Key Concept Summary of Field Stops – 2011 River Trip

Day 1

1-1 Natural Science Building

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

1-2 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.

1-3 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 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.

Night 2 – Camp at Trout Creek; meet river guides

Day 3

3-1 Trout Creek / Morning Camp Discussion

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; landscape analysis (landform, material, age, process).

3-2 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, river incision, strath / fill terraces.

3-3 Whiskey Dick Camp (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).

Night 3 – Camp at Whiskey Dick

Day 4

4-1 Morning Camp Discussion/Exercise: Middle Deschutes Hydrology and Landscape Analysis

Aerial photography, landscape change, landform analysis, spatial and temporal scaling, map scaling, photo scaling, channel change, land-use change, irrigation practice, river hydrology, paleoflood hydrology, Deschutes basin hydrology, water budgets, regional geologic setting, Whitehorse Rapids, landslide analysis.

4-2 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.

4-3 Lunch Stop (entrance to Clarno Fm landscape)

Regional geology of Deschutes basin, whitewater hydraulics, fluvial mechanics, sediment transport processes, Clarno Formation landscape characteristics.

Night 4 – Camp at “Outhouse Flood Bar”

Day 5

5-1 Morning Camp Discussion / Exercise:

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.

5-2 Outhouse flood bar / pontification point

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, river incisision, strath terraces, terrace gravels.

Night 5 – Camp at Deschutes River State Recreation Area / The Dalles

Day 6

6-1 Morning Camp Discussion

Review of Outhouse to Maupin Deschutes Rafting reach from Day 5 afternoon, landslides, Dant Debris Flow, Buckskin Mary Rapids, Outhouse Flood Bar; CRB, bedrock terrain, hummocky topography, hillslope gradients, formative causes of river rapids, 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; 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.

6-2 The Dalles Hwy 197 Roadcuts

Columbia River Basalt Group, Wanapum Basalt, 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

6-3 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

6-4 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

6-5 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

6-6 Cascade Locks / Bridge of the Gods / Bonneville Dam

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 – Return to Monmouth