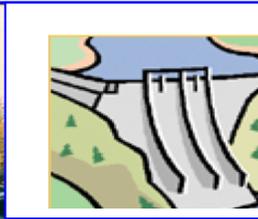


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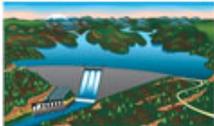
# Some Dam – Hydro News™ And Other Stuff



**Quote of Note:** *“I contend that for a nation to try to tax itself into prosperity is like a man standing in a bucket and trying to lift himself up by the handle.” - Winston Churchill*

**Some Dam - Hydro News → Newsletter Archive for Current and Back Issues and Search:**  
(Hold down Ctrl key when clicking on this link) <http://npdp.stanford.edu/>. After clicking on link, scroll down under Partners/Newsletters on left, click one of the links (Current issue or View Back Issues).

**“Good wine is a necessity of life.” - -Thomas Jefferson**  
**Ron’s wine pick of the week: 2017 Foppiano Vineyards US Red Blend "Lot 96"**  
**“No nation was ever drunk when wine was cheap.” - - Thomas Jefferson**



## Dams:

(Anything or -body needs more attention when it gets old.)

**The problem America has neglected for too long: deteriorating dams**  
**Aging, poorly maintained structures put thousands at risk—and climate change is only making things worse.**

BY MAYA WEI-HAAS, GRAPHICS BY RILEY D. CHAMPINE, nationalgeographic.com, MAY 27, 2020

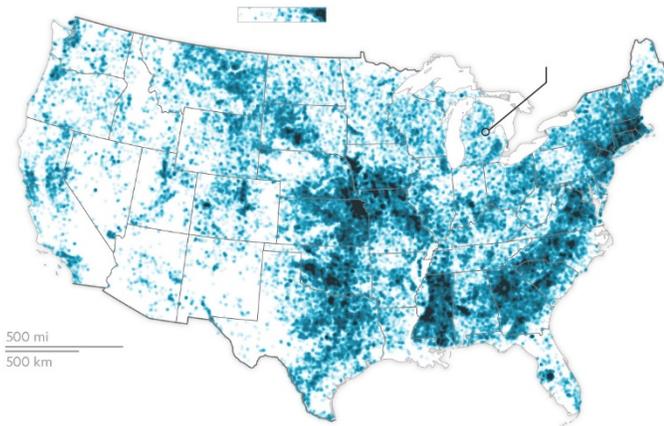
**AGING AND UNDERMAINTAINED** infrastructure in the United States, combined with changing climate over the coming decades, is setting the stage for more dam disasters like the one that struck Midland, Michigan, last week. **More than 91,000 dams dot the nation—and roughly 15,500 of them could cause fatalities if they failed,** according to the National Inventory of Dams. Most of these dams were built many decades ago. **By 2025, 70 percent of them will be more than a half century old,** according to the American Society of Civil Engineers. <https://www.infrastructurereportcard.org/wp->



<content/uploads/2017/01/Dams-Final.pdf>. This means many U.S. dams were built with now-outdated standards and methods, as well as for different climate trends. What's more, dams need continual maintenance to keep operating safely over the decades. Valves break. Metal rusts. Concrete crumbles.

**There are more than 91,000 dams in the U.S.**

The dams shown below are recorded in the National Inventory of Dams, which is compiled and maintained by the U.S. Army Corps of Engineers.



**THERE ARE 276 DAMS NOT SHOWN FOR ALASKA, HAWAII AND PUERTO RICO.**

Combine this aging and outdated infrastructure with the more frequent, heavy rains that climate change likely will generate, and the nation will face a “perfect storm” for more catastrophes, says Anne Jefferson, a hydrogeologist at Kent State University in Ohio. This latest dam failure [https://youtu.be/Hc3u\\_CHVHJ8](https://youtu.be/Hc3u_CHVHJ8) came after a deluge dumped nearly five inches of water on central Michigan in just 48 hours. As the waters rose, the nearly century-old Edenville dam collapsed and sent a torrent downstream that overflowed the Sanford dam. Water surged across roads and into homes and businesses. By Wednesday evening, the flood had almost completely drained one lake upstream of the dams, leaving a vast muddy expanse in its wake.



For years, concerns had swirled about the condition of Edenville dam, which is privately owned and operated. In 2018, the Federal Energy Regulatory Commission (FERC) revoked the Edenville dam's license to generate hydroelectricity, citing concerns that it could only withstand about 50 percent of the Probable Maximum Flood, an estimate of the largest flood that could sweep the region. For more than 14 years before that license

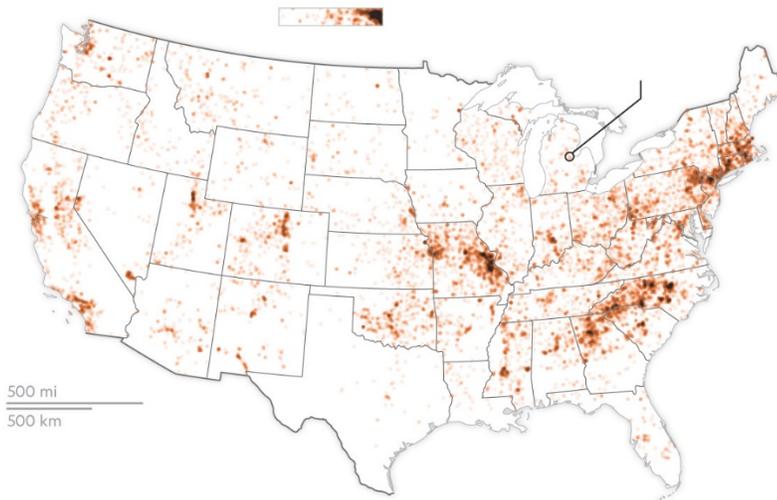
was pulled, the dam's owner had failed to make the requested improvements. At many dams across the nation, investment hasn't kept up with the repairs and upgrades needed to keep these systems standing strong. On the American Society of Civil Engineers report card for U.S. infrastructure, dams earned a "D" letter grade.

Exactly how many U.S. dams are at risk of failing is uncertain. The National Inventory of Dams lists condition information for nearly 80 percent of high-hazard potential dams, meaning that their failure would result in at least one death. More than 2,330 of these high-hazard dams need

repairs, some 15 percent of all dams in this hazard category. But data remain spottier for dams of other hazard potentials, such as significant or low hazard.

**About 1 in 6 dams has a high hazard potential.**

These 15,500 dams are deemed so crucial that if they were to fail, it would likely cause loss of life and heavy economic damage. Both of the dams near Midland, Michigan had this rating.

