ZAMBIA

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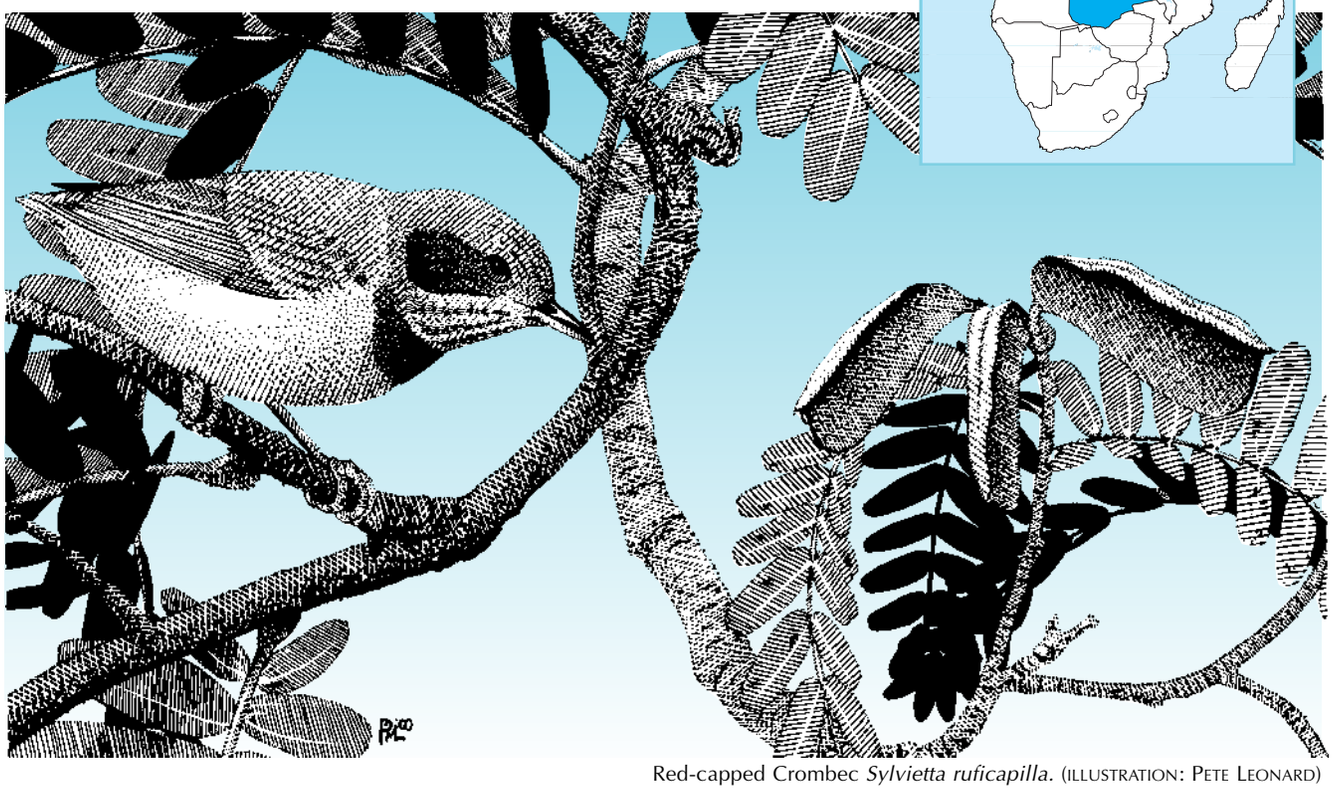

Red-capped Crombec *Sylvietta ruficapilla*. (ILLUSTRATION: PETE LEONARD)

GENERAL INTRODUCTION

The Republic of Zambia is a landlocked tropical country with an area of 752,614 km². It is bordered by Angola to the west, the Democratic Republic of Congo (formerly Zaïre) and Tanzania to the north, Malawi and Mozambique to the east, and Zimbabwe, Botswana and Namibia to the south. In 1994, the population was estimated to be 9.3 million, with an annual growth-rate of 3.2%, and the average population density was 12.4 people/km². Zambia's nine Provinces are divided into 53 Districts. The capital city, Lusaka, has an estimated population of 1.6 million. The major industrial and mining centres are north of the capital, on the Copperbelt.

Most of Zambia is an elevated plateau at 900–1,250 m above sea-level, with a general decline in the south-west towards the Kalahari basin. A small area in the north-east exceeds 2,000 m and, although a few other areas (mainly in the east) approach such altitudes, none are as biogeographically significant. Through Zambia lie several ancient rifted troughs, notably the Luangwa, Luano and Middle Zambezi Valleys and the country around Lakes Mweru and Tanganyika. Much of this land lies below 900 m and Zambia's lowest point is where the River Zambezi enters Mozambique, at 325 m above sea-level. Most of the country is drained by the Zambezi system which flows into the Indian Ocean. The remaining area lies within the River Congo catchment and thus eventually feeds into the Atlantic Ocean.

Zambia's climate can be divided into three seasons. The hot, rainy season usually lasts from five to six months between November and April. The remaining months are generally dry, with temperatures cooler between May and August and hotter in September and October. Annual rainfall averages between 700 mm and 1,500 mm, decreasing southwards and in the major low-lying river valleys.

Whilst aspects of Zambia's environment, flora and fauna are unique, the relative uniformity of her topography and biomes are not conducive to the evolution of nationally endemic species. However, Zambia can boast large tracts of pristine wilderness which are probably less exposed to environmental, population, industrial and political pressures than many neighbouring countries.

ORNITHOLOGICAL IMPORTANCE

Over 740 species have been recorded in Zambia. Of this total, well over 600 species are residents or Afrotropical migrants which breed or are assumed to do so—there is proof of breeding in Zambia for at least 470 of these species. About 100 Zambian species are non-breeding migrants or vagrants from the Palearctic region and the remainder comprise non-breeding Afrotropical migrants and vagrants.

Eighteen species of global conservation concern are listed for Zambia (Collar *et al.* 1994), of which two are classified as Endangered: *Sarothrura ayresii* and *Agapornis nigrigenis*. However, only the latter species has been recorded with certainty in Zambia. *Agapornis nigrigenis* has a restricted range that is centred on the small areas of mopane woodland north-west of Livingstone and, whilst it may occasionally wander into adjacent Namibia, it is virtually endemic to Zambia. It is possible that *Sarothrura ayresii* does occur in Zambia, if only sporadically, but at present there are no confirmed records.

Eight Vulnerable species occur regularly in Zambia. *Egretta vinaceigula* and *Grus carunculatus* occur in wetlands over a wide area, and the estimated numbers comprise a significant proportion of the world populations. *Falco naumanni* and *Crex crex* are widespread Palearctic migrants, the former perhaps occurring mainly on passage and the latter a wintering visitor which is probably more common than records suggest. *Hirundo atrocaerulea* is an Afrotropical migrant which breeds and occurs on passage in the eastern highlands. *Falco fasciinucha* and *Chloropeta gracilirostris* have very limited distributions and both are difficult to monitor due to the inaccessibility of their habitat. *Pogoniulus makawai* is still known only from the holotype. Many authorities now consider this specimen to represent an aberrant individual of *P. bilineatus*,

Map 1. Location and size of Important Bird Areas in Zambia.

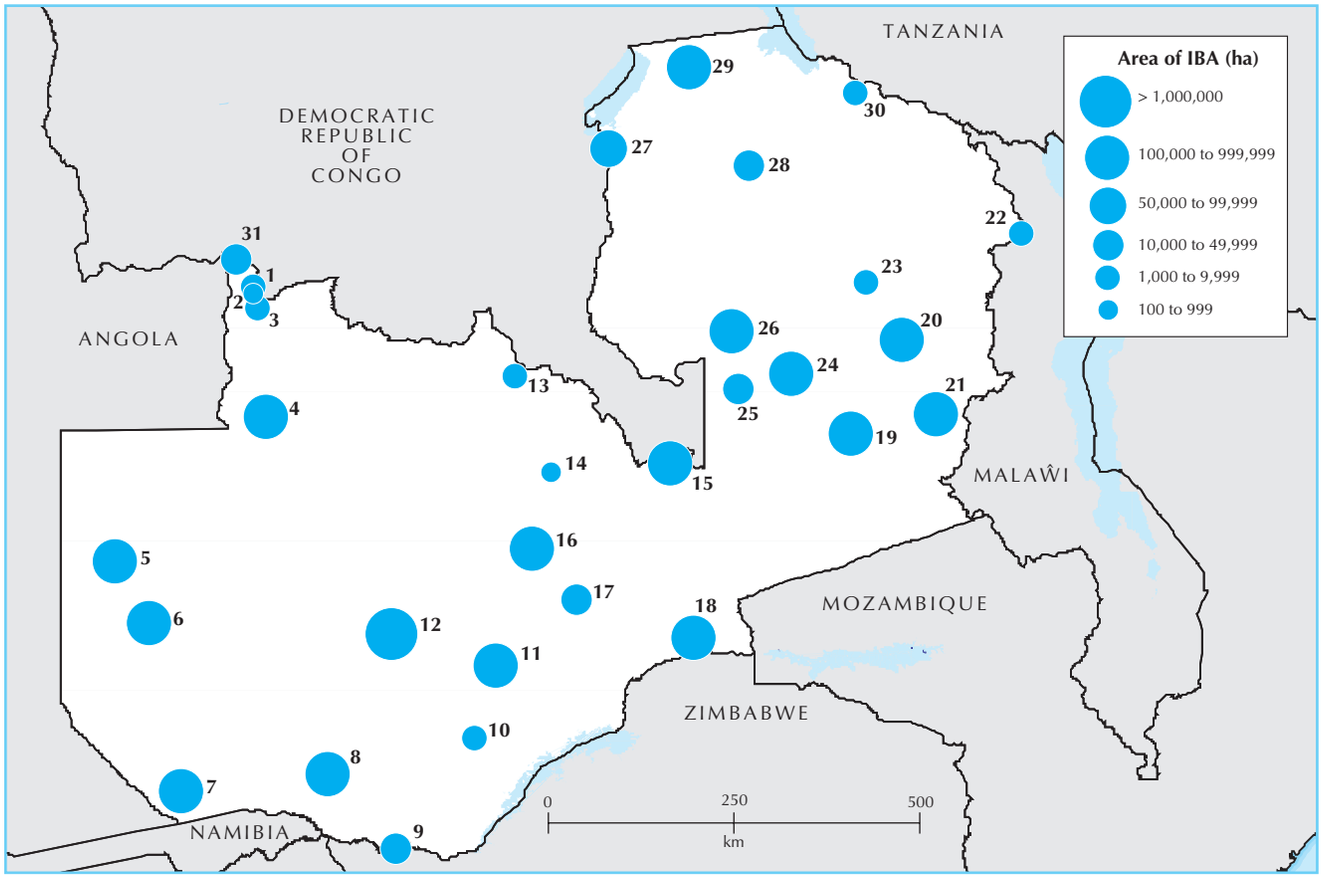

Table 1. Summary of Important Bird Areas in Zambia. 31 IBAs covering 86,413 km²

IBA code	Site name	Administrative region	Criteria (see p. 11; for A2/A3 codes, see Tables 2/3) A1	A2				A3				A4i	A4ii	A4iii
				105	s051	s052	s055	A05	A06	A07	A10			
ZM001	Hillwood	North Western	✔					✔			✔			
ZM002	Source of the Zambezi	North Western						✔			✔			
ZM003	Chitunta plain	North Western	✔								✔			
ZM004	West Lunga National Park and Lukwakwa	North Western	✔			✔					✔			
ZM005	Liuwa Plain National Park	Western	✔								✔	✔		
ZM006	Barotse flood-plain	Western	✔									✔		
ZM007	Sioma Ngwezi National Park	Western									✔			
ZM008	Machile	Southern	✔		✔						✔		✔	
ZM009	Mosi-oa-Tunya and the Batoka Gorge	Southern	✔								✔	✔		
ZM010	Nkanga river conservation area	Southern	✔								✔			
ZM011	Kafue flats	Southern, Central	✔								✔	✔		✔
ZM012	Kafue National Park	North Western, Central, Southern	✔		✔						✔	✔	✔	
ZM013	Chimfunshi	Copperbelt									✔			
ZM014	Imanda	Copperbelt									✔			
ZM015	North Swaka	Central									✔			
ZM016	Lukanga swamp	Central	✔											✔
ZM017	Chisamba	Central	✔								✔			
ZM018	Lower Zambezi National Park	Lusaka									✔	✔	✔	
ZM019	South Luangwa National Park	Central, Northern, Eastern	✔								✔	✔	✔	
ZM020	North Luangwa National Park	Northern									✔			
ZM021	Lukususi National Park	Eastern									✔			
ZM022	Nyika National Park	Eastern	✔	✔						✔				
ZM023	Shiwa Ng'andu	Northern	✔								✔			
ZM024	Lavushi Manda National Park	Northern	✔								✔			
ZM025	Kasanka National Park	Central	✔								✔			
ZM026	Bangweulu swamps	Northern, Luapula	✔								✔	✔		
ZM027	Luapula mouth	Luapula	✔						✔		✔			
ZM028	Kalungwishi	Northern	✔								✔			
ZM029	Mweru Wantipa National Park	Luapula, Northern	✔								✔	✔		
ZM030	Saisi river	Northern	✔				✔				✔			
ZM031	Jimbe drainage	North Western						✔			✔			
	Total number of IBAs qualifying:		22	1	2	1	1	3	1	1	28	9	4	2

but the possibility of the taxon being validated cannot be excluded. Two other Vulnerable species, *Gyps coprotheres* and *Aquila clanga*, are not listed for Zambia by Collar *et al*. (1994).

Eight globally near-threatened species occur regularly in Zambia. *Lybius chaplini* is the country's only true endemic, known from a relatively small area centred on the Kafue flats, from about 14°S through much of Southern Province. It is localized and generally associated with the fig-tree *Ficus sycomorus* in open country. Its level of dependence on *Ficus sycomorus* requires investigation, as does the current status of the tree itself. *Balaeniceps rex* is one of the few species that tourists come to Zambia with the specific aim of seeing. The majority inhabit the extensive swamps of the Bangweulu basin and, to a lesser degree, around Lake Mweru Wantipa. *Macronyx grimwoodi* and *Cisticola njombe* are localized residents—the former is known from wet dambos in parts of North-western Province and the latter (a restricted-range species) from rank grass and bracken-briar on the Nyika Plateau. Of three non-breeding Palearctic migrants in this category, *Glareola nordmanni* is rarely recorded other than on passage, but is possibly overlooked, and very large movements have been witnessed (e.g. at Liuwa Plain National Park, IBA ZM005). *Gallinago media* and *Circus macrourus* are widespread during the rains, the former is probably under-recorded, but the latter seems genuinely sparse. *Phoenicopterus minor* is recorded in Zambia occasionally, and has even attempted to breed, but it is essentially a vagrant. A ninth globally near-threatened species, *Ardeola idea* (not listed for Zambia by Collar *et al*. 1994), has been recorded in Zambia even less frequently, but may be a regular visitor in very small numbers.

The conservation status of several other species occurring in Zambia is perhaps a cause for concern at a subregional level. *Podiceps cristatus* has undergone a dramatic decline over its East African range in recent years and the sparse records from Zambia over the last decade perhaps suggest a parallel trend. Similarly, *Botaurus stellaris capensis*, a subspecies restricted to the southern Afrotropical region, has disappeared from large areas of its former range and it would seem that parts of Zambia (principally the Bangweulu basin) are its last stronghold. *Terathopius ecaudatus* is still very widespread but, as with countries further south, it has become scarce in many farming areas. *Eupodotis senegalensis* was once more widespread than it is now, with most recent records coming from areas west of the Zambezi. There is also concern about *Neotis denhami* in both eastern and southern Africa, so it would seem wise to monitor Zambian populations carefully. *Buphagus africanus* and *B. erythrorhynchus* were formerly more widespread and seem to have suffered from both the decrease in large-mammal populations and from the use of poisonous cattle-dips. However, recent records from long-vacated areas suggest that, with the gradual change to safe dipping chemicals, these two species may begin to recolonize.

