



S F S THE SCHOOL
FOR FIELD STUDIES

The Patagonian Winter

SFS 3282

Syllabus
4 credit

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



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 Patagonian winter is a defining aspect of the physical, ecological, and social systems of the region. This course will examine the different ways that winter affects human and non-human systems. We bring 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, winter brings the season when glaciers would normally be recovering their mass. However, climate change is creating changes in all 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, and the precipitation tends more toward rain. This is leading to changes in the ecological and social contexts of the Patagonian winter that we will explore in this course.

This course covers the relevance and changes to winter in high latitude regions. In addition, it evaluates 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 what defines Patagonian winter and how it drives the ecology and social contexts of the region.

Learning Objectives

A fundamental skill is applying interdisciplinary 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, and landscape observation of Patagonian glaciers, 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.

Assessment

The evaluation breakdown for the course is as follows:

Assessment Item	Value (%)
Field Exercise: The Winter Water Cycle	15
Field Exercise: Frozen Frontiers	15
Field Exercise: The Ecological Lens of Winter	15
Field Activities	15
End of Week Synthesis	10
Participation	10
Final Exam	20
TOTAL	100

Field Exercise: The Winter Water Cycle (15%)

In the context of winter, we are going to explore and recognize in the field the water cycle and its interrelations between climate change (past and future) in Patagonia. In this context, the students must connect previous class topic and field experiences. Students will produce a field report that include: (1) schematic analysis and description of the main topics reviewed. 1-page report for each site. More detailed instructions are forthcoming.

Field Exercise: Frozen Frontiers (15%)

The physical phenomenon of winter has a unique expression in the cultural and social system in Patagonia. During this session, students will visit different locations for different purposes, including fostering tourism, promoting conservation efforts, or revitalizing cultural practices. Working in small groups, students will delineate a socioecological activity, be it tourism, conservation, cultural preservation, or estancia management. Each group will compile a brief report detailing their chosen activity and its seasonal variations. Through this assignment, students will attain a comprehensive understanding of the distinctive characteristics of Patagonia during the winter season.

Field Exercise: The Ecological Lens of Water (15%)

The winter in Patagonia means a need for native fauna and flora to adapt to relatively harsh conditions. During this FEX, students will visit various locations that compare and contrast with locations that have been visited previously in the course. In small groups, students will develop a series of notes and observations about the ecological adaptations in the locations we visit for this FEX. Each group will write a short report that describes the observations they made and its implications. This assignment encourages the students to synthesize information that they have gathered throughout the course to apply it to observing Southern Patagonian winter through an ecological lens.

Field Activities (15%)

Many of our field outings will involve activities, either during our time in the field or back in the Center. These may include field sketches, short written reflections, and one-minute videos. As the program continues, integrating ideas, concepts, and contexts from various field outings may become part of a field activity. All field activities will be open note.

End-of-Week Syntheses (10%)

The pace of the Summer 1 session is fast, and we will travel to many different locations, each one providing a different perspective to ever-evolving information sets. At the end of every week, we will have an End-of-Week Synthesis, in which the cohort will work in small groups to review and synthesize the locations and activities of the prior week, developing themes and making deeper connections with those activities from prior weeks.

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 classroom and field.

Final Exam (20%)

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

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 – Apart from the FEX reports, all graded materials (i.e., field activities and final exam) will be submitted on the same day as assigned. In contrast, each FEX report must be submitted by email no later than 6pm on the day following the final observation made for that report. For example, a group's final observation for FEX b is on June 14, then the due date for their report is June 15 at 6pm. All FEX reports must be submitted by email. Exceptions to this rule will be evaluated individually. Late assignments will incur a penalty of 10% of your grade for each day you are late. After two days past the deadline, material will no longer be accepted. Assignments will be handed back to students no more than three days following submission.

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

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

Code	Title and outline	Type	Hours	Readings
PW 01	Introduction to physical courses: Orientation to the course topics and syllabus. Outline the FEXs and student-led discussions. Exploring Reserve Magallanes with a winter lens.	O, FL	2.0	
PW 02	Introduction to Patagonia: learn how to evaluate Patagonia through physical, ecological, and cultural lenses with a special focus on how winter has shaped this territory and ancestral knowledge.	L, FL	1.0	
PW 03	Socioecological systems and ecosystem services: What are some social services provided by nature during winter in Magallanes Region?	GL, FL	1.0	Zagarola et al., 2014
PW 04	The Magellanic Rainforest: Exploring the broadleaf evergreen forests of the southernmost rainforests in the world.	FL	2.0	
PW 05	Winter adaptations: How do plants and animals survive frost, desiccation, and lack of light?	FL	2.0	Iriarte et al., 1991
PW 06	Physical system in winter: How physical system define winter in Patagonia and how it has changed		3.0	Aguirre et al., 2018

