THE SCHOOL FOR FIELD STUDIES

Ecology of Endangered Wildlife
SFS 3721

Syllabus

The School for Field Studies (SFS)
Center for Wildlife Studies and Human Dimensions of Conservation (CWSHDC)
Kimana, Kenya

4 credits

This syllabus may develop or change over time based on local conditions, learning opportunities, and faculty expertise. Course content may vary from semester to semester.

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COURSE CONTENT SUBJECT TO CHANGE

Please note that this is a copy of a recent syllabus. A final syllabus will be provided to students on the first day of academic programming.

SFS programs are different from other travel or study abroad programs. Each iteration of a program is unique and often cannot be implemented exactly as planned for a variety of reasons. There are factors which, although monitored closely, are beyond our control. For example:

- Changes in access to or expiration or change in terms of permits to the highly regulated and sensitive environments in which we work;
- Changes in social/political conditions or tenuous weather situations/natural disasters may require changes to sites or plans, often with little notice;
- Some aspects of programs depend on the current faculty team as well as the goodwill and generosity of individuals, communities, and institutions which lend support.

Please be advised that these or other variables may require changes before or during the program. Part of the SFS experience is adapting to changing conditions and overcoming the obstacles that they may present. In other words, this is a field program, and the field can change.

Course Context

Biodiversity encompasses the variety of different kinds of living organisms on the earth's surface including plants, animals (vertebrates and invertebrates), fungi, and microbes (viruses and bacteria). It also includes species diversity, genetic diversity, and diversity of terrestrial and aquatic ecosystems, together with their associated evolutionary and ecological processes. Fundamentally, biodiversity makes human life on earth possible, and it has many values, some intrinsic and others utilitarian. The latter includes the wide range of needs and benefits humans obtain from biodiversity like fuel, medicine, food, shelter, and raw materials. In addition, ecosystems provide key ecological life supporting services such as nutrient cycling, control of diseases and agricultural pests, water purification, climate regulation, pollination, and carbon sequestration.

Biodiversity also holds enormous value for potential benefits that have not been discovered, for instance new medicines and other possible unknown services. It also has cultural values for humans for religious or spiritual reasons. The intrinsic value of biodiversity refers to its inherent worth, which is independent of its value, and essentially its inalienable right to exist on the earth's surface. The natural world's opportunities for human recreation comprise another key value of biodiversity, and the tourism industry therefore benefits significantly from nature. Lastly, biodiversity has profound influence in shaping who humans are, how humans relate with each other and the social normality that exists in communities and societies.

Globally, most wildlife species face enormous anthropogenic pressure from multiple direct and indirect human activities, which threatens their survival and long-term conservation. Further, many fauna and flora species have become extinct, and many others are increasingly being pushed to the verge of extinction. Each species that is lost triggers the loss of other species within the landscape or ecosystem it's found, and this is an issue of great concern among conservationists. The International Union for Conservation of Nature (IUCN) Red List of threatened species shows that >42,000 species face eminent extinction, and this represents only 28% or over 150,300 species whose conservation status has been assessed. This includes 33% of reef-building corals, 14% of birds, 34% of confers, 25% of mammals and 40% of amphibians.

Across the world species extinction rates are accelerating at alarming rates, and its ramifications now and in the future can't be underestimated. About 99% of all species that have ever lived on the earth's surface have become extinct during the 5 known mass species extinctions. These were mainly caused by natural processes like asteroid impacts and volcanic eruptions. However, the current causes of extinction are primarily caused by humans due to many factors like loss and degradation of species' habitats, overexploitation (e.g., overfishing, hunting, over exploitation of plant resources), environmental pollution, climate change and invasive species. Accordingly, it's postulated that today, the rate of species extinction is occurring at a rate of 1,000 to 10,000 times faster mainly due to human activities. Another emerging and widespread cause of species extinction in aquatic ecosystems is plastic pollution in seas and oceans. In addition, the emergence of diseases due to globalization characterized by trade and travel across the world is increasingly endangering many wildlife species like salamanders, frogs, and bats. Prevalence of wildlife crimes including trafficking has also emerged as a big threat to survival and long-term conservation of many flora and fauna species.