A threat which continues to face certain species is that of illegal live-export. Recently, both *Balaeniceps rex* and *Grus carunculatus* have been seen being exported, and it seems likely that these were not isolated incidents. The possibility of a resumption in the illegal trade of *Agapornis nigrigenis* should not be ignored.

Of the 11 species with restricted ranges that occur in Zambia, three are of global conservation concern and have been described above—the range of *Agapornis nigrigenis* defines the Southern Zambia Secondary Area (s051) of avian endemism, the range of *Pogoniulus makawai* defines the North-west Zambia Secondary Area (s052), and *Cisticola njombe* is one of eight species whose distributions jointly define the Zambian sector of the Tanzania–Malaŵi mountains Endemic Bird Area (EBA 105), the other seven species being *Phyllastrephus alfredi*, *Laniarius fuelleborni*, *Sheppardia sharpei*, *Cisticola nigriloris*, *Apalis chapini*, *Serinus whytii* and *Euplectes psammocromius*. The eleventh restricted-range species, *Ploceus reichardi*, is known in Zambia from a single locality on the Saisi river, on the border with Tanzania, and this site defines the Zambian part of the South-west Tanzanian swamps Secondary Area (s055).

Most of the country falls within the Zambezian biome (code A10), with Zambia holding 56 out of the 67 species that are restricted to this biome. Within this region there are a number of factors affecting the avifauna. Altitude, as described above, is a particularly significant environmental factor. The low-lying valleys not only hold certain species not found elsewhere, but also act as natural barriers in terms of the distribution of many plateau species, and also play an important role in altitudinal movements. At the other extreme, a small portion of the north-east, notably the Nyika Plateau, Mafinga and Makutu mountains, is covered by the Afrotropical Highlands biome (A07), and holds 41 out of the 226 species in the continent that are restricted to this biome.

Table 2. The occurrence of restricted-range species at Important Bird Areas in Zambia. Sites that meet the A2 criterion are highlighted in **bold**. Species of global conservation concern are highlighted in **bold blue**.

105 – Tanzania–Malaŵi mountains Endemic Bird Area (eight species in Zambia; one site meets the A2 criterion)	
IBA code:	**022**
Phyllastrephus alfredi	✔
Laniarius fuelleborni	✔
Sheppardia sharpei	✔
Cisticola nigriloris	✔
Cisticola njombe	✔
Apalis chapini	✔
Serinus whytii	✔
Euplectes psammocromius	✔
Number of species recorded:	**8**

s051 – Southern Zambia Secondary Area (two sites meet the A2 criterion)		
IBA code:	**008**	**012**
Agapornis nigrigenis	✔	✔

s052 – North-west Zambia Secondary Area (one site meets the A2 criterion)	
IBA code:	**004**
Pogoniulus makawai	✔

s055 – South-west Tanzanian swamps Secondary Area (one site meets the A2 criterion)	
IBA code:	**030**
Ploceus reichardi	✔

Species diversity increases in proportion to rainfall, and this is particularly apparent in the north-west, where the rainy season may last from seven to eight months. The Guinea–Congo Forests biome (A05) extends to this region (its southern limit), and 17 species can be found here out of the 278 species that are restricted to this biome continent-wide. A few species are confined to the areas within the River Congo catchment zone, including two of the 13 species in Africa that are restricted to the Lake Victoria Basin biome (A06). In the dry south-west, two species characteristic of the Kalahari–Highveld biome (A11) reach Zambia, out of the 13 species that are restricted to this biome.

The distributions of numerous birds (especially Zambezian biome endemics) are centred on Zambia, and amongst these are many which are either of marginal occurrence or sparse elsewhere. Examples of those with significant Zambian populations might include *Hieraaetus ayresii*, *Sarothrura lugens*, *Pachycoccyx audeberti*, *Tricholaema frontata*, *Cossypha bocagei* and *Lanius souzae*. In addition, Zambia probably provides the principal non-breeding grounds for species such as *Gallinago media* and *Ficedula albicollis*. There are a small number of endemic and near-endemic subspecies (Aspinwall and Leonard 1998).

Overall, Zambia's importance for bird populations lies mainly in her extensive woodlands and wetlands which support large numbers of many species. However, all the major habitats have distinct bird communities (see Benson *et al*. 1971), and these habitats and communities are described below.

Zambia's vegetation is dominated by woodland of various types (White 1983). Miombo (dominated by trees of *Brachystegia*, *Julbernardia* and *Isoberlinia*) constitutes about 80% of this woodland and is associated with elevated plateaus, erosion surfaces and escarpments. In many areas, miombo forms a mosaic with grassy dambos along the drainage lines. Being neither strictly evergreen nor deciduous, it is best regarded as 'transition woodland' (White 1983). The canopy is usually closed, but the comparatively thin foliage allows sufficient light to reach the ground and support a continuous ground-cover of grasses and herbs. Many of these annuals rely on regular fires to clear mats of dead grass that suppress new growth, thus miombo is a fire-climax vegetation-type. Without regular fires, miombo in higher-rainfall areas returns to evergreen

forest, via 'transition woodland' (Trapnell 1959, White 1983). This has been demonstrated by the well-known experiments with protected plots on the Copperbelt. Although there are various different miombo formations, it is not yet clear how these affect bird distributions, which are often noticeably patchy on a local scale. Mixed-species bird parties are typical of this habitat. Bird species endemic to miombo include *Tockus pallidirostris*, *Tricholaema frontata*, *Monticola angolensis*, *Cercotrichas barbata*, *Eremomela atricollis*, *Sylvietta ruficapilla*, *Muscicapa boehmi*, *Anthreptes anchietae*, *Lanius souzae*, *Plocepasser rufoscapulatus* and *Ploceus angolensis*.

Most mopane woodland occurs in one of two blocks. The first lies at low altitudes in the Luangwa, Luano and Middle Zambezi valleys and the second in a narrow belt between the Zambezi and the Kafue, north-west of Livingstone. Mopane (*Colophospermum mopane*) often grows in monospecific stands and the structure of mature ('cathedral') mopane is not unlike miombo; however, it tolerates a wider range of soil-types and is often associated with poorly drained, alkaline soils with a high clay content. No birds are endemic to mopane, but the species spectrum is somewhat distinctive and can include *Pterocles bicinctus*, *Agapornis lilianae* or *A. nigrigenis*, *Tockus erythrorhynchus*, *Lamprotornis mevesii*, *Passer diffusus* and *Plocepasser mahali*.

Other types of savanna woodland are less easy to categorize, but those dominated by a mixture of *Acacia*, *Combretum* and *Terminalia* species are often known as munga. Although no species are confined to this woodland-type, its avifauna remains distinctive and characteristic birds include *Streptopelia capicola*, *Halcyon chelicuti*, *Merops pusillus*, *Lybius torquatus*, *Dendropicos fuscescens*, *Sylvietta rufescens*, *Nilaus afer*, *Dryoscopus cubla* and *Serinus mozambicus*. Similar formations, but often more scrubby, develop in areas of much human activity, and a certain amount of scrub occurs naturally. Characteristic species include *Cercotrichas leucophrys*, *Cisticola chiniana*, *Prinia subflava*, *Tchagra senegalensis* and *Euplectes capensis*.

Little monodominant *Acacia* woodland occurs in Zambia, but certain bird species, such as *Streptopelia decipiens* and *Eremomela usticollis*, are invariably associated with *Acacia* trees. In the far south-west, areas dominated by trees of this genus are home to species such as *Tricholaema leucomelas*, *Laniarius atrococcineus*, *Lamprotornis nitens* and *Estrilda erythronotos*.

Extensive deciduous thickets (itigi) occur in the low-lying area between Lakes Mweru and Tanganyika. Typical birds include the migratory *Pitta angolensis* and the resident *Nicator gularis*. The same species are found in similar habitat in the Luangwa, Luano and Middle Zambezi Valleys alongside *Francolinus natalensis*, *Cercococcyx montanus*, *Andropadus importunus*, *Cercotrichas quadrivirgata* and *Erythrocercus livingstonei*.

Generally smaller areas of thicket occur over much, but not all, of the plateau and most notably in parts of Southern Province. Such patches may be very small and found within other habitats. The birds inhabiting them are the most widespread of thicket species and include *Chlorocichla flaviventris*, *Phyllastrephus terrestris*, *Camaroptera brachyura* and *Pytilia melba*.

Moist evergreen forest or mushitu is typically found along drainage lines, north of about 14°S. Whereas riparian forest tends to occur in thin, dual strips along a watercourse, mushitu tends to form single isolated blocks, which may be rather broad and are often

Table 3. The occurrence of biome-restricted species at Important Bird Areas in Zambia. Sites that meet the A3 criterion are highlighted in **bold**. Species of global conservation concern are highlighted in **bold blue**. Any other species with a restricted range are highlighted in blue.

A05 – Guinea–Congo Forests biome
(17 species in Zambia; three sites meet the A3 criterion)

IBA code:	**001**	**002**	004	**031**
Sarothrura pulchra	✔			✔
Columba unicincta	✔	✔		✔
Columba iriditorques	✔	✔	✔	✔
Cercococcyx olivinus	✔	✔	✔	✔
Alcedo leucogaster				✔
Campethera caroli	✔			✔
Baeopogon indicator	✔	✔		✔
Bleda syndactyla	✔	✔		✔
Neocossyphus fraseri	✔	✔		✔
Apalis rufogularis	✔	✔		✔
Muscicapa infuscata		✔		✔
Muscicapa cassini				
Bias flammulatus				✔
Platysteira castanea				✔
Terpsiphone rufiventer	✔	✔		✔
Nectarinia batesi	✔	✔		✔
Nectarinia rubescens	✔			✔
Number of species recorded:	**12**	**10**	2	**16**

A06 – Lake Victoria Basin biome
(two species in Zambia; one site meets the A3 criterion)

IBA code:	**027**
Bradypterus carpalis	✔
Chloropeta gracilirostris	✔
Number of species recorded:	**2**

A07 – Afrotropical Highlands biome
(41 species in Zambia; one site meets the A3 criterion)

IBA code:	001	002	**022**	023	031
Sarothrura affinis			✔		
Streptopelia lugens			✔		
Caprimulgus poliocephalus			✔		
Schoutedenapus myoptilus			✔		
Apaloderma vittatum			✔		
Pogoniulus leucomystax			✔		
Hirundo atrocaerulea			✔		
Andropadus nigriceps			✔		

A07 – Afrotropical Highlands biome ... continued
(41 species in Zambia; one site meets the A3 criterion)

IBA code:	001	002	**022**	023	031
Chlorocichla laetissima					
Phyllastrephus alfredi			✔		
Laniarius fuelleborni			✔		
Zoothera gurneyi			✔		
Alethe fuelleborni			✔		
Pogonocichla stellata			✔		
Sheppardia sharpei			✔		
Cossypha anomala			✔		
Pseudoalcippe abyssinica			✔		
Cisticola nigriloris			✔		
Cisticola njombe			✔		
Apalis chapini			✔		
Bradypterus alfredi	✔	✔			✔
Bradypterus cinnamomeus			✔		
Chloropeta similis			✔		
Phylloscopus ruficapilla					
Sylvia lugens			✔		
Dioptrornis fischeri			✔		
Trochocercus albonotatus			✔	✔	
Nectarinia prigoginei			✔		
Nectarinia mediocris			✔		
Nectarinia kilimensis			✔		
Nectarinia johnstoni			✔		
Serinus frontalis					
Serinus hypostictus			✔		
Serinus whytii			✔		
Cryptospiza reichenovii			✔		
Estrilda melanotis			✔		
Ploceus baglafecht			✔		
Ploceus bertrandi			✔		
Euplectes psammocromius			✔		
Onychognathus walleri			✔		
Onychognathus tenuirostris			✔		
Number of species recorded:	1	1	**37**	1	1

Table 3 ... continued. The occurrence of biome-restricted species at Important Bird Areas in Zambia. Sites that meet the A3 criterion are highlighted in **bold**. Species of global conservation concern are highlighted in **bold blue**. Any other species with a restricted range are highlighted in blue.

A10 – Zambezian biome (56 species in Zambia; 28 sites meet the A3 criterion)

IBA code:	**001**	**002**	**003**	**004**	**005**	006	**007**	**008**	**009**	**010**	**011**	**012**	**013**	**014**	**015**	016	**017**	**018**	**019**	**020**	**021**	022	**023**	**024**	**025**	**026**	**027**	**028**	**029**	**030**	**031**
Falco dickinsoni	✔		✔	✔	✔	✔	✔	✔		✔	✔	✔		✔		✔	✔	✔	✔	✔	✔	V	✔		✔		✔	✔			✔
Agapornis nigrigenis								✔				✔																			
Agapornis lilianae																		✔	✔	✔											
Centropus cupreicaudus			✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔						✔		✔	✔	✔	✔	✔	✔	
Merops boehmi				✔							V	✔												✔	✔				✔		
Coracias spatulatus				✔	✔		✔	✔	✔	✔	✔	✔			✔		✔	✔	✔	✔	✔		✔	✔	✔	✔		✔			✔
Tockus bradfieldi							✔	✔				✔																			
Tockus pallidirostris	✔	✔	✔	✔								✔	✔		✔		✔	✔		✔	✔		✔	✔	✔			✔			✔
Stactolaema anchietae		✔													✔									✔	✔						
Stactolaema whytii													✔										✔		✔			✔			
Pogoniulus makawai				✔																											
Tricholaema frontata	✔	✔		✔						✔	✔	✔	✔		✔		✔				✔		✔	✔	✔			✔			✔
Lybius chaplini										✔	✔	✔					✔														
Lybius minor	✔			✔								✔	✔	✔	✔		✔		✔				✔	✔	✔	✔		✔			✔
Mirafra angolensis	✔		✔														✔														
Hirundo nigrorufa	✔		✔																									✔			✔
Hirundo rufigula	✔		✔																												
Macronyx fuellebornii	✔		✔	✔	✔					✔	✔	✔	✔		✔		✔						✔	✔	✔	✔		✔		✔	✔
Macronyx grimwoodi			✔																												
Lanius souzae	✔	✔	✔	✔	✔		✔			✔		✔	✔		✔		✔				✔		✔	✔	✔			✔			✔
Monticola angolensis	✔	✔		✔					✔	✔		✔			✔		✔				✔	✔	✔	✔	✔			✔			✔
Cercotrichas barbata	✔	✔	✔	✔								✔	✔		✔		✔				✔		✔	✔	✔	✔		✔			✔
Myrmecocichla arnotti	✔			✔			✔	✔	✔	✔	✔	✔	✔		✔		✔	✔	✔	✔	✔		✔	✔	✔			✔			✔
Pinarornis plumosus																															
Turdus libonyana	✔	✔	✔	✔			✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔		✔			✔
Turdoides hartlaubi			✔	✔	✔	✔	✔			✔	✔	✔		✔	✔	✔							✔	✔	✔	✔	✔	✔			
Cisticola pipiens			✔	✔	✔	✔	✔					✔	✔	✔	✔								✔		✔	✔	✔	✔	✔	✔	
Cisticola angusticauda		✔		✔									✔										✔	✔	✔						✔
Cisticola dambo	✔		✔																												
Calamonastes undosus	✔	✔	✔	✔			✔			✔	✔	✔	✔		✔		✔	✔	✔	✔	✔		✔	✔	✔			✔			✔
Eremomela atricollis	✔	✔										✔	✔		✔								✔	✔	✔			✔			✔
Sylvietta ruficapilla	✔	✔	✔	✔	✔					✔		✔	✔		✔		✔				✔		✔	✔	✔			✔			✔
Phylloscopus laurae	✔	✔											✔	✔									✔					✔			✔
Muscicapa boehmi	✔	✔										✔			✔				✔	✔	✔		✔	✔	✔			✔			
Batis margaritae	✔			✔									✔	✔																	
Parus rufiventris	✔	✔	✔	✔	✔		✔					✔	✔		✔		✔	✔			✔		✔	✔	✔			✔			✔
Parus griseiventris	✔	✔	✔	✔	✔		✔			✔		✔	✔		✔		✔	✔			✔		✔	✔	✔	✔		✔			✔
Anthreptes anchietae												✔			✔								✔	✔	✔			✔			✔
Nectarinia bannermani	✔	✔																													✔
Nectarinia talatala	✔				✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔		✔		✔	✔					
Nectarinia oustaleti																							?					✔			
Nectarinia manoensis	✔			✔						✔		✔			✔						✔		✔	✔				✔			✔
Nectarinia shelleyi										✔		✔						✔	✔	✔											
Serinus mennelli	✔	✔	✔							✔		✔			✔		✔	✔			✔		✔	✔	✔			✔			
Lagonosticta nitidula				✔	✔	✔	✔		✔		✔	✔	✔	✔		✔							✔	✔	✔	✔	✔		✔	✔	
Vidua codringtoni										✔	✔								✔												
Vidua obtusa	✔		✔	✔					✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔		✔		✔			✔			✔
Plocepasser rufoscapulatus												✔	✔		✔				✔	✔	✔		✔								
Ploceus temporalis	✔		✔																												
Ploceus katangae																										✔	✔		✔		
Ploceus reichardi																														✔	
Ploceus olivaceiceps																					✔										
Ploceus angolensis				✔											✔								✔								
Lamprotornis acuticaudus				✔	✔	✔	✔					✔	✔												✔	✔					
Lamprotornis mevesii								✔			✔	✔						✔	✔	✔											
Neocichla gutturalis																				✔	✔										
Number of species recorded:	**28**	**17**	**21**	**27**	**13**	7	**15**	**9**	**8**	**20**	**15**	**34**	**23**	**9**	**27**	7	**21**	**14**	**14**	**13**	**21**	1	**31**	**24**	**30**	**13**	**6**	**28**	**5**	**5**	**22**

V Vagrant
? The presence of this species is not absolutely certain (sight records might refer to the very similar *N. talatala*).

