Independent Study
Large Landscape Conservation and the Future of America's Rivers

Location and Meeting Times TBD

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Description

This 4-credit independent study is suited for urban planners, landscape architects, and architects interested in the conservation and restoration of America's rivers. Our approach explores river conservation from a "whole systems" standpoint. In addition to readings, field trips, and discussions with conservation professionals, students will conduct in-depth research on America's sixth longest river: the Arkansas. They will examine its development for beneficial use from source to mouth and its corresponding ecological alteration across four states. They will create work products that serve to: (1) build understanding of the whole river system and (2) enhance or repair the river's ecological functions through scalable efforts that take into account cultural needs serviced by the river.

Objectives

1. To understand planning approaches and tools used by river conservation professionals in various organizational disciplines and settings (an emphasis will be placed on large landscape conservation efforts and the work of land trusts).
2. To develop models and designs, which demonstrate an understanding of historical alterations to the Arkansas River, the cultural needs met by those alterations, and the ecological consequences of those alterations.
3. To develop a set of principles and practices that can guide conservation planning approaches to future river management and to demonstrate implementation pathways through final projects that take into account on-the-ground social, political, and economic realities.

Structure

Unlike a traditional independent study—which is proposed by the student and approved, supervised, and evaluated by a professor—this independent study is designed for four to eight students interested in undertaking research and executing projects within a collaborative framework. Each student will still be required to obtain a faculty sponsor, who, through consultation with me, will affirm the student's final grade. Faculty sponsors must sign a Petition for Independent Study form. A description of a student's project is usually included with the form, and this syllabus may help serve that purpose. I am happy to discuss this effort with faculty members in order to help students obtain sponsorship. Students will also need to record a placeholder course in Gropius. Students enrolled in Joyce Rosenthal's course, *Environmental Planning and Sustainable Development*, can elect to have Professor Rosenthal sponsor their independent study, which creates an opportunity to devote time and effort to an 8-credit "mega-project" that serves both the requirements of the course and the independent study. A highlight of the independent study will be a week of travel in Colorado's Lower Arkansas River Valley, which will take place during Harvard's spring break. The Loeb Fellowship Program is covering a majority of travel costs.

Expectations

This independent study will pose serious challenges, as there is no precedent for undertaking work at this scale on the Arkansas River. No conservation group exists that focuses on the Arkansas River in its entirety. The study provides an opportunity for students to apply conservation approaches to the Mississippi River system's second longest tributary within a theoretical framework. Students may find that what they set out to accomplish through this independent study may be unachievable for various reasons: lack of data, political or economic realities, the size of the task, or existing cultural precedents and path dependencies. This is a common situation confronted by conservation professionals attempting to address large-scale issues and implement change. Not all efforts are feasible or successful. Working at the nexus of large landscape conservation, natural resource management, and fresh water allocation and procurement, students should be prepared to constantly reconsider approaches to what is feasible—scaling and rescaling projects so that they are firmly rooted in on-the-ground realities. To address real-world challenges through practical applications of conservation principles will be our aim.

Requirements

Pre-Enrollment

1. ATTEND AN INFORMATIONAL SESSION ABOUT THE INDEPENDENT STUDY. This will take place on Monday, January 26, from 6:00 to 7:00 PM. We will gather in the Gund lobby just before 6:00, then move to a nearby meeting space. I am happy to discuss the study further with interested students, in one-on-one conversations.
2. REQUEST TO PARTICIPATE. Send me an email with a request to participate. Provide background information about your studies (MUP, MLA, 1st year, 2nd year, etc.) and your professional interests. Let me know which of our core research questions appeals to you and why (see Project 2: Addressing River Issues). Secure the approval of a faculty sponsor, and let me know who that person will be.
3. CONFIRM YOUR PARTICIPATION INTEREST NO LATER THAN FRIDAY, JANUARY 31. After course shopping, please confirm your interest and ability to participate. Keep in mind that participation will be limited to eight students. I will confirm whether or not I can/will accommodate you by Monday, February 2, so that you can make other course arrangements if necessary.

Post-Enrollment

1. WEEKLY MEETINGS. We will meet weekly. The day, time, and location will be determined after enrollment in the independent study group is confirmed and course shopping at the GSD is complete.
2. READING MATERIALS. A set of background reading materials will provide a foundation for our explorations and establish a framework through which we shall operate. A bibliography of supplemental reading materials will also be provided.
3. PROJECT 1: UNDERSTANDING RIVER FLOWS. This initial mapping project will build an understanding of the river system as it exists today.
4. PROJECT 2: ADDRESSING RIVER ISSUES. This project, which is proposed by the student, will be based on core research questions, what we have learned in the course of completing the first project, and personal/professional interests.

