Geographic Information Systems

ORNL has a staff with extensive experience in Geographic Information Systems (GIS) analysis and modeling. GIS is a collection of computer hardware, software, and geographic data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. Our main focus is the use of GIS for logistics, transportation, and supply chain operations support. ORNL has one of the most extensive transportation system network models for the highway, rail, and waterway systems in the United States. Results of modeling on these networks may be displayed using GIS.

ORNL's Capabilities

- Facilities and infrastructure management tools for space, maintenance, security, and use management.
- Route planning and analysis tools for air, highway, rail, and inland waterways.
- Analysis tools for freight management and analysis.
- Integration of vehicle and freight tracking technologies with interactive GIS display and analysis systems.
- Emergency response and evacuation planning and management tools.
- Population analysis for characteristics, location, and vulnerabilities.
- Optimal location(s) for a facility or transportation infrastructure construction or relocation.

Questions ORNL Can Help Answer

- How is the land within a port facility being used? Are there more efficient ways to use this property?
- What is the optimal routing configuration for a cargo shipping operation? How would that alter with a change in customer demand?
- How would increased freight flows on specific transportation links impact the transportation system? What are the alternate routes that could be used?
- What are the historical trends in the movement of hazardous materials over the transportation infrastructure?
- What is the best way to manage the maintenance of a highway system?
- What is the best timing and routing means for evacuating the population from a coastal area that is in the path of a hurricane?
- What are the security vulnerabilities along a route that that has large scale hazardous materials shipments?

ORNL's Comparative Advantage

- Experienced staff focused on solving the customer's problems.
- Use of state of the art GIS software coupled with optimization tools and detailed routing networks.
- Leverage our experience to provide increased value to the customer.
- Knowledgeable staff who provide unbiased analysis and recommendations.

Experience

GeoFreight is a GIS based decision support tool that enables transportation planners to carry out activities in intermodal freight planning and policy making. It uses a routing model to assign data on freight flows to highway and rail segments in the U.S. transportation network. The volume of freight flows are displayed on a map of the transportation system. It can be used to identify potential bottlenecks, measure the volume of use for specific transportation segments or areas, and examine domestic and international flows.

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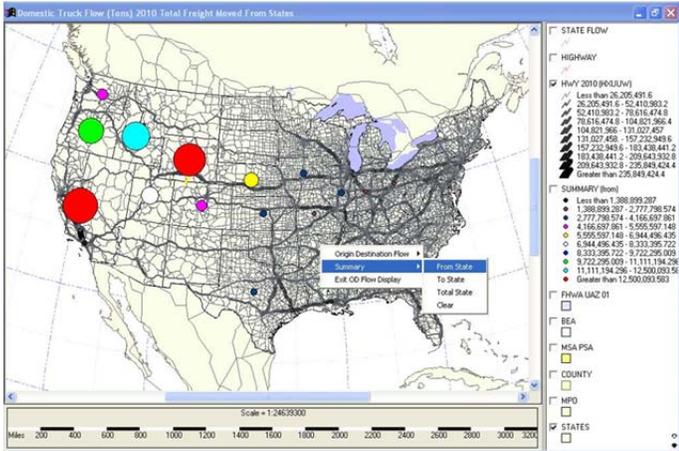
Origin Destination Flows *map. The user is able to examine the tons of freight that pass through the selected area from all states that use the impacted route.*

ORNL has performed numerous studies for different government agencies on commodity freight flows. An example of this is a recent study for the Department of Homeland Security on the food supply chain. We used the ORNL freight flow analysis data to map flows of different commodities and determine the vulnerabilities in the supply chain.
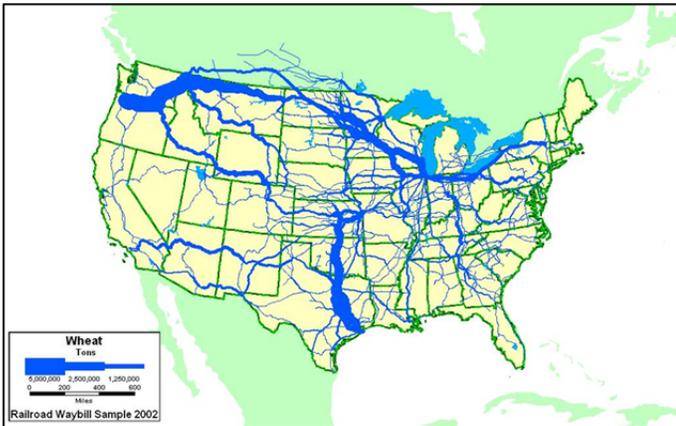

Domestic and International Wheat Flows in the United States

The Oak Ridge Evacuation Modeling System (OREMS) is used to help local governments implement an interactive evacuation system that provides the capability to determine the impact of changes in the transportation system as the evacuation is occurring. The system is linked with a traffic counting system and the traffic flow is displayed on GIS software.
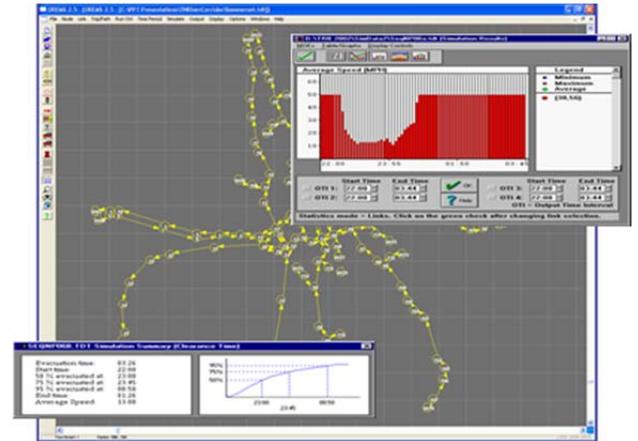
Oak Ridge Evacuation Modeling System

The Transportation Operations Model is a system developed to help plan the movement of spent nuclear fuel from different reactor sites in the U.S. to a permanent repository site. Part of this system is a GIS based logistics system that allows the user select between alternative rail yards to use for a shipment. The characteristics of each rail yard along with the distance between the rail yard and the reactor site are included in the application.
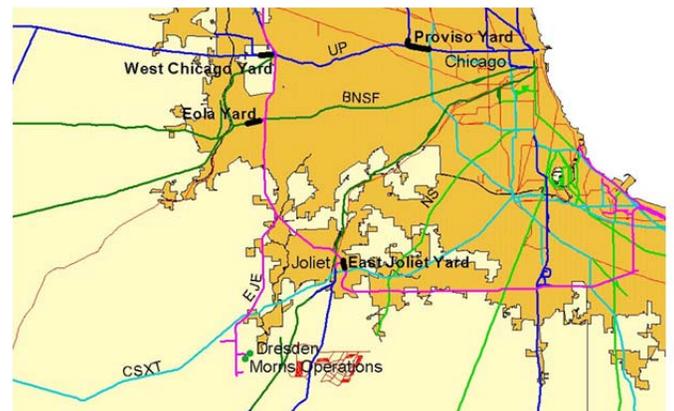
Rail Yards near Chicago

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