

ESRI technology in support of the Global Earth Observation System of Systems (GEOSS)

Nick Thomas
Environmental Industry Manager
ESRI Redlands

What exactly is GEOSS?

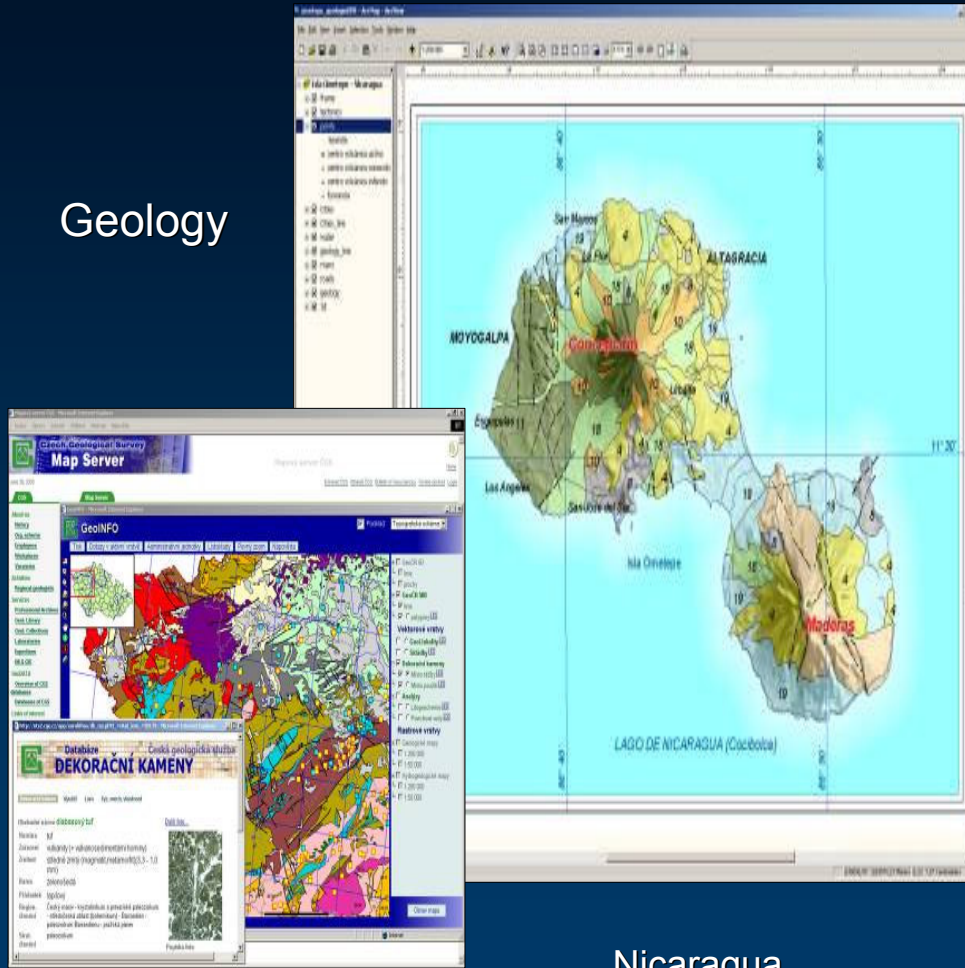
“GEOSS will provide a framework to collate and access environmental data which will be used to improve understanding of global environmental systems”.

A System that will include many types of spatial data for varied application areas.

Natural Resource Inventories

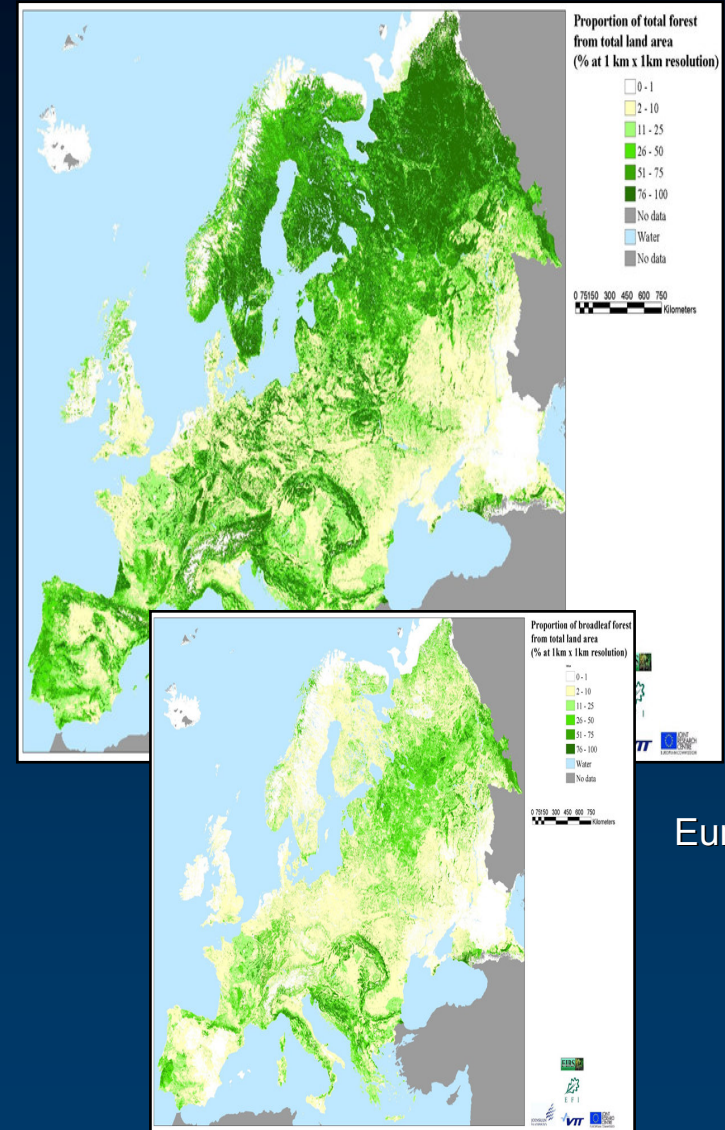
Forests

Geology



Nicaragua

Czech Republic



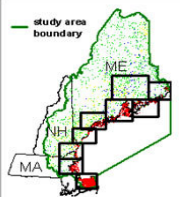
Europe

Coastal Zone Management

USFWS Gulf of Maine Coastal Program Gulf of Maine Watershed Habitat Analysis - Microsoft Internet Explorer

Address: <http://gulfofmaine.fws.gov/gomanalysis/gomanalysis.html>

Gulf of Maine Watershed Habitat Analysis



The Gulf of Maine Coastal Program has completed a project which identifies important habitats within the U.S. portion of the Gulf of Maine watershed.

We first selected 64 endangered, threatened and declining Fish and Wildlife Service 'trust' species which use this area. Habitats for each species then were mapped and ranked-- from actual sightings, or by developing habitat suitability models reflecting the environmental requirements for each species. These models were applied to map themes such as **land cover**, soils, or **water depths**, and select locations suitable to the needs of each species. **Species-specific maps** then were combined and processed to display particularly high-value areas.

The environmental themes, species maps, and combined data are being made available to assist and focus habitat protection efforts in areas of greatest biological value.

Examples from original 64 species

- * Click rectangles for closer views (scale ~1:250K)
- * Enlarge study area image (scale ~1:2500K)
- * Close up example (scale ~1:24K)

Project Summary - general information on the analysis [PDF \(9929b\)](#) | [text version](#) |

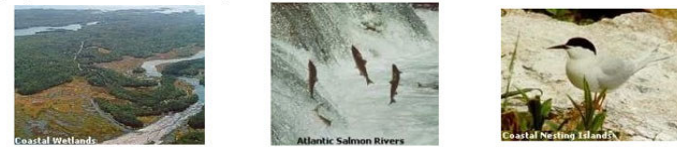
Full Report - "USFWS Gulf of Maine Watershed Habitat Analysis" with specific information on the analysis, including [habitat models](#), descriptions of

USFWS Gulf of Maine Coastal Program Home Page - Microsoft Internet Explorer

Address: <http://gulfofmaine.fws.gov/>

U. S. Fish & Wildlife Service Gulf of Maine Coastal Program

Building partnerships to protect and restore nationally important fish and wildlife habitat in the Gulf of Maine watershed...



To view or print portable document format (PDF) files, you will need [Adobe Acrobat Reader](#). Text versions of the files are also provided. [\[help\]](#)

What's New / Search

Projects & Data

Habitat Mapping (GIS), Protection & Restoration Projects (with links to data)

- [Atlantic Salmon Watersheds](#) (045)
- [Casco Bay](#) (045)
- [Coastal Nesting Islands](#) (045)
- [Gulf of Maine Watershed Habitat Analysis](#) (04A, ME, 04B) **Species Added!**
- [Habitat Restoration Initiatives](#) (02F 1495b) and [Protection](#) (02F 1495a) (045)
- [Merrymeeting Bay and Lower Kennebec River](#) (045)
- [Older Analyses](#) ([see here](#))

Gulf of Maine Rivers Ecosystem Team

GPAC Regional Tidal Marsh Database

Directions to our office

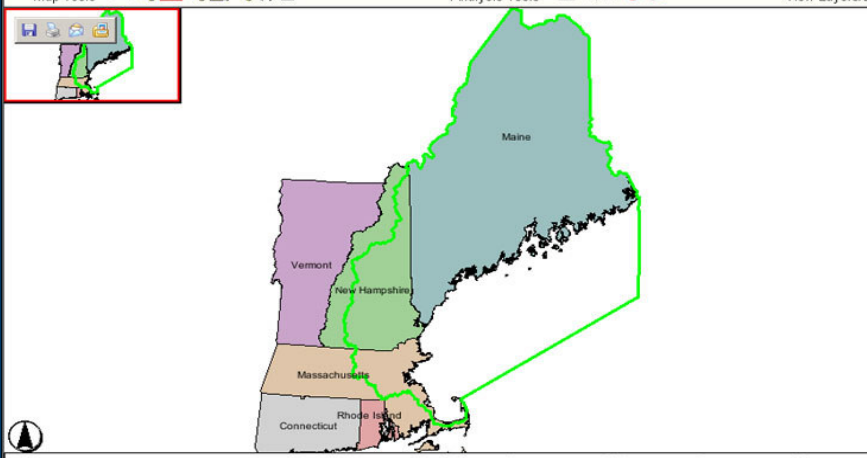
Information Reports & pamphlets available from our office

Links to other Gulf of Maine web sites

U. S. Fish & Wildlife Service
Gulf of Maine Coastal Program

Gulf of Maine Watershed Habitat Analysis

Current tool in use: Zoom In



Map Tools | Analysis Tools | View Layers/Legend

All View Layers

Metadata

Refresh Map

Visible Active

- Watershed
- States
- Land Cover
- Bathymetric

Habitat Types & Importance

- Forested
- Grassland
- Saltwater Wetland

Map Services

Visible Active

- All View
- Fish and Raptors
- Federally Listed

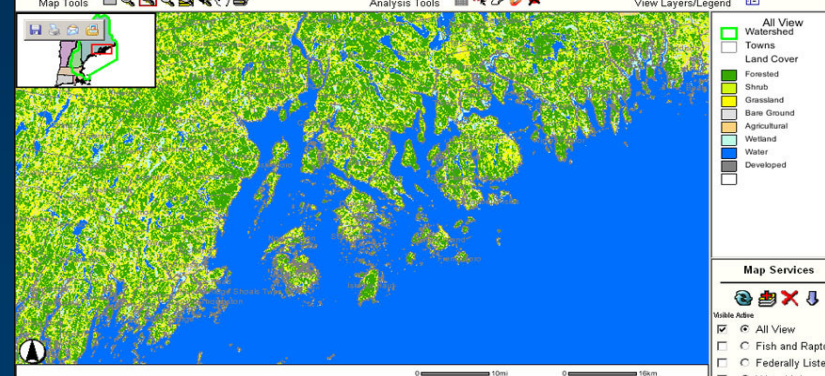
A USFWS Project. SDS Map Server Software developed by [SDS](#) ([contact us](#)).