Grading

Final grades will be comprised as follows:

Engagement, Accountability, Exploration, Overcoming Obstacles, Execution:	20%
Project 1:	30%
Project 2:	50%

PROJECT 1: UNDERSTANDING RIVER FLOWS

The Arkansas River flows through four states: Colorado, Kansas, Oklahoma, and Arkansas. The goal of this project is to understand the river as a natural system altered by human activity over the last 150 years. We will do this by: (1) mapping the river's course from source to mouth; (2) documenting where humans have modified the flow of water; (3) understanding the rationale behind these engineering efforts; and (4) exploring the intended and unintended consequences of these actions and the contemporary ecological and cultural ramifications they bring. The project will center on the Arkansas' main channel while taking the entire hydrologic basin into account (i.e., tributaries). Students or student pairs will be responsible for becoming an expert on river flow through one state. The matter of tributaries spanning multiple states will be discussed. Based on these discussions, available data, and student skill sets, project focus areas may shift from states to hydrologic units (i.e., regions, sub-regions, accounting units, and cataloging units).

Project Requirements

1. The deliverable will be a map or series of maps illustrating the river's course through each state.
2. Maps will reveal major engineering features along the Arkansas River and its tributaries. These may include: dams, diversions, interbasin transfers, channels, irrigation canals, M&I intake/discharge facilities, locks, levees, etc.
3. Each feature will be identified with a name and the date it was created.
4. Contemporary, average annual flows (in cfs) will be listed at various points along the river.
5. Regular presentations and updates regarding deliverables will be given. In addition to providing an overview of items one through four (above), students should consider and discuss what key contemporary issues they have uncovered in their initial research. These contemporary issues should relate to our core research questions or other important ecological or cultural considerations. It would be ideal if these issues could be documented in the design.
6. A bibliography of sources used to compile the data must be submitted (Chicago Manual of Style: Author Date System). Outreach to local experts is encouraged. If experts become key resources for this effort, list them in your bibliography (include organization and title).

Flexibility in Execution

Students may choose to combine forces on this project across two or more (even all) states. The end goal is to build a product that most effectively conveys information and builds understanding. If a division of labor or a combining of forces better accomplishes this task, great.

Evaluation

Evaluation will be based on three criteria: (1) the deliverable meets the requirements; (2) the degree to which the design builds understanding of the "whole system;" and (3) utility (the degree to which the project can be helpful to conservation and planning interests).

PROJECT 2: ADDRESSING RIVER ISSUES

While the purpose of the River Flows project is to build understanding of the Arkansas River Basin within a whole systems context—and to expose ourselves to the myriad of issues created and/or faced by human and ecological communities within the system—the purpose of this project is to research and address a specific conservation issue of interest. This issue should pertain to one or more of our core research questions, or to a related issue that emerges during the River Flows project.

Project Requirements

1. Submit a one to two page proposal that outlines:
   a. The research question you will address.
   b. The approach you will take to address it.
   c. The deliverable you envision emerging.
   d. Preliminary core research questions and potential deliverables are as follows:

PRELIMINARY CORE RESEARCH QUESTIONS	POTENTIAL DELIVERABLES
1. How have humans altered stream flows in the Arkansas River from source to mouth? What did seasonal water flows look like at the onset of the 19th century? What do they look like today? – *How has human activity altered ecologies?* – *What are the cultural implications of these altered ecologies?* – *How will climate change affect future stream flows and ecologies?* – *What future conservation activities are indicated, and what feasible first steps can be taken given the on-the-ground political and economic realities and cultural precedents.*	Maps, illustrations, and/or animations demonstrating changes in water flow (cfs) over time. Identification of potential conservation opportunities.
2. In Colorado, who owns the Arkansas River? How has ownership changed over time? What are the priorities for protecting prime irrigated farmland and important ecological systems? – *Who are the largest agricultural, municipal, and industrial owners?* – *How does ownership equate or not equate with resource control?* – *How will climate change, increasing selenium concentrations, depleted aquifers, and other environmental factors affect cooperation and competition regarding the procurement, sharing, and use of water resources?*	Maps, animations, and tools designed to look at ownership changes over time, current ownership, and preservation priorities.
3. What engineering solutions will promote more efficient use of water for agricultural and municipal users, and restore in-stream flows? – *What new engineering systems need to be adopted?* – *What adaptation of existing systems could take place?* – *Is deconstruction of certain systems called for?* – *What legal obstacles hinder creative change?* – *What political structures need to be established or dismantled to bring about the needed change?* – *How should the Arkansas River look and function in the next century? What changes in thinking and policy will drive these developments?*	Catalogue of applicable case studies demonstrating possible engineering solutions. (Revised flow projections, if possible, based on engineering solutions.)

