# Week 2

## GIS CONCEPTS
## Part I

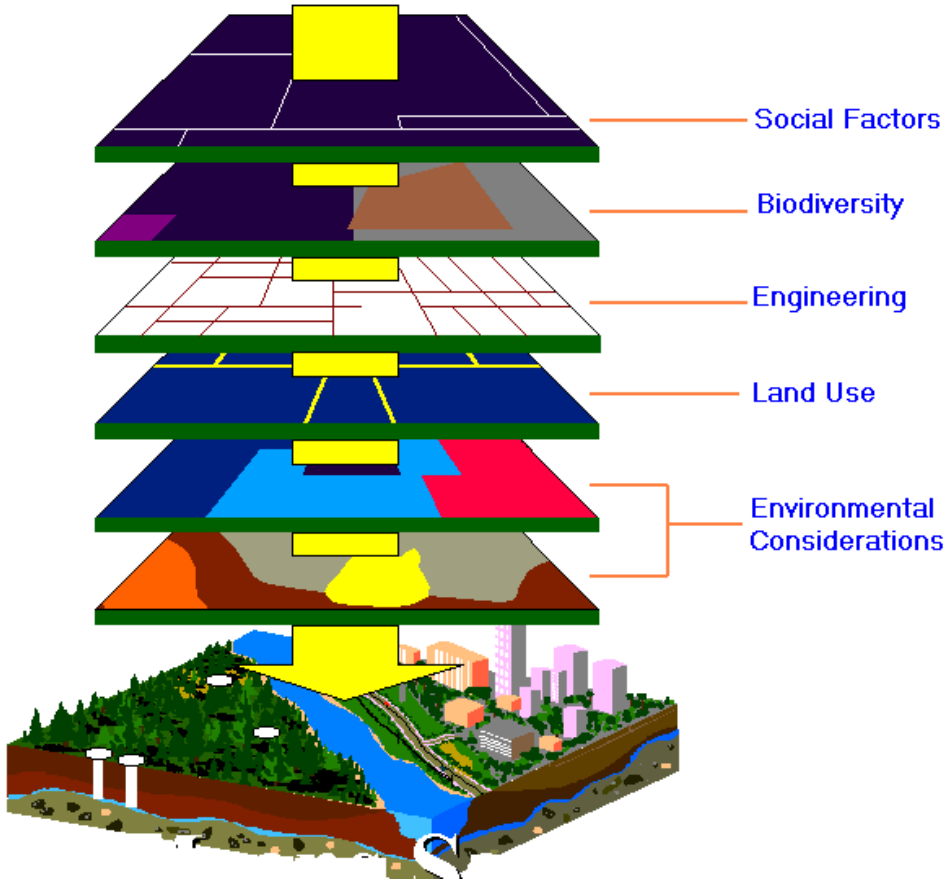
## GIS ON THE WEB
## Part II

# topics of the week – part I

- ❑ GIS functions and GIS data
- ❑ Spatial relationships

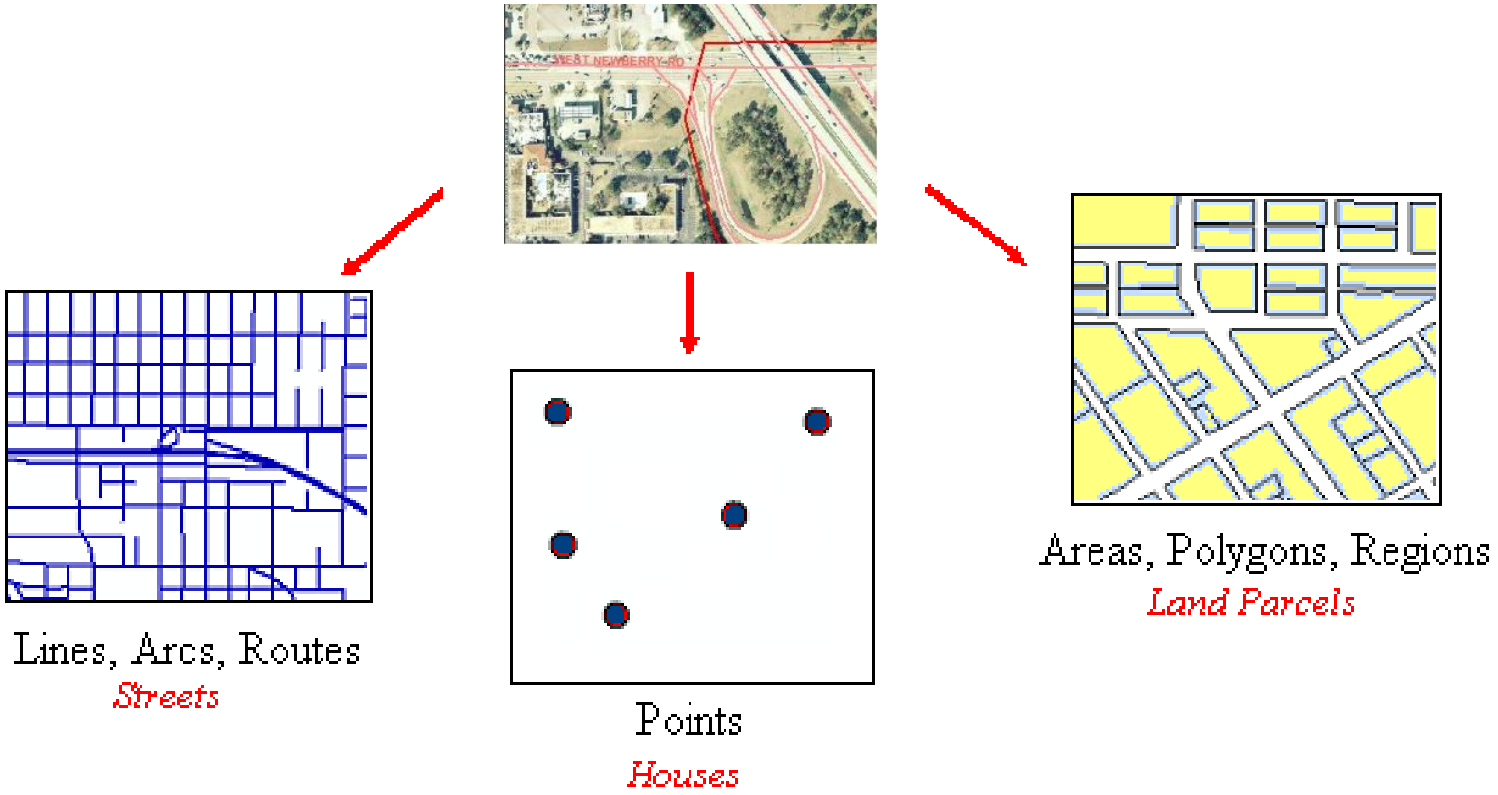
# Organizing convention for spatial data

- Store Information by thematic layers of spatial data
- Answer questions by integrating different layers of data
- Onion analogy for representing reality



# Feature classes in the vector model

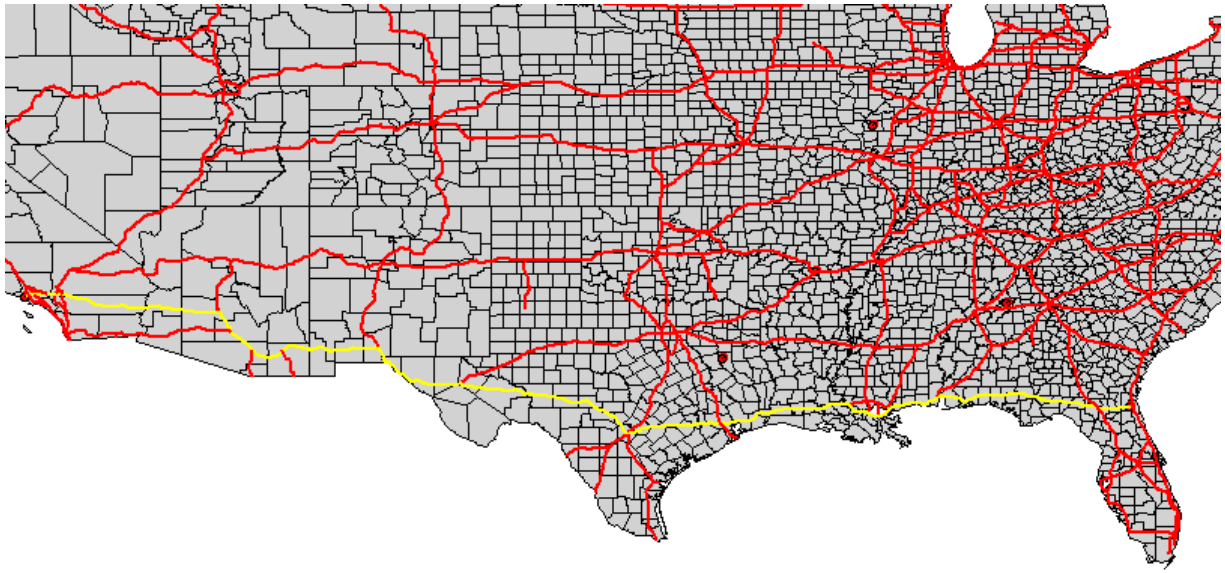
- Real-world objects are modeled into three basic geometric shapes



