

Leaning Forward: Siting Disaster Medical Relief Materiel for Faster Response

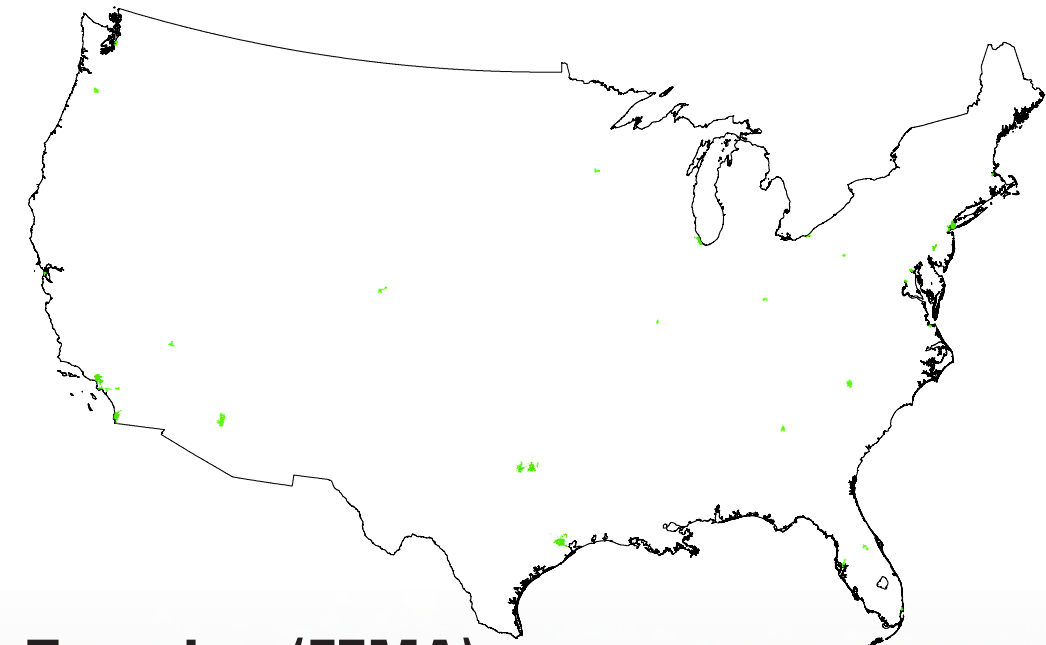
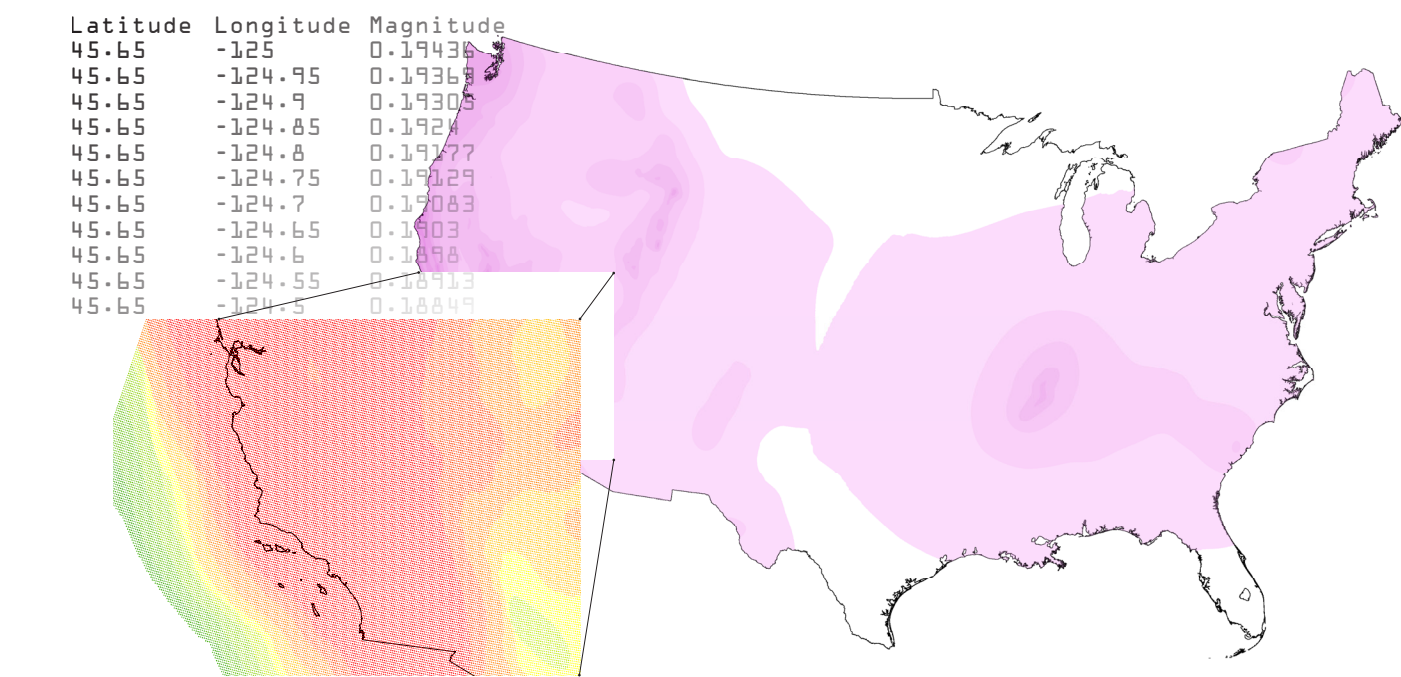
Introduction and Background

