

## BIODIVERSITY ACTION DAY IN NAIVASHA

WWF in collaboration with the promotion of private sector development in Agriculture organized a local Biodiversity Action Day in Naivasha (Kihoto grounds) on 15<sup>th</sup> May 2010 to celebrate the International Biodiversity Day (IBD) which takes place every year on 22<sup>nd</sup> May.

The aim of the Biodiversity Action Day was to contribute to this year's theme "Biodiversity & Development" by raising awareness about the significance of biodiversity for the development of Lake Naivasha landscape. The landscape went through rough patches last year owing to the drought which was occasioned by global warming and inappropriate land use practices in the upper catchment. The drought led to the deaths of tens of thousands of livestock and wildlife, thousands of acreages of forests were lost due to fires. Lake Naivasha receded to unprecedented levels in recent times severely affecting local fisheries and horticulture- the bedrock of the region's economy. This brought to fore the need to protect the existing biodiversity if human development was to be sustained.

The Action Day in Naivasha was not only to create awareness but inform about benefits of biodiversity and ecosystems, but also to demonstrate opportunities of how to solve the dilemma between development and sustainability. For this purpose, WWF and PSDA organized the Action Day at Kihoto Grounds on the fringes of Lake Naivasha. Other partners who contributed to the success of the event included Oserian Development Company, Homegrown, Lake Naivasha Growers Group(LNGG), Panda Flowers, Municipal Council of Naivasha, Naivasha District Commissioner's office, Naivasha Watershed Conservation Project NAWACOP, Elsamere, Kenya Wildlife Service( KWS), Naivasha Partners for Change, KENGEN, Nakuru Wildlife



**Participants at Naivasha Biodiversity Action Day march to Kihoto Grounds for the celebrations.**



**Mrs. Alice Kaudia Environment Secretary presenting trophies to the best school in interpreting the IBD theme**

Conservancy( NWC),Lake Naivasha Riparian Association( LNRA), Naivash District Schools Patron Environmental Network(NADSPEN), National Environmental Authority(NEMA ) and Naivasha Partners for Change.

Over 400 people attended the event which was presided over by Alice Kaudia- the Environment Secretary in the Ministry of Environment & Mineral Resources.Following powerful messages on the importance of biodiversity the Guest of Honour and Environmental Groups the Environment Secretary led the participants to a tree planting exercise at a nearby school.

Prior to the event, a group of 10 students selected from various schools in the landscape undertook a 4 days analysis of the landscapes ecosystem and how it contributes to human development.

**Group activities to create awareness and exchange experiences were conducted:**

### ***Group 1: Effects of Human Activities on Biodiversity in the Upper Catchment of L. Naivasha***

This study was conducted to establish the impacts of human activities on biodiversity of the Upper Catchment of Lake Naivasha. Decline in species diversity was noted. There was high BioDiversity loss due to human influence, land ownership and lack of regulation on land use, more diversity occurred on the remaining natural habitats as compared to the human created systems.

Environment education should be enhanced to promote biodiversity conservation. Programs that will promote recovery & conservation of biodiversity should be initiated.

#### ***Animal & Bird Species:***

At the lake edge, the birds that were identified utilizing the lake edge vegetation included: Egyptian ducks, king fishers, cormorants, sea gulls, fish eagles, swifts. Hippos were also spotted. Within the riparian zone, the main wild animals were: buffalos, zebras, giraffes, gazelles, vervet

monkeys, antelopes. Within the grassland, shrubs and bushes zone, only zebras, antelopes, dik dik, hares, squirrels were encountered.

### **Plant Species distribution along the study transect:**

At the Plateau Zone, the bushes included: *leonotis nephtifolia* & *sloanum incanum*. In Kinangop Plateau, the main tree species in this forest block included indigenous species such as dobea and ceda.

The stability of the ecological zones was affected by human activities such as agriculture, livestock farming, settlement & quarrying. Areas with human activities exotic plants species occurred. The dominant species observed were: the black wattle tree, croton, graveria, eucalyptus & Cyprus. Biodiversity was found to be used for food, medical use, timber, firewood and aesthetic value.

