

**ST. LAWRENCE UNIVERSITY KENYA SEMESTER PROGRAM  
SUMMERERM 2009**



**CHALLENGES IN CONSERVATION: NATIONAL PARKS AT RISK  
(ENVIRONMENTAL STUDIES 248, BIOLOGY 248, AFRICAN STUDIES 248)**

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## **COURSE OVERVIEW**

This field-based course demonstrates how the lack of active management can undermine biodiversity conservation in small, insularized and highly impacted protected areas like Nairobi and Lake Nakuru National Parks. The lack of active management has resulted in a significant decline of the numbers migratory species and big cats of the Nairobi National Park. Moreover, the park no longer attracts as many tourists as it used to do in the past. The high concentrations of Africa's charismatic mega fauna, on the other hand, have made Lake Nakuru Park the most visited park in Kenya. These high concentrations also pose a real threat to the park and its environment since these animals have exceeded the park's carrying capacity.

A case study approach is adopted where the problems and issues in each protected area are first introduced through lectures and readings. Local practitioners, scientists and, experts then elaborate on the main issues and give their expert opinions, arguments and, counter-arguments. Structured field exercises and experiments consolidate the theoretical knowledge and are used to test some of the proposed hypotheses. Finally, students share knowledge and experiences gained through a series of discussions and debates. This analytical, interactive and, solution-oriented approach to learning makes students more excited about what they learn especially that they deal with pressing management problems that threaten biodiversity conservation. Knowledge, field techniques and analytical skills acquired during the course prepare students for a professional career and could form the basis of their own future work.

More than 70% of the time is spent in the field inside and around Nairobi and Nakuru National Parks. Field exercises are carried out in groups and include techniques of identifying large mammals and studying their behavior, game counts of large mammals, assessing the impact of rhino browsing on the destruction of the *Euphorbia candelabrum* woodland and, assessing the impact of large herbivores on rangelands. Results of the exercises are shared and discussed with park and ranch managers whose opinions are taken into considerations when designing new projects. The course is four weeks long and is suitable for seniors and juniors from any discipline as well as biology, environmental studies and conservation biology soft mores. Applicants should have a solid academic record (at least a B- average). Students will earn 1.5 SLU units or 6 credits. To provide individual attention and enhance maximum student participation, a maximum of 12 students can participate in the course.

## **THE ISSUES**

### **Nairobi National Park**

Established in 1946, Nairobi National Park is Kenya's oldest park and the only game park in the world neighboring a capital city. Historically the park was part of the dry season dispersal zone where more than 25,000 wildebeest and 10,000 zebra used to roam over the Athi-Kapiti ecosystem, which covered an area of 2300 Km<sup>2</sup>. However, most of the dry season dispersal zone was lost to development and the park eventually became the main dry-season grazing refuge for the migratory species. This was also coupled by a dramatic reduction in the numbers of the migratory species, especially the wildebeest of which less than 2000 individual are still alive. The wildebeest migration ceased altogether in the year

2000. Moreover, no more than 100 wildebeest and less than 2000 zebra live in the Athi-park today.

The reduction in the numbers of migratory species has resulted in a gross underutilization of the park's rangelands. The short and palatable grasslands, preferred by the migratory species were eventually replaced by tall, moribund and unpalatable grasses. Meanwhile the grasslands in the dispersal area have been kept short and green by the effect of grazing livestock. The green and nutritive grass in the dispersal area continued to attract more of the park's wild herbivores that now spend most of their time in the dispersal area and do not return to the park in significant numbers unless the grass outside the park is depleted, usually towards the highest of the dry season or during drought periods. However, the migratory animals would leave the park and head towards the dispersal area immediately after the next rains trigger growth of enough green grass outside the park. Large predators including lions, hyenas and cheetahs also follow the migratory animals to the dispersal area. There, the predators find it easier to prey on domestic livestock to the dismay of the livestock owners who may or may not be compensated for the loss of their livestock. Often the inhabitants of the dispersal area retaliate by mass killing of lions which are the main culprits. Devoid of wildlife and dominated by tall and moribund grass that obstructs the viewing of the few remaining animals, the park is fast losing tourists and their badly needed sweet money that pays for the day to day running of the park.

