Spatial Tools in Water Resource Management

Susan Steele-Dunne
Nick van de Giesen
Olivier Hoes
Wim Bastiaanssen

1. Introduction to GIS

Course Introduction: Learning objectives

By the end of this course, you will be able to:

1) Explain what a GIS is, and to describe its key features
2) Use GIS to map and analyze data
3) Use GIS spatial analyst toolbox to work on real WRM problems
4) Understand important terminology in remote sensing
5) Explain the advantages and disadvantages of measurements in different parts of the EM spectrum
6) Use real remote sensing data to study problems in WRM

Course Introduction: People

Lecture	Contact person
Introduction to GIS	Susan Steele-Dunne
Spatial Analysis in GIS	Susan Steele-Dunne & Olivier Hoes
Watershed Delineation	Susan Steele-Dunne
Introduction to Remote Sensing & Visible RS	Nick van de Giesen
Thermal IR Remote Sensing	Wim Bastiaanssen
Microwave Remote Sensing	Susan Steele-Dunne

Course Introduction: Blackboard

- Lecture notes
- Collegerama/vodcasts
- Assignment instructions data and submission
- Grade Center
- Announcements
- **Discussion Board** (New thread for each module)

Course Introduction: Assignments

Submit assignments via **Blackboard**.

Turn in a report as a **pdf** file

Filename:
Assignment1_YourName_StudentNumber.pdf
(e.g. Assignment1_Steele-Dunne_123456.pdf)

Assignment is due at **8am** on the due date.
10% per day penalty for late assignments.

CT5401 – Lecture 1
Introduction to GIS

- What is GIS?
- Data models to represent our world
- Functions of a GIS
- Real applications of GIS in Hydrology and Water Resources Management
- Introduction to Assignment 1

CT5401 – Lecture 1
Introduction to GIS

- **What is GIS?**
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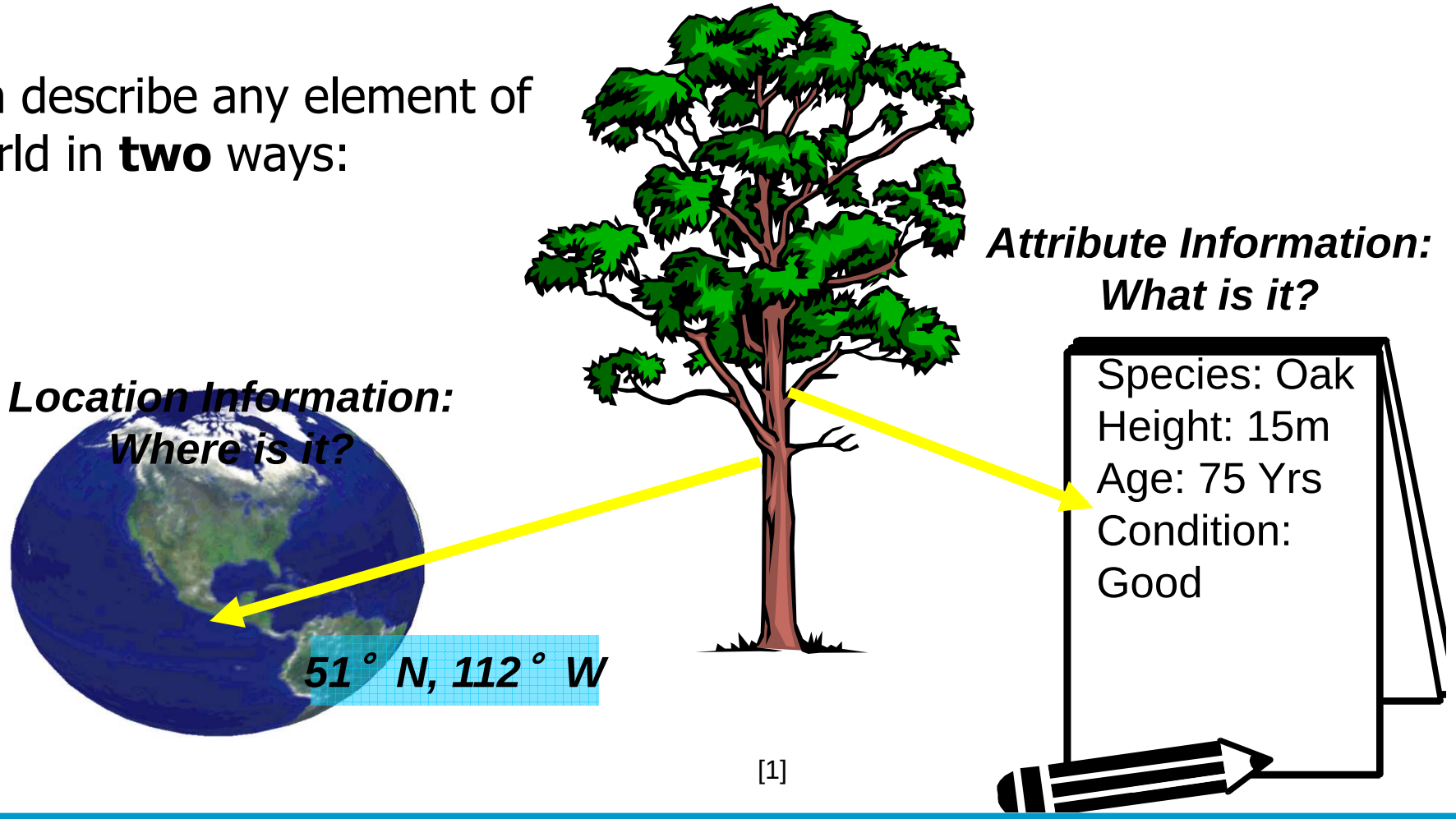
What is a GIS?

We can describe any element of our world in **two** ways:



[1]

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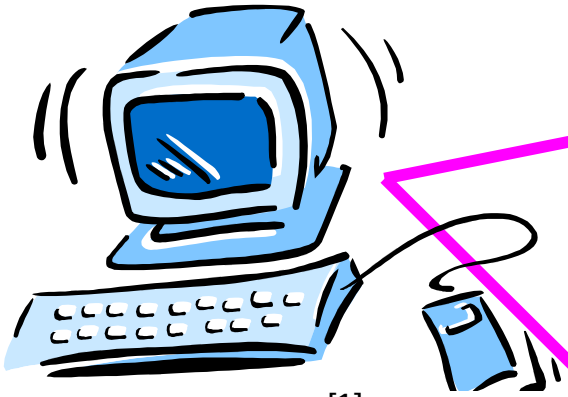
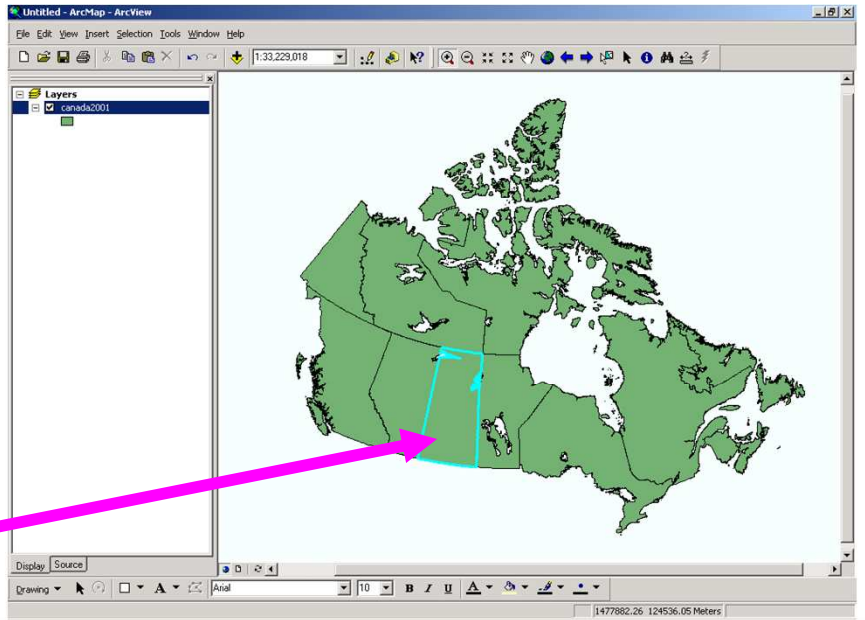
What is a GIS

GIS links datasets

GIS software links the location data and the attribute data:



[1]



Attributes of canada2001

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1	Polygon	5900000	British Columbia	Colombie-Britannique	3907738	1643969	
2	Polygon	4600000	Manitoba	Manitoba	1119583	477085	
3	Polygon	1300000	New Brunswick	Nouveau-Brunswick	729498	313609	
4	Polygon	1000000	Newfoundland and Labrador	Terre-Neuve	512930	227570	
5	Polygon	1200000	Nova Scotia	Nouvelle-cosse	908007	403819	
6	Polygon	3500000	Ontario	Ontario	11410046	4556240	
7	Polygon	1100000	Prince Edward Island	Ile-du-Prince-douard	137312	48630	
8	Polygon	2400000	Quebec	Québec	7237479	3230196	
9	Polygon	4700000	Saskatchewan	Saskatchewan	978933	431628	
10	Polygon	6000000	Yukon	Yukon	28674	13793	
11	Polygon	6200000	Northwest Territories	Territoires du Nord-Ouest	26745	8177	
12	Polygon	6100000	Nunavut	Nunavut	37360	14669	

Record: 1 Show: All Selected Records (1 out of 13 Selected.) Options

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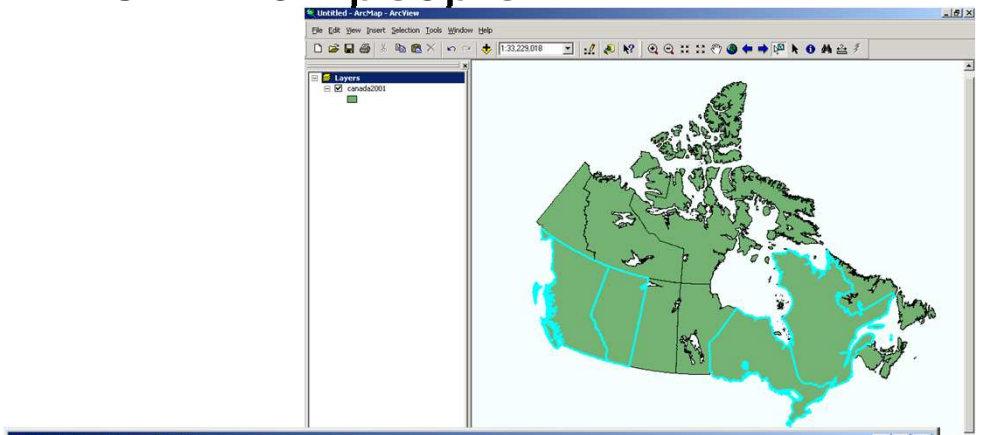
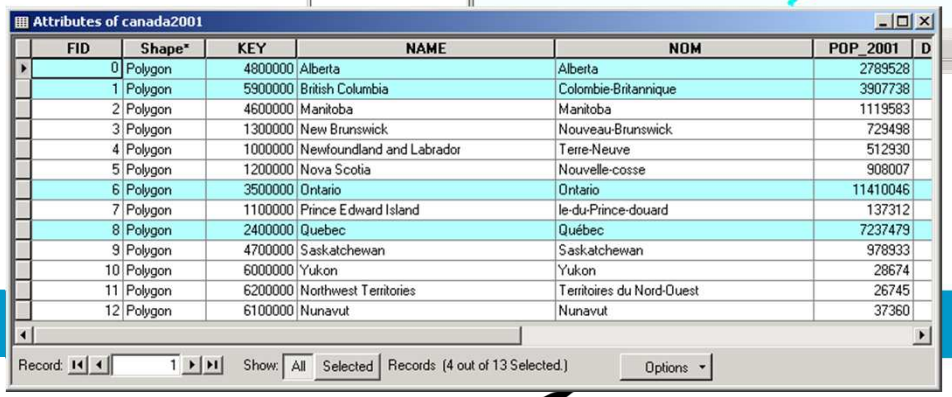
What is a GIS?

GIS software can answer questions about our world:

Attribute Questions:

What provinces have more than 1.5 million people?





Attributes of canada2001

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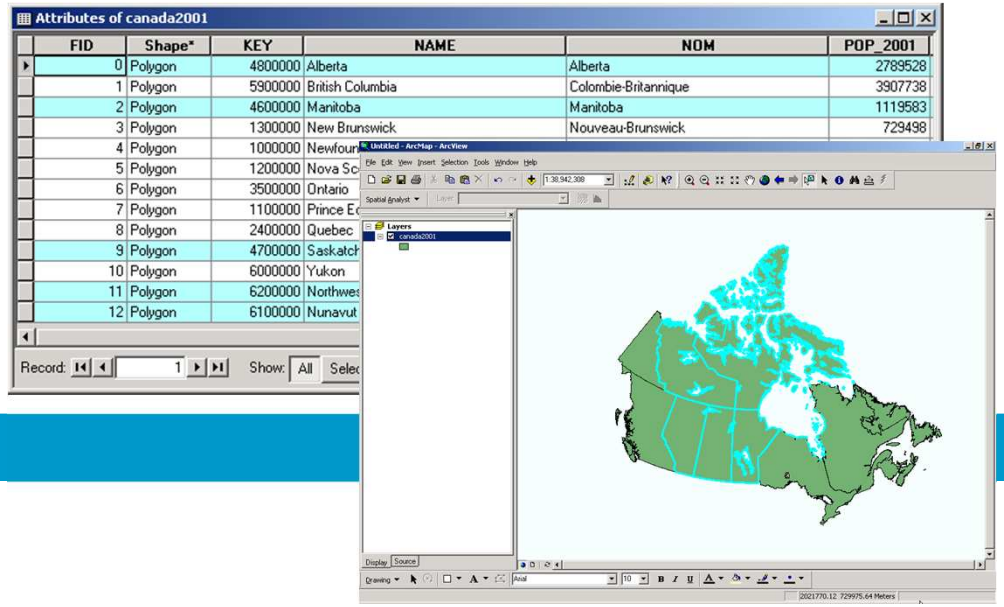
10	Polygon	6000000	Yukon	Yukon	28674	
11	Polygon	6200000	Northwest Territories	Territoires du Nord-Ouest	26745	
12	Polygon	6100000	Nunavut	Nunavut	37360	

Record: 1 Show: All Selected Records (4 out of 13 Selected.) Options

Spatial Questions:

What provinces border Saskatchewan?



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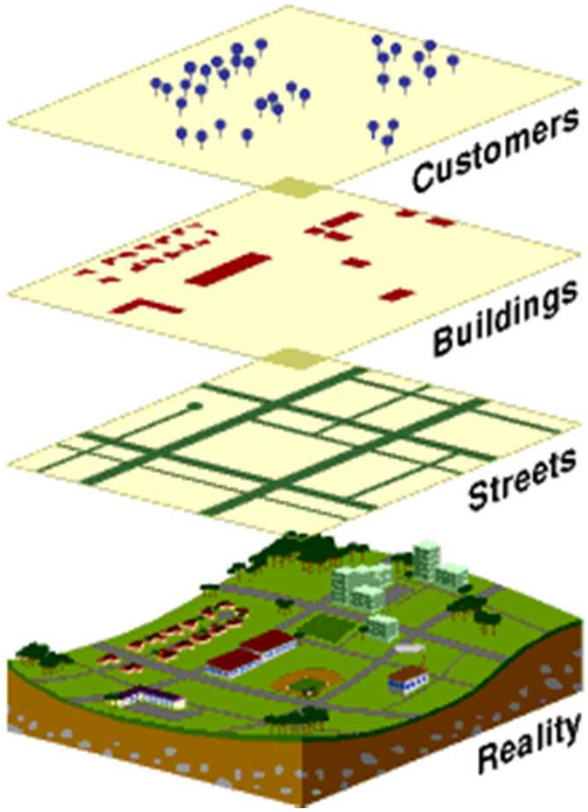
What is a GIS?

- In a GIS, different types of information are represented as separate map layers
- Each layer is linked to descriptive information
- Layers are combined to make a map



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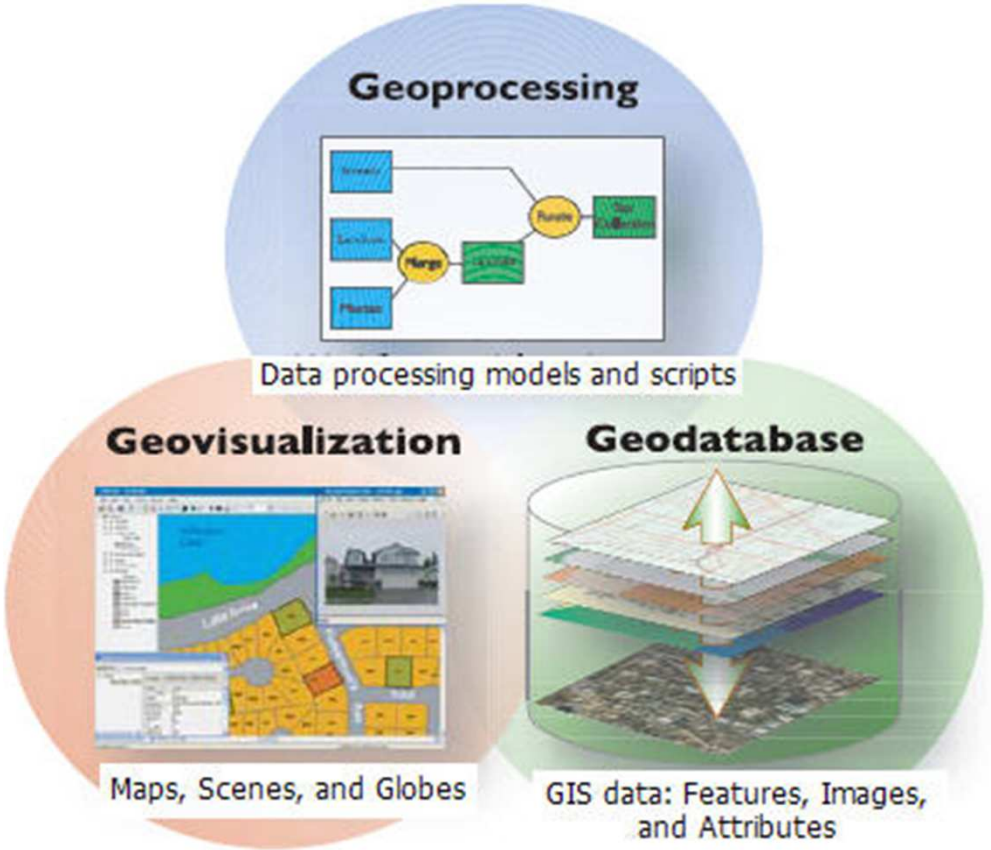
Geographical Information Systems

Key functions of a GIS:

- Data management
- Mapping and Visualization
- Geoprocessing



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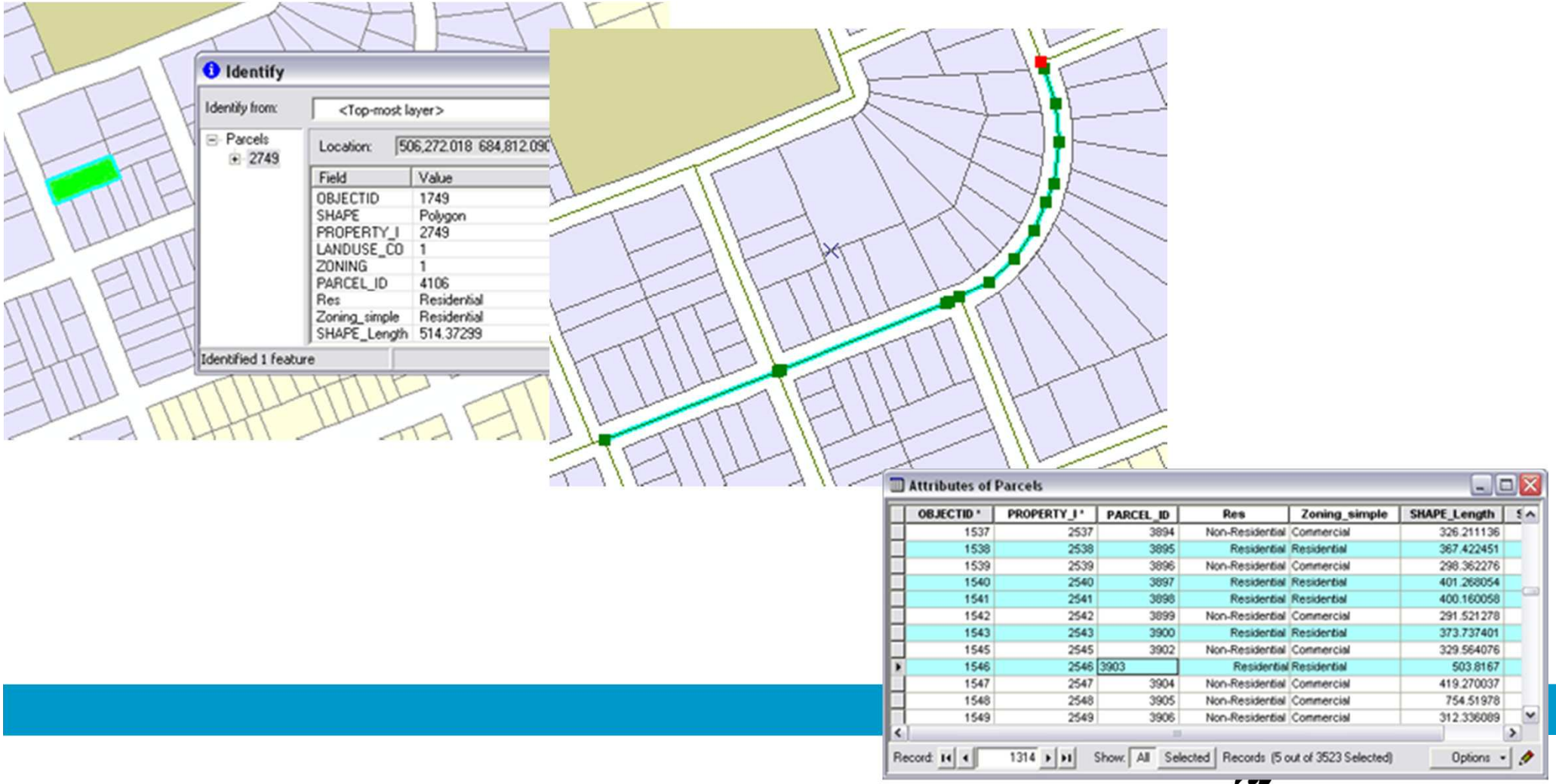
Working with individual data elements



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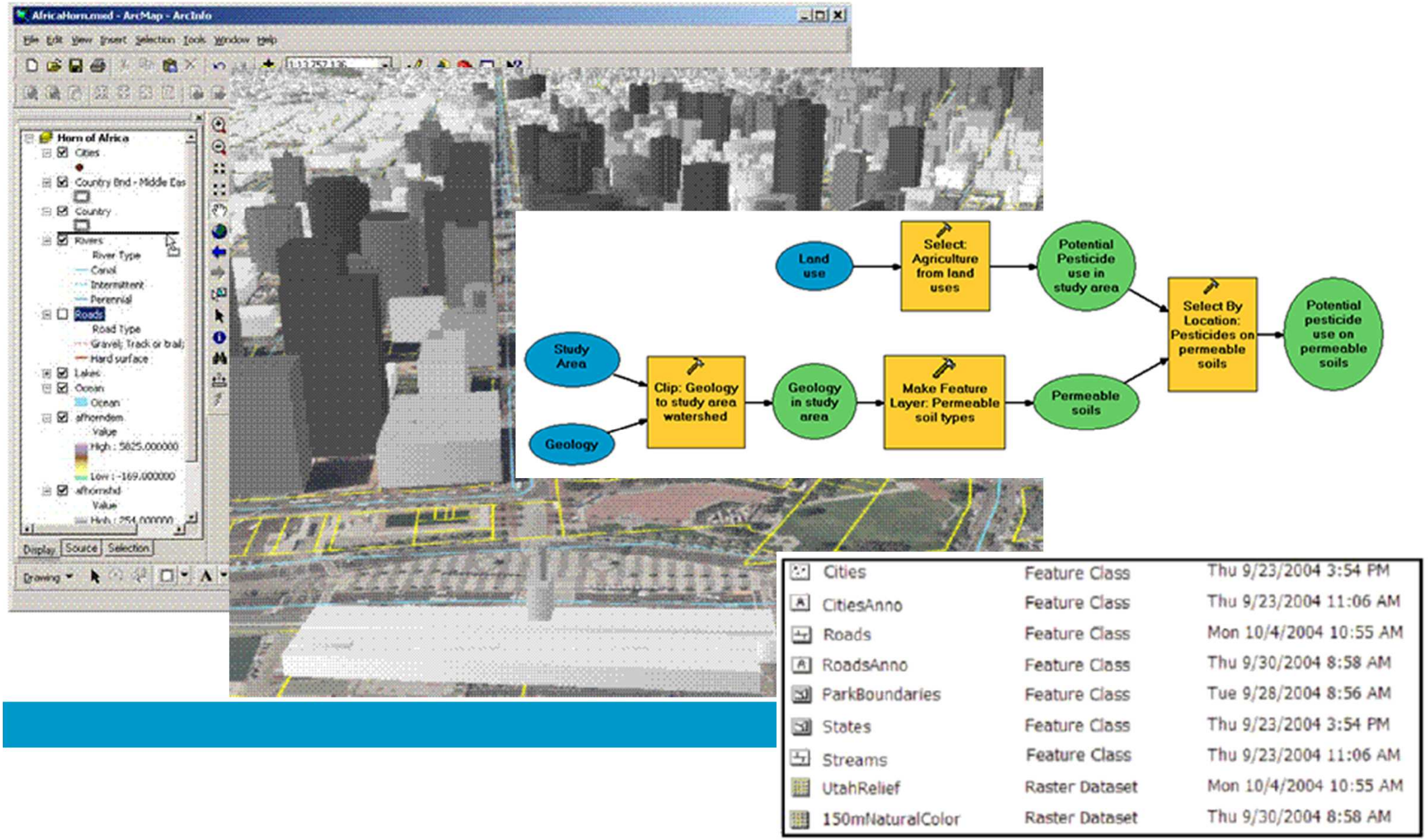
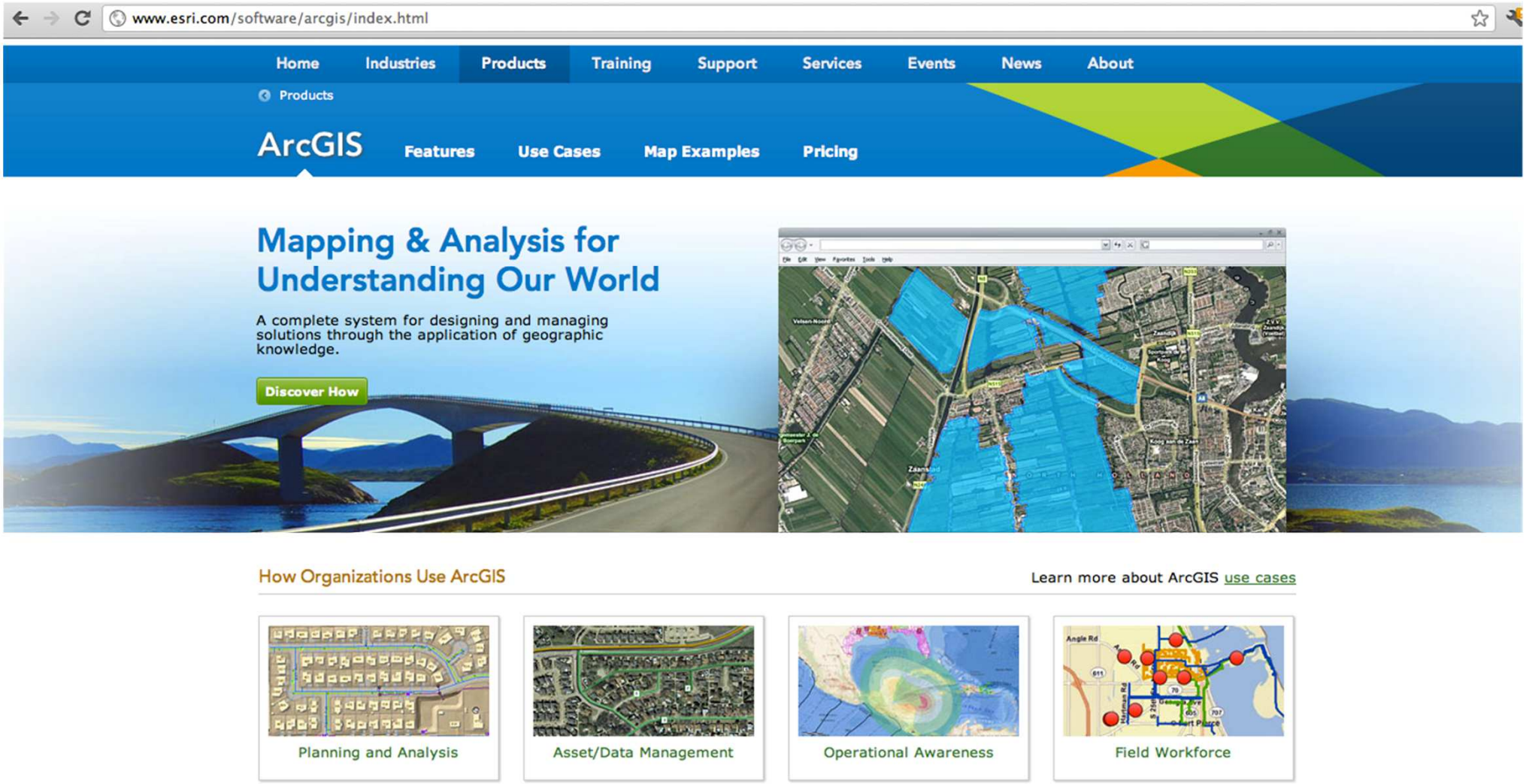
Working with GIS datasets



ArcGIS



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GRASS GIS

grass.fbk.eu

Welcome to GRASS GIS

You are at a GRASS mirror site in ITALY (IT) (other mirror sites)
This site is updated daily: 19 Apr 2012

Search | Advanced search

Intro | Docs | Download | Community | Applications | Development | Sponsors

About GRASS
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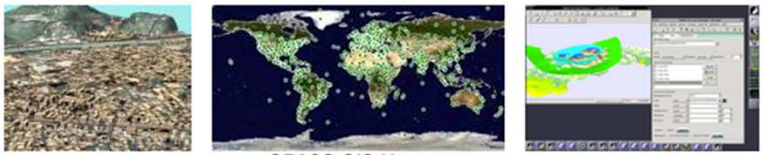
Wiki - help site | FAQ
Mirror sites
Mailing lists | IRC
Translating
Newsletter
Get involved!
GRASS in the Press
Bug/Feature trackers

Donate

Celebrating 28 years!



GRASS GIS User map

Geographic Resources Analysis Support System

Commonly referred to as GRASS, this is free Geographic Information System (GIS) software used for geospatial data management and analysis, image processing, graphics/maps production, spatial modeling, and visualization. GRASS is currently used in academic and commercial settings around the world, as well as by many governmental agencies and environmental consulting companies. GRASS is an official project of the Open Source Geospatial Foundation.

Module of the day:
r.in.srtm Import SRTM HGT files into GRASS

Latest News! XML RSS FEED

- 19 Feb 2012: **GRASS GIS 6.4.2 source code and selected binaries released** - New stable GRASS release version 6.4.2 with improvements and stability fixes
- 12 Jan 2012: **winGRASS 6.4.2RC3 and OSGeo4W-GRASS 6.4.2RC3 packages released** - New stable winGRASS pre-release version 6.4.2RC3 ready for download
- 12 Jan 2012: **GRASS 6.4.2RC3 source code released** - New stable GRASS pre-release version 6.4.2RC3 with stability fixes

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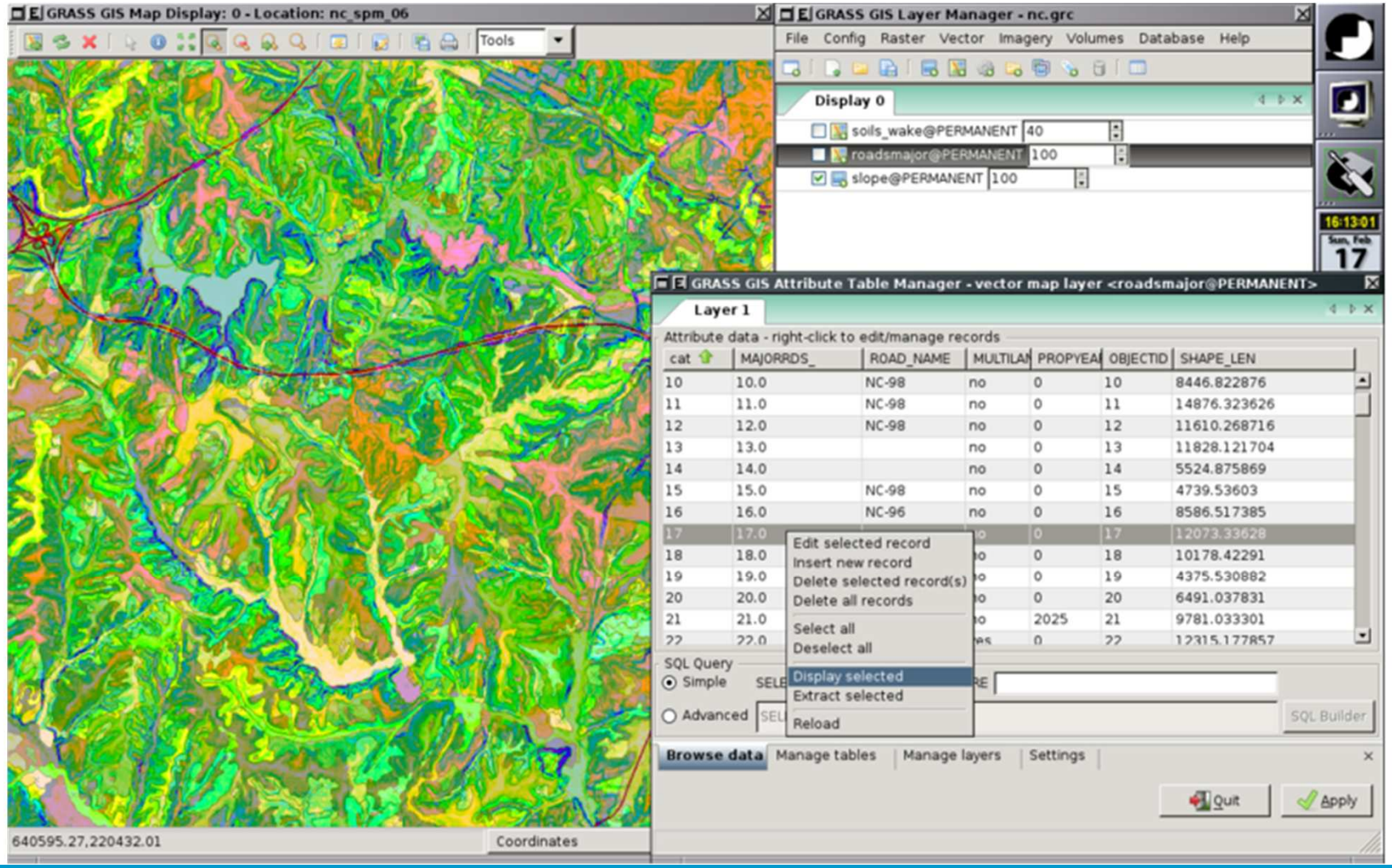
GRASS GIS



http://en.wikipedia.org/wiki/File:Wxgui-atm.png

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Quantum GIS

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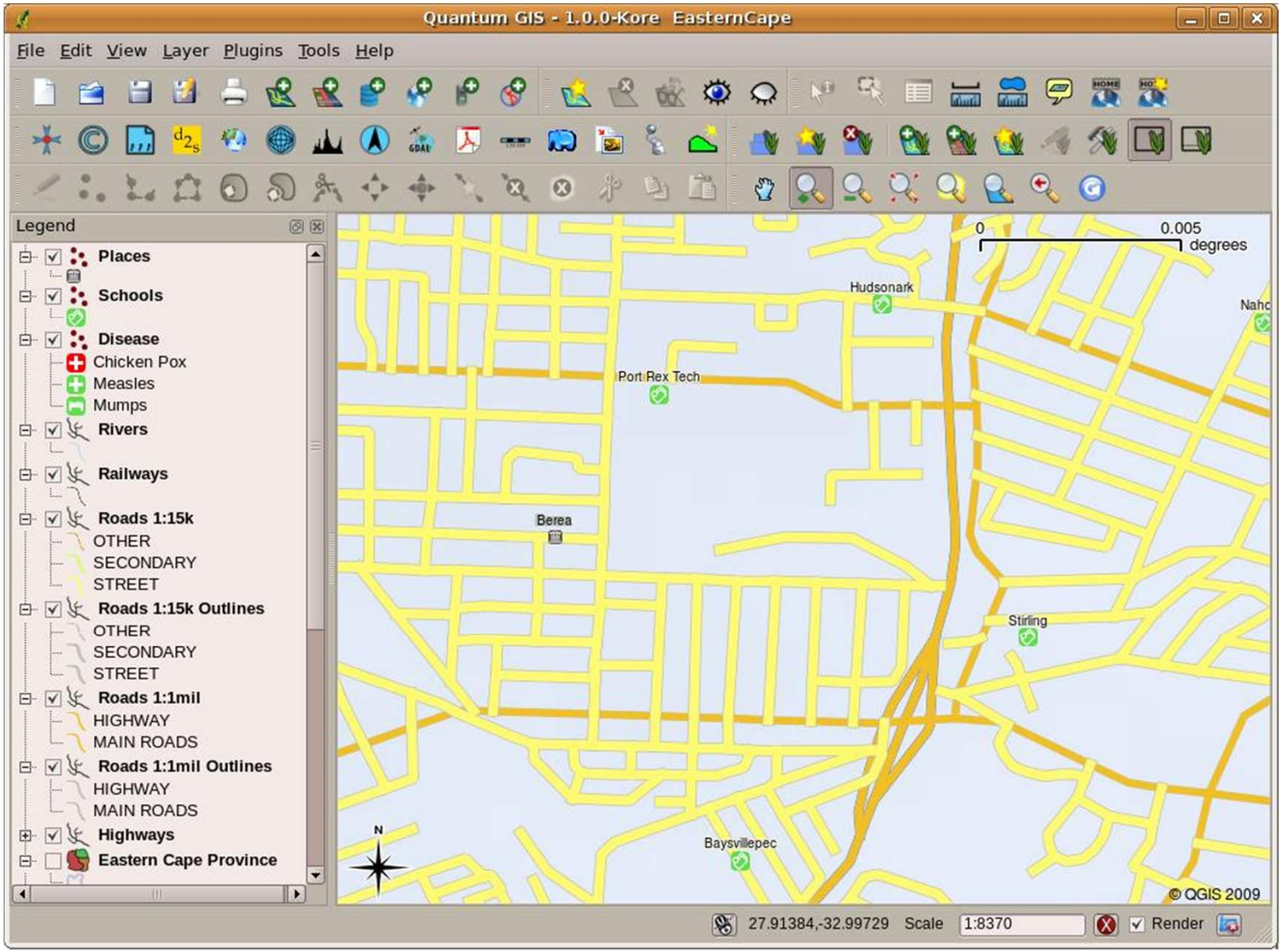
Quantum GIS



http://blog.qgis.org/node/123

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CT5401 – Lecture 1
Introduction to GIS

