CHAPTER 14
The Congo Basin Forest Partnership (CBFP) Priority Landscapes

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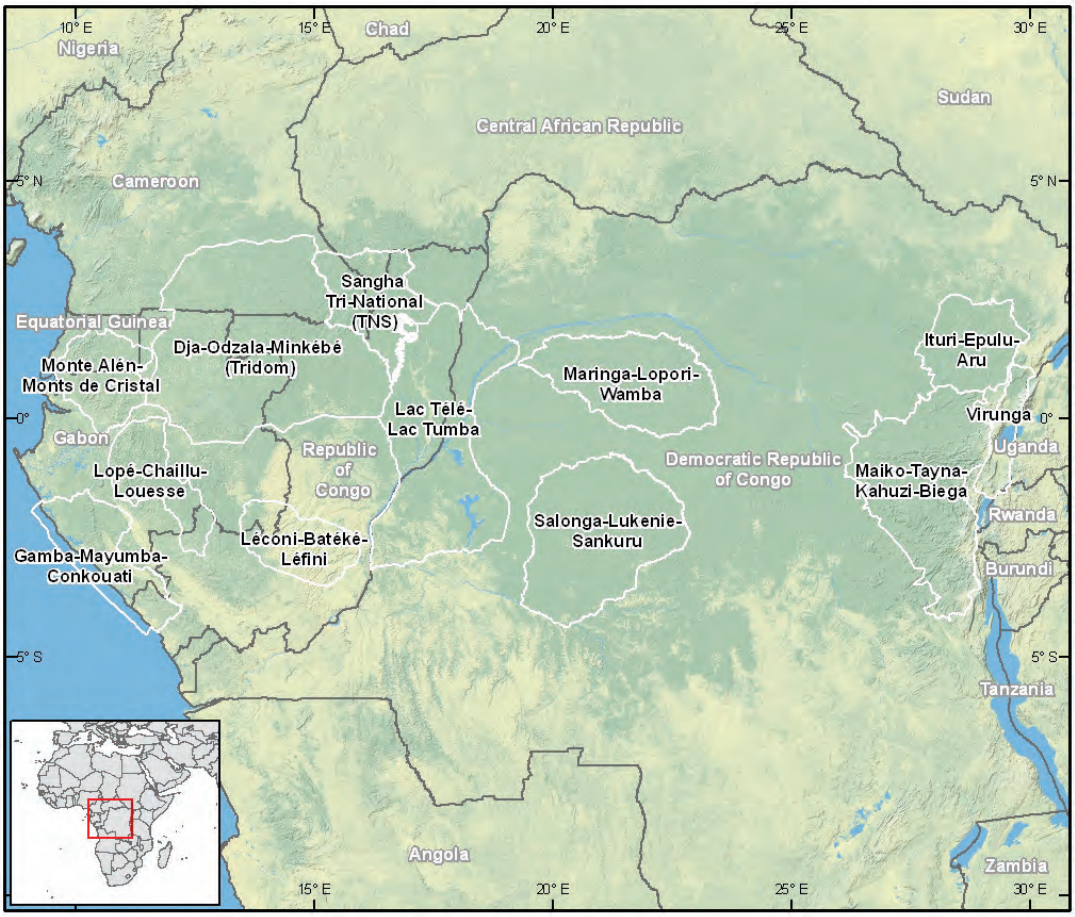
The 12 CBFP landscapes were presented in detail in the 2006 State of the Forest report. The following 12 chapters build on the previous presentations to provide the current state of the landscapes (figure 14.1). Updates are provided on a select set of topics and indicators, including: land use planning, land cover monitoring, large mammal and human impact monitoring, and human activities. These topics are introduced below.



