DRC. However, where we know about the current status of chimpanzees and the threats to their continued survival we can also prioritise management actions. The management actions selected here address the main threats to chimpanzees in DRC in CCUs that were selected in the range-wide priority setting (Chapter 3).

Priority actions

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Research and monitoring	Conduct standardised exploratory surveys in DRC at five sites identified in Chapter 4	♦♦♦♦	NGOs, government agencies	2011–2013	800,000
Habitat loss	Clarify how chimp conservation is represented in the Forestry code in DRC and work to incorporate additions if necessary	♦♦	ICCN, NGOs	2010–2020	10,000
Habitat loss	Support land-use planning in Congo and landscape planning within CCU	♦♦♦♦	ICCN, NGOs, local government	2010–2015	500,000
Hunting and habitat loss	Mining impacts in DRC assessed and tackled	♦♦♦♦	PA authorities, NGOs, local government	2010–2020	750,000
Hunting	Law enforcement protection and monitoring to stop hunting (indirect and direct) of chimpanzees in CCUs (increasing surveillance–ecoguards– judiciary efficiency)	♦♦♦♦	Government wildlife protection agencies, international NGOs, police, judiciary	Begins in 2010, lasts 10 years	5,000,000
Hunting	Study the distribution and drivers of hunting on chimpanzees in CCUs (including direct and indirect hunting, i.e., snares)	♦♦♦♦	Government protection agencies, international and local NGOs, university	Begins in 2011, lasts 3 years	300,000 Combine with surveys/ monitoring
Promotion of conservation	Meetings/workshops to educate about existing laws (national and international) and importance of chimpanzees and their habitat conservation	♦♦♦♦	Ministry of Environment, institution in charge of conservation or wildlife, and partnership NGOs	5 years	300,000
Community support and Hunting	Extension programmes for alternative protein supplies to replace bushmeat, following site-specific needs assessment	♦♦♦♦	Agriculture extension agencies (government and NGOs) in partnership with conservation NGOs and agencies	5 years	1,000,000
Habitat loss	Encourage agroforestry and plantations in eastern DRC sites	♦♦♦♦	ICCN, development NGOs, WWF	5 years	250,000–500,000
Financing	Assessment completed for potential of each CCU to access carbon (REDD+) and other new financing opportunities (ecosystem services, biodiversity offsets). Findings are promoted to governments and entities in the carbon and other markets	♦♦♦	Lead NGO, ICCN and climate change office in Kinshasa	2 years	1,000,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

Rwanda

Most of Rwanda's chimpanzees occur in the NK003 CCU. Nyungwe National Park and the Cyamudongo tourism site form the Rwandan component of this CCU. RDB, with WCS support, has rehabilitated Nyungwe National Park since the 1994 genocide and management and tourism operations are fairly efficient at present. There is a need to promote health monitoring and to reduce the possibilities of disease transmission to chimpanzees visited by tourists. Many of the priorities identified as part of the national action plan for great apes in 2004 are included in this plan.

Priority actions

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Habitat loss	Restoration of degraded habitat in NK003 CCU	♦♦♦♦	RDB, NGOs	5 years	500,000
Habitat loss	Establish bamboo plantations to reduce cutting in parks	♦♦♦	RDB, NGOs	5 years	300,000
Habitat loss	Encourage agroforestry (for fuelwood)	♦♦♦♦	RDB, UNDP, local government	5 years	300,000
Hunting	Law enforcement protection and monitoring to stop the indirect snaring of chimpanzees	♦♦♦♦	RDB, NGOs, police, judiciary	Begins in 2010, lasts 10 years	300,000
Health	Implement recommendations from Great Ape Health Workshop 2009 in disease management protocol	♦♦♦♦	RDB, NGOs, MGVP	Within 5 years	150,000
Hunting and habitat loss	Transboundary collaboration between Burundi and Rwanda	♦♦♦♦	INECN, RDB, NGOs	2010–2020	600,000
Community support	Development of tourism projects, ensuring employment and benefit sharing with local communities, following site-specific feasibility studies and market assessment. Include monitoring	♦♦♦♦	Governments, plus conservation NGOs in partnership, international and local tourism agencies and companies	10 years	800,000
Community support	Development of a broad-based education campaign to inform people about the importance and rarity of chimpanzees	♦♦♦♦	Local NGOs, RARE, CBOs, conservation NGOs	3 years	500,000
Financing	Assessment completed for potential to access carbon (REDD+) and other new financing opportunities (ecosystem services, biodiversity offsets)	♦♦♦	RDB/WCS	2 years	300,000
Financing	A business plan is developed for Nyungwe National Park	♦♦♦♦	RDB/WCS	1 year	50,000–100,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