A11 – Kalahari–Highveld biome (two species in Zambia; no sites meet the A3 criterion)

IBA code:	007	008
Pterocles burchelli	✔	
Lamprotornis australis	✔	✔
Number of species recorded:	2	1

in the centre of dambos. Surface water may or may not be present, though there is always a deep bed of damp leaf-litter. The avifauna of mushitu is always very different to that of the surrounding habitat, and characteristic species include *Pogoniulus bilineatus*, *Campephaga quiscalina*, *Andropadus virens*, *Chlorocichla flavicollis*, *Phyllastrephus cabanisi*, *Turdus pelios*, *Sheppardia bocagei*, *Bradypterus lopezi*, *Phylloscopus laurae*, *Apalis cinerea*, *Trochocercus cyanomelas*, *Nectarinia olivacea*, *Telophorus multicolor*, *Dicrurus ludwigii*, *Lamprotornis splendidus* and *Ploceus bicolor*.

In northern Mwinilunga District, such forests are particularly well developed and, in addition, to the above species, a number of birds characteristic of the Guinea–Congo Forests biome occur, including *Columba unicincta*, *Cercococcyx olivinus*, *Baeopogon indicator*, *Bleda syndactyla*, *Neocossyphus fraseri*, *Apalis rufogularis*, *Nectarinia batesi* and *N. rubescens*. A few species, at their southern limits of distribution, such as *Ptyrticus turdinus*, *Cossypha polioptera* and *Bradypterus alfredi*, are also known from northernmost Luapula Province.

The avifauna of montane forest in the eastern highlands belongs to the Afromontane Highlands biome and shares very few species with the other types of moist forest in Zambia. Characteristic birds include *Apaloderma vittatum*, *Pogoniulus leucomystax*, *Andropadus nigriceps*, *Alethe fuelleborni*, *Sheppardia sharpei*, *Cossypha anomala*, *Pseudoalcippe abyssinica*, *Apalis chapini* and *Cryptospiza reichenovii.*

Dry forest-types on Kalahari sands include the deciduous mutemwa (teak *Baikiaea*) forest of the south-west and the evergreen mavunda (*Cryptosepalum*) forest, mainly in the north-west. Both types are vulnerable to fire. Ornithologically, the latter is more notable, supporting a combination of miombo species in the canopy and mushitu and thicket species in the lower strata. In Zambia, *Telophorus viridis* is restricted to this habitat, and other characteristic species include *Guttera pucherani*, *Campephaga quiscalina*, *Batis margaritae* and *Dicrurus ludwigii*. Still known only from the type-specimen, *Pogoniulus makawai*, if it is a valid species, may be endemic to this habitat.

Several other related categories of forest are less well defined, but worthy of mention. Riparian forest is widespread and home to many species such as *Gorsachius leuconotus* and *Scotopelia peli*. In more northerly areas, the distinctions between this and mushitu may become blurred in places. Certain birds are generally associated with bracken-briar and other forms of tangled growth found along forest margins, but rarely enter the forest. These include the widespread *Estrilda perreini*, and the more restricted *Prinia leucopogon* in Mwinilunga and Luapula Provinces, and *Bradypterus cinnamomeus* at montane levels. A number of more adaptable species appear to be equally at home in forest and rich woodland, such as *Tauraco schalowi*. However, the occurrence in woodland of some, such as *Apaloderma narina*, is strictly seasonal. A few species favour areas where forest and swamp meet (not to be confused with the term 'swamp-forest' sometimes used for 'mushitu'), including *Tchagra minuta* and *Pyrenestes ostrinus*.

Dry grassland occurs patchily over much of Zambia, but is most extensive in the west, where characteristic bird species include *Francolinus albogularis*, *Eupodotis senegalensis* and *Calandrella conirostris*. Other typical species that occur more widely include *Vanellus coronatus*, *Mirafra africana*, *Anthus vaalensis* and *Cisticola aridulus*.

A large proportion of Zambia's wetter grasslands take the form of dambos. These occur on shallow drainage lines over most of the plateau and range from the narrow and relatively dry to the broad, spongy and wet. Some may even contain perennial rivers or areas of permanent swamp, and thus the differences between the wettest dambos and the more permanent wetlands are negligible. Birds inhabiting the grassy areas include *Coturnix chinensis*, *Sarothrura lugens*, *Macronyx fuellebornii*, *Cisticola brunnescens*, *C. robustus*, *Euplectes hartlaubi*, *Estrilda paludicola* and *Ortygospiza locustella*.

Montane grassland in the eastern highlands is home to species such as *Francolinus levaillantii*, *Coturnix coturnix* and *Cisticola ayresii*.

Zambia is rich in large wetlands and therefore supports large numbers of resident and migratory waterbirds. Congregations of many species meeting the 1% threshold are known from several areas and these are detailed in the site accounts.

Many rivers, such as the Kafue and Zambezi, have wide floodplains which, when dry, hold birds such as *Neotis denhami*, *Glareola pratincola*, *Anthus richardi*, *Ortygospiza atricollis* and many of the species characteristic of dry grassland. When inundated, the spectrum changes dramatically and families such as herons and egrets (Ardeidae), ibises and spoonbills (Threskiornithidae) and wildfowl (Anatidae) may be well represented. As floodwaters recede, areas of mud are exposed and these are especially favoured by waders (Charadriidae and Scolopacidae).

An important habitat, not only for resident species, but also for large numbers of breeding waterbirds, is swamp. Resident swamp-dwellers include *Botaurus stellaris*, *Ardea purpurea*, *Balaeniceps rex*, *Porphyrio porphyrio*, *Centropus cupreicaudus*, *Bradypterus baboecala* and *Acrocephalus gracilirostris*. The formations are variable, but only areas dominated by *Cyperus papyrus* show significant differences in avifauna and are the preferred habitat of species such as *Acrocephalus rufescens* and *Muscicapa aquatica*. *Bradypterus carpalis* and *Chloropeta gracilirostris* are restricted in Zambia to the papyrus swamp at the mouth of the Luapula river where it enters Lake Mweru.

Zambia has several large lakes and dams, such as Bangweulu, Mweru, Tanganyika and Kariba. The margins of these may support a limited number of species, but areas of open water, particularly where deep, are often less rich in birds. In shallower parts, species of *Phalacrocorax*, *Pelecanus* and *Chlidonias* occur. In some areas, notably on Kalahari sands in the west, seasonal pans develop in the rains. Many waterbirds take advantage of these, including *Egretta vinaceigula*, *Dendrocygna viduata*, *Anas erythrorhyncha* and *Gallinula angulata*. Rivers such as the Zambezi and Luangwa have well-defined channels along much of their length and support fair numbers of waterbirds, especially when floodwaters fill adjacent oxbow lakes. They also provide two further ornithologically important habitats: sandbars and sand cliffs. Species associated with the former include *Alopochen aegyptiacus*, *Burhinus vermiculatus*, *Vanellus albiceps*, *Charadrius marginatus* and *Rynchops flavirostris*. Those making extensive use of sand cliffs for breeding include *Apus horus*, *Merops bullockoides*, *M. nubicoides* and *Riparia paludicola*.

Several more specialized habitats have an effect on bird distributions. Woodland on rocky ground occurs over much of Zambia, though not on Kalahari sands, and is favoured by a number of species such as *Anthus lineiventris*, *Cercomela familiaris* and *Cisticola aberrans*. Extensive rock exposures are of limited occurrence, mainly in the south-east of the country. Typical birds include *Buteo augur*, *Aquila verreauxii*, *Hirundo fuligula*, *Myrmecocichla cinnamomeiventris*, *Corvus albicollis* and *Onychognathus morio*. Even more localized are species occupying precipices, such as *Falco fasciinucha*, or granite kopjes in Eastern Province, such as *Pinarornis plumosus* and *Emberiza capensis*. A few aerial feeders such as *Apus apus*, *Merops apiaster* and *Hirundo rustica* occur in the sky, irrespective of the habitat below. Many dry-season visitors require bare open ground and usually this only becomes available after a bush fire. Species characteristic of burnt ground include *Rhinoptilus chalcopterus*, *Cursorius temminckii* and *Pinarocorys nigricans.* Termite mounds are found throughout the country in a variety of habitats and can often affect bird distribution, such as in miombo where they provide small islands of thicket. Areas dominated by termitaria and supporting only scattered shrubs are favoured by such characteristic species as *Oenanthe pileata* and *Myrmecocichla nigra*.

A few species have close associations with certain trees, notably: *Gypohierax angolensis* with *Raphia* palms; *Falco chicquera*, *Cypsiurus parvus* and *Cichladusa arquata* with *Borassus* and *Hyphaene* palms; *Bubalornis niger* and *Telacanthura ussheri* with baobabs (*Adansonia digitata*); and *Lybius chaplini* with *Ficus sycomorus*. Large mammals (domestic and wild) play an important role in the lives of some birds, the most obvious being the two species of *Buphagus*. *Bubulcus ibis*, *Motacilla flava* and *Creatophora cinerea* also frequently feed around them. Vultures (Accipitridae), and to a lesser extent *Leptoptilos crumeniferus*, depend on their carcasses. Two further food-sources attract a wide variety of birds—insects fleeing bush fires fall prey to such species as *Milvus migrans*, *Dicrurus adsimilis*, *Coracias* and *Hirundo* species, and at flying-termite emergences almost any species can be found enjoying a free feast.

Lastly, man's influence on bird distribution has been significant. Artificial waterbodies have affected the movements and distribution of many waterbirds. Cleared arable land may attract *Ciconia abdimii*, migrant *Aquila* and *Falco* species and many other species

typical of bare ground. Where farmland is fallow or regenerating, *Turnix sylvatica*, *Streptopelia* and *Euplectes* species may occur, and airstrips offer an artificially dry and bare habitat where species characteristic of dry grassland are invariably found.

Of the various man-made constructions utilized by birds, pylons, electricity and telephone wires are used as perches by various species of raptor (Accipitridae), bee-eater (Meropidae), roller (Coraciidae) and swallow (Hirundinidae), and scrub-loving birds colonize the cleared land below. Species such as *Tyto alba*, *Passer griseus*, *P. domesticus* and *Lagonosticta senegala* often breed in and around houses and large buildings, and bridges often serve as cliff substitutes for nesting *Apus affinis*, *Hirundo abyssinica* and *H. rufigula*. *Hirundo semirufa*, in particular, takes advantage of culverts for this purpose. For details of the habitat requirements of Zambian birds, see the species accounts in Benson *et al.* (1971).

CONSERVATION INFRASTRUCTURE AND PROTECTED-AREA SYSTEM

There are 19 National Parks in Zambia, covering nearly 9% of the country and most of its important ecosystems. In addition, 35 Game Management Areas (GMAs) account for a further 22%. Thus in total nearly 31% of Zambia's land surface is under the jurisdiction of the Zambia Wildlife Authority (ZAWA). These two types of protected area differ in three main respects: entrance into and residence in GMAs is unrestricted, and within their limits controlled hunting may take place. These areas together form the basis of a wildlife-management concept which affords protection of breeding resources within the National Parks, and provision for sustainable utilization of wildlife in the surrounding GMAs. The ZAWA is the most important Department concerned with conservation and management of the environment in Zambia.

About 70,000 km² (9%) of Zambia's forests and woodlands are managed as Protection and Production Forest Reserves by the Forest Department. The Forest Act recognizes two types of forest: National and Local. National Forests are for the conservation and development of forests with a view to securing supplies of timber and other forest produce, providing protection against floods, erosion and desiccation, and maintaining the flow of rivers. The Act provides that Local Forests shall be used exclusively for securing supplies of timber and affording protection for land and water-supplies at the local level. In recent years, a particularly worrying trend of degazetting many National and Local Forests has developed.

There are smaller areas of natural, historical and archaeological significance to Zambia. A few Bird and other Nature Sanctuaries come under the protection of the Zambia Wildlife Act. The National Monuments Commission and the National Museums Board are responsible for sites and artefacts of scenic, natural, cultural, historical and archaeological significance. The National Heritage Conservation Commission is responsible for National Heritage Sites. Although not statutory, protection of some natural resources is provided by privately controlled estates. Game-ranching is a rapidly expanding industry in Zambia.

All wild birds are protected under the Zambia Wildlife Act and it is a criminal offence to hunt, kill, capture or be in possession of any wild bird without a licence. Two sub-categories comprise firstly gamebirds—mainly ducks and geese (Anatidae) and francolins and quails (Phasianidae)—which may be hunted in specified seasons in specified numbers, and secondly protected birds (species for which the penalty for an offence is enhanced). In addition, the legislation permits the Director of Zambia Wildlife Authority to issue a special licence for the hunting or capture of any bird and the Minister may license the export of any bird.

The Environmental Protection and Pollution Control Act establishes the Environmental Council of Zambia, which is "to protect the environment and control pollution, so as to provide for the health and welfare of persons, animals, plants and the environment". It has particular responsibility for water, air, waste disposal, pesticides and toxic substances, noise and ionizing radiation.

This legislative framework is more than adequate in catering for Zambia's conservation needs, but the enforcement and implementation of that legislation is often ineffective.

At present, the two ministries most concerned with conservation (the Ministry of Tourism and the Ministry of Environment and Natural Resources) are undergoing restructuring. The ZAWA, for example, is soon to become an autonomous Authority and new legislation is expected.

Of the environmental threats facing Zambia, perhaps the most significant is the cutting of trees for fuel. Although currently a hazard only in the most populated areas of the country, it is a problem which requires tackling immediately. Traditional 'slash and burn' farming practices (chitemene) were once kind to miombo and allowed swift regeneration, but in recent times the cutting has become increasingly harsh and the time allowed for regeneration has become increasingly short. In some areas, notably northern Mwinilunga (see 'Overview of the inventory'), the pressure to find fertile land has led people to clear mushitus, when once they were left untouched and valued as sources of clean water and rich hunting grounds. Inevitably, the soils beneath such forests are poor and their agricultural value is quickly lost. A further aspect of timber exploitation is the export of certain hardwoods (notably *Baikiaea plurijuga* and *Pterocarpus angolensis*) which, combined with fires (whether drought-related or purposely lit) has resulted in the near-eradication of virgin mutemwa. Finally, soil erosion has become a serious problem in some areas as a result of many factors, such as agricultural malpractice, overgrazing and poor road construction.

