Geography 329. Landforms and Landscapes of North America. Fall 2016

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Office Hours: Wednesday, 10:00-11:00 AM; Thursday, 1-2 PM; or by appointment.

Overview of the course.

This course is an introduction to the natural landscapes of North America, from the Pacific Northwest with its rainforests and active volcanoes to the forest-covered ridges and valleys of the Appalachians. It is a *selective* introduction—we'll cover landscapes that are especially interesting and distinctive, but we'll have to overlook a lot of others.

Each region has its own set of landforms, climate, biogeography, and soils, and its own "look" and character. These characteristics often have a strong influence on a region's human land uses, environmental problems, and natural hazards. None of these distinctive landscapes can be understood without considering their long-term evolution over geologic time. Although the same basic set of tectonic and geomorphic processes have shaped all of these landscapes, the results in each case are unique. Each records a sequence of events that can include past and present motion of the lithospheric plates, cataclysmic volcanic eruptions, changes in the stream network, glacial erosion, and major fluctuations of climate and vegetation.

Each landscape we will study has also posed a unique set of challenges and opportunities for humans living there at various times up to the present. For example, Native Americans in the Pacific Northwest before the arrival of Europeans used resources and interacted with the landscape in very different ways from those living what is now southern Wisconsin, because of the vastly different topography, climate, and biogeography. Today as well, residents of the cities of Seattle and Portland live in an environment of snow-capped volcanic peaks, active faults, and towering conifers that is very different from the landscapes of the Midwest. We won't study these relationships in great detail; instead, we'll look at a few especially interesting case studies for each region.

The landscapes of North America have posed challenges and opportunities for scientists trying to understand basic processes of geology, landform development, and biogeography, since the early nineteenth century. In fact, many of the most basic questions about the development of these landscapes are the subject of exciting new research today. How old is the Grand Canyon? Why have the Sierra Nevada risen to their present height, and when did that uplift begin? There have been major new developments on both of those questions in the last few years, and we'll discuss these and other examples of recent research in lecture

Online Resources and Course Announcements:

On your course dashboard (https://coursedashboard.learnuw.wisc.edu/) you should find a link to the Canvas home page for Geog 329 (it has the wheel-like symbol, not the D2L symbol). If you haven't used Canvas course pages before, it should be pretty similar to Learn@UW (D2L) or Moodle, but if you have any questions, please ask. On the Canvas home page you can find copies of the syllabus and other documents, copies of lecture slides, review guides for exams, dropboxes for assignments, and a variety of other important resources. Exam and homework scores will be available through the Canvas grade book.

All course announcements will be made through the class email list, which uses your university email address (wisc.edu). Make sure to check that email address regularly to avoid missing anything important.

Expectations and Prerequisites.

Doing well in this course will require attending lecture *and* careful study of the assigned readings. I will post copies of the slides I use in lecture, on Canvas, but I don't provide the fairly extensive explanation of important concepts that you will get in lecture. The readings do not simply repeat lecture material, and I will draw on them for questions on the in-class exams and in take-home essay questions. I will assume that you have had an introductory course in physical geography or physical geology, but I am also well aware that you may need a review of many of the concepts covered in that course. Students who haven't had the prerequisite have done well in this course if they made the effort to get caught up on basic concepts. At the start of the semester, I'll review plate tectonics, and later on, I will review other material you may have learned before. I will *not* review the geologic timescale, or common minerals and rocks, in lecture, and if you need to review those topics you should do so on your own (***This Dynamic Earth and WebGeology, both in the reading list and linked on Canvas, will be especially helpful for this purpose***). If you don't understand a concept discussed in lecture or the readings, *ask for an explanation*.

Textbook and other assigned readings.

All assigned and optional readings will listed by date and lecture topic in two or three ***reading lists*** provided during the semester. The required textbook is *Rough-Hewn Land: A Geologic Journey from California to the Rocky Mountains*, by Keith Heyer Meldahl, ISBN 978-0-520-27577-5. This book is an account of the geological history of landscapes from California east to the Great Plains, written for a general audience. It directly covers regions of North America that we'll spend at least half the semester on, and it also explains and illustrates concepts that we can apply to a lot of the other landscapes that we'll look at. **Note:** We won't start to focus on landscapes directly covered by Meldahl's book until about the fourth week of the semester, but it will become a very helpful source at that point. You can start reading ahead if you want to be prepared for some of the most important landscapes we cover, through the middle of the semester.

A variety of other short required readings will be assigned to cover gaps in the textbook or to provide case studies. These are generally not too technical and I will provide some guidance where needed on unfamiliar terms or difficult concepts. There will also be some optional readings. All of these additional readings will be provided in electronic form on Canvas.

Grading.

There will be three in-class exams (54% of overall grade), three essay assignments completed outside of class (24%), a project assignment (10%), and a participation grade (12%). The ***in-class exams*** are short and objective, made up of short-answer and multiple choice questions. They are equally weighted and non-cumulative. Before each exam, I will hand out an outline of the topics to be covered. The three ***essay assignments*** are essentially a way to ask more-depth, thought-provoking questions than I can easily do on the in-class exams. The questions you will answer with these essays will relate to both lecture material and reading. The ***project***, completed early in the semester, will allow you to explore specific landscapes of North America using a variety of methods and online resources.

