MONTANA ASSOCIATION OF DAM & CANAL SYSTEMS

Improving Montana Dam Inspections

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Montana Department of Natural Resources & Conservation – Dam Safety Program

October 15, 2025

Improving Montana Dam Inspections

Outline

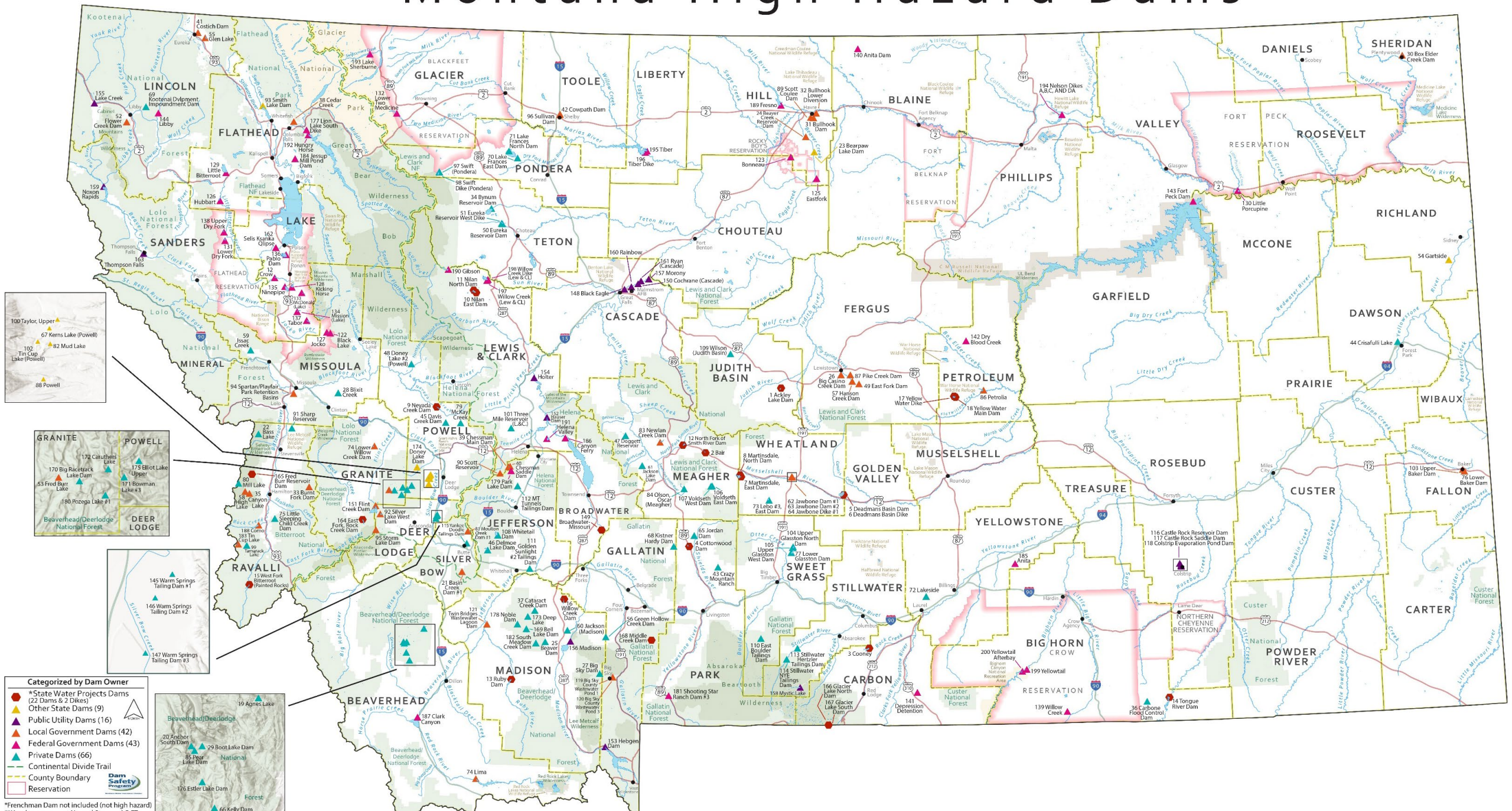
- Background
- Impetus
- Historical challenges
- Risk-based inspection guidelines
- 2024 – 2025 pilot study
- HB 924 / CARDD program
- 2026 plans

