

Oroville Dam: Part of Our Community

Oroville Dam contributes to public safety, supports wildlife habitat, stores water supplies and offers recreation opportunities.

How does the Department of Water Resources use the Oroville Dam to manage water for the region and the state?

LEARN HOW!





1957



1963



1964

Safety for the Region

BY MATT JOCKS

How the construction of the Oroville Dam brought safety to the region

On a nice sunny day at Lake Oroville, a fisherman waits patiently for his catch. More than an hour away in the farmland of Sutter County, growers are irrigating their crops. Though separated by miles, each of these California residents are served by the water stored by the Oroville Dam.

Before the dam was constructed more than 50 years ago, the Feather River basin had experienced severe flooding many times. A devastating flood in 1909 wiped out ranches and homes; an even bigger flood in 1955 caused multiple deaths and significant destruction. Not long after the 1955 floods public officials called for action, and planning for the construction of the Oroville Dam began.

At 770 feet, Oroville Dam is the tallest dam in the United States. The dam's primary function is flood management. In fact, the dam was already on the job in 1964, four years before it was fully constructed, when the partially completed dam limited damage to downstream communities from the site during heavy storms.

As those who've built their lives in the region know, especially those with deep family roots in the community, the benefits of the Oroville Dam complex don't stop at recreational activities or protecting homes and families from rising waters; the dam also brings economic stability.

Steve Kroeger, retired city manager of Yuba City, has been part of the community for 25 years. He knows the prosperity of

the region is tied directly to the water and safety that the dam provides.

"We benefit from being an agricultural community," he said. "When the economy turns down, we stay more stable here because of the world's reliance on California's fruits, nuts and vegetables."

Sunsweet, a family of farmers who grow and sell dried prunes, is a perfect example of the dam's influence. Shortly after the dam was completed, the company moved its international operations from the Santa Clara Valley to Yuba City. The area's high-quality water made it an attractive location for the company's plant as Sunsweet looked to diversify into its now-successful offering of bottled drinks. Today, the company employs more than 700 people in the area.

"A lot of times people take [water quality] for granted," Kroeger said. "All you have to do is live in a community where water quality isn't good and you quickly have an appreciation for high-quality surface water."

The dam and its surrounding community were tested in early 2017, when concerns about the integrity of Oroville Dam's emergency spillway resulted in Butte County Sheriff

"When the economy turns down, we stay more stable here."

STEVE KROEGER
*Retired city manager,
Yuba City*



1968

Workers during the Oroville Dam's initial construction, from its groundbreaking in 1957 to its completion in 1968.

PHOTOS COURTESY OF THE DEPARTMENT OF WATER RESOURCES

Kory Honea calling for evacuations of downstream residents. Thankfully, the worst-case scenarios did not come to fruition, and public agencies have made substantial investments in the Oroville Dam facilities and emergency response procedures.

"We dodged a bullet," Kroeger said. "Now, we get the benefit of having the positive that comes out of a scare without experiencing the negative."

As the state looks to a future where weather conditions will become even more volatile, planning and preparing for emergencies becomes even more important.

"It is a totally different equation out there when it comes to climate," Kroeger said. "Without the reliability of the Oroville Dam holding that water back, I believe we would be subject to more high-water flows throughout our community, which puts a community at risk."

Stewards of California's Water

How the Oroville Dam and the State Water Project impact the rest of the state

BY MATT JOCKS

In a state where the same road trip can include big cities, rural communities, farmlands, mountains and deserts, there is one element that these diverse places have in common: water. And while some places in California must periodically deal with too much water (floods), others often have far too little (droughts and groundwater overdraft).

Negotiating the path with this variability is a massive job, managed in part by the Department of Water Resource's California State Water Project (SWP). The largest system of its kind in the United States, the SWP is a 700-mile network of reservoirs, aqueducts, power plants and pumping plants. It delivers water to more than 28 million people, produces clean hydropower for the state's energy grid and irrigates about 750,000 acres of farmland.

In many ways, the cornerstone of the SWP is the Oroville Dam, which manages the water that flows to communities, farms and ecosystems downstream of the Feather River Basin.

"Oroville Reservoir is where our water supply really begins," said Ted Craddock, acting Deputy Director of the SWP.

Craddock explained the system is not just about flood management and water supply, but also general water resources management. The SWP always strategizes with the future in mind as communities across California continue to swing between possible droughts and floods.

