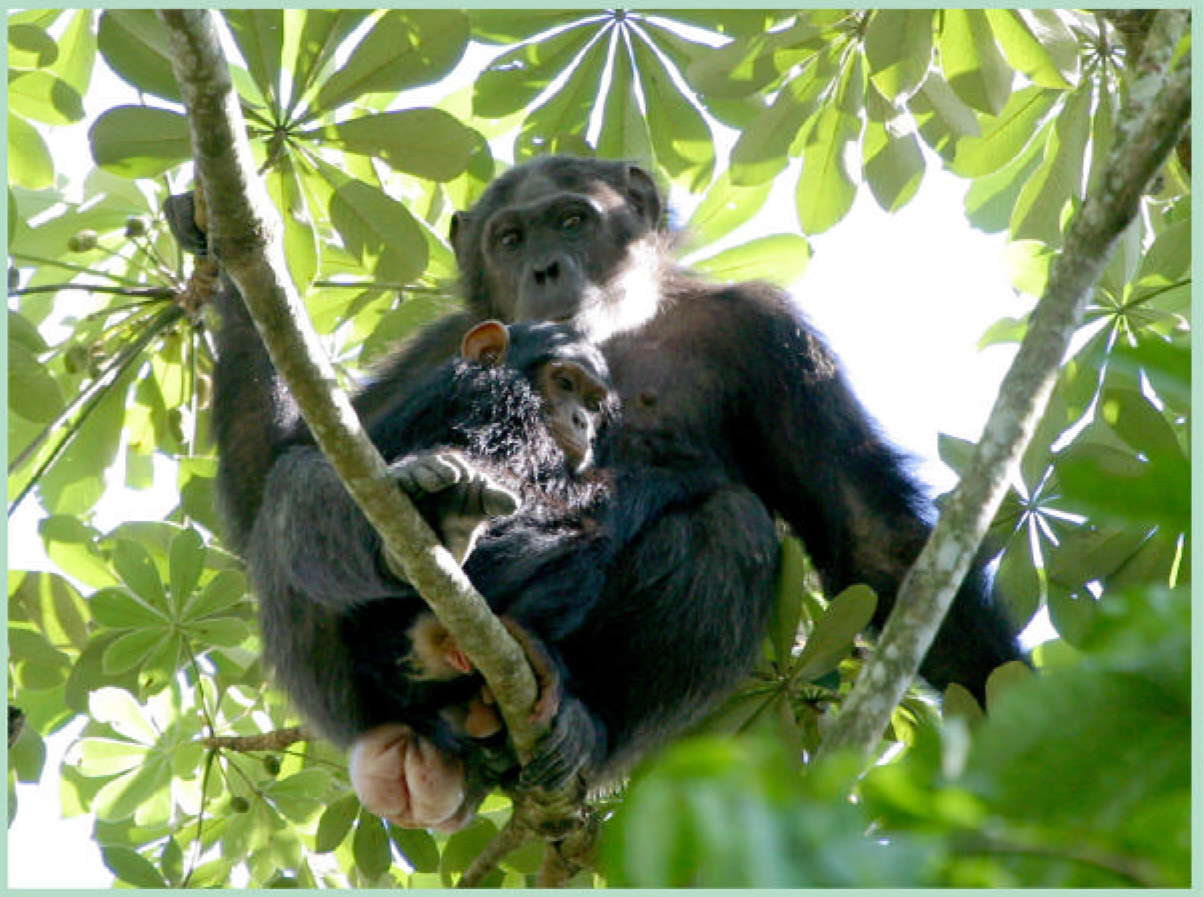
Albertine Rift
Technical Reports
Series Number 2

THE STATUS OF CHIMPANZEES IN UGANDA



WILDLIFE CONSERVATION SOCIETY

A.J. PLUMPTRE, D. COX AND S. MUGUME

the Jane Goodall Institute

WCS's Albertine Rift Programme

The WCS Albertine Rift Programme is working to conserve some of Africa's most biodiverse sites for the future generations of Africans and the global community. The Albertine rift stretches from the northern end of lake Albert down to the southern end of lake Tanganyika and encompasses the forests, savannahs, wetlands and mountains to be found in the rift and on the adjacent escarpment in Uganda, Rwanda, Burundi, Tanzania and Democratic Republic of Congo. This area of Africa contains 40% of all bird species and 25% of all mammal species on the African continent. Many species are endemic to this part of the world and it has been identified as being of global conservation importance by several global priority-setting exercises (it is an endemic bird area, ecoregion and a hotspot). The Albertine Rift Programme focuses on three main goals:

- The provision of science-based information to enable protected area managers to better manage conservation sites within the region.
- Building capacity of African nationals to be able to use a scientific method in their approach to protected area management, particularly focussing on staff of protected area authorities in the region (UWA, ORTPN and ICCN).
- Supporting management authorities to manage certain sites within the Albertine Rift through financial support for the basic operating costs, planning, training, monitoring and research programmes. WCS is committed to site conservation over long periods of time because it recognises the need for long term support.

To learn more about the programme visit: www.albertinerift.org

JGI UGANDA

In 1989 four chimps were confiscated by local authorities and brought to Entebbe Zoo. In September 1990, these four chimps disappeared overnight from Entebbe airport. In the summer of 1991 a representative of TRAFFIC in Rome discovered the whereabouts of the four chimps from a visiting Russian circus. Uganda's chimps had learned to ice skate during their world travels! Many weeks later, the chimps were once again confiscated and with the help of International Primate Protection League and the Jane Goodall Institute, were shipped back to Entebbe. Since 1991, the Jane Goodall Institute has been active in Uganda with a primary interest in the conservation of the endangered chimpanzee as well as the welfare of those brought into captivity. The Institute works closely with the Uganda Wildlife Authority and the Uganda Wildlife Education Centre (UWEC) (formerly Entebbe Zoo).

Projects include:

- Administration of Ngamba Island Chimpanzee Sanctuary. This 100 acres of forested island, 23 kilometres from Entebbe in Lake Victoria, was established in October 1998. It is currently caring for 33 orphaned chimpanzees that have been confiscated in Uganda.
- Ongoing training and capacity building of Ugandan Nationals and other African nationalities in the care of captive chimpanzees, including rehabilitation and resocialization.
- Habituation of primates in the Kibale National Park for eco-tourism activities that will increase revenue to the park to carry out its conservation work, in collaboration with the Uganda Wildlife Authority (UWA).
- Snare removal programmes in Kibale and Budongo Forests, in collaboration with Kibale Chimpanzee Project (KCP) and Budongo Forest Project (BFP) respectively. The PHVA workshop highlighted the problem of poaching with snares, with 25% of known chimpanzee research communities suffering from injuries related to snares.
- Working with local communities to resolve conflicts with chimpanzees and their livelihoods
- Environmental Education programmes for primary and secondary school children, particularly those found residing near chimpanzee habitat forests.

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Cover Photo: Mother and infant chimpanzee, Kalinzu Forest, I. Furuichi.

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Camp staff:

John Rwagala, Deo Businge, Kareebi Obed, Kusemererwa Richard.

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contents

Section 1: Previous surveys

Infant chimpanzee in Musanga tree. T.Furuichi

Introduction

The forests of western Uganda are some of the largest remnants of forest remaining in this country and also some of the most important for conservation (Uganda Forest Department 2002; Howard, 1991). However the size of these forests rarely exceeds 4-500 km^2 of tropical-high forest (additional land consisting of savannah or montane grassland occurs in most of the gazetted forest reserves, boosting their size). This surface area may be insufficient to protect some of the larger-bodied mammals in the long term because their population sizes will be too small to be viable, and factors such as disease and genetic inbreeding may lead to their long-term decline and eventual extinction (Soulé 1987). In Uganda, chimpanzees (*Pan troglodytes schweinfurthii*) are one of the species that is probably most vulnerable to population extinction because, where studied, these animals tend to occur at lower densities than other large mammals. Their reproductive ability to recover quickly from a population decline is also poor, with interbirth intervals of between 4.4 to 6 years (Wrangham, de Waal, and McGrew, 1994; Boesch and Boesch-Achermann, 2000) and females commencing reproduction between 10-15 years old (Wallis, 1997).

The eastern chimpanzee (*Pan troglodytes schweinfurthii*) occurs across much of north and north-eastern Democratic Republic of Congo and reaches the western forests and woodlands of Burundi, Rwanda, Tanzania and Uganda. It is one of the four subspecies of chimpanzee now recognised to exist in Africa. This subspecies is classified as endangered under IUCN criteria as is the species *P.troglodytes* because of the extensive decline in populations across Africa as a result of hunting and habitat loss. The conservation of chimpanzees requires knowledge about the extent of their distribution, the threats they face, population dynamics and their abundance and relative importance of sites for their long-term survival. This requires research, much of it long-term because of the need to habituate animals to the presence of observers. It usually takes between three to ten years, depending on the size of communities, to habituate chimpanzees to humans so that they can be followed (Boesch and Boesch-Achermann, 2000; A.Plumptre pers. obs.).

Uganda has had a long history of research on chimpanzees dating to 1962 with the pioneering work of Vernon and Frankie Reynolds (Reynolds and Reynolds, 1965). This was followed by a long programme of research on chimpanzees in Kibale forest initially by Ghiglieri (Ghiglieri, 1984) in the 1970s and then by Gil. Isabirye Basuta, Richard Wrangham and Colin Chapman in the 1980s (Wrangham et al., 1986) with many additional researchers contributing to studies here in the 1990s. Following increased security in Uganda in the 1990s several additional studies were initiated in Budongo Forest Reserve (Vernon Reynolds, Christopher Bakuneeta and Andrew Plumptre), Semuliki Wildlife Reserve (Kevin Hunt), Bwindi Impenetrable National Park (Craig Stanford and John Bosco Nkurungi) and Kalinzu Forest Reserve (Chie Hashimoto and Takeshi Furuichi).

Chimpanzee communities

Chimpanzees live in communities of individuals in a similar way to humans. This means they do not move around in one group like gorillas or monkeys but split up and come back together at intervals in what is termed a ‘fission-fusion’ society. Communities vary in size and in Uganda they range between about 20 to over 100 individuals. Infants are born every 4-5 years and stay with their mothers until they are 8-10 years old. They do not become sexually mature until about 10 years old (Goodall, 1986). The late onset of sexual maturity, together with low fecundity, makes the species extremely vulnerable as it can take decades for a population to recover from a decline in numbers. This is one of the main reasons chiumpanzees are a conservation concern globally.

The complex social system of chimpanzees makes it particularly difficult to census this species. You cannot count the number of individuals in groups for instance because they rarely, if ever all come together. It is possible to count the number in a community through the recognition of individual animals. This takes time and studies of the habituation process show that it can take several years to recognise all the individuals in one community. This species is also very difficult to census through standard line transect surveys unlike many other primates because they are rarely seen because of their low abundance and ability to freeze and remain silent when an observer passes by. One aspect of their behaviour however does help in the estimation of their numbers and that is the fact that they build nests to sleep in at night once they have been weaned. Counting nests has been used as an alternative to counting individual chimpanzees (Ghiglieri, 1984; Tutin and Fernandez, 1984; Plumptre and Reynolds, 1996, 1997).

Previous surveys of chimpanzees

From as early as the 1920s, Uganda Forest Department staff have undertaken surveys of timber and tree distributions within Uganda's forest Reserves. Biologists have also visited the forests and collected animal and plant specimens and documented species distributions across Uganda. However, there has been little quantitative work on large mammal distribution and abundance in these forests. There have been some quantitative studies within certain forests such as Kibale Forest (now National Park) by Struhsaker (1997) and others, and in Budongo Forest (Reynolds 1992), but these have focussed on one site within a forest, sometimes only one or a few species of animal and have not compared different forests. More recently there have been some surveys that look at the geographical variation of the abundance of primates and large mammals within single forests: Budongo Forest Reserve (Plumptre & Reynolds 1994, 1996, 1997); Kibale National Park (Chapman & Lambert, 2000; Chapman et al. 1999; Mitani, Struhsaker and Lwanga 2000) and Bwindi

Impenetrable National Park (McNeilage *et al.* 1998). There have been few studies, however, that have collected similar data across forests to allow comparisons to be made.

Chimpanzees were first surveyed formally in Uganda in 1962 (Reynolds and Reynolds, 1965). This survey showed chimpanzees distribution in Uganda but did not determine population sizes in most of the forests surveyed (an estimate was obtained through more detailed research for Budongo Forest). This survey successfully identified the main forest blocks that supported chimpanzees but did not record all sites where chimpanzees occur in Uganda. In the 1970s Ghiglieri estimated the density of chimpanzees in Kibale forest and subsequent work by Chapman and others has monitored the population density in this forest (Ghiglieri, 1984; Chapman et al., 1999; Chapman and Lambert, 2000). In the 1980s, Peter Howard surveyed 12 of the larger forest reserves in Uganda. The presence, and approximate locations, of evidence of large mammals and human activity along forest paths walked were recorded. In seven of the forests (Kibale National Park, Semuliki National Park, Kalinzu Forest Reserve, Maramagambo Forest Reserve, Bwindi Impenetrable National Park, Kasyoha-Kitomi Forest Reserve and Itwara Forest Reserve), estimates of primate density were obtained using transect lines (Howard 1991).

In the 1990s surveys were made of chimpanzees in Kalinzu Forest Reserve (Hashimoto, 1995; Furuichi et al., 2001). Biodiversity surveys of all of the large Forest Reserves and National Parks in Uganda were also undertaken by the Uganda Forest Department which built upon Howard's surveys of the 12 forests and expanded it to 65 forest reserves which formed about 75% of Uganda's forest estate (Howard & Davenport 1996). These surveys focused on certain taxa (birds, trees, rodents and shrews, butterflies and moths), and were designed to investigate the relative species richness of the different forests to guide future conservation planning within the Forest Department. These inventories did not survey primate populations or other large mammals in the forests because the diversity of species was not particularly high in comparison with other taxa, however they did record the presence of chimpanzees as this is a species of conservation concern. These surveys confirmed the presence of chimpanzees in Otzi Forest Reserve on the Sudan border which had been rumoured but not proven (Davenport et al., in press).

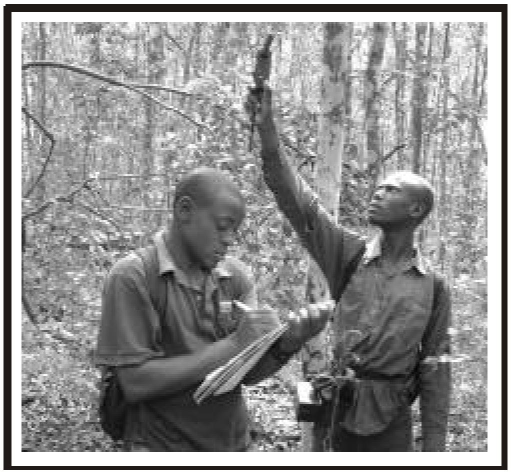
Censusing chimpanzees in Uganda

In 1997 the Uganda Wildlife Authority and Uganda Forest Department held a workshop to carry out a population and habitat viability assessment for chimpanzees in this country. One of the workshops' main recommendations was that surveys be undertaken in the forests where chimpanzees are known to occur. This was due to the fact that at that time most information on the species came from only two forests; Kibale National Park and Budongo Forest Reserve (Edroma, Rosen and Miller 1997). Much of the research has focussed on ecological and behavioural studies of primates (*Budongo:* Plumptre et al. 1997; Newton-Fisher 1999; Newton-Fisher et al. 2000; *Kibale:* Ghiglieri 1984; Chapman & Wrangham 1993; Wrangham et al. 1986; Struhsaker 1997; Lambert 1998; Conklin-Brittain et al., 1998; Mitani & Watts 1999) rather than population and distribution surveys.

