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Glen Canyon Fish Escapement Options

Glen Canyon Dam Adaptive Management Program
Technical Work Group Meeting, April 12, 2022

Connie Svoboda, P.E., Hydraulic Engineer
Bureau of Reclamation, Technical Service Center

Background

- Lake Powell water levels are rapidly declining due to historic drought
- As reservoir elevations have continued to drop, the epilimnion is nearing the penstock intake elevations
- Risk of downstream fish entrainment has increased
- Non-native game fish above Glen Canyon (smallmouth bass, walleye, striped bass) threaten to compete with and/or predate the native fish community downstream including threatened and endangered species (humpback chub, razorback suckers)



Project Goals

- Exploring fish exclusion options to prevent passage of non-native fish through Glen Canyon Dam with focus on longer-term options
- Determining applicability and scalability for Glen Canyon Dam
- Documenting options for further consideration



Approach

- Conduct literature review
 - Review devices and techniques used to limit fish escapement from reservoirs
 - Include physical exclusion and behavioral barriers
- Perform applicable project review
 - What has been considered? What has been installed?
 - Reach out to every Reclamation region
 - Reach out to USACE and other federal/state entities
 - Review Fish Protection Prize (2020) outcomes



Approach

- Options Assessment

- What is the applicability to Glen Canyon Dam?
- Determine pros and cons based on criteria such as field readiness, applicability, scalability, operational impacts, impacts to recreation, maintenance requirements
- Identify which technologies may be most applicable

- Documentation

- Complete report of findings
- Present results at TWG



In-Reservoir Options

- **Physical Exclusion**

- Exclusion nets
- Fixed screens, conduit screens, bar racks, louvers
- Flexible curtains
- Guide walls
- Deeper water withdrawal through bypass pipes

- **Behavioral Barriers**

- Bubble Curtains
- Light and Sound Barriers
- Submerged Velocity Jets/Flow Alteration
- Turbulence Barriers
- Electric Barriers
- Floating Booms, Hanging Curtains/Chains



Downstream Options

- At Dam

- Expected Survival through Francis Turbines
- Energy Dissipating Sleeve Valve

- Downstream of Dam

- Downstream Collection/Netting



Example Case Studies

- **Lovewell Dam, Kansas**

- Reduce fish loss (walleye, crappie, gizzard shad) from reservoir during spillway and outlet works discharges
- Fish exclusion net 430-ft-long by 21-ft maximum height



- **Elkhead Reservoir, Colorado**

- Reduce downstream movement of nonnative fish (northern pike, smallmouth bass) through spillway
- Fish exclusion net 575-ft-long by about 30 ft-high

- **Ridges Basin Dam, Colorado**

- Eliminate non-native fish survival from discharge pipe
- Energy dissipating sleeve valve with 0.63-inch holes



- **USACE Brandon Road Interbasin Project**

- Control movement of aquatic nuisance species (invasive Carp)
- Electric dispersal barrier, air bubble curtain, acoustic fish deterrent, flushing flows from lock, engineered channel with no habitat



Next Steps

- Continue interviewing subject matter experts and reviewing projects that address fish escapement
- Begin options assessment based on applicability to Glen Canyon Dam
- Report of Findings – September 1, 2022



Connie Svoboda, 303-445-2152
csvoboda@usbr.gov



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