

**ES458/558 River Environments of Oregon
Instructions for Final Report – Summer 2006**

NOTE: The Final Report is due in my mailbox in the Natural Science Office on Friday Sept 8, 4:00 PM.

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 fancy cover, photos, and tab-separators. The field trip report will be organized according to the following outline format:

- 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. Expanded Summary Outlines of Pre-Trip Readings
 - i. Orr and Orr, 1999 - Overview of High Lava Plains
 - ii. Orr and Orr, 1999 - Overview of Deschutes-Columbia Plateau
 - iii. O'Connor et al., 2003a - Overview of Deschutes Geology, Hydrology, Geomorphology

- III. Field Stop Descriptions and Content Summary (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. geologic significance / interpretation
 - C. Geomorphic Field Observations (for each stop)
 - i. Overview of Geomorphic Setting
 - ii. Summary of Geomorphic Variables
 - a) Landforms
 - b) Processes
 - c) Materials (types of deposits, texture, grainsize, description)
 - d) Age
 - D. Field Photos / Stop Overview (from field photos)
 - E. Field Stop Interpretation and Summary

Note: stops to include, in the following order:

1-1 Natural Science Building Roof; 1-2 Santiam River State Recreation Area; 1-3 Big Cliff Dam / Santiam; 1-4 Suttle Lake / Mount Washington Overview; 1-5 Lava Butte / Lake Benham; 2-1 Paulina Peak / Newberry Caldera; 2-2 Little Cone Campground (east side of Paulina Lake), 2-3 Paulina Lake Outlet; 2-4 Paulina Falls Knickpoint; 2-5 Paulina Creek / Ogden Group Camp (Paulina Creek Discharge Measurements); 2-6 Paulina Creek Terrace Analysis / Catastrophic Flood Record; 2-7 Overview of Columbia Plateau / Loess Hills of North-Central Oregon; 3-1 The Dalles Hwy 197 Roadcuts; 3-2 Petersburg Bar (spill-over delta); 3-3 Fairbanks divide (Missoula Flood overflow notch); 3-4 Celilo Falls Overlook (Butte and Basin Scabland Topography); 4-1 Trout Creek road cut / hillslope cut; 4-2 Warm Springs river / Railroad Cut; 5-1 Whiskey Dick Camp (Deschutes hydrology lecture); 5-2 Hike to Overview of "The Pot" Landslide complex; 6-1 Dant Debris Flow / Buckskin Mary hillslope observations; 6-2 Outhouse flood bar; 6-3 Cascade Locks / Bridge of the Gods:

- IV. Course Synthesis Questions and Summary (Answer the Questions in Narrative Format; word-processed)
 - 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.

List and discuss the spectrum of geologic processes that operate to dam rivers in Oregon. Explain the upstream and downstream effects of these dams; how are they recorded on the landscape?

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.

Why is it important to use geologic evidence to extend the historic river gage records back in time thousands of years? Why is it important to understand the long-term geologic history of a river basin.

V. Results from Lab/Field Exercises (answer all questions / type written)

- A. Answers to Field Trip Reading Questions (p. 191-193 of field guide)
- B. Surficial Mapping Data Log Summary (p. 195-196 of field guide)
- C. Results of Geologic Timeline Exercise for Field Stops (p. 223-230 of field guide)
- D. Answers to Fluvial Hydrology Problem Set (p. 201 of field guide)
- E. Review of Day 1 / Preview of Day 2 Fluvial Concepts (p. 203-204 of field guide)
- F. Field Hydrology – Discharge Calculation at Lower Paulina Creek (p. 205 of field guide, Quest. 1-5; p. 206 Quest. 7 A-E; p. 206 Quest. 8)
- G. Whiskey Dick Landscape Profiling Exercise (p. 209 of field guide; Quest. 1-3)
- H. Buckskin Mary Exercise (Flood Recurrence Intervals and valley morphology) (p. 211-212 of field guide)
- I. Deschutes Basin Applied Field Problem Set (p. 217-222 of field guide)

VI. Acknowledgements

VII. References Cited

VIII. Appendix I – Copies of field notes and other hand-written materials

Key Concept Summary of Field Stops

1-1 Natural Science Building Roof

Tectonic setting of western Oregon, Juan de Fuca Plate, North American Plate, Coast Range accretion, Cascade Volcanic Arc, Earth Energy sources (gravity, geothermal, solar), watersheds, trip itinerary/overview.

1-2 Santiam River State Recreation Area

Geomorphic mapping criteria (landform, material, age, process), bedrock vs. regolith, colluvium alluvium, force, work, mass, gravity, weight, bedload, suspended load, dissolved load, climate history, glacial history of western Cascades, geologic history of western Cascades

1-3 Big Cliff Dam / Santiam

Dams, anthropogenic, reservoirs, energy vs. load, downstream scour, upstream sedimentation, salmonid habitat, dam census of Pacific Northwest, significance of dams, social factors of dams, dam building history, reasons for dams (flood control, reservoirs, water resources), more on western Cascades geologic history

1-4 Suttle Lake / Mount Washington Overview

Mt. Washington vs. Black Butte, high cascades volcanic arc, history of cascades/high cascades, climate change, glacial vs. interglacial, glacial erosion, roadcut with diamicton, suttle lake, moraine-dammed lake, glacial valley, soils chronology

1-5 Lava Butte / Lake Benham

Overview of Newberry volcano, cinder cones, basaltic eruptions, cinder cone development, tephra, lava flows, soils chronology, lava-damming, history of upper Deschutes, Lake Benham / benham falls, carbon dating, cinder cone morphology, age relations of cinder cones, Mazama ash, crater lake history, cross-cutting relations, age dating of geomorphic landscapes, deposits, and bedrock.

