APPENDIX A

Descriptions of Biologically Important Areas

Highest Priority

COASTAL SUBREGION

Name: Gamba
Map identification: c1a
Political unit(s): Gabon
Size: 14,470 km²

This area encompasses the Gamba complex of protected areas and surrounding regions. All habitat types of the coastal zone cover the gently hilly terrain: mangroves, beaches, coastal savannas, inundated forest, and lowland and highland rain forest. Inland forests are primarily evergreen and are characterized by okoumé (*Aucoumea klaineana*) and ozouga (*Sacoglottis gabonensis*) or okoumé, alep (*Desbordesia glaucescens*), and ozigo (*Dacryodes buettneri*) (Sayer et al. 1992). Two large lagoon systems located on the coast are lower in human population density than any others on the Gulf of Guinea. Doumenge (1997), Doumenge et al. (2003), and Wilks (1990) identified Gamba as a critical area for biodiversity conservation in Central Africa.

The Setté-Cama Reserve, the coastal portion of the Gamba complex, includes the Petit Loango and Plaine Ouango faunal reserves and the Iguéla, Ngové-Ndogo, and Setté-Cama hunting reserves (Sayer et al. 1992). Higher in the Doudou Mountains is the Moukalaba faunal reserve, in the Moukalaba River valley, just east of the Duogoua and Moukalaba rivers. A mosaic of secondary grassland, gallery forest, and lowland rain forest characterizes this inland area. The grasslands, which are burned each year during the long dry season, are dominated by *Pobeguinea* species that grow to about 2 m. Woodland areas occur on better-drained soils.

The Gamba complex is extremely important as it supports intact habitat and assemblages of large mammal species not found elsewhere. Ranging from the coast to inland forests, the habitat diversity is very rich. The two large lagoon systems provide a relatively productive habitat for hippo (*Hippopotamus amphibius*) and manatee (*Trichechus senegalensis*). Gamba's keystone mammal is the elephant (*Loxodonta africana*), which is present in large numbers. A substantial population of western lowland gorilla (*Gorilla gorilla*) inhabits the Mount Doudou area. Other primates present are chimpanzee (*Pan troglodytes*), mandrill (*Mandrillus sphinx*), golden potto (*Arctocebus aureus*), elegant needle-clawed galago (*Euoticus elegantulus*), northern talapoin (*Miopithecus* sp.), and black colobus (*Colobus satanas*) (Oates 1996). Prominent mammal species also include the endemic white-legged duiker (*Cephalophus ogilbyi crusalbum*), Bates' dwarf antelope (*Neotragus batesi*), buffalo (*Syncerus caffer*), water chevrotain (*Hyemoschus aquaticus*), and waterbuck (*Kobus ellipsiprymnus*) (WCMC 1993; Sayer et al. 1992). It is suspected that the area has endemic species of small mammals; a survey is in progress. Extensive large mammal surveys have been completed for the area; however, they are lacking in solid information for hippo and manatee.

Avifauna include many strictly grassland species such as the rare white-fronted bee-eater (*Merops bullockoides*), while the area is also rich in forest species. Also recorded in the area is the Loango weaver (*Ploceus subpersonatus*), which is endemic to the Gabon-Cabinda coast. An inventory has been completed for Mount Doudou (Fisher 2000), and inventories have also been done for Setté-Cama. However, much of the area is in need of further avifaunal study.

For invertebrates, the area is a representative habitat not proposed elsewhere within the Congo Basin. Therefore, protection would serve complementarity issues well. High species richness is suspected for Mount Doudou's invertebrates. Ecotones, which are found at altitudinal changes and along rivers bordered by savanna in the Gamba complex, provide for unique assemblages of herpetological species. The isolated Doudou mountain range also supports important species of reptiles and amphibians. The leatherback

turtle (*Dermochelys coriacea*) is recorded in coastal habitats of Setté-Cama (WCMC 1993).

Human pressure is low for most of the Gamba complex. A substantial portion of the area has been logged selectively. In some areas, forest activities have changed the structure of the rain forest, and on some steep slopes of the Mount Doudou area, logging has caused severe local damage. However, the area meets many other criteria required for high integrity. There is potential in the Gamba area for serious habitat degradation due to petroleum exploitation. Commercial oil exploitation also provides increased access to the region (WCMC 1993). This could have a significant impact on the unique lagoon systems. In much of the protected areas of this region, hunting and cultivation are illegal, however, the area has been heavily hunted in the past and is still under pressure from poaching. Poaching may decrease what are now fairly high densities of some large mammals (specifically elephant and gorilla) and may also represent a serious threat to hippo and manatee. An invasive fire ant introduced to the region, *Wasmannia auropunctata*, poses a threat to many fauna. An European Economic Community/IUCN report (Wilks 1990) proposed that the Mount Doudou area be incorporated into the surrounding protected areas of Setté-Cama. Doing so would protect the endemic white-legged duiker and would extend Setté-Cama to establish the Gamba complex as the largest protected area in Gabon (Sayer et al. 1992). A portion of rainforest in the Doudou Mountains (3320 km^2) was recognized as a protected area in 1999 as part of WWF's Gifts to the Earth program.

Name: Lopé-Abeilles-Chaillu
Map identification: c3b
Political unit(s): Gabon
Size: 28,050 km^2

Lopé-Abeilles-Chaillu, located south of the Ogooué River in central Gabon, is a large area with unique legal protection. The 5000 km^2 Lopé Reserve, designated as a wildlife management area, incorporates the Offoué-Okanda faunal reserve and the Lopé-Okanda hunting reserve. The Lopé Reserve contains two mountainous areas, Mount Brazza and the Lopé-Okanda plain. This plain is one of the driest areas in Gabon, with a mean monthly temperature of 25.7°C and annual rainfall of only 1500 mm (Sources Station d'Etudes des Gorillas et des Chimpanzés). There have been proposals to extend Lopé and declare it a national park. Other areas in the region receiving some level of protection are the Abeilles Forest, Soungou-Milondo, Mount Iboundji, and Nyanga Sud and Nyanga Nord. The Abeilles Forest, Soungou-Milondo, and Mount Iboundji were specifically included in a EEC/IUCN report (Wilks 1990) as important areas to include in order to achieve a network of protected areas in Gabon that is fully representative of the country's biodiversity (Sayer et al. 1992). Important neolithic archeological sites have been recorded in the area, showing human presence for a long period (UNEP-WCMC 2001).

Altitudes vary and habitats are diverse within Lopé-Abeilles-Chaillu, providing for an exceptional biodiversity of flora and fauna. Elevation ranges from 250 to 1000 m. Major rivers are the Ogooué, Offoué, Mingoué, and Lolo. The area is marked by a mosaic of forest types and also has an important island of relict savanna in its north. The Lopé-Abeilles-Chaillu area comprises a large part of the Chaillu Massif running through central Gabon, which is of tremendous botanical significance. This mountain chain is rich in biotopes (habitat pockets characterized by uniformity in climate and distribution of biotic and abiotic components), which contribute to this being the wealthiest floral area, in terms of endemics, within the Guinean-Congolian Forest Region. At least ten new plant species were described here in the 1990's, including some that are locally abundant. Endemic plants include species within the families Violaceae, Caesalpiniaceae, Burseraceae, Conaraceae, Begoniaceae, and Dichapetalaceae. The area is relatively well known botanically, but further exploration will undoubtedly reveal more endemics.

A small portion of relict savanna in the Lopé Reserve harbors unique flora, where many of the most common plants are endemics restricted to approximately 1000 km^2 of Lopé. This section continues to the north adjacent to the Ogooué River and is bordered by a railroad. Soil is relatively sandy, and the forest that encircles the savanna is a pioneer environment rich in okoumé (*Aucoumea klaineana*), azobe (*Lophira alata*), *Cola lizae*, and *Dialium lopense*. The last two species are endemics. The threshhold toward the savanna is rich in large Monocotyledons, such as members of the Zingiberaceae, or ginger, family.

Lopé-Abeilles-Chaillu provides a valuable representative habitat and is sizeable enough to ensure the long-term survival of large mammals, birds, and the highly diverse flora. The large range of habitats and altitudes ensures a continuation of ecological and evolutionary processes. The area supports large populations of forest elephant (*Loxodonta africana*), western lowland gorilla (*Gorilla gorilla*), and chimpanzee (*Pan troglodytes*) and has significant populations of mandrill (*Mandrillus sphinx*), elegant needle-clawed galago (*Euoticus elegantus*), and golden potto (*Arctocebus aureus*). Lopé Reserve has a very important population of the threatened and restricted black colobus (*Colobus satanas*). It is the only large group left, numbering at least 50,000 monkeys (Oates 1996). Of special significance, the Lopé-Abeilles-Chaillu area contains the entire geographic range of the endemic sun-tailed monkey (*Cercopithecus solatus*), discovered in the mid-1980's (Oates 1996). The forest/savanna interface has shifted dramatically in the past and allows a subset of mammals to benefit from access to the savanna, namely buffalo (*Syncerus caffer*) and red river hog (*Potamochoerus porcus*), and it allows others to use them seasonally, namely mandrills and chimpanzees. The area supports the seasonal migrations of elephants. More studies are needed of small mammals.

About 300 birds are recorded in the area, including the following endemic species: forest swallow (*Hirundo fuliginosa*), grey-necked rockfowl (*Picatharthes oreas*), Dja River warbler (*Bradypterus grandis*), and crested malimbe (*Malimbus racheliae*). It is likely that the Lopé Reserve is also an important locality for the Gabon batis (*Batis minima*), which is a sympatric species of the grey-necked rockfowl in many parts of northeast Gabon (Nicoll and Langrand 1986; Oates 1986; Christy and Vande Weghe 1999). Forty-four species of reptiles have been recorded, among which 38 have been identified (Blanc and Frétey 2000a, 2000b). They include serrated hingeback tortoise (*Kinixys erosa*), *Gerrhosaurus nigrolineatus, Varanus ornatus*, African rock python (*Python sebae*), 12 species of colubrids, 3 elapids, and 4 viperids. The crocodile *Osteolaemus tetraspis* is fairly common. Of the 47 species of recorded amphibians, 43 have been identified, among which are the toad, *Nectophryne atra*, the very common Arthroleptid, *Cardioglossa leucomystax*, several hyperolid treefrogs, and the rhacophorid, *Chiromantis rufescens*, with its foam nests. The rare African swallowtail butterfly (*Papilio antimachus*) has been recorded in Lopé (Sayer et al. 1992). The montane area around Mount Chaillu (1200 m) is important for invertebrates as the vegetation is quite different from the surrounding area. The area's altitudinal variation provides good potential for the development of endemic forms of invertebrates, but whether they occur is currently unknown.

There are very few roads in this portion of Gabon (the south and west have none), and the current human population is low. Research has been conducted in the north of the zone continuously since 1983 and in the east for a briefer period. This includes an ongoing census and study of the area's gorilla and chimpanzee populations (Tutin and Fernandez 1983). The foremost threat to this area results from forest exploitation. Logging concessions have been issued for most of the zone. Although illegal, logging is reported to be a major industry in the north of the Lopé Reserve, where high densities of okoumé (*Aucoumea klaineana*) occur. This is a light wood valuable for plywood that dominates the selective logging industry in Gabon (UNEP-WCMC 2001). Commercial hunting is taking place in the north near the Trans-Gabon Railway. Large mammal populations had been enjoying a period of recovery after heavy hunting; however, this may once again be a threat. A small amount of indigenous fishing and agriculture occurs, though these activities are potentially sustainable. Other constraints come from the lack of a legal control officer to monitor the large area outside the Lopé Reserve, low population densities of endangered endemic species, a lack of information on the biology in the south of the area, and the lack of economic activities outside natural resources exploitation. It is vital that the legal status of protection for the Lopé Reserve and this larger area is monitored and that illegal activities are controlled.

Name: Louesse
Map identification: c3c
Political unit(s): ROC, Gabon
Size: 8470 km²

The Louesse area, in the southwest of the ROC, is located within the Chaillu Massif. The highest summits reach up to 700–900 m at the northeast side of this mountain range. Evergreen and semi-deciduous dryland forest covers the region, with traces of montane vegetation. The type of semi-deciduous forest found here comprises 11% of the country's habitat. The flora is dominated by okoumé

(*Aucoumea klaineana*), limba (*Terminalia superba*), and sipo (*Entandrophragma utile*). Many species of Caesalpiniaceae are found. Also present in abundance is dibetou (*Lovoa trichilioides*) (Davis et al. 1994).

Louesse is of very high biological interest and is also at special risk from rapidly accelerating cycles of shifting cultivation and overhunting of wildlife. These pressures may be more significant threats to the area's biodiversity than that of deforestation, which usually takes the form of selective logging. Inventories of flora and fauna must be completed for the Louesse area, in addition to socio-economic studies. A dialogue should be initiated with logging companies for development of a schedule of conditions. Work must be done to develop a protected area in Louesse, as well as for identification of the reserve type. Conservation issues for the entire Chaillu Massif should be kept in perspective while working toward a management plan for the Louesse area.

Name: Campo Ma'an
Map identification: c4
Political unit(s): Cameroon, Equatorial Guinea
Size: 7880 km^2

The Campo Ma'an area has been protected to some extent as a faunal reserve since 1932. On January 6, 2000, Campo Ma'an was declared a national park. It is located in the Center-South Province, bordering Equatorial Guinea on the Atlantic coastal plain. It has a humid equatorial climate, with a mean annual temperature of 26°C and an average annual rainfall of 2000 mm that has two peaks, in May and October. The flat coastal plain rises inland and includes some low hills. A dense, humid forest begins at sea level and then passes through a transition forest, with legumes characterizing the higher altitudes. The area is rich in plant species, including *Lophira alata, Afzelia* sp., *Khaya ivorensis*, *Pterocarpus*, and *Aframomum*, as well as several plants with medicinal significance (UNEP-WCMC 2001). It also supports several endemics. The area is relatively well known, though new inventories are needed to confirm existing information, notably for vegetation. Doumenge (1997) indicated this as a critical site for biodiversity conservation in Central Africa.

Whereas the primary conservation significance of Campo Ma'an is botanical, it is also important for large mammals, such as elephant and gorilla, and dolphins and whales offshore. Some mammals found in the reserve are elephant (*Loxodonta africana*), gorilla (*Gorilla gorilla*), buffalo (*Syncerus caffer*), bongo (*Tragelaphus euryceros*), red river hog (*Potamochoerus porcus*), sitatunga (*T. spekei*), African civet (*Civettictis civetta*), tree hyrax (*Dendrohyrax dorsalis*), five species of duiker (*Cephalophus* spp.), and common duiker (*Sylvicapra grimmia*). The avifauna is also rich and diverse. The grey-necked rockfowl (*Picathartes oreas*) is found in the park, and it is an important migration site for hornbills (Bucerotidae family, *Tockus* sp.) from Dja. Twenty-six species of reptiles, belonging to the *Kinixys, Chamaeleo, Lygodactylus, Varanus, Naja,* and *Bitis* genera, and 13 species of amphibians have been recorded (Blanc 1993). The Campo Ma'an area may have the highest richness of invertebrates in the Guinean-Congolian Forest Region. The coastal portion provides important habitat for sea turtle nesting.

Although Campo Ma'an is a good example of relatively undisturbed coastal forest, logging had been permitted in the reserve under a 25-year logging concession (1968–1993), resulting in considerable forest degradation. The subsequent fragmented forest patches have disturbed the elephant populations. The zone has essentially been recolonized by evergreen forest, and the hope is that the fauna will also recuperate. There has been significant poaching of mammals for ivory and meat. With the new status as a national park, exploitation should cease. The new park limits, however, exclude the northern portion of the larger priority area, which should be considered for conservation efforts as well. Botanical inventories are needed to compare the area with the forests of Korup and in Gabon.

Name: Monte Cristal-Monte Alén
Map identification: c5a
Political unit(s): Gabon, Equatorial Guinea
Size: 13,190 km^2

The Mount Cristal-Mount Alén area is the northern portion of a mountain range running from Mount Alén in Equatorial Guinea, across the Cristal Mountains and the Chaillu Massif in Gabon, and to the southern end of the Chaillu Massif in the ROC. A small section of the area (800 km^2) in Equatorial Guinea had been protected in the Macizo de Mount Alén (Machado 1998).

This was recently expanded to 2000 km² and granted national park status. The highest altitudes are found here, where Mount Alén rises to approximately 1350 m. The reserve is significant as a water catchment for the major rivers of Uoro and Lana. Mount Alén's terrain is rugged, with rocky outcrops and several large waterfalls. The Cristal Mountains area is a massif reaching 1000 m. The entire area is covered by primary evergreen rain forest and receives high levels of rainfall. The Cristal Mountains are considered a Pleistocene refuge for xerophytes and orophytes and are one of two distinct Centers of Plant Diversity in the Atlantic Equatorial Coastal Forest ecoregion (Davis et al. 1994). This area is characterized by wet evergreen coastal rain forests and is estimated to have more than 3000 species of vascular plants. Over 100 of these are strict endemics to this ecoregion and to the Cristal Mountains. There is a very high tree species richness present, as well as many known endemic plants from the Violaceae, Caesalpiniaceae, Burseraceae, Conaraceae, Begoniaceae, and Dichapetalaceae families. The area has a high level of botanical integrity, as it is uninhabited and nearly untouched by agriculture. Mount Alén was indicated as a critical site for biodiversity conservation by Doumenge in 1997. Much of the area is unexplorable due to its dramatic topography.

A good representation of Atlantic forest mammal species is present in the Mount Cristal-Mount Alén area, including elephant (*Loxodonta africana*), buffalo (*Syncerus caffer*), gorilla (*Gorilla gorilla*), leopard (*Panthera pardus*), and chimpanzee (*Pan troglodytes*). There are high densities of the threatened mandrill (*Mandrillus sphinx*) on Mount Alén (Sayer et al. 1992).

Two hundred sixty-five species of birds have been recorded thus far for Mount Alén, including several of the lower Guinea endemics, specifically forest swallow (*Hirundo fuliginosa*), Gabon batis (*Batis minima*), grey-necked rockfowl (*Picathartes oreas*) and crested malimbe (*Malimbus racheliae*). Also recorded are three species of montane affinity, grey cuckoo-shrike (*Coracina caesia*), black-capped woodland warbler (*Phylloscopus herberti*), and pink-footed puffback (*Dryoscopus angolensis*). *Phylloscopus herberti* had previously been considered endemic to the Cameroon mountain chain.

The Mount Cristal-Mount Alén area should be considered for protection due to its unique species representation and its high biological integrity. There has been some forest exploitation, yet the area is relatively intact and uninhabited. Proposed conservation actions for the area are to establish a working group between Equatorial Guinea (Mount Alén) and Gabon (Mount Cristal) for potential linkage and identification of common actions and coordination mechanisms, to prepare the management plan for Mount Cristal, to establish a corridor to the Chaillu Massif area, and to establish a biological research station. A good knowledge of the existing vegetation and animal population has been reached and should be published. The establishment of ecotourism could be of great benefit to the area. Plans should be made for sustainable exploitation of the forest and its fauna in the area surrounding the proposed area of protection. Training of biologists and field managers should be conducted.

Name: Inselbergs of Equatorial Guinea and Gabon
Map identification: c5b
Political unit(s): Equatorial Guinea, Gabon
Size: 3160 km²

The inselbergs of Equatorial Guinea and Gabon area is situated on an interior plateau of 500–600 m at the eastern side of Mount Cristal-Mount Alén. The area is dissected by valleys south of the Volo River. The Altos de Nsork National Park covers 700 km² of the region. The inselbergs' outcrops, located on isolated hilltops, have deeply eroded clay soils that create frequent and very rapid changes in elevation. This favors the formation of many specialized habitats that are prime locations for endemic species.

Numerous areas of mature forest provide habitat for large numbers of animals in this region. Forest vegetation is dominated by *Podocarpus* sp., *Eleophorbia grandifolia,* and *Polyscius equatogisinensis*. There is a remarkable occurrence of *Podocarpus*, which exists up to 600 m. At least seven species of endemic plants have been recorded for the area. Examples of known endemics are *Polyscios acuotogumiensis* and a large number of species from the Rubiaceae and Euphorbiaceae families. Aside from botanical study, few biological inventories have been done for the inselbergs. There are known to be large bat colonies present that have not been researched. It is suspected that the area fosters endemic bird species.

Due to their unique and diverse habitats, the inselbergs of Equatorial Guinea and Gabon are considered important for conservation. Botanical inventories for all existing inselbergs in the zone and also ecological studies of relationships of the area's vegetation and fauna should be conducted. Proposals should be made to fund the protection of the inselbergs, and management plans for Altos de Nsork and Piedra Nzas must be elaborated upon. Development of ecotourism for selected inselbergs, such as Piedra Nzas, could be of benefit. Support and development must be contributed for the introduction of sustainable forest management and exploitation of fauna in the surrounding areas. A commission should be established between Equatorial Guinea and Gabon to address transboundary problems and issues.

NIGERIA-CAMEROON HIGHLANDS SUBREGION

Name: Mount Cameroon
Map identification: n2
Political unit(s): Cameroon
Size: 2670 km^2

Mount Cameroon is the highest mountain in West-Central Africa, as well as its only active volcano. The most recent eruption occurred in April 1999. The town of Buea is located on the southeast side of the mountain, and Limbe is at its southern foot. Mount Cameroon has one of highest rainfalls in the world, with the highest levels (up to 10 m annually recorded at Debundscha) on the southwest side of the mountain, facing the coast. There is a significant rain-shadow area to the north and northeast of the mountain. It is one of the last mountains in West-Central Africa where natural vegetation can be found intact from sealevel to the subalpine zone, though most forest on the mountain is threatened by subsistence and plantation agriculture (Cheek et al. 1996). Forest coverage extends from sealevel up to about 2000–2500 m of the 4095 m mountain. At middle and lower elevations, forests are repeatedly regenerating where lava flows cut through, providing for unique ecotones and successional phases of plant establishment. This usually begins with plant species that are normally thought of as tree epiphytes, while here they occur independently. The extremes of elevation, high rainfall, and lava flows and cones of different ages provide habitat for rare, unusual, and endemic species in many taxa. Located toward the center of what is believed to have been an important Pleistocene refugium, Mount Cameroon is considered a Center of Plant Diversity (Cheek et al. 1996). The mountains possess a wide range of ecologically diverse habitats, including montane, submontane, subalpine prairie, and lowland forest. The lowland forests are richest in plant biodiversity and are also subject to higher threat from agriculture and human encroachment. Mount Cameroon has long been noted as important for endemic grasses (Collar and Stuart 1988), as well as many other endemic montane, forest, and prairie plant species (Sayer et al. 1992). Fifty species and three genera of plants are strictly endemic, and 50 more are near-endemic to the main massif and its foothills (Cheek et al. 1996). The area holds important complementarity with Bioko for evolutionary processes.

Over 330 bird species are recorded from Mount Cameroon, and 16 of the species of birds endemic to the Cameroonian Highlands are known to occur on the mountain (Dowsett and Dowsett-Lemaire 2001). Two species are strictly endemic to Mount Cameroon, the Mount Cameroon francolin (*Francolinus camerunensis*) and the Mount Cameroon speirops (*Speirops melanocephalus*). The scarce swift (*Schoutedenapus myoptilus*) was discovered during a March 2001 survey conducted in the vicinity of Mann's Spring (2300 m) above Mapanja; the only other recorded site of this bird on the West African mainland is Mount Manenguba (Dowsett and Dowsett-Lemaire 2001). Other threatened or near-threatened birds recorded in the area are the green-breasted bush shrike (*Malaconotus gladiator*), grey-necked rockfowl (*Picathartes oreas*), Ursula's mouse-colored sunbird (*Nectarinia ursulae*), grey-headed greenbul (*Phyllastrephus poliocephalus*), Cameroon Mountain greenbul (*Andropadus montanus*), and the Cameroon Mountain roughwing (*Psalidoprocne fuliginosa*) (Collar and Stuart 1988). The mountain is the only known site for *Psalidoprocne fuliginosa* in Cameroon (Dowsett and Dowsett-Lemaire 2001). A "working checklist" of all birds by Dowsett and Dowsett-Lemaire (2001), prepared for the Mount Cameroon project, is available. Collar and Stuart (1988) indicated the area as a key forest for threatened birds in Africa.

Four small mammals appear to be endemic to Mount Cameroon, two shrew species (*Crocidura eisentrauti* and *Sylvisorex morio*), one rodent (*Lophuromys roseveari*), and a subspecies of another rodent (*Otomys tropicalis burtoni*) (Dowsett and Dowsett-Lemaire 2001). Large mammals are poorly known and should be studied further. Preuss's guenon (*Cercopithecus preussi*) appeared to be fairly common at high altitudes during the Dowsett and Dowsett-Lemaire March 2001 survey. Several other Cercopithecidae monkeys occur on Mount Cameroon, many of which suffer heavy hunting pressure, especially at the lower altitudes. Other significant fauna of Mount Cameroon include an endemic toad (*Werneria preussi*), a rare treefrog (*Hyperolius krebsi*), and a skink (*Panaspis gemmiventris*) known otherwise only on Bioko (Collar and Stuart 1988). Mount Cameroon is important for endemic species of invertebrates, particularly Lepidoptera, which has been the most studied. Many endemic dryland forest species, found at altitudes above 900 m, are forebearers of similar altitude Ougando–Zaire species. Also, endemic radiations are known to exist in some invertebrate taxa, for example, in the Gastropoda. Important Streptaxidae species are found here and on Bioko.

Human population in the area is high, and the lower elevations have been subject to serious deforestation on all sides of the mountain, including within the Bambuko Forest Reserve where cutting is illegal. The collection of NTFPs, including firewood and pygeum (*Prunus africana*), has occurred at an unsustainable level. *Prunus africana* is harvested and sold commercially as a treatment for prostate enlargement. A local project to remedy exploitation of *Prunus africana* has recently been initiated with good results (Dowsett and Dowsett-Lemaire 2001). Oil palm plantations that are encroaching on the mountain's habitat all belong to a government parastatal, Cameroon Development Corporation, which is currently undergoing privatization. Environmental impact studies carried out by the Mount Cameroon Project will most likely result in some limitations on further plantation creation. Hunting pressures have also taken a toll on the area's wildlife. In fact, very little remains of wildlife on the southern, eastern, and northern sides of the mountain. The Mount Cameroon Project, trying to develop parameters for sustainable hunting, was unable to come up with a database for calculating sustainable offtake, as numbers were so low. Despite these threats, conservation opportunites are high for Mount Cameroon. A national park has long been proposed, and the dramatic landscape provides good potential for tourism.

Name: Douala-Edéa
Map identification: n3
Political unit(s): Cameroon
Size: 4690 km²

Douala-Edéa, at the mouth of the Sanaga River, is the best example of complex coastal vegetation in Cameroon. Gartlan (1989) and Doumenge (1997) indicated this as a critical site for biodiversity conservation in Central Africa. The Douala-Edéa Forest Reserve covers approximately 1600 km². Soils are very sandy and acidic due to marine deposits by the Atlantic's north-flowing currents. A wide variety of habitat types is present, including mangroves along the coast, forested sand dunes, freshwater swamps or lakes in deflation plains, and some high forest on yellow clay soils. The primary vegetation type is coastal forest with 43 families of trees, including Euphorbiaceae, Olacaceae, and Caesalpiniaceae (such as *Cynometra hankei, Berlinia* sp., and *Macrolobium* spp.). The *Klainedoxa-Sacoglottis-Lophira-Coula* forests have a canopy of 19–40 m and support several rare species including black colobus (*Colobus satanas*) and chimpanzee (*Pan troglodytes*). Deciduous trees are sparse.

Seven species of anthropoid primates are found in Douala-Edéa, including mandrill (*Mandrillus sphinx*), de Brazza's monkey (*Cercopithecus neglectus*), greater white-nosed monkey (*C. nictitans*), grey-cheeked mangabey (*Lophocebus albigena*), and white-collared mangabey (*Cercocebus torquatus*) (Oates 1996; UNEP-WCMC 2001). Population densities of primates are low, which is suspected to be due to the high levels of defensive chemicals, such as terpenoids, alkaloids, cardiac glycosides, tannins, and saponins, found in the local vegetation (Oates 1996). These chemical compounds, a result of the poor soil quality, might prove important in future biomedical research (UNEP-WCMC 2001).

Other mammal species found in Douala-Edéa are blue duiker (*Cephalophus monticola*), hippopotamus (*Hippopotamus amphibius*), giant pangolin (*Manis gigantea*), tree pangolin (*M. tricuspis*), African civet (*Civettictis civetta*), and sitatunga (*Tragelaphus spekei*), and in coastal

lagoons, West African manatee (*Trichechus senegalensis*) (UNEP-WCMC 2001). There is a well-developed avifauna in the lowland forests, and wetlands/coastal and migrant bird species are also present. More than 200 bird species have been recorded thus far. Many species of amphibians found here are only known to exist in West Africa, with some endemism. The coast is important for marine turtle nesting.

The primary threat to the Douala-Edéa area is that it has recently been opened to oil exploitation. Though few of the area's tree species have commercial value, the area would be particularly vulnerable were deforestation to occur due to the sandy soil composition and high levels of rainfall. There seems to be slow regeneration of vegetation in this habitat after clearing (UNEP-WCMC 2001).

Name: Rumpi Hills
Map identification: n5a
Political unit(s): Cameroon
Size: 2930 km²

The Rumpi Hills Forest Reserve is located in the Southwest Province of Cameroon, Department of Ndian, between the towns of Kumba and Mundemba. It is just to the southeast of Korup National Park and is part of a mountain range that continues to the northeast and includes the Bakossi Mountains, Mount Kupe, and the Manengouba Massif. The southern portion of this range probably has the best example of submontane forest in Western Africa. The Rumpi Hills make up the westernmost and wettest zone, with relatively undisturbed forest that ranges from sea level to the summit of Mount Rata at 1778 m. Granite and Precambrian gneiss account for most of the area's geology, and although the hills do not show a classic volcanic cone, there is a small crater lake present, Lake Dissoni. Endemic atyid shrimps and aplocheilid and clariid fishes are reported by Schliewen (2000). The climate is semi-tropical, with a short dry season from November to March and a long rainy season from April to October. Doumenge (1997) indicated this as a critical site for biodiversity conservation in Central Africa.

The area's vegetation transitions with altitude from dense, humid, lowland forests to submontane forests and then to piedmont prairie at the highest elevations. Whereas the vegetation of the lowland forests varies little from that of Korup National Park, the submontane areas see a difference in the presence of a few mountain tree species, such as *Xylopia africana*, as well as a number of epiphytes (Fomete Nembot and Tchanou 1998). The submontane and piedmont zones of the Rumpi Hills are home to some endemic plant species.

The fauna is rich and diversified. Some species of interest include the Eisentraut's pipistrelle (*Pipistrellus eisentrauti*), a subspecies of l'Hoest's monkey (*Cercopithecus lhoesti preussi*), red-eared monkey (*C. erythrotis*), *Adolphus africanus,* and *Chamaeleo eisentrauti,* which is endemic to Mount Rumpi. Vulnerable bird species include green-breasted bush shrike (*Malaconotus gladiator*), white-throated mountain babbler (*Lioptilus gilberti*), grey-necked rockfowl (*Picathartes oreas*), white-naped pigeon (*Columba albinucha*), Cameroon Mountain greenbul (*Andropadus montanus*), grey-headed greenbul (*Phyllastrephus poliocephalus*), and Ursula's mouse-colored sunbird (*Nectarinia ursulae*) (Gartlan 1989). Collar and Stuart (1988) indicated the area as a key forest for threatened birds in Africa.

The Rumpi Hills have been a forest reserve since 1938; however, the boundaries have never been clearly defined. There is also a lack of any real management plan, and some biodiversity has been lost due to hunting and agriculture. More scientific inventories should be done, especially for plants.

Name: Manengouba-Kupe
Map identification: n5b
Political unit(s): Cameroon
Size: 3670 km²

This area encompasses Mount Kupe and the Manengouba Massif, located approximately 100 km northeast of Mount Cameroon. It is part of the mountain chain that extends from the island of Bioko north to the Mambili Mountains in Nigeria and beyond. While entirely surrounded by human settlement, the area itself is relatively isolated, save for a road that runs from Bangem up into the Manengouba Massif. Mount Kupe is a steep-sided mountain of crystalline rock, with a dramatic relief of long, narrow peaks and bare outcrops. The small Mane-

has Forest Reserve is located on the mountain, 7 km northeast of the summit. The Manengouba Massif is a succession of mountains culminating in a summit of 2411 m. It is an extinct volcano with two crater lakes found at 2078 m within a 4-km-wide caldera. The northern border of Manengouba has a very steep slope that descends 700 m down to the Mbo Plain. Both areas have fertile, acidic soils derived from volcanic ash.

