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KENYA LAKE SYSTEM IN THE GREAT RIFT VALLEY KENYA

The Kenya Lake System is composed of three alkaline lakes and their surrounding territories: Lake Bogoria, 10,700 ha; Lake Nakuru, 18,800 ha; and Lake Elementaita, 2,534 ha. These lakes are found on the floor of the Great Rift Valley where major tectonic and/or volcanic events have shaped a distinctive landscape. Some of the world's greatest diversities and concentrations of bird species are recorded within these relatively small lake systems. For most of the year, up to 4 million Lesser Flamingos move between the three shallow lakes in an outstanding wildlife spectacle. Surrounded by hot springs, geysers and the steep escarpment of the Rift Valley with its volcanic outcrops, the natural setting of the lakes provides an exceptional experience of nature.

COUNTRY

Kenya

NAME

Kenya Lake System in the Great Rift Valley

NATURAL WORLD HERITAGE SERIAL SITE

2011: Inscribed on the World Heritage List under natural criteria (vii), (ix) and (x).

STATEMENT OF OUTSTANDING UNIVERSAL VALUE

The UNESCO World Heritage Committee issued the following Statement of Outstanding Universal Value at the time of inscription:

Brief Synthesis

The Kenya Lake System is composed of three alkaline lakes and their surrounding territories: Lake Bogoria, 10,700 ha; Lake Nakuru, 18,800 ha; and Lake Elementaita, 2,534 ha. These lakes are found on the floor of the Great Rift Valley where major tectonic and/or volcanic events have shaped a distinctive landscape. Some of the world's greatest diversities and concentrations of bird species are recorded within these relatively small lake systems. For most of the year, up to 4 million Lesser Flamingos move between the three shallow lakes in an outstanding wildlife spectacle. Surrounded by hot springs, geysers and the steep escarpment of the Rift Valley with its volcanic outcrops, the natural setting of the lakes provides an exceptional experience of nature.

Criterion (vii): The Kenya Lake System presents an exceptional range of geological and biological processes of exceptional natural beauty, including falls, geysers, hot springs, open waters and marshes, forests and open grasslands concentrated in a relatively small area and set among the landscape backdrop of the Great Rift Valley. The massed congregations of birds on the shores of the lakes including up to 4 million Lesser Flamingos which move between the three lakes is an outstanding wildlife spectacle. The natural setting of all three lakes surrounded by the steep escarpment of the Rift Valley and associated volcanic features provides an exceptional experience of nature.

Criterion (ix): The Kenya Lake System illustrates ongoing ecological and biological processes which provide valuable insights into the evolution and the development of soda lake ecosystems and the related communities of plants and animals. Low species diversity and abundant resident populations of birds and other animals make the soda lakes of the property especially important environments in which to conduct investigations of trophic dynamics and ecosystem processes. The production of huge biomass quantities in these distinctive soda lakes and the food web that this green algae supports are also of international scientific value, and provide critical support to birds, which visit the property in large numbers as part of their migration in response to seasonal and episodic changes in the environment.

Criterion (x): The Kenya Lake System is the single most important foraging site for the Lesser Flamingo in the world with about 1.5 million individuals moving from one lake to the other and provides the main nesting and breeding

grounds for Great White Pelicans in the Great Rift Valley. The lakes' terrestrial zones also contain important populations of many mammal and bird species that are globally or regionally threatened. They are home to over 100 species of migratory birds and support globally important populations of Black-Necked Grebe, African Spoonbill, Pied Avocet, Little Grebe, Yellow Billed Stork, Black Winged Stilt, Grey-Headed Gull and Gull Billed Tern. The property makes a critical contribution to the conservation of the natural values within the Great Rift Valley, as an integral part of the most important route of the African-Eurasian flyway system where billions of birds are found to travel from northern breeding grounds to African wintering places.

