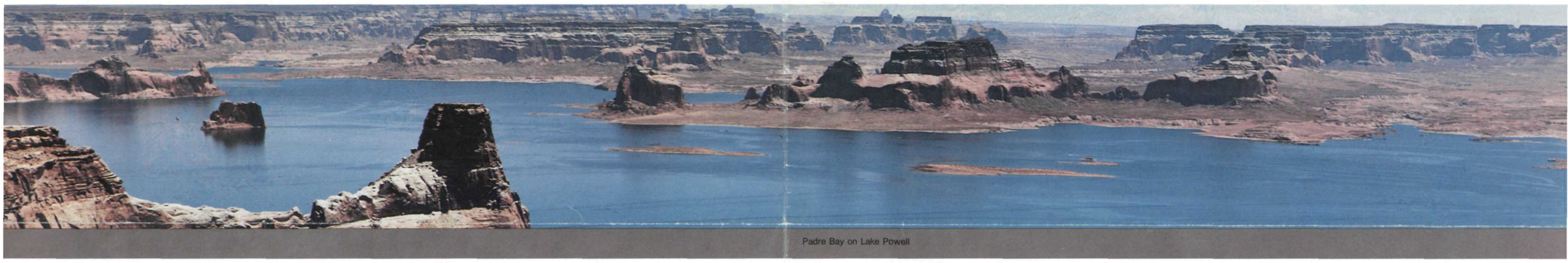
Glen Canyon Dam

Lake Powell

U.S. Department of the Interior
Bureau of Reclamation



Padre Bay on Lake Powell

Wedged into a deep sandstone gorge on the Colorado River, Glen Canyon Dam backs up water for more than 180 miles to form beautiful Lake Powell. Each year millions of visitors are drawn to the lake, but recreation makes up only a small part of the benefits offered by the lake and the dam which formed it. Lake Powell's dependable supply of water for irrigation, municipal and industrial use, and hydropower generation benefits millions of people far from its spectacular shores.

Glen Canyon Dam and the Colorado River Storage Project

Glen Canyon Dam is the key storage unit in a far-reaching water development plan called the Colorado River Storage Project (CRSP). The annual flow of the Colorado River is highly erratic, with spring floods that dry to a trickle in the summer and fall. When Glen Canyon was completed and Lake Powell was formed, the irregular flows were brought under control. The now steady flow from the dam and Lake Powell makes water developments possible throughout the Upper Colorado River Basin and provides a regulated supply of water to meet downstream commitments.

To help pay for the construction of Glen Canyon Dam and other Upper Basin water developments, hydroelectric power is produced at the powerplant located at the toe of the dam. The maximum powerplant capacity is 1,288,000 kilowatts. Power produced at Glen Canyon is sold to municipalities, public utilities, and governmental agencies in seven western states.

Other storage units in the CRSP include Flaming Gorge in Utah, Navajo in New Mexico, as well as Blue Mesa, Crystal, and Morrow Point Dams of the Wayne N. Aspinall Unit in Colorado.

The Canyon, The Lake and the Dam

From the concrete barrier of Glen Canyon Dam, upstream for more than 180 miles, Lake Powell's blue waters lap at cliffs, buttes and gentle sands. Hour by hour, earth-tone colors change as shadows creep through the canyon.

Rain and wind sometimes sweep across the lake, but are quickly gone. This is desert and the sun dominates.

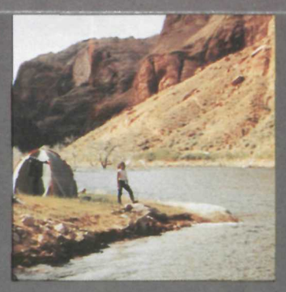
Lake Powell is awesome, vast, overwhelming... it is ever changing, always sublime.

Lake Powell

Glen Canyon Dam backs Colorado River water through Glen Canyon to form Lake Powell, one of the most scenic lakes in the world. When full at 3,700 feet above sea level, Lake Powell is 186 miles long. The shoreline distance—backing in and out of numerous side canyons—is an incredible 1,960 miles.

Lake Powell started filling on March 13, 1963, when diversion tunnel gates were partially closed. Although the filling rate varied because of erratic precipitation, the lake usually peaked a little higher each year. In 1980, it was completely full and water flowed over the spillway. A test spill was allowed; however, operators at the dam now try to avoid the waste of spilling from a full reservoir without producing hydroelectric power.