Sudan

There are no recent data on chimpanzees in southwest Sudan, and surveys in this region are needed to identify key populations and the threats to their continued existence. Once this is known, a conservation action plan could be developed. However, at present the Lord Resistance Army occupies this region and access is difficult.

Priority projects

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Research and monitoring	Training to build capacity in survey and monitoring methodology	♦♦♦♦	NGOs, government agencies	Completed 2011	20,000
Research and monitoring	Conduct standardized exploratory surveys in SW Sudan	♦♦♦♦	NGOs, government agencies	Start second half of 2011 completed 2013	300,000
Promotion of conservation	Meetings/workshops to educate about existing laws (national and international) and importance of chimpanzees and the conservation of their habitats	♦♦♦♦	Ministry of Environment, institution in charge of conservation or wildlife, and partnership NGOs	2 years	100,000
Promotion of Conservation	Develop a conservation action plan for chimpanzees in Sudan	♦♦♦♦	Ministry of Environment, institution in charge of conservation or wildlife, and partnership NGOs	By 2015 after surveys	100,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

A patchwork of forest and agriculture characterises the habitat of chimpanzees in eastern Africa. Photo © A.J. Plumptre/WCS.

Tanzania

Most of Tanzania's chimpanzees occur outside its parks and reserves. The management and conservation of chimpanzees by TANAPA and NGO partners is well supported in Gombe and Mahale, and there is no great need for additional actions. Consequently, the focus of any new chimpanzee conservation actions should be in the larger landscapes around Mahale (CCUs TZ002 and TZ003) and in southern Tanganyika (the most southerly chimpanzee population, although not a priority on a global scale). Threats in this region include loss of the important riparian forest to agriculture, fires gradually reducing the extent of the forest, and increasing human populations moving into the area. A recent meeting hosted by JGI to develop a national chimpanzee action plan for Tanzania identified the two CCUs selected here as two of its four main targets. The other two were the populations in the Greater Gombe Ecosystem and in southern Tanganyika.

Priority projects

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Habitat loss	Create protected areas in TZ002 and TZ003 outside Mahale Park and support their management	♦♦♦♦	National government	5 years	600,000
Health	Develop rapid response protocols and mechanisms for disease outbreaks	♦♦♦♦	PAA, NGOs, researchers, external expertise as required	Within 2 years	100,000
Health	Implement IUCN guidelines for regulations with habituated chimpanzees (researchers, tourism, PA staff)	♦♦♦♦	PAA, NGOs, researchers	2010–2013	50,000
Habitat loss	Research charcoal/fuelwood needs around Tanzania, CCUs and nearby large towns which rely on fuel from them	♦♦♦♦	JGI, local government, Forest and Beekeeping Department (FBD)	5 years	100,000–250,000
Habitat loss	Support implementation for village land use plans (TZ002 and TZ003)	♦♦♦♦	JGI, FZS-MEMP, local government, TaNaPa	10 years	50,000–100,000
Habitat loss	Promoting regeneration of natural trees and training local communities	♦♦♦	JGI, FZS-MEMP, FBD, local government	10 years	200,000
Financing	Assessment completed to access carbon (REDD+) and other new financing opportunities (ecosystem services, biodiversity offsets)	♦♦♦	NGOs, TANAPA, wildlife department	2 years	300,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

Uganda

Chimpanzees in Uganda are mostly confined to forest blocks that are becoming increasingly isolated. Most populations in these forest blocks are smaller than 500 individuals, and it is crucial to maintain any remaining connectivity between them. Chimpanzee tourism operates at five sites already; another 2–3 sites are being explored. There is, therefore, a real need to strengthen regulations on tourism and health issues across all sites and to implement IUCN protocols. Conflicts between people and chimpanzees are also high because of crop-raiding and the killing of young children by chimpanzees. These conflicts are leading to chimpanzees being killed in retaliation, thus JGI plans to run workshops based on IUCN guidelines (Hockings and Humle 2009). The 2003–2008 national chimpanzee action plan (REF) needs reviewing and updating.

