

## ESM 588: Environmental Sustainability

Instructor: Dr. Daniele Spirandelli  
Course Time: T Th 4:00-5:50pm  
Location: Ondine 204  
CRN: 11211, 4 credits

Office Hours: Th 2:30-3:30p or by appointment  
Office: SRTC 206C  
Contact: [spir@pdx.edu](mailto:spir@pdx.edu)

**COVID-19:** Please note the content outlined below is for an ideal situation. Due dates, course content, or any other aspect of the course may be subject to change as the situation evolves. If these changes occur, you will be notified via email and it will be announced on the course D2L page.

All classes will be taught in-person. All students and instructors are required to properly wear masks during class time. If you are feeling un-well, have a temperature or know you have been exposed to someone with COVID, please stay home and inform the instructor of your absence. If you have any questions or concerns at any time, please do not hesitate to contact the instructor.

Please carefully review the **Classroom Requirements for All Students and Faculty Due to Covid-19** at the end of this syllabus.

**Course Overview:** This course explores the topics of sustainability in natural and human-influenced ecosystems, with a focus on ecosystem services and the processes of regeneration, maturity, collapse and renewal. Topic areas include natural processes of change in ecological systems, interactions among ecological and social systems, provisioning and valuation of ecosystem services, and ecosystem management.

**Learning Objectives.** My goals for you are that upon successful completion of the course you will:

1. Sufficiently grasp the theory of Panarchy; Understand ecosystem change in human-influenced ecological systems and be able to discuss the differences between sustainability and ecological resilience.
2. Describe and give examples of hierarchies and adaptive cycles in social-ecological systems; define and give examples of ecosystem services, and approaches to ecosystem service valuation.
3. Appreciate the challenges and potential negative impacts of environmental resource management.
4. Critically assess and summarize scientific research using appropriate tools and guidelines.

**Class Format and Student Activities:** Class periods will typically include syllabus review, mini-lectures to introduce key concepts and case studies, an opportunity for whole class or small group discussions to provide context for the readings and cases, and student presentations. There are 7 in-class workshops that focus on either the readings, a case study assessment or the final project. At the end of each workshop groups will submit a report – the focus and form of each report will vary by topic. The major product of the class will be a term paper and presentation. Please see lecture topic list (below) for specific reading assignments.

**Teams:** Students will organize into teams during week 1. Teams will be used to facilitate discussion, comprehension, and support learning. As is the case in much of environmental management, teams are important institutions for accomplishing goals, but individual success stands on the quality and contribution of an individual's work. Teams are encouraged to work together to understand the material, but unless an assignment explicitly indicates that it is a team assignment, work submitted must be your own.

**Attendance and Participation:** Please do not miss class. Engaged participation in class activities is essential. If you need special accommodations, please discuss your needs with me as early as possible and/or contact the Disability Resource Center. If you are ill, please email me before class if at all possible. Extended absences are highly discouraged, however, please do not attend class if you have a fever or any signs of a

contagious disease. Please notify me should you need to miss a class period so that we can discuss strategies to support your learning during this time.

**Communication and Availability:** I am happy to answer questions via email, but please allow 24-48 hours for a response and check the syllabus and course handouts first! You are welcome to drop in during my office hours to discuss questions about the course. If the course office hours don't work for you, make an appointment to meet with me or your GTA at another time. If possible, please send me a brief description of your question by email so that I can be prepared. If you are having difficulties with the assignments or the material, please come to office hours early in the term.

**Student Conduct Code:** PSU has a well-defined conduct code, <http://www.pdx.edu/dos/codeofconduct>. Academic honesty is essential. Please do not present someone else's ideas or work without attribution. You should maintain professional conduct at all times. Please be respectful of your classmates, instructor, and GTA with your verbal comments or those posted to the zoom chat or other class forums.

**Reading Materials:** Reading materials for this course will include book chapters from relevant texts, peer-reviewed literature, and seminal works in key areas. All literature will be located on D2L or I may provide web references where to find readings.

### Assessment

Assignments will be graded with points and weighted as shown below. Due dates for assignments are shown on the course schedule.

