

# NEPAL

## INTRODUCTION

based on information provided by Rajendra Lal Shrestha and H.S. Nepali.

**Area:** 147,181 sq.km.

**Population:** 16,300,000 (1985).

Nepal is a small, landlocked, mountainous Kingdom on the south slope of the Great Himalaya. The country is roughly rectangular in shape and runs parallel to the Himalayan axis; it is approximately 880 km from east to west, and on average about 140 km from north to south. It is bounded to the north by the Tibetan Autonomous Region of the People's Republic of China, to the east by Sikkim, and to the south and west by India.

Nepal is an agricultural country, with about 94% of the population engaged in farming. The major crops are rice, maize and wheat as cereals, and jute, oil-seeds, sugar cane, potatoes and tobacco as cash crops. The population of about 16.3 million is growing at the rate of 2.7% per year, and this rate is likely to increase because of the age structure.

Most of the country has a monsoonal climate, with an average annual rainfall of between 1,000 and 2,500 mm, 80-90% of which falls during the summer monsoon from June to September. Average maximum temperatures during summer range from over 40°C in the lowlands to about 20°C in the midland hills and 16°C at 4,000m in the highlands.

On the basis of its topography and climate, Nepal can be divided into four major ecological zones: Lowland, Midland, Highland and Trans Himalayan. The Lowland Zone or Terai occupies a narrow strip along the southern edge of the country, on the border with India. Altitudes range from 60-300 metres above sea level, and the climate is tropical. The region is characterized by large rivers and their flood plains, dense tropical forest and extensive areas of tall grassland. The human population density is very high, and large areas of the forest and natural grassland have been converted into agricultural land.

The Midland Zone is comprised of a series of hill ranges, steep sided valleys and intermontane basins stretching across the middle of the country, at elevations from 1,000m to 3,500m. The climate is subtropical or temperate, and varies greatly according to the local topography. Population pressure has increased considerably in recent decades and extensive deforestation has taken place in the centre and east of the country. Soil erosion is severe, and landslides are becoming increasingly frequent during the heavy rains of the summer monsoon. Most of the natural ecosystems are under threat, and many species of wildlife have shown a drastic decline in numbers in recent years.

The Highland Zone includes all the northern regions of Nepal from the bottom edge of the coniferous forest zone at about 2,750m up through the rhododendron, birch and alpine meadow zones to the barren rocky slopes and perpetual snows at over 8,000m on the summits of the high Himalayas. Many areas are extremely remote and difficult of access, and as such are naturally protected from any major incursions by man.

The relatively small Trans Himalayan Zone lies to the north of the main Himalayan chain in western Nepal. It is situated within the rain shadow of the Himalayas and, with an annual rainfall of less than 500 mm, is significantly drier than the other zones. It lies at the extreme southern edge of the great Tibetan Plateau, and like that region, is typified by a semi-arid steppe vegetation.

Nepal straddles the transition zone between the Palearctic Realm to the north and the Indomalayan Realm to the south. Thus, most species of animals and plants occurring at high altitudes in the Himalayas are characteristic of the Palearctic Realm, while the fauna and flora of the southern lowlands, on the edge of the great Gangetic plain, are typically Indomalayan. Because of this meeting of biogeographical realms, the great range in altitudes and the diversity of climatic zones, Nepal has an extremely rich fauna and flora. Nearly 100 species of mammals and 850 species of birds have been recorded, and it is estimated that there are some 10,000 indigenous species of plants.

### **Summary of Wetland Situation**

Lacking a coastline, and with over two-thirds of its territory mountainous, Nepal has rather few wetlands other than fast-flowing rivers and streams. There are three major river systems fed by the snows and glaciers of the Himalayas: the Kosi in the east, the Gandak in the centre, and the Karnali in the west. These rivers, along with the numerous smaller rivers rising in the Mahabharat and Siwalik Ranges, contribute up to 40% of the annual flow of the Ganges River, and 71% of its dry season flow. Other wetlands include about 5,000 ha of small lakes scattered throughout the country, 1,200 ha of man-made reservoirs, 5,000 ha of village tanks and ponds, and some 185,000 ha of rice paddies. Large reservoirs under construction in the Gandak River system (45,000 ha), Bagmati River basin (9,000 ha) and Karnali River basin (24,000 ha) will add a further 80,000 ha of surface water area when completed (Rajbanshi, 1986).

Most of the lakes in the highlands are oligotrophic and many are of recent glacial origin. There are some small pockets of marshy grassland in river valleys, and a few of the mid-elevation lakes have fringing marshes. The most extensive marshes occur in the lowlands, on the flood plains of the three major rivers. Severe flooding during the summer monsoon and constant shifting of the river channels have created wide flood plains with a mosaic of sand and shingle banks, oxbow lakes, patches of riverine forest, marshes and seasonally flooded grasslands.

Although Nepal possesses rather few wetlands, the ecological diversity of the wetland ecosystems is very great, and this is reflected in the great variety of wetland fauna. A total of 164 indigenous species of fishes have been recorded, with species of *Schizothorax*, *Orienus*, *Schizothorichthys* and *Tor* dominating in most of the rivers and streams in the midland and highland zones. Over 130 species of waterfowl have been recorded, including most species typical of the Gangetic plain, and a wide variety of migrants which cross the Nepalese Himalayas on their way between breeding areas in north and central Asia, and wintering areas further south in the Indian subcontinent. The aquatic reptiles include two threatened species of crocodilians, the Marsh Crocodile *Crocodylus palustris* and the Gharial *Gavialis gangeticus*. The Gharial is endangered throughout its range, and the Nepalese populations may now be the most viable remaining in the wild.

In general, however, very little information is available on the wetlands of Nepal. The national conservation bodies have focused most of their attention on the problems caused by over-exploitation of the country's forest resources. During the 30-year period from 1950 to 1980,

more than 30% of Nepal's forests were destroyed. It is hardly surprising, therefore, that wetlands have received very little attention. However, the recent global campaign to promote the conservation of wetlands has been well received in Nepal, and the need to conserve wetlands is now widely recognized.

Following the establishment of the National Parks and Wildlife Conservation Office in 1972, various rich natural areas were set aside for nature conservation (Shah, 1978). By 1987, six National Parks, four Wildlife Reserves and one Hunting Reserve had been created (Jaakko Poyry Oy & Madecor, 1987). Many of Nepal's most important wetlands are included within this system of reserves. Most of the important highland lakes are situated in the three large Himalayan National Parks (Sagarmatha, Langtang and Shey Phoksumdo); the country's largest lake, Lake Rara, is protected in Lake Rara National Park; and significant tracts of the riverine wetlands in the lowlands are protected in the Royal Sukla Phanta Wildlife Reserve, Royal Bardia Wildlife Reserve, Royal Chitwan National Park and Kosi Tappu Wildlife Reserve. However, by far the most important site for waterfowl in Nepal, namely Kosi Barrage, is unprotected. It has been recommended that the nearby Kosi Tappu Wildlife Reserve be extended southwards to include the barrage, but the situation is complicated because the area is leased to the Government of India (Jaakko Poyry Oy & Madecor, 1987).

### **Wetland Research**

There has been no systematic research on wetlands in Nepal. A considerable amount of fisheries research has been carried out by the Fisheries Development Division of the Department of Agriculture, which has 14 Fisheries Development Centres scattered throughout the country. A Lake Development Centre has been established in the Pokhara Valley to explore and improve the fisheries potential of the seven lakes in the valley, and the Centre has already carried out limnological studies at three of the lakes. Detailed biological investigations have been made at Taudaha Lake in Kathmandu Valley, and waterfowl censuses have been undertaken at Kosi Barrage, the Pokhara Lakes and several other sites. Other wetland related studies have included research on the Marsh Crocodile and Gharial at wetlands in the lowlands, a survey of habitat of the Relict Himalayan Dragonfly *Epiophlebia laidlawi* in Kathmandu Valley, an ecological study of waterfowl in Royal Chitwan National Park, and research on the Swamp Deer *Cervus duvauceli* in Royal Sukla Phanta Wildlife Reserve.

### **Wetland Area Legislation**

There is no legislation which relates specifically to wetlands, but much of the legislation concerning protected areas is relevant to this type of habitat. The National Parks and Wildlife Conservation Act 2029 was introduced in 1973 to provide a legal basis for Nepal's conservation programme. This act superseded the Wildlife Protection Act of 1958 (amended in 1967) and the Hunting Rules of 1967. The National Parks and Wildlife Protection Regulations were drawn up in 1974 to control hunting and restrict trade in wild animals in accordance with the Convention on International Trade in Endangered Species (CITES), of which Nepal is a signatory. Other relevant regulations include the Royal Chitwan National Park Regulations (1974), Wildlife Reserve Regulations (1975) and Himalayan Mountain National Park Regulations (1979). In addition to national parks, the legislation provides for the establishment of three categories of reserves, namely wildlife reserves, strict nature reserves and hunting reserves. Also, provision has been made under the Soil Conservation and Watershed Management Act (1982) for the protection of watershed areas.

The Nepalese Government acceded to the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention) on 17 December 1987, and designated one site, Kosi Tappu Wildlife Reserve, for inclusion in the List of Wetlands of International Importance established under the terms of the Convention.

