BUREAU OF RECLAMATION

LTEMP Flow Experiments

Adaptive Management Work Group Meeting

August 22, 2024

LTEMP Experiments

"The overall approach attempts to strike a balance between identifying specific experiments and providing flexibility to implement those experiments when resource conditions are appropriate."

"…rather than proposing a prescriptive approach to experimentation, an adaptive management-based approach that is responsive and flexible will be used to adapt to changing environmental and resource conditions…"

--2016 LTEMP ROD, p. B-9

Potential LTEMP Flow Experiments

- **Sediment** (High Flow Experiments)
  - Spring HFE
  - Proactive spring HFE
  - Fall HFE
  - Fall HFE extended duration (up to 250 hr)

- **Aquatic Resource**
  - Macroinvertebrate Flow
  - Trout Management Flows
  - Low summer flows (2nd ten years of LTEMP)

- **LTEMP SEIS**
  - Smallmouth Bass Flows
  - HFE protocol revision

LTEMP Process for Experiments

- Annual Reporting and TWG meetings
- Notification and Consultation to Tribes & PA Parties
- Implementation / Planning Team Recommendation
- DOI decision

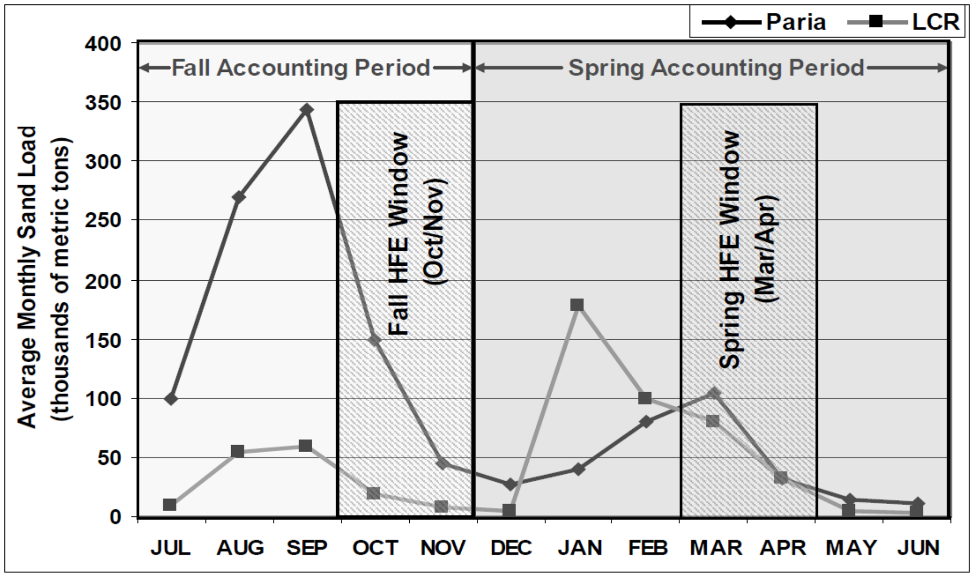
1.4 COMMUNICATION AND CONSULTATION PROCESS FOR ALTERNATIVE D

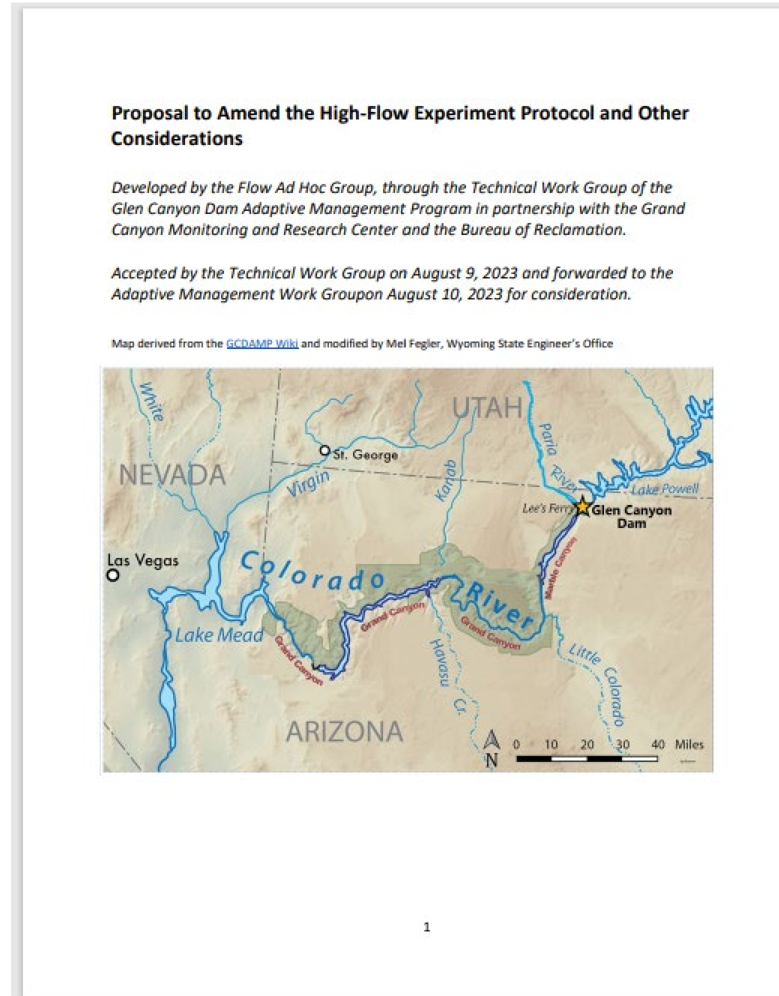
To determine whether conditions are suitable for implementing or discontinuing experimental treatments or management actions, the DOI will schedule implementation/planning meetings or calls with the DOI bureaus (USGS, NPS, FWS, BIA, and Reclamation), WAPA, AZGFD, and one liaison from each Basin State and from the UCRC, as needed or requested by the participants. The implementation/planning group will strive to develop a consensus recommendation to bring forth to the DOI regarding resource issues as detailed at the beginning of this section, as well as including WAPA's assessment of the status of the Basin Fund. The Secretary of the Interior will consider the consensus recommendations of the implementation/planning group, but retains sole discretion to decide how best to accomplish operations and experiments in any given year pursuant to the ROD and other binding obligations.