**Attendance and Participation (10%):** Each week you will be responsible for completing the week's readings and answering questions about the readings during whole class and small group discussions. Be prepared to ask and answer questions, and please remain attentive to your peers.

**Workshop Reports (30%):** You will work as a team and on your own to complete 7 workshop reports that will focus on a case study or the final course project. At the end of each workshop, you will submit a report. The focus and form of the report will vary by week and topic.

**Term Paper (40%)**

**Term Presentation (20%)**

**Grading:** This course uses a standard grade scale: 92-100% (A), 90-91% (A-), 88-89% (B+), 82-87% (B), 80-81% (B-), 78-79% (C+), 72-77% (C), 70-71% (C-), 68-69% (D+), 62-67% (D), 60-61% (D-), <60% (F)

Week	Date	Assignment Due at end of class	Lecture/Workshop Topic	Readings
1	9/28		Introductions Intro to ecological system dynamics <i>and Change</i>	
	9/30	Carbon budget activity	Intro to Elements of sustainability Intro to Panarchy Case Studies	White et al.; Holling 2001
2	10/5		Review components of Panarchy Workshop #1: Panarchy case study (1)	Walker and Salt pp 53-63; 74-95; Sitas et al. 2021; Assigned case study readings, pick one:
	10/7	Report #1	Workshop #2: SES Term project & SES topic description	<ol style="list-style-type: none"> <li>1. Coral Reefs in the Caribbean (Walker and Salt pp 64-73)</li> <li>2. Lake District, Wisconsin (Peterson et al. 2003)</li> <li>3. Alpine Grassland, Italy (Soane et al. 2012)</li> <li>4. Urban System, Charleston (Barthel et al. 2005)</li> </ol>
3	10/12	Report #2	Linking ecological and social systems	Garmestani 2009, Bohensky & Maru 2011
	10/14	Report #3	Workshop #3: Panarchy case study (2)	
4	10/19		Ecosystem Services	MEA, Synthesis, pp 1-24, 39-49; Koch et al. 2009; Dick et al. 2011
	10/21	Report #4	Workshop #4: Panarchy case study (3)	
5	10/26		Ecosystem services valuation	Fisher et al. 2008; Wallace 2007;
	10/28	Presentation	Presentation of Panarchy case studies	Nelson et al. 2009
6	11/2		Replacing ecosystem services?	López-Morales & Mesa-Jurado 2017;
	11/4	Report #5	Workshop #5: SES Case study description	Pauly 2007
7	11/9	Report #6 (due end of week)	Managing with Uncertainty Workshop #6: SES Case study development	Staudinger et al. 2021; Clifford et al 2020; Stults and Larsen 2018.
	11/11	No Class	No Class	
8	11/16		Adaptive management	Norstrom 2020; Vincent et al. 2020;
	11/18	Report #7	Workshop #7: SES Case study conceptual model	Daigler et al. 2019
9	11/23		Peer review and final paper/presentation prep	

	11/25	No class	No class	
10	11/30 12/2	Final presentation due before class	Individual presentations Individual presentations Class conclusions	
11	12/9	Term paper due by midnight	Deliverable Due	

