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Hazards within the Bear Lake basin, Utah

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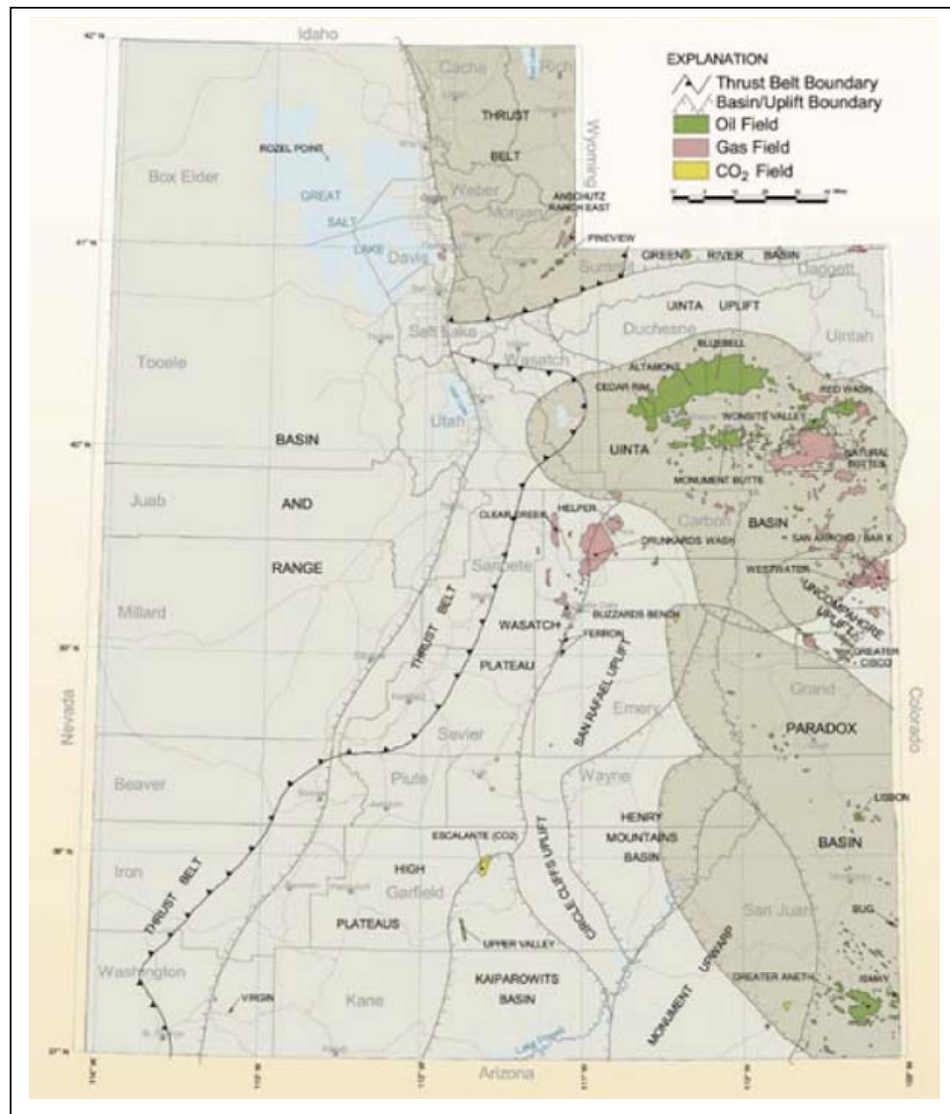


Figure 7. Oil and Gas Fields in Utah Showing Geologic Provinces, Sedimentary Basins, and Principal structural boundaries (modified from Chidsey et al., 2005).

HAZARDS

The Bear Lake basin developed from fault subsidence that continues today, slowly deepening the lake along the eastern side. The Bear Lake graben is about 5 miles long and 4.3-8.6 miles wide. It extends across the Utah-Idaho border and involves faults on both eastern and western sides of Bear Lake. The faults around the lake

are still active, but large magnitude earthquakes are relatively infrequent. Three quakes of magnitude 7+ on the eastern fault and 2 on the western fault have shifted the valley floor by as much as 18.4 ft in the last 6500 years (USGS, 2001). The most recent earthquake of that size was about 2000 years ago.

A severe earthquake along the Bear Lake fault would almost certainly trigger landslides in the area. Most of the resulting slides and slumps would occur in unconsolidated material along the east shore of the lake. Additionally, long periods of shaking caused during earthquake episodes create ground cracking and movement along the established fault lines. This is likely to occur across the delta fans in Round Valley and the Laketown area (Kaliser, 1972). Figure 8 displays the active fault lines in the basin.

