



Sagebrush Creek Dam



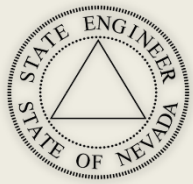
NEVADA DIVISION
OF WATER RESOURCES



NDWR Dam Safety

Keith Johnson, Staff 2, Associate Engineer
Division of Water Resources
26 August 2020

Nevada Dam Safety EAP and TTX Workshop



Tim Wilson, P.E.
State Engineer

Adam Sullivan, P.E.
Deputy Administrator

Micheline Fairbank, J.D.
Deputy Administrator

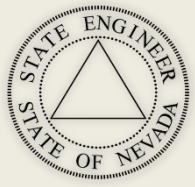
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Director



Brumadinho Tailings Dam Collapse



“On 25th January 2019, the tailings dam of the Brumadinho iron mine operated by Vale S/A failed catastrophically. The death toll stood at 259 and 11 people remained missing as of January 2020.”- ScienceDirect



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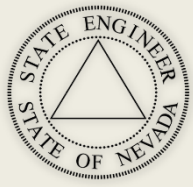
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Edenville Dam



Footage captured of the Edenville Dam embankment failing to hold back floodwaters on Tuesday, May 19, 2020 in Edenville, Michigan. Video Courtesy Lynn Coleman



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The Michigan Dam Failures Are a Warning

Many need repairs. Let's fix them before climate-related flooding gets worse.

By Upmanu Lall and Paulina Concha Larrauri

Dr. Lall is director of the Columbia Water Center at Columbia University, where Ms. Concha Larrauri is a researcher.

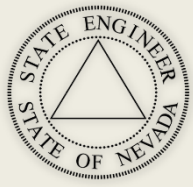
May 27, 2020



The failed Sanford Dam last week, which flooded the Tittabawassee River and parts of Sanford, Mich. Rebecca Cook/Reuters

Two dams down, a few thousand more to go.

Luckily, no one died last week when rain-swollen flooding breached two dams in Central Michigan. But thousands were evacuated, homes and businesses were inundated, and floodwaters spilled into a chemical plant and Superfund site.



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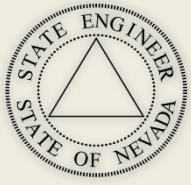


NDWR Dam Safety Program

Our Goal:

- The goal of Nevada's dam safety program is to avoid dam failure and thus prevent loss of life and destruction of property.





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NDWR Dam Safety Program

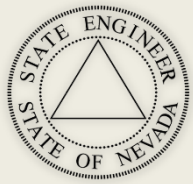
Staff:

- Four total staff (2.75 FTE)
- 12+ additional trained NDWR employees (basin engineers)

Duties:

- Inspections
- Review of all proposed dam projects in the state (new, alterations, and decommissioning)
- Permitting of jurisdictional dam applications
- Review of Emergency Action Plans (EAP)
- Inundation map review and verification
- Storage fees





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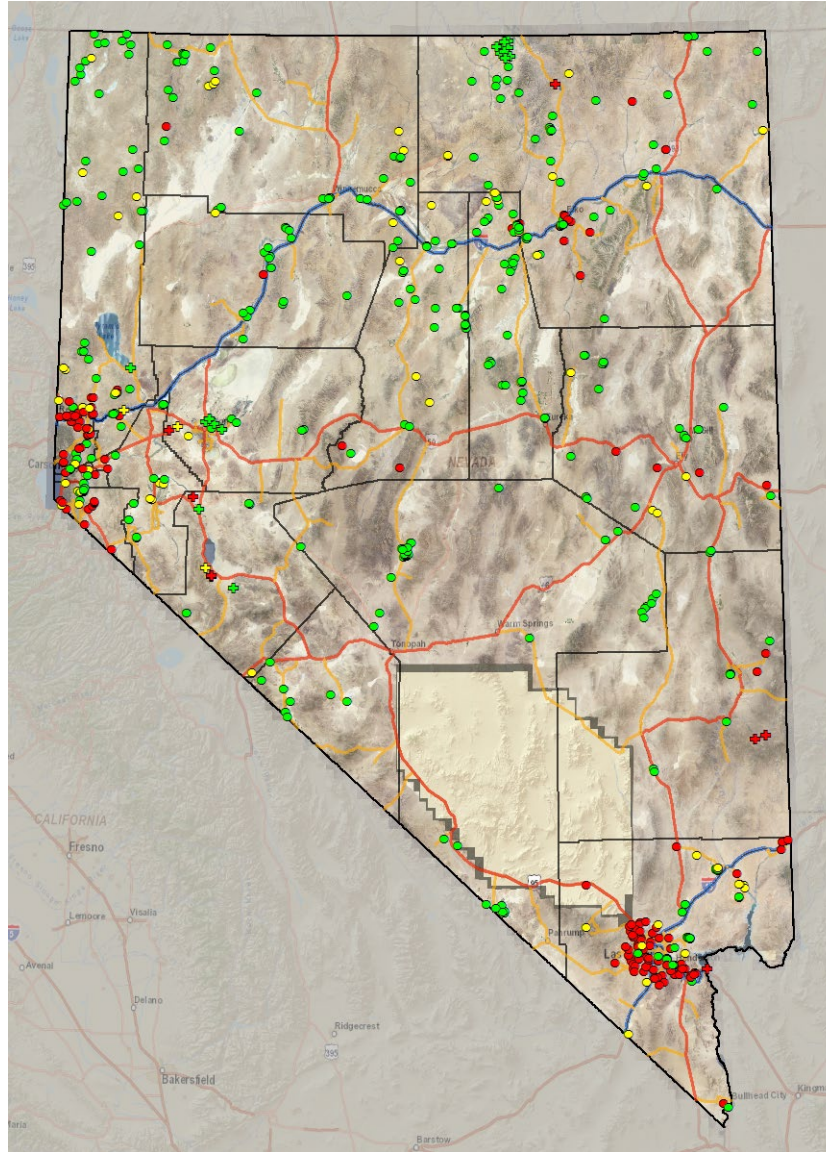
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State of Nevada Jurisdictional Dams



