Common Response 2.1
Presentation of Data and Results in the Staff Report and Responses to Comments

Introduction

This introduction provides important context to this common response. A similar introduction is provided in each common response to ensure that the reader has the appropriate context when reviewing common responses. For ease of reference, a table of contents is included after this introduction to guide readers to specific subject areas.

Protecting the San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) watershed and its many beneficial uses of water is one of the State Water Resource Control Board's (State Water Board) primary responsibilities and top priorities. In response to declines of several native aquatic species since the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Watershed (Bay-Delta Plan or Plan) was last comprehensively updated, the State Water Board commenced a process to update the Bay-Delta Plan for the Sacramento River and its tributaries, Delta eastside tributaries (including the Calaveras, Cosumnes, and Mokelumne Rivers), and Delta for the reasonable protection of fish and wildlife beneficial uses, referred to as the Sacramento/Delta Update to the Bay-Delta Plan. The Bay-Delta Plan identifies beneficial uses of water to be protected in the Bay-Delta watershed, water quality objectives and program of implementation to achieve the reasonable protection of those beneficial uses, monitoring, evaluation, and special study provisions. The State Water Board's proposed action to update the Bay-Delta Plan is supported by a Staff Report/Substitute Environmental Document (Staff Report), which provides an evaluation of the environmental impacts and economic effects in support of consideration of different alternatives to update the Bay-Delta Plan to achieve reasonable protection of fish and wildlife beneficial uses in the Sacramento/Delta. The Staff Report is functionally equivalent to an Environmental Impact Report under the California Environmental Quality Act (CEQA) but also provides the additional analyses that support the State Water Board's consideration of the action under the Clean Water Act and Porter-Cologne Water Quality Control Act.

Development of the final Staff Report and final draft Bay-Delta Plan were informed by several opportunities for public comment over multiple years. This common response may address issues that were raised during any of those public comment periods. In September 2023, the State Water Board released the 2023 draft Staff Report evaluating different alternatives for the Sacramento/Delta Update to the Bay-Delta Plan for public review and comment. Following release of the 2023 draft Staff Report, the State Water Board released draft amendments to the Bay-Delta Plan in October 2024 (2024 draft Plan) for public review and comment that incorporated alternatives identified in the 2023 draft Staff Report with revisions based on public comments. The State Water Board released revised draft Plan updates in July 2025 (July 2025 revised draft Plan), but delayed public comment on that version of the Plan pending further updates, though some parties did submit public comments on the July 2025 draft that are part of the State Water Board's response to comments. In December 2025, the State Water Board released Chapter 13, *Revised Proposed Plan Amendments*, as a limited recirculation of the 2023 draft Staff Report (2025 partially recirculated draft Staff Report) together with the December 2025 revised draft Plan for public

review and comment. These documents reflect the updated proposed project, referred to as the revised proposed Plan amendments, which brings together in the Bay-Delta Plan program of implementation a voluntary agreement (VA) pathway that incorporates commitments identified in the Healthy Rivers and Landscapes (HRL) proposal and would apply to specified HRL water rights, and a regulatory pathway based on the proposed Plan amendments that would apply to other water rights and to any HRL water rights no longer covered under the VA pathway. In August 2026, the State Water Board released a final draft Bay-Delta Plan that included refinements to the revised proposed Plan amendments based on public comments received on the December 2025 revised draft Plan. At the same time, the State Water Board released this final Staff Report, including responses to comments previously received on the draft Staff Report. The final Staff Report informs the State Water Board's consideration of adoption of the Sacramento/Delta updates to the Bay-Delta Plan.

With respect to the CEQA impact conclusions, it is important that they be understood in the context of the overall nature of the proposed project, which is intended to be an environmental restoration action. CEQA only considers changes that could negatively impact the existing environment and does not recognize or offset negative changes with improvements that could result from an environmentally beneficial project. Here, the impacts that could potentially result from implementation of the restoration action occur in a system that has been highly altered, and the project would be expected to improve conditions for native fish and wildlife in the Sacramento/Delta watershed over time. However, the project will also result in changes in hydrology and changes in water supply that could result in some potentially significant adverse environmental impacts at certain times and locations that must be analyzed under CEQA. These potentially significant environmental impacts should be viewed in light of the overall purpose and goals of the Sacramento/Delta update to the Bay-Delta Plan.

