ENVS 166 Agroecosystem Analysis & Watershed Management
Summer Session 2016
Mon. & Weds. 9-12:30, NS2 233 and beyond

Instructor: Dr. Katie Monsen, kmonsen@ucsc.edu
NS2 Rm. 471 ☼ Office hours – Thurs 1-3 and by appointment

This is a draft syllabus and highly subject to change.

Course Description
Official: Explores a range of approaches to examine agroecosystem function, watershed management, and concepts of sustainability. Uses a combination of lecture, demonstration, field work, and field trips to illustrate approaches to analysis of managed ecosystems behavior and the integration of biophysical and socio-political knowledge to aid in watershed management.

What is a watershed? What are agroecosystems? How does addressing societal, and especially agricultural, problems with watersheds in mind change our approach to solving them? How do we analyze such problems in the first place? What challenges do our local watersheds (the San Lorenzo River, the Pajaro River, and the Elkhorn Slough watersheds) face, and how do those compare with watersheds in other places, nationally and globally? We will explore these questions and their application through class readings, discussions, field trips, and research, working to understand concepts such as hydrology, nutrients and pesticides, multifunctionality, landscape biodiversity, watershed economics, communities, and knowledge networks.

Course Components
Discussion & participation:
Many class periods will include discussion of course readings as a key mode of engaging with this material. Please prepare for class by engaging with the readings so we can explore them together. Readings will be posted on eCommons. The evaluation of your participation will be based on attendance in class and your contribution to class discussion and activities.

Research project & paper:
You will complete an in-depth study of an aspect of watershed management, including a literature review, critical assessment of the current state of knowledge, identification of future research needs, and a short research proposal that would help address research questions that arise from your work. The term papers will be 1500 words, and will include a minimum of 10 references, all of which must be from peer-reviewed literature or government/NGO documents. Information on how you will be evaluated on the paper will be handed out separately. Students will present their findings to the class informally on Aug. 18.

Written assignments & final exam:
You will have four weekly assignments to help you engage more deeply with the course material. These will be posted by Thursday afternoon and will be due the next Tuesday in class. Similarly, the take-home final exam will be posted on Aug. 18 and due the last day of class, Aug. 25 (a Thursday in this case, instead of a Tuesday).

Coursework evaluation
Participation: 20%
Weekly assignments (total): 30%
Project & paper: 30%
Final exam: 20%

Course schedule:
July 25 ❁ Class introduction, ecosystem concepts & watersheds (geology, soils, climate & cropping systems)
Dolman, B. 2012. Watershed 2.0 (re-thinking and retrofitting for resilience). TEDx Mission City 2.0.

US Center for Watershed Protection. 1998. Basic concepts in watershed planning. Chapter 1 *in* The Rapid Watershed Planning Handbook. Environmental Protection Agency.

July 27 ❁ Multifunctional landscapes & ecosystem services

Boody, G., B. Vondracek, D. Andow, M. Krinke, J. Westra, J. Zimmerman, and P. Welle. Multifunctional agriculture in the United States. BioScience 55: 27-38.

Martens, J.R.T., M.H. Entz, and M.D. Wonneck. 2015. Review: redesigning Canadian prairie cropping systems for profitability, sustainability, and resilience. Canadian Journal of Plant Science 95: 1049-1072.

Quinn, C.E., J.E. Quinn, and A.C. Halfacre. 2015. Digging deeper: a case study of farmer conceptualization of ecosystem services in the American South. Environmental Management 56: 802-813.

Aug. 2 ❁ Hydrology & soil erosion

Harter, T. 2003. Basic concepts of groundwater hydrology. UC ANR Publication 8083.

O'Geen, A.T., and L. Schwankl. 2006. Understanding soil erosion in irrigated agriculture. UC ANR Publication 8196.

Schiel, D.R., and C. Howard-Williams. 2016. Controlling inputs from the land to sea: limit-setting, cumulative impacts, and ki uta ki tai. Marine and Freshwater Research 67: 57-64.

Thrush, S.F., et al. 2004. Muddy waters: elevating sediment input to coastal and estuarine habitats. Frontiers in Ecology and the Environment 2: 299-306.

Aug. 4 ❁ Water quality: nutrients & pesticides in irrigated and organic agriculture

Hunt, J.W., et al. 2006. Spatial relationships between water quality and pesticide application rates in agricultural watersheds. Environmental Monitoring and Assessment 121: 245-262.

