Activity Profile

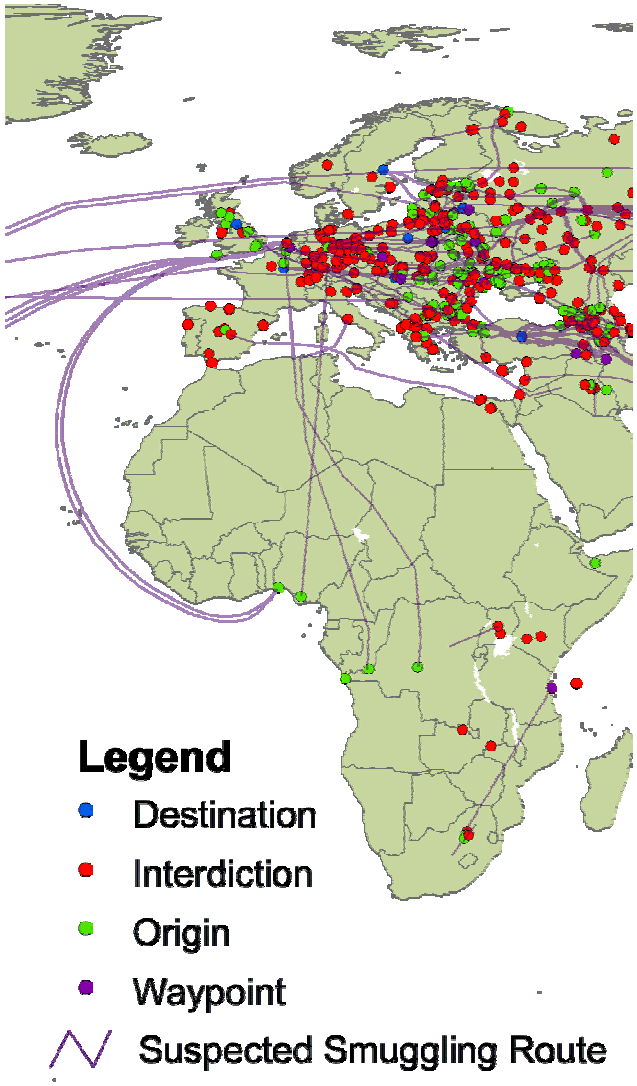
Geospatial Science at The Department Of Energy

Mapping The Mission

- Defense
- Energy
- Science
- Environment

Analysis of Radionuclide Theft and Diversions

Geospatial Science Program



Need

Characterize problem and prioritize program actions to reduce the threat to U.S. national security from radiological materials being used in “dirty bombs.”

Approach

Argonne is working with the DOE National Nuclear Safety Administration, NA-25, to compile information from diverse sources into a comprehensive database, analyze and model information, and communicate results.

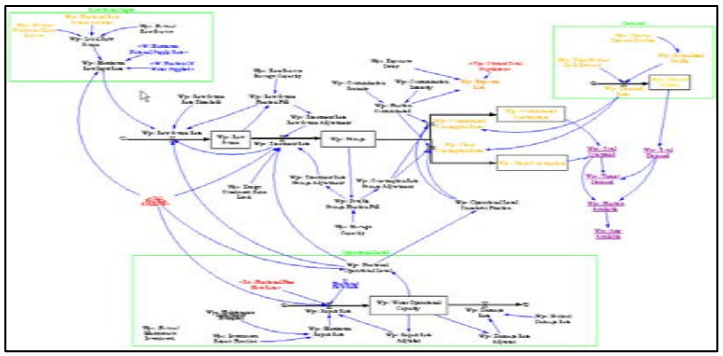
Benefits

Increased understanding of radionuclide sources and their locations, theft and diversion activities, and the ability to direct resources in the International Radiological Threat Reduction program where they will be most effective.

POC: Roy Lindley, lindley@anl.gov

Critical Infrastructure Protection

Geospatial Science Program



Need

Risk-based Critical Infrastructure Protection Decision Support System (CIP-DSS).

Approach

Develop system dynamics models for 17 critical infrastructures and key assets (electricity, gas, transportation, water, food, agriculture, etc.).

Identify interdependencies among critical infrastructures and key assets.

