



Bonobo (*Pan paniscus*)

Conservation Strategy 2012–2022



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Bonobo (*Pan paniscus*)

Conservation Strategy 2012–2022

International Union for Conservation of Nature & Institut Congolais pour la Conservation de la Nature



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1. Executive Summary

The bonobo, *Pan paniscus*, is an Endangered species of primate endemic to the Democratic Republic of Congo, and found only in the dense, equatorial forests south of the Congo River. Its historic range is estimated to have been around 565,000 km², but the species is now severely threatened, particularly by poaching and the commercial bushmeat trade, even though the killing or capturing of bonobos for any purpose is against national and international laws.

For the past three decades, research and conservation organizations have been supporting the government of the DRC in its efforts to protect these unique great apes. Unfortunately, institutional, social and economic decline, combined with the turmoil created by recent wars, have meant that bonobos are under increasing pressure as urban and rural human populations engage in the unsustainable exploitation of natural resources. This has resulted in the elimination of wildlife from vast expanses of rainforest and in the dramatic reduction of suitable habitat.

To help to address these issues, the IUCN/SSC Primate Specialist Group facilitated a broadly participative consultation process intended to analyse the impediments to effective conservation of bonobos. Three 'Conservation Challenges Working Groups' were established during a roundtable meeting in Kinshasa in March 2010. One of these working groups, led by the Max Planck Institute for Evolutionary Anthropology, undertook to compile and analyse all existing bonobo survey data and to model bonobo occurrence and their habitat (Hickey *et al.* 2012). This assessment identified four bonobo strongholds – the 'northern block' (Maringa-Lopori-Wamba), the 'eastern block' (Tshuapa-Lomami-Lualaba), the 'southern block' (Salonga) and the 'western block' (Lac Tumba-Lac Mai Ndombe). The analysis revealed that, despite the immense effort invested, survey data collected between 2003 and 2010 covered less than 30% of the bonobo's geographic range. Quantitative data were too patchy to allow the total number of bonobos remaining to be estimated; however, the systematic surveys that have been conducted give a minimum population of about 15,000–20,000 individuals. The modellers overlaid polygons of areas where some recent surveys had been carried out over the final map of suitable conditions to identify areas that have not yet been surveyed and that are likely to provide suitable conditions for bonobos, both within and outside protected areas. The model clearly showed fragmentation of probable suitable areas, not only by river systems and savannas, but also due to human activities.



An adolescent female bonobo at Wamba in repose © Takeshi Furuichi

The process culminated in 2011 with a bonobo conservation stakeholder workshop convened under the auspices of the *Institut Congolais pour la Conservation de la Nature* and the International Union for Conservation of Nature, which brought together 68 people representing 33 organizations and government departments to develop a bonobo conservation strategy. Stakeholders at the workshop formulated the following Vision and Goal for the strategy:

Vision By 2050, bonobo populations across their range are viable and increasing relative to 2008–2015 surveys, face minimal threats, and their long-term survival is ensured.

Goal By 2022, priority areas for bonobo conservation are effectively managed and protected, the current main threats are reduced, there is no further habitat loss, and known bonobo populations are stable relative to baseline surveys.

When workshop participants ranked threats to the bonobo's survival with regard to spatial scope, severity and reversibility, poaching emerged as by far the most important direct threat. Reducing bonobo mortality due to poaching should therefore be of highest priority for conservation action. Habitat loss through deforestation and fragmentation ranked second, while recognising that forests are often severely depleted of their wildlife before habitat destruction begins. Disease was considered to be a potential future threat.

Indirect threats (factors that contribute to the persistence of direct threats) were judged to be intimately interconnected and essentially linked to difficult socioeconomic and political contexts, and the problems of weak governance that result from them. Indirect threats to bonobos include the bushmeat trade, proliferation of weapons and ammunition, weak law enforcement, weak stakeholder commitment to conservation, human population growth, expansion of slash-and-burn agriculture, insufficient subsistence alternatives, and industrial-scale commercial activities which have the potential for enormous negative impact: agriculture, logging, oil and mining, and associated infrastructure development.

Objectives, intervention strategies and actions were elaborated during the workshop. The objectives of the overall strategy fall under four main intervention strategies:

1. **Strengthening institutional capacity.** Objectives include creating new protected areas, eliminating poaching in protected areas, monitoring and controlling the bushmeat trade, eliminating the circulation of weapons and ammunition in protected areas, and working with logging companies to implement specific wildlife protection activities in their concessions.
2. **Consultation and collaboration with local actors.** Objectives include integrating bonobo conservation issues into national development plans, developing land-use and macro-zoning plans, and implementing sustainable subsistence activities at key sites.
3. **Awareness building and lobbying.** Objectives include developing a nationwide communications strategy, undertaking awareness-building activities at key sites, sensitising urban communities and private sector operators, and lobbying government administration at national and provincial levels.
4. **Research and monitoring activities.** The objective is to develop a clear monitoring framework. Implicit throughout this plan is that surveys and monitoring of both bonobos and the threats to bonobos (including disease/health monitoring) are necessary as a means to track changes in population size and distribution, to assess the level and location of threats, and ultimately to assess progress towards the Goal and Vision of the Strategy. There will also be a disease prevention plan, focussed on the prevention of human-bonobo disease spread, together with an early detection mechanism and an emergency intervention plan to address potentially catastrophic disease outbreaks.
5. **Sustainable funding.** The objective is to evaluate funding needs for bonobo conservation and create sustainable sources of funding.

It is recommended that a mechanism to coordinate bonobo conservation activities and implementation of the strategy be established. Detailed project proposals and activity plans to address the different objectives will be developed once the coordination mechanism is in place. Additional information relevant to this conservation strategy is available at www.primate-sg.org/bonobo/

2. Introduction

The bonobo, *Pan paniscus*, is an Endangered species of great ape endemic to the Democratic Republic of Congo (DRC), and found only in the equatorial forests south of the Congo River. The Congo River forms a biogeographical barrier separating bonobos from chimpanzees, *Pan troglodytes*, and gorillas, *Gorilla beringei*. Bonobos occupy a variety of habitats, including dense humid forest, swamp forest, dry forests, secondary forests and forest/savanna mosaics. They prefer to nest in mixed mature forest *terra firma* habitat (Mohneke & Fruth 2008; Reinartz *et al.* 2006, 2008), but swamp forests are also an important habitat for nesting (Mulavwa *et al.* 2010; Furuichi *et al.* 2012). Their historic range extends from the Lualaba River in the east to the Kasai and Sankuru rivers in the south, and the Congo River to the north and west, across an area of 564,542 km².

Bonobos are mainly frugivorous, but also eat vegetation (leaves, flowers, seeds, mushrooms, algae and aquatic plants), invertebrates (larvae, termites, ants, earthworms) and occasionally fish and small- to medium-sized mammals. They live in fission-fusion communities of 10 to over a hundred animals, on average 30–80 individuals, moving in smaller parties when they feed. Adolescent females emigrate from their natal communities and move between communities before settling permanently into one. Males usually remain in their natal community. Bonobo males are less territorial and less aggressive towards males of neighbouring communities than are chimpanzee males. A major difference with chimpanzees and most other primates is their social structure, which is female dominated. Female coalitions influence mating strategies and food sharing, and are maintained and reinforced by behaviour unique to bonobos known as genital rubbing. This behaviour also serves to reduce social tensions (e.g., Lacambra *et al.* 2005; Fruth *et al.* 2013; Reinartz *et al.* 2013).

Bonobos are classified as Endangered on the Red List of Threatened Species (IUCN 2012), and are listed on Appendix I of the Convention for International Trade in Endangered Species (CITES). Although information on the status of bonobos outside areas where the *Institut Congolais pour la Conservation de la Nature* (ICCN) and its conservation partners are active is incomplete, there is a consensus that bonobo numbers are declining over much of the species' range. The most immediate threats to their survival are poaching and habitat loss, both in terms of habitat destruction and fragmentation. These direct threats have increased significantly during the wars and political and economic instability that DRC has endured during the past 20 years. Poaching for the commercial bushmeat trade is the greatest threat to wildlife throughout the Congo Basin and is particularly damaging to slow-reproducing species, such as the great apes (e.g., Williamson *et al.* 2013). Habitat destruction and fragmentation are the result of several factors driven by human population growth and the expansion of subsistence and commercial agricultural activities.

2.1 Bonobo Conservation Strategies

Experts have drawn up strategies for bonobo conservation through a number of meetings and workshops (Thompson-Handler *et al.* 1995; Coxe *et al.* 2000; Thompson *et al.* 2003; GRASP 2005). These plans were ambitious in their objectives, and implementation has so far been extremely limited. This is probably because the objectives generally lacked pragmatism, were too all-encompassing and required resources that would be extremely difficult to mobilise. The most recent of these plans, which covered all three great ape species that occur in DRC, adopted a more pragmatic approach with conservation actions focusing on surveys, research and monitoring, strengthening of the protected area network and conservation education. Many of these actions have been partially or wholly accomplished; however, this plan did not target direct interventions, such as antipoaching activities to reduce the killing of great apes, even though most NGOs have been supporting government antipoaching activities for the past 15 years. In addition, the structure given responsibility for coordinating implementation does not have a clearly agreed mandate, or the necessary resources, to fulfil its responsibilities.

2.2 Process for the Elaboration of a New Bonobo Conservation Strategy

Between 2009 and 2011, the IUCN/SSC Primate Specialist Group (PSG) organized and facilitated a three-phase conservation process for bonobos. This began in 2009 by bringing together representatives of the major international groups working in bonobo conservation to seek commitment to a *process* for developing a coordinated conservation strategy. A major challenge will be to ensure that the conservation measures proposed are implemented effectively, so participants were also asked to identify the main obstacles to bonobo conservation. They agreed upon three broad themes and the following steps were then undertaken:

- I. In 2010, three 'Conservation Challenge Working Groups' (CCWG) were established to analyse issues that are impeding progress towards bonobo conservation. Discussions were organized around the following themes:
 - CCWG I: Methods and mechanisms for improved coordination and collaboration between those working towards bonobo conservation;
 - CCWG II: Methods for prioritizing, both geographic scope and activities;
 - CCWG III: Methods for better integration and collaboration between bonobo conservation and other sectors and global issues.
- II. The aims of the working groups were to a) understand better the complexities of each challenge; b) find solutions to overcome these challenges; and c) develop a workplan outlining how these challenges could be surmounted. Consultations took place between March 2010 and January 2011. After a roundtable meeting in Kinshasa, communication between group members was mainly electronic. Summary reports from the three working groups can be downloaded at www.primatesg.org/bonobo/
- III. As part of CCWG II, the Max Planck Institute for Evolutionary Anthropology (MPI-EVAN) brought together 15 experts from nine institutions from 14–18 January 2011. All available bonobo survey data were compiled, standardized and used to a) build a model that predicts the occurrence of suitable environmental conditions for bonobos throughout their range, and b) identify gaps in survey coverage and assess where future surveys of bonobos are needed. All bonobo survey datasets were archived in the A.P.E.S. database¹ and are listed in Appendix I.
- IV. A stakeholder workshop was organized under the auspices of ICCN and IUCN to bring together all the practitioners and organizations involved in bonobo conservation. A total of 68 people, from 33 organizations and government departments, participated in the workshop in Kinshasa from 19–22 January 2011 (see Appendix II). The approach used to develop this conservation strategy was based on BirdLife International's methodology (Sande & Hoffmann 2002), with the following steps:
 - assessment of the current status of bonobos
 - a threat analysis (identification, categorization, evaluation of severity)
 - elaboration of a Vision and Goal for the plan
 - elaboration of objectives, intervention strategies and actions
 - identification of a coordination mechanism for implementation of the plan
- V. A draft strategy was compiled and elaborated by the workshop organisers and circulated to participants for their input before finalization.

Conservation and research initiatives benefit enormously from thorough planning and coordination. Previous bonobo conservation plans involved no formal coordination mechanism; rather individual organizations carried out activities as a function of the resources they were able to mobilise, the priorities as they saw them at the time, and the prevailing political context. Poor collaboration between NGOs has hindered effective and concerted implementation of bonobo conservation in the past. Therefore, the current initiative sought to overcome these problems through an inclusive approach to implementation and a workable mechanism to ensure that resources are mobilized

¹ IUCN/SSC A.P.E.S. database developed and managed by MPI-EVAN. See <http://apesportal.eva.mpg.de/>



Pasteur Cosma Wilungula Balongelwa closing the bonobo workshop on behalf of ICCN, with Annette Lanjouw of the Arcus Foundation and workshop facilitator Conrad Aveling
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in a timely and coordinated manner. During the 18 months leading up to the 2011 workshop, considerable effort was devoted to improving communication between bonobo NGOs and discussion of how to support bonobo conservation through the Conservation Challenge Working Groups. Additionally, the outputs of the survey data working group were important not only to summarize knowledge on bonobo populations and to create the predictive model, but also to facilitate information sharing and foster collaborations. Together these working groups laid the groundwork for the 2011 workshop and conservation strategy development.

The new strategy aims to ensure the long-term protection of bonobos across their range through the implementation of conservation actions designed to reduce, and if possible eliminate, the direct threats and contributing factors that are causing bonobo populations to decline. Given the extremely difficult context (institutional, security, accessibility), particular effort was made to ensure that the choices of strategies and actions were pragmatic and realistic.

This strategy covers the following:

- Current state of knowledge of bonobo populations
- Main threats to bonobos
- Priority sites for bonobo conservation
- Strategic objectives and actions to ensure the survival of bonobos
- Coordination mechanisms for implementation of the plan
- Priority actions for the first year of implementation

3. Status of Bonobo Populations

3.1 Current Knowledge

Information on the distribution and abundance of bonobos is fragmented, as much of their geographical range has not been surveyed. Speculative population estimates have varied from 29,500 (Myers Thompson 1997) to 50,000 (Dupain & van Elsacker 2001). Fruth *et al.* (2008) advised caution on the use of these figures, because of the wide confidence intervals – the estimate for Salonga alone was 7,100–20,400 (Grossmann *et al.* 2008). Through analysis of all available data from recent surveys (2003–2010), the modelling group ascertained that less than one third of the bonobo's range has been surveyed. Figure 1 shows the bonobo's range as modelled for suitable conditions (Hickey *et al.* 2012). Figure 2 shows the areas surveyed for bonobos between 2003 and 2010. The total area surveyed (139,537 km²) represents almost 25% of the historic range (564,542 km²), thus it was not possible to produce a rangewide estimate of bonobo density or abundance.

Although quantitative data are patchy, the sites that have been surveyed give a minimum population estimate of 15,000–20,000 individuals (see Table 1). All available bonobo nest survey data collected between 2003 and 2010 were used to develop a model to predict the spatial distribution of potentially suitable conditions for bonobos throughout the area between the Kasaï and Congo rivers (Hickey *et al.* 2012). The modelling software used for this exercise was MaxEnt (Phillips *et al.* 2006).

The predictive environmental variables used in the final analysis were:

- percent forest land cover
- forest edge density (a measure of forest fragmentation)
- distance from rivers
- distance from agriculture

The main caveats of the resulting predictive model, which were systematically addressed², are:

- bias may exist due to some sites and habitat types being sampled more intensively than others
- nest location errors could be present due to a possible inconsistency in GPS settings used across sites
- environmental predictor variables were limited to those available across the full range in raster format, because MaxEnt requires spatially complete data. Highly detailed biotic and abiotic data relevant to bonobos are lacking at this scale.

Table 1. Minimum bonobo population estimates

Landscape	Bonobo population size
Salonga-Lukenie-Sankuru	>5,000
Tshuapa-Lomami-Lualaba	>5,000
Lac Télé-Lac Tumba Swamp Forest Landscape	<5,000
Maringa-Lopori-Wamba Forest Landscape	<5,000
Outside protected areas	>1,000
Minimum total estimate	15,000-20,000

² Iterative modelling with data from a single site at a time, followed by modelling with all data minus one site at a time, provided an assessment of the potential bias. Based on this sensitivity analysis, any bias in the final model is expected to be low. The resolution of predictor variables in the final model was 100-m pixels, and several predictor variables were developed using a neighbourhood analysis such that the conditions (e.g., edge density or percent forest) in neighbouring pixels were incorporated into a given pixel's value. These steps reduced the effect of any potential GPS location errors. Data points that did not meet basic quality assessment/quality control rules were excluded from the final analysis. The unavoidable limitation of spatially complete environmental predictor variables likely has the most influence on the model outcomes.

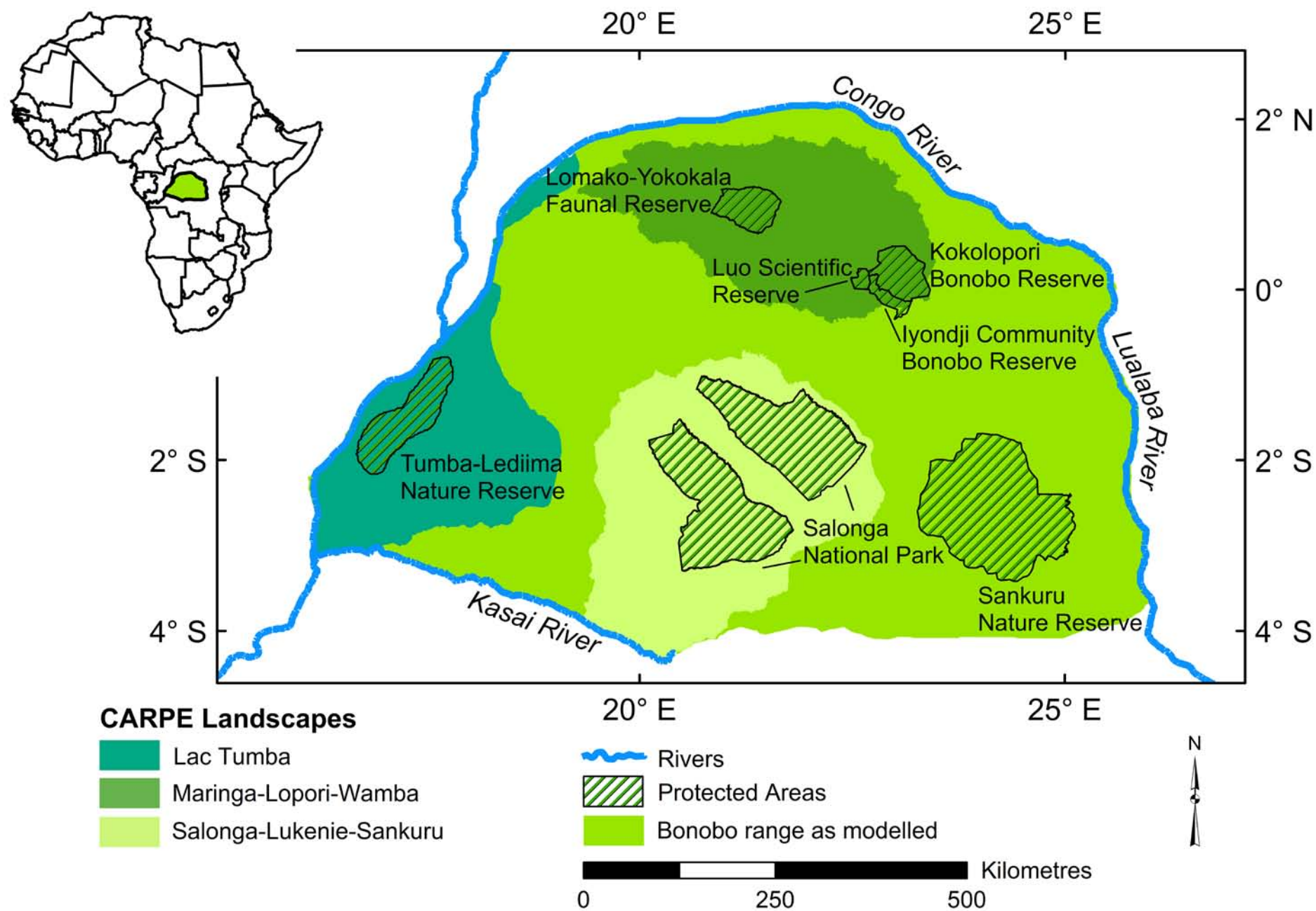


Figure 1. CARPE landscapes and officially designated protected areas overlapping the bonobo range, as modelled for suitable conditions.

