

# Geography 547: Fluvial Geomorphology

## Tentative Lecture Schedule

Fall, 2017

The readings for this course will be made available through a print shop (TBA) with possible additions to be provided on Blackboard or handouts including exercises and web materials that will be discussed in lecture. Exams will focus on what is covered in lecture, so also study the lecture Power Points that will be made available after lectures.

### [1] Introduction

### [2] Landscapes and Unifying Concepts in Geomorphology

Bierman & Montgomery (B&M), pp. 20-30

Introduction to Fluvial processes

Channels, discharge, flow velocity, sediment supply, bank materials B&M, 179-184

Fluvial Landforms

Planforms: meandering, braiding, anastomosed, wandering.

Schumm, Chs.1&2, pp.3-17; B&M, 199-205; Wohl, 133-143

### [3] Floodplains, Alluvial fans, Terraces, Deltas

B&M, 205-209

#### Standard morphologic metrics:

Bankfull discharge; Ordinary high water marks (OHWM: legal corollary to bankfull); W/D;

Hydraulic geometry Wohl, 125-130; B&M, 187-188; James

Lab and Field Methods 6-5; Analytical Sidebar 6-6; OHWM handout

#### Channel Network Topology - Stream order & magnitude; Horton's laws of drainage

composition, structural inferences from drainage patterns Knighton, pp.9-24;

Easterbrook, pp.138-152; James, p.6-13 to 6-19 & Anal. Sidebar 6-7, Analytical Sidebar 6-7.

### [4] Network Topology (*continued*)

#### Theories of morphological adjustment

Dynamic equilibrium; concept of grade; complex response; thresholds; channel evolution models; non-linear dynamic systems

Wohl, 130-133; Schumm 1977, 74-81; B&M 36-40

### [5] Hydraulics of Channel-Forming Processes

Hydraulic roughness (Manning's  $n$ ); Darcy-Weisbach friction factor, velocity and discharge by Manning's equation; shear stress; stream power

B&M, 185-187, Wohl, 53-55; James p.6-3, Analytical Sidebar 6-1

Flow classification: steady uniform flow, critical & subcritical flow (Froude number), laminar & turbulent flow (Reynolds number); Energy (head), energy grade line; channel incision and lateral migration.

B&M, 189-193; Wohl pp.47-55, 65-67

### [6] Hydrologic Aspects of River Science

Measuring Discharge James, 6-1 to 6-3 & Lab and Field Methods 6-1, 6-2 & 6-3

Urban Hydrology and Geomorphology

Impervious surfaces, empirical flood studies

Schueler; EPA

### [7] Streamflow Hydrology (cont.): Stormflows and Floods

Hydrographs; dimensionless unit hydrographs James pp.6-7 to 6-9; Analytical Sidebar 6-3

#### Modeling: Rainfall-runoff and peak Q modeling;

Demonstration of SWMM model

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**[8] Field Methods in Fluvial Geomorphology  
Mapping and River Science**

Handouts

**[9] Mapping and River Science** *(continued)*

Mapping channel networks and divides; NHD; LiDAR

James, Anal. Sidebar 6-8 & DEM exercise (handout)

Structure from Motion (SfM)

see Power Points

**[10] Tuesday: Midterm Exam**

Thursday: Work on projects *[guest lecture]*

**[11] Sediment: Entrainment & Transport, Concentrations, Budgets, Properties, Sediment  
Delivery Ratios**

James Ch.10

Thursday: **Physical Sedimentology & Lab Methods**

Power Points; handout exercise

**[12] Tuesday: Work on projects**

Thursday: Guest lab introduction

**Sediment Lab Methods** *(continued)*

Handout; exercise

**[13] Channel Classification & Restoration** *[guest lecture]*

**Channel classification** James pp.6-12 to 6-13; Lab and Field Methods 6-6; Rosgen Catena

**Stream Restoration**

Design flows:

SCS Ch.5, 5-1 to 5-3

Philosophies:

handout; James Ch.13

**[14] Channel Classification & Restoration** *(continued)*

**Flood Frequency Analysis** *(if time)* - Recurrence intervals, binomial probability theory, discharge data calibrations; hydrograph development; Flood frequencies curves

Hogan, Ch.1; James, 15-1 to 15-10; SCS, Ch5, pp.5-4 to 5-12

Thursday: **Thanksgiving**

**[15] Flood Frequency Analysis** *(continued if time)*

**[16] Student project presentations**

**Readings**

Bierman, P.R. & Montgomery, D.R. 2014. Key Concepts in Geomorphology. W.H. Freeman & Co. 494pp.

James, L.A. nd. Watersheds and Water Resources, unpublished textbook.

Chapter 5. Hydrologic Models [and urban hydrology] (excerpts)

Chapter 6. Concentrated Flows in Channels (excerpts)

Chapter 10. Non-Point Source Pollution (Sediment excerpts)

Chapter 15. Flood Risk Assessment (excerpts)

Schumm, S.A. 2005. River Variability and Complexity, Cambridge Univ. Press; 220pp. Available online from USC computers as an ebook: <http://libcat.csd.sc.edu/record=b3047892~S1>

Wohl, E.E. 2014. Rivers in the Landscape, Wiley Blackwell. 318pp.