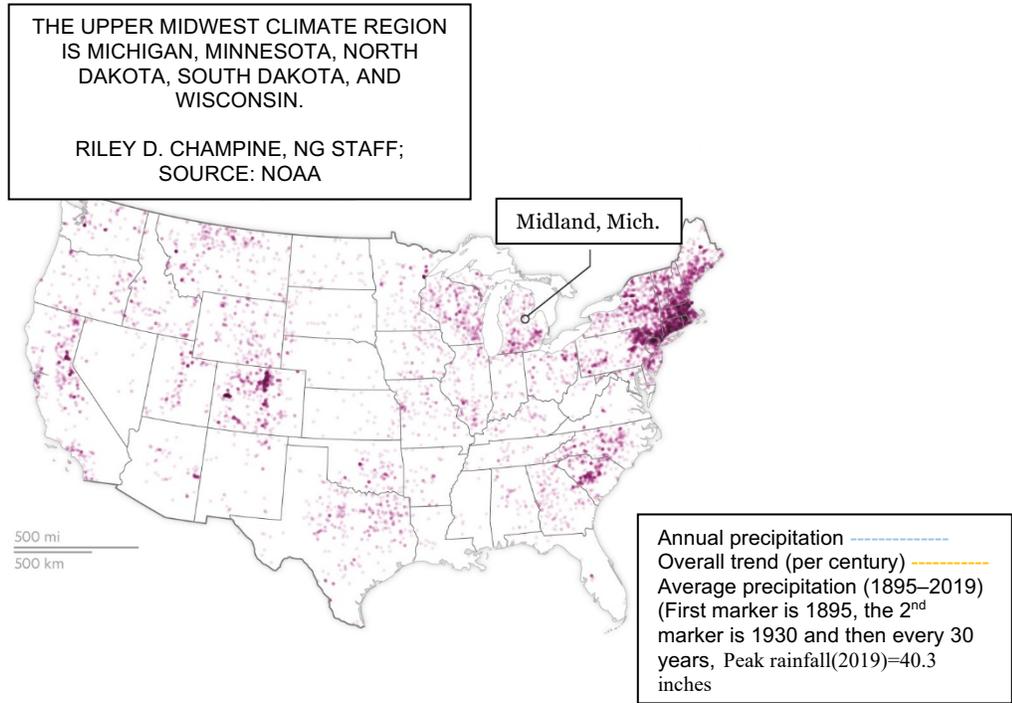


THE HAZARD POTENTIAL RATING FOR 7,190 DAMS IN TEXAS IS NOT AVAILABLE.  
RILEY D. CHAMPINE, NG STAFF; SOURCE: USACE; ASCE

Information about the condition ratings of specific dams is not available to the public. A recent investigation by the Associated Press uncovered and mapped out 1,688 of the high-hazard dams that were in poor or unsatisfactory condition. The true number is likely higher, according to the AP report. <https://apnews.com/f5f09a300d394900a1a88362238dbf77> Repairing and upgrading dams across the United States would cost upwards of \$70 billion, based on estimates from the Association of State Dam Safety Officials. To address issues for the roughly 700 dams owned by the U.S. Army Corps of Engineers alone would cost more than \$25 billion, by the Corps' estimates, and would take more than 50 years to complete based on the current level of funding.

Dam ownership and operation is divided among private enterprises—about 63 percent of the U.S. total—and state, local, and federal governments. The regulation and oversight of private and other non-federal dams are largely on a state-by-state basis, says Martin McCann, director of Stanford University's National Performance of Dams Program. But that oversight varies widely: For instance, Alabama has no dam safety regulatory program, while California has a relatively well-funded program with a technically strong staff, McCann says. Many state dam safety programs lack resources or the regulatory authority to effectively manage the dams, according to ASCE.

But even California's well-funded program isn't invincible. In 2017, the Oroville dam on California's Feather River failed, sparked by the crumbling of parts of the concrete spillways where excess water flows downstream. The dam holds more than a trillion gallons of water; the collapse forced nearly 200,000 people to evacuate the area. The report from the independent forensics investigation concluded that the incident was due to a "long-term systemic failure" of not



only the California Department of Water Resources, but also general industry-wide practices for identifying and addressing problems.

**More than 8,000 dams are over 90 years old.**

Old dams are not necessarily unsafe, but they need to be maintained for integrity. **The dams near Midland were built in the 1920s** and had a history of safety concerns. The Edenville dam in Michigan was rated as poor on its last inspection in August of 2018 and Sanford dam rated as fair. After years of conflict between owner Boyce Hydro and the surrounding communities, the situation seemed to be heading toward resolution. Midland and Gladwin counties set up a group to purchase the pair of dams and their associated lakes with the intention of repairing the systems and overseeing continued maintenance—but **the rain swept through and the region flooded before the process was complete.**

**Climate change is increasing rainfall in the Upper Midwest**

**The problems with compromised dams will likely grow more severe in the years ahead.** “The dawning reality is that the dam, levee, and other infrastructure failures will be more likely to occur as global warming intensifies,” says Shana Udvardy, a climate resilience analyst with the Union of Concerned Scientists. As air temperatures increase, so does the amount of moisture the atmosphere can hold; that means more frequent and intense rain and flooding, Udvardy says. **That effect may be particularly pronounced in the Midwest,** where climate models suggest that winter and spring rains could increase by up to 30 percent by the end of the century, according to the Fourth National Climate Assessment. The last few decades have already seen more heavy downpours across the nation. The Michigan catastrophe follows exceptional flooding across large swaths of the U.S. in **2019, which was the wettest year on record** for Michigan, Minnesota, North Dakota, South Dakota, and Wisconsin.

**Many of the nation's dams weren't designed with these modern or future trends in mind.** “We’ve sort of built ourselves and locked ourselves into a past climate,” Jefferson says. For centuries, humans have strived to harness the environment to suit our needs. Dams are part of this precarious legacy. **We’ve enjoyed benefits from these systems, and now must deal with their risks.** “We’re seeing again and again,” Udvardy says, **“it’s not whether they’re going to fail; it’s a matter of when they’re going to fail.”**

(They are after anyone who proposes a dam design similar to that of the dam that failed in Brazil.)

## AI Gedicks: The Menominee River is an endangered river

By AI Gedicks | May 26, 2020, madison.com

Thanks to a major pollution cleanup effort by multiple federal and state agencies and citizen groups, the Lower Menominee River will be "delisted" or removed as an "Area of Concern" for pollution and habitat loss. This restoration work took more than two decades and cost at least \$200 million, according to the U.S. Environmental Protection Agency. The delisting of the Lower Menominee River was announced that at the same time American Rivers, a national conservation group, named the Menominee River one of the 10 most endangered rivers in America, citing the threat from Aquila Resources' proposed metallic sulfide mine on the banks of the river. This is the second time in four years that the river has made the endangered list. Why spend so much time and money on cleaning up pollution in the Lower Menominee River only to allow potential toxic discharges from the proposed Back Forty mine into the headwaters of the river?



American Rivers, along with the Menominee Indian Tribe of Wisconsin and the Coalition to SAVE the Menominee River, have called on Michigan's Environment, Great Lakes and Energy (EGLE) agency to deny the tailings dam safety permit for the Back Forty project because the proposed dam, containing large amounts of toxic mine waste, threatens the Menominee River, the Menominee Tribe's sacred sites and the drinking water of communities in Marinette, Wisconsin and Menominee, Michigan.

Aquila withdrew its original dam safety permit application because of insufficient information in December 2019, but said it plans to re-submit its application in the spring of 2020. Aquila plans to use the risky upstream dam construction — the same method now banned in Brazil due to the 2019 dam collapse that killed over 270 people and flooded the countryside with toxic waste. In addition to the inherent instability of upstream tailings dams, opposition groups have criticized EGLE for its failure to require that Aquila disclose its stated plans for an underground mine after the open pit phase of the project. Without this information, it is impossible to evaluate the impact of additional mine waste being dumped into a tailings dam that was not designed to handle mine waste from an underground mine.



