The Global Conservation Program

Achievements and Lessons Learned from 10 Years of Support for Threats-based Conservation at a Landscape and Seascape Scale

Ndoki-Likouala Landscape Conservation Area (Republic of Congo)

WILDLIFE CONSERVATION SOCIETY

Ndoki-Likouala Landscape Conservation Area

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Key Achievements, Impacts and Lessons Learned Attained with GCP Funding

The Ndoki-Likouala Landscape Conservation Area (NLCA) project in the Republic of Congo aims to conserve one of the world's last remaining wildernesses. The lowland tropical forest site is a stronghold for several globally threatened large mammal species and a top priority for biodiversity conservation. It was among the first to be adopted under the WCS Living Landscapes Program[1] and included in the WCS/USAID GCP-I portfolio of conservation sites. The main objective of this project has been the development and implementation of a multi-partner conservation strategy, including the government, the logging industry and local communities, to reduce the key threats to the landscape's biodiversity. Since its inception in 1991, the project has had numerous successes and made a positive, measurable impact on this globally significant landscape.

1 The Living Landscapes Program develops and tests threats-based, highly participatory and wildlife-focused strategies to resolve the conflicts between people and wildlife that threaten important wild places and the biodiversity they support.

Ndoki-Likouala Landscape Conservation Area, Project Highlights

• **Nouabalé-Ndoki National Park (NNNP) management plan.** Building on the foundational success of the gazetting of NNNP in 1993, further conservation efforts by WCS culminated in the adoption of the NNNP management plan in 2003, only the second protected area management plan adopted by the government of the Republic of Congo.

• **Goualougou Triangle Annexation.** In 2003, the Goualougo Triangle was annexed to the Nouabalé-Ndoki National Park, through the collaborative efforts of WCS, the Congolese Government and the timber company Congolaise Industrielle des Bois (CIB). This set aside 25,000 hectares from the Kabo Forest Management Unit (FMU) for conservation, comprising a block of remote intact forest that harbors an incredible abundance of wildlife. It is particularly unique due to its population of chimpanzees, which exhibited naïve responses to people when first contacted by researchers in 1999 as a result of little or no previous contact with hunters or other humans.

Box 1: Forest Stewardship Council (FSC) Certification of Tropical Timber and the Creation of Conservation Set-asides

In 2004, the timber company Congolaise Industrielle des Bois (CIB) announced their commitment to pursue FSC certification, in partnership with WCS and the Tropical Forest Trust, thus raising the bar for sustainable forest management in Central Africa. As part of this process, CIB, in consultation with WCS and the Mondika Gorilla Research Center, announced two important areas in its Kabo Forest Management Unit (FMU) set aside for conservation. The two areas, the Djéké Triangle and the Bomassa/Mombongo zone, comprise over 14,000 hectares in the Bomassa Triangle that will not be harvested. The Bomassa Triangle provides an important conservation conduit in the Sangha Tri-National Protected Area network, connecting national parks (including NNNP) in the Central African Republic and the Republic of Congo.

Both areas contain important complexes of bais and yangas (natural clearings frequented by large mammals); the Djéké Triangle is a pristine forest block that has never been logged. This set-aside follows on from the milestone conservation of the Goualougo Triangle, which was set aside from the Kabo FMU in 2001 and was annexed to the Nouabalé-Ndoki National Park in 2003, through the collaborative efforts of WCS, the Congolese Government and CIB.

The Kabo FMU was awarded FSC certification in 2006 – the first concession in Central Africa to receive FSC certified status. In 2008, the Pokola FMU was also awarded FSC certification, raising CIB's total certified area to 7,500 km^2. This is currently the largest contiguous FSC-certified natural tropical forest in the world.

• **Project for Ecosystem Management of the Park Buffer Zone.** In 1999, WCS, in collaboration with the Government, the logging industry (CIB) and local communities, initiated an innovative and pioneering project to promote responsible wildlife and forest management in the Kabo-Pokola-Loundougou forestry concessions surrounding the Nouabalé-Ndoki National Park. Wildlife management measures included the regulation of bushmeat offtake in logging concessions and the provision of alternative protein sources to logging company employees.

• **Law Enforcement Effectiveness.** WCS, in collaboration with the Ministry of Forest Economy and the Environment (MEFE) partners, focused on enhancing the effectiveness and capacity of government law enforcement agents to address poaching by facilitating the implementation of effective protection systems and providing training and equipment to MEFE park guards. Law enforcement efforts have helped secure the protected areas and wildlife populations in the buffer zone through a combination of fixed patrols to control the traffic of bushmeat on logging roads, and mobile patrol units, including bi- and tri-national patrols, to deal with external threats originating from neighboring countries.

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Chimpanzee

• **Forest Stewardship Council (FSC) Certification.** WCS worked closely with the CIB timber company and the government of the Republic of Congo to facilitate the adoption and implementation of wildlife-friendly logging practices which led to the FSC certification of the Kabo Forest Management Unit in 2006 – the first logging concession in Central Africa to receive FSC-certified status (see Box 1).

• **Lac Télé Community Reserve (LTCR) Resource Management.** The legal decree that classified the Lac Télé Community Reserve was put in place in 2001, based on a WCS-MEFE feasibility study conducted in 2000. Building on this success, in 2003 an official WCS-MEFE collaborative full-scale community resource management project was initiated, eventually securing resource rights for the local households of Lac Télé.

• **Environmental education.** WCS promoted environmental education and conservation awareness through public meetings with villages and semi-nomadic camps in the buffer zone surrounding NNNP, radio and TV shows broadcast locally and extension work conducted with the primary and secondary schools of the buffer zone and the nearest large town of Ouesso.

• **Financial sustainability.** In 2004, WCS helped create the Sangha Tri-National Foundation, Central Africa's first major conservation trust fund, supporting transboundary conservation between Ndoki and neighboring protected areas in Cameroon and the Central African Republic. In addition, WCS has collaborated with the government and tour operators to promote ecotourism in the area.

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Logging truck

• **Monitoring to evaluate conservation success and to adapt management.** Building on GCP-I investments, in 2006 WCS conducted the first systematic landscape-scale surveys of elephants, chimpanzees, and gorillas across the Ndoki-Likouala Landscape to comprehensively evaluate the impact of conservation interventions and to inform future management. In 2008, WCS announced the results of wildlife surveys conducted across 48,000 km² (about 18,000 square miles) of continuous forest in the north of the country. These surveys, which included the 2006 Ndoki-Likouala landscape surveys, estimated gorilla numbers there at 125,000, which exceeds the previous global estimate[2]. The announcement crowned twenty years of conservation success and challenged WCS and its partners to safeguard the newly discovered gorillas and their habitat.

GCP Program Background

The goal of the Wildlife Conservation Society's Biodiversity Conservation at the Landscape Scale (BCLS) Program is to ensure conservation of biological diversity in regions of global importance, using a landscape- (or seascape-) and species-based approach. For the past 10 years, the WCS Living Landscapes Program (LLP) has been developing and testing wildlife-focused strategies to resolve the conflicts between people and wildlife that threaten biodiversity found in these important wild places. The LLP-developed Landscape/Seascape Species Approach (LSA) is threats-based and highly participatory; it promotes conservation of landscapes (and seascapes) by focusing efforts on key animal species found within that landscape/seascape. The conservation of these Landscape Species offers a focused and cost-effective way to retain a full complement of biodiversity and overall ecological integrity.

While WCS recognizes the integral role that protected areas play within national biodiversity conservation plans, we also realize that parks and reserves are seldom sacrosanct and are always embedded in larger, human-dominated landscapes. Regardless of how large or small a protected area may be, the plants and animals it contains are often threatened by human resource use, whether directly or indirectly. Therefore, the management of parks and reserves cannot occur in

2 Gorilla numbers had previously been estimated to be only about 95,000 globally.

isolation from the surrounding landscape; rather, management plans must take into account where and how human activities conflict with biodiversity conservation as well as where conservation activities might adversely impact human welfare. As human populations continue to expand, the incentive for over-exploiting natural resources within and outside protected areas will increase and, therefore, the need for biodiversity conservation tools that address human-wildlife conflict will become even more important. In our efforts to conserve Landscape Species that frequently move beyond protected area boundaries, we recognize that parks and reserves must be integrated into the broader landscape, a landscape in which, realistically, people will continue to exploit natural areas and wild species to meet their socio-economic needs.

