



Inventaire Rapide des Zones Humides Représentatives en République Démocratique du Congo

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Executive Summary

In 2002, the government of the Democratic Republic of Congo committed to increase its protected area coverage to 15% from just over 8%. WWF, RAMSAR, OSFAC and other partners supported the effort by convening an expert workshop in Kinshasa, DRC in November 2007, to undertake a country wide biodiversity assessment, including a rapid inventory and prioritization of the biodiversity value of the wetlands of the Democratic Republic of Congo. Several products were developed prior to the workshop to facilitate the work of the experts. These were: (1) a map classifying small sub-basins in DRC by the predominant aquatic habitat types and (2) a map of human use/suitability. The aquatic habitat or ecosystem map was used as a basis for ensuring representation of all habitat types across the country and the suitability map provided a measure of the level of human impact. For this assessment we used MARXAN, a site selection program, to suggest possible areas for prioritization based on an algorithm to maximize suitability and meet habitat representation goals. The inputs to MARXAN were the terrestrial and freshwater ecosystem classifications and the human use/suitability layer. We set goals of representing at least 20% of every habitat type (higher goals were set for very rare habitat types). MARXAN then analyzed the distribution of these habitat types across DRC and chose those that are likely to be the least impacted (have the lowest human use/suitability score). MARXAN was run 500 times. Those areas that are continually chosen are considered more "irreplaceable", ie, they are necessary for inclusion in the set of priority areas if all habitat types are to be represented. The results of the MARXAN analysis were brought to the expert workshop as one input for the working group discussions in which priority areas were identified. Additionally, the results of the gap analysis for freshwater ecosystem types were used to make certain that under-represented types were included in wetland priority areas. The wetlands working group used these data as a basis for their discussions. The group went through a facilitated process in which they identified those wetlands with known biological values across the country. For each wetland area, experts evaluated its biodiversity value in terms of species richness, species endemism, and ecological and evolutionary phenomena. The knowledge base of the workshop attendees was largely related to freshwater fish species and their distributions. Thus, knowledge on fish species was the largest contributor to area selection; however, there was one bird expert and several of the participants had knowledge of areas of importance for aquatic invertebrates. Species richness is the number of individual species known to occur in an area and endemism is the number of species found only within that area. The ecological and evolutionary phenomena that were considered are the following: key staging, feeding, breeding areas for migratory waterbird species; areas/sites that regularly support >20,000 waterbirds; highly significant spawning ground/nursery area/migratory route for non-avian wetland dependent species; extraordinary radiations or adaptations; intact biotas; refuge areas; many relict or primitive taxa; and generic or family level endemism.

In total, the freshwater experts highlighted 30 wetland priority areas, covering parts of every province of DRC. These areas cover a large portion of DRC and meet or exceed the representation goal of 20% for nearly every aquatic ecosystem type. Each priority area include a description with information on the biological diversity of the area, as well as data responding to the following fields of The Information Sheet on Ramsar Wetlands (RIS):

- Wetland Type (from the Ramsar "Classification System for Wetland Type"; number 19)
- Identification of uses, social and cultural value of the sites (number 23)
- Land tenure in the sites (number 24)
- Current land use (number 25)
- Adverse factors (past, present or potential) threatening the sites (number 26)

Subsequent to the workshop a desk study of available information on the threats to key wetland areas, as well as their socio-economic importance was conducted in order to provide more detailed information on each of the areas. The desk study compiled information from diverse historic and contemporary documents as well as from direct observation (Bas Congo, Equateur and Orientale provinces). Most scientific articles and complementary gray literature were accessed electronically, whereas available print documents were consulted in Kinshasa. Available data are presented by area, following the Ramsar format.

Introduction

A. Background/Political Context

One of the key challenges facing the DRC government and ICCN is to articulate a vision for the future of natural resource management that will guide the pace, scope and intensity of future natural resource development and exploitation. A second challenge is to identify priority areas for conservation, including areas for potential gazettelement into protected areas to achieve the DRC government's goal of conserving 15 % of the country under legal protected area status. In order to achieve these objectives, a series of priority reforms have been initiated by the DRC government. These reforms include, among others, the promulgation of a new Forest Code in 2002 and the ongoing legal review of all logging concession titles. At the same time, several large-scale natural resource management programs funded by USAID¹, the EU², and other donors are being implemented in priority landscapes across DRC. These programs are working to lay down the foundation for a multi-purpose land use planning that could be replicated at the national level.

Building on these efforts, the Minister of Environment and ICCN have initiated a country-wide biodiversity assessment (including a rapid inventory and prioritization of the biodiversity value of the wetlands) to identify priority areas for conservation and contribute strategic data to inform ongoing government legal reviews, the conversion of logging titles, and future national, multi-purpose land use planning processes.

B. Value of wetlands globally and in the Congo Basin context

The Democratic Republic of Congo (DRC) is rich in natural resources and, its wetlands and the life they support are no exception. In this document we use the definition of wetlands given by the Ramsar Convention on Wetlands:

areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.

The country is entirely encompassed within the Congo Basin, the second largest river basin in the world, covering about 4,000,000 square kilometers and draining the largest expanse of lowland tropical forest in Africa (Chapman 2001; Figure 1). The Congo contains a large variety of wetland types, including mountain streams, waterfalls, hot saline springs, subterranean systems, blackwater rainforest rivers, extensive rapids, vast swamps, and large lakes. During the Pliocene, the basin was disconnected from the sea and formed a large inland lake. Eventually, via stream capture the Congo again drained to the Atlantic Ocean; the extensive swamps in the center of the basin are remnants of this pre-historic lake (Leveque 1997). The relative environmental stability of the basin over a long period (since the Pleistocene), the wide range of habitats, and prolonged isolation have favored the evolution of a large, endemic freshwater fish fauna. Upwards of 700 freshwater fish species have been described from the basin and more species are described each year (Teugels and Geugan 1994; J. Snoeks, pers. comm.).

¹ United States Agency for International Development

² European Union

The wetlands of the Congo also provide important feeding and breeding grounds for wetland migratory birds. However, only one site, Ngiri, has been nominated within DRC as an Important Bird Area based on waterbird congregation criteria (BirdLife International 2008). Presumably, this is due to a lack of data on waterbird congregations across the country, as there has not been a country-wide assessment of waterbirds. Other aquatic taxa, such as aquatic plants, mollusks, herpetofauna, and odonates, are also known to have rich and endemic faunas in the basin; species in these groups are also still being described and data on their distribution are limited.

Globally, wetlands are of significant value. According to the Millenium Ecosystem Assessment (MEA 2005), the total economic value of 63 million hectares of wetland around the world is between about \$200 billion a year (Schuyt and Brander 2004) and \$940 billion (Costanza et al. 1997). Wetlands provide a multitude of services – provisioning (e.g., drinking water, food and fiber), supporting (e.g., soil formation), regulating (e.g. water filtration and flood control), and many other spiritual, cultural and aesthetic services. Wetlands in the DRC play an important role in many people’s livelihoods. Local natural resources are often the only means of subsistence for local populations, particularly since the onset of the war in the 1990s, which increased the isolation of the majority of rural communities from economic alternatives outside the exploitation of local resources.

Archeological records show that the first human societies in the present DRC developed along waterways, and on the shores of lakes and river banks. Neolithic sites in the vicinity of Pool Malebo (site E7 in this document), Lake Kisale (area E9), the Ituri basin (area E17) and Lake Edouard (area E20), to cite a few, attest to the relevance of these watersheds in the development of early societies in the region (see, for example, Olivier, 1966; Clark, 1971, Schoenbrun, 1993, Cahen, 1979, De Maret, 1977, etc). Land transformation around the Great Lakes’ region in eastern DRC began around 2000 BP with Bantu groups that practiced long-fallow agriculture (Schoenbrun, 1993:4-5). These groups established villages around lakes and rivers, with fishing and agriculture as their principal activities (ibid, 8).

Tribes and clans’ histories are associated with rivers and other bodies of water that are part of these groups’ oral traditions (socio-economic reports for the Salonga-Lukenie-Sankuru and Lac Tumba Segment Landscapes, WWF, 2006) including migration movements in the late XIX and early XX centuries when many villages located along waterways accessible to European posts and plantations migrated into more isolated areas to escape, first the slave trade and later the rubber tax (Harms, 1983).

To this day, a great part of the Congolese population continues to depend on natural resources for their livelihoods. Local populations fish, hunt, and collect non-timber forest products across the proposed areas. Freshwater fish are an important source of protein for local communities and it is estimated that 70,000 tons of fish are consumed in DRC per year (CEFDHAC 2001). Additionally, seasonally inundated areas are important for rice production (NAPAD, 2006, WFP, 2006).

The absence and poor condition of roads and inadequate infrastructure have resulted in more reliance on waterways for transportation and access to services (Tollens and Biloso, 2006:61). The recent war also caused displaced populations to resettle along waterways and to depend more on local natural resources for their livelihoods (Socio-economic report Lac Tumba segment, WWF, 2006).

Approach and Methodology for Rapid Inventory of Wetland Priority Areas

In order to undertake a rapid inventory and prioritization of the biodiversity value of the wetlands of the Democratic Republic of Congo, we convened an expert workshop in Kinshasa, DRC in November 2007. Through a facilitated process the experts (Appendix I.) selected a set of wetland priority areas across the country. Several products were developed prior to the workshop to facilitate the work of the experts. These were: (1) a map classifying small sub-basins in DRC by the predominant aquatic habitat types and (2) a map of human use/suitability. The aquatic habitat or ecosystem map was used as a basis for ensuring representation of all habitat types across the country and the suitability map provided a measure of the level of human impact.

Aquatic Ecosystem Classification and Gap Analysis

The freshwater ecosystems of the DRC support an exceptional concentration of biodiversity, but building a country-wide freshwater ecosystem classification using field-derived species or community data would be impossible due to data gaps. Broad-scale freshwater habitat classifications, however, can generally be derived from global, continental, and country-wide GIS datasets. These classifications are based on a combination of abiotic (e.g. geomorphology) and biotic (e.g. catchment land cover) features, with the specific features selected based on knowledge of freshwater species and habitat distribution patterns.

The ecosystem or habitat map provided the basis for a coarse-filter analysis (Figure 2). Coarse-filter approaches rely on identifying representative examples of all the ecosystem types in a given region. These system types or communities are assumed to serve as a surrogate – or coarse filter – for conserving the majority of species. Information on fine-filter targets that might fall through a coarse-filter – typically rare or wide-ranging species – were incorporated in this effort through the contributions of workshop participants.

From a set of 12 different variables, four major variables were identified as being the most relevant in delineating freshwater ecosystem types (Figure 2). These variables are:

- discharge (size of system): Divisions were based on size of mainstem Congo River and its major tributaries (eg, Oubangui, Kasai): Mainstem River, Major Tributary, Large Rivers, Small Rivers
The yearly discharge data is modeled using WWF's HydroSHEDS in combination with a global water model called WaterGAP, produced by the University of Kassel
- cascades (known to support their own unique faunas - special habitat type): Cascade locations come from UNOCHA/SPIAF and were attributed to the sub-basins in which they occurred
- catchment land cover (simplified into five classes known to have a major influence on shaping aquatic habitats: evergreen forest, deciduous forest, savanna, freshwater marsh and swamp forest): Vegetation data come from Global Landcover 2000, adjusted according to an African legend. The original GLC-Africa legend was reclassified into five classes; these classes were assumed to be one driver of aquatic processes in the Congo. Within each unit, the type that covered the majority of the basin was assigned to that basin. The dominant landcover type was cross-checked with White's Vegetation Map of Africa. In cases where a sub-basin is covered by >25% wetland vegetation (ie, freshwater marsh and/or swamp forest), the sub-basin was classified as that wetland vegetation type that was pre-dominant (ie, either freshwater marsh or swamp forest), regardless of other landcover types inside the basin. AFRICOVER provided the most detailed wetland classification by specifically defining classes of vegetation in relation to the seasonality of flooding, and was therefore used for this wetlands assignment. We chose a 25% cut-off for wetland vegetation because we wanted to insure representation of these habitats in the final analysis.

- watershed slope (slope affects the speed with which water flows through the system) : derived from HydroSHEDS elevation data. As this data provides elevation in full meters (integer), and due to the occurrence of cascades throughout the Congo, accurate calculations of hydrologic gradient are too scale dependent (ie, depend heavily on the size of the subbasin). Expert consultation identified gradient as a driver for aquatic processes in the Congo, and after revising a land-slope map of the Congo, it was decided that land slopes show a relevant distribution. Instead of classifying exact slopes, we decided to follow a method singling out the high slope lands from the plateaus. Any subbasin unit that had more than 30% of its area with slopes of greater than 15% were classified as having high slopes.

The sub-basins of the entire Congo River basin, and those upstream parts of the Nile inside the DRC, were delineated with a common size threshold of 500 km² using HydroSHEDS, resulting in a map with almost 4000 units. Each of these units were classified by the above four variables. This resulted in a map with 34 classes, including the larger lakes as a separate class. A gap analysis of the current protected area system (Appendix II) was conducted to determine which system types were either not represented or under-represented in the current protected area system.