Integrity

The three lakes constituting the property represent the most significant Rift Valley lakes within Kenya, and are an essential component of those in the Great Rift Valley as a whole. Each of the three components of the property is gazetted as a protected area and whilst the property is of small size, it contains the main ecosystems and features that support its Outstanding Universal Value. Surrounded by an area of rapidly growing population, the property is under considerable threat from surrounding pressures. These threats include siltation from soil erosion, increased abstraction of water in the catchment, degradation of land, deforestation, growth in human settlements, overgrazing, wildlife management, tourism and pollution coming from Nakuru town. Management authorities must be vigilant in continuing to address these issues through effective multi-sector and participatory planning processes.

Protection and Management Requirements

Each component of the property enjoys adequate legal protection, up-to-date management plans and a satisfactory on-ground management presence. In order to maintain and enhance the Outstanding Universal Value of the property it will be important to sustain and enhance this effective management, and to address a range of long-term issues. These include catchment level management of threats and development with particular emphasis on management of groundwater and surface pollution and forest cover, inter-sectoral and participatory management processes especially with respect to environmental impact assessment of adjoin development and the building of increased ecological connectivity between the component parts of the system. Transboundary cooperation is also important as the values of the property are partly dependant on protection of other lake and wetland areas that support migratory species. In this regard there is potential for other areas, including Lake Natron in Tanzania, to be considered as part of a future transnational serial World Heritage property.

INTERNATIONAL DESIGNATION

2011: All three lakes plus Lake Baringo designated a Wetland of International Importance under the Ramsar Convention (-71,850 ha).

IUCN MANAGEMENT CATEGORY

II National Park

BIOGEOGRAPHICAL PROVINCE

East African Woodland/Savanna (3.5.4)

GEOGRAPHICAL LOCATION

The Kenya Lake System in the Great Rift Valley includes three lakes in the Rift Valley Province of central Kenya. From south to north, Lake Elementaita National Wildlife Sanctuary lies roughly 20 km south-east of Nakuru town bordered by the Ndundori-Ngorika-Gitare Hills to the east and the Eburru Hills to the west, Lake Nakuru National Park lies 3 km south of Nakuru town surrounded by woodlands and grasslands and Lake Bogoria National Reserve lies about 10 km north of the equator and is bordered by the Siracho escarpment to the east and a series of hot springs and geysers to the west.

Geographical Coordinates to the Nearest Second

Name	Location or Municipality	Coordinates of centre point
Lake Nakuru National Park	Nakuru	36°05' 07.96" E, 0° 21' 32.48" S
Lake Bogoria National Reserve	Baringo/Koibatek	36°05' 51.82" E, 0°15' 30.12" N
Lake Elementaita National Wildlife Sanctuary	Gilgil	36°14' 23.92" E, 0° 26' 33.47" S

DATES AND HISTORY OF ESTABLISHMENT

Lake Nakuru

1961: Southern end of the lake designated a bird sanctuary under the management of the Kenya Royal National Parks.

1964: Bird sanctuary extended to cover the whole lake and a small strip of land around it.

1968: Whole area of the lake and surrounding shore (covering 6,000 ha) was officially gazetted as a National Park.

1974: Expansion of the area south of the lake increased the Park area to 18,000 ha.

Lake Bogoria

1970: Gazetted as a wildlife protection area.

Lake Elementaita

1999: Area around Lake Elementaita designated an Important Bird Area in 1999.

2010: Gazetted as a National Wildlife Sanctuary.

AREA

The inscribed World Heritage property combines a total area of 32,034 ha, which includes the three water bodies, Lake Nakuru National Park, Lake Bogoria National Reserve and the riparian area of Lake Elementaita. Lake Elementaita National Wildlife Sanctuary is surrounded by a 3,581 ha buffer zone (part of the Soysambu Wildlife Sanctuary and the Ututu Wildlife Conservation Trust), although this is not included within the property. Lake Bogoria and Lake Nakuru do not have formal buffer zones but wide gazetted terrestrial zones within the protected areas serve as buffers for the lake bodies.