The Minnesota Court of Appeals has recently rejected a permit for PolyMet Mining Corp.'s proposed sulfide mine because the Minnesota Pollution Control Agency failed to

address evidence that the company was planning a mine nearly four times larger than the operation covered by the permit. Michigan regulators should be held accountable if they fail to take Aquila's mine expansion plans into account when they evaluate the dam safety permit application. *AI Gedicks is executive secretary of the Wisconsin Resources Protection Council*

(Success, guess they named the reservoir right.)

## Master Plan: \$30 million for Schafer Dam to be enlarged awarded

A needed project at Schafer Dam at Success Lake that was put on hold for 15 years is now going to be completed. Earlier this week, the U.S. Army Corps of Engineers awarded a \$30 contract to begin construction on Phase I of the Success Reservoir Enlargement Project to enlarge Richard L. Schafer Dam. The project will be for abutment widening of the dam and also the relocation of an existing road near the dam. “A top priority of mine has been to see Success Reservoir enlarged to increase flood protection for the city of Porterville, other communities, and the hundreds of thousands of acres of farmland below Schafer Dam,” Congressman Kevin McCarthy said. “After securing funding for this project and years of meetings with USACE officials to advance this project, the award of this contract denotes a key milestone in the SREP – the commencement of construction at Schafer Dam following an approximate 15-year pause. “I want to commend Brigadier General (Kimberly) Colloton, Colonel (James) Handura, and the USACE project team on their continued work to see the SREP through to completion, and I want to thank the Tule River Improvement Joint Powers Authority and other local stakeholders for the support and dedication to advancing this project.”



Congress authorized the SREP in the Water Resources Development Act in 1999 for flood control project. SREP construction began in 2003, but was put on hold in 2005 following potential safety concerns with Schafer Dam. Those safety concerns have been resolved, allowing the project to continue. In October, 2016 the U.S. Army Corp of Engineers, which oversees Success Lake, allocated \$200,000 for the SREP. In February, 2018, President Trump signed into law the Bipartisan Budget Act which included more than \$15 billion to flood and storm damage projects. The SREP was fully funded as a result of the legislation. On May 18, 2020, a \$30 million contract was issued to Central Valley Environmental Incorporated for Phase I of the SREP. Funding for Phase II of the SREP is expected to be approved in 2021. Phase II will raise the emergency spillway at Schafer Dam by 10 feet. On August 8, legislation sponsored by McCarthy to rename Success Dam to Richard L. Schafer Dam was signed by President Trump. Schafer worked as the Water Master on the Tule River for 56 years.

The U.S. Army Corps of Engineers Sacramento District will host a public meeting February 4 to discuss the re-initiation of the Tule River Spillway Enlargement Project, which received \$74 million in appropriations in 2018 to raise Success Dam’s spillway up to 10 feet higher. A total of \$74 million has been set aside in appropriations for the SREP. The U.S. Army Corp of Engineers reports there’s now a 1-in-50 chance in any given year for flooding to occur in Porterville from the Tule River. The U.S. Army Corp of Engineers reported completion of the SREP will reduce the flood risk in half. The goal is for the construction of the entire SREP project to be completed by 2024.

(Today’s History lesson.)

### **Dam is 100 + years old**

By Suzy Kelly, Columnist, May 29, 2020, chaffeecountytimes.com

This photo from BV Heritage in 1910 is at a town now gone. The photo in last week’s paper was identified by Jim Foreman and some others. It is from the 1940s. This is the dam in Buena Vista, Chaffee County, CO at the town lake and the spillway with the rock wall. The city park dam has been in existence for over 100 years. The city added colored lights in a recessed area under the dam. They were to be turned on in the spring and summer.





They were a target for BB guns and were discontinued in the 1970s. The log building called the community house in the background was built in 1922-23 by volunteers. It housed the chamber of commerce and was used for other meetings too. One side of it was the town public library. In 1971 when the highway was enlarged to a four-lane highway the community house had to be moved. It was sold to Sky Valley Ranch and they moved it to their camp, where it is still being used. This location is now where Buena Vista Heritage had the South Park Depot set up along with the caboose.

(Here's your typical anti-dam article – Not much here on the benefits of dams.)

## When dams cause more problems than they solve, removing them can pay off for people and nature

By Jon Honea, The Conversation, MAY 29, 2020, phys.org

Across the United States, dams generate hydroelectric power, store water for drinking and irrigation, control flooding and create recreational opportunities such as slack-water boating and waterskiing. But dams can also threaten public safety, especially if they are old or poorly maintained. On May 21, 2020, residents of Midland, Michigan were hastily evacuated when two aging hydropower dams on the Tittabawassee River failed, flooding the town.



Penobscot River

I'm an ecosystem scientist and have studied the ecology of salmon streams in the Pacific Northwest, where dams and historical over-harvest have drastically reduced wild populations of these iconic fish. Now I'm monitoring how river herring are responding to the removal of two derelict dams on the Shawsheen River in Andover, Massachusetts. requires There's growing support across the U.S. for removing old and degraded dams, for both ecological and safety reasons. Every case is unique and detailed analysis to assess whether a dam's costs outweigh its benefits. But when that case can be made, dam removals can produce exciting results.

### Pros and cons of dams

It's relatively easy to quantify the benefits that dams provide. They can be measured in kilowatt-hours of electricity generation, or acre-feet of water delivered to farms, or the value of property that the dams shield from floods. Some dam costs also are obvious, such as construction, operation and maintenance. They also include the value of flooded land behind the dam and payments to relocate people from those areas. Sometimes dam owners are required to build and operate fish hatcheries to compensate when local species will lose habitat. Between 1850 and 2016, 63 dam failures with fatalities occurred across the U.S., killing an estimated 3,432 to 3,736 people. Credit: National Performance of Dams Program, Stanford University, CC BY-ND

Other costs aren't borne by dam owners or operators, and some have not historically been recognized. As a result, many were not factored into past decisions to dam free-flowing rivers. Research shows that dams impede transport of sediment to the oceans, which worsens coastal erosion. They also release methane, a potent greenhouse gas, as drowned vegetation beneath dam reservoirs decomposes. One of dams' greatest costs has been massive reductions in numbers and diversity of migratory fish that move up and down rivers, or between rivers and the ocean. Dams have driven some populations to extinction, such as the iconic Baiji, or Yangtze River dolphin, and the once economically important Atlantic salmon on most of the U.S. east coast.