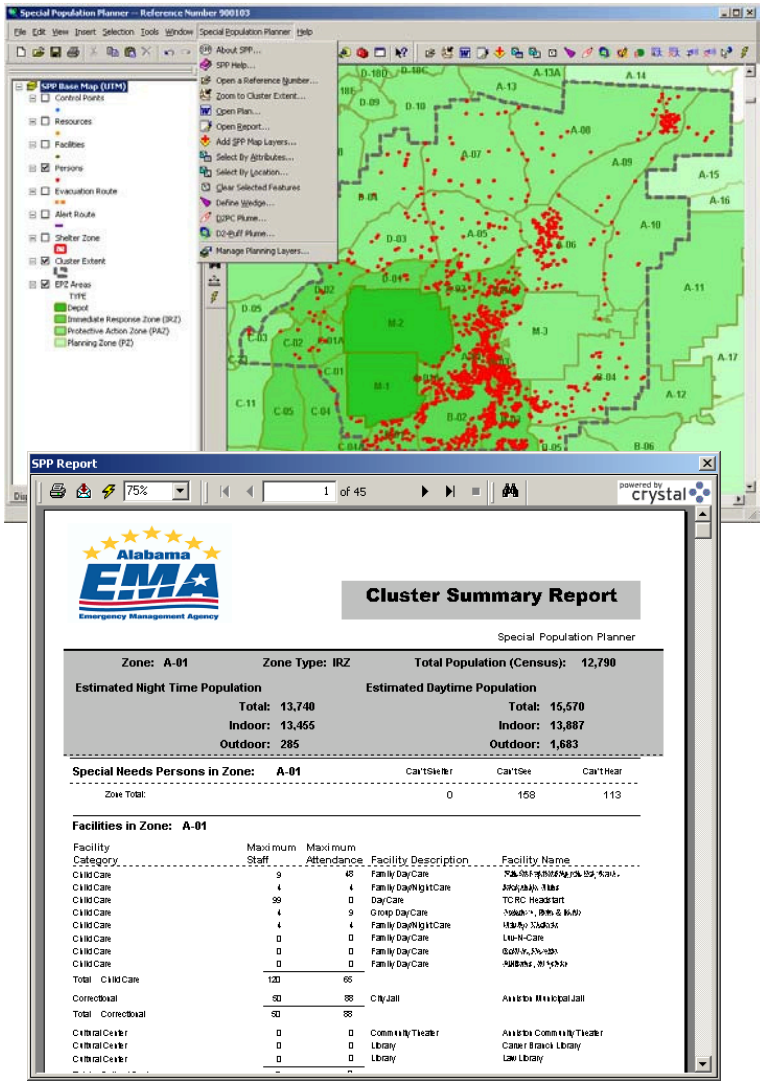
Benefits

Determine critical infrastructure vulnerabilities, protection strategies, and emergency response options during natural disasters or terrorist attacks.

POC: Sharon DeLand, smdelan@sandia.gov

Emergency Planning and Preparedness for Special-Needs Populations

Geospatial Science Program



Need

Some individuals lack the physical or mental capacity to implement evacuation orders or other protective actions in emergencies. Emergency planners and responders need to understand and plan for these issues.

Approach

Special Population Planner (SPP) software and a voluntary registry of information from persons with special needs was produced by Argonne for the Alabama Emergency Management Agency.

Benefits

SPP software can be easily configured for all-hazards analysis and any geographic area. A cost-effective methodology for compiling special-needs data has been established. Handling of special-needs issues in the Alabama project area has been improved.

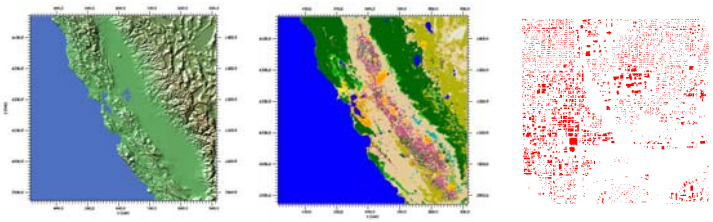
POCs: Ed Tanzman, tanzman@anl.gov

Geospatial Data in NARAC

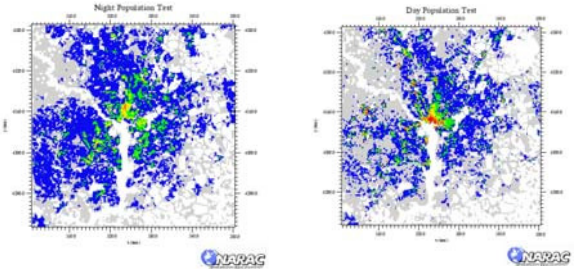
Geospatial Science Program

Three roles for geospatial data in NARAC:

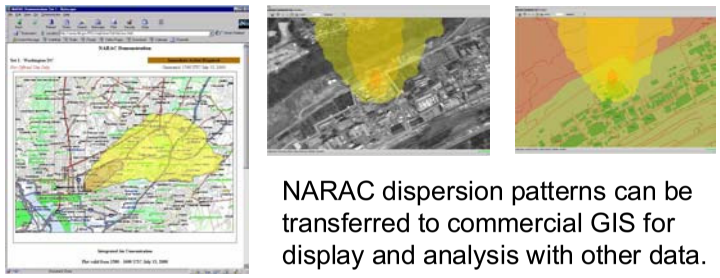
1. Model calculations



2. Health effects using day/night population



3. Product base maps



NARAC dispersion patterns can be transferred to commercial GIS for display and analysis with other data.

Need

The National Atmospheric Release Advisory Center (NARAC) provides tools and services that map the spread of hazardous material in the atmosphere.

Approach

NARAC is a national center for planning, preparedness, emergency response, and assessments involving a wide variety of hazards, including nuclear, radiological, chemical, biological or natural emissions.

Benefits

NARAC products provide information on affected areas, potential casualties, health effects, and recommended protective actions.

NARAC has national and global responsibilities and responds at a wide range of domain sizes, which necessitates a large requirement for multi-scale geospatial information.

This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48. UCRL-PRES-218029

POC: Hoyt Walker, hwalker@llnl.gov

Critical Infrastructure Protection

Geospatial Science Program

Need

GIS support for the National Infrastructure Simulation and Analysis Center (NISAC).

Approach

GIS-based tools for modeling, simulation, and analysis of critical infrastructures, their interdependencies, complexities and potential consequences of disruptions.

Apply NISAC tools Support to DHS Undersecretary for Emergency Preparedness & Response, DOE Office of Energy Assurance and other federal agencies.

