BASIC COURSE INFORMATION

Credit Hours: 0.25 semester credits
Day and Time: 8 full weekend days (Saturday or Sunday, 8am-4pm), see schedule below
Location: Meet in NSB 106 to go out into the field

INSTRUCTOR INFORMATION
Instructor: Dr. Kristina Faul
Office: NSB 119
Office Phone: 510-430-2202
Email: kfaul@mills.edu
Office hours: N/A, on maternity leave Fall 2013

Co-instructor: Dr. Laura Rademacher, University of the Pacific
Phone: 209-946-7351
Email: lrademacher@pacific.edu

COURSE WEBSITE
After you enroll, you will be given access to the course website on Blackboard.

COURSE PREREQUISITES
None

REQUIREMENTS FULLFILLED BY THIS COURSE
None, but most graduate schools (including medical schools) require some sort of research experience. This experience may be applied toward the 1 credit of directed research requirement for the B.S. This experience may lead to a summer research project and/or to presentations of your work at regional and national meetings (see below for examples of Student Research Poster Presentations).

COURSE DESCRIPTION, LEARNING GOALS, and LEARNING ASSESSMENT

ENVS 179 (Directed Research) is a course in which you will participate in REAL field research for an ongoing funded research project led by Dr. Faul (Mills) and Dr. Rademacher (UoP). The project is described in the section below.

The learning goals of this course are:

- To collect field data to aid in testing the hypothesis: "Small upstream reservoirs trap organic carbon, nutrients, and heavy metals in the San Francisco Bay area" by collecting and interpreting appropriate data and measurements
- To learn to accurately, safely, and properly use and troubleshoot field equipment for analyses and sampling
- To develop time management, organization, and interpersonal skills

The achievement of these goals will be assessed by the following measurable criteria:

- Your ability to properly perform analyses in the field and to take samples with field equipment.
- A complete and organized set of field data. You will be required to record this information for the project in a field notebook (to remain in the research lab when not in use) and on data sheets (see provided example).
- A complete and organized set of field samples. Samples brought home from the field will properly be stored in the refrigerator (NSB 101) for future analysis.

THE RESEARCH PROJECT

Title: "The Role of Small Upstream Reservoirs in Trapping Organic Carbon, Nutrients, and Metals in the San Francisco Bay Area"

Research Project Objectives: The objective of the research project is to test several hypotheses including: (1) that small, urban reservoirs may serve as sinks for carbon, nutrients, and metals, (2) that perennial reservoirs are more efficient sinks for carbon, nutrients, and metals than ephemeral reservoirs, (3) that microbes play an important role in biogeochemical cycling in small, urban reservoirs, and (4) that sediment records from small, urban reservoirs provide a window into the recent past and record microbial and biogeochemical cycling responses to environmental changes. By testing these hypotheses, an improved understanding of how urban-impacted reservoirs cycle widespread pollutants will be developed, which can provide a scientific foundation for developing long-term management plans of these systems, which are often managed locally.

Research Project Description: Whereas the nature and sources of urban water quality impairments are well studied, questions remain about how watershed modifications resulting from urbanization impact biogeochemical cycling in smaller, localized systems. With more than 50% of the world's population living in cities, there is a growing imperative to understand the role of urban watershed/reservoir systems role in biogeochemical cycling of carbon, nutrients, and metals, and how this role may change in response to factors such as climate change. Modifications to watershed/reservoir systems may result in downstream sediment starvation, upstream sediment deposition, changes in stream flow rates and stream paths due to culverting, and changes in vegetation and land use associated with housing developments and freeways. The San Francisco Bay (SFB) area is one example of an increasingly urbanizing region with a long history of pollution pressures. Many studies investigate the regional-scale SFB system, however, few investigations of the role of small urban watershed/reservoir systems, such as those in Oakland California, play in contributing to or mitigating inputs to this regional system exist.

