BUREAU OF RECLAMATION

Shasta Division

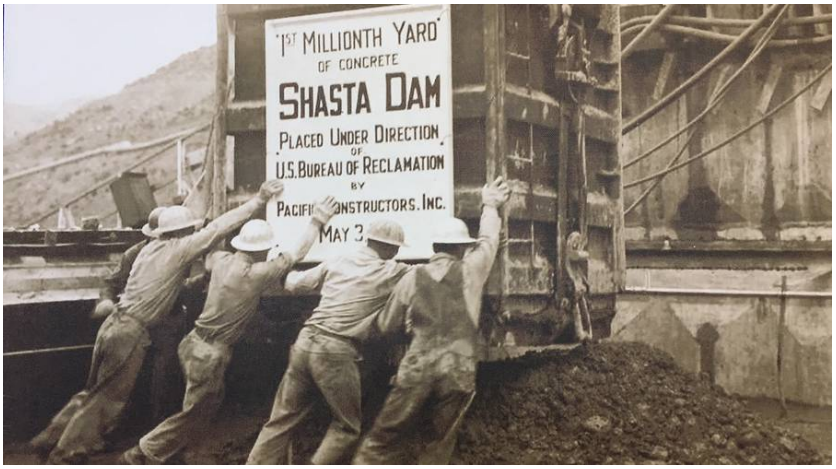
Shasta Dam is located about nine miles northwest of Redding, California, on the Sacramento River. Built during the seven-year period between 1938 and 1945, the dam is a 602-foot-high concrete gravity dam, which provides flood control, power, and water supply benefits. The reservoir is also used extensively for recreation. Shasta Dam and Shasta Reservoir are key facilities in the Central Valley Project (CVP). The water stored in the reservoir represents about 41 percent of the stored water in the CVP.

Shasta Reservoir is fed by the Sacramento, Pit, and McCloud rivers, with additional water coming from Squaw Creek. This drainage area receives an average of 62 inches of annual precipitation, which in pre-dam years was a major contributor to frequent floods in the valley below. With the construction of Shasta Dam, the river flows have been regulated and water stored. Water is used for irrigation, municipal and industrial needs, salinity control for the Sacramento-San Joaquin Delta, and to meet environmental needs. Water released to the river is sent through the Shasta Powerplant, which produces hydroelectric power for the 15-state western power grid.

Some Details about Shasta Dam

- Height of structure - 602 feet (138.5 meters)
- Mass concrete - 6,541,000 cubic yards (5,001,000 cubic meters)
- Length of crest - 3,460 feet (1,054.6 meters)
- Thickness (base with spillway apron) - 883 feet (269.1 meters)
- Thickness at crest - 30 feet (9.1 meters)
- Downstream face of dam - 31 acres in area (12.5 hectares)
- Weight of dam - 5 million tons (13,607,771.1 metric tons)
- Historical cost - $121,000,000

Construction



Initial construction on Shasta Dam began in 1938 with excavation and the relocation of the Southern Pacific Railroad that ran through the dam site. A tunnel was blasted through the nearby hillside to detour the train, moving the line away from the excavation work.

Along the Sacramento River in Redding, aggregate was being gathered and sent to stockpiles near the dam site by way of a 9.6-mile-long conveyor belt - the longest of its type in the world. The conveyor belt delivered tons of gravel that would be used in the concrete mix to build the dam.

With excavation complete, construction on the dam could begin. Freshly mixed concrete was delivered to waiting forms, 50 by 50 feet and five feet deep, using eight-cubic yard steel buckets suspended from a cableway system used to efficiently move huge amounts of concrete to waiting crews.

These massive blocks were placed one on top of another, first to form the abutments, and finally finishing the dam by completing the spillway. As the abutments rose, crews were busy building the permanent relocation track for the Southern Pacific Railroad, above where the new reservoir would be formed. When this track was completed, the train was moved to its new home high above the river and spillway construction began.

To allow workers to start excavation in the river channel for the spillway, an earthen coffer dam was built across the river upstream of the dam site, causing the river to rise and find the now empty railroad tunnel. The river now flowed past the dam site through the tunnel, just as the train had years before. With the river successfully diverted and excavation complete, construction of the spillway began.

