



**THE SCHOOL FOR FIELD STUDIES  
CENTER FOR WILDLIFE MANAGEMENT  
STUDIES,  
KILIMANJARO BUSH CAMP, AMBOSELI, KENYA**



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**EE 491 – DIRECTED RESEARCH  
CWMS SYLLABUS, SPRING 2009**

**FACULTY**

**JOHN W. KIRINGE, PH.D., MOSES M. OKELLO, PH.D., SALATON TOME, M.S.**

**OFFICE HOURS**

**DAILY 8:00 AM TO 5:00 PM  
7:00 PM TO 9:00 PM BY APPOINTMENT ONLY**

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**TABLE OF CONTENTS**

1. Course overview .....	2
2. Learning objectives .....	2
3. Assessment .....	2
4. Grading Scheme.....	3
5. General reminders .....	3
6. Lectures .....	4
7. Lecture Topics, Descriptions and Required Readings .....	4
8. DR Project Descriptions .....	6

## **1. COURSE OVERVIEW**

The aim of this course is to provide students with the opportunity to apply the scientific process in a field research project that addresses a local issue related to the environment. This course prepares students to distinguish hidden assumptions in scientific approaches and separate fact from interpretation, cause from correlation and advocacy from objectivity. The directed research topics are derived from the SFS center's five year research plan as defined by the center staff and local stakeholders. Thus, the center's research agenda is driven by local needs and interests. Through the Directed Research project, students will contribute to a growing body of scientific research that informs local conservation and resource management decisions.

Each student will join a faculty-led team that will carry out field research, data analysis and communication of results in one or across several of the following disciplines: ecology, natural resource management and socio-economics. This semester, the directed research projects will focus on the following questions, each of which is described in more detail in section 8 of this syllabus:

1. What are the community perceptions and expectations of national parks and community wildlife sanctuaries in Amboseli area?
2. How much is wildlife dispersal and migration space undergone contraction by human activities and structures in Olgulului / Ololorashi Group Ranch near Amboseli, Kenya?
3. What is the impact of human activities on the range status of elephant habitats in the Amboseli Ecosystem?

## **2. LEARNING OBJECTIVES**

Students will be expected to follow closely supervision by faculty and learn how to plan, execute and collect data in teams. They will also be trained in aspects of data analysis using statistical packages and spatial tools such Geographic Information Systems in such away that meets research objectives and generates information critical for management of Amboseli Ecosystem. Another important skill expected is writing a scientific paper in standard accepted format. Data collection will involve biological measurements to PRA tools such as discussions and interviews with local communities. Animal and plant identification will be valuable tools, as well as appreciation and respect of local cultures in the process of research.

The core skills students will learn in this course are field skills, analytical skills, communication skills and critical thinking, as well as team work and time management. The specific objectives of the course are the following:

1. Design a field research project
2. Conduct field data collection

3. Manage and interpret data sets
4. Communicate research results to diverse audiences

To achieve those objectives, the specific tools used in this course include experimental design, field techniques, basic descriptive statistics and parametric and non-parametric quantitative analysis. Succinct scientific writing, graphic and tabular presentation of results and effective delivery of oral presentations will be emphasized.

### 3. ASSESSMENT

Assessment Item	Due date	Value (%)
DR proposal	13 Nov. 2008	10
DR Draft Written paper	30 Nov. 2008	23.5
DR Final Written paper	4 Dec. 2008	61.5
DR In-house Presentation	5 Dec. 2008	-
DR Oral Presentation	7 Dec. 2008	5
<b>TOTAL</b>		<b>100</b>

### 4. GRADING SCHEME

A 92.50 - 100%	B+ 87.50 - 89.99%	C+ 77.50 - 79.99%	D 60.00 - 69.99%
A- 90.00 - 92.49%	B 82.50 - 87.49%	C 72.50 - 77.49%	F <60.00%
	B- 80.00 - 82.49%	C- 70.00 - 72.49%	

### 5. GENERAL REMINDERS

**Plagiarism.** Using the ideas and material of others without giving due credit, is cheating and will not be tolerated. A grade of zero will be assigned if anyone is caught cheating or aiding another person to cheat either actively or passively (e.g., allowing someone to look at your exam).

**Readings.** The readings assigned for each lecture and exercises are listed in this syllabus, or will be assigned prior to the lecture. All of them are in PDF format in the Student drive to help save printing paper and reduce waste.

**Deadlines** for assignments are established to promote equity among students, to allow faculty enough time to review and return comments and grade before other assignments are due; and to avoid clashes with other activities and courses. Therefore, deadlines are firm and extensions will only be considered under extreme circumstances. When appropriate the files should be placed in the assigned folder of the students drive on the server. Late assignments will incur a 10% penalty for each hour that they are late. This means an assignment that is 5 minutes late will have 10% removed,

one that is 1 hour and 5 minutes late will have 20% removed, etc. Assignments will be handed back to students no later than one-week grading period.