The Wildlife Conservation Society's BCLS Program was designed to ensure biodiversity conservation in a selection of globally significant sites, by identifying actions to conserve Landscape Species and by increasing the capacity of local and national organizations to implement such actions. Over the course of Cooperative Agreement LAG-A-00-99-00047-00, the WCS GCPII/USAID portfolio has included 7 sites:

- **Glover's Reef Living Seascape** (Belize)
- **Greater Madidi Landscape Conservation Area** (Bolivia)
- **Ndoki-Likouala Landscape Conservation Area** (Republic of Congo)
- **Greater Yasuní-Napo Moist Forest Landscape Conservation Area** (Ecuador)
- **Maya Biosphere Reserve Living Landscape** (Guatemala)
- **The Eastern Steppe Living Landscape** (Mongolia)
- **Southern Sudan Transboundary Living Landscape** (Southern Sudan)

Location, Global Importance and Key Threats to this Landscape

The Ndoki-Likouala Landscape Conservation Area (see Figure 1) extends over approximately 30,000 km² and comprises a vast stretch of lowland Guineo-Congolian forest, rich in African mahoganies and large mammals. It is home to important populations of some of the continent's most endangered species: forest elephants, western lowland gorillas, chimpanzees and bongo. The region's low-density human populations have, until recently, been isolated from modern human influence. Biodiversity in the region is partially under protection in two protected areas: the Nouabalé-Ndoki National Park and the Lac Télé Community Reserve. Yet these reserves alone do not provide sufficient habitat for wide-ranging or low-density species, nor is the capacity of the Congolese Ministry of Forest Economy and the Environment (MEFE) strong enough to effectively manage these areas. Consequently, the unique and extraordinary biological values of the region are threatened by the rapid development of logging throughout northern Congo and the associated creation of immigrant logging communities who increase pressure on forest resources, including the export of massive volumes of bushmeat made possible by increased access to previously remote regions.

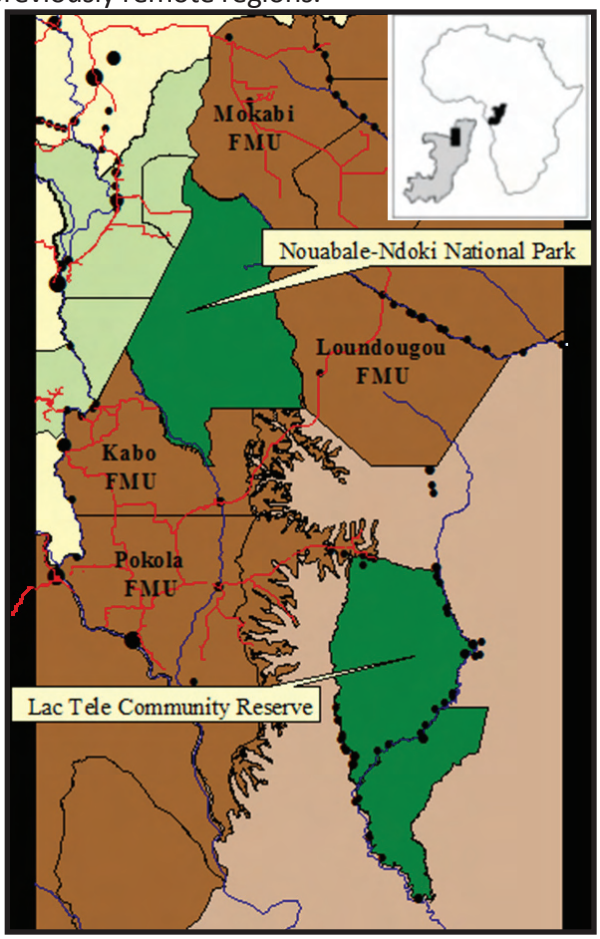


Figure 1. The land-use types of the Ndoki-Likouala Landscape Conservation Area. Protected areas appear in green with darker shades representing those located within the Republic of Congo. Forest Management Units are dark brown and undesignated swamp areas are light brown, human settlements appear as black dots and access features as red (main roads) or blue (navigable rivers) lines.

The Wildlife Conservation Society's Historic and Current Roles in this Landscape

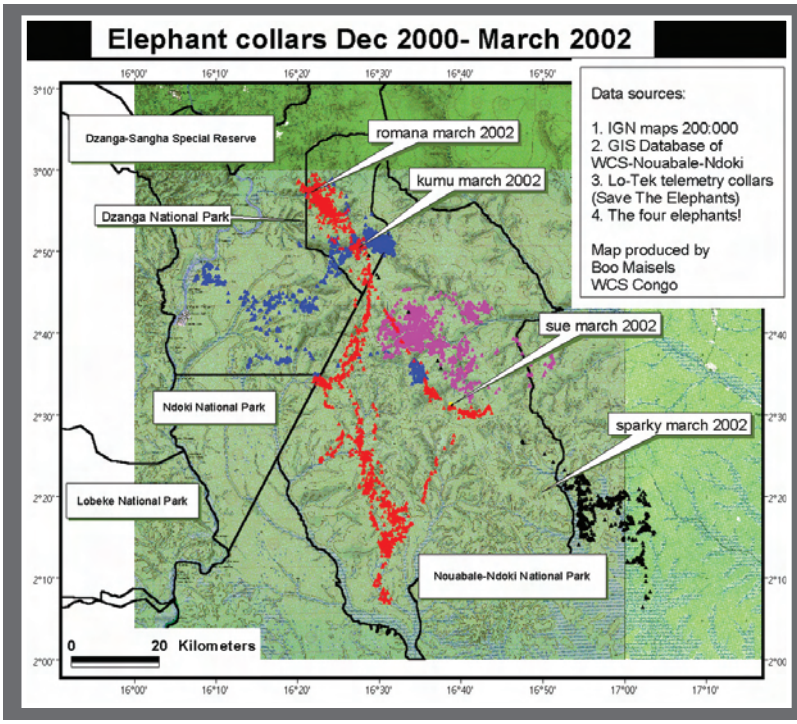
WCS has been working in the Ndoki-Likouala Landscape since the creation of the Nouabalé-Ndoki Project in 1991, when an agreement was signed with the Congolese Government's then-Ministry of Forests and Water. Initial work in the landscape focused on biological surveys in and around the site of the proposed National Park which culminated in the gazetting of the Nouabalé-Ndoki National Park (NNNP) in 1993, a farsighted and highly significant event at the time given the extent to which the landscape has subsequently changed – the NNNP is now entirely surrounded by commercial timber concessions. WCS expanded its activities in 1999 to include collaborative promotion of responsible wildlife and forest management in the Kabo-Pokola-Loundougou forestry concessions, signing an agreement for implementation of the Project for Ecosystem Management of the Park Buffer Zone (PROGEPP – Projet de Gestion des Ecosystèmes dans la Périphérique au Parc National de Nouabalé-Ndoki) with the Government, the logging industry (specifically the then-Swiss-German owned timber company Congolaise Industrielle des Bois) and local communities. In 2000, WCS and MEFE began conservation activities with local communities in the Lac Télé area, focusing on socio-economic and biological assessments and consulting with local communities on natural resource management.

WCS's Approach to Threats-based Conservation at a Landscape Scale

The Landscape Species Approach – Extending Beyond Protected Area Boundaries

The principle goal of the Ndoki-Likouala Landscape project is to conserve biodiversity through the application of the Landscape Species Approach (LSA). Central to this approach is the concept of Landscape Species, whose ecological status and requirements help us to define key management strategies across a mosaic of land-use zones. Important research on migration patterns of elephants (see Box 2) – the archetypal Landscape Species – highlighted the importance of thinking beyond protected area boundaries when taking into account the biological needs and threats facing those species that WCS is concerned with protecting.