### Old dams under stress

As dams age, maintenance costs rise. **The average age of U.S. dams is 56 years, and seven in 10 will be over 50 by 2025.** The American Society of Civil Engineers classifies 14% of the nation's 15,500 high hazard potential dams – those whose failure would cause loss of human life and significant property destruction—as deficient in their maintenance status, requiring a total investment of US\$45 billion to repair. **Like the failed Michigan dams, which were built in 1924, older dams may pose growing risks.** Downstream communities can grow beyond thresholds that determined the dams' original safety standards. And climate change is increasing the size and frequency of floods in many parts of the U.S. These factors converged in 2017, when intense rainfall stressed the Oroville Dam in Northern California, the nation's tallest dam. Although the main dam held, two of its emergency spillways—structures designed to release excess water—failed, triggering evacuations of nearly 200,000 people. <https://youtu.be/Quh6fX57YxY> Huge rains caused by early snowmelt led to erosion and risk of a catastrophic failure at California's Oroville Dam in 2017.

### Benefits from free-flowing rivers

As dam owners and regulators increasingly recognize the downsides of dams and deferred maintenance costs mount, some communities have opted to dismantle dams with greater costs than benefits. **The first such project in the U.S. was the Edwards Dam on the Kennebec River in Augusta, Maine** In the mid-1990s when the dam was up for relicensing, opponents provided evidence that building a fish ladder—a step required by law to help migratory fish get past the dam—exceeded the value of the electricity that the dam produced. Federal regulators denied the license and ordered the dam removed. Since then, the river's river herring population has grown from less than 100,000 fish to more than 5,000,000, and the fish have drawn ospreys and bald eagles to the river. This project's success catalyzed support for removing more than 1,000 other dams.

I've been studying one such project—removal of the derelict Balmoral and Marland Place dams on the Shawsheen River in Andover, Massachusetts. The owner of the Marland Place dam, originally built in the 18th century to power a mill, faced a \$200,000 bill to restore it to safe condition. The Balmoral, an ornamental dam built in the 1920s, had changed hands so many times that the latest owner—a company in another state—wasn't even aware that it owned a century-old dam in Massachusetts. **The project was a broad team effort.** State environmental officials wanted to help restore the river's health. Federal regulators supported removing the

dams to open up historical habitat to migratory fish such as river herring, American shad and American eels. And Andover leaders wanted to improve recreation on the river. **Dam removals require extensive permitting and a lot of negotiation.** For the Shawsheen project, experts from the nonprofit Center for Ecosystem Restoration in Rhode Island guided the many organizations involved through the process.

Breaching the Edwards Dam on Maine's Kennebec River, which was built in 1837. <https://youtu.be/oj6-E-w20J0> My role was organizing a volunteer effort to monitor the response of river herring that migrate from the ocean to spawn in freshwater systems. The fish didn't disappoint. Although the first spawning season was less than three months after the dams were removed, data collected by local volunteer monitors—who number over 300—indicated that the newly opened habitat had hosted approximately 1,500 river herring spawners **for the first time in more than 100 years. Since then, numbers have fluctuated, following the pattern on the** Like salmon, river herring mostly spawn where they hatched. During the previous three years of monitoring, spawners in the Shawsheen were all strays from elsewhere in the system. But this year we expected to see a large number of newly matured adults from our first year of monitoring. Our work is on hold during the COVID-19 pandemic, but we look forward to measuring increased numbers in the spring of 2021.

### Still growing

**In April 2020, California's State Water Resources Control Board approved two key permits for removing four large aging hydropower dams on the Klamath River** in California and southern Oregon. This would be the largest dam removal in the U.S. The board acted based on evidence that dam removal would improve drinking water quality by reducing algal blooms, and would restore habitat for endangered salmon and other organisms that rely on free-flowing rivers. The project still needs approval from the Federal Energy Regulatory Commission. Assuming it goes forward, I expect that a restored Klamath River will further fuel the movement to remove dams whose costs now clearly outweigh their benefits

(Excerpts from an ad and remembering that May31 was National Dam Safety Awareness Day.)

### The Importance of Dams and Dam Safety

straughanenvironmental.com, June 1, 2020

On May 31, 1889, the South Fork Dam, near Johnstown, Pennsylvania, failed after days of extreme rainfall and decades of improper upkeep, sending massive flood waters into the valley below.

**The flood tore through the valley, destroying nearly everything in its path including bridges, factories, and towns. The flood claimed more than 2,200 lives,** the largest loss of civilian life from a man made disaster in the United States prior to September 11, 2001. Every year on May 31st, the tragic failure of the South Fork Dam is commemorated on National Dam Safety Awareness Day. Dam safety is a critical component of the work Straughan performs, and there is no better time to highlight the importance of dams and the essential need to maintain dam safety.



### Why dams?

Since the beginning of civilization, humans have needed to maximize the usefulness of water resources and minimize destruction from floods and drought. To this end, dams have been used for millennia, **providing storage for drinking water and irrigation, flood control, and open water for navigation and recreation** as well as improving water quality and generating electricity.[hydropower]

### Where are dams?

When we think of dams, we picture massive dams like the Hoover Dam, Grand Coulee Dam, and Three Gorges Dam, and naturally so, with these being some of the largest structures built in human history. Dams this large, however, are rare and typically far away from most people.



Smaller dams like municipal water reservoirs, recreational ponds, and ponds in developments tend to be some of the most common and often part of our community landscape. Dams generally can be classified as concrete dams or embankment dams. Embankment (or earthen) dams are made of soil and rock and are the most common dams in use today.

### Dam hazards

While dams are essential components of our infrastructure systems, they also present potential hazards. The mass and potential energy of the water impounded by a dam can be devastatingly destructive if the dam were to fail and the water were to be released uncontrolled. When properly constructed, designed, and maintained, dams pose a very low risk of failure. Poor design, neglect, and catastrophic natural events such as massive rainstorms, hurricanes, or earthquakes can cause dams to fail. When a dam fails and there is an uncontrolled release of water, the resultant flood can cause massive destruction by flooding downstream areas and carrying debris at high velocities. Dams tend to receive public attention only when a failure appears imminent, and unfortunately, this has not been uncommon. In just the past few years there have been many major news stories about dam failures including the Oroville Dam in California, the College Lake Dam in Virginia, the Whaley Bridge Dam in the United Kingdom [5], the breach of many dams from one storm event in South Carolina in 2015, and, just two weeks ago with the Edenville Dam in Michigan.

### Dam safety

Every individual dam carries a potential danger and there are over 90,000 inventoried dams in the U.S. today. This number is far from comprehensive; studies have shown that the National Inventory of Dams only accounts for a fraction of the existing reservoirs. Each dam has a different age, size, condition, use, and hazard potential. The sheer number of dams and the complexity of each dam's particular circumstances make managing dam infrastructure a difficult task. Today, that task is as difficult as ever, as climate change alters rainfall patterns and development of areas downstream from dams leads to hazard creep. Ultimately, the safe design, construction, operation, and maintenance is the responsibility of the dam owner, but today, 49 of the 50 states have established dam safety regulatory programs that assist dam owners and the public by regulating dams in their individual jurisdictions.

To safely design and operate a dam, the potential danger posed by the dam must be understood. Engineers and owners/operators do this by assigning each dam a hazard classification. Dams are classified as low, significant, or high hazard based on the impacts that would be caused by a breach of the dam.

