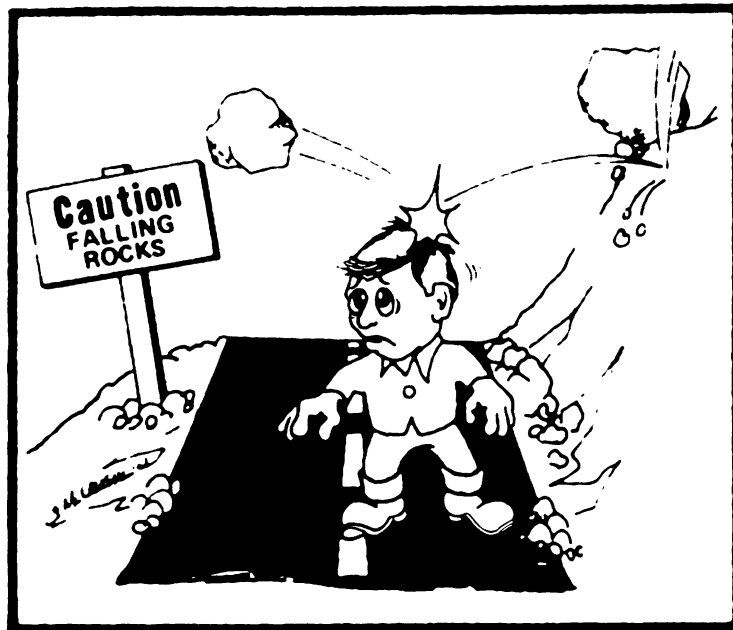
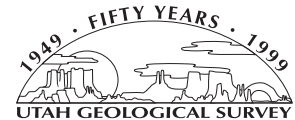


# NOTABLE UTAH ROCK FALLS IN THE 1990s AND 1980s

compiled by  
**William F. Case**  
Utah Geological Survey

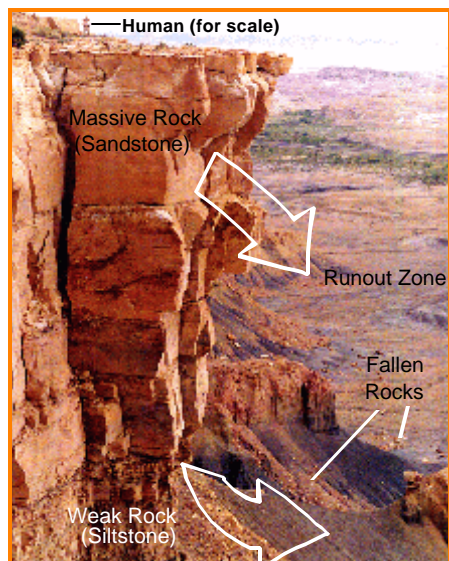


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## Notable Utah Rock Falls in the 1980s and 1990s by William F. Case



Future rock fall and runout zone of past rock falls, Emery County. Michael D. Laine, Utah Geological Survey.

This rock-fall history was compiled to help understand rock-fall hazards in Utah. The study of rock falls is important because they are the most common landslides in mountainous and hilly areas and they regularly impact humans. This compilation helps answer questions such as (1) When do rock falls occur?, (2) Where do rock falls occur?, (3) What does a rock fall damage?, and (4) What causes rock falls?

Rock falls consist of pieces of rock that bounce, roll, and fall downslope and finally come to rest in the “runout zone” on the slope below the source.

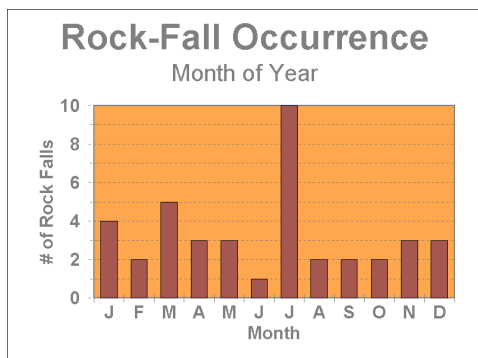
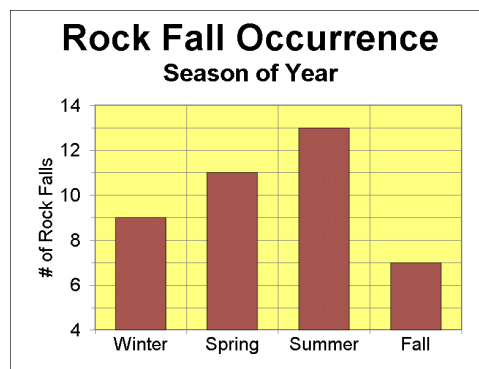
Many rock-fall events impact humans but go unrecorded because they are only temporary nuisances and are cleaned up without documentation. The ones that do make the news have significantly impacted human welfare or property.

