

Linking biology and geomorphology in coastal wetlands (and other habitats)

Syllabus for fall semester of 2013

Updated 9/4/2013

1. Time. The class will be held on Friday 4-5 pm Eastern Time. See the bottom of the syllabus for instructions about logging in and taking the course for credit.

2. Contacts. The course is being organized by Steven Pennings at the University of Houston. Email spennings@uh.edu, Telephone 713 743 2989. The course is being offered for credit at the University of Houston and at the following additional institutions. Enrolling in these courses may involve additional course work beyond the weekly internet lecture.

<u>Institution</u>	<u>Course number and instructor</u>
Boston University	ES543 , Estuaries and Nearshore Systems, Sergio Fagherazzi, Sept 3-30 only.
University of Georgia	Merryl Alber
University of Virginia	EVSC 4993-003, EVSC 9999-007 , Linda Blum
University of South Carolina	MSCI 599 Coastal Wetlands, Jim Morris
University of Houston	BIOL 6297 , Steve Pennings, may also be offered in Civil & Env Engineering, Kyle Strom
Indiana University	SPEA-E 579 , Chris Craft
Coastal Carolina	CMSS 787 , Richard Peterson.
Texas A&M, TAMU Galveston	MARB689 , Anna Armitage
Florida International University	BSC 6926 , Evelyn Gaiser

3. Course content

Until recently, studies of wetland ecology and geomorphology were conducted independently. We now realize that these fields are inextricably linked. Wetland flora and fauna affect geomorphology, and wetland geomorphology affects the success of plant and animal species. This course provides a unique opportunity to learn from experts in the field distributed across multiple universities. Speakers will discuss the topic from various perspectives, with some lectures generalizing the material beyond wetlands to other habitat types. Course content will be delivered live over the internet.

The course web site is at <http://biogeomorph2013.wordpress.com/>.

Schedule of lectures and associated readings

- Aug. 30 Kyle Strom, University of Houston. Basics of mud transport.
- Hill, P. S., Newgard, J. P., Law, B. A., & Milligan, T. G. (2013). Flocculation on a muddy intertidal flat in Willapa Bay, Washington, Part II: Observations of suspended particle size in a secondary channel and adjacent flat. *Continental Shelf Research*, 60, Supplement, S145 – S156.
- Wiberg, P. L., Law, B. A., Wheatcroft, R. A., Milligan, T. G., & Hill, P. S. (2013). Seasonal variations in erodibility and sediment transport potential in a mesotidal channel-flat complex, Willapa Bay, WA. *Continental Shelf Research*, 60, Supplement, S185 – S197.
- Sept. 6 Duncan FitzGerald, Boston University. Interactions among marshes, tidal inlets, and barrier systems.
- FitzGerald, D. M., Fenster, M. S., Argow, B. A., & Buynevich, I. V. (2008). Coastal Impacts Due to Sea-Level Rise. *Annual Review of Earth and Planetary Sciences*, 36(1), 601-647.
- Wilson, C. A., Hughes, Z. J., & FitzGerald, D. M. (2012). The effects of crab bioturbation on Mid-Atlantic saltmarsh tidal creek extension: Geotechnical and geochemical changes. *Estuarine, Coastal and Shelf Science*, 106(0), 33 – 44.
- Sept. 13 Sergio Fagherazzi, Boston University. Erosion at marsh edges.
- Fagherazzi S., Mariotti G., Wiberg P.L., and K.M. MacGlathery (2013) Marsh collapse does not require sea-level rise, *Oceanography*, 26(3) 70-77.
- Mariotti G. and Fagherazzi S. (2013) Critical width of tidal flats triggers marsh collapse in the absence of sea-level rise, *Proceeding of the National Academy of Sciences*, 110(14) 5352-5356 doi:10.1073/pnas.1219600110
- Sept. 20 Linda Blum, University of Virginia. Plant roots and marsh elevation.
- Blum, L.K. and E. Davey. 2013. Below the Salt Marsh Surface: Visualization of Plant Roots by Computer-Aided Tomography. *Oceanography* 26(3):42-44. *Note that this will not be available until September 2013 and that it is a real short article written for a very general audience.*
- Mudd, S.M., S.M. Howell, and J.T. Morris. 2009. Impact of dynamic feedbacks between sedimentation, sea-level rise, and biomass production on near-surface marsh stratigraphy and carbon accumulation. *Estuarine, Coastal and Shelf Science* 82:377-389.
- Nyman, J.A. R.J. Walters, R.D. Delaune, and W.H. Patrick Jr. 2006. Marsh vertical accretion via vegetative growth. *Estuarine, Coastal and Shelf Science* 69:370-380.
- Sept. 27 James Morris, University of South Carolina. Modeling marsh platform elevation.
- Morris, J.T., P.V. Sundareshwar, C.T. Nietch, B. Kjerfve, D.R. Cahoon. 2002. Responses of coastal wetlands to rising sea level. *Ecology* 83:2869-2877.
- Morris, J.T. 2007. Ecological engineering in intertidal saltmarshes. *Hydrobiologia* 577:161-168

