THE SCHOOL FOR FIELD STUDIES

Wildlife Health and Conservation
SFS 3254

The School for Field Studies (SFS)
Center for Endangered Species Conservation
Kimana, Kenya

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 may present. In other words, this is a field program, and the field can change.

Course Overview

Invasive species, climate change, and habitat destruction and loss are some of the major threats to biodiversity and the conservation of wildlife. Globally, many financial and human resources have been used to enhance biodiversity conservation but have resulted in mixed success. Many fauna and flora species are still facing numerous anthropogenic pressures like poaching, bushmeat activities, trade in live flora and fauna and their products, pollution, and overfishing, creating a lot of uncertainty on the future of the affected species. The International Union for Conservation of Nature (IUCN) Red List of threatened species shows that >42,000 species face eminent extinction. And still, only 28% of species have been assessed for conservation status, including 33% of reef-building corals, 14% of birds, 34% of confers, 25% of mammals and 40% of amphibians. Each fauna and flora 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. Moreover, across the world, species extinction rates are accelerating at alarming rates, and its ramifications now and in the future can't be underestimated.

Conservation actions have largely focused on mitigating direct or indirect anthropogenic threats facing biodiversity. But emergence of diseases due to intrinsic or extrinsic factors has increasingly been recognized as a major threat to wildlife health and conservation, especially for species that are either endemic, threatened, or endangered. Accordingly, understanding the impact of diseases on wildlife health has become a very important strategy for enhancing conservation. Wildlife health refers to the ability of a wild population, species or individual to cope with stress factors (e.g. environmental and climatic change impacts, finding food, avoiding predators, coping with parasites), while still being capable of producing healthy offsprings. It also concerns the impact of diseases on populations and individuals of a species. Wildlife health has the potential to negatively affect a) human health (e.g. salmonellosis in wild birds) b) economic health (e.g. avian influenza in chickens) c) biodiversity conservation (e.g. avian malaria in wild birds) and d) livestock health (e.g. TB in possums infecting cattle).

Disease is usually interpreted as an illness caused by microscopic agents like viruses, bacteria, parasites and fungi. However, non-infectious agents like algal boom, heavy metals, botulism and pesticides also cause wildlife diseases and death in some instances, and these are equally of concern. Specifically, diseases pose a great risk to wildlife survival and conservation not only by causing death but also by impacting negatively on ecological fitness, reproductive health and longevity of individuals in a population. For instance, amphibian chytridiomycosis is a fungal infection of the skin and has been documented to lead to large scale population decline and extinction of about 200 species of frogs worldwide. This loss has been recognized as one of the most catastrophic biodiversity losses due to disease. Diseases can also be transmitted to mammalian wildlife predators when they feed or scavenge on dead animals. For example, salmonella is known to spread in populations of wild birds like sparrows and not only causes death and loss in some individuals, but it can be transmitted to animals feeding on dead or infected individuals. Salmonella can also spread to humans and other animals causing severe losses. Occurrence of epidemics can also significantly impact wildlife. In this regard, avian influenza, which is a highly contagious virus, can affect wild and domestic birds as well as cross

and infect humans and other mammals. Further, some wildlife diseases can spread to humans (zoonotic) or other animal species and vice versa.

Knowledge of wildlife health and disease is important to effectively manage the health of wildlife. Wildlife health management and health monitoring (e.g. pre-translocation health screens and quarantine) are an integral part of wildlife species recovery programs and significantly compliment other actions or strategies used in wildlife conservation. To promote or enhance wildlife health there's a need to adopt the "One Health Approach". This approach recognizes that the health of animals (wild and domestic), humans and the environment are linked and intertwined. It entails/involves applying a coordinated, collaborative, multidisciplinary and cross-sectoral approach to address existing or potential health risks that originate at the animal-human-environment interface. The strategy involves cooperation between sectors like human and veterinary medicine, agriculture, and the environment to improve disease surveillance, prevention, and response through shared knowledge and holistic strategies. Some of its key applications include mitigating threats arising from climate change, management of zoonotic diseases, and ensuring food safety. Benefits of the "One Health Approach" include a) reducing risks of pandemics by addressing threats where they emerge, and b) fostering sustainability by promoting environmental sustainability by addressing issues such pollution, impacts of invasive species, and loss of biodiversity.

