Horizontal Fish Screen Solution for Downstream Fish Passage at a Historic Dam used to restore Lahontan Cutthroat Trout Population

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Agenda

- Introduction to Derby Diversion Dam
- Decline of Lahontan Cutthroat Trout (LCT)
- The Effort to Restore LCT Populations
- Accelerated Design of the Downstream Fish Passage
- Technical Solutions and Major Design Components
- Construction Challenges
- Project Successes

Derby Dam

- Built in 1903/05 (without upstream or downstream fish passage) to serve irrigation needs in Carson River watershed near Reno
- One of the first Bureau projects designed and built
- Placed on National Register of Historic Places in 1978
- Cut passage to Lahontan Cutthroat Trout and Cui-ui

Photo: Granite Construction via PIX4Dcloud

Derby Dam

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2021: Provided screening of irrigation water and fish return to the Truckee River.

Restored aquatic connectivity for the 1st time in 116 years.

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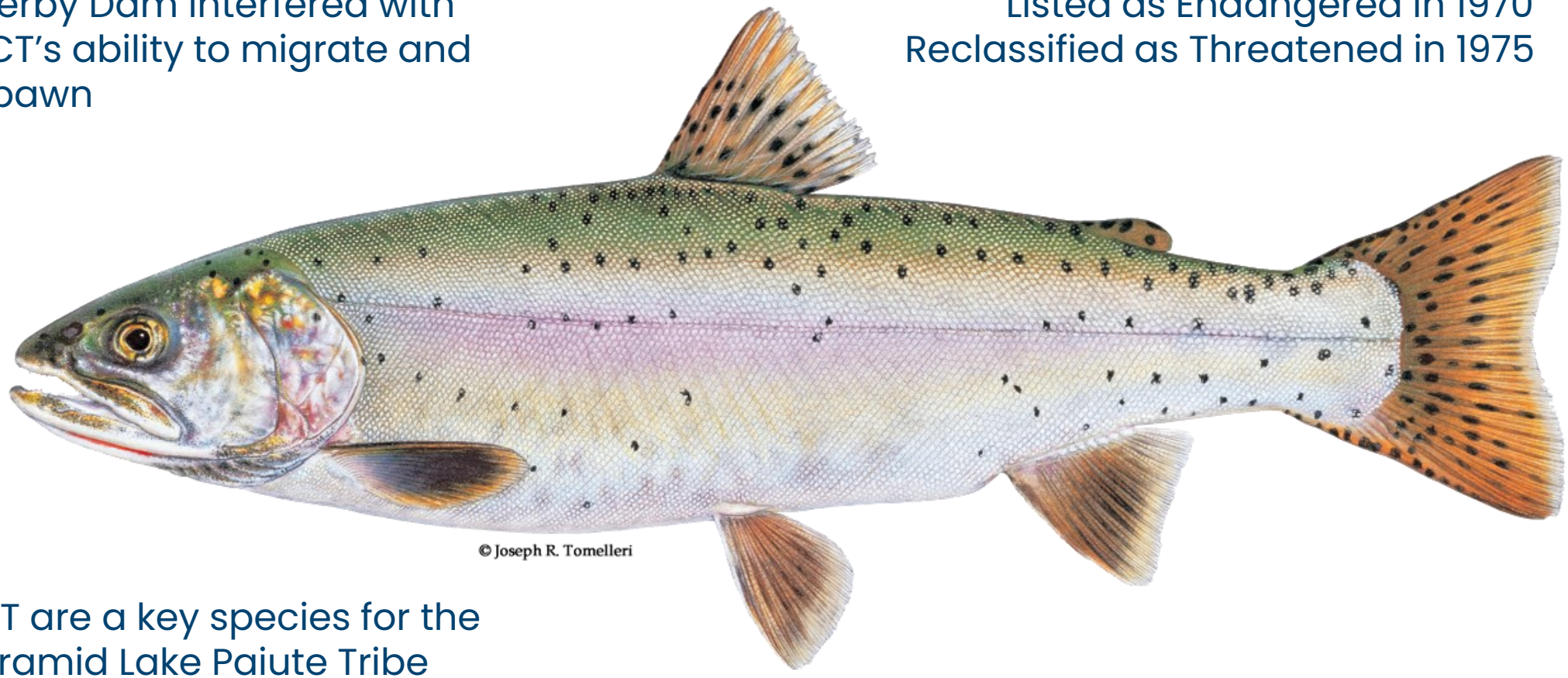
BUREAU OF
RECLAMATION