626 Total Dams

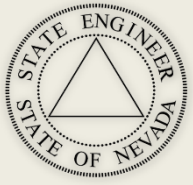
- 148 High Hazard
- 85 Significant Hazard
- 393 Low Hazard

Dams include:

- Water Supply
- Wastewater Processing
- Tailings Dams
- Process Ponds
- Detention Basins
- Recreation
- Evaporation Ponds
- Leach Process Ponds

Doesn't include:

- Federal Dams (BOR, USACE, BIA)



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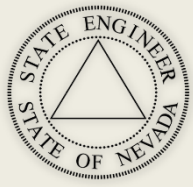
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Nevada Dam Statistics

- **NRS 535 – Dams and Other Obstructions:**
 - Taller than 20 feet
 - Shorter than 20 feet but impounds more than 20 acre-feet of water
 - Neither of the above but can be categorized as a significant or high hazard





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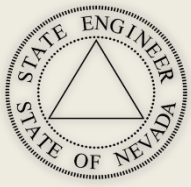
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Hazard Classification – NAC 535.140

- Hazard classification does not take into account what the dam impounds (i.e. cyanide leachate) or the condition of the dam

Low Hazard	Significant Hazard	High Hazard
(1) Very low probability of causing a loss of human life; and (2) Reasonable probability of causing little, if any, economic loss or disruption in a lifeline.	(1) Reasonable probability of causing a loss of human life; or (2) High probability of causing extensive economic loss or disruption in a lifeline.	High probability of causing a loss of human life.



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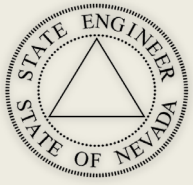
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Inspection Frequency

- **NAC 535.360: Inspection frequency by hazard**
 - High Hazard Dams – Every year
 - Significant Hazard Dams – Every three years
 - Low Hazard Dams – Every five years





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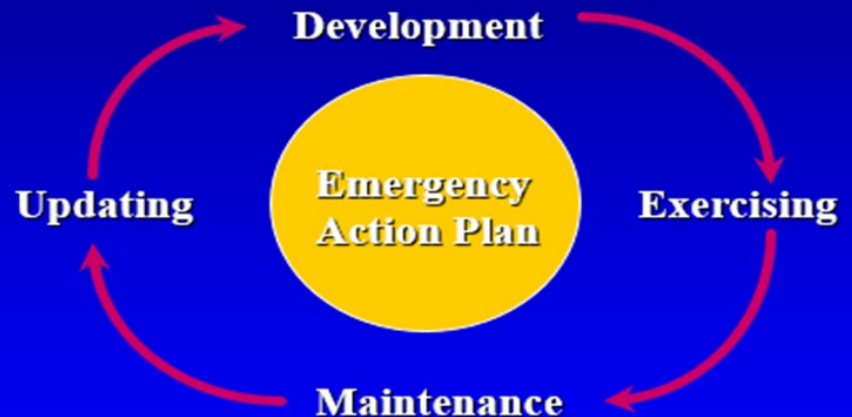
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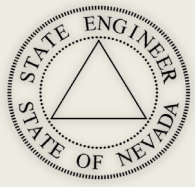


Dam Emergency Action Plans

The dams within State of Nevada Jurisdiction:

- Emergency Action Plans (EAPs) are required for **Significant & High Hazard** Dams.
- For High Hazard dams there are approximately 150 EAPs complete of 150, but not all are up to date at this time.
- For Significant Hazard dams there are approximately 72 EAPs complete of 85 at this time.
- Low Hazard dams are not required to have an EAP.





