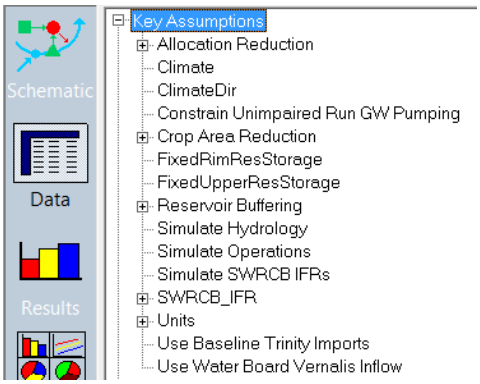
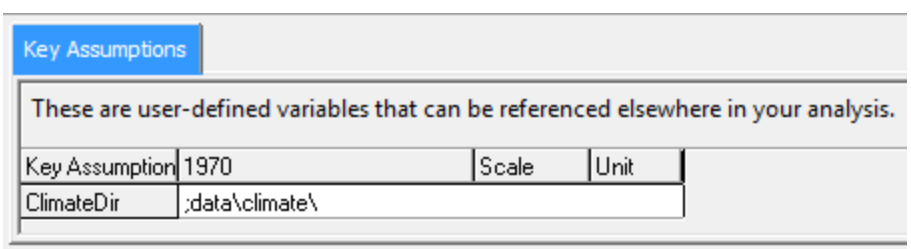
Chapter 9 Key Assumptions

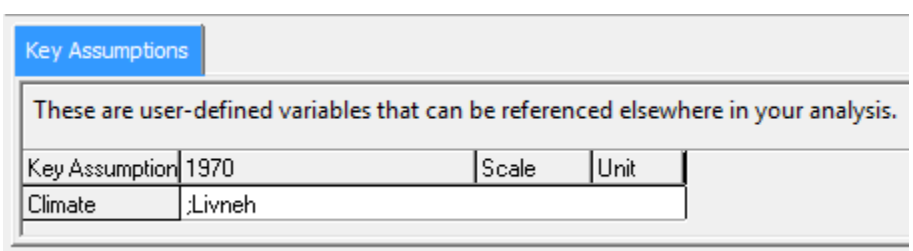
SacWAM was designed to provide flexibility in simulating system operations through the use of a set of controls or model settings. These controls can be accessed in the WEAP Data view under Key Assumptions. This chapter describes each control.



9.1 ClimateDir and Climate

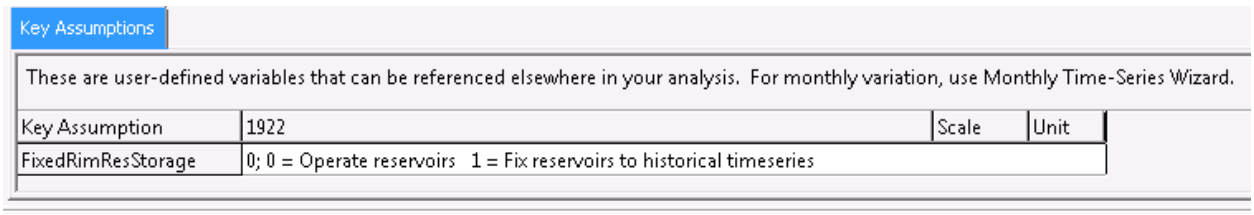
There are two Key Assumptions that are used to specify climate input data that will be used during model simulation. The *ClimateDir* parameter specifies the location or path of the climate data within the model directory. Currently, this parameter is set at “data\climate\” and likely does not need to be changed by the model user. The parameter *Climate* specifies the name of the subdirectory located within “data\climate\” that contains the actual climate data used by WEAP’s Soil Moisture Model and MABIA module. In the current version of SacWAM there is only one directory, “Livneh,” which contains the historical climate inputs derived from the Livneh et al. (2013) dataset as described in Sections 4.3 and 5.2.1. If another climate dataset is to be used, the model user should create a new subdirectory within “data\climate\” and enter the name of the new subdirectory into the *Climate* Key Assumption. In specifying the directory and subdirectory, the WEAP software uses a semi-colon (“;”) to signify a text string.





