

Metrics Project (Draft Plan, June 03, 2021)

Introduction

In 2016, the Department of the Interior (DOI), through the Bureau of Reclamation (Reclamation) and the National Park Service (NPS), completed a Final Environmental Impact Study (FEIS) for the Long Term Experimental and Management Plan (LTEMP) (DOI 2016a). The purpose of the LTEMP is to provide a comprehensive framework for adaptively managing Glen Canyon Dam over the next 20 years consistent with the Grand Canyon Protection Act of 1992 and other provisions of applicable Federal law. The LTEMP identifies specific options for dam operations (including hourly, daily, and monthly release patterns), non-flow actions, and appropriate experimental and management actions that meet the GCPA's requirements. The need for this plan stemmed from the need to use scientific information developed since 1996 to better inform DOI decisions on dam operations and other management and experimental actions so that the Secretary of the Interior could continue to meet statutory responsibilities for protecting downstream resources for future generations, conserving species listed under the Endangered Species Act (ESA), avoiding or mitigating impacts to National Register of Historic Places (NRHP)-eligible properties, and protecting the interests of American Indian Tribes, while meeting obligations for water delivery and the generation of hydroelectric power (DOI 2016a, 2016b).

Eleven resource-specific goals were identified in the FEIS, and seven potential alternative management and experimental strategies were evaluated in terms of their ability to achieve those goals. Alternative D was ultimately identified as the one to best meet the broadest set of objectives and resource goals of the LTEMP by providing the best balance of performance among downstream resources. The selection of Alternative D as the preferred alternative, and the one most likely to achieve the desired outcomes specified in the eleven resource goal statements, was codified in the Record of Decision (ROD) signed by the Secretary of the Interior on December 15, 2016 (DOI 2016b).

Purpose and Need for Metrics

Section 6.1 (c) of the 2016 LTEMP ROD states that “The DOI, in consultation with the AMWG, will develop monitoring metrics for the goals and objectives using those in Appendix C of the FEIS as a starting point.” Appendix C refers to a suite of “performance metrics” developed by Runge et al. (2016) for evaluating the relative merits of the seven alternatives evaluated in the 2016 EIS. These metrics were quantifiable values generated by explicit equations using measured data inputs that allowed for an “apples to apples” comparison of the various alternatives. Comparisons of the performance of these metrics ultimately led to selection of Alternative D as the preferred alternative.

The performance metrics developed by Runge et al. (2016), while suitable for comparing alternatives, were not designed nor intended to measure resource outcomes based on empirical observations of resource condition. In 2019, the Department of Interior’s Assistant Secretary for Water and Science directed the Glen Canyon Dam Adaptive Management Program (GCDAMP) to identify a set of “metrics” for assessing how well the selected alternative was meeting the goals and objectives stated in the LTEMP. In the FY2021-2023 work plan, Reclamation set aside funding to support the USGS Grand Canyon Monitoring and Research Center (GCMRC) to work with GCDAMP stakeholders in developing a new set of performance metrics for tracking progress towards attaining the resource goals specified in the LTEMP, using the previous performance metrics as a starting point.

For the purposes of this project, performance metrics, or metrics (we use these interchangeably) are defined as 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 resource goals. The scope of this effort encompasses resources within the Colorado River ecosystem with features that may be influenced by Glen Canyon Dam operations or management actions undertaken as part of the LTEMP.

As noted in the introduction, the LTEMP FEIS and ROD identified eleven general goals tied to individual resources of concern to the GCDAMP. These goals are captured in the following statements:

- 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 invasive species.
- 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.