A threats assessment identified the following key direct threats: unsustainable hunting by villagers; unsustainable commercial hunting; timber offtake; canopy loss; and bai disturbance and physical damage. These are, in large part, caused or exacerbated by commercial timber extraction itself, as well as the associated increases in population pressure and access (via new roads) to the region. Therefore, in addition to upgrading the status and effectiveness of protected areas, a key objective of the Ndoki-Likouala Landscape project's work is collaboration with staff from MEFE, managers of



Box 2: Elephant Telemetry Studies

GPS telemetry studies in the Ndoki-Likouala Landscape showed that elephants regularly migrated outside the Nouabalé-Ndoki National Park boundaries and into neighboring logging concessions. Since the first collars were placed in 2001, logging activities have completely surrounded the Park and road infrastructure has been substantially developed. In order to maintain key elephant migration corridors, wildlife and conservation management strategies need to be implemented and enforced across a broad range of land-use zones.

logging companies operating in northern Congo and local communities to design and implement innovative systems of wildlife conservation and management on forestry concession lands, in order to reduce the negative ecological impacts of logging operations (e.g., environmentally sensitive road placement, no-cut zones), prohibit the hunting of endangered species and the export of bushmeat from the concessions, control the negative impacts of logging-based demographic growth, establish wildlife management systems for sustainable subsistence use by communities, and develop alternative sources of protein for community consumption (to substitute for bushmeat).

The Landscape Species selected to represent the main habitat types and the key threats in the landscape include: forest elephant (*Loxodonta Africana cyclotis*), chimpanzee (*Pan troglodytes*), forest buffalo (*Syncerus caffer*), bongo (*Tragelaphus euryceros*) and dwarf crocodile (*Ostaeolaemus tetraspis*). Conservation objectives were formulated for each of these species, and also for key tree species, as well as larger-scale objectives for Nouabalé-Ndoki National Park (NNNP) and the Lac Télé Community Reserve (LTCR). The Ndoki-Likouala Landscape's conceptual model (Figure 2) explicitly demonstrates how the identified threats adversely affect the conservation targets (whether directly or indirectly) and which interventions are necessary to remove or reduce these threats and achieve the desired outcomes. (The threats and interventions described in the conceptual model are listed in terms of their IUCN classification in Tables 1 and 2).

Building the Conservation Landscape

Using tools developed as part of the Landscape Species Approach, the project team applied a strategic planning framework to landscape-scale conservation. Combining the biological needs of the Landscape Species with their vulnerability to specific threats permitted the construction of Conservation Landscape maps to facilitate prioritization in terms of where and how to focus conservation efforts.

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Table 1. IUCN-CMP Unified Classification of Direct Threats (from the Conceptual Model shown in Figure 2).

IUCN Classification	Direct Threat(s)
5.1 *Hunting & Collecting Terrestrial Animals*	• Unsustainable village and commercial hunting
5.3 *Logging & Wood Harvesting*	• Timber offtake • Canopy loss
7.3 *Other Ecosystem Modifications*	• Bai disturbance and physical damage

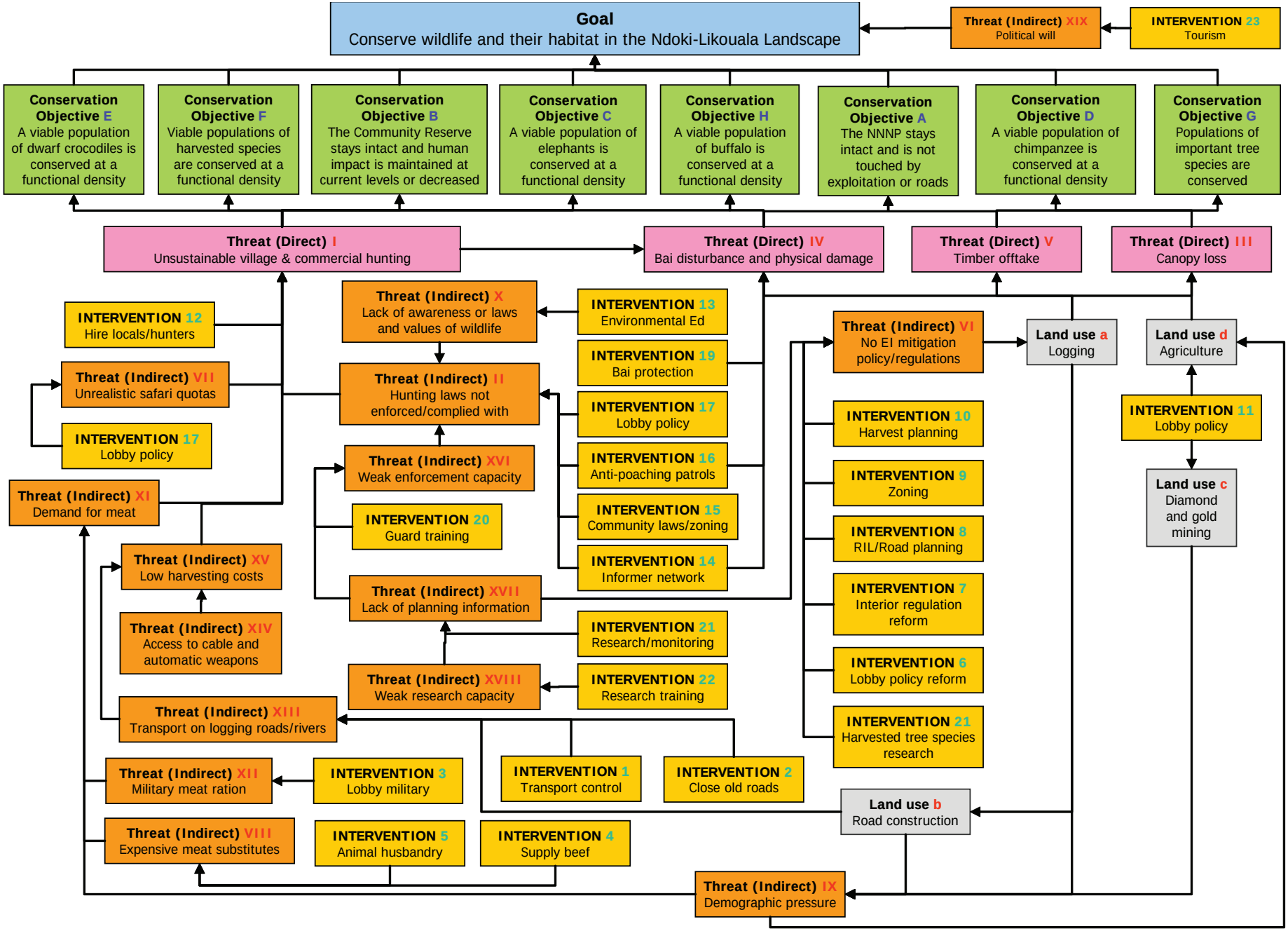


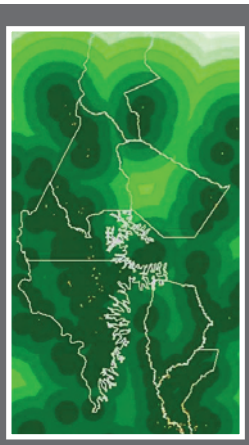
Figure 2. Conceptual Model for the Ndoki-Likouala Landscape Conservation Area, illustrating the links between interventions (in yellow), indirect and direct threats (in gold and pink) and conservation targets (in green).

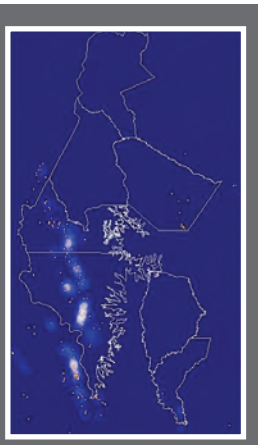
Table 2. IUCN-CMP Unified Classification of Conservation Actions ("Interventions"), from the Conceptual Model (Figure 2).