4. Can market-based solutions protect agricultural water in communities facing the "buy-and-dry" trend? Will these solutions treat farmers and investors equitably over time? Can they contribute to ecological restoration? – *What economic impact has the buy and dry trend had in Colorado's Arkansas Valley as measured by poverty rates, median income, employment, and/or Main Street building occupancy over time?* – *What is the economic impact of protected farmland given the variety of commodities being produced?* – *As water is an increasingly valuable asset, what market, conservation, and engineering mechanisms will enable farmers to retain that asset for commodities production while creating supplemental income streams by meeting other needs?*	Analysis of existing models (lease-back, Super Ditch, in-stream flow program). Proposal for modified or alternative models drawing on real world examples.
5. With recent legislation allowing domestic rainwater capture in Colorado, what architectural innovations can be employed to provide clean, affordable water for domestic use in poverty-stricken rural areas troubled by poor water quality? How can these solutions contribute to overarching housing problems? – *What would model homes in Colorado's Arkansas Valley look like? Model communities and developments?* – *Are there implications for greenhouse design?* – *How can communities implement designs in the face of poverty and decline?* – *How will these designs adapt to possible climate change variations?*	Architectural renderings, plans, and designs.

2. Discuss your proposal with me; secure approval.
3. Share your proposal with the group and be prepared to provide regular updates regarding your progress and to solicit feedback. Keep the needs of other projects in mind, and share resources you find that might be of interest or useful to others. The hope is that regular exchanges about our work will build ideas and lead to more thoughtful and thorough projects.
4. A presentation of the final product(s) will be given.
5. A bibliography of sources used to compile the data must be included (Chicago Manual of Style: Author Date System). Outreach to local experts is encouraged. If experts become key resources for this effort, list them in your bibliography (include organization and title).

Large Landscape Conservation and the Future of America's Rivers
Schedule & Readings (DRAFT)

CRITICAL DEADLINES HIGHLIGHTED

Monday, January 26—Overview/Expectations

Tuesday, February 3—Whole Systems Planning

Agenda:

1. Welcome & Introductions
2. Scheduling & Information Sharing
3. Overview of the Arkansas River
4. Project 1 Approach
5. Readings
    a. Required
        i. Angela H. Arthington, *Saving Rivers in the Third Millennium (p. 1-12)*
        ii. The Nature Conservancy, *Colorado River Basin Conservation Business Plan (all)*
    b. Optional
        i. Malcolm Newson, *Land, Water, and Development: Sustainable and Adaptive Management of Rivers (p. 14-19, 96-117)*
        ii. Peter Behr, *Looming Water Crisis (all)*
        iii. The Nature Conservancy, *Stepping up to the Challenge: A Concept Paper on Whole Systems Conservation (all)*

Tasks/Assignments:

1. Project 1 Reconnaissance
    a. What information is out there?
    b. What data sources will be helpful?
    c. What examples of work can inform execution?

Tuesday, February 10—Theoretical Frameworks

Agenda:

1. Reconnaissance Sharing
2. Project 1: Developing an Execution Plan
3. Readings
    a. Required
        i. Wallace Stegner, *Beyond the Hundredth Meridian: John Wesley Powell and the Second Opening of the American West (p. 1-8, 212-231)*
    b. Optional
        i. Arthur Maass and Raymond L. Anderson, *...and the Desert Shall Rejoice: Conflict, Growth, and Justice in Arid Environments (p. 1, 365-369)*
        ii. Christopher Stone, *Should Trees Have Standing: Law, Morality, and the Environment (p. 1-31, 79-88)*
        iii. Donald Worster, *Rivers of Empire (p. 19-60)*
        iv. John Wesley Powell, *Report on the Arid Region of the United States (p. iii-ix, 25-45)*
        v. Marc Reisner, *Cadillac Desert: The American West and Its Disappearing Water (p. 1-15)*
        vi. Patricia Limerick, *A Ditch in Time: the City, the West, and Water (p. 1-11, 131-141)*
        vii. William Smythe, *The Conquest of Arid America (p. ix-xi, 41-48, 311-319)*

Tasks/Assignments:

1. Begin Project 1 Development

Tuesday, February 17—Practical Frameworks: Conservation Tools

Agenda:

1. Project 1 Check-In: Review Progress
2. Readings
   a. Required
      i. Colorado Open Lands, *Beatty Canyon Ranch Conservation Easement (all)*
      ii. Colorado Water Trust (et al), *Model Conservation Easement Language (all)*
      iii. Jamie Williams, *Large Landscape Conservation: A View from the Field (all)*
      iv. Sarah Bates, *Land Trusts and Water: Strategies and Resources for Addressing Water in Western Land Conservation (7-34)*
   b. Optional
      i. Internal Revenue Service, *Treasury Regulations Section 170(h) (all)*
      ii. Matthew McKinney, *Large Landscape Conservation (p. 2-20)*
      iii. Todd Doherty, *Water Transfers in the West: Projects, Trends, and Leading Practices in Voluntary Water Trading (p. vii-1, 20-22)*

