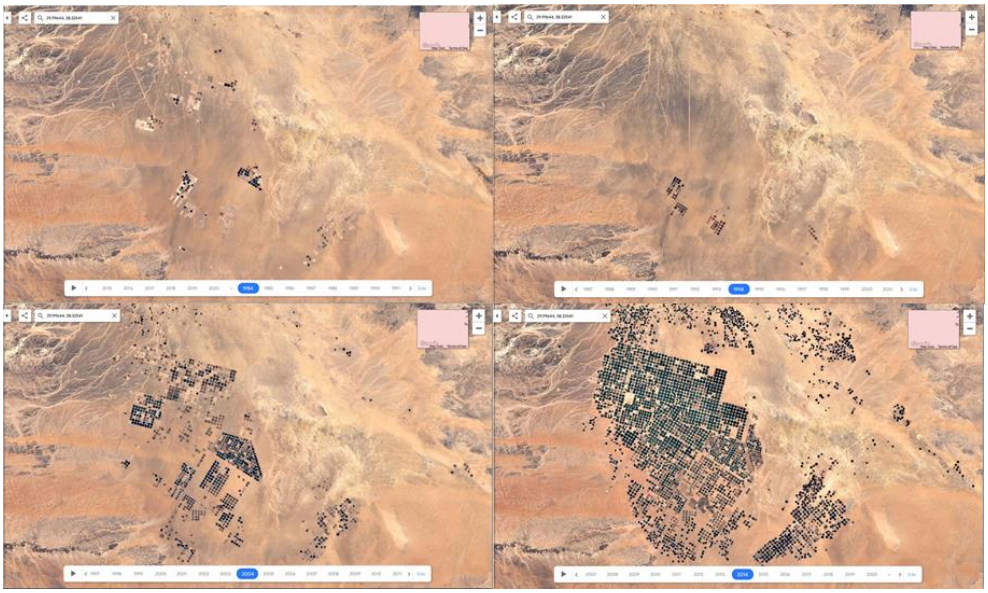
GEOG 494: OUR CHANGING PLANET: A SEMINAR IN LAND CHANGE SCIENCE



Land-cover change in Saudi Arabia (Google Earth Engine time series)

Spring 2023

Hello and welcome!

I'm Dr. Xavier Haro-Carrión (he / him; you can call me Xavier if you wish), your course instructor, and I am eager to guide you in the process of developing a capstone project in Land Change Science!

Email me at xharocar@macalester.edu
Visit me in **CARN 104F**

Course learning outcomes

- Examine analytical frameworks and/or models to analyze land-use / land-cover (LULC). change processes.
- Evaluate the consequences of these processes on environmental goods and services and on natural resource management.
- Improve your understanding of human interactions with the environment, and thus provide a scientific foundation for sustainability, vulnerability and resilience of land systems.
- Design and execute an independent inquiry related to LULC processes that fulfills the requirements of a capstone project in Geography.

Prerequisites

Being a junior or senior Geography major.

Course Description

Changes in land use and land cover are both a cause and effect of global environmental change. Land Change Science (LCS) seeks to understand these processes as coupled human-environment systems to address theory, concepts, models, and their applications to environmental and societal problems. The purpose of this seminar is to provide a conceptual basis for LCS, as well as to review the approaches and analytical techniques used in LCS research. We will utilize readings, discussions and, to a lesser extent, lectures to review foundational LCS scientific literature and student-selected readings. Students will conduct a semester-long research project on a case study of their interest to explore a LCS question. They will use appropriate methodological approaches including in-depth literature reviews, modeling, Geographic Information System (GIS), remote sensing, spatial analysis, or other geographical tools.

Meeting times and office hours

Time	Monday	Tuesday	Wednesday	Thursday	Friday
08:30-09:40					
10:40 – 11:30					
15:30 – 16:30					

	Class times
	Instructor Office hours

Textbook

This class has no required textbooks. The following books are good sources of information for the topics that will be covered (all available in my office). Copies of chapters and additional sources (e.g. peer-reviewed papers) are detailed in the "Detailed Weekly Schedule" section of this syllabus and will be made available in Moodle.