## 6. LECTURES

Code	Titles of Lectures /Field Exercises	Type	Instructor	Time (hr:min)
	<b>Classroom Component</b>			
DR 01	Directed research introduction	L	JW/ All	2.0
DR 02	Introduction to the Scientific Method	L	DR supervisors	1.0
DR 03	Risk and Time Management in Field Research	L	SAM	1.5
DR 04	Effective Communication Skills: Written	L	JW	1.5
DR 05	Introduction to Biometry and statistical tools	L	MO / All	2.0
DR 06	Statistical analysis computer lab	Lab	MO / All	3.0
DR 07	Effective Communication Skills : Oral	L	JW/ST	1.5
DR 08	Introduction to spatial analysis	L / Lab	ST / Guest	4.0
	<b>Total Classroom Contact Hours</b>			<b>16.5</b>
	<b>Research Components</b>			
DR 00	Field work		Faculty	80.0
DR 10	Data analysis and writing		Faculty	72.0
DR 11	Research presentation preparation (oral)		Faculty	16
DR 12	Presentation of research: In-house		Faculty	2.0
DR 13	Presentation of research: External to community		Faculty	3.0
	<b>Total Research Contact Hours</b>			<b>173.00</b>
<b>TOTAL RESEARCH CONTACT HOURS</b>			<b>184.5 Hours</b>	

**Note:** L, FL and FE represent a lecture, field lecture and field exercise respectively. L/FL, represents a lecture combined with field practice

## 7. LECTURE TOPICS, DESCRIPTIONS AND REQUIRED READINGS

Code	Lecture Title and Description	Readings
DR01	<b>Directed Research Introduction</b> Refer to individual directed research syllabus	See directed research readings

DR02	<p><b>Introduction to the Scientific Method</b></p> <ul style="list-style-type: none"> <li>- This class will focus on how we obtain knowledge and how scientific method is the most objective. Then go into important tenets of the scientific method</li> </ul>	<p>Gordon, J. 2007. Planning research: A concise guide for the environmental and natural resource sciences. Yale University Press, USA.(Required)</p> <p>Ratti, J. T and Garton, E. O.1994. Research and the experimental design. In: Bookhout, T.A. (Ed). Research and management techniques for wildlife and habitats. Fifth ed. The Wildlife Society, Bethesda, Md. Pp1-23 (Suggested)</p>
DR03	<p><b>Risk and Time Management in Field Research</b></p>	<p>No reading necessary</p>
DR04	<p><b>Effective communication skills: Written</b></p> <ul style="list-style-type: none"> <li>- Give students appropriate guidelines on writing and presenting scientific data in standard scientific format</li> </ul>	<p>Gordon, J. 2007. Planning research: A concise guide for the environmental and natural resource sciences. Yale University Press, USA.</p> <p>Milewski, T. 1991. Scientific methods in ecology: evaluating scientific reports. Notes, SFS Kenya, Program <b>(Required)</b></p> <p>Rod, L. 2007. Some style and grammar tips for biostatistics and statistics students <b>(Required)</b></p> <p>Vanclay, J.K. 1993. Writing a scientific paper for publication Ann. For. 1(2):199-202 <b>(Required)</b></p>
DR05	<p><b>Introduction to Biometry and statistical tools</b></p> <ul style="list-style-type: none"> <li>- Introduce students to various statistical terminologies, scales of data and how to properly distinguish data types for analysis</li> <li>- To expose students to statistical inference, hypothesis testing, common analytical tools and when to use them</li> </ul>	<p>Zar, J. H. 1999. Biostatistical Analysis. Fourth Edition. Prentice – Hall Publishers. New Jersey. 661 pp. (Suggested general reading)</p>

DR06	<b>Statistical analysis computer lab</b> <ul style="list-style-type: none"> <li>- Introduce students to parametric, non – parametric and enumerative statistical analysis using computer software (SPSS), and interpretation of analysis output</li> </ul>	Zar, J. H. 1999. Biostatistical Analysis. Fourth Edition. Prentice – Hall Publishers. New Jersey. 661 pp. (Suggested general reading)
DR07	<b>Effective Communication Skills I: Oral</b> <ul style="list-style-type: none"> <li>- Introduce students on approach and style of preparing and effectively communicating research work to peers and non-scientific community</li> <li>- Learn how to make power point presentation for peers and non-scientific community</li> </ul>	No readings are recommended for this lecture
DR08	<b>Introduction to spatial analysis</b> <ul style="list-style-type: none"> <li>- This is to display spatially important features in relationship to each other for purposes of analysis of spatial relationships</li> </ul>	To be provided

## 8. DR PROJECT DESCRIPTIONS

<b>Title of DR Project 1</b>	<b>Insights into community perceptions and expectations of national parks and community wildlife sanctuaries</b>
<b>Project Advisor:</b>	<b>Salaton Tome, M.Phil.</b>
<b>Research Assistant:</b>	An intern
<b>Project Partner(s):</b>	The key partner is the local Maasai community-members of Kimana Olgulului, Kuku and Mbirikani Group Ranches. Other partners include relevant line departments, Kenya Wildlife Service (KWS), international and local NGOs working in the area.
<b>Project Deliverables:</b>	<ul style="list-style-type: none"> <li>◆ An up to date literature review of functioning community sanctuaries</li> <li>◆ Documentation of dominant community views</li> <li>◆ Documentation of net flow of benefits (to KWS, local tourism industry, local entrepreneurs and to communities) directly or indirectly</li> <li>◆ An analysis of pertinent legislation and policies (or gaps) informing community participation in wildlife conservation /management.</li> </ul>
<b>Number of Students and Research Responsibilities</b>	8-10 students: Students will be in smaller groups of 2-3 to ensure greater efficiency in data collection and sampling coverage.
<b>Project Description</b>	<b><i>Problem/Issues</i></b>  What are the community perceptions and expectations of national parks and wildlife

sanctuaries?