A lot of in-country and global strategies and resources have been used to mitigate vulnerability of species to extinction processes but with mixed success. In particular, the IUCN has been in the forefront of alerting the world on the conservation status of species across the world using its Red List of

threatened species. It was founded in 1964, and today it has become a leader and authority in provision of comprehensive sources of data and information on the conservation status of many taxa globally. Primarily, the IUCN Red List is an index which shows trends in overall extinction risk of various species in the world, and it's then used by countries and conservation partners to monitor their achievements in reduction of biodiversity loss. It provides information about range, population size, habitat, and ecology, use and/or trade, threats, and conservation actions that inform conservation decisions. The list acts as a critical indicator on the status and conservation of the world's biodiversity. It's therefore a very powerful tool that is used to initiate actions and inform conservation of species in countries and globally including policy formulation and changes to enhance conservation. Overall, the IUCN Red List categories on conservation status of species and the criteria used for the classification are intended to be an easily and widely understood system for classifying species at high risk of global extinction. It categorizes species into 9 groups: 1) Not evaluated, 2) Data deficient, 3) Least concern, 4) Near threatened, 5) Vulnerable, 6) Endangered, 7) Critically endangered, 8) Extinct in the wild, and 9) Extinct.

Course Case Study

Across the globe, Kenya is renowned for its rich biodiversity that span the air, water, and land; a key natural wealth that makes the country a conservation hub and tourism destination. Historically, there was less concern about the conservation of the country's biota resources and their habitats, but this has rapidly changed in the last decades, and many species are at risk of becoming extinct. Some key causes of decline in population of some species are linked to anthropogenic causes such as overhunting or overharvesting, impacts of native species, emergence of diseases, habitat degradation or loss. Other causes for the decline are inherent demographic and genetic phenomena of some species themselves like the cheetah, and more recently climate change. Recent evidence suggests that deforestation and habitat destruction are prime direct and indirect causes of reported rampant decline in numbers of many species in the country. Overexploitation (hunting, bush meat, illegal killing due to human wildlife conflicts, conversion of wildlife dispersal areas and blocking of migration corridors) are also important drivers of large mammal decline. Country wide infrastructure and expansion of human settlements have equally become key drivers' decimation of many species.

Kenya's first National Wildlife Census in 2021 revealed there are dangerously few numbers of some wildlife iconic species, including the black rhino. The census, which lasted three months, established that 5 species are "critically endangered". These are: Tana River Mangabey, with 1,650 individuals, Black Rhinoceros (897 individuals), Hirola antelope (497 individuals), Sable Antelope (51 individuals), and Roan Antelope with 15 individuals. According to the IUCN criteria, this designation corresponds to the highest degree of risk, indicating these species have a 50% likelihood of going extinct within ten years or three generations. The census also established relatively low numbers of 9 species which have been classed as "endangered". These are: African elephant, African lion, Cheetah, White Rhinoceros, Eastern bongo, Grevy's Zebra, African Wild Dog, Nubian Giraffe and Sitatunga. In the list of species of concern are: Lesser Kudu, hippopotamus, Thomson's gazelle and generally all species of giraffes. The striped hyaena, sitatunga, leopard, white rhino, Grevy's zebra, African wild dog Eastern bongo Lelwel hartebeest (*Alcelaphus buselaphus*) and Rothschild's giraffe (*Giraffa camelopardalis rothschildi*) are also listed in multiple sources as species of conservation concern due to declining numbers. Lions, leopards, and elephants are listed as 'vulnerable' in the IUCN Red List but as endangered in the Wildlife Conservation and Management Act (Kenya 2013) because of their immense value in conservation and tourism in the country. The Act has also listed some vulnerable species including spotted hyena, greater and lesser kudu, hippopotamus, and springhare among others. Although not mentioned in the Act, there is currently a serious concern in Kenya and East Africa on the population trends of giraffes and pangolins.