Aspinall, R., & Hill, M. J. (Eds.). (2008). Land use change: Science, policy, and management. CRC Press.

Brannstrom, C., & Vadjunec, J. M. (Eds.). (2013). Land change science, political ecology, and sustainability: Synergies and divergences. Routledge.

Gutman, G. (Ed.). (2004). Land change science: Observing, monitoring and understanding trajectories of change on the Earth's surface. Kluwer Acad. Publ.

Millington, A., Jepson, W., & Millington, A. C. (Eds.). (2008). Land change science in the tropics: Changing agricultural landscapes (1. ed). Springer.

National Research Council (U.S.) (Ed.). (2010). Understanding the changing planet: Strategic directions for the geographical sciences. National Academies Press.

This is an excellent guide for writing. We will use many of it's chapters and I strongly encourage you to check it:

Belcher, W. L. (2019). Writing your journal article in twelve weeks: A guide to academic publishing success (Second edition). The University of Chicago Press

Course Details

Structure

A seminar is a shared intellectual experience in which the instructor and students inform one another. The instructor sets the broader context of the learning experience, serves as a thought partner, and mentor students on their projects. However, much of the success of the course depends on the degree to which students are self-motivated and capitalize on the resources available to them.
To assist students in completing their capstone project, this seminar will function as a research workshop. Our thrice day weekly sessions will involve two primary activities:

1. discussing relevant literature (with some occasional lectures) and reviewing scientific writing skills. Initial readings will be provided by the instructor with the purpose of building a common background about land change science, and later readings will be provided by the students based on individual (or collective) interests;
2. providing feedback, encouragement, evaluations of work-in-progress and project work time.

Daily contributions to class

Given the nature of this class, attendance will play an essential role in learning and will be factored into your grade. We will learn from each other as much as we will learn individually. are encouraged and expected to attend and actively participate in class meetings. Discussion offers an opportunity to digest complex topics or case studies and to think critically about land change topics, models, frameworks, techniques, etc.
If you need to miss class because of participation in academic or sport activities, illnesses, or other circumstances, try to let me know in advance.
Students may wish to take part in religious observances that occur during this semester. If you have a religious observance/practice that conflicts with your participation in the course, please contact me before the end of the first two weeks of classes.

Discussion Leadership

During the semester you will facilitate 2-4 discussions of a scientific paper or another type of relevant literature on a topic related to your capstone project . You will choose an article and lead a discussion during a particular class period. You must share with me

your selected article and the leadings questions, activities or other approaches you will use to lead a discussion at least one week before your assigned date. This deadline is intended to provide your classmates enough time to ready your selected paper.

Capstone project

The primary purpose of the senior seminar in Geography is to facilitate the development of a senior capstone research paper built on the themes, concepts and frameworks studied in class. In general, the purpose of your capstone experience is to formulate a research question of significance in the literature and evaluate this question utilizing geographic tools including Geographic Information Systems (GIS), remote sensing or others. In this course, the capstone project will be broke down into the following:

- **Proposal.** A short description of what your capstone project will be about. It should include a description of its significance, clear research question or objective, a framework, data, methods, and some key preliminary bibliography. You'll have to present your proposal to your peers. No strict format will be required for your written proposal, but I encourage you to start looking at the format that will be used for your draft and final products. More details will be provided in class.
- **Project Draft.** This draft will be a complete initial version of your final paper. It should stand as a complete document, with all sections of a research paper and with proper formatting. We will use the template and guidelines for "Research Articles "of the Journal of Land Use Science. This is a prominent journal of land change science that publishes theoretical and empirical aspects of land change science at the interface of social and environmental systems.

