IUCN Conservation Outlook Assessment 2017 **(archived)**
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Please note: this is an archived Conservation Outlook Assessment for Kenya Lake System in the Great Rift Valley. To access the most up-to-date Conservation Outlook Assessment for this site, please visit https://www.worldheritageoutlook.iucn.org.

Kenya Lake System in the Great Rift Valley

SITE INFORMATION

Country:
Kenya
Inscribed in: 2011
Criteria:
(vii) (ix) (x)

Site description:
The Kenya Lake System in the Great Rift Valley , a natural property of outstanding beauty, comprises three inter-linked relatively shallow lakes (Lake Bogoria, Lake Nakuru and Lake Elementaita) in the Rift Valley Province of Kenya and covers a total area of 32,034 hectares. The property is home to 13 globally threatened bird species and some of the highest bird diversities in the world. It is the single most important foraging site for the lesser flamingo anywhere, and a major nesting and breeding ground for great white pelicans. The property features sizeable mammal populations, including black rhino, Rothschild's giraffe, greater kudu, lion, cheetah and wild dogs and is valuable for the study of ecological processes of major importance. © UNESCO

SUMMARY

2017 Conservation Outlook

Good with some concerns

The three lakes which make up the Kenya Lake System World Heritage site are subject to pronounced and unpredictable fluctuations in rainfall, water levels and alkalinity – factors which determine the movements of flamingoes and other birds between these lakes, and others beyond. Waterbird counts over the past 20 years suggest that bird populations are stable, but there are uncertainties over the future of the lakes as the catchment areas come under progressively more intensive land use and increasingly large volumes of water are used upstream. Management within the three reserves is well-planned and adequately resourced, but there is uncertainty over the extent to which land degradation, deforestation and upstream water use are being curbed in the lake catchment areas (which are experiencing high rates of population growth and development pressure).

Current state and trend of VALUES

Low Concern
Trend: Stable

The three lakes that make up the Kenya Lakes System World Heritage site are all subject to quite drastic fluctuations in water levels and associated ecological parameters, and it is these episodic fluctuations that drive the unpredictable mass movements of flamingoes and other birds. Bird counts have been carried out since 1991 and suggest overall stability in bird populations, but the annual and seasonal variability in these counts is so pronounced that only major changes in numbers could be detected. The deforestation and degradation of land in each of the lake’s catchment areas, and upstream use of water indicate a trend towards lower average lake levels, which would impact negatively on the scenic values of the lakes and their productivity. Mammal populations are growing quite strongly, especially in Lake Nakuru National Park where carrying capacity limits for some key species are being reached or even exceeded.

Overall THREATS

High Threat

The most important threats relate to the sustained supply of water to the lakes which is threatened by deforestation and degradation of the catchment areas, and by upstream water abstraction. The massive population of lesser flamingoes and other birds depend on a network of at least ten ‘flamingo lakes’, so any significant ecological change in any of the other lakes (in Kenya, Tanzania and Ethiopia) could have a devastating impact on the entire system. Water pollution is a significant threat, and there are minor issues related to tourism pressures, small-scale mineral extraction and invasive alien species. Potential future threats may arise from geothermal energy development, climate change, infrastructure development projects and oil exploration activities.

Overall PROTECTION and MANAGEMENT

Mostly Effective

There is little information on the effectiveness of current management in addressing threats to the property, but it was considered adequate at the time the nomination was evaluated in 2010 (IUCN, 2011). Management within the three reserves is well-planned and adequately resourced, but there is uncertainty over the extent to which land degradation, deforestation and upstream water use are being curbed in the lake catchment areas (which are experiencing high rates of population growth and development pressures).

FULL ASSESSMENT

Description of values

Values

World Heritage values

► Outstanding natural beauty

Criterion:(vii)

The three lakes, each with its own characteristic features, are areas of outstanding natural beauty. Flanked by the towering walls of the Great Rift escarpments, they nestle in the valley floor, their open waters set against the thorn-tree savannas, forests and marshes that surround them. The landscape is punctuated by volcanic cones, hot springs and gushing geysers. Massive congregations of flamingos and other birds and a diverse array of large mammals inhabit the area, creating an unmatched experience of raw nature, truly one of the great wonders of the natural world (SOUV, 2011).

► Exceptional geo-morphological features of the Great Rift Valley

Criterion:(viii)

Africa’s Great Rift Valley is one of the world’s most distinctive geo-morphological features, cutting through the continent from the Red Sea to southern Mozambique along two parallel fault lines. The Kenya Lake System includes a representative sample of some of its main geo-morphological features, including the three alkaline lakes, parts of the rift escarpment, and a range of volcanic features and associated geothermal manifestations (geysers, fumeroles and hot springs) (SOUV, 2011).

