



# **Defining Metrics for the Long-Term Experimental and Management Plan**

**Adaptive Management Work Group Meeting**  
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# Introduction, Purpose and Need

- **LTEMP defines 11 goals**
  - **How do we know if goals are being achieved?**
  - **Need to define performance metrics!**
- **Section 6.1(c) of the LTEMP ROD\* states:**

“The DOI, in consultation with the AMWG, will develop monitoring metrics for the goals and objectives using those in Appendix C as a starting point.”

**(Note: Appendix C = performance metrics developed by Runge et al. (2016) to help select the preferred LTEMP alternative.)**
- **FY 21-23 TWP, Reclamation Project C.12**

\* Department of Interior, 2016, Record of Decision for the Glen Canyon Dam Long Term Experimental and Management Plan Final Environmental Impact Statement, December 2016. Bureau of Reclamation, Upper Colorado River Region, Salt Lake City, Utah and National Park Service, Intermountain Region, Lakewood, Colorado.

# Performance Metrics: Definitions

- **Performance Metrics (from Wikipedia)**

“Performance metrics measure an organization's activities and performance.”

- **Performance Metrics (from ASQ website)**

“figures and data representative of an organization’s actions, abilities, and overall quality” (<https://asq.org/quality-resources/metrics>)

- **Performance Metrics (from draft plan)**

“objective, quantified measurements collected using standardized protocols that are indicative of resource condition so as to provide a measurement of how well the AMP is doing at attaining established LTEMP goals”

# LTEMP Goals

## ■ LTEMP Goals (from 2016 LTEMP FEIS and ROD)

- 1. Archaeological and Cultural Resources. **Maintain the integrity of potentially affected NRHP-eligible or listed historic properties in place, where possible, with preservation methods employed on a site-specific basis.**
- 2. Natural Processes. **Restore, to the extent practicable, ecological patterns and processes within their range of natural variability, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems.**
- 3. Humpback Chub. **Meet humpback chub recovery goals, including maintaining a self-sustaining population, spawning habitat, and aggregations in the Colorado River and its tributaries below the Glen Canyon Dam.**
- 4. Hydropower and Energy. **Maintain or increase Glen Canyon Dam electric energy generation, load following capability, and ramp rate capability, and minimize emissions and costs to the greatest extent practicable, consistent with improvement and long-term sustainability of downstream resources.**
- 5. Other Native Fish. **Maintain self-sustaining native fish species populations and their habitats in their natural ranges on the Colorado River and its tributaries.**
- 6. Recreational Experience. **Maintain and improve the quality of recreational experiences for the users of the Colorado River Ecosystem. Recreation includes, but is not limited to, flatwater and whitewater boating, river corridor camping, and angling in Glen Canyon.**
- 7. Sediment. **Increase and retain fine sediment volume, area, and distribution in the Glen, Marble, and Grand Canyon reaches above the elevation of the average base flow for ecological, cultural, and recreational purposes.**
- 8. Tribal Resources. **Maintain the diverse values and resources of traditionally associated Tribes along the Colorado River corridor through Glen, Marble, and Grand Canyons.**
- 9. Rainbow Trout Fishery. **Achieve a healthy high-quality recreational rainbow trout fishery in GCNRA and reduce or eliminate downstream trout migration consistent with NPS fish management and ESA compliance.**
- 10. Nonnative Invasive Species. **Minimize or reduce the presence and expansion of aquatic nonnative invasives.**
- 11. Riparian Vegetation. **Maintain native vegetation and wildlife habitat, in various stages of maturity, such that they are diverse, healthy, productive, self-sustaining, and ecologically appropriate.**



# Metrics Project Objectives

- Determine technically feasible, sustainable metrics to provide objective measures of progress towards attaining the 11 LTEMP resource goals.
- Use metrics to periodically evaluate and report status of the 11 LTEMP resource goals relative to pre-LTEMP (pre-2016) condition and LTEMP projections.
  - Improve annual/cyclical reporting by distilling large amounts of scientific information into a set of standardized metrics that can be communicated to DOI managers and GCDAMP stakeholders via standardized methods and graphics on a regular (annual?) basis.
  - Inform other planning efforts (e.g., specify knowledge gaps in the context of resource goals).

