Appendix O

Analysis of Lake Powell Infrastructure Protection Releases

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Appendix O. Analysis of Lake Powell Infrastructure Protection Releases

O.1 Lake Powell Infrastructure Protection Release Analysis

The Draft EIS includes alternatives that assume additional releases from the Colorado River Storage Project Upper Initial Units (UIUs; Flaming Gorge, Blue Mesa, and Navajo Reservoirs) to protect infrastructure at Lake Powell. Operations at these units specifically contemplated in the Draft EIS alternatives are intended to remain within the scope of the existing Records of Decision. This appendix analyzes these modeled releases – referred to as Powell infrastructure protection (PIP) releases – across alternatives. The PIP release modeling assumptions are simplifications of the actual PIP process, which, like the Drought Response Operations Agreement, involves collaborative decision-making among stakeholder workgroups and includes subjective judgments that cannot be captured in a model. The modeled PIP releases represent a potential range of releases and do not necessarily reflect the views of all stakeholders. Actual releases may be lower, higher, or may not occur. The modeling assumptions regarding operation of the Upper Initial Units presented in this Draft EIS are not intended to, and do not, limit the Secretary's ability to operate these facilities as necessary to respond to hydrologic conditions in accordance with applicable federal law, including operations for the authorized purposes as stated in the 1956 Colorado River Storage Project Act. These modeling assumptions are intended solely for NEPA analysis and do not reflect a position by Reclamation on operations that might be implemented under a PIP collaborative process.

The Continued Current Strategies comparative baseline, Basic Coordination Alternative, and Supply Driven Alternative include modeled PIP releases, which are triggered when Lake Powell is projected to decline, or physically declines, below elevation 3,525 feet. Continued Current Strategies and Basic Coordination assume additional releases from Flaming Gorge, Blue Mesa, and Navajo Reservoirs, while Supply-Driven assumes additional releases only from Flaming Gorge Reservoir. Each UIU's operations are adjusted within their Records of Decision. Additionally, PIP releases in the Supply Driven Alternative are limited to 500 kaf annually, while Continued Current Strategies and Basic Coordination do not have constraints on annual releases. The Lower Basin shortage distribution method does not impact Upper Basin operations for the Supply-Driven Alternative. While the results for both Lower Basin shortage distribution methods are included, the results included in this appendix are identical and will therefore not be differentiated in the discussion. Details on modeling assumptions are in **Appendix A**, CRSS Model Documentation, **Section A.5.11**. The following sections compare the responses of individual and total annual PIP release volumes and frequency under different hydrologic conditions. Results are presented using conditional plots, which separate results based on five flow categories (see **Chapter 3.2.6** for additional details on conditional plots).

O.1.1 PIP Release Volumes

PIP release volumes shown in **Figure O-1** are estimates of the additional annual volumes released from each UIU and the total of all three UIUs. Each reservoir has different operating years and monthly targets that are used to estimate the additional releases. During years when PIP releases are triggered due to Lake Powell's projected or actual pool elevation, the following calculations are used to estimated annual additional release volumes:

- Flaming Gorge: previous May 1 (April 30 in CRSS) storage minus current May 1 storage
- Blue Mesa: previous December 31 storage minus current December 31 storage
- Navajo: sum of water year additional releases