Why Build a Downstream Fish Passage?

Derby Dam interfered with LCT's ability to migrate and spawn

Listed as Endangered in 1970
Reclassified as Threatened in 1975



LCT are a key species for the Pyramid Lake Paiute Tribe

Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*)
Photo: Joseph R. Tomelleri, USFWS

The Effort to Restore LCT Populations

- 1970s: An out-of-basin population of LCT was discovered
- 1995: Lahontan NFH Complex developed a conservation broodstock for use in recovery efforts in the Truckee Basin system.
- 2004: USFWS and the Bureau designed and completed a fish bypass around Derby Dam to provide upstream fish passage.
  - Upstream passage was never put in service because fish migrating downstream could end up in irrigation system.
  - FCA and the Bureau worked together to find a screening solution.
- 2014: LCT were observed spawning naturally downstream of Derby Dam for the first time in over 80 years.

Map: Environmental Protection Agency

Successful Schedule Acceleration

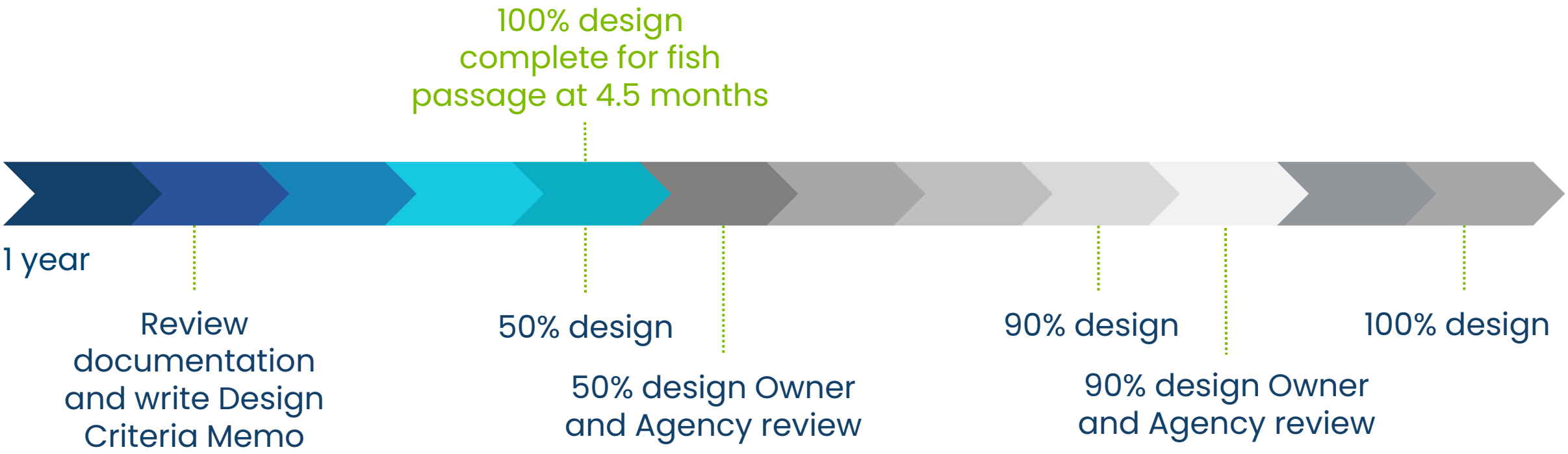
- Design schedule
- Permitting
- Agency coordination
- Delivery method

Photo: Granite Construction via PIX4Dcloud

Fully Designed in 4.5 Months

*Electrical and SCADA design were completed in November after structural, mechanical, and civil design were completed.

