

Beneficios de una Infraestructura Nacional de Datos Espaciales: Una Vision Global

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Director of Products
ESRI, USA
Chile**

Outline

- **Introduction**
- **The value of Geographic Information Systems**
- **Examples**
- **Strategies for developing GIS**
- **Spatial Data Infrastructures**
 - **Evolution**
 - **Geoportals**
- **Conclusions**

Our World Faces Many Challenges



Increasing

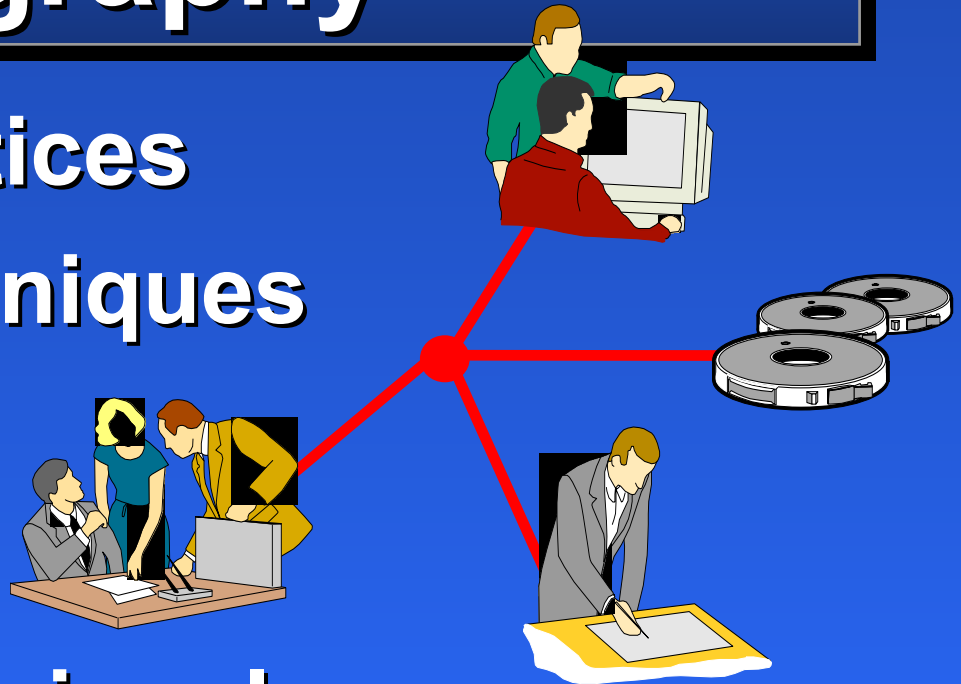
- Population
- Consumption
- Land Use Conflicts
- Disasters

Declining

- Resources
- Diversity
- Natural Areas
- Security

Solving Such Complex Problems Requires Geography

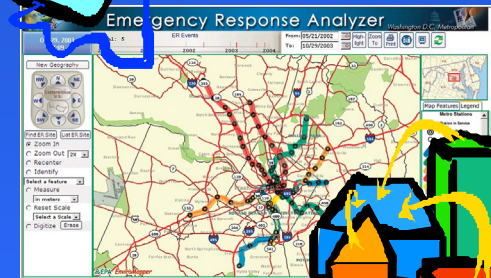
- Policies / practices
- Methods / techniques
- Technology
- Data
- Trained professionals



Geographic Information

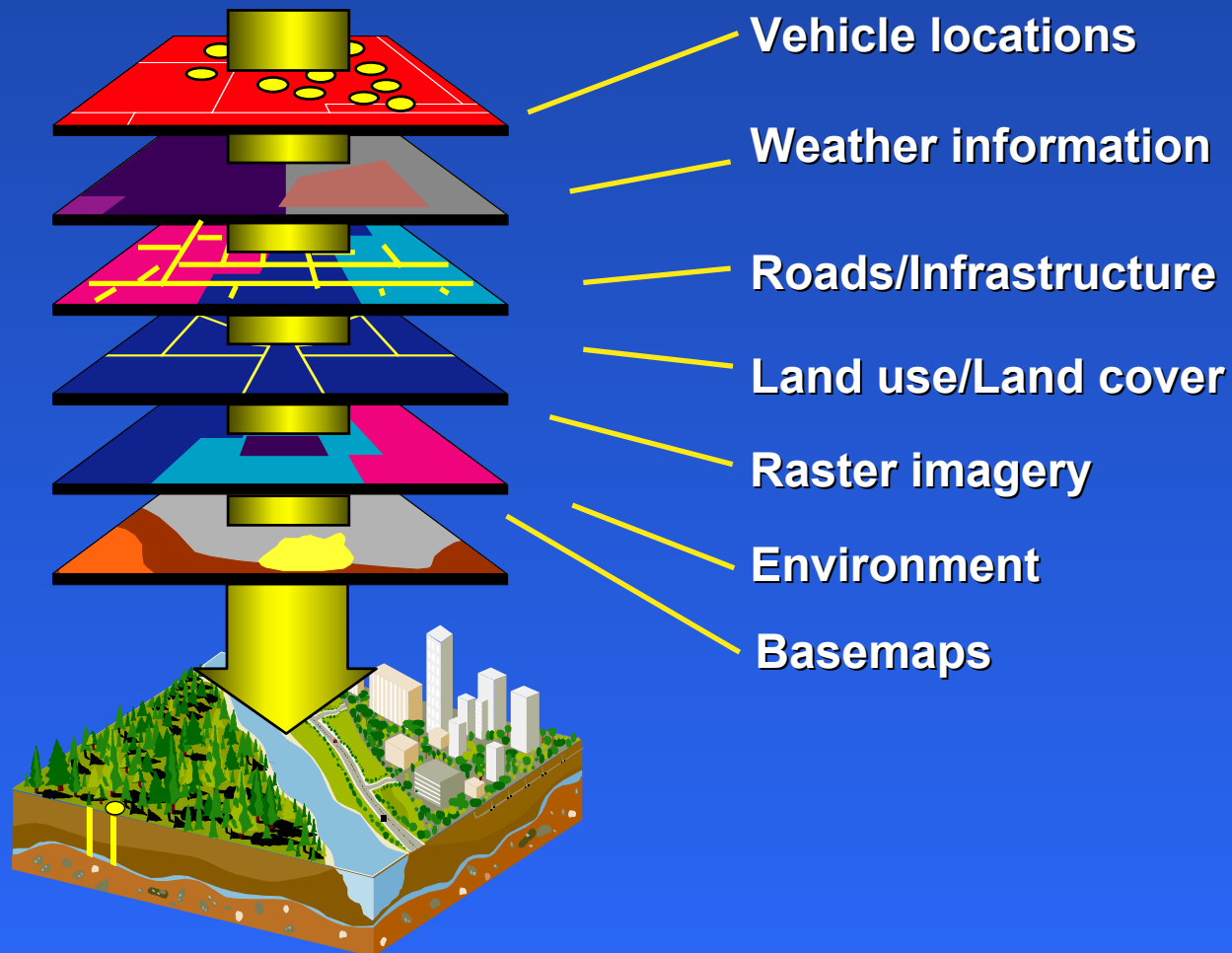
A Valuable Resource

- Everything is located somewhere
- 80% of government data is geographic
 - Address
 - Postal codes
 - Roads, Railways
 - Census boundaries
 - Election areas
 - Facilities (hospitals, schools, maintenance depots, pipes)
 - Natural resources (minerals, forests, vineyards..)



GIS Integrates All Types of Data

Geography is a “key”



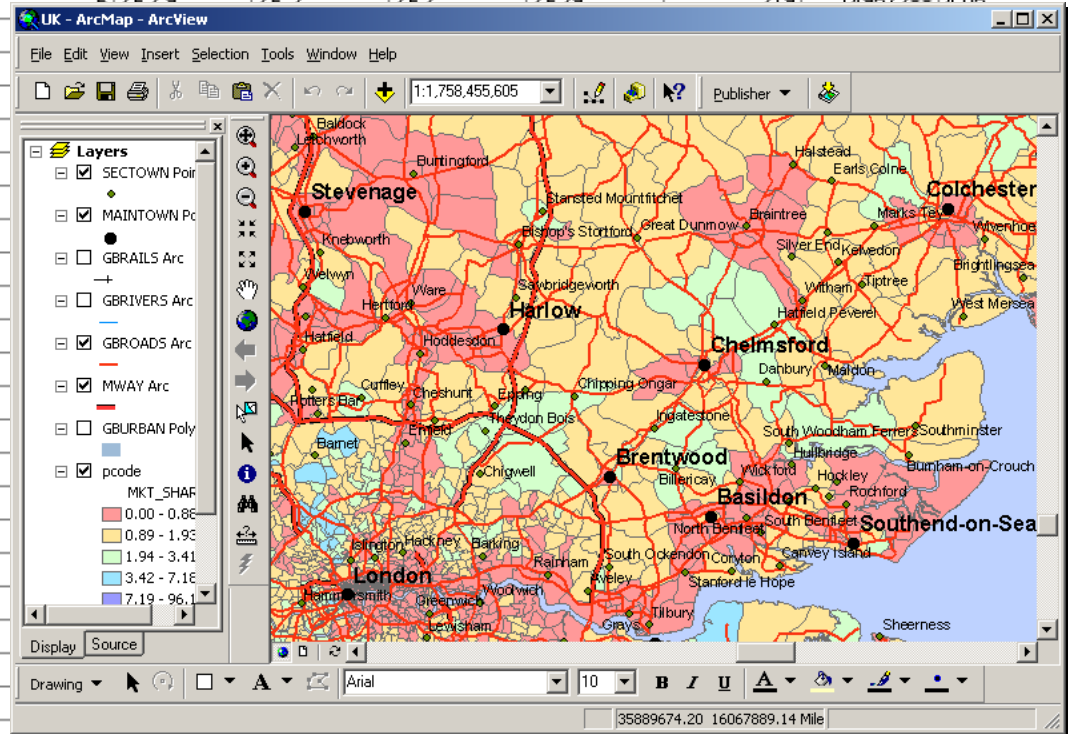
Forming collections of data to create information ...

Palabras

A Map is Worth Millions of Bytes

Attributes of pcode

FID	Shape*	AREA	PERIMETE	PSECT_	PSECT_ID	BART_COM	AREA_DIS	PDIST	PC	BCT	BSI	MKT_SHAR
0	Polygon	42968.77344	785.14099	2	1	ZE 2 9	ZE 2	ZE2	ZE29	219	14957288	4.05
1	Polygon	38217.71875	730.09796	3	2	ZE 2 9	ZE 2	ZE2	ZE29	219	14957288	4.05
2	Polygon	51445.99219	1019.40808	4	3	ZE 2 9	ZE 2	ZE2	ZE29	219	14957288	4.05
3	Polygon	52792.80469	1047.96777	5	4	ZE 2 9	ZE 2	ZE2	ZE29	219	14957288	4.05
4	Polygon	21963.61133	564.76471	6	5	ZE 2 9	ZE 2	ZE2	ZE29	219	14957288	4.05
5	Polygon	120291104	112123.1562	7	6	ZE 2 9	ZE 2	ZE2	ZE29	219	14957288	4.05
6	Polygon	17080.23242	489.94165	8								
7	Polygon	16861.21875	533.09491	9								
8	Polygon	18488.31055	594.82257	10								
9	Polygon	43951.52344	806.06305	11								
10	Polygon	44691.67969	788.91254	12								
11	Polygon	28638.28711	625.67053	13								
12	Polygon	18014.88281	502.21948	14								
13	Polygon	697040.0625	5471.89893	15								
14	Polygon	27055.74609	642.57513	16								
15	Polygon	106340.0234	1700.55688	17								
16	Polygon	84947.17188	1403.63184	18								
17	Polygon	18724.8125	506.59579	19								
18	Polygon	33621.78516	712.62097	20								
19	Polygon	11587.95508	433.05527	21								
20	Polygon	210233792	163722.9375	22								
21	Polygon	23696.13867	601.33801	23								
22	Polygon	20468.17578	542.48907	24								
23	Polygon	10252.21094	378.15375	25								
24	Polygon	18168.01953	498.99432	26								
25	Polygon	2332628.25	8658.6582	27								
26	Polygon	34735.26953	790.32886	28								
27	Polygon	391066.5312	3565.69434	29								
28	Polygon	106814.1015	1457.23206	30								
29	Polygon	26766.96914	597.66455	31								



Value of GIS

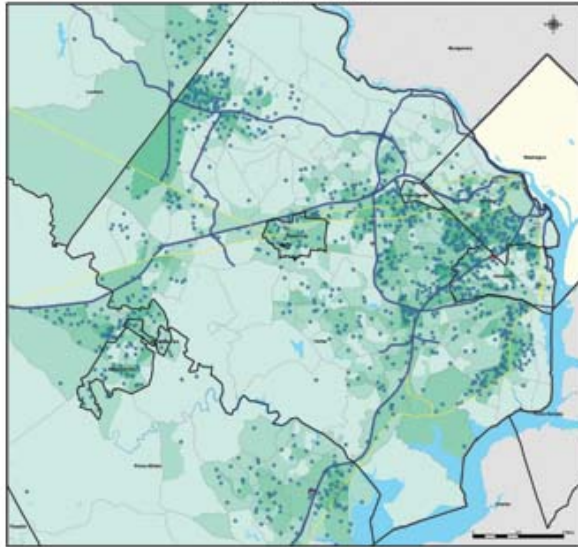
- **Oxford Economic Research Associates Ltd (OXERA) -1996**
- **Ordnance Survey added +£100m to UK economy per year**
 - **Government, Utilities, Transport**
- **Developing the economy**
- **Opening up new markets**

GIS Applications Are Diverse

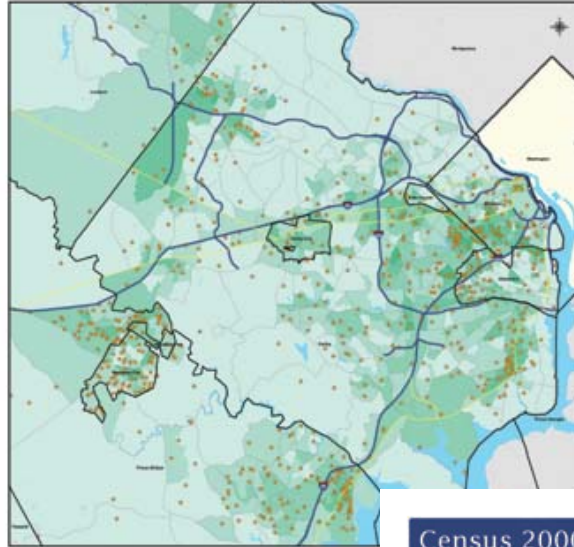
- Population
 - Economic development
 - Bio-diversity
 - Homeland Security
 - Urbanization
 - Pollution
 - Congestion
 - Conservation
 - Land Use
 - Oceans
 - Humanitarian
 - Water Resources
 - Crime
 - Health
 - Education
 - Logistics
 - Energy
 - Defense/Security
 - Environment
 - Government
 - Efficiency
 - Agriculture/Forestry
 - Public Safety
- ...GIS is Important**

Census / Elections

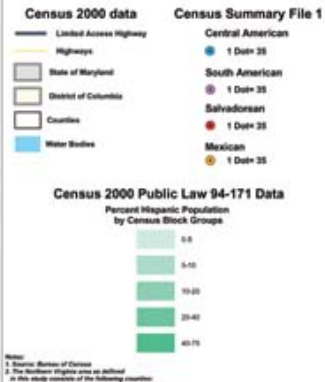
Central American



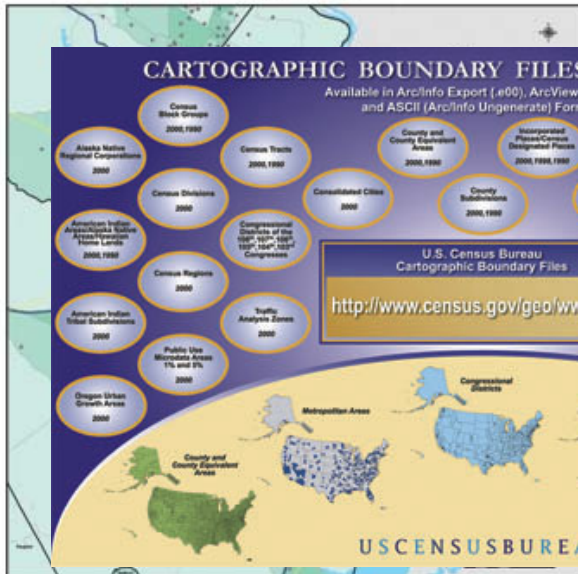
Mexican



DRAFT Major Hispanic Sub-Groups in Northern Va.