To meet its intended purpose, Lake Powell must fluctuate. During spring runoff, May through July, the lake normally rises. During the remainder of the year, the lake declines. How much or how fast it drops depends on both the water surface and elevation, how much water is carried over from the previous year, and how much runoff water flows into Lake Powell from the Colorado River system. During a series of low-water years, Lake Powell could drop more than 200 feet below its maximum elevation, but that would be highly unusual.



Photos from left to right:

Rainbow Bridge reflected in Lake Powell

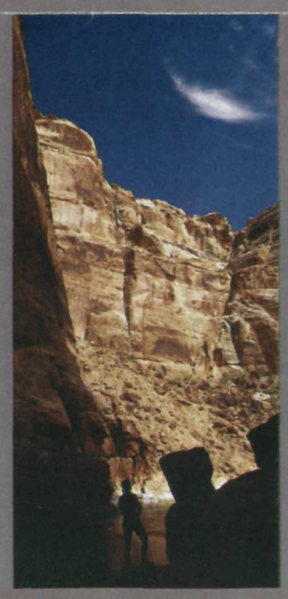
Morning at camp on Lake Powell

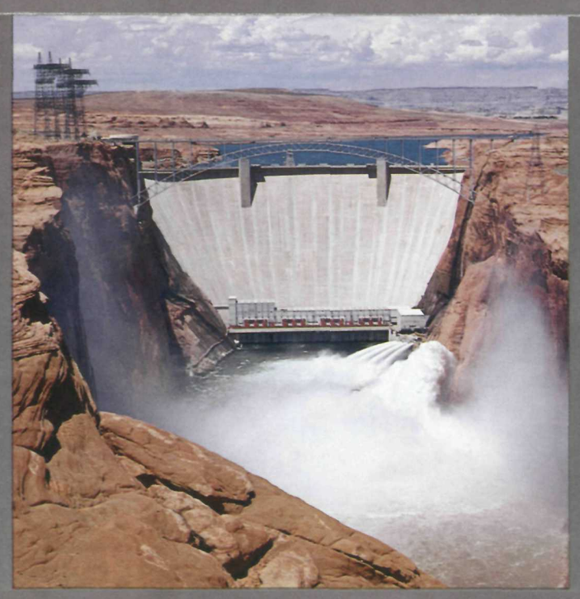
Wildflowers and cacti flourish near the lake.

In Rock Canyon on Lake Powell.

Left Spillway test—Glen Canyon Dam

Boating on Lake Powell





Rainbow Bridge

A star attraction of the Glen Canyon National Recreation Area is Rainbow Bridge. This wonder is the largest natural bridge on earth. The Navajos call it "Nonnoshoshi" or "the rainbow turned to stone."

A recent study found that Rainbow Bridge is 290 feet above the bottom of the streambed, rather than the 309 feet previously believed. It has a span of 278 feet and a minimum thickness at the top of 42 feet across. When full, Lake Powell's waters are 48 feet deep directly beneath the arch, but the water surface is still 21 feet below the lowest part of the bridge abutments.

When Lake Powell began to fill, there was some concern that the stability of Rainbow Bridge would be threatened by the rising water. Precise surveys conducted semiannually for ten years since Lake Powell entered Rainbow Bridge National Monument grounds show no discernible movement or change that can be attributed to the presence of standing water beneath the arch. In other words, Lake Powell apparently has no significant effect on the structural integrity of Rainbow Bridge.

The Colorado River Below the Dam

Before Glen Canyon Dam was built, the Colorado River ran warm and muddy red. Now it is clear and cold. Today, stocked rainbow trout thrive in the cold water, often reaching trophy size.

The riverflow fluctuates not as much seasonally as it does daily and weekly in response to power demands from distant towns. During the recreation season, water releases through the dam are no lower than 3,000 cubic feet per second. To maintain good boating through the Grand Canyon, maximum water releases are maintained at about 32,000 cubic feet per second.

Since water releases from the Glen Canyon Powerplant are usually greater during the day than at night, boaters and campers along the river should take precautions to prevent boats from being grounded as the riverflows decrease.

