



## THE PUBLIC EYE

# Stressed dams across state often go years without repairs



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Rollins Dam on the Bear River in Nevada County has a valve that hasn't opened or shut properly since 2014. In 2016, the Nevada Irrigation District, which owns the dam, told inspectors that it was designing replacement parts. Installation was expected in November, but it's still unclear if the work was completed.

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When it comes to inspecting dams, California is second to none. A panel of national experts examined the state's Division of Safety of Dams last year and declared it tops in the field, citing inspectors' knack for flagging small problems before they turn serious.

Getting dam owners to fix those flaws quickly is another matter.

A Sacramento Bee investigation prompted by the nearly catastrophic failure of Oroville Dam's flood-control spillway in February found that owners of some of California's most important dams – those whose failure could cause residents downstream to lose their lives – often allow deficiencies to linger for years – even though these shortcomings get cited repeatedly in annual inspection reports.

Cracked concrete goes unpatched. Rusted equipment goes unrepaired. Sensors that measure pressure inside dams stay broken. Valves and gates

that release water from reservoirs remain frozen in place.

Operators sometimes fail to clear out clogged drainage systems critical to maintaining the structural integrity of spillways and dams. They're also slow to remove trees, brush and other vegetation whose roots can clog drains, weaken earthen dams or undermine slabs of concrete.

State officials said the problems cited by inspectors are almost always insignificant, and don't require immediate attention. But experts say the consequences from seemingly innocuous shortcomings can be considerable. A team of investigators looking into what caused the devastating fracture of Oroville's spillway pointed to a drainage system clogged with tree roots as a probable contributing factor.

"These little things add up," said Jeffrey Mount, an expert on flood manage-



A valve at Rollins Reservoir hasn't opened or shut properly since 2014. [www.sacbee.com/news/state/california/water-and-drought/article188707104.html](http://www.sacbee.com/news/state/california/water-and-drought/article188707104.html)





DAVID MIDDLECAMP San Luis Obispo Tribune file photo

Mark Hutchinson, San Luis Obispo County's deputy public works director, examines the spillway at Lopez Dam last spring. It took four years to pinpoint a small leak's cause in a concrete structure adjacent to the dam spillway. Remote cameras and specialized concrete mixes were used.

ment at the Public Policy Institute of California. "Every one of them increases the likelihood of an accident."

Mount pointed to a nearly forgotten incident at Folsom Dam, where bird droppings helped corrode the support arm of one of the spillway gates. The gate buckled on July 17, 1995, releasing nearly half of the reservoir's water over the next week or so – a failure that could have proven disastrous for downstream residents in Sacramento if it had happened during the rainy season. While bird droppings weren't the main reason the gate failed, U.S. Bureau of Reclamation officials said they may have been a contributing factor.

The Bee based its findings on five years of inspection reports by the Department of Water Resources' Division of Safety of Dams at 93 facilities. Those are the dams where the state directed owners to conduct a "comprehensive review" of their spillways in the aftermath of the Oroville crisis, which forced the evacuation of 188,000 people and is expected to cost \$600 million. The reviews are ongoing.

The state singled out those dams, out of 1,249 under its authority, in part because construction records and blueprints suggested problems could be lurking there. No federal dams, such as Shasta or Folsom, are covered; they aren't under the state's jurisdiction. Federal inspectors have said they're conducting reviews of the spillways at federal dams after the Oroville emergency. The reviews are supposed to be completed by Dec. 31.

The state inspection reports, beginning in 2012, revealed a troubling pattern of delay and deferral of maintenance issues.

At Hernandez Dam in San Benito County, a dam employee apologized to a state inspector in July

2013 for not repairing damaged concrete on the spillway, but the problem still hadn't been fixed when inspectors returned a year later. At Rollins Dam in Nevada County, an outlet valve got stuck when an employee was demonstrating it for inspectors in 2014; it wouldn't open all the way for at least the next two years. At Iron Canyon Dam in Shasta County, inspectors found standing water in the spillway chute for four straight years, a sign of a blocked culvert.

