Summer 2007 - ES558 River Environments of Oregon
Instructions for Final Report and Portfolio Checklist

NOTE 1: The Final Report is due in my mailbox in the Natural Science Office on or before Friday Sept 8, 4:00 PM.

NOTE 2: All written materials and answers to review questions should be word processed, spell-checked, and presented in a high quality format.

Final Report and Portfolio: 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 portfolio will be organized according to the following outline format, in the prescribed order:

Task 1. Answers to Field Trip Reading Questions on p. 191-193 (sections 1 through 6) of the field guide.
Task 2. Day 1 Review Questions (item 3) on page 204 of the field guide.
Task 3. Paulina Creek Review Questions (items 7 and 8) on page 206 of the field guide.
Task 4. Results from "Whiskey Dick" Lab Exercise problems (items 1-3) on page 209 of the field guide.
Task 5. Results from "Buckskin Mary" Lab Exercise problems (items 1, 3, and 4) on pages 211-212 of the field guide (note: in the field we only worked on question 1, you will need to revisit and complete questions 3 and 4 on your own).
Task 6. Answers to Paulina Lake Review Questions (Part 1, A-I) on page 217 of field guide (note: we did not write these up in the field, but we collected observations and told the story in the field, part 1 A-I represents a set of review questions for the field stop at Paulina Lake).
Task 7. Answers to "Part 3 – Incision Rate Problem" on page 219 and 220 of the field guide (we did not directly work these problems in the field with pencil and paper, but we did a number of on-the-fly thought experiments with these types of calculations regarding river incision rates and terrace development).
Task 8. Geologic timeline exercise – read over the instructions on p. 223 of the field guide. Throughout the field trip, we emphasized materials, ages, and "telescoping" through geologic time on the landscape. While we did not systematically organize this exercise for completion during the field trip, we did play the game verbally at each stop. Fill out the data table for the following list of field features encountered during our excursion:

Day 1-Stop 1: river channel gravels North Santiam State Park (near Mills City),
Day 1-Stop 1: floodplain deposits North Santiam State Park (near Mills City),
Day 1-Stop 1: bedrock outcrop in river channel North Santiam State Park (Mills City,
Day 1-Stop 2: basaltic bedrock outcrop on road-cut at Big Cliff Dam (near Detroit lakes),
Day 1-Stop 3: Mt. Washington volcanic edifice (stop at overlook above Suttle Lake),
Day 1-Stop 3: Black Butte volcanic edifice (stop at overlook above Suttle Lake),
Day 1-Stop 3: diamicton outcrop in road-cut, at overlook above Suttle Lake,
Day 1-Stop 4: Suttle Lake moraine bordering picnic area and beach,
Day 2-Stop 1: Mazama ash at La Pine campground,

Day 2-Stop 2: Big Obsidean flow as viewed from Paulina Peak,
Day 2-Stop 4: Paulina Creek gravel deposits encountered during hike
Day 2-Stop 5: Aa lava flow and Lava Butte cinder cone,
Day 3-Stop 1: John Day Formation hillslope outrcrop (Trout Creek campground),
Day 3-Stop 1: Columbia River Basalt rimrock outcrop (Trout Creek campground),
Day 3-Stop 1: high-level gravel and pumiceous deposits at quarry cut (Trout Creek camp),
Day 3-Stop 2: high-level gravel deposits in railroad cut at tributary junction between Warm Springs and Deschutes rivers (raft stop at railroad tracks),
Day 4-Stop 1: Clarno Formation exposed in hillslopes near Whiskey Dick pull out,
Day 4-Stop 2: "The Pot" landslide deposits near Whiskey Dick pull out,
Day 5-Stop 1: Large gravel deposit at tributary mouth near Dant / Buckskin Mary Rapids,
Day 5-Stop 2: Outhouse Flood Gravel Bar near outhouse at lunch stop,
Day 5-Stop 2: railroad cut of terrace gravels exposed above Outhouse Bar,
Day 5-Stop 3: Columbia River Basalts outcropping on Deschutes Canyon walls as seen while floating the final several miles back to Maupin.