# Not All Metrics are Created Equal!

- Monitoring is a fundamental requirement of adaptive management, but there are many different reasons for monitoring:
  1. To evaluate progress towards achieving management objectives
  2. To determine resource status in order to identify appropriate management actions
  3. To increase understanding of resource dynamics
  4. To enhance and develop models
- Focus of this project is on #1 (primarily)

# Draft Criteria for Selecting Metrics

- Reflects the expected performance outcome of each LTEMP goal or measures a performance outcome that triggers a compliance action or experiment
- **Quantifiable (metric = measurable)**
- Technically and financially feasible to measure
- **Compatible with the metrics used to select LTEMP preferred alternative**

# Process for Identifying Draft Metrics

1. Compile list of possible performance metrics from current GCDAMP monitoring activities/programs
2. Finalize criteria for selecting most appropriate metrics
3. For each LTEMP goal, evaluate and select metrics that provide best measures of progress towards achievement of that goal
4. For each selected performance metric, describe applicable criteria and rationale for selecting the metric
5. For each selected metric, describe data required, how metric is calculated, how metric will be presented and interpreted, and limitations or uncertainties of the metric
6. For each goal, describe how the selected metrics relate to (i.e., are consistent with or an extension of) the original performance metrics used to select alternative D



# Project Timeline: FY21

- April-May 2021: Preliminary presentations to TWG and AMWG ✓
  - Identify project objectives and describe current inventory and assessment process and general timeline.
- June 2021 TWG: ✓
  - GCMRC presented draft process and timeline document for evaluating and selecting metrics, including draft criteria.
  - Solicited general comments on definitions, criteria, etc., due 06/30/21.
  - Received oral or written feedback from AZGF, GCWC, Zuni, Hopi, Navajo, Hualapai, NPS, FFF/TU, CA, NV
- July 2021: ✓
  - GCMRC and Reclamation brief Secretary's Designee, Designated Federal Officer, and other DOI managers regarding progress.
- July- August 2021: Tribes, GCMRC, and BOR met to discuss metrics.
- August 2021 AMWG: ← **WE ARE NOW HERE**
  - GCMRC presents revised draft process and timeline for evaluating and selecting metrics, including draft criteria.
  - Solicits general comments and feedback on process, due 9/17/21.

# Summary of Stakeholder Concerns

- **Goals too general; need more explicit targets**
- **Quantified metrics do not and can not adequately or appropriately reflect Tribal perspectives**
- **Tribes would like to see traditional knowledge guide metrics selection**
- **Goal-specific metrics are contrary to Tribes' interest in having a more holistic, integrated, ecosystem-based approach to studying and managing Co. R.**

# Proposed Project Timeline: FY22

- **October 2021 TWG:**
  - **GCMRC presents draft LTEMP performance metrics (sample)**
  - **TWG provides input during meeting; discussion of how best to graphically represent metrics to meet stakeholder needs.**
  - **Input from TWG (due ~ end of October; date TBD)**
- **December 2021:**
  - **GCMRC pilots a sample reporting of metrics in the FY2021 Annual Report, including sample graphics**
- **January 2022:**
  - **GCMRC solicits feedback from the TWG regarding the sample reporting of metrics in the FY2021 Annual Report.**
- **February 2022:**
  - **GCMRC solicits feedback from the AMWG and DOI regarding the sample reporting of metrics in the FY2021 Annual Report.**

# Summary Points

- Focus is on defining metrics *for the purpose of assessing & tracking progress towards achieving LTEMP Goals (as listed in the ROD)*

*Metrics will measure how Goal X is doing,*

*NOT why Goal X is increasing or decreasing*

- Metrics = measured (or modeled with measurements)
- **Focus is on metrics, not targets**
- Not all metrics being measured under GCDAMP will be included in this project; that doesn't mean they aren't important to monitor for other reasons!