While this new map provides a classification for freshwater ecosystem types, including rivers and streams, earlier landcover assessments that, to some extent, located wetlands in the DRC were:

- the WCMC Wetlands of Africa (1996),
- the Global Land Cover 2000 project, with an African legend of 2002
- FAO's AFRICOVER which, for the DRC, came out in 2003
- the 2004 Global Lakes and Wetlands Database (GLWD) by the University of Kassel and WWF
- the DRC land cover map of Université catholique de Louvain of 2006

All of these assessments located (seasonal) waterbodies and classified them according to a various wetland types. AFRICOVER provides the most detailed wetland classification by specifically defining classes of vegetation in relation to the seasonality of flooding. For the habitat classification the WCMC/GLWD were used to locate seasonal waterbodies outside the DRC and AFRICOVER was used within the DRC.

We were unable to find system-wide maps or assign viable classifications for two variables that are likely important for freshwater habitat classification within the Congo context; these are surficial geology and the distinction between black, clear, and white water rivers. White-water rivers generally contain large quantities of inorganic sediment, giving them their color and a low transparency. Clear-water rivers have low sediment loads and high transparency. Black-water rivers are very low in dissolved minerals, have a high acidity, and a brown color derived decaying vegetation. A future recommendation would be to develop chemical standards that would apply to the Congo basin, and would help identify whitewater from blackwater, with the footnote that, due to mixing and seasonality, many rivers will classify as grey water rivers. Another recommendation would be to assess the relative importance of surficial geology variables on the hydrology and geomorphology and incorporate this information into the aquatic ecosystem classification for the Congo Basin.

The aquatic ecosystem classification was overlaid with the current protected area system to determine which types are not currently represented in DRC's protected area system. These gaps can help guide future designations, such that aquatic systems are better represented.

Human Use / Suitability Analysis

The human use/suitability analysis provides a nation-wide picture of relative levels of human use and development across the country. While recognizing that many forms of human use may be compatible with conservation objectives, the suitability analysis is a compilation of factors that generally reduce the viability of an area for effective conservation. It includes spatial data that represent current infrastructure, roads, railroads, rivers, mines, dams, and densely populated places. Rivers were included in the analysis because they are one of the major means of transportation in DRC. This analysis is not an attempt to quantify direct impacts at any given area but instead seeks to provide a coarse picture of where conflicts between conservation objectives and intensive human use are least likely (Figure 3).

Marxan Model

Early conservation assessments were often totally reliant on expert opinion to delineate and prioritize conservation sites. Since then, decision support software has been developed to optimize and systematize the use of complex geospatial datasets, such as those described above. For this assessment we used MARXAN, a site selection program, to suggest possible areas for prioritization based on an algorithm to maximize suitability and meet habitat representation goals. The inputs to MARXAN were the terrestrial and freshwater ecosystem classifications and the human use/suitability layer. We set goals of representing at least 20% of every habitat type (higher goals were set for very rare habitat types). MARXAN then analyzed the distribution of these habitat types across DRC and chose those that are likely to be the least impacted (have the lowest human use/suitability score). MARXAN was run 500 times. Those areas that are continually chosen are considered more “irreplaceable”, ie, they are necessary for inclusion in the set of priority areas if all habitat types are to be represented (Figure 4).

Delineation and Prioritization of Wetland Areas

The results of the MARXAN analysis were brought to the expert workshop as one input for the working group discussions in which priority areas were identified. Additionally, the results of the gap analysis for freshwater ecosystem types were used to make certain that under-represented types were included in wetland priority areas. The wetlands working group used these data as a basis for their discussions. The group then went through a facilitated process in which they identified those wetlands with known biological values across the country. For each wetland area, experts evaluated its biodiversity value in terms of species richness, species endemism, and ecological and evolutionary phenomena. The knowledge base of the workshop attendees was largely related to freshwater fish species and their distributions. Thus, knowledge on fish species was the largest contributor to area selection; however, there was one bird expert and several of the participants had knowledge of areas of importance for aquatic invertebrates. Species richness is the number of individual species known to occur in an area and endemism is the number of species found only within that area. The ecological and evolutionary phenomena that were considered are the following: key staging, feeding, breeding areas for migratory waterbird species; areas/sites that regularly support >20,000 waterbirds; highly significant spawning ground/nursery area/migratory route for non-avian wetland dependent species; extraordinary radiations or adaptations; intact biotas; refuge areas; many relict or primitive taxa; and generic or family level endemism.

Compilation of Fish Biodiversity Data by Wetland Priority Area

Data on fish biodiversity were compiled by Ulrich Schliewen, Curator of Ichthyology at Zoologische Staatssammlung München, (ZSM). They are based on collections information provided by raw data by Africa Museum Tervuren (MRAC, J. Snoeks & E. Vreven), ZSM and Sinaseli Tshibwabwa. Schliewen used published and unpublished taxonomic contributions

(mainly after 2004) as well as information from Eschmeyer (2008) to harmonize taxonomy as far as possible, as well as to sort out obviously unreliable distributions. Nevertheless, the data are the result of an ongoing collaboration between ZSM, MRAC, AMNH, Sinaseli Tshibwabwa, Victor Mamonekene, WWF and possibly additional data suppliers, to provide a database for the biogeographic analysis of fish distributions in the Congo basin. They have to be treated as imperfect, with many mistakes and cannot be used as such for any other purpose as the Ramsar contribution of WWF.

Threats Assessment and Socio-Economic Importance

Subsequent to the workshop a desk study of available information on the threats to key wetland areas, as well as their socio-economic importance was conducted in order to provide more detailed information on each of the areas. The desk study compiled information from diverse historic and contemporary documents as well as from direct observation (Bas Congo, Equateur and Orientale provinces). Most scientific articles and complementary gray literature were accessed electronically, whereas available print documents were consulted in Kinshasa (WWF-DRC, FORAF³, etc.). Many of the geographical references were compared to existing GIS data on surface waters, protected areas, populated areas, forestry concessions, and similar spatial features that permitted the identification of socially relevant points within the areas⁴.

It was difficult to find current literature on many of the areas because the number of studies conducted in the DRC declined during the war years and are just beginning to increase again. Another difficulty concerned the different names and spellings of relevant areas. The names of many geographical references changed after independence, requiring comparison between various pre- and post-independence sources to verify the information.

Available data are presented by area, following the Ramsar format. Additionally, each area was associated with the province or provinces and territories it overlaps. Available pictures are included in Appendix III.

³ Projet Forêts d'Afrique

⁴ The shapefiles were obtained through www.rdc-humanitaire.net, and from WWF-US Conservation Science Program

Results

Wetland Priority Areas and associated Socio-economic information

In total, the freshwater experts highlighted 30 wetland priority areas, covering parts of every province of DRC (Figure 5). These areas cover a large portion of DRC and meet or exceed the representation goal of 20% for nearly every aquatic ecosystem type. Experts rated the relative biological value of each priority area (Table 1).

Descriptions of each priority area are given below. Each description includes information on the biological diversity of the area, as well as data responding to of the following fields of The Information Sheet on Ramsar Wetlands (RIS):

- Wetland Type (from the Ramsar "Classification System for Wetland Type"; number 19)
- Identification of uses, social and cultural value of the sites (number 23)
- Land tenure in the sites (number 24)
- Current land use (number 25)
- Adverse factors (past, present or potential) threatening the sites (number 26)

Compilation of Fish Biodiversity Data by Wetland Priority Area

Although the data are very preliminary and biased by where collections have occurred, they do provide a baseline of information (Appendix IV). Examples of regions where data are missing are Lac Mweru, which contains at least a dozen more cichlid species, and the Lower Congo, whose material has not yet been fully sorted and identified. In total, upwards of 1,000 fish species have been identified from the region (excluding Lake Tanganyika). According to this analysis, the following wetland areas are all known to host two-hundred freshwater fish species or more: Fleuve Congo de Pool Malebo à Kisangani (E11), Lac Tanganyika (E30), Aruwimi - Ituri – Uélé (E17), Chutes - Fleuve Congo entre Kisangani et Kindu (E12), Pool Malebo (E7), Tshuapa - Maringa - Lopori – Lomami (E14), and Upemba - Kundelungu – Lufira (E9).

Caveat: The ichthyofauna and other aquatic-dependent faunas of major parts of the Congo basin are virtually unknown. Existing studies suggest that discoveries of new species are highly likely. For example, the Fwa River is only 20km long but has been relatively well-sampled and found to contain 26 fish species (of which 5 are endemic cichlids) (Roberts and Kullander 1994); it is possible that there are tens or more of these unique but unexplored areas in the region. In the Inkisi Basin, a Lower Congo affluent, the number of fish species known has doubled within the last two years (Soleil Wamuini, PhD research, MRAC). In the whole Congo system, it is likely that several hundreds of new species await discovery (J. Snoeks, pers. comm.). Thus, this assessment only gives a relative level of importance of those regions within the Congo Basin that have been sampled, and even these are preliminary evaluations, given the general lack of knowledge.

Thus, it is important to note that as a coarse-scale national assessment, this exercise is not intended to offer detailed guidance for area-level or operational management of either protected areas or other land uses. Such guidance is better provided through more fine-grained project planning and design. There are large data gaps regarding the wetlands of the DRC and their biodiversity. Thus, experts took a conservative approach in highlighting areas of importance. This assessment, like others at national and regional levels, takes a macroscopic view of the country, and is useful for 1) highlighting large areas that contain wetlands of national biological significance; 2) identifying priorities for further, more detailed social and biological research at finer spatial resolution; and 3) beginning to identify relationships between biodiversity priority areas and the lands and resource use activities of indigenous and local communities.

The areas presented in this document span the DRC, overlapping, partially or completely, forty out of 44 ICCN⁵ areas under protection. As of today, road construction and new infrastructure (dams, etc.) do not represent the most common threats to wetland priority areas in the region, as has been observed in other Ramsar sites (Batllori-Sampedro and Diaz-Sosa, 1999:8). However, future infrastructure projects could have significant impacts on the wetland priority areas. Some of the common existing threats identified for the proposed areas include pollution from mining activities and urban waste, over-exploitation of fisheries, and soil erosion due to deforestation.

The aquatic gap analysis revealed that several wetland types were either not represented or poorly represented in the current protected area system (Table 1). Of particular note are several types of savanna rivers, swamps and marshes, and cascades on the largest size classes of rivers. Any expansion of the current protected area system should endeavor to include these ecosystem types. Similarly, Inogwabini et al (2005) identified freshwater swamp and permanently and seasonally flooded vegetation types as the most under-represented habitat types in the current DRC protected area system. The results of this assessment provide some suggestions regarding where these under-represented habitats across DRC are most likely to have high biodiversity values and provide guidance for regions in which more detailed assessments should take place.

⁵ Institute Congolais pour la Conservation de la Nature

Area #: E1 Area Name: Bassin d'Inkisi et Chutes

Province: Bas Congo

Territory: Mbanza Ngungu

Habitat Types that Predominate in the Area:

Karstic and other subterranean hydrological systems

Permanent rivers/streams/creeks

Rapids

Of special note: Zongo Rapids, Mbanza-Ngungu Caves

Distinctive Biodiversity Characteristics:

Outstanding at subregional scale for fish endemism: Mbanza-Ngungu caves harbour CITES and IUCN protected *Caecobarbus geertsii*; some caves threatened by agricultural development with lots of sediment entering caves. The caves also potentially harbor other endemic fish or invertebrate species. Along with the caves found in Lastoursville and Ndendé in Gabon, these caves represent a rare habitat type and constitute the only known cave systems in the Congo Basin. There are also many endemic fishes found in the rapids, e.g., *Schilbe zairensis*. This region provides a good example of how future exploration is greatly needed in the Congo -- the number of fish species in the Inkisi has doubled since Soleil Wamuini started to work on it two years ago (Soleil Wamuini, PhD research, MRAC).

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Notes: Many unpublished datasets for this region.

Social and cultural values:

- The Inkisi Basin is one of the few areas accessible by land from Kinshasa. The road between Kinshasa and Matadi crosses the watershed, facilitating the transportation of agricultural products, fish, firewood and some bushmeat to the capital. The Inkisi River borders the Kisantu Botanical Gardens. This river is fished by local populations for household consumption and small-scale commerce.
- This basin was part of the Kingdom of the Kongo. The region east of the Inkisi River all the way to the Kwango River was part of the Kongo federation as early as the XV century. The Inkisi valley is mentioned in historical records as the setting of some of the Kongo's expanding conquests (Thorton, 2001:112,114). The towns of Kimpemba, Kimpangu and Kinzundu, located within this watershed, are also associated to historical areas of the Kongo Kingdom. This area also included important commercial routes during the slave trade (See, for example, Woodson, 1945: 424).
- The Kisantu Botanical Gardens, the rapids, and the Mbanza Ngungu caves are popular tourist sites for visitors coming from Kinshasa. The absence of drivable roads connecting Kinshasa to other parts of the country makes these sites some of the few places accessible to tourists.