"When we look at that water," Craddock said, "we're always looking at the future, planning for droughts and sustainability of the state's water resources."

Oroville Reservoir is front and center in the long-term picture.

"Oroville Dam and the entire State Water Project are vital to California's economy and quality of life," Craddock said. "And water stored in Oroville is also a critical component of drought resiliency plans for agencies who depend on its water in other parts of the state."

Here is a look at how the SWP uses its network, including the Oroville Dam, to effectively manage water in California:

"Oroville Reservoir is where our water supply really begins."

TED CRADDOCK
Acting deputy director, California State Water Project

FLOOD MANAGEMENT

Reservoirs created by dams help store millions of acre-feet of water that comes from rain and melting snow. Many communities where dams are located would flood many years without them.

ENVIRONMENT

Water management helps natural environments. The SWP has instituted near- and long-term strategies to provide environmental flows to restore habitats, protect endangered species, maintain temperature and water quality control, limit salinity intrusion into the Delta and to study the potential impacts of climate change on water resources sustainability and water deliveries. Dams in the SWP provide a vital habitat for a variety of species.

CLEAN ENERGY

Hydroelectric power is produced by SWP dams to operate pumping stations and transport water throughout the state. Oroville Dam produces this kind of power and manages water releases through three plants. Excess power generation provides even more clean energy to the state's supply. The SWP generates about 6 billion kilowatt-hours a year through its nine hydroelectric dams statewide, making it the fourth largest producer of clean energy in the U.S.

WATER STORAGE

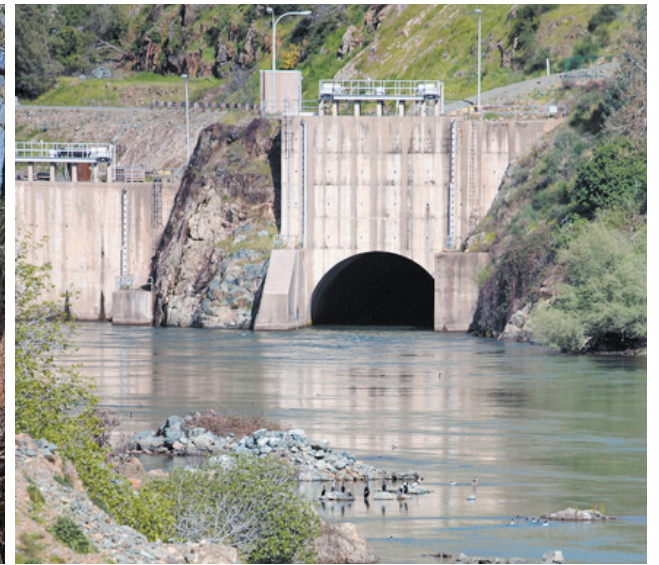
Having access to water when needed is an important part of California's water resources management strategy. The SWP's 36 water storage facilities can store roughly 5.7 million acre-feet of water to serve communities, farmers and ecosystems. Lake Oroville, with 3.53 million acre-feet of storage, is the largest reservoir in the SWP and the second largest reservoir in the state.

RECREATION

Many facilities in the SWP system provide a multitude of recreational opportunities both on and offshore, including destinations like Lake Oroville's Feather Falls. Providing access to the beautiful outdoors enriches local communities and attracts tourist dollars. Through an agreement with DWR, the Lake Oroville State Recreation Area is operated by the California Department of Parks and Recreation.

The Feather River Basin, which drains water from the northern Sierra Nevada into the Sacramento Valley.





PHOTOS COURTESY OF THE DEPARTMENT OF WATER RESOURCES

Lake Oroville: Destination Beautiful

BY HOWARD HARDEE

Every person and creature benefits from protecting California's water

Oroville Dam benefits the surrounding communities in more ways than just water storage and flood management. From boundless recreational opportunities and spectacular scenery to responsible energy practices, here are just a few of the ways Oroville Dam enhances the integrity of the region:

ACTIVITIES

There is an abundance of recreational opportunities available in and around Lake Oroville. It's a great place for traditional pastimes such as boating, houseboating, water skiing, sailing, fishing, hunting and camping — as well as a go-to place for more unique experiences, like staying on a floating campsite. A network of trails totaling more than 75 miles circles the lake and includes facilities for hikers, equestrians and mountain bikers. The Lake Oroville Visitor Center is the best resource to start planning any adventure.