Tasks/Assignments:

1. Complete Project 1 Deliverable(s) Draft

Week of February 23 (no meetings…India Trip)

Tuesday, March 3— Practical Frameworks: Flow Science

Agenda:

1. PRESENT PROJECT 1 DELIVERABLE(S) DRAFT
2. Project 2 Discussion
3. Readings
   a. Required
      i. Angela H. Arthington, *Saving Rivers in the Third Millennium (p. TBD)*
      ii. Geoffrey E. Petts, *Instream Flow Science for Sustainable River Management (all)*
   b. Optional
      i. James Rice, *Controlled Flooding in the Grand Canyon: Drifting Between Instrumental and Ecological Rationality in Water Management (all)*
      ii. Joseph Clements, *Meanders and the Development of the Arkansas River (p. TBD)*

Tasks/Assignments:

1. Complete Project 1 Deliverable(s) Final

Tuesday, March 10— Practical Frameworks: Colorado Matters / Water Sharing

Agenda:

1. PRESENT PROJECT 1 DELIVERABLE(S) FINAL
2. Colorado Trip Discussion
3. Project 2 Discussion (continued)
3. Readings
   a. Required
      i. James Sherow, *Watering the Valley (p. 1-47 required; 48-78 optional)*
      ii. Kansas-Colorado, *Arkansas River Compact (all)*

iii. Peter D. Nichols and Leah K Martinsson, *Catlin Canal Pilot Project Proposal for Colorado Water Conservation Board Selection (all)*

b. Optional
   i. Colorado General Assembly, *House Bill 13-1248 (all)*
   ii. Colorado Natural Heritage Program, *Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative (p. TBD)*
   iii. H. David Gold, *Supreme Court Struggles with Damage Assessment in Water Dispute as Interstate Compact Breaks Down (all)*
   iv. Jeff Lukas, *Climate Change in Colorado: A Synthesis to Support Water Resources Management and Adaptation (p. TBD)*
   v. Palmer Land Trust, *Our Land, Our Water, Our Future: a Conservation Plan for the Western Lower Arkansas Valley (p. TBD)*
   vi. Peter D. Nichols, *Development of Land Fallowing-Water Leasing in the Lower Arkansas Valley (p. TBD)*
   vii. Western Resource Advocates, *Filling the Gap: Meeting Future Urban Water Needs in the Arkansas Basin (p. TBD)*

Tasks/Assignments:
1. Project 2 Proposal

Week of March 16—Spring Break (Colorado Trip)

Great Nonfiction Adventure to Flavor Your Travel (All Optional)
1. Wallace Stegner, *Beyond the Hundredth Meridian: John Wesley Powell and the Second Opening of the West*
2. Hampton Sides, *Blood and Thunder: The Epic Story of Kit Carson and the Conquest of the American West*
3. David Fridtjof Halaas and Andrew Edward Masich, *Halfbreed: The Remarkable True Story of George Bent : Caught Between the Worlds of the Indian and the White Man*
4. Timothy Egan, *The Worst Hard Time: The Untold Story of Those Who Survived the Great American Dust Bowl*

Week of March 23

Agenda:
1. PRESENT PROJECT 2 PROPOSAL

Tasks/Assignments:
1. Begin Project 2 Development

Week of March 30

Agenda:
1. Project 2 Updates & Resource Sharing

Tasks/Assignments:
1. Continue Project 2 Development

Week of April 6

Agenda:
1. Project 2 Updates & Resource Sharing

Tasks/Assignments:

1. Continue Project 2 Development

Week of April 13

Agenda:

1. Project 2 Updates & Resource Sharing

Tasks/Assignments:

1. Complete Project 2 Deliverables Draft

Week of April 20—No Meetings (Florida Trip)

Week of April 27

Agenda:

1. PRESENT PROJECT 2 DELIVERABLE(S) DRAFT

Tasks/Assignments:

1. Continue Project 2 Development

Week of May 4

Agenda:

1. Project 2 Updates & Resource Sharing

Tasks/Assignments:

1. Continue Project 2 Development

Week of May 11

Agenda:

1. Project 2 Updates & Resource Sharing

Tasks/Assignments:

1. Complete Project 2 Deliverable(s) Final

Week of May 18—Final Projects Due

Agenda:

1. PRESENT PROJECT 2 DELIVERABLE(S) FINAL