Priority projects

Objective	Project	Priority	Agencies who could be responsible	Time scale	Estimated cost (US$)
Health	Develop rapid response protocols and mechanisms for disease outbreaks including lines of communication and partner collaborations, establishment of rapid response team and emergency interventions	♦♦♦♦	UWA, NGOs, researchers, external expertise as required	Within 2 years	1,000,000
Health	Implement IUCN guidelines for regulations with habituated chimpanzees (researchers, tourism, PA staff)	♦♦♦♦	UWA, NFA, NGOs, researchers	Within 3 years	50,000
Health	Establish and enhance veterinary capacity (laboratory and equipment) to manage/ monitor disease	♦♦♦	PAA, NGOs, researchers	2010–2020	500,000
Habitat loss	Revision of land-use plans for forest reserves (Uganda; CCU UG001,003,005)	♦♦♦♦	NFA, JGI, KFP, BCFS, Makerere University	3 years	100,000
Habitat loss	Design cost–effective corridors and purchase private land in CCU UG002 to connect CCU UG001 to CCU UG003 (Uganda)	♦♦♦	NFA, JGI, BCFS	10 years	250,000
Habitat loss	Patrol for illegal activities in all CCUs	♦♦♦♦	KFP, BCFS, JGI	2010–2020	500,000
Promotion of conservation	Training programmes that improve local CBO skills to implement projects relative to conservation of chimpanzees and their habitat	♦♦♦	Institution in charge of conservation or wildlife, partner NGOs, and local authorities and leaders	5 years	250 000
Community support	Development of tourism projects, ensuring employment and benefit-sharing with local communities, following site-specific feasibility studies and market assessment. Includes monitoring	♦♦♦♦	Governments, plus conservation NGOs in partnership, international and local tourism agencies and companies	2010–2020	800,000
Community support	Dissemination of IUCN guidelines on how to address chimpanzee-human conflict	♦♦	Conservation NGOs and UWA	3 years	100,000
Financing	Assessment completed to access carbon (REDD+) and other new financing opportunities (ecosystem services, biodiversity offsets)	♦♦♦	NGOs, TANAPA, wildlife department	2 years	300,000

Priority: ♦♦♦♦ = high; ♦♦♦ = medium-high; ♦♦ = medium; ♦ = low.

Implementation of the Action Plan

Implementation of this action plan should begin as soon as possible, particularly if CCUs in areas outside our current area of knowledge are to be identified before they are lost. Development across DRC in particular is rapid, and new areas are being opened up with roads, especially for logging and mining concessions. Planning is currently taking place at national level about where these concessions will be allocated, thus conservation areas need to be identified very soon, before possibilities are lost. Where logging and mining concessions occur within CCUs there is a need to manage these well so that bushmeat hunting does not decimate the animal populations that occur there (see Morgan and Sanz 2007). In CAR, we need to find out where chimpanzees occur within the large polygons that were identified in the southeast of the country, and draw up plans for chimpanzee conservation at these locations. In Sudan, sites where chimpanzees still occur along the border with CAR need to be identified. In the rest of East Africa conservation actions must be reinforced where we know that chimpanzees still occur. Many are in designated protected areas, but key sites outside protected areas include the Greater Mahale Ecosystem to the east of Mahale National Park in Tanzania (including the Ugalla and Masito areas TZ002 and TZ003), the corridor area between Budongo and Bugoma Central Forest Reserves, and south to Itwara forest in Uganda (Ug-002).

Monitoring of chimpanzee populations is being undertaken at very few sites across their range. There is a need to develop national programmes to measure the impact of the implementation of this plan. Standard survey methods counting nests have been developed for chimpanzees (Plumptre and Reynolds 1996; Plumptre and Cox 2005; Kühl, *et al*. 2008) and are relatively simple to implement. Nest decay rates need to be calculated at each site, however, and not 'borrowed' from other sites. Either these measurements need to be taken at the time of the survey or a 'marked nest count' method should be used (which avoids having to measure nest decay rates).