Learning Objectives

In this course students will learn and examine diverse and critical aspects of wildlife health in Africa, Kenya, and in the Amboseli and Maasai-mara landscapes. This learning process will be achieved through interactive classroom learning sessions, experiential field activities, class discussions and lectures by Faculty and various guests. The specific objectives of the course will enable students to:

1. Discuss the concept of One Health as an integrated approach to enhancing wildlife health and enhancing long-term conservation outcomes.
2. Explain the role of wildlife health in local and pastoral community livelihoods.
3. Apply field based quantitative and qualitative research methods to estimate wildlife populations and identify key health concerns in the ecosystem.
4. Demonstrate understanding of ethical practices in wildlife management, including safe handling during translocation, treatment, and euthanasia.
5. Determine conservation and management practices for controlling and preventing wildlife diseases, with a focus on primates and carnivores.
6. Evaluate how wildlife-livestock interactions and local land use practices influence ecosystem health and conservation outcomes in Amboseli.
7. Apply field observations to assess how tourism and livestock management (e.g. wastewater and disinfection practices) affect human, animal, and environment health.
8. Appraise current innovations and techniques used in wildlife monitoring and census in the context of emerging zoonotic risks.
9. Design and produce educational material that can be used to promote One Health in community and conservation settings.

Assessment

The evaluation breakdown for the course is as follows:

Assessment Item	Value (%)
Participation	10
Sustainable Waste Management Pitch	20
Field Exercise 1	10
Field Exercise 2	20
Field Exercise 3	10
Final Exam	30
TOTAL	**100**

Participation (10%)

Faculty will collectively evaluate students on their participation throughout the course. A grading rubric shall be provided to the students at the beginning of the program so that they understand how this will be assessed.

Sustainable Waste Management Pitch (20%)

In this exercise, students will develop an innovative and sustainable pitch for managing waste. Students will work in groups to identify a biodegradable or a non-biodegradable waste in Amboseli ecosystem that has not been well managed and develop a practical pitch that local community can adopt and implement. Students will work as a group and Faculty will guide them on how to do this assignment which will be graded and contribute 20% of the course grade

Field Exercise 1: Wildlife identification and sexing (10%)

In this field exercise, students will identify large mammals in Amboseli National Park using their morphological features. They will also identify the sex and social organization among the animals. Students will write an individual 4-page paper that will be graded to 10% of the overall course grade.

Field Exercise 2: Estimating wildlife populations and distribution (15%)

In this field exercise, students will use road counts to record the number of large mammals in Amboseli National Park. The data collected will be collated and synthesized to estimate wildlife population in the park. Students will complete a group assignment to contribute 20% of the course grade.

Field Exercise 3: Managing tourism generated wastewater OR Livestock disinfection (10%)

Students will participate in both field exercises but will choose one to focus on for their assignment. Assessment summing up to 10% of the course grade is based on clarity of site description, quality of observations, and depth of One Health reflection.

Managing tourism generated wastewater within a One Health framework: Students will conduct a short, structured field observation examining how tourism facilities manage wastewater and how these practices affect human health, animal health, and ecosystem health. Each student will document one site through direct observation and simple mapping of visible wastewater sources, pathways, management practices, and surrounding environmental features. The exercise strengthens students' ability to link visible environmental processes with the broader One Health framework, assessing how wastewater management can reduce risks and enhance multispecies well-being.

Livestock disinfection and One Health interfaces: Students will make observations at a cattle dip or livestock market to outline how disinfection practices influence human, animal, and ecosystem health. Each student will record observations, draw a simple systems diagram, and reflect on the benefits and risks of disinfection practices.

Final Exam (30%)

The exam will contain short answer essays and questions. Students will be expected to clearly demonstrate a critical understanding of key aspects of the course learned in class and during the field exercises and situate them in the context of the importance of promoting wildlife health as a critical foundation of sustainable conservation strategies.

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

Honor Code/Plagiarism – SFS places high expectations on their students and we hold students accountable for their behaviors. SFS students are held to the honor code below. SFS has a zero-tolerance policy towards student cheating, plagiarism, data falsification, and any other form of dishonest academic and/or research practice or behavior. Using the ideas or material of others without giving due credit is cheating and will not be tolerated. Any SFS student found to have engaged in or facilitated academic and/or research dishonesty will receive no credit (0%) for that activity.

> *"SFS does not tolerate cheating or plagiarism in any form. While participating in an SFS program, students are expected to refrain from cheating, plagiarism and any other behavior which would result in a student receiving credit for work which they did not accomplish on their own. Students are expected to report any instance of cheating or plagiarism by others."*

AI Usage in Assignments – SFS acknowledges the growing role of artificial intelligence (AI) tools in education and professional settings. While AI can be a valuable resource for learning and productivity, its use must align with the learning goals and integrity of each assignment. For this reason, students are encouraged to discuss the acceptable uses of AI for each assignment with the instructor. If you wish to use AI for any part of an assignment, consult with the instructor beforehand to ensure that its use adheres to the academic expectations of the course. Let's work together to navigate this evolving landscape responsibly!