IUCN Classification	Interventions
2.1 *Site/Area Management*	• Guard training • Research training • Hire locals/hunters • Close old roads • Anti-poaching patrols • Bai protection
2.3 *Habitat and Natural Process Restoration*	• Close old roads
3.1 *Species Management*	• Research/Monitoring • Harvested tree species research
4.1 *Formal Education*	• Research training
4.2: *Training*	• Guard training • Research training • Hire locals/hunters
4.3: *Awareness and Communications*	• Environmental education • Lobby military
5.1 *Legislation*	• Lobby policy reform (logging; agriculture; hunting; diamond and gold mining; safari quotas)
5.2 *Policies and Regulations*	• Interior regulation reform • Bai protection • Community laws/zoning • Harvest planning • Zoning • RIL/Road planning
5.3 *Private Sector Standards and Codes*	• Anti-poaching patrols • Transport control • Close old roads • Harvest planning • Zoning • RIL/Road planning
5.4 *Compliance and Enforcement*	• Anti-poaching patrols • Guard training • Transport control • Bai protection • Informer network
6.1 *Linked Enterprises and Livelihood Alternatives*	• Hire locals/hunters • Guard training • Tourism • Animal husbandry
6.2 *Substitution*	• Animal husbandry • Supply beef
6.3 *Market Forces*	• Tourism • Supply beef
6.5 *Non-Monetary Values*	• Environmental education
7.2 *Alliance and Partnership Development*	• Lobby policy reform • Interior regulation reform • Tourism
7.3 *Conservation Finance*	• Tourism

Mapping Biological Landscapes, which represent hypothetical habitat quality for each of the five Landscape Species, was achieved through the collection of scientific information and expert knowledge of their ecological requirements and functions within the landscape. This information represented over ten years of field research in the landscape combined with other relevant literature, remote sensing imagery and vegetation classification techniques. Four data layers went into creating the Biological Landscapes' habitat quality models: vegetation type, distance to water, distance to bais (one type of natural forest clearing) and density of yangas (another type of forest clearing). Each data layer was individually evaluated for each Landscape Species and only used when applicable (i.e. known to affect that species' habitat preference). Individualized data layers were combined to produce a Biological Landscape map for each species. For instance, we determined that bongo prefer terra firma forest habitat within 5 km of water, nearer to bais, and areas with a high density of yangas, but that they avoid all swamp habitat. Elephants, on the other hand, use all vegetation types and can easily travel to water. Therefore, their habitat quality is based only on distance from bais and density of yangas (see Box 3).

Human Landscapes, models which represent the combined impact of the key threats, were built for each Landscape Species, using information derived from previous threats assessments. Four direct threats (illegal safari hunting, cable snares, commercial hunting, and access to automatic weapons which facilitate poaching and commercial hunting) and two indirect threats (population pressure and access through navigable rivers/large roads) were used to build these

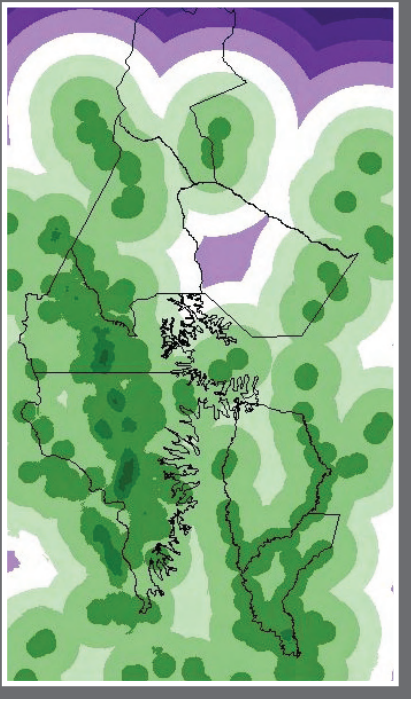




Box 3: Building a Biological Landscape for Elephants

The four data layers used to create biological landscapes (left to right, above): vegetation type[1]; distance to water[2]; distance to bais (a type of forest clearing)[3]; and density of yangas (another type of forest clearing)[4]. The spatially explicit Biological Landscape for elephants[5] (right) was mapped according to the elephants' use of different types of forest clearing (layers 1 and 2 were omitted due to the elephants' use of all vegetation types and the lack of impact of access to water on their behavior). Each map shows the entire area of interest in the Ndoki-Likouala Landscape, with boundary lines delimiting the NNNP, LTCR and the forestry concessions of Pokala, Kabo, Loundougou and Mokabi.

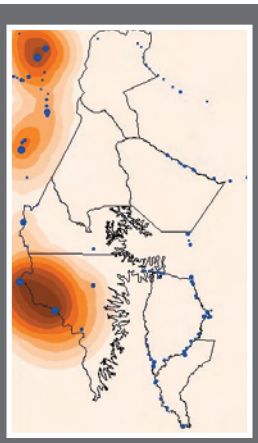
1 Vegetation data map showing terra firme forest (light green), Gilbertiodendron forest (dark green), swamp forest (light blue), raphia swamp forest (pink), water (dark blue), savanna (yellow), and agriculture (purple).
2 Lighter shades of blue indicate increasing distances from water.
3 The bais are shown in yellow, with lighter shades of green indicating increasing distances from bais (including those outside the area of interest).
4 The yangas are shown in yellow, with lighter shades of blue indicating higher yanga densities (including those outside the area of interest).
5 Areas of highest biological value for the species are highlighted in darker green, with areas of declining biological value indicated by lighter shades of green to white to purple (with darker shades of purple indicating the lowest biologically valuable areas).

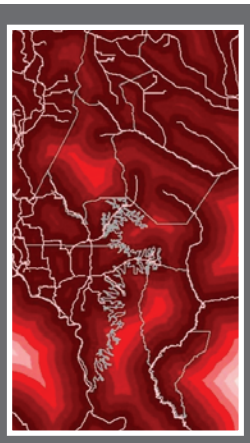


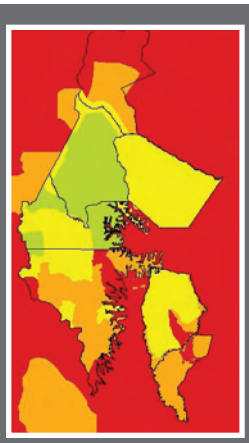
Human Landscapes (see Box 4). Each threat was individually represented for each species (e.g., the threat of cable snares was highest for chimpanzee but did not affect elephants or crocodiles) and made spatially explicit (e.g., threats were often lowest within Nouabalé-Ndoki National Park). Threats were combined such that indirect threats increased the impact of direct threats (e.g., safari hunting was more severe near population centers and access routes) in order to produce more accurate Human Landscape maps for each species.

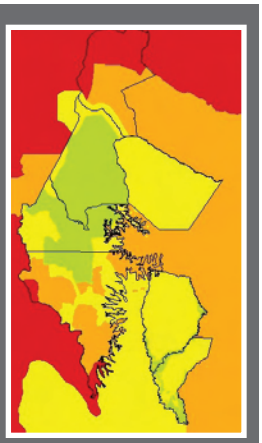
Conservation Landscapes are maps which overlay the Biological and Human Landscapes in order to highlight potential areas of wildlife/human conflict by contrasting areas of biological value against the different levels of threats. Conservation Landscapes can be used to prioritize conservation action and form the basis for monitoring the impact of WCS's conservation efforts (see Figure 3 for an example).

In northern Congo, where vast tracts of potentially good habitat remain for all five Landscape Species, WCS frequently prioritized areas of high biological value and a variety of threat levels. For species such as bongo and elephant, for example, whose preferred habitat lies outside of the areas under current protection, this puts an emphasis on reducing threats to key habitats via protected area buffer zone management programs. In a socio-economic environment that is changing as rapidly as that in northern Congo, the Conservation Landscape becomes, by necessity, a highly dynamic entity. The project team therefore recognized from the beginning that all Biological, Human, and Conservation Landscapes should be constantly revised and improved within an adaptive management framework, addressing inaccuracies, incorporating new information on species biology, and updating data on threats and land-use in order to inform short-term management decisions on the implementation of effective interventions.