Area of the three components

Name	Area of property (ha)	Area of buffer zone (ha)
Lake Nakuru National Park	18,800	0
Lake Bogoria National Reserve	10,700	0
Lake Elementaita National Wildlife Sanctuary	2,534	3,581
TOTAL	32,034	3,581

LAND TENURE

The Government of Kenya wholly owns the Kenya Lake System. Lake Elementaita and the riparian land are owned by the Government of Kenya. Soysambu Wildlife Sanctuary, which is part of the Lake Elementaita buffer zone, is a wildlife sanctuary under private ownership. The Kenya Wildlife Service (a government body) corporate owns and manages Lake Nakuru National Park. Lake Bogoria National Reserve is managed by Baringo and Koibatek County Councils with the assistance of the Kenya Wildlife Service, which is a government parastatal.

ALTITUDE

The three lakes lie on the floor of the Great Rift Valley with surrounding highlands reaching elevations of > 2,000 m above sea level.

Altitude of the three lakes (modified from Olago *et al.*, 2009)

Name	Altitude (m)
Lake Nakuru	1,800
Lake Elementaita	1,776
Lake Bogoria	960

PHYSICAL FEATURES

The Kenya Lake System is part of a series of alkaline lakes on the floor of the Eastern Rift Valley which formed as a result of major tectonic and/or volcanic events between 2 and 0.5 million years ago. The area is characterized by steep fault scarps, deep gorges, step-faulted blocks, cinder cones and craters on the rift floor, gushing geysers and hot springs. Lakes Elementaita, Nakuru and Bogoria are ecologically, geologically and hydrologically connected. They are essential to the hydrological cycle that contributes to geothermal energy; the heated geothermal waters contributing to the unique aquatic habitats and unique assemblages of planktonic and benthic flora and fauna which support the lakes globally significant bird diversity.

Lake Elementaita is a shallow lake (depth 0.9-1.5 m) with an area of 2,000 ha that lies on the floor of the rift valley at 1,776 m above sea level. At its southern end, it is fed by the Kariandusi hot springs and two small streams, the Mereroni and Kariandusi, flowing from the eastern plateau. To the east, the lake is flanked by small-scale agricultural holdings, while two large wildlife conservancies namely Ututu and Soysambu surround the remainder of the lake. The surrounding highlands reach up to 2,668 m above

sea level, characterised by dramatic rocky faults, volcanic outcrops and cones including the 'Sleeping Warrior' and what is commonly referred to as Delamere's Nose or the 'Horse Shoe Crater'.

Lake Nakuru is a shallow lake (maximum depth 3 m) surrounded by swamps and alkaline mudflats, with an open water surface varying between 3,500 and 4,900 ha depending on fluctuations in water level. Three major rivers drain into the lake (Njoro, Makalia and Nderit), as well as the seasonal stream Lamudiak which drains into the lake during the rainy season. There is inflow from several alkaline springs along the shore. The soils in the area are alluvial in origin and highly permeable, while the rocks are basaltic in formation and are part of the western wall of the Great Rift Valley. The lake is surrounded by escarpments including Mau ranges to the West, Eburru to the South, Bahati Escarpment to the North-East and Menengai crater to the North.

Lake Bogoria is a deep narrow lake (17 km long, depth 11-14 m), covering an area of 3,800 ha. Its surface recharge is from the Sandai-Waseges, Lobo and Emsos Rivers, as well as other minor perennial springs that discharge fresh water into the lake. There are geologic manifestations of ongoing volcanic processes in the form of fumaroles, hot springs and geysers within the lake, along the lake shores and various points in the surrounding areas.

CLIMATE

Temperatures in the Kenya Lake System range from 10°C in the highland areas to 32°C in the lowlands with a daily mean of 25°C. The mean annual rainfall ranges from 500-1,000 mm occurring in two seasons, April-May and October-November. The temperature and rainfall regimes of the region combine to give the sites a hot and arid to semi-arid climate.

