Thermal Curtain/Exclusion Net

TWG Meeting, January 25, 2024

2016 LTEMP Biological Opinion

"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."

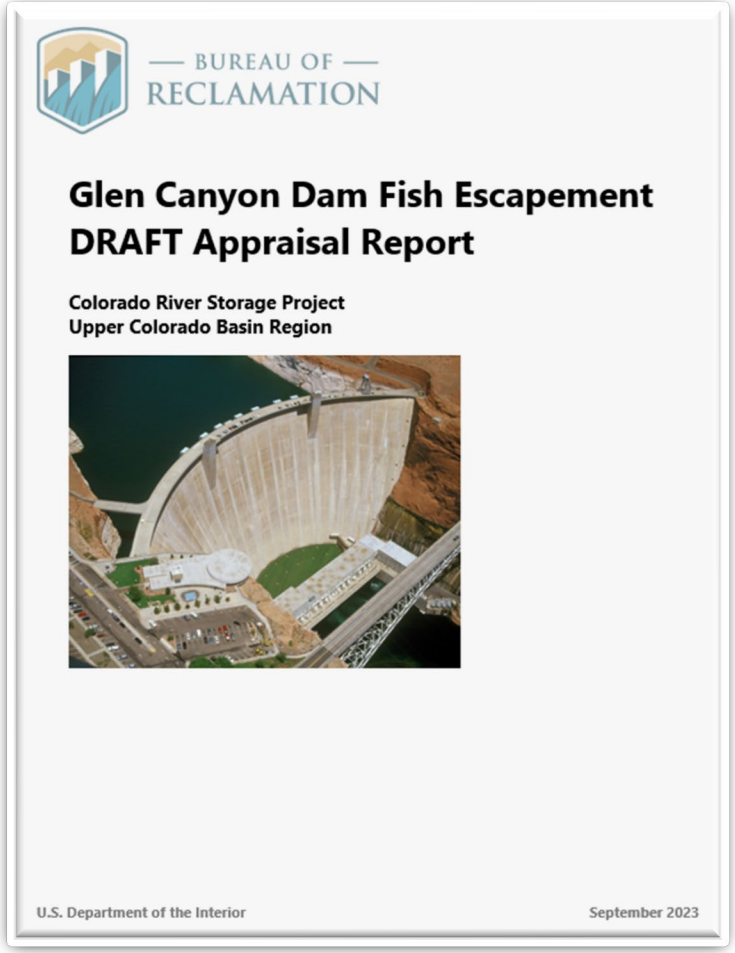
GCDAMP Invasive Fish Species Strategic Plan Below Glen Canyon Dam

"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 GC."

- Sept 2022: Report on fish escapement options

1. In-Reservoir Barriers
    a. Physical barrier screen
    b. In-reservoir net
    c. Air bubbles
    d. Underwater acoustic barriers
    e. Multi-stimulus barriers
    f. Carbon dioxide barriers
    g. Floating barriers
    h. Electrical barriers
2. At Dam Options
    a. Deeper water withdrawal
    b. Turbine mortality
    c. Energy dissipating valve
3. Downstream Removal
    a. Manual collection and removal through sorting facility
    b. Manual collection and removal through electrofishing