# Next Steps

- **Today:** Seek AMWG input (focus, definitions, criteria, timeline, etc.)
- **September:** draft 3-4 goal metric examples (plus example graphics) for discussion at October TWG
- **October TWG:** Present criteria and example metrics and graphics for discussion
- **December-January:** Pilot a few example metrics in Annual Report and at ARM

# Science Advisors Review

- **Completing a 3rd party review of GCDAMP monitoring metrics:**
  - **Reviewing similarly sized/scoped large multi-cooperator and multi-science programs:**
  - **Synthesizing methods to track resource conditions, assess program impacts, lessons learned.**
  - **Tandem review of GCDAMP monitoring metrics:**
    - **Metrics suggestions, selection criteria, recommendations based on lessons learned from other programs.**



# Science Advisors Review

- Reviewing similarly sized/scoped large multi-cooperator and multi-science programs:
  - South Florida Ecosystem Restoration Task Force.
  - Kissimmee River Restoration Project
  - Lower Colorado River Multi-Species Conservation Program.
  - Chesapeake Bay Program.
  - Missouri River Recovery Program
  - Platte River Recovery Implementation Program
  - South Florida Ecosystem Restoration Task Force
  - Upper Mississippi River Restoration Program

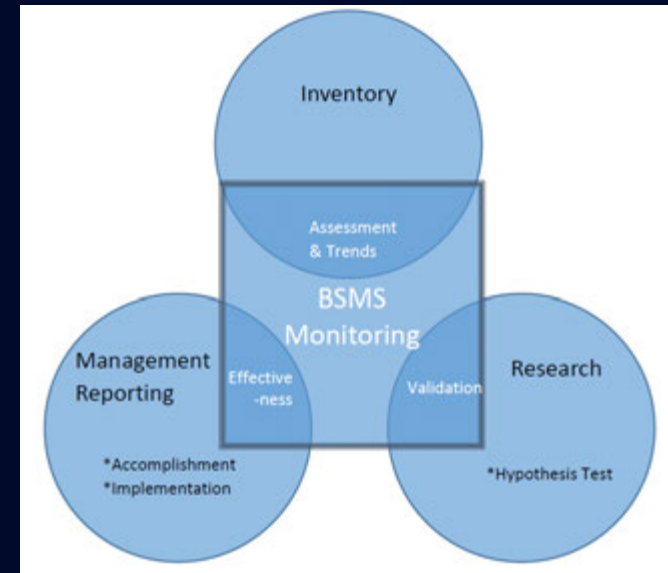
Plus...

- BLM Assessment, Inventory, and Monitoring (AIM) Strategy
- USACE Environmental Management Program

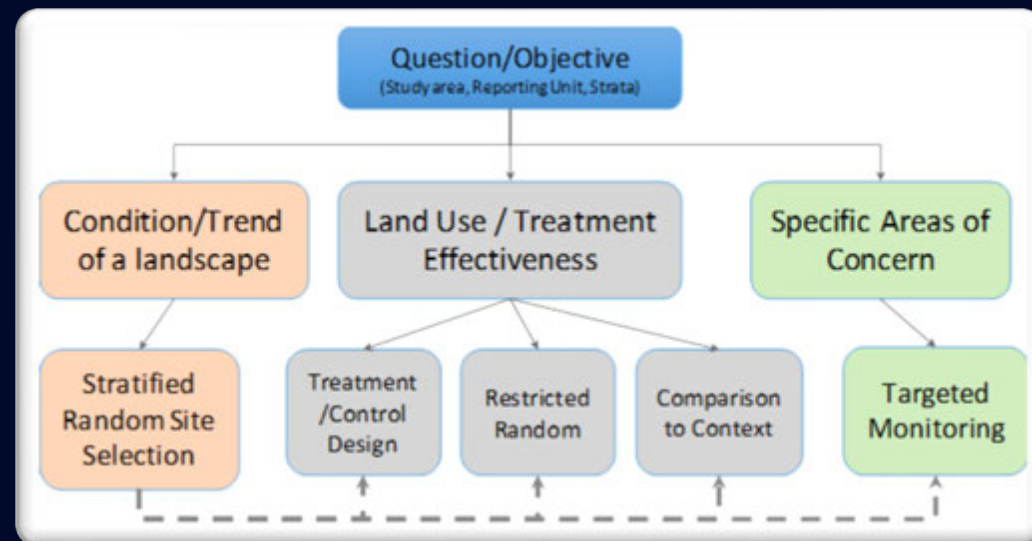


# SA Review: Types of Metrics

- Implementation Monitoring (plan)
- Effectiveness Monitoring (treatment)
- Surveillance Monitoring  
(Long-term Condition/Trends)
- Ecological Effects Monitoring
- Adaptive (Management) Monitoring
- Validation Monitoring



*(from Aplet et al. 2014 and others)*





# Questions?

July, 1973 →



May 18, 2021 →



Fall Canyon Camp, River mile 212 , right bank