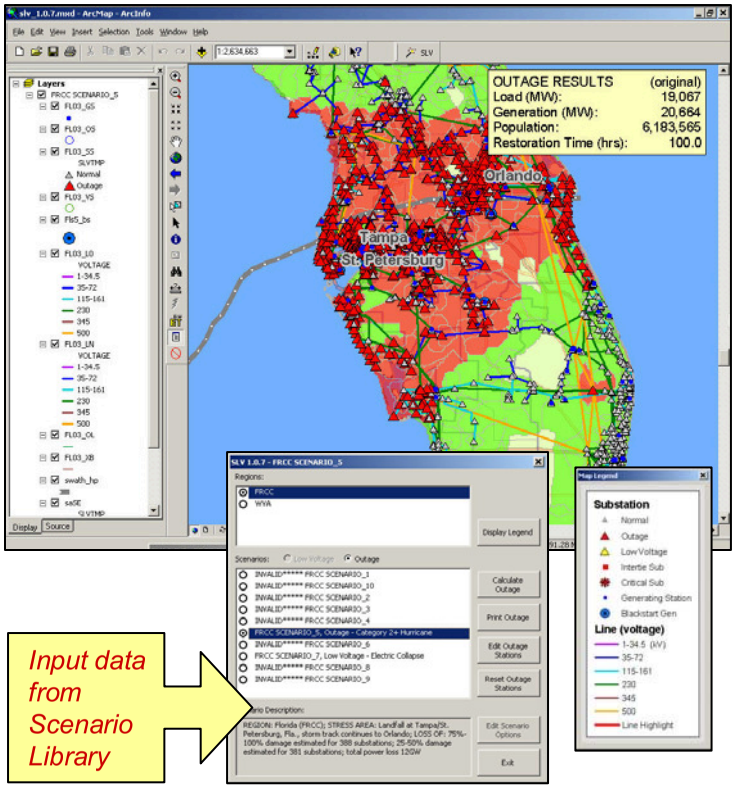
Benefits

Address interdependency issues (policy, planning, crisis response and education/training) at national, regional, urban and metropolitan scales.

POCs: Randy Michelsen, rem@lanl.gov / Theresa Brown, tjbrown@sandia.gov

Scenario Library Visualizer (SLV)

Geospatial Science Program



Need

GIS support for data input and visualization of regional electric and gas outage scenarios.

Approach

Develop scenario library of outage simulations.

Develop custom visualization tools to provide map-based view of scenarios.

Identify potential impacts to critical infrastructures dependent upon electric power.

Benefits

Capability for rapid response during emergencies that affect homeland security (natural disasters, terrorist attacks, etc.).

POC: Austin Ivey, ivey@lanl.gov

Second Line of Defense (SLD)

Geospatial Science Program

Need

GIS support for monitoring movement of nuclear materials at customs ports around the world.

Approach

Develop GIS links to models of the movement of nuclear materials.

Develop GIS-based visualization tools to assist with detecting and tracking movement of nuclear materials.

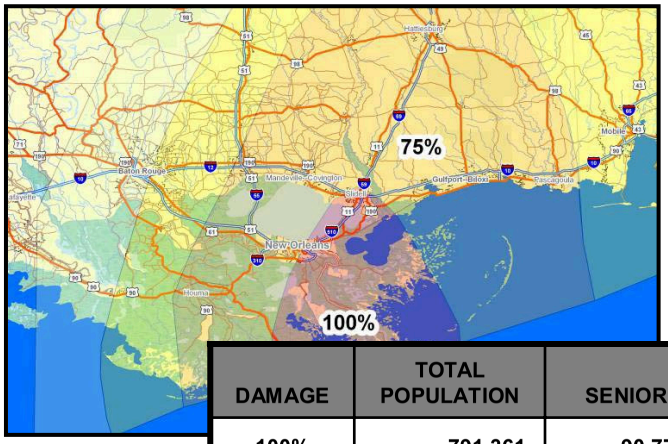
Benefits

Prevent nuclear proliferation and guard against terrorist acquisition of nuclear materials.

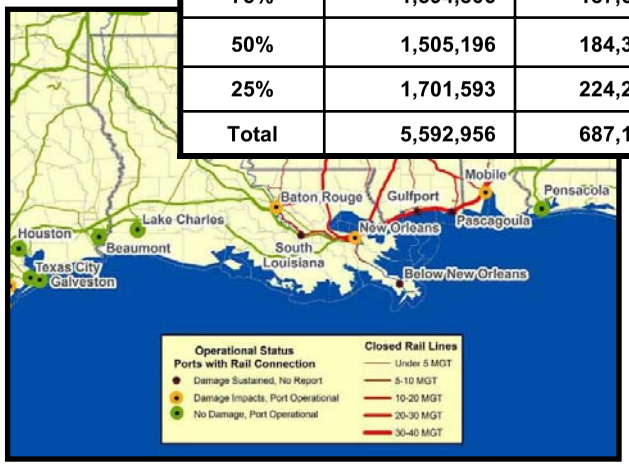
POC: Kevin Saeger, saeger@lanl.gov

Emergency Preparedness and Response

Geospatial Science Program



DAMAGE	TOTAL POPULATION	SENIOR
100%	791,361	90,773
75%	1,594,806	187,677
50%	1,505,196	184,372
25%	1,701,593	224,279
Total	5,592,956	687,101



Need

To support the Office for Electricity Delivery & Energy Reliability, Infrastructure and Energy Restoration Division's Visualization and Modeling Workgroup during natural or technological disasters.