South American

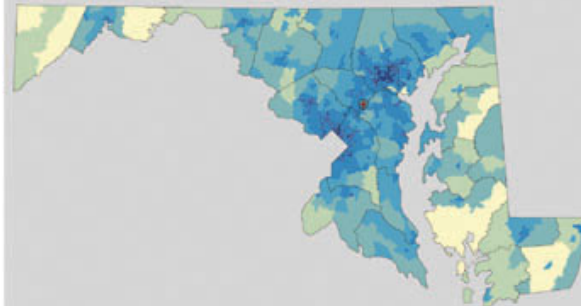


Salvadorean

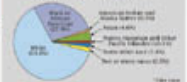


Census 2000: Maryland Profile

Population Density by Census Tract

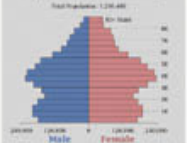


State Race* Breakdown



*Excludes all Census of any race makes up 4.3% of the state population.

Population by Sex and Age



Housing Tenure



Population Per Square Mile by Census Tract



CARTOGRAPHIC BOUNDARY FILES FOR DOWNLOAD

Available in ArcInfo Export (.e00), ArcView Shapefile, and ASCII (ArcInfo Ungenerate) Formats

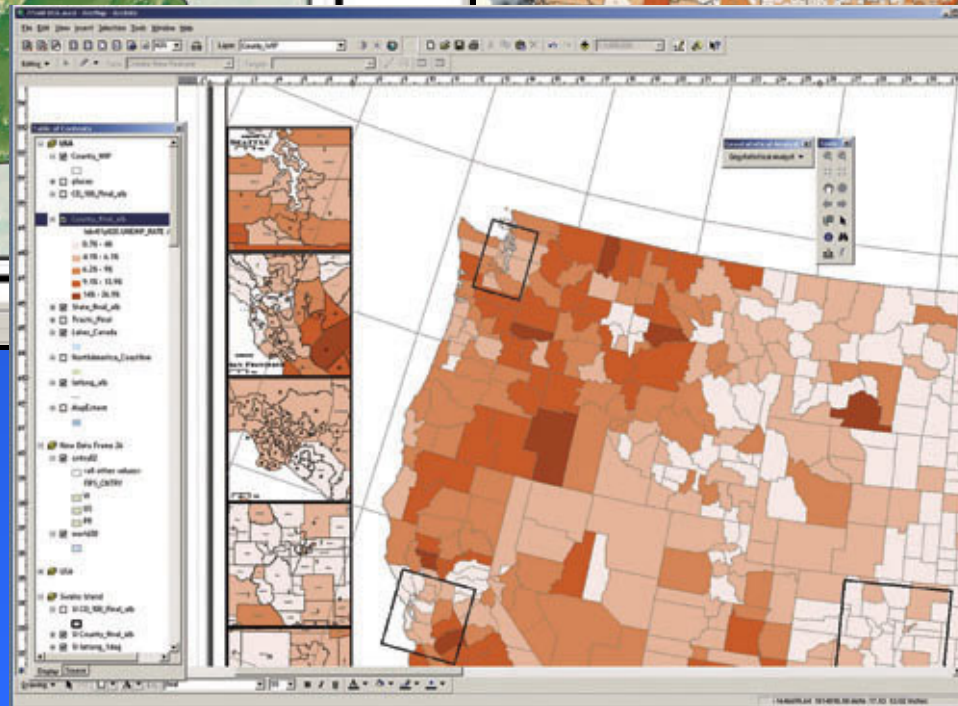
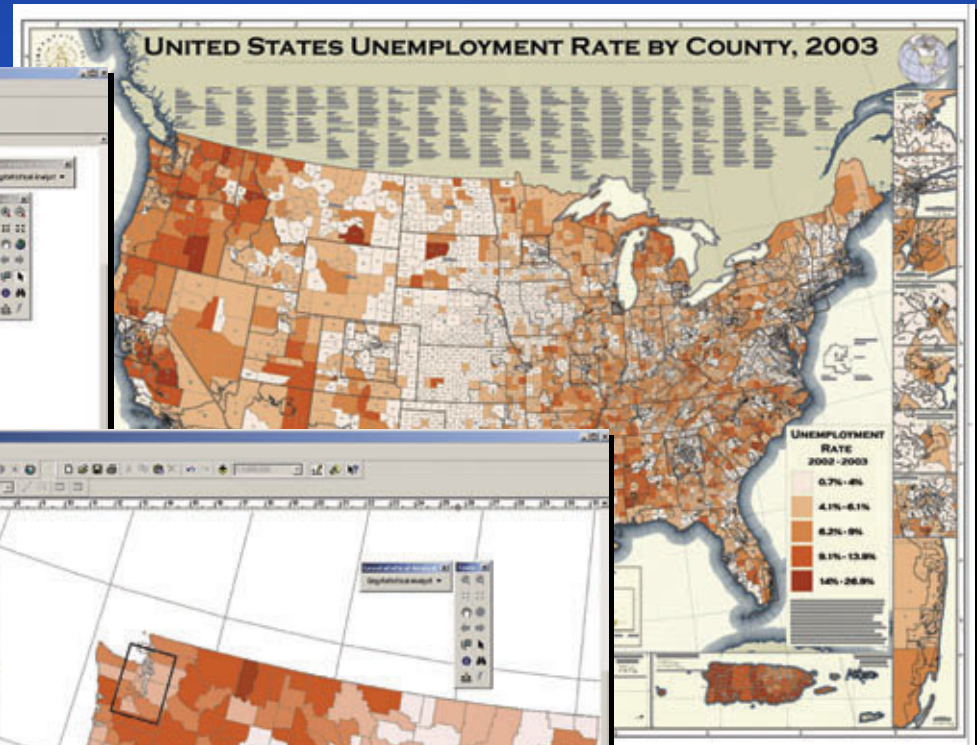
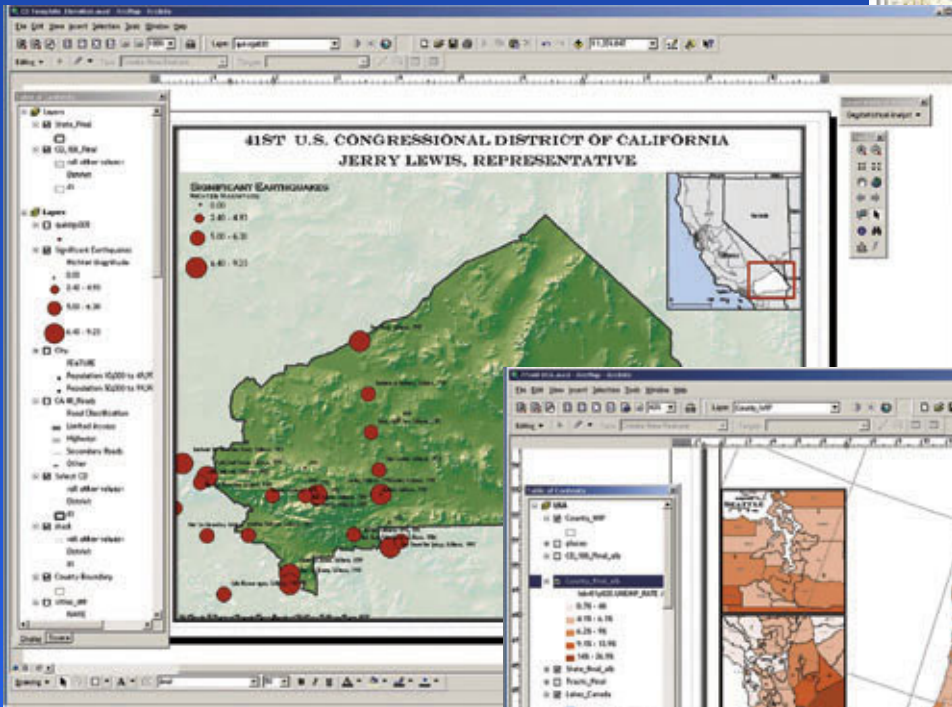


USCENSUSBUREAU

Helping You Make Informed Decisions • 2002-2003

U.S. Department of Commerce • Economics and Statistics Administration • U.S. Census Bureau

Library Information Systems



Human Health and Disease Surveillance

Health Secretary's Command Center US Department of Health & Human Services

III. Geovisualization Tools Development

Weighted Nonparametric Smoothing (Headbanging)



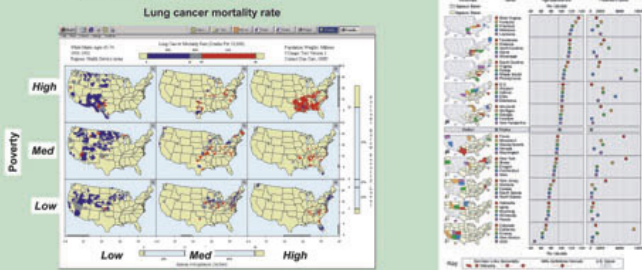
Data: Pickle et al., Atlas of United States Mortality, NCHS, 1996.
Headbanging: Mungtolo et al., Statistics in Medicine, 1999

Conditioned choropleth maps*

- Decompose a single map into strata according to 1 or 2 other factors
- Let users control classifications (high, medium, low) with sliders

Linked micromap plot*

- Links statistical graphs & maps by color
- Can sort on either panel



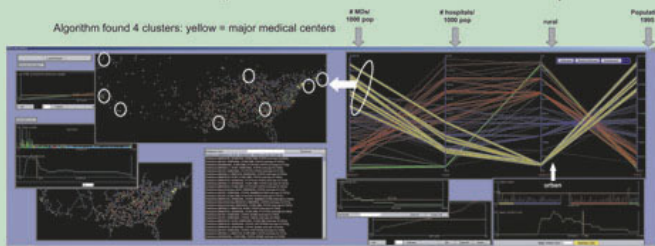
*Carr, Wallin, and Carr, Statistics in Medicine 2000

