RECLAMATION

Managing Water in the West

CalLite 2.0 Screening Model

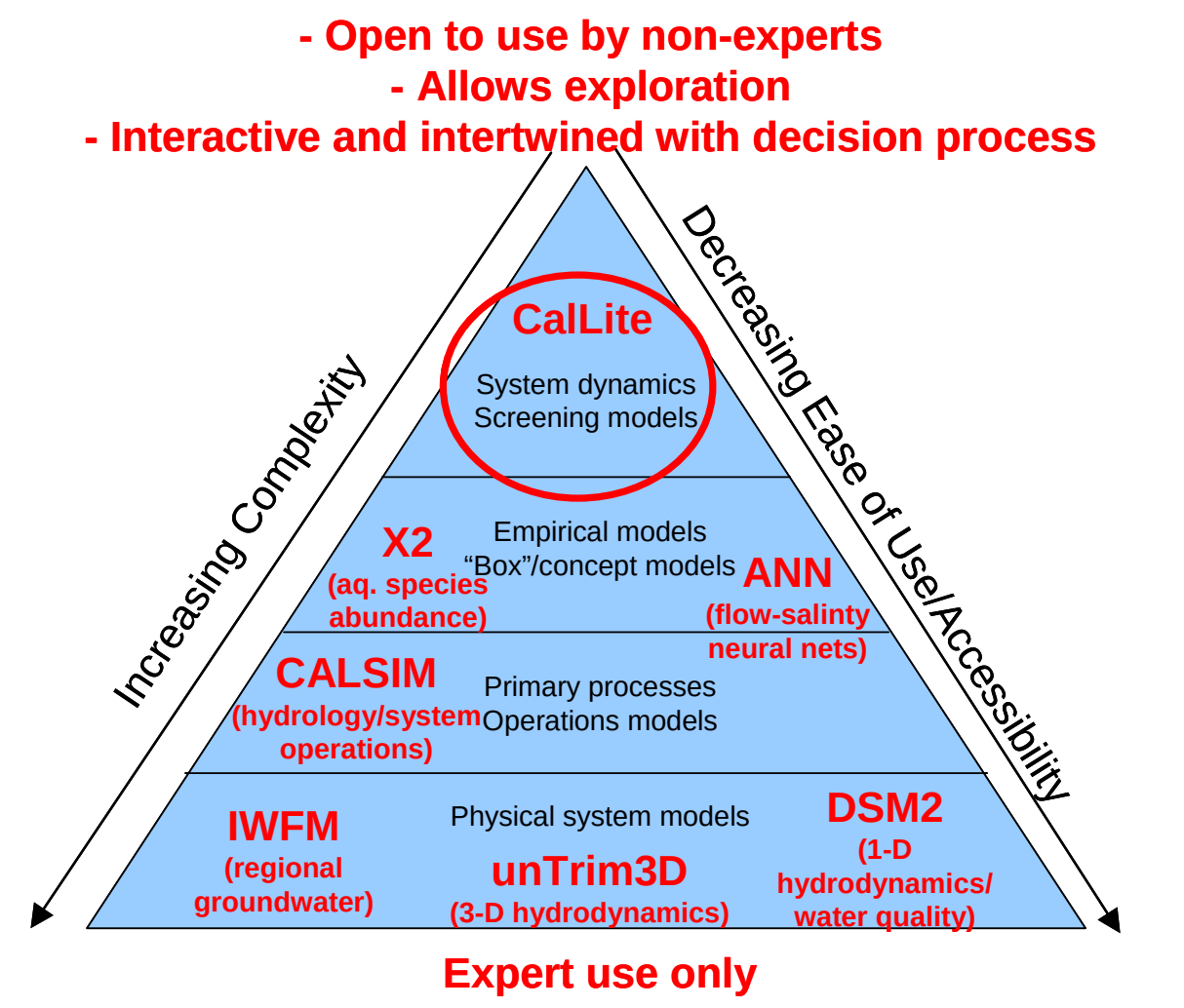
Tom FitzHugh

U.S. Bureau of Reclamation