VEGETATION

The unique aquatic and terrestrial habitats of the three lakes have been recognised as wetlands of international importance under the Convention on Wetlands (Ramsar, 1971). The hypersaline aquatic zones are characterized by cyanophytes *Spirulina platensis* and *Arthrospira fusiformis*, which form the foundation of the lakes' simple food chain. The surrounding terrestrial habitats contain a rich diversity of floral communities including 556 recorded species (85 families) at Lake Nakuru in the reserve and surrounding wetlands and 210 species (53 families) recorded at Lake Bogoria National Reserve.

Terrestrial vegetation around Lake Elementaita consists of upland forest, woodland (mostly *Acacia* forest), dry bushland (including dominant species such as *Acacia xanthophloea* and *Eurphobia candelabrum*), scrubland (dominated by *Olea* sp. and *Tarchonanthus camphoratus*) and grassland (including *Cynodon dactylon*, *Chloris gayana* and *Panicum* spp.). Marshes located in the southern part of the lake are dominated by *Cyperus laevigatus* and *Typha* spp.

The aquatic zone of Lake Nakuru is characterized by a cyanophyte *Arthrospira fusiformis*, which is the foundation of the lake's simple food chain. The terrestrial zone is predominantly *Acacia* woodland, *Tarchonanthus camphoratus* bushlands and grassland communities (dominated by *Sporobolus spicatus*). The site is famous for having the largest *Euphorbia candelabrum* forest stand in East Africa, however part of the *Euphorbia* forest had burnt down and efforts to rehabilitate it is ongoing.

Although hyper-saline, Lake Bogoria supports a dense growth of green algae (*Spirulina platensis*) which provides a key feeding ground for Lesser Flamingos. Terrestrial vegetation is primarily thorny bush land dominated by *Acacia* sp., *Combretum* sp., *Ficus* sp. and alkaline-tolerant grasslands (dominant grasses include: *Sporobolus ioclados*, *Dactyloctenium aegyptium*, *Chloris virgata* and *Dagitaria velutina*).

FAUNA

The open water, long and highly indented shore lines, alkaline and freshwater springs, marshes, woodlands, bush lands and grasslands of the Kenya Lake System constitute an extremely rich and diverse habitat supporting around 500 species of birds, 70 species of mammals and many amphibian and reptile species.

The Kenya Lake System supports globally important populations of waterbirds and forms a key site in the major African-Eurasian migratory flyway. The lakes host a congregation of between 1.5 and 2 million near-threatened lesser flamingo *Phoeniconaias minor* and globally significant populations of the greater flamingo *Phoenicopterus ruber*, black-necked grebe *Podiceps nigricollis*, great white pelican *Pelecanus onocrotalus*, African spoonbill *Platalea alba*, pied avocet *Recurvirostra avosetta*, little grebe *Tachybaptus ruficollis*, yellow-billed stork *Mycteria ibis*, black-winged stilt *Himantopus himantopus*,

grey-headed gull *Larus cirrocephalus* and gull-billed tern *Gelochelidon nilotica*. A total of 13 globally threatened bird species including the Madagascar pond heron *Ardeola idae* (EN) and Egyptian vulture *Neophron percnopterus* (VU), and the grey-crowned crane *Balearica regulorum* (VU), lesser kestrel *Falco naumanni* (VU), greater spotted eagle *Aquila clanga* (VU), and white-headed vulture *Trionoceps occipitalis* (VU). and eight regionally-threatened bird species also occur within the Lake System.

Lake Elementaita is a key breeding site for the great white pelican, with over 8,000 breeding pairs, the largest in Africa. Lake Nakuru National Park is home to millions of flamingos, numbers that have been noted as representing one of the greatest ornithological spectacles on earth. Lake Bogoria is a key feeding ground for the lesser flamingo, with spectacular populations of as many as 2 million recorded. At times, it also supports the highest population of greater flamingo in the entire Great Rift Valley alkaline lakes. Large numbers of birds move between each of the sites, sometimes on a daily basis, hence all three lakes are strongly connected in a unique Rift Valley "flamingo system".