# Determining spatial relationships

**I-10 *connects* Jacksonville and Santa Monica**

**I-10 has *length* and *direction***



**Santa Monica is *contained* in California**

**Jacksonville is *adjacent* to the Atlantic Ocean**

# GIS functions

Capture

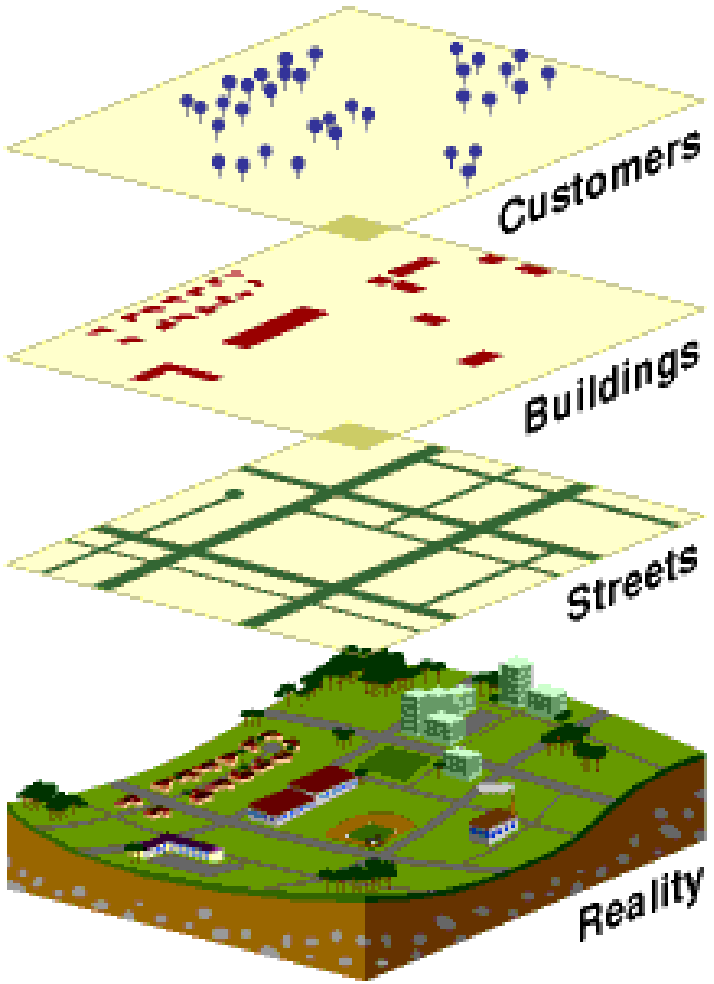
Store

Answer Questions

Analyze

Display

Output



# Capture, create data

***New data***

- **Digitize from paper maps**
- **Digitize over digital maps**
- **Scan paper maps**
- **Create fresh using GPS devices**
- **Create from tex tfiles that store geographic location [*mostly points]***

**Text file example:**

X Y
450632.55, 355789
450633.56, 355791

# Capture, create data

***Use existing digital data - GIS format or other***

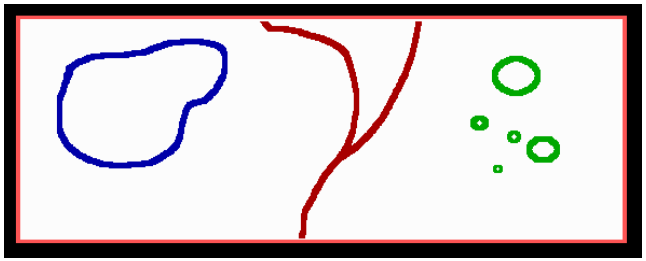
- **Download from public GIS web portals**
- **Buy from specialized GIS agencies**
- **Convert from other formats into GIS formats**
- **Subtract, collapse, add, integrate from existing GIS data into new GIS data that respond to your needs**
- **Volunteered user data (knowingly, non-knowingly)**
  - World peace map

*Create new data vs. using existing data, pros & cons*

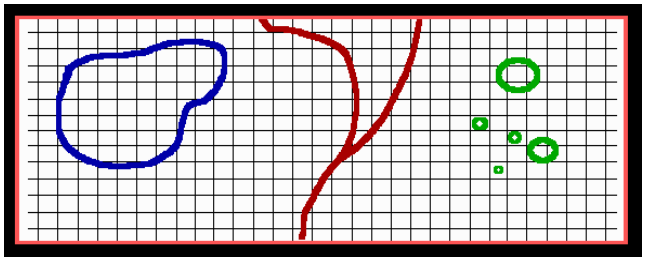
# Store data

## Two fundamental models for storing geographic data

- **Vector Model -** *Discrete representation of reality, traditional geometric shapes*



- **Raster model -** *Uses square cells to model reality*
  - *with attributes - grids*
  - *without attributes - areals*

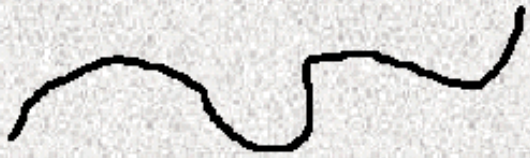



# More on Vector and Raster

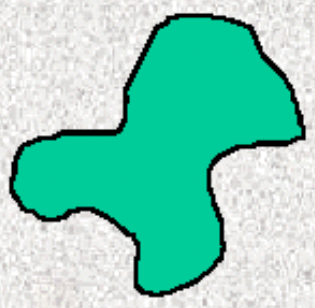
***Vector*** **GIS is composed of points, lines, and polygons (areas).**
***Raster*** **GIS is composed of rasters, or cells.**