Sources: UMD-CARPE, FORAF, Tom Patterson US National Park Service.
Figure 14.1: The CBFP Landscapes

Land Use Planning

The purpose of land use planning is to develop management and governance strategies that reflect scientific understanding of natural and social systems as well as changing societal conditions and values. Ideally, it is a process in which stakeholders (community members, scientists, government representatives, private businesses, traditional authorities, etc.) come together to debate and discuss how to manage lands for the benefit of current and future generations and to ensure ecological sustainability of lands and resources. Effective planning processes promote decisions that are informed, understood, accepted and capable of being implemented.

Photo 14.1: In Cameroon, the forests are an important source of both timber and non-timber forest products.

There are two levels of planning involved in the CBFP landscape land use planning process: the landscape level scale and the macro-zone scale. Landscape level planning assesses broad, wide-ranging trends, influences, and impacts at a large scale, incorporating and integrating multiple protected areas with resource-use zones. A large scale perspective facilitates the identification of resource use opportunities that provide economic and social benefits while promoting ecological sustainability. Experience has demonstrated that planning for ecological sustainability requires this large scale integrated approach.

The macro-zones are areas within the landscape. They are zoned for differing uses and levels of resource protection, and are created to support the landscape desired conditions and objectives. Three types of macro-zones are delineated within the Landscapes: protected areas (PA), whose predominant purpose is the conservation of the natural state of the flora, fauna and other natural resources; community-based natural resource management (CBNRM) areas in which communities have some form of natural resources use rights; and extractive resource zones (ERZ) which include forest concessions, large-scale private plantations, mines, safari hunting zones, and energy and transportation infrastructure.

Central to planning is the recognition that in most cases not all desired data on the landscape and its resources will be available in detail. Even the best plans need to be altered to adjust to improving data and information; changing social, economic or other conditions; evolving threats; or feedback from monitoring efforts. Therefore, these plans are adaptive in nature and amendments or entire revisions are expected.

Sound strategies for landscape planning incorporate multiple opportunities for involvement and concurrence by local communities, government, relevant industry, and other stakeholders. Creating a sense of ownership among local community members and a wider audience of stakeholders by involving them in planning discussions and decision-making, improves the likelihood that the plan will be supported and its implementation will be successful. Without true legal governance authority, the only authority landscape leads have to implement management plans is that which they obtain through consensus. The maps in the following landscape sections are not legal administrative maps, but represent the different approaches to natural resource management as embodied in the macro-zones.

Land Cover Monitoring

Photo 14.2: In forest areas, settlements often develop around extractive industries, such as logging or mining.

Monitoring land cover and land use is essential for successful natural resource management within the Landscapes. Satellite data provides the most cost effective and synoptic means of land cover monitoring. Landsat satellite data is particularly suited for monitoring forest cover and change in the Congo Basin because its spatial resolution is sufficient to detect the small scale deforestation characteristic of the Basin, and because Landsat data have been acquired since 1975. Thus Landsat data can be used to make baseline estimates of forest cover and rates of forest loss and to consistently and accurately monitor forests going forward. The forest cover extent and loss estimates in the accompanying landscape chapters were derived by an automated method using MODIS (Moderate Resolution Imaging Spectroradiometer) data and Landsat data (Hansen *et al.*, 2008; Lindquist *et al.,* 2008). Forest cover and loss are provided for circa 1990, 2000 and, where available, 2005.

Most of the deforestation that occurs in the Congo Basin is a result of clearing associated with small scale agriculture, particularly along the corridors of the existing road network. Commercial logging also impacts forest cover, but this logging is highly selective and is usually only detectable in satellite images as expansion of the road network. Forest cover captured by remote sensing data is based on biophysical and structural traits, and floristic detail can only be provided by *in situ* data. Likewise, although remote sensing data reveals the condition of the forest canopy, assessment of forest ecosystem conditions must incorporate ground-based monitoring of flora and fauna.

Large Mammal and Human Impact Monitoring

Since the early 1990s, it has been recognized that hunting, not deforestation, is the most serious threat to wildlife biodiversity across most of the Congo Basin. Most species are targeted for meat; and elephants primarily for ivory, although they have more recently been hunted for their meat as well. The bushmeat is destined for three main sets of consumers: the local rural communities, laborers working in logging and mining concessions within the forest, and the increasingly important urban markets. Much of the ivory eventually goes to the Far East, especially China.