Fall HFEs

- 2024 (210,000 mt): As of August 18
- 2023 (32,000 mt): No (trigger not met)
- 2022 (1,600,000 mt): No (trigger met)
- 2021 (1,492,000 mt): No (trigger met)
- 2020 (6,385 mt): No (trigger not met)
- 2019 (52, 711 mt): No (trigger not met)
- 2018 (753,000 mt): Yes – 60 hrs. (Nov 5-8)
- 2017 (274,189 mt): No (trigger not met)
- 2016 (884,748 mt): Yes – 96 hrs. (Nov 7-12)
- 2015 (1,168,498 mt): No (trigger met)
- 2014 (1,213,000 mt): Yes – 96 hrs. (Nov 10-15)
- 2013 (1,849,192 mt): Yes – 96 hrs. (Nov 11-16)
- 2012 (690,000 mt): Yes – 96 hrs. (Nov 18-23)

Revised HFE Protocol





Proposal to Amend the High-Flow Experiment Protocol and Other Considerations

Developed by the Flow 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.

Accepted by the Technical Work Group on August 9, 2023 and forwarded to the Adaptive Management Work Groupon August 10, 2023 for consideration.

Map derived from the GCDAMP Wiki and modified by Mel Fegler, Wyoming State Engineer's Office

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Old Protocol

Revised HFE Protocol (LTEMP FSEIS)

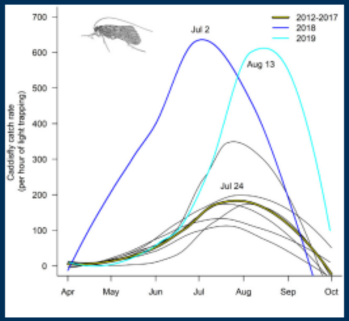
- Planning for HFE releases will follow the planning and implementation process.
- Sand budget models will be run throughout the fall to determine whether sufficient sediment is available to conduct an HFE release.
- If sufficient sediment is available in the fall, the planning and implementation team may recommend conducting the fall HFE release (October or November) or defer implementation to the spring implementation window (March-June).
- Prior to the spring implementation window, the planning and implementation process will again be used to provide a recommendation on the duration, magnitude, and timing of the spring HFE release.
- If the HFE release is conducted, sediment accounting will restart on July 1.
- If, through the planning and implementation process, the recommendation is not to conduct an HFE release despite sufficient sediment, the remaining mass balance at the end of June will be carried into the new accounting period.

Macro Invertebrate Flows

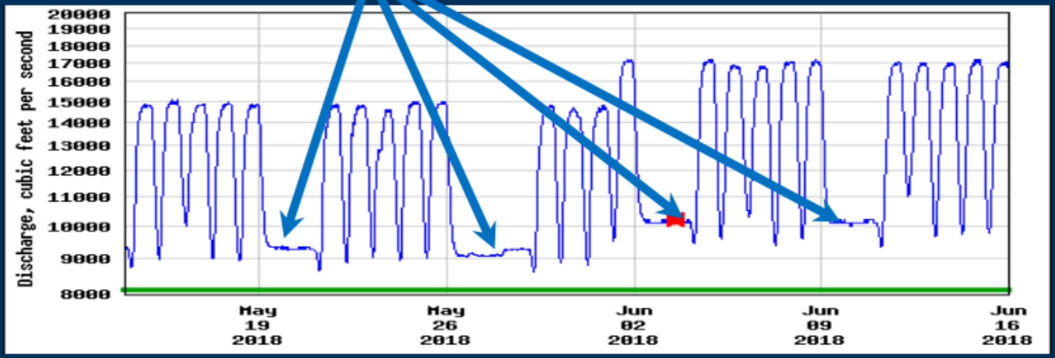
What Is A Bug Flow?

- Give bugs the weekends off
- Weekend stable low flows from May-August
  - Minimizes impact to hydropower
  - Experiment tested 2018-2020 & 2022
    - paused in 2021 for Science Advisor review
- Restores discharge to natural range of variability (no tide)

Adult caddisfly abundance



May-August



"Objectives of Bug Flow Experiment: Improve food base productivity and abundance or diversity of mayflies, stoneflies, and caddisflies"
From 2016 Glen Canyon Dam EIS, Table 4.