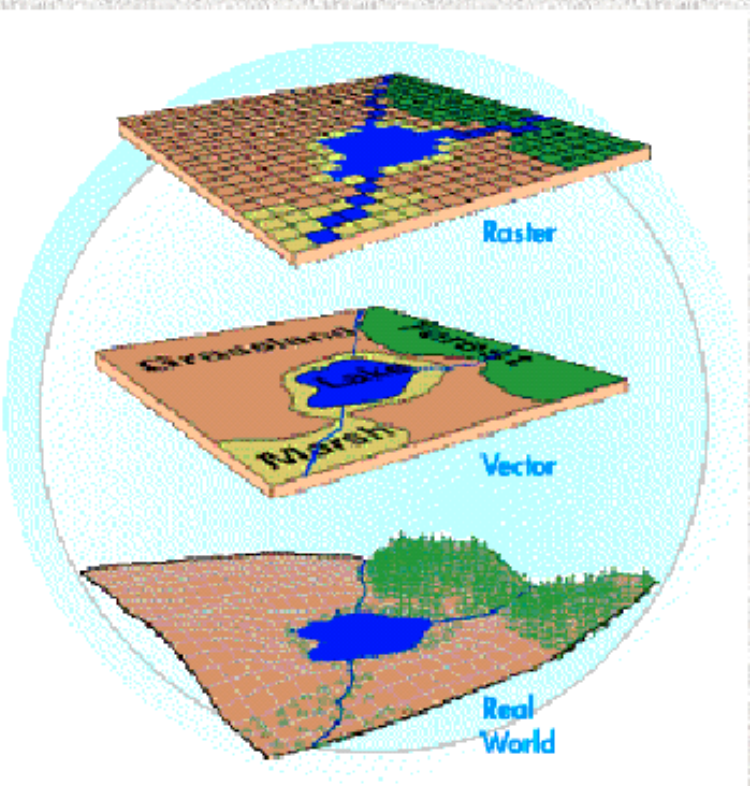
Points

Lines



Areas

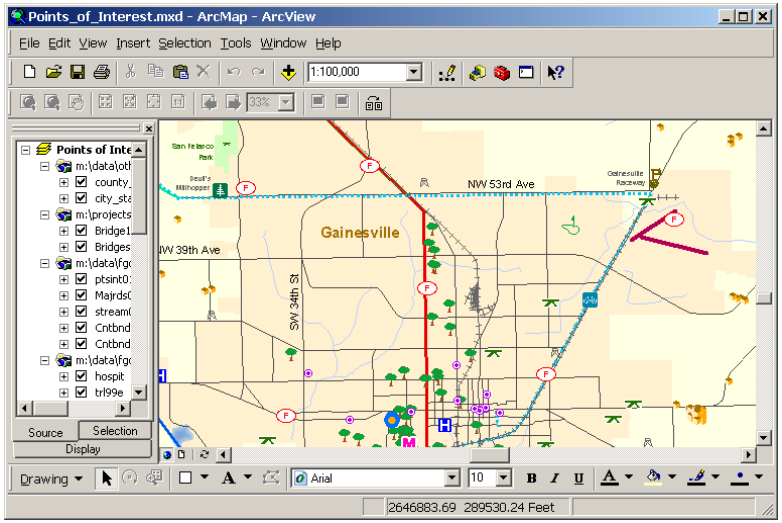




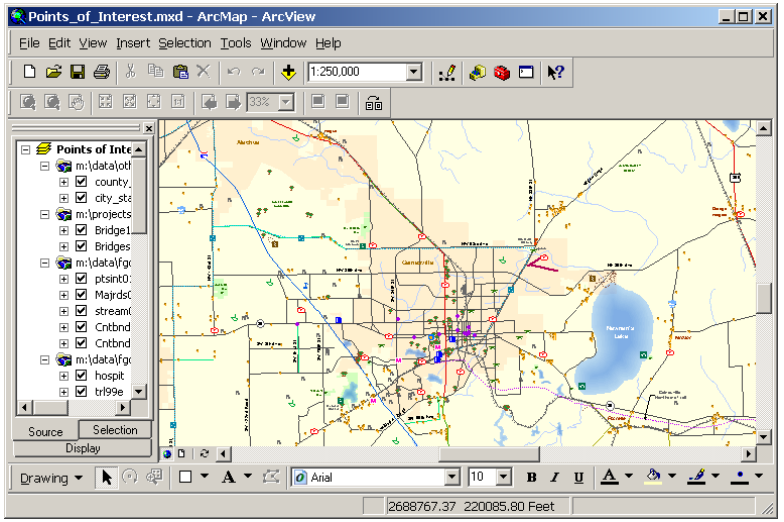
# Map scales

*Map scale* = ratio of map distance to ground distance in the same unit

- Large scale vs. Small scale
- Scale of display vs. Scale of data capture



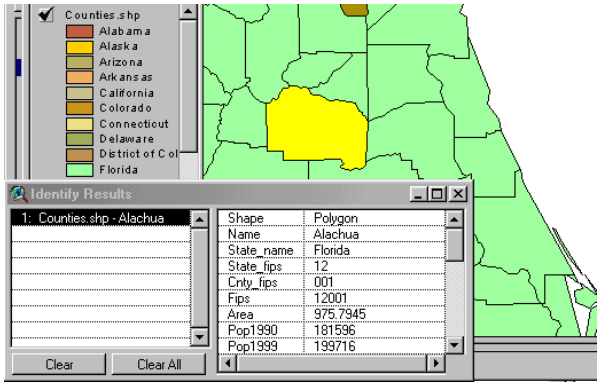

***large***




***small***

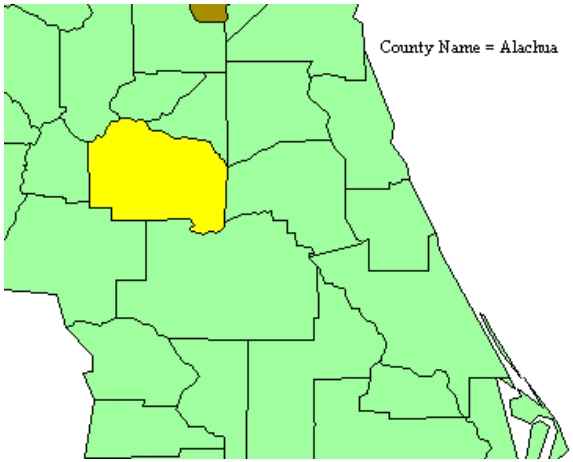
# Answer Questions

- What is where, identify specific features

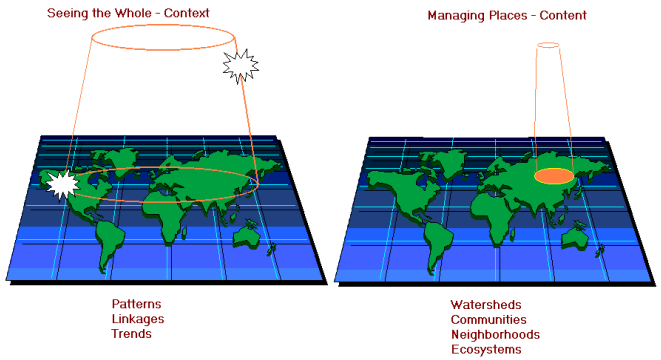



- Where is what, identify features based on known conditions

*County Name = Alachua*



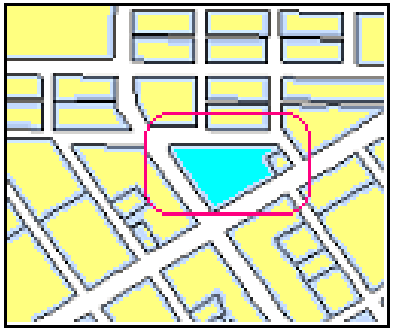

- Context and Content of Questions



# Analysis

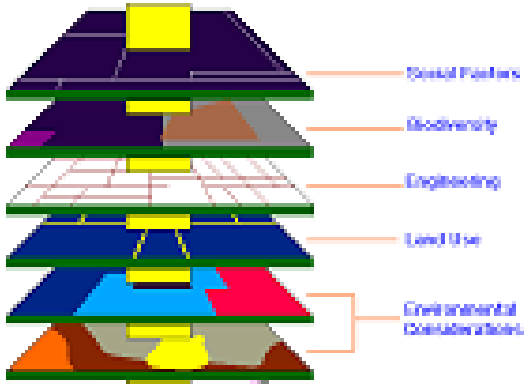
- **Proximity**

  ***Which parcels are fully contained within the red line?***



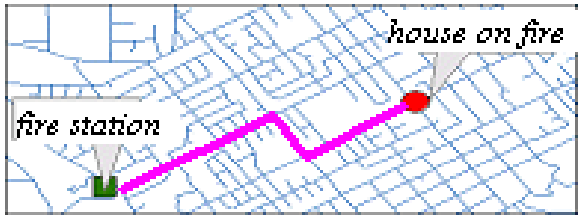
- **Overlay**

  ***What were the environmental and engineering factors that determined current land use?***



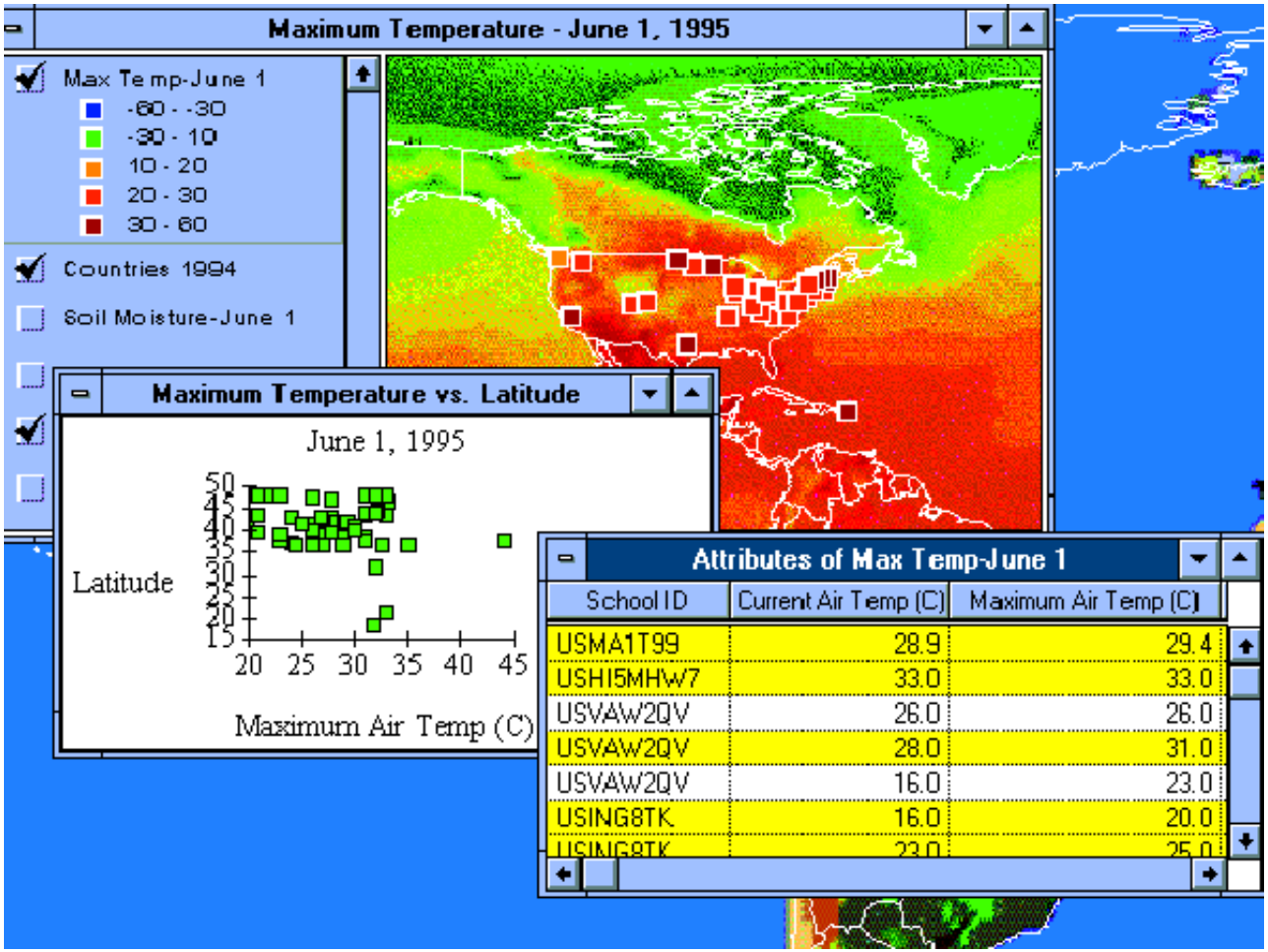
- **Network**

  ***Which is the shortest route to the house on fire?***



# Display

Chart




Table

# Output and medium of publication

## Format

- Paper maps (wall, book, report, etc)
- Images, jpg, gif, pdf, bmp, etc.
- Project with interpreted data that points to the datasource, usually software dependent
