**G 652 FLUVIAL GEOMORPHOLOGY FALL 2018**

Instructor: Dr. Ellen Wohl

Rm 330, Natural Resources Building

office phone, 491-5298

office hours 9-10 MWF

**Syllabus**

 week of

1. *Introduction* 20 Aug

scope of course

historical background of geomorphology

philosophies of approach

geomorphic transport laws

six degrees of connection

2. *Drainage Basins* 27 Aug, 3 Sep

channel initiation and slope processes

hydrographs & flood frequency analysis

hyporheic processes

network evolution & analysis

3. *Channel processes* 10, 17, 24 Sep

flow mechanics: flow states, velocity, resistance, energy, power

sediment processes: entrainment, erosion of cohesive beds, bank erosion,

sediment transport

 instream wood dynamics

**POUDRE FIELDTRIP SATURDAY SEPTEMBER 29**

4. *Channel patterns* 1, 8, 15 Oct

channel classifications

controls on channel adjustment: hydraulic geometry, equilibrium,

 extremal hypotheses, dominant discharge, bed configuration,

 channel form – meandering & braided, biotic influences on channel form,

channel gradient

**MIDTERM EXAM 12 OCT**

**PAWNEE BUTTES FIELDTRIP SATURDAY OCTOBER 20**

5. *Fluvial Landforms*  22, 29 Oct

floodplains

terraces

alluvial fans and deltas

6. *Paleohydrology* 5, 12 Nov

channel changes through time - complex response, equifinality

paleoflood indicators – regime-based, paleocompetence, botanical, paleostage indicators

7. *Management Applications - Case Studies* 26 Nov

floods: Tucson 1983, Front Range

Los Angeles River

gullies

sand & gravel mining

instream, channel-maintenance and environmental flows

river rehabilitation/restoration

8. *Future Directions* 3 Dec

headwaters

large rivers & floodplains

anthropogenic changes

landscape evolution modeling

restoration of large rivers

**FINAL EXAM 3-10 December**

**Course requirements**

*Exams*: The midterm exam will consist of short, in-class essay questions on topics which you will be given ahead of time. The final exam will be a take-home essay exam covering all of the class material (both lectures and outside readings).

*Fieldtrips*: There will be two fieldtrips, for which you will be expected to turn in group reports.

*Homework:* You will receive short problem sets and will have a week to complete each.

**Grading:**

Exams, 25% each 50%

Homework 20%

Fieldtrip exercises 25%

Class participation\* 5%

\* Class meetings will include discussions. One of the strengths of this course is that it includes people from diverse backgrounds. I always appreciate willingness to share experience in classroom discussions.

**GENERAL REFERENCES** (chronological)

LEOPOLD, L.B., WOLMAN, M.G. and MILLER, J.P. 1964. Fluvial processes in geomorphology. W.H. Freeman and Co., 522 pp.

SCHUMM, S.A., ed. 1972. River morphology. Dowden, Hutchinson, and Ross, 429 pp.

SCHUMM, S.A. 1977. The fluvial system. Wiley Interscience, 338 pp.

RICHARDS, K. 1982. Rivers: Form and process in alluvial channels. Methuen, 358 pp.

GREGORY, K.J., ed. 1983. Background to palaeohydrology: A perspective. Wiley and Sons, Chichester, 486 pp.

ELLIOTT, C.M., ed. 1984. River meandering. Proceedings of the Conference Rivers 83, American Society of Civil Engineers, 1036 pp.

SCHUMM, S.A., HARVEY, M.D. and WATSON, C.C. 1984. Incised channels: Morphology, dynamics and control. Water Resources Publications, 200 pp.

GREGORY, K.J., LEWIN, J. and THORNES, J.B., eds., 1987. Palaeohydrology in practice: A river basin analysis. Wiley and Sons, Chichester, 370 pp.

MAYER, L. and NASH, D., eds., 1987. Catastrophic flooding. Allen and Unwin, 409 pp.

SCHUMM, S.A., MOSLEY, M.P. and WEAVER, W.E. 1987. Experimental fluvial geomorphology. Wiley Interscience, 413 pp.

BAKER, V.R., KOCHEL, R.C. and PATTON, P.C., eds. 1988. Flood geomorphology. Wiley.

CHANG, H.H. 1988. Fluvial processes in river engineering. Wiley Interscience, 432 pp.

IKEDA, S. and PARKER, G., eds. 1989. River meandering. American Geophysical Union, Water Resources Monograph 12, 485 pp.

BULL, W.B. 1991. Geomorphic responses to climatic change. Oxford University Press, New York, 326 pp.

CALOW, P. and PETTS, G.E. 1992. The rivers handbook: hydrological and ecological principles. Blackwell Scientific Publications, Oxford, vol. 1 (vol. 2, with same title and editors, published in 1994).

PALMER, T. 1994. Lifelines: the case for river conservation. Island Press, Washington, D.C., 254 pp.

SCHUMM, S.A. and WINKLEY, B.R., eds., 1994. The variability of large alluvial rivers. ASCE Press, New York, 467 pp.

GREGORY, K.J., STARKEL, L. and BAKER, V.R., eds. 1995. Global continental palaeohydrology. Wiley, Chichester, 334 pp.

COSTA, J.E., MILLER, A.J., POTTER, K.W. and WILCOCK, P.R., eds., 1995. Natural and anthropogenic influences in fluvial geomorphology. American Geophysical Union Monograph 89, 239 pp.

RITTER, D.F., KOCHEL, R.C. and MILLER, J.R. 1995. Process geomorphology, 3rd ed. Wm. C. Brown, 546 pp.

DE WAAL, L.C., LARGE, A.R.G. and WADE, P.M., eds. 1998. Rehabilitation of rivers: principles and implementation. Wiley, Chichester, 331 pp.