The terrestrial zone of the Lake System property supports globally significant populations of mammals, including the black rhino *Diceros bicornis* (CR) and near-threatened white rhino *Ceratotherium simum*. Lake Nakuru is a sanctuary for a total of 125 free ranging rhinos making it one of the largest concentrations in the region. Several globally threatened carnivore species are resident within the terrestrial zone of the Lake System, including the African wild dog, *Lycaon pictus* (EN), the lion *Panthera leo* (VU), the cheetah, *Acinonyx jubatus* (VU) and the near-threatened leopard *Panthera pardus*. The property also hosts significant resident populations of the charismatic herbivore community such as Rothschild giraffe *Giraffa camelopardalis rothschildi*, Burchell's zebra, *Equus burchelli*, greater kudu *Tragelaphus strepsiceros*, Bohor reedbuck *Redunca redunca*, Defassa waterbuck *Kobus ellipsiprymnus*, bushbuck *Tragelaphus scriptus* and African buffalo *Syncerus caffer*. The rare large-eared leaf-nosed bat *Hipposideros megalotis* is resident.

The Kenyan horned viper *Bitis worthingtonii*, which is endemic to the central Rift Valley is found within the Lake Elementaita terrestrial habitat.

CONSERVATION VALUE

The Kenya Lake System presents an exceptional range of geological and biological processes set within the steep escarpments of the Great Rift Valley, which is the largest single geological land form in the world. Distinctive physiographic features include fumaroles, geysers and hot springs. The Lake System represents the most significant Rift Valley lakes within Kenya and is an essential component of those in the Great Rift Valley as a whole. The lakes also constitute wetlands of regional and international significance under the Ramsar Convention. The biodiversity includes diverse fauna and flora that is endemic, congregatory, range-restricted, biome-restricted and globally threatened. The three lakes are included among the sixty "Important Bird Areas of Kenya" by Birdlife International as they host 13 globally threatened bird species and support globally important populations and congregations of water birds. The Lake System is also a critical site for conservation of Lesser Flamingos (sustaining 75% of the global population), as well as supporting one of the major breeding colonies of Great White Pelicans. The Lake System also includes sizable populations of mammals, including Black Rhino, Rothschild's Giraffe, Greater Kudu, Lion, Cheetah and Wild Dog. The three lakes have remained preserved with minimal interference from human activities. With Lake Baringo they are designated a Ramsar Wetland.

LOCAL HUMAN POPULATION

There are no permanent inhabitants within the Kenya Lake System. However Lake Nakuru National Park is situated adjacent to the expanding agricultural and industrial town of Nakuru. Nakuru District has a high population density (190 persons per square km) and mean annual growth rate (4.9%), with population overspill into less productive lands around Lake Elementaita and Naivasha.

VISITORS AND VISITOR FACILITIES

The Kenya Lake System is an important local and international tourist destination, drawing 1.5 million visitors (including 0.57 non-residents) between January 2005 and May 2009, not including visitors to Lake Elementaita. Visitor facilities are well established in Lake Nakuru National Park including two lodges (Sarova Lion Hill and Lake Nakuru Lodge) and nine camp sites strategically located within the park. The main circuit road of 75 km is an all weather road. In addition there are 200 km of unimproved roads. There is also an airstrip for tourist aircraft and park management (located at Naishi), a park headquarters, an education centre, two hostels and a water quality laboratory.

In Lake Bogoria National Reserve, accommodation includes Acacia, Riverside and Fig Tree campsites, and the Lake Bogoria Dryland Environmental Education Centre Campsite. Outside the Reserve there is the Lake Bogoria Spa Resort (a three-star hotel) and Zakayo's and Papyrus inns (catering for low budget visitors). In addition, there are three community-run campsites and one picnic site outside the reserve: Lobo River Camp and Picnic site, NETBON Camping site and Emsos Community Campsite. Other infrastructure includes a 10 km tarmac road from the main gate to the geysers and hot springs on the western side and an airstrip located near the main gate. Accessibility to the eastern side of the Reserve is limited to walking and cycling.