***Background***

Conservation policies and agencies in Africa have come under heavy criticism especially in the '80s because of their exclusionist approach. Conceptual and empirical evidence from many countries indicate that the conservation goals have not been achieved. Consequently, new approaches which encourage the promotion of community participation, the concept of sustainable utilization and the centrality of markets in shaping the structure of conservation were introduced. These approaches have been concretized in different ways in different regions mostly paying special attention to the prevailing socio-political and economic circumstances of the particular area. For example in Southern Africa the focus has largely been on enhancing community based conservation while in Eastern Africa the focus has been on community conservation initiatives that centre on protected areas or 'park outreach'.

Community-based conservation in East Africa has evolved through complex interaction between factors operating at many levels and especially historical events before and after independence. The low agricultural potential and previously low human over much of the region have played a significant part in shaping the development of the conservation agenda. As such an extensive area of East Africa is legally conserved and is under the management of a large number of state and local-level agencies which in most part have failed to take into consideration the needs and interest of the local community. Though each country is still largely dependent on agriculture, each of the three East African countries of Kenya, Tanzania and Uganda have embraced different development agendas with Kenya concentrating on light industry and tourism. A substantial portion of the tourism industry is dependent on a network of protected which largely found in the marginal areas inhabited by pastoralist. Unfortunately the policies which are used to manage these areas have resulted in disenfranchisement of the local communities through alienation of resources they were hitherto using and destruction of local authority over the environment. With limited exceptions, few benefits accrue back to the local communities which have to bear the cost of conservation.

However, starting from the '70s there has been concerted effort by the government and NGOs sector to develop policies and structure for community conservation in Kenya. This was based on the realization that the myriad initiatives premised on the 'park outreach' model were failing and becoming increasingly difficult to justify morally vis-à-vis human rights terms. Though the primary focus of projects targeting local communities around Amboseli and Tsavo national parks was towards the protected areas, they were important in informing the subsequent initiatives. These field based as well as lessons from other countries has been used as stepping stones for the ensuing community conservation initiatives some which include: benefit sharing with local communities; minimizing conflicts between conservation interests and local needs; and increasing co-operation with other sectors of relevance to conservation goals. In Kenya the Amboseli region can be duly considered the cradle of these community based conservation initiatives and as such the most

appropriate place to launch an investigation on the same.

Amboseli National Park epitomizes problems facing conservation of biodiversity in many developing countries. With its small area most of the mammal congregations found within the PA seasonally migrate beyond its boundary to the surrounding group ranches. The owners of these ranches are the Maasai, traditionally nomadic pastoralists, who are fast changing in both their lifestyle and willingness to host wildlife on their land without any benefit. The scenario therefore begs the question of how wildlife can be conserved adequately under conditions of rapidly changing landuse. Fortunately, several measures such as the involvement of the local community in managing and benefiting from wildlife in their area of jurisdiction have been put in place to address the issue.

### **Objectives**

The thrust of Spring 2009 will continue the directed research on reviewing the evolution and structure of the different permutation of community based conservation initiatives within the Amboseli system. Some of the fundamental issues which require investigation include: Who bears the cost of supporting wildlife in the system? Who benefits and under what arrangement? What types of initiatives abound in the area? What measures are needed to strengthen the initiatives? What are some the legal and policy issues which need addressing?

*Specific objectives are to:*

- Carry out a comprehensive economic and financial analyses of community conservation,
- Investigate benefit -incentive systems and sharing mechanisms among various partners in these protected areas / community sanctuaries
- Examine the institutional (legal and policy framework) governing the distribution of benefits.

### **Methods**

Study will involve:

- ◆ Thorough literature search and an analysis of past and present community based conservation programs
- ◆ Conduct social surveys in representative sites using a combination of participatory techniques and semi-structured questionnaires. The focus is to provide information on sources of economic livelihood, benefits accruing, relationship with conservation actors etc.
- ◆ Key informants and focus group discussion
- ◆ Carry out exploratory benefit-cost analysis associated with community based

	<p>conservation initiatives</p> <p><b>Linkage to other five-year research plan</b></p> <p>This project is closely related to project 1:0 in aspects of natural resource management (influence of land tenure) – so can draw from it and also project 3:0 on population dynamics within group ranches.</p>
<b>Permits/permissions required:</b>	Permission to do research in Eselenkei, Kuku, Mbirikani, Kimana, and Olgulului will be sought from the group ranch officials. Additionally access to several tourist facilities will be sought.
<b>Equipment/materials required:</b>	Topographic maps of the area, GPS equipment,