Combining statistical clustering algorithms with new visualization tools

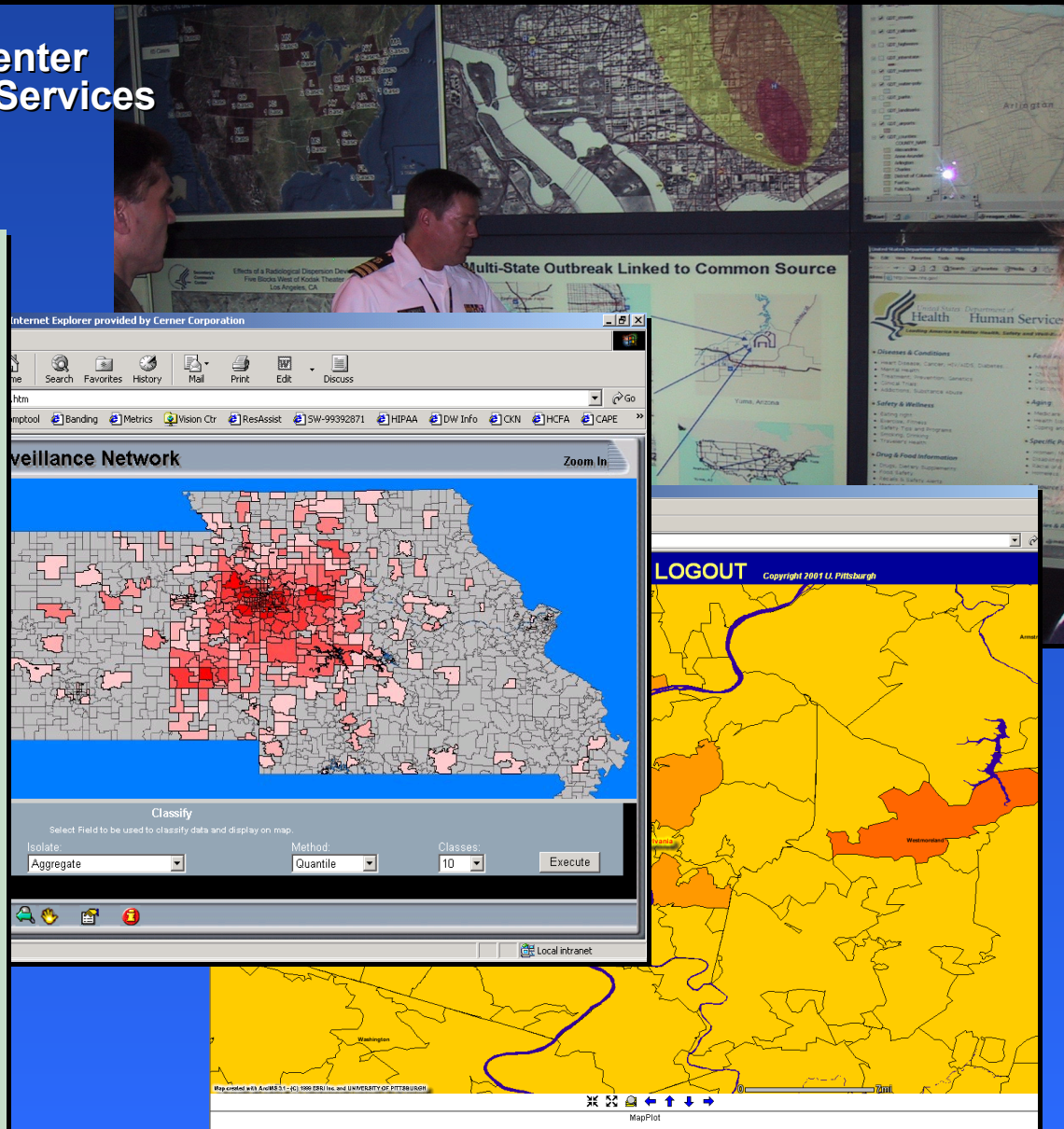
US map

Algorithm found 4 clusters: yellow = major medical centers

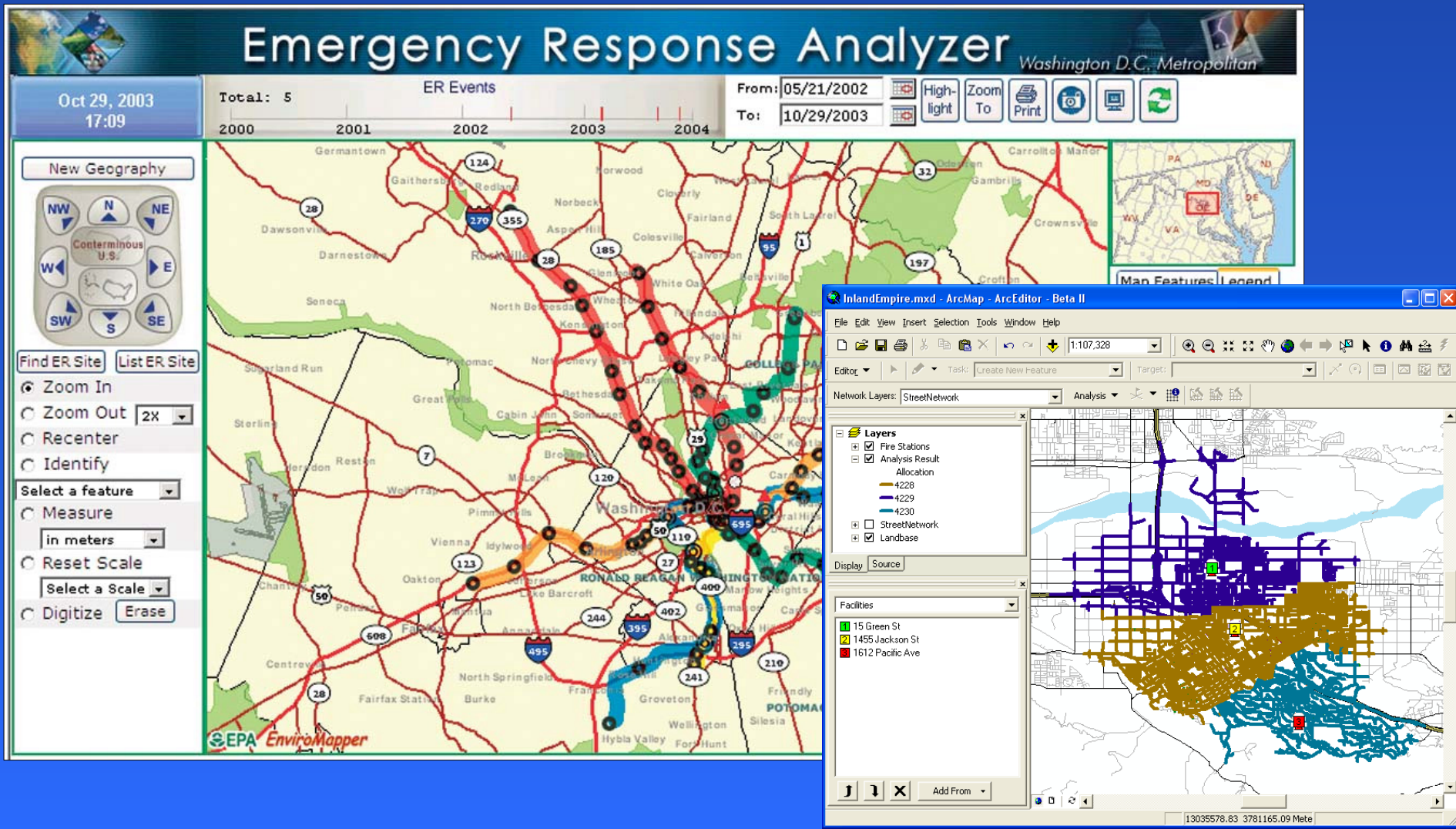
Parallel coordinate plot



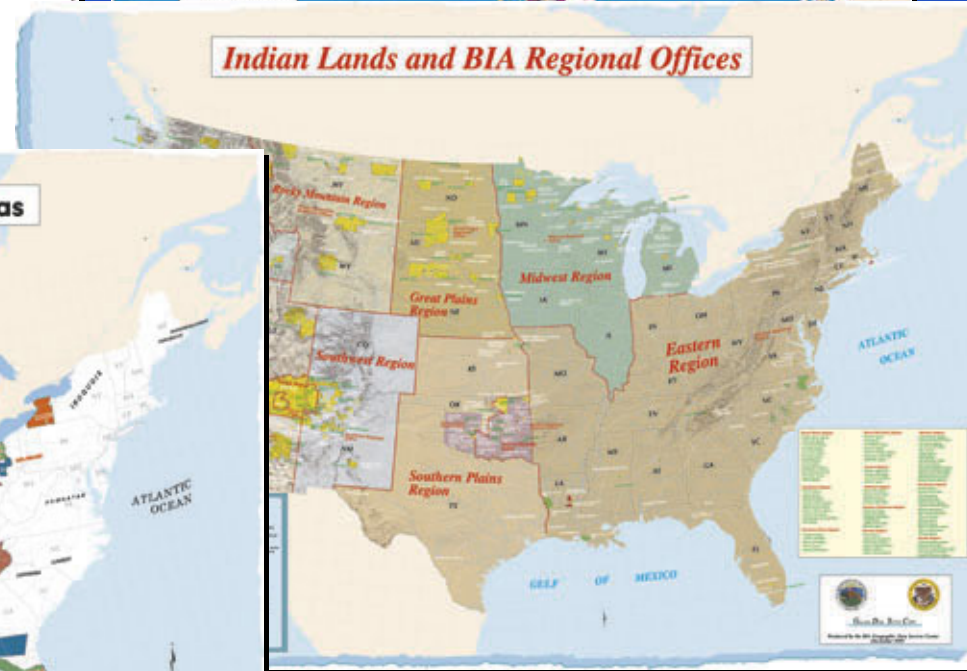
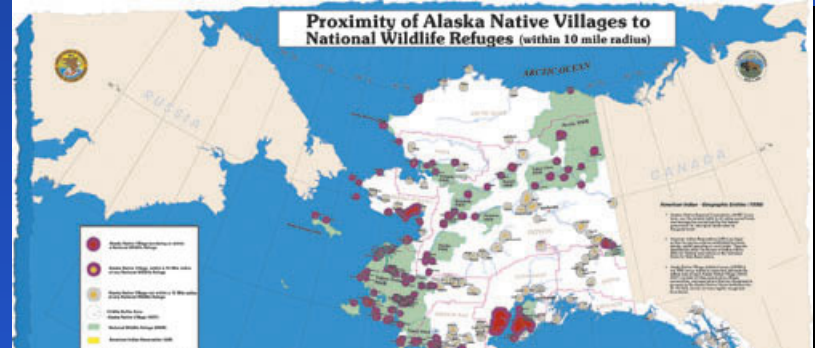
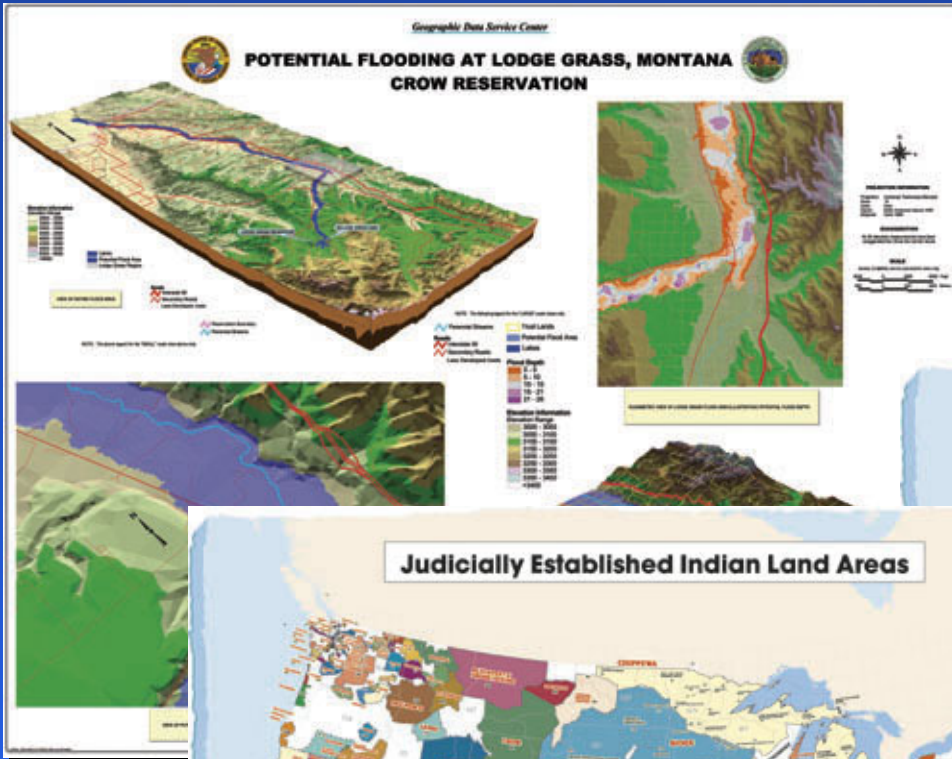
Alan MacEachren, Diansheng Guo, Penn State University (NSF & NCI grants); see www.geovista.psu.edu/grants/sgg/



Transportation Planning / Management



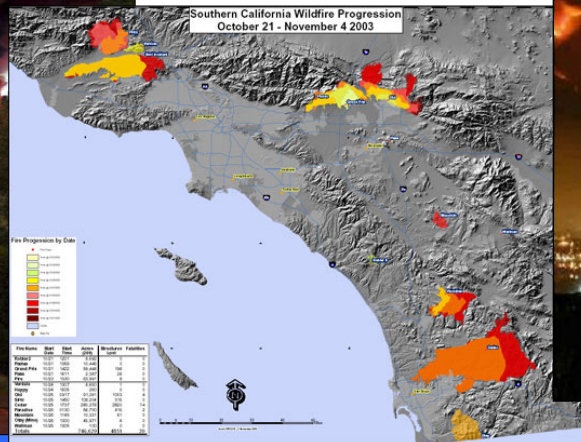
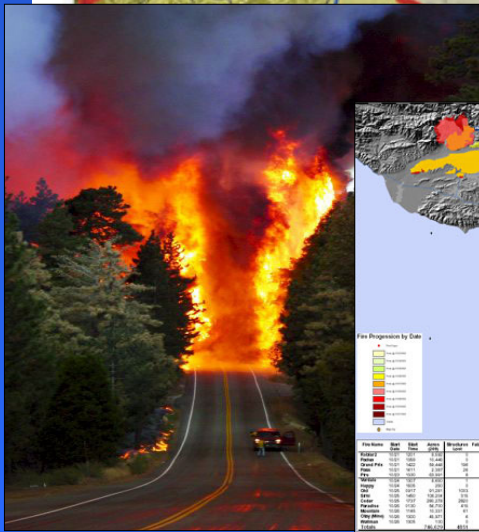
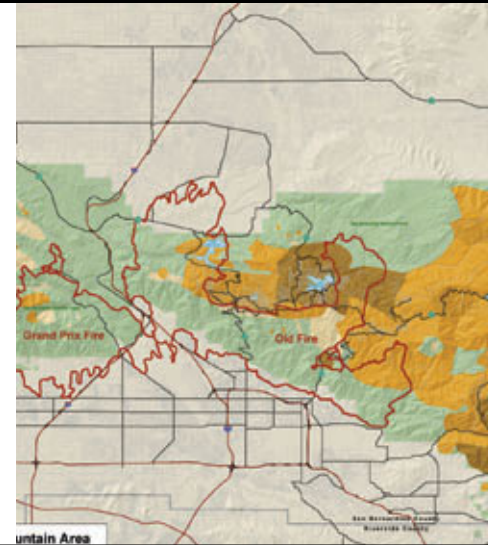
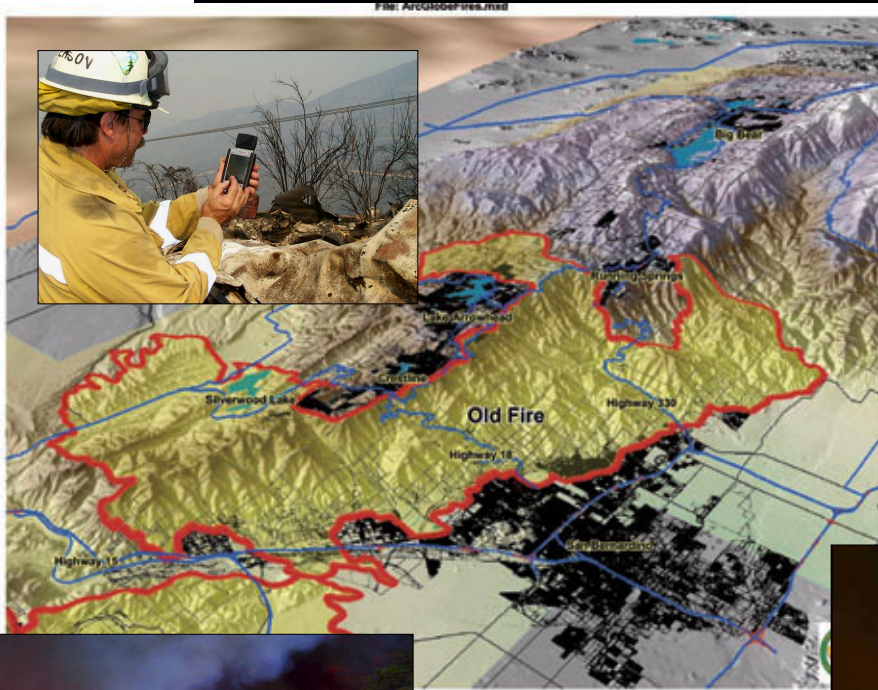
Native American Land Management - BIA