INTERNATIONAL MEASURES RELEVANT TO THE CONSERVATION OF SITES

Zambia has ratified the Ramsar Convention and World Heritage Convention. Portions of the Kafue flats and Bangweulu swamps have been listed as Wetlands of International Importance under the Ramsar Convention (Ramsar Sites) and the Victoria Falls have been declared a World Heritage Site. Zambia has also ratified the Convention on Biological Diversity (CBD), the Convention to Combat Desertification (CCD), the Convention on Climate Change and the Convention on International Trade in Endangered Species (CITES), and is a party to the African Convention on the Conservation of Nature and Natural Resources. It participates in UNESCO's Man and the Biosphere Programme.

OVERVIEW OF THE INVENTORY

Thirty-one Important Bird Areas (IBAs) have been identified in this inventory (Map 1, Table 1), which together cover a combined area of 86,413 km², equivalent to c.11% of Zambia's total land surface. At present, about 86% of the area covered by IBAs receives some form of statutory or private protection (National Park, 68%; Game Management Area, 15%; National Forest, 2%; privately owned, 1%). Twenty-two sites meet the A1 criterion, holding significant numbers of one or more of the 17 species of global conservation concern that occur regularly in the country (Table 1). A total of five sites meet the A2 criterion: two sites for the Southern Zambia Secondary Area (s051), covering *Agapornis nigrigenis*, near-endemic to Zambia, while the other two Secondary Areas and the single Endemic Bird Area are covered by one site each (Table 2). All but two of the 31 sites meet the A3 criterion and, of these 29, all but one qualify for the Zambezian biome (A10), not surprisingly given Zambia's central position in this biome. However, three of the other four biomes in Zambia are also represented in the IBA network, by a total of five sites (Tables 1 and 3), the exception being the (marginal) Kalahari–Highveld biome (A11). Nine sites are thought to support significant congregations of particular species of waterbird (in total, 38 species across the nine sites), thus meeting the A4i criterion, while two sites are thought to hold more than 20,000 waterbirds on a regular basis, thus meeting the A4iii criterion, and four sites hold significant numbers of two species of congregatory landbird, thus meeting the A4ii criterion (Table 1).

The wide geographical spread of IBAs has ensured that substantial areas of all major habitat-types have been included. Several sites require more fieldwork. Sites with ill-defined boundaries or with poorly documented avifaunas include the Barotse flood-plain (IBA ZM006), Mosi-oa-Tunya and the Batoka Gorge (ZM009), the Lukanga swamp (ZM016), Kalungwishi (ZM028) and the Saisi river (ZM030). Particularly lacking for many sites are data concerning congregatory species such as waterbirds.

One of the most immediate conservation concerns, in national terms, is the deforestation occurring in northern Mwinilunga (sites ZM001, ZM002, ZM004 and ZM031). Here, many of the finest mushitus have already been cleared and several species with highly restricted Zambian ranges are severely threatened. These include *Sarothrura pulchra*, *Alcedo leucogaster*, *Campethera caroli*, *Muscicapa infuscata*, *Bias flammulatus* and *Platysteira castanea*. The most important forests lie in the upper Jimbe drainage north of 11°S and they also constitute the only Zambian localities from which a wide variety of non-avian taxa are known (e.g. the primate *Colobus angolensis*). Action is urgently required to protect these areas.

A number of general areas remain poorly represented or wholly excluded from the inventory. Miombo and mushitu vegetation in the north of the country require better coverage in the IBA network, but more work is needed to identify suitable sites that have a realistic future of protection. Worthy of consideration are the National Forests in Solwezi, Kasempa, Kaoma, Kasama and Mbala Districts. Both Lusenga Plain National Park and Sumbu National Park may prove to be suitable IBAs once explored. The Muchinga escarpment supports large stretches of miombo and may also be important for *Falco fasciinucha* but, at present, data are lacking. Fortunately, the area is very inaccessible and the habitat is unlikely to be threatened.

Pinarornis plumosus is the only Zambezian biome species known from Zambia that is not covered by any sites in the IBA network. It seems unlikely that this species will become threatened in the foreseeable future, but if it were thought necessary, a suitable site for this species would be Mbewe Hill (and adjacent kopjes) near Nyanje Mission in Petauke District. This site is also one of the very few Zambian localities from which *Emberiza capensis* is known. Species restricted to the Afrotropical Highlands biome that are not covered by the IBA network are *Chlorocichla laetissima*, *Phylloscopus ruficapilla* and *Serinus frontalis*. The first-named is known in Zambia only from a site in northernmost Nchelenge District, known as Kasangu or Chitunda, while *Phylloscopus ruficapilla* is known in Zambia only from the Mafinga mountains, which also hold a large number of other highland birds, including *Phyllastrephus cabanisi placidus*. With further fieldwork, both sites may prove to be suitable IBAs. *Serinus frontalis* is known only from the area along the Tanzanian border near Mbala.

Two further areas are perhaps worthy of mention, although at present they probably do not merit IBA status. Firstly, the dry plains of western Zambezi District hold two species found nowhere else in Zambia, *Francolinus albogularis* and *Cisticola textrix*. Secondly, the deciduous thicket between Chirundu and Siavonga in Gwembe District is the only area from which *Cercococcyx montanus* is regularly reported and also the only locality for what is perhaps the race *stictifrons* of *Ploceus bicolor* (sight records only).

Very few areas in Zambia remain completely unexplored by ornithologists, but examples include several areas along the Angola border, a block of mavunda between Kaoma and Kabompo, northern Sesheke and Senanga Districts, the Jivundu swamps in Solwezi District, much of the Luano and Lukusashi valleys, and many escarpment areas. In addition, many areas have not been visited during the rains, when access becomes very difficult. Excluding rare vagrants, the present network of IBAs affords some protection for all but 12 species on the national list. Those not already mentioned are listed here, and those asterisked (*) are thought likely to be present within the current IBA network on further study: *Podiceps cristatus*, *Alcedo quadribrachys**, *Eremopterix leucopareia*, *Muscicapa cassini**, *Sporopipes squamifrons** and *Estrilda melpoda**.

COMMENTS ON THE INVENTORY

- Maps used for the compilation of the inventory are the 1:250,000 series published by the Survey-General in Lusaka.
- For consistency, names used follow those on the 1:250,000 maps, but it should be noted that some names have many different spellings, e.g. 'Wantipa' is sometimes spelt 'wa Ntipa' and 'Saisi' is sometimes spelt 'Saise'.
- Four of the IBAs are (to a varying extent) part of transboundary protected areas (sites ZM007, ZM009, ZM018, ZM022).
- For certain waterbird species, at sites where comprehensive counts are lacking or not immediately available in the timeframe of this project, qualification of the species under the A4i criterion is based on local reports or estimates of total abundance, calculated by extrapolating localized data in relation to the extent of suitable habitat. The resulting estimate of the total number of individuals at the site is then usually not stated, but simply expressed as being larger than the minimum threshold required to trigger qualification under A4i, e.g. "1,000+" where 1,000 is the threshold.
- Data provided here concerning 'Other threatened/endemic wildlife' are neither up-to-date nor comprehensive. For many groups, data are totally lacking. Species that are listed are mainly mammals considered to be globally threatened or with small world ranges (e.g. species or subspecies endemic or near-endemic to Zambia; see Ansell 1978).

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GLOSSARY

dambo a grassy drainage line through woodland (also known as a 'vlei').
kopje a rather bare, granite hill or collection of boulders.
mavunda dry evergreen forest dominated by *Cryptosepalum.*
miombo broadleaved woodland dominated by *Brachystegia*, *Julbernardia* and *Isoberlinia* species.
mopane woodland dominated by *Colophospermum mopane.*
munga woodland dominated by *Acacia*, *Combretum and Terminalia* species.
mushitu evergreen forest, the seasonally or permanently wetter types also known as 'swamp-forest'.
mutemwa dry deciduous forest dominated by *Baikiaea.*
termitaria termite mounds.

SITE ACCOUNTS

Hillwood — ZM001

Admin region North Western
Coordinates 11°15′S 24°19′E — A1, A3 (A05, A10)
Area 3,200 ha **Altitude** 1,400 m — Unprotected

Site description

Hillwood is one of the few large-scale farms in northern Mwinilunga District and around it has grown a thriving community. As well as cattle and maize, a private game reserve has been established (2,000 ha) with camping facilities and the farm sees a steady trickle of the more adventurous tourists. The farm is bisected by the Sakeji river. Over much of the area, the vegetation remains largely undisturbed. The three dominant habitats are grassy plains (wet and dry), miombo and mushitu (the local name for the last is 'lito').

Birds

See Box and Table 3 for key species. Although Hillwood is home to a wide variety of miombo and dambo birds, it is the forest species that comprise the most important element. Most belong to the Guinea–Congo Forests biome and, within Zambia, many are restricted to this small area, including *Baeopogon indicator*, *Neocossyphus fraseri*, *Apalis*

rufogularis and *Nectarinia batesi*. Other notable forest species include *Halcyon malimbica*, *Indicator exilis*, *I. meliphilus*, *Cossypha polioptera* and *Nectarinia bannermani*. In the grassland *Mirafra angolensis*, *Hirundo nigrorufa* and *Cisticola dambo* are common, *Neotis denhami* and *Turnix hottentotta* are regular and *Anthus brachyurus* scarce. *Neolestes torquatus* and *Cisticola lateralis* are both common in scrub. Among species of global conservation concern, *Crex crex* is a (probably regular) wintering visitor and passage migrant, *Gallinago media* a regular wintering visitor, *Falco naumanni* an irregular passage migrant, and *Grus carunculatus* a vagrant. There are recent records of *Sarothrura pulchra* and *Campethera caroli*. One species of the Afrotropical Highlands biome also occurs: *Bradypterus alfredi*.

Key species

A1	*Crex crex*	*Gallinago media*
A3 (A05)	Guinea–Congo Forests biome: 12 of the 17 species of this biome that occur in Zambia have been recorded at this site; see Table 3.	
A3 (A10)	Zambezian biome: At least 28 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.	

Other threatened/endemic wildlife

The butterfly *Eicochrysops pinheyi*, a Zambian endemic, is quite common. Several amphibians, reptiles and dragonflies with limited distributions in Zambia are known to occur and it is likely that the area holds much flora and fauna that is similarly restricted.

Conservation issues

Hillwood itself is well protected, but much forest in the surrounding areas is being cleared—see 'Overview of the inventory' for details.

Source of the Zambezi — ZM002

Admin region North Western
Coordinates 11°22′S 24°19′E
Area c.200 ha
Altitude 1,490 m

A3 (A05, A10)
Protected Forest Area, National Monument

Site description

Lying along the border with the Democratic Republic of Congo, about 50 km north of Mwinilunga, the focus of this site is the strip of forest along the small valley which constitutes the source of the River Zambezi. The forest is surrounded by rich miombo that also covers most of the reserve's area. Beyond the boundary are a few scattered villages.

Birds

See Box and Table 3 for key species. It is the forest species that are of most interest—species of the Guinea–Congo Forests biome include *Columba iriditorques*, *Bleda syndactyla* and *Terpsiphone rufiventer*, and a large number of miombo species also occur. One species of the Afrotropical Highlands biome is present: *Bradypterus alfredi*.

Key species

A3 (A05)	Guinea–Congo Forests biome: 10 of the 17 species of this biome that occur in Zambia have been recorded at this site; see Table 3.
A3 (A10)	Zambezian biome: At least 17 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife

It is likely that the site holds many species of animal and plant with limited distributions in Zambia.

Conservation issues

Being a National Monument, this is a relatively high-profile site and therefore perhaps under less threat of habitat destruction than many. However, the surrounding woodland is slowly being cleared for small-scale farming and the site may be in danger of becoming an 'island'. Trees within the area are sometimes felled for honey and subsistence hunting, and trapping would appear to be increasing. An attendant mans a gate on the approach road and all visitors travelling by road sign a register.

Chitunta plain — ZM003

Admin region North Western
Coordinates 11°30′S 24°23′E
Area c.2,000 ha **Altitude** 1,400 m

A1, A3 (A10)
Unprotected

Site description

The site lies about 30 km north of Mwinilunga and comprises the lower half of the Chitunta river and a section of the Luakera, at the confluence of the two. Both flow through wide grasslands that are a mixture of dambo, flood-plain and dry plain. There are doubtless many similar sites in the district but this remains the best-known and most studied due to its accessibility. It is bisected by the Mwinilunga–Ikelenge road.

Birds

See Box and Table 3 for key species. This is the best known locality for *Macronyx grimwoodi* which is common in the wet grassland. *Ploceus temporalis* has a very restricted range in Zambia and breeds colonially in shrubs along the main channel of the Luakera. *Jynx ruficollis* is perhaps regular in the stunted miombo and has not been regularly recorded anywhere else in Zambia. Other birds include *Mirafra angolensis*, *Hirundo nigrorufa* and *Cisticola dambo*. Among species of global conservation concern, *Gallinago media* is a regular wintering visitor and *Macronyx grimwoodi* is a common breeding resident, while *Circus macrourus* is an irregular passage migrant and *Grus carunculatus* is an occasional visitor.

Key species

A1	*Gallinago media*	*Macronyx grimwoodi*
A3 (A10)	Zambezian biome: At least 21 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.	

Other threatened/endemic wildlife

The butterfly *Eicochrysops pinheyi*, a Zambian endemic, is quite common here, but data on other wildlife groups are lacking.

Conservation issues

The site is not protected, but is relatively undisturbed. There is some subsistence fishing and cattle sometimes graze, but there would not appear to be any real threats at present.

West Lunga National Park and Lukwakwa — ZM004

Admin region North Western
Coordinates 12°50′S 24°30′E
Altitude c.1,100–1,400 m **Area** c.410,000 ha

A1, A2 (s052), A3 (A10)
National Park, Game Management Area

Site description

The site is conveniently divided into two parts, bisected from north to south by the West Lunga river. Lukwakwa Game Management Area constitutes the western half and its western boundary is the Mwinilunga–Kabompo road. The most important habitat is mavunda forest, which covers a substantial proportion of the area, and there are also grasslands such as the Mayau plain and woodlands of various formations. West Lunga National Park, the eastern half, stretches to the Kabompo river and the habitat is similar, though there is less mavunda and more miombo.

Birds

See Box and Tables 2 and 3 for key species. Mayau, the type locality (and only one known) of *Pogoniulus makawai*, lies on the western boundary of the site. This locality therefore remains the most likely area of occurrence for the species, if it is a valid taxon. A wide range of Zambezian biome endemics occur at the site and, among the other species of global conservation concern (apart from *Pogoniulus makawai*), *Grus carunculatus* is regular and almost certainly breeds, and *Gallinago media* is a non-breeding visitor in moderate numbers, while *Egretta vinaceigula* is only a vagrant. *Neotis denhami* has been recorded in Lukwakwa Game Management Area. Other characteristic species of mavunda at the site include *Guttera pucherani*, *Campephaga quiscalina*, *Batis margaritae* and *Telophorus viridis*. Other notable species include *Indicator exilis*, *Ploceus angolensis* and two species of the Guinea–Congo Forests biome, *Columba iriditorques* and *Cercococcyx olivinus*.

Key species		
A1	*Grus carunculatus*	*Pogoniulus makawai*
	Gallinago media	
A2 (s052)	North-west Zambia Secondary Area: *Pogoniulus makawai* has been recorded at this site.	
A3 (A10)	Zambezian biome: 27 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.	

Other threatened/endemic wildlife

Mammals include *Cephalophus silvicultor* (LR/nt) and the National Park has perhaps one of the largest protected populations of *Tragelaphus spekii* (LR/nt) in Zambia. Butterflies include *Mylothris mavunda* which is, on present evidence, endemic to the area, while the site is also the stronghold of *Charaxes variata*.

Conservation issues

The area is very sparsely populated and perhaps the only potential threat to the forest is fire, which has already affected areas close to the Mwinilunga–Kabompo road. Much of the area was once rich in large mammals, but such populations have been decimated by poaching.

Liuwa Plain National Park — ZM005

Admin region Western
Coordinates 14°32′S 22°37′E — A1, A3 (A10), A4i
Area 366,000 ha **Altitude** c.1,000 m — National Park

Site description

Vast plains cover most of the area which remains comparatively poorly known. During and after the rains much of this area floods or becomes partially inundated and as the dry season progresses this water recedes leaving numerous small pans. There are also small stretches of *Diplorhynchus* scrub, woodland of various formations (including types dominated by *Burkea africana* and *Baikiaea plurijuga*) and patches of riparian forest. The entire park is situated just north of Kalabo, between the Luambimba and Luanginga rivers.