February 21-22, 2012

U.S. Department of the Interior
Bureau of Reclamation

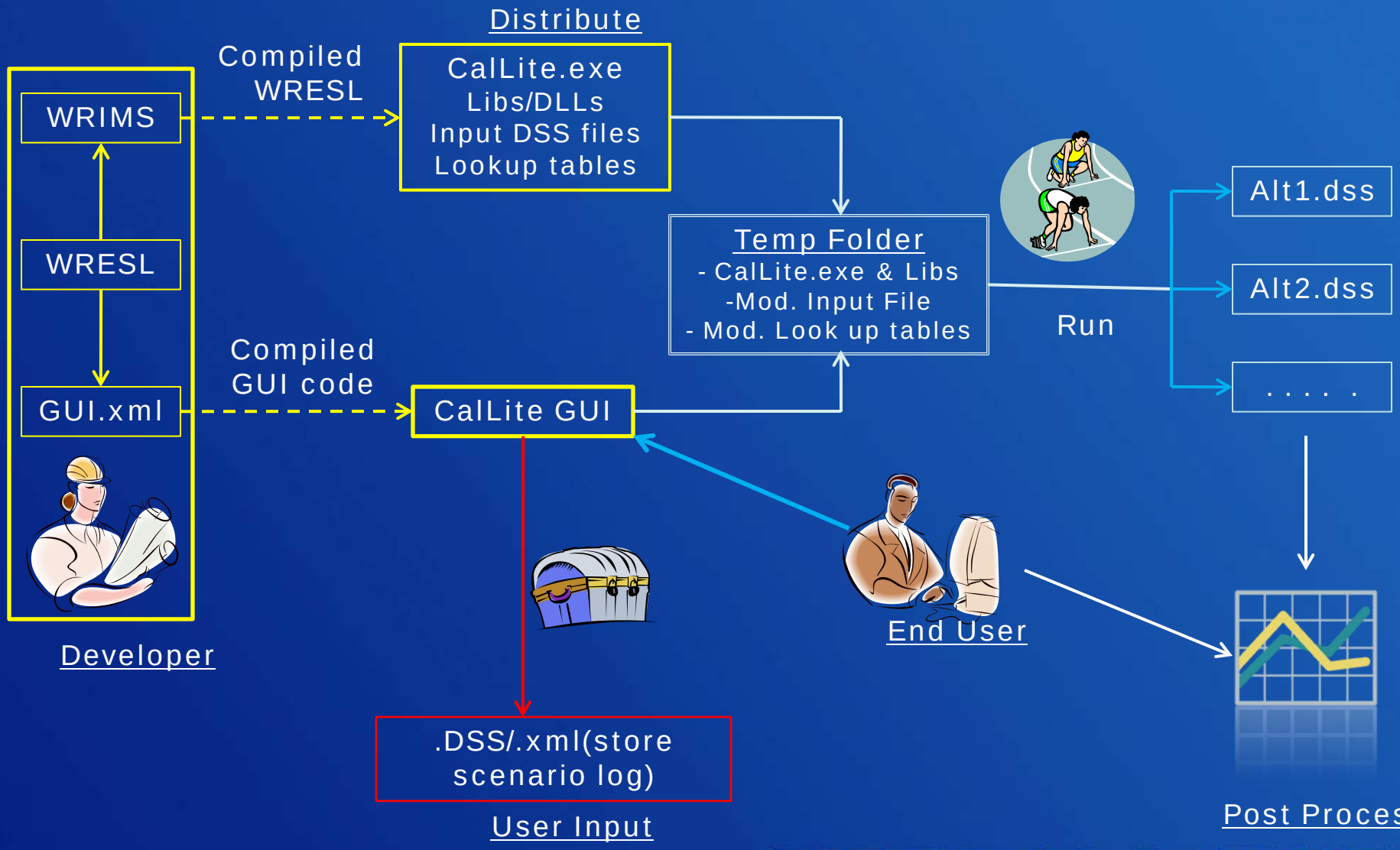
What is CalLite?



