



THE SCHOOL  
FOR FIELD STUDIES

# Ecology and Conservation of Southeast Asian Elephants

## Syllabus, Summer

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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.



## Course Overview

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This 4 week Special Topics program will focus on the ecology and conservation of the Asian elephant (*Elephas maximus*). Due to a drastic decrease in wild elephant populations, the reality of a world without these charismatic megafauna is becoming a likely possibility. In Asia this is primarily due to a booming human population and increased demand for space. Elephants are of great scientific interest due to their complex behaviors associated with intelligence and social interactions, forming deep family bonds and displaying empathy by recognizing and responding to another elephant's pain or problem and showing signs of grief after the loss of a family member. Saving the elephants requires improved scientific understanding of the species and the increasingly complex environment that they inhabit.



Elephants in Keo Seima Wildlife Sanctuary, Mondulkiri Province, Cambodia (Lloyd, 2017)

Asian elephants are an endangered species that occupy a range covering Bangladesh, Bhutan, India, Nepal, and Sri Lanka in South Asia; and Cambodia, Indonesia (Kalimantan and Sumatra), Lao PDR, Malaysia (Peninsular Malaysia and Sabah), Myanmar, Thailand, and Vietnam in South-east Asia; and China in East Asia. There are believed to be only 40,000 – 50,000 Asian elephants remaining (WWF, 2017), of which 15, 000 – 20, 000 are in captivity. Action plans and conservation strategies have been initiated by government institutions and non-government organizations throughout the Asian elephant range where targeting the interface between humans and elephants is a priority. Different solutions are needed for different areas and often these are continuously changing and evolving.

In Cambodia there are between 250-600 elephants remaining in the wild (IUCN Redlist, 2008). Elephants have long been a symbol of power and prestige as well as a symbol of tradition in Cambodia. From the Angkorian Empire to contemporary royal traditions, elephants have played a central ceremonial role. Elephants continue to play a role in traditional livelihoods of the indigenous Bunong peoples in Cambodia's highlands.



Recreation of Angkor Army on Campaign (Tom Chandler/ Monash University)

The two core populations of elephants in Cambodia are in the Cardamom Mountains Landscape in the South West and the Eastern Plains Landscape in Mondulakiri and Rattanakiri provinces. Some elephant herds in Cambodia are believed to traverse the borders of neighbouring Vietnam and Thailand, hence there are difficulties in accurate population estimates.



quantitative and qualitative methods. Students will contribute to collecting valuable and informative data whilst directly observing elephants, using continuous and interval sampling. Elephant habitat use will be recorded indirectly based on signs such as footprints, dung and feeding signs which can help to distinguish elephant age, group composition and food-plant preferences. Semi-captive elephants provide an ideal and safe opportunity for students to get close enough to observe elephant behaviour and gather data that can contribute to our knowledge of their wild counterparts. Conservation challenges and conflict associated with the human-elephant interface will be explored and students will interview local villagers that are directly affected by wild elephant crop-raiding. Students will be trained in both quantitative and qualitative data collection techniques and learn suitable statistical analyses useful for life sciences research.



Dr Megan English undertaking elephant research with wild elephants in Borneo (English, 2012)

### **Elephant Valley Project:**

Students will spend the second and fourth weeks of the course based at the Elephant Valley Project located within and adjacent to Keo Seima Wildlife Sanctuary in Mondulkiri Province. The Elephant Valley Project, located 15 minutes away from the town of Sen Monorom, is run by the Elephant Livelihood Initiative and Environment (E.L.I.E) whose aim is to 'improve the captive elephant's health and welfare situation by the development of an elephant sanctuary while providing province-wide veterinary care and associated social support programs for the Bunong people'. The Elephant Valley Project is an elephant sanctuary that cares for injured and overworked elephants in a landscape where they forage naturally and roam the surrounding grassy hilltops, lush evergreen and mixed deciduous forests. Students will spend time each day with the skilled and professional Bunong elephant caretakers, known as Mahouts, who are the core of the sanctuary and have a deep connection with their elephants. You

will also join volunteers for meals and, in your free time, you will have the opportunity to participate in scheduled volunteer activities. Read more about Elephant Valley Project here: <http://www.elephantvalleyproject.org/evp-in-depth/>.



