Water Unavailability Methodology for the Delta Watershed: Refined Watershed Analysis

October 11, 2022

This document describes how the Water Unavailability Methodology for the Delta Watershed (Methodology) currently evaluates water unavailability at the watershed level, proposes a refined analysis that better recognizes the connectivity of tributaries within the Sacramento-San Joaquin Delta (Delta) Watershed, and discusses its implications for water right curtailments.

Current Watershed Analysis

The Methodology evaluates water unavailability at two scales: in headwater subwatersheds and in the entire Sacramento River watershed and the entire San Joaquin River watershed. Water rights and claims diverting in headwater subwatersheds outside of the Legal Delta are assumed to only have access to local water supplies, so water is unavailable to some rights or claims if the total demand within the subwatershed exceeds its total supply. This subwatershed analysis also ensures that demands that can't be met by local supplies are not considered in the watershed-wide analysis. Subwatersheds where total riparian demand exceeds available supply are considered disconnected from the watershed, so their supplies and demands are not included in the watershed analysis.

The Methodology currently analyzes water unavailability at the entire watershed scale by pooling supplies and demands for all subwatersheds within each watershed (the Sacramento and San Joaquin separately), including supplies from small tributaries in lower subwatersheds and demands on the valley floor (see left side of Figure 1). The Methodology also accounts for instream flow releases in excess of natural flows that are abandoned below their intended reach, as well as the commingling of supplies from the Sacramento and San Joaquin Rivers in the Legal Delta; appropriative demands in the Legal Delta are prorated between both watersheds based on their relative total supplies. Total supplies within each watershed are compared to demands for water, in order of water right or claim priority, and each demand is subtracted from the available supply. At the point where zero supply is available to a given water right or claim, water is unavailable at that priority date and it and all junior water rights or claims in the watershed are curtailed. Water rights and claims which divert from multiple subwatersheds, including those in the Legal Delta with access to supplies from both watersheds, are only curtailed when water is unavailable from all sources.

Proposed Refined Watershed Analysis

The proposed refined watershed analysis for the Methodology improves the spatial resolution of the watershed analysis, acknowledging the connectivity of tributary streams within the Delta watershed. Rather than the entirety of a given demand being compared to the total supply within its respective watershed, each demand is only charged against subwatersheds which are expected to contribute available supply to meet this demand (see right side of Figure 1). Available supplies from each subwatershed are tracked individually, and the demand of a given water right or claim is distributed between its subwatershed and any "upstream" subwatersheds based on the magnitude of supply that is available to it from each. Water is unavailable to a given water right or claim if there is zero supply available from all upstream subwatersheds. The refined watershed analysis does not change the headwater subwatershed analysis or other aspects of the current Methodology.

Figure 1 shows schematics of the current watershed analysis (left) and the refined watershed analysis (right). In the refined analysis, the upstream tributaries contributing supply to meet a given demand include the subwatershed where it is located and any other subwatersheds which flow into it. For example, a demand in the Upper Sacramento Valley is distributed only between the Sacramento Bend and Upper Sacramento Valley Floor subwatersheds, while a demand in the Legal Delta is distributed among all 20 subwatersheds in the Delta Watershed.