Approach

Using a variety of tools and working under the coordination of NETL, subject matter experts from several of DOE's National Laboratories leverage existing expertise to respond to natural and man-made emergencies that impact energy infrastructure.

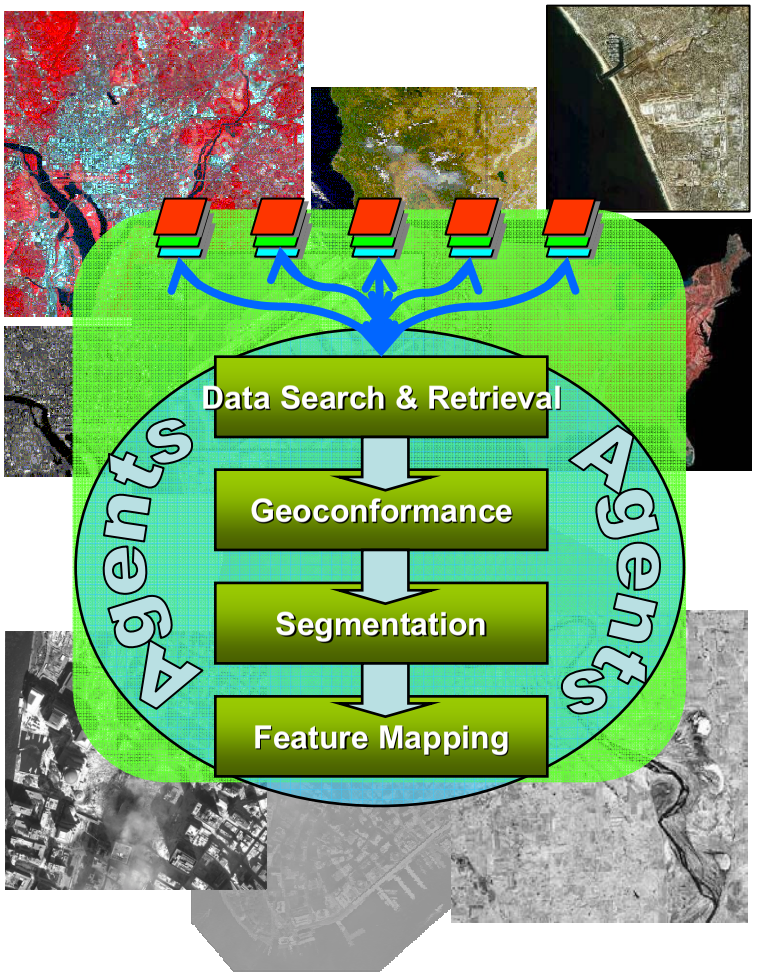
Benefit

Oak Ridge National Laboratory's GIST group provides expertise on population dynamics, demographic analysis, multimodal commodity flow analysis, and transportation routing and contingency planning.

POC: Budhendra Bhaduri, bhaduribl@ornl.gov

Image-to-Intelligence Archive (I2IA)

Geospatial Science Program



Need

The amount of data available to image analysts today is enormous, typically exceeding multiple terabytes and hundreds of thousands of individual image files.

Approach

Development of an agent-based system architecture that autonomously manages a massive but dynamic image data archive that transforms data to an intelligence archive to aid national security needs.

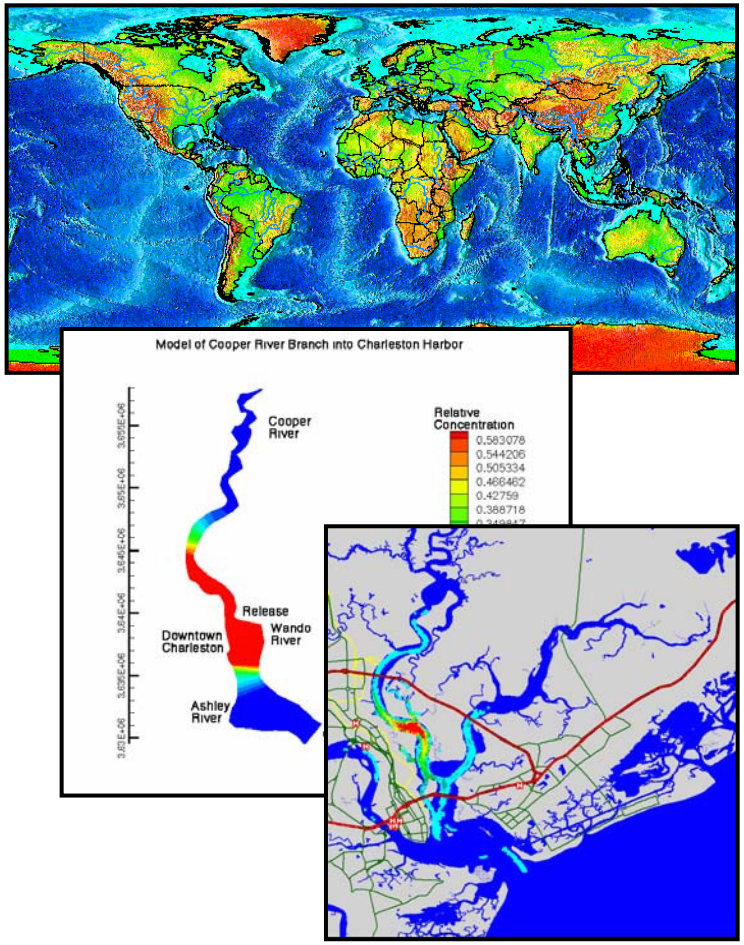
Benefit

Effectively and efficiently managing terabytes of image data is essential to rapid response to discrete events and assessment of threats and vulnerabilities. Allows rapid visual query to retrieve similar objects in archive and change detection in a space-time framework.

