ES458 -River Environments
Pre-Trip Reading Questions (updated summer 2016)

Read through the course readings and answer the following questions on separate pages. Neat, word-processed answers are most preferable, but field sheets / hand-written notes are also acceptable. Many of the field stops on the trip will also help answer these questions.

Section 1. Orr and Orr - Overview of High Lava Plains

1-1. Briefly describe the physiographic setting (elevation, physical boundaries, general characteristics) of the High Lava Plains province of Oregon.

1-2. What fault zone dominates the High Lava Plains? What is its orientation?

1-3. What three major fault/fracture zones converge in the proximity of Newberry Volcano? What is the likelihood of a Newberry Eruption during our field trip?

1-4. What is meant by "bimodal" lava composition of the High Lava Plains? List and discuss the two types of lavas that have been erupted in the High Lava Plains.

1-5. How does the age of volcanic deposits in southeastern Oregon (e.g. Owyhee uplands) compare the age near Newberry?

1-6. What is the geologic explanation for the formation of Fort Rock, southeast of Newberry?

1-7. When were the basalts of Lava Butte (south of Bend) erupted? What impact did the eruption have on the Deschutes river in that area?

1-8. What type of volcano is Newberry? How did the central Newberry crater (and associated lakes) form? What other famous Oregon volcano experienced similar processes?

Section 2. Orr and Orr - Overview of Deschutes-Columbia Plateau

2-1. What are the major rivers that drain the Deschutes-Columbia Plateau region? What is the dominant type of bedrock material that characterizes the region?

2-2. Where does the Deschutes river drain from and to? How long is it? How does it relate to the Columbia River?

2-3. What is the significance of the Columbia River Basalt (CRB) group in this region? When were the CRB's erupted? Over how long of a period were they erupted?

2-4. Describe the geographic extent of the Columbia River Basalts in terms of Washington and Oregon? How far north do they extend? How far south? How far east? How fare west?

2-5. Approximately how many individual lava flows have been identified in the Columbia River Basalt Group? Approximately how often did the eruptions take place?

2-6. Where is the source region for the Columbia River Basalts? Were these erupted by volcanic mountains? Explain your answer.

2-7. How do the Clarno and John Day formations compare to the CRB's? Are they older or younger? Are they also composed of basalts? What are they composed of? What type of rock material?

2-8. How do the "Dalles Formation" and "Wasco windblown silts" compare to the CRB's? Are they older or younger? Are they also composed of basalts? What are they composed of? Are the lithified rocks are unconsolidated sediment?

2-9. How did the Pleistocene ice ages and Missoula floods impact the Columbia Plateau? What types of deposits and landforms record the history of the Missoula floods?

Section 3. O'Connor et al., 2003, Overview of the Deschutes River Basin Geology, Hydrology and Geomorphology

3-1. What is the drainage area of the Deschutes River? What are the physiographic boundaries of the Deschutes? (to the east, west, north, south)

3-2. What are the types and ages of bedrock on the west side of the Deschutes Basin? What are the types and ages of bedrock on the east side?

3-3. How old are the Clarno and John Day Formations? What types of rocks are these formations composed of ? How did they form?

3-4. What are the Columbia River Basalts? Where do they occur with respect to the Deschutes Basin? What is the significance of the "CRBs" geologically?

3-5. What is known about the vertical incision (erosion) rates of the Deschutes River in the past 4 million years? Is it incising? Filling? What are the rates and how do we know?

3-6. List and describe the three primary physiographic "terranes" identified in the Deschutes basin. How are each characterized relative to the other? Where are the highest elevations?

3-7. Draw a sketch map showing annual rainfall (precipitation) patterns across the Deschutes basin? Where are the areas of highest precipitation? Lowest?

3-8. Examine Figure 6 summary of river flow hydrographs from the Deschutes Basin. Which areas show the highest peak discharge annually? Which show the lowest? What geographic portion of the basin is associated with the most variable runoff discharge? What locations the least variable?

3-9. Historically, list the three largest annual peak flow discharge (flood) events recorded on the Deschutes River. What are the values of each in cubic feet per second…

3-10. Does the flow and discharge of the Deschutes change drastically throughout the year? Why or why not? What geologic processes control the discharge of the Deschutes river?

3-11. How have volcanic eruptions impacted the Deschutes River drainage over the past 4 million years?

3-12. Of the three dominant types of geologic terranes in the Deschutes Basin, which are associated with the highest rates of sediment production? Which are associated with the lowest?

3-13. Cite and discuss the historic rates of sedimentation associated with dams and reservoirs in the Deschutes basin.

3-14. In one or two sentences for each, summarize the 5 important basin scale processes and factors that control Deschutes Basin hydrology and geomorphology.