Map: 335870.04, 4599501.47 -- Image: 387, 444 -- ScaleFactor: 1479.2669516003554

U. S. Fish & Wildlife Service
Gulf of Maine Coastal Program

Gulf of Maine Watershed Habitat Analysis

Current tool in use: Zoom In



Map Tools | Analysis Tools | View Layers/Legend

All View Layers

- Watershed
- Towns
- Land Cover
- Forested
- Shrub
- Grassland
- Bare Ground
- Agricultural
- Wetland
- Water
- Developed

Map Services

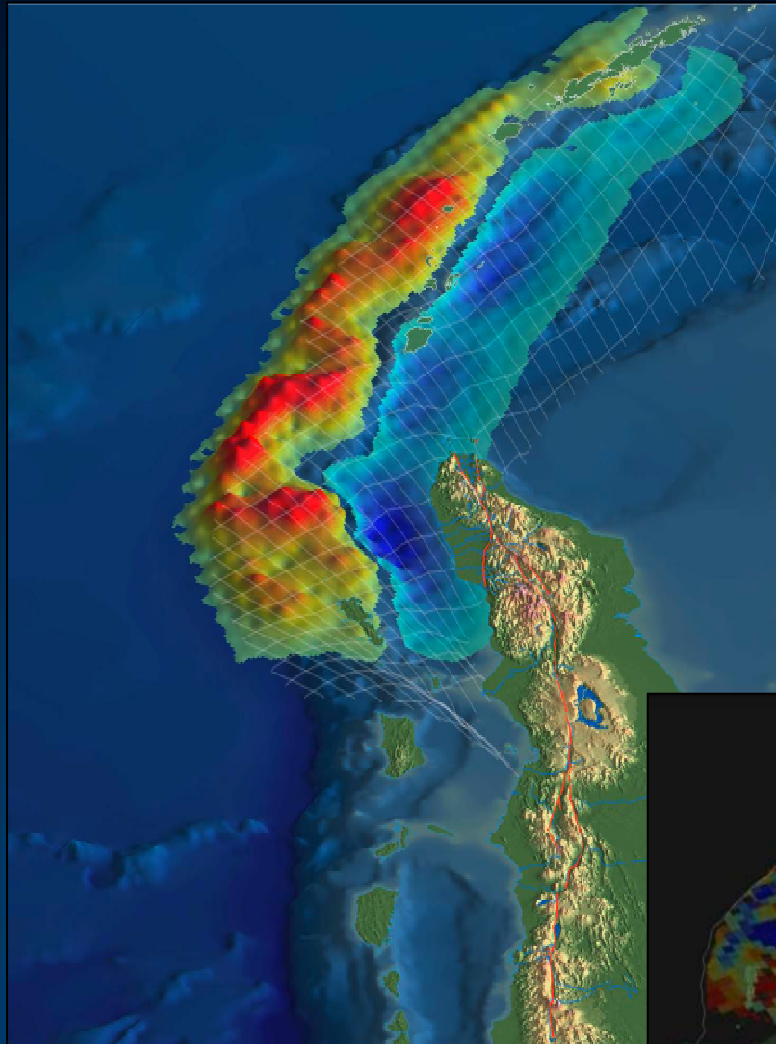
Visible Active

- All View
- Fish and Raptors
- Federally Listed

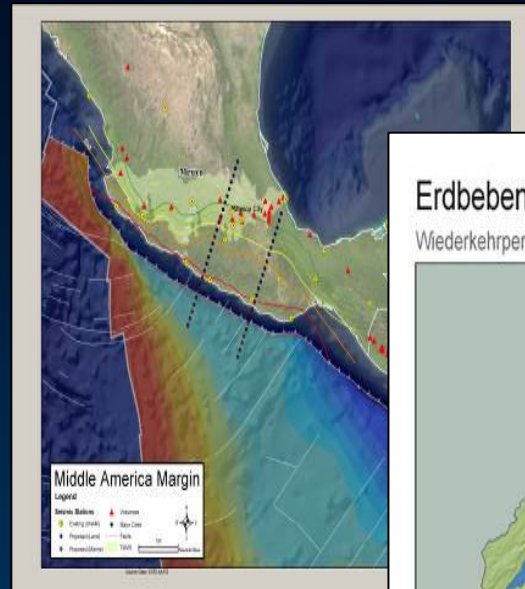
A USFWS Project. SDS Map Server Software developed by [SDS](#) ([contact us](#)).

Map: 593935.72, 4875726.01 -- Image: 757, 367 -- ScaleFactor: 194.5591188952422

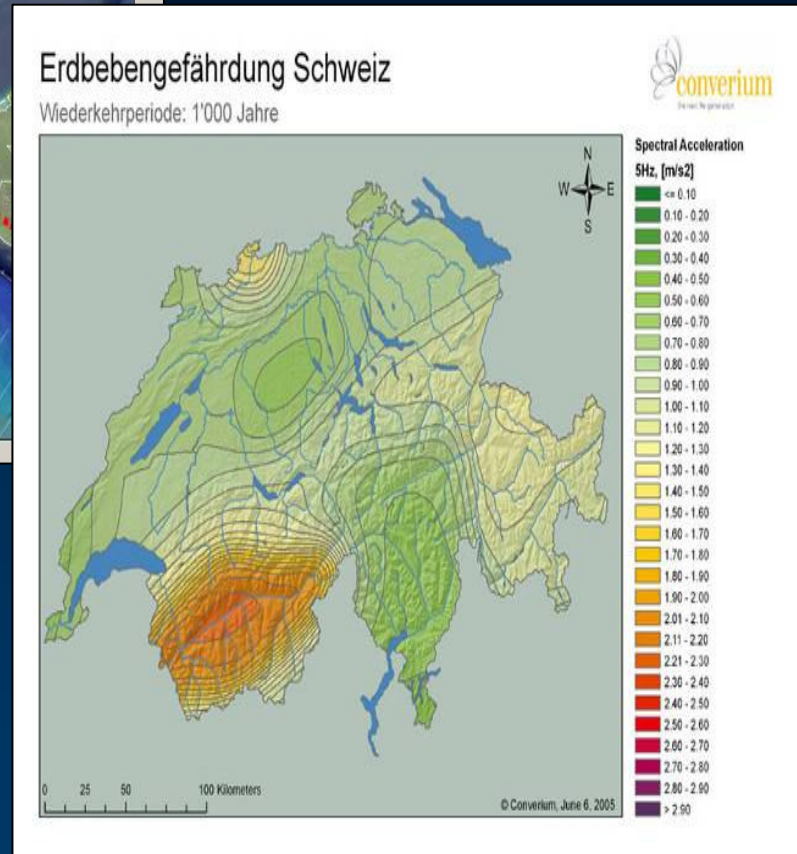
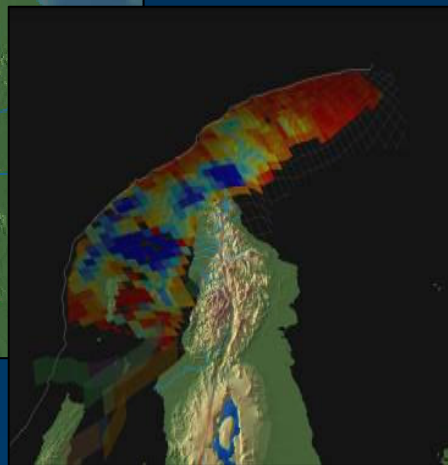
Earthquake Modeling and Visualization



Indonesia

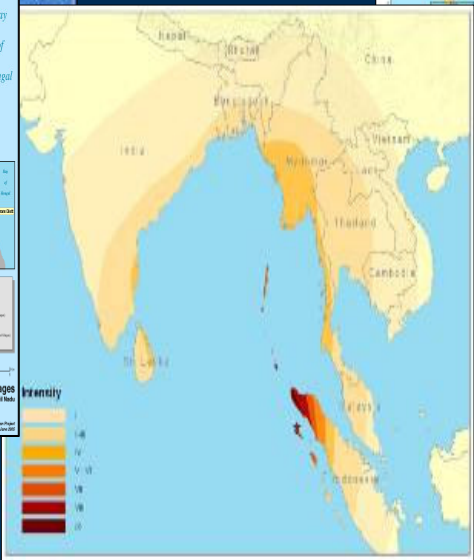
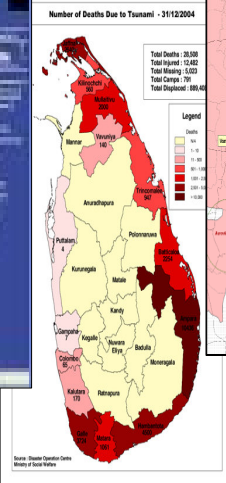
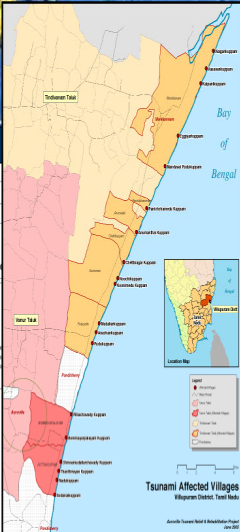
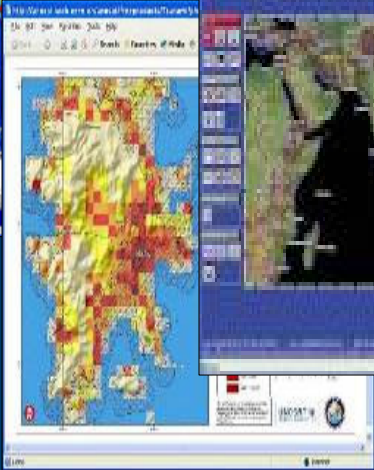
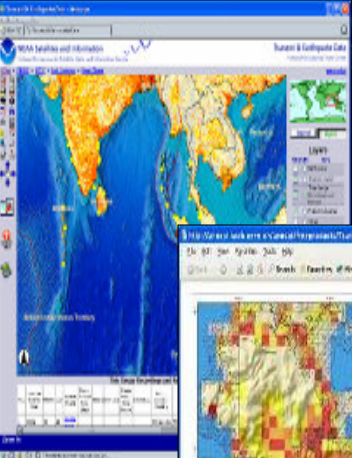
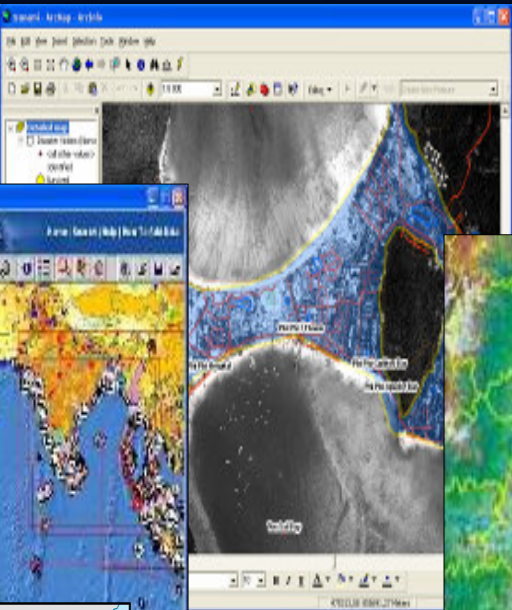