- GIS data with new knowledge stored into various GIS formats

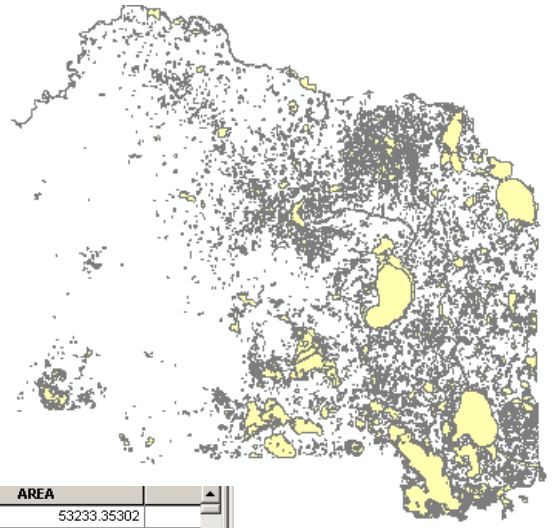
## Medium

- Paper
- Desktop (images, projects, live data) – single user
- Network (images, projects, live data) – multiple users
- Internet (images, projects, live data) – public use

# Three components of geographic data

## *Geometry*

**Geographic features**



## *Attributes*

**Descriptive information**

| OBJECTID* | Shape* | AREA |
|---|---|---|
| 1 | Polygon | 53233.35302 |
| 2 | Polygon | 2246.91016 |
| 3 | Polygon | 140.42082 |
| 4 | Polygon | 383.77933 |
| 5 | Polygon | 2424.9155 |
| 6 | Polygon | 2744.96696 |
| 7 | Polygon | 2910.46316 |
| 8 | Polygon | 9585.07983 |
| 9 | Polygon | 5258.15586 |
| 10 | Polygon | 3709.66528 |
| 11 | Polygon | 1157554.52887 |

## *Behavior*

**Rules we set, ex. display only at a particular scale.**

# topics of the week – part II

- What is Internet GIS?
- Examples of Commercial GIS Web Applications
- Examples of Government/Public GIS Internet Applicat.
- Examples of Civil Society GIS Internet Applications

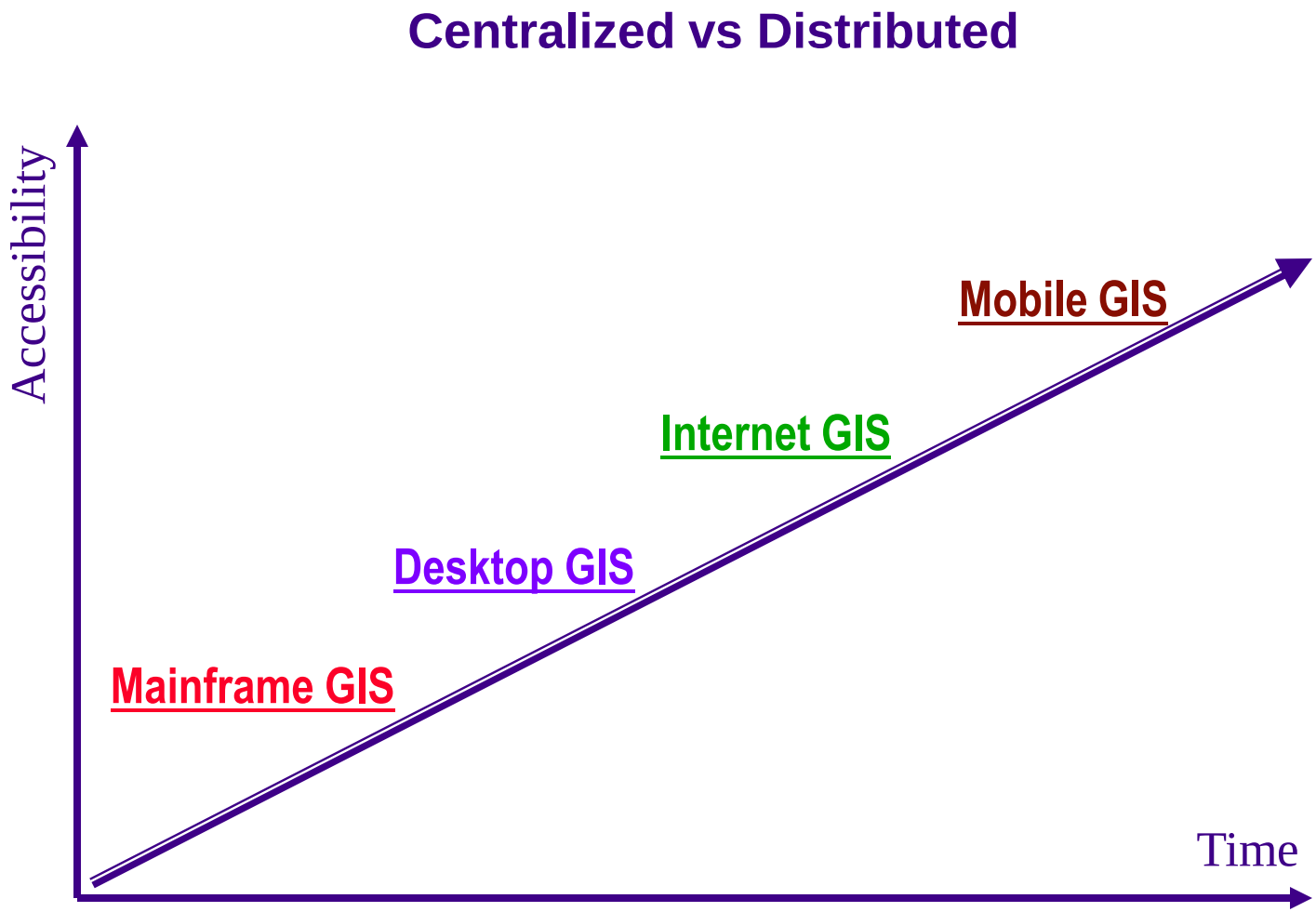
# What is Internet GIS

- Internet GIS uses the Internet to distribute data and to conduct spatial analysis in a distributed environment.
- Web Mapping refers to making and displaying maps on the Web, with little or no analysis capability.