Improving Montana Dam Inspections

Take-Home Message

Properly inspected and evaluated dams are exceedingly unlikely to fail

Montana High Hazard Dams



Inspections

- Montana is among the 40% of states that do not conduct their own inspections

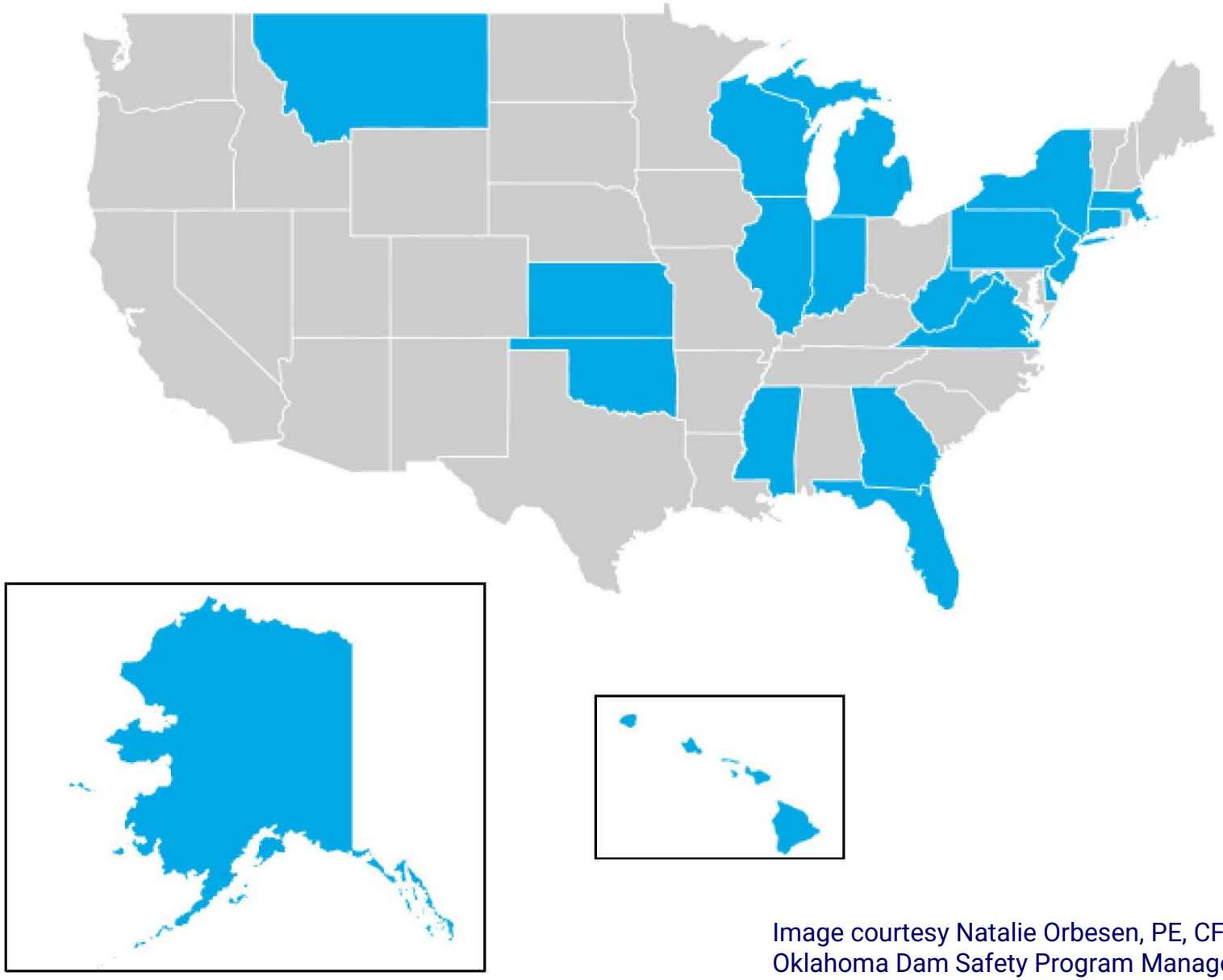


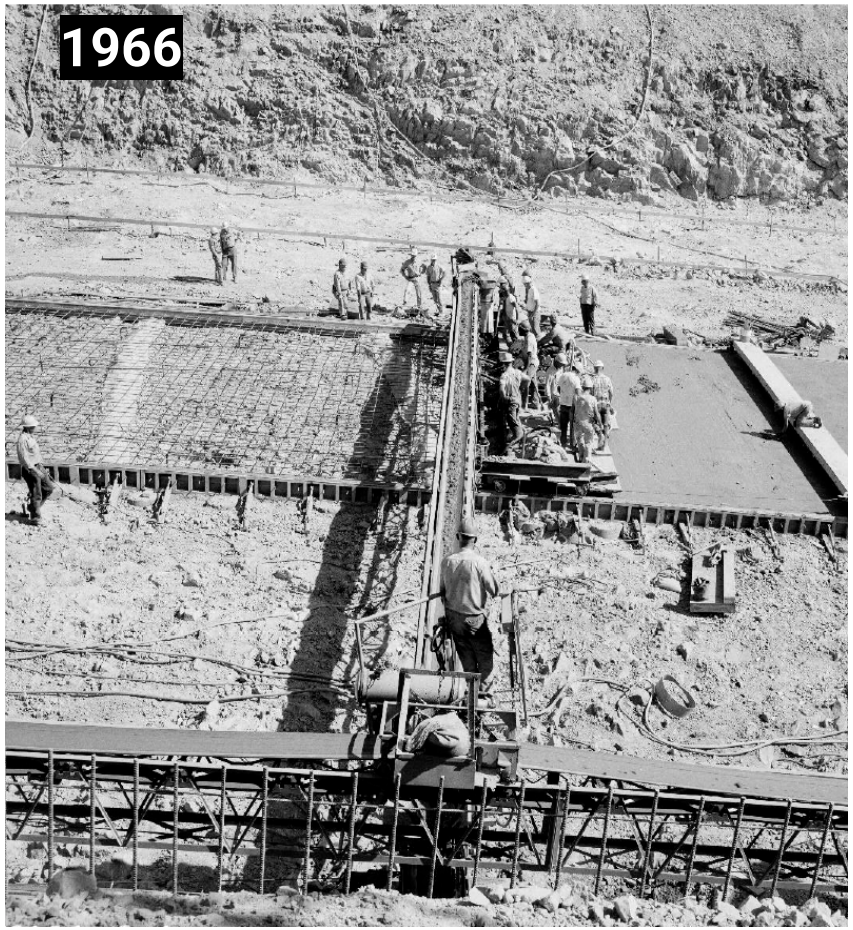
Image courtesy Natalie Orbesen, PE, CFM, Oklahoma Dam Safety Program Manager