The species which best indicate whether an ecosystem is intact in the Central African rainforests are generally the larger-bodied, slower breeding mammals. If a forest is being unsustainably hunted, these species are the first to be depleted. This is because they are (i) selected for by hunters, as they give the best rate of return (in terms of kilograms of meat) per unit effort; (ii) generally occur at lower density than smaller species and (iii) because of their slower reproductive rate, are harvested faster than their rate of replacement. Among the larger mammals there are two major groups which are of particular concern: the great apes and elephants. Both take over a decade to reach reproductive age and, even then, have a long interbirth interval (four years). They are the only seed dispersers for an important set of tree species, and elephants are also important in opening up the understory, facilitating seed germination and sapling growth. Elephants are usually the very first species to become locally extinct, or at least very rare, when a forest is unsustainably hunted. These species have therefore been chosen as the animal indicators for "the state of the forest"; in other words they indicate an intact ecosystem where seed dispersion and regeneration are still taking place. It should be noted that a strong positive relationship between large mammal abundance and forest inaccessibility has been observed. Much of the previously inaccessible forest of the Congo Basin, outside national parks and other protected areas, is becoming vulnerable to unsustainable hunting due to the construction of logging roads (Blake *et al.*, 2007, 2008).

Photo 14.3: Two species of doves (Columba unicincta and Treron calva) in a forest clearing in the Okapi Faunal Reserve (Edo).

In most cases, direct observation of animals in the forest is not possible, either because of poor visibility or the animals are nocturnal or uncommon, therefore proxies are used instead of the animals themselves. These proxies are animal signs, especially those which are produced and degrade at predictable rates. These signs are much more abundant than the animals themselves, which facilitates more precise density or distribution estimates. For example, the average chimpanzee produces a nest every night; each nest takes about three months to degrade completely, so at any one time there are about 90 times more chimpanzee nests in an area than there are chimpanzees. For calculating density of apes, therefore, the proxy used is the number and distribution of night nests. Dung is also a useful proxy for other large mammals, particularly elephants. Where density cannot be calculated directly, encounter rate (number of signs per kilometer walked) is a useful proxy for animal abundance. Finally, for monitoring human impact, all signs are generally used as indicators, but these are classified into indicators of hunting, farming, illegal logging, etc. Their encounter rate is the metric used to detect change.