All but two of the 93 dams on the state's list are considered "high hazard" facilities, meaning a failure could kill people downstream. Every inspection report reviewed by The Bee pronounced the dams "safe for continued use," even if the same shortcomings were cited year after year.

Dam owners and state officials insisted that the problems cited by inspectors were minor and didn't constitute a threat to the integrity or safety of the structures.

Eric Van Deuren, a dam safety official at Pacific Gas and Electric Co., said the utility addresses problems flagged by inspectors in order of seriousness. Inspectors found repeated problems at six different PG&E hydroelectric dams.

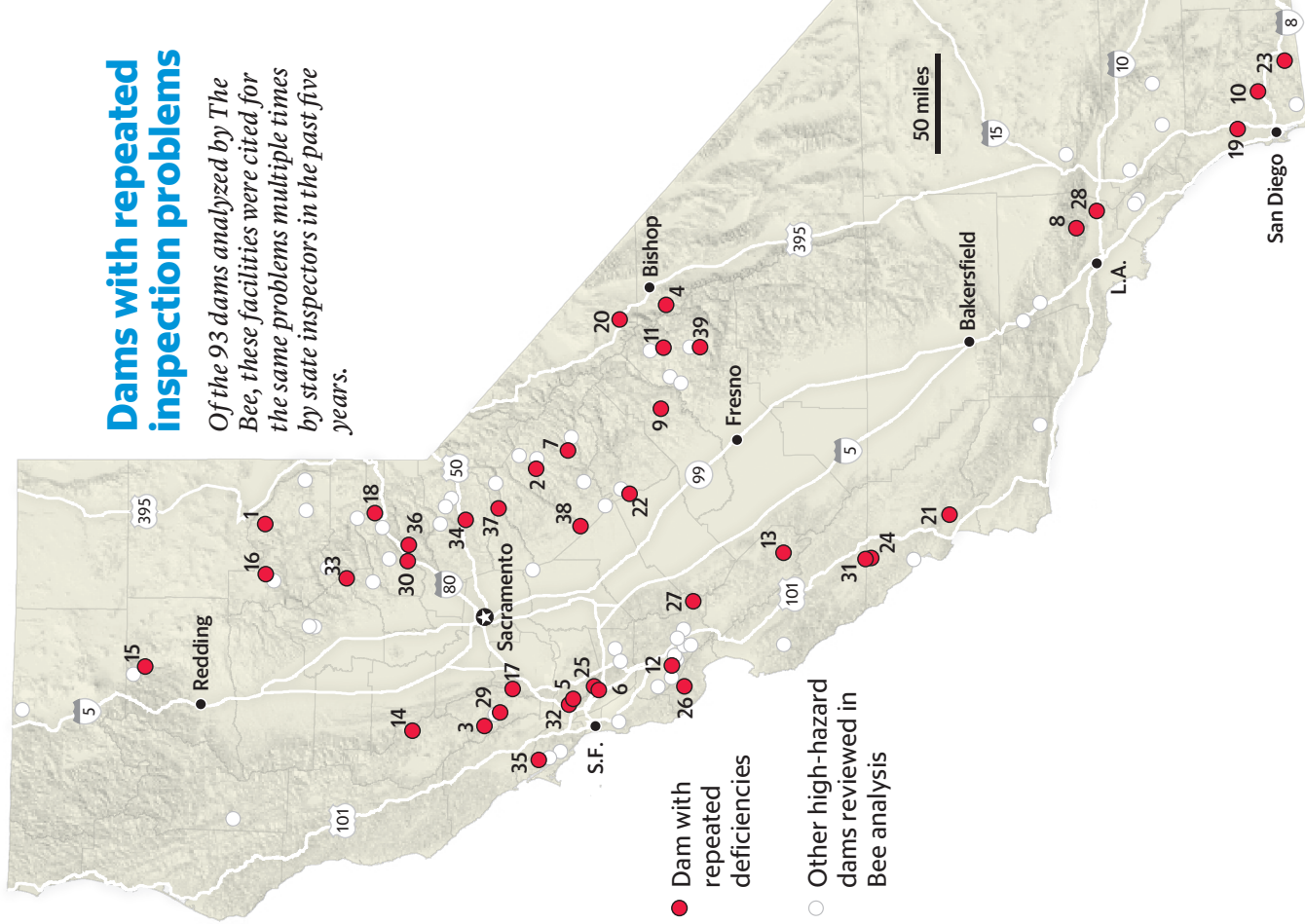
"If any of those inspections had revealed dam-safety issues that posed an immediate threat to the stability of the dam or public safety, then PG&E would not have just sat on them," he said.