Opinions for saving the park are sharply divided. Some conservationists argue that the best course of action lies in saving the park's dispersal area by purchasing and leasing land to maintain an open ecosystem and by providing people with financial incentives to accommodate the wildlife. Others argue that this action is too little and too late to save the park since it is already fenced on three sides and the unfenced Southern side is strangled by rapid development. This group argues that the best course of action is to completely fence the park and actively manage it as an insularized system.

### **Lake Nakuru National Park**

Established in 1960 mainly as a bird Sanctuary, Lake Nakuru National Park is the world-famous haunt for its flamingos where at times concentrations of more than a million flamingos and a diverse array of other water bird species could be witnessed. The park is also endowed with a high biodiversity of large mammals, including leopards, black and white rhinos, hippos, giraffes and, buffalos. Despite being one of Kenya's largest tourist attractions, the Park is very small in size and was enclosed off by an electric parameter fence in 1987. About 40km<sup>2</sup> of its 188km<sup>2</sup> area is covered by the lake. Many species were successfully introduced or reintroduced to park including buffalo, Rothschild's giraffe, black and white rhinos and, later lions. The presence of a high concentrations of large herbivores enclosed year round within a small area has caused considerable damage to the park's vegetation, place most of the small to medium sized herbivores at a competitive disadvantage, and resulted in habitat degradation and soil erosion. Most of the park's herbivores appear severely emaciated and massive die-offs are not uncommon during prolonged droughts. Due to the heavy grazing pressure, most of the park's palatable grass species are replaced by unpalatable or poisonous vegetation. This is particularly evident in the woodland and the riverine vegetation where sheet and gully erosion are evident. Given the small size and

insularized nature of the park it seems that reductions of some of the large mammals need to be carried out on regular basis but no action has yet been taken to rectify the problem.

The expanding black rhino population in the park is linked to the disappearance of the *Euphorbia candelabrum* woodland. Ever since their reintroduction to the park in 1987 the black rhinos started debarking the Euphorbia trees probably to compensate for the lack of some essential minerals in the park's soils. The soils of park are deficient in calcium, phosphorous and magnesium and also lack copper and cobalt, elements which affect reproductive ability in herbivorous species. The debarking exposes the tree stems to attacks by insects which damages the stem and interferes with food and water transportation mechanisms. Many of the debarked trees dry out and eventually succumb and die. The debarking has caused the loss of more than 90% of park's *Euphorbia candelabrum* woodland but the problem has not been fully investigated and no remedial measures were implemented. More recently, the destruction of the *Acacia xanthophleoa* woodland in the park has also been linked to debarking by giraffe, probably also to compensate for the mineral deficiencies characterizing the park's soils.

Some of the Parks problems originate from outside its boundaries. Lake Nakuru drainage basin, which includes the lake and its watershed, covers an area of approximately 1800km<sup>2</sup>. The basin has lost more than 80% of its forest resources and experienced a more than two-fold increase of its human population over the last thirty years or so. The main sources of water supply to the lake include rainfall, natural springs, surface runoff from Mau Hills and Nakuru town and, sewage from Nakuru town. The four streams supplying water to the lake originate from the Mau Hills and pass through densely populated and intensively cultivated areas. Soil, silt, organic load and agricultural chemicals derived from these areas as well as industrial and domestic effluent from Nakuru Town are transported into the lake. The level of these pollutants is on the rise and poses a serious threat to the lake and its ecosystem. The frequent massive die-offs of flamingos since 1993 might be a result of a changing lake hydrology resulting from the above mentioned threats.

## **COURSE SCHEDULE**

Immediately after completing the first five days of orientation and introductory lectures, we will spend a week at the compound and work on the Nairobi National Park's component which includes lectures and readings about the park's history, ecology and, management and also visits to the park and its dispersal area. A number of guest speakers, including government officials and local experts, will discuss the challenges facing the park, share with us their experiences and thoughts and discuss possible solutions. General elements of animal behavior and ecology as well as mammal identification techniques will also be introduced.

We will then travel to Lake Nakuru National Park where we will explore the main issues and problems facing the park. We will learn about the park's physical environment, threats to the lake and, ecology of lesser flamingos. We will examine the dynamics of the large herbivores in the face of the insularization of the Park. We will discuss with park personnel the park's history, ecology, and management and will address the problems and threats currently facing the park. We will conduct several field exercises in collaboration with the park management and some of our results may be used by the park to design new management strategies. A

total game count of the large mammals will be carried out and we will compare our results with the results of the game counts carried out in the past by the park's personnel. We will assess the impact of rhino browsing on the destruction of the *Euphorbia candelabrum* woodland and will carry out a grassland assessment to analyze show the impact of large herbivores on the park's rangelands.

