
GEOGRAPHY/SOILS 526
**HUMAN TRANSFORMATIONS OF EARTH
SURFACE PROCESSES (TRANSFORMING EARTH SYSTEMS)
SPRING 2019**

Schedule: Mondays and Wednesdays 2:30-3:45 pm in Science Hall 444

Credits: 3 (Counts toward the Natural Science requirement.)

Credit Information: This class meets for two 75-minute class periods each week over the spring semester and carries the expectation that students will work on course learning activities (reading, writing, assignments, projects, etc.) for about 3 hours out of classroom for every class period.

Instructor: Prof. Erika Marín-Spiotta (she/her/hers), marinspiotta@wisc.edu

Office Hours: Tuesdays 3-4 pm, Thursdays 12-1 pm in Science Hall 223 or by appointment

SYNOPSIS

This course takes an earth systems approach to explore the role of human societies in shaping earth surface processes from local to global scales. We address how alterations to our landscapes and waterways affect biological, physical and chemical interactions among our biosphere, geosphere, hydrosphere and atmosphere. We discuss methods used to distinguish the "human impact" from background variability.

FULL COURSE DESCRIPTION

The influence of human activities is now recognized to extend all over the globe, which has led some researchers to propose renaming our current geologic epoch the Anthropocene, for the "Age of Humans." This course takes an earth systems approach to explore the role of human societies in shaping earth surface processes. We address how alterations to our landscapes and waterways affect biological, physical and chemical interactions among our biosphere, geosphere, hydrosphere and atmosphere. In particular, we focus on the methods used to distinguish the "human impact" from background variability. Topics covered include: approaches to understand earth system interactions, major alterations to biogeochemical cycles and geomorphic processes, biophysical consequences of changes in land cover and land use, urban biogeochemistry, and emergence of novel environmental conditions. For each topic, we delve into the biophysical science behind each relevant process and discuss different approaches for characterizing and quantifying changes due to human activities. We explore the recent literature to evaluate how biogeochemical and earth system models incorporate human influences to better understand feedbacks between the earth surface, atmosphere and climate.

COURSE LEARNING OUTCOMES

At the end of the semester, students should be able:

- 1) To synthesize how major global biogeochemical cycles and earth surface processes are influenced by human activities;
- 2) To identify positive and negative feedbacks among the biosphere, geosphere and atmosphere at different spatial and temporal scales;
- 3) To explain how different methods are used to characterize and quantify human effects on the earth system;

- 4) To interpret and analyze research findings in the primary literature, that is, scientific articles in peer-reviewed journals;
- 5) To summarize research for different audiences.

DELIVERABLES

The final products for this course will be:

- (1) an annotated bibliography;
- (2) an opinion to the editor essay;
- (3) a methods tool-box;
- (4) a research proposal. (Grad students)

READINGS

All required readings will be posted on Canvas. There is no required textbook for this course.

How to (seriously) read a scientific paper:

<https://www.sciencemag.org/careers/2016/03/how-seriously-read-scientific-paper>

A NOTE ON EXPECTATIONS:

This course is reading intensive and has a large in-class discussion component and I expect you to attend all class meetings, complete the reading assignments and come prepared to ask questions, share your reactions and engage in the conversation. You are welcome to bring your laptop, tablet or smartphone for class use. I will ask each of us to be aware of how much time we spend talking so that we are not dominating the conversation and we allow our fellow classmates to share their views. I expect us to be respectful of each other, even when we disagree, and to let each other know ("Ouch and educate") when someone says something that is not respectful.

At the beginning of each class period I will devote time for questions on any material from previous class meetings. I expect you to let me know if any of the material is confusing either in person before or after class, by email or in my office hours. Comments are welcome at any time. I encourage you to come to office hours. Anecdotal evidence suggests that asking questions in class and coming to office hours helps students learn course material. There will be no extra credit yet I am happy to work with you if you require any special accommodations for your success in this course. I'm happy to work with you to make this a productive learning experience.

EVALUATION:

- Participation in class discussion: 10 points total
- Discussion facilitations (two): 10 points total
- Annotated bibliography: 4 points total
- Reading reflections (two): 10 points total
- Op-Ed essay: 19 points
- Methods tool-box: 35 points

Undergrad students total: 88 points.

Grad students: All of the above plus:

- Research proposal: 24 points

Grad students total: 112 points.

There will be no exams, instead your grade is composed of multiple in-class and outside assignments due throughout the semester.

Final letter grades will be determined as a percentage of the total possible points following these guidelines: (A (100-93); AB (92-88), B (87-81), BC (81-78), C (77-70), D (69-60), F (\leq 59)).