► Extraordinary soda lake ecosystem processes and trophic dynamics

Criterion:(ix)

The three lakes are generally shallow, alkaline lakes with relatively small catchments and no surface outlets. Straddling the equator at altitudes of around 1,500m they are subject to high rates of evaporation and marked fluctuations in water levels. The alkaline lake waters support a prolific growth of green algae (Spirulina platensis), the main food of the itinerant Rift Valley population of lesser flamingoes (IUCN, 2011). The alkaline Rift Valley lakes are among the world's most productive ecosystems and, although these harsh environments are relatively species-poor, they feed extraordinary numbers of birds. They provide important insights into our understanding of trophic dynamics and ecosystem processes.

► Exceptionally diverse bird fauna, including rare and endangered species

Criterion:(vii)

All three lakes are recognized as Important Bird Areas (Birdlife, 2017a,b,c) and listed as Ramsar Sites, on account of the numbers and diversity of birds, including many rare and endangered species. Many diverse bird species have been recorded in these lakes, with about 480 species recorded at Lake Nakuru, 450 species at Lake Elementeita and 370 species at Lake Bogoria (IUCN, 2011). Survival of some of these birds are threatened both globally (13 species) and regionally (8 species) (UNEP-WCMC, 2012). Lake Elementeita supports the region's main breeding colony of Great White Pelicans (8,000 pairs) and there are globally important populations of Black-necked Grebe, African Spoonbill, Avocet, Little Grebe, Yellow-billed Stork, Black-winged Stilt, Grey-headed Gull and Gull-billed Tern (IUCN, 2011)

► World's largest congregations of lesser flamingoes

Criterion:(x)

Congregations of more than 1.5 million Lesser Flamingos have been counted at Lakes Nakuru and Bogoria, as they move between the ten 'Flamingo Lakes' of East Africa. Such congregations are globally unique and constitute one of the world's most spectacular wildlife phenomena (SOUV, 2011)

► Crucial flyway for bird migration

Criterion:(x)

The Great Rift Valley is of global significance as a migratory corridor for 500 million birds of 350 species which pass through the area en route between their summer breeding grounds in Eurasia and over-wintering sites in southern Africa (IUCN, 2011). The lakes serve as over-wintering sites for large numbers of Palearctic waders as well as being an important stop-over for birds on passage (BirdLife, 2017a)

► **Diverse assemblage of mammals, including rare and endangered species**
Criterion:(x)

The lake shore habitats, particularly those of Lake Nakuru National Park, support a diverse assemblage of large mammals, including important populations of endangered species such as black (and southern white) rhino, Rothschild's giraffe, lion, cheetah and leopard (KWS, 2003)

Other important biodiversity values

►

The site is also the home of the white Rhino, Rothschild Giraffe, Lions, Leopards apart from the many birds. It is also part of the route of the migratory birds from Europe to South Africa which using it as a resting spot (IUCN 2011. Kenya Lakes System. New Evaluation)

Assessment information

Threats

Current Threats
High Threat

The most significant current threats are related to developments outside the property affecting the sustained inflow of water to the lakes. All three

catchments have witnessed massive deforestation (Mau Forest, especially), settlement of people in the catchments and thus intensification of land use over the past few decades. Upstream abstraction of water for irrigation as well as deforestation and over-grazing are affecting the quality and quantity of the inflowing waters and may be affecting long-term lake levels, even though the lake levels are presently high. This will affect the ecology of the lakes and threaten the survival of the flamingos especially.

► Dams/ Water Management or Use

Very High Threat
Inside site, widespread(15-50%)
Outside site

Small irrigation dams have been constructed on rivers flowing into the lakes and river flows have reduced markedly (IUCN , 2012). At Lake Elementeita there is currently little water flowing into the lake because ‘farmers use most of the water for irrigation upstream (GLECA, 2010). Given the rate of population increase and intensification of land use in the area, this trend seems likely to accelerate, unless deliberate steps are taken to curb water abstraction.

► Other Ecosystem Modifications

High Threat

The three lakes are quite small (40 km2, 38 km2 and 25km2 for Lakes Nakuru, Bogoria and Elementeita respectively) and although the property includes surrounding lakeshore habitats (totaling 217km2), the three areas are isolated from one another. The primary functional linkages between them are associated with their shared role in supporting the lesser flamingo and other bird populations. The terrestrial components of the three lakes are not large enough to support viable populations of many species that would naturally occur in the area.