## ***Group 2 Activities- The Shrinking Home***

### **Study report of the Lake Naivasha Ecosystem Biodiversity:**

Lake Naivasha is a Ramsar site with freshwater rich in biodiversity. The lake is situated on a high altitude of about 1890m above sea level. It has 3 inlets: Rivers Malewa, Karati and Gilgil and an underground outlet. The lake covers approximately an area of 145 square kilometers with a depth of 8-9m. It's a habitat to various plants & animals also support small & large scale economic activities, chief of which is horticulture.

The lake is also a famous bird watching paradise with over 350 different bird species. Apart from the main lake, there are other 3 more chemically distinct basins within the ecosystem, slightly alkaline Olioden lake, deeper fresh Crater Lake & Crescent Island lagoon, which formally was one lake as recent as 1982. Due to climate change & increase in human population leading to increased activities such as developments.



**Photo showing interruption of natural ecosystems by human settlement**



**Human development within the remnant forest blocks in Kinangop Plateau**

The aim of this group was to identify & recognize the importance of plant & animal species in different eco-zones, within the lake ecosystem.

### **Discussion and Conclusion**

1. There was low wild animal diversity along the transect from the riparian zone to the plateau. This is mainly because of the invasion by human beings and land privatization. The remnant forests blocks were within private properties.
2. Natural ecological zones have shrunk in size due to land conversion from natural vegetation to agriculture and settlement.

This has resulted to modification of the indigenous species to the exotic species.

3. There is increasing settlement and development in the upper catchment. This was noted from the quarrying, activities construction and clearing of vegetation. There was also human settlement and cultivation very close to the river banks. The color of the water was also reddish brown which was attributed to silt load in the water. Cultivation on high gradient land was also observed. This poses a major threat to biodiversity of the area.
4. There are a lot of interventions by NGOs such as the WWF, LNRA, NAWACOMP and Government institutions such which need to be enhance to ensure that the biodiversity of the areas is preserved.

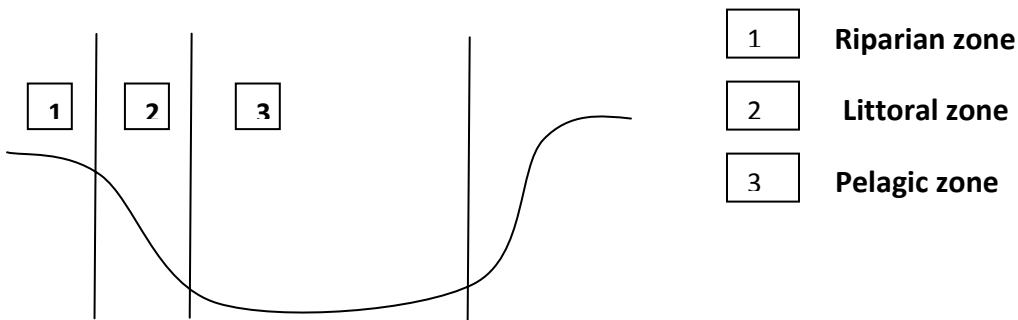
Other interventions recommended include:

- a. Eforcement fo exixsting laws
- b. Promotion of community awareness
- c. Promotion of alternative livelihoods
- d. Initiate agro-forestry & Aforestation programs
- e. Promote programs such as the payment for ecosystem services to help preserve the remaining forest blocks.



The Main Lake (Riparian, Littoral and Pelagic zones) from up – bottom

## Results and Discussions



Lake Naivasha ecosystem studied was the Main lake has freshwater and Oloidien which is slightly alkaline. The composition of these ecosystems determines the biological diversity in within each eco-zones as shown below:

### a) Riparian Zone

The riparian zone had a high density of numerous plant and animal species as compared to the rest of the zones. The dominant plant species were Kikuyu grass, *Acacia xanthophloea*, mature papyrus, stinging nettle, tendrils which form the undergrowth. The predominant species were mushroom, lichens, mosses and other introduced species; the palm trees, while in Lake Oloidien the dominant plant species were the thick and stout *cyperus latifolia* (*papyrus spp.*), due to their high tolerance to salts since the lake is slightly alkaline.