CalLite 2.0 Development Objectives

- Create a WRIMS-based screening model that:
  - Closely replicates key features and results of the detailed CalSim model, with much faster run-time
  - Has a user-friendly and flexible GUI
- Two types of CalLite use:
  - Educational use by interested stakeholders
  - Study production by model developers and water resources management professionals
- Developed in conjunction with CA DWR

CalLite 2.0 Design



RECLAMATION

CalLite 2.0 GUI

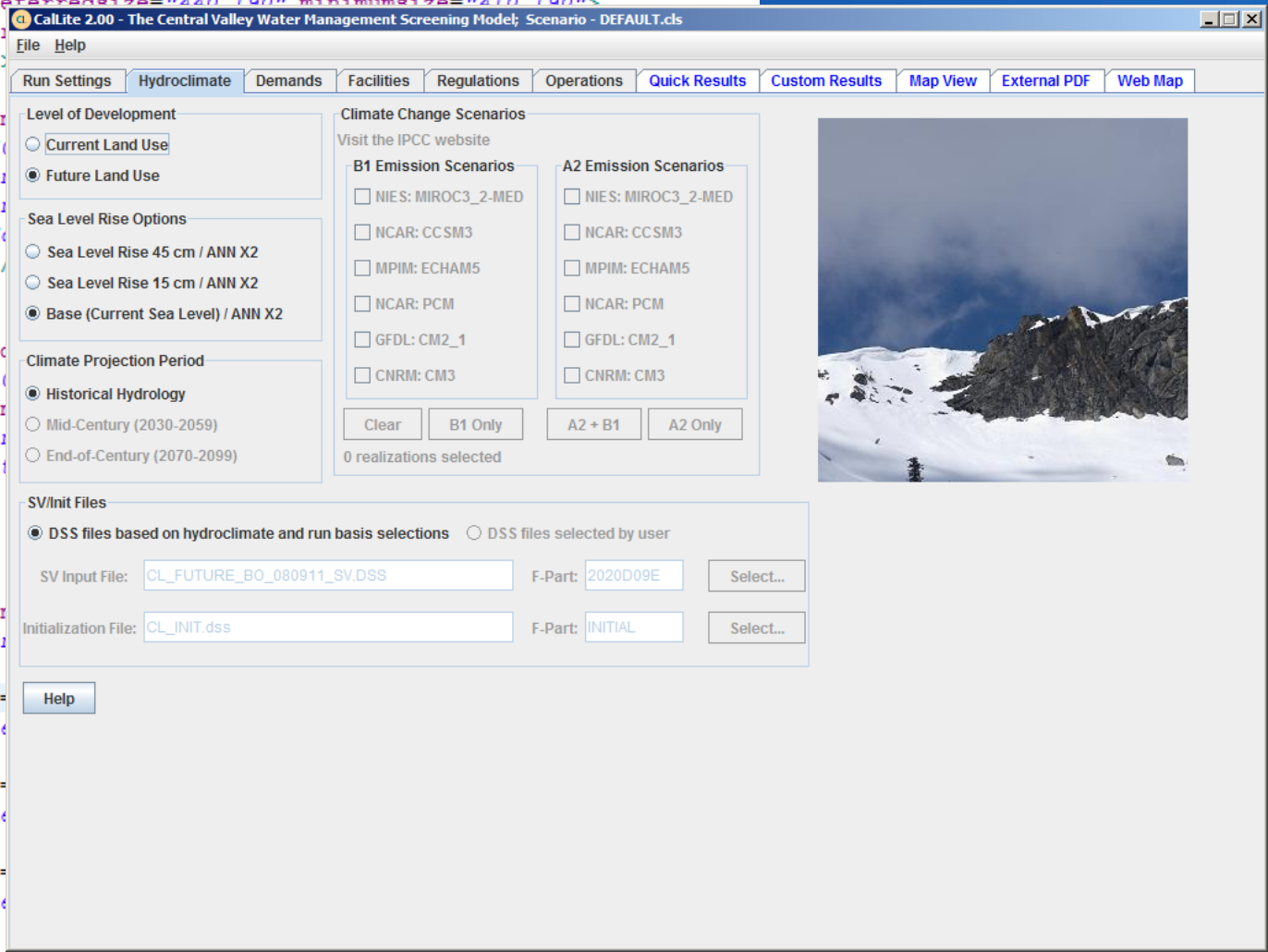
- **Scenario Construction**
  - **User can adjust hydrologic inputs, regulations, facilities, and other scenario settings to set up and run quick screening analyses**
- **Data and Results Visualization**
  - **Quick Results: focus on commonly needed views (timeseries, tables, statistical summaries, exceedence plots) for key system variables**
  - **Custom Results: extend output views to custom multiple-variable and derived-variable constructs**
  - **Spatial Selection of Results: Schematic and Google Map views of results**