9.2 FixedRimResStorage

The Key Assumption *FixedRimResStorage* is used to select between constraining upper watershed reservoirs to operate to their historical levels and allowing the model to dynamically simulate reservoir storage driven by downstream demands and reservoir operational requirements (e.g., flood control). *FixedRimResStorage* can have a value of "0" or "1." A value of "1" will result in the use of historical storage levels. This parameter was set to "1" during model calibration and validation exercises, but should normally be set equal to "0" to allow the model logic to operate the reservoirs.



Key Assumptions

These are user-defined variables that can be referenced elsewhere in your analysis. For monthly variation, use Monthly Time-Series Wizard.

Key Assumption	1922	Scale	Unit
FixedRimResStorage	0; 0 = Operate reservoirs 1 = Fix reservoirs to historical timeseries		

FixedRimResStorage affects bounds on Top of Conservation and Top of Inactive parameters for reservoirs located in the upper watersheds:

- Black Butte Reservoir
- Camanche Reservoir
- Camp Far West
- Clear Lake
- East Park Reservoir
- Englebright Reservoir
- Folsom Lake
- Indian Valley Reservoir*
- Jenkinson Lake
- Keswick Reservoir
- Lake Berryessa
- Lake Natoma
- Lewiston Lake
- Los Vaqueros Reservoir
- New Bullards Bar
- New Hogan Reservoir
- Oroville Reservoir
- Pardee Reservoir
- Shasta Lake
- Stony Gorge Reservoir†
- Thermalito Afterbay
- Trinity Reservoir
- Whiskeytown Reservoir

*Top of Inactive only.
†Top of Conservation only.

FixedRimResStorage also affects the *Top of Buffer* parameter for the following reservoirs when reservoir operations are being dynamically simulated using model demands and logic:

- Folsom Lake
- Camp Far West
- Clear Lake
- New Hogan Reservoir
- Oroville Reservoir
- Camanche Reservoir
- Pardee Reservoir
- Lake Berryessa
- Shasta Lake
- Stony Gorge Reservoir
- Black Butte Reservoir
- New Bullards Bar

9.3 IFR and Simulate SWRCB IFRs

A set of WEAP IFR objects were created in SacWAM to allow SWRCB to study the effects of alternative flow requirements based on unimpaired flows. IFR objects were placed downstream from the major foothill reservoirs, on tributaries to the Sacramento River at their confluence with the Sacramento River, and at USGS and DWR gauge locations on the Sacramento River. These locations are listed in Table 9-1.

Table 9-1. Instream Flow Requirement Locations within SacWAM

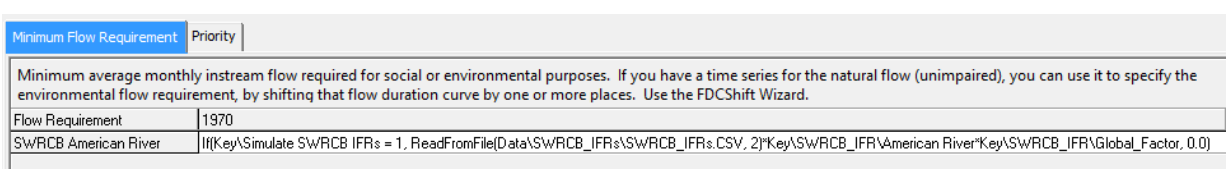
Reservoirs	Sacramento River Tributaries		Sacramento River	Other Valley Locations
Berryessa	American River	Cottonwood Creek	Above Bend Bridge	Delta outflow
Black Butte	Antelope Creek	Cow Creek	At Vina	
Camanche	Battle Creek	Deer Creek	At Hamilton City	
Camp Far West	Bear River	Feather River	At Ord Ferry	
Clear Lake	Big Chico Creek	Mill Creek	At Butte City	
Englebright	Butte Creek	Mokelumne River	At Colusa	
Folsom	Cache Creek	Putah Creek	Below Wilkins Slough	
New Hogan	Calaveras River	Stony Creek	At Knights Landing	
Oroville	Clear Creek	Thomes Creek	At Verona	
Shasta	Cosumnes River	Yuba River	At Freeport	
Trinity			At Rio Vista	

SacWAM was designed to run in an "unimpaired" mode in order to generate timeseries of unimpaired flows that can subsequently be used to create and test new flow requirements. In the unimpaired mode, all reservoirs, flow requirements, and diversions are inactive. To implement an unimpaired model run and generate unimpaired monthly timeseries for future use, the following steps should be followed:

1. Set the *Simulate Operations* key assumption to "0".
2. Turn off all UDCs by navigating to *User Defined LP Constraints* in the data tree and unchecking the "Active?" box.
3. Run the model for the user-specified time period.
4. Export unimpaired flow timeseries from SacWAM results to a file called "SWRCB_IFRs.csv" using the "SWRCB IFR Flows" favorite.
5. Place the file "SWRCB_IFRs.csv" in the directory Data\SWRCB_IFRs\ in the WEAP area directory.