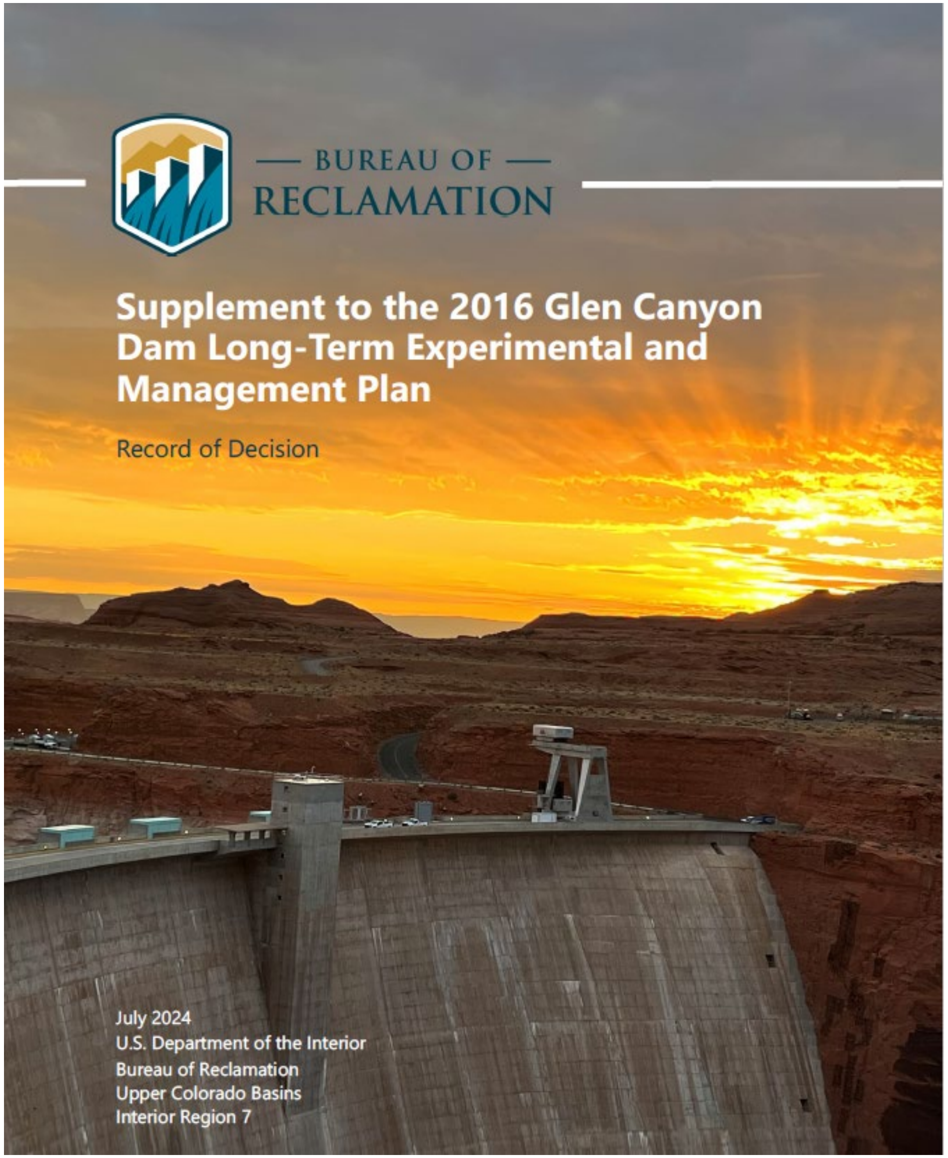
USGS

https://www.gcmrc.gov/discharge_qw_sediment/station/GCDAMP/09380000

Smallmouth Bass Flows

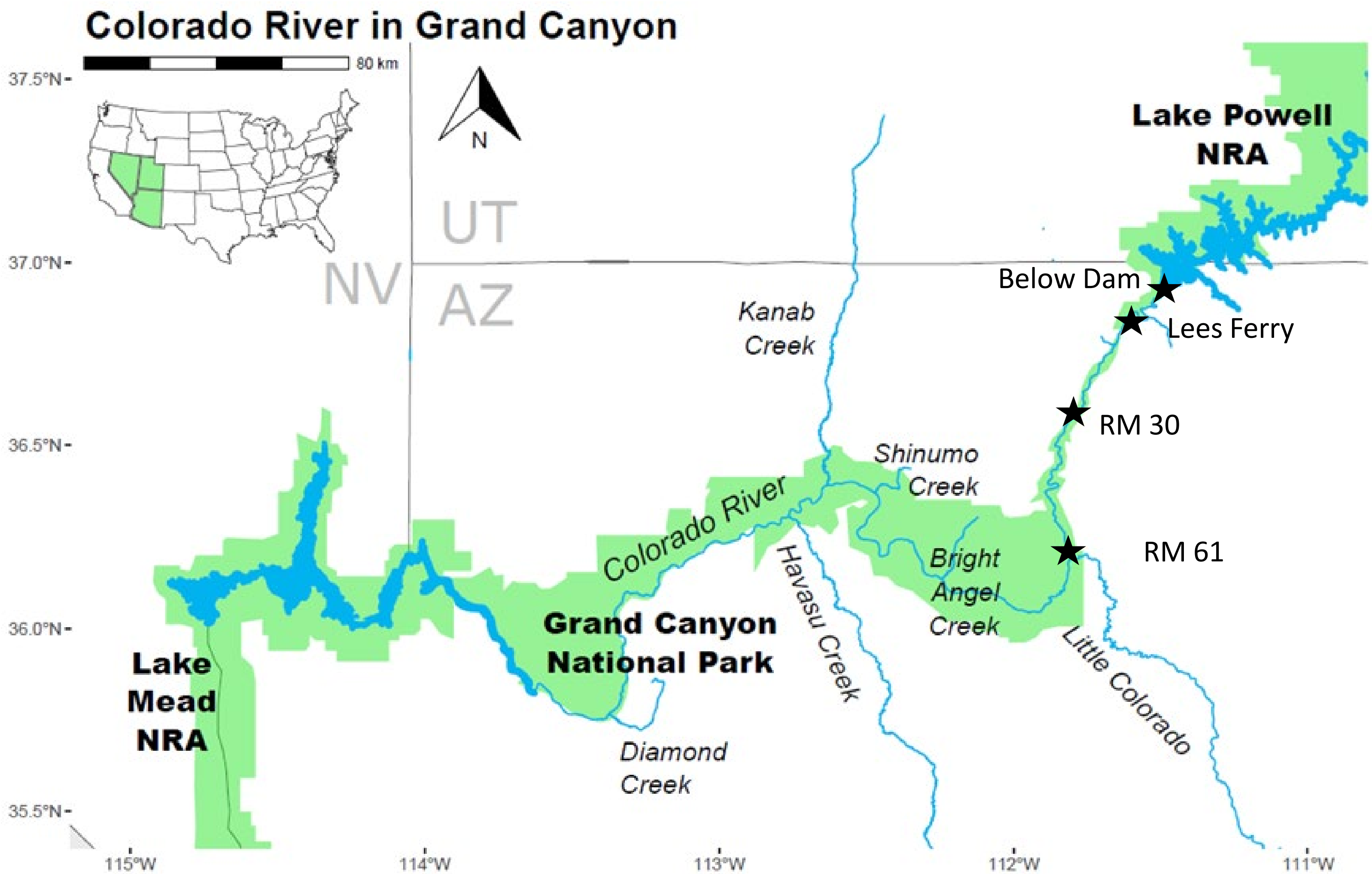
Record of Decision

- Operational Flows (2024-2027)
  - Cool mix is the preferred alternative for 2024
  - Cool Mix Alternative and the other alternatives possible in 2025-2027 (if needed).
- HFE Protocol Revision (2024-2036)



2024 Implementation

- **2024 (Cool Mix)**
  - **ROD provided guidance specific to 2024**
    - "A cool mix would occur when the average daily temperature at river mile 61 exceeds 15.5°C (60°F) for 3 consecutive days. "
    - "The Cool Mix Alternative would be implemented until the mean daily water temperature (without bypass) falls below 15.5°C (60°F) at river mile 61"…or
    - "Potential off-ramp conditions will be monitored and considered to determine whether conditions warrant ending any experimental flows, as determined through the planning and implementation process. "
    - "A monitoring plan for 2024 has been outlined by the Department agencies and will serve as guidance for determining the status and effectiveness of the action."

