THE SCHOOL FOR FIELD STUDIES

Conservation Science and Practice

SFS 3800

Syllabus

The School for Field Studies (SFS)
Center for Amazon Studies (CAS)
Iquitos, 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 they may 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 humans have as stewards of the natural environment, and to provide them with the concepts, tools, and incentives to affect conservation of the natural environment. Dramatic changes are occurring in almost every corner of the world; many of which are a result of anthropogenic disturbances. Human activities are changing atmospheric gases and contributing 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.

With a strong focus on the environmental biodiversity, and species conservation, and drawing largely from local examples that students will observe first-hand, this course explores the effect that humans have on nature and the solutions and mitigation that can be applied to protect biological diversity, ecosystems, species, and genetic diversity. By nature an interdisciplinary field, where concepts and research in ecology, environmental science, taxonomy, genetics, and evolution inform the practical applications of social, economic, and behavioral sciences, conservation is as much about managing people as it is about managing biodiversity.

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

1. Conservation Science and Ecosystem Services
2. Threats to biodiversity
3. Conservation strategies and Alternative incomes

The conservation issues that students will observe in the Amazonian and Andean regions are highly varied, and many are repeated across the globe. Furthermore, by learning to critically examine and document the threats they see in the field students learn to apply their theoretical knowledge to complex real-world situations. Students will be able to draw parallels between Peruvian conservation strategies, and those used across the globe. The diversity of threats and conservation strategies students observe in Peru will allow an insight into the complexity of conservation biology and the importance of treating every issue within the local context, taking into account biological, environmental, social 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 the current questions being addressed by conservation science in both global and local perspectives

2. Define the major threats to biological diversity and identify both direct and indirect drivers of the threats
3. Employ field research methods and analytical tools, including qualitative and quantitative methods, that make up part of a practicing conservationists' tool kit
4. Design and use wildlife survey techniques to assess wildlife populations, threats and the need for conservation action
5. Design and evaluate conservation strategies and plans aimed at protecting and supporting biodiversity, and promoting the social processes that enable these strategies

Assessments

Assessment Item	Value (%)
Oral presentations (2)	10
Short exercises (3)	15
Field Exercise	20
Public dissemination 'Popular press' report – Tamshiyacu Tahuayo	10
Participation	10
Final Exam	20
TOTAL	100

Assessment Descriptions

A grading rubric will be provided for each assignment.

Oral presentations (in pairs) (10%): Students will deliver an oral summary of a scientific paper to the class (10-15 min). One presentation on threats to biodiversity will be at SFS center (PowerPoint presentations are mandatory) and one during a field trip. It is expected that students include a critique to the paper and/or personal opinion about the topic. Detailed instructions will be given in advance.

Short exercises (15%): Students will deliver three short assignments. Detailed instructions will be given in advance.

- Fisheries at Nauta: Each student will write a one-page report (single space) describing a species of fish, reporting the measured size at Nauta market and comparing it to the minimum size established by the local regulatory authorities.
- Mapping: By using QGIS software, each student will create a map that includes key elements (scale bar, legend, grid, etc.), and will provide a short description of it (max. 250 words).
- Essay responding to Pyron, 2017: Each student will write a short essay (max. 1000 words) focusing on the question "Why biological conservation matters". It is expected that students integrate the topics covered during the semester, include examples of the Amazon area, and use at least five scientific references.

Public dissemination 'Popular press' report on conservation research in Tamshiyacu Tahuayo (10%): Wider dissemination – an article, blog, film or 'popular press' or social media piece on the value, threats,

monitoring and conservation action in PSNR. This assignment is by nature 'open', but concise works are favored. Assignments will be assessed on the content of their story, but also the style and originality of the final product. Assignments will be 'published' on SFS media, but an offline version must be submitted for grading. (Products in Spanish are optional).

Field Exercise (20%): One field exercise will be written up formally in the form of a scientific paper. This assignment should be no more than 1500 words (not including bibliography, tables, or figures). The exercise itself will be done in groups, and the reports will be done individually. (Detailed instructions will be given in advance).

- Management plan for extraction of *Socratea exorrhiza* palm. By collecting data at CAS forest, and applying basic concepts on resource management, students will design a baseline for a management plan for extraction of *S. exorrhiza* palm and show the main findings in a map.

