

# The Cost of Rehabilitating Dams in the U.S.

A Methodology and Estimate  
February 2023



Association of State  
Dam Safety Officials

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# The Cost of Rehabilitating Dams in the United States



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## ACKNOWLEDGEMENTS

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The Association of State Dam Safety Officials (ASDSO) would like to thank the task force members who developed the methodology and report.

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## INTRODUCTION

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In 2022, the ASDSO Board of Directors established a task force to review and update the methodology and processes that were developed several years earlier by ASDSO to estimate the costs to rehabilitate non-federal dams in the United States (U.S.). This was a one-year project financed by ASDSO. The updated methodology and processes used readily available data to estimate the number of dams in need of rehabilitation based on dam height, age, and Condition Assessment rating. Data from more than 500 dam rehabilitation projects nationwide, ranging from \$10,000 to more than \$500 million, was used in determining the total amount of funding needed for dam rehabilitation at a national level.

The purpose of this report is to inform national and state policy decisions and provide the public and the media with a high-level understanding of the national dam rehabilitation need in terms of estimated costs. The findings and methodologies are *not* meant to be used to estimate a specific dam rehabilitation cost.

## STUDY FINDINGS

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Based on the study detailed in this report, ASDSO estimates the cost to rehabilitate the nation's non-federal dams at \$157.5 billion with \$34.1 billion of that amount needed just for the most critical dams. Costs will continue to rise as maintenance, repair, and rehabilitation work is deferred.

## U.S. DAMS AND DAM SAFETY: THE NEED

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Investments are needed at the federal, state, and local levels to rehabilitate the tens of thousands of dams in need of rehabilitation to meet current design and dam safety standards to reduce the risk to the public. Many dam owners, especially private dam owners or owners without a revenue stream, may find it difficult to finance costly rehabilitation projects.

Increased statutory authorities and investments are also needed to bolster state dam safety regulatory programs that are responsible for overseeing the safety of approximately 70 percent of the nation's dams, including many that pose some of the highest risk to public safety. Many state dam safety programs are limited in their dam safety regulatory capabilities due to a lack of state statutory authorities and funding, both of which are needed to reduce dam safety risks for public safety. Likewise, investments at the federal level are needed to continue addressing the repair and rehabilitation of high-hazard potential dams owned and regulated by federal agencies.

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The failure of even one of these dams may have significant adverse impacts on large populations and centers of commerce.

Facts about dams in the U.S.:

- There are more than 88,600 non-federal dams in the United States.
- The number of high-hazard potential dams, where loss of life is probable should the dams fail, has increased almost 20 percent over the past 10 years to more than 16,000.
- Each state has hundreds, if not thousands, of dams within their borders.
- States regulate 70 percent of U.S. dams. Federal agencies regulate or own five percent of U.S. dams. The rest are unregulated.
- Approximately 65 percent of dams are privately owned. About 31 percent are owned by federal, tribal, state, or local governments. The rest are owned by quasi-governmental utilities or unknown ownership.
- Many dam owners cannot afford the high cost of dam rehabilitation and need grants and loans to rehabilitate their dams to reduce the risk of dam failures or serious incidents.
- About half of the states have limited grant and/or loan programs for dam owners.
- The number and amount of Federal grant and loan programs have increased since the last comprehensive ASDSO report was completed in 2012.

Dams are a critical part of the nation's infrastructure, equal to or even more important than bridges, roads, airports, and other major infrastructure elements. Dams provide a life-sustaining resource to people in all regions of the U.S. They can serve several functions at once, including water supply for domestic, agricultural, industrial, and community use; flood control; recreation; and clean, renewable energy through hydropower. In light of climate change, droughts, and extreme rainfall events, dams are an essential part of our nation's infrastructure for capturing water when available and providing flood protection to downstream communities.

Dams are often innately hazardous structures (see Table 1). Failure or mis-operation can result in the release of the reservoir contents (e.g., water, mine waste, agricultural refuse) causing negative impacts both upstream and downstream, even at locations remote from the dam. Negative impacts of primary concern are the loss of human life and economic loss including property damage, lifeline disruption, and environmental damage.

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### Table 1: Hazard Classification Defined<sup>1</sup>

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**High-Hazard Potential** = Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life.

