FE 257. GIS and Forest Engineering Applications

Introduction

Instructor Information

- Associate Professor in FERM Department
  - Instructor for FE 257, FE 480, FE 432/532
- PhD from Forest Resources with minor in Geography at OSU
  - Professional Land Surveyor
  - Professional Engineer
- GIS/Spatial tools experience at OSU, public agencies, private sector (USFS, ODFW, USFWS, DOE, USU, CH2M HILL)
- My experience with course learning at OSU

This Week's Topics

- Course mechanics
  - Lecture and lab materials
- Grading
- Class Format
- Assignments
- What is a GIS?
- Brief GIS history
- GIS Lab 1: Calculating Stream Lengths and Watershed Areas.

Course Mechanics

- Time:
  - Lecture MW 12:00-12:50 LINC 210
    - Five labs
- Office: Crop Science 347
  - Office hours: Monday 1:00-3:00
- Make it to class and be on time

Course Materials

- The text
  - Available at the OSU bookstore
- Lectures and labs
  - **Lecture notes and labs available at the course WWW site:**
    http://fe257.forestry.oregonstate.edu
  - Print these out prior to the start of lecture and lab and bring them with you
    - I will provide these to you only today
  - Buy a three-ring binder (minimum 1.5 inch spine) to store course materials

Grading

- Weekly Exercises (50%, 100 pts, 8)
  - GIS labs
  - Lecture questions
  - Lab and lecture questions in your materials
- Final Project (25%, 50 pts)
  - Report with maps
  - Encourage you to find and develop a project
  - I'll help you find one if needed
- Exams (25%, 50 pts, 3)
  - Mid-term and final
  - One lab-based

Class Format

- GIS principles
  - Occasional demonstrations
- Guided and self-guided GIS exercises in labs
- Some labs will have brief time at the end for you to work on the weekly lab assignment

Course learning objectives

- An understanding of GIS fundamentals and theory and an ability to apply these concepts in problem solving.
- The ability to create thematic maps.
- Familiarity with advanced GIS operations and the ability to use these techniques.
- The ability to import data of different structures and to use these data to solve problems.
- The ability to import data of different cartographic projections and to use these data to solve problems.
- The ability to communicate with others in writing and orally regarding GIS applications.
- The ability to design and complete a spatial analysis.

What will I learn?

- An overview of GIS
- How GIS data are captured, stored, retrieved, analyzed & displayed
- Where to go for more information
- GIS software and its functionality
- How to use ArcGIS for GIS applications
- Questions?

Geographic Information Systems

Applications in Natural Resource Management

Chapter 1

Geographic Information Systems

Chapter 1 Objectives

- Why GIS use is prevalent in natural resource management
- Evolution of the development of GIS technology and key figures
- Common spatial data collection techniques and input devices that are available
- Common GIS output processes that are typical in natural resource management
- The broad types of GIS software that are available.

What is a GIS?

- Multitude of definitions and applications are possible
- Geographic Information System(s)
  - GIS provides tools for solving specific problems related to spatial data
- GIS can also be an acronym for GIScience
  - the identification and study of issues that are related to GIS use, affect its implementation, and that arise from its application (Goodchild, 1992)

GIS Definitions

- There are various definitions of a GIS that have evolved from different uses and disciplines.
- A GIS minimally consists of a database, location information, and a digital link between them.
  - Or, a digital connection that tells us where something is and what it is
- Most GIS definitions identify the nature of geographic or spatial data in making distinctions from other software programs.

Non-spatial and spatial data

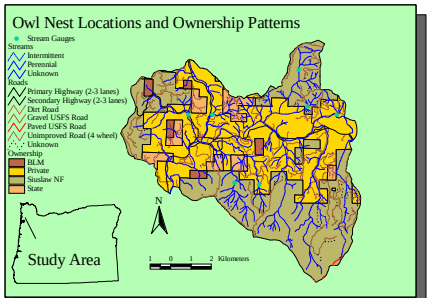
River	Length
Nehalem	258761
N. Santiam	128433
Rogue	194639

Gauge	Latitude	Longitude
1	424210	1244292
2	456889	1238951
3	446867	1230064
4	440157	1241338

