EDUCATION EVENT REPORT AND RECOMMENDATIONS

Attendee's Name and Report Writer:
Joseph Kerski, Geographer:
Education/GIS, USGS, Denver, Colorado.

Event:

Conduct Hands-On Training for USGS Western Geographic Science Center staff in Principles and Applications of Geographic Information Systems.

Location: Menlo Park, California.

Summary

I taught a one-week course in geographic information systems at the Western Geographic Sciences Center from 28 October through 1 November 2002. The class featured theory and hands-on use of ArcGIS 8.2, and focused on:

1) How to apply GIS tools and methods to Earth-based problems in geography, earth science, biology, history, and hydrology.

2) Practical hands-on work with ArcGIS 8.2.

3) An introduction to the research base, resources, organizations, subject matter, and literature of Geographic Information Systems and Sciences.

4) Downloading, formatting, and using USGS spatial data, including NHD, NED, DOQ, DEM, NLCD, DRG, and DLG data in ArcGIS.
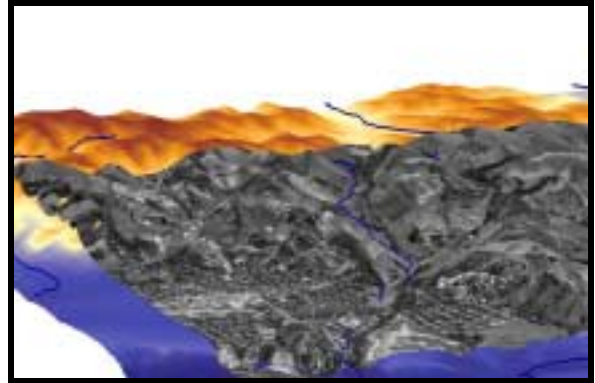
Participants in the course analyzed the best location for a fire tower, using USGS DLG, DEM, and DOQ data, and created a three-dimensional perspective of the study sites during the activity.

*Most of the participants in the GIS course are shown here during a break in our GPS collection activity. I would like to thank Liz Colvard, Alan Mikuni, and Len Gaydos for inviting me and paying my way to Reston to conduct this training. I would like to say that the Western Geographic Science Center made me feel very welcome; even loaning me their van!   I also met with several of the educational outreach staff and others outside of the course participants during the week. **I request that I be given a full standalone license for ArcGIS on my laptop computer to improve future courses (see more detail in recommendations section).***
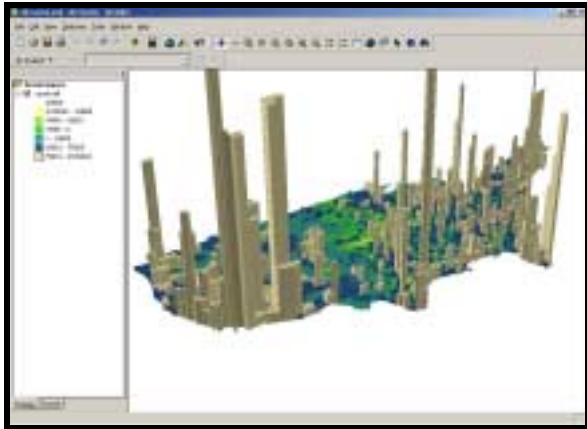
Participants in the course analyzed USA demographics and population change for the past 100 years, and created a 3-dimensional map as part of this activity.
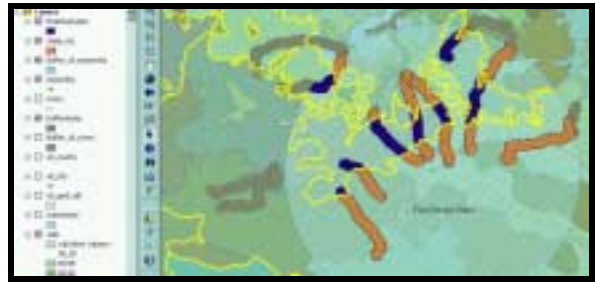
Final results of our Stipa Comata *(needle grass) site selection analysis, which involved several overlay, query, and buffering operations.*

Joseph Kerski from the Rocky Mountain Mapping Center was the facilitator for the GIS course. In a course such as this, success is in large part based on whether the software and hardware works. Therefore, I greatly appreciated the technical assistance of Dario Garcia, Liz Colvard, Ray Pearce, and Lori Winterman-Sturm in preparing such an excellent computer lab. If others were involved in the planning for this course, know that I am most appreciative. I also thank the participants of the class for sharing their knowledge with me. It was a true privilege to work with these people.

I was impressed at the kinds of questions that the participants asked throughout the week. We all learned from each other and therefore the educational environment was excellent.

