THE SCHOOL FOR FIELD STUDIES

Conservation Science and Practice
SFS 3800

Syllabus

The School for Field Studies (SFS)
Center for Amazon Studies (CAS)
Loreto, Peru

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 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 be present. In other words, the elephants are not always where we want them to be, so be flexible!

Course Overview

The overarching goal of this course is to make students aware of the enormous responsibility and challenges humans have as stewards of the natural environment, and to provide them with the concepts, tools, and incentives for conservation of natural environment. Dramatic changes are occurring in almost every corner of the world, many of which are a result of anthropogenic disturbances. Human activities release many greenhouse gases that contribute to climate change. Humans are overexploiting natural resources, polluting ecosystems, introducing exotic species into ecosystems, and causing habitat destruction at such a high rate that many scientists think that we have entered the sixth mass extinction of life on Earth. The fate of millions of species is dependent on actions that we take in the next few decades.

Adopting an integrative view of the relationship between biodiversity and people, this course explores the concepts and strategies currently used to mitigate, restore, or conserve ecosystems, species, and genetic diversity. Using the Peruvian Amazon and Andean Highlands as our classroom, the course will draw largely from local examples that students will be able to observe first-hand. Furthermore, it will challenge students to integrate and apply their tropical and political ecology knowledge in conservation in order to respond creatively to real-world cases.

The focus of the course is based largely on field activities that build on three core questions that will be answered in a series of lectures, videos, and readings:

1. What is Conservation Science?
2. What are the challenges in conservation science?
3. What are the current tools and strategies used in the practice of conservation science?

The conservation challenges that students will observe in the Amazonian and Andean regions are highly varied and many are repeated across the globe. Therefore, students will be encouraged to critically examine and document a wide variety of threats and learn to apply their theoretical knowledge to resolve complex real-world issues. Moreover, students will be able to draw parallels between Peruvian conservation strategies and those used globally by international agencies. The diversity of challenges and conservation strategies students observe in Peru will provide insight into the complexity of Conservation Science and the importance of treating these challenges within their own context by considering biological, environmental, social, economic and political factors.

Learning Objectives

Students will draw on observations and evidence to assess threats, evaluate the efficacy of conservation practices and offer resource management strategies and alternative incomes to local communities.

Students will be able to:

1. Identify socio-environmental relationships that form the basis of conservation science practices at local, regional and global scales.
2. Identify current challenges in conservation science in different contexts and formulate projects to face them.
3. Identify major threats to biological diversity and their direct and indirect drivers.
4. Employ current conservation methods and analytical tools that make up part of local and global conservation initiatives, including qualitative and quantitative methods.

Assessment

The evaluation breakdown for the course is as follows:

Assessment Item	Value (%)
Participation	10
Quizzes (4)	20
Field Exercise 1	5
Field Exercise 2	15
Field Exercise 3	5
Field Exercise 4	15
Presentation	10
Final Exam	20
TOTAL	**100**

Participation and topic discussions (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.

Quizzes (20%)
Four short quizzes (15 min) will be used to evaluate the three main sections of the course. Each quiz will consist of 4-5 questions administered at the end of the class. Succinct responses are suggested.
Quiz 1: What is conservation science?
Quiz 2: What are the challenges in conservation science?
Quiz 3: Conservation tools (I): Andean conservation
Quiz 4: Conservation tools (II): Amazon section

Field Exercises (FEX) (40%)

Four field exercises will be conducted. With these FEXs students will gain experience for the Directed Research component at the end of the semester. The FEXs require field observation, data collection, analysis and report writing. Each Field Exercise in Conservation Science is different and developed to train students on different aspects of research and the application of this knowledge.

