GEO 5159 GIS Applications in Environmental Systems

Seminar 1, 28 September 2006
Introduction to Course; Class Logistics; First Assignment

\[ V = \frac{1}{N} \cdot \sqrt{S} \cdot R^{2/3} \]

\[ f = (K*I) \left[ 1 + \frac{(\phi - \theta_i)S_f}{F} \right] \]
What is this class about?

• MODELING!!!
• All GIS is modeling of geographic systems.
• Models come in many, many flavors.
• This class covers some of them.
• The entire class is about MODELING environmental systems.
Definition of “Model”

- Simplified, idealized representation of a part of the real world.
- Learning Tool.
- Experimental Tool.
- Constantly tested by comparison with the real world.
- Useful insofar as they explain or simulate the real world.
Models come in many, many flavors.

- **Representation models** – images, dioramas, wind-tunnel models, flow channels, sand tables, maps, globes.
- **Conceptual models** - no numerical values or formulas
- **Theoretical models** - with numerical values or formula
- **Empirical models** - based on observations, but the mechanism may be unknown.
  - Statistical, e.g. Regression Models
  - Rule-based Models
  - Models based on many measurements (e.g. USLE, RUSLE)
- **Physical-mathematical models** - based on physical laws, first principles
- **Stochastic models** - bases on the concept of randomness and probability: Random numbers simulate variation.
Some of the ways that GIS is used for Modeling

- Representation Modeling
- Exploratory Data Analysis
- Environmental Modeling
  - Environmental Risk Assessment
  - Atmospheric Modeling
  - Soil Erosion Modeling
  - Hydrological
    - Topographic Modeling
    - Watershed Analysis
    - Dynamic Modeling
  - Land-water interactions
  - Habitat Modeling
- Human-Environment Modeling
  - Land Suitability Modeling
  - Land-use/land-cover change
    - Economic models (Walker)
    - Agent-based models
  - Archaeological Modeling
  - Decision-Support Systems
    - Land allocation
    - Agroforestry (Ellis)
- Business/Economic Modeling – Thrall
- Emergency Management
1. Who should take this class - People who:

- Are already skilled GIS users, have strong computing skills (including experience with programming), and strong statistical background.
- Know how to frame research questions, do the literature work, plan the research tasks, and carry them out.
- Are willing to write and present material for public audiences.
- Work independently with minimal guidance.
2. Who should take this class - People who:

- Are willing to spend inordinate amounts of time downloading, adapting, and even creating massive amounts of data to solve your research problem.
- Are willing to spend inordinate amounts of time learning difficult, user-unfriendly, and poorly documented, research-grade computer- and GIS- models that probably won’t solve your problem without major adaptation that you have to do yourself.
People who should NOT take this class

- Undergraduates (?)
- First-time GIS class
- Want to learn more “GIS Skills”
- Are trying to finish and defend a thesis or dissertation this semester
- Plan to be gone very often during the semester
- Are taking another demanding class.
The Problem

• GIS are useful for any problem on the Earth’s surface that has spatial heterogeneity – everything!
• Enormous breadth and depth to all applications.
• Enormous variety of approaches to problems.
• How can a professor teach, and a student learn the vast amount of stuff that is out there?

The Solution

• Students determine what to teach and to learn.
Assignment: Due 28 January

Three-Week Review Paper: Write a general review paper for your field that describes GIS uses, past, present, and future (maximum 10 pages of text); then review in detail one topic of GIS use in your field (maximum 10 pages of text).

The paper will be submitted by copying it to the January Term Papers folder on Okeechobee:Users:GEO 5159 GIS in Environment. Submission will be due at 4:30 P.M. on Friday, 28 January.
2-3 Weeks after 28 January
31 Jan; 7 Feb; 14 Feb

• Each student leads discussion of his or her paper in 30-minute blocks.
  – All students read all papers.
  – Each presenting student will designate two cited papers as “essential,” scan them, and place them in the class folder.
  – All students will read the “essential” papers.
  – All students will participate in discussion.
Student Discussion Schedule

• 31 Jan (3)
• 7 Feb (3)
• 14 Feb (3)
• 21 Feb (3)
Then, Remainder of Semester

- PROJECT!
- Discussion: teams of 1, 3, 5, or entire class?
- Define the question or problem.
- Define Objectives
- Tasks
- Individual Assignments