### DIRECTED RESEARCH READINGS

- Adams, W.M., and D. Hulme, 2000. If Community Conservation is the Answer in Africa, What is the question? *Oryx* 35 (3): 193 – 200
- Bekure, S. (eds) 1987. Maasai Herding: Investigation of pastoral production on Group Ranches in Kenya
- Berger, D. 1993. Wildlife Extension: Participatory Conservation by the Maasai of Kenya. ACTS Environmental Policy Series No. 4. pp 5- 45.
- Campbell, D.J., H. Gichohi, A. Mwangi & L. Chege. 2000. Land Use Conflict in Kajiado District, Kenya. *Land Use Policy* 17: 337-348.
- Government of Kenya. 1989. Development Plan for Kuku Group Ranch. Ministry of Livestock Development and Department of Livestock Production. Government Printer, Nairobi.
- Ferraro P. J., and Kiss, A. 2002. Direct Payments to Conserve Biodiversity. *Science* 298: 1718 – 1719
- Hackel, J. D. 1998. Community conservation and the Future of Africa’s Wildlife. *Conservation Biology* 13 (4) 726 - 734
- Katampoi, K., G. Genga, M. Mwangi, J. Kipkan, J. Seitan, M. Van Klinken, and MS Mwangi. 1990. Kajiado District Atlas. ASAL Programme Kajiado, Kajiado.
- Macnab, J. 1991. Does game cropping serve conservation? A re-examination of the African data. *Can. J. Zool.* 69: 2283-2290.
- Norton – Griffiths, M. 1996. Why Kenyan Conservation is failing. *Swara* (Special 40<sup>th</sup> anniversary edition), pages 6 – 8.
- Ogolla, B. D. & J. Mugabe. 1996. Land tenure systems and natural resource management. In: Juma, C. and J. B. Ojwang (eds.), *In land we trust: environment, private property and constitutional change*. ACTS Environmental Policy Series No. 7. Initiative Publishers. Nairobi. Pp. 85-116
- Ogutu Z. A. 2002. The Impact of ecotourism on livelihood and natural resource management in Eselenkei, Amboseli Kenya. *Land Degradation and Development* 13: 251 – 256

- Okello, M.M., Wishishitemi, B.E. & Mwinzi, A.M. 2001. Relative importance of conservation areas in Kenya based on diverse tourist attractions. *The Journal of Tourism Studies* 12(1): 39 – 49 (Required)
- Okello, M. M., B.E.L. Wishitemi, and B. Lagat. 2005. Tourism Potential and achievement of Protected Areas in Kenya: Criteria and Prioritization. *Tourism Analysis* 10 (2):151 – 164 (Suggested)
- Okello, M.M. & Manka, S.G. Tourism Satisfaction, The Role of Various Attractions And Implications for Tourism And Conservation In Amboseli National Park, Kenya. Submitted to *Tourism Analysis (Suggested)*
- Okello, M.M. & Manka, S.G. The Role and Relative Importance of Large Mammal Species In Tourism Viewing In Amboseli National Park, Kenya. Submitted to *Journal of Sustainable Tourism (Suggested)*
- Okello M.M. 2005. The Dilemma of Balancing Conservation and Tourism Interests in a Small National Park: The Case of Amboseli, Kenya. Submitted to *Tourism Management*
- Okello, M., Seno, S., and Wishitemi, B. 2003. Maasai community wildlife sanctuaries in Tsavo – Amboseli , Kenya. *Parks* 13(1): 62 - 75. Conservation Partnerships in Africa. IUCN, Gland, Switzerland
- Seno, S.K., W.W. Shaw. 2002. Land Tenure Policies, Maasai Traditions, and Wildlife Conservation in Kenya. *Society and Natural Resources*. 15: 79-88.
- Thresher, P. 1981. The present value of an Amboseli Lion. *World Animal Review* 40: 30 – 33
- Western D. Amboseli National Park: Enlisting landowners to conserve migratory wildlife. *AMBIO* 11(5): 302 - 308
- Wishitemi, B.E.L. and Okello, M. M. 2003. Application of the Protected Landscape Model in Southern Kenya. *Parks* 13(2): 12 - 21. Category V. IUCN, Gland, Switzerland
- Whyte, I. 1993. The movement patterns of elephants in the Kruger National Park in response to culling and environmental stimuli. *Pachyderm* 16: 72-80.