In 1999 the Jane Goodall Institute (JGI) and the Wildlife Conservation Society (WCS) commenced a four-year programme in collaboration with the Uganda Wildlife Authority and the Uganda Forest Department, to evaluate the current status of chimpanzees in Uganda. At the same time data were collected on other primates and large mammals. In addition the surveys aimed to collect quantitative data on the human impact and use of these forests so that an evaluation of the threats to each forest could be made. The main objectives of the surveys were to:

1. Assess chimpanzee population size in the different forests and relative abundance between forests.
2. Assess the distribution of chimpanzees within forests to identify those areas of greater importance for their conservation.
3. Assess the population status of other primates and large mammals and their relative abundance between forests.
4. Evaluate the current threats to the forest and the large mammals in the forest.

This report summarises the findings of these surveys.



Section 2: Censusing chimpanzees

Field team collecting data in Maramagambo forest. A. Plumptre, WCS

Introduction

Counting chimpanzees in forests is a difficult task. Compared to monkeys chimpanzees live at low densities (0.2-2.0 per km^2) wherever they occur and hence are rarely seen. Therefore we have to rely on indirect signs to census these animals. Chimpanzees build individual nests at the age of four years and above nest counts can provide an indication of the number of adults and juvenile animals present in a given area. Several methods of nest counting have been developed over the years. The following section provides an overview of these methods and what we consider to be the most accurate method.

History of chimpanzee census methods

Chimpanzee densities were initially determined by estimating chimpanzee home range size by following habituated or semi-habituated animals (Reynolds and Reynolds 1965). The problem with this method is that 1. it assumes you know the home range well and this can take many years to ascertain and 2. it assumes adjacent ranges abutt exactly with the range you are studying. For example, the published findings of a 10 year study in Kibale forest to determine chimpanzee home range size (Chapman and Wrangham 1993), were found to be invalid when further research revaelaed that several of the chimpanzees in their community used a much larger range than recorded in the original study.

Nest counting techniques have been used in many sites in Africa. Ghiglieri (1984) was one of the first to use this technique to census the chimpanzees in part of Kibale forest in western Uganda. A modification of his technique was used in Gabon to undertake a nation-wide census of chimpanzees (Tutin and Fernandez 1984). Working with Vernon Reynolds, Andrew Plumptre further modified the technique and developed an alternative and more accurate method of nest counting, the ‘marked nest count’ method. This differs significantly from the traditional “Standing Crop Count” method (Plumptre and Reynolds 1996, 1997).

Standing crop and marked nest count methods

Standing Crop counts

The standard nest count technique as developed by Ghiglieri (1984) and Tutin and Fernandez (1984) and used many times subsequently (eg. Hashimoto 1995) involves walking transects and calculating the density of nests found along the transects. The calculated density then has to be corrected by the rate of decay of the nests to estimate the population density of chimpanzees. Nest decay can be highly variable however with decay rates ranging from 10 to 154 days in one study in Budongo Forest (Plumptre and Reynolds 1996). The estimates obtained from the standard nest count techniques rarely calculate the errors around the estimate and have never incorporated the errors associated with the variations in nest decay rate. In addition calculating the nest decay rates at a site is time consuming if you have to wait 154 days or longer until the last nest decays. It also matters when you start monitoring nests for decay. The nests you count at time ‘*t*’ have been affected by factors leading to decay up to several months before time *t*. if you start monitoring at the time you start your census then you are not monitoring the decay rates which led to the current standing crop of nests that you are counting. There is a time lag involved and it is unclear when monitoring of nest decay should really take place – we would advocate at least 1-2 months before the counting of nests takes place. This standard count technique we have termed the

'Standing Crop count' because it involves a one time visit to an area to determine the current density of nests at the time of the visit.

Marked nest counts

One way to avoid having to calculate nest decay rate is to revisit transects regularly and count the number of nests that appear over time. In these surveys we established transects in several forests that we visited every 2 weeks over a period of about 3-4 months. On the first walk along the transect we counted and marked all nests with a ribbon and stake below them. We then carried out a second walk of the transect soon afterwards to ensure we had not missed any old nests. On every subsequent visit we only counted new nests which were unmarked and then marked them so that they were not counted in future visits. It required about 6 visits to obtain a reasonable sample size for about five 4 km transects in Uganda. Elsewhere in Africa this is likely to be a low estimate of the sample size required and it may need 20-30 transects to obtain a sufficient sample size because chimpanzee densities are lower. A sufficient sample size is about 50 sightings of nests along the transects of new nests (i.e. not including the first count).

Methods in detail

Whichever method is used (marked nests or standing crop), certain protocols need to be followed. For this census we used tha marked nest count with the following protocol. Transects were located in some form of random or stratified-random manner in the area to be censused. Stratification can be based upon habitat types if these are known or as in the case of these surveys the area was divided into equal sized blocks and the transect located randomly within each block. The forest was divided up into sectors of roughly equal size with boundaries of the sector usually following a geographical feature. Sites for transects were chosen within certain sectors within forests aiming to maximise coverage of the forest with transects. A baseline was cut along one side of the sector and divided into equal lengths and a transect position located using random numbers along each section of the baseline. Transects were cut through the forest following a compass bearing which was perpendicular to the baseline.

Once the transects were cut they were walked at a speed of approximately 1 km per hour to ensure that nests and animals were not missed. This speed is also appropriate for censusing primates (Struhsaker, 1997).

Area searched

There are two ways in which the extent of area searched can be calculated when walking transects. The easiest is to have a fixed width to the transect in which all nests can be seen. In practice this is about 10 metres on either side of the transect for forests in Uganda. The area searched can be calculated simply as:

Area = Length of transect in metres x 2 (because of both sides of the transect) x 10 metres

A problem with this method is that any nests seen beyond 10 metres are ignored which can significantly reduce your overall sample size. In Uganda we used standard “Distance sampling” methods that recorded the perpendicular distance from the transect to the nest for each sighting. The computer package “DISTANCE” was used to fit a curve to the drop off in sightings of nests from the transect so that an estimate of the area searched could be calculated (Buckland et al. 1993).

Recording nests

Any sighting of a chimpanzee nest was recorded on a data sheet, the tree the nest was in identified with a coloured ribbon (below the nest if possible), and a recognisable stake placed in the ground directly below the nest. The perpendicular distance was measured with a tape measure or rangefinder (10-75 metre rangefinder) to the nearest metre and also recorded on the data sheet. We also assigned an age to the nest so that we could assess if some nests had been missed on previous censuses:

1. New = Green leaves within the cup of the nest and the nest intact
2. Old = leaves brown but the nest still pretty much intact

3. Very Old = gaps in the cup of the nest that the observer can look through due to loss of leaves.

The distance of the nests along the transect was also recorded. When carrying out marked nest counts observers were asked to highlight on the data sheet any old nests that were not marked so that we could check with previous data sheets to see if the nest was marked in the past but the ribbon and stake lost (it was very rare that both were lost, however).

Forests surveyed

Most of the large forests in western Uganda were surveyed along with several forest patches outside the forest reserves. Bwindi Impenetrable National Park was

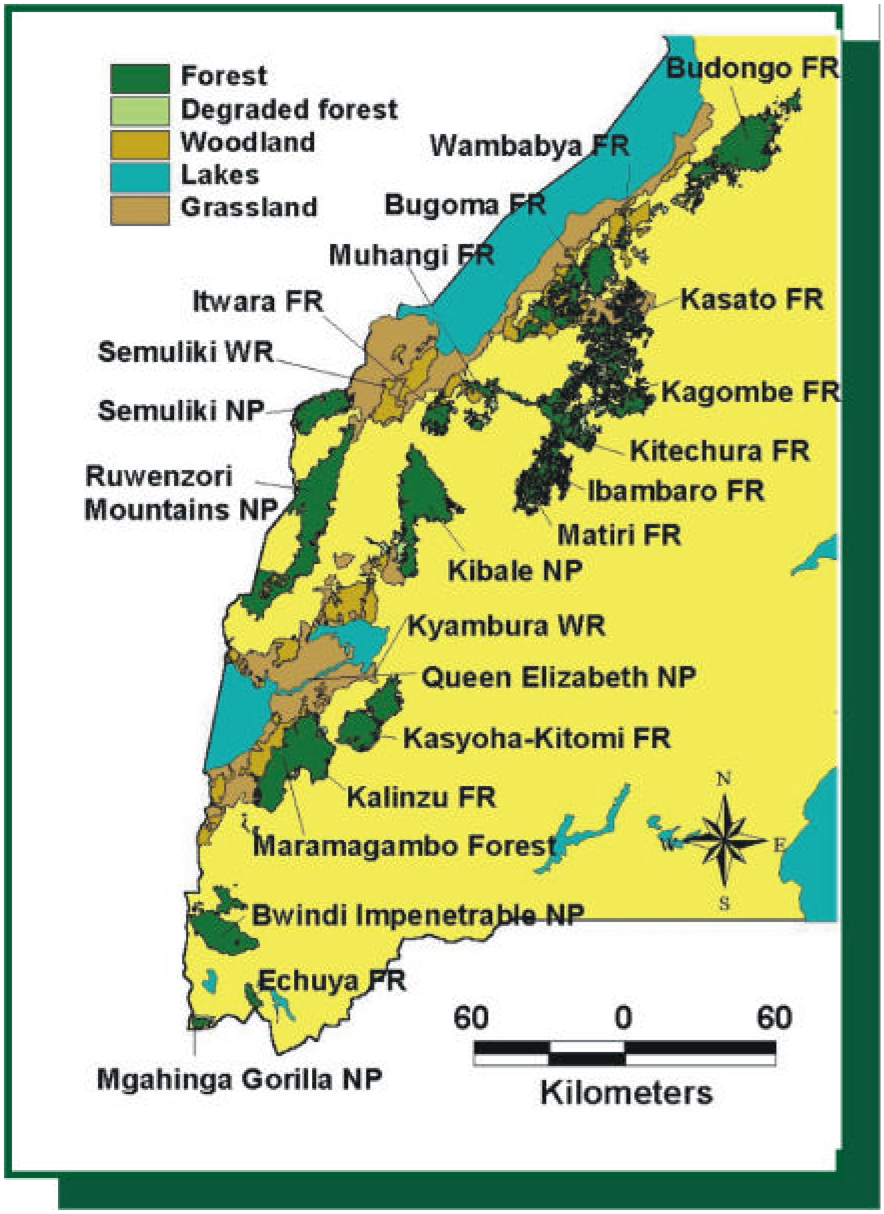


Figure 2.1 The protected areas where chimpanzee estimates were obtained in Uganda. NP=National Park; FR=Forest Reserve; WR=Wildlife Reserve

surveyed in 1997 as part of the mountain gorilla census. In 1999 Bugoma, Wambabya, Kasato, Kagombe, Kitechura, Ibambaro and Matiri forest reserves were surveyed with other small forest patches to the east of these forests. Budongo Forest Reserve and Kibale National Park were surveyed in 2000 followed by Semuliki National Park, Kasyoha-Kitomi and Kalinzu Forest

Reserves in 2001. Finally in 2002 Echuya Forest Reserve, Maramagambo forest (jointly managed by Forest Department and Uganda Wildlife Authority), Itwara Forest Reserve, Muhangi Forest Reserve and Ruwenzori Mountains National park were surveyed (Figure 2.1).

Estimates for Semuliki Wildlife Reserve were obtained from Kevin Hunt (Pers. comm.) and Allan (2000). Estimates from Kyambura Wildlife Reserve were obtained from Allan (1994).

Data analyses

The data were analysed using "DISTANCE" where perpendicular distances were measured. DISTANCE is free on the internet and with the associated reference (Buckland et al., 1993) can be downloaded or ordered from the DISTANCE web site (http://www.ruwpa.st-and.ac.uk/distance).

Standing crop nest counts with DISTANCE were analysed using the following methods:

1. Nests were entered individually and not as groups – so sample size was always =1.
2. The 'effort' that was entered was equal to the length walked on the transects (because they are only walked once).

Marked nest count data were analysed using the following method:

1. The data from the first walk of a transect was excluded – i.e. only newly produced nests were analysed.
2. The 'effort' was equal to the length of the transects only (NB if you are counting live primates on the line then the effort is equal to the distance walked in total = length of transect x number of times it was walked). This is because you are factoring in a time component and what you are effectively wanting to do is walk the line once after three months and count all new nests but you cannot do this because some nests will disappear in this time.
3. From DISTANCE a density estimate was obtained for nests produced over the time of the survey (time between first and last walk of the transect).

This was divided by the number of days elapsed between the first and last time the transect was walked to calculate a chimpanzee density.

Most chimpanzee studies have assumed that each chimpanzee builds one nest every night (for adult and juvenile chimpanzees). Detailed studies in Budongo Forest Reserve showed that chimpanzees will sometimes reuse nests and at other times build two or more nests in a 24 hour period. On average these factors tended to cancel each other out and in Budongo forest it was estimated that chimpanzees build 1.09 nests each day (Plumptre and Reynolds 1997). Therefore the overall nest density needs to be divided by 1.09. Obtaining similar data from other sites with habituated chimpanzees would be useful to make comparisons with Budongo but for now this is the only estimate available. In the Budongo Forest “Sonso” chimpanzee community 15.7% of the chimpanzees studied were were four years or younger in age and in the Ruhija community in Bwindi Impenetrable National Park 25% of the community are in this age group. This age group rarely will rarely build a nest as they usually sleep with their mothers. Density estimates based on nests must therefore either acknowledge that these are adult and juvenile chimpanzees, or multiply by the percentage of infants from habituated communities that are in similar forests to obtain an estimate of the number of additional infant chimpanzees. In this survey we used the mean of the various communities described which indicated that 20% do not build nests. The population estimate was then corrected by this percentage.

Costs of census methods

Standing crop count surveys are less costly than marked nest counts as they only require one visit per site. If nest decay rates are to be calculated on site (rather than borrowing decay rates estimated from other sites) the costs will not differ significantly because both require staff on site for at least 3-4 months. Marked nest counts are generally more accurate because you do not have to factor in the decay rate of nests – this is true provided you obtain sample sizes of about 50+ new nests. If the sample size is too low then your accuracy will not be very different. However, if you carry out a standing crop count on your first walk of a transect you can always abandon a marked nest count method and use the standing crop count if you are finding very few new nests. So we would advocate always planning a marked nest method and abandoning it if you obtain very low sample sizes. In this survey we were able to obtain sufficient sample sizes to use the marked count method in all the forests where we used transects (Figure 2.2).

Reconnaissance walks

In some forests it was difficult to cut transects because of the terrain and also in most forests it was not possible to cut transects in all areas of the forest due to logistical constraints. We therefore made use of reconnaissance walk methods for increasing the information we had about chimpanzees in these forests.