Tourism at Lake Elementaita Wildlife Sanctuary is increasing. There are several a tourist lodges: Lake Elementaita Lodge, Lake Elementaita Country Lodge, Pink Lake Man Eco-lodge, Flamingo Camp and tented camp, Sunbird Hotel, Sleeping Warrior, Mawe Mbili Camp and Delamere's Camp, within Soysambu Wildlife Sanctuary. There are also several proposed accommodation facilities within the Soysambu Wildlife Conservancy.

SCIENTIFIC RESEARCH AND FACILITIES

The Eastern Rift Valley's soda lake system is among the world's most productive ecosystems, serving as a feeding ground to millions of birds. The three lakes of the Kenya Lake System provide unique insight into the evolution and development of soda lake systems and the ecological dynamics and food chains of these harsh yet highly productive biological systems.

Since 1991 there has been consistent monitoring of the status and trends of water birds at key wetlands in Kenya, including the Kenya Lake System. January counts of waterfowl species diversity at the three lakes 1999-2009 generally recorded the greatest number of species as Lake Nakuru. The total number of individual birds recorded each January appears to have decreased in recent years, although this is attributed to peak numbers of birds now being observed during the months of March and September rather than January and July (due to changing weather patterns), with the three sites actually maintaining stable numbers between years. January waterfowl counts also indicate that the Kenyan population of Lesser Flamingos have fluctuated 1992-2007 between 279,620 and 1,452,513 birds (mean 937,249 birds). In January 2009, a total of 32,045 water birds consisting of 56 species were recorded at Lake Elementaita, compared with 126,519 water birds belonging to 64 species at Lake Nakuru and 133,033 water birds belonging to 33 species at Lake Bogoria.

The Kenyan Wildlife Service (KWS), the National Museums of Kenya the Department of Resource Surveys and Remote Sensing, the World Wide Fund for Nature, and Soysambu Wildlife Sanctuary undertake monitoring of the Kenya Lake System. In addition to the twice yearly water-bird counts, monthly water quality monitoring is undertaken by KWS, the Municipal Council of Nakuru and the Nakuru Water and Sanitation Services Company. In addition there is a quarterly mammal count carried out within the Lake Nakuru National Park as well as a biannual mammal count undertaken in the Naivasha/Elementaita area. There is no systematic mammal monitoring programme for the Lake Bogoria National Reserve.

The Soysambu Wildlife Conservancy adjacent to Lake Elementaita plans to establish a research centre within the conservancy. This is expected to provide research facilities and accommodation for researchers, students and volunteers, as well as a reference library, natural history and wildlife museum and a wildlife orphanage centre.

MANAGEMENT

All three sites have a management plan in place describing extensively the management and monitoring procedures that are applied: the Greater Lake Elementaita Conservation Area Management Plan (2010-2020), the Lake Nakuru Integrated Ecosystem Management Plan (2002-2012) and the Lake Bogoria National Reserve Integrated Management Plan (2007-2012). At each site, a management committee including various stakeholders related to the lakes' catchments is in place to monitor the implementation of the plan. A National Steering Committee chaired by KWS and comprising the three local management committees and the National Museums of Kenya has also been established to enhance management of the Kenya Lake System and ensure stakeholder coordination. It meets at least three times a year to review progress of conservation across the three sites.

Lake Elementaita National Wildlife Sanctuary falls under the responsibility of KWS but does not yet have a locally based staff member directly responsible for the gazetted area. However, most of the area which needs active management (buffer zone) is under private ownership and benefits already from

conservation efforts. A local landowners and users association (the Greater Lake Elementaita Conservation Area) provides a dynamic management structure that aims at controlling entry into the site and all related construction or developments within the catchment.

