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# Glen Canyon Dam DO Augmentation

Progress Update July 2024

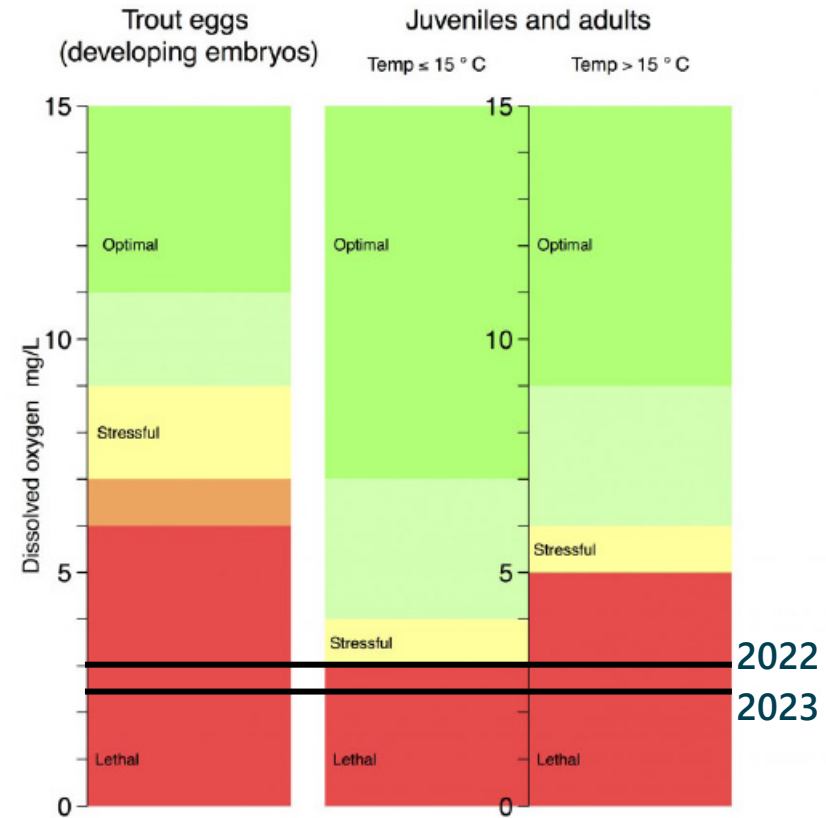
Alex Walker

WQG, AMWQ Division, UC Region

# Background: Low DO in Glen Canyon

- Dissolved Oxygen concentrations:
  - 2.4 mg/L September 14, 2022
  - 2.9 mg/L September 19, 2023
- Low levels stress fish and cause mortality
- Reclamation and the GCDAMP is concerned about effects in Glen Canyon

Average dissolved oxygen requirements for salmonids  
Genera *Oncorhynchus* which includes Rainbow Trout and *Salmo* which includes Brown Trout

