

Dams

2013
GRADE **D**



The average age of the 84,000 dams in the country is 52 years old. The nation's dams are aging and the number of high-hazard dams is on the rise. Many of these dams were built as low-hazard dams protecting undeveloped agricultural land. However, with an increasing population and greater development below dams, the overall number of high-hazard dams continues to increase, to nearly 14,000 in 2012. The number of deficient dams is estimated at more than 4,000, which includes 2,000 deficient high-hazard dams. The Association of State Dam Safety Officials estimates that it will require an investment of \$21 billion to repair these aging, yet critical, high-hazard dams.

Dams: Conditions & Capacity

Our nation's dams provide essential benefits such as drinking water, irrigation, hydropower, flood control, and recreation. The safe operation and proper maintenance of these dams is critical to sustaining these benefits while preventing the possibility of a dam failure. Thousands of our nation's dams are in need of rehabilitation to meet current design and safety standards. They are not only aging, but are subject to stricter criteria as a result of increased downstream development and advancing scientific knowledge predicting flooding, earthquakes, and dam failures.

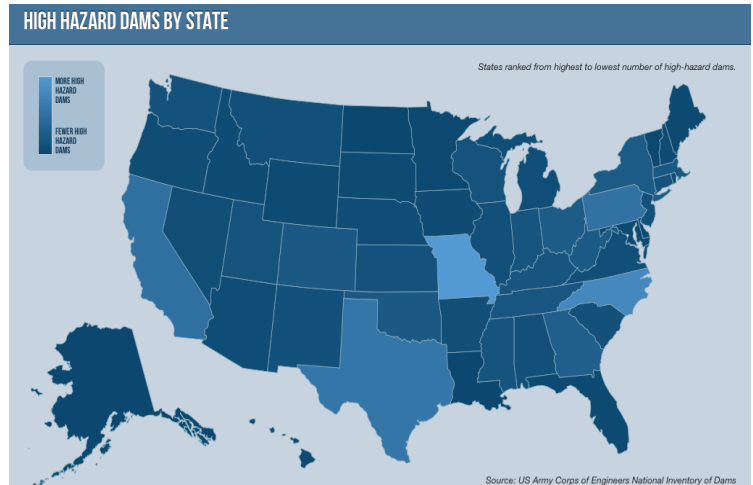
Dams are classified based on their hazard potential, or anticipated consequences in the case of failure. The failure of a dam that is classified as **high-hazard** is anticipated to cause a loss of life. As of 2012, there are 13,991 dams in the United States that are classified as high-hazard, showing a continued increase in the overall number of dams with that classification. The number has increased from 10,118 high-hazard dams just ten years ago. Another 12,662 dams are currently labeled as **significant hazard**, meaning a failure would not



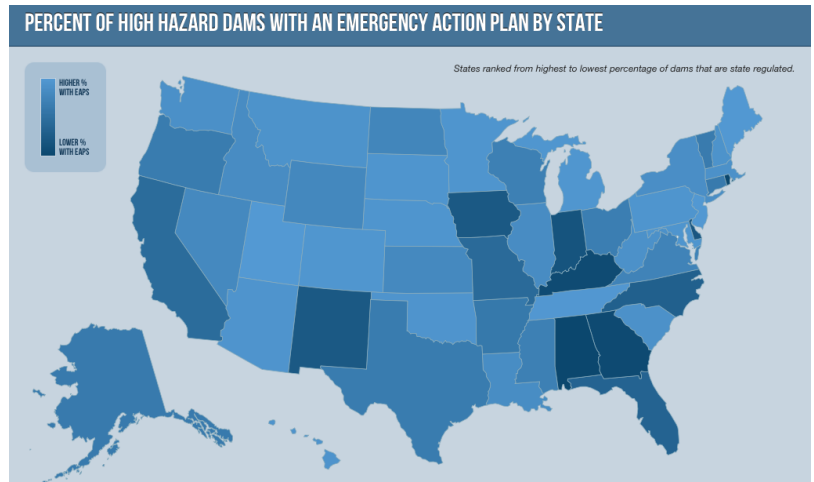
Crab Orchard Dam, Illinois
Courtesy of United States Fish and Wildlife Service

necessarily cause a loss of life, but could result in significant economic losses.