  My purpose in adopting a journal to guide your capstone project formatting is to provide clear, detailed and accessible resources for you. Also, I would hope it brings the capstone experience closer to the publication process of a research paper. We'll review details in class, but you are encouraged to check the journal's "Instruction for authors" section for details about number of words, font, citation format, sections, etc. You will also find nice Word and LaTeX templates. You must submit your project draft using the format requirements of the *Journal of Land Use Science*.
- **Peer review of drafts**. Peer-review is a critical process in the production of scientific knowledge and it will be a critical component of your capstone project. You will receive a copy of two other students' project drafts and will provide feedback. We'll also rely on geography journal styles to provide feedback. I will provide examples of manuscripts I have reviewed and revisions I have received for your reference. In essence, you will have to provide a document that evaluates the significance of the paper you are evaluating, broad comments and / or suggestions for each section and detailed suggestions. Revisions could include suggestions on the prose, grammar and/or English revisions if you consider them appropriate.
- **Final paper.** After receiving feedback, you will have some time to revise your paper and prepare a final version of it.
- **Oral presentation of final product.** Near the end of the semester, we will have panels

of students presenting their research as if we were at an academic conference. Each person will have 11-13 minutes for the presentation. Your presentation should provide the audience with a clear sense of the research project, your findings, and the significance of the project. You have to present either in a panel organized by your instructor open to the public or in the Midwestern Undergraduate Geography Symposium organized by University St. Thomas. I encourage you to present in both!

Course policies and support

Resources
All course materials, including lecture slides, readings and book chapters, will be made available on Moodle. We will use Moodle to complete and turn in assignments due outside our regular class schedule and keep track of all grades.

Flexibility
This is your senior seminar. I have set deadlines with the goal to make you succeed in your capstone project and assigned readings to make sure you have key foundational information to do your project.
I am very flexible in accommodating less readings and revising the content to enhance your learning experience, but ideally, I would like to stick to deadlines. If you are experiencing problems at any time that might require accommodations, please talk to me as soon as possible.

Office Hours
I will hold regular office hours to discuss questions, issues or concerns about the class in detail. If your schedule conflicts with posted office hours, we can schedule a different meeting time. Outside of class and office hours, email is the best way to contact me. I respond to email as soon as possible, but I mostly respond during work hours (8:00 am to 4:00 pm on weekdays).

Diversity
I acknowledge that at least some of the scientific content of this class has been historically built on a small subset of privileged voices. Therefore there may be both overt and covert biases in the material due to the lens with which it was written. Integrating a diverse set of experiences is important for a more comprehensive understanding of science, and I am working continuously to enhance the diversity of bibliographic sources used in this class. In addition to course content, I am also committed to creating a learning environment that supports a diversity of thought, perspective and experience, and to honoring your identities including race, gender, class, nationality, religion, etc. Please contact me (in person or electronically) or submit anonymous feedback if you have any suggestions to improve the quality of the course materials and enhance diversity and inclusion.

Disabilities
I am committed to ensuring access to course content for all students, including those with disabilities. If you are encountering barriers to your learning that I can mitigate, please bring them to my attention. I will be happy to work with you to ensure your success in the class.
Reasonable accommodations are available for students with documented disabilities. Contact the Disability Services office by emailing disabilityservices@macalester.edu or calling 651-696-6874 to schedule an appointment to discuss your individual needs.

Well-Being
Here at Macalester, you are encouraged to make your well-being a priority throughout the semester and career here. Investing time into taking care of yourself will help you engage more fully in your academic experience. Remember that beyond being a student, you are a human being carrying your own experiences, thoughts, emotions, and identities with you. It is important to acknowledge any stressors you may be facing, which can be mental, emotional, physical, financial, etc., and how they can have an academic impact. I encourage you to remember that you have a body with needs. In the classroom, drink water, use the restroom, and step out if you are upset and need a break. Please do what is necessary so long as it does not impede your or others' ability to be mentally and emotionally present in the course. Outside of the classroom, sleep, moving your body, and connecting with others can be strategies to help you be resilient at Macalester. If you are having difficulties maintaining your well-being, please don't hesitate to contact me and/or find support from other resources on the following page.

Academic Support
Personalized tutoring, academic support and study skills are available at the Macalester Academic Excellence (MAX) at: https://www.macalester.edu/max/#/0. These resources are there to help you and I encourage you to make good use of them.