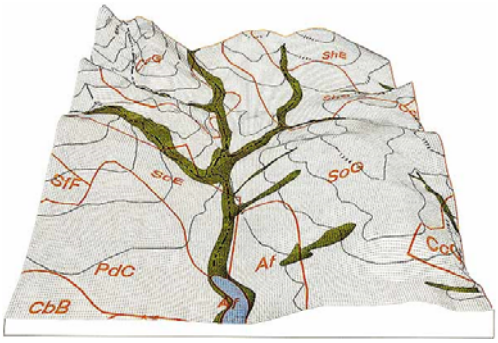
GIS Applications

- The digital mapping capabilities of GIS allows us to examine landscapes in ways that would be impossible or nearly impossible with other tools
- GIS capabilities that benefit natural resource applications include:
  - Resource mapping
  - Measurements of landscapes or structures
  - Overlays or integration of multiple information layers
  - Modeling resources

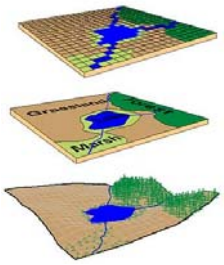
Resource Mapping



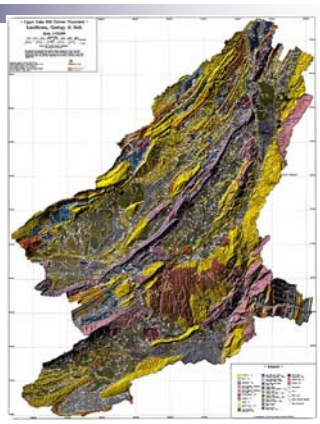
Landscape / Structure Measurements



Overlays or Integration of Themes



Modeling resources



Brief GIS history

- Written records of property boundary locations date to 1400 BC
- The term “geographic information system” dates to the 1960s
- Many associate overlay analysis with modern day GIS

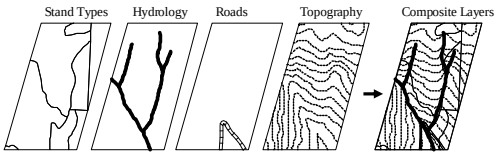


Figure 1.1. GIS theme overlay.

Overlay analysis history

- The integration of multiple sources of information
- Demonstrated manually in 1854 by Dr. John Snow in his isolation of cholera sources in London
- Demonstrated again:
  - 1954, Jacqueline Tyrwhitt, Town & Country Planning Text Book
  - 1969, Ian McHarg, Design with Nature
- Wouldn't it be great to do this digitally?
  - The origin of modern day GIS…

GIS history

- 1960s saw the development of spatial databases of land cover
  - USGS, US NRCS
- Mapping programs began to appear
  - IMGRID, CAM, SYMAP
- CIA produces World Data Bank
  - Coastlines, major rivers, political borders through out the world
- US Census Bureau produces method for linking census information to locations for the 1970 census
  - Based on respondent addresses

GIS history

- Roger Tomlinson drives the creation of the Canada Geographic Information System (CGIS) in 1964
  - First national GIS system
- Land Use and Natural Resource Inventory System
  - LUNR, New York 1967
- Minnesota Land Management System
  - MLMIS, Minnesota 1969

GIS history

- The genesis of ArcGIS: Odyssey
  - Produced by Harvard University in 1977
  - Graduate student Jack Dangermond worked on Odyssey
- ArcInfo introduced in 1981
  - First major commercial GIS venture
- MapInfo corporation appears in 1986
- The personal computer concept progresses during the 1980s and becomes standard during the 1990s

Why GIS and natural resources?

- The origins of modern day GIS are with initial databases that described natural resource conditions
  - CGIS LUNR MLMIS
- Managing natural resources is a complicated business and GIS is particularly well suited as a mapping and analytical tool to support management decision-making
  - Spatial considerations are paramount for natural resource monitoring and management
- Software and hardware developments have brought GIS to the desktop of many natural resource personnel
  - Many employees now need to be at least conversant about GIS and related technology
- Technological developments (GPS, LiDAR, Satellite imagery) make spatial data availability much more affordably and readily than in the past
- Educational opportunities for GIS and related tools training is now widely available

Before class next week…

- Buy book
  - Read Chapters 1, 2, and 4 prior to next week
- Download
  - Lecture 2 notes
  - Lab 2 notes