Participation (10%): Participation in *all* activities relating to the Conservation Science and Practice course is graded. Good participation can include asking questions and interacting with local experts during field excursions, expressing opinions during class discussions, and peer teaching. Your participation and interaction with community and project members is an important part of the course. Note that participation is scored particularly highly during guest lectures.

Final Exam (20%): One final exam, which includes short answer and essay questions.

Grading Written Assignments

All assignments should be written and/or presented in grammatically correct English, using proper sentences, paragraphs, punctuation, etc. Writing should be succinct. An incoherent narrative will be considered an expression of faulty scientific reasoning. The evaluation of written work is holistic, with quality levels and criteria as stated below. Numbers are listed in parentheses beside each quality level, based on a grading scale of 100 points. A more-detailed grading rubric will be supplied in class.

Exceptional (95 to 100 points). The work goes well beyond the task assigned. It is impressive, unusually complete, and imaginative. Excellent use is made of the reference material cited within the paper or of examples cited. The scientific conclusions are clearly supported by data presented and there is evidence of originality in analysis. Reference material shows excellence with respect to both breadth and depth. Only outstanding submissions will be designated as Exceptional.

Strong (85 to 95 points). The work fully engages the major scientific principles embodied in the topic. Data are good and/ or well-chosen to convey information. The scientific analysis makes good use of the data presented. The writing demonstrates a clear understanding of the fundamental issues of the topic being explored. Reference material is appropriate for the topic being discussed.

Respectable (75 to 84 points). A sensible approach to addressing the issues contained in the topic being explored is shown. The writing engages most of the appropriate scientific issues and principles. Some problems are evident: the choice of data or examples is correct, but incomplete; the scientific analysis, though generally correct, shows gaps; pertinent information may be missing. These omissions do not seriously hinder the usefulness of the work. Reference material is good but incomplete.

Marginal (70 to 74 points). The work partially engages the major scientific principles embodied in the topic being explored. The work generally relates to the assigned task, but gaps and problems are prominent and interfere with its effectiveness. Data or examples are poorly chosen and do not contribute substantially to the scientific analysis. The analysis has serious gaps. Reference material is shallow or only marginally appropriate.

Weak (60-69 points). The work shows little depth. The effort is spotty with only fragmentary evidence of understanding the data, examples, and reference material in reporting on the subject. The analysis is grossly incomplete, and reference material is absent or inappropriate. Minimal (less than 60 points). There is little or no meaningful effort in evidence. The approach taken is devoid of knowledge of the principles embodied in the topic being explored. Analysis is absent or shallow. No appropriate references are cited.

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 any 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 stated for several reasons: they are a part of working life to which students need to become accustomed and promote equity among students, and deadlines allow faculty time to review and return assignments before others are due. 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 might be used to at your home institution, missing even one lecture can have a proportionally greater effect on your final grade simply because there is little room to make up for lost time. Participation in all components of the program is mandatory because your actions can significantly affect the experience you and your

classmates have while at SFS. Therefore, it is important that you are *prompt for all activities*, bring the necessary equipment for field exercises and directed research, and simply get involved.

Course Content

Type: **L**-Lecture, **FL**- Field Lecture, **FEX**- Field Exercise, **GL**- Guest lecture
(Schedule may change due to unexpected circumstances).

No.	*Lecture / Activity*	*Time (hrs)*	*Type*	*Readings and videos*
CS1	**Course overview** Overview and introduction to the course.	1.0	L	Week 1
CS2	**What is conservation science?** Students will discuss Pyron's paper (2017). Overview lecture on conservation biology and conservation science. Introduction to ecosystem services (Briefing Belen Market visit)	2.0	L	Week 1 - Pyron (2017) - Soulé (1985) - Kareiva and Marvier (2012)
CS3	**Belen Market Iquitos - Non-timber forest products** Students to find products from a set list. By interacting with vendors, they will try to find out where the products come from and how they are produced or extracted.	1.0	FL	Week 1 - Vasquez and Gentry (1989)
CS4	**Non-timber forest products** Discussion on non-timber forest products found in Belen Market. Class on ecosystem services in the Amazon.	1.0	L	Week 1
CS5	**Threats to biodiversity I** We list global threats as a class and then focus on threats to Amazonia. Logging, agriculture, climate change, road ecology, fragmentation, invasive species. (Briefing Nauta fish market visit)	2.0	L	Week 2 - Video: What Ever Happened To Saving The Rainforest - Laurance (2009)[+], Laurence et al. (2014)[+]
CS6	**Fisheries at Nauta.** Estimation of size of three fish species at Nauta market and comparison to minimum size established by the local regulatory authorities. Class on fisheries in the Amazon.	2.0	FL	Week 2
CS7	**Threats to biodiversity II** Class on threats to Amazonian biodiversity (cont…) Drug trafficking, waste management (plastic),	2.0	L	Week 2 - Video: Peru's dirty gold – TechKnow - Video: The story of stuff