TINKLER, K.J. and WOHL, E.E., eds. 1998. Rivers over rock: fluvial processes in bedrock channels. American Geophysical Union Monograph 107, 323 pp.

DARBY, S.E. and SIMON, A., eds. 1999. Incised river channels: processes, forms, engineering and management. Wiley, New York, 442 pp.

MILLER, A.J. and GUPTA, A., eds. 1999. Varieties of fluvial form. Wiley, New York, 521 pp.

WOHL, E. 2000. Mountain rivers. American Geophysical Union Water Resources Monograph 14, 320 pp.

WOHL, E., ed. 2000. Inland flood hazards: human, riparian, and aquatic communities. Cambridge University Press, 498 pp.

DORAVA, J.M., MONTGOMERY, D.R., PALSCAK, B.B. and FITZPATRICK, F.A., eds. 2001. Geomorphic processes and riverine habitat. American Geophysical Union, 253 pp.

WOHL, E.E. 2001. Virtual Rivers: lessons from the mountain rivers of the Colorado Front Range. Yale University Press, 210 pp.

HOUSE, P.K., WEBB, R.H., BAKER, V.R. and LEVISH, D.R. eds. 2002. Ancient floods, modern hazards: principles and applications of paleoflood hydrology. American Geophysical Union, 385 pp.

BRIDGE, J.S. 2003. Rivers and floodplains: forms, processes, and sedimentary record. Blackwell Publishing, 491 pp.

GREGORY, S., BOYER, K. and GURNELL, A., eds. 2003. The ecology and management of wood in world rivers. American Fisheries Society Symposium 37, AFS, Bethesda, Maryland, 431 pp.

KONDOLF, G.M. and PIEGAY, H., eds. 2003. Tools in fluvial geomorphology. John Wiley and Sons, 688 pp.

WILCOCK, P.R. and IVERSON, R.M., eds. 2003. Prediction in geomorphology. American Geophysical Union Monograph 135, 256 pp.

BENNETT, S.J. and SIMON, A., eds. 2004. Riparian vegetation and fluvial geomorphology. American Geophysical Union Press, Washington, D.C., 282 pp.

WOHL, E. 2004. Disconnected rivers: linking rivers to landscapes. Yale University Press, New Haven, Connecticut, 301 pp.

BRIERLEY, G.J. and FRYIRS, K.A. 2005. Geomorphology and river management: Application of the River Styles framework. Blackwell Publishing, Oxford, UK, 398 pp.

SCHUMM, S.A. 2005. River variability and complexity. Cambridge University Press, 220 pp.

**Suggested readings**

1. **Introduction**

Wohl, chapter 1

2. **Drainage basins**

Schumm, S.A., Mosley, M.P. and Weaver, W.E. 1987. The drainage network, in Experimental fluvial geomorphology, Wiley, p. 11-58.

Wohl, chapter 2

3. **Channel processes**

Powell, D.M. 1998. Patterns and processes of sediment sorting in gravel-bed rivers. Progress in Physical Geography 22: 1-32.

Montgomery, D.R. 1999. Process domains and the river continuum. Journal of the American Water Resources Association 35: 397-410.

Wohl, chapters 3 and 4

4. **Channel patterns**

Leopold, L.B. and Maddock, T. 1953. The hydraulic geometry of stream channels and some physiographic implications. USGS Professional Paper 252, 57 pp

Wolman, M.G. and Miller, J.P. 1960. Magnitude and frequency of forces in geomorphic processes. Journal of Geology 68: 54-74.

Schumm, S.A. and Lichty, R.W. 1965. Time, space and causality in geomorphology. American Journal of Science 263: 110-119.

Wohl, chapter 5

5. **Fluvial landforms**

Wohl, chapter 6

6. **Paleohydrology**

Schumm, S.A. 1969. River metamorphosis. Journal of Hydraulics Division, ASCE 95: 255-273.

Schumm, S.A. and Parker, R.S. 1973. Implications of complex response of drainage systems for Quaternary alluvial stratigraphy. Nature 243: 99-100.

Wolman, M.G. and Gerson, R. 1978. Relative scales of time and effectiveness of climate in watershed geomorphology. Earth Surface Processes 3: 189-208.

Kochel, R.C. and Baker, V.R. 1982. Paleoflood hydrology. Science 215: 353-361.

Wohl, chapter 3, section 2

7. **Management applications -- case studies**

Jarrett, R.D. and Costa, J.E. 1986. Hydrology, geomorphology, and dam-break modeling of the July 15, 1982 Lawn Lake Dam and Cascade Lake Dam failures, Larimer County, Colorado. USGS Professional Paper 1369.

Kresan, P.L. 1988. The Tucson, Arizona, flood of October 1983: implications for land management along alluvial river channels. In, V.R. Baker, R.C. Kochel and P.C. Patton, eds., Flood geomorphology. Wiley, NY, p. 465-489.

Graf, W.L. 1996. Geomorphology and policy for restoration of impounded American rivers: what is “natural?” In, B.L. Rhoads and C.E. Thorn, eds., The scientific nature of geomorphology: proceedings of the 27th Binghamton Symposium in Geomorphology. Wiley and Sons, NY, p. 443-473.

Kondolf, G.M. 2006. River restoration and meanders. Ecology and Society 11: 42.

Wohl, chapter 7

Each course instructor shall state clearly in the course syllabus that the course will adhere to the Academic Integrity Policy of the Colorado State University General Catalog and the Student Conduct Code. Colorado State University has long upheld values of academic and scholastic integrity. The General Catalog's "Policies and Guiding Principles" asserts that CSU "expects students to maintain standards of personal integrity that are in harmony with the educational goals of the institution" - citing "principles of academic honesty" as the first example.