

Key Concept Summary of Field Stops – 2013 River Trip

Day 1

1-1 Natural Science Building / Introduction

Trip itinerary/overview; opening soil circle

1-2 North 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, geologic time scale.

1-3 Detroit 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.

Night 1 – Camp at LaPine State Park

Day 2

2-1 Morning Camp Discussion

Landscape analysis (landform, material, age, process), sediment coring, soil sampling, Mt. Mazama, Crater Lake History, tephra, Mazama Ash, pumiceous sediment, Mazama blast zone, regolith, lava flows, basalt, High Cascades, regional Newberry geology, cinder cone history, Teepee Draw Tuff, Newberry Caldera, fault junction (Brothers, Tumalo, Walker Rim), High Lava plains, rhyolite age progression, Basin and Range extension, bimodal volcanism.

2-2 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.

2-3 Little Cone Campground / 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 Terrace Analysis / Catastrophic Flood Record

Field hydrology, discharge calculations, terraces, terrace gravels, mazama ash, catastrophic outburst floods, floodplains, high terrace, middle terrace, vertical incision rates, flood scour, soils chronology, aridisols, clay films, soil development vs. time, landform / geomorphic surfaces, Paulina Lake outburst floods, Mazama ash stripping and erosion.

2-6 Finley Butte

Newberry cinder cone distribution, cinder cone alignment, regional geologic structure, lineaments, stress fields vs. cinder cone emplacement, relative age dating of cinder cones, cinder cone eruptive processes, small-batch magma generation, “parasitic” cinder cone volcanism, superimposed on shield volcano.

Night 2 – Camp at LaPine State Park

Day 3

3-1 Morning Camp Discussion

Fluvial hydrology, force, energy, mass, work, Newton’s second law, discharge, slope, stream power, sediment transport, aggradation/degradation, deposition vs. erosion, balance of energy vs. load, camp flume experiment, channel erosion, landslide dams, alluvial fans.

3-2 Lava Butte / Lake Benham/Benham Falls

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.

3-3 Ogden State Park / Crooked River Gorge

Overview of Crooked River history, Crooked river caldera, Clarno Formation, John Day Formation, Eocene-Oligocene stratigraphy, Smith Rock, pyroclastic flow, volcanoclastic rocks, ash flow tuff, welded tuff, the tuff of Smith Rock, caldera-margin ring fractures, structural dip, ring faults, basalt and andesite, rhyolite, Newberry Volcano, intracanyon basalt flow, Deschutes formation, rock age vs. permeability vs. groundwater flow rates, hydrothermal alteration.

3-4 Smith Rock State Park (continued from Stop 3-3)

Rhyolite dike, tuff of Smith Rock, intracanyon basalt flow, caldera eruption, ring fractures, intracaldera facies, pumice-rich tuff, lithic-rich tuff, xenoliths, ash flow tuff.

Night 3 – Camp at Beaver Tail / meet river guides

Day 4

4-1 Morning Camp Discussion/Workshop

Columbia River Basalts, Miocene geologic history of Pacific Northwest, fissure eruptions, flood basalts, Columbia Plateau, flood history of middle Deschutes river, regional hydrologic analysis, Paleoflood hydrology, high-water indicators, flood reconstruction, regional flood geography, statistical analysis of historic hydrologic data, recurrence intervals, magnitude-frequency analysis, historic flood analysis, gauging stations, Discharge calculations, field hydrology, Paulina Creek Q part 2, rational runoff model, infiltration, permeability.

4-2 Beaver Tail Camp Discussion (Deschutes hydrology/dinner lecture)

Ground water, hydrogeology, regional geology of Deschutes basin, influence of groundwater on Deschutes River discharge, flood history of Deschutes river, regional hydrologic analysis, climatology, water resources, river hydrology, river discharge, fluvial landforms (active channel, floodplain, terraces, hillslopes), river hydrology, paleoflood hydrology, Deschutes basin hydrology, water budgets, regional geologic setting.

Night 4 – Camp at Beaver Tail (cont.)

Day 5

5-1 Deschutes River History / Incision Rates

Strath terraces, terrace gravels, incision rates, long-term river hydraulics, baselevel change,

weathering/erosion, terrace development.

5-2 Lunch Stop

Regional geology of Deschutes basin, whitewater hydraulics, fluvial mechanics, sediment transport processes, formative causes of river rapids.

5-3 Beavertail Campground Evening Lecture

CRB, overview of Missoula Floods, Palouse Loess, last glacial advance, Montana Ice Dam Lakes, Clark Fork Idaho Ice Dams, Dam Burst Floods, channeled scablands, slackwater deposits, flood scour landscapes; Missoula floods, loess history; 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, Missoula floods, gravel bars, flood deltas, spill-over deltas, pebble imbrication, flood gravels, cross-stratification, foresets, paleocurrents, deposition vs. erosion evidence of flooding

Deschutes river fisheries, steelhead-coho-trout, continuum concept, shredders, decomposers, grazers, food chain, caddis flies, may flies, dry fly, nymphs, redds, spawning cycles, gravel size / spawning gravels, anadromous vs. resident fish, steelhead vs. rainbow trout.

Night 5 – Camp at Beaver Tail (Cont.)

Day 6

6-1 Morning Camp Discussion / Exercise: Whitehorse Rapids / Landslides

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.

6-2 NS218 Closing Summary / Landslide Dams

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

End Day 6 – Closing of Soil Circle in front of Natural Science Building