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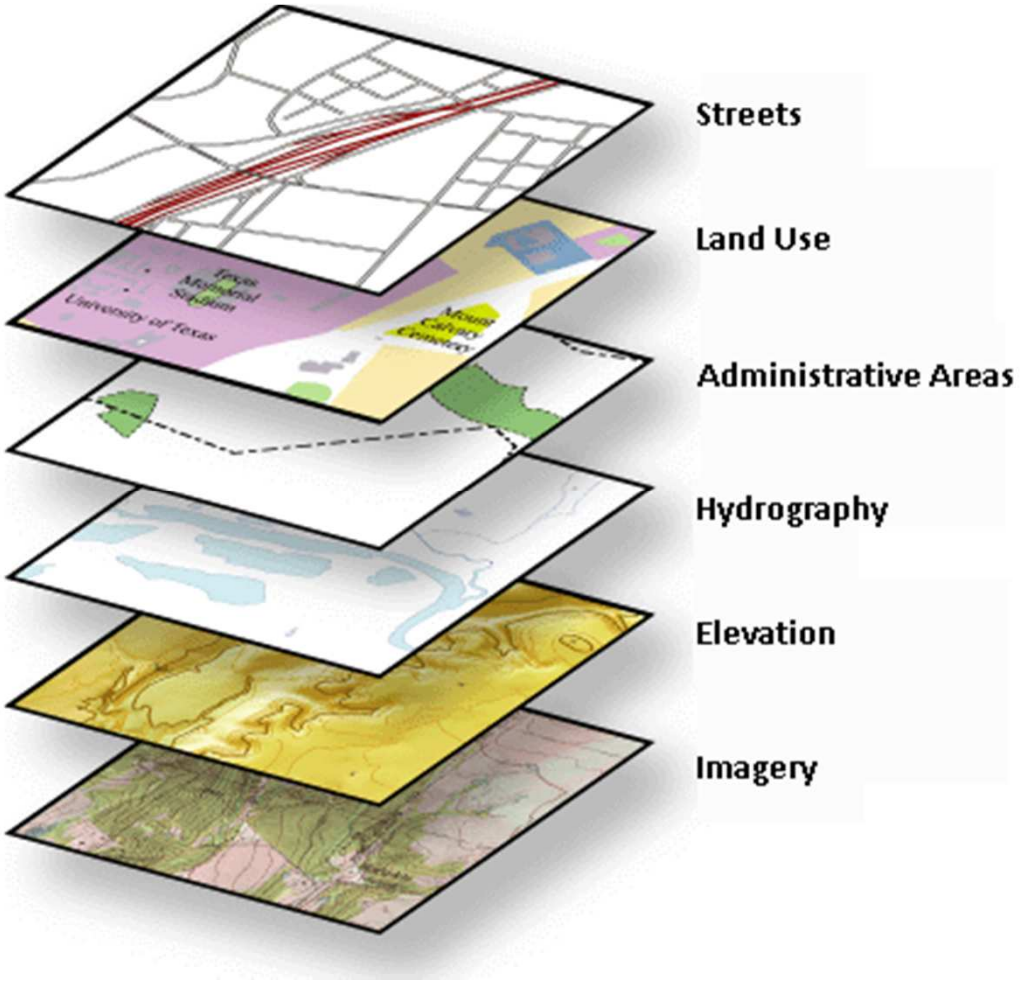
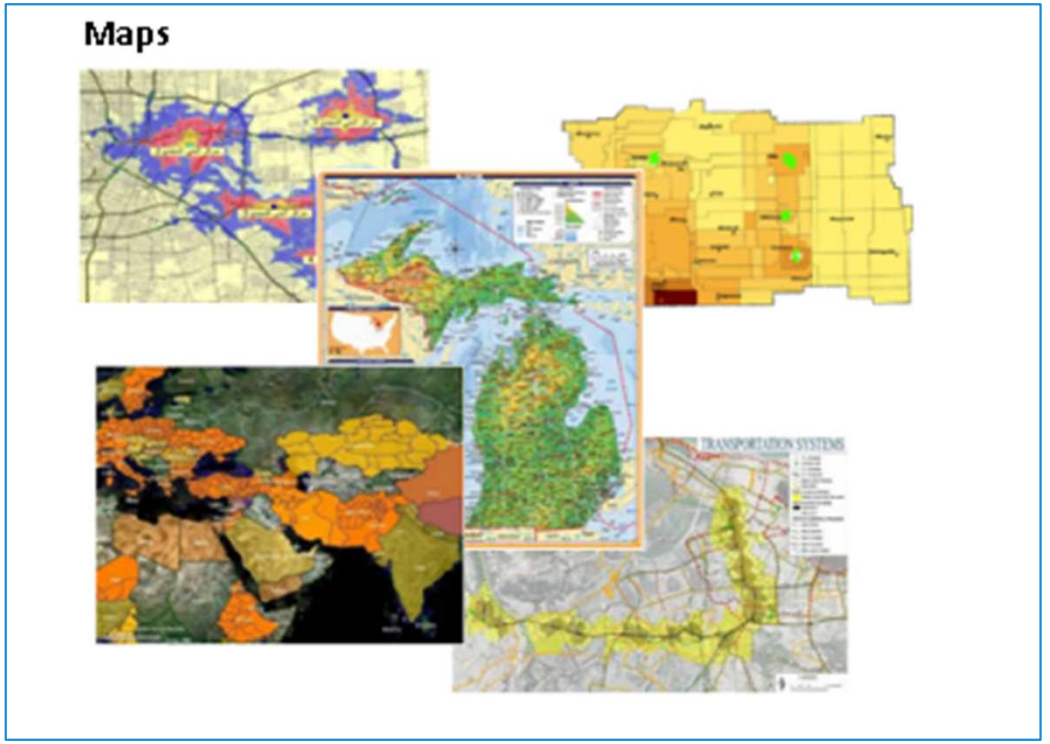
A map is made up of layers





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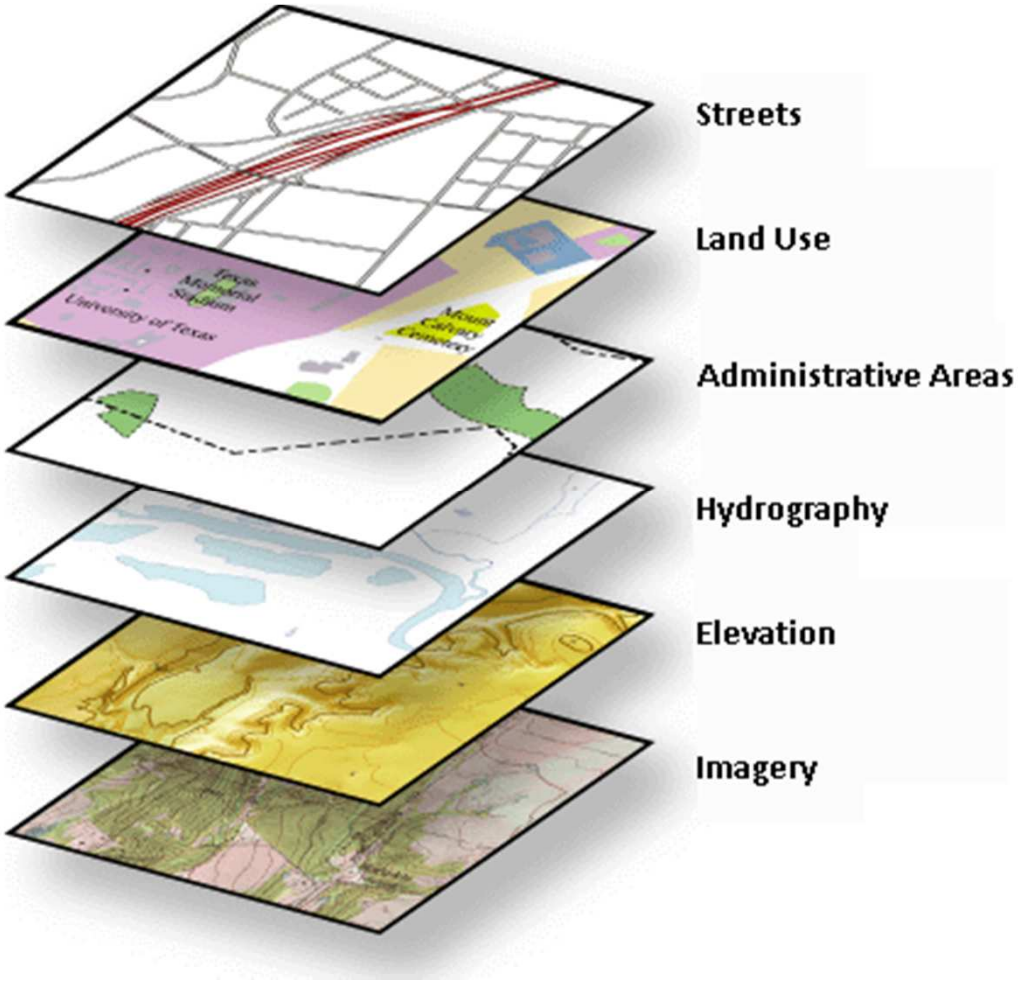
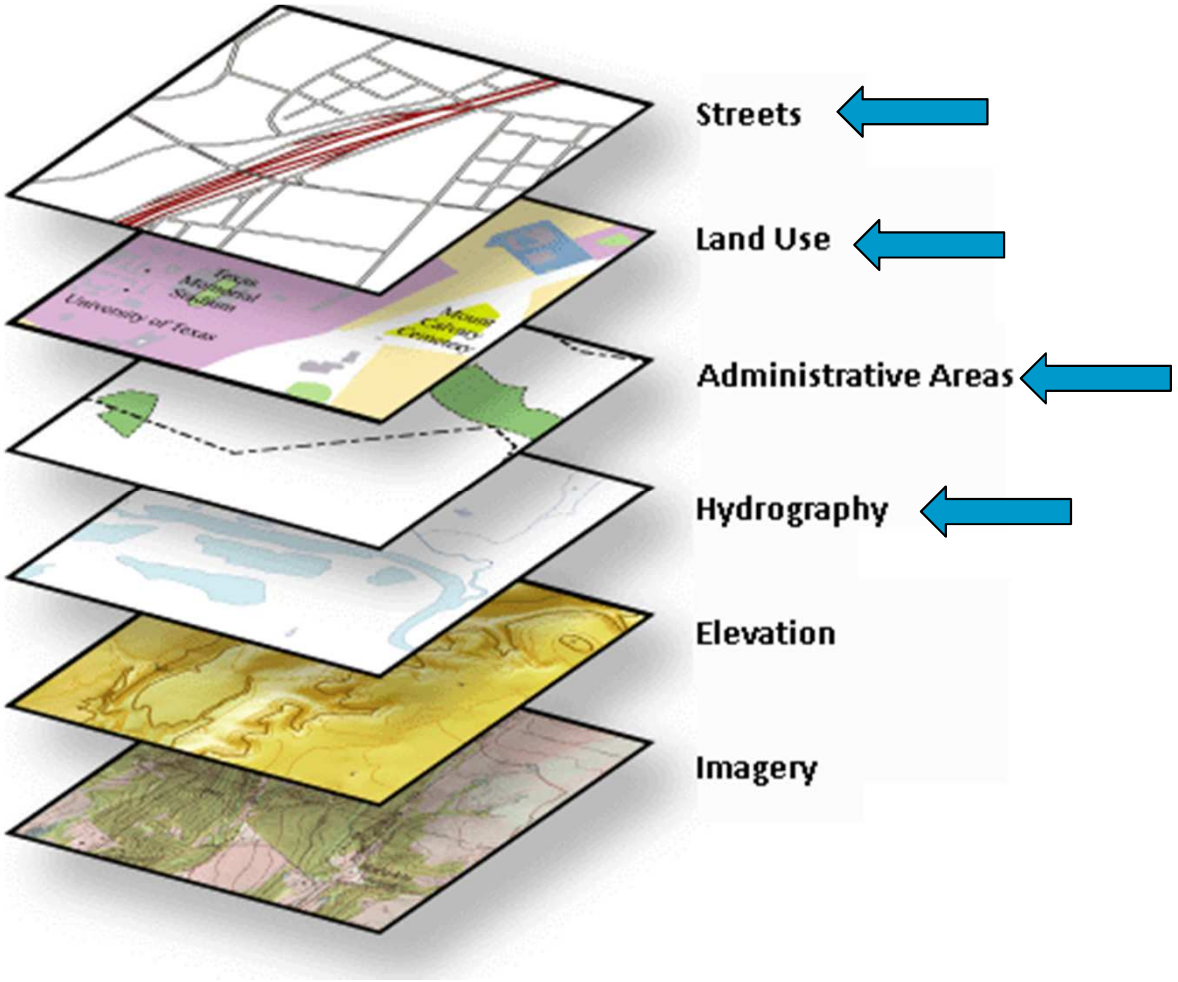
GIS data structures



- Feature classes
- Raster datasets
- Attributes and descriptive information

GIS data structures



- **Feature classes**
- Raster datasets
- Attributes and descriptive information

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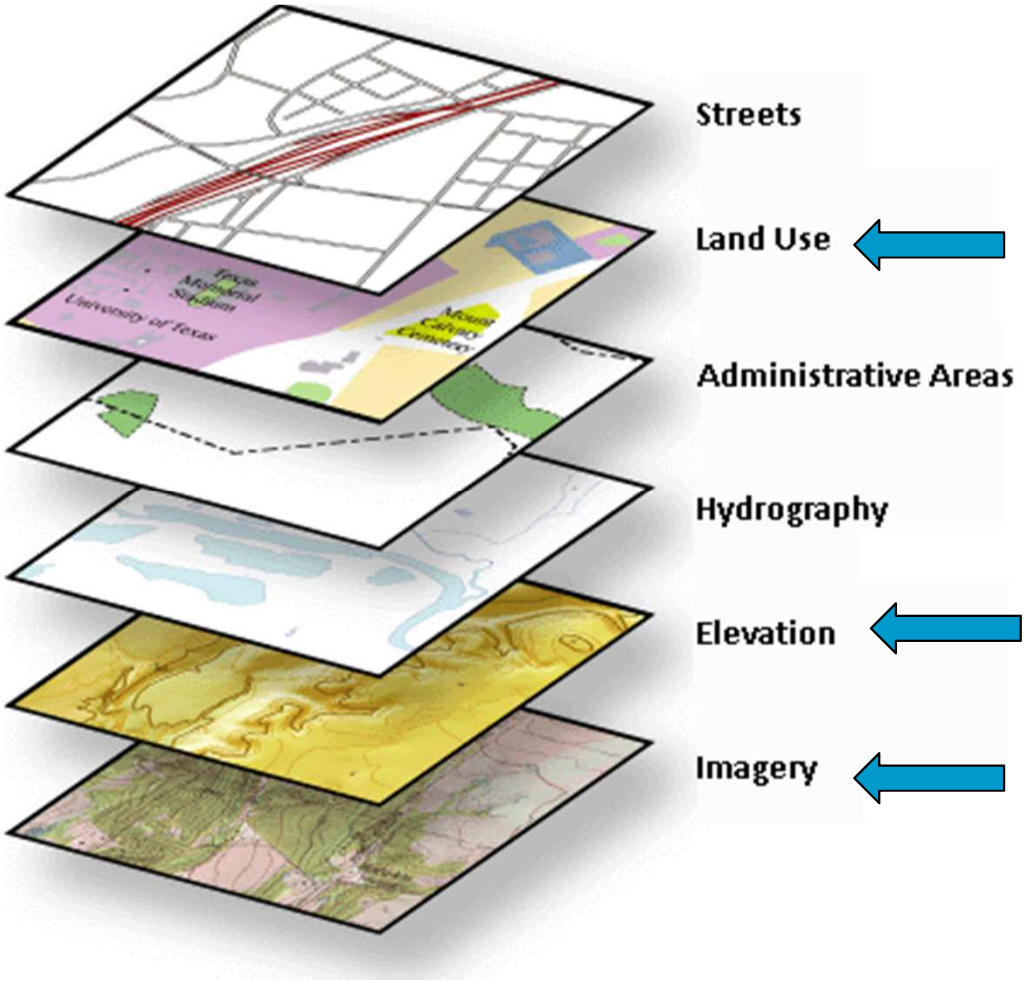
GIS data structures



- Feature classes
- **Raster datasets**
- Attributes and descriptive information

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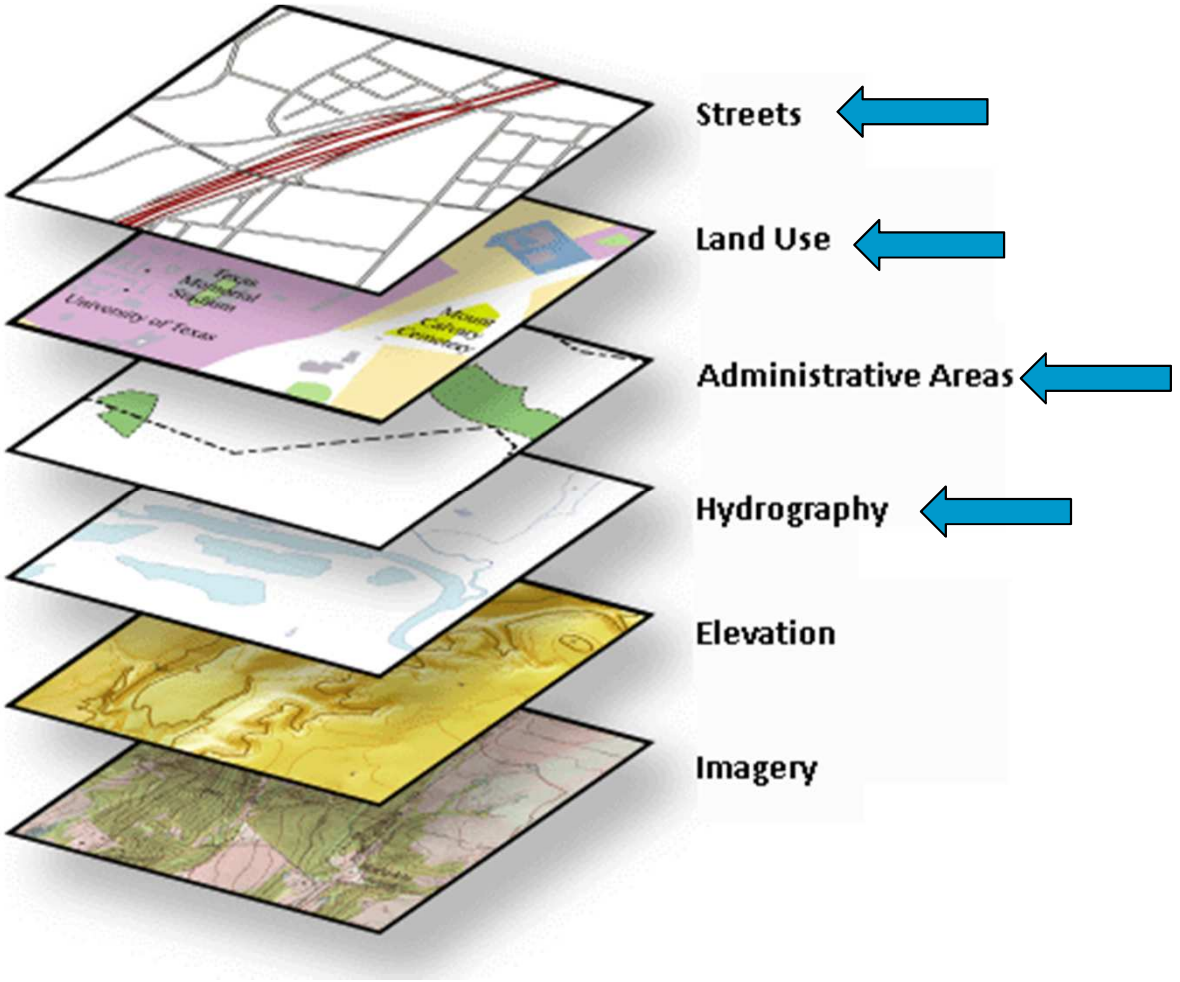
GIS data structures



- Feature classes
- Raster datasets
- **Attributes and descriptive information**

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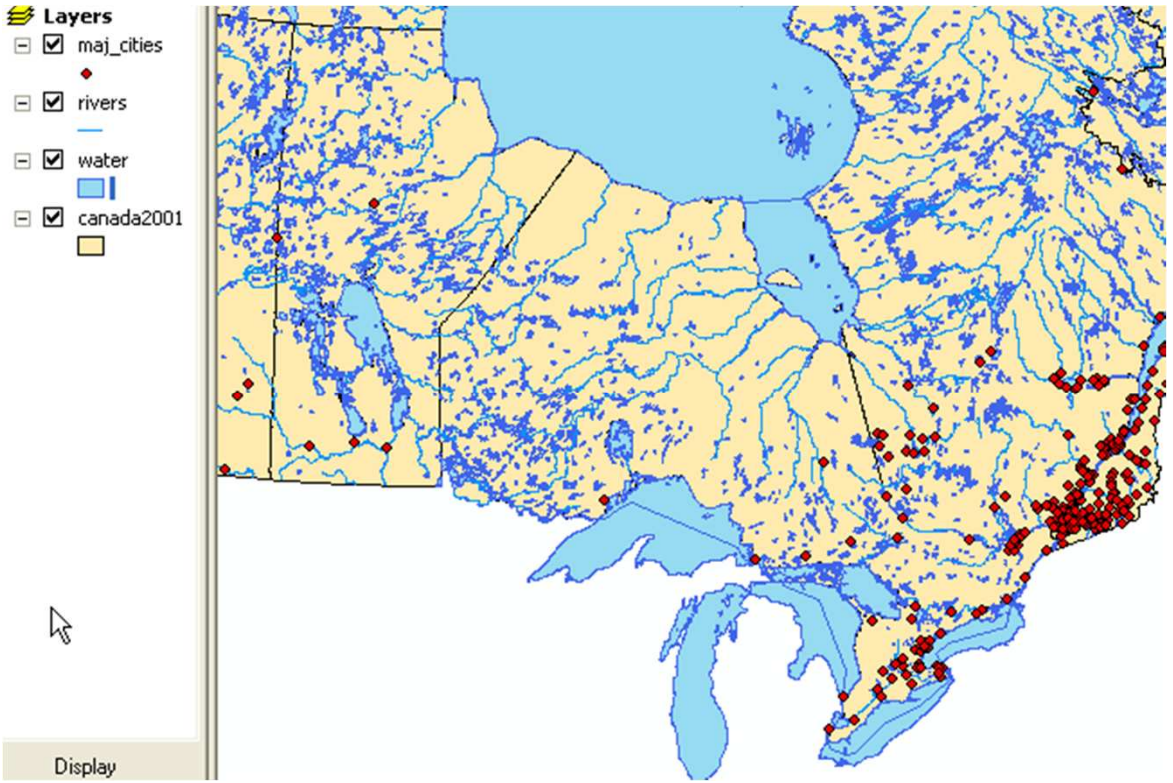
Vector for Discrete Data

Vector is shape based data

A representation of the world using points, lines, and polygons

Vector models are useful for storing data that has distinct boundaries, such as country borders, land parcels and streets



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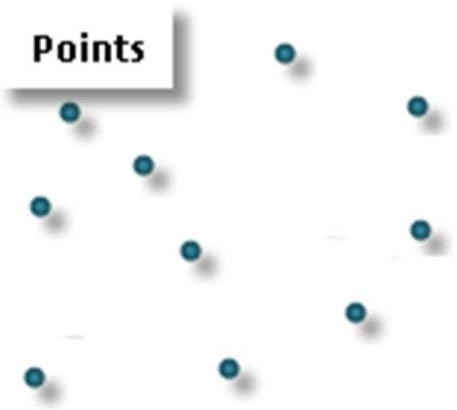
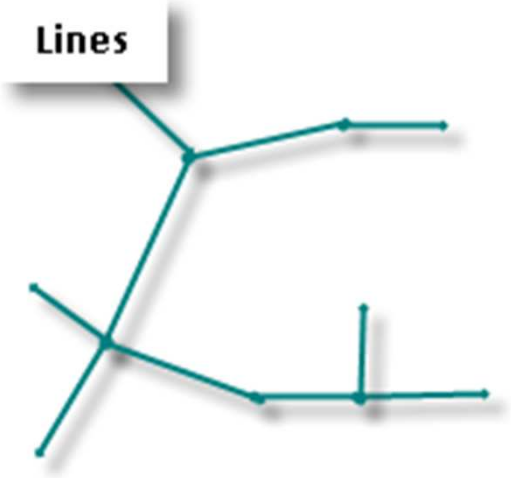
GIS data structures: Feature





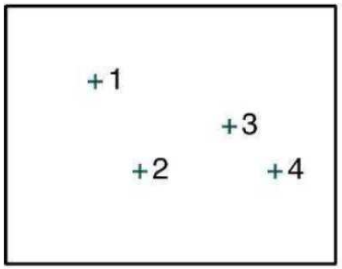
e.g.
Well locations
Weather station locations
Stream gauge locations
Pollutant point sources
Water hydrants
Gulleys

e.g.
River
Pipelines (e.g. water or sewer)
Elevation contour lines
Other contour lines (e.g. annual precipitation)
Road centerline

e.g.
Land parcel
Soil types
Land use zones
Country boundaries
Lakes
Buildings

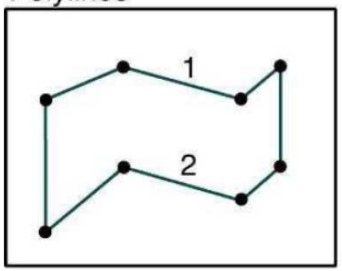
Vector for Discrete Data

Points



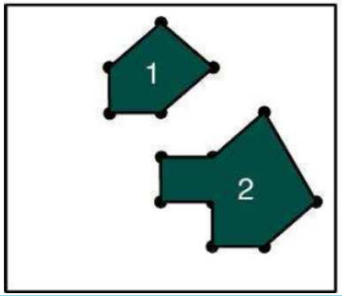
Point number	(x,y) coordinates
1	(2,4)
2	(3,2)
3	(5,3)
4	(6,2)

Polylines



Polyline number	(x,y) coordinates
1	(1,5) (3,6) (6,5) (7,6)
2	(1,1) (3,3) (6,2) (7,3)

Polygons



Polygon number	(x,y) coordinates
1	(2,4) (2,5) (3,6) (4,5) (3,4) (2,4)
2	(3,2) (3,3) (4,3) (5,4) (6,2) (5,1) (4,1) (4,2) (3,2)

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Vector Dataset for Water Resources Management

Grootschalige Basiskaart Nederland (GBKN)

A digital topographic map with prescribed content and precision including the most important topographic features (buildings, roads, waterways).

GBKN is a basemap, for all of the Netherlands, for use in many applications.

Scale from 1:500 to 1:5000.

Grootschalige Basiskaart Nederland

Applications:

Consultancy

Presentation: e.g. basis for maps

Registration: e.g. underground cables and pipes

Design e.g. civil engineering, architecture, infrastructure.

Basis in GIS: You can couple administrative data to geographical data on the built environment

www.gbkn.nl

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Grootschalige Basiskaart Nederland
GBKN- Urban

Precision 28cm

www.gbkn.nl

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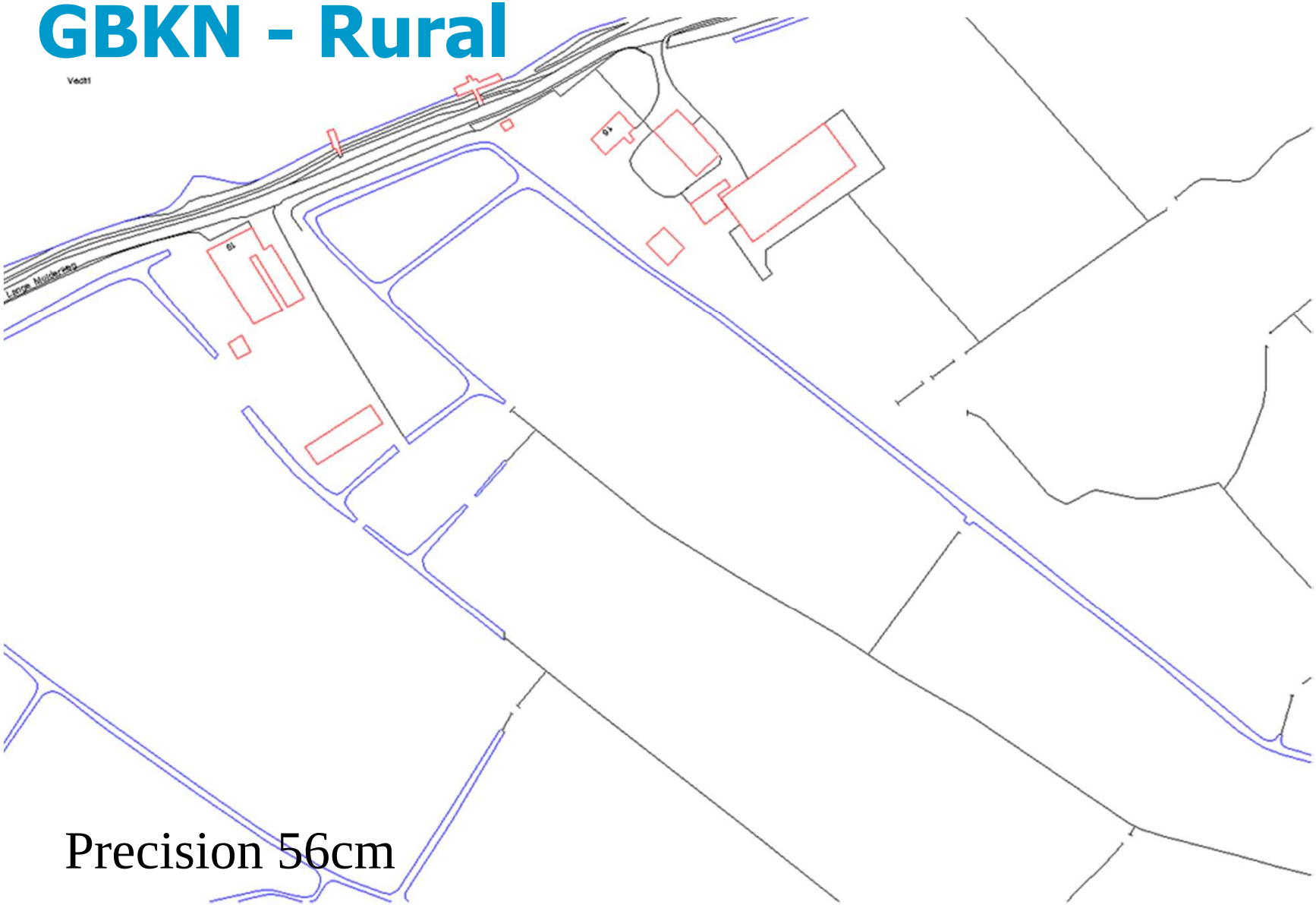
GBKN - Rural



Precision 56cm

www.gbkn.nl

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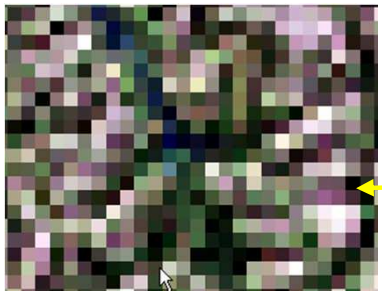
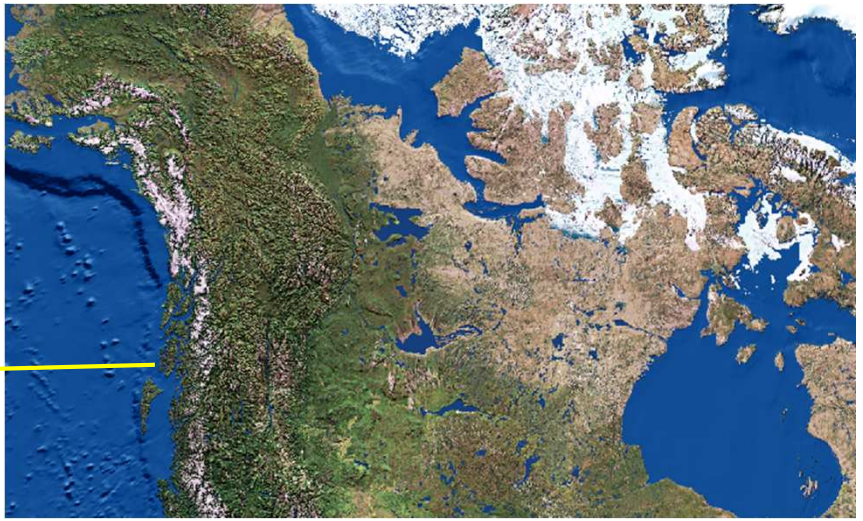
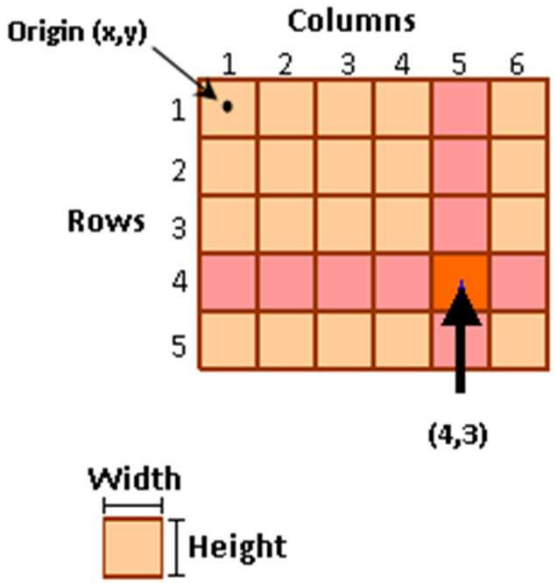
GIS data structures: Raster

- Continuously changing values
- Stored as floating point values
- Elevation, noise pollution, rainfall, slope, temperature
- Cells organized in rows and columns, assigned index position number
- Many storage formats e.g. TIFF, JPEG, ESRI Grid