	non-timber forest products, overfishing, mining, tragedy of the commons			- Hardin (1968), Asner et al. (2013)[+], Bernardes & Günther (2014)[+]
CS8	**Biodiversity** Discussion on the biodiversity concept, biodiversity indices and its implications on decision making for conservation.	1.0	L	Week 2
CS9	**Introduction to Monitoring techniques** Overview lecture on monitoring techniques. Monitoring environmental variables, habitat structure and target species. Bioindicator species. Examples of monitoring programs in the tropics.	1.5	L	Week 2 - Sutherland (2010). Contents, pp. 1-10, 408-410.
CS10	**Hunting and bushmeat** **Study case The Maijuna – community conservation** Lecture on the Maijuna community, threats and conservation strategies. (Trip overview and academic briefing for the trip to Sucusari)	1.0	L	Week 3 - Video: Guardians of the Forest - Ripple et al. (2016). - Gilmore et al. (2010), pp. 159-165 plus the maps and color plates
CS11	**Hunting in the Peruvian Amazon and the use of hunting at mammal mineral licks** Students will interact with local hunters from the village of Sucusari and interview them informally about their hunting practices, preferences and experiences (guest lecture – Brian Griffiths).	2.0	FL/GL	Week 3 - Blake et al. (2012)
CS12	**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 (measuring and monitoring biodiversity, analyzing the geographic distribution of endangered species, landscape ecology, identifying priorities for conservation management, etc.)	1.0	L	Week 4 - Video: Why all maps are wrong?
CS13	**Policy responses to ecosystem degradation** International conservation agreements Conservation priorities Protected areas as a conservation strategy Endangered Species Act, IUCN red list	1.0	L	Week 4 - Video: The IUCN Red List A Barometer of Life - Video: The IUCN Red List Guiding Conservation for 50 years - Peres and Zimmerman (2001)

CS14	**Protected Areas in Peru** Protected areas in Peru and the role of the Peruvian Ministry of the Environment (guest lecture – Steven Sevillano)	1.0	GL	Week 4 - Rodríguez and Young (2000) - Video: Creating new protected areas in Peru - Amazon Conservation Association
CS15	**Visit to white-sand forest ("bosques de varillales")** Threats to white-sand forests in Allpahuayo-Mishana National Reserve. Conservation of endangered ecosystems.	1.0	FL	Week 4 - Video: Sand Wars Trailer - Fine and Bruna (2016) - Fine and Baraloto (2016)*
CS16	**Using QGIS** Students will learn the basic feature of QGIS software as a tool to manage geospatial data and show information visually by creating maps. Students will be able to create a map, including key elements (scale bar, legend, grid, etc.)	2.0	L	Week 4
CS17	**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. c) Conservation in Tamshiyacu Tahuayo Regional Conservation Area	5.0	FL/GL	Week 5 - Bodmer et al. (2017)
CS18	**Conservation issues in the Andes** Students will take notes during the excursion to Cusco and the surrounding area: Wayqecha, Parque de la Papa, Abra Malaga and Huacarpay. Students will record conservation issues; what should be conserved and why, who the stakeholders are, what the threats are, and what conservation actions are currently in place. Notes will be discussed back in CAS.	4.0	FL	Week 6 - Video: Removing Cattle from Manu National Park - Aucca and Ramsay (2005)*, Mathez-Stiefe et al. (2017)*
CS19	**Human-wildlife coexistence** Lecture on human-wildlife coexistence in Wayqecha Cloud Forest surroundings (Denise Mateo, San Diego Zoo Global).	1.0	GL	Week 6 - Goldstein et al. (2006)
CS20	**Andean bear tracks** Case study on human-wildlife coexistence. Students will look for Andean bear tracks in	2.0	FL	Week 6