► Invasive Non-Native/ Alien Species

Data Deficient
Inside site, scattered(5-15%)
Outside site

There has been concern by the Lake Nakuru management of the growth of

Solanum incanum in the grazing areas for the large mammals and also the occurrence of invasive alien speciesin Lake Bogoria (LBNR Committee, 2007). Though this may affect the integrity of the sites, it is noteworthy that some of these new species may be beneficial as observed with the introduction of the tilapine fish Oreochromis alcalicus grahami in Lake Nakuru in 1962 that changed the ecology and trophic dynamics of the lake. Prior to this introduction there were no fish in Lake Nakuru, and its introduction now supports a diversity of piscivorous birds including the pelicans(KWS, 2003).

► Housing/ Urban Areas

High Threat
Outside site

There is increased Housing developments both in part of Ututu Conservancy to the South of Lake Elementaita, as well as in the Eastern side within a critical buffer zone without any Environmental Impact Assessment having been undertaken. The Environmental Restoration Order given in December 2012 by the National Environment Management Authority to the developer seem to have been totally ignored. (State Party report, 2014; SOC report 2014).

► Other

Data Deficient
Outside site

The lesser flamingoes and other birds move great distances between the ten ‘flamingo lakes’ of the eastern Rift, and beyond, so are vulnerable to ecological changes or pollution of any of the other lakes. There is already a major soda factory on Lake Magadi, and a similar development has been mooted for Lake Natron (which serves, critically, as the main breeding site for lesser flamingoes).

► Livestock Farming / Grazing

Low Threat
Outside site

There are concerns about livestock grazing at Lakes Bogoria and Elementeita, where cattle and goats graze along the lakeshore habitats, causing increased rates of erosion, run-off and siltation (BirdLife, 2017c;

pers. obs.; LBNR Committee, 2007)

► Erosion and Siltation/ Deposition

High Threat
Inside site, scattered(5-15%)
Outside site

The catchment areas of the three lakes are relatively small (930 km2, 1,800 km2 and 630 km2 for Lakes Bogoria, Nakuru and Elementeita respectively), and subject to rapid deforestation, over-grazing and expansion of agriculture (IUCN, 2011). Forest cover in Lake Nakuru's catchment was reduced from 47% in 1970 to just 26% in 1986 (IUCN, 2011), and nearly half the catchment is now under cultivation (BirdLife, 2017a). These land-use changes are resulting in increased soil erosion, run-off and siltation, especially Lake Nakuru.

► Hyper-Abundant Species

Low Threat
Inside site, scattered(5-15%)

Lake Nakuru National Park is surrounded by a 74-km electric fence that prevents animal dispersal, and has allowed large mammal populations to increase to a level where serious ecological imbalances are becoming apparent. The number of buffaloes, gazelles, Rhinos and other mammals have increased very much in the park. The number of giraffes have also increased to the extent that they were beginning to destroy the Acacia woodland by debarking the trees excessively (BirdLife, 2017a).

► Tourism/ Recreation Areas

Low Threat
Inside site, extent of threat not known
Outside site

Lake Nakuru National Park attracts 300,000 visitors annually, and this is creating some pressures related to off-road driving, over-crowding and waste management. Lake Nakuru is one of Kenya's most popular tourist destinations, and management of tourism impacts is generally good (IUCN, 2011). At present tourism exerts little pressure on either of the other two lakes and is a force for their conservation (BirdLife, 2017c)

► Mining/ Quarrying

Very Low Threat
Inside site, extent of threat not known
Outside site

Small-scale extraction of soda and sand on the eastern shores of Lake Elementeita is not a major threat, but any expansion of these operations could have a significant impact on the site (BirdLife, 2017c)

► Water Pollution

High Threat
Inside site, scattered(5-15%)
Outside site

Pollution of the lakes' water is a problem, especially affecting inflows from the growing agricultural and industrial town of Nakuru (population 500,000). Though the town has wastewater treatment plant, the treatment of wastewater entering the lake from the town has been inadequate (BirdLife, 2017a). Alot of runoff water also find its way into the lake bringing in alot of solid waste and nutrients (IUCN, 2011). In the wider catchments, intensification of agriculture and increased use of fertilizers may be increasing the nutrient load of inflowing waters and could lead to eutrophication. Further challenge is the siltation arising from the soil being washed into the lake from the deforested catchment areas.

Potential Threats

Data Deficient

Four potential threats are (1) geothermal energy development, (2) climate change, (3) infrastructure development around the lakes and (4) oil and gas exploration activities. The ongoing developments of the geothermal plants in Menengai crater and at the Kabarak valley within the region of the Kenya Lake Systems, accompanied with the construction of high voltage transmission power lines is another source of danger for the migratory birds. Climate change phenomenon is already manifesting its effects through the high water levels in the lakes and the changed ecology of the lakes, especially in L. Nakuru that has resulted into the loss of the flamingo population in the lake. There are lots of infrastructure development in the region, including major roads whose

potential impact is unknown and therefore deserve recognition.