POC: Budhendra Bhaduri, bhaduribl@ornl.gov

Hydrologic Transport Assessment System (HYTRAS)

Geospatial Science Program



Need

Nuclear, biological and chemical agents enter waterways from many sources: industrial facilities adjacent to waterways, vessels traveling on waterways, surface deposition of airborne materials, and others.

Approach

Application and integration of watershed modeling techniques (based on USDA's NRCS rainfall-runoff model, non-point contaminant data, precipitation, temperature, soil type, land use/land cover, and population distribution datasets).

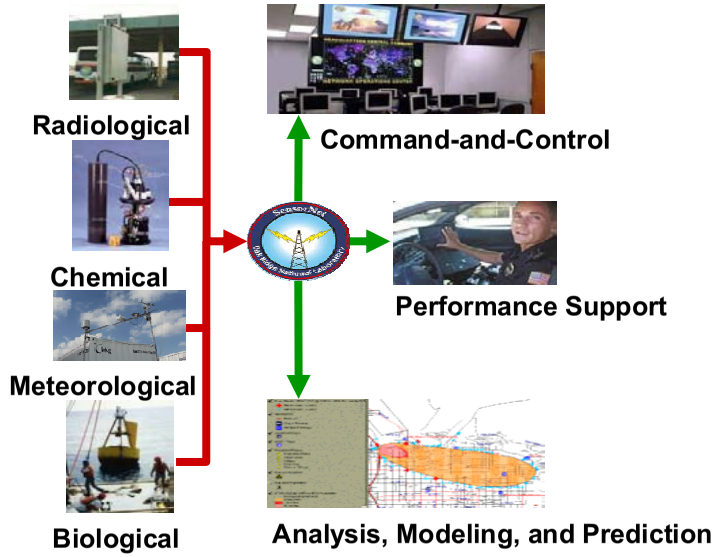
Benefit

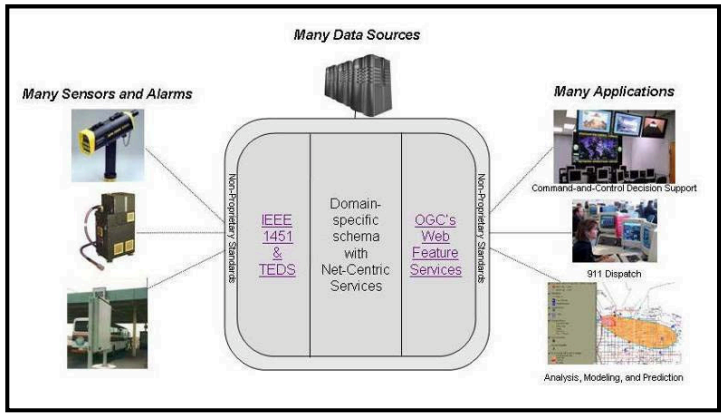
HYTRAS predicts the transport of nuclear, biological, and chemical agents in surface waters, and downstream exposure risk assessment resulting from incidents.

POC: Budhendra Bhaduri, bhaduribl@ornl.gov

SensorNet

Geospatial Science Program





Need

The emerging technical innovations in public safety will be information technologies: Wireless Data/Mobile Computing, Intelligent Video Surveillance, GIS, Situation Awareness, Location-Based Services (GPS), RFID Tagging, Sensor Networks, Biometrics, Forecasting, Information Fusion, and Analytics.

Approach

Through collaboration with Open Geospatial Consortium (OGC), the National Institute for Standards and Technology (NIST), and the Organization for the Advancement of Structured Information Standards (OASIS), promote interoperability and information sharing standards for interfacing autonomous sensor networks.

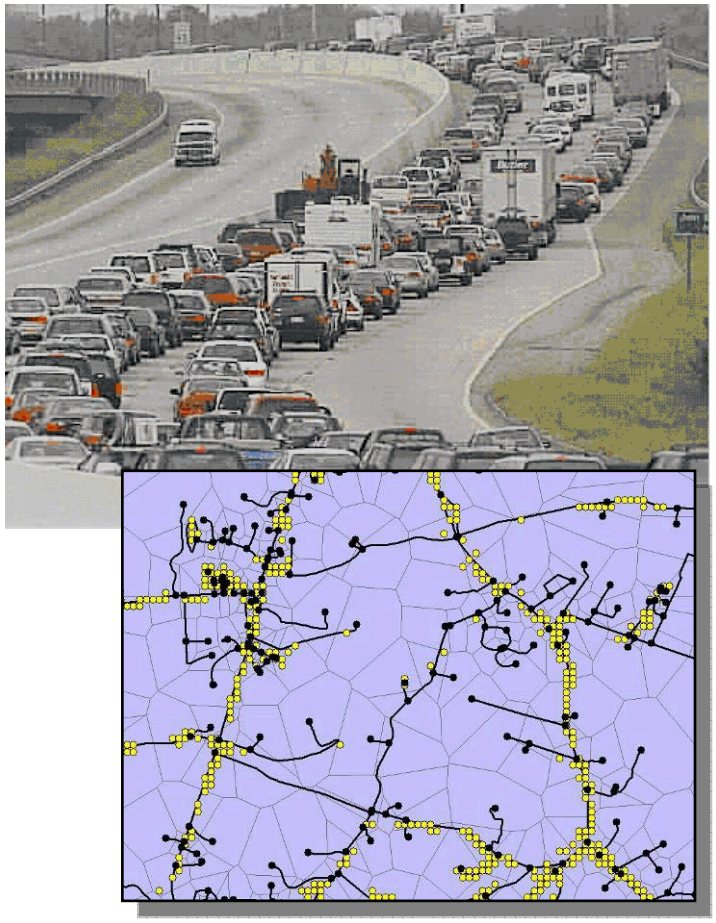
Benefit

Deployment of SensorNet test beds in a variety of locations and operational settings that test and refine various aspects of the emerging technical solutions.