- Low: no loss of life and limited damage
- Significant: possible loss of life and moderate damage
- High: likely loss of life and significant damage

To determine the hazard classification, engineers perform a dam breach analysis in which hydrologic and hydraulic models are developed with various storm events, the storage of water behind the dam, the breach of the dam, and the resultant downstream floodwave are simulated. Dam breach analyses evaluate a range of weather events from a sunny day scenario with no precipitation, to the probable maximum flood, the largest flood that could conceivably occur at a location. Impacts to structures, roadways, infrastructure, and public spaces are valued to determine potential hazards. Because high and significant hazard dams present the potential for serious damage and loss of life, it is essential to develop an emergency



**action plan** for each of these dams. Emergency action plans provide information and plans that allow dam owners/operators, emergency personnel, and the public to be prepared for any dam safety incidents to save lives and protect property.

### **Dam removal**

**Not every dam that exists today is essential.** Many dams have outlived their use, deteriorated in condition, cause environmental harm, and/or pose hazards that outweigh the benefits they provide. **Some estimate that 75% to 90% of existing dams no longer serve a functional purpose.** A resolution to the issues posed by obsolete dams is to remove them entirely. In addition to the removal of the potential safety hazard, many environmental benefits can be realized by the restoration of waters to their natural free flowing states, such as removing obstructions to fish passage, lowering water temperatures, restoring the natural sediment flows, and raising dissolved oxygen levels. However, the adverse effects of dam removal, such as increased downstream flooding or elimination of water quality storage must be considered.-----

(Give them hell.)

### **Dam disaster enabled by government failures**

#### **EDITORIAL**

JUN 1, 2020, dailypress.net



**Gov. Gretchen Whitmer and Attorney General Dana Nessel have promised a vigorous investigation to hold accountable those responsible for the catastrophic Midland-area dam collapse.** They'll need a wide net, and a willingness to look at the role their own shops played in enabling the disaster. Early indications are that

Michigan residents, just as with the Flint water crisis, were again failed by government at all levels as well as by the private sector. The crumbling of the Edenville Dam Tuesday comes as no surprise. Federal regulators flagged the deficiencies of the hydroelectric structure more than two decades ago, and engaged in a long battle with the dam's owners to force improvements to spillways to make it safer. The owners insisted the structure could handle the worst storms and stubbornly fought making the necessary upgrades.

The Federal Electric[Energy] Regulatory Commission finally pulled the license of the most current owner, Boyce Hydro, in 2018 because of the high risk to life and property. **But instead of making residents safer, it placed them in greater danger.** The loss of the federal licenses shifted oversight to the states, and Michigan is one of the few state's whose regulations on dam safety **are far less stringent than the federal standards.** State regulators inspected the dam in January and expressed concerns about the ability of its spillways to handle a significant surge in water level. Last fall, the Department of Environment, Great Lakes and Energy (EGLE) rejected a request from Boyce to lower lake levels behind the dam out of concern such a move would endanger aquatic species.

**The dispute ended up in state court, where just three weeks ago Nessel asked that the higher lake levels be maintained at levels high enough to preserve the freshwater mussels that live in the lake, despite the previous concerns expressed by both state and federal inspectors.** Just as in Flint, poor communication and conflicting regulations between state and federal agencies and misplaced bureaucratic priorities created a dangerous situation in Midland that should have been apparent. The company in a statement last week also said it was under pressure from homeowners around the lake to keep water levels high for recreational purposes. **Still, Boyce has much to answer for.** It should have improved the spillways to enable the dam to operate properly and safely.



The state Legislature, too, has been aware for years that Michigan's regulatory standards for dams are inadequate, and has not moved to fix them. Now, Michigan must act swiftly to bring its regulations in line with those of the federal government. Dozens of small dams similar to Edenville are operating across Michigan. They should be immediately inventoried, and those that are not up to federal standards should be brought into compliance or shut down. And all state agencies should clearly understand that when the choice is between protecting human life or wildlife habitat, humans get the priority. What happened in Midland could have been prevented. The task ahead is to determine why it wasn't, and to put in place safeguards to ensure it doesn't happen again. — *The Detroit News*

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(Always have to have a dam removal story.)

## Hands Mill Dam Removal

winooskinrcd.org, June 1, 2020

Winooski NRC is requesting that consulting engineers who are experienced in dam removal design and licensed to practice in Vermont submit proposals for a comprehensive geomorphological assessment, preliminary (30 percent) design and sediment management plan for removal of Hands Mill Dam in Washington, VT.

### About the Dam

Hands Mill Dam, located in and owned by the Town of Washington, impounds a segment of the Jail Branch, a tributary to the Winooski River. Constructed to impound more than 500,000 cubic feet, it is subject to regulation under 10 V.S.A. §1082 and falls under the jurisdiction of the Vermont Dam Safety Program. State ID number is 225.01. Its initial build date is unknown, but there was a mill on site as early as 1866 that may have used an early timber dam for mechanical power. Shortly after the November 1927 flood, the dam was reconstructed with concrete and the mechanical power feature was lost. Hands Mill is classified as a Significant Hazard potential dam and recent Dam Safety reports indicate that a sudden failure could cause "probable loss of life and property damage." This potential loss of life may trigger a reclassification to "High Hazard" under Vermont's new Dam Safety regulations which are scheduled to launch in 2020 and 2022. Compounding the hazard classification risks is the dam's current condition. The overall condition of the dam is poor, partially breached and continues to deteriorate and progressively breach. Winooski NRC is working in partnership with the Town of Washington, the United States Fish and Wildlife Service, the Vermont Department of Fish and Wildlife, and the Vermont Department of Environmental Conservation to launch Phase 1 – Preliminary design (30%) to remove Hands Mill Dam and restore the upstream channel for hazard mitigation, aquatic organism passage, stream equilibrium, and water quality. The full project scope will later include 100% design for dam removal, stream bed and bank remediation, floodplain and wetland restoration, and historical documentation.

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(There's so many lawsuits, I lost count.)

## New lawsuit filed in Mid-Michigan dam collapses with new approach

By ABC12 News Team | Jun 03, 2020, .abc12.com

MIDLAND COUNTY (WJRT) (6/3/2020), MI - Two law firms teamed up to file another lawsuit for property owners who sustained flood damage after the Edenville and Sanford dams collapsed on May 19. Ven Johnson Law and Romanucci & Blandin used a new approach that differs from class action lawsuits filed on behalf of flooded property owners in Gladwin and Midland counties. This lawsuit in Midland County Circuit Court is seeking mass tort claim. While a class action lawsuit may result in a single large award for property owners to split, the new lawsuit allows property owners to have their claims evaluated and compensated individually.

"We feel strongly that this mass tort approach is the most beneficial for each client because it allows them each to be treated and compensated individually, rather than lumping them all into a single class," said Antonio Romanucci, founding partner of Romanucci & Blandin. Defendants in

the case include Boyce Hydro, which owns the failed dams, and its operators. Attorneys who filed the lawsuit are seeking compensation for property owners who suffered loss of property, costs to repair property, loss of business income, loss of profits and lost use or enjoyment of property. **"This devastating event and the catastrophic consequences suffered by the communities harmed were entirely preventable,"** said Ven Johnson, a Saginaw native and founder of Ven Johnson Law. "The defendants indisputably knew for years that these dams were inadequate, decrepit, unstable, unsafe, and would fail under predictable conditions."