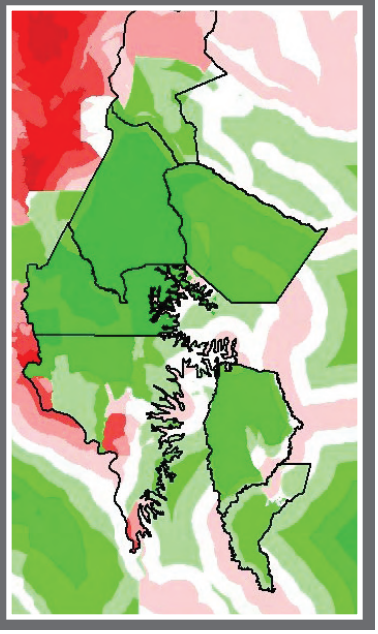




Box 4: Building a Human Landscape for Elephants

The Human Landscapes were mapped using the threats identified in the threats assessment. These were made spatially explicit for the following key threats (left to right, above): population pressure[1]; access (via navigable rivers and large roads)[2]; cable snares[3]; automatic weapons (not shown); commercial hunting[3]; and unsustainable safari hunting (not shown). The Human Landscape for elephants[4] (right) was mapped by combining all of the threat maps, except the threat from cables snares, which does not impact this species. Each map shows the entire area of interest in the Ndoki-Likouala Landscape, with boundary lines delimiting the NNNP, LTCR and the forestry concessions of Pokala, Kabo, Loundougou and Mokabi.

1 Settlements (the size of the blue points indicates relative settlement size) and cumulative population pressure, with darker shades of orange indicating higher pressure.
2 Navigable rivers and large roads are shown in pink, with darker shades of red indicating smaller distances from access.
3 The level of threat for cable snares and commercial hunting: green indicates no threat and yellow, orange and red indicate low, medium and high threat levels, respectively.
4 Darker reds indicate higher levels of threat, while darker greens indicate lower threat levels.



Implementing Conservation at a Landscape Scale: Overcoming Challenges, Grasping Opportunities and Managing Adaptively

Having explicitly defined the key threats to the NLCA and selected a suite of Landscape Species impacted by these threats, the focus then shifted to threat abatement. By addressing limiting factors to conservation across the landscape it was possible to secure some remarkable successes while adapting to the dynamically changing conservation context. The implementation of conservation interventions in Ndoki-Likouala involved three major approaches: managing the Protected Areas; implementing conservation in the broader landscape; and addressing policy issues and forming government partnerships.

Protected Area Management

Protected areas form the cornerstone of conservation efforts in the Ndoki-Likouala Landscape, where contiguous blocks of uninhabited forest and habitat for a remarkable diversity of wildlife still exist. Central to this concept are the Nouabalé-Ndoki National Park (NNNP: 4,200 km^2) and the Lac Télé Community Reserve (LTCR: 4,545 km^2). In the NNNP, over ten years of technical expertise in wildlife research, monitoring and protected area management culminated in the adoption of the Nouabalé-Ndoki National Park management plan in 2003, only the second protected area management plan adopted by the government in the Republic of Congo. The legal decree classifying the Lac Télé Community Reserve was signed by the government in 2001, following the initiation of a WCS-MEFE feasibility study in 2000. In 2003, WCS and MEFE initiated an official project to collaborate on full-scale community resource management activities. The next two years saw a full evaluation of the current legal limits of the LTCR with a proposal for possible extension.

Law Enforcement in Protected Areas

Law enforcement in protected areas and of protected species can be an extremely effective strategy for wildlife conservation (see Box 5) and Congolese law currently provides adequate and integral protection for the majority of endangered wildlife species which occur in the landscape, including elephants, great apes and dwarf crocodiles. However, at present there is no dedicated governmental wildlife or protected areas authority with a significant field-based presence to enforce these laws, although wildlife law enforcement has traditionally fallen under the jurisdiction of the Ministry of Forest Economy and the Environment. Unfortunately, scarce human resources and weak technical capacity of MEFE officers, combined with a poor understanding of the law at the local and regional level, has greatly impeded on-the-ground law enforcement efforts both inside and outside protected areas. The lack of effective law enforcement agents is compounded by an ineffective judicial process which

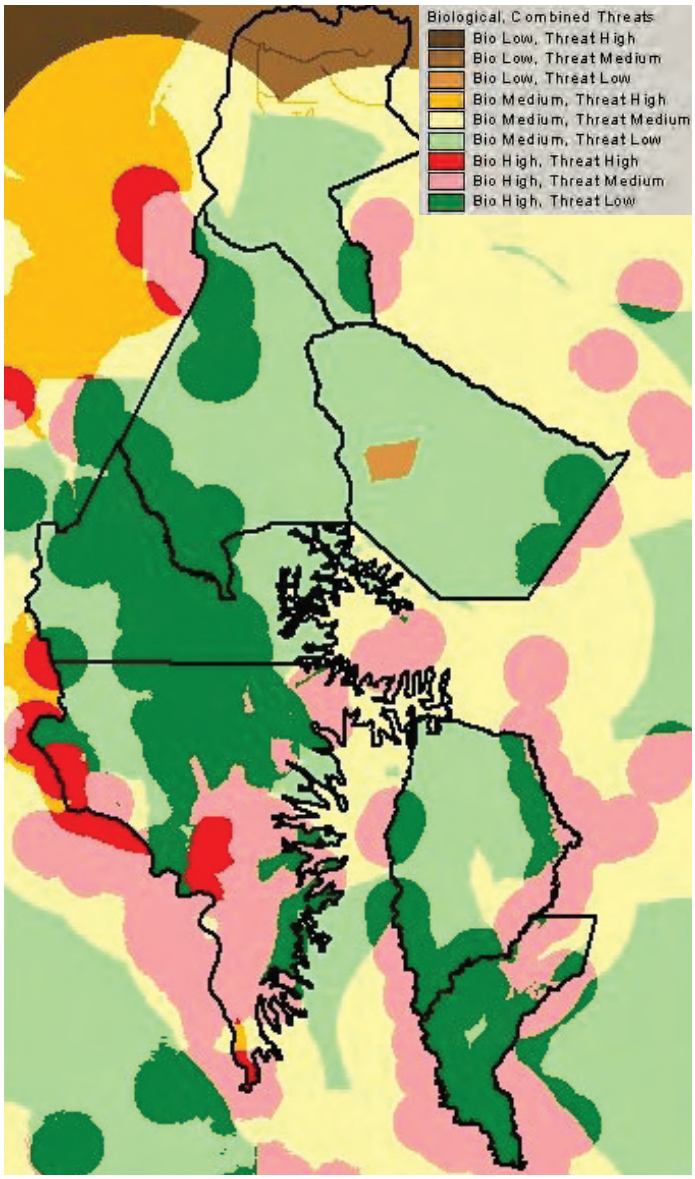
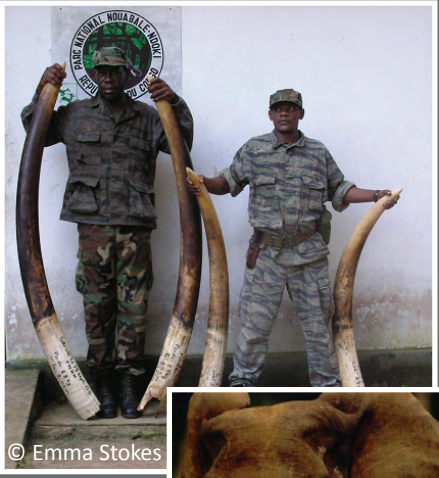


Figure 3. The Conservation Landscape[1] for elephants, highlighting key areas of human-wildlife conflict and helping prioritize conservation actions.