This is a history of 53 events in Utah that were recorded between 1887 to 1999. Reports of rock “slides” are included in this study if the report mentioned damage caused by “falling” rock. Sources for the compilation are the St. George Daily Spectrum (1990), Times-Independent of Moab (1985-1991), Salt Lake Tribune (1991-1999),

and Deseret News (1988-1999); published reports from the Utah Geological Survey and U.S. Geological Survey; major-earthquake damage records from the University of Utah Seismograph Stations; and personal communications with investigators and witnesses.

This is not a valid statistical representation of rock-fall occurrences and therefore any statistical inferences must consider the incompleteness of the rock-fall history. At best the statistical inferences offer qualitative insights into rock-fall processes. Other than the general location, the date of occurrence, and the damage, limited geological information can be gleaned from newspaper and earthquake damage reports.

Rock falls are caused by surface erosion and weathering processes such as wet-dry or freeze-thaw cycles, and are occasionally triggered into falling “before their time” by brief, intense weather-related or earthquake ground-shaking processes.



The time of the year that rock falls occur gives insight to their causes. This rock-fall history indicates that rock falls, except those triggered by earthquakes, are more common in spring (11) and summer (13) compared to winter (9) and fall (7). July, with 10 events, has equal to or more than twice as many rock falls than any other month; March is second with 5 events. Possibly the spring thaw and spring and summer cloudbursts cause most rock falls.

The time-of-day occurrences favor daylight hours for rock falls, probably because that’s when people are around to record the event. The occurrences may also indicate that rock falls were triggered by afternoon heating or thunderstorms. Eighteen reports note the approximate time of day a rock fall

occurred; 10 between 6 a.m. and 6 p.m, and 8 from 6 p.m. to 6 a.m.

Fourteen reports of non-earthquake related rock falls suggest that the trigger was an intense weather-related process, such as a rapid spring thaw or cloudburst; a triggering mechanism was not indicated in twenty-seven reports.

Most of the rock-fall damage, excluding those triggered by earthquakes, was to roads (19), railroad tracks (2), and water aqueducts (2); 8 reports of damage to homes and cars. Fourteen rock-fall events occurred along trails and at outdoor-recreation sites, such as campgrounds. Between 1993 and 1999 rock falls killed 4 people and injured 11.

Earthquake-triggered rock falls were not considered in the statistical inferences in this study because occurrence time is not relevant to other processes causing rock falls. Ground shaking, particularly if the earthquake magnitude is greater than or equal to 5, produces widespread rock-fall damage to roads, canals, trails, and private property. Utah has had nine earthquakes of magnitude 5 or greater, and all produced multiple rock falls (O'Brien and Nava, n.d.).

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## Rock Fall Reports, from 1999 to 1983

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### October 10, 1999

A rock fall and slide occurred 7 miles up from the mouth of Big Cottonwood Canyon, Salt Lake County; four people were injured (Hinton, 1999).

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### August 28, 1999

A serendipitous sighting of a dust cloud while boating on Lake Powell captured a rock fall in action. The rock fall occurred in the afternoon on the north face of Wilson Creek Canyon on the San Juan Arm of Lake Powell. The rock is in the Chinle Formation that is folded on the crest of the Circle Cliffs anticline. The geologic structure probably weakened the rock.

The event was witnessed and documented by T.C. Chidsey (verbal communication, 2000), Utah Geological Survey.



Rock fall on the shoreline of Lake Powell.

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### August 2, 1999

At about 8:45 p.m., rocks falling from an overhanging cliff killed a camper on the Goosenecks section of the San Juan River, San Juan County. The slide may have been triggered by rain. It was heard by other people in the area (Deseret News, 1999c).

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### April 17, 1999

A rock fall and slide crossed the Bonneville Shoreline Trail, north of the Utah State Capitol, Salt Lake City, Salt Lake County (Deseret News, 1999b; Loomis, 1999). Photographs by Rich Giraud, Utah Geological Survey.



Rock slide on Bonneville Shoreline Trail.



Hikers near a large rock-fall clast.

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**January 13, 1999**

Just before 11 a.m. about 30 rocks the size of small cars fell on I-70 about 15 miles east of Salina, Sevier County. The falling rock demolished a van and semi-trailer truck; two people were injured, one seriously (Vigh, 1999).

