

REFERENCE BRIEF · THE SCENARIO LIBRARY

The COEQWAL scenario library

How the scenarios are built: strategies, hydroclimates, and the model runs behind them

The scenario library pairs 28 water management strategies with five hydroclimates. Each pairing is one scenario, and one scenario is one CalSim 3 simulation over a 100-year period. Over 100 scenarios make up the library, and every outcome level COEQWAL reports traces to one of these runs.

This brief describes how the scenario library is constructed. It is a reference brief, part of the project's background material, and it carries no modeled results. For what the runs produce, see the summary briefs on the [Data page](https://coeqwal.org/data) (<https://coeqwal.org/data>).

§2 WHAT A SCENARIO IS

Every scenario pairs one water management strategy with one hydroclimate. The strategy describes the decisions, priorities, and policies that determine how water is allocated: the part of the system that can be controlled. The hydroclimate describes the temperature and the patterns of rain and snow that determine how much water is available, the part that cannot.

The pairing is the unit of analysis. A result belongs to the pair, never to a strategy alone: the same strategy can produce different results under different hydroclimates, and comparing a strategy across hydroclimates is one of the central readings the library is structured to support.

§3 THE 28 STRATEGIES

The strategies span the main levers of Central Valley water management. The website organizes them in five groupings, and the matrix in §5 lists all 28 under the same five headings.

Baselines. Six strategies that hold water management at or close to today's rules: Current operations, its reintroduction variant, and four variants that change the agency rule set, the land-use dataset behind agricultural demand, or the drought provisions. Current operations is the strategy every other strategy is compared against. *Current operations with reintroduction* is listed under this heading because the library groups it there; it is not a baseline, because reintroduction has not occurred.

Farms and groundwater. Four strategies that limit groundwater pumping, two in the San Joaquin Valley and two across the Central Valley. In each pair, one strategy limits pumping directly and one reaches the limit by reducing crop acreage.

Rivers and salmon. Nine strategies that change instream flow requirements: No flow requirements, Functional environmental flows, Winter-run refuge flows, a reduced-crop-acreage version of each of the last two, and the four reintroduction variants that pair with them.

Community water systems. Two strategies that change where community water systems sit in the allocation order: Prioritizing human health water deliveries to community water systems, and Prioritizing full demands of community water systems.

The Delta. Seven strategies that change conditions in and around the Delta: four Delta outflow targets, running from Reduce Delta outflows (35% unimpaired flow target) to Increase Delta outflows (65% unimpaired flow target), together with

Increase Shasta carry-over storage, Relax Delta salinity standards, and the Delta Conveyance Project.

A strategy's public identity is its descriptive name, for example *Functional environmental flows* or *Groundwater pumping limits in the San Joaquin Valley*. Each strategy is described in its own documentation brief, linked from its row in §5.

§4 THE FIVE HYDROCLIMATES

Each strategy is simulated once under each of five hydroclimates: a historical hydroclimate, and four projected climates named by their level of stress on the water system. The four projections are a sample of possible futures drawn from state planning studies and downscaled global climate models. They are not predictions, and they are not stages of a single timeline. Each is a complete simulation period in its own right.

HYDROCLIMATE	CONDITIONS
Historical hydroclimate	Temperature, precipitation, and flow patterns reflect historical conditions
Moderate climate stress	Slightly warmer and moderately wetter, +3.5% flow change
Moderate-high climate stress	Moderately warmer, with little change in precipitation, -1% flow change
High climate stress	Much warmer and moderately drier, -6.5% flow change
Extreme climate stress	Much warmer and much drier, -19.2% flow change

Two things the table does not show. The historical hydroclimate is not the observed record: it is the 100-year climate and hydrologic record built for CalSim 3, adjusted for recent climate change so that overall time trends are removed while the observed variability of wet years, dry years, and multi-year patterns is preserved. And each of the four flow changes is an average: the average change in total annual flow across California's major water supply basins, over a 30-year period centered on 2043.

The five hydroclimates, their source data, and the modeling behind them are documented in full in the companion reference brief, [The five COEQWAL hydroclimates](https://coeqwal.org/documents/Background/hydroclimates_brief.html) (https://coeqwal.org/documents/Background/hydroclimates_brief.html).

§5 THE SCENARIO MATRIX

Every scenario in the library appears below. Rows are the 28 strategies, grouped under the five headings of §3 and listed in the order the website uses; each strategy name links to its documentation brief. Columns are the five hydroclimates, in order of increasing climate stress. Each cell holds the identifier of the CalSim 3 run for that pairing, the same identifier that appears in the references note of each brief and in the machine-readable records behind the website.