The purpose of this metrics project is to identify performance metrics that will allow federal managers, GCDAMP stakeholders, scientists, and the general public to assess progress towards achieving the desired outcomes for the 11 LTEMP goals. Most of the goals are focused on maintaining or improving the condition of specific types of resources such as several fish species, cultural resources, sediment, or riparian vegetation. Thus, most metrics will focus on assessing performance relative to a specific desired

resource outcome, such as attaining a population size for Humpback Chub specified in the U.S. Fish and Wildlife Service (Service) recovery goals for that species. One goal (Goal 2) is more process-oriented and seeks to “restore natural processes” that sustain the Colorado River ecosystem and may require more conceptual metrics. Another (Goal 8) is specifically concerned with tribal perspectives on maintaining diverse values and resources valued by tribes and will need to be defined by the tribes whose values are at stake. Thus, to convey complex information regarding a diverse set of goals in an accessible form, the metrics may vary somewhat in nature and will be a simplified representation of condition rather than an attempt to depict all aspects of resource condition.

In other words, the purpose of this project is not to identify all metrics that are, or should be, monitored to understand how the Colorado River ecosystem functions. Many diverse variables influence ecosystem conditions. It is not possible nor necessary to monitor all of the factors that drive resource condition in order to measure and assess LTEMP goal performance. Nonetheless, it is important to recognize that many different ecosystem drivers can affect resource outcomes. Where necessary to clarify the relationship between ecosystem drivers and resource outcomes, we will identify the important ecosystem drivers underlying individual performance metrics in conceptual models that will accompany the individual metrics descriptions.

Summary of Metrics Project Objectives

- Determine technically feasible, sustainable metrics to provide objective measures of progress towards attaining the 11 LTEMP resource goals.
- Implement selected 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 stakeholders via standardized methods and graphics on a regular (annual or less frequent) basis.
 - Inform other planning efforts (e.g., specify knowledge gaps in the context of resource goals).

Process for Identifying LTEMP Performance Metrics

The GCMRC has been monitoring Colorado River ecosystem resource conditions as well as many ecosystem drivers of resource condition for more than twenty years. Many current monitoring efforts were originally designed to track resource conditions relative to a set of goals developed by GCDAMP stakeholders at the inception of the Program, while other monitoring efforts have been developed more recently in response to specific experiments or emerging issues.

Below is a general outline of the steps that will be followed to arrive at a list of LTEMP performance metrics, as well as a proposed timeline for accomplishing these steps:

Metrics Selection Roadmap:

- Compile a list of possible monitoring metrics that can be derived from current GCDAMP monitoring activities, including those activities led by GCMRC and by cooperators.
- Finalize criteria for selecting the most appropriate performance metrics.
- For each LTEMP goal, evaluate and select performance metrics that provide the best measures of progress towards achievement of that goal using the finalized criteria.
- For each selected performance metric, describe the criteria and rationale used to select that metric. This description will, at a minimum, address each of the criteria identified above.

- For each selected performance metric, describe the data required for the metric, how the metric is calculated, how the metric is to be presented and interpreted (historic range, trend, target level, threshold), and uncertainties or limitations of the metric (i.e., how well the metric tracks the actual resource and why).
- For each goal, describe how the selected metrics relate to the metrics used in the LTEMP decision-support process, i.e., how the selected metrics are consistent with or differ from those used to select the preferred LTEMP alternative.

A note about defining metrics for LTEMP resources without explicit quantified targets

In past discussions within GCDAMP stakeholders, some stakeholders have expressed a desire to define quantified “targets” for each resource goal. The LTEMP does not include specific quantified targets for each resource goal; rather, goals are usually expressed in terms of “maintaining” or “increasing” or “decreasing” specific resource conditions. The GCDAMP could potentially benefit from better definition of attainable, quantifiable target conditions, but in the absence of more quantified objectives (i.e., resource condition targets), this project will identify metrics that report both quantitative and relative measures of change (for example, measurements that show if a particular resource is increasing or decreasing relative to its pre-2016 condition). If in the future specific target conditions are defined, metrics can be refined to produce data specifically addressing those targets.

