= Oroville Dam =

Oroville Dam is an earthfill embankment dam on the Feather River east of the city of Oroville , California in the United States . At 770 feet (230 m) high , it is the tallest dam in the U.S. and serves mainly for water supply , hydroelectricity generation and flood control . The dam impounds Lake Oroville , the second largest man @-@ made lake in the state of California , capable of storing more than 3 @.@ 5 million acre @-@ feet (4 @.@ 4 km3) , and is located in the Sierra Nevada foothills east of the Sacramento Valley .

Built by the California Department of Water Resources (DWR) , Oroville Dam is one of the key features of the California State Water Project (SWP) , one of two major projects passed that set up California 's statewide water system . Construction was initiated in 1961 , and despite numerous difficulties encountered during its construction , including multiple floods and a major train wreck on the rail line used to transport materials to the dam site , the embankment was topped out in 1967 and the entire project was ready for use in 1968 . The dam began to generate electricity after completion of the Edward Hyatt Pump @-@ Generating Plant , then the country 's largest underground power station .

Since its completion in 1968 , the Oroville Dam has allocated the flow of the Feather River from the Sacramento @-@ San Joaquin Delta into the State Water Project 's California Aqueduct , which provides a major supply of water for irrigation in the San Joaquin Valley as well as municipal and industrial water supplies to coastal Southern California , and has prevented large amounts of flood damage to the area ? more than $ 1 @.@ 3 billion between the years of 1987 and 1999 . The dam has confined fish migration up the Feather River and the controlled flow of the river as a result of the Oroville Dam has affected riparian habitat . Multiple aims at trying to counter the dam 's impacts on anadromous fish have included the construction of a salmon / steelhead incubator on the river which began shortly after the dam was completed .

= = History = =

In 1935 , work began on the Central Valley Project (CVP) , a federal water project that would develop the Sacramento and San Joaquin river systems for irrigation of the highly fertile Central Valley . However , after the end of World War II in 1945 , the state experienced an economic boom that led to rapid urban and commercial growth in the central and southern portions of the state , and it became clear that California 's economy could not depend solely on a state water system geared primarily towards agriculture . A new study of California 's water supplies by the Division of Water Resources (now California Department of Water Resources , DWR) was carried out under an act of the California State Legislature in 1945 .

In 1951 , California State Engineer A.D. Edmonston proposed the Feather River Project , the direct predecessor to the SWP , which included a major dam on the Feather River at Oroville , and aqueducts and pumping plants to transfer stored water to destinations in central and southern California . The proposed project was strongly opposed by voters in Northern California and parts of Southern California that received water from the Colorado River , but was supported by other Southern Californians and San Joaquin Valley farmers . However , major flooding in the 1950s prompted the 1957 passage of an emergency flood @-@ control bill that provided sufficient funding for construction for a dam at Oroville , whether it would be part of the SWP or not . Groundbreaking on the dam site occurred in May 1957 with the relocation of the Western Pacific Railroad tracks that ran through the Feather River canyon . The Burns @-@ Porter Act , which authorized the SWP , was not passed until November 8 , 1960 ? and only by a slim margin . Engineer Donald Thayer of the DWR was commissioned to design and head construction of Oroville Dam , and the primary work contract was awarded to Oro Dam Constructors Inc . , a joint venture led by Oman Construction Co .

Two concrete @-@ lined diversion tunnels , each 4 @,@ 400 feet (1 @,@ 300 m) long and 35 feet (11 m) in diameter , were excavated to channel the Feather River around the dam site . One of the tunnels was located at river level and would carry normal water flows , while the second one

would only be used during floods . In May 1963 , workers poured the last of 252 @,@ 000 cubic yards (193 @,@ 000 m3) of concrete that comprised the 128 @-@ foot (39 m) high cofferdam , which would protect the construction site from floods . This structure would later serve as an impervious core for the completed dam . With the cofferdam in place , an 11 @-@ mile (18 km) rail line was constructed to move earth and rock to the dam site . An average of 120 train cars ran along the line each hour , transporting fill that was mainly excavated from enormous piles of hydraulic mining debris that were washed down by the Feather River after the California Gold Rush .

On December 22 , 1964 , disaster nearly struck when the Feather River , after days of heavy rain , reached a peak flow of 250 @,@ 000 cubic feet per second (7 @,@ 100 m3 / s) above the Oroville Dam site . The water rose behind the partially completed embankment dam and nearly overtopped it , while a maximum of 157 @,@ 000 cubic feet per second (4 @,@ 400 m3 / s) poured from the diversion tunnels . This Christmas flood of 1964 was one of the most disastrous floods on record in Northern California , but the incomplete dam was able to reduce the peak flow of the Feather River by nearly 40 percent , averting massive amounts of damage to the area . Ten months later , four men died in a tragic accident on the construction rail line . On October 7 , 1965 , two 40 @-@ car work trains , one fully loaded and the other empty , collided head @-@ on at a tunnel entrance , igniting 10 @,@ 000 US gallons (38 @,@ 000 l) of diesel fuel , completely destroying the two locomotives . The burning fuel from the collision started a forest fire that burned 100 acres (40 ha) before it could be extinguished . The crash delayed construction of the Dam by a week while the train wreckage was cleared .