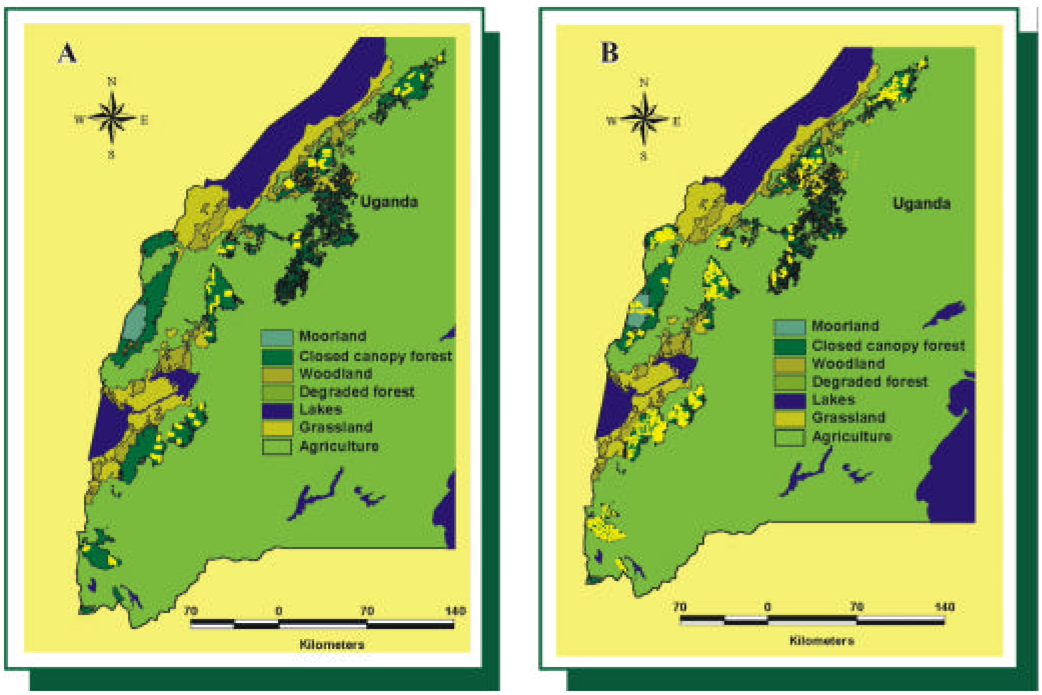


Figure 2.2 The locations of GPS points which were taken during the surveys. The coverage of transects (A) and reconnaissance walks (B) are shown.

Surveys using existing paths within the forest or routes of least resistance have been termed ‘reconnaissance surveys’ (Walsh and White 1999). The advantage that this survey technique has is that it can be undertaken quickly without having to cut transects, and that you can therefore cover a much larger area.

The drawback is that the surveys are biased because paths tend to travel through the more open areas of the forest or follow trails used by animals. This bias can be corrected by correlating encounter rates obtained on reconnaissance surveys with those found on adjacent transects in parts of the survey area. If a correlation exists then a correction factor can be calculated to correct additional reconnaissance surveys in the study area with no adjacent transects.

Reconnaissance surveys were made throughout the forest reserves (Figure 2.2) and aimed to enter each 3x3 km square (where possible 2x2 squares were used) within the forest. GPS units (Garmin II plus) were used to locate the position of the survey teams within the forest using 1951 Ordnance Survey Maps of Uganda (UTM Co-ordinate System). Reconnaissance walks were also made within 50 metres of any transect cut so that correlations between transects and reconnaissance walks could be made.

Training programmes and data collected

Training programmes of 2-3 days length prior to each forest survey were run to ensure that errors between observers were minimised. Training in map reading, use of compasses, data collection procedures, use of GPS and rangefinder and in the completion of data entry sheets was given.

The following data were recorded for each reconnaissance walk and transect:

1. GPS location of the start point
2. GPS location after every 250 metres of trail walked.
3. Forest Type at each 250 metre location
4. Animal sightings or dung of elephant, buffalo and bushpig with number of animals sighted and GPS location.
5. Signs of human use of the forest with GPS location.
6. End point of the reconnaissance walk and distance travelled.

Distance was measured with a hipchain and spools of biodegradable thread (Forestry Supplies Catalogue) or tape-measures.

Forest Types

Forest types were assigned based on forest structure rather than species composition. This was primarily because it would have been impossible to train all team members to accurately identify trees. A classification based on structure allows different forests to be compared and shows to what extent they may have been modified by man in areas where human activity was recorded. One of the following forest types were noted at each 250m waypoint:

1. Closed Tropical High Forest (>50% canopy closure, trees taller than 15m)
2. Open Tropical High Forest (<50% canopy closure, trees taller than 15m)
3. Closed young/secondary forest (>50% canopy closure, trees shorter than 15m)
4. Open young/secondary forest (<50% canopy closure, trees shorter than 15m)
5. Woodland (Trees widely spread and with grass below them)
6. Grassland (greater than 20m radius area of grassland with no trees)
7. Swamp/waterlogged (Forest where the soil is obviously waterlogged at certain times of year)
8. Bamboo
9. Giant Lobelia/Giant Senecio
10. Rock
11. Shamba (cultivated land).

Animals

The following animal sightings were recorded. Whenever an animal group was seen, a count of all individuals visible was noted.

1. Primates – all monkey groups were identified to species.
2. Chimpanzee nests – any nests found were counted and aged as recent (solid nest with green leaves) or old (leaves dead and often holes in the nest cup)
3. Ungulates – all ungulates observed were identified as far as possible.
4. Dung – the number of piles of elephant, buffalo and bushpig dung was recorded. Antelope dung was not recorded because of the difficulty of separating species.

Human signs

Any evidence of human use of the forest was recorded as follows:

1. Pitsaw sites – the number of pits were counted
2. Huts (for poachers or pitsawyers)
3. Shambas - cultivated fields in the forest
4. Snares and pitfall traps
5. Beehives
6. Paths that were obviously made by humans
7. Cut trees – for poles, firewood or timber
8. Fireplaces
9. Poachers or porters seen in the forest

GIS – spatial distribution

Encounters of each object recorded were mapped spatially using the GIS computer package ARCVIEW 3.2. Relative abundance in different areas of the forest was represented using circles of different sizes. This enabled the spatial distributions of objects to be analysed visually and made it easier to assess where the main threats to the forest are occurring (in the case of human use/impact) or the main concentrations of chimpanzees occurred.

The underlying distribution of vegetation types and the protected area boundaries were digitised from maps produced by the Uganda Forest Department.

Camp site in Kasyoha-Kitomi Forest

Park-people boundary

Field team for KalinzuMaramagambo forests

Chimpanzee eating figs, Budongo

Glacier in Ruwenzori Mountains park

Pitsawing activities - one of the threats

Section 3: National Survey results

Male chimpanzee in Kalinzu Forest Reserve. T. Furuichi

Introduction

The results obtained from the surveys allowed us to estimate chimpanzee populations in each forest and also measure the variation in distribution of chimpanzees within the larger forests. The results of distribution within forests are given for each forest reserve in the appendix at the end of the report. In this section we combine the results for each forest in order to estimate a total number of chimpanzees in Uganda.

Density estimates from transects

Chimpanzee nesting habits tended to be similar in all the forests surveyed. As was found in Budongo Forest, they tended to nest in the understory trees more often than in the canopy (Plumptre and Reynolds, 1996,1997; Brownlow et al. 2001). A few nests were found on the ground in Bwindi Impenetrable National Park and Itwara Forest Reserve but these were rare. The marked nest count method is particularly useful for including ground nests because decay rates of ground nests are very variable.

The estimates of average density per forest based on surveys from transects are given in Table 3.1. A total of 2,956 kilometres were walked along the various transects in eight of the major forests surveyed. Average density was calculated by estimating the density of chimpanzees for each site within a forest that was surveyed with transects and calculating a mean for these sites. For most forests it was possible to estimate separate detection curves from perpendicular distance data for each site within the forests. In forests where observations were lower than 50 nests we combined data for several sites to obtain one detection curve for the forest as a whole. The perpendicular distances were combined in this way in Bwindi Impenetrable National Park, Itwara Forest Reserve, and Kagombe Forest Reserve.

Table 3.1 Estimates of population sizes with 95% confidence limits for forests surveyed with transects.

Forest	Distance walked (Km)	Density (no km^{-2})	Population in Forest	95% confidence limits
Budongo FR	513.7	1.36	584	356-723
Bugoma FR	511.2	1.90	570	424-769
Kagombe FR	165.8	0.71	80	29-218
Itwara FR	126.6	1.35	120	67-215
Kibale NP	564.1	2.32	1,298	817-1,615
Kasyoha-Kitomi FR	477.7	0.92	370	250-530
Kalinzu FR	311.0	1.55	220	120-380
Bwindi NP	285.6	0.43	140	49-566

The density obtained in Kibale National Park, at 2.32 km^{-2} was the highest of any forest surveyed in Africa. As this is one of Uganda's largest forests it is therefore the forest that contains the largest population of chimpanzees in this country.

Correlations with reconnaissance walks

Most correlations between the encounter rates of chimpanzee nests from reconnaissance walks beside individual transects and the encounter rates derived from the transects were highly significant (Plumptre et al., 1999,2001,2002). Variation was high though when comparing individual transects and their associated reconnaissance walks rather than combining the transect and reconnaissance encounter rates for one site within a forest. Given the number of sectors within forests which had transects (34) it was possible to obtain an encounter rate for each sector. The data for all the reconnaissance walks adjacent to these transects was combined and correlated with the densities of chimpanzees obtained from the analysis of the transect data. Given the significant variations in altitude in the forests surveyed (600 metres – 5,100 metres above sea level) correlations were made for forests that are higher than 1,500 metres and forests lower than this altitude. The results did not differ greatly between forests, however (Fig. 3.1), and the gradients were not significantly different (t=0.442, P=ns). Regressing encounter rate on density and forcing it through the origin gave a highly significant correlation for all data combined (F=198.2; df=1,33; P=0.000; R^2_{adj}=0.8530).

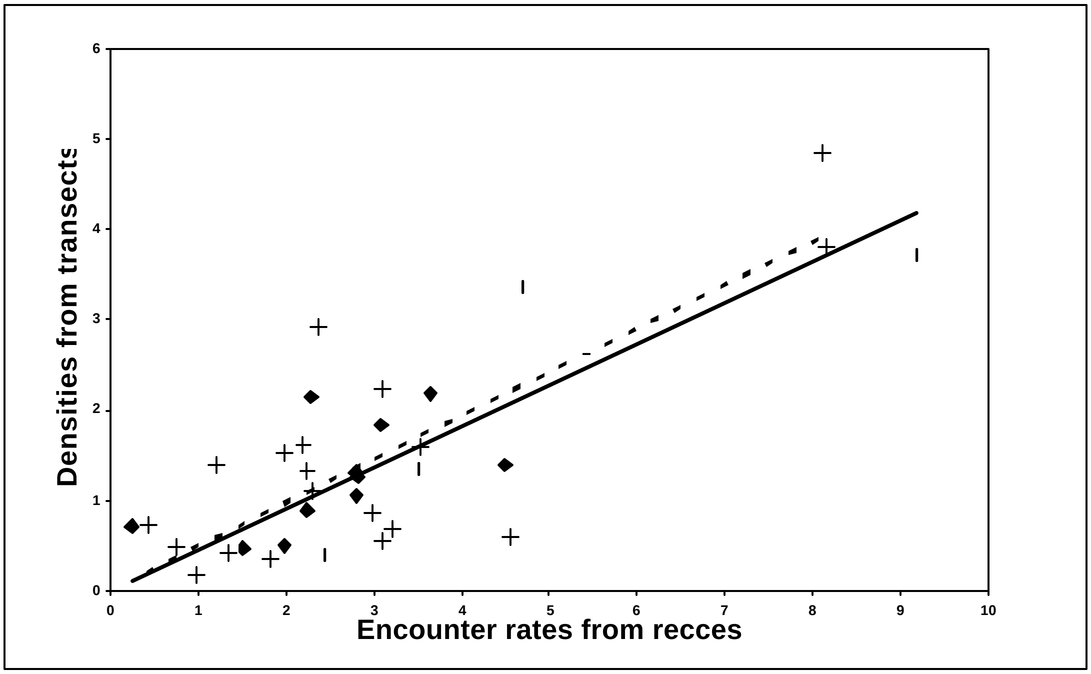


Figure 3.1 The relation between encounter rates obtained from reconnaissance walks adjacent to transects and densities obtained from those transects for 34 sites. The high (dotted line and crosses) and low altitude forests (solid line and diamonds) have been separated in the figure but do not differ significantly.

Using this regression we can derive an equation to estimate chimpanzee density from encounter rates obtained from reconnaissance walks in forests as follows:

Density of chimpanzees = 0.471 (*Encounter Rate*)

Using this equation we were able to estimate chimpanzee densities in the forests where we were unable to use transects. Future monitoring of chimpanzees may be possible without the need to cut transects in these forests as encounter rates from reconnaissance walks can be used to calculate population density from the equation. This will increase the errors of the estimate, however, and more analysis is needed to assess how much this will affect the ability to detect changes in the populations estimated.

Population estimates for all forest sites in Uganda

The population estimates for all forests surveyed with transects and/or reconnaissance walks indicate that about 4,500 nest-building chimpanzees occur in Uganda (Table 3.2). The encounter rate data for Bwindi Impenetrable National Park were used in this table because only two sites had been surveyed with transects (estimate in Table 3.1) and one of these was a particularly low-density area for chimpanzees. The revised estimate for Bwindi became 198 km^{-2} which appears to be more similar to estimates being generated by counting habituated chimpanzees and assessing their home range in Bwindi (C.Stanford pers. comm.). Estimates were also made for some areas where the numbers of chimps are known to be low. These included Semuliki Wildlife Reserve (estimate from K. Hunt and C. Allan (2000)); Kyambura Wildlife Reserve (estimates from semi-habituated community in the Kyambura gorge); and the large areas of forest patches between Bugoma and Budongo and south of Bugoma (estimates based on surveys in Kasato, Wambabya, Kanaga and Ruzaire Forest Reserves). The estimated population density for Kagorra Forest Reserve is low because chimpanzees have not been reported frequently.

We also calculated the total estimated chimpanzee numbers using the following correction factors:

1. Dividing the number of chimpanzees by 1.09 to correct for the number of nests built per day by weaned chimpanzees (Plumptre and Reynolds, 1997)
2. Multiplying the number of chimpanzees by 1.20 to correct for the percentage of infants aged four or younger that do not build nests (20 percent was taken as an average of habituated communities in Budongo

and Kalinzu Forest Reserves and Kibale and Semuliki National Parks – Data contributed by S. O'Hara, C.Stanford).

Table 3.2 Estimated chimpanzee density and total population size for each forest surveyed. Corrections for percentage of weaned chimpanzees and number of nests built per day have also been made. Nb. Bwindi density uses reconnaissance data.