Key Finding: Normalization of Deviance

- “Almost immediately after construction, the concrete chute slab cracked above and along underdrain pipes, and high underdrain flows were observed. The slab cracking and underdrain flows, **although originally thought of as unusual, were quickly deemed to be ‘normal.’”**
- “The seriousness of the weak as-constructed conditions was not recognized during numerous inspections and review processes over the almost 50-year history of the project. “

Key Finding: Lack of Independent Assessment

- “Although poor foundation conditions were well documented, all subsequent reviews mischaracterized the foundation as good quality rock.”
- “As a result, the significant erosion of the spillway foundation during the incident was not anticipated.”



Oroville Lessons Learned for Montana

Two Major Recommendations Prioritized

- DNRC should use downstream risk in decision-making
- Dams with significant downstream risk should complete comprehensive dam reviews

DOWL

MEMORANDUM

TO:	Michele Lemieux, DNRC Dam Safety Program
FROM:	Jason H. Thom, PE
DATE:	January 4, 2019
SUBJECT:	Montana Dam Safety Program Review regarding Oroville IFT Final Report

This memorandum is provided in response to request from the Montana Dam Safety Program (DSP) to provide review comments identifying potential changes to the DSP based on the findings of the Independent Forensic Team Report (IFTR) that was issued in January 2018 regarding the 2017 Oroville Dam Spillway Incident that occurred in 2017.

This memorandum contains opinions based on experience as a consulting engineer performing dam design and construction administration of high hazard dams regulated by the Montana DSP over the 30+ years that the DSP has existed. While this background provides a familiarity with the Montana DSP, it also reflects a perspective (or bias) that should be considered. The DSP policies need to take into consideration the impacts to all the stakeholders to provide an effective program for the various parties.

Downstream Risk in Decision-Making

Flower Creek Dam, Lincoln County

Oscar Olson Dam, Meagher County

Comprehensive Dam Reviews

Evaluate all the features that could lead to public risk and answer the following questions:

- Is the feature consistent with the current design and construction practice?
- If there are variations from current practice, do they present a risk of failure?
- If there is not enough information, is the potential risk significant enough to justify further investigations or evaluation?

In addition, the reviews should be:

- Thorough, utilizing all available design, construction and operation information.
- Critical and independent, not a simple reliance on past reviews.

Types of Dam Inspections

- Annual Owner O&M →

- **Five-Year Dam Evaluations** →
  - Visual Inspection
  - Safety Evaluation

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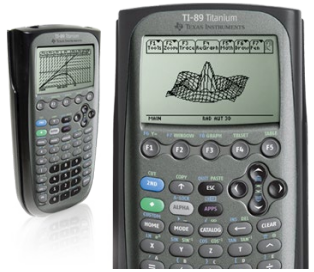


- Comprehensive Dam Evaluation →

Calculator graphic from Texas Instruments

Historical Challenges – Five-Year Dam Evaluations and Reports

- Variations in level of effort put forth by engineer.
  - Encourages dam owners to “shop” for the lowest cost inspection.
- Lack of budget for adequate evaluations.
  - Engineers are reluctant to provide assurances required by rules.
- Lack of direction from DNRC on depth of required evaluations
- Wide inconsistencies in reports received
- Missing and incorrect information is prevalent.
  - Copy-paste errors are common.
- Unnecessary report content (that may be costing dam owners).
- Confusing terminology; administrative rules need clarification.
- **Five-year inspections are a big expense for dam owners. A commonsense approach that protects the public and supports water storage is needed.**

How Have We Improved?