- Morris, J.T., Sundberg, K., and Hopkinson, C.S. 2013. Salt marsh primary production and its responses to relative sea level and nutrients in estuaries at Plum Island, Massachusetts, and North Inlet, South Carolina, USA. *Oceanography* 26(3):78-84.
- Oct. 4 Ray Torres, University of South Carolina. Creek networks.
- Dalrymple RW, Mackay DA, Ichaso AA, Choi KS. 2012. Processes, morphodynamics, and facies of tide-dominated estuaries. Pp. 79-107 in RA Davis and RW Dalrymple (eds) *Principles of tidal sedimentology*.
- Ensign SH, Doyle MW and Piehler MF. 2013. The effect of tide on the hydrology and morphology of a freshwater river. *Earth Surf. Process. Landforms* 38:655-660.
- Oct. 11 Rick Peterson and Rich Viso, Coastal Carolina University. Effects of geomorphology on water flow.
- Gardner, L. R., 2005. Role of geomorphic and hydraulic parameters in governing pore water seepage from salt marsh sediments. *Water Resources Research* 41, W07010, doi:10.1029/2004WR003671.
- Winter, T.C., 1999. Relation of streams, lakes, and wetlands to groundwater flow systems. *Hydrogeology Journal*, 7, 28-45.
- Oct. 18 Matt Reidenbach, University of Virginia. Interactions between coastal vegetation and hydrodynamics.
- Koch, E., J. D. Ackerman, J. Verduin and M. van Keulen (2006). Fluid dynamics in seagrass ecology-from molecules to ecosystems. *Seagrasses: Biology, Ecology and Conservation*, Springer Netherlands: 193-225.
- Hansen, J. C. R. and M. A. Reidenbach (2012). Wave and tidally driven flows in eelgrass beds and their effect on sediment suspension. *Marine Ecology Progress Series* 448: 271-287.
- Oct. 25 Matt Kirwan, Virginia Institute of Marine Sciences. Geographic variation in plant production.
- Kirwan, ML, Guntenspergen, GR, and Morris, JT., 2009. Latitudinal trends in *Spartina alterniflora* productivity and the response of coastal marshes to global change. *Global Change Biology*, v. 15, p. 1982-1989, doi:10.1111/j.1365-2486.2008.01834.x
- Kirwan, ML and Mudd, SM, 2012. Response of salt-marsh carbon accumulation to climate change. *Nature* 489, 550-553.
- Nov. 1 Greg Okin, University of California, Los Angeles. Movement of soil by aeolian processes in vegetated terrestrial systems.
- Okin G.S. 2013. Linked Aeolian-Vegetation Systems. In: John F. Shroder (ed.) *Treatise on Geomorphology*, Volume 11, pp. 428-439. San Diego: Academic Press.
- Nov. 8 Steve Pennings, University of Houston. Animal-sediment interactions in salt marshes.

