Dissolved Oxygen State-of-Practice Study

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Report Background

• Report is a response to GCDAMP stakeholder concerns about low DO effects on the rainbow trout fishery.
  • Reminder: Colorado River is re-aerated after passing through the Paria Riffle at Lees Ferry (RM 0.2).

• TSC reviewed a wide range of technologies currently used. Selected a couple based on perceived likelihood of success.
Low dissolved oxygen (DO) concentrations are a common water quality problem downstream of hydropower facilities

Figure 1. Thermal stratification of a hydropower reservoir

• **Takeaway**: any option will require significant engineering analysis and feasibility study. No short-term, off-the-shelf fixes available.

• **Best options to increased DO:**
  • Hypolimnetic aeration (broad class of solutions, e.g., bubblers):
    • Hypolimnetic (deep water) aeration requires no modification to dam.
    • Expensive. Requires oxygen delivery or generation on-site.
      • Approximately 22 tons of pure oxygen per day required to achieve a 2 mg/L increase at a discharge of 8000 CFS.
  • Turbine aeration: rough zone, air injection
    • Tried turbine aeration in rough zone in 2006, it was deemed damaging and off-limits.
      • Has potential with new post-2006 turbines, operational scenario likely different.
    • Forced air injection through existing piping.
Bubble Plume Oxygenation
Introduction of air during rough zone operation
Outflows at Canyon Ferry, MT without and with forced air injection
Other options

• Bubble plumes using atmospheric oxygen (supersaturation issues, efficiency)

• Aerating turbines (significant retrofit to facility needed)

• Aerating weir downstream (Lack of gradient and difficulty due to location)

• Speece Cone (infrastructure needed and possible scale issues)