1. Participation (10 points)

- Discussion: Every week, you are expected to read all the assigned readings prior to class and to think about them critically in preparation for participation in class discussions.
- Written discussion questions: By 8 pm the day prior to each class meeting, you will be responsible for posting one question on the online discussion board to help steer the discussion.
- Completion of in-class assignments or worksheets.
- Everyone starts with these 10 points of participation and will lose them if you repeatedly do not engage constructively in class discussions, miss more than four class periods without letting me know, or stop coming to class without letting me know if you will need to miss class for an extended period of time.

2. Discussion facilitation (10 points total): Each student will lead two class discussions. Leaders will be responsible for leading discussion in class, addressing appropriate questions that the other participants will have posted on the discussion board. You are encouraged to use activities to help promote deeper understanding of the material being explored. The discussion leaders will be responsible for compiling all the submitted questions into one Word document and sending it to me by 1 pm the day of class for printing.

3. Annotated bibliography (4 points): An annotated bibliography is an organized list of sources by topic where we will compile summaries of all read papers that can serve as a reference for future work. Discussion facilitators will be responsible for writing (in your own words- do not just rewrite the paper abstract) an abstract for each the assigned papers *the days you lead seminar discussion only*. At the end of the semester, abstracts for each weekly topic will be compiled and shared with the rest of the seminar participants. Abstracts should be around 100 words and provide a brief review of the major themes and/or questions brought up in the reading. The abstracts should distill the main ideas of the paper. All reading summaries are due the week of leading discussion.

4. Reading reflections (10 points): Please submit two 1-page, single-spaced reading reflections (5 points each) on two readings of your choice additional to those required for the class. These readings may come from the course bibliography and be a peer-reviewed article or chapter or a news article that expands on the topics discussed in class. Summarize the reading, describe how it relates to course concepts and other readings and reflect on how it advances your understanding of the topic.

5. Op-Ed essay (19 points): An Op-Ed ("opposite the editorial page" or "opinion editorial") is a written piece that expresses an opinion. Choose an audience and venue (magazine, newspaper, blog) and write a short essay (500-600 words only) to make

an argument about a topic related to the course. You will receive separate writing guidelines for the op-ed.

- First draft (5 points) due on Wednesday, March 6th.
- Peer-reviews due (2 points each). Each student is responsible for providing a peer-review of two other Op-Eds. Reviews are due on Wednesday, April 3rd.
- Final draft (5 points) due on Monday, April 15th.
- In-class presentations (5 points) of Op-Ed on Monday, April 15th and Wednesday, April 17th.

6. Methods Tool-box (35 points): The goal of this project is to explore methods (experimental, observational, inferential, modeling...) and concepts from the course in more detail. Forms can be written papers, websites, or visuals (but these last should be accompanied by explanatory text). You will receive separate guidelines for this project.

- Outline (10 points) due on Wednesday, February 27th.
- Presentations in class (5 points) on Monday, April 29th and Wednesday, May 1st.
- Final project (20 points) due on Wednesday, May 1st.

GRADUATE STUDENTS:

7. Research proposal (24 points): Write a 5-page (single-spaced) NSF style proposal to fund research on a topic related to the course. Please consult your final topic with me. I will hand out writing guidelines for the proposal.

- First draft (10 points) due on Monday, March 25th.
- Peer review (4 points) due on Monday, April 1st.
- Final draft and response to reviews letter (10 points) due on Monday, April 22nd.

ACADEMIC INTEGRITY:

Failure to properly document sources in papers, plagiarism, data fabrication, copying from other student's work, intentionally impeding the academic work of others, or turning in assignments that have already been submitted for credit in other courses are among some of the actions considered academic misconduct. To avoid any possibility of misunderstanding, you are strongly encouraged to consult the campus academic integrity web page: <https://conduct.students.wisc.edu/academic-integrity/> or talk to me when in doubt. Common examples of academic misconduct include: cutting and pasting text from articles or from the web without proper citation and paraphrasing without crediting the source. When in doubt about how to properly cite something, come talk to me.

ADDITIONAL RESOURCES FOR STUDENTS:

I am happy to work with students who need additional accommodations. Please talk to me early on in the semester, or as challenges arise, so I can help you find the best accommodations.