The last few days of the course will be spent in data analysis and write-up of the field exercises as well as completing other written assignments.

## **LECTURE AND ACTIVITY LIST**

### **The Insularization of Nairobi National Park**

1. Mammal ecology and behavior (Lecture 1.5h/Lab 6.0h)
2. The insularization of Nairobi National Park (Lecture 1.5h)
3. Africa: Playing God with Nature (Film and Discussion/ 1.5h)
4. The future of Nairobi National Park's dispersal area (Lecture 1.5h)
5. A visit to Nairobi National Park's dispersal area facilitated by a local scholar and expert (Lecture 1.0h/Lab 3.0h)
6. Perspectives of a local practitioner on the Lease Program that aims at saving the park's dispersal area (Lecture 1.0h)
7. Perspective of a local practitioner on the Kitengela Predator Consolation Program (Lecture and discussion/ 1.0h)
8. Nairobi National Park's warden perspective on KWS role, community involvement and management options for NNP (Lecture and discussion/ 1.5h)

### **The Insularization of Lake Nakuru National Park**

1. Management issues of Nakuru National Park as seen by the Senior Research Officer of the park (Lecture/ 1.5h)
2. The insularization of Lake Nakuru National Park (Lecture/ 1.5h)
3. Game counting techniques (Lecture/ 1.5h)
4. Conducting a sample game count in Lake Nakuru National Park (Lecture 1.0 /Lab 4.0h)
5. A local scholar's perspective on the conservation status of Lake Nakuru's flamingos (Lecture 1.5h)
6. Assessing black rhino's damage to the Euphorbia Candelabrum woodland (Lecture 1.0h/ Lab 6.0h)
7. Assessing giraffe damage to the Acacia woodland (Lecture 1.0h/ Lab 6.0h)
8. Overview of grass morphology, development, identification and classification (Lecture 1.5h Lab 3.0h)
9. The ecological status of a grass and grass biomass estimation (Lecture 1.5/ Lab 3h)
10. Factors which influence the grazing value of grass (Lecture 1.5h/ Lab 3.0h)
11. The descending step point technique for assessment of grasslands (Lecture 1.0/ Lab 4.0h)
12. The impact of Nakuru town and surrounding development on the Lake Nakuru National Park (Lecture 1.5h/ Lab 4.0h)

## **GRADED ASSIGNMENTS**

Students will be graded on the following elements:

1. **Nairobi National Park or Lake Nakuru National Park paper (40%):** An analytical paper based on personal experiences, lectures, readings and discussions on one of the two parks. You are free to choose the title and the theme of the paper. The paper consists of a title, an introduction followed by the presentation of your data and argument, and ending with a conclusion. You are highly encouraged to present your personal opinions and to suggest solutions and give management recommendations as long as you could provide supporting argument. The paper should be between 6- 8pages long, typed, double spaced, Times New Roman font, 12 point. All arguments should be supported by specific references to published and unpublished sources, lectures, discussions or group presentations.
2. **Mammal ecology and social organization (20%):** In this field exercise each student will be required to provide a 200 – 250 words summary of 10 mammal species sighted either in Nairobi and Lake Nakuru National Parks or in both. The summary should include: scientific and common names, feeding and drinking habits, preferred habitats, social organization, reproduction biology, general conservation status of the species or the sub-species, and, interesting or fun information about each animal.
3. **Nairobi and Lake Nakuru National Parks group presentations (20%):** Two sessions of group presentations will take place to address the insularization of each of the two parks. In the case of Nairobi National Park you are free to choose from any of the two topics:
  - A. Should the dispersal area of Nairobi National Park be conserved or is it already too developed to be of any use to biodiversity conservation? What measures need to be in place to achieve effective conservation?
  - B. Should Nairobi National Park be fenced or maintained as an open eco-system? How should the management of the park change in line of your recommendations?

You can also choose one of the following topics in the case of Lake Nakuru National Park:

- A. What does it take to minimize the negative impacts of Nakuru town and of the developments on the catchment of the lake on the Lake Nakuru National Park?
- B. How should the Nakuru Park's large mammal be managed to minimize their negative impacts on the environment and on the declining mammal populations?