**Significant-Hazard Potential** = Dams assigned the significant hazard potential classification are those dams where failure or mis-operation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

**Low-Hazard Potential** = Dams assigned the low hazard potential classification are those where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

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With advances in scientific knowledge, dam safety standards, and best practices, the nation's dams are subject to stricter dam safety criteria as compared to when they were initially designed and constructed. The average age of our nation's dams is 61 years, and many dams may not be able to safely withstand loadings from extreme storms and earthquakes. By 2025, seven out of 10 dams in the U.S. will be over 50 years old. Moreover, continued development (e.g., increased population and changing land use) in areas downstream of dams previously determined to be low-hazard potential means that these same dams are now deemed to be high-hazard potential. This results in the need for dams to be rehabilitated to meet higher, more stringent safety standards to safeguard life and property. While dams may have been built with the best engineering and construction standards of the time, in many cases the standards used were less stringent than what would be used today, and these dams may pose an unacceptable risk to the public. These situations demand greater attention to and investments in measures that reduce risks to public safety and economic assets.

Lessons to be learned from more recent events, including the Oroville Dam Spillways Incident (California, 2017) and the failures of Spencer Dam (Nebraska, 2019) and Edenville Dam (Michigan, 2020), highlight the need for comprehensive engineering reviews and more frequent, detailed inspections of dams nationwide. Such efforts have identified and will continue to identify more dam safety issues. With a better understanding of the level of risk that these dams pose to public safety, it is anticipated that the number of deficient dams in need of rehabilitation will continue to rise.

It is encouraging to report that, in recent years, new federal and state funding programs have been enacted. In 2016, Congress created the High-Hazard Potential Dams Rehabilitation (HHPD Rehab) Grant Program under FEMA's National Dam Safety Program. The authorized funding level, at its highest, was \$60 million annually. In

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<sup>1</sup> FEMA, Federal Guidelines for Dam Safety, Hazard Potential Classification Systems for Dams, April 2004



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2021, the Bipartisan Infrastructure Law (also known as the Infrastructure Investment and Jobs Act) was passed, which added \$585 million to the HHPD Rehab Grant Program, and this funding can be used until expended for dam rehabilitations and removals. The Department of Agriculture, Natural Resources Conservation Service (NRCS) offers grants for dam rehabilitation through its Watershed Rehabilitation Program and focuses specifically on dams built by the NRCS and owned now by local sponsors. Another new federal program is the U.S. Army Corps of Engineers' Water Infrastructure Financing Program, which will provide low-interest loans to dam owners for rehabilitation projects. (See the ASDSO website at [damsafety.org](https://damsafety.org) for more information on funding programs.)

## BASIS OF UPDATED STUDY

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In 2001, the ASDSO Board of Directors formed a task group to prepare a report on the cost of rehabilitating our nation's dams. In 2003, ASDSO issued a report entitled *The Cost of Rehabilitating Our Nation's Dams: A Methodology, Estimate and Proposed Funding Mechanisms*. Based on a national inventory of dams at the time and available rehabilitation cost data, the task group developed a methodology for estimating the funding needed to rehabilitate the nation's approximately 65,000 non-federal dams. In 2009, the same methodology was used but updated to account for the changing inventory of over 83,600 non-federal dams, inflation, and engineering assessments that led to hazard classification changes (see Table 1) and to account for deferred maintenance. Subsequently, ASDSO has routinely updated cost estimates based on dam statistics in the U.S. Army Corps of Engineers' National Inventory of Dams<sup>2</sup> (NID). The last estimate under the existing methodology was in 2022, which included over 88,600 non-federal dams.

In 2022, the ASDSO Board of Directors requested a full update to the previous report because more dam-specific information was publicly available, such as a dam's age and Condition Assessment rating (see Table 2). A new task force was convened for that purpose, and for continuity, it included task force members from past dam rehabilitation estimates. The principal tasks were to review the methodologies and associated rehabilitation cost estimates utilized in previous reports, collect dam rehabilitation cost data, and update methodologies as needed to calculate more representative cost estimates for dam rehabilitations on a general nationwide basis.

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<sup>2</sup> The National Inventory of Dams is a database program administered by the U.S. Army Corps of Engineers that houses information on dams regulated either by the federal government or state governments.