The focus of this course and the SFS-Kenya program on conservation of endangered wild large mammal species is based on several considerations. Firstly, there are many of these species that are currently of great conservation concern in Kenya, Africa and globally, including but not limited to elephant, rhino, Rothschild giraffe, cheetah, lion, Tiger and hirola antelope. A lot of national, regional, and global efforts and all manner of strategies have been used to enhance conservation of these species but with mixed success. Apart from being a key species in ecosystems and landscapes where they live, some are key tourist attractions and therefore contribute immensely to local economies and Gross domestic product (GDP) of many countries. For instance, in Kenya the tourism sector is one of the key economic drivers, and contributes approximately 8.8% of the country's GDP, which was estimated to be worth USD 7.9 billion in 2018. Most tourists visiting the country are partly attracted by its rich and diverse wildlife endowment especially large predators like lion, cheetah and leopard, and mega-herbivores like elephant and black rhino, including the spectacular and world-famous wildebeest migration between Maasai-Mara and Serengeti N. Park in Tanzania. In 2018, the World Travel and Tourism Council (WTTC), estimated the total global domestic travel and tourism spending was US$ 3,971 billion in 2017. This shows that the travel and tourism industry is a significant contributor to the economic development of most economies in the world, and loss of wildlife species that are pillars of the industry will have significant socio-economic ramifications globally. Secondly, in Kenya, East Africa, and Africa as a whole, the current political, research and conservation discourse tends to focus partly on how endangered wild large mammal species can be salvaged from forces of extermination and extinction. Thirdly, land tenure and land use changes in landscapes and ecosystems where these species are found are not only a major threat to their long-term conservation, but they tend to alter the behavior and demography of the species. Fourthly, wildlife crimes such as illegal trade on live wildlife and wildlife parts tend to focus on large wild mammal species like cheetah, rhino, lion, and elephants.

From the foregoing and in view of the great concern on the numerous species that are of conservation concern in Kenya, Africa and globally, the program will focus on a comprehensive evaluation on; a) biology of selected wildlife species that are of conservation concern, and its linkage to vulnerability of the species to extinction processes, b) biology of selected wildlife species that are of conservation concern, and how it can be used to enhance their conservation, c)drivers of decline of species that are currently of conservation concern, d) aspects of human-dimensions and their role in decline of species that are currently of conservation concern, and e) national, regional and global efforts and strategies that are being used to enhance conservation of species which are of conservation concern, and mitigation of threats facing these species.

Course Overview

This course will provide students with in-depth understanding on; a) key factors which trigger significant decline in populations of wildlife species, and how this makes them vulnerable to extinction processes, b) role of ecology or biology in enhancing conservation and management of species that are of conservation concern, c) ecology and behavior of selected species that are of conservation concern such as the savannah elephant, Rothschild giraffe, cheetah, African wild dog, African lion, and black rhino, and d) role of technology in management and conservation of wildlife species that are of conservation concern (e.g. radio telemetry, drones, genetic mapping and analysis, embryology, captive breeding, etc.)

During the course, students will learn and apply in the field multiple approaches and techniques to studying the ecology and behavior of selected wildlife species which are of conservation concern in Kenya. They will also explore the application of ecological principles and concepts in enhancing conservation and management of wildlife species. Selected field exercises and field-based experiential

hands-on learning sessions will be used to impart the expected learning and skills of the course. The course will be done in key wildlife and biodiversity conservation landscapes in Kenya, mainly:

1. Amboseli region/ecosystem, situated in Southwest Kenya, along the Kenya-Tanzania borderland is a key African savannah elephant conservation landscape in the country. The population is one of the very few elephant populations in the country that has fully recovered from the devasting effects of poaching in the 1970s and early 1980s. However, the landscape is rapidly getting transformed into a human dominated environment posing a huge threat to conservation of wildlife including elephants, lions, cheetah etc. It's noteworthy that rampant poaching exterminated black rhinos in the Amboseli ecosystem, and to date this is still a big concern among conservationists.
2. Maasai Mara ecosystem, which lies contiguous to the Serengeti N. Park in the Northern part of Tanzania, and it's a key tourist destination in Kenya and East Africa. It's home to endangered and iconic species including the African lion, elephant, cheetah, and black rhino, which frequently move between Maasai-Mara and Serengeti N Park. This presents an opportunity to examine cross-border collaboration and challenges in conservation of endangered species. Unethical tourism in Maasai Mara national reserve has direct ecological and demographic negative impacts on cheetah and lion conservation. However, the region has the best and highest number of community conservancies, and this presents an opportunity to examine the role of communities in conservation of endangered species.
3. Laikipia landscape in Central Kenya is one of the pillars of wildlife conservation in the country and is home to several endangered species like Africa elephant, lion, cheetah, bongo, grevy zebra and the African wild dog. The highest populations of black and white rhinos in the country are found in the region, and it has the second largest population of elephants. In addition, the region has numerous private conservancies which play a major role in wildlife conservation, including conservation of several endangered species. Land tenure in Laikipia is embedded in Kenya's colonial history and therefore adds a different political debate in the conservation of endangered species.