The State Water Board reviewed and considered all comments and developed common responses to address recurring comments and common themes. For ease of reference, this common response includes a table of contents on the following page to help guide readers to specific subject areas.

Table of Contents

Overview

This common response explains how the Staff Report presents and interprets data and modeling results to evaluate baseline conditions, alternatives presented in the Staff Report, and the regulatory and VA pathways. The Staff Report presents data in many different ways. Each data presentation format has been specifically chosen to best disclose the potential effects and impacts of the resource area under consideration. This common response explains common presentation formats used in the Staff Report, but does not repeat the resource-specific methods or impact analyses.

The Staff Report provides scientific information to support possible updates and information on the potential benefits, environmental impacts, economic effects, and associated mitigation measures for possible alternatives for updating the Sacramento/Delta portions of the Bay-Delta Plan. Because hydrology and water supply vary by season, water year[1], location, and modeled scenario, no single statistic, table format, or figure type can be used for every aspect of the analysis. The Staff Report presents different types of data and results depending on the subject being evaluated. For example, Chapter 2, *Hydrology and Water Supply*, describes the flow regime within the Sacramento/Delta watershed, including flow magnitude, frequency, duration, timing, and rate of change; Chapter 3, *Scientific Knowledge to Inform Fish and Wildlife Flow Recommendations*, presents a review and summary of the best available science on flow needs for the protection of fish and wildlife; Chapter 7, *Environmental Analysis*, evaluates environmental impacts; Chapter 8, *Economic Analysis and Other Considerations*, addresses economic effects associated with the proposed Plan amendments; Chapter 9, *Proposed Voluntary Agreements*, evaluates environmental impacts and economic effects associated with the Voluntary Agreements; and Chapter 13, *Revised Proposed Plan Amendments*, presents updated analyses for the 2025 revised proposed Plan amendments. The Staff Report therefore presents results in multiple ways to show both the magnitude and frequency of modeled changes, including tables, figures, summary statistics, time series results, frequency-of-occurrence results, boxplots, exceedance plots, cumulative distributions, and water-year-type summaries.

In Chapter 6, *Changes in Hydrology and Water Supply*, the Staff Report explains that results of the Sacramento Water Allocation Model (SacWAM) are intended to be used in a comparative manner to assess changes in system operations and incremental effects between modeled scenarios. Chapter 6 presents model results in graphical and tabular formats to facilitate comparisons of streamflow, reservoir storage, and water supply among modeling scenarios. Chapter 13, *Revised Proposed Plan Amendments*, presents updated SacWAM results for the 55 percent unimpaired flow with water supply adjustments scenario and the VA scenario by region, including seasonal and annual total volumes by water year, cumulative distributions, boxplots, cumulative distribution tables, and water-year-type summaries. Elsewhere in the Staff Report, tables, charts, and graphs are used to fully describe the range of possible effects that could occur under the Sacramento/Delta alternatives. Various types of data presentation, such as line graphs, pie charts, bar charts, boxplots, cumulative distribution tables, and exceedance plots help communicate different types of information and different aspects of the results, such as the probability that a certain outcome may occur as compared to other outcomes.

[1] A water year extends from October 1st of the preceding calendar year through September 30th of the current calendar year. For example, water year 2024 started on October 1, 2023, and ended on September 30, 2024.

Results are also presented using summary statistics including the average, minimum, maximum, and median values, and summaries by water year type. These statistics should be read together with supporting tables, figures, appendices, and model-result files where more detailed numerical results are provided. This allows the data to be presented in a concise manner to easily convey summary information of potential effects to the reader. In addition, in many instances, the State Water Board presents the full set of data alongside the average conditions, in appendices, or through modeling files posted on the State Water Board's website for interested readers.