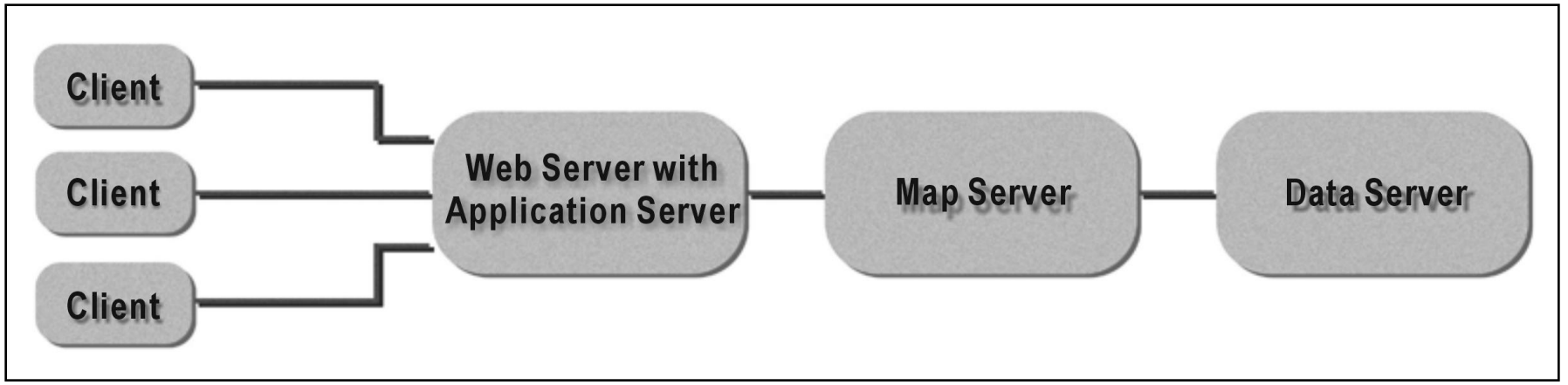
# Features of Internet GIS

- Wide accessibility, users any where can access GIS data and analysis tools over the Internet.
- No GIS software is required to be installed locally.
- Takes advantage of the existing graphic user interface provided by the World Wide Web.
- Users can manipulate maps and GIS data directly over the Web.
- Local GIS software can also access remote data anywhere, via the Internet, if it is Internet aware.
- Internet GIS enables incorporation of real-time information.
- It is generally at no cost to the user – but not always