WILDLIFE

An incredible amount of nature is protected around the Oroville Dam. Lake Oroville and its neighboring facilities are home to seven nesting pairs of bald eagles, while its surrounding areas serve as their habitat for roosting and breeding. There are also 600 vernal pools in the area, unique wetlands where rare plants and endangered species can be found such as fairy and tadpole shrimp. Hundreds of acres of pine tree-covered foothills surround the lake, making it an ideal hideout for threatened species like giant garter snakes. Hikers who come across valley elderberry shrubs should pause to look closely for the endangered valley elderberry longhorn beetle hidden amongst its leaves.

One of the most ecologically precious features of Lake Oroville is the 11,800-acre Oroville Wildlife Area. The area is mostly comprised of riparian woodland habitat along the Feather River and grasslands around the Thermalito Afterbay, and is inhabited by dozens of species of wildlife.

The California Department of Water Resources (DWR) and the California Department of Fish and Wildlife work together

to operate the Feather River Fish Hatchery, located just below Lake Oroville. As one of the most successful hatcheries on the West Coast, the facility produces more than 9 million Chinook salmon and 450,000 steelhead annually, contributing to the multimillion dollar commercial and sportfishing industries and the perpetuation of California's coastal fish populations.

SUSTAINABILITY

DWR operates the State Water Project (SWP), which is committed to reducing its carbon footprint. The SWP has a power portfolio consisting of 65 percent carbon-free resources, with a goal of going 100 percent carbon-free by 2045. Three facilities at Lake Oroville — the Hyatt Powerplant, the Thermalito Diversion Dam Powerplant and the Ronald B. Robie Thermalito Pumping-Generating Plant — generate about 2.2 billion kilowatt hours (kWh) of renewable energy in a median water year. This power helps the state avoid burning roughly 189,000 tons of fossil fuel. In total, the SWP is the fourth largest producer of energy in the United States.



THE HISTORY OF FLOODING

The Feather River Basin has always been prone to flooding. The Oroville Dam and its facilities protect downstream communities by helping to manage rising waters, even if levees eventually become breached. Here are some notable events when the dam has stood up to natural waters, mitigating loss of life and property:

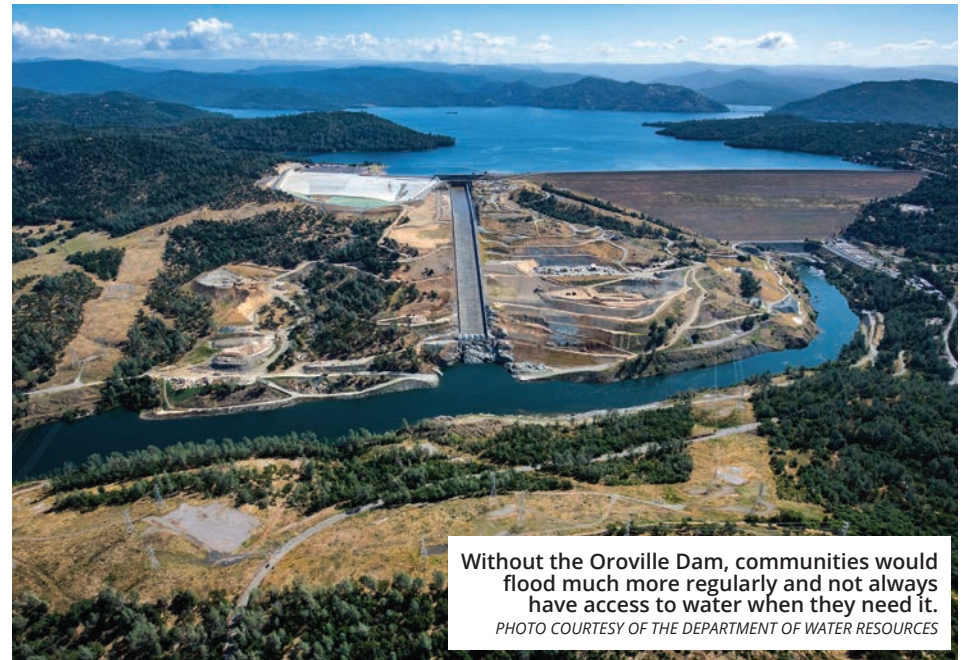
1955, December

Before construction began on the dam in 1957, roughly 40,000 residents were forced to evacuate on Christmas Eve when the Feather River burst through a levee in Sutter County. Ninety percent of Yuba City was flooded, 38 people drowned and 600 others were stranded.