► Storms/Flooding, Temperature extremes

Low Threat
Inside site, extent of threat not known
Outside site

Whilst the property has demonstrated extreme resilience to fluctuations in climate and water levels, the possible future impacts of climate change are unpredictable (IUCN, 2012). This is especially evident with the massive flooding in Lake Nakuru in the last four years that has resulted in changes in its ecology with the emigration of flamingos from the lake to other water bodies. The flooding has also reduced the grazing area for the mammals, destruction of the yellow acacia, (Acacia xanthophloea) especially near the Park entrance (personal observation, 2017). It is not certain, the direction that this threat may take, but certainly it is contributing to changes in the ecology of Lake Natron. Flooding has also occurred in the other two lakes in the site in the last four years.

► Commercial/ Industrial Areas

Data Deficient
Outside site

The lakes lie along the main ‘transport and infrastructure corridor’ between the port of Mombasa and countries to the north-west (Uganda, Rwanda, Sudan and DRC). As this corridor develops further, and branches to the north and south are developed, it is likely to further disrupt landscape connectivity, particularly for large mammals. Further, there has been massive development of geothermal power generation within these lakes region at Menengai (5Kms to the north of L. Nakuru, lying between L. Bogoria and Nakuru) with the construction of high voltage transmission powerlines. These are likely to affect, especially kill large number of birds migrating along this corridor, especially the nomardic flamingos that do move in large numbers at night between the lakes.

► Oil/ Gas exploration/development

Data Deficient

Outside site

There have been major interest in oil and gas exploration especially around L. Bogoria region, but this has not been formally sanctioned. The discovery of oil by Tullow Company in the Turkana basin has stimulated the need for further exploration of this resource along the Rift Valley (Tullow Oil Concession Map, 2011)

► Renewable Energy

High Threat
Inside site, scattered(5-15%)
Outside site

There are plans for the development of geothermal energy in the Bogoria-Silali block, including Lake Bogoria, with eight 100 MW power plants projected to be completed by 2017 (SOC report, 2014). Some exploratory work is taking place around Kabarak region, while in Menengai crater, the development of a geothermal plant is taking place. These points lie between L. Nakuru and L. Bogoria within the floor of the Rift Valley. Though outside the boundaries of the World Heritage property, they are on the flight path of the migratory birds between L. Nakuru and Bogoria. These developments may therefore affect the migration of these birds. The development of these plants is accompanied by the construction of high voltage powerlines, crisscrossing the Heritage site and thus likely to affect the migratory path of the birds which are likely to be electrocuted as they fly through.

► Mining/ Quarrying

High Threat
Outside site

Lake Natron is the main breeding site for the Lesser Flamingos found in all the ten African Rift Valley lakes. The Government of Tanzania had proposed to put up Soda Ash plant, an activity that has high potential of destroying the breeding sites for these birds. Though the plan has been shelved as at now, it is not certain that it may be revisited again in the future.

It is noted however that the States Parties of Kenya and Tanzania are in agreement on the need to protect and conserve this site, with even a committee proposed to be formed to coordinate the protection of the site. However, there is no evidence that the committee was formed nor that it is

working.

Protection and management

Assessing Protection and Management

► Relationships with local people

Mostly Effective

Local stakeholders are involved at a number of levels, with broad representation on the management committees of each site (Kenya, 2010). The stakeholders for the lakes Bogoria and Elmentaita are identified, however their involvement in site management is minimal. For Lake Bogoria, the Endorois who are the indigenous people there have their rights to the lake recognised and their views are communicated to the management through the Endorois Welfare Committee (EWC). They are allowed to settle within the game reserve. However, their traditional management practices and the involvement in natural and cultural resource management and decision-making appear not to be fostered appropriately. However, there is a programme of outreach, communication and information exchange with them and the lake management and other key stakeholders which helps to facilitate effective conservation of the site’s values (Kenya, 2016). The needs of stakeholders in L. Bogoria, especially the Endorois community is being addressed within the management system for the site through sharing of resources generated by the park and offering scholarships to the needy (Endorois children). Annually, the community gets 10% of the funds collected from the park as community grant to suppor their livelihoods.

Further, there is fostering of local self-employment, especially for L. Bogoria through making of handicrafts sold to the tourists. Generally, the impacts of site management on the community is positive (Kenya, 2015). Lake Nakuru is well managed by the Kenya Wildlife Service who have also been given mandate to take care of Lake Elmentaita (World Heritage Committee, 2015). Wildlife-human conflict around Lake Nakuru National Park (LNNP) has been minimized through the erection of a game-proof electric fence, which has gone a long way towards resolving past conflicts and improving relationships with local people. To further enhance support for the park, LNNP supports

social and enterprise projects in neighbouring communities (KWS, 2002) through the initiative called the cooperate social responsibility. This support, though started over fifteen years back is still being given to the communities around the park.

