Invasive Fish Strategic Plan Update

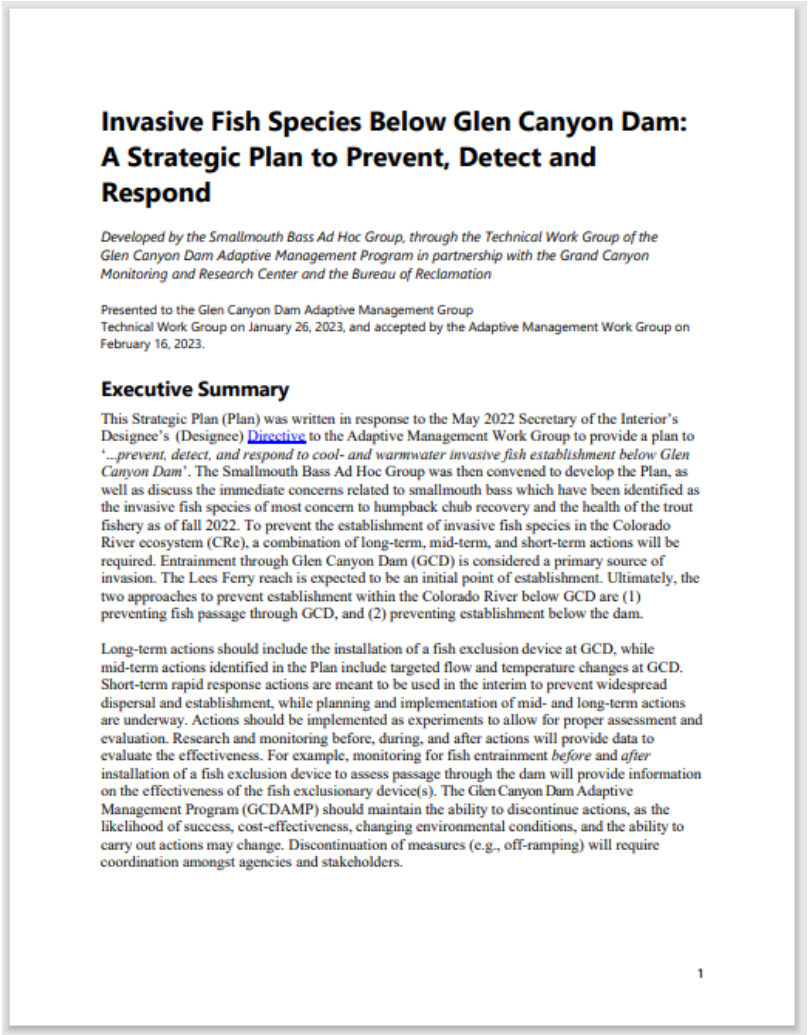
AMWG, August 22, 2024

To address this problem, a multi-faceted approach is required in order to be most effective. This includes:

(1) the long-term placement of a fish exclusionary device(s) to reduce further entrainment (non-flow actions),

(2) mid-term operational flow options which utilize the dam to change temperature and/or velocity to prevent and/or reduce reproductive success and limit establishment of fish that have already passed through the dam, and

(3) short-term rapid response actions to remove invasive fishes to protect Lees Ferry, the mainstem and its tributaries from further establishment (non-flow actions).



Invasive Fish Species Below Glen Canyon Dam: A Strategic Plan to Prevent, Detect and Respond

Developed by the Smallmouth Bass Ad Hoc Group, through the Technical Work Group of the Glen Canyon Dam Adaptive Management Program in partnership with the Grand Canyon Monitoring and Research Center and the Bureau of Reclamation

Presented to the Glen Canyon Dam Adaptive Management Group Technical Work Group on January 26, 2023, and accepted by the Adaptive Management Work Group on February 16, 2023.

Executive Summary

This Strategic Plan (Plan) was written in response to the May 2022 Secretary of the Interior's Designee's (Designee) Directive to the Adaptive Management Work Group to provide a plan to '*...prevent, detect, and respond to cool- and warmwater invasive fish establishment below Glen Canyon Dam*'. The Smallmouth Bass Ad Hoc Group was then convened to develop the Plan, as well as discuss the immediate concerns related to smallmouth bass which have been identified as the invasive fish species of most concern to humpback chub recovery and the health of the trout fishery as of fall 2022. To prevent the establishment of invasive fish species in the Colorado River ecosystem (CRe), a combination of long-term, mid-term, and short-term actions will be required. Entrainment through Glen Canyon Dam (GCD) is considered a primary source of invasion. The Lees Ferry reach is expected to be an initial point of establishment. Ultimately, the two approaches to prevent establishment within the Colorado River below GCD are (1) preventing fish passage through GCD, and (2) preventing establishment below the dam.

Long-term actions should include the installation of a fish exclusion device at GCD, while mid-term actions identified in the Plan include targeted flow and temperature changes at GCD. Short-term rapid response actions are meant to be used in the interim to prevent widespread dispersal and establishment, while planning and implementation of mid- and long-term actions are underway. Actions should be implemented as experiments to allow for proper assessment and evaluation. Research and monitoring before, during, and after actions will provide data to evaluate the effectiveness. For example, monitoring for fish entrainment *before* and *after* installation of a fish exclusion device to assess passage through the dam will provide information on the effectiveness of the fish exclusionary device(s). The Glen Canyon Dam Adaptive Management Program (GCDAMP) should maintain the ability to discontinue actions, as the likelihood of success, cost-effectiveness, changing environmental conditions, and the ability to carry out actions may change. Discontinuation of measures (e.g., off-ramping) will require coordination amongst agencies and stakeholders.