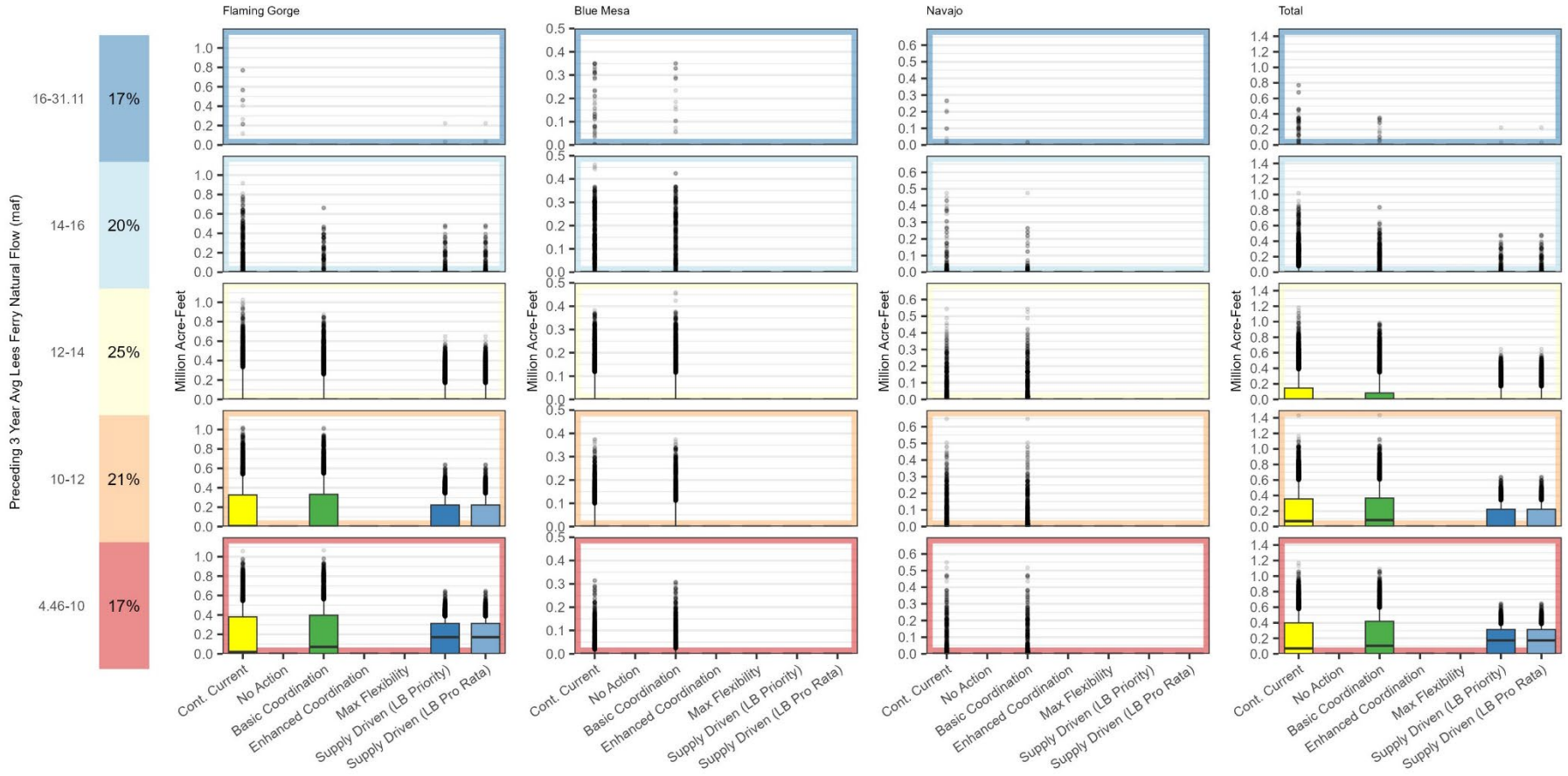
Even though the UIUs operate on different annual scales, their annual volumes are aggregated to compute a total annual volume of estimated PIP water released, since additional releases from Flaming Gorge and Blue Mesa cannot be determined each month in CRSS.

Figure O-1 shows PIP release volumes across all years (2027-2060) of the simulation. If there is no PIP release in a year, the data remains in the plot as zero. Each boxplot in the figure illustrates the distribution of modeled results, where the bold center line represents the median value, the top and bottom of each box shows the interquartile range which captures the 25th to 75th percentile, the lines extend to the 10th and 90th percentiles, and the outliers are represented as dots beyond these lines. The No Action, Enhanced Coordination, and Maximum Flexibility alternatives are zero for all flow categories and all percentiles because PIP releases are not included in those alternatives.

Figure O-1 illustrates that there are limited PIP releases in the Average Flow Category (12.0-14.0 maf). Volumes released from UIUs are zero at the median. When aggregated to total volumes, the upper quartile of Continued Current Strategies is 150 thousand acre-ft (kaf) and Basic Coordination is 80 kaf, while Supply-Driven remains at zero.

As hydrologic conditions become drier, PIP releases increase in volume. In the Critically Dry Flow Category (less than 10.0 maf), median PIP releases are greater than zero in all scenarios that include PIP releases; the total PIP releases are 69 kaf, 104 kaf, and 172 kaf, for Continued Current Strategies, Basic Coordination, and Supply-Driven, respectively. Most of the PIP releases come from Flaming Gorge, which has the largest storage of any of the UIUs. For Continued Current Strategies and Basic Coordination in the Critically Dry Flow Category, annual total releases can be as large as 1.1 maf, but 90% of the futures release 600 kaf or less. Supply-Driven has releases up to 650 kaf, but 90% of the releases are 390 kaf or less. In Supply Driven, the maximum PIP release at Flaming Gorge is specified to be 500 kaf; however, there are a few instances where Flaming Gorge is modeled to release more than 500 kaf due to monthly operational constraints.

Figure O-1
Response of PIP Release Volumes by Reservoir Across Alternatives



O.1.2 PIP Release Frequency

PIP release frequency by hydrologic condition is shown in **Figure O-2**. Each bar in the figure reports the percent of years with PIP releases in each flow category. The No Action, Enhanced Coordination, and Maximum Flexibility alternatives are zero for all flow categories because PIP releases are not included in those alternatives. In the Average Flow Category, PIP releases occur more frequently in Continued Current Strategies and Basic Coordination at 36% and 30%, respectively, compared to Supply-Driven. The frequency of PIP releases increases with drier flow categories across all scenarios where PIP releases are modeled. In the Critically Dry Flow Category, Basic Coordination and Supply Driven have PIP releases occurring in 63% of years and in Continued Current Strategies they occur in 60% of years.

Figure O-2
Percent of Years with PIP Releases Across Alternatives