Oroville Dam was designed to withstand the strongest possible earthquake for the region , and was fitted with hundreds of instruments that serve to measure water pressure and settlement of the earth fill used in its construction , earning it the nickname " the dam that talks back " . (It is believed that a MW 5 @.@ 7 earthquake in the Oroville area in 1975 was caused by induced seismicity from the weight of the Oroville Dam and reservoir itself on a local fault line .) The embankment was finally topped out on October 6 , 1967 , with the last of 155 million tons (140 @.@ 6 million t) of material that took over 40 @,@ 000 train trips to transport . On May 4 , 1968 Oroville Dam was officially dedicated by the state of California . Among the notable figures present were Chief Justice (formerly California governor) Earl Warren , Senator Thomas Kuchel , and California Representative Harold T. " Bizz " Johnson . The dedication was accompanied by a week of festivities in nearby Oroville , attended by nearly 50 @,@ 000 people .

= = Operations = =

Construction of the underground Edward Hyatt Pump @-@ Generating Plant was finished shortly after the completion of Oroville Dam . At the time , it was the largest underground power station in the United States , with three 132 megawatt (MW) conventional turbines and three 141 MW pump @-@ generators for a total installed capacity of 819 MW . The Hyatt Powerplant is capable of pumping water back into Lake Oroville when surplus power is available . The pump @-@ generators at Hyatt can lift up to 5 @,@ 610 cubic feet per second (159 m3 / s) into Lake Oroville (with a net consumption of 519 MW) , while the six turbines combined utilize a flow of 16 @,@ 950 cubic feet per second (480 m3 / s) at maximum generation .

Since 1969 , the Hyatt plant has worked in tandem with an extensive pumped @-@ storage operation comprising two offstream reservoirs west of Oroville . These two facilities are collectively known as the Oroville @-@ Thermalito Complex . Water is diverted into the upper Thermalito reservoir (Thermalito Forebay) via the Thermalito Diversion Dam on the Feather River . During periods of off @-@ peak power use , surplus energy generated at Hyatt is used to lift water from Thermalito 's lower reservoir (the Thermalito Afterbay) to the forebay , which releases water back into the afterbay to generate up to 114 MW of power at times of high demand . The Hyatt and Thermalito plants produce an average of 2 @.@ 2 billion kilowatt hours (KWh) of electricity each year , about half of the total power produced by the SWP 's eight hydroelectric facilities .

Water released from Oroville Dam travels down the Feather River before joining with the Sacramento River , eventually reaching the Sacramento @-@ San Joaquin Delta , where the SWP

's California Aqueduct diverts the freshwater for transport to the arid San Joaquin Valley and Southern California . Oroville @-@ Thermalito hydroelectric facilities furnish about one @-@ third of the power necessary to drive the pumps that lift the water in the aqueduct from the delta into the valley , and then from the valley over the Tehachapi Mountains into coastal southern California . Water and power from the dam contributes to the irrigation of 755 @,@ 000 acres (306 @,@ 000 ha) in the arid San Joaquin Valley Westside and municipal supplies to some 25 million people .

During the winter and early spring , Lake Oroville is required to have at least 750 @,@ 000 acre feet (0 @.@ 93 km3) , or a fifth of the reservoir 's storage capacity , available for flood control . The dam is operated to maintain an objective flood @-@ control release of 150 @,@ 000 cubic feet per second (4 @,@ 200 m3 / s) , which may be further reduced during large storms when flows below the Feather 's confluence with the Yuba River exceed 300 @,@ 000 cubic feet per second (8 @,@ 500 m3 / s) . In the particularly devastating flood of 1997 inflows to the reservoir hit more than 331 @,@ 000 cubic feet per second (9 @,@ 400 m3 / s) , but dam operators managed to limit the outflow to 160 @,@ 000 cubic feet per second (4 @,@ 500 m3 / s) , sparing large regions of the Sacramento Valley from flooding .

Oroville Dam completely blocks migrations of Chinook salmon and steelhead in the Feather River . In 1967 , in an effort to compensate for lost habitat , the DWR and the California Department of Fish and Game completed the Feather River Fish Hatchery . The Fish Barrier Dam , built in 1962 , intercepts fish before they reach the base of the impassable Thermalito Diversion Dam and forces them to swim up a fish ladder to the hatchery , which is located on the north bank of the Feather River . The hatchery produces 10 million salmon smolt to stock in the river each year , with 20 % for the spring run and 80 % for the fall run . This facility has been successful enough that there is concern that salmon of hatchery stock is out @-@ competing remaining wild salmon in the Feather River system .