Mexico



Switzerland

Managing Tsunami Disaster Relief



Many Participants

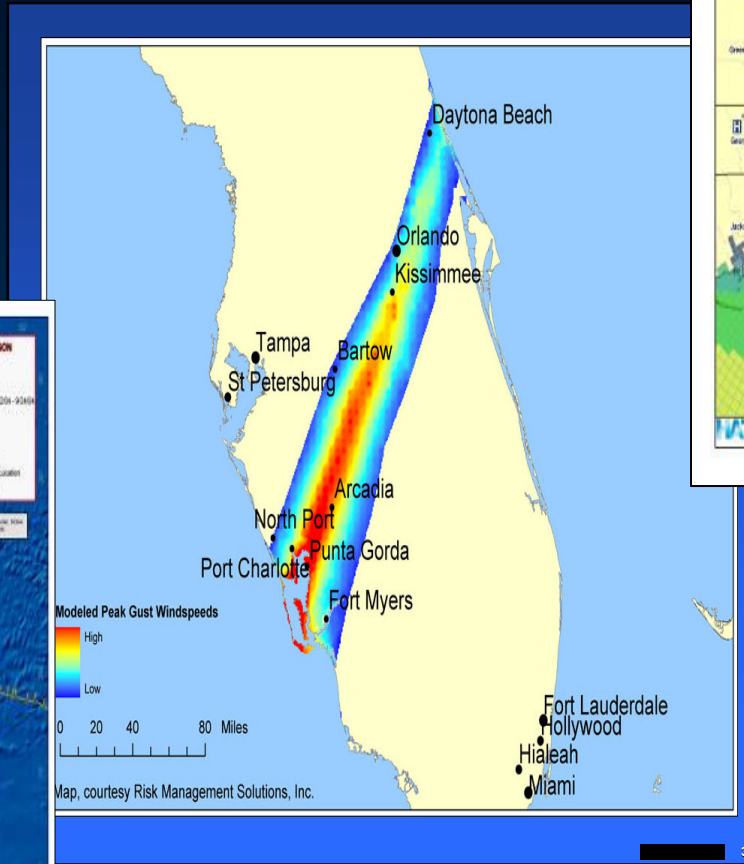
Hurricane Events

Real Time Tracking

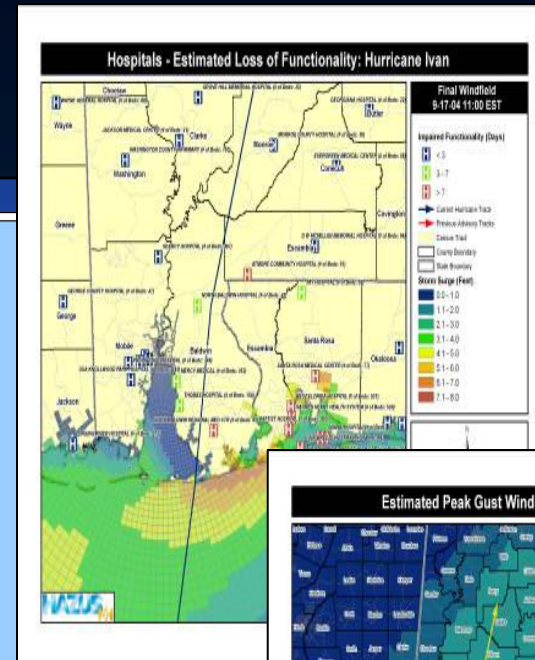


Caribbean

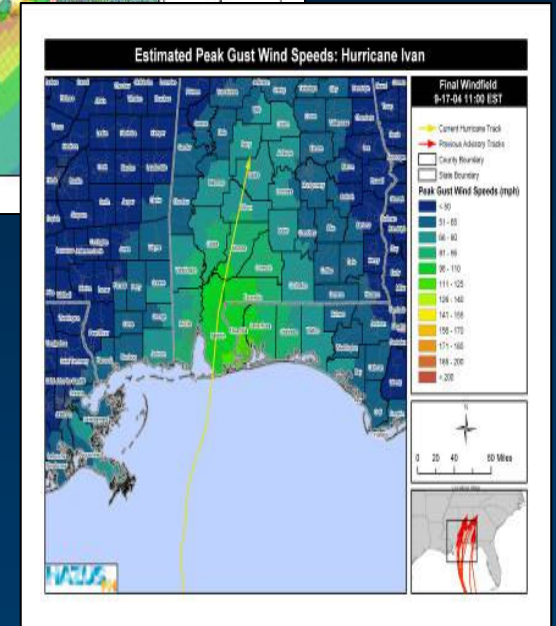
Modeling



Florida



Damage Assessment

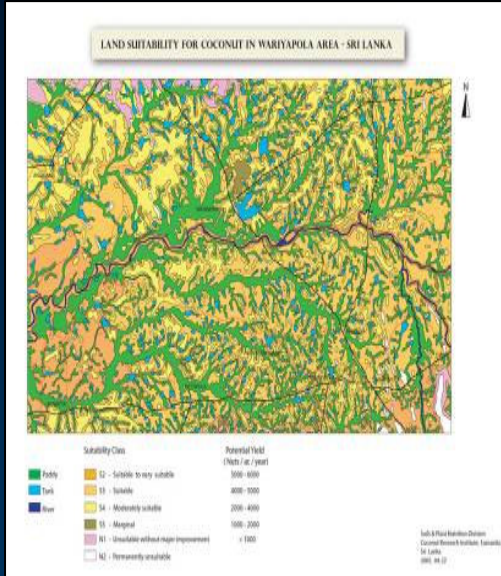


Alabama/Florida

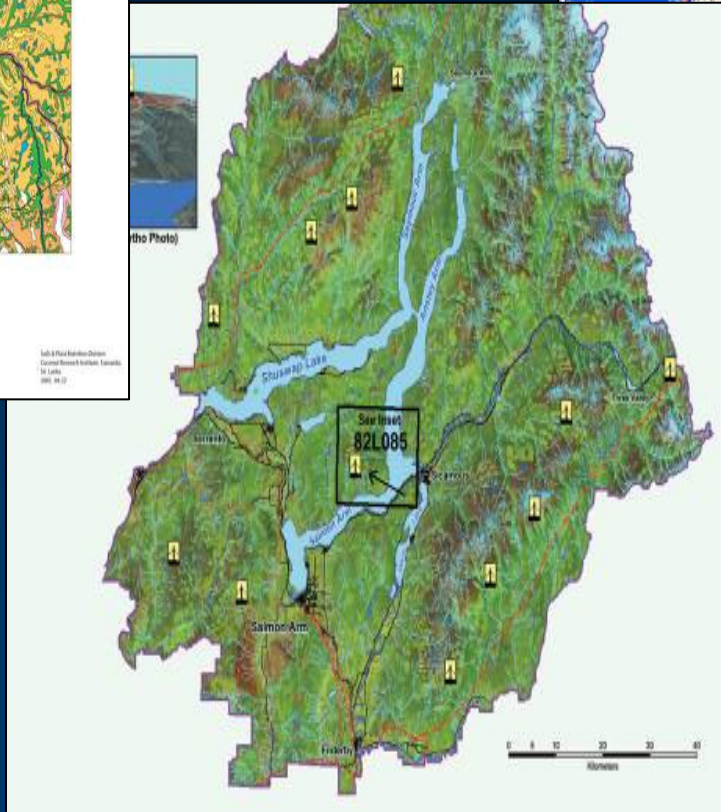
Suitability Modeling

Oil Well Placement Saudi Arabia

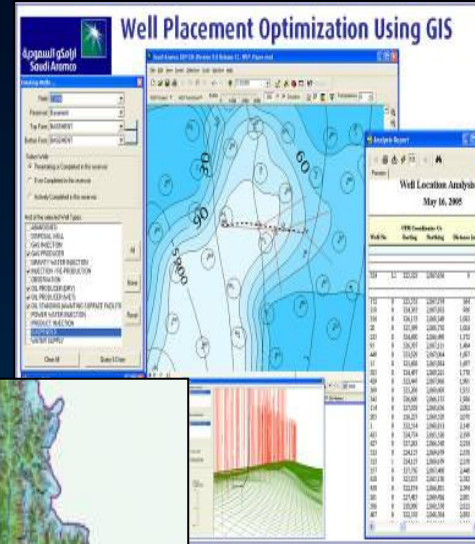
Agriculture



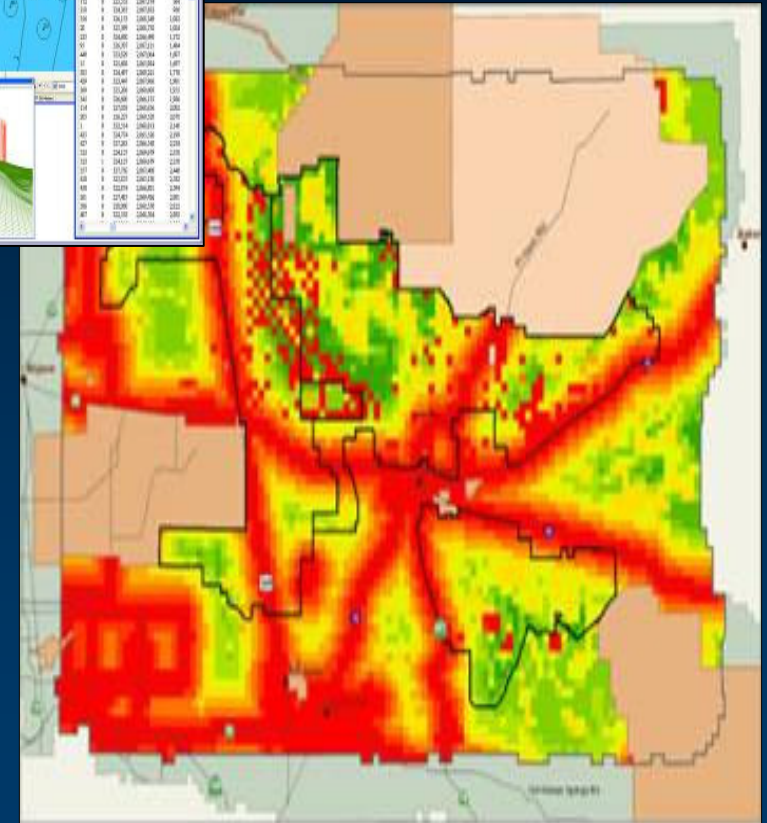
Wind Turbines



Canada



Desert Tortoise Habitats

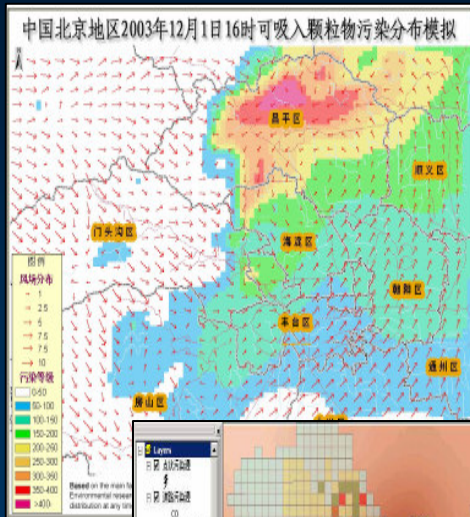


California

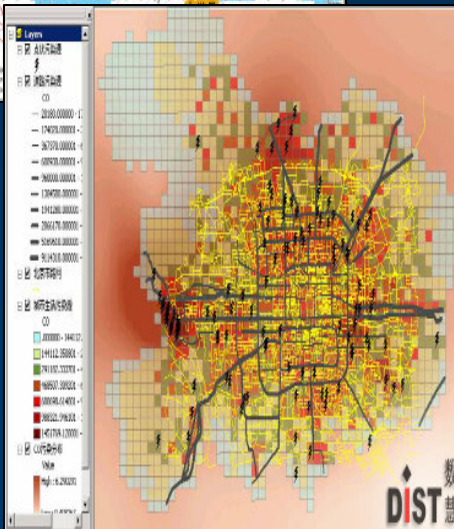
Sri Lanka

Human Health and the Environment

Air Pollution Modeling & Monitoring



Beijing

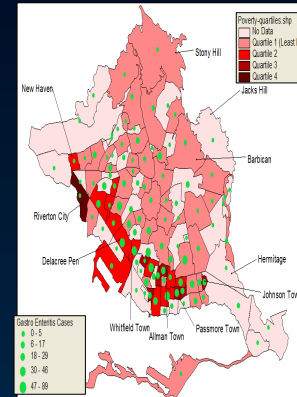


EPA Citizen Access



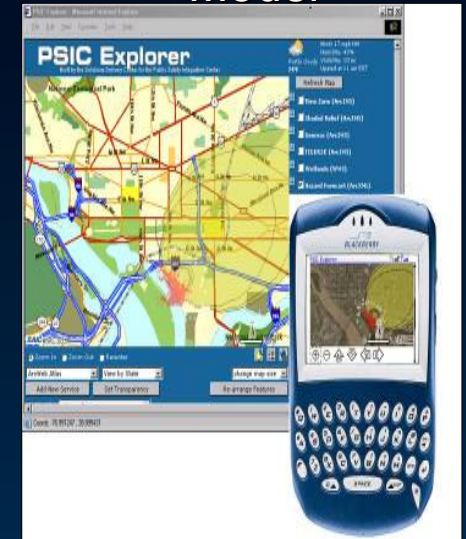
USA

Typhoid Epidemiology



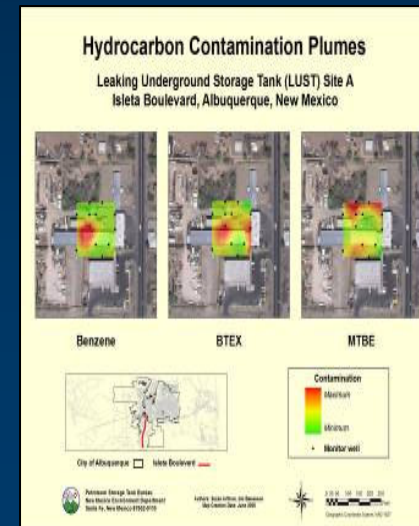
Jamaica

Web Based Diffusion Model



Washington D.C.