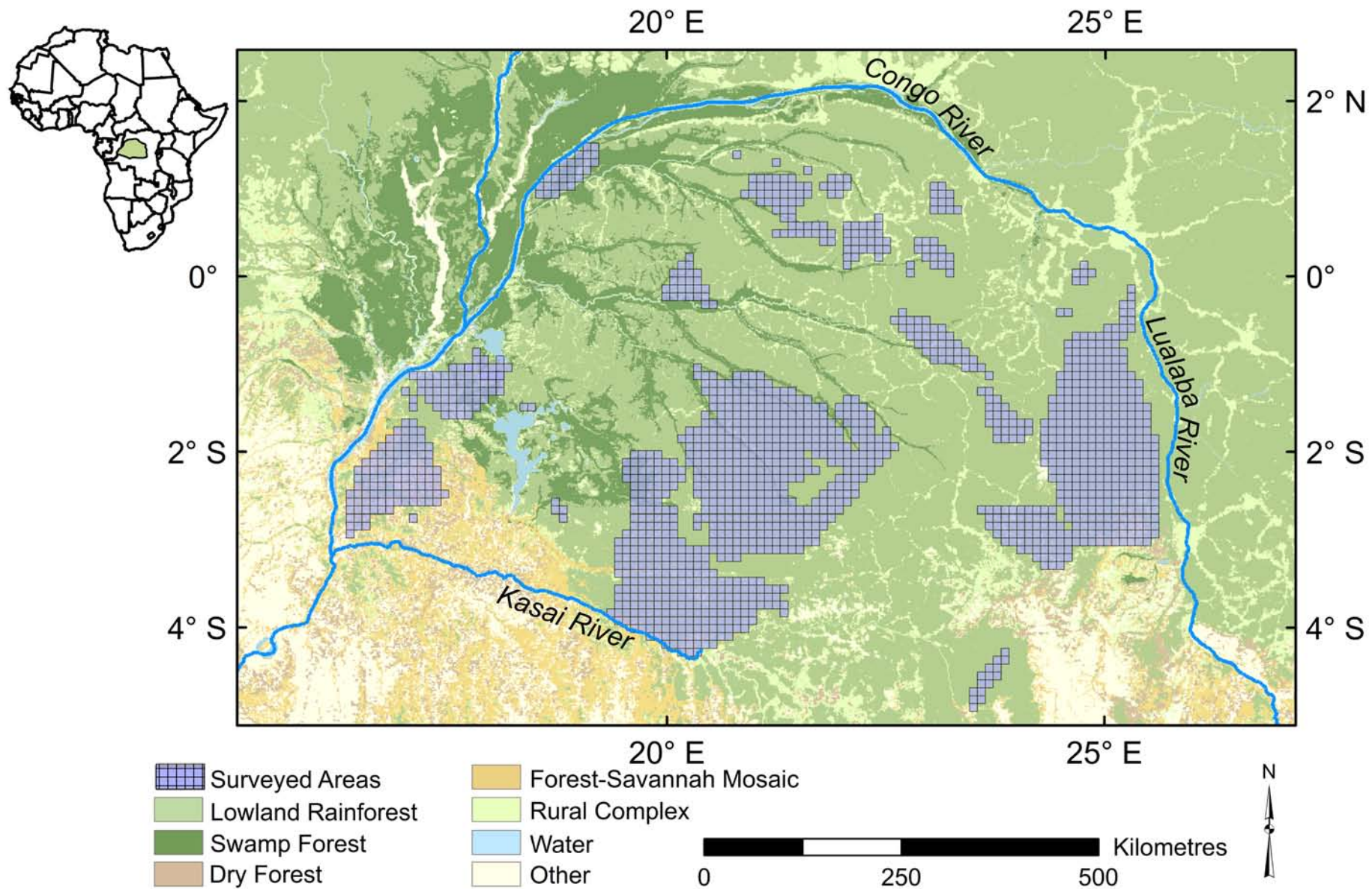


Figure 2. Map of generalized survey areas within which 2003–2010 bonobo surveys were conducted. [Unlike the nest-only data used to model suitable conditions for bonobos, not all grid squares were surveyed or contained nests]. Landcover layer: WRI & MECNT 2010

Figure 3 indicates the relative probability of occurrence of suitable conditions for bonobos. The model identified areas likely to provide suitable conditions for bonobos that have not yet been surveyed. The model also indicates that, on a rangewide scale, the principal factors determining the distribution of bonobo nests are a) distance from agriculture and b) forest edge density, both of which suggest that bonobos avoid areas of higher human activities (Hickey *et al.* 2012). The poaching associated with these measures of human activities is considered to be the common determinant of current bonobo distribution, as for most other large species in the Congo Basin.

3.2 Priority Populations

The modelling exercise identified four strongholds (Fig. 4) that harbour the majority of bonobos known to remain. We refer to these as the ‘northern block’ (Maringa-Lopori-Wamba), ‘eastern block’ (Tshuapa-Lomami-Lualaba, TL2), ‘southern block’ (Salonga) and ‘western block’ (Lac Tumba-Lac Mai Ndombe). Each of these forest blocks contains at least one proposed or existing protected area and large expanses of forests where most conservation and research projects currently operate. The concentration of research and conservation activities in these blocks may have introduced a bias and overestimation of the importance of these areas compared with other less-intensively surveyed sites. The model also predicts that some unsurveyed areas outside of these four strongholds likely contain suitable conditions for bonobos, and these will be priorities for future survey efforts.

Northern block (Maringa-Lopori-Wamba)

This block corresponds approximately to the Maringa-Lopori-Wamba landscape adopted by the Congo Basin Forest Partnership (CBFP) and the *Commission des Forêts d’Afrique Centrale* (COMIFAC). Situated in the Maringa and Lopori river basins in Equateur Province, this landscape covers approximately 74,000 km². The area is very far from urban centres, experiences high levels of poverty and people are extremely dependent on natural resources obtained through slash-and-burn agriculture, fishing and hunting. The human population is estimated at 586,700 inhabitants with densities of 2–4 people/km² where the existing or proposed protected areas are located, and up to 32 people/km² in agro-pastoral zones and urban centres. Forest covers approximately 67% of the block with swamps covering an additional 26%. The rest is young secondary forest and rural complex (Dupain *et al.* 2009). The block contains four areas offering various levels of protection:

- Lomako Yokokala Forest Reserve (3,625 km²)
- Luo Scientific Reserve (225 km²)
- Kokolopori Bonobo Reserve (4,000 km²), a community-based natural resource management (CBNRM) area
- Iyondji Community Bonobo Reserve (1,100 km²), an area of intact forest adjacent to the Luo Scientific Reserve.

Since 2006, a major participative land-use planning exercise has been carried out, covering approximately 70% of the landscape. This work has designated a mosaic of protected areas, CBNRM areas, sylvo-agro-pastoral zones and logging concessions³. The objective is to maintain forest cover and connectivity between ecologically important habitats in order to reconcile conservation needs and human activities.

Bonobos are found in varying densities throughout this landscape. Although current data do not allow estimation of the total number of bonobos in this stronghold, surveys suggest that this block contains some of the most important populations in the bonobo’s range.

³ As of August 2012, one concession was operational (TRANS-M) and two more are planned (K7 and K2 have been attributed to SIFORCO).

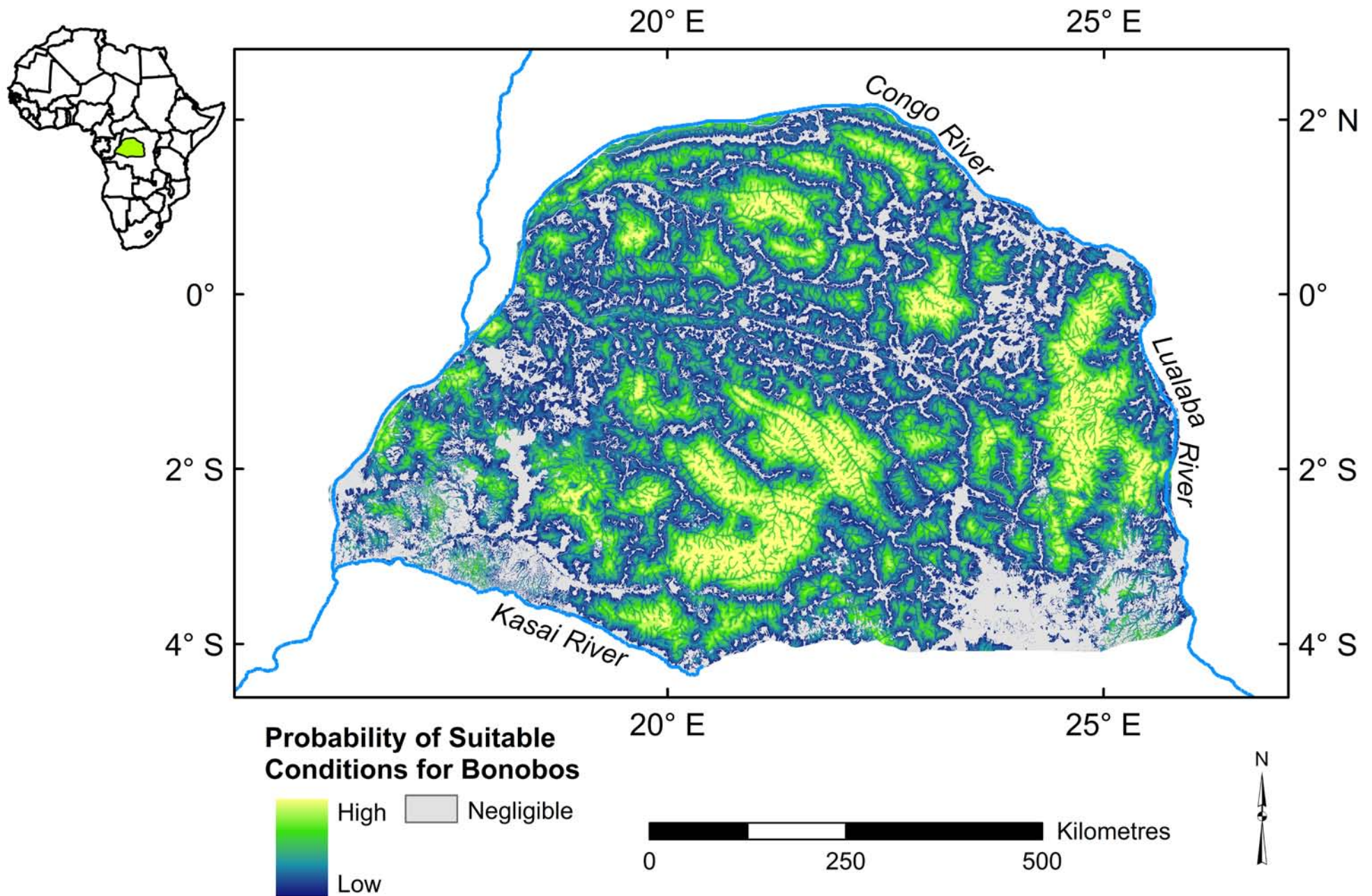
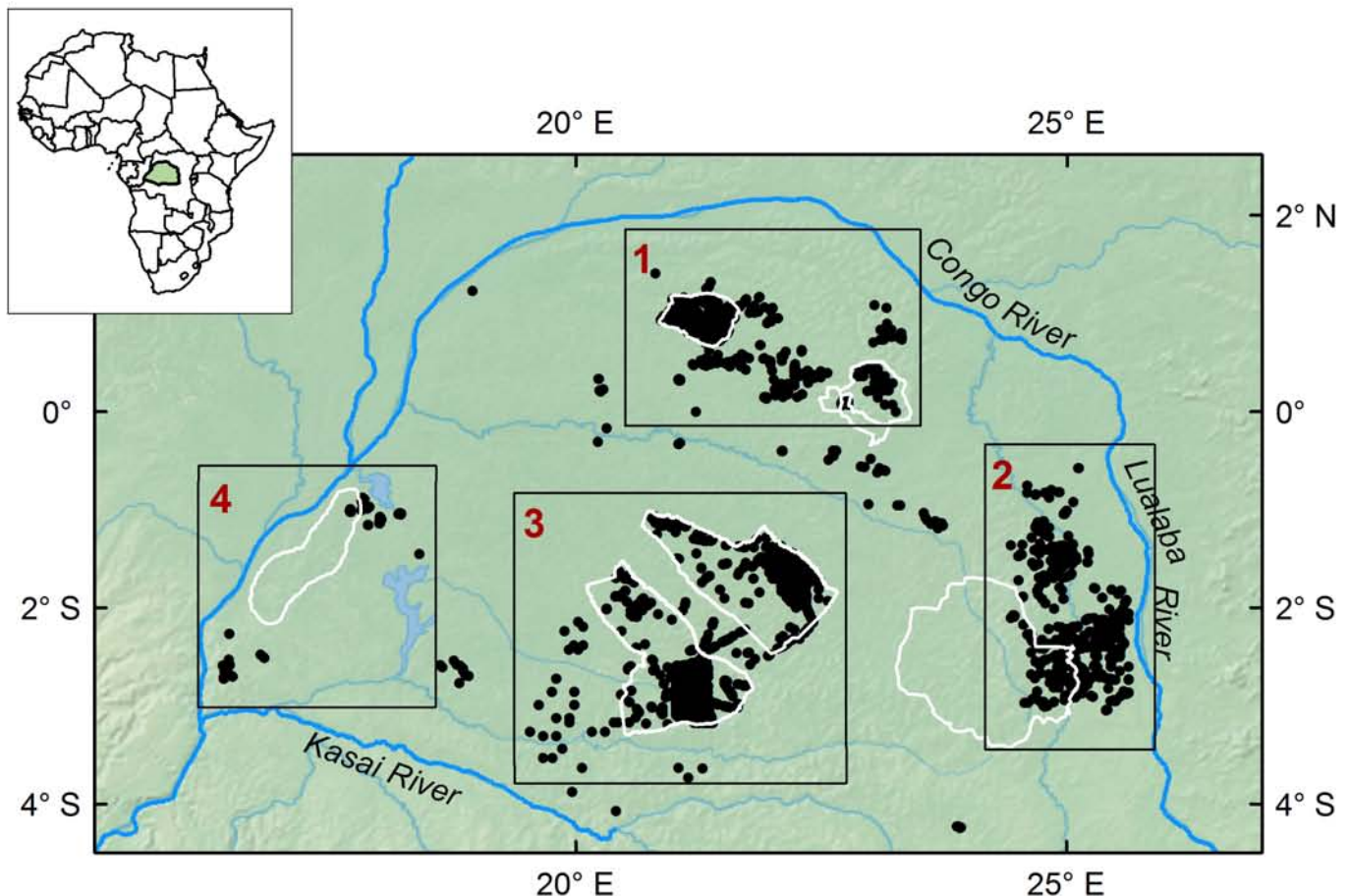


Figure 3. Map of rangewide suitable conditions for bonobos as modelled by Hickey *et al.* 2012 (model reproduced with permission). Grey shade indicates negligible opportunity for bonobo occurrence and tends to correspond with the following landcover categories: open water, rural complex, other (see Fig. 2)



Organizations working within each stronghold

1: Northern Stronghold

- African Wildlife Foundation (AWF)
- Association de Conservation de Bonobo dans les Sources de Lomako (ACBL)
- Awely
- Bonobo Conservation Initiative (BCI)
- Centre de Développement Agro-Pastoral (CEDAP)
- Centre de Recherche en Ecologie et Foresterie (CREF)
- Conservation des Ressources de Lingomo (CRL)
- Forêt des Bonobos
- Les Amis des Bonobos du Congo (ABC)
- Wamba Committee for Bonobo Research (WCBR)
- Protection de l'Ecosystème et des Espèces Rare du Sud-Est de l'Equateur (PERSE)
- Vie Sauvage
- Zoological Society of Milwaukee (ZSM)

3: Southern Stronghold

- Lukuru Wildlife Research Project
- Max Planck Institute (MPI)
- Wildlife Conservation Society (WCS)
- World Wildlife Fund (WWF)
- Zoological Society of Milwaukee (ZSM)

2: Eastern Stronghold

- Action Communautaire pour la Protection des Primates du Kasai (ACOPRIK)
- Bonobo Conservation Initiative (BCI)
- Groupe de Réflexion et d'Action pour le Développement Endogène (GRADE)
- Lukuru Foundation
- Solidaires et Organisés pour Sauver la Nature (SOS Nature)
- Wildlife Conservation Society (WCS)

4: Western Stronghold

- Bonobo Conservation Initiative (BCI)
- Centre de Recherche en Ecologie et Foresterie (CREF)
- Comité de Bonobo de Botuali
- Comité de Bonobo de Mbie Mokele
- Mbou-Mon-Tour (MMT)
- World Wildlife Fund (WWF)

0 250 500 Kilometres



Figure 4. Map of all types of bonobo signs from survey data submitted to the A.P.E.S. database and location of the four bonobo strongholds

Southern block (Salonga)

This block roughly corresponds to the western part of the COMIFAC/CBFP Salonga-Lukenie-Sankuru landscape. Located astride the provinces of Equateur, Bandundu, Kasai Occidentale and Kasai Orientale, this huge landscape covers approximately 104,140 km² extending across the Salonga, Yenge, Loile, Luilaka, Lokolo, Lukenie and Sankuru river basins. Two protected areas are located in this landscape:

- Salonga National Park (33,350 km²), two blocks separated by a corridor. This is the second largest forested national park in the world.
- Bososandja Domaine Réserve Naturelle (340 km²), an area of forest-savanna mosaic.