Typical Project vs. Accelerated Design



Partnership is Key

fca

McMillen
20 YEARS

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

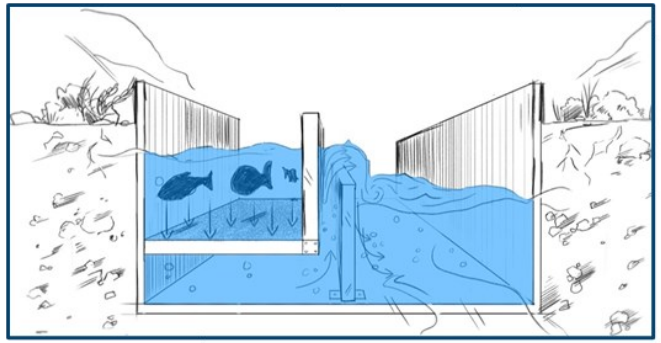
PAIUTE INDIAN TRIBE OF UTAH

BUREAU OF RECLAMATION

GRANITE

Technical Solutions

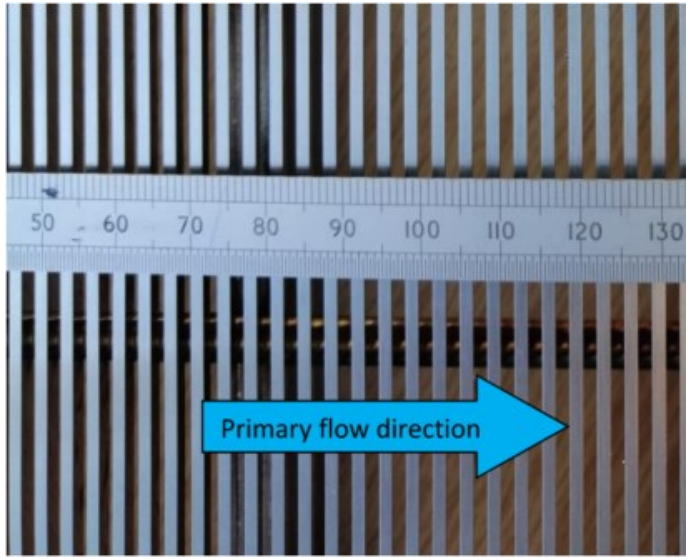
- 17 m^3/s- Farmers Screen
- Managing flow variation from 1.13 to 17 m^3/s :
  - 4 large screens – 3.74 m^3/s
  - 1 small screen – 2.04 m^3/s
  - Operational range
- Horizontal screens are passive screens
  - Approach Vel. <0.076 m/s
  - Sweeping vel. >0.76 m/s
  - Self cleaning/no moving parts