This common response focuses on the data presentation methods used in the Staff Report and provides examples of data presentations and how they should be interpreted. Similar topics are also discussed to some extent in other common responses when related to specific topics covered in those common responses:

Please see Common Response 6.1, *Sacramento Water Allocation Model and Changes in Hydrology and Water Supply*, for comments regarding SacWAM assumptions, scope, and the use of SacWAM results to evaluate changes in hydrology and water supply;

Please see Common Response 6.2, *Baseline and No Project Alternative*, for comments regarding the environmental baseline used to evaluate impacts of the Bay-Delta Plan; and

Pease see Common Response 7.1, *General CEQA and Approach to the Analysis*, for comments regarding the general CEQA approach, level of analysis, and scope of environmental review.

Types of Data Presented in the Staff Report

As used in this common response, "data" and "results" include measured, observed, and modeled information presented in the Staff Report. Examples include streamflow, reservoir storage, surface water supply, salinity, temperature, habitat, agricultural, economic, and other resource-specific information. Measured or observed data may be collected through devices like stream gages, while models may be used to simulate past, present, or future stream flows that cannot be measured directly.

The Staff Report presents information in text, tables, figures, appendices, and model-result files, depending on the level of detail needed to explain the analysis. More detailed methods and results are provided in the relevant technical appendices, including modeling appendices for SacWAM, Delta Simulation Model II (DSM2), economic, and other resource-specific analyses.

Tables and figures are used together in recognition that each presentation format has strengths and limitations. A table is an arrangement of data in rows and columns and provides precise numerical values. Tables are designated in the Staff Report as "Table" followed by the chapter and section number or common response number, a hyphen, and then numbered sequentially within that section or common response (e.g., Table 1.2-1, Table 1.2-2, etc.). Figures help make patterns, trends, and comparisons easier to see. A bar chart can provide a graphic comparison between discrete categories of information, whereas a line graph can show how one variable changes in relation to a separate, independent variable. Graphs, charts, exceedance plots, etc. are labeled "Figure" in the Staff Report followed by the chapter and section number or common response number, a hyphen, and then numbered sequentially within that section or common response (e.g., Figure 1.2-1, Figure 1.2-2, etc.). For annualized results, such as surface water supply within a region, values for modeled scenarios are generally presented as differences from the corresponding baseline value. A

positive value indicates more flow or water supply than the baseline, while a negative value indicates less flow or water supply than the baseline.

Some commenters stated that some figures or statistical summaries were inadequate or difficult to interpret, or that descriptions of model outputs were inadequate. Results should be read in context. SacWAM results are intended to be used in a comparative manner, allowing assessment of changes in system operations and incremental effects between scenarios. Results are presented in graphical and tabular formats that facilitate comparison of streamflow, reservoir storage, and water supply among modeling scenarios. Because each presentation format emphasizes different information, averages, medians, time series results, frequency-of-occurrence results, boxplots, exceedance plots, cumulative distributions, water-year-type summaries, tables, appendices, and model-result files should be read together.

