

MANAGEMENT STRATEGY · ENVIRONMENT

Functional environmental flows

A management strategy in the COEQWAL scenario library

This strategy imposes new minimum flow requirements on tributaries to the Sacramento and San Joaquin rivers that mimic characteristics of natural and functional seasonal flow patterns. The flow requirements are derived from estimated natural flows and scaled according to water availability in each year. It is a variation of the functional-flows approach that applies the requirements to the tributaries only, leaving the downstream main stems (Sacramento and San Joaquin Rivers) and Delta outflow as they are under current operations. Everything else in the strategy matches current operations; the only intentional change is this tributary flow requirement set.

This brief describes *the “Functional Environmental Flows” scenario*, one of 28 management strategies in the COEQWAL scenario library. Each strategy is simulated once under each of five hydroclimates; the references note at the end of this brief lists the model runs.

A variant of this strategy, [Functional environmental flows with reintroduction](https://coeqwal.org/documents/Strategy_Documentation/strategy_brief_functional-environmental-flows-with-reintroduction.html) (https://coeqwal.org/documents/Strategy_Documentation/strategy_brief_functional-environmental-flows-with-reintroduction.html), 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 two strategies share the same CalSim 3 simulation; modeled results differ only for the winter-run salmon key outcome.

§2 WHAT THIS STRATEGY CHANGES

The strategy adds new minimum flow requirements on tributaries to, and upstream locations on, the Sacramento and San Joaquin rivers. The flow values were developed by the COEQWAL eflows team based on natural-flow estimates, with selected seasonal components added and scaled according to expected water availability in each year. Flow requirements can be met with reservoir releases, delivery reductions, runoff and streamflow from undammed reaches, or some combination of each.

This is the tributaries-only variation of the functional-flows approach. A broader version of the same idea also places requirements on the main stems of the two rivers and on Delta outflow; this strategy deliberately leaves those downstream requirements out, so the only change from current operations is on the tributaries themselves.

The requirements are minimums, not maximums. Simulated flows are frequently larger than the functional minimum at any given location and timestep, often due to releases for deliveries or the availability of runoff from streams not controlled by a dam. Where a functional flow requirement coincides with a pre-existing minimum flow requirement, the larger of the two values is used.

The functional flow requirements are assigned high weights (priority) in CalSim's operations logic but are not guaranteed to be met in every timestep — they may be missed when an upstream reservoir cannot release enough water, or when released water is lost to groundwater seepage in transit. The goal of this scenario is to understand the feasibility and related effects of attaining functional flow regimes in Central Valley rivers, not to specify a particular flow policy.

§3 THE CONFIGURATION IN DETAIL

The table compares the eight operational fields that define this strategy against current operations — the strategy that represents existing operational rules, recent (2020) land use, and TUCPs. Rows that match current operations are shown in light gray; rows that differ are highlighted.

ASPECT	CURRENT OPERATIONS	THIS STRATEGY
TUCP actions	Active	Active
SGMA actions	None	None
Land use	2020 LandIQ	2020 LandIQ
Delta regulations	Standard	Standard
BiOps	2019 / 2020 ITP	Modified versions of 2019 / 2020 ITP
Infrastructure	Standard	Standard
Flows	Standard	Functional flows on Sacramento and San Joaquin tributaries (main-stem and Delta-outflow requirements not included)
Allocation / priorities	Standard	Standard

§4 LINEAGE AND SOURCE

This strategy was developed by the COEQWAL eflows team. It is built on COEQWAL Current Operations scenario using DWR's adjusted historical hydrology with the 2020 LandIQ land-use dataset, with functional minimum flow requirements added on tributaries to the Sacramento and San Joaquin rivers. It is the second version of the functional-flows configuration (EflowsV2): a variation that removes the downstream Sacramento, San Joaquin, and Delta-outflow

requirements present in the broader functional-flows scenario, keeping only the tributary and upstream requirements. The CalSim model files for this strategy are referenced by the run IDs in the references note at the end of this brief.

§5 RELATED STRATEGIES

RELATED STRATEGIES — ENVIRONMENT

No flow requirements. Current operations without minimum flow requirements on Central Valley rivers.

Winter-run refuge flows. Sacramento River flow requirements and Shasta cold-water storage protection to support Sacramento River winter-run Chinook salmon life-cycle needs.

Functional environmental flows with reduced crop acreage. Functional flow requirements combined with reduced irrigated acreage across the Central Valley, reflecting groundwater management under SGMA.

Winter-run refuge flows with reduced crop acreage. The winter-run refuge flows combined with reduced irrigated acreage across the Central Valley, reflecting groundwater management under SGMA.

Increase Delta outflows (65% unimpaired flow target). USBR Alternative 3 for the Long-Term Operation of the Central Valley Project, with Delta outflow requirements set to roughly 65% of unimpaired volume.

Increase Delta outflows (55% unimpaired flow target). USBR Alternative 3 for the Long-Term Operation of the Central Valley Project, with Delta outflow requirements set to roughly 55% of unimpaired volume.

§6 WHAT THIS DOESN'T SAY

This brief describes a scenario representation in CalSim, not a real-world policy proposal or implementation plan. The strategy as modeled may not capture all details necessary to support direct translation to actual operations. The brief does not predict, evaluate, or recommend any outcome — it describes what the scenario changes about CalSim's representation of the system. For what the model produces under this strategy, see the result briefs referenced in §7.

§7 SEE RESULTS FOR THIS STRATEGY

To see modeled outcomes under this strategy across all nine key outcomes at the reference hydroclimate, see the *Rivers, salmon and the Delta ecosystem* theme brief.

To see outcomes at a specific location of interest, see the relevant LOI briefs — particularly those for locations on the Sacramento and San Joaquin tributaries.

Compare this strategy in the data explorer → (<https://coeqwal.org/explore?strategy=s0046>)

REFERENCES — MODEL RUNS

Each strategy is simulated once under each of five hydroclimates. The table lists the model run behind this strategy and the current-operations run it is compared against, for each hydroclimate, so any reader can trace this page to specific CalSim runs.

HYDROCLIMATE	THIS STRATEGY	CURRENT OPERATIONS
Historical hydroclimate (adjusted)	s0046	s0020
Moderate climate stress (EC-Earth3-Veg)	s0156	s0134
Moderate-high climate stress (cc50)	s0084	s0047
High climate stress (cc95)	s0104	s0056
Extreme climate stress (TaiESM1)	s0130	s0108

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