In a non-emergency situation, dam owners say it's appropriate to plan repairs methodically. For instance, it took four years to pinpoint the cause and repair a small leak in a concrete structure adjacent to the spillway at Lopez Dam near San Luis Obispo; the project required remote cameras and specialized concrete mixes.

"Patching a spillway is not like patching a

## Dams with repeated inspection problems

*Of the 93 dams analyzed by The Bee, these facilities were cited for the same problems multiple times by state inspectors in the past five years.*



Name	County	Vegetation	Valves/gates	Concrete	Sensors/data	Seepage/ sediment/drain	Equipment
1 Antelope	Plumas	●			●		
2 Beardsley	Tuolumne				●		
3 Bell Canyon	Napa	●					🌿 Vegetation growing in or near spillways or other vital structures
4 Bishop Creek	Inyo			●			
5 Briones	Contra Costa	●					
6 Chabot	Alameda	●	●				
7 Cherry Valley	Tuolumne	●	●				⚙️ Problems with valves, gates and other mechanisms that release or take in water, such as broken valves or failure to open and close gates every three years for the inspectors
8 Cogswell	Los Angeles	●	●		●		
9 Crane Valley Storage	Madera	●	●				
10 El Capitan	San Diego	●					
11 Florence Lake	Fresno	●					
12 Guadalupe	Santa Clara				●		
13 Hernandez	San Benito	●	●	●		●	
14 Indian Valley	Lake				●		
15 Iron Canyon	Shasta	●				●	
16 Lake Almanor	Plumas	●					
17 Lake Curry	Napa		●		●		💧 Damaged concrete on spillway chutes, the face of the dam or other major structures
18 Lake Fordyce	Nevada					●	
19 Lake Hodges	San Diego			●			
20 Long Valley	Mono				●		
21 Lopez	San Luis Obispo				●		
22 McSwain	Mariposa	●					
23 Morena	San Diego			●			📈 Broken or aging monitoring sensors or overdue sensor data
24 Nacimiento	San Luis Obispo		●			●	
25 New Upper San Leandro	Alameda	●	●			●	
26 Newell	Santa Cruz		●				
27 North Fork	Santa Clara	●		●			
28 Puddingstone	Los Angeles				●		💧 High dam seepage, sediment buildup, or persistently plugged drains
29 Rector Creek	Napa			●			
30 Rollins	Nevada		●				
31 San Antonio	Monterey			●			
32 San Pablo	Contra Costa		●			●	
33 Sly Creek	Butte	●					🔧 Old or corroded equipment that should be replaced or repaired
34 Sly Park	El Dorado				●		
35 SoulaJule	Marin					●	
36 Sugar Pine	Placer				●		
37 Tiger Creek Regulator	Amador		●				
38 Tulloch	Calaveras				●		
39 Wishon	Fresno					●	





Metropolitan Water District of Southern California

Robert A. Skinner Dam in Riverside County has had repeated problems with vegetation in its spillway.

## CRACKS, CLOGGED DRAINS, BROKEN VALVES AMONG LITANY OF PROBLEMS AT STATE'S DAMS

These are some of the problems that have gone uncorrected for years at California dams in spite of being flagged repeatedly by inspectors from the state Department of Water Resources. The sample below is based on a Sacramento Bee analysis of five years of inspection reports at the 93 dams singled out for further review by state officials following the February crisis at Oroville Dam. All of the dams mentioned below are classified as “high hazard” by the state because of their proximity to people living downstream.

### **NOBODY HOME AT NORTH FORK**

The inspector who showed up in September 2012 at tiny North Fork Dam, owned by the Pacheco Pass Water District in Santa Clara County, could barely hide his frustration.