Credible Risk Database

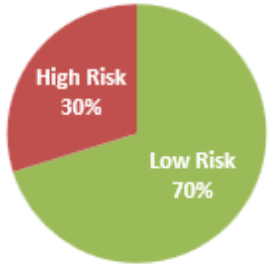
RISK THRESHOLD

For the purpose of applying updated risk-informed dam inspection guidelines, all dams are classified as having either high or low risk based on the estimated number of persons at risk in the credible dam breach inundation area. A dam that has more than 100 persons at risk constitutes a high risk structure. Anything less than this is assumed to constitute a low risk structure.

SUMMARY RESULTS

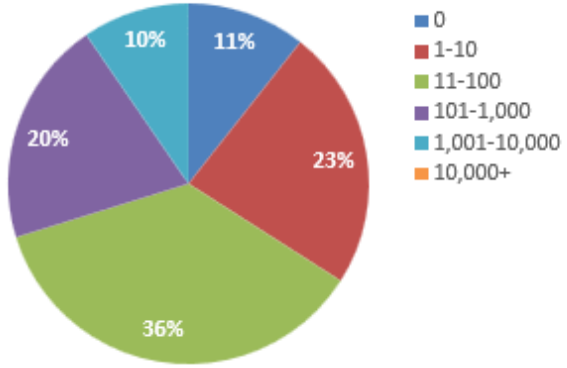
OVERVIEW

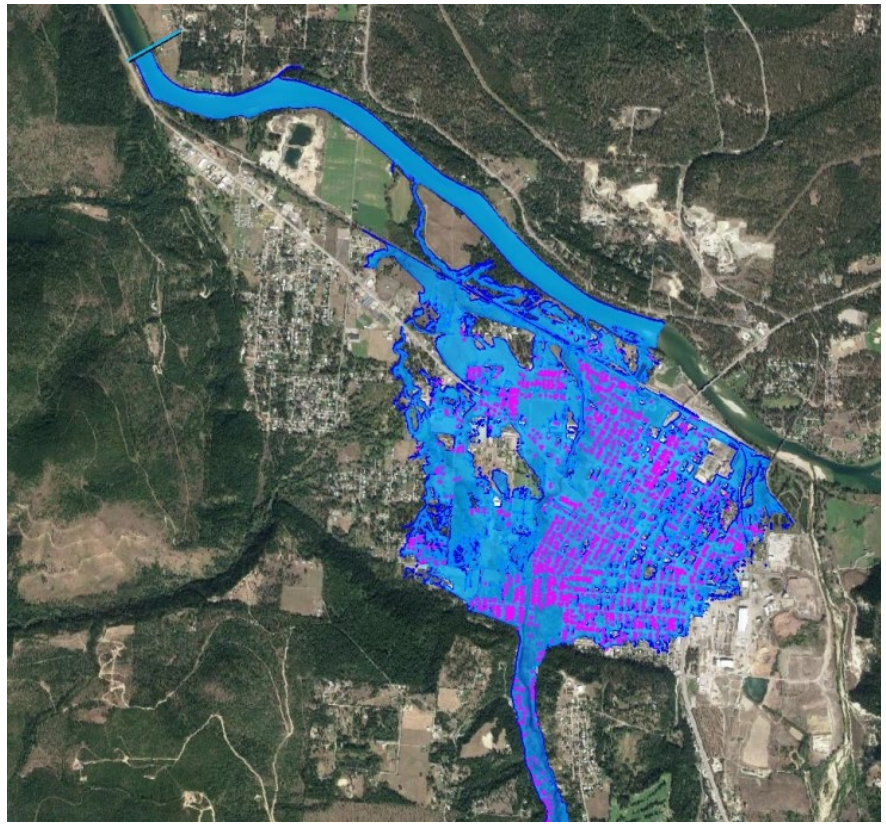
Number of Dams Analyzed	94
Number of Low Risk Dams	66
Number of High Risk Dams	28



BINNED RESULTS

Dams with 0 Persons at Risk	10
Dams with 1 to 10 Persons at Risk	22
Dams with 11 to 100 Persons at Risk	34
Dams with 101 to 1,000 Persons at Risk	19
Dams with 1,001 to 10,000 Persons at Risk	9
Dams with greater than 10,000 Persons at Risk	0





How Have We Improved?

Updated Safety Evaluation Template & Guidance

GUIDELINES FOR FIVE-YEAR DAM EVALUATIONS

Montana Department of Natural Resources and Conservation
Version 1.2 (revised January 2023)

Painted Rocks Dam, Ravalli County

These guidelines are consistent with Administrative Rule 36.14. This document was initially prepared by Gannett Fleming, Inc. (Versionn 1.0) under contract with the Montana Department of Natural Resources & Conservation. Periodic updates to the guidelines and corresponding templates will be made by Montana Department of Natural Resources & Conservation as needed.