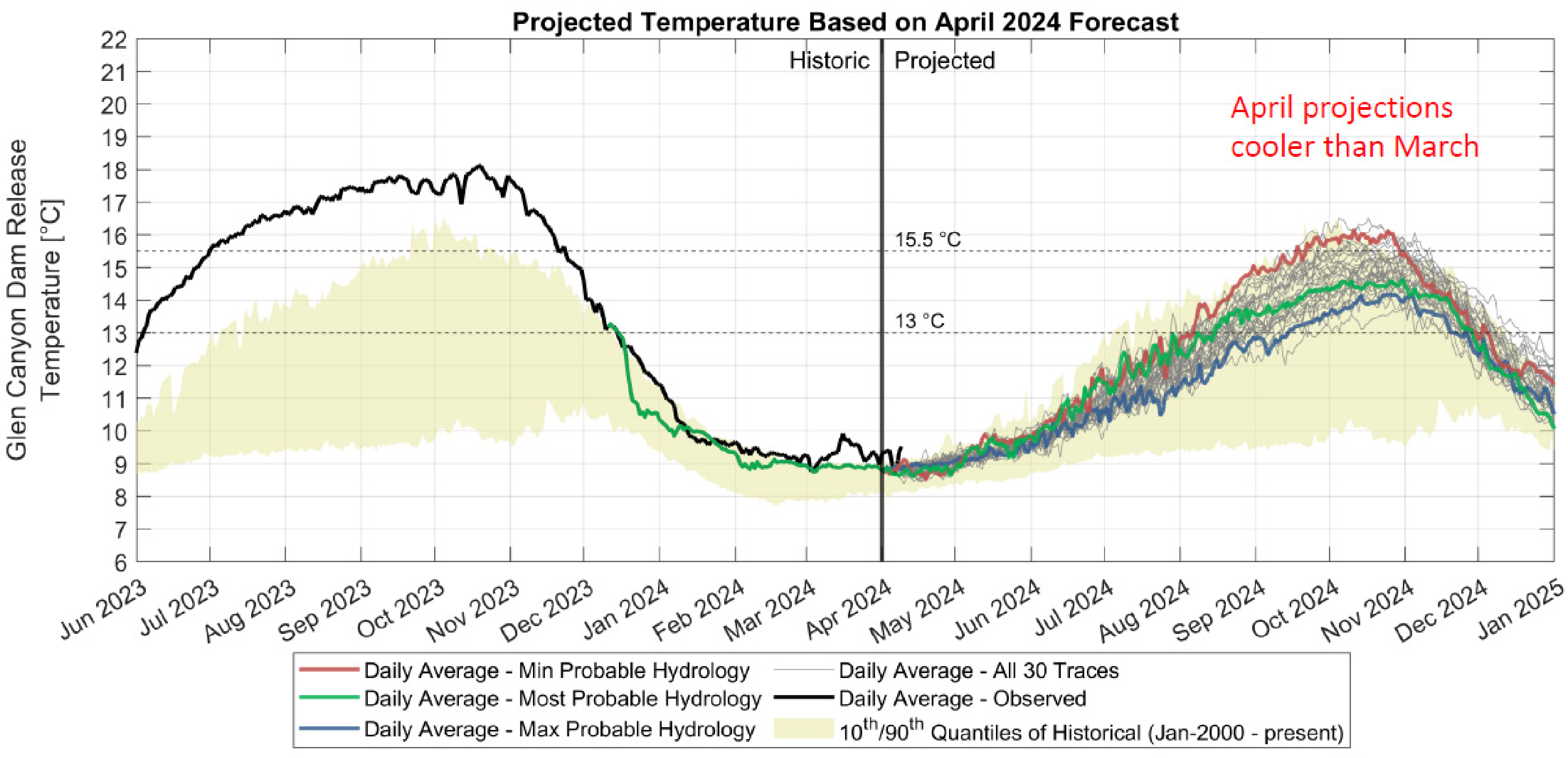


Colorado River in Grand Canyon
80 km
N
37.5°N
37.0°N
36.5°N
36.0°N
35.5°N
115°W
114°W
113°W
112°W
111°W
UT
NV
AZ
Lake Powell NRA
Below Dam
Lees Ferry
RM 30
RM 61
Kanab Creek
Shinumo Creek
Colorado River
Havasu Creek
Bright Angel Creek
Little Colorado
Grand Canyon National Park
Lake Mead NRA
Diamond Creek

Timeline of events
(April 2024)

