

EV 320, Block 6, 2016

Barnes

Watershed Biogeochemistry

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Office hours: We will be together a lot – if you need to meet with me outside of class time just set up a meeting via email or in class, I am happy to meet with you.

This course provides an introduction to the hydrologic cycle in the context of watersheds. We will discuss the major components of the hydrologic cycle as well as how water interacts with the ecosystem to effect biogeochemical cycling. These ideas will be explored by qualitatively through reading peer reviewed literature and quantitatively using data analysis, statistics, and GIS.

Objectives:

- For you to be able to critically evaluate information (also known as thinking!)
- For you to acquire fundamental knowledge about the water cycle, its key processes, and storage reservoirs
- For you to quantitatively understand and calculate hydrologic variables relevant to a water budget
- For you to understand how water interacts with the landscape and drives biogeochemical cycling and transport

Course Format:

Class will begin every morning at 9 AM unless otherwise noted. There will be formal lab sessions many afternoons – usually in the GIS Lab (Palmer 1). The GIS Lab is reserved for our class every afternoon of the block and I expect you to spend most afternoons working on your projects. Morning sessions will usually last until about noon and will rely on you doing the reading so that class discussions are not completely boring. We will also work through problems in class and in many instances it will be helpful for you to have a laptop with you.

Attendance:

We will be covering a lot of material in this course, with every day building on the previous day. Therefore I believe you should come to all classes – but I understand that sometimes things happen. If you have two unexcused absences, the Dean of Students will be notified. If you have three unexcused absences you are in serious jeopardy of failing the class.

If you need to miss class for any justifiable reason during the block (e.g., athletic team travel, religious observance), please notify me **today** so we can make arrangements on how you will receive the material so as to not fall behind.

Canvas: I will use Canvas extensively throughout the course. I will do my best to have everything posted multiple days in advance but always by 4 PM for the following day.

Problem Sets: You will complete five problem sets throughout the block. They are due at the start of class on the day specified on the schedule. Please note that neat assignments are expected – if you are someone who has handwriting that most can barely read, please type out answers. All problem sets are available electronically on canvas so you can do this (if necessary). Partial credit is given generously for calculation based problems resulting in the incorrect answer. However, to receive partial credit I must be able to read and follow your calculations (i.e. show your work and be neat!). All problem sets will be started in class – it is in your best interest to ask questions, if necessary!

Journal Reviews: You will complete five journal reviews throughout the block (in weeks 2 and 3). These reviews are to be no more than two pages, 1.5 spaced, 11 or 12 point font, 1 inch margins. The review will consist of a brief summary (1 maybe 2 paragraphs) and then a discussion of the strengths and weaknesses of the article (additional guidance provided on Canvas). In addition, you will prepare 2 discussion questions in response to the article. Both the review and the discussion questions should be posted on Canvas.

Projects:

These are short descriptions of the aims of the projects. Specific, detailed instructions will be given separately at the start of each project.

Week 1: Fountain Creek Project

The Sierra Club Water Sentinel Team is very interested in the water quality of Fountain and Monument Creeks. In particular they are worried about any chemical constituent that is out of compliance with water quality standards. Your task is to use water quality and stream flow data from the USGS NWIS database in conjunction with spatial data sets (analyzed using GIS) to help the Sierra Club determine their priorities (e.g. What constituents are of concern? What are the possible sources?)

Weeks 2-3.5: Individual Project

In the second week of the class you will start your own projects – the project topic is very much up to you but it must meet this one requirement: it must relate spatial data (GIS) to water quality (geochemistry) and/or quantity (flow) data to answer a question of interest. You will have to (1) find the spatial, water quality, and flow data (2) analyze it, and (3) contextualize it within the literature. There will be two end products: a scientific abstract, series of figures & annotated bibliography (20% of your total grade) and an oral presentation (20% of your overall grade).

Grading:

Problem Sets	15%
Journal Reviews	15%
Fountain Creek Project	10%
Oral Final	20%
Individual Project	40%

Grade Assignment ("+" and "-" will also be given when appropriate):

A = 90-100%

B = 80-89%

C = 70-79% S = 70-100%

D = 65-69% CR= 65-69% NC = below 65%

D+, D, CR, and NC does not fulfill EV Department major requirements.

Late assignment policy:

Late assignments will get a deduction of 1/3 of a letter grade for every day it is late (part of 1 day counts as a day). For example, if the paper is due Monday at 9AM and you turn it in at 3PM on Monday, that would count as being 1 day late and the grade would go from a B to B-.

Honor Code:

Failure to properly document sources in papers, plagiarism, copying from other student's work, or turning in assignments that have already been submitted for credit in other courses are among some of the actions considered intellectual theft under the Colorado College Honor System. I encourage you to work together and talk through issues, but your final written work must be your own. I will give you further information on how the honor code applies to specific assignments as we go. If you are uncertain about the Honor Code's application to a particular project, please ask me. If you have questions or to read further details of the Honor Code see:

<http://www.coloradocollege.edu/other/honorcouncil/constitution-bylaws/constitution.dot>

Disability Accommodations

If you have a disability and require accommodations for this course, please speak with me privately as soon as possible so that your needs may be appropriately met. If you have not already done so, you will need to register with Accessibility Resources (Learning Commons in Tutt Library, 227-8285), the office responsible for coordinating accommodations and services for students with disabilities.