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**November 20, 1998**

A rock fall closed U-128 at Milepost 27, between I-70 and Castle Valley, Grand County. (Deseret News, 1998).

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**March 12, 1997**

At about 1:30 p.m., U.S. 189, near the Sundance turnoff in Provo Canyon, Utah County, was closed by a landslide consisting of several tons of mud and rock. The rock slide and falls are part of the Hoover landslide, an old but still active slide. Other slides occurred up canyon nearer the Deer Creek dam. One side of a pickup cab was crushed by falling rock; the driver was slightly injured. Sudden thawing of frozen soil is believed to be the trigger of the rock falls and slides (Nelson, 1997; Rayburn, 1997).

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**January 5, 1997**

Refrigerator-sized boulders landed on U.S. 189, near the Sundance turnoff, Provo Canyon, Utah County. It occurred at 6:40 p.m.; it damaged a semi-truck but did not injure anyone (Salt Lake Tribune, 1997).

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**December 10,11, 1996**

Dinner-table-sized boulders fell onto U.S. 189, near milepost 18.8, Provo Canyon, Wasatch County. The next day another rock fall occurred 2,500 ft (760 m) away, to the southwest. The rock fall was triggered by freeze-thaw cycles (Ashland, 1997).

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**July 29, 1995**

A falling rock killed a teenager at about 5:15 p.m. at the Hanging Rock Campground, American Fork Canyon, Utah County. The trigger was apparently a gust of wind. The teen was inside a barrier labeled a "Falling Rock Area." The barrier was installed where a woman was killed by a falling rock dislodged by hikers on July 26, 1994 (Deseret News, 1995c).

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**July 22, 1995**

Three men were injured by rocks tumbling down a mountain slope near the Dogwood picnic area, Big Cottonwood Canyon, Salt Lake County. The rock fall occurred at night, after a short rainfall (Deseret News, 1995b).

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**May 2, 1995**

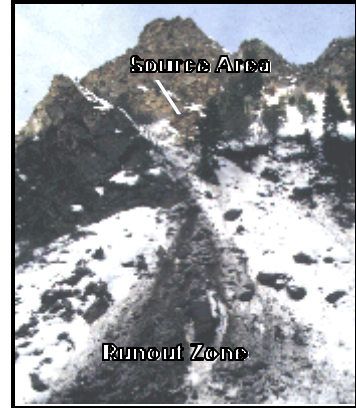
A large boulder blocked U.S. 189 in Logan Canyon, Cache County for two days. Mudslides caused by several days of rain may have triggered the rock fall (Deseret News, 1995a).

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**January 13, 1995**

At about 4 p.m. a rock fall near milepost 8 in Big Cottonwood Canyon, Salt Lake County, crushed a car killing one occupant and seriously injuring the other. The three largest boulders measured about 12 X 8 X 6 feet (3.5 X 2.5 X 1 m) and weighed about 45 tons (41 tonnes). The rock fall probably occurred as a result of many freeze-thaw cycles (Hylland, 1995a, 1995b). Photographs by Mike D. Hylland, Utah Geological Survey.

Boulder that hit Big Cottonwood Canyon Road.



Source area and runout zone of rock fall.

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**May 16, 1994**

A 4,600 pound (2,090 kg), 5-foot-wide (1.5 m) boulder narrowly missed a 75-year-old cottage in Ogden Canyon, just below Pineview Dam, Weber County. The building is used as temporary housing by visiting Thiokol executives. It was occupied at the time but the executive was out the night the boulder fell. Craig Nelson, Dames and Moore, estimated that the chances of the home taking a direct hit is 1-in-125, and that the odds of a rock fall are 1-in-25 in any given year (Seigel, 1995).

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**March 9, 1994**

A single boulder that measured about 5 X 4.5 X 4.5 feet ( 1.5 X 1.4 X 1.4 m) and probably weighed about 7 tons (7 tonnes) damaged a tennis court in Olympus Cove, Salt Lake County. The cause of the rock fall may have been melting snow after a big storm at the end of February (Black, 1994). Photograph by Bill Black, Utah Geological Survey.



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**November 29, 1993**

A boulder the size of a semi-truck blocked I-84, near the Morgan interchange, Morgan County for two days. The rock fell 50 feet (15 m) to the freeway; the asphalt was damaged (Deseret News, 1993b).