An elephant at the Elephant Valley Project in Mondulkiri Province, Cambodia (Lloyd, 2017)

## Learning Objectives

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1. Gain in-depth knowledge about the issues facing wild and captive elephants throughout Asia with particular focus on elephants in Cambodia.
2. Develop skills for conducting rigorous scientific research using quantitative and qualitative methods:
3. Interview local villagers affected by elephant crop-raiding
4. Assist in developing conflict mitigation strategies
5. Indirect observations to estimate elephant demography
6. Behavioural observations for social interactions, foraging and welfare
7. Health checks and remedies for ailments
8. Understanding of Cambodia's highland ecosystems and Bunong traditional culture associated in particular with elephant interactions.
9. Gain confidence in both independent and group work activities and public speaking.

## Assessment

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Assessment Item	Value (%)
Ecosystem engineers assignment	20
Conservation strategies debate	20
Health and welfare quiz	10
Grant proposal elephant research	20
Grant proposal oral presentation	10
Fieldwork participation	10
Class participation	10
<b>Total</b>	<b>100</b>

## Assessment Descriptions

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**Ecosystem engineers assignment (20%):** This assignment will be a 3 page report on the importance of elephants as ecosystem engineers. Habitat fragmentation and encroachment on elephant habitat by agricultural crops are the main causes of decline in wild elephant populations. As elephants require around 10% of their body weight of forage each day, they must traverse vast distances in order to meet these intake needs, sculpting the landscape as they do so. This is becoming increasingly challenging in a human dominated landscape matrix. Students will refer to their lecture material, readings and fieldwork on elephant plant selection and feed intake rates, and discuss the impact of elephants on an ecosystem. Questions will be provided for the students to address in their report.

**Grant proposal human-elephant conflict (20%):** Students will work in groups of three to develop a grant proposal for the Wildlife Conservation Society (WCS) and the Ministry of Environment (MoE). Topics will involve research needs associated with human-elephant conflict in Cambodia. The proposal will follow guidelines provided by the International Elephant Foundation.

**Grant proposal oral presentation (10%):** Each group will give a 15 minute presentation of their research topic to an audience at The Elephant Valley Project, Mondulkiri.

**Health and welfare quiz (10%):** This quiz will focus on elephant health and welfare in captivity. Elephants are not considered to be domesticated, even in captivity. Their ecological and biological needs are shaped by conditions experienced by their wild counterparts (Varma *et al.* 2008); as a result captive elephants can suffer from a variety of physical and psychological ailments. The quiz will be based on information gained from lecture material, readings, and fieldwork experience and involve issues that elephants face in captive environments in Asia.

**Debate:** Students will participate in a debate on a topic associated with a conservation strategy that purportedly benefits wild elephant conservation. Students will be divided to work in two groups to prepare several “arguments” in order to foster healthy respectful debate and clear expression of various outlooks and positions. The members of each team should work together to formulate arguments and supporting facts/ examples which strengthen their side of the debate. Each member of each team will have the opportunity to voice the teams’ arguments, in a specific order and two students will be adjudicators/judges of the debate.

## Grading Scheme

A	95.00 – 100.00%	B+	86.00 – 89.99%	C+	76.00 – 79.99%	D	60.00 – 69.00%
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:** You are expected to read and make notes on all the required articles/book chapters prior to each class. Making use of information from required readings will be part of the course assessments. All readings are available as PDFs on the Student Drive or from a common laptop. It is encouraged that ‘optional readings’ be reviewed by students. The reading list might be updated or changed during the course of the program and some readings that are initially listed as ‘optional’ may be changed to ‘required’.

**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 actively or passively. All assignments unless specifically stated should be individual pieces of work.

**Deadlines** for written and oral assignments are not flexible due to the timing and nature of the program. It is important to respect deadlines to ensure that faculty is able to review and return assignments in a timely manner.

Assignments will be handed back to students after a one-week grading period. Late assignments will incur a 10% penalty for each day that they are late. No assignment will be accepted after three days.

**Participation:** Since we offer a program that is likely more intensive than you are 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 at SFS. Therefore, it is important that you are prompt for all activities, bring the necessary equipment for field exercises and simply get involved.

