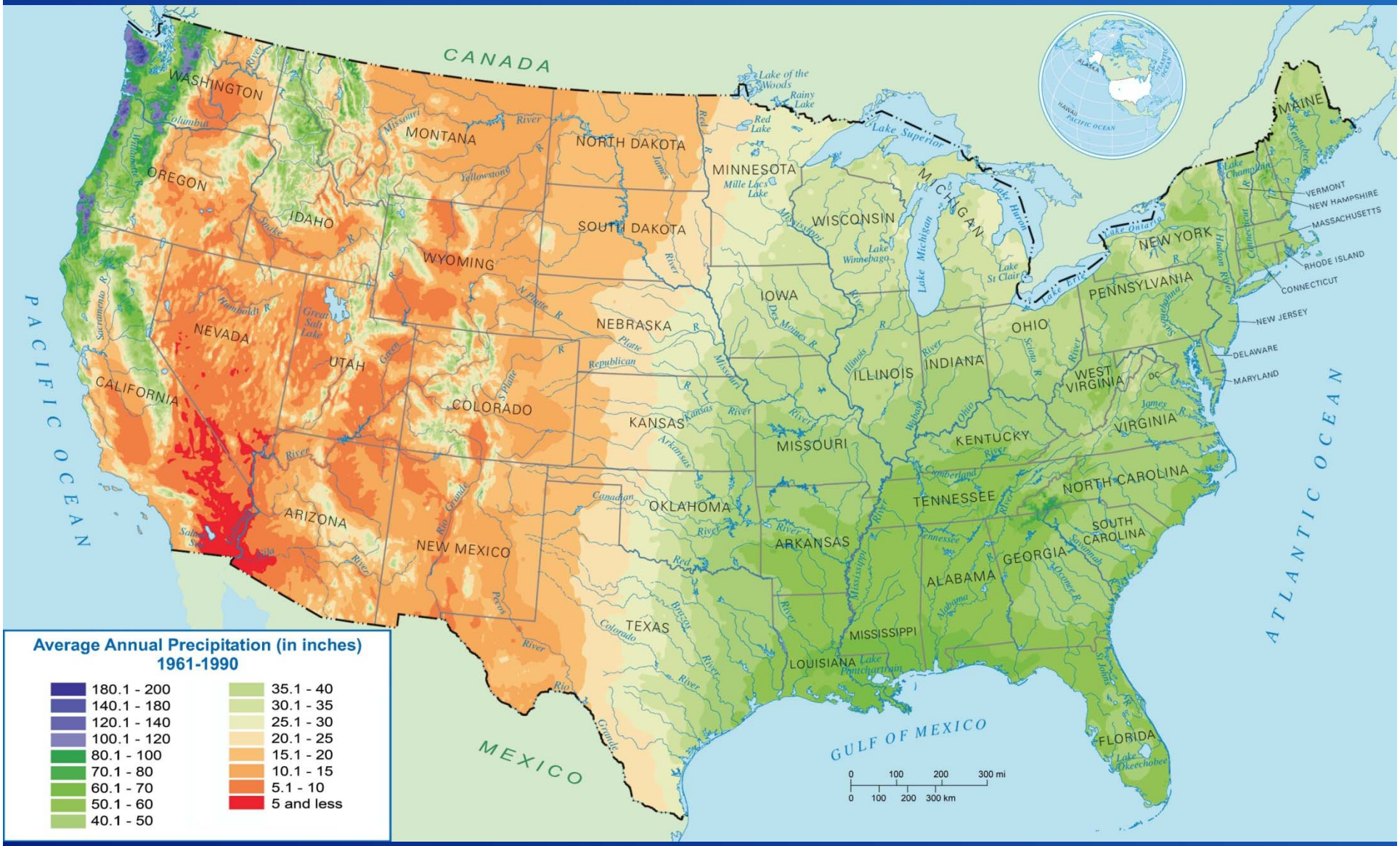
History of Reclamation

Created in 1902 to help address the development of the semi-arid/arid American West through the development of water projects for irrigation

RECLAMATION



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Reclamation's Time Line

1902	1920's -	1970's - Present
Irrigation	Irrigation	Irrigation
	Hydropower	Hydropower
	Flood Control	Flood Control
		Municipal & Industrial
		Recreation
		Fish & Wildlife
		Indian Water Rights

RECLAMATION

Reclamation's Role

- Largest Wholesaler of Water in US
  - Irrigate 10 M acres (20% of Farmers in West)
  - Supply M&I water to 31 M people
- Second Largest Hydropower Producer in US
  - 40B kwh / yr
- Flood Control & Recreation

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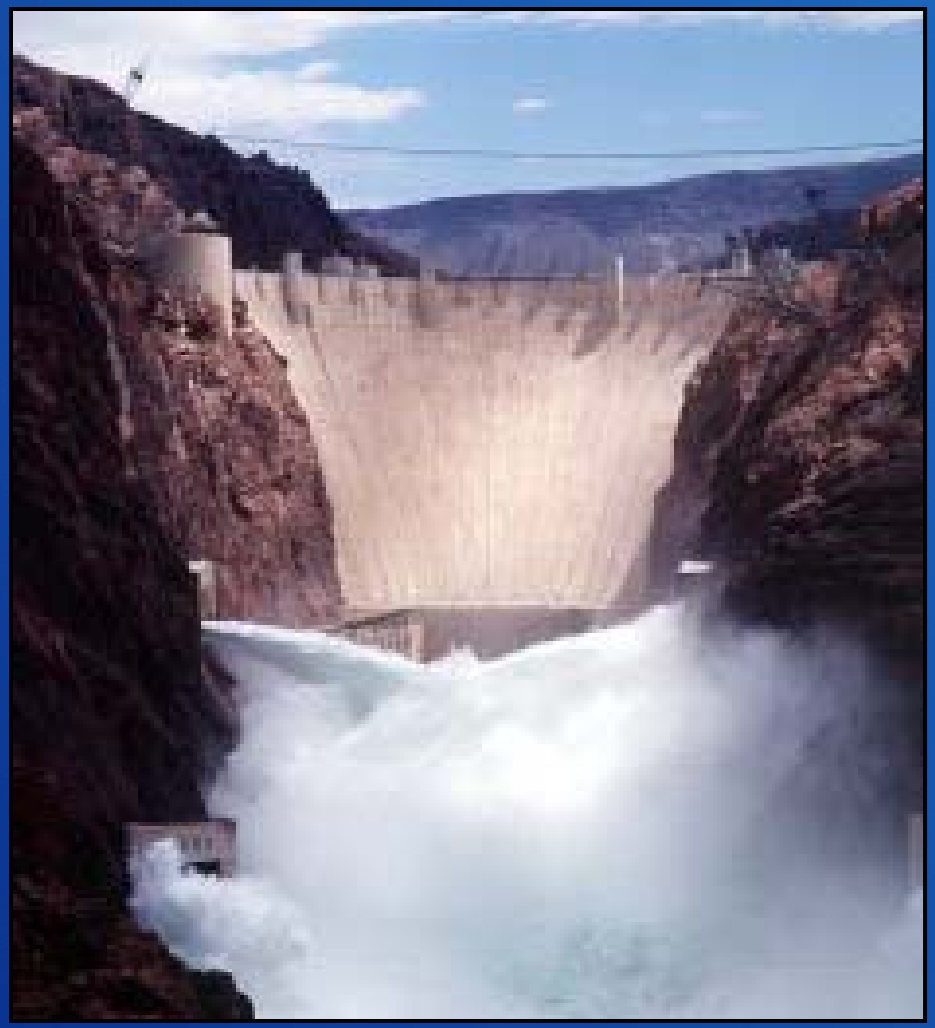
Infrastructure