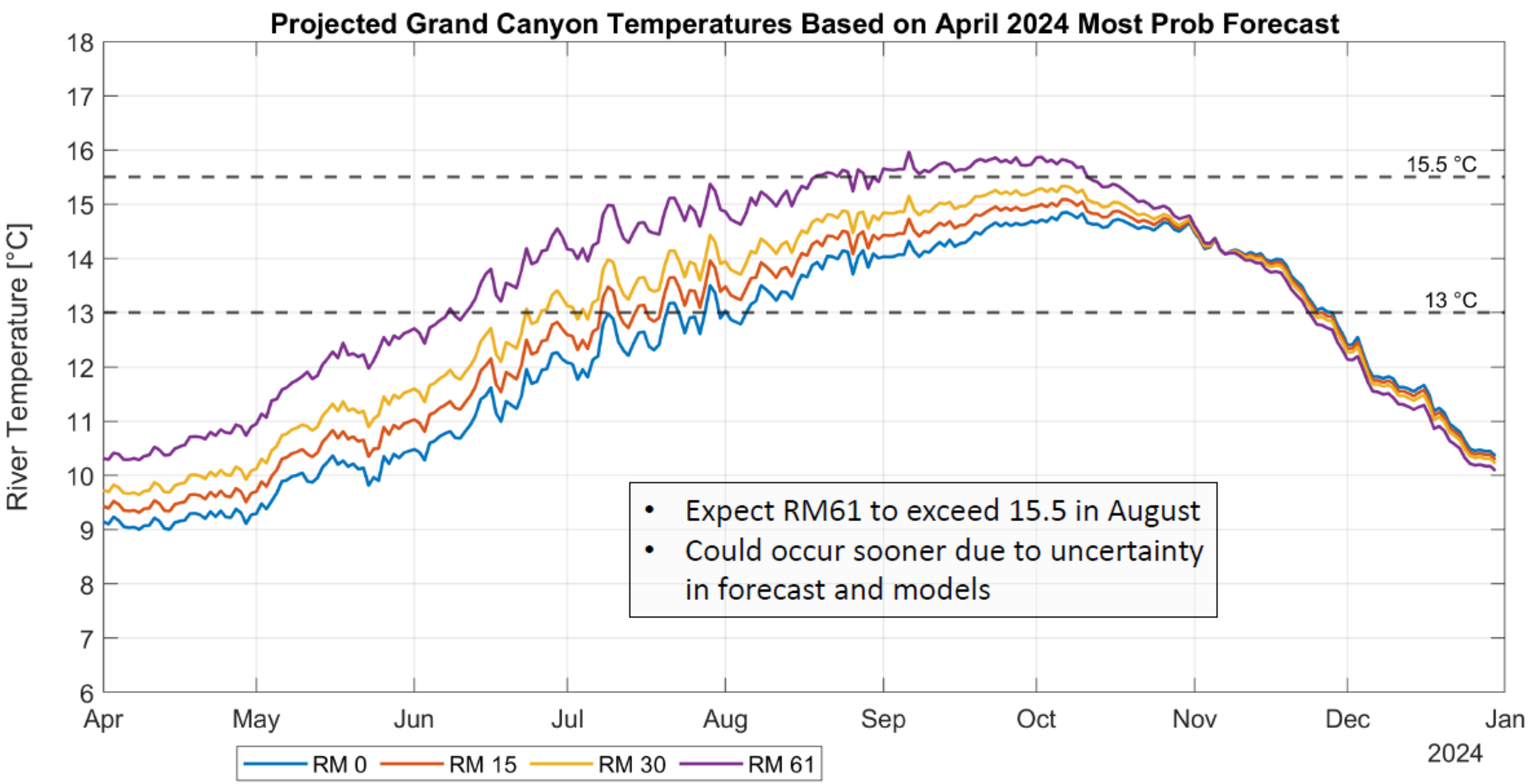
CE-QUAL-W2 Modeled Temperature

1k Model



Timeline of events
(April 2024)

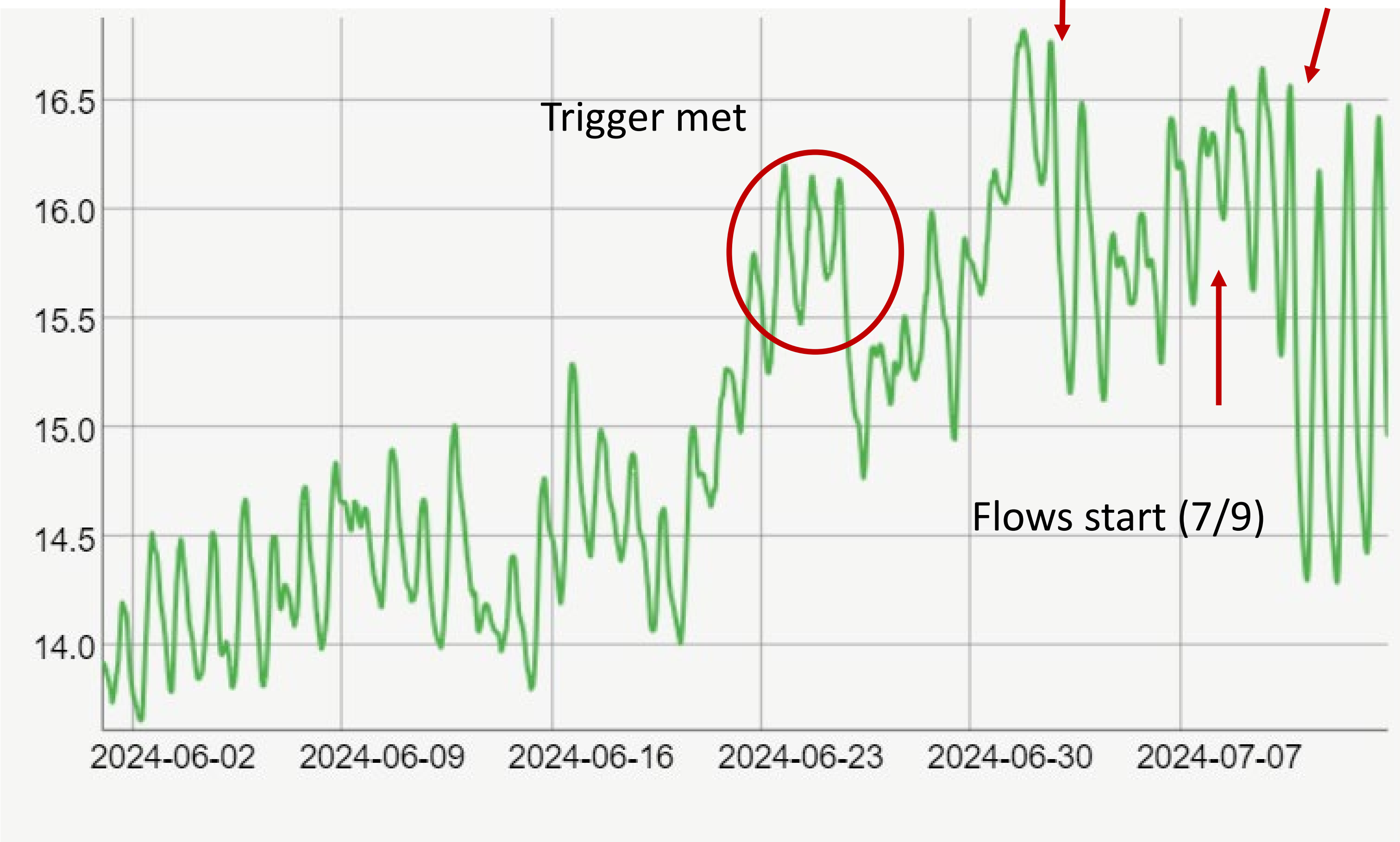
Dibble et al. Grand Canyon Modeled Temperature



Timeline of events
(June-July 2024)

ROD Signed (7/3)

Cool temps reach LCR (7/11)



Implementation (Hydrograph Development)