Lake Nakuru National Park is under direct management by KWS, who have appropriate staff numbers (170 permanent rangers), budget and means (including a plane, a research unit, an educational centre and a rhino monitoring centre). A stakeholders' forum: Lake Nakuru Catchment Conservation and Development Forum meets regularly to monitor the implementation of the management plan.

Lake Bogoria National Reserve is managed by a multi-stakeholder management committee led by Baringo and Koibatek county councils that have authority to manage the reserve as provided for in the Wildlife Conservation & Management Act. There is a warden in charge who supervises almost 40 staff and benefits from enough means and budget (including an education centre).

MANAGEMENT CONSTRAINTS

Surrounded by an area of rapidly growing population, the Kenya Lake System is under threat from numerous pressures. However, regulatory and management measures have significantly improved over recent years. Whilst forest conservation is not a problem within the boundaries of the property, increasing conversion of forests and woodlands to agricultural land and human settlements is a major concern for the catchment areas (particularly around Lake Nakuru), affecting the quantity and quality of water which goes into the lakes. The Forest Act (2005) provides a sound basis for addressing this issue and many reforestation programs are now being implemented, including in the Mau Escarpment which suffered particularly serious deforestation. Water pollution is also a problem, mostly originating from Nakuru town, although treatment of waste water entering the lake from the town has improved and water quality monitoring is now in place. Concerns about industrial pollution and surface runoff persist but the municipality of Nakuru is taking decisions to solve these issues.

Up to 300,000 visitors enter Nakuru National Park per year, presenting a significant management challenge. However, so far KWS has successfully controlled direct or indirect consequences of overpopulation in the park. Tourist access roads do not pass through fragile spots within the three sites. In Lake Bogoria National Reserve and Lake Nakuru National Park, there are areas designated as ecologically fragile (marshes, springs, lake shore, open lake, river mouth, breeding sites, hot springs) and habitats for rare species where intense access and use is restricted. Lake Elementaita also has zones that are recognized as fragile spots, where access is controlled.

The boundaries of the three sites are clearly demarcated on the ground (and in the case of Nakuru, a 70 km electric fence exists). However, there is risk of new settlement in the eastern part of the Elementaita buffer zone, although the Greater Lake Elementaita Conservation Area Management Committee is charged with controlling any new development or land-use conversion. A pipeline is under construction near the buffer zone of Elementaita (but it will be buried) and a proposed landfill site on the border of Nakuru National Park in the Soysambu Conservancy jeopardises connectivity between the Nakuru and Elementaita sites.

Artisanal extraction of soda and sand occurs along the northwestern shore of Lake Elementaita and grazing by nomadic pastoralists occurs in the southern area of Elementaita but this is considered to have little or no impact.

Whilst unpredictable, ecological and climatic changes may greatly affect the Lake System, with records over the past 80 years showing huge water level fluctuations in all lakes (including complete drying out of Elementaita and Nakuru). Until now, the property has been resilient to these climatic fluctuations and water management measurements can be taken to mitigate some of the risks.

COMPARISON WITH SIMILAR SITES

The Kenya Lake System was inscribed on the World Heritage List under natural criteria (vii), (ix) and (x) for the exceptional range of geological and biological processes providing valuable insight into the evolution and development of soda lake ecosystems and related plant and animal communities, the massed congregations of birds along lake shores including the outstanding wildlife spectacle of up to 4 million Lesser Flamingos moving between the three lakes, and the exceptional natural beauty of the falls, geysers, hot springs, open waters, marshes, forests and open grasslands set among the backdrop of steep escarpments in the Great Rift Valley.

The Kenya Lake System is part of the Great Rift Valley which is an exceptional geomorphological feature in itself. This scenic beauty compares favourably to the dominant freshwater wetland ecosystems of the Pantanal Conservation Area (Brazil) and associated Amolar Mountains. Comparison may also be made with the Djoudj Bird Sanctuary (Senegal). However, the Kenya Lake System illustrates a different and unique association of topographies, volcanic activities, multiple ecosystems and wilderness areas making it more impressive than the landscape found within and around the Djoudj Sanctuary.