### **Wetland Area Administration**

Prior to the National Parks and Wildlife Conservation Act of 1973, conservation was the responsibility of the Forest Department, which established hunting reserves, issued hunting licenses and controlled hunting within forest reserves. In 1972, a National Parks and Wildlife Conservation Office was set up as a semi-autonomous branch of the Forest Department, with responsibility for the administration and management of parks and reserves and for the coordination of the activities of the wildlife guards. The Office, with the assistance of FAO and UNDP, initiated a National Park and Wildlife Project in 1973. The objectives were to conserve and manage the country's rich wildlife resources and habitats, establish and manage national parks and nature reserves, and run a local education programme in collaboration with the Conservation Education and Publicity Unit created in 1974. In 1982, the National Parks and Wildlife Conservation Office was upgraded to departmental status within the Ministry of Forests. The provision of guards and enforcement of law in all parks and reserves has been the responsibility of the Royal Nepal Army since 1975. The Department of Soil Conservation and Watershed Management was set up in 1974, and is responsible for the management of watershed protection areas.

### **Organizations involved with Wetlands**

#### a) Governmental Organizations

##### - Department of National Parks and Wildlife Conservation

Responsible for the administration and management of parks and reserves, and for the coordination of the activities of the wildlife guards.

##### - Fisheries Development Division, Department of Agriculture

Responsible for research and management of fisheries, and development of aquaculture.

##### - Department of Soil Conservation and Watershed Management

Responsible for the management of watershed protection areas.

##### - King Mahendra Trust for Nature Conservation

An autonomous organization established in 1982 under the King Mahendra Trust for Nature Conservation Act (2039), to promote the conservation and management of natural resources in order to improve the quality of life of the human population.

##### - Natural History Museum, Tribhuvan University

Established in 1975 under the auspices of the Institute of Science and Technology, Tribhuvan University, to promote research on Nepal's fauna and flora, and to increase public interest in natural history and nature conservation.

##### - Nepal Nature Conservation Society

An independent government registered society, established in 1971 to encourage local interest in natural history and conservation. - Nepal Bird Watching Club - Nepal Heritage Society  
An independent society concerned primarily with the country's cultural heritage.

## WETLANDS

Site descriptions based on a report prepared for this Directory by Rajendra Lal Shrestha and H.S. Nepali, a series of wetland data sheets provided by Carol Inskipp, and additional wetland data sheets and mid-winter waterfowl counts provided by Devi Gurung et al., Harka B. Gurung, Yam Gurung, Kim C. Hudson, Steven Madge, Megh Bahadur Pandey, J.O.M. Roberts, Michael J. Rogers, Anthony Stones, Rajendra N. Suwal and Kalu Ram Tamang.

**Wetland name:** Rani Tal

**Country:** Nepal

**Coordinates:** 28°51'N, 80°11'E;

**Location:** in the terai of extreme southwestern Nepal, 12 km SSE of Mahendranagar, Kanchanpur District.

**Area:** 220 ha.

**Altitude:** 100m.

**Biogeographical Province:** 4.8.4.

**Wetland type:** 14.

**Description of site:** A small, permanent, freshwater lake and associated grassy marshes, surrounded by forest. The lake is situated near the eastern border of the Royal Sukia Phanta Wildlife Reserve, and is the only lake in the Reserve.

**Climatic conditions:** Tropical monsoonal climate with an average annual rainfall of 1,443 mm, an average maximum temperature of 42°C, and an average minimum temperature of 10°C. Over 90% of the annual precipitation falls between June and September. Extreme temperatures of 50°C and 3°C have been recorded.

**Principal vegetation:** The lake vegetation includes *Pistia* sp; the surrounding marshes are dominated by the tall grasses *Saccharum spontaneum*, *Vetiveria zizanioides*, *Eulaliopsis binata*, *Heteron contoratus*, *Arundo donax* and *Phragmites karka*. In a region of Sal forest (*Shorea robusta*), with thick lianas and dense undergrowth beneath a heavy forest canopy.

**Land tenure:** The lake and surrounding areas are state owned.

**Conservation measures taken:** The lake is protected within the Royal Sukla Phanta Wildlife Reserve (15,500 ha), established in 1976. From 1965 to 1976, the area was afforded some protection as a Royal Shikar (Hunting) Reserve.

**Land use:** None at the lake; there is some illegal cattle grazing and collection of firewood and fodder in the Wildlife Reserve.

**Disturbances and threats:** None, except for some cutting of marsh grasses for weaving.

**Economic and social values:** None known.

**Fauna:** The lake is visited by a large variety of waterfowl, both resident and migratory species. Resident species include *Phalacrocorax niger*, *Egretta garzetta*, *E. alba*, *Ardea purpurea*, *Anas lomus oscilans*, *Dendrocygna javanica*, *Sarkidiornis melanotos*, *Nellapus coromandelianus*, *Gallinula chloropus*, *Porphyrio porphyrio*, *Metopidius indicus*, *Rostratula benghalensis* and *Sterna melanogaster*. Passage migrants and winter visitors include *Phalacrocorax carbo*, *Anser indicus*, *Anas penelope*, *A. falcata*, *A. strepera*, *A. acuta*, *A. querquedula*, *Netta rufina*, *Fulica atra*, *Himantopus himantopus*, *Tringa erythropus*, *T. stagnatilis*, *T. nebularia*, *T. ochropus*, *T. glareola*, *Gallinago gallinago*, *Calidris temminckii*, *C. subminuta* and *Philomachus pugnax*. The Black-necked Stork *Ephippiorhynchus asiaticus* is an occasional visitor. The Grey-headed Fish-Eagle *ichthyophaga ichthyaetus*, Swamp Francolin *Francolinus gularis* and Brown Fish-Owl *Ketupa zeylonensis* occur in the area, and Pallas's Fish-Eagle *Haliaeetus leucoryphus* has been recorded.

The lake supports a small population of the Marsh Crocodile or Mugger *Crocodylus palustris*, and 14 species of fishes have been recorded including *Tor tor*, *Ghanna* spp and *Mystus* spp.

The Wildlife Reserve has a rich mammalian fauna including Tiger, Smooth-coated Otter, Hispid Hare (*Panthera tigris*, *Lutra perspicillata*, *Caprolagus hispidus*), and Nepal's largest remaining population of Swamp Deer *Cervus duvauceli* (at least 900 in 1976). The endangered Pigmy Hog *Sus salvanius* may also be present.

**Special floral values:** None known.

**Research and facilities:** There is an observation hide on stilts overlooking the lake. The Wildlife Reserve is fully staffed and the necessary infrastructure has been provided. Basic faunal and floral surveys have been carried out; an ecological study of the Swamp Deer was undertaken in 1974-76 (Schaaf, 1978), and the avifauna has been well documented.

**References:** Bhatt & Shrestha (1977); Fleming (1977); Green (1986); Inskipp & Inskipp (1985); Karpowicz (1985); Schaaf (1978).

**Criteria for inclusion:** lb. 2b, 3b.

**Source:** Carol Inskipp, Rajendra Lal Shrestha, H.S. Nepali and Kim C. Hudson.

**Wetland name:** Karnali River

**Country:** Nepal

**Coordinates:** 28°22'-28°38'N, 81°05'-81°18'E;

**Location:** on the western terai, 50 km northwest of Nepalganj, Bardia District.

**Area:** c.9,000 ha.

**Altitude:** 170m.

**Biogeographical Province:** 4.8.4.

**Wetland type:** 11, 12, 13, 15 & 18.

**Description of site:** A stretch of the Karnali River on a broad alluvial plain at the base of the Himalayan foothills in southwestern Nepal. The river is wide and shallow, with numerous channels, sand banks and stony islands, some associated riverine forest, and seasonally flooded grassland in adjacent areas. The discharge fluctuates widely from a minimum of 310 cubic metres per second in March to a maximum of 9,950 cubic metres per second in August.

**Climatic conditions:** Tropical monsoonal climate with an average annual rainfall of 2,012 mm, a maximum temperature of 43.6°C and a minimum temperature of 3.0°C. Most of the annual precipitation falls between June and September.

**Principal vegetation:** Seasonally flooded riverine forest dominated by *Acacia catechu* and *Dalbergia sissoo*; moist mixed riverine forest dominated by *Ficus glomerata*, *Eugenia jambolana* and *Mallotus philippinensis*; seasonally flooded grassland dominated by *Saccharum spontaneum* and the shrub *Tamarix dioica*. In a region of Sal forest (*Shorea robusta*) with areas of grassland and savanna.

**Land tenure:** The river and marshes are state owned; adjacent areas are partly state owned and partly private farmland.

**Conservation measures taken:** The northeastern part of the wetland is included within the Royal Bardia Wildlife Reserve (96,800 ha), established in March 1976 and increased in size by almost threefold in 1982. From 1969 to 1976, the area was afforded some degree of protection as a Royal Shikar (Hunting) Reserve.

**Land use:** Fishing and river transportation outside the reserve. Some cutting of grass for thatch and collection of fern shoots, herbs and other forest products are permitted on a controlled basis in the Wildlife Reserve, but all hunting, agricultural practices and stock grazing have been stopped. Local people and visitors may fish in rivers bordering the Reserve.

**Disturbances and threats:** None at present; the wetland is situated in an uninhabited and almost undisturbed area. However, there are plans to construct a 390 metre high dam on the Karnali River upstream from the wetland, for hydro-electric power and irrigation (the Chisapani Project). Construction could begin in 1995. The dam would take eight years to complete, and would create

a reservoir of 29,110 ha. If this project goes ahead, much of the wetland habitat along the Karnali River below the dam will be lost.

**Economic and social values:** The river supports a small fishery.

**Fauna:** The Karnali River supports one of the largest populations of the endangered Gharial *Gavialis gangeticus* in Nepal, with a minimum of 10-15 adults in 1981 (Groombridge, 1982). The Marsh Crocodile or Mugger *Crocodylus palustris* is also present. The river is noted for its Mahseer *Tor tor*, a premier sporting fish. Other fishes include barbels *Barbus spp*, large silurid catfish and *Ompac bimaculatus*. The islands and shingle banks provide nesting habitat for *Esacus recurvirostris*, *Vanellus duvaucelii*, *Sterna melanogaster* and *S. albifrons*, and *Glareola lactea* occurs and may breed. The Smooth-coated Otter *Lutra perspicillata* is common, and the Ganges Dolphin *Platanista gangetica* has been reported.