Learning Objectives

Globally, biodiversity, landscapes, and ecosystems they live in are under threat from all kinds of human activities, from directly destroying habitat to spreading invasive species, diseases, overexploitation, illegal wide life crimes and more recently climate change. These collectively threaten survival, reproduction, and long-term conservation of biodiversity, and expose many species to extinction processes. In this regard, this course is premised on the importance of ecology, ecological principles, and concepts as pillars in effective management and conservation of threatened and endangered species. Further, we cannot begin to protect, manage, and conserve an animal without knowing its biology, how it's affected by human activities, what is happening around it, and as such, ecology provides the essential basis for these endeavors and generally nature conservation. Ultimately, the learning objectives of the course are:

1. Apply elements of ecology, ecological concepts, and principles in studying and understanding conservation of endangered species
2. Design, using elements of ecology, ecological principles, actions, or strategies that alleviate environmental and ecological problems facing conservation of endangered species.
3. Examine linkage between wildlife species' biology and their vulnerability to extinction processes and how this knowledge is used to enhance conservation of endangered species.

4. Evaluate ecological effectiveness of strategies used to conserve and restore populations of endangered species and how they can be improved.
5. Investigate how wild animals' population performance indicators can influence decisions to enhance conservation of endangered species.

Assessment

The evaluation breakdown for the course is as follows:

Assessment Item	Value (%)
Ecology and behavior of savannah elephants	20
Ecological and human threats facing lions in the Amboseli ecosystem	15
Use of technology in management of threatened and endangered species	10
Ecological monitoring of Black Rhino habitats	15
Participation	10
Final exam	30
TOTAL	**100**

Ecology and behavior of savannah elephants (20%)

This field exercise will be done in Amboseli N. Park. Students will learn how to age and sex savannah elephants. They will use the scan sampling technique to sample and document behavioral attributes of selected groups of elephants in the park. The exercise will assist students in learning how to conduct ethograms to study animal behavior. Data collected will be synthesized and analyzed appropriately and each student will use it to write a 3-to-4-page assignment for grading.

Ecological and human threats facing lions in the Amboseli ecosystem (15%)

Lions in the Amboseli Ecosystem are increasingly facing a lot of ecological and anthropological threats which threaten their long-term conservation and co-existences with communities. In this regard, this exercise will endeavor to elucidate key ecological and human threats facing lions and their implications thereof in the management and long-term conservation of the species. Of particular concern is rampant encroachment, degradation and reduction of key habitats used by the species and an increase in the interface between the species and locals which often results in conflicts and in some instances retaliatory attacks. Students will conduct Key informant interviews (KIs) drawn from; community leaders, Kenya Wildlife Service, ALOCA, International Fund for Animal Welfare and Big Life Foundation. The faculty will guide students on how to prepare a questionnaire instrument for the interviews. Each student will write a 3-to-4-page assignment using the information gathered in the interviews for grading.

Use of technology in management of threatened and endangered species (10%)

Students will learn in the field various technologies that are used by wildlife researchers and conservationists to study ecology, movement and ranging behavior of African lion, cheetah, black and white rhino. They will also understand how the data collected using these technologies is applied to management and conservation decisions of these species. They will then write a short reflection essay.

Ecological monitoring of Black Rhino habitats (15%)

Since the early 1980s, Kenya has increasingly used sanctuaries as a recovery strategy for black rhinos after their near decimation by rampant poaching in the 1970s and 1980s. In Lake Nakuru N. Park and Laikipia region students will learn about this strategy and critically examine or analyses its suitability and associated ecological challenges. In addition, students and Faculty will collect woody vegetation data in Ol Pejeta conservancy where long-term monitoring of impacts of mega-herbivores (black rhino,

elephants, and giraffe) has been going on. Faculty will guide students on how to synthesis the data collected, and each student will then write a 2 to 3 page write up of the assignment for grading.

Participation (10%)
Everybody should be prepared for each academic session. This implies reading the materials for each session with enough detail to be able to ask relevant questions and to participate in analytical discussions about the key issues. Active participation during classes, discussions, assignments, and hikes is expected.

Final Exam (30%)
This will be worth 30% of the course grade and will comprise of ONE compulsory question in section A and 3 questions in section B in which students will answer ANY 2 questions. Students will be expected to demonstrate an understanding of key ecological concepts and principles and situate them in the context of what makes some wildlife species vulnerable to extinction processes and actions or strategies that can be used to reduce such vulnerability.