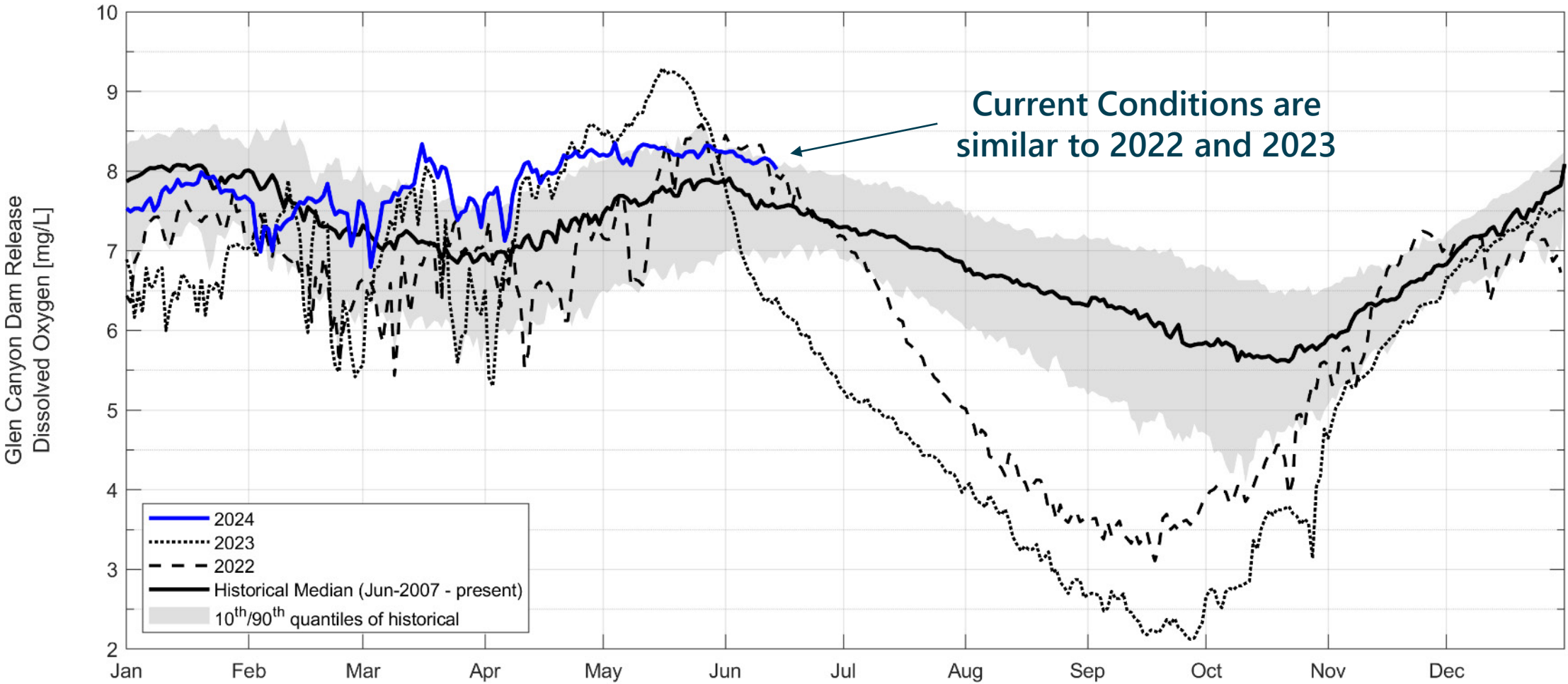


References: Chapman, G. 1986. Ambient water quality criteria for dissolved oxygen. U.S. E.P.A. EPA 440/5-86-003. 46 pp  
Raleigh, R.F., T. Hickman, R.C. Solomon, and P. C.Nelson. 1984. Habitat suitability information: Rainbow trout. U.S. Fish Wildl. Serv. FWS/OBS-82/10.60. 64 pp  
Raleigh, R.F., L. D. Zuckerman, and P. C.Nelson. 1986. Habitat suitability index models and instream flow suitability curves: Brown trout, revised. U.S. Fish Wildl. Serv. Biol. Rep. 82(10.124). 65 pp.

Image courtesy of Bridget Deemer and Ted Kennedy

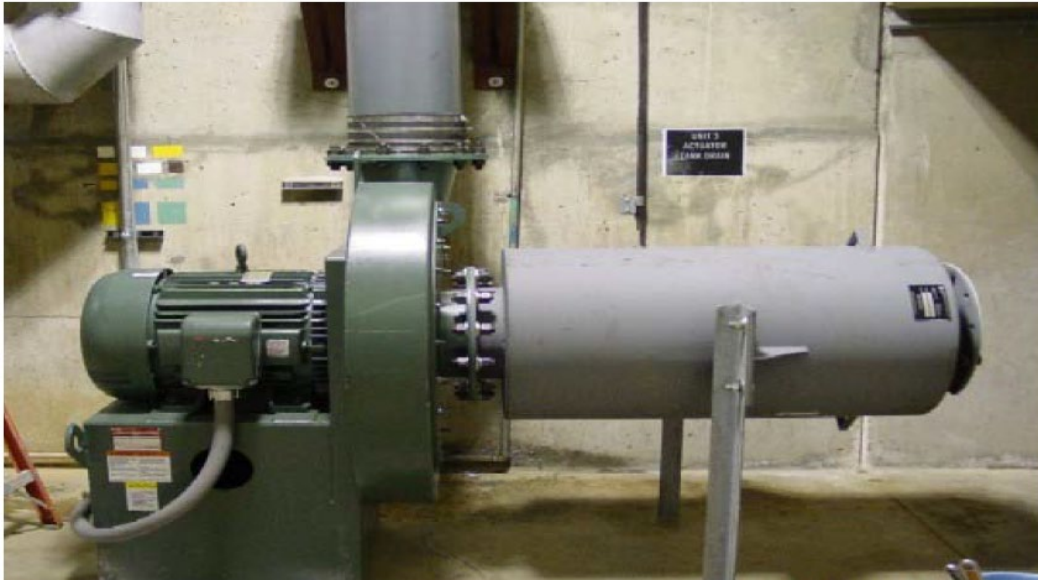


# Glen Canyon Dam Current Observations: DO



# Possible Treatment: Air Injection

- Augment DO in water column as it passes through GCD
- Successfully implemented by Reclamation at Canyon Ferry Dam, MT
  - Increased mean downstream DO from 4.6 to 6.0 mg/L
- Employed by TVA at multiple sites