FEX 1 (5%)
Subject: Identify the elements for sustainability in a usual day in the Amazon.
Objective: Our objective is to develop observational skills in the field and learn the scientific method.
Methods: We will visit the Belen Market of Iquitos, a perfect example where biodiversity, humans and economy interconnects via complex dynamics. Students will observe different natural products, interact with local people, and understand how nature is commodified and traded in one of the most biodiverse markets of the world. In a short report, students will reflect about these elements (biodiversity, humans and economy) and about what will be required to make them sustainable over time. Students will produce a report (~600-700 words long) to be used as source of discussion in the next class.

FEX 2 (15%)
Subject: Analysis of monitoring data
Methods: By generating simulated datasets of wildlife monitoring results similar to those collected during an excursion to Tamshiyacu-Tahuayo Regional Conservation area, students will learn how to perform a single-species occupancy model for conservation purposes. Using three different cases, one per group, this FEX aims to show how this emerging form of analysis can provide strong results about the drivers of species occurrence in a given area as well as how these results can be used for conservation. In a scientific report, students will explain the methods used and their individual results. They will also put together a short presentation for their peers.

FEX 3 (5%)
Subject: Reserve design
Methods: Designing a system of natural protected areas can be challenging, especially under financial constraints. With this FEX, students will need to decide which criteria to use (including ecological, biological, social and financial) to guarantee the conservation of 10 threatened species distributed over 10 proposed natural areas, each with different characteristics. Students must do this while optimizing the benefit/cost rate. Students will need to support their proposal in a short report.

FEX 4 (15%)
Subject: Open standards in conservation projects
Methods: Students will learn how to plan a conservation project together with local people by using the CMP Open Standards. The workshop will be developed over 3 sessions (10 hours), going from the definition of the objective, scope and vision and the development of result chains, project indicators and adaptive management loops. Across the different steps, students will present their results to their peers and ask/respond to different questions. At the end, students are expected to have covered all the different stages of CMP Open Standards and learn how to use this tool for future conservation projects.

Presentation **(5%)**
Understanding that scientific knowledge is dynamic and that people may hold differing positions with regards to different subjects is important to developing our own position as scientists and citizens. Here, students will present and facilitate the discussion about controversial topics of Conservation Science based on classic rebuttal papers. Students are encouraged to develop “creative ways” to facilitate the class discussion.

Final Exam (20%)
One written exam will be given based on material covered in lectures, readings, and field experiences.

Grade corrections in any of the above items should be requested in writing at least 24 hours after assignments are returned. No corrections will be considered afterwards.

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 and Lecture Videos - You are expected to have read all required articles and textbook readings prior to each class, as well as listen and watch all lecture videos. In order to encourage reading and watching lecture videos before coming to class or going to the field, discussions will reference readings and lecture videos for that particular day. All readings and lecture videos will be given to each student at the beginning of the semester.

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 (e.g., allowing someone to look at your exam). All assignments unless specifically stated should be individual pieces of work.

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 not be accepted anymore. Assignments will be handed back to students after a one-week grading period.

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

Lectures, Exercises, and Exams

See Faculty Handbook for full description of the table here.

Type: D: Discussion, **FL:** Field Lecture, **GL:** Guest Lecture, **L**: Lecture, **O**: Orientation, **WS**: Workshop

Code	*Title and outline*	*Required Readings*	*Type*	*Hours*
CS1	**Course overview:** Overview and introduction to the course. Directions for the Belen Market outing will be given at the end. Direction for the Open Standards workshop	Week 1 Syllabus	O	1
CS2	**Belen Market Iquitos – Elements for sustainability** Students will explore how biodiversity, people and economy interrelate in this space. By observing and interacting with vendors, they will try to identify challenges for the sustainability of these relationships. **1st Field exercise**	Week 1 CS2_Instructions 1	FL	2

