



S F S THE SCHOOL
FOR FIELD STUDIES

Patagonian Winter SFS 3282

Syllabus

The School for Field Studies (SFS)
Center for Climate Studies (CCS)
Puerto Natales, Chile

This syllabus may develop or change over time based on local conditions, learning opportunities, and faculty expertise. Course content may vary from year to year.



COURSE CONTENT SUBJECT TO CHANGE

Please note that this is a copy of a recent syllabus. A final syllabus will be provided to students on the first day of academic programming.

SFS programs are different from other travel or study abroad programs. Each iteration of a program is unique and often cannot be implemented exactly as planned for a variety of reasons. There are factors which, although monitored closely, are beyond our control. For example:

- Changes in access to or expiration or change in terms of permits to the highly regulated and sensitive environments in which we work;
- Changes in social/political conditions or tenuous weather situations/natural disasters may require changes to sites or plans, often with little notice;
- Some aspects of programs depend on the current faculty team as well as the goodwill and generosity of individuals, communities, and institutions which lend support.

Please be advised that these or other variables may require changes before or during the program. Part of the SFS experience is adapting to changing conditions and overcoming the obstacles that may present. In other words, the elephants are not always where we want them to be so flexibility is key.

Course Overview

The Patagonian winter is a defining aspect of the ecological and social systems of the region. This course will examine the different ways that winter affects human and non-human systems. This course brings you to the world-famous Torres del Paine National Park in the stillness of winter, to observe the camelid guanacos and flightless ñandús as they get ready for the approaching winter. The shortening days drive changes in the ranching practices in the *estancias* in the area as they move their livestock to winter pastures. The approaching Winter Solstice also connects indigenous communities as they make ready for the coming New Year. Finally, the winter brings the season when glaciers would normally be recovering their mass. However, climate change is creating changes in all of these interactions.

High-latitude regions, such as Patagonia, are often more prone to the effects of climate change, making changes more apparent and significant. Indeed, climate change in Patagonia is quite clear, and one of the seasons that have seen the most marked change is the winter. There has been less precipitation, and higher temperatures, meaning that there is less overall precipitation, and that which falls tends more to be rain. This is leading to changes in ecological and social contexts of the Patagonian winter that we will explore in this course.

This course covers past adaptations to historic winter climates, from plant and animal community distributions and the human settlement patterns driven by climate conditions for the maintenance of communities. We examine how the Patagonian winter drives the ecology and social contexts of the region.

Note that – as with many things related with the field – topics and timings may change.

Learning Objectives

A fundamental skill in applying ecological and sociological lenses to examine the impacts and implications in Patagonia of the coming of winter and the longest night of the year.

You will be challenged to examine the natural phenomenon of the Winter Solstice through various lenses – physical, social, and ecological – within the context of Southern Patagonia. This interdisciplinary approach will teach you a variety of skills, including: interdisciplinary system-thinking around conservation, key informant interviewing, aquatic macroinvertebrate sampling in freezing glacial rivers, landscape observation of rugged Patagonian steppes, forests, wetlands, and rivers.

You will visit locations and with people that will help provide context to explore the implications and impacts of the coming of winter and the deepest night of the year. This includes visiting Patagonian ranches (*estancias*) in the hills and forests of Southern Patagonia, hiking through the forests, along the rivers, and up to glaciers in Torres del Paine National Park, and learning from Kawesqar and Mapuche-Williche people living in the region.

Thematic Components and Research Direction

How do human [social] and non-human [ecological] systems respond to winter and the lengthening nights?

In order to address this rather broad question we will examine two specific components:

1. Subtheme 1

Understand how social systems in Patagonia respond to the coming of the Winter solstice, specifically evaluating the impacts to indigenous peoples, ranchers, and tourism operations. By examining how winter structures and defines the ways people interact with the landscape, it is possible to examine the economic dynamics and impacts on sustainable conservation. We give special emphasis to local ecological knowledge and how it can be integrated with scientific disciplines.

2. Subtheme 2

Understand how non-human ecological systems in Patagonia respond to the lengthening nights. We will specifically examine plant and animal behavioral responses on land and in freshwater. Tying this to glacial and hydrological dynamics, it is possible to examine how the growing nighttime shifts the ways that natural ecosystems behave during this time of year.

Assessment

The evaluation breakdown for the course is as follows:

Assessment Item	Value (%)
FEX 1: Distributions of woody plant species	20
FEX 2: Reflections on Local Ecological Knowledge	20
Panel Discussions	20
Participation	10
Final Exam	30
TOTAL	100

Assignment Delivery – All assignments must be handed in by their deadline. All written assignments must be submitted using MS Word or – if handwritten – must be sufficiently clearly written so as to be easily legible. Submissions sent after the hand-in deadline will be considered late, with 10% being deducted for every day.