POC: Budhendra Bhaduri, bhaduribl@ornl.gov

Intelligent Consequence Management

Geospatial Science Program



Need

Existing consequent management approaches are constrained by lack of integration of behavioral, social, and physical models and spatial data.

Approach

Integrate sound behavioral assumptions, dynamic traffic assignment, and high-resolution demographic data in a GIS framework for an evacuation model.

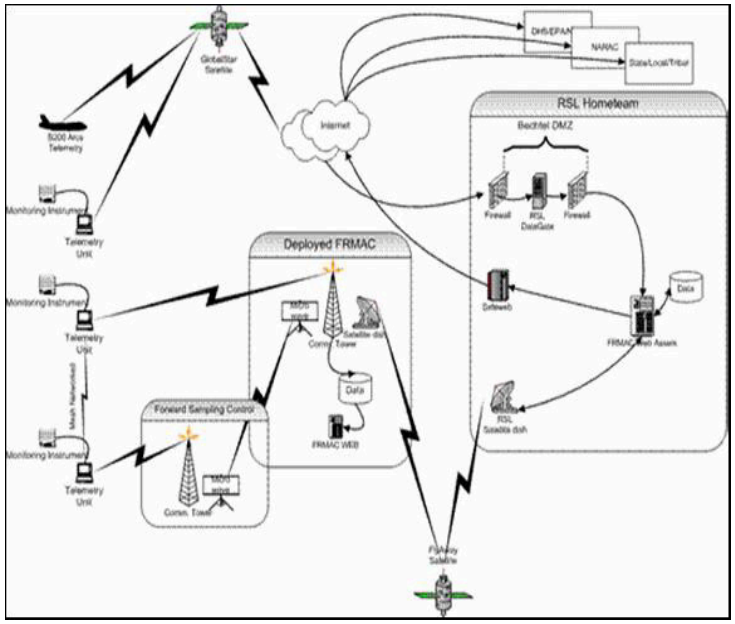
Benefit

Allows local planning and response analysis on a national basis to assess real time consequence analysis, compounding effects from disasters, and energy impacts of disasters.

POC: Budhendra Bhaduri, bhaduribl@ornl.gov

Emergency Response GIS and Wireless Technology

Geospatial Science Program



Need

Telemetry systems are necessary to allow emergency response organizations to provide field data, faster, and with greater reliability to decision makers during a nuclear incident.

Approach

Real-Time Data Acquisition and Dissemination (RDAD) is an architecture being developed at the DOE Remote Sensing Laboratory (RSL) that allows mobile data acquisition platforms to move data through any IP communication channel to central command and control assets. Implementation of this system is being approached within existing operational, security, and networking constraints.

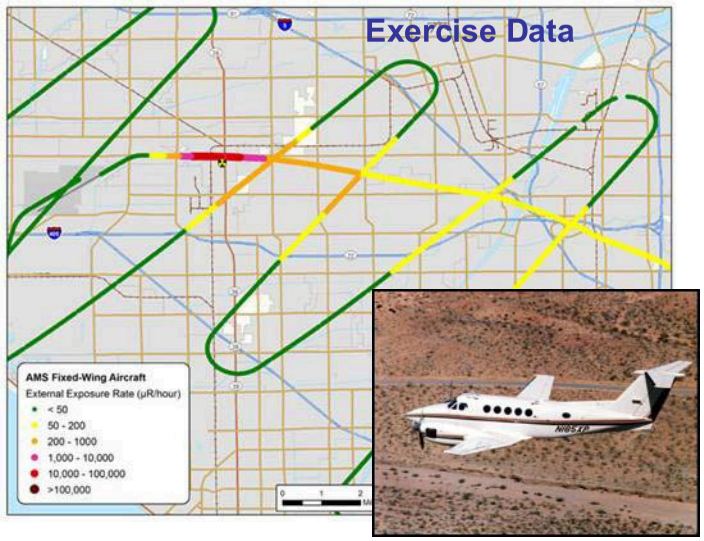
Benefits

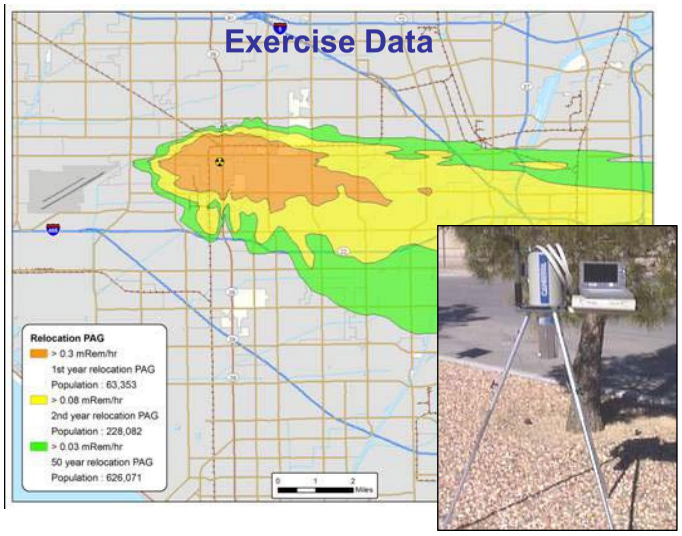
As field data are collected and transmitted, they are made available for real-time display and analysis using internet mapping applications. This provides immediate access to valuable emergency information by decision makers across the country.