- McBurney Disability Resource Center. Provides services for an inclusive and accessible education. If you need accommodations, please talk to me as soon as possible so we can plan to help you. <http://www.mcburney.wisc.edu/>
- GUTS (Greater University Tutoring Service). Contact to request tutors to help you with course material. I may be also able to put you in touch with potential tutors. <http://www.guts.wisc.edu/>

- UW Writing Center. Provides drop-in or scheduled appointments for help. They will help with just about any type of writing assignments/needs. <http://www.writing.wisc.edu/>
- L&S Student and Academic Affairs. Contact for student advising and help with accommodations for health issues or other emergencies that may affect your ability to complete coursework. <http://saa.ls.wisc.edu>
- As a student at UW-Madison there are numerous resources available to you, including your Deans. Each student has two Deans, an Academic Dean, whose role is to assist students with academic matters pertaining to their respective School or College, and the Dean of Students, whose role is to assist students with personal matters.
- Students facing food and/or housing insecurity are urged to contact the Dean of Students Office for support: <https://doso.students.wisc.edu/student-assistance/> UW also has a Student Food Pantry: <https://www.asm.wisc.edu/theopenseat/> If you don't feel comfortable contacting the Dean of Students directly, please notify me so I can help you access resources.
- Mental Health Services. University Health Services mental health providers understand the complexities of student life and offer an open, safe and confidential environment to help students through challenges that may interfere with their development, well-being and academic productivity. <https://www.uhs.wisc.edu/mental-health/>
- Multicultural Student Center. Provides resources, advocacy and community particularly for students of color and other underrepresented and underserved students on campus. <https://msc.wisc.edu>
- Campus Women's Center: <https://ocfr.wisc.edu/parent-resources/campus-womens-center/>
- LGBT Campus Center: <https://lgbt.wisc.edu/>
- Veterans Resource Center: <https://veterans.wisc.edu/>
- International Student Services: <https://iss.wisc.edu/>
- Title IX Office: <https://compliance.wisc.edu/titleix/>

Geography/Soils 526				Spring 2019 Schedule			
				Topics	Assignments	Readings	
Jan	W	23	Week 1	Introduction & Measuring the Anthropocene I			
	M	28	Week 2	Measuring the Anthropocene II		Smith & Zeder 2013; Waters et al. 2016	
	W	30		Critiques of the Anthropocene		Malm & Hornborg 2014; Ruddiman et al. 2015; Davis & Todd 2017	
Feb	M	4	Week 3	Earth systems approach I		Flato 2011; Jacobson et al. 2000	
	W	6		Earth systems approach II		Prentice et al. 2015; Chin et al. 2014	
	M	11	Week 4	Carbon cycle I		Ciais et al. 2014	
	W	13		Carbon cycle II		Shoemaker et al. NOAA/ESRL websites	
	M	18	Week 5	Nitrogen cycle I		McLauchlan et al. 2007	
	W	20		Nitrogen cycle II	<i>Calculate your N footprint</i>	de la Reguera et al. 2017; Fissore et al. 2011; http://calc.nprint.org/:.YYF	
	M	25	Week 6	Land-atmosphere interactions I		Devaraju et al. 2015; Kirschbaum et al. 2011	
	W	27		Land-atmosphere interactions II	<i>Methods Toolbox outline due</i>	Garcia et al. 2016	
Mar	M	4	Week 7	Land cover reconstructions I		Klein Goldewijk et al. 2017; Arno et al. 2017	
	W	6		Land cover reconstructions II	<i>Op-ed first draft due</i>	Gaillard et al. 2010	
	M	11	Week 8	Agriculture I		Hartman et al. 2011	
	W	13		Agriculture II		Ruddiman et al. 2014	
	M	18	Week 9	<i>No class- Spring break</i>			
	W	20		<i>No class- Spring break</i>			
	M	25	Week 10	Erosion and mining the subsurface	<i>Grad student proposal first draft due</i>	Tarolli and Sofia 2016; Induced Earthquakes (USGS)	
	W	27		Geoengineering			
April	M	1	Week 11	Land-water interface I	<i>Grad student proposal peer-review</i>	Jefferson et al. 2013; Walling 2006	
	W	3		Land-water interface II	<i>Op-Ed peer-reviews due</i>	Campanella 2018	
	M	8	Week 12	<i>Methods Toolbox workshop</i>			
	W	10		<i>Methods Toolbox workshop</i>			
	M	15	Week 13	<i>Op-Ed presentations I</i>	<i>Final Op-Ed pieces due</i>		
	W	17		<i>Op-Ed presentations II</i>			
	M	22	Week 14	Urbanization I	<i>Final grad student proposal due</i>	Lookingbill et al. 2009; Milner 2017	
	W	24		Urbanization II			
May	M	29	Week 15	<i>Methods Toolbox presentations</i>	<i>Annotated Bibliography due</i>		
	W	1		<i>Methods Toolbox presentations</i>	<i>Final Methods Toolbox due</i>		