GPS coordinates and attributes from our field activity on USGS DOQ. We also digitized buildings on the USGS campus.

The class was broken up into sections of discussion, hands-on joint activities, and independent "challenge" exercises.

The GIS course emphasized hands-on training in ArcGIS 8.2 running on a Windows 2000 platform.

GPS coordinate collection brings in a host of considerations important to GIS work, particularly those of coordinate systems and datum shifts. We later brought the coordinates into ArcGIS, overlaying them on top of a USGS DOQ and a DRG.

Analyzing data for the local area after downloading it from the terraserver web site in preparation for our GPS collection.

Liz Colvard, the major organizer of this training event and Western Geographic Science Center Outreach Coordinator, collects GPS coordinates.

Participants in the class were largely from research, ESIC, data integration, data production.

I was impressed that several supervisors attended the full course, including ESIC Chief Diane Garcia, foreground. I was also impressed at the number of ESIC staff doing media outreach and GIS research.

One of the results of our demographic analysis of San Mateo County using TIGER data. We also used this data set to practice address geocoding.

Location of Training: USGS McKelvey Research Building, Menlo Park, California.

GIS Workshop at USGS WGSC

Facilitator:

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What are Geographic Information Systems and Geographic Information Sciences? Why are they integral to the mission of the USGS, and how do the USGS and our customers use GIS? Learn all about these questions and pick up a wealth of practical skills with GIS through this engaging hands-on workshop!

8am – 4pm   27 Oct – 1 Nov 2002

Skills Addressed:

Spatial and Tabular Query and Analysis
Geocoding
Joining and manipulating tables
Spatial Data Types, Locations, and
         Producers
Vector and Raster Data Structures and
         Analysis
Collecting GPS coordinates
Moving GPS coordinates and attributes to
         GIS
Hyperlinking Features to Photographs
Registering Imagery
Digitizing points, lines, and polygons
Definition of GIS
Evolution and definition of ArcGIS
Why GIS? Applications
GIS vs GIScience
Related Sciences
Data types
Data quality
Data sources
Core Functions in GIS:
         Displaying and symbolizing data
         Geocoding
         Digitizing new features
         Tabular querying
         Spatial querying
         Creating attributes
         Raster analysis
         3D analysis
         Buffering
         Network
         Overlay: clip, union, intersect
                  Projecting Data
How to Download Data
Sources of GIS information

Syllabus

Day 1

AM

Introductions

Goals of the Course:

1) To understand the principles, applications, trends, and pertinent issues of geographic information systems and sciences.

2) To become competent in solving problems using spatial analysis methods through geographic information systems software (ArcGIS 8.2)

3) To understand how to download, format, and use USGS base spatial data within ArcGIS.

Joseph's Course Philosophy

Computer setup: folders, read-only/archive, view file types

Hands-On: World Demographic Analysis

Displaying and symbolizing data, querying data, joining tables

Discussion: What is GIS?

Discussion: What is ArcGIS and Extensions?

Discussion: ArcMap, ArcCatalog, ArcToolbox

ArcView 3 saving projects vs ArcGIS 8 saving map documents

--------------Lunchtime----------------

PM

Hands-On: World Earthquake Analysis Symbolizing data, tabular and map query, buffering, select by location

Changing Projection

Discussion: Data Types

Evaluations

Day 2

AM:

Review of Day 1

Hands-On: Historical County Analysis Chart symbols Creating and mapping new tabular data Layouts and printing Exporting for Graphic Production

Discussion: How is GIS used?

Hands-on: Downloading and formatting Current Earthquake Data for ArcGIS

Discussion: Types of Base Data

Hands-On: Downloading and Analyzing Vector Data from National Atlas

--------------Lunchtime----------------

PM:

Hands-On: Downloading and Analyzing Vector Data from National Atlas, part 2

Hands-On: Downloading and Analyzing Raster Data from Terraserver

Wrap-Up

Evaluations

Day 3

Hands-On: Stipa Comata Study Site Analysis

Discussion: GIS vs GISciences

Hands-On: Digitizing new features

Discussion: GPS

Hands-On: Collecting GPS Coordinates

Hands-On: Bringing GPS coordinates and attributes into ArcGIS

----------------Lunchtime--------------

Hands-On: Hyperlinking photographs to GPS coordinates and maps

Hands-On: Downloading, formatting, and analyzing DLG data

Hands-On: Downloading and analyzing DEM data

Wrap-Up

Evaluations

Day 4

Hands-On: Finish digitizing office location

Hands-On: Stipa comata site selection

Discussion: Data Quality

Hands-On: Digitizing polygons on Images

Hands-On: Downloading and analyzing NHD Data

-------------Lunchtime-----------------

Hands-On: Downloading Census and TIGER data; analysis

Hands-On: Downloading NLCD, NED, SRTM data; analysis

Hands-On: 3D Analysis with DEM Data

Wrap-Up

Evaluation

Day 5

AM

Hands-On: Projections

Hands-On: Land Use Analysis

Hands-On: Geocoding

Hands-On: Tinker Time

Discussion: Past and Future Issues

Wrap-Up

Evaluation

-----End----

*I handed out questionnaires at the end of
each day that aided me in preparing the
class for the following day.*

Challenge Questions

I handed out the following questions. The
participants worked through these on their
own, and we then summed them up as a
group before moving on.