The forest cover of the Manengouba-Kupe area provides a good representation of Western African submontane forest. The elevational gradients provide for transitional belts of vegetation. On Mount Kupe, the moist, dense forest cover continues to the summit, except on the very steep slopes and the areas with shallow soil. It comprises closed-canopy forest with an average height of 10–15 m. Some montane species, such as *Podocarpus latifolius* and *Philippia mannii,* are restricted to the summit. Characteristic trees are *Dicranolepis vestita, Ficus mucuso, Carapa* sp., and *Cephaelis mannii*. Species existing as epiphytes are *Dorstenia, Haemanthus, Dracaena,* and *Selaginella vogelii* (Collar and Stuart 1988). In contrast, the forests of the Manengouba Massif are dry, stunted, and montane in character, probably due to its location behind Mount Kupe in rainfall patterns (Collar and Stuart 1988). The forest area is also patchy due to grazing, cutting, and burning with degraded areas mostly covered in short grasses. An abundance of *Polyscias fulva* differentiates Manengouba's vegetation from that found at similar altitudes on Mount Cameroon, which is otherwise comparable.

Both segments of the Manengouba-Kupe area have high levels of endemic species. Collar and Stuart (1988) indicated both Mount Kupe and Manengouba as key forests for bird conservation in Africa. Mount Kupe is habitat for one endemic bird, the Mount Kupe bush shrike (*Malaconotus kupeensis*), as well as three other endangered birds: the green-breasted bush shrike (*Malaconotus gladiator*), grey-necked rockfowl (*Picathartes oreas*), and the white-throated mountain babbler (*Lioptilus gilberti*). Other important birds present on Mount Kupe are the Cameroon Mountain greenbul (*Andropadus montanus*), grey-headed greenbul (*Phyllastrephus poliocephalus*), and Ursula's mouse-colored sunbird (*Nectarina ursulae*). Important birds of Manengouba are the Cameroon Mountain greenbul (Andrapadus montanus) and Bannerman's weaver (*Ploceus bannermani*).

Important mammal species found on Mount Kupe are the russet-eared guenon (*Cercopithecus erythrotis*), drill (*Mandrillus leucophaeus*), and a skink (*Panaspis pauliani*) (Collar and Stuart 1988). Small mammals restricted to Manengouba and Mount Oku are Hartwig's soft-furred rat (*Praomys hartwigi*) and a shrew, *Sylvisorex granti* (Bowden 1986; Macleod 1987). Five frogs, *Leptodactylon erythrogaster, Cardioglossa trifasciata, Phynodon* sp., *Leptopelis* sp., and *Astylosternus* sp., are endemic to Manengouba, as is a chameleon, *Chameleo q. quadricornis* (Collar and Stuart 1988). Hazelwood and Stotz (1981) indicated at least 15 plant species needing protection that were nearly or completely restricted to Mount Kupe: *Guaduella ledermannii, Puelia acuminata, Glossacalyx brevipes, Pentabrachium reticulatum, Eurypetalum unijugum, Medusandra richardsinia, Atractogyne gabonii, Hamilcoa zenkeri, Didymocarpus kamerunsis, Dielsantha galeopsides, Whitfieldia preussi, Filetia africana, Barombia gracillima, Calchone acuminata,* and *Afrofittonia sivestris.*

Human pressures arising from the high populations surrounding these areas are degrading forests at lower elevations on both Mount Kupe and Manengouba. The area along the road on Manengouba from Bangem to the crater has been completely cleared. Both mountain areas are unique and worthy of protection. Manengouba's crater is especially scenic and has good potential for tourism, a positive opportunity if developed with conservation issues in mind.

Name: Obudu-Okwangwo-Takamanda
Map identification: n5c
Political unit(s): Cameroon, Nigeria
Size: 6300 km²

The Obudu-Okwangwo-Takamanda area sits astride Nigeria and Cameroon northeast of Korup National Park. It includes the Obudu Plateau, the Takamanda Forest Reserve, the Cross River National Park (Okwangwo Division), and the proposed Afi River Game Reserve. The nearest towns are Obudu in Nigeria and Akwaya in Cameroon. The Okwangwo portion of the Cross River area had been indicated by the IUCN as worthy of conservation measures in numerous publications due to high levels of species richness. Collar and Stuart (1988) listed the Obudu Plateau as an important site for threatened

bird species of Central Africa. The Takamanda Reserve was presented as a critical area for biodiversity by Fomete Nembot and Tchanou (1998) and Doumenge (1997). The area is marked by an intense altitudinal gradient between lowland rainforest and montane grassland that exists up to 1600 m. The Obudu Plateau has a general elevation of 1500 m, but contains odd peaks that almost reach 2000 m.

The Takamanda area offers a mosaic of vegetation types, including lower-altitude ancient secondary forest, which is very species-rich, recent secondary forest, which is species-poor, and also submontane and montane forest (Fomete Nembot and Tchanou 1998). The Obudu-Okwangwo area once was under continuous moist forest cover, though human interference led to replacement of much of the forest by grasslands (UNEP-WCMC 2001). Important transition zones are found where remaining forest patches meet grassland (UNEP-WCMC 2001). Of Nigeria's 550 threatened plant species, 42 have been recorded in the Obudu Plateau (Gbile et al. 1978).

The Obudu-Okwangwo-Takamanda area is most remarkable for its population of an endemic subspecies of gorilla (*Gorilla gorilla diehli*). Expectations are not good for this gorilla's persistence. Though some forest remains intact, the population is small and still hunted. Other important mammals in the area include drill (*Mandrillus leucophaeus*), elephant (*Loxodonta africana*), Preuss's guenon (*Cercopithecus lhoestis preussi*), red-eared monkey (*C. erythrotis*), western gorilla (*Gorilla gorilla gorilla*), and chimpanzee (*Pan troglodytes*) (Fomete Nembot and Tchanou 1998). Important birds of the area are white-throated mountain babbler (*Lioptilus gilberti*), Bannerman's weaver (*Ploceus bannermani*), green-breasted bush shrike (*Malaconotus gladiator*), Cameroon Mountain greenbul (*Andropadus montanus*), Fernando Po swift (*Apus sladeniae*), grey-headed greenbul (*Phyllastrephu poliocephalus*), and possibly the Cameroon Mountain roughwing (*Psalidoprocne fuliginosa*) (Collar and Stuart 1988). A frog, *Cardioglossa schioetzi,* is known to exist only in Obudu and in the nearby Oshie area, Cameroon (Gartshore 1986).

The most important element of the fauna at this site is the endemic and highly threatened gorilla subspecies. Generally, exploitation of bushmeat and NTFPs is heavy in the area. Due to recent drought, fires started for clearing for agriculture are spreading to the forest, which has become a crisis.

Name: Oban-Korup
Map identification: n5d
Political unit(s): Cameroon, Nigeria
Size: 9670 km^2

Oban-Korup is the largest contiguous block of lowland evergreen moist forest in the Nigeria-Cameroonian highlands. The area contains two important national parks, which combined cover approximately 5000 km^2. Cross River was declared a national park by presidential decree in 1991, Korup in 1986. The parks are combined as one area, as they encompass a significant drainage basin for the Cross River system and also create an important transboundary forested area between Cameroon and Nigeria. The nearest towns are Ikom and Calabar in Nigeria and Mundemba in Cameroon. Oban-Korup has been included in several listings of critical sites for conservation. Collar and Stuart (1988) indicated Korup as a key forest for threatened birds, Oates (1996) included both Korup and the Oban Hills as priority sites for primate conservation, and Korup/Ejagham was included in the IUCN's list of critical sites (Doumenge 1997; Doumenge et al. 2003).

The Oban-Korup area is a unique example of intact altitudinal forest zonation ranging from sealevel to the edge of montane forests and prairie. The majority of the area is covered by Biafran-type evergreen forest that has one of the most diverse floras in Africa. Fifty-two tree and liana families are recorded, including Scytopetalaceae (12%), Euphorbiaceae (11.7%), Caesalpiniaceae (9.6%), Olacaceae (6.7%) and Sterculiaceae (6.4%) with *Ubanguia alata* being abundant (UNEP-WCMC 2001). High levels of defensive chemicals were found in many plants, probably due to poor soil (UNEP-WCMC 2001). There are also some semi-deciduous elements present. Botanically, the area has a high number of Cross-Mayombo endemics and a significant number of narrow endemics (i.e., *Napoleona egertonii*). Inventories are badly needed to gain increased understanding of the richness of species found here.

Oban-Korup is important for birds and of critical concern for invertebrates, and it contains many threatened mammal species. These include drill (*Mandrillus leucophaeus*), Preuss's red colobus (*Procolobus badius preussi*), Preuss's guenon (*Cercopithecus preussi*), chimpanzee (*Pan troglodytes*), collared mangabey (*Cercocebus torquatus*), russet-eared guenon (*Cercopithecus erythrotis*), leopard (*Panthera pardus*), and elephant (*Loxodonta africana*). Oates (1996) also listed the following primates found in this area to be of conservation concern: angwantibo (*Arctocebus calabarensis*), pallid needle-clawed galago (*Euoticus pallidus*), and crowned monkey (*Cercopithecus pogonias*). Other mammals found in the area include grey-cheeked mangabey (*Cercocebus albigena*), bushbaby (*Galago* spp.), sitatunga (*Tragelaphus spekei*), Ogilby's duiker (*Cephalophus ogilbyi*), African civet (*Civettictis civetta*), red river hog (*Potamochoerus porcus*), Lord Derby's flying squirrel (*Anomalurus derbianus*), tree squirrels (*Funisciurus* spp.), and potto (*Perodicticus potto*) (UNEP-WCMC 2001). More than 390 bird species have been recorded in Korup National Park, including two threatened species, grey-necked rockfowl (*Picathartes oreas*) and yellow-footed honeyguide (*Melignomon eisentrauti*) (Collar and Stuart 1988). Some other birds present are black-headed bee-eater (*Merops breweri*), white-tailed ant-thrush (*Neocossyphus poensis*), red-tailed greenbul (*Criniger calurus*), and blue-billed malimbe (*Malimbus nitens*) (UNEP-WCMC 2001). A herpetological survey was conducted in the area by Lawson (1993). Small mammals are very poorly known in Oban-Korup. Inventories and distributional data are needed for these.

While the flora and fauna of Oban-Korup are intact and not fragmented from sealevel to the montane zone, large mammal populations have been badly depleted by high levels of unsustainable hunting, despite national park status. Agricultural expansion and the collection of NTFPs are also occurring in the area.

Name: Niger Delta Core
Map identification: n9b
Political unit(s): Nigeria
Size: 5480 km^2

The Niger Delta Core area, located in the southernmost part of Nigeria, centers around the largest river delta in tropical Africa. The habitat is primarily freshwater swamp forest, rare in western Africa. With over one-quarter of the African continent's human population, Nigeria puts great pressure on its natural resources, and some wildlife species have already been pushed to extinction in this area. The central delta freshwater swamp forests are distinguished (as Niger Delta Core) from the larger delta system, which is considered as a buffer area (n9a) and is characterized by mangroves and some dryland forest.

The Niger Delta exhibits a complex vegetation zonation. The dominant freshwater swamp forests are flooded for a portion of the long rainy season and have a dry season that generally lasts only for the months of January and February (Sayer et al. 1992). While some dryland forest tree species are found in spots of higher elevation, the freshwater swamp forest generally holds fewer species than its drier counterpart. Larger species are *Alstonia boonei, Lophira alata, Symphonia globulifera,* and *Mitragyna ledermannii* (a useful timber tree). Smaller species forming the main canopy are *Oxystigma mannii, Anthostema aubryanum,* and *Nauclea pobeguinii*. *Raphia hookeri* palm is often prolific, as well as *Panadanus candelabrum,* which is found in land margins between waterways (Sayer et al. 1992).

The Niger Delta is a likely Pleistocene forest refuge. A significant area of continuous forest remains; however, a few of the largest mammals, such as the Niger Delta pygmy hippopotamus (*Hexaprotodon liberiensis*) are extinct or greatly diminished. Rare fauna include a subspecies of the pygmy hippo, Sclater's guenon (*Cercopithecus sclateri*), African manatee (*Trichechus senegalensis*), and the anambra waxbill (*Estrilda poliopareia*). This area overlaps eastern and western forest faunas, with ranges of several eastern and western species (i.e., duikers and primates) intersecting here. Inventories have been partially completed (for fish, crustaceans, and mammals); however, much more is needed, especially for small mammals, amphibians, and plants.

The Niger Delta Core has persisted as a large area of important swamp forest habitat together with other delta ecosystems. However, the threats from oil extraction and logging are significant as is widespread, though not highly commercialized, hunting. Human settlement in the area is widespread, and the population density is rising.

Name: São Tomé
Map identification: n11
Political unit(s): Democratic Republic of São Tomé and Príncipe
Size: 836 km²

São Tomé is an 836-km² island, volcanic in origin and part of the Cameroon line, located 280 km from the continent. São Tomé is an oceanic island — it was never connected to the mainland. The island forms part of the Democratic Republic of São Tomé and Príncipe, which has its administrative capital in the northeast of the island. The highest altitude is found at the Pico de São Tomé (2024 m). The government of São Tomé and Príncipe is in the final stages of preparing two protected areas to be known as the Parques Naturais d'Ôbô, which will total 293 km². São Tomé's ecology is unique and of evolutionary interest due to the island's isolation. Endemism is found in all taxa and is at markedly high levels for birds, herpetofauna, invertebrates, and plants.

The remaining forest on São Tomé has been classified into five broad types. Lowland primary forest is found in the southwest, montane and mist forest in the center, and a small area of deciduous dry forest in the northeast. There is a range of altitudinal vegetation types. Outside of the primary forest are significant areas of secondary forest. Important habitats for many endemic species have regenerated. The remaining lowland and montane primary forest is currently in one contiguous block, with the area of dry deciduous forest in the northeast cut off from other areas of primary forest. Therefore, there is no contiguous zone for recruitment of species that share both habitats. One mangrove area is also located to the south.

Typical of small islands, São Tomé's fauna is not especially rich in comparison with many continental areas. However, the island's isolation has lead to significant levels of endemism in some taxa. The seven species of amphibians of São Tomé and Príncipe are endemic (100%). Six species dwell on São Tomé, among which four are restricted to that island, one also occurs on Das Rolas, a close islet, and one on these two islands and on Príncipe. The genus *Nesionixalus,* with two species, is endemic to São Tomé (Frétey and Blanc 2000). Of the 16 species of reptiles (2 turtles, 6 lizards, 8 snakes) occuring on São Tomé, 2 lizards (33%) are endemic. Another one, *Lygodactylus thomensis,* is also known from Annobón and, therefore, endemic of the Guinea Gulf islands. Three snakes (38%) are endemic. Few mammals are endemic to São Tomé, though there is a shrew, *Crocidura thomensis,* and two endemic bat species, of which *Myonycteris brachycephala* is notable, being the only known mammal with an asymmetric dental formula. São Tomé possesses a total of 16 endemic bird species and 2 endemic genera, and it has been designated as an important Endemic Bird Area by BirdLife International (Stattersfield et al. 1998). Four bird species were recently rediscovered after having been unobserved for more than 60 years and are considered to be critically endangered: the dwarf olive ibis (*Bostrychia bocagei*), Newton's fiscal (*Lanius newtoni*), the São Tomé canary (*Neospiza concolor*) and the São Tomé short-tail (*Amaurocichla bocagei*). Of the known herpetological fauna of São Tomé, 100% of amphibians (6 species), 100% of snakes (3 species), and 80% of lizards (6 species) are endemic. São Tomé's beaches are important for marine turtle nesting.

The Gulf of Guinea islands are of particular interest for invertebrate studies, although as with invertebrate studies in all areas of the region of analysis, data are poor. São Tomé has been the most widely studied island, and each island has its own distinctive fauna. New species are frequently discovered. Although checklists for several groups exist, there is almost no ecological or distributional work. Altitudinal range, rainfall patterns, and heavily dissected landscapes have led to distributional patterns that may vary across the region and in some cases lead to very localized species. Endemism is high across a wide range of invertebrate groups, for example Lepidoptera, Coleoptera, and Gastropoda. Possible radiations are known to exist in the terrestrial gastropod genera *Thapsia* and *Bocageia* on São Tomé, although knowledge does not exist as to whether this results from speciation or successive colonization. Such phenomena are certain to exist with other taxa. Relict species also certainly exist. The number of endemic plant species on São Tomé (81) is much higer than in the Gulf of Guinea

islands (14). There is however, a lack of recent data for many species.

São Tomé is currently subject to land conversion threats. Land privitization is leading to new agricultural practices, including market gardening. The resultant loss of shade cover from the traditional cocoa/coffee plantations will increase pressure for timber and firewood to be found in other areas. This will potentially include areas of primary forest, reducing available habitat and degrading the forests through selective logging for domestic consumption. Recreational impacts may increase due to an increased number of users as oil exploration and free trade zones become a reality. Sand extraction from beaches is a current problem threatening coastal habitats and turtle populations. Although current exploitation threats are low, the potential for disturbance of sensitive species will increase if an increase in recreational users occurs. Climate change may alter vegetation patterns causing a contraction of already very small areas (<10 km^2) of high-altitude moist forest. This would impact species limited to this habitat. Island populations are particularly sensitive to introduction of alien species, and endemic species on São Tomé are threatened by introduced animals such as mona monkey (*Cercopithecus mona*), black rat (*Rattus rattus*), civet (*Civettictis civetta*), and weasel (*Mustela nivalis*) (Stattersfield et al. 1998).

Name: Príncipe
Map identification: n12
Political unit(s): Democratic Republic of São Tomé and Príncipe
Size: 128 km^2

Príncipe is a 128-km^2 volcanic island in the Gulf of Guinea that is included in the Cameroonian volcanic line. The administrative capital is Santo Antonio on the northern half of the island. The altitude is much lower than on São Tomé, at 948 m. Príncipe is 220 km from the mainland, and like São Tomé, was never connected to the the mainland. It is planned that the Príncipe block of Ôbô National Park will cover almost the entire southern half of the island. This portion of the island is mountainous, with primary montane forest, while the northen half of the island is relatively flat with swamp and degraded forest areas. There is also a small area of lowland forest in the south. All remaining primary forest is limited to one block in the south and center of the island. A small area of degraded forest remains in the north-central portion of the island, though it is separated from the principal forest block. It is estimated that there are 40 km^2 of remaining lowland and montane forest on Príncipe. There is a range of altitudinal vegetation types, and 37 endemic plant species are recorded on the island (Figueiredo 1994).

While São Tomé is a much larger and higher island than Príncipe, Príncipe has a geological history more than twice as long as that of São Tomé. Príncipe had been undergoing evolutionary development and colonization from the mainland for 17 million years by the time São Tomé emerged from the ocean (Gulf of Guinea Islands Biodiversity Project 2001). It is also suspected that each island received its flora separately from the mainland. This history, combined with the island's isolation and the effect of sealevel changes that resulted in severe contraction of land area, makes Príncipe of great evolutionary interest. Each island in the Gulf of Guinea has its own distinctive fauna. Endemism is very high across all taxonomic groups, and the island's biodiversity is unique to Central Africa.

Príncipe is designated as an Endemic Bird Area, with six species restricted to this island (Stattersfield et al. 1998). One particularly unusual bird, *Horizorhinus dohrni,* has been classified by different sources as a warbler, flycatcher, babbler, and thrush (Stattersfield et al. 1998). All of these are forest birds and appear to have adapted well to secondary growth in disturbed areas (Stattersfield et al. 1998). Of the known herpetological fauna, 2 endemic species of amphibians occur on Príncipe, one restricted to that island and one common with São Tomé and Das Rolas, and 12 species of reptiles: 6 lizards and 6 snakes. Endemism levels are 50% (3 species) for the lizards, with another species occuring also on Annobón, and 67% (4 species) for the snakes. One lizard, *Feylinia polylepis,* and one snake, *Typhlops elegans,* are restricted to Príncipe. The island's beaches are important for marine turtle nesting. There is very little recent ecological or distributional data for invertebrates, though endemism is high across a wide range of taxonomic groups (e.g., Lepidoptera, Coleoptera, Gastropoda).

Príncipe suffers many of the same threats faced by São Tomé, such as land conversion and resulting forest degradation, recreational impacts, climate change, and the introduction of exotic species. Another very serious

concern specific to Príncipe is the commercial trapping of the African grey parrot (*Psittacus erithacus*) for the international pet trade. Although the Príncipe population is no longer considered an endemic subspecies, recent studies indicate that it shows distinct behavioral adaptations that differentiate it from mainland populations. Hunting has intensified over the last 20 years, and capture is primarily directed at nestlings, with estimates of harvested nestlings ranging from 600 to 3000 per year (Juste 1996). Although parrot populations appear healthy now, it is feared that they will crash once the adult generation dies. One of the endemic forest birds, the Príncipe speirops (*Speirops leucophaeus*), is thought to be declining and is considered threatened (Stattersfield et al. 1998).

NORTHEAST AND CENTRAL SUBREGION

Name: Haute Ituri–Aru
Map identification: ne1
Subregion: Northeast
Political unit(s): DRC
Size: 12,380 km²

The Ituri Forest encompasses the 60,000-km² watershed of the upper Ituri river. Haute Ituri-Aru is the northeast portion of the forest, located east of the Mambasa-Mungbere Road. It is a transition area, beginning as intact lowland rain forest that then rises in the east to elevations of 1000–1400 m, and finally gives way abruptly to the hills of the Albertine Rift. Forest-savanna mosaic is found in the north, and this juxtaposition of terrains produces unusual and unique assemblages of flora and fauna. The forest is a Pleistocene refuge providing exceptional species richness, with 15% endemism (Sayer et al. 1992). Ituri has the highest known okapi (*Okapia johnstoni*) density, approximately 0.5 individuals per km². Ituri is listed as one of the top forest sites in Africa important for bird conservation (Collar and Stuart 1988).

The Haute Ituri-Aru area is large, and few sites have been inventoried thus far. The transition zone between forest and savanna and the resulting ecotone are in particular need of surveys. These are highly likely to contain significant richness and unusual species assemblages. A possibility exists for diversification of buffalo subspecies, in particular an occurrence of both red and black forms. Surveys were done by Dechave and Lejoly in 1990 and Taton in 1949.

Human impact on the area is most significant at the more accessible eastern border, within the transitional zone from forest to savanna. This is also the area that is most important botanically. Current threats are mainly due to established forest exploitation activities and slash and burn agricultural practices. There has also been significant impact from gold mining in the forest. Future threats are difficult to predict as they are associated with ongoing ethnic strife and prevailing anarchy in the region.

Name: Ituri-Epulu
Map identification: ne2
Subregion: Northeast
Political unit(s): DRC
Size: 15,720 km²

The Ituri-Epulu area covers the central and western portion of the larger Ituri Forest and is bordered by Mambasa to the east, Wamba to the northwest, the Ituri River to the south, and the Nepoko River affluent to the north. The terrain comprises lowland and swamp forests in the southeast and inselbergs (isolated, jutting hilltops), which run east to west through the northeastern section of the forest reserve. Altitudes range from 650 to 1000 m, with inselbergs claiming the highest elevations. The bare granite tops of these inselbergs provide for the presence of unique xerophyllic communities of plants (Sayer et al. 1992). Dominant trees of the lowland Ituri Forest are *Julbernardia seretii, Cynometra alexandri,* and *Gilbertiodendron dewevrei*. Carbon-dating research has determined that Guinean-Congolian rain forest has persisted for at least 4000 years in the Ituri Basin (Hart et al. 1996).

In general, information for the Ituri-Epulu area is incomplete. Surveys done for mammals have been insufficient, knowledge of plants is limited to a central portion of the area, and almost no research has been done on small mammals, insects, amphibians, and reptiles, nor for the unique biota found on the inselbergs. Despite the lack of quantitative data, it is assumed that the area contains a high level of plant species with restricted distributions, for example, *Encephalartos ituriensis* (a cycad), a newly recorded species of *Pradosia* tree, and *Justicia irumensis* (a flowering tropical shrub).

The fauna of Ituri is rich and diverse. It is also suspected that this portion of the Ituri Forest has high levels of hybridization and dispersion of mammal populations. Significant populations of okapi, elephant, and primates have persisted and not been excessively reduced by war. Thirteen primate species are recorded for the Ituri Forest, including the rare owl-faced monkey (*Cercopithecus hamlyni*) and l'Hoest's monkey (*C. lhoesti*) (Oates 1986). This abundance of primates has been called "the richest assemblage recorded from any forest in Africa" (Hart et al. 1986). The elephant (*Loxodonta africana*) population in Ituri is estimated to be 6700 individuals (UNEP-WCMC 2001). A rare mammal species, the fishing genet (*Osbornictis piscivora*), is found in this section of the Ituri Forest. Other mammal species include African golden cat (*Felis aurata*), leopard (*Panthera pardus*), water chevrotain (*Hyemoschus aquaticus*), buffalo (*Syncerus caffer*), bongo (*Tragelaphus eurycerus*), sitatunga (*T. spekei*), giant forest hog (*Hylochoerus meinertzhageni*), red river hog (*Potamochoerus porcus*), pygmy antelope (*Neotragus batesii*), anubis baboon (*Papio anubis*), giant ground pangolin (*Manis gigantea*), giant forest genet (*Genetta victoriae*), brush-tailed porcupine (*Atherurus africanus*), black-legged mongoose (*Bdeogale nigripes*), black mongoose (*Crossarchus alexandri*), marsh mongoose (*Atilax paludinosus*), Congo clawless otter (*Aonyx congica*), and greater cane rat (*Thryonomys swinderianus*) (Sidle and Lawson 1986; UNEP-WCMC 2001). The Ituri Forest has a high number of duiker species, including blue duiker (*Cephalophus monticola*), white-bellied duiker (*C. leucogaster*), Weyn's duiker (*C. weynsi*), black-fronted duiker (*C. nigrifrons*), bay duiker (*C. dorsalis*), and yellow-backed duiker (*C. sylvicultor*) (UNEP-WCMC 2001; Hart, pers. comm., 2001). Two endemic weavers occur in this portion of the Ituri Forest, the yellow-legged weaver (*Ploceus flavipes*) and the golden-naped weaver (*P. aureonucha*) (Collar and Stuart 1988). Other notable fauna recorded in the area includes African slender-snouted crocodile (*Crocodylus cataphractus*), African dwarf crocodile (*Osteolaemus tetraspis*), and the African giant swallowtail butterfly (*Papillo antimachus*) (UNEP-WCMC 2001).

One Ituri Forest species that has risen to the status of a national symbol for forest conservation is the okapi (*Okapia johnstoni*). A small, short-necked giraffe that was discovered around the turn of the century, the okapi occurs entirely within the DRC's borders. A forest station established by the government at Epulu in 1952 employed local forest tribes to use indigenous techniques to capture and habituate the okapi. This proved to be a positive collaboration, and the spirit of this endeavor persisted, aiding greatly in gaining support for conservation initiatives in the area. A significant tourist attraction grew around viewing the okapi in naturalistic enclosures at the capture station. In 1992, the Okapi Wildlife Reserve was established within this portion of the Ituri Forest, and in 1996, it became a World Heritage site. A radio telemetry study of the region conducted by WCS estimated the local okapi population to total 4500 to 6500, indicated as the most significant okapi population found within a protected area (Sayer et al. 1992).

As with all of the DRC's protected areas, the future of the Okapi Wildlife Reserve hangs in the balance due to the recent war and continuing anarchy. The Okapi Wildlife Reserve was added to the List of World Heritage Sites in Danger in 1997, after armed conflict in the region had resulted in killing of elephants within the reserve, looting of facilities, and illegal gold mining. Reserve staff evacuated in 1998. They have since returned, and elephant poaching and much illegal mining has been removed over at least some sections of the reserve. Proposed actions are to reinforce the capacity of the inventory control management for the Réserve de Faune à Okapi to update the management plan and enforce the current system of biological monitoring. As of 2001, the Okapi Wildlife Reserve is benefitting from United Nations Foundation support to pay guards and to improve protection.

Name: Itombwe Hinterland
Map identification: ne3
Subregion: Northeast
Political unit(s): DRC
Size: 11,460 km²

The Itombwe Hinterland is located in a transitional zone between high elevations of the Itombwe Massif, where altitudes reach a summit of 3475 m at Mount Mohi, to the western lowland regions of the Guinean-Congolian Forests. The area is bordered to the north by the latitude of Uvira and to the south by Giri. It is south of the town of Bukavu and Kahuzi-Biega National Park. The Itombwe Massif is located within the largest forest refugia of Central Africa (Doumenge

1990). It is believed that the region's significant forest areas persisted in the Itombwe through the driest periods of the Pleistocene (Sayer et al. 1992). Itombwe is most noted for its exceptional richness of bird species, and it has been indicated as the single most important area for bird conservation on the continent (Collar and Stuart 1988). The priority area indicated is one of the few remaining intact highland to lowland transitional forests of Central Africa, being marked by rigid slopes and plateaus with semi-montane forests transitioning into dense woods.

Due to the diverse habitats provided by isolated massifs, the transitional hinterland itself has very high diversity of bird species with at least some endemics, including the Itombwe night-jar, the Itombwe owl (*Phodilus prigoginei*), and Schouteden's swift (*Schoutedenapus schoutedeni*) (Sayer et al. 1992). The area is also important for primates, including the eastern lowland gorilla (*Gorilla berengei graueri*) (Sayer et al. 1992). It is currently a recolonization zone for mammals, with species entering the zone from the Itombwe Massif area to the east, which has exceptional endemism of mammal species. The area also contains some overlap with the ecosystem of the Albertine Rift, a habitat important for invertebrates as well as reptiles and amphibians. Protection of this overlapping area would conserve species not represented in other proposed areas, including known endemic gastropod species. Radiations in gastropods exist, with known taxa occurring that are related to taxa in western refuge zones.

This area, when protected together with the Itombwe Massif, would conserve perhaps Africa's most important altitudinal gradient of forest from lowland to alpine vegetation. Currently the area is subject to a high threat from commercial hunting, as well as erratic movement of the people, which is associated with animal-raising and mining activities. Illegal mining is a threat. A 1996 famine led to large deforestation of the transition forest. The current status needs to be reevaluated as this area was one of the main centers of deforestation. Portions of the lowland forest contain zones of slash and burn agriculture, which has not yet encroached significantly on the forest, but could easily begin to in the future.

Remote sensing, rapid inventories, and mapping of habitats should be completed for the area. Also, socio-economic studies of the Itombwe population should be undertaken. Contact must be maintained with local initiatives and priorities. A space utilization plan must be developed in cooperation with the local population that provides for rational use of the natural resources.

Name: Maiko
Map identification: ne6
Subregion: Northeast
Political unit(s): DRC
Size: 18,310 km^2

This area in the Kivu Province of the DRC encompasses Maiko National Park and eastward to the montane forests of the Rift Valley. It contains the middle and upper watersheds of the Loya, Maiko, and Oso Rivers, and is bordered by the towns of Lubutu to the southwest, Manguradjipa to the northeast, and Opienge to the north. The area is almost entirely covered in dense, mostly primary, equatorial rain forest with a transitional zone between montane forest and lowland forest species in the east. Altitudes range from 750 m to over 1300 m. The lowland portion contains isolated massifs in the north and rolling hills in the south. The central portion of Maiko is relatively flat.

Together with the Ituri Forest, this area is the most important reservoir of northeast Congo biodiversity. It is one of the most remote and intact forest blocks in the northeast portion of the Guinean-Congolian Forest Region. A very unusual combination of high profile species occurs only within the Maiko area, including eastern lowland gorilla (*Gorilla berengei graueri*), okapi (*Okapia johnstoni*), Congo peafowl (*Afropavo congensis*), and chimpanzee (*Pan troglodytes*). Typical of other forest fauna are elephant (*Loxodonta africana*), leopard (*Panthera pardus*), buffalo (*Syncerus caffer*), and various antelopes, including duikers. The area holds a very high botanical richness with a high probability of new species, possibly including endemics. For mammals, the area is a center of hybridization within the transitional groups of the montane and lowland forests. Additionally, the area contains a representative habitat for invertebrates that would conserve species not represented in other proposed areas.

The actual conservation status of the Maiko area has remained relatively unknown since the beginning of the

war in 1996. Threats in the recent past have been from small-scale mining for gold, coltan, and diamonds, some logging, and poaching of okapi, elephant, and duikers. The northeast region of Manguradjipa is now seriously deforested. Illicit activities in the area have been difficult to control due to the lack of an effective management infrastructure, the size and accessibility of the interior, rebel forces in the area, and the presence of a well-used path through the park. Despite the many constraints, the Maiko area is of great importance and has a high potential for future conservation value.