“None of the requested work from (the) last inspection has been performed at the dam,” he wrote. “Work involved removal of vegetation from the dam and the spillway. I again requested the owner remove all the brush from the downstream and upstream face of the dam and from the left spillway wall. The owner assured me this work will be done.”

The shortcomings piled up, year after year. In 2014 an inspector said cracking had left the spillway’s concrete surface in “poor to serviceable condition.”

At an August 2016 inspection, inspectors got to the root of the problem: “The Pacheco Pass Water District ... does not have a functioning board of directors and measures have been taken to dissolve the District,” an inspector wrote.

That appears to be changing. After a decade of inactivity, a new board was elected last December. Rob Bernosky, board secretary, said the flaws cited repeatedly by the inspectors aren’t “terribly egregious” but are being addressed. Pacheco Pass

is also evaluating its long-term future, holding talks with the much larger Santa Clara Valley Water District about a possible takeover.

### **A FROZEN VALVE, AND A \$30 MILLION HEADACHE**

As state inspectors watched, employees struggled to open one of the outlet valves of Newell Dam, 11 miles north of Santa Cruz. It’s a task that’s supposed to be performed once every three years in the presence of inspectors, to show the valves are in good working order.

The Aug. 23, 2012, demonstration didn’t go so well. One of the valves opened, but stayed frozen “in the half-open position,” the inspectors wrote.

It’s still stuck.

Eileen Cross, a spokeswoman for the city’s water department, said Santa Cruz developed an “acceptable workaround” that got the state’s approval while the city figured out how to pay for the project.

“It’s like a \$30 million project,” Cross said. “For us it’s a huge, huge project.” Repairs are getting underway soon, she said.

### **‘UNCONTROLLED RELEASE OF THE RESERVOIR’ – OR NOT**

Lake Curry, located in Napa County and owned by the city of Vallejo, has been a trouble spot for decades. Since 1995 the state has reduced the maximum of water the reservoir can store, by about 8 percent, because of various deficiencies.

For the past three years, the state has focused on a corroded cast-iron pipe through which water is released from the lake.

Inspectors in 2014 said the pipe “varies from fair to poor condition,” and a failure could result “in uncontrolled release of the reservoir.” After a 2016 inspection, they again warned about the pipe’s

deterioration.

City officials told the inspectors they were waiting on funding for repairs, and in June 2016 they submitted a plan to fix the problem. Michael Malone, director of Vallejo's water department, said the work should be completed soon. He added that, despite the inspectors' warnings, the city's consultant concluded that the problem wasn't a serious safety concern after all.

"The public is not in danger," he said.

## GETTING THE VALVES TO WORK

Every three years, dam owners must demonstrate that their valves and gates can open and shut properly.

When inspectors showed up in September 2014 at Rollins Dam, in the Nevada County foothills, expecting to get a demonstration, an "electric systems malfunction" kept the valves from operating.

During a follow-up inspection three months later, one valve opened perfectly but the other got stuck after opening two-thirds of the way. A 2015 inspection report said the valve could open 88 percent, after hardened grease had been removed from the mechanism.

In September 2016 the Nevada Irrigation District told inspectors they were designing replacement parts for the valve, which "still cannot be fully operated," according to the state's report. Installation was expected to be completed last month. District officials didn't respond to requests for comment.

## AN APOLOGY, THEN ANOTHER HEADACHE

Dave Meraz, an employee of the San Benito County Water District, had a simple statement for the inspectors who visited Hernandez Dam in July 2013: Sorry.

Inspectors had told Meraz the year before to fix multiple problems at the dam: cracks on the spillway, clogged drains and more. Meraz "agreed to make the necessary repairs and apologized for not completing the work since the last inspection," inspectors wrote.

The problems weren't cleared up until the March 2016 inspection. But that same inspection brought a new problem to light: Attempting to demonstrate an outlet valve for the inspectors, a dam employee was able to open the mechanism but couldn't shut it back up.

The valve remained locked in the open position until shortly before last winter, said general manager Jeff Cattaneo.

Cattaneo said the valve, which wasn't a safety hazard, would have been repaired sooner but the reservoir had to be empty first.