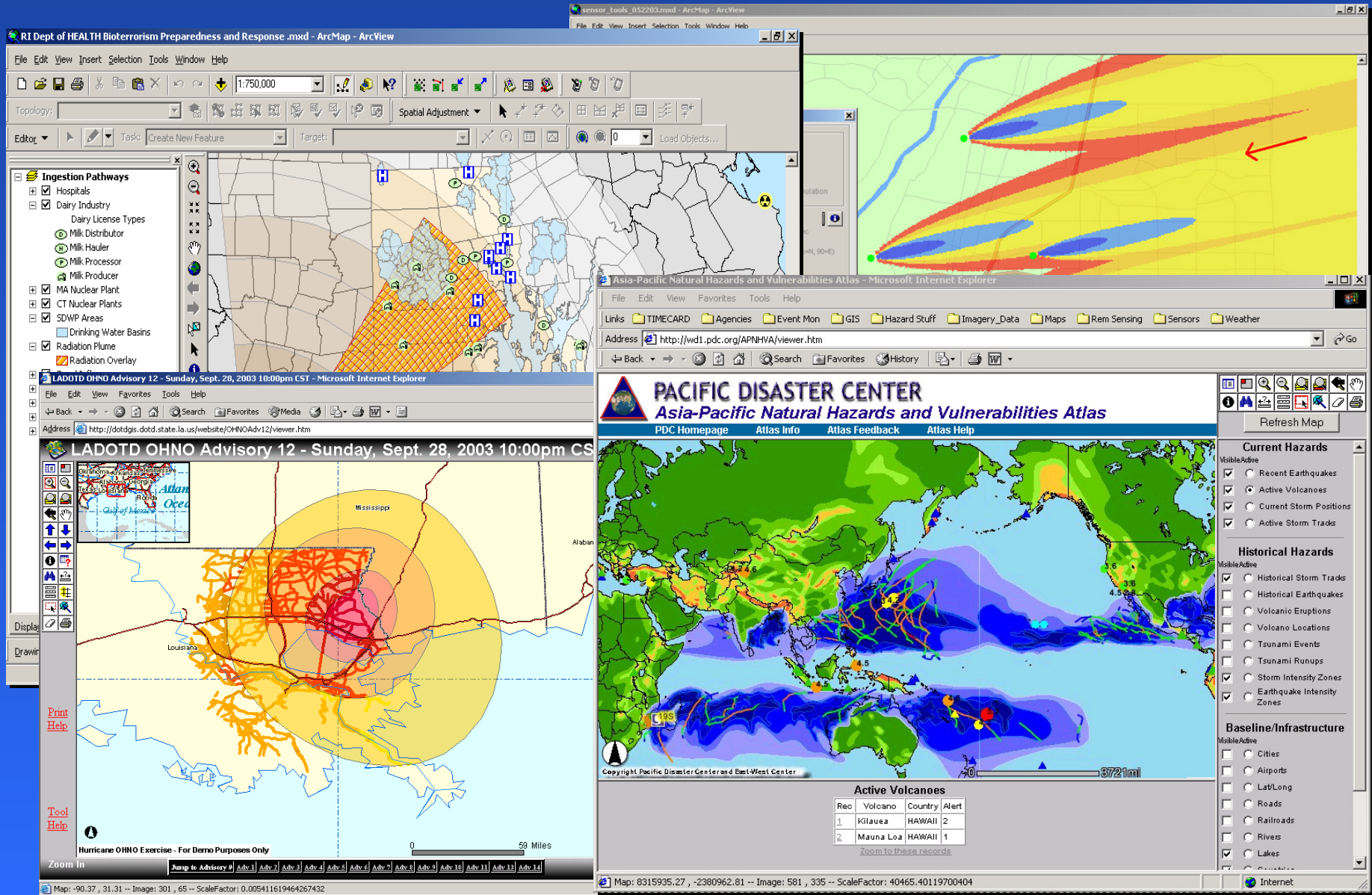
[illegible]

Citizens can annotate the maps And Submit Plans

US Forest Service Forest Mortality / Wildfire

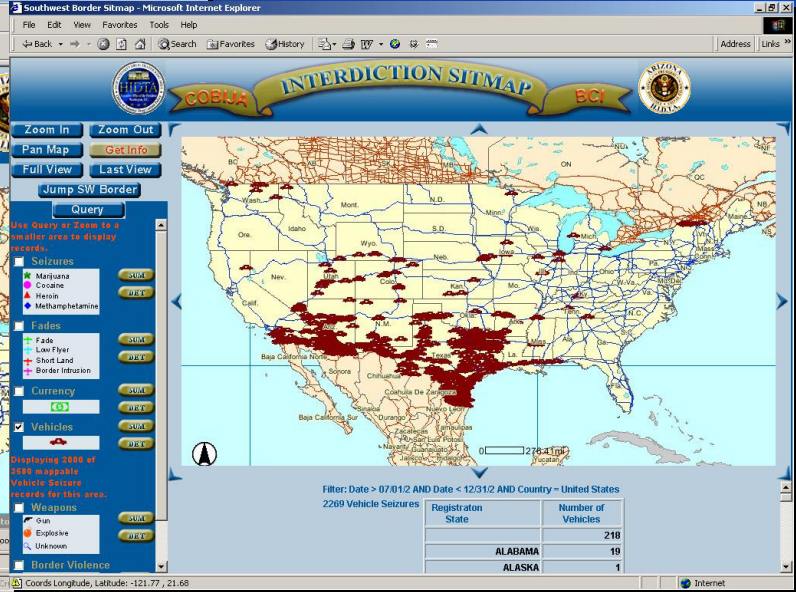


Risk Assessment Simulation Modeling

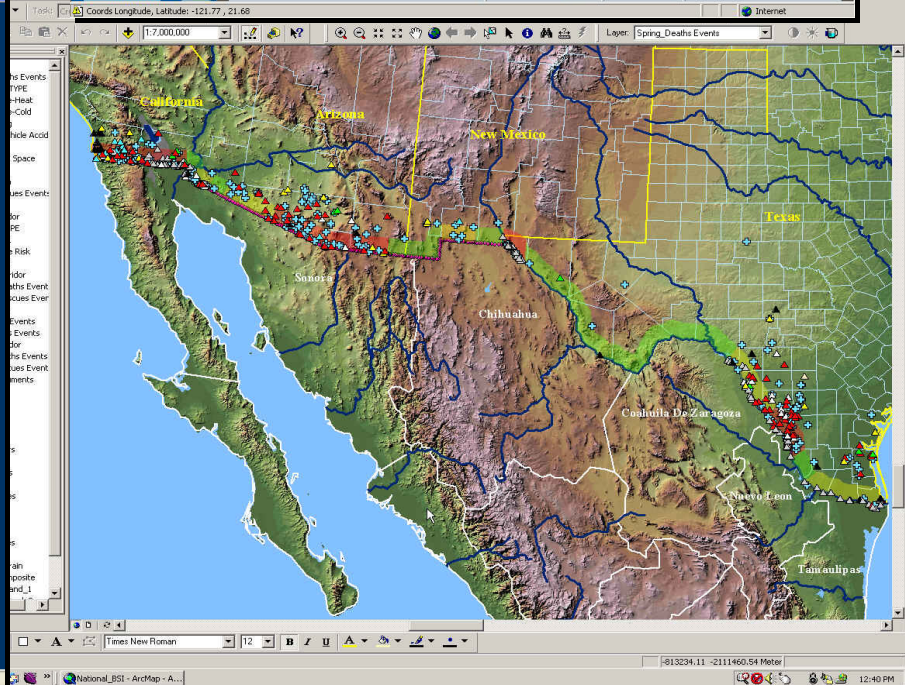
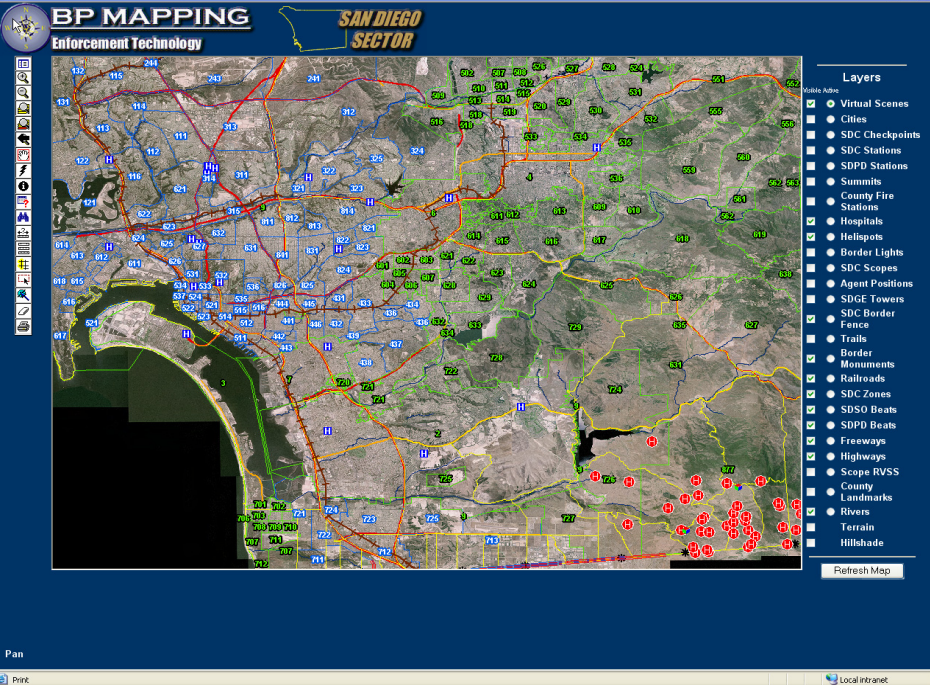


National Law Enforcement / Security

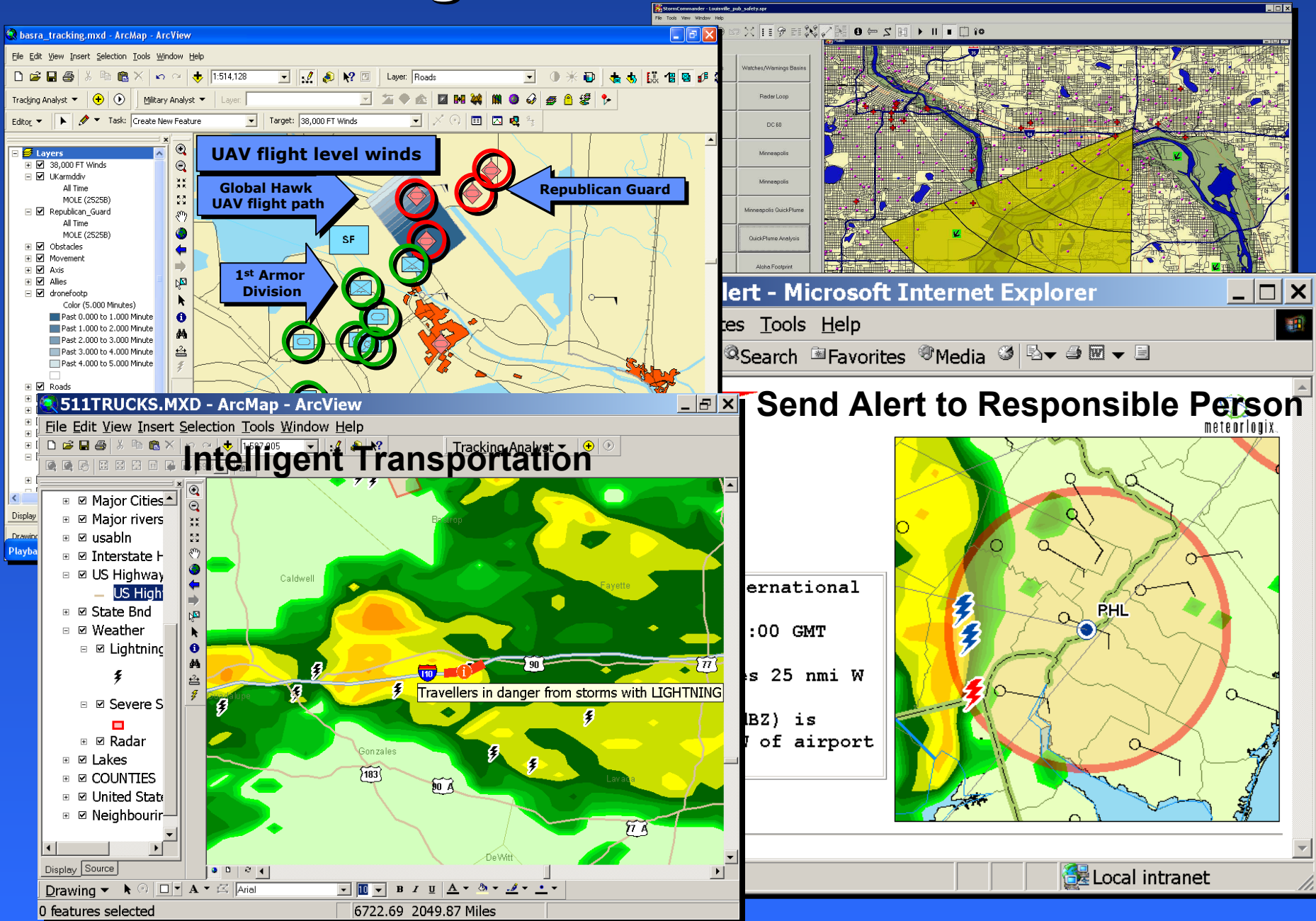
Southwest Border Sitmap - Microsoft Internet Explorer