In both the Central and East African countries, the three greatest threats identified were hunting of chimpanzees and habitat loss or degradation, followed by lack of law enforcement. Projects that tackle these threats have been highlighted as a high priority above. Focusing on these initially is likely to have the greatest impact on eastern chimpanzee conservation.

This plan should be used to educate politicians, local government officials, protected area authorities and other stakeholders that have a major impact on eastern chimpanzees, to create new protected areas in critical sites, particularly those which are in ecological habitats otherwise poorly represented (Greater Mahale Ecosystem, including Ugalla and Masito — Savanna woodland — probably the driest habitat eastern chimpanzees occupy, and a site in the Western Congolian Swamp forest where no protected areas exist at the moment), to try to minimise the impacts of development projects on chimpanzees, and to encourage national support for the conservation of this endangered ape.

Young chimpanzee in a fig tree at Gangu, Bili Uele in DRC. Photo © Cleve Hicks.

Although not usually targeted, around 25% of chimpanzees in Uganda have snare injuries, such as a missing foot. Photo © T. Furuichi.

7. Glossary

Organisations

A.P.E.S.	Ape Populations, Environments and Surveys
BCFS	Budongo Conservation Field Station
COMIFAC	Commission des Forêts d'Afrique Centrale
DFGFI	Dian Fossey Gorilla Fund International
FBD	Forest and Beekeeping Department
FZS	Frankfurt Zoological Society
GRASP	Great Ape Survival Partnership
ICCN	Institut Congolais pour la Conservation de la Nature
INECN	Institut National de l'Environnement et Conservation de la Nature
IUCN	International Union for Conservation of Nature
JGI	Jane Goodall Institute
KFP	Kalinzu Forest Project
MGVP	Mountain Gorilla Veterinary Project
MEMP	Mahale Ecosystem Management Project
MPI	Max Planck Institute
NASA	National Space Agency
NEMA	National Environment Management Authority
NFA	National Forest Authority
ORTPN	Office Rwandais du Tourisme et des Parcs Nationaux
PSG	Primate Specialist Group
RDB	Rwanda Development Board
SSC	Species Survival Commission
TANAPA	Tanzania National Parks
TAWIRI	Tanzania Wildlife Research Institute
TL2	Tshuapa-Lomami-Lualaba Project
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
USAID	United States Agency for International Development
UWA	Uganda Wildlife Authority
WCMC	World Conservation Monitoring Centre
WCS	Wildlife Conservation Society
WHRC	Woods Hole Research Center
WWF	World Wide Fund for Nature
ZSL	Zoological Society of London

Sites

GME	Greater Mahale Ecosystem
ZFR	Zemongo Faunal Reserve

Terms

CCU	Chimpanzee Conservation Unit
ECAP	Eastern Chimpanzee Action Plan
CBO	Community-based Organisation

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Appendix 1: List of delegates who attended the workshop in Kampala, 17–20 August 2009, with their affiliations.

Name	Affiliation
Aggrey Rwetsiba	Uganda Wildlife Authority
Andy Plumptre	Wildlife Conservation Society
Ashley Vosper	Wildlife Conservation Society
Benoit Kisuki	Institut Congolais pour la Conservation de la Nature
Bryna Griffin	Dian Fossey Gorilla Fund International
Charles Masunzu	Wildlife Department Tanzania
Chie Hashimoto	Primate Research Institute, Kyoto University
Cleve Hicks	University of Amsterdam
Colonel Minasona Lero	Sudan Wildlife Department
Danni Hanni	Jane Goodall Institute
Dario Melo	Jane Goodall Institute
David Greer	World Wide Fund For Nature
Elizabeth Bennett	Wildlife Conservation Society
Fidele Amsini	Wildlife Conservation Society
Fred Babweteera	Budongo Conservation Field Station
Gil Isabirye Basuta	Makerere University Zoology Department
Grace Nangendo	Wildlife Conservation Society
Guy Mbayma	Institut Congolais pour la Conservation de la Nature