[DAM NAME]

5-YEAR DAM EVALUATION
ENGINEER'S REPORT

Inventory No. [MT-0000]
[County], Montana

January 1, 2025

Dam Owner
Dam Owner: [Name]
Dam Owner Representative: [Name]

Engineer
Engineer of Record: [Name]
Agency/Organization: [Name]

NOTE TO USER:
Montana Department of Natural Resources & Conservation Dam Safety Program (Montana Dam Safety) has provided this template to facilitate completion of engineer responsibilities with regard to the Five-Year Dam Evaluation Report. This template should be used in accordance with Section 4.0 of Montana Dam Safety's "Guidelines for Five-Year Dam Evaluations".

Note that this is a generic template, and unique appurtenances or site conditions at a specific dam may not be referenced herein. The Engineer is responsible to identify all features that should be evaluated and documented in the Evaluation Report. The template is flexible and can be edited and tailored to a specific dam. Additional report sections should be added as needed to address all appurtenant structures.

1.0 DAM BACKGROUND & HISTORY (*Required for all dams.*)

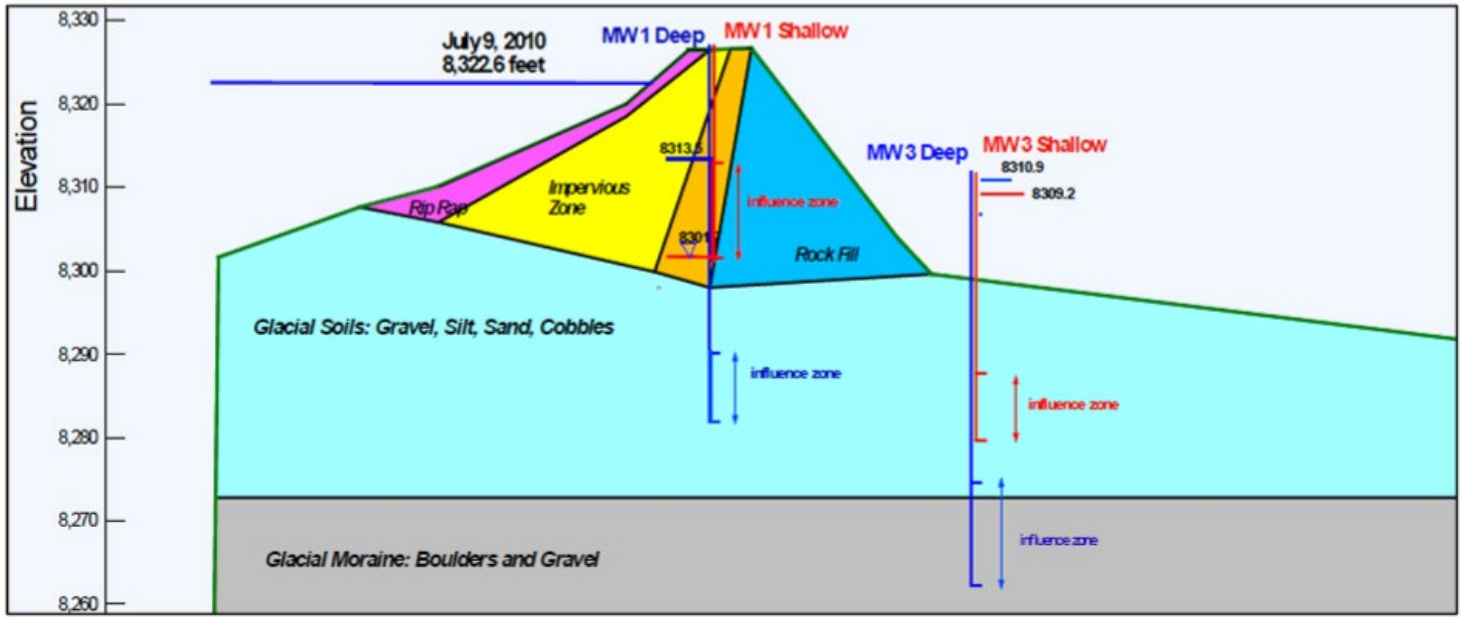
Dam Information			
Dam Name:	[Dam Name]	Inventory No:	[MT-0000]
County:	[County]	Hazard Class:	*High*
Dam Owner Information			
Owner:	[Name]	Owner Contact:	[Name]
Address:		Phone:	
		Email:	
Engineer Information			
Agency:	[Name]	Engineer of Record:	[Name]
Address:		Phone:	
		Email:	

1.1 Dam Records & Available Documentation

Indicate which of the following were obtained and reviewed:	
☐ Owners Questionnaire	☐ Flood Records
☐ Previous Evaluation Report	☐ Pool Level Records
☐ Design Records	☐ Piezometric Levels
☐ As-Built Drawings	☐ Seepage Records
☐ Drawings for Modification(s)	☐ Hydrologic & Hydraulic Analysis
☐ Other Historical Inspection Reports (list below)	☐ Embankment Stability Analysis
☐ Operational & Maintenance Records	☐ Structural Stability Analysis
☐ Construction Records	☐ Outlet Works Analysis
☐ Other (list below)	Include pertinent drawings in Attachment A.