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**July 21, 1993**

A hiker, startled by a rock fall, lost his balance while resting on a ledge and fell to his death in Waterfall Canyon, Weber County (Deseret News, 1993a).

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**November 9, 1992**

A rock slide, including large boulders, measuring 80 feet (24 m) wide and 20 feet (6 m) deep blocked all but one lane of traffic on U.S. 6-50 at Billies Mountain, Utah County (Deseret News, 1992c).

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**September 2, 1992**

A magnitude 5.8 earthquake triggered landslides, including rock falls, in St. George, Washington County and eastward, up to 27 miles (43 km) from the epicenter. Rock falls occurred on many of the steep rocky cliffs in the area. They impacted Ridgeview Drive, St. George, a hiking trail at the Pah Tempe Resort in La Verkin, an unused section of the Hurricane Canal, and several sections of the Shinob Kibe Canal southeast of St. George (Bauman, 1992; Black and others, 1995; House and Gorrell, 1992). Photographs by Bill Black, Utah Geological Survey.



Boulders on the Pah Tempe Resort trail.



Rock fall into unused stretch of the Hurricane Canal.

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**March 3, 1992**

Several large boulders blocked the Emigration Canyon Road, Salt Lake County, near 4230 East. Rain and warm weather thawed the ground and released the boulders (Deseret News, 1992b).

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**January 3, 1992**

U-95 near Hite Marina, San Juan County, was closed due to a rock slide caused by the "weather" (Deseret News, 1992a).

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**December 27, 1991**

For 30 seconds, at 10:20 a.m., the parking lot at the Granite Mountain Records Vault was pelted with rocks up to 1 foot (0.3 m) in diameter. The vaults are located near the mouth of Little Cottonwood Canyon, Salt Lake County. Witnesses saw a big dust cloud and heard what sounded like an earthquake. Five vehicles sustained damage ranging from potholed windshields to major hood and roof dents (Deseret News, 1991d; Horiuchi, 1991).

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**September 8, 1991**

Timpanogos Cave trail, Utah County, was closed at 10 different locations by rock debris up to 8 feet (2.5 m) deep (Deseret News, 1991c).

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**September 1, 1991**

A 60 x 8 x 4.5 ft (18 x 2.5 x 1.4 m) rock slab fell from Landscape Arch, Arches National Park, Grand County, just after a group of tourists walked along the Landscape Arch trail. The trail was closed after the rock fall. The last rock fall from the arch was in 1941 (Woolf, 1991).

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**August 4, 1991**

At 5:30 a.m. a Hobble Creek Canyon, Utah County, home and guest house were struck by several boulders triggered by an intense rainstorm that occurred the previous evening. The boulders came from a rock ledge 900 feet (275 m) above the buildings. The inferred boulder paths are shown on the diagram. The largest boulder, 7 X 5 X 4 feet (2 X 1.5 X 1 m) actually passed through the roof and the upper story, and then exited the guest house (Harty, 1991, 1992).

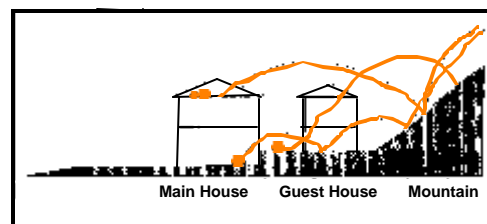


Diagram showing boulder paths (Harty, 1991)

**April 24, 1991**

An overnight rock slide blocked U-9 closing the stretch between Zion National Park and Mount Carmel Junction, Kane County. Boulders were 10-15 feet (3-5 m) deep on the highway. The slide occurred at a road cut (Deseret News, 1991b).

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**February 16, 1991**

A small rock slide "... affected westbound traffic on I-80 and southbound traffic on I-215 ..." near the mouth of Parleys Canyon, Salt Lake County. Rain triggered the rock fall at around 8 p.m. (Deseret News, 1991a).

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**February 12, 1991**

An early morning rock fall closed Potash Road and damaged a railroad spur near Moab, Grand County. The Denver and Rio Grande Railroad (D & RG) spur connects a potash mine with the main D & RG line (Barker, 1991; The Times-Independent, 1991). Two other rock falls have closed the railroad spur: February 12 in 1986 (within a mile of the 1999 event), and July 1 in 1988. Photograph by Craig Morgan, Utah Geological Survey.