In emergency response slang, “leaning forward” refers to the preemptive deployment of resources when a disaster response is anticipated, for example, when a hurricane is forecast to strike a particular area. Preemptive deployment can be costly if the disaster is misjudged, and pre-positioning supplies and equipment may allow for more efficient response.

The National Disaster Medical System includes about 60 teams of civilian medical personnel, logisticians, and incident managers who intermittently serve as federal responders during disasters. Teams have a basic cache of equipment to create a self-sufficient field hospital. The caches typically are shipped over ground, being moved by air for overwater travel.

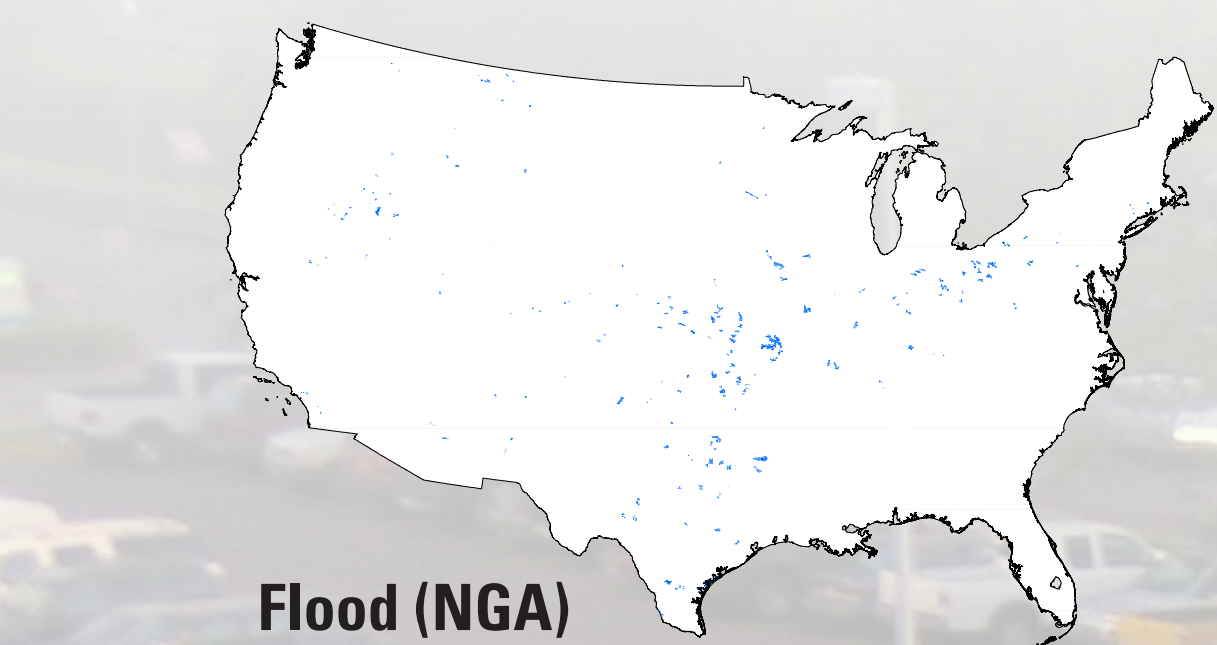
Earthquake (USGS)