GUI Flexibility

- GUI separate from WRIMS model but both can be adjusted in tandem as needs evolve
- Model criteria options and results options defined separately from model code
  - Reconfigurable without recompiling
  - Modeler can control labels, time series, etc. without programming
- Open source, portable implementation
  - Eclipse + Java + SwiXML + HECDSS + JFreeChart

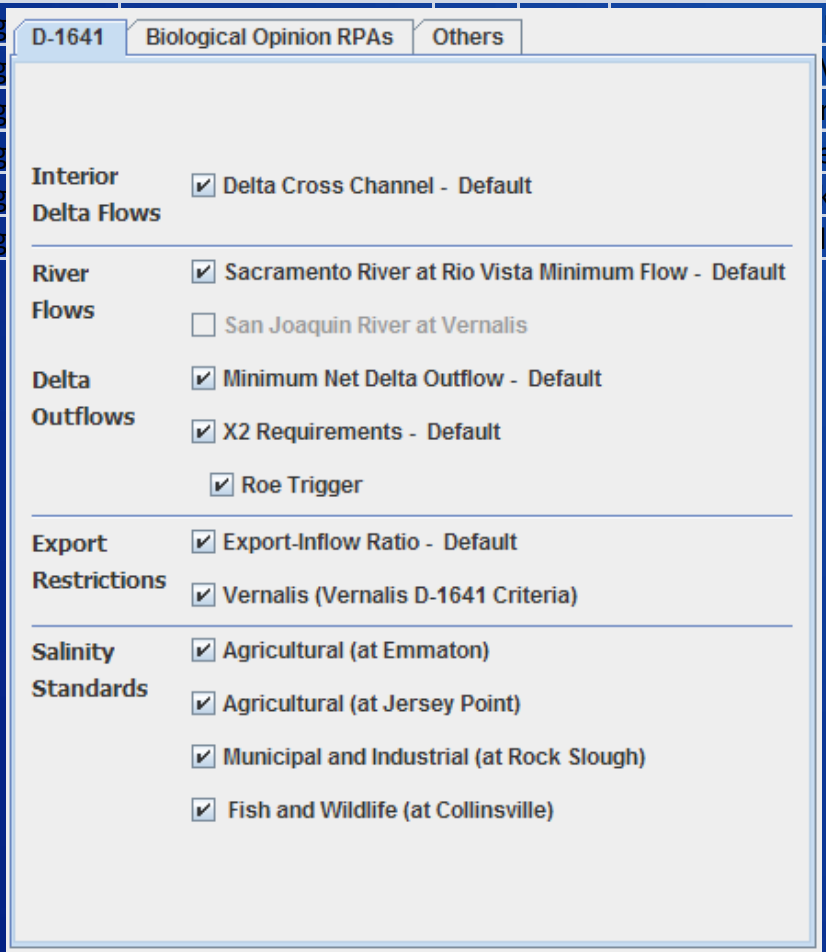
GUI.xml

```
<panel id="controls" resizeable="true" layout="GridBagLayout"
    preferredsize="450,748">
    <gridbagconstraints anchor="GridBagConstraints.NORTHWEST"
        gridx="0" gridy="0" gridheight="2" />

    <panel id="ss" resizeable="false" border="TitledBorder(Scenarios)"
        layout="GridBagLayout" preferredsize="440,190" minimumsize="410,190">
        <gridbagconstraints anchor
            gridx="0" gridy="0" />
        <hbox>
            <gridbagconstraints an
                gridx="0" gridy="
            <button id="btnAddScen
            <button id="btnDelScen
            <button id="btnClearSc
                text="Clear All" /
        </hbox>

        <scrollpane name="spsl" id
            preferredsize="410,100
            <gridbagconstraints in
                anchor="GridBagCon
            <list id="SelectedList
            </list>
        </scrollpane>

        <hbox>
            <gridbagconstraints in
                anchor="GridBagCon
            <buttongroup>
                <radiobutton name=
                    selected="true
                </radiobutton>
                <radiobutton name=
                    enabled="false
                </radiobutton>
                <radiobutton name=
                    enabled="false
                </radiobutton>
```