He said keeping tabs on Hernandez is tough. Located in a remote part of the county, Hernandez is 55 miles from district headquarters in Hollister. The dam has no full-time employees; it's monitored remotely.

"It's not like we go down there every single day," Cattaneo said. "We go down there once or twice a month to do inspections."

## SHRUBS IN THE SPILLWAY

The Metropolitan Water District of Southern

California is a \$1.6 billion-a-year behemoth with 19 million customers and considerable sway over state water policy.

But it's been rendered seemingly powerless by vegetation growing at its dam near Temeculah in Riverside County.

Inspectors who visited Robert A. Skinner Dam in April 2013 noted that "a large shrub was seen growing in the spillway channel that needs to be removed."

A year later, inspectors warned again about a tree growing in the spillway. By 2015, it had been removed, but in 2016 inspectors found a new tree growing inside the outlet where water is released. Last April, inspectors said the tree hadn't been removed. Also, trees were sprouting again around the spillway.

Gordon Johnson, chief engineer at Metropolitan, said the agency hasn't neglected the problem. Vegetation gets trimmed, it grows back.

"We don't tear up concrete and be invasive about it. We control the vegetation," he said. "We contain the growth and maintain it."

## WHERE ARE THE DATA?

When dams are built, engineers often install devices that measure water pressure, movements within the dam caused by seismic activity, pressure changes or natural settling. Dam owners are supposed to report the data annually to state inspectors.

However, at least five dam owners went multiple years without reporting data, despite repeated complaints from inspectors. At Puddingstone and Cogswell dams, both owned by Los Angeles County, inspectors said the last instrumentation report they saw contained sensor data at least seven years old.

Foresthill Public Utilities District, owner of Sugar Pine Dam in Placer County, was told repeatedly to develop a plan for replacing its aging piezometers, which measure water pressure. When inspectors visited the dam in March of this year, five of the 16 piezometers were broken. One third of the piezometers at Guadalupe Dam, owned by Santa Clara Valley Water District, went unrepaired for three consecutive years.

All but three of the original 56 piezometers installed at Oroville Dam in the 1960s have stopped functioning, according to inspection reports.

## BLACKBERRY BUSHES AND A CLOGGED DRAIN

When inspectors arrived in January 2014 at Iron Canyon Dam, a hydroelectric facility owned by Pacific Gas and Electric Co. in Shasta County, they found standing water in the spillway chute. A likely culprit: a clogged culvert.

When they returned a year later, they found the problem hadn't been fixed. The same was true in January 2016 and May 2017.

PG&E dam safety official Eric Van Deuren said the culvert is located far from the dam and "doesn't impact anything safety related." The culprit: blackberry bushes that get cleared out but then pop up again.

"You know how fast those grow back," he said.





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Owners of the Sugar Pine Dam and Reservoir, near the north fork of the American River north of Foresthill, have been told repeatedly to replace devices that measure water pressure and report that data to the state. A 2017 inspection showed that about a third of the dam's devices were broken.

sidewalk in front of your house,” said Mark Hutchinson, the county’s deputy public works director.

Spokeswoman Erin Mellon of the Department of Water Resources said the Division of Safety of Dams allows owners to postpone repairs if they aren’t considered serious or urgent.

“Issues that do not present an immediate dam safety concern, and are related to routine maintenance, are given lower priority and may appear in subsequent inspection reports,” Mellon said in an email.

### ‘TEETH IN THE SYSTEM’

The Bee’s review of inspection reports, obtained through the California Public Records Act, found some problems went unaddressed for years. They ranged in scope from multimillion-dollar repairs to small jobs that could have been dealt with quickly by workers with hand tools.

- At least 10 dam owners were told repeatedly to remove vegetation growing in or near spillways or other vital structures.

- At least 15 dam owners were told repeatedly about problems with valves, gates and other mechanisms needed to release or take in water. In some cases, dam owners took years to repair or replace busted valves. In others, dam owners failed to comply with a requirement that they open and close the gates and valves at least once every three years in the inspectors’ presence.

- At least seven dam owners were told repeatedly to repair damaged concrete, either on spillway chutes, the face of the dams or other major

structures.