<b>Title of DR Project II:</b>	<b>Contraction of Wildlife Dispersal space by Human Activities and Structures in Olgulului / Ololorashi Group Ranch near Amboseli, Kenya: A landscape level analysis</b>
<b>Project Advisor:</b>	<b>Moses M. Okello, Ph.D.</b>
<b>Research Assistant:</b>	An intern and research assistant
<b>Project Partner(s):</b>	Department of Resource Survey and Remote Sensing (DRSRS), KWS, Kenya Agricultural Research Institute (KARI), Group Ranches (Kuku, Kimana and Mbiriakani) and conservation NGO's (African Wildlife Foundation (AWF), Africa Centre for Conservation (ACC) and private ecotourism enterprises in the ecosystem.
<b>Project objectives and deliverables:</b>	<ul style="list-style-type: none"> <li>• To identify, establish prevalence and intensity of human activities and structures that contribute to the shrinking of the dispersal area,</li> <li>• Establish their location, and area of such human activities and structures and map them out for spatial analysis</li> <li>• To establish if the remaining dispersal area has sufficient resources (such as browse, grass forage, cover and water) necessary for wildlife and livestock</li> <li>• To examine potential options for the conservation of the dispersal area on a landscape level in view of the continuing group ranch subdivision and land use changes in the ecosystem.</li> <li>• Establish wildlife (large mammals) distribution and habitat associations of Kimana Group Ranch</li> </ul>
<b>Directed research progress and research responsibilities</b>	<p><b>All students in this Directed Research</b> will be encouraged to take part in all aspects of the work to harness all their competencies and skills. This work will be carried out on a landscape level in the entire dispersal area. Student groups will define the scope of their work, the study sites and contribution towards collective complete data / information for the dispersal area.</p> <p>This similar work has now been completed for Kuku, Kimana and Mbirikani group ranches, and part of Olgulului / Ololorashi Group Ranch.</p> <p>The Spring 2009 will end the spatial work in Olgulului / Ololorashi Group Ranch. It will also spatially cover the recent development on the Kimana Group Ranch site so as to cover all the entire area around Amboseli National Park.</p>
<b>Project Description</b>	<p style="text-align: center;"><b><u>INTRODUCTION</u></b></p> <p>There are six group ranches between Tsavo west / Chyulu Hills national parks and Amboseli / Kilimanjaro conservation area. This area forms one of the key conservation blocks in Kenya. Local Maasai who are traditionally pastoralists inhabits this area. They have lived side by side with wildlife for many years. The pastoralism lifestyle though now declining has been compatible with the ecology of this area, which is characterized by low and erratic rainfall (200 – 500 mm per year). The soils are of recent volcanic activities and therefore there are many rock outcrops and shallow poorly developed soils. Most of the area is a rangeland only suitable for wildlife conservation and pastoralism. However, in the recent past, there are land</p>

use changes and other socio – economic developments that threaten this area as a dispersal area for wildlife in Tsavo – Amboseli ecosystem. The ecological integrity and cultural lifestyle of the ecosystem is being destabilized by the following processes: increase in human population; agricultural establishment and expansion especially along riverine areas, swamps and in open rangelands for horticultural production; impending and continuing group ranch sub – division; persecution of wildlife through illegal poaching and bush meat trade; the high intensity of human – wildlife conflicts; the expansion of market centers that displace wildlife; general environmental degradation from overstocking of livestock; and excessive depletion of tree and shrub plant cover resources by local communities for various uses. With these changes, the crucial data urgently needed for conservation of wildlife resources in the dispersal area (that will influence the viability of the neighboring parks dependent on it) are: the status of the dispersal area in Kimana Group Ranch; the factors responsible for the decline of this dispersal space; the effective remaining wildlife dispersal size; factors that will promote the continuity and integrity of the remaining dispersal area and associated intervention measures; resource sufficiency and endowment in the dispersal area that will provide for wildlife presence, needs and survival; and compatible land use practices that can be promoted alongside wildlife conservation in the remaining dispersal spaces, and the models and mechanisms that will promote local community socio – economic welfare and support for conservation. This directed research seeks to address these crucial areas and provide data and information based on a landscape level approach. The project will be done in four phases that will coincide with study sites, with each study site taking about two directed research student groups. The project is expected to last for five years in order to cover the entire dispersal area between Tsavo West / Chyulu system and Amboseli / Kilimanjaro conservation system.

#### **DATA COLLECTION AND ANALYSIS**

Using two main ecological indicators of **wildlife presence** (large mammal density and diversity) and **human structures and activities** (such roads, bomas, tourism investments, hotels etc), the following area will be mapped and estimated in size

- **Different dispersal area contraction: location and area taken in the ecosystem:** These areas will include market areas and extended areas of wildlife exclusion, Maasai homesteads and immediate area of degradation that excludes wildlife, clusters of Maasai settlements (e.g. markets, electric fences and agricultural concentration areas) and areas of public utilities (such as cattle dips, schools, health centers, administration centers) where wildlife has been excluded.
- **Spatial, location and size of tourism investments:** Amboseli park is very quickly being surrounded by tourism investments to tap into the lucrative tourism industry. It is now increasingly being encroached on by camp sites, Maasai cultural bomas, tourist hotels and tented camps and other tourist activities and structures. Mapping their spatial location, effect on insularizing Amboseli and its wildlife displacement effects (in relation to wildlife migration routes and dispersal) will be mapped and elaborated.
- **Location of wildlife and livestock concentration sites in the dispersal areas:** Areas of wildlife concentration in the group ranches (watering points, community sanctuaries, relatively unsettled, undegraded wildlife inhabited locations) in the dry season will be identified in relation to wildlife large mammal distribution and abundance.