Forest	Density	Nest building chimps	With correction factors	95% confidence limits
Budongo FR	1.36	580.80	639.41	392-796
Wambabya FR	3.62	123.84	136.34	117-156
Bugoma FR	1.90	570.00	627.52	467-847
Kasato FR	0.08	2.15	2.37	2-3
Kagombe FR	0.71	80.44	88.56	32-240
Kitechura FR	0.00	0.00	0.00	0
Ibambaro FR	0.00	0.00	0.00	0
Matiri FR	0.00	0.00	0.00	0
Muhangi FR	0.65	13.30	14.64	13-17
Kibego FR	0.75	9.58	10.54	9-12
Itwara FR	1.35	116.64	128.41	71-230
Semuliki NP	0.21	45.55	50.15	43-57
Ruwenzori Mountains NP	0.46	454.18	500.01	428-573
Kibale NP	2.32	1298.08	1429.08	899-1,778
Kasyoha-Kitomi FR	0.92	368.68	405.88	275-363
Kalinzu FR	1.55	212.62	234.08	132-418
Maramagambo Forest	0.46	202.01	222.39	190-255
Bwindi Impenetrable NP	0.60	193.24	212.74	182-243
Echuya FR	0.00	0.00	0.00	0
Estimates for low density sites				
Otzi FR		25	27.52	20-40
Semuliki WR		60	66.06	40-90
Kyambura WR		50	55.05	30-70
Kagorra region	0.3	12.90	14.20	10-40
South of Bugoma	0.04	40.56	44.65	40-54
Between Bugoma & Budongo	0.03	62.67	68.99	62-83
Total		**4,505**	**4,962**	**4,000-5,700**

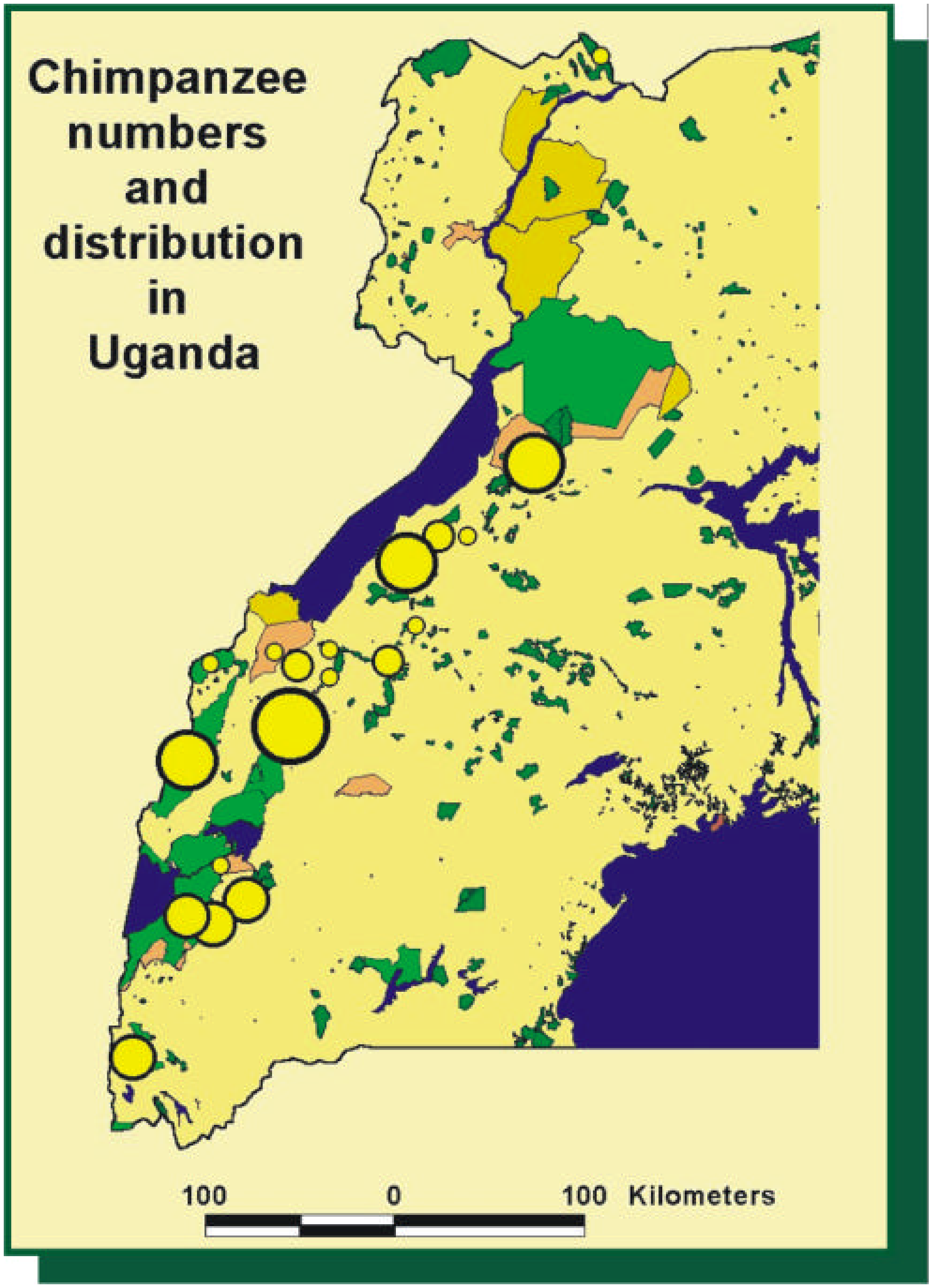


Figure 3.2 The relative abundance of chimpanzees in each of the protected areas where they occur in Uganda. The larger the yellow circle, the larger the number of chimpanzees present. Otzi Forest Reserve is shown in the top of the figure on the Sudan border.

The distribution and relative abundance of chimpanzees is depicted in Figure 3.2. This figure highlights the importance of Kibale National Park and the larger forest reserves for chimpanzee conservation in Uganda. If we accept the value of 500 individuals as a minimum population size for long-term viability then only four forests in Uganda have viable populations (Kibale, Budongo, Bugoma and Ruwenzori Mountains). However viability can be enhanced greatly if occasional immigrations can take place. Maintaining the connectivity between many of the smaller forests will be vital if chimpanzees are to survive in the long-term for many populations. The GEF Albertine Rift project aims to develop a corridor linking Budongo Forest to Bugoma forest and through to Kagombe, Muhangi and Itwara forests down to Semuliki Wildlife Reserve by working with private landowners and others to maintain forest on their land. If successful this project will greatly enhance the viability of chimpanzees in many of the smaller forest patches in this region. Similarly, ensuring that the connections between Kalinzu forest, Kasyoha-Kitomi forest, Queen Elizabeth National Park, Kyambura Wildlife Reserve, Maramagambo forest, and Kibale Forest are maintained will ensure the viability of chimpanzees in this landscape of savannah woodlands and forests.

The total number of chimpanzees, 4,950, is higher than previous estimates. Teleki (1989) estimated about 4,000 chimpanzees for Uganda and this was revised down to 3,300 at the chimpanzee PHVA in 1997 (Edroma et al., 1997). It is encouraging therefore that the population in Uganda is not as low as was first thought.

The 2002 human population census was completed recently and it makes an interesting comparison with the chimpanzee census presented here. The total human population in Uganda is over 24 million people as compared with about 5,000 chimpanzees. All Districts and counties in Uganda have more people than the total chimpanzee population in Uganda and 98.4% of all the subcounties in Uganda have more people than the chimpanzee population of the country.

Section 4: Threats to chimpanzees

Chimpanzee missing foot due to snare injury. T.Furuichi.

Introduction

Across Africa chimpanzee populations are rapidly declining due to hunting for bushmeat and/or the loss and fragmentation of habitat. Ugandan's for the most part do not eat chimpanzees and consequently the threat from the bushmeat trade is less than in other countries (but the threat does exist at some sites - see below). The fact that chimpanzees are not eaten in Uganda means that they are generally tolerant of human presence. Because of this Uganda's chimpanzees can be readily habituated for viewing for research and tourism purposes. Rwanda, Burundi and Tanzania are in a similar position but the chimpanzee populations in these countries are much lower than in Uganda. Hence Uganda is the best country in the world to view wild chimpanzees. The Ugandan government, therefore, should be enhancing its opportunities to market chimpanzee tourism. Ensuring that the value of chimpanzees is clearly understood at all levels- from local people to politicians – will go a long way towards reducing threats and improving their chances of long term survival in Uganda. This section reports on the threats the survey teams encountered both to chimpanzees and the forest integrity.

Encounter rates of threats from surveys

During the chimpanzee and other large mammal surveys evidence of human activity in the forests was also recorded (see section 2 – censusing chimpanzees). Encounter rates per kilometre walked were calculated for all signs of human activity. Encounter rates associated with pitsawing (pitsaw pits, stacked timber, cut trees for props, porters carrying timber, campsites for pitsawyers) and hunting (snares, pitfall traps, skinned animals, hunters encountered, nets, dogs) were summed to provide a measure of the relative abundance of these two threats. Any site where farming or charcoal burning was taking place was taking place in the forest was also noted and referenced spatially using GPS (Garmin II plus).

Hunting of bushmeat

Bushmeat hunting occurs in all the forests surveyed. In many of the forests the predominant signs of hunting are the presence of snares and pitfall traps, although in some forests hunting with nets and dogs is more common. It partly depends on the level of law enforcement by the Uganda Wildlife Authority or Forest Department. Hunting with dogs and nets occurred in the forests that were more remote, and less intensively visited by staff. These forests included Kasyoha-Kitomi, Kagombe and Kitechura.

Figure 4.1 shows the relative intensity of hunting sign in the various forests surveyed. This figure shows that Bugoma and Budongo forests have the highest levels of bushmeat hunting, particularly along their southern edges where the human population density is higher. The Forest Department does not have the resources to provide protection and patrols to stop bushmeat hunting unlike national parks, and although hunting of most species is illegal they do not have the manpower to be able to control it in their forests. Many of the national parks surveyed had lower signs of hunting although Ruwenzori Mountains was an exception to this rule.

Signs of large mammals are few in these forests and appear to be lower than the number of signs encountered in the mid 1980s when surveyed by Peter Howard (Howard 1991). Certain species, notably elephant, buffalo and bushbuck occur at very low densities where they are found. In Budongo forest, where the Murchison Falls National Park borders the northern edges of the forest, the sign of ungulates increases the nearer to the park you go indicating that distance from human habitation may be important in reducing hunting pressure. Few forests have more than about 10 km from the edge to the centre of the forest and this distance is easily walked by hunters setting snares.

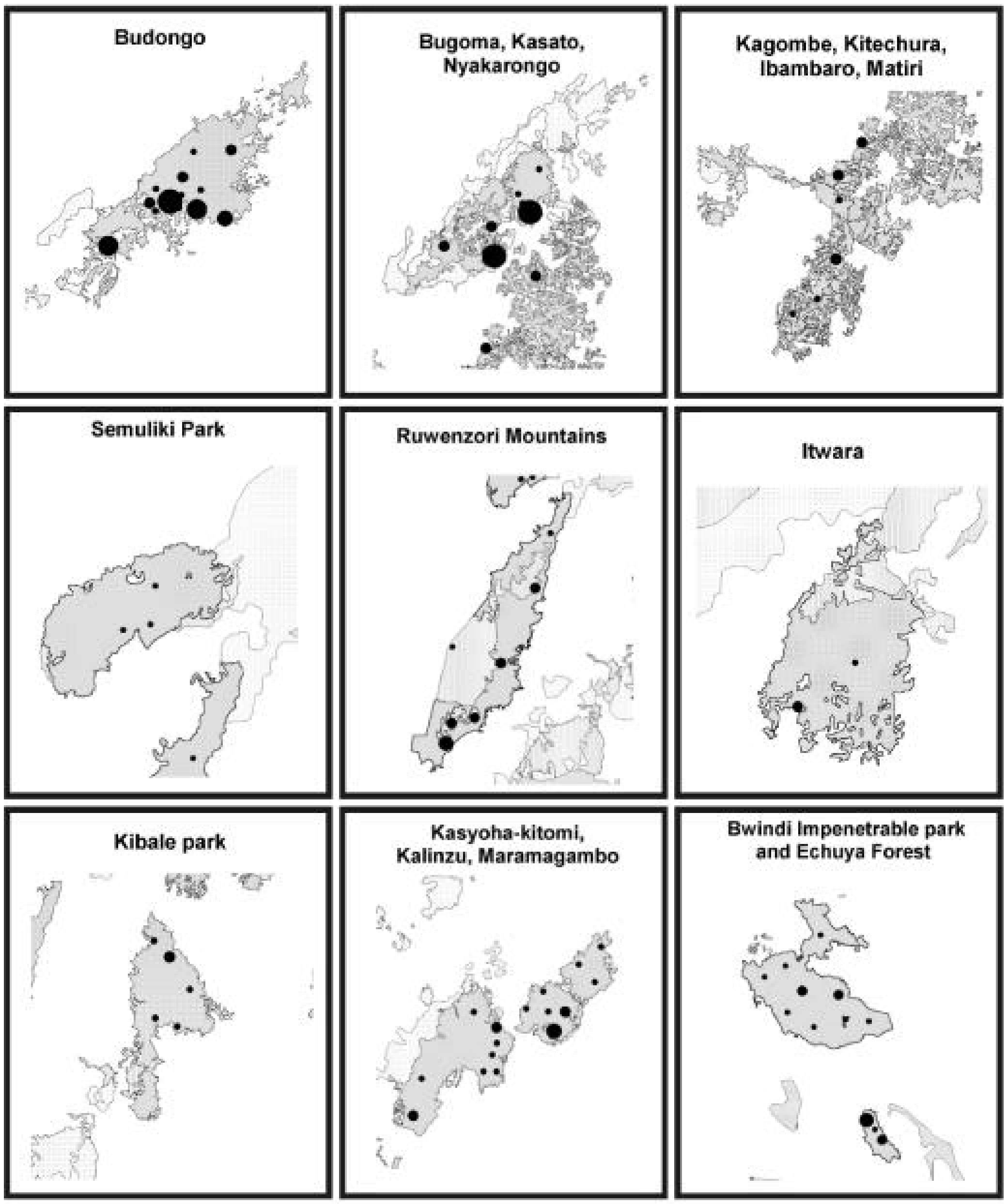


Figure 4.1 Hunting sign (encounter rate per km walked) in each of the forests surveyed. The larger the circle, the larger the encounter rate. Signs include snares, pitfall traps, hunters encountered, dogs and nets.

Deliberate hunting of chimpanzees was rare but does occur in some of these forests (Table 4.1). Ruwenzori Mountains National Park was the only forest where chimpanzees were regularly hunted for the consumption of their meat. One person admitted to hunting chimpanzees for meat in Kagombe Forest but this was the only case and he was an immigrant from Congo. Although chimpanzees are not targeted in the other forests by hunters they are still very much affected by the indiscriminate effects of snaring.

Table 4.1 Forests where hunting of chimpanzees specifically occurs. The method used to hunt and the reasons why they are hunted are given. Where chimpanzees are not specifically targeted by hunters is indicated with 'Not targeted'.

Forest	Method to hunt	Why hunted
Budongo FR	Not targeted	
Bugoma FR	Spears/bows	For Crop raiding
Kagombe FR	Spears/bows	For Crop raiding
Itwara FR	Not targeted	
Semuliki NP	Not targeted	
Ruwenzori N P	Snares, dogs and nets, spears/bows	For meat consumption locally
Kibale NP	Spears/bows	For dog meat and crop raiding
Kasyoha-Kitomi FR	Dogs and nets	For dog meat
Kalinzu FR	Snares	For dog meat and body parts (witchcraft)
Maramagambo Forest	Not targeted	
Bwindi Impenetrable NP	Not targeted	

Setting of snares indiscriminately kills or maims other animals, including endangered species. Many chimpanzees in Budongo and Kibale forests have lost feet or hands because of snare injuries (between 25-35% of the population of habituated animals). Consequently a strategy addressing this issue is urgently needed if species being affected by snaring are to survive in these forests. Large mammals are known to have important effects on the structure and composition of forests through selective browsing and seed dispersal (Plumptre, Reynolds and Bakuneeta 1994). In Budongo Forest for instance it is believed that elephants have strongly influenced tree composition within the forest (Sheil 1996; Laws, Parker and Johnstone 1975). Over time, loss of these large mammals would therefore alter the whole composition and ecology of certain forests affecting all biodiversity currently found in these forests.