Academic Integrity
Students are expected to complete and turn in their own work and to follow established academic practices regarding proper use and citation of materials and ideas that are not their own. Engaging in cheating or plagiarism will result in a failing grade in this class. More information is available about Macalester's academic integrity at: https://www.macalester.edu/academicprograms/academicpolicies/academicintegrity/

Content generated by ChatGPT or other Artificial Intelligence sites without proper attribution or authorization is another form of plagiarism. If you are unsure about whether something may be plagiarism or another form of academic dishonesty, please reach out to me to discuss it as soon as possible.

Title IX
Macalester is committed to providing a safe and open learning and living environment for all students, staff, and faculty. Any community member experiencing sexual harassment, sexual violence, relationship violence, or stalking, is encouraged to seek help and support. Please be aware that as a faculty member, I need to report disclosure about

sexual harassment, sexual misconduct, relationship violence, and stalking to the Title IX Office. The purpose of this report is to ensure that anyone experiencing harm receives the resources and support they need. I will keep this information private and it will not be shared beyond this required report. You can contact Macalester's Title IX Coordinator directly at titleixcordinator@macalester.edu.

Grading

Assignment	Points
Discussion Leadership	10%
Daily contributions to class.	10%
Capstone project:	80%
• Proposal: oral presentation	• 3%
• Proposal: Written, framework and preliminary Bibliography	• 10%
• Project Draft	• 15%
• Peer review of drafts	• 15%
• Final paper	• 32%
• Oral presentation of final product	• 5%

Scale Letter	Range
A	93.0% to 100 %
A-	90.0% to < 93.0 %
B+	87.0% to < 90.0 %
B	83.0% to < 87.0 %
B-	80.0% to < 83.0 %
C+	77.0% to < 80.0 %
C	73.0% to < 77.0 %
C-	70.0% to < 73.0 %
D+	67.0% to < 70.0 %
D	63.0% to < 67.0 %
D-	60.0% to < 63.0 %
F	0.0% to < 60.0 %

Detailed Weekly Schedule

Disclaimer: This schedule represents my current plan and objectives. Details about pre-class assignments, readings and specific dates might be added / adjusted as we progress in the semester with the goal of enhancing your learning experience.

Some weeks in this schedule provide daily details, others a list of weekly readings and other weekly topics. This is intended to provide a basic course structure while allowing for plenty of flexibility to accommodate readings suggested by the students, add or eliminate some readings, introduce class activities for the completion of your capstone project, etc. In general, I anticipate flexibility with readings, but ideally, I would like to keep deadlines and major themes fixed.

Week 1: Welcome
January 20

Learning outcome: This week we will discuss expectations, address concerns and learn about each other's journeys in Geography.

This week:

- **Friday:**
  Read the syllabus

Week 2: Land Change Science - Foundations
January 23,25 and 27

Learning outcome: This week we'll study some theoretical foundations and the history of land change science as a field of research.

This week readings:

- **Monday**

  Turner, B. L., Lambin, E. F., & Reenberg, A. (2007). The emergence of land change science for global environmental change and sustainability. Proceedings of the National Academy of Sciences, 104(52), 20666. https://doi.org/10.1073/pnas.0704119104

  Aspinal. R.J. Chapter I: Basic and applied land use science. In: Aspinall, R., & Hill, M. J. (Eds.). (2008). Land use change: Science, policy, and management. CRC Press.

  Moran, E. et al. Chapter I: The development of the international land-use and land-cover change (LUCC) research program and its links to NASA's land-cover and land-use change (LCLUC) initiative.

- **Wednesday**

  Hill, M. Developing spatially dependent procedures and models for multicriteria decision analysis: place, time, and decision making related to land use change. In: Aspinall, R., & Hill, M. J. (Eds.). (2008). Land use change: Science, policy, and management. CRC Press.

- **Friday**

  Turner, B. L., & Robbins, P. (2008). Land-Change Science and Political Ecology: Similarities, Differences, and Implications for Sustainability Science. Annual Review of Environment and Resources, 33(1), 295–316. https://doi.org/10.1146/annurev.environ.33.022207.104943

  Chowdhury, R. R. The intersection of independent lies: land change science and political ecology. In Brannstrom, C., & Vadjunec, J. M. (Eds.). (2013). Land change science, political ecology, and sustainability: Synergies and divergences. Routledge.