Average human population density is relatively low, estimated at 2.4 inhabitants/km². Slash-and-burn agriculture, fishing, hunting (subsistence and commercial) and collection of other non-timber forest products (NTFPs) are their main activities. Logging concessions cover approximately 25% of the landscape.

Within the framework of USAID's Central African Regional Programme for the Environment (CARPE) programme, conservation partners are working with local communities and the DRC government to elaborate a land-use plan that is intended to reconcile biodiversity conservation and sustainable development for local communities. This work is proceeding slowly due to the huge size of this zone, and the complex socioeconomic and institutional context.

A number of surveys have been carried out in Salonga National Park (SNP). Estimates of the number of bonobos in SNP include 19,000 (Reinartz *et al.* 2006) and 7,100–20,400 individuals (Grossman *et al.* 2008). However, poaching pressure has been persistently high since these estimates were made, with declines of up to 70% in bonobo numbers in some areas of the park recorded during a 2010 repeat survey of the Lokofa bloc (Liengola *et al.* 2010). Additionally, recent surveys in the corridor between the two blocks of the park showed that bonobos were rare or absent within 10 km of villages and completely absent in most of the northern two-thirds of the corridor (Maisels *et al.* 2009, 2010).

Commercial hunting for bushmeat in this area is intense, in part because of the heavily armed poachers coming in search of ivory. Unlike the other strongholds, SNP still harbours a remnant elephant population that attracts hunters, often backed by the military, to areas such as Lokofa. Hunters penetrate into the heart of the landscape to reach the most intact wildlife populations. However, in more remote areas or where there is adequate and enhanced guard protection within



An elephant bath on the Yenge River, northern block of SNP
© Gay Reinartz/ZSM

the park, bonobos can still be found at relatively high densities (Guislain & Reinartz 2010/2011). To control the upsurge in elephant poaching and the proliferation of military weapons in the region, government armed forces (FARDC) recently undertook a joint operation with ICCN, called 'Operation Bonobo', which successfully returned control of the park to ICCN. Since SNP represents the largest existing expanse of legally-protected and intact bonobo habitat, with a self-sustaining bonobo population, protection of this park and its wildlife is of paramount importance.

The Iyaelima people, who live in the southern sector of SNP, have a taboo against killing bonobos (Thompson *et al.* 2008), but most ethnic groups do not have such taboos, and the species is frequently found in the bushmeat trade. Even in areas occupied by the Iyaelima, poaching by outsiders (who have no taboo) has begun, due to the very high demand for bushmeat in the mining towns to the south.

Western block (Lac Tumba-Lac Mai Ndombe)

This block corresponds to the DRC sector of the COMIFAC/CBFP Lac Tété-Lac Tumba landscape. It extends over more than 72,000 km² and includes the Tumba and Mai Ndombe lakes. Seasonally-flooded and swamp forests cover 60–65% of the area, while the southern parts are covered with savanna-forest mosaic. This vast wetland is part of a transboundary Ramsar agreement with the Republic of Congo. The DRC sector (65,700 km²) is the largest Ramsar site in the world.

Excluding the city of Mbandaka (with >500,000 inhabitants), the human population density is 6–18 people/km². As in the other blocks, their main activities are agriculture, fishing, hunting and collection of NTFPs. Commercial poaching to supply urban bushmeat markets is intense, as the markets in Mbandaka, Kinshasa and Brazzaville are easily accessed by the Congo River. Logging concessions, located largely in the south, cover approximately 40% of the landscape. The *terra firma* forests are mainly old secondary forests that have been logged in the past.

Within the framework of the CARPE programme, a land-use plan is being developed, which includes three protected areas, 13 CBNRM areas and six resource extraction zones. The proposed protected areas are:

- Tumba-Lediima Natural Reserve (7,500 km²)
- Ngiri Biosphere Reserve (524 km² created in January 2011), with no bonobos but a small population of chimpanzees (being located on the right bank of the Congo River)
- Mabali Scientific Reserve (2.6 km²), under CREF management

Surveys conducted in the Lac Tumba landscape from 2001 to 2005 confirmed the presence of bonobos in this region (Inogwabini *et al.* 2007, 2008). The population in the Malebo-Ngoumi area, a forest-savanna mosaic habitat, was estimated at around 2,300 (Inogwabini *et al.* 2007). The high density estimates from areas within the Lac Tumba-Lac Mai Ndombe hinterland have been interpreted as being linked to local taboo of the Batéké people against the killing and consumption of bonobos (Inogwabini *et al.* 2008).

In 2004 and 2005, accords were signed and boundaries delimited to create three community-managed reserves at Botuali, Mbie-Mokele and Nkosso, totalling approximately 2,200 km². In addition, 'Bonobo Committees' were established in 37 villages (*groupements*) in the areas where local people have agreed to protect bonobos.

Eastern block (Tshuapa-Lomami-Lualaba, TL2)

Most of the Eastern block (apart from the Sankuru Reserve, see 'Southern block', above) is not part of a COMIFAC/CBFP landscape, because it is only since 2007 that surveys have highlighted the biological importance of the area (ICCN 2010). Covering approximately 20,000 km², the TL2 landscape is located astride three provinces (Orientale, Maniema and Kasai Orientale) stretching from the Tshuapa River basin in the west to the Lualaba (Congo) River in the east. The western part of TL2 is contiguous with the Sankuru Natural Reserve in Kasai Orientale. Outside the main cities, human density in this block is low at less than one inhabitant/km². Large parts of the zone are totally uninhabited. The main livelihood activities are slash-and-burn subsistence agriculture, hunting, seasonal fishing and artisanal logging. No industrial logging or mining operations exist in this area. One existing and one proposed protected area are located within this block:

- Sankuru Reserve (23,161 km²), created in 2007
- the proposed Lomami National Park (9,000 km²), to be surrounded by a buffer zone of approximately 16,380 km² with Wildlife Reserve status

During the participatory process for the creation of Lomami National Park, the results of the surveys initiated in 2007 (Hart *et al.* 2009) were instrumental in proposing boundaries based on known locations of animals and people. The 2007 surveys highlighted the biological richness of the zone. Several species or subspecies of endemic primates, one new to science (Hart *et al.* 2012) were discovered in the diverse habitats, which include dense tropical rainforest, forest-savanna mosaic, flooded areas and large rivers. Despite the remoteness of the area, wildlife, including bonobos, is under intense pressure from the commercial bushmeat trade (Hart & Hart 2011).

The number of bonobos in the proposed national park with the surrounding buffer zone (including the south-eastern portions of the Sankuru Reserve between the Tshuapa and Lomami Rivers) is estimated to be 9,500 individuals (5,800–13,700; ICCC 2010). The bonobos seem to be more concentrated in the south, particularly in the Luidjo and Kasuku river basins and in the forests bordering the patchwork of savannas in the southern part of the future park. The southwestern boundary of the future Lomami National Park is contiguous with the Sankuru Natural Reserve (23,161 km²), created in 2007. However, surveys covering just over half of the Sankuru Natural Reserve, west of the Tshuapa River, found that bonobos were present in just 17% of the reserve (the Lomela and Katako-Kombe territories in the east) and were absent in the south-central and southwest area, close to the town of Lodja (Hart *et al.* 2009; Liengola *et al.* 2009). With a human population of over 78,000 inhabitants living in and around the Sankuru Reserve, signs of intense hunting pressure were widespread. Over half of the reserve is secondary or degraded forests, fragmented by areas of human occupation.

3.3 Knowledge Gaps and Conclusions

Current knowledge of the status of bonobos is incomplete since recent bonobo surveys cover less than 30% of their historical range. While these data indicate that most bonobos reside in PAs (or proposed PAs) and buffer areas in the four strongholds, there are suitable conditions for bonobos outside protected areas where no recent surveys have been undertaken. These are areas with:

- low human occupation
- low deforestation
- low edge density
- further distance from human activities (agriculture, roads)
- further distance from rivers
- high forest cover

It is important to note that the predictive model was limited by the data available at the time of the 2011 workshop and should be considered as a work in progress to be refined as more data become available (Hickey *et al.* 2012).

Undertaking surveys of previously unsurveyed areas is paramount to identify possible additional sites for protection with a view to a) increasing the proportion of the bonobo population under protection and b) maintaining habitat continuity to ensure continued gene flow between bonobo populations. Criteria for choosing the sites to be surveyed should be:

1. areas with the highest predicted value for bonobo occurrence (to be surveyed first)
2. sites with the largest surface areas
3. sites adjacent or close to current bonobo priority areas

More than 54% (83,760 km²) of the area predicted to be suitable for bonobos has not been surveyed. To narrow down the areas within the bonobo's range that should be priorities for future survey efforts, the rangewide map of suitable conditions was used to identify priority sites for future surveys (see Box 1). This produced a preliminary list of 14 'high priority' areas for future surveys, which are given in order of priority in Table 2 and mapped in Figure 5. The area categorized

as high priority is approximately 130,000 km², as experts selected areas that have been surveyed in the past where it was judged that a repeat survey should be high priority.

Finally, while it is important to identify areas to be surveyed and potentially new bonobo populations, the biggest challenge and the most urgent priority for bonobo conservation is to secure their effective protection wherever they are known to occur, especially if this is within a protected area.

Box 1. Methods Used to Identify Priority Areas for Future Bonobo Surveys

To determine priorities for future surveys within the bonobo's geographic range, we used the following three-step approach. First, we developed a small programme in Visual Basic that contained a clickable map for recording expert opinions on where future survey effort should be located. The base map consisted of a grid with cell size of 0.084 degrees, corresponding to approximately 10×10km, with layers for landcover, conservation landscapes, protected areas, rivers and other bodies of water, the bonobo's geographic range and GPS locations of previous survey effort. By default, all cell values were set to no priority (0) and any click on a specific cell turned this default value into a priority (1). The programme was available for download via the A.P.E.S. Portal and instructions on how to use it were sent to the 35 contributors to the study 'A spatially-explicit rangewide model of suitable conditions for the bonobo (*Pan paniscus*) for conservation planning', which has been integral to the process of developing the bonobo conservation strategy (Hickey *et al.* 2012). These experts were asked to provide input on which areas should be priorities for future bonobo surveys, together with their justifications for selecting particular cells. Ten respondents used the programme to identify priorities, however two combined their input, so a total of nine programme outputs were received and analysed.

Data were pooled by summing the number of times each 10×10km cell was selected divided by the total number of programme outputs received (nine). Results were superimposed on a base layer in ArcGIS, revealing 12 distinct areas that had been selected by two or more bonobo experts. Two areas located in the southern extent of the bonobo range were added, because the area along the southern range limit was identified as a priority by several experts, but the cells selected were non-overlapping. Thus, a total of 14 areas were classified as high priority for future surveys. These 14 high priority areas were converted into polygons and mapped (Fig. 5). The justifications for selection and the summary statistics for each (size, coordinates, mean percentage selection) are presented in rank order in Table 2. Cells that were selected only once were classified as priority and are shown in Figure 5, but are not listed in Table 2.



Bonobo survey team at work near the Ameteka trail in SNP © Gay Reinartz/ZSM

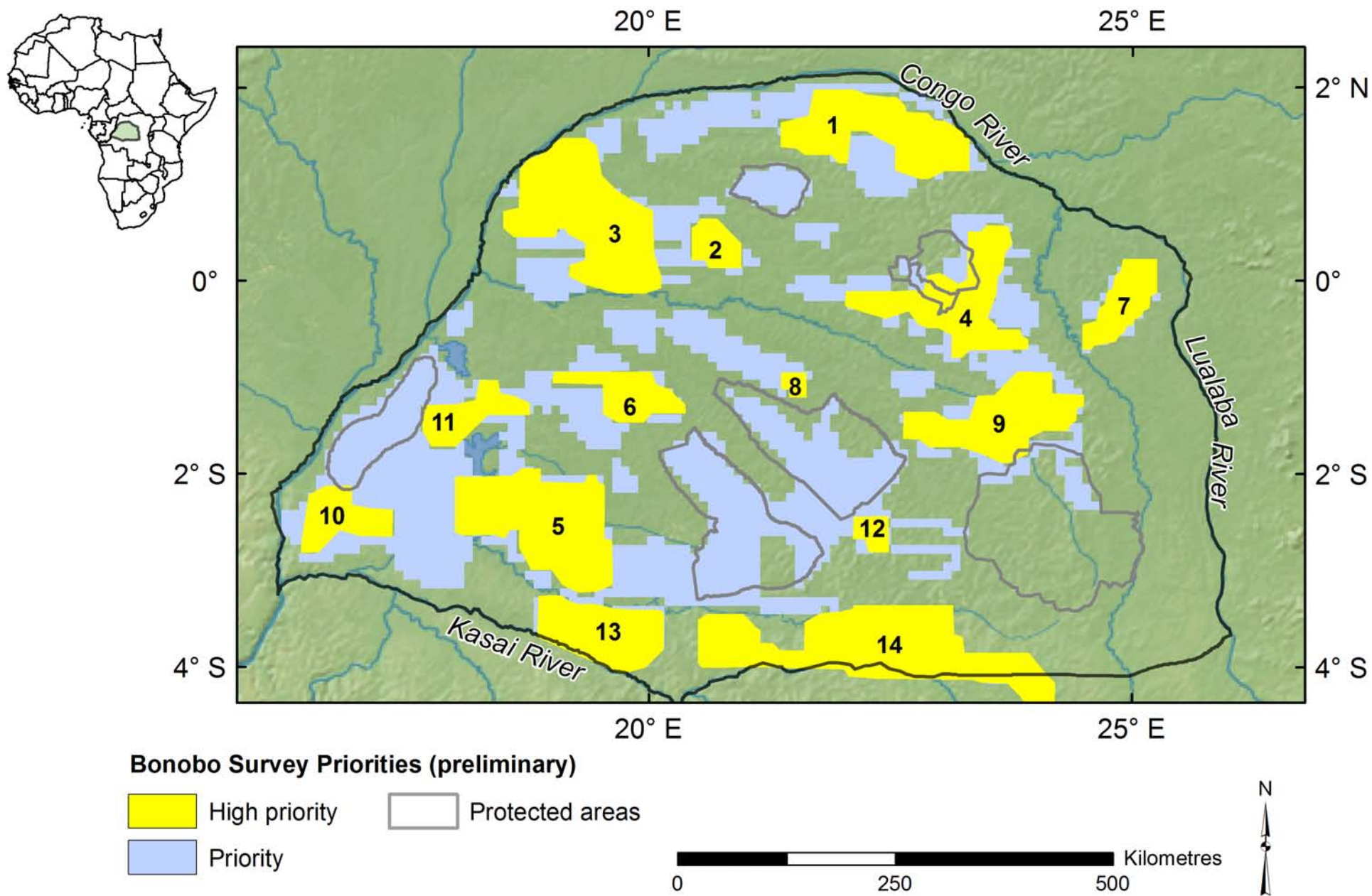


Figure 5. Results of a preliminary assessment of future bonobo survey priorities. 'High priorities' (yellow areas) were selected by two or more respondents, 'priorities' (blue areas) by only one respondent (see Box 1 and Table 2)

Table 2. Bonobo survey priority sites (preliminary)

No	Name	Long	Lat	Size (km²)	Mean response (%)	Criteria
1	Maringa-Lopori-Wamba north	22.372	1.541	12831.93	28.0	<ul style="list-style-type: none"> • Large area • Intact forest • High suitability from model prediction • Adjacent to Lomako
2	Maringa-Lopori-Wamba southwest	20.695	0.369	2639.70	26.6	<ul style="list-style-type: none"> • Anecdotal evidence of bonobo presence from hunters and confiscated orphans • High suitability from model prediction
3	Maringa-Lopori-Wamba Lac-Télé-Lac Tumba	19.368	0.652	18595.57	21.2	<ul style="list-style-type: none"> • Area poorly known • Large area • Intact forest • Confirmed bonobo presence; needs population size estimates • High suitability from model prediction • Anecdotal evidence of bonobo presence from hunters and confiscated orphans
4	Maringa-Lopori-Wamba southeast	23.168	-0.189	11936.71	20.8	<ul style="list-style-type: none"> • Area adjacent to Kokolopori • High suitability from model prediction
5	Lac Mai-Ndombe-Salonga	18.908	-2.520	16890.25	20.4	<ul style="list-style-type: none"> • Previously and historically confirmed bonobo presence in parts of area • Potential link to western populations • Large area • Intact forest • High suitability from model prediction
6	Salonga northwest	19.786	-1.181	4958.70	20.2	<ul style="list-style-type: none"> • Large area • Intact forest • Area unknown • High suitability from model prediction
7	Tshuapa-Lomami north	24.897	-0.225	4785.72	19.2	<ul style="list-style-type: none"> • Adjacent to TL2 • Unsampled • High suitability from model prediction
8	Salonga NP north	21.514	-1.074	761.45	17.5	<ul style="list-style-type: none"> • Large area • Intact forest • Neighbouring Salonga NP population • Unknown area • Potential corridor
9	Sankuru north	23.634	-1.438	11212.22	17.4	<ul style="list-style-type: none"> • Large area • Intact forest • Wamba to the North • Salonga NP Lomela to the West • Possible links between Salonga and TL2 • Area unknown
10	Lac Tumba-Lédira south	16.824	-2.464	4936.30	16.9	<ul style="list-style-type: none"> • Large forest block • Includes vast logging concession (SIFORCO) where baseline data needed • Assessment of suitability of savanna-forest mosaic as bonobo habitat • Confirmed bonobo presence; needs population size estimates
11	Lac Mai-Ndombe north	18.147	-1.390	4553.31	16.2	<ul style="list-style-type: none"> • Confirmed bonobo presence; needs population size estimates
12	Salonga NP southeast	22.318	-2.618	1444.69	14.8	<ul style="list-style-type: none"> • Adjacent to Salonga NP
13	Southern range limit Sankuru Lukenie River	19.522	-3.658	9097.86	9.0	<ul style="list-style-type: none"> • Recently confirmed bonobo presence outside of known IUCN range • Distribution of bonobos poorly known • Potentially new habitats • Large area • Genetic diversity • Potential differences in bonobo ecology
14	Southern range limit	22.384	-3.843	24113.79	8.1	<ul style="list-style-type: none"> • Large area • Sampling extremes of bonobo range • Potentially new habitats • Genetic diversity • Potential differences in bonobo ecology

4. Strategic Action For Bonobo Conservation

4.1 Threat Analysis

Evaluation of the current status of bonobos highlighted the major direct threats to their populations and served as a starting point for elaboration of the conservation strategy. Workshop participants carried out an in-depth analysis of threats, distinguishing between direct threats and underlying factors (indirect threats).

