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GEOL 595.01: River Restoration

Johnnie N. Moore

University of Montana - Missoula, johnnie.moore@umontana.edu

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**River Restoration
Geology 595—Section 01
CRN 33445
Wednesdays 3:10PM-6:00PM
Science Complex 333**

**J. N. Moore
SC363 Phone: 243-6807
Email: gl_jnm@selway.umt.edu**

Format and Content: This is a seminar-format course. We will concentrate on developing an understanding of the physical and chemical aspects of river restoration. We will read some of the primary literature in fluvial geomorphology, hydrology, sediment transport, river modification and change, and river restoration techniques.

Structure and Approach: We will read and discuss approximately three papers each week and dedicate about an hour of discussion to each. At least one week before (longer when possible), I will pick one person to present one of the three papers, for a total of three presentations each week. We will probably have about 12 sessions for a total of approximately 36 papers to read and discuss during the term. This may change depending on our progress and changing goals throughout the year.

Presenters: Each presenter will develop and present a detailed overview of the paper that highlights the important aspects that the author(s) is(are) presenting. It should be well organized and include overheads of any relevant figures, tables, etc. My expectation is that you will give a brief "lecture" on the topic covered in the paper for about 25-30 minutes. This may require that you do some additional background reading to clarify some points (papers have been provided on ERES for reference). If there are important questions that arise during your preparation that you could not answer or you think are important to discuss, you can present those in your presentation for the following discussion.

Listeners: Each person not presenting a paper will read all the papers and develop one discussion question for each paper. Those will be handed in at the beginning of each class to aid us in our discussion. I will expect each listener to participate in the discussion that will last about 15-20 minutes after the presentation.

Topics: Readings will be divided into three main areas. We will spend about 1/3 of the term on each major topic. The first set of readings will concentrate on river geomorphology and hydrology. The goal will be to review the major principles of fluvial hydrology, including channel morphology and change, surface-groundwater interaction, major geochemical systems, sediment transport and floodplain development—how rivers function naturally. The second set of readings will concentrate on how rivers have been modified by the actions of humans. There will be an emphasis on major changes resulting from road building, deposition of mining wastes, placer mining, hydraulic mining, and gravel mining. Finally, the last set of readings will emphasize principles and

techniques of river restoration. We will try to determine what are appropriate actions and what goals can be reached by engineered/management solutions. Our goal will not be to produce a "manual" for river restoration, but to determine the general techniques and philosophies that will help restore the physical and chemical function of rivers. This will necessitate some discussion of values—fish vs. birds, irrigation vs. river rafting, etc.

Fieldtrips: We will also take several local field trips to look at river morphology, function, modification and restoration. Location and number will depend on the Winter and Spring weather/snow pack and runoff, but we will likely look at rivers/streams affected by metal mining, placer mining, and road building here in western Montana. I also plan to have a multi-day fieldtrip to Utah or Nevada and/or California to look at river restoration projects. That field trip will be in conjunction with Dr. Jack Schmidt from Utah State University and his river restoration class. I expect that trip to last 5-6 days and be late in the term, about early or middle April. The timing and location of that trip will depend on Dr. Schmidt's schedule, weather and availability of folks to show us around restoration sites. We will camp and likely get cold and wet.

Grading: The course can be taken for a grade or as pass/not pass or audited. For the P/NP option, to pass the course the student must do all their assigned presentations, participate in the discussions, turn in all the discussion questions and attend most of the fieldtrips (see below for details). Each student selecting the grade option will in addition be required to produce a term paper on some aspect of river restoration/modification/function. The topic can be oriented toward a field problem or a literature review. In grading the term paper, I will consider content, presentation, organization, significance, etc. If auditing the student must meet all the requirements for the P/NP option, but does not have to attend the fieldtrips.

Evaluation Criteria:

- A—Exceptional performance: excellent presentations that are well organized and professionally presented; major effort to participate in the discussions; active participation in field trip projects/discussions; professional and insightful term paper extremely well backed by citations and discussion.
- B/P— Good performance: obvious effort to present well organized presentations; meets all basic class requirements (questions, presentations, fieldtrips, etc.); good effort in participation in discussions in class and field; professional term paper, with adequate reference citations and discussion.
- C/NP—Failing performance: Minimal effort in the class; participates minimally or not at all in discussion; not prepared for an assigned presentation or extremely poorly prepared; does not turn in discussion questions or turns in only minimal number; does not attend fieldtrips or does not participate in fieldtrip functions.

Readings: All readings are on ERES: GEOL595.01. You will be given the password and login information in class. Along with the assigned readings you will find a set of "reference" articles. These are more detailed and cover background you may need in your readings.

Preliminary Schedule:

Introduction

1/30 Humans as a geologic force; global river/water concerns; basic framework.

Fluvial Processes

2/6 Fluvial Processes, Ground Water - Surface Water Interaction.

2/13 Adjustment of Channel Form.

2/20 Channel Changes.

Human Effects on Rivers

2/27 Flow Diversions, Dams and Floodplain Development .

3/6 Dams (Cont'd.) & Mining Effects on Rivers .

3/13 Mining Effects (Cont'd.) & Contaminants.

3/20 Spring Break—no class

3/27 Logging and Floodplain Development.

River Restoration Techniques

4/3 Philosophy of River Restoration/Rehabilitation.

4/10 River Characterization for Restoration/Rehabilitation.

4/17 Tentative week for long fieldtrip (Fri-Wed).

4/24 Channel Engineering Approaches.

5/1 Restoration of River Corridors.

5/8 Restoring River Water/Sediment Quality.

5/15 Final Exam Week