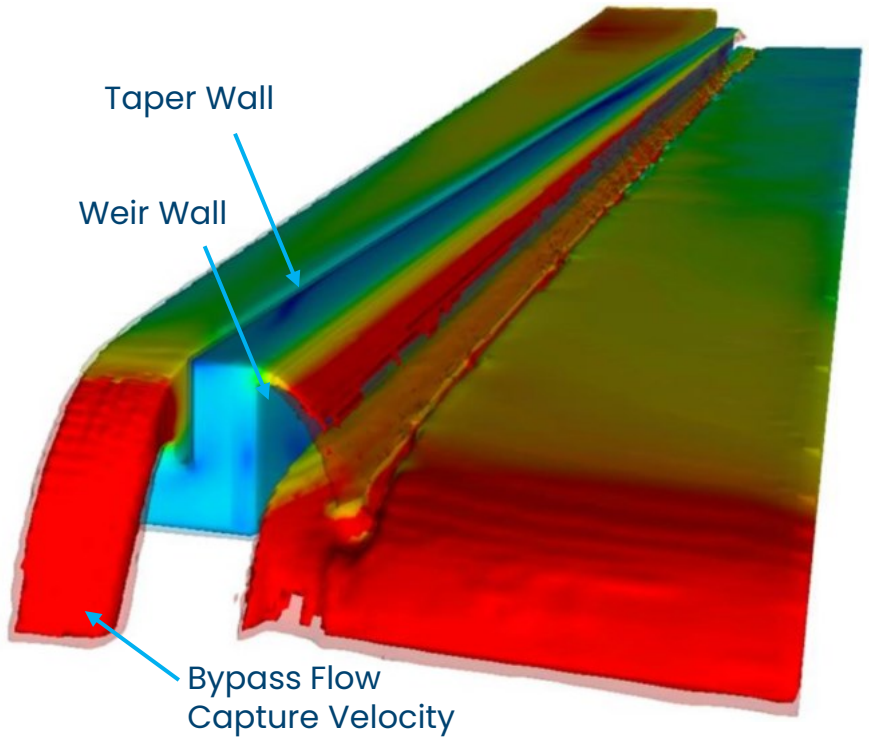
Drawing: FCA
CFD Model: Jo Scott, Gilkes

CFD Modeling

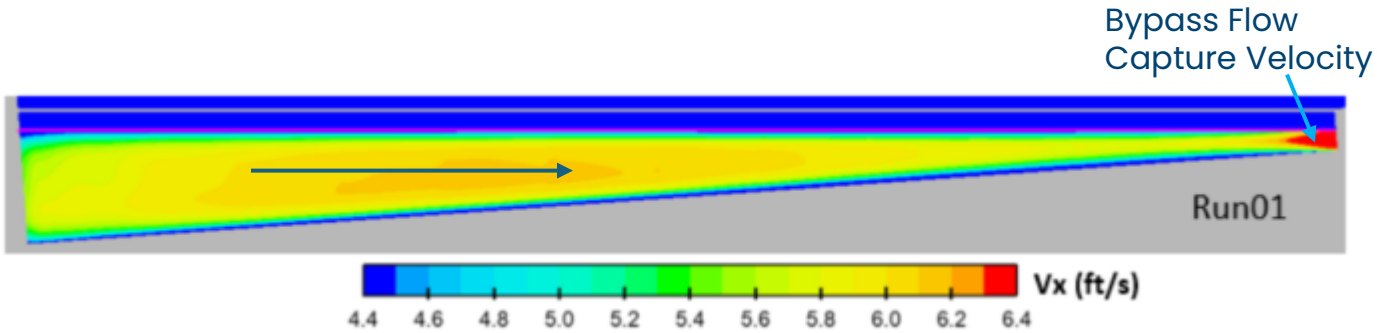
- Wedge-Wire screen
- Completed by Jo Scott PhD (Gilkes)
- Evaluated different flow and water depth conditions
- Min. water depth (305 mm)
- Normal water depth ~600 mm
- Through Velocity
- Approach Velocity



Wedge-wire screen - 1.75 mm opening



Velocity over a typical simulation



Velocity along the screen

Major Design Components

- Liquefiable material remediation
- Sediment management
- Concrete box culvert
- Fish return flumes
- Engineered log jam
- Connecting new and old infrastructure

Photos on right: McMillen, Inc.
Photo on left: FCA

Construction Challenges

- Compressed schedule
- Irrigation diversion schedule – Sequencing
- Land slide/slope stabilization
- Site access
- COVID-19 pandemic
- Fire Season
- Winter Construction

Video: Granite Construction

Awards

INTERNATIONAL PARTNERING INSTITUTE

2021 Partnered Project of the Year | Ruby Level

ENR Engineering News-Record

Award of Merit in Water / Environment
Southwest 2021 Best Projects

AGC

2020 Pinnacle Award Contractor's Excellence
Public Sector over $10M

Questions

Photo: FCA

Thank you.

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Because it Matters

McMillen