Land Tenure:

- Small scale farmers, traditionally owned (on average 0.2ha per family (FAO, NEPAD, 2006:4)) within the site and in surrounding areas.
- The Kisantu Botanical Garden is part of the National System of Botanical Gardens, under the ICCN.
- Several religious missions with agricultural projects.

Land Use (within the site):

- 200 ha of inundated rice fields (FAO, NEPAD, 2006:4).
- Power stations of Sanga (working?) (Ministry of Mines, DRC 2003:10) and Zongo (operative, SNEL, 2007)
- Agriculture, subsistence and small scale commercial fishing, production of charcoal.

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site): Deforestation (and consequent erosion) provoked by the harvesting of firewood and the production of charcoal for local consumption and markets in Kinshasa.

Area #: E2 Area Name: Bassin du Lac Kivu

Provinces: North and South Kivu

Territories: Nyiragongo, Walungu, Kabare, Kalehe, Masisi, Idjwi and the communes of Goma and Bukavu

Habitat Types that Predominate in the Area:

Permanent freshwater lakes (larger than 8 hectares)

Permanent rivers/streams/creeks

Description: Lac Kivu and its watershed.

Distinctive Biodiversity Characteristics:

Outstanding at the sub-regional scale for Richness: High diversity of aquatic macro-invertebrates and at least 15 endemic haplochromine cichlids (Snoeks 1994)

Key staging, feeding, breeding areas for migratory waterbird species

Quality of Information:

Level of scientific understanding: High

Need for biological inventories: Low

Social and cultural values:

- The Lake Kivu basin includes the site of the Ijwi Kingdom (Ijwi island). Important for its history of resisting Belgian colonial rule (Newbery and Newbery, 1982).
- The Lake Kivu Basin is among the most densely populated watersheds in the DRC. The cities of Goma and Bukavu constitute important commercial and political centers in the

eastern DRC. The recent war and current on-going conflict in the area has provoked the displacement of large numbers of people, including local pygmy groups.

- Local populations rely on water and land resources for their subsistence. The lake is exploited by artisanal and semi-industrial fishers.

Land tenure:

- The lake Kivu basin partially overlaps the Reserve of Sud Masisi, and the national parks of Kahuzi-Biega, and the Virungas.
- Private agro-pastoral concessions
- Traditional ownership

Land use (within the site):

- Agriculture, ranching, firewood and charcoal, subsistence and commercial fishing (Hanek, et. Al, 1991)
- Tourism (Virungas National Park)

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within the site):

- The Lakes Region in the Eastern DRC is under pressure due to population density and demand of food
- Over fishing
- Deforestation (and consequent erosion) provoked by the harvesting of firewood and the production of charcoal for local consumption and markets in urban centers
- Political instability renders part of this site inaccessible to civilians.

Area #: E3 Area Name: Fleuve Congo en dessous de Matadi à l'Estuaire

Province: Bas Congo

Territories: Muanda and Seke-Banza

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Freshwater, tree-dominated wetlands

Seasonal/intermittent freshwater marshes/pools on inorganic soils

Mangroves

Estuarine habitats

Description: Mainstem of the Congo River below the last rapids including the estuary and mangroves. Region includes two large towns (Matadi and Boma) and one large city (Moanda). Large freshwater river, estuarine region with mangroves, lower reaches of Mpozo River

Distinctive Biodiversity Characteristics:

Outstanding at the sub-regional scale for richness (Water birds: Pelicans, Black-crowned crane (*Balearica pavonina*), *Ardeola ibis*, *Vanellus senegallus*, herons (*Ardea goliath*), and large

numbers of egrets (*Egretta alba*); freshwater, brackish and marine fish; sea turtles; manatee; crabs, shrimp, oysters)

Outstanding at the sub-regional scale for fish endemism: Examples of endemic species include *Tylochromis praecox*, *Micralestes holargyreus*, *Steatocranus mpozoensis*, *Oreochromis lepidurus*

Key staging, feeding, breeding areas for migratory waterbird species

Rare habitat type: Mangrove and associated estuary are unique for DRC

Species of special concern: Sea turtles; Manatees

Description: The lower Congo River and associated coastal swamps, from the coast upstream to Boma, are rich in marine species. Mangrove National Park, located in the DRC, was designated as a Ramsar site in 1996. Mangrove areas are dominated by red mangrove (*Rhizophora racemosa*) as well as *R. mangle*, *Avicenia nitida*, *A. tomentosa*, *Longucularia racemosa*, *Hibiscus tiliaceus*, and *Acrostichum aureum*. Other vegetation includes wet grasslands (*Heteropogon contortres* and *Andropogon schirensis*), grassland savanna (*Annona arenaria* and *Anisophylla pogeii*), swamp vegetation (*Canavalia maritima*, *Ipomea pescaprae*, and *Alternanthera maritima*), and strips of *Corynanthe paniculata* forest (Ramsar 1994). Total fish richness is unknown for the region. Aquatic fauna includes shark, barracuda, sole, capitaine, snakes, turtles, crustaceans (shrimp, crab), and oysters (Ramsar 1994). Notable mammals are manatee (*Trichechus senegalensis*) and dwarf buffalo (*Syncerus caffer nanus*) (Ramsar 1994). A mixture of marine and freshwater fishes is found in the lower river, including several uncommon species of freshwater fish.. Several cichlids have limited distributions in the lower portion of the Congo River, including *Haplochromis fasciatus* and *Oreochromis lepidurus*.

Threats: Oil exploitation, increased human population, and the introduction of exotics threaten the lower Congo River. African bonytongue (*Heterotis niloticus*) has already been introduced.

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Social and Cultural values:

- This area was part of the Kongo Kingdom, as well as part of the commercial route during the slave trade
- The towns of Matadi (provincial capital of the Bas Congo) and Boma (first colonial capital) are located in this watershed. Both are important commercial towns due to their access to the Congo River and the Atlantic Ocean.
- The *Parc National des Mangroves* and the coastal town of Moanda are tourist destinations currently

Land tenure:

- Agricultural and forestry concessions
- Traditional ownership
- The Biosphere reserve of La Luki partially overlaps this site. The National Marine Mangrove Park lies within this site.

Land use (within the site):

- Some private agricultural (coffee, rubber) concessions.
- Various forestry titles (currently under exploitation) awaiting conversion under the new forestry code partially overlap this site.
- Local waterways are fished by local populations. .

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site):

- Pollution from urban centers (Matadi and Boma)
- Scarce arable land
- Potential mining activities (Ministry of Mines, 2003:16)

Lower Congo Rapids Region

The Lower Congo Rapids are located between Kinshasa and Matadi. This stretch of river encompasses 32 falls and rapids within the Cristal Mounts Rapids. These rapids extend over a 300-km-long stretch of river, with a large drop in elevation and the occurrence of many pools. Richness of fish species is high, and many species exhibit morphological adaptations to fast-flowing waters. Approximately 50% of the fish species are endemic. A highly endemic, Rheophilic snail fauna with four endemic monotypic genera (*Congodoma*, *Liministesta*, *Septariellina*, and *Valvatorbis*) also inhabits the rapids (Brown 1994). Specializations among fish include reduction of eye size (microphthalmism), a pinkish coloration, and modified body form (dorsoventrally depressed heads and bodies). Among the species adapted to fast-flowing water are cyprinids of the genera *Garra* and *Labeo*; catfishes of the genera *Atopochilus*, *Euchilichthys*, *Chiloglanis*, and *Gymnallabes*; cichlids of the genera *Steatocranus*, *Teleogramma*, *Lamprologus*, and *Steatocranus*; and a group of endemic mastacembelids (Roberts and Stewart 1976). As examples, a mastacembelid eel (*Mastacembelus brachyrhinus*) and the endemic *Lamprologus lethops* are both cryptophthalmic, meaning their eyes are reduced in size and partially or completely covered by skin and other tissues (Roberts and Stewart 1976). Rheophilic snails also exhibit adaptations, with the ability to adhere to rocks in the swift current, and to tolerate large fluctuations in water level. This area is an important survey area, as new cichlid and other species have recently been collected, it is suspected that more new species will be identified. However, it is very difficult to detect or collect species in this habitat type. The Inga Dam, a hydroelectric dam on the Congo River southwest of Kinshasa, blocks one channel of the river, but does not seem to affect the rapids. A large hydroelectric dam has been proposed, the Grand Inga project, which would block the whole channel and likely have serious effects on this distinctive biota. This region includes areas **E4** and **E6**.

Area #: E4 Area Name: Fleuve Congo au dessus de Matadi et Bela

Province: Bas Congo

Territories: Seke-Banza, Songololo, Luozi

Habitat Types that Predominate in the Area:

Karstic and other subterranean hydrological systems

Permanent rivers/streams/creeks

Rapids

Description: This region includes the Inga Rapids.

Distinctive Biodiversity Characteristics:

Outstanding at the sub-regional scale for fish endemism: Some of the endemic fish from this region are *Steatocranus glaber*, *Lamprologus tigripictilis*, *Rhabdalestes schelly*, *Nanochromis consortus*, *Nanochromis splendens*, *Teleogramma gracile*.

Extraordinary radiations or adaptations: Species radiation of cichlids that extends throughout the lower Congo rapids

Quality of Information:

Level of scientific understanding: Medium

Need for biological inventories: Medium

Notes: Research on fishes for this region has been completed by Roberts, Schelly, Schliewen, Stiasny.

Social and Cultural values:

- Historical site of the Kingdom of the Kongo. Important commercial route during the slave trade.
- The caves of Banza Sanda (road to Luozi), as well as Stanley's Manianga post were a tourist destination in the region before Independence, (Infor Congo, 1958:369, 371)

Land tenure:

- INGA I and II hydroelectric power plants are located in this site
- Traditional ownership
- Some private agricultural concessions

Land use (within the site):

- Hydroelectric power generation (Inga I and II)
- Sugar production (surrounding area)
- Subsistence agriculture, subsistence and small-scale commercial fishing, production of charcoal.

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within the site): Deforestation (and consequent erosion) provoked by the harvesting of firewood and the production of charcoal for local consumption and markets in Kinshasa.

Area #: E6 Area Name: Fleuve Congo entre Bela et Kinsuka

Provinces: Bas Congo, Kinshasa

Territories: Kasangulu, Mbanza Ngungu and the urban and rural communes of Kinshasa

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Rapids

Distinctive Biodiversity Characteristics:

Outstanding at the sub-regional scale for fish endemism: Some of the endemic fish from this region are *Lamprologus weneri* and *Teleogramma brichardi*.

Extraordinary radiations or adaptations: Species radiation of cichlids that extends throughout the lower Congo rapids.

Quality of Information:

Level of scientific understanding: Medium

Need for biological inventories: Medium

Social and Cultural values:

- Historical site of the Kingdom of the Kongo. This area was part of the kingdom as early as the 14th century (Thorton, 2001: 119). Important commercial route during the slave trade.

Land tenure:

- N'sele National Park is located in this site
- Traditional ownership

Land use (within the site):

- Subsistence agriculture
- 2000 ha of inundated plains around Pool Malebo are dedicated to rice production (30 km by 5 km encompassing Limete, Masina and N'sele *communes* (FAO, NEPAD, 2006:3)

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site):

- Proximity to Kinshasa
- Pollution of waterways
- Urban sprawling
- The vicinity of Kinshasa is deforested
- Seasonal inundations destroy crops and damage houses

Area #: E7 Area Name: Pool Malebo

Province: Kinshasa

Territories: urban and rural communes of Kinshasa

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Description: Large, flat riverine expansion with sandy islands and only a few woody islands, rocks and adjacent marshes. Pool Malebo is an approximately 24-km-wide, 500-km² pool formed by a rock-sill barrier in the Congo River mainstem directly above the lower Congo rapids. Water flows quickly through the pool, and it has one major island. Extensive palm and papyrus swamps surround the pool's edges and floating mats of *Eichhornia* often drift by in the flowing waters.

Distinctive Biodiversity Characteristics:

Outstanding for the region of analysis for fish richness: A large diversity of species occurs within Pool Malebo, apparently stemming from the different input-drainages, e.g., Kwango, Oubangui, Koyo, Kasai.

Outstanding at the ecoregional scale for fish endemism: Quite a few species are known only from Pool Malebo, including several mountain catfish, *Dolichamphilius brienii*, and *Belonoglanis bouillonii*, and an African suckermouth catfish, *Atopochilus chabanaudi*. However, collection intensity has always been high.

Threats: This unique riverine habitat is subject to industrial and sewage pollution from the nearby cities of Kinshasa and Brazzaville. Fishing pressure is also high in this area.

Quality of Information:

Level of scientific understanding: High

Need for biological inventories: Low, except for hard substrates (rocks, wood).

Social and Cultural values:

- Evidence of Neolithic human settlements (Clark, 1971:70).
- Historical site of the Kingdom of the Kongo (Thorton, 2001)

Land tenure (within the site):

- Private recreational concessions around the pool.
- Traditional ownership

Land use (within the site):

- Tourism (Maluku), recreation, fishing, transportation
- Important port and market (Maluku) for products coming from upriver.

