

EV 311, Block 8, 2017
Barnes

**Water: Hydrology, Aquatic Chemistry & Ecology
aka Stream Ecology**

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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 examines the interactions between the physiochemical and biotic components of lotic ecosystems. Streams and rivers provide an excellent setting to think about ecological concepts around disturbance and connectivity. We will examine how the geology of a region controls stream habitat quality and in turn the stream community (algae, macroinvertebrates, fish), in addition to nutrient cycling. These ideas will be explored through field study, data analysis, and peer reviewed literature.

Objectives:

- For you to acquire a fundamental understanding of physical, chemical, and biological processes of streams and rivers.
- For you to understand commonly used stream ecology field and laboratory methods
- For you to acquire the skills to conduct and analyze scientific methods and data relevant to stream and river ecology
- For you to be able to critically evaluate and synthesize information from multiple sources

Course Format:

Class will begin every morning at 9:00 AM unless otherwise noted (we will leave earlier on some field trip days) and we will be in the field in the afternoon many days. 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. There will be a lab/field session most afternoons starting at 1:30 PM so please be prepared to be outside for all types of weather. It is Colorado and I have experienced everything from hail to floods in this class; rain and snow are not reasons to stay inside (lightning is). This is water after all!

Given all our time in the field, please fill out the form on SUMMIT. https://apps.ideal-logic.com/ccfieldstudy?key=29L66-D685_K9KH-5PTF_cc140f3a Given that we are leaving on the 1st TUESDAY, please do this tonight!

Attendance:

We will be covering a lot of material in this course, with every day building on the previous day. Therefore, you should come to all classes. If you need to miss a class I expect you to email me BEFORE class (i.e. by 8:45 AM) to alert me to your absence. If you have two unexcused absences, the Dean of Students will be notified. If you have three unexcused absences, you will likely fail 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.

Readings:

All readings listed should be done BEFORE class. In addition to the assigned reading I have indicated additional readings (italicized) that serve as useful background material and/or present similar information in a slightly different way. The Allan chapters are very thorough (but a bit dense), please plan accordingly.

Projects & Labs:

Labs and problem sets are due at the start of class on the day specified on the schedule, unless otherwise noted. 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!).

Stream Reach Project: For approximately 1.5 weeks you will work with a group of students to apply the various methodologies you learn throughout the block to your stream reach (along Mesa Creek): survey the system, measure discharge, nutrients, organic matter, primary productivity, macroinvertebrate community, ecosystem metabolism AND synthesize this information to characterize the multiple components and interactions of the ecosystem to address an ecological question of interest. Darren, Kyra and I will be available to groups throughout the block for assistance in the field.

Grading:

Labs & Short Assignments	30%
Stream Reach Project	30%
Midterm: Lab Practicum & Paper	20%
Oral Final	20%

Grade Assignment

("+" and "-" will be given when appropriate, e.g. 89.6 > B+ >87.0, 83.4 > B- >79.6):

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 (3%) for every day it is late (part of 1 day counts as a day). For example, if the problem set is due Monday at 9 AM and you turn it in at 3 PM the same day, that would count as being 1 day late and the grade would go from a B to B-. **Papers and exams will NOT be accepted late.**

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.

Everything on the syllabus and schedule is subject to change.

Week 1: Hydrology & Geomorphology

Day 1: Hydrology Introduction

- Water Balance
- Hydrology basics
- Reading: Physical Hydrology pg 7-15, 99-107, 199-208
- *Background Hydrology Reading: misc Physical Hydrology xxx-xxx*

LAB @ 1:30 PM

- Waders, field notebooks
- Monument Creek Observations

Day 2: Mt Princeton Field Trip – meet at 9 AM east side of Tutt Science

- **PS #1 due 9 AM**
- Sites: Headwaters of Arkansas River, South Platte, Chalk Creek
- Measuring discharge, Channel Morphology, Pebbles & Power
- Reading: Allan Chapter 3

Day 3: Mt Princeton Field Trip: Chalk Creek Project

- Survey Chalk Creek
- Chalk Creek Pebble Count, Discharge measurements
- Transport
- *Background Reading: Pebble Count Overview, Rosgen 1994*