Timber harvesting

Harvesting of trees for timber is legal in several forest reserves, notably Budongo, Bugoma, Kalinzu and Kasyoha-Kitomi. Much of the harvesting is carried out using pitsawing rather than sawmills and is only legal in certain compartments. Illegal logging occurs in many of these forests, particularly those with valuable timber species, the mahogany species *Khaya* and *Entandrophragma*, found in Budongo and Kalinzu. Illegal logging sometimes takes place at night and is very difficult to control with the small number of staff Forest Officers have available to them. Consequentlythere was evidence of illegal timber extraction throughout many of these forests (Figure 4.2).

Tackling illegal logging is of primary concern if these forests are to be managed for timber production in future. At present there is a push by the Forest Department to increase the number of species harvested in the forests to make sustainable management more financially viable. Including more species and increasing extraction will lead to even greater pressure on the forest resource, particularly if illegal logging cannot be controlled. Studies indicate that chimpanzees can survive in forests that have been selectively logged. The disturbance and openings in the forest resulting from selective logging offer increased opportunities for tree species that provide fruit for these animals, notably figs (Plumptre et al. 1997, Plumptre and Grieser-Johns, 2001; Plumptre and Reynolds, 1994). However, where logging has taken place the density of chimpanzees is often lower than in mature forest (Plumptre and Reynolds, 1994; Struhsaker, 1997).

There is potential to establish community management of timber harvesting in these forests to provide incentives to the local people to manage the forest rather

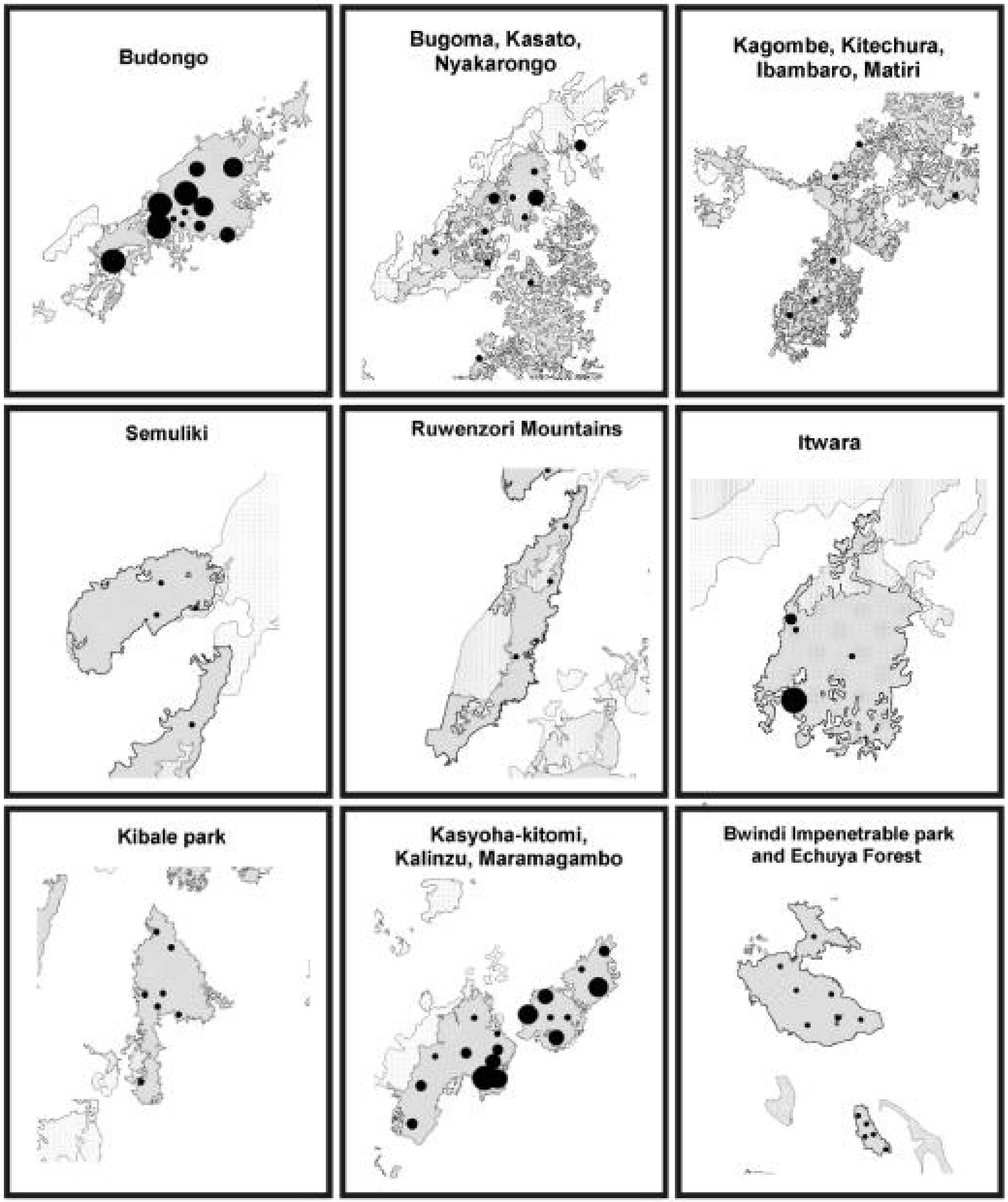


Figure 4.2 Timber harvesting sign (encounters per kilometre walked). Sign includes pitsaw sites, stacked timber, felled trees and pitsaw camps.

than illegally harvest the trees. However, there are certain issues that need to be examined carefully before collaborative management is established. These include:

1. Who is carrying out illegal logging? Often people from south west Uganda are brought in to pitsaw in the forests. Apparently they work harder because they want to return home and so will finish the job more quickly. The people bringing them in may be local politicians or businessmen and these people together with the local communities must be included in any collaborative management if it is to be successful. As people in villages realise more power under the decentralisation process they may become stronger at tackling these 'big men' but for the moment this is unlikely in many sites.
2. Where are the local community from? For instance around Budongo Forest 70% of the local community come from elsewhere in the country (mainly Nebbi, Arua, Lira and Democratic Republic of Congo). If you talk with these people you find that few of them consider themselves residents (even if they have lived there most of their lives) and all plan to return to their home area in the future. Consequently planning long term management of forests with people who do not expect to remain in the area may be futile. Similarly many people around Kasyoha-Kitomi come from around Kabale-Kisoro and have homes in both places.
3. How will revenue from timber extraction be shared within the community and how will funds be managed for the community as a whole. While pitsawing is hard work and people carry out the activity because of the personal benefits it affords them only a few individuals benefit directly with the community only benefiting indirectly from the 'trickle down' effect of increased cashflow in bars, restaurants and shops for example. The management of timber profits and the appropriate allocation will be crucial if collaborative management is to succeed.
4. How will timber harvesting be managed with local communities? There is a real need for reduced impact logging techniques in the tropical high forests to minimise damage and encourage regeneration. Many of these techniques are known and available. Training of pitsawyers is needed and incentives developed to ensure that the techniques are implemented correctly.

Charcoal burning

The use of timber resources for charcoal burning is also having a impact on the forest reserves. In the past charcoal burning was legal in certain forests but today it is illegal in tropical high forest (At the time of the survey a small trial was being made in Kalinzu to determine if it could be reintroduced there). However it still goes on illicitly. Figure 4.3 shows the relative abundance of charcoal burning sites within each of the forests surveyed. It is clear that this activity is far less widespread than bushmeat hunting and illegal timber harvesting and is primarily occurring in Kasyoha-Kitomi and Kalinzu forest reserves, although in Kalinzu one of the sites was legal charcoal burning.

Charcoal burning has the potential to cause more damage than timber harvesting, if not carefully controlled, as people are less selective in the tree species they harvest for charcoal. There is increasing demand for charcoal in Uganda, particularly in the large towns and cities. The impacts of charcoal production on chimpanzees are unknown. Charcoal production should be concentrated in plantations rather than natural forest wherever possible as in the long term the wood resources in natural forest will not be sufficient to meet demand.

Encroachment

The greatest impact on the forests occures where the forest has been encroached for farmland. Encroachment was particularly intense in south east Kasyoha-Kitomi Forest where an area of at least 10 km^2 had been cleared for agricultural use (Figure 4.4). The Forest Department has since evicted these people. This is in an area where the human population density is not particularly high but soil fertility is low, and declines rapidly following deforestation. Improved farming techniques and soil enrichment is necessary to ensure that people do require more forest.

Encroachment is resulting in the loss of critical chimpanzee habitat. The greatest conversion of forest to agriculture however is currently taking place outside the forest reserves. Analysis of satellite imagery from the mid 1980s and 2000/2001 indicates that approximately 800 km^2 of forest has been lost in chimpanzee habitat areas in Uganda (Plumptre, 2002). This is almost twice the area of Budongo Forest

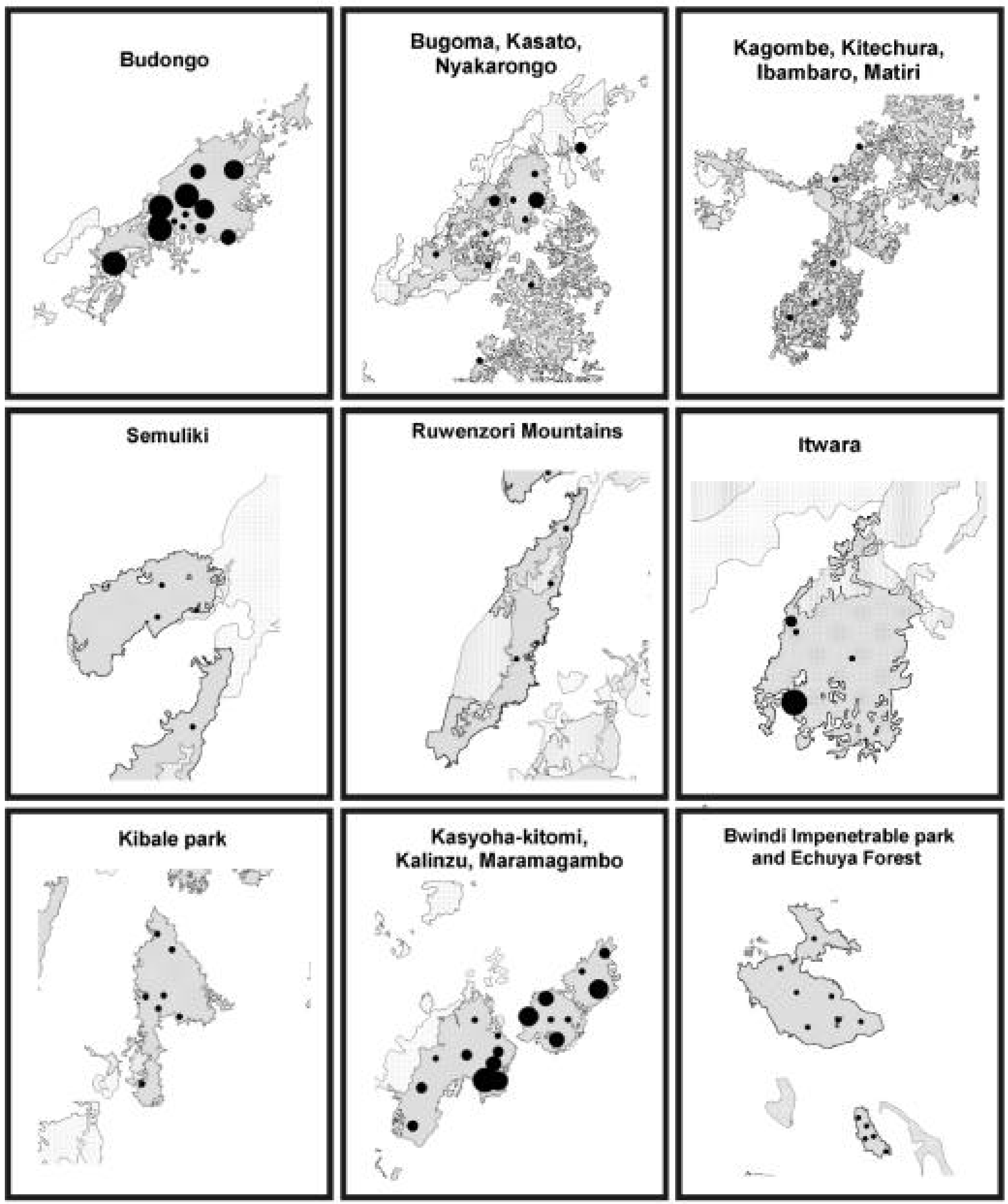


Figure 4.3 Encounter rates of signs of charcoal making within the forests.

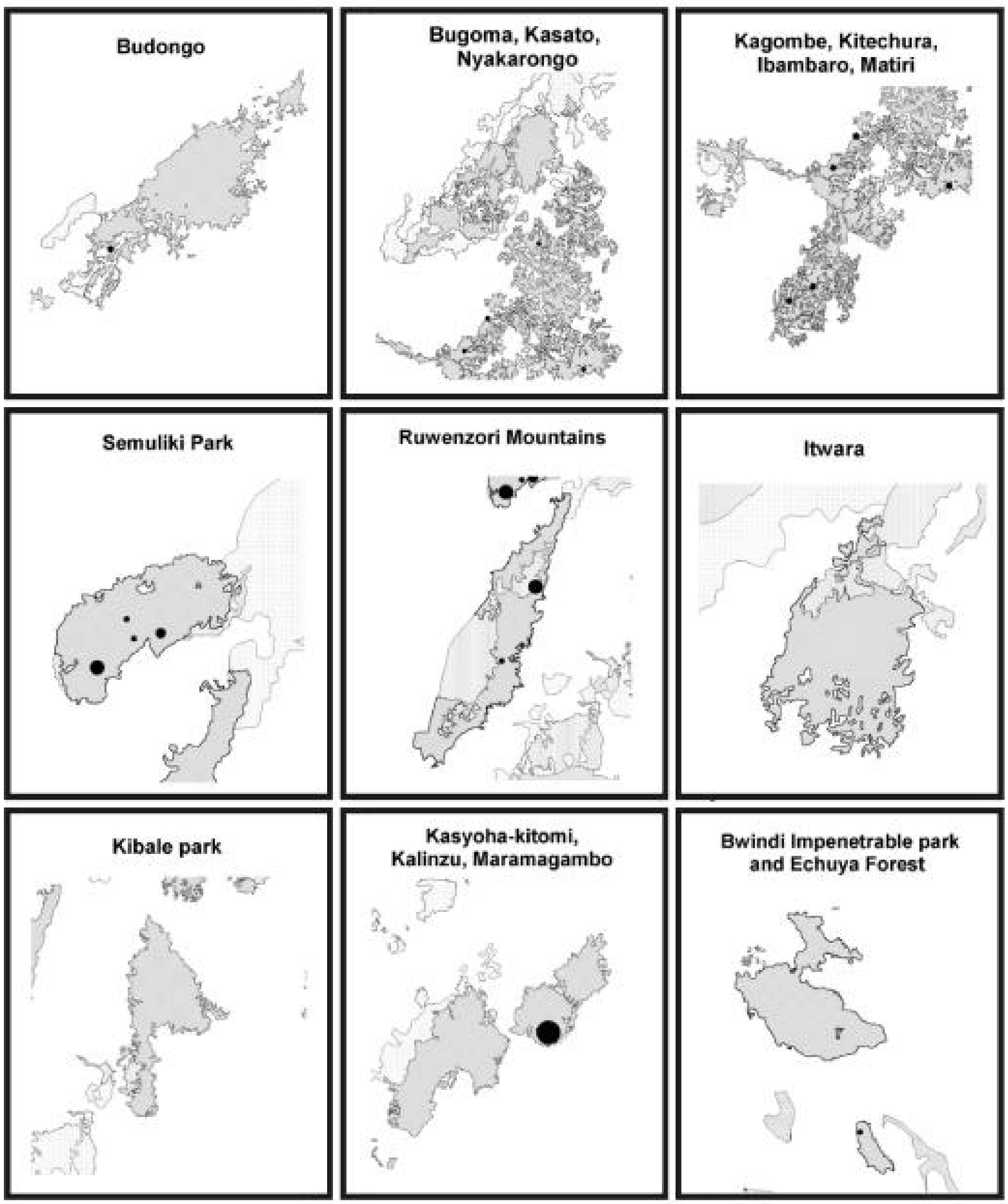


Figure 4.4 Encounter rates of encroachment for farming within the forest.

