

# Lake Powell

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**Lake Powell** is a man-made reservoir on the Colorado River, straddling the border between Utah and Arizona. It is the second largest man-made reservoir in the United States behind Lake Mead, storing 24,322,000 acre feet (30 km³) of water when full. Lake Powell was created by the flooding of Glen Canyon by the controversial Glen Canyon Dam, which also led to the creation of Glen Canyon National Recreation Area, a popular summer destination. The reservoir is named for explorer John Wesley Powell, a one-armed American Civil War veteran who explored the river via three wooden boats in 1869. In 1972, Glen Canyon National Recreation Area was established. It is public land managed by the National Park Service, and available to the public for recreational purposes.

Lake Powell is a storage facility for the Upper Basin states of the Colorado River Compact (Colorado, Utah, Wyoming, and New Mexico). The Compact specifies that the Upper Basin states are to provide a minimum annual flow of 8.23 million acre feet (10 km³) to the Lower Basin states (Arizona, Nevada, and California).

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## History

In the 1940s and early 1950s, the U.S. Bureau of Reclamation planned to construct a series of Colorado River dams in the rugged Colorado Plateau province of Colorado, Utah and Arizona. Glen Canyon Dam was born of a controversial damsite the Bureau selected in Echo Park, in what is now Dinosaur National Monument in Colorado. A small but politically effective group of objectors led by David Brower of the Sierra Club succeeded in defeating the Bureau's bid, citing Echo Park's natural and scenic qualities as too valuable to submerge.

But by agreeing to a relocated damsite near Lee's Ferry, between Glen and Grand Canyons, Brower did not realize what he had gambled away. At the time, Brower had not actually been to Glen Canyon. When he later saw Glen Canyon on a river trip, Brower was stunned to discover that it had the kind of scenic, cultural, and wilderness qualities often associated with America's finest national parks.

Lake Powell



<b>Basin countries</b>	United States
<b>Max length</b>	299 km (186 mi)
<b>Max width</b>	40 km (25 mi)
<b>Average depth</b>	40 m (132 ft)
<b>Max depth</b>	170 m (560 ft)
<b>Water volume</b>	<i>full</i> : 63 km³ (24 mio acre-feet) <i>current</i> : 30 km³ (13 mio acre-feet)
<b>Shore length<sup>1</sup></b>	3,057 km (1,900 mi)
<b>Surface elevation</b>	<i>full</i> : 1,127 m (3,700 ft) <i>current</i> : 1,097 m (3,598 ft)

<sup>1</sup> Shore length is not a well-defined measure.

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Over 80 side canyons in the colorful Navajo Sandstone contained clear streams, abundant wildlife, arches, natural bridges, and thousands of Native American archeological sites. By then, however, it was too late to stop the Bureau and its commissioner Floyd Dominy from building Glen Canyon Dam. Dominy was a firm believer in subduing the river for human use, once saying "Now I admit that nature can't improve upon man. We're probably the supreme being." Brower believed the river should remain free, and would forever after consider the loss of Glen Canyon his life's ultimate disappointment.

Construction on Glen Canyon Dam began with a demolition blast keyed by the push of a button by President Dwight D. Eisenhower at his desk in the Oval Office on October 1st, 1956. The first blast started clearing tunnels for water diversion. On February 11th, 1959, water was diverted through the tunnels so dam construction could begin. Later that year, the bridge was completed, allowing trucks to deliver equipment and materials for the dam, and also for the new town of Page, Arizona.

Concrete placement started around the clock on June 17th, 1960. The last bucket of concrete was poured on September 13th, 1963. Over 5 million cubic yards (4,000,000 m<sup>3</sup>) of concrete make up Glen Canyon Dam. The Dam is 710 feet (216 m) high, with the surface elevation of the water at full pool being approximately 3700 feet (1100 m). Construction of the Dam cost \$155 million, and 18 lives were lost in the process. From 1963 to 1966, turbines and generators were installed for hydroelectricity. On September 22nd, 1966, Glen Canyon Dam was dedicated by Lady Bird Johnson.

Upon completion of Glen Canyon Dam on September 13th, 1963, the Colorado River began to back up, no longer being diverted through the tunnels. The newly flooded Glen Canyon formed Lake Powell. As the lake filled over the years, seismic activity in the area increased as the ground shifted beneath the increasing weight of the water. It took 17 years for the lake to rise to the high water mark, on June 22nd, 1980. Since then the reservoir has fluctuated wildly and currently, in spring 2007, is less than 60% of its total capacity.<sup>[1][2][3]</sup>

Colorado River flows have been below average since the year 2000, leading to lower lake levels. In the winter of 2005 (before the spring run-off) the lake reached it lowest level since filling, which was approximately 150 feet below full pool. Since 2005 the lake has risen 60 feet, but it is still 90 to 100 feet below full pool (elevation 3700 feet above sea level).