Summary Statistics

Averages, Medians, Quartiles, and Percentages

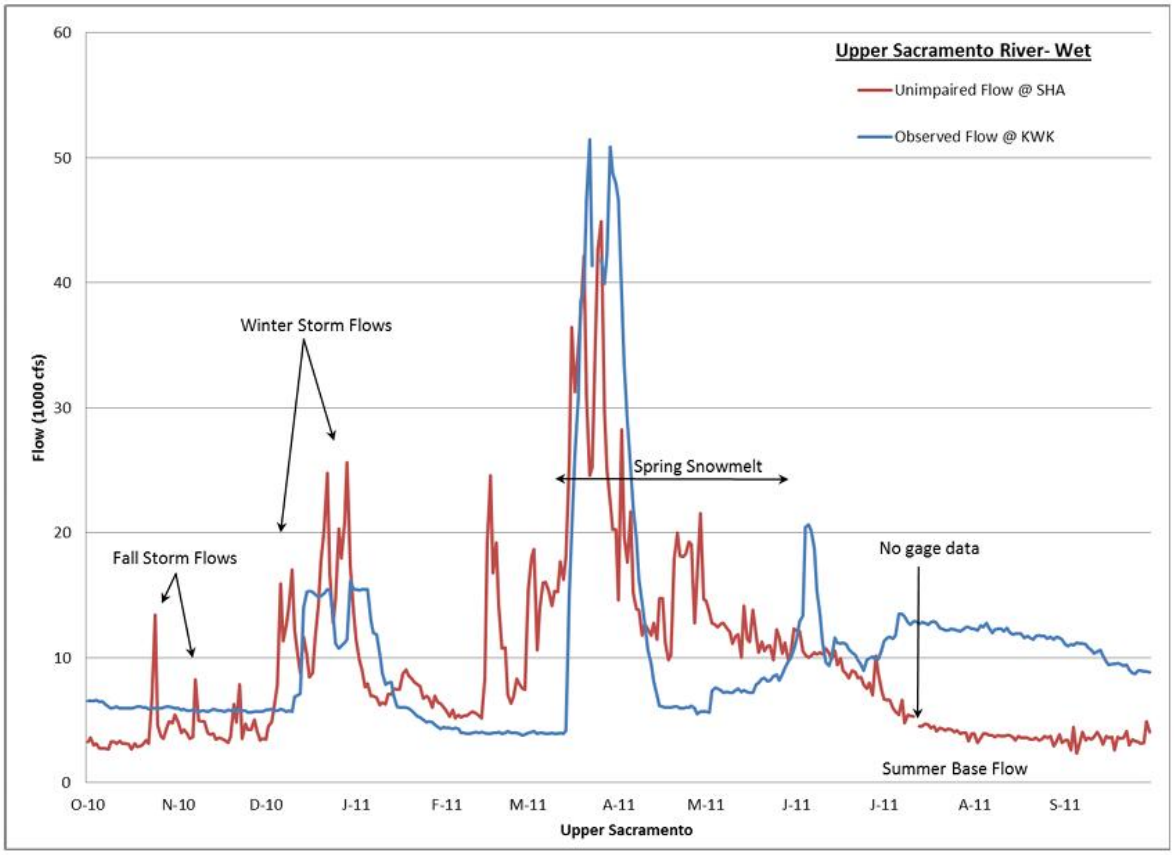
Summary statistics are used to summarize large data sets and facilitate comparisons among baseline conditions, alternatives, and the revised proposed Plan amendments. An *average* (or *mean*) describes the central tendency of a data set and is calculated as the sum of all data values divided by the number of data values. A *median* identifies the middle observed value in a numerically sorted data set. By definition, half of the observed values are greater than or equal to the median, and half of the observed values are less than or equal to the median. Whereas averages can be affected by high or low values in a data set, the median is often less susceptible to outliers. Therefore, the Staff Report uses both averages and medians to describe results. *Quartiles* describe the range around the median. There are two quartiles: the lower quartile, representing the 25th percentile, and the upper quartile, representing the 75th percentile. One quarter of the data values are less than the lower quartile (25th percentile) and three quarters of the data values are less than the upper quartile (75th percentile). Half of the data values are between the two quartiles. A *percentage* is a number or ratio that is expressed as a fraction of 100, often by the percent sign "%". Percentages are used to express values as a proportion of a total.

A number of commenters stated that averages or monthly results are inadequate because they do not fully show the range of potential outcomes, and that some results should have been presented at a finer scale or by water year type. As discussed in Common Response 7.1, *General CEQA and Approach to the Analysis*, Section 21159 of CEQA states that "the agency may utilize numerical ranges or averages where specific data is not available; however, the agency shall not be required to engage in speculation or conjecture" (Pub. Resources Code, § 21159, subd, (a)). Furthermore, as the Supreme Court noted in *Communities for a Better Environment*, "[e]nvironmental conditions may vary from year to year and in some cases it is necessary to consider conditions over a range of time periods" (Communities for a Better Environment v. South Coast Air Quality Management District (2010) 48 Cal.4th 310, 327-328, citing Save Our Peninsula Committee v. Monterey County Bd. of Supervisors (2001) 87 Cal.App.4th 99, 125). For every impact assessment in the Staff Report, best professional judgment was used to select the metrics best suited to present results and determine impacts. Averages were often used to summarize modeling and analysis results in a way that readers could easily interpret. Because hydrology and water supplies vary substantially by season and water year, averages often are presented with additional information, such as minimum and