The Wildlife Reserve supports a rich mammalian fauna with several threatened species such as Tiger Pant *heratigris*, Swamp Deer *Cervus duvauceli* and Hispid Hare *Caprolagus hispidus*.

**Special floral values:** None known.

**Research and facilities:** The Wildlife Reserve is adequately wardened, but there are no facilities for visitors or research. An ecological survey of the Reserve was undertaken between 1975 and 1977, and basic faunal and floral surveys have been carried out.

**References:** Green (1986); Groombridge (1982); Inskipp & Inskipp (1982); Shrestha (1986).

**Criteria for inclusion:** 1b, 2a.

**Source:** Harka B. Gurung and Carol Inskipp.

**Wetland name:** Lake Rara

**Country:** Nepal

**Coordinates:** 29°32'N, 82°05'E;

**Location:** in Mugu District, Karnali Zone, in the mid-western Himalayan region, 24 km north of Jumla and 370 km northwest of Kathmandu.

**Area:** 1,036 ha.

**Altitude:** 2,980m.

**Biogeographical Province:** 2.38.12.

**Wetland type:** 14.

**Description of site:** A clear, oligotrophic lake at high altitude in the Himalayas of mid-western Nepal, at the headwaters of the Karnali River. The lake lies in the first and oldest of the Kathmandu nappes, and is thought to have been formed as a result of river capture. It is very deep (maximum 167m), and the margins shelve steeply below water level. The lake does not freeze over in winter, in contrast to lakeside streams which are frozen for at least four months of the year. The lake is fed by a number of small seasonal streams, mostly entering along the northern shore, and has a single outlet, the Nijar Khola river, at the western end. Lake Rara is the largest lake in Nepal; it is surrounded by meadows and coniferous forest with a back-drop of snow-capped Himalayan peaks, and is noted for its outstanding scenic beauty.

**Climatic conditions:** Temperate monsoonal climate. At Jumla, 24 km to the south, the average annual rainfall is 462 mm, the mean maximum temperature 27.2°C (June), and the mean minimum temperature -4.1°C. At Lake Rara, conditions are somewhat drier and colder, and the area is snow-bound, to a depth of at least 60 cm, from December until March or April.

**Principal vegetation:** Patches of marsh with reeds (probably *Phragmites*), *Juncus sp* and *Fimbristylis sp* around the lake's margin, and a rich growth of *Myriophyllum sp* in shallow water. There is a large open area of marshy meadows and abandoned fields south of the lake with species such as *Polygonum imilletii*, *Oxygraphis polypetala* and *Ranunculus sp*. Surrounding forests are dominated by *Pinus excelsa* with *Juniperus wallichiana*, *Rhododendron arboretum*, *Picea smithiana* and *Quercus semecarpifolia*.

**Land tenure:** The lake and surrounding areas are state owned.

**Conservation measures taken:** The lake and its entire catchment area are protected within the Lake Rara National Park (10,600 ha), established in 1976 to conserve the unique beauty and fragile ecosystems of the area. The 600 inhabitants of the two small villages in the park, Rara and Chhabru, were resettled in the southern lowlands of Nepal in 1980.

**Conservation measures proposed:** Prearey and Pritchard (1985) have recommended that some management be implemented to restrict the natural encroachment of forest on to the abandoned meadows south of the lake.

**Land use:** None.

**Disturbances and threats:** None; in a very remote and sparsely populated area. Less than ten tourists were reported to have visited the lake in 1985.

**Economic and social values:** The lake and surroundings are noted for their outstanding scenic beauty, but the park is perhaps one of the least visited National Parks in the world.

**Fauna:** The lake has a rich invertebrate fauna; the larvae of mayflies (Ephemeroptera), *Gammarus* sp and lumbriculid worms are abundant, and aquatic beetles, hemipterans and *Planorbis* and *Limnea* snails are present. Several species of fish occur, including the snow trout *Schizothorax sinuatus*, *S. hodgsoni* and *S. progastus*.

The lake is a wintering area for small numbers of several species of waterfowl, and provides a staging area for many species migrating across the Himalayas. Winter visitors include *Tachybaptus ruficollis*, *Podiceps cristatus* (maximum 85), *P. nigricollis* (maximum 15), *Anas crecca*, *A. platyrhynchos*, *Netta rufina* (maximum 40), *Aythya fuligula* (maximum 50), *Bucephala clangula*, *Mergus merganser*, *Fulica atra* (maximum 200). Passage migrants include *Phalacrocorax carbo*, *Botaurus stellaris*, *Egretta alba*, *Ardea cinerea*, *Anser anser*, *A. indicus*, *Tadorna ferruginea*, *Anas penelope*, *A. strepera*, *A. acuta*, *A. clypeata*, *Aythya ferina*, *A. nyroca*, *Hydrophasianus chirurgus*, *Charadrius mongolus*, *Tringa ochropus*, *T. glareola*, *Actitis hypoleucos*, *Calidris minuta*, *C. temminckii*, *Larus ichthyaetus*, *L. brunnicephalus*, *L. ridibundus* and *Gelochelidon nilotica*.

Mammals include the Common Otter *Lutra lutra*.

**Special floral values:** None known.

**Research and facilities:** There is a small guest house at the National Park Headquarters, but visitors must be self-sufficient in food and other supplies. A management plan has been prepared for the park (Bolton, 1976), a preliminary ecological survey has been undertaken, and several avifaunal surveys have been carried out.

**References:** Bolton (1976); Brearey & Pritchard (1985); Cox (1985); Ferro (1978/79); Fleming *et al.* (1985); Green (1986); Inskipp & Inskipp (1985); Karpowicz (1985).

**Criteria for inclusion:** 1b, 2b, 3 b.

**Source:** Harka B. Gurung, Megh Bahadur Pandey, Carol Inskipp, Rajendra Lal Shrestha and H.S. Nepali.

**Wetland name:** Phoksumdo Tal

**Country:** Nepal

**Coordinates:** 29°12'N, 82°57'E;

**Location:** in Dolpo District, on the southern slopes of Kanjiroba Himal, 145 km northwest of Pokhara.

**Area:** c.500 ha.

**Altitude:** 3,660m.

**Biogeographical Province:** 2.38.12.

**Wetland type:** 14.

**Description of site:** A high altitude oligotrophic lake in the Himalayas of northwestern Nepal; the second largest lake in Nepal. The lake is very deep and "Y" shaped with a shoreline of about 25

km. It is fed by two rivers rising in snow-melt on Kanjiroba Himal, and drains south into the Suli River, a tributary of the Bheri River.

**Climatic conditions:** Temperate monsoonal climate.

**Principal vegetation:** Little if any aquatic vegetation; some pasture land and primitive agriculture in surrounding areas, and pine forests of *Pinus excelsa* with *Abies spectabilis* and *Quercus semecarpifolia* on adjacent slopes.

**Land tenure:** The lake and surrounding areas are state owned.

**Conservation measures taken:** The lake and its entire catchment area are protected in the Shey Phoksumdo National Park (355,500 ha), established in 1984.

**Land use:** Some livestock grazing (sheep and goats) and subsistence agriculture around the lake. Phoksumdo Tal is in a very remote and sparsely populated area, with only three small villages in the vicinity.

**Disturbances and threats:** Overgrazing around the lake by herds of sheep and goats brought into the area from distant villages during summer, and burning of forest to provide more pasture and agricultural land. There is a considerable amount of illegal hunting in the National Park.

**Economic and social values:** None known.

**Fauna:** Apparently of little if any importance for waterfowl. No information is available on the other fauna of the lake. The National Park supports a rich mammalian fauna including the endangered Snow Leopard *Panthera uncia* and many Tibetan species.

**Special floral values:** No information.

**Research and facilities:** Several studies have been carried out on the larger mammals of the park, but very little is known about the lake. There are no facilities for tourists, and few visitors have been allowed to enter the area.

**References:** Green (1986); Karpowicz (1985); Sakya (1978).

**Criteria for inclusion:** 0.

**Source:** Carol Inskipp, Rajendra Lal Shrestha and H.S. Nepali.

**Wetland name:** Jagdishpur Reservoir

**Country:** Nepal

**Coordinates:** 27°35'N, 83°05'E;

**Location:** in the southern lowlands (terai) near the Indian border, 10 km north of Taulihawa, Kapilvastu District.

**Area:** Unknown.

**Altitude:** 100m.

**Biogeographical Province:** 4.8.4.

**Wetland type:** 17.

**Description of site:** A water storage reservoir with associated freshwater swamps and marshes in the terai near the Indian border.

**Climatic conditions:** Tropical monsoonal climate with an average annual rainfall of about 1,400 mm, a maximum temperature of about 35°C, and a minimum temperature of about 10°C. Most of the precipitation falls between mid-June and late September.

**Principal vegetation:** No information.

**Land tenure:** No information.

**Conservation measures taken:** None.

**Land use:** No information.

**Disturbances and threats:** No information.

**Economic and social values:** No information.

**Fauna:** Little information is available. The reservoir is known to be important for a variety of waterfowl including *Ardea cinerea* and *Porphyrio porphyrio*, and *Ciconia ciconia* has been recorded.

