

## **ES458 RIVER ENVIRONMENTS OF OREGON**

### **Policies and Procedures**

Summer 2017 Term - Western Oregon University

3 cr Field Course July 29 – August 2 Natural Sciences Bldg, Rm 218 / Central Oregon

INSTRUCTOR: Dr. S. Taylor  
OFFICE HOURS: By Appointment

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### **COURSE DESCRIPTION:**

This field course focuses on the geomorphology of select fluvial environments in western and central Oregon (Santiam River, Newberry Volcano, Deschutes River, Columbia River, and Willamette River). The emphasis is on observation and analysis of river processes, deposits, and landforms associated with active tectonics, mass wasting, glaciation, volcanism, and flooding. Additional topics include regional geology, hydrology, river classification, surficial mapping, and paleohydrology.

### **COURSE GOALS AND LEARNING OBJECTIVES:**

ES458 learning objectives are aligned with WOU Earth Science program outcomes and select components of the LEAP (Liberal Education and America's Promise; <http://aacu.org/leap>) learning outcomes developed by the Association of American Colleges and Universities. Upon successful completion of ES458 River Environments, students will be able to demonstrate minimum competency in the following program areas:

1. Associate concepts of regional geology, stratigraphy, structural geology and geomorphology to direct field observation (IL).
2. Apply algebraic, trigonometric, and statistical principles to geologic data collection and analysis (Q).
3. Summarize select elements of the regional physiography, geologic setting and history of western and central Oregon (PO1).

### **THE PROFESSOR'S PHILOSOPHY ON UPPER DIVISION EARTH SCIENCE / GEOLOGY COURSES:**

The upper division Earth Science / Geology course sequence is designed for mature, serious students who are willing to work hard, play hard, have fun, and learn in-depth skills / concepts in a professional academic setting. By default, our student population is very diverse with a wide array of skills, interests, and career goals. The student population ranges from serious Earth Science majors with focused career objectives, to Geology / Earth Science minors to Science Education majors. As such, the professor is charged with serving a diverse array of student interests and career goals in the most professional manner possible. The problem-solving and technical skills acquired via training in the Earth Sciences are highly valuable (and marketable), regardless of career track. Students are expected to actively participate in the learning process and make a significant contribution to the academic integrity of the Earth Science program at Western Oregon University. The ultimate goal of the program is to provide graduates with the academic skills that will enable them to be highly competitive in graduate school or the career marketplace. *GO TEAM!*

### **REQUIRED READING:**

Journal articles, text readings, and field guide, to be provided by the instructor.

### **CLASS NOTES:**

A comprehensive set of instructor class notes are available for download via the internet. The class web site is at URL <http://www.wou.edu/taylor> and follow the links to the "ES458/558 River Environments" home page.

### **PHILOSOPHY ON FIELD-BASED EDUCATION**

This course is field-based and takes place outside of the "normal" context of a college classroom. The class will involve a number of field trip stops that focus on identifying geologic features and landscape elements, making observations, collecting field data, and conducting "on-the-fly" analysis and interpretation. Students are expected to keep detailed field notes and to mark positions of field stops on topographic maps. In addition, students will work in teams to take photographs (digital or analog) to document the features associated with each stop. A typical class day will begin with breakfast and a morning meeting, followed by field stops, with a

typical "class time" ranging from 9:00 AM to 6:00 PM. The morning meeting will involve working on lab exercises and problem sets. Evening activities will include camping, meal preparation, and completion of "homework" exercises. NOTE: you will be collecting data on some of the days and be expected to work up analyses and interpretations during some of the evening hours. The field notes, maps, photos, and field/lab exercises will be compiled into a final report chronicling results and interpretations compiled during the field trip (see "Final Report" section below for details).

**EVALUATIONS AND EXPECTATIONS:**

Student performance will be evaluated on the basis of field trip participation, field exercises, and a final report. The following is a breakdown of evaluation points and letter grades:

Participation	75 pts
Field Exercises/Pre-trip Reading	100 pts
Final Report	100 pts
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TOTAL:	275 pts

Final Grading Scale

Percent Range of Total Points	Letter Grade	Percent Range of Total Points	Letter Grade
94-100%	A	77-79%	C+
90-94%	A-	73-76%	C
87-89%	B+	70-72%	C-
83-86%	B	67-69%	D+
80-82%	B-	63-66%	D
		60-62%	D-
		<60%	F

**Participation:** Students are expected to be engaged during the field stops, ask questions, interact with their peers, and generally be supportive of outdoor experiential education. This portion of your grade will be subjectively evaluated by the instructor. As long as you are playing along, being a good sport, not complaining too much, and engaged in the science adventure, you will do well in this part of the course.