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**Table 2: Condition Assessment Defined<sup>3</sup>**

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**SATISFACTORY** - No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions (static, hydrologic, seismic) in accordance with the applicable regulatory criteria or tolerable risk guidelines.

**FAIR** - No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range to take further action.

**POOR** - A dam safety deficiency is recognized for loading conditions which may realistically occur. Remedial action is necessary. POOR may also be used when uncertainties exist as to critical analysis parameters which identify a potential dam safety deficiency. Further investigations and studies are necessary.

**UNSATISFACTORY** - A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.

**NOT RATED** - The dam has not been inspected, is not under state jurisdiction, or has been inspected but, for whatever reason, has not been rated.

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ASDSO members were asked to provide actual dam rehabilitation costs for non-federal dam repairs over the past 10 years and estimated costs for known upcoming projects. The request resulted in the collection of cost data for over 500 projects, including dam removals, from across the nation. Project costs ranged from \$10,000 for small projects to more than \$500 million for large complex projects. The project cost data was converted to 2022 dollars<sup>4</sup>, and it was evaluated and analyzed to determine representative dam rehabilitation cost estimates. Outlying data was identified and not included if it overly skewed the cost estimates.

The task group concluded that a national cost estimate to repair the nation's non-federal dams, based on available data, is \$157.5 billion. Of this figure, approximately \$34.1 billion is needed for non-federal high-hazard potential dams where loss of life is probable should the dams fail or be mis-operated.

### Contributing Factors That Increased Estimated Cost Needs Over Time

Estimated costs for dam rehabilitation have greatly increased from 2003 to 2022 (see Figure 1) primarily due to an increased number of dams in the NID. The 2023 estimate has significantly increased since 2022 due to several factors including the following:

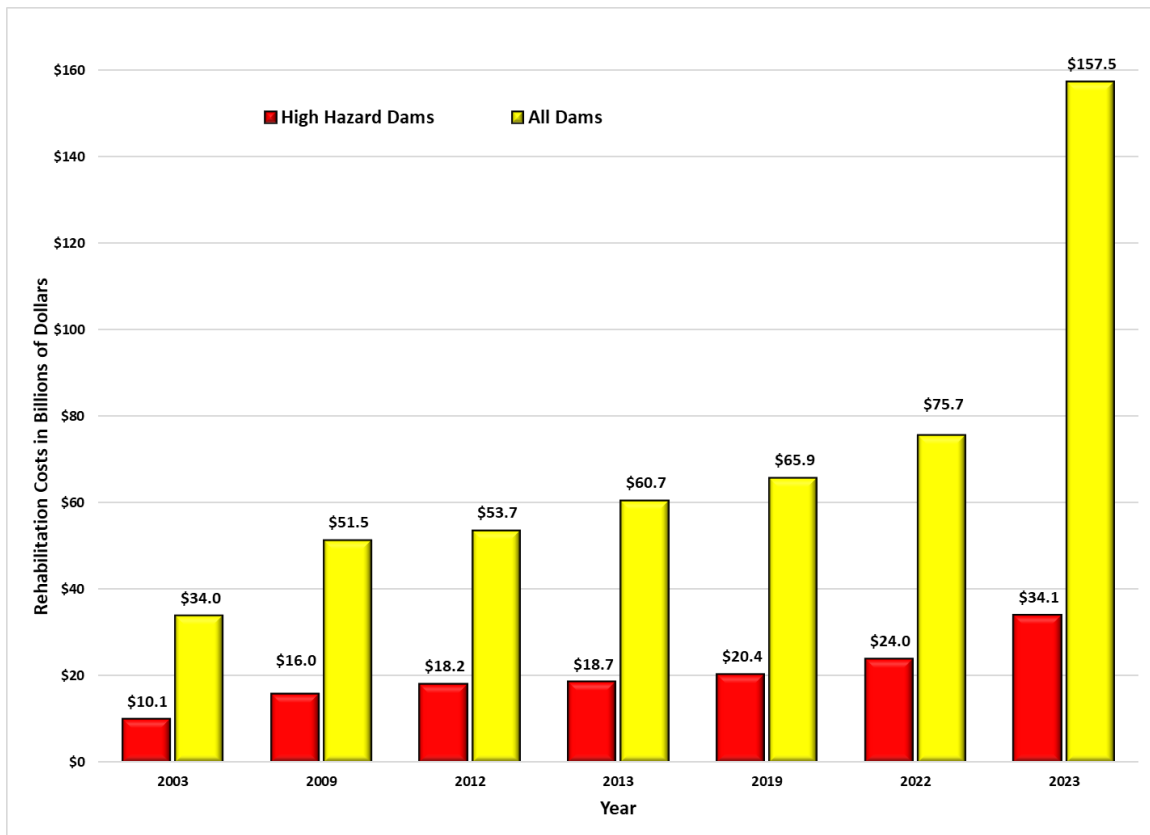
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<sup>3</sup> United States Army Corps of Engineers, National Inventory of Dams, List of Definitions