Reserve. If densities of chimpanzees are around 0.03-4 km^{-2} in these forests as (Table 3.2) then approximately 25-30 chimpanzees have been lost due to this

reduction in forest cover. More critically, forest connectivity and dispersal opportunities for chimpanzees has also been significantly reduced, preventing gene flow necessary to maintain viable metapopulations. In the long term, the inability to disperse could be the greatest threat to chimpanzee communities in these forests.

Other threats observed

Mining

Signs of mining were few and were primarily old (greater than 5 years). The only site with evidence of recent mining activity was Kasyoha-Kitomi. According to local residents this forest has been mined in the past for gold but recently has been mined fairly heavily for Columbo-tantalite, commonly referred to as Coltan. Coltan is a mineral used as a semiconductor in computer chips, particularly those used in cell phones. In 2000-2001 it was being mined heavily in eastern Democratic Republic of Congo (DRC) and Rwanda as it was fetching prices of over $80 per kilo and several kilos could be mined at some sites each day. Nyungwe forest in Rwanda had two sites with over 3,000 miners at one point in 2000. Miners in DRC were harvesting bushmeat around camps which led to severe population declines in both elephants and gorillas. International pressure reduced the exploitation of Coltan in the region and the price has dropped considerably to about $10 per kilo or less. In Kasyoha-Kitomi the army was involved in much of the mining activity, although we met several people around Kasyoha-Kitomi who had stockpiled Coltan in the hope the price would increase in future (one admitted to having 500 kilos!). At present most Coltan is purchased from mines in Australia and there is pressure to encourage companies to recycle cellphones and reprocess the

Coltan. In the event that world coltan prices increase, there is potential for serious problems in Kasyoha-Kitomi forest.

Trade in infant chimpanzees

Chimpanzee infants are often taken from mothers that have been killed for meat in the hope they can be sold as pets, for entertainment and for biomedical research. Not much of this trade occurs in Uganda but infant chimpanzees are often smuggled across the border from the Democratic Republic of Congo. This activity is illegal in Uganda and if they are found, chimpanzees are confiscated. From the 1960s-1998 confiscation rates averaged about 1 chimpanzee every 1.5 years although most of these confiscations took place in the 1990s. Recently there seems to have been an increase in the number of chimpanzees being sold and 14 infants have been confiscated since 1998 (three to four per year). This is probably a result of the civil war in Congo and the inability of park staff to adequately manage and monitor activity in and around protected areas.

Killing chimpanzees for crop raiding

The surveys revealed that in many areas local people were not particularly concerned about chimpanzees crop raiding. Most losses are due to raiding by baboons, vervet monkeys and bushpigs. Around Bugoma Forest where cocoa is grown, and around Budongo Forest where sugar cane is grown as cash crops there is much more antagonism towards chimpanzees. Studies in Budongo Forest have shown that chimpanzees used to raid mangoes, papaws and other crops prior to local people growing sugar cane but they would only take one or two fruits before leaving and the villagers were not particularly concerned. Local attitudes have changed, howver, with sugar cane – a cash crop that provides significant income – being lost to raiding chimpanzees (C.Hill, F. Babweteera pers comm.). Some villagers living near the forest actively hunt the chimpanzees that raid sugar cane or set snares at the edges of their fields which kill or maim chimpanzees that are caught in them.

The Budongo Forest Project is experimenting with a trap that has been designed to catch chimpanzees and other crop raiding species alive, so that farmers can release the chimpanzees - after scaring them to deter them from returning – and destroy vermin species. Whether the trap will be as effective as is hoped remains to be seen. It is evident, however, that experimenting with this trap has been effective in reducing friction between the protected area authorities and local people as they have seen that the authorities attempting to help them solve this problem.

Threats analysis

A simple process has been developed to assess the success conservation managers have in reducing threats to protected areas and protected species (Margoluis and Salafsky, 2001). The aim of the method is to encourage managers to assess how effective they are in tackling the major problems they are facing while conserving a protected area. This *'Threats Reduction Assessment'* (TRA) divides threats into three components:

- The area they threaten
- The intensity of the threat in a given area
- The urgency that something is done to mitigate the threat

Breaking the threat up into these three components helps the manager think about the threats more carefully and is used in the TRA to rank the threats in the protected area. The process then looks at how effectively the threats are reduced over time following management actions.

At the end of the censuses we brought together the senior field staff who had worked in many of the different forests to assess the threats to each of the forests we surveyed. We used the TRA process of breaking the threats into their components and then ranking them to determine the importance of various threats to each of the forests we surveyed where chimpanzees occur (Table 4.2). Care must be taken when interpreting table 4.2 as the threats have been ranked with respect to the forest where they occur, NOT between the different forests. For instance a value of 11 in Kibale National Park is not equivalent to a value of 11 in Kagombe Forest Reserve. They only provide a measure of the importance of the various threats within a particular forest. Those threats with the highest total scores on the rankings are the ones that were assessed as having the greatest impact on the forest integrity and species found within them. The threats assessed only include those activities impacting species and habitats within the forests surveyed and not outside or at the edge of these forests. Man traps for instance are placed around several of these forests and will affect species that come out to crop raid but were not assessed here.

The details of the threats analysis for each forest are summarised in the Appendix under the individual forest profiles.

Table 4.2 Ranking of threats to each forest where chimpanzees are known to occur. The higher the number the greater the impact, extent and urgency of the threat. Threats that probably occur but were not observed/assessed are indicated with '?'. Note that comparisons cannot be made between forests in this table (see text).

Threat		Budongo FR	Bugoma FR	Kagombe FR	Itwara FR	Semuliki NP	Ruwenzori NP	Kibale NP	Kasyoha-Kitomi FR	Kalinzu FR	Maramagambo	Bwindi NP
Hunting	*With firearms*						7		1	3	4	
	Dogs/Nets/Spears	1		11	10	8	1	10	13	11	11	7
	Mantraps			1								
	Pitfall traps			8				8				
	Snares	10	6	10	1	11	5	15	14	9	9	8
	Animal collecting						?					
Charcoal burning		6		6				16	9	13	12	
Chemical Effluent								4				
Crop raiding		4	2	5	3	4		3	4	1	4	1
Encroachment		11	10	8	9				15	11	7	
Fire		7	5	4		2	3	17	7	6	?	7
Firewood									12	12		
	Household use	9	7	12	7	7		12	10	7	8	2
Fishing						5					5	
Grazing		2	2		5	3		6	3	4		3
Medicinal plant collection		3	4	3		1		2	3			4
Mining						?		8	5	2		
NTFP collection		13	9	9		?	4	15	11	8		5
	Bush ropes				4	6					4	
	Poles				8	10					7	
	Rattan	13	8		13	12						
	Coffee				2							
Pitsawing		14	11	13	11		3	18	16	14	11	
	Legal	6	3		6				6	8		
Rebels						13	7	9			1	
Research		1						15		?		?
Roads						9		5	8	?	?	
Sawmilling		8						0		8		
Tourism		1				?	?	11		?	?	?
Water Collection				2				1			?	

Section 5: Conservation Action

Poacher with duiker.. A. Plumptre, WCS

Introduction

If chimpanzees are going to survive in Uganda in the long term conservation actions must target the threats listed in Table 4.2 and the Appendix. There are other threats affecting these forests that could not be assessed during this study due to limited time and resources, but we are confident that our assessments have focussed on the most significant and pressing issues. The threats that have not been examined are essentially indirect threats such as political decisions to change the land uses of protected areas as happened with Butamira Forest Reserve in 2002. What we have observed, recorded and summarised here are the direct threats that are having an impact on the forests.

The actions needed to reduce the impacts of these threats are what will form the basis of a strategic action plan for chimpanzees populations in Uganda. Following the production of this report, WCS and JGI will be working with UWA to develop such a strategic action plan for chimpanzees in Uganda bringing together the main stakeholders involved in chimpanzee conservation. We present here some ideas that could be considered under the action plan as actions that would reduce the threats we observed.

Most of the threats we have listed can be grouped into a smaller subset of categories that need similar actions to address them as follows:

- Encroachment or forest loss
- Bushmeat hunting, fishing and animal collecting
- Local community use of plants (timber, firewood, NTFPs and medicinal plants)
- Increased access to the forest (roads, mining, access to water, grazing, fire)
- Conservation activities (tourism and research)
- Crop-raiding

We have omitted rebel activity from this list as it is the most difficult threat to tackle as a conservation manager. However we would encourage close liaison with the military forces where they are posted near or within the forests as they can have as much of an impact as the rebels themselves.

Encroachment and forest loss

Over the past 40 years both the Uganda Wildlife Authority (UWA) and the Uganda Forest Department (FD) have managed to maintain the boundaries of most of their protected areas over periods of political instability and war. Loss of forest within protected areas is a tiny fraction of the total forest lost (Plumptre, 2002) in the region of Uganda where chimpanzees occur. Most forest has been lost outside protected areas as people have cleared land for farming. However, pressures to clear the forests to gain access to land for agriculture is high in Uganda due to the rapidly growing human population. Where patrols are limited such as in Kasyoha-Kitomi forest local people encroached quite deep into the forest without being noticed quickly. This highlights the need for regular patrols and monitoring. UWA has a patrol-based data collection system in place with associated software (MIST) to handle the incoming data. Collecting spatially referenced information using GPS units provides information of patrol coverage allowing managers to track, map and plan patrolling activities to ensure more even coverage of patrols. It is critical that the Forest Department establishes an efficient patrolling/monitoring system in its natural forests. Close collaboration with UWA for example, and the implementation of some of UWA's recent protection and monitoring strategies would go a long way towards reducing the impacts of the threats we have observed.

Limiting the loss of forest outside protected areas is more of a problem and yet the maintenance of corridors is crucial if chimpanzees are to survive in many of these forests in the long term. There is a need to develop mechanisms to conserve natural forest on public and private land outside protected areas in Uganda. One of these could include tax incentives to people who keep natural forest on their land as occurs in other countries. Developing land use plans that factor in biological corridors at both district and the national level is essential for the long term survival of natural habitat outside protected areas. There are already laws that state that forest should be left within 50 metres of streams but there is no enforcement of this law where it is infringed. It is critical therefore that the laws are clearly and widely understood and that they are enforced.

Actions needed

- Regular monitoring systems in place in UWA and FD
- District and national land use plans that restrict forest conversion in potential corridors for wildlife
- Stiffer penalties for infringements of the law

Bushmeat hunting, fishing and animal collecting

Hunting of animals for meat occurs in all the forests surveyed. The threat analyses all highlighted the impact of hunting on wildlife and the long-term integrity of the forests. This is because large mammals tend to be targeted by hunters and it is the large mammals that have the greatest impact on the structure and ecological processes of the forests. In most of the forests people did not target chimpanzees for meat but did target them because of crop-raiding problems (see below). Many chimpanzees are caught in snares set for duikers and bushpigs, suffering debilitating injuries – often losing limbs – and at times result in fatalities. Given that there are so few chimpanzees in Uganda and that where they have been studied about 25% of chimpanzees suffer from snare injuries, a much greater effort is required to tackle this problem.

Collection of animals for the pet trade or zoos is less common in Uganda than in many other countries where chimpanzees occur. Many young chimpanzees are brought over the border from DR Congo, however, and recently this has been increasing with the withdrawal of Uganda's military presence in DR Congo. There was evidence that the collection of reptiles in the Ruwenzori Mountains park, particularly the endemic chameleons, had led to a drastic decline in their abundance with local guides stating that they now rarely see the species.

A closer collaborative effort between customs and the police is urgently required to tackle the trade from DR Congo and prevent hunters bringing young chimpanzees across the border into Uganda. Preventing the movement of infant chimpanzees into Uganda will not only reduce the burden on the Ugandan facilities responsible for caring for the confiscated infants, but also limit the options available to poachers. As a result there will be a decline in the capture of infants in Congo.

JGI and Budongo Forest Project have established snare removal programmes in Budongo forest and Kibale park which have been very successful. For the most part snaring activity is lower in the parks because there are rangers dedicated to patrolling the forests and removing snares unlike Forest Department rangers who are primarily occupied with monitoring pitsawing activities. There is a need to develop a more extensive patrolling strategy, particularly in the larger forest reserves where the abundance of large mammals tends to be higher and snaring activity is more common. Unfortunately, insufficeint funding is hindering increased protection measures. The development of research and tourism areas can help reduce the incidence of snares but does not eliminate the threat unless a specific snare removal programme is also implemented.

Education of local hunters and providing them alternative methods of income generation will reduce the incidence of hunting but probably not eliminate it. Often hunting is a cultural activity and raises the status of someone in the village so that it is difficult to completely eliminate it.

Actions needed

- Snare removal programmes with regular law enforcement patrols
- Programmes that target hunters living in communities adjacent to the forests to provide alternative livelihood options
- Work with police and customs to prevent trade of young chimpanzees to Uganda

Local community use of plants

The use of forest products ranged from fairly destructive practices such as timber harvesting (sawmilling and pitsawing), firewood collection and charcoal making down to the more milder impacts of medicinal plant and wild coffee harvesting. As a general rule it should be possible to establish sustainable off-take quotas for plant products provided research and monitoring programmes are in place to monitor harvest off-take and assess the impacts on the productivity of the plants. Where the harvesting is for commercial purposes which will have markets further afield than the local community (timber, charcoal making, building poles and fence posts and rattan cane) it is far more important that these programmes are in place.

For some species, on-farm substitution may be a method of reducing the impact on the natural forest. This has been tried for bamboo and some medicinal plants around Bwindi Impenetrable National park and Mgahinga Gorilla National Park with some success. On-farm substitution will probably be most needed in areas of high demand and low availability. Plantations of fast growing trees such as eucalyptus and pine is a type of on-farm substitution that can reduce the pressure on the natural forest by providing local alternatives for firewood, building poles, bean stakes and timber or charcoal. In order for people to invest in plantations they need to be sure they will be able to sell the trees later. This requires better law enforcement in the natural forest so that the alternatives that exist there are not exploited, thereby driving down the price of plantation products.