**Special floral values:** No information.

**Research and facilities:** Cox carried out a brief avifaunal survey in 1978.

**References:** Cox (1982).

**Criteria for inclusion:** 0.

**Source:** Carol Inskipp.

**Wetland name:** Gaidhawa Tal

**Country:** Nepal

**Coordinates:** 27°30'N, 83°15'E;

**Location:** in the southern lowlands (terai) near the Indian border, west of Bhairawa, Lumbini Zone.

**Area:** Unknown.

**Altitude:** 100m.

**Biogeographical Province:** 4.8.4.

**Wetland type:** 14.

**Description of site:** A small freshwater lake and associated marshes in the terai near the Indian border.

**Climatic conditions:** Tropical monsoonal climate with an average annual rainfall of about 1,400 mm, a maximum temperature of about 35°C, and a minimum temperature of about 10°C.

Most of the precipitation falls between Mid-June and late September.

**Principal vegetation:** No information.

**Land tenure:** No information.

**Conservation measures taken:** None.

**Land use:** No information.

**Disturbances and threats:** No information.

**Economic and social values:** No information.

**Fauna:** Thought to be an important wintering area for waterfowl. In January 1980, Underwood observed 57 *Mycteria leucocephala*, 20 *Platalea leucorodia* and 20 *Sarkidiornis melanotos* at the lake. All three of these species are uncommon in Nepal.

**Special floral values:** No information.

**References:** Underwood (1980).

**Criteria for inclusion:** 1b, 3b.

**Source:** Carol Inskipp.

**Wetland name:** Titi Tal

**Country:** Nepal

**Coordinates:** 28°38'N, 83°37'E;

**Location:** 2.5 km east of the Kali Gandaki River, 55 km northwest of Pokhara, central Nepal.

**Area:** 6 ha.

**Altitude:** 2,620.

**Biogeographical Province:** 2.38.12.

**Wetland type:** 14.

**Description of site:** A small freshwater lake and associated marshes in the upper drainage of the Narayani River, in the main Himalayan range. Nearby peaks rise to over 8,150m.

**Climatic conditions:** Temperate monsoonal climate.

**Principal vegetation:** A dense growth of marsh grasses and other aquatic plants covers over half the surface of the lake.

**Land tenure:** No information.

**Conservation measures taken:** None.

**Conservation measures proposed:** The lake is situated within the proposed Annapurna Conservation Area.

**Land use:** No information.

**Disturbances and threats:** No information.

**Economic and social values:** No information.

**Fauna:** Little information is available. *Anas platyrhynchos* was found nesting in 1970 and 1977, these constituting the only recent breeding records of this species in Nepal.

**Special floral values:** No information.

**References:** Martens (1972); Roberts (1978).

**Criteria for inclusion:** 0.

**Source:** Carol Inskipp, Rajendra Lal Shrestha and H.S. Nepali.

**Wetland name:** Phewa Tal

**Country:** Nepal

**Coordinates:** 28°15'N, 83°55'E;

**Location:** one km west of Pokhara, Kaski District, in the Himalayan foothills of West Nepal.

**Area:** 400 ha.

**Altitude:** 742m.

**Biogeographical Province:** 4.8.4.

**Wetland type:** 14 & 19.

**Description of site:** A clear, freshwater lake and associated marshes with adjacent rice paddies in the Pokhara Valley. Most of the lake is fairly deep (maximum depth 20m), but there are shallow areas on the northern and western shores with emergent aquatic vegetation. The lake is fed by several small streams and a river entering at its western end, and has a single outlet into the Pardi Khola river at its eastern end. The water level has been raised artificially by the Pardi Dam at the eastern end, to provide water for irrigation.

**Climatic conditions:** Humid subtropical monsoonal climate with an average annual rainfall of 3,477 mm, a mean minimum temperature of 6°C (December), and a mean maximum temperature of 31°C (May and June).

**Principal vegetation:** Grassy marshes along the northern and western shores; rice paddies in adjacent areas, and terraced fields, secondary scrub and degraded forest with *Schima wallichii* and *Castanopsis indica* on nearby hillsides.

**Land tenure:** The lake is state owned. The lake shore and surrounding areas are privately owned.

**Conservation measures taken:** The fishermen around the lake have formed an Association with two major objectives: to improve the management of the fishery by stocking with both indigenous and exotic fish species; and to protect the lake from poachers using non-conventional fishing methods. The forested slopes around a hotel on the north shore of the lake (Fishtail Lodge) are protected by the owners.

**Land use:** Subsistence fishing, sport fishing, pleasure boating and other forms of outdoor recreation; subsistence farming and tourist development in surrounding areas. The lake is used as a water supply for irrigation in the Pokhara valley, and there are many hotels and one of the King's palaces on the south shore.

**Disturbances and threats:** The reed-beds which existed at the west end of the lake until at least 1970 have been cleared, and the cutting of the remaining aquatic vegetation for animal fodder continues on a large scale. During the tourist season (October to May), pleasure boating causes a considerable amount of disturbance to waterfowl populations. Forest clearance has caused erosion problems on the hillsides around the lake, and these are likely to get worse as deforestation continues.

**Economic and social values:** Phewa Tal is noted for its scenic beauty, with Macchapucchare and other Himalayan peaks forming a back-drop to the lake. It is a very popular tourist attraction;

there is a thriving tourist industry in the area, and the renting of boats and sale of fish to tourists provides a useful source of income for the local people. Recent studies suggest that the lake could support a valuable commercial fishery based on a sound stocking programme.

**Fauna:** The lake has a rich fish fauna including several native species of carp, as well as murrel, garfish and spiny eels. Two very popular sport fishes, the Mahseer *Tor tor* and the Asla, are abundant.

The lake, marshes and adjacent rice paddies support small resident and wintering populations of many species of waterfowl, and provide an important staging area for waterfowl migrating over the Himalayas, particularly in spring. Residents include *Tachybaptus ruficollis*, *Phalacrocorax carbo* (maximum 110), *Ardeola grayii*, *Bubulcus ibis*, *Butorides striatus*, *Egretta garzetta*, *E. intermedia*, *E. alba*, *Amaurornis phoenicurus*, *Vanellus duvaucelii* and *V. indicus*. Winter visitors include *Podiceps cristatus*, *Ardea cinerea*, many ducks, mainly *Anas strepera* (up to 500), *A. platyrhynchos* (up to 350), *A. acuta* (up to 500) and *Aythya ferina* (up to 800), with smaller numbers of *Anas penelope*, *A. falcata* (maximum 16), *A. crecca*, *A. querquedula*, *A. clypeata*, *Netta rufina*, *Aythya baeri* (rare), *A. nyroca*, *A. fuligula*, *Bucephala clangula* and *Mergus merganser*, and also small numbers of *Fulica atra*, *Gallinago stenura* and *G. gallinago*. Duck numbers reach their peak during the spring migration in late February and early March. Other species recorded on passage include *Ardea purpurea*, *Dendrocygna javanica*, *Anser anser*, *A. indicus*, *Tadorna ferruginea*, *Nettapus coromandelianus*, *Hydrophasianus chirurgus*, fifteen species of shorebirds, three species of gulls and four species of terns. All occur in small numbers except for the shorebirds *Vanellus vanellus*, *Tringa nebularia*, *T. ochropus* and *Actitis hypoleucos* which are common.

**Special floral values:** None known.

**Research and facilities:** A Lake Development Centre has been established at Pokhara to study the fisheries potential of the lakes in the Pokhara valley. A detailed limnological study has been carried out, and there have been some experiments with improved fishing techniques. Several waterfowl censuses have been made, and the avifauna of the area has been well documented.

**References:** Bhatt (1977); Fleming (1973), Inskipp & Inskipp (1985); Karpowicz (1985); Kemp *et al.* (1985); Rajbanshi (1986).

**Criteria for inclusion:** 1b, 1e, 2b, 3b.

**Source:** Harka B. Gurung, Carol Inskipp, J.O.M. Roberts, Michael J. Rogers, Rajendra Lal Shrestha and H.S. Nepali.

**Wetland name:** Begnas Tat

**Country:** Nepal

**Coordinates:** 28°10'N, 84°05'E;

**Locations :** 15 km southeast of Pokhara, in the Himalayan foothills of West Nepal.

**Area:** 225 ha.

**Attitude:** 800m.

**Biogeographical Province:** 4.8.4.

**Wetland type:** 14 & 19.

**Description of site:** A shallow, eutrophic freshwater lake and associated marshes with surrounding rice paddies, in the Pokhara Valley.

**Climatic conditions:** Humid subtropical monsoonal climate with an average annual rainfall of 3,477 mm, a mean minimum temperature of 6°C (December), and a mean maximum temperature of 31°C (May and June).

**Principal vegetation:** Some emergent vegetation around the shoreline, and floating vegetation on the surface. The reed-beds which once existed on the southern shore were cleared in the late

1970s and early 1980s. The lake is surrounded by rice paddies, and there are terraced fields and patches of secondary scrub and degraded forest on the nearby hills.

**Land tenure:** The lake is state owned; surrounding areas are privately owned (subsistence farmers).

**Conservation measures taken:** The fishermen around the lake have formed an Association with two major objectives: to improve the management of the fishery by stocking with both indigenous and exotic fish species; and to protect the lake from poachers using non-conventional fishing methods. The success of the latter has resulted in better natural recruitment of indigenous fish species.

**Land use:** Commercial fishing, sport fishing, pleasure boating and other outdoor recreation; subsistence farming in surrounding areas.

**Disturbances and threats:** The cutting of aquatic vegetation for animal fodder and other purposes has almost completely destroyed the emergent aquatic vegetation. Pleasure boating during the tourist season (October to May) causes considerable disturbance, and this, coupled with the lack of secluded marsh areas, can result in most waterfowl leaving the lake. The surrounding hillsides have been badly deforested and the deforestation continues.