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**Spring or Early Summer, 1991**

A rock fall occurred in Dark Canyon in the Book Cliffs in Duchesne County within 300 feet (100 m) of a gas-field access road. Source rocks consisted of jointed (a "checkerboard" fracture pattern), porous sandstone. The sandstone "cubes" slid over slick, wet, clayey mudstone. The mudstone was wet because of rain and melting snow, some of which percolated through joints and pores in the sandstone and pooled at the impermeable mudstone at the base of the sandstone (Willis, 1994).

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**December 20, 1990**

A rock slide on Bridge Mountain, across from the National Park Service headquarters in Zion National Park, Washington County, produced a large sand and dust cloud that stopped traffic for 10-15 minutes. The slide occurred about 12:40 p.m. A large rock flake fell nearly 1,500 feet (455 m) and deposited a debris pile about 200 yards (200 m) wide by 200 yards (200 m) long (St. George Spectrum, 1990).

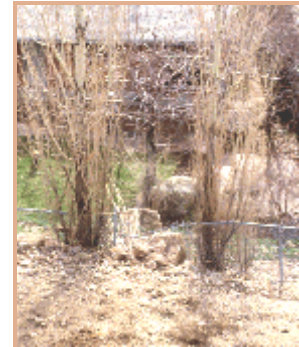
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**March 27, 1989**

A rock fall hit the back fence and yard at Teton Dr., Salt Lake City, Salt Lake County. Boulders came from a Lake Bonneville boulder-beach deposit. The backyard chain-link fence stopped all but the largest rocks. The largest boulder was blocked from hitting the house by another large lawn decoration rock, probably from a previous rock fall. The data and photographs are from unpublished records by Craig V. Nelson, Salt Lake County Geologist and William F. Case, Utah Geological Survey.



Rocks accumulated behind a chain-link fence.



A big boulder broke through a chain-link fence and came to rest on older rock fall boulder used for lawn decor. Note house in background.

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**March 19, 1989**

A rock fall closed U.S. 191 at Willow Creek between Helper and Duchesne, Carbon County (Harty, 1989). Photograph by William F. Case, Utah Geological Survey.

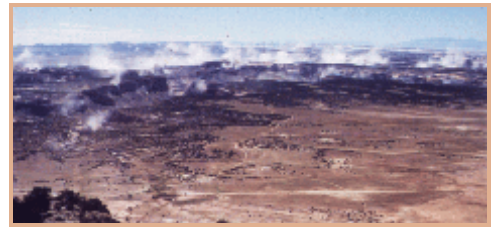


Large rock on highway had to be blasted to open the highway.

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**August 14, 1988**

Multiple rock falls were triggered by a magnitude 5.3 earthquake centered at Fuller Bottom, near the San Rafael River, Emery County. The rock falls produced "curtains" of dust in Buckhorn Wash and tributaries and on the slopes below the Wasatch Plateau near Castledale (Case, 1988; O'Brien and Nava, n.d.). Photograph by Terry A. Humphrey, Bureau of Land Management, Price, Utah.



"Curtains" of dust from simultaneous rock falls in Buckhorn Wash and tributaries.

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**January 29, 1989**

A magnitude 5.4 earthquake triggered a rock slide that closed I-70 in Salina Canyon, Sevier County (Gomez, 1989).

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**July 16, 1988**

A rock slide closed U-128, near Big Bend Park, Grand County, sometime during the early morning hours (The Times-Independent, 1988b).

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**July 1, 1988**

Just after noon a rock fall occurred in Bloody Mary Wash (Moab Canyon), Grand County. Boulders the size of cars careened down a 150-foot high (45 m) slope stopping just before rolling onto U.S. #191. Traffic on the highway was stopped because of poor visibility for about 30 minutes. The dust cloud was seen from Moab. The rock fall damaged several hundred feet of track of a Denver and Rio Grande railroad spur (The Times-Independent, 1988a). Photographs by Genevieve Atwood, Utah Geological Survey.



Light-colored scar on cliff is the source of the rock fall.



Don R. Mabey (Utah Geological Survey) stands in a crater produced by the rock fall.

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**May 30, 1988**

A massive rock slide with boulders the size of a house closed U-95 between Blanding and Natural Bridges National Monument, San Juan County. At the time of the newspaper report other rocks were dangerously perched on the 500-foot-high (150 m) Comb Ridge cliff (Deseret News, 1988).



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**mid-April, 1988**

A rock fall blocked a creek in upper Hackberry Canyon, part of the Hackberry Canyon Wilderness Area, in central Kane County. The resulting lake extended about 100 feet (30 m) upstream. By the time the rock fall was noticed the lake had drained through the dam to a depth of about 4 feet (1.2 m) (Doelling, 1988).