BP Mapping - Microsoft Internet Explorer



Integration of Weather



Natural Resources / Mining

Turn Your GIS Data Into An Advanced Hydrologic Model

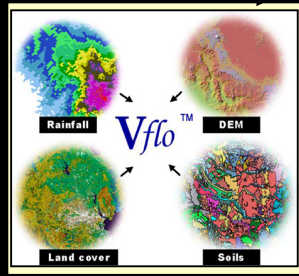
ArcGIS

+

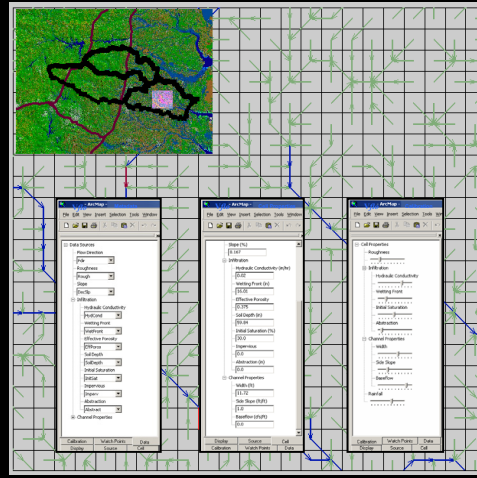
Vflo™ for ArcGIS

=

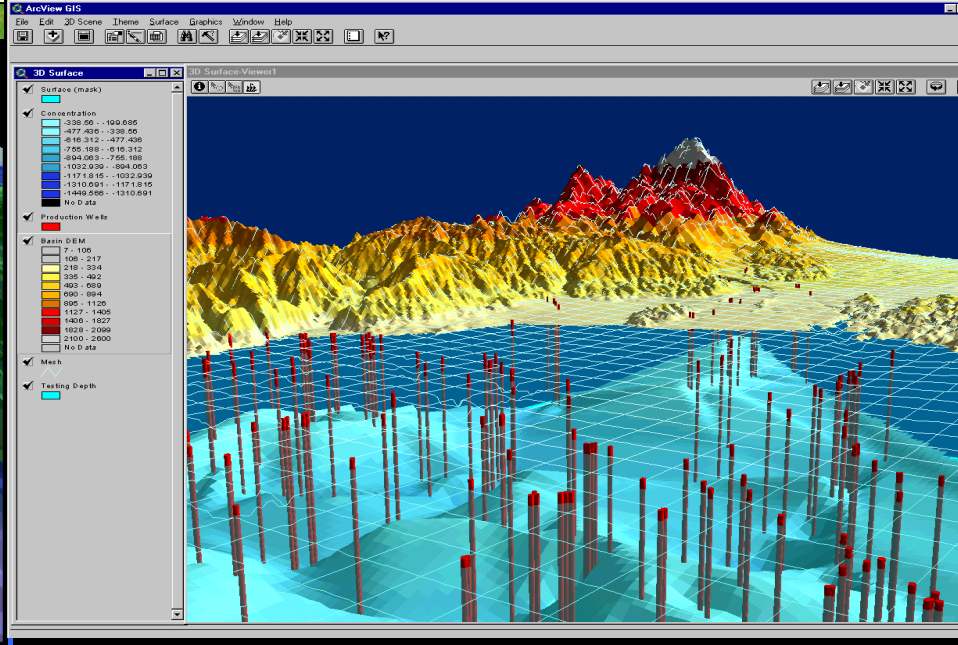
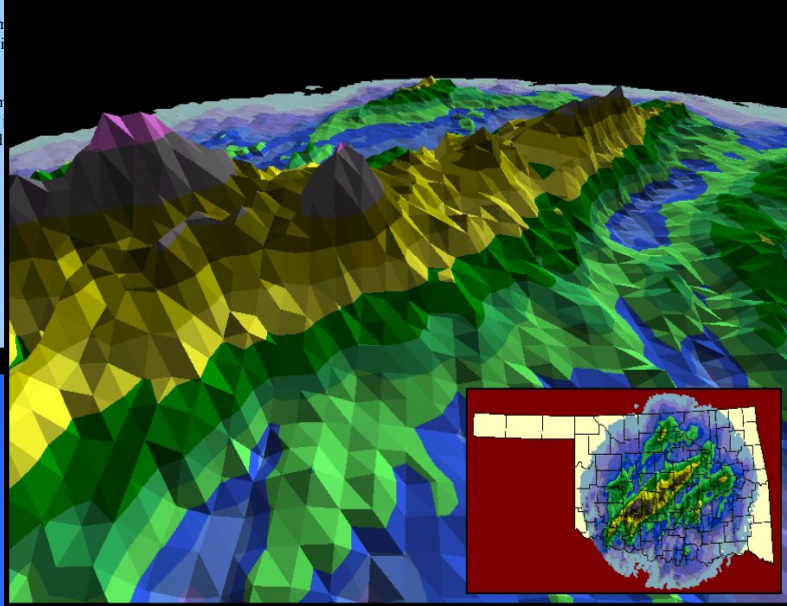
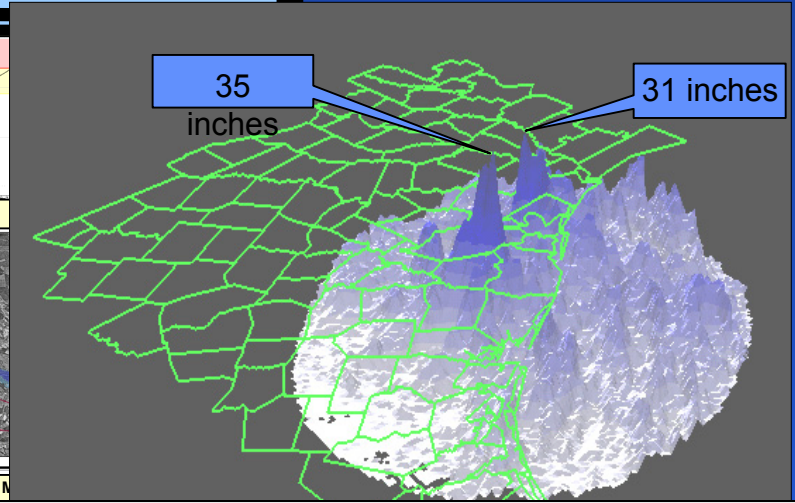
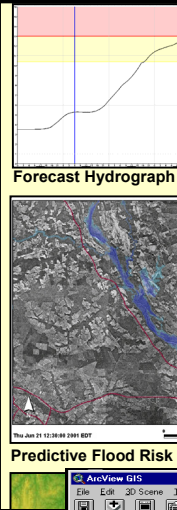
Unparalleled Analysis



- Both data preparation and modeling are accomplished using the industry-standard ArcGIS interface.
- Existing geospatial data are leveraged using ESRI's powerful tools and unified data management system.
- Model creation, simulation and verification are done in a controlled desktop environment.
- The same model can be implemented in different time systems.
- The Vflo™ model can enhance and ungauged



- Vflo™ for ArcGIS is a physics-based distributed hydrologic model.

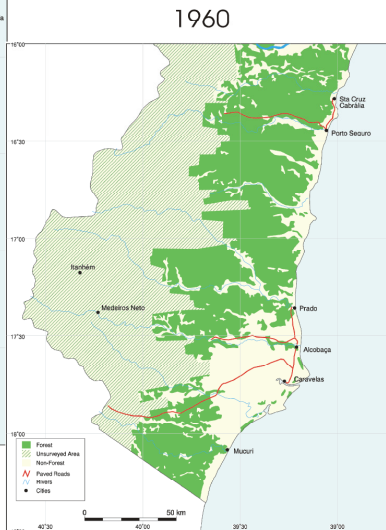


Forest Loss, Brazil

FRAGMENTATION OF FOREST COVER IN SOUTHERN BAHIA, BRAZIL. 1945 - 1990

Research by The New York Botanical Garden and the Centro de Pesquisas do Cacau

The Atlantic Forest once stretched uninterrupted along the entire Eastern coast of Brazil, occupying more than one million square kilometres. Today it is one of the world's most endangered ecosystems; less than 8% of the original forest remains, and the large majority of the remainder is highly fragmented.



©WWF Edward Porter

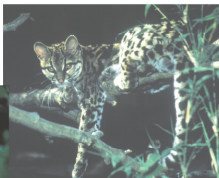


Information derived from Atlas ... do Meio Ambiente, Fundação IBGE, Instituto Brasileiro de Geografia e Estatística, 1990, Brasília.

The remaining Atlantic Forest is one of the richest forests on earth; scientists from the New York Botanical Garden have found 450 tree species in one hectare of Atlantic Forest, the highest tree diversity recorded anywhere on earth. Of 680 bird species found in the Atlantic Forest, 199 are found nowhere else on earth; 73 mammals and 260 reptiles and amphibians are also unique to the region. These forests are a butterfly paradise with more than 2000 species. The Atlantic Forest is home to many endangered species, including the white-necked hawk, the maned sloth, and the Golden-headed Lion Tamarin (*Leontopithecus chrysomelas*), of which fewer than 1000 individuals remain in the wild.



©WWF Edward Porter



L. jaguaris/WWF-UK



David Lawton/WWF-UK

The loss of the Atlantic Forest is due primarily to agricultural expansion, initially for sugar cane and more recently for cattle ranching. In southern Bahia logging for timber has increased since the late 1980s, as cocoa production in the forest understorey has been affected by crashing cocoa prices on international markets. The situation worsened in 1989 when "witch's broom" fungal disease swept through the cocoa plantations.



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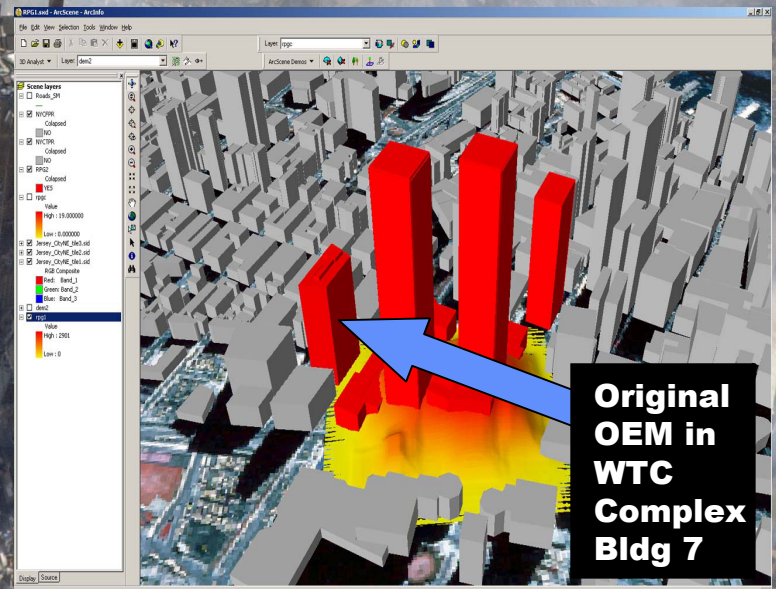
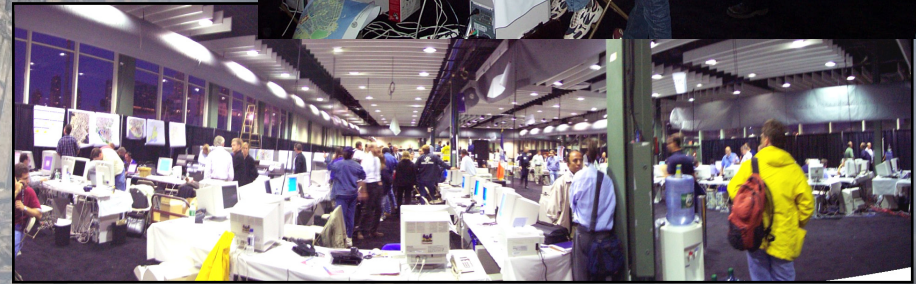


THE NEW YORK
BOTANICAL GARDEN



Mendonça, J. B., A. M. de Carvalho, L. A. Matta Silva, and W. W. Thomas. 1994. 45
Anos de Desmatamento no Sul da Bahia, Remanescentes do Meio Atlântico - 1945,
1960, 1974, 1990. Projeto Mata Atlântica Nordeste, CEPEC, Ilheus, Bahia, Brasil.

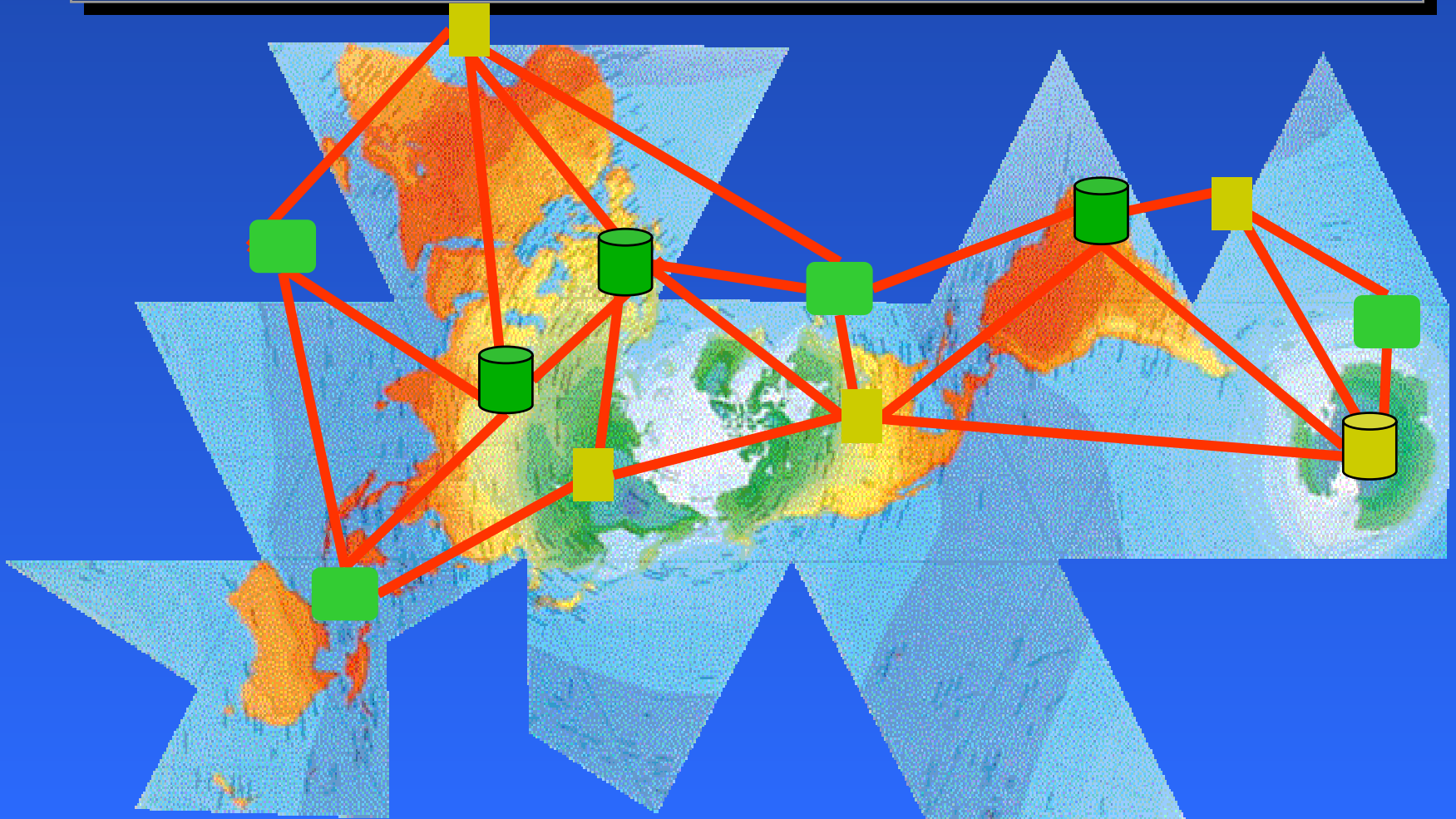
GIS in the Office of Emergency Management, New York City