Criteria for Distinguishing “Performance Metrics” from other monitoring metrics

Monitoring is a fundamental requirement of the adaptive management process (Walters, 1986; Walters and Holling, 1990). The DOI Adaptive Management Technical Guide (Williams and others, 2007) identifies four primary purposes for monitoring within an adaptive management program:

1. To evaluate progress towards achieving management objectives.
2. To determine resource status in order to identify appropriate management action.
3. To increase understanding of resource dynamics via the comparison of predictions against field observations.
4. To enhance and develop models of resource dynamics as needed.

All four reasons for monitoring are important; however, the focus of the current metrics project is identifying metrics for evaluating and reporting progress towards achieving management objectives, i.e., LTEMP goals (Purpose #1 in the above list), and secondarily, on determining “resource status in order to identify appropriate management action(s)”, e.g., compliance triggers (Purpose #2). To the extent that certain performance metrics can also contribute to Purposes #3 and #4, they may be given additional weight in the final metrics selection process, but metrics that primarily inform the last two purposes while not aiding with purposes #1 and #2 are not the focus of this project.

In terms of criteria for selecting metrics that meet the purposes defined above, the following are suggested as a starting point:

- Reflects the expected performance outcome of each LTEMP resource goal or measures a performance outcome that triggers a compliance action or experiment.
- Quantifiable (measurable).
- Technically and financially feasible to measure.

- Compatible with the metrics used to select LTEMP preferred alternative

There may be other criteria that would be useful to consider when making the final selection of performance metrics. Additional input on the criteria will be solicited as part of the stakeholder engagement process outlined below.

Project Timeline (draft proposal)

- 1. April 2021 TWG:** presentation by GCMRC
 - Define "metric" for the purposes of this project.
 - Identify project objectives and describe current inventory and assessment process and general timeline.
 - Accept general comments and feedback on project as presented.
- 2. May 2021 AMWG:** Status update by Reclamation
 - Reclamation shares project objectives and general timeline.
 - Solicit general comments and feedback.
- 3. June 2021 TWG:**
 - GCMRC presents draft process and timeline document for evaluating and selecting metrics, including draft criteria.
 - Solicit general comments on process, definitions, and criteria from TWG, due by June 30, 2021.
 - Following initial TWG input, GCMRC PIs will begin drafting metrics descriptions and will seek additional input from individual technical cooperators, as needed
- 4. July 2021:**
 - GCMRC and Reclamation brief Secretary's Designee, Designated Federal Officer, and other Department of the Interior managers regarding progress.
 - Solicit general comments on objectives, process, and timeline.
- 5. August 2021 AMWG:**
 - GCMRC presents revised draft process and timeline document for evaluating and selecting metrics, including draft criteria.
 - Accept general comments and feedback on process from AMWG, due by XXX (date TBD in consultation with the AMWG).
- 6. October 2021 TWG:**
 - GCMRC completes a first draft of metric descriptions for a sample of 3-4 goals
 - GCMRC presents draft LTEMP performance metrics document; shared two weeks before TWG meeting.
 - TWG provides input during meeting; including a discussion of how best to present graphical representation of metrics to meet stakeholder needs. Input from TWG by XXXX (TBD in consultation with the TWG).
- 7. December 2021:**
 - GCMRC pilots a sample reporting of metrics in the FY2021 Annual Report, including sample graphics for reporting resource conditions.
- 8. January 2022:**
 - GCMRC solicits feedback from the TWG regarding the sample reporting of metrics in the FY2021 Annual Report.
- 9. February 2022:**
 - GCMRC solicits feedback from the AMWG and from DOI regarding the sample reporting of metrics in the FY2021 Annual Report.

- GCMRC and Reclamation will consider discussion and feedback from the January Annual Reporting Meeting and February AMWG meeting to determine objectives, process and timeline for the remainder of the year (2022).

Implementation of Performance Metrics

Implementation of annual reporting of metrics is anticipated to begin in FY2022, following feedback on the initial pilot reporting effort at the January 2022 Annual Reporting Meeting. It is anticipated that the metrics will be periodically reviewed thereafter to ensure that they are meeting the needs of the GCDAMP, that significant gaps in reporting do not exist, and that they adequately capture the status of resource conditions important to the program.

References

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