Use of computers in the classroom: Given the strong evidence from multiple studies that show that knowledge retention and understanding are not assisted with note-taking on computers, tablets, and phones, we do not permit their use in the classroom, unless students have been offered learning accommodations requiring such devices through the Office of Academic Affairs. Recompiling notes is a useful way of laying down the pathways in the brain that result in stronger memory development. Thus, we strongly recommend students compile notes in their course and field notebook(s). Not only will this help with overall comprehension, these notebooks will be the only available “outside resource” for your final exam. The only exceptions to the “no computers in class” rule are for leading discussions and presentations and those students with learning accommodations granted through the Office of Academic Affairs.

FEX 1: Distribution of evergreen woody plants (20%)

The distribution of broadleaf evergreen woody plants across a landscape can help uncover the geographic patterns in which an evergreen growth strategy is more useful than a deciduous one. In the eastern portion of Torres del Paine National Park, the students will geotag the locations of various species of native broadleaf evergreen woody plants using a phone app. The data will then be used to develop a simple ecological niche model in the program MaxEnt that combines climatic and topographic variables across the landscape to help visualize the expected distributions of these evergreen plants in the forests of Southern Patagonia.

FEX 2: Reflections on Local Ecological Knowledge (20%)

The ecological knowledge of the Patagonian winter is held by many groups of people. These include the indigenous Kawesqar and Williche communities, managers of the National Parks, and *estancia* operators. Many of these people are not typically invested and interested in climate change, since they are often concerned with historical concerns, such as recovering ancestral territory, or with managing current economic concerns. During the course, students will conduct various interviews of guest lecturers. This FEX will ask students to synthesize these interviews to develop different analyses of how the climate change implications are understood by different communities.

Panel Discussion (20%)

Students will work in groups to draw together themes surrounding climate change on the winters in Patagonia, specifically related to the human and non-human systems covered in the class. Each group will be assigned one topic, and the students will use online academic resources to deepen the content developed in the course lectures. Each student group will then present the content of their findings, creating a conceptual map of the ways in which climate change affects winter systems. Then, the class will work together to find cross-linkages between the different themes, further exploring the ways that the implications of changing winters have multiple, sometime concatenated, impacts across systems.

Participation and topic discussions (10%)

Everybody should be prepared for each academic session. This implies reading materials for each session with enough detail to be able to ask relevant questions; participating in analytical discussions about the key issues. Throughout the semester, students will also be asked to lead assignments on assigned topics. Active participation during classes, discussions, and assignments is expected, both in the classroom and in the field.

Final Exam (30%)

A written examination will be given, based on the lectures, discussions, field activities, and readings.

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

Plagiarism – using the ideas or material of others without giving due credit – is cheating and will not be tolerated. A grade of zero will be assigned for anyone caught cheating or aiding another person to cheat either actively or passively.

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

A Note about Class Readings

Many of the classes have two or more papers associated with them. In these cases, different readings will be assigned to different reading groups. The members for each group will be expected to have read the key portions of their article for the upcoming class, so as to help lead the discussion on the topics covered in their paper. Many research articles use data collection and analysis methodologies that are unfamiliar, and each reading group will be advised about the sections they will be responsible for reading in their papers.

Lectures, Exercises, and Exams

D: Discussion; **FEX:** Field Exercise; **FL:** Field Lecture; **GL:** Guest Lecture; **L:** Lectures; **O:** Orientation

<i>Code</i>	<i>Title and outline</i>	<i>Readings</i>	<i>Type</i>	<i>Hrs</i>
Winter01	a. Introduction to course		O	1.0
	b. Introduction to Patagonia: learn how to evaluate Patagonia through physical, ecological, and cultural lenses		L	2.0
Winter02	a. Winter in Patagonia: Exploring winter as a multi-disciplinary phenomenon at the high latitudes of Patagonia.		L	1.5
	b. Primary land-uses in Patagonia: The mosaic of current cultural uses of the Patagonian landscape and seascape; understanding how seasonality affects cultural contexts	(Inostroza et al., 2016)	L	1.5
Winter03	Estancia visit 1: Explore the ways that winter affects the use of territory on a lowland sheep-herding estancia.		FL	3.0