<b>Constraints:</b>	<ul style="list-style-type: none"> <li>• The main constraint to producing excellent information is limited facilities and software for GIS that can allow overlaying of information to show relationships. Some good investment in more powerful GIS equipment and basic faculty training may greatly assist the quality of work produced.</li> <li>• Some other constraints may be road network or access to more remote areas of the group ranches for sampling and wildlife counts.</li> </ul>
<b>Equipment/materials required:</b>	GIS maps of group ranches, topographic maps of group ranches, Scoping scopes, Binoculars, Rangefinders, Mammal Field Guides, Tally counters, any previous aerial photographs, GIS equipment, software and computers.
<b>Other issue(s):</b>	For this information to be useful for the ecosystem, it has to be taken together with other similar work in other group ranches done before to see the problem for each group ranch and the entire ecosystem holistically

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- Norton-Griffiths, N. 1997. Why Kenyan Conservation is failing. *Swara* November 1996 / February 1997: 6-8. Special *Swara* 40th anniversary edition
- Ogolla, B. D. & J. Mugabe. 1996. Land tenure systems and natural resource management. **In:** Juma, C. and J. B. Ojwang (eds.), *In land we trust: environment, private property and constitutional change*. ACTS Environmental Policy Series No. 7. Initiative Publishers. Nairobi. Pp. 85-116

- Okello, M.M. & J.W. Kiringe. 2004. Threats to biodiversity and their implications in protected and adjacent dispersal areas of Kenya. *Journal of Sustainable Tourism*. 12(1): 55-69.
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- Okello, M.M., Seno, S.K., & Wishitemi, B. L. 2003. Maasai community wildlife sanctuaries in Tsavo – Amboseli Ecosystem, Kenya: management partnerships and their conditions for success. *Parks* 13(1): 7 - 15. IUCN Gland, Switzerland.
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- Western, D. 1975. Water availability and its influence on the structure and dynamics of a savannah large mammal community. *East African Wildlife Journal*. 13: 265-286.
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<b>Title of DR Project III</b>	<b>Range condition, trend and productivity in the Maasai group ranches of the Amboseli region of Kenya</b>
<b>Project Advisor(s)</b>	<b>John W. Kiringe</b>
<b>Research Assistant (s)</b>	An intern/research assistant
<b>Project Partner(s)</b>	The Maasai people who live in communal group ranches (i.e. Kuku, Kimana and Mbirikani Group Ranches) that straddle between the Amboseli, Chyulu and Tsavo West National Parks, Ministry of Fisheries and Livestock Development and local NGOs working in the area such as African Centre for Conservation (ACC), African Wildlife Foundation(AWF) among others.
<b>Project Objectives and Deliverables</b>	<ul style="list-style-type: none"> <li>• Assess range condition, trend and productivity within the group ranches</li> <li>• Assess the carrying capacity of the rangelands within the group ranches</li> <li>• Establish factors influencing the status and rangeland condition within the group ranches</li> <li>• Establish the impacts and implications of rangeland changes on the Maasai community, pastoralism, land use, wildlife conservation and other biodiversity resources within the group ranches</li> <li>• Develop a holistic ecological monitoring protocol and indicators that will help elucidate changes in range condition and trend</li> <li>• Use the research findings to make recommendations on the best strategies that will enable the group ranches (i) enhance sustainable utilization of rangeland resources and promote the socio-economic welfare of the Maasai community (ii) mitigate rangeland degradation (iii) maintain their ecological integrity and (iv) promote conservation of wildlife and other biodiversity resources</li> </ul>
<b>Number of Students and Research Responsibilities</b>	A group of about nine or ten students will be involved in this project, and whenever necessary work in the same or different study site(s). This way, a rapid collection of the required data and information will be achieved. Faculty will guide students on how to (i) develop their directed research proposal (ii) share out various responsibilities in the field and during data analysis and (iii) write their directed research papers
<b>Project Description</b>	<p><b>INTRODUCTION</b></p> <p>Rangelands cover about 4.5 billion hectares of the world's dry lands or one fifth of the earth's land surface, which is more than double the area that is under cultivation and represent the most valuable yet neglected and abused biome. They support approximately 135 million people or nearly one fifth (20%) of the world's population and are confined to the tropic and sub-tropic regions. Compared to the high potential lands, their climatic conditions and soil types are such that potential for crop production under natural conditions is extremely low. Until recently, the predominant inhabitants of these vast lands were pastoralists such as the Maasai, Samburu, Rendille, Boran of Kenya. However, in the last few decades, large populations of non-pastoral communities have migrated and settled in rangelands, and are an integral component of these regions. In spite of their dry nature, soils</p>

and vegetation of rangelands are fundamental natural resources upon which their inhabitants depend on. One of the fundamental concerns of these lands is that degradation and subsequent loss of soils and vegetation will precipitate a cascade of ecological, environmental as well as socio-economic and political problems some of which can spill over and even be felt beyond the locality or region where such degradation has occurred.

