

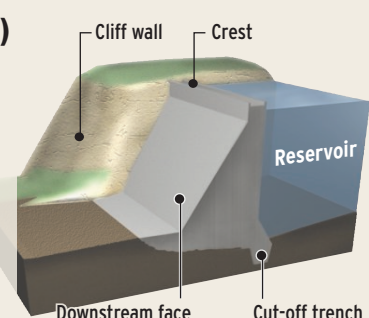
There are more than 900 dams in the state, with about 230 of those labeled “high hazard.” While earthquakes and severe weather pose perennial threats to dams, Utah faces unique safety challenges with the age of its dams, heightened seismic risks and a continuing trend of urban growth within dam breach zones.

# How safe are Utah's dams?

## Dams 101: How they are built and why they break

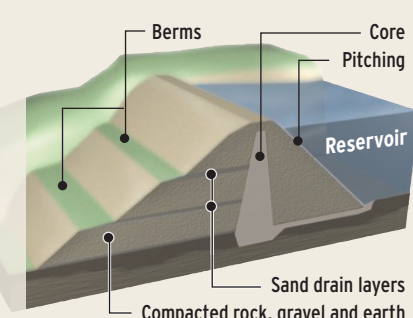
### Masonry (Gravity)

Works well in locations with high solid walls, such as canyons. They can be straight or curved and have a triangular profile. The arch design and buttress design are common variations, offering great strength with less concrete. Its strength comes from its design.



### Embankment

Made of compacted rock and earth fill using natural material at the dam site, this design greatly reduces cost. It can be made of rock, sand, gravel and earth. The water-resistant core is made of clay or even concrete. Its strength comes from its mass.



### Why dams fail

- “Overtopping” occurs when excess water floods over the dam or damages its spillway.
- Failure of construction materials.
- Inadequate upkeep and maintenance.
- Cracking due to natural settling.
- Erosion from seepage that results in “piping,” in which sinkholes threaten slope stability.

## Dam-safety profiles: A look at some of Utah's largest and best-known high-hazard dams, along with safety concerns



### Wanship

(Rockport Lake)  
On the Weber River in Summit Co.  
**Height:** 175 feet  
**Maximum storage:** 60,860 acre-feet of water  
Built in 1956, this dam is operated and maintained by the U.S. Bureau of Reclamation.



### Deer Creek

On the Provo River in Wasatch Co.  
**Height:** 235 feet  
**Maximum storage:** 149,700 acre-feet of water  
This federal dam was built in 1940. In July 2003, crews began work to protect it from liquefaction in case of an earthquake. They are strengthening the foundation, upgrading the spillway and raising the crest 6 feet. Work is expected to wrap up in December.



### Flaming Gorge

On the Green River in Daggett Co.  
**Height:** 502 feet  
**Maximum storage:** 3,515,500 acre-feet water  
Built in 1963, this is Utah's largest dam, both in height and the amount of water it stores. The concrete arch structure is operated and maintained by the U.S. Bureau of Reclamation. On June 21, 1997, one of its river outlet pipes ruptured, flooding the power plant, shutting down the dam's three hydroelectric generators and reducing water flow. Officials say the dam never was at risk of failure.

### 1. Arthur V. Watkins

(also known as Willard Dam)  
Willard Creek near the Great Salt Lake in Box Elder Co.  
**Height:** 36 feet  
**Maximum storage:** 198,270 acre-feet  
In May, a \$17.4 million contract was awarded to fix seepage and erosion problems with this earthen dam, built in 1964. Work on the 14.5-mile-long dam, Utah's fifth largest, began this month and is scheduled to end by November 2009.

### 2. Big Sand Wash

Near the town of Upalco in Duchesne Co.  
**Height:** 112 feet  
**Maximum storage:** 14,600 acre-feet  
Built in 1968 for irrigation and enlarged in 2006, this earthen dam currently meets the state's minimum safety requirements.

### 3. DMAD

Sevier River, 6 miles from Delta in Millard Co.  
**Height:** 34 feet  
**Maximum storage:** 21,380 acre-feet  
Built in 1959, the dam failed during Utah's flood year of 1983. It has seen several modifications, including recent work to correct seepage problems and earthquake vulnerability. Inspectors say the structure still needs spillway upgrades to meet safety rules.

