# Conservation Science and Practice in Peru

# SFS 3800

**Syllabus**
**4 credits**

The School for Field Studies (SFS)
Center for Amazon Studies (CAS)
Tarapoto, 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.

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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 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. Understand what conservation science is and identify socio-environmental relationships that form the bases of conservation science practices at local, regional and global scales.
2. Identify current challenges in conservation science in different contexts.
3. Identify and understand major threats to biological diversity and their direct and indirect drivers.
4. Become familiar with current and traditional 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. Full rubrics for each assessment are at the end of this syllabus.

| Assessment Item | Value (%) |
|---|---|
| Participation | 10 |
| Prelim Exam | 20 |
| Essay and discussion | 10 |
| Field Exercise 1 | 10 |
| Field Exercise 2 | 10 |
| Presentation | 10 |
| Final Exam | 30 |
| **TOTAL** | **100** |

### 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.

### Prelim Exam (20%)

This will be used to evaluate the first two sections of the course. Will consist of 10 questions about: What is conservation science? And What are the challenges in conservation science?

### Essay and discussion (10%)

***Subject:*** What is Conservation Science?
***Objective:*** Understanding what Conservation Science entails
***Methods:*** This course is the link between the Tropical ecology and Political ecology course, therefore, observing the diversity of natural resources used by local people is key to understand the interdependence that exist between them. We will visit a local market, a perfect example of where biodiversity, people, and economy interconnect via complex dynamics. Later, in a discussion session, student group will present pictures from our visit and discuss about what conservation science means for them. Finally, students will need to present an individual essay where they discuss two main things they learned during the visit and how their initial understanding of conservation science have changed.

### Field Exercises (20%)

**Two** field exercises will be conducted. With these FEXs students will gain experience for the Directed Research (DR) 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 (10%)**
***Subject:*** How to develop a monitoring program for species conservation
***Methods:*** Quantify population changes is key to assess if different conservation efforts are contributing to save a target species. In this FEX, we will visit the habitat of and develop a monitoring program for the conservation of a threatened species. The underlying questions of this FEX are (1) what type of data should be collected? (2) how do we account for the temporal and spatial variability and (3) how should

we correct by detectability? By responding these questions, students are expected to have a better understanding of the challenges on wildlife monitoring program and how to deal with those. The report will look like a research proposal and will require student's attention in preparation to Directed Research.

**FEX 2 (10%)**
***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 a whole day, 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. The instructions will be provided at the beginning of the workshop. 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 (10%)
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. Grading will be based on clarity and accuracy of content (3 pts.), audiovisual delivery (3), Q&A/discussion (3) and the previous coordination made with the professor (1).

### Final Exam (30%)
One written exam will be given based on material covered in lectures, readings, and field experiences.

Rubrics details will be e-mail to students together with instructions. 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

**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."*

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

| ***No*** | ***Title and outline*** | ***Type*** | ***Time (hrs)*** | ***Readings*** |
|---|---|---|---|---|
| CS 01 | **Course overview**<br>Overview and introduction to the course. | O | 1.0 | |
| CS 02 | **What is Conservation Science? (1/3)**<br>**Market Visit**<br>Visit to the Market. Students will explore how biodiversity, people and economy interrelate in this space. By observing and interacting with vendors, students will try to identify challenges for the sustainability of these relationships. | FL | 2.0 | Kustz (2022). |
| CS 03 | **What is Conservation Science? (2/3)**<br>**Essay and Discussion**<br>Discussion about our visit to the market. | D | 1.0 | Soulé (1985). Kareiva and Marvier (2012). |
| CS 04 | **What is Conservation Science? (3/3)**<br>**Current trends of Conservation Science**<br>Overview of conservation science with global and local examples. Introduction to the current trends in Conservation Science and examples. Discussion of different points of view and current controversies. | L | 2.0 | Soulé (2013). Kareiva (2014). Doak et al., (2015). |

