River Geology Field Course
Summer 2008 – Final Portfolio Instructions

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, with section tabs clearly labeled:

I. Introduction
- a. General overview of course and field trip
  - i. Figure: Road Map with Trip Stops
- b. Summary of Course Objectives and Goals of Field Trip

III. Systematic Field Stop Description (repeat this section for each stop, sequentially on the trip; see stop summary at the end of this document)

- 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, grainsize, description)
- D. Photo Gallery (from field photos)
- E. Stop Interpretation and Summary (1 to 3 paragraphs summarizing the take home message for each stop)

III. Course Synthesis and Summary Questions (Answer the Following 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.

IV. Results from Lab/Field Exercises (answer all questions / type written; present in the following order:)
- A. Reading Questions (p. 191-194; include sections 1 through 5, omit section 6)
- B. Intro Hydrology Problem Set (p. 201-202; question 1 A-C, omit Q 2 and 3)
- C. River Concepts (p. 203-204; did not work on field trip, complete as follow-up)
- D. Field Exercise: Whiskey Dick (p. 209-210; question 1-3)
- E. Field Exercise: Buckskin Mary (p. 211-212; questions 1A-E, Q4)
- F. Deschutes River – Applied Hydrology (p. 217-222; all questions)
- G. Landscape Analysis – Harpham Flat to Maupin (p. 230A-230B; OPTIONAL)
- H. Results and observations of stratigraphic field cross-sections (HWY197 Dalles, Trout Creek, Warm Springs)

V. Acknowledgements
VI. References Cited
VII. Appendix I – Copies of Field Notes

Key Concept Summary of Field Stops – 2008 River Trip

1-1 Santiam River State Recreation Area

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. 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

1-2 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

1-3 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

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 Crater 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 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-cuttingrelations, age dating of geomorphic landscapes, deposits, and bedrock.

3-1 The Dalles Hwy 197 Roadcuts

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

3-2 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; 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

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

4-3 Raft Camp 1 RM80 (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.

5-1 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.

5-2 Raft Camp 2 RM74 (Deschutes hydrology lecture 2)

Flood recurrence intervals, flood history, regional flood geography, statistical analysis of historic hydrologic data, hydrometeorology, rain-on-snow history.

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, depostional vs. erosional landscape records, carbon dating, flood chronology, landslide dams, catastrophic outburst floods, geology vs. meteorologic flood processes.

6-3 Harpham Flat Area – Closing Circle

Columbia River Basalts, regional geologic summary, Maupin-area landslide terrain, rapids and geologic causes, closing comments.