Tentative Course Schedule (next page)

- Week 1: Hydrology
- Week 2: Watershed biogeochemistry
- Week 3: Agriculture
- Week 4: Celebration of Learning

Everything on the syllabus and schedule is subject to change.

Date	9:00 AM (Palmer 127)	1:30 PM (<i>optional session: italics</i>)	Reading (to be done before class) & Assignments	other awesomeness
<i>Hydrology</i>				
15-Feb	Hydrologic cycle & water budgets			
16-Feb	Weather, Precip, ET	Start Fountain Creek GIS Project (GIS Lab)	PS#1 due; Hornberger 1-15, 17-39 & Brooks 10-12, 30-38, 50-70, 81-109	
17-Feb	Soil Water, Infiltration	Querying the USGS NWIS database (GIS Lab)	PS#2 due; Hornberger 171-193 & Brooks 33-37, 43-46, 113-125	
18-Feb	Runoff, Hydrographs	<i>work on Fountain Creek Project (GIS Lab)</i>	Hornberger 199-211, 99 – 116 & Brooks 125-138, 141-155, 160-170	
19-Feb	Intro to Streams & Biogeochemistry	<i>work on Fountain Creek Project (GIS Lab)</i>	PS #3 due; Hornberger 223-234 + assigned article on Canvas	
<i>Watershed Biogeochemistry</i>				
22-Feb	Dr. Kamini Singha - Using Geophysics to Explore Hydrology (http://inside.mines.edu/~ksingha/)	<i>work on Fountain Creek Project (GIS Lab)</i>	Parsekian et al. 2005, JR #1 due; Hornberger 123-142 & Brooks 173-186	
23-Feb	Groundwater, Groundwater- Surface Water Interactions Watershed Characteristics & Biogeochemistry	Start Individual Projects (GIS Lab)	Fountain Creek project due; 2 of 3 articles assigned, background: Brooks 187-194	
24-Feb	Dr. Kyle Whittinghall - Using computer models to estimate transport and removal (https://kyleawhittinghill.wordpress.com/)	<i>Work on Individual Projects (GIS Lab)</i>	Stewart et al. 2013 ERL & , JR #2 due	
25-Feb	Hydrology, Redox & Nutrient Cycling	Work on Individual Projects (GIS Lab)	PS#4 due; assigned articles on Canvas (2)	
26-Feb	Dr. Tim Covino - Instream N processing (http://covinocsuwatershed.weebly.com/)	<i>Work on Individual Projects (GIS Lab)</i>	Covino et al. 2010; JR# 3 due	
<i>Hydrology and Biogeochemistry of Agricultural Systems</i>				
29-Feb	Dr. Kate Brauman - Water Scarcity & Agriculture (http://gli.environment.umn.edu/team/kate-brauman/)	Dr. Peter Gleick (classroom @ 1:30), start PS #5	JR #4 due; Brauman et al. 2016 Elementa*	State of the Rockies: Dr. Peter Gleick 7 PM
1-Mar	Nitrogen, Phosphorus & Agriculture	Work on Individual Projects (GIS Lab)	assigned articles on Canvas (2)	
2-Mar	Agriculture Nutrient Mitigation Strategies	<i>Work on Individual Projects (GIS Lab)</i>	PS #5 due, assigned articles on Canvas (1-2)	

3-Mar	Dr. Pamela Matson - Yaqui Valley Agriculture (https://earth.stanford.edu/pamela-matson)	<i>Work on Individual Projects (GIS Lab)</i>	Seeds of Sustainability, Ch 10	Robert's Lecture: Dr. Pam Matson 6 PM
4-Mar	Dr. Eve Lyn Hinckley – agriculture & ws bgc (http://www.colorado.edu/envs/people/eve-lyn-hinckley)	<i>Work on Individual Projects (GIS Lab)</i>	TBA, JR #5 due	
<i>Celebration of Learning week</i>				
7-Mar	Oral Final - <i>Work on Projects</i>	<i>Work on Individual Projects (GIS Lab)</i>		
8-Mar	Oral Final - <i>Work on Projects</i>	<i>Work on Individual Projects (GIS Lab)</i>		
9-Mar	Final Project Presentations		Final Project due by 5 PM	

The Brooks reading is from the 4th edition of *Hydrology and the Management of Watersheds* (2012, Blackwell). It is available for FREE online through our library (you need to be on the campus system the first time you try to access it).

<https://tiger.coloradocollege.edu/record=b2112410~S5> follow the directions from there (View Electronic Book, then enter user name and password – not the same as single sign in, so if you haven't used EBL then you need to create an account > Login > View Book)