**Economic and social values:** The lake supports a small commercial fishery, and the renting of pleasure boats to tourists provides some income for the local people. The fisheries production has been increased from 21.7 kg/ha/year in 1981-82 to 25.9 kg/ha/year in 1985 by stocking with large fingerlings and improved management.

**Fauna:** Amphibians and fishes abound, and the Mahseer *Tor tor*, a very popular game fish, is common. The lake, marshes and adjacent rice paddies once supported small resident and wintering populations of many species of waterfowl, and provided a staging area for waterfowl migrating over the Himalayas, but the destruction of marsh vegetation and high levels of disturbance in recent years have made the area unsuitable for most species. A census in March 1987 revealed only small numbers of grebes (*Tachybaptus ruficollis* and *Podiceps cristatus*), herons and egrets (*Bubulcus ibis*, *Egretta garzetta*, *E. alba* and *Ardea cinerea*), *Fulica atra*, *Metopidius indicus*, *Vanelius indicus* and *Gallinago sp.* *Nettapus coromandelianus* has nested at the lake, and sixteen other species of Anatidae have been recorded in winter or on migration, including *Anser indicus*, *Tadorna ferruginea*, *Anas falcata*, *Netta rufina*, *Aythya nyroca* and *Bucephala clangula*. Other passage migrants have included several species of shorebirds, gulls and terns. A Black necked Crane *Grus nigricollis* was observed in 1978, and White-tailed Eagles *Haliaeetus albicilla* have occurred in winter.

**Special floral values:** None known.

**Research and facilities:** A Lake Development Centre has been established at Pokhara to study the fisheries potential of the lakes in the Pokhara valley. A detailed limnological study has been carried out, and there have been some experiments with stocking and improved fishing techniques. Several waterfowl censuses have been made, and the avifauna of the area has been well documented.

**References:** Bhatt (1977); Fleming (1973); Inskipp & Inskipp (1985); Karpowicz (1985); Rajbanshi (1986).

**Criteria for inclusion:** lb. 3b.

**Source:** Carol Inskipp, Michael J. Rogers, Rajendra Lal Shrestha and H.S. Nepali.

**Wetland name:** Rupa Tat

**Country:** Nepal

**Coordinates:** 28°10'N, 84°10'E;

**Location:** 24 km southeast of Pokhara, in the Himalayan foothills of West Nepal.

**Area:** c.65 ha.

**Altitude:** 800m.

**Biogeographical Province:** 4.8.4.

**Wetland type:** 14 & 19.

**Description of site:** A small, eutrophic freshwater lake and marshes with adjacent rice paddies, in the Pokhara valley.

**Climatic conditions:** Humid subtropical monsoonal climate with an average annual rainfall of 3,477 mm, a mean minimum temperature of 6°C (December), and a mean maximum temperature of 31°C (May and June).

**Principal vegetation:** Some floating aquatic vegetation and fringing reed-beds; rice paddies along the northern shore, degraded forest to the west, and relatively undisturbed forest to the east.

**Land tenure:** The lake is state owned; the adjacent rice paddies are privately owned (subsistence farmers).

**Conservation measures taken:** The fishermen around the lake have formed an Association with two major objectives: to improve the management of the fishery by stocking with both indigenous and exotic fish species; and to protect the lake from poachers using non-conventional fishing methods.

**Land use:** Fishing and aquaculture; there are two small fish farms at the lake.

**Disturbances and threats:** Deforestation in the surrounding hills is creating erosion problems, and the fishing activities cause some disturbance to waterfowl.

**Economic and social values:** The lake supports a small subsistence fishery. Recent studies have suggested that with a sound stocking programme and improved management, the fishery could be operated on a commercial basis.

**Fauna:** Little information is available. The lake is known to support a rich invertebrate fauna, and fishes are abundant. Small numbers of waterfowl were observed by P. Heath in 1986, including *Nettapus coromandelianus* and *Metopidius indicus*.

**Special floral values:** None known.

**Research and facilities:** A Lake Development Centre has been established at Pokhara to study the fisheries potential of the lakes in the Pokhara valley. A limnological study has been carried out, and there have been some experiments with improved fishing techniques and aquaculture.

**References:** Rajbanshi (1986).

**Criteria for inclusion:** lb.

**Source:** Carol Inskipp, Rajendra Lal Shrestha and H.S. Nepali.

**Wetland name:** Wetlands in Royal Chitwan National Park

**Country:** Nepal

**Coordinates:** 27°20'-27°35'N, 83°55'-84°45'E;

**Location:** in Chitawan and Nawal-Parasi Districts, in the Inner Terai of south-central Nepal 120 km southwest of Kathmandu.

**Area:** National Park 93,200 ha; area of wetlands unknown.

**Altitude:** c.150m.

**Biogeographical Province:** 4.8.4.

**Wetland type:** 11, 12, 13, 14, 15 & 18.

**Description of site:** The wetlands within the Royal Chitwan National Park on the flood plains of the Rapti, Reu and Narayani rivers. Wetland habitats include wide, shallow rivers with extensive shingle banks and many sandy islands, seasonally flooded riverine forest and grassland, and several small oxbow lakes and associated marshes formed by frequent changes in the river channels. Both the Rapti and the Reu flow west into the Narayani which drains southwards into the Ganges. The Rapti forms the northern boundary of the eastern portion of the park, and the Narayani forms the western boundary. The monsoon rains cause severe flooding and changes in the character and course of the rivers. The discharge in the Narayani varies from as little as 173

cubic metres per second in March to 11,370 cubic metres per second in August. The four principal lakes are Devi Tal (120 ha), Manna Tal (100 ha), Tammer Tal (25 ha), and Lame Tal; all are shallow, permanent, freshwater lakes with a luxuriant growth of aquatic vegetation.

**Climatic conditions:** Humid tropical monsoon climate with an average annual rainfall of 2,400 mm, a mean maximum temperature of 38°C (June), and a mean minimum temperature of 6°C (December). About 90% of the precipitation falls during the summer monsoon, from June to September. The winters are relatively dry with northerly winds from the Himalayas and Tibetan Plateau prevalent.

**Principal vegetation:** Most of the lakes are almost covered in the water hyacinth *Lantana camara*. Tall grassland, up to eight meters high, and riverine forest forms a mosaic along the river banks, and are maintained by seasonal flooding. Several types of grassland have been identified. *Saccharum spontaneum* is one of the first species to colonize newly created sand banks, and grows in pure stands or in association with *Narenga* sp. Various short grasses and herbs such as *Polygonum plebujum* and species of *Persicaria*, *Cyperus*, *Kyllingia* and *Mariscus* grow on exposed sand banks. *Arunda-Phragmites* associations form dense tall stands along stream beds on the flood plain and around lakes, while *Themeda villosa* forms a tall grass cover in clearings in the forest. Early stages in the development of riverine forest are dominated by *Acacia catechu* and *Dalbergia sissoo*, and later stages by *Bombax ceiba* and *Trewia nudiflora*, with an understorey of *Callicarpa macrophylla*, *Clerodendron viscosum* and *Phyllanthus emblica*. The riverine forests on the south bank of the Rapti and on the large islands and lower section of the Narayani remain in good condition, but the northern bank of the Rapti River (outside the park) is intensively cultivated, and only narrow strips of forest remain along the west bank of the Narayani. The climax vegetation of the Inner Terai is sal forest (*Shorea robusta*), which covers 70% of the park.

**Land tenure:** State owned (Government of Nepal).

**Conservation measures taken:** All the wetlands are protected in the Royal Chitwan National Park (93,200 ha), established in 1973 and enlarged to its present size in 1977. The park was listed as a World Heritage Site in November 1984. Management of the park is currently of a high standard (Green, 1986).

**Land use:** Nature-oriented tourism in the National Park; intensive fishing in the rivers outside the park. Because of the tremendous pressure to allow cutting of the tall grass for roof thatch, the National Park is opened for two weeks a year to local thatch-cutters. Between 50,000 and 80,000 permits are issued each year, and over 66,830 tonnes of grass are harvested annually.

**Disturbances and threats:** Overgrazing along the park boundary is accelerating the already extensive erosion of river banks, and the large-scale cutting of tall grasses within the park has resulted in changes in the floral composition of the grassland communities. Considerable antagonism exists between the park authorities and local people, particularly residents of Padampur Panchayat, and this is likely to escalate as the local human population continues to increase and remnant forest and grassland areas outside the park decline. There is over-fishing and excessive disturbance along the rivers just outside the park, and the oxbow lakes are rapidly becoming overgrown with water hyacinth *Lantana camara*. There are proposals to build two pulp mills and a hydro-electric barrage on the Narayani River upstream of the park. Effluents from the mills and changes in the water regime could have a serious effect on the riverine ecology, particularly for the endangered Gharial.

**Economic and social values:** The National Park is extremely important for tourism, and provides a valuable source of revenue for the Government. Visitor numbers rose from less than 1,000 in 1974 to over 8,000 in 1982. However, few local people are employed in the park, and the local population gains little direct benefit from tourism.

**Fauna:** The rivers and lakes are rich in amphibians and fishes. Some 62 species of fishes have been recorded in the Narayani, including *Tor tor*, *T. putitora*, *Barilius* spp and *Puntius* spp.

The wetlands support a large population of the Marsh Crocodile or Mugger *Crocodylus palustris* (about 200 individuals in 1978), and the Narayani River has one of the world's largest surviving populations of the endangered Gharial *Gavialis gangeticus* (about 50 adults in 1982). Other reptiles include some 19 species of snake, monitor lizards *Varanus* spp and freshwater turtles.