maximum values, water-year-type summaries, cumulative distributions, exceedance plots, appendices, or model-result files. These additional data presentations help show the range and frequency of modeled results. Where the Staff Report presents model results at a monthly, annual, water-year-type, or long-term average scale, readers should review the figure title, axis labels, caption, supporting text, and appendices to understand the modeling time step, evaluation metric, and purpose of the summary being presented.

Time Series and Frequency of Occurrence

Time series tables or charts present daily, monthly, seasonal, or annual values over time to assess effects of the project alternatives. They allow readers to see the magnitude and timing of changes and to identify specific periods of interest. Time series are used frequently in the Staff Report to show how the results of an alternative scenario change from the baseline scenario on a monthly basis. For example, Figure CR 2.1-1 shows a time series of daily unimpaired and observed flows in the Sacramento River below Keswick Reservoir for Water Year 2011.



Source: CDEC 2023.
cfs = cubic feet per second
KWK = Keswick Reservoir
SHA = Shasta Reservoir
Daily unimpaired flows presented here are produced by the California Department of Water Resources as full natural flows at Shasta Reservoir.

Figure CR 2.1-1. Daily Hydrograph of the Sacramento River below Keswick Reservoir for Water Year 2011 with Unimpaired Flow and Observed Flow (copy of Figure 2.2-4 from Chapter 2, *Hydrology and Water Supply*)

Frequency-of-occurrence summaries are used when the analysis focuses on how often a condition or threshold occurs. For example, some analyses compare the frequency with which modeled flows, storage levels, temperatures, salinity, or other metrics meet, exceed, or fall below a specified condition under baseline and modeled scenarios.

Distribution-Based Presentations

Boxplots

Boxplots are used to broadly characterize the distributions of monthly or annualized numerical results. As illustrated in Figure CR 2.1-2, a boxplot shows the range of modeled or observed values, including minimum and maximum values, the lower and upper quartiles, and the median. In a boxplot, the minimum and maximum values are represented by the horizontal lines, or "whiskers", at the lower and upper extremes of the boxplot, respectively. When used to portray streamflow data, these whiskers represent the driest and wettest hydrologic conditions, respectively. The lower and upper quartiles (or 25th and 75th percentiles) are represented in Figure CR 2.1-2 by the bottom and top of the gray box, respectively, and the median is represented by the horizontal line inside the gray box. The gray box represents the *inter-quartile range,* within which the middle 50 percent of data values are located. If, for example, the median line is positioned such that it appears closer to the lower quartile, this indicates that the lower half of data points in the inter-quartile range fall within a smaller range of values than the upper half. Similarly, if, for example, the maximum whisker is located closer to the gray box than the minimum whisker, this indicates that the highest 25 percent of all data points fall within a smaller range of values than the lowest 25 percent.