How Water Is Released from the Reservoir

BY HOWARD HARDEE

Coordination and analytics play a critical role in managing water control at Oroville Dam



Without the Oroville Dam, communities would flood much more regularly and not always have access to water when they need it.
PHOTO COURTESY OF THE DEPARTMENT OF WATER RESOURCES

A lot goes into making the State Water Project (SWP) operate smoothly. The California Department of Water Resources (DWR), which operates and maintains the SWP, must react appropriately to changing conditions — such as the state of the snowpack in the Sierra Nevada, expected natural runoff, releases from upstream facilities, weather forecasts, water supply demands, downstream flow and water quality and water supply requirements. Any of these factors can impact how much water is stored behind the Oroville Dam, and when and how much of it gets released.

One of the people weighing in on these decisions is Molly White. As lead manager of water operations for the SWP, her duties are broad in scope and have a tangible impact: White is responsible for the planning and monitoring of water movement from Lake Oroville in the north to Lake Perris in southern California, all while maintaining public safety through flood control releases, complying with environmental regulations and maximizing the supply of water heading downstream.

“The dam provides many benefits to the community.”

MOLLY WHITE
*Lead manager of water operations,
California State Water Project*



“Working in real-time operations is exciting and changing from day to day,” White said. “While this can be challenging, it presents opportunities. I play a part in providing for public safety and water supply planning for more than 27 million Californians and 750,000 acres of farmland.”

Decisions are well-informed. White and her colleagues use real-time data to adjust short- and long-term plans for the reservoir as forecasted weather conditions change hour by hour. Throughout the year, her team coordinates with a host of local, state and federal agencies — such as the National Weather Service, the U.S. Army Corps of Engineers, and other reservoir operators like Yuba Water Agency and the U.S. Bureau of Reclamation — to make forecast-informed decisions to ensure downstream releases are coordinated, which is an important factor in public safety, water supply and meeting downstream environmental regulations. The coordination between these agencies has become a model for dam operators throughout the state.

Following a wet winter like the one of 2018-19, throughout the summer, Lake Oroville has remained above historical average capacity, thanks to a higher-than-average snowpack in the Sierra Nevada mountains above the Feather River watershed. Those conditions are great for the state’s water supply — especially on the tail end of a historic drought. As water is released throughout the summer, this makes room in the reservoir for inflows during the winter months, allowing it to act as a flood buffer.

To release water into the Feather River, DWR relies primarily on the Hyatt Pumping-Generating Plant, located at the base of the 770-foot-tall Oroville Dam. In addition to Hyatt, releases can also be made through the main spillway. Following the recent reconstruction of the dam’s spillways, DWR coordinated its flood control operations with the U.S. Army Corps of Engineers, Division of Safety of Dams and the Federal Energy Regulatory Commission.

White said that decisions about DWR’s dam operations are made with the public safety as the top priority.

“The dam provides many benefits to the community,” White said. “Not only does it provide public safety for the downstream communities, it provides great recreational opportunities during the summer months, especially in a wet year like this one.”

1986, February

Unprecedented storms brought the heaviest 24-hour rainfall ever recorded in the Central Valley, and 17.6 inches of water to Four Trees in the Feather River Basin. The storms cost \$400 million damages even with the dam and water management systems in place.

1997, January

More than 70,000 residents were safely evacuated from Marysville and Yuba City when levees were breached by the flooding Feather River. The city of Oroville was also evacuated as Lake Oroville came close to capacity and set a new inflow record during the same storm.

Did you know?

*Oroville Dam’s main spillway has been used to safely release water from Lake Oroville **26 of the 50 years** since the dam was finished in 1969, preventing catastrophic flooding and damages.*

Who Takes Care of — Lake — Oroville?

BY HOWARD HARDEE

Meet the people behind the maintenance of the lake's facilities and land — Oroville Field Division



Pat Whitlock and his dedicated staff at the Oroville Field Division make sure facilities are maintained, the waters are safe and wildlife is protected, among many other duties.