## Reading List

### Research articles:

- Auclair L, Baudot P, Genin D, Romagny B, Simenel R. Patrimony for Resilience: Evidence from the Forest Agdal in the Moroccan High Atlas Mountains. *Ecology & Society* [serial online]. December 2011;16(4):1-13.
- Balmford, A., Bruner, A., Cooper, P., Costanza, R., Farber, S., Green, R.E., Jenkins, M., Jefferiss, P., Jessamy, V., Madden, J., Munro, K., Myers, N., Naem, S., Paavola, J., Rayment, M., Rosendo, S., Roughgarden, J., Trumper, K. and Turner, R.K. 2002. Economic reasoning for conserving wild nature. *Science* 297: 950-953
- Baumgärtner S, Derissen S, Quaas M, Strunz S. Consumer Preferences Determine Resilience of Ecological-Economic Systems. *Ecology & Society* [serial online]. December 2011;16(4):1-12.
- Benson, & Garmestani. (2011). Embracing panarchy, building resilience and integrating adaptive management through a rebirth of the National Environmental Policy Act. *Journal of Environmental Management*, 92(5), 1420-1427.
- Bohensky, E., & Maru, Y. (2011). Indigenous Knowledge, Science, and Resilience: What Have We Learned from a Decade of International Literature on "Integration"? *Ecology and Society*, 16(4), 1.
- Bures, R., & Kanapaux, W. (2011). Historical Regimes and Social Indicators of Resilience in an Urban System: The Case of Charleston, South Carolina. *Ecology and Society*, 16(4), 16.
- Clifford, K.R., Yung, L., Travis, W.R. *et al.* (2020). Navigating Climate Adaptation on Public Lands: How Views on Ecosystem Change and Scale Interact with Management Approaches. *Environmental Management* 66, 614–628. <https://doi.org/10.1007/s00267-020-01336-y>
- Daigle, J.J., Michelle, N., Ranco, D.J. *et al.* (2019). Traditional Lifeways and Storytelling: Tools for Adaptation and Resilience to Ecosystem Change. *Human Ecology* 47, 777–784. <https://doi.org/10.1007/s10745-019-00113-8>
- Fisher, B and RK Turner. 2008. Ecosystem services: classification for valuation. *Biological Conservation* 141: 1167-1169.
- Folke, C., Carpenter, S., Walker, B., Scheffer, M., Elmqvist, T., Gunderson, L. and Holling, C.S. 2004. Regime shifts, resilience, and biodiversity in ecosystem management. *Annual Reviews of Ecology, Evolution and Systematics* 35: 557-581.
- Garmestani, A., Allen, C., & Gunderson, L. (2009). Panarchy: Discontinuities Reveal Similarities in the Dynamic System Structure of Ecological and Social Systems. *Ecology and Society*, 14(1), [n.].
- Holling, C.S. 2001. Understanding the complexity of economic, ecological, and social systems. *Ecosystems* 4: 390-405. Kearney, J., et al. 2007. The role of participatory governance and community-based management in integrated coastal and ocean management in Canada. *Coastal Management* 35: 79-104.
- Koch, E.W., et al.. 2009. Non-linearity in ecosystem services: temporal and spatial variability in coastal protection. *Frontiers in Ecology and the Environment* 7: 29–37.

- López-Morales, Carlos, & Mesa-Jurado, Maria. (2017). Valuation of Hidden Water Ecosystem Services: The Replacement Cost of the Aquifer System in Central Mexico. *Water (Basel)*, 9(8), 571.
- Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-being: Synthesis*. Island Press, Washington, DC.
- Naidoo, R., Balmford, A., Costanza, R., Fisher, B., Green, R.E., Lehner, B., Malcolm, T.R. and Ricketts, T.H. 2008. Global mapping of ecosystem services and conservation priorities. *Proc. of the National Academy of Sciences* 105: 9495-9500.
- Nelson, E., et al. 2009. Modeling multiple ecosystem services, biodiversity conservation, commodity production, and tradeoffs at landscape scales. *Frontiers in Ecology and the Environment* 7: 29–37.
- Norström, A.V., Cvitanovic, C., Löf, M.F. *et al.* (2020). Principles for knowledge co-production in sustainability research. *Nature Sustainability* 3, 182–190. <https://doi.org/10.1038/s41893-019-0448-2>
- Pauly, D. 2007. The Sea Around Us project: documenting and communicating global fisheries impacts on marine ecosystems. *Ambio* 36: 290-295.
- Sitas, N., Ryan, P., and Lisen Schultz. (2021). ‘Systems scoping’, in Biggs et al. (ed.) *Routledge Handbook of Research Methods for Social-Ecological Systems*. Routledge: London, pp. 83-94.
- Staudinger, M.D., Lynch, A.J., Gaichas, S.K., Fox, M.G., Gibson-Reinemer, D., Langan, J.A., Teffer, A.K., Thackeray, S.J. and Winfield, I.J. (2021). How does climate change affect emergent properties of aquatic ecosystems?. *Fisheries*. DOI: <http://dx.doi.org/10.1002/FSH.10606>.
- Stults, M. and Larsen, L. (2020). Tackling Uncertainty in US Local Climate Adaptation Planning. *Journal of Planning Education and Research*, 40(4), pp. 416–431. doi: [10.1177/0739456X18769134](https://doi.org/10.1177/0739456X18769134).
- Vincent, K., Carter, S., Steynor, A. *et al.* (2020). Addressing power imbalances in co-production. *Nat. Clim. Chang.* 10, 877–878. <https://doi.org/10.1038/s41558-020-00910-w>
- Wallace, KJ. 2007. Classification of ecosystem services: problems and solutions. *Biological Conservation* 139: 235-246.
- Technical Articles**
- Khan, KS; Regina Kunz; Jos Kleijnen; Gerd Antes. 2003. 5 steps to conducting a systematic review. *J R Soc Med* 96 :118–121
- Pullin, A., & Gavin B. Stewart. (2006). Guidelines for Systematic Review in Conservation and Environmental Management. *Conservation Biology*, 20(6), 1647-1656. Retrieved from <http://www.jstor.org/stable/4124692>
- Jarmul, D. 2009. How to Write an Op-Ed Article, Duke University [http://newsoffice.duke.edu/duke\\_resources/oped](http://newsoffice.duke.edu/duke_resources/oped)  
Book Excerpts (available on Course e-reserve)
- Berkes, F. and Folke, C. (eds.) 2000. *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. Cambridge University Press, Cambridge, U.K. (Chapter 10)
- African Savannas: Global Narratives and Local Knowledge of Environmental Change*. T. Bassett and D. Crummey, eds. Oxford, UK: James Currey Publishers; and Portsmouth, NH: Heineman Books, 2002 (Peter Little Chapter)
- Walker, B.H. and D. Salt. 2006. *Resilience Thinking: Sustaining Ecosystems and People in a Changing World*. 174p. Island Press, Washington, D.C., USA.
- White, I.D., Mottershead, D.N. and Harrison, S.J. 1992. *Environmental Systems: An Introductory Text*. 2nd edition, Chapman and Hall, New York, N.Y., (Chapter 25, pp 522-549).