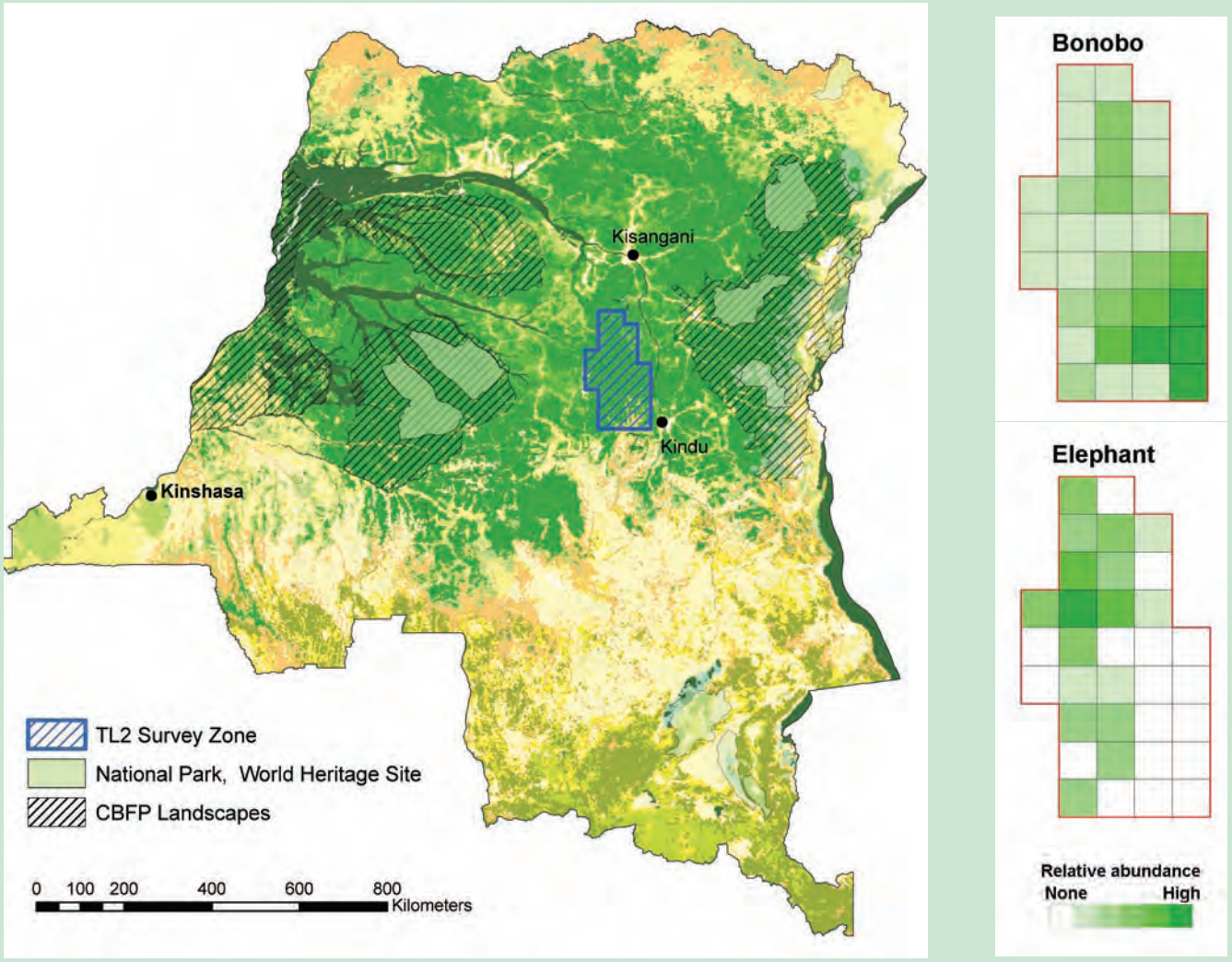
Photo 14.4: Elephants extracting salt from a bai in Dzanga-Ndoki National Park.

Box 14.1: Biodiversity of the TL2 Landscape in Central DR Congo

The conference that led to the delineation of the CBFP landscapes (Libreville 2000, WWF) drew an imprecise outline in the center of DR Congo indicating a totally unexplored area of possible but unknown importance. It was not until 2007 that scientific teams explored the forested basin of the middle Lomami River, from the Upper Tshuapa to the Lualaba (TL2).

The unexpected biodiversity of the area comes not only from range extensions of some of Congo's major endemic fauna but also the discovery of new taxa. Known ranges have been extended throughout the TL2 landscape for bonobo, okapi, blue monkey and numerous bird species. Genetically distinct forms of several species are associated with the cross-hatch of north-south running rivers (Ruiki, Kasuku, Lomami) overlaid by large east-west running barriers of infertile swamp forests. The southern forest is broken by north-south bands of edaphically specialized savannas with a distinctive flora.

Bushmeat from TL2 forests is an important food resource for local communities, but large quantities are now exported to the urban markets of Kindu and Kisangani whose neighboring forests have been emptied of large mammals. Both protected species, species endemic to the landscape and newly discovered taxa are targeted by hunters putting the biodiversity of this landscape in danger.



Source: John Hart, www.bonoboincongo.com.