4.1.1 Direct Threats

These are factors that can directly cause the reduction or loss of bonobos. Three direct threats were identified:

1. poaching, the most serious threat to bonobos across their range
2. habitat loss, both in terms of habitat destruction and fragmentation
3. disease transmission, a potential future concern

4.1.1.1 Poaching

Despite being a fully-protected species under DRC law, bonobos are killed, traded and consumed in many parts of their range. Poaching has particularly negative consequences for bonobo population dynamics because bonobos have a very long interbirth interval (average 4.5 years at Wamba, 8.0 years at Lomako, Wich *et al.* 2004), and females do not produce their first infant before 13–15 years old. Thus, it takes many years for a population that has been hunted to recover. Added to this is the fact that the death of an adult female usually results in the death of its dependent infant. The latter is either killed at the same time as its mother or captured alive for sale as a pet.

The most common tools of hunting are snares (generally wire and, increasingly, nylon nooses) and guns (especially shotguns), but automatic rifles, locally fabricated guns and poison arrows are also used (Hart *et al.* 2008). Bonobos moving on the ground are vulnerable to snares. Snaring is particularly destructive for wildlife as it is not selective and animals that manage to escape may be mutilated for life or die from infection.

Poaching of bonobos is often linked to broad-scale commercial hunting to supply urban bushmeat markets, one of the principal threats to wildlife throughout central Africa (Nasi *et al.* 2008; Wilkie *et al.* 2011). Virtually every vertebrate species is taken and vast areas of central African forest have



Poaching for bushmeat trade is the greatest threat to wildlife in DRC. Hunters carrying bushmeat out the forest after it has been preserved by smoking
© Terese Hart

already been emptied of their large and medium-sized vertebrates. As wildlife populations are progressively impoverished, hunters move further and further into remote forest blocks in search of the remaining intact wildlife populations. Access to large vertebrates enables hunters to obtain returns on their investment in terms of hunting effort. Extrapolations of offtake from bushmeat surveys in the bonobo's range reveal highly unsustainable hunting. In TL2, before the imposition of the region's first closed season and efforts to directly combat bonobo hunting, it was estimated that 270 bonobos were killed annually from a hunting catchment of about 12,000 km² to provision over eight bushmeat markets supplying the city of Kindu (Hart & Hart 2011). In the remote Salonga-Lukenie-Sankuru landscape it has been estimated that every day nine tons of bushmeat are extracted from an area of 50,000 km² (Steel *et al.* 2008). Over a 4-month period, field teams uncovered evidence of the killing of 13 bonobo and live trafficking of three orphans. In addition, bonobo meat was found to be for sale on multiple occasions at two markets and two crossing points (Steel *et al.* 2008).

A few exceptions exist where local taboos forbidding the killing and consumption of bonobos have been instrumental in the preservation of specific local populations (Inogwabini *et al.* 2008; Lingomo *et al.* 2009). However, in many areas these taboos are changing rapidly due to years of war and civil unrest, the influx of immigrants, and the near total breakdown of law and order and of previous social norms (Fruth *et al.* 2008).

4.1.1.2 Habitat Destruction and Fragmentation

Most habitat destruction in the bonobo's range has resulted from slash-and-burn subsistence agriculture, which is most intense where human densities are highest and growing. Human settlements are concentrated along the transport and communications network (rivers and roads). This pattern of land use leads to the progressive fragmentation of the forest massif, but with the post-war rehabilitation of infrastructure there will be a considerable increase in habitat loss and degradation with the expansion of such commercial endeavours as industrial logging, agriculture (especially oil palm plantations), mining and oil extraction, that will, besides, fuel and facilitate the bushmeat trade.

Annual forest loss in DRC is low compared to tropical forests in other regions of the world (Hansen *et al.* 2011), although it increased from 0.22% per year for 2000–2005 to 0.25% for 2005–2010 (Potapov *et al.* 2012). Gross forest loss in DRC from 2000 to 2012 totalled 2.3% of forest area, with an increase of 13.8% between 2000–2005 and 2005–2010. The increase has been greatest in primary forest loss, where the rate almost doubled between the two time periods (Potapov *et al.* 2012).

Following the analysis of a suite of factors, including land-use patterns, human activities and habitat suitability, Junker *et al.* (2012) estimated that there has been a 29% reduction in suitable conditions within the bonobo's range since the 1990s. At the rangewide scale, deforestation has been most severe along the extensive river network that serves as the transportation system, because rivers are the primary access route for penetrating into the forests and moving timber and other goods out to urban centres.

4.1.1.3 Disease

The risk of epidemics spreading among wild bonobos is a cause of serious concern. Diseases that pose a risk to bonobos include infectious natural pathogens (e.g., Ebola) and human-borne diseases, such as respiratory ailments. Many diseases and parasites can affect bonobos, including respiratory, gastrointestinal or skin pathogens, which vary in severity from latent to fatal (Cawthon Lang 2010). Despite the absence of direct reports of massive die-offs of bonobos, a highly virulent epidemic (e.g., Ebola Hemorrhagic Fever) could devastate bonobo populations, considering their highly cohesive social structure, and high rates of physical contact amongst group members, resulting in rapid contagion rates across a population. In Gabon and the Republic of Congo, the Ebola virus has caused massive declines in chimpanzee and gorilla populations, with specific areas experiencing up to 90% decreases of their great ape populations (Bermejo *et al.* 2006; Caillaud *et al.* 2006; Huijbregts *et al.* 2003; Leroy *et al.* 2004; Walsh *et al.* 2003). While it is difficult to separate the impact of the epidemics from that of the other threats or to obtain precise pre-post Ebola numbers, Walsh *et al.* (2003) estimated that the Ebola virus was responsible for a decline of about one third of the entire population of gorillas in Gabon.

Human population growth and the resulting increase in hunting means that bonobos and humans are in increasingly close proximity. Disease transmission is also a concern in other situations where bonobos and humans come into close contact: tourism, the habituation of research groups and sanctuaries for orphaned great apes. Disease could be a very serious threat to bonobos, and should be monitored as such.

Box 2. Analysis of Antibodies and DNA using Faecal Samples from Wild Great Apes

With support from the Environmental Research & Technology Development Fund of the Japanese Ministry of the Environment, a research group at the Primate Research Institute (PRI) of Kyoto University has developed new methodologies for detecting variations in DNA and antibodies using faecal samples from wild bonobos. In collaboration with research and conservation groups, faecal samples were collected from bonobo populations at seven sites that cover much of their geographic range: Iyondji, Lac Tumba, Lomako, Malebo, Salonga, TL2 and Wamba. PRI is undertaking analyses of the prevalence of human infectious diseases and genetic structure in each bonobo population. These analyses for screening will contribute to the development of efficient plans for the conservation of wild great ape populations. The research group at PRI would be happy to collaborate with any researchers working towards similar goals or to provide technical advice. Contact Takeshi Furuichi (furuichi@pri.kyoto-u.ac.jp) for further information.

Screening of antibodies for zoonotic pathogens in wild bonobo populations

Infectious diseases, including those transmitted from humans to great apes, are one of the greatest threats to the survival of great apes, with the potential to cause local extinctions. As yet, we do not adequately understand the mechanisms of transmission or know enough about the prevalence of different pathogens in the environment, and it is difficult to establish effective ways to prevent disease transmission. The occurrence of pathogens and frequency of disease outbreaks differ between sites and species of great ape, and may change over time. Respiratory disease outbreaks among the Wamba bonobos have only been observed since the war in Congo (1996–2002), when displaced people and soldiers were moving through the forest. To examine the prevalence of pathogens in wild great ape populations, we have developed new methods for detecting IgA antibodies in faecal samples. A preliminary examination of samples from four bonobo populations found that about one quarter of wild bonobos have specific IgA antibodies for all of the human respiratory viruses that we tested for. Furthermore, there were large inter-site differences in the positive ratio of antibodies detected. While high positive ratios at some sites suggest that disease transmission between humans and bonobos and/or among the bonobo populations is frequent, low positive ratios at other sites indicate that those bonobos are ‘naïve’ to human diseases – that they have had no prior exposure to these viruses and would, therefore, be at greater risk of outbreaks if such viruses entered the population. The required means of prevention of disease transmission may differ for each bonobo population according to the types and prevalence of viruses that occur there. Monitoring of IgA antibodies will help establish effective and efficient guidelines for disease prevention in wild great ape populations. This study (Yoshida *et al.* in prep.) was supported by the Japanese Ministry of the Environment.

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Genetic diversity of wild bonobo populations

Analyses of genetic diversity provide invaluable information for conservation planning with respect to population viability. We have recently developed new methods for detecting DNA in faeces, and were able to analyze samples from seven bonobo populations (see above). A preliminary analysis of mitochondrial DNA (mtDNA) revealed that these populations can be grouped into three clusters: a western cluster that includes Lac Tumba and Malebo, a central cluster that includes Lomako, Wamba, Iyondji and Salonga, and an eastern cluster that includes TL2. While the central cluster showed the largest nucleotide diversity, the eastern cluster had unique haplotypes of mtDNA. While it is important to conserve all bonobo populations, we suggest that it is particularly important to conserve the central cluster for preservation of a wide variety of genes and to conserve the eastern cluster for their unique genes. When we compared the populations, we found that those that are more isolated (Malebo, Wamba and TL2) had the lowest genetic diversity, which suggests that they may face a higher risk of extinction. Analysis of the genetic diversity among various bonobos populations, together with detailed information about their geography and biology, provides an important component in conservation planning and in assessing the value of each subpopulation. This study (Kawamoto *et al.* in press) was supported by the Japanese Ministry of the Environment.

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4.1.2 Indirect Threats

Indirect threats are factors (typically social, economic, political, institutional or cultural) that contribute to the presence or persistence of direct threats. These factors are intimately interconnected and are essentially all linked to the difficult socioeconomic and political contexts in DRC and the problems of weak governance that result from them.

Workshop participants identified the following contributing factors:

4.1.2.1 Bushmeat Trade

The high demand for bushmeat, particularly in urban centres where one third of the Congolese population lives, is one of the most important drivers of the commercial bushmeat trade. The rise in illegal hunting is exacerbated by rapid social change, an increase in demand for meat, and eroding traditional taboos. The economic dynamics of the bushmeat trade are complex and often vary in different areas and contexts; nonetheless, research has shown that a high proportion of urban citizens consume bushmeat. There is a strong cultural attachment to bushmeat in Central Africa in general (Wilkie *et al.* 2005; Nasi *et al.* 2008) and DRC is no exception. In Kinshasa (9 million inhabitants), 28% of households surveyed consumed bushmeat (Mbayma 2008). The high demand for bushmeat in Kinshasa combined with defaunation within a wide radius of the city makes bushmeat expensive and limits consumption by people who have little or no income. A study of bushmeat consumption in Kinshasa confirmed that if their incomes were to increase citizens would prefer to eat more bushmeat (Mbayma 2008). In contrast, in Kindu, where bushmeat is relatively abundant in the surrounding forests, the price of bushmeat was roughly one third to half that of domestic meat (Hart & Hart 2011). The bushmeat trade is highly opportunistic; as human populations shift in response to emerging poles of economic development across the country (e.g., road building, logging and mining), centres of bushmeat activity shift to feed the influx of people who support these labour-intensive industries. Bushmeat in such opportunistic markets is now priced higher than the equivalent in Kinshasa (T. Hart pers. comm.).



[left] A pirogue loaded with bushmeat (antelope, bushpigs, primates) confiscated by ICCN guards in SNP © Gay Reinartz/ZSM

[upper right] Bushmeat market at Basankusu. Women play a significant role in the commercial bushmeat trade, but these vendors have agreed not to sell the meat of bonobos © Awely

[lower right] Shotgun cartridges and the skull of a bonobo killed by poachers © Terese Hart

An adult male bonobo playing with an infant at Wamba
© Takeshi Furuichi



4.1.2.2 Availability of Firearms and Ammunition

The shotgun is the most common weapon used to supply the commercial bushmeat trade. However, 15 years of armed conflict and the collapse of law and order have led to a significant rise in the illegal circulation of military weapons and ammunition, already evident a decade ago (Hart & Mwinyihali 2001) and the situation is worsening. Semi-automatic weapons are commonly used for poaching of elephants and group-living monkeys (notably red colobus), and in DRC roughly 800,000 'small arms' such as Kalashnikovs are thought to be in civilian hands (Killicoate *et al.* 2007). In 2007, the cost of a Kalashnikov was only US\$ 50 (Killicoate *et al.* 2007). These are often dispensed to hunters by middlemen who are directly or indirectly involved in the bushmeat trade. Suppliers include military, police, businessman, local authorities and other well-connected people.

Information collected by ICCN and partners shows that the problem is widespread. Guns are generally used to hunt animals that are large enough to justify the cost of a cartridge; however, the cost of ammunition for military weapons (AK-47, FAL), is often insignificant because much of it has been illegally 'diverted' from official stocks. For example, in Boende (Salonga-Lukenie-Sankuru landscape) a UNESCO/IUCN evaluation mission confirmed the disappearance of 206 crates of ammunition from a military stock, even though it had been placed under police control (Aveling *et al.* 2007).

4.1.2.3 Weak Law Enforcement

Although DRC has an adequate legal framework for managing nature conservation and forestry, it has great difficulty in enforcing its laws. Prosecutions are rarely carried out and there is widespread lack of transparency. With limited political will and severe understaffing, provincial governments struggle to enforce their own environmental regulations. There are many reasons for this, all linked to the difficult socio-political context (e.g., corruption, non-respect of the law, ignorance of the law, impunity, lack of understanding of the implications of conservation, weak stakeholder commitment). Law enforcement agents are often implicated in commercial poaching. Laws may be arbitrarily 'enforced' where, for example, agents have jurisdiction over groups outside their own ethnic lineage. Some people or groups may disregard state-mandated regulations on the premise of self-government or allegiance to conflicting regime.

While it is true that ignorance of the law is widespread (at the level of both local communities and administrative authorities), it is nevertheless a fact that people are often well aware of the law, but choose not to comply with it since they run little risk of punishment. The breakdown of law-and-order during years of conflict, combined with economic insecurity, has exacerbated the problems of non-compliance with the laws.



Deforestation near the town of Djolu in 2004 © Takeshi Furuichi

4.1.2.4 Weak Stakeholder Commitment

Workshop participants identified two groups of provincial stakeholders: administrative authorities and local communities. In the case of administrative authorities, lack of motivation, inconsistent application of the law, corruption and inadequate professionalism are caused in part by poor working conditions (salaries, resources), insufficient training, ethnicity/kinship loyalties, absence of monitoring, nonexistence of accountability and poor understanding of conservation problems.

In the case of local communities, weak commitment is more likely to be due to poverty, lack of subsistence alternatives, and poor understanding of the long-term consequences of failed conservation. In some areas there is still a legacy of giving bonobos or other Endangered species as special gifts to honour dignitaries.

4.1.2.5 Logging

Workshop participants highlighted three types of logging:

Artisanal: this is low-technology cutting and processing of trees (using chainsaws, axes and machetes) for domestic energy (firewood, charcoal) and timber for construction (planks, beams sawn by hand or chainsaw). Logs are typically felled and cut by pit-sawyers to transport in pieces, often in association with clearing for agricultural purposes. Given the low human densities in rural areas, this type of forest exploitation would conceivably have a very low impact in much of the bonobo's range. Rural populations harvest timber this way in forest areas owned under traditional law. According to a 2011 report, whilst there is a moratorium on new concessions, artisanal logging permits have proliferated⁴. Theoretically these are for relatively small areas and to supply the national market; however, there are known cases where such permits have been abused to carry out industrial-scale logging.

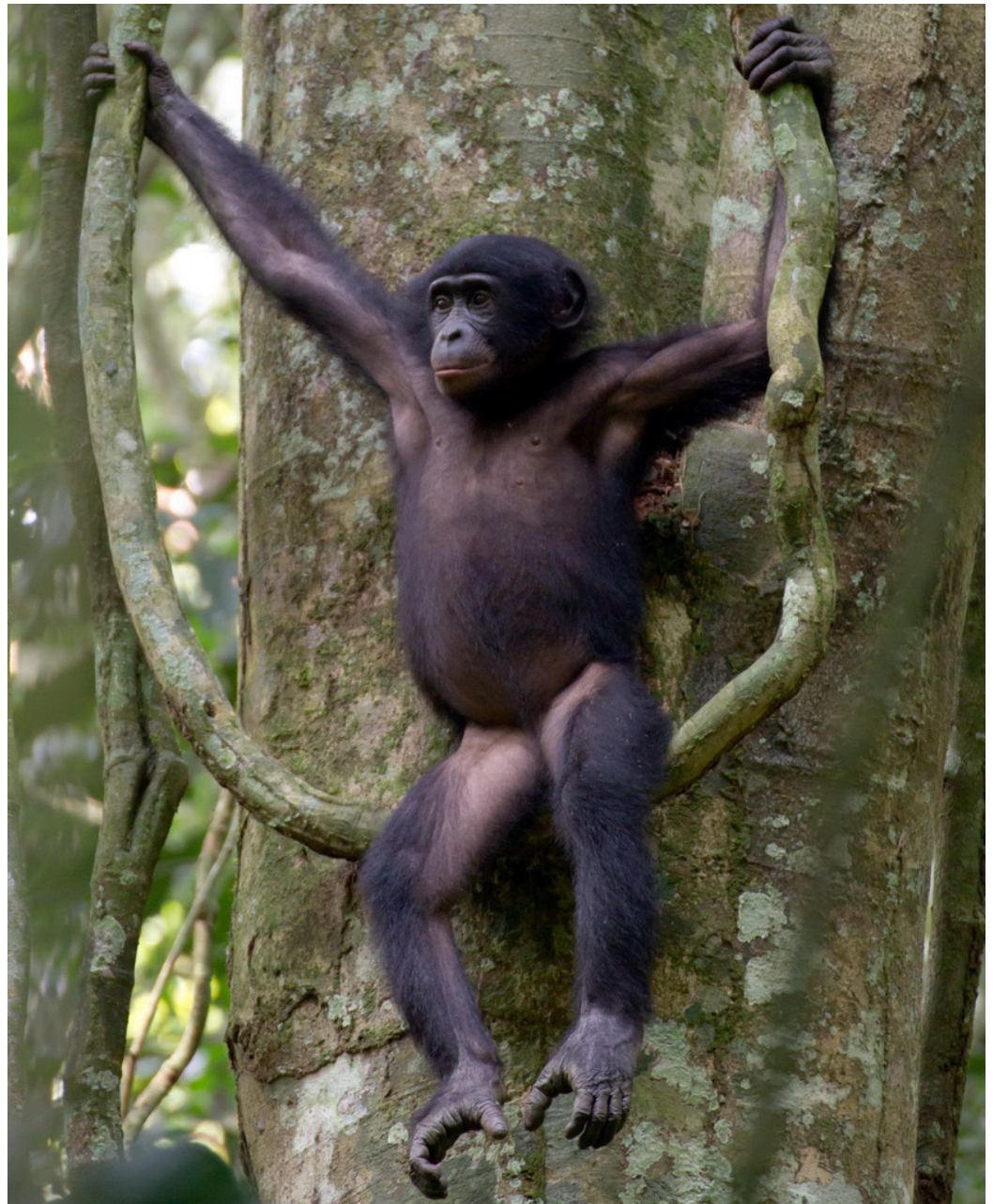
Although no empirical data were available, the perception drawn from the workshop exercise (see Section 4.2) was that this activity is widespread (4.25 on a scale of 1–5) and corresponds to areas of human occupation. Since transport of logs requires road or river access, the overall impact of artisanal logging may decline with distance from access routes and human centres. The magnitude of the halo of deforestation around towns and cities is in direct proportion with the number of inhabitants.