Usually, rangelands are regarded as wastelands with very little economic value. However, if managed appropriately taking into account their ecological limitations, they are a valuable biome with considerable economic returns. They are an important source of livelihoods for local communities especially pastoralists who have practiced traditional pastoralism for thousands of years. Indigenous pastoral production is an important and ecologically sound form of land use in rangelands since they are too dry to support crop production. For millennia, tapping the productivity of this vast land has depended mostly on wildlife and domestic animals especially cattle, sheep, goats, camels and donkeys. Within Africa, 230 million cattle, 246 million sheep, and 175 million goats are supported almost entirely by rangeland ecosystems. In 1987, the International Institute for Environment and Development and the World Resources Institute estimated that wildlife and livestock in pastoral areas support nearly 30-40million pastoralists and millions of other settled non-pastoral communities outside rangelands. About four fifths of the world beef and mutton production (which is roughly 52 million tons), comes from animals that forage on rangelands. The value of livestock among pastoral communities is way beyond producing vital resources like hides and skins, milk, blood and meat. Livestock is regarded as a capital investment and in some communities like the Maasai, they are associated with social status . They represent an important asset that can be converted or liquidated to cash whenever a need arises.

Rangelands in arid and semi-arid regions are fragile and easily get degraded. Land degradation in dry lands can be defined as, “the reduction of biological productivity of dry land ecosystems including rangeland’s pasture, rain fed and irrigated croplands as a result of an acceleration of natural physical, chemical and hydrological processes.” These processes may include; erosion and deposition by wind or water, salt accumulation in soils, ground or surface water run-off, a reduction in amount of diversity of natural vegetation and decline in ability of the soil to transmit or store water for plant growth. By the end of the 20<sup>th</sup> century, rangelands of Africa and other parts of the world were subjected to a lot of pressure with nearly 70% of these lands getting degraded resulting in severe degradation in certain regions like the Sahel in Africa. In Africa, the annual loss of rangeland productivity is estimated at \$7 billion, more than the gross domestic product of Ethiopia, with both Africa and Asia accounting for two thirds of this loss at the global level. Arresting the deterioration of the world’s rangeland environment presents a difficult challenge. Mitigating this kind of degradation and subsequent deterioration requires regular assessment and monitoring to keep abreast with changes in the state of the environments. With better animal husbandry and ecologically sound range management practices, rangelands can attain even higher economic returns than is currently realized. Another equally important livestock production system is ranching either by individual landowners

or communally owned ranches. For instance, the Maasai group ranches of the Amboseli region and the Maasai-Mara ecosystem are examples of huge tracks of rangeland landscapes that were set aside by the Kenya Government with an objective of boosting livestock production among the Maasai.

In spite of their harsh conditions, rangelands are important biodiversity depository sites, and in countries like Kenya, Botswana, Uganda, Tanzania and Sudan they support a variety of wildlife species where protected areas networks in form of reserves and national parks have been established. Wildlife based tourism in such countries generates significant revenue in form of foreign currency and contributes to the overall national economy. In addition to livestock production, rangelands supply a variety of other resources and products which are important to local economies including bush meat, tubers medicinal plants, building, fencing and thatching materials, tannins, gums, fruits, berries and incense. The value of rangelands in supplying bush meat and vegetable food stuffs to local communities cannot be overestimated. These are derived from species that are well adapted to the ecological limitations of such areas and therefore available in the event of substantial crop failure or loss of livestock due to prolonged drought. Other uses of rangelands include mining for example Rubies and Tanzanite in Kenya and Tanzania respectively, quarrying, bio-prospecting (e.g. for important genetic resources, herbal medicines and other biological materials), rural based economies (e.g. game ranching, eco-tourism and livestock sales).

In Kenya, rangelands cover about 80% of the total land and include; the Coast region, North Eastern, Rift Valley and Eastern parts of the country. These are both arid and semi-arid zones but support a large proportion of the country's livestock population (about 70% of sheep and goats, >50% of cattle, all the camel population) as well as nearly 35% of the country's population majority of whom are pastoralists. The population of livestock, which is an important backbone of many African economies often, exceeds the carrying capacity of the land by half or more. A study that looked at the increasing grazing and browsing pressure on rangeland grasslands in nine southern African countries showed that the capacity of the land to support local communities and sustain livestock production is diminishing. It's imperative that the on-going rangelands degradation in Kenya and other parts of Africa be addressed and appropriately mitigated.

### **RESEARCH RATIONALE**

The Masai Group Ranches adjacent Amboseli, Chyulu and Tsavo West National Parks, are important wildlife dispersal areas without which the parks would be degraded and become ecologically unviable since they are too small to support large and viable wildlife populations. This landscape is also home to the Maasai community who has used it for traditional nomadic pastoralism for hundreds of years. However, in the last couple of years, the rangelands in the ranches have undergone significant changes in their condition and if this is not addressed, it's likely to trigger a cascade of ecological changes thereby undermining the ability of the land to support wildlife, livestock production as well as compromise the livelihood of the Maasai people. It is probable that these changes especially on the vegetation is related to considerable changes that have occurred in the last couple

of year especially land use practices, which have seen agriculture become prevalent. Apart from increased human population and related activities, livestock numbers appear to have been on the increase and this has added a new dimension with regard to utilization of the vegetation especially the herb layer. Further, due to the introduction of the group ranch system and the underlying restrictions in resource use by the community, livestock appears to be restricted in its overall coverage through which grazing takes place on a yearly basis thus putting a lot of pressure on the rangeland's vegetation. Traditional nomadic pastoral lifestyle, a sound ecological practice that helps rangelands to maintain their integrity and ability to support livestock, wildlife and people, has also dramatically changed in the recent past. It has now been replaced by a more or less sedentary lifestyle that is characterized by almost permanent Maasai homesteads (bomas) which compounds the total amount of pressure exerted on the rangelands. Collectively these changes in conjunction with prevalent drought conditions are potential threats to the ecological and environmental integrity of the ranches.