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### Other Resources

Don't forget to check out the ESM webpage for all sorts of info on what the department is doing: [www.pdx.edu/esm](http://www.pdx.edu/esm), as well as the AESS seminar webpage: <https://sites.google.com/a/pdx.edu/esm-science-seminar/>

**Department scholarships and other awards:** <http://www.pdx.edu/esm/awards-and-scholarships>

Undergraduate students interested in the Paul Croy or Barry Commoner awards should check out their descriptions on the ESM website. Graduate students interested in research scholarships should check out the Bushby and Dunnette awards on the ESM website.

### ***University Programs Undergraduate Students***

**LSAMP (Louise Stokes Alliance for Minority Participation)** is dedicated to enhancing the undergraduate experience for underrepresented students in Science, Technology, Engineering, and Mathematics. Funded by the National Science Foundation, our LSAMP program focuses on: Creating a community among LSAMP scholars that values excellence, diversity, and persistence; and Expanding opportunities for LSAMP scholars through participation in undergraduate research experiences and leadership initiatives. If you're interested in finding out more, visit our LSAMP center [in 103 Epler Hall](#), talk to ESM-LSAMP faculty advisory member Cat de Rivera <[derivera@pdx.edu](mailto:derivera@pdx.edu)>, SRTC 238e, or check out: <http://www.pdx.edu/lsamp/home>.

**McNair Fellows Program** - for first-generation to college students as well as students from backgrounds underrepresented in the sciences: <http://www.pdx.edu/mcnair-program/>.

**Advising & Career Services:** <https://www.pdx.edu/careers/> and <https://www.pdx.edu/careers/what-can-i-do-degree-environmental-studiesenvironmental-sciences>