GIS Imperative

- **Strategic:** geography can organize
 - Create master plans
 - Manage resource allocation / usage
- **Tactical:** location improves services
 - Evaluate health / social locations
 - Estimate utility requirements
- **Operational:** overcoming distance
 - Plan facility maintenance
 - Raise property tax collection
 - Optimize deliveries

Strategies for Developing NSDI

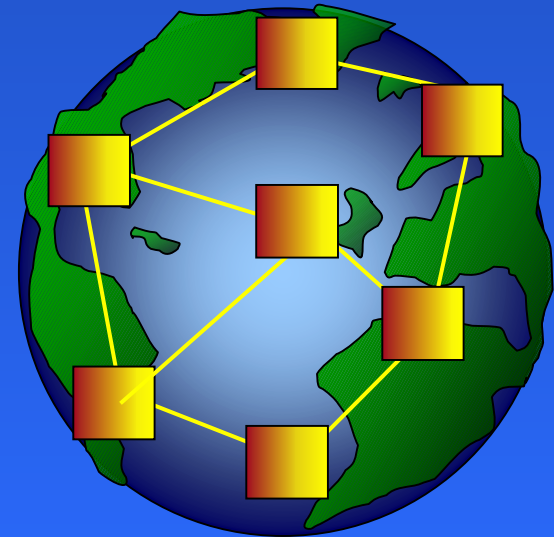
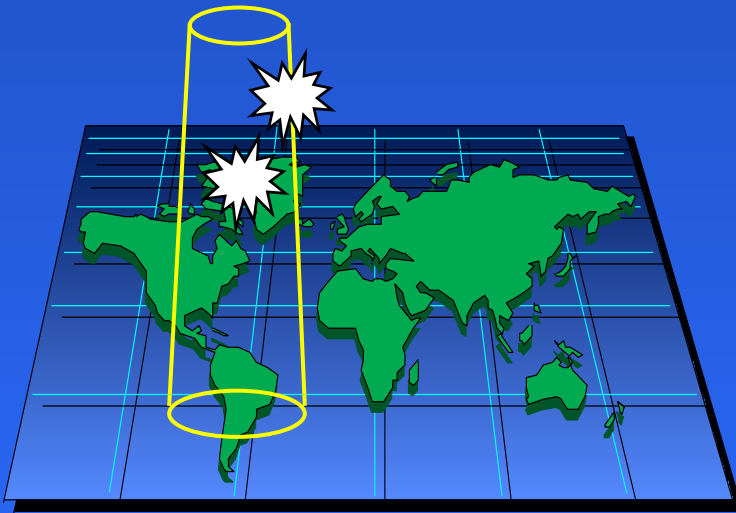


Building GIS Bottom Up

- **Difficult to create common approaches / standards**
 - **Catalogs**
 - **Data exchange / integration**
- **Hard to build cooperation / sharing**
- **Too slow**
- **Too expensive**

Many Countries Developing Top Down GIS Strategies

- Spatial Data Infrastructures

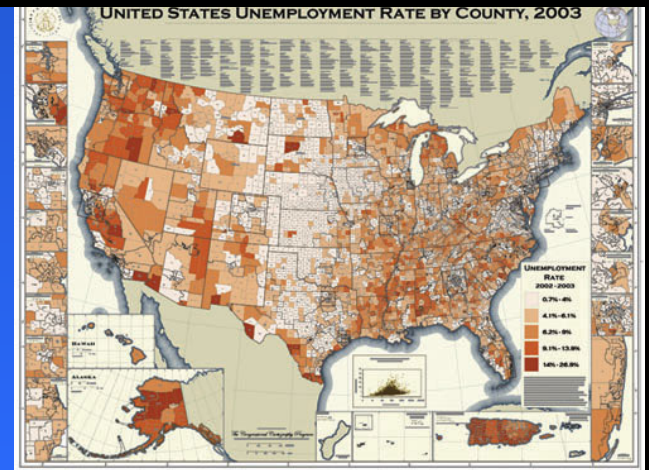
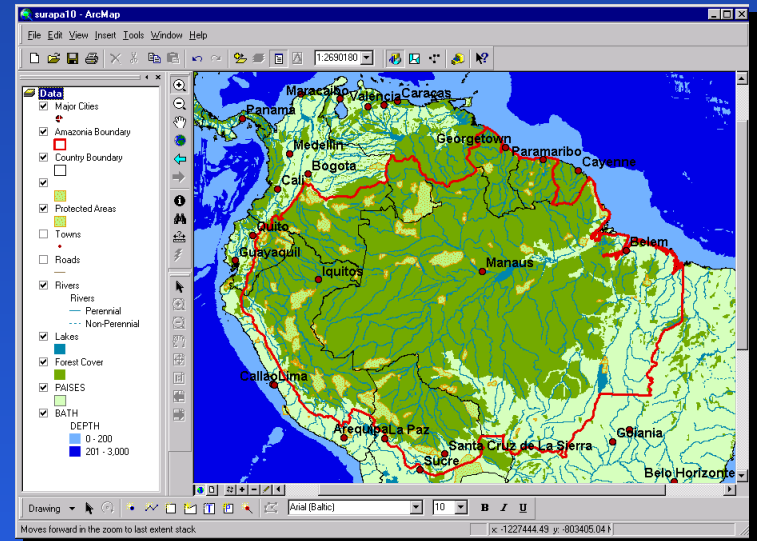


Spatial Data Infrastructure

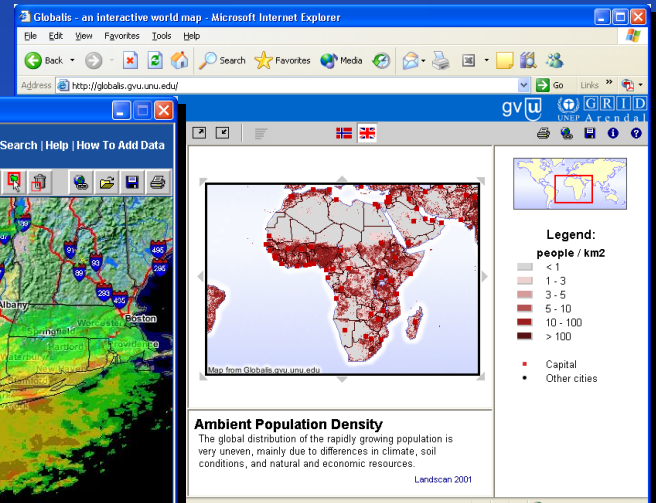
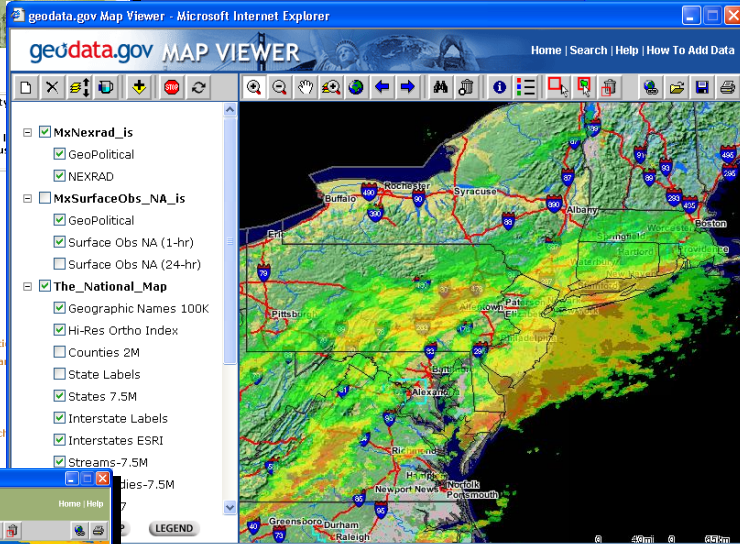
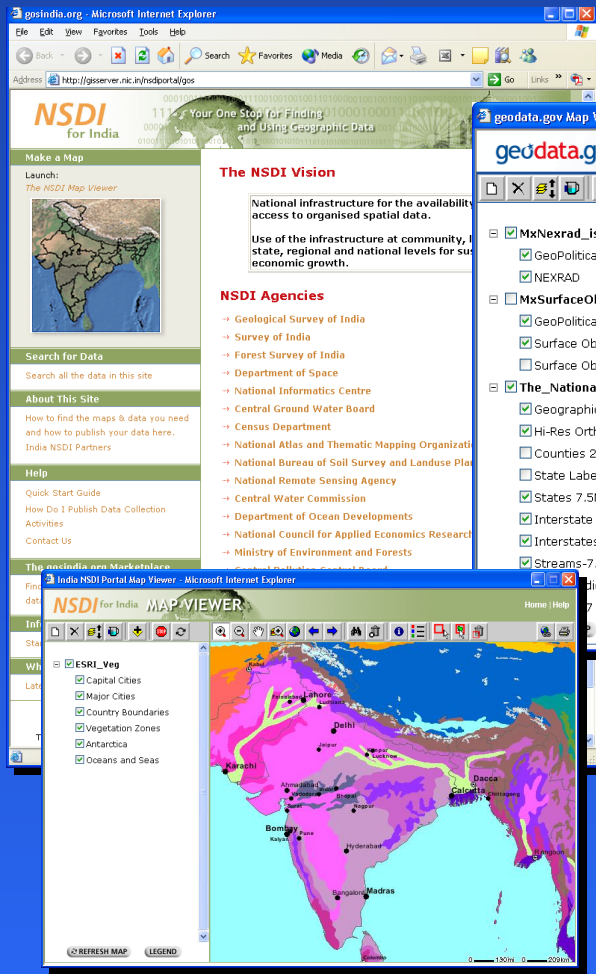
- **Coined in 1993 by the US National Research Council**
- Technology, policies, standards, human resources, and related activities
- Acquire, process, distribute, use, maintain, and preserve spatial data
- All levels of government, the private and non-profit sectors, and academia

SDI Today

- Many scales
 - Global SDI
 - National SDI
 - Regional SDI
 - Local SDI
- Many programs
 - +100 NSDI
 - +1000 R+L SDI



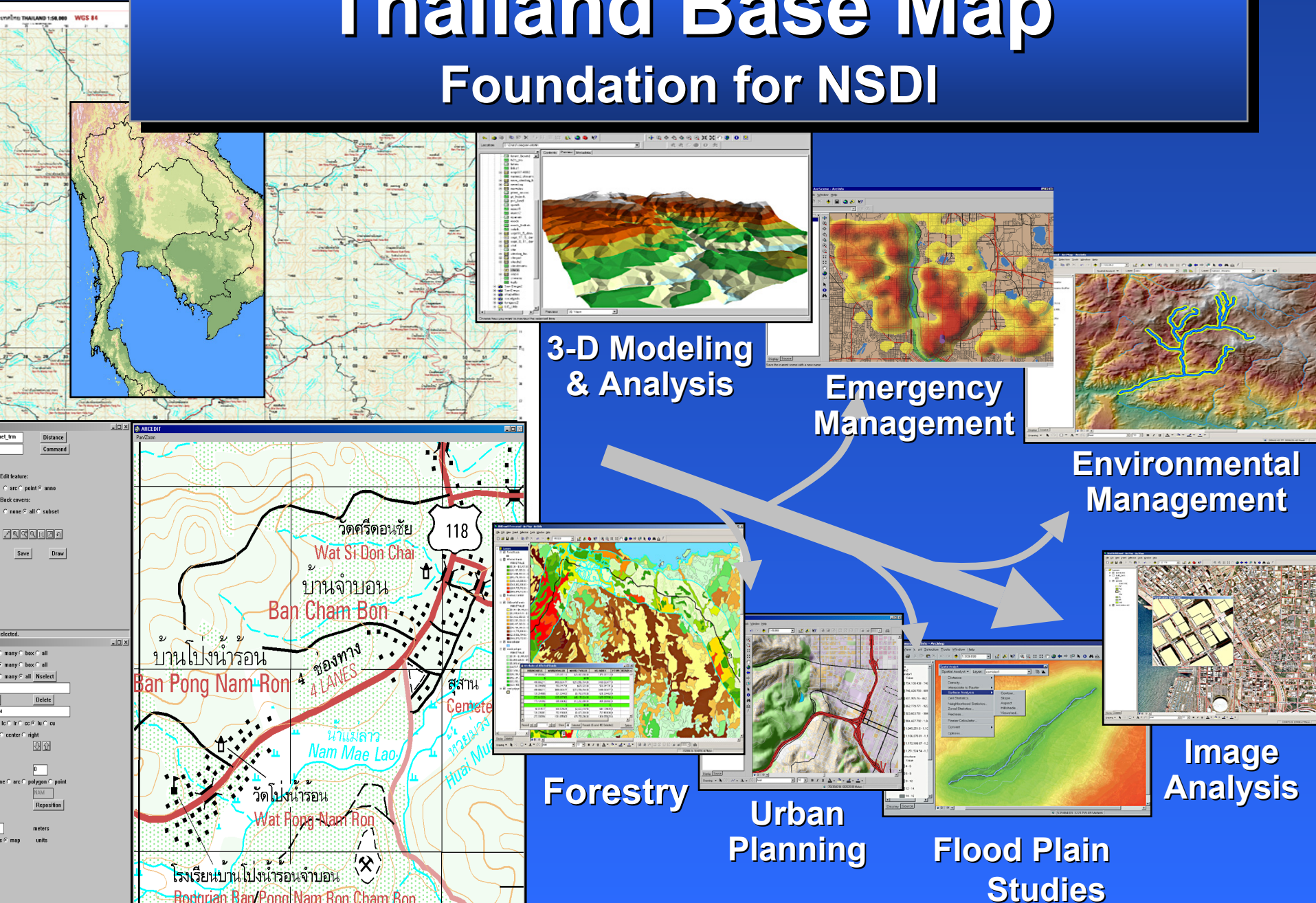
Many Global and National SDI India, USA, Europe, UNEP



- GSDI
- Global Map
- Digital Earth

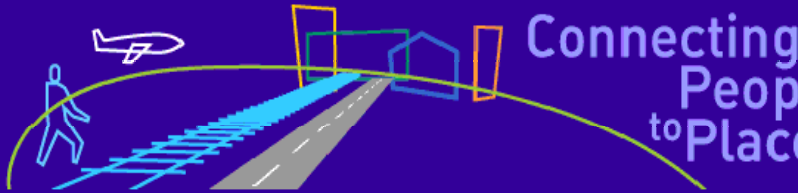
Thailand Base Map

Foundation for NSDI



UK Government On-line

transport
direct.info



Connecting
People
to Place

Journey Planner

Congestion/Delays

Maps for Transport

Ticket Purchase

About us

language

Journey Planner

Advanced Planner



Search cr
Before you
Find:

