

## Key Concept Summary of Field Stops – 2009 River Trip

### 1-1 Natural Science Building Roof

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*

### 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 Paulina Lake Outlet

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

### 2-3 Paulina Falls Knickpoint

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

### 2-4 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, flood scour, soils chronology, aridisols, clay films, soil development vs. time, landform / geomorphic surfaces.

### 2-5 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.

## *Night 2 – Camp at Deschutes River State Recreation Area / The Dalles*

### 3-1 The Dalles Hwy 197 Roadcuts

Columbia river basalts, Dalles Formation, diamicton, pyroclastic flows, debris flows, volcanoclastic 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

## *Night 3 – Camp at Trout Creek; meet river guides*

### 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 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.

## *Night 4 – Camp at Whiskey Dick*

### 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 Lunch Stop at Gravel Bar / Jumping Rock

Paleoflood hydrology, high-water indicators, flood reconstruction, whitewater hydraulics, fluvial mechanics, sediment transport processes.

## *Night 5 – Camp at Buckskin Mary*

### 6-1 Buckskin Mary Breakfast Work (Deschutes hydrology lecture 2)

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

#### 6-2 Hike to 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

#### 6-3 Outhouse flood bar

Deschutes flood history, flood records, landscape analysis, paleoflood hydrology, depositional vs. erosional landscape records, carbon dating, flood chronology, landslide dams, catastrophic outburst floods, geology vs. meteorologic flood processes.