Muramoto, J., R.F. Smith, C. Shennan, K.M. Klonsky, J. Leap, M.S. Ruiz, and S.R. Gliessman. 2011. Nitrogen contribution of legume/cereal mixed cover crops and organic fertilizers to an organic broccoli crop. Hortscience 46: 1154-1162.

Zhang, Q., W.P. Ball, and D.L. Moyer. 2016. Decadal-scale export of nitrogen, phosphorus, and sediment from the Susquehanna River basin, USA: analysis and synthesis of temporal and spatial patterns. Science of the Total Environment 563: 1016-1029.

Aug. 9 ❁ Water quality: special cases – cannabis & wine grapes

Bauer, S., J. Olson, A. Cockrill, M. van Hattem, L. Miller, M. Tauzer, and G. Leppig. 2015. Impacts of surface water diversions for marijuana cultivation on aquatic habitat in four northwestern California watersheds. PloS One 10.

Merz, J.E., and P.B. Moyle. 2006. Salmon, wildlife, and wine: marine-derived nutrients in human-dominated ecosystems of central California. Ecological Applications 16: 999-1009.

Aug. 11 ❁ Water quality: special cases – animal agriculture

Haack, S.K., J.W. Duris, D.W. Kolpin, M.J. Focazio, M.T. Meyer, H.E. Johnson, R.J. Oster, and W.T. Foreman. 2016. Contamination with bacterial zoonotic pathogen genes in US streams influenced by varying types of animal agriculture. Science of the Total Environment 563: 340-350.

G. L. Wilson, B.J. Daizell, D.J. Mulla, T. Dogwiler, and P.M. Porter. 2014. Estimating water quality effects of conservation practices and grazing land use scenarios. Journal of Soil and Water Conservation 69: 330-342.

Aug. 16 ❁ Beyond agriculture: other human uses in the watershed

Castello, L., and M.N. Macedo. 2016. Large-scale degradation of Amazonian freshwater ecosystems. Global

Change Biology 22: 990-1007.

Winemiller, K.O., P.B. McIntyre, L. Castello, E. Fluet-Chouinard, T. Giarrizzo, S. Nam, I.G. Baird, W. Darwall, N.K. Lujan, et al., 2016. Balancing hydropower and biodiversity in the Amazon, Congo, and Mekong. Science 351: 128-129.

Aug. 18 ❁ Landscape biodiversity & ecosystem services

Bianchi, F.J.J.A., C.J.H. Booij, and T. Tscharntke. 2006. Sustainable pest regulation in agricultural landscapes: a review on landscape composition, biodiversity and natural pest control. Proceedings of the Royal Society B 273: 1715-1727.

Pisani Gareau, T., and C. Shennan. 2010. Can hedgerows attract beneficial insects and improve pest control? Center Research Brief #13. CASFS.

Aug. 23 ❁ Economics & acceptance of watershed-based practices

Chess, C., and G. Gibson. 2001. Watersheds are not equal: exploring the feasibility of watershed management. Journal of the American Water Resources Association 37: 775-782.

Stuart, D., R.L. Schewe, and M. McDermott. 2014. Reducing nitrogen fertilizer application as a climate change mitigation strategy: understanding farmer decision-making and potential barriers to change in the US. Land Use Policy 36: 210-218.

Aug. 25 ❁ Social issues: communities, culture & knowledge networks; final presentations

Babin, N., N.D. Mullendore, and L.S. Prokopy. 2016. Using social criteria to select watersheds for non-point source agricultural pollution abatement projects. Land Use Policty 55: 327-333.

Floress, K., L.S. Prokopy, and S.B. Allred. 2011. It's who you know: social capital, social networks, and watershed groups.

Course Expectations

Timeliness: Assignments are due at the beginning of class or section on the due date. Late assignments will receive a deduction of 25% per day (24 hrs or portion thereof). Please anticipate printer or other common problems and allow time for them.

Ethical conduct: Students are expected to adhere to the UCSC policy on academic integrity - http://www.ucsc.edu/academics/academic_integrity/ and associated links. All written assignments should be original works composed individually for this course. All academic integrity violations (e.g. plagiarism, cheating, multiple submissions, facilitating dishonesty) will be prosecuted. Be sure that you know what constitutes plagiarism - http://scwibles.ucsc.edu/Documents/Avoiding%20Plagiarism.pdf has a good explanation.

Engagement: This class is an opportunity to be deeply engaged with this concept of watersheds. I expect you to address everyone with whom we interact (including each other) with respect, including by being on time and using laptops for course work while in class. Late arrival (more than 5 min.) will result in reduced participation scores.