Name: Salonga
Map identification: ne9
Subregion: Central
Political unit(s): DRC
Size: 64,630 km²

This priority area contains the Salonga National Park, which was given its national park status in 1970 and was later declared a World Heritage site in 1984. It is the largest rainforest national park in the world, covering 36,000 km². The park is split into two sectors, 17,000 km² in the north and 19,000 km² in the south, separated by about 45 km. A large part of the central basin of the Congo River, the area is located north of the Kasaï/Sankuru River, east of Lake Maï-Ndombe, south of the Lomela River, and west of the Lonkonia River. Nearby villages are Boende to the north, Ikela to the east, and Lodja (a larger town) to the southeast. Generally only accessible by water routes, the area is quite isolated and is one of the largest intact forest blocks in the Congo Basin.

Three types of terrain dominate the area: low plateaus, high plateaus, and river terraces, each with their own floristics. In the northwest sector, large rivers flow slowly between marshy banks, while to the east, rivers run through deeper valleys sometimes bordered by high cliffs (UNEP-WCMC 2001). Altitudes range from 350 m in the west to 700 m in the east. Forest types vary among swamp, dryland, and riverine, and natural borders exist, creating areas of vegetational mosaic. Much of the forest is primary. Evergreen forests are characterized by well-developed stands of *Gilbertiodendron dewevrei*. Between rivers, the vegetation is mostly semi-deciduous forest of *Polyalthia suavaeoleus, Stadtia stipitata, Schorodophloeus zenkeri, Parinari glabra,* and *Annonidium mannii*. Transitory vegetational communities of *Harungana madagascariensis* and *Macaranga lancifolia* occur along many riverbanks (UNEP-WCMC 2001). Grassland vegetation (distinctive from savanna) is found in the southern sector, and is locally known as *botoka-djoku,* or elephant's bath (UNEP-WCMC 2001; Thompson, pers. comm., 2001).

Mammal species of special concern found within Salonga include both subspecies of forest elephant (*Loxodonta africana cyclotis* and *L. africana africana*), several *Cercopithecus* species, bongo (*Tragelaphus eurycerus*), and the bonobo, or pygmy chimpanzee (*Pan paniscus*). The bonobo is now restricted to the central portion of the Guinean-Congolian forests south of the Congo River and east of the Lomami (Oates 1996). Bonobo populations are known from Salonga, Maringa-Wamba, Salonga-Lukenie, Lomami-Lualaba, Maringa-Lopori, Tshuapa-Lomela, and Lukenie-Sankuru, where they have been studied by research teams (Thompson, pers. comm., 2001). During a 1991 survey by Gauthier-Hion and Maisels, a local field assistant reported that four bonobos had been present but no actual evidence was recorded (Thompson, pers. comm., 2001). In 1987, Meder and Burgel found feeding remains and nine nests and observed three adult bonobos, and from the noise made by the bonobos, the local guides estimated that there were about 20 individuals (Thompson, pers. comm., 2001). Salonga is the only federally protected portion of the bonobo's habitat. Other primates found in high densities are Thollon's red colobus (*Procolobus tholloni*), Angola black-and-white colobus (*Colobus angolensis*), black mangabey (*Lophocebus aterrimus*), and Allen's swamp monkey (*Allenopithecus nigroviridis*). Dryas monkey (*Cercopithecus dryas*) is found near the park, but not within its borders (Oates 1996). The undisturbed nature of the area suggests that it may hold intact species assemblages. Though superficial, a recent estimate has been done on the density and abundance of populations of mammal species. There is a lack of inventory on fish, birds, and invertebrates. There is probably low endemism and richness for reptiles and amphibians, though notable fossorial snakes are found in the park, including species of stiletto snakes (*Atractaspis* spp.) and related species in the subfamily Aparallactinae.

Other species found in Salonga include long-tailed pangolin (*Manis tetradactyla*), giant ground pangolin (*M. gigantea*), tree pangolin (*M. tricuspis tricuspis*), hippopotamus (*Hippopotamus amphibius*), leopard (*Panthera pardus iturensis*), African golden cat (*Felis aurata aurata*), Angolan mongoose (*Crossarchus ansorgei*), Congo water civet (*Osbornictis piscivora*), red river hog (*Potamochoerus porcus ubangensis*), yellow-backed duiker (*Cephalophus sylviculter*), okapi (*Okapia johnstoni*), water chevrotain (*Hyemoschus aquaticus*), sitatunga (*Tragelaphus spekei*), bushbuck (*T. scriptus*), and dwarf buffalo (*Syncerus caffer nanus*). Notable birds include the endemic Congo peafowl (*Afropavo congensis*), cattle egret (*Bubulcus ibis*), yellow-billed stork (*Mycteria ibis*), and black stork (*Ciconia nigra*) (a migrant). The African slender-snouted crocodile (*Crocodylus cataphractus*) is a common reptile (UNEP-WCMC 2001).

Threats to the conservation of Salonga come primarily from high hunting pressure and from armed conflict occurring in the area. Poaching by both traditional and modern methods has reduced numbers of elephant and grey parrot (*Psittacus erithacus*). Increased bushmeat traffic has been reported along rivers bordering the southern sector of the park. Official conservation management of Salonga is virtually non-existent. Inhabiting the area are the Iyalima people in the eastern portion of the south sector of the park in Zone Oshwe, District Maï-Ndombe, Bandundu Province, and a group of Kimbanguists live near Lomela and also into Zone Dekese (Thompson, pers. comm., 2001).

The current situation within Salonga National Park and its periphery needs to be evaluated. Management capacities must be strengthened in order to control poaching. This will require the procurement of effective equipment for park guards. Surveys of bonobo and other large mammals must be completed for the periphery of the park. Habitat should be analyzed through remote sensing. An effective management plan must be developed, incorporating socio-economics of affiliated zones outside of the park. The CITES program's MIKE (Monitoring of the Illegal Killing of Elephants) management plan for the park should be implemented in an effort to save elephant populations.

Name: Maringa-Wamba
Map identification: ne15
Subregion: Central
Political unit(s): DRC
Size: 11,170 km²

Found south of the Congo River, the Maringa-Wamba area is located within the basin of the Lopori River and characterized by lowland forest and swamp forest. A percentage of the forest is seasonally inundated. The area is a representative subsection of the larger central Congolian lowland rainforest ecoregion.

Maringa-Wamba was chosen as a priority area due to the presence of bonobo, or pygmy chimpanzee (*Pan paniscus*), an endemic species that is restricted to a small region of the Guinean-Congolian forests within the DRC. There is currently a high density of bonobos in Maringa-Wamba. Thollon's red colobus (*Procolobus tholloni*) is also present in Maringa-Wamba, and additional endemics are expected due to the restricted habitat. A Bonobo Action Plan has been initiated for the area.

Remote sensing should be conducted to sufficiently characterize the vegetational habitat of Maringa-Wamba. Proper inventories of bonobo populations must be completed, and a plan must be implemented to monitor these. Eventually, negotiations must be made in regard to the leasing of forest concessions in the area.

Name: Salonga-Lukenie
Map identification: ne16
Subregion: Central
Political unit(s): DRC
Size: 23,730 km²

The region from the lower portion of Salonga National Park south to the Lukenie River shares much of the same rich ecology found within Salonga National Park; however, it does not benefit from the same protected status. The area is hilly, with an irregular savanna and forest mosaic, and increases in altitude from the southern border of the Guinean-Congolian Forest Region.

The Salonga-Lukenie area is critical habitat for many of the same species that enjoy some level of protection within Salonga National Park. These include Congo peafowl (*Afropavo congensis*), Thollon's red colobus

(*Procolobus tholloni*), Congo clawless otter (*Aonyx congica*), black mangabey (*Lophocebus aterrimus*), as well as a number of grassland-dependent species, such as Grimm's duiker (*Sylvicapra grimmia*), serval (*Felis serval*), side-striped jackal (*Canis adustus*), Egyptian mongoose (*Herpestes ichneumon*), and the black-bellied bustard (*Eupodotis melanogaster*) (Thompson 2000).

The LWRP is involved in a conservation effort to protect the rapidly declining populations of bonobo, or pygmy chimpanzee (*Pan paniscus*). The species is found worldwide only within a discontinuous range within the central Congo forests. It is the rarest of the great ape species and one of man's closest relatives. While once common, surveyors estimate that the total population of bonobos is now fewer than 20,000 (Oates 1996; Thompson 2000). Few of the isolated populations are thought to be self-sustaining. Once thought to be purely arboreal, it has recently been shown that the bonobo populations of Salonga-Lukenie also make use of drier grassland habitats within the area, consuming grassland fruits (Thompson 2000).

The bonobo and its habitat are currently threatened by the effects of foreign occupation, human population, and war ongoing in the country (Thompson, pers. comm., 2001). In the Salonga-Lukenie area, traditional beliefs once protected the bonobo from being hunted for meat. However, this taboo is disintegrating as transient human populations enter the area. Additionally, the hunting of adult females for infants they carry occurs as part of the live animal trade and is a lesser-reported, yet significant, threat to the bonobo. The political and economic unrest of the last decade in this area has made conservation efforts very difficult.

Name: Itimbiri
Map identification: ne18
Subregion: Northeast
Political unit(s): DRC
Size: 16,080 km²

The Itimbiri area is roughly defined within a triangle between the towns of Bondo, Aketi, and Buta in the Haut-Zaire province of the DRC, north of the Congo River. The Itimbiri River runs through the area before joining the Congo River, and the Uele River defines the area's northern boundary. The terrain consists of lowland and alluvial forest as well as a mosaic of semi-cultivated forest with sudden occurrences of savanna. This forest-savanna ecotone provides for interesting plant diversity, including the presence of endemics (White 1983). The area is also a notable transitional zone for fauna, supporting prominent species from two ecoregions: Congo east and Congo west.

The only source of botanical information for this area is from the work of Gérard in 1960, who characterized the forests of *Gilbertiodendron dewevrei*. For fauna, only numerical references exist, with some additional information resulting from the study of the Ebola and monkey pox viruses.

Itimbiri is under threat of habitat degradation as a result of agricultural activity and mineral exploitation. The area is very poorly known, and its high importance is speculative. Exploration and surveys are critically needed to ascertain Itimbiri's current status. Remote sensing and rapid inventories should be completed for this area in order to characterize habitat types and gain rough inventories of species. Evaluations must be made of human impact on the area. Based on knowledge gained from these studies, a reevaluation must be made of the status and conservation role of the area, and potential plans must be made for the establishment of a protected area.

WESTERN SUBREGION

Name: Minkébé Complex
Map identification: w1a
Political unit(s): Gabon, Cameroon, ROC
Size: 20,590 km²

The Minkébé Complex is an area of sparsely populated forest spanning three countries. It encompasses Ngoila in Cameroon, Minkébé in North Gabon, the Souanke District in the ROC, and the Djoua River valley that runs the border between Gabon and the ROC. The Minkébé Forest Reserve received its final gazettement on October 17, 2000. The area had been indicated as a critical site for biodiversity conservation in Central Africa by Doumenge (1997). Represented are a large evergreen forest plateau, superficial swamps of *Raphia* and *Uapaca,* and semi-deciduous transitional forests. These forests are

comparable to those found in the Dja Faunal Reserve in Cameroon and in Odzala National Park in the ROC.

A portion of Minkébé in the Woleu-Ntem province already enjoys status as a protected area. Ngoila-Mintom, Djoua, and Nabemba-Garabinzam have also been proposed for protection initiatives. As a whole, the Minkébé Complex has a very rich and diversified fauna, and all characteristic forest species are present, including a large elephant population. Important bird species found in Minkébé are oriole cuckoo-shrike (*Campephaga oriolina*), forest swallow (*Hirundo fuliginosa*), grey-necked rockfowl (*Picathartes oreas*), Verreaux's batis (*Batis minima*), and Rachel's malimbe (*Malimbus racheliae*). In terms of complementarity, the area is important for invertebrates. The Ngoila-Mintom area, in Cameroon, has important mandrill (*Mandrillus sphinx*) populations.

Although less bountiful in botanical diversity than other forests to the west, the Minkébé Complex is the largest intact forest in this biogeographic region. The Maranthaceae forests, and the evergreen and transitional forests, which are composed of tree species such as okoumé (*Aucoumea klaineana*), sorro (*Scyphocephalium ochocoa*), ilomba (*Pycnanthus angolensis*), obeche (*Triplochiton scleroxylon*), *Celtis* spp., limba (*Terminalia superba*), and engona (*Pentaclethra eetveldeana*) (Sayer et al. 1992) are highly representative of biodiversity potentials for the Congo Basin. The thick semi-deciduous forests or secondary forests found in mosaic with old-growth forest are very rich in Caesalpiniaceae. Spots of monodominant *Gilbertiodendron* forest are found. The Minkébé Complex is poorly documented botanically, but it is assumed to be very similar to Dja and Lobéké, which do have botanical inventories.

An area of special botanical interest is found on the mountains of Bélinga, at the site of a large iron deposit. A unique habitat of dwarf forest occurs on the mountain's shallow soils, as well as a significant center of endemism, the result of a Pleistocene Begoniaceae refuge. Studies must be done to determine whether the site can be conserved if planned iron mining occurs.

Outside of protected areas, major threats are from widespread logging, forest exploitation, poaching, urbanization, and subsistence and commercial hunting. Ivory poaching is most intensive on the Cameroon-Gabon border but occurs throughout the Minkébé Complex. Hunting pressure is particularly high along roads and waterways.

Suggested conservation actions are to identify potential actors in the area's private sector for conservation initiatives, reinforce anti-poaching efforts, and support and publicize the protected status being proposed for Ngoila-Mintom, Djoua, and Nabemba-Garabinzam. Makokou, where some infrastructure is present, should be reactivated as a long-term research station. Specific studies to be done are an assessment of the possible importance of the Bélinga Massif for endemic species, research into the relationships of the area's flora and fauna, and inventories of small mammals, invertebrates, and potential NTFPs.

Name: Odzala Complex
Map identification: w1b
Political unit(s): ROC
Size: 9120 km^2

This area, in the ROC, includes a portion of Odzala National Park (Hecketsweiler 1990; Hecketsweiler et al. 1991), which is well known as a refuge for the world's largest concentration of lowland gorillas. In May 2001, a presidential decree was signed, expanding the park to cover 13,600 km^2, quadruple its former size. The unique richness of the area had caused it to first be established in 1935 as a strict nature reserve. Odzala then received status as a national park in 1940 and in 1977 was accepted as a biosphere reserve. The possibility of establishing a corridor with Minkébé in Gabon, via Djoua, and with Lac Télé, via Kandeko, has been suggested.

An undulating plateau in the south of Odzala levels out to the north. The majority of the park is covered by a vast area of open canopy, semi-evergreen forest with a dense underbrush of Marantaceae species. Savanna is limited to the south, in the forest-savanna transition zone. There is a small occurrence of forest rich in *Gilbertiodendron* species. Odzala comprises a mosaic of savannas, marshes, forests (some periodically inundated), and several hundred marshy clearings known as bais. Ranging in size from less than 0.5 ha up to 12 ha, the bais contain rich mineral deposits that attract many species, in particular large mammals such as elephants, forest buffalo, and gorillas. In addition to the unique gorilla population, Odzala supports some of the largest populations of forest elephants and forest buffalo, the only lions surviving in Central Africa, and 400 of

the ROC's 640 identified bird species (Dowsett-Lemaire, pers. comm., 2001).

The species richness of plants and mammals is not exceptionally high in Odzala. However, the densities, or biomass, of medium and large mammals is absolutely exceptional. This is due to the fact that it is a vast, undisturbed area, with high habitat diversity, including the distinctive bais. The presence of lion and hyena is unique. Large mammals found in Odzala include elephant (*Loxodonta africana*), a relict population of lions (*Panthera leo*) in the savanna area, leopard (*P. pardus*), spotted hyena (*Crocuta crocuta*), dwarf buffalo (*Syncerus caffer nanus*), giant forest hog (*Hylochoerus meinertzhageni*), red river hog (*Potamochoerus porcus*), gorilla (*Gorilla gorilla*), chimpanzee (*Pan troglodytes*), bongo (*Tragelaphus eurycerus*), sitatunga (*T. spekei*), duiker species, including yellow-backed duiker (*Cephalophus sylvicultor*), and several monkey species. The rare giant African swallowtail butterfly (*Papilio antimachus*) has been observed in this area.

Economic hardship and regional conflicts have long resulted in Odzala National Park being insufficiently funded and poorly protected. In 1992, the ECOFAC Project undertook management of Odzala and maintained a continual presence in the park at Mboko and also at Olouma on the Mambili River until the civil war broke out in 1997 (Dowsett, pers. comm., 2001; ECOFAC 1996). ECOFAC reestablished its presence in 1999, after the worst phase of the war. The park is very remote from human settlement and difficult to access, however, a small logging concession has reportedly been granted in the southwest of the park in the vicinity of the only access road, which connects Mbomo to Mboko in the park interior (Dowsett-Lemaire, pers. comm., 2001). Additional roads would facilitate poaching of gorilla, elephant, and chimpanzee for bushmeat, ivory, and trophies. Elephant populations in the area have been particularly vulnerable, although there was a remarkable improvement during the short time (1992–1994), at least in the south, when a concerted effort to control elephant poaching was undertaken by ECOFAC. The ease with which animals such as forest elephants and gorillas can be observed at the bai clearings makes Odzala exceptionally attractive for research. The unique habitat also provides a future potential for ecotourism, which may or may not prove to be feasible at the close of civil conflict.

Name: Nki-Boumba Bek
Map identification: w1c
Political unit(s): Cameroon
Size: 6930 km^2

The Nki-Boumba Bek area, located in the East Province of Cameroon, in the departments of Haut-Nyong, Boumba, and Ngoko, is characterized by a forest massif located between the Boumba and Dja Rivers. It is a virtually uninhabited area, with the nearest cities being Moloundou to the east, Ngoila and Lomie to the west, and Yokadouma to the north. Altitudes range from 350 to 600 m. Doumenge (1997) and Doumenge et al. (2003) indicated the area of Boumba-Bek as a critical site for biodiversity conservation in Central Africa.

Nki-Boumba Bek is a transitional zone between the forests of Dja and semi-evergreen forest to the east. Primarily, it is forested, with some small enclosed savannas or swamps. Unlike the coastal forests to the west, these medium-altitude forests are not dominated by species of Caesalpiniaceae, barring the significant exception of *Gilbertiodendron dewevrei* (Sayer et al. 1992). The flora in the area implicates high levels of human impact in the distant past, most likely the result of agriculture.

Nki-Boumba Bek is notable for a high concentration of large mammals such as elephant (*Loxodonta africana*), buffalo (*Syncerus caffer nanus*), gorilla (*Gorilla gorilla*), chimpanzee (*Pan troglodytes*), bongo (*Tragelaphus eurycerus*), giant forest hog (*Hylochoerus meinertzhageni*), and red river hog (*Potamochoerus porcus*). It is an important area of faunal exchange with the Dja area. Over 300 bird species are recorded in the area, with a very rich Guinean-Congolian component. These species include two lower Guinea endemics: Dja river warbler (*Bradypterus grandis*) in Nki, and Picathartes oreas, of which one nest was recorded on the Boumba river in 1997 (Dowsett-Lemaire, pers. comm., 2001). *Bradypterus grandis,* a globally threatened species, was found in a saline of Nki. Further explorations of bird populations are necessary, as only the extreme southeast of Nki has been surveyed.

Commercial hunting is a conservation concern for Boumba Bek, though it is insignificant in Nki, which is too inaccessible. Commercial forest exploitation has not taken place within the Nki-Boumba Bek area, though logging in the surrounding zone presents an imminent threat to the integrity of the area. Establishment of a national park and/or a faunal reserve is planned for this

area, reducing the threat of forest degradation, at least within its borders. Conservation goals include linking this area to the protected areas of Dja and Minkébé. Anti-poaching efforts in the area must be reinforced, especially in the northeast, where the effects of the bushmeat trade for Bertoua and other large towns are serious.

Name: Sangha Trinational
Map identification: w1e
Political unit(s): Cameroon, ROC, CAR
Size: 11,000 km²

This area is composed of three national parks: Lobéké in Cameroon, Dzanga-Sangha in the CAR, and Nouabalé-Ndoki in the ROC. In December 2000, a trinational accord was signed combining these protected areas into Sangha Park, an area of more than 10,000 km². The first agreement of its kind in Central Africa, it is intended to link the protected parks as well as the surrounding hunting zones and production forests. The move involves a commitment by the countries to harmonize their forestry management systems and laws. Scientific research available for the zones of Sangha varies among project sites.

Many forest types are found in Sangha Park, including swamp forest, evergreen forest, semi-evergreen forest, transitional zones between forest and savanna, and *Gilbertiodendron dewevrei* forest, typified by a thick canopy and little ground vegetation common in the Guinean-Congolian forests. It is believed that a large area of forest in this region, probably restricted to the edges of main rivers such as the Sangha, was populated and cultivated for oil palms (*Elaeis guineensis*), from the period 2300 to 900 BP (White and Oates 1999). Oil palm is restricted in large part to areas of recent human habitation. After cultivation declined, the flora gave way to mahogany forests (including *Entangophragma cylindricum*), which have been exploited to some extent for their valuable timber. Logging that has occurred in some areas of Sangha has contributed to an opening of the forest canopy. Much of the area has never been logged, however, such as the core area of Lobéké and all of Nouabalé-Ndoki. The resulting patchwork of forest types promotes a high diversity and an abundance of mammals in the area.

The area is also characterized by the presence of immense wet grasslands, called bais. Bais develop on suitable substrates and are very attractive to mammals and various bird species. Nearly all key species of the area, including certain birds such as African grey parrot (*Psittacus erithacus*) and green pigeons (*Treron calva*), visit the bais in order to consume the mineral-rich mud, water, and aquatic plants. The aquatic herbs *Hydrocharis chevalieri* and *Rynchospora corymbosa,* which dominate the bais, make them preferred feeding sites for western lowland gorillas (WCS 2001). The large populations of elephants (*Loxodonta africana cyclotis*), western lowland gorilla (*Gorilla gorilla*), chimpanzees (*Pan troglodytes*), bongo (*Tragelaphus eurycerus*), giant forest hog (*Hylochoerus meinertzhageni*), and sitatunga (*Tragelaphus spekei*) found within Sangha Park are a globally outstanding assemblage of mammal species.

Over 390 bird species have been tape recorded in Dzanga-Sangha, 350 from Lobeke and 302 from Nouabalé-Ndoki (data mentioned in WCS draft management plan). Dzanga-Sangha, unlike the other two sites, has more than the "traditional" forest species because of savannas in the north, which explains the relatively high number of bird species found in this area. An important population of Dja River warbler (*Bradypterus grandis*) is found in Lobéké and an unknown species of *Caprimulgus* found in Lobéké and Nouabalé-Ndoki. The large assemblages of Guinean-Congolian species present are significant. *Bradypterus grandis,* for example, is a lower Guinea endemic. The night-jar *Caprimulgus* species needs further study, especially in Nouabalé-Ndoki. A new species of forest robin (*Stiphornis sanghensis*) from Dzanga-Sangha was described in 1999, the entire range of which is not yet known.

Threats vary for the three blocks of the trinational park. At present, hunting is controlled in Nouabalé-Ndoki, but medium to high levels are occurring in Dzanga-Sangha and Lobéké. Logging is taking place in Dzanga-Sangha and also in the surrounding regions of Lobéké and Nouabalé-Ndoki. There is the risk of savanna "encroachment" from the north in the CAR. Diamond mining once again threatens the northern reaches of Dzanga-Sangha. Primary threats to the biodiversity of the area as a whole continue to be poaching and forest exploitation.

Proposed conservation actions are to reinforce relationships between forestry companies and government, augment anti-poaching efforts by increasing the forest's guard force, convey the results of the Yaoundé Summit to governmental ministries, address zoning problems,

and continue the development of trinational cooperation, including the establishment of a trust fund (e.g., with GTZ).

Name: Lac Télé
Map identification: w3a
Political unit(s): ROC
Size: 10,910 km²

The Lac Télé area of the Epana District is within the Ubangui-Congo Basin, distinguished as the lowest-altitude zone of the Congo Basin. Included in this area is the protected area of Likouala aux Herbes/Lac Télé, designated as a Ramsar site in 1998. The area's terrain is dominated by extensive swamp forests and swamp grasslands, with some islands of dryland forest, humid savanna, and floating prairies found along watercourses. This is the largest mass of swamp forest and inundated forest in Africa. On higher ground, dense forests of *Albyzia zygia, A. ferruginea, Irvingia grandiflora, Klainedoxa gabonensis, Entandrophragma* spp., *Piptadeniastrum africanum, Pentaclethra* spp., *Pericopsis alata,* and *Pterocarpus soyauxii* occur (Ramsar 1998). At sites of abandoned plantations, secondary forest is dominated by *Lophira alata* and *Musanga cecropioides* tree species (Ramsar 1998). In regard to other forest types, riparian forests consist mainly of *Guibourtia demeusii, Parinari excelsa,* and *Uapaca heudelotii;* inundated forests of *Gilbertiodendron dewevrei;* wooded savannas of *Setaria restoidea* and *Hyparrhenia diplandra;* and flooded savannas of *H. diplandra* (Ramsar 1998).

The variety of habitats represented in Lac Télé and its periphery provide for a vast diversity of fauna. More than 11 primates are located here, including gorilla (*Gorilla gorilla*), chimpanzee (*Pan troglodytes*), and red colobus (*Procolobus pennantii*). A gorilla population to the west of the river is of particular importance. Buffalo (*Syncerus caffer nanus*) and sitatunga (*Tragelaphus spekei*) inhabit the savannas and swamp forests. Other mammals include elephant (*Loxodonta africana cyclotis*), Peters's duiker (*Cephalophus callipygus*), black-fronted duiker (*C. nigrifrons*), blue duiker (*C. monticola*), yellow-backed duiker (*C. sylvicultor*), and red river hog (*Potamochoerus porcus*).

Though very little research has been done at Lac Télé, and a thorough list of birds does not exist, the site is thought to be species rich. It is important for migratory bird species from the Ardeidae, Ciconiidae, and Pelicanidae families (Ramsar 1998). Herons and egret species are plentiful and include *Ardea purpurea, A. goliath, Ardeola ralloides, A. ibis, Egretta garzetta, Casmerodius albus, Nycticorax nycticorax, Anhinga rufa, Phalacrocorax africanus, Leptoptilos crumeniferus, Ciconia abdimii, C. episcopus,* and *Actophylornis africana* (Ramsar 1998). There are also several species of Anatidae and Alcedinidae (Ramsar 1998). Lac Télé is notable as well for invertebrates, with the presence of numerous species complementary to those of plateau forests.

The northern sector of the Lac Télé area is fairly intact, however, there is a good deal of human pressure and also significant hunting activity in the south. The site is public property, and the local population is supported by subsistence agriculture (bananas, manioc, taros, etc.), hunting, and fishing (Ramsar 1998). At this point, the pressures have not yet led to habitat degradation, but hunting pressures endanger the prized animal populations. Proposed actions are to identify potential actors from the private sector for conservation activity around Lac Télé. Thorough inventories of mammal and bird species should be conducted, as there is a significant lack of basic data for the area.

Name: Mbam-Djérem
Map identification: w5
Political unit(s): Cameroon
Size: 17,400 km²

The Mbam-Djérem area is located between Tibati and Yoko, with higher elevations reaching 1500 m in the west around the Mbam River. The Pangare Djérem Reserve has covered the eastern portion of the region for some time; on January 6, 2000, Mbam-Djérem National Park was created (covering 4165 km²). Drainage is from affluents of the Sanaga River to the south. The vegetation is characterized by a mosaic of forest and savanna, with the forest gradually overtaking savanna. This occurs as extensions of forest spread from galleries within the savanna. Doumenge (1997) indicated this as a critical site for biodiversity conservation in Central Africa.

Avifauna in the area is rich, with more than 300 species of birds. A systematic inventory is needed for an evalution of the area's biological importance. Additionally

for invertebrates, there is a high need for biological surveys, as a potential for complementarity is expected.

There is very high hunting pressure on the area's animal populations; however, the habitat is currently well preserved. Access to the area is very difficult and thus conservation potential is high. Other risks include some agricultural expansion in the west, perhaps including cattle ranching. There is also the proximity of a railroad that runs through the nature reserve south to Yaoundé.

Proposed actions to undertake within Mbam-Djérem National Park include the following: create guard posts, continue the inventory efforts begun by the WCS (some basic species lists exist), conduct other in-depth biological surveys, control access to and from the railroad, monitor impacts from the Chad-Cameroon pipeline project, pursue establishment of a trust fund (from the pipeline project), and study the potential for the extension of buffer zones, with local community participation.

High Priority

COASTAL SUBREGION

Name: Tchibanga
Map identification: c1d
Political unit(s): Gabon
Size: 10,470 km²

The Tchibanga area is located in the extreme southwest of Gabon, between the Nyanga River and the border with the ROC. A road leads from the coastal town of Mayumba inland to the major city of Tchibanga, capital of the Nyanga Province. The Banio Lagoon cuts inland north of the town of Ndindi. Small mangrove areas are found on the coast around Mayumba, though the majority of the region is composed of non-forested areas (e.g., coastal savannas) or semi-deciduous transitional forest of ilomba (*Pycnanthus angolensis*), engona (*Pentaclethra eetveldeana*), limba (*Terminalia superba*), and obeche (*Triplochiton scleroxylon*) (Sayer et al. 1992). The transition of coastal to inland forest habitat provides for a very rich diversity of flora and fauna. Nineteen percent of Gabon's recorded plant species are endemic (Sayer et al. 1992), and a portion of those are found in the Tchibanga region, specifically, species of the Begoniaceae family.

Tchibanga is an important part of the coastal habitat for intact large mammal assemblages, including hippo (*Hippopotamus amphibius*) and manatee (*Trichechus senegalensis*). For forest areas, Oates (1996) lists important primates of southwest Gabon to be golden potto (*Artocebus aureus*), elegant needle-clawed galago (*Euoticus elegantulus*), mandrill (*Mandrillus sphinx*), northern talapoin (*Miopithecus* sp.), black colobus (*Colobus satanas*), chimpanzee (*Pan troglodytes*), and gorilla (*Gorilla gorilla*). The last three are among the most threatened primate species in Africa (Oates 1996).

Potential for habitat degradation of Tchibanga comes mainly from oil exploration in the area. This could have a serious impact on lagoon systems. The region has been selectively logged for okoumé (*Aucoumea klaineana*), for which there is no management plan in the area (Sayer et al. 1992). Increased levels of hunting may cut down what are now fairly high densities of some large mammals, such as elephant and gorilla, and could also represent a serious threat to hippo and manatee populations. Additionally, an invasive fire ant (*Wasmannia auropunctata*) has proven a threat to coastal fauna. Despite these numerous dangers, the region has relatively low human pressure and therefore has the potential to preserve its integrity with proper protection and management.

Name: Estuaire Ogooué-Wonga Wongué
Map identification: c2
Political unit(s): Gabon
Size: 19,020 km²

The Estuaire Ogooué-Wonga Wongué is a vast area surrounding the Ogooué Basin located in the Ogooué-Maritime Province of Gabon. It contains the most extensive area of swamp forest in Gabon. The Wonga Wongué Presidential Reserve, a Ramsar site, is on the coast south of Libreville and can be visited by presidential invitation only. The larger area includes beaches, several freshwater lakes, mangrove areas, swamp forests, okoumé-ozouga forests, and stunted woodland savanna. Much of the area above the river basin is flat plain, with some gently rolling hills and coastal plateaus. Small rivers are numerous and have resulted in interesting erosion features, such as the amphitheaters of the Cirque de Grand- and the Cirque de Petit-Bam Bam (UNEP-WCMC 2001).

The Ogooué Basin area is an important wetlands ecosystem of open swamps with papyrus, muddy forests, firm-soiled forest, and savanna. Vegetation of the outlying rainforest includes the valuable okoumé (*Aucoumea klaineana*), as well as purpleheart (*Copaifera mopane*), ebony (*Diospyros* spp.), limba (*Terminalia superba*), iroko (*Milicia excelsa*), ilomba (*Pycnanthus angolensis*), and African mahogany (*Khaya* spp.). Trees can be found interspersed with rubber vine (*Landolphia* sp.) and climbing palm (*Calamus* sp.) (UNEP–WCMC 2001). There have been numerous relevant botanical inventories conducted around the station of Oyome and around Lake Ezanga.