Task 9. Take-Home Final Exam: Course Synthesis Questions and Summary (Answer the Following Questions in Narrative Format)

Landforms and Processes Associated with western and central Oregon Rivers

1. What are the dominant processes that influence western and central Oregon Rivers? In your narrative include both a discussion of both geologic and tectonic variables.
2. List and discuss the 4-fold landscape analysis classification system that we employed on the field trip. Provide field trip examples for each of the categories that we used to understand the landscape around us at each stop.
3. List and discuss the predominant landform and processes associated with hillslope and valley environments along western and central Oregon Rivers?

Meteorologic and Climate Controls on Fluvial Processes in western-central Oregon

4. Compare and contrast precipitation patterns west of the Cascades vs. east of the Cascades.

    A. What are the dominant atmospheric controls on these precipitation patterns?
    B. What types of meteorologic conditions cause flooding west of the Cascades?
    C. What meteorologic condition causes the highest magnitude floods?
    D. What types of meteorologic conditions cause flooding east of the Cascades?

River Flooding in Western and Central Oregon

5. What types of climatically-driven and tectonically driven geologic processes result in large magnitude flooding in western and central Oregon?
6. Compare and contrast the magnitude of floods associated with meteorological vs. geological processes in western and central Oregon.
7. 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?

8. Paleoflood Analysis: Why is it important to assess the magnitude and frequency of flood discharges along rivers? 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.

Task 10. Photo journal and Field Stop Summary. For each field stop on the trip, show a labeled point position on the road base map (see field guide), a photo record of the stop, and 1 to 3 paragraphs summarizing of the primary content piece experience at each stop (repeat this task for each stop, sequentially on the trip).

Tips: Visit the class web site for a vast array of field photos collected over the past 4 years. Use your field guide as needed to provide summary notes for each stop. Use the key concept summary notes below to focus your write-ups.

Key Concept Summary of Field Stops

Day 1 – Pre-Excursion Stop. 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.

Day 1- Stop 1. 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

Day 1 – Stop 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

Day 1 – Stop 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

Day 1 – Stop 4. Suttle Lake

glacial vs. interglacial, glacial erosion, suttle lake, moraine dammed lake, glacial valley, soils chronology

Day 2 – Stop 1. Mazama Ash at La Pine Campground

Mt. Mazama, Crater Lake, caldera collapse, Mazama ash deposition, 7000 year marker horizon, surface stratigraphy and measuring geologic time

Day 2-Stop 2. Paulina Peak

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.

Day 2 – Stop 3. Paulina Lake

Little Cone Campground (east side of Paulina Lake): Paulina lake observations, lake terraces, wave erosion, caldera uplift; Paulina Lake Outlet: Paulina lake observations, lake terraces, wave erosion, caldera uplift, Paulina outlet knickpoint, headward erosion, catastrophic outburst floods;

Day 2-Stop 4: Paulina Creek gravel deposits encountered during hike

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

Day 2-Stop 5: Aa lava flow and Lava Butte cinder cone,

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.

Day 3-Stop 1: Trout Creek campground

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

Day 3-Stop 2: Railroad Cut: Confluence of Warm Springs and Deschutes rivers

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

Day 3-Stop 3: Upstream Whiskey Dick Campground Lecture (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.

Day 4-Stop 1: Hike to overview of “The Pot” landslide deposits near Whiskey Dick pull out

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.

Day 5-Stop 1: Large gravel deposit at tributary mouth near Dant / Buckskin Mary Rapids

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

Day 5-Stop 2: Outhouse Flood Gravel Bar near outhouse at lunch stop

Deschutes flood history, flood records, landscape analysis, paleoflood hydrology, depostional vs. erosional landscape records, carbon dating, flood chronology; meteorological vs. geological flood records