

# Ecogeomorphology of the Tuolumne River Course Syllabus

**Spring 2018; GEL 136 – 5 units  
(1105 F Watershed Building)**

Nicholas Pinter - Professor/Instructor of Record  
Andrew Rypel – Professor/Instructor  
Sarah Yarnell, Carson Jeffres - Contributing Instructors  
George Snyder, TA  
Miranda Bell, TA

Lecture on Mondays and Wednesdays (11:00-11:50a); Lab on Fridays (12:10p-2:00p).  
Plus 3 required field trips; Student enrollment limited to 16.

## **Required Text:**

*Stream Ecology: Structure and function of running waters.* Allan, J.D. and Castillo, M.M. 2007. Springer.  
<http://link.springer.com/book/10.1007%2F978-1-4020-5583-6>

## **Additional Reading:**

*Confluence: A Natural and Human History of the Tuolumne River Watershed*  
Mount JF, Purdy SE, Epke G, Finger M, Lusardi RA, Marks N, Nichols AL, Null S, O'Rear T, Purdy SE,  
Senter A, and Viers JH. 2010.  
<http://watershed.ucdavis.edu/tuolumne/resources/ConfluenceTuolumneV1.pdf>

## **Course Goals**

The field of watershed science, and specifically the study of rivers and streams, is inherently multidisciplinary, involving a broad array of physical, biological and social sciences. Traditional hierarchical undergraduate education programs that train students in fields that support watershed science necessarily emphasize in-depth study within a specific discipline. This focused education is vital to producing professionals with useful technical and analytical skills. However, most students who pursue careers related to watershed science and management rarely work solely within their discipline. Rather, their work is inevitably integrated with other professionals addressing related issues with different skill sets. The ability to work closely and collaboratively with professionals from different backgrounds is fundamental to success in the field of watershed science and management.

This course seeks to introduce advanced undergraduate students to multidisciplinary collaborative watershed and stream analysis through combined laboratory and field study of a selected stream system. Topics relating to management of stream systems will be discussed throughout with emphasis on the management of Sierra Nevada rivers in California. Students from diverse backgrounds will work in interdisciplinary research teams to collect and analyze field data from the Tuolumne River system. These teams will present results of the field studies in the form written reports due at the end of the class. Data collection will focus on key ecological issues relevant to management within the watershed such as: what are the impacts of regulated flow regimes on aquatic biota, what are the impacts from

the recent Rim fire, and what long-term monitoring data are needed to address on-going conservation strategies in the face of climate change?

### **Class Requirements**

The course is worth 5 units. Lecture/Lab will meet weekly during spring quarter from 11:00-11:50 am on Mondays and Wednesdays and 12:10-2:00 pm on Fridays. The classroom meetings will involve lectures on topics related to watershed science, Sierra Nevada rivers, and the Tuolumne River watershed. The labs will involve hands-on skills required to conduct data collection in the field. Class participants are required to participate in a half-day field study in Putah Creek (May 25), a one-day field study in the American River watershed (May 19) and a nine-day field study in the Tuolumne River watershed (June 18-26). Grading will be deferred until one week following completion of fieldwork.

Grades in the course depend upon quality of work and effort and participation in class and the field studies. It is important to note two key expectations for students in this class. First, this course emphasizes collaborative study. This means that efforts to foster effective collaboration will play an important role in determining the final grade. Second, because this course is limited to advanced undergraduates, there is an expectation that each student will be knowledgeable within their specific discipline, and will provide that expertise to their collaborative team and the entire class effort. This means that class participants must assume the role of both student and teacher, learning from and educating their peers.

There are several expected deliverables for this class:

#### Lab write-ups

For weeks 3-9, you will submit a copy of your lab work from the previous week's lab exercise (schedule below). The work should be submitted via email to the TAs in a format appropriate to the exercise. Lab work is to be sent by the Monday following the lab. Lab write-ups will be worth 3 points each, with one lab worth 2 points. There is no credit given for late labs.