Week 3: Library Resources
January 30, February 1 and 3

Learning outcome: Whether you want to do a literature-review based capstone or an empirical study, you'll need library tools. We'll learn about them this week. We'll also discuss how to start a research project from scratch,

This week:

- **Monday:**

  Library Day – Databases, reference management and other tools (We'll meet in room 206 at the library)

- **Wednesday**

  Belcher, W.L. Week 0: Writing your article from scratch. In: Belcher, W. L. (2019). Writing your journal article in twelve weeks: A guide to academic publishing success (Second edition). The University of Chicago Press

  Schwartz, M. A. (2008). The importance of stupidity in scientific research. Journal of Cell Science, 121(11), 1771–1771. https://doi.org/10.1242/jcs.03334

- **Friday:**

  Library Day – Databases, reference management and other tools (We'll meet in room 206 at the library)

  NOTE: Xavier will be out-of-town this day.

Week 4: Land Change Science – Foundations
February 6, 8, 10

Learning outcome: Moving a bit beyond foundational concepts, we'll start reviewing methods, frameworks and models used in land change science to study human-environment systems.

This week:

Chapter 1: How are we changing the physical environment of Earth's surface. In: National Research Council (U.S.) (Ed.). (2010). Understanding the changing planet: Strategic directions for the geographical sciences. National Academies Press.

Magliocca, N. R., Rudel, T. K., Verburg, P. H., McConnell, W. J., Mertz, O., Gerstner, K., Heinimann, A., & Ellis, E. C. (2015). Synthesis in land change science: Methodological patterns, challenges, and guidelines. Regional Environmental Change, 15(2), 211–226. https://doi.org/10.1007/s10113-014-0626-8

de Jong, L., De Bruin, S., Knoop, J., & van Vliet, J. (2021). Understanding land-use change conflict: A systematic review of case studies. Journal of Land Use Science, 16(3), 223–239. https://doi.org/10.1080/1747423X.2021.1933226

Aspinall, Richard, and Michele Staiano. "A Conceptual Model for Land System Dynamics as a Coupled Human–Environment System." Land 6, no. 4 (November 16, 2017): 81. https://doi.org/10.3390/land6040081.

Feng, Huihui, Shu Wang, Bin Zou, Yunfeng Nie, Shuchao Ye, Ying Ding, and Sijia Zhu. "Land Use and Cover Change (LUCC) Impacts on Earth's Eco-Environments: Research Progress and Prospects." Advances in Space Research 71, no. 3 (February 2023): 1418–35. https://doi.org/10.1016/j.asr.2022.09.054.

Week 5: Land Change Science – Products and lit. review-based case studies

February 13, 15, 17

Learning outcome: This week we'll look at recently available products to conduct land change science research and how land-cover products can be used in land change science research. We'll also start reviewing literature-review-based examples of land-change science research and share our project ideas.

This week:

Brown, Christopher F., Steven P. Brumby, Brookie Guzder-Williams, Tanya Birch, Samantha Brooks Hyde, Joseph Mazzariello, Wanda Czerwinski, et al. "Dynamic World, Near Real-Time Global 10 m Land Use Land Cover Mapping." Scientific Data 9, no. 1 (June 9, 2022): 251. https://doi.org/10.1038/s41597-022-01307-4.

Deng, X., & Li, Z. (2016). A review on historical trajectories and spatially explicit scenarios of land-use and land-cover changes in China. Journal of Land Use Science, 11(6), 709–724. https://doi.org/10.1080/1747423X.2016.1241312

Project Proposal Presentations

Week 6: Land Change Science – Country or regional examples

February 20, 22 and 24

Learning outcome: We'll review some country and sub-country examples of land change science research that will hopefully help you plan your project.

This week:

Guarderas, Paulina, Franz Smith, and Marc Dufrene. "Land Use and Land Cover Change in a Tropical Mountain Landscape of Northern Ecuador: Altitudinal Patterns and Driving Forces." Edited by Manoj Kumar. PLOS ONE 17, no. 7 (July 27, 2022): e0260191. https://doi.org/10.1371/journal.pone.0260191.