GUI_Links2.table

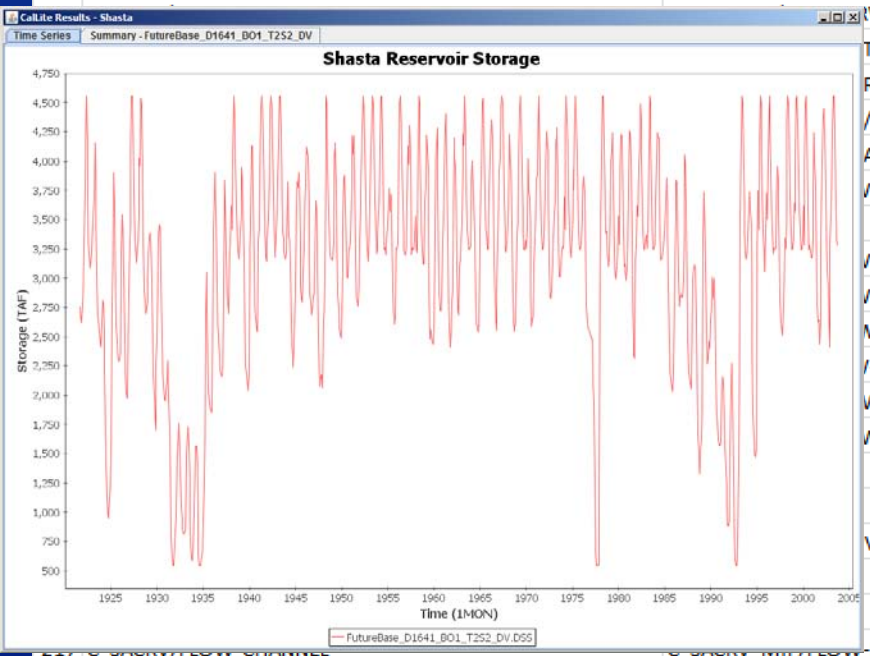
ckbReg3	GUI_D1641Regs.table	1	-2	DCC_DLTSW - Delta Cross Channel	Regulations	gui_xchanneldays
ckbReg8	GUI_D1641Regs.table	2	-2	EI_DLTSW - Export-Inflow Ratio	Regulations	gui_EIRatio
ckbReg6	GUI_D1641Regs.table	3	-2	NDO_DLTSW - Minimum Net Delta Outflow	Regulations	GUI_NDO_Flow
ckbReg4	GUI_D1641Regs.table	4	-2	RV_DLTSW - Sacramento River at Rio Vista Minimum Fl	Regulations	gui_RioVista
ckbReg7	GUI_D1641Regs.table	5	-2	X2_DLTSW - X2 Requirements	Regulations	gui_x2active|gui_x2km
ckbReg				Roe Trigger	Regulations	
ckbReg				Vernalis	Regulations	
ckbReg				maton	Regulations	
ckbReg				ey Point	Regulations	
ckbReg				k Slough	Regulations	
ckbReg				linsville	Regulations	



RECLAMATION

GUI_Links3.table

ID	Primary	Secondary	Ytitle	Title	Slegend
102	S_TRNTY/STORAGE	null	Storage	Trinity Reservoir Storage	null
103	S_SHSTA/STORAGE+SHSTAE/STORAGE	null	Storage	Shasta Reservoir Storage	null
104	S_FOLSM/STORAGE	null	Storage	Folsom Reservoir Storage	null
105	S_TRNTY/STORAGE+S_SHSTA/STORAGE+S_FOLSM/STORAGE	null	Storage	CVP North of Delta Storage	null
106	S_SLCVP/STORAGE	null	Storage	CVP San Luis Reservoir Storage	null
107	S_OROVL/STORAGE	null	Storage	Oroville Reservoir Storage	null
108	S_SLSWP/STORAGE	null			
111	S_TRNTY/STORAGE	S_TRNTYLEVEL4DV/STORAGE-LEVE			
112	S_SHSTA/STORAGE+SHSTAE/STORAGE	S_SHSTALEVEL5DV/STORAGE-LEVE			