How Have We Improved?

Guidance on Analysis of Dam Instrumentation



TECHNICAL NOTE 10

Analysis of Dam Instrumentation as part of a Five-Year Dam Evaluation

Montana Department of Natural Resources and Conservation

Working Draft Version 1.1 (revised January 2023)

GANNETT FLEMING

These guidelines are consistent with Administrative Rule 36.14. This document was initially prepared by Gannett Fleming, Inc. (Version 1.0, October 2022) under contract with the Montana Department of Natural Resources & Conservation. Periodic updates to the guidelines and corresponding templates will be made by Montana Department of Natural Resources & Conservation as needed.

How Have We Improved?

Two-Part Inspections: ARM 36.14.601

Improving Montana Dam Inspections

Recap So Far

- Credible Risk
- Updated Report Template & Guidance
- Guidance on Instrumentation Analysis
- Two-Part Inspections

Still a cost pressure!

How Have We Improved?

Inspection Assistance Programs

- 2024 Pilot Study
- 2025 Inspection Assistance
- 2026 Inspection Assistance
- HB 924 and beyond

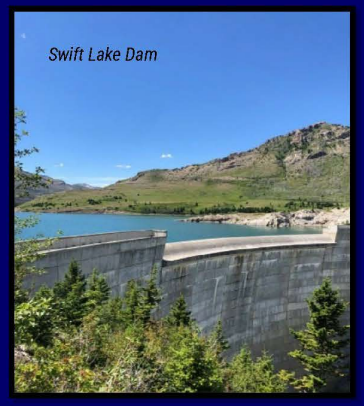
2024 Pilot Study – Reason

1. Montana dam owners pay the majority of expenses to keep their dams operational
2. It is exceedingly unlikely for properly inspected and evaluated dams to fail
3. Assisting dam owners with five-year dam safety inspections and safety evaluations supports long-term water storage in Montana

A Pilot Study of Dam Inspection Expense Assistance

A Report to Montana Dam Owners

"Dam inspections are crucial for ensuring the safety, stability, and reliability of dams." ~Association of State Dam Safety Officials



By the Montana Department of Natural Resources & Conservation Dam Safety Program

March 2025

2024 Pilot Study – Structure

- Dams must provide public benefit
- Letter of interest
- Limit of 40 hours – evaluation only
- 19 dams participated

2024 Pilot Study – Conclusions

1. Average Five-Year Dam Inspection & Safety Evaluation = $27,000
2. Participants supported a balanced cost share of 50%
3. Cost-sharing dam inspections ensures thorough, quality inspection reports

2024 Pilot Study – Feedback

1. Limit of 40 billable hours was too low
2. Funding allowed engineers to complete more thorough evaluations – though many kept working even when funds ran out
3. Challenges with state contracting process

2025 Inspection Assistance

- Public benefit
- State-permitted dams only
- Increased billable hour limits
- 13 dams participating (some multi-dam systems)
- Not all eligible dams participating
- Interest and need from Forest Service dams

Dam Type	Maximum Billable Hours
Low-Consequence Dam[1]	40
High-Consequence Dam[1]	50
Reservoir System or Flood Control System[2]	70

National Dam Safety Program

FEMA State Assistance Grant Progam

- Continued financial and technical support
- 2019 – present for these projects

FEMA
REGION VIII

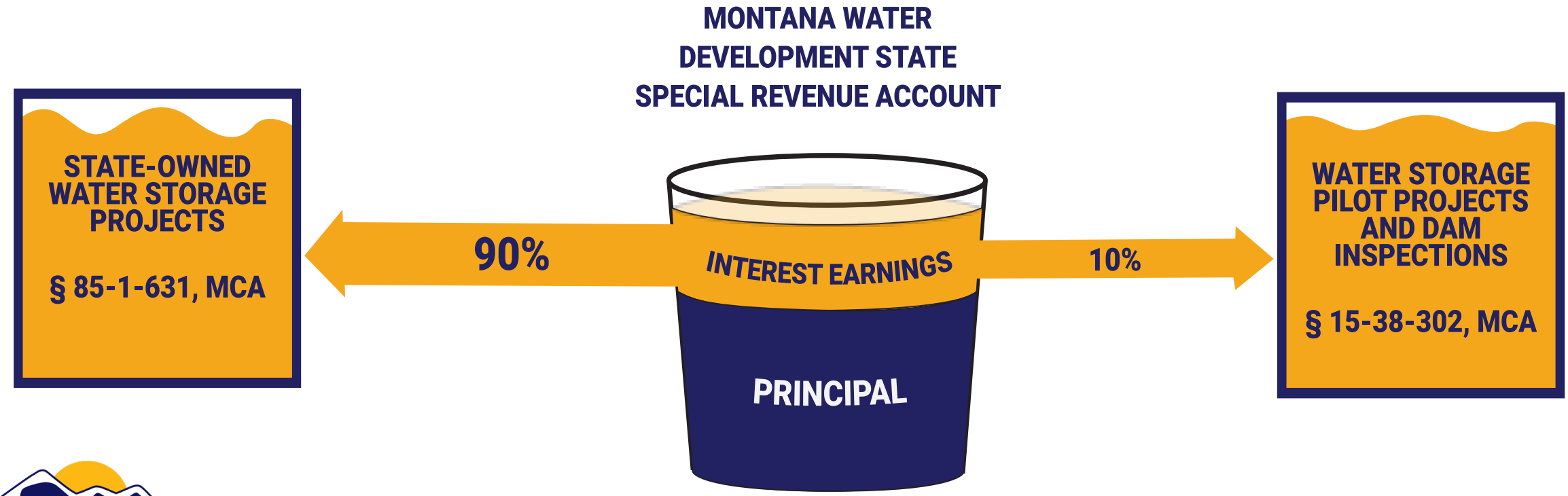
Graphics from FEMA National Dam Safety Program and FEMA Region VIII