## Course Content

Key: **SR**- Siem Reap, **EVP** – Elephant Valley Project, **SM**- Sen Monorom and **PP**- Phnom Penh

\*Readings with an asterisk (\*) are optional

<i>Lecture Title and Description</i>	<i>Type</i>	<i>Time (hrs)</i>	<i>Activities</i>	<i>Readings</i>
<b>Orientation (SR)</b> -Welcome, introductions and tour of the center. -Sessions exploring Cambodian cultural norms, health and safety, SFS rules and policies, and student life on the program Town tour		7		

<b>Cambodian History Overview (SR)</b> A brief overview of Cambodia's tumultuous history from the Angkorian period to the present day	L	2		
<b>The Angkor Empire (SR)</b> Explore the World Heritage site of Angkor guided by an expert in the history and culture of the great Angkorian Empire including the temples of Angkor Wat, Ta Prom and Bayon. Students may also get the chance to visit an Angkorian elephant enclosure and marvel huge elephant gates and at the elaborate Elephant Terraces.	L/FT	4		
<b>Introduction to course (SR)</b> This will cover what to expect from the course and fieldwork components and how student participation will contribute to improved knowledge of wild and captive elephants. Explanation of direct and indirect research Methodologies for wild and captive elephants as well as a brief Introduction about Mondulkiri and the Bunong people.	L	4		
<b>Evolution &amp; Distribution (SR)</b> We will discuss the worldwide distribution of elephants with specific focus on <i>Elephas maximus</i> and learn what kinds of habitat conditions and threats exist for extant populations.	L	1.5		Maltby & Bourchier (2011)
<b>EVP Introduction (EVP)</b> Students will be introduced to the manager of the sanctuary and given a briefing of the safety protocols in place. We will then go to the forest and meet the elephants and their caretakers, learning the history of each elephant prior to being brought to EVP.	GL/F W	4		
<b>Ecology (EVP)</b> Students will be taught about elephant habitat use and their role	L/FW	6	-Feed intake rate and quantity	Campos-Arceiz & Blake (2011). English <i>et al.</i> (2014).

as ecological engineers and keystone species in the various ecosystems that they occupy in Asia. Understand the challenges these megaherbivores face based on their resource requirements and foraging preferences due to human encroachment.			-Plant selection preferences, this will contribute to developing our understanding of elephant resource needs in the wild and in captivity.	
<b>Anatomy and Physiology (EVP)</b> Learn about the physical traits of elephants and the differences in these traits between species and sub-species. Sexual dimorphism in physiology will be explored and related back to variations between male and female resource needs.	L/FW	4	How to use footprints and dung boli size to estimate the age class of individuals and group composition as well as how dung can be used to determine population densities of wild elephants using dung density counts along line transects.	
<b>Cognition (EVP)</b> Learn about the brain structure of elephants and complex behaviours such as tool-use, problem solving, cooperation, social interactions and spatio-temporal movement patterns.	L	1.5		Plotnik <i>et al.</i> (2010). McComb <i>et al.</i> (2014).
<b>Communication (EVP)</b> The four ways in which elephants communicate to each other: chemical, tactile, olfaction and vocalisations will be explored and students will learn how studying these with captive elephants can benefit wild elephant conservation.	L	2		
<b>Social behaviour (EVP)</b> Learn about close family ties, social complexity and fission-fusion society of elephants and how characteristics of their strong individual personalities affect how they interact with each other and their environment.	L/FW	4.5	tactile and vocal social interactions will be recorded using continuous sampling, this will help to identify herd dynamics and individual elephant nature and welfare	
<b>Threats to conservation (SM)</b> Learn about the leading threats to Asian elephants including: habitat destruction and fragmentation, human-population growth,	L	2.5		Leimgruber <i>et al.</i> (2003).

poaching from the wild for captivity and poaching for tusks and body parts.				
<b>Human-elephant conflict (SM)</b> Learn about human-elephant conflict in Asian countries, particularly Cambodia, the impact of rapid human population growth and expansion leading to the destruction of elephant habitat and increasing conflict with people.	L/GL/ FW/D	14	Guest Lecture from Wild Earth Allies  Fieldwork: Interviewing local people about conflict with wild elephants, visiting conflict areas such as farms and Community Protected Areas. Disseminating camera trap images of crop-raiding elephants. 1 hour debate	Webber <i>et al.</i> (2011).
<b>Conservation strategies (SM)</b> Understand in-situ and ex-situ conservation strategies and how local government and non-government organisations are involved. Use of elephants as an “umbrella” species where not only the individual species can be protected but entire ecosystems that depend on them.	L/GL	3		Fernando <i>et al.</i> (2012)
<b>Health &amp; welfare in captivity (EVP)</b> Explore the physical and psychological ailments common for captive elephants such as stereotypic behaviour, PTSD, arthritis, foot problems and dietary deficiencies.	L/GL/ FW	6.5	Health Check	Simpson <i>et al.</i> (2017). English <i>et al.</i> (2014).
<b>Culture, mythology, religion and folklore (EVP)</b> Elephants have been immersed in Asian culture and religion for hundreds of years. Students will learn about elephants in Buddhism, Hinduism and Cambodian culture with specific focus on the Bunong people.		3.5	Guest Lecture about Bunong beliefs	L/GL
<b>Statistics for life sciences (EVP)</b> Students will be taught different types of statistical analyses including those used for univariate,	L	1.5		