He and other attorneys representing plaintiffs claim Boyce Hydro and its operators knew the dams were inadequate since they took ownership in 2006, but they didn't make any major repairs or upgrades. "As a direct result of the defendants' carelessness, negligence and willful indifference, our clients have suffered damages as well as anguish and mental anxiety," Romanucci said. Attorneys representing plaintiffs are hosting a virtual town hall meeting at 6 p.m. Thursday for property owners interested in learning more about the lawsuit. [Click here to sign up for the virtual town hall.](#)

[\(We all gotta get a drone.\)](#)

## **Drones Take SCE's Dam Safety Inspections to New Heights**

**In steep, difficult-to-reach areas, unmanned aerial vehicles deliver high-definition images that help safely monitor and maintain the towering structures.**

By Paul Netter, Energized by Edison Writer, May 29, 2020, energized.edison.com

**They're quiet, they capture crucial high-definition images and, most of all, they're safer.** And, though also widely used in utility equipment inspections and wildfire mitigation efforts, drones have quickly become an essential tool for Southern California Edison in its dam safety inspections too. **With 83 dams in SCE's hydroelectric system stretching from Catalina Island to Big Creek near Fresno,** it's easy to see why. In addition to safer and more cost-effective inspections, drones help SCE's hydro team maintain the dams **safely and effectively.**



"The drones have been a powerful tool and I think we can do a lot more going forward," said Nicolas von Gersdorff, SCE's chief dam safety engineer. **Drones' advantage over helicopters includes better control over the height to the structure, letting it get up close and personal while still having a bird's eye view.** Future use of the drones includes FAA approval to fly outside the line of sight — which the FAA doesn't yet allow — as well as the use of Artificial Intelligence and Machine Learning. As is, the Dam & Safety group's two Parrot Anafi drones — operated by two FAA and SCE Air Operations-authorized pilots observing the utility's strict confidentiality policies and procedures — have greatly enhanced inspections of remote, difficult-to-access dams, efficiently delivering high-resolution images that identify minor issues like leakages and cracks before they become major problems. Images that Patrick Le, one of the drone operators and an SCE engineer, said are further enhanced through technologies like LiDAR and 3D mapping.

**"Drones are just an excellent tool with speed, safety and practicality,"** said Le of the unmanned aerial vehicles used for dam inspections since 2016. "We get measurable data and a bird's eye view." Drones can easily inspect pipelines in hard-to-reach areas, reducing expense and safety



hazards. In the winter, that data can come through as thermal imaging of powerhouses' penstock pipes. This speed and capability is important when SCE needs to manage near-record snow in the system- Opens in new window. And Le and his group are intrigued by LiDAR analysis and Structure from Motion, saying, "We essentially stitch a series of photos together in a 3D model to get something you can't get with a typical visual inspection. Sometimes you can capture things you can't see with the naked eye." Even more crucial are the drones' elimination of the safety risks involved in worker inspections that require

specialized equipment and training to physically access steeply sloped areas of a structure. And, amid the COVID-19 pandemic- Opens in new window, SCE's Meg Richardson pointed out another unexpected bonus. "Just looking at where we are with present times and COVID-19, inspections can be done via drone now instead of having people go out in groups," said Richardson, an SCE senior advisor in Regulatory Affairs and Compliance. "I think it's also a way to be innovative for what the future might look like."

Patrick Le, an SCE engineer who started flying this drone last year, calls it safer and more effective because of the quality of data delivered without putting anyone in harm's way. Surveillance cameras, like the drones, also provide improved and continuous situational awareness of dams that can take hours to reach on difficult and snow-swept roads. The team finds the cameras particularly useful during earthquakes- Opens in new window like those experienced within the last year in the area. "We pulled up the camera and getting that immediate feedback is tremendously valuable," said von Gersdorff. "We have emergency action plans for all our dams and what we see from case studies is that the timing is so essential in improving our emergency response capabilities."

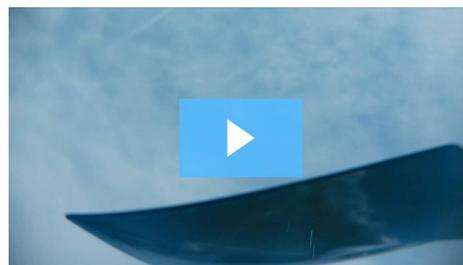


Together, the high-tech drones and cameras present opportunities galore for the Dam & Safety team to continue enhancing safety- Opens in new window and inspections. "Technology like this sets forth that we can be better prepared because we are being innovative with the technology out there," said Richardson. "We're continuing to look at innovation on how to meet regulatory requirements as well as additional ways this technology can be used in what will be the new normal. It's definitely a highlight."

(Here you go. If you're stuck inside, do this! Hydro spelled with a W.)



[Hydro:](#)



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(Was it climate change or not? Is the PMF [probable maximum flood] enough? No one mentioned that the design criteria at the Federal level for high hazard dams is the PMF.)<sup>4</sup>

**Expect more': Climate change raises risk of dam failures**

By HENRY FOUNTAIN, THE NEW YORK TIMES | MAY 25, 2020 | mcall.com

The dam that failed in central Michigan on Tuesday gave way for the same reason most do: **it was overwhelmed by water. Almost 5 inches of rain fell** in the area in the previous two days, after earlier storms had saturated the ground and swollen the Tittabawassee River, which the dam held back. No one can say yet whether the intense rainfall that preceded this disaster was made worse by climate change. But global warming is already causing some regions to become wetter, and increasing the frequency of extreme storms, according to the latest National Climate Assessment. The trends are expected to continue as the world gets even warmer. That puts more of the nation's 91,500 dams at risk of failing, engineers and dam safety experts said. **"We should expect more of these down the road,"** said Amir AghaKouchak, a professor of civil engineering at the University of California, Irvine. "It's unfortunate but this is what the trend is going to be."

Overall, he and others say, **dams in the United States and elsewhere are unprepared for the changes coming in a warming world.** The dam that failed Tuesday, forcing the evacuation of about 40,000 people in and around Midland, Michigan, and threatening a chemical complex and toxic waste cleanup site, was designed a century ago, long before climate change was a concern. The dam, at Edenville Township, about 30 miles upstream from Midland, had severe design problems: It had been cited for having spillways that were inadequate to handle a maximum flood, whether affected by climate change or not. (A second dam at Sanford, 10 miles downstream, was overrun by the arriving floodwaters but did not collapse.)

But the Edenville Dam was hardly alone in being outdated, with design or maintenance deficiencies or other problems that might make it unsafe. **The American Society of Civil Engineers, in its latest report card on infrastructure in 2017, gave the nation's dams a "D" grade.** The average age of dams in the United States is nearly 60. **And nationwide, about 15,500 are classified as having a high hazard potential; in Michigan, more than 170 dams are in that category, as was the Edenville Dam.** Repairing and upgrading high-hazard dams alone could cost tens of billions of dollars.