The two species of highest concern in the Estuaire Ogooué-Wonga Wongué area are the western race of the gorilla (*Gorilla gorilla gorilla*) and chimpanzee (*Pan troglodytes*), both of which are threatened. Other notable mammals are buffalo (*Syncerus caffer*) (with a population of 30,000), elephant (*Loxodonta africana*), sitatunga (*Tragelaphus spekei*), bongo (*T. euryceros*), yellow-backed duiker (*Cephalophus sylvicultor*), blue duiker (*C. monticola*), giant pangolin (*Manis gigantea*), *Cercopithecus* monkeys, warthog (*Phacochoerus aethiopicus*), and aardvark (*Orycteropus afer*) (UNEP-WCMC 2001). The coastal region, specifically Mandji Island, is an important area for migratory species of birds, including Paleoarctic and African water bird species. Endemic birds of the area include Loango slender-billed weaver (*Ploceus subpersonatus*), African river martin (*Pseudochelidon eurystomina*), and rosy bee-eater (*Merops malimbicus*). Other birds of interest include white pelican (*Pelecanus onocrotalus*), parrots (Psittacidae), and bustards (Otididae). Among the other taxonomic groups, the area is habitat to turtles, Gabon viper (*Bitis gabonica*), python (*Python sebae*), and significant species of Lepidoptera invertebrates.

Primary constraints to conservation of this area are a result of introduction of exotic species in the Wonga Wongué Reserve, vast political control, forest exploitation, oil exploitation, and hunting and specialty fishing. Many exotic species have been introduced into Wonga Wongué, including pony (*Equus caballus*), Burchell's zebra (*Equus burchelli*), peccary (*Tayassu* sp.), black-tailed gnu (*Connochaetus taurinus*), and wildboar (*Sus scrofa*) (UNEP-WCMC 2001). All of these, excluding the zebra, have become established and threaten the integrity of the indigenous wildlife. The potential suspension of oil exploitation will induce an increase in the exploitation of other natural resources, such as forest products. This phenomenon has been witnessed previously during periods of low oil prices. Significant poaching and forest exploitation had degraded forests within the reserve in the past, though management has proven effective in recent years. Outside of the presidential reserve, forest exploitation is weakly controlled. There is also damage occurring from a high activity of seasonal fishing that targets one or two species.

Large mammal densities and a uniquely vast swamp forest habitat make the Estuaire Ogooué-Wonga Wongué an invaluable resource for the country of Gabon. Proposed conservation actions are to elicit a statute review for the Wonga Wongué Reserve, effectively put in action a durable development plan for the zones outside of the protected area, establish a mechanism of perennial conservation financing, revise relevant juridical and institutional bodies (while respecting the conventions of co-management), and impose non-renewal of permits for forest and oil exploitation in the protected areas. Other beneficial actions would be to complete cartography of occupation and utilization of space areas and conduct identification of phylum, class, and family of hunted animals and fish of the area.

NIGERIA-CAMEROON HIGHLANDS SUBREGION

Name: Bioko
Map identification: n1
Political unit(s): Equatorial Guinea
Size: 2020 km^2

Bioko, the largest island in the Gulf of Guinea, is part of the volcanic chain that includes Mount Cameroon, São Tomé, Príncipe, and Annobón. It is an active volcanic island and is dominated by three volcanic peaks, Pico de Basilé, which is the highest at 3011 m, Gran Caldera de Luba (2261 m), and Pico Biao (2010 m). Pico de Basilé is the second highest mountain in western Central Africa after Mount Cameroon. Bioko is a province of Equatorial Guinea, and its capital, Malabo, is on the northern coast. It is approximately 40 km offshore of Cameroon and has a total land area of 2020 km^2 (Sunderland and Tako Tanyi 1999). Rainfall is very high, with the heaviest in the southwest reaching over 10 m per year. The island was connected to the mainland some 10,000 to 12,000 years

ago, which has resulted in faunal speciation and much subspeciation. Many "incipient" species are present. Thus, Bioko is a very important site for the study of evolution and the past distribution of species.

Bioko has the highest number of plant species of all the islands in the Gulf of Guinea, with 1105 species representing 605 genera in 124 families (Figueiredo 1994). The flora is quite similar to that of Mount Cameroon, with the noted exception of some poorly represented families, such as palms. The two mountain areas share a similar vegetation gradient from lowland forest through to montane forest at middle elevations, with alpine savanna at the peaks. The very high rainfall, or perhaps the persistent cloud cover at lower altitudes on Mount Cameroon and the southern massif of Bioko, has resulted in montane forest habitats being found at as low as 500-m altitude. Montane forests of both Bioko and Mount Cameroon include *Schefflera* forest, dwarf or scrub forest, and ultimately subalpine and Afro-alpine meadows on the summits. Forest species include *Crassocephalum mannii, Hypericum lanceolatum, Myrica arborea, Philippia mannii,* and *Schefflera abyssinica*. Montane scrub occurs above the forest, grading into grasslands at the highest elevations. The subalpine belt is characterized by meadows of tussock grass and sedge vegetation, including *Andropogon amethystinus, Festuca abyssinica,* and *Crepis cameroonica*. Lowland forest is found at lower altitudes on Bioko, drainage is radial, and a unique monsoon forest covers the south of the island.

Bioko is one of Africa's most important sites for primate conservation, supporting at least 12 species, of which about 7 are endemic subspecies. The island was formerly joined to the mainland, and the evolutionary processes exhibited in consequent species are of special interest. The montane forest populations of drill (*Mandrillus leucophaeus*) and Pennant's red colobus (*Procolobus pennantii*) are very important. Endemic primates include the subspecies of drill (*Mandrillus leucophaeus poensis*), red-eared monkey (*Cercopithecus erythrotis erythrotis*), Preuss's monkey (*Cercopithecus preussii insularis*), black colobus (*Colobus satanas satanus*), northern needle-clawed galago (*Euoticus pallidus pallidus*), and Allen's galago (*Galago alleni alleni*), all of which are on the IUCN's red list of endangered species (Hilton-Taylor 2000). Rare primates also include Preuss's monkey (*Cercopithecus preussi*) and crowned monkey (*Cercopithecus mona pogonias*). Other mammals are Ogilby's duiker (*Cephalophus ogilbyi*), tree pangolin (*Manis tricuspis*), Beecroft's scaly-tailed squirrel (*Anomalurus beecrofti*), and Demidoff's galago (*Galagoides demidoff*) (Wilson and Reeder 1993). An endemic subspecies of Cape buffalo once found on Bioko is now extinct. Some endemic species and subspecies of bats are known from the island. Bioko supports several species of birds endemic to the Cameroonian Highlands. One bird, the Fernando Po speirops (*Speirops brunneus*), is endemic to the montane forests of Bioko and 14 of the bird species known to be endemic to BirdLife's Cameroonian Endemic Bird Area are found on Bioko. Bioko's beaches are important as nesting sites for four species of marine turtle. Thirty-one species of amphibians have been recorded, including one endemic caecilian (*Schistometopum garzonheydti*) and one endemic anuran (*Leptopelis brevipes*). Among the 57 species of reptiles (19 lizards, 37 snakes, and 1 crocodile), *Chamaeleo feae* is endemic (Frétey and Blanc 2000; UNEP 1989). Adaptive radiations of invertebrates are known to exist in some taxa, resulting in endemic species. For example, a huge radiation of Gastropoda Streptaxidae has occurred in the Bioko-Mount Cameroon area.

Bioko's biodiversity is threatened by increasing poverty, human population growth, and heavy hunting. The lowland forest is very fragmented and degraded everywhere aside from the southern third of the island, which has sustained very little habitat damage. Much of this has been converted to cocoa plantations, though in many areas many of the original canopy trees have been maintained to provide shade (Sunderland and Tako Tanyi 1999). On Bioko, the threat from hunting is extremely great relative to habitat loss. Most of the area useful for agriculture was cleared many decades ago, and therefore the rate of habitat loss is now fairly low. However, hunting of duiker and primates is intensive as well as extensive and has put several of the larger species in a situation where they could well be extirpated on Bioko within the next 15 years (e.g., drill, black colobus, red colobus, crowned guenon, and Preuss's guenon). Some primate populations are already at very low numbers. The Gran Caldera, remote and difficult to access due to a rugged terrain, is the exception to the high levels of hunting elsewhere on the island. The lowland forest at the base of the volcano and over the southern third of Bioko is critical to primate conservation. Some commercial logging occurred in the southern forests during the early 1990's,

but has since ceased (Sunderland and Tako Tanyi 1999). Human population is low in southern Bioko, and a future protected area is planned.

Name: Bamenda-Banso Highlands
Map identification: n6
Political unit(s): Cameroon
Size: 8790 km²

The Bamenda-Banso Highlands is a highly populated area in the Northwest Province of Cameroon. The primary area of interest for conservation is the high forest, from 1500 m up to the highest peak, Mount Oku. Mount Oku is Western Africa's second-highest mountain, at 3011 m, and was formed by volcanic and uplifting actions. It is much older than Mount Cameroon and has a rounded, well-drained surface (Collar and Stuart 1988). Collar and Stuart (1988) indicated Mount Oku as a key forest for threatened birds in Africa and went on to say that it contains "…the most biologically differentiated and most seriously threatened of all the forests in the Western Refugium…." This is the only large area with any intact forest remaining in the Bamenda-Banso Highlands (Sayer et al. 1992). Mount Oku covers approximately 2000 km,² and is covered with about 50% forest and 50% grassland. Also located in the Bamenda-Banso Highlands are the Kimbi Faunal Reserve, the Mbi Crater Faunal Reserve, and the Mbam Massif, which are important areas for endemic Nigerian-Cameroonian bird species. Both faunal reserves are small and have poaching problems (UNEP-WCMC 2001). Kimbi is a large area of gallery forest with buffalo, baboon, and chimpanzee. The Mbi Crater Reserve has a crater lake with a grass-covered rim, some marsh and lowland rain forest, and is a habitat for many mammal species including rock hyrax and several primates and ungulates (WCMC 1993).

The Bamenda-Banso Highlands are characterized by submontane and montane forest and montane grassland. Forest degradation has altered the character of Mount Oku and it is now composed of moist montane forest, degraded montane forest, bamboo (*Arundinaria alpina*), savanna, and grasslands. The areas of primary forest have a 10–20 m canopy that is rich in epiphytes (Thomas 1987). Mount Oku's crater lake, Lake Oku, is found at 2227 m and is surrounded by primary montane forest, habitat for the following important trees: *Ixora, Myrica, Agauria, Nuxia, Schefflera, Polyscias,* and *Syzgium* (Thomas 1986). The highest part of Mount Oku's summit is covered by *Podocarpus* and bamboo, which is a unique phenomenon in West Africa (Macleod 1987).

Cameroonian montane endemics are found in the Bamenda-Banso Highlands in every taxonomic group. More than 40 species of plants are restricted to this area, including an orchid (*Disperis nitida*) that is restricted to Mount Oku and a few sites nearby (Macleod 1987; Thomas 1987). Bannerman's turaco (*Turaco bannermani*) and the banded wattle-eye (*Platysteira laticincta*) are endemic birds of the Bamenda Highlands (Collar and Stuart 1988; Sayer et al. 1992). Their best refuge is in the forests of Mount Oku (Collar and Stuart 1988). More than 10 species of Cameroonian Highland endemic mammals are found in this area, including Preuss's guenon (*Cercopithecus preussi*) and Cooper's green squirrel (*Aethosciurus cooperi*). Hatwig's soft-furred rat (*Praomys hartwigi*) and a shrew (*Sylvisorex granti camerunensis*) only occur on Mt Oku and Mount Manengouba (Bowden 1986). Ten chameleons are restricted to this area, with other important herpetological species including a clawed toad of the genus *Xenopus,* which is probably endemic to Lake Oku, a restricted toad, *Wolsterstorffina mirei,* and a restricted frog, *Astylosternus ranoides.* Boistel and Amiet (2001) recently described a new toad species, *Wolsterstorffina chirioi*.

The Bamenda-Banso Highlands are severely threatened. Illegal grazing, agricultural encroachment, fire damage, and overexploitation of *Pygaeum* bark have all caused serious degradation of these important montane forests. For example, the forest covering Mount Oku was reduced from 175 km² in 1963 to 87 km² in 1983 (Macleod 1987). The remaining fragments are some of the last remnant patches of afro-montane forest found in west Central Africa and are rich in Cameroon montane endemics as well as widely disjunct populations of East African montane species. The crater lakes found in the area are very important for research into evolutionary processes. BirdLife International, together with the Cameroonian government, has been conducting a forest conservation project on Mount Oku for the past 12 years. This project works with local villages to encourage sustainable forest use by helping to market forest products and replanting cleared trees.

Name: Mambili Plateau
Map identification: n7
Political unit(s): Nigeria, Cameroon
Size: 2240 km²

The Mambili Plateau in Nigeria is the northernmost priority area within the Nigeria-Cameroonian mountain range that begins at Bioko and Mount Cameroon. Though historically humans have heavily used the area, there is only one paved road running south to the town of Gembu. Trails connect the remaining settled areas of the mountains. Nigeria's highest mountain, Chappal Waddi (2425 m), is located just northeast of the Mambili Plateau in the Gashaka-Gumti National Park.

The main plateau, at 1500–1600 m, is primarily rolling montane grassland, which has been seriously eroded through overgrazing (Dowsett-Lemaire 1989). Patches of forest dominated by *Syzygium guineense* persist in isolated hollows, though most forest cover has been degraded to sparse lines of *Raphia* palm (Dowsett-Lemaire 1989). The vegetation is quite rare and unusual, with the presence of endemics and disjunct species. A relict population of western lowland gorilla (*Gorilla gorilla*) survives on the Mambili Plateau (Oates 1996). It is also habitat for a representative assemblage of montane bird species.

In the 1920's, tribal herders began moving onto the Mambili Plateau, and their livestock grew to be the primary cause of forest degradation. Severe erosion of the grazed land can now be observed, mainly seen as a deepening of riverbeds and a collapse of their banks. This occurrence is attributed to changes in the flow of rainwater caused by eradication of the vegetation cover (Hurault 1998).

Name: Western Ondo Forest
Map identification: n8b
Political unit(s): Nigeria
Size: 3440 km²

The Western Ondo Forest area is part of the most densely settled and developed parts of the African forest zone. It is located approximately 100 km from the former capital of Nigeria and its largest city, Lagos, which has a population of 1,764,800 (World Gazetteer 2001). The area includes the Omo Nature Reserve, a small protected site that has been expanded slightly beyond its original area of 5 km². Omo was declared a strict reserve in 1949, then in 1977, it was accepted as a biosphere reserve. The physical terrain of Omo is highest in the west, and it gradually declines to the southeast, becoming relatively flat along the banks of the Omo River. The numerous small streams in the region are full during the rainy season and normally dry during the dry season. Average annual rainfall is 2030 mm.

The Western Ondo Forest is located in a zone of moist lowland evergreen forest. The majority of the intact forest is open and characterized by species of *Strombosia pustulata, Octolobus angustatus, Scottellia coriacea, Corynanthes pachyceras, Khaya ivorensis, Sterculia rhinopetala, Terminalia superba, Canthium vulgare, Hunteria umbellata, Xylopia aethiopica, Diospyros* spp., *Ficus* spp., *Drypetes* spp., *Cola* spp., and *Funtumia elastica*.

The Omo Forest Reserve is listed as an Important Bird Area, and still supports relict populations of elephant (*Loxodonta africana*) and chimpanzee (*Pan troglodytes*). The Ondo Forest also contains a few endemic species, including the white-throated guenon (*Cercopithecus erythrogaster*), a primate with one of the most restricted distributions in Africa (Oates 1996). Other common mammals found in the area are duikers (*Cephalophus* spp.), antelopes (*Neotragus* sp.), and warthog (*Phacochoerus aethiopicus*) (UNEP-WCMC 2001).

The improvement of roads following World War II resulted in the expansion of exploitative activity into the forests of the Ondo State (Sayer et al. 1992). Threats from logging, farming, hunting, population increase, and road building continue at very high rates. The large animal populations once found here are now small and highly fragmented. The Omo Forest Reserve has been a site for research and conservation activities conducted by the Nigerian Forest Elephant conservation group (Oates 1996).

Name: Eastern Ondo Forest
Map identification: n8c
Political unit(s): Nigeria
Size: 2740 km²

The Eastern Ondo Forest area in the Edo State of Nigeria includes the newly approved Okomu National Park, formerly the Okomu Wildlife Sanctuary. The larger area is covered by lowland rain forest, which is now highly

fragmented and degraded by settlement, logging, and farming. This is a unique ecosystem in that it combines, in a lowland forest, elements of both the upper Guinea and the Congolian regions. It is, therefore, an important transition zone for flora and fauna. A healthy population of an endemic primate, the Nigerian white-throated guenon (*Cercopithecus erythrogaster*), inhabits Okomu (Oates 1996). The area also contains remnant elephant and chimpanzee populations. Like the neighboring Omo Forest Reserve, Okomu has been listed as an Important Bird Area by BirdLife International.

NORTHEAST AND CENTRAL SUBREGION

Name: Kahuzi-Biega and Utu-Iseke
Map identification: ne4
Subregion: Northeast
Political unit(s): DRC
Size: 13,670 km²

The Kahuzi-Biega and Utu-Iseke area includes Kahuzi-Biega National Park, named after two extinct volcanoes, and a buffer zone surrounding its borders. Kahuzi-Biega was declared a World Heritage site in 1980. Included are the areas of Kibeleketa and Kamituga, both of which are mining centers. Hilly terrain descends from the mountains west of the Albertine Rift and then transitions eastward to the Lualaba lowland forest. Forest cover is continuous with montane strata found at higher altitudes, which reaches 3308 m on Mount Kahuzi. The majority of the mountain coverage is primary forest mixed with bamboo stands, found particularly at higher altitudes. Also found are subalpine and alpine grasslands. At lower elevations, the vegetation includes equatorial rain forest, mesophytic forest with *Hagenia* trees, and Cyperus swamp forest (UNEP-WCMC 2001).

Kahuzi-Biega Park was established to protect a small population of a gorilla subspecies, now identified as *Gorilla berengei graueri,* or eastern lowland gorilla, which is endemic to the DRC. The lowland sector of the park has (or perhaps had before the impact of the war), the largest existing population of eastern lowland gorilla, or Grauer's gorilla. The subspecies classification had been under dispute; however, it is now believed that *Gorilla berengei berengei* gorillas only number 620 in the Virunga Park (Hall et al. 1998). The recent WCS gorilla survey estimates populations of *Gorilla berengei graueri* to be much higher than was suspected, with over 14,000 individuals inhabiting the lowland rain forest of Kahuzi-Biega and the Kasese area to the northwest (Hall et al. 1998). This represents the largest united population of *graueri* gorillas, for which a total existing population is estimated to be 16,900 (Hall et al. 1998). The presence of a mosaic of biotypes makes the park well-suited as gorilla habitat. The numerous other primates found in the area include chimpanzee (*Pan troglodytes*), owl-faced monkey (*Cercopithecus hamlyni*), black and white colobus monkey (*Colobus guereza*), red colobus (*C. badius*), potto (*Perodicticus potto*), Demidoff's dwarf galago (*Galago demidoff*), olive baboon (*Papio anubis*), red-tailed monkey (*Cercopithecus ascanius*), Wolf's monkey (*C. wolfi*), l'Hoest's monkey (*C. lhoesti*), blue monkey (*C. mitis*), grey-cheeked mangabey (*Lophocebus albigena*), and spectacled galago (*Galago matschiei*) (Steinhauer-Burkart 1995). A distinct subspecies of *Cercopithecus* has been recorded here (Hart, pers. comm., 2001). Notable mammal species also include elephant (*Loxodonta africana*), buffalo (*Syncerus caffer*), forest hog (*Hylochoerus meinertzhageni*), and many antelope and duiker. Significant bird species include the endemic Rockefeller's sunbird (*Nectarinia rockefelleri*), African green broadbill (*Pseudocalyptomena graueri*), and Grauer's swamp warbler (*Bradypterus graueri*) (UNEP-WCMC 2001).

Present threats to the Kahuzi-Biega and Utu-Iseke area are very high. The area remains vulnerable to stock raising, hunting, agriculture, human settlement, and mining. This combination of factors leaves the area in a weak position, especially outside of the park boundaries. The recent war in the DRC resulted in a breakdown of infrastructure in Kahuzi-Biega. The result has been elevated levels of poaching and other prohibited activity within the protected area. Very recently, coltan mining has become widely established inside the national park. This has led to major incursions, although these are not well documented due to insecurity (Hart, pers. comm., 2001). Miners are relying on bushmeat for food, and it is feared that significant numbers of elephant and gorilla have been killed (IUCN 2001). The deteriorated road system has long made it difficult for guards to patrol the park (UNEP-WCMC 2001).

Proposed conservation actions for Kahuzi-Biega and Utu-Iseke are to reinforce the capacities of park manage-

ment, including organization of the guards and the provision of effective equipment, devise and implement an updated management plan for the park, and implement the recommendations presented in the socio-economic studies of the GTZ. In particular, the park's infrastructure must be rehabilitated. Remote sensing and rapid inventories should be conducted within accessible zones of Kahuzi-Biega National Park. A resurvey will be urgent for the park once security permits.

Name: Lutunguru-Tayna
Map identification: ne5
Subregion: Northeast
Political unit(s): DRC
Size: 10,140 km^2

Lutunguru-Tayna, in the Kivu Province of the DRC, covers the corridor between the Maiko and Kahuzi-Biega areas. The town of Lutunguru is found at the end of a road in the mountains west of Lake Rutanzige, and Tayna is a river that flows into Maiko. Virunga National Park, known for one of the only remaining populations of mountain gorilla (*Gorilla berengei berengei*), is just to the east of Lutunguru-Tayna. There are few roads into the area, though important mountain foot trails provide access to the interior. The area is covered in transitional and lowland forest, much of which is primary.

The 500-km^2 gorilla reserve of Tayna has been proposed in the Lubero territory to protect and monitor populations of eastern lowland gorilla (*Gorilla berengei graueri*), which are numerous within Lutunguru-Tayna. The most recent survey of *G. b. graueri,* conducted by the WCS in the early 1990's, estimated the largest population of the species (14,659) located in the lowland sector of Kahuzi-Biega and the Kasese area of the Lutunguru-Tayna corridor, though Tayna itself was not covered by the survey (Hall et al. 1998). Other notable fauna includes chimpanzee (*Pan troglodytes*), African buffalo (*Syncerus caffer*), and Congo peafowl (*Afropavo congensis*). All large mammal populations are currently threatened, and fragmentation is in progress in the eastern sector, where human populations are high.

The primary threats faced by this area are the establishment of immigrant settlements, large-scale stock raising, hunting of large mammals, and rampant artisanal mining. Though the actual biodiversity status of the corridor is not yet well documented, Lutunguru-Tayna is important as a linking corridor between two known areas of rich biodiversity, Maiko and Kahuzi-Biega. Remote sensing surveys should be conducted to assess the status of sites in order to localize corridors. It is also urgent that an organization be identified and established to support conservation in the area. A management plan should then be developed and implemented for this linkage area.

Name: Lomami-Lualaba
Map identification: ne7
Subregion: Northeast, Central
Political unit(s): DRC
Size: 28,550 km^2

The Lomami-Lualaba area, in the Haut-Zaire and Kivu provinces, includes forested area between the two rivers and extends southeast to forest clusters in the Ulindi River and Elila River zones. The Lualaba River, headwater of the Congo River, descends through a series of waterfalls, including Tshunga Falls and Boyoma Falls, which mark the end of the Lualaba and the beginning of the Congo River. To the north, the area is limited to the Loango Basin, to the south, the Kasuku Basin. Hill forests border along both banks of the Lualaba in the south with a boundary of forest-savanna, though only along the left bank to the north. A forest-savanna mosaic, with resulting ecotone, is found to the south around the Kasuku River. Lomami-Lualaba is indicated as a critical site for conservation (Doumenge 1990) and is an IUCN critical site.

The forests between the Lomami and Lualaba are known for a high diversity of primates, including three endemic subspecies. These are a subspecies of blue monkey (*Cercopithecus mitis heymansi*), a subspecies of Wolf's monkey (*C. wolfi elegans*), and a subspecies of red colobus (*Procolobus rufomitratus parmentieri*). There have been two scientific teams in this area (both expeditions in 2000) that collected fecal samples from bonobos and confirmed their presence on the left bank of the Lualaba (Thompson, pers. comm., 2001). The only known population of okapi (*Okapi johnstoni*) on the left bank of the Lualaba has been recorded in this area (Hart, pers. comm., 2001). Chimpanzee (*Pan troglodytes*) may occur in the Kindu area on the Lualaba's right bank. Little exploration has

been done to date in terms of the populations of other large mammals of the area. The primate subspecies indicates interfluvial isolation, and it is suspected that other endemic species are likely to occur. In its entirety, Lomami-Lualaba provides a good representation of the biodiversity of the southern Congo region.

The eastern section of Lomami-Lualaba, on the right bank, is significantly populated along a road that leads from Kindu to Kisangani. A market for bushmeat exists in Kisangani, though there are few roads providing access to the interior forest. Subsistence hunters rely on the forest for game. Higher habitat degradation occurs to the north and to the east of the Lualaba/Congo river. Mining is also conducted mainly within the Kindu area, which has scarcely been explored. Remote sensing surveys, rapid inventories, and density estimates should be completed for the Lomami-Lualaba area in order to develop a potential management plan.

Name: Maringa-Lopori Complex
Map identification: ne11
Subregion: Central
Political unit(s): DRC
Size: 31,340 km²

The Maringa-Lopori Complex is located south of the Congo River and east of Basankusu in the Equateur Province of the DRC. It stretches from the Lopori River and extends as far as the Maringa River Basin. Maringa-Lopori is primarily covered in lowland rain forest with areas of swamp forest (particularly along the Maringa River), inundated forest, and patches of degraded lowland forest (Sayer et al. 1992).

The Maringa-Lopori area, like Maringa-Wamba to the southeast, has a high abundance of bonobos, or pygmy chimpanzees (*Pan paniscus*). This primate is endemic to the restricted habitat of this area south of the Congo River. Another primate located in the area, and possibly restricted to a similar habitat as the bonobo, is the dryas monkey (*Cercopithecus dryas*). Also present is the highly distinctive Thollon's red colobus (*Procolobus thholloni*), which also has a restricted distribution.

Exhaustive inventories are needed for all species of flora and fauna, as very little knowledge exists of Maringa-Lopori. Habitat fragmentation has occurred as a result of logging and agriculture. Intervention must be made to ensure efficient protection of this zone, particularly in regard to forest concessions allowed in the area. Eventually a proposition should be made for the establishment of a protected area. Following that, a management plan must be developed and implemented.

Name: Bili Uere
Map identification: ne12
Subregion: Northeast
Political unit(s): DRC
Size: 23,590 km²

The Bili Uere area is located in the north of the DRC, Haut-Zaire province, north of the Uele River. The Bili Uere hunting reserve covers almost 60,000 km². The Uere River flows into the Uele from the east, and the Bili River drains into the junction of the Ubangui and Uele rivers. Bili Uere has been listed as an IUCN critical site, and was also identified by the ICCN as one of 16 sites most important for biodiversity conservation in the DRC.

The area is covered by lowland rain forest in mosaic with savanna and areas of cultivated land, some of which is seriously degraded. It is a transitional zone between the two ecoregions of eastern and western Congo Basin. With the exception of the work of Gérard (1960), who characterized the forests of *Gilbertiodendron dewevrei* (his collections remain in Belgium), there is no information regarding flora. In regard to the area's fauna, existing references are either restricted to numbers or are the result of research associated with the Ebola and monkey pox viruses.

At the beginning of the century, the gorilla's range extended north of the Uele River, though the subspecies that was present in Bili Uere is unknown. The gorilla has been thought to be extinct in the region for some time (Schaller 1976). Recently it had been suspected that a population of gorilla with a very limited range persisted in Bili Uere. Tom Butynski and Karl Aman's expeditions failed to find gorilla in the area, though they did record chimpanzee (*Pan troglodytes*) (Hart, pers. comm., 2001). African lion (*Panthera leo*) is also present in Bili Uere, though populations of this species are reduced throughout its entire range, and elephant (*Loxodonta africana*) populations have more recently been overhunted here.

Bili Uere is under threat from habitat degradation resulting from agricultural activity and mineral exploitation. The area has suffered serious elephant poaching from 1998 to the present, and populations are significantly depleted (Hart, pers. comm., 2001). Other wildlife has been less affected during the period. There is currently no effective control of illegal hunting in the area. Remote sensing and rapid inventories should be completed in order to characterize habitat types and gain rough inventories of species. In particular, investigations must be made for confirmation of the presence of gorilla in the area. Evaluations must be made of the human impact on Bili Uere. Based on knowledge gained from these studies, a reevaluation must be made of the status and conservation role of the Bili Uere reserve, and potential plans must be made for the establishment of a revised protected area.

Name: Tshuapa-Lomela
Map identification: ne14
Subregion: Central
Political unit(s): DRC
Size: 36,100 km²

The Tshuapa-Lomela area is located west of the Lomami River in the Kasaï province of the DRC. The Tshuapa, Lomela, and Lubefu are a few of the rivers draining the region. The Lubefu River is the headwaters of the Sankuru-Kasaï River system, which drains west, and the Tshuapa and Lomela Rivers drain north into a shared confluence. Ikela, on the Tshuapa River, is the nearest town of significant size, and is a confirmed bonobo site (Thompson, pers. comm., 2001). This block of lowland rainforest is virtually unknown in regard to flora and fauna. Its significance lies in the fact that the forest is never inundated by seasonal flooding. This provides a unique situation among Guinean-Congolian rainforests. It is suspected that forest coverage of this large area is currently intact. However, the area faces an impending threat of forest exploitation.

It is likely that Tshuapa-Lomela has a species richness similar to that of nearby Salonga and Lomami-Lualaba. Remote sensing and rapid inventories should be undertaken to provide preliminary information for all taxa of the area. A possible management plan should then be devised.

Name: Rubi-Télé
Map identification: ne19
Subregion: Northeast
Political unit(s): DRC
Size: 20,880 km²

The Rubi-Télé area in the Haut-Zaire province of the DRC is located south of the town of Buta, between the Rubi and Télé Rivers. Established in 1930, the Rubi-Télé hunting reserve covers 9080 km². The area has been listed as an IUCN critical site. Proposed in conjunction with the Ituri forest for protected status, Rubi-Télé is noted as important due to the drier forest habitat types found there. Dense Guinean-Congolian forest, gallery forest, and savanna predominate (WCMC 1993). *Gilbertiodendron* forests are also abundant.

Mammal species represented in Rubi-Télé include elephant (*Loxodonta africana*), buffalo (*Syncerus caffer*), chimpanzee (*Pan troglodytes*), okapi (*Okapia johnstoni*), bongo (*Tragelaphus eurycerus*), and sitatunga (*Tragelaphus spekei*) (WCMC 1993). The Congo peafowl (*Afropavo congensis*) is also likely in the area (Hart, pers. comm., 2001). The area is also important for invertebrate species. While not exceptional in their biodiversity, invertebrates are abundant, and the area provides a good representation of central Guinean-Congolian rain forest, which is complementary to species of the tropical humid forests of the South Congo and Kivu areas.

Remote sensing and rapid inventories should be completed for Rubi-Télé in order to characterize habitat types and develop rough species lists. In particular, investigations must be made into the possible presence of gorilla in the area (see Itimbiri and Bili Uere areas). Evaluations must be made of the human impact on Rubi-Télé. Based on these studies, a reevaluation must be made of the status and conservation role of the Rubi-Télé reserve, and potential plans must be made for the establishment of a revised protected area. If managed properly, Rubi-Télé has potential for sustainable use as a hunting reserve (WCMC 1993).

WESTERN SUBREGION

Name: Ngotto
Map identification: w1d
Political unit(s): CAR, ROC
Size: 6700 km²

The Ngotto area is located southwest of Bangui, in the CAR and partially within the ROC. In 1951, Ngotto was established as a classified forest of 625 km² (WCMC 1993). Conservation efforts on the part of ECOFAC have led to an area of 740 km², situated within a triangle of forest between the Bodingué and M'Baéré Rivers, to be set aside for total protection, while a forest management area covers 1950 km² between the M'Baéré and Lobaye Rivers (ECOFAC 2001). The Basse-Lobaye Biosphere Reserve (182 km²), established in 1977, is found within this forest area as well. Also a proposed Ramsar site, Ngotto is covered by a large *Raphia* forest interspersed with inland swamp areas. Dominant plant species of the forest are of the Meliaceae, Ulmaceae, Sterculiaceae, and Sapotaceae families. The sapele tree (*Entandrophragma cylindricum*), common in Ngotto, is a red wood tree used for making high-quality veneers and planks. It is one of the principal trees being cut in the CAR (Sayer et al. 1992). To the north, the dense, humid forest transitions into savanna. Rich floral diversity results from this mosaic of ecosystems.