Surrounding areas:

- 2000 ha of inundated plains around Pool Malebo are dedicated to rice production (30 km by 5 km encompassing Limete, Masina and N'sele *communes* (FAO, NEPAD, 2006:3)
- Small scale farming, residential

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site):

- Over fishing (including the use of fine meshes) recorded as early as the 1930s (Harms, 1979:115)

- Lake and river banks are heavily deforested

Surrounding areas:

- The proximity to Kinshasa puts pressure on remaining forests for the production of fire wood and charcoal.
- Urban sprawling.
- Over fishing.

Area #: E8 Area Name: Bassin du Lac Moëro

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Permanent freshwater lakes (larger than 8 hectares)

Description: Shallow lake with extensive swampy delta. Catchment principally Luapula-Chambeshi, also eastern escarpment of the Kundelungu Plateau

Distinctive Biodiversity Characteristics:

Outstanding for the region of analysis for fish, aquatic mollusks (Brown 1984; Dudley 2000), and wetland bird endemism: ~15 endemic cichlids (e.g., *Tylochromis* (Stiassny 1989); *Pseudocrenilabrus Katongo et al 2006*); 12 endemic gastropods (out of ~ 27 total species); high endemism among other fish taxa (e.g., *Nothobranchius malaissei*); papyrus yellow warbler (*Chloropeta bensoni*) is known only from Lake Mweru at the mouth of the Luapula River in Zambia and from Nkole in DRC (Cotterill 2004, 2006).

Extraordinary radiations or adaptations: Adaptive radiation of cichlid fishes; Speciation in mollusks

Notes: Heavy fishing impacts, particularly in lower Luapula River are unsustainable.

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Social and Cultural values:

- Fishing constituted the principal source of revenue for this area before the onset of mining explorations in the area.
- The Lake Mweru basin supplied fish to the workforce in the copper mines from the 1920s until the 1960s (Jul-Larsen, et.al, 2003).
- Fish constitute an “emergency” food, relied upon when crops fail and during war times.
- Industrial fishing developed during WWII until the 1960s. Crocodiles were hunted out to improve fishing conditions. Fishing in spawning areas led to the decline of certain species. From the 1990s onwards, fish from the basin is sold in diamond mines (Jul-Larsen, et.al, 2003).

Land tenure (within the site):

- Traditional ownership
- Mining concessions

- Other private concessions (?)

Land use:

- Subsistence and commercial fishers using lines, gillnets, traps and dams in the lake and adjoining marshes. Reports of the use of fine mesh gillnets (under 5 cm) date back to the 1980s (Maes, ed, 1990)
- Local populations' principal economic activities include fishing (lake, marshes, rivers) and agriculture (mostly cassava) (Jul-Larsen, et.al, 2003)
- Mining

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site):

- Mining.
- Over-fishing, fishing in spawning areas, use of fine net gillnets.
- Lack of economic alternatives has increased pressure on fisheries as a source of income (Jul-Larsen, et.al, 2003)

Area #: E9 Area Name: Upemba – Kundelungu - Lufira

Province: Katanga

Territories: Bukama, Kambove, Kasenga, Kipushi, Lubudi, Malemba Nkulu, Manono, Mitwaba, Pweto and the communes of Likasi

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Permanent freshwater lakes (larger than 8 hectares)

Permanent freshwater marshes/pools; ponds (below 8 ha), marshes and swamps

Distinctive Biodiversity Characteristics:

Outstanding for the region of analysis for fish richness: ~ 200 species of fish (F.P.D. Cotterill, pers. comm.); Upemba National Park has been documented to be one of the richest regions globally for Odonata (Frazier 1995). The swamps, shallow lakes, and river channels of Upemba host a relatively rich aquatic fauna and suspected high odonate endemism.

Outstanding for the region of analysis for fish endemism: ~47 endemic fish species, Upemba Lechwe (*Kobus anelli*), Upemba shrew (*Crocidura zimmeri*) (Malaisse 1997; Cotterill, 2005)

At least 15 reptiles are endemic to Katanga, and these include 3 aquatic reptiles: the Upemba hinged terrapin *Pelusios upembae* ; Upemba water snake *Lycodonomorphus upembae* and Laurent's water snake. *L. leleupi* (Broadley & Cotterill 2004).

Key site for migratory birds: Globally important habitat for Shoebill and Wattled Cranes (also Lufira Swamps; see International Crane Foundation for survey information)

Area/site that regularly support >20,000 waterbirds

At least 16 endemic birds occur in this region, with two weaver birds restricted to the Lufira basin (*Ploceus ruweti*) and Upemba (*Ploceus upembae*) occurs in this region (Cotterill .2004, 2006)

Quality of Information:

Level of scientific understanding: Low generally, High in Upemba National Park (de Witte 1966)
Need for biological inventories: High especially in Lufira and unexplored habitats. Current status of biodiversity not known, although at least one conservation NGO is active in Katanga (<http://www.bakasbl.org/>).

Notes: See Broadley & Cotterill (2004) and Cotterill (2005, 2006) for latest synthesis of biodiversity data; and numerous reports from Mission de G. F. de Witte for detailed summaries of many different taxa. These collections in Brussels are still being worked out (see Van Bruggen & Van Goethem (2001) for recent examples). More intensive inventories are needed to complement previous research in this region.

Social and cultural values:

- Important Neolithic sites of Kamoia and Sanga (Katanga). Burial site of Sanga on the shores of Lake Kisale (Oliver, 1966:374) First traces of iron age cultures in the region. Historically important copper zone.
- Intense fishing activities in the Upemba basin (Cahen, 1979:70; De Maret, 1977: 323). Part of the Luba Kingdom (Mwenze river and its affluents) (De Clerck and Reefe, 1984:412)
- The Kiwakishi caves (near the town of Mitwaba) and the Lofoi falls (340m high) were popular tourist attractions during the colonial period (Infor Congo, 1958:683)

Land tenure (within the site):

- Mining concessions (copper).
- Upemba National Park, Kundelungu National Park, Lubudi Swamp Game Reserve, Lufira Reserve
- Traditional ownership

Current landuse (within the site):

- Power plants of Mwadingusha (not operating) and Koni (operating?) (Ministry of Mines, DRC, 2003:10).
- Fishing with long line, traps and gillnets in the Mwadingusha Reservoir (Van der Knaap 1994)
- Agriculture

Surrounding/catchments areas: Mining and agriculture.

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site):

- Certain areas within the site are still considered conflict zones (Mayi-Mayi rebels, refugees in Lake Upemba islands) (OCHA, 2008) Current military conflict in the area impedes regular development of economic activities. Political instability (OCHA, 2008).
- Poaching.

Area #: E10 Area Name: Rivière Fwa

Provinces: Kasai Occidental, Kasai Oriental

Territories: Dibelenge, Kabeya Kamwanga, Lupatapa

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Distinctive Biodiversity Characteristics:

Outstanding at the sub-regional scale for fish richness: This river is only 20 km long, but hosts at least 26 species.

Outstanding for the region of analysis for fish endemism: Two endemic genera, (*Cyclopharynx*, *Schwetzochromis*) and five endemic fish species (*Cyclopharynx fuae*, *C. schetzi*, *Schwetzochromis neodon*, *Thoracochromis callichromus*, and *T. brauschi*) are known from the region.

Extraordinary radiations or adaptations

Quality of Information:

Level of scientific understanding: High

Need for biological inventories: Low

This stretch of river is relatively well sampled by various expeditions (eg, Roberts and Kullander 1994). In the same area, there is a small lake named Lake Munkamba for which we have no information about its biodiversity.

Social and cultural values:

- Lake Fwa was a popular tourist destination during the colonial period (Infor Congo, 1958:310,420).

Land tenure (within the site):

- Mining concessions (possibly diamond)
- Traditional ownership
- Other tenure possible, but unable to verify

Land use (within the site):

- Fishing
- Agriculture (uncertain)

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site): Mining has caused migration into the Kasai increasing pressure on local natural resources.

Area #: E11 Area Name: Fleuve Congo de Pool Malebo à Kisangani

Provinces: Kinshasa, Bandundu, Equateur, Orientale

Territories: Bafwasende, Banalia, Basankusu, Basoko, Bikoro, Bolobo, Bolomba, Bomongo, Bongandanga, Budjala, Bumba, Djolu, Isangi, Kwamouth, Lisala, Lukolela, Makanza, Mushie, Opala, Ubundu, Yahuma, Yumbie and Communes de Kisangani, Mbandaka and Kinshasa.

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Permanent freshwater swamps

Description: Large, low slope, sandy, lowland river in rainforest

Distinctive Biodiversity Characteristics:

Outstanding for the region of analysis for fish richness; Amphibian fauna unknown, probably not rich.

Highly significant spawning ground/nursery area/migratory route for non-avian wetland dependent species: Water chevrotain (*Hyemoschus aquaticus*)

Notes: The distribution of the Congo sunbird (*Nectarinia congoensis*) is centered on this region and this species is on the IUCN redlist.

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Social and cultural values:

- This site expands over an ethnically diverse region, and includes various Batwa groups.
- Various villages located along the river, including Bolobo, Lukolela, Ngombe, Irebu, Lulonga, etc (Grenfell and Comber, 1885:362) were well established at the arrival of the first explorers.
- The Equateur section of this site is an area historically controlled by the Bobangi and, Bangala tribes (ibid: 368), that was raided by slave traders in the XVIII and XIX century. This was the site of local wars to control trade routes (Harms, 1983:135).
- This part of the River Congo was among the first zones with established European trading posts (Grenfell and Comber, 1885).
- In the late XIX and early XX centuries this area knew important migration movements of populations fleeing traders and escaping conscription by the Congo Free State (ivory, rubber, and copal) (WWF Lac Tumba report, 2006).
- A phenomenon called « miraculous fishing » (Botamba, F. 2005, pers com) occurs in the channel linking the Congo to the Ubangi river when the direction of the water flow is reversed due to flooding in the southern part of the basin (State of the Forest 2006, 2007:176).
- Several of the forestry titles requesting conversion under the new forestry code are located in this watershed. Strong dependency on the river for communications and livelihoods. Seasonal and permanent fishing camps. Periods of food scarcity due to flooding (WWF Lac Tumba report, 2006).

Land tenure (within the site):

- Agricultural concessions (cocoa, palm oil, coffee, partially and fully⁶ exploited).
- Several of the forestry titles requesting conversion under the new forestry code are located in this watershed.
- The reserve of Yangambi is located in this site.
- Traditional ownership.

In the surrounding area:

- Some titles awaiting conversion
- Some agricultural concessions

Land use (within the site):

- The territory of Bumba is an important producer and supplier of rice and maize for national consumption Tollens and Biloso for WFP (2006,23,43).
- Subsistence and small-scale commercial fishing (gillnets, line, traps, barrage system)
- Logging

In the surrounding/catchments areas: Agriculture, fishing, hunting, logging, mining

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site):

- Over fishing (rivers as well as swamps and inundated forests)
- Erosion of river banks due to heavy rains and/or deforestation

In the surrounding areas: Over fishing, mining.

Area #: E12 Area Name: Chutes/Fleuve Congo entre Kisangani et Kindu

Provinces: Orientale, Maniema

Territories: Kasongo, Kibombo, Kindu, Opala, Pangi, Punia, Ubundu, and Communes de Kindu and Kisangani.

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Series of rapids and waterfalls (Chutes Boyoma, ex-Stanley Falls)

Distinctive Biodiversity Characteristics:

Outstanding for the region of analysis for fish richness

Outstanding for the region of analysis for fish and mollusk endemism

Description: Rheophilic species occur in this stretch of river. The rapids upstream from Kisangani on the mainstem Congo River support endemic mollusc species. These rapids are also suspected to be important for aquatic insects. Amphibian fauna unknown, probably not rich.

Quality of Information:

Level of scientific understanding: Low

⁶ For example, the palm plantation in the territory of Isangi.

Need for biological inventories: High

Notes: These rapids have not been surveyed since the last century; further surveys may uncover new mollusk and fish species.

Social and Cultural Values:

- Wagena fishers exploit the local rapids through a unique fishing method. Subsistence and small-scale commercial fishing.

Land tenure (within the site):

- Agricultural concessions (palm oil) partially exploited.
- Traditional ownership.
- This site partially overlaps the Lomami-Lualaba Reserve (*Reserve Naturelle Protégée*)

Landuse (within the site):

- Fishing (gillnets, line, traps, barrage system)
- Subsistence and small-scale commercial fishing
- Hunting
- Logging

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site):

- Poaching
- Control of certain areas by local war lords

Area #: E13 Area Name: Lac Maï-Ndombe/Bassin de la Lukenie

Provinces : Bandundu, Equateur

Territories : Bikoro, Inongo, Kiri, Kutu, Mushie

Habitat Types that Predominate in the Area:

Forested peatlands; peat swamp forests

Permanent rivers/streams/creeks

Permanent freshwater lakes (over 8 ha)

Description: Large, shallow blackwater lake with unique water quality (pH ~4.0, no minerals, high tannin content). The Maï-Ndombe region extends from the southwest part of Salonga to Lake Maï-Ndombe and consists of swamps with terra firma flats and forest canopy openings. Soil is sandy with rocky laterite shores in some areas, with many inundated forests during the rainy season. Lake Maï-Ndombe is a shallow, blackwater lake surrounded by rainforest. It is part of the Lukenie River system and connected to a large, flooded forest area toward the east and north. During high-water periods of the rainy season, the swamp connects with Lac Tumba. It is part of one of the largest blocks of shallow blackwater and flooded forest in the Congo Basin.