Tabular intensity data for a fixed probability was plotted as point data and interpolated to a raster.



Terrorism (FEMA)

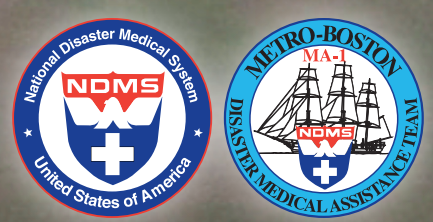
Cities designated to receive funding in the Urban Areas Security Initiative in fiscal year 2011, weighted by tier.



Data Sources

- DOT U.S. Department of Transportation
- FEMA FEMA Federal Emergency Management Agency
- NGA National Geospatial-Intelligence Agency
- NOAA National Oceanic & Atmospheric Administration
- USGS U.S. Geological Survey

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The views expressed in this poster are those of the author alone, and do not represent the views of Tufts University or the United States Government.

Methodology

Siting of three warehouses, consistent with the current federal budget allowance, is analyzed based on three factors:

- 1. Demand** - the locations where hazards occur, combined with the concentration of population;
- 2. Facilities** - proximity to an airport with a

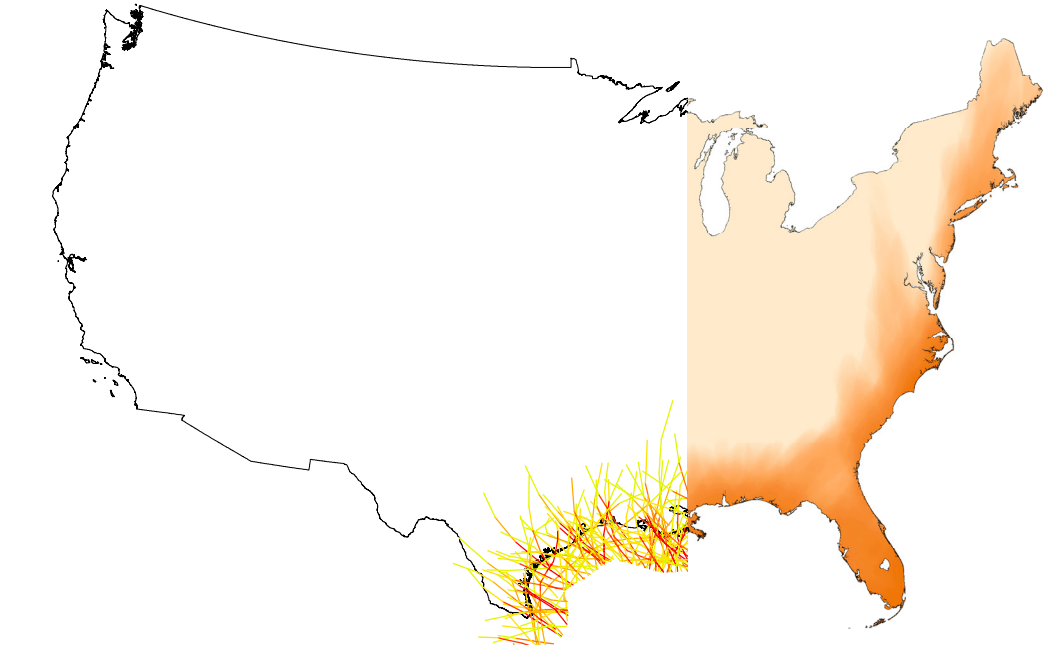
runway long enough to depart a fully-loaded cargo plane for extracontinental missions; and

- 3. Network** - the web of highways for ground transport.