Contamination Plume



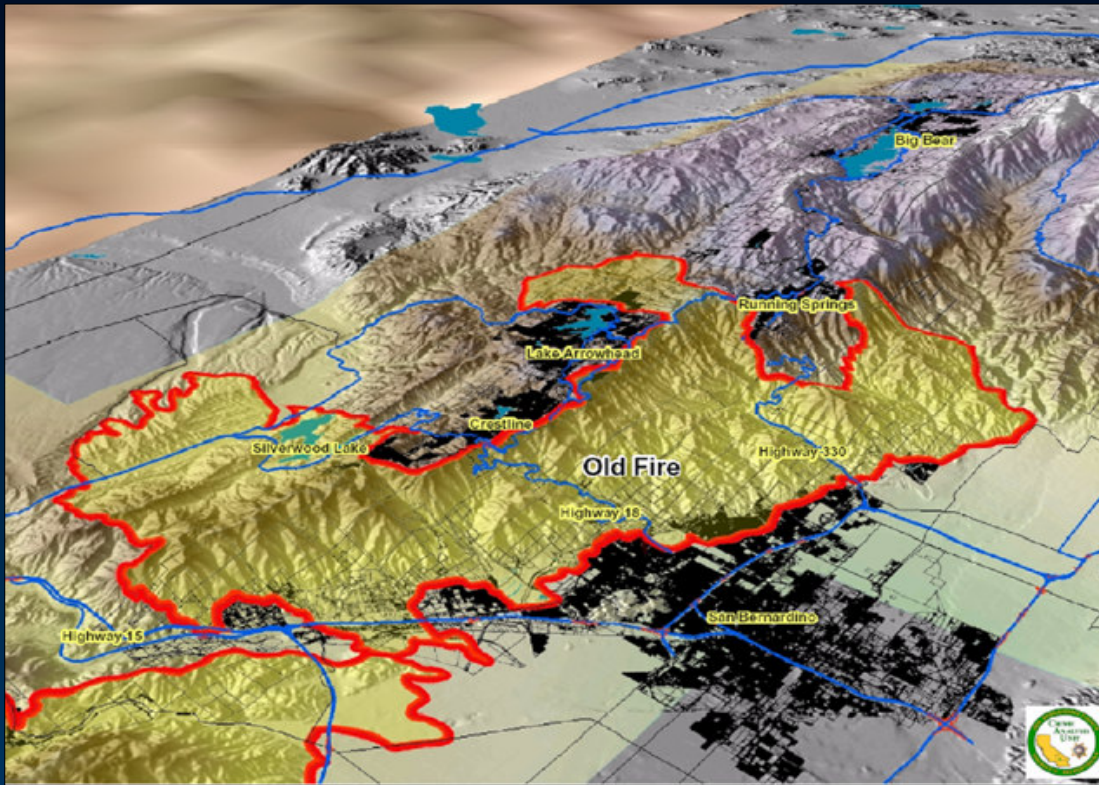
New Mexico

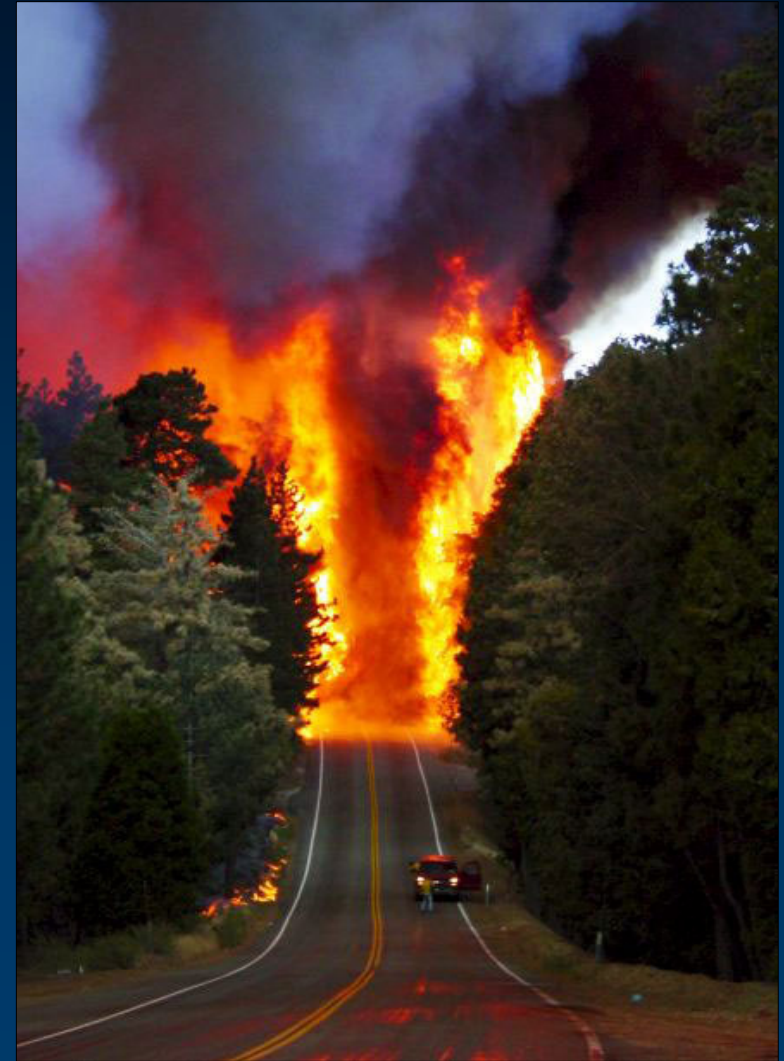
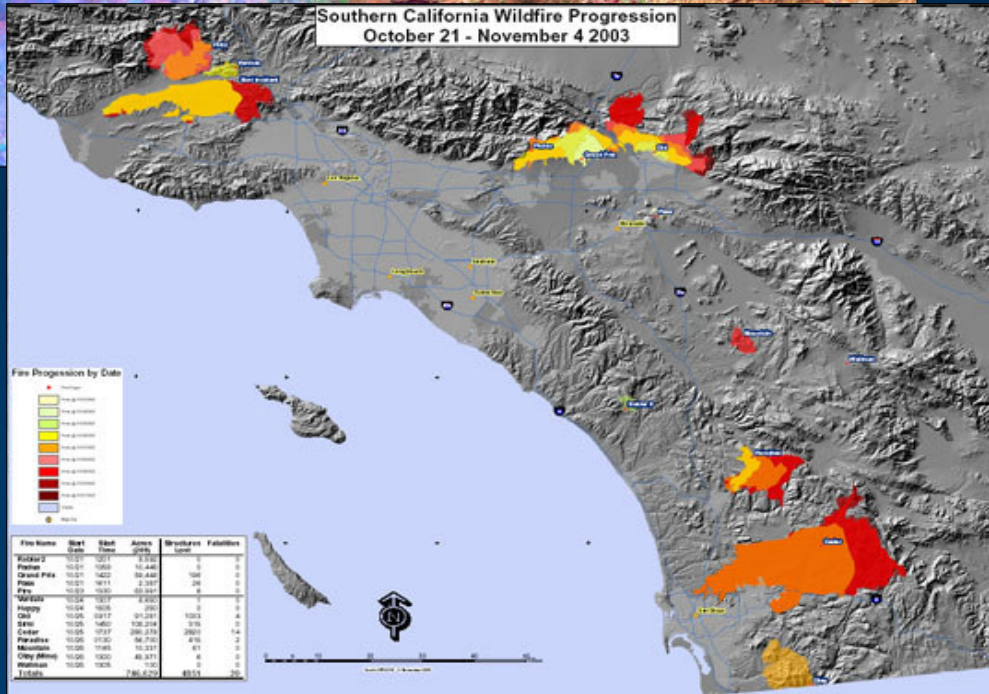
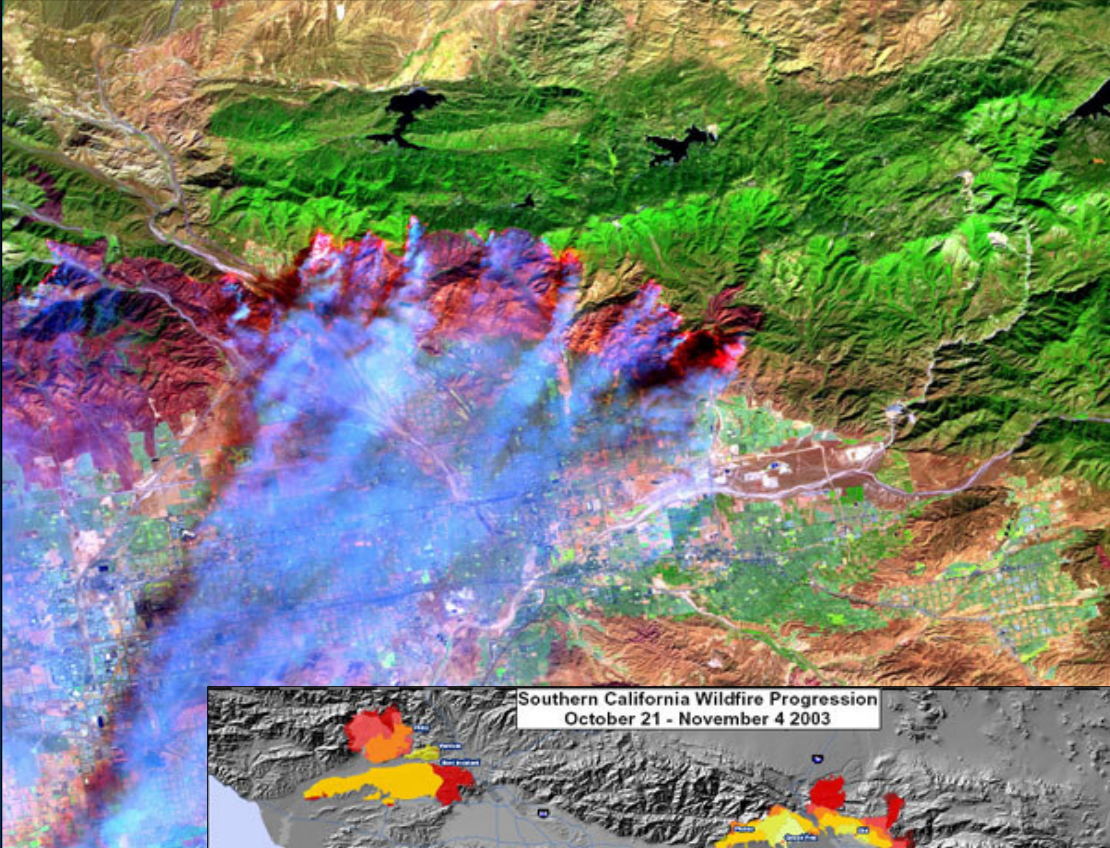
Forest Mortality due to environmental factors



- Drought
- Air Pollution
- Bark Beetle

Fire Visualization





Remembering that,

“GEOSS will provide a framework to collate and access environmental data which will be used to improve understanding of global systems”.