<sup>4</sup> US Bureau of Labor Statistics CPI used to convert past costs into 2022 dollars.

- 1) a more refined methodology for calculating estimated costs, which considers the age of the dam (e.g., aging infrastructure) and its Condition Assessment rating (e.g., proxy for estimated rehabilitation costs);
- 2) more refined categories for dam height to better estimate costs for taller and more complex dams;
- 3) updated project costs that account for increased engineering costs of expanded scope/breadth of current engineering studies and analyses, and escalated costs for construction materials and labor.

**Figure 1: Estimated Dam Rehabilitation Cost Needs Over Time**



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## NEW ESTIMATED COSTS METHODOLOGY

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The 2023 dam rehabilitation cost estimates are based on an updated methodology that incorporates a dam's height, age, and Condition Assessment rating, along with the use of actual and estimated dam rehabilitation costs provided by ASDSO members. To facilitate the development of national estimates, the task force made the following assumptions:

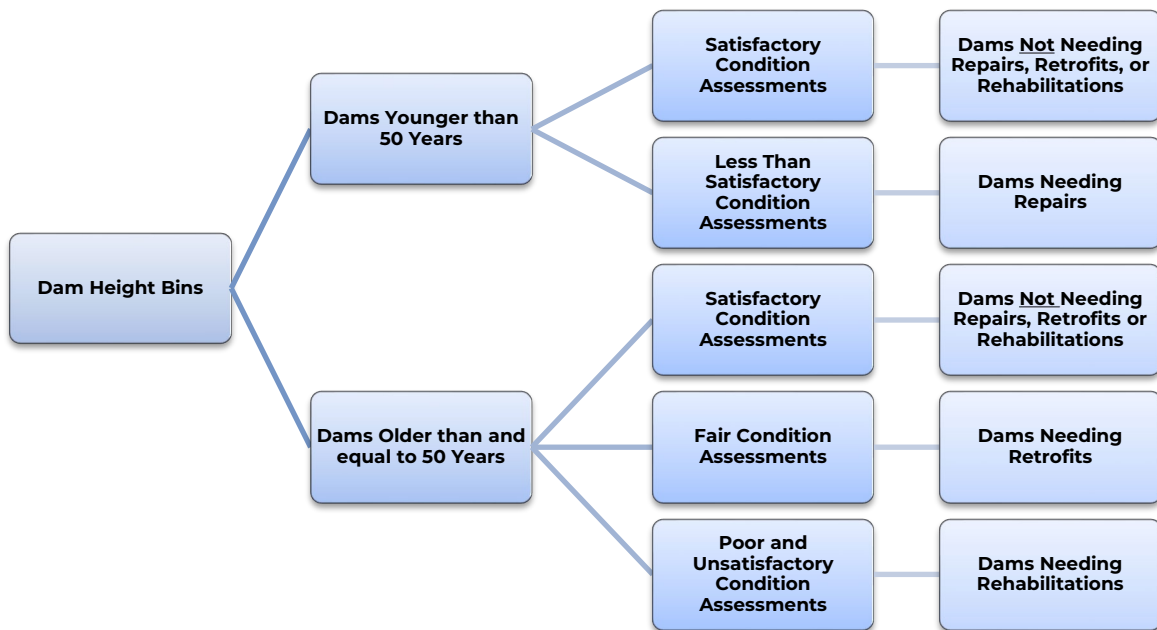
- 1) the working definition of dam rehabilitation would include dam repairs, retrofits, and rehabilitations;
- 2) dam height would continue to be the primary criterion in categorizing dams listed in the NID into representative groups; and,
- 3) national estimates would exclude federally owned dams. The task force group determined that most, if not all, federal agencies have more accurate dam repair cost estimates for their specific dams.