Glen Canyon Dam, Lake Powell and the Navajo Reservation

Glen Canyon Dam, Lake Powell, new paved highways and the incorporated town of Page have remarkably transformed a large area of the Utah-Arizona canyonlands.

Before 1956, the land near the future damsite was virtually inaccessible. Even rafters and boaters could easily visit only the floor of the canyon. When the Glen Canyon Dam construction crews arrived, they found they had to drive 200 miles to cross from one side of the canyon to another.

Glen Canyon Bridge was completed in 1959 and, together with the connecting highways, permitted trucks by the thousands to deliver equipment and materials for the dam and for the new town of Page.

Nearby Navajo Indians, who pastured livestock on meager desert grass in the area, suddenly found themselves near stores, schools and medical care. Many Navajos worked on the construction of Glen Canyon Dam.

Land for the town of Page and the south side of Lake Powell, formerly a part of the Navajo Indian Reservation, was exchanged by the Tribe for equivalent land in southeastern Utah.

The Incorporated City of Page

Page, Arizona, is a town carved from the desert. Named for John C. Page, Commissioner of Reclamation from 1937 to 1943, the town was first designed as home base for the thousands of men and women and their families associated with the construction and operation of Glen Canyon Dam. Today, the city serves as a chosen home for many people, as well as a base for travelers.

At the peak of Glen Canyon Dam construction, Page had about 7,500 residents. The present population is about 6,000.

From 1957 to 1975, Page, Arizona, was operated as a Federal Government construction town. In March 1975, the town incorporated under the laws of the State of Arizona.

How the Site for Glen Canyon was Selected

The lower section of Glen Canyon was first considered for a damsite in the early 1920's. The final site for Glen Canyon Dam was carefully examined and selected by a group of Bureau of Reclamation engineers and geologists working from 1946 to 1948. There were three main criteria in choosing this particular site:

1. The area forming the reservoir basin could contain an immense amount of water;

2. The canyon walls and bedrock foundation were strong and stable enough to safely support a high dam;

3. A large source of good rock and sand for making concrete aggregate to build the dam was close by, on Wahweap Creek just five miles from the construction site.

Construction History

Glen Canyon Dam was authorized by the U.S. Congress in April 1956. The first blast occurred on October 15, that same year, signaling the start of construction.

In April 1957 the prime construction contract to build Glen Canyon Dam was awarded to Merritt-Chapman and Scott Corporation. Until June 1960 the emphasis was on rerouting the river and excavating—drilling tunnels, blasting to bedrock for the foundation, and carving into the canyon walls for the abutments of the dam. The canyon was actually shaped to fit the dam.

Concrete placement began in the summer of 1960 and continued day and night until September 1963, when the final "bucket" was dumped. The "bucket" used was a huge container holding 24 tons of damp concrete. In all, it took over 400,000 buckets of concrete to build Glen Canyon Dam.

The turbines and generators that produce the hydroelectric power were installed between 1963 and 1966.

Glen Canyon Dam was dedicated by Mrs. Lyndon B. "Ladybird" Johnson on September 22, 1966.

Glen Canyon Dam	
Height above bedrock	710 feet
Height above original river channel	638 feet
Volume of concrete:	
Dam only	4,901,000 cubic yards
Powerplant and miscellaneous	469,000 cubic yards
Total concrete	5,370,000 cubic yards
Cost of dam	$155,000,000
Cost of powerplant	$70,000,000
Cost of dam, powerplant, switchyard, Town of Page, associated facilities, etc. (93 percent will be repaid U.S. Treasury from sale of power)	$272,000,000
Cost of recreation facilities	$10,000,000
Glen Canyon Powerplant	
Number of generating units	8
Cost of powerplant	$70,000,000
Installed capacity	1,288,000 KW

Milestones	
Construction authorized	April 11, 1956
First construction Contract awarded (Right Diversion Tunnel excavation)	October 1, 1956
Diversion of Colorado River around damsite	February 11, 1959
First bucket of concrete	June 17, 1960
Last bucket of concrete	September 13, 1963
First power generation	September 4, 1964
Dedicated by Mrs. Lyndon B. Johnson	September 22, 1966
Dedication of John Wesley Powell Museum in Page	August 1, 1969
Lake Powell	
Start of storage	March 13, 1963
Completion of initial filling	June 22, 1980
Total capacity when full (at the elevation of 3,700 feet)	26,214,861 acre feet
Depth of water at dam when full	568 feet
Shoreline distance when full	1,960 miles
Surface acres when full	161,390 surface acres

The Hydrologic Cycle and Hydroelectric Power

The hydrologic cycle is a combination of forces from the sun, the wind, and the turning of the earth. Water vapor is evaporated from the sea by the heat of the sun. As the water vapor rises it cools and condenses to form clouds, which then drop their precipitation in the form of snow and rain. Runoff from this precipitation forms the streams and rivers which eventually return to the sea. Thus, the hydrologic cycle is completed and begins again.