- What is needed to see this occur?
 - System Interoperability
 - Data models and standards
 - Web Accessibility
 - Tools to manipulate spatial datasets
 - Web based raster data management
 - Method to publish data
 - Reporting mechanisms

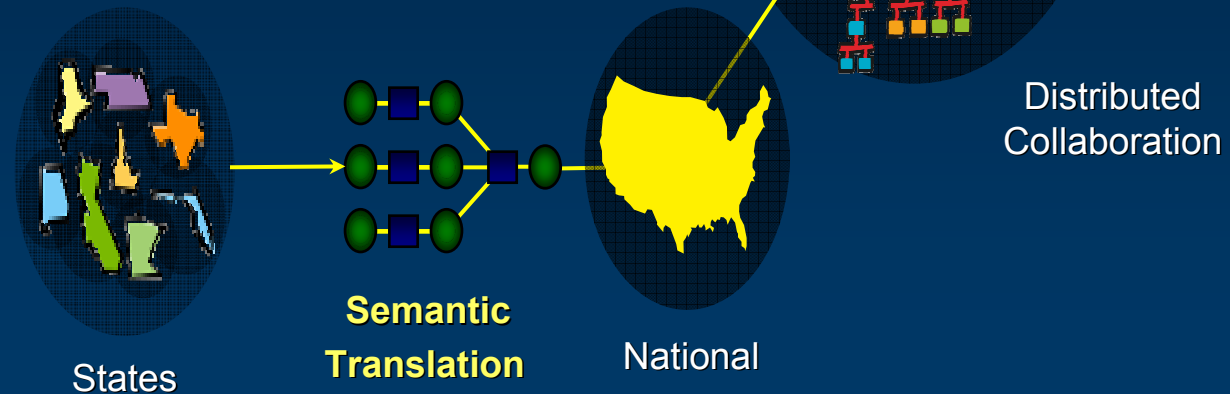
Interoperability Procedures Are Critical

The Key for Integrating Efforts

Data Transformation

- Formats
- Data Models
- Schema
- Projections / Datum

Interoperability Procedure (ETL)



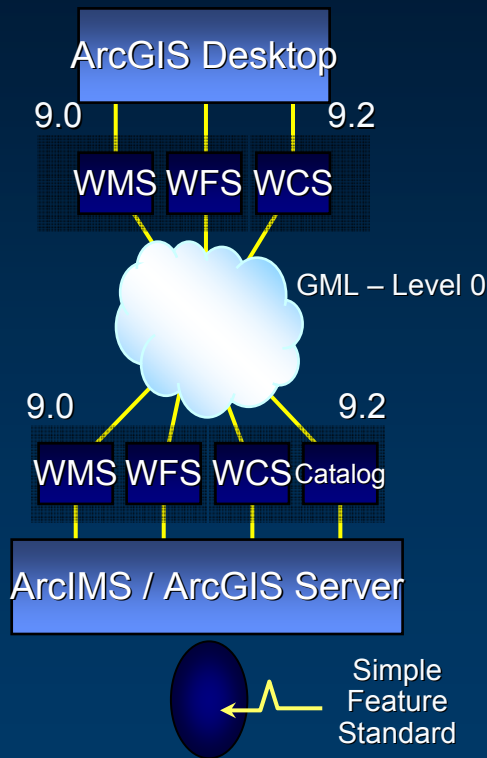
Interoperability

Ensuring an Open Platform

Data Interoperability Extension

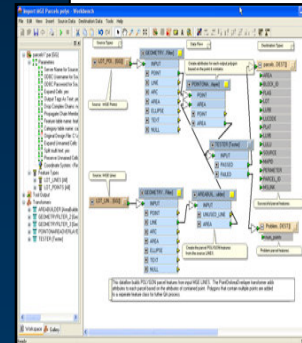
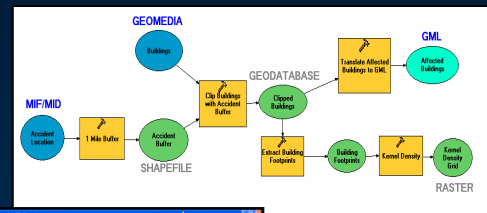
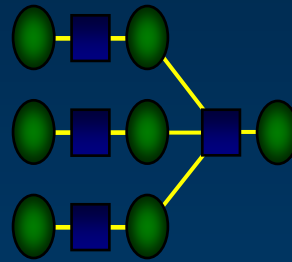
New Data Sources & Converters

Support for OGC Standards



Supports Data Transformation

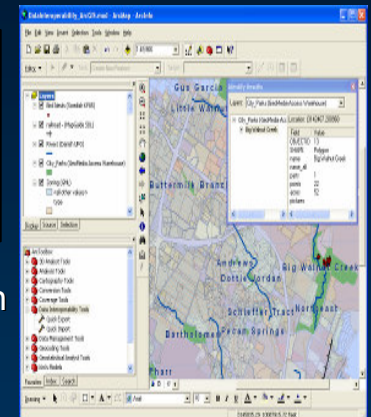
- Formats
- Data Models
- Schema
- Projections / Datum



Creating Custom Format Converters

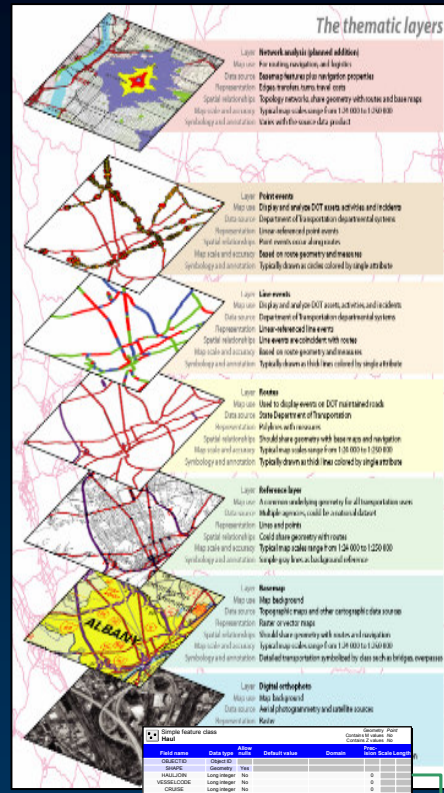
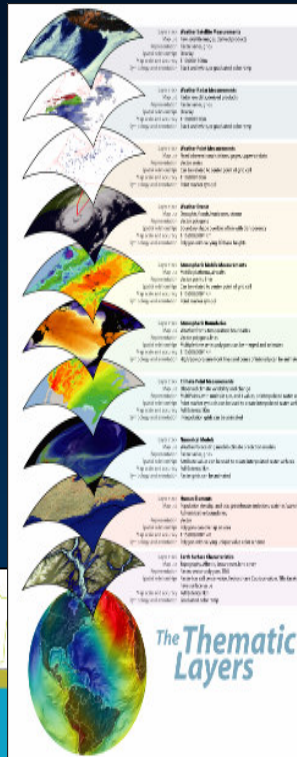
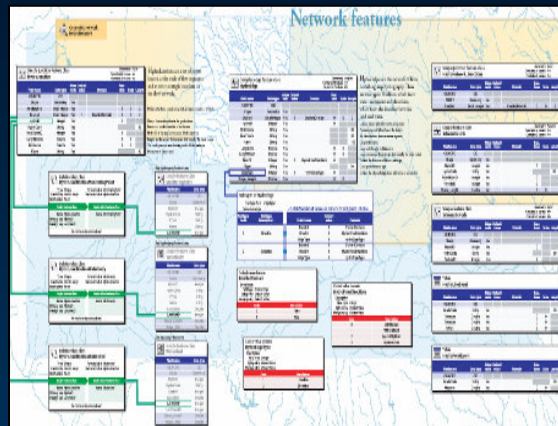
Integrated with ModelBuilder

Direct Read & Use



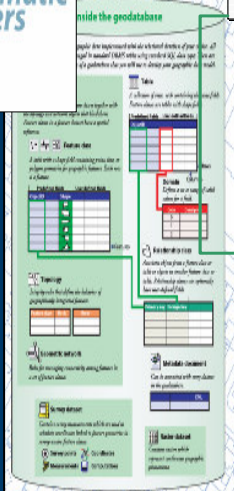
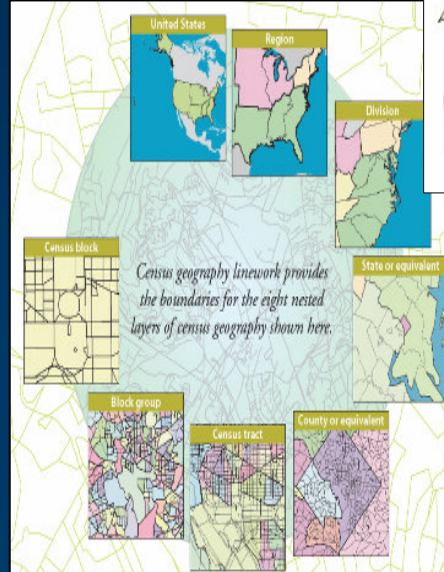
Geodatabase Data Models

Standardized Templates for Many Fields



- Address
- Agricultural
- Atmospheric
- Base Map
- Biodiversity
- Census-Admin
- Boundaries
- Defense-Intel
- Energy Utilities
- Environmental
- Forestry
- Geology
- Groundwater
- Health
- Historic Preservation & Archaeology
- Homeland Security
- Hydro
- IHO
- Land Parcels
- Local Government
- Marine
- National Cadastre
- Petroleum
- Pipeline
- Telecommunications
- Transportation
- Water Utilities

ArchHydro

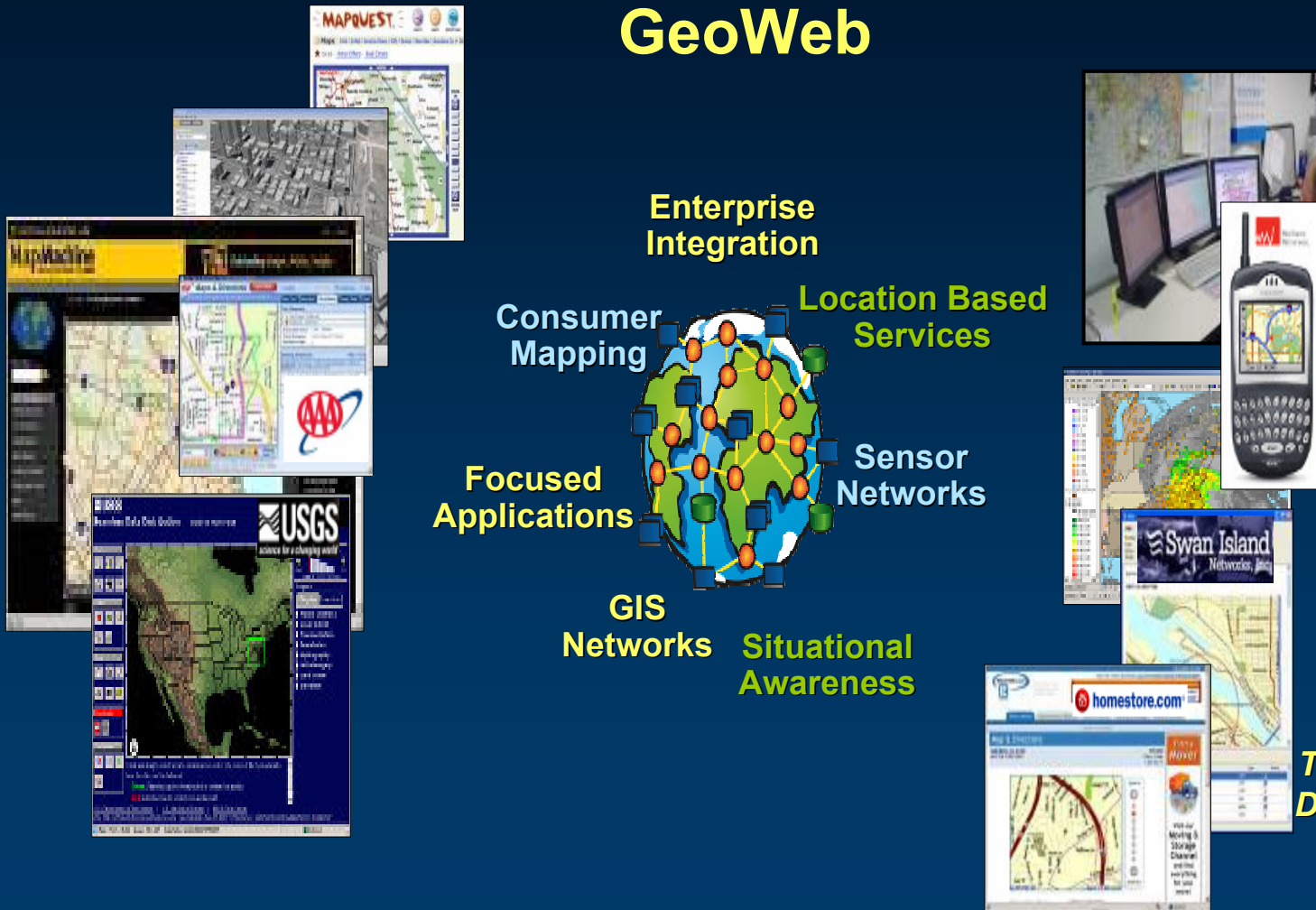


Field name	Data type	PK	Default value	Domain	Precision	Scale Length
OBJECTID	OID	Yes			0	
SHAPE	Geometry	No				
VEG_CODE	Long Integer	No			0	
VEG_CODE	Long Integer	No			0	
SHAPE_ID	String	No			100	7
SHAPE_ID	String	No			0	
SHAPE_ID	String	No			0	
SHAPE_ID	String	No			0	
SHAPE_ID	String	No			0	
SHAPE_ID	String	No			0	