Figure 14.2: TL2 localization and inventories result

Selected biodiversity discoveries are listed in the table below:

Common name	Scientific name	Observation
Bonobo	*Pan paniscus*	Range extended east of the Lomami River to 3 degrees South, large population in the southern savanna ecotone.
Okapi	*Okapia johnstonii*	Range confirmed east of the Lomami River, and extended south to the forest ecotone, west of the Lomami River.
Forest elephant	*Loxodonta cyclotis*	At the exception of the Salonga´s population, this is the last remaining elephant population of at least 500 in Congo's central cuvette.
"Lesula"	*Cercopithecus sp.*	Newly discovered, known by its vernacular, restricted to forest between the middle Lomami and upper Tshuapa rivers.
Heyman's Blue Monkey	*Cercopithecus mitis heymansi*	Abundant and widely distributed both east and west of the Lomami River.
Blue Monkey unnamed form	*Cercopithecus mitis ssp*	A morphologically distinct, undetermined form with wide distribution both east and west of the Lomami River.
Elegant Mona Monkey	*Cercopithecus wolfi elegans*	Restricted to the Kasuku River Basin, in both forest and savanna ecotone.
Central African Red Colobus	*Piliocolobus oustaleti parmentierorum*	Restricted to forest west of the Ruiki River between the lower Lomami River and the Lualaba.
Tshuapan Red Colobus	*Piliocolobus tholloni*	Major population between the middle Lomami and Upper Tshuapa south to the savanna ecotone.

For more information: www.bonoboincongo.com

Human Activities

Human populations across the Congo Basin are characterized by their heavy dependence on local natural resources for their subsistence and as principal, and often only, source of income. Agriculture, collection of non-timber forest products, hunting and fishing are widespread activities closely tied to the current state and future transformations of the basin's forests. While agriculture and collection of non-timber forest products are important subsistence activities for almost every household (WWF 2006), fishing and hunting are often the sole sources of revenue and protein for the poorest rural populations (Bennett *et al.*, 2007, Nasi *et al.*, 2008).

The bushmeat trade has been identified as an important threat to biodiversity and ecosystem function, as described above. This activity is easily observable, as bushmeat traders are seen daily at principal and secondary river ports and in markets in every city. Quantifying the impact of this trade, however, continues to pose major challenges. Harmonized data sets are difficult to find, information is often site-specific and collected over short periods of time. Also, while market surveys are helpful, interviewing merchants alone provides little light on the actual origins of bushmeat and much less on the conditions under which it was obtained (local versus foreign hunters, levels of local controls, within or outside protected areas, etc.). Bushmeat markets need to be placed within a larger picture that includes the characteristics of the demand (urban areas, mining towns, previously depleted zones, etc.), the economic alternatives to those populations located in and near principal sources of bushmeat as well as other actors and the specific political and economic dynamics between the source and the end markets. These actors include middlemen, transporters, local civilian authorities, and the military.

Even though standardized indicators on local economic activities for the Basin do not exist yet, looking at the principal species of bushmeat traded, purchase and retail prices, and shifts in principal markets can help compare and understand the differences and similarities across landscapes. Other qualities of local trade, such as available infrastructure and distance between sources and principal markets can help understand the role of bushmeat in local economies as well as the possibilities and limitations of alternative economic activities, such as agriculture.

Photo 14.5: Black Legged Mongoose (Bdeogale nigripes) caught in a snare in the Epulu forest.

Box 14.2: UNESCO's Programme on Man and the Biosphere (MAB) and the Biosphere Network in the Congo Basin

UNESCO's Programme on Man and the Biosphere (MAB) aims at providing the basic scientific knowledge needed to effectively address sustainable development and natural resource management issues. This program is present on the ground through a worldwide network of biosphere reserves. In 2008, there were 531 biosphere reserves in 105 countries and five continents, totaling 400 million hectares of land and aquatic habitats. There are 12 biosphere reserves in 6 Central African countries, including Rwanda, of which 5 are located within the landscapes of Gamba-Mayumba-Conkouati, Dja-Odzala-Minkébé (Tridom) and Virunga.