Distinctive Biodiversity Characteristics:

Outstanding at ecoregional scale for fish richness

Outstanding at subregional scale for fish endemism: e.g., *Nanochromis wickleri*, *N. transvestitus*, *Hemichromis cerasogaster*

Species of Special Concern: *Crocodylus cataphractus*

Description: The southwestern part of the Cuvette Centrale covers the lowest part of the extensive, low-lying central depression of the Congo Basin. Mai-Ndombe and the Lokoro harbour at least 120 fish species, including several endemics and undescribed species (Chrysichthis, Characins). Freshwater mammals include Allen's swamp monkey (*Allenopithecus nigroviridis*), Congo clawless otter (*Aonyx congica*), and giant otter shrew (*Potamogale velox*). The rare small kingfisher (*Corythornis leucogaster leopoldi*) is recorded around Lake Mai-Ndombe (Hughes and Hughes 1992). A new species of a brown semi-aquatic snake of the genus *Boulengerina* sp. (Elapidae) has recently been discovered (Van Wallach, pers. comm.)

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Notes: As only a few historical collections exist for the region, species richness and endemism are most likely underestimated. Before 2002 only 51 species were recorded, but a recent survey including the Lokoro drainage and some affluents in the southwestern part of Salonga NP, identified 120 species (Schliewen 2002, unpublished report to German Agency for Technical Cooperation (GTZ)). Further collections will undoubtedly increase the species richness again, and priority should be given to fish and mollusks.

Threats: Lake Mai-Ndombe has an established fishing community and has served as a sport-fishing destination, but these activities currently do not threaten the integrity of this low productivity ecosystem. Future threats are low, unless fishing pressure increases.

Social and Cultural Values:

- Various Batwa communities located within this site.

Land tenure (within the site):

- At least nine titles requesting conversion under the new forestry code are partially or completely within this watershed.
- Part of Lac Tumba segment of landscape, overlaps the Lac Tumba-Ledima Reserve and the Malebo site (WWF).
- Traditional ownership

Land use (within the site):

- Subsistence and commercial fishing.
- Logging
- Agriculture
- Hunting

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site):

- Poaching, including in concessions under forestry exploitation.
- Over-fishing, use of fine mesh gillnets.

Area #: E14 Area Name: Tshuapa - Maringa - Lopori - Lomami

Provinces : Equateur, Orientale, Maniema, Kasai Oriental

Territories : Basankusu, Befale, Bikoro, Boende, Bokungu, Bolomba, Bongandanga, Dekese, Djolu, Ikela, Ingende, Isangi, Katakokombe, Kindu, Kiri, Kole, Lodja, Lomela, Makanza, Monkoto, Opala, Oshwe, Ubundu, Yahuma and Communes de Kisangani

Habitat Types that Predominate in the Area:

Freshwater, tree-dominated wetlands

Forested peatlands; peatswamp forests

Permanent rivers/streams/creeks

Description: The northeastern part of the Cuvette Centrale covers part of the extensive, low-lying central depression of the Congo Basin. Once beneath a Pliocene lake or endorheic swampy drainage, the basin is very flat. In general, the region is poorly documented. The terrain is composed of lowland sandy soil with swamp areas, and forest cover is mixed with some dense habitats. The region contains numerous blackwater sites.

Distinctive Biodiversity Characteristics:

Outstanding at the sub-regional scale for fish richness: A large fraction of freshwater fishes only occurs in the northern Cuvette Centrale, but most species are often shared with the Republic of Congo.

Outstanding at the sub-regional scale for fish endemism: Many endemics, if the area north of Koyo (Ngiri, area of Owando-Ouessou is included).

Notes: This region provides core habitat for aquatic mammals, such as Allen's swamp monkey (*Allenopithecus nigroviridis*). Other notable aquatic mammals include giant otter shrew (*Potamogale velox*), Congo clawless otter (*Aonyx congica*), sitatunga (*Tragelaphus spekei*), and chevrotain (*Hyemoschus aquaticus*). A waterbird of special concern found in this region is Hartlaub's duck (*Pteronetta hartlaubii*). This bird species is threatened throughout its range by habitat loss due to deforestation, and populations are believed to be declining, especially in West Africa (Scott and Rose 1996).

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Social and cultural values:

- The Maringa-Lopori Basin was heavily exploited for ivory and later for rubber (*Landolphia spp*) by the Congo Free State (Harms, 1983:126). Local populations fled

south, into more isolated areas, such as the Lomela and Salonga basins, to escape the rubber tax (ibid: 130)

- The territory of Basankusu was an important site in the early developments of the Kimbanguist movement (Joset, 1968:116).
- Some sacred sites are associated with practices to limit the harvesting of certain animal species. Traditional leaders still exercise some control over fishing zones and fishing periods (SLS socio-economic report, WWF, 2006).

Land tenure (within the site):

- The majority of forestry titles requesting conversion under the new forestry code are located in this watershed.
- This site is overlapped by the Maringa-Lopori-Wamba, the Salonga-Lukenie-Sankuru and the Tshuapa- Lomami-Lualaba Landscapes
- Traditional ownership

Land use (within the site):

- Fishing constitutes the third most important source of income for local households (SLS socio-economic report, WWF, 2006)
- Subsistence agriculture

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site):

- Increased activities include the use of fine mesh gillnets (including mosquito nets), DDT and other chemicals to speed harvest (SLS socio-economic report, WWF, 2006).
- Poaching, including in concessions under forestry exploitation
- Certain areas are still controlled by local warlords

Area #: E15 Area Name: Kwilu - Kwango

Provinces: Bandundu, Kasai Occidental, Kinshasa

Territories: Bagata Bulungu, Feshi, Gungu, Idiofa, Ilebo, Kahemba, Kasongo Lunda, Kenge, Kwamouth, Masi Manimba, Popokabaka, Tshikapa and Communes de Kikwit and Kinshasa

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Rapids

Distinctive Biodiversity Characteristics:

Suspected high fish endemism in rapids including undescribed *Steatocranus* cichlids, but not enough information available to evaluate. Also a transition zone with many headwater streams.

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Notes: High need for inventories to better assess the biological characteristics and value of this area.

Land tenure (within the site):

- Mining concessions
- Traditional ownership
- The hunting reserve of Swa-Kibula is located within the site. The hunting reserve of Mangai partially overlaps this site.

Landuse (within the site):

- Mining (diamonds)
- Subsistence agriculture
- Subsistence fishing

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site):

- Over-hunting in this zone has led to dependency on bushmeat coming from the north (E13 and E14 sites, and the Salonga-Lukenie-Sankuru landscape).
- Mining activities in the region have led to migration into the site, leading to increased pressure on natural resources.

Area #: E16 Area Name: Yangambi - Lindi - Tshopo - Maiko - Maniema

Provinces : Orientale, Maniema, Sud Kivu

Territories :: Bafwasende, Banalia, Basoko, Kindu, Lubutu, Punia, Pangi, Shabunda, Ubundu, and Communes de Kisangani

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Description: Affluents of the Lualaba/Congo northeast of the river, draining rainforest.

Distinctive Biodiversity Characteristics:

Outstanding at the sub-regional scale for fish endemism: A localized degree of endemism occurs at least on the lower reaches of several of the rivers within this area. Endemic species include *Chromidotilapia schoutedeni*, *Hypsopanchax platysternus*, *Congochromis squamiceps*

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Land tenure (within the site):

- Some forestry titles requesting conversion under the new forestry code are partially or completely within this watershed.
- Mining concessions (?)
- Traditional ownership

Landuse (within the site):

- Mining (diamonds)
- Subsistence agriculture
- Subsistence fishing
- Hydroelectric power generation (Station of Tshopo on the Tshopo River, 18,000 Kw capacity) (Ministry of Mines, 2003:10)

Factors (past, present or potential) adversely affecting the site's ecological character in land and water use and development projects (within site): Mining

Area #: E17 Area Name: Aruwimi-Ituri- Uélé

Province: Orientale

Territories: Aketi, Ango, Aru, Bafwasende, Bambesa, Banalia, Basoko, Bondo, Buta, Dugu, Dungu, Faradje, Irumu, Mahagi, Mambasa, Niangara, Poko, Rungu, Wamba, and Watsha,

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Distinctive Biodiversity Characteristics:

Suspected high fish richness and endemism, but not enough information available to evaluate. Notes: Congo clawless otter (*Aonyx congica*), and giant otter shrew (*Potamogale velox*) may also occur here. Endemic aquatic genet (*Osbornictis piscivora*) largely restricted to the eastern part of the Congo Basin and is most commonly found in shallow headwater streams running through limbali forest (*Gilbertiodendron* spp.), such as that found within this area. Within this region, the group of wetlands named Abiangama is also an important area for mammals, reptiles, batrachians, and savanna and forest birds that come to this area during the dry season. It is a key site for migratory birds and a feeding or resting ground for many species. This area is also an ecotone – a zone of transition between the forests and savanna. The Ituri River in the northeastern Congo forest flows through the Okapi Wildlife Reserve. The Ituri is a major upper tributary of the Congo River and is separated from it by waterfalls, providing a potential for isolated faunal groups and high endemism.

Quality of Information

Level of scientific understanding: Low

Need for biological inventories: High

Notes: It is suspected that this is an important region for fish and Odonata, but it's not certain where in this region. There is a need for surveys across the region. The Abiangama wetland could also benefit from an interdisciplinary study of all the taxa that occur and visit this important wetland. A comparison between the Northern transition zone and the southern transition zone within this region could also be of scientific interest.

Social and Cultural Values:

- Neolithic site (40,000 BP) (Cahen, 1979:67)
- Various known tourist spots before the war (Birdlife International).
- Various Mbuti and Efe groups inhabit the area.

Land tenure (within the site):

- Mining (gold) and forestry concessions.
- Traditional ownership.
- Overlaps the Ituri-Epulu-Aru landscape.
- Includes Garamba National Park and the Okapi Reserve

Landuse (within the site):

- Mining (gold)
- Subsistence agriculture
- Hunting
- Subsistence fishing
- Logging

Factors adversely affecting the site's ecological character in land and water use and development projects (within site)

- Current state of insecurity in areas close to the Sudanese and Ugandan borders.
- Logging east of the Ituri landscape has resulted in a higher alluvium load of the Ituri River (State of the Forest 2006, 2007:206).
- Illegal logging
- Mining

Area #: E20 Area Name: Lac Édouard

Province: Nord Kivu

Territories: Beni, Lubero, Rutshuru, Walikale, and Communes de Butembo

Habitat Types that Predominate in the Area:

Permanent freshwater lakes (over 8 ha)

Distinctive Biodiversity Characteristics:

Key staging, feeding, breeding areas for migratory waterbird species: Part of the Rift valley that is a key migratory route for wetland birds.

Area/site that regularly support >20,000 waterbirds

Estimate over 60 endemic species of haplochromine cichlids

Notes: The food web has been altered by the extermination (via hunting) of hippopotamus in the lake.

Quality of Information

Level of scientific understanding: Low

Need for biological inventories: High

Social and Cultural values:

- The site of Ishango is an important Neolithic site (21,000 PB) associated to hunting of hippopotamus and fishing (Cahen, 1979:67)
- Fish constitutes the principal source of protein for local populations (UNDP/FAO (1991))

Land tenure (within the site):

- This site overlaps the Virungas National Park and the hunting reserve of the Rutshuru
- Traditional ownership
- Agricultural concessions (?)

Surrounding area: Protected Areas (Virungas, Rutshuru)

Land use (within the site):

- Subsistence and commercial fishing. Strong dependence of households on fisheries as source of income.
- Illegal harvesting within protected areas for the production of fire wood and charcoal.

Factors adversely affecting the site's ecological character in land and water use and development projects (within site):

- Over fishing (UNDP/FAO, 1991).
- Pollution from nearby copper mines (Maes, ed, 1991). Poor roads limit access to villages.
- Deforestation around populated areas (Maes, ed, 1991).
- The Lakes Region is under pressure due to population density and demand of food.

Area #: E21 Area Name: Lac Tumba

Provinces: Equateur, Bandundu

Territories: Bikoro, Bomongo, Inongo, Lukolela and Communes de Mbandaka

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Permanent freshwater marshes/pools; marshes and swamps

Description: Lac Tumba empties into the Congo River near its confluence with the Ubangui River. It is a large, lateral lake (765 km²) with acidic water and a low mineral content.

Distinctive Biodiversity Characteristics:

The lake has rich invertebrate and fish faunas that are largely supported by allochthonous organic matter washed in from the surrounding forests.

Key staging, feeding, breeding areas for migratory waterbird species: Congregations of *Anhinga rufa* and *Ardea purpurea* occur here.

Notes: Other aquatic species of note include, *Crocodylus cataphractus*, *Crocodylus niloticus*, *Hippopotamus amphibius*, and two endemic frogs, *Cryptothylax minutus* and *Phlyctimantis leonardi*.