**Since the mid-19th century there has been an average of about 10 dam failures a year** in the United States, said Martin W. McCann Jr., a civil engineer who directs the National Performance of Dams Program at Stanford University. More than 90% of failed dams are less than about 50 feet high. (Edenville was 54 feet tall.) Rivers and reservoirs swollen by rainfall are the cause of most of the failures. "It's not a new thing per se," McCann said. But some recent dam episodes have been shown to have a climate change link. In February 2017, at Oroville Dam in California, the tallest in the nation, heavy mountain runoff into the reservoir **led to the near-failure of an emergency spillway and severe damage to the main spillway. Nearly 200,000 people were evacuated as a precaution and repairs cost more than \$1 billion.** A later study found that human-caused warming had increased early season runoff in the Sierra Nevada, contributing to the high water levels at the dam.

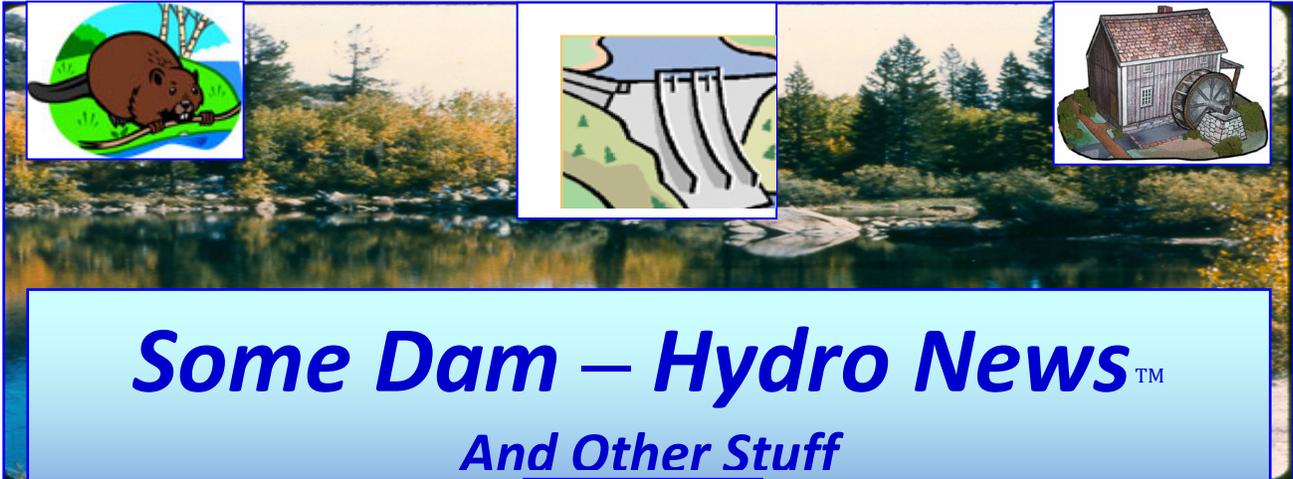
**'Truly devastating': Michigan officials assess flood damage** and there is little doubt that extreme rainfall events are getting more frequent. The fourth National Climate Assessment, issued in 2018, **showed that the number of heavy precipitation two-day events has increased in all regions except the Southwest since the early 1900s. And since 1950, extreme events increased by more than 50% in the Midwest.** But Bill McCormick, who is in charge of dam safety for the state of Colorado and is the incoming president of the Association of State Dam Safety Officials, said short-duration extreme precipitation wasn't the only problem. **Rainfall of longer duration but less intensity** — an overall wetter climate, which climate models forecast for parts of the United States in coming decades — **can contribute to the risk.** "They tend to saturate the ground," McCormick said. "Then, if you do get these 4- or 5- inch rains, the ground can't absorb it."

**That was evident in the Michigan disaster,** he said, where even though the two-day deluge was not considered the most extreme possible rainfall event, it still overwhelmed the dam because the ground was already saturated from several days of rain. Dam engineers have usually based their designs on past weather — what a decade or decades of data show about the maximum potential flood a dam would have to withstand. That would have been how the Edenville Dam was

designed in the 1920s. But there was no expectation that future weather patterns might be different. This kind of thinking largely persists today, AghaKouchak said. “Still, our engineering design concept is based on the so-called stationary assumption — that things will stay the same,” he said.

“But as we get more and more evidence of changes in extremes, the question is if it’s reasonable to stay with this stationary assumption,” he said. “The answer is, probably not.” Some designers are beginning to change their ways, said Robert Lempert, a principal researcher at the RAND Corp. who specializes in climate risk analysis. Legislation recently approved in California, for example, requires state engineers to take climate change into account when designing infrastructure projects. “If you’re building a dam you want to pull in climate change from the very beginning,” he said. “How is climate change going to affect the design of the dam, or even whether I want a dam at all?” For existing dams, operational changes might be called for, such as reducing the water levels behind the dam at certain times of year in anticipation of more extreme storms. “And you want to put climate change on the agenda for any maintenance and upgrades,” Lempert said. “Those upgrades might include changing spillway designs to incorporate the kind of rainfall pattern that occurred in Michigan, McCormick said. Rather than one designed to handle high peak inflow from a short, extreme storm, designers may opt for one that could cope with larger volumes over a longer time period. “You need to look at how a given spillway is designed,” he said, “if the circumstances of the rainfall change.”



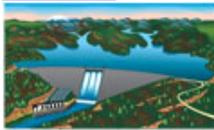


ii



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 (Hold down Ctrl key when clicking on this link) <http://npdp.stanford.edu/> . After clicking on link, scroll down under Partners/Newsletters on left, click one of the links (Current issue or View Back Issues).

**Dams:**



(A solemn reminder!)

**The Teton Dam broke 44 years ago today. This man was sitting on it when it happened.**

By Nate Sunderland, June 5, 2020, EastIdahoNews.com

**Video:** <https://www.eastidahonews.com/2020/06/the-teton-dam-broke-44-years-ago-today-this-man-was-sitting-on-it-when-it-happened/>

Former excavation foreman Jay Calderwood sits down with EastIdahoNews.com to talk about his experience trying to repair the dam before it broke.

*EDITOR’S NOTE: EastIdahoNews.com originally posted this story on June 5, 2016. We are publishing it again today to commemorate the 44th anniversary of the Teton Dam catastrophe.*

REXBURG, Idaho — The images of the Teton Dam breaking on June 5, 1976, remain a vivid reminder of the terrifying, but also awe-inspiring, nature of the disaster. But the images don’t quite compare to hearing the story of 79-year-old Jay Calderwood – one of the three men who were atop the dam when it began to disintegrate around them.

Calderwood, then 39 years old, was the general foreman over excavation at the Teton Dam site. For months prior to the break, he had worked digging at the site and laying pipe. The U.S. Bureau of Reclamation had undertaken the dam as a way to prevent flooding from spring runoff and to supply farmers with water. BOR officials estimated it would take three years to fill, but it nearly filled during its first spring. Calderwood said the unexpected amount of water so soon after construction played a major role in the destruction of the Teton Dam.

**Progression of the break**

Courtesy U.S. Bureau of Land Management



On the morning of the disaster – a Saturday- Calderwood received an urgent message to come into work around 10:30 a.m. “I told the wife I’ll be back in a couple hours ... we’d had a heck of a heavy snow accumulation that year. (The dam) nearly filled that first spring,” he told EastIdahoNews.com. “I told her the water must be leaking around the spillway because the dam had almost been filled the day before.” The problem, however, turned out to be significantly more severe. Arriving at 11 a.m., Calderwood saw a hole – about 10 feet around – along the northern edge of the dirt dam.