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Smallmouth Bass Ad Hoc Group Charge:

The Smallmouth Bass Ad Hoc Group is charged with evaluating warmwater nonnative fish actions to assess their effectiveness, and as necessary, review and recommend updates to the "Invasive Fish Species Below Glen Canyon Dam: A Strategic Plan to Prevent, Detect and Respond" (i.e., the Strategic Plan).

Long term – Fish Exclusion/Temperature Control

Figure 1. A construction photograph of the penstock intake structures on the face of Glen Canyon Dam. A schematic of the proposed TCD structures has been added to illustrate their proposed size and location.

Background

2016: LTEMP EIS Biological Opinion

> “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.”

2020: “Review of Temperature Control Options for Reservoir Release Flows” (Svoboda, 2020) compiled information on how water temperature is currently controlled at dams (state-of practice)

2020: Technology Search (external vendor yet2, 2020) was used to seek all ways that water temperature is controlled in any industry that may be applicable to dams (out-of-box ideas)

2022: “Glen Canyon Dam Fish Escapement Options” (Svoboda, 2022) reviewed fish escapement alternatives that may limit fish escapement from reservoirs

2024: “Glen Canyon Dam Fish Escapement Appraisal Study” (Wagner and Svoboda, 2024)

Current Technologies at Dams

Examples: Shasta Dam, Folsom Dam, Jordanelle Dam, Flaming Gorge Dam, Hungry Horse Dam, Cougar Dam, Applegate Lake

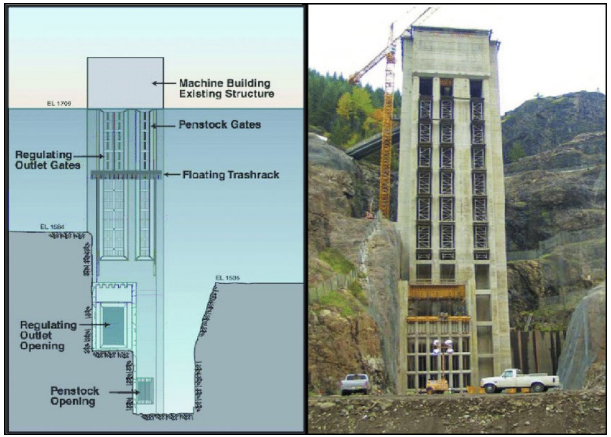
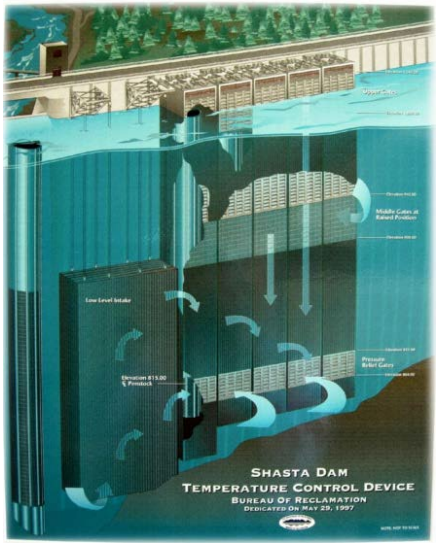


Image from USACE



Current Technologies at Dams

Whiskeytown Lake, California

- Thermal curtain installed to lower the downstream release temperature
- Curtain installed in 1993, replaced in 2011, additional repairs in 2017.
- Approximately 2,400 ft long, 100 ft deep, and constructed of polypropylene with a 30 ft gap between bottom of curtain and reservoir bottom.

Lewiston Reservoir, California

- 830-ft-long, 35-ft-deep fixed temperature control curtain installed in 1992 to reduce downstream temperatures at Clear Creek tunnel
- 1,100-ft-long, 13-ft-deep semi-adjustable temperature curtain installed to provide desirable water temperature to the Trinity River Hatchery.

Photograph from BCI Construction USA, Inc., Lewiston Reservoir

Alternative 1. Fish Barrier Netting
Alternative 2. Partial depth exclusion curtain

- **Design considerations**
  - Width: ~1,000 ft
  - Depth: Deep enough to cover epilimnion (50-200 ft)
  - Elevation: Adjustable with changing reservoir elevations
  - Canyon Wall Attachment
    - Is full exclusion possible?
      - Most fish are found near canyon wall
      - Resident populations between net location and dam
    - Steep canyon walls are unique. Other systems with exclusion nets have gently sloping shoreline
    - Track system vs series of anchors
    - Appraisal study assumed a 300 ft scribed, tracked, or otherwise improved connection to the canyon wall
    - Installation requires work above and below the surface
  - Others

Next Steps

- Value Planning Study
- Biofouling study
- Hydrologic modeling
- Design considerations

FIGURE 8 Metal floats in place and curtain ready to be anchored to the river bottom by 800-lb weights

Photo: Bureau of Reclamation