- Bertness, M. D., C. Holdredge, and A. H. Altieri. 2009. Substrate mediates consumer control of salt marsh cordgrass on Cape Cod, New England. *Ecology* 90:2108-2117.
- Hughes, Z. J., D. M. FitzGerald, C. A. Wilson, S. C. Pennings, K. Więski, and A. Mahadevan. 2009. Rapid headward erosion of marsh creeks in response to relative sea level rise. *Geophysical Research Letters* 36. DOI: 10.1029/2008GL036000
- Wang, J. Q., X. D. Zhang, L. F. Jiang, M. D. Bertness, C. M. Fang, J. K. Chen, T. Hara, and B. Li. 2010. Bioturbation of burrowing crabs promotes sediment turnover and carbon and nitrogen movements in an estuarine salt marsh. *Ecosystems* 13:586-599.
- Nov. 15 Brian Silliman, Duke University. Flow and ecological processes in rocky intertidal and salt marshes.
- Bertness, MD, GC Trussell, PJ Ewanchuk and BR Silliman. 2002. Do alternate stable community states exist in the Gulf of Maine rocky intertidal zone? *Ecology* 83:3434-3448.
- Silliman, BR and MD Bertness. 2002. A trophic cascade regulates salt marsh primary production. *PNAS* 99:10500-10505.
- Van Wesenbeeck, BK, CM Crain, AH Altieri, MD Bertness. 2007. Distinct habitat types arise along a continuous hydrodynamic stress gradient due to interplay of competition and facilitation. *Mar. Ecol. Prog. Ser.* 349:63-71.
- Nov. 22 Evelyn Gaiser, Florida International University. Microbial binding of wetland sediments.
- Hagerthey, S. E., B. J. Bellinger, K. Wheeler, M. Gantar and E. Gaiser. 2011. Everglades periphyton: A biogeochemical perspective. *Critical Reviews in Environmental Science and Technology.* 41: 309-3434.
- McGlathery, K., K. Sundback, and P. Fong. 2012. *Estuarine Benthic Algae.* Estuarine Ecology. 2nd Ed. 203-234.
- Nov. 29 No class (Thanksgiving Holiday).
- Dec 6 Bob Miller, University of California, Santa Barbara. Kelp forests, hydrodynamics and ecological processes.
- Gaylord, B., K. J. Nickols, and L. Jurgens. 2012. Roles of transport and mixing processes in kelp forest ecology. *J Exp Biol* 215: 997-1007.
- Palardy, J. E., and J. D. Witman. 2011. Water flow drives biodiversity by mediating rarity in marine benthic communities. *Ecology Letters* 14: 63-68.
- Dec. 13 Victor Thompson, University of Georgia. Effects of pre-historic humans on marsh geomorphology.
- Thompson, Victor D., John Turck, and Chester DePratter. 2013. Cumulative Actions and the Historical Ecology of Islands along the Georgia Coast. In *The Archaeology*

and Historical Ecology of Small Scale Economies, edited by Victor D. Thompson and James C. Waggoner, Jr., pp. 79-95. University Press of Florida, Gainesville.

DePratter, Chester B., and Victor D. Thompson. 2013. Past Shorelines of the Georgia Coast. In *Life Among the Tides: Recent Archaeology on the Georgia Bight*, edited by Victor D. Thompson and David Hurst Thomas, 145-167. Anthropological Papers Number 98 of the American Museum of Natural History, New York.

4. How to participate

If you wish to take this course for credit, you need to enroll in one of the courses listed on the first page or arrange a “special topics” course with a willing instructor at your home institution. If you simply wish to sit in on the lectures, you are welcome to do so without formally enrolling. In either case, please email the course organizer, Steven Pennings, at spennings@uh.edu so that he can add you to the email list for course-related announcements. All you’ll need is a computer with a high-speed connection to the internet.

Please use the following link to log in: <http://vcomm.uh.edu/bchs/>. You need a good internet connection. Ethernet is better than wireless. The first time you log in, you may need to download a flash plugin. This takes only a couple seconds. Sign in as “guest”, but enter a name so that we can identify you as an individual. Steve Pennings will then allow you to enter the meeting. This may take a couple minutes if a lot of people are entering at the same time. The software has a chat function where you can type comments and icons that you can click to “raise your hand” to ask a question. We will enable video for some participants, but perhaps not all if the number of participants grows large. We will enable your microphone when you are recognized to ask a question.