1. Required to operate within the 2017 Glen Canyon Operating Criteria

2. Temperature target

3. Operational parameters for bypass

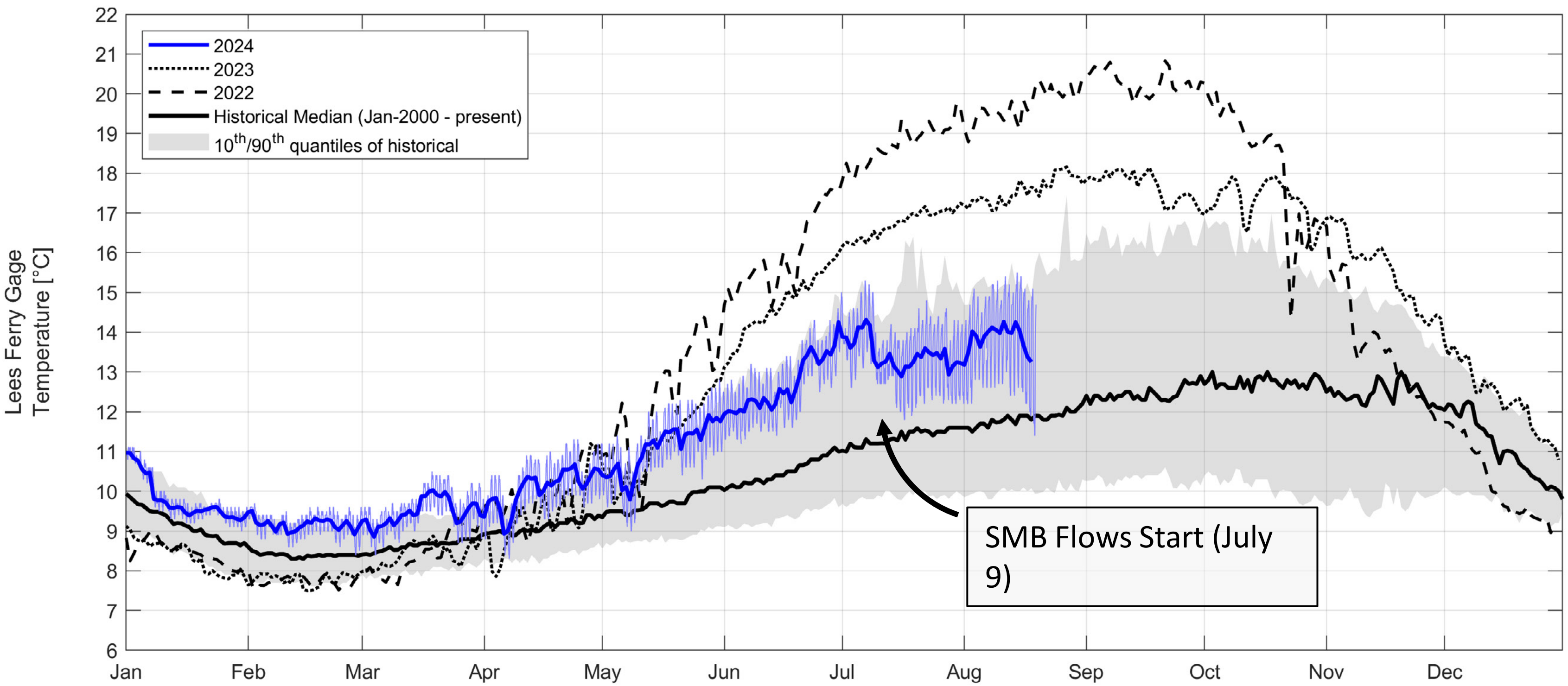
4. Other potential constraints (Rapid temperature changes (ex. >4°C/hr) could have negative impacts to HBC)

Implementation
(example hydrograph)

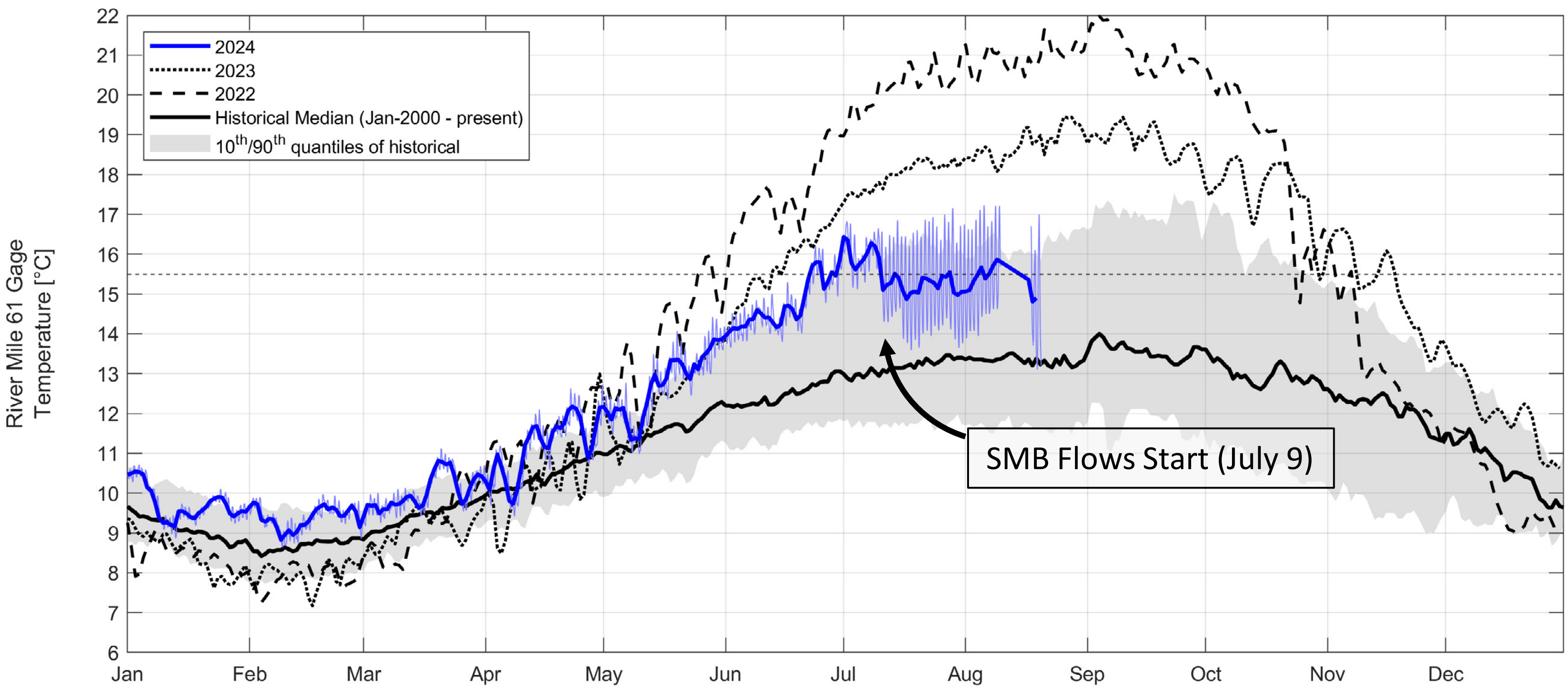
Hour System Time (MST)	Bypass Release (cfs)	Penstock Release (cfs)	Total Release (cfs)
0:00	5,000	4,480	9,480
1:00	5,000	4,480	9,480
2:00	5,000	4,480	9,480
3:00	5,000	4,480	9,480
4:00	5,000	4,480	9,480
5:00	5,000	4,480	9,480
6:00	5,000	4,480	9,480
7:00	5,000	4,480	9,480
8:00	5,000	4,480	9,480
9:00	5,000	4,480	9,480
10:00	5,000	4,480	9,480
11:00	5,000	4,480	9,480
12:00	5,000	6,086	11,086
13:00	5,000	10,086	15,086
14:00	0	15,086	15,086
15:00	0	15,086	15,086
16:00	0	15,086	15,086
17:00	0	15,086	15,086
18:00	0	15,086	15,086
19:00	0	15,086	15,086
20:00	0	15,086	15,086
21:00	0	14,480	14,480
22:00	5,000	6,980	11,980
23:00	5,000	4,480	9,480

