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RECLAMATION

Temperature Control and Fish Passage at Glen Canyon Dam – Recent Progress

GCDAMP Technical Working Group

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2016 LTEMP Biological Opinion

- Temperature Control Device:
- Reclamation would explore the efficacy of a temperature control device at the dam to respond to potential extremes in hydrological conditions due to climate conditions that could result in nonnative fish establishment. Evaluations would be ongoing for all current and evolving technological advances that could provide for warming and cooling the river in both high- and low-flow discharge scenarios, and high and low reservoir levels. These studies should include evaluating and pursuing new technologies, an analysis of the feasibility, and a risk assessment and cost analysis for any potential solutions.

Review: Dam Impacts on River Temperature

- High Reservoir, COLD water impacts
- Low Reservoir, WARM water Impacts

Temp. Control Studies to Date

- 1978: BO concern for fish populations and aquatic resources from cold dam releases (USFWS 1978).
- 1995: BO directed BOR to “...implement a selective withdrawal program for Lake Powell waters...” (USFWS 1995).
- 1997: Value Planning Study identified five design proposals costing \$15 to \$148.5 million (BOR 1997).
- 1997: Feasibility Study recommends uncontrolled surface withdrawal (fixed inlet) design as preferred alternative
- 1999: Draft Science Plan (GCMRC 1999) and Draft EA for a TCD on Glen Canyon Dam (BOR 1999)—withdrawn.
- 1999: Scientific Review of EA expressed concern for unintended negative effects, esp. NNF (Mueller et al. 1999).

Temp. Control Studies to Date

- 2001: BOR workshop of scientists and managers evaluated feasibility of a TCD (BOR 2001).
- 2003: AMWG requested Survey of Selective Withdrawal Systems (Vermeyen et al, 2003)
- 2003: GCDAMP Science Advisors recommended construction of a pilot TCD (Garrett et al. 2003).
- 2004 – 2006: Prolonged drought drives a second round of feasibility studies. An external frame selective withdrawal structure selected due to most operational range (180 vertical feet).
- 2006: Draft EA for a TCD on Glen Canyon Dam (BOR 2006)—preempted by LTEP.
- 2006-2007: Value Engineering Study, Constructability Review, Final Design completed.
- 2018: Temperature modeling to determine release temperatures using half, full bypass and without bypass at three reservoir elevations (TWG presentation)

Recent TCD Exploration

- Reclamation [R&D Office report](#) reviewing temp control options for reservoir release flows in January 2020.
- A technology search was recommended as a next step.
- In March 2020, Reclamation developed a Technology Search to explore innovative TCDs.
- Contractor (Yet2) provided a report with a multitude of ideas.
 - Reviewed at April TWG meeting.
 - Discussed w/ Reclamation GCD staff.
 - Reclamation is still shopping the results around internally.

Remaining Questions

- Can we refine the problem statement?
 - Advantage native fish... or disadvantage non-native fish?
 - Timing: Most critical time of year?
 - Temps: Desired / catastrophic temperature ranges.
 - Location: Specific reach of the river?
 - Risk:
 - Most likely future conditions – reservoir levels?
- At what critical times of year do we need what temperatures in what reach of the river?
- At what critical times of the year do we need to avoid what catastrophic temperatures in what reach of the river?

2016 LTEMP Biological Opinion

- Fish Passage:
- Reclamation would pursue means of preventing the passage of deleterious invasive nonnative fish through Glen Canyon Dam. Because Glen Canyon Dam release temperatures are expected to be warmer under low reservoir elevations that may occur through the LTEMP period, options to hinder expansion of warmwater nonnative fishes into Glen and Grand Canyons would be evaluated. Potential options to minimize or eliminate passage through the turbine or bypass intakes, or minimize survival of nonnative fish that pass through the dam would be assessed (flows, provide cold water, other). While feasible options may not currently exist, technology may be developed during the LTEMP period that could help achieve this goal.

Fish Passage

- 2007 – 2009 GCD forebay fish survey report.
- Improved Fish Exclusion Prize Competition – Reclamation – 2019.
- Reclamation partnered with DOE Water-Power Technologies Office to launch a prize competition to evaluate fish passage – 2019 to 2020.
- September 2020: winners were selected at the virtual AFS meeting, awarded lab space to prototype at DOE lab TBD.
- Internal discussions to look for obvious technologies applicable to GCD took place – no low hanging fruit.

Questions?



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Downstream Temperatures Using No Bypass, Half Bypass and Full Bypass

Surface elevation \approx 3550 ft. August					
Location	No Bypass	Half Bypass	Δ	Full Bypass	Δ
RM-0 Lees Ferry	11.0	11.0	0	10.0	-1.0
RM-30	12.0	12.0	0	11.0	-1.0
RM-61 LCR	15.0	13.0	2.0	12.0	-3.0
RM-87 Bright Angel	15.5	14.5	1.0	15.0	-0.5
RM-166 Fern Glen	15.8	15.8	0	15.0	-0.8