⁴ <http://www.foresttransparency.info/drc/news/578/artisanal-logging-permits/>

Legal industrial logging: forest concessions have a significant impact on bonobos and their habitat. The opening up of logging roads linked to the navigable river superhighway allows hunters to rapidly penetrate far into the forest. People settle along logging roads and their slash-and-burn agriculture intensifies forest fragmentation. Additionally, job opportunities created by the logging companies attract people seeking work into the forest, for direct employment with the logging companies, supply services and commerce. Immigration in turn stimulates local demand for forest products, particularly bushmeat. The recent lifting of the ban on extension of forest harvesting to industrial logging prompted Greenpeace International to write a letter to the World Bank Group denouncing its recommendation to officially lift the moratorium on the allocation of logging concessions as soon as the technical criteria from the Presidential Decree 05/116 of 24 October 2005 are considered to have been fulfilled⁵.

Illegal industrial logging: the well-known negative impacts of legal logging are even greater in the case of illegal logging, since legal dispositions (forest management plans, social responsibilities) are not respected. This can lead to excessive levels of timber extraction (quantity, quality, species), unplanned road networks, and little or no control over the activities of people living in the area (such as poaching and agriculture). Furthermore, illegal operators rely on bushmeat to feed their

A juvenile male bonobo at Wamba © Takeshi Furuichi



⁵ http://www.globalwitness.org/sites/default/files/library/21%20February%20WB%20letter_English.pdf

personnel and poaching quickly becomes a commercial activity. However, to date there is no direct evidence of illegal industrial logging activity in the bonobo's range.

4.1.2.6 Mining and Petroleum (Oil and Gas)

In 1955–1956 oil exploration was at its pre-independence peak in DRC. Mining and oil extraction activities are not new to the bonobo landscape; deep drilling has taken place at four sites in the 'Cuvette Centrale' of Equateur and Bandundu. In the past decade there has been a resumption of petroleum/oil industry activities within the bonobo's range, and in 2007, the DRC oil ministry committed to resume oil exploration activities in the territory of Dekese, south of SNP and north of the Lukenie River. A recent report shows that concessions have already been attributed in critical bonobo habitat (ICG 2012). Although prospection in the Central Basin is not yet allowed, the granting of an oil exploration permit in Virunga National Park (a World Heritage Site), sets a worrying precedent.

4.1.2.7 Infrastructure

Paralleling the build-up of industrial natural resource extraction, large-scale infrastructure development not only has a large impact in terms of environmental degradation and habitat fragmentation, but also plays a prominent role in facilitating the trafficking of bushmeat. Currently, infrastructure in DRC is virtually nonexistent. Most goods are transported by air. Although there are an estimated 157,000 km of roads in the country, most of them are poorly maintained and there are no major paved roads connecting the regions of the country. The national road network is targeted for rehabilitation as part of the national development plan, and this will lead to an increase in settlements along the newly accessible roads. This could bring about a massive increase in the bushmeat trade and other forest products, particularly illegally-extracted timber.

Though to date few projects have been undertaken across the whole country and none within the bonobo's range, the momentum shown by recently-signed development projects and those already underway signals a likely threat in the foreseeable future. A number of resources-for-infrastructure deals have been signed (and more are expected) between the DRC government and investors from the natural resource sector. In September 2007, China signed its largest single deal in Africa with the DRC: a US\$ 5 billion loan to develop infrastructure, mining, bioenergy, forestry and agriculture. This will provide an enormous road and rail network that is likely to facilitate movement of bushmeat out of the central forest block to densely populated centres. Most prominently, the China Railways Engineering Company has launched a large-scale infrastructure programme, with no mention of Environmental and Social Impact Assessments for either the mining or infrastructure components of this agreement.

4.1.2.8 Insufficient Subsistence Alternatives

Poverty and a lack of economic alternatives trap local communities into subsistence livelihoods based on exploitation of natural resources. This exploitation, whether slash-and-burn agriculture, hunting or use of other NTFPs, tends to be unsustainable as few local communities have the technical and financial means to improve their practices or change their activities.

4.1.2.9 Human Population Growth

The annual human population growth rate in DRC is estimated at 2.6% (UNDP 2011), which leads to a doubling of the population every 35–40 years. In the context of widespread poverty and breakdown of state services, this growth intensifies the negative impacts on bonobo habitat due to deforestation, exploitation, and unsustainable use of natural resources. However, workshop participants considered population growth to be an issue that they could not address within the framework of this conservation strategy. Nonetheless, it is important to note that population growth is happening now and there seems to be nothing done to address this omnipotent and escalating threat, as all other factors are intensified by the human population increases.

4.1.2.10 Commercial Agriculture

DRC is home to the world's second largest old growth tropical rainforest – an invaluable biodiversity hotspot and a carbon sink. Old growth forests have become bargaining chips in global climate negotiations and the impact of REDD+ promises to intensify as demand for palm oil products

continues to escalate. The development of oil palm plantations is a major cause of rainforest destruction in Malaysia and Indonesia, and now global agricultural companies based in the Far East have their sights set on the DRC.

A rush into the biofuel sector would further threaten this fragile ecosystem (Fitzherbert *et al.* 2008; Senelwa *et al.* 2012). As China moves aggressively into the biodiesel industry, their ZTE Agribusiness Company Ltd has received approval to develop a large oil palm plantation in DRC. The DRC government has identified bioenergy and biofuel production as a priority area for industrialization and has reiterated a determination to uphold cooperative ties with China.

Aerial view showing forest clearing for cultivation typically within 1 km of roads © Takeshi Furuichi



4.2 Threat Ranking

Four working groups, each focusing on one of the bonobo strongholds, undertook a ranking exercise to assess the scope, severity and reversibility of each of the threats identified as follows:

Spatial scope: Defined as the proportion of the bonobo's range likely to be negatively impacted by the direct and indirect threats.

Severity: Defined as the level of impact of the direct and indirect threats.

Reversibility: Defined as the capacity to recover from the effects of the direct and indirect threats.

The criteria used for ranking spatial scope, severity and reversibility were as follows:

Value	Spatial scope	Level of impact (severity)	Reversibility (capacity to recover)
0	Absent	No impact or minimal	Easily reversible
1	< 25%	Moderately degrades	Reversible if there is enough commitment
3	25–75%	Seriously degrades	Reversible but with great difficulty
5	> 75%	Completely destroys or eliminates	Not reversible

Lac Tumba

Threats	Spatial scope	Level of impact	Score	Reversibility
Direct threats				
Poaching	3	3	6	3
Habitat loss	5	3	8	3
Disease	5	3	8	3
Indirect threats				
Bushmeat trade	5	3	8	1
Availability of guns and ammunition	5	3	8	3
Agricultural expansion	3	3	6	3
Legal industrial logging	5	3	8	1
Illegal industrial logging	3	3	6	3
Artisanal forest exploitation (charcoal, timber)	5	3	8	3
Lack of law enforcement	5	1	6	3
Ignorance of the law	5	3	8	1
Non-respect of the law	5	3	8	1
Lack of understanding of conservation issues	5	3	8	1
Lack of commitment by local administrative authorities	1	3	4	1
Lack of commitment by stakeholders (local communities)	5	3	8	1
Insufficient subsistence alternatives	5	5	10	3
Development of communications infrastructure (roads, railways)	1	3	4	3
Human population growth	5	1	6	3

Salonga

Threats	Spatial scope	Level of impact	Score	Reversibility
Direct threats				
Poaching	5	3	8	3
Habitat loss	1	1	2	0
Disease	1	1	2	0
Indirect threats				
Bushmeat trade	5	3	8	3
Availability of guns and ammunition	5	3	8	3
Agricultural expansion	1	3	4	1
Legal industrial logging	3	3	6	3
Illegal industrial logging	1	1	2	1
Artisanal forest exploitation (charcoal, timber)	1	3	3	1
Lack of law enforcement	5	3	8	3
Ignorance of the law	3	3	6	3
Non-respect of the law	3	3	6	3
Lack of understanding of conservation issues	5	3	8	3
Insufficient commitment by local administrative authorities	3	3	6	3
Insufficient commitment by stakeholders (local communities)	3	1	4	1
Insufficient subsistence alternatives	3	3	6	3
Development of infrastructure networks (roads, railways)	1	1	2	3
Human population growth	3	3	6	3

Sankuru-TL2

Threats	Spatial scope	Level of impact	Score	Reversibility
Direct threats				
Poaching	5	3	8	3
Habitat loss	1	3	4	5
Disease	1	1	2	0
Indirect threats				
Bushmeat trade	5	5	10	3
Availability of guns and ammunition	5	5	10	3
Agricultural expansion	3	3	6	3
Legal industrial logging	1	1	2	1
Illegal industrial logging	0	0	0	0
Artisanal forest exploitation (charcoal, timber)	0	0	0	0
Lack of law enforcement	3	5	8	1
Ignorance of the law	3	1	4	0
Non-respect of the law	3	3	6	3
Lack of understanding of conservation issues	3	1	4	1
Insufficient commitment by local administrative authorities	1	1	2	1
Insufficient commitment by stakeholders (local communities)	3	1	4	3

Table, Sankuru-TL2, continued on next page

Table, Sankuru-TL2, continued from previous page

Threats	Spatial scope	Level of impact	Score	Reversibility
Insufficient subsistence alternatives	5	1	6	1
Development of infrastructure networks (roads, railways)	1	3	4	5
Human population growth	3	1	4	3

Maringa-Lopori-Wamba

Threats	Spatial scope	Level of impact	Score	Reversibility
Direct threats				
Poaching	5	3	8	3
Habitat loss	1	3	4	5
Disease	5	1	6	3
Indirect threats				
Bushmeat trade	5	3	8	3
Availability of guns and ammunition	5	3	8	3
Agricultural expansion	1	5	6	3
Legal industrial logging	1	5	6	1
Illegal industrial logging	1	1	2	3
Artisanal forest exploitation (charcoal, timber)	5	1	6	5
Lack of law enforcement	5	5	10	3
Ignorance of the law	5	3	8	1
Non-respect of the law	5	3	8	3
Lack of understanding of conservation issues	5	3	8	3
Insufficient commitment by local administrative authorities	5	5	10	1
Insufficient commitment by stakeholders (local communities)	3	5	8	1
Insufficient subsistence alternatives	5	3	8	3
Development of infrastructure networks (roads, railways)	0	0	0	0
Human population growth	5	3	8	3



Typical bonobo habitat: mixed mature forest with *Haumania* understorey © Gay Reinartz/ZSM

Summary (averages) for the four blocks

Threats	Salonga	Sankuru-TL2	Maringa-Lopori-Wamba	Lac Tumba	Average for spatial scope and level of impact	Average for reversibility
Direct threats						
Poaching	8	8	8	6	7.5	3
Habitat loss	2	4	4	8	4.5	3.3
Disease	2	2	6	8	4.5	1.5
Indirect threats						
Bushmeat trade	8	10	8	8	8.5	2.5
Availability of guns and ammunition	8	10	8	8	8.5	3
Lack of law enforcement	8	8	10	6	8	2.25
Insufficient subsistence alternatives	6	6	8	10	7.5	2.5
Non-respect of the law	6	6	8	8	7	2.5
Lack of understanding of conservation issues	8	4	8	8	7	2
Ignorance of the law	6	4	8	8	6.5	1.75
Insufficient commitment from stakeholders (local communities)	4	4	8	8	6	1.5
Agricultural expansion	4	6	6	6	5.5	2.5
Insufficient commitment from local administrative authorities	6	2	10	4	5.5	1.5
Legal industrial logging	6	2	6	8	5.5	1.5
Human population growth	6	3	8	6	5.8	3
Artisanal forest exploitation (charcoal, timber)	3	0	6	8	4.25	2.25
Illegal industrial logging	2	0	2	6	2.5	1.75
Development of infrastructure networks (roads, railways)	2	4	0	4	2.5	2.75

Direct threats

- Poaching is without question the most serious threat in terms of spatial scope and level of impact (7.5). Its impact is reversible but only with great difficulty and several decades of bonobo population recovery (3);
- Habitat loss is currently lower in terms of spatial scope and level of impact (4.5), but it will be difficult to reverse, especially when caused by industrial agriculture, mining or human settlements, none of which are easily removed once installed (3.3);
- At the present time, disease has a low spatial scope and level of impact (3.5) and is considered to be more easily reversible (1.5). Given that known impact to date has been limited, disease is seen more as a *potential* threat.

Indirect threats (contributing factors)

- I. The bushmeat trade and the proliferation of guns and ammunition are the two most important indirect threats. Both are considered reversible but will require enormous effort.
- II. Issues of law enforcement and knowledge of the law are important contributing factors. Law enforcement is extremely weak and, globally, DRC is one of the lowest ranking nations on all *World Governance Indicators* (World Bank 2012) and on the *Corruption Perceptions Index* (Transparency International 2011). Non-respect of the law and ignorance of the law were both scored highly.
- III. The difficult socioeconomic context, in particular the absence of subsistence alternatives, has a strong influence on levels of threat, driving people to turn to unsustainable activities such as poaching, the bushmeat trade, and slash-and-burn agriculture. This situation is reversible, but would be difficult to change in the current context.
- IV. The weak commitment of stakeholders at the local level is undoubtedly linked to lack of understanding of the law, the absence of subsistence alternatives and lack of understanding of conservation issues. Although the spatial scope and level of impact are relatively high, they are nevertheless considered reversible with sufficient commitment (1.5). This would require compelling awareness-building efforts and funding of alternative livelihood projects.
- V. The weak commitment of local administrative authorities appears to vary regionally. Although the reasons for this variability are not clearly understood, participants considered that weak commitment could be reversed with enough effort (1.5).
- VI. Industrial logging (both legal and illegal) is generally considered to be a moderately severe threat. Currently the impact of logging is greatest in the Lac Tumba region, due to easy river access for transporting timber to Kinshasa. This situation is considered reversible if sufficient effort is made (1.5 to 1.75), such as proactive closing of logging roads, rehabilitation of natural vegetation, and allowing long recovery times between logging cycles.

Overall, none of the threats are considered totally irreversible, although it will be difficult to mitigate the majority.

In conclusion, the ranking exercise clearly shows that poaching is by far the most important direct threat to bonobos. Reducing bonobo mortality caused by poaching should therefore be the highest priority for this conservation strategy. Although there is agreement that habitat loss and disease are likely to become more important threats in the future, the ranking of the various threats was different in each stronghold, which means that the appropriate strategies will need to take into consideration the local context. Areas where habitat loss to agriculture is occurring are necessarily close to human settlements, and it is likely that great apes in those areas have already been hunted out. Human population growth, agricultural expansion and the likelihood of logging and mining development in the bonobo's range will all make the threat of habitat loss an important consideration in the near future.

4.3 Conceptual Models

Conceptual models in the form of flowcharts are a useful way of understanding the relationships between direct threats and their contributing factors (indirect threats). Combined with threat-ranking exercises, conceptual models can be used to identify entry points for intervention strategies that will reduce the impacts of the threats.

Conceptual models for the three direct threats to bonobos are presented in Figures 6a–c.

