

## EDUCATION EVENT REPORT AND RECOMMENDATIONS

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

### Event:

Conduct Hands-On Training for USGS Staff in *Introduction to ArcGIS Using Federal Data Sets*, with Jennifer Sieverling, EGIS

Location: USGS National Training Center, Denver, Colorado

Date: 29 Aug – 2 Sep 2005

### **Summary**

I taught a one-week course in Geographic Information Systems (GIS) at the USGS National Training Center. The class was entitled "Introduction to ArcGIS Using Federal Data Sets." The class featured theory and hands-on use of ArcGIS 9.0, focusing on:

- 1) How to apply GIS tools and methods to Earth-based problems in current research in geology, hydrology, biology, history, and geography.
- 2) Practical hands-on work with GPS and with ArcGIS 9.1, including ArcMap, ArcCatalog, and ArcToolbox, with Spatial and 3D Analyst extensions.
- 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 Landsat imagery, NHD, NED, DOQ, DEM, NLCD,

DRG, TIGER, NWI wetlands, NRCS SSURGO, and DLG data in ArcGIS. The sites included National Atlas, The National Map, the seamless data server, Geospatial One Stop, GIS Data Depot, ESRI TIGER, NRCS Portal, the Global Land Cover Facility, and others.

- 5) Discussion on where to continue one's GIS education—online courses through ESRI and universities, books, journals, universities, community colleges, USGS training, the USGS Enterprise Geographic Information Office, ESRI instructor led courses, and via other means.



*GIS course participants during our GPS collection activity. I thank the participants for their expertise and enthusiasm. I was impressed by the way they worked together and helped each other.*

*We had an excellent group that represented water resources, the geographic information office, minerals, and spatial data collection.*

*I look forward to working with the participants in the future with technical questions and in upcoming courses.*

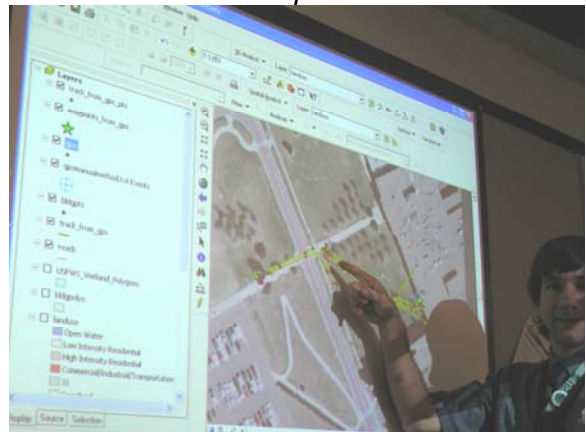


*Training site, USGS National Training Center, Denver, Colorado.*

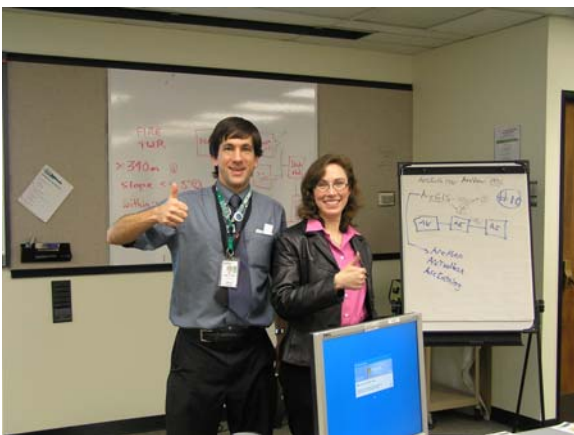


*Class participants working through GIS core functions and spatial data sets.*

*In a course such as this, success is in large part based on whether the software and hardware works. Therefore, I greatly appreciated the organizational and technical assistance by the National Training Center staff (Russel Smith, Gloria Armstrong, Ralph Roland), Bill Oatfield, and others. They helped with getting the COM port to recognize the GPS units. I also thank Jennifer Sieverling for her technical assistance and EGIS support for this course. If others were involved in the smooth operation for this course, know that I am most appreciative.*



