

GEOGRAPHY 326/GEOLOGY 326
Landforms: Topics and Regions
Topic: Fluvial Geomorphology

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Office Hours: 1:30 - 3:00 P.M. Tuesdays; 10-10:40 A.M. Mondays; or by appointment

Required Texts: *Fundamentals of Fluvial Geomorphology* by Ro Charlton. Routledge (Taylor and Francis Group), New York. ISBN# 13: 978-0-415-33454-9 (pbk).

Exams: Three in-class exams; no final during exam week ----- February 24, April 7, and May 5; Exams will focus on material presented in class lectures. Exams are graded on a curve.

Lecture topics:

January 20, 2009 **Drainage networks: stream orders and network composition**

Reading assignment: Charlton, Chapters 1 & 2, pp. 1-20 (Introductory concepts & the fluvial system)

Power point 1: River & Drainage Network Temporal Evolution

Power point 2: Basin Scale Climate & Floods UMV

Topics:

Definitions of drainage systems and component parts

Drainage network evolution over differing time scales

Stream network classification and laws of stream order ranks

Drainage basin scale and sensitivity to climate generated runoff

January 27, 2009 **The magnitude-frequency concept in the context of changes in natural and human environmental factors and settings**

Reading assignment: Charlton, Chapter 3, pp. 21-36 (Flow regime; Measuring streamflow; magnitude and frequency of flows)

Reading assignment:

IPCC, 2007, A Report of Working Group 1 of the Intergovernmental Panel on Climate Change: Summary for Policy Makers - pdf file

Angel, J.R., and Huff, F.A., 1997, Changes in Heavy Rainfall in Midwestern United States, *Journ. of Water Resources Planning and Policy*, 1997 – pdf file.

Power point 3: IPCC Report, Climate Change, and Examples

Topic:

Measuring streamflow (discharge)
Partitioning of runoff in surface (overland) vs baseflow components
The magnitude and frequency concept
Atmospheric circulation regimes and flow hydrology
Climate change and atmospheric circulation

February 3, 2009

**Atmospheric circulation and hydrology (continued from above);
The magnitude-frequency concept in the context of
natural and human environmental factors and settings**

Reading assignment:

Knox, 2002, Agriculture, erosion, and sediment yields –
pdf file

Knox, 2001, Agricultural influence on landscape sensitivity
in the Upper Mississippi Valley – pdf file

Power point 4: Agriculture and Mining Influence on UMV Hydrology

Topics:

Physiographic factors that influence on runoff characteristics
Agricultural land use factors that influence runoff characteristics
Land cover and tillage

February 10, 2009

**The magnitude-frequency concept in the context of
natural and human environmental factors and settings**

Reading assignment:

World Commission on Large Dams Report - pdf file

Graf, W.L. 2005, Geomorphology and American Dams: The
Scientific, Social, and Economic Context – pdf file

Optional reading: Nislow et al., 2002, Effects of dam control on
flow regime & vegetation: Connecticut River – pdf file

Power point 5: Channelization

Power point 6: Dams

Power point 7: Wisconsin's Kickapoo Dam Controversy

Topics:

Channelization

Urban land use factors that influence runoff characteristics

Dams

Wisconsin's Kickapoo Dam Controversy

February 17, 2009

**Wrap-up & summary of February 3rd & 10th lectures;
Introduction to flow regimes & processes in channels**

Reading assignment: Charlton, Chapters 6 & 7, pp. 69-116 (flow in
Channels & processes of erosion, transport, & deposition)

Power point 8: HEC-RAS – Modeling Beagle Branch Flood

Power point 9: Flow Hydraulics and Channel Bedforms

Topics:

Energy and streamflow; types of energy heads: elevation, depth, & Velocity
Types of sediment loads in streams & rivers
Measuring and describing sediment loads
Bedforms of sand bed channels and relations with flow regime

February 24, 2009

Exam 1 and Movie documentary on Yangtze River, Three Gorges Dam

March 3, 2009

Floods

Reading assignment: Knox, 2000, Sensitivity of modern and Holocene floods to climatic change – pdf file
Optional reading: Bulletin 17B – Flood frequency analysis – pdf file
Optional reading: Clayton & Knox, 2008, Glacial Lake Wisconsin dam break flood – pdf file

Power point 10: Floods from Dam Breaks and Extreme Precipitation

Topics:

Floods associated with excessive precipitation
Floods associated with excessive snowmelt
Floods associated with dam breaks

March 10, 2009

River morphology

Reading assignment: Charlton, Chapter 8, pp. 117-156 (channel form and behavior)

Power point 11: Meander Cutoff – Little Platte River

Topics:

Classification of alluvial channels in relation to sediment load
At-a-station and downstream hydraulic geometries
Floodplain landforms and sediments

March 17, 2009

No Class – Spring Break

March 24, 2009

Movie documentary: *Great Upper Mississippi River Flood of 1993*

March 31, 2009

Fluvial system response to environmental change

Reading assignment: Charlton, Chapter 9, pp. 157-176 (system response to change)

Power point 12: Later Quaternary Upper Mississippi River Paleohydrology

Topics:

Types of causative factors producing change in river systems
Sensitivity to change
Terrace formation
Response to extreme floods
Fluvial responses to Quaternary climate change: upper Mississippi River
Effects of baselevel change

April 7, 2009

Exam 2 & Lecture

April 14, 2009

Paleohydrology

Reading assignments:

Slackwater sediments for paleoflood reconstruction - pdf
Competent depth for paleoflood reconstruction – pdf
Channel morphology for paleoflood reconstruction – pdf

Power point 13: Paleoflood Magnitude and Frequency

Topic:

Reconstruction of flood magnitudes and frequencies beyond the record of instrumentation, using morphologic and stratigraphic evidence

April 21, 2009

Paleohydrology (continue) and Alluvial chronologies

Reading assignment: Knox, 1983, Responses of rivers to Holocene climate change - pdf file

Power point 13: Paleoflood Magnitude and Frequency
Power point 14: Alluvial Chronologies

April 28, 2008

Managing River Channels & Floodplains

Reading assignment: Charlton, Chapter 10, pp. 177-200 (managing River channels & restoration of channels & floodplains)

Power point 15: Historical Metamorphosis of the Upper Mississippi River
Power point 16: Rosgen Method of Channel Classification & Restoration
Power point 17: Old River Control Structures: Lower Mississippi River

Topic:

Management and restoration of rivers and floodplains

May 5, 2008

Exam 3 and wrap-up