Deadlines – Deadlines for written and oral assignments are instated to promote equity among students and to allow faculty ample time to review and return assignments before others are due. As such, deadlines are firm; extensions will only be considered under extreme circumstances. Late assignments will incur a penalty of 10% of your grade for each day you are late. After two days past the deadline, assignments will no longer be accepted. Assignments will be handed back to students after a one-week grading period. Grade corrections for any assessment item should be requested in writing at least 24 hours after assignments are returned. No corrections will be considered afterwards.

Content Statement – Every student comes to SFS with unique life experiences, which contribute to the way various information is processed. Some of the content in this course may be intellectually or emotionally challenging but has been intentionally selected to achieve certain learning goals and/or showcase the complexity of many modern issues. If you anticipate a challenge engaging with a certain topic or find that you are struggling with certain discussions, we encourage you to talk about it with faculty, friends, family, the HWM, or access available mental health resources.

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 course is mandatory, it is important that you are prompt for all activities, bring the necessary equipment for field exercises and class activities, and simply get involved.

Course Content

Type - L: Lecture, **FL:** Field lecture, **FEX:** Field Exercise, **D:** Discussion, **PREP:** Preparation for an exercise

No	*Title and outline*	*Type*	*Time (hrs)*	*Required Readings*
1	**Case study overview: The One Health Approach** Students will learn aspects of the One Health Approach as a strategy of enhancing wildlife health and its long-term conservation. The lecture discuss the interconnectedness of humans, animals, and environmental health in promoting wildlife health and conservation. The role of various sectors and professionals (e.g. public health, veterinary, wildlife scientists and environmentalists) to balance and optimize the health of people, animals, and ecosystems will also be explored.	L	2.0	
2	**Effects of human activities and climate change** Human induced climate change effects are known to be leading contributors in changes in wildlife populations. Students will visit the Amboseli region to observe and learn about how various human activities affect wildlife health. Afterwards, students will develop an innovative and sustainable pitch for managing waste in the Amboseli region.	TL; FEX	2.5	Acevedo-Whitehouse & Duffus (2009). Surasinghe (2011).
3	**Pesticide poisoning and its contribution to the decline of Africa's 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. This has become a major threat to the survival and conservation of many species. Use of pesticides to kill problematic wildlife species, especially large predators (lion, spotted hyena, cheetah and wild dog) has become rampant in the	L	1.5	Odino and Ogada (2008).

No	Title and outline	Type	Time (hrs)	Required Readings
	recent past across the continent. This lecture will examine the use of pesticides as poisons and how this is a threat to the health and conservation of both target and non-target species.			
4	**Wildlife health & conservation awareness** Public knowledge and initiatives about conservation matters form the backbone of a healthy ecosystem. In this guest lecture, students will learn about community awareness on wildlife health, emerging issues, and recent health awareness campaigns.	L; FEX	1.5	Deem, Karesh, & Weisman (2001).
5	**Wildlife identification and sexing** This lecture will introduce students to large mammals sexing and their associated social organization in the Amboseli ecosystem, with a focus on endangered species in the ecosystem.	PREP	1.0	Estes (1991).
6	**Wildlife identification and sexing** Students will identify and sex large mammals in Amboseli National Park and compare the social organization of identified mammals.	FEX	3.0	Kingdon, J. (2015).
7	**Estimating wildlife populations and distribution** With advancement in techniques of animal censusing, this lecture will explore the application of novel techniques that conservationists can use with minimal interference to wildlife.	L	1.5	Okello (2005). Greene (2017).
8	**Estimating wildlife populations and distribution** Students will conduct field mammal count in Amboseli National Park. Transects along the defined road network will be used to count wildlife in the Amboseli National Park.	FEX	3.0	Jachmann (2002).
9	**Solid waste disposal and wildlife health** This course will introduce students to the concepts of solid waste, the environmental and ecological consequences of solid waste disposal, with a focus on its effects on wildlife health.	L	1.5	Ferronato & Torretta (2019).
10	**Waste disposal and wildlife health** Students will visit waste disposal sites to characterize waste, observe wildlife/domestic animals' presence, estimate weight of dumps, and measure proximity of dump to protected areas and residential homes.	FEX	3.0	
11	**Managing tourism generated wastewater** Explore how tourism-generated wastewater shapes human, animal, and ecosystem health in the Amboseli landscape. Examine how infrastructures, governance, and everyday practices mediate	FEX	2.0	Pawłat-Zawrzykraj & Podawca (2020). Holmberg & Ideland (2022).