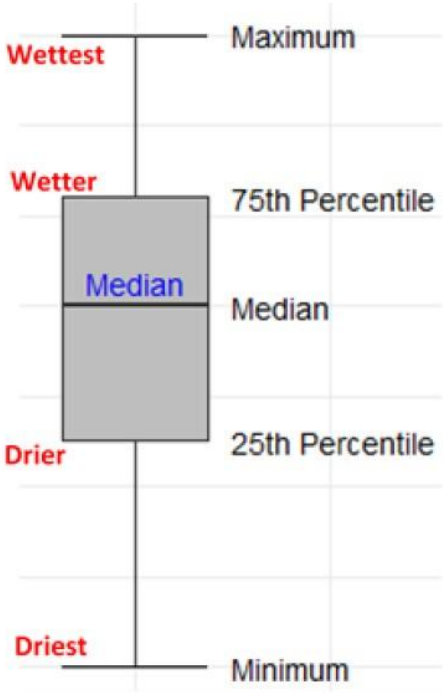
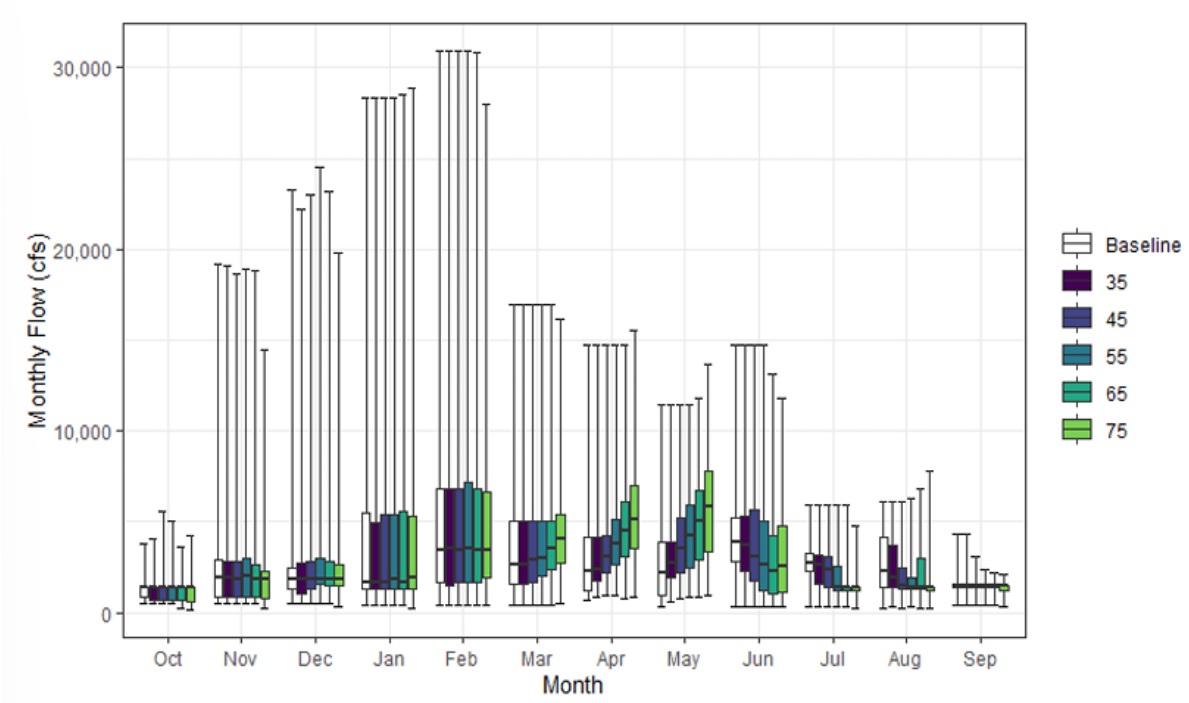


Figure CR 2.1-2. Generic Boxplot Example (copy of Figure 6.1-1 from Chapter 6, *Changes in Hydrology and Water Supply*)

When multiple boxplots are presented in the same figure, the x-axis may represent the timeframe corresponding to the data, as shown in Figure CR 2.1-3, where different modeling scenarios are identified by different colors, or the x-axis may represent each modeling scenario, similar to the x-axis of a bar chart. Some commenters stated that Staff Report figures with multiple boxplots were difficult to interpret because the boxplots appeared to be compressed. When variability is low relative to the scale used in the figure, a boxplot may appear compressed to a horizontal line. This does not indicate missing data, but rather indicates that the plotted values are close together at the scale shown. A consistent scale may be used for multiple boxplots within a figure or across multiple figures to allow comparison across scenarios, water year types, locations, or species. In Figure CR 2.1-3, for example, the data for September indicate that across all modeled scenarios, the middle 50 percent of modeled data fall within a narrow range, although some scenarios show maximum and minimum values that may occur within a much wider range.