Birds

See Box and Table 3 for key species. Huge numbers of waterbirds can congregate at this site. *Egretta vinaceigula* is a regular visitor; concentrations of more than 10 are not uncommon and groups of over 30 have been recorded. *Grus carunculatus* is a common resident or visitor—counts have exceeded 1,000 individuals at times. *Glareola nordmanni* and *Charadrius asiaticus* are both abundant passage migrants, and the site is clearly of exceptional importance for the former species, which has been recorded recently in tens of thousands with some regularity (while one estimate in 1977 was of hundreds of thousands of birds). To date, this is the only known Zambian breeding locality for *Chlidonias hybridus*. *Mirafra apiata* and *Spizocorys conirostris* have isolated populations in the general area and other grassland birds include *Falco rupicoloides*, *Neotis denhami* and *Eupodotis senegalensis*. Recently, large numbers of *Turnix hottentotta* have been recorded, although these may be seasonal.

Key species			
A1	*Egretta vinaceigula*	*Grus carunculatus*	
	Falco naumanni	*Glareola nordmanni*	
A3 (A10)	Zambezian biome: 13 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.		
A4i		Breeding (pairs)	Non-breeding
	Egretta vinaceigula	May breed	80+
	Platalea alba	May breed	150+
	Grus carunculatus	Breeds	1,000+
	Glareola pratincola	Breeds	1,000+
	Glareola nordmanni	—	100,000
	Charadrius asiaticus	—	250+
	Chlidonias hybridus	Breeds	150+

Other threatened/endemic wildlife

A wide variety of mammals occur, including *Panthera leo* (VU), *Lycaon pictus* (EN), *Acinonyx jubatus* (VU) and, in particularly large numbers, *Connochaetes taurinus*—the largest protected population in Zambia (Jeffery *et al*. 1989, 1996).

Conservation issues

According to park staff there are over 160 villages within its boundary and consequently there are many cattle as well. At present this is not a major threat, but human encroachment needs to be carefully monitored. There is much illegal hunting, which affects the larger mammals and perhaps also the birds.

Further reading

Clarke and Loe (1974), Osborne (1978).

Barotse flood-plain — ZM006

Admin region Western
Coordinates 15°17′S 23°02′E — A1, A4i
Area c.600,000 ha — Game Management Area,
Altitude c.1,000 m — Unprotected

Site description

The West Zambezi Game Management Area is situated to the west of the main river channel of the immense Zambezi flood-plain. Following good rains, much of the area becomes inundated between about February and June. At this time the area near Mongu hosts the traditional Kuomboka ceremony of the Losi people, when the king (Litunga) is transported, in an ornate boat, to his palace on higher ground. During the dry season, people move into temporary villages and cultivate large areas of the flood-plain. Much of the area is poorly known and more work is required to define the exact limits of an IBA.

Birds

See Box for key species. Although more data are required, the area is undoubtedly important for waterbirds, and species such as *Phalacrocorax africanus*, *Anastomus lamelligerus*, *Charadrius asiaticus* and *Chlidonias hybridus* are known to exceed their 1% thresholds. Among species of global conservation concern, *Circus macrourus* and *Gallinago media* are non-breeding visitors, as is *Falco naumanni* (also a passage migrant), and *Grus carunculatus* is a common resident or visitor, while *Egretta vinaceigula* has been noted occasionally. Seven species occur that are restricted to the Zambezian biome (see Table 3).

Key species			
A1	*Egretta vinaceigula*	*Grus carunculatus*	
	Circus macrourus	*Gallinago media*	
	Falco naumanni		
A4i		Breeding (pairs)	Non-breeding
	Phalacrocorax africanus	Breeds	5,000+
	Bubulcus ibis	—	10,000+
	Anastomus lamelligerus	Breeds	1,000+
	Platalea alba	Breeds	150+
	Plectropterus gambensis	Breeds	3,750+
	Grus carunculatus	Probably breeds	145+
	Glareola pratincola	Probably breeds	1,000+
	Charadrius pecuarius	Breeds	1,000+
	Charadrius asiaticus	—	200+
	Philomachus pugnax	—	20,000+
	Gallinago media	—	300+
	Gallinago nigripennis	Probably breeds	500+
	Larus cirrocephalus	Probably breeds	1,000+
	Chlidonias hybridus	May breed	150+
	Chlidonias leucopterus	—	2,000+
	Rynchops flavirostris	Breeds	100+

Other threatened/endemic wildlife

An endemic species of *Hemisus* frog is known from the site. The flora and fauna of the area are poorly known, but very few large mammals remain.

Conservation issues

The area is relatively highly populated and there is likely to be much subsistence hunting, but the extent and nature of other threats are not known and require further investigation. Recently there have been attempts to re-establish traditional land-management practices, which would benefit the environment.

Sioma Ngwezi National Park — ZM007

Admin region Western
Coordinates 17°17′S 23°27′E — A3 (A10)
Area 527,600 ha **Altitude** c.900 m — National Park

Site description

The third largest of Zambia's National Parks, situated in the dry south-west. Much of the area is very sandy and there are few permanent water-sources. The Mashi river (also known as the Kwando) lies along the park's south-western boundary, although the international border with Angola is delineated by the edge of the flood-plain on the Zambian side. Mopane woodland and mutemwa forest cover a large proportion of the area and there is also grassland, thicket and woodland of various types. In places, the woodland is dominated by *Acacia* species.

Birds

See Box and Table 3 for key species. A number of species from the Zambian list are restricted to the dry south-west of the country. Most occur within the site, including *Pterocles burchelli* and *Lamprotornis australis,* both characteristic of the Kalahari–Highveld biome (A11), as well as *Tockus bradfieldi*, *Tricholaema leucomelas*, *Sylvia subcaerulea*, *Bradornis mariquensis*, *Laniarius atrococcineus*, *Lamprotornis nitens* and *Estrilda erythronotos*.

Key species

A3 (A10)	Zambezian biome: 15 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.	

Other threatened/endemic wildlife

Mammals known to occur include *Loxodonta africana* (EN) and *Giraffa camelopardalis angolensis* (only Zambian population of the species outside the Luangwa Valley).

Conservation issues

The small number of settlements in the area present no significant threat and much of the area is unsuitable for habitation. There is illegal hunting, but it probably does not affect the avifauna, although poaching pressure is heavy on larger wildlife.

Further reading

Clarke and Loe (1974).

Machile — ZM008

Admin region Southern
Coordinates 17°03′S 25°15′E — A1, A2 (s051), A3 (A10), A4ii
Area c.300,000 ha — Game Management Area,
Altitude c.1,000 m — Local Forests, Unprotected

Site description

An area dominated by mopane woodland, with some grassland, flood-plain, thicket, mutemwa forest and munga. It covers sections of the mid-Machile, Simatanga, Sichifulo and Sala rivers, though there are very few permanent sources of surface water. The area is bisected by the Livingstone–Mulobezi railway line and there are small villages scattered throughout.

Birds

See Box and Tables 2 and 3 for key species. This is the stronghold of *Agapornis nigrigenis* and supports c.5,500 individuals (over half the known population). Among other species of global conservation concern, *Falco naumanni* is a passage migrant and non-breeding visitor, while *Grus carunculatus* is a breeding visitor. One species of the Kalahari–Highveld biome (A11), *Lamprotornis australis*, occurs at this site.

Key species

A1	*Falco naumanni*	*Agapornis nigrigenis*	
	Grus carunculatus		
A2 (s051)	Southern Zambia Secondary Area: *Agapornis nigrigenis* has been recorded at this site.		
A3 (A10)	Zambezian biome: Nine of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.		
A4ii		Breeding (pairs)	Non-breeding
	Agapornis nigrigenis	5,500 birds	—

Other threatened/endemic wildlife

Mammals known to occur include *Pedetes capensis* (VU).

Conservation issues

Parts of the site are situated within Game Management Area 8 and two small Local Forests. Desiccation due to climate change has perhaps resulted in a decrease of dry-season surface water upon which *Agapornis nigrigenis* depends. There is some small-scale hunting of this species for consumption and perhaps pest-control although, paradoxically, an ongoing reduction in sorghum and millet as crops (in favour of maize) may also be affecting the population negatively. Potential threats to this species include destruction of habitat for firewood and resumption of illegal trade. A detailed four-year study of *A. nigrigenis* is being carried out at present, to determine the species's ecological requirements and devise a conservation strategy for its survival.

Further reading

Dodman (no date = 1996).

Mosi-oa-Tunya and the Batoka Gorge — ZM009

Admin region Southern
Coordinates 17°56′S 26°04′E — A1, A3 (A10), A4i
Area c.10,000 ha **Altitude** c.800–900 m — National Park, Unprotected

Site description

The site comprises the Mosi-oa-Tunya National Park and the adjacent Batoka Gorge which extends downstream as far as the confluence of the Zambezi with the Kalomo river. At 6,600 ha, the park is Zambia's smallest, but it is the most popular as it flanks a stretch of the Zambezi river just south of Livingstone that includes the Victoria Falls. As well as riparian habitats such as sandbars and fringing forest, there is woodland (mainly mopane) and the immense basalt gorge below the falls (much of which is over 100 m deep).

Birds

See Box and Table 3 for key species. The site is most important for the species occurring in and around the gorge. *Falco fasciinucha* has been recorded with some regularity and is known to nest here—Hartley (1993) estimated that 8–10 pairs occurred in the gorge along 60 km of its length—but it is perhaps not as common as some local tour operators might suggest, possibly due to confusion with other species such as *Falco peregrinus*. Other breeding species of interest include *Ciconia nigra*, *Aquila verreauxii* and *Apus barbatus* and, along the river above the falls, *Gorsachius leuconotus*, *Podica senegalensis* and *Glareola nuchalis*.

Key species

A1	*Falco fasciinucha*		
A3 (A10)	Zambezian biome: Eight of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.		
A4i		Breeding (pairs)	Non-breeding
	Ciconia nigra	7+	c.20
	Glareola nuchalis	Breeds	300+

Other threatened/endemic wildlife

A wide variety of mammals occur, including *Loxodonta africana* (EN).

Conservation issues

Being such a high-profile site, it seems likely that there will always be a reasonable level of protection. However, the disturbance created by the increased tourist activity requires investigation. The continual presence of light aircraft above the falls has been linked with a decrease in sightings of *Falco fasciinucha* in that area, although this has not been proven. Below the National Park, the Batoka Gorge offers a large stretch of suitable habitat and this remains somewhat inaccessible and relatively undisturbed. However, there are proposals to construct a hydroelectric dam in the gorge which could have a serious impact on the site.

Further reading

Clarke and Loe (1974), Dowsett (1975), Hartley (1993).

Nkanga river conservation area — ZM010

Admin region Southern
Coordinates 16°37′S 27°02′E — A1, A3 (A10)
Area 9,700 ha **Altitude** c.1,200 m — Unprotected

Site description

Nkanga comprises three private farms on the Southern Province Plateau, just north-east of Choma. Much of the area is fenced game farm, and the remainder includes various crops (maize, coffee, tobacco) and livestock (beef and dairy cattle, sheep). Tourists are welcome and there is a campsite as well as catered accommodation. The habitat is a mosaic of miombo, munga and thicket, interspersed with dambos and several open grassy plains. There are a number of dams, some permanent hot springs and scattered kopjes. The rocky Nkanga river and its tributaries are flanked by dense riparian thicket.

Birds

See Box and Table 3 for key species. Species of global conservation concern include the Zambian endemic *Lybius chaplini*, which is common in suitable habitat. The area holds a good number of Zambezian biome endemics, six *Francolinus* species occur and some of the more localized species include *Anas sparsa*, *Stephanoaetus coronatus* and *Pachycoccyx audeberti.* Colossal roosts of *Hirundo rustica* are regular in the reedbeds below the hot springs during the early rains. Recently, *Buphagus erythrorhynchus* has been recorded regularly and there are hopes that it will recolonize the area naturally, having been wiped out by poisonous cattle-dips in the past. Among other species of global conservation concern, *Crex crex* and *Gallinago media* are wintering visitors, while *Circus macrourus* (winters in some years) and *Falco naumanni* are both regular on passage, and *Egretta vinaceigula*, *Phoenicopterus minor*, *Grus carunculatus* and *Glareola nordmanni* have all been recorded as vagrants.

Key species

A1	*Crex crex*	*Lybius chaplini*
	Gallinago media	
A3 (A10)	Zambezian biome: 20 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.	

Other threatened/endemic wildlife

None known to BirdLife International.

Conservation issues

Despite continual poaching, the area has been actively protected for several decades and is rich in indigenous fauna, both within and outside the game farm. There are probably no serious threats to the birdlife. Gamebirds are shot, sometimes in considerable numbers (mainly *Numida meleagris* and *Francolinus* species), but there is careful management to ensure sustainable take-off.

Kafue flats — ZM011

Admin region Southern, Central
Coordinates 15°45′S 27°16′E — A1, A3 (A10), A4i, A4iii
Area 600,000 ha — National Parks,
Altitude c.1,000 m — Game Management Area, Ramsar Site

Site description

A vast area of swamp, open lagoon and seasonally inundated floodplain surrounding the Kafue river as it flows from west to east before reaching the Zambezi escarpment. When wet, the alluvial clays render much of the area inaccessible and extensive cracks form on drying. The swamp is dominated by *Typha* and there are only scattered pockets of *Cyperus papyrus*. The flats are bordered by termitaria and munga woodland. At its widest point, the area liable to flooding is some 70 km across. Hydroelectric dams have been constructed at either end of the flats, although Itezhi-Tezhi (at the western end) is more important for regulating the flow and Kafue Gorge (at the eastern end) generates most of the power. An initial agreement to simulate the annual inundation has not always been followed, especially when there have been fears of water shortages. However, rainfall permitting, the cycle has been 'smoothed'; thus the simulated flood is not as high, but lasts longer than it would under natural conditions. Many fishermen live on the numerous small islands in the centre of the swamps and other communities exist around the edges, although some of these are somewhat seasonal depending on the water-level.

Birds

See Box and Table 3 for key species. Very large concentrations of resident and migratory waterbirds occur and many species breed in large colonies deep within the swamps. *Grus carunculatus* is common here all-year-round, and this is the single most important area for the species anywhere, with 3,200 individuals counted in October 1983 (here considered equivalent to more than 1,000 breeding pairs). Among the other species of global conservation concern, *Gallinago media* occurs in large numbers, *Egretta vinaceigula* is uncommon, but almost certainly breeds, *Circus macrourus* visits in good numbers, *Falco naumanni* is numerous at times and *Crex crex* is probably common, while *Ardeola idae* and *Glareola nordmanni* are rare non-breeding visitors. *Lybius chaplini* is local, in small numbers. Phoenicopterus *minor* and *Gyps coprotheres* are both vagrants to the area. Counts from earlier decades for some of the waterbirds listed in the Box (meeting the A4i criterion) exceed recent counts, for instance >6,000 *Pelecanus onocrotalus* (Nov 1971), >5,000 *Plegadis falcinellus* (Dec 1975), >100,000 *Plectropterus gambensis* (Nov 1972), >29,000 *Anas erythrorhyncha* (Aug 1971), >5,000 *Netta erythrophthalma* (Jan 1973), and >50,000 *Glareola pratincola* (Apr 1972, May 1980). Other waterbirds which are often found in notable numbers include *Ciconia abdimii*, *Fulica cristata* and *Vanellus armatus*. Particularly numerous in the dry season are *Eremopterix leucotis*, *Calandrella cinerea* and *Oenanthe pileata*, when other characteristic species include *Neotis denhami* and *Pterocles gutturalis*.