► Legal framework

Mostly Effective

Legal framework for the site is generally effective in maintaining its values. There are no land tenure issues that could be an impediment to management for L.Nakuru, but for L. Bogoria, where the Endorois were given rights to the land around the lake even though the lake is controlled by the Baringo County Government (Kenya, 2016). In L. Elmentaita, surrounding land owned by communities and Soysambu conservancy. Lake Nakuru is legally protected as a National Park through the National Legislative laws Lake Elmentaita is legally placed under the management of the Kenya Wildlife Services for its protection (World Heritage Committee 2014). Each of the three component sites is wholly owned by the Government of Kenya and managed according to different legal and institutional arrangements (Kenya, 2010). Lake Nakuru is a National Park, managed by Kenya Wildlife Service (KWS), while Lake Bogoria is designated as a National Reserve and managed by the Baringo County Government. Lake Elementeita is a National Wildlife Sanctuary, managed by KWS, with its surrounding lands (outside the property) under private ownership and managed as a Wildlife Conservancy. The site also benefits other pieces of legislation that serve to strengthen the provisions for catchment protection, including the Environmental Management and Co-ordination Act (1999), Water Act (2002) and Forest Act (2005)

► Enforcement

Some Concern

There is good enforcement of the management protocol in Lakes Bogoria and Nakuru by the respective enforcement authorities. In L. Elmentaita, the enforcement is not strong enough and this has resulted into uncontrolled activities around some parts of the lake.

► Integration into regional and national planning systems

Some Concern

Though there are no formal mechanisms for regional co-ordination between the Kenyan, Tanzanian and Ethiopian authorities, the normadic and migratory life of the lesser flamingos, and the location of their breeding ground in L. Natron, creates a strong need for cooperation between these state parties (Tanzania National Single Species Action Plan 2010-2020 for the Lesser Flamingo). Kenya and Tanzania governments have shown desire to form joint committee for the protection of Lake Natron and management of these birds migratory route. However, this idea has not been brought to fruition (Kenya, 2015). In Kenya, there is a National Steering Committee for the Kenya Lakes System, chaired by the Director of KWS that supervises the three site management committees. It is expected to be meeting three times a year (Kenya, 2010). However, there was no evidence of these meetings taking place as proposed.

► Management system

Mostly Effective

Each site has a management plan which describes the management and monitoring procedures to be carried out on a catchment-wide basis by a wide range of stakeholders. In each case, there is a multi-stakeholder committee which meets on a regular basis to co-ordinate management. Three separate plans cover the periods 2002-12, 2007-12 and 2010-20 for LNNP (KWS, 2002), LBNR (LBNR Committee, 2007) and the Greater Lake Elementeita Conservation Area (GLECA, 2010) respectively. In each case the plan area is zoned for particular uses and management interventions, with the GLECA area (for example) divided into a Core Zone (coinciding with the area designated as World Heritage) covering the lake and its islands and shoreline, with adjacent areas designated as Buffer, Riverine and Controlled Development Zones (GLECA, 2010). At Lake Bogoria, the terrestrial part of the LBNR is divided between designated zones for ‘grazing’, ‘wilderness’ and ‘natural preservation areas’ (LBNR Committee, 2007).

► Management effectiveness

Mostly Effective

Management of the site is generally effective, especially for L. Nakuru NP and L. Bogoria National Game Reserve. Management within the boundaries of the property is well-resourced and sufficient to satisfy the requirements set out in the Operational Guidelines (IUCN, 2011). There are qualified staff employed to manage both L. Nakuru NP and L. Bogoria NGR while L. Elmentaita is managed by the staff from L. Nakuru NP and the Soysambu Conservancy. The staff have the necessary management infrastructure, vehicles and equipment. Lake Elementeita management is however rather week since the staff in Nakuru are far away from the lake (50 Km) hence the lake depends to a large extent on the involvement of conservation-oriented landowners from the surrounding ‘buffer zone’ (IUCN, 2011).

► Implementation of Committee decisions and recommendations

Data Deficient

The property was listed in 2011 at which time the SP was encouraged to (1) strengthen the legal status and on-the-ground management of Lake Elementeita, (2) enhance the functional linkages between the three components of the site through the establishment of wildlife corridors and (3) curb deforestation in the catchment areas especially the Mau escarpment that serves Lake Nakuru (UNESCO, 2011). Though a number of meetings have been held by the management and stakeholders focussed on deliberating on the best ways to conserve the site with a number of recommendations made, there is no much information to show the extent of implementation of these recommendations (SOC - Report 2015, State Party Kenya).