*Joseph Kerski pointing at the map of the Denver Federal Center that we created. 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, DRG, and vector layers. We also used the Teraserver tool from ArcScripts online, which automatically brings in DOQs and DRGs from Teraserver into ArcMap.*

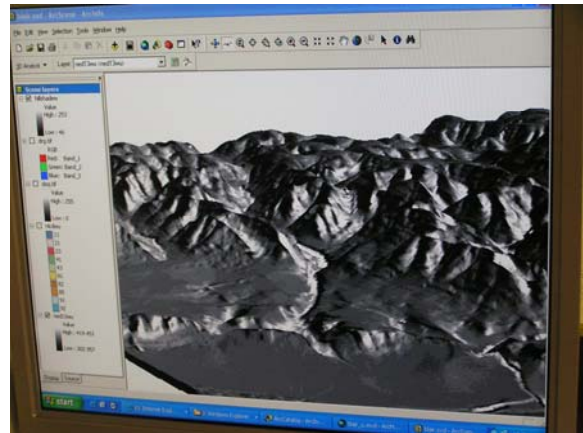


*Joseph Kerski and Jennifer Sieverling pose for the cameras.*

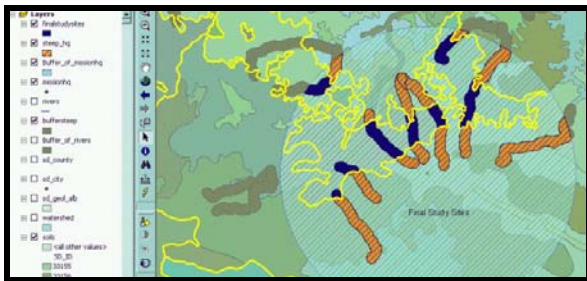


Collecting GPS coordinates and recording field data. We used the free Minnesota DNR Garmin program to bring the points to our ArcGIS map document.

*under consideration for the fire tower.*



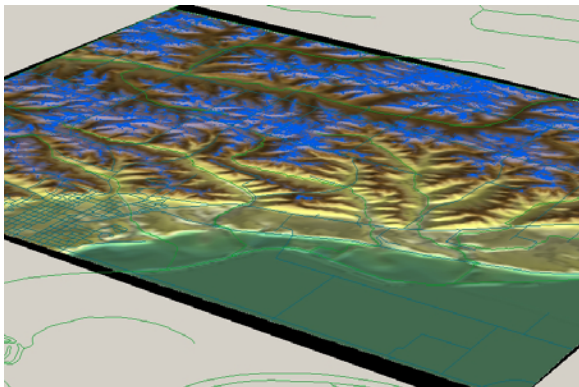
3D representation of our fire tower study sites.



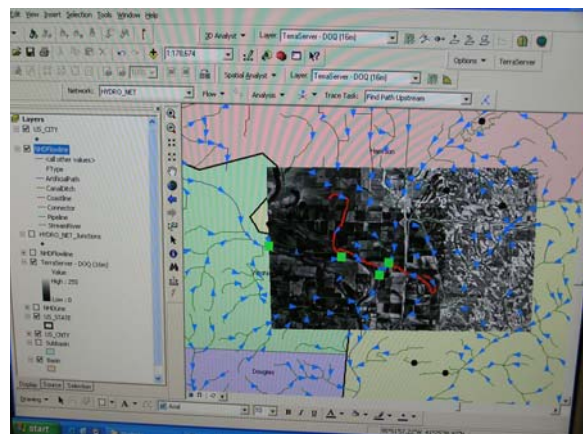
Final results of our Stipa Comata (needle grass) site selection, which involved several overlay, query, and buffering operations.



Some results of our analysis of neighborhood demographics using data from the TIGER files and the 2000 Census.