1 Conservation Landscapes contrast areas of different biological value against the different levels of threat (the legend shows 9 possible combinations of habitat quality and human impact).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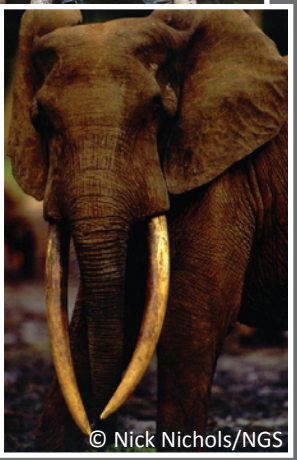
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Box 5: Elephant Poaching and Law Enforcement Monitoring in the Nouabalé-Ndoki National Park

Poaching elephants for their ivory remains one of the most serious threats to the Nouabalé-Ndoki National Park and forms the basis of its law enforcement and protection strategy. The adoption of an adaptive management strategy that encouraged the evolution of effective monitoring and surveillance systems in this area has been key. The presence of large-tusked bull elephants in the NNNP – due largely to effective protection efforts over the past ten years – is the major driving force for the illegal incursion of poachers across the NNNP borders. Commercial forestry exploitation to the north of the Park, combined with illegal diamond mining and human immigration across the border from neighboring Central African Republic, resulted in a considerable increase in poaching incidents in the northern and western sectors of the NNNP in 2003. An immediate response by Park staff resulted in the creation of two advance guard camps in the NNNP, and a ten-fold increase in patrol effort. The result was an immediate reduction in poaching. Since then, recorded elephant poaching incidences in the Park have remained low, although persistent pressure exists on the northern border from the Mokabi forestry concession and illegal immigrants settling from Central African Republic and Democratic Republic of Congo.

often yields impunity for even those offenders that are caught. In both the Nouabalé-Ndoki National Park and, more recently, in the Lac Télé Community Reserve, WCS has collaborated with MEFE to enhance the effectiveness and capacity of government law enforcement agents in the region. This collaboration included facilitating the implementation of protection systems that effectively respond to perceived threats and providing training and equipment to MEFE park guards. Bolstering protected area protection efforts through collaborative transboundary patrol efforts (with Central African Republic and Cameroon counterparts) in the Sangha Tri-National[3], and through effective buffer zone management programs – including the mobilization of wildlife law enforcement agents in surrounding logging concessions and on logging roads – has further ensured the integrity of protected areas in the landscape.

Conservation Management, Wildlife Research and Monitoring

During GCP-I a number of wildlife monitoring and research projects were completed to obtain data vital for effective conservation management (e.g., assessment of the distribution and relative abundance of large mammals and other key species, including the Landscape Species; collection of information on human impacts in key areas; bai monitoring on foot and via aerial videography; elephant telemetry to determine scale and drivers of elephant movement). This also involved training and mentoring national staff, as well as facilitating their study for higher university degrees, in order to build capacity in conservation management, wildlife research and monitoring. These training activities ensured the availability of capable human resources for the long-term sustainability of conservation in the Ndoki-Likouala Landscape.

Local Stakeholder Involvement

The Ndoki-Likouala Landscape has traditionally had a low human population density (<1/km²), with indigenous Bangombe and Bambendzele subsisting in the area around the Nouabalé-Ndoki National Park as semi-nomadic hunter-gatherer societies (a notable exception

3 In 2004, WCS helped create the Sangha Tri-National Foundation, Central Africa's first major independent conservation trust fund, to support trans-boundary conservation between Ndoki and neighboring protected areas in Cameroon and the Central African Republic.

here is the village of Bomassa, see Box 6). However, over the past three decades, the arrival of commercial timber exploitation has brought with it considerable human immigration into the region through the growth of logging towns and associated trading centers. The result is that most employment in the region is now associated either directly or indirectly with commercial forestry. Incorporating these local stakeholders in wildlife conservation and community-based natural resource management programs therefore presents a considerable challenge as these immigrant groups are often itinerant and have neither traditional systems of tenure nor any sense of ownership to the land or its resources.

Lac Télé Community Mapping Project

The Lac Télé Community Reserve is the sole such reserve in Congo. The inhabitants of the reserve, and various external influences, place pressure on the natural resources of the reserve through activities such as fishing, hunting and agriculture. However, in contrast to the situation elsewhere around the NNNP, a community-based approach may be able to provide for sustainable use of the natural resources of Lac Télé given a number of characteristics of the reserve's local environment and human population.

Firstly, the population has relatively few immigrants and is largely homogeneous, with over 90% being

Photos: © Emma Stokes

Box 6: Mitigating Human-Elephant Conflict in Bomassa Village

The village of Bomassa is the closest village to the NNNP and has developed strong links with the WCS/MEFE project. A riverine community on the Tri-national border of Congo, Central African Republic and Cameroon, the village has traditionally been a major frontier trading town for communities up and down the Sangha River and, in the past, a prominent centre for elephant poaching. A strong interdependence between the NNNP and the village has reaped considerable mutual benefits, not least through sustainable hunting programs in and around the village, direct economic incentives provided to indigenous Bomassans through the Park's preferential employment policy to encourage village development, local revenue generated by ecotourism and the provision of basic services such as education and health. The success of conservation efforts in and around the village saw a return of elephants to the region around Bomassa in 1998 after years of poaching pressure. As a result, incidences of crop damage by elephants have begun to increase and the NNNP was requested to assist the village in finding a solution to the problem. The WCS project has implemented a series of experimental fields in Bomassa to test the efficacy of methods to deter elephant visitation to manioc fields.

In 2004, a new method (originally elaborated in Zimbabwe), based on the use of chili peppers as elephant deterrents, was implemented. The method is based on a combination of passive and active measures; passive measures include construction of simple barriers around fields and active measures involve the burning of bricks manufactured from chili pepper and elephant dung. A production line of chili peppers was initiated by establishing nurseries. Sale of chili pepper to tourists is facilitated and the plants provide an extra line of defense around the manioc plants. The project, if successful could provide both a sustainable, and commercially viable, method for maintaining local livelihoods as well as positive attitudes towards elephant conservation in the region.

indigenous Bomitaba, giving them a strong incentive to manage their natural resources for the long term. Secondly, each family group retains knowledge of the limits of its traditional community territories for fishing, hunting and other activities, even though the long-established authority over these territories has been eroded in recent years. Another important factor is the population's preference for fish as a source of protein, in contrast to other sites where meat, and particularly bushmeat, is at a premium. A final and significant factor which contributes to the management of the reserve is the swamp forest which surrounds the reserve in all directions except the north. This nearly impenetrable swamp forest makes movement difficult except along rivers and the road, facilitating control of the pernicious bushmeat and wildlife product trade.

To this end, the WCS project in Lac Télé has been working with local communities to increase stakeholder involvement in the management of their natural resources. A socio-economic team based in the field worked with each family group in the 27 villages of the reserve, mapping each traditional community territory, noting limits and important cultural sites. The history of each territory was also recorded to assist in the resolution of disputes between territory owners. The mapping of all territories assisted communities when establishing natural resource management committees for each territory and use type. These committees, in collaboration with WCS staff, have established regulations for each territory which incorporate local customs, national laws and the overall goals of the Lac Télé project, and they have a direct say in the management of their territories, as well as a direct interest in upholding interior regulations and assisting the project and government in management of the reserve. In addition, to further control the bushmeat trade, WCS reached an agreement with the Likouala regional military commander to stop purchasing bushmeat for troops at markets within the reserve boundaries.

Conservation in the Broader Landscape

Collaboration with Private Enterprise

In 1999, WCS, the then-Swiss/German-owned timber company CIB (Congolaise Industrielle des Bois) and the Government of Congo signed an agreement to implement a collaborative wildlife management program in CIB-operated logging concessions in the periphery of the Nouabalé-Ndoki National Park. This ground-breaking collaboration between an international conservation NGO, the private sector, national government and the local community resulted in the initiation of the WCS program PROGEPP (Projet de Gestion des Ecosystèmes dans la Péripherie du Parc National de Nouabalé-Ndoki). The goal of PROGEPP is to ensure the integrity of the Nouabalé-Ndoki National Park through the protection and sustainable management of its peripheral zone, working closely with the WCS/MEFE project based in the Nouabalé-Ndoki National Park. The program has succeeded in offering additional protection to wildlife populations in over two-million hectares of contiguous forest, over 80% of which lies in multiple-use production zones.

Wildlife Management in Logging Concessions

The greatest threat to wildlife conservation efforts in the Ndoki-Likouala Landscape is the commercial bushmeat trade. With the rapid advance of logging activities in the region, the increased access through logging road networks and increased demand through human population growth centered around logging communities, traditional methods for subsistence hunting are fast being replaced by a commercial trade in bushmeat with sale to regional urban centers. This problem is further fuelled by a lack of alternative protein sources and the ready availability of military weapons[4].