Dam height was selected as a primary criterion because it is an effective indicator of overall size, complexity, and cost of dam rehabilitation projects, and it is readily available through the NID. This was the conclusion of the 2003 report and evaluation of the 2022 collected cost data provided verification for its continued use as the primary criterion. The task group considered additional criteria such as dam length, but that information is not required in the NID and is not as widely reported for all dams. Dams were binned into six height categories: dams less than or equal to 15 feet (Bin 1), over 15 feet and less than or equal to 25 feet (Bin 2), over 25 feet and less than or equal to 50 feet (Bin 3), over 50 feet and less than or equal to 100 feet (Bin 4), over 100 feet and less than or equal to 200 feet (Bin 5), and over 200 feet (Bin 6). Previous studies included only four height categories, with the category for the tallest dams being those greater than 50 feet in height. This study added two additional categories for taller dams as the cost data showed rehabilitation of taller dams to be significantly higher than other categories. Dam age and Condition Assessment ratings were then used as secondary and tertiary criteria, respectively, to further refine the cost estimates.

The logic diagram, shown in Figure 2, was used for each height bin to determine the percentages of dams that require some level of rehabilitation. After binning dams by their height, the methodology then sub-divided dams by their age, and then by their Condition Assessment rating. While the terms repair, retrofit, and rehabilitation can be used synonymously, these terms were used to distinguish different levels of costs with repair being the lowest and rehabilitation being the highest. The levels of rehabilitation costs, which could include dam removal projects, were broken into the following types:

- Repairs - Dams less than 50 years old with a Condition Assessment rating of less than Satisfactory (Fair, Poor and Unsatisfactory).
- Retrofits - Dams 50 years old and greater with a Condition Assessment rating of Fair.
- Rehabilitations - Dams 50 years old and greater with Condition Assessment ratings of Poor and Unsatisfactory.

**Figure 2: Logic Diagram**



Newer dams rated less than Satisfactory typically require less extensive and expensive repairs, while older dams with a Fair rating may require extensive and expensive retrofits, and older dams with a Poor or Unsatisfactory rating generally need the most extensive and expensive rehabilitations. The task group analyzed the collected cost data and statistically evaluated the data for the most representative cost distribution. The following data selections were used for each height bin: 33<sup>rd</sup> percentile of costs (excluding outliers) for Repairs; 66<sup>th</sup> percentile (excluding outliers) for Retrofits; and the average costs (all data) for Rehabilitations (see Table 3).

**Table 3: Estimated Project Costs for Dams with a Condition Assessment Rating of Less than Satisfactory**

Bins (Dam Heights in feet)	Dams Less than 50 Years Old	Dams Greater than or Equal to 50 Years Old	
	Less than Satisfactory Condition	Fair Condition	Poor and Unsatisfactory Condition
	Repair	Retrofit	Rehabilitation
1 ( $\leq 15$ )	\$400,000	\$1,380,000	\$2,870,000
2 ( $> 15$ & $\leq 25$ )	\$790,000	\$1,890,000	\$2,670,000
3 ( $> 25$ & $\leq 50$ )	\$1,410,000	\$4,000,000	\$6,230,000
4 ( $> 50$ & $\leq 100$ )	\$1,360,000	\$4,800,000	\$8,580,000
5 ( $> 100$ & $\leq 200$ )	\$3,080,000	\$20,000,000	\$23,840,000
6 ( $> 200$ )	\$9,180,000	\$26,340,000	\$95,300,000

*Note that the cost information above is for individual dam repair, retrofit, and rehabilitation projects.*

This new methodology allows cost estimates to be easily updated as our nation's dams age and when changes occur in the number of dams reported in the NID and updates are made to the Condition Assessment ratings of dams.