# Evolution of GIS architecture



# Basic Architecture of Internet GIS




desktops/laptops

computer acting as server and related software

# Commercial  Web GIS free for everyone

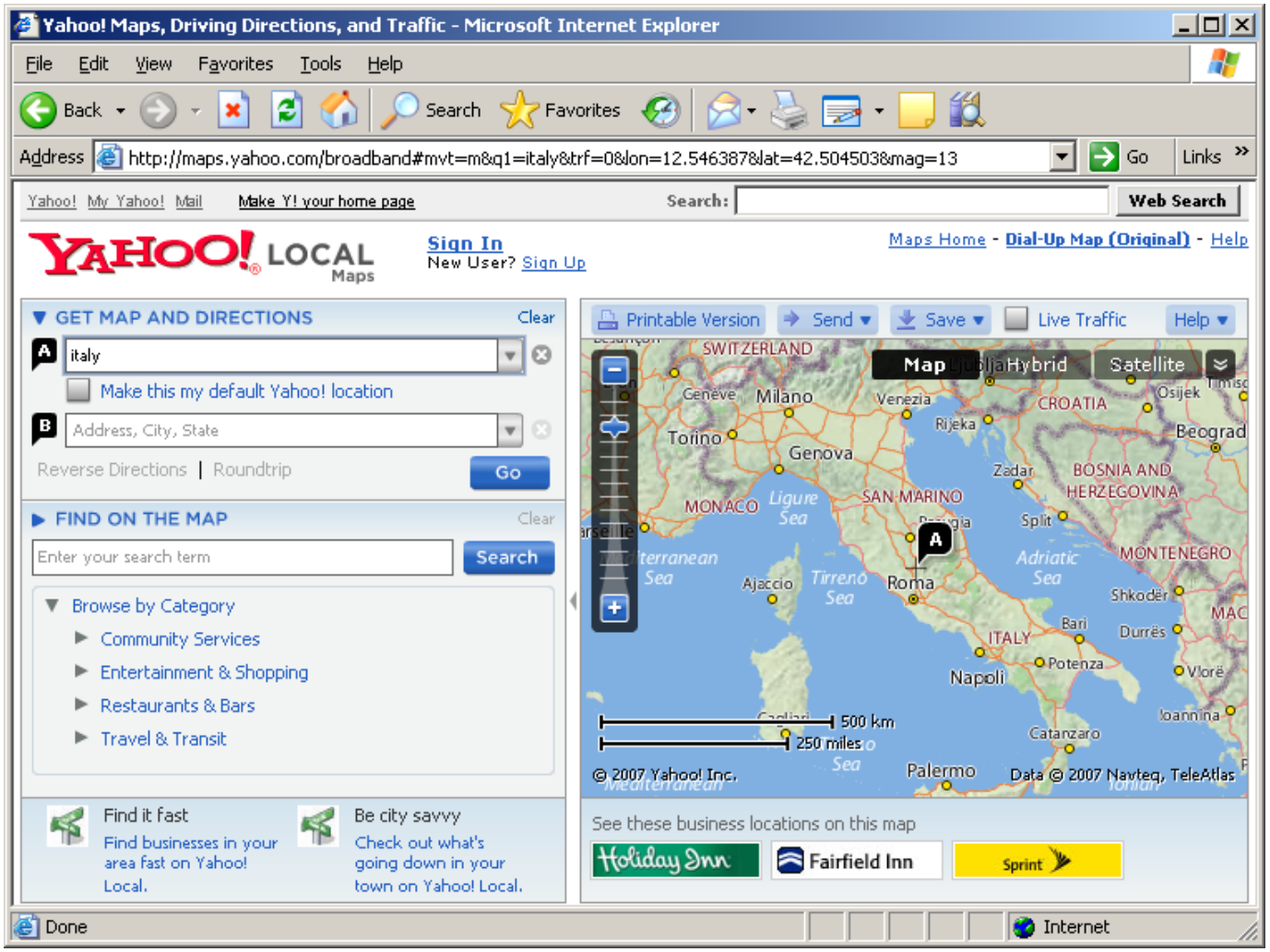
Yahoo Maps  - http://maps.yahoo.com/

Google Maps - http://maps.google.com

Google Earth - http://earth.google.com/

MSN Virtual Earth - http://www.bing.com/maps

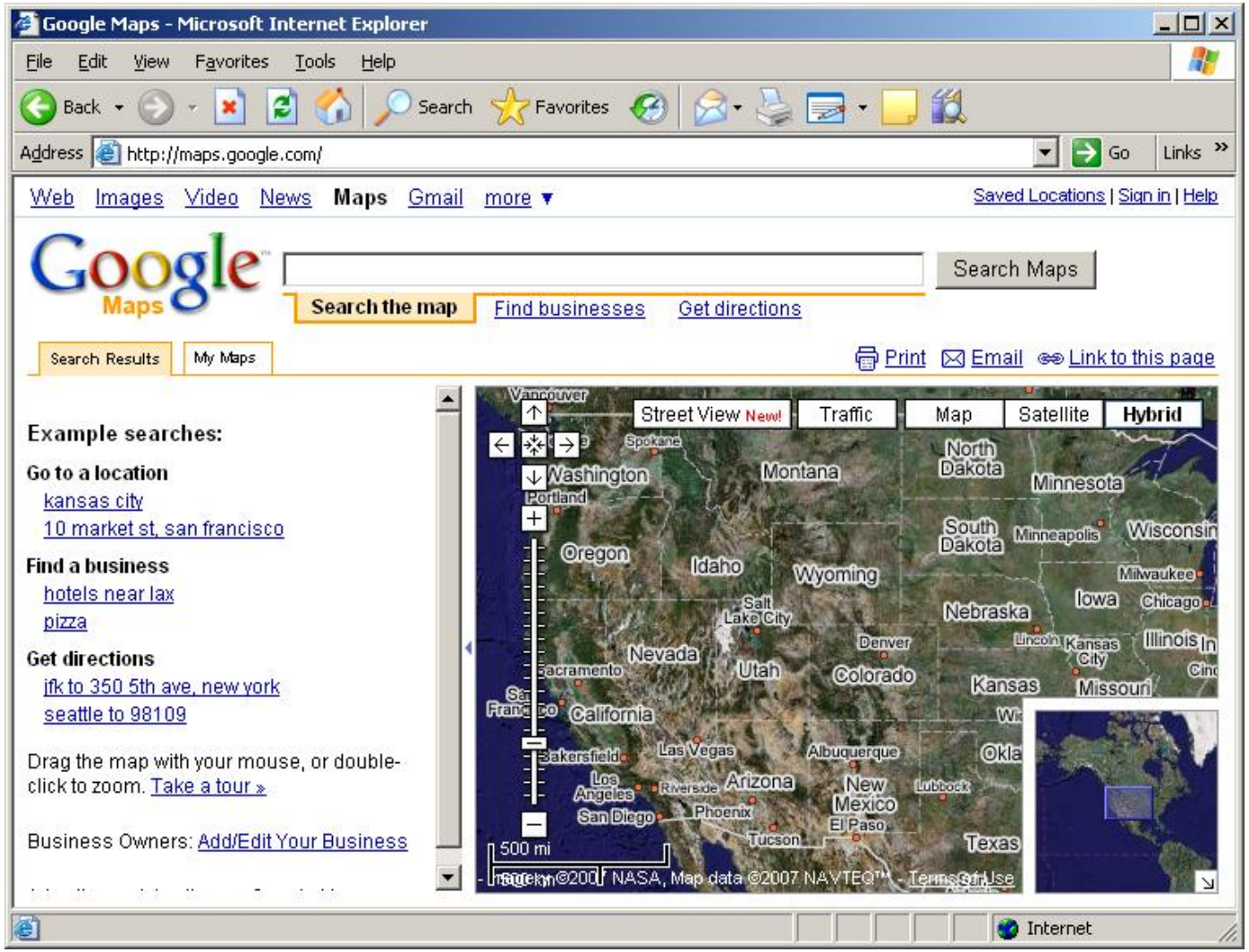
# Yahoo Maps


Yahoo! Maps, Driving Directions, and Traffic - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://maps.yahoo.com/broadband#mvt=m&q1=italy&trf=0&lon=12.546387&lat=42.504503&mag=13
Go Links
Yahoo! My Yahoo! Mail Make Y! your home page
Search: Web Search
YAHOO! LOCAL Maps
Sign In
New User? Sign Up
Maps Home - Dial-Up Map (Original) - Help
GET MAP AND DIRECTIONS
Clear
italy
Make this my default Yahoo! location
Address, City, State
Reverse Directions | Roundtrip
Go
FIND ON THE MAP
Clear
Enter your search term
Search
Browse by Category
Community Services
Entertainment & Shopping
Restaurants & Bars
Travel & Transit
Find it fast
Find businesses in your area fast on Yahoo! Local.
Be city savvy
Check out what's going down in your town on Yahoo! Local.
Printable Version
Send
Save
Live Traffic
Help
Map
Hybrid
Satellite
SWITZERLAND
Geneve
Milano
Venezia
CROATIA
Osijek
Rijeka
Beograd
Torino
Genova
Zadar
BOSNIA AND HERZEGOVINA
MONACO
Ligure Sea
SAN MARINO
Split
Adriatic Sea
MONTENEGRO
Ajaccio
Tirreno Sea
Roma
Shkodër
Bari
Durrës
ITALY
Potenza
Napoli
Vlorë
Ioannina
Catanzaro
Palermo
500 km
250 miles
© 2007 Yahoo! Inc.
Data © 2007 Navteq, TeleAtlas
See these business locations on this map
Holiday Inn
Fairfield Inn
Sprint
Done
Internet

# Features

- Created and maintained by NAVTEQ
- Can be accessed at: http://maps.yahoo.com/
- Provides maps, imagery, hybrid display of the two
- Provides for geo-spatial searches, driving directions
- Provides traffic information

# Google Maps


Google Maps - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://maps.google.com/
Go Links
Web Images Video News Maps Gmail more
Saved Locations | Sign in | Help
Google Maps
Search Maps
Search the map
Find businesses
Get directions
Search Results
My Maps
Print Email Link to this page
Example searches:
Go to a location
kansas city
10 market st, san francisco
Find a business
hotels near lax
pizza
Get directions
jfk to 350 5th ave, new york
seattle to 98109
Drag the map with your mouse, or double-click to zoom. Take a tour »
Business Owners: Add/Edit Your Business
Street View New!
Traffic
Map
Satellite
Hybrid
Vancouver
Spokane
Washington
Portland
Montana
North Dakota
Minnesota
Oregon
Idaho
Wyoming
South Dakota
Minneapolis
Wisconsin
Milwaukee
Chicago
Iowa
Nebraska
Salt Lake City
Denver
Lincoln
Kansas City
Illinois
Nevada
Utah
Colorado
Kansas
Missouri
Sacramento
California
Las Vegas
Albuquerque
Bakersfield
Los Angeles
Riverside
Arizona
New Mexico
Lubbock
San Diego
Phoenix
El Paso
Tucson
Texas
500 mi
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Internet

# Features

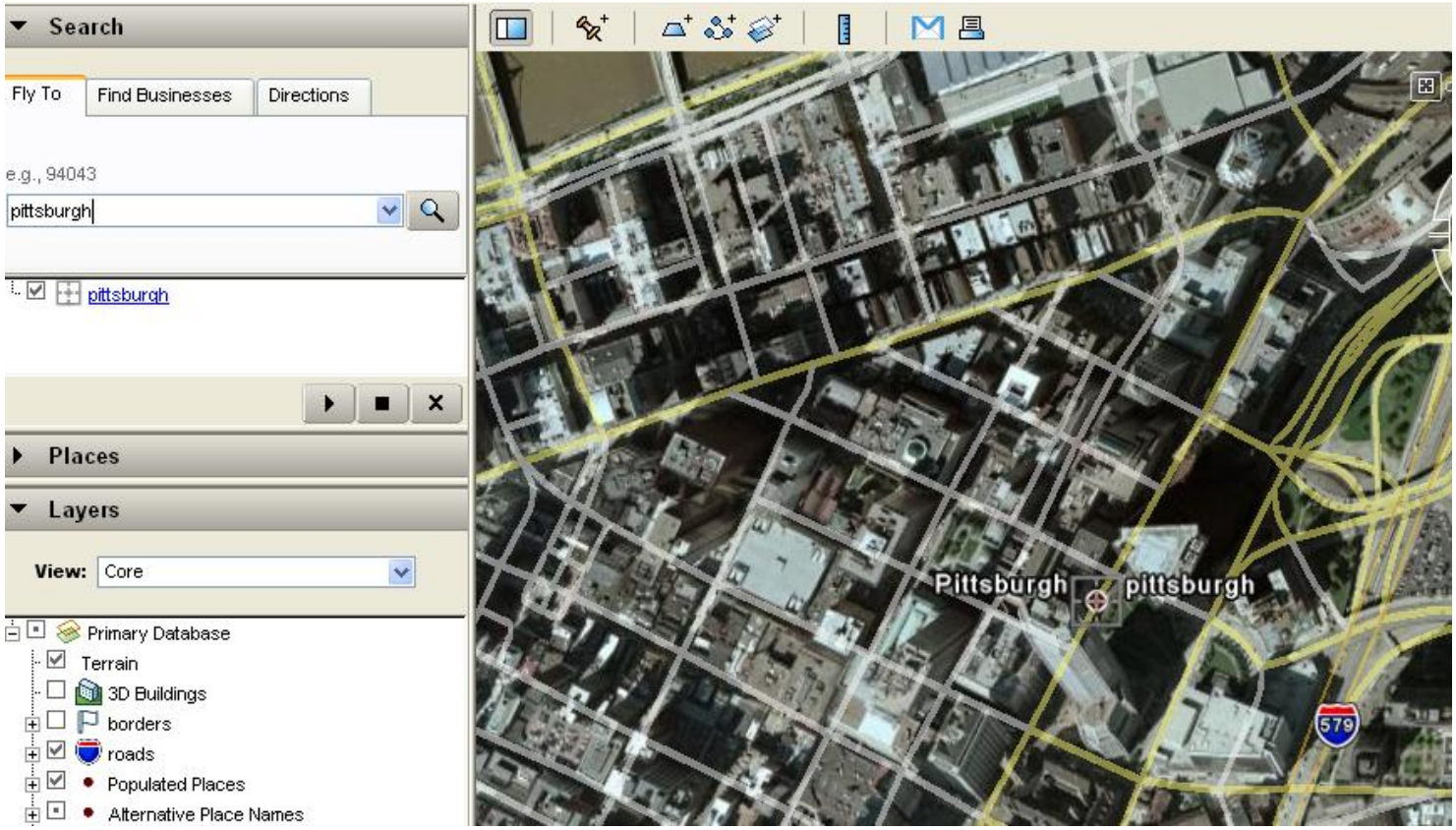
- Created and maintained by Google
- Can be accessed at: http://maps.google.com/
- Provides maps, imagery, hybrid display of the two
- Provides for geo-spatial searches
- Lately provides for user customization
- A new feature the street view – does not cover the entire US yet