The biosphere reserves are designed to address one of the most important questions faced by the world today: how to reconcile the conservation of biodiversity, the improvement of economic and social conditions and the continuance of associated cultural values? Adopted by the UNESCO General Conference in November 1995, the Seville Strategy and the Statutory Framework for the World Network of Biosphere Reserves stipulate the conditions and game rules for efficient management of the world's biosphere reserve network (http://www.mab-france.org/fr/publi/scan/seville_fr.zip).

Biosphere reserves are both a concept and a tool. As such, each biosphere reserve is characterized by a well-designed zoning system representing a gradient between: (I) one or more core zones dedicated to biodiversity conservation (conservation aspect); (II) a clearly delineated buffer zone surrounding, or close to, the core zones, to be used as a laboratory for collaborative activities compatible with ecologically viable practices such as environmental education, leisure, ecotourism and basic or applied research (development aspect); and (III) a transitional zone with more flexible limits to accommodate various agricultural activities, human settlements and other uses, and in which local communities, administrative organizations, scientists, nongovernmental organizations, cultural and economic groups and other entities from the private sector work in partnership to manage and sustainably develop the resources of their territory (logistical aspect).

Between 1976 (when the first biosphere reserve was created) and 1984, only 23 % of the biosphere reserves had adopted the three-tier zoning system (core zone, buffer zone, transition zone). Today, however, no fewer than 98 % of biosphere reserves strive to reconcile conservation and local economic development by using this zoning system, as well as by supporting local people's participation in the sustainable management of natural resources.

In February 2008, the third World Congress of Biosphere Reserves held in Madrid (Spain) approved the Madrid Action Plan (http://unesdoc.unesco.org/images/0016/001633/163301f.pdf). In a context of worsening and accelerating global changes, poverty and inequality, this Plan has been designed to take advantage of the Seville Strategy and to turn, at the international level, the biosphere reserves into important sites for sustainable development in the first decades of the 21st century. Based on nearly forty years of experience managing biosphere reserves since the MAB program was launched in 1970, the Madrid Action Plan aims to highlight the biosphere reserves and their role as «learning and implementation laboratories for local and regional sustainable development.»

Based on the broad strategic guiding principles of this Plan, the African Network of MAB, "AfriMAB," is planning to take steps to expand the coverage of biosphere reserves to coastal and marine ecosystems – ecosystems characterized by the presence of mangroves, which are not only highly diverse and fragile habitats, but also densely populated. In addition, UNESCO/MAB, ERAIFT (*École régionale post-universitaire d'Aménagement et de Gestion intégrés des Forêts et Territoires tropicaux*), RAPAC (*Réseau des Aires protégées d'Afrique centrale*), and CAWHFI (Central Africa World Heritage Forest Initiative) have decided with the support of partners to strengthen their collaboration and target the Central African forests as the ideal environment to develop a network of biosphere reserves, including transnational reserves, that will serve as: i) sites of excellence for the sustainable future of the Congo Basin; (ii) drivers of change; and (iii) catalysts for new ideas through the testing of innovative development approaches.

For this reason, the Tridom, which saddles three countries and encompasses three biosphere reserves [Dja (Cameroun), Minkébé/Makokou (Gabon) and Odzala (Congo)], as well as the Mayombe project which aims to create a transnational site between the biosphere reserves of Dimonika (Congo), Luki (DRC) and the area of Cabinda (Angola), is a priority for AfriMAB. Within the framework of this initiative, the GRASP partnership (Great Apes Survival Project) promotes the idea of using large primates as ambassadors of peace while encouraging the integration of environmental problems into transnational "peace-building" operations and conflict resolution.