A central premise of PROGEPP was the regulation of bushmeat offtake in logging concessions, laid out in the form of a land-use zoning plan that clearly demarcated zones for community hunting and collection of other forest products and zones for hunting by logging employees. This land-use plan was informed by a series of ecological and socio-economic field research projects on the wildlife and local community-use of the area, and important habitats lying in forestry concession land (such as natural elephant clearings and salt licks) were afforded additional and integral protection by the strict prohibition of hunting. In the Loundougou forestry concession to the east of the NNNP, traditional hunter-gatherer societies were involved in a participatory process to identify and maintain sacred forest areas and semi-nomadic utilization zones. The zoning plan was implemented through concession-wide

4 The proliferation of readily available military weapons is the result of civil unrest in adjacent countries such as the Central African Republic and Democratic Republic of Congo.

awareness programs and consultation, and enforced by mobile MEFE patrol units who were trained, equipped and facilitated by WCS-PROGEPP and financed partly through CIB. The program yielded immediate stabilization of wildlife populations in the zones immediately adjacent to the NNNP and served as a model for wildlife management programs in forestry concessions on a national level, raising the bar for the private sector to take responsibility for wildlife and other natural resources as part of their exploitation agreements. This has ultimately been manifested by the implementation of a Congolese law requiring all private enterprises in forestry concessions to establish mobile law enforcement units known as USLABs (Unités de Surveillance d'Anti-Braconnage).

Since commercial timber exploitation facilitates the bushmeat trade, WCS-PROGEPP established road blocks at key logging road junctions throughout the concessions to search logging vehicles and prevent transport of protected species. The bar was raised again in 2003 through a collaborative agreement to prohibit transport of bushmeat of any kind in CIB vehicles. The challenge of controlling bushmeat traffic in logging concessions will be compounded in coming years, as National Route 2 will pass just 5 km to the southeast of the NNNP and will open up logging road networks throughout northern Congo and Central African Republic to public access.

Provision of Alternative Protein Sources

In 2001, household surveys on protein consumption in major logging towns in the landscape revealed that bushmeat made up to 30-40% of meals while fish made up 40-60%. One of the most concrete results of WCS's work with CIB was the company's agreement to develop and import alternative protein sources for its employees as one strategy to alleviate bushmeat offtake. Cattle importation and poultry farming were encouraged in the logging towns of Kabo and Pokola and, in 2003, cold rooms were installed in Pokola and Kabo to allow the importation of frozen proteins, mainly salt water fish, but also beef, pork and chicken. A significant increase in domestic meat consumption was subsequently registered, as the percentage of overall diet derived from domestic meat sources increased in Pokola from only 2% in 2001 (prior to the importation of cattle and installation of cold rooms) to 15-25% in 2004.

Other husbandry initiatives have included both technical and material assistance to traditional farmers. In 2004, the WCS Field Veterinary Program collaborated with state veterinary and livestock agents to launch a livestock risk assessment study to assess potential pathogens, suitable means of control and improved local husbandry techniques. Other non-husbandry initiatives supported include gardening development and material assistance to local fishermen in the Sangha River and the Likouala swamps. Fishing represents a key activity in this landscape, providing a considerable buffer to seasonal offtake of bushmeat; therefore, sustainable fisheries management programs offer great promise to alleviate overall bushmeat consumption. Research on fish stocks and current levels of offtake and abundance was initiated throughout the landscape, notably in the Likouala-aux-Herbes and Sangha River communities. Relying on traditional activities and values to provide alternatives to bushmeat may indeed prove an even more viable and sustainable option in the long-term. With this in mind, the program embarked on a major 3-year fisheries assessment project in the Sangha in 2007, funded by FFEM (Fonds Français pour l'Environnement Mondial); this project was greatly informed by the research on household surveys and seasonal protein consumption in the logging concessions undertaken during GCP funding.

Management Planning in Logging Concessions

Following the creation of PROGEPP, management plans[5] were drawn up for the Kabo, Pokola and Loundougou Forest Management Units (FMUs), with WCS providing input on all wildlife-related management activities such as wildlife inventories and information on hunting activities and regulations. This was the first management initiative of its kind in the Congo and, given the general lack of scientific information available for closed tropical moist forests on which to base the forest management plan, WCS's role was critical. Many innovations in forest logging practices were put into practice in these logging concessions, including: the integration of biodiversity conservation in the management process (although production is still central to the management process, now the ecological and social roles of the forest are also considered); the financing of the management plan's development and implementation costs by the logging company; and the

5 In addition to wildlife management, the plans also cover commercial timber and other socio-economic interests.

engagement of frequently marginalized users of forest resources into a participatory management process.

The wildlife management plan focuses on habitat conservation and hunting regulations: restricting hunting of protected species and export of bushmeat; implementing environmentally-sensitive road planning and zoning; enforcing road closures after logging is completed; establishing set-aside areas without logging; and conserving seed-trees and retaining the aerial bridges between crowns for primates. Once management plans had been drafted, the next step was to obtain Forest Stewardship Council (FSC) certification based on the adoption of reduced-impact logging methods (see Box 1).

Outreach and Awareness

WCS is involved in conservation education program efforts focused on protected species, principles of wildlife management, hunting rules and regulations (including appropriate hunting techniques), land-use zoning, Ebola awareness (with the WCS Field Vet Program), and promotion of alternative protein sources, among others. These outreach and awareness messages are delivered via nature clubs and education programs for children and teachers, public meetings, radio and TV broadcasts and through individual contacts with local wildlife managers and enforcement officials, as well as local and national residents. They aim to change the attitudes of people to ensure the long-term survival of wildlife and nature. This outreach includes holding meetings with individuals representing the full spectrum of stakeholders in the area, in order to raise awareness of local issues. For example, WCS facilitates frequent public meetings throughout the logging concessions of the buffer zone with villages and semi-nomadic camps to raise awareness of wildlife management and conservation among CIB employees, hunters and local community members (including traditionally marginalized groups such as Bambejele community members).

Conservation Education Programs

WCS provides environmental education and conservation awareness through Club Nature, in the logging concession towns, and Club Ebobo, in the villages immediately surrounding the NNNP. Club Ebobo (the local name for gorilla) was initiated for the children of Bomassa village by research staff at the Mbeli Bai gorilla study project, and has since expanded to include the village of Makao on the site of the northern base of the NNNP. Many Bambenzele children that were formerly marginalized and did not attend school have been able to participate in Club Ebobo. Club Nature sessions are conducted by educators in collaboration with local primary and secondary school teachers, to raise the local children's awareness of the importance of their natural ecosystem. Additionally, WCS collaborated with Regional Education Ministry teachers and inspectors to develop a protected species teaching manual and curriculum based on WCS's protected species conservation education program (for elephant, gorilla, chimpanzee, leopard, bongo, etc) that was distributed by the Ministry of Education[6].

Radio & TV Broadcasts

In order to raise conservation awareness on the local, regional and national level, WCS, in collaboration with Congo TV, has produced and aired many documentary films on topics such as natural resource use, wildlife management/conservation, elephant conservation in the face of the poaching crisis, the commercial bushmeat trade in Congo, Lac Télé Community Reserve and crocodile hunting in LTCR. Additional TV programs and radio spots have been produced in the local languages (Bomitaba and Lingala) for broadcast by the local TV and radio stations.

© T. Breuer

Children, Club Ebobo

6 Club Nature has also developed a manual that may be used by teachers or NGOs throughout the region.

Partnerships with Local NGOs

WCS works with local NGOs and community-based organizations to increase their forest management and conservation capacity. WCS, together with the Association for the Protection of Tropical Ecosystems and Development in the Sangha (APTEDS), promotes environmental education in the Sangha Department's capital, Ouesso. This collaboration also provides educational outreach on other topics including the provision of alternatives to bushmeat, such as domestic beef. WCS also collaborates with Conservation de la Faune Congolaise (CFC - Conservation of Congolese Wildlife) to provide alternative livelihood activities and raise awareness of conservation problems in Lac Télé Community Reserve and its periphery. CFC staff have participated in WCS training programs and collaborated on activities such as bushmeat and fisheries monitoring.

Policy Issues/Government Partnerships

The Ndoki-Likouala program was considerably strengthened during GCP-I, through the bolstering of WCS-Congo's standing and infrastructure in the country as a whole and in particular at the program's office in Brazzaville. Rather than detracting from the site's activities, this has strengthened the program by establishing direct links with government partners, liaising with these partners on policy issues, providing norms for legal texts, and enabling the development of a technical collaboration with CNIAF (National Center for Management of Floral and Faunal Inventories) in order to build national institutional capacity for database management and monitoring of natural resources in Ndoki-Likouala and other landscapes.