CS3	**What is conservation science?** Overview of the concept of conservation science and practice; with global and local examples of them.	Week 2 - Soulé (1985) - Kareiva and Marvier (2012) -Pearson (2016) Optional: -Mace (2014)	L	1.5
CS4	**Trends in conservation science: The "New Conservation"** Students will discuss different points of view and controversies currently present in conservation science. At the end students will have a better picture of Conservation Science as a dynamic, multidisciplinary and evolving science.	Week 2 - Soulé (2014) - Kareiva (2014) - Doak et al., (2015) - Petriello and Wallen (2015)	D	1.5
CS5	**Environmental justice: Radio Ucamara** Students will attend the experience of a local radio run by Kukama people facing environmental problems and calling for justice in different parts of the Amazon during the last decades.	Week 2 Optional: -Martin et al. (2016a)	GL	2
CS6	**Introduction to challenges in Conservation Science:** Overview lecture on direct and indirect challenges for conservation: including the development of new methods to quantify biodiversity, predict the effects of climate change, human actions and the development of environmental policies. At the start of class, students will have their **first** quiz on "What is Conservation science?"	Week 2 Martin et al. (2016b) Optional: Soares-Filho et al., (2006) Almeida et al., (2016) de Area Leão Pereira et al., (2019) - Video: Sand Wars Trailer	L	1.5
CS7	**Long-term wildlife monitoring in practice – Climate change** a. Wildlife monitoring techniques b. Students will spend one week working within a long-term wildlife-monitoring project that investigates the effects of climate change on mammals.	Week 3 - Bodmer et al. (2017) Tamshiyacu Tahuayo Regional Conservation Area Guest Lec. Richard Bodmer	FL-GL	5

CS8	**Emerging Monitoring Techniques** Overview lecture on emerging monitoring techniques of biodiversity, including the temporal and spatial monitoring of target species, habitat and environmental changes. We also cover the use of citizen science in conservation and give examples of these in the tropics.	Week 3 Guillera-Arroita (2017) Iknayan et al.(2013)	L	1.5
CS9	**Analysis of monitoring data (Part I: Simulations)** Students, in groups, will generate and analyze a hypothetical monitoring data set using a single species occupancy model. **2nd Field Exercise**	Week 4	Lab	1.5
CS10	**Analysis of monitoring data (Part II)** Students will be analyzing the data with covariates under the guidance of the professor	Week 4	Lab	2.5
CS11	**Analysis of monitoring data (Part III)** Students will briefly present their results to their peers.	Week 4	Lab	1.5
CS12	**Over-exploitation and Community based conservation** Field lecture on the Maijuna community, their history and some over-exploitation threats (hunt and logging) in the amazon. - Interview to 2/3 member of the community - Lecture from the BluePlanet NGO: Elizabet - Discussion about how management could make these activities sustainable	Week 4 Video: Guardians of the Forest Sucusari/Explore Napo	FL/D	2
CS13	**Habitat loss and fragmentation** Lecture over habitat loss and fragmentation as main threats to biodiversity. **Led by group 1** Is fragmentation bad/good for biodiversity?	Week 5 Discussion: Fletcher et al., (2018) Fahrig et al., (2019) Optional: Fahrig (2017) Wilson et al., (2016)	L/D	2

CS14	**Climate Change** Lecture over the evidences and the present and future impacts of changes on climate on biodiversity. **Led by Group 2:** The synergy of CC and human land use	Week 5 Discussion: Corlett (2011) Brodie et al., (2012) Optional: Bellard et al (2012)	L/D	2
CS15	**Corruption and conservation** Lecture about the impacts of corruption on biodiversity, especially in the Amazon. **Led by group 3:** Is corruption bad/good for conservation?	Week 5 Discussion: Smith and Walpole (2005) Ferraro 2005 Katzner 2005 Walpole and Smith (2005) Optional: Smith et al., (2003) Laurance et al., (2004)	L/D	2
CS16	**Introduction to Conservation tools: Protected Areas in Peru** Protected areas in Peru and the role of the Peruvian Ministry of the Environment. At the start of class, students will have their **second** quiz about the challenges in conservation science	Week 5 Rodríguez and Young (2000) - Video: Creating new protected areas in Peru - Amazon Conservation Association	L	1
CS17	**Reserve design** Theorical/practical lecture about how to design a reserve system using different criteria. **Field Exercise 3: Students will present a mini report of the exercise**	Week 5 Suggested: Cabeza and Moilanen (2001).	L/Lab	1.5
CS18	**Technology in conservation: Introduction to Geographic Information Systems (GIS)** Lecture introducing GIS. Students will learn the basics on geospatial concepts, use of GPS, and GIS applied to Conservation Science	Week 5	L	1

