HAZUS-MH Used in Support of Utah Seismic Safety Legislation
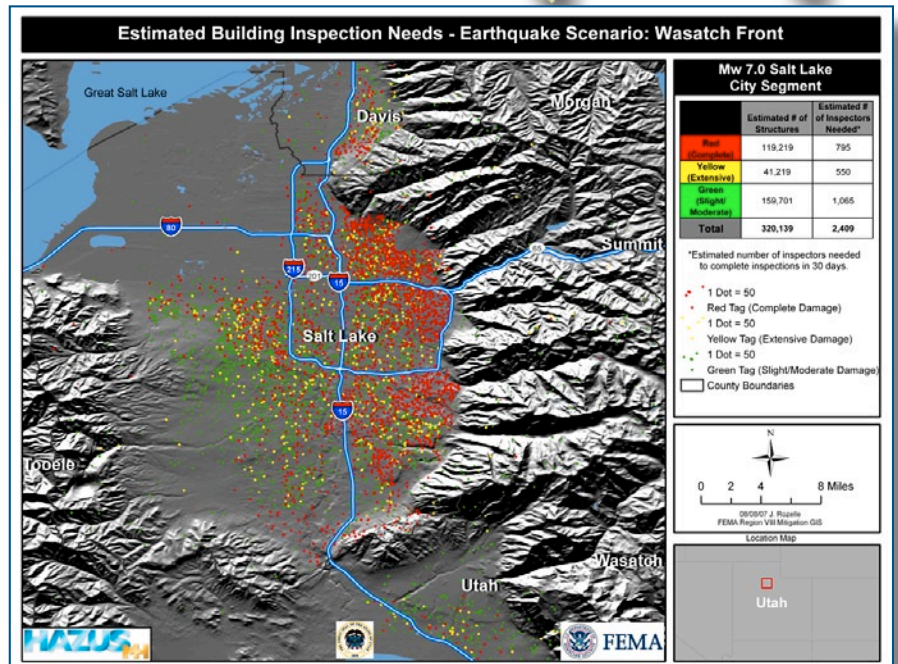
The State of Utah has recently taken important steps to reduce the vulnerability of schools to damaging earthquakes, as well as addressing its Unreinforced Masonry (URM) building stock. HAZUS-MH has played an important role in these initiatives. The model has sharpened the focus on the vulnerability of schools in this region to damaging earthquakes. Specifically, HAZUS-MH has been used to estimate losses and potential casualties from scenario earthquakes in a region that is among the most susceptible in the U.S. to seismic activity.

The Wasatch Front region of Utah is an extremely active seismic zone that experiences approximately 700 earthquakes per year. Though many of these temblors are less than 3.0 on the Richter magnitude scale, a 7.0 quake will occur roughly once every 350 years along the central portion of the Wasatch Fault. The last large quake along the fault occurred between 400 and 600 years ago.

Estimated building inspection needs after a 7.0 magnitude earthquake in the Wasatch Front region of Utah.

The Wasatch Front is home to Utah's most populous counties, including the counties of Salt Lake, Utah and Davis. More than 80% of Utah's population is located in areas that are subject to large earthquakes. Although Utah has been a national leader in incorporating seismic design into modern building codes, the seismic threat was not widely recognized in Utah until the mid-1970's. As a result, many (±185,000) of the buildings in the area are "Unreinforced Masonry Buildings" or "URMs", which are brick and mortar structures that are not reinforced by steel, and tend to be brittle and inflexible during earthquake events.

FEMA considers the Wasatch Front to be a High Hazard area. The agency in partnership with the State of Utah has conducted studies of the region using HAZUS-MH to estimate damages and losses.

HAZUS-MH was used to model losses from a magnitude 7.0 event, providing estimates for three different times of day: 2 AM, 2PM, and 5PM. For this study, HAZUS-MH estimates a daytime event will cause more than 6,000 deaths. The model estimates that 80% of the severe casualties in the scenario earthquake would be caused by URMs. HAZUS-MH determined that casualties from schools would be approximately 1,100. The model estimates that of the 765 schools in this 17 county region, 205 would be moderately damaged and 38 would sustain major damage. The accompanying HAZUS-MH map shows concentrations (in red) of the most vulnerable buildings in the Wasatch Front to the effects of ground shaking from a magnitude 7.0 earthquake.

The HAZUS-MH findings and supporting analysis have drawn attention once again to the vulnerability of URMs to damaging earthquakes in the Wasatch Front. In light of these findings, Joint Resolution 7, passed in February of 2008, states that "a major seismic event could result in catastrophic loss of life, property and business in the state" and calls for a state-wide inventory of public URMs. Joint Resolution 7 specifically:

> "Urges the Utah Seismic Safety Commission to compile an inventory of unreinforced masonry buildings in the state; urges the Commission to use the data to determine the extent of the problem in the state; and urges the Commission to recommend priorities to address the problem in a manner that will most effectively protect the lives, property and economy of the state".

This resolution calls for an inventory of structures. It also references the important role of the Utah Seismic Safety Commission in providing technical and scientific support for this critically important initiative.

Most of the population of Utah lives just west of the Wasatch Mountains in the north central part of the state. This view shows the region with the cities of Ogden and Salt Lake City in the foreground.

The 3-D perspective view, courtesy of NASA, was generated using topographic data from the Shuttle Radar Topography Mission (SRTM), a Landsat 5 satellite image mosaic, and a false sky. Topographic expression is exaggerated four times.