**Library Research Tutorials:** <http://guides.library.pdx.edu/home/howto> and <http://guides.library.pdx.edu/esm>

### **Statement for Title IX Reporting Obligations**

Portland State is committed to fostering a safe, productive learning environment. Title IX and our school policy prohibit discrimination on the basis of sex, which regards sexual misconduct — including harassment, domestic and dating violence, sexual assault, and stalking. We expect a culture of professionalism and mutual respect in our department and class. Please be aware that as a faculty member, I have the responsibility to report any instances of sexual harassment, sexual violence and/or other forms of prohibited discrimination to PSU's Title IX Coordinator, the Office of Equity and Compliance or the Dean of Student Life and cannot keep information confidential. You may report any incident of discrimination or discriminatory harassment, including sexual harassment, to either the [Office of Equity and Compliance](#) or the [Office of the Dean of Student Life](#). If you would rather share information about sexual harassment or sexual violence to a confidential employee who does not have this reporting responsibility, you can contact a confidential advocate at 503-725-5672 or by scheduling on-line ([psuwr.c.youcanbook.me](http://psuwr.c.youcanbook.me)) or another confidential employee found on the sexual misconduct [resource webpage](#). For more information about your obligations and resources for sex/gender discrimination and sexual violence (Title IX), please complete the required student module [Creating a Safe Campus](#) in your D2L.

### **Access and Inclusion for Students with Disabilities**

PSU values diversity and inclusion; we are committed to fostering mutual respect and full participation for all students. Our goal is to create a learning environment that is equitable, useable, inclusive, and welcoming. If any aspects of instruction or course design result in barriers to your inclusion or learning, please notify me.

**If you have, or think you may have, a disability that may affect your work in this class, please contact your instructor.** You may also contact the Disability Resource Center to schedule an appointment and

initiate a conversation about reasonable accommodations. The DRC is located in 116 Smith Memorial Student Union, 503-725-4150, [drc@pdx.edu](mailto:drc@pdx.edu), <https://www.pdx.edu/drc>.

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### **Classroom Requirements for All Students and Faculty Due to Covid-19**

The University has established rules and policies to make the return to the classroom as safe as possible. It is required for everyone to follow all the Return to Campus rules and policies. To participate in this class, PSU requires students to comply with the following.

#### **Masks Required at all Times in Classroom**

- [Wear a mask or face covering indoors](#) at all times. Your mask or face covering must be properly worn (fully covering nose and mouth and tight fitting). Mesh masks, face shields, or face covering that incorporates a valve designed to facilitate easy exhalation are not acceptable. Because a mask must be worn in the classroom, there should be no eating or drinking in the classroom. If you have a medical condition or a disability that prevents you from wearing a mask or cloth face covering, you must obtain an accommodation from the [Disability Resource Center \(DRC\)](#) to be exempt from this requirement.
- CDC, State, and County guidance does not limit class size for in-person instruction or require physical distancing.

#### **Vaccination**

- Be vaccinated against COVID-19 and complete the [COVID-19 vaccination attestation](#) form. Those students with medical or nonmedical exemptions or who will not be on campus at all must complete the process described on “COVID-19 Vaccine Exemption Request Form” to establish those exemptions.

#### **Health Check, Illness, Exposure or Positive Test for COVID-19**

- Complete the [required self-check for COVID-19 symptoms before coming to campus each day](#).
- If you are feeling sick or have been exposed to COVID-19, do not come to campus. Call SHAC to discuss your symptoms and situation (503.725.2800). They will advise you on testing, quarantine, and when you can return to campus.
- If you test positive for COVID-19, [report your result to SHAC](#) and do not come to campus. SHAC will advise you on quarantine, notification of close contacts and when you can return to campus.
- Please notify me, (i.e. your instructor), should you need to miss a class period for any of these reasons so that we can discuss strategies to support your learning during this time.
- If I become ill or need to quarantine during the term, either I or the department chair will notify you via PSU email about my absence and how course instruction will continue.

#### **Failure to Comply with Any of these Rules**

As the instructor of this course, the University has given me the authority to require your compliance with these policies. If you do not comply with these requirements, I may ask you to leave the classroom or I may need to cancel the class session entirely.

In addition, failure to comply with these requirements may result in a referral to the Office of the Dean of Student Life to consider charges under PSU's Code of Conduct. A student found to have violated a university rule (or rules) through the due process of student conduct might face disciplinary and educational sanctions (or consequences). For a complete list of sanctions, see Section 14 of the [Student Code of Conduct & Responsibility](#).

**Guidance May Change**

Please note that the University rules, policies, and guidance may change at any time at the direction of the CDC, State, or County requirements. Please review the University's main [COVID-19 Response](#) webpage and look for emails from the University on these topics.