#### Pop quizzes

Three short pop quizzes will be given during the quarter on the assigned reading material. Each quiz will be worth 5 points.

#### Student Research Papers

Each student will produce a written scientific research paper discussing some aspect of the Tuolumne River watershed (suggested topics to be provided in class). The written paper will have a 1500 word traditional research paper format with a minimum of 10 appropriately documented scientific references. Additional details on formatting will be provided in class. The research paper is due the last week of class (5p Friday June 8) BEFORE we leave for the Tuolumne field trip, and is worth 50 points.

### Flogs

Two field logs will be due after the Tuolumne field trip. Example flogs from past classes can be found on previous class webpages, but generally they include any form of written or visual expression of thoughts, impressions or observations while in the field. Each flog is worth 5 points.

### Group research papers

While in class and in the field, students will be divided into three interdisciplinary teams of four students each. Each team will work to collect and record field data, and to enter and process the data back in the office following the field trip. This data will then be shared among all class participants for use in their final group papers. Each final paper will be in a traditional 1500 word scientific paper format, and focus on a single question of interest that incorporates collected field data (topics to be provided in class). Data collected in previous years will be available for use if desired. It is up to each student team to determine how best to divide the work of collating the data and producing the written report; however, it is fully expected that each student will be involved in all aspects of the project and that no one team member will do the bulk of the work. Papers are due by midnight Friday June 29 and are worth 50 points.

### Class Debate

The class debate will occur during the last Friday lab of the quarter and is worth 20 points.

### Final grade:

Lab work – 20 pts

Pop quizzes – 15 pts

Class participation – 15 pts

Student research paper – 50 pts

Field trip participation – 20 pts

Flogs – 10 pts

Class Debate – 20 pts

Final group paper – 50 pts

*Total – 200 points*

After project submissions and completion of the course, data, papers, and accompanying materials will be posted on the class website to be used in subsequent classes and in related outreach materials. It will be the responsibility of the students to see that the papers, and all supporting data, will be suitable for posting on the class website. The Center for Watershed Sciences retains all rights to any material collected or created as part of this class.

### **Student Costs**

There is no fee charged to student accounts for this class. It is expected however that students will provide their own personal field equipment (backpack, appropriate field clothing, field notebook, sleeping bag, sleeping pad, etc.). Personal camping items can be rented from Outdoor Adventures. All field costs, including shuttle, guides, equipment, and food, will be organized by Outdoor Adventures

and supported by the generosity of the Center for Watershed Sciences and the Stephen D. Bechtel Jr. Foundation.

### Field trips

There will be three field trips (details to be provided in class):

- 1) SF American River watershed (Saturday May 19)
- 2) Putah Creek (Friday May 25)
- 3) Tuolumne River watershed (Monday June 18 – Tuesday June 26)

Because of the costs associated with these field trips, which are underwritten by the Center for Watershed Sciences, you are required to attend and participate.

### Class Schedule

Week	Date	Monday Lecture (Lecturer)	Wednesday Lecture (Lecturer)	Friday Lab
1	April 2-6	Overview (All); paper topic disc	California water geography (Yarnell)	Field methods intro; teams
2	April 9-13	Tuolumne River overview (Moyle, Jeffres)	Watershed processes (Yarnell)	Basin and stream reach assessment
3	April 16-20	Watershed processes (Lyell glacier virtual hike/discussion)	Channel processes & habitat (Yarnell)	Channel assessment Surveying methods
4	April 23-27	Channel processes & habitat (Tuol Meadows virtual hike/discussion)	Water Quality (Willis)	Hydrologic analyses
5	Apr 30-May 4	Aquatic ecology/Primary productivity (Jeffres)	Benthic macro-invertebrates (Jeffres)	BMI methods/ID
6	May 7-11	California fishes (Moyle)	Aquatic ecology/foodwebs (Jeffres)	Fish methods/ID
7	May 14-18	California amphibians (Yarnell)	Regulated river impacts (Yarnell)	Herpt methods/ID
8	May 21-25	Meadow ecology (Wolfe)	Floodplain Ecology (Jeffres)	Putah Creek field trip (12p – 5p)
9	May 28-Jun 1	<i>Memorial Day</i>	Fire ecology (Steel)	Class Debate
10	June 4-8	Climate change and Drought (Yarnell)	Watershed management & policy discussion	<i>Dead Day</i>