348 Reservoirs
(~ 450 Dams)

58 Hydroelectric Plants

55,000 Miles of Canals

$2B in Hydropower Assets



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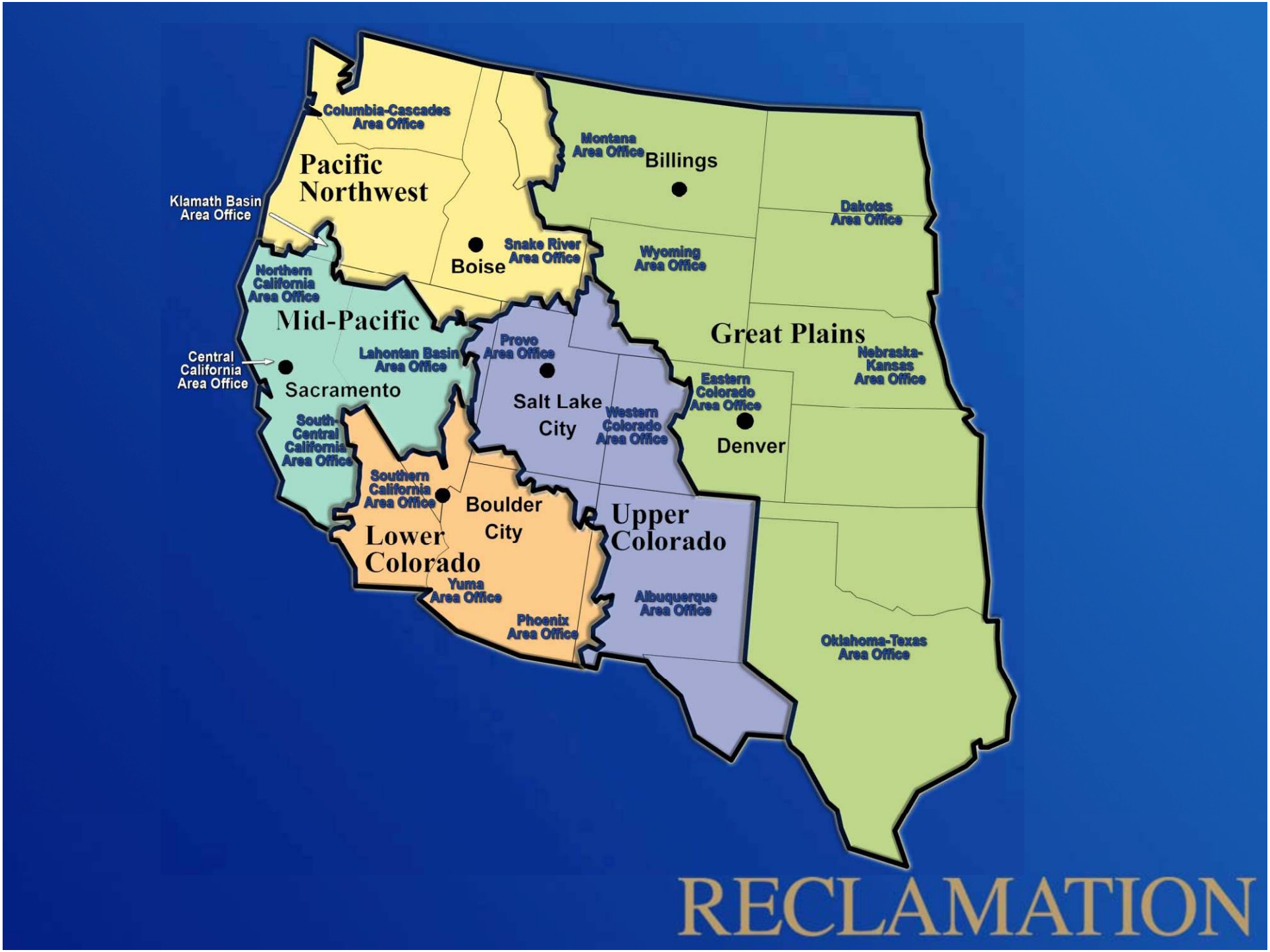
Columbia-Cascades Area Office
Pacific Northwest
Klamath Basin Area Office
Boise
Snake River Area Office
Montana Area Office
Billings
Dakotas Area Office
Wyoming Area Office
Great Plains
Nebraska-Kansas Area Office
Northern California Area Office
Mid-Pacific
Central California Area Office
Sacramento
Lahontan Basin Area Office
Provo Area Office
Salt Lake City
Western Colorado Area Office
Eastern Colorado Area Office
Denver
South-Central California Area Office
Southern California Area Office
Boulder City
Lower Colorado
Yuma Area Office
Phoenix Area Office
Upper Colorado
Albuquerque Area Office
Oklahoma-Texas Area Office
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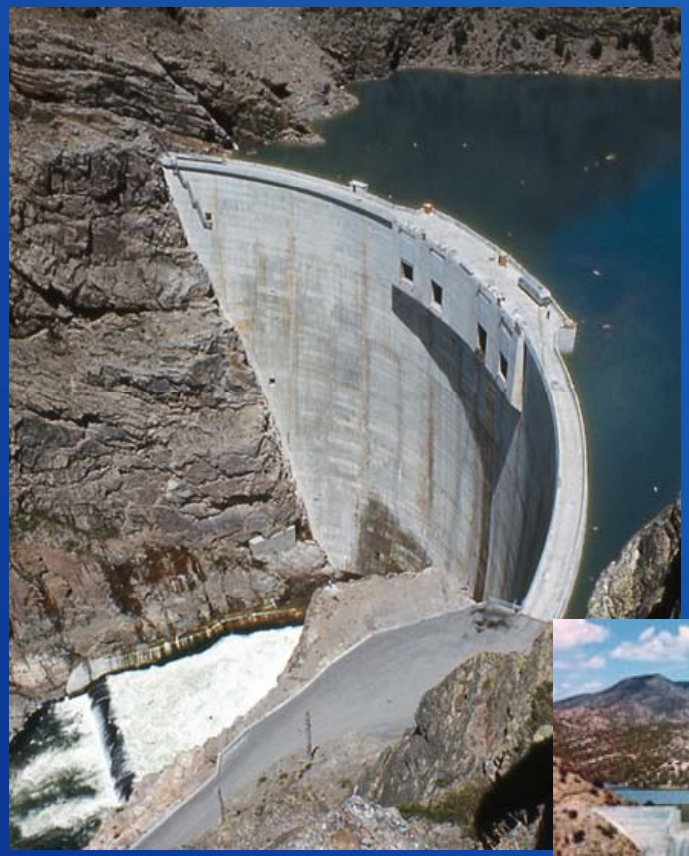
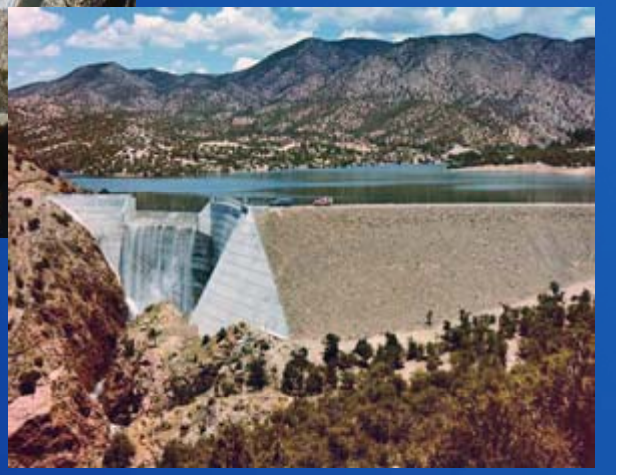
Technical Service Center, Denver, CO