Outbound

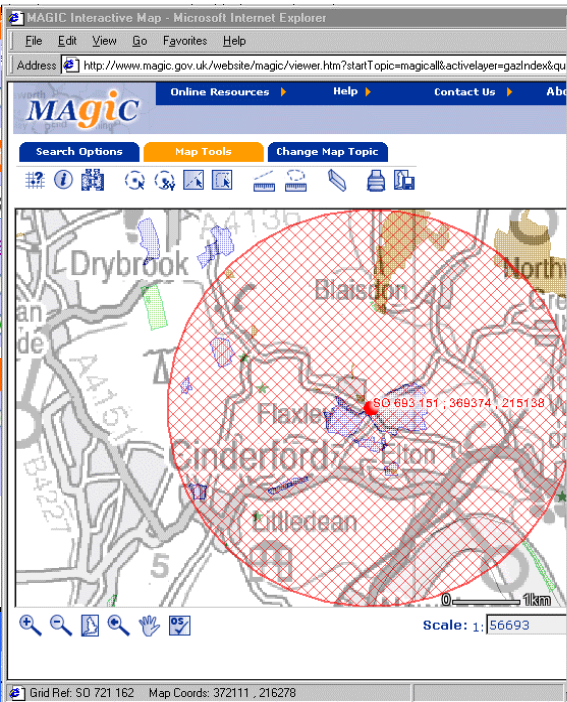
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via

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No

From



Site Check Report

Report generated on July 2

You clicked on the p
Grid Ref. SO 693 15
Full Grid Ref. 369374, 21

The following features have been f
metres of your search

Reference	Name
GLoucestershire47	LITTLE DEAN C
GLoucestershire479	GUNNS MILLS F
GLoucestershire31188	WELSHBURY H ASSOCIATED E

Scheduled Monume

Reference	Name	Hectares
33	SEVERN VALE	186124

Local Environment Agency

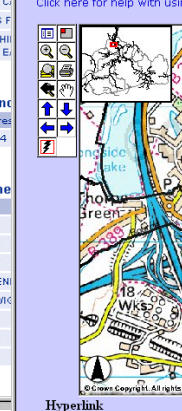
Reference	Name	Hectares
33	SEVERN VALE	186124

Woodland Grant Sche

Reference	Name
015001963001	EMMIN'S FARM
015001971001	SHAPRIDGE
015001988001	BLAISDON WOOD
015003592001	CHURCH FARM (ABEN
015003866001	BLAISDON WOOD (MILK
015004182001	LEY PARK
015004397001	LEY PARK
015004656001	WATKINS ESTATES

SurreyAlert.info - Micros
The Rivers of Sur

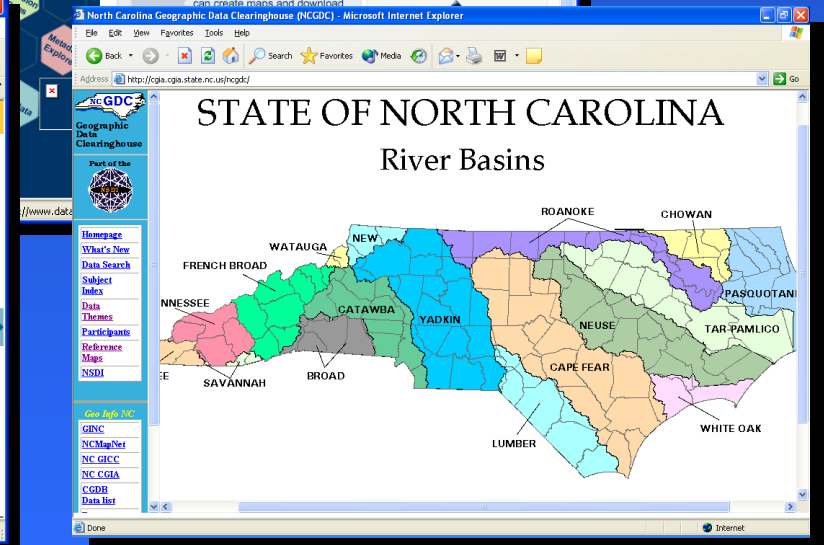
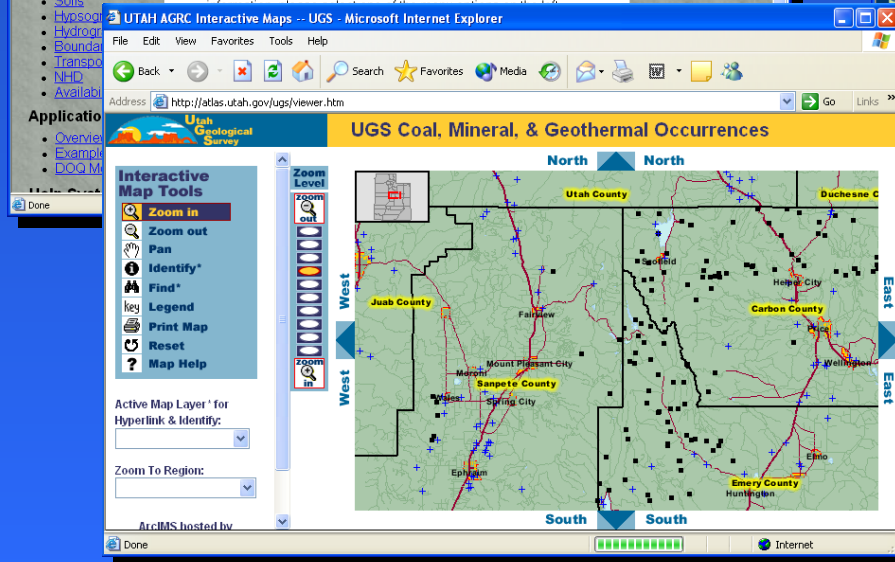
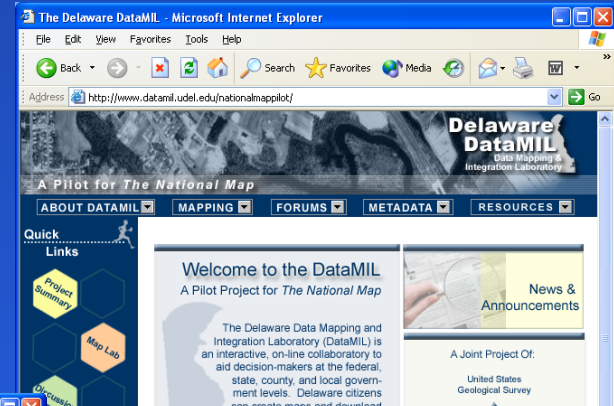
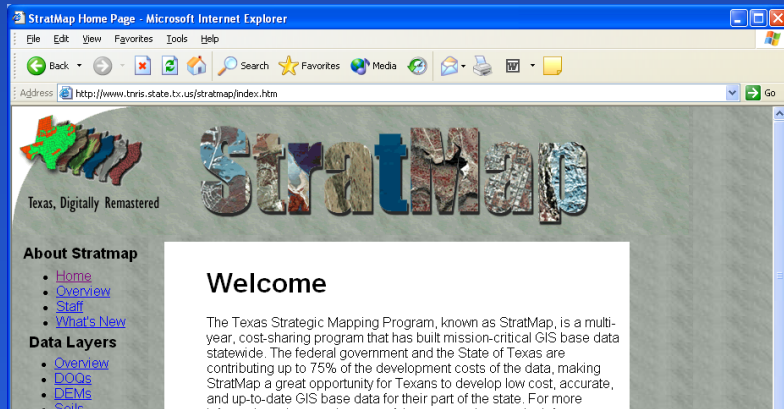
Click here for help with using this map.



Map: 503138.73, 169276.6 -- Image: 310, 51 -- ScaleFactor: 6.44509137779058

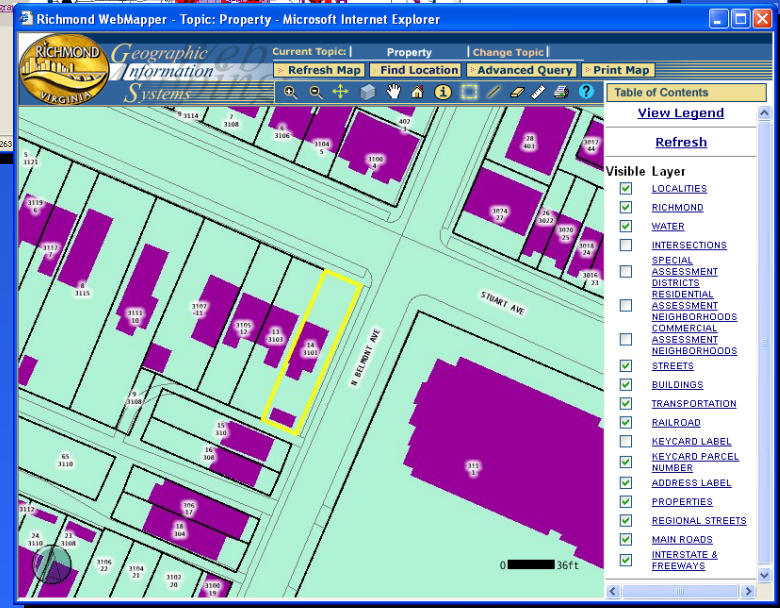
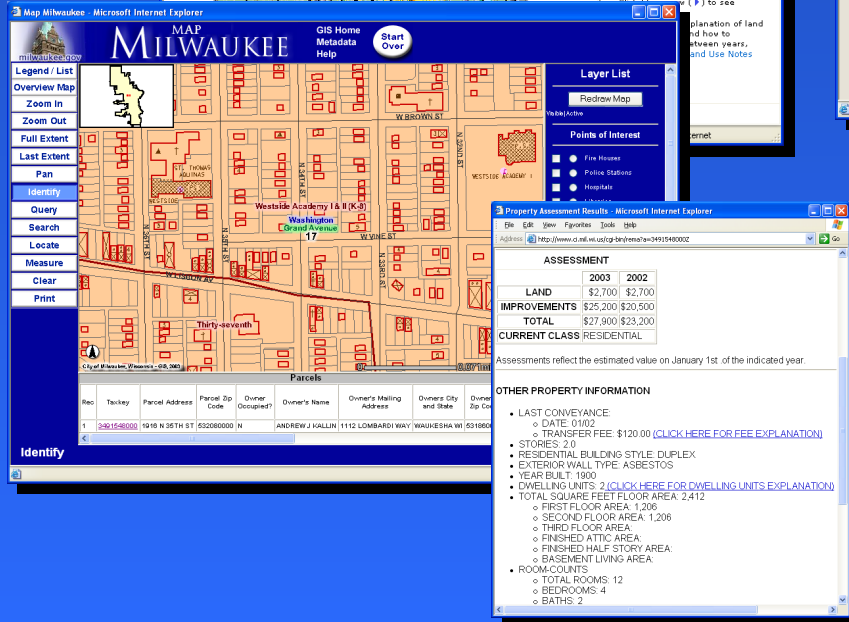
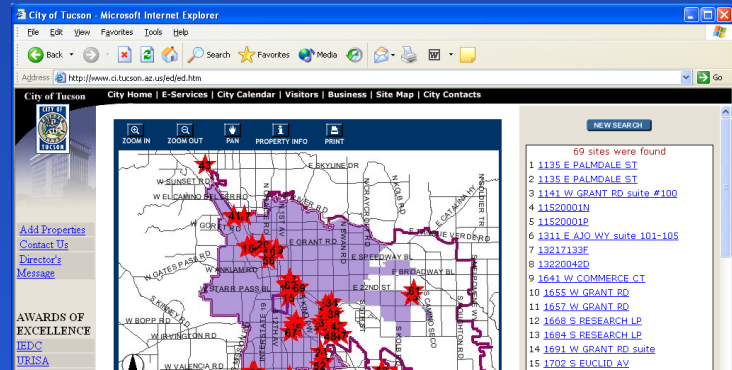
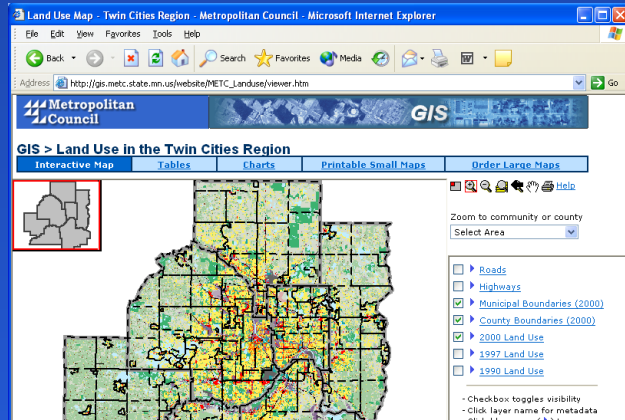
Many State Agencies