Hazards were identified based on responses to disasters over the past 13 years. Hurricane, responsible for more responses than any other hazard, was emphasized in the demand model. A Location-Allocation analysis identified the three optimum warehouse sites.

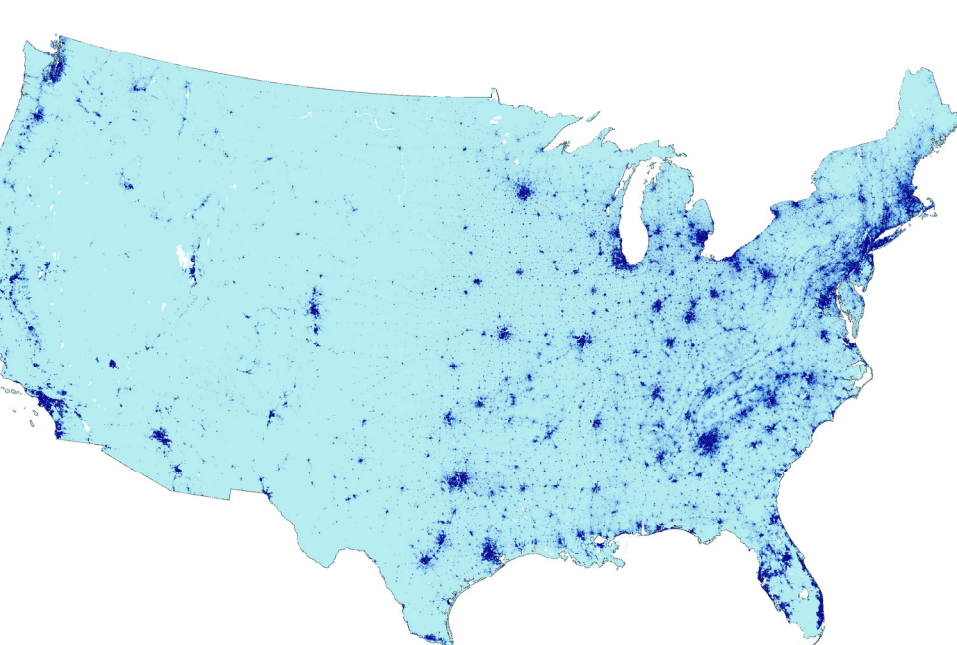
Coastal Hurricane (NOAA)

Historic storm tracks 1842-2009 were rasterized by frequency (line density) and intensity (segment wind speed).



Population (NOAA)

Density of population used in severe weather forecasting.