Orange = bypass release
Blue = penstock release

Lees Ferry Observations – Temperature



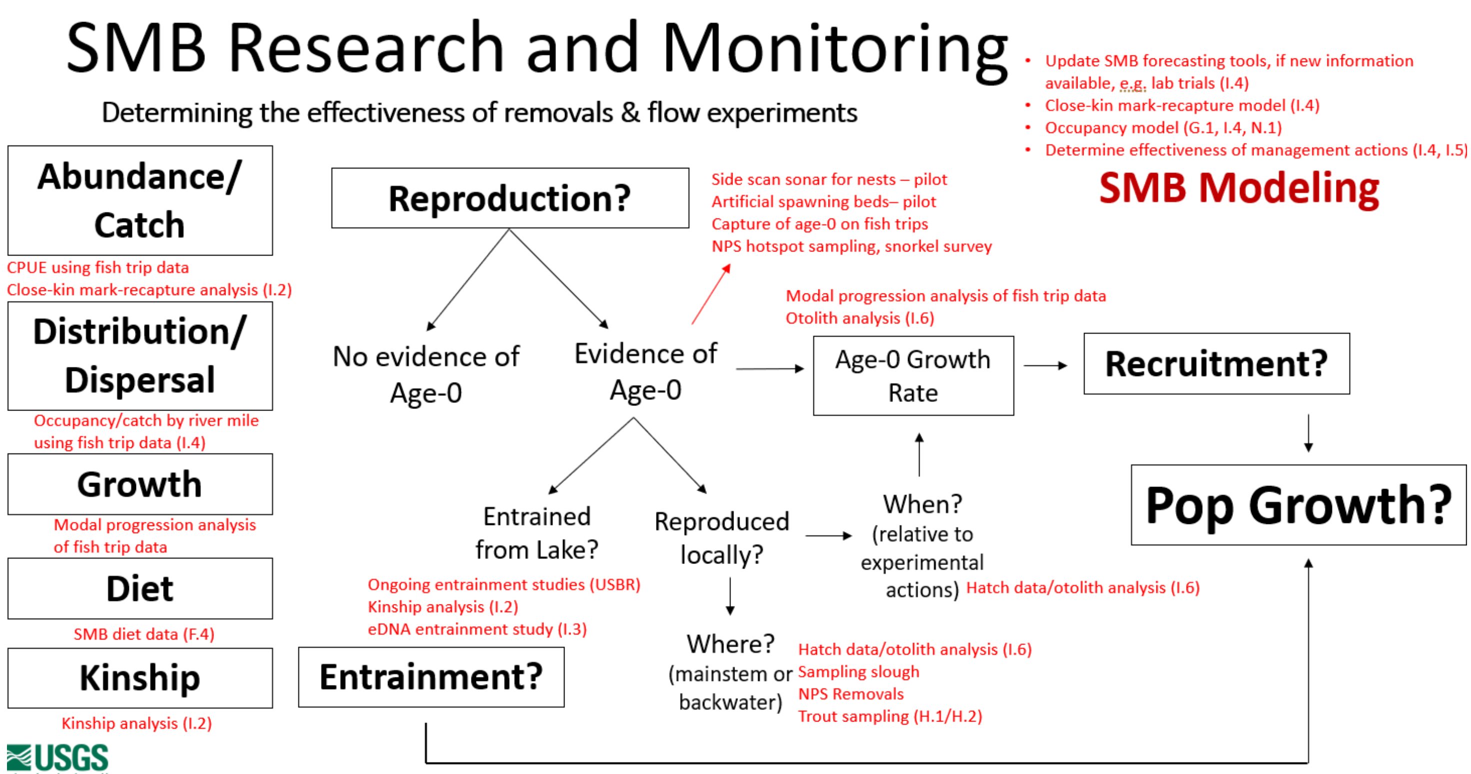
River Mile 61 Observations – Temperature



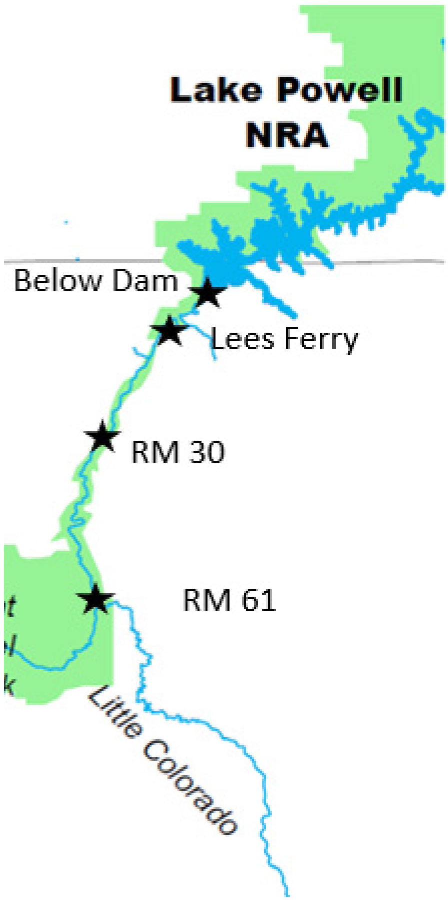
Now in real time: https://waterdata.usgs.gov/monitoring-location/09383100/#parameterCode=00010&period=P7D&showMedian=false