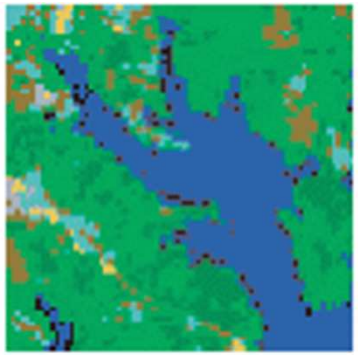




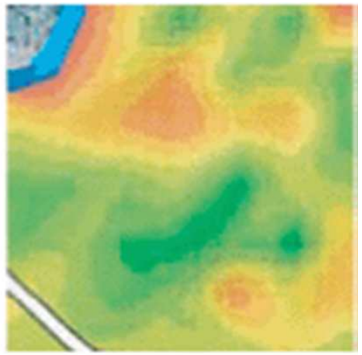
GIS data structures: Raster



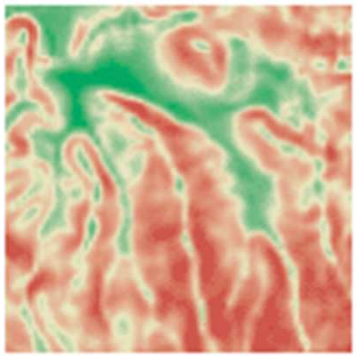
Orthophoto



Land Use

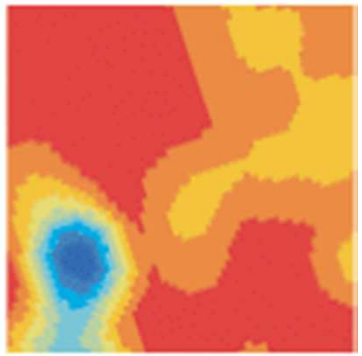


Concentration



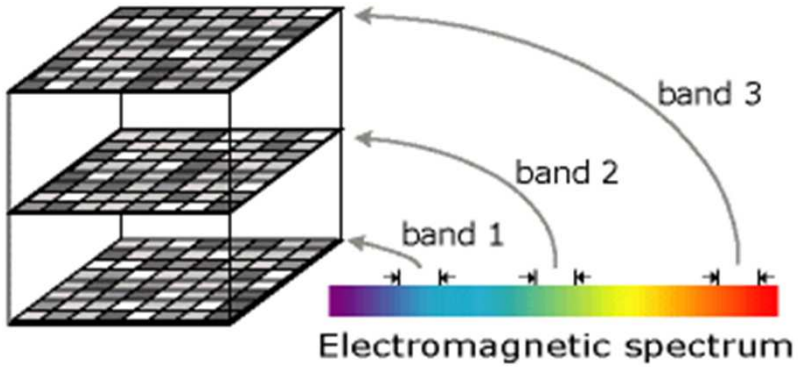
Slope

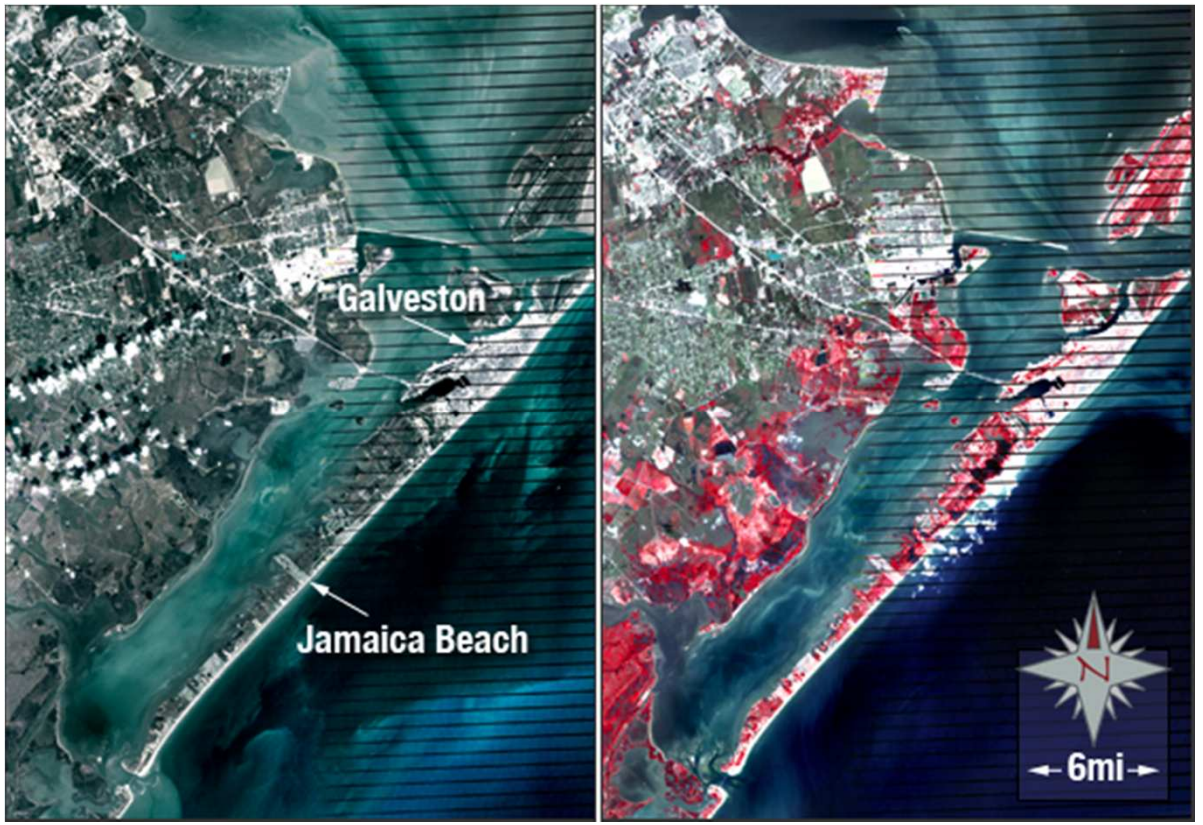
Elevation



Population

GIS data structures: Raster





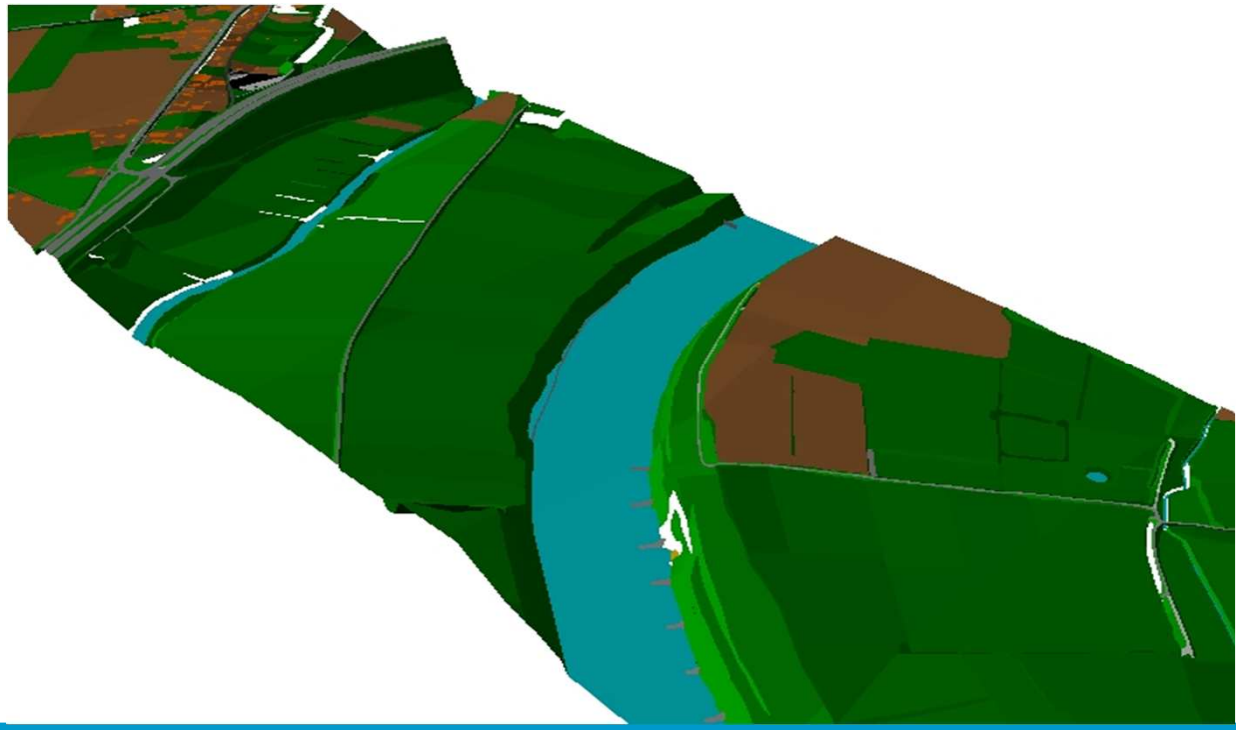
Landsat 7 images of Galveston, Texas before (left, 10/12/07) and after (right, 9/28/08), depicts scarring left after Hurricane Ike.

http://landsat.gsfc.nasa.gov/images/archive/e0015.html

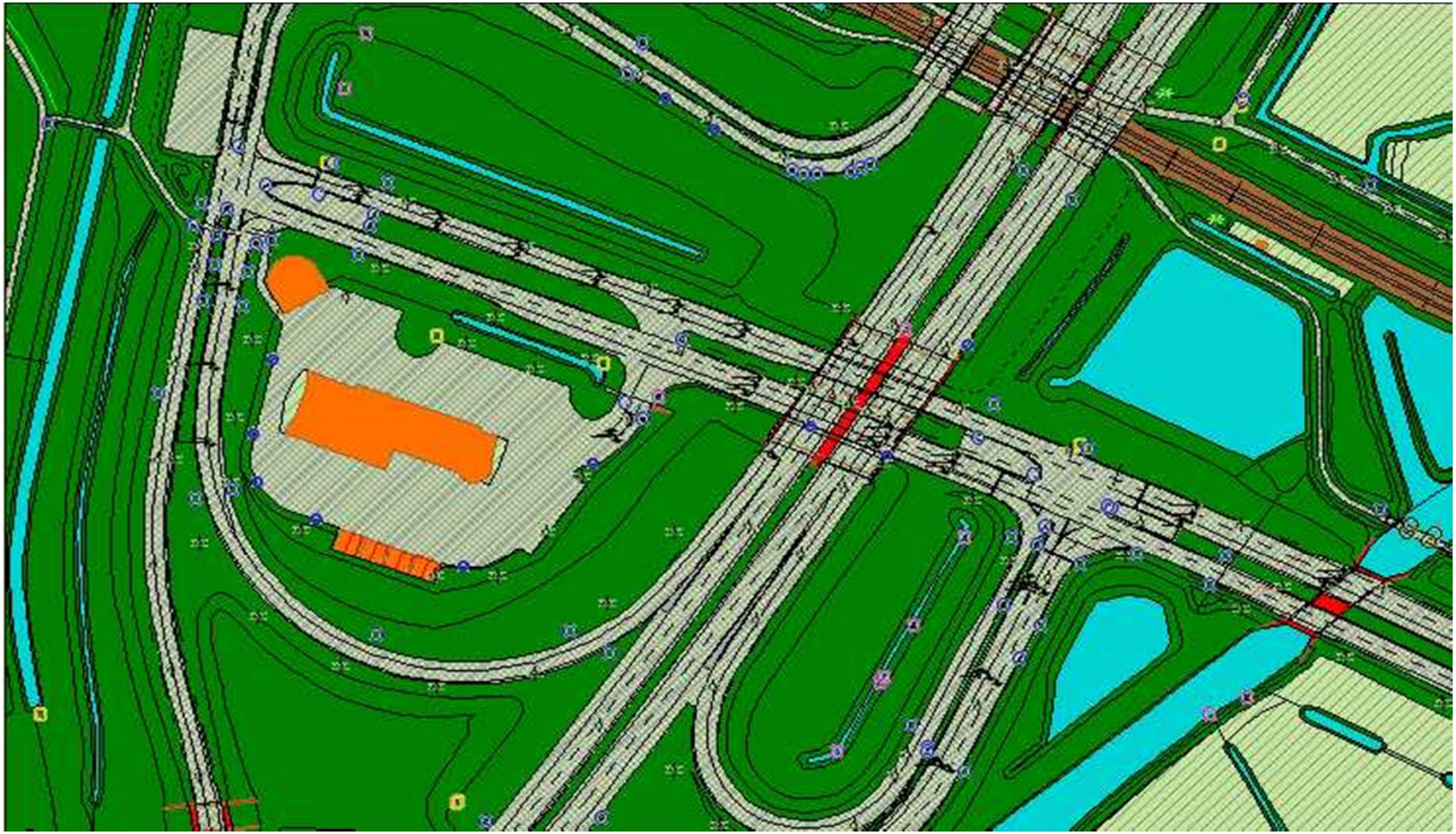
Raster Dataset
Digitaal Topografisch Bestand (DTB)

Produced by **Rijkswaterstaat** (Ministry for Infrastructure and Environment)

Detailed topographic geo-information (Scale 1:1000) on roads and waterways.



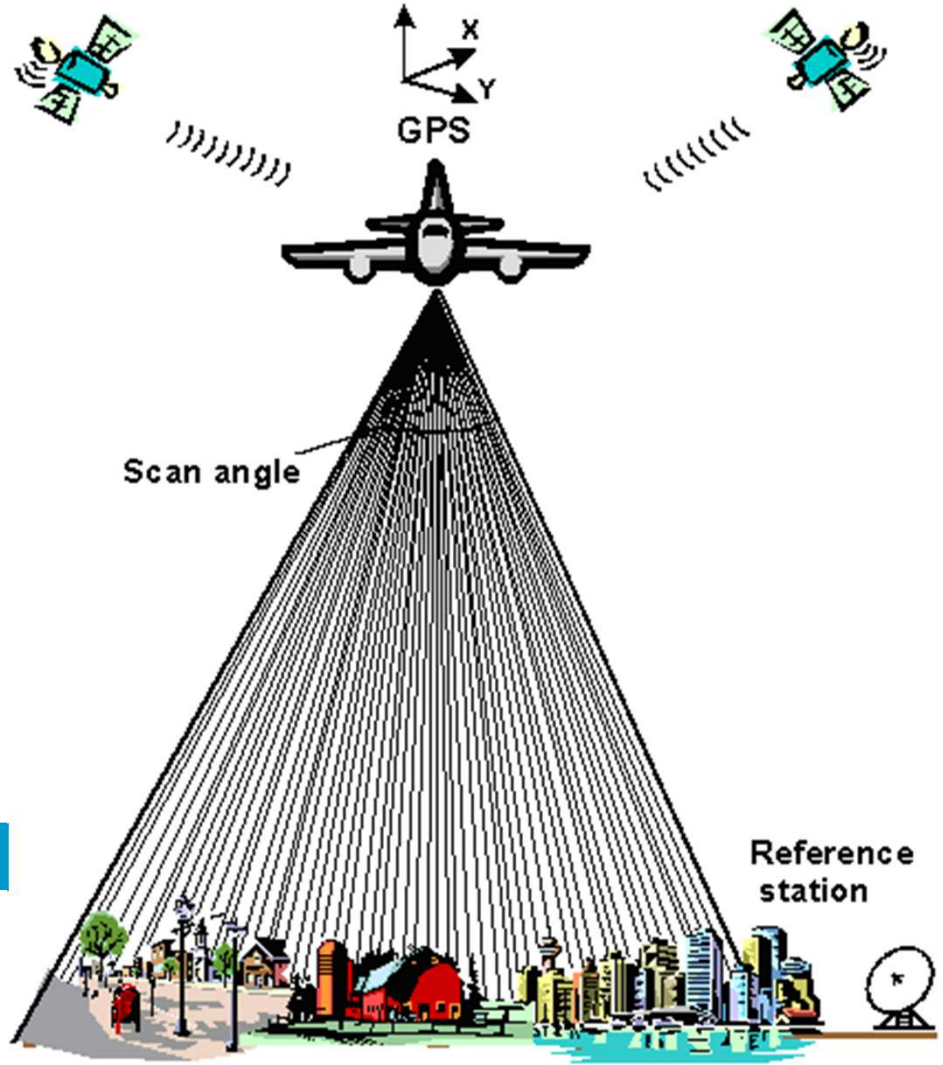
Digitaal Topografisch Bestand (DTB)



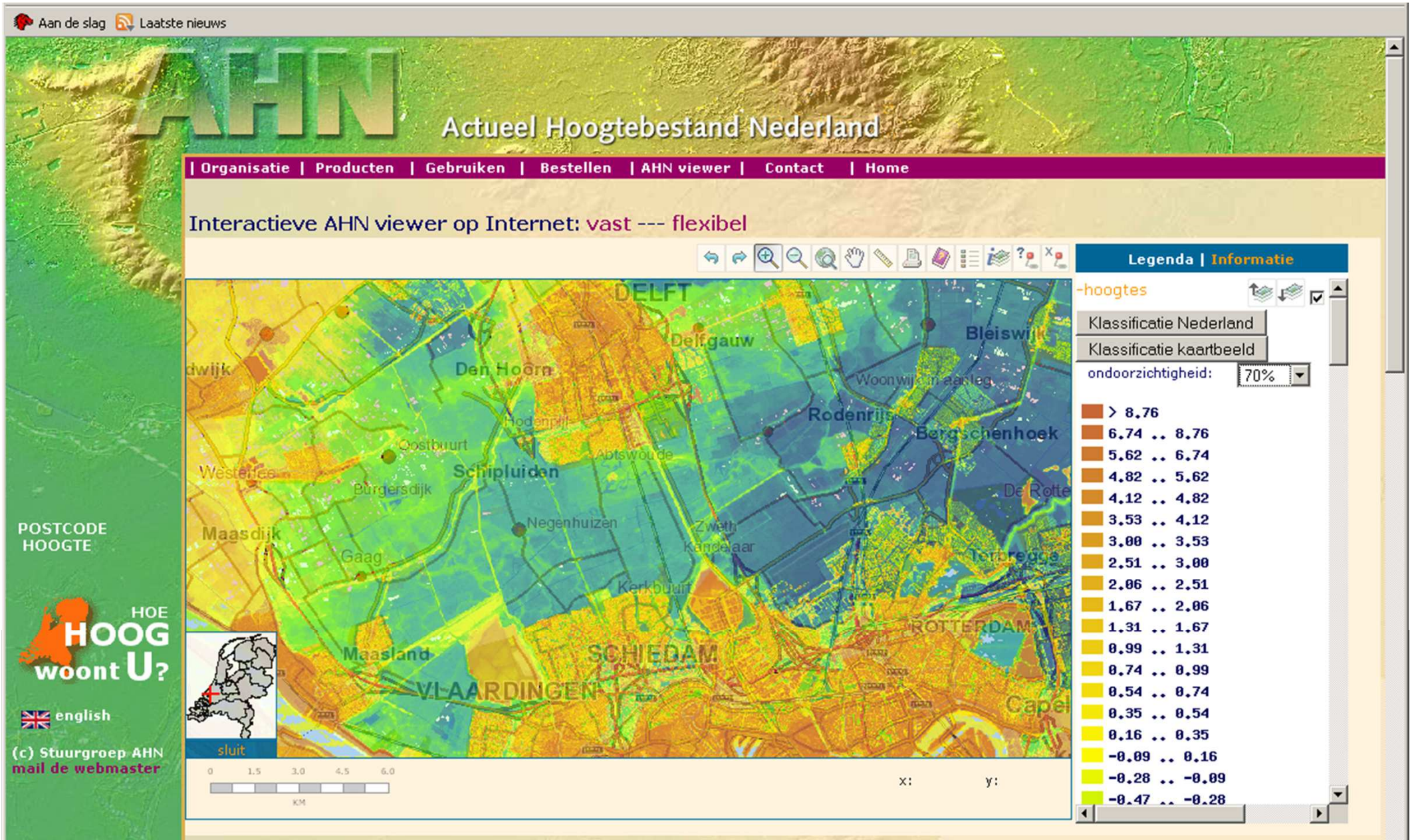
Actueel Hoogtebestand Nederland
Actual Height Model of the Netherlands

- Website: www.ahn.nl

- Airborne Laser Altimetry
  - LIDAR
    - Light Detection and Ranging

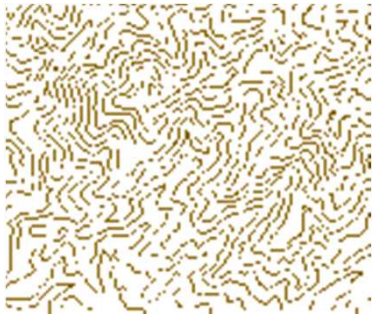


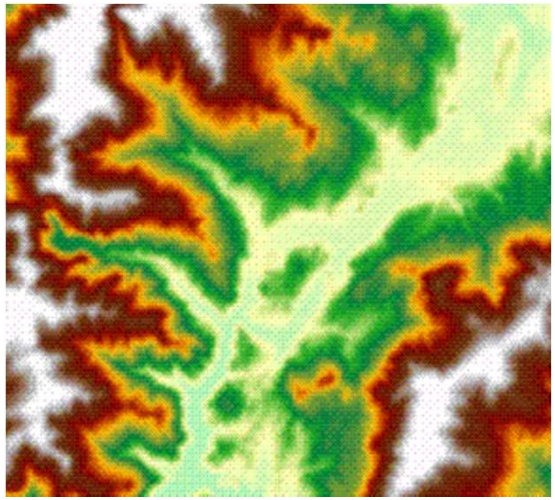
www.ahn.nl/kaart

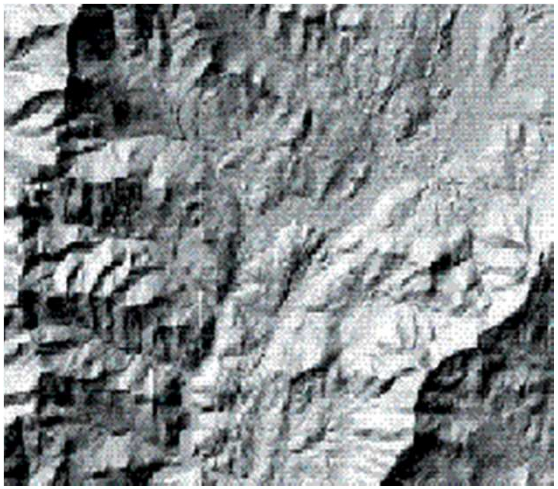


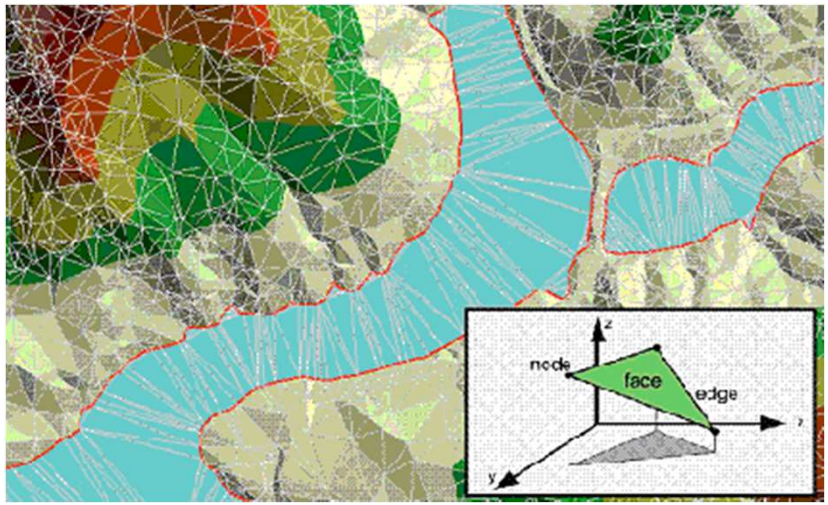
Surfaces

can be represented using features or rasters









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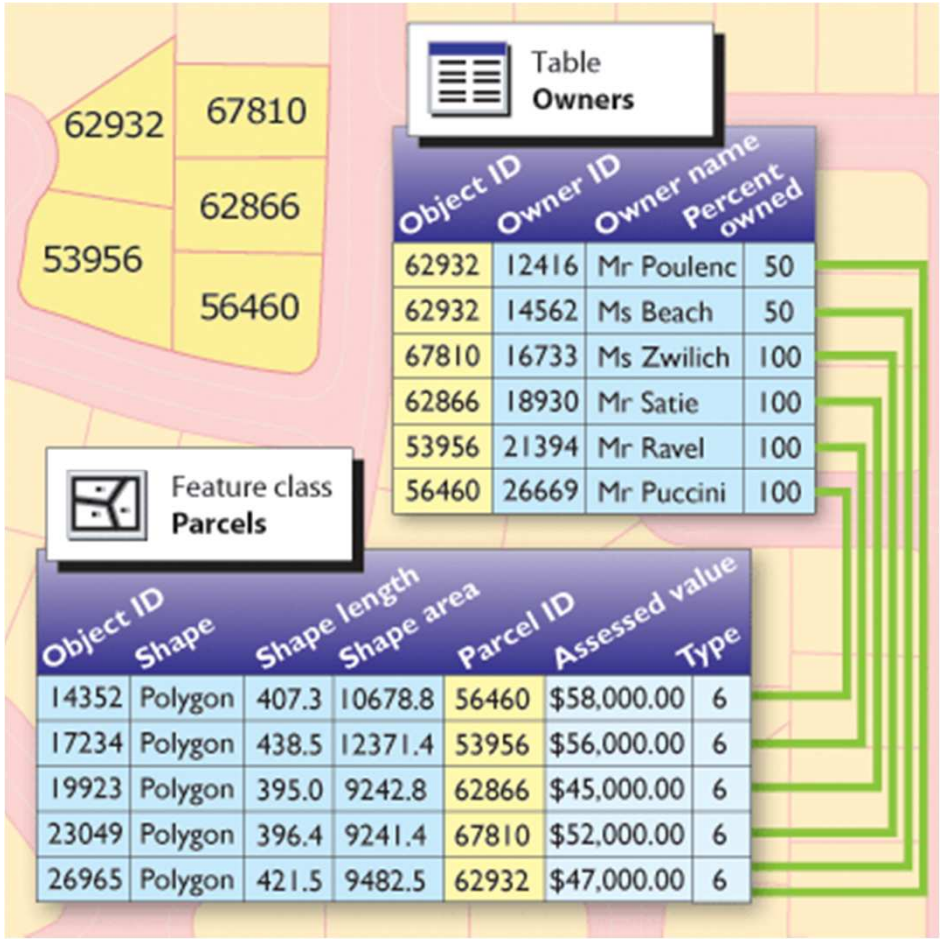
GIS data structure: Atrributes



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Activity: GIS data models for Water Resources Management

Here are five tasks you might have as a water manager:

(a) Water supply demand and forecasting
(b) Wastewater and stormwater system design
(c) Flood damage assessment
(d) Drought monitoring & warning
(e) Designing a water quality monitoring network & database.

Divide into groups of 4 students.

Each group will focus on one task.

Activity: GIS data models for Water Resources Management

For your task:

1) **What data will you collect for your geodatabase?**
2) **Will that data be raster/feature/attribute data?**
3) **What will the attributes of the feature data be?**
4) **Can you think of 3 spatial questions you might ask?**

3 attribute questions?

3 minutes -	Think by yourself and make a list
10 minutes –	Combine your list with the rest of your group and brainstorm
15 minutes -	Share results with whole class. Do they have any additional suggestions?

(Each group appoint someone to write notes, and someone to present to whole class)

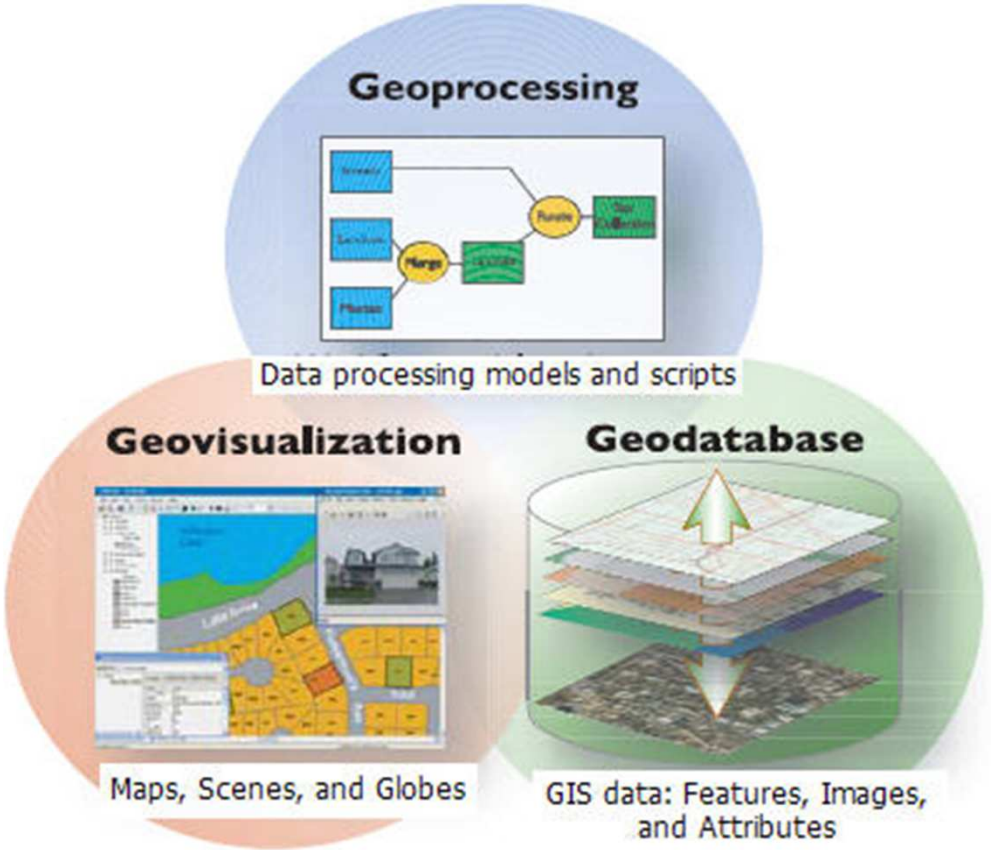
CT5401 – Lecture 1
Introduction to GIS

- What is GIS?
- Data models to represent our world
- **Functions of a GIS**
- Real applications of GIS in Hydrology and Water Resources Management
- Introduction to Assignment 1

Geographical Information Systems

Key functions of a GIS:

- ***Data management***
- Mapping and Visualization
- Geoprocessing



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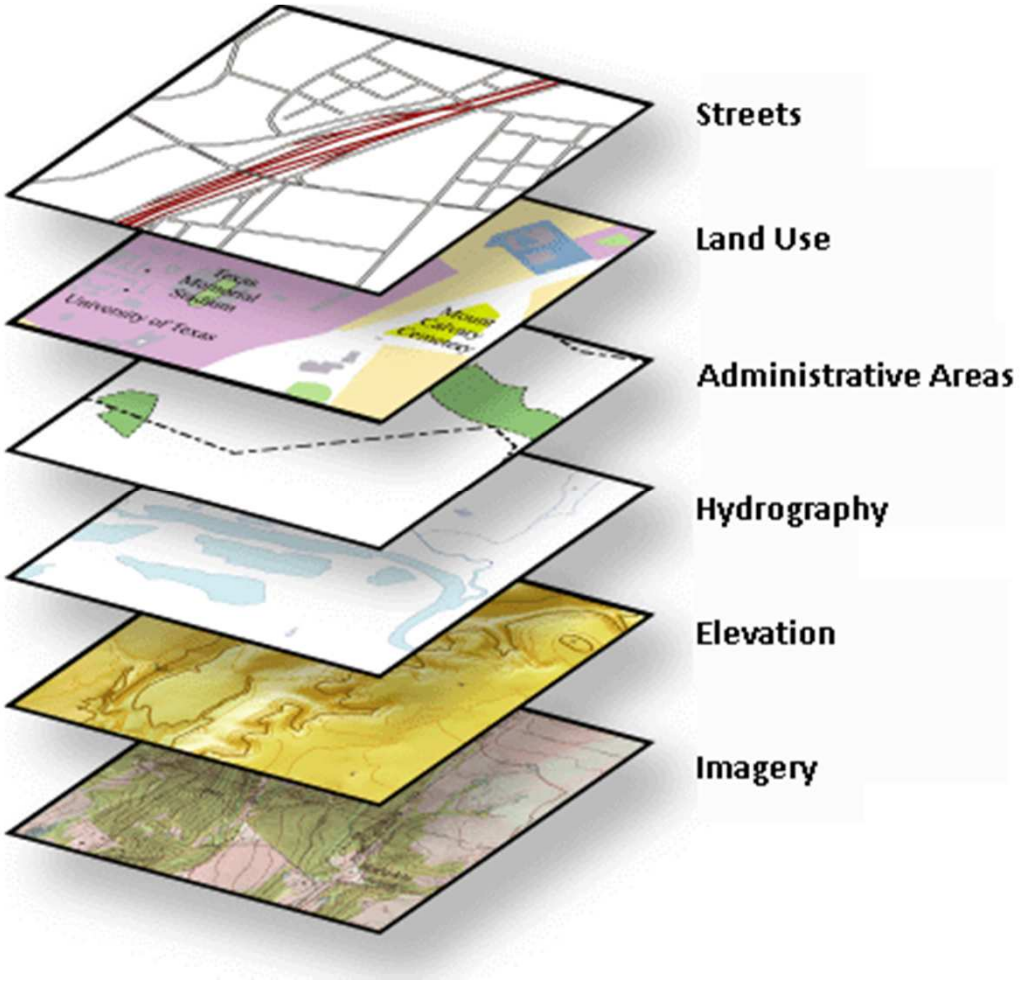
Data management



Maps

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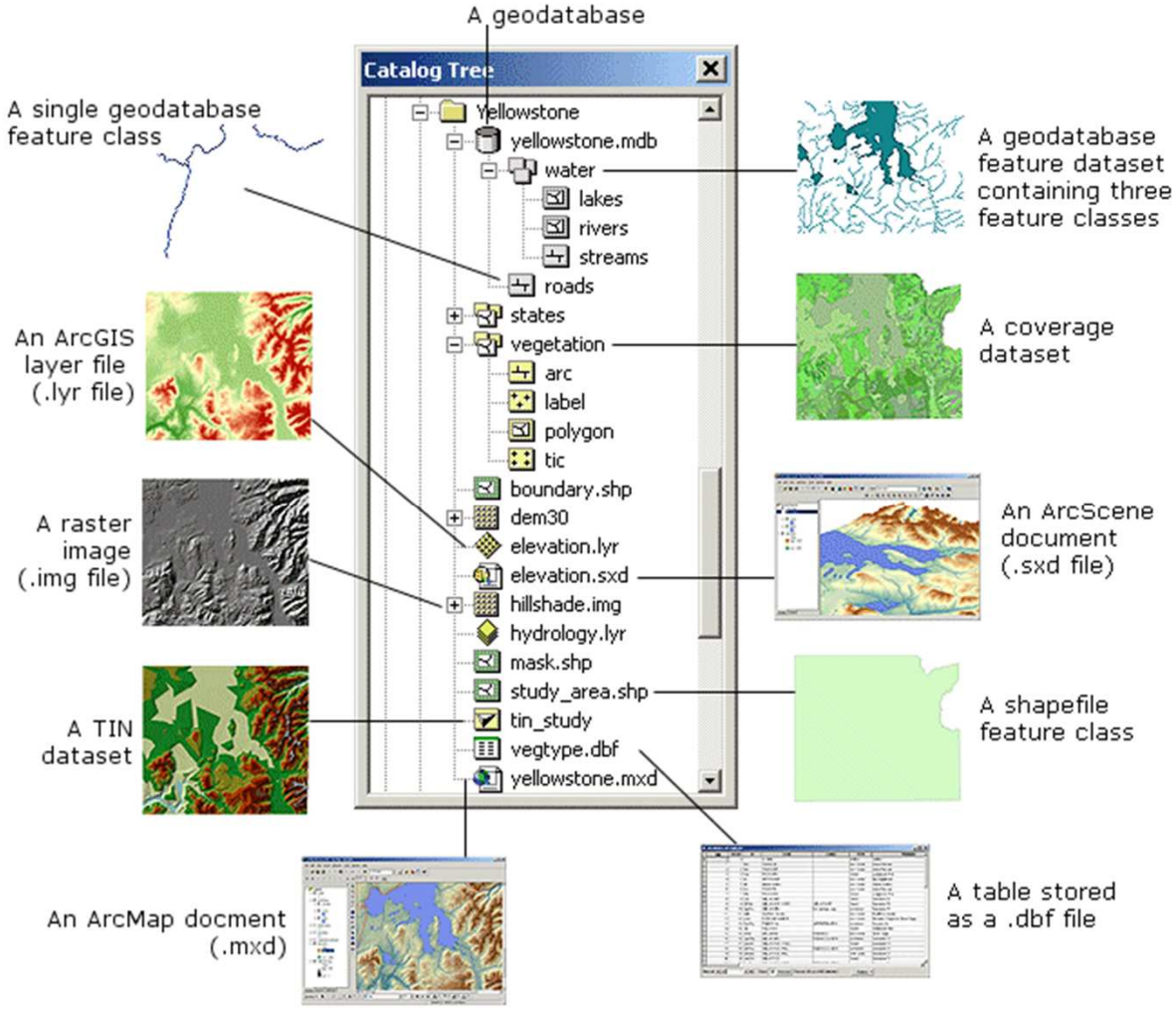
Data Management
ArcCatalog: The Catalog Tree



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Geographical Information Systems

Key functions of a GIS:

- Data management
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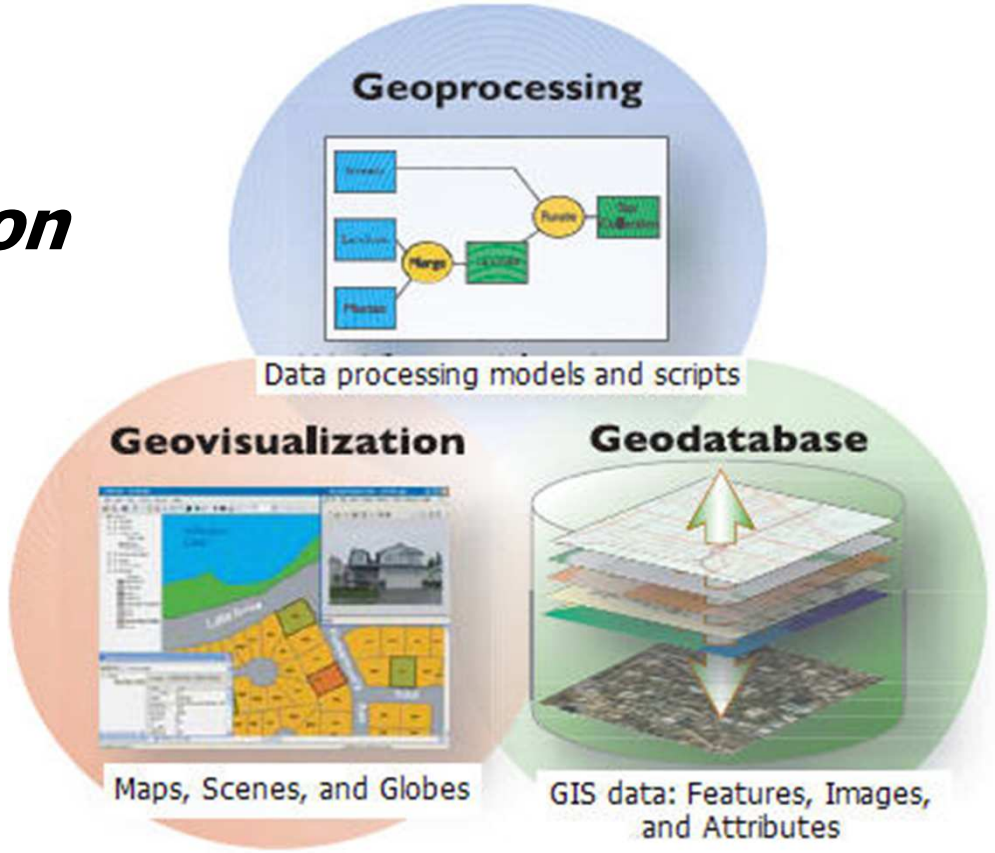

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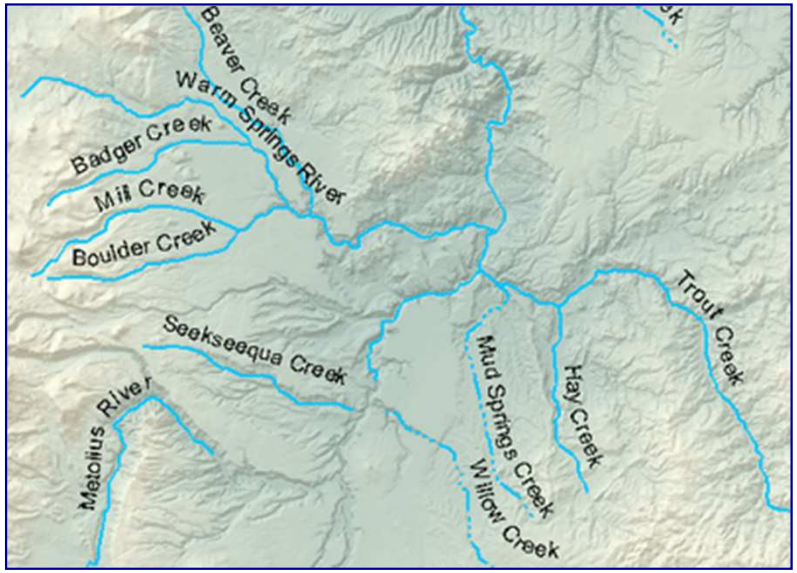
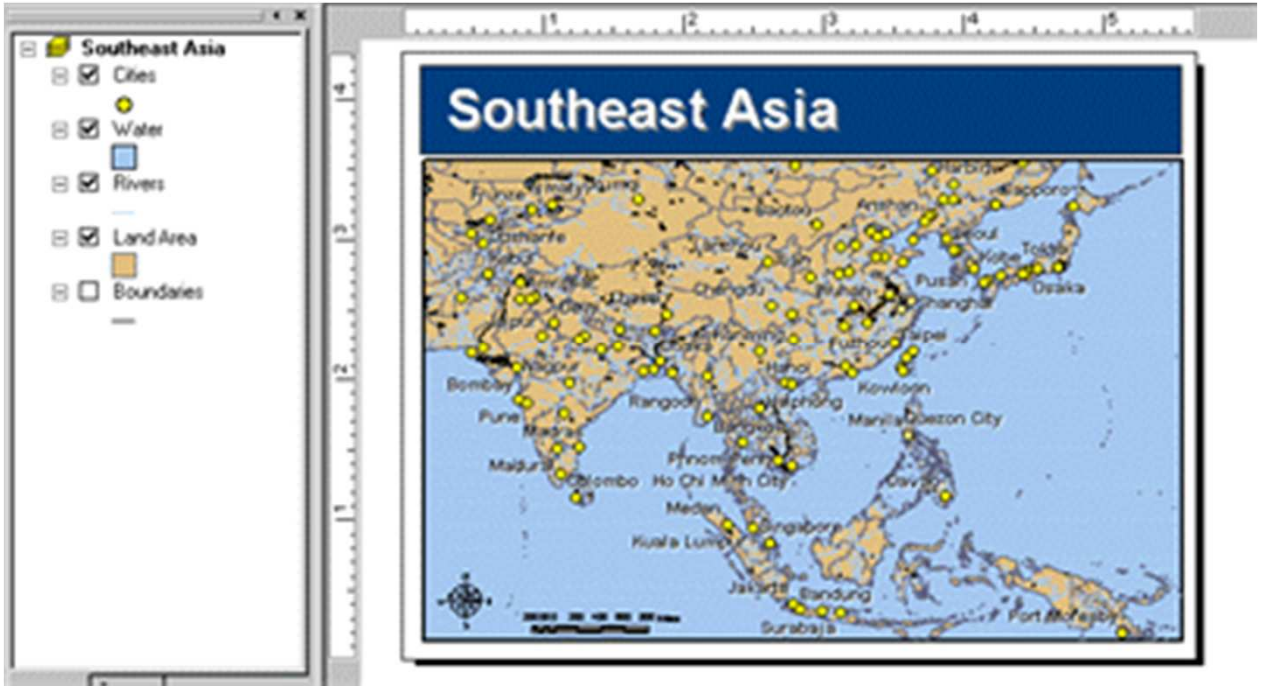
Mapping and Visualization



Single symbol maps



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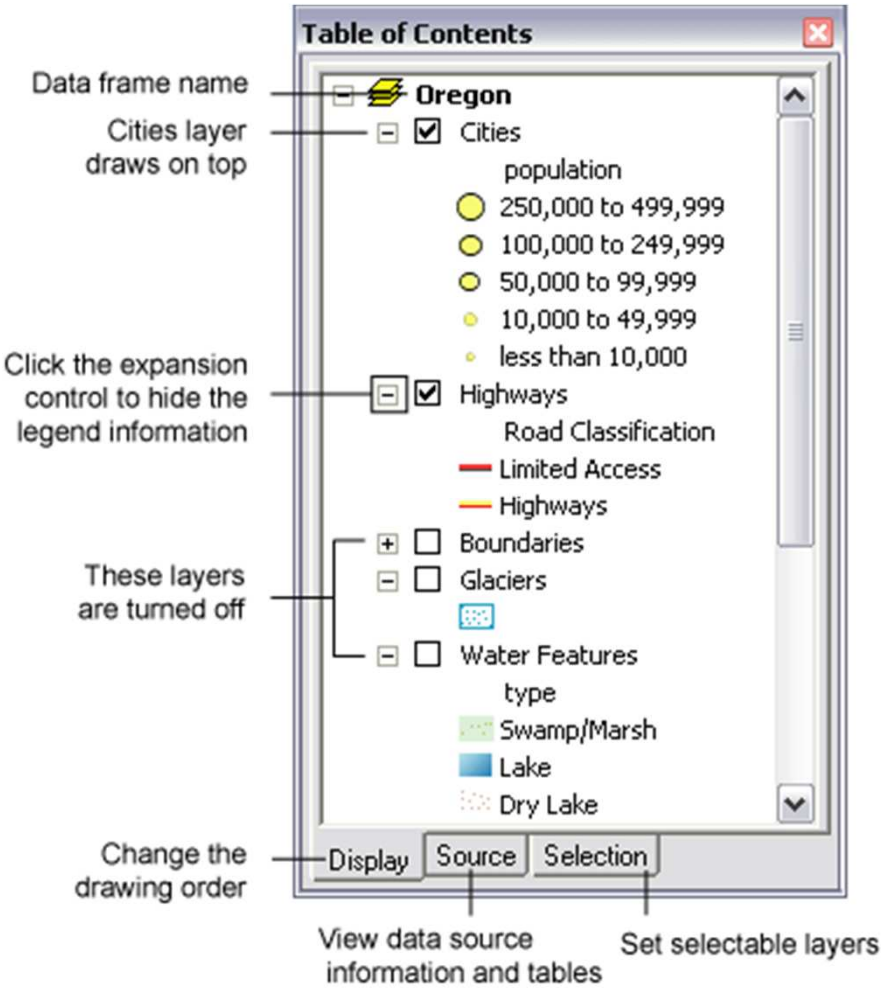
Mapping and Visualization



Symbolizing feature data by attribute

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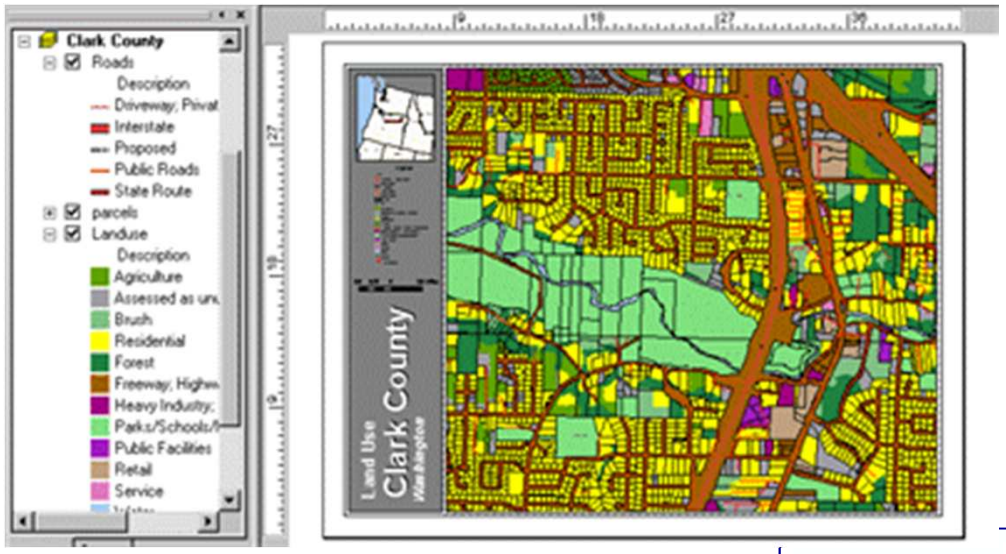
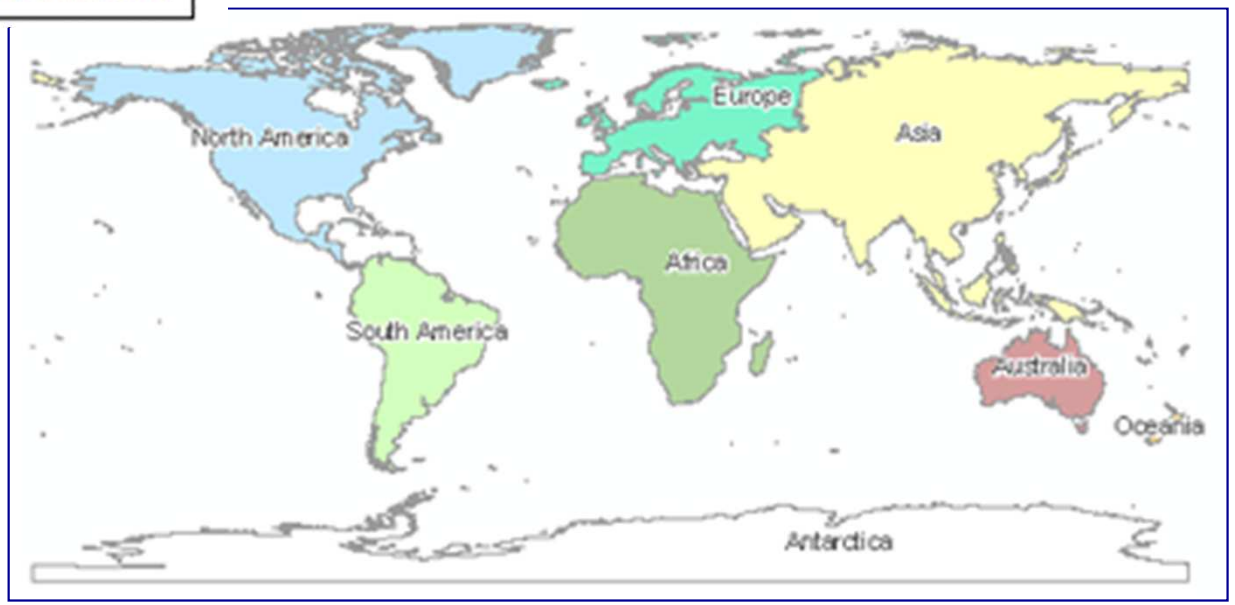
Mapping and Visualization



Symbolizing feature data by attribute (category)



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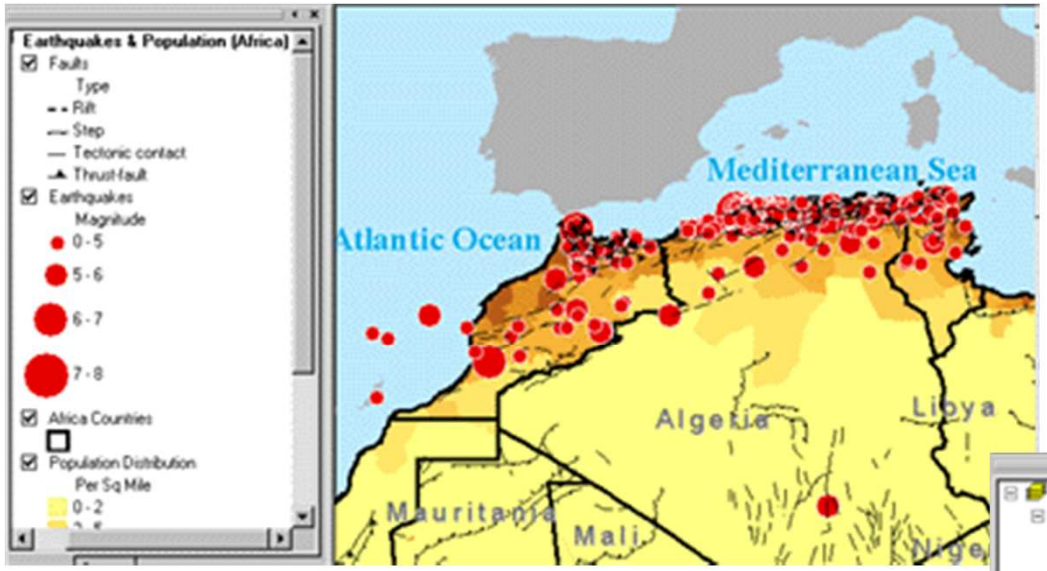
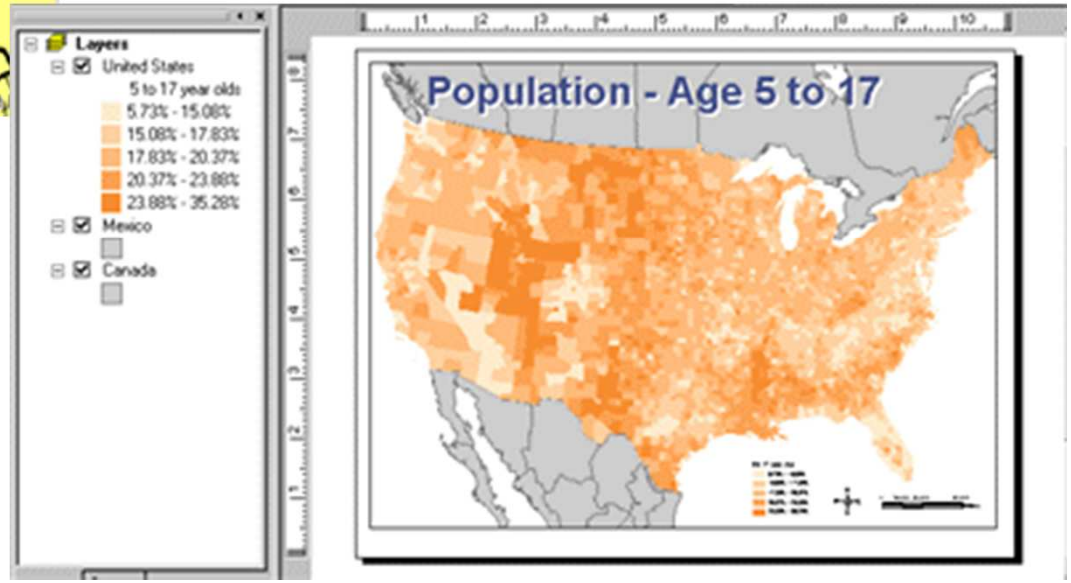
Mapping and Visualization



Symbolizing feature data by attribute (quantity)



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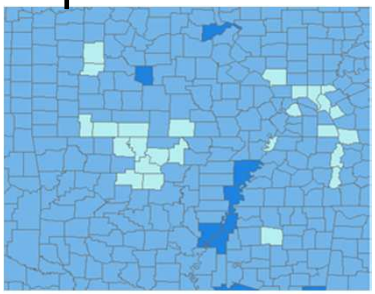
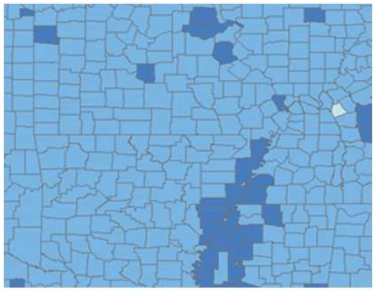
Equal Interval



Percent Population Under 5

- 3% - 6%
- 6% - 9%
- 9% - 12%
- 12% - 15%
- 15% - 18%

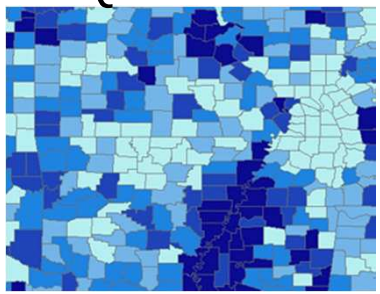
Defined Interval



Percent Population Under 5

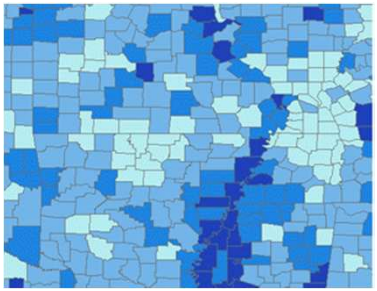
- 3% - 4%
- 5% - 8%
- 9% - 12%
- 13% - 16%
- 17% - 20%

Quantiles



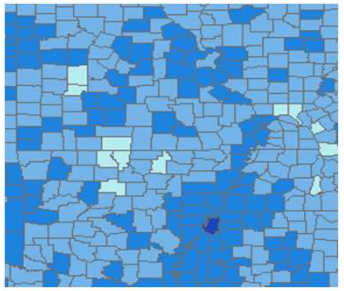
Percent Population Under 5

- 2.7% - 6.3%
- 6.3% - 6.8%
- 6.8% - 7.2%
- 7.2% - 7.8%
- 7.8% - 18%



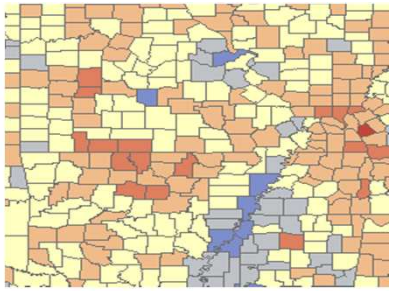
Percent Population Under 5

- 3% - 6%
- 6% - 7%
- 7% - 8%
- 8% - 10%
- 10% - 18%



Percent Population Under 5

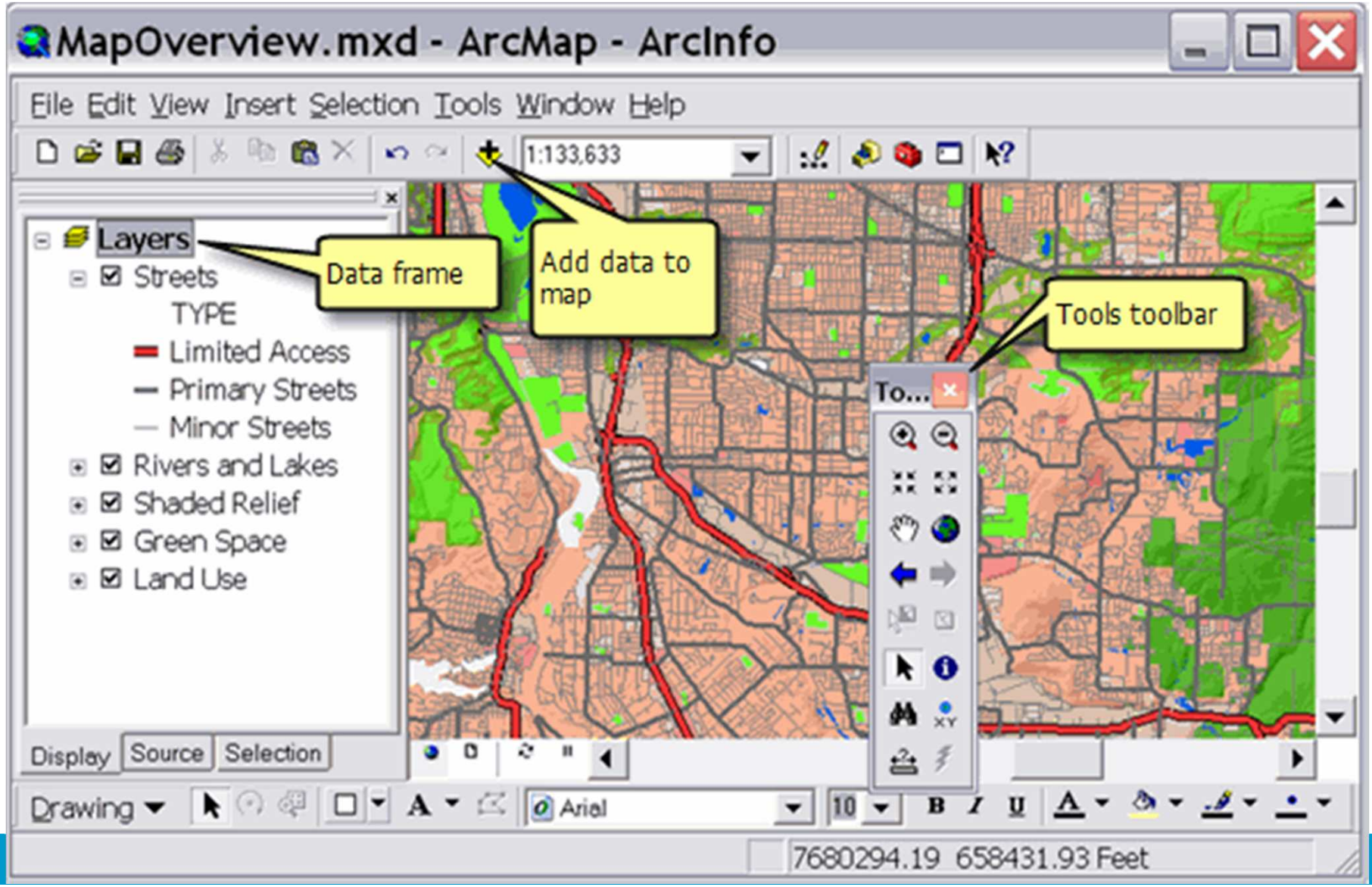
- 2.6539% - 5.1977%
- 5.1978% - 7.0378%
- 7.0379% - 9.5815%
- 9.5816% - 13.0979%
- 13.098% - 17.9589%



Population Under 5 Deviation from Mean

- < -2.5 Std. Dev.
- -2.5 - -1.5 Std. Dev.
- -1.5 - -0.5 Std. Dev.
- -0.5 - 0.5 Std. Dev.
- 0.5 - 1.5 Std. Dev.
- 1.5 - 2.5 Std. Dev.
- > 2.5 Std. Dev.

ArcMap: Data Frame



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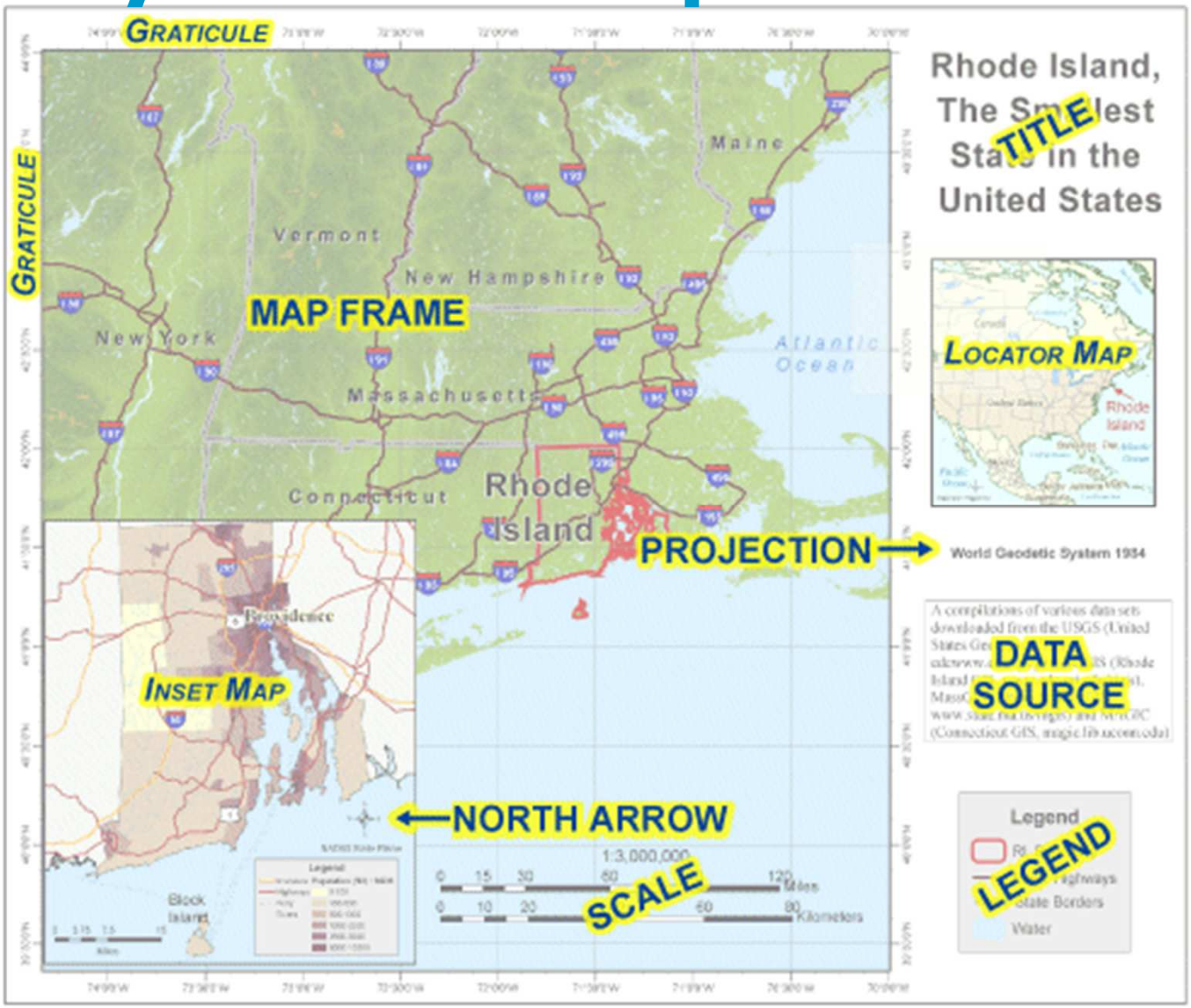
Map layout and composition



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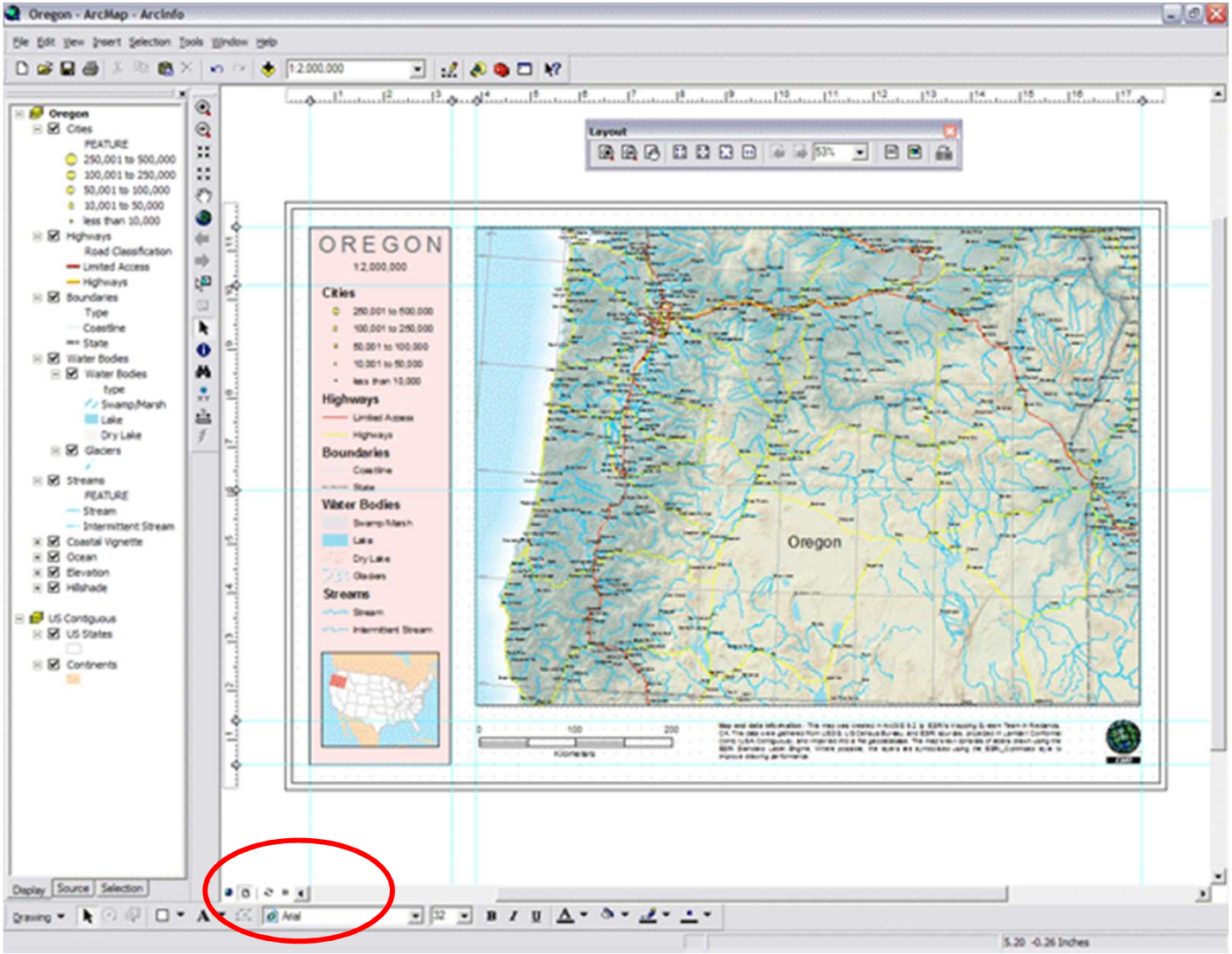
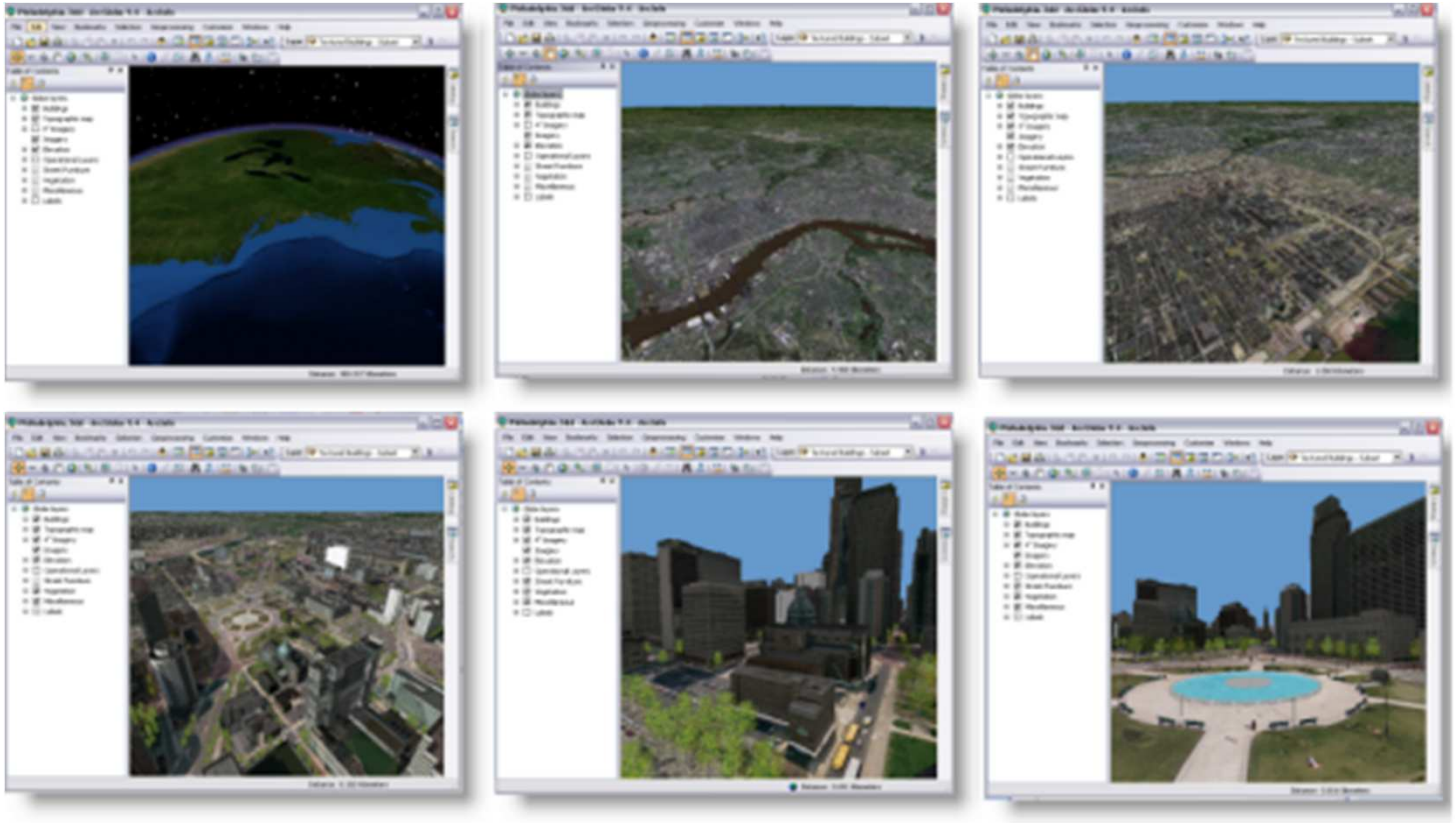
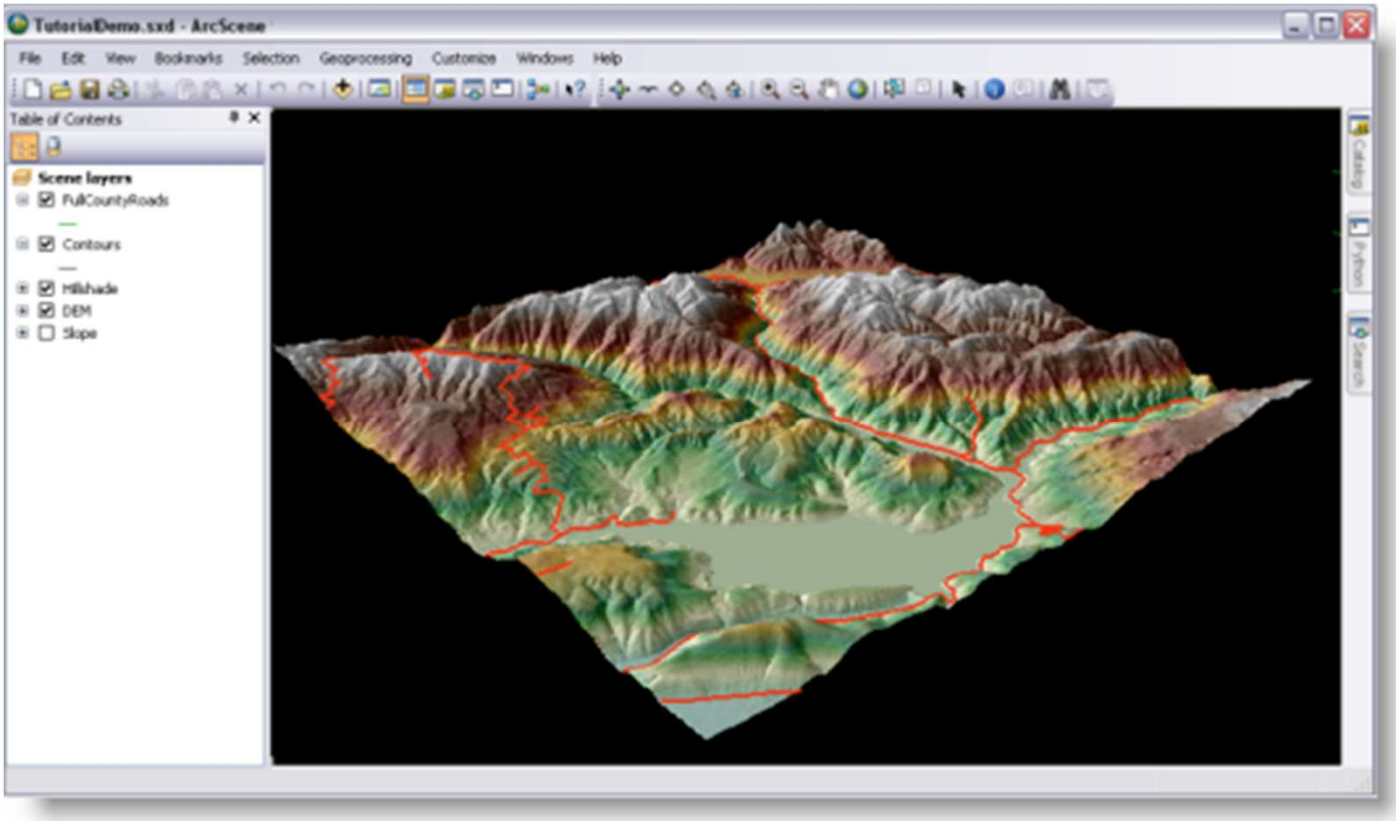
ArcMap: The Map layout