The ***participation grade*** is based on asking questions about course topics, either in class or in written form uploaded to a dropbox on Canvas (you can do either for any of the questions). To get full credit for this, you need to ask questions (or submit them to the dropbox) in **twelve different weeks** of the semester. I'll answer the verbal questions in class; the written ones will be answered on the Canvas page but I may also bring them up in class. The questions need to have some depth, and should be along the lines of "how do we know this is true," "why is this alternative explanation not true," etc. You can bring up your question in the middle of a lecture, if it's relevant, but I'll also set aside time for questions on at least one day per week.

Graduate students should meet with the instructor by the fourth week of classes, to agree on an individualized list of several additional readings (journal articles and/or book chapters). They will then

write a short paper (~1000-2000 words) summarizing and critiquing what they have read and responding to questions posed by the instructor. This paper is intended to be a short and focused critical essay, not a formal literature review or a research paper. In addition, graduate students will be held to a higher standard in grading of the short essays completed outside of class.

Grading scale: I start with the following scale in assigned letter grades, based on overall percentage in the course. In some semesters I lower the grade breaks slightly to account for exams that were harder than intended or other factors, but in other semesters I use this scale unchanged:

A 92-100%
AB 87-91.9%
B 80-86.9%
BC 73-79.9%
C 65-72.9%
D 55-64.9%

Overview of the lecture topics.

The course will start with lectures on basic concepts on Earth Science that will be used through the rest of the semester. We will then study the relatively young and tectonically active landscape of Cascadia (British Columbia, Washington, Oregon, and northern California), at the boundary between two converging lithospheric plates. From there the focus will move south and east across the mountain ranges and basins of the western U.S., where we will often need to consider a much longer and more complicated history of changing plate boundaries, mountain building, and erosion. At the same time, we'll look at examples of change in these landscapes over the last few thousand or even few hundred years. We will then jump east across the continent to the old mountain ranges of the Appalachians. Finally, we will finish with the Midwestern US and the Canadian Shield.

Lecture and exam schedule. The exam dates listed are fixed, but the schedule of lecture topics will most likely be modified as needed. Due dates for the projects and essays will be given at the time those assignments are handed out and/or posted on Canvas. This schedule lists the basic topics to be covered, but not specific case studies of land use, environmental issues or hazards, or scientific discoveries. *Reading lists* will be handed out separately from this syllabus, and will also be available on Canvas.

9/6, 9/8, 9/13. Introduction to the course. Basic concepts of plate tectonics. Faulting and folding. Isostasy and mountain-building processes. Volcanism and major types of volcanoes.

9/15, 9/20. Cascadia. Plate tectonic setting of the Pacific Northwest. History of major Cascades volcanoes. Formation of coast ranges and Puget/Willamette lowlands. Rainforests and rainshadows. Great subduction zone earthquakes.

9/22, 9/27. Columbia Basin, Snake River Plain, and the Yellowstone Region. Mantle plumes, flood basalts, and calderas. The Missoula Floods and Palouse loess. Soils, forests, and fire in Yellowstone. *One or both of these lectures may be online, with added reading material. Check the week before to be sure.*

9/29, 10/4, California 1: Long-term tectonic evolution of the western Cordillera and California. Accreted terranes. Cretaceous subduction zone and batholiths. Origin of the Central Valley. Origin of gold ores.

10/6. Exam 1. Covers lecture material through 10/4.

10/11. California 2: Evolution of the Sierra Nevada and California's river systems. Placer gold. Transform boundary, San Andreas Fault, Coast Ranges, and earthquakes.

10/13, 10/18, 10/20. Basin and Range. Extension, development of fault-block mountains, fans and pediments, Lake Bonneville and other pluvial lakes. Basin and Range biogeography.

10/25, 10/27. Laramide Orogeny. Great Unconformity and Paleozoic to Mesozoic Paleogeography. Dinosaur localities. Tectonic explanations for Laramide Orogeny, old and new. River incision and the dramatic landscapes of the American West.

11/1, 11/3. The Colorado Plateau. History of the Colorado River (Why the Grand Canyon? And when?). The Colorado Plateau and the development of geomorphology, past and present.

11/8, 11/15, 11/17. The Rocky Mountains, Intermontane Basins, and Great Plains. North to south variation of the Rockies, Cenozoic volcanic activity, the Rio Grande Rift, Post-Laramide erosion, basin-filling and volcaniclastic sedimentation. Drainage development; antecedent vs. superimposed streams. Alpine glaciation and the Rocky Mountain high country today. The Ogallala Formation and formation of the High Plains surface and the High Plains aquifer. Dust and drought on the Plains.

11/10 Exam 2. Covers lecture material from 10/11 through 11/8.

11/22, 11/29. Overview of Eastern North America: The Atlantic margin and formation of the Appalachian Mountains.

12/1. The Appalachians, Piedmont, and Coastal Plains. Transect: Coastal Plain, Piedmont, Great Valley, Blue Ridge, Valley and Ridge, and Allegheny Plateau. Cycles of erosion vs. dynamic equilibrium. Drainage development. Water gaps, wind gaps, and the Mason-Dixon line.

12/6. The Stable Craton. Precambrian evolution of Lake Superior region. Impact structures. Basins and arches of the Midwest. Interior Low Plateaus.

12/8. Glaciation of the Midcontinent. The Laurentide Ice Sheet and continental-scale patterns of ice flow, erosion, and deposition. Sculpting of the Great Lakes basins, the northern Great Plains, and the Canadian Arctic. Variation of glacial landforms across the mid-continent. Drainage rearrangement as a result of glaciation. Ten thousand lakes, and how the fish got to them.

12/13. Catchup and/or review.

12/15. Exam 3. Covers lecture material from 11/15 through 12/13

[no exam during finals week]