Students who chose the same topic will work as a team to prepare a 30 - 45minutes presentation to the rest of the class followed by a 20 - 30 minutes discussion. The first part of the presentations is factual and the second part is analytical. Presenters are encouraged to present their own views as long as they are supported by solid facts. If the team is divided on the issue, the presentations could take a debate's format. Team members are encouraged to prepare for and discuss their presentations well in advance. Each student is required to carry out an internet search of the Kenyan main newspapers (The Daily Nation: [www.nationaudio.com](http://www.nationaudio.com), the East African Standard: [www.eastandard.net](http://www.eastandard.net) and the East African: [www.nationmedia.com/eastafrican](http://www.nationmedia.com/eastafrican)), print and read between 7 to 10 articles on each of the two parks. Each group presentation team is required to share and discuss these articles and include them in their presentations. The entire team will receive the same grade for each

presentation. Grading is based on the level of preparedness, the presented facts, quality of the presented material, strength of the arguments and ability to answer student and staff questions.

4. **Class participation 20%:** Attendance as well as quantity and quality of student participation in course activities will make 20% of the course's grade.

## **READING LIST**

### **Nairobi National Park:**

Gichohi, H. 2000. Functional Relationships between Parks and Agricultural Areas in East Africa: The Case of Nairobi National Park. In: Prins, H. H. T. *et al.* (Eds). *Wildlife Conservation by Sustainable Use*. Kluwer Academic Publishers, Boston, USA. **(Read at the beginning)**

Kamula, J. and Makala, S. 2004. A survey to determine the availability of land for wildlife migration in the areas bordering Nairobi National Park. East African Wildlife Society. **(Read before the lectures on the Kitengela predator consolation and lease programs)**

Friends of Nairobi National Park. 2000. Nairobi National Park Migration Appeal. Friends of Nairobi National Park. **(Read before the lectures on the Kitengela predator consolation and lease programs)**

Various articles about Nairobi National Park in 2003. Njiwa: Magazine of the Eastern African Environmental Network. **(Read at the beginning)**

Odhiambo, P. and H. Becha. 2002. Roadmap towards Sustainable Management of Kitengela Wildlife Migratory Routes and Dispersal Area Workshop. The East African Wildlife Society. **(Read before the lectures on the Kitengela predator consolation and lease programs)**

Kristjanson, P., M. Radeny, D. Nkedianye, R. Kruska, R. Reid and H. Gichohi. 2001. Valuing Alternative Land Use Options in the Kitengela Wildlife Dispersal Area. A joint report requested by the Kitengela Community and undertaken by the International Livestock Research Center and the African Conservation Center, Nairobi, Kenya. **(Read before the tour of the dispersal area)**

Vos, W. and Sinnary, A. S. M. 2003. Changes in herbivore stocking density and the effects of a controlled burn on grassland condition in Nairobi National Park. In: N. Alisopp, A. R. Palmer, S. J. Milton, K. P. Kirkman, G. I. H. Kerley, C. R. Hurt and C. J. Brown. *Proceedings of the VII<sup>th</sup> International Rangelands Congress*, Durban, South Africa. **(Read before visiting the park)**

G. Krembs. 2003. Age and sex composition, vegetation preferences, and the effects of burning on the distribution of 16 species of large fauna in Nairobi National park. The School for Field Studies, Center for Wildlife Management Studies, Nairobi, Kenya **(Read before visiting the park)**

Leuthold, W. 1977. African Ungulates: A comparative Review of their Ethology and Behavioral Ecology. Springer-Verlag, Berlin. Chapter 12. Pp 109 – 126 **(Read before the visit to the park)**

Leuthold, W. 1977. African Ungulates: A comparative Review of their Ethology and Behavioral Ecology. Springer-Verlag, Berlin. Chapter 13. Pp 139 – 151 **(Read before the visit to the park)**

**Lake Nakuru National Park:**

Githaiga, J. M. 2003. Ecological Factors Determining Utilization Patterns and Inter-lake Movements of Lesser Flamingos (*Phoeniconaias minor* Geoffroy) in Kenyan Alkaline Lakes. Ph. D. Thesis. University of Nairobi: Physical Features of the Study Lakes: 23-25 **(Read before the lecture on the conservation status of Lake Nakuru flamingos)**

