ES202 Lab 6: Fluvial Processes Lab Instructions (updated Winter 2012)

Uses AGI Lab Manual 9th Edition

Using your lab book, complete the following exercises:

ACTIVITY 11.1 p. 261, Questions A.1 and A.2

Fill in answers for questions a-h about the topographic map shown on p. 261

Remember: gradient = elevation difference / distance along line of profile; Refer to Fig. 11.4 to see how to calculate gradient. *Procedure:* Calculate stream gradient (rise / run) in ft / mile. Find points A and B, where the contour lines cross and you can determine the elevation. The change in elevation (relief) is the difference between the two elevations. Then determine the length of the straight line segment between the two points using the bar scale.

Activity 11.1 p. 261-262, Questions B.1 through B.4, inclusive. Refer to Fig. 11.3 on p. 253

Question B.1, p. 262 (refer to figure 11.3)
Hints: The "upland surface" the lab manual refers to is the gently sloping area along the southern margin of the map with the word "BEAVER". Remember water flows downhill, perpendicular to contour lines, gradient = rise / run, the Great Divide lies along the crest of the Rocky Mountains, drainage to the east flows into the Gulf of Mexico, drainage to the west flows into the Pacific, see inset map.

Q B.2 Compare drainage pattern diagrams on Fig. 11.2, p. 252 to the topographic pattern shown on Fig. 11.3, which one matches?

Q B.3 determine drainage divides by thinking of water flowing downhill, perpendicular to contour lines. The drainage divide is the part of the watershed where water flows away from high points. Refer to Figure 11.1A on p. 250 to see what a drainage divide looks like and how it is drawn. To draw a drainage divide for Garvin Canyon, enlarged map on p. 262, start your line at the mouth of the stream tributaries (Garvin canyons it enters Timber Canyon), and draw it following the slope along the ridges and high points, perpendicular to the contour lines.

Q B.4 – determine the gradient of the south-flowing small tributary in Garvin Canyon, that lies parallel to and directly north of the "n" in Canyon on the map.

QB.5 thorugh B.7 SKIP

Activity 11.1 Question C on p. 263, (refer to figure 11.5, map from Arkansas). *Hint*: Look at the concentric, ring-shaped mountains separated by valleys in the area north and south of Waldron. The green map color represents forested mountain slopes. Compare the topographic patterns in Fig. 11.2, p. 252, which type of geologic feature / drainage pattern does the Waldron site most resemble?

Activity 11.1 Question D on p. 263, refer to the map in Figure 11.6. Answer questions D.1 through D.4, inclusive.

Ideas for answering Questions: Discharge is the measure of volume of water that flows through a river channel (for e.g. measured in gallons per day). 12,000 years ago, the climate was dramatically different that it is today. It was the end of the last major glacial "ice age", particularly in the northern Midwest states (e.g. north Dakota)… glaciers were rapidly melting and retreating. Glacial ice covered Canada and the upper Midwest of the U.S. 20,000 years ago.

Think about where the melt water would have been flowing 12,000 years ago, and compare to the climate and hydrologic conditions present in North Dakota today.

Activity 11.1 E, p. 264 Questions E1. Through E3., inclusive. Refer to Figure 11.7 Ennis, MT Map.

Explanation: An alluvial fan is a fan-shaped deposit of sediment occurring where steep mountain rivers exit narrow canyons, and splay out onto broad open areas. Lawton Ranch is at the head of the fan, near the mountain river exit point (flowing east to west). Bear Creek on the southwestern part of the map flows along the "toe" of the fan, down gradient from Lawton Ranch. The entire alluvial fan is sloping from east to west, as shown by the contour patterns.

ACTIVITY 11.2 (p. 265)

Complete questions 11.2A through F, inclusive.

Concepts to Consider: think about current meander loops that are so tightly closed that they may cut themselves off via erosion). The questions ask you to compare the 1936 river shape to the 1992 shape; think of meandering, cutbank erosion, and point bar deposition. The goal is to see historic changes in the river position over about 60 years)

ACTIVITY 11.3 (p. 266)

Complete questions 11.3 A through D, inclusive.

(*hint*: use the distance from the Escarpment to the present falls position as the distance of erosion over the past 11,000 years: Rate of erosion = erosion distance / time of erosion.