- Primary center of technical expertise in dam engineering
- Run like a business
- Regions hire the TSC to provide engineering services
- Responsible for the dam safety work for all 450 dams in Reclamation Inventory





RECLAMATION

Waterways & Concrete Dams
and
Structural Analysis

RECLAMATION

What Do We Do?

- Design new dams
- Evaluate safety of existing dams
- Design modifications for existing dams

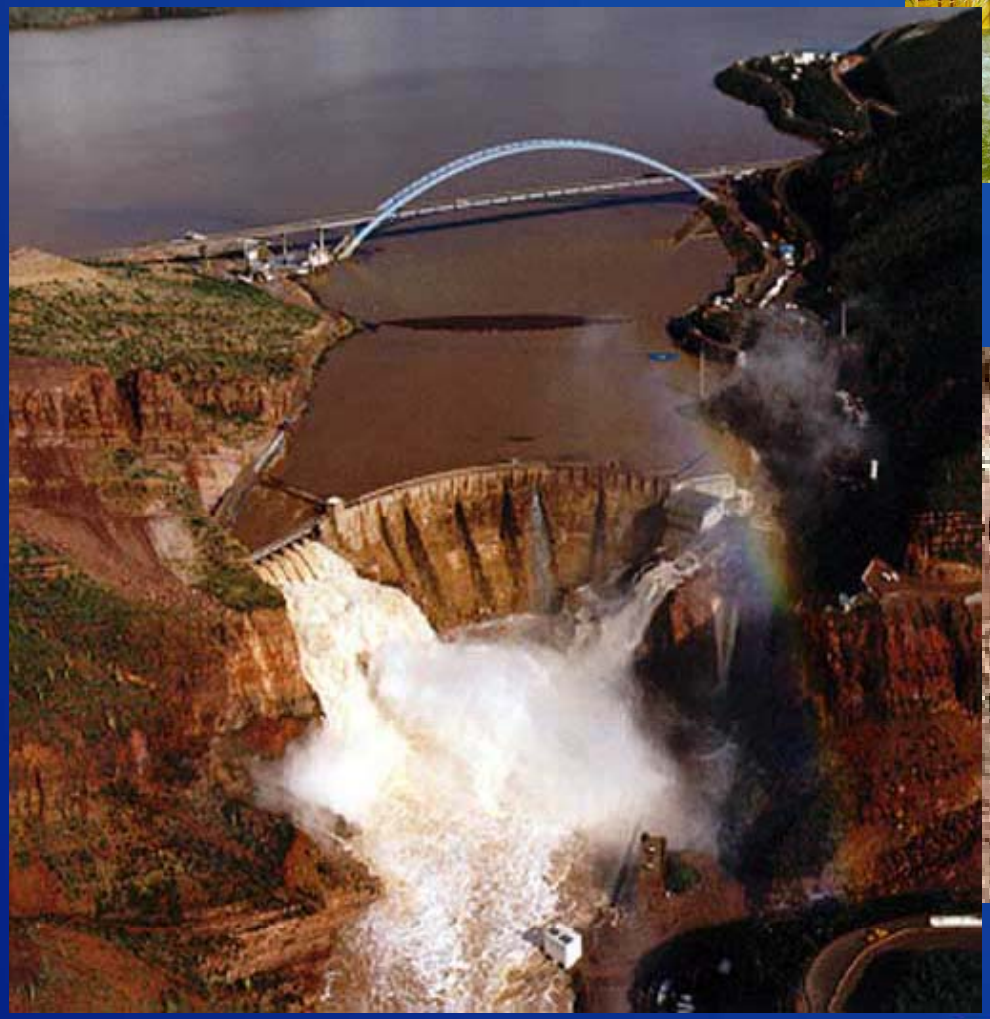
RECLAMATION

Construction of New Dams

RECLAMATION

Structural Modifications to Dams and Spillways

Hydraulic Model Study and Prototype of New Top-Seal Radial Gated Spillways.