Notable mammal species of the Ngotto forest are chimpanzee (*Pan troglodytes*), leopard (*Panthera pardus*), and elephant (*Loxodonta africana*). Ngotto provides a good representation of Guinean-Congolian avifauna, with over 330 bird species recorded. It has been listed as an Important Bird Area of Central Africa.

Primary threats to Ngotto forest are from logging and hunting. A fourth parallel road was completed in the early 1990's, providing increased access to the interior (Sayer et al. 1992). An European Economic Community project in the area was launched to protect the forest after logging and encourage replanting of extracted trees (Sayer et al. 1992). The area surrounding the Basse-Lobaye Reserve remains under threat of serious degradation from logging. A high demand for bushmeat in surrounding urban centers has led to very large-scale commercial hunting in this and neighboring forests (ECOFAC 2001). Overhunting of large mammals, such as leopard, great pangolin, chimps, and gorillas, has left their populations threatened.

Biological inventories are needed to assess further importance of Ngotto's biodiversity. Sociological research must be done in preparation for the goal of identifying potential actors from the private sector for conservation initiatives in the area. Establishment of a corridor into North Congo to the Ibenga and Motaba Rivers has been proposed.

Name: Dja Faunal Reserve
Map identification: w1f
Political unit(s): Cameroon
Size: 6590 km²

The Dja Faunal Reserve is a Biosphere Reserve and World Heritage site covering 5260 km² in southern Cameroon. The reserve's terrain is primarily low-altitude rolling hills. To the southeast, the Dja River follows a major fault line and has formed deep-cut valleys dropping from a plateau. The reserve is encircled by the Dja River, creating a naturally enclosed unit. Waterfalls and rapids are found in the south below cliffs created by the fault line. Dja was included in IUCN/WWF Project 1613 as an important site for primate and rain forest conservation in West Africa.

Dja is located in a notable transition zone between the southwest Cameroon forests and the Congo Basin forests. It has remained relatively undisturbed. Gartlan and Agland (1981) indicated four basic habitat types in Dja: uncut high forest, swamp vegetation, old secondary forest, and abandoned cocoa and coffee plantations. The dense evergreen and semi-evergreen rain forest has a main canopy of 30–40 m with scattered emergents reaching 60 m. Tree species are quite rich in this forest block, and legumes are particularly common, as well as lianes. Tree species listed include *Afzelia bipindensis, Anthonotha ferruginea,* and *Piptadeniastrum africanum* in the Leguminosae; *Sterculia oblonga* and *Triplochiton scleroxylon* in the Sterculiaceae; *Entandrophragma* sp., *Guarea cedrata,* and *Lovoa trichilioides* in the Meliaceae; and *Baillonella toxisperma* in the Sapotaceae, as well as *Afrostyrax lepidophyllus, Anopyxis klaineana, Terminalia superba, Ceiba pentandra, Nauclea diderrichii,* and *Canarium schweinfurthii* (UNEP-WCMC 2001). Mostly homogeneous stands of *Gilbertio-*

dendron dewevrei forest also occur. Secondary forest grows around the abandoned villages and plantations and provides a particularly good example of the significant differences from primary forest due to the relative scarcity of Meliaceae species.

Dja's fauna is very rich and diversified, with all forest species present. Populations of elephants are still large, and many primate species are present in good numbers. These include lowland gorilla (*Gorilla gorilla*), chimpanzee (*Pan troglodytes*), potto (*Perodicticus potto*), talapoin (*Miopithecus talapoin*), black and white colobus monkey (*Colobus angolensis*), greater white-nosed guenon (*Cercopithecus nictitans*), moustached guenon (*C. cephus*), crowned guenon (*C. pogonias*), white-collared mangabey (*Cercocebus torquatus*), agile mangabey (*C. galeritus*), white-cheeked mangabey (*C. albigena*), and Demidorff's galago (*Galago demidovii*) (UNEP-WCMC 2001). Other mammals include leopard (*Panthera pardus*), buffalo (*Syncerus caffer*), bongo (*Tragelaphus eurycerus*), sitatunga (*T. spekei*), giant forest hog (*Hylochoerus meinertzhageni*), and black colobus (*Colobus satanas*) (UNEP-WCMC 2001). Collar and Stuart (1988) indicated Dja as a key forest for threatened birds in Africa, and in 1994, the reserve was surveyed by P. Christy, with approximately 250 bird species recorded (Dowsett-Lemaire, pers. comm., 2001). The presence of large colonies of rockfowl (*Picathartes* sp.) has been confirmed (Dowsett-Lemaire, pers. comm., 2001).

The primary threat to the Dja forest area results from poaching, while some forest exploitation and other human pressures occur in the surrounding region. There are no logging concessions within the reserve, and population has been low since 1946, when villages were relocated prior to establishment of the reserve (UNEP-WCMC 2001). Traditional hunting rights within the reserve are granted to local tribes, which has been of great importance to the livelihood of the local population. These practices could be maintained at subsistence levels, however, traditional hunting methods are being superseded by the use of modern firearms. Present hunting levels risk seriously or entirely depleting populations of large mammals in Dja and also result in increased pressure on small mammals. The effects could be potentially irreversible. While cocoa, coffee, and subsistence plots intrude to some extent onto the reserve, the effects are marginal (Dowsett-Lemaire, pers. comm., 2001). The only road in existence is from Somalomo to Ekom in the north, and villages along it have not increased in size for the past ten years nor has the extent of their agricultural activities (Dowsett-Lemaire, pers. comm., 2001).

Anti-poaching efforts must be reinforced, especially in the west, if the rich and unique fauna of the Dja Reserve is to be maintained. This must be undertaken both locally and at the government level as some poaching is inflicted by non-residents of the area. In places where maintaining healthy animal populations is important to local tribes, associations to monitor hunting pressure might be formed at the local level. Work must continue on community management, and the reserve should be linked with the forests to the east and southeast. A zoning plan with a local hunting zone and a buffer zone within 15–25 km from the villages has been proposed (Ngandjui and Blanc 2000).

Name: Mingouli-Ivindo
Map identification: w1g
Political unit(s): Gabon
Size: 2890 km^2

The Mingouli-Ivindo forest is located southeast of the town of Makokou, in the provinces of Ogooué-Ivindo and Ogooué-Lolo in Gabon. The forest surrounds the Ivindo River, which flows through a dramatic series of cataracts and the falls of Kongou, Mingouli, and Tsengué-Lélédi. The Dilo River is another important waterway in the area. Mount Kinguié (749 m) and the Ngota mountain range are within this forest block. The area comprises Guinean-Congolian rainforest with some swamp forest. It has remained virtually uninhabited, and most of the forest is primary. Mingouli was included in an EEC-IUCN report (Wilks 1990) as an area that should be targeted for protection in pursuit of achieving a network of protected areas in Gabon that is fully representative of the country's biodiversity.

The Mingouli-Ivindo area is notable for diverse primate species, including De Brazza's monkey (*Cercopithecus neglectus*), crested mangabey (*Cercocebus galeritus*), and guereza (*Colobus guereza*). These three species exist nowhere in Gabon outside of the northeastern forests (Oates 1996). Further, this may be one of the last areas where *Colobus satanas* and *C. guereza* co-exist (Oates 1996). Other primates are chimpanzee (*Pan troglodytes*), gorilla (*Gorilla gorilla*), elegant needle-clawed galago (*Euoticus elegantulus*), mandrill (*Mandrillus sphinx*), golden

potto (*Arctocebus aureus*), and talapoin (*Miopithecus talapoin*) (Oates 1996). Elephant (*Loxodonta africana*), duiker (*Cephalophus* spp.), and chevrotain (*Hyemoschus aquaticus*) populations are present (Sayer et al. 1992), as well as two species of crocodiles, *Crocodylus cataphractus* and *Osteolaemus tetraspis.* Probably once abundant in Mingouli, the Nile crocodile (*Crocodylus niloticus*) has been hunted to extinction in many rivers of Gabon (Sayer et al. 1992).

The Mingouli-Ivindo forest is less disturbed by human intervention than many parts of the Guinean-Congolian Forest Region. It has historically been protected due to its isolation from roadways. In the nature reserve of Ipassa-Makokou, which is accessible from the town of Makokou, few mammals remain due to heavy poaching (Sayer et al. 1992). In recent years, the Trans-Gabon Railway has brought transportation closer to this interior area. Logging, specifically by a French company, Rougier, has recently threatened to encroach upon the primary forests of Mingouli-Ivindo. This activity has been a source of much controversy.

A research station, originally opened by CENAREST (Centre National de la Recherche Scientifique et Technologique) in 1962, exists in the Ipassa-Makokou Biosphere Reserve and is now being used by ECOFAC as a base for their work in Congo-Odzala. It contains research facilities and an herbarium with specimens of all plant species identified for the region. This facility could serve as a valuable headquarters for management of the larger Mingouli-Ivindo forest block. It was suggested by Oates (1996) that Ipassa-Makokou be extended south into the Mingouli-Ivindo forest and that conservation efforts be buffeted.

Name: Léconi-Batéké
Map identification: w2b
Political unit(s): Gabon, ROC
Size: 5860 km²

This area in the extreme southeast of Gabon is located on the Batéké Plateau, just south of the town of Lékoni and southeast of Franceville. It is in the Haut-Ogooué Province within the Léfini drainage. The vegetation marks a transition zone between savanna and gallery forest. The savanna mosaic is primarily undisturbed and provides the best representation of plateau gallery habitat within the western portion of the Guinean-Congolian Forest Region. Léconi was included in an EEC-IUCN report (Wilks 1990) as an area important to include in the pursuit of achieving a network of protected areas in Gabon that is fully representative of the country's biodiversity (Sayer et al. 1992).

The Léconi-Batéké area has high species diversity and some endemism. While the habitat is largely intact, large mammal populations are seriously depleted as a result of hunting. The last population of lions (*Panthera leo*) in Gabon was found in Léconi-Batéké, but they have been hunted to extinction in the recent past, as has been the African wild dog (*Lycaon pictus*) (Dowsett-Lemaire, pers. comm., 2001). The area has been identified as an Important Bird Area for Central Africa. Notable birds on the Batéké Plateau include Finsch's francolin (*Francolinus finschi*), dambo cisticola (*Cisticola dambo*) (known from the Gabon side only thus far), black-chinned weaver (*Ploceus nigrimentum*), and Congo moor chat (*Myrmecocichla tholloni*) (Dowsett-Lemaire, pers. comm., 2001). All of these birds have restricted distributions in this part of Africa (Dowsett-Lemaire, pers. comm., 2001).

Léconi-Batéké is largely uninhabited; however, the area has been hunted for decades, and large animal species have largely been depleted. This is likely to continue. There are commercially exploited mineral springs in the area (WCMC 1993). The area's scenery and wildlife provide a potential for ecotourism.

Name: Léfini
Map identification: w2c
Political unit(s): ROC
Size: 6930 km²

Léfini Faunal Reserve, established in 1951, is located at the southern reach of the Batéké Plateau. The Léfini and Nambouli Rivers and their tributaries dissect the plateau, forming dramatic canyons. The area is mainly composed of open grassland savanna of *Loudetia simplex,* and *Hymenocardia acida* dominates the short-canopy woodland areas, though it is not a forest species (Dowsett-Lemaire, pers. comm., 2001). The numerous rivers are bordered by thick forest, which is impenetrable in spots.

Léfini has a high faunal species diversity, though like the rest of the Batéké Plateau, large mammal populations

have been largely depleted due to long-term hunting. The reserve has some endemism. Though their numbers are low, Léfini still has populations of many mammals, including elephant (*Loxodonta africana*), buffalo (*Syncerus caffer*), sitatunga (*Tragelaphus spekei*), common duiker (*Sylvicapra grimmia*), and yellow-backed duiker (*Cephalophus sylvicultor*) (UNEP-WCMC 2001). Hippos (*Hippopotamus amphibius*) are found along the Lesio and Louna rivers. Léfini has been designated an Important Bird Area of Central Africa based primarily on the presence of Finsch's francolin (*Francolinus finschi*), black-chinned weaver (*Ploceus nigrimentum*), and Congo moor chat (*Myrmecocichla tholloni*) (Dowsett-Lemaire, pers. comm., 2001). The reserve, along with the entire Batéké Plateau and Likouala, should be surveyed for possible populations of Bouvier's red colobus (*Procolobus badius bouvieri*) (Oates 1996).

While Léfini provides an intact and unpopulated habitat, large mammal populations have been seriously depleted. The area has been hunted for decades, and it is unlikely that enough protection will be provided to halt poaching of the remaining animals. Baseline studies are urgently needed to increase understanding of Léfini's biodiversity and potential for conservation and rehabilitation. Studies should include biological inventories, sociological studies of threats to the area, and geological studies as well as in-depth research to understand the larger ecological context of the entire Batéké Plateau. Léfini offers a prime opportunity to establish long-term studies on the impact of fires on forest islands and savanna environments, as well as the impacts of community exploitation of forest products. A potential corridor between the protected areas in Gabon and the ROC should be identified, and management plans should be prepared. These should include attention to NTFPs, especially in Léfini. Studies must be done to learn how to increase NTFPs, inside or outside protected areas, to meet community needs. Protection capacities must be reinforced, based on identification of key areas from inventories. The extent to which wildlife populations have or have not recovered should be assessed, and potential sites for reintroduction efforts should be investigated.

Name: Mankanza Swamp
Map identification: w3b
Political unit(s): DRC
Size: 9000 km²

The Mankanza Swamp, within the Ubangui-Congo River Basin, is located just upstream from the junction of the two rivers. It is in the Equateur Province of the DRC, which had an estimated 99.7% forest coverage in 1990 (Ipalaka 1990). The same province also produced the highest commercial veneer and sawlog volume for the country in 1985 (Sayer et al. 1992). Gemena is the nearest town to the north, and Lisala is to the east. These remote towns are connected by a poorly maintained road. The small islands of Sumba and Esumba, as well as numerous smaller, unnamed islands are found here between the banks of the Congo River.

Mankanza Swamp is composed almost entirely of dense forest on hydromorphic soils or swamp forest (Ipalaka 1990). There are some transitional islands of dry forest. Much of the Ubangui-Congo Basin is flooded twice a year, and as a whole, it is the most extensive block of swamp and inundated forest in all of Africa. A specifically adapted assemblage of flora and fauna is suspected to occur in this area, though further studies are needed. The area is relatively intact.

Name: Giri
Map identification: w3c
Political unit(s): DRC, ROC
Size: 8470 km²

Giri is located between the Ubangui and Congo rivers adjacent to the DRC's border with the ROC. The provincial center of Equateur Province, Mbandaka, lies just across the Congo River. The Giri River bisects this area, then flows into the Ubangui River. The Ubangui-Congo Basin is the lowest-altitude zone of the larger Congo Basin. Giri has elevations between 350 and 400 m (WCMC 1993). This subsection of the extensive lowland swamp forest has been designated as an IUCN critical site (as Ngiri) for Central African conservation. Swamp and riverine forests are found in mosaic with swamp grassland and islands of dryland forest. Notable mammal species found in Giri are hippo (*Hippopotamus amphibius*), buffalo (*Syncerus caffer*), and also Allen's swamp

monkey (*Allenopithecus nigroviridis*) (WCMC 1993). It is also an important area for avifauna.

Baseline studies are needed for Giri, which may prove to be important for red colobus (*Procolobus badius*). Inventories of all other flora and fauna would be useful for the area. This is a large and relatively intact area, with high potential for research and conservation.

Name: Lac Tumba
Map identification: w3d
Political unit(s): DRC
Size: 4450 km²

Lac Tumba is located at an altitude of 350 m, south of Mbandaka and north of Lac Maï-Ndombe. Botende Hunting Reserve, originally established in 1959 as Botende Classified Forest, is adjacent to the lake. The lake itself, which covers 765 km² (more or less, depending upon the season), connects directly to the junction of the Ubangui and Congo Rivers. The surrounding forests are inundated twice a year, resulting in an ecosystem that is uniquely adapted to flooding (WCMC 1993). The area was listed as a critical site for forest conservation by the IUCN.

The swamps and forests surrounding Lac Tumba are habitat to a rich assemblage of mammals, including mona monkey (*Cercopithecus mona*), red-tailed monkey (*Cercopithecus ascanius*), black mangabey (*Lophocebus aterrimus*), chimpanzee (*Pan troglodytes*), and elephant (*Loxodonta africana*). Two threatened crocodiles are found in the area, the Nile crocodile (*Crocodylus niloticus*) and the long-snouted crocodile (*Crocodylus cataphractus*), and the lake itself supports five endemic fish species (WCMC 1993). Within the Botende Reserve, 119 bird species have been recorded (Stuart et al. 1990).

Name: Maï-Ndombe
Map identification: w3e
Political unit(s): DRC
Size: 6160 km²

The Maï-Ndombe area surrounds a large lake that covers approximately 2300 km² (more or less, depending on the season). Lake Maï-Ndombe, in the Bandundu region, lies at an altitude of 300 m. The town of Inongo is located on a central peninsula of the lake, and Kutu is at the southern point. The area is approximately 150 km west of Salonga National Park, and a protected corridor linking the two important areas is suggested. Maï-Ndombe marks the southern boundary of the Ubangui-Congo Basin, and the terrain begins to have more hills. This long, winding lake is surrounded by *Raphia* swamp forest and galleries of periodically inundated dryland forest. Forty-one fish species are recorded for Lake Maï-Ndombe, with three endemics (WCMC 1993). The area is also habitat for hippo (*Hippopotamus amphibius*) and forest elephant (*Loxodonta africana*) (Burgis and Symoens 1987).

The Maï-Ndombe area has practically no degradation of habitat; however, hunting pressure is very high. Sociological studies are needed to understand the nature of this threat, and possible strategies must be devised to prevent the complete loss of some key species. This area should be given protection in conjunction with a corridor to Salonga National Park in order to preserve habitat critical to the local fauna.

Moderate Priority

COASTAL SUBREGION

Name: Mayombe (Conkouati)
Map identification: c1b
Political unit(s): ROC, Gabon
Size: 13,900 km²

The Mayombe (Conkouati) area includes the ROC's entire coastal expanse. The Conkouati Faunal Reserve within this area is near the Gabon border. The area is of low altitude, with fine beaches along the coast and mountainous areas inland. Several lagoons are located inside the Conkouati Reserve, including Lagune de Conkouati, Lac Tchimba, Lac Tchibenda, and Lac Kiroka, all connecting with the Atlantic. Vegetation includes evergreen and semi-evergreen rain forest, coastal savannas, an extensive swamp forest in the Kouilou Basin, mangrove areas, and stunted scrub areas. A few villages are located on the coast and along Madingo-Kayes road.

More than 60 mammal species are recorded for Mayombe. Threatened mammals found in the area are mandrill (*Mandrillus sphinx*) and chimpanzee (*Pan*

troglodytes), as well as manatee (*Trichechus senegalensis*) in Lake Tchibenda, Lagunede Conkouati, and the Kouiluo River. Gorilla (*Gorilla gorilla*) has been recorded in Conkouati. Other common mammals are buffalo (*Syncerus caffer*), waterbuck (*Kobus ellipsiprymnus*), red river hog (*Potamochoerus porcus*), sitatunga (*Tragelaphus spekei*), forest duikers (*Cephalophus* spp.), and brush-tailed porcupine (*Atherurus africanus*) (UNEP–WCMC 2001). Whales can be viewed seasonally at the coastal zone. Over 430 species of birds have been recorded in the Mayombe-Conkouati area, indicating a rich Guinean-Congolian component. Further avifauna explorations are necessary for the peaks of the Mayombe and Conkouati area.

The vast lagoon systems, high densities of large animals, and the large diversity of primates make Mayombe (Conkouati) a unique center of biodiversity. Doumenge (1997) indicated Mayombe as a critical site for conservation in Central Africa. Primary threats to the area are from oil exploration, poaching, and logging. A lack of funding and staff to control poaching has resulted in a significant decline in animal populations within the reserve (UNEP-WCMC 2001). The beach is advancing on the continent, and coastal plants are in the progress of being destroyed. This phenomenon could provide an interesting study of the sand bank progression inland.

Name: Cabinda-Bas Congo
Map identification: c1c
Political unit(s): DRC,
Angolan state of Cabinda, ROC
Size: 14,510 km^2

The Cabinda-Bas Congo area encompasses the inland portion of the Angolan state of Cabinda and an extreme western section of the DRC, just north of the mouth of the Congo River. The area is covered primarily in lowland rainforest with some transition to savanna and also small mangrove areas. It is relatively well populated, with many roads traversing the entire expanse, thus, much of the forest is degraded.

The evergreen and semi-deciduous forests of Cabinda-Bas Congo are multistoried, with a 40–60 m canopy. They are characterized by species of *Librevillea, Gilletiodendron, Tetraberlinia,* and *Julbernardia* (Sayer et al. 1992). Lower-canopy (30–40 m) deciduous forests are dominated by species of *Oxystigma, Pentaclethra,* and *Gossweilerodendron* (Sayer et al. 1992). Mangroves are composed of *Rhizophora racemosa* and *R. harrisonii* that transition into *Pandanus-Raphia* swamps (which include the species *R. palma-pinus* and *R. hookeri* (Sayer et al. 1992). Endemic species of Begoniaceae are probably present.

The relict patches of forest are habitat for the threatened lowland gorilla and for chimpanzee (WCMC 1993). The area is also notable for unusual assemblages of herpetological species and is suspected to have a high level of endemism for invertebrates, though inventories are necessary. Cabinda-Bas Congo is threatened by prospecting and logging (WCMC 1993). Cabinda has vast oil reserves, a point of much political contention. Degradation continues to result from oil exploitation in this area.

Name: mouth of Congo River
Map identification: c6
Political unit(s): DRC, Angola
Size: 3980 km^2

The mouth of the Congo River is found at the coastal border of Angola and the DRC. The second longest river in Africa, after the Nile, empties at Banana, after its 4700-km journey from the highlands of northeastern Zambia. The major cities of Muanda, Boma, and Matadi are located along the lower banks of the Congo. It is just beyond Matadi that Livingstone Falls render the river unnavigable for a stretch to Malebo Pool at Kinshasa and Brazzaville.

The area surrounding the mouth of the Congo River is dominated by extensive mangroves, which reach as far upsteam on the south bank as Pedra do Feitiço in Angola (WCMC 1993). This mangrove zone is composed primarily of *Rhizophora racemosa* and *Avicennia nitida,* with fewer numbers of *Conocarpus erectus* and *Laguncularia racemosa* (Sayer et al. 1992). Other important vegetation includes species of *Pandanus, Raphia,* and *Hibiscus.* Mammals in the area include African manatee (*Trichechus senegalensis*) (a small and highly endangered population), hippopotamus (*Hippopotamus amphibius*), sitatunga (*Tragelaphus spekei*), common reedbuck (*Redunca redunca*), and buffalo

(*Syncerus caffer*) (Hughes and Hughes 1992). There are also several primate species here, including blue monkey (*Cercopithecus mitis*), talapoin (*Miopithecus talapoin*), and red-capped mangabey (*Cercocebus torquatus*) (Hughes and Hughes 1992).

The mangroves of this area have been polluted by the industrial oil activities in Cabinda, and some logging has occurred (Sayer et al. 1992). In 1990, Doumenge, in concert with the IUCN, proposed a marine national park in this area. The United Nations Educational, Scientific, and Cultural Organization (UNESCO), as well, had made contributions toward establishment of the Mangrove National Park to protect this important area (Sayer et al. 1992). The proposed protected area was named a Ramsar site in 1996 (Ramsar 1994).

NIGERIA-CAMEROON HIGHLANDS SUBREGION

Name: Ndikinimeki
Map identification: n4
Political unit(s): Cameroon
Size: 10,490 km²

Ndikinimeki is a hilly and mountainous region that traverses the littoral and central provinces of Cameroon. The southern boundary is the Sanaga River, and adjacent towns are Bafia in the east and Yabassi to the west. Ndikinimeki marks the southern end of the Cross River-Sanaga River forest block, and it is the only large, intact forest remaining in these provinces. Nearer the coast, it is covered by lowland forest with intruding elements of coastal forest. This then transitions into dry, semi-deciduous forest resulting from an ancient refuge area. The area includes the cloud forest-covered Mount Nlunano.

A significant elephant (*Loxodonta africana*) population remains in Ndikinimeki, as well as a large population of chimpanzee (*Pan troglodytes*). It is also important for drill (*Mandrillus leucophaeus*) and possibly for Preuss's red colobus (*Procolobus badius preussi*). The area is critical habitat for the world's largest frog species, the African giant frog (*Conraua goliath*).

The main threats to this botanically rich forest area are from poaching, logging, and extensive burning. Some logging roads have been built into the interior, allowing easier access for subsistence and commercial hunters.

Name: Rio del Rey
Map identification: n10
Political unit(s): Cameroon, Nigeria
Size: 1560 km²

The Rio del Rey area is situated in the extreme western portion of Cameroon along the coast, close to the Nigerian border. It contains the largest extent of mangroves found among the areas considered during the workshop, as well as in the entire Gulf of Guinea, and it is an IUCN critical site. It comprises brackish creeks and channels, small islands of higher land, and tidal mudflats. Ninety percent of the woody vegetation of the estuary is made up of red mangrove trees (*Rhizophora racemosa*) growing to 25 m high along the creeks. White mangrove (*Avicennia nitida*) also occurs, and *Pandanus candalabrum* trees are common along the creeks.

Mangrove ecosystems are extremely important coastal wetland formations and are key in maintaining the health of coastal fisheries. Specific organisms and ecological processes are restricted to these areas. The fisheries off the shore of Rio del Ray have an annual fish production of approximately 4300 metric tons, which is of great nutritive and economic importance to Cameroon (Sayer et al. 1992).

Several species from all taxonomic groups are restricted to the unique habitat found in Rio del Rey. The estuary harbors diverse fish fauna of some 40 species (predominantly marine). Nile crocodiles (*Crocodylus niloticus*) and slender-snouted crocodiles (*C. cataphractus*) are not uncommon. Broad-snouted crocodiles (*Osteolaemus tetraspis*) are frequently found in freshwater streams. Mammals include the otter shrew (*Potamogole velox*), marsh mongoose (*Atilax paludinosus*), manatee (*Trichechus senegalensis*), and mona monkey (*Cercopithecus mona*) (Green 1996). Palearartic migrants, such as the squacco heron (*Ardeola ralloides*), osprey (*Pandion haliaetus*), avocet (*Recurvirostra avosetta*), ringed plover (*Charadrius hiaticula*), and intra-African migrants, such as the lesser flamingo (*Phoeniconaias minor*), have been recorded (Green 1996).

Due to their key ecological role in the tidal ecosystems, the health of Rio del Ray's mangroves is of great importance to the economics as well as the biodiversity of Cameroon and Nigeria. While the mangrove area itself has little commercial value, activities nearby cause some measure of degradation. Local damage is caused by runoff of pesticides and fertilizers used on large oil

palm, banana, and rubber plantations found inland (Sayer et al. 1992). These drain into the mangrove areas and cause eutrophication and algal growth, which interfere with transpiration. Harmful pesticides also accumulate in the trophic chain and damage wildlife. For the near future, the primary threat is exploitation of oil in the area. High levels of pollution can result even from offshore oil operations.

Name: Annobón
Map identification: n13
Political unit(s): Equatorial Guinea
Size: 17 km²

Annobón is a small, 17-km² island located 340 km from the African mainland. It is the most remote island in the volcanic chain including Mount Cameroon and the other Gulf of Guinea islands, though it was never connected to the continent. Annobón is a province of Equatorial Guinea, with one settlement located on the northern coast. The island is mountainous, with a high altitude of 645 m. Primary forest covers the center and south, and a volcanic crater lake is located centrally. Very little has been published in regard to Annobón's ecology due to a lack of visitation by scientists. Inventories are required for all taxa.

Species richness is much lower in comparison with other islands of the region due to its size and isolation. Endemism, however, is high across all existing taxa. Six species of reptiles have been recorded: one endemic snake, *Philothamnus girardi,* and five lizards, among which four are endemic to the island: *Hemidactylus aporus, H. newtoni, Mabuya ozorii, Panaspis annobonensis;* the fifth, *Lygodactylus thomensis,* occurs also on the islands of São Tomé and Príncipe (Frétey and Blanc, in press). The island has been designated as an Endemic Bird Area due to the presence of two endemic passerines, the Annobón paradise flycatcher (*Terpsiphone smithii*) and Annobón white-eye (*Zosterops griseovirescens*) (Stattersfield et al. 1998). Of evolutionary significance, speciation appears to have occurred after rare species colonizations. Possible radiations are known to exist in some invertebrate taxa, including in the Streptaxidae family, on Annobón, although knowledge does not exist whether this results from speciation or successive colonization. Such phenomena are certain to exist within other taxa. Relict species are also expected to exist, though origins await research.

Annobón is subject to no known threats apart from the introduction of alien species. Recent introductions have occurred, for example, of African giant snails (*Achatina marginata*). Island populations are intrinsically sensitive to the introduction of alien species. The unmodified forest is fragmented and dissected by modified forest. Local inhabitants practice a form of forest agriculture that involves cultivating food products on the forest floor.

Northeast and Central Subregion

Name: Lusambo
Map identification: ne10
Subregion: Central
Political unit(s): DRC
Size: 17,860 km²

This area takes its name from the town of Lusambo, which was the capital of the Kasaï Province until 1950. A savanna-forest mosaic dominates the area's vegetation, with significant transition zones found between the two. While the area has not been well studied, there is good potential that a unique vegetational biotope exists here, with the likelihood of endemic plant species. Lusambo also provides important complementarity to other areas of the Congo Basin.

Lack of any good data or collections makes an immediate case for the Lusambo area difficult. There is probably an impact from mining activities. Remote sensing and rapid biological inventories should be conducted for Lusambo, the area's infrastructure should be researched, and maps should be prepared. Based on the information gathered, a possible strategy and management plan should be developed.

Name: Bangassou Forest
Map identification: ne13
Subregion: Northeast
Political unit(s): CAR
Size: 6620 km²

The Bangassou Forest, on the north bank of the Ubangui River, is located in the south of the CAR on the border with the DRC. This area marks the northernmost block of forest-savanna mosaic within the Guinean-

Congolian Forest Region. The lowland rainforest found here is predominantly semi-deciduous forest of two types. Dense, semi-deciduous forest is composed of *Celtis* spp. and *Triplochiton acleroxylon,* while at the edge of the forest zone and in islands within the savanna, the semi-deciduous forest is characterized by *Aubrevillea kerstingii* and *Khaya grandifoliola* (Sayer et al. 1992). Also plentiful are species of Meliaceae, including the valuable timber tree, sapele (*Entandrophragma cylindricum*).

Vegetation of the Bangassou Forest is naturally fragmented, with an ecotone found between forest and savanna. The forest therefore supports taxa characteristic of several habitat types, and endemism is expected to exist within these abrupt transitions. A number of large mammals are present including elephant (*Loxodonta africana*), bongo (*Tragelaphus eurycerus*), and duiker (*Cephalophus* spp. and *Sylvicapra grimmia*).

The Bangassou Forest is relatively intact, with no major disturbance. Agricultural impact that occurred in the past has diminished, and the forest cover may be increasing (Peeters 1965; Sayer et al. 1992). The area does, however, suffer severe pressure from poaching. Inventories completed by the World Bank's Projet d'Amenagement des Ressources Naturelles should be complemented with further botanical inventories. Campaigns to stop poaching must be strenthened, and a management plan must be finalized and implemented.

Name: Lukenie-Sankuru
Map identification: ne17
Subregion: Central
Political unit(s): DRC
Size: 22,110 km²

Located in the Kasaï Province of the DRC, Lukenie-Sankuru covers the southernmost portion of the Salonga forest block. As a whole, the Salonga-Lukenie-Sankuru area is the largest intact zone of lowland rain forest in the central Congo Basin. The terrain in Lukenie-Sankuru is hilly, and vegetation consists of primary and some secondary forest, blocks of dry savanna, and riparian forest found along the large rivers. Natural borders exist, forming a forest-savanna mosaic. The IUCN 1996 Action Plan for African Primate Conservation identified this area as a priority for study and conservation (Oates 1996).