**Field Exercises:** Field and lab exercises will be worked BOTH during "class time" (9 AM – 6 PM) and during evening hours throughout the week. You will be expected to complete post-trip lab, reading, and homework assignments following the field week. Due dates for field exercises will be prescribed by the instructor (some will be due during the field week, others will be due after the field week), and based on consultation with the students.

**Final Report Due Dates:** The project is due by September 1, 2017; late projects will be accepted with a 10% grade penalty. You will receive an "Regular Progress" (RP) grade until the final project is submitted.

**PRE-TRIP READING ASSIGNMENT**

To prepare for the learning adventure, pre-trip readings and review questions include: Orr and Orr, 1999 - Overview of High Lava Plains; Orr and Orr, 1999 - Overview of Deschutes-Columbia Plateau; O'Connor et al., 2003a - Overview of Deschutes Geology, Hydrology, Geomorphology. Reading materials and review questions are available on the ES458 class web site at [www.wou.edu/taylor](http://www.wou.edu/taylor)

**FINAL REPORT**

Final Report: Field notes, observations, exercises, results, interpretations, maps, and photo logs will be compiled into a final field trip report. The final report should be compiled as a portfolio, presented in the neat,

professional-looking three ring binder, with cover and tab-separators. The field trip report will be organized according to the following outline format, and presented in the following order:

- I. Introduction
  - a. General overview of course and field trip
    - i. Figure: Road Map with Trip Stops
  - b. Goals and Objectives of Course and Field Trip
- II. Regional Geologic Setting of High Lava Plains – Deschutes/Columbia Plateau
  - a. Written summary and annotated outlines of pre-trip readings, as assigned in the introductory class letter: (pre-trip readings include: Orr and Orr, 1999 - Overview of High Lava Plains; Orr and Orr, 1999 - Overview of Deschutes-Columbia Plateau; O'Connor et al., 2003a - Overview of Deschutes Geology, Hydrology, Geomorphology)

III. Field Stop Description (repeat this section for each stop, sequentially on the trip)

- A. Location Map / Stop Identification / Physiographic Description
- B. Geologic Overview
  - i. Bedrock Geology
    - a. rock types
    - b. chronology / rock age
    - c. geomorphic setting
- C. Geomorphic Field Observations (for each stop)
  - i. Landforms
  - ii. Processes
  - iii. Materials (types of deposits, texture, grain size, description)
- D. Photo Gallery (from field photos)
- E. Stop Interpretation and Summary

III. Course Synthesis and Summary (Answer the Questions in Narrative Format)

A. Landforms and Processes Associated with western and central Oregon Rivers

What are the dominant processes that influence western and central Oregon Rivers? In your narrative include both a discussion of both geologic and tectonic processes.

What are the landforms associated with lower hillslope and valley environments along western and central Oregon Rivers?

B. Meteorologic and Climate Controls on Fluvial Processes in western and central Oregon

Compare and contrast precipitation patterns west of the Cascades vs. east of the Cascades. What are the dominant controls on these precipitation patterns?

What types of meteorologic conditions cause flooding west of the Cascades? What meteorologic condition causes the highest magnitude floods?

What types of meteorologic conditions cause flooding east of the Cascades?

C. Geologic Controls on Fluvial Processes in western and central Oregon

What types of climatically-driven and tectonically driven geologic processes result in large magnitude flooding in western and central Oregon?

Compare and contrast the magnitude of floods associated with meteorological vs. geological processes in western and central Oregon.

#### D. Overview of Hydrologic and Paleohydrologic Techniques (from field exercises)

Why is it important to assess the magnitude and frequency of flood discharges along rivers?

List and discuss the types of techniques that can be used to reconstruct ancient paleofloods, particularly as applied to rivers in western and central Oregon.

#### E. Overview of River Classification Systems (from field exercises)

List and discuss the types of criteria that are used to classify rivers. Why is river classification important for understanding fluvial processes?

#### IV. Results from Lab/Field Exercises (answer all questions / type written; *TENTATIVE LISTING, TBD*)

A. Pre- and Post-Trip Reading Questions (p. 191-194; include sections 1, 2, 3, 4, and 5)

B. Stream Ordering Exercise (p. 197-199)

C. Fluvial Hydrology Problem Set (p. 201)

D. River Hydrology Concept Review Questions (p. 203-204, questions 1, 2 and 3)

E. Paulina Creek Review Questions (p. 206, questions 7 and 8)

F. Whiskey Dick / Whitehorse Profile Exercise (p. 209 Questions 1, 2, 3)

G. Buckskin Mary Flood Hydrology Exercise (p. 211-212 Questions 1 and 4).

H. Deschutes River – Applied Hydrology (p. 219-222; all questions part 3 and part 4)

I. Observations of stratigraphic field cross-sections

- Mt. Washington Overlook (Glacial Diamicton)