| ***No*** | ***Title and outline*** | ***Type*** | ***Time (hrs)*** | ***Readings*** |
|---|---|---|---|---|
| CS 05 | **Key Concepts: Habitat and Ecosystems in CS**<br>Lecture about these two concepts and their application in CS. | FL | 2.0 | |
| CS 06 | **Key Concepts: Ecosystem Services and Disservices**<br>Students will discuss the importance of ecosystem benefits or affectations to people and how they shape multiple aspects of conservation science. | FL | 2.0 | |
| CS 07 | **Developing a Monitoring Plan for Species Conservation**<br>A field class in the local National Reserve to become familiarized with different aspects of developing a Monitoring Program. | FL | 2.0 | |
| CS 08 | **Introduction to Monitoring Technics (1/3)**<br>During a multi-day field excursion, students will learn monitoring techniques for terrestrial animals. | GL | 2.0 | |
| CS 09 | **Introduction to Monitoring Technics (2/3)**<br>During a multi-day field excursion, students will learn monitoring techniques for birds. | GL | 2.0 | |
| CS 10 | **Introduction to Monitoring Technics (3/3)**<br>During a multi-day field excursion, students will learn monitoring techniques for aquatic animals. | GL | 2.0 | |
| CS 11 | **Review of the Monitoring Technics**<br>Review the different monitoring techniques applied during our field excursion. | L | 2.0 | Guillera-Arroita (2017)<br>Bailey et al (2014) |
| CS 12 | **Principles of Data Collection**<br>**Working on FEX 1 (1/2)**<br>Review of FEX1 to development of a Monitoring Plan. How to account for temporal and spatial variability as well as for detectability? | L | 2.0 | Iknayan et al. (2013) |
| CS 13 | **Alternative incomes - the stingless bee project**<br>Students learn about a traditional sustainable alternative income in Amazonia while learning to manage new hives at the place. | GL | 2.0 | Video: Beekeeping in the Amazon - OnePlanet |
| CS 14 | **Working on FEX 1 (2/2)**<br>Review of FEX1 to development of a Monitoring Plan. How to account for temporal and spatial variability as well as for detectability? | L | 2.0 | Iknayan et al. (2013) |
| CS 15 | **Key Concepts: Human perception of Nature**<br>We all perceive reality differently. How do perceptions shape nature and our actions? Based on a field experiment, students will discuss their own differences on how they perceive the same natural reality. | FL | 2.0 | |

| *No* | *Title and outline* | *Type* | *Time (hrs)* | *Readings* |
|---|---|---|---|---|
| CS 16 | **Community Based Conservation**<br>We will have the opportunity to continue talking with the local indigenous community and explore how they manage the conservation of their territory. | FL; D | 2.0 | |
| CS 17 | **The use and conservation of aquatic and Terrestrial Resources**<br>Together with member of the local indigenous community, we explore how they manage aquatic and terrestrial resources and the tragedy of the commons. | FL | 2.0 | Berkes (2004) |
| CS 18 | **The Importance of Traditional Knowledge in Conservation and Political Ecology.**<br>Discussion of this important topic from two different perspectives. | FL | 1.0 | Fabiano et al. 2021 |
| CS 19 | **Visit to Indigenous Museum**<br>Students will engage with the history behind the recognition of Indigenous Territory as conservation areas. | FL | 1.0 | |
| CS 20 | **Threats to Biodiversity 1:**<br>**Habitat loss and fragmentation**<br>Lecture over habitat loss and fragmentation as main threats to biodiversity.<br>**Led by group 1** Is fragmentation bad/good for biodiversity? | L; D | 1.0 | Fletcher et al., (2018)<br>Fahrig et al., (2019)<br>Haddad et al., (2015)<br>Fahrig (2017)<br>Fahrig (2018) |
| CS 21 | **Climate Change**<br>Lecture over the evidence, perceptions and impacts of changes on climate in biodiversity. Solutions and challenges.<br>**Led by Group 2** | L; D | 1.0 | Brodie et al., (2012)<br>Bellard et al., (2012)<br>Malhi et al., (2020) |
| CS 22 | **Corruption and the Economy of conservation**<br>Lecture about the impacts of corruption in biodiversity, especially in the Amazon. How this affect conservation and it´s finance.<br><br>**Led by group 3:** Is corruption threating biodiversity conservation? | L; D | 1.0 | Smith et al., (2003)<br>Laurance et al., (2004)<br>Smith and Walpole (2005)<br>Ferraro (2005)<br>Katzner (2005)<br>Walpole and Smith (2005) |
| CS 23 | **Overexploitation: gold mining in the Amazon**<br>Lecture about the impacts of mining in biodiversity, especially in the Peruvian Amazon. | GL; D | 1.0 | Swenson et al., (2011)<br>Caballero et al. (2018) |

| *No* | *Title and outline* | *Type* | *Time (hrs)* | *Readings* |
|---|---|---|---|---|
| CS 24 | **Introduction to Conservation tools: Natural Protected Areas in Peru**<br>Protected areas in Peru and the role of the Peruvian Ministry of the Environment. | L | 2.0 | Rodríguez and Young (2000) |
| CS 25 | **Technology in conservation: Geographic Information Systems (GIS) and Citizen Science: The case of eBird**<br>Lecture introducing GIS and its application with eBird. Students will learn the basics on geospatial concepts, use of GPS, and GIS applied to Conservation Science as well as other technologies currently used in conservation like eBird. | L; FL | 2.0 | Gorelick et al (2017) |
| CS 26 | **Biosphere Reserves and RAMSA sites: Reserva Alto Mayo**<br>Visit to Reserva de Alto Mayo, a new reserve of high biodiversity that protect the cloud forest between the Amazonas and the San Martin Region. Several stops will help us to see the high endemism and different initiatives of Conservation in the area. | FL | 2.0 | |
| CS 27 | **Tracking climate change in the Andes**<br>Early field lecture surveying mountain birds across an Andean ecotone. How do we track species response to Climate Change? | FL | 2.0 | |
| CS 28 | **Food security and conservation: Coffee farms, farmers and conservation in the Andes**<br>Visit to a shaded coffee farm currently working with ICRAF, where different agroforestry approaches are under developing to mitigate the negative affects of Climate Change | GL | 2.0 | |
| CS 29 | **Open standards as a tool to develop conservation projects**<br>Working in three groups, over a few sessions, we aim to develop a project for the conservation of a species, an ecosystem and a landscape through the OS framework. | WS | 5.0 | |
| | **Total contact hours** | | **53** | |