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Dam Failures in Nevada

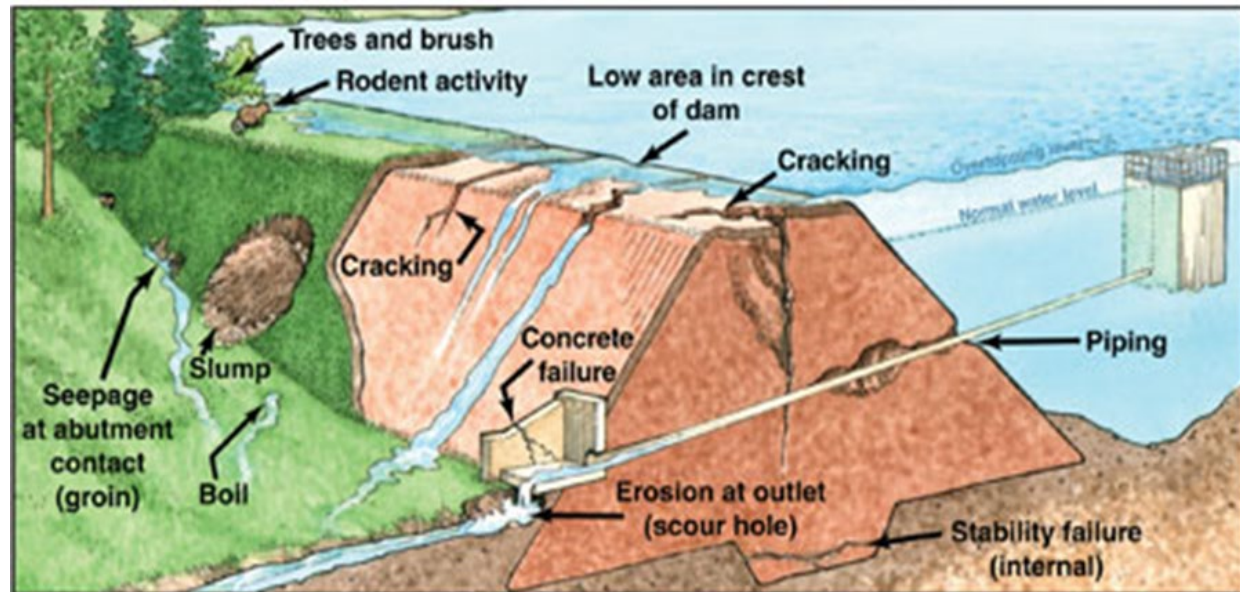
Within the past 2 years, Nevada has experienced dam failures including:

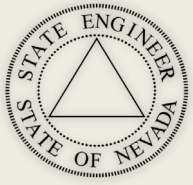
- Twenty-One Mile Dam
- Charleston Dam
- Washoe Lake Dam (just saved from failure)
- Echo Canyon (Spillway)

Need for Better EAPs

Raising our Expectations

Outreach





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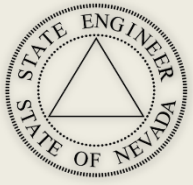
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Washoe Lake Dam Incident (Nevada, June 2018)

- Fisherman posted photo on Facebook the morning of June 18, 2018.
- At noon, our office received a phone call that water was flowing around Washoe Lake Dam.





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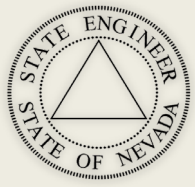
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Washoe Lake Dam Incident (Nevada, June 2018)



Right Downstream Toe



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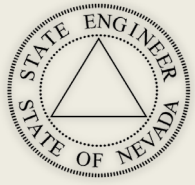


Twenty-One Mile Dam Failure (Nevada, 2017)

- Center Breach area was about 50 feet wide and 40 feet deep.
- The Main Breach is located near the right abutment was about 120 feet wide and greater than 50 feet in depth.
- Over 1.5 inches of rain on top of snow that was melting. (~680 square mile watershed).



View from the news helicopter the day after the breach (2/9/17)



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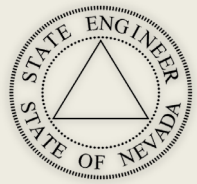
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Twenty-One Mile Dam Failure (Nevada, 2017)





Downstream of Twenty-One Mile Dam Failure

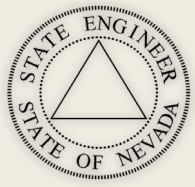
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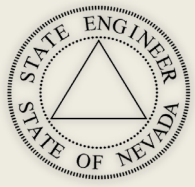
Twenty-One Mile Dam – Highway 223 and UPRR



HWY 223 below Dake Reservoir

UPRR Railroad downstream of HWY 223





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