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Ecotourists

A catastrophic decline in bongos in 1997-8 due to vector-borne disease led to successful lobbying for their removal from the safari hunting list in 1999. Both bongo and elephant are now protected in the Republic of Congo; safari hunting for trophy animals of these species is illegal. This achievement is particularly noteworthy given that laws in the neighboring countries of Central African Republic and Cameroon currently permit safari hunting of bongo (and elephant in Cameroon). Bongo populations appear to be slowly recovering in the Ndoki-Likouala area, but until convincing biological information can be presented to the contrary, their exclusion from safari hunting should be maintained.

Based upon the success of the PROGEPP partnership, WCS staff worked with the Government of Congo and civil institutions to develop forestry and wildlife management norms for national-scale application in 2005-7, following the official signing of the new Wildlife Law. Furthermore, collaboration with the Congolese government led to their 2004 commitment to form a 'parastatal' Congo Wildlife Service, through an MOU with WCS. Finally, a current regulation requires all commercial forestry concessions to provide wildlife enforcement teams (the "USLABs" mentioned above).

Sustainability

WCS has partnered with the Government of Congo and international private tour operators to facilitate the implementation of ecotourism in the Ndoki-Likouala Landscape, and specifically the Nouabalé-Ndoki National Park. This type of travel, with its inherent education component for the visitor, encourages conservation of the environment while the income generated benefits local people and provides a source of financial sustainability for conservation activities. Ecotourism can also be an important tool for developing local, national, and international support for a protected area.

Development of ecotourism in the Ndoki-Likouala Landscape began in early 2001, focusing on gorilla viewing at Mbeli Bai, a large forest clearing in the NNNP. Elusive forest animals such as gorillas, forest elephants, forest buffalo, sitatunga, otters, and a variety of bird species, can be seen under excellent viewing conditions at these forest clearings. Ecotourism has continued to expand since that time, with the construction of new tourism

infrastructure, the building of local staff's capacity to manage tourism operations, the addition of activity options for visitors, including gorilla treks in the recently set-aside Djéké Triangle, and an increase in international popularity due to promotional campaigns. To ensure the long-term success of ecotourism as a conservation and development strategy, the existing partnerships with private tour companies and ground operators will be expanded. The governmental Ministries of Forest Economy and the Environment and the Ministry for Tourism are expected to produce guidelines and a national strategy for the future development of ecotourism within Congo, building upon the knowledge generated by ecotourism development in Ndoki-Likouala.

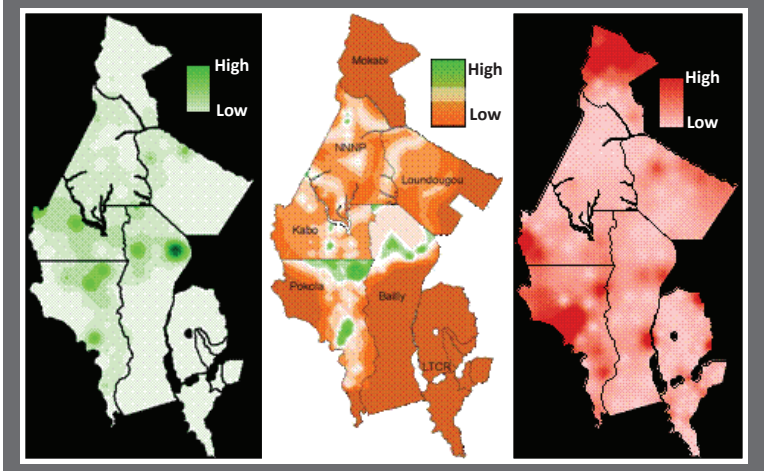
In 2004, WCS helped create the Sangha Tri-National Foundation, Central Africa's first major independent conservation trust fund, which is managed by a board of directors comprising representatives from the three governments (Congo, Cameroon and the Central African Republic), WCS, WWF and others. The Sangha Tri-National Foundation will ensure the long-term financial sustainability necessary to support the growth and management of the three connecting parks.

Measures of Success

Given the increased investment of conservation effort to protect the natural resources of the Ndoki-Likouala Landscape, measuring the success of these efforts becomes progressively more important in evaluating and adapting management strategies. Monitoring the conservation targets, in this case the populations of wildlife (in particular, Landscape Species), presents both a logistical and methodological challenge in the vast dense forests of northern Congo. In doing so, however, the program has obtained valuable information on the direct impact of management activities in reducing threats and meeting targets. Given the highly dynamic socio-economics of northern Congo, this field-based information is irreplaceable in guiding management decisions. Therefore, devising simple, reproducible and effective monitoring programs forms a critical element in the adaptive management approach to landscape conservation. Furthermore, the implementation of effective management and monitoring systems across a variety of different land-use types in the Ndoki-Likouala landscape presented the opportunity for long-term and sustainable conservation strategy planning processes to incorporate an assessment of the real costs and benefits of landscape-scale conservation in Central Africa.

In 2006, building upon GCP-I investments in the landscape, WCS conducted the first systematic landscape-scale surveys of elephants, chimpanzees, and gorillas in the core of the Ndoki-Likouala Landscape, to evaluate the impact of conservation interventions under three different land-use types: integral protection, commercial logging, and community-based natural resource management. WCS examined species' abundance in management units affected by different levels of human disturbance. Survey results clearly showed that management units which had implemented interventions to reduce poaching and protect habitats - regardless of land-use strategy - harbored significantly higher

Box 7: Spatial Distribution of Elephants in the Landscape



Spatial distribution of elephants in the landscape (based on dung counts) shows the potential impact of protected area management programs in buffering protected areas for forest elephant conservation. Note the high densities in the Kabo and Pokola UFAs (wildlife management underway) compared to northern Mokabi (no wildlife management). Shown here are: (left) simple interpolation maps of the dung counts; (center) predicted densities from a statistical model with covariates distance to NNNP, management unit, distance to roads, distance to bais, and density of yangas; and (right) simple interpolation maps of the human sign counts.

abundance and more stable populations of all three surveyed species. Meanwhile, a neighboring logging concession (Mokabi) with no wildlife conservation activities was found to have low abundances, which were in further decline. The statistical analyses and models developed by WCS provided some interesting insights into the drivers of elephant and ape distribution in the Ndoki- Likouala Landscape:

- The results highlighted that the Ndoki-Likouala Landscape with the Nouabalé-Ndoki National Park at its core is one of the last remaining strongholds for forest elephants with logging concessions able to support high elephant densities – but only with anti-poaching measures in place.
- Roads are exploited by elephant poachers - even when subject to anti-poaching controls – and have a major negative influence on elephant distribution and abundance, so wilderness areas without access are extremely important (see Box 7).
- Ndoki-Likouala has one of the largest remaining great ape populations in Africa.
- Chimpanzees show a preference for unlogged or more mature forests making the Nouabalé-Ndoki National Park one of the last strongholds for chimpanzees in West Equatorial Africa.
- Logging concessions can support very high gorilla densities – but only with clear protection zones (set-asides), anti-poaching measures and RIL; if these criteria can be met, in conjunction with fully protected areas, then logging concessions are potentially extremely valuable for gorilla conservation.

Value of the GCP Program

The inception of the first phase of USAID's GCP program and the inclusion of the Ndoki-Likouala Landscape Conservation Area among the suite of focal sites was valuable in several key ways. The extensive conservation experiences gained over the decade prior to the GCP program's inception within the Ndoki-Likouala Landscape informed the Living Landscapes Program's development of the Landscape Species Approach. On the other hand, the LSA provided a strategic planning framework that facilitated continued project progress and helped WCS efficiently use available resources. The Ndoki-Likouala Landscape is a model for conservation management regionally and globally and lessons learned in this living heart of the Congo Basin rainforest are emanating far and wide. The WCS Program in the Republic of Congo is building on the successes gained during GCP-I funding to continue its important conservation work in this landscape, one of the world's greatest remaining strongholds for forest wildlife.

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WCS/Congo
151 section 1
Avenue General de Gaulle
Plateau ville, Brazzaville
Republic of Congo

The Living Landscapes Program
WILDLIFE CONSERVATION SOCIETY
2300 Southern Blvd
Bronx, NY 10460 USA