# Google Earth

- Maintained by Google
- Can be downloaded at: http://earth.google.com/
- Developed by Keyhole, Inc.
- Acquired in ‘04, renamed in ‘05
- Three versions:
  - Free
  - Plus
  - Professional

# Features

- Combines satellite imagery, maps, Google Search
- Allows for user's own information, for street view, etc.

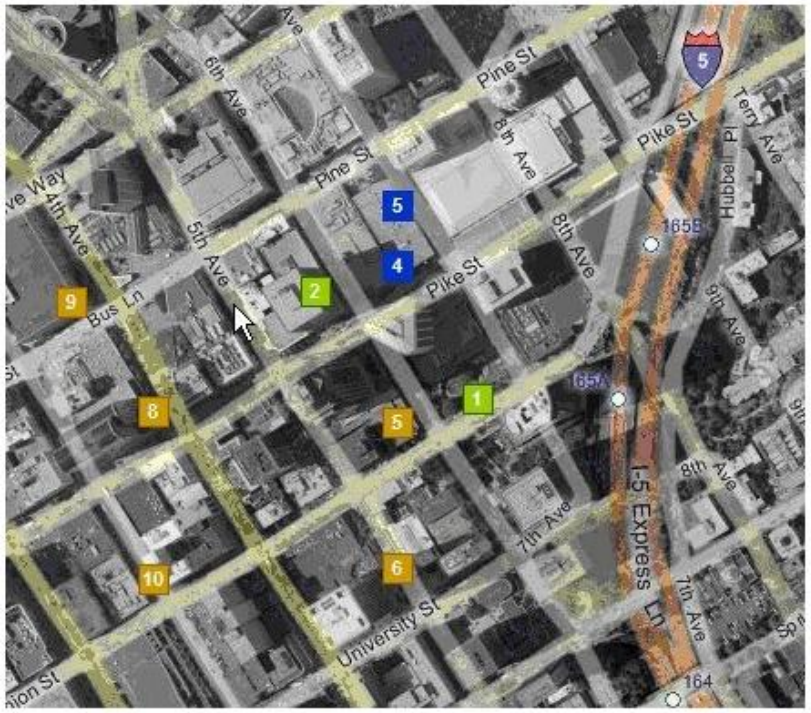


# Google Sky

- The New Digital Sky, Google Video – Tony Tyson, UC Davis
- New Frontiers in Astronomy, Google Video - Alberto Conti and Carol Christian, Hubble Institute
- Mars Crowdsourcing Experiment – from images to GIS data

# MSN Virtual Earth

- Created and maintained by Microsoft
- Also known as Windows Live Local
- URL - http://www.bing.com/maps



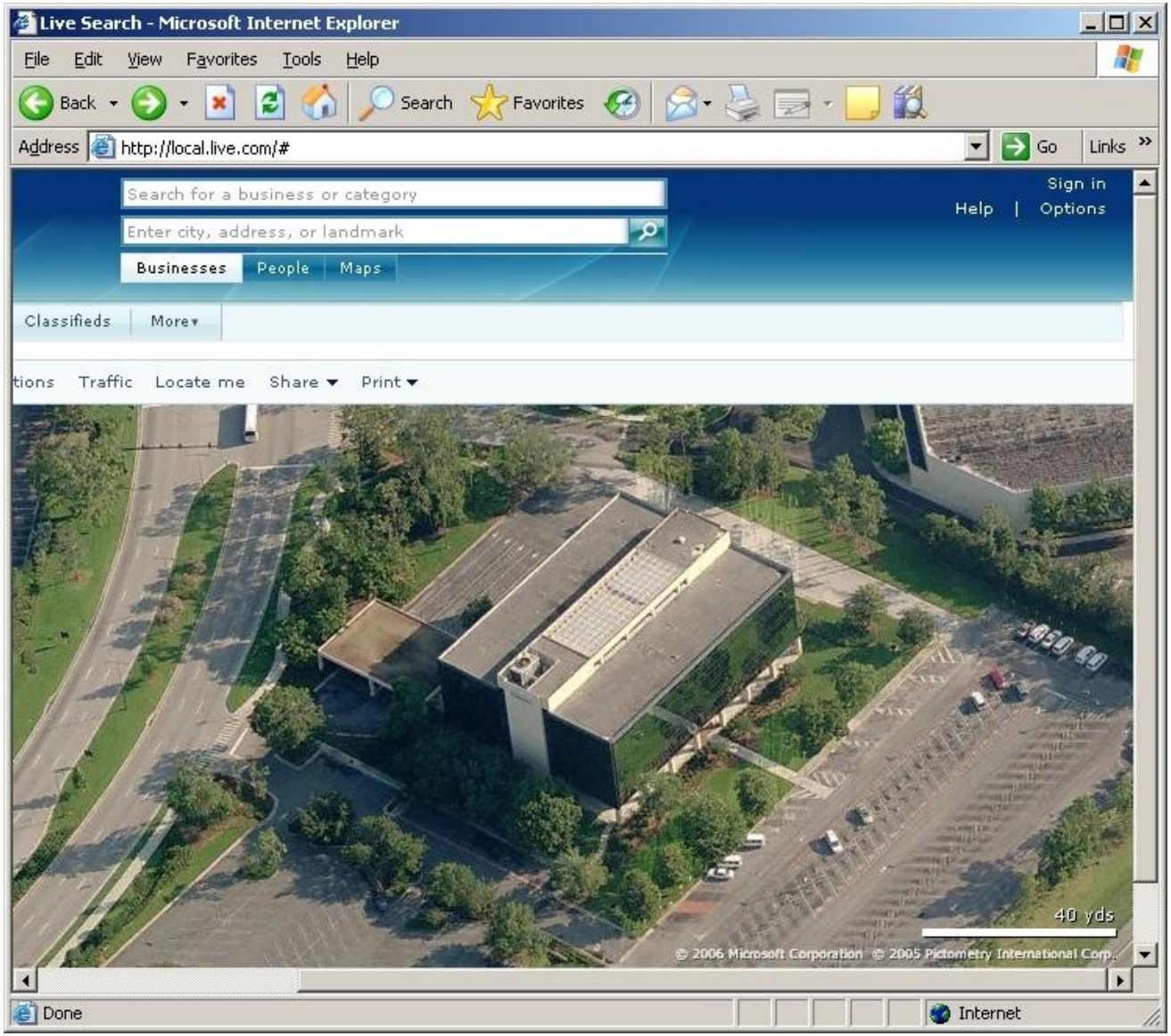
# Features

- Scratch Pad option: a place to "hold" the locations of interest during a search and discover session
- Ability to add local data layers, such as businesses or restaurants
- Ability to choose from a number of different data types
- Allows for user's own information
- Provides oblique imagery i.e. satellite images with 45-degree-angle views of buildings and neighborhoods

# Oblique Imagery

- Created by Pictometry and sold to Microsoft along with orthogonal images under a five year contract.
- The oblique does not cover all counties in US, much less the world.
- Live demo on Oblique Imagery from LocalLive.
- Live demo on Oblique Imagery using the desktop EFS.