Other soda lakes in the region include Magadi and Logipi in Kenya (not protected and considered of less conservation interest), Natron and Eyasi in Tanzania and Langan Awass and Abijatta-Shalla in Ethiopia. Although these lakes account for over 400 species of aquatic and terrestrial birds, the Kenya Lake System has a higher and more diverse avifauna with 450 species recorded and many more species of mammals included within its boundaries. Lake Turkana (the world's largest alkaline lake) in the Great Rift Valley was inscribed on the World Heritage List in 1997 as a serial site (three national parks) and is described as an outstanding laboratory for the study of plant and animal communities and their evolution. While the Kenya Lake System is much smaller than this cluster, it represents a unique place for the understanding of soda lakes ecosystem evolution complementing the values of Lake Turkana.

The Kenya Lake System has some of the highest bird diversities in the world occurring in huge congregations. For instance, it supports two of the five species of flamingo in the world (the Lesser and the Greater Flamingo) with occasional congregations representing more than 75% of their total populations. Those two Flamingo species exist elsewhere in Africa but in no other place do they reach the concentrations found within the Kenya Lake System and Lake Natron in Tanzania during the breeding season. The spectacular movement of flamingos between the three lakes is also unique to the Kenya Lake System. The Kenya Lake System is also home to over 100 species of migratory birds and supports globally important populations of 13 species. Comparison can be made with the Djoudj Bird Sanctuary in Senegal, a fragile sanctuary for breeding and migrating birds which is known to support around one million water birds and is one of the main West African sanctuaries for Palearctic migrants. This property is similar to the Kenya Lake System for its high concentrations of migrants, but the Kenya Lake System has much higher concentrations of birds and a greater overall number of bird species.

STAFF

The three sites that constitute the Kenya Lake System have a total staffing level of 222 persons. Lake Nakuru National Park is managed by KWS with 170 permanent rangers, Lake Bogoria National Reserve is managed by two county councils with a warden in charge, who supervises around 40 staff whereas Lake Elementaita National Wildlife Sanctuary does not yet have a locally based staff member and is dependent upon the KWS warden based in Naivasha.

Training for rangers, wardens and officers of KWS and other organisations is available through the KWS Training Institute in Naivasha and the Mweka African College of Wildlife Management in Moshi. There is also the Manyani Field Training School for rangers and officers.

BUDGET

The sources of finance for the conservation of the Kenya Lake System come from the Government of Kenya, donors, NGOs, KWS which manages the Lakes Nakuru and Elementaita and the Koibatek/Baringo County Councils which manage the Lake Bogoria National Reserve. The latter two entities source their finances from tourism revenue collected as entrance fees at the gates, camping and lease fees for lodges particularly within the Lake Nakuru National Park. The amount of funds allocated for Lake Nakuru National Park for the financial year 2007/2008 was approximately Ksh 35,000,000 (Approx. US \$ 450,000) while that of the Lake Bogoria National Reserve Ksh 15,000,000 (US \$ 200,000). The Lake Elementaita has been gazetted in 2010 and therefore no official figures are available from the private sector.

LOCAL ADDRESSES

Kenya Wildlife Service, P.O. Box 40241-00100, Nairobi, Kenya.
Web address: www.kws.go.ke

National Museums of Kenya, P.O. Box 40658-00100, Nairobi, Kenya.
Web address: www.museums.or.ke

Lake Bogoria National Reserve, P.O. Box 64 Marigat, Kenya.

Web address: www.lake-baringo.com/LakeBogoriaKWS.htm

REFERENCES

The principal sources for the above information were the original World Heritage nomination, IUCN's evaluation report and Decision 35 COM 8B.6 of the UNESCO World Heritage Committee.

Olago, D.O., Opere, A. & Barongo, J. (2009) Holocene palaeohydrology, groundwater and climate change in the lake basins of the Central Kenya Rift. *Hydrological Sciences Journal* 54(4): 765-780.

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