Montana Growth & Opportunity Trust: A future where all Montana dams are safe

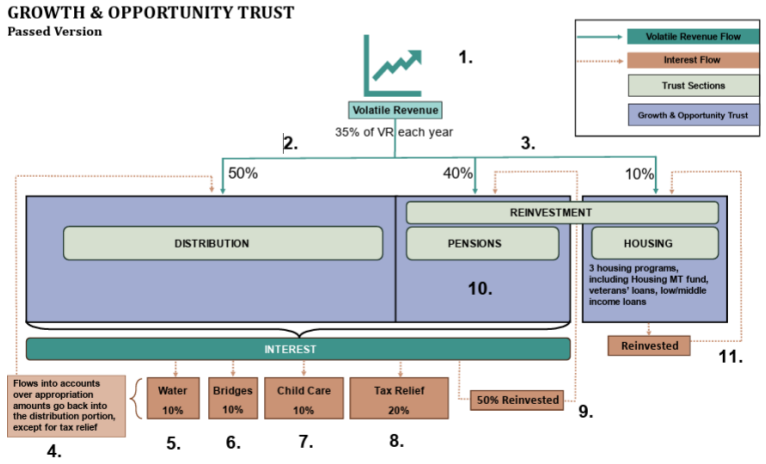
- HB 924 created the Montana Growth & Opportunity (GO) Trust
- $10 M FY25 seed money + 10% of non-housing GO trust interest annually
  - $10 M annual cap
- 10% of interest to dam inspections and water storage pilot projects

Image from legmt.gov/house

Growth & Opportunity (GO) Trust



Volatile Revenue



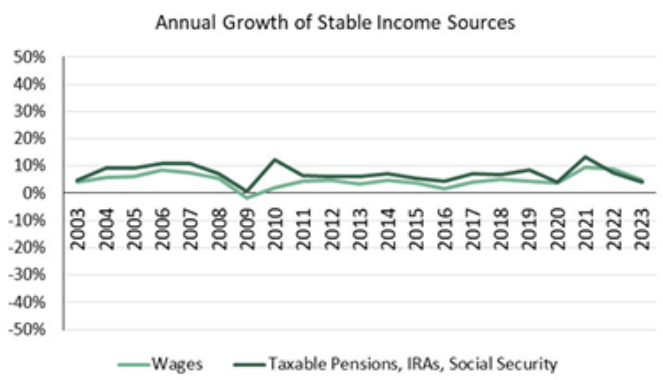


Figure 1: Stable Income Sources

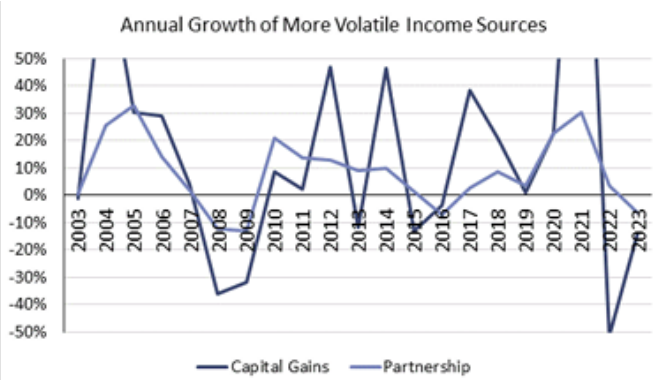


Figure 2: Volatile Income Sources

Capital Gains Estimate − *Seven Year Low* = *Increment*

$4.0 *billion* − $2.5 *billion* = $1.5 *billion*

Increment ∗ *Tax Rate* = *Capital Gains Volatile Revenue*

$1.5 *billion* ∗ 4.1% = $61.5 *million*

Partnership Estimate − *Seven Year Low* = *Increment*

$5.0 *billion* − $3.0 *billion* = $2.0 *billion*

Increment ∗ *Tax Rate* = *Partnership Volatile Revenue*

$2.0 *billion* ∗ 5.9% = $118.0 *billion*

TCA Estimate − *Seven Year Low* = *TCA Volatile Revenue*

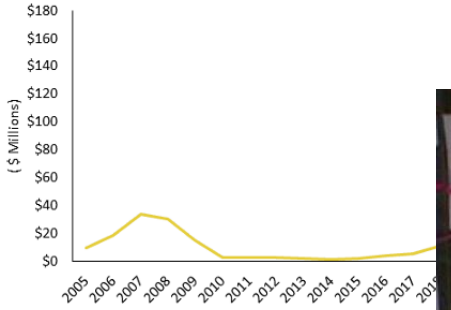
$75.0 *million* − $10.0 *million* = $65.0 *million*