GIS Web Services Will Provide the Framework

Supporting Many Geospatial Communities

GeoWeb



Over Time

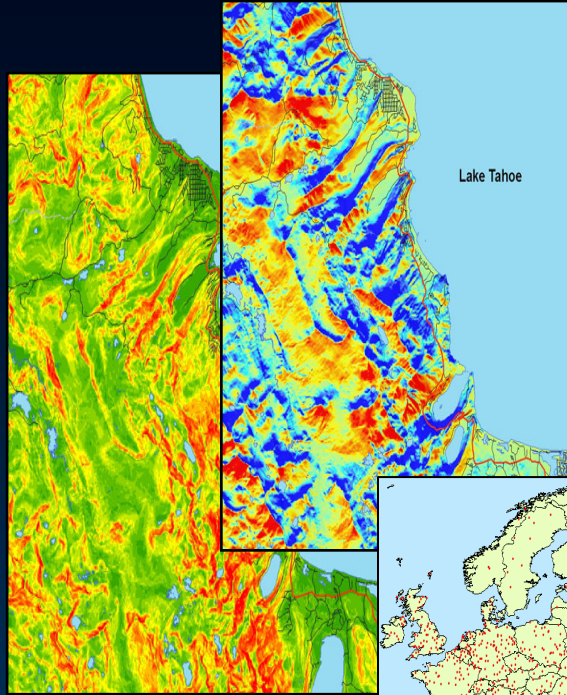
- Expanded GIS Services
- More Synergy
- Easier Exploration Tools
- Pervasive Use

*The GeoWeb Will Evolve Rapidly
Driven by Millions of Participants*

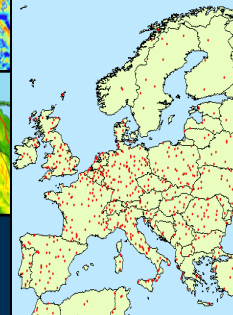
Geoprocessing

Improving the Capabilities

- Very Large Data Sets
- Spatial Analysis Tools
 - Solar Radiation
 - Random Sampling
 - Statistics / Geostatistics
 - Cartographic Tools
 - Generalization
 - Vector-Raster Improvements
- Fast Geocoding (5-10x)
- Time Based Modeling / Simulation
- Batch Geoprocessing
- Server Based

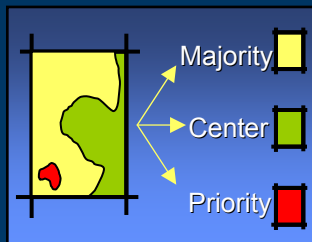


Solar Radiation

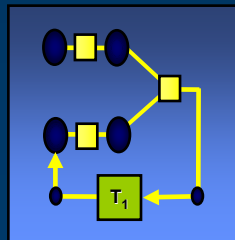


Random Sampling

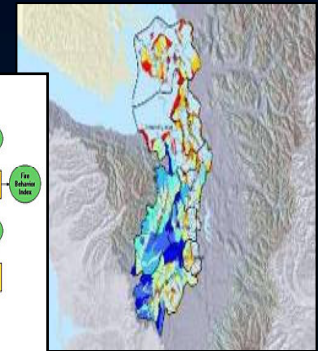
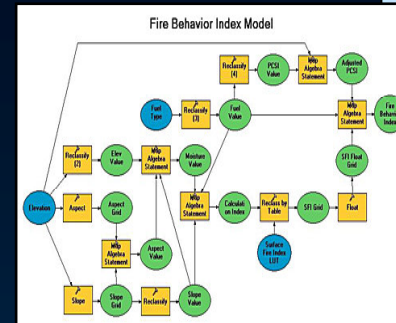
Raster Conversion



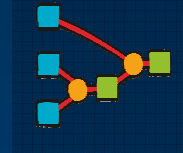
Model Looping



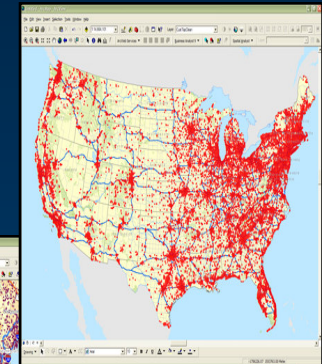
Improved Modeling



ArcGIS Server



Geoprocessing on Server



Geocoding

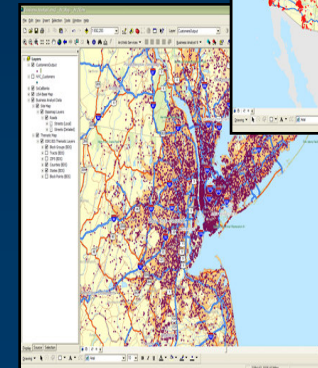


Image / Raster Capabilities

- Enhanced Projections
- Dynamic Ortho-Rectification and Pan Sharpening
- More Formats (JPEG 2000, ECW ...)
- Raster Attribute Tables
- Fast Loading

Ortho On-the-fly

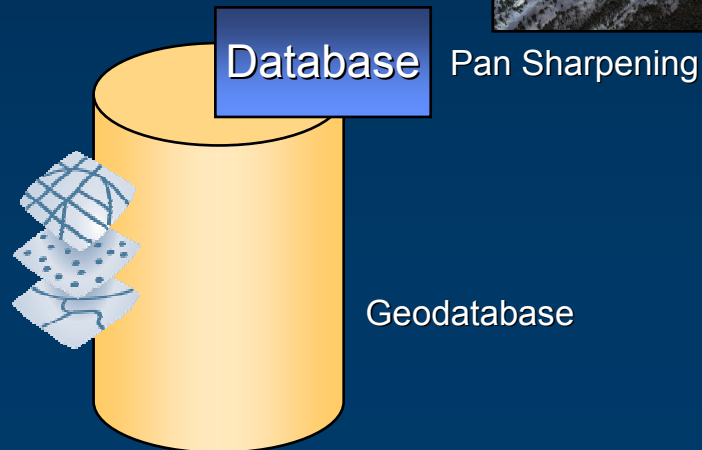
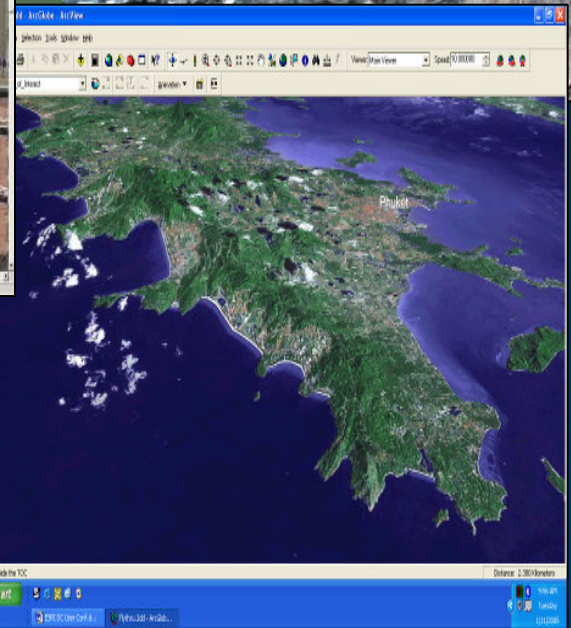
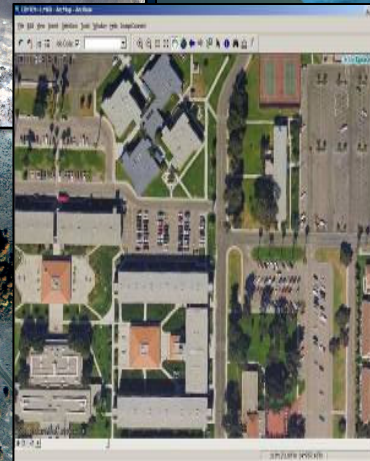
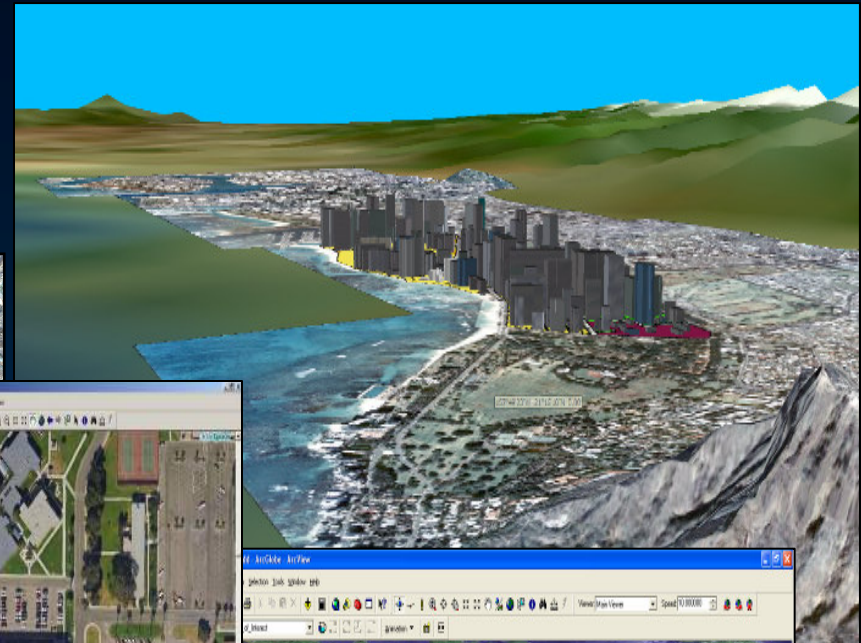
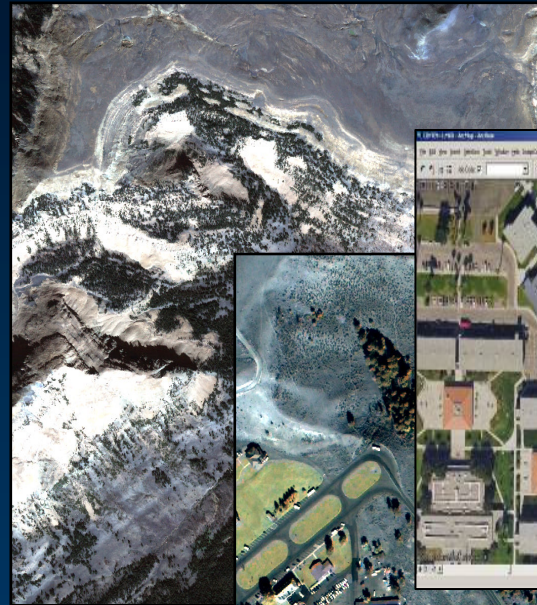
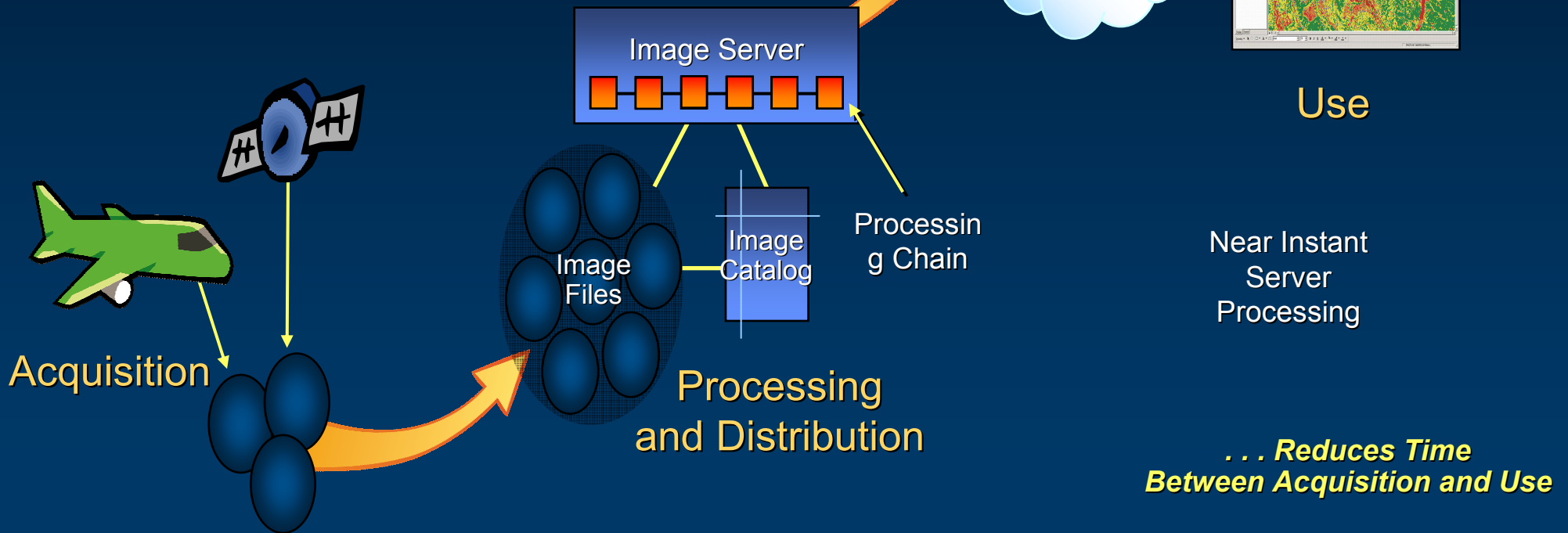
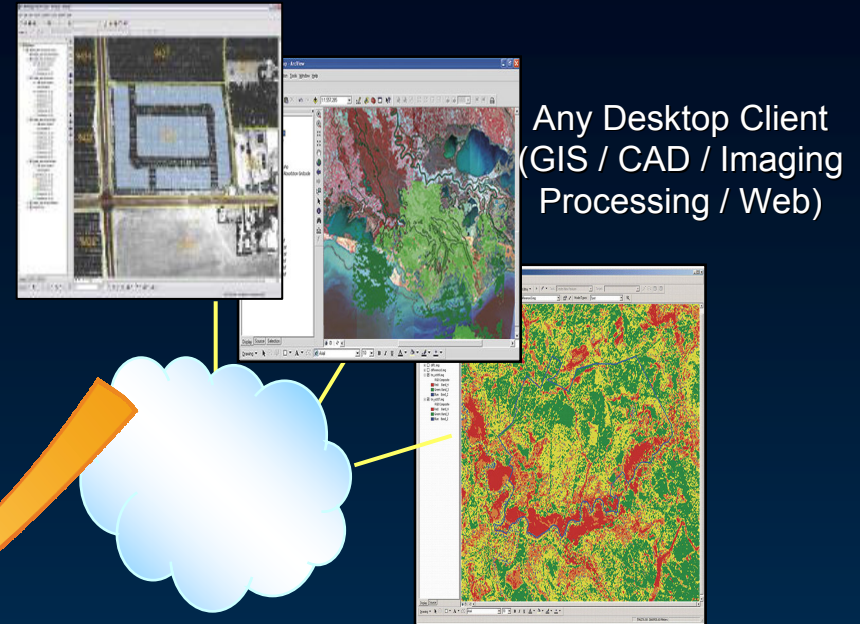