The spillway construction included installing 18 river valves placed at three different elevations. Once installed, the river could rise and flow through the lower of these valves, returning the river to its original course. Eventually, the reservoir rose high enough to send water through two of the five generators installed in the newly constructed powerplant at the base of the dam. The electricity proved a valuable World War II necessity as it was sent south to shipyards and other defense operations.

Because of the hard work and determination of many, this massive dam was completed in 1945, 22 months ahead of the original schedule - an amazing feat when you think of the challenges they faced to finish the job.

What Went Into Shasta Dam

- Aggregate (gravel, sand) - 11,975,000 tons (10,863,500 metric tons)
- Cement - 1,270,414 tons (1,152,500 metric tons)
- Piping and conduit - 4,000 tons (3,600 metric tons)
- Cooling pipe - 1,348 miles (2,169 kilometers)
- Steel - 28,000 tons (25,400 metric tons)

Shasta Powerplant

Shasta Powerplant is located at the base of the dam and helps managers maximize the benefit of water stored in Shasta Reservoir. Water released to meet downstream commitments pass through the generators causing them to spin, generating clean hydroelectric power for distribution to the western U.S. power grid. Power generation at Shasta Dam is very closely tied to water demand: as the reservoir water is called upon to meet water needs downstream, it is sent through generators for power production. Power generated is then available to meet project demands (to operate pumping plants, etc.) as well as other power demands. Sale of generated power at the Shasta Powerplant is managed by the Department of Energy's Western Area Power Administration to preference customers such as federal and state agencies, cities and towns, rural electric cooperatives, public utility districts, irrigation districts and Native American tribes, meeting the needs of consumers in the western United States. The sale of this electricity produces more than $50 million dollars in revenue annually to the federal government.

Shasta Reservoir

Shasta Reservoir contains 4.5 million acre-feet of water when full, making it the largest reservoir in California. With 365 miles of shoreline and 30,000 surface acres, Shasta Reservoir is a prime location for water recreation and camping. These recreational opportunities bring millions of dollars into the local economy annually.

Roughly 90 % of the water stored in the reservoir is from rainfall. The region's winter rains generally fill the reservoir close to capacity each spring, providing the water necessary to meet the needs of the busy summer months. As water is sent downstream during the summer, the reservoir level will lower, leaving ample room for flood control during the winter months. During dry years the surplus storage in Shasta reservoir is vitally important. Shasta Reservoir surplus provides water that helps meet obligations normally met by annual rainfall.

Keswick Dam

Keswick Dam is a 157-foot-high concrete gravity dam, with a crest length of 1,046 feet, constructed nine miles downstream from Shasta Dam on the Sacramento River. Keswick Dam acts as an afterbay dam controlling river fluctuations from the Shasta Powerplant. Water released from Shasta Dam downstream to the Keswick Reservoir is stored for release through Keswick Dam and Powerplant. With steady releases from Keswick Dam, managers can regulate the flows of the Sacramento River downstream. Keswick Power Plant has three generators with a rated capacity of 105 megawatts.

A fish-trapping facility at Keswick Dam traps Chinook salmon and steelhead as they migrate upstream. The endangered winter-run Chinook salmon are transported to the Livingston Stone National Fish Hatchery below Shasta Dam for spawning. Other runs of Chinook salmon and steelhead are transported to the Coleman National Fish Hatchery, located east of Anderson, California.