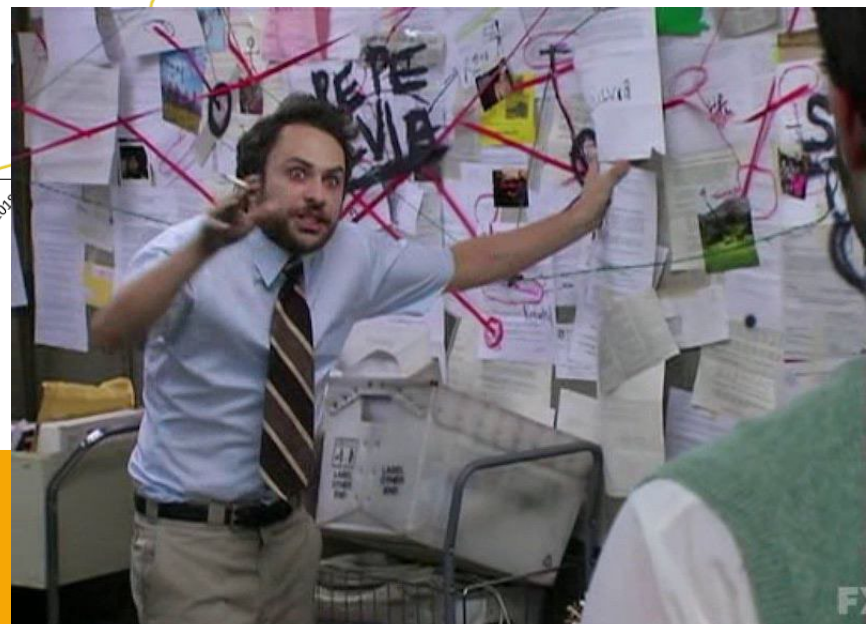
Total Volatile Revenue

$61.5 *million*
$118.0 *million*
+ $65.0 *million*
$244.5 *million*

From the total volatile reve
for this example ($244.5 million), a 17.5% transfer to the GO Trust would occur on November 1 and May 1. The amount of each transfer would therefore be $42.8 million.

Figure 3: Historical TCA Interest Earnings





- HB 924 graphics from Legislative Fiscal Division: https://archive.legmt.gov/content/Publications/fiscal/2027-Biennium/Committees/LFC/Interim/HB-924-Summary.pdf
- Charlie Day graphic from "It's Always Sunny In Philadelphia" S4E10.

A future where all Montana dams are safe

	Year	2025	2026	2027	2028
HB 924[1]	Transfers (seed money)	$ 10 M	$ -	$ -	$ -
	10% of GO Trust interest (estimated)	$ -	$ 2.3 M	$ 2.8 M	$ 3.2 M
	10% for dam inspections and water storage pilot projects	$ -	$ 230,000	$ 280,000	$ 320,000
2024 Pilot Study Results	Number of dams/reservoirs[2]	20	14	5	12
	Total inspection cost (estimated[3])	$ 540,000	$ 378,000	$ 135,000	$ 324,000
	Less 50% cost share	$ 270,000	$ 189,000	$ 67,500	$ 162,000
	Program cost	$ 270,000	$ 189,000	$ 67,500	$ 162,000

[1]Source: Montana Budget & Policy Center, https://montanabudget.org/report/go-trust-overview
[2]Dams and reservoirs combined where appropriate
[3]Using the average cost of $27,000 per dam, from the 2024 pilot study
[4]There are 20 non-federal high hazard dams regulated by the US Forest Service that may benefit from an inspection assistance program but are not included in these numbers.

Growth and Opportunity Trust Administered by DNRC's Conservation and Resource Development Division

- Conservation and Resource Development Division (CARDD) will administer
- Dams that
  - Provide public benefit
  - Are subject to Dam Safety Act and requirements
- Straightforward application process

2026 Inspection Assistance Program

- 14 Dam Safety-permitted dams
- Bipartisan Infrastructure Law funds remaining
- First-come, first-served
- Same process as 2025
- Information and instructions: https://dnrc.mt.gov/Water-Resources/Dam-Safety/assistance-to-states

Questions?

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- All Oroville photos from January 5, 2018, “Independent Forensic Team Report – Oroville Dam Spillway Incident”