### 4. Echo

On the Weber River in Summit Co.  
**Height:** 158 feet  
**Maximum storage:** 73,940 acre-feet  
Officials are determining corrective actions for the 77-year-old earthen dam. Safety concerns include risk of liquefaction and a weakening foundation in a severe earthquake. Spillway work also has been recommended.

### 5. Enterprise, Lower

On Little Pine Creek, 11 miles upstream of Enterprise in Washington Co.  
**Height:** 56 feet  
**Maximum storage:** 1,742 acre-feet  
This dam has been upgraded in light of problems with its upstream companion, the Upper Enterprise Dam.

### 6. Enterprise, Upper

On Little Pine Creek, 12 miles upstream of Enterprise  
**Height:** 73 feet  
**Maximum storage:** 11,813 acre-feet  
Residents prepared for possible flooding in February, when officials faced heavy rains and an early runoff before they had installed a new discharge pipe.

### 7. Gunlock

Santa Clara River, 6 miles upstream from Santa Clara in Washington Co.  
**Height:** 117 feet  
**Maximum storage:** 15,000 acre-feet  
State officials say the 1970 dam meets all safety requirements. Gunlock was one of three dams in southwest Utah that narrowly missed structural problems during heavy rains in January 2005, thanks to improvements in its emergency spillway.

### 8. Holmes

On North Fork of Holmes Creek in Davis Co.  
**Height:** 66 feet  
**Maximum Capacity:** 1,420 acre-feet  
This dam has been completely replaced in the 16 years since it was first built, at a cost of \$1.3 million.



### Quail Creek South Dam

On the Virgin River 10 miles upstream from Washington in Washington Co.  
**Height:** 80 feet  
**Maximum storage:** 46,000 acre-feet  
This dam failed in 1989, flooding 50 to 60 homes and swamping roads, farmlands and utilities. The failure prompted a massive review of dam-safety procedures in Utah. The dam was rebuilt in 1990 and now meets all state safety standards.

### 9. Johnson

On the Fremont River, 12 miles upstream from Fremont Junction in Sevier Co.  
**Height:** 31 feet  
**Maximum storage:** 15,300 acre-feet  
Built in 1910 and enlarged in 1966, this dam remains under investigation for safety issues while its owner, Fremont Irrigation Co., conducts an engineering study.

### 10. Kaysville

On south fork of Holmes Creek, one mile upstream from Kaysville  
**Height:** 43 feet  
**Maximum storage:** 315 acre-feet  
Completed 1914, this dam had its spillway modified 80 years later. The owners were ordered in 2007 to breach the dam temporarily until a leak could be repaired.

### 11. Little Dell

On Mountain Dell, up Parleys Canyon just above Salt Lake City  
**Height:** 224 feet  
**Maximum storage:** 25,000 acre-feet  
Built in 1993, this dam is run by Salt Lake City as a public utility and meets state safety requirements.

### 12. Long Park

On Sheep Creek, 13 miles upstream from Manila in Daggett Co.  
**Height:** 112 feet  
**Maximum storage:** 14,600 acre-feet  
Built in 1980, the dam underwent substantial reconstruction in 2001, with federal financial support.

### 13. Mill Hollow

On Mill Hollow, 15 miles upstream of Woodland in Wasatch Co.  
**Height:** 42 feet  
**Maximum storage:** 403 acre-feet  
Construction upgrades have been recently completed on this state Division of Wildlife Resources dam.

### 14. Millsite

Three miles upstream from Ferron, Emery Co.  
**Height:** 115 feet  
**Maximum storage:** 20,000 acre-feet  
State engineers say the dam, built in 1971 and modified in 1998, still needs work to meet safety standards, but the project is on hold while officials seek federal financing.

### 15. Mona

On Currant Creek, about 8 miles upstream from Elberta in Juab Co.  
**Height:** 28 feet  
**Maximum storage:** 30,000 acre-feet  
Built in 1895, Mona is one of 17 high-hazard Utah dams that are more than a century old. The dam was upgraded in 1998 and now meets state safety standards.