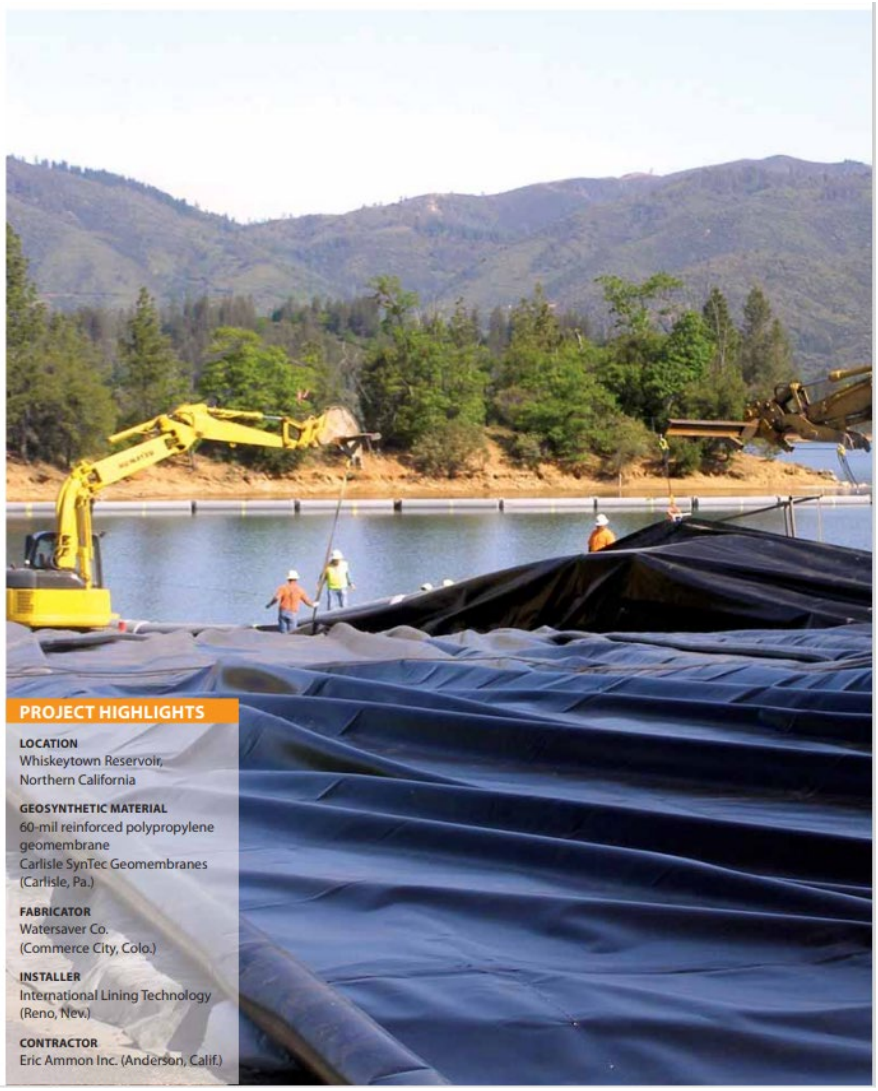
- 2024: Purpose of this Appraisal Report was to investigate net barrier and thermal curtain.



A 731-m-wide, 91-m-deep fish exclusion barrier net with floating surface collector at Baker Lake

Whiskytown Reservoir Thermal Curtain

(2,400 ft wide by ~100 ft deep)



PROJECT HIGHLIGHTS

LOCATION
Whiskeytown Reservoir, Northern California

GEOSYNTHETIC MATERIAL
60-mil reinforced polypropylene geomembrane
Carlisle SynTec Geomembranes (Carlisle, Pa.)

FABRICATOR
Watersaver Co. (Commerce City, Colo.)

INSTALLER
International Lining Technology (Reno, Nev.)

CONTRACTOR
Eric Ammon Inc. (Anderson, Calif.)

FIGURE 7
The floats and the curtain were deployed using a conveyor system

Photo: Watersaver Co.

Whiskytown Reservoir Thermal Curtain

(2,400 ft wide by ~100 ft deep)

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

FIGURE 9 The conveyor system used for pulling the curtain out into the reservoir during the installation process is visible in this picture. Photo: Bureau of Reclamation

- 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

Preliminary Cost estimate

Description	Appraisal Alt 1 – Net Option (April 2023)	Appraisal Alt 2 – Curtain Option (April 2023)
Subtotal	$14,125,000.00	$14,935,000.00
Mobilization	Included in Pay Items	Included in Pay Items
Subtotal with Mobilization	$14,125,000.00	$14,935,000.00
Contract Cost Allowances (+/- 25%)	$3,375,000.00	$3,565,000.00
Contract Cost[1]	$17,500,000.00	$18,500,000.00
Construction Contingencies (+/-25%)	$4,500,000.00	$4,500,000.00
Field Cost[2] (Apr-23)	$22,000,000.00	$23,000,000.00
Escalation to NTP	N/A	N/A
Field Cost with Escalation	N/A	N/A
Non-Contract Costs[3]	**To be determined by the appropriate responsible office**	**To be determined by the appropriate responsible office**
Feature Construction Cost[4]	**To be determined by the appropriate responsible office**	**To be determined by the appropriate responsible office**

1) Contract Cost – The estimated cost of the contract(s) at the time of award at this Unit Price Level
2) Field Cost – Value established to accommodate construction and contract closeout
3) Non-Contract Costs – The estimated costs for Reclamation and/or service contractors to implement the work
4) Feature Construction Cost – The sum of Field Cost and Non-Contract Costs; the estimated budget value

Near Term Steps

- Finalize TSC Report
- Biofouling study to begin (S&T funded with in-kind from WAPA,NPS,PNNL)
- Conduct Temperature and TDS modeling assess effectiveness
- Conduct Value Planning Study on thermal curtain and/or net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Questions?


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Preliminary 2D modeling