The geochemistry of reservoir inlet, outlet, and lake waters will be used to unravel modern cycling in urban-impacted systems. We will study three local reservoirs: Lake Aliso, on the Mills College campus in Oakland, CA; Lake Anza in Tilden Park in Berkeley, CA; and Don Castro Reservoir in Hayward, CA. Reservoir sediment cores will be used to reconstruct the history of biogeochemical cycling, specifically of organic carbon, nutrients, and metals in two systems in response to continued urbanization.

RECENT RESEARCH STUDENT POSTER PRESENTATIONS

Stitt, C. R., K. L. Faul, and L. K. Rademacher, METAL CYCLING THROUGH AN EPHEMERAL ACID MINE DRAINAGE IMPACTED URBAN RESERVOIR IN OAKLAND, CA, Geological Society of America (GSA) Annual Meeting 2012, Paper #209999.

Wu, C., K. L. Faul, and L. K. Rademacher, MICROBIAL ASSEMBLAGES IN A SMALL, URBAN RESERVOIR IMPACTED BY ACID MINE DRAINAGE, OAKLAND, CA, Geological Society of America (GSA) Annual Meeting 2012, Paper # 211542.

REQUIRED MATERIALS

1.) Rite in the rain field notebook and field pen (provided by the instructor)

2.) Field equipment and instructions (provided by the instructor)

3.) Personal field gear (provided by you)
- -appropriate shoes: hiking boots or other waterproof boots
- -outdoor clothing appropriate to the weather (e.g., rain gear, layered clothing possibly including t-shirts, shorts, jackets, pants, hats, gloves, 2 layers of socks, etc.)
- -water and/or sport drinks
- -lunch/snacks
- -sunscreen
- -personal backpack

COURSE REQUIREMENTS, GRADING STANDARDS, AND POLICIES

ATTENDANCE & TARDINESS
This course is completely attendance based. If you can't come to the course meetings, there is no point in enrolling in the class! You must attend your sampling profiling dates. Attendance will be recorded by the team leader. Excused absences for religious holidays, medical reasons, *occasional* athletic events, or jury duty must be arranged with me in advance.

Sampling dates will be one full weekend day (Saturday or Sunday, ~8am to 4pm) every other weekend beginning August 31st and continuing until Dec 14th (see detailed schedule below).

There will be three sampling teams: Lake Aliso (on the Mills campus), Lake Anza (in the Berkeley Hills), and Don Castro (in Hayward). You may request a specific lake, a specific day (Saturday or Sunday), or a specific rotation. I will take your preferences into account when assigning you a team along with scheduling and transportation needs. A team leader will be assigned for each team based on experience and leadership skills. If the team leader informs me that you are consistently late for sampling and are therefore unable to participate in calibration activities, your grade may be jeopardized.

PARTICIPATION

Participation means:

- Being patient while being trained and accepting direction from others
- Actively participating in sampling and profiling
- Participating in transportation organization
- Dressing properly for field days
- Participating in rescheduling should the need arise (e.g., rain dates)
- Carefully filling out all fields on data sheets for each site on each sampling day (the team leader will place them in the research binder in the lab)
- Recording data and information in field notebook (provided) and returning it and your field pen to Dr. Faul at the end of the semester
- Returning samples and CLEAN, DRY equipment to the Chemistry Research Lab
- Keeping the Chemistry Research Lab clean and organized

GRADING

This course is pass/fail. Everyone's attendance is critical for success. Attendance and active participation will result in a passing grade. As little as one unexcused absence will result in a failing grade. Consistent non-participation (hanging around while others are working) may also result in a failing grade.

COLLEGE POLICY ON INCOMPLETES

A student qualifies for incomplete grade only if she has completed 2/3 of the total coursework and is responding to unforeseen circumstances (e.g., you are hospitalized). In this class, students must complete 5 sampling dates to qualify for consideration of an incomplete.