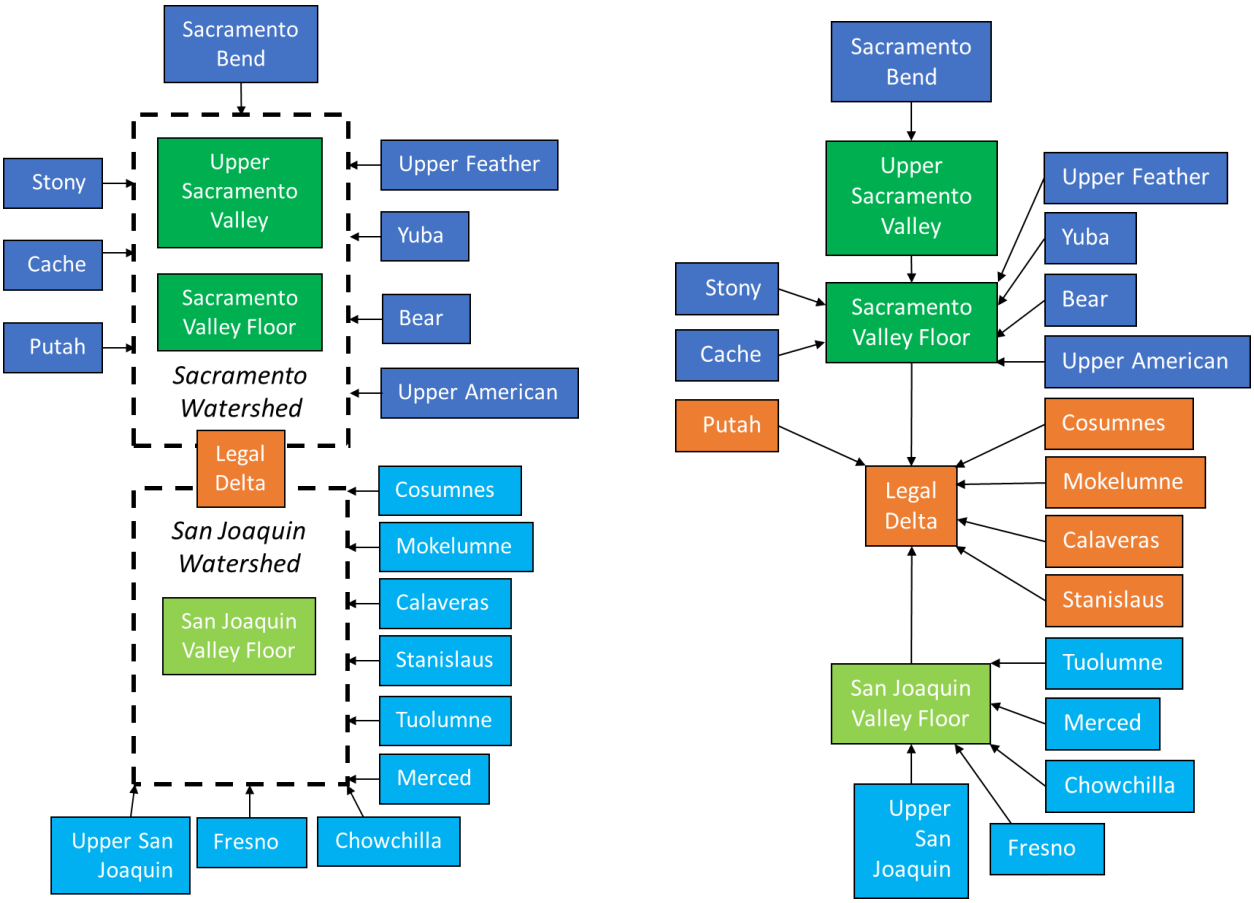

Figure 1. Schematics of Current (left) and Refined (right) Watershed Analyses

Comparison of Watershed Analyses

The refined analysis specifically addresses comments received on the Methodology, namely that the current analysis oversimplifies where water supplies and demands are located within each watershed. By distributing demands only among supply sources located within or upstream of a given subwatershed, the refined analysis ensures that demands in one tributary subwatershed do not affect curtailments in a second tributary subwatershed if curtailments in the second subwatershed won't make water physically available in the first. For example, curtailments in the Upper Sacramento Valley will not be made based on demands in the Upper Feather subwatershed because the Feather River is only tributary to the Sacramento watershed in the Sacramento Valley Floor. The refined analysis will no longer result in the watershed-wide curtailment dates that are produced by the current analysis (e.g., post-1914 appropriative water rights in the San Joaquin River watershed outside of the Legal Delta with a priority date of 1919 or later being curtailed). Instead, both the subwatershed-level analysis and the refined

watershed analysis will produce curtailment dates that vary based on diversion location (subwatershed and within or outside of the Legal Delta).

Figure 1 demonstrates how the refined watershed analysis changes the availability of supplies from several sources compared to the current analysis. First, the majority of Sacramento watershed tributaries (Stony and Cache Creeks and the Upper Feather, Yuba, Bear, and Upper American Rivers) supply only demands on the Sacramento Valley Floor and in the Legal Delta because they flow into the mainstem of the Sacramento River below the Red Bluff Diversion Dam (the boundary between the Upper Sacramento Valley and Sacramento Floor subwatersheds). Second, supplies from Putah Creek and the Cosumnes, Mokelumne, Calaveras, and Cosumnes Rivers supply only demands in the Legal Delta because they do not flow into the mainstem of the Sacramento or San Joaquin Rivers outside of the Legal Delta.

Compared to the Methodology's current analysis, the refined watershed analysis may, under certain circumstances, result in less curtailments in Sacramento and Legal Delta tributary subwatersheds because there are fewer competing demands for the available supplies. For example: under the refined analysis, supplies from the Upper American can only meet demands within that subwatershed, the Sacramento Valley Floor, and the Legal Delta. Curtailments in the Upper American may therefore be less likely than under the current analysis, where the Upper American's supplies and demands are combined with all other tributaries in the Sacramento River watershed. Conversely, the refined watershed analysis may result in more curtailments in valley floor and San Joaquin tributary subwatersheds under some circumstances because there are fewer supplies available to meet demands in these areas. For example, under the current analysis demands in the Upper Sacramento Valley have equal access to supplies from all ten Sacramento subwatersheds. Under the refined analysis, curtailments may be more likely in the Upper Sacramento Valley subwatershed because only supplies from the Sacramento Bend and Upper Sacramento Valley tributaries are considered available to meet the demands in the Upper Sacramento Valley subwatershed.

The refined analysis also would change the way in which demands in the Legal Delta are prorated between the Sacramento and San Joaquin watersheds. Under the current analysis, appropriative demands in the Legal Delta are apportioned between watersheds based on the total supply available from each; if the Sacramento River watershed contributes 80 percent of the total watershed supply, 80 percent of each appropriative Legal Delta demand is charged against the Sacramento River watershed's supply and 20 percent is charged against San Joaquin River watershed's supply. Under the refined analysis, this proration would instead be calculated for each individual water right or claim based on the remaining water supply available at its priority. This is consistent with the refined method of distributing demands between upstream subwatersheds, which is applied to rights and claims outside the Legal Delta. In the example above, the most senior Legal Delta right would be distributed similar to the same 80-20 split between the Sacramento and San Joaquin watersheds (comprised of a proportional spilt of each of the 20 individual subwatersheds' supplies) because nearly all supplies in the entire watershed are available at the most senior priority. The demands of a more junior water right, however, would only be charged against those tributaries which have remaining supply available at its lower priority date. The refined analysis would not impact the assumption that water rights and claims in the Legal Delta are not curtailed unless there is zero water supply available from all upstream tributaries for the given analysis period.