

**GEOLOGY 380 - ENVIRONMENTAL GEOLOGY AND NATURAL HAZARDS**  
**Fall 2002, MTWF 10:00-10:50 PM**

**Professor:** Dr. Lisa Ely

**Office:** Lind Hall Rm 220, 963-2177 **E-mail:** ely@cwu.edu

**Office Hours:** Tuesday 2-4 PM, Wednesday, 1:30-3 PM

**Graduate Teaching Assistant:** Brooke Asbury (office hours TBA)

**Texts:**

Lundgren, L.W., 1999, **Environmental Geology**, 2nd edition, Prentice Hall, New Jersey.

McPhee, John, 1989. **The Control of Nature**, Farrar, Straus and Giroux, New York.

**Aim of the Course:** To understand the impact of naturally occurring geologic processes on humans, and the effect of human activities on the physical environment. The class will examine regional and global environmental issues such as earthquakes, floods, volcanic hazards, land use, and ground-water supply and pollution. Students will learn to evaluate environmental problems and potential solutions from a geologic and scientific perspective.

**Course Outcomes:**

- Know the definition of risk and what factors are considered in determining the degree of risk associated with a natural hazard.
- Be able to research a current environmental geology issue, develop an opinion based on scientific evidence, and defend that opinion in written and oral format.
- Know how to compose a management plan for mitigation of a given geologic hazard.
- Construct a written environmental assessment of a specific geologic hazard, using original scientific observations.
- Conduct an oral presentation of an original environmental assessment and management plan, using scientific evidence to defend conclusions.
- Be familiar with current news items relating to the environmental issues covered in this course and be able to discuss at least one in detail.
- Know and explain a) the conditions conducive to the occurrence of and b) the specific hazards resulting from the geologic features and processes covered in this course, including soils, earthquakes, volcanoes, rivers and floods, landslides.
- Assess landslide hazards based on geologic data, topographic maps, aerial photos and field observations.
- Construct an earthquake hazard map.
- Conduct a flood-frequency analysis and be able to interpret flood-frequency graphs.
- Discuss factors limiting water supply, including physical, political, and economic.
- Know the types and characteristics of ground-water aquifers, how ground-water is extracted.
- Understand the variables that affect contaminant migration in ground- and surface-water.
- Describe several of the environmental problems at the Hanford Nuclear Reservation.
- Discuss how climate change could affect the geologic processes covered in this course.

**Components of the Course:** The class periods will be a combination of lectures by the instructor, in-class group discussions, and work in small groups. A major focus of the course will be hands-on practice evaluating real environmental geology problems through a series of projects in which students will gather, analyze and interpret their own original data. These class projects will build the foundation for a final independent research project that students will conduct in pairs in the latter half of the quarter. The controversial nature of the environmental issues covered in this course is conducive to a format of frequent student participation. Part of the grade will be based on participation in the in-class activities and discussions, therefore regular attendance is important. The course will also include homework projects, readings, a required field trip, two mid-term exams, a research project, and a final exam.

**Grading:**

Midterm exams (2 @ 15% each):	30%
Final exam:	20%
Homework assignments, field trip, participation in classroom activities:	30%
Research project (written and oral reports):	20%

The due dates for assignments and readings are listed on the course outline. Other assignments will include library research and written summaries on current environmental geology topics, which will be used in class discussions. All assignments are due by 5:00 PM on the due date, which is either listed in the course outline or given in class. The only exceptions are cases in which the class is notified by the instructor of a change in the due date for a particular assignment. Five percentage points will be subtracted from the grade of late homework assignments for each day past the due date. Cheating or plagiarism on an exam or assignment will result in an automatic zero for that exam or assignment. Multiple instances of cheating will result in a failing grade for the class.

**Field Trip, Monday, Nov. 11:** There will be a required all-day field trip to the Hanford Nuclear Reservation, which was the site of plutonium production for nuclear weapons and other activities in the latter 20th century. This trip presents a unique opportunity to learn about the role of the local geology in the clean-up strategies at a contaminated site. Remember, it's not everyone who has access to a major nuclear waste site practically in their own back yard!

**Research Project:** The research project will be an environmental assessment of a geologic hazard or environmental problem from a geologic perspective. Students will work in teams of two (no solo projects and no larger groups). You and your partner will submit a 2-page proposal of your topic midway through the quarter and a final written report and oral presentation at the end of the quarter. The final project will be in the form of a professional environmental assessment of a hazard at a particular site or a specific impact of an environmental problem, such as would be conducted by a hired consultant in environmental geology. Similarly, the oral presentation will be organized as a presentation to the agency, company, or public interest group that could have hired you to do the work. The proposal should be 2 pages with at least 3 cited references to published papers on the topic. The 10-page report should include a statement of the problem, description of the site, original analysis and interpretation of the geologic hazard or issue, and a discussion and recommendation of strategies for mitigation of the hazard or problem. Each team will turn in a single joint copy of the proposal and report. Both members of each team will receive the same grade, and are expected to contribute equally to the project. Details of the project will be discussed in class and described on a separate handout.

