Geology 230
Ecogeo: Grand Canyon Seminar
Winter 2020

N. Pinter

Wednesdays, 5:10p – 7:30p, EPS Building 1316

Course Outline and Requirements

Goals and Objectives: this 3 unit graduate seminar is preparatory to the private and optional Grand Canyon field trip, March 10-28. The course will 1) familiarize student participants with the geology, ecology and management issues associated with the Grand Canyon and Colorado River, 2) encourage students to become class "experts" in some critical issue or concept relevant to the field trip, 3) translate and communicate the science of the Colorado River and surroundings into a broader context, including management and even literary perspectives; and 4) help organize logistics for the optional field trip, including food, gear, transportation and field itineraries.

Currently, ~40 million people rely on the water in the Colorado River, but changing precipitation patterns and increasing population and water demands are adding challenges to river management. The US Bureau of Reclamation recently published a study assessing supply and demand under various climate and demand scenarios (http://www.usbr.gov/lc/region/ programs/crbstudy/finalreport/) American Rivers listed the Colorado River as the most endangered river in the United States (http://www.americanrivers.org/endangered-rivers/2013-report/colorado/). Each student will find a topic within their area of expertise that has to do with the changing Colorado River. We will convene a meeting in October to set the stage, provide some background reading, and discuss possible topics. You will be expected to come to the first class with a primary and secondary topic that you would like to cover.

The course will be followed by an optional, private Grand Canyon rafting trip. Trip participants should expect to help organize logistics for the field trip, including food, gear, transportation, etc.

Requirements: students are required to attend classes. When not possible, it is their responsibility to communicate with the professors or other students regarding assignments and logistics so that they are equal contributors to the class effort. *One absence will be excused without consultation needed; each additional absence will result in one letter drop in grade regardless of cause and without appeal.*

Students are required to complete four assignments during the quarter and one in the field: (1) a 10-12 minute class presentation, (2) write a 800-word "literary pitch related to another student's presentation and topic *(instructions below)*, (3) complete a research-level review paper on their presentation topic; (4) complete all reading assignments, including two novels. In addition, (5) students going on the river trip are expected to lead a "Future Extrapolations" discussion of their presentation topic *(instructions below)*.

Presentations: Each paper should address a key management or research issue related to the Colorado River, Grand Canyon National Park, or the Colorado River watershed. A list of topics from previous years will be included at the end of this syllabus, and presentation topics may overlap past presentations, or you may propose new topics.

The selection of topics and coordination of the effort will require communication and cooperation with other students. In many cases, students will be asked to switch topics to avoid duplication, to cover must-do topics, or to steer students towards the spirit of this year's Ecogeo class.

The class presentations will summarize the current state of research and current applications to the Grand Canyon and Colorado River. Presentations will be 10-12 min. in duration, include a Powerpoint, followed by a couple of questions. *Presentations must be prepared by reviewing the relevant research literature and must include a PPT slide listing the literature from which information was actively sourced.* Most sources should be journal articles, monographs, and printed agency reports – no Wikipedia.

Fiction Readings: (1) Paolo Bacigalupi, Water Knife
(2) Kim Stanley Robinson, Pacific Edge (see due dates)

Literary Pitch: Each student will write one 600-800 word "literary pitch" extrapolating from another student's presentation. Assignments will be made at the end of each class session at which students present, and these assignment must be uploaded to Canvas *by midnight the following Sunday*.
Your pitch should imagine a future scenario, at least 50-100 years from the present, related to the topic of that lecture. Imagine what the Colorado River, Grand Canyon National Park, or the US West might look like if current trends continue and/or if some unexpected future event were to occur. Include possible characters and a narrative arc. Be creative and make this vision and your narrative interesting to an author or reader. These pitches may be posted on the Ecogeo website, so please proofread (peer review is encouraged) to clean your submissions of grammatical, spelling, and punctuation errors.

Final paper: Students will be required to prepare a 5-page (not counting figures and references), single-spaced research term paper on the topic presented in class. This paper is due on March 4th, no exceptions. The topic of the paper should generally be the same as a student's presentation, unless discussed and approved by the instructor in advance. All papers should have a central focus on the Colorado River area. Papers should fully review primary sources from the scholarly literature and may, in some case, include original data or analyses. In all cases, papers should be scholarly, consistent with a graduate-level seminar in a science department, drawing upon the research literature on that topic. To avoid plagiarism, all information and figures from the literature must include citation(s) and be in your own words; however, a few short quotes are allowed if quotation marks are used.