	Wayqecha Cloud Forest surroundings (Denise Mateo, San Diego Zoo Global).			
CS21	**Conservation at Wayqecha Cloud Forest** Research at Wayqecha Cloud Forest Biological Station. Mission of ACCA (Asociación para la Conservación de la Cuenca Amazónica; guest lecture - Javier Farfán)	1.0	L	Week 6
CS22	**Community conservation, management & sustainability** Overview lecture on community conservation, management and sustainability, ecotourism, alternative incomes. Comparison between conservation strategies implemented in the Amazon and the Andean regions	1.0	L	Week 8 - Berkes (2007)
CS23	**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).	1.0	FL/GL	Week 8 - Fraser et al. (2006)
CS24	**Visit to "paiche" farm** Students will visit a fish farm, where local producers grow "paiche" (*Arapaima gigas*) as an alternative income rather than fish from the wild.	1.0	FL	Week 8
CS25	**Study case – "Paiche" farming along Iquitos-Nauta road** Discussion on ecological and social implications of fish farming in the Iquitos region.	1.5	L	Week 8 - Bocanegra et al. (2016)
CS26	**Field Exercise (FEx) briefing**	0.50	L	Week 8
CS27	**FEx- Management plan for extraction of *Socratea exorrhiza* palm** Students will collect data on the spatial distribution and size of *S. exorrhiza* at CAS forest, in order to design a baseline for a management plan for extraction of palm.	2.0	FEX	Week 8
CS28	**FEx review and data analysis**	2.5	L	Week 8
CS29	**Alternative incomes - the stingless bee project** Students learn about a traditional sustainable alternative income in Amazonia while learning	3.0	GL/FL	Week 9 - Klein et al. (2007) - Video: Beekeeping in the Amazon - OnePlanet

	to manage new hives at CAS (guest lecture - Carlos García)			
CS30	**Wildlife trade, CITES, rescue centers, welfare & reintroductions** a) Briefing on CREA visit b) CREA Rescue center tour and guest talks on i) rescue and reintroduction and ii) conservation education c) Discussion on the role of rescue centers: Wildlife trade, rescue centers, reintroductions, conservation education and conservation funding.	2.5	FL	Week 9 - Adimey et al. (2012)* - Video: Illegal animal trafficking in Peru Unreported World
CS31	**Sustainable use of ornamental fish to protect forests** *Aquatrade* ornamental fish exporters visit – brings together themes of extraction, sustainability alternative incomes/values for intact forest, endangered species, links with business, international trade in wildlife, animal welfare, diversity, management and more.	2.0		Week 9 - Video: Project Piaba For Ornamental Fish - Video: Fish Collectors Peru - Chao and Prang (1997) - Moreau and Coomes (2007)*
CS32	**Reforestation and Forest restoration strategies** Discussion on forest restoration strategies (natural regeneration, active vs. passive restoration). Visit to a local farm, where students will learn about an initiative on reforestation.	2.0	FL	Week 10 - Meli et al. (2017)
CS33	**Permaculture as a tool for conservation science** Students will visit a local farm and discuss the potential of permaculture systems as a conservation strategy in the Amazon region.	1.0		Week 10
CS34	**Exam review** Lecture summarizing the course contents. Final reflections	2.0	L	Week 10
CS35	**Final exam**	1.5		Week 10
	TOTAL HOURS	**60**		

[+] Papers previously assigned, to be presented at CAS.

* Papers previously assigned, to be presented on site.

Reading List

Adimey, N., et al. (2012). Manatee Rescue, Rehabilitation, and Release Efforts as a Tool for Species Conservation, in: Sirenian Conservation: Issues and Strategies in Developing Countries. University Press of Florida, pp. 204–217.

Asner, G.P., et al. (2013). Elevated rates of gold mining in the Amazon revealed through high-resolution monitoring. Proceedings of the National Academy of Sciences 110, 18454–18459.

Aucca, C. and Ramsay, P.M., (2005). Management of biodiversity and land use in southern Peru: ECOAN's activities to help conserve *Polylepis* woodlands. Mountain Research and Development, 25(3), 287-289.

Berkes, F., (2007). Community-based conservation in a globalized world. Proceedings of the National Academy of Sciences 104, 15188–15193.

Bernardes, C. and Günther, W., (2014). Generation of domestic solid waste in rural areas: case study of remote communities in the Brazilian Amazon. Human Ecology, 42 (4), 617–23.