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**July 21, 1987**

A Utah Power and Light wooden flume in Big Cottonwood Canyon, Salt Lake County, was damaged by bounding boulders in four places. The rock fall occurred near the Stairs Power Plant at 1 p.m. during a cloudburst. Water from the ruptured flume scoured a gully and deposited an alluvial fan on the Big Cottonwood Canyon road (Case, 1987a).

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**July 5, 1987**

A 2-foot (0.6 m) boulder fell from a Lake Bonneville boulder beach into a back yard on North Cliff Drive, Salt Lake City, Salt Lake County, damaging a barbeque grill, and upsetting dinner guests. Other boulders were poised to fall (Nelson, 1993).

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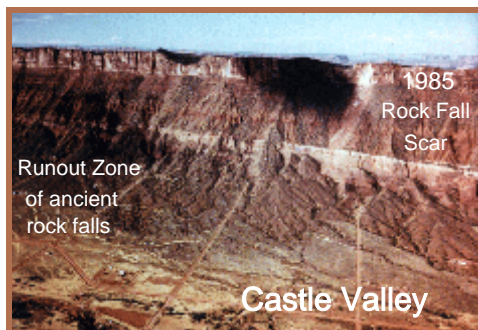
**February 12, 1986**

Sometime between the end of a shift at midnight and before the beginning of the morning shift at Texas Gulf Potash Plant, a rock as big as a house crashed onto a Denver and Rio Grande railroad spur. The pieces blocked one lane of Potash Road near Moab, Grand County (The Times-Independent, 1986). The railroad spur was damaged within a mile of the location of another rock fall, also in the morning and on the same date in 1991.

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**July 8, 1985**

A rock fall from Porcupine Rim, Castle Valley, Grand County produced a spectacular dust cloud. The rock fall occurred at 7 a.m. Two homes were narrowly missed by boulders; the interior of one of the homes was covered with dust

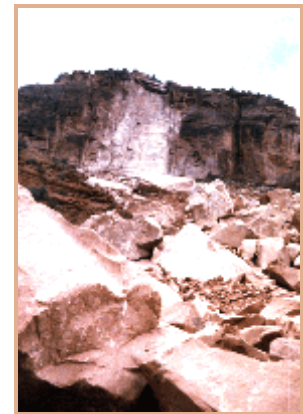


Aerial view of 1985 rock-fall scar, older rock-fall scars on Porcupine Rim, and the rock-fall runout zones below the scars. Photograph by William F. Case, Utah Geological Survey.



Dust from rock fall. Photograph by Ron Drake, The Times-Independent (Moab).

up to ½ inch (20 mm) deep that entered through open windows. A noise that sounded like an earthquake preceded the rock fall (The Times-Independent, 1985).



Rock fall scar on Porcupine Rim, Castle Valley. Photograph by William F. Case, Utah Geological Survey.

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**June 7, 1985**

A rock fall occurred near the vaults in Little Cottonwood Canyon, Salt Lake County. Witnesses reported noise and sparks from falling rocks (William Mulvey, Utah Geological Survey, 1985).

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**1985**

Rock fall in Provo River Canyon, Utah County, damaged the Olmstead culinary water aqueduct and contaminated Provo City's drinking water. The large rock fell from a ledge and rolled 1500 feet (457 m) before it hit the aqueduct (Christenson and others, 1987).



Olmstead Aqueduct damaged by rock fall. Photograph by Robert Robison, Utah County Geologist.

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**July 3, 1984**

Pilot reported "smoke" near Dead Horse Point State Park at 9:22 a.m.; park superintendent Gordon Topham verified that the "smoke" was actually a rock-fall dust cloud. Ivan G. Wong, Woodward-Clyde Consultants, recorded the rock fall on seismographs up to 30 miles (50 km) away (Case, 1987b).



Scar at location of rock fall is directly below Dead Horse State Park. Photograph by William F. Case, Utah Geological Survey.

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**1983**

A large dust cloud was produced when fragments of Navajo Sandstone fell from a cliff on Lake Powell near Rainbow Bridge. The spectacular photograph was taken by Tom Tyler, a visitor to Rainbow Bridge, and donated to the National Park Service. The photograph is used on a National Park Service poster that warns boaters about rock falls on the cliffs surrounding Lake Powell.

The information was provided by T.C. Chidsey (verbal communication, 2000).



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- 1991d, Slide damages 5 vehicles: December 28, 1991.
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- 1992b, Rocky road: March 3, 1992.
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