RECLAMATION

Structural Modifications to Dams and Spillways

Bartlett Dam, Arizona
Dam Raise and Spillway Improvements

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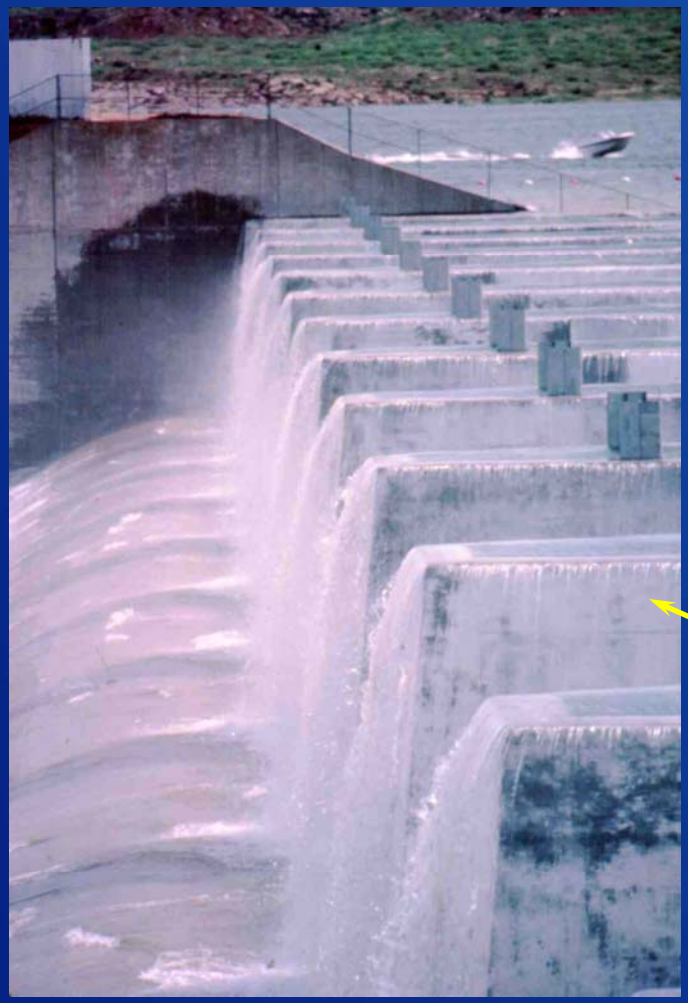
Structural Modifications to Dams and Spillways

Stewart Mountain Auxiliary Spillway (foreground), augmenting discharge capacity of Service Spillway (background)

Structural Modifications to Dams and Spillways



Ute Dam (NMISC) Spillway

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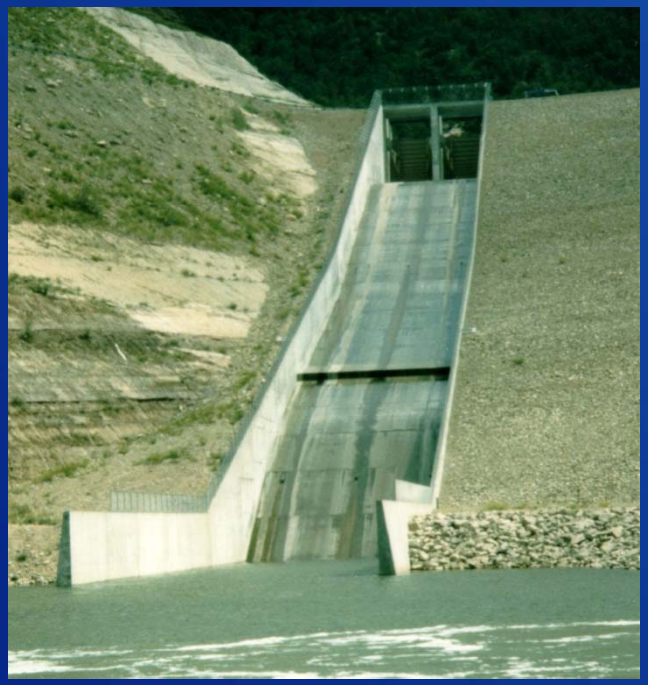
Structural Modifications to Dams and Spillways

- **Spillways:**
  - **Air Slots to prevent cavitation**
  - **Cavitation Repair**