► Boundaries

Some Concern

Two of the three lakes lie within protected areas that include significant areas of terrestrial habitats, serving as ‘buffer zones’ for the water bodies they surround. The third (Lake Elementeita) borders onto the privately-owned Soysambu Wildlife Conservancy, which has been designated as a Buffer Zone (outside the World Heritage property). Each site is demarcated on the ground with concrete beacons or fences, and Lake Nakuru is completely enclosed by a 74-km electric game-proof fence (Birdlife, 2012a). The proposal to restore landscape connectivity and ecological resilience by establishing a wildlife

corridor between Lake Elementeita and Lake Nakuru National Park though agreed on in principle (IUCN, 2011) has not been implemented however. Such a connectivity would be very helpful to the L. Nakuru NP since it would relieve it from overgrazing due to the large number of large mammals in the park.

► Sustainable finance

Mostly Effective

Management of Lake Nakuru and L. Elmentaita is financed through budget allocations made by KWS while for Lake Bogoria NGR is done through the Baringo County Government. In both cases, the funds are generated from gate entry fees and other tourism-related revenues (lodge concession fees, camping and guide fees etc) that are generated across the national parks system, pooled and allocated according to perceived needs and priorities (KWS, 2002). Both L. Nakuru NP and L. Bogoria NGR are among the most popular wildlife destinations in the country that generate substantial profit (KWS, 2002).

► Staff training and development

Mostly Effective

The staff maning these facilities are generally well trained, with the Kenya Wildlife Services which is managing the Lake Nakuru National Park and Lake Elmentaita hiring well educated staff from the Universities and colleges and also further offering them training at their staff training colleges in Naivasha and a Law Enforcement Academy located in Tsavo West National Park, at Manyani (UNEP-WCMC, 2012). The staff manning L. Bogoria are also generally well trained. The number of staff manning these facilities is generally adequate with over 100 being located in LNNP, and they are also in-charge of L. Elmentaita while L. Bogoria has a staff of about 30 people (IUCN, 2011).

► Sustainable use

Some Concern

The principal form of consumptive resource use within the property is livestock grazing, which affects the shores of Lakes Elementeita and Bogoria. There are no clearly defined strategies to regulate grazing within the

reserves, which has been practiced since before these two areas became protected areas (LBNR Committee, 2007; GLECA, 2010). Though legally, only a small portion (<10%) of the LBNR is designated as a grazing area, in practice grazing seems to take place all over the park (LBNR Committee, 2007; pers.obs.)

► Education and interpretation programs

Mostly Effective

There are environmental education centres, used extensively by local schools, at LNNP and LBNR (UNEP-WCMC, 2012). LNNP operates an ambitious schools outreach programme which involves hosting school parties at the park and disseminating environmental education materials (KWS, 2002).

► Tourism and visitation management

Mostly Effective

The Kenya Lakes System attracts a large number of national and international visitors, averaging about 400,000 annually (2005-7; Kenya, 2010), of whom about 155,000 (40%) are foreign non-residents. Most of these visitors go to LNNP, which has three high-end tourist lodges, nine campsites, two hostels, an airstrip, an education centre and other tourist facilities (UNEP-WCMC, 2012). At the other two lakes, most tourist facilities are located outside the reserves.

► Monitoring

Mostly Effective

Waterbird counts have been conducted at all three sites (and other Kenyan wetlands) twice each year since 1991 (UNEP-WCMC, 2012). There is a wide-ranging monitoring programme at LNNP which includes automatic flow detectors on all the inflowing rivers, as well as regular monitoring of water quality and weather. Mammal counts and vegetation transects are also conducted on a regular basis to determine whether carrying capacity limits are being reached (KWS, 2002).

► Research

Data Deficient

The LNNP management plan proposes the establishment of a research committee to co-ordinate research programmes throughout the park's catchment area (KWS, 2002). Nine broad research topics are identified for priority attention including important issues such as hydrology, park carrying capacity, flamingo mortality etc (KWS, 2002). The Soysambu Wildlife Conservancy (part of the buffer zone around Lake Elementeita) plans to establish a research centre within the conservancy (UNEP-WCMC, 2012).

Overall assessment of protection and management

Mostly Effective

There is little information on the effectiveness of current management in addressing threats to the property, but it was considered adequate at the time the nomination was evaluated in 2010 (IUCN, 2011). Management within the three reserves is well-planned and adequately resourced, but there is uncertainty over the extent to which land degradation, deforestation and upstream water use are being curbed in the lake catchment areas (which are experiencing high rates of population growth and development pressures).