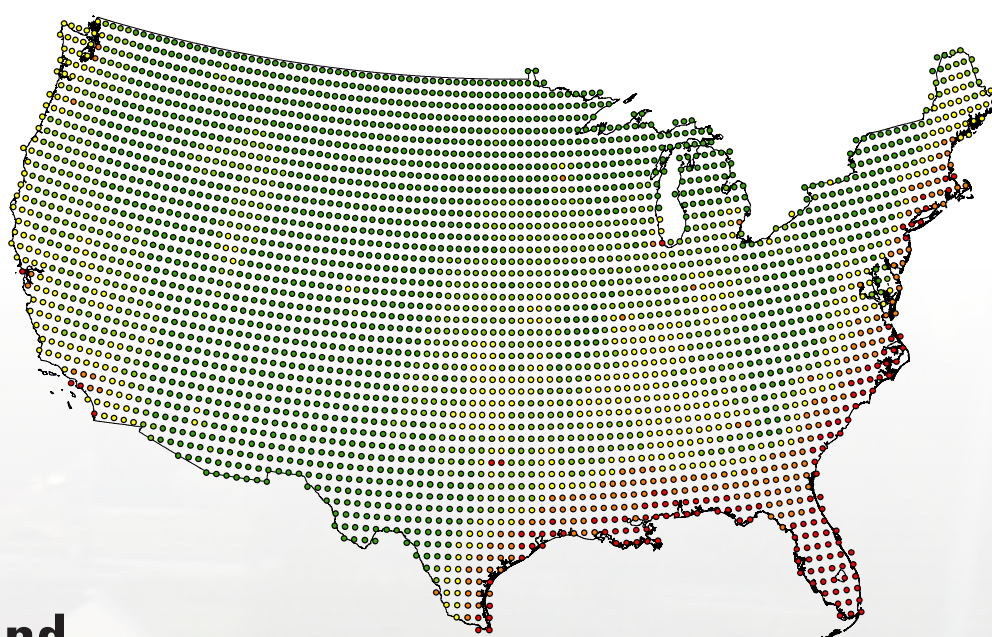
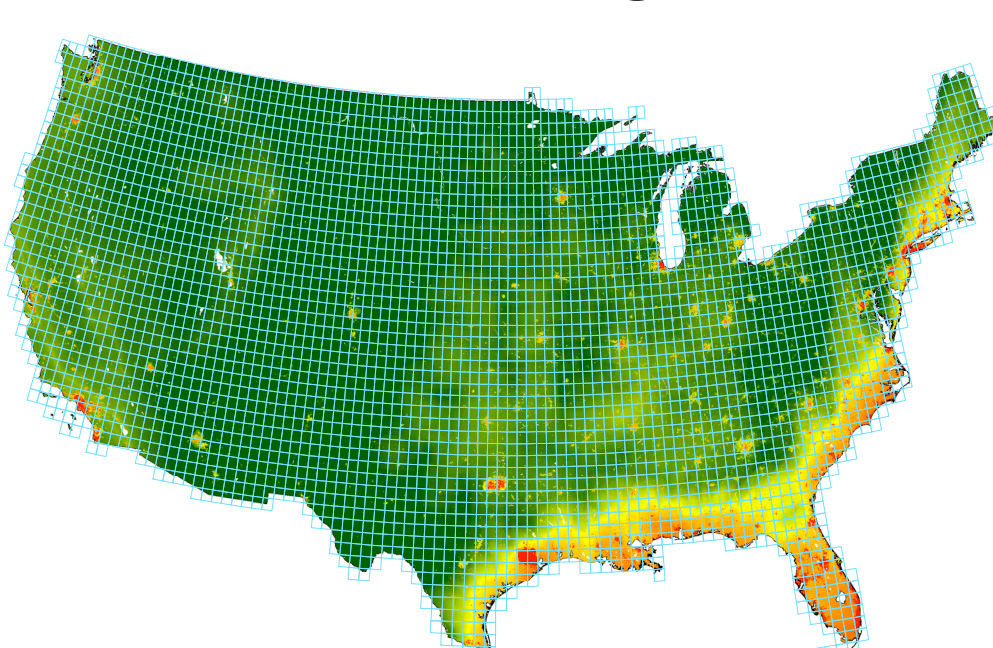


Hazard Probability and Intensity

Historic or probabilistic analysis of hazards which have led to past federal response missions is also weighted by the intensity of the hazard. The composite hazards are overlaid with population to form the geographic demand for response.

Composite Hazard and Population

Weighted Sum fuzzy overlay combines hazards and population, emphasizing hurricane x3 and population x2, shown with a 0.5° fishnet grid.