Blake, J.G., Mosquera, D., Salvador, J., (2012). Use of mineral licks by mammals and birds in hunted and non-hunted areas of Yasuní National Park, Ecuador: Hunting and mineral lick use in lowland Ecuador. Animal Conservation 16, 430–437.

Bocanegra, F.A., et al. (2006). Paiche: The giant of the Amazon. Instituto de Investigaciones de la Amazonía Peruana, 1- 70.

Bodmer, R., et al. (2018). Major shifts in Amazon wildlife populations from recent intensification of floods and drought: Amazon Wildlife Populations. Conservation Biology 32, 333–344.

Chao, N.L. and Prang, G., (1997). Project Piaba-towards a sustainable ornamental fishery in the Amazon. Aquarium Sciences and Conservation, 1(2), pp.105-111.

Fine, P.V.A., Baraloto, C., (2016). Habitat Endemism in White-sand Forests: Insights into the Mechanisms of Lineage Diversification and Community Assembly of the Neotropical Flora. Biotropica 48, 24–33.

Fine, P.V.A., Bruna, E.M., (2016). Neotropical White-sand Forests: Origins, Ecology and Conservation of a Unique Rain Forest Environment. Biotropica 48, 5–6.

Fraser, E.D.G., (2006). Bottom up and top down: Analysis of participatory processes for sustainability indicator identification as a pathway to community empowerment and sustainable environmental management. Journal of Environmental Management 78, 114–127.

Gardner, E. (2012). Peru battles the golden curse of Madre de Dios. Nature 486, 306–307.

Gilmore, M.P., (2010). Perú: Maijuna. Rapid Biological and Social Inventories Report 22. M.P. Gilmore, C. Vriesendorp, W.S. Alverson, A. del Campo, R. von May, C. López Wong, and S. Ríos Ochoa (eds.). The Field Museum, Chicago. (pp.159-165 plus the maps and color plates).

Goldstein, I., et al. (2006). Andean bear–livestock conflicts: a review. Ursus 17, 8–15.

Hardin, G. (1968). The tragedy of the commons. Science 162, 1243-1248.

Kareiva, P., Marvier, M., (2012)., What is conservation science? BioScience, 62(11), 962-969.

Klein, A.-M., et al. (2007). Importance of pollinators in changing landscapes for world crops. Proceedings of the Royal Society B: Biological Sciences 274, 303–313.

Laurance, W.F., et al (2009). Impacts of roads and linear clearings on tropical forests. Trends in Ecology & Evolution 24, 659–669.

Laurance, W.F., Sayer, J., Cassman, K.G., (2014). Agricultural expansion and its impacts on tropical nature. Trends in Ecology & Evolution 29, 107–116.

Mathez-Stiefel, S., et al. (2017). Research Priorities for the Conservation and Sustainable Governance of Andean Forest Landscapes. Mountain Research and Development, 37(3), 323-339.

Moreau, M.A. and Coomes, O.T., (2007). Aquarium fish exploitation in western Amazonia: conservation issues in Peru. *Environmental Conservation*, *34*(1), pp.12-22.

Peres, C.A. and Zimmerman, B., (2001). Perils in parks or parks in peril? Reconciling conservation in Amazonian reserves with and without use. Conservation Biology, 15(3), pp.793-797.

Pyron, A., (2017). We don't need to save endangered species. Extinction is part of evolution. The Washington Post. URL https://www.washingtonpost.com/outlook/we-dont-need-to-save-endangered-species-extinction-is-part-of-evolution/2017/11/21/57fc5658-cdb4-11e7-a1a3-0d1e45a6de3d_story.html?utm_term=.8bb6946de4be

Ripple, W.J., et al. (2016). Bushmeat hunting and extinction risk to the world's mammals. Royal Society Open Science 3.

Rodríguez, L.O., Young, K.R., (2000). Biological Diversity of Peru: Determining Priority Areas for Conservation. AMBIO: A Journal of the Human Environment 29, 329–337.

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

Sutherland, W.J., 2006. Ecological census techniques: a handbook. Cambridge University Press, Cambridge, UK; New York.

Vasquez, R. and Gentry, A.H., (1989). Use and Misuse of Forest-harvested Fruits in the Iquitos Area. Conservation biology, 3(4), pp.350-361.