Table 14.1: Ecological characteristics of the Congo Basin Biosphere Reserves

Biosphere reserve	Country	Date of creation	Principal ecosystem	Main habitats	Elevation (m)	Total area and (core zone)[1] (ha)
Waza	Cameroon	1979	Tropical rainforest	Tropical deciduous rainforests *Anogeissus leiocarpus* forests on sandy soils *Acacia spp.* wooded savannas on clay soils Shrubby savannas Herbaceous savannas with *Lannea humilis* Flooded prairies	+300	170,000 (nc)
Benoué	Cameroon	1981	Tropical rainforest	Wet deciduous tropical forests Tropical dry open forests Wooded savannas	+800 to +1,100	180,000 (nc)
Dja	Cameroon	1981	Tropical rainforest	Tropical evergreen rainforests with *Afrostyrax lepidophyllus, Anopyxis klaineana* and *Anthonotha ferruginea* *Gilbertiodendron dewevrei* forests Swamps Old secondary forests Cocoa and abandoned coffee plantations	+400 to +800	526,000 (nc)
Odzala	Congo	1977	Tropical rainforest	Tropical rainforests with *Entandrophragma utile, E.cylindricum* and *E.candollei* Marantaceae forests Logged forests Savannas with *Hymenocardia acida, Annona arenaria* and *Hyparrhenia diplandra*	+400 to +600	110,000 (nc)
Dimonika	Congo	1988	Tropical rainforest	Tropical rainforests on plains Secondary forests Savannas	+85 to +810	136,000 (nc)
Ipassa Makokou	Gabon	1983	Tropical rainforest	Tropical evergreen rainforest with P*olyalthia suaveolens, Panda oleosa, Plagiostyles africana* and *Dacryodes buettneri* Agro-ecosystems	+450 to +500	15,000 (10,000)
Basse-Lobaye	CAR	1977	Tropical rainforest	Semi-deciduous wet tropical forests with *Ulmaceae, Sterculiaceae, Meliaceae* and *Sapotaceae* Young forests with firm undergrowth Forest galleries	<+500	18,200 (nc)
Bamingui-Bangoran	CAR	1979	Tropical dry forest	Semi-deciduous dry tropical forest Forest galleries Wooded savanna with *Terminalia spp.*, *Anogeissus spp.* and *Isoberlinia dokae* Shrubby savannas Edaphic savannas Prairies	+350 to +450	1,622,000 (nc)

Biosphere reserve	Country	Date of creation	Principal ecosystem	Main habitats	Elevation (m)	Total area and (core zone)[1] (ha)
Yangambi	DRC	1977	Tropical rainforest	Tropical evergreen rainforest with *Brachystegia laurentii* and *Gilbertiodendron dewevrei* Semi-humid deciduous tropical forests with *Scorodophloeus zenkeri* Semi-deciduous secondary forests with *Pycnanthus angolensis* and *Fagara macrophylla* Saltwater marsh forests Insular valley forests Regrowth forest Flooded plains	+490 to +530	235,000 (160,000)
Luki	DRC	1979	Tropical rainforest	Tropical rainforests with *Gossweilerodendron balsamiferum, Gilletiodendron kisantuense* and *Terminalia superba* Secondary forests with *Terminalia superba* Tree savannas Herbaceous savannas Agro-forestry systems Agro-ecosystems	+150 to +500	32,968 (6,816)
Lufira	DRC	1982	Tropical dry forest	Tropical humid forests "Muhulu" Miombo open forests open with *Cassia singueana, Psorospermum febrifugum* and *Afzelia quanzensis* Wooded savannas Forest galleries with *Khaya nyasica, Chlorophora excelsa* and *Parkia sp.* Flooded prairies with *Leersia spp., Oryza spp., Typha spp.*and *Phragmites spp.* Agro-ecosystems Pastures	+1,200	14,700 (2,800)
Volcanoes	Rwanda	1983	Montane forests	Low, medium and high elevation forests sheltering a mountain gorilla population (*Gorilla beringei ssp. beringei)* Forests with *Neoboutonia spp.* Bamboo forests (*Arundinaria alpina)* Forests with *Hagenia abyssinica* Prairies Pastures Marshes Swamp Small-sized lakes	+2,400 to +4,507	12,500 (nc)

1 Core zone area – nc = not communicated.