Lukenie-Sankuru has become a focal point for conservation of the bonobo, or pygmy chimpanzee (*Pan paniscus*), which occurs solely in the DRC south of the Congo River. The LWRP, established in 1992 to protect the bonobo, has its center at Yasa in the middle of this area. Lukenie-Sankuru's boundary coincides with the southern geographic limit of the bonobo, which is significant as one of man's closest relatives. Other notable primates include Thollon's red colobus (*Procolobus [badius] tholloni*) and black mangabey (*Lophocebus aterrimus*), and other notable mammal species include Grimm's duiker (*Sylvicapra grimmia*), Egyptian mongoose (*Herpestes ichneumon*), side-striped jackal (*Canis adustus*), serval (*Felis serval*), and Congo clawless otter (*Aonyx congica*) (Thompson 2000). Threatened birds found in Lukenie-Sankuru are the black-bellied bustard (*Eupodotis melanogaster*) and the Congo peafowl (*Afropavo congensis*).

Lukenie-Sankuru has experienced some habitat degradation as a result of agricultural activity and forest exploitation. The primary threat, however, is a result of high levels of hunting. In combination with Salonga National Park and the Salonga-Lukenie zone to the north, this is a very large block of intact forest that likely supports uniquely intact species assemblages. Reassessments should be made concerning forest concessions and protection status for the area.

Name: Ebola
Map identification: ne20
Subregion: Northeast
Political unit(s): DRC
Size: 7800 km²

The Ebola area is centered between the Congo and Ubangui rivers in the Equateur Province of the DRC, close to the border of the CAR. The Ebola River runs east to west, linking the towns of Abumombazi and Businga. The area is best known for the Ebola virus that took its name from the river, which first emerged here in 1976. Outbreaks occurred here and in Sudan in that year, and then again in the former Zaire in 1995.

The Ebola area has altitudes between 500 and 600 m and is composed of several Guinean-Congolian forest types. Fauna is diverse, with an occurrence of okapi (*Okapia johnstoni*) restricted to the DRC. The area is

inhabited, and commercial forest exploitation occurs to some extent (WCMC 1993). The Ebola area has been classified as an IUCN critical site and has been repeatedly recommended for protection (Stuart et al. 1990; IUCN 1989; WCMC 1993). Very little information is available for the Ebola area, though some biological inventories were conducted here in connection with research into the Ebola virus.

Name: Lokoro
Map identification: ne21
Subregion: Central
Political unit(s): DRC
Size: 16,110 km²

The Lokoro area links the swamp forests of the Ubangui-Congo region and Lake Maï-Ndombe with the western border of the Salonga-Lukenie savanna-forest complex. This covers a transition zone that includes alluvial forest, swamp forest, and forest mosaics. The corridor provides a potential extension zone for large mammals, including elephants (*Loxodonta africana*) and bonobo (*Pan paniscus*). If critical species were provided some level of protection within the corridor, then their populations might be capable of migrating out of restricted pockets in currently protected areas. This could prove especially significant to the bonobo, which is close to its western range limit in this area. The actual biodiversity and species abundance are unknown for the corridor itself. Inventories are needed for all groups of taxa.

Priority

COASTAL SUBREGION

Name: Koulamoutou
Map identification: c3a
Political unit(s): Gabon, ROC
Size: 29,980 km²

The Koulamoutou area is a linkage area spanning the Chaillu Massif from the Lopé Reserve in Gabon to the Louesse area of the ROC. It encompasses a long series of mountain chains that include Mount Mitra, Mount Milondo, and Mount Iboundji. The area is covered primarily in evergreen rain forest with some semi-deciduous forest (Sayer et al. 1992). These forests are very rich in unique biotopes. This allows the massif to be the wealthiest area, in terms of endemic plants, in the entire Guinean-Congolian Forest Region. Endemic plants are found in the following families: Violaceae, Caesalpiniaceae, Burseraceae, Conaraceae, Begoniaceae, and Dichapetalaceae. While relatively well-known botanically, further exploration will doubtless turn up more endemics.

In addition to the area's unique floral richness, it is also critical habitat for many rare, vulnerable, and endemic faunal species. Lopé Reserve has a very important population of the threatened and restricted black colobus (*Colobus satanas*). It is the only large group left, numbering at least 50,000 monkeys (Oates 1996). A new species of primate was discovered in the mid-1980's in the Abeilles Forest, the sun-tailed monkey (*Cercopithecus solatus*) (Oates 1986). *C. solatus* was also observed in the center of Lopé Reserve in 1994 (Oates 1996). Endemic birds of Koulamoutou are a forest swallow (*Hirundo fuliginosa*), grey-necked rockfowl (*Picatharthes oreas*), Dja River warbler (*Bradypterus grandis*), and crested malimbe (*Malimbus racheliae*). Gabon batis (*Batis minima*), a bird endemic to Gabon, probably also occurs in the Lopé Reserve.

Historically, the rain forests of Gabon have benefitted greatly from the country's low population and limited access to the interior. The bulk of the country's economy resulted from extraction of oil along the coast. In 1987, Gabon had the second highest income per capita for Africa, and projects, such as a railroad leading from the coast into the interior, were completed. Soon after, however, lower oil prices reduced the country's revenues by almost half, and by 1992, the country had Africa's second highest debt (Sayer et al. 1992). Concurrently, logging standards were lowered as a shift began toward exploitation of forest resources, which was facilitated by the railroad (Sayer et al. 1992). Logging permits had been given for selective logging of the entire Lopé Reserve (Oates 1996). The southern portion of the region, within the ROC, is at risk from rapidly accelerating cycles of shifting cultivation and overhunting of wildlife. These pressures may be more significant threats to the area's biodiversity than that of deforestation in the area, which usually takes the form of selective logging.

Name: Evinayong-Oyem-Mitzic
Map identification: c5c
Political unit(s): Gabon, Equatorial Guinea
Size: 21,150 km²

The Evinayong-Oyem-Mitzic area is a linkage area between Mount Cristal-Mount Alén and the inselbergs of Equatorial Guinea spanning the border of Equatorial Guinea and Gabon. In May 2000, a network of protected areas was established for Equatorial Guinea, suggesting a significant move by the government to make efforts for conservation of its natural resources. Mount Cristal-Mount Alén have the highest altitudes, with Mount Alén reaching 1350 m. The inselbergs occur within a 500–600 m interior plateau to the east of Mount Cristal-Mount Alén.

The most significant features of the Evinayong-Oyem-Mitzic area are the unique habitats of the inselbergs and the intact representation of fauna found around Mount Alén and Mount Cristal. The inselbergs are very rich in endemic plants, with at least seven species recorded. The most characteristic plant of west and central African inselbergs is *Cyanotis lanata* (Barthlott and Porembski 1996). These isolated hills likely played a historic role as a refuge for succulents and grassland species during the ongoing paleoclimatic shift between forest and savanna; mosaic xeric habitats act as stepping stones for the migration of flora through larger forest zones and are often the last intact sites within degraded landscapes (Barthlott and Porembski 1996). Healthy populations of threatened mammals are found in the mountains, including elephant (*Loxodonta africana*), gorilla (*Gorilla gorilla*), mandrill (*Mandrillus sphinx*), and chimpanzee (*Pan troglodytes*). Many endemic birds have been recorded for the area, and it is expected that more will be discovered, especially in the inselbergs.

There have been low levels of forest exploitation in Evinayong-Oyem-Mitzic, and the area remains relatively uninhabited. Conservation for this area should come in the form of cooperative management between the countries of Gabon and Equatorial Guinea. Standards should be set for the critical areas, as well as for the larger buffer zones around them. Ideally management would extend south to the greater Chaillu Massif.

NIGERIA-CAMEROON HIGHLANDS SUBREGION

Name: Mamfe-Bafoussam
Map identification: n5e
Political unit(s): Nigeria, Cameroon
Size: 5660 km²

Mamfe-Bafoussam is a linkage area between the highland areas of Rumpi Hills, Manengouba-Kupe, Oban-Korup, and Obudu-Okwangwo-Takamanda. This is probably the most critical mountain area in Cameroon or Nigeria for biodiversity conservation. Portions of the area have been indicated in numerous studies as vital areas for conservation focus (Collar and Stuart 1988; Oates 1996; Doumenge 1997).

Within Mamfe-Bafoussam, one can find the best examples of submontane and montane forest in all of West Africa. It contains extinct volcanoes with picturesque crater lakes, wide, sweeping plateaus, and mountains with dramatic, steep peaks and valleys. The area is habitat to numerous endemic and threatened species of every floral and faunal taxonomic group. A most noted and vulnerable example of these is the endemic subspecies of gorilla (*Gorilla gorilla diehli*).

This important section of the Nigeria-Cameroonian Highlands has suffered degradation from agricultural activity, commercial and subsistence hunting, and the collection of NTFPs. Many of these activities could continue sustainably if altered through management and education. With its many scenic areas, the area has great potential for tourism. Promotion of these activities, along with a heightened sense of the unique natural richness of these mountains, may help to reverse some of the damage caused by human exploitation.

Name: Ondo Forest
Map identification: n8a
Political unit(s): Nigeria
Size: 24,200 km²

The Ondo Forest, located just east of Lagos, the former capital of Nigeria, is one of the most densely settled and developed parts of the African forest zone. Okomu National Park and the Omo Nature Reserve are located within this area. The larger Ondo Forest surrounding

these small protected areas is heavily degraded and fragmented, though it is connected in part by secondary forest. This is a unique ecosystem in that it combines, in lowland rain forest, elements of both the upper Guinea and Congolian regions. It is, therefore, an important transition zone for fauna and flora. Although large mammal populations still survive, they are greatly reduced in number and are highly disjointed. The area provides habitat to a few endemic species, such as the white-throated guenon (*Cercopithecus erythrogaster*), and has remnant elephant (*Loxodonta africana*) and chimpanzee (*Pan troglodytes*) populations.

Nigeria is home to more than one-quarter of Africa's population, thus pressures on its forests have been great. Half of the country's forests have disappeared within living memory (Sayer et al. 1992). With the oil boom of the 1970's came an escalated standard of living. The results were an increase in demand for timber and fuelwood and also the expansion of agriculture and intensification of hunting to feed the rapidly growing population. The recent popularity of bushmeat in metropolitan markets has held grave consequences for the country's wildlife. Harcourt et al. (1989) estimated that 50% more gorillas were killed each year than were born. The Ondo Forest must at least serve as a linkage area and buffer zone for Okomu and Omo if populations of large animals are expected to survive. Currently, threats from logging, farming, hunting, population increase, and road building continue at very high rates. Oates wrote in 1996 that "…these areas suffer from a lack of interest on the part of the international community." Measures must be taken to increase awareness of the rich resources that have historically been provided by the Ondo Forest but are in danger of being lost permanently.

Name: Niger Delta buffer
Map identification: n9a
Political unit(s): Nigeria
Size: 12,350 km²

The Niger Delta buffer is the zone surrounding the Niger Delta core priority area, which is the largest river delta in tropical Africa. This buffer area is composed of mangroves and some dryland forest. This zone not only provides a buffer for the freshwater swamp forests of the Niger Delta, it also provides a transition to coastal habitats and the interior lowland forests. Mangrove ecosystems are critical to the health of coastal and marine habitats. The vegetation is made more complex by an overlap of eastern and western forest faunas. Evolutionarily, the Niger Delta is likely a Pleistocene refuge and thus possesses a special collection of taxa. Endemic and near-endemic taxa include a subspecies of the pygmy hippo (*Hexaprotodon liberiensis*), a subspecies of the red colobus monkey (*Procolobus* sp.), Sclater's guenon (*Cercopithecus sclateri*), African manatee (*Trichechus senegalensis*), and the anambra waxbill (*Estrilda poliopareia*).

As stated previously for the Niger Delta core, the area is threatened by oil extraction, logging, and hunting. Human population in the area is rising. The unique wildlife of the delta is in grave danger as a result of these pressures.

NORTHEAST AND CENTRAL SUBREGION

Name: Lindi-Maiko Aval
Map identification: ne8
Subregion: Northeast
Political unit(s): DRC
Size: 7590 km²

The Lindi-Maiko Aval area, in the Haut-Zaire Province of the DRC, is located just to the east of Kisangani. It is between the Lindi and Maiko Rivers, and the Tshopo River flows through the center. The area is covered by lowland rain forest and gallery forest, with stands of *Gilbertiodendron* forest. This is a site of a fluvial isolation that has resulted in endemism of plant and mammal species. Flora and fauna of Lindi-Maiko Aval are representative of the northeastern Congolian lowland forest ecoregion, with no hybridization of species. Many typical lowland subspecies are present, and the refuge provides good opportunity for the study of evolutionary processes.

The Lindi-Maiko Aval area is threatened by forest exploitation, diamond mining, and agricultural activity. Serious faunal depletion has resulted from hunting for the bushmeat market in Kisangani. Research must be done to determine the current status of the area's habitat and also to determine the impact of the local human population and of forest and mining activities. Density estimates should be made for species populations.

Cooperation must be reached with commercial logging companies present in the region in order to achieve a goal of sustainable forest usage.

Name: Lodja-Ikela-Opala
Map identification: ne22
Subregion: Central
Political unit(s): DRC
Size: 60,170 km²

The Lodja-Ikela-Opala area links the priority sites of Salonga National Park, Lusambo, Tshuapa-Lomela, Lomami-Lualaba, and Maringa-Wamba in the center of the DRC. This area covers important corridors for the movements of large mammal populations, as well as providing buffer zones to hotspots of outstanding biodiversity. Salonga, itself, is the largest rainforest national park in the world, with a habitat that is largely untouched. All of these areas support rich assemblages of species and are especially diverse in species of primates. As a whole, this central zone of forest roughly covers the entire range of the endangered bonobo (*Pan paniscus*). The corridors link areas of primary forest and thus widen suitable habitat for the protection of bonobo. The vegetation of Lodja-Ikela-Opala is composed of lowland forest (evergreen and semi-deciduous), riparian forest, swamp forest, and mosaics of forest types.

Low pressure from local human populations is a major asset to the integrity of the Lodja-Ikela-Opala area. Primary threats are the result of forest exploitation, high hunting pressure, and ongoing civil strife. Remote sensing and rapid inventories should be completed for the corridors of Lodja-Ikela-Opala. These results should supplement knowledge of the critical biodiversity of the priority areas in making a case for the protection and management of linking areas between them.

Name: Punia-Kindu
Map identification: ne23
Subregion: Northeast
Political unit(s): DRC
Size: 3110 km²

The Punia-Kindu area links Kahuzi-Biega and Lomami-Lualaba, providing an important corridor for species movements between the two. The area also includes Maniema, an IUCN critical site. Guinean-Congolian lowland rainforest is found near the Lualaba River. Altitudes then climb to 1500 m in the east, where typical semi-montane forest occurs. Relict populations of eastern lowland gorilla (*Gorilla berengei graueri*) inhabit this area, as well as forest elephant (*Loxodonta africana*) and buffalo (*Syncerus caffer*). Fauna recorded within Maniema includes two endemic primates, a subspecies of red colobus (*Procolobus rufomitratus lulindicus*) and a subspecies of the Angola black and white colobus (*Colobus angolensis cordieri*) (WCMC 1993). The integrity of the Punia-Kindu area is primarily threatened by the exploitation of cassiterite and coltan.

Name: Lenda
Map identification: ne24
Subregion: Northeast
Political unit(s): DRC
Size: 31,040 km²

Lenda is a corridor between the Maiko National Park, Ituri-Epulu, and Lindi-Maiko Aval. It is located to the west of the Albertine Rift highlands, to the south of the Nania-Befwasende Road, and to the north of the Lubutu Road. As a whole, these combined areas offer the most important reservoir of northeast Congo biodiversity. The corridor covers a significant portion of the Ituri Forest, which has its southern boundary at approximately 0∞ latitude. This is one of the largest intact forests persisting at the edge of the Guinean-Congolian Forest Region and is cited as a key forest for threatened birds in Africa by Collar and Stuart (1988).

Forest coverage for Lenda is mixed and monodominant, though varied. Lowland rainforest mixes with swamp forest and spots of degraded forest. Stands of *Gilbertiodendron* forest are monodominant, whereas other forest types are rich in tree species. With one of the most outstanding assemblages of large mammal species in the Guinean-Congolian Forest Region, this corridor is critical to the persistance of migrating populations. Notable species include chimpanzee (*Pan troglodytes*), owl-faced monkey (*Cercopithecus hamlyni*), l'Hoest's monkey (*C. lhoesti*) elephant (*Loxodonta africana*), leopard (*Panthera pardus*), okapi (*Okapia johnstoni*), buffalo (*Syncerus caffer*), and various antelope, including duikers. It is also suspected that portions of Lenda have high levels of

hybridization and dispersion for mammal populations. Endemic birds found in the area are yellow-legged weaver (*Ploceus flavipes*), golden-naped weaver (*P. aureonucha*), and the endemic Congo peafowl (*Afropavo congensis*) (Collar and Stuart 1988).

While Lenda's biological importance is high, the potential integrity of the area is in question. Poaching, mining activities (e.g., diamonds), logging, and unsustainable agricultural activities all threaten the area to some degree. Remote sensing and specific biological inventories should be conducted for this linkage area. Based on these results, an eventual management plan must then be developed for the corridor.

Name: Source Epulu-Kibali
Map identification: ne25
Subregion: Northeast
Political unit(s): DRC
Size: 5900 km²

Source Epulu-Kibali links the two northern priority areas of the Ituri Forest, Haut Ituri-Aru and Ituri-Epulu. It is bisected by the Mambasa-Mungbere Road and Mbuti and Efe tribes subsist throughout the region. This corridor is composed of lowland forest grading up to altitudes of 1400 m, as well as important inselbergs. These isolated massifs support a unique, highly endemic, and disjunct flora. The variety in terrain produces unusual and unique assemblages of flora and fauna. Many plant species with restricted distributions are found in the upper Ituri Forest, and close to 15% of the mammal species are thought to be endemic to the area (Sayer et al. 1992). Many of the forest's birds are found nowhere else.

All of these unique factors create an area with high biological importance, and it remains an important corridor despite light settlement currently in the region. During the colonial period and for some time after, the Epulu-Kibali area was important for coffee production. This central portion of the upper Ituri Forest currently has a relatively high integrity value, with threats concentrated to the east, where populations are higher close to the Albertine Rift. Ethnic strife is occurring in this savanna area along Lake Albert. In the bordering population centers, established forest exploitation as well as slash and burn agricultural practices have degraded the forest to some extent. Epulu-Kibali is now primarily threatened as a settlement frontier for migrating human populations.

WESTERN SUBREGION

Name: Lobaye-Sangha-Likouala-Ivindo buffer
Map identification: w1h
Political unit(s): Gabon, Cameroon, ROC, CAR
Size: 152,440 km²

Lobaye-Sangha-Likouala-Ivindo is a large buffer zone encompassing the Dja Faunal Reserve, Nki-Boumba Bek, the Minkébé Complex, Mingouli-Ivindo, the Odzala Complex, Sangha Trinational, and Ngotto and spanning the four countries of Cameroon, Gabon, the ROC, and the CAR. It reaches to the northern limit of the Guinean-Congolian Forest, and the southeast is limited where dryland forest transitions into the swamp-dominated forests of the Ubangui-Congo Basin. The Lobaye-Sangha-Likouala-Ivindo Buffer area includes some of the most phenomenal examples of rainforest diversity in the world, such as Odzala National Park, which contains the world's largest concentration of lowland gorillas. The largest block of Guinean-Congolian Forest that is protected and understood, it is critical that this area be preserved with core conservation areas and sufficiently large buffer areas to allow elephant movements. Several sites within this area have been indicated as critical conservation sites by organizations and individuals working in the region.

The Lobaye-Sangha-Likouala-Ivindo buffer area is essentially covered by semi-evergreen forest, small swamps, and characteristic bais, with some evergreen forest to the west of the area. Many mosaics are found of savanna, marsh, and differing forest types, including Maranthaceae forests, evergreen, and semi-deciduous forests. The diversity of floristic regions provides rich and varied habitat for large populations of fauna.

Overall, the Lobaye-Sangha-Likouala-Ivindo buffer area is very high in species richness, though low in presence of endemic species relative to other biogeographic regions of the Congo Basin. Several significant and threatened species find critical habitat in this area. It has

also been indicated as the single most important zone for African forest elephants (Barnes et al. 1995), who move throughout the zone. The Dja River marks the eastern border of spatial distribution for mandrill (*Mandrillus sphinx*) populations. The forests have a very high diversity of bird species, and points within the area have been classified as Important Bird Areas of the world.

Habitats of the Lobaye-Sangha-Likouala-Ivindo buffer area are largely intact, and there is a high occurrence of large mammal species. However, poaching is serious in places and poses a significant threat to many populations. Hunting is associated with selective logging, as the construction of roads by commercial logging companies provides increased access to the forest interior. Hunting in the area targets the threatened populations of gorilla, elephant, and chimpanzee for supply of bushmeat, ivory, and trophies. Other pressures encroaching onto this sparsely populated area are from widespread logging, forest exploitation, and an increase in human population. The Dja Faunal Reserve is under significant pressure currently.

Management plans already existing for the protected areas of this region must be reassessed and buffeted. Where they do not exist, and for the protected areas' buffer zones, management plans should be developed and implemented. Anti-poaching efforts, especially, must be reinforced. Potential actors of the private sector should be identified for support of conservation activity. Relationships between forestry companies and governments must be reinforced. More biological studies should be done to assess and publicize the great importance of the area.

Name: Léconi-Batéké-Léfini
Map identification: w2a
Political unit(s): Gabon, ROC
Size: 36,790 km^2

Léconi-Batéké-Léfini, spanning southeast Gabon and into the ROC, covers much of the 60,000-km^2 Batéké Plateau. A higher-elevation area, the Batéké Plateau supports savanna species and may act as a stepping stone for different taxa. The plateau has been subject to invasive and widespread fires, and the largely uninhabited plateau is primarily composed of open grassland savanna. There are also patches of forest on the plateau, and gallery forests found along the rivers and steep canyons occur in some parts of Léfini. The area is extensive, with many vegetational transitions that create unique forest-savanna ecotones. The Léconi-Mpassa area, to the south, is one of the best examples of undisturbed forest-savanna mosaic in Central Africa.

Though populations of large mammals have been severely reduced due to hunting, the habitat is largely intact and species diversity is fairly high. The plateau's avifauna is rich and varied, with four endemics: Finsch's francolin (*Francolinus finschi*), Congo moor chat (*Myrmecocichla tholloni*), black-chinned weaver (*Ploceus nigrimentum*), and dambo cisticola (*Cisticola dambo*). All of these birds reach high grassy plateaus in northern Angola, which is approximately the limit of their range south of the Batéké Plateau (Dowsett-Lemaire, pers. comm., 2001).

The foremost conservation concern for the area is the extreme pressure from hunting. All populations of large mammals have been reduced, and many have been hunted to extinction within the region — for example, lion (*Panthera leo*). Studies are urgently needed to increase understanding of the Batéké Plateau's biodiversity and potential for conservation and rehabilitation. The extent to which wildlife populations have or have not recovered should be assessed, and potential sites for reintroduction efforts should be investigated. Protective measures must be taken to reduce hunting levels if the remaining populations of large mammals are not to be completely eradicated. Studies should include biological inventories, sociological studies of threats to the region, and geological studies, as well as in-depth research to understand the larger ecological context of the area. Studies must be done to learn how to increase NTFPs, inside or outside protected areas, to meet community needs. A potential corridor between the protected areas of Gabon and the ROC should be identified, and management plans should be prepared. There is a possible population of Bouvier's red colobus (*Procolobus badius bouvieri*) in the Léfini drainage, which should be investigated.

Name: Ubangui-Congo buffer
Map identification: w3f
Political unit(s): ROC, DRC
Size: 107,680 km²

The Ubangui-Congo buffer is bisected by the border between the ROC and the DRC. The area is the most extensive zone of swamp forest and inundated forest on the African continent. Seasonal flooding of the forests results in a uniquely adapted fauna. There is a good mixture of habitats, and many endemic plant species are recorded for the region.

A very important population of western lowland gorilla (*Gorilla gorilla gorilla*) is found to the west of the Ubangui River. Oates (1996) states that this threatened species's numbers are likely to crash during this century, leaving only isolated populations in conservation areas. The primary pressures on gorilla populations are a result of hunting for meat, trade, and trophies and of habitat loss from forest clearance for agriculture and logging. Another notable primate found in the Ubangui-Congo Basin is Allen's swamp monkey (*Cercopithecus nigroviridis*), which inhabits the palm and swamp forests along the river. This monkey has the smallest set of chromosomes (48) of all *Cercopithecus* and is believed to be a holdback from the swamp-dwelling evolutionary ancestor of modern arboreal monkeys (Kingdon 1989). The intact and extensive swamp habitat provides many good opportunities for evolutionary research.

The northern sector of the Ubangui-Congo Basin is fairly intact; however, there is a great deal of human pressure and serious hunting in the south. Baseline studies are urgently needed to understand biological importance (inventories), nature of threat (sociological studies), and larger ecological context (geological studies) of the region. Potential corridor areas should be identified, and management plans should be implemented. A corridor linking Maï-Ndombe to Salonga National Park is also suggested. Potential actors from the private sector must be identified for conservation activity, especially in the Lac Télé area.

Name: Brazzaville-Pool
Map identification: w4
Political unit(s): DRC, ROC
Size: 10,450 km²

The Brazzaville-Pool area surrounds the capitals of Brazzaville and Kinshasa, on the banks of the lower Congo River. The river forms the 5-km² Malebo Pool (also called Stanley Pool) at this point, which is part of the Batéké Plateau that extends down from Gabon, crossing the ROC. The entire plateau covers approximately 60,000 km² and reaches altitudes of 700–800 m. It is covered primarily by open grassland savanna, with some patches of forest on the plateau and gallery forests found along the rivers. The dominant vegetation is *Loudetia* grassland with small pockets of *Hymenocardia* woodland.

Over 235 fish species are recorded for the Malebo Pool, and 7 are believed to be endemic (WCMC 1993). Mammals found in the vicinity of the pool include hippo (*Hippopotamus amphibius*), bushpig (*Potamochoerus larvatus*), water mongoose (Herpestidae), sitatunga (*Tragelaphus spekei*), and otter (Mustelidae) (Burgis and Symoens 1987). The area is also important for species of reptiles, amphibians, and butterflies.

Though over 240 bird species have been recorded, the area is still considered to be poorly known, especially within the ROC. All three of the Batéké Plateau endemics are found within Brazzaville-Pool in good numbers. These include Finsch's francolin (*Francolinus finschi*), Congo moor chat (*Myrmecocichla tholloni*), and black-chinned weaver (*Ploceus nigrimentum*). Also found here is one of the only two known populations of white-headed robin-chat (*Cossypha heinrichi*).

The primary threat to natural resources of this area is a result of pressure from numerous human populations. Virtually all game animals have been hunted out of the area; however, this zone was not selected for its large mammals. Rather, concentration should be directed at protecting the few threatened forest patches that remain. Inventories are needed, both biological and sociological, to assess the feasibility of conservation efforts, which should include monitoring the status of endemic species (e.g., birds, small mammals, and butterflies) and the exploitation of forest products in heavily settled areas. Conservation efforts should be linked with

research and education institutions in Kinshasa and Brazzaville, and an international schools' wildlife education program should be established, including clubs, radio programs, etc.

Freshwater Priority Areas

***designates areas identified by the freshwater group as important for marine biodiversity.**

PRIORITY LEVEL I: HIGHEST PRIORITY

Name: Coastal mangroves
Map identification: F1*
Political unit(s): Nigeria, Cameroon, Gabon, ROC
Size: 14,180 km²

Key areas of coastal mangrove in the Gulf of Guinea are located from Port Gentil to Kouilou, and include Rio del Rey, the Niger Delta, and Cameroon Bay. Mangrove areas, in conjunction with the coastal estuaries, provide an important ecological function in maintaining the biodiversity of marine ecosystems. These are vital reproduction areas for fish, including marine species. Mangroves serve in maintaining the nutrient-rich upwelling in the gulf and help to prevent coastal erosion. Additionally, mangroves have a high capacity to sequester pollutants, trapping sediment and silt and buffering the marine habitat. The coastal mangroves are rich in euryhaline fish species, as well as shellfish, waterbirds, and aquatic mammals such as manatee (*Trichechus senegalensis*) and Atlantic hump-backed dolphin (*Sousa teuszii*). They are important as migration, feeding, or resting sites for migratory waterbirds.

The biodiversity integrity of these coastal mangroves is variable along the coastal zone. Mangroves of the Niger Delta are modified and degraded, thus integrity is low. For Rio del Rey Bay and Cameroon Bay, integrity is moderate, and in Gabon south of Port Gentil to Congo, the integrity is high. A significant threat may result from the likely production of Chinese rice in some mangrove areas.

Name: Coastal estuaries
Map identification: F2*
Political unit(s): Cameroon, Gabon, ROC, Equatorial Guinea
Size: 2130 km²

Key sites of the coastal estuaries are Cameroon Bay, the Ogooué Delta, Estuaire du Gabon, and Rio Muni. These freshwater habitats are characterized by mangroves, mud flats, swamp forest, and open water. Estuaries provide a critical ecological function in the maintenance of marine biodiversity for the Gulf of Guinea. Upwellings occur along these coastal areas, resulting in high levels of productivity. The estuaries are a major stopover point for migratory waterbirds, serving as migration, feeding, or resting sites. This has been recognized to be of international importance. Waterbird species show high concentrations and diversity. In particular, it is an important area for breeding terns.

The coastal estuaries are also very rich in shellfish, marine invertebrates, and marine shallow-water fish. It is habitat for aquatic mammals, such as West African manatee (*Trichechus senegalensis*) and hump-backed dolphin (*Sousa teuszii*). The integrity value for shellfish and migratory waterbirds is moderate. Surveys of waterbirds and aquatic mammals are a priority. Significant threats to the area result from population pressure and oil exploration.

Name: Niger Delta and coastal swamp forest
Map identification: F3
Political unit(s): Nigeria
Size: 33,710 km²

The Niger Delta, located near Lagos, the former capital of Nigeria, is the second largest river delta in the world. The blackwater-whitewater composition of the Niger River mirrors that of the Amazon River. This delta region is situated at the crossroads of two ichthyological provinces, which provides for a unique richness of species. It is a rare habitat type with mangrove and swamp forest, supporting species of special concern, such as pygmy hippopotamus (*Hexaprotodon liberiensis*), manatee (*Trichechus senegalensis*), and Atlantic hump-backed dolphin (*Sousa teuszii*). This important area is highly threatened by oil exploration and accidental oil spills, as

well as a host of other pressures. Integrity of the Niger Delta has been ranked low, due to the fact that oil exploration (specifically conducted by the Shell Oil Company) has had a severe impact on habitats.

Good information exists for the Niger Delta, though little has been published. Surveys are needed for the Atlantic hump-backed dolphin (*Sousa teuszii*), West African manatee (*Trichechus senegalensis*), pygmy hippopotamus (*Hexaprotodon liberiensis*), and various otter species. This is an important stopover area for waterbirds, and high concentrations are probable. An Odonata survey is also urgently required. Development of a recovery plan for the Niger Delta is an imperative priority for biodiversity conservation.

The freshwater coastal swamp forest of the Niger Delta area is a specific priority. It is a rare habitat type distinguished by restricted species, such as certain palms. Another biodiversity target is the region's characteristic fish species, including *Clarias* spp. The swamp forest is also highly vulnerable to external threats from oil exploration and population pressure. The surrounding area has one of the highest human populations within the region. Conservation integrity for the swamp forest area of the delta is judged to be moderate, though only patches of forest remain. The reduction in scale of the swamp forest may well be significant, leaving only remnants of small, underrepresented habitat.

Name: Kouilou-Niari
Map identification: F5
Political unit(s): ROC, DRC
Size: 43,090 km²

The Kouilou-Niari area covers the upper and middle reaches of the Kouilou and Niari Rivers. It is located on the Chaillu Massif and also includes the Bouenza River area. The vegetation is primarily forest and savanna, and important rapids are located in the region. Very little species data are available for the region. However, this is a contact zone between the Ogooué and Congo Rivers, and it is suspected to be rich in freshwater species, with the presence of endemics. Human impact on the region is significant. There is increasing urbanization, and the Moukoukoulou Dam on the Bouenza River has cut off the migration of shrimps and fish. Traditional agriculture has been dominant in Kouilou-Niari. The region's hydrography is moderately intact. An immediate priority for this region is to inventory species and complete an environmental impact assessment for an impending dam at Kouilou-Niari.