Mwangi, E. 1998. Large herbivore dynamics in the face of insularization: the case of Lake Nakuru National Park, Kenya. Afr. J. Ecol. 36:276-279 **(Read at the beginning)**

Mwangi, E. and D. Western 1998. Fluctuations in food supply in an insularized and heavily grazed savanna ecosystem in Kenya. Afr. J. Ecol. 36:207 – 212 **(Read at the beginning)**

Tainton, N. M. (ed.). 1999. Veld management in South Africa. University of Natal Press, Pietermaritzburg. Pp: 355 – 370 **(Read before the vegetation field exercises)**

Forse, B. 1988. Rhinos find Sanctuary in Kenya. New Scientist. Pp: 28 **(Read before the lecture on the history, ecology and management of the park)**

Kock, R. A., I. O. Jumba, J. Wambua, J. Mwanzia, A. Siagi and S. M. Kisia. 1994. Status of trace elements in waterbuck (*Kobus ellipsiprymnus defassa*) in relation to soil and forage composition, and implications for animal health in the Lake Nakuru National Park. Proceedings of the workshop on “use of research and findings in the management and conservation of biodiversity **(Read before the lecture on the history, ecology and management of the park)**

Lake Nakuru National Park. 2003. Animal census results (Unpublished data) **(Read before the game counting lectures)**

Holland, P. G. and A. R. T. Hove. 1975. The distribution of Euphorbia Candelabrum in the Southern Rift Valley, Kenya. Vegetatio. 30:49-54 **(Read before the vegetation exercises)**

Githaiga, J. M. 2003. Ecological Factors Determining Utilization Patterns and Inter-lake Movements of Lesser Flamingos (*Phoeniconaias minor* Geoffroy) in Kenyan Alkaline Lakes. Ph. D. Thesis. University of Nairobi: Ecology of the Lesser Flamingo: 10-16 **(Read before the lecture on the conservation status of Lake Nakuru flamingos)**

Murei, B. K. 1994. The geology of Lake Nakuru National Park and its surface catchment. Proceedings of the workshop on “use of research and findings in the management and

conservation of biodiversity (**Read before the lecture on the impact of the town and development on the park**)

Kimani, P. K., M. C. Chemelil, P. M. Mutulu, P. N. Karogo and E. W. Muchiri. 1994. Hydrology and land use of Lake Nakuru catchment. Proceedings of the workshop on “use of research and findings in the management and conservation of biodiversity (**Read before the lecture on the impact of the town and development on the park**)

Githaiga, J. M. 2003. Ecological Factors Determining Utilization Patterns and Inter-lake Movements of Lesser Flamingos (*Phoeniconaias minor* Geoffroy) in Kenyan Alkaline Lakes. Ph. D. Thesis. University of Nairobi: Conclusions: 195-208 (**Read before the lecture on the conservation status of Lake Nakuru flamingos**)

Mavura, W. J. and P. T. Wangila. 2002. The pollution status of Lake Nakuru, Kenya: Heavy metal and pesticide residues, 1999/200. African Journal of Aquatic Science. 27: 91-96 (**Read before the lecture on the conservation status of Lake Nakuru flamingos**)

Karanja, A. K., S. S. China and P. Kundu. 1994. The influence of land use on Njoror River catchment between 1975 and 1985. Proceedings of the workshop on “use of research and findings in the management and conservation of biodiversity (**Read before the lecture on the impact of the town and development on the park**)

Ndeteit, R. 1994. Impact of urban development on biodiversity conservation: a case for Nakuru National Park. Proceedings of the workshop on “use of research and findings in the management and conservation of biodiversity (**Read before the lecture on the impact of the town and development on the park**)

Kisivuli, M., R. Ndeteit and A. Kahiha. 1994. PRA case studies in Pwani and Kilo communities (1990 – 1991). Proceedings of the workshop on “use of research and findings in the management and conservation of biodiversity (**Read before the lecture on the impact of the town and development on the park**)

Daniels, R. and T. Bassett. 2002. The spaces for conservation and development around Lake Nakuru National Park, Kenya. The professional Geographer, 54: 481 – 490 (**Read before the lecture on the impact of the town and development on the park**)

Van Oudtshoorn, F. 1992. Grazing value and ecological status of Grasses. Chap. 5, Pp.6257-73. In: Van Oudtshoorn, F. *Guide to Grasses of South Africa*. Briza Publications, Pretoria (**Read before the vegetation exercises**)