PW 07	Water cycle in winter: We will explore the water cycle in Patagonian winter, its relevance to other systems and its recent changes.		3.0	Vaughan et al., 2013
PW 08	Glaciers in Patagonia: We will explore the recent changes of the glaciers in Patagonia		3.0	Weidemann et al., 2018
PW 09	Snow and its energy and mass balance: We will explore and analyze the properties of the snowpack	FL	3.0	Cuffey & Paterson, 2010
PW 10	End-of-the-week activity: Water cycle in winter, past and futures perspectives	D	3.0	
PW 11	Eco-social connections: Winter can highlight the ways that ecosystems, ecology, and society are intertwined. Visit to local museum.	FL	2.0	Rozzi, 2013
PW 12	The first “Patagonians”: The settling of the landscape during the retreat of the glaciers. Visit to Rupestre Patagonia and cave paintings	FL	2.0	
PW 13	Winter management of the Torres del Paine National Park: comparing trends and activities in Protected Areas.	GL, FL	1.0	Ruiz et al., 2019
PW 14	Winter tourism: Winter is a slow time for tourism in Patagonia. In Torres del Paine National Park, we will explore some implications for winter tourism.	GL, FL	1.0	
PW 15	Cultural conservation: The challenges of climate, dispossession, and conservation.	GL, FL	1.0	
PW 16	Indigenous knowledge: Kawésqar: The pre-Hispanic peoples of the Patagonian canals and fjords.	FL	2.0	
PW 17	Estancia visit: Explore how winter affects the use of territory on a lowland sheep-herding estancia.	FL	2.0	
PW 18	Winter Solstices: Connecting the physical and cultural on the day with the longest night.	L, D	1.0	
PW 19	Winter planning: planning and effects of winter and climate change.	L	1.0	
PW 20	Celebration of <i>We-Tripantu</i>	GL	2.0	
PW 21	End-of-the-week activity: Winter and climate change: Participatory activity among peers for comparing the role of winter in cultural, biological conservation, tourism and estancias, and the potential impacts of climate change.	D	3.0	
PW 22	Reforestation efforts: Visiting the CONAF tree nursery to see how reforestation efforts start. <i>Guest Speaker: Pablo Sanhueza</i>	GL	2.0	
PW 23	Ecological context setting: Setting the expectations for the similarities and differences between El Calafate and Ultima Esperanza areas. Connecting these with ecological patterns.	L	1.0	
PW 24	The ecology of the first Patagonians: We explore the ways in which the first peoples would have experienced and adapted to winters in Patagonia.	FL	2.0	

PW 25	Winter birdwatching: Many birds take advantage of the coastal wetlands along Lago Argentino. In Humedal Nimez, we look for iconic birds and understand what they do with the onset of winter.	D	2.0	
PW 26	Connectivity and disconnection with the environment: Comparisons of the ecological experience and impacts of the boardwalk in Perito Moreno vs. the trails in Torres del Paine	FL	2.0	
PW 27	The role of glaciers on forest structure: Exploring up close how glaciers shape the forests that grow near them.	FL	2.0	Garibotti et al., 2011
PW 28	Winter and life in freshwater: How does winter affect Patagonian freshwater ecosystems?	FL	2.0	Birrell et al., 2020
PW 29	Land management effects on ecology: Looking at the impacts of how land-use change compounds the impacts of climate change on ecology.	D	2.0	
PW 30	End-of-the-week activity: Winter themes through an Ecological lens: Participatory activity among the students, evaluating how winter affects ecological contexts in all the places we have visited in the class	D	3.0	
PW 31	Course/Exam Review	D	1.0	
	Total		60	

Course Readings

1. Aguirre, F., Carrasco, J., Sauter, T., Schneider, C., Gaete, K., Garín, E., ... & Casassa, G. (2018). Snow cover change as a climate indicator in Brunswick Peninsula, Patagonia. *Frontiers in Earth Science*, 6, 130.
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4. Christensen, T. R., Prentice, I. C., Kaplan, J., Haxeltine, A., & Sitch, S. (1996). Methane flux from northern wetlands and tundra: an ecosystem source modelling approach. *Tellus B*, 48(5), 652-661.
5. Cuffey, K. M., & Paterson, W. S. B. (2010). *The Physics of Glaciers* (Fourth). Butterworth-Heinemann, Elsevier Inc
6. Davies, B. J., Darvill, C. M., Lovell, H., Bendle, J. M., Dowdeswell, J. A., Fabel, D., García, J. L., Geiger, A., Glasser, N. F., Gheorghiu, D. M., Harrison, S., Hein, A. S., Kaplan, M. R., Martin, J. R. V., Mendelova, M., Palmer, A., Pelto, M., Rodés, Á., Sagredo, E. A., ... Thorndycraft, V. R. (2020). The evolution of the Patagonian Ice Sheet from 35 ka to the present day (PATICE). *Earth-Science Reviews*, 204, 103152. <https://doi.org/10.1016/J.EARSCIREV.2020.103152>
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8. Iriarte, J., W. Johnson, & W. Franklin, 1991. Feeding ecology of the Patagonia puma in southernmost Chile. *Revista Chilena de Historia Natural* 64: 145–156.

9. Langer, M., Westermann, S., Muster, S., Piel, K., & Boike, J. (2011). The surface energy balance of a polygonal tundra site in northern Siberia—Part 2: Winter. *The Cryosphere*, 5(2), 509-524.
10. Rozzi, R., 2013. Biocultural Ethics: From Biocultural Homogenization Toward Biocultural Conservation In Rozzi, R., S. T. A. Pickett, C. Palmer, J. J. Armesto, & J. B. Callicott (eds), *Linking Ecology and Ethics for a Changing World*. Springer Netherlands, Dordrecht: 9–32, http://link.springer.com/10.1007/978-94-007-7470-4_2.
11. 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.
12. Vaughan, D. G., Comiso, J. C., Allison, I., Carrasco, J., Kaser, G., Kwok, R., Mote, P., Murray, T., Paul, F., Ren, J., Rignot, E., Solomina, O., Steffen, K., & Zhang, T. (2013). Observations: Cryosphere in Climate Change 2013. In V. B. and P. M. M. Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia (Ed.), *The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 317–382). <https://doi.org/10.1017/CBO9781107415324.012>
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