- At least three dam owners were told repeatedly to fix broken or aging sensors that monitor water pressure changes, movements within the dam due to seismic activity, and other important data. At least eight dam owners were told repeatedly to submit overdue data from those instruments.

- At least eight dam owners were told repeatedly to address unusually high dam seepage, unwanted sediment buildup or persistently plugged drains.

- At least three dam owners were repeatedly told to replace or repair old or corroded equipment.

The documents could contain evidence of even more serious problems. It’s impossible to know, because before giving them to The Sacramento Bee the state blacked out large portions of inspectors’ findings, citing terrorist concerns.

Dam experts say the repeat offenses show the state has to do a better job of cracking down on dam owners whose facilities don’t measure up.

“You’ve obviously got an enforcement problem,” said J. David Rogers, a dam-safety expert at Missouri University of Science and Technology. “The inspections are taking place, but the mitigation measures, the upkeep and maintenance – there must not be a very severe penalty for not doing the things. ... There’s got to be teeth in the system.”

Two state legislators who questioned state officials at an Oroville Dam oversight hearing in the spring said they plan to take action in response to The Bee’s findings.

State Sen. Jim Nielsen, R-Tehama, has co-authored a pending bill that would require more frequent and thorough dam inspections. He said he

now plans to amend the legislation to force dam owners to deal more quickly with issues cited by inspectors.

“There’s got to be at least more strict oversight of the yearly inspection reports and the followup,” said Nielsen, whose district includes Oroville.

Assemblyman Jim Frazier, D-Discovery Bay, also called for legislative changes. Frazier, a former home builder and concrete contractor, said the sorts of problems inspectors pointed out at dams would have never been allowed to linger at a construction job site.

“In the private sector, if these were ignored, your job would get shut down or red tagged,” he said.

## **SHRUBS AND THE SPILLWAY**

Mellon, the DWR spokeswoman, said the Division of Safety of Dams does have an enforcement system – and uses it. Of the 1,249 dams it oversees, 39 are under reservoir restrictions that force dam owners to reduce the amount of water they can store. Legislation enacted this year, following the Oroville emergency, enables DSOD to slap property liens on dam owners or fine them up to \$1,000 a day “if unsafe conditions are not corrected in a reasonable manner,” she said.

Last year the 70-employee dam-safety division was given top marks by a team of independent engineers. A review, performed by the Association of State Dam Safety Officials, concluded that California operates “the leading dam safety program in the nation.”

When told of The Bee’s findings, William Bingham, who led the review, said he wasn’t surprised. Even strong dam-safety agencies like California’s have trouble getting dam owners to correct problems quickly.

“California is probably getting more done than most other states,” said Bingham, a dam consultant in Pennsylvania.

Even so, the frantic crisis last winter at Oroville suggests the state’s efforts don’t go far enough.

A decade’s worth of inspection reports at Oroville showed that dam workers removed vegetation cited in state inspection reports, only to allow it to grow back.

Inspectors found trees and brush growing alongside the spillway in 2011 and 2013. A photo accompanying the February 2015 inspection report shows tree limbs dangling over the spillway, in the vicinity of where it cracked two years later. Inspectors noted that the tree was removed by the time a midyear inspection was done a few months later. A January 2017 photo by the Chico Enterprise-Record shows vegetation starting to grow back in roughly the same place, a month before the Oroville crisis.

A deep chasm opened up in the spillway Feb. 7. A team of forensic investigators has said tree roots likely clogged the spillway’s drainage system, causing water to collect underneath the spillway chute. The water may have created upward pressure on one of the concrete slabs, ultimately causing it to fail, the forensic team has said.

Robert Bea, a dam-safety expert at UC Berkeley, said he thinks the state took far too long to remove trees and brush. By the time they were chopped down, the roots were already growing underneath the concrete chute and clogging the drains, he said.

Mount, of the Public Policy Institute of California, said Oroville’s lesson is clear.

“It might be a rusted facility,” Mount said. “It might be a valve which is not operable. ... It’s not like one big thing, one glaring thing, that causes the problems. It’s the accumulative little things, which increases the probability that one of those little things will be the weak link and then the system fails.”

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