Grading Scheme

A	95.00 - 100.00%	B+	86.00 - 89.99%	C+	76.00 - 79.99%	D	60.00 - 69.99%
A-	90.00 - 94.99%	B	83.00 - 85.99%	C	73.00 - 75.99%	F	0.00 - 59.99%
		B-	80.00 - 82.99%	C-	70.00 - 72.99%		

General Reminders

Readings – Assigned readings and hand outs (exercises/assignments) will be available prior to the scheduled activities. Course readings must be read and clarification on issues sought where necessary since ideas and concepts contained in them will be expected to be used and cited appropriately in assigned course essays and research papers.

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

Deadlines – Deadlines for written field exercises and other assignments are posted to promote equity among students and to allow faculty ample time to review and return assignments in good time. As such, deadlines are firm, and extensions will only be considered under the most extreme circumstances. Late assignments will incur a 10% penalty for each hour that they are late. This means an assignment that is five minutes late will have 10% removed. an assignment that is one hour and five minutes late will have 20% of the grade deducted.

Participation – Since we offer a program that is likely more intensive than you might be used to at your home institution, missing even one lecture can have a proportionally greater effect on your final grade simply because there is little room to make up for lost time. Participation in all components of the program is mandatory because your actions can significantly affect the experience you and your classmates have while attending the SFS program. Therefore, it is important that you are prompt for all course activities.

Course Content

Type: L: Lecture, **FL:** Field/Traveling Lecture, **GL:** Guest Lecture, **FEX:** Field Exercise

*Readings in **Bold** are required.

No	*Title and outline*	*Type*	*Time (hrs)*	*Readings*
1	**Introduction** Overview of key anthropogenic activities which trigger significant population decline of wildlife species which make them vulnerable to extinction processes. It will also examine wildlife species in Kenya, Africa, and globally that are either threatened, endangered and vulnerable, and key concerns on their future.	L	1 hour	
2	**Role of ecology in management and conservation of endangered species** This lecture will explore key behavioral and ecological attributes which make some wildlife species more vulnerable to anthropogenic activities which threaten their long-term conservation. It will also examine the role of ecological principles and concepts in making informed decisions for enhanced management and conservation of threatened and endangered species.	L	1 hour 20 min	
3	**Dynamics and ecological changes in the Amboseli Ecosystem and their impacts on conservation and management of endangered species** The lecture will provide a comprehensive examination of past and present ecological state of the Amboseli Ecosystem. It will identify key drivers (direct and indirect) of ecosystem changes, dynamics, and current ecological state, and their implications to long-term conservation of savannah elephants, cheetahs, and lions.	FL	1 hour 40 min	**Okello and Kioko (2010).** **Groom and Western (2013).** Victoria et al. (2019).
4	**Population performance indicators of threatened and endangered species** Making informed decisions is central to successful and long-term management and conservation of wildlife species that have declined substantially in the wild. In this regard, the focus of this lecture is premised on exploration of concepts of population dynamics and indicators that are used to study population performance of threatened and endangered species. The lecture will also examine application of population performance indicators in enhance management and conservation of threatened and endangered species.	L	1 hour 20 min	**Sabrina et al. (2014).** **Okita-Ouma et al. (2021).**
5	**Ecology and behavior of savannah elephants, Part I** The population of savannah elephants in Kenya and the entire African continent has declined significantly since the 1960s, and their future conservation is increasingly becoming uncertain. Accordingly, students will learn key behavioral and ecological aspects of savannah elephants (e.g., feeding, movement and ranging behavior, ecological	L	1 hour 40 min	**Estes (1991).**