POC: James Essex, essexjj@nv.doe.gov

GIS for Nuclear Emergency Response

Geospatial Science Program





Need

For responding to emergency situations involving the release of radiological materials into the environment, there is a critical need for decision makers to have timely access to data about radiological conditions and response status in the field.

Approach

For the past 14 years, RSL scientists have maintained a deployable GIS capability to respond to nuclear emergencies in the United States. The GIS is scalable to provide capability for small and large responses alike. GIS personnel are trained in radiological response data needs and are always on-call for rapid deployment anywhere in the country.

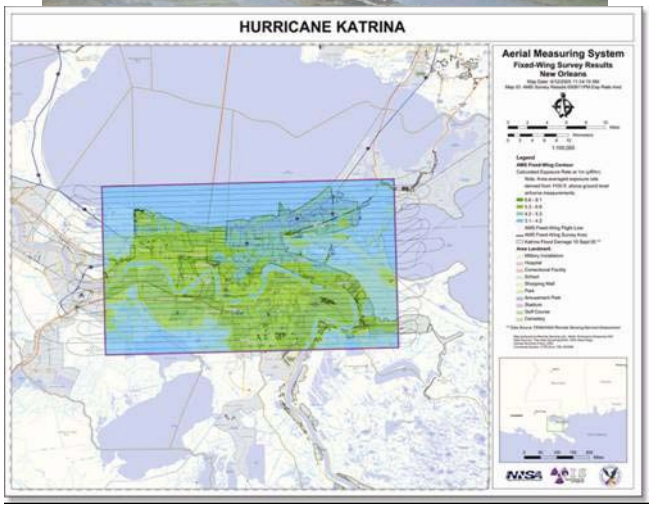
Benefits

The GIS capability provides command and control for field operations, a mechanism for assessment of measurement data for decision making, and the means to turn the information into data products for distribution to decision makers.

POC: Al Guber, guberal@nv.doe.gov

Katrina Response GIS Support

Geospatial Science Program



Need

At the request of the State of Louisiana, the Remote Sensing Lab was tasked by NNSA to deploy a B-200 aircraft outfitted with radiological sensors to the New Orleans area to survey for displaced radiological sources.

Approach

The B200 aircraft surveyed 975 square miles in the region to look for hazardous sources that may have been displaced by the storm or looters. Data from the aircraft was telemetered in real-time to a GIS system where radiation scientists based in Las Vegas could assess the information as it was collected.

Benefits

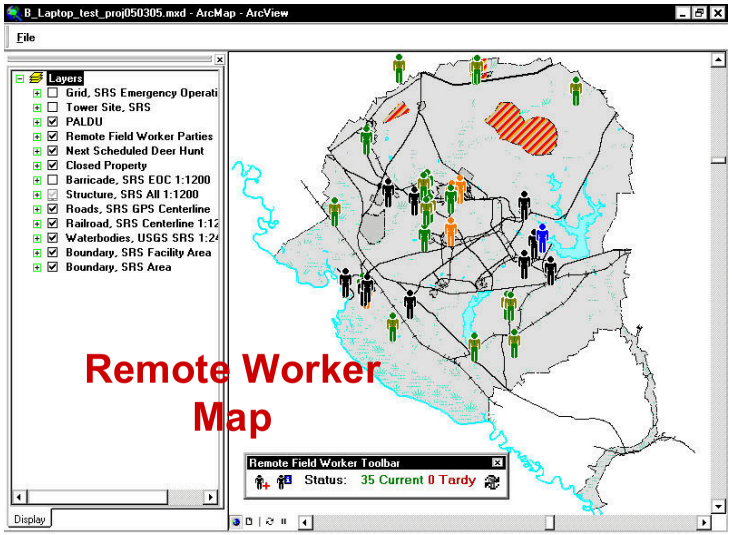
Aerial data was analyzed and contoured using GIS algorithms and resultant data were plotted in map format for distribution to emergency managers throughout the affected region and the US.

POC: Al Guber, guberal@nv.doe.gov

SRS Remote Worker Program

Geospatial Science Program

Remote Worker Webpage



Remote Worker Map

Need

To provide centralized tracking and accountability for workers at remote locations.

Approach

Utilize data base tables and geographic event themes to allow editing by multiple dispatchers to a centralized database.

Benefits

Notifies dispatcher if area is restricted (keeps worker safe).

Notifies dispatcher when worker is overdue.

Provides personnel accountability in case of site emergency.

Coordinates emergency services for personnel.