## **COURSE OUTLINE: GEOLOGY 380 - ENVIRONMENTAL GEOLOGY**

**Fall 2002, MTWF 9:00-9:50 AM, Lind Hall Rm. 103**

**Professor:** Dr. Lisa Ely, Lind Hall Rm 220, 963-2177 e-mail: [ely@cwu.edu](mailto:ely@cwu.edu)

**Graduate Teaching Assistant:** Brooke Asbury

<b>Date</b>	<b>Topic</b>	<b>Reading Assignments</b>
<u>Week 1</u>		
Wed, Sep 25	Introduction; What Is Environmental Geology?	
Thur, Sep 26	Risk Assessment: In-class Project	Ch. 1 & 2, p. 1-35
Fri, Sep 27	Rocks and Soil: When is a Rock not a Hard Place?	Ch. 9, p. 242-246, 248-250
<u>Week 2</u>		
Mon, Sep 30	Soil Loss and Engineering Properties of Soils	Ch. 9, p. 255-262, 267-275
Tue, Oct 1	Landslides, Slope Stability	Ch. 5, p. 116-132
Wed, Oct 2	Landslides, Slope Stability	Ch. 5, p. 132-146
Fri, Oct 4	Slope Stability Assessment In-class Project	
<u>Week 3</u>		
Mon, Oct 7	Debris flows -Discussion of Research Projects	McPhee p. 183-272
Tue, Oct 8	Los Angeles Against the Mountains In-class Project <b>*DUE:</b> Slope Stability Assessment Report	
Wed, Oct 9	Earthquakes	Ch. 4, p. 73-97
Fri, Oct 11	Earthquakes	
<u>Week 4</u>		
Mon, Oct. 14	Seismic Hazards	Ch. 4, p. 97-115
Tue, Oct 15	Seismic Hazard Assessment In-class Project <b>*DUE:</b> Los Angeles Against the Mountains	add'l handout
Wed, Oct 16	Seismic Hazard Assessment In-class Project	
Fri, Oct 18	Volcanic Hazards <b>*DUE:</b> Project Partners and Topic	Ch. 3, p. 36-72
<u>Week 5</u>		
Mon, Oct 21	Volcanic Hazards	McPhee, p. 93-179
Tue, Oct 22	Volcanic Hazards	
Wed, Oct 23	Volcanic Hazard Assessment In-class Project	
Fri, Oct 25	Water from Source to Sink <b>*DUE:</b> Seismic Hazard Assessment Report	Ch. 10, p. 276-292
<u>Week 6</u>		
Mon, Oct. 28	<b>Hour Exam I</b>	
Tue, Oct 29	Surface and Ground Water Issues	
Wed, Oct 30	Surface and Ground Water Issues	
Fri, Nov 1	Ground Water <b>*DUE:</b> Project Proposal	Ch. 10, p. 292-314

### Week 7

Mon, Nov 4	Ground Water	
Tue, Nov 5	Ground Water Contamination, Management and Clean-up	Ch. 13, p. 381-404, 415-420
Wed, Nov 6	Ground Water Contamination, Management and Clean-up	
Fri, Nov 7	Hanford Site Overview	Handout & <a href="http://www.hanford.gov">www.hanford.gov</a>

### Week 8

Mon, Nov 11	<b><u>Required All-Day field trip to Hanford</u></b>	
Tue, Nov 12	Rivers and Channel Processes	Ch. 9, p. 262-267; Ch .7 p. 171-177
Wed, Nov 13	Managing the River: In-class Debate	McPhee p. 3-92
Fri, Nov 15	Flood Hazards	Ch. 7, p. 177-206

### Week 9

Mon, Nov 18	Floods: How Big and When?	
Tue, Nov 19	Flood Frequency Assessment In-Class Project	
Wed, Nov 20	Global Climate Change: Past, Present...Future?	Ch. 14, p. 421-425; 434-446;
Fri, Nov 22	Global Climate Change: Past, Present...Future?	454-458

### Week 10

Mon, Nov 25	Global Climate Change and Greenhouse Warming	
Tue, Nov 26	Current Issues in Environmental Change: Discussion *DUE: Flood Frequency Assessment Report	Ch. 15, p. 459; 462-472
Wed, Nov 27	<b>Hour Exam II</b>	
Fri, Nov 29	THANKGIVING HOLIDAY--NO CLASS	

### Week 11

Mon, Dec 2	TBA	
Tue, Dec 3	Project Presentations	
Wed, Dec 4	Project Presentations	
Fri, Dec 6	Project Presentations *DUE: RESEARCH PROJECT REPORTS	

**FINAL EXAM: Friday, December 13, 8:00-10:00 AM**