No	Title and outline	Type	Time (hrs)	Readings
	requirements etc.) that make their management and conservation challenging in rapidly and increasingly changing landscapes in Kenya and Africa.			
6	**Ecology and behavior of savannah elephants, Part II** This field exercise will be done in Amboseli N. Park, a key savannah elephant conservation protected area in Kenya and Amboseli Ecosystem. During the exercise, students will learn and practice how to age and sex savannah elephants. They will use scan sampling techniques and ethograms to sample and document behavioral attributes of selected groups of elephants in the park.	FEX	4 hours 30 min	
7	**The power of poison: pesticide poisoning of Africa's wildlife and the decline of wildlife populations** In Africa, human-wildlife conflicts have continued to escalate and despite numerous interventions, they are still rampant. A key outcome of this is a surge in retaliatory attacks against wildlife by local communities, and this has become a major threat to survival and conservation of many species. Use of pesticides to kill problematic wildlife species especially large predators (lion, spotted hyena, cheetah and wild dogs) has become rampant in the recent past across the continent. This lecture will therefore examine the use of pesticides as poisons to eliminate problematic wildlife species, and its threat to the future of threatened and endangered species including many other non-target species.	L	1 hour 40 min	**Odino and Ogada (2008).**
8	**Ecological and human threats facing lions in the Amboseli Ecosystem (Theory and prep)** How to prepare and administer a questionnaire for key informants. Students will then collectively develop a draft questionnaire which will be reviewed by faculty to ensure its comprehensive and suitable for the FEX.	L	2 hours	
9	**Ecological and human threats facing lions in the Amboseli Ecosystem** Students will talk to selected key informants drawn from different stakeholders in the Amboseli Ecosystem to assess their views on key ecological and social threats facing lions. The species is increasingly facing a lot of anthropogenic and environmental pressure and if this is not effectively addressed their conservation in the ecosystem will be in jeopardy. During the exercise, students will seek views of the key informants on possible actions or strategies that can be used to enhance conservation of the species.	FEX	4 hours	
10	**Ecological effectiveness of Kenya's protected areas in conservation of endangered species** Globally, protected areas are viewed as key strategies for preserving nature whilst conserving diverse flora and fauna	L	1 hour 20 min	**Ngene et al. (2017).**

No	Title and outline	Type	Time (hrs)	Readings
	biodiversity. Despite this, their contribution to long-term conservation of biodiversity has mixed levels of success. This lecture will examine different types of protected areas in Kenya and their ecological effectives in conservation of endangered large mammalian wildlife species in the country.			**Okello et al. (2015).** Douglas-Hamilton, et al. (2005).
11	**Ecology, behavior, and demography of lions** African lions were historically abundant and widely found in Kenya and Africa. In this lecture, students will learn key ecological and behavioral attributes of African lion which make them vulnerable to decline in their numbers and make their conservation and management a big challenge. Range and demographic changes of the species in Kenya, Amboseli Ecosystem and Africa will also be examined.	L	1 hour 40 min	**Estes (1991).** **Ogutu and Dublin (2002).**
12	**Use of technology in management and conservation of threatened and endangered species 1**: Advances in technology have increasingly been recognized as an incredible opportunity for enhancing conservation and management of wildlife more so that are great conservation concern. Students will therefore explore various technological opportunities that exist and are currently used in wildlife research and management (e.g., radio telemetry, drones, genetic mapping and analysis techniques, embryology etc.). This will be augmented with appropriate case studies of selected wildlife species that are of conservation concern.	L	1 hour 40 min	**Budhan et al. (2006).** **Steven (2008).**
13	**Demographic changes of elephants in Kenya, Amboseli and Maasai Mara Ecosystems from 1960s to 2023** Historically, elephants were widely spread in the country and were abundant, but this has significantly changed since the early 1960s. Within the country the species has been classified as endangered and a lot of management and conservation actions have been used to enhance their conservation, expand their range, and increase their numbers. This lecture will therefore examine the demographic and range changes of elephants in Kenya, Amboseli and Maasai Mara Ecosystems (key elephant conservation landscapes in the country). Direct and indirect causes of rampant decline in the country will be discussed and how they are a threat to sustainable and long-term conservation and management of the species.	L	1 hour 40 min	**Ngene et al. (2013).**
14	**Use of technology in management and conservation of threatened and endangered species II: case of cheetah conservation in the Maasai-Mara Ecosystem** Ecology, life history traits of cheetah and conservation challenges of this wide-ranging maso-predator. It will also	L	1 hour 40 min	