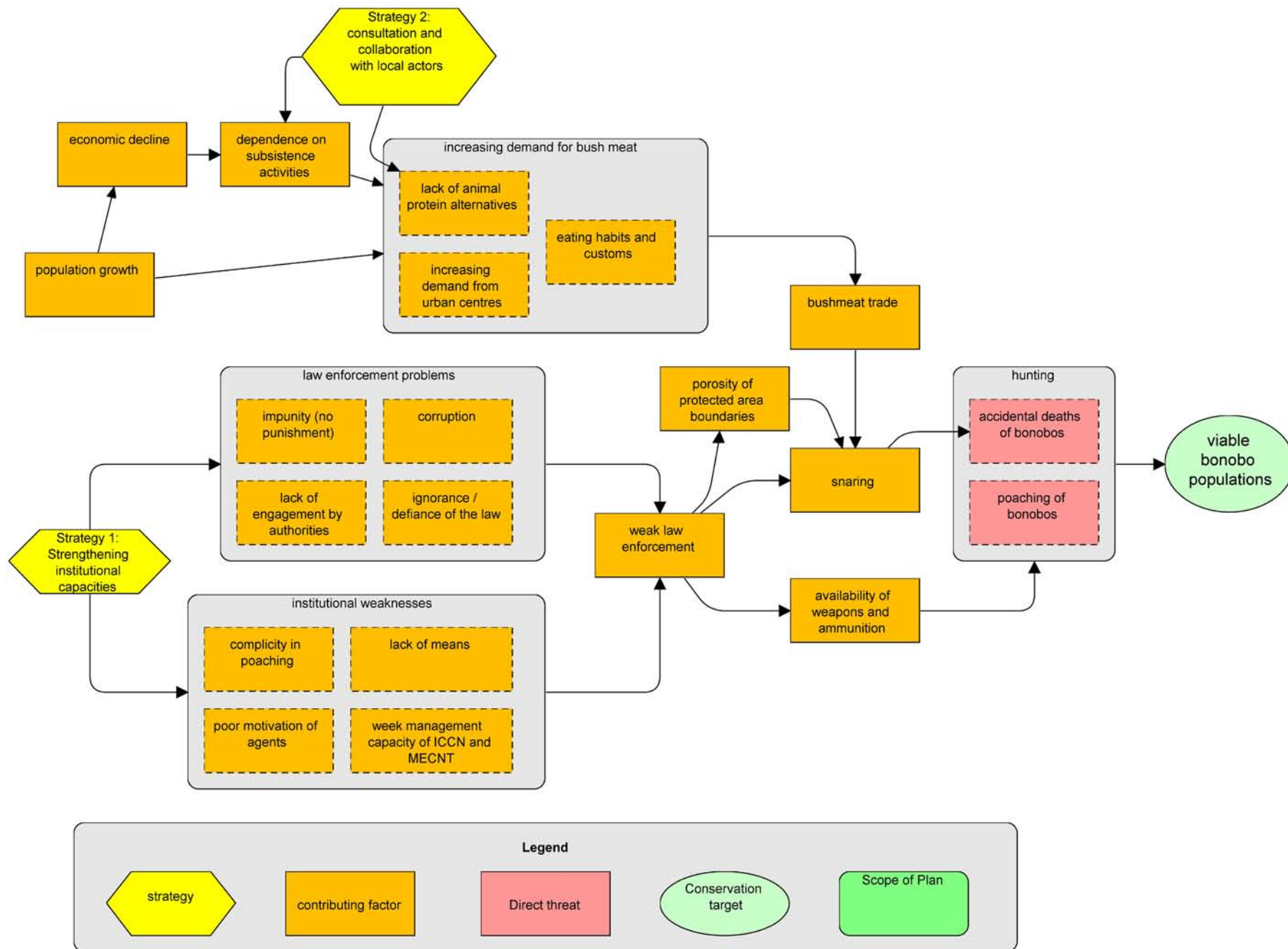


Figure 6a. Poaching model



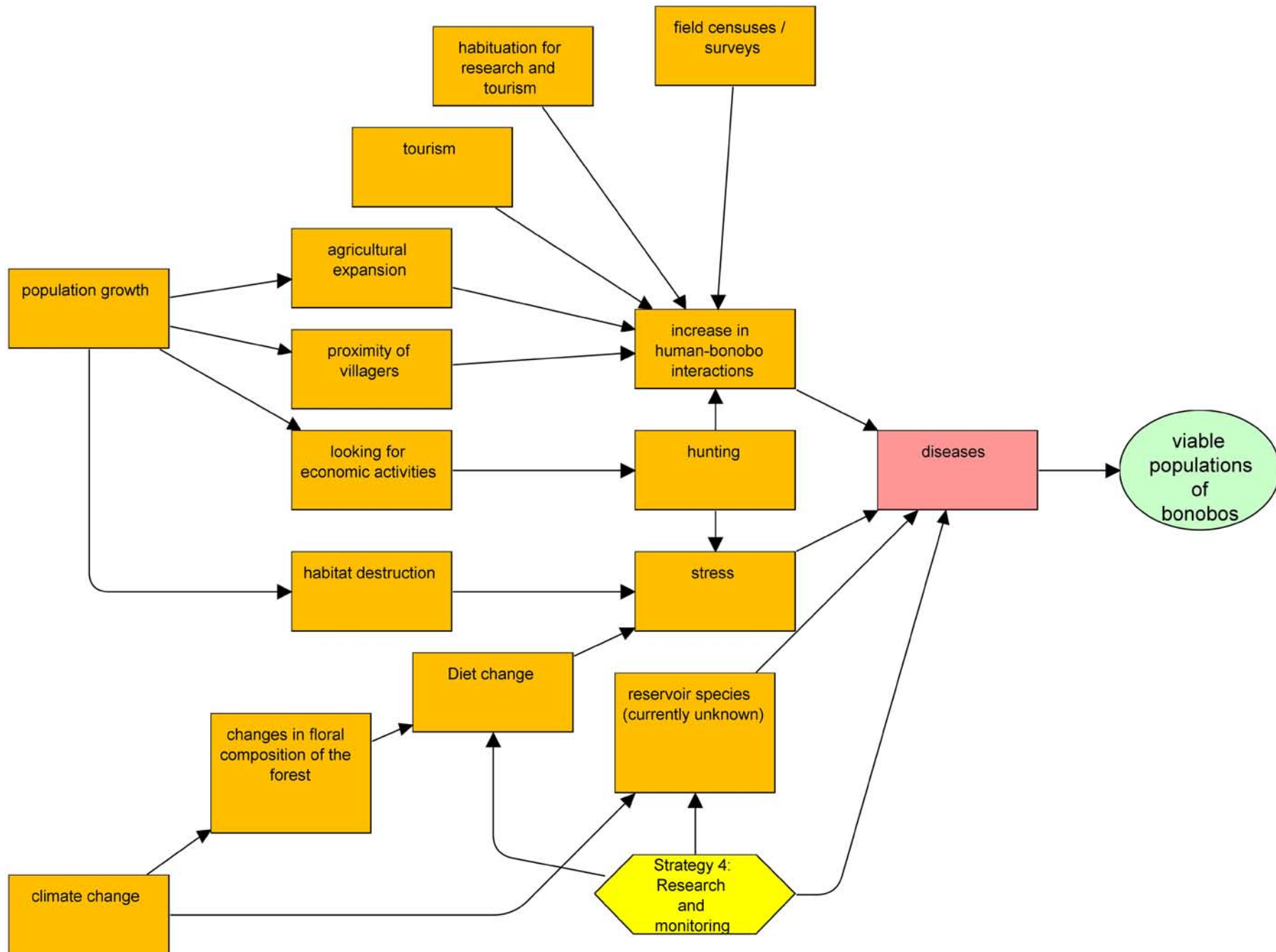


Figure 6c. Disease model

4.4 Vision and Goal of the Conservation Strategy

An over-arching Vision is an inspirational and relatively short statement that specifies the desired status of a species (including range, ecological role and relationship with humans) over a given period (which should be long-term, typically 30–40 years). A Goal describes what can be realistically achieved in the medium-term (typically 5–10 years). The following Vision and Goal were developed by the workshop participants:

Vision

By 2050, bonobo populations across their range are viable and increasing relative to 2008–2015 surveys, face minimal threats, and their long-term survival is ensured.

Goal

By 2022, priority areas for bonobo conservation⁶ are effectively managed and protected, the current main threats are reduced, there is no further habitat loss, and known bonobo populations are stable relative to baseline surveys.

4.5 Intervention Strategies and Objectives

The threat analysis and conceptual models enabled a series of entry points to be identified where strategies could be developed to tackle the contributing factors and thus reduce the impacts of the threats. The entry points are indicated by yellow hexagons in the conceptual models.

The threat-ranking exercise highlighted the importance of illegal activities (poaching, bushmeat trade, circulation of guns and ammunition) and the problems of poor law enforcement (tainted by a lack of political will and widespread corruption). Therefore, a strong emphasis was placed on intervention strategies that would improve law enforcement and create a real deterrent for the perpetrators of wildlife-related crimes. Law enforcement has a greater chance of succeeding if stakeholders are informed, convinced of the need for it and fully aware that there are real risks to law breaking. For this reason, as it will also be necessary to develop awareness-building strategies targeting the different groups of stakeholders, including high profile media coverage of all arrests and sentencing of traffickers, dealers and poachers of bonobos and other protected species.

Finally, bonobo conservation activities must be conducted over the long-term and sustainable sources of funding must be secured. To achieve this, workshop participants proposed five main intervention strategies:

- Strengthening institutional capacity
- Consultation and collaboration with local actors
- Awareness building and lobbying
- Research and monitoring activities
- Sustainable funding

The following tables present priority actions needed for each strategic objective. Due to time constraints during the workshop, participants did not elaborate detailed projects and activity plans for the specific objectives. This will be done once the mechanism for coordination is in place.

4.5.1 Strategy 1 Strengthening Institutional Capacity

This strategy addresses the fundamental problem of weak capacity for law-enforcement and for ensuring conservation of the habitat. On the one hand, conservation and forest management legislation in DRC is generally sound but poorly applied for various reasons (inadequate human, technical and financial resources, poor governance, corruption, lack of political will, ignorance of the law). On the other hand, the human, administrative, infrastructure and financial resources needed

⁶ PAs and other key areas in the four strongholds and eventually newly-discovered viable populations outside the strongholds

to ensure protection of bonobos and their habitat are inadequate (weak capacity for PA management and almost nonexistent management and protection of biodiversity outside PAs).

The objectives of this intervention strategy focus on significantly reducing poaching and trafficking of bonobos and other protected species, better control over the illegal circulation of guns and ammunition, and strengthening biodiversity conservation in PAs and forest concessions.

Strategy 1: Strengthening institutional capacity

Strategic objectives	Priority actions	Priority level Moderate ★ High ★★ Very high ★★★
S1/O1 By 2022, poaching within PAs is significantly reduced and bonobo densities are stable or increasing, compared to baseline surveys*	Strengthening capacities of PA staff for more effective antipoaching. This will include: <ul style="list-style-type: none"> • training • provision of equipment and infrastructure • establishment of effective, adaptive and targeted actions within PAs (patrols, intelligence network) and surrounding areas (intelligence network, road and river mobile patrols) • provision of motivating working conditions • auditing of implementation to ensure compliance by antipoaching staff (LEM) 	★★★
	Establish system to ensure that poachers, traffickers, and gun and ammunition suppliers (see also S1/O4 below) are properly sanctioned by the judiciary system: <ul style="list-style-type: none"> • train, equip and motivate political and administrative authorities • ensure coordination and synergies between relevant authorities (administration, police, military, justice) • ensure follow-up of cases • ensure wide media coverage of all cases leading to arrest and sentencing of wildlife criminals 	★★★
S1/O2 By 2022, the PA network shelters 90% of bonobos** and the full range of their ecological diversity	Support completion of the administrative process for gazetting of the proposed national park within the 'Eastern block'	★★★
	Conduct the necessary surveys and scientific research that underlie and guide decisions on the best placement, size, design, habitat and ecological context of PAs so that bonobos have long-term access to the full spectrum of ecological needs for a self-sustaining population	★★★
	Assess where new PAs would be most effective in terms of (i) absolute size of additional bonobo population protected (ii) connectivity to existing PAs containing significant numbers of bonobos and (iii) probability of new PAs being effective over a timescale of 100 years into the future	★★★
	When priority areas for bonobos have been identified, initiate consultation and participatory processes with local (neighbouring communities, traditional and administrative authorities) and national stakeholders to achieve recognition and formalization of the legal status of new PAs	★★★
S1/O3 By 2016, measures to control and monitor the illegal bushmeat trade in priority bonobo areas*** have been established and are showing a steady decline in the occurrence of bonobos in the trade	Support relevant local authorities (police, army, MECNT) to a) effectively combat poaching and commerce of protected species and illegal bushmeat; b) ensure judicial follow-up of cases where authorities are involved in wildlife-related crime	★★★
	Support effective law enforcement activities targeting transport networks for bushmeat, arms, munitions and sale of illegal hunting tools	★★★
	Produce reliable baseline data on bonobo occurrence in the bushmeat trade and monitor trends over time	★★★

Table, Strategy 1, continued on next page

Table, Strategy 1, continued from previous page

Strategic objectives	Priority actions	Priority level Moderate ★ High ★★ Very high ★★★
S1/O4 By 2018, the illegal circulation of guns and ammunition in PAs and their buffer zones is eliminated	Support mixed operations (FARDC, ANR, PNC, ICCN) to recover guns and ammunition held illegally and dispose of them appropriately so that they cannot be used for poaching; support the law enforcement efforts needed to apprehend illegal holders and the judicial process to secure effective prosecution of cases	★★★
	Undertake sensitisation and lobbying campaigns for effective enforcement of legislation regarding the carrying of firearms and ammunition (see also Strategy 3), including supporting efforts to census legal holders of hunting weapons	★★
	Organise sensitisation campaigns for voluntary handover of illegally-held weapons and ammunition, and compliance with regulations for shotguns	★★
S1/O5 By 2016, logging companies in the bonobo range are implementing management plans that secure effective protection of bonobos and other protected species	Identify both legal and illegal logging companies operating in the bonobo range and assess their activity status; lobby for immediate halt of illegal activities	★★★
	Ensure that measures identified for wildlife management and conservation of protected species in the forest management plans of logging companies are clearly stated in specific internal company regulations, are applicable, implemented and effective	★★★
	Support MECNT Conservation Department to implement sustainable forest management plans (financial support from logging companies, technical support from NGOs)	★★★
	Provide technical expertise to logging companies to ensure adequate baseline data collection and follow-up surveys to monitor the impacts of logging operations on bonobos within concessions	★★★

* preferably carried out between 2008 and 2015

** as identified by the modelling group and eventually found in other areas identified as having suitable conditions for bonobos

*** across the four strongholds, giving priority to the trade of bushmeat originating from protected areas

4.5.2 Strategy 2 Consultation and Collaboration with Local Actors

Local actors are the people and their traditional and governmental representatives living close to bonobos. These are key actors with whom it is essential to engage, since many of the threats identified result from their activities (poaching, bushmeat trade, forest clearance). This strategy should target interventions that encourage local actors to support bonobo conservation within the framework of sustainable development initiatives. Clearly this strategy cuts across all interventions whose success can only be achieved if they are developed in consultation and collaboration with the local actors.

Although it is beyond the scope of this plan to resolve the socioeconomic problems of local communities living in the bonobo's range, it is nevertheless possible to design targeted interventions in collaboration with local actors that will reconcile local issues and bonobo conservation. Land-use and zoning plans are important first steps and will set the framework for initiatives such as improved agricultural techniques, sustainable use of NTFPs and the development of alternative sustainable activities to encourage bonobo protection.

Another important actor with a considerable impact on conservation is the Congolese army. It is widely known that there is military involvement in the circulation of weapons and commercial poaching in DRC. Consultation and collaboration with this actor (also treated under Strategy S1/O4) is crucial to restore the enforcement of national laws. At the same time, advocacy at the highest levels is needed so that sanctions will be imposed upon those implicated in commercial poaching.

Strategy 2: Consultation and collaboration with local actors

Strategic objectives	Priority actions	Priority level Moderate ★ High ★★ Very high ★★★
S2/O1 By 2015, land-use and macro-zoning plans developed for the four strongholds that reconcile the development aspirations of local populations with the long-term preservation of viable bonobo populations	Identify priority areas for land-use and macro-zoning plans	★★★
	Gather ecological, social and economic data for the zones in question	★★★
	Elaborate and implement a public participation strategy	★★
	Elaborate land-use and macro-zoning planning in collaboration with all local stakeholders (provincial government services, NGOs, private sector)	★★
S2/O2 By 2022, targeted sustainable alternative activities have resulted in increased local support and decreased pressure on bonobos (as demonstrated by surveys and monitoring) in the four strongholds	Elaborate a strategic plan supporting activities aimed at improving the sustainability of subsistence activities. The plan should identify: <ul style="list-style-type: none"> • selection criteria for priority sites in the four strongholds • intervention methods (e.g., improving agricultural techniques, development of agricultural and other NTFPs, ways to improve access to markets, appropriate social interventions) • monitoring indicators • projects to be implemented 	★★★
	Support project implementation and monitor impacts on local attitudes and behaviour towards bonobo conservation, and on bonobo numbers	★★
S2/O3 By 2018, bonobo conservation issues are integrated into national development plans (and local/provincial management plans)	Promote establishment of a mechanism that allows the systematic involvement of ICCN/MECNT in inter-ministerial consultations relating to national development plans in the bonobo range. In particular there should be regular consultation with the Ministries of: <ul style="list-style-type: none"> • Infrastructure, Public Works and Reconstruction (particularly “Pro-routes”) • Agriculture • Decentralisation and Land-use • Planning • Environment • Defence • Justice 	★★
	Maintain a permanent dialogue with independent investors (agriculture, logging, mining) operating in the bonobo range to ensure that bonobo conservation issues are taken into consideration	★

4.5.3 Strategy 3 Public Awareness and Lobbying

Ignorance and non-respect of the law, together with poor understanding of conservation issues, are threats that can be addressed through wide-reaching public-awareness campaigns and lobbying of decision-makers. The four main targets are:

- State institutions whose decisions more-or-less directly affect the protection of bonobos (Justice, Infrastructure, Defence, Environment, Agriculture, Education), at national and regional levels
- Local communities and their representatives
- Urban dwellers who consume forest resources
- Private investors operating in the bonobo's range (logging, agriculture, mining, transport and communications)

Given the scale of intervention necessary, in terms of geographic scope and the range of targets it is essential that this strategy makes use of the skills of all actors involved in bonobo conservation. This will require the creation of partnerships to implement the various components of this strategy. Indeed public awareness (sensitization) is a key component of almost every bonobo conservation project currently active. The association *Amis des Bonobos du Congo* is a notable in this domain. *Lola ya Bonobo*, the bonobo sanctuary in Kinshasa, welcomes more than 20,000 visitors (school children and other citizens) every year. Additional public awareness and lobbying activities are covered by Strategy 2 (consultation and collaboration with local actors).

Strategy 3: Public awareness and lobbying

Strategic objectives	Priority actions	Priority level Moderate ★ High ★★ Very high ★★★
S3/O1 By 2014, a detailed nationwide intervention strategy to increase public awareness and support bonobo conservation has been developed	Elaborate intervention strategy in consultation with all conservation actors. The strategy should identify: <ul style="list-style-type: none"> • targets • objectives for each target • intervention methods for each target • implementing partners • a budget • a monitoring plan to measure impacts of the interventions 	★★★
S3/O2 By 2018, implementation of the strategy targeting buffer zones around PAs results in increased support for bonobo conservation*	<ul style="list-style-type: none"> • Establish local partnerships to implement activities, including training of teams, an environmental programme, and targeted campaigns (as defined in the strategy) • Support development and production of appropriate materials for the target audience (schoolbooks, posters, films, plays, etc.) • Monitor results with pre and post surveys of awareness/ attitudes and how they relate to bonobo presence in bushmeat markets 	★★★
S3/O3 By 2016, implementation of the strategy targeting urban populations results in increased support to bonobo conservation**	<ul style="list-style-type: none"> • Establish partnerships for implementation of activities in accordance with S3/O1 • Support the implementation of activities that include the development of appropriate materials for the target audience (posters, films, radio and TV broadcasts, school visits, promotional material, etc.) • Monitor results with pre and post surveys on awareness/ attitudes and how they relate to the demand for bonobo meat and their presence in urban markets 	★★★
S3/O4 By 2016, implementation of the strategy targeting government ministries at national and provincial levels results in increased political will to support bonobo conservation efforts***	<ul style="list-style-type: none"> • Establish partnerships for implementation of activities in accordance with S3/O1 • Support implementation of activities that include the development of appropriate materials for the target audience (posters, copies of relevant legal texts, films, promotional material, workshops, etc.) • Monitor results (with pre and post surveys and with baseline data on wildlife-related crimes carried out by public officials, corruption cases, sentences handed down, and other indicators defined in the strategy) on awareness/attitudes and how they relate to bonobo conservation (reduced trafficking, political support for PA creation, political support for sentencing of public officials involved in wildlife-related crimes, etc.) 	★★★

Table, Strategy 3, continued on next page

Table, Strategy 3, continued from previous page

Strategic objectives	Priority actions	Priority level Moderate ★ High ★★ Very high ★★★
S3/O5 By 2016, implementation of the strategy targeting private investors operating in the bonobo range† results in implementation of wildlife regulations, leading to effective bonobo protection‡	<ul style="list-style-type: none"> • Establish partnerships for implementation of activities in accordance with S3/O1 • Support implementation of activities including development of appropriate materials for target audience (copies of relevant legal texts, workshops on best practice, media campaigns against companies operating illegally, etc.) • Monitor results: trends in companies having adequate management plans concerning wildlife regulations, implementation rates, impact on bonobos within concessions, and so on 	★★★

* Demonstrated by a decrease in bonobos on bushmeat markets and other indicators defined in the strategy

** Demonstrated by decreases in demand for bonobo meat, presence in urban markets, and other indicators defined in the strategy

*** Demonstrated by decrease in involvement of public officials in illegal trafficking of bonobos and other protected species, increase in convictions of public officials involved with wildlife crime, an increase in efforts to curb illegal trafficking of bonobos and other protected species, and other indicators defined in the strategy

† Number of operators, location of their activities and size of the area under their management to be defined in the strategy

‡ Demonstrated by stable bonobo populations within private concessions of complying operators

4.5.4 Strategy 4 Research and Monitoring Activities

Research and monitoring are integral to most activities defined in this plan and, therefore, the strategies detailed above. The three key components of conservation monitoring are (i) monitoring the conservation target (in this case, bonobo populations and distribution), (ii) monitoring threats (especially hunting, habitat loss and infectious disease) and (iii) monitoring interventions (such as law enforcement). Analysis of the relationships between these components (such as the effort and spatial distribution of antipoaching) should indicate whether specific management strategies are working or not, and which ones are more effective. In addition, decisions on the best location, size, design, habitat type and ecological context of PAs should be informed by scientifically-validated information on bonobo ecology and their response to human impacts. Additionally, awareness and lobbying programmes must include monitoring of their effectiveness, both in terms of measurable



Training park guards to monitor bonobo populations in SNP; Estate Patrol Post and Research Station. © Gay Reinartz/ZSM

increases in awareness/change of attitudes and, if possible, on how those changes impact bonobos. Finally, research and monitoring needs to include ways of prevention, early detection and containment of infectious diseases, identified as a potentially serious threat to bonobos.

