Evaluating Reservoir Selective Withdrawal Operations and its Impacts using CE-QUAL-W2 Model

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CE-QUAL-W2 (W2) is a 2D, laterally averaged hydrodynamic and water quality model with over 30 years of development history. The W2 model is capable of simulating multiple types of water bodies, including reservoirs and river systems. It can model a diverse range of water quality constituents, from general constituents and inorganic solids to bacteria, nutrient cycles, and eutrophication processes. The model generates detailed outputs for all simulated water quality constituents, available at any longitudinal, vertical, and temporal point. W2 has been successfully applied to hundreds of rivers, lakes, and reservoirs both in the U.S. and internationally. The model serves as a valuable management tool for assessing the direct and indirect impacts of various stressors, conducting thermal and water quality studies, updating reservoir operation manuals, and developing environmental impact statements.

This presentation will offer an overview of the latest capabilities of the W2 model, with a particular focus on its application to the F.E. Walter reservoir and riverine system. Specifically, we will apply the newly updated selective withdrawal algorithm in the W2 model to quantify the impacts on downstream water quality, especially temperature and dissolved oxygen, resulting from releases from the reservoir and river system. Given specific storage and flow conditions, various selective withdrawal strategies lead to unique outcomes in terms of cold-water storage utilization and downstream water quality during the reservoir release season. These strategies allow resource managers to evaluate how reservoir operations align with downstream environmental objectives. Key considerations in the current model development for the F.E. Walter reservoir included the representation of tower control structure levels, gate operations, and water blending from multiple levels. The presentation will discuss the W2 model development, results, and alternative analysis.

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