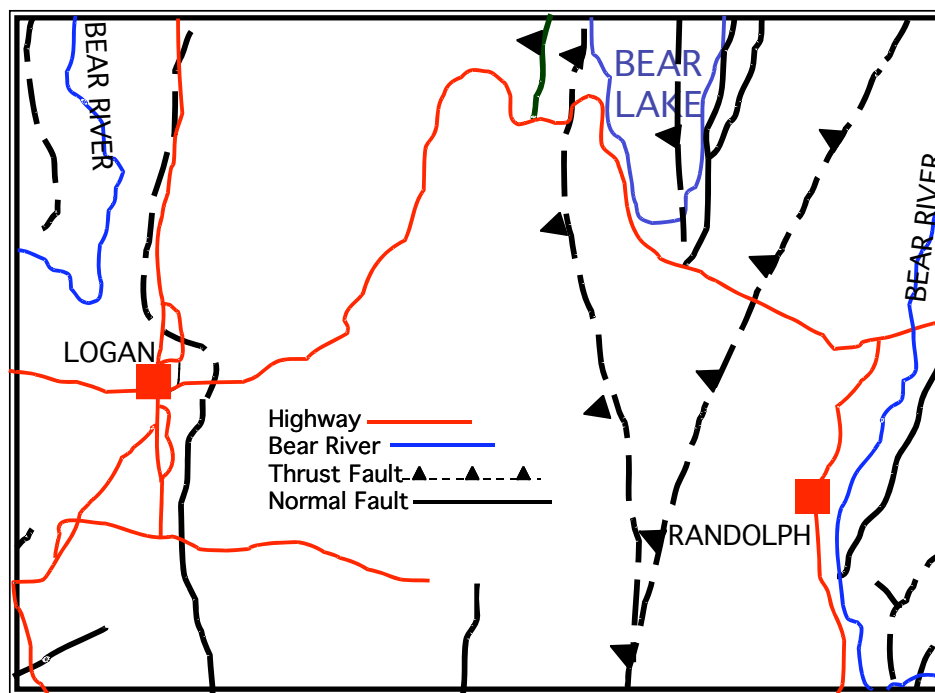


Figure 8. Active Fault Lines in Rich County and the Bear Lake Basin (USGS Earthquake Hazard program, <http://earthquake.usgs.gov>, 2006).

Both consolidated and unconsolidated materials are frequently subject to failure and slippage on slopes. Clear evidence indicates that slides occurred in the past in the Bear Lake area and that today there is not complete stability. Old slides around

the periphery of the lake are responsible for damming the outlet of Bear River and for the rising of the Bear Lake level (Williams, 1962). The west side of the lake gives evidence to having slid in several places leaving area of exposed fracturing. The bedrock formations in the area are either inherently weak or have been weakened through subsequent earth movements and pressures. The same is true on the talus slopes common on the east shore of the lake. Series of cobbles and boulders at the road's edge along with dead trees on the slope indicate the activity of rock movement (Kaliser, 1972). Seiche waves generated by landslides or an earthquake in the North and South Eden deltas could potentially submerge, with destructive force, the opposite slopes (Kaliser, 1972).

Waterspouts observed over Bear Lake in 1996 and 1998 were accompanied by wind gusts of up to 80 mph. The waterspouts lifted some of the lake water a short distance into the air, but caused no serious damage nor inflicted any injury. Small tornados touched down over open land around Bear Lake in 1954, 1965, and again in 2004. In each instance the tornado remained on the ground for only a short time with a path mostly over open fields. Small outbuildings and trailers were damaged in the 1954 and 1965 instances but no damage was reported in 2004 (<http://www.wrh.noaa.gov>).



Water Funnels Over Bear Lake

Photo from: <http://newweb.wrh.noaa.gov/slc/climate/tornado.php>

Flooding of Bear Lake itself is not an issue. PacifiCorp's regulation of water levels is stipulated to remain at or below flood stage. To accomplish this PacifiCorp has established a late winter lake target elevation of 5918 to assist in spring flood mitigation, leaving a buffer of 5.56 feet or 390,000 acre-feet for basin flood control each year. The Utah Comprehensive Emergency Management team (2000) has not identified any areas of large flood potential adjacent to Bear Lake that are not associated with the Bear River. Small streams feeding Bear Lake may experience flooding during years of high mountain precipitation or rapid snowmelt. Debris related flooding is possible along Swan Creek and Big Creek. Rock slides caused by severe thunderstorms or spontaneous spring snowmelt could impact access along the eastern side of the lake.