## Geology

Glen Canyon was carved by differential erosion from the Colorado River over an



Lake Powell from space



Lake Powell, May 2007. Note the prominent "bathtub ring" caused by low water.

estimated 5 million years. The Colorado Plateau, through which the canyon cuts, arose some 11 million years ago. Within that plateau lie layers of rock from over 300 million years ago to the relatively recent volcanic activity. Pennsylvanian and Permian formations can be seen in Cataract Canyon and San Juan Canyon. The Moenkopi Formation, which dates from 230 million years ago (Triassic Period), and the Chinle Formation are found at Lees Ferry and the Rincon. Both are the result of the ancient inland sea that covered the area. Once the sea drained, windblown sand invaded the area, creating what is known as Wingate Sandstone. The more recent (Jurassic Period) formations include Kayenta Sandstone, which produces the trademark blue-black "desert varnish" that streaks down many walls of the canyons. Above this is Navajo Sandstone, the result of more compressed sand dunes. Many of the arches, including Rainbow Bridge, lie at this transition point. This period also includes light yellow Entrada Formations, and the dark brown, almost purple Carmel Formation. These latter two can be seen on the tops of mesas around Wahweap, and the crown of Castle Rock and Tower Butte. Above these layers lie the Straight Cliffs *Sandstone* and conglomerate shales that make up the Kaiparowits Plateau and San Rafael Swell to the north of the lake.

The confluences of the Escalante River and San Juan River lie within Lake Powell. The slower flow of the San Juan has produced incredible Goose Necks, where 5 miles of river are contained within 1 mile on a straight line.

## Features

The lake's main body stretches up Glen Canyon, but has also filled many (over 90) side canyons. The lake also stretches up the Escalante River and San Juan River where they merge into the main Colorado River. This provides access to many natural geographic points of interest as well as some remnants of the Anasazi culture.

- Rainbow Bridge National Monument
- Defiance House ruin
- Cathedral in the Desert
- San Juan goosenecks
- Kaiparowits Plateau
- Hole-in-the-Rock crossing
- the Rincon
- Three-Roof Ruin
- Padre Bay
- Waterpocket Fold

## Development

Facts	
Start of storage	March 13, 1963
Completion of initial filling	June 22, 1980
Surface area	266 mi <sup>2</sup>



This is the southwestern portion of Lake Powell, which lies in Arizona. The back of Glen Canyon dam can be seen to the right in this image.



Because most of the lake is surrounded by steep sandstone walls, access to the lake is limited to developed marinas:

1. Lees Ferry Subdistrict
2. Page/Wahweap Marina
3. Antelope Point Marina
4. Halls Crossing Marina
5. Bullfrog Marina
6. Hite Marina

The following marinas are accessible only by boat:

1. Dangling Rope Marina
2. Rainbow Bridge National Monument
3. Escalante Subdistrict

Glen Canyon National Recreation Area draws more than two million visitors annually. Recreational activities include boating, fishing, waterskiing, jet-skiing, and hiking. Prepared campgrounds can be found at each marina, but many visitors choose to rent a houseboat or bring their own camping equipment, find a secluded spot somewhere in the canyons, and make their own camp (there are no restrictions on where visitors can stay). Anyone who camps further than a quarter of a mile from a marina, however, must bring a porta-potty. The burying of human waste in Glen Canyon National Recreation Area is prohibited. Pet waste must also be packed out.

The southwestern end of Lake Powell can be accessed via U.S. Highway 89 and Arizona State Route 98. Use Utah SR-95 and Utah SR-276 to get to the northeastern end of the lake.



Rainbow Bridge



The section of Lake Powell near Dangling Rope Marina, looking southwest at sunrise.

## References

1. ^ [http://www.usbr.gov/uc/water/rsrvs/ops/crsp\\_40\\_gc.html](http://www.usbr.gov/uc/water/rsrvs/ops/crsp_40_gc.html) Department of the Interior, Bureau of Reclamation, Upper Colorado Region - Operational data
  2. ^ <http://www.usbr.gov/uc/water/crsp/cs/gcd.html> Department of the Interior, Bureau of Reclamation, Upper Colorado Region - Current status
  3. ^ [http://www.azgfd.gov/h\\_f/edits/lake\\_levels.shtml](http://www.azgfd.gov/h_f/edits/lake_levels.shtml) Arizona lakes water level report
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- Stiles, Jim, *The Brief but Wonderful Return of Cathedral in the Desert*, Salt Lake Tribune, June 7, 2005



Water cascading down rocks after a heavy rainfall

## External links

- Report on Lake Powell (<http://waterquality.utah.gov/watersheds/lakes/LAKEPOWL.pdf>)PDF (503 KiB) by the Utah Division of Water Quality
- Glen Canyon National Recreation Area (National Park Service) (<http://www.nps.gov/glca/>)
- Glen Canyon Institute (<http://www.glencanyon.org/>) - organization in favor of decommissioning Glen Canyon Dam
- Friends of Lake Powell (<http://www.lakepowell.org/>) - organization opposed to decommissioning Glen Canyon Dam

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