Key species

A1	*Egretta vinaceigula*		*Crex crex*
	Circus macrourus		*Gallinago media*
	Falco naumanni		*Lybius chaplini*
	Grus carunculatus		
A3 (A10)	Zambezian biome: 15 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.		
A4i		Breeding (pairs)	Non-breeding
	Pelecanus onocrotalus	Breeds	3,086 (Jul 1994)
	Phalacrocorax africanus	Breeds	10,000+
	Egretta ardesiaca	Breeds	2,933 (Jan 2000)
	Casmerodius albus	Breeds	2,223 (Jul 1993)
	Mesophoyx intermedia	Breeds	1,000+
	Bubulcus ibis	—	14,126 (Jan 1995)
	Ardeola ralloides	Breeds	1,506 (Jul 1997)
	Mycteria ibis	Breeds	667 (Jan 1998)
	Anastomus lamelligerus	Breeds	15,000–20,000 (Oct 1999)
	Plegadis falcinellus	Breeds	4,097 (Jul 1999)
	Platalea alba	Breeds	1,595 (Jan 2001)
	Dendrocygna bicolor	Breeds	58,384 (Jan 1994)
	Alopochen aegyptiacus	Breeds	3,500+
	Plectropterus gambensis	Breeds	4,133 (Jul 1994)
	Sarkidiornis melanotos	Breeds	20,698 (Jan 1994)
	Anas erythrorhyncha	Breeds	10,407 (July 1999)
	Anas hottentota	Breeds	3,930 (Jan 2001)
	Netta erythrophthalma	Breeds	3,068 (Jan 2000)
	Grus carunculatus	1,000+	1,171 (Jan 1995)
	Glareola pratincola	Breeds	17,070 (Jul 2000)
	Glareola nordmanni	—	100+
	Charadrius pecuarius	Breeds	5,000–6,000 (Oct 2000)
	Charadrius asiaticus	—	30,000–35,000 (Nov 1995)
	Vanellus crassirostris	Breeds	1,395 (Jan 2001)
	Philomachus pugnax	—	71,285 (Jan 2001)
	Gallinago media	—	300+
	Chlidonias hybridus	May breed	1,226 (Jul 1997)
	Chlidonias leucopterus	—	2,000+
	Rynchops flavirostris	Breeds	520 (Jan 2000)
A4iii	More than 20,000 waterbirds occur regularly.		

Other threatened/endemic wildlife

A wide variety of mammals are known to occur, including *Tragelaphus spekii* (LR/nt) and, most notably, the endemic subspecies *Kobus leche kafuensis* (the largest protected population of this species anywhere).

Conservation issues

The site is composed of the Kafue Flats Game Management Area No. 11, together with two National Parks—Lochinvar (41,000 ha) and Blue Lagoon (42,000 ha)—which comprise a designated Ramsar Site. The controlled flooding has altered many aspects of the ecosystem, such as the timing of breeding seasons, a rapid spread of thorny shrubs in place of grassland, and a slight change in the assemblage of bird species present. The possible and observed effects of the artificial flooding regime on the breeding numbers and success of *Grus carunculatus* are of some concern. As yet, the effects on other birdlife do not seem to be serious. However, good comparative data are lacking.

The proximity of the Kafue flats to Lusaka means that there is a high demand for meat and fish and, as a result, illegal hunting and fishing occur widely. Poaching camps are hidden in many parts of the swamp and may be quite large. In recent years, trees which were known to hold nesting colonies of heron (Ardeidae) and stork (Ciconiidae) species have been felled and further investigation is required to assess the potential threats and disturbance to other colonies within the flats. Within the last decade, water-hyacinth *Eichhornia crassipes* has covered significant areas of open water on the lower portion of the Kafue flats. This invasive alien weed is difficult to control and spreads rapidly. Its impact on the area's birdlife has yet to be assessed, but it would seem to be a potential threat to any species that requires open water.

Further reading

Bolnick (1995), Clarke and Loe (1974), Douthwaite (1974, 1977, 1978), Dowsett (1966), Howard (1989).

Kafue National Park — ZM012

Admin region North Western, Central, Southern
Coordinates 15°23′S 26°00′E — A1, A2 (s051), A3 (A10), A4i, A4ii
Area 2,240,000 ha **Altitude** 1,000–1,470 m — National Park

Site description

About 200 km west of Lusaka, Zambia's biggest National Park covers a large area of the Kafue drainage above the flats. The gently undulating terrain is dominated by a miombo–dambo mosaic and in the south there are patches of mopane and mutemwa (notably the Ngoma forest). In the north-west corner of the park are the Busanga swamps and surrounding flood-plain, and along the major rivers is riparian forest. Near the point where the Kafue leaves the park is the Itezhi-Tezhi dam, behind which an area of between 300–400 km² has been flooded. In the rains, most roads become impassable. There are a number of tourist lodges within the park, some of which allow camping, and there are also some seasonal camps.

Birds

See Box and Tables 2 and 3 for key species. *Agapornis nigrigenis* is a breeding resident in the blocks of mopane in the south, and both *Grus carunculatus* (common breeding resident) and *Egretta vinaceigula* (irregular visitor, possibly breeds) can be found at scattered localities throughout. *Circus macrourus*, *Falco naumanni*, *Crex crex* and *Gallinago media* all winter, while *Phoenicopterus minor* and *Gyps coprotheres* are rare vagrants. Finally, among globally threatened species, *Lybius chaplini* is an uncommon and very local resident. A wide variety of Zambezian biome endemics occur, including *Merops boehmi*, *Coracias spatulatus*, *Lanius souzae* and *Muscicapa boehmi*. Large numbers of waterbirds may be found in the Busanga swamps and during the rains there is much dispersal to smaller flood-plains, dambos and pans throughout the park. *Guttera pucherani* inhabits the dense thickets in the south and along the main rivers are species such as *Podica senegalensis*, *Glareola nuchalis*, *Rynchops flavirostris*, *Scotopelia peli* and *Alcedo semitorquata*. *Phoenicopterus minor* and *Gyps coprotheres* are rare vagrants.

Key species

A1	*Egretta vinaceigula*	*Crex crex*
	Circus macrourus	*Gallinago media*
	Falco naumanni	*Agapornis nigrigenis*
	Grus carunculatus	*Lybius chaplini*

A2 (s051) Southern Zambia Secondary Area: *Agapornis nigrigenis* has been recorded at this site.

A3 (A10) Zambezian biome: 34 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

		Breeding (pairs)	Non-breeding
A4i	*Anastomus lamelligerus*	May breed	1,000+
	Platalea alba	?	150+
	Charadrius asiaticus	—	200+
A4ii	*Agapornis nigrigenis*	100+ birds	—

Other threatened/endemic wildlife

A wide variety of mammals are known to occur, including *Lycaon pictus* (EN), *Acinonyx jubatus* (VU), *Loxodonta africana* (EN), *Cephalophus silvicultor* (LR/nt) and *Pipistrellus anchietae* (VU). A tiny number of *Diceros bicornis* (CR) may still survive, though these are unlikely to represent a viable population.

Conservation issues

There has been widespread illegal hunting in the park and considerable areas hold very few large mammals. Although this must have ecological implications, it is not clear to what extent birds have been affected. Much of the park is uninhabited and inaccessible, but human encroachment perhaps needs to be assessed and monitored.

Further reading

Brooke (1966), Clarke and Loe (1974).

Chimfunshi — ZM013

Admin region Copperbelt
Coordinates 12°20′S 27°31′E — A3 (A10)
Area 9,300 ha **Altitude** c.1,300 m — Unprotected

Site description

A large private farm on the banks of the Kafue river and close to its headwaters. It lies between the Chingola–Solwezi road and the border with the Democratic Republic of Congo. Much of the area is rich miombo woodland which is interspersed with dambo and mushitu. Some sections of the Kafue are fringed with tall riparian forest and others spread onto wide flood-plains. At the heart of the farm is a long-established chimpanzee orphanage which has received considerable attention from the international media (though chimpanzees are not indigenous to Zambia). This aspect of the farm continues to grow and develop; 5,300 ha has been fenced in order to establish a private game reserve and within this area, 1,000 ha has been fenced for chimpanzees. Cattle are farmed on the remaining 4,000 ha. Visitors are welcome, there are chalets, a campsite and an education centre, and there are plans to build a lodge and an airstrip.

Birds

See Box and Table 3 for key species. The area is rich in Zambezian biome endemics, including *Stactolaema whytii*, *Lybius minor*, *Eremomela atricollis*, *Phylloscopus laurae*, *Plocepasser rufoscapulatus* and *Lamprotornis acuticaudus.* As well as those already mentioned, a wide range of mushitu species includes *Musophaga rossae*, *Mesopicos griseocephalus*, *Campephaga quiscalina*, *Sheppardia bocagei*, *Trochocercus cyanomelas*, *Telophorus multicolor* and *Estrilda perreini.* *Grus carunculatus* is a rare visitor.

Key species

A3 (A10) Zambezian biome: At least 23 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife

None known to BirdLife International.

Conservation issues

Much of the indigenous game had disappeared due to poaching by the late 1970s, but with increased protection and restocking it is hoped that numbers will build up to their former levels. It is unlikely that there are any serious threats to birds at the site.

Imanda ZM014

Admin region Copperbelt
Coordinates 13°29′S 27°56′E — A3 (A10)
Area c.300 ha **Altitude** c.1,200 m — Unprotected

Site description
A large mushitu, 25 km west of Mpongwe and just south of St Anthony's Mission and Lake Kashiba (a National Monument). The forest is partly surrounded by a large dambo and also by some villages and cultivation. A number of poorly defined tracks run through the forest, but otherwise it remains relatively undisturbed.

Birds
See Box and Table 3 for key species. A wealth of mushitu species are to be found, several of which are endemic to the Zambezian biome. Imanda is a well-known site for *Batis margaritae*, which is fairly common. Other typical species include *Musophaga rossae*, *Mesopicos griseocephalus*, *Campephaga quiscalina*, *Sheppardia bocagei*, *Bradypterus lopezi*, *Phylloscopus laurae*, *Apalis cinerea*, *Trochocercus cyanomelas* and *Telophorus multicolor*. *Columba larvata* and *Indicator meliphilus* have also been recorded.

Key species
A3 (A10) Zambezian biome: Nine of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife
None known to BirdLife International.

Conservation issues
Near villages, small gardens have been cut into the forest and such clearance, while not a threat at present, requires careful monitoring. Within the forest there is some subsistence hunting and some cutting of trees for building poles. In dry years, fire is always a threat.

North Swaka ZM015

Admin region Central
Coordinates 13°23′S 29°22′E — A3 (A10)
Area c.100,000 ha — National Forest, National Monument
Altitude 1,250–1,893 m

Site description
A poorly known area on the border with the Democratic Republic of Congo, north of Mkushi town. The rocky terrain lies mainly between 1,250–1,400 m, but climbs as high as 1,893 m. The various headwaters of the Lunsemfwa system have carved gorges in the hills where strips of submontane forest occur. Several dramatic waterfalls include those on the Changwena river which are popular amongst the more adventurous tourists. The area is dominated by miombo and there are dambos at lower altitudes, but the higher levels are semi-montane, the vegetation including *Podocarpus latifolius*.

Birds
See Box and Table 3 for key species. The area is rich in Zambezian biome endemics such as *Stactolaema anchietae*, *Lanius souzae*, *Eremomela atricollis*, *Anthreptes anchietae*, *Plocepasser rufoscapulatus* and *Ploceus angolensis*. Other notable species include *Aquila verreauxii*, *Sheppardia bocagei*, *Myrmecocichla cinnamomeiventris* and *Elminia albicauda*.

Key species
A3 (A10) Zambezian biome: 27 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife
None known to BirdLife International.

Conservation issues
Much of the area is inhospitable and very sparsely populated, in common with neighbouring areas in the Democratic Republic of Congo. Fort Elwes is a National Monument. There is some subsistence hunting, cattle-grazing and tree-cutting. However, this and other potential threats require investigation.

Lukanga swamp ZM016

Admin region Central
Coordinates 14°22′S 27°43′E — A1, A4iii
Area 300,000 ha **Altitude** 1,100 m — Unprotected

Site description
Despite its proximity to the main railway line, this enormous wetland remains one of Zambia's least-explored areas. It comprises swamp, open water and seasonally inundated flood-plain and access is difficult. It is part of the Kafue drainage system and, whilst it usually drains into that river, there are occasions when the reverse occurs. There is much small-scale fishing and presumably much human habitation, but further exploration is required.

Birds
See Box for key species. The site is very poorly known, but is likely to be very rich in waterbirds. It almost certainly holds important numbers of *Grus carunculatus* (a breeding resident) and is presumably an important breeding area for many other species. *Circus macrourus* occurs; *Gallinago media* and *Egretta vinaceigula* have not been recorded, but are likely to occur. There have been two sightings of *Balaeniceps rex*, probably wandering individuals, and there is a record of the very localized *Charadrius forbesi*. Seven species occur that are restricted to the Zambezian biome (see Table 3).

Key species

A1	*Circus macrourus*	*Grus carunculatus*
A4iii	More than 20,000 waterbirds are thought to occur regularly.	

Other threatened/endemic wildlife
Mammals known to occur include *Tragelaphus spekii* (LR/nt).

Conservation issues
General disturbance caused by human activity is likely to be the principal threat and more specific problems may include nest-robbing at breeding colonies. However, further investigation is required.

Further reading
Benson and Irwin (1967).

Chisamba ZM017

Admin region Central
Coordinates 15°00′S 28°15′E — A1, A3 (A10)
Area c.35,000 ha **Altitude** 1,100 m — National Forest, Unprotected

Site description
The site straddles the main Lusaka–Kabwe road, just west of Chisamba, and encompasses several private farms and a National Forest (c.4,000 ha). The terrain is very varied. Much of the area is miombo and munga woodland and there are also large patches of thicket, some small strips of riparian forest, a few dambos and several rocky hills. In the farmed areas there is cleared pasture, arable land and there are numerous dams. At least three of the farms now operate game ranches and, in addition to the direct ecological benefits, such areas also receive better protection. Tourist facilities are established in some places and are being developed in others. Within the National Forest are several sites of historic interest.

Birds
See Box and Table 3 for key species. As well as a wide variety of Zambezian biome endemics, the area is most important for its resident population of *Lybius chaplini*. The dams support large numbers of waterbirds, and in the past the globally threatened *Egretta vinaceigula* was recorded regularly, although it is only irregular at present. *Crex crex* and *Gallinago media* winter, *Circus macrourus* and *Falco naumanni* are both regular on passage and *Glareola nordmanni* has been recorded staying through the non-breeding season. Other notable species include *Stephanoaetus coronatus*, *Pachycoccyx audeberti*, *Lybius minor* (on the southern edge of its range) and *Amblyospiza albifrons*. *Circus macrourus* and *Falco naumanni* are both regular on passage and *Glareola nordmanni* has been recorded staying through the non-breeding season.

Key species

A1	*Crex crex*	*Lybius chaplini*
	Gallinago media	
A3 (A10)	Zambezian biome: At least 21 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.	

Other threatened/endemic wildlife

None known to BirdLife International.

Conservation issues

The protected status and condition of the National Forest requires monitoring, but otherwise there are few threats.

Lower Zambezi National Park — ZM018

Admin region Lusaka
Coordinates 15°26′S 29°41′E — A3 (A10), A4i, A4ii
Area c.440,000 ha **Altitude** 350–1,480 m — National Park

Site description

A large and varied area about 100 km east of Lusaka, flanking the Zambezi river and bisected by its escarpment. The north-western half lies on the plateau, and is mainly covered by miombo woodland, with some munga and occasional strips of riparian forest. The escarpment is very steep in places, generally inaccessible and thus little explored. The valley floor is covered by a mosaic of mopane, deciduous thicket and munga. The Zambezi is a broad, but well-defined river along this stretch, with varying numbers of sandbars and small islands depending on the water-level. There are patches of riparian forest, many oxbow lakes and areas of flood-plain. Several permanent tourist lodges are just outside the park and a number of seasonal camps lie within. Most roads become impassable during the rains.

Birds

See Box and Table 3 for key species. Large numbers of waterbirds may congregate, especially at drying oxbows. Sandbanks are home to enormous numbers of *Merops nubicoides* and smaller numbers of *M. bullockoides*, and the miombo and mopane holds a wide array of characteristic species. *Guttera pucherani*, *Pitta angolensis*, *Nicator gularis*, *Andropadus importunus* and *Erythrocercus livingstonei* inhabit the deciduous thickets. *Circus macrourus* is a rare passage migrant and non-breeding visitor.