Successful completion of this class is a requirement for participation in the Colorado River trip, including vigorous course effort and attainment of scientific knowledge appropriate for a graduate-level class. Thus, **an "A" or "B" grade on the final paper is a non-negotiable requirement for the field trip**, with no accommodation or refund for students who do not meet this requirement.

"Future Extrapolations:" While on the river, students will lead a 10-minute discussion. These discussions will pivot your scientific presentation, starting with that background, and extrapolating that issue 50-100 years (or possibly more) into the future – i.e., creating science-based speculative fiction.

Imagine what the Colorado River, Grand Canyon National Park, or the US West might look like if current trends continue and/or if some unexpected future event were to occur. As a REQUIREMENT of this assignment, you MUST present a positive outcome for your topic or issue. If you like, imagine more than one scenario. Discuss barriers to your positive outcome(s), including technical, economic, political, and social obstacles, and how these barriers can be overcome. In some cases, adaptive pathways may be challenging to imagine, so explore the patterns of dysfunction that create these challenges – why, even when stakeholders share common goals, they may find it difficult to act to promote these goals.

In the spirit of speculative fiction, explore "what if"s, and feel free to think the unthinkable. As a scientist, base this speculation on current baseline conditions, documented trends, and plausible future events.

Course Schedule:

The class will meet every Wednesday from 5-7:30pm, through and including March 4th. Attendance is mandatory (see policy under "Requirements" on p. 1).

January 8: Student introductions, outline of general topics, initial assignments, summary of field trip logistics.

by midnight, Jan. 10: Submit a presentation topic via Canvas

January 15: Intro to the geology of the Grand Canyon (Nicholas) *Reading 1 due*
Intro to the ecology of the Grand Canyon (Jenny Gremer) *Reading 2 due*

if needed, Jan. 17 (by midnight): Submit final and revised presentation topic via Canvas

January 22: Environmental Speculations in Science, History, and Science Fiction
including guidance on how to write your two "Literary Pitches"
(Prof. Michael Ziser, UCD Dept. of English)
Assignment (2 readings): *William Cronon, "A Place For Stories"*
& excerpt from John Fleck's "Water is for Fighting Over"

January 29: Student presentations 1

February 5: Student presentations 2

Book 1 completed

February 12: Student presentations 3

February 19: Student presentations 4

February 26: Student presentations 5

March 4: All papers due and final, submitted electronically on Canvas. Field assignments finalized. Trip logistics finalized.

March 10: First-half and full-trip participants depart Davis, night in Flagstaff

March 12: First half puts in at Lee's Ferry

Book 2 completed

March 18: Second half departs Davis

March 19: Switchover at Phantom Ranch; first half return to Davis ~3/19/2020

March 28: Takeout at Diamond Ranch; second half returns to Davis

During class meetings there will be regular updates and information regarding field trip logistics. As a reminder, if a student misses a class, it is solely his or her responsibility to find out what was discussed.

Presenter: _____ **Ecogeo Student Presentation Rubric**

	Yes <——————> No				
Did the presenter lead with a clear main question or issue?	O	O	O	O	O
Did the presentation review the background scientific literature?	O	O	O	O	O
Was the presentation logically organized and did it flow well?	O	O	O	O	O
Did the speaker's volume, enunciation, vocal style, eye contact, and enthusiasm make for an effective and clear presentation? Any suggestions?	O	O	O	O	O
Were the presentation graphics clear and effective?	O	O	O	O	O
Were the 'big picture' concepts and significant conveyed well?	O	O	O	O	O
Was the presentation tailored to the correct audience – in this case, an interdisciplinary graduate-student seminar in the sciences?	O	O	O	O	O
Did the presentation last ≥10 min. and ≤15 min?	O				O

What did you like best about this presentation?

If you had to suggest one improvement to this presentation, what would it be?