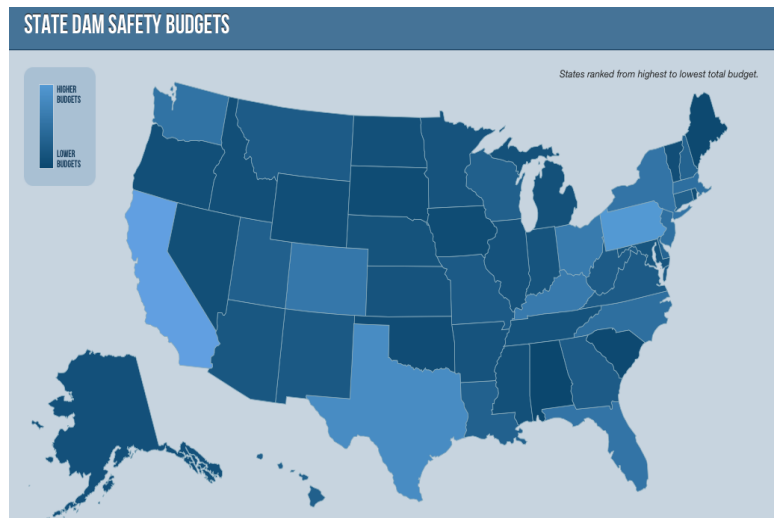
The average age of our nation's dams is 52 years. By 2020, 70% of the total dams in the United States will be over 50 years old. Fifty years ago dams were built with the best engineering and construction standards of the time. However, as the scientific and engineering data have improved, many dams are not expected to safely withstand current predictions regarding large floods and earthquakes. In addition, many of these dams were initially constructed using less-stringent design criteria for low-hazard dams due to the lack of development below the dam.



The U.S. Census Bureau estimates a population increase of 130 million people within the United States by 2050. This population growth will likely move development further into the unpopulated areas below aging dams, increasing the populations at risk and reclassifying many low or significant hazard dams as high-hazard. However, “high-hazard” does not necessarily mean the dam is deficient, but instead that the consequences are expected to include loss of life should the dam fail.



Dam failures can not only risk public safety, but they can cost our economy millions of dollars in damages. For example, the Iowa Lake Delhi dam failure in 2010 cost an estimated \$50 million in damages and \$120 million in economic losses, and swept away half a dozen homes. Since dam failures can cause severe consequences to public safety and the economy, emergency action plans (EAPs) for use in the event of an impending dam failure or other uncontrolled release of water remain vital. While the number of high-hazard dams with an EAP has increased, only 66% of dams have EAPs, far below the national goal of 100%.



The complexity of monitoring the conditions of our nation's dams is partly because they are owned and operated by many different entities. While some of the nation's dams are owned and

operated by federal, state, and local governments, the majority, 69%, are owned by a private entity. The federal government owns 3,225 dams, or approximately 4% of the nation's dams. It may be surprising to some that the U.S. Army Corps of Engineers owns only 694 dams.

Other than 2,600 dams regulated by the Federal Energy Regulatory Commission, the remaining dams in the nation are not regulated by the federal government, but instead rely on state dam safety programs for inspection. State dam safety programs have primary responsibility and permitting, inspection, and enforcement authority for 80% of the nation's dams. Therefore, state dam safety programs bear a large responsibility for public safety, but unfortunately, many state programs lack sufficient resources, and in some cases enough regulatory authority, to be effective. In fact, the average number of dams per state safety inspector totals 207. In South Carolina, just one and a half dam safety inspectors are responsible for the 2,380 dams that are spread throughout the state. Alabama remains the only state without a dam safety regulatory program.

Dams: Investment & Funding

The federal National Dam Safety program, which provides grants to states to improve programs through training, technical assistance, inspection, and research, expired in September 2011. This program, administered by the Federal Emergency Management Agency (FEMA), is dedicated to protecting the lives of American citizens and their property from the risks associated with the failure or mis-operation of America's dams. Additionally, a national dam rehabilitation and repair program, which would fund the repair, removal, or rehabilitation of the nation's publicly owned, nonfederal, high-hazard dams, still has not been established.



Water flows over the Devils Kitchen Dam in southern Illinois.
Courtesy of United States Fish and Wildlife Service

Funding needs are significant, and vary according to who owns and operates the dam. The Association of State Dam Safety Officials estimates that the total cost to rehabilitate the nation's non-federal and federal dams is over \$57 billion. To rehabilitate just those dams categorized as most critical, or high-hazard, would cost the nation \$21 billion, a cost that continues to rise as maintenance, repair, and rehabilitation are delayed. Overall, state dam safety program staffing has increased over the past several years. However, in 2011 state programs spent over \$44 million on their regulatory programs, a decrease from recent years.