Key species

A3 (A10)	Zambezian biome: 14 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.		
A4i		Breeding (pairs)	No-breeding
	Mycteria ibis	?	500+
A4ii	*Merops nubicoides*	2,000+	—

Other threatened/endemic wildlife

A wide variety of mammals are known to occur, including large numbers of *Loxodonta africana* (EN).

Conservation issues

Recently resurrected as a National Park; the area had been degazetted and game numbers decimated. Now, despite continual pressure from poaching, game numbers are increasing and the park is becoming a popular tourist destination once more. It seems unlikely that the birdlife has suffered or is suffering in anyway. However, the effects of a dramatic increase in the non-native water-hyacinth *Eichhornia crassipes* require investigation.

South Luangwa National Park — ZM019

Admin region Central, Northern, Eastern
Coordinates 13°02′S 31°34′E — A1, A3 (A10), A4i, A4ii
Area 905,000 ha **Altitude** 500–1,250 m — National Park

Site description

The second-largest and probably the most famous of Zambia's National Parks. It encompasses a section of the mid-Luangwa Valley, mainly on the west bank of the river and stretching to the lip of the Muchinga Escarpment. Most of the area lies between 500–900 m, although the park rises to at least 1,250 m in the west. Along the river is an alluvial belt of *Acacia*, in particular *A. albida*. Mopane dominates the adjacent terrain and in the north this belt becomes wider, covering almost half the park's width. Beyond this there are large areas of scrub and munga, and finally miombo. Scattered grasslands are more common in the north, the largest being the Chifungwe plain, and strips of riparian forest and thicket occur throughout. The active, meandering river has created many oxbow lakes and sandbanks and sandbars are a prominent feature when the water-level is low. In relation to the size of the park, the area utilized by the tourism industry is very small and in the rains, even this becomes largely inaccessible. The many lodges and camps are mostly on the east bank, both outside and within the park.

Birds

See Box and Table 3 for key species. Mopane birds are very well represented, with *Agapornis lilianae*, *Lamprotornis mevesii* and *Plocepasser mahali* being particularly numerous. Large concentrations of waterbirds may occur, especially at drying oxbows, and several species breed in significant numbers, the best known example being the long-established colony of *Mycteria ibis*. Vast colonies of *Merops nubicoides* breed in sandbanks, along with *Apus horus*, *Merops bullockoides* and *Hirundo paludicola*. *Ixobrychus sturmii*, *Crecopsis egregia* and *Porphyrio alleni* are locally not uncommon in the rains, and other species present in significant numbers include *Balearica regulorum*, *Rynchops flavirostris* and *Scotopelia peli*. *Vidua codringtoni* has been recorded on a number of occasions. *Neotis denhami* is an irregular non-breeding wanderer. Recently, a single *Aquila clanga* has twice been tracked to the park by satellite telemetry, representing a huge leap in the species's known migratory range. Of other species of global conservation concern, *Ardeola idae* may be a regular vagrant, *Falco naumanni* is a rare passage migrant, *Grus carunculatus* is a vagrant, while *Gallinago media* winters in small numbers.

Key species

A1	*Gallinago media*		
A3 (A10)	Zambezian biome: 14 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.		
A4i		Breeding (pairs)	Non-breeding
	Mycteria ibis	300+	—
	Platalea alba	Breeds	150+
	Rynchops flavirostris	Breeds	100+
A4ii	*Merops nubicoides*	10,000+	—

Other threatened/endemic wildlife

A wide variety of mammals occur, including *Lycaon pictus* (EN), *Loxodonta africana* (EN), the endemic subspecies *Giraffa camelopardalis thornicrofti* and *Connochaetes taurinus cooksoni*, and possibly still a tiny number of *Diceros bicornis* (CR).

Conservation issues

The area is relatively well protected and although some illegal hunting takes place it seems unlikely that the birds are affected. Most of the park is uninhabited and inaccessible, but human encroachment perhaps needs to be assessed and monitored.

Further reading

Astle (1989), Clarke and Loe (1974), Feely (1964), Scott (1991).

North Luangwa National Park — ZM020

Admin region Northern
Coordinates 11°53′S 32°11′E — A3 (A10)
Area 463,600 ha **Altitude** 600–1,300 m — National Park

Site description

Situated wholly on the west bank of the Luangwa river, the park lies upstream from South Luangwa National Park and is separated from it by a 30–40-km-wide corridor (Munyamadzi Game Management Area). Much of the area lies between 600–900 m and is dominated by mopane, although large areas of this woodland have been destroyed by elephants when poaching pressure has caused them to concentrate

in safe areas. Away from the river, the park climbs towards the first ridges of the Muchinga Escarpment and, in places, reaches over 1,300 m. Here, the better-drained soils support miombo. There are smaller patches of munga and riparian forest, but little grassland. Compared to its sister park it is poorly known and access is restricted.

Birds

See Box and Table 3 for key species. The avifauna is very similar to that of South Luangwa (ZM019). The Zambezian biome endemics include *Neocichla gutturalis* and several species typical of escarpment woodland such as *Nectarinia shelleyi* and *Plocepasser rufoscapulatus*.

Key species

A3 (A10) Zambezian biome: 13 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife

A wide variety of mammals occur, including *Loxodonta africana* (EN) and good numbers of the endemic subspecies *Connochaetes taurinus cooksoni*.

Conservation issues

The area suffered considerably from poaching in the past, but is now actively protected and game numbers are increasing. Although some illegal hunting still occurs, it seems likely that the birds are not affected. Most of the park is uninhabited and, although currently not a problem, human encroachment perhaps needs to be assessed and monitored.

Further reading

Clarke and Loe (1974), Scott (1991).

Lukusuli National Park — ZM021

Admin region Eastern
Coordinates 12°46′S 32°36′E — A3 (A10)
Area 272,000 ha **Altitude** 650–1,240 m — National Park

Site description

This poorly known National Park lies close to the Malaŵi border and about 70 km north of Chipata. Most of the park lies at plateau level or over the escarpment and as a result it is dominated by miombo. Of the various miombo formations, the richest are to be found in the eastern half where broad dambos run through the woodland. In many areas towards and across the escarpment, the woodland becomes thin or stunted, although here the drainage lines become well-defined rocky streams along which patches of riparian forest and thicket may be found. Granite outcrops can be found through much of the park, some of which are very large, and patches of mopane occur at lower altitudes. There is a single road running from west to east from which one or two vague tracks have been made by licensed aquamarine miners, but there are no tourist facilities.

Birds

See Box and Table 3 for key species. The area is poorly known, but holds a wealth of miombo birds, and is one of the few areas from which *Ploceus olivaceiceps* is known, although this species would seem to be highly localized within the park (being dependent on significant quantities of the lichen *Usnea*). This species is also known from several localities just beyond the park's eastern boundary, but none offers realistic long-term protection. Other species include *Coracias spatulatus*, *Tockus pallidirostris*, *Tricholaema frontata*, *Lanius souzae*, *Monticola angolensis*, *Cercotrichas barbata*, *Sylvietta ruficapilla*, *Muscicapa boehmi*, *Nectarinia manoensis*, *Plocepasser rufoscapulatus* and *Neocichla gutturalis*. *Macronyx croceus* is common in the dambos and along the streams are *Anas sparsa* and *Alcedo semitorquata*. *Falco naumanni* is probably a regular passage migrant.

Key species

A3 (A10) Zambezian biome: 21 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife

None known to BirdLife International.

Conservation issues

The small-scale mining of aquamarine has decreased as licence fees have risen, and this industry would seem to present no threat to the park at current levels. Large mammals are sparse and illegal hunting continues, although it seems unlikely that the birdlife is at risk. There would appear to be some clearance of miombo in peripheral areas near villages and, although the areas concerned are small, the problem requires investigation.

Further reading

Clarke and Loe (1974).

Nyika National Park — ZM022

Admin region Eastern
Coordinates 10°38′S 33°38′E — A1, A2 (105), A3 (A07)
Area 8,000 ha **Altitude** 1,400–2,200 m — National Park

Site description

This park lies along the Malaŵi border in the far north-east of the country. It adjoins the much larger Malaŵian park of the same name (site MW002) and is best approached from that side. Together with the Mafinga and Makutu mountains, it forms the eastern highlands, which constitute the only truly montane area in Zambia. The undulating terrain is dominated by montane grassland, but there are scattered patches of montane forest, usually in depressions or along streams. The largest of these are Chowo (90 ha) and Manyanjere (75 ha). Along the western side of the park runs a precipitous escarpment which, in places, supports miombo. At higher levels, this woodland becomes somewhat stunted.

Birds

See Box and Tables 2 and 3 for key species. Over 40 species are confined in Zambia to the eastern highlands, among them the globally threatened *Hirundo atrocaerulea*, which occurs as a breeding visitor and passage migrant, as well as eight species with globally restricted ranges (see Table 2). Within the eastern highlands, many of these 40+ species are restricted to Nyika alone, and most are characteristic of the Afrotropical Highlands biome. A number of other species not belonging to this biome assemblage are, nevertheless, restricted in Zambia to this small area, including *Accipiter rufiventris*, *Cossypha caffra*, *Cisticola lais*, *Batis capensis*, *Nectarinia famosa* and *Serinus canicollis*. Other characteristic birds of Nyika include *Francolinus hildebrandti*, *F. levaillantii*, *Coturnix coturnix*, *Neotis denhami* (occasional; breeds on the Malaŵian side), *Columba arquatrix*, *C. larvata*, *Indicator meliphilus* and *Cisticola ayresii*. Of the other species of global conservation concern, *Circus macrourus* is regular, *Falco naumanni* occurs in small numbers on passage, *Grus carunculatus* is an uncommon resident (breeding on the Malaŵi side), *Crex crex* is occasional, and *Cisticola njombe* is common. One species occurs that is restricted to the Zambezian biome, *Monticola angolensis* (see Table 3). The site is the only regular non-breeding area in Zambia for *Sylvia atricapilla*, and *Ceratogymna brevis* is an erratic visitor.

Key species

A1	*Circus macrourus*	*Crex crex*
	Falco naumanni	*Hirundo atrocaerulea*
	Grus carunculatus	*Cisticola njombe*

A2 (105) Tanzania–Malaŵi mountains EBA: All of the eight species of this EBA that occur in Zambia have been recorded at this site; see Table 2.

A3 (A07) Afrotropical Highlands biome: 37 of the 41 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife

A wide variety of mammals are known, including *Rhynchocyon cirnei* (VU), *Otomys typus* (LR/nt), *O. denti* (LR/nt) and *Rhabdomys pumilio* (DD). There are many butterflies unknown elsewhere in the country, including *Axiocerces nyika*, *Iolaus helenae*, *Lepidochrysops handmani*, *L. chalceus* and *L. nyika*, all of which are (on present evidence) endemic to the Nyika. Other species known from nowhere else in Zambia include *Neptis nina*, *Cymothoe cottrelli*, *Charaxes nyikensis*, *Uranothauma williamsi* and indeed much of the flora and fauna is of very limited distribution elsewhere in Zambia.

Conservation issues

There is some illegal hunting of the larger mammals and it would

appear that fire-breaks around the forest patches are not being maintained properly. Within Zambia, the total area of mature montane forest is c.200 ha, so the many species restricted to this habitat are very vulnerable on a national scale. However, this is fortunately not the case in neighbouring countries, in which montane forest is more widespread.

Further reading

Clarke and Loe (1974), Dowsett-Lemaire (1983, 1985, 1989).

Shiwa Ng'andu — ZM023

Admin region Northern
Coordinates 11°12′S 31°45′E — A1, A3 (A10)
Area 9,000 ha **Altitude** 1,400–1,800 m — Unprotected

Site description

An unusual but well-known private estate. At its heart is an enormous manor house around which has grown a thriving community with its own school, post office and clinic. It lies at submontane levels and the surrounding mountainous terrain is, in places, quite dramatic. Lake Ishiba Ngandu, a natural water-body, provides a somewhat rare plateau habitat, with fringing reedbeds and *Cyperus papyrus* swamp. Elsewhere, miombo is predominant, both in the flatter areas and on the hills, and there are also broad dambos, some mushitu and riparian forest. The soils are poor and, besides cattle production, other economic activity has included production of essential oils. Situated about 70 km north of Mpika, it is easily accessible and there are tourist facilities at Kapisha Hot Springs, some 10 km west of the main estate.

Birds

See Box and Table 3 for key species. With its wide range of habitats, the site supports a considerable diversity of birdlife. *Gypohierax angolensis* is regularly seen, especially around the lake, and *Sarothrura lugens*, *Tyto capensis*, *Cisticola robustus* and *Ortygospiza gabonensis* are all found in the dambos. *Hirundo fuligula*, *Thamnolaea cinnamomeiventris* and *Cisticola aberrans* are regular in rocky areas and mushitu birds include *Sheppardia bocagei* and *Lamprotornis splendidus*. *Podica senegalensis* and *Alcedo semitorquata* are found along the rivers and *Acrocephalus rufescens* inhabits the papyrus swamp where *Ardeola idae* has been recorded once. *Crex crex* is occasionally noted, and *Gallinago media* winters in small numbers. Amongst the Zambezian biome endemics is *Ploceus angolensis*, at the very eastern edge of its range, and a single species of the Afrotropical Highlands biome, *Trochocercus albonotatus*, also occurs.

Key species

A1	*Crex crex*	*Gallinago media*
A3 (A10)	Zambezian biome: 31 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.	

Other threatened/endemic wildlife

None known to BirdLife International.

Conservation issues

The area is well protected, although there is pressure from tree-cutting.

Further reading

Harvey (1997).

Lavushi Manda National Park — ZM024

Admin region Northern
Coordinates 12°18′S 30°50′E — A1, A3 (A10)
Area 150,000 ha **Altitude** 1,200–1,810 m — National Park

Site description.

Situated to the west of the Great North Road between Serenje and Mpika, the park lies mainly between 1,200–1,400 m, although the Lavushi Manda Hills exceed 1,800 m in places. It is bisected by a single dirt road and thus access to most of the area is very difficult and much of it remains poorly known. The terrain is dominated by mature miombo woodland, but the park encompasses the headwaters of numerous small rivers along which run strips of forest or dambos. In the hills are canyons and rock-faces. There are no tourist facilities.

Birds

See Box and Table 3 for key species. In and around the riparian forest are *Accipiter melanoleucus*, *Scotopelia peli*, *Merops boehmi* and *Apalis thoracica*, whilst the dambos hold *Euplectes hartlaubi* and *Ortygospiza locustella*. *Neotis denhami* has been recorded. The miombo supports a wide variety of birds typical of this habitat, such as *Stactolaema anchietae*, *Anthus caffer* and *Anthreptes anchietae*, and *Ficedula albicollis* is a common wintering visitor. Inhabiting the rocky areas are *Buteo augur*, *Aquila verreauxii*, *Caprimulgus tristigma*, *Anthus lineiventris*, *Thamnolaea cinnamomeiventris* and *Onychognathus morio*.

Key species

A1	*Gallinago media*
A3 (A10)	Zambezian biome: At least 24 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife

None known to BirdLife International.

Conservation issues

Some illegal hunting occurs and large mammals are not numerous, but it seems unlikely that birds are at risk. Much of the park is uninhabited and inaccessible, but human encroachment perhaps needs to be assessed and monitored.

Further reading

Clarke and Loe (1974).

Kasanka National Park — ZM025

Admin region Central
Coordinates 12°31′S 30°13′E — A1, A3 (A10)
Area 39,000 ha **Altitude** c.1,200 m — National Park

Site description

Run by the Kasanka Trust, this was the first National Park to be privately managed and is entirely reliant on independent funding. It is situated to the west of the Serenje–Samfya road. Miombo dominates the area, but amongst the broad range of other habitats are an unusually high number of lakes (pans), some *Cyperus papyrus* swamp, dambo, mushitu, riparian forest and a few patches of dry evergreen forest. There are good tourist facilities and the park's attractions include a tree-hide for viewing sitatunga *Tragelaphus spekii* which has been built 18 m up in a large mululu tree *Khaya nyasica*.