Delaware, North Carolina, Texas, Utah



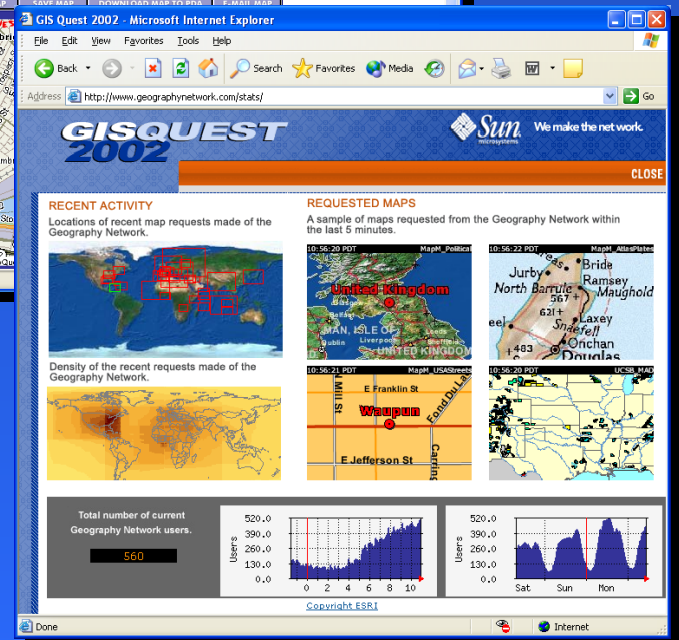
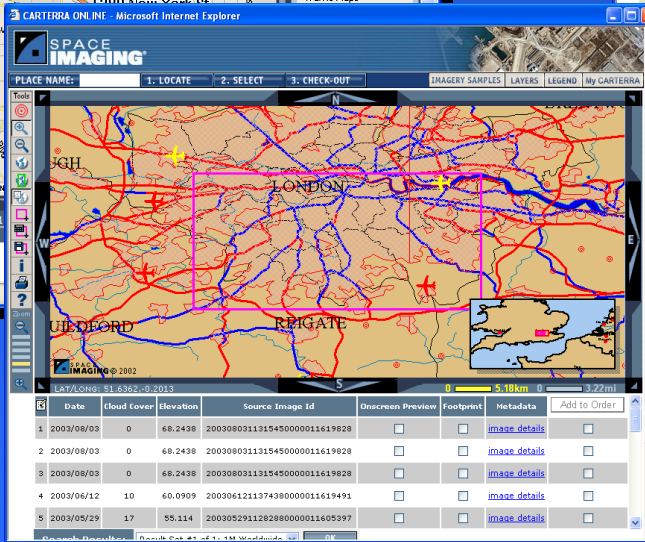
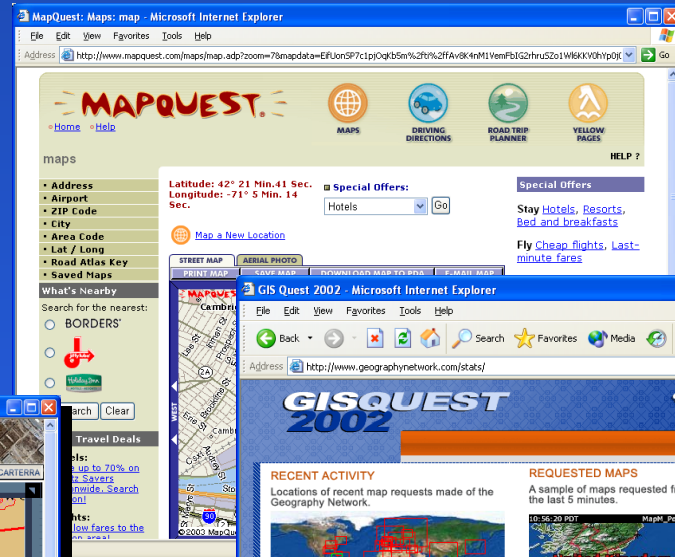
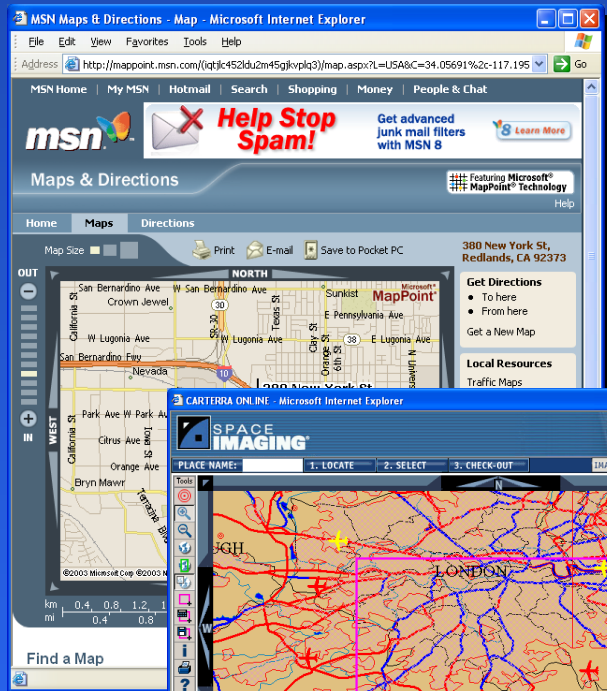
Many Local Government Agencies

Milwaukee, Minneapolis, Richmond, Tucson

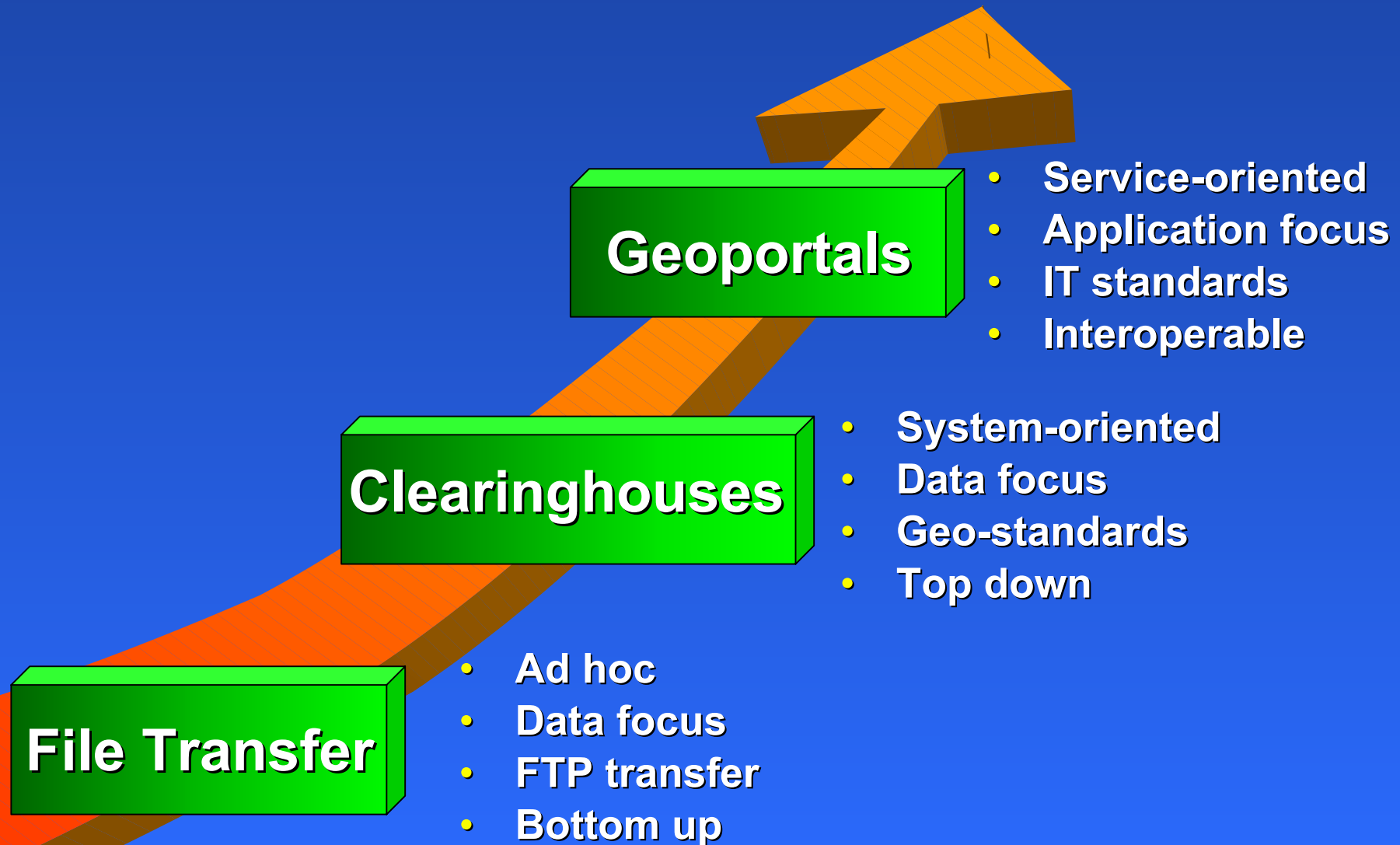


Many Private Initiatives

ESRI, Microsoft, Mapquest, Space Imaging, Digital Globe



Evolution of SDI Technology



National Geospatial Data Clearinghouse

Federal Geographic Data Committee - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media

Address http://130.11.52.184/


Search for Geographic Data

Federal Geographic Data Committee
National Geospatial Data Clearinghouse

[status](#)
[web links](#)
[help](#)

The Geospatial Data Clearinghouse is a collection of over 250 spatial data servers, that have digital geographic data primarily for use in Geographic Information Systems (GIS), image processing systems, and other modelling software. These data collections can be searched through a single interface based on their descriptions, or "metadata."

Click on the name of a Clearinghouse Gateway on the map below that is closest to you and you will be presented with a selection of query forms. All entry points or gateways shown have exactly the same lists of servers.



Internet

Status of NSDI Clearinghouse Nodes - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media

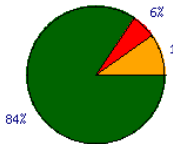
Address http://edcns15.cr.usgs.gov/serverstatus/

Status of Clearinghouse Server Nodes - Tuesday, Sep 9, 2003, 10:00 CST

Status of the following servers is determined by periodic polling (hourly) of the Z39.50 processes on registered Clearinghouse Server Nodes.

If the server cannot be reached in 60 seconds, the TIMED OUT status will appear. This could be due to network traffic. If the database is unavailable, then a server 'DOWN' indication is shown.

Clearinghouse Node Statistics - 273 Total

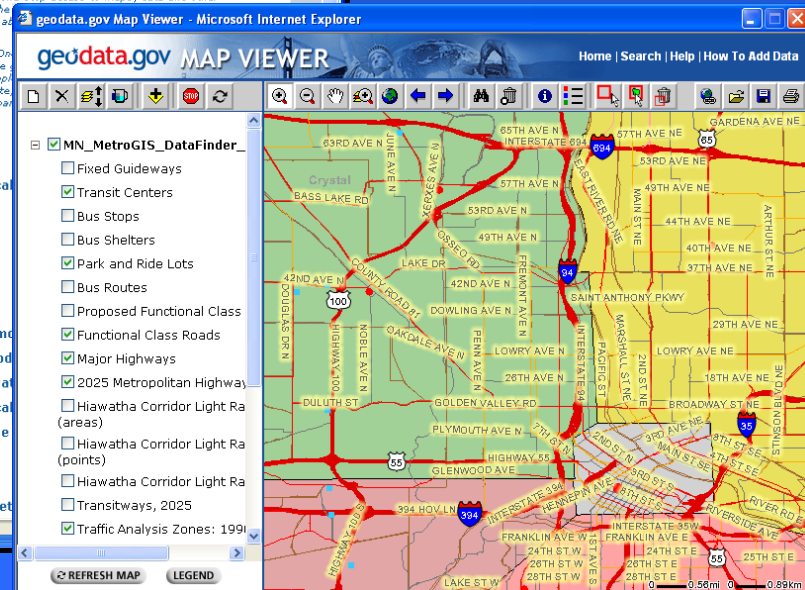
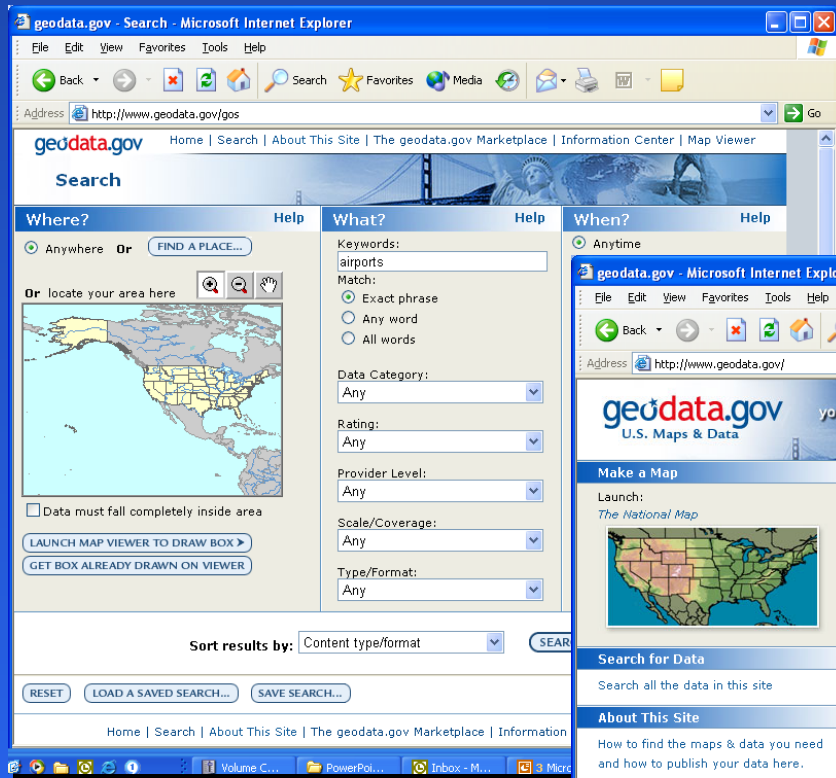


STATUS	NODE NAME	[Z39.50 Connection Information]
UP	Africa Data Dissemination Service	[152.61.128.5:210]
UP	African Geospatial Data Sets	[152.61.128.18:2210]
TIMED OUT	African Water Information	[192.132.208.19:210]
TIMED OUT	Alamo Area Council of Governments	[206.254.218.1:210]
UP	Alaska Geospatial Data Clearinghouse	[130.118.181.36:210]
UP	Alaska State Geospatial Data Clearinghouse (ASGDC)	[204.89.222.35:5210]
UP	Anchorage Alaska Geospatial Data Clearinghouse Node	

Done Internet

www.geodata.gov

Geospatial One-Stop



Stages of E-Government

1. **Static** information – govt. on-line
2. **Dynamic** information – many sites
3. **Interactive** – download forms
4. **Transaction** – users pay for services on-line
5. **Seamless** – full integration of services across admin. boundaries

E-Gov Web Sites v Portals

Feature	Web site	Portal
Organizing principle	Structure of government	Citizen needs and interests
Home page	List of Agencies / Departments	List of Citizen tasks
Content	Static information	Interaction and transactions
Look and feel / Navigation	Varies from dept – dept	Common across government

The Case for GIS

- **Save money**
 - Decrease facility replacement costs
 - Reduce fertilizer levels
 - Alleviate traffic congestion
 - On-line services (elections, billing, planning applications..)
- **Make money**
 - Economic development – inward investment
 - Increase property taxes
 - Sell maps, data and services
- **Improve services**
 - Reduce pollution
 - Improve water supply
 - Communicate plans



Strategic Goals

Next Steps

- **Phase 1 – Infrastructure Initiation**
- Develop vision
- Create GIS Center
- Establish GIS Council
- Begin forging partnerships
- Establish interim system architecture
- Assemble current data resources

Strategic Goals

Next Steps

- **Phase 2 – Countrywide System Architecture**
- System design and planning
- Develop standards
- Build “framework” data layers
- Early wins from key example applications

Strategic Goals

Next Steps

- **Phase 3 – Expand Geographic Infrastructure**
- **Improve based on “business” needs**
- **Continue “build-out” of system architecture**
- **Seek permanent, flexible funding sources**

Critical Success Factors

- Vision
- Funding
- Organization
- Leadership
- Management



Why SDI?

- **Foundation stone for good governance**
 - **Transparent government**
 - **Increase participation in democratic process**
 - **Empower government workers and citizens**
 - **Improve service effectiveness / efficiency**
 - **Improve decision making**

Why NSDI?

- **Collect data once, use it many times**
- **Avoid development of duplicate data sets**
- **Reduce data management / service costs**
- **Generate revenue from data/service sales**

Conclusions

- SDI's are gathering momentum at all scales
- The business case is compelling
- Technology is mature
- Strong leadership is required