McPhee Dam Spillway Air Ramp



Glen Canyon Dam Tunnel Spillway

Structural Modifications to Dams and Spillways

- **Concrete Dams:**
  - **Overtopping Protection**

Coolidge Dam (BIA)
Concrete Overtopping Protection

Structural Modifications

- **Concrete Dams:**
  - **Buttressing/Stabilizing.**

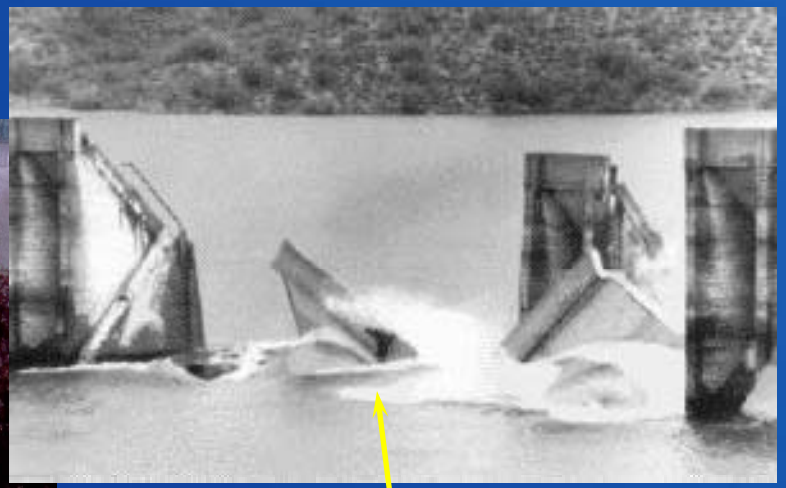
Santa Cruz Dam (NMSISC) RCC Buttressing

Stewart Mountain Dam Post-tensioned Anchors

Structural Modifications

- **Concrete Dams:**
  - **Partial or Complete Breach.**

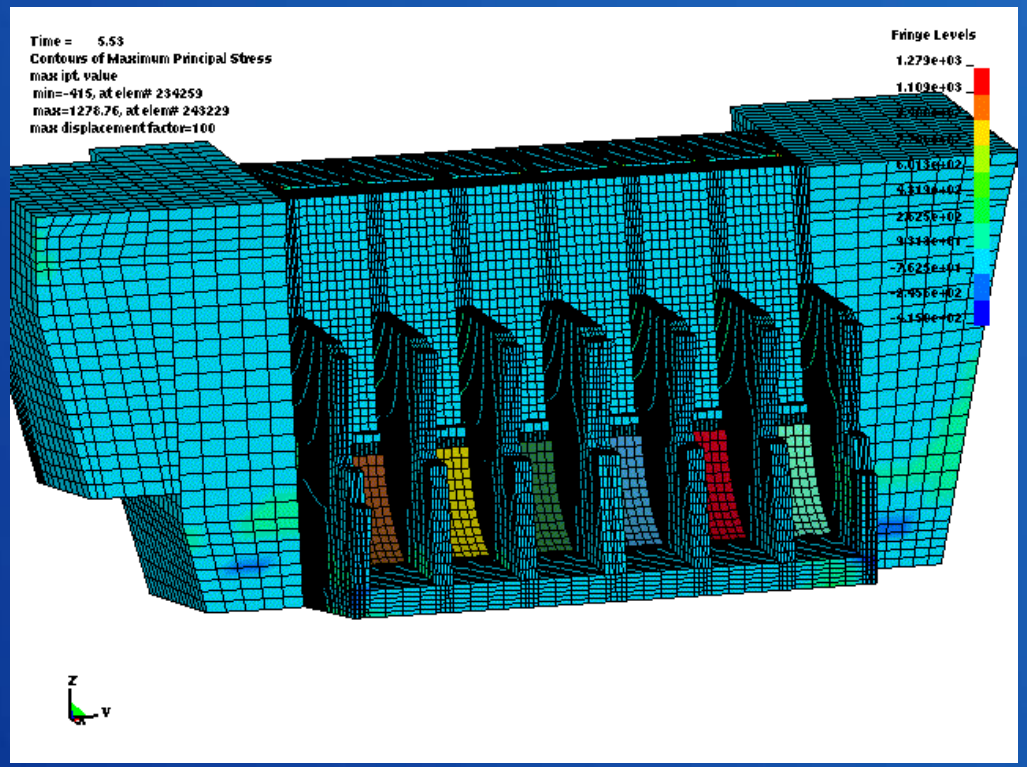
Clear Creek Dam Interim Breach



Waddell Dam Breach

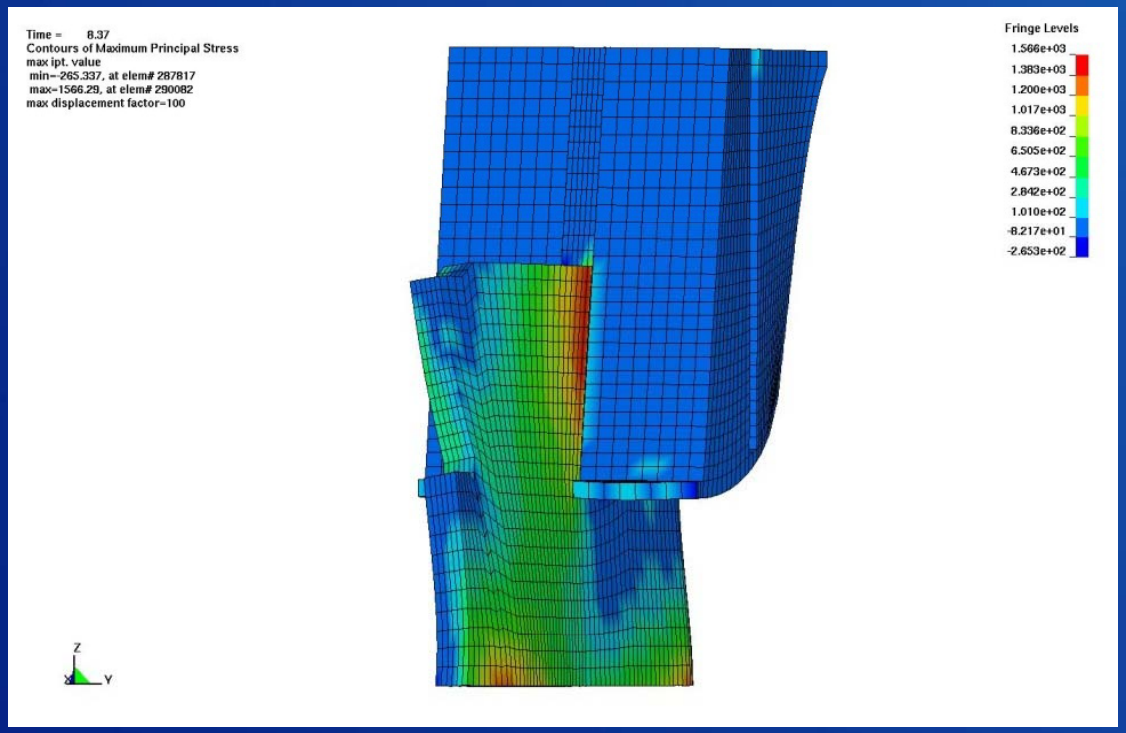