Because not all dams listed in the NID have a date of construction provided or the dam's Condition Assessment rating is listed as Not Available or Not Rated, the following assumptions were made:

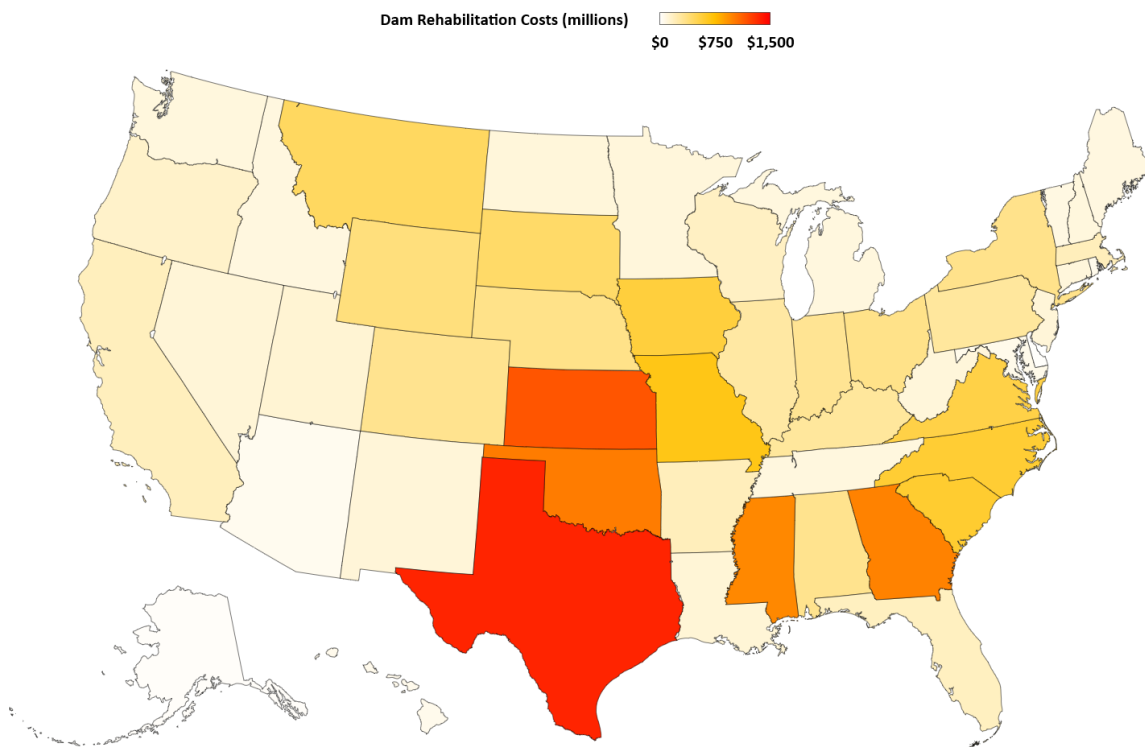
- Dams without a date of construction were assumed to be more than 50 years old because the date of construction is less likely to be known for older dams.
- Dams without a Condition Assessment rating (e.g., Not Available or Not Rated) were assigned a rating based on the national breakdown of dams with Condition Assessment ratings. For example, if 50 percent of the dams nationwide have a Condition Assessment rating of Satisfactory, then 50 percent of the dams listed as Not Available or Not Rated were assigned a Satisfactory condition assessment.

This methodology was also used to estimate state-specific dam rehabilitation costs (see Table 4) for use in determining state-specific financial needs for loan/grant programs. Note that state dam inventory numbers and data may differ from what is provided in the NID; therefore, cost estimates may vary.

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**Figure 3: Estimated State-Specific Costs  
(All Dams Rated Less than Satisfactory)<sup>5</sup>**

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State-specific costs range from \$130 million in Delaware to \$1,360 million in Texas (see Table 4).

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<sup>5</sup> State estimates are a subset of national total based on the national report methodology. Note that state dam inventory numbers and data may differ or be more up to date from what is provided in the NID; therefore, cost estimates may vary.