Day 4: Mt Princeton Field Trip - back by 3 PM

- **PS #2 due by 9 AM**
- Survey calculations

Day 5: More Hydro-Geomorph Connections

- Skim Rosgen 1994
- geomorphology & hydrology calculations for Chalk Creek

Week 2: Stream Biota, Transport, & Nutrient Cycling

Day 6: Beaver Creek Field Trip – meet at 8:00 AM east side of Tutt Science

- Macroinvertebrate collection
- Water sampling
- Reading: Allan Chapter 8, *Wallace & Webster 1996*
- **Chalk Creek Lab due 7:30 AM on Canvas** (excel and short answer)

LAB: Titrations *times are approximate given the morning field trip*

- Lab Group A: 1:30 – 3:00 PM
- Lab Group B: 3:00- 4:30 PM

Day 7: Abiotic Forces & Stream Biota (Honors Convocation @ 10:30 AM)

- Reading: Allan Chapter 5

LAB: Macroinvertebrate Identification

- Lab Group A: 1-3 PM
- Lab Group B: 3-5 PM

Day 8: Transport & Nutrient Cycling

- Reading: Allan Chapter 11, Allan 1987, *Allan Chapter 9*

LAB 1:30 PM, meet in the classroom

- Mesa Creek Site Visit
- Tracer Test Prep
- BOD Titrations

Day 9: Tracer Test! Meet at 9 AM east side of Tutt Science

- We will be at Mesa Creek all morning. I expect us to be done by 12:30 but given that it is an experiment there are a lot of moving pieces. I strongly suggest bringing a snack.
- Reading: Covino et al. 2010, *Stream Solute Workshop 1990, Chapter 8 Webster & Valett*
- **Macroinvertebrate Lab due 9 AM on Canvas**
- Midterm Essay Posted on Canvas at 3 PM, due Monday 5/8/17 by 9 AM

Day 10: Midterm: Lab Practicum

- Meet in the teaching lab at your designated time. I expect the test to take you no more than 2 hours. You will start the test in groups of 4. Sign up here:
<https://docs.google.com/document/d/1oLPGQVojps8vvR9kLW2s6WwWThiHzmOLIJNooPh1tyc/edit?usp=sharing>

Week 3: Stream Biota & Metabolism

Day 11: Fish Assessment

- Electrofishing in Fountain/Monument Creek with DNR, time TBA
- **Midterm Essay due 9 AM on Canvas**

Day 12: Biotic Assemblages & their Interactions + Nutrient Spiraling Calculations

- Reading: Read all abstracts and complete assigned article (Bunn & Arthington 2002, Power 1992, Kohler & McPeck 1989), *Allan Chapter 9*
- Review Covino et al. 2010 & *Stream Solute Workshop 1990, Chapter 8 Webster & Valett* papers

LAB @ 1:30

- Mesa Creek: Reach characterization

Day 13: Organic Matter Budgets

- Reading: Webster & Meyer 1997, *Allan Chapter 12*
- **Nitrogen Spiraling Lab due 9 AM on Canvas**

LAB @ 1:30

- Mesa Creek: OM assessment & Macroinvertebrate collection

Day 14: Stream Metabolism

- Reading: Chapter 28 Bott (2 part pdf)

LAB @ 1:30

- Macroinvertebrate ID

Day 15: Project work day

- **LAST DAY TO COLLECT SAMPLES**
- **Stream Metabolism Lab due 9 AM on Canvas**
- **Final Exam Questions due by 5 PM on Canvas**

Week 4: Celebration of Learning

Day 16: Oral Final

- 20 minutes, 4 questions, 5 min each.
- You will be grouped by Reach Team so that the remainder of the day can focus on data analysis, reading, etc. for your Reach Project. *Order will be determined randomly.*

Day 17: Project work day/ Presentations

- **Draft of Final Abstract due 8 AM**
- **Peer review due by 5 PM**
- Finish Reach Project!
- Class dinner & **Final Presentations** at Becca's (2323 West Kiowa St) @ 5:30 PM

Day 18: No class

- **Final Project due 10 AM on Canvas**