No	Title and outline	Type	Time (hrs)	Required Readings
	contamination risks and how sustainable wastewater management can enhance multispecies well-being.			
12	**Wastewater field exercise in Maasai Mara** Map tourism-water-wildlife interfaces, focusing on wastewater management in hotels.	FEX	3.0	Staunstrup, Hjalager, et al. (2022).
13	**Local knowledge, livestock-wildlife interfaces, and health systems** Students learn how community knowledge, access to health care, and reported disease patterns (e.g. zoonoses, water-borne, and vector-borne illnesses) interact to shape One Health outcomes in Amboseli.	L	1.5	
14	**Livestock disinfection field exercise** This field exercise in Kimana will examine livestock-wildlife interactions and local practices such as cattle disinfection and mobility management to understand how pastoral knowledge and governance influence ecosystem and animal health.	FEX	3.0	
15	**Tourism, mobility, and health risks** Explore how wildlife tourism infrastructures and visitor movements reconfigure patterns of exposure and health risk in conservation landscapes. Emphasizing a One Health lens, students will analyze how behaviors, infrastructures, and governance systems mediate disease risk, and how local actors perceive and manage these risks within broader political economies of tourism.	L	1.5	Kalema-Zikusoka, Rubanga, Ngabirano & Zikusoka (2021). Nova (2021).
16	**Wildlife nutrition** Explore the key role nutrition plays in population dynamics of wildlife populations, and the impacts of nutritional stress and deficiencies on population performance. It's commonly accepted in wildlife science that wildlife population sizes are a function of habitat quality. Accordingly, wildlife biologists' endeavor to manage wildlife populations by enhancing the nutritional quality of habitats so they can support large and viable populations.	L	1.5	Maskall & Thornton (1996).
17	**Epidemiology and surveillance of wildlife diseases** Understanding disease dynamics and tools for intervention is crucial for the management of outbreaks. This guest lecture will introduce students to disease ecology among wildlife populations and surveillance systems tailored to wildlife settings. Students will discuss a case scenario of a wildlife disease outbreak in Kenya.	L	1.5	Christensen (2001). Muturi, Gachohi, Mwatondo, et al. (2018).

No	Title and outline	Type	Time (hrs)	Required Readings
18	**Application of wildlife surveillance techniques** Technology is rapidly changing how wildlife is monitored and managed, with increased precision and efficiency. Students will learn from conservation experts at the Nairobi giraffe center on the types, applications, and challenges of deploying technologies in developing countries.	L; FL	3.0	Lahoz-Monfort, & Magrath (2021). Shrestha & Lapeyre (2018).
19	**Wildlife capture, handling techniques and care** This session will provide background on wildlife physical capture events, darting process, handling an immobilized animal, euthanasia, wildlife safety, and species-specific recommendation and care	L; FEX	3.0	Smith (2016).
20	**Wildlife welfare and ethics** This lecture will introduce students to ethical principles and welfare considerations involved in the treatment, management, and conservation of wildlife both in-situ and ex-situ.	L	1.5	Soulsbury, Gray, Smith, et al. (2020). Roth (2024).
21	**Snake bite research and intervention program** A guest lecture by an ophiologist will give students a detailed understanding of snakebite epidemiology, antivenom research, and intervention measures used in remote areas in Kenya. Case studies of success and challenges in treatment of snakebite in rural semi-arid areas of Kenya will be explored.	L	1.5	Russell, Schoenbrunner & Janis (2021).
22	**Non-human primate disease management** Students will gain an understanding of clinical signs, diagnosis, and care of disease among non-human primate populations. An understanding of the zoonotic risks associated with non-human primates will be explored through past African case studies. This will be followed by visit to the Kenya Primate Research Institute.	L; FL	3.0	Devaux, Mediannikov, Medkour & Raoult (2019).
23	**The role of veterinary education in wildlife health** Students will learn from educators' perspective how veterinary education plays a role in equipping carriers in zoological and wildlife medicine in developing countries. A discussion on the challenges and opportunities that veterinary students encounter will also be shared.	L; FL	3.0	Aguirre (2009).
24	**Course overview and exam review**	D	1.0	
	Total		**50.5**	
	UMN Instructional Hours*		**60.6**	