**Table 4: Estimated State-Specific Costs for Dams Rated less than Satisfactory<sup>6</sup>**

States and Territories		Total Number of Dams	Estimated Cost of Rehab (\$Billions) for Total Dams	Total Number of HHP <sup>7</sup> Dams	Estimated Cost of Rehab (\$Billions) for HHP Dams
Alaska	AK	105	\$0.19	27	\$0.07
Alabama	AL	2,222	\$3.33	209	\$0.47
Arkansas	AR	1,194	\$2.01	167	\$0.34
Arizona	AZ	269	\$0.46	107	\$0.17
California	CA	1,331	\$1.93	725	\$1.46
Colorado	CO	1,813	\$3.30	393	\$0.95
Connecticut	CT	830	\$1.05	267	\$0.33
Delaware	DE	83	\$0.13	57	\$0.09
Florida	FL	986	\$1.84	91	\$0.12
Georgia	GA	5,498	\$9.91	531	\$1.51
Guam	GU	NR	\$0.00	NR	\$0.00
Hawaii	HI	127	\$0.56	117	\$0.50
Iowa	IA	4,028	\$5.72	85	\$0.03
Idaho	ID	372	\$0.93	75	\$0.33
Illinois	IL	1,589	\$2.71	238	\$0.42
Indiana	IN	1,059	\$3.19	262	\$0.80
Kansas	KS	6,417	\$11.69	291	\$0.65
Kentucky	KY	1,008	\$2.91	253	\$1.19
Louisiana	LA	656	\$1.21	42	\$0.12
Massachusetts	MA	1,298	\$2.00	306	\$0.46
Maryland	MD	409	\$0.62	98	\$0.30
Maine	ME	560	\$0.92	71	\$0.17
Michigan	MI	986	\$0.98	168	\$0.30
Minnesota	MN	1,090	\$1.05	49	\$0.06
Missouri	MO	5,335	\$6.84	1,445	\$1.96
Mississippi	MS	6,059	\$9.68	354	\$0.76
Montana	MT	2,718	\$4.67	142	\$0.31

<sup>6</sup> State estimates are a subset of national total based on the national report methodology. Note that state dam inventory numbers and data may differ or be more up to date from what is provided in the NID; therefore, cost estimates may vary.

<sup>7</sup> HHP – High-Hazard Potential



States and Territories		Total Number of Dams	Estimated Cost of Rehab (\$Billions) for Total Dams	Total Number of HHP <sup>7</sup> Dams	Estimated Cost of Rehab (\$Billions) for HHP Dams
North Carolina	NC	3459	\$5.97	1,520	\$2.83
North Dakota	ND	805	\$1.10	26	\$0.09
Nebraska	NE	2,897	\$3.48	125	\$0.10
New Hampshire	NH	632	\$0.99	145	\$0.33
New Jersey	NJ	807	\$1.16	229	\$0.36
New Mexico	NM	299	\$1.16	175	\$0.78
Nevada	NV	454	\$1.18	147	\$0.40
New York	NY	1,891	\$3.40	426	\$1.01
Ohio	OH	1,329	\$3.47	370	\$1.06
Oklahoma	OK	4,885	\$10.16	377	\$1.23
Oregon	OR	744	\$1.57	107	\$0.42
Pennsylvania	PA	1,435	\$2.88	755	\$1.88
Puerto Rico	PR	36	\$0.27	36	\$0.27
Rhode Island	RI	233	\$0.58	95	\$0.30
South Carolina	SC	2,368	\$6.08	609	\$1.66
South Dakota	SD	2,435	\$4.43	44	\$0.15
Tennessee	TN	1,147	\$0.96	218	\$0.18
Texas	TX	7,255	\$13.61	1,491	\$3.76
Utah	UT	777	\$1.28	215	\$0.41
Virginia	VA	2,698	\$5.42	370	\$0.71
Vermont	VT	358	\$0.86	55	\$0.23
Washington	WA	758	\$0.99	384	\$0.58
Wisconsin	WI	1,025	\$1.75	217	\$0.38
West Virginia	WV	530	\$1.08	403	\$0.85
Wyoming	WY	1,317	\$3.84	68	\$0.29
<b>Total</b>		<b>88,616</b>	<b>\$157.48</b>	<b>15,177</b>	<b>\$34.10</b>

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## ORIGINS OF THE ASDSO STUDY

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The National Dam Safety Program Act of 1996 (NDSPPA, PL 104-303) called for the Federal Emergency Management Agency (FEMA) to carry out a program of technical and archival research to develop: (1) improved techniques, historical experiences, and equipment for rapid and effective dam construction, rehabilitation, and inspection; and (2) devices for the continued monitoring of the safety of dams.