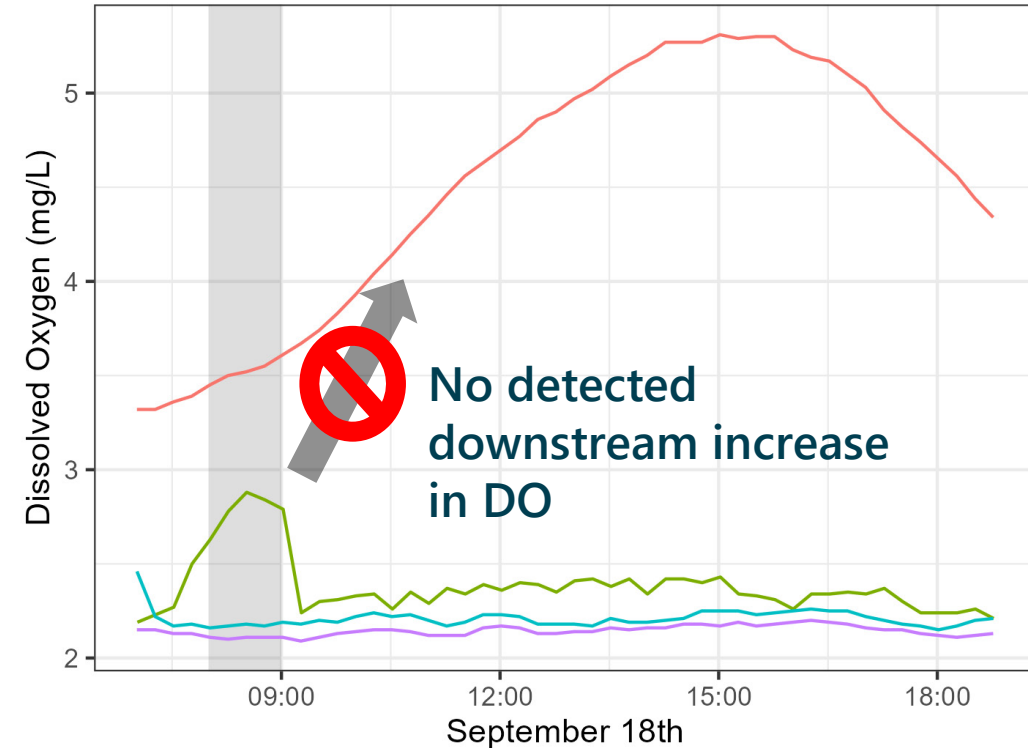


Turbine air injection blower at Canyon Ferry Powerplant



# Initial Testing: September 2023

- Coordinated with GCD Operations to test existing service air system for draft tube injection.
- Injected air into a single draft tube at a rate of ~1700 CFM
- Despite ideal testing conditions (low flows, low starting DO, max possible air injection), we did not detect increases in dissolved oxygen downstream.
- Air injection with existing equipment at GCD is not suitable for resolving low dissolved oxygen issues.



Sonde

- -8 mile
- Below Dam
- DT2
- DT8



# Currently:

- **Initializing project to describe feasibility of DO Augmentation system at GCD**
  - Model potential DO increases under a range of conditions
  - Identify a preferred method of augmentation
  - Assess how increased DO would improve downstream fisheries
  - Funding in progress, expected to begin fall 2024
  - Collaborators: GCMRC (Brian Healy and Bridget Deemer), USBR TSC
- **Technology Search for DO augmentation methods – follow up to DO State of Science Report**
  - Worldwide search for existing and new methods (via a subcontractor, Yet2)
  - Pending final approval, pursuing a project to start July 2024, with a report by end of calendar year
- **Discussions with Pacific Northwest National Laboratory**
  - 3D modeling of fluid dynamics to predict oxygen mass transfer in water – helpful to determine potential design
  - Preliminary discussions – timeline TBD





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