

Utah Braces for the Future

Almost 75 percent of Utah's population lives near the Wasatch Fault. Earth scientists have shown that this fault has repeatedly experienced strong earthquakes of magnitude 7 or larger and will continue to do so in the future. Efforts to increase public awareness of earthquake hazards in Utah have resulted in residents and community leaders taking actions that will save lives and reduce damage in future earthquakes.



The Wasatch Fault cuts along the base of the abrupt mountain front rising behind the buildings of downtown Salt Lake City. Movement on this fault has uplifted the Wasatch Range to form a spectacular backdrop for Utah's three largest cities. (Courtesy of the Salt Lake Convention and Visitors Bureau.)

When the first trail-weary Mormon settlers arrived in the Salt Lake area of Utah in 1847, they proclaimed it to be "the place." They did not know, however, that the spectacular landscapes of the Wasatch Range and adjacent valleys had been

largely shaped by numerous powerful earthquakes. The people of Utah were first publicly informed of the danger that threatens them in 1883 in the *Salt Lake Tribune*, when G.K. Gilbert of the U.S. Geological Survey (USGS) warned that future violent earthquakes on the Wasatch Fault could be disastrous for the growing towns the settlers had built.

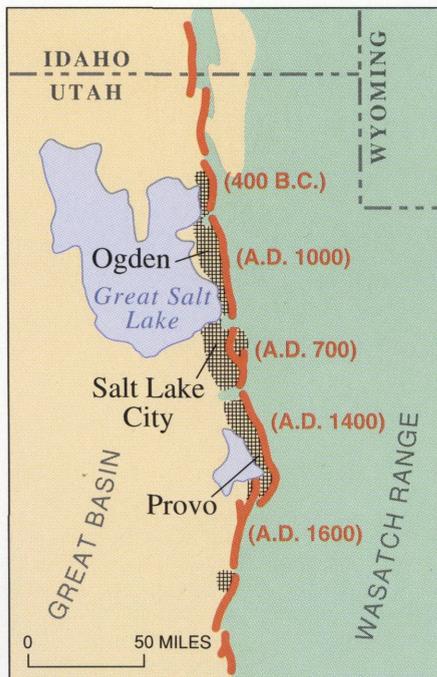
Although residents of Utah have so far been spared the disaster that Gilbert foresaw more than a century ago, several earthquakes of magnitude 7 or larger have struck other areas between the Rocky Mountains and the Sierra Nevada in that time. The most recent of these occurred in 1983 near Borah Peak, Idaho, and once again reminded the people of Utah of the potential for catastrophic earthquakes in their state. At about the same time, the USGS Earthquake Hazards Reduction Program launched a full-scale study of this earthquake threat, and the residents of Utah be-

gan to increase their planning for a catastrophic earthquake on the Wasatch Fault.

By the late 1980's, scientists from the USGS, the Utah Geological Survey, the University of Utah, and other cooperating institutions had learned that:

- The 240-mile-long Wasatch Fault is made up of several segments, each of which can independently produce earthquakes as powerful as magnitude 7.5.
- During the past 6,000 years, a strong earthquake (magnitude greater than 6.5) has occurred about once every 350 years somewhere along the Wasatch Fault.
- The urban areas of Salt Lake City, Ogden, and Provo lie on soft lake sediments that will shake especially violently during large earthquakes.
- An earthquake on the Wasatch Fault could severely damage gas, electric, water, communication, and transportation lifelines, crippling these urban areas.

To ensure that this new knowledge was effectively used to reduce earthquake losses, the USGS supported geologists to work with the planning departments of four Utah counties. These geologists prepared maps that show where ground failures



Earthquakes on the Wasatch Fault threaten the urban areas of Utah (hachured). About 75% of the State's 2 million people live within 15 miles of one of the fault's several segments (red). Dates indicate approximately when the most recent strong (magnitude greater than 6.5) earthquake occurred on a fault segment.

The historic Salt Lake City and County Building has been made safer from earthquakes by a state-of-the-art engineering technique called base isolation. Rubber pads used in the technique have been installed beneath this 101-year-old unreinforced masonry structure to cushion it from earthquake shaking. (Courtesy of the Salt Lake Convention and Visitors Bureau.)



(fracturing, slumping, and sliding) from Wasatch Fault earthquakes are expected to be most severe. Such hazard maps assist public officials in evaluating requests for construction approval and urban planners in recommending suitable land-use practices.

Using the information provided by scientists, Utah residents and their representatives have embarked on several courses of action to prepare for earthquakes. They have:

- Approved a state earthquake building code and proposed legislation on a broad range of seismic safety issues, including earthquake insurance, earthquake-safety education in public schools, and earthquake-rescue training for firefighters.

- Created the Utah Seismic Safety Commission. This commission, which advises the legislature and residents of Utah on earthquake safety issues, outlined a long-term strategic plan for earthquake safety in January 1995.

- Passed an ordinance for Salt Lake County that requires studies of geologic hazards to be made before buildings are constructed in areas most at risk from earthquakes.

- Made major improvements in the public infrastructure. At least 10 fire stations in Salt Lake City and 4 of 6 major hospital buildings have been strengthened or replaced with new earthquake-resistant structures. More than 400 public and private school buildings in the region have

been evaluated for seismic resistance, and three high schools and one grade school have been strengthened or replaced. In addition, the earthquake resistance of the historic Salt Lake City and County Building has been increased.

Although no powerful earthquake has occurred on the Wasatch Fault for the past 150 years, future such events are certain. In the past decade, the people of Utah have become more aware of the threat of a catastrophic earthquake. Strong bonds between residents, their church communities, and public agencies have created an effective network for disaster preparation unequalled in the United States. Taking action today reduces the loss of life and property in future earthquakes. The Utah experience exemplifies what can be achieved in earthquake-prone regions of the United States through the cooperation of scientists and engineers, government, and the local community.

Michael N. Machette and William M. Brown

COOPERATING ORGANIZATIONS

Brigham Young University
 Federal Emergency Management Agency
 University of Utah
 U.S. Bureau of Reclamation
 Utah Division of Comprehensive Emergency Management
 Utah Geological Survey
 Utah Seismic Safety Commission
 Utah State University

For more information contact:

Utah Geological Survey (801) 467-7970
 2363 South Foothill Drive
 Salt Lake City, UT 84109-1491
 blund@email.state.ut.us

*U.S. Geological Survey Fact Sheet-166-95
 1995*



More than 6 feet was added to this fault scarp by vertical movement in the 1983 Borah Peak, Idaho, earthquake (magnitude 7.3). Because the region affected was sparsely populated, the earthquake caused only two deaths and about \$10 million of damage. An earthquake of similar magnitude on the Wasatch Fault in Utah would affect heavily populated urban areas and could have much more severe consequences.