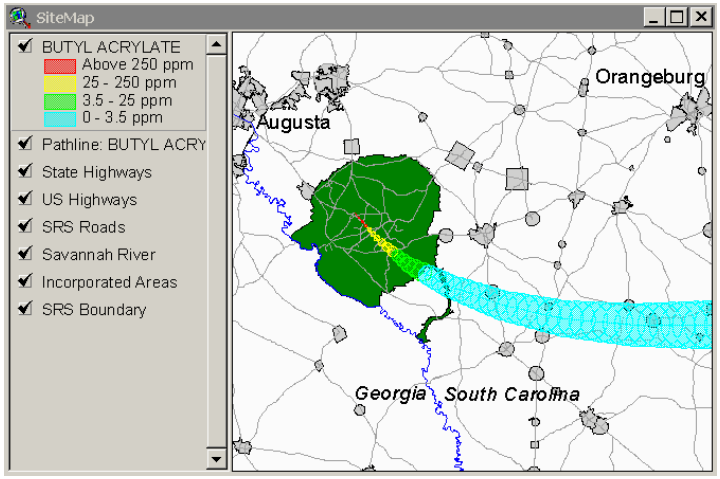
Implements consistent standards, requirements, expectations.

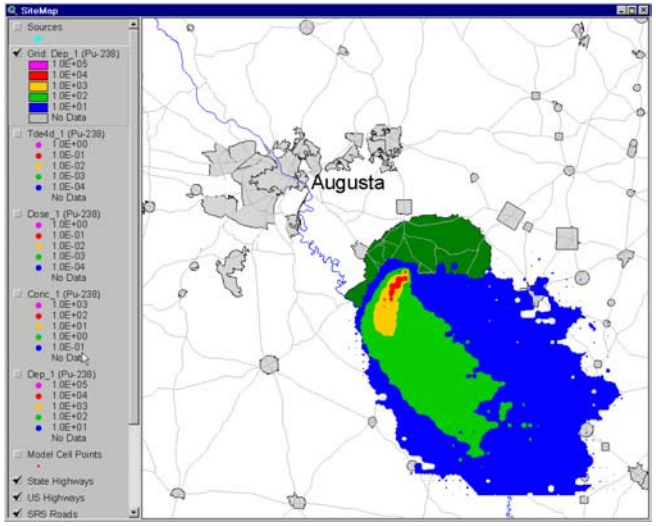
Helps to create community of trained dispatchers.

POC: D. M. Isiminger, Jr. / david.isiminger@srs.gov

Plumes in ArcView for Emergency Response

Geospatial Science Program





Need

Import calculations from atmospheric transport models into ArcView for emergency response.

Approach

Suite of atmospheric transport models from simple Gaussian plume to advanced Lagrangian Particle Deposition Model.

Results passed as text file to custom ArcView import application with easy-to-use interface.

Results automatically imported into ArcView as shapefiles or grids and color coded.

Benefits

Automated processing with easy-to-use interface allows import within seconds.

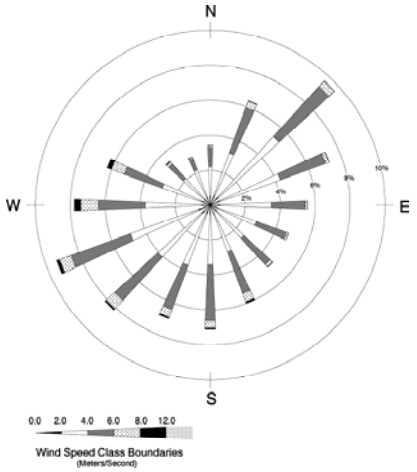
Display of plumes within GIS is useful for decision makers during an emergency.

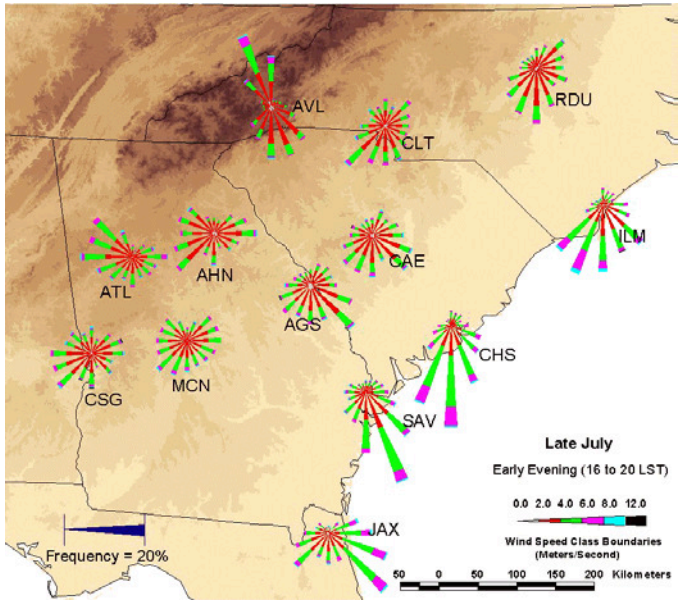
GIS files can be shared with other agencies.

POC: Larry D. Koffman, larry.koffman@srnl.doe.gov

Windrose Analysis in a Geospatial Framework

Geospatial Science Program





Need

Analyze 50 years of wind data over the Southeast for temporal and spatial trends.

Approach

A windrose is a graphic representation of wind velocity frequency over some period of time, showing speed ranges and direction.

Automated processing of wind data with a custom ArcView application creates windrose shapefiles for graphic display.

The windrose shapefiles are located geographically using station coordinates.

Benefits

Automated processing to create windrose graphics allows for easy creation of thousands of windroses representing various time ranges.

Geographic placement of windroses allows for visual correlation of spatial relationships.

Automation allows for movies to be generated.

POC: Larry D. Koffman, larry.koffman@srnl.doe.gov