**ES473 Environmental Geology Textbook Review Questions**

Instructions: visit the ES473 class web site and download a digital MS word document version of the text review questions. Review and read the relevant textbook chapter posted on the ES486 moodle site (moodle.wou.edu) and answer the following questions. Answers should be word-processed with MS Word using figures and pasted images from the text book or favorite internet resources. Your work should look complete and professional.

**Chapter 5 Rivers and Floods**

1. Define the following term s related to river and flood processes (provide sketches or equations where required):
	1. Floodplain (define, describe and draw a cross-sectional sketch)
	2. Streams vs. Rivers vs. Drainage Basins (distinguish between the three)
	3. Channel slope or gradient (define, provide equation, draw a sketch)
	4. Stream Power
	5. List and describe the three primary process of sediment transport by river systems.
	6. Discharge (provide equation, explanation of variables, and units of measure)
	7. Alluvial Fan vs. Delta (define and describe the difference, provide map-view sketches)
	8. Meandering vs. Braided channel patterns (define and describe the difference, provide map view sketches of each pattern)
	9. Flooding and Flood Stage (describe and define, draw a sketch)
	10. Upstream vs. Downstream Floods (describe the difference and related hazards / effects)
	11. 100-year floodplain vs. 500-year floodplain (describe the differences and how they are determined in the field)
2. Examine Figure 5.1 map / profile views of a watershed system. Answer the following questions:
	1. True or False: river gradient increases as water flows from head to mouth in a watershed system.
	2. True or False: stream discharge increases with distance downstream towards the mouth of a river system.
	3. True or False: channel width and cross-sectional area increase with distance downstream towards the mouth of a river.
	4. Describe the width and areal extend of floodplains as rivers flow in a downstream direction towards the mouth.
3. Discuss and describe pool and riffle morphology in channel systems in the context of sediment load, channel depth and flow velocity.
4. Examine Figures 5. 12, 5.13 and 5.17. Define and describe a “flood hydrograph”, draw a graphical sketch, show the X and Y axis variables; what is “flood peak lag time”. Briefly discuss how a hydrograph can be used to characterize river flood events at a given location.
5. Discuss the statistical process for determining the magnitude and frequency of flood events. In your answer include sketches of the critical components of the analysis, and provide equations for flood recurrence intervals and probability of occurrence.
6. Read Section 5.4 on Flood Hazards, answer the following questions:
	1. Describe the patterns of flood hazards to life and property loss in the U.S. annually.
	2. List the 6 (six) factors that control the damage caused by floods.
	3. Examine Table 5.1, list the 5 top historic floods in the U.S. that have caused the most loss of life and property damage at the time the textbook was published.
7. List and discuss 4 techniques and methods that are used to mitigate flood damage. Draw sketches to support your answers.
8. Read over the flood analysis case study on Mission Creek, Santa Barbara, CA (1971-1995) on pages. 124-128. Answer the following questions:
	1. What is “annual peak flow” and how is it measured?
	2. List the four years of highest peak flow on record in cfs (cubic feet per second). What are the general causal effects associated with flooding in this area.
	3. What was the rainfall intensity over an 8 hour period associated with the 1995 floods? How much damage was associated with this event?
	4. What does the variable “Q100” refer to, describe and define.
	5. Read the graph in Figure 5.G., determine the predicted Q100 discharge from the best-line fit of the data, answer in cfs.
	6. How can this type of magnitude frequency analysis be used to mitigate future flood damage and loss of life along Mission Creek, in Santa Barbara, CA?