CS19	**Software for Geographic Information Systems (GIS)** Students will explore different GIS software available to spatially measure and monitor biodiversity, habitat and environmental changes; identifying priorities for conservation management. **Practice. Quantifying recent fires in the Amazon**	Week 5 https://www.globalforestwatch.org Optional: Gorelick et al (2017)	Lab	1.5
	Trip to Cuzco			
CS20	**Biosphere Reserves: Manu National Park** Introduction to one of the main Biosphere reserves of Peru. The history, main studies and their impact in global ecology and conservation	Week 6 **Acjanaco**	FL	0.5
CS21	**Financing a conservation project** Students will need to be creative to successfully fund their conservation project	Week 6 **Wayqecha/Manu**	FL	1.5
CS22	**Tracking climate change footprint in the Andes** Early field lecture surveying mountain birds across an Andean ecotone. How do we track species response to Climate Change?	Week 6 **Wayqecha**	FL	2
CS23	**Sustainable use of natural resources: Using ancient and modern practices in conservation** Lecture of how traditional and modern practices are used in Andean conservation	Week 6 Tito et al (2018) Parque de la Papa	FL	2
CS24	**Using landscape ecology for the conservation of the High Andes ecosystems** The SLOSS dilemma and the total amount hypothesis. Are *Polylepis* birds adapted to habitat fragmentation? At the end of the class, students will have the **3rd quiz** about conservation tools (Part I)	Week 6 Fahrig, L. (2013) Abra Málaga	FL	1.5
	BREAK	Week 7		

CS25	**Visit to Morphosapi butterfly garden and Evergreen Institute** Local project based on local community empowerment, biological research and environmental education (guest lecture – Esteban Fong and Neus Collado).	Week 8	FL	2
CS26	**Ex-situ Conservataion: Amazonian Manatees** Students will explore the case of CREA rehabilitating Manatees populations	Week 8	FL	**2**
CS27	**Alternative incomes - the stingless bee project** Students learn about a traditional sustainable alternative income in Amazonia while learning to manage new hives at CAS	Week 8 - Video: Beekeeping in the Amazon - OnePlanet (Guest lecture - Carlos García)	GL	**3**
CS28	Open standards as a tool to develop conservation projects I	Week 9	WS	4
CS29	Open standards as a tool to develop conservation projects II	Week 9	WS	3
CS30	Open standards as a tool to develop conservation projects III At the end, students will have **a 4th quiz** about conservation tool (II)	Week 9	WS	3
CS31	Conservation science review	Week 10	D	2
CS32	**Final Exam**	Week 10	E	1
		Total hours		**62**

Reading List

Almeida, R. M., Lovejoy, T. E., & Roland, F. (2016). Brazil's Amazon conservation in peril. *Science*, *353*(6296), 228-229.

Brodie, J., Post, E., & Laurance, W. F. (2012). Climate change and tropical biodiversity: a new focus. *Trends in ecology & evolution*, *27*(3), 145-150.

Cabeza, M., & Moilanen, A. (2001). Design of reserve networks and the persistence of biodiversity. *Trends in ecology & evolution*, *16*(5), 242-248.

Corlett, R. T. (2011). Impacts of warming on tropical lowland rainforests. *Trends in ecology & evolution*, *26*(11), 606-613.

de Area Leão Pereira, E. J., Ferreira, S., Jorge, P., de Santana Ribeiro, L. C., Sabadini Carvalho, T., & de Barros Pereira, H. B. (2019). Policy in Brazil (2016–2019) threaten conservation of the Amazon rainforest.