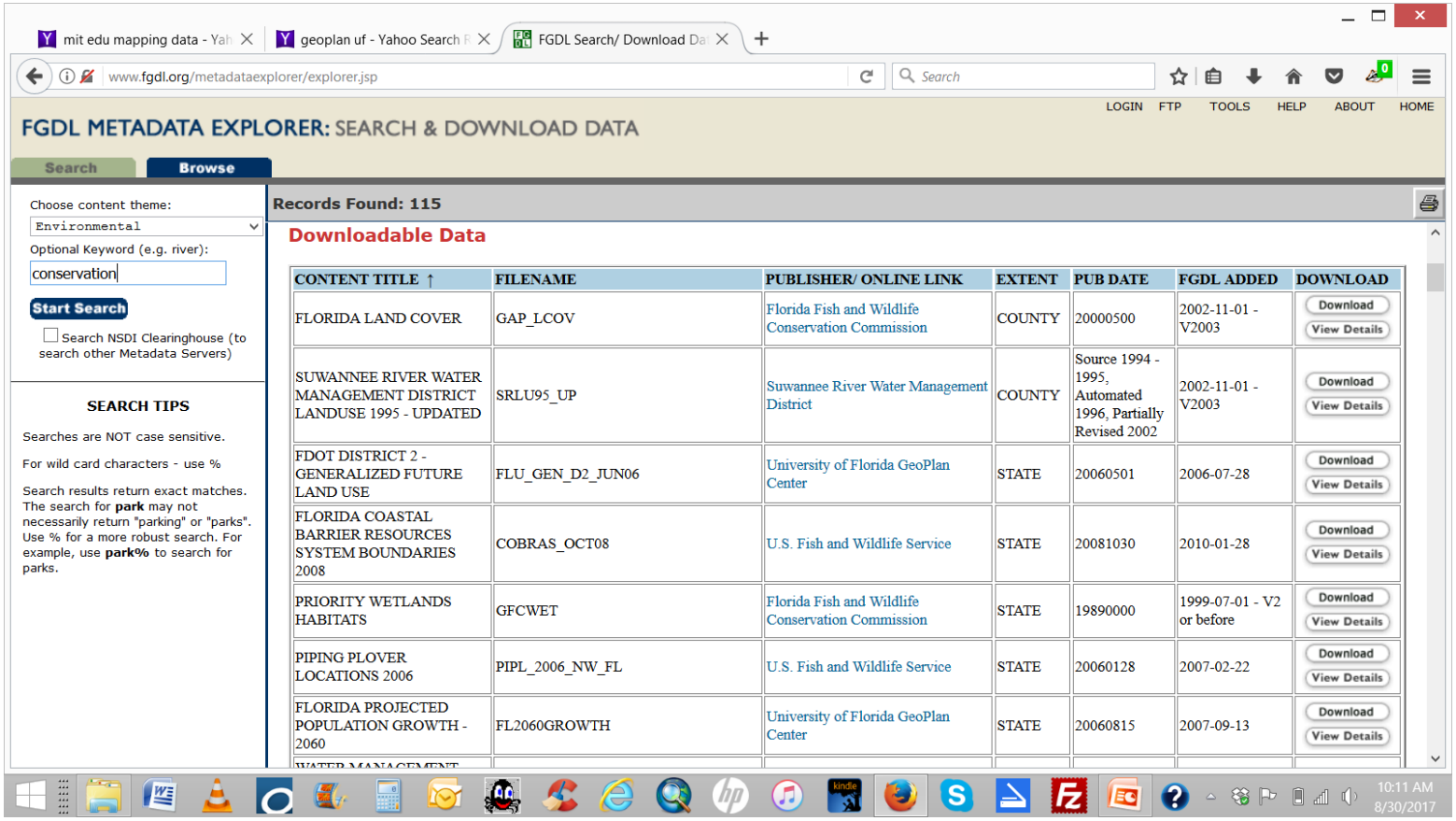
# Oblique Imagery



# Public GIS Internet Applications

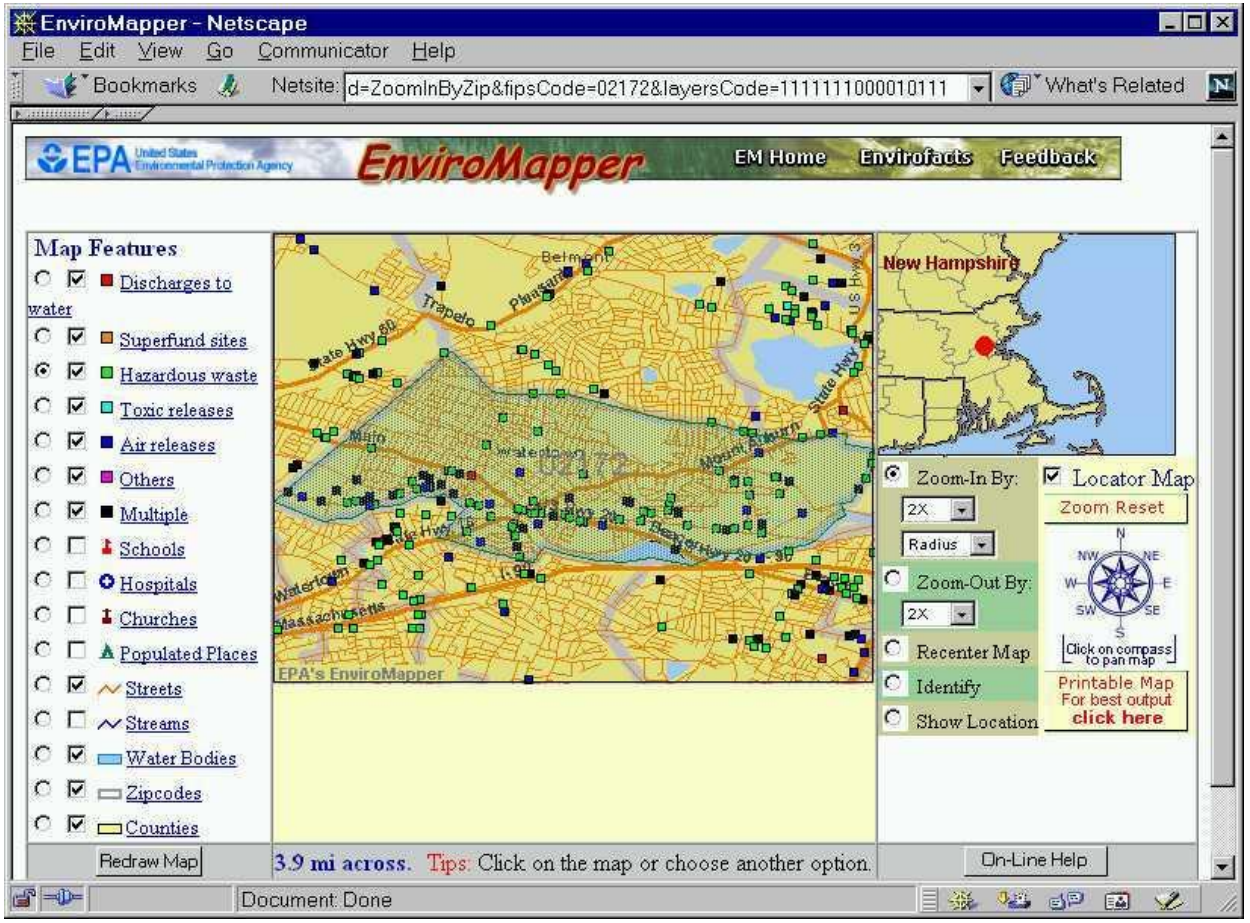
## Florida Geographic Data Library

http://fgdl.org



# Public GIS Internet Applications - EPA EnviroMapper

http://www.epa.gov/geospatial



# Civil Society GIS Internet Applications - OpenStreetMap

http://www.openstreetmap.org