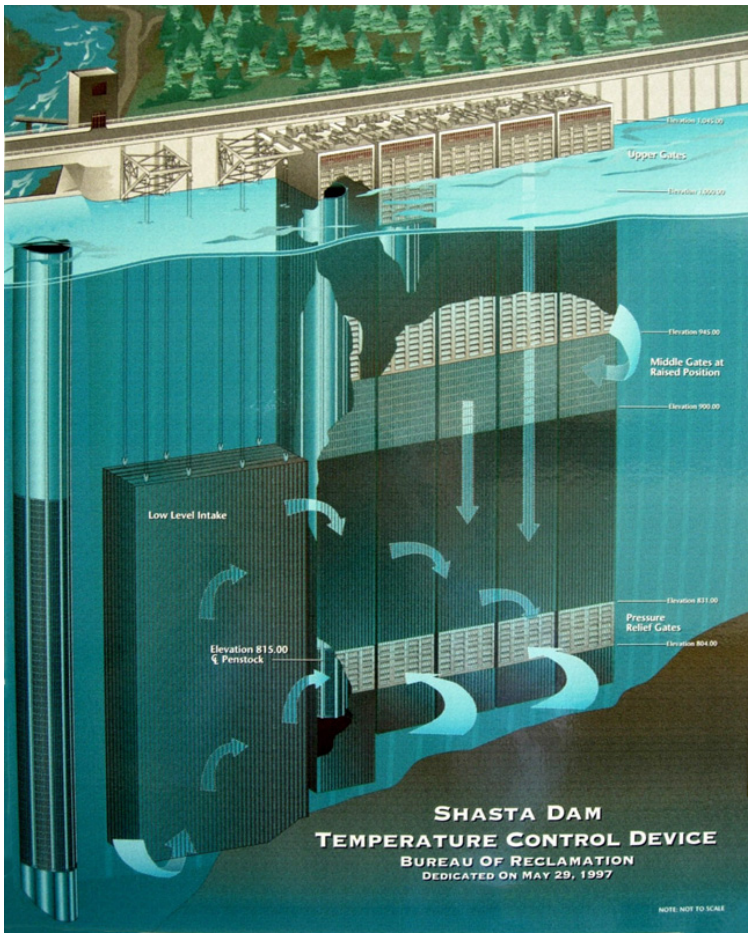
Some Facts about Keswick Dam

- Concrete gravity dam with earth-embankment wings
- Height of structure - 157 feet (47.8 meters)
- Length of crest - 1,046 feet (318.8 meters)
- Thickness at crest - 20 feet (6.1 meters)
- Concrete volume - 214,000 cubic yards (163,614.7 cubic yards)
- Reservoir capacity - 23,800 acre-feet (29,357,300 cubic meters)
- Maximum depth - 118 feet (35.97 meters)

Temperature Control Device

With the completion of Shasta Dam in 1945, the natural migration of Chinook salmon and steelhead on the Sacramento River was blocked. This, coupled with earlier mining, logging, and fishing operations along the river, has caused the numbers of all salmon and steelhead runs on the river to decline.

With the endangered species listing of the winter-run Chinook salmon, Reclamation and other federal and state agencies started looking at ways to protect this species. One of the things determined was that by providing colder water for optimal spawning, the Chinook salmon will have a better chance at survival. This was to be part of a bigger project to provide sustainable spawning habitat downstream of Shasta Dam. The idea was to mimic the upstream environment that the salmon could no longer reach.



Regulations were put in place to protect habitat from mining, logging, and fishing operation; and, a plan was devised to add spawning gravel to the river, as well as design and build a selective intake structure for Shasta Dam, to ensure the availability of cold water.

With the building of the Temperature Control Device, operators at Shasta Dam are now able to selectively withdraw water from a range of depths, including the deeper, colder water, sending it through the power plant generators, maximizing power generation, while at the same time meeting water commitments and environmental needs for the fisheries downstream.

Livingston Stone National Fish Hatchery

Located just downstream of Shasta Dam is the Livingston Stone National Fish Hatchery, operated by the U.S. Fish and Wildlife Service. The hatchery, opened in February 1998, is operated as a winter-run Chinook salmon spawning and rearing facility. With the winter-run Chinook salmon on the endangered species list, officials within Reclamation, the U.S. Fish and Wildlife Service, and other concerned parties assisted in getting the hatchery designed, built, and ready for business in just five short months.

As the fish migrate upstream for spawning, they are caught at Keswick Dam and transported to the hatchery for spawning. Spawning efforts include genetic testing to guarantee species identification. Fish raised at the hatchery are released back into the Sacramento River.

In 2006, the Livingston Stone National Fish Hatchery was chosen as one of only two facilities in the world tasked with raising the Delta smelt, also threatened, for a backup or refuge population should the fish become extinct in the wild.