Changes in flows represent the typical patterns for Project tributaries.
cfs = cubic feet per second

Figure CR 2.1-3. Changes in Hydrology across the Scenarios for the American River above the Sacramento River (copy of Figure 6.3-1 from Chapter 6, *Changes in Hydrology and Water Supply*)

Exceedance and Cumulative Distribution Plots and Tables

When a finer examination of the statistical distribution of results is needed, results may be presented as exceedance curves or tables. An exceedance curve shows the frequency with which a given value, such as the volume of water stored in a reservoir, is equaled or exceeded within a data set. As shown in Figure CR 2.1-4, exceedance curves are generally plotted with the percent of values equaled or exceeded on the x-axis and the variable of concern on the y-axis. When presented as a table, exceedance tables are generally sorted from the largest value to the smallest value.

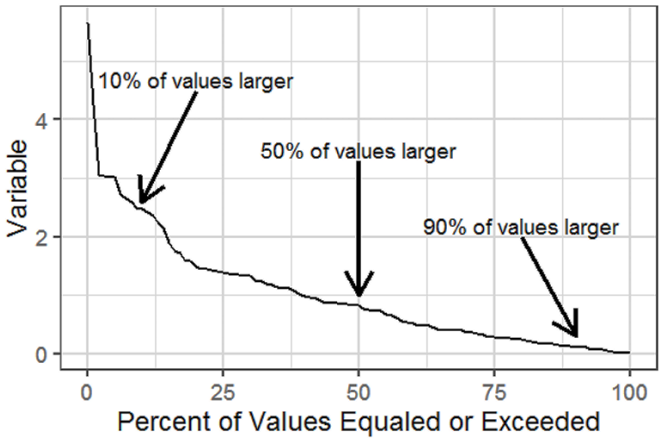
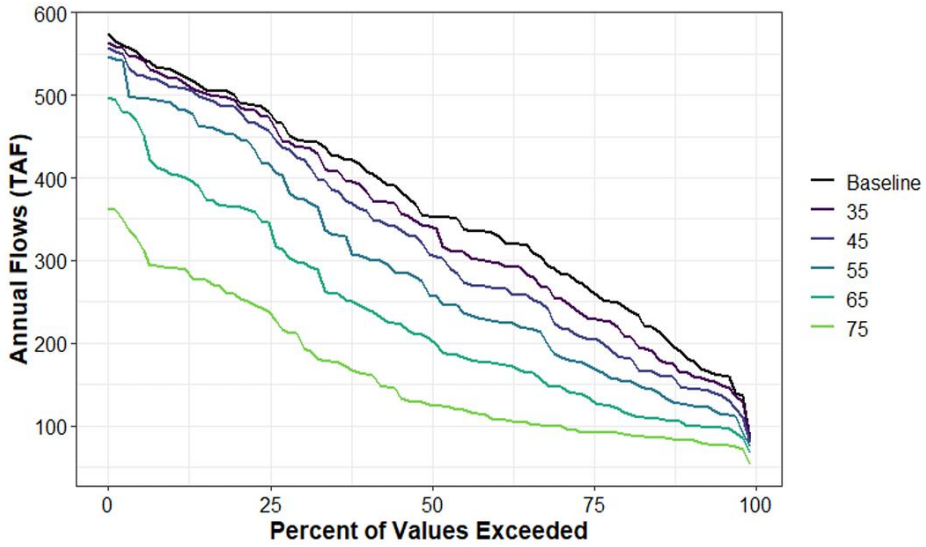


Figure CR 2.1-4. Generic Exceedance Curve Example (copy of Figure 6.1-2 from Chapter 6, *Changes in Hydrology and Water Supply*)

Suppose, for example, the data in Figure CR 2.1-4 represent daily average flow in cubic feet per second (cfs) for a small stream measured over the course of a full year. According to the exceedance curve, only about 25 percent of days had flows of 1.5 cfs or higher; conversely, more than 75 percent of days had flows less than 1.5 cfs. Fewer than 10 percent of days were completely dry (more than 90 percent of days had flows greater than 0 cfs), and peak flows of 3 cfs or more only occurred about 5 percent of the time. It is not possible to determine from this graph alone when in the year particular flows were observed because the data are organized in descending order of magnitude, instead of chronologically.