STRATEGY	HISTORICAL	MODERATE	MODERATE-HIGH	HIGH	EXTREME
BASELINES					
Current operations	s0020	s0134	s0047	s0056	s0108
Current operations with reintroduction[†]	s0020	s0134	s0047	s0056	s0108
Current operations with historical land use	s0011	s0133	s0048	s0057	s0107
Current operations without TUCPs	s0021	s0135	s0049	s0058	s0109
Current USBR operations	s0024	s0137	s0050	s0059	s0111
Current USBR operations without TUCPs	s0023	s0136	s0051	s0060	s0110
FARMS AND GROUNDWATER					
Groundwater pumping limits in the San Joaquin Valley	s0025	s0138	s0067	s0087	s0112
Groundwater pumping limits via reduced crop acreage in the San Joaquin Valley	s0026	s0139	s0068	s0088	s0113
Groundwater pumping limits in the Central Valley	s0027	s0140	s0062	s0063	s0114
Groundwater pumping limits via reduced crop acreage in the Central Valley	s0028	s0141	s0069	s0089	s0115
RIVERS AND SALMON					
No flow requirements	s0030	s0143	s0071	s0091	s0117
Functional environmental flows	s0046	s0156	s0084	s0104	s0130

STRATEGY	HISTORICAL	MODERATE	MODERATE-HIGH	HIGH	EXTREME
Functional environmental flows with reintroduction [†]	s0046	s0156	s0084	s0104	s0130
Functional environmental flows with reduced crop acreage	s0032	s0145	s0073	s0093	s0119
Functional environmental flows with reduced crop acreage and reintroduction [†]	s0032	s0145	s0073	s0093	s0119
Winter-run refuge flows	s0031	s0144	s0072	s0092	s0118
Winter-run refuge flows with reintroduction [†]	s0031	s0144	s0072	s0092	s0118
Winter-run refuge flows with reduced crop acreage	s0033	s0146	s0074	s0094	s0120
Winter-run refuge flows with reduced crop acreage and reintroduction [†]	s0033	s0146	s0074	s0094	s0120
COMMUNITY WATER SYSTEMS					
Prioritizing human health water deliveries to community water systems	s0035	s0147	s0075	s0095	s0121
Prioritizing full demands of community water systems	s0037	s0149	s0077	s0097	s0123
THE DELTA					
Reduce Delta outflows (35% unimpaired flow target)	s0040	s0151	s0079	s0099	s0125
Maintain Delta outflows (45% unimpaired flow target)	s0041	s0152	s0080	s0100	s0126
Increase Delta outflows (55% unimpaired flow target)	s0042	s0153	s0081	s0101	s0127
Increase Delta outflows (65% unimpaired flow target)	s0039	s0150	s0078	s0098	s0124
Increase Shasta carry-over storage	s0044	s0154	s0082	s0102	s0128
Relax Delta salinity standards	s0045	s0155	s0083	s0103	s0129
Delta Conveyance Project	s0065	s0157	s0085	s0105	s0131

[†] Each marked strategy adds one action that is not a water management action: reintroduction of winter-run Chinook salmon to cold-water habitat upstream of Shasta Dam. The marked strategy and the strategy directly above it share the same CalSim 3 simulation, which is why the two rows carry identical run identifiers. Reintroduction has not occurred, so it is not part of any baseline: the comparison reference for every scenario in the library is current operations under the same hydroclimate, without reintroduction. Reintroduction enters the modeling through the winter-run life cycle model, not through CalSim 3, so modeled results differ from the partner strategy only for the winter-run salmon key outcome.

§6 CURRENT OPERATIONS AND THE BASELINE

One strategy, *Current operations*, represents the current operating rules for the major Central Valley water systems: the operational logic of the California Department of Water Resources' 2023 Delivery Capability Report, with agricultural demands set by the 2020 LandIQ land-use dataset and Temporary Urgency Change Petition (TUCP) actions active. It is simulated under all five hydroclimates, like every other strategy, and it is the reference every other strategy is compared against.

Comparisons are always matched by hydroclimate: an alternative strategy under a given hydroclimate is compared with current operations under that same hydroclimate. Current operations under the historical hydroclimate is the baseline, the scenario that represents the lived status quo. Current operations under a projected hydroclimate is a climate-projected baseline: an independent model run showing where current management would land if the climate changed but the rules did not. It is a full simulation, not an adjustment applied to the historical run.

Current operations with reintroduction is listed with the baselines in §5 because the library groups it there, and it is not a baseline: reintroduction has not occurred, so the comparison reference for every scenario is current operations under the same hydroclimate, without reintroduction.

§7 WHAT THIS DOESN'T SAY

The library is a sample, not a census. The 28 strategies do not cover every possible way of managing Central Valley water, and the five hydroclimates do not cover every possible climate; the absence of a combination from the library is not evidence about that combination. No scenario is a prediction of what will happen, and the library does not rank the strategies or single one of them out. Strategies as modeled are idealized representations in CalSim 3, not policy proposals or implementation plans.

§8 WHERE TO GO NEXT

For what the project is and why the library exists, see the companion reference brief, [The COEQWAL project](https://coeqwal.org/documents/Background/project_background_brief.html) (https://coeqwal.org/documents/Background/project_background_brief.html). For any single strategy, see its documentation brief, linked from that strategy's row in the matrix in §5. For modeled results, see the summary briefs on the [Data page](https://coeqwal.org/data) (<https://coeqwal.org/data>).

[Browse the scenario library in the data explorer](https://coeqwal.org/explore) → (<https://coeqwal.org/explore>)

REFERENCES — MODEL RUNS

Every scenario is one CalSim 3 run. The run identifier for each strategy under each of the five hydroclimates is listed in the matrix in §5, in the references note of that strategy's documentation brief, and in the machine-readable records that accompany the summary briefs on the [Data page](https://coeqwal.org/data) (<https://coeqwal.org/data>), so any result can be traced to a specific model run.