Participants in the course determined the best location for a fire tower, using USGS DLG, DEM, and DOQ data, and created a three-dimensional perspective of the possible sites. The blue represents areas



Some results from our analysis of the

*middle Missouri River basin using NHD data together with satellite imagery, aerial photographs, and online USGS gaging station information.*

The class spent most of its time immersed in ArcMap, ArcCatalog, and ArcToolbox (above) components of ArcGIS, as well as WinZIP and Internet Explorer software.

I handed out questionnaires at the end of each day that aided me in preparing the class for the following day. We had the typical oddities with ArcGIS, Microsoft, and the Internet, but fewer glitches than in most labs I have taught in, thanks to the hard work of the NTC staff.

Each day included short discussion topics on data models, map projections, ESRI software components, and other topics between the hands-on work.

### **Challenge Questions**

Sample questions that I handed out to the participants to work through these on their own. 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?

### **Fire Tower Challenge**

Determine the best location for a fire tower in the Loess Hills of Blair, Nebraska, that has to be at least 380 meters high, less than 5 degrees of slope, within 50 meters of a road, and within 300 meters of a stream.

### **Registration Challenge**

How can you register the Minnesota image with the state outlines shape file? How can you do this with a historical map from [historical.maptech.com](http://historical.maptech.com) for the Columbus, Ohio, area?

### **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?

### **Materials**

I created a CD-ROM for each of the participants that included guidelines, data, lessons, and articles related to GIS. This included all of the exercises and data sets that we worked on during class so the participants could use this CD to further explore the data sets and review each class activity. Participants were also given a blank CD that they could write their own projects and map documents to at the end of the class.

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

Lessons (Kerski)

How to Use USGS Data in ArcGIS (Kerski)  
GIS Overview (Kerski)

GIS references—conference proceedings,

journals, newsletters, books (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)  
Map Projections  
Canada LIS-GIS movie  
The World in a Box GIS Movie (GITA)  
Geography Matters GIS movie  
USGS GeoData  
Terraserver Guidelines (Kerski)  
ArcGIS procedures (ESRI)

### ***Unsolved Mysteries***

At the conclusion of the course, these mysteries remained:

1. We could not import DLG files in SDTS format using the tool SDTS Import to Coverage. However, this command worked fine for me with the same version of the software and the same data on my computer at my desk. The only difference is that my computer runs Windows 2000 and the lab runs XP.
2. We could not get Select by Location to work for a certain plate boundary file in the lab. However, once again, it worked fine on my computer at my desk.
3. We could not get 1 last computer to recognize the COM port for the GPS unit.

### ***Data Recommendations***

The National Map portal is improving, and I commend those involved with this effort. It is still missing nearly all of our DLG data. In addition, the vector downloads files named 23.shp, 24.shp, etc., which are not very

intuitive.

The NHD site was extremely easy to use, and with Utility Network Analysis tools, was quite useful to all attendees.

The Terraserver ArcGIS tool still does not access the high-resolution color DOQs from post 2000. These DOQs are online on the Terraserver site, but just not accessible using the Terraserver tool. I hope this is resolved soon.

### ***Training Recommendations***

These types of training events should be increasingly used in the future to prepare our workforce for new opportunities and challenges, such as maintaining and improving Geospatial One Stop and The National Map. As the comments I received during the daily surveys reflected, having one of our own people conduct the training supplements other training (for example, ESRI in-class trainings and Virtual Campus courses) in a cost-effective way by emphasizing how to use USGS digital data in GIS analysis. The Enterprise GIS Office is an excellent cadre of expert individuals and a library of resources for USGS staff to use to enable them to be successful with GIS.

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. As we increasingly emphasize partnerships for Geospatial One Stop and The National Map, GIS training should be included as a component for our mapping liaison staffs. I would like to continue 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.

### ***Course Agenda***

## **GIS Training at USGS NTC**



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[\*\*http://rockyweb.cr.usgs.gov/outreach/\*\*](http://rockyweb.cr.usgs.gov/outreach/)

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What is ArcGIS, and how can I use it on the job? How can I access and use the wealth of federal data sets that are online? How can I integrate GPS and GIS? Pick up a wealth of practical skills with GIS through this engaging hands-on workshop!

**Mon-Fri 29 Aug – 2 Sep 2005**  
**Keystone Room**  
**USGS National Training Center**  
**Mon-Thu: 8 am to 430 pm**  
**Fri: 8 am to 3 pm**

***Prerequisites:***

1. Familiarity with Windows operating system and computer data management.
2. Willingness to learn from each other.

***Skills Addressed:***

Tables:

Creating, downloading from Internet, joining to maps, querying, modifying

Querying:

Tabular  
Spatial

Data:

Models, sources, downloading, formatting, types of data, locations, producers, analysis, quality issues, metadata

Mapmaking:  
Symbolizing, displaying

GPS:  
Collecting, moving coordinates to GIS

Imagery:  
Downloading, registering, using

Digitizing:  
Points, lines, polygons

GIS:  
Definition, applications, evolution, GIS vs ArcGIS, GIS vs Geographic Information Science, sources of training, sources of literature, sources of technical help

Core GIS Functions:  
Vector and raster analysis, 3D analysis, buffering, overlaying, projecting, geocoding

***Agenda***

***Day 1***

**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 9.0)
- 3) To understand how to download, format, and use USGS and other federal base spatial data within ArcGIS.

**Joseph's Course Philosophy**

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

Hands-On: National Atlas

Hands-On: Aquifer Analysis

Hands-On: Terraserver Download of DRG and DOQ

Hands-On: World Demographic Analysis  
Displaying and symbolizing data, querying data, joining tables

Discussion: What is GIS?

Discussion: What is ArcGIS and Extensions? History and Current software: ArcMap, ArcCatalog, ArcToolbox, ArcIMS, ArcExplorer, etc.

Hands on: Mapping GNIS point data

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

Changing Projections

Discussion: Data Types

Wrap-Up

Evaluations

## **Day 2**

Review of Day 1

Earthquake Analysis

Hands-On: Historical County Analysis  
Chart symbols

Creating and mapping new tabular data  
Layouts and printing

Exporting for Graphic Production

Discussion: Map Documents, layer files, shape files, coverages, geodatabases

Discussion: How is GIS used? Literature for learning about GIS.

Hands-On: Fire Tower Analysis:  
Downloading, formatting, and analyzing DEM, satellite image, and NLCD data  
Wrap-Up

Evaluations

## **Day 3**

Review of Day 2

Discussion: GIS vs GISciences

Hands-On: Digitizing new features  
Creating and populating attribute tables

Discussion and Hands-on: Coverages, Shapefiles, and Geodatabases

Discussion: GPS

Hands-On: Collecting GPS Coordinates

Hands-On: Bringing GPS coordinates and attributes into ArcGIS; creating thematic maps, and hyperlinking photographs

Hands-On: County demographic analysis;  
3D analysis

Hands-On: TIGER base map and demographic download and analysis  
Wrap-Up - Evaluations

## **Day 4**

Review of Day 3

Hands-On: Downloading and Using Satellite Imagery

Hands-On: Site Selection in a Metropolitan Area, Geocoding



Discussion of EGIS: Sieverling

Hands-On: Geodatabases

Discussion: Data Quality and Metadata

Hands-On: Registering Imagery

Hands-On: Downloading and Using NHD data

Wrap-Up - Evaluation

## **Day 5**

Review of Day 4

Hands-On: Stipa Comata Study Site Analysis using Projections, Buffers, Overlays, Selection Queries

Hands-On: Independent Study Time

Sieverling: Contents of ArcGIS 9.1 data repository

Discussion: GIS Literature, listservs, sources of information, and how do I continue my training in GIS?

Wrap-Up - Final Evaluation

**\*\*end of report\*\***