Recent observations in Kuku, Kimana and Mbirikani Group Ranches indicate that there has been significant changes and modifications of the woody species and the herb layer which have raised a lot of concern among the members as well as the officials. They have also noted a decline in pasture quality and plant species composition, which they feel, will in the long run undermine livestock production. Whereas the community and their leaders are concerned on the ability of the ranches to support livestock production, our concern includes the implications of such changes to wildlife and the livelihoods of the local community, which is heavily dependent on this land and its natural resources. An understanding of the dynamics and changes of the herb layer, trees and shrubs in the ranches and intervention strategy is urgently needed. This can partly be addressed by undertaking short and long term studies on the factors that influence and drive the structure, dynamics and productivity of the herb layer. This information will be useful in establishing biomass levels in the rangelands throughout the year, as well as estimating forage utilization/off-take by livestock and wildlife species. Biomass level and productivity dynamics, together with off - take rates of large herbivores will be useful in establishing stocking rates and stability of the grazing system in the group ranches of Amboseli region. Assessment and monitoring of the range condition and trend is equally important. Overall, the findings of this study are a critical step towards effective and sustainable management of the range forage resources and its associated faunal populations.

### **DATA COLLECTION PROCEDURE**

This research will focus on Kuku, Kimana and Mbirikani Group Ranches and its envisaged that data from these ranches will give a clear picture on rangeland condition and trends within the Amboseli region, their productivity and carrying capacity especially for livestock production. It will also shed light on the causal factors for rangeland condition changes and trends, and their impacts and implications on: the socio-economic status of the Maasai community, pastoralism, land use, conservation of wildlife other biodiversity types across the region. Overall, the findings will be useful in sustainable utilization of the rangelands and associated resources. Data collection started in Spring 2007 and has focused on

	<p>Kuku Group Ranch and later shift to Kimana and Mbirikani. A variety of techniques and approaches will be employed to help obtain the desired data and information. These will involve:-</p> <ul style="list-style-type: none"> <li>• Comprehensive literature review of various aspects of rangelands</li> <li>• Comprehensive review on past and present rangeland utilization in Maasai land, changes in the Amboseli region and impacts and implications on rangeland resources</li> <li>• Conduct social surveys in representative areas using a combination of participatory techniques and semi-structured questionnaires. This approach will be used to elucidate various aspects of rangelands within the Amboseli region. Key informants and focus group discussion will also be employed to complement the household social surveys.</li> <li>• Rangeland condition and trends will be discerned by conducting vegetation and soil components within representative sites of the group ranches. These will employ a variety of existing techniques and approaches. Other aspects of the rangelands which will also be investigated include: <ul style="list-style-type: none"> <li>(a) Monitoring changes in the species composition of the herb layer</li> <li>(b) The structure and dynamics of the herb layer</li> <li>(c) Biomass production and levels of primary productivity. This will focus more on the herb layer and will employ the destructive (harvest) and non-destructive methods.</li> <li>(d) Plant biomass utilization/off-take (mostly the herb layer) by wildlife and livestock</li> <li>(e) Livestock stocking rates and carrying capacity of the group ranches. This will also involve conducting livestock counts within the ranches</li> <li>(f) Monitoring seasonal variation in rainfall. If this is monitored over the years, it will help to establish how rainfall availability influences rangeland condition and trend, the herb layer biomass production and productivity levels, ecological resilience of the rangelands especially during drier seasons or drought conditions.</li> <li>(g) Depending on the study site characteristics, agricultural fields, Maasai bomas and other human structures will be noted and mapped out using GPS and GIS software. Any soil erosion gullies will be noted and mapped out and an overall assessment on the degree or severity and prevalence of soil erosion determined.</li> </ul> </li> </ul>
<b>Constraints (include any actions that the Support Center can perform to help)</b>	None
<b>Permits/permissions needed</b>	See DR01
<b>Equipment/materials</b>	General topographic and grid maps of the Maasai group ranches in the Amboseli region, compasses, assorted tape measures, GPS equipment, GIS software, plant

<b>needed</b>	identification and vegetation field guides, other sampling tools such as ranging poles, quadrats, pin-frames, Pasture Disc, clip boards and data entry sheets etc
<b>Other considerations</b>	In order to have a clear picture and understanding on rangeland condition and trends in the larger Amboseli Ecosystem, this study needs to cover other group ranches as well. Thus, it is imperative that once Kuku Group Ranch is adequately covered, the focus will shift to Kimana and Mbirikani Group Ranches respectively.

## DIRECTED RESEARCH READINGS

### Note:-

Faculty will also **provide other readings to supplement this list** but students are **STRONGLY** advised to also search for relevant literature in the library and using the internet.

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