Strategy 4: Research and Monitoring Activities

A detailed monitoring plan will need to be drawn up with measurable targets (quantity/extent/time) for each of the activities.

Strategic objectives	Priority actions	Priority level Moderate ★ High ★★ Very high ★★★
S4/O1 By 2015, analyses of trends in bonobo populations are produced every 4–5 years and analyses of distribution every 2 years	<ul style="list-style-type: none"> Monitor bonobo population density and distribution in PAs, buffer zones and logging concessions in the bonobo range (<i>c.f.</i> Kühl <i>et al.</i> 2008) Produce regular reports with maps showing trends in the above, both at site level and for the whole range 	★★★
S4/O2 By 2013, analyses of threats to bonobos are carried out annually	<ul style="list-style-type: none"> Monitor no. of bonobos killed or captured Monitor habitat loss (village-level agriculture, other activities causing habitat destruction) Monitor potential habitat loss (planned industrial oil palm, rubber, other crop plantation plans, and mining plans) and establish rapid response to mitigate their impacts on bonobos 	★★★
S4/O3 By 2013, effectiveness of law enforcement is tracked across entire bonobo range	<ul style="list-style-type: none"> Monitor law enforcement activities (patrol number, composition, time spent, etc.) Monitor judiciary follow through Assess effectiveness by comparing effort of law enforcement and judiciary follow through with seizure, arrest and prosecution rates 	★★★
S4/O4 By 2014, logging concessions are monitored for compliance with wildlife law	<ul style="list-style-type: none"> Regular checks on whether companies have management plans that include appropriate internal regulations for fauna protection Reporting on the proportion of companies that have these regulations Name and shame those that do not 	★★★
S4/O5 By 2016, a sound health monitoring and disease prevention plan is developed and implemented, focusing on the prevention of human-bonobo disease spread, having the potential to address eventual disease outbreaks among bonobos and contributing to the well-being of local communities living around PAs	In consultation with all relevant actors (Ministry of Health, other health agencies, local and regional health workers, research institutions and conservation NGOs), elaborate a bonobo health monitoring and disease prevention plan. The plan should identify: <ul style="list-style-type: none"> targets objectives for each target intervention methods for each target implementing partners a budget a monitoring plan to measure impacts of the interventions 	★★
	Establish partnerships for the implementation of activities, including: <ul style="list-style-type: none"> training field teams on early detection, prevention, first aid, sample storage, health education (as defined in the plan) where needed (as defined in the plan) support local health programmes focusing on prevention of human-bonobo disease transmission regular screening and sample analysis (to assess current health status and enable early detection of anomalies) and interpretation of results support the establishment of an 'emergency intervention plan' (with funds restricted to emergency use only) to define a clear chain of actions to be followed during eventual outbreaks 	★★
	A strict disease prevention and monitoring plan must be developed for former-captive bonobos being released into natural habitats. Release programmes must follow IUCN guidelines for re-introduction	★★

4.5.5 Strategy 5 Sustainable Funding

The bonobo's geographic range covers a huge area in an extremely isolated region of DRC. Given that there is genuine political will to ensure effective protection of bonobos, this will only be possible if the necessary human, technical and financial resources can be guaranteed over the long-term. The sustainability of funding is therefore a central element to ensuring the survival of bonobos.

Until now, funding for bonobo conservation has come from bilateral and multilateral cooperation, international and national NGOs, private foundations, research institutes and the Congolese state. These funds are generally linked to cycles that are specific to each donor and which are often short-term. This makes it difficult to establish programmes where activities can proceed without interruption over the long-term. Furthermore, with respect to bilateral and multilateral cooperation, biodiversity conservation often takes second place to more immediate and visible needs faced in the DRC (humanitarian, social, political, institutional).

The emergence of new funding mechanisms, such as debt-for-nature swaps, REDD+, Payment for Ecosystem Services and biodiversity offsets, opens new prospects for achieving sustainable funding. However, these mechanisms are relatively new and details of how they will operate are still under study.

Strategy 5: Sustainable funding

Strategic objectives	Priority actions	Priority level Moderate ★ High ★★ Very high ★★★
S5/O1 By 2022, sustainable sources of funding for bonobo conservation effectively support PA management, and other programmes and initiatives securing bonobo conservation*	Evaluate bonobo conservation funding needs. This will require drawing up business plans for PAs and buffer zones in the bonobo range, and evaluating the costs of activities outside the bonobo range (e.g., awareness building, lobbying)	★★★
	Undertake studies to evaluate the potential for forests in the bonobo range to access different funding mechanisms (e.g., biodiversity offsets, carbon markets, PES, REDD+)	★★
	Undertake a feasibility study for the establishment of a sustainable funding mechanism; this study should take into consideration the different initiatives currently being explored in the DRC	★★
	Elaboration and submission of funding proposals (favouring partnerships between conservation organizations, government agencies and development and/or health agencies)	★★★

* in accordance with the Goal of this plan

4.6 Monitoring Plan

A monitoring plan provides the framework for following up on implementation of a conservation strategy and assessing the effectiveness of the actions undertaken. A clear monitoring framework will need to be drawn up for the species as a whole and for each site, including specific, measurable targets for bonobo population size and distribution, threat levels (based on signs recorded in the field, remote sensing and disease indicators) and interventions (especially law enforcement). The framework will include the types of data to collect, the method by which they should be collected, and the timing of data collection. Normally the framework will include a regular (at least every five years) cycle of population surveys, annual landscape-wide threat monitoring, annual (if possible) or at most every three years surveys of habitat integrity (e.g., remote sensing) and collection of human impact data in the most threatened parts of the bonobo's range during year-round antipoaching patrols. Disease monitoring will require collaboration with key partners in wildlife and human health, and should focus on both health monitoring of bonobos themselves and on identifying emerging epidemics that could impact bonobos (especially Ebola and Marburg).

The A.P.E.S. Portal⁷ is developing composite indices to measure great ape population status, threats to great apes and conservation actions. These indices combine information from different sources, can be calculated for any time period, and are directly comparable. They can be set to a starting value (e.g., 1) for Year 1 of the plan, and can be used to improve the quality and relevance of the monitoring plan. It is likely that for law enforcement monitoring, the SMART tool⁸ (or the MIST⁹ tool, later shifting to SMART¹⁰) will be used to assess effectiveness of law enforcement, and triangulation will be done through the population and distribution data held in the A.P.E.S. database. All new bonobo survey data will be archived with the A.P.E.S. database.

7 <http://apesportal.eva.mpg.de/>

8 <http://www.smartconservationsoftware.org/Home/WhatsSMART.aspx>

9 <http://www.ecostats.com/software/mist/mist.htm>

10 <http://www.smartconservationsoftware.org/Home/HowcanSMARTworkforyou.aspx>

Strategy 1: Strengthening institutional capacity and monitoring progress towards targets

Indicator	Type (performance, progress, impact)	Method	Existing data	Organisation responsible	Date or frequency	Where	Cost (low, medium, high)
S1/O1 By 2022, poaching within PAs is significantly reduced and bonobo densities are stable or increasing, compared to baseline surveys							
Bonobo density is maintained or increased from 2014 levels	Progress	Standard line transects carried out, data analysed and reported on	Partial (site dependant)	ICCN and partners	Full surveys of PAs implemented every four years	All sites	Medium
Bonobo distribution throughout the region is maintained or increased from 2012	Progress	All georeferenced data from surveys, recces and antipoaching patrols collated and analysed in occupancy framework	Partial (site dependant)	ICCN and partners	Data collection continuous, analysis every year, if possible	All sites	Medium
Frequency of bonobo poaching incidents detected per patrol per year is reduced by 80% compared to 2013	Performance	Law enforcement. Enter data into MIST or SMART	Partial	ICCN and partners	Continuous	In PAs	Medium
Poaching-free area of PAs increases to 85% of PAs or more	Impact	Law enforcement. Enter data into MIST or SMART	Partial	ICCN and partners	Continuous; monthly reports by patrol staff and annual reports with full site maps produced	In PAs	Medium
S1/O2 By 2022, the network of PAs shelters 90% of bonobos and the full range of their known ecological diversity							
PAs within bonobo range cover the full suite of ecological conditions and correct relative proportions	Performance	Surveys Remote sensing analyses	Incomplete	ICCN and partners	Continuous	Priority sites	Medium
PA dimensions/number are increased to fulfil the 90% target by 2022	Performance	Government changes shape of, or extends boundaries, or creates new, PAs	Incomplete	ICCN and partners	Continuous	All sites	Low
Proportion of bonobos in PAs increases from 2012 onwards	Impact	Bonobo population survey data from outside PAs are compared with survey data from inside PAs	Incomplete	ICCN and partners	4-yearly surveys of both PAs and the areas outside PAs that contain bonobos	Priority sites	Medium

Table, Strategy 1, continued from previous page

Indicator	Type (performance, progress, impact)	Method	Existing data	Organisation responsible	Date or frequency	Where	Cost (low, medium, high)
S1/O3 By 2016, measures to control and monitor the illegal bushmeat trade in priority bonobo areas have been established and are showing a steady decline in the occurrence of bonobos in the trade							
Frequency of bonobo carcasses or live infants being traded per year, per province, per unit effort of control (e.g., per market check-day, individual aircraft searches) is reduced by 90% by 2016	Performance	LEM data collected and entered into MIST or SMART Market controls Confiscations Intelligence gathering	Partial	ICCN and partners	Continuous	Urban markets in or near priority sites; along trade routes and rivers; at airports and main river crossings	High
Proportion of prosecutions and sentences handed down and served relative to crimes concerning killing/trade of bonobos increases from 2012, to attain 100% of guilty parties	Progress	LEM Tracking judiciary Data entered into MIST or SMART	No	ICCN, Ministry of Justice, partners	Continuous	Priorities should be major poachers, traders, white collar, government, military (and rebel) authorities	Low
S1/O4 By 2018, the illegal circulation of guns and ammunition in PAs and their buffer zones is eliminated							
Frequency of incidents involving illegal weapons per PA and buffer zone per year is reduced by 50% per year from 2013	Performance	LEM collected and entered into MIST or SMART	Partial	ICCN, local authorities	Continuous	PAs and buffer zones	Medium
Proportion of prosecutions and sentences handed down and served relative to illegal possession and traffic of guns and ammunition from 2012, increased to 100% of all guilty parties	Progress	LEM Judiciary Data entered into MIST or SMART	No	ICCN, Ministry of Justice, partners	Continuous	Priorities should be major traffickers, traders, white collar, government, military (and rebel) authorities	Low
S1/O5 By 2016, logging companies in the bonobo range implement management plans that secure effective protection of bonobos and other protected species							
Proportion of logging companies in bonobo range with operational internal rules forbidding illegal hunting in logging concessions is 100% by 2016	Performance	Management plans examined and checked for the appropriate regulations	No	ICCN and partners	Continuous	Logging concessions	Low
Frequency of bonobo poaching incidents detected per patrol per year in logging concessions has dropped by 85% by 2016	Impact	LEM data collected and entered into MIST or SMART	No	Logging companies plus ICCN and conservation partners	Continuous	Logging concessions	Low

Strategy 2: Consultation and collaboration with local actors

Indicator	Type (performance, progress, impact)	Method	Existing data	Organisation responsible	Date or frequency	Where	Cost (low, medium, high)
S2/O1 By 2015, land-use and macro-zoning plans developed for the four strongholds that reconcile the development aspirations of local populations with the long-term preservation of viable bonobo populations							
Macro-zoning plans exist for all priority sites	Progress	Macro-zoning plans	Partial	ICCN and partners	Continuous	Priority sites	Medium
S2/O2 By 2022, targeted sustainable alternative activities have resulted in increased local support and decreased pressure on bonobos (demonstrated by survey data) within the four strongholds							
Proportion of non PA area of priority sites in which community conservation projects exist	Progress	GIS measurement of areas	None	ICCN and partners	Continuous	Priority sites	Low
Attitude and awareness changes	Impact	Attitudes surveys (Yr 1 for baseline)	None	ICCN and partners	Every 4 years	Priority sites	Low
Bonobo densities	Progress	As in S1/O1	As in S1/O1	As in S1/O1	As in S1/O1	As in S1/O1	As in S1/O1
S2/O3 By 2018, bonobo conservation issues are integrated into national development plans (and local/provincial management plans)							
Regional development plans contain provisions for bonobo protection	Progress	Regional development plans	None	ICCN	Continuous	Priority sites	Medium

Strategy 3: Public awareness and lobbying

Indicator	Type (performance, progress, impact)	Method	Existing data	Organisation responsible	Date or frequency	Where	Cost (low, medium, high)
S3/O1 By 2014 a detailed nationwide intervention strategy to increase public awareness and support to bonobo conservation has been developed							
Strategy document approved	Progress	Strategy document	Partial	ICCN and partners	First year	All sites	Low
S3/O2 By 2018, implementation of the strategy targeting buffer zones around PAs results in increased support to bonobo conservation							
Proportion of localities targeted by a public awareness campaign	Performance	Mission reports	Partial	ICCN and partners	Continuous	All sites	Medium
Attitude and awareness changes	Impact	Attitude surveys (Yr 1 for baseline)	None	ICCN and partners	Every 4 years	All sites	Medium
Bonobo densities	Progress	As in S1/O1	As in S1/O1	As in S1/O1	As in S1/O1	As in S1/O1	As in S1/O1
S3/O3 By 2016, implementation of the strategy targeting urban populations results in increased support to bonobo conservation							
Attitude and awareness changes	Impact	Attitude surveys (Yr 1 for baseline)	None	ICCN and partners	Every 4 years	All sites	Low
Market availability and urban trade of bonobos	Progress	Market surveys and LEM	Partial	ICCN and partners	Every 4 years	All sites	Medium
S3/O4 By 2016, implementation of the strategy targeting government ministries at national and provincial level results in increased political will to support bonobo conservation							
Political support (LE implementation, finalization of administrative procedures for creation of PAs)	Impact	Follow up effective implementation of wildlife laws and creation of PAs	Partial	ICCN, Ministry of Justice	Annual	All sites	Medium
Number of public officials involved in wildlife-related crimes (and prosecuted, serving sentence)	Progress	LEM, Judiciary	None	ICCN, Ministry of Justice	Annual	All sites	Medium
S3/O5 By 2016, implementation of the strategy targeting private investors operating in the bonobo range results in implementation of the wildlife regulations leading to effective bonobo protection							
Proportion of private operators (logging, mining, etc.) active in the bonobo range that implement sound wildlife regulations	Performance	Documentation	Partial	ICCN and partners	Annual	All sites	Medium
Bonobo density, as estimated from nest density	Progress	Standard line transects	Unknown	Private companies (with technical assistance)	Every 4 years	All sites identified in the strategy	Medium

Strategy 4: Research and monitoring activities

Indicator	Type (performance, progress, impact)	Method	Existing data	Organisation responsible	Frequency	Where	Cost (low, medium, high)
S4/O1 By 2015, analyses of trends in bonobo populations are produced every 4-5 years and analyses of distribution every two years							
Trends in bonobo <u>density</u> throughout the region are monitored from 2014	Progress	Track and analyse trends in site-specific line transect survey results from S1/O1 Carry out rangewide density analysis with A.P.E.S. database	Partial (site dependant)	ICCN and partners	Every 4–5 years	All sites	Medium
Trends in bonobo <u>distribution</u> throughout the region are monitored from 2014	Progress	Track and analyse trends in site-specific recce and presence/absence survey data results from S1/O1; Carry out rangewide distribution analysis with A.P.E.S. database	Partial (site dependant)	ICCN and partners	Every 2 years	All sites	Medium
Proportion of all bonobos within PAs is monitored from 2012 onwards	Progress	Comparison of abundance data (expressed in numbers of bonobos) from inside and outside PAs	Incomplete	ICCN and partners	Every 4–5 years	Priority sites	Medium
Progress towards the target of 90% of bonobos in PAs by 2022 is monitored	Performance	Examination of PA creation/ extension documents to verify geographic location of new 'bonobo appropriate' areas	Incomplete	ICCN and partners	Annual	All sites	Low
Different habitats and their proportions within PAs in bonobo range monitored from 2015	Progress	Analysis of trends in successive cycles of remote sensing data, collated with PA boundary outlines; analysis of trends in data on habitat types and extent collected on foot (georeferenced)	Incomplete	ICCN and partners	Every 5 years Every year	Priority sites	Medium

Table, Strategy 4, continued on next page

Table, Strategy 4, continued from previous page

Indicator	Type (performance, progress, impact)	Method	Existing data	Organisation responsible	Frequency	Where	Cost (low, medium, high)
S4/O2 By 2013, analyses of trends in threats to bonobos are carried out annually							
Hunting pressure on bonobos is monitored from 2012	Progress	Analysis of annual trends in LEM data (bonobo hunting, including seizures of meat and live animals, arrests, market controls) collected in S1/O3 using MIST or SMART	Partial	ICCN and partners	Annual	Data from entire bonobo range (site-specific data plus trafficking data)	Medium
Areas of each PA that are poaching free are monitored (target 85% of the PA or more)	Progress	Collate data from ecological monitoring surveys, law enforcement and any other activity (see S1/O1); enter into MIST or SMART and analyse for changes between years or for trends across multiple years	Partial	ICCN and partners	Annual trend analysis (monthly reports are in SO/O1)	In PAs	Medium
Potential agricultural plantation and mining plans that would remove bonobo habitat are monitored	Progress	Examine proposals to Ministry of Agriculture and Rural Development and Ministry of Mines for oil palm, rubber and other industrial plantations, and mining developments within bonobo range	Unknown	ICCN and partners	Continuous	Throughout bonobo range	Low
S4/O3 By 2013, effectiveness of Law enforcement monitoring is tracked across all bonobo range							
Trends in bonobo poaching incidents detected per unit effort (patrols per year and similar) are monitored from 2013	Performance	Track LEM data from S1/O1 and S1/O3 and analyse using MIST or SMART	Partial	ICCN and partners	Annual trend analysis (monthly reports are in SO/O1 and S1/O3)	In PAs	Low
Trends in the proportion of bonobo-related and weapons/ammunition-related arrests to successful prosecutions, and effectiveness of effort to ensure that this is done, are monitored from 2013	Performance	Track LEM data from S1/O3 and analyse using MIST or SMART	Partial	ICCN and partners	Annual trend analysis	Throughout the country's courts	Low
Trends in illegal weapons and ammunition trafficking and use is monitored to unit effort of antipoaching, and effectiveness calculated	Performance	Track LEM data from S1/O4 and analyse using MIST or SMART	Partial	ICCN and partners	Annual trend analysis (monthly reports are in SO/O4)	Throughout bonobo range and at points where guns/ammunition are trafficked	Medium