Image Server

- for Processing and Serving Geoimagery

On-the-Fly

- Georeferencing
- Ortho Rectification
- Pan Sharpening
- Mosaicing
- . . .



ArcWeb Services

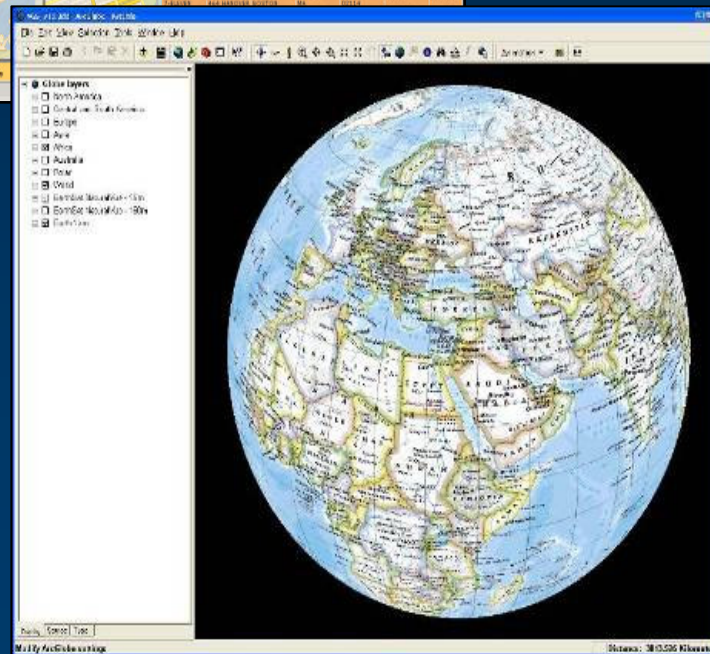
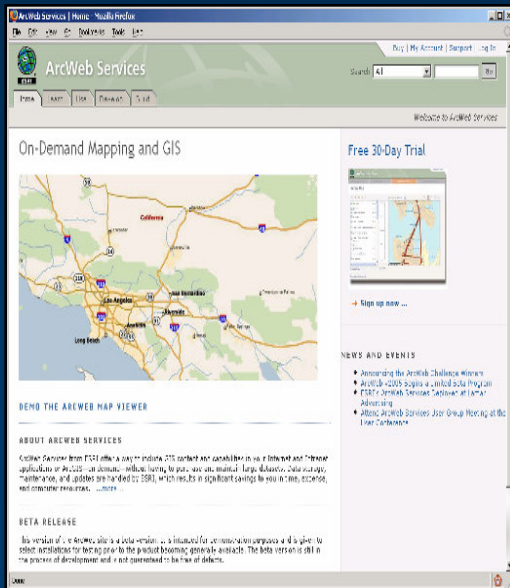
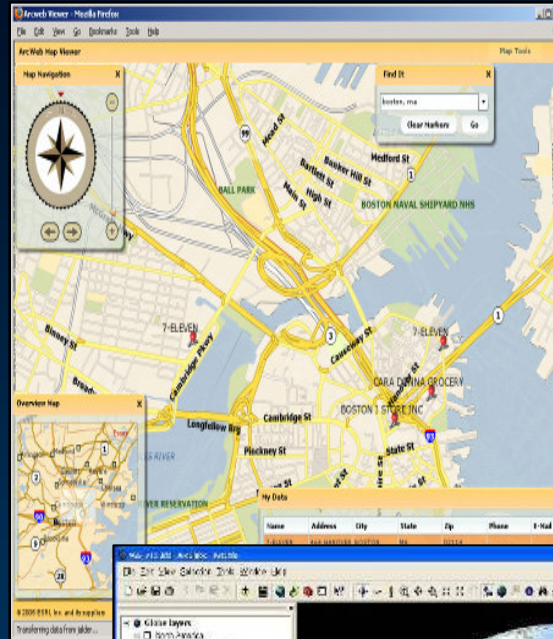
Hosted Services

On Demand Mapping and GIS

Three Types of Services

- **Public** - Individuals, Public Service & Developers
- **Commercial** - Government & Business
- **Hosted** - Outsourced Application Hosting

- Imagery
- Weather
- Geocoding
- Streets
- Mapping
- Routing
- Demographics
- Hazards
- Business locations
- Traffic
- Hydrographic Maps
- Gazetteer



Providing Online Access

Land use Planning

Permit Tracking

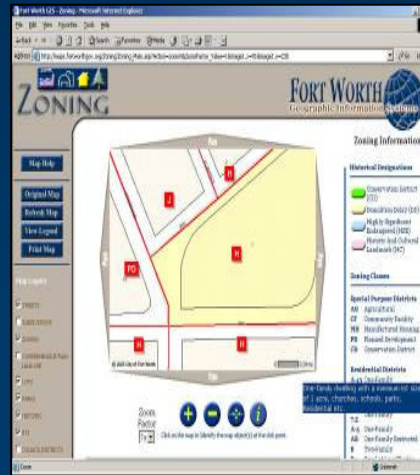


Nashville, Tennessee

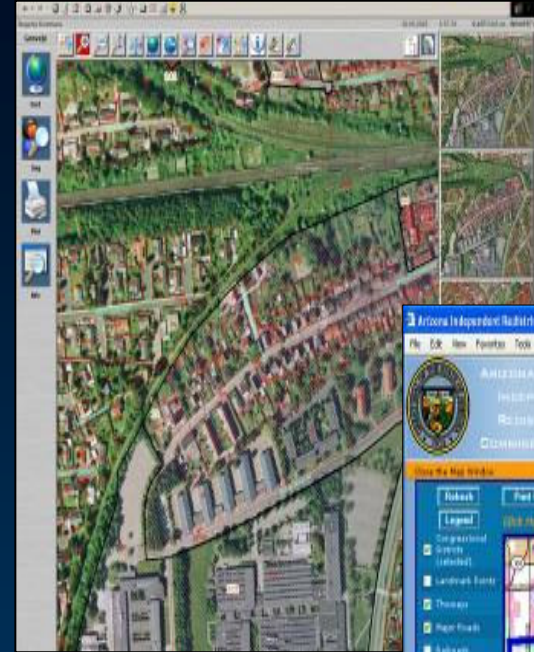
Agriculture



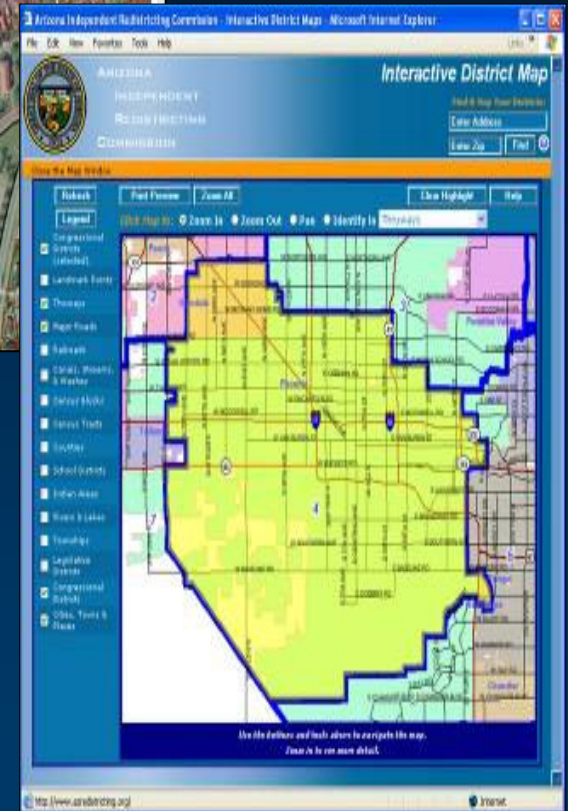
Germany
Property rights



Fort Worth Texas



Germany



Sustainable Development

What should the GEOSS be providing its client community?

- A data search mechanism
- A metadata catalogue
- Modeling and Analytical tools
- Arguably a method to report results

GIS Portals

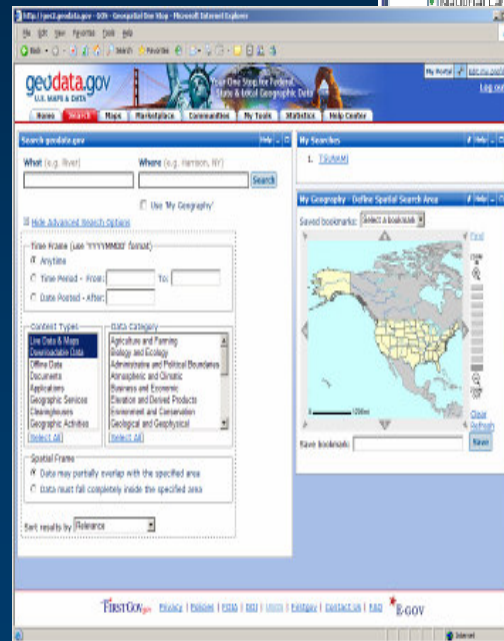
Geodata.Gov

(Geospatial One Stop)