PHOTO BY EMILY TEAGUE

Lake Oroville is a beautiful destination, where visitors enjoy a multitude of activities both on and off the water. The team at the local California Department Water of Resources (DWR) Oroville Field Division works hard to keep it that way — and they are often undetected by locals and visitors alike.

For instance, high lake levels may be ideal for enjoying a weekend on a houseboat, but it can be an all-hands-on-deck situation for Pat Whitlock, chief of DWR's Oroville Field Division. When the lake level rises, debris that was previously high-and-dry gets picked up by the rising water and starts to float on the surface of the lake. This debris can clog the intake structure, the spillway gates at Oroville Dam, posing a danger to recreational users and emergency responders when it amasses on the lake surface.

That's why Whitlock has a crew on the lake every day during heavy debris loading periods during the spring and early summer seasons. The Field Division first uses small boats to extract heavy objects from the water in an orchestrated manner, then tows big pods of the debris behind large barges into sheltered coves.

"We relocate all that debris so it can be taken care of later in the season when the lake drops down again," Whitlock said.

The Oroville Field Division, one of five SWP field divisions throughout the state, has an unusually wide scope. Approximately 130 operations and maintenance workers, engineers, environmental scientists and staff help run the day-to-day operations, assisting with various aspects of flood

management, water supply and power generation. In addition, OFD also manages \$13 million in annual funds to support environmental protection, recreation and fish and wildlife enhancements.

The Oroville Field Division is also responsible for the operation and maintenance of all structures around Lake Oroville that provide water to local water users, as well as to the Feather River. It's up to Field Division staff to make sure generators are up and running properly around the clock at all of Lake Oroville's hydroelectric plants, which includes the Hyatt Powerplant and the Thermalito Powerplant.

Likewise, staff maintains the Thermalito Afterbay and Forebay and three upstream lakes that also feed into Lake Oroville as part of the Feather River watershed — Antelope Lake, Frenchman Reservoir and Lake Davis. The Oroville Field Division is also responsible for the Feather River Fish Hatchery.

The Oroville Field Division takes a variety of actions to protect the local environment, which supports a vast array of fish, wildlife and plant species, as well as historic and prehistoric cultural resources.

Many may be surprised to learn that Oroville Field Division funds the California Department of Fish and Wildlife at the Feather River Fish Hatchery as well as the 11,800-acre Oroville Wildlife Area. Oroville Field Division also funds multiple studies on the Feather River that benefit Chinook salmon, steelhead and green sturgeon, and Oroville Field Division staff monitor and protect the seven pairs of bald eagles that nest in the Lake Oroville area.

Many of these out-in-the-field duties can come with potential safety risks for staff, but Whitlock said DWR makes

**"It's not
just a job, it's
much more than
that."**

PAT WHITLOCK
Chief, Oroville Field Division

sure its Field Division offices are just as protected as the lands and waters they care for — no matter the task.

"We have more policies, more training and even job hazard analysis," he said. "If it is a bigger job, then a pre-work safety plan is developed."

And then there's the community side of the Oroville Field Division. Oroville Field Division partners with local and state agencies to protect the community by reducing fire risk. Oroville Field Division funds several hundred thousand dollars of fuel load reduction actions around Lake Oroville each year. Oroville Field Division staff have coordinated with CalFire and State Parks on controlled burns, cut brush and trees and have even experimented with goat grazing as a method to reduce grass and brush. In addition, Oroville Field Division participates with the community on events like the Oroville Salmon Festival, the annual Trunk or Treat kids Halloween event, the Fourth of July Fireworks Show and C.A.S.T. for Kids — a fishing event for special needs children.

Whitlock said that it's not common for a Field Division office to play a role in so many projects, but the Oroville team has taken on more responsibilities than usual for the benefit of the community. He noted that the Field Division staff live in the area too, and for them it is personal.

"It's not just a job, it's much more than that," said Whitlock. "The Oroville Field Division is important to the lake and to all of Oroville, too."

Rebuilding the Main Spillway

BY MATT JOCKS

A look at some of the recent investments into the Oroville Dam and spillways

After a succession of heavy storms in early 2017, the main spillway and the slope beneath the emergency spillway crests at Oroville Dam sustained significant damage and had to be reconstructed. The California Department of Water Resources (DWR) and its construction partners — with oversight and input from outside experts called the “Board of Consultants” — developed and used innovative solutions that were new to the dam safety and infrastructure industry.