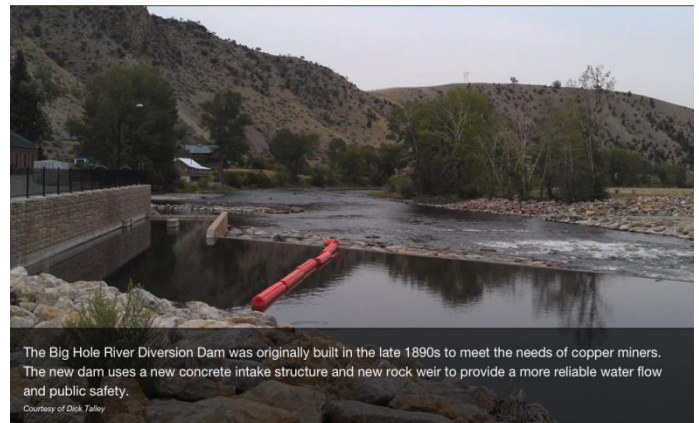
The U.S. Army Corps of Engineers estimates that more than \$25 billion will be required to address dam deficiencies for Corps-owned dams. At current investment rates, these repairs would take over 50 years to complete. The Bureau of Reclamation has identified approximately 20 of its high and significant hazard dams where risk reduction actions are justified. The cost of those actions is estimated at \$2 billion over the next 15 years.

The dam safety engineering practice is moving towards a risk-based decision-making process for the design, rehabilitation, and operation of dams. Risk-based decisions enable the dam owner to better utilize limited funding, and prioritize projects, by focusing on repairs and operational changes that reduce risk to acceptable levels, thus improving community resilience. Engineers, dam owners, regulators, and emergency management professionals should be engaging those communities affected by a dam failure, in order to provide a fair portrayal of risk. Through broader community collaboration, stakeholders will be better able to support land use decisions, emergency action planning, and maintenance and rehabilitation funding, which will reduce community risk in the long term.

Dams: Success Stories

Big Hole River Diversion Dam Replacement

The Big Hole River Diversion Dam was originally built in the late 1890s to meet the needs of the local copper mines. By 2009 the dam's intake structure was outdated and structurally failing, threatening the main water source for the city of Butte, Montana, if the dam should fail. With more frequent emergency repairs, increasing public safety concerns for the river's recreational users, and the fish passage being restricted, it was decided that a replacement project was necessary.



The old structure was removed and replaced with a new concrete intake structure and a new rock weir. The new intake structure now provides a more reliable water flow from the river to the existing pump house. The newly constructed dam also took into account recreational use and boater safety, creating a boat and fish passage channel. Most importantly, the dam has provided Butte the security of drawing water from the Big Hole River for years to come.

Living with Dams: Know Your Risks

There are over 84,000 dams scattered across the country, and most people are not aware of their existence, nor of what to do if there is a problem. The National Dam Program recognizes the vital role that public awareness plays regarding dam safety and has been working to increase public awareness surrounding dams.

The Association of State Dam Safety Officials teamed up with FEMA to produce [*Living with Dams: Know Your Risks*](#). The booklet was created to help answer questions about dams: what purposes they serve, associated risks, guidance for those living near dams, and where to find further information.

Printed copies of the booklet were distributed by FEMA, for the first time, at the National Dam Safety Awareness Day activities on May 31, 2012. Since then, copies have been distributed across the country, raising public awareness of this hidden infrastructure.

Dams: Conclusion

As our nation's dams continue to age and the size of the population protected by dams continues to increase, more people downstream are at a potential risk. Many state dam safety programs are operating with limited resources and authority, thereby reducing critical inspections and regulatory actions necessary to maintain the safety of dams. Additionally, the number of dams needing repair continues to grow, while the funding required also increases over time. Some modest gains have been realized by increasing the number of emergency action plans for high-hazard dams and completing some dam safety repairs; however, a significant commitment from the federal, state, local, and private sector to America's dams is long overdue.



Raising the Grades: Solutions that Work Now

- **Reauthorize the National Dam Safety Program** by 2014 and fully fund the program for each year under the reauthorization.
- **Establish a national dam rehabilitation and repair funding program** to cost share repairs to publicly owned, nonfederal, high-hazard dams.
- **Develop** emergency action plans for every high-hazard dam by 2017.
- **Implement a national public awareness campaign** to educate individuals on the location and condition of dams in their area.
- **Encourage incentives to governors and state legislatures** to provide sufficient resources and regulatory authorities to their dam safety programs.
- **Require federal agencies that own, operate or regulate dams to meet the standards** of Federal Guidelines for Dam Safety.