<i>Code</i>	<i>Title and outline</i>	<i>Readings</i>	<i>Type</i>	<i>Hrs</i>
Winter04	Estancia visit 2: Explore how winter and market demands affect the management of an estancia focused on holistic management and ecotourism.		FL	3.0
Winter05	a. Snow and ecology: explore the implications of snow on terrestrial ecosystems and ecology		L	1.0
	b. Winter adaptations: How do plants and animals survive the challenges of frost, desiccation, and lack of light?	(Iriarte et al., 1991)	L	1.0
	c. Human adaptations: How humans and communities have adapted and evolved to live in Patagonia. Lessons not learned yet.		D	2.0
Winter06	Climate change impacts in the field: Travel to the eastern portion of Torres del Paine National Park and examine the expected impacts of climate change on local ecology.	(Neukom et al., 2010)	FL	3.0
MULTI-DAY TRIP: Eastern Torres del Paine National Park				
Winter07	Wildlife Observation: Winter in Torres del Paine means fewer tourists, which means less disturbance to wildlife. Observation of guanacos and ñandús in the National Park.	(Altmann, 1974)	FL	3.0
Winter08	FEX 1 Distribution of evergreen woody plants: Record the distributions of different native evergreen woody plants within different zones of the national park.	(Rohman et al., 2021)	FEX	4.0
Winter09	Winter tourism in TdP: Winter is a slow time for tourism in Patagonia. Discuss the implications for lean winter tourist seasons, and the options being pursued for winter tourism.	(Ruiz et al., 2019)	GL	2.0
Winter10	Ecosocial connections: Winter can highlight the ways that ecosystems, ecology, and society are intertwined.	(Rozzi et al., 2012)	L	2.0
Winter11	a) Kawésqar, Aonikenk, Yaghan and Selknam: The pre-Hispanic indigenous peoples of Patagonia and Tierra del Fuego. They are alive.		L	1.5
	b) Colonial takeover of Patagonia: The takeover of Patagonia by Chile and Argentina, spurred by natural resource	(Gigoux, 2020)	L	1.5

Code	Title and outline	Readings	Type	Hrs
	extraction, genocides, green-grabbing, and eco-extractivism.			
Winter12	a) The in-migration of Williche peoples: Non-local cultural traditions, dispossession of non-local indigenous peoples, and the redeveloping Mapuche identity in Chile.		L	1.5
	b) Celebration of <i>We-Tripantu</i>		GL	2.5
Winter13	Challenges of practicing indigenous culture: Reviving Kawésqar cultural heritage Kawésqar observations of winter		GL	1.5
Winter14	a) Chile's conservation model: Examine the history and management principles of Chile's models for landscape, coastal, and marine conservation.	(Pauchard & Villarroel, 2002)	L	1.5
	b) Biodiversity Conservation vs Biocultural conservation: Explore how landscape conservation can be placed at odds with indigenous cultural practice and maintenance	(Laterra et al., 2021)	L	1.5
Winter15	Resource extraction and indigenous livelihoods: Estancias continue to separate indigenous people from the collection of key materials from the landscape. Salmon farming and processing is changing Southern Patagonia. The promise of employment competes against indigenous sovereignty.	(Marquet et al., 2020)	L GL	1.0 1.5
Winter16	FEX 2: Local Ecological Knowledge: evaluate interviews of key environmental stakeholders to evaluate how concepts related with climate change are understood and addressed.		FEX	2.0
Winter17	a) Winter and life in freshwater: How does winter affect Patagonian freshwater ecosystems?		L	2.0
	b) Freshwater ecosystem services: What are some social services provided by water?	(Zagarola et al., 2014)	L	1.0
Winter18	a) Glacier Boat Trip: Travel by boat to the Balmaceda and Serrano glaciers.		FL	1.5
	b) Role of glaciers on hydrology: Students will discuss the various ways	(Thayyen & Gergan, 2010)	D	1.5

Code	Title and outline	Readings	Type	Hrs
	in which glaciers affect river hydrology and fjord processes.			
MULTI-DAY TRIP: Western Torres del Paine				
Winter19	Concatenated impacts of climate change on glacier-fed systems		FL	2.0
Winter20	The terrestrial-freshwater interface, and the importance of winter for providing ecosystem services		FL	2.0
Winter21	Preparation of Discussions		D	2.0
Winter22	Student-Led Discussions		D	4.0
Winter 23	Final Exam: A written exam with open-ended questions covering the topics of the semester.		Exam	2.0
Winter24	Patagonian Skiing: Evaluate the role of natural areas, climate change, and the ski industry in Chilean Patagonia.		FL	2.0
Total contact hours				63.0