Demand

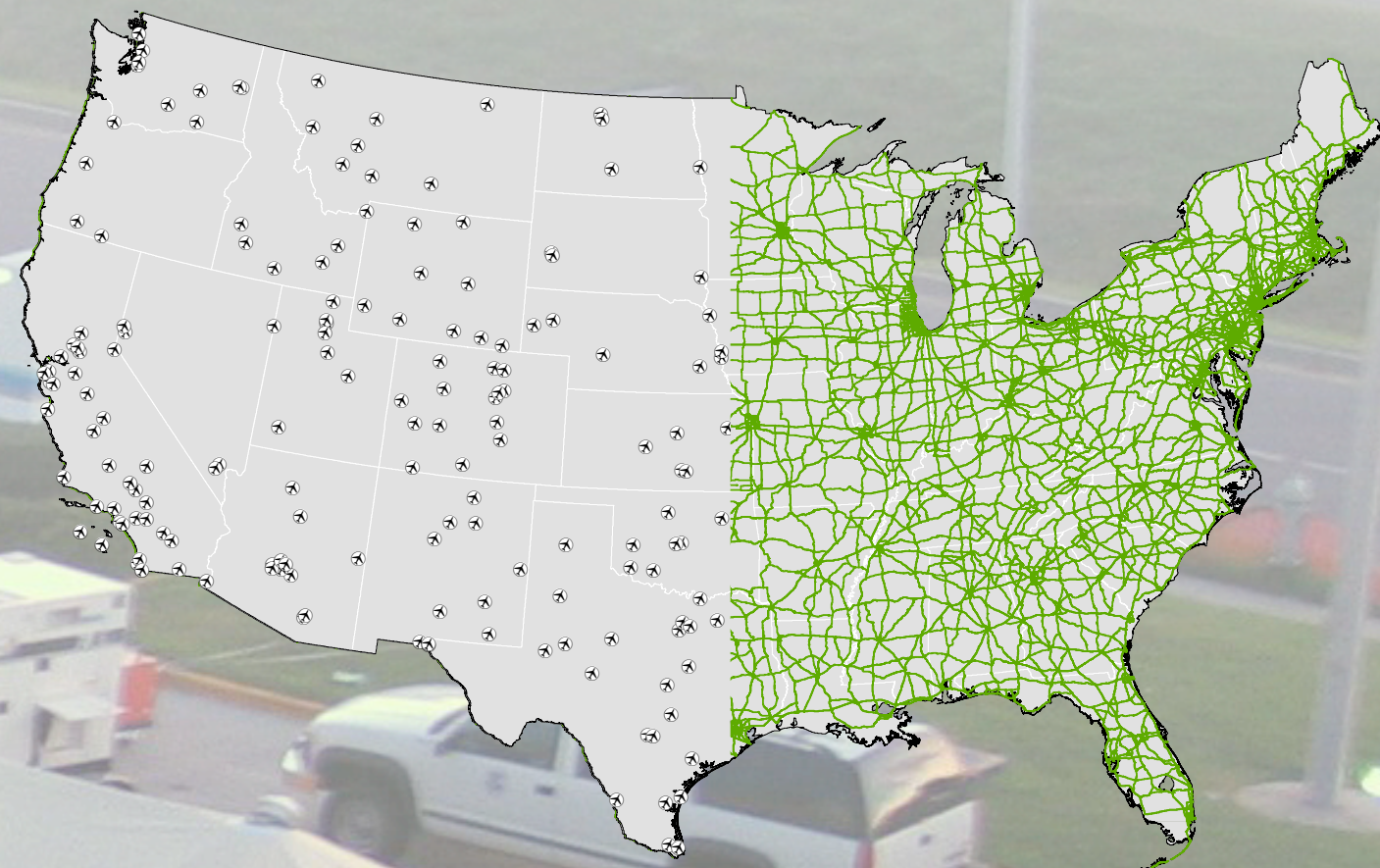
Composite raster was generalized at a 0.5° interval and converted to point data, forming a grid of demand points.

Optimized Warehouse Placement

Location-Allocation network analysis identifies the three best locations to site a warehouse to optimize ground transport response time to the most likely disaster locations in the conterminous United States.

Facilities and Network (DOT)

Candidate warehouse locations are restricted to airports with a runway at least 7,600 ft., required to depart a fully-loaded C-17 Globemaster III cargo plane. Ground transport distance is analyzed for interstate highways and US routes.



Learn more about NDMS



Base of operations at West Jefferson Medical Center, Marrero, Louisiana. Members of the National Disaster Medical System treated nearly 170,000 patients, many at field hospitals like the one pictured, during the 2005 response to Hurricane Katrina and Hurricane Rita. Photo by author.