As shown in Figure CR 2.1-5, exceedance plots can also be used to compare results of different alternatives. Exceedance plots and tables are useful when readers need to understand not only the average result, but also the range and frequency of results across modeled years. They should be read with any corresponding exceedance tables, water-year-type summaries, and appendices.



TAF = thousand acre-feet

Figure CR 2.1-5. Exceedance Frequency Distribution of Annual Drum Canal Total Inflow (thousand acre-feet) (copy of Figure 6.3-24 from Chapter 6, *Changes in Hydrology and Water Supply*)

Similarly, cumulative distribution plots and tables present modeled or observed values in ranked order, though the values are generally sorted from smallest to largest. Cumulative distributions allow readers to evaluate both the magnitude of a result and how often certain values occur within a range. Cumulative distribution and exceedance plots can be used with streamflow, reservoir storage, water supply, hydropower, and other results to show the range of modeled or observed conditions across wet, dry, and intermediate years.

Percent exceedance and cumulative distribution charts are used throughout the Staff Report. For example, in Chapter 6*, Changes in Hydrology and Water Supply*, these charts are presented to disclose the full range of effects on end-of-April and end-of-September carryover storage for various reservoirs as well as the effects of flow scenarios on spring X2 positions. In Chapter 7, *Environmental Analysis*, they are used to display the annual total exchange contractor shortages by flow scenario. Data presentation using these types of charts provide much more information than an average or even averages based on water year type, as it contains each annual total similar to a time series graph, but ranked and plotted in ranked order. Users can inspect the graphs and determine the frequency at which to expect certain river flows under different scenarios, as shown in Figure CR 2.1-5.

Water Year Types and Long-Term Hydrologic Variability

Water-year-type summaries group results by hydrologic conditions. Unless otherwise noted, the Staff Report uses the Sacramento Valley Water Year Hydrologic Classification, which includes five water year types in ascending levels of water availability: critical, dry, below normal, above normal, and wet.

Water-year-type classifications and summaries are useful for describing valley-wide conditions because hydrology and water supply vary substantially across wet, dry, and intermediate years. However, they may not represent detailed conditions on individual tributaries. Accordingly, water-year-type summaries and averages should be read with cumulative distributions, exceedance plots, detailed tables, figures, appendices, and model-result files.

The Sacramento Valley index is an index of total runoff. It is used to determine the Sacramento Valley water year type as implemented in the State Water Board Water Right Decision 1641 (D-1641). The index is described in the Sacramento Valley Water Year Hydrologic Classification and D-1641, and is determined as follows:

INDEX = 0.4X + 0.3Y + 0.3Z, where

- *X* is the current year's April through July Sacramento Valley unimpaired runoff forecast (in million acre-feet (MAF)),
- *Y* is the current year's October through March Sacramento Valley unimpaired runoff (in MAF), and
- *Z* is the previous year's index, capped at 10.0.

The unimpaired flow estimates used to calculate X and Y above are the sum of Sacramento River above Bend Bridge near Red Bluff, Feather River inflow to Oroville Reservoir, Yuba River at Smartville, and American River inflow to Folsom Reservoir (all in MAF). The final determination of

water year type is based on the May index value, and the classification is defined according to Table CR 2.1-1.

Table CR 2.1-1. Sacramento Valley Water Year Hydrologic Classification

Water Year Type	Calculated Water Year Index
Critical	Less than or equal to 5.4
Dry	Greater than 5.4, and less than or equal to 6.5
Below Normal	Greater than 6.5, and less than or equal to 7.8
Above Normal	Greater than 7.8, and less than 9.2
Wet	Greater than or equal to 9.2

Hydrologic classifications were developed primarily to consider water availability, rather than to describe actual hydrology or flow conditions. The range of unimpaired flow estimates is not exclusive to a water year type, and two years that have the same unimpaired flow value may have different classifications. Additionally, the classification system is intended to classify conditions for the entire Sacramento Valley rather than for individual tributaries. Each tributary may experience slightly different precipitation and resulting flow. Therefore, results at the more detailed scale of individual tributaries are helpful to provide additional contextualizing information.

References Cited

No references cited.