Course Readings

- Altmann, J., 1974. Observational Study of Behavior: Sampling Methods. *Behaviour* 49: 227–267.
- Gigoux, C., 2020. “Condemned to Disappear”: Indigenous Genocide in Tierra del Fuego. *Journal of Genocide Research* 1–22, <https://www.tandfonline.com/doi/full/10.1080/14623528.2020.1853359>.
- Inostroza, L., I. Zasada, & H. J. König, 2016. Last of the wild revisited: assessing spatial patterns of human impact on landscapes in Southern Patagonia, Chile. *Regional Environmental Change* 16: 2071–2085, <http://link.springer.com/10.1007/s10113-016-0935-1>.
- Iriarte, J., W. Johnson, & W. Franklin, 1991. Feeding ecology of the Patagonia puma in southernmost Chile. *Revista Chilena de Historia Natural* 64: 145–156.
- Laterra, P., L. Nahuelhual, M. Gluch, P. L. Peri, & G. Martínez-Pastur, 2021. Imaginaries, Transformations, and Resistances in Patagonian Territories from a Socio-Ecological Perspective : 397–427, https://link.springer.com/10.1007/978-3-030-69166-0_19.
- Marquet, P. A., J. C. Castilla, A. Gaxiola, R. Huccke-Gaete, & A. Pena-Vega, 2020. Indigenous rights to Patagonia’s Guafo island. *Science* 370: 669–670, <https://www.science.org/doi/10.1126/science.abf1962>.
- Neukom, R., J. Luterbacher, R. Villalba, M. Küttel, D. Frank, P. D. Jones, M. Grosjean, J. Esper, L. Lopez, & H. Wanner, 2010. Multi-centennial summer and winter precipitation variability in southern South America. *Geophysical Research Letters* 37: n/a-n/a, <http://doi.wiley.com/10.1029/2010GL043680>.
- Pauchard, A., & P. Villarroel, 2002. Protected areas in Chile: History, current status, and challenges. *Natural Areas Journal* 22: 318–330.
- Rohman, M., L. B. Prasetyo, & M. D. Kusri, 2021. Predicting spatial distribution of Asian Horned Frog (*Megophrys montana* Kuhl & Van Hasselt 1882) in Java Island using citizen science’s data. *IOP Conference Series: Earth and Environmental Science* 771: 012027, <https://iopscience.iop.org/article/10.1088/1755-1315/771/1/012027>.
- Rozzi, R., J. J. Armesto, J. R. Gutiérrez, F. Massardo, G. E. Likens, C. B. Anderson, A. Poole, K. P. Moses, E. Hargrove, A. O. Mansilla, J. H. Kennedy, M. Willson, K. Jax, C. G. Jones, J. B. Callicott, & M. T. K.

- Arroyo, 2012. Integrating Ecology and Environmental Ethics: Earth Stewardship in the Southern End of the Americas. *BioScience* 62: 226–236.
- Ruiz, J. B., M. Lamers, S. Bush, & G. B. Wells, 2019. Governing nature-based tourism mobility in National Park Torres del Paine, Chilean Southern Patagonia. *Mobilities* Routledge 00: 1–17, <https://doi.org/10.1080/17450101.2019.1614335>.
- Thayyen, R. J., & J. T. Gergan, 2010. Role of glaciers in watershed hydrology: A preliminary study of a “himalayan catchment.” *Cryosphere* 4: 115–128.
- Zagarola, J. P. A., C. B. Anderson, & J. R. Veteto, 2014. Perceiving patagonia: An assessment of social values and perspectives regarding watershed ecosystem services and management in Southern South America. *Environmental Management* 53: 769–782.

Your instructors

Shaw Nozaki Lacy, Ph.D.

Shaw was born on the island of Guam in the West Pacific but grew up in several countries before sitting for his B.Sc. in Marine and Environmental Biology at the University of St. Andrews. He later studied Natural Resource Management (M.S.) and Resource Ecology Management (Ph.D.) at the University of Michigan, where he also received a Graduate Certificate in Science, Technology, and Public Policy. Shaw’s research is primarily in the area of aquatic ecology and the impacts of climate on species distribution patterns, the impacts of invasive species, and the role of Andean uplift in shaping the freshwater fish fauna of Chile. His other areas of research include evaluating how climate affects native Southern Patagonian tree growth, and incorporating spatial ecology into conservation planning the Magallanes Region.

Rafaela Retamal, Ph.D.

Dr. Rafaela Retamal completed her undergraduate in Biology at the University of Concepción, Chile in 2001. She traveled to Costa Rica and attended CATIE (the Tropical Agricultural Research, Teaching and Higher Education Center), where she got her M.Sc. in Integrated Management of Hydrographic Basins in 2006. She returned to Chile and received her Doctorate in 2015 from the University of Concepción in Environmental Sciences, focusing on Continental Aquatic Systems. Dr. Retamal has researched erosion modeling in lake basins, payments for ecosystem services, and perceptions on water management. She has advised on environmental impact assessments and environmental sustainability. Recently, she founded ECOSOR Chile, a consulting company whose mission is to support moving tourism towards sustainability and turning global change into opportunities through nature-based solutions (NbS). She directed the a public exhibition in 2021-2022 titled “Planeta Agua: Entre Ríos y Fiordos,” a science dissemination project covering freshwater systems in Chilean Patagonia. Today, she is dedicated to supporting initiatives in art, culture, and heritage that promote a transformation from a culture of law to a culture of knowledge. She is working to conserve wetlands and aquatic ecosystems, focusing primarily on Patagonia, which must be considered as a socio-environmental laboratory.