## Descriptions of Weekly Activities (Readings are to be completed *by the start of the week* listed)

### >>> Week 1

*Lecture M:* Introduction to the course goals and requirements, discussion of paper topics

*Lecture W:* California water geography

*Lab:* Introduction to labs, discussion of student projects, schedules

*Readings:* Field Safety handout in lab; *Stream Ecology* chapter 1

### >>> Week 2

*Lecture M:* Tuolumne River overview

*Lecture W:* Watershed Processes

*Lab:* Introduction to basin and channel assessment methods, drainage network analysis

*Readings:* CA virtual water tour videos; *Stream Ecology* chapter 2, pp 75-87; *Confluence* chapters 1-3;

USFS Field methods chapters 1-4

**{research paper topic due Friday}**

### >>> Week 3

*Lecture M:* Watershed processes discussion

*Lecture W:* Channel processes and instream habitat

*Lab:* Survey techniques – cross-sections, long profiles, study site mapping

*Readings:* Lyell Glacier virtual hike & lecture; *Stream Ecology* chapter 3, pp 88-93; *Confluence* chapter 4; USFS Field methods chapters 5-8

### >>> Week 4

*Lecture M:* Channel processes and instream habitat discussion

*Lecture W:* Water Quality

*Lab:* Hydrologic analysis methods, discharge, water quality, sediment analysis

*Readings:* Tuolumne Meadows virtual hike & lecture; *Stream Ecology* chapter 4, pp 94-104; USFS Field methods chapters 9-11

**{research paper detailed outline due Friday}**

### >>> Week 5

*Lecture M:* Introduction to Aquatic Ecology; Primary productivity

*Lecture W:* Benthic macroinvertebrates

*Lab:* Aquatic macroinvertebrate sampling methods and species identification

*Readings:* *Stream Ecology* chapters 6-7; *Confluence* chapters 5-6

### >>> Week 6

*Lecture M:* Fishes of California

*Lecture W:* Aquatic ecology/foodwebs

*Lab:* Fish sampling methods and species identification

*Readings:* *Stream Ecology* chapters 8-10; *Confluence* chapter 7

**{research paper draft due Friday}**

>>> Week 7

*Lecture M:* California amphibians

*Lecture W:* Impacts of regulated rivers on physical and ecological processes

*Lab:* Herpetology sampling methods and species identification

*Readings:* Stream Ecology chapter 13; Confluence chapters 8-12; Yarnell et al. 2010

>>> Week 8

*Lecture M:* Plant and Meadow Ecology

*Lecture W:* Floodplain Ecology

*Lab:* Putah Creek field trip

*Readings:* Stream Ecology chapter 14

**{research paper final draft due Friday}**

>>> Week 9

*Lecture M:* Climate change impacts and Drought

*Lecture W:* Fire Ecology and the Tuolumne Rim fire

*Lab:* Class Debate

**{materials for class debate due Friday}**

*Readings:* Null et al. 2010; Viers & Rheinheimer 2011

>>> Week 10

*Lecture W:* Water management & policy discussion

**{final research paper due Friday}**

*Readings:* Confluence chapter 13; Yarnell et al. 2015; Null & Lund 2007

June 8: Final research paper due

June 18-26: Tuolumne River Field Trip

Final group papers are due Friday June 29 after we return. Grades assigned one week following.