Quality of Information

Level of scientific understanding: Low

Need for biological inventories: High

Social and cultural values:

- Some sacred sites correspond to spawning areas, under the guardianship of traditional authorities (Socio-economic study Lac Tumba segment, WWF, 2006)

Land tenure (within the site):

- Part of the Lac-Télé-Lac Tumba Landscape.
- At least three forestry titles requesting conversion under the new forestry code are located in this watershed.
- Private agricultural concessions partially under exploitation
- Traditional ownership.

Landuse (within the site):

- Subsistence and small-scale commercial agriculture
- Subsistence and small-scale commercial fishing (gillnets, line, traps, barrage system)
- Subsistence hunting
- Logging.

Factors adversely affecting the site's ecological character in land and water use and development projects (within site): Seasonal fishers and immigrants fish in areas protected under local taboos, endangering the health of spawning sites (Socio-economic study Lac Tumba segment, WWF, 2006)

Area #: E22 Area Name: Ngiri

Province: Equateur

Territories: Bomongo, Makanza

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Permanent freshwater marshes/pools; marshes and swamps

Distinctive Biodiversity Characteristics:

Key staging, feeding, breeding areas for migratory waterbird species: The Ngiri region is a BirdLife Important Bird Area for waterbirds [Criteria A4i: 1,000+ breeding pairs of *Ardea purpurea*; A4ii: 870+ breeding pairs of *Merops malimbicus*]

Quality of Information

Level of scientific understanding: Low

Need for biological inventories: High

Social and cultural values:

- Local populations are known as traditional fishers involved in commercial activities along local waterways.
- Strong dependency on the river and its tributaries for local livelihoods and seasonal migrants.
- Some sacred sites correspond to spawning areas, under the guardianship of traditional authorities (Socio-economic study Lac Tumba segment, WWF, 2006)

Land tenure (within the site):

- Part of the Lac-Télé-Lac Tumba Landscape.
- Overlaps the Ngiri Reserve (*Reserve naturelle protégée*)
- Two yet unexploited forestry concessions partially overlap this watershed.
- Abandoned agricultural concessions (cocoa, palm oil, coffee) (Socio-economic study Lac Tumba segment, WWF, 2006)
- Traditional ownership.

Landuse (within the site):

- The territory of Gemena is a principal producer and supplier of rice and maize for national consumption (Tollens and Biloso for WFP, 2006,23,43).
- Fishing constitutes the second most important source of income for local households(Socio-economic study Lac Tumba segment, WWF, 2006)

Factors adversely affecting the site's ecological character in land and water use and development projects (within site)

- Over fishing (rivers as well as swamps and inundated forests)
- Erosion of river banks.
- Seasonal fishers and immigrants fish in areas protected under local taboos, endangering the health of fish spawning sites. (Socio-economic study Lac Tumba segment, WWF, 2006).
- Increased activities include the use of fine mesh gillnets (including mosquito nets), DDT and other chemicals to speed harvest (Socio-economic study Lac Tumba segment, WWF, 2006).
- Dry land is scarce.
- Difficult access to the site results in little investment in development projects and low NGO presence.

Area #: E23 Area Name: Lac Albert

Province: Orientale

Territories: Irumu, Mahagi, Djugu

Habitat Types that Predominate in the Area:

Permanent freshwater lakes (over 8 ha)

Distinctive Biodiversity Characteristics:

Outstanding at the ecoregional scale for fish endemism: *Labeo mokotoensis*, endemic to Lake Ndaraga (Altitude: 1750 m) at Mokoto in the national park, not far from Lake Albert.

Key staging, feeding, breeding areas for migratory waterbird species: Part of the Rift valley that is a key migratory route for wetland birds

Area/site that regularly support >20,000 waterbirds

Several tens of undescribed haplochromine cichlids

Quality of Information

Level of scientific understanding: Low

Need for biological inventories: High

Land tenure (within the site):

- Traditional ownership
- Other (?)

Landuse (within the site):

- Subsistence and commercial fishing (Maes, ed, 1991) Households depend on fish as a source of income.
- Subsistence agriculture

Factors adversely affecting the site's ecological character in land and water use and development projects (within site)

- Over fishing and fishing in spawning areas reported as early as the 1980s (Maes, ed, 1991)
- Poor quality of roads limits access to villages.

The Lakes Region is under pressure due to population density and demand of food.

Area #: E24 Area Name: Haut-Kasaï

Provinces: Katanga, Kasaï Occidental, Kasaï Oriental

Territories: Dilolo, Kabongo, Kamina, Kaniama, Kapanga, Luiza, Mwene Ditu Sandoa

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Permanent freshwater lakes (larger than 8 hectares)
Headwater streams
Rapids

Distinctive Biodiversity Characteristics:

Suspected high fish richness and endemism, but not enough information available to evaluate. This region includes several large rapids upstream from Tshikapa, along the border with Angola. The region is known to be rich in mollusks, with endemic species, which suggests that there is an increased but yet unexplored endemism in other groups — for example, in aquatic insects and fishes. The integrity level of the region is unknown, though there are probable effects from diamond mining and artisanal gold mining that occurs upstream.

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Notes: Although the Kasai rapids upstream of Tshikapa have been previously surveyed, it remains an important survey area for mollusks and other aquatic taxa, as new species may reside there. Other parts of the region also need to be surveyed, particularly unexplored rapids.

Land tenure (within the site):

- Partially overlaps the Shaba Elephant Reserve (*Reserve naturelle protégée*) and the hunting domain of Bushimaie (*Reserve de chasse*).
- Mining concessions (gold)
- Traditional ownership

Landuse (within the site):

- Mining: gold (Kisenge, Katanga)
- Subsistence and commercial fishing
- Subsistence agriculture

Factors adversely affecting the site's ecological character in land and water use and development projects (within site): Mining

Area #: E25 Area Name: Shiloango

Province: Bas Congo

Territory: Tshela

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Notes: Forested rivers and streams

Distinctive Biodiversity Characteristics:

Outstanding at the ecoregional scale for fish richness

Outstanding at the ecoregional scale for fish endemism: Several nearly endemic fish, e.g., *Chilochromis duponti*, *Chromidotilapia* sp. "Shiloango", some however shared with the Niari.

Notes: Transition zone between Lower Guinea and the Congolian provinces

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Notes: The existing data are old and need to be verified.

Social and Cultural values:

- Historical site of the Kingdom of the Kongo. Important commercial route during the slave trade.
- The Kimbangist movement originated in this site in the 1920s (Joset 1968:103).

Land tenure (within the site):

- At least three forestry titles awaiting conversion under the new forestry code.
- Private agricultural concessions
- Traditional ownership

Landuse (within the site):

- Subsistence fishing
- Subsistence and commercial agriculture
- Logging

Area #: E26 Area Name: Haut Lualaba

Province: Katanga

Territories: Bukama, Dilolo, Kambove, Kamina, Lubudi, Mutshatsha, Sandoa, and Communes de Likasi

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Permanent freshwater lakes (larger than 8 hectares)

Notes: Landscape mosaic of dambos (floodplains), headwater streams (including many fish spawning areas), and large rivers.

Distinctive Biodiversity Characteristics:

Outstanding at the sub-regional scale for fish endemism: About fifteen endemic species

Notes: A mixture of Zambezian and Upper Congo faunas occur here.

Quality of Information

Level of scientific understanding: Low

Need for biological inventories: High

Social and cultural values:

- Important Iron Age site (Katoto) (De Maret, 1977:21).
- Part of the Baluba Kingdom. Many Luba villages were located along the Lualaba and its affluents De Clerck and Reefe (1984:420).
- Fishing is a historically important economic activity in the watershed (Paine 1950:334)

Land tenure (within the site):

- Mining concessions
- Traditional ownership

Land use (within the site):

- Hydroelectric power plant (N'zilo I) (working?) (Ministry of Mines, 2003:10)
- Mining
- Fishing
- Agriculture (some seasonally inundated areas are cultivated during the dry season) Paine (1950:327)

Factors adversely affecting the site's ecological character in land and water use and development projects (within site): Mining

Area #: E27 Area Name: Moyen-Kasaï

Provinces: Bandundu, Kasaï Oriental, Kasaï Occidental

Territories: Demba, Dibaya, Dibelenge, Ilebo, Kabeya Kamiji, Kamwanga, Kazumba, Kole, Luebo, Luiza, Lupatapata, Lusambo, Miabi, Mweka, Oshwe, Tshikapa, and Communes de Kananga and Tshikapa

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Karstic and other subterranean hydrological systems

Notes: Savanna-gallery forest rivers and streams with numerous rapids and crossing karstic areas

Distinctive Biodiversity Characteristics:

Outstanding at the ecoregional scale for fish endemism: *Labeo luluae* and *Steatocranus rouxi*, two endemic fish to the Lulua river. Numerous rapids fishes described, to be evaluated in detail

Quality of Information

Level of scientific understanding: Low

Need for biological inventories: High

Social and Cultural values:

- The Kasai river and its tributaries are used for the transportation of over 60% of agricultural products coming from Bandundu to Kinshasa (Tollens and Biloso for WFP, 2006,23,61).

Land tenure (within the site):

- At least three forestry concessions requesting conversion located in the area

Surrounding areas: At least three forestry concessions requesting conversion located in the surrounding areas

Landuse (within the site):

- Logging
- Mining (diamonds: Lubembe, Longatshimo, Tshikapa rivers, among others) (Ministry of Mining, 2003)
- Agriculture
- Fishing
- Hydroelectric power Lungudi (Tshikapa, operational?)

Factors adversely affecting the site's ecological character in land and water use and development projects (within site): Mining

Area #: E28 Area Name: Lac Gefu

Province: Kasai Oriental

Territories: Lubao, Kabinda

Habitat Types that Predominate in the Area:

Permanent freshwater lakes (over 8 ha)

Notes: A karstic lake

Distinctive Biodiversity Characteristics:

Suspected high fish endemism: *Tilapia gefuensis*, a highly distinct cichlid endemic to Lac Gefu, suggests that other endemic species occur here. Highlighted for the special habitat type of karstic systems.

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Note: Near this lake, there are numerous other lakes including those with caves, i.e. Lake Kazuwa and Lake Nkenza that could be interesting in terms of fish diversity, especially Cichlidae.

Area #: E29 Area Name: Saline Mwashia

Province: Katanga

Territories: Kambove, Kasenga

Habitat Types that Predominate in the Area:

Saline springs

Distinctive Biodiversity Characteristics:

Outstanding at the ecoregional scale for fish endemism: *Oreochromis salinicola*

Notes: This species is known only from Mwashia (also spelt Moa Chia and Mwashya), a region of saline springs near the Lufira River below the barrage lake at Mwadingusha in Katanga, Democratic Republic of the Congo. Highlighted for the special habitat type of saline springs.

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Area #: E30 Area Name: Lac Tanganyika

Provinces: Katanga, Sud Kivu

Territories: Fizi, Kabambare, Kalemie, Moba, Mwenga, Nyunzu, and Uvira

Habitat Types that Predominate in the Area:

Permanent freshwater lakes (over 8 ha)

Permanent rivers/streams/creeks

Description: A large, deep graben lake

Distinctive Biodiversity Characteristics:

Outstanding for the region of analysis for fish and aquatic invertebrate richness

Outstanding for the region of analysis for fish and aquatic invertebrate endemism

Notes: An extremely high degree of endemism in all taxonomic groups. Probably around three hundred endemic fish species. High intra-lacustrine endemism in cichlids.

Quality of Information:

Level of scientific understanding: High

Need for biological inventories: Medium

Social and cultural values:

- Neolithic sites
- Early development of Bantu cultures

Land tenure (within the site):

- Private concessions (?)
- Traditional ownership

Landuse (within the site)

- Subsistence and commercial fishing
- Hydroelectric power generation (Kalemie, operational?) (Ministry of Mines, 2003:10)
- Subsistence agriculture

Factors adversely affecting the site's ecological character in land and water use and development projects (within site):

- Sedimentation of the lake due to erosion provoked by deforestation.
- Pollution of waterways from effluents from towns FAO (2006:4).

Area #: E31 Area Name: Pédicelle d'Ikelenge

Province: Katanga

Territories: Dilolo, Mutshatsha

Habitat Types that Predominate in the Area:

Shrub-dominated wetlands

Freshwater, tree-dominated wetlands

Permanent rivers/streams/creeks

Notes: Congo headwaters along Zambezi headwaters. Gallery forests and dambo (seasonally flooded) Zambezi grasslands, mesic Miombo.

Distinctive Biodiversity Characteristics:

Outstanding at the subregional scale for aquatic invertebrate richness: Odonata

Outstanding at the subregional scale for aquatic invertebrate endemism: Odonata; Exceptional levels of plant endemism (Linder 2001; J Biogeography)

Notes: Late Cenozoic drainage evolution has driven speciation in gallery forests and wetlands. Contact/transition zone between Congo and Zambezi Basins.