Name: Ivindo River
Map identification: F9
Political unit(s): Gabon, Cameroon, ROC
Size: 62,060 km²

This region extends along the Ivindo River from the Chutes de Mingouli-Ivindo to just across the southern border of Cameroon. Its boundary corresponds roughly with the Minkébé National Park. The Ivindo is a mostly rocky, deep river punctuated by rapids along its course through dense tropical forest. It has a unique fish fauna that is probably the result of a very long isolation, which has not been compromised by the recent river capture of the Ogooué. The Ivindo River fauna is now separated from the Ogooué River by the 50-km stretch of rapids and falls. Though the region is not exceptionally rich when compared to the Ogooué, it is represented by several endemic genera. These include *Ivindomyrus, Paramormyrus, Boulengeromyrus, Grasseichthys,* and *Diapteron*. Questions concerning the evolutionary history of the Ivindo River include how the Ivindo fauna arose and why it is more similar to the Ntem River in Cameroon.

The Ivindo River region has a very low human population. There is pressure from gold mining, though the activity is apparently not attracting additional immigrants. There is potential that an iron mine will be established at Bélinga within 20 years. Investigation and promotion of responsible aquaculture with native species should be implemented for the Ivindo region, particularly with tilapia (*Oreochromis niloticus*).

Name: Lower Congo Rapids
Map identification: F11
Political unit(s): DRC, Angola

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, rheophyllic 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 (micropthalism), a blue or bluish 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 *Leptotilapia;* 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). Rheophyllic 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 it is suspected that 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.

Name: Kalengwe Rapids
Map identification: F12
Political unit(s): DRC

The Kalengwe Rapids are in the south of the DRC, just to the west of Upemba National Park and near headwaters of the Congo River. The area is identified for its richness and exceptional endemism of mollusc species, which suggests that there is an increased but yet unexplored endemism in other groups — for example, in aquatic insects and fishes. The integrity of the region is unknown, though mining in the area most likely has an impact.

Name: River Kasaï Rapids
Map identification: F14
Political unit(s): DRC, Angola

The rapids of the River Kasaï are located upstream from Tshikapa. The region is known to be rich in molluscs, 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. Though it has been previously surveyed, it remains an important survey area for molluscs, as new species may reside there.

Name: Lac Fwa
Map identification: F15
Political unit(s): DRC
Size: 12,270 km^2

The Lac Fwa region is located within the Congo River headwaters in the Kasaï Oriental Province. It is actually not a lake, but a large, spring-fed river with a partially strong current. It is a unique habitat type for the Congo Basin. Its biodiversity value results from endemism of fish species, evolutionary phenomena, and its rare habitat type. An endemic genus, *Cyclopharynx* and five endemic fish species are known from the region.

Name: Maï-Ndombe
Map identification: F17
Political unit(s): DRC
Size: 50,370 km^2

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 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 one of the largest blocks of shallow blackwater and flooded forest in the Congo Basin.

Maï-Ndombe is very rich in fish species, with several endemics. 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 Maï-Ndombe (Hughes and Hughes 1992). As only a few historical collections exist for the region, species richness and endemism are most likely underestimated. A survey must include all affluent streams and the entire flooded forest. Priority should be given to fish and molluscs. Lake Maï-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.

Name: Thysville Caves
Map identification: F19
Political unit(s): DRC
Size: 750 km²

The Thysville Caves, located near Mbanza-Ngungu, are fed by the Congo system and support one of Africa's few true fishes restricted to subterranean environments. This endemic blind cyprinid, *Caecobarbus geertsii,* is the only African freshwater fish on the IUCN red list (Hilton-Taylor 2000). 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. The Thysville caves are located on the edge of a degraded forest, and the region is heavily populated. Further deforestation could result in a reduction of allochthonous nutrient inputs, which supply the energy for the cave ecosystem. The threat of pollution is moderate. These caves are relatively unknown scientifically and should be resurveyed.

Name: Barombi Mbo Crater Lake
Map identification: F20
Political unit(s): Cameroon
Size: 5 km²

Barombi Mbo is the best known crater lake in West Africa. It is 2.15 km in diameter, with a depth of 111 m. Located close to the town of Kumba in southern Cameroon, the lake has a very small catchment and only one small outflow to the Mungo River. It is an oligotrophic, stratified lake system on a notably small scale. There is no detectable oxygen below 40 m (Schliewen, unpublished). This unusual habitat has resulted in specific adaptations by some species. For example, a fish, *Konia dikume,* has an increased hemoglobin concentration in its blood, which allows it to store excess oxygen and thus enter deoxygenated water for short periods of time in order to feed on *Chaoborus* larvae (Green and Corbet 1973).

Despite Barombi Mbo's small size, a remarkably high number of species has been recorded. Currently, 18 species have been recorded in total from the lake and its inflowing stream, 12 of which are endemic (Schliewen, unpublished). These include 4 endemic cichlid fish genera with 11 endemic species: *Pungu, Stomatepia, Konia,* and *Myaka*. In addition, there is one endemic clariid catfish. The status of *Barbus cf. batesii* is worth investigating in terms of endemism. Two species of caridinid shrimps have been recorded, at least one of which (*Caridina* sp.) is probably endemic. There is also one endemic sponge, *Corvospongilla thysi* (Schliewen, unpublished). This is also the site of the most famous example of adaptive radiation in fishes for West Africa.

Originally, Barombi Mbo's crater rim was completely forested. Farming has now affected 70% of the rim, and a village is located on the spring. Deforestation is likely to increase erosion and cause increased sedimentation of the oligotrophic lake system. Population growth, water extraction, overfishing, pesticides, and the introduction of exotic species also threaten the conservation integrity of Barombi Mbo. There is critical need for a monitoring program. A management plan is also needed to conserve the region's entire biota. It is suggested that a field interpretation center be established at Barombi Mbo in the immediate future.

Name: Lake Bermin
Map identification: F22
Political unit(s): Cameroon
Size: 0.5 km²

Lake Bermin is a volcanic crater lake of extremely small size (0.5 km²) in the Nigeria-Cameroon highlands. It is approximately 750 m in diameter with a depth of 15 m. The crater rim is high, and the lake is slightly stratified (Stiassny et al. 1992). Richness and endemism are outstanding for the lake's size and depth. Eleven species are recorded within the 0.5 km² area, including nine endemic cichlid species, which all belong to the tilapiine subgenus *Coptodon*. These are only related distantly to the *Sarotherodon* found in Barombi Mbo (Schliewen, unpublished). Included is Africa's first reported species flock of substrate-spawning tilapiines (Stiassny et al. 1992). Together with Barombi Mbo and Ejagham, this area's fauna constitutes the best-accepted evidence for sympatric speciation in nature (see Barombi Mbo description). Biotas are intact, and unusual species assemblages are present. It is believed that Lake Bermin is a more recent lake than Barombi Mbo, due to a lower degree of morphological specialization than seen in the Barombi cichlids. Still, several species display remarkable features. For example, *Tilapia snyderae,* at approximately 5.5 cm, is the smallest known tilapiine cichlid fish and occurs in three different color-morphs (Stiassny et al. 1992). Another fish, *Tilapia (Coptodon) spongotroktis,* feeds primarily on whole chunks of Lake Bermin's massive freshwater sponge growth (Schliewen, unpublished).

Conservation integrity of Lake Bermin's ecosystem is currently high. Small-scale farming occurs in the area but is limited. However, due to the lake's small size, any single event could have catastrophic results for the system's biodiversity. Thus, a management plan is urgently needed for this important crater lake.

Name: Lake Ejagham
Map identification: F23
Political unit(s): Nigeria
Size: 0.5 km²

Lake Ejagham is a comparatively shallow, small, rainforested lake near the village of Eyumojok in the Southwest Province of Cameroon. The lake is approximately 1050 by 700 m, and the depth is 16 m. Ejagham is in the Cross River Basin and is not a volcanic crater lake, though it is ecologically similar to the other isolated crater lakes of the Cameroonian line. A waterfall separates the lake from the nearby Munaya River. In terms of nutrient content, the lake is mesotrophic, and soil is sandy, with few rocks and a large interior mud plain.

Within this small lake, seven cichlid species, one aplocheilid, one poeciliid, and one barbus are recorded. All seven of the cichlid species are endemic to an area of less than 0.5 km². Ejagham was colonized by a different species than Barombi Mbo (namely, *Sarotherodon galilaeus*), but by the same as Bermin (namely *Tilapia* [*Coptodon*] *guineensis*). Aside from *Tilapia deckerti,* these remain undescribed (Schliewen, unpublished; Schliewen et al. 2001; Thys van den Audenaerde 1968). Species richness is not comparable to the Bermin and Barombi Mbo crater lakes, most likely because speciation is not yet complete. Sympatric speciation is ongoing in Lake Ejagham, and it is one of the few sites where this process can be studied directly and has not been inferred from already established "old" species. The region's integrity is high; no logging occurs due to the swamp condition. The lake is in very good condition biologically. Threat is ranked to be medium due to its size and the high sensitivity of an isolated lake.

Name: Upemba
Map identification: F26
Political unit(s): DRC
Size: 20,090 km²

Upemba National Park, in the DRC, is located in a transitional forest zone. Altitude ranges from 585 to 1200 m. The swamps, shallow lakes, and river channels of this ecoregion host a relatively rich aquatic fauna and suspected high odonate endemism. A restricted bird, the Lake Lufira weaver (*Ploceus ruweti*), occurs in this region. Upemba's integrity is moderate. Many roads transect the region, and there is population pressure as well as mining activity nearby. More intensive inventories are needed to complement previous research in this region.

Name: Mount Cameroon and Ndian-Meme-Mungo
Map identification: F27
Political unit(s): Cameroon, Nigeria
Size: 19,210 km²

The Ndian-Meme-Mungo region comprises several small, isolated coastal drainages. Included are the headwaters of the Mungo River, the Kotto, Dissoni and Mboandong Lakes, and additional small streams draining Mounts Cameroon, Bakossi, and Rumpi. Lake Barombi Mbo is a separate priority within this area. This is a very wet area; Mount Cameroon has a mean annual rainfall of over 10,000 mm. Originally, these mountains were completely covered in rainforest. The freshwater systems include clear, low-nutrient streams on volcanic soil. Several eutrophic, shallow crater lakes occur in this region. The numbers of species per drainage are comparatively low, most likely due to the region's small catchment areas. The highest diversity of fishes is found in the low-lying portions of the short coastal drainages up to about 600 m above sea level. Each of the small drainages has at least one endemic cyprinodont and cichlid, and several also have an endemic cyprinid. Given the small size of each of the drainages, the degree of endemism is high. Odonata species are of special concern, displaying high levels of richness and endemism. Endemism of Odonata species is seen in the lower-elevation streams, while it is not found at the summits of mountains. Endemic Odonata are especially seen as a result of adaptive radiations. Odonata species are suspected to function as surrogates for other aquatic insect fauna in this location. These areas are significant for their intact biotas, unusual assemblages, and relict taxa.

The Mount Cameroon region has both pristine and heavily impacted areas. Plantations surround some of the protected areas. Subsistence agriculture and population density pressures also have an impact on the region. Threats to conservation are high for the unprotected areas of this region. The headwaters of the Meme and Mungo Rivers are not inventoried. It may be that the Kwa drainage in Nigeria and the Wouri drainage in Cameroon should be included in this priority area. A concerted multitaxa research program should take place in these drainage basins.

Name: Cross River
Map identification: F32
Political unit(s): Nigeria, Cameroon
Size: 52,850 km²

The Cross River encompasses an area of about 70,000 km², of which 50,000 km² lie in Nigeria and 20,000 km² lie in Cameroon. Teugels et al. (1992) conducted the first and only major survey of this basin. The region contains a wide range of habitats including mangrove swamps, estuaries, rocky rapids, lakes, sandy main channels, low-lying swamps, and a dense drainage pattern with numerous and varied small streams. The Cross River drains two important national parks, Oban, in Nigeria, and Korup, in Cameroon.

Freshwater species are remarkably rich for this comparatively small basin. There are an estimated 44–55% more fish species here than within any other comparable West African basin surveyed. For total freshwater species, there are an estimated 36–47% more in the Cross River Basin than in any equivalent basins, of which siluroids, percoids, characoids, cyprinoids, cyprinodontiformes, and osteoglossids form 95% of the ichthyofauna. Recorded thus far for the region are 166 or more species in 42 families. Additional undescribed taxa are known as well. About 33 (20%) of the fish species represent a marine intrusive fauna. Of 132 freshwater fish species, at least 11 (8%) are probably endemic. Lundberg et al. (2000) note burgeoning estimates of fish diversity in the Cross system, including an undescribed riverine tilapiine

cichlid. Manatee (*Trichechus senegalensis*) were originally recorded in the Cross Basin, and hippo (*Hippopotamus amphibius*) historically had large populations. The postulated paleorefugium of wet tropical forest at the site of the Cross River system may have created circumstances favorable to the evolution and maintenance of highly diversified ichthyofauna. The region's longitudinal zonation is interesting. The occurrence of endemic cichlid fish radiations in isolated crater lakes of the basin (Lakes Bermin and Ejagham) is due to founder stocks that still live in the neighboring riverine habitats.

Human impacts on the biodiversity of the Cross River system have been documented. Integrity for the lower Cross is low, while it is more moderate for upper reaches. Oil exploitation, heavy fishing pressure, high population pressure, and pollution from the construction of gravel roads are all detrimental to the region's ecology. Migratory fishermen use portions of the basin, and there is the potential for new dam construction in the upper Cross. The deterioration of the main Cross River would likely impact biodiversity in the national parks. There is a need for key biological studies, such as migration analyses.

Name: Cuvette Centrale
Map identification: F35
Political unit(s): DRC
Size: 419,430 km²

The Cuvette Centrale covers the extensive, low-lying central depression of the Congo Basin. Once beneath a Pliocene lake, 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. The Cuvette Centrale 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). It is expected that the region has high endemism and richness for fish species. Inactive logging concessions occur in this region. Logging activity that currently takes place is very selective. In the southwest of the Cuvette Centrale, human population numbers are low, while to the northeast, they are somewhat higher.

Name: middle Congo River mainstem
Map identification: F36
Political unit(s): DRC
Size: 76,880 km²

The central channel of the Congo River from Tumba to the Kindu region carves a semi-circle through the central DRC. The Congo is the richest river in Africa in terms of freshwater biodiversity. It is suspected to claim the most endemic freshwater species on the continent. This section of the Congo has a wide, flat riverbed with stretches of whitewater. It is edged by tropical rainforest and swamp forest. Integrity for this robust river is high, though overexploitation of large species is likely occurring. Hunting of aquatic megafauna is suspected to be at an unsustainable level.

Surveys are needed for the river's waterbirds and aquatic mammals. Aquatic mammals endemic to the Congo Basin may include Allen's swamp monkey (*Allenopithecus nigroviridis*), Congo clawless otter (*Aonyx congica*), and giant otter shrew (*Potamogale velox*). Non-endemic mammals reliant on the riverine habitats may include sitatunga (*Tragelaphus spekei*), chevrotain (*Hyemoschus aquaticus*), and spot-necked otter (*Lutra maculicollis*). Waterbirds may include Hartlaub's duck (*Pteronetta hartlaubii*) and African finfoot (*Podica senegalensis*), among others.

PRIORITY LEVEL II: HIGH PRIORITY

Name: Bay of Cameroon freshwater swamps
Map identification: F4
Political unit(s): Cameroon
Size: 780 km²

Coastal freshwater swamps, such as those located near Douala, have become an extremely rare habitat and are very threatened by urban development, oil extraction, and associated pollution. The biodiversity of these

Cameroonian swamps is only known from a single collection, which indicates a fauna similar to that of the Niger Delta coastal swamps. There is probably no local endemism, with the exception of cyprinodont fish species. Growing human population in Douala and the existence of plantations in the region are primary constraints to the freshwater swamp's integrity.

Name: Atlantic coastal lagoons
Map identification: F7
Political unit(s): Gabon, ROC
Size: 6810 km²

This series of coastal lagoons is found in southern Gabon at Nkomi, Iguéla, Ndogo, Banio, Mandje, and Congo-Conkouati. A portion of the region lies within current and proposed protected areas, such as the Gamba Complex. The lagoons consist of large areas of shallow water surrounded by mangrove and swamp forest. Coastal lagoons serve an important ecological function in the reproduction of marine fish and fish growth. Brackish, freshwater, and marine fish inhabit this transitional zone. The lagoons are also rich in molluscs and other shellfish. Endemism of aquatic fauna is not known. The lagoons are used as critical migration, feeding, and resting sites by waterbirds, which are found in high concentrations at certain times of the year. Aquatic mammals include manatee (*Trichechus senegalensis*) and Atlantic hump-backed dolphin (*Sousa teuszii*). Some of these lagoons remain in a relatively intact state, and access is low. However, oil exploitation occurs in the region and has polluted some lagoons.

Name: Ogooué River
Map identification: F8
Political unit(s): Gabon, ROC, Equatorial Guinea
Size: 152,330 km²

This region covers the Ogooué River Basin, which covers 205,000 km². It is notable as a refuge for fish species, which appear to have persisted here through the last interpluvial period. Aside from the Congo River, the Ogooué is probably the richest in aquatic species of all rivers in the region of analysis, with an estimated 200 fish species. There is an especially high diversity of mormyrids (snoutfishes), which are the dominant group in forest rivers of the Ogooué Basin. It is estimated that 50% of the mormyrids are endemic to the basin, and these constitute about 15% of all the fish found there. The Ogooué is likely the center of speciation for the mormyrid genus, *Brienomyrus*. The river has interest from an evolutionary perspective, both as a refuge and as a model for fish speciation in a riverine fauna. Research is required to understand the mechanism by which the fauna of the Ivindo, a tributary to the Ogooué, became isolated from that of the Ogooué. The introduction of exotic species, including *Heterotis niloticus* and various non-native tilapia, create a moderate threat for the Ogooué River's fish fauna.

Various sections of the Ogooué River are in need of specific studies. The middle Ogooué rapids between Njolé and Lastoursville are shallow-gradient rapids for over 200 km of the main channel of the Ogooué. The Musée National d'Histoire Naturelle has extensive fish collections from some areas of the Ogooué River, though they are likely limited from the rapids, which are difficult to collect from and are likely to have their own fauna. The lakes and swamps of northern Lambaréné and Ngomo in the Ogooué River Basin are possibly very important as a large, lowland, equatorial swamp, and an Odonata survey is needed for these. The large Ogooué Delta, between Port-Gentil and Lambarene, is an important survey area for aquatic mammals and waterbirds. Mammals may include Atlantic hump-backed dolphin (*Sousa teuszii*) and West African manatee (*Trichechus senegalensis*). Waterbirds may show high concentrations and diversity at the river delta, and this may be an important stopover site. The delta is an important area for breeding terns. The turtle *Trionyx inunguis* occurs in the Ogooué River.

Name: rapids upstream from Kisangani
Map identification: F10
Political unit(s): DRC

The rapids upstream from Kisangani on the mainstem Congo River are significant as a rare habitat and support endemic mollusc species. While not outstanding for richness of fish or molluscs, these rapids are suspected to be important for aquatic insects. These rapids have not been surveyed since the last century; further surveys may uncover new mollusc species.

Name: Lac Télé-Likouala aux Herbes
Map identification: F13
Political unit(s): ROC
Size: 20,250 km²

Lac Télé-Likouala aux Herbes was designated as a Ramsar site in 1998. The region is a massive and intact area of swamp and swamp forest, with inundated savannas and floating beds of grasses. Swamp forests contain raffia palms, seasonally flooded forests are dominated by *Gilbertiodendron dewevrei,* flooded savannas are characterized by *Hyparrhenia diplandra,* and floating prairies contain *Vossia* and *Echinocloa* grasses. Lac Télé is an open-water lake, possibly the result of meteorite impact. The region is rich in freshwater fish and waterbirds, and it is important for migratory bird species of the Ciconiidae (stork), Ardeidae (heron/bittern), and Pelicanidae (pelican) families (Ramsar 1998). It also claims more than five species of freshwater turtle and has vibrant populations of aquatic mammals, including Allen's swamp monkey (*Allenopithecus nigroviridis*), giant otter shrew (*Potamogale velox*), and two otters (*Aonyx congica* and *Lutra maculicollis*). Allen's swamp monkey is endemic to the central Congo Basin. Endemic species of mormyrid and cyprinodont fish are recorded for the region. A long-term management plan is needed for the Lac Télé-Likouala aux Herbes region, and additional surveys should be completed, specifically for Odonata and aquatic insects, of which virtually nothing is known.

Name: Tumba
Map identification: F16
Political unit(s): DRC
Size: 8710 km²

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. The lake has rich invertebrate and fish faunas that are largely supported by allochthonous organic matter washed in from the surrounding forests. The conservation integrity of Lac Tumba and the surrounding region is high, though a growing human population around the lake could threaten it. It is in close proximity to Mbandaka, which results in high levels of fishing and commerce.

Together with Lake Maï-Ndombe, this is an important area for mammal and waterbird surveys. Aquatic mammals endemic to the basin may include Allen's swamp monkey (*Allenopithecus nigroviridis*), Congo clawless otter (*Aonyx congica*), and giant otter shrew (*Potamogale velox*). Other aquatic mammals in need of survey are sitatunga (*Tragelaphus spekei*), chevrotain (*Hyemoschus aquaticus*), and spot-necked otter (*Lutra maculicollis*).

Name: Lake Dissoni
Map identification: F21
Political unit(s): Cameroon
Size: 3.5 km²

Lake Dissoni is a volcanic crater lake close to the village of Massaka in the Southwest Province of Cameroon. The lake is oligotrophic, and forest covers the high crater rim. A high density of endemic, undescribed semi-pelagic caridinid shrimps characterize Lake Dissoni, though they do not seem to have fully exploited all possible niches. Species richness appears to be low, but the system has been poorly studied, and it may be at an evolutionary transition toward speciation. An endemic lampeye, *Procatopus lacustris,* is known from Lake Dissoni. Both the *Clarias* sp. and *Barbus cf. batesii* are not well studied and may be endemic. Lake Dissoni is important for intact biotas and adaptive radiation of local species. Conservation integrity for Lake Dissoni is high; only small, artisanal fishing is in practice. The surrounding region has a relatively high human population, however, and the impact from this could be large.

Name: Lower Kouilou to Sounda
Map identification: F24
Political unit(s): ROC
Size: 8400 km²

The lower Kouilou River region between Bas-Kouilou and Gorges de Sounda includes the main river as well as rapids, lateral lakes, and flooded forest. The biota of the region is currently intact, though Conoco conducted oil exploration less than ten years ago. A potentially serious threat is the impending construction of a hydroelectric dam near Gorges de Sounda, at the confluence of the Kouilou and Niari Rivers. The region is also threatened by the introduction of exotics. African bonytongue

(*Heterotis niloticus*), native to the Nilo-Sudan, already dominates the local fishery. Ecological studies are a priority for the region.

Name: Chutes de Nki, Chutes de Chollet
Map identification: F25
Political unit(s): Cameroon

This stretch of approximately 40 km on the Dja River, including the Chutes de Nki and the Chutes de Chollet, separates coastal fish faunas from Congo fish faunas. Some waterfalls are greater than 20 m in height. The surrounding region is hilly rainforest, and the river has both rocky areas and slowly flowing sections. The rapids and falls in this region of the lower Guinean bioregion are rare. According to collections by Schliewen (2000 and in preparation), the Dja River includes fish fauna characteristic of both the West Coastal Equatorial and Sangha ecoregions; these two distinct faunas are separated by this short stretch of falls. It is estimated that this area alone contains more than 150 fish species. Two of these have been found only in the region of Nki and Chutes de Chollet: an undescribed characin and an undescribed *Steatocranus* species. Intact biotas and unusual assemblages are already known to exist, though data from the most recent survey have not yet been analyzed completely.

Name: Ituri Forest
Map identification: F28
Political unit(s): DRC
Size: 11,320 km^2

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. The relatively undisturbed Ituri Forest provides a good example of northeastern forest for comparison with western forests of the Congo Basin. The river is expected to be rich in aquatic species. Aquatic mammals include Congo clawless otter (*Aonyx congica*), giant otter shrew (*Potamogale velox*), and possibly the aquatic genet (*Osbornictis piscivora*), which is endemic to the Congo Basin. Ecological integrity is high for the region, with the surrounding Ituri Forest in good condition. Gold mining occurred here in the 1940's, but most of the mining population has now left the area. This is an important site for fish and Odonata surveys. It is expected that high endemism will be found for these taxa.

Name: Bangweulu Lake and swamps
Map identification: F39
Political unit(s): Zambia, DRC
Size: 17,830 km^2

The Chambeshi floodplains and the extensive swamps, lakes, and streams of the Bangweulu area support a distinctive assemblage of aquatic species. The region is rich in Odonata species and probably also in other aquatic insects. It is also rich in aquatic molluscs, with over 30 species and 1 endemic. It is a migration, feeding, or resting site for large numbers of migratory waterbirds, including the endangered wattled crane (*Bugeranus carunculatus*) and the shoebill (*Balaeniceps rex*). Notable mammals include sitatunga (*Tragelaphus spekei*) and an endemic floodplain antelope subspecies of black lechwe (*Kobus leche smithemani*). Integrity of the freshwater ecosystem is moderately impaired. The region is subject to population pressure, overfishing, and burning in swamp areas. Bangweulu Swamps: Chikuni was designated as a Ramsar site in 1991 (Ramsar 2001).

Name: Nachtigal Falls
Map identification: F40
Political unit(s): Cameroon

Nachtigal Falls is an important stretch of rapids and waterfalls near Batchenga in Cameroon that serves as a barrier to movement. Several endemic fish are known from the area, and further investigation is expected to reveal new species. The falls are located in a highly populated area, though the rapids and their biota are likely to be intact.

PRIORITY LEVEL III: MODERATE PRIORITY

Name: lower Congo River mouth and swamps
Map identification: F6
Political unit(s): DRC, Angola
Size: 720 km²

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 pogei*), 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. *Erpetoichthys* is among those genera limited to the coastal zones. Several cichlids have limited distributions in the lower portion of the Congo River, including *Lamprologus lethops, Haplochromis fasciatus,* and *Oreochromis lepidurus.* Oil exploitation, increased human population, and the introduction of exotics threaten the lower Congo River. African bonytongue (*Heterotis niloticus*) has already been introduced.

Name: Malebo Pool
Map identification: F18
Political unit(s): DRC, ROC
Size: 11,860 km²

Malebo Pool, formerly called Stanley Pool, 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 *Eichornia* often drift by in the flowing waters. The priority region includes part of the Lukunga River. There are a few fish that are known only from Malebo Pool, including several mountain catfish, *Leptoglanis mandevillei, L. brieni,* and *L. bouilloni,* and an upside-down catfish, *Atopochilus chabanaudi*. 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.

Name: Chaillu Massif
Map identification: F29
Political unit(s): Gabon, ROC
Size: 10,150 km²

The Chaillu Massif, a mountainous area that includes Mount Iboundji (972 m), has steep gradients and dense forest. The streams that drain these mountains are not expected to be rich in fishes, although they may be found to support numerous, small, stream fishes. Many endemic cyprinodonts live in the small mountain streams of this region, and other groups may exhibit endemism as well. Rough terrain, few roads, and low human population pressure help maintain the integrity of freshwater systems of the Chaillu Massif. This is an important survey area for fish.

Name: Monts de Cristal
Map identification: F30
Political unit(s): Gabon
Size: 1960 km²

The Monts de Cristal are a small coastal mountain range in northern Gabon. The mountains are forested and at an approximate altitude of 800 m. The ecology of these mountains is similar to that of the Chaillu Massif found farther south. It is likely that the mountains' streams are poor in aquatic species. However, they are rich in endemics, with several known endemic cyprinodonts. Integrity for the region is high; there is a small human population, and there are few roads aside from the main route connecting Kougouleu with Médouneu.

Name: Nyong-Doume blackwater swamps
Map identification: F31
Political unit(s): Cameroon
Size: 17,430 km²

The Nyong-Doume blackwater swamps are located along the upper reaches of the Nyong, Doume, and Boumba Rivers. Although these are separate drainages, the characteristics of these rivers are similar and the most upstream portions of the rivers connect with one another during flooding. The Boumba and Doume Rivers are affluents to the Sangha-Ngoko-Dja system, while the Nyong drains to the coast. This region is near the villages of Abong Mbang, Ayos, and Doume. The flooded forests of this region support a rare habitat of blackwater swamps. Flooded areas are vast during the rainy season, connecting the headwaters of the Nyong, Boumba, and Doume rivers. During the dry season, the flooded forest remains quite wet, with many freshwater pools. Forests have a low diversity of tree species, and swampy meadows of *Echinochloa* are found close to the rivers. The swamps are not well surveyed, although preliminary collections do not indicate a high richness. However, several species of forest crocodiles and swamp-blackwater fishes live in these waters. The level of endemism is unknown, but it is likely to be low. Currently, the swamps in this region are pristine, though the area is moderately threatened by human population pressure.

Name: Zambezi-southeast Congo transition zone
Map identification: F33
Political unit(s): DRC, Zambia
Size: 29,130 km²

This region, which includes the headwaters of both the Congo and Zambezi Rivers, is the interface of the eastern Congo, Kasaï, and Zambezi River Basins. This transition zone may be evolutionarily significant due to potential faunal interactions between the Zambezi and the Congo River at its easternmost extent. This region lies along the border of the DRC and Zambia. Ecological integrity for the region is low as a result of large-scale copper mining, population pressure, pollution in Zambia, and riparian vegetation loss from overgrazing.

Name: Cuanza-Kasaï contact zone
Map identification: F34
Political unit(s): Angola, DRC

The western contact zone between the Kasaï and Cuanza headwaters has potential evolutionary importance as a boundary between two faunistic zones. This area is considered a priority for sampling for fish and molluscs. Little sampling has occurred here, such that the aquatic fauna is largely unknown. Civil strife has plagued this area, and its present ecological integrity is unknown. There have been refugee movements in the vicinity.

Name: northeast Congo Basin forest
Map identification: F37
Political unit(s): DRC
Size: 30,470 km²

This region includes limbali (*Gilbertiodendron* spp.) forest, particularly that located north of Beni. Headwaters in the northeastern Congo Basin originate in this area. The aquatic genet (*Osbornictis piscivora*), endemic to the Congo Basin, is largely restricted to the eastern part of the basin and is most commonly found in shallow headwater streams running through limbali forest. Ecological integrity of the forest is moderate. Ethnic tensions in the region are currently high. Savanna burning and cattle grazing also occur in the area.

Name: Ruwenzoris West
Map identification: F38
Political unit(s): DRC
Size: 11,130 km²

Forested streams drain the west slope of the Ruwenzori Mountains. The endangered Ruwenzori otter shrew (*Micropotamogale ruwenzorii*) is endemic to the Ruwenzoris, though not to the Congo Basin. The area has high rainfall, mountainous forests, and a high elevational gradient, and it is suspected that the area may contain endemic aquatic insects and fishes.

The area also includes lowland habitats and papyrus swamps. Wetland birds of importance include papyrus canary (*Serinus koliensis*), Carruthers's cisticola (*Cisticola*

carruthersi), greater swamp warbler (*Acrocephalus rufescens*), white-winged warbler (*Bradypterus carpalis*), papyrus yellow warbler (*Chloropeta gracilirostris*), and papyrus gonolek (*Laniarius mufumbiri*). A dense human population, high conversion of land to agricultural use, gold panning, and heavy bushmeat hunting threaten the region's integrity.

Name: northern Bioko
Map identification: F41
Political unit(s): Equatorial Guinea
Size: 770 km²

The clearwater streams of northern Bioko originate in the mountains and descend through the lowlands. This island was connected to the mainland approximately 12,000 years ago, when sea levels were lower. As a result, northern Bioko's fauna includes continental representative freshwater fish. Endemism is relatively low, although one endemic fish, *Aphyosemion oeseri,* is known and other endemics are possible. This region was also added as a priority area in an effort to achieve national representation. Conservation integrity for northern Bioko is low. It is in close proximity to the capital and the airport. Local farming also has an impact. Oil exploration is expanding, bringing associated effects. Human population growth in Malabo is expected to further stress the freshwater systems of Bioko. The isolation of the island's fish fauna from the continental fauna has potential importance for studies of genetic drift.