Doak, D. F., Bakker, V. J., Goldstein, B. E., & Hale, B. (2015). What is the future of conservation?. In *Protecting the wild* (pp. 27-35). Island Press, Washington, DC.

Fahrig, L. (2013). Rethinking patch size and isolation effects: the habitat amount hypothesis. *Journal of Biogeography*, *40*(9), 1649-1663.
Fahrig, L. (2017). Ecological responses to habitat fragmentation per se. *Annual Review of Ecology, Evolution, and Systematics*, *48*, 1-23.
Fahrig, L., Arroyo-Rodríguez, V., Bennett, J. R., Boucher-Lalonde, V., Cazetta, E., Currie, D. J., ... & Koper, N. (2019). Is habitat fragmentation bad for biodiversity?. *Biological conservation*, *230*, 179-186.
Ferraro, P. (2005). Corruption and conservation: the need for empirical analyses. A response to Smith & Walpole. *Oryx*, *39*(3), 257-259.
Fletcher Jr, R. J., Didham, R. K., Banks-Leite, C., Barlow, J., Ewers, R. M., Rosindell, J., ... & Melo, F. P. (2018). Is habitat fragmentation good for biodiversity?. *Biological conservation*, *226*, 9-15.
Guillera-Arroita, G. (2017). Modelling of species distributions, range dynamics and communities under imperfect detection: advances, challenges and opportunities. *Ecography*, *40*(2), 281-295.
Iknayan, K. J., Tingley, M. W., Furnas, B. J., & Beissinger, S. R. (2014). Detecting diversity: emerging methods to estimate species diversity. *Trends in ecology & evolution*, *29*(2), 97-106.
Kareiva, P. (2014). New conservation: setting the record straight and finding common ground. *Conservation Biology*, *28*(3), 634-636.
Kareiva, P., & Marvier, M. (2012). What is conservation science?. *BioScience*, *62*(11), 962-969.
Katzner, T. E. (2005). Corruption–a double-edged sword for conservation? A response to Smith & Walpole. *Oryx*, *39*(3), 260-262.
Laurance, W. F. (2004). The perils of payoff: corruption as a threat to global biodiversity. *Trends in Ecology & Evolution*, *19*(8), 399-401.
Mace, G. M. (2014). Whose conservation?. *Science*, *345*(6204), 1558-1560.
Martin, A., Coolsaet, B., Corbera, E., Dawson, N. M., Fraser, J. A., Lehmann, I., & Rodriguez, I. (2016a). Justice and conservation: the need to incorporate recognition. Biological Conservation, 197, 254-261.
Martin, J. L., Maris, V., & Simberloff, D. S. (2016b). The need to respect nature and its limits challenges society and conservation science. *Proceedings of the National Academy of Sciences*, *113*(22), 6105-6112.
Miller, T. R., Minteer, B. A., & Malan, L. C. (2011). The new conservation debate: the view from practical ethics. *Biological Conservation*, *144*(3), 948-957.
Minteer, B. A., & Miller, T. R. (2011). The New Conservation Debate: ethical foundations, strategic trade-offs, and policy opportunities. *Biological Conservation*, *144*(3), 945-947.
Petriello, M. A., & Wallen, K. E. (2015). Integrative reflections on the new conservation science debate. *Biodiversity and Conservation*, *24*(6), 1549-1551.
Rodríguez, L. O., & Young, K. R. (2000). Biological diversity of Peru: determining priority areas for conservation. *AMBIO: A Journal of the Human Environment*, *29*(6), 329-338.
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Soulé, M. E. (1985). What is conservation biology?. *BioScience*, *35*(11), 727-734.
Tito, R., Vasconcelos, H. L., & Feeley, K. J. (2018). Global climate change increases risk of crop yield losses and food insecurity in the tropical Andes. *Global change biology*, *24*(2), e592-e602.

Walpole, M. J., & Smith, R. J. (2005). Focusing on corruption: a reply to Ferraro and Katzner. *Oryx*, *39*(3), 263-264.

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