In the cycle, as runoff flows back to the sea, the water can be stored behind dams, then released through dam powerplants to create electricity. Hydroelectric power is produced when the force of falling water is routed through pipes enclosed in the dam (penstocks) and directed against the blades of turbines. The turbines' blades are connected to large shafts that turn generators, which produce electric power.

The hydroelectric power produced at Glen Canyon Dam travels north, east and south over large transmission lines. Contrary to popular belief, energy from Glen Canyon Dam does not go to Los Angeles. Nor does it go to Las Vegas. Only in emergencies does it reach any of the region's largest cities, such as Phoenix, Salt Lake City or Denver. The power, instead, is sold to hundreds of medium and small cities and towns in Arizona, Colorado, Utah, Wyoming, New Mexico and Nebraska. To keep transmission losses to a minimum, transformers increase power from 13,800 volts at the generator to as much as 345,000 volts. The main transmission lines leading from the dam are made of aluminum strands bound together in 1-inch-diameter bundles.

All hydroelectric power produced by CRSP generating units is dispatched from the Power Operations Center in Montrose, Colorado. There, dispatchers and schedulers meet the power demands of contracted customers. Complex on-line computers scan the performance of each generator every six seconds. Signals and commands are sent over an elaborate microwave system linking Glen Canyon and the other CRSP storage units to the Power Operations Center.

In the summer months, much of the electricity is sent south to run air conditioners and pump water for irrigation. In the winter much of it goes north, where it helps supply heating loads.

From 1964 through December 1988, electricity generated at Glen Canyon Dam amounted to 108.3 billion kilowatt hours and was sold for $787,000,000.

Administration

Glen Canyon Dam and Powerplant, and Lake Powell, are operated and administered by the Interior Department's Bureau of Reclamation. For information, contact the CRSP Power Operations Office at the Glen Canyon Powerplant, P.O. Box 1477, Page, Arizona 86040, telephone (602) 645-2481.

Recreation on Lake Powell and within the Glen Canyon National Recreation Area is administered by the Interior Department's National Park Service. For more information, contact the Superintendent, Glen Canyon National Recreation Area, P.O. Box 1507, Page, Arizona 86040, or call (602) 645-2471.

Tour of Glen Canyon Dam and Powerplant

The Bureau of Reclamation encourages visitors to take the free self-guided tour of the dam and powerplant. The tour usually takes about 30 to 45 minutes to complete, but you may proceed at your own pace. A tour guide booklet is available at the Carl Hayden Visitor Center to make your visit more enjoyable. During the summer, guided tours are available on a scheduled basis.

Films and Video Tapes

Films and video tapes on Glen Canyon Dam and Lake Powell are available free upon request. They vary in length from 15 to 28 minutes. Contact the Bureau of Reclamation, Office of Public Affairs, PO Box 11568, Salt Lake City, Utah 84147, or call (801) 524-5403.

Regulations and Safety

Always check with State, U.S. Coast Guard, and National Park Service representatives for current information on boating and safety regulations within the Glen Canyon National Recreation Area which includes Lake Powell.

Shoreline Dangers

Some of the shoreline around Lake Powell is loose and can slip and fall. Before you approach too close in your boat, look for these danger signals:

1. Highly broken rock cliff containing loose boulders.
2. A steep sand "cliff" that could crumble at any time.
3. Fresh scars on rocky slopes where more rock could fall.
4. High waterline obscured by fallen rock.
5. Pea-green or brownish water stirred up by falling rock or sand.

Dangerous sections of Lake Powell's shoreline are too numerous to mark and can appear quickly after a change in the water level or after rainy weather.

Watch for them.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration

PF101A
PAUC50M0283