There are various animals observed at the riparian zone; in the main lake the most dominant were species were the insects (beautiful butterflies, safari ants, crabs, spider, millipedes and centipedes) and Birds species (Great crested grebe a threatened species, African fish eagles, cormorant, kingfisher, seagull, pelicans, Macco duck and saddle-billed stork). The most common mammals comprise of Colobus moneys, baboons, vervets, hippos at night, Zebras and Giraffe) the reason behind their dominance is that, the riparian zones habours a diverse large number of plants that provide food to grazers and browsers and nesting sites for birds. Other animals such as the Reptiles (snakes) were not spotted but are said to be commonly found in large numbers (*KWS information pamphlets for Lake Naivasha*).

In Lake Oloidien the dominant animal species within the riparian zone was the cormorants nesting on Acacia ps. fever trees, as it provides a suitable habitat with available food. Insects were also found in large numbers such as the butterflies.

## b) Littoral zone

The dominant plants at the littoral zone were the sedges comprising regenerating *cyperus papyrus*, *typha*, *cyperus latifolia*, followed by the spirulina (*a microphyte*), water lilies (*Nymphae*) and stinging nettle. The zone provides a favourable condition because of its shallowness, marshy with a high level of nutrients. It was concluded that the dominant species had a high productivity stability levels. The dominant plant species are tolerant to the conditions such as velocity of the flood water flowing into the lake. Other plants species that were predominant have low tolerance to the prevailing conditions including influence man and the animals in habiting or breeding within the littoral zone.

The animals found within the littoral zone were the Zooplanktons (as observed in the microscope), hippos (*hippotamus amphibious*), birds such as the Greater and Lesser flamingo, cormorants, kingfisher, seagull, pelicans), fish fingerlings (*Common carp a bottom feeder*, *tilapia zillii*, *Black bass*, *Barbus amphigrama*, *Oreochromis leocostictus*, *Mosquito fish*) and Amphibians such as the toad within the main lake.



Greater and Lesser flamingos at Oloidien



Hippos and Comorants at the littoral zone

In Lake Oloidien the dominant animals within the littoral zone were birds (The greater and lesser flamingo and the cormorants) while hippos (*hippotamus amphibius*) were the common mammals found.

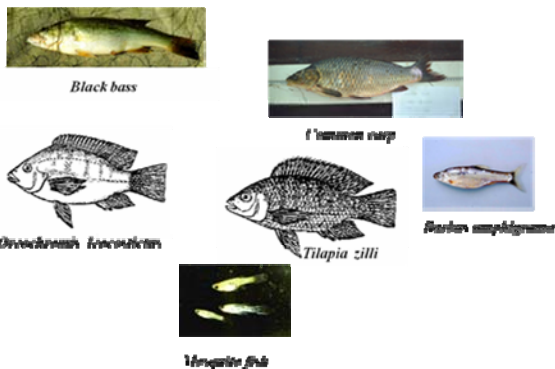
Other dominant mammals include hippos in both the main lake and Oloidien and Fishes. The most stable species of fish in the main lake is the common carp who feed in the bottom of the lake. It was noted that their food is less subjected to any external disruption, they have a high productivity levels as oppose to tilapia and bass whose breeding site have been encroached by human (boat rides), in addition to overfishing as its on high demand.

**c) Pelagic zone**

The turbidity levels of water were high in the palegic zone to an extent were visibility was up to 21cm (as measured by use of a secchi disk), thus spotting plant and animal species was difficult. Literature review was used as a means of data collection other than observation.

The most stable plant species were the *Spirulina sp*, phytplanktons and lastly the water hyacinth. The reason for dominance is due to availability of nutrients and less plants that compete for the same habitat resources within the zone.