Analyses Used in Design and Risk

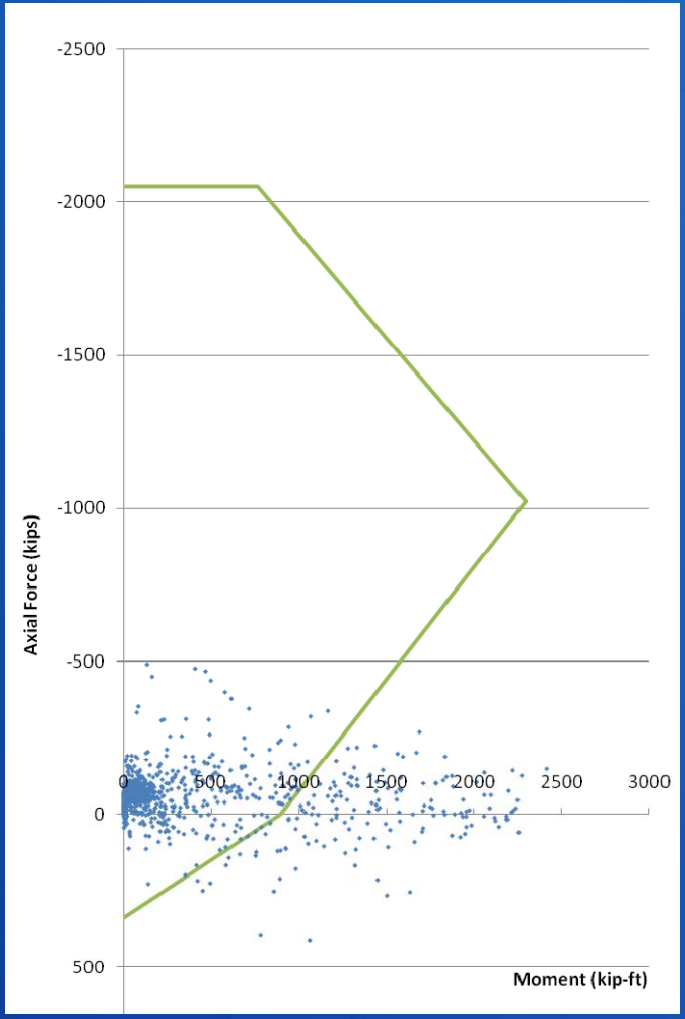
- Normal Operating Conditions
- Floods
- Earthquakes



RECLAMATION

Analyses Used in Design and Risk





How many points fall outside the reinforcement capacity?

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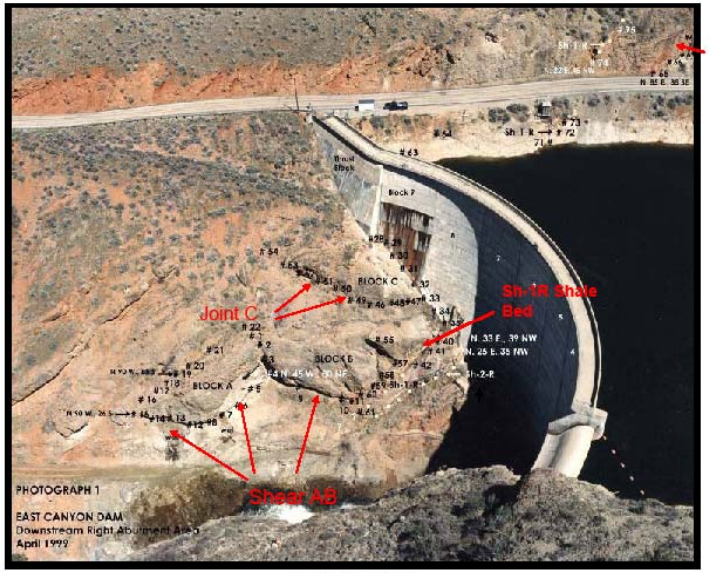
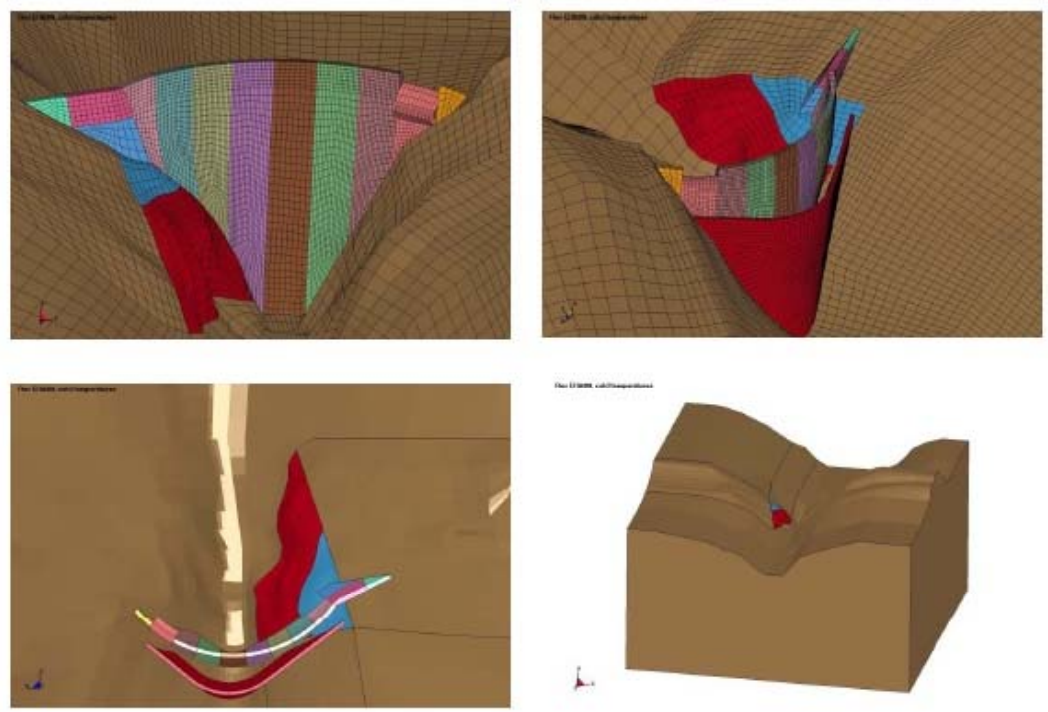
Analyses Used in Estimating Risk



(east canyon dam right abut)
View of right abutment MN shot points surveyed by Neeley in 1999. Shear AB is clearly visible dipping towards the river channel

Photo B



How does sliding of a foundation block affect dam stability?