Ofori Acheampong, Joseph, Emmanuel Morgan Attua, Michael Mensah, Benedicta Y. Fosu-Mensah, Roland Akuka Apambilla, and Eric Kofi Doe. "Livelihood, Carbon and Spatiotemporal Land-Use Land-Cover Change in the Yenku Forest Reserve of Ghana, 2000–2020." International Journal of Applied Earth Observation and Geoinformation 112 (August 2022): 102938. https://doi.org/10.1016/j.jag.2022.102938.

Yuan, F., M. Mitchell, B. Bohks, K. Mullen, and C. Smith. "Long-Term Land Use and Land Cover Changes Affected by the Conservation Reserve Program in the Minnesota River Valley." Journal of Geography and Geology 7, no. 2 (May 18, 2015): p105. https://doi.org/10.5539/jgg.v7n2p105.

Project Proposal Due

Week 7: Land Change Science – integration with other disciplines, limitations, and advancements

February 27, March 1 and 2

Learning outcome: This week we'll review some of the traditional limitations of land change science research: the integration with social data and some recent examples of how that limitation is being addressed.

This week:

Rindfuss, R.R. et al. Linking pixels and people. In: Gutman, G. (Ed.). (2004). Land change science: Observing, monitoring and understanding trajectories of change on the Earth's surface. Kluwer Acad. Publ.

Byron, I., & R. Leslie. Spatial methodologies for integrating social and biophysical data at regional catchment scale. In: Aspinall, R., & Hill, M. J. (Eds.). (2008). Land use change: Science, policy, and management. CRC Press

Kinnebrew, Eva, Elizabeth Shoffner, Aldo Farah?Pérez, Megan Mills?Novoa, and Katherine Siegel. "Approaches to Interdisciplinary Mixed Methods Research in Land?change Science and Environmental Management." Conservation Biology 35, no. 1 (February 2021): 130-41. https://doi.org/10.1111/cobi.13642.

Kouassi, Jean-Luc, Amos Gyau, Lucien Diby, Yeboi Bene, and Christophe Kouamé. "Assessing Land Use and Land Cover Change and Farmers' Perceptions of Deforestation and Land Degradation in South-West Côte d'Ivoire, West Africa." Land 10, no. 4 (April 16, 2021): 429. https://doi.org/10.3390/land10040429.

Week 8: Land Change Science – Global implication, drivers and consequences
March 6, 8 and 10

Learning outcome: Changes in land surface are global and have numerous consequences. This week we'll review some of them by selecting from the list below some papers to discuss in class.

This week:

Lambin, E. F., & Meyfroidt, P. (2011). Global land use change, economic globalization, and the looming land scarcity. Proceedings of the National Academy of Sciences, 108(9), 3465–3472. https://doi.org/10.1073/pnas.1100480108

Lambin, E. F., Turner, B. L., Geist, H. J., Agbola, S. B., Angelsen, A., Bruce, J. W., Coomes, O. T., Dirzo, R., Fischer, G., Folke, C., George, P. S., Homewood, K., Imbernon, J., Leemans, R., Li, X., Moran, E. F., Mortimore, M., Ramakrishnan, P. S., Richards, J. F., … Xu, J. (2001). The causes of land-use and land-cover change: Moving beyond the myths. Global Environmental Change, 11(4), 261–269. https://doi.org/10.1016/S0959-3780(01)00007-3

Hong, Chaopeng, Jennifer A. Burney, Julia Pongratz, Julia E. M. S. Nabel, Nathaniel D. Mueller, Robert B. Jackson, and Steven J. Davis. "Global and Regional Drivers of Land-Use Emissions in 1961-2017." Nature 589, no. 7843 (January 28, 2021): 554-61. https://doi.org/10.1038/s41586-020-03138-y.

Davison, Charles W., Carsten Rahbek, and Naia Morueta-Holme. "Land-use Change and Biodiversity: Challenges for Assembling Evidence on the Greatest Threat to Nature." Global Change Biology 27, no. 21 (November 2021): 5414–29. https://doi.org/10.1111/gcb.15846.