Name	Affiliation
Jerry Lwanga	Yale University
John Hart	Tshuapa-Lomami-Lualaba Project
Julian Easton	Wildlife Conservation Society
Koichiro Zamma	Great Ape Research Institute
Leonidas Nzigiyimpa	Institut National de l'Environnement et Conservation de la Nature
Liz Williamson	SSC Primate Specialist Group
Louis Rugerinyange	Rwanda Development Board/ORTPN
Mark Ocen	Ministry Tourism, Trade and Antiquities
Nerissa Chao	Wildlife Conservation Society
Panta Kasoma	Jane Goodall Institute
Peter Apell	Jane Goodall Institute
Rene Beyers	University of British Columbia
Richard Tshombe	Wildlife Conservation Society
Robert Rose	Wildlife Conservation Society
Sandra Tranquilli	A.P.E.S. database
Shadrack Kamenya	Jane Goodall Institute
Stuart Nixon	Zoological Society of London
William Olupot	Wildlife Conservation Society
Takeshi Furuichi	Primate Research Institute, Kyoto University

Appendix 2: Cultural behaviours identified in different eastern chimpanzee communities.

Classifications from Whiten *et al.* 2001 as have the data for Budongo, Gombe and Mahale. The other sites in the table were updated at the workshop.

Behaviour	Budongo	Bulindi	Kibale Kanyawara	Kibale Ngogo	Kalinzu	Bili-Uele	Gombe	Mahale M group	Mahale K group
1. Investigatory probe	?	+	+	?	?	+	C	H	H
2. Play start	H	?	C	H	?	?	C	C	C
3. Drag branch	H	+	H	+	H	?	C	C	C
4. Leaf sponge	C	?	C	+	?	?	C	+	E
5. Branch clasp	C	?	C	?	C	?	C	C	C
6. Branch shake	C	+	H	H	?	?	C	C	C
7. Buttress beat	C	C	C	C	C	C	C	C	C
8. Nasal Probe		?		?	?	?		+	
9. Comb	+	?		X	?	?			
10. Insect pound		?		?	C	?			
11. Resin pound		?		?	E	?		E?	E?
12. Branch hook		?		X	?	?			
13. Perforate	E?	+	E	?	E	?			
14. Dig	E?	+	E	X	E	+			
15. Brush stick		?		?	E	?			
16. Seat stick	E	?	E	X	?	?	E	E?	E?
17. Stepping stick	E	?	E	X	?	?	E	E?	E?
18. Leaf Container		?		X	?	?	+		
19. Leaf mop	E?	?	E	+	?	?	+		+
20. Leaf wipe		?		X	?	?	+		
21. Leaf brush		?		X	?	?	+		
22. Open and probe		+		X	?	?			
23. Sponge push pull		?	E	?	?	?	+	+	E
24. Algae scoop	E	?	E	X	E	?	E	E	E
25. Ground night nest	+	+	E?	X	+	H	+	E?	E?
26. Anvil prop	E	E	E	?	E	X	E	E	E
27. Food pound onto wood	H	?	E?	X	?	H	C		
28. Food pound onto other		?	E?	X	?	H	C		
29. Nut hammer, wood hammer on wood anvil	E	E	E?	E	E	X		E	E
30. Nut hammer, wood hammer on stone anvil	E	E	E?	E	E	X			
31. Nut hammer, stone hammer on wood anvil	E	E	E?	E	E	X		E	E
32. Nut hammer, stone hammer on stone anvil	E	E	E?	E	E	X			
33. Nut hammer, other	E	E	E?	E	E	X			
34. Pestle-pound	E?	?	E?	?	E	?		E?	E?
35. Club		+		?	?	?	H	+	