Past Student Presentation

A review of the challenges and effect of the fill lake mead policy
Age and origin of volcanic lava flows of the Grand Canyon and their influence on river geomorphology
Agricultural adaptation t drought in lower Colorado basin
An Economic Analysis of Protected Areas and Grand Canyon River Rafting
Aquatic endangered species: spring snails
Assessment of Sediment Transport and Sandbar Formation throughout High -Flow Release from Glen Canyon Dam
Biological Soil Crusts: Ecological Roles and Effects of Disturbance in Desert Systems
Can Humpback Chub and a Blue Ribbon Trout Fishery Coexist in the Grand Canyon?
Change in sediment movement before and after the Glen Canyon Dam with a focus on the disruption of the ecology.
Climate Change, Development, and Groundwater-Surface Water Interactions in Grand Canyon National Park
Climatology of the Intermountain West: Assessment of Temp., Precipitation, and Snowpack in a Changing Climate Regime
Colorado Basin Water Supply and Demands in a Changing Climate
Colorado River Basin Salinity
Dynamics and Evolution of Tributary Alluvial Fans in the Grand Canyon below Glen Canyon Dam
Earthquakes and Faulting in the Grand Canyon
Ecohydraulic modeling of habitats in the Colorado River
Ecological consequences of changes in resource extraction through time
Ecological disturbance by invasive burros: NPS vs. the public
Ecology of the main invasive plants and their primary impacts within the GC
Economic impacts of allowing trade of Colorado River Water
Effect of Glen Canyon Dam on the Temperature Regime of Colorado
Effects of Glen Canyon dam on Colorado River water temperature
Endangered species and adaptive management in the Grand Canyon
Evaluating Salinity Management Programs in the Colorado River Basin
Examining how extirpated fish species were lost and lessons for remaining fish
Extent and ecosystem impacts of Biological Soil Crust in the Colorado River Basin
Fire ecology and management in Grand Canyon National Park
Flooding and Riparian Vegetation and Nutrient Cycling in the Grand Canyon
Grand Canyon fish management plan & goals, process and current state
Grand Canyon Hydraulics and Humpback Chub
Groundwater pathways leading to springs in the Grand Canyon
Groundwater-surface water interactions
Groundwater-Surface Water Interactions in Grand Canyon National Park
High Flow Experiments and Sediment Transport in the Grand Canyon
High Flow Experiments in the Grand Canyon: An Evolving Water Management Paradigm for the Colorado River
How flow processes affect distribution of habitat and species ecology
Human impacts on sediment transport
Hydrochemistry, Hydrologic Regime, and Peoples of Havasu Creek Watershed
Hydroclimatic Change and Connections to Aquatic Ecosystem Management in the Grand Canyon
Hydrodynamics of the Colorado River: impacts on river form and process
Insights from the recent drought on the potential for ecological restoration in Glen Canyon

Invasive animal ecology perhaps beetles and biocontrol
Invasive species control and endangered species management in the Southwestern US
Mechanisms of River Incision Into Bedrock: Implications for Grand Canyon Formation
Mountain lion corridors and landscape connectivity in the Grand Canyon
Native American tribal water rights in the Colorado River basin
Native Fish of the Grand Canyon
Native riparian plant restoration and issues impacting success
Nature as a context for learning
Navajo San Juan agreement
Nitrogen & Phosphorus Dynamics below Glen Canyon Dam
Non-geologic paleo indicators of environmental change
Operations and Tradeoffs in the Colorado River
Paleozoic Stratigraphy of the Grand Canyon
Plant Community Restoration Strategies in the Grand Canyon
Pre- and post-dam shifts in vegetation throughout the Grand Canyon: What do novel systems mean for management?
Pre-Cenozoic Stratigraphy and Paleogeography of the Grand Canyon, AZ
Precambrian history, rocks, and structure of the Grand Canyon
Quaternary Paleoclimate of the Colorado Plateau
Rafting through time: the prehistoric ecology of the Canyon
Reconciling the Colorado River Delta
Response of fish biota to dams in the Lower Colorado River Basin
Restoration of the Colorado River Delta and effects of 2014 release
Review of water rights allocation the CO and how we got to XXX 323 US-Mexico
Riparian Vegetation Responses to Altered Disturbance Regimes in the Grand Canyon
Rise of the Colorado Plateau
Salinity in the Colorado River Basin
Sediment Supply and Flow in the Colorado River Basin
Sediment Supply and Flow in the Colorado River Basin
Tectonic and Landscape Evolution of the Colorado Plateau
The ecology and history of livestock and wildlife grazing in and around Grand Canyon National Park
The role of the canyon in shaping the distributions of rodents
The science behind Colorado Compact and the Grand Canyon
The Tectonic Evolution of the Colorado Plateau and Grand Canyon Region
Theories on the Age of the Grand Canyon
Tick-borne disease; ecological complexity
Tribal Relations and Conflicts around the Grand Canyon National Park
Upper Colorado River Basin Flows and Paleohydrology
Uranium Mining Impacts on Grand Canyon Groundwater Resources: Past, Present, and Future
Vegetation Removal for Achieving Diverse Water Management Goals
Water Conservation Opportunities and Challenges in the Colorado Basin
Water history analysis of Colorado River & formation of the Colorado River Compact
Water quality - future and implications