Potapov, Peter, Svetlana Turubanova, Matthew C. Hansen, Alexandra Tyukavina, Viviana Zalles, Ahmad Khan, Xiao-Peng Song, Amy Pickens, Quan Shen, and Jocelyn Cortez. "Global Maps of Cropland Extent and Change Show Accelerated Cropland Expansion in the Twenty-First Century." Nature Food 3, no. 1 (December 23, 2021): 19–28. https://doi.org/10.1038/s43016-021-00429-z.

Newbold, Tim, Lawrence N. Hudson, Samantha L. L. Hill, Sara Contu, Igor Lysenko, Rebecca A. Senior, Luca Börger, et al. "Global Effects of Land Use on Local Terrestrial Biodiversity." Nature 520, no. 7545 (April 2, 2015): 45–50. https://doi.org/10.1038/nature14324.

Zalles, Viviana, Matthew C. Hansen, Peter V. Potapov, Diana Parker, Stephen V. Stehman, Amy H. Pickens, Leandro Leal Parente, et al. "Rapid Expansion of Human Impact on Natural Land in South America since 1985." Science Advances 7, no. 14 (April 2, 2021): eabg1620. https://doi.org/10.1126/sciadv.abg1620.

Week 9: Spring Break
March 13, 15 and 17

Learning outcome: Appreciate the importance of taking a break, enjoying doing things outside of academic commitments and taking care of yourself. Enjoy the break!

Week 10: Land Change Science – Regional and student-selected topics
March 20, 22, and 24

Learning outcome: This week we'll read one last country-level example of land change science research and transition to more student-led papers and project work.

This week:

- **Monday:**
  Capitani, Claudia, Arnout van Soesbergen, Kusaga Mukama, Isaac Malugu, Boniface Mbilinyi, Nurdin Chamuya, Bas Kempen, et al. "Scenarios of Land Use and Land Cover Change and Their Multiple Impacts on Natural Capital in Tanzania." Environmental Conservation 46, no. 1 (March 2019): 17–24. https://doi.org/10.1017/S0376892918000255.

- **Wednesday:**
  Student-led paper discussion
- **Friday:**
  Project work

Week 11: Project work and and student-selected topics
March 27, 29, and 31

Learning outcome: This week we'll concentrate on student-led papers and project work.

This week:

- **Monday:**
  Student-led paper discussion
- **Wednesday:**
  Project work
- **Friday:**

Assessing the research process

Week 12: The peer-review process
April 3, 5 and 7

Learning outcome: This week we'll learn how to review and provide feedback to a scientific manuscript.

This week:

- **Monday**
  Haro-Carrión, X., Waylen, P., & Southworth, J. (2020). Spatiotemporal changes in vegetation greenness across continental Ecuador: A Pacific-Andean-Amazonian gradient, 1982–2010. *Jour*nal of Land Use Science, 1–16. https://doi.org/10.1080/1747423X.2020.1866705
- **Wednesday**
  Previous version and reviewers' comments of Monday's paper
  Examples of peer-review letters
- **Friday**
  Student-led paper discussion

Project Draft Due

Week 13: Project work and student-selected topics
April 10, 12 and 14

Learning outcome: This week we'll concentrate on student-led papers and project work.

This week:

- **Monday:**
  Student-led paper discussion
- **Wednesday:**
  Project work
- **Friday:**
  Assessing the research process

Peer reviews due

Week 14: Project work
April 17, 19 and 21

Learning outcome: We'll continue working on our projects and start preparing for our final presentations.

This week:

- **Monday:**
  Assessing the research process
- **Wednesday:**
  Project work
- **Friday:**
  What's a "Professional" presentation?
  Career Panel

Week 15: Research presentations

April 24, 26 and 28

Learning outcome: The End! This week we'll listen to the final results of each other projects and conduct course evaluations.

This week:

- **Monday:**
  Assessing the research process & Course evaluations
- **Wednesday:**
  Project Presentations
- **Friday:**
  Project Presentations
- **Saturday:**
  Midwestern Undergraduate Geography Symposium (MUGS).

Final Project due May 5