No	Title and outline	Type	Time (hrs)	Readings
	examine the historical and recent causes of the species' population decline in Africa including the current conservation efforts that are being used to halt rapid decline of the species.			
15	**Application of veterinary medicine in conservation and management of threatened and endangered species** Veterinary medicine is a versatile branch of animal medicine and has continued to play a critical role in wildlife management and conservation. From this perspective, this lecture will explore the role of veterinary medicine in enhancing management and conservation of threatened and endangered species. Aspects which will be covered include but not limited to; collaring, translocation techniques, handling and care of confiscated wildlife, treatment, captive breeding, embryology etc.	L	1 hour 40 min	
16	**Ecology, demography, and conservation of black rhinos in Africa and Kenya** Globally rhinos are found in a few countries with the black rhino being restricted to the African continent. The rhino is one of the existing mega-herbivores that is at the verge of extinction despite global partnerships in enhanced conservation of the species. Broadly the lecture will examine the following: a) species of rhinos and their geographical range, b) general ecology of black rhinos and how they make the species vulnerable to extinction, and challenges in its management and conservation, c) demography, past and current range of black rhinos in Kenya and Africa, and d) conservation approaches at national and continental levels.	L	1 hour 40 min	**Oloo et al. (1994).** **Garnier et al. (2001).**
17	**Ecology, social organization, and behavior of Grevy zebra** This zebra species is rare in Kenya and has a very restricted range. For a variety of factors its future conservation is a great concern, and various strategies are being used to enhance its conservation but with mixed outcomes. Students and Faculty will examine key ecological and behavioral attributes of the species and their relationship to its population performance and vulnerability to mention processes.	L	1 hour 40 min	**Cordingley et al., (2009).** **Sundaresan et al. (2008).**
18	**The role on sanctuaries in recovery and conservation of Black rhino in Kenya** In Kenya black rhinos were almost exterminated by rampant poaching in the 1970s and 1980s. To save the species from eminent extinction, the government conceived use of sanctuaries where founder black rhinos were conserved and actively managed. This lecture will examine the genesis of this conservation approach, requirements for establishment	L	1 hour 40 min	**Cedric et al. (2020).** **Brett, R.A.**

No	Title and outline	Type	Time (hrs)	Readings
	of rhino sanctuaries and challenges faced by these conservation areas.			
19	**Ecological monitoring of black rhino habitats for their effective management and conservation** This monitoring exercise will be done in Ol Pajeta conservancy, a key black rhino conservation area in Kenya. It will focus on the impacts of mega-herbivores on whistling acacia (*Acacia drepanolobium)* which is a keystone woody vegetation species in the conservancy and covers over 20% of the total area and constitutes 40% of all trees. The species constitutes over 75% of the black rhino diet in Ol Pejeta and giraffes spend 90% of their feeding time browsing in habitats where this species is abundant. In this exercise, students and Faculty will assess the impacts of mega-herbivores on whistling acacia in selected sites of the conservancy and use the data to make key inferences.	FEX	5 hours	**Wahungu, G.M, et al. (2011).** **Birkett, A & Stevens-Wood, B (2005).**
20	**Gorilla biology, behavior, and ecology** Students will learn key features of gorilla biology, behavior, ecology, with a particular emphasis on how these traits influence susceptibility and/or resilience to survival threats and inform conservation strategies**.**	L	1 hour 40 min	**Caillaud et al., (2020).**
21	**Gorilla conservation: health monitoring** Students will learn about the health and disease risks facing eastern gorillas, and how conservation partners in the region work and collaborate to conserve them through health monitoring and a "One Health Approach"	L	1 hour 40 min	**Spelman et al. (2013).** **Petrželková et al., (2022).**
22	**Gorilla science: translating lab approaches to field I: gorilla stress physiology** This lecture will examine the kind of information that can be gained from non-invasive collection and analysis of gorilla fecal samples to determine paternity and studying different aspects of their physiology and health	L	50 mins	**Eckardt et al., (2019).**
23	**Gorilla science: translating lab approaches to field II: skeletal project** In this practical, students will learn about the value of preserving naturally accumulated skeletons of gorillas and other wild animals. Unique knowledge of skeletal analysis can provide an understanding about gorilla biology and health. Students will practice techniques in forensic identification to solve the mystery of a missing gorilla from a monitored social group in Volcanoes National Park.	L	50 mins	
24	**Course overview and exam review**	L	50 mins	
	Total		50	
	UMN Instructional Hours*		60	

**UMN defines* an instructional hour as a 50-minute block. SFS syllabi are written in full 60-minute hours for programming purposes. Therefore 50 full hours = 60 UMN instructional hours (for four credit courses) and 25 full hours = 30 UMN instructional hours (for two credit courses).*

Reading List

*Readings in **Bold** are required

1. Adcock, et al. (2007). Habitat characteristics and carrying capacity relationships of 9 Kenyan black rhino areas. Report to the Kenya Wildlife Service, Nairobi, Kenya
2. **Arild et al. (2017).** The endangered Arctic fox in Norway—the failure and success of captive breeding and reintroduction. Polar Research, 36 (9)
3. **Berryman (2004).** Limiting factors and population regulation. Oikos, 105(3), 667–670.
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