RECONSTRUCTION COMPLETED

12.4 million pounds

of rebar used to reconstruct the main spillway (8.355 million pounds more than used in its original construction)

1.21 million cubic yards

of concrete placed on the main and emergency spillways, the equivalence of 372 Olympic-sized swimming pools

7 feet, 6 inches

average thickness of the main spillway's concrete

509,600 cubic yards

of concrete used on the main spillway, enough concrete to build a sidewalk from Oroville to Amarillo, Texas

55,000 feet

of drainage pipe installed on the main spillway, the equivalence of a 10-mile high tower if stacked vertically

178.5 feet wide and 3,055 feet long are the dimensions to the reconstructed main spillway, the equivalence in width to a 12-lane freeway

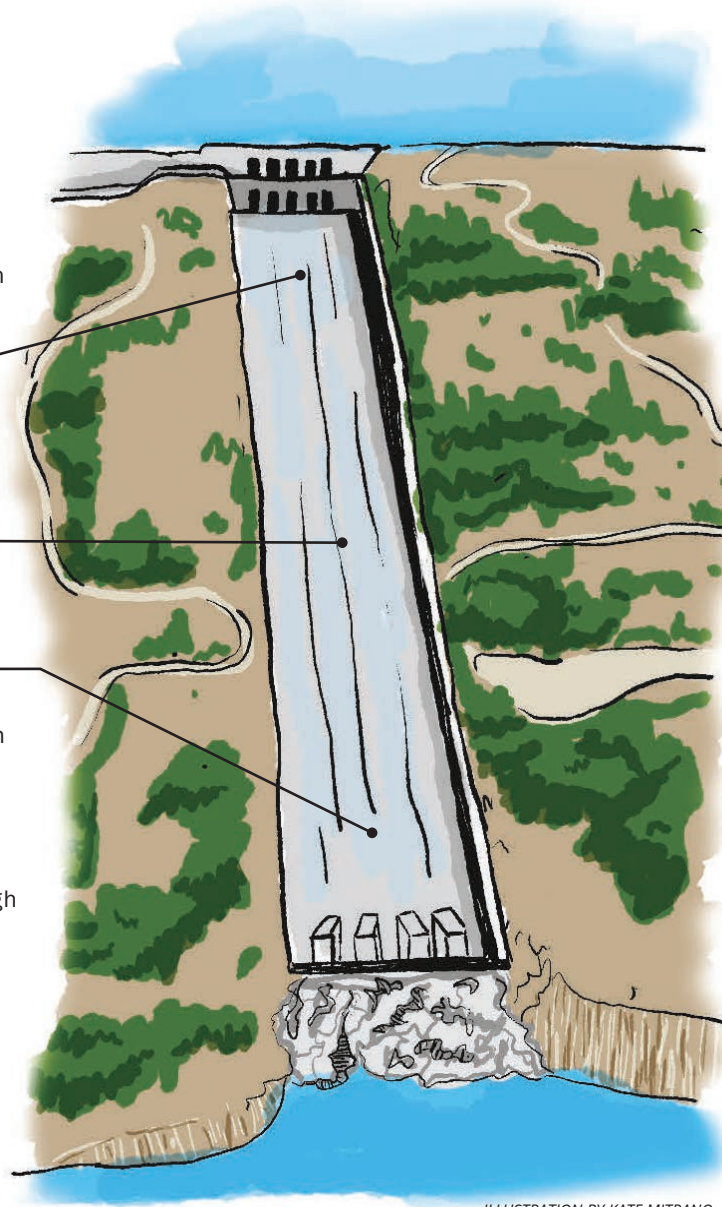


ILLUSTRATION BY KATE MITRANO

CONSTRUCTION TIMELINE

May 2017

Planning for construction of temporary main spillway begins by DWR and construction partner Kiewit

November 1, 2017

The temporary main spillway is completed by the official start of the 2017-18 rainy season

May 2018

Construction resumes to build the permanent main spillway when weather clears

October 2018

All concrete placements for the main spillway are complete

Winter of 2018-19

Finishing touches added to main spillway, including drain installation, joint sealing and backfill