Behaviour	Budongo	Bulindi	Kibale Kanyawara	Kibale Ngogo	Kalinzu	Bili-Uele	Gombe	Mahale M group	Mahale K group
36. Termite fish using leaf midrib	E?	x	E	X	E	X			C
37. Termite fish using non-leaf materials	E?	x	E	X	E	X	C		C
38. Ant fish		?		+	?	?	+	C	C
39. Ant dip wipe		?		X	C	H	C		
40. Ant dip single		?		X	C	H	+		
41. Fluid dip		+	H	+	+	?	C	H	H
42. Bee probe		+		+	?	+	+		
43. Marrow pick		?		X	?	?			
44. Lever open		?		?	+	?	C		
45. Expel/stir		?	E?	?	+	?	C	H	H
46. Seat-vegetation		+	+	+	?	H			
47. Fly whisk	H	?	E	+	?	?	+		
48. Self tickle		?		?	?	?	H		
49. Aimed throw	+	?	+	?	?	?	C	C	
50. Leaf napkin	C	?	C	?	+	?	C	+	
51. Leaf dab		?	C	?	?	?	+		
52. Leaf groom	+	?	C	+	C	?	C	C	C
53. Leaf clip, mouth	C	?	H	H	+	?		C	C
54. Leaf clip, fingers	C	?	H	?	+	?		+	
55. Leaf strip		?	H	X	?	?	H	+	
56. Leaf squash		?		?	+	?	H	?	?
57. Leaf inspect	C	?		?	+	?	+	?	?
58. Index-hit		?		+	?	?	+		
59. Hand clasp		H	C	H	H	?		C	C
60. Knuckle Knock		?		?	X	?	H	C	C
61. Branch din		?	?	X	?	?		E?	E?
62. Branch slap	C	+		?	?	?		+	
63. Stem pull through		?	H	?	?	?	+	H	
64. Shrub bend	C	?		?	X	?		C	
65. Rain dance.	H	?	C	H	C	+	C	C	C
66. Snail smash on wood (subset of food pound)				X	?	H			
67. Termite mound smash on wood and stone (subset of food pound)				?	E	H			
68. Tortoise smash on stone and wood (subset of food pound)				E	?	+			
69. Fruit smash on wood and stone (subset of food pound)				?	?	H			
70. Ant scoop				?	?	+			
71. Ground nest missing one side				X	?	+			
72. Fruit hammer to smash termite mound				X	E	+			

C = Customary; **H** = habitual; **+** = present; **X** = absent with no environmental explanation; **E** = absent with environmental explanation; **?** = not established

Appendix 3. Stakeholders that have a positive or negative impact on chimpanzees, their interests and activities, and the relative intensity of their impacts.

East Africa

Stakeholder	Interests	Activities	Impact P/N	Intensity H/M/L
Local community	Livelihoods	Firewood collection; NTFP collection; land	N/P	H
Poachers / hunters	Meat, cash and medicine	Illegal hunting	N	H
Farmers	More land	Forest clearing	N	H
Pit sawyers	Timber	Sawing	N	H
National Park authorities	Managing protected areas	Patrols; education; tourism; outreach; research; monitoring	P	H
Forestry authorities	Timber production	Cutting timber; land management	P/N	H
Ministry responsible for wildlife	Conservation and trade	Hunting block legislation; research permits; conservation	P/N	H
Central government	Laws and policy creation; biodiversity conservation	Policy and law; implementation of international conventions; creation of logging and mining concessions; and other land use decisions	P/N	H
Ministry of Infrastructure	Development	Roads; dams; bridges	P/N	H
Ministry of Energy	Power supply	Hydroelectric power generation; power lines	N	H
Ministry of Lands	Land use and allocation	Land planning; use allocation; tenure issues	P/N	H
Commercial agricultural developers	Improving farming output	Commercial interests; land conversion	N	H
Conservation NGOs	Conservation	Conservation projects	P	H
Police	Maintaining law and order	Enforcing laws, unless corrupt	P/N	H
Judiciary	Prosecuting law breakers	Prosecutions and defence of suspects	P/N	H
Rebel groups	Power	Exploitation of people	N	H
Beekeepers	Honey collection	Collecting honey, can start fires	N	M
Local employees (extractive resource companies)	Livelihoods	cutting trees; mining	N	M
National community	Livelihoods, wellbeing; chimpanzee conservation	Consuming products that indirectly impact chimpanzees	P/N	M
International community	Livelihoods; wellbeing; chimpanzee conservation	Consuming products that indirectly impact chimpanzees	P/N	M
Logging companies	Timber	Tree cutting; roads	N	M
Mining companies	Minerals, sand, lime, etc.	Infrastructure development for mineral exploration and extraction	N	M
Ministry of Agriculture	Improving farming output	Land conversion; land use	N	M
Ministry of Mining	Revenue from minerals	Allocation of mining concessions	N	M
Ministry of Tourism	Control of, and revenue generation from, tourism	Permits; development infrastructure; promotion of tourism	P/N	M
Ministry responsible for forestry	Forest management	Logging permits; timber plantations; charcoal production	N	M
National tourist companies	Revenue from tourism	Commercial	P/N	M
International tourist companies	Revenue from tourism	Commercial	P/N	M
Researchers	Conservation and scientific study	Scientific and conservation information	P/N	M

