

**COURSE INFORMATION**

Statistics 5931

Environmental Statistics

Fall Semester 2009

**Time/place:** 9:05-9:55 MWF, ClaOff B26, StPaul Campus

**Instructor:** Gary W. Oehlert

48 McNeal (StP), 624-7702
313B Ford (Mpls), 625-1557
102 Johnston (Mpls), 624-3801
gary@umn.edu

Use email, don’t leave voice mail.

**Office Hours:** 10:00-11:00 MWF, 48 McNeal, and by appointment

**Text:** Manly, Bryan F. J. *Statistics for Environmental Science and Management*, 2nd edition

**Class Web Page:** [http://www.stat.umn.edu/~gary/classes/envstat](http://www.stat.umn.edu/~gary/classes/envstat)

**Coverage**

Environmental statistics is simply statistics applied to environmental data. In particular, environmental statistics has come to mean a collection of methods that attack problems that arise over and over again in environmental data. Some of these common problems are change or trend detection, spatial and/or temporal covariation, sampling problems, data below detection limits, among others.

We cannot possibly cover everything in great depth. (Most courses taught by the Statistics department here at Minnesota are narrowly focussed and very deep; this one is a mile wide and an inch deep.) I was planning to talk about sampling, censored data, and change/trend detection in spatial or temporal contexts, but I would like to try to cover things that are of interest to you. So I need to hear from you where your interests lie and what topics you would like to see covered.

**Grading**

There will be no homework or exams. Grades will be based on three project reports and one oral presentation. A project consists of you finding data appropriate for one of the topics that we will cover, analyzing the data, and writing a report on your analysis. The report should describe the origin of the data and the question of interest, describe the methods used to analyze the data, and give the results. I anticipate that the reports will be 10ish pages in length.

If you are of a more methodological orientation, you may use a project to study the methods, rather than use the methods to study data. Come see me if you are interested in this rather than data analysis.

Oral presentations give you the opportunity to present one of your three projects orally to the class. Presentations should be about 20 minutes in length, and you may choose any of your projects to present.

Projects are due October 12, November 2, and November 30; oral presentations will take place during the December class periods.

Please note, the project reports are writing assignments, and your grade will be influenced by the quality of your writing as well as the quality of your analysis.

**Offices and hours**

I will be in St. Paul on MWF mornings as shown above, but you will find me most of the time in 102 Johnston Hall where I do my Associate Dean thing for CLA. I also have an office in 313B Ford Hall in the Statistics department, but I’m not there very much.

If you want to leave a voice mail, leave it at the 4-3801 number; I won’t hear voice mail at the other numbers.

**Disabilities**

Students with disabilities that affect their ability to participate fully in class or to meet all course requirements should bring this to my attention and work through Disabilities Services so that appropriate accommodations can be arranged.

**Computing**
You’ll need to use some kind of statistical software to do your projects in this course. This presents a problem, as we are from diverse backgrounds with different software traditions. For the projects, feel free to use whatever software you like.

That said, I don’t know all the different analysis packages and can’t demonstrate in class with many of them. The two obvious alternatives are SAS or R. The advantages of SAS are that it is a widely used commercial package; its disadvantages are that it is relatively expensive (with an annual license fee) and I break out in hives when I use it. R is free/open source, has a growing user community, has a number of available add ons that do some of our tasks, and is typically the system of choice for research statisticians.

So, use whatever package you like, but I’ll mostly be demonstrating with R.

Handouts
Copies of any handouts or overheads will be available on the class web page.

Outline

1. Computational Prelude
   - R
   - Monte Carlo simulation
   - MCMC
   - Bootstrap

2. Some Principles
   - Likelihood
   - Bayesian statistics
   - Meta analysis

3. Detection Limits
   - Substitution
   - Parametric ML
   - Order statistics
   - Survival methods

4. Change and trend
   - Goals and definitions
   - Seasonal Kendall
   - Graphics and smoothing
   - Regression
   - Time series

5. Spatial data
   - Point processes/uniformity
   - Geostatistics/Kriging

6. Sampling
   - Lots of methods