The NDSPPA also established the Interagency Committee on Dam Safety (ICODS). The ICODS Subcommittee on Dam Safety Research (SDSR) determined that funding for the rehabilitation of dams is an important part of an effective dam safety program.

In Fiscal Year 2000, the SDSR recommended, and FEMA provided, funding for a task committee to research and develop options that the federal government could consider in establishing funding programs for dam rehabilitation projects. FEMA and the SDSR called on the Association of State Dam Safety Officials (ASDSO) to establish this committee. Its nine members were charged with:

- 1) researching and estimating the total dam rehabilitation costs for the United States;
- 2) collecting information on existing funding programs;
- 3) developing recommendations for the establishment of federal dam restoration grant and/or loan programs; and
- 4) drafting model state legislation, rules, and guidelines for state dam restoration grant and/or loan programs.

It was hoped that the findings of the committee would be utilized by Congress, individual states, FEMA, ASDSO, and the dam safety community to increase the availability of funding sources.

The committee began its work in October 2000 and completed its initial report—*The Cost of Rehabilitating Our Nation's Dams: A Methodology, Estimate and Proposed Funding Mechanisms*—in December 2002. A revised version of this report was published in October 2003.

The committee's intensive two-year, peer-reviewed study considered the number of state-regulated dams, the size of the dams, the costs of deferred maintenance (any maintenance activity that does not require formal engineered plans or the approval of a professional engineer), the cost of engineering evaluation and design, the cost of rehabilitation (whether repair, replacement, or removal), and the cost of increasing storage capacity or structural upgrades. Estimates did not include costs for administration of a funding mechanism; nor did they consider the increasing number

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of high-hazard-potential dams, those whose failure or mis-operation may cause loss of human life.

The committee concluded that the cost of upgrading or repairing all non-federal dams in the U.S. would exceed \$36 billion. Almost one-third of this amount—\$10.1 billion—would be needed for the nation’s most critical dams, the more than 10,000 non-federal dams across the nation whose failure may cause loss of human life.

It recommended the creation of a national dam rehabilitation loan program. Subsequently, ASDSO worked with lawmakers to draft the Dam Rehabilitation and Repair Act that would provide funding for repairs to high-hazard-potential dams. Congress did not pass this legislation.

### The 2009 Update

In the spring of 2008, ASDSO convened a task force to update the initial rehabilitation costs study. Several members of this group had worked on the original project. The principal objectives of this effort were:

1. to review the existing methodologies, eligibility criteria, and associated cost estimates utilized in the 2003 report;
2. to determine an accurate estimate of the current national cost of dam rehabilitation; and,
3. to recommend ideas for addressing the need.

Over the next nine months, the committee completed its review and update, concluding that a sound national cost estimate to repair the nation’s dams, based on available data, was \$51.46 billion. Of this figure, approximately \$16 billion was needed for the repair of high-hazard potential dams (those dams whose failure would likely cause loss of human life): Just over half of this figure—roughly \$8.7 billion—was needed to repair publicly-owned high-hazard potential dams, with the remaining \$7.3 billion needed for privately owned dams.

These numbers increased significantly since the 2003 report. The estimated cost of rehabilitating all dams rose by 42 percent, while the cost to rehabilitate high-hazard potential dams rose by 58 percent. It was suggested, then, that the numbers would likely continue to rise until a comprehensive state and federal rehabilitation strategy is implemented.

### The 2012 Update

Once again in December 2012, making appropriate adjustments to the logic diagrams, a new task group revised the estimates. That study determined that the total cost estimated for non-federal dams was \$53.69 billion. High-hazard potential dams were estimated at approximately \$18.2 billion (\$11.2 billion for publicly owned and \$7 billion for privately owned). In this update, the task group considered the costs for

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federally owned structures using modified logic diagrams. The federal estimate was approximately \$4 billion for all federally owned dams with approximately \$3 billion of this amount attributed to federally owned high-hazard dams. It was determined later that these federal estimates were likely much lower than actual costs for federal projects.

2012 to 2022

Cost calculations for non-federally owned dams were run based on updated NID numbers in 2016, 2019, and 2022, which included an associated inflation factor. No task groups were convened for these efforts.

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