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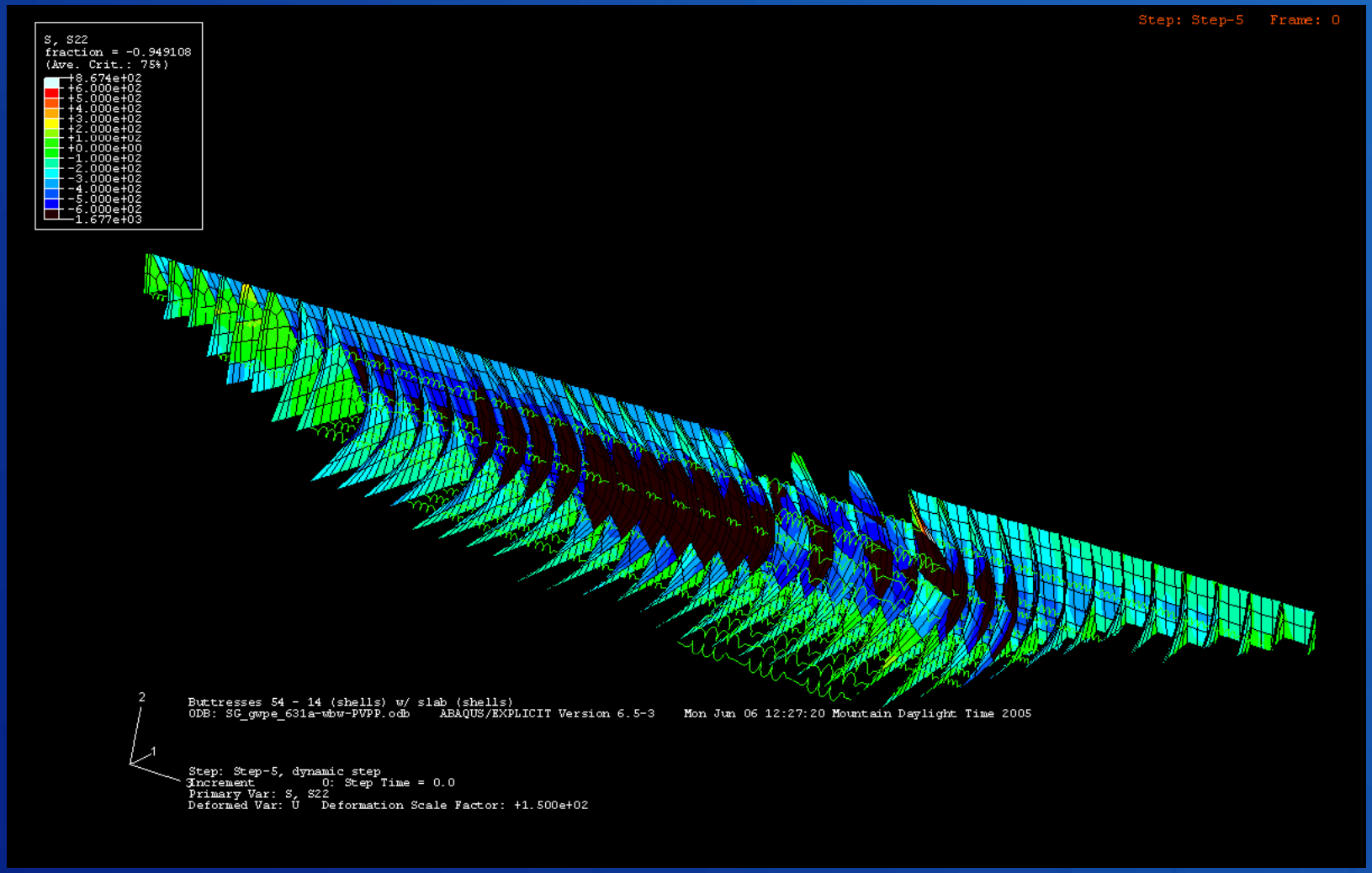
Analyses Used in Design and Risk



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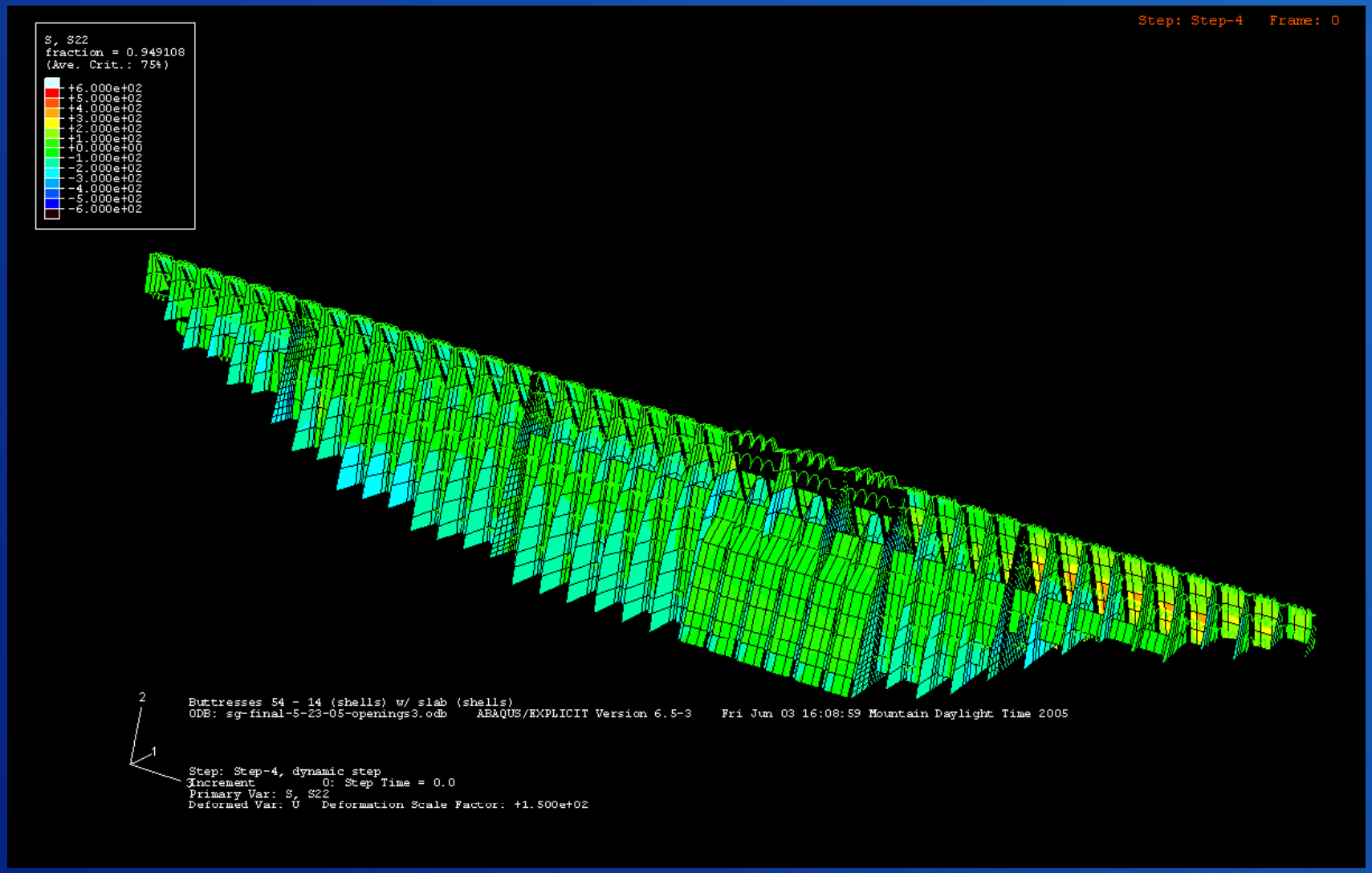
Analyses Used in Design and Risk