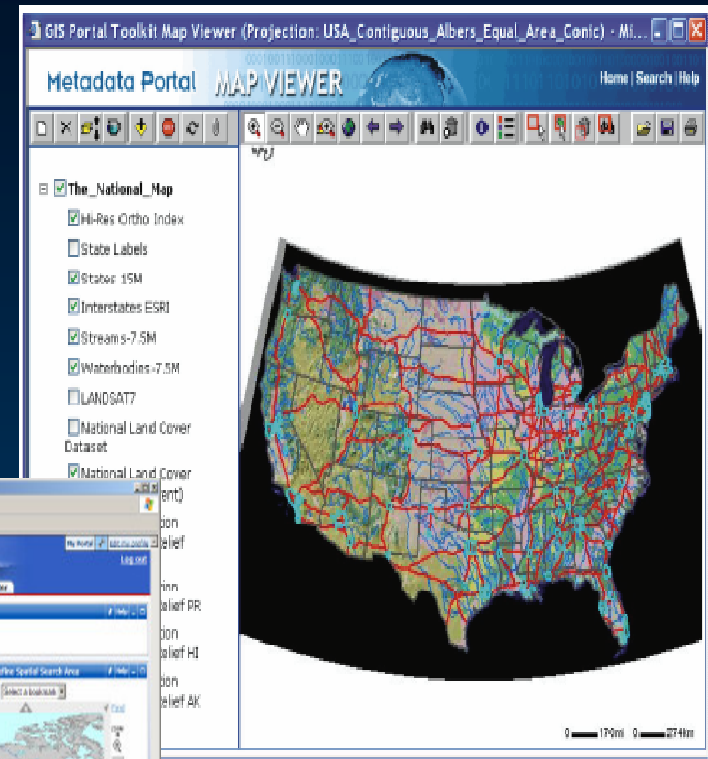
Metadata



Fast / Simple / Intelligent Search



Open Map Viewer

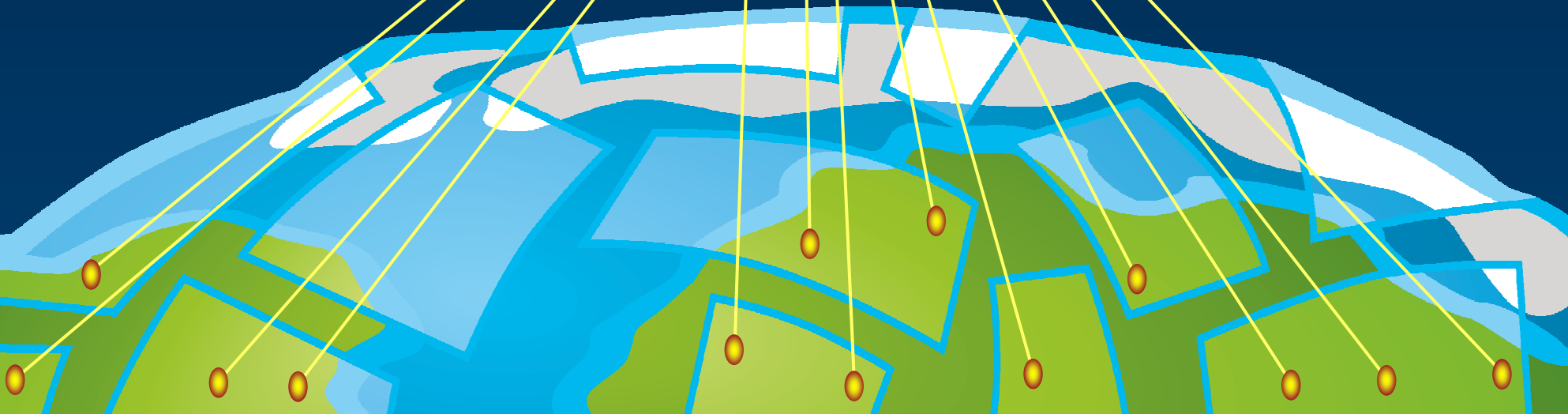


Individual Systems Will Be Connected into a System of Systems

Facilitated by . .
Metadata

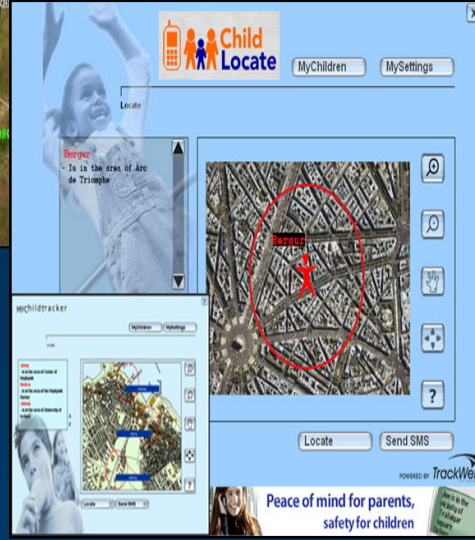
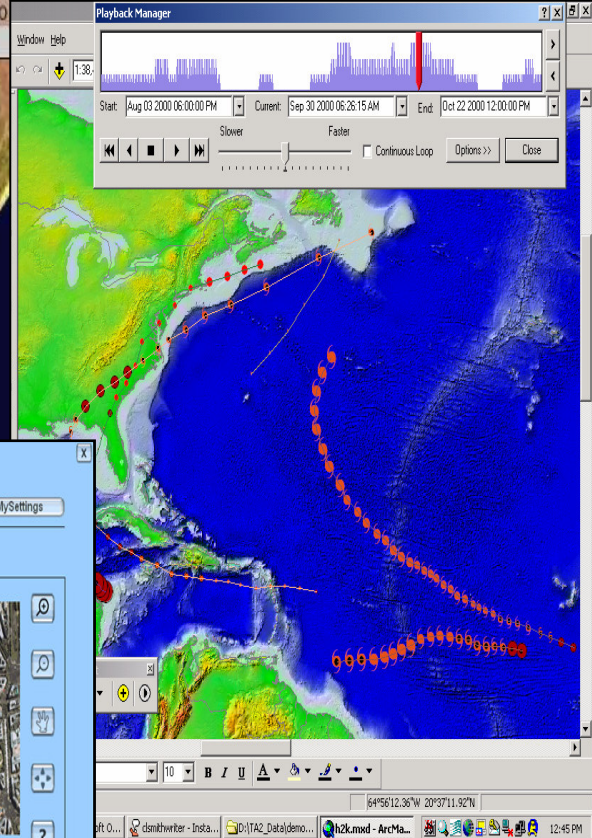
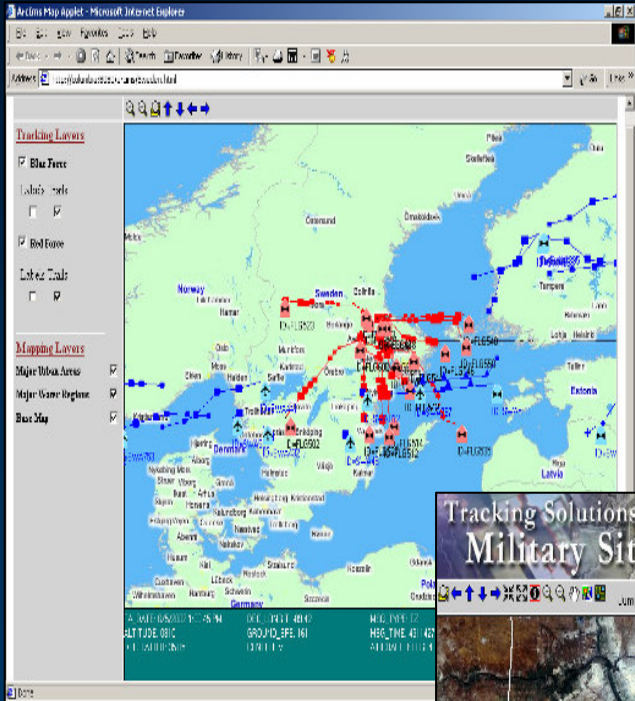
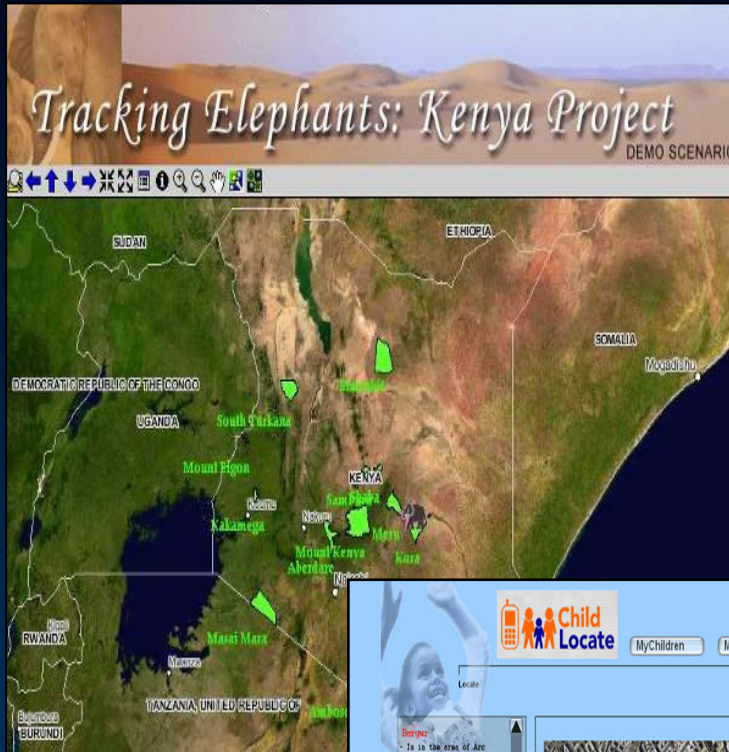


*... Providing New Capabilities
For Integration, Collaboration
And Improvement*



Real Time Tracking

Serving & Analyzing Real Time Data



Helping Support Real Time GIS Situations

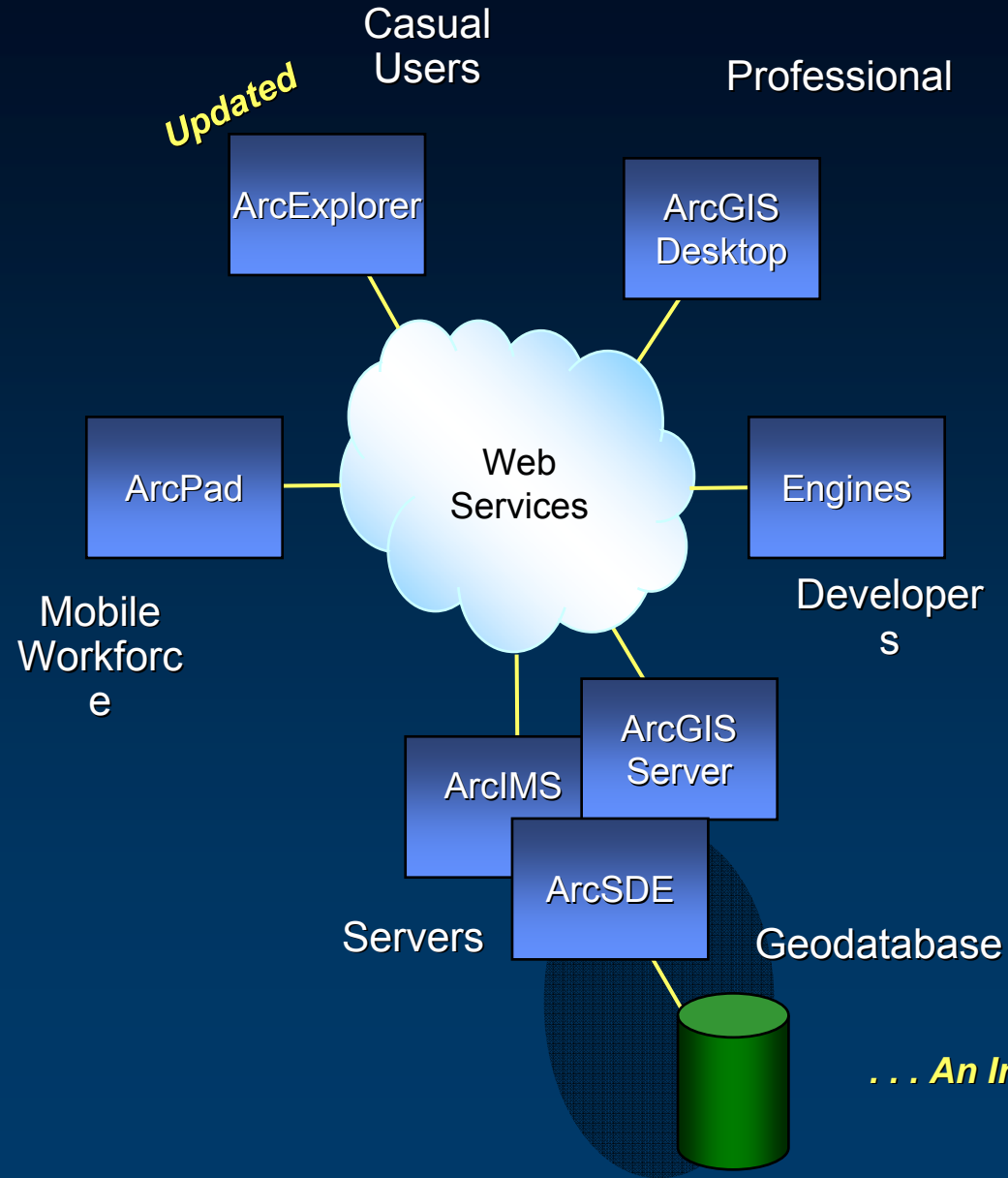
In Conclusion...

- The GEOSS is a monumental effort being undertaken by multitudes of organisations and individuals
- Geospatial technology should be a facilitator in this process not a hindrance
- Once GEOSS is a tangible resource, the scientific community must translate research into policy recommendations
- ESRI is prepared to support the GEOSS initiative

ESRI Software Products

GIS Platforms

- Desktop GIS
- Embedded GIS Components (Engines)
- GIS Servers
- Mobile GIS



- Compilation
- Mapping
- Geoprocessing
- Visualization
- Management
- Authoring
- Serving
- Viewing

... An Integrated Platform for Everybody