Allowing some use of the forest will probably create better relations between local people and park authorities. This is certainly the assumption of most 'integrated conservation and development projects' (ICDP). In the long term though it is probably better helping local people find alternative methods of making money in order to reduce the heavy reliance on forest products and resources.

Actions needed

- monitoring and research programmes to assess off-take and viability of plants harvested
- On-farm substitution programmes in areas of high human population density where demand for a plant is high.
- Plantations to take the pressure for poles, timber and firewood off the natural forest

Increased access to the forest

Providing increased access to the forests increases the risks to the forest. Often increased access through the provision of roads or other means leads to increases in illegal activities unless law enforcement activities are also increased. Opening up the forest to local people can lead to other threats such as the invasion of exotic species along paths and roads and an increase in the incidence of fires. The forests where chimpanzees occur in Uganda have all been affected by fire resulting from the activities of local people, even in the wettest forests such as Bwindi Impenetrable National Park. As a general rule it is probably best to limit access as much as possible and try to provide the resources required to satisfy local needs from outside the forest.

Actions needed

- limiting human access to forests
- Identify what people want from the forest and look for alternatives that could be developed outside the forest

Conservation activities

Research and tourism activities can have quite an impact on the forest. Both can benefit the conservation of the forests by providing regular surveillance and information to better manage the forests. However, they also affect the forest and chimpanzees and as a result they are potential threats. While the impacts of tourism on gorillas are being assessed and monitored there has been little work on this issue with chimpanzees. Chimpanzees like the gorillas are at risk from human diseases and there is a need to develop standard protocols for all the chimp tourism and research sites about the behaviour of tourists and researchers to minimise the spread of disease.

Chimp tourism is probably more destructive to the forest than gorilla tourism because an intensive network of trails are developed and maintained in the forest. In some sites these trails have developed their own vegetation over time and it has been noted that certain species, including chimpanzees, avoid the trails (Plumptre pers. obs.; Plumptre and Reynolds, 1997). These trails increase access to the forest for hunters. Currently a large percentage of Kibale National Park and Budongo Forest Reserve are covered by grid trails - as much as 30-40% of the forest in the case of Kibale. We would recommend that zoning plans for all the forests are developed as part of a management planning process that details where research and tourism take place and where trails can be developed.

Habituating chimpanzees for research and tourism purposes leads to the loss of fear of humans and can potentially lead to increased crop raiding or even attacks on people. Human infants have been attacked and killed by chimpanzees in Uganda and elsewhere. There is a need therefore to ensure that chimpanzees maintain a certain level of fear of people and are less likely to attack as a result.

Actions needed

- Develop protocols for the behaviour of researchers and tourists to minimise disease risks and risks of over habituation
- Develop zoning plans as part of the management plans for the forests to detail where tourism and research can develop trail systems

Crop raiding

Where chimpanzees are crop raiding cash crops there is great friction between the local communities and the protected area authorities. This is particularly true around Bugoma forest where cocoa is being grown and around Budongo forest where sugar cane is being grown. Elsewhere chimpanzees raid mango and papaw trees but people do not regard these as important crops. Around Budongo forest fruit trees are considered as food for children and many children help themselves to the fruits so they usually do not mind that much if a chimpanzee occasionally visits the trees also (C. Hill pers comm.). Crop raiding by other species is a major problem in Uganda currently because it leads to a very negative attitude towards protected areas and their managers. There is therefore a great need to find ways of reducing this friction by either reducing the level of crop loss or by raising the tolerance of local people so that they are prepared to accept a certain amount of loss. Crop raiding is a very emotive issue and finding effective solutions is difficult. In many studies it is often found that the species most people complain about is not the species that causes the most damage and there is a need to determine what it is people are really complaining about before trying to tackle the issue (Hill et al., 2002). Developing coherent land use plans for the districts that would determine where certain cash crops can be grown would be one way of reducing some of the conflict if it is linked with developing alternative cash crops that are less palatable. One possible cash crop is chilli peppers which is proving to be working well as a crop that minimises crop raiding loss while increasing local community livelihood security in Zimbabwe (F. Osborn, pers. comm.). Tea is another good buffer crop and is probably why there is less problem between chimpanzees and farmers around Kibale National Park.

Actions needed

- Assess levels of damage and crop loss in Hoima and Masindi districts and determine whether it is really the loss of crops that people are complaining about
- Work with districts to develop land use plans that minimise conflict through crop raiding
- Assess possible alternative cash crops that are less palatable (such as tea)

Conclusions

We have given some possible actions that are needed to address the threats we observed during these surveys. These ideas will feed into an action planning process that will involve representatives of most of the main stakeholders (protected area authorities, researchers, NGOs, District Environment Officers, police, and customs). The action plan will be developed using a logframe approach with goal, objectives and activities which will aim to be as specific as possible, stating where and when actions will take place and who will implement it.

No action planning process is of any use though unless the actions are implemented. However, there has been a good follow-up to the chimpanzee population and habitat viability analysis workshop that was held in 1997 (Edroma et al., 1997), from which one of the recommendations was the nation-wide survey of chimpanzees presented in this report. There will be a need to monitor chimpanzee populations over time to assess whether the actions that are taken to reduce the threats will ultimately conserve the chimpanzee population. The numbers we have presented in this report act as a baseline from which monitoring can assess changes in future. Given the difficulty in censusing chimpanzees and the errors involved it will be difficult to detect small changes in populations even with the significant effort we have invested in these surveys. Detecting changes between two separate census results often requires a major change in the population (Plumptre, 2000). Over several surveys though it becomes easier to detect more subtle changes through trend analysis. We would recommend therefore that as part of the action plan a subset of the sites we have surveyed are selected and monitored at 5 year intervals to determine the trends in the chimpanzee populations in Uganda.

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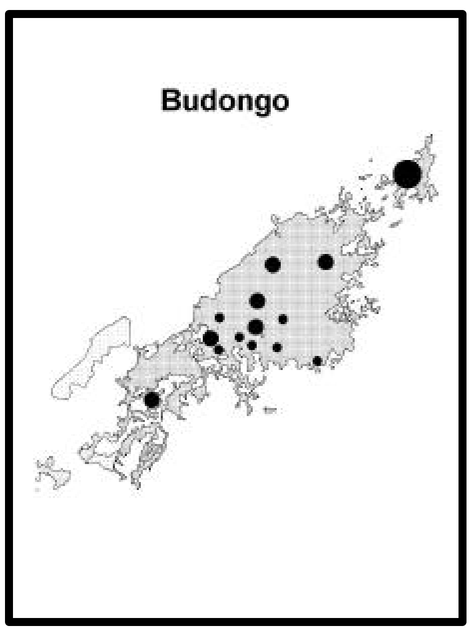
Appendix: chimpanzee abundance within forests and threats analysis

Camp site in Kasyoha-Kitomi Forest Reserve. A.Plumptre, WCS

Budongo Forest Reserve

Distribution of chimpanzee nests

Chimpanzees were distributed throughout the forest reserve as depicted in the figure below. The figure shows the central point of sectors surveyed within the forest and the size of the circle reflects the relative abundance of the chimpanzee nests.



Threats analysis

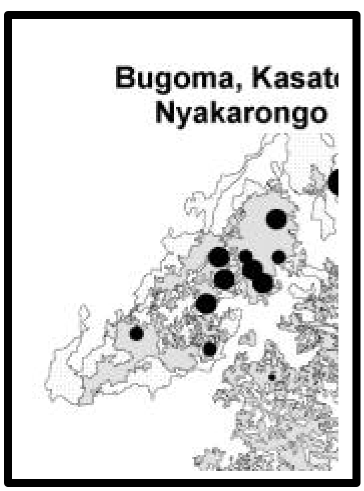
The details of the threats analysis for Budongo Forest Reserve are given in the table below:

Threat	Area	Impact	Urgency	Total	Rank
Hunting *Dogs/Nets/Spears*	2	2	3	7	1
Snares	13	5	10	28	10
Charcoal burning	4	9	7	20	6
Crop raiding	9	1	8	18	4
Encroachment	3	13	13	29	11
Fire	5	10	6	21	7
Firewood Collection *Household*	10	7	9	26	9
Grazing	1	4	4	9	2
Medicinal plant collection	8	3	5	16	3
NTFP *General*	11	8	11	30	13
Rattan	12	6	12	30	13
Pitsawing *Illegal*	14	12	14	40	14
Legal	6	12	2	20	6
Research	1	4	1	6	1
Sawmilling	7	14	1	22	8
Tourism	4	3	1	8	1

Bugoma Forest Reserve

Distribution of chimpanzee nests

Chimpanzees were distributed throughout the forest reserve as depicted in the figure below. The large circle to the north east was Wambabya Forest Reserve which had a high density of nests.



Threats analysis

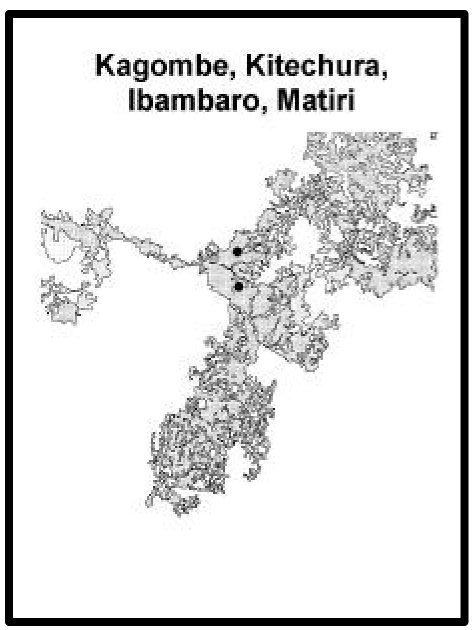
The details of the threats analysis for Bugoma Forest Reserve are given in the table below:

Threat	Area	Impact	Urgency	Total	Rank
Hunting *Snares*	9	2	6	17	6
Crop raiding	5	1	4	10	2
Encroachment	4	11	10	25	10
Fire	2	8	5	15	5
Firewood *Household*	6	5	9	20	7
Grazing	3	4	3	10	2
Medicinal plant collection	7	4	2	13	4
NTFP *General*	8	7	9	24	9
Rattan	10	6	7	23	8
Pitsawing *Illegal*	11	10	11	32	11
Legal	1	10	1	12	3

Kagombe, Kitechura, Ibambaro and Matiri Forest Reserves

Distribution of chimpanzee nests

Chimpanzees were distributed throughout the forest reserves as depicted in the figure below. Chimpanzees and their nests were only recorded in Kagombe forest.



Threats analysis

The details of the threats analysis for Kagombe, Kitechura, Ibambaro and Matiri Forest Reserves are given in the tables below:

Kagombe FR

Threat	Area	Impact	Urgency	Total	Rank
Hunting *Dogs/Nets/Spears*	13	9	10	32	11
Mantraps	2	2	3	7	1
Pitfall traps	10	5	10	25	8
Snares	8	8	10	26	10
Charcoal burning	4	7	6	17	6
Crop raiding	6	4	5	15	5
Encroachment	3	11	11	25	8
Fire	1	6	4	11	4
Firewood *Household*	12	12	12	36	12
Medicinal plant collection	5	3	2	10	3
NTFP *General*	9	10	7	26	9
Pitsawing *Illegal*	11	13	13	37	13
Water Collection	7	1	1	9	2

Kitechura & Ibambaro FR

Threat	Area	Impact	Urgency	Total	Rank
Hunting ***Dogs***/*Nets/Spears*	10	4	6	20	6
Mantraps	5	5	11	21	8
Pitfall traps	6	3	8	17	5
Snares	13	6	11	30	12
Charcoal burning	9	12	9	30	12
Crop raiding	3	1	4	8	2
Encroachment	2	14	14	30	12
Fire	14	13	13	40	14
Firewood *Household*	8	8	5	21	8
Grazing	7	7	3	17	5
Medicinal plant collection	4	2	1	7	1
Mining *(Sand)*	1	11	2	14	3
NTFP *General*	12	9	7	28	9
Pitsawing *Illegal*	11	11	12	34	13

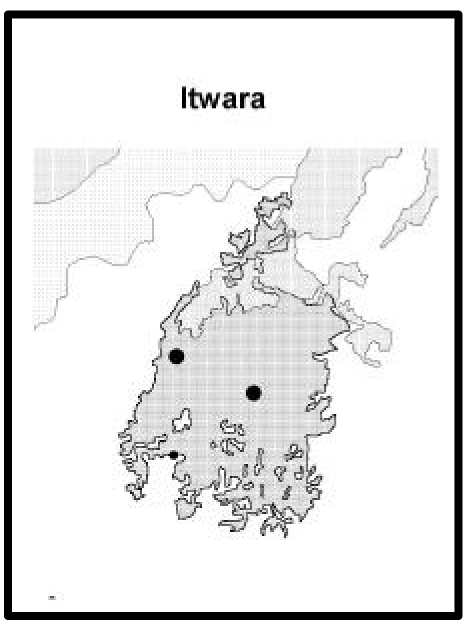
Matiri FR

Threat	Area	Impact	Urgency	Total	Rank
Hunting *Dogs/Nets/Spears*	7	3	4	14	4
Pitfall traps	3	3	3	9	2
Snares	12	5	11	28	12
Charcoal burning	8	9	10	27	10
Crop raiding	1	1	5	7	1
Encroachment	4	12	12	28	12
Fire	2	10	9	21	6
Firewood *Household*	11	6	7	24	8
Medicinal plant collection	5	4	2	11	3
NTFP *General*	10	7	6	23	7
Pitsawing *Illegal*	9	8	8	25	9
Roads	6	12	1	19	5

Itwara Forest Reserve

Distribution of chimpanzee nests

Chimpanzees were distributed throughout the forest reserve as depicted in the figure below. The figure shows the central point of sectors surveyed within the forest and the size of the circle reflects the relative abundance of the chimpanzee nests.



Threats analysis

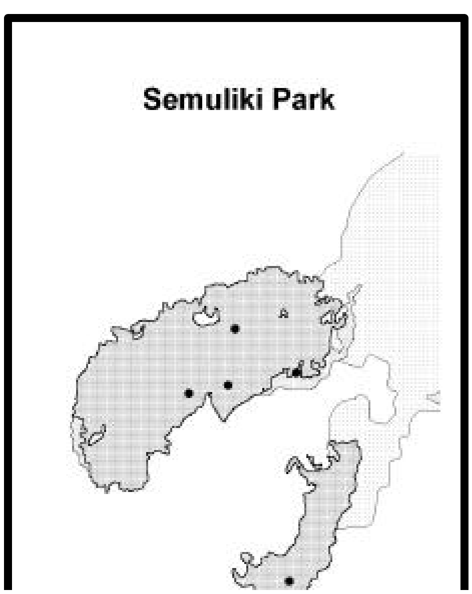
The details of the threats analysis for Itwara Forest Reserve are given in the table below:

Threat	Area	Impact	Urgency	Total	Rank
Hunting *Dogs/Nets/Spears*	11	6	9	26	10
Snares	1	2	4	7	1
Crop raiding	5	4	3	12	3
Encroachment	3	11	11	25	9
Firewood *Household*	7	9	6	22	7
Grazing	4	5	5	14	5
NTFP ***Coffee***	9	1	1	11	2
Bush ropes	8	3	2	13	4
Poles	10	7	7	24	8
Pitsawing *Illegal*	6	10	11	27	11
Legal	2	8	8	18	6

Semuliki National Park

Distribution of chimpanzee nests

Chimpanzees were distributed throughout the park as depicted in the figure below. The number of calling chimpanzees indicated that they occurred in the far west of the forest in reasonable numbers but due to insecurity we were unable to access here.