Table, Strategy 4, continued on next page

Table, Strategy 4, continued from previous page

Indicator	Type (performance, progress, impact)	Method	Existing data	Organisation responsible	Frequency	Where	Cost (low, medium, high)
S4/O4 By 2014, logging concessions are monitored for compliance with wildlife laws							
Proportion of logging companies in bonobo range with operational internal rules forbidding illegal hunting in logging concessions is tracked	Performance	Management plans examined, checked for appropriate regulations and reports produced	No	ICCN and partners	Continuous	Logging concessions	Low
Trends in bonobo (and other) poaching incidents detected per patrol per year in logging concessions are monitored	Performance	LEM data collected in S1/O5 are analysed using MIST or SMART	No	Logging companies plus ICCN and conservation partners	Annual analysis showing multi-year trends	Logging concessions	Low
S4/O5 By 2016, a sound health monitoring and disease prevention plan is developed and implemented, focusing on the prevention of human-bonobo disease spread, having the potential to address eventual disease outbreaks among bonobos and contributing to the well-being of local communities living around PAs							
Health monitoring and disease prevention plan is completed by 2013	Progress	Health monitoring and disease prevention plan written	None	ICCN, Ministry of Health, conservation, health and research partners	Start 2013	Priority sites	Low
All field personnel are trained in disease prevention, sample collection, early detection by beginning of 2014	Performance	Workshops	None	ICCN, Ministry of Health, conservation, health and research partners	2-yearly refresher courses	Priority sites	Low
Health monitoring of wild bonobos and local communities around PAs conducted from beginning of 2014	Impact	Analysis of bonobo faecal samples and carcasses; collection and examination of human health records	None	ICCN, Ministry of Health, conservation, health and research partners	Ongoing (any unusual illnesses/deaths immediately reported)	Priority sites	Medium
Emergency intervention plan developed by end 2013, and funds available by start 2014	Progress	Plan developed, emergency funds available	None	ICCN, Ministry of Health, conservation, health and research partners	As defined in the strategy	National, but detailed for each site	Low

Strategy 5: Sustainable funding

Indicator	Type (performance, progress, impact)	Method	Existing data	Organisation responsible	Date or frequency	Where	Cost (low, medium, high)
S5/O1 By 2022, sustainable sources of funding for bonobo conservation effectively support PA management and other programmes and initiatives securing bonobo conservation.							
At least one trust fund created and supporting bonobo conservation activities	Performance	Trust Fund	None	ICCN and partners	Continuous	All sites	Medium
Total annual expenditure on bonobo conservation	Performance	Financial reports	Partial	ICCN and partners	Continuous	All sites	Low

4.7 Implementation of the Conservation Strategy

Several of the interventions proposed in this conservation strategy are already being carried out, particularly those which support the management of existing PAs. Other initiatives should begin as soon as possible, particularly the updating of information on the status of bonobos in areas that have not been surveyed recently – this is particularly urgent as planning decisions taken within the framework of post-war reconstruction are likely to impact bonobos. The attribution of commercial logging concessions and rehabilitation of the road network are particularly important in this respect. Expert assessment of critical habitat for bonobos within logging or other extractive industry concessions must be carried out in compliance with international standards, and strict protection measures must be guaranteed. Conservationists must also engage with logging companies with respect to management of hunting and the bushmeat trade in their concessions (see Morgan & Sanz 2007; Morgan *et al.* 2013). Since poaching and weak law enforcement have been identified as the most important threats to the bonobo's survival, projects that directly address these issues should be given priority.

A particular feature of bonobo conservation is the relatively high number of conservation and research organizations operating in the bonobo's range. This situation has advantages and disadvantages. On the one hand, a large number of actors means that many sites can be targeted and a wide range of expertise mobilized. On the other hand, a multiplicity of actors can create competition for limited financial resources and, in the absence of sound coordination, can compromise the efficiency and effectiveness of interventions. This plan has been produced in a fully participatory manner and provides the general framework within which conservation actors and funding agencies can plan their interventions in a coherent, transparent and efficient manner. Furthermore, joint implementation of specific projects will help to strengthen the cohesion and relevance of field interventions.

In view of this large number of actors, a coordination mechanism for implementing this conservation strategy is considered desirable. Workshop participants agreed that this should be a light structure, to ensure that everyone participates and that limited financial resources are not wasted. The coordination mechanism should reinforce coordination not only between conservation NGOs and the government, but also between the NGOs themselves. This will help to ensure that by speaking with a common voice the impact of their messages and their actions on the ground are strengthened.

Finally, the bonobo conservation coordination mechanism should complement existing structures within ICCN – CoCoCongo at the national level; CoCoSi at the site level – which were created to strengthen coordination of all conservation activities for which ICCN is responsible.

Three options for a coordination mechanism have been proposed (Blomley 2011):

1. **One NGO is chosen to represent the others.** This NGO should have a track record of working with a range of external stakeholders, including government and the private sector, and ideally already be engaged in external networking and communication. It should have a strong field presence, but also a presence in Kinshasa that allows it to identify with national as well as local issues. The NGO should have the confidence of other bonobo groups, and therefore feel confident that common interests would be represented, rather than those of the individual NGO. Meetings held on a semi-annual basis would allow for planning and reporting between the lead NGO and the wider group.
2. **A small secretariat is created to represent the wider group members.** This could be a small subgroup of the wider bonobo NGO community. It could include one or two international NGO and one or two national NGO representatives. One of the NGO representatives would be tasked as the lead and the others would take on specific roles.
3. **An independent facilitator is engaged to represent the NGO group.** Option 3 assumes that NGOs are unable to agree a primary 'lead' NGO or small group of lead NGOs (options 1 and 2) and an external, independent coordinator of the bonobo network is therefore needed, who could potentially be housed and supported by an individual NGO member. This is not an ideal solution but could be considered if there is distrust between NGOs. This option would require a plan to transition to a more permanent model (1 or 2 above).

4.8 Priorities for the First Year of Implementation of the Conservation Strategy

As noted above, many bonobo conservation projects exist, several of which have been operational for many years. Therefore, one of the main objectives of this plan is to set a strategic framework for bonobo conservation in order to federate the efforts of all the actors, and in this way improve the coherence and effectiveness of bonobo conservation activities.

Due to the limited time during the Kinshasa workshop, it was not possible to elaborate detailed activities and workplans for the five strategies identified. The first year of implementation of this plan should therefore focus on joint planning of priority interventions. In the case of new activities, it will be necessary to refine intervention strategies and develop project proposals for submission to funding agencies. In the case of existing activities, it will be a question of pursuing the activities underway with the resources available.

During the first year, priority should be given to the following actions:

Coordination

Decide, in full consultation with all stakeholders, upon the coordination mechanism for implementation of the bonobo conservation strategy. Discussions could take place in conjunction with a meeting of the CoCoCongo. During these discussions, stakeholders will also decide how joint funding proposals will be prepared and joint projects implemented.

Strategy 1 Strengthening institutional capacity for law enforcement and sustainable management of forest diversity

- Continue activities in support of the management of existing and proposed PAs (capacity building and support for antipoaching and biomonitoring (LEM), management plans, antipoaching, community conservation, etc.)
- Lobbying military authorities regarding the illegal circulation of automatic weapons
- Lobbying provincial governments to introduce closed hunting periods
- Engage with logging companies active in the region with a view to establishing collaborative agreements for wildlife management in their concessions

Strategy 2 Consultation and collaboration with local actors

- Identify priority areas for land-use and macro-zoning plans and begin to collect the relevant information about the areas in question (ecological, social, economic)
- Elaborate a detailed plan for interventions aimed at improving the sustainability of subsistence activities. It is essential to clearly define the scope of the interventions and to remain coherent with respect to the capacity and resources available. It will not be possible to resolve all problems, so the approach should be realistic and pragmatic. These discussions should involve all partners

Strategy 3 Awareness building and lobbying

- Elaborate a detailed awareness-building and lobbying strategy, clearly defining the target groups, the objectives to be achieved and methods of intervention with respect to each target group. The roles and contributions of the various partners should also be clearly defined and the strategy should include a monitoring plan to evaluate the impact of the interventions (indicators, attitude surveys before and after, etc.)
- Elaborate a detailed programme of activities to submit to funding agencies

Strategy 4 Research and monitoring activities

- Draw up an overall bonobo monitoring framework that includes:
- Population and distribution surveys (full surveys of each site every 5 years)
- Threats monitoring (signs of hunting, illegal logging, habitat destruction and disease in both bonobos and humans at key bonobo sites)

- Law enforcement monitoring (continuous, using SMART/MIST)
- Elaborate a health monitoring, disease prevention and emergency intervention plan to address eventual outbreaks

Strategy 5 Sustainable funding

Start the process of evaluating the long-term financial needs for bonobo conservation. This will involve producing business plans for all existing and proposed PAs and their buffer zones, including community conservation activities, and estimating the operational costs for nationwide activities such as public awareness and lobbying.

Bonobo orphans – victims of the bushmeat trade – with their carers at Lola ya Bonobo © Liz Williamson



Adult female bonobo with her infant at Wamba © Takeshi Furuichi



Synthesis of Priority Actions for Year 1

[illegible]

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6. Acronyms and Abbreviations Used

ABC	<i>Amis des Bonobos du Congo</i>
ACOPRIK	<i>Action Communautaire pour la Protection des Primates du Kasai</i>
ANR	<i>Agence National de Renseignement</i>
AWF	African Wildlife Foundation
BCI	Bonobo Conservation Initiative
CARPE	Central African Regional Programme for the Environment
CBFP	Congo Basin Forest Partnership
CBNRM	Community-Based Natural Resource Management
CCWG	Conservation Challenge Working Group
CEDAP	<i>Centre de Développement Agro-Pastoral de Djolu</i>
CI	Conservation International
COMIFAC	<i>Commission des Forêts d'Afrique Centrale</i>
CoCoCongo	<i>Coalition pour la Conservation au Congo</i>
CoCoSi	<i>Comité de Coordination du Site</i>
CREF	<i>Centre de Recherche en Ecologie et Foresterie</i>
FARDC	Armed Forces of the DRC (<i>Forces Armées de la République Démocratique du Congo</i>)
GIS	Geographic Information System
GRASP	Great Apes Survival Partnership
ICCN	<i>Institut Congolais pour la Conservation de la Nature</i>
IUCN	International Union for Conservation of Nature
LEM	Law Enforcement Monitoring
MPI-EVAN	Max Planck Institute for Evolutionary Anthropology
MECNT	Ministry of the Environment, Conservation & Tourism (<i>Ministère de l'Environnement, Conservation de la Nature et Tourisme</i>)
MMT	Mbou-Mon-Tour
NGO	non-governmental organisation
NP	national park
NTFP	non-timber forest product
PA	protected area

PES	Payment for Ecosystem Services
PERSE	<i>Protection de l'Ecosystème et des Espèces Rare du Sud-Est de l'Equateur</i>
PNC	Congolese National Police (<i>Police Nationale Congolaise</i>)
PSG	Primate Specialist Group
REDD	Reducing Emissions from Deforestation & Forest Degradation
SNP	Salonga National Park
SOS Nature	<i>Solidaires et Organisés pour Sauver la Nature</i>
SSC	Species Survival Commission
TL2	Tshuapa-Lomami-Lualaba
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific & Cultural Organisation
USAID	United States Agency for International Development
USFWS	United States Fish & Wildlife Service
WCBR	Wamba Committee for Bonobo Research
WWF	World Wide Fund for Nature
WCS	Wildlife Conservation Society
ZSM	Zoological Society of Milwaukee

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Maringa-Lopori-Wamba
landscape © Takeshi Furuichi



Appendix I: List of Bonobo Survey Datasets Archived in the A.P.E.S. Database

Site	Landscape	Protection	Abundance class	Year
Beminyo	Salonga-Lukenie-Sankuru	Salonga National Park	300	2000-2002
Bilya HotSpot-Iyondje	Maringa-Lopori-Wamba	unprotected	present	2009
Biondo-Biondo	Salonga-Lukenie-Sankuru	Salonga National Park	?	2000-2002
Bolobo	Lac Tél�-Lac Tumba	unprotected	100	?
Bonima	Salonga-Lukenie-Sankuru	Salonga National Park	present	2000-2002
Bosango	Lac Tél�-Lac Tumba	Lac Tumba-Lediima Reserve	100	2004
Boseka-Bokungu	Maringa-Lopori-Wamba	unprotected	100	2008
Botuali-Ilombe	Lac Tél�-Lac Tumba	unprotected	present	?
Botwali	Lac Tél�-Lac Tumba	unprotected	100	2004
Cadjobe (Djolu-Befale)	Maringa-Lopori-Wamba	unprotected	500	2006
Cadjobe CBNRM	Maringa-Lopori-Wamba	unprotected	500	2009
Estate core area	Salonga-Lukenie-Sankuru	Salonga National Park	50	2006-2009
Estate Extended Sector (excl. Core Area)	Salonga-Lukenie-Sankuru	Salonga National Park	1000	2006-2009
Ikela-Bokungu Region	outside	unprotected	present	2008
Ikolo	Salonga-Lukenie-Sankuru	Salonga National Park	?	2005
Isaka-Bekongo	Salonga-Lukenie-Sankuru	Salonga National Park	?	2000-2002
Isanga	Salonga-Lukenie-Sankuru	Salonga National Park	50	2000-2002
Iyondji forest block	Maringa-Lopori-Wamba	unprotected	present	2009
K7	Maringa-Lopori-Wamba	unprotected	present	2010
Kenia	Lac Tél�-Lac Tumba	unprotected	?	?
Kinki	Salonga-Lukenie-Sankuru	Salonga National Park	?	2000-2002
Kokolopori	Maringa-Lopori-Wamba	Bonobo Reserve	500	2004-2005
Kutu-region	outside	unprotected	present	2009-2010
Lilungu	Tshuapa-Lomami-Lualaba	unprotected	100	2005
Lingomo	Maringa-Lopori-Wamba	unprotected	100	2008
Lokoro-Lukenie	Salonga-Lukenie-Sankuru	unprotected	present	2006-2007
Lomako-Yokokala	Maringa-Lopori-Wamba	Wildlife reserve	1000	2010
Lonua	Maringa-Lopori-Wamba	unprotected	present	2006

Site	Landscape	Protection	Abundance class	Year
Lotoi-Lokoro	Salonga-Lukenie-Sankuru	unprotected	present	2006-2007
Lotulo	Salonga-Lukenie-Sankuru	Salonga National Park	?	2000-2002
Lubefu	outside	unprotected	present	2010
LuiKotale study area	Salonga-Lukenie-Sankuru	Salonga National Park	100	2003-2004
LuiKotale-Bompusa	Salonga-Lukenie-Sankuru	Salonga National Park	50	2012
Lukenie-Sankuru	Salonga-Lukenie-Sankuru	unprotected	present	2006-2007
Lukuru	Salonga-Lukenie-Sankuru	unprotected	100	1994-1995
Malebo-region	Lac Télé-Lac Tumba	Lac Tumba-Lediima Reserve	present	2005-2008
Mampoko (Bolombo-Losombo)	Lac Télé-Lac Tumba	unprotected	present	2005-2008
Maringa-Lopori-Wamba_1_K7	Maringa-Lopori-Wamba	unprotected	present	2004
Maringa-Lopori-Wamba_2_K7	Maringa-Lopori-Wamba	unprotected	present	2004
Maringa-Lopori-Wamba_3_K7	Maringa-Lopori-Wamba	unprotected	present	2004
Maringa-Lopori-Wamba_4_K7	Maringa-Lopori-Wamba	unprotected	present	2004
Mbala-Ndongese	Lac Télé-Lac Tumba	unprotected	present	2005
Mbie Mokele	Lac Télé-Lac Tumba	unprotected	100	2006
Mompono-Bekumolokole	Maringa-Lopori-Wamba	unprotected	100	2008
Mompono-Yaama	Maringa-Lopori-Wamba	unprotected	100	2008
Monieke-Bokote	outside	unprotected	present	2006
Mpoka (Mompulenge-Mbanzi)	Lac Télé-Lac Tumba	unprotected	present	2009
Mushi	outside	unprotected	?	?
Ngombe-Botuali	Lac Télé-Lac Tumba	Lac Tumba-Lediima Reserve	100	2005
Nkosso	Lac Télé-Lac Tumba	Lac Tumba-Lediima Reserve	present	2006
Salonga Corridor	Salonga-Lukenie-Sankuru	unprotected	present	2008
Salonga East	Salonga-Lukenie-Sankuru	Salonga National Park	present	2008
Salonga NP north	Salonga-Lukenie-Sankuru	Salonga National Park	5000	2004
Salonga NP south	Salonga-Lukenie-Sankuru	Salonga National Park	5000	2004
Salonga-Iyaelima	Salonga-Lukenie-Sankuru	Salonga National Park	5000	2006
Salonga-Lokofa	Salonga-Lukenie-Sankuru	Salonga National Park	300	2002
Salonga-Lokofa	Salonga-Lukenie-Sankuru	Salonga National Park	500	2005
Salonga-Lokofa 2010	Salonga-Lukenie-Sankuru	Salonga National Park	present	2010

Site	Landscape	Protection	Abundance class	Year
Salonga-Lomela	Salonga-Lukenie-Sankuru	Salonga National Park	5000	2006
Samba	Maringa-Lopori-Wamba	unprotected	100	2007
Sankuru reserve	Salonga-Lukenie-Sankuru/Tshuapa-Lomami-Lualaba	Nature reserve	present	2009
Sankuru reserve-Lomela	Salonga-Lukenie-Sankuru	Nature reserve	?	2007
Tshuapa-Lomami-Lualaba (TL2)	Tshuapa-Lomami-Lualaba	Conservation Landscape	>5000	2008–2010
Wamba	Maringa-Lopori-Wamba	Luo Reserve	100	2003–2005
Yetsi-Ikela	outside	unprotected	100	2008
Yongo	Salonga-Lukenie-Sankuru	Salonga National Park	50	2000–2002



The bonobo survey data modelling group

Appendix II: List of Workshop Participants

Sitea

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