Once steps 1-5 are complete it will be possible to run the model with operations and the SWRCB IFRs active and explore the impacts of the new IFRs. To do so, set *Simulate Operations*="1" and *Simulate SWRCB IFRs*="1" and reactivate UDCs.

At runtime, SacWAM will now read timeseries data in the file "SWRCB_IFRs.csv" and use the data to determine IFRs. The model user has the option of multiplying the timeseries values by a parameter found in *Key Assumptions\SWRCB_IFR*, which can be used to scale the unimpaired flow by a time-varying amount. For example, the timeseries read from SWRCB_IFRs.csv by the IFR object located on the American River at its confluence with the Sacramento River can be scaled by the parameter *Key Assumptions\SWRCB_IFR\American River*. Additionally, all of these IFRs can be scaled globally by *Key Assumptions\SWRCB_IFR\Global_Factor*.



9.4 Simulate Hydrology

The Key Assumption *Simulate Hydrology* is used to select between DWR inflow timeseries and model simulation of hydrological processes using WEAP catchment objects. *Simulate Hydrology* can be assigned a value of "0" or "1." A value of "1" activates the catchment objects.

Key Assumptions

These are user-defined variables that can be referenced elsewhere in your analysis. For monthly variation, use Month

Key Assumption	1970
Simulate Hydrology	0; 0=Use CalSim3 Inflow Time Series Data, 1=Use Upper Watershed Catchments to Simulate Hydrology

9.5 FixedUpperResStorage

The Key Assumption *FixedUpperResStorage* is used to choose between forcing the smaller reservoirs in the upper watersheds to constrain the Top of Inactive parameter to a static value or to use average monthly historical values. *FixedUpperResStorage* can have a value of "0" or "1." A value of "1" will result in the use of historical storage levels. This variable was used during calibration and validation of the model and should normally be set at "0" to allow the model logic to operate the reservoirs.

Key Assumptions

These are user-defined variables that can be referenced elsewhere in your analysis. For monthly variation, use Monthly Time-Series Wizard.

Key Assumption	1922	Scale	Unit
FixedUpperResStorage	1; 0 = Set TOC and TOI to single values 1 = Fix TOC and TOI to average monthly storage		

- *FixedUpperResStorage* affects Top of Inactive storage for the following reservoirs
- Bowman Lake
- French Meadows
- Hell Hole
- Ice House
- Jackson Meadows Reservoir
- Lake Almanor
- Lake Combie
- Lake Fordyce
- Lake Spaulding
- Little Grass Valley Reservoir
- Loon Lake
- Merle Collins Reservoir
- Rollins Reservoir
- Scotts Flat Reservoir
- Sly Creek Reservoir
- Stony Gorge Reservoir
- Union Valley Reservoir

9.6 Use Water Board Vernalis Inflow

The Key Assumption *Use Water Board Vernalis Inflow* is used to select between two different flow timeseries for representing boundary inflows on the San Joaquin River at Vernalis. If a value of "0" is selected, a timeseries derived from CalSim II is used. If a value of "1" is selected, a timeseries developed during SWRCB's Phase 1 process is used. For further details, see Section 7.2.2.2 in Chapter 7 on Other Assumptions.