Water was quickly gushing from the hole, and it was widening with each passing moment.

“I seen that hole in the side of the dam, and I thought, ‘Oh man, I don’t know that we’re going to be able to stop this,’” he said. Calderwood and another excavator got into two bulldozers and shoveled boulders into the water. A whirlpool had formed behind the dam above the breach as water was being sucked through the hole. “The thought was ... push it into the whirlpool hoping that it would suck it down and slow the water,” Calderwood said. “We didn’t figure it would stop it, but we were hoping to slow it down enough (so) we could figure out another way to stop it.”



They never got the chance. After less than 20 minutes of pushing dirt, Calderwood's boss, who was standing on the dam, felt the ground beneath his feet shift and settle as the north side of the dam collapsed down on the gaping hole and water began pouring overtop the dam. The superintendent waved the two men in dozers to get off the dam and took off running. "I started to back up and the water starts caving in and washing out the dirt," Calderwood said. "It just kept coming off in big chunks and getting wider as it caved in. I thought, 'Boy, I'm not going to make it,' I thought this was it." Calderwood was worried the dirt behind him would give way. He briefly considered leaving his bulldozer and running, but figured he would fall. "So I stuck with the dozer and it didn't catch me, but I thought it was going to," he said. Just minutes before noon, the northern edge of the dam gave way, releasing more than 1 million cubic feet of water per second, according to the BOR.

A wall of water – more than 20 feet high – thundered down the Teton River canyon, obliterating a power station and concrete plant below the dam in minutes. The water picked up hundreds of recently cut logs that lined the banks near the dam. Those logs, along with heavy equipment, mud and debris, became battering rams. "It was a frightening experience to see how much power (the flood) had," Calderwood said. "I'll never forget the water going down the canyon and hitting huge cottonwoods standing 60 to 80 feet tall, and that water was mowing them down like ... they (were) mowing alfalfa." The wall of water rushed down the canyon, heading straight for the communities of Wilford, Newdale, Teton, Sugar City and Rexburg.

Video of the Teton Dam breaking and an explanation about why it failed is not available. | Courtesy History Channel

### **Getting the word out**

Don Ellis, a radio anchor with KRXK in Rexburg was one of the first reporters to arrive on the scene. The above audio is his live broadcast from the scene of the disaster.

The dam workers had alerted authorities of the impending disaster shortly before 11 a.m.

Don Ellis with the Rexburg radio station KRXK was among the first media on the scene. He went live recounting the disintegration of the dam as it happen right in front of him.



“The whole north side of the Teton Dam is caving in, and water is coming through in monumental amounts ... it’s coming apart, it’s just completely coming apart,” he reported live. As he watched the northern edge collapse, he issued a strong and ominous warning — one that he would repeat dozens of times over the next hour.

“What can I say? People downstream had better get out,” he said.

On top of the Teton River canyon, Ellis watched as the water spread into the Upper Valley.

“From my vantage point here at the dam ... we can see the water moving out into the valley – you can actually see it from here,” he said. “It’s flooding everything, it’s flooding everything in that valley.”

Courtesy BYU-Idaho Special Collections  
Photos Courtesy BYU-Idaho Special Collections..



### The evacuation

The Teton Reservoir was 270 feet deep and nearly 17 miles long, according to the BOR. The reservoir took about six hours to fully empty, spilling about 80 billion gallons of water into eastern Idaho. Evacuation orders went out across valley shortly before the dam collapsed. It only took about 20 minutes for the water to reach populated areas, but that was enough time for most people. In an interview recorded in the BYU-Idaho Special Collections, Zeruah Moon, wife of Sugar City’s then-mayor Lyle Moon, recalled heading back into town to get something.

“Nobody was in town but me. A cop car that went by and another fellow that went by said, ‘Don’t you know that there is a flood? Get out!’” she said. “In less than 10 minutes, there was nobody at all around. It was really weird. It was like everybody was in a dream-type thing.”

The Idaho Transportation Department reports some 35,000 people were evacuated across the valley that day. Many of them ended up at Ricks College (now Brigham Young University-Idaho), which became a haven for the displaced during and after the flood.

In an Upper Snake River Valley Historical Society tape, Keith Walker, a resident of Rexburg who helped in the recovery effort, remembers then-college President Henry B. Eyring telling him that “anything you need, it’s yours — just ask for it.”

On that first day, the college provided some 5,000 meals for victims from its reserve food storage, a value of \$10,000, according to a 1977 Ricks College news release.

### The devastation



Photos Courtesy BYU-Idaho Special Collections. View more photos here:

[https://www.flickr.com/photos/byui\\_library/albums/72157623364635347/page2](https://www.flickr.com/photos/byui_library/albums/72157623364635347/page2)

The damage caused by the flood was massive. The wall of water first hit Wilford, a tiny community about three miles wide. Most of people got out in time, but nearly every home and business in the community was obliterated and carried downstream. As the flood expanded, more than 13,000 livestock were said to have perished and were carried along with the water, according to news reports following the flood. The water destroyed seven bridges, and nearly 80 percent of the valley’s 700 miles of county roads were washed away, the Idaho Transportation Department said. Railways also were completely destroyed. Sugar City and Teton saw damage similar to Wilford. Local newspapers reported that more than 300 homes were destroyed in those small communities. Rexburg saw less damage overall due to its elevation, but about 4 to 6 feet of water rushed down Main Street, destroying hundreds more homes and businesses and leaving a massive amount of debris and mud in its wake. Debris left on Main Street in Rexburg after the flood in 1976, compared with the same portion of Main Street from today. | Courtesy BYU-Idaho Special Collections and Joyce Edlefsen, EastIdahoNews.com Debris left on College Avenue in Rexburg after the flood in 1976, compared with the same portion of street from today. **The water even reached some 150 homes miles away in Blackfoot before it dissipated or was caught by the American Falls Reservoir. Eleven people were killed, and more than 800 were treated for flood-related injuries.**

### The aftermath

The Idaho Transportation Department estimates some 3,000 people were made homeless by the disaster. Cleanup took months and cost more than \$2 billion – more than \$8 billion in today's dollars.

News releases from Ricks College show that between June and August, some 386,250 meals and 100,000 person-nights of lodging were provided to those in need. Following the disaster, the dam site was immediately closed by the Bureau of Reclamation, and all the contracted employees – including Jay Calderwood – lost their jobs. Calderwood quickly found more work though in the months following repairing the railways. He said he is still amazed at the damage that occurred. "Oh my goodness, the devastation down there ... it was sad. People had to start over," he said.



An aerial picture of the Teton Dam today. | Stephan Rockefeller, EastIdahoNews.com

Now after 40 years, the effects of the flood have faded, and the dam site is mostly just a remote tourist attraction. But Calderwood doesn't think we've heard the end of the Teton Dam story. He thinks at some point it will be rebuilt – partially because of how much of it is still there. "They have millions of dollars of infrastructure still there that was never used ... tunnels and pipes at the bottom of that canyon," Calderwood said. "I'm sure they'll use that site again, but it would be shame to lose all that infrastructure there."



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