► Assessment of the effectiveness of protection and management in addressing threats outside the site

Data Deficient

The management plans for each site provide for integrated catchment-wide strategies for dealing with issues that affect the quality and quantity of water flowing into the lakes, but there is little information on the effectiveness of implementing these strategies. While there have been reported improvements in the management of sewage and reduction of pollution from Nakuru municipality (IUCN, 2011), there is reported to be little water flowing into Lake Elmenteita from its three main rivers 'because farmers use most of the water for irrigation upstream' (GLECA, 2010).

► Best practice examples

Involvement of all stakeholders in the management decision is important for sustainable management of the site

State and trend of values

Assessing the current state and trend of values

World Heritage values

► Outstanding natural beauty

Low Concern
Trend:Deteriorating

The natural beauty of the lakes is protected within the context of the surrounding shoreline habitats by national park and reserve status at Lakes Nakuru and Bogoria. The shoreline habitats around Lake Elementeita are less secure, as they lie within private property (designated as Wildlife Conservancy and recognized as a Buffer Zone outside the World Heritage property; IUCN, 2011) The riparian area to the South and East of Lake Elementaita has already been impacted by uncontrolled urban development. The aesthetic qualities of the lake landscapes vary according to natural fluctuations in the lake levels (which can leave vast expanses of unattractive exposed mudflats during drier periods), which may be exacerbated by deforestation and degradation of the catchment areas

► Exceptional geo-morphological features of the Great Rift Valley

Good
Trend:Stable

The geo-morphological features of the Rift Valley can be considered secure generally since the zone is not very active volcanically inspite of the geothermal vents presence.

► Extraordinary soda lake ecosystem processes and trophic dynamics

Low Concern
Trend:Data Deficient

The ecological processes characteristic of the alkaline lakes are likely to be responding to changes in the quality and quantity of the inflowing waters. Deforestation, over-grazing, soil erosion and water abstraction in the

catchment areas are probably having an impact, but there are presently no supporting data to confirm this. The trophic dynamics at Lake Nakuru has been significantly altered following the introduction of a unique cichlid fish from Lake Magadi, (another of the alkaline 'flamingo lakes' of Kenya). The change in the water level in the last four years, has siginificantly changed the alkalinity and therefore the ecology of Lake Nakuru and Lake Elmentaita, but minimally L. Bogoria. The dilution effect of the high water level is the cause of these ecological changes that make the lakes lowr their soda lake ecosystem characteristics.

► Exceptionally diverse bird fauna, including rare and endangered species

Data Deficient
Trend:Data Deficient

Though records show an overall trend of the waterbirds having increased considerably in numbers and diversity since the introduction of fish to Lake Nakuru in 1961/2, the population of the flamingos have been fluctuating strongly in the site (Birdlife, 2012a). Subsequently there was a trough in waterbird numbers (other than flamingoes) in the mid-90s attributed to major changes in the food chain associated with a period of low lake levels (Birdlife, 2012a), but they subsequently recovered when the lake level rose again. It seems likely that future demands for water abstraction will cause water levels to drop more generally, affecting waterbird populations more permanently. Environmental changes that influence water levels in the lakes is likely to have major impact on the number and diversity of these birds.

► World's largest congregations of lesser flamingoes

Low Concern
Trend:Deteriorating

Lesser flamingo numbers on each of the lakes fluctuate drastically and unpredictably. January waterfowl counts conducted annually since 1991 indicate that the Kenyan population of lesser flamingoes has fluctuated between 280,000 and 1,450,000 birds between 1992 and 2007 (UNEP-WCMC, 2012), but no clear trend in population. Since 2014, the high water level in Lake Nakuru has changed ecology of this lake and flamingos flew away due to lack of Arthrospira fusiformis (Spirulina platensis) their main food which could no longer thrive in biomass. The lake has not recovered upto now. Also,

Lake Elmentaita and L. Bogoria have had low counts of the lesser flamingos around this time. Though the changes in water level had been suggested to follow a ten year cycle, due to the climate change phenomenon, it may be hard to predict the direction which the water level fluctuations may take in future.

▶ Crucial flyway for bird migration

Low Concern
Trend:Deteriorating

The status and trends in waterbird numbers at key wetlands in Kenya have been monitored since 1991 and indicate stable overall numbers of birds recorded (UNEP-WCMC, 2012), with seasonal peaks during March and September (while birds are on passage). However, the construction of a number of high voltage power line transmissions in this region, especially between L. Nakuru and Bogoria is likely affect migratory birds since these lines cut across the flyway for these birds.