The rivers and oxbow lakes are very important as breeding, wintering and staging areas for a wide variety of waterfowl. Residents and summer visitors include *Anhinga melanogaster*, *Ixobrychus sinensis*, *I. cinnamomeus*, *Nycticorax nycticorax* (colony of about 500 near Devi Tal), *Ardeola grayii*, *Bubulcus ibis*, *Butorides striatus*, *Egretta garzetta* (abundant), *E. intermedia*, *E. alba*, *Anastomus oscitans*, *Ciconia episcopus*, *Leptoptilos javanicus*, *Pseudibis papillosa* (flocks of up to 40), *Dendrocygna javanica* (hundreds), *Porzana fusca*, *Amaurornis akool*, *A. phoenicurus*, *Hydrophasianus chirurgus*, *Metopidius indicus*, *Rostratula benghalensis*, *Burhinus oediacnemis*, *Esacus recurvirostris*, *Glareola lactea* (flocks of up to 300), *Vanellus duvaucelii*, *V. indicus*, *Sterna aurantia*, *S. melanogaster* and *S. albifrons*.

Winter visitors include up to 750 *Phalacrocorax carbo* and several thousand ducks, mainly *Tadorna ferruginea*, *Anas strepera*, *A. crecca*, *A. platyrhynchos*, *A. acuta* and *Mergus merganser*. Other winter visitors and passage migrants occurring in smaller numbers include *Tachybaptus ruficollis*, *Podiceps cristatus*, *Phalacrocorax niger*, *Ardea cinerea*, *Mycteria leucocephala*, *Ciconia nigra* (maximum 20), *Ephippiorhynchus asiaticus*, *Anser anser*, *A. indicus* (maximum 117), nine other species of ducks, *Grus grus*, *Anthropoides virgo*, *Porzana pusilla*, *Gallinula chioropus*, *Porphyrio porphyrio*, *Fulica atra*, *Larus ichthyaetus*, *L. brunnicephalus*, *L. ridibundus*, *Hydroprogne caspia* and *Sterna hirundo*. Twenty-one species of shorebirds have been recorded as winter visitors or passage migrants, the most numerous being *Charadrius dubius*, *C. alexandrinus* (up to 120), *Tringa nebularia* (up to several 100), and *Calidris temminckii*. Wintering Anatidae are most abundant along the Narayani River, while shorebirds favour the Rapti River.

Many other species of birds occurring in the park are to a large extent dependent on the wetlands. These include the raptors *Pandion haliaetus*, *Ichthyophaga ichthyaetus* and *I. nana*, the Bengal Florican *Houbaropsis bengalensis*, the owls *Ketupa zeylonensis* and *K. flavipes*, and four species of kingfishers, *Ceryle rudis*, *Alcedo atthis*, *A. meninting* and *Pelargopsis capensis*.

In all, over 450 species of birds have been recorded in the National Park.

The park is renowned for its rich mammalian fauna, including many threatened species such as the Indian Rhinoceros *Rhinoceros unicornis* (at least 300), Tiger *Panthera tigris* and Hispid Hare *Caprolagus hispidus*. Mammals especially dependent on the wetlands include the Smooth-coated Otter *Lutra perspicillata*, Fishing Cat *Felis viverrina* and Ganges Dolphin *Platanista gangetica*. The biomass of wild ungulates in the riverine/grassland vegetation types far exceeds that reported anywhere else in the Indian sub-continent.

**Special floral values:** None known.

**Research and facilities:** The National Park is well staffed with wardens and armed guards, and there are many facilities for visitors in the park and at the town of Sauraha just outside. Numerous studies have been carried out on the wildlife and ecology of the park, much of the work focusing on the larger mammals. Halliday (1982) carried out a study of the distribution of resident and migratory birds along the Rapti and Narayani Rivers in 1982, and an Aberdeen University Expedition has surveyed the fish in the Narayani River. A crocodile rearing project, funded by Frankfurt Zoological Society, was initiated in 1978 to produce Gharials for release in the park and for re-introduction into other river systems in Nepal. A hatchery was established near the park headquarters, and the first releases were made in March 1981.

**References:** Green (1986); Groombridge (1982); Gurung (1983); Halliday (1982); Inskipp & Inskipp (1985); Karpowicz (1985); Upreti (1985).

**Criteria for inclusion:** 1b, 2a, 2b, 3b.

**Source:** Harka B. Gurung, Carol Inskipp, Devi Gurung *et al.*, Yam Gurung, Rajendra Lal Shrestha, Anthony Stones, Rajendra N. Suwal, Kalu Ram Tamang and H.S. Nepali.

**Wetland name:** Taudaha Lake

**Country:** Nepal

**Coordinates:** 27°38'N, 85°17'E;

**Location:** on the southern edge of Kathmandu Valley, seven km SSW of Kathmandu.

**Area:** 4 ha.

**Altitude:** 1,370m.

**Biogeographical Province:** 2.38.12/4.8.4.

**Wetland type:** 15.

**Description of site:** A freshwater pond surrounded by rice paddies, on the southern edge of Kathmandu Valley. The pond has a maximum depth of six metres; it is fed by several intermittent streams from the adjacent rice terraces, and drains through a permanent outlet. The water level increases during the rainy season in summer, and recedes during the winter. A pH value of 7.8 has been recorded.

**Climatic conditions:** Temperate monsoonal climate with an average annual rainfall of 1,407 mm, a mean maximum temperature of 28°C (May, June and July), and a mean minimum temperature of 2°C (January).

**Principal vegetation:** Yadav *et al.* (1983) recorded 39 species of aquatic plants, the dominant species including *Ceratophyllum demersum*, *Hydrilla verticillata*, *Nymphoides vindicum*, *Trapa quadrispinosa* and species of *Lemna*, *Wolfia*, *Spirogyra* and *Ulothrix*. Surrounding areas are under cultivation for rice.

**Land tenure:** The pond is state owned; surrounding land is privately owned.

**Conservation measures taken:** None.

**Land use:** Fishing, washing of clothes and recreation (swimming); cultivation of rice and other crops in surrounding areas.

**Disturbances and threats:** The run-off from adjacent agricultural land contains fertilizers and organic waste which are causing eutrophication and speeding up plant succession. As a result, the area of open water is decreasing in size. Hunting and fishing are uncontrolled, and there is a considerable amount of disturbance from people washing in the lake, and from traffic on a nearby road.

**Economic and social values:** Taudaha Lake is the only remaining natural lake in the Kathmandu Valley, and is thus of considerable value for limnological and botanical research.

**Fauna:** The lake supports a rich fish fauna, and Yadav *et al.* recorded 36 taxa of macro-invertebrates, mainly Oligochaeta, Ephemeroptera, Chironomidae and Mollusca. Some waterfowl have been reported in the past (e.g. *Tachybaptus ruficollis* and *Porzana pusilla*), but very few birds have been present in recent years because of the increased disturbance.

**Special floral values:** None known.

**Research and facilities:** Studies have been carried out on the flora and fishes of the lake, and Yadav *et al.* made a detailed biological investigation in 1981 and 1982.

**References:** Fleming *et al.* (1985); Yadav *et al.* (1983).

**Criteria for inclusion:** 1b.

**Source:** Carol Inskipp, Rajendra Lal Shrestha and H.S. Nepali.

**Wetland name:** Bagmati River and Basant Gaon Ponds

**Country:** Nepal

**Coordinates:** 27°40'N, 85°18'E;

**Location:** near Chobar Gorge, 5-10 km south of Kathmandu.

**Area:** Basant Gaon Ponds 25 ha; 5 km of river.

**Altitude:** 1,270m.

**Biogeographical Province:** 2.38.12/4.8.4.

**Wetland type:** 11 & 17.

**Description of site:** A group of small water storage reservoirs at Basant Gaon, and a five km stretch of the Bagmati River south from Basant Gaon. The river is shallow and fast-flowing, with wide banks of mud, sand and shingle. Unlike much of the Bagmati River elsewhere in Kathmandu Valley, this stretch is relatively undisturbed.

**Climatic conditions:** Temperate monsoonal climate with an average annual rainfall of 1,407 mm, a mean maximum temperature of 28°C (May, June and July), and a mean minimum temperature of 2°C (January).

**Principal vegetation:** There is very little aquatic vegetation. Adjacent areas are under cultivation, mainly for rice.

**Land tenure:** No information.

**Conservation measures taken:** None.

**Conservation measures proposed:** It has been suggested that some protection be given to the Basant Gaon Ponds.

**Land use:** No information.

**Disturbances and threats:** Hunting at Basant Gaon Ponds, and some general disturbance from local people.

**Economic and social values:** No information.

**Fauna:** The ponds and river provide a staging and wintering area for a wide variety of migrant ducks and shorebirds. Numbers are generally small, but it is believed that if disturbance could be reduced, the area would hold many more birds. The commoner shorebirds include *Vanellus vanellus*, *V. duvaucelii*, *V. cinereus*, *V. indicus*, *Charadrius dubius*, *C. alexandrinus*, *Tringa nebularia*, *T. ochropus*, *T. glareola*, *Actitis hypoleucos*, *Gallinago gallinago* and *Calidris temminckii*. The Ibisbill *Ibidorhyncha struthersii* is regular on autumn passage, and *Himantopus himantopus* and *Charadrius placidus* have been recorded.