bivariate and multivariate datasets.				
<b>The future (EVP)</b> The final lecture on elephants will be reflect on what students have learnt, where there are knowledge gaps, and what the future holds for elephants if current trends continue. Possible solutions will be discussed.	L/Disc /FW	4.5	Farewell to the elephants	
<b>Student presentations (EVP)</b>		2		
<b>Cambodian History (PP)</b> In Phnom Penh you will have the chance to immerse in Cambodian history including visits to the Royal Palace and National Museum. You will also learn about Cambodia's recent troubled past and the Khmer Rouge. You will visit one of the prison sites known as S21.		4		
<b>Disorientation (SR)</b> How to utilize and continue your SFS experience beyond the program itself through the Alumni network and campus reps program. Also preparing for the return home and reverse culture shock.		3		
<b>Total Hours</b>		<b>60+</b>	(Additional hours for field work, group work, and project development)	

## Reading List

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Campos-Arceiz, A., & Blake, S. (2011). Megagardeners of the forest—the role of elephants in seed dispersal. *Acta Oecologica*, 37(6), 542-553.

English, M., Gillespie, G., Ancrenaz, M., Ismail, S., Goossens, B., Nathan, S., & Linklater, W. (2014). Plant selection and avoidance by the Bornean elephant (*Elephas maximus borneensis*) in tropical forest: does plant recovery rate after herbivory influence food choices?. *Journal of Tropical Ecology*, 30(4), 371-379.

English, M., Kaplan, G., & Rogers, L. J. (2014). Is painting by elephants in zoos as enriching as we are led to believe? *PeerJ*, 2, e471.

Fernando, P., Leimgruber, P., Prasad, T. & Pastorini, J. (2012). Problem-Elephant Translocation: Translocating the Problem and the Elephant? *PLOS One*, 7, e50917.

IUCN Redlist of threatened species (2008).

<http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T7140A12828813.en>

Leimgruber, P., Gagnon, J. B., Wemmer, C., Kelly, D. S., Songer, M. A., & Selig, E. R. (2003). Fragmentation of Asia's remaining wildlands: implications for Asian elephant conservation. In *Animal Conservation forum*, 6 (4), pp. 347-359. Cambridge University Press.

Maltby, M. & Bouchier, G. (2011). Current Status of Asian Elephants in Cambodia. *Gajah*, 35, 36-42.

McComb, K., Shannon, G., Sayialel, K. N., & Moss, C. (2014). Elephants can determine ethnicity, gender, and age from acoustic cues in human voices. *Proceedings of the National Academy of Sciences*, 111(14), 5433-5438.

Open Development Cambodia (2017).

<https://opendevdevelopmentcambodia.net/map-explorer/>.

Plotnik, J. M., de Waal, F., Moore, D., & Reiss, D. (2010). Self-recognition in the Asian elephant and future directions for cognitive research with elephants in zoological settings. *Zoo biology*, 29(2), 179-191.

Simpson, G., Zimmerman, R., Shashkina, E., Chen, L., Richard, M., Bradford, C. M., ... & Planet, P. (2017). Mycobacterium tuberculosis Infection among Asian Elephants in Captivity. *Emerging Infectious Diseases*, 23(3), 513.

Webber, C. E., Sereivathana, T., Maltby, M. P., & Lee, P. C. (2011). Elephant crop-raiding and human–elephant conflict in Cambodia: crop selection and seasonal timings of raids. *Oryx*, 45(2), 243-251.

Wildlife Conservation Society (2017).

<https://cambodia.wcs.org/Saving-Wild-Places/Seima-Forest.aspx>

World Wildlife Fund (2017).

[http://wwf.panda.org/what\\_we\\_do/endangered\\_species/elephants/asian\\_elephants/](http://wwf.panda.org/what_we_do/endangered_species/elephants/asian_elephants/)