### 16. Mountain Dell

On Parleys Creek, 6 miles upstream from Salt Lake City  
**Height:** 105 feet  
**Maximum Storage:** 3,290 acre-feet  
This 92-year-old dam on Salt Lake City's doorstep recently had \$718,000 in modifying construction to prevent the possibility of damage from water running over its top in heavy water years.

### 17. Otter Creek

On Otter Creek, about 9 miles upstream from Kingston in Piute Co.  
**Height:** 43 feet  
**Maximum storage:** 71,790 acre-feet  
Built in 1897, the dam has seen upgrades in 1983 and 2000, but state engineers say some safety issues persist.

### 18. Panguitch Lake

On Panguitch Creek, 14 miles upstream from Panguitch in Garfield Co.  
**Height:** 28 feet  
**Maximum storage:** 23,730 acre-feet  
Built in 1872 and modified in 1942, this is the state's third oldest nationally recognized dam – only Silver Creek Estates in Summit County and Fairview Lake in Sanpete County are older – with a relatively large storage capacity. Recently completed studies indicate it meets safety requirements.

### 19. Pineview

On Ogden River, in Weber Co.  
**Height:** 137 feet  
**Maximum storage:** 110,000 acre-feet  
Built in 1936, this dam is operated and maintained by the U.S. Bureau of Reclamation. Upgrades in 2002-2003.

### 20. Piute

On Sevier River, 9 miles upstream of Marysville in Piute Co.  
**Height:** 90 feet  
**Maximum storage:** 136,855 acre-feet  
The fourth biggest state-regulated dam in Utah, Piute was built in 1938 and modified twice since, most recently in 2005.

### More on the Web

Go to [s1trib.com](http://s1trib.com) for interactive data on the dams nearest you, along with more than 700 dams across Utah, including profiles, digital maps and additional information.

### 21. Porcupine

East fork of Little Bear River in Cache Co.  
**Height:** 165 feet  
**Maximum storage:** 14,500 acre-feet  
Engineers recently finished \$4.5 million in work on this 17-year-old dam, primarily to improve its spillway and flatten the slopes of the dam.

### 22. Recapture Creek

On Recapture Creek in San Juan Co.  
**Height:** 140 feet  
**Maximum storage:** 16,000 acre-feet  
Completed in 1984, the dam was rebuilt two years ago to add a stability berm and improve the spillway capacity. The structure now meets all safety standards.

### 23. Rocky Ford

On the Beaver River 5 miles upstream from Minersville in Beaver Co.  
**Height:** 68 feet  
**Maximum storage:** 38,733 acre-feet  
The dam is being reworked to boost the capacity of its gated spillway. This follows modifications in 1977 and 1999 that, state engineers said, would bring it up to safety standards.

### 24. Scofield

On the Price River in Carbon Co.  
**Height:** 125 feet  
**Maximum storage:** 65,800 acre-feet  
Built in 1945, the dam is undergoing spillway rehabilitation, which began in 2007 and is expected to wrap up by December. Analyses indicated if the spillway failed, it would cause catastrophic failure of the dam.

### 25. Sevier Bridge

On the Sevier River, 27 miles upstream from Leamington in Juab Co.  
**Height:** 92 feet  
**Maximum storage:** 363,165 acre-feet  
Even after a current round of reconstruction is complete, this 94-year-old dam still has safety concerns with its outlet, upstream face and downstream slopes, say state engineers.

### 26. Soldier Creek

On the Strawberry River in Wasatch Co.  
**Height:** 272 feet  
**Maximum storage:** 1,127,610 acre-feet  
Also known as Strawberry Reservoir, this dam is Utah's third largest and is operated and maintained by the U.S. Bureau of Reclamation.

### 27. Starvation

On the Strawberry River in Duchesne Co.  
**Height:** 210 feet  
**Maximum storage:** 152,330 acre-feet  
Built in 1969, this dam is operated and maintained by the U.S. Bureau of Reclamation.

Sources: U.S. Bureau of Reclamation, Association of State Dam Safety Officials, Firefly Visual Dictionary, simsscience.org

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