Birds

See Box and Table 3 for key species. Besides the large number of Zambezian biome endemics, the miombo avifauna includes species such as *Pachycoccyx audeberti*, *Anthus caffer* and *Elminia albicauda*, and both *Stactolaema anchietae* and *S. whytii* occur. Along the rivers *Scotopelia peli*, *Podica senegalensis* and *Alcedo semitorquata* are regular, and *Circaetus cinerascens*, *Musophaga rossae*, *Merops boehmi* and *Nectarinia verticalis* are regular in and around most forest. A wide variety of waterbirds are found. *Grus carunculatus* is resident, *Egretta vinaceigula* and *Balaeniceps rex* are rare visitors, *Circus macrourus* occurs in small numbers and *Falco naumanni* is probably regular on passage.

Key species

A1	*Circus macrourus*	*Grus carunculatus*
A3 (A10)	Zambezian biome: At least 30 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.	

Other threatened/endemic wildlife

A wide variety of mammals occur, including *Tragelaphus spekii* (LR/nt) and *Cephalophus silvicultor* (LR/nt). There is an enormous seasonal influx of the migratory fruit bat *Eidolon helvum*. Reptiles include the most southerly known population of *Crocodylus cataphractus* (DD).

Conservation issues

Since being privately managed, the park has been actively protected and there are probably no threats to the birdlife.

Further reading

Clarke and Loe (1974), Farmer (1992).

Bangweulu swamps — ZM026

Admin region Northern, Luapula
Coordinates 11°50′S 30°07′E — A1, A3 (A10), A4i
Area c.400,000 ha — Game Management Area, Ramsar Site, Unprotected
Altitude c.1,160 m

Site description

A vast area of swamp, flood-plain and termitaria encompassing about 40% of the total wetland area in the Bangweulu basin. The site includes Chikuni Game Management Area, a designated Ramsar Site (250,000 ha), and some adjacent areas to the north and west. It lies on the southern side of the basin and reaches the Serenje–Samfya road to the south-west. In areas of permanent swamp the vegetation is dominated by *Cyperus*, *Phragmites*, *Typha*, *Limnophyton* and *Thalia* species, and in the flooded grassland dominant genera include *Acroceras*, *Leersia*, *Sacciolepsis* and *Setaria*. During flood periods, thick mats of aquatic vegetation may form 'floating meadows'. The extent and timing of the annual flood depends on rainfall, but water-levels usually begin to rise in January and reach their peak in March. From April onwards the water recedes and the flood-plain tends to be dry by late May, although in wetter years pools may persist until August. The area holds considerable numbers of large mammals, and tourists and licensed hunters may stay at one of several camps on the south-eastern side. Many small-scale fishermen inhabit islands and other surrounding areas.

Birds

See Box and Table 3 for key species. The area is famous for its population of *Balaeniceps rex*, an uncommon resident which, for much of the year, is loosely concentrated near the main river channels, although during flood periods there is much dispersal. *Grus carunculatus* is a common breeding resident, often present in large numbers, *Egretta vinaceigula* is a scarce resident or visitor which possibly breeds, while *Gallinago media* is a common wintering visitor. The three Palearctic *Circus* species are all regular, with *C. pygargus* the most numerous, followed by *C. macrourus*; least common is *C. aeruginosus*. *Falco naumanni* occurs in some numbers, *Phoenicopterus minor* is a vagrant. The basin as a whole may represent one of the last strongholds of the Afrotropical subspecies *Botaurus stellaris capensis*, in view of its drastic decline in southern Africa (Allan in Harrison *et al.* 1997). *Neotis denhami* is common on the flood-plain and during passage periods is found alongside large numbers of *Ciconia abdimii* and *C. ciconia*. Some of the largest concentrations of herons (Ardeidae), storks (Ciconiidae) and wildfowl (Anatidae) occur as the flood-waters recede and at this time large numbers of waterbirds are also breeding within the swamp. *Egretta vinaceigula* is a scarce resident or visitor which possibly breeds, while *Gallinago media* is a common non-breeding visitor. The three Palearctic *Circus* species are all regular, with *C. pygargus* the most numerous, followed by *C. macrourus* and least common is *C. aeruginosus*. The permanent swamps must hold enormous numbers of rails (Rallidae), but no censusing has been carried out. Common swamp passerines include *Acrocephalus rufescens*, *Cisticola pipiens*, *Muscicapa aquatica* and *Ploceus katangae* (small range in Zambia). *Merops variegatus* is distributed throughout the area and the plains hold an isolated population of *Cisticola aridulus* alongside the rather localized *Euplectes progne*. *Phoenicopterus minor* is a vagrant.

Key species

A1	*Egretta vinaceigula*	*Falco naumanni*	
	Balaeniceps rex	*Grus carunculatus*	
	Circus macrourus	*Gallinago media*	
A3 (A10)	Zambezian biome: At least 13 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.		
A4i		Breeding (pairs)	Non-breeding
	Egretta ardesiaca	Breeds	500+
	Egretta garzetta	Breeds	1,000+
	Casmerodius albus	Probably breeds	500+
	Bubulcus ibis	—	10,000+
	Ardeola ralloides	Breeds	500+
A4i ... continued		Breeding (pairs)	Non-breeding
	Ardeola rufiventris	Breeds	1,400+
	Botaurus stellaris	17+	—
	Balaeniceps rex	Breeds	Min. 232 (1983)
	Anastomus lamelligerus	Breeds	1,000+
	Ephippiorhynchus senegalensis	Probably breeds	Min. 275 (1983)
	Plegadis falcinellus	Probably breeds	1,000+
	Platalea alba	Probably breeds	150+
	Plectropterus gambensis	Breeds	3,750
	Grus carunculatus	Common	780+ (1992)
	Glareola pratincola	Probably breeds	1,000+
	Charadrius pecuarius	Breeds	1,000+
	Charadrius asiaticus	—	200+
	Gallinago media	—	300+
	Gallinago nigripennis	Breeds	500+
	Philomachus pugnax	—	20,000+
	Chlidonias leucopterus	—	2,000+

Other threatened/endemic wildlife

A wide variety of mammals occur, including *Tragelaphus spekii* (LR/nt) and the endemic subspecies *Kobus leche smithemani*. Reptiles include *Crocodylus cataphractus* (DD).

Conservation issues

The swamps support a large human population and general disturbance is a continual threat to sensitive species such as *Balaeniceps rex*. Furthermore, nests of this species are raided or even actively destroyed if discovered and it would appear that small numbers of birds are still being caught for illegal live export. Large breeding colonies may suffer the same fate if found and small numbers of birds are hunted under licence. Fires are widespread in the dry season and may thwart the breeding attempts of some species.

Further reading

Buxton *et al.* (1978), Christian (1997), Howard and Aspinwall (1984), Mwenya (1973), Renson (1998).

Luapula mouth — ZM027

Admin region Luapula
Coordinates 09°42′S 28°38′E — A1, A3 (A06, A10)
Area c.70,000 ha **Altitude** 900 m — Unprotected

Site description

A large area of *Cyperus papyrus* swamp in the lowest reaches of the Luapula river as it fans out to meet Lake Mweru. Its western boundary is the main river channel, which is also the international border with the Democratic Republic of Congo, and in the east the wetland has a well-defined edge. The tarmac Mansa–Nchelenge road runs a little way above and parallel to the shoreline, which is fairly densely populated. Within the swamp are scattered open lagoons and a network of small channels, kept navigable by fishermen and inhabitants of the larger islands.

Birds

See Box and Table 3 for key species. The site has long been known for its isolated population of *Chloropeta gracilirostris* (of the distinctive race *bensoni*), but is otherwise little explored. Recent work has revealed that species to be widespread and not uncommon, although easily overlooked. Furthermore, *Bradypterus carpalis* was discovered in considerable numbers and also found to be widespread. Besides the array of larger waterbirds that may occur, characteristic swamp species include *Sarothrura rufa*, *Centropus cupreicaudus*, *Merops variegatus*, *Tchagra minuta*, *Cisticola pipiens*, *Bradypterus baboecala*, *Acrocephalus rufescens*, *Muscicapa aquatica*, *Ploceus pelzelni*, *P. katangae* (small range in Zambia) and *P. melanocephalus*. A second globally threatened species, *Falco naumanni*, occurs and is perhaps regular on passage.

Key species

A1	*Chloropeta gracilirostris*	
A3 (A06)	Lake Victoria Basin biome: Both of the species of this biome that occur in Zambia have been recorded at this site; see Table 3.	

A3 (A10)	Zambezian biome: Six of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife
Mammals at the site include *Tragelaphus spekii* (LR/nt).

Conservation issues
A major threat to the site is fire. Whereas most swamp-dwelling species will tolerate a lack of water, it may take months before birds return to areas that have been burnt. Trapping of birds is also widespread.

Further reading
Dowsett *et al.* (1999), Leonard and Beel (1996b, 1999).

Kalungwishi — ZM028

Admin region Northern
Coordinates 09°52′S 30°20′E — A1, A3 (A10)
Area 45,000 ha **Altitude** 1,500–1,600 m — State ranch

Site description
This site is currently a disused farm, owned by the state, but up for sale. About 100 km east-north-east of Kasama and lying at the headwaters of the Kalungwishi river, it is in one of the highest parts of the Northern Province. At its heart is a vast dambo flanking the river and its many tributaries, which also support numerous patches of mushitu. The remaining area is predominantly miombo and both the ranch and adjacent areas are very sparsely populated.

Birds
See Box and Table 3 for key species. The site is poorly known, but clearly holds a rich diversity of species owing to the variety and maturity of the habitat. *Grus carunculatus* is a resident and probably breeds, while *Gallinago media* winters. Characteristic of the dambo are *Coturnix chinensis*, *Turnix hottentotta*, *Sarothrura lugens*, *Caprimulgus natalensis*, *Hirundo nigrorufa*, *Schoenicola brevirostris*, *Cisticola tinniens*, *Macronyx fuellebornii*, *M. ameliae*, *Euplectes hartlaubi* and *Anomalospiza imberbis*. Mushitu species known to occur include *Cossypha bocagei*, *Bradypterus lopezi*, *Phylloscopus laurae*, *Apalis cinerea* and *Telophorus multicolor*, and the miombo holds a large number of Zambezian biome endemics.

Key species

A1	*Grus carunculatus*	*Gallinago media*
A3 (A10)	Zambezian biome: 28 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.	

Other threatened/endemic wildlife
None known to BirdLife International.

Conservation issues
At present the area is virtually pristine and benefits from the very low density of human habitation. However, the site needs very careful monitoring, especially if it is sold and subdivided.

Mweru Wantipa National Park — ZM029

Admin region Luapula, Northern
Coordinates 08°43′S 29°36′E — A1, A3 (A10), A4i
Area 313,400 ha **Altitude** 900–1,425 m — National Park

Site description
Lying in the far north of the country, between Lakes Mweru and Tanganyika, the park encompasses a third lake, from which it takes its name. Until recently the water-level fluctuated both seasonally and over longer cycles and much of the wetland was swamp. However, a dam has been built and a large proportion of this habitat has been flooded. The lake and surrounding areas lie at comparatively low altitude, between 900–1,000 m, and itigi thicket is the dominant vegetation-type. Further west, the land gradually rises and reaches over 1,400 m where the terrain is rugged, hilly and clad in miombo. A single road bisects the park running roughly north–south along the western shore of the lake, and there are no tourist facilities.

Birds
See Box and Table 3 for key species. Waterbirds can be numerous at times and the lake shore has in the past supported large numbers of migrant waders. *Balaeniceps rex* was once a regularly seen resident, but its recent status is uncertain—it is likely to have suffered from the increase in water-level. In 1955, over 600 pairs of *Phoenicopterus minor* nested, probably unsuccessfully, although the site lies on the periphery of this species's normal breeding range. More than 3,000 *Pelecanus onocrotalus* were present in 1954. Species characteristic of the thicket include *Ceuthmochares aereus*, *Pitta angolensis*, *Nicator gularis*, *Telophorus multicolor* and *Ploceus bicolor*. Birds of more open habitats include *Corythaixoides personatus* and *Uraeginthus bengalus* and the miombo remains largely unexplored.

Key species

A1	*Balaeniceps rex*	*Phoenicopterus minor*	
A3 (A10)	Zambezian biome: Five of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.		
A4i		Breeding (pairs)	Non-breeding
	Pelecanus onocrotalus	Breeds	1,800+
	Bubulcus ibis	—	10,000+
	Anastomus lamelligerus	?	1,000+

Other threatened/endemic wildlife
A wide variety of mammals occur, including *Tragelaphus spekii* (LR/nt) and *Cephalophus silvicultor* (LR/nt).

Conservation issues
The level of protection is low and large mammals have suffered from illegal hunting. Threats to the birds and the vegetation are probably few, but the effect of the dam requires further investigation.

Further reading
Brown (1957), Clarke and Loe (1974).

Saisi river — ZM030

Admin region Northern
Coordinates 08°58′S 31°40′E — A1, A2 (s055), A3 (A10)
Area 3,000 ha **Altitude** 1,525 m — Unprotected

Site description
Just east of Mbala, the river and its immediate tributaries constitute the only system which drains from Zambia into Tanzania. The site covers the stretch adjacent to the border where there is papyrus swamp, a small flood-plain and rich termitaria. Villages are scattered throughout the surrounding area, cattle are grazed on the flood-plain and the river is heavily fished.

Birds
See Box and Tables 2 and 3 for key species. A poorly known area, apparently visited for the first and only time by ornithologists in 1996, when *Ploceus reichardi* was discovered in considerable numbers—it probably breeds in the area. *Gallinago media* occurs, and other birds found included *Rallus caerulescens*, *Sarothrura rufa*, *Gallinago gallinago*, *G. nigripennis*, *Corythaixoides personatus*, *Tricholaema lacrymosa*, *Saxicola rubetra*, *Nectarinia mariquensis* and *Quelea erythrops*.

Key species

A1	*Gallinago media*
A2 (s055)	South-west Tanzanian swamps Secondary Area: *Ploceus reichardi* has been recorded at this site.
A3 (A10)	Zambezian biome: At least five of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife
None known to BirdLife International.

Conservation issues
The habitat surrounding the site is somewhat degraded, but the flood-plain and swamp are relatively undisturbed. Other than some hunting and trapping of small birds, there are probably few threats to birdlife, although further investigation is required.

Further reading

Leonard and Beel (1996a, 1999).

Jimbe drainage — ZM031

Admin region North Western
Coordinates 10°57′S 24°03′E — A3 (A05, A10)
Area 10,000 ha **Altitude** c.1,250 m — Local Forest, Unprotected

Site description

The area lies at the northernmost tip of the North Western Province, extending southwards and eastwards from the borders with the Democratic Republic of Congo and Angola (in the north and west) towards Muhonge Local Forest (No. 73). Miombo dominates the vegetation, but there are a few patches of grassland and, most importantly, a network of streams that are lined with moist evergreen forest.

Birds

See Box and Table 3 for key species. The area holds many species that are endemic to the Guinea–Congo Forests biome. Those with the most restricted ranges in Zambia include *Sarothrura pulchra*, *Alcedo leucogaster*, *Campethera caroli*, *Bias flammulatus* and *Platysteira castanea*. *Ploceus superciliosus* probably breeds in areas where forest and grassland meet and *Ptyrticus turdinus* would appear to be sparse. A wide range of Zambezian biome endemics also occur. One species of the Afrotropical Highlands biome is present: *Bradypterus alfredi*.

Key species

A3 (A05) Guinea–Congo Forests biome: 16 of the 17 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

A3 (A10) Zambezian biome: 22 of the 56 species of this biome that occur in Zambia have been recorded at this site; see Table 3.

Other threatened/endemic wildlife

These are among the most notable forests in Zambia, as they hold many taxa typical of the Guinea–Congo Forests biome. Much of the fauna has a highly restricted distribution in Zambia. Snakes include *Philothamnus carinatus*, *Causus lichtensteinii* and *Thelotornis kirtlandii*. Several species of dragonfly are endemic to the area.

Conservation issues

About 90% of the site is unprotected but, due to its proximity to Angola, it is much more sparsely populated than surrounding areas, where many forests have been cleared for small-scale farming. The broad mushitus found at headwaters in this region probably represented the areas of greatest biodiversity, yet these are particularly favoured for cultivation and virtually none remain. Within the site, much of the gallery forest is presently undisturbed, but action is urgently required to protect it.

Further reading

Leonard and Van Daele (1999).

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