2-1 Paulina Peak / Newberry Caldera

Overview of newberry volcano, cinder cones, big obsidian flow, history of newberry eruptions, Newberry volcanism vs. Cascade arc, overview of caldera / lakes, significance of newberry with respect to regional tectonics, cinder cone morphology / age relations.

2-2 Little Cone Campground (east side of Paulina Lake)

Paulina lake observations, lake terraces, wave erosion, caldera uplift

2-3 Paulina Lake Outlet

Paulina lake observations, lake terraces, wave erosion, caldera uplift, Paulina outlet knickpoint, headward erosion, catastrophic outburst floods

2-4 Paulina Falls Knickpoint

Knickpoint processes, headward erosion, slope/gradient observations, catastrophic outburst floods, paleoflood hydrology

2-5 Paulina Creek / Ogden Group Camp (Paulina Creek Discharge Measurements)

Field hydrology, discharge calculations, terraces, terrace gravels, mazama ash, catastrophic outburst floods, floodplains, high terrace, middle terrace, flood scour, soils chronology, aridisols, clay films, soil development vs. time, landform / geomorphic surfaces.

2-6 Paulina Creek Terrace Analysis / Catastrophic Flood Record

Field hydrology, discharge calculations, terraces, terrace gravels, mazama ash, catastrophic outburst floods, floodplains, high terrace, middle terrace, flood scour, soils chronology, aridisols, clay films, soil development vs. time, landform / geomorphic surfaces.

2-7 Overview of Columbia Plateau / Loess Hills of North-Central Oregon

Loess, glacial history of PNW, climate change, catabatic winds, history of Columbia basin, Columbia river basalts, Pleistocene history

3-1 The Dalles Hwy 197 Roadcuts

Columbia river basalts, Dalles Formation, diamictite, pyroclastic flows, debris flows, volcanoclastic deposits, stratigraphic layering / interpretation, Missoula floods, loess history, paleosols, aridisols, carbonate development

3-2 Petersburg Bar (spill-over delta)

Missoula floods, gravel bars, flood deltas, spill-over deltas, pebble imbrication, flood gravels, cross-stratification, foresets, paleocurrents, deposition vs. erosion evidence of flooding

3-3 Fairbanks divide (Missoula Flood overflow notch)

Missoula floods, gravel bars, flood deltas, spill-over deltas, pebble imbrication, flood gravels, cross-stratification, foresets, paleocurrents, deposition vs. erosion evidence of flooding

3-4 Celilo Falls Overlook (Butte and Basin Scabland Topography)

Missoula Floods, erosional landscape records, paleoflood history, big water

4-1 Trout Creek road cut / hillslope cut

Stratigraphic layering and analysis, geomorphic mapping, floodplains, hillslopes, terraces, colluvium, alluvium, diamicton, sediment sorting, clast roundness, pumice layers, Mt. Jefferson eruptive history, soils development, soils chronology, lacustrine deposition, hillslope vs. valley bottoms, bedrock geology and history of middle Deschutes River, Clarno Formation, John Day Formation, Columbia River Basalts, landslides, terraces, canyon rim

4-2 Warm Springs river /Railroad Cut

Stratigraphic layering and analysis, geomorphic mapping, floodplains, hillslopes, terraces, colluvium, alluvium, diamicton, sediment sorting, clast roundness, pumice layers, Mt. Jefferson eruptive history, soils development, soils chronology, terrace chronology, middle Deschutes geomorphic history

5-1 Whiskey Dick Camp (Deschutes hydrology lecture)

Ground water, hydrogeology, regional geology of Deschutes basin, influence of groundwater on Deschutes River discharge, flood history of Deschutes river, regional hydrologic analysis.

5-2 Hike to Overview of "The Pot" Landslide complex

Landslides, rock-block slides, creep, aerosols / dust influx, hillslope transport, slope wash, soils development, colluvium, active vs. inactive hillslopes, bedrock vs. regolith, large-scale landslides, hummocky topography, knob-and-kettle topography, chaotic landscape development, relative dating, landforms analysis, co-seismic mass wasting, landslide dams, catastrophic outburst floods.

6-1 Dant Debris Flow / Buckskin Mary hillslope observations

Recurrence intervals, flood frequency-magnitude, debris flow, flooding, transport-limited hillslopes, weathering-limited hillslopes, aspect, aspect-controlled hillslope processes, north slope/south slope moisture conditions

6-2 Outhouse flood bar

Deschutes flood history, flood records, landscape analysis, paleoflood hydrology, depositional vs. erosional landscape records, carbon dating, flood chronology

6-3 Cascade Locks / Bridge of the Gods

Columbia River gorge, coseismic landslides, rock-block slides, Columbia river history, subduction zone earthquakes, landslide dams, catastrophic outburst floods, geology vs. meteorologic flood processes.