**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

1. Acevedo-Whitehouse, K., & Duffus, A. L. (2009). Effects of environmental change on wildlife health. Philosophical Transactions of the Royal Society B: Biological Sciences, 364(1534), 3429-3438.
2. Aguirre, A. A. (2009). Essential veterinary education in zoological and wildlife medicine: a global perspective. Revue scientifique et technique, 28(2), 605
3. Christensen, J. (2001). Epidemiological concepts regarding disease monitoring and surveillance. Acta Veterinaria Scandinavica, 42(Suppl 1), S11.
4. Deem, S. L., Karesh, W. B., & Weisman, W. (2001). Putting theory into practice: wildlife health in conservation. Conservation biology, 15(5), 1224-1233
5. Devaux, C. A., Mediannikov, O., Medkour, H., & Raoult, D. (2019). Infectious disease risk across the growing human-nonhuman primate interface: a review of the evidence. Frontiers in public health, 7, 305
6. Estes, R. D. (1991).
7. Ferronato, N., & Torretta, V. (2019). Waste mismanagement in developing countries: A review of global issues. International journal of environmental research and public health, 16(6), 1060
8. Greene, K. et al., (2017).
9. Holmberg, T., & Ideland, M. (2022). The (in)visibility of sewage management and problematization as strategy for public awareness. The Sociological Review, 71(3), 696-715. https://doi.org/10.1177/00380261221136417
10. Jachmann, H. (2002).
11. Kalema-Zikusoka, G., Rubanga, S., Ngabirano, A., & Zikusoka, L. (2021). Mitigating impacts of the COVID-19 pandemic on gorilla conservation: Lessons from Bwindi Impenetrable Forest, Uganda. Frontiers in Public Health, 9, 655175.
12. Kingdon, J. (2015).
13. Lahoz-Monfort, J. J., & Magrath, M. J. (2021). A comprehensive overview of technologies for species and habitat monitoring and conservation. BioScience, 71(10), 1038-1062.
14. Martin Odino and Darcy Ogada (2008). Furadan use in Kenya: a survey of the distributors and end-users of toxic Carbofuran (Furadan) in pastoralist and rice growing areas. A report submitted to Kenya Wildlife Trust (KWT).
15. Maskall, J. and Thornton, I. (1996). The distribution of trace elements in Kenyan soil profiles and implications for wildlife nutrition. In: Appleton, J.D., Fuge, R and MacCall, G. J.H. (eds). 1996. Environmental geochemistry and health. Geological society special publication, 13: 47-62
16. Muturi, M., Gachohi, J., Mwatondo, A., Lekolool, I., Gakuya, F., Bett, A., ... & Njenga, M. K. (2018). Recurrent anthrax outbreaks in humans, livestock, and wildlife in the same locality, Kenya, 2014–2017. The American journal of tropical medicine and hygiene, 99(4), 833.
17. Nova, N. (2021). Cross-species transmission of coronaviruses in humans and domestic mammals: What are the ecological mechanisms driving transmission, spillover, and disease emergence? Frontiers in Public Health, 9, 717941
18. Okello, M. M. (2005).

19. Pawłat-Zawrzykraj, A., & Podawca, K. (2020). Diversification of Municipalities Located in the Impact Area of National Parks in Terms of Environmental Requirements of Sustainable Tourism. Sustainability, 12(12), 4896. https://doi.org/10.3390/su12124896
20. Roth, E. (2024). “Bats who harm” and “bats who may be harmed”: The interspecies politics of virus sampling. Society & Animals, 33(2), 147-161.
21. Russell, J. J., Schoenbrunner, A., & Janis, J. E. (2021). Snake bite management: a scoping review of the literature. Plastic and Reconstructive Surgery–Global Open, 9(4), e3506
22. Shrestha, Y., & Lapeyre, R. (2018). Modern wildlife monitoring technologies: Conservationists versus communities? A case study: The Terai-Arc landscape, Nepal. Conservation and Society, 16(1), 91-101.
23. Smith, S. (2016). Principles of capture, handling and transportation. In BSAVA Manual of Wildlife Casualties (pp. 17-26). BSAVA Library
24. Soulsbury, C. D., Gray, H. E., Smith, L. M., Braithwaite, V., Cotter, S. C., Elwood, R. W., ... & Collins, L. M. (2020). The welfare and ethics of research involving wild animals: A primer. Methods in Ecology and Evolution, 11(10), 1164-1181
25. Staunstrup, J. K., Hjalager, A.-M., Steffansen, R. N., & Sørensen, M. T. (2022). Water footprints and sewage management challenges in second home tourism. Environment and Planning E: Nature and Space, 6(1), 113-131. https://doi.org/10.1177/25148486221101554
26. Surasinghe, T. (2011). The effects of climate change on global wildlife and terrestrial ecosystems. TAPROBANICA: The Journal of Asian Biodiversity, 2(1).