**Special floral values:** None known.

**Research and facilities:** The avifauna of the area has been well documented.

**References:** Inskipp & Inskipp (1986).

**Criteria for inclusion:** lb.

**Source:** Carol Inskipp and H.S. Nepali.

**Wetland name:** Shivapuri Watershed

**Country:** Nepal

**Coordinates:** 27°48'N, 85°22'E;

**Location:** on the north side of Kathmandu Valley, 10 km NNE of Kathmandu.

**Area:** Reserve 14,487 ha; area of wetlands unknown.

**Altitude:** 1,366-2,732m.

**Biogeographical Province:** 2.38.12.

**Wetland type:** 12.

**Description of site:** Fast-flowing rivers and streams in the Shivapuri Watershed and Wildlife Reserve on the south slopes of Shivapuri Dada, the second highest hill on the edge of Kathmandu Valley.

**Climatic conditions:** Temperate monsoonal climate with the average annual rainfall ranging from less than 1,800 mm in parts of the watershed to over 3,200 mm. About 90% of the precipitation falls during the monsoon between May and October. Temperatures reach a maximum of 23°C in August.

**Principal vegetation:** No information is available on the aquatic vegetation. About 50% of the watershed is still forested with oak and oak-pine associations dominated by *Quercus semecarpifolia*, *Q. lanata*, *Pinus roxburghii* and *P. wallichiana*.

**Land tenure:** State owned.

**Conservation measures taken:** The entire watershed is protected in the Shivapuri Watershed and Wildlife Reserve (14,487 ha), established in 1985. The main objectives of the reserve are to ensure a reliable and high quality supply of water for Kathmandu, and minimize degradation of land by applying appropriate corrective measures. Some fuelwood and fodder plantations have been established in the reserve.

**Land use:** The watershed is the main source of water for domestic consumption and hydro-electric power in Kathmandu. Some 5,000 people reside in the reserve, and live by subsistence agriculture. The summit of Shivapuri Dada is a popular area for tourists.

**Disturbances and threats:** The cutting of trees for cattle fodder and fuel, the extension of agricultural land up the mountain slopes, grazing by livestock throughout the watershed, and uncontrolled tourism are all causing considerable damage to the natural plant communities

**Economic and social values:** The watershed is particularly important as a source of water for Kathmandu City, and is a popular area for tourists.

**Fauna:** Shivapuri is noteworthy for its population of the Relict

Himalayan Dragonfly *Epiophlebia laidlawi*, a threatened species restricted to the Himalayas between Kathmandu Valley and Darjeeling. The dragonfly is dependent on clear, cold, rapidly flowing streams in steep forested valleys at altitudes from 2,100 to 2,700m, a habitat type under threat throughout the eastern Himalayas.

**Special floral values:** No information.

**Research and facilities:** The IUCN/SSC Odonata Specialist Group carried out a survey of the *Epiophlebia laidlawi* population in 1981, and made some recommendations for conservation.

**References:** Green (1986); Wells et al. (1983).

**Criteria for inclusion:** 1a, 2a.

**Source:** See references.

**Wetland name:** Wetlands in Langtang National Park

**Country:** Nepal

**Coordinates:** 28°00'-28°20'N, 85°15'-86°00'E;

**Location:** near the Tibetan border in north-central Nepal, 60 km NNE of Kathmandu.

**Area:** National Park 171,000 ha; area of wetlands unknown.

**Altitude:** Wetlands at 3,600-4,380m.

**Biogeographical Provinces :** 2.38.12.

**Wetland type:** 12 & 14.

**Description of site:** Numerous small lakes and ponds, and a fast-flowing river with gravel banks, at high altitude in Langtang National Park in the central Himalayan region of Nepal. The principal lakes are the three Gosainkunda lakes (Gosainkunda, Bhairavkunda and Sarawastikunda) at the source of the Trisuli River (4,380m), the two Naukund lakes at 3,750m, and the five Panch Pokhari lakes, also at 3,750m. Gosainkunda, Bhairavkunda and the Naukund lakes are deep, oligotrophic lakes with clear, turquoise-blue waters and no aquatic macro-vegetation. Saraswatikunda and the Panch Pokhari lakes are also oligotrophic, but are shallower than the others and have some algal growth. There are many smaller freshwater lakes and ponds above 3,600m in the park, particularly around Langtang village. Some of the shallower lakes and ponds freeze over in winter, and some are seasonal. The principal river is the Langtang Khola which has its source in the 20 km long Langtang Glacier. The river descends rapidly through a broad glacial

valley, and in the region of Kyanjin, at 3,800m, there are wide gravel banks and numerous gravel islands.

**Climatic conditions:** Temperate monsoonal climate; the average annual rainfall at Langtang village (3,429m) is 1,027 mm, and the mean monthly maximum temperatures are 7°C in January and 17°C in June.

**Principal vegetation:** Most of the lakes have no aquatic vegetation other than phytoplankton and some algae, but seasonal ponds near Langtang village support a wide variety of emergent plants. There is some *Salix* scrub in Langtang Khola valley, and *Myricara rosea* grows on the riverside gravels and flats. Most of the lakes are surrounded by alpine meadows.

**Land tenure:** State owned (Nepal Government).

**Conservation measures taken:** The wetlands are protected in Langtang National Park (171,000 ha), established in 1976.

**Land use:** Some of the lakes are visited by pilgrims and tourists trekking in the park, and the Langtang Khola valley is on a popular trekking route. The alpine meadows around the lakes are grazed during the summer by domestic livestock from settlements both within and outside the park.

**Disturbances and threats:** Tourists and pilgrims cause some disturbance and littering, particularly at the Gosainkunda lakes during the Gosainkund Festival. Meadows around the lakes are heavily grazed during the summer months.

**Economic and social values:** Gosainkunda is a holy lake and the site of a pilgrimage. The lake is visited by some 8,000 Hindus and Buddhists each July and August, most pilgrims staying a maximum of 24 hours, and worshipping the god Shiva by bathing in the lake. The lakes at Panch Pokhari are also an important pilgrimage site. The park is very popular for tourist trekking, and over 2,000 tourists visited the park annually during the period 1977-79.

**Fauna:** The snow trout *Schizothorax plagiostomus* occurs in the lower reaches of the Langtang Khola, but the lakes are devoid of fish, and support very little animal life. Chironomid larvae and pea-mussels (Sphaeriidae) have been found in the mud at Gosainkunda and Saraswatikunda. Invertebrates are more numerous at the small ponds near Langtang village and Kyanjin, and the frog *Rana polunini* occurs around Langtang village.

Very few waterfowl have been recorded at the lakes, despite numerous visits to some of the lakes by bird-watchers. A pair of *Tadorna ferruginea* has been seen regularly at Saraswatikunda, and is known to have bred there in 1980. *Aythya fuligula* has been recorded as a migrant at a pond near Kyanjin. Up to 18 pairs of Ibisbills *Ibidorhyncha struthersii* nest on the gravel banks and islands of the Langtang Khola river near Kyanjin. This is the largest breeding concentration of Ibisbills known in Nepal. The birds arrive in April and leave again in September.

**Special floral values:** None known.

**Research and facilities:** There are many lodges in the park, providing food and accommodation during the trekking season in spring and autumn. One of these is situated at Gosainkunda Lake. The Durham University Himalayan Expedition conducted an 18 month multi-disciplinary survey in 1976-77, and this has formed the basis for the first management plan. Several geological, ecological and botanical surveys have been carried out, and the avifauna of the park has been well documented.

**References:** Durham University Himalayan Expedition (1977); Green (1986); Inskipp & Inskipp (1985); Klapste (1986); Redman & Murphy (1980).

**Criteria for inclusion:** lb.

**Source:** Carol Inskipp, Rajendra Lal Shrestha and H.S. Nepali.

**Wetland name:** Lakes in Sagarmatha National Park

**Country:** Nepal

**Coordinates:** 27°49'-28°01'N, 86°41'-86°57'E;

**Location:** on the southern slopes of Sagarmatha (Mount Everest), in the Solu-Khumbu District of Sagarmatha Zone, northeastern Nepal near the border with Tibet.

**Area:** c.500 ha of lakes.

**Altitude:** 4,700-5,500m.

**Biogeographical Province:** 2.38.12.

**Wetland type:** 14.

**Description of site:** Seventeen small glacial lakes in the upper catchment of the Dudh Kosi and its tributaries, on the southern slopes of Mount Everest. All are oligotrophic lakes devoid of macro-vegetation, and with clear, turquoise-blue waters. The Dudh Kosi flows south into the Ganges. There are two main groups of lakes, the Gokyo lakes on the western flank of the Ngozumpa Glacier (the source of the Dudh Kosi), and the Panch Pokhri lakes at the source of a tributary, some 25 km to the southeast. The Gyoko lakes are a chain of five lakes impounded by the lateral moraine of the Ngozumpa Glacier: Longponga (35 ha, 4,700m), Toujung (10 ha, 4,800m), Dudh Pokhari (63 ha, 4,790m), Ngojumba (105 ha, 4,925m) and Gyazumpa (49 ha, 5,125m). The Panch Pokhri lakes are a group of ten small lakes, the largest being only 35 ha in extent, at 5,000-5,500m. The other two lakes are Gyuba Tschomoche (35 ha, 5,280m), near the eastern edge of the Ngozumpa Glacier, and Tshola Tsho (50 ha, 4,500m), a few km to the east of Longponga.

**Climatic conditions:** Temperate monsoonal climate with an average annual rainfall of about 950-1,050 mm, an average minimum temperature of -7.7°C (January), and an average maximum temperature of 16.2°C (August). About 80% of the precipitation falls in the monsoon season from June to September.

**Principal vegetation:** The lakes are devoid of macro-vegetation. There are some dwarf rhododendrons, other low alpine shrubs and grasses around the lower lakes (e.g. Longponga and Toujung), but most of the surrounding areas are bare rock, moraine and scree.

**Land tenure:** State owned (Government of Nepal).

**Conservation measures taken:** All the lakes are protected in the Sagarmatha (Mount Everest) National Park (124,300 ha), established in 1976, and listed as a World Heritage Site in 1979.