## Reading List


1. Almeida, R. M., Lovejoy, T. E., & Roland, F. (2016). Brazil's Amazon conservation in peril. *Science*, *353*(6296), 228-229.
2. Bailey, L. L., MacKenzie, D. I., & Nichols, J. D. (2014). Advances and applications of occupancy models. *Methods in Ecology and Evolution*, *5*(12), 1269-1279.
3. Berkes, F. (2004). Rethinking community-based conservation. *Conservation biology*, *18*(3), 621-630.
4. Brodie, J., Post, E., & Laurance, W. F. (2012). Climate change and tropical biodiversity: a new focus. *Trends in ecology & evolution*, *27*(3), 145-150.
5. Cabeza, M., & Moilanen, A. (2001). Design of reserve networks and the persistence of biodiversity. *Trends in ecology & evolution*, *16*(5), 242-248.
6. Corlett, R. T. (2011). Impacts of warming on tropical lowland rainforests. *Trends in ecology & evolution*, *26*(11), 606-613.
7. 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.
8. 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.
9. Fahrig, L. (2013). Rethinking patch size and isolation effects: the habitat amount hypothesis. *Journal of Biogeography*, *40*(9), 1649-1663.
10. Fahrig, L. (2017). Ecological responses to habitat fragmentation per se. *Annual Review of Ecology, Evolution, and Systematics*, *48*, 1-23.
11. 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.
12. Fabiano, E., Schulz, C., & Branas, M. M. (2021). Wetland spirits and indigenous knowledge: Implications for the conservation of wetlands in the Peruvian Amazon. Current Research in Environmental Sustainability, 3, 100107.
13. Ferraro, P. (2005). Corruption and conservation: the need for empirical analyses. A response to Smith & Walpole. *Oryx*, *39*(3), 257-259.
14. 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.
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.
16. 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.
17. Kareiva, P. (2014). New conservation: setting the record straight and finding common ground. *Conservation Biology*, *28*(3), 634-636.
18. Kareiva, P., & Marvier, M. (2012). What is conservation science?. *BioScience*, *62*(11), 962-969.

19. Katzner, T. E. (2005). Corruption–a double-edged sword for conservation? A response to Smith & Walpole. *Oryx*, *39*(3), 260-262.

20. Laurance, W. F. (2004). The perils of payoff: corruption as a threat to global biodiversity. *Trends in Ecology & Evolution*, *19*(8), 399-401.

21. Mace, G. M. (2014). Whose conservation?. *Science*, *345*(6204), 1558-1560.

22. Malhi, Y., Janet Franklin , Nathalie Seddon , Martin Solan , Monica G. Turner , Christopher B. Field and Nancy Knowlton. Climate change and ecosystems: threats, opportunities and solutions. 375Phil. Trans. R. Soc. B. http://doi.org/10.1098/rstb.2019.0104

23. Martin, A., Coolsaet, B., Corbera, E., Dawson, N. M., Fraser, J. A., Lehmann, I., & Rodriguez, I. (2016). Justice and conservation: the need to incorporate recognition. Biological Conservation, 197, 254-261.

24. 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.

25. 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.

26. Petriello, M. A., & Wallen, K. E. (2015). Integrative reflections on the new conservation science debate. *Biodiversity and Conservation*, *24*(6), 1549-1551.

27. 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.

28. Senior, R. A., Hill, J. K., & Edwards, D. P. (2019). Global loss of climate connectivity in tropical forests. *Nature Climate Change*, 1.

29. Smith, R. J., & Walpole, M. J. (2005). Should conservationists pay more attention to corruption?. *Oryx*, *39*(3), 251-256.

30. Smith, R. J., Muir, R. D., Walpole, M. J., Balmford, A., & Leader-Williams, N. (2003). Governance and the loss of biodiversity. *Nature*, *426*(6962), 67.

31. Soares-Filho, B. S., Nepstad, D. C., Curran, L. M., Cerqueira, G. C., Garcia, R. A., Ramos, C. A., ... & Schlesinger, P. (2006). Modelling conservation in the Amazon basin. *Nature*, *440*(7083), 520.

32. Soulé, M. (2014). The “new conservation”. In *Keeping the wild* (pp. 66-80). Island Press, Washington, DC.

33. Soulé, M. E. (1985). What is conservation biology?. *BioScience*, *35*(11), 727-734.

34. 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.

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

36. Wilson, M. C., Chen, X. Y., Corlett, R. T., Didham, R. K., Ding, P., Holt, R. D., ... & Laurance, W. F. (2016). Habitat fragmentation and biodiversity conservation: key findings and future challenges.