Quality of Information:

Level of scientific understanding: High

Need for biological inventories: Low

Area #: E32 Area Name: Rivière Oubangui: cours moyen, à partir de Bangui (Chutes de Zongo)

Provinces: Equateur, Orientale

Territories: Aketi, Ango, Bondo, Bosobolo, Libenge, Mobayi Mbongo, Yakoma, and Communes de Zongo

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks

Rapids

Distinctive Biodiversity Characteristics:

Outstanding at the ecoregional scale for fish richness and endemism, i.e., *Steatocranus ubangiensis*, *Haplochromis oligacanthus*, etc.

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Social and cultural values:

- Local populations heavily dependent on fish for their livelihoods.
- Traditional fishers known for their commercial activities and use of local waterways for transportation. Strong dependence on local fisheries for economic revenue and subsistence.

Land tenure (within the site):

- Private agricultural concessions partially under exploitation
- Traditional ownership

Land use (within the site):

- The territory of Gemena is a principal producer and supplier of rice and maize for national consumption (Tollens and Biloso for WFP, 2006:23, 43)
- Fishing (gillnets, line, traps, barrage system). Power station Mobayi Mbongo (Gbadolite, operational?) (Ministry of Mines, 2003:10)

Factors adversely affecting the site's ecological character in land and water use and development projects (within site):

- Over fishing (rivers as well as swamps and inundated forests)
- Erosion of river banks

Area #: E33 Area Name: Lualaba entre Upemba et Kindu

Provinces: Maniema, Orientale

General Geographic Location:

Below Upemba region downstream to Kindu

Habitat Types that Predominate in the Area:

Permanent rivers/streams/creeks in merely savannah area with series of rapids and waterfalls

Distinctive Biodiversity Characteristics

Richness: Not enough information to evaluate

Endemism : Not enough information to evaluate

Notes: Includes a series of rapids that probably hosts a distinctive fish fauna. Area of rapids virtually unsampled; presence of specially adapted and endemic catfish and others very likely. Amphibian fauna unknown, probably not rich.

Quality of Information:

Level of scientific understanding: Low

Need for biological inventories: High

Notes: Some data available in Banister & Bailey (1979)

Social and cultural values:

- Local populations heavily dependent on fish for their livelihoods.
- Part of the Luba Kingdom, last stronghold of King Kasongo Nyembo during the colonial rule De Clerck and Reefe (1984:405).

Land tenure (within the site):

- Traditional ownership

Landuse (within the site)

- Subsistence fishing

Factors adversely affecting the site's ecological character in land and water use and development projects (within site): Over fishing (rivers as well as swamps and inundated forests)

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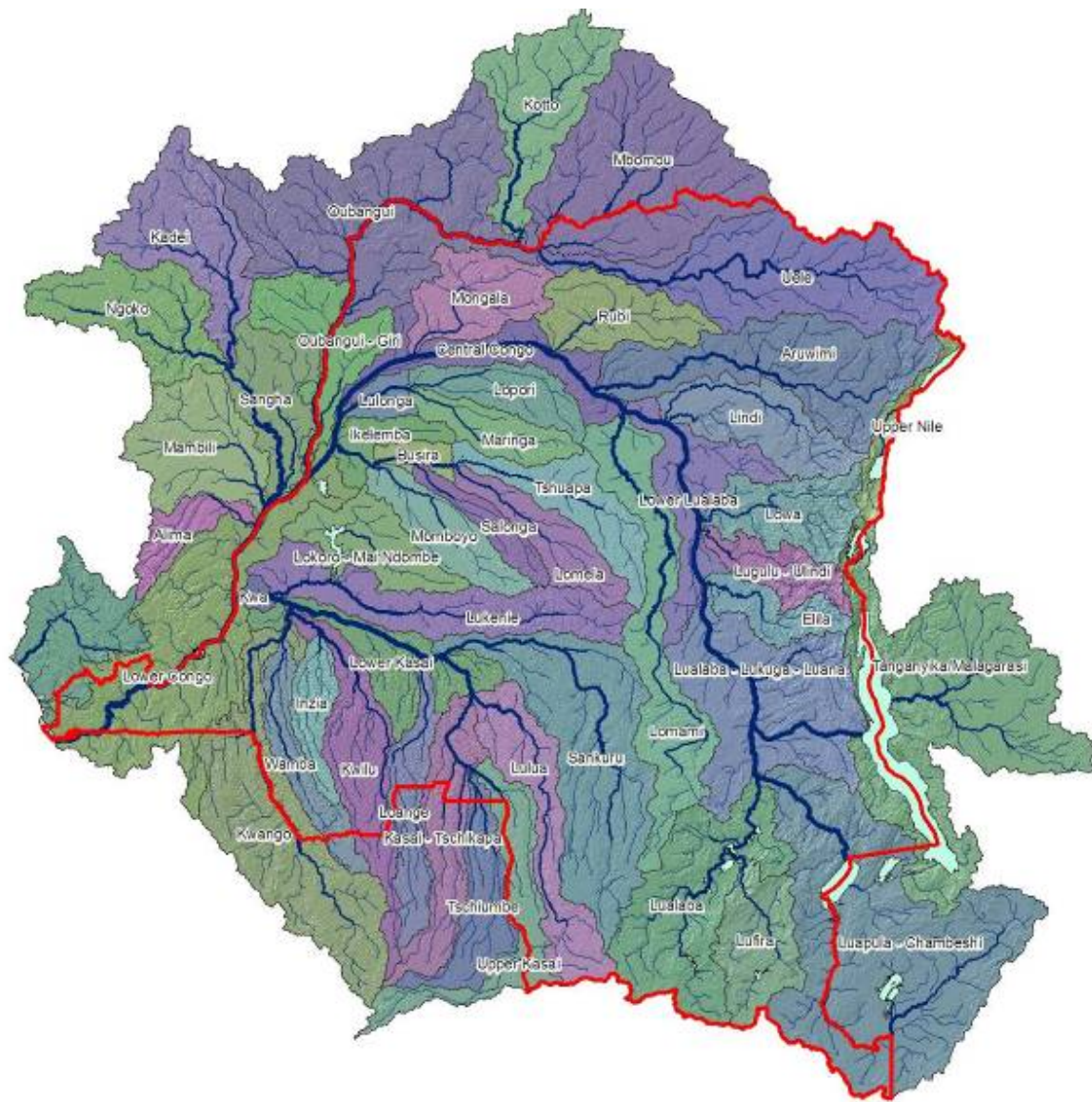


Figure 1. The Congo Basin and its sub-basins. The red line demarcates the boundaries of the Democratic Republic of Congo.

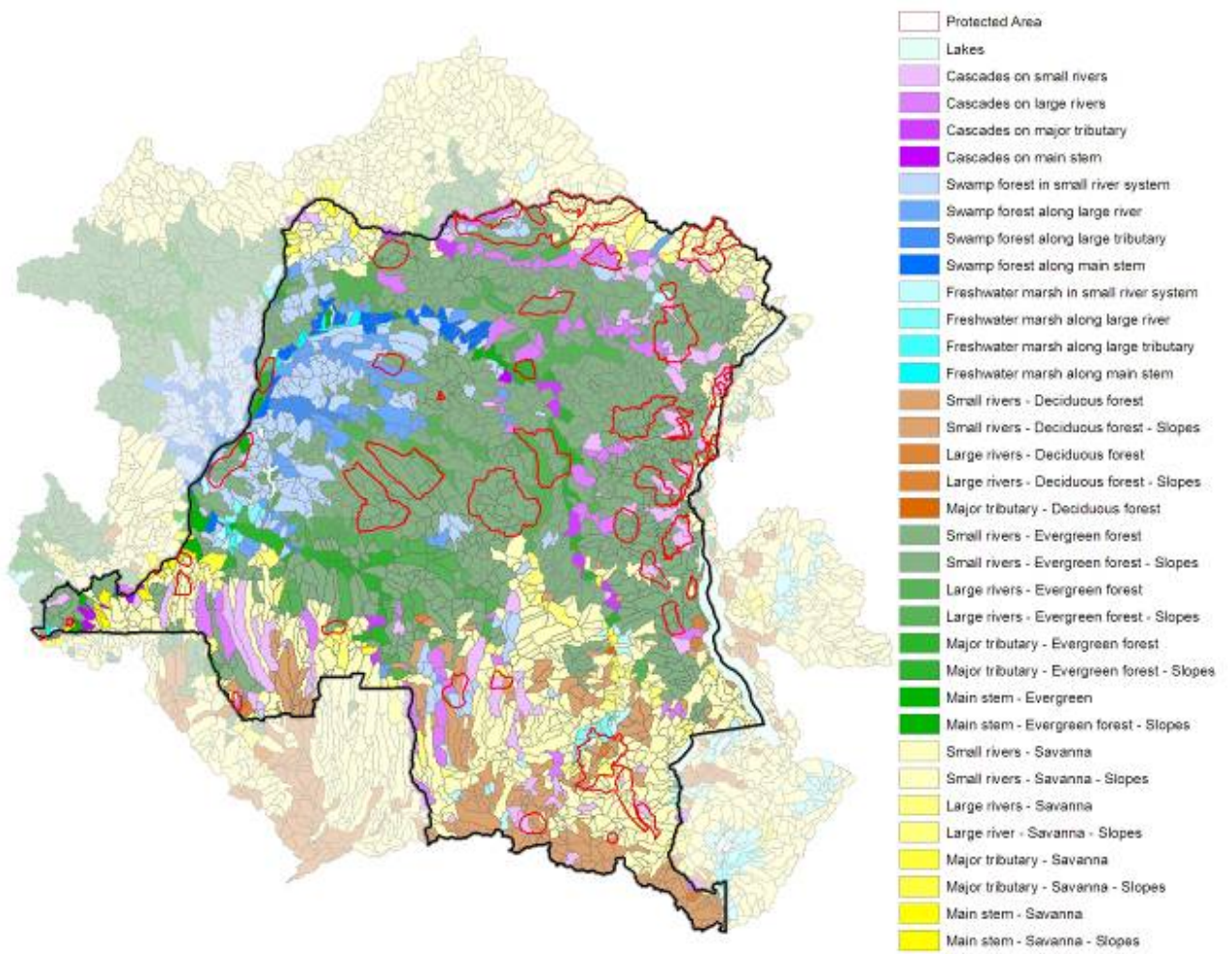


Figure 2. Aquatic ecosystem or habitat classification of sub-basins of the Congo River and current protected area network. The sub-basin units average 1,000 sq km.

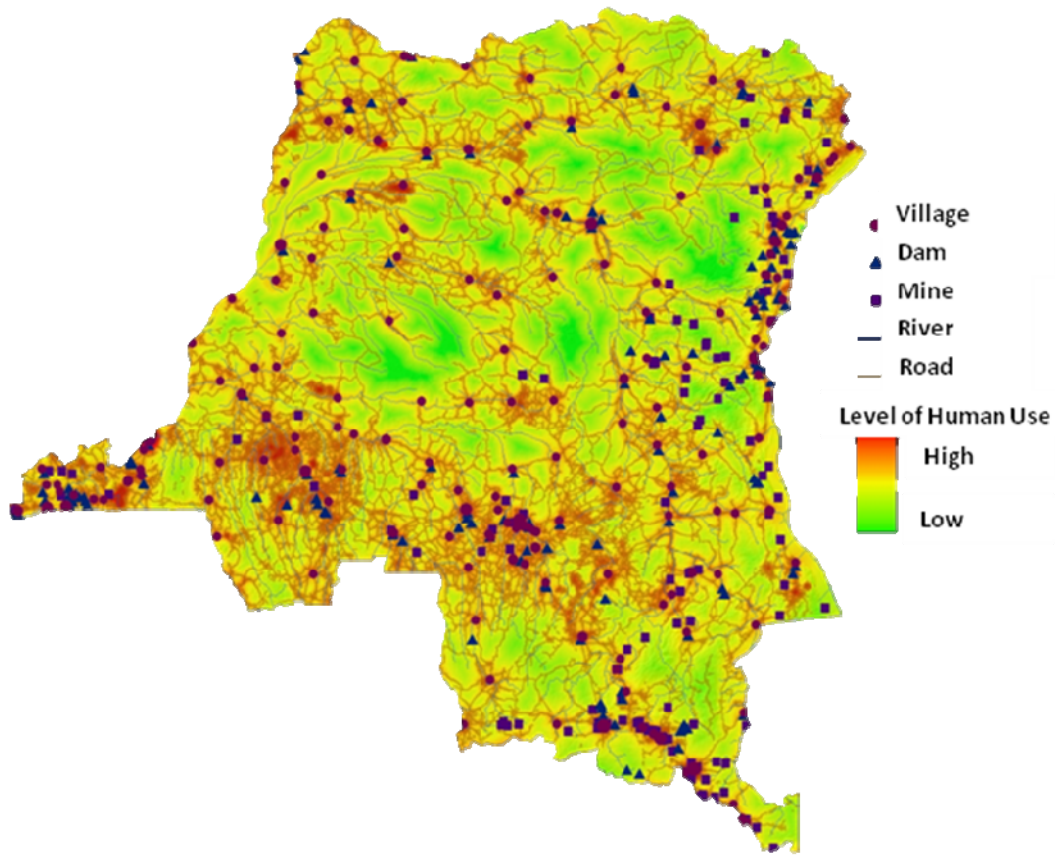


Figure 3. Results of the human use/suitability analysis. This analysis examines factors that generally reduce the viability of an area for effective conservation. It includes spatial data on current infrastructure, roads, railroads, rivers, mines, dams, and densely populated places.