Stakeholder	Interests	Activities	Impact P/N	Intensity H/M/L
Refugees	Survival	Land occupation; resource extraction; degradation	N	M
International governmental donors (USAID, UNEP)	Support to development and poverty alleviation	Development projects	P/N	M
Media	News	Spreading news	P/N	M
Military	Maintenance of power of government	Control armed activities, unless corrupt	P/N	M
Consumers of forest products	Harvesting from the forest for revenue or survival	Harvesting of NTFPs	P/N	M
UNHCR and other refugee organizations / agencies	Humanitarian needs	Projects in areas of conflict	P/N	M
Multinational tobacco companies	Producing tobacco	Destroying forest	N	M
Large scale agricultural companies (e.g., sugar)	Producing crop	Destroying chimpanzee habitat	N	M
Livestock keepers	Grazing and fodder	Grazing animals; collection of fodder; fires	N	L
Oil companies	Oil extraction	Infrastructure development for oil exploration and extraction	N	L
Local government	Local population welfare	Gaining votes; improving livelihoods	P/N	L
Church	Missionary work	Praying; teaching; changing beliefs and attitudes; community projects	P	L
Ministry of Environment	Conservation of the environment	Promoting sustainable use	P/N	L
Tourists	Vacation	Wildlife viewing	P/N	L
Community development NGOs	Support to local people	Promoting human well-being	P/N	L
Ministry of Health	Health of national population	Support to medical services	P/N	L
Ministry of Water and Irrigation	Sustainable use of water	Support to water projects	P/N	L
Customs	Management of cross-border trade and movement of goods	Check trade in chimpanzees, unless corrupt	P/N	L

Impact on chimpanzees, their interests and activities: **P** = positive; **N** = negative
Relative intensity of their impacts: **H** = High; **M** = Medium; **L** = Low

Central Africa

Stakeholder	Interests	Activities	Impact P/N	Intensity H/M/L
Development NGOs	Development projects to alleviate poverty	Development projects that support people	N	H
Central government	Source of revenue; biodiversity conservation	Policy and law; implementation of international conventions; creation of logging and mining concessions and other land use decisions	P/N	H
Provincial government	Source of revenue; biodiversity conservation	Law enforcement; issuing concessions and other documents that can have negative impacts	P/N	H
Conservation institutions	Conservation, research, tourism	Implement conservation programs	P	H
Artisanal loggers	Income	Habitat loss and degradation while harvesting timber	N	H
Artisanal miners	Income	Habitat loss and degradation while harvesting minerals	N	H
Local communities	Bushmeat hunting, cultural values attributed to sites	Undertake poaching and cultivation but can contribute to research or protection if employed to do so	P/N	H
Immigrant communities	Survival/settlement	Farming; mining; logging; conservation	N/P	H
Conservation NGOs	Technical and financial support	Support conservation projects	P	H
Humanitarian NGOs	Emergency support in conflict	Support to displaced people and conflict situations	N/P	H
Police	Maintain law and order	Enforce laws, unless corrupt	N/P	H
Mining societies	Extraction of minerals	Mining activities	N	H
Donors	Supporting development	Support projects to alleviate poverty	P/N	H
International institutions	Various	Various	P/N	H
Regional institutions	Various	Various	P/N	H
Militias	Power	Exploitation of people	N	H
Army	Security and control of power	Maintenance of security if not corrupt, otherwise exploitation of people	N/P	M
Forestry organisations	Timber extraction	Logging	N	M
Other public services	Various	Various	N	M
Church	Spreading the word of God	Church services and projects	P	L
Tourist operators	Income from tourism	Take tourists to sites	P	L

Impact on chimpanzees, their interests and activities: **P** = positive; **N** = negative
Relative intensity of their impacts: **H** = High; **M** = Medium; **L** = Low

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