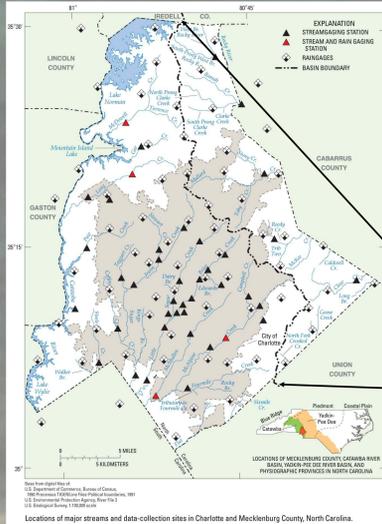


Background

The U.S. Geological Survey (USGS) in cooperation with the City of Charlotte and Mecklenburg County has been collecting water-resources data in Mecklenburg County, North Carolina, since 1924. The data collection in and around Mecklenburg County currently consists of 70 raingages and 42 streamgages. The growth of this network in recent years has resulted from frequent and severe small-stream flooding.



Mecklenburg County covers 525 mi² and has a population of 771,617 (2004 Census).

A ridge line dividing the Catawba and Pee Dee River basins results in relatively small watersheds that all originate within the county.

Objective

To design and implement a flood-tracking and notification system that will be effective in reducing future flood losses while retaining USGS standards and methods in the collection, processing, and dissemination of data.

Approach

The Charlotte-Mecklenburg rain- and stream-monitoring network that was in place in 1997 relied on landline and satellite telemetry to retrieve and disseminate data by way of the USGS National Water Information System (NWIS) Web page. Although this means of data dissemination was adequate for engineering and documentation purposes, it was inadequate for real-time flood warning in flashy, urban basins. After much investigation, it was determined that line-of-site radios would be the quickest way to disseminate rainfall and streamflow data to the appropriate users.

ALERT Protocol

True real-time data
Multiple data receivers
Event-driven data

Polling System

Standard time-series data
Data verification
Remote control of field sites

Two types of radio systems were evaluated. The Automated Local Evaluation in Real-Time (ALERT) format disseminated the data the quickest, but a polling, two-way system allowed verification and retrieval of time-series data and the monitoring of sites from a base-station computer.