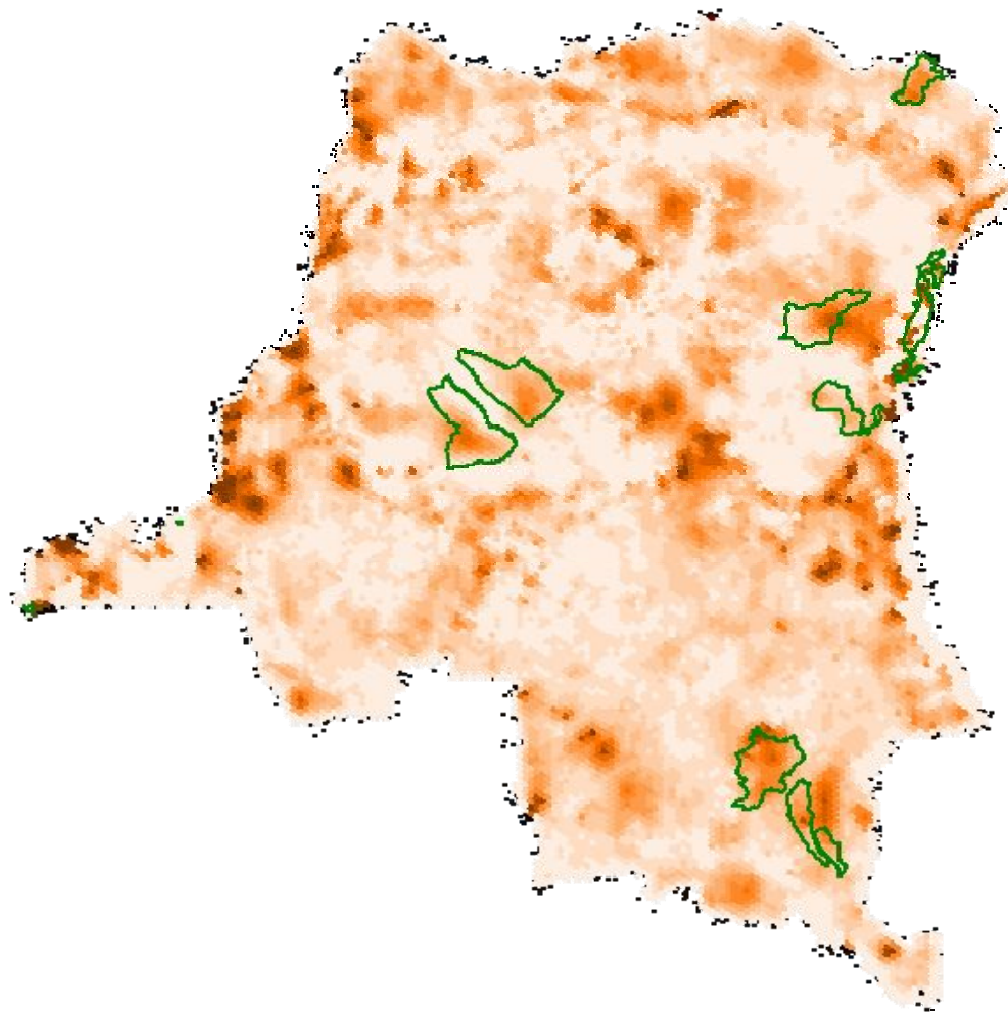


Figure 4. Results of the Marxan analysis. The areas with more brown represent freshwater or terrestrial habitat types that are most frequently chosen by the Marxan software and thus are important for meeting the goals of habitat representation.

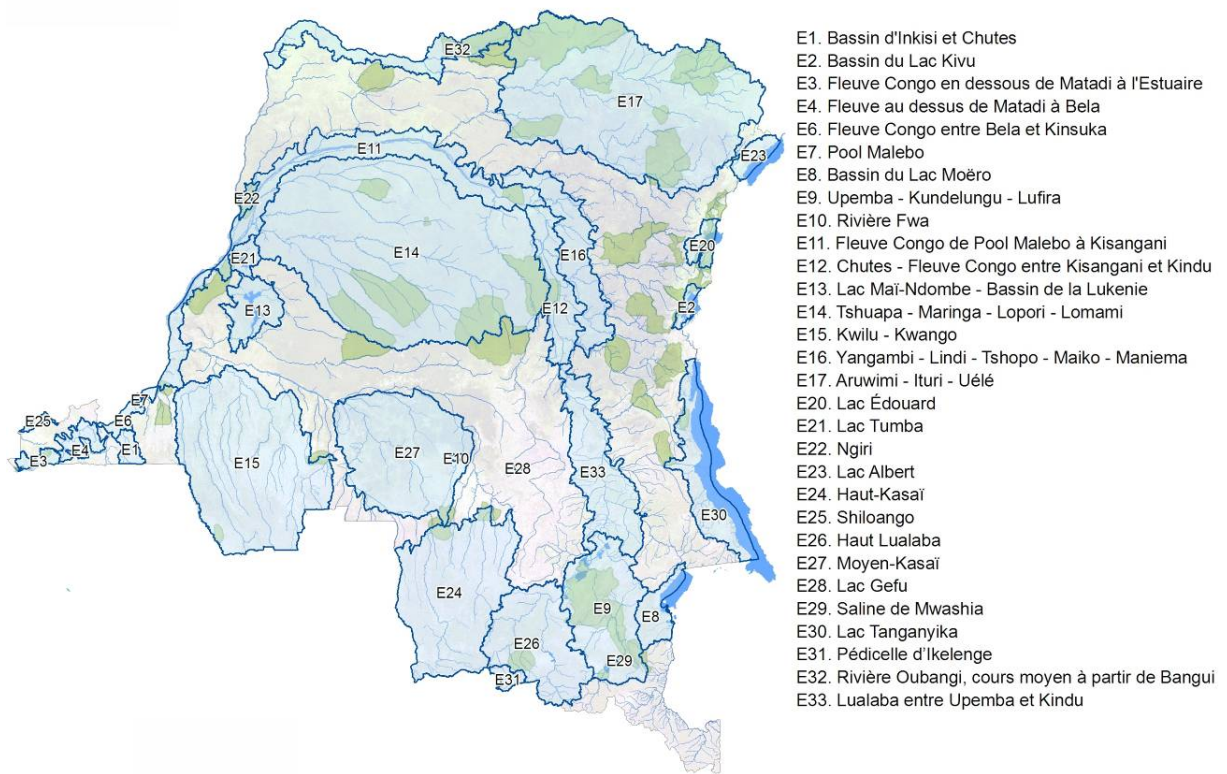


Figure 5. Wetland priority areas across the Democratic Republic of Congo.

Table 1. Biological values assigned by experts to each of the priority areas. From highest to lowest, these are: R (outstanding at the Regional scale), SR (outstanding at the subregional scale), E (outstanding at the ecoregional scale). Fields with blanks indicate that the area was not considered important for that attribute. Data unavailable means that there is not enough information available to evaluate this area.

Area #	Wetland Priority Area Name	Endemism	Richness	Phenomena
E1	Bassin d'Inkisi et Chutes	SR		
E2	Bassin du Lac Kivu	SR	SR	
E3	Fleuve Congo en dessous de Matadi à l'Estuaire	SR	SR	
E4	Fleuve au dessus de Matadi à Bela	SR		Fish radiations
E6	Fleuve Congo entre Bela et Kinsuka	SR		Fish radiations
E7	Pool Malebo	SR	R	
E8	Bassin du Lac Moëro	R*		Fish radiations
E9	Upemba - Kundelungu - Lufira	R	R**	
E10	Lac Fwa	R	SR	
E11	Fleuve Congo de Pool Malebo à Kisangani		R	
E12	Chutes - Fleuve Congo entre Kisangani et Kindu	R***	R	
E13	Lac Mai-Ndombe - Bassin de la Lukenie	SR	E	
E14	Tshuapa - Maringa - Lopori - Lomami	SR	SR	
E15	Kwilu - Kwango	Data Unavailable	Data Unavailable	
E16	Yangambi - Lindi - Tshopo - Maiko - Maniema	SR		
E17	Aruwimi - Ituri - Uélé	Data Unavailable	Data Unavailable	
E20	Lac Édouard			Stopover for migratory waterbirds
E21	Lac Tumba		SR	
E22	Ngiri			Stopover for migratory waterbirds (BirdLife IBA)

E23	Lac Albert		E	
E24	Haut-Kasaï	Data Unavailable	Data Unavailable	
E25	Shiloango	E		
E26	Haut Lualaba	SR		
E27	Moyen-Kasaï	E		
E28	Lac Gefu	Data Unavailable	Data Unavailable	
E29	Saline de Mwashia	E		
E30	Lac Tanganyika	R	R	
E31	Pédicelle d'Ikelenge	SR****	SR****	
E32	Rivière Oubangi, cours moyen à partir de Bangui	E	E	
E33	Lualaba entre Upemba et Kindu	Data Unavailable	Data Unavailable	

Table 2. Aquatic ecosystem types and representation within the current protected area network in DRC.

Aquatic Ecosystem Type	Total Area (sq km)	Area within Protected Areas(sq km)	Percentage representation
Cascades on small rivers	118237	19077	16.13
Cascades on large rivers	95273	9771	10.26
Cascades on major tributary	15684	0	Not represented
Cascades on main stem	4892	0	Not represented
Swamp forest in small river system	162102	11288	6.96
Freshwater marsh in small river system	19049	806	4.23
Swamp forest along large river	61957	1796	2.90
Freshwater marsh along large river	11309	1384	12.24
Swamp forest along large tributary	11699	25	0.21
Freshwater marsh along large tributary	1202	0	Not represented
Swamp forest along main stem	26490	557	2.10
Freshwater marsh along main stem	5156	102	1.99
Small rivers - Deciduous forest	98213	3810	3.88
Small rivers - Evergreen forest	475012	76204	16.04
Small rivers - Savanna	239138	38992	16.31
Small rivers - Deciduous forest - Slopes	59240	5135	8.67
Small rivers - Evergreen forest - Slopes	390781	60181	15.40
Small rivers - Savanna - Slopes	235603	15710	6.67
Large rivers - Deciduous forest	1221	0	Not represented
Large rivers - Evergreen forest	97244	9775	10.05
Large rivers - Savanna	21279	904	4.25
Large rivers - Deciduous forest - Slopes	5575	1090	19.55
Large rivers - Evergreen forest - Slopes	50423	762	1.51
Large river - Savanna - Slopes	32951	4108	12.47
Major tributary - Deciduous forest	544	0	Not represented
Major tributary - Evergreen forest	29236	3820	13.06
Major tributary - Savanna	7624	0	Not represented
Major tributary - Evergreen forest - Slopes	17855	1071	6.00
Major tributary - Savanna - Slopes	4806	0	Not represented
Main stem - Evergreen	7379	1179	15.98
Main stem - Savanna	2090	0	Not represented
Main stem - Evergreen forest - Slopes	7289	0	Not represented
Main stem - Savanna - Slopes	6260	467	7.47
Lakes	28768	2300	8.00

Appendix I. Contributors

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Appendix II. List of protected areas included in the gap analysis.

Réserve de biosphère de la Luki
Massif d'Itombwe
Réserve de faune à Okapis
Parc National de la Salonga
Parc National de la Maiko
Parc National de la Garamba
Parc National de Kundelungu
Parc National de l'Upemba
Réserve de biosphère de la Lufira
Réserve de biosphère de Yangambi
Réserve de Bomu
Domaine de Chasse de Gangala-na Bodio
Domaine de Chasse de Bomu
Domaine de chasse de Bili-Uere
Domaine de Chasse de Bushimaie
Domaine de Chasse de Luama-Katanga
Parc de la N'Sele
Domaine de chasse de Lubudi Sampwe
Domaine de chasse de Maika-Penge
Domaine de Chasse de Swa-Kibula
Domaine de chasse de Mangai
Domaine de chasse de Luama-Kivu
Parc Marin des Mangroves
Domaine de chasse de Rubi-Tele
Réserve forestière de Lomako-Yokokala
Réserve du Lac Tumba-Lediima
Domaine de chasse de Tshangalele - Kolwezi
Réserve Scientifique de Luo
Réserve de Shaba Elephant
Réserve de Lomami-Lualaba
Réserve du Sud Masisi
Réserve du Mont Kabobo
Réserve de Abumonbazi
Réserve de Epi
Réserve de Maniema
Réserve de la Ngiri
Réserve de Mai Mpili
Domaine de Chasse de Bombo Lumene
Domaine de chasse de Rutshuru
Parc National de Kahuzi-Biega
Parc National des Virunga
Réserve naturelle de Tayna

Réserve naturelle de Kisimba Ikobo
Réserve naturelle du Sankuru