**Land use:** Tourist trekking in the National Park. The three lowest Gyoko lakes (Longponga, Toujung and Dudh Pokhari) lie on a popular tourist trekking route; Ngojumba, Gyazumpa and Tshola Tsho are occasionally visited by trekkers, but Gyuba Tschomoche and the Panch Pokhri lakes are very much off the beaten track. There is a popular tourist lodge by Dudh Pokhari lake.

**Disturbances and threats:** None known at the lakes. Problems elsewhere in the National Park have been summarized by Green (1986).

**Economic and social values:** Set amidst magnificent mountain scenery, the lakes have great scenic value and attract many visitors each year. About 5,000 foreigners visited the National Park in 1981, and income from tourism has become an integral part of the local economy.

**Fauna:** The lakes are devoid of fish, and support very little animal life of any kind. Small numbers of waterfowl of a variety of species have been recorded at the Gyoko lakes, particularly at the height of the spring migration in May. These include *Anser indicus*, *Tadorna ferruginea*, *Anas penelope* (maximum 35), *A. strepera*, *A. acuta*, *A. clypeata*, *Aythya ferina*, *A. nyroca*, *A. fuligula*, *Numenius arquata*, *Tringa totanus*, *T. nebularia*, *T. ochropus*, *Actitis hypoleucos*, *Gallinago gallinago*, *Larus brunnicephalus* and *L. ridibundus*. No information is available for Gyuba Tschomoche, Tshola Tsho and the Panch Pokhri lakes, but it is likely that these lakes are also used by small numbers of waterfowl during the migration seasons.

**Special floral values:** None known.

**Research and facilities:** A considerable amount of research has been carried out in the National Park, and the fauna and flora have been well documented, but little attention seems to have been

given to the lakes. The Panch Pokhri lakes in particular remain very poorly known. There are several tourist lodges in the Gokyo valley, including one by Dudh Pokhari lake.

**References:** Biwa (1974): Green (1986): InkiDD & InkiD (195) Schneider (197).

**Criteria for inclusion:** lb.

**Source:** Carol Inskipp, Rajendra Lal Shrestha and H.S. Nepali.

**Wetland name:** Kosi Barrage and Kosi Tappu Wildlife Reserve

**Country:** Nepal

**Coordinates:** 26°33'-26°45'N, 86°54'-87°04'E;

**Location:** on the Sapta Kosi River near Biratnagar, Saptari and Sunsari Districts, in the terai of southeastern Nepal near the border with India.

**Area:** Kosi Barrage, several hundred ha; Wildlife Reserve, 6,500 ha.

**Altitude:** 75-81m.

**Biogeographical Province:** 4.3.1.

**Wetland type:** 11, 12, 13, 15, 17 & 18.

**Description of site:** A water storage reservoir (Kosi Barrage) on the Sapta Kosi river, a tributary of the Ganges. The barrage was constructed between 1958 and 1964, and has created a large expanse of open water with fringing reed-beds and other marsh vegetation. Extensive mudflats and sand banks are exposed at low water levels. Embankments to the east and west contain the river during periods of flooding. Borrow pits alongside the embankments retain water for most of the year and support dense reed-beds. The Kosi Tappu Wildlife Reserve is situated a few km to the north of the barrage. It incorporates a 24 km stretch of the Sapta Kosi and the adjacent flood plain. The river is very wide and shallow, with many low islands, extensive mudflats, and fringing marshes. The discharge varies from a minimum of 287 cubic meters per second in March to a maximum of 15,940 cubic meters per second in August.

**Climatic conditions:** Tropical monsoonal climate with an average annual rainfall of 2,110 mm, an average maximum temperature of 37°C, and an average minimum temperature of 8°C.

**Principal vegetation:** Extensive reed-beds and other freshwater marshes around parts of the reservoir and along the banks of the Sapta Kosi; rice paddies in adjacent areas. The original vegetation of Kosi Tappu was riverine forest dominated by *Acacia catechu* and *Dalbergia sissoo*, mixed deciduous forest and grassland, but much of this has been degraded by over-exploitation and siltation.

**Land tenure:** Kosi Tappu Wildlife Reserve is state owned (Government of Nepal); the barrage is leased to the Government of India. Adjacent areas are privately owned.

**Conservation measures taken:** Kosi Barrage and its associated marshes are unprotected. A twenty-four km stretch of the river north of the barrage is protected in the Kosi Tappu Wildlife Reserve (6,500 ha) established in 1976. By 1979, 12,000 villagers had been moved out of the reserve and settled elsewhere. In December 1987, the Government of Nepal acceded to the Ramsar Convention and designated the Kosi Tappu Wildlife Reserve for inclusion in the List of Wetlands of International Importance established under the terms of the Convention.

**Conservation measures proposed:** It is hoped to extend the Wildlife Reserve southwards to incorporate Kosi Barrage (an extension of about 13,000 ha), but the situation is complicated because the land is leased to the Government of India. There is also a plan to extend the Wildlife Reserve to the west to include the proposed Trijuga Hunting Reserve (36,300 ha).

**Land use:** Subsistence fishing; agriculture, mainly the cultivation of rice, in surrounding areas.

**Disturbances and threats:** Kosi Barrage is silting up as a result of soil erosion in the water catchment area. The wetland is in a densely populated area, and there is a considerable amount of disturbance from human activities. Habitat destruction and overstocking by domestic animals continue to pose problems in the Wildlife Reserve.

**Economic and social values:** The Barrage supports a small fishery of importance for the local communities.

**Fauna:** Kosi Barrage is Much the most important wetland in Nepal for waterfowl. About 114 species of waterfowl, i.e. almost all the species known to occur in Nepal, have been recorded. Common residents include *Phalacrocorax carbo* (several hundred), eight species of herons and egrets, *Anastomus oscitans* (up to 30), *Ciconia episcopus*, *Pseudibis papillosa*, *Anas poecilorhyncha*, *Metopidius indicus*, *Rostratula benghalensis*, *Esacus recurvirostris*, *Glareola lactea* (up to 1,500), *Vanellus duvaucelii*, *V. indicus*, *Charadrius dubius*, *Sterna aurantia* and *S. melanogaster*. Summer visitors include *Ixobrychus sinensis*, *I. cinnamomeus*, *Nettapus coromandelianus*, *Gallinago cinerea*, *Hydrophasianus chirurgus* and *Sterna albifrons*.

The barrage is especially important as a staging area and wintering area for a variety of trans-Himalayan migrants, notably ducks and shorebirds. Duck numbers build up from late December and reach a peak between mid-February and mid-March; up to 50,000 have been recorded at one time (e.g. in mid-February 1981). The maximum counts include:

7,000 *Dendrocygna javanica*

4,000 *Tadorna ferruginea*

600 *Anas penelope*

80 *A. falcata*

2,000 *A. strepera*

2,000 *A. crecca*

100 *A. platyrhynchos*

50,000 *A. acuta*

1,800 *A. querquedula*

500 *A. clypeata*

50 *Netta rufina*

100 *Aythya ferina*

20 *A. baeri*

150 *A. nyroca*

100 *A. fuligula*

Thirty species of shorebirds have been recorded as winter visitors or passage migrants, the main migration occurring between February and mid-May, when up to 1,500 shorebirds have been reported. The commoner species include *Vanellus vanellus*, *Pluvialis dominica*, *Charadrius alexandrinus*, *Numenius arquata*, *Tringa nebularia*, *T. ochropus*, *Actitis hypoleucos*, *Gallinago gallinago*, *Calidris minuta*, *C. temminckii* and *Philomachus pugnax*. Small numbers of gulls and terns occur in winter or on passage, mainly *Larus ichthyaetus*, *L. brunnicephalus*, *L. ridibundus* (maximum 150), *Chlidonias hybrida*, *Gelochelidon nilotica*, *Hydroprogne caspia* and *Sterna hirundo*. Other regular migrants include *Podiceps cristatus*, *Phalacrocorax niger*, *Ardea cinerea*, *Anser indicus*, *Porphyrio porphyrio* and *Fulica atra*. Noteworthy species, which have been recorded in small numbers, include *Pelecanus onocrotalus* (up to 52), *P. philippensis* (regular in spring in very small numbers), *Mycteria leucocephala*, *Ciconia nigra*, *Ephippiorhynchus asiaticus*, *Leptoptilos dubius*, *L. javanicus*, *Threskiornis melanocephalus* (up to 30), *Platalea leucorodia* (up to 70), *Sarkidiornis melanotos* and *Rynchops albicollis*. Other noteworthy birds of the marshes and grassland include Swamp Partridge *Francolinus gularis*, the endangered Bengal Florican *Houbaropsis bengalensis*, White-tailed Stonechat *Saxicola leucura* and Striated Marsh Warbler *Megalurus palustris*. The Wildlife Reserve contains Nepal's last surviving population of wild Water Buffalo *Bubalus arnee*, with some 60 reported in 1977. It is thought, however, that the entire population has hybridized with feral Water Buffalo. The Ganges Dolphin *Platanista gangetica* occurs quite commonly in the river.

**Special floral values:** None known.

**Research and facilities:** Basic accommodation is available for tourists in the Wildlife Reserve and at Kosi village. Numerous ornithologists and bird-watchers have visited the barrage, and the avifauna has been well documented.

**References:** Green (1986); Inskipp (1985); Inskipp & Inskipp (1985); Karpowicz (1985).

**Criteria for inclusion:** 2b, 3a.

**Source:** Harka B. Gurung, Carol Inskipp, Steven Madge, Rajendra Lal Shrestha, Anthony Stones and H.S. Nepali.

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