Field Instrumentation

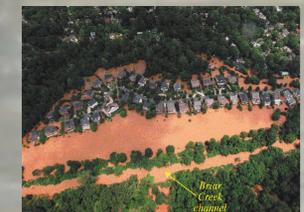
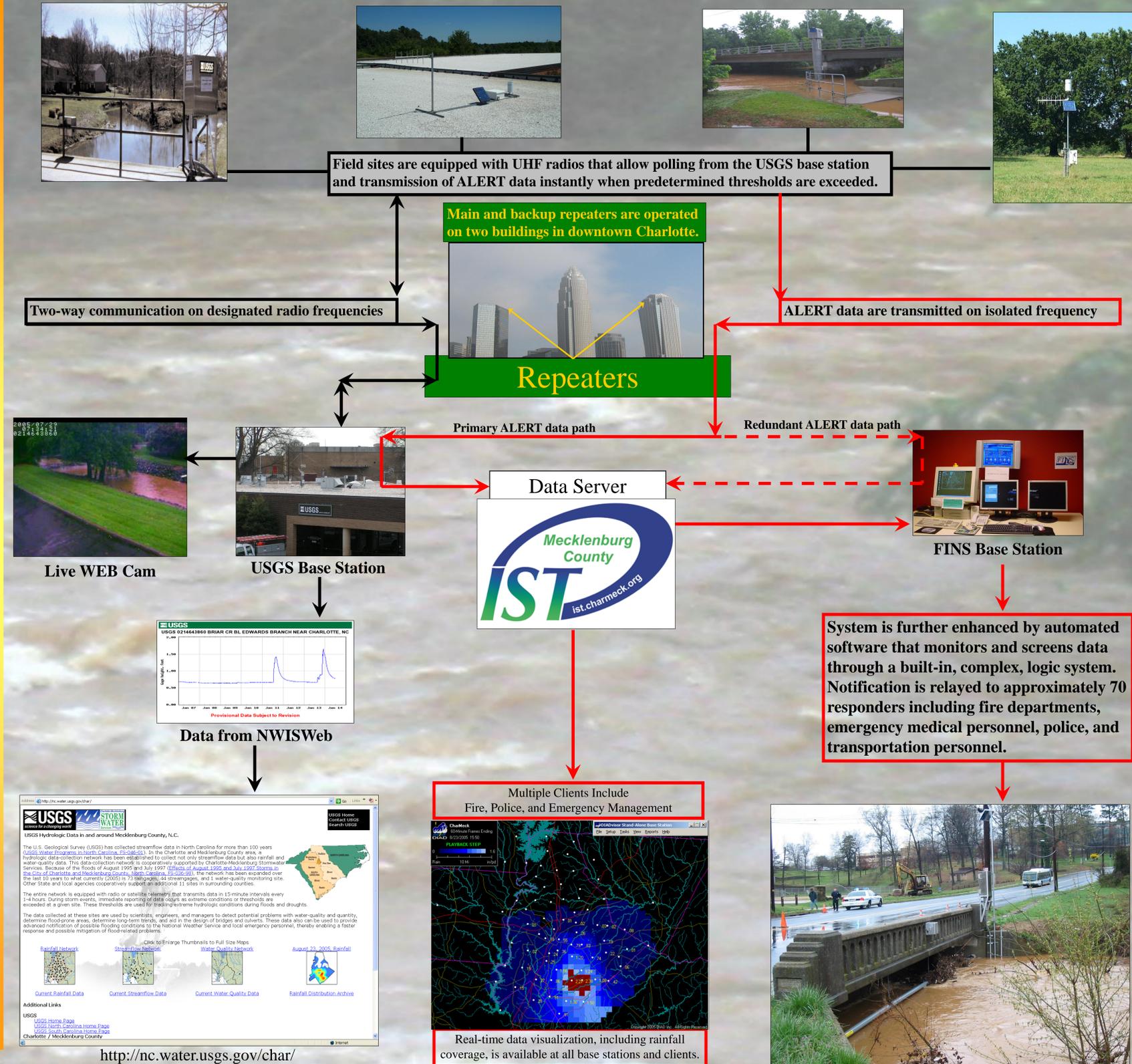


USGS Base Station

Taking into consideration the users' requirements and the limitations of each protocol, a hybrid system was designed using the best features of both systems.

This results in increased lead time for emergency personnel.

System Operation



Flooded homes along Myers Park Drive when Briar Creek overflowed its banks. (Photograph from The Charlotte Observer/Gary O'Brien)



Rising floodwaters overtopping a local bridge. (Photograph by Jerald B. Robinson, USGS)

In late August of 1995, Tropical Storm Jerry traveled from the Gulf of Mexico through the southeast and dropped more than 8 inches of rain over much of Mecklenburg County, with a maximum recorded rainfall total of 9.37 inches. The resulting floodwaters caused an estimated \$4 million in property damage. This was one of the worst storms recorded in the area and resulted in peak flows at many streamgages for the period of record. Less than 2 years later, the Charlotte-Mecklenburg region experienced major flooding again as remnants of Hurricane Danny stalled over the area and resulted in rainfall amounts in excess of 13 inches across the county within a 24-hour period. Property damage totaling \$60 million was reported, new peak-flow records were established, and three lives were lost. Most of the affected residents had little or no warning of imminent flood danger.



Vehicle storage lot in southern Mecklenburg County flooded by Sugar Creek. (Photograph from The Charlotte Observer/Stephanie Grace Lim)



A tow truck driver wades through waist-deep water to assist motorists as Stewart Creek overtops Morehead Street. (Photograph from The Charlotte Observer/Kent D. Johnson)



<http://nc.water.usgs.gov/char/>

Selected references:
Hazzell, W.F., Young, W.S., Billings, R.J., and Combs, D.M., 2003, Design, operation, and maintenance of the Flood Information and Notification System (FINS), Charlotte, North Carolina [unpublished paper presented at the Conference of the National Hydrologic Warning Council, October 22-24, 2003, in Dallas, TX, 9 p.].
Robinson, J.B., Hazzell, W.F., and Young, W.S., 1998, Effects of August 1995 and July 1997 storms in the city of Charlotte and Mecklenburg County, North Carolina: U.S. Geological Survey Fact Sheet FS-036-98, 6 p.