Threats analysis

The details of the threats analysis for Semuliki National Park are given in the table below:

Threat	Area	Impact	Urgency	Total	Rank
Hunting *Dogs/Nets/Spears*	11	6	9	26	8
Snares	12	7	10	29	11
Crop raiding	5	1	6	12	4
Fire	4	3	1	8	2
Fishing	2	5	8	15	5
Firewood *Household*	6	12	7	25	7
Grazing	3	4	2	9	3
Medicinal plant collection	1	2	3	6	1
Mining *(oil)*	?	?	?	?	low
NTFP *Palms*	?	?	?	?	low
Bush ropes	8	8	5	21	6
Poles	8	9	11	28	10
Rattan	9	11	12	32	12
Rebels	13	10	13	36	13
Roads	10	13	4	27	9
Tourism	?	?	?	?	low

Ruwenzori Mountains National Park

Distribution of chimpanzee nests

Chimpanzees were distributed throughout the park as depicted in the figure below, showing they are confined to the lower altitudes in the park.

Threats analysis

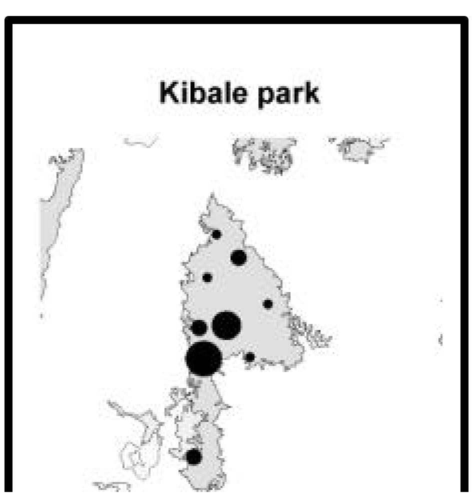
The details of the threats analysis for Ruwenzori Mountains National Park are given in the table below:

Threat	Area	Impact	Urgency	Total	Rank
Hunting *Firearms*	6	7	6	19	7
Dogs/Nets/Spears	2	1	1	4	1
Snares	5	4	5	14	5
Animal collecting	?	?	?	?	?
Fire	1	6	2	9	3
NTFP *General*	3	3	4	10	4
Pitsawing *Illegal*	4	2	3	9	3
Rebels	7	5	7	19	7
Tourism	?	?	?	?	?

Kibale National Park

Distribution of chimpanzee nests

Chimpanzees were distributed throughout the park as depicted in the figure below. The highest densities were around the Ngogo research station and the Kanyanchu tourism site.



Threats analysis

The details of the threats analysis for Kibale National Park are given in the table below:

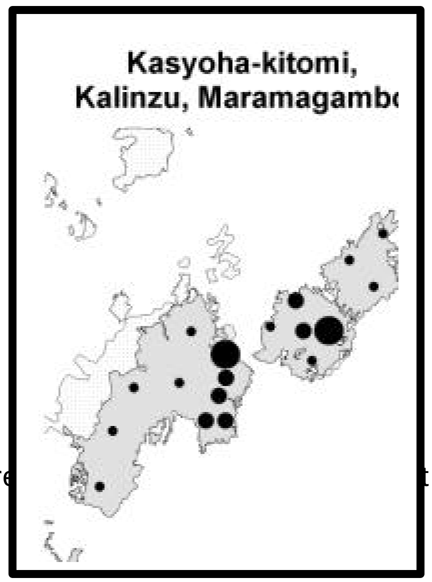
Threat	Area	Impact	Urgency	Total	Rank
Hunting *Dogs/Nets/Spears*	9	6	10	25	10
Pitfall traps	7	6	10	23	8
Snares	16	7	14	37	15
Chemical effluent	3	6	5	14	4
Charcoal burning	10	14	15	39	16
Crop raiding	6	1	5	12	3
Fire	11	17	16	44	17
Firewood *Household*	13	8	12	33	12
Grazing	8	4	8	20	6
Medicinal plant collection	5	3	3	11	2
Mining *(Sand)*	2	17	4	23	8
NTFP *General*	14	10	13	37	15
Pitsawing *Illegal*	15	15	17	47	18
Rebels	4	9	11	24	9
Research	17	13	7	37	15
Roads *(FACE*	3	11	2	16	5

foundation)					
Tourism	12	13	7	32	11
Water collection	1	2	1	4	1

Kasyoha-Kitomi, Kalinzu and Maramagambo Forest Reserves

Distribution of chimpanzee nests

Chimpanzees were distributed throughout the forest reserves as depicted in the figure below. Kalinzu Forest had the highest densities; much higher than the contiguous Maramagambo forest which is at a lower altitude.



Threats analysis

The details of the thre t reserves are given in the table below:

Kasyoha-Kitomi Forest Reserve

Threat	Area	Impact	Urgency	Total	Rank
Hunting	7	2	2	11	1
Firearms					
Dogs/Nets/Spears	15	3	14	32	13
Snares	15	4	14	33	14
Charcoal burning	3	11	12	26	9
Crop raiding	11	1	5	17	4
Encroachment	4	16	16	36	15
Fire	5	12	7	24	7
Firewood	9	10	11	30	12
Commercial					
Household	13	10	4	27	10
Grazing	2	6	8	16	3
Medicinal plant collection	10	5	1	16	3

Mining		8	8	6	22	5
NTFP *General*		12	7	10	29	11
Pitsawing *Illegal*		16	14	15	45	16
	Legal	6	14	3	23	6
Roads		1	15	9	25	8

Kalinzu Forest Reserve

Threat	Area	Impact	Urgency	Total	Rank
Hunting *Firearms*	2	3	4	9	3
Dogs/Nets/Spears	12	7	10	29	11
Snares	11	7	10	28	9
Charcoal burning	13	14	13	40	13
Crop raiding	3	2	2	7	1
Encroachment	7	10	12	29	11
Fire	4	9	8	21	6
Firewood *Commercial*	9	11	11	31	12
Household	8	8	5	21	7
Grazing	5	6	7	18	4
Mining	1	4	3	8	2
NTFP *General*	10	5	9	24	8
Pitsawing *Illegal*	14	13	14	41	14
Legal	6	12	6	24	8
Research	?	?	?	?	?
Roads	?	?	?	?	?
Sawmilling	6	12	6	24	8
Tourism	?	?	?	?	?

Maramagambo Forest Reserve

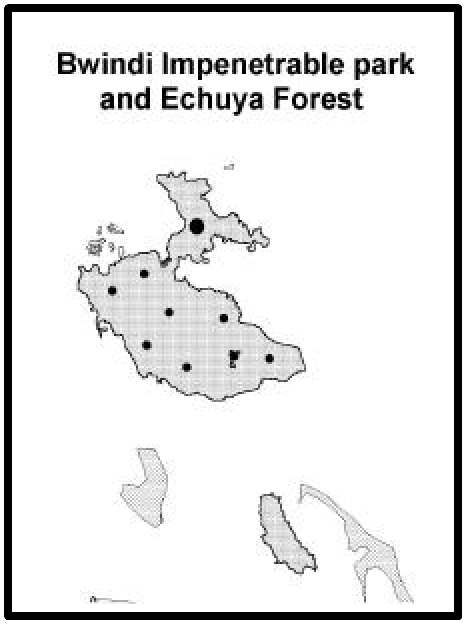
Threat	Area	Impact	Urgency	Total	Rank
Hunting *Firearms*	3	3	4	10	4
Dogs/Nets/Spears	12	7	11	30	11
Snares	11	6	11	28	9
Charcoal burning	9	12	12	33	12
Crop raiding	6	1	3	10	4
Encroachment	2	10	8	20	7
Fire	?	?	?	?	?
Firewood *Household*	8	8	5	21	8
Fishing	7	5	7	19	5
NTFP *Bush ropes*	4	4	2	10	4
Poles	5	9	6	20	7
Pitsawing *Illegal*	10	11	9	30	11
Rebels	1	2	1	4	1
Roads ***(paths made by people)***	?	?	?	?	?

Tourism	?	?	?	?	?
Water Collection	?	?	?	?	?

Bwindi Impenetrable National Park and Echuya Forest Reserve

Distribution of chimpanzee nests

Chimpanzees were distributed throughout the forests as depicted in the figure below. No chimpanzees were found in Echuya but in Bwindi the nests were fairly evenly distributed across the forest with slightly higher densities at lower altitudes.



Threats analysis

The details of the threats analysis for Bwindi Impenetrable National Park and Echuya Forest Reserve are given in the tables below:

Bwindi Impenetrable National Park

Threat	Area	Impact	Urgency	Total	Rank
Hunting *Dogs/Nets/Spears*	1	8	7	16	7
Snares	8	8	8	24	8
Crop raiding *elephant,gorilla, baboon*	4	2	2	8	1
Fire	5	6	6	17	7
Firewood *Household use*	2	3	4	9	2
Grazing	3	4	3	10	3
Medicinal plant collection	7	7	1	15	4
NTFP *General*	6	5	5	16	5
Research	?	?	?	?	?
Tourism	?	?	?	?	?

Echuya Forest Reserve

Threat	Area	Impact	Urgency	Total	Rank
Hunting *Dogs/Nets/Spears*	1	1	1	3	2
Snares	1	1	1	3	2
Firewood (Bamboo) *Commercial*	4	4	4	12	6
(Bamboo) *Household*	4	4	4	12	6
Grazing	2	2	2	6	3
NTFP *Bamboo*	3	3	3	9	4

The Albertine Rift Technical Reports

The Albertine Rift Technical Reports series has been developed to publish results from research activities that the Wildlife Conservation Society has undertaken with other partners in the region of the Albertine Rift. The aim of the series is to provide a mechanism for more detailed results to be published that would not ordinarily be published in scientific journals. We believe that it is essential that details records such as these are made so that future scientists and managers can use the results, particularly in future monitoring surveys. The series also publishes the results of workshops or syntheses of information that again would not be possible in a short scientific publication.

Previous reports:

Hill, C.M., Osborn, F.V. and Plumptre, A.J. 2002. Human-wildlife conflict: identifying the problem and possible solutions. *Albertine Rift Technical Report* No. 1, 137 pp

The Wildlife Conservation Society (WCS)

The Wildlife Conservation Society is dedicated to saving wildlife and wildlands to assure a future for threatened species such as elephants, gorillas, chimpanzees, cheetahs, tigers, sharks or lynx. That mission is achieved through a conservation program that protects some 50 living landscapes around the world, manages more than 300 field projects in 53 countries, and supports the largest system of living institutions in the USA – the Bronx Zoo, the New York Aquarium, the Wildlife Centres in Central Park, Queens and Prospect Park, and the Wildlife Survival Centre on St Catherine's Island, Georgia. We are developing and maintaining pioneering environmental education programmes that reach more than three million people in the New York metropolitan area as well as in all 50 United States and 14 other countries. We are working to make future generations inheritors, not just survivors.

WCS has been a driving force in conservation in africa since the 1920s when the Bronx Zoo's first president, William Hornaday, initiated a programme to save the white rhinos of South Africa. Since this time the WCS Africa Programme has been characterised by pioneering conservation work such as the first field studies and census of the mountain gorillas by George Shaller in Congo (1959), creation of the Nouabale-Ndoki national park in Congo Republic (1993), Masoala park in Madagascar (1996), and Nyungwe National Park in Rwanda (2001). WCS focuses on the use of scientific information to manage conservation areas and as such has more field scientists on the ground than any other conservation organisation in the world. Currently the WCS Africa Programme works in 14 countries protecting a range of spectacular and diverse ecosystems across the continent. While Africa has some of the richest landscapes of the natural world it also faces extreme challenges of poverty, high human population growth and rapidly changing political systems. WCS Africa programme recognises these challenges and the subsequent pressures on biodiversity. Throughout its field-based programmes WCS works with governments, national institutions and local communities to conserve Africa's natural heritage for both Afrticans and the world at large.

To learn more about WCS visit: www.wcs.org

The Jane Goodall Institute (JGI)

The Jane Goodall Institute advances the power of individuals to take informed and compassionate action to improve the environment of all living things. The objectives of the Institute are to:

- Increase primate habitat conservation
- Increase awareness of, support for and training in issues related to our relationship with each other, the environment and other animals (leading to behavior change)
- Expand non-invasive research programs on chimpanzees and other primates
- Promote activities that ensure the well-being of chimpanzees, other primates and animal welfare activities in general

History

The Jane Goodall Institute for Wildlife Research, Education and Conservation, a tax-exempt/non-profit, was founded in 1977 California by Jane Goodall and Genevieve, Princess di San Faustino. Initially, day-to-day operation of the Institute was handled by board members and other volunteers working out of their homes. In the early 1980s JGI moved to the San Francisco offices of the California Academy of Sciences, where it functioned essentially as a USA/Africa "communication link" and as a repository for files.

To keep pace with Jane's increased public visibility, professional status, and interests, the Institute office soon moved to the area Jane always thought it should be: Washington, DC.

To learn more about JGI visit: www.janegoodall.org

Chimpanzees have been studied in Uganda since the early 1960s. These studies have determined that chimpanzees are only found in the forests and woodlands of western Uganda with one small isolated population on the Sudan border. However, there has been no attempt to undertake a census to estimate the total population occurring in this country. It has also been unclear which forests are the most important for chimpanzee conservation because we lacked the numbers in each forest reserve or national park.

This report summarises the results of a survey that the Wildlife Conservation Society and the Jane Goodall Society have undertaken, in collaboration with the Uganda Wildlife Authority and Uganda Forest Department, between 1999 and 2002. The results estimate the total population of chimpanzees in Uganda to be between 4,500-5000 individuals. The study showed that only three forests have more than 500 individuals, a number that is often used as the minimum estimated for a population to be viable in the long term. Kibale National Park is clearly the most important forest for chimpanzee conservation with over 25% of Uganda's chimpanzees to be found in this forest. Chimpanzees are threatened by hunting by local communities, capture for the wildlife trade, accidental snaring and degradation or loss of habitat.

Author biographies

Author biographies

Andrew Plumptre currently directs the Albertine Rift programme of the Wildlife Conservation Society (WCS). This programme has three main objectives: to undertake research of relevance to protected area managers, to provide training to protected area managers and national NGOs and to support the management of critical protected areas in the Albertine Rift. Dr Plumptre was one of the scientists to establish the Budongo Forest Project which has been studying chimpanzees since 1990.

Debby Cox is the Executive Director for JGI Uganda. She has been working in Africa since 1994 with chimpanzee conservation and welfare projects in both Uganda and Burundi. As part of JGI-Uganda's work she is looking at ensuring the long-term survival of the chimpanzee population, while allowing sustainable development of rural areas in Uganda.

Sam Mugume worked for JGI and led the field teams involved in the surveys of several of these forests between 1999-2001. He obtained his MSc undertaking a project testing the efficacy of different chimpanzee census methods and prior to this he managed the field teams of the Kibale Chimp Project. He subsequently has taken a post with the Uganda Bureau of Statistics and has been closely involved in the 2002 human population census.

WILDLIFE CONSERVATION SOCIETY

the Jane Goodall Institute