The pelagic zone also is a habitat to a large number of Fish species most of which were introduced as shown below:



**Fish species in Lake Naivasha(Main Lake)**



**African Fish eagle targeting fish at the pelagic zone**

## **Biodiversity Interactions**

During the study, we establish several interactions and relationships that determined the dominance of species within an eco-zone, namely:-

- a) Competition (water lilies and water hyacinth)
- b) Parasitism (weevil feeding on water hyacinth)
- c) Saprophytism (mushroom, fungi)
- d) Predation (African fish eagle and fish)
- e) Symbiotism
- f) Opportunism (Red algae bloom due to increased nutrients in water)
- g) Commensalism (water and hippos.

## **Importance of Lake Biodiversity**

Lake Naivasha ecosystem has proved to be rich in biological diversity, which has environmental, socio-economic and cultural benefits.

### **Environmental benefits**

- A habitat to various animals, breeding and nesting sites for fish, amphibians and birds both resident and migratory birds.
- Provides food, water and source of energy
- Soil erosion control (such as plants species found at the riparian zone)
- Maintaining the hydrological and nutrient cycle
- Water purification (*Cyperus spp.* and the water hyacinth)
- Aesthetic value

### **Socio-economic and cultural benefits**

- Recreation & tourism,
- Industrial development (used as a source of raw material)
- Horticulture (flower farms)
- Transportation (boat-ride)
- Source of employment

## **Challenges and Threats**

Since 1982, the lake has undergone drastic changes due to increase in population, climatic changes and other human activities, the following are the challenges and threat we noted during the study.

1. Over abstraction of water for large scale farming, industrial and other uses
2. Water pollution due to the pesticides and fertilizers being washed into the lake from the horticultural farms.
3. Clearing of vegetation for developments leading to soil erosion, siltation, drying up of rivers, streams and springs
4. Unplanned housing and settlements such as poorly sited sewage system
5. Overexploitation of ecosystem resources such as fish through unsustainable fishing method
6. Invasive species such as the water hyacinth
7. Tourism & transport (boat ride)
8. Private ownership of the riparian land

### **Conservation Interventions**

- Advocate for tourism as oppose to overdependence on horticulture, which will encourage conservation of biodiversity
- Strengthen the implementing agencies to ensure compliance of enacted laws and regulations relevant to biodiversity
- Closely monitor human activities that take place in both the upper and lower catchment and ensure that they comply with the laid down laws and regulations
- Promote conservation education and awareness creation with the relevant agencies
- Encourage controlled abstraction of water using meters, sourcing other alternative water sources (roof harvesting, flood water harvesting) and using water sparingly
- Encourage organic farming as oppose to inorganic (fertilizers)
- Government to make a plan on the developments that should take place within specified areas in the ecosystem and protect other areas of importance (riparian land)
- Government to strictly regulate the exploitation of resources such as fish and encourage the use of sustainable practices, alternative source of livelihood for the dependence (bee farming)
- Decongest the human settlements and horticultural farms within the lake ecosystem
- Strengthen stakeholder collaboration

### **Conclusion**

From the research study, it is Crystal clear that the lake is very important to the country and the world at large for its biological diversity and fresh water resources. It supports essential socio-economic activities that add up to the country's Gross Domestic Product (GDP), justifiable in Tourism, Horticulture and geothermal power station. On the other hand the lake ecosystem is

facing several challenges and threats that are far reaching, from being one major freshwater lake to a smaller main lake and 3 more distinct basins with different chemical composition, which has led to decline in species diversity, emergence of invasive species and extinction of other species.

Joint efforts should therefore be enhanced by both local and international communities, spearheaded by one body that can manage it holistically taking into consideration relevant laws and regulations in order to achieve a well conserved ecosystem that is sustainable.



**Alice Kaudia launching the tree planting ceremony at Lake Naivasha Secondary school in Kihoto-Naivasha**