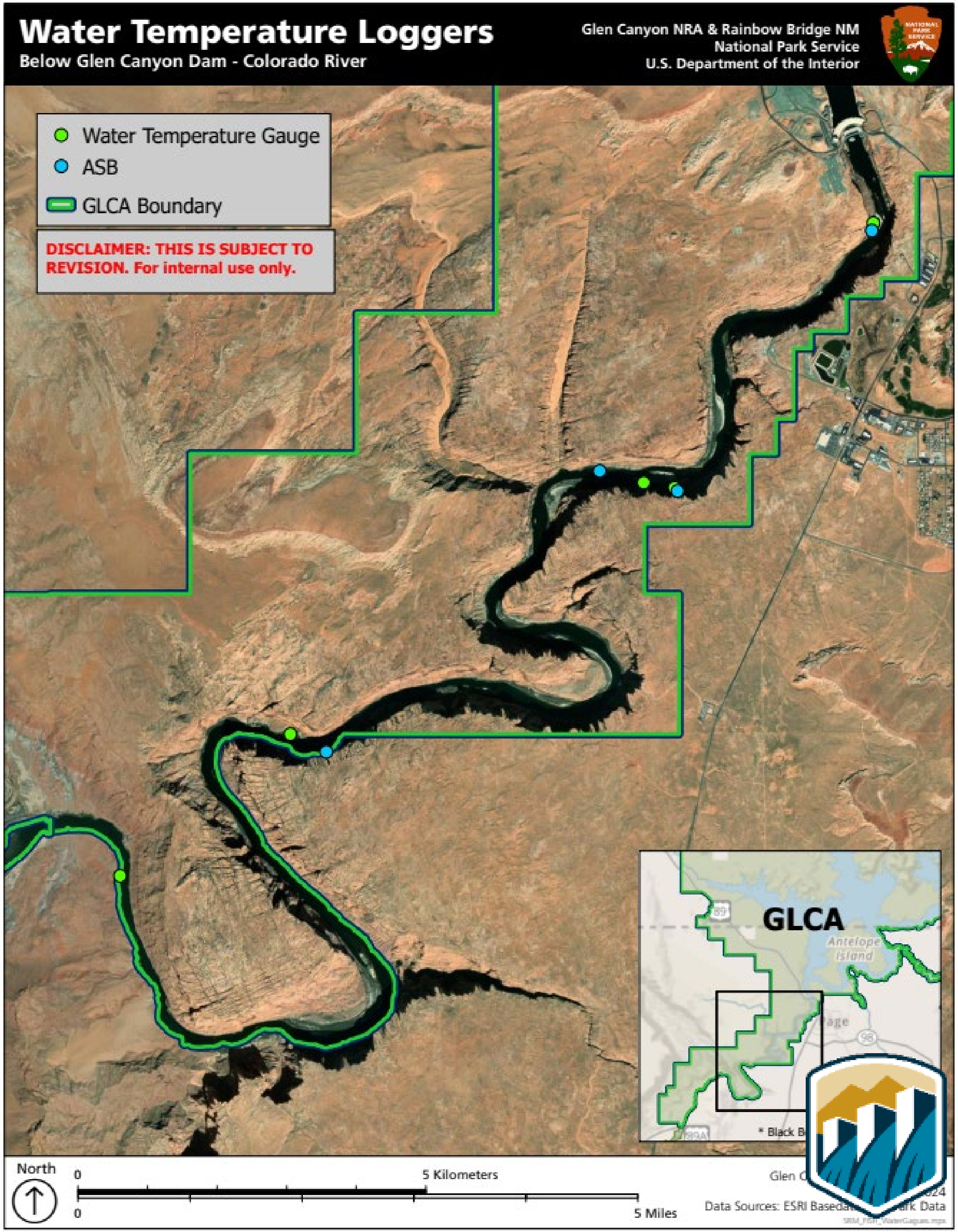
Monitoring Plan

- TWP workplan elements
  - Project I – Nonnative fish monitoring
  - Project A – stream flow and water quality monitoring
  - Elements of other Projects
- Experimental Funds
- NPS removal efforts

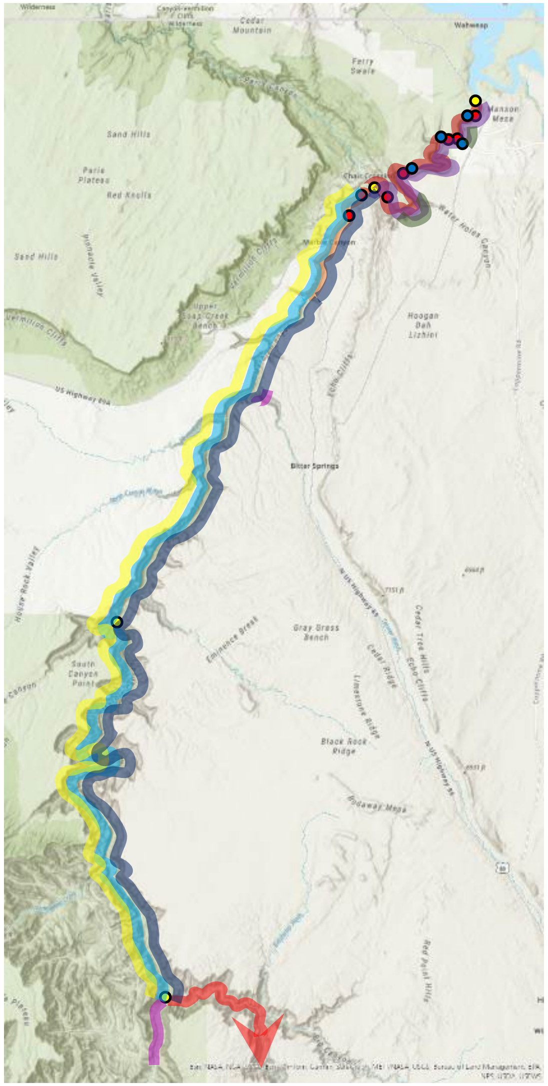


Where are we monitoring temperature?





Where are we monitoring fish?



- USGS Stream Gages
- Temp loggers
- Artificial bass nests
- NPS GLCA LF sampling – Weekly EF or netting
- NPS GRCA PBR sampling – roughly bi-weekly EF/netting
- AGFD Trout sampling – 2 trips, April and July
- AGFD Mainstem sampling
- BioWest downstream trip – 1 trip in this area, September
- GRCA Downstream trip – 3 trips, June, Sept, Oct
- GCMC TRGD sampling – 1 trip
- Juvenile Chub Monitoring – 2 trips
- LCR Chub Monitoring – 3 trips

No young of year smallmouth bass captured to date!


Questions?
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RECLAMATION
USGS
science for a changing world