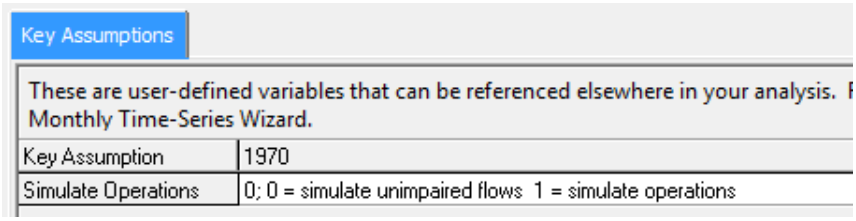
Key Assumptions

These are user-defined variables that can be referenced elsewhere in your analysis. For monthly variati

Key Assumption	1970
Use Water Board Vernalis Inflow	0; 0=Use CalSim2 Vernalis Inflow, 1=Use Water Board Vernalis Inflow

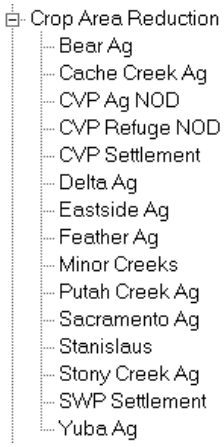
9.7 Simulate Operations

The Key Assumption *Simulate Operations* is used to select between two different simulation modes. If the variable is set to "0" then the model simulates unimpaired flows by switching off all reservoirs, IFRs, and transmission links. This option was provided so that the model can be used to generate unimpaired flow timeseries for the creation of IFRs (see Section 9.3). If this variable is set to "1" then all operations are simulated.



9.8 Crop Area Reduction

The Key Assumptions located under *Crop Area Reduction* are used as multiplicative factors to reduce the ICA. The factors should be assigned values between 0 and 1.



These factors are applied in the area expressions for the crops in each DU (below). The factor is multiplied by the area for each crop. The value of one minus the factor is multiplied by the total irrigated area of the DU in the Fallow crop class. The combination of these expressions reduces ICA by the factor and increases the fallow area by an equivalent amount, thereby maintaining the same land area. Different DUs are affected by different reduction factors as indicated in Table 9-2.

Area | Crops | Surface Layer Thickness | Total Soil Thickness | Soil Water Capacity

Enter the land area for branch, or branch's share of land area from branch above.

Range: 0 and higher

Demand Sites and Catchment	1922	Scale	Unit
A_03_PA			N/A
Irrigated Agriculture			N/A
Al Pist	0		AC
Alfalfa	108.09 * Key\Crop Area Reduction\CVP Ag NOD		AC
Corn	0		AC
Cotton	0		AC
Cucurb	0		AC
DryBean	0		AC
Fallow	2037.25 * (1-Key\Crop Area Reduction\CVP Ag NOD)		AC
Fr Tom	0		AC
Grain	35.18 * Key\Crop Area Reduction\CVP Ag NOD		AC
On Gar	0		AC
Oth Dec	57.87 * Key\Crop Area Reduction\CVP Ag NOD		AC
Oth Fld	23.47 * Key\Crop Area Reduction\CVP Ag NOD		AC
Oth Trk	17.35 * Key\Crop Area Reduction\CVP Ag NOD		AC
Pasture	1794.43 * Key\Crop Area Reduction\CVP Ag NOD		AC
Potato	0		AC

Table 9-2. Demand Unit Crop Area Reduction Factors and Associated Demand Units

Reduction Factor	DU Prefix	Affected Demand Units
Bear Ag	A_	23_NA, 24_NA1, 24_NA2, 24_NA3
Cache Creek Ag	A_	20_25_NA1
CVP Ag NOD	A_	02_PA, 03_PA, 04_06_PA1, 04_06_PA2, 07_PA, 08_PA, 16_PA, 21_PA
CVP Settlement	A_	02_SA, 03_SA, 08_SA1, 08_SA2, 08_SA3, 09_SA1, 09_SA2, 18_19_SA, 21_SA, 22_SA1
Delta Ag	A_	50_NA1, 50_NA2, 50_NA3, 50_NA4, 50_NA5, 50_NA6, 50_NA7
Eastside Ag	A_	60N_NA1, 60N_NA3, 60N_NA4, 60N_NA5, 60S_PA
Feather Ag	A_	12_13_NA
Minor Creeks	A_	02_NA, 03_NA, 04_06_NA, 05_NA, 10_NA
Putah Creek Ag	A_	20_25_NA2, 20_25_PA, SIDSH
Sacramento Ag	A_	08_NA, 09_NA, 11_NA, 16_NA, 17_NA, 18_19_NA, 21_NA, 22_NA
Stanislaus	A_	61N_NA2, 61N_NA3, 61N_PA
Stony Creek Ag	A_	04_06_PA3
SWP Settlement	A_	11_SA1, 11_SA2, 11_SA3, 11_SA4, 12_13_SA, 14_15N_SA, 15S_SA, 16_SA, 17_SA, 22_SA2
Yuba Ag	A_	14_15N_NA2, 14_15N_NA3, 15S_NA
CVP Refuge NOD	R_	None

9.9 Allocation Reduction

The Key Assumptions located under *Allocation Reduction* are used as multiplicative factors to reduce allocations beyond the reduction that occurs through the logic described in Chapter 7. There are a total of 10 different allocation types that can be adjusted using these Key Assumptions (see below). These Allocation Reduction factors should have values between 0 and 1.