-Warm Spring Railroad Cut HWY197 Roadcut (John Day Fm. / strath terrace gravels)

-Hwy 197 Road Cut (The Dalles Formation, Missoula Flood Silts, Pleistocene Paleosols)

V. Acknowledgements

VI. References Cited

VII. Appendix I – Copies of Field Notes

#### **PRE-TRIP ORGANIZATIONAL MEETING**

A pre-trip organizational meeting will be held on Tue. July 26 at 6:00 PM in Rm 218 of the Natural Sciences Building. The purpose of this class meeting is to provide an introduction to the course, organize cooking teams, review course policies, and general team building. Please contact the instructor if you are not able to attend the pre-trip meeting; we will work out the details as needed.

#### **POST-TRIP MEETING AND REVIEW SESSION**

A post trip class meeting will be held on Tue. August 8 at 6:00 PM in Rm 218 of the Natural Sciences Building.

The purpose of this class meeting is to provide a summary and review of the field trip, and to assist students in completing their field exercises and final report. This will also be an opportunity for class participants to share data, photos, and other materials in preparation for final project submittal. The instructor will be available to answer questions and provide additional resources and reference materials. Please contact the instructor if you are not able to attend the post-trip meeting; we will work out the details as needed.

#### **TENTATIVE COURSE SCHEDULE / TRIP ITINERARY**

Special Note: This schedule is considered tentative at best. The instructor reserves the right to add and delete field stops whenever necessary, depending on time schedule and field conditions. Students are expected to maintain a flexible attitude and to continuously repeat the following mantras: "**no worries**", "**it's all good**", and "**we get there, when we get there!**"

**ES458/558 River Environments of Oregon  
Tentative Field Trip Itinerary – Summer 2017**

**Pre-Trip Meeting Wed. July 25**

**Class Introduction / Logistics**  
*(6 PM Natural Science Bldg, NS218)*

**Day 1 Sat. July 29 "The Adventure Begins"**

Stop 1-1 Natural Science Building Roof  
Stop 1-2 North Santiam State Park east of Salem  
Stop 1-3 Detroit Dam / Detroit Lakes  
Stop 1-4 Suttle Lake  
*Drive East / Camp at Big River Campground, Sun River Area*

**Day 2 Sun. July 30 "From Volcanoes to River Canyons"**

Begin Day Campground Worksheets / Lab Exercises  
Stop 2-1 Paulina Peak  
Stop 2-2 Little Cone Campground / Paulina Lake  
Stop 2-3 Paulina Lake (Paulina Creek Outlet)  
Stop 2-4 Paulina Falls  
Stop 2-5 Paulina Creek Field Exercise (Ogden Group Camp and McKay Crossing)  
*Drive to Madras; Camp at Trout Creek, meet River Guides*

**Day 3 Mon. July 31 "Rafting, Rapids, and Rays"**

Begin Day Raft Preparation / Launch  
Stop 4-1 Lower Trout Creek – Road Cut  
Stop 4-2 (Beebe et al. Stop 3) Warms Springs Confluence / Railroad Cut  
Stop 4-3 (Beebe et al. Stop 4) Axford Flood Deposits (cutbank river left)  
Stop 4-4 (Beebe et al. Stop 5) River Mile 78.5 Whiskey Dick; Camp-site lecture on Deschutes River hydrology and geomorphology  
*Camp at Whiskey Dick*

**Day 4 Tue. August 1 "Another Day Floating the River"**

Begin Day Campground Worksheets / Lab Exercises  
Stop 5-1 Morning Hike to "The Pot" Overlook (from Whiskey Dick);  
River Mile 77 Whitehorse Rapids (Yee Haw!)  
Stop 5-2 (Beebe et al., Stop 6) River Mile 76 – The Pot – lower end  
Stop 5-3 River Mile 64 Buckskin Mary; Camp site lecture on paleoflood hydrology  
*Camp at Buckskin Mary*

**Day 5 Wed. August 2 "Out of the 'Chutes' Back Into the Valley"**

Begin Day Campground Worksheets / Lab Exercises  
Stop 6-1 (Beebe et al., Stop 8) River Mile 64 – Buckskin Mary / Dant DF Overlook  
Stop 6-2 (Beebe et al., Stop 9) River Mile 62.5 – Outhouse Flood Bar  
Stop 6-3 High Cascades Overlook – Mt. Hood Vista  
*Return to Monmouth via Government Camp-Sandy-Mollala-Woodburn*

**Post-Trip Meeting Tues. August 8**

**Field Trip Summary / Class Project Schedule**  
*(6 PM Natural Science Bldg, NS218)*