STANDARD OPERATING SAFETY PROCEDURE FOR FIELD WORK

1. **Field trip policy statement:** All students taking part in Directed Research field work must read, date, and sign the Student Release Form and turn it in to Dr. Faul.
2. **Health forms:** Dr. Faul must have a completed health form for all field participants regardless of the duration of the field work. Health forms will be kept in the field sampling clipboard. Each field trip participant has the option of submitting a health form in a sealed envelope with his/her name on the envelope, but, if a participant chooses to use an envelope, the instructor may ask the participant whether he/she has any potentially life-threatening health conditions that the instructor should know about. Health forms will be shredded when the student is no longer participating in Directed Research.
3. **First aid kit:** A first aid kit must be taken on all field work, regardless of the duration of the trip. The team leader must take the responsibility of learning at least basic first aid skills.
4. **Report of accident, injury, or illness:** In the event of an accident/injury/illness during field work, immediately notify Dr. Faul at 831.320.6390.
5. **Preventing foot injuries:** Team leaders must insist that students wear sneakers or boots while working in the field, rather than sandals or flip flops.
6. **Student field teams:** Students must work in groups of at least three so that one can go for help while another stays if someone is injured.

7. **Second-in-command:** A team leader should always have a designated second-in-command in the event of accident or injury to the leader. The field trip leader should not be the only person who knows the itinerary, emergency contact information, and location of cell phone(s) and first aid supplies.
8. **Vehicle use:** The driver and all passengers wear seat belts. The number of passengers in the vehicle must not exceed the number of seatbelts available.
9. **Avoiding missing persons:** Each time the team leader loads up the vehicle for departure, she should do a head count in each vehicle to make sure that all students are present. At the end of a field trip, the leader should double-check to make sure that everyone has, in fact, returned safely to campus.
10. **Clean-up:** Following a field trip, all equipment must be cleaned and put away. Any broken or missing items must be reported to Dr. Faul. Coolers must be dry before being put away.

COURSE SCHEDULE

All field days are 8am to 4pm, unless the team decides together otherwise.

	Team Don Castro	**Team Anza**	**Team Aliso**
Dates	Every other **Sat** beginning on 8/31 and ending on 12/7	Every other **Sun** beginning on 8/31 and ending on 12/7	Every other **Sat** beginning on 9/7 and ending on 12/14
Team Leader			
Participant 1			
Participant 2			
Participant 3			

*Driver

RAIN DATES AND RESCHEDULING

If we have a rain date, the sampling MUST be rescheduled in a timely manner. It is critical for this research to have bimonthly sampling/depth profiling. The team needs to decide on a make-up date together, but can't go on the same date as the other sampling teams since there is only one set of equipment.

RESPONSIBLITIES OF THE TEAM LEADER

1. For Anza and Don Castro: Call the Park Supervisor 24+ hours before you enter the park:
   Lake Anza: Tilden Park Supervisor Sergio Huerta (510)-544-2711
   Don Castro Reservoir: Don Castro Park Supervisor Joseph Murdach (510) 544-3072
2. Be sure the correct permit and sampling forms are in the clipboard before leaving for the field
3. Report to Dr. Faul any interactions with rangers in the field
4. Take attendance at each field day
5. Call participants if they are more than 15 minutes late

6. Arrange transportation to/from field sites
7. Train new students in protocols, in conjunction with Dr. Faul
8. Coordinate rescheduling of canceled field days
9. Oversee safety & first aid issues in the field
10. Make sure that all data fields are recorded on data sheet for each site/day
11. Place data sheets in the appropriate research binder in the lab
12. Enter data from paper data sheets into Excel file data sheets (just like the paper sheets)
13. Email Excel file data sheets to Dr. Faul (kfaul@mills.edu) and Dr. Rademacher (lrademacher@pacific.edu)
14. Confirm samples are in refrigerator after sampling
15. Confirm field equipment is clean and operational after returning from the field
16. Alert Dr. Faul when batteries or supplies are running low