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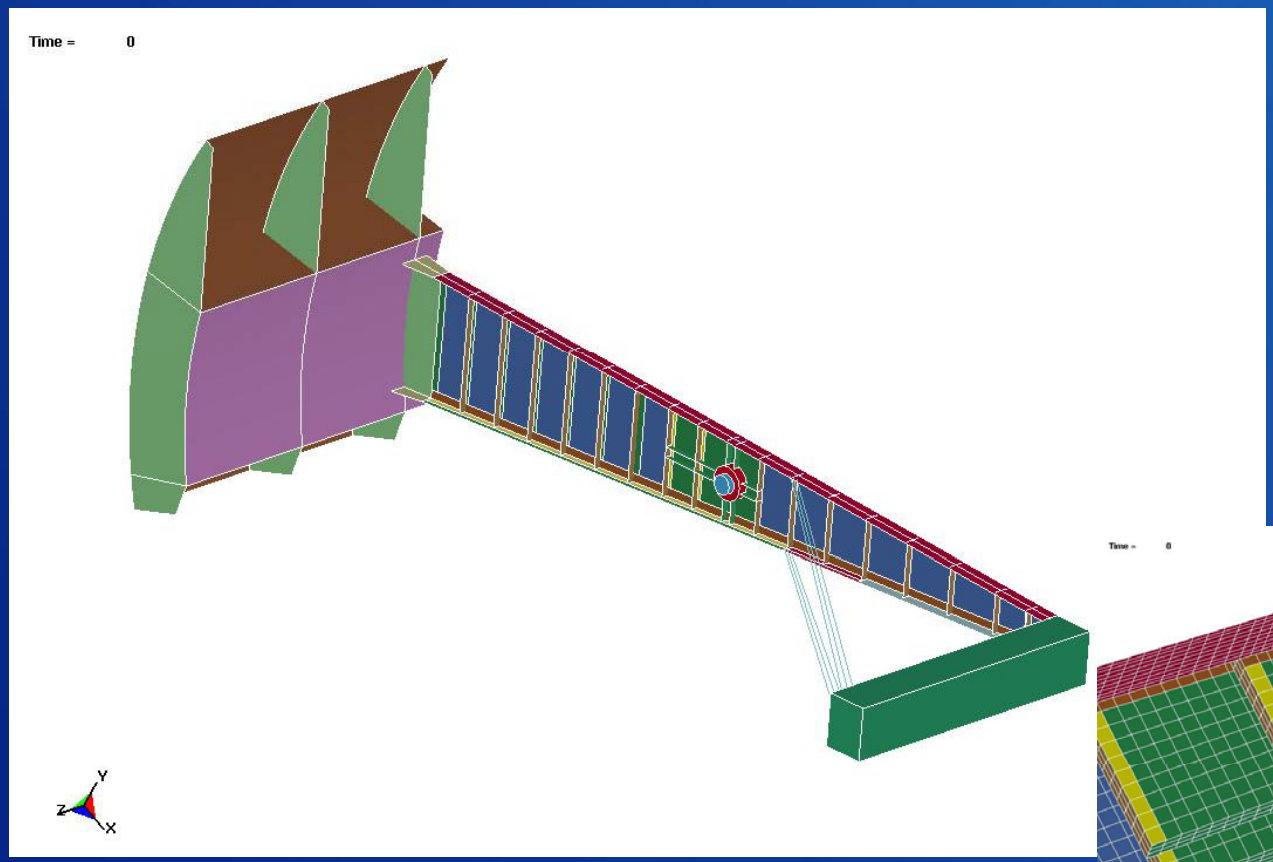
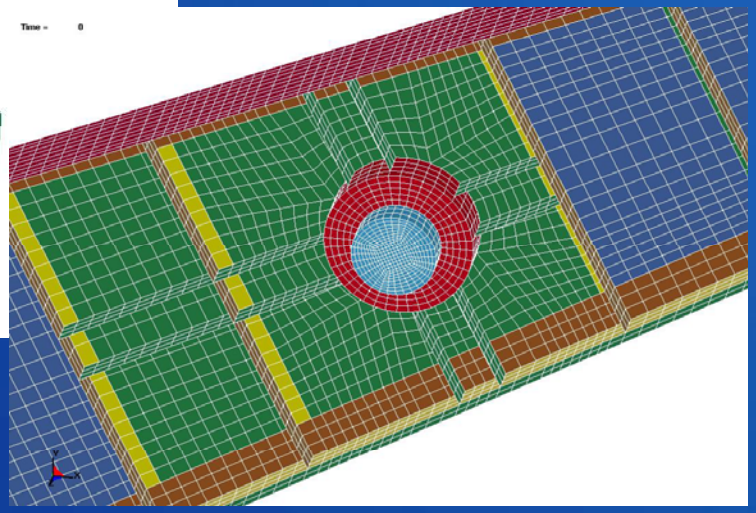
Analyses Used in Design and Risk





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