World Demography Challenge

You work for the UN Environmental
Programme (UNEP). You need to test a
new program in a country that meets certain
criteria of age, growth rate, and income, as
follows:

1) Percentage of population between 0 and
14 years is greater than or equal to 40

2) GNP per capita is less than or equal to
500

3) Growth Rate is less than 3%

How many countries meet these criteria?

What are their names?

Earthquake Challenge

You work for FEMA and need to determine
how many earthquakes in the USA were
within 100 km of a plate boundary in 2001:

Historical County Challenge

You work for HUD and need to determine
the following in planning a social program:
how many counties lost population during
the 1990s?

For the county that lost the most people
during the 1990s: How many people left?

What percentage of people left?

For the county that gained the most people
during the 1990s: How many people were
added?

What percentage of people were added?

Principal Aquifer Challenge

You are a water resource specialist
planning for population growth and water
needs in the state. How many aquifers are
partly or wholly in the state of California?

Which aquifer in California has the largest
spatial extent?

How many different rock names are associated with California aquifers?

Stipa Comata Site Selection Challenge

Problem: As a biologist, you need to select study sites for Stipa comata, needle grass. The grass has the following characteristics:

1. Stipa comata grows best along riparian areas; that is, along streams. You would like to study these grasses within 1 kilometer of streams.

2. You want to study Stipa comata that grows along streams that are on a certain slope, of at least .01.

3. The Stipa comata that you want to study has an organic matter, weighted average (omwa) of between 0 and .40.

4. The study site should be within 30 kilometers of your office in Mission, South Dakota, to reduce costs of transporting your field equipment.

How many study sites can you select from?

NLCD and NED Challenge

You need to locate a new fire tower on forested uplands of sufficiently high (over 650 m) elevation in the San Mateo County area.

Use the data on `http://landcover.usgs.gov/classes.html` to create a field with land cover classes for the San Mateo County area that you downloaded yesterday from the seamless USGS data server.

How many cells meet the criteria?

How much land area meets the criteria?

** end of Challenge Questions **

The training facilities for the class were one of the best I have ever experienced, thanks to the hard work by the WGSC staff. We were set up with a U-shaped classroom with laptop computers running ArcGIS and connected to the Internet.

Materials

I handed out and displayed the following materials to the training:

How to Use USGS Data in ArcGIS (Kerski)
ArcGIS Books (ESRI)
What is GIS? (ESRI)
Understanding GPS
Samples of GIS Journals
GIS in Education (Kerski)
UTM Coordinate System
Sample GIS Texts
GIS Touches Our Everyday Lives (ESRI)
ArcView - Based Lessons (Kerski)
Map Projections
Canada LIS-GIS movie
Yellowstone GIS movie
Geography Matters GIS movie
USGS GeoData
Terraserver Guidelines (Kerski)

Recommendations

I again request that I be given a hardware key and a standalone license for ArcGIS. It is needlessly difficult to facilitate a course such as this without the full use of the software I am teaching on the computer I use most frequently. This would allow me to improve each course that I teach and everyone taking such a course would benefit.

I recommend that these types of training events be used increasingly in the future to prepare our workforce for new opportunities and challenges. As the comments I received during the daily surveys reflected, having one of our own people conduct the training supplements other training (for example, from ESRI) in a cost-effective way by emphasizing how to use USGS digital data in GIS analysis. To maximize the effectiveness of the interdisciplinary sciences of the USGS, our employees must understand the nature of spatial analysis, even if they are not using GIS daily on the job.

While we increasingly emphasize partnerships for The National Map, GIS training should be included as a component for our C&R staffs. I would like to be considered as one of the trainers for this effort.

In addition, we cannot expect our data users to understand how to use our spatial data in various ways if we cannot do the same procedures ourselves. Our own employees need to understand how our data is accessed and used.

We also are using data from other agencies and organizations, and we need to be familiar with some of the most common of these data sets as well, for example, Census TIGER data, and NWI wetlands data. Using other agency data will increase in the future and needs to be included in these GIS workshops.

Thank you for inviting me to facilitate this GIS course. --Joseph Kerski

end of report