▶ Diverse assemblage of mammals, including rare and endangered species

Good
Trend:Improving

The population of mammals, especially in Lake Nakuru NP have always been periodically estimated by the KWS scientists. However, this has not been done effectively for the other two water bodies, the Lake Elementeita and Lake Bogoria National Reserve (UNEP-WCMC, 2012). In L. Nakuru NP, there has been a steady increase in numbers of most prominent species (IUCN, 2011) with some species populations even exceeding the area’s carrying capacity and therefore they had to be transferred to other parks since the high number may cause bitat damage (Birdlife, 2012a).

Summary of the Values

▶ Assessment of the current state and trend of World Heritage values

Low Concern

Trend: Stable

The three lakes that make up the Kenya Lakes System World Heritage site are all subject to quite drastic fluctuations in water levels and associated ecological parameters, and it is these episodic fluctuations that drive the unpredictable mass movements of flamingoes and other birds. Bird counts have been carried out since 1991 and suggest overall stability in bird populations, but the annual and seasonal variability in these counts is so pronounced that only major changes in numbers could be detected. The deforestation and degradation of land in each of the lake's catchment areas, and upstream use of water indicate a trend towards lower average lake levels, which would impact negatively on the scenic values of the lakes and their productivity. Mammal populations are growing quite strongly, especially in Lake Nakuru National Park where carrying capacity limits for some key species are being reached or even exceeded.

Additional information

Benefits

Understanding Benefits

► **History and tradition, Wilderness and iconic features, Sacred natural sites or landscapes, Cultural identity and sense of belonging**

Lake Bogoria is culturally connected to the Endorois community who associate it with their origin.
Hot springs in Lake Bogoria have got healing value and the Endorois and other communities are known to visit it for this spa-like benefit from the hotsprings.

Due to increase in water level in the last four years, the hotsprings were flooded and no more hot steam was coming out, hence affecting this important cultural value.
The visitors to the sites were known to litter the site with plastic bottles and bags thus polluting the habitat.

The climate change impact is unpredictable, but the effect of the high water level in the last four years has caused tremendous changes in the lake especially by flooding the hotspring sites and minimally affect the water quality and the ecology of the lake, with few lesser flamingos being available in the lake.

► **Carbon sequestration, Water provision (importance for water quantity and quality), Pollination**

The site shows very high primary productivity through the dominant blue-green algae Arthrospira fusiformis through which carbon is withdrawn from the atmosphere/water.
Through the springs, water is made available, especially in L. Bogoria that is used by the livestock.
In L. Bogoria, bee keeping is another major activity and the vegetation in the protected area, especially the Acacia trees aid in keeping the bees and contributing to the beekeeping venture.

Generally, these factors have minimal effect on the environmental services offered.

► **Tourism-related income, Provision of jobs**

Tourism opportunities offer income through the neighbouring communities selling their merchandise to the tourists. It also assists in provision of jobs such as tour guides to the community as well as in the management of the parks. This is especially so for Lake Bogoria where the people manning the park are generally drawn from the local community.

The factors have minimal effect to the benefit type associated with the site.

► **Collection of medicinal resources for local use, Outdoor recreation and tourism, Natural beauty and scenery**

In L. Bogoria, the Endorois community collect herbal medicine from the vegetation within the park. The hotspring and the mud from the lake is also used for medicinal purposes especially in the treatment of skin diseases. Hotsprings are especially used for outdoor recreation and it is one of the major tourist attraction in the lake.

There is no significant data to establish how these factors may be affecting the stated benefit type.

Summary of benefits

The site has alot of benefits that both the local and international communities derive from it. This therefore calls for proper management so that humanity may sustainably benefit even in the future.

Projects

Compilation of active conservation projects

№	Organization/ individuals	Project duration	Brief description of Active Projects
1	Kenya Wildlife Service - Soysambu Conservancy	From: 2010 To: 2016	Lake Elementeita Wildlife Sanctuary Re-survey and Boundary Variation Project Phase 1
2	Kenya Wildlife Service	From: 2009 To: 2018	Lake Nakuru National Park (water monitoring etc)
3	Ututu Wildlife Conservation Trust		Lake Elementeita Buffer Zone
4	National Museums of Kenya/Kenya Wildlife Service/Nature Kenya		Annual Water fowl count – every January and July
5	Kenya Forest Service		Rehabilitation of Mau Forest

Compilation of potential site needs

№	Site need title	Brief description of potential site needs	Support needed for following years

1	Ecological Monitoring	Ecological monitoring of all the three lakes is necessary due to the changing climatic conditions that is causing changes in the physical, chemical and biological characteristics of the lakes. Changes in the physio-chemical characteristics may render the OUV of areas of large population of Lesser flamingos be lost since the lakes will not be able to supply the flamingo food abundantly to support the large population.	From: 2017 To: 2020

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