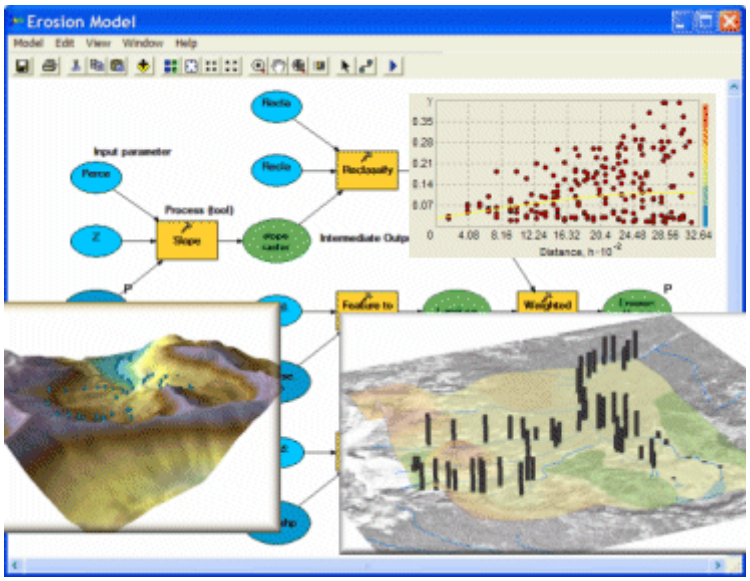
Geog 621/Biol 533: GIS for Environmental Analysis	Spring 2009 1:10-2:50 pm

Davis, office HSS 273 338-2983, or GIS lab 338-6140/6332.

Office Hours W 11-12, MW 3-4:30 pm



Description: GIS methods applied to environmental analysis. Many applications in environmental studies, geosciences, conservation biology, physical geography. Topics and methods to be covered: (1) raster and surface display methods; (2) raster spatial analysis focusing on categorical data and continuous / statistical surfaces; (3) spatial statistics and the generation of statistical surfaces from point sampled and contour data; and (4) modeling and programming methods. Good complement to Geog 620, which focuses on building map datasets, and using discrete data and vector mode analysis; combining raster and vector modes provides a complete toolkit. The major topics are described below:

- **Raster and Surface Display Methods; Scientific Data Visualization and Analysis**.We'll explore how to display raster and vector data in 2D and perspective ("3D") views of surfaces, both elevation and derived environmental surfaces, and methods of viewing and draping earth imagery. We'll also explore creation of graphs, sections and profiles from continuous environmental and surface data.
- **Raster Spatial Analysis**. Geoprocessing tools provides a straightforward way to analyze research questions, and allows us to work with maps as unique variables, useful for spatial data management and modeling. A wide range of geoprocessing tools will be explored.
- **Analysis of Sample Data using Spatial Statistics and Geostatistics**. One of the most important tasks for GIS in environmental analysis is deriving maps from field samples. We will start by exploring the characteristics of sample data (e.g. air quality measures) with spatial statistics tools, then learn conventional and geostatistical methods of data interpolation used to derive maps from data in point samples. We'll also explore a related method -- creating a surface model from elevation contours.
- **Modeling and Programming with Geoprocessing Tools**. We'll explore how to use all of these tools together in a complex procedure, using both graphical flow-charting and scripted methods.

Course Structure: Lecture/Laboratory, based upon units: classroom, two units; laboratory, two units. Sequence of exercises and one final project. Real-world applications of the tools are emphasized throughout.

Readings:

- ArcGIS Online Desktop help sections
- assigned readings, in map library: various research articles applying GIS to environmental analysis problems.

Grading Policy: Out of 100 pts: Exams 2 x 20 pts ea; Regular exercises total 30 pts; Final project 30 pts.

Lab Exercises: See the web site for documents and blank answer sheets. Turn in both a hardcopy (black & white is ok) and submit the pdf in iLearn. This allows color maps to be reviewed online.

Late Exercise Policy: exercises -1 pt (out of 10) during 1st late week, -2 during 2nd, etc.; final project: -1 pt/day. Note: Exercises are due at the *start* of the lab date on the subsequent week. Exercises turned in after the start of the class are considered late, and will be penalized. No exceptions. Lab support is only provided on the topic of the lab week. In other words, don't get behind.

Exam Dates: Mar. 9, April 20

Web page: http://bss.sfsu.edu/jdavis/geog621

Schedule: Spring 2009: Lecture M 1:10-2:50; Lab W (1:10-2:50)

Mon.	**Wed.**	**Lecture Outline**	**Exercises** (assigned Mondays, due *beginning* of class following Monday unless indicated)
1/26	1/28	Intro to the course, Environmental Analysis and Raster Spatial Analysis Methods	Introduction to the labs, datasets, etc.
2/2	2/4	1. Understanding & Displaying Raster Data: continuous fields, surfaces, analysis assumptions	Ras.1. *Introduction to Spatial Analyst and Raster Display Methods*
2/9	2/11	2. Intro to Raster Spatial Analysis	Ras.2. *Introduction to Raster Data & Analysis*
2/16	2/18	3. Raster Spatial Analysis Operations	Ras.3. *Raster Spatial Analysis Operations*

2/23	2/25	4. Local, Focal & Zonal Statistics	Ras.4. *Local, focal & zonal statistics*
3/2	3/4	5. Distance & Density Analysis	Ras.5. *Distance & Density*
3/9 **exam**	3/11	exam	StatSurf.1. *Perspective Views using ArcScene*
3/16	3/18	6. Surface Analysis: display, derivatives. Scientific Data Visualization/Analysis perspective views, draping, viewsheds	StatSurf.2. *Interpreting Surfaces with Graphs and Viewshed Analysis*
3/23	3/25	Spring break	
3/30	4/1	(continued)	StatSurf.3. *Spatial Statistics*
4/6	4/8	7. Analysis of Sample Data: Spatial Statistics; Surface creation from sample and contour data, including basic concepts of Geostatistical Analysis continued)	StatSurf.4. *Creating Surfaces from Data* *Optional: Geostatistical Analysis (ESRI Online Module: Basics of Geostatistical Analyst)*
4/13	4/15	8. Modeling & Programming	*Using Model Builder & Python for Modeling*
4/20	4/22	**Exam 2**	Project Preparation & Data Acquisition
4/27 5/4 5/11	4/29 5/6 5/13	Final project & other topics/demos	**Final project** (proposal due 4/15, project due 5/13, at end)
Friday:	**5/22**	**Display/Presentation of Final Projects**	