- Allocation Reduction
  - CVP Settlement
  - CVP Ag NOD
  - CVP MI NOD
  - CVP Refuge NOD
  - CVP Exchange
  - CVP Ag SOD
  - CVP MI SOD
  - CVP Refuge SOD
  - SWP Settlement
  - SWP SOD

9.10 Use Baseline Trinity Imports

The *Use Baseline Trinity Imports* Key Assumption is used to specify whether the model should use a baseline timeseries of Trinity River imports through the Clear Creek Tunnel or dynamically determine these imports based on storage conditions. If a value of "1" is entered, a monthly timeseries of flows through the Clear Creek Tunnel will be read from Data\Diversions\SACVAL_ClearCreekTunnel_DiversionFlows.csv. If a value of "0" is entered, the model will simulate Clear Creek Tunnel flows using the logic described in Chapter 7.

Key Assumptions

These are user-defined variables that can be referenced elsewhere in your analysis. For monthly variation, use Monthly Time-Series Wizard.

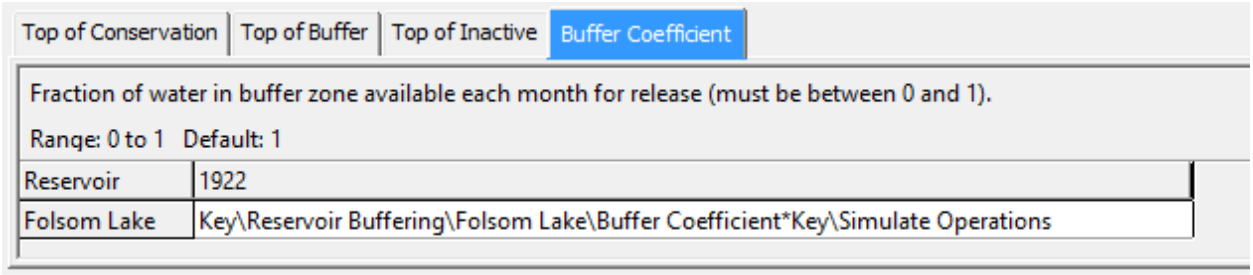
Key Assumption	1922
Use Baseline Trinity Imports	0; 0=do not use baseline time series of Trinity Imports 1 = utilize baseline time series of Trinity Imports

9.11 Reservoir Buffering

The Key Assumptions under Reservoir Buffering can be used to set the buffer pool volume and buffer coefficient for upper watershed reservoirs. These Key Assumptions were provided to simplify the specification of buffering parameters for reservoirs of interest to SWRCB.

- Reservoir Buffering
  - Black Butte
    - Buffer Pool
    - Buffer Coefficient
  - Camanche
  - Camp Far West
  - Clear Lake
  - Folsom Lake
  - Lake Berryessa
  - New Bullards Bar
  - New Hogan
  - Oroville
  - Pardee
  - Shasta
  - Stony Gorge

These Key Assumptions are, in turn, read into the expressions for Top of Buffer and Buffer Coefficient parameters in the reservoir interface, as shown in the example below.



9.12 Constrain Unimpaired Run GW Pumping

The Key Assumption *Constrain Unimpaired Run GW Pumping* affects model access to groundwater. A value of "1" adds groundwater pumping limits; a value of "0" does not impose groundwater pumping limits in the model. For more details on model limits to groundwater pumping, see the Groundwater Pumping discussion in Section 3.3.

9.13 Units

Different data sources use different units. The Key Assumptions under *Units* contain conversion factors for TAF/month to cfs (*TAFmonth2CFS*), inches to millimeters (*in2mm*), and cfs to cubic meters per month (*convertcfstom3*).