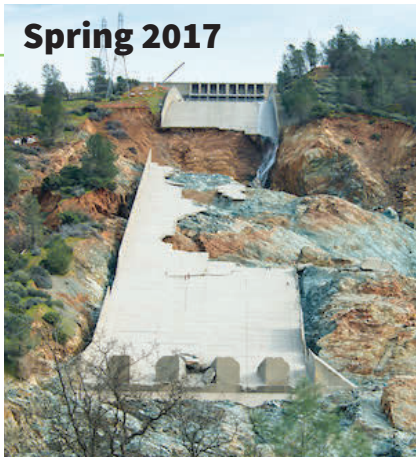
2018

Reconstruction completed for area around the main spillway and 1,450-foot cutoff wall built to protect the unlined hillside from erosion

2019

All work on emergency spillway completed

Spring 2017



Spring 2019



TIME LAPSE

Spring, 2017. After the wettest winter recorded in 100 years, damages were discovered to the main spillway and the slope beneath the emergency spillway crests. Both were temporarily closed for upgrades and reconstruction.

Spring, 2019. Thanks to the hard work and dedication of construction crews, water management agencies and public safety officers, the main spillway is ready to help manage reservoir water levels.



PHOTO BY ANNE STOKES

What's Next for Oroville Dam

John Yarbrough, principal engineer at the Department of Water Resources (DWR), gives some fast facts

LAKE WATER LEVELS

DWR's primary consideration when operating the lake is public safety, so we are always looking at how to balance the many needs and uses of the reservoir beyond water supply. This includes:

- Assessing forecasted inflows to the reservoir and ensuring that it has required space available for flood management.
- Keeping the lake levels lower during winter months so there is more room to capture rainfall from large storms.
- Increasing the reservoir level by capturing snowmelt during spring and early summer to meet water supply needs for the environment and people throughout the State and, as a consequence, provide better recreational opportunities as well.

CHANGING CLIMATE

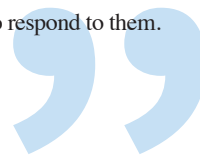
A changing climate increases uncertainty about future weather and flood management conditions. DWR is doing several things to address this uncertainty including:

- Continuously investing in weather forecasting tools and systems.
- Partnering with the Yuba Water Agency, the U.S. Army Corps of Engineers, the Bureau of Reclamation, the National Weather Service, Scripps Institute, and others to innovate new techniques to use weather forecasts to inform and coordinate reservoir operations.
- Conducting comprehensive studies of all State Water Project facilities that consider the effects of climate change, which will help identify ways to enhance the reliability of the Oroville facilities in the future.

PUBLIC SAFETY

All public infrastructure carries some amount of risk, so an emergency is possible in the future. DWR is putting a lot of effort into understanding the risks and taking action to reduce them. Here are a few examples:

- Completing a detailed risk assessment of the Oroville facilities, conducted by an independent group of experts and world-renowned safety experts.
- Completing a dam safety needs assessment for the Oroville facilities with public engagement.
- Working with local agencies to make sure they understand risks and have plans to respond to them.



BY LAURA HILLEN

Sheriff Kory Honea has been helping the California Department of Water Resources (DWR) keep the lands and waters surrounding the Oroville Dam safe since he first joined the Butte County's Sheriff's Office in 1993. However, in the past two years, Sheriff Honea has come to have even greater respect for the dam.

What role does the Oroville Dam play in the community?

Sheriff Honea: Having the tallest dam in the nation in my county brings with it risk as well as benefits; and I think that is something we should all better understand. Locally, we benefit from the agriculture and the water, and also from the flood protection.

What has changed since 2017?

SH: My fellow members of my department and I now have a much better understanding of what DWR does and a better understanding of the entire Oroville Dam complex. With that comes much closer interactions and relationships. Now we regularly work together. I have a clear pathway of communication to the highest levels of DWR; so whenever there is an issue or concern, I can reach out directly and get an answer quickly. A lot of these issues go back to having a better understanding of what it takes to operate the Oroville Dam and manage the reservoir. It is very complex; and I don't think everybody fully appreciates or understands that.

What advice do you have for other communities?

SH: It is very likely that there is a dam in your community — and if you aren't familiar with it, you should become familiar with it. If you have a better understanding of dam operations then you are in a better position to make decisions when it comes to public safety. If you work together to move past difficult or potentially tragic situations and work to build relationships, those can be the silver linings from those instances.

PHOTO COURTESY OF BUTTE COUNTY SHERIFF'S OFFICE

For more information or updates on the Oroville Dam, visit:

<https://water.ca.gov/Programs/State-Water-Project/SWP-Facilities/Oroville>