Name: southern Bioko streams
Map identification: F42
Political unit(s): Equatorial Guinea
Size: 660 km²

The streams of southern Bioko originate in the mountains and have short drainages descending directly to the sea. High waterfalls mark these forested, cool, high-velocity streams. While the aquatic fauna is impoverished, it is nevertheless interesting due to the presence of sicydine gobies (*Sicydium* spp.) and marine intruders that have preference for clear streams. Similar habitats are found on the mainland at Mount Cameroon, but these are under more pressure than those of southern Bioko. Bioko's streams are chosen as a priority due to their intactness and also in an effort to achieve national representation. Located in a future protected area with a low human population, ecological integrity for this freshwater system is very high.

Name: mangroves and lagoon near Porto Alegre
Map identification: F43
Political unit(s): Democratic Republic of São Tomé and Príncipe
Size: 30 km²

The coastal lagoon and mangroves near Porto Alegre include São Tomé's only mangroves. Also the island's only lagoon, this region is of national importance. The lagoon is brackish and could be classified as a marine ecosystem. This is a migration, feeding, and resting site for migratory waterbirds. A protected area is proposed for the region. This area was selected to achieve national representation.

NO PRIORITY LEVEL — HEADWATERS

Headwaters serve an important ecological function by maintaining downstream hydrology and may also support endemic faunas. All headwaters of the Congo Basin are poorly known biologically and hydrologically.

Name: Congo headwaters
Map identification: F44
Political unit(s): DRC

The headwaters of the Congo River include the upper portions of the many rivers and streams that feed this large river in its semi-circular course from its origin on the Shaba Plateau to its mouth on the coast of the DRC. The Congo River is the second longest river in Africa after the Nile. Its drainage basin, exceeding 3,700,000 km², is the second largest in the world, and covers almost all of the DRC, the ROC, the CAR, northern Angola, eastern Zambia, and portions of Tanzania and Cameroon. The central portion of the Congo Basin, the Cuvette Centrale, is covered by the largest block of

rainforest in Africa. The Congo River system has been environmentally stable for a long time. This and the wide variety of habitats represented have encouraged speciation of aquatic fauna. Over 700 fish have been described from the Congo River system, and about 80% are thought to be endemic. It is difficult to define the exact extent of the headwaters due to the low topography of the basin and the lack of basin-wide and uniform hydrological data.

Name: Ogooué headwaters
Map identification: F45
Political unit(s): ROC

The Ogooué River rises just outside of Gabon in the ROC and flows westward through Franceville and Lambaréné, to empty at Port-Gentil. The river system drains most of Gabon and has two major tributaries, the N'Gounie and the Ivindo Rivers. Most of the upper Ogooué Valley is forested floodplain with islands of permanent swamp. The Trans-Gabon Railway runs through much of the Ogooué Valley, hence the forest and river have been largely exploited.

Name: Sanaga headwaters
Map identification: F46
Political unit(s): Cameroon, CAR

The Sanaga River drains the majority of the central rain forest of Cameroon. Major affluents are the Djérem and Mbam Rivers. The Pangar and Lom Rivers feed into the Djérem River, which eventually flows into the Sanaga River proper. Other headwaters include the Noun, Ndjim, and Ndjéké Rivers. A portion of the Sanaga River system is protected within the Mbam-Djérem Game Reserve. Dams constructed on the Djérem and Noun Rivers have reduced flooding significantly (Hughes and Hughes 1992).

Name: Nyong headwaters
Map identification: F47
Political unit(s): Cameroon

The Nyong River in Cameroon has two sources, one from the southern central plateau, the other from the floodplains of the central districts, above Ayos. The latter region includes a 1000-km^2 *Sterculia ambacensis* swamp. At altitudes above 650 m, the river is bounded by forest, below Ayos is a stretch of floating grassland bordered by a periodically inundated floodplain. While forests of the upper Nyong are intact, the grasslands are a result of forest clearing in an attempt to control sleeping sickness (Hughes and Hughes 1992).

Name: Cross headwaters
Map identification: F48
Political unit(s): Cameroon, Nigeria

The Cross River begins in the mountains of western Cameroon and north of Enugu (62°7'N/7°27'E), Nigeria. Major tributaries originating in the highlands of Cameroon include the Mbu and Manyu Rivers. Major tributaries that feed into the Cross within Nigeria include the Anyim and Aboine Rivers. Seasonally inundated floodplains surround the Cross River in its upper reaches within Cameroon. Downstream from Afikpo, a series of floodplain lagoons and lakes are connected with the river during floods, but isolated during the dry season. Human population density is high along the Cross River and threatens the health of much of the river. Cross River National Park, established in 1991, and the Ejagham Forest Reserve protect portions of the river and its tributaries.

Name: Ntem headwaters
Map identification: F49
Political unit(s): Cameroon

The Ntem River, in southwestern Cameroon, empties at the border with Equatorial Guinea in the Campo Reserve. Some of the major tributaries of the Ntem are the Kom and Ayina Rivers. The Ntem has a high species richness for the area, with significant endemism (Kamdem Toham 1998).

Name: Kouilou-Niari headwaters
Map identification: F50
Political unit(s): Republic of Congo

The Kouilou-Niari headwaters are located on the Batéké Plateau, in the southern ROC. Tributaries draining the plateau are the Louéssé and Bouenza Rivers. The Niari Valley runs between the escarpment of the Chaillu Massif and the Dihésé Plain. The Tsoulou Faunal Reserve is along the Niari River near Kibangou. The confluence of the Kouilou and Niari Rivers is adjacent to the Dimonika Biosphere Reserve, and the emerging Kouilou River empties into the Atlantic just north of Pointe-Noire.

APPENDIX B

Selected Endemic Species of the Guinean-Congolian Forest Region

Ecoregion	*Birds*	*Amphibians*	*Reptiles*	*Mammals*	*Butterflies*
Nigerian lowland forests	*Malimbus ibadanensis*	*Bufo perreti*	*Cnemaspis petrodroma*	*Cercopithecus erythrogaster*	0
Niger Delta swamp forests	0	0	0	0	*Acraea actinote*
Cross-Niger transition forests	0	0	0	0	0
Cross-Sanaga-Bioko coastal forests	*Stiphrornis gabonensis*	*Afrixalus schneideri* *Phrynobatrachus werneri*	*Cynisca gansi* *Cynisca schaeferi* *Chamaeleo camerunensis* *Urocotyledon weileri* *Scelotes poensis* *Typhlops "Douala"*	*Chalinolobus egeria* *Crocidura picea* *Procolobus preussi* *Hipposideros curtus*	0
Atlantic equatorial coastal forests	0	*Astylosternus schioetzi* *Hemisus perreti* *Hyperolius inornatus* *Hymenochirus curtipes* *Hymenochirus feae* *Xenopus andrei* *Petropedetes palimpes* *Phrynobatrachus ogoensis* *Idiocranium russelli*	*Cynisca bifrontalis* *Cynisca haughi* *Monopeltis galeata* *Monopeltis jugularis* *Hydraethiops laevis* *Poecilopholis cameronensis* *Urocotyledon palmatus* *Feylinia boulengeri*	0	0
Mount Cameroon and Bioko montane forests	*Francolinus camerunensis* *Speirops melanocephalus* *Speirops brunneus*	*Arthroleptis bivittatus* *Didynamipus sjostedti* *Werneria tandyi* *Herpele multiplicata* *Crotaphatrema bornmuelleri*	0	*Sylvisorex morio* *Lophuromys roseveari* *Praomys morio*	*Acraea epaea* *Charaxes musakensis*

Continued

Appendix B. Continued

Ecoregion	*Birds*	*Amphibians*	*Reptiles*	*Mammals*	*Butterflies*
Cameroonian highlands forests	*Tauraco bannermani* *Apalis bamendae* *Platysteira laticincta* *Telophorus kupeensis* *Ploceus bannermani* *Bradypterus bangwaensis* *Kupeornis gilberti*	*Astylosternus nganhanus* *Cardioglossa oreas* *Leptodactylodon axillaris* *Leptodactylodon perreti* *Leptodactylodon polyacanthus* *Bufo villiersi* *Werneria bambutensis* *Wolterstorffina mirei* *Arlequinus krebsi* *Xenopus amieti* *Xenopus longipes* *Phrynobatrachus manengoubensis* *Leptodactylodon boulengeri* *Hyperolius adametzi* *Leptopelis nordequatorialis*	*Atractaspis coalescens* *Chamaeleo eisentrauti* *Chamaeleo pfefferi* *Chamaeleo quadricornis* *Cnemaspis gigas* *Leptosiaphos chriswildi* *Leptosiaphos ianthinoxantha* *Leptosiaphos lepesmei* *Panaspis duruarum*	*Myosorex okuensis* *Myosorex rumpii* *Sylvisorex isabellae* *Hybomys eisentrauti* *Hylomyscus grandis* *Lamottemys okuensis* *Lemniscomys mittendorfi* *Lophuromys dieterleni* *Lophuromys eisentrauti* *Otomys occidentalis* *Praomys hartwigi*	*Acraea uvui* *Acraea wigginsi* *Acraea obliqua* *Charaxes obudoensis* *Charaxes tectonis*
Sâo Tome and Príncipe moist lowland forests	*Zoonavena thomensis* *Bostrychia bocagei* *Columba malherbii* *Columba thomensis* *Treron sanctithomae* *Alcedo nais* *Alcedo thomensis* *Prinia molleri* *Neospiza concolor* *Serinus rufobrunneus* *Lanius newtoni* *Terpsiphone atrochalybeia* *Horizorhinus dohrni* *Nectarinia hartlaubii* *Nectarinia newtoni* *Nectarinia thomensis* *Oriolus crassirostris* *Ploceus grandis* *Ploceus sanctithomae* *Lamprotornis ornatus* *Amaurocichla bocagei* *Turdus olicaceofuscus* *Speirops leucophaeus* *Speirops lugubris* *Zosterops ficedulinus* *Otus hartlaubi*	*Leptopelis palmatus* *Nesionixalus molleri* *Nesionixalus thomensis* *Phrynobatrachus dispar* *Phrynobatrachus feae* *Ptychadema newtoni* *Dermophis thomensis* *Hyperolius thomensis* *Schistometopum ephele* *Schistometopum thomense*	*Lamprophis lineatus* *Philothamnus girardi* *Philothamnus thomensis* *Hemidactylus aporus* *Hemidactylus greefi* *Hemidactylus newtoni* *Feylinia polylepis* *Panaspis africana* *Panaspis annabonensis* *Rhinotyphlops feae* *Rhinotyphlops newtoni* *Typhlops elegans* *Lygodactylus delicatus* *Lygodactylus thomensis* *Lygodactylus wermuthi* *Mabuya ozorii* *Rhinotyphlops newtonii* *Rhinotyphlops principis* *Rhinotyphlops feae* *Hapsidophyrys principis*	*Crocidura thomensis*	*Acraea newtoni* *Acraea pharsalus* *Acraea insularis* *Acraea medea* *Acraea niobe* *Acraea zetes* *Charaxes defulvata* *Charaxes thomasius* *Charaxes lemosi* *Charaxes odysseus* *Charaxes antiquus* *Charaxes montieri* *Charaxes barnesi*

Appendix B. Continued

Ecoregion	*Birds*	*Amphibians*	*Reptiles*	*Mammals*	*Butterflies*
Northwestern Congolian lowland forests	0	*Xenopus boumbaensis* *Xenopus pygmaeus*	*Polemon griseiceps* *Cnemaspis dilepis* *Leptotyphlops perreti* *Leptosiaphos fuhni* *Rhinotyphlops debilis* *Rhinotyphlops stejnegeri* *Atheris broadleyi*	*Suncus remyi* *Sylvisorex konganensis* *Prionomys batesi*	*Acraea odzalae* *Charaxes superbus*
Western Congolian swamp forests	0	0	*Helopphis schoutedeni*	0	0
Eastern Congolian swamp forests	*Nectarinia congensis*	*Cryptothylax minutus*	0	*Praomys mutoni*	0
Central Congolian lowland forests	0	*Hyperolius robustus*	*Boulengerina Christyi* *Helophis schoutedeni* *Polemon robustus* *Limnophis bicolor*	*Cercopithecus dryas*	0
Northeastern Congolian lowland forests	*Centropus neumanni* *Ploceus aureonucha*	*Hemisus olivaceus* *Hyperolius diaphanus* *Hyperolius langi* *Hyperolius schoutedeni* *Kassina mertensi* *Phrynobatrachus gastoni* *Ptychadena christyi* *Rana amieti*	*Lygodactylus depressus* *Chamaelycus christyi* *Rhinotyphlops graueri*	*Osbornictis piscivora* *Congosorex polli* *Crocidura caliginea* *Crocidura congobelgica* *Crocidura polia* *Sylvisorex oriundus*	0
Central African mangroves	0	0	0	0	0

APPENDIX C

Workshop Participants' Research Sites

Name	Site(s)	Focus	Dates
1. Achoundong, Gaston	Cameroon (forest)	botanical	1980–2000
2. Adeleke, Wale	Nigeria (forest)	forest inventories	1980–1990
	Cross River National Park	forest management	
	Obam-Okwango		
	Omlo Forest Reserve		
	Gashaka-Gumti		
3. Agnagna, Marcellin	Lac Télé, Likouala aux Herbes		
		crocodiles and primates surveys	1986, 1989–1996
	Djéké-Mombenzélé	crocodiles and elephants surveys	1989–1996
	Nouabalé-Ndoki	elephant surveys	1989–1996
	Motaba-Makao	elephant surveys	1989–1996
	Mayumba-Conkouati	elephant surveys	1990–1991
4. Anaclé, Bissielo	Libreville, Gamba	Gabon evaluation, GEF	1999
	Gabon	WWF project	1998
	Gabon, Cameroon, CAR	Ecoregion-based conservation phase reconnaissance	1999
	Gabon	Developed and evaluated biodiversity strategy	1998
	Gabon	Developed and evaluated biodiversity strategy	1998
5. Angoué, Claudine	Congo Basin	socio-economics	1994–2000
6. Aveling, Conrad	Odzala	mammals	1992–2000
	east DRC	mammals	1984–1991
	Dja	mammals	1992
	Equatorial Guinea (Mount Alén)	mammals	
	São Tomé	mammals	
	CAR (Njoko)	mammals	
	Gabon (Lopé, Mayumba)	mammals	2000
	Rwanda National Park, volcanoes		1982
7. Butyinski, Tom	Bioko-Equatorial Guinea	primates, birds, antelope	1986–1990
	Itombwe Mount Tshiaberimu, DRC	primates, birds, antelope	1995–1996
	Burindi Imponctable, Uganda	primates, birds, antelope	1983–1993

Name	Site(s)	Focus	Dates
8. Bearder, Simon (and nocturnae primate research group [Oxford])	Mount Cameroon	primates	2000
	Mount Kupe		
	Korup		
	Ebom		
	Dja Reserve		
	Lobéké Reserve		
	Makokou Bélinga		
	Makandé		
	Franceville		
	Moreca (Bioko)		1981–1983
	Moca (Bioko)		1992
9. Bengono, Hyrceinte	Director of the Frit-Yaoundé		
10. Beresford, Pamela	Dzanga-Sangha	birds	1996, 1998
11. Bila-Isia, Inogwabini	Kahuzi-Biega, adjacent forests	elephants, gorillas, chimpanzees	1993–1996
	Salonga National Park, northern sector	overview	1997–1998
12. Blanc, Charles	Lopé, Gabon	reptiles, amphibians	1995
	Campo, Cameroon	reptiles, amphibians	1992
13. Blom, Allard	Bai Mokon	mammals	
	Bayanga	tourism	
	Salonga South	mammals	
	Ituri	mammals	
	Salonga North	mammals	
	Wotsi Key	mammals	
	Ikela	mammals	
	Salonga North	mammals	
	Surveys in Gabon, Equatorial New Guinea	mammals	
	Lopé	mammals/botany savanna	
14. Boundzanga, Georges Claver	Brazza. Pointe-Noire, Dolisié Nkayi	étude sur la filière bois énergie les principales dans villes du Congo	
	(north Congo)	évaluation des unités pilotes d'afforestation et d'agroforesterie à Pokala, Enyelle	
15. Brecheler, F. J.	Cameroon		1962
	Cameroon, Bestona		1960–1962
	Sangmelima		1962
	Yokadouma		1961
	Betaté Oya		1961
	Yaoundé		1960–1962

Name	Site(s)	Focus	Dates
15. Brecheler, F. J. (cont.)	Libreville	plants	1968–1998
	Gamba	plants	1985–1998
	Rabi	plants	1970–1999
	Lastoursville	plants	1978–1998
	Mounts de Cristal	plants	1999
	Makandé	plants	
16. Brown, Michael	Cameroon, Gabon	local forest reserve management system	1998–2000
	Ticar	local forest reserve management system	1998–2000
	Mount Cameroon	local forest reserve management system	1998–2000
17. Burger, Marius	Mount Doudou-Moukalaba	herpetology	2000
18. Carroll, Richard	Dzanga-Sangha	mammals	1980–1990
19. Clair, Mbourou	les villages de la Lopé, sa périphérie, les plantations	étude sociologique et de mandrilles	1995
20. Collomb, J.G.	Gabon–Lopé	primates	1997–1998
21. Colyn, Marc	Central Africa, forêt de plaine	biogeographic, mammalia	1976–2000
22. d'Huart, Jean-Pierre	Salonga National Park	park development, mammals	1990
	Virunga National Park	park management, mammals, birds	1971–1975
23. Dodman, Tim (contact for surveys carried out by Wetlands International)	coastal Gabon	waterbird surveys	1992
	southern Chad, northern CAR, Cameroon	black crow surveys	2000
	coastal Cameroon	waterbird surveys	1998–1999
24. Doumenge, Charles	Ipasa-Gabon	Bélinga, plantes	1983–1984
	Korup-Cameroon	Mounts Takamanda, Bakossi plants	1987
	Odzala-Congo	plants	1990
	Conkarati-Congo	plants	1992
	Itombwe-DRC	plants	1994
		nombreuses observations sur les forêts et les impacts humains sur les forêts de l'Afrique Centrale, impacts, utilisations	
	Odzala-Conkanati	des observations sur les mammifères et oiseaux	
25. Dowsett, F.R.	many	birds, mammals, etc.	1988–2000
26. Drewes, R.C.	Bioko, Lunda rise (Zambia)	herpetology	

Name	Site(s)	Focus	Dates
27. ECOFAC	Dja, Cameroon	modalités exploitation villageoises	1997–1999 1993–1994
		management zoning plan	
	Odzala, ROC	management zoning plan	
	Lopé, ROC	management zoning plan	
	Mt. Alén, Equitorial Guinea	management zoning plan	
	São Tomé, Príncipe	privatisation impact sur utilités des terres	1998
28. Effantsame, Ernestine		étude des désasres des implantés dans la réserve de la Lopé-Okanda.	
		enquête des consommations du gibier dans les marchés de LBV au Gabon ainsi qu'à l'intérieur	
29. Ekobo, Atanga	Lobéké, Boumba-Bek, Nki, Korup	mammals	1990–1998
30. Fisher, Brian	Minkébé	ants	1998
	Mount Doudou	ants	2000
31. Fotso, Roger	Yaoundé region	birds	1984–2000
	Dja Reserve	birds	1995–1998
	Douala	birds	1984–2000
	Bonyong Mbo Sanctuary	birds	1998–2000
	Mount Oku	birds	1989–1995
	Equateur, Bankaba, Basankuzy	birds	1996
32. Gami, Norbert	Odzala	étude socio-économique terroirs	1995–1996
	Congo		
	periphery of d'Odzala Park	villageois-cogestion des zones	1999–2000
	gorilla sanctuary of north Losi	gestion participative et création	
	ROC	structuration des associations villageoises	1997–2000
	Conkouati-Congo	etude ethnozoologique	1996
		étude socio-économique ouesso	1996
33. Garcia, J. E.	Bioko	marine turtles	1995
	Mount Alén	primates	1994
34. Gartlan, Steve	Korup		
	Douala-Edéa		
	Kupe		
	Lobéké		
	Lac Tumba, DRC		
	Mount Cameroon		
35. Gascogne, Angus	São Tomé, Príncipe		1989–present
	Annobón		Oct. 2000

Name	Site(s)	Focus	Dates
36. Gautier-Hion, Annie	Bélinga, Gabon	primates	
	Makokou, Gabon	large mammals	1965–1981
	Salonga, Zaire	primates	1989–1991
	Ngotto, CAR	primates	1994
	forest of the Abeilles, Makendi, Gabon	primates	1995–1996
	Odzala, ROC	primates	1996–1997
37. Goodman, Steven M.	Mount Doudou	small mammals	1998–2000
	Minkébé	birds	
38. Happold, David	Gambari, Nigeria		1966–1976
	Sapoba, Forest Reserve		
39. Hart, John	Ituri Okapi Faunal Reserve	biological studies, human impact	1980–present
	Maiko National Park	large mammals, human impact	1989–1992
	Rubi-Télé Hunting Reserve	one inventory mission, large mammals	1989
	Itombwe	large mammals and birds, human impact	1996
	Kahuzi-Biega	large mammal surveys	1999
40. Hart, Terese	Wildlife Reserve, Okapi	botany conservation	1981–2000
41. Hopkins, Carl D.	Central Africa	fish	1975–2000
42. Hoyle, David (WCS)	Banyong Mbo	NTFR	1996–2000
		hunting	1996–2000
		socio-economic	1996–2000
	Mbam Djerem	socio-economic	2000
43. Issembe, Yves	Gabon and Equatorial Guinea	plants	ongoing
44. Jacques, Pierre	Makokou-Ipassa-Libreville-Dimonika (Mayombe, Congo-Brazzaville)	Franceville et nombreuses stations au Gabon	
	Cameroon, Campo, Mount Cameroon	Manengouba, Rumpi Hills-Sangbolabo	
45. Joiris Daou, V.	Campo, Cameroon	economic anthropology	1985
	Moleundou, Cameroon (notably for WWF-US)	religious anthropology rel. interethnique baha/agriculteurs	1986–1991
46. Kamdem Toham, André	Sanaga, Ntem, Cross Rivers, Ogowe	freshwater fish and impact of deforestation in freshwater systems	1991–1998
	Southern Gabon	freshwater fish	1998
47. Kamnyamibwa, Sam	Kahuzi-Biega	birds, general surveys	1994–1995
48. Kingdon, Jonathan	Songo Pono	mammals	1978
	Buea region	mammals	1978
	Edéa region	mammals	1978

Name	Site(s)	Focus	Dates
48. Kingdon, Jonathan (cont.)	Kumka region	mammals	1978
	Makandé	mammals	1994
	Lopé	mammals	1994
	Goma region	mammals	1986
	Kaynabayongo	mammals	1986
	(intensive museum and literature research multiple localities)		1964–2000
49. Lahm, Sally	all over Gabon	mammal surveys, human-widlife relation	1982–2000
50. Langrand, Olivier	Moka River	birds	
	Leconi		
	Port-Gentil		
51. Languy, Marc	Virunga, DRC	birds	1992–1994
	Gabon, Gamba	birds	1995–1997
	Cameroon	birds	1998–2000
52. Lejoly, Jean	Zaire, DRC	botanical	1976–1997
	Kisangani		
	Bondo		
	Maiko National Park		
	Lac Albert		
	Nioka		
	Odzala National Park		1990–1996
	São Tomé, Príncipe		1993–1998
	Equitorial Guinea		1993–1999
	Dja		1994–1998
	Ngotto, ROC		1994–1998
53. Lelkie, David	Hovi Ne, DRC	Hontegattere's duiker	1981–1983, 1985–1986, 1991, 1995–1996
	Congo	ne primates, duikers	1999
54. Liengola, Innocent	Okapi Reserve, Ituri Forest	botanique en matière de conservation	1994
55. Maley, Jean	Lac Ossa near Edéa	paléo extenxion de l'okoumé holocène	
	Lac Njupi near Nyos	ouest Cameroon Bamenda	
	Lac Nguène south of Monts de Cristal		
	Lac Kamalété	southern Lopé	
		podocarpus	
	Lac Barombi Mbo	west Cameroon, near Kumba	
	Lac Assom near Tibati	nord du domaine forestier	
	Lac Maridor near Oyane	north Wonga Wongué	
		plusieurs publications, étude de l'histoire de la végétation	1990–2000
	Kouila-Mayombe		

Name	Site(s)	Focus	Dates
56. Mamonekene, Victor	Conkouati Reserve	fish	1996
	Dimonika Reserve		1990
	Lac Télé Reserve		1998
	Odzala National Park		1993
57. McGregor-Reid, Gordon	upper Cross River below Mamfe, Cameroon	freshwater fish	1991–1992
	Cocobeach, Gabon		2000
	swamp forest, Lagos, Nigeria		
	Barombi Mbo crater lake, Cameroon		1988–1989
	Korup, Ndian, Alepa-Yafe, Rio del Rey		1988, 1989
58. Molloy, Lisa	Lopé, Gabon	forest buffalo	1996
59. Muloko, Nicole	Ntoutoume	molecular ecology	
60. Ngnegueu, Paul Robinson	southeast Cameroon	general ecology monitoring	1994
	Dja, Lobéké, Boumba-Bek,	mammal inventory	
	Minkébé, Nki	birds, ants	
61. Nicaise, Rabenkogo	Port-Gentil, Gabon	dynamic of natural milieus	1989
	Libreville, Gabon	Gabon mangroves	1995
62. M. Amiru–Kano	Nigerian Conservation Foundation		
63. Oates, John	Nigeria	mammals, ecology — especially primates	1996–2000
64. Olson, David	Campo	invertebrates	1988
65. Oslisly, R.	Lopé	homme/milieu	1982–2000
		archeology	
		paleoenvironment	
	Gabon estuary	paleoenvironment	1982–2000
	Lastoursville	paleoenvironment	1994
	Lebamba-Ndendé	paleoenvironment	1992
	Makokou-Bélinga	paleoenvironment	1984–1985
	Otoumbi	paleoenvironment	1982–2000
	Divangui	paleoenvironment	1997
	Betéké Plateau	paleoenvironment	1986–1982
	Moanda-Mounana	paleoenvironment	1987–1989
	Wonga-Wongué-Oyan	paleoenvironment	1999
	Lac Nguene	paleoenvironment	1999
	Mouila-Fougamou	paleoenvironment	1997
	Mandji	paleoenvironment	
	Abeilles Forest	homme/milieu	1999
		archeology	

Name	Site(s)	Focus	Dates
65. Oslisly, R. (cont.)	Oyem	archeology	1985
	Mitzic	archeology	
	Libreville	archeology	1980–1990
	Cocobeach	archeology	1988
	Tchibanga	archeology	1986
	Mayumba	archeology	1986
	Mimongo-Koulamoutou Road	archeology	1992
	Oyan (road near Makokou)	archeology	1984
	Port-Gentil	archeology	1987
	Kribi, Cameroon		2000
	Ebodje, Cameroon		2000
	Campo Ma'an, Cameroon		2000
	Lac Assom, Cameroon		2000
	Banyang Mbo, Cameroon		1998
66. Reinartz, Gay, Zoological Society of Milwaukee	DRC	primates	1997, 2000–present
67. Schliewen, Ulrich	Barombi Mbo	fish	1990–1996, 2001
	Lake Bermin	fish	1990–1992
	Lake Ejagham	fish	1992–1994
	Lake Dissoni	fish	1996
	Lobéké-Boumba Bek-Nki	fish	1999–2000
	Rumpi Hills	fish	1996
68. Séraphin, Dondyas	WWF-CARPO	enquête socio-économique sur l'ens. du Gabon pour l'élaboration du Plan d'Action Forestier Tropical Gabon	
69. Steel, Lisa	Libreville and urban centers, Gabon	bushmeat	1993
70. Stenmanns, Frank	Equatorial Guinea	forestry and conservation project	1992–1999
71. Stiassny, Melanie	Gabon	fish	1998–2000
72. Telfer, Paul	Gabon-Lopé, Setté-Cama	primates	1994–2000
73. Teugels, Guy	ROC	fish	1990, 1991
	Cameroon	fish	
74. Thirakul, Souane	Cameroon, dense forest, savanna	dendrology	1980–1983
	Sudan		1982
	CAR		1990
	Ethiopia		1994

Name	Site(s)	Focus	Dates
75. Thomas, Duncan	Douala-Edéa	plants	1977–1978
	Korup		1978–2000
	Ejagham		1991
	Kupe		1986–1987
	Kicher Ljim		1986–1996
	Tchabel Mgabo		1996
	Campo Ma'an		1994–1996
	Rumpi Hills		1984–1995
	Bakossi Mountains		1986
76. Trefon, Théodore	Kinshassa	socio-economics and forest products	
	Libreville		
	Yaoundé		
77. Tutin, Caroline (CIRMF)	Lopé, Gabon	primates, plant-animal interactions, pherology	1983
78. IUCN Bureau Regional Bureau for Central Africa	Lac Télé, Likouala aux Herbes	conservation, development	1994–1999
	Conkouati	conservation, development	1994–1999
	Dja	conservation, development	1995–2000
		étude sur les sites critiques UICN/CEFDHAC	1998
		étude sur les lois et politiques	
		forestières des pays d'Afrique Centrale	
		UICN/CEFDHAC	1998
		projet régional cogestion UICN-GTZ pour les ressources naturelles (sites au Cameroon et au ROC)	1998–2000
79. Vabi, Michael B.	Korup	socio-economics and anthropology	1995–2000
	Kupe		1998–2000
	Lobéké		1998–2000
80. Van Noort, S.	Gabon–Mount Doudou	insects	2000
81. Vital, Kate Mbo	Virunga	primates	
	Tsmaberiaw	rodents	1996–present
82. Wallach, Van	Kinshassa — Kikwit-Lwiro	snakes	1978–1981
83. Walsh, Peter	Gamba-Banyag Mbo-Numbale-Lopé	large mammals	1996–1999

Name	Site(s)	Focus	Dates
84. Vande Weghe, Jean Pierre	Koluizi	birds	1985–1995
	Kalima, DRC	birds	1992
	Rangi, DRC	birds	1980–1985 1992–1993
	Pointe Denis	birds, butterflies	1999–2000
	Mondah	birds, butterflies	2000
85. White, Lee	Gabon	wildlife surveys, forest ecology	1989–present
86. Wilks, Chris	Midé	forest inventory	1980
	Wagny	forest inventory	1980
	Maki-Offoué	forest inventory	1980
	Chaillu Massif	forest inventory	1985
	Nyonyie	botanical inventory	1987
	Minkébé	botanical inventory	1987
	Lac Ezanga	botanical inventory	1991
	Atem	botanical inventory	1991
	Gamba (Ohoubou-Avocette)	botanical inventory	1992–1994
	Abeilles Forest	forest inventory	1988
	southern Lopé	forest inventory	
	Lastourville-OkonDja	forest inventory	1996–1998
	Bokoué	forest inventory	1995
	southern estuary	forest inventory	1998
	Mitemele	forest inventory	1980
	Mount Alén	botanical inventory	1996
	Ndoké	forest inventory	1999
	Aconbé-Nzook	forest inventory	1991
	Mounte Chaillu North (Mboumi)	forest inventory	1996
87. Zeh-Nlo, Martin	United Nations Development Program Cameroon	conservation	1999
88. Zephirin, Mogba	Innovative Resources Management	local management systems of natural resources	ongoing

APPENDIX D

Information and Data Sources

Data layer	Source
Birds	Worldmap, Zoological Museum, University of Copenhagen; BirdLife International
Mammals	Worldmap, Zoological Museum, University of Copenhagen; Africa Mammal Databank, University of Rome
Plants	Worldmap, University of Bonn; Worldmap, Jon Lovett; Missouri Botanical Gardens; Wageningen Herbarium
Reptiles, amphibians	Worldmap, Zoological Museum, University of Copenhagen
Fish	WWF database (Thieme et al. 2005)
Landcover	University of Maryland and Joint Research Centre, Italy, derived from Advanced Very High Resolution Radiometer maps from CARPE CD-ROM; WCMC mangrove database
Geographic basemap (rivers, topography)	Digital chart of the world; USGS Hydro 1K
Climate (temperature, rainfall)	Centre for Resource and Environmental Studies, Australian National University. 1995. Africa — a topographic and climatic database, version 1.0.
Infrastructure (roads, towns, administrative units)	Digital chart of the world (ESRI, 1993) from CARPE CD-ROM; Digital chart of the world (World Resources Institute 1995) from African data sampler (Nigeria)
Protected areas	WCMC database, 1999, including Yaoundé Workshop edits and edits to Minkébé and Lopé (from WRI); IUCN priority sites; Doumange
Logging concessions	WRI
Population	National Center for Geographic Information and Analysis at the University of California at Santa Barbara, 1994, Consortium for International Earth Science Information Network
Additional reference material	American Museum of Natural History; Marc Colyn