Mapping and Visualization: ArcGlobe



Mapping and Visualization: ArcScene



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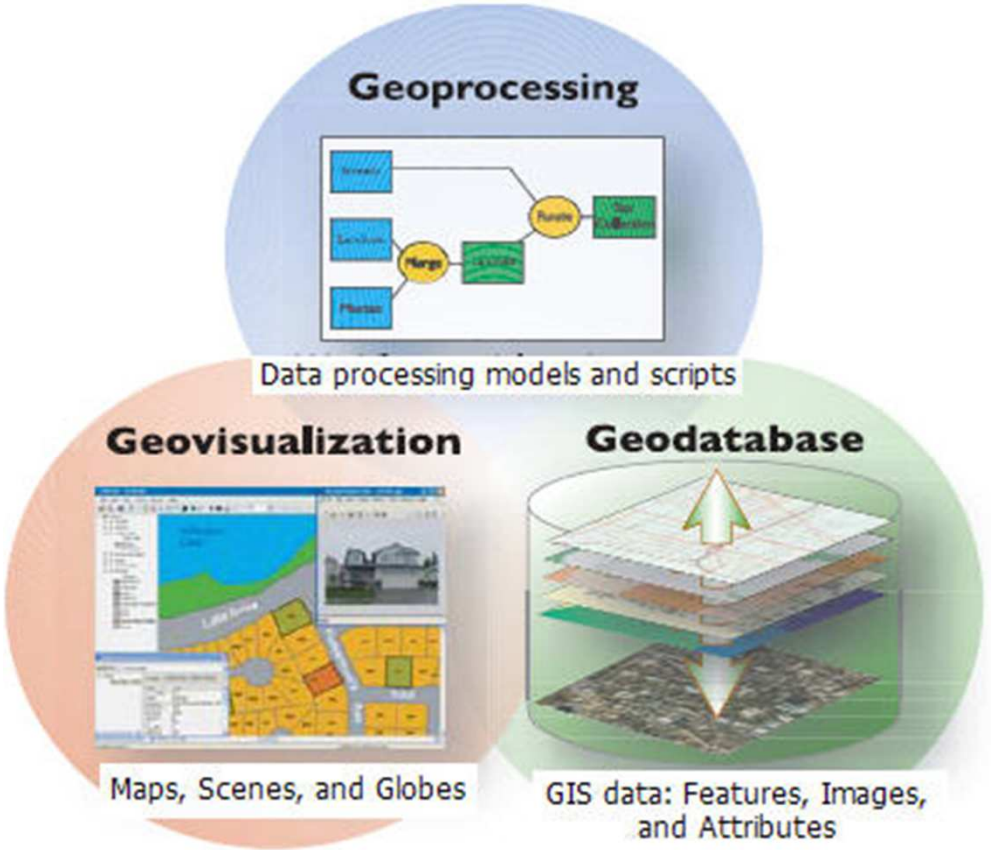
Geographical Information Systems

Key functions of a GIS:

- Data management
- Mapping and Visualization
- ***Geoprocessing***



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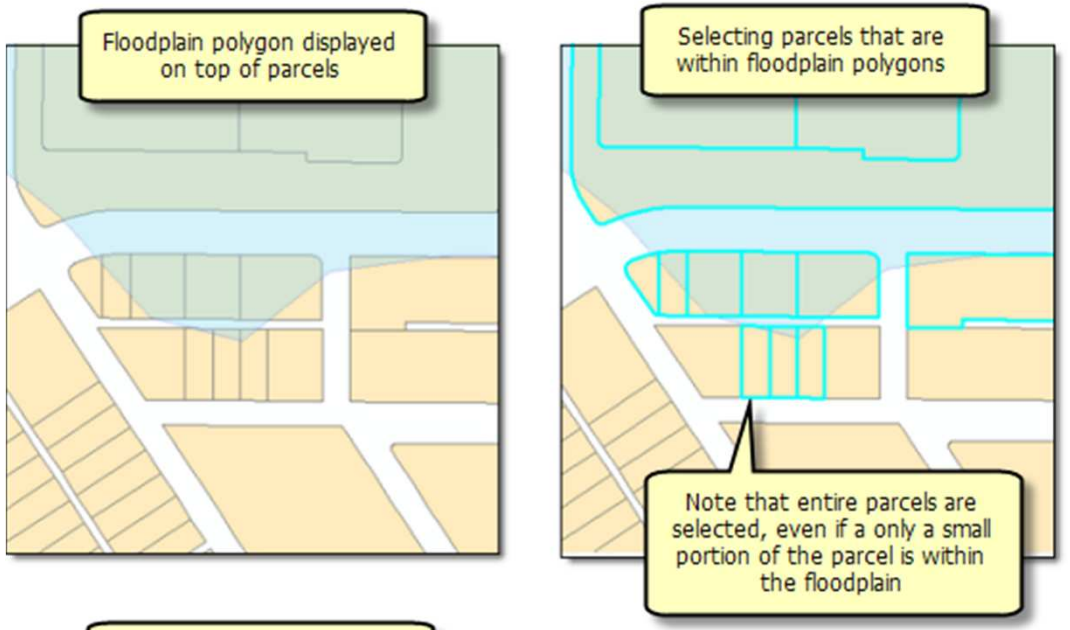
Geoprocessing

Geoprocessing = operating on geographic data to create new information

Goals: 1) To model a system
2) To automate GIS tasks

Geoprocessing: Overlay Analysis



FID_flood	FID_parcels	Landuse	Shape_Area
3	500	PI	1013.98214
3	501	PI	1093.83982
-1	502	PI	335.67542
3	502	PI	1270.8455
-1	503	PI	389.41059

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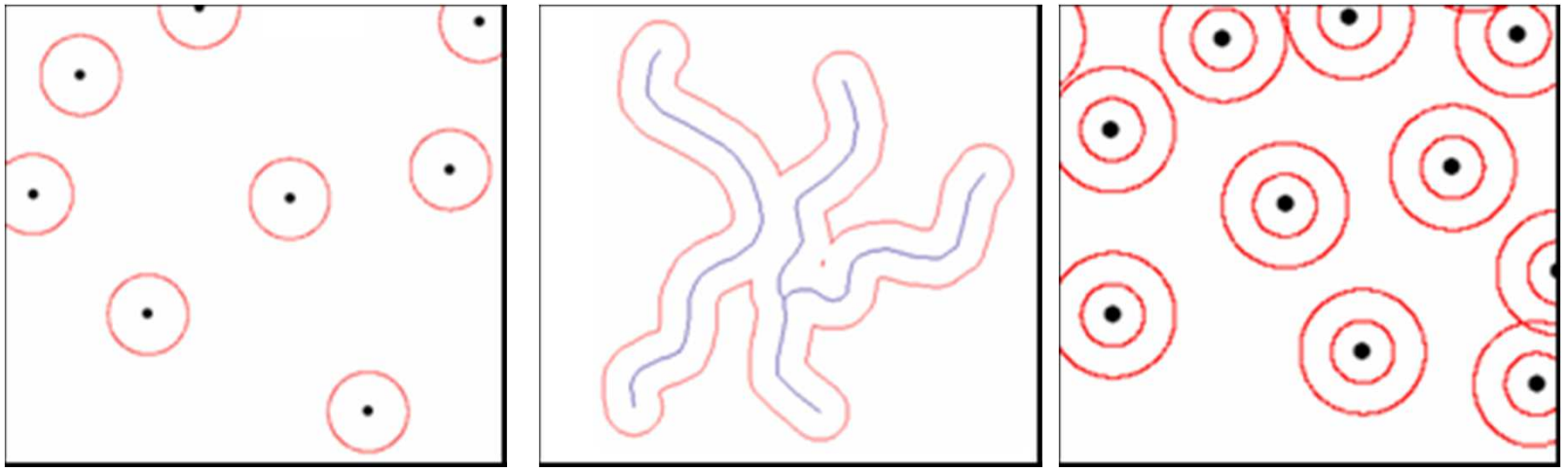
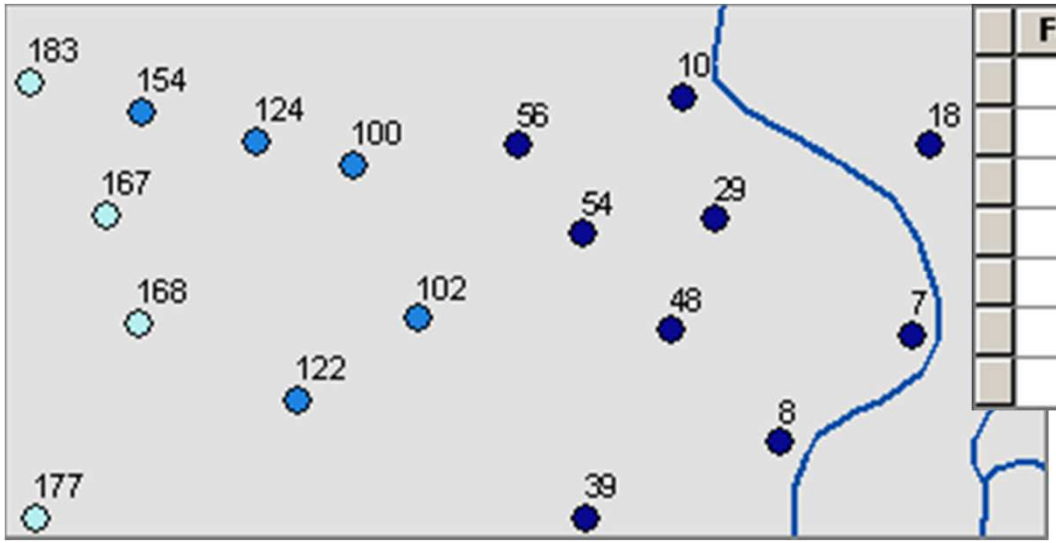
Geoprocessing:Proximity Analysis

Buffer



Near



FeatureID	NearDist	NearAngle
0	56	18.394009
1	122	-31.848772
2	195	-2.41069
3	48	-35.72168
4	105	-13.856518
5	177	-10.703785
6	75	-23.185714

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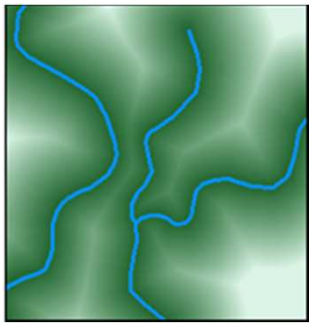
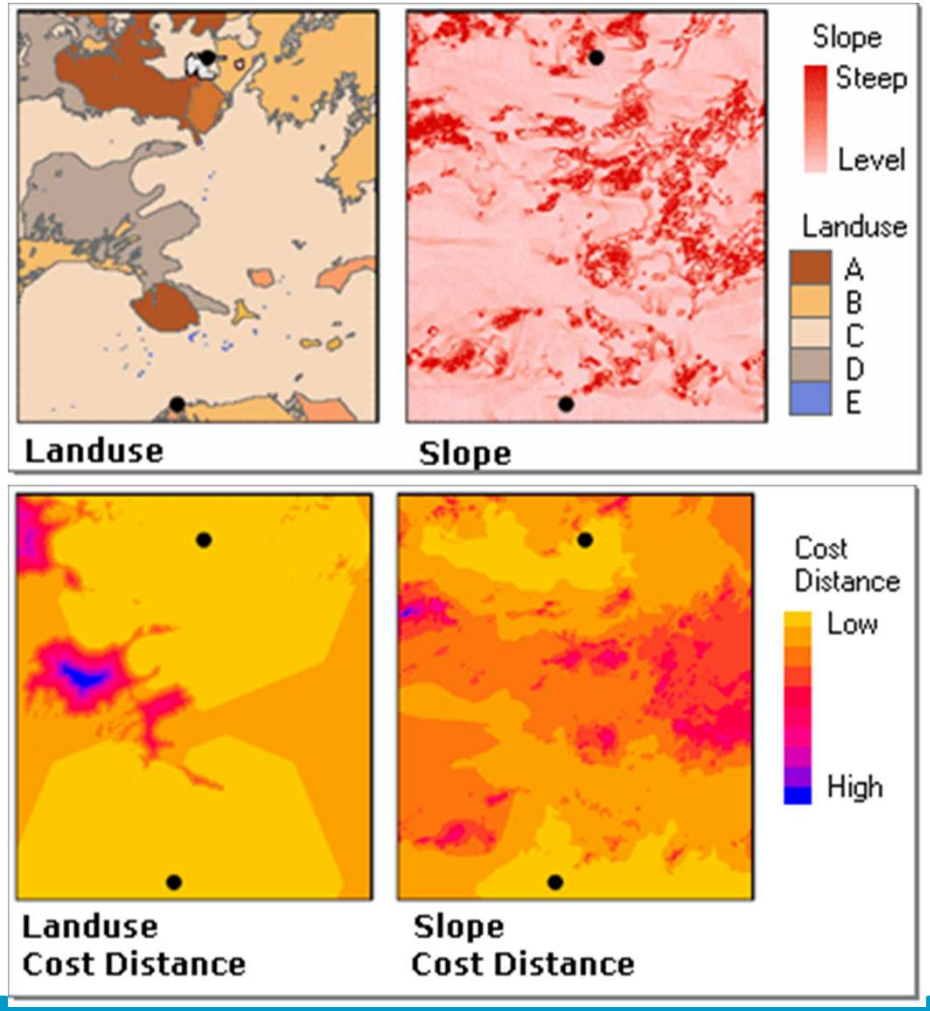
Geoprocessing:Proximity Analysis

Euclidean Distance



Euclidean Allocation

Cost Distance



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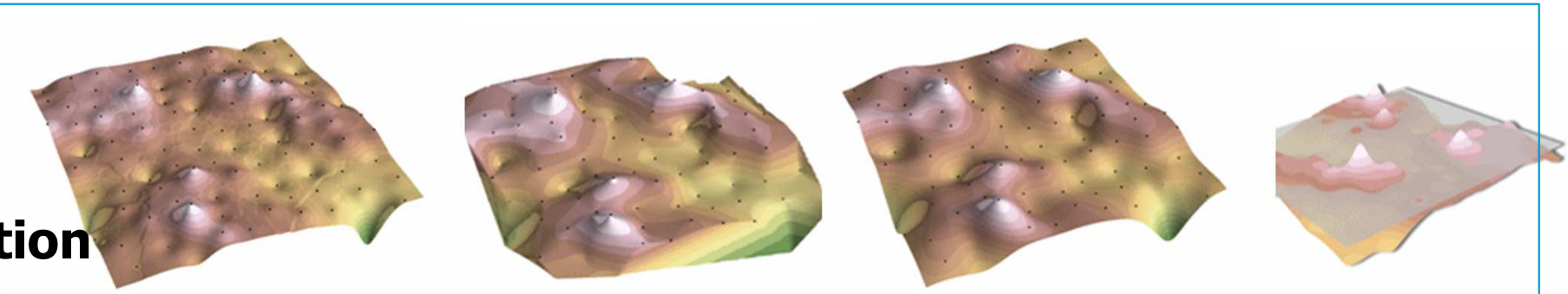
Geoprocessing: Surface creation & analysis

Interpolation



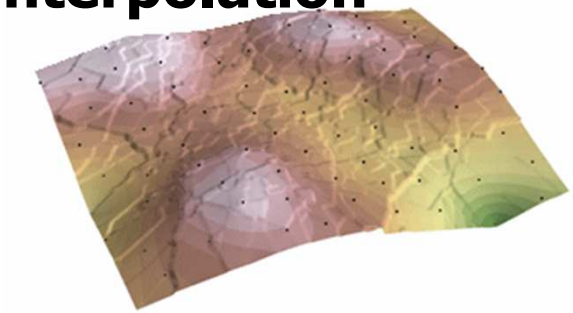
Inverse distance weighted

Natural neighbours

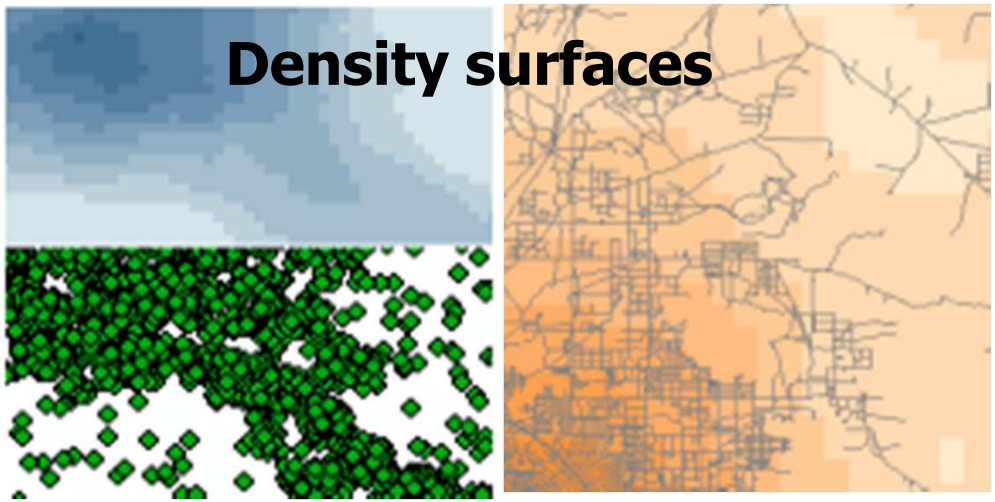
Spline

Trend

Geostatistical Interpolation



Density surfaces



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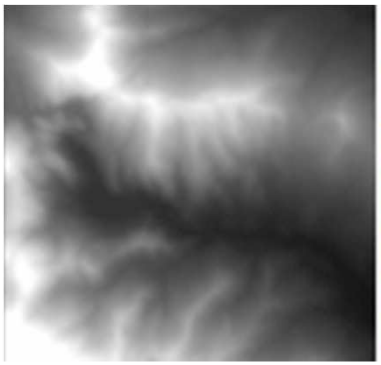
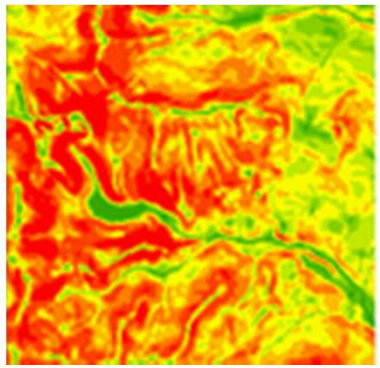
Geoprocessing: Surface creation & analysis

Terrain Analysis

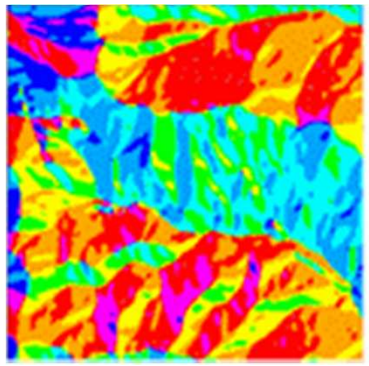
Elevation



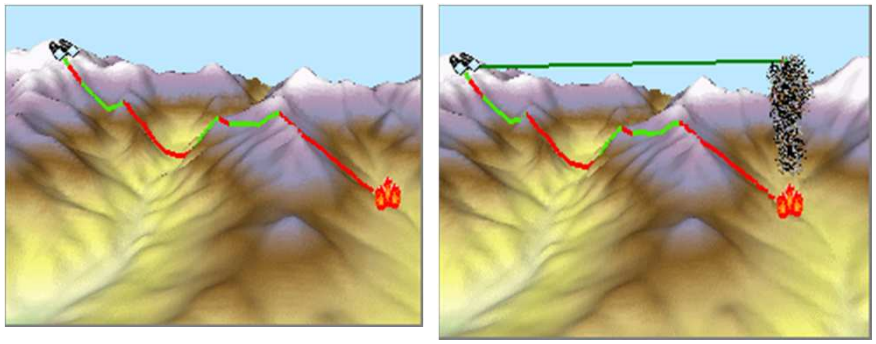
Slope



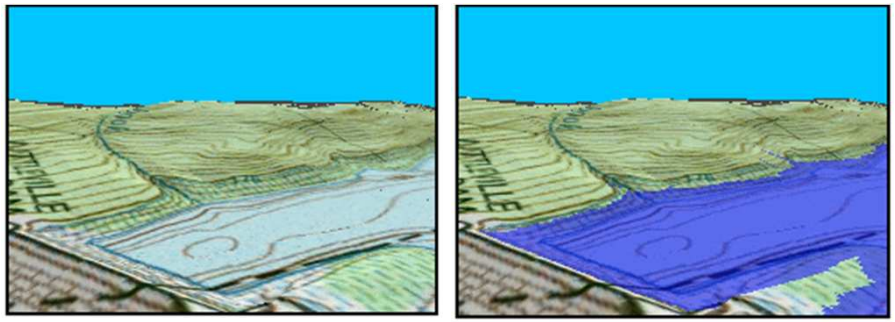
Aspect



Visibility tools



Volume tools



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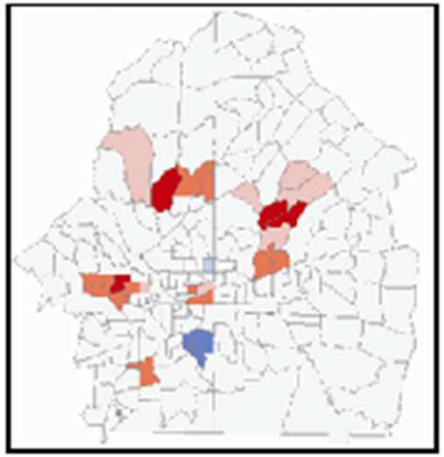
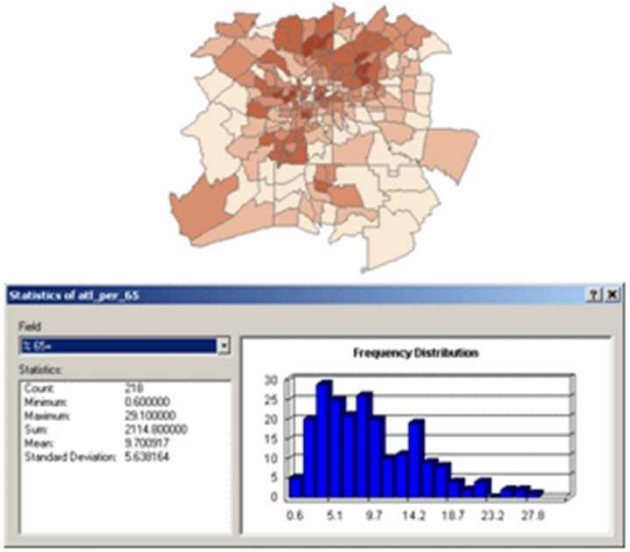
Geoprocessing: Statistical Analysis

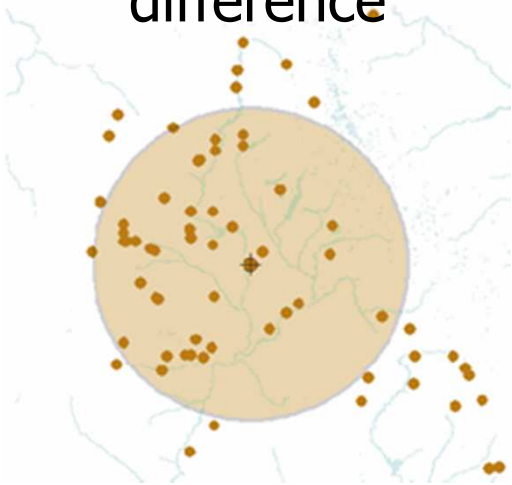
Statistical significance



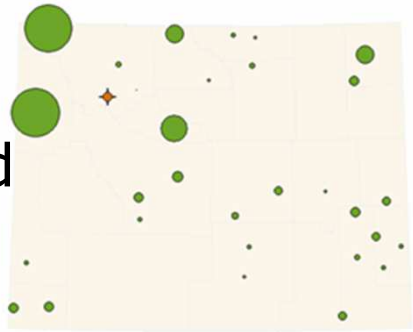
Summary statistics and histogram



Standard difference



Weighted spatial statistics



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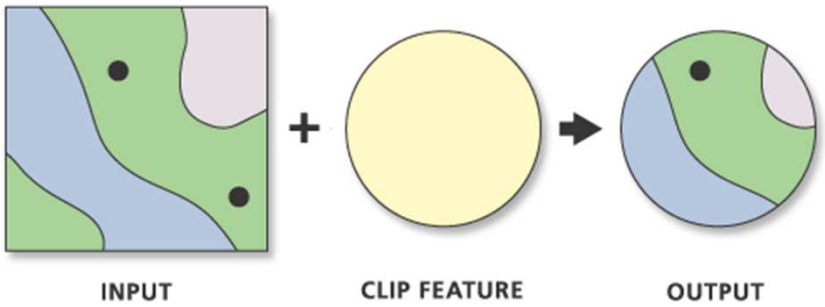
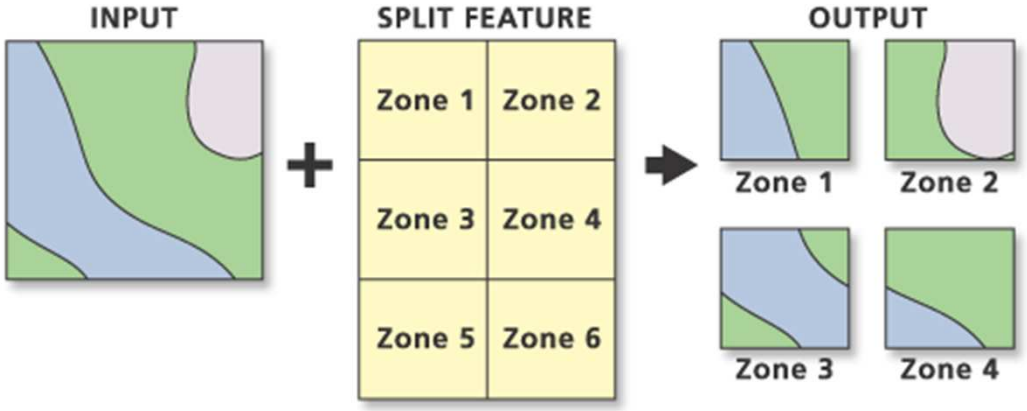
Geoprocessing: Selecting and Extracting

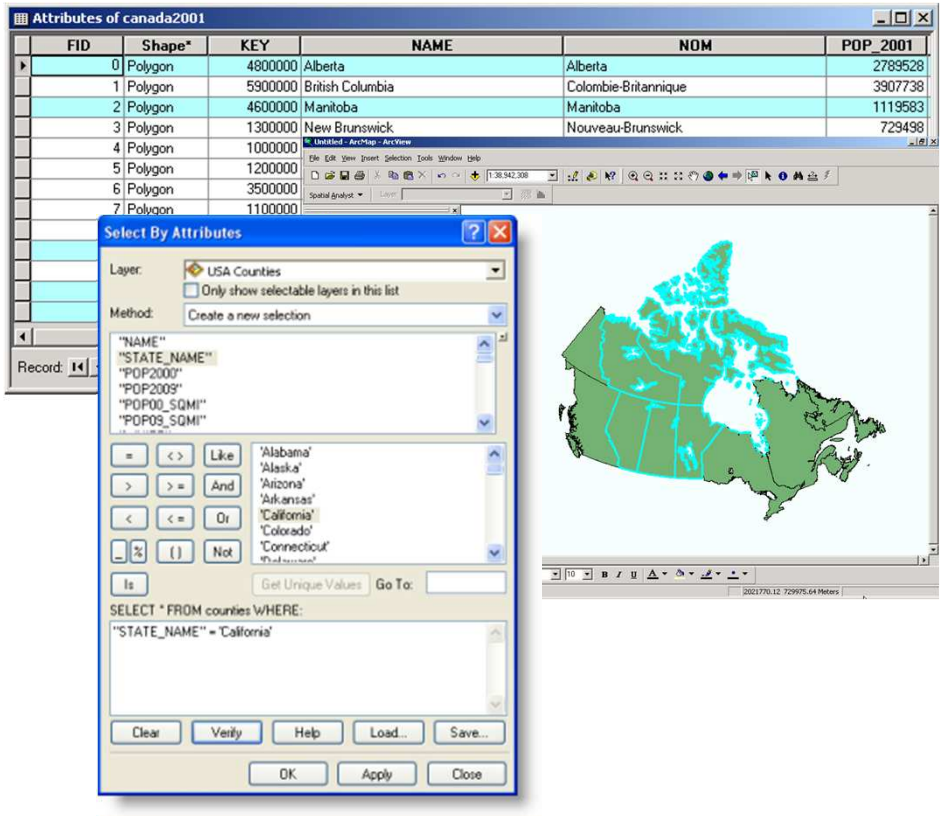
Clip



Split



Select (by Attribute or location)



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Activity: GIS data models for Water Resources Management

For your task:

1) **Think of a "big" problem that could be solved using GIS. (Finding a location for something, designing a new piece of infrastructure, minimizing damage due to some event)**
2) **What are the steps involved in solving your problem?**
3) **Are there any tools that you've seen today that might be helpful?**

3 minutes -	Think by yourself and make a list
10 minutes –	Combine your list with the rest of your group and brainstorm
15 minutes -	Share results with whole class. Do they have any additional suggestions?

(Each group appoint someone to write notes, and someone to present to whole class)

GIS in Hydrology and Water Managment

Using Delft-FEWS and Quantum GIS for flood forecasting in the Rhine

Jan Verkade,
Water Resources Management, TU Delft
& Deltares

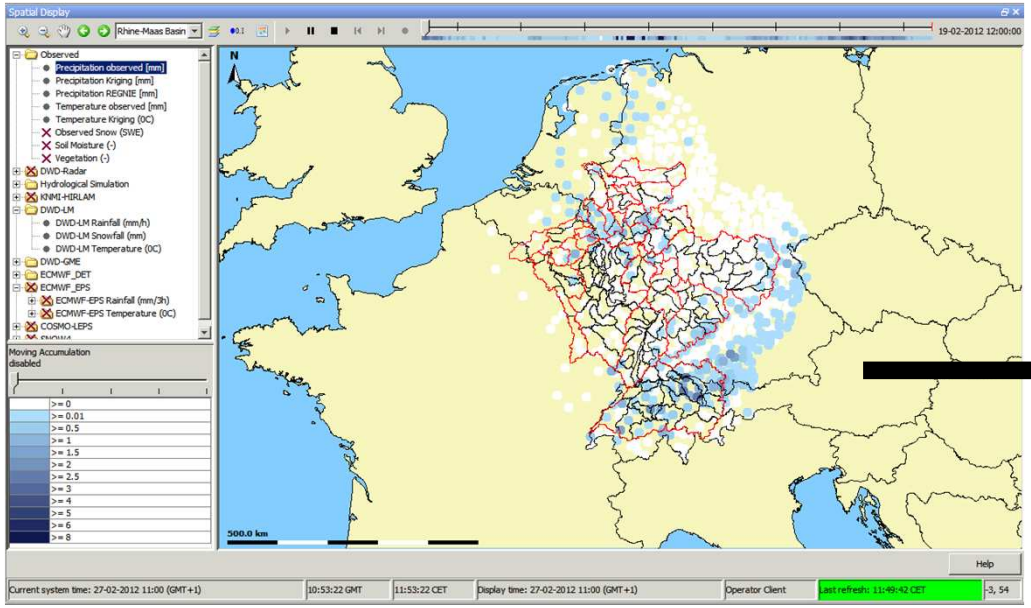
Deltares
Enabling Delta Life

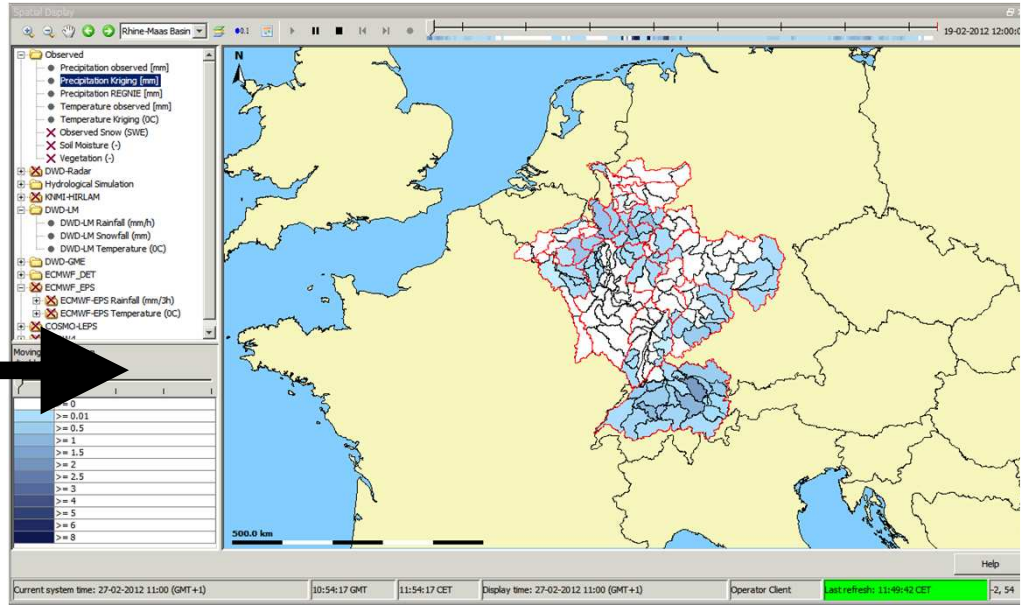
TU Delft

Interpolation of point data in Delft FEWS

Input:
Precipitation data at stations

Output:
Precipitation data for each HBV sub-basin





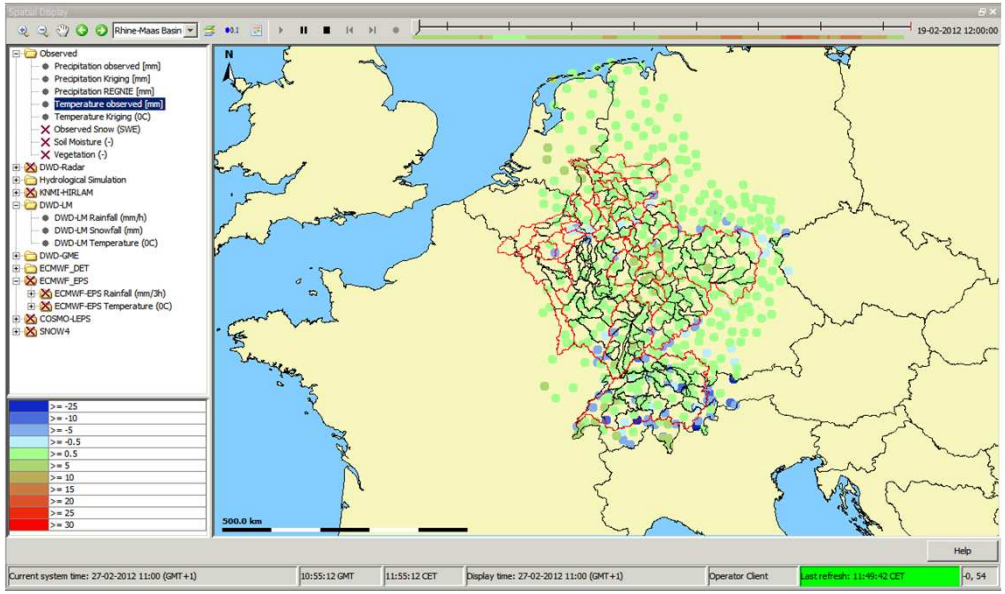
Deltares
Enabling Delta Life

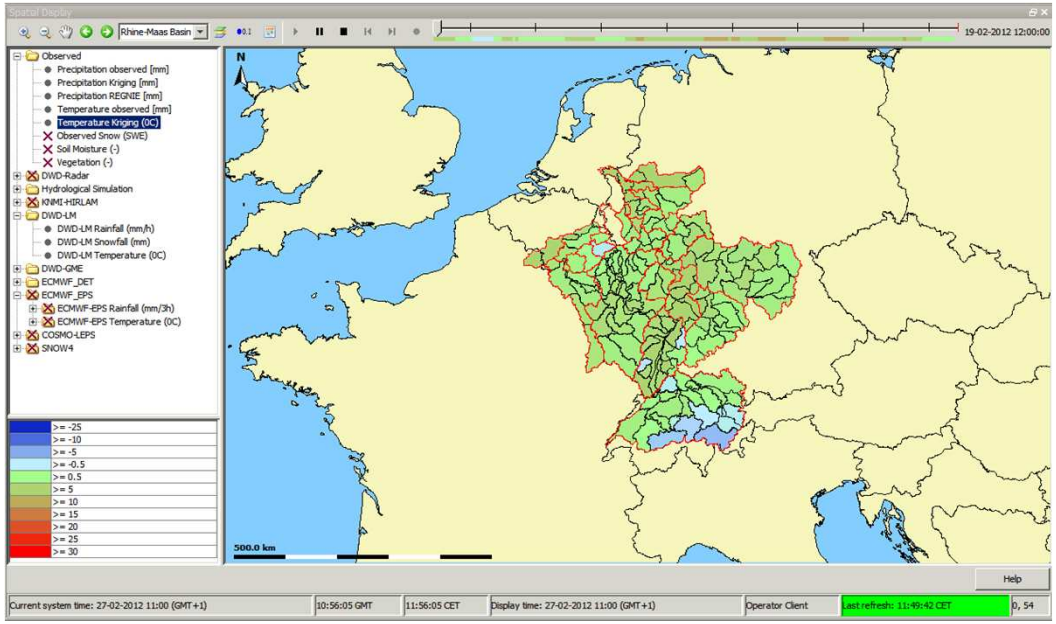
TU Delft

Interpolation of point data in Delft FEWS

Input:
Temperature data at stations

Output:
Temperature data for each HBV sub-basin





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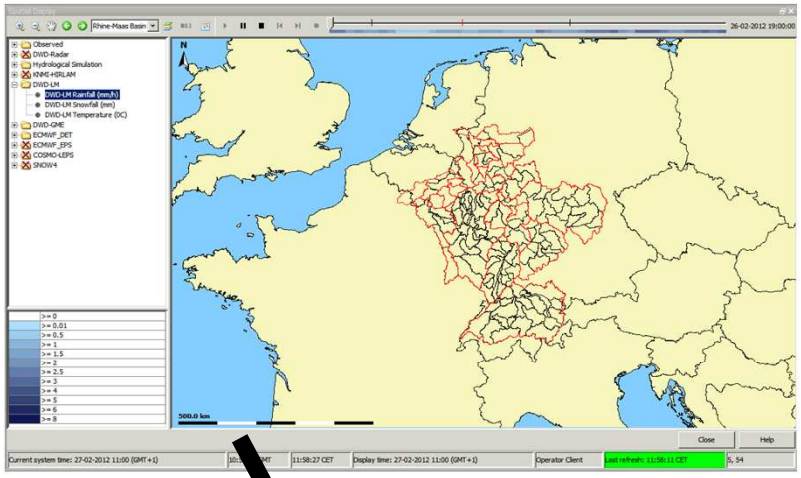
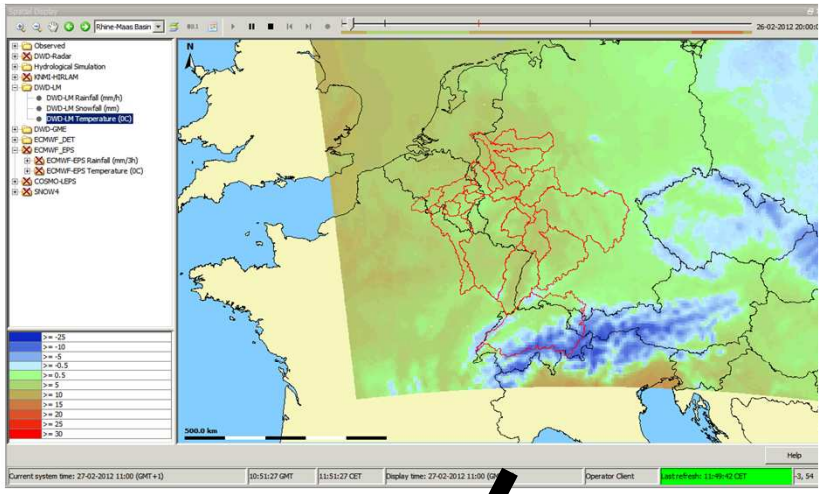
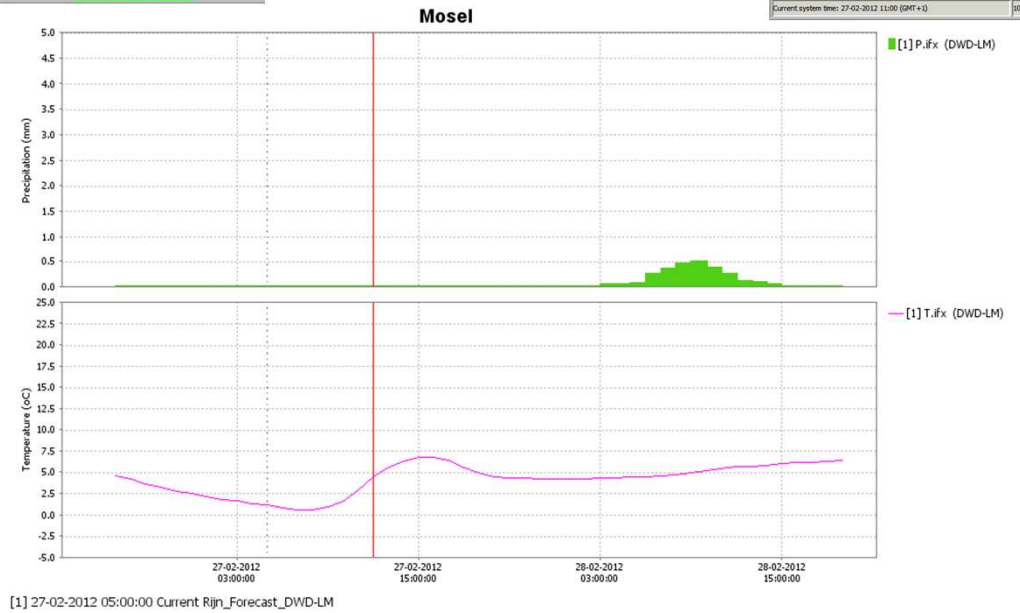
Simulation in Delft-FEWS







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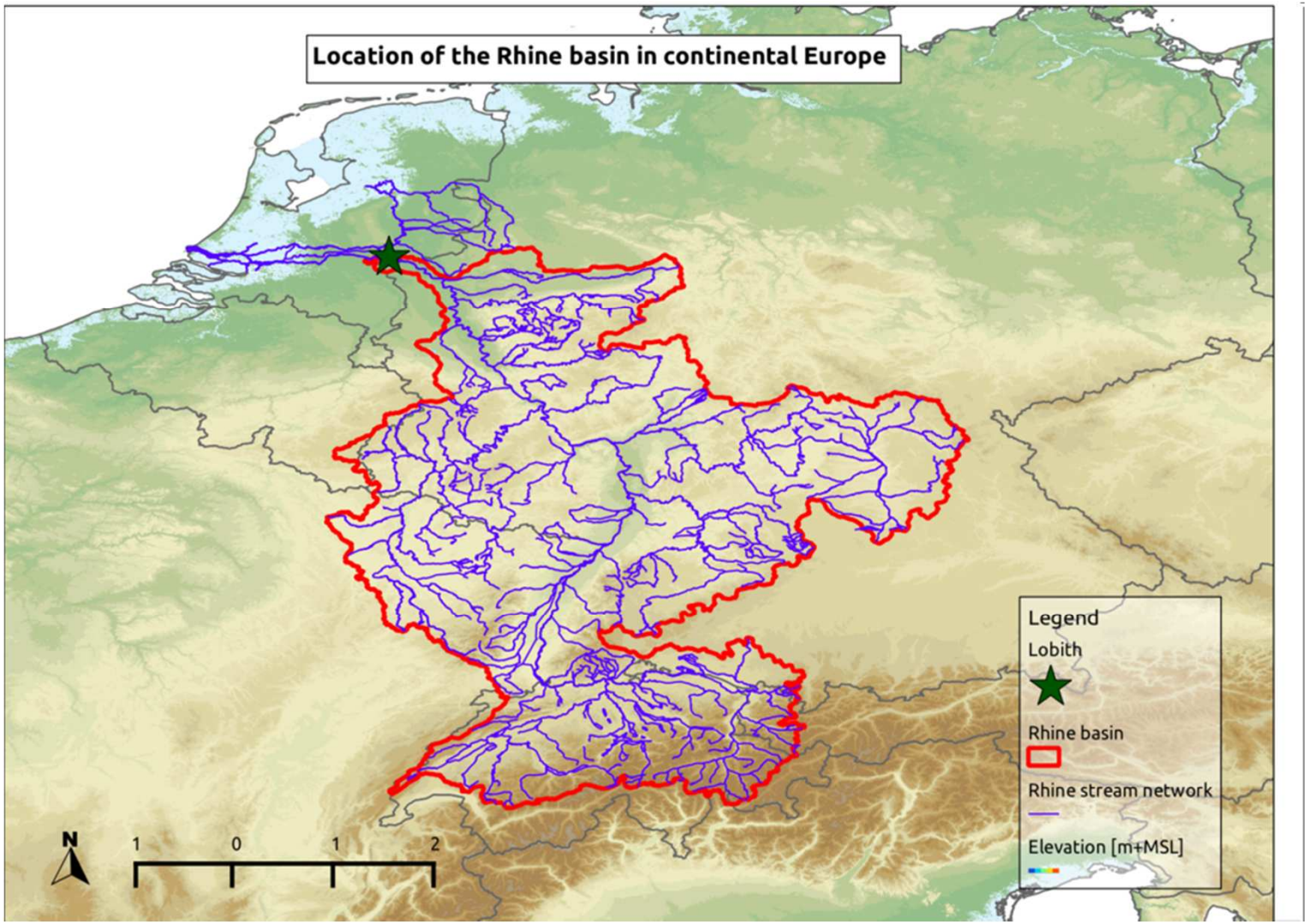
Visualization using Quantum GIS



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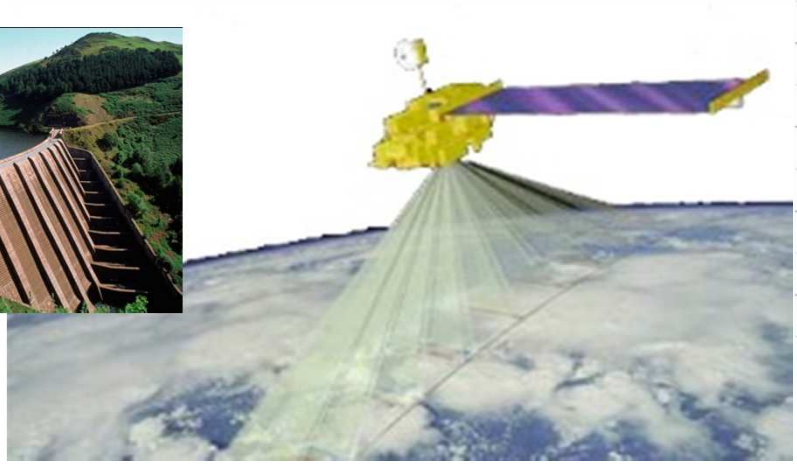
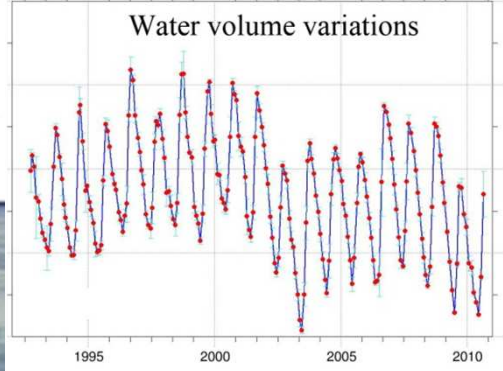
[2]

[3]





[4]

GIS in Hydrology and Water Management

Estimating water volume variations in lakes and reservoirs using satellite altimetry and imagery data

Zheng Duan,
Hydrology, TU Delft

TU Delft

Introduction

Water volume variation is important

- availability for water allocation
- hydrological and climate change studies

Lack of in-situ data

- In-situ water levels
- Bathymetry map

Remote sensing offers global data

- Satellite imagery data → water surface areas
- Satellite altimetry data → water levels

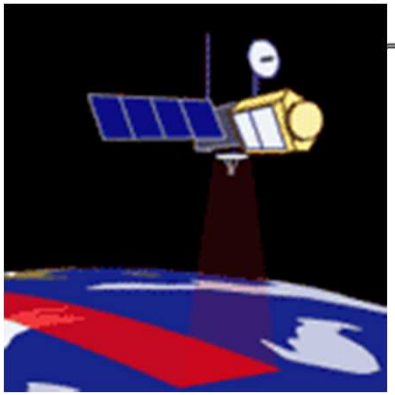
[5]

Basic Principle of Satellite Altimetry

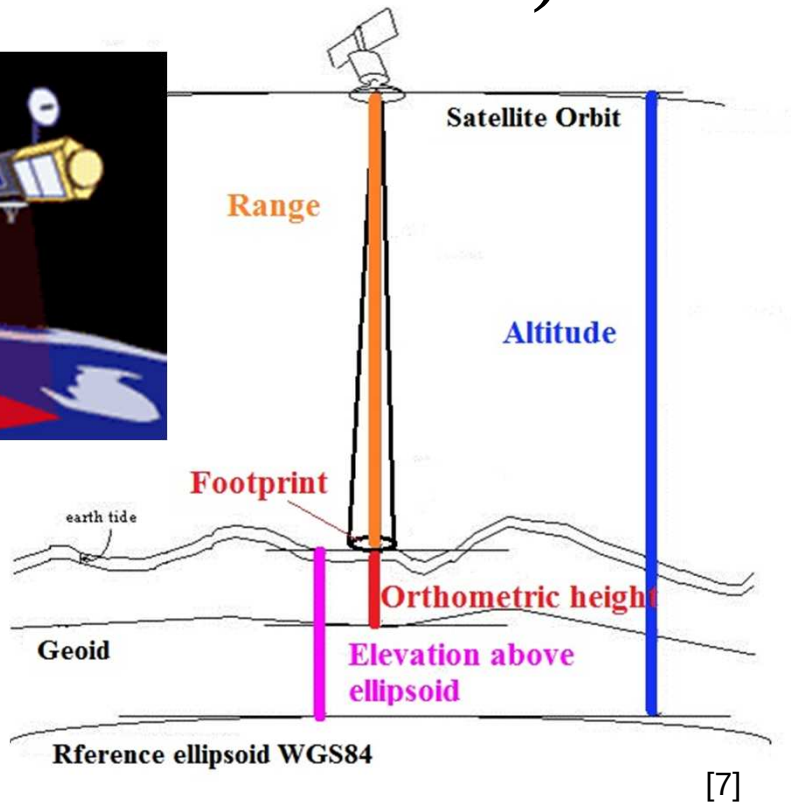
Height =Altitude - Range(corrected)

Range (distance between satellite and water surface)

- Altitude of satellite
- Height



[6]



[7]

Finally time-series of water levels can be obtained from satellite altimetry

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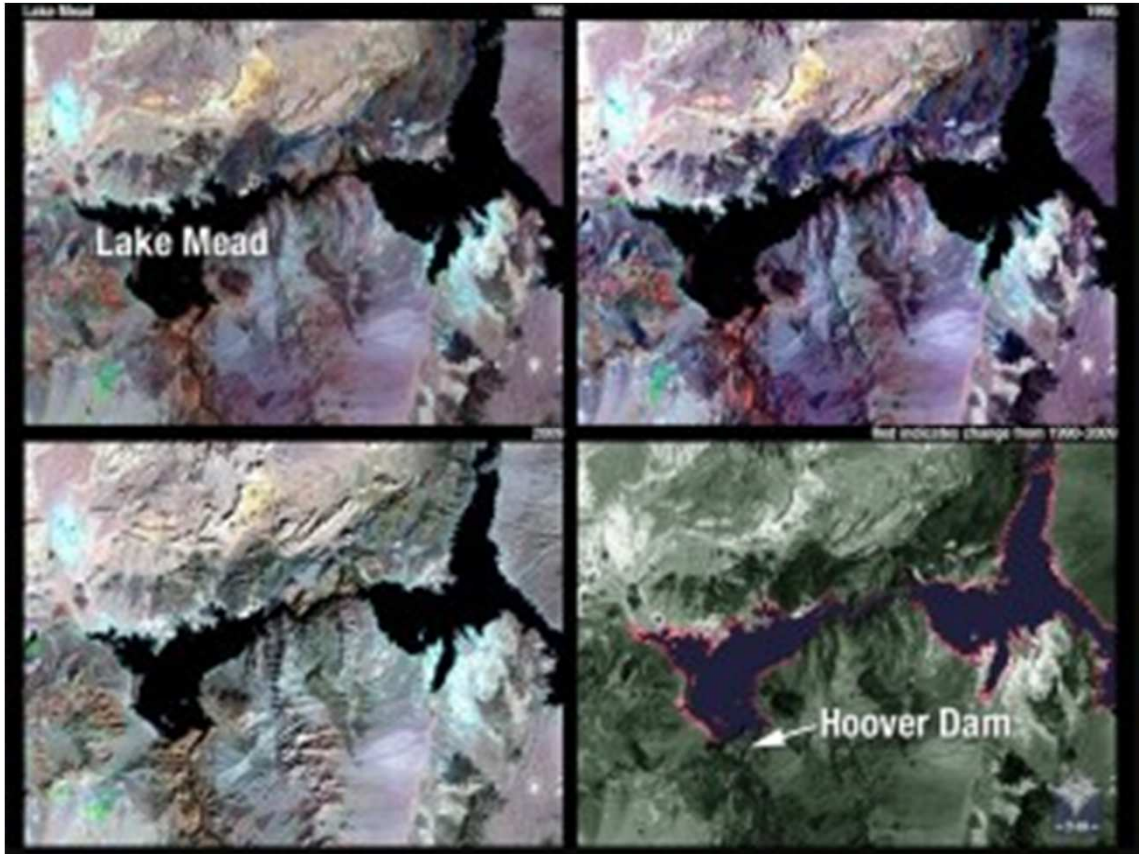
Method: Land Classification using Landsat bands



Credit: NASA/USGS

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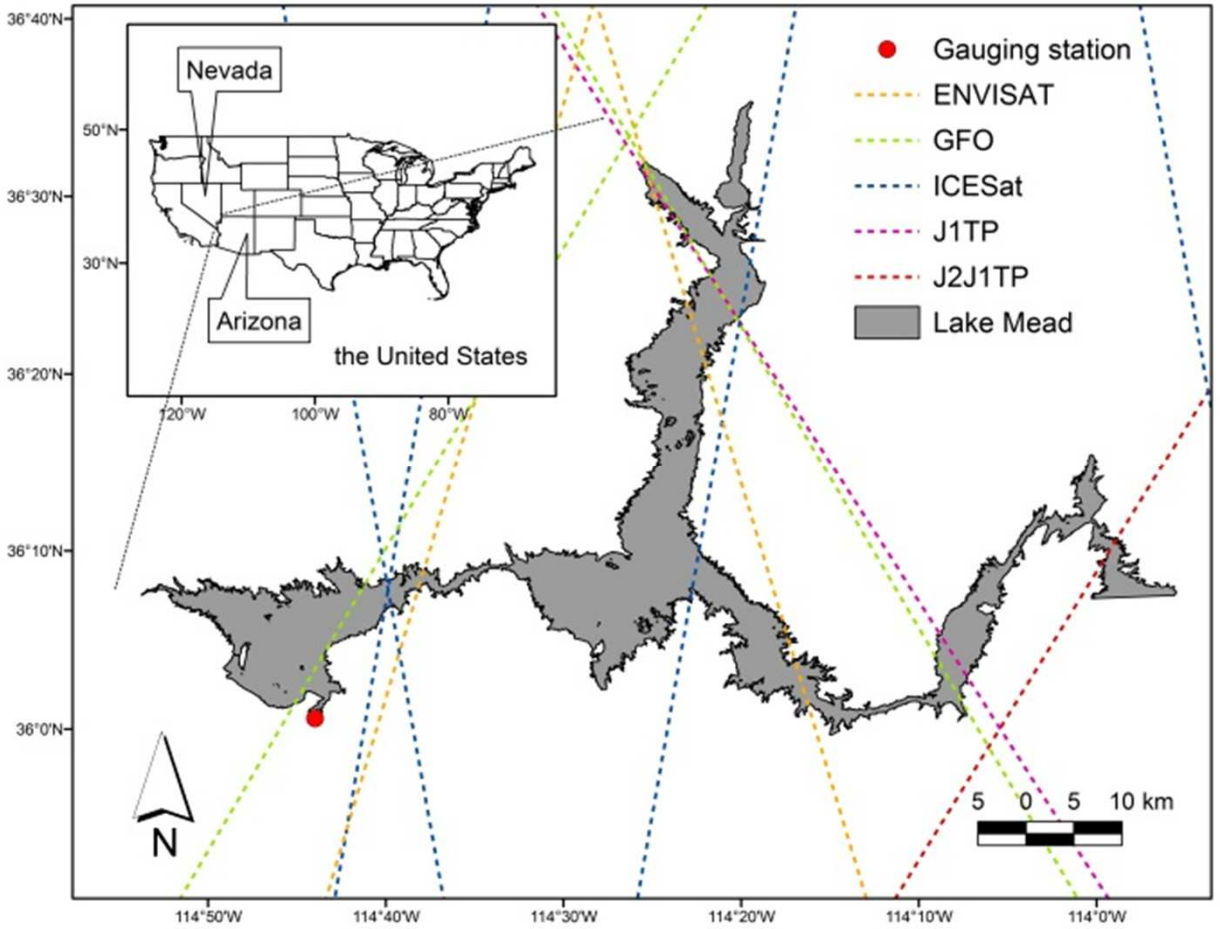
Study area: Lake Mead



Characteristics	Lake Mead
Country	The U.S.A
Latitude	52° 31′-53° 05′N
Longitude	5° 02′-6° 00′E
Maximum Length (km)	180
Maximum width (km)	13
Length of shoreline (km)	890
Maximum depth (m)	150
Mean depth (m)	69
Lake area (km^2)	640
Water volume (km^3)	35.2

In Figure: ENVISAT,GFO, ICESat, J1TP and J2J1TP are flying tracks for different satellite altimetry missions

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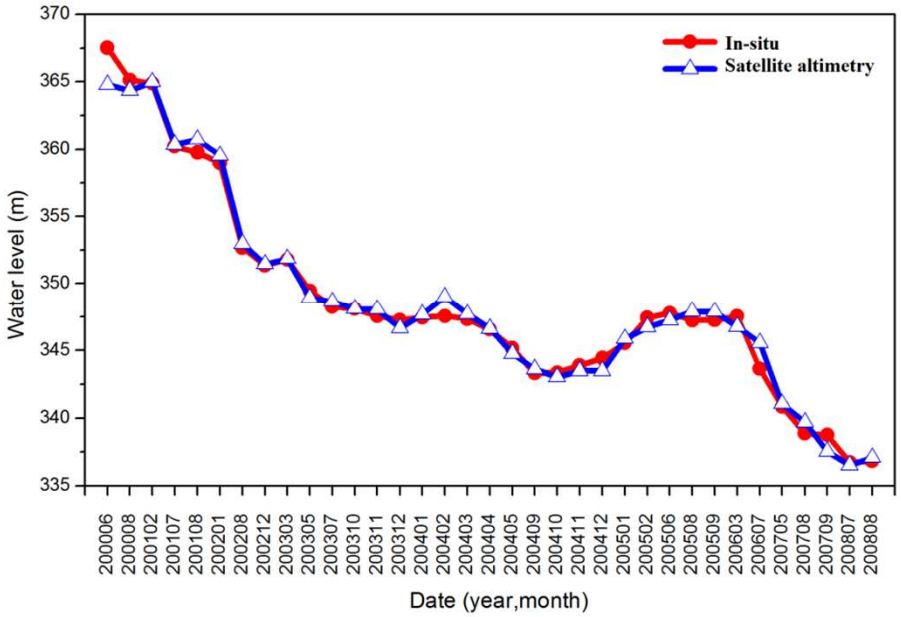
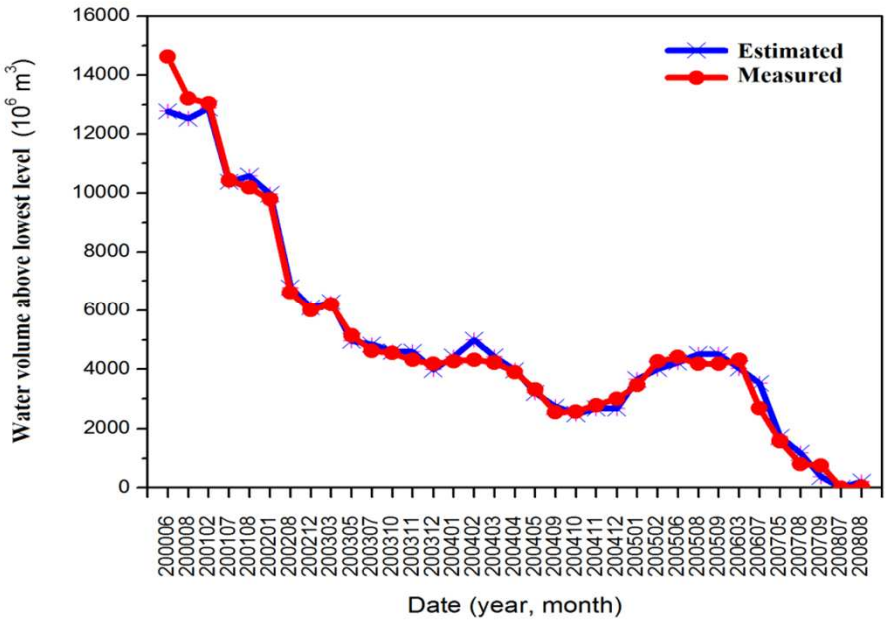
Results





Water level: In-situ vs. satellite altimetry-derived

Water volume:
In-situ vs. Estimated using satellite altimetry and satellite imagery data

Water volume variation can be derived using only satellite data within 10% accuracy

Period	No.	R^2	RMSE(10^6 m^3)
2000-2008	35	0.99	428

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GIS in Hydrology and Water Management

GIS to enable IWRM: Early assessments on the use of groundwater for intensive farming in the Chaco-Pampean plains – Argentina

Santiago Gaitan,
Water Resources Management, TU Delft

TU Delft

Study Area:

Chacho-Pampean Plains,
to the West of the Parana River,
in the Province of Santa Fe, Argentina.

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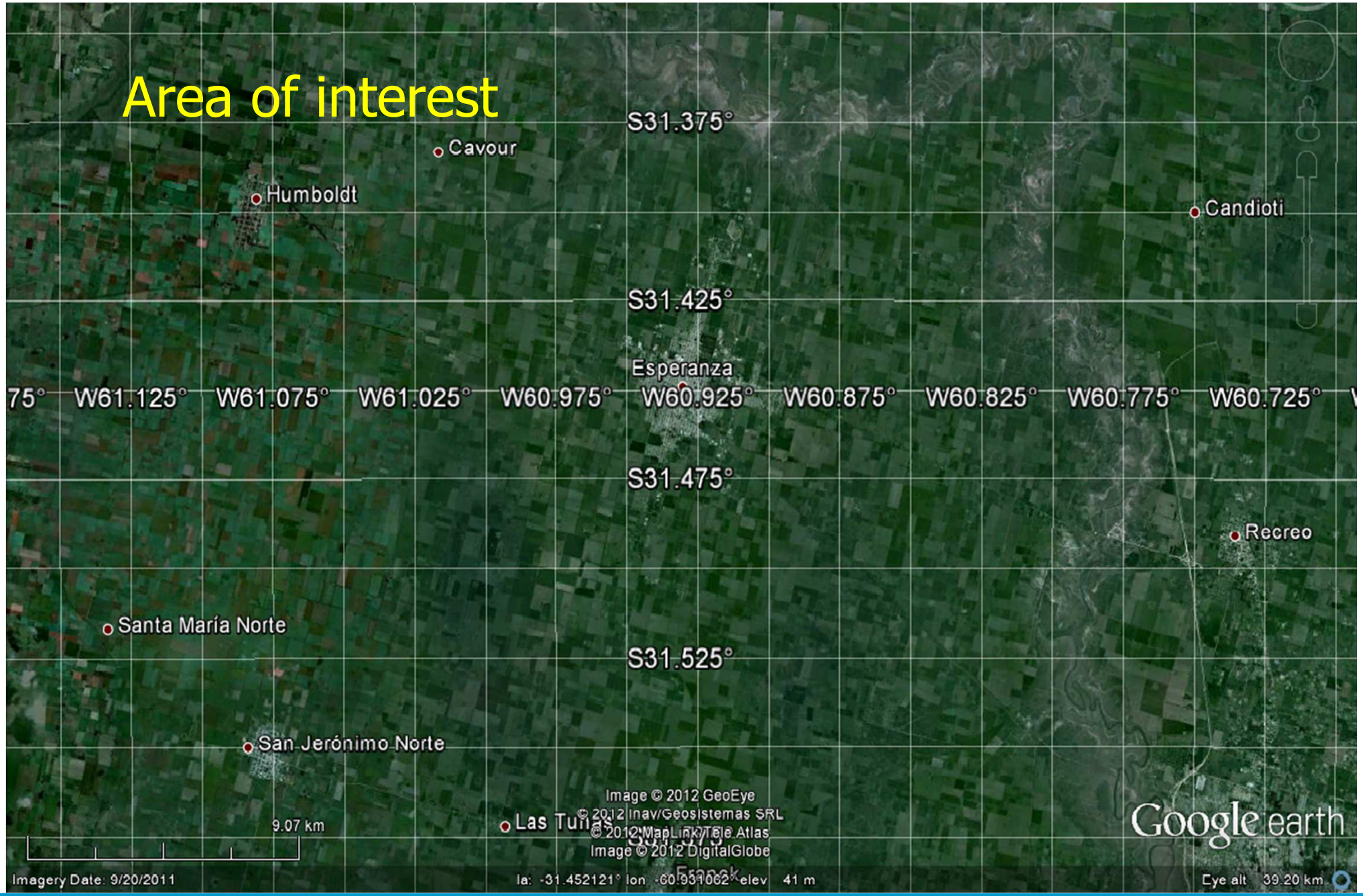
Area of interest



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Problem Definition

Water availability

- Mild temperature climate:
  - Rainfall ~ 930mm/year
  - Rainfall excess ~ 40mm/year
- Relatively well drained soils
- Surface water not enough for irrigation.
- GW pumped from aquitard beyond a phreatic aquifer
- Growing, intensive farming of soybean and wheat to supply emerging international markets.
- Environment becoming very prone to droughts.

Problem Definition

Challenges

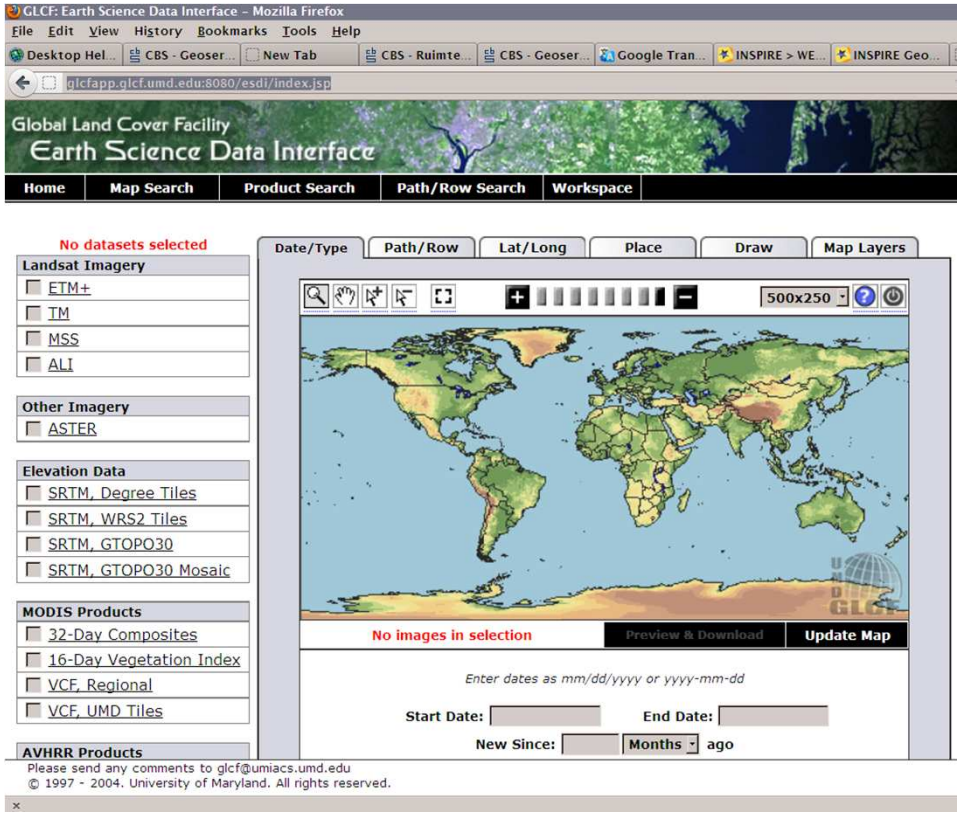
- Competitive use of the groundwater resource for drinking, industrial and agricultural purposes.
- Agricultural water discharge (with a potential agrochemical-pollutant charge).
- No measurement, registry nor control of the pumped water for irrigation.
- Incipient law enforcement actions on soil and water resources exploitation.
- Very limited surveying power. Lack of accurate environmental data.

Landsat Imagery

Land use characterization & calculation of vegetation indexes

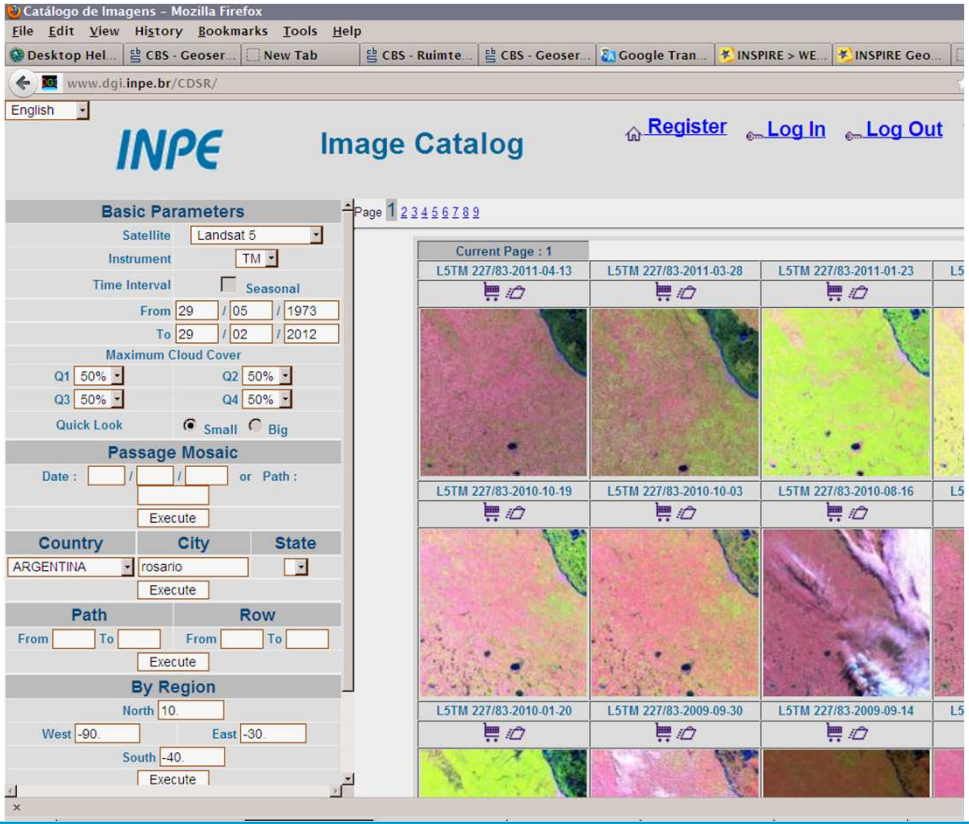
Global Land Cover Facility – USA

http://glcf.umiacs.umd.edu/



Divisão de Geração de Imagens - Brazil

http://www.dgi.inpe.br/CDSR/



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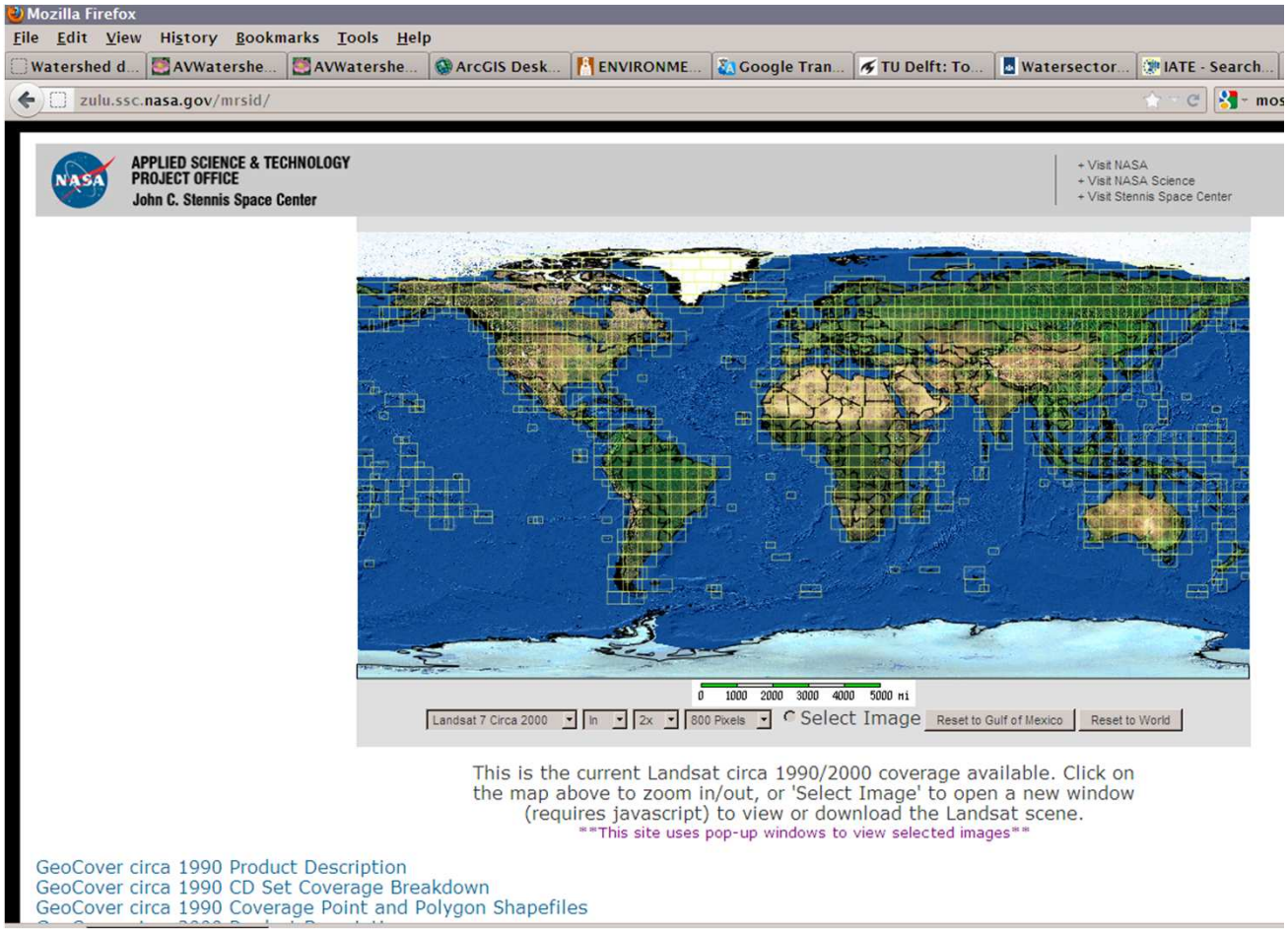
Reference raster for registration

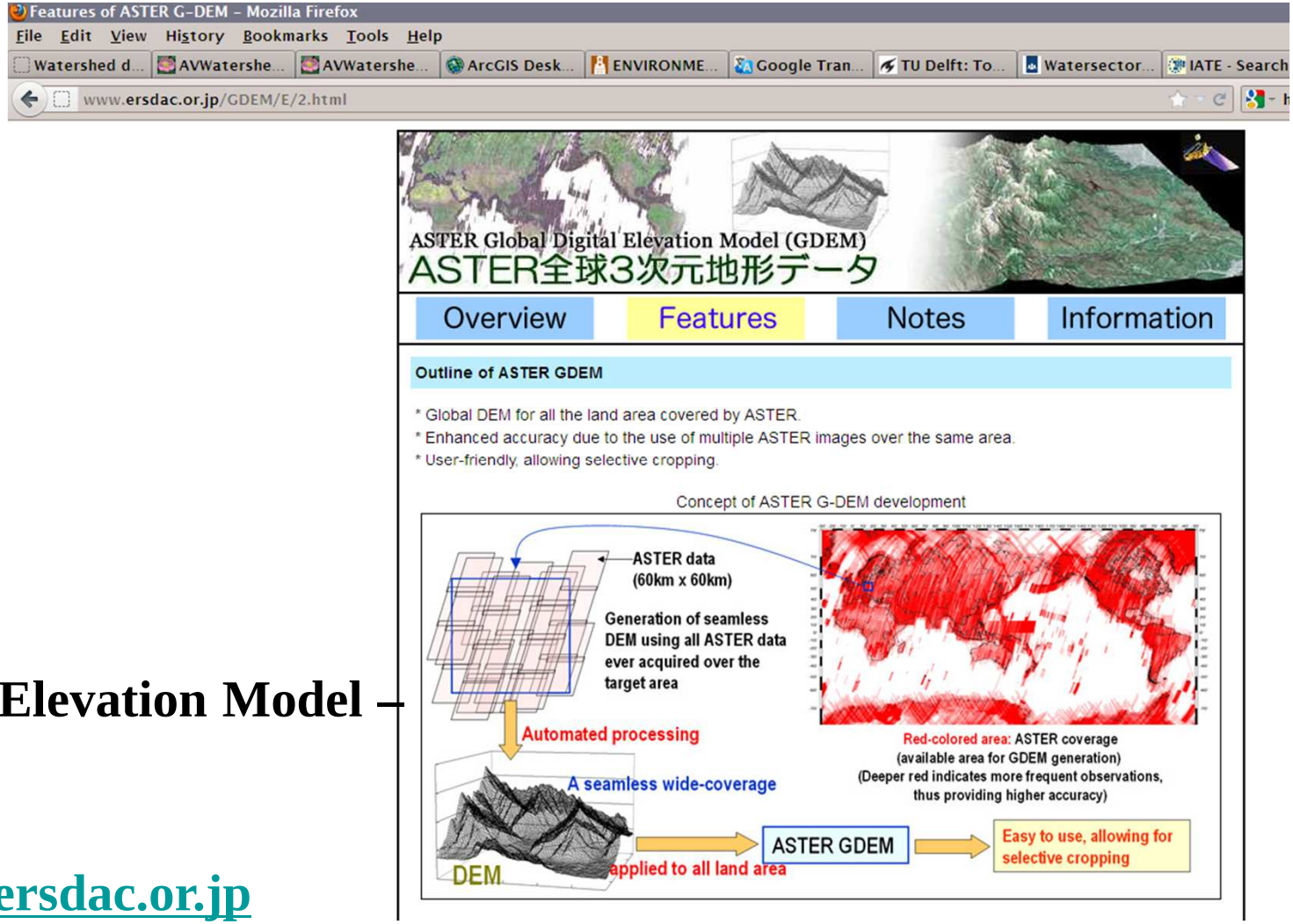
Geocover resource from National Aeronautics and Space Administration - USA

http://zulu.ssc.nasa.gov/mrsid/



Data: Digital Elevation Model

Topography &
Watershed
delineation



ASTER Global Digital Elevation Model – Japan & USA

http://www.gdem.aster.ersdac.or.jp

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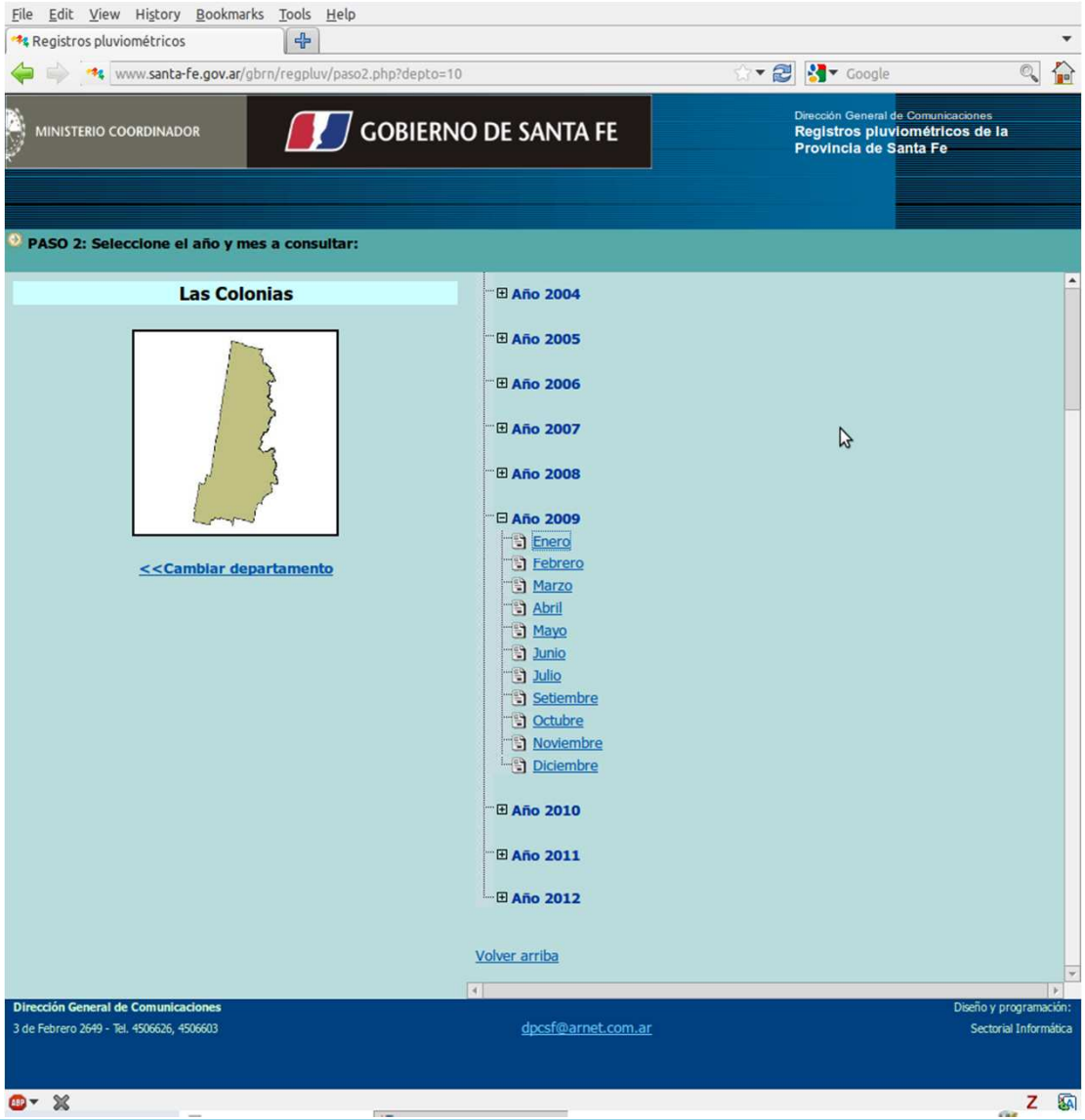
Rainfall data

Pluviometric registries from local gauges in Argentina



http://www.santa-fe.gov.ar/gbrn/regpluv/

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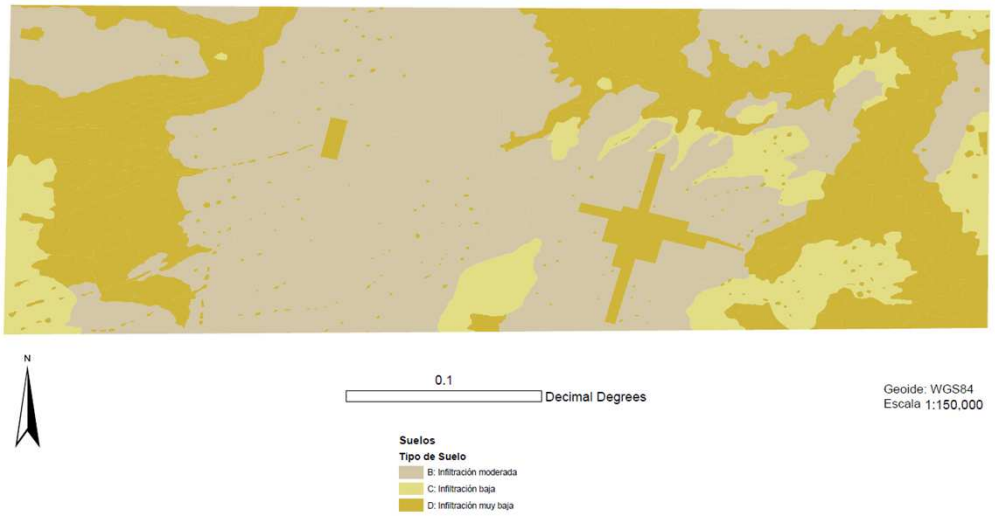
Hydrogeological & Edaphological data

Geohydrology Investigations Group – Argentina

http://fich.unl.edu.ar

Clasificación hidrológica de suelos en el área Humboldt - Esperanza



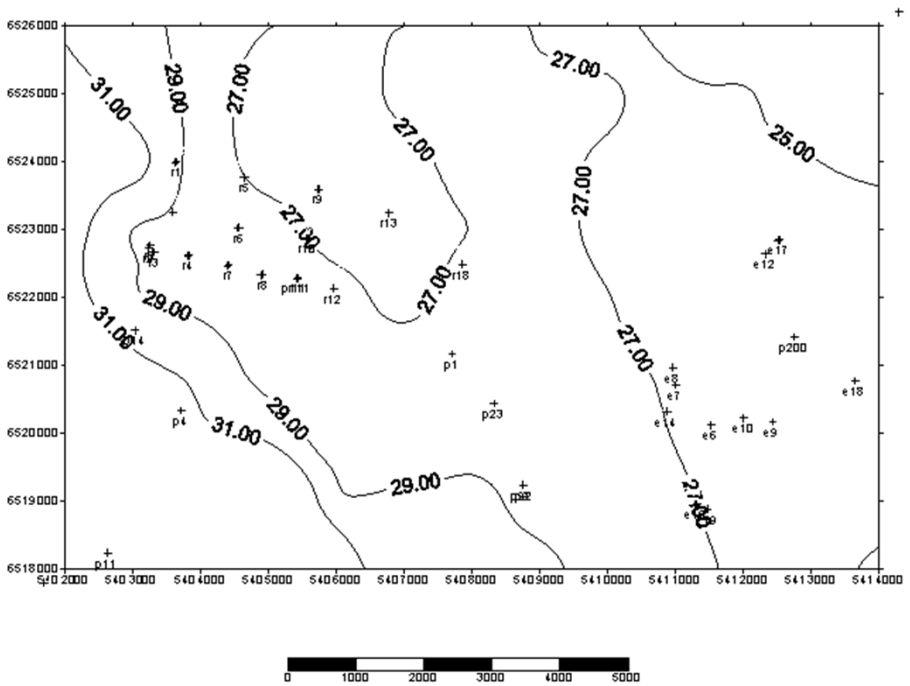


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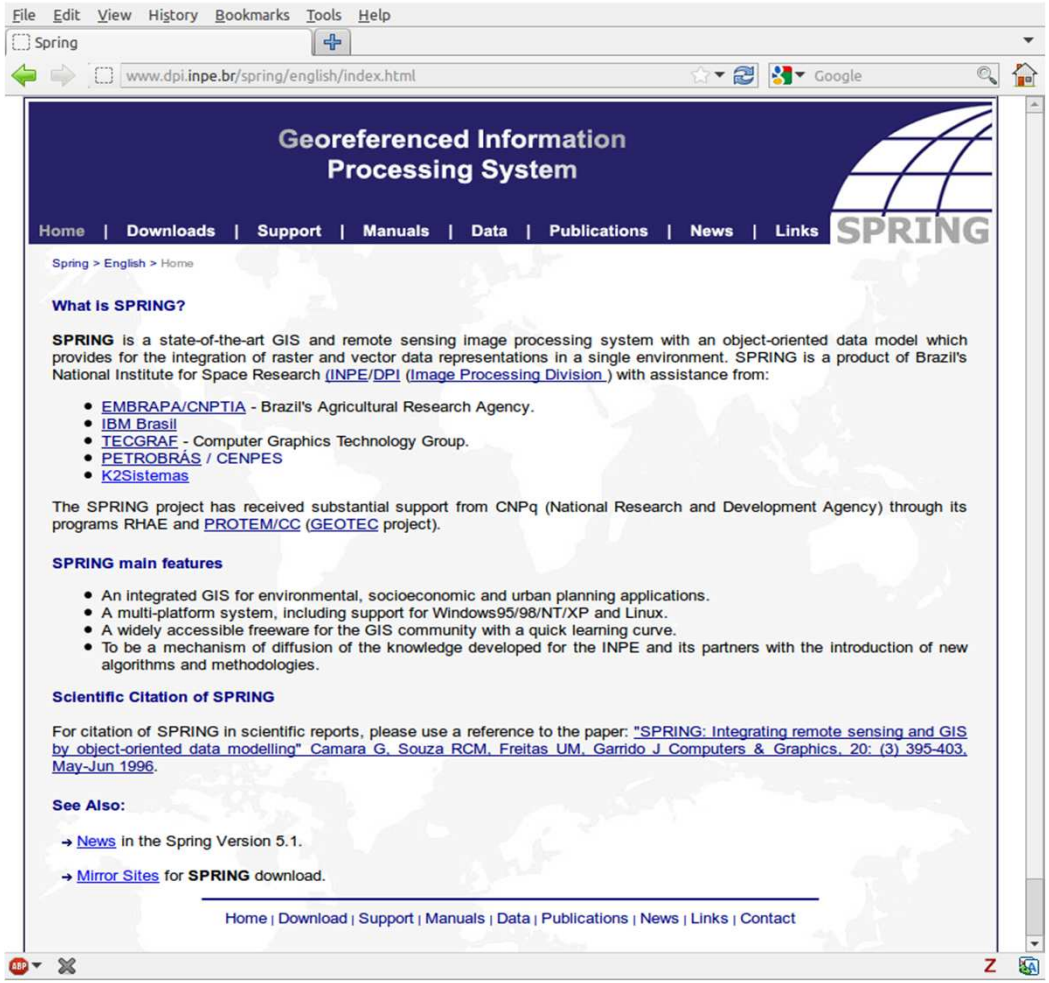
Image processing software (with GIS capabilities)

SPRING

(Sistema de Processamento de Informações Georreferenciadas),

National Institute for Space Research – Brazil



http://www.dpi.inpe.br/spring/english/index.html

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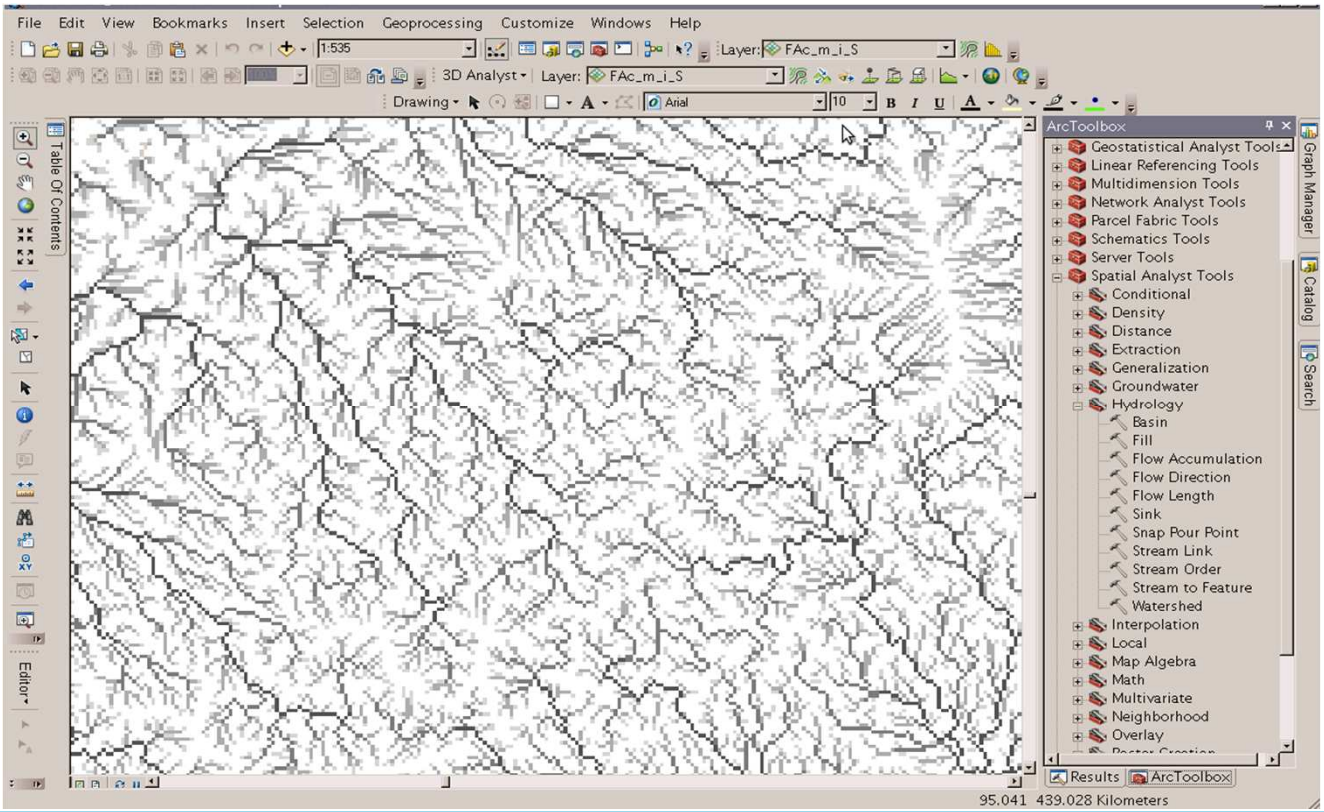
Spatial processing and analysis software

ArcGIS, ESRI – USA

http://www.esri.com/software/arcgis/index.html



Key extensions for ArcMap:

- **3D Analyst** for kriging
- **Spatial Analyst** for

  Hydrological analysis (flow direction, flow accumulation, streamlines and watersheds extraction)

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Conceptual model

Water content in soil:

$$W = W0 + R + C - I - Ro - Per - Evt$$

W: Soil water content (useful for plant development)
W0: Precedent soil water content
R: Rainfall
C: Phreatic contribution
I: Interception
RO: Run off
Per: Percolation
Evt: Evapotranspiration

Implementing conceptual model given available data

GIS-based model for qualitative assessment of the potential soil moisture (for every pixel):

$$Mp = a(R) + b(Ac) + c(Wt) + d(D) + e(Cn)$$

Mp: Potential moisture in soil

R: Scaled value of the monthly cumulative rainfall

Ac: Scaled value of the flow accumulation (drained area to each pixel)

Wt: Scaled value of the water table level

D: Scaled value of the terrain declivity

Cn: Scaled value of the curve number (measure of imperviousness)

a, b, c, d and e: weighting parameters (future calibration parameters after verification of the model)

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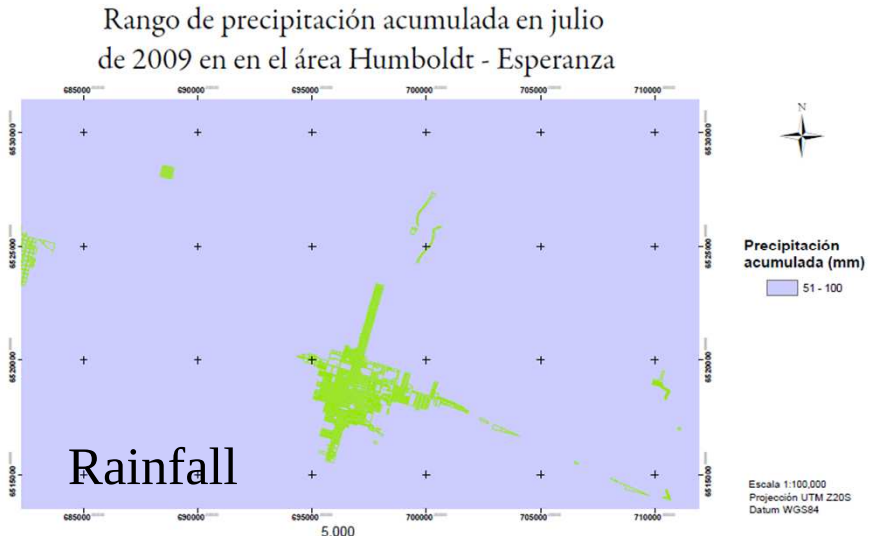
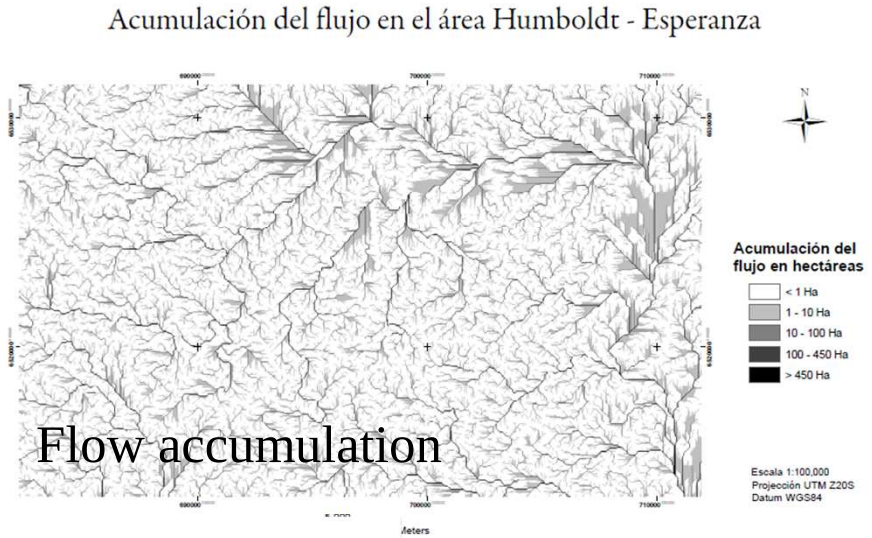
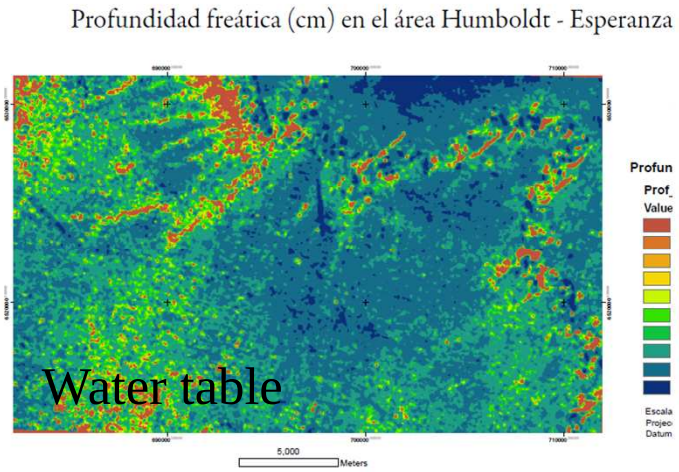
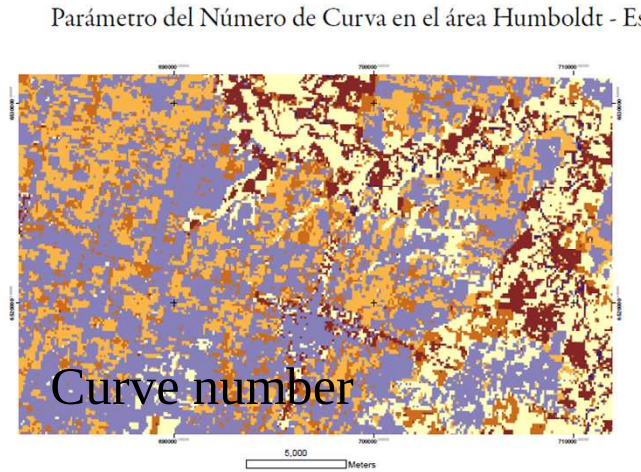
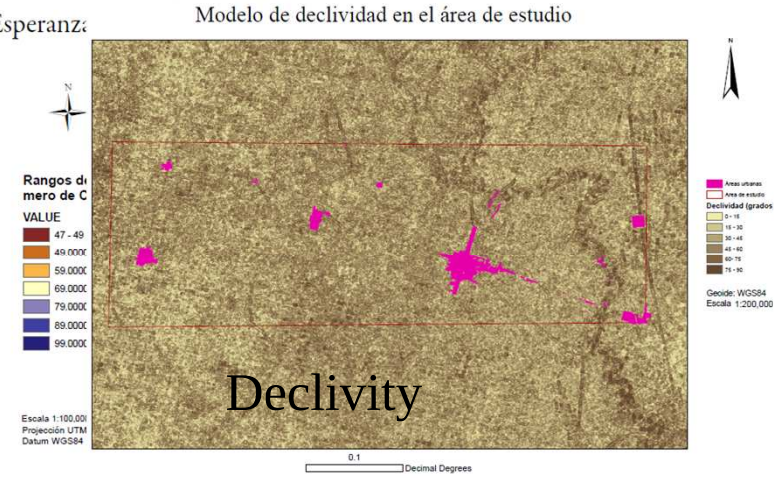
Model parameters











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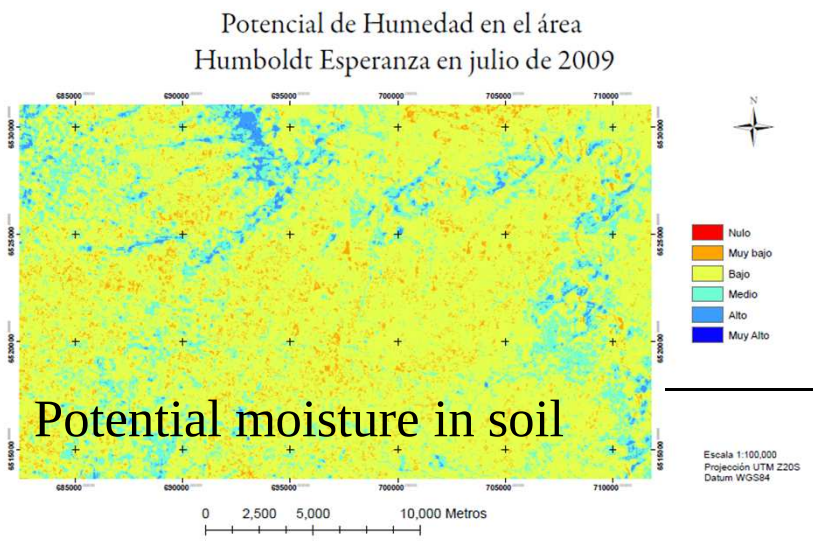
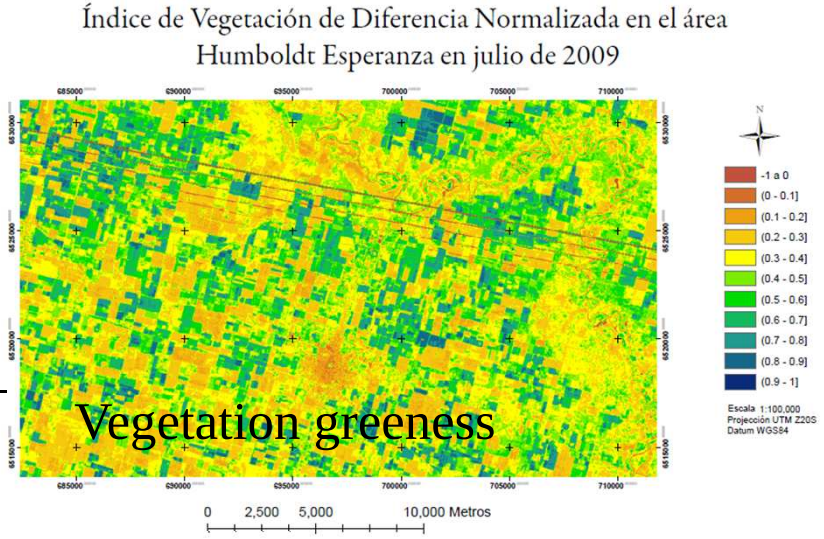
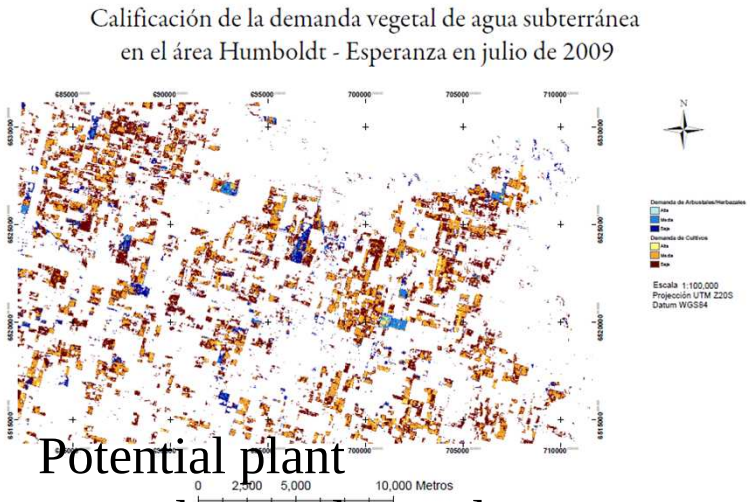
Results (2/2)



Potential moisture in soil



Vegetation greeness



Potential plant groundwater demand

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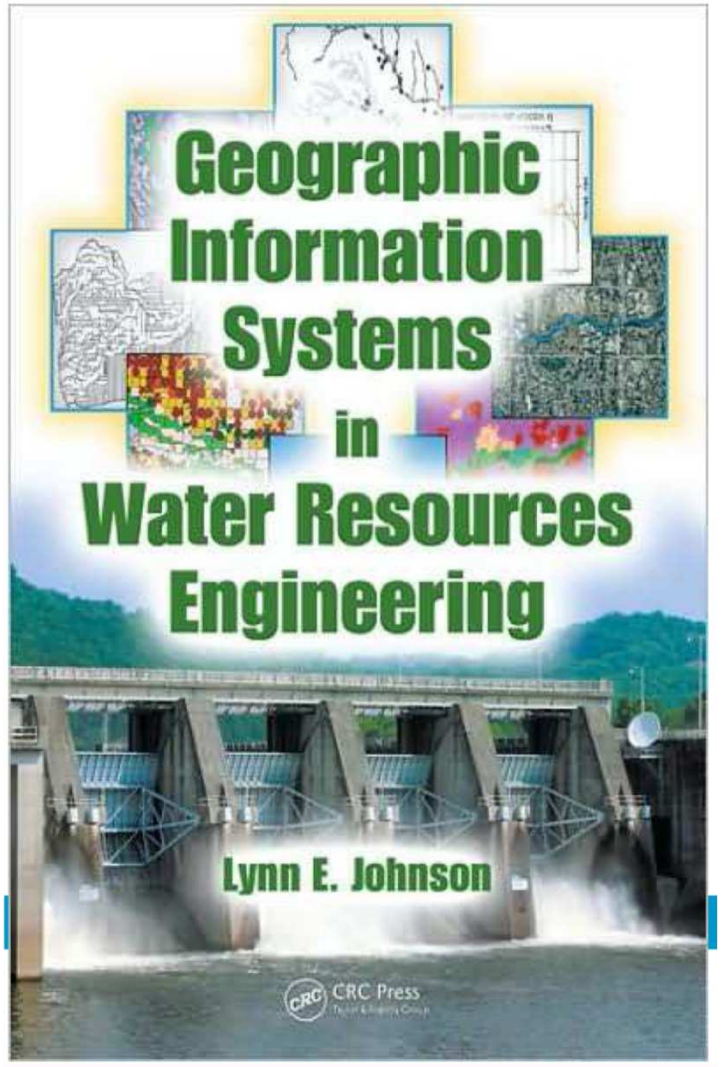
More applications in Hydrology and Water Resources Management

Available online through TU Delft library:



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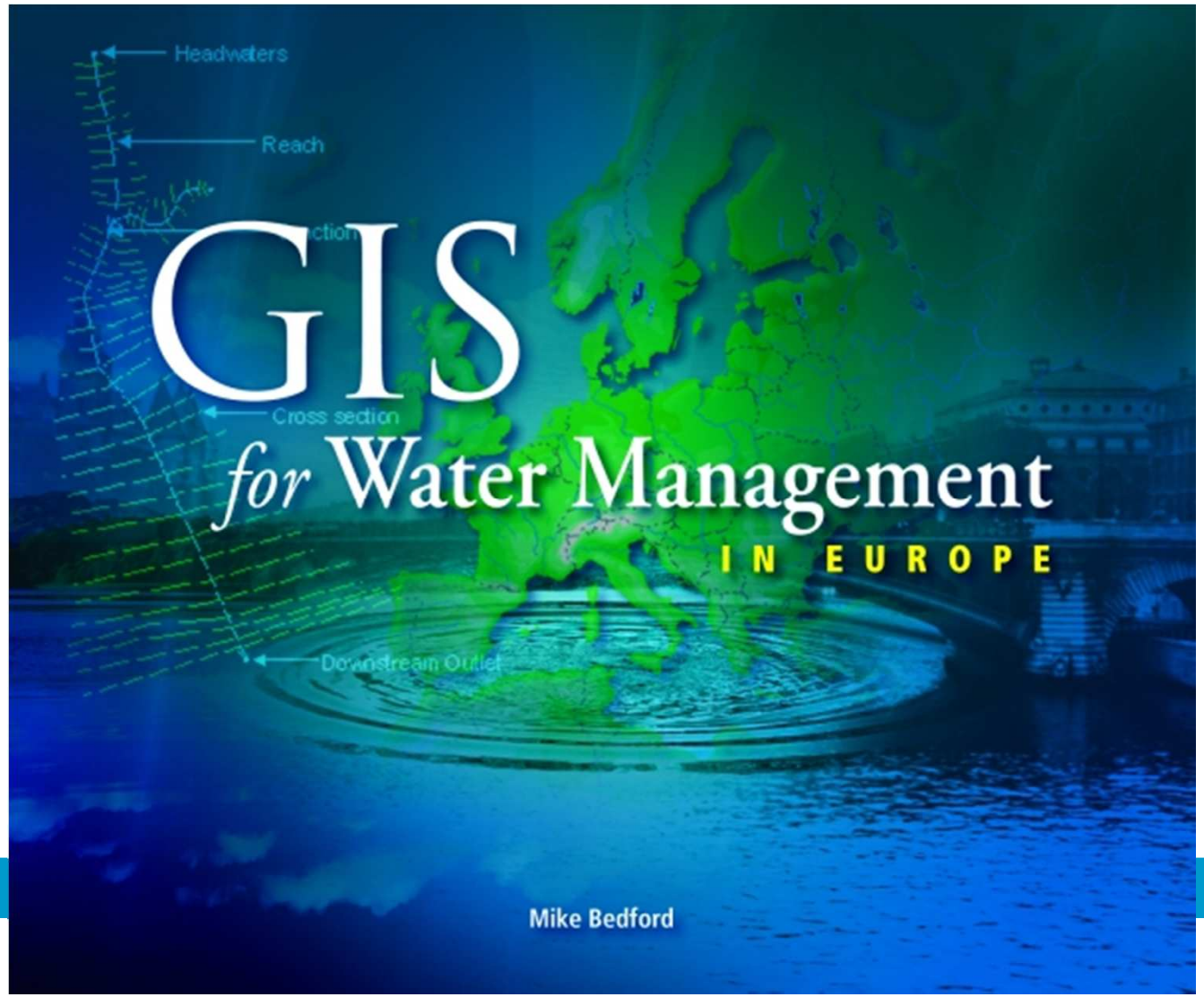
ESRI
GIS for Water Management



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Introduction to Assignment 1

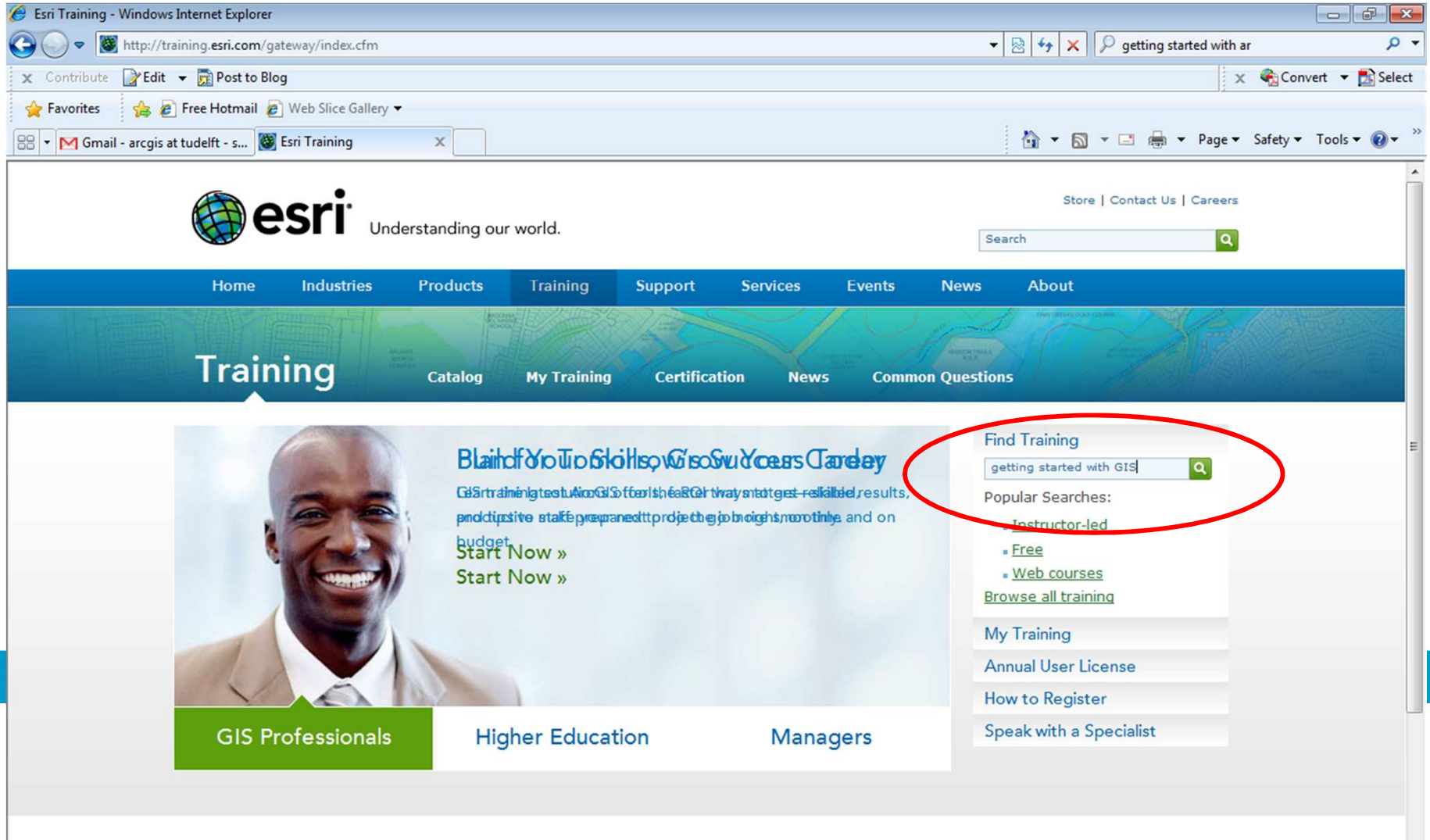
Part 1 Getting started with GIS
Part 2 Spatial Analyst toolbox
Part 3 How one plus one equals three!

You can bring headphones to listen to audio component of slideshow.

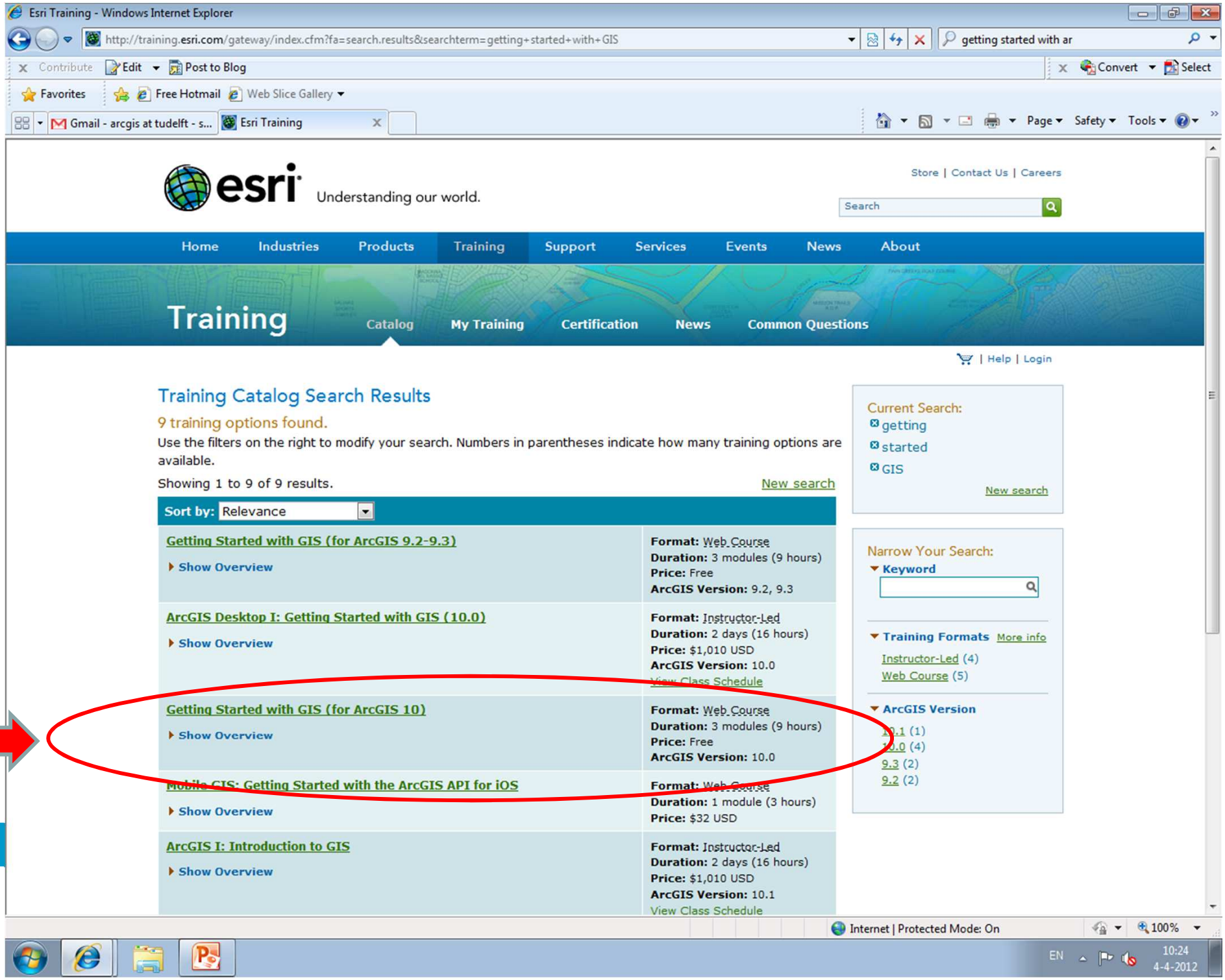
It might be useful to bring laptop to have instructions on one screen while you do ArcMap bits on desktop.

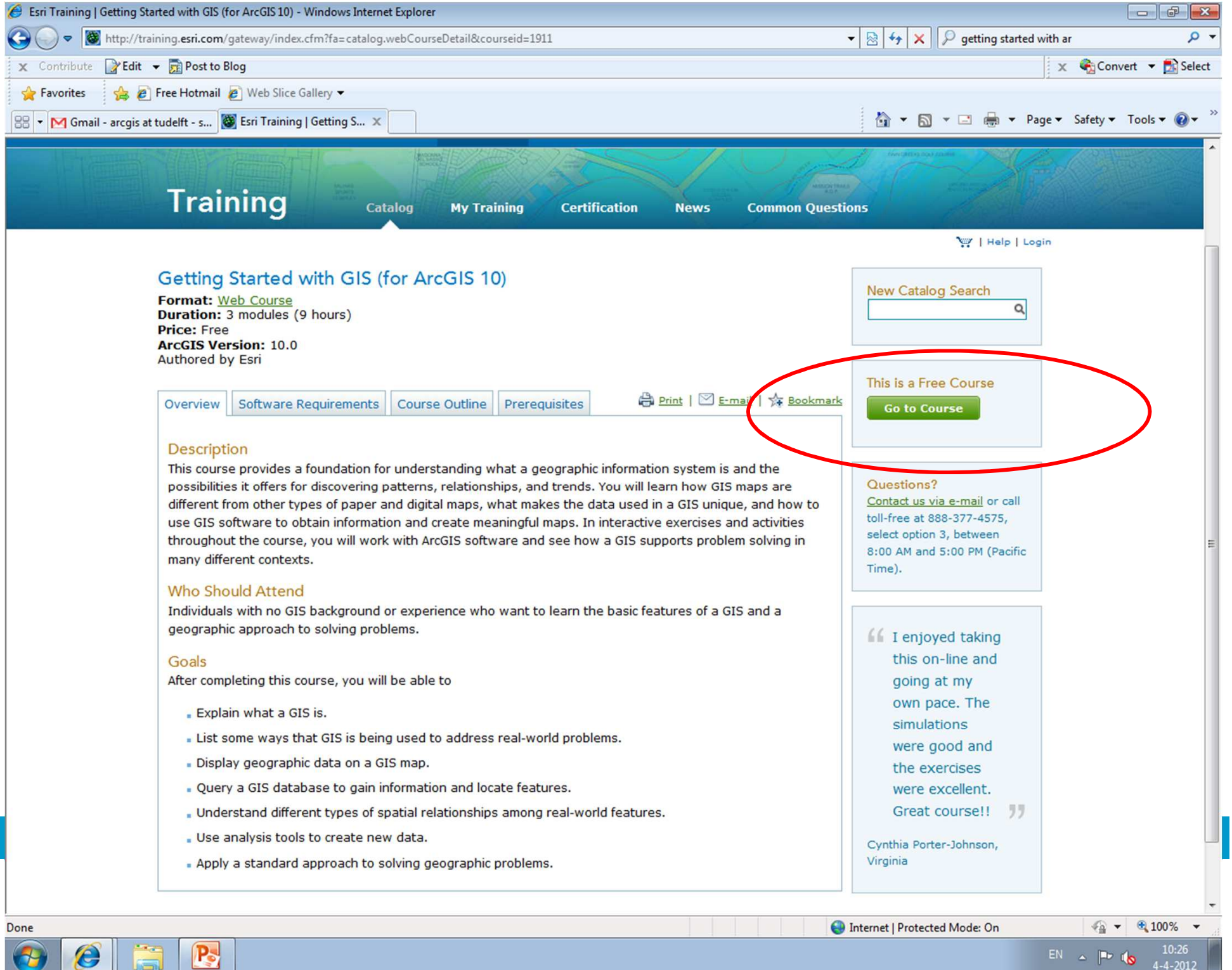
Assignment 1
Part 1, Getting started with GIS

- Go to **training.esri.com**
- Under Find Training, enter "Getting Started with GIS"



Select the **FREE** web course!




Esri Training | Getting Started with GIS (for ArcGIS 10) - Windows Internet Explorer
http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=1911
getting started with ar
Contribute
Edit
Post to Blog
Convert
Select
Favorites
Free Hotmail
Web Slice Gallery
Gmail - arcgis at tudelft - s...
Esri Training | Getting S...
Page
Safety
Tools
Training
Catalog
My Training
Certification
News
Common Questions
Help | Login
Getting Started with GIS (for ArcGIS 10)
Format: Web Course
Duration: 3 modules (9 hours)
Price: Free
ArcGIS Version: 10.0
Authored by Esri
Overview
Software Requirements
Course Outline
Prerequisites
Print | E-mail | Bookmark
Description
This course provides a foundation for understanding what a geographic information system is and the possibilities it offers for discovering patterns, relationships, and trends. You will learn how GIS maps are different from other types of paper and digital maps, what makes the data used in a GIS unique, and how to use GIS software to obtain information and create meaningful maps. In interactive exercises and activities throughout the course, you will work with ArcGIS software and see how a GIS supports problem solving in many different contexts.
Who Should Attend
Individuals with no GIS background or experience who want to learn the basic features of a GIS and a geographic approach to solving problems.
Goals
After completing this course, you will be able to
Explain what a GIS is.
List some ways that GIS is being used to address real-world problems.
Display geographic data on a GIS map.
Query a GIS database to gain information and locate features.
Understand different types of spatial relationships among real-world features.
Use analysis tools to create new data.
Apply a standard approach to solving geographic problems.
New Catalog Search
This is a Free Course
Go to Course
Questions?
Contact us via e-mail or call toll-free at 888-377-4575, select option 3, between 8:00 AM and 5:00 PM (Pacific Time).
I enjoyed taking this on-line and going at my own pace. The simulations were good and the exercises were excellent. Great course!!
Cynthia Porter-Johnson, Virginia
Done
Internet | Protected Mode: On
100%
EN
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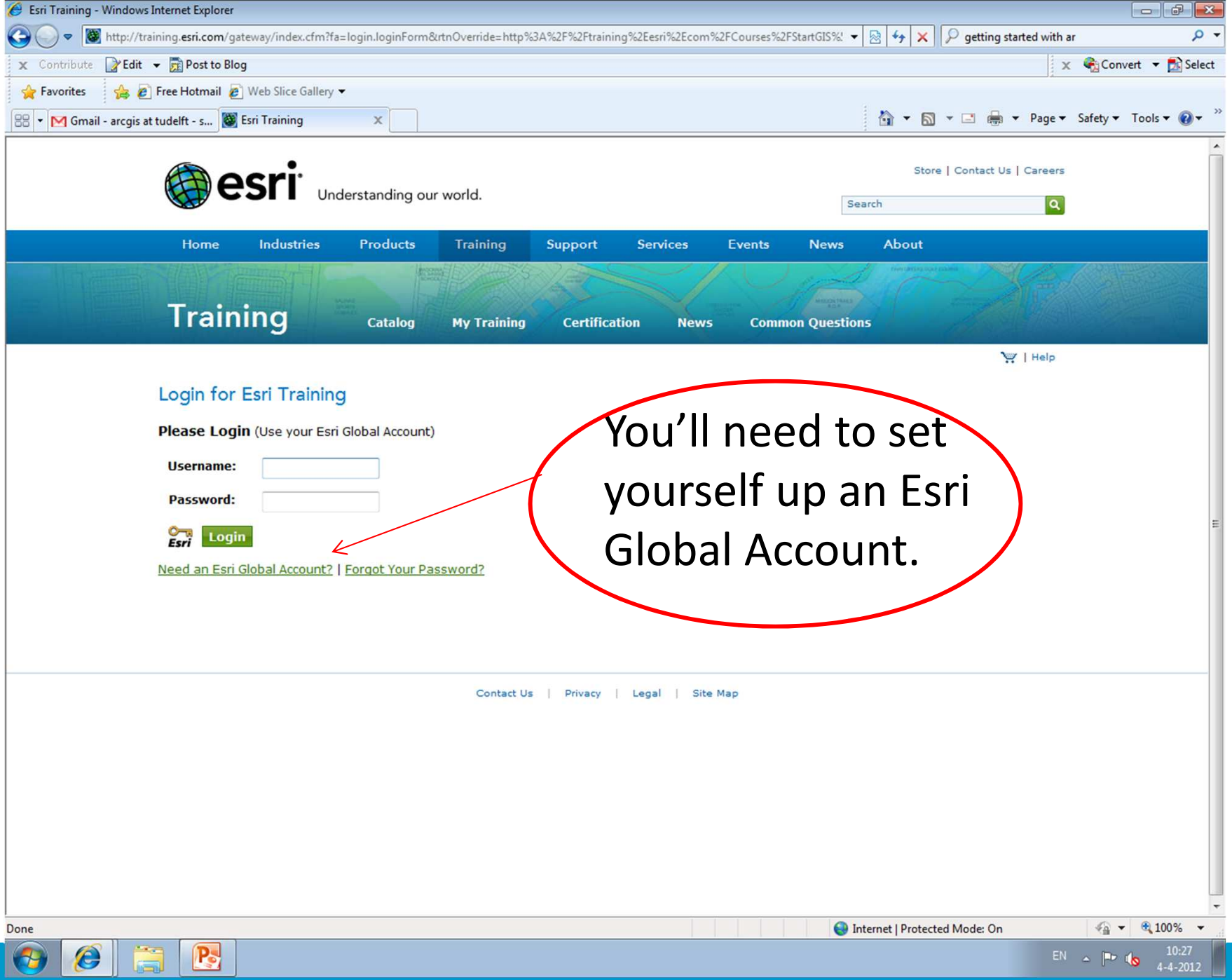
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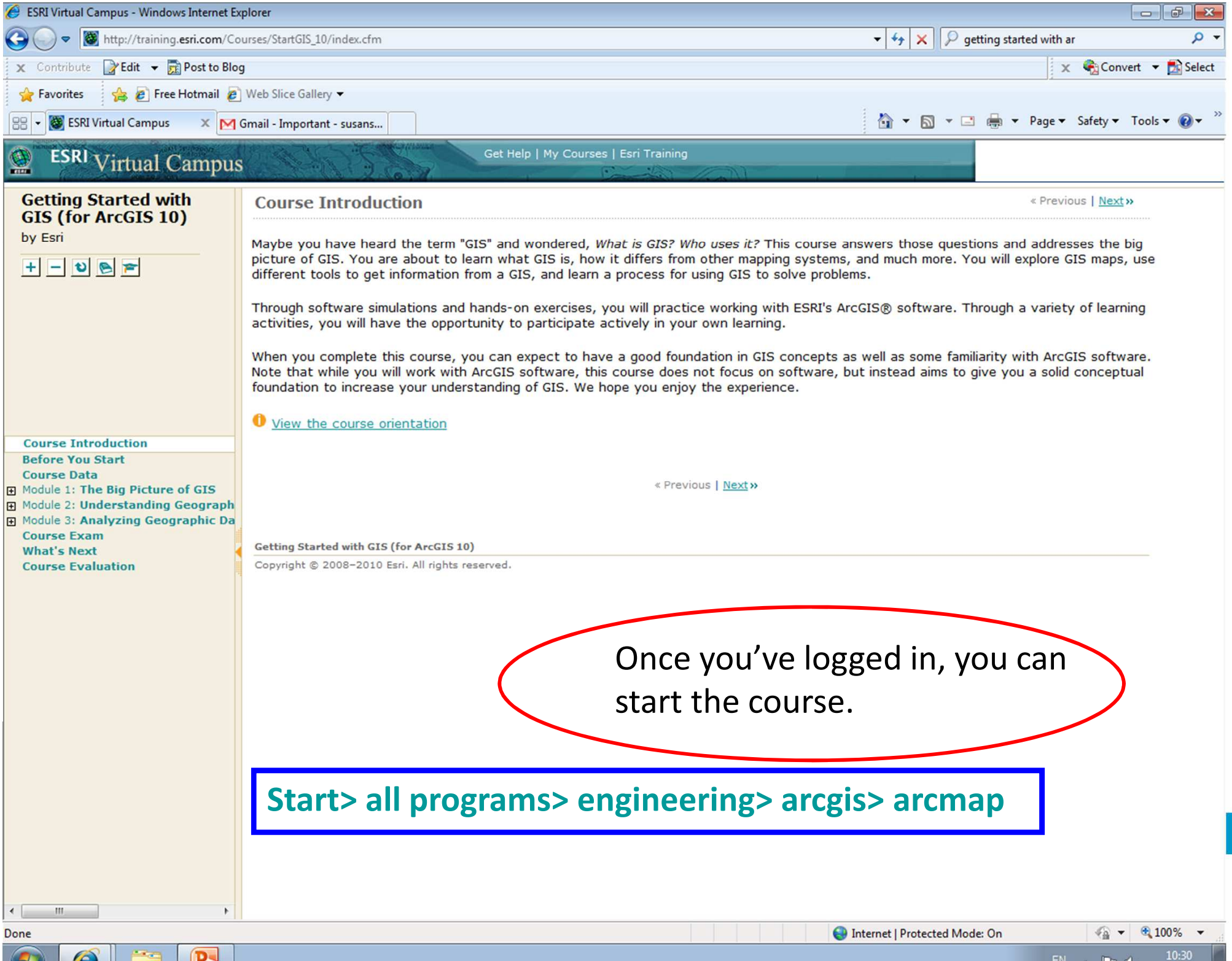
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Before You Start
Course Data
Module 1: The Big Picture of GIS
Module 2: Understanding Geograph
Module 3: Analyzing Geographic Da
Course Exam
What's Next
Course Evaluation
Course Introduction
« Previous | Next »
Maybe you have heard the term "GIS" and wondered, What is GIS? Who uses it? This course answers those questions and addresses the big picture of GIS. You are about to learn what GIS is, how it differs from other mapping systems, and much more. You will explore GIS maps, use different tools to get information from a GIS, and learn a process for using GIS to solve problems.
Through software simulations and hands-on exercises, you will practice working with ESRI's ArcGIS® software. Through a variety of learning activities, you will have the opportunity to participate actively in your own learning.
When you complete this course, you can expect to have a good foundation in GIS concepts as well as some familiarity with ArcGIS software. Note that while you will work with ArcGIS software, this course does not focus on software, but instead aims to give you a solid conceptual foundation to increase your understanding of GIS. We hope you enjoy the experience.
View the course orientation
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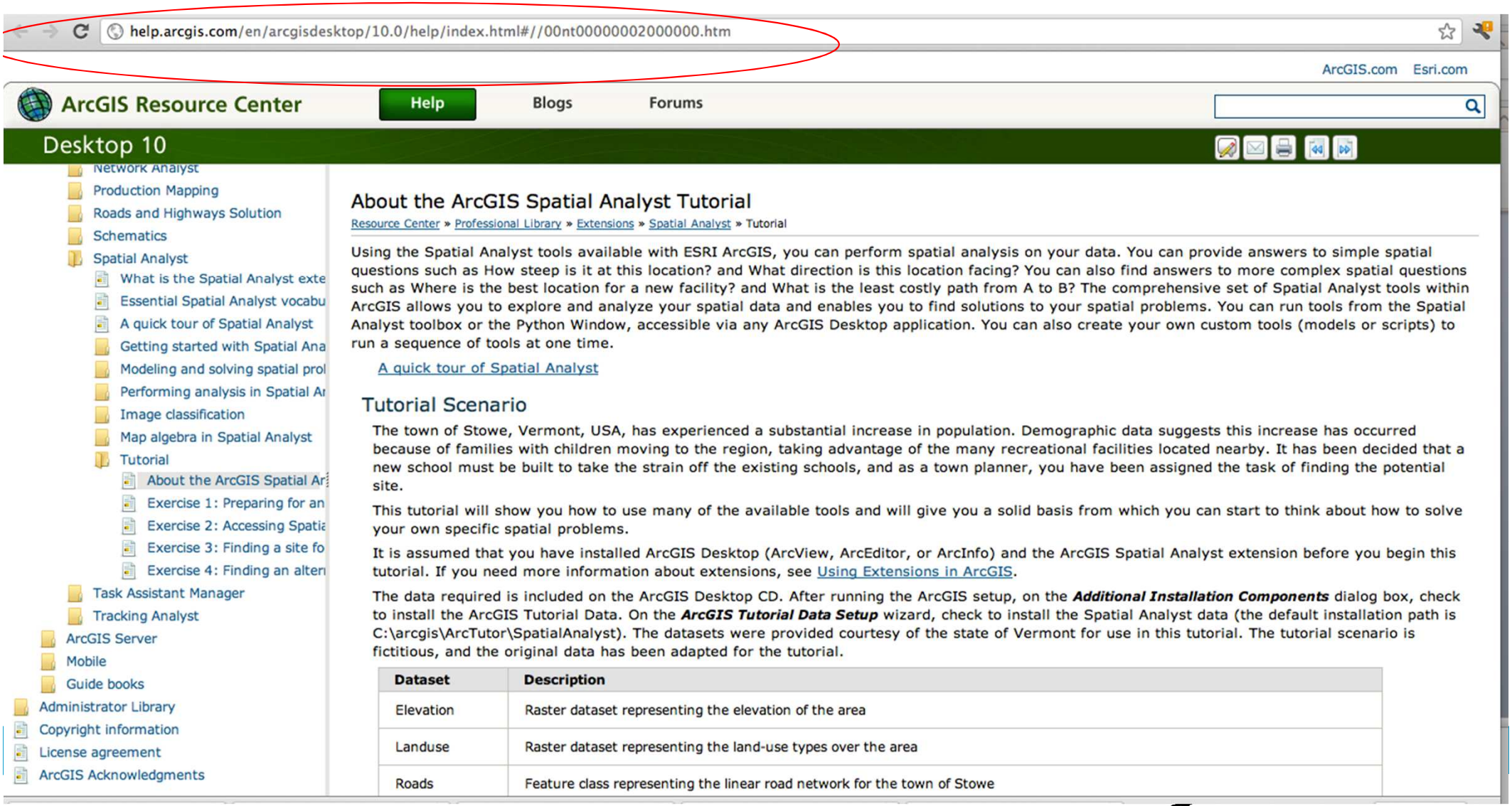
Assignment 1, Part 2: Spatial Analyst Tutorial



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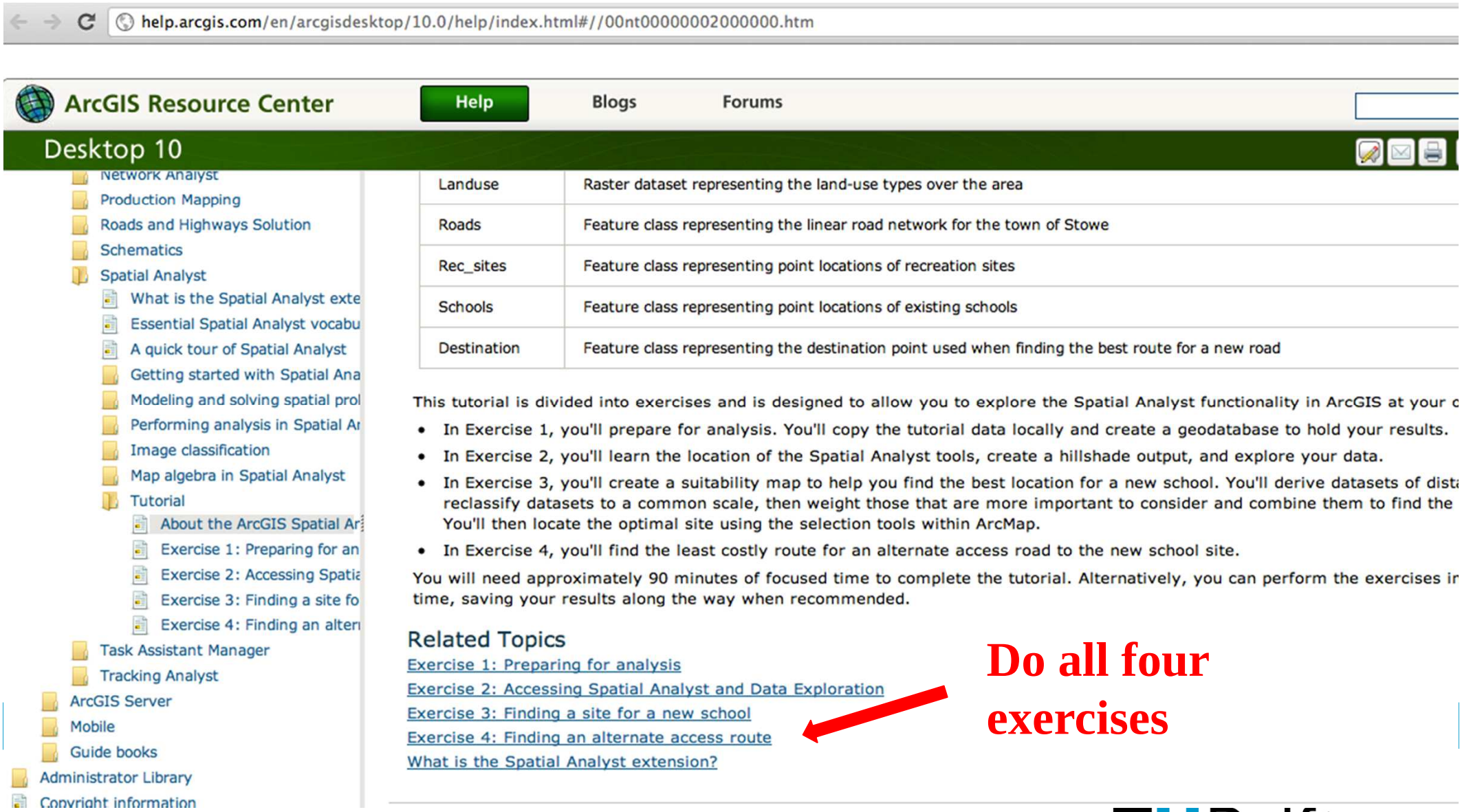
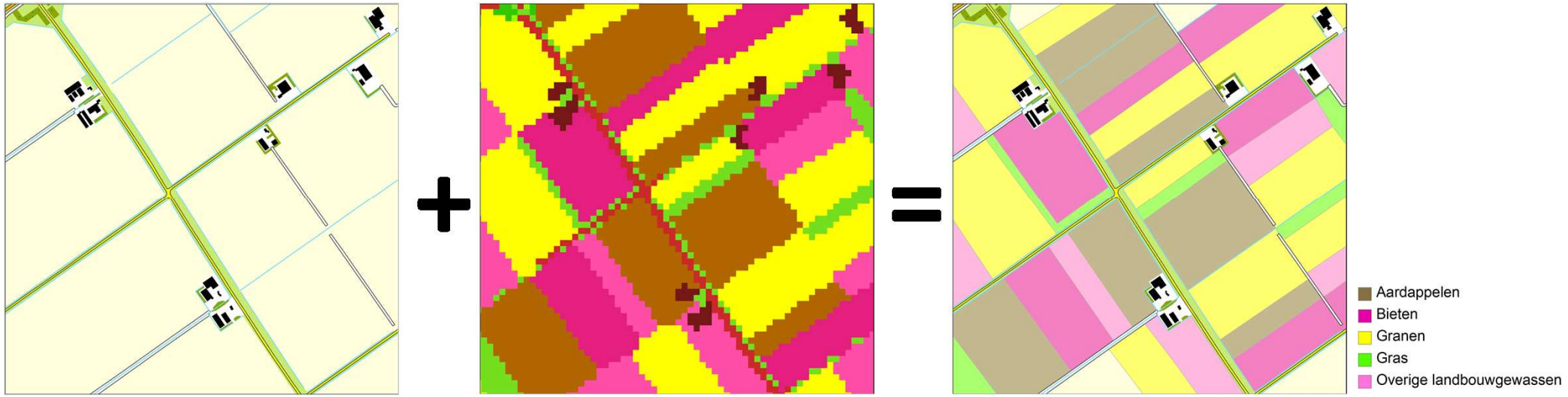
Assignment 1, Part 2: Spatial Analyst Tutorial



Do all four exercises

Assignment 1, Part 3: How one plus one equals three

TOP10NL LGN6 Improved combined map.



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[1] Cliparts, source: unknown.
[2] Grasmere Lake, Cumbria, UK; photo courtesy of Tony Richards.
[3] Dam of Clywedog reservoir, source: http://www.euwfd.com/html/lakes_and_reservoirs.html
[4] Multi-angle Imaging SpectroRadiometer (MISR), photo courtesy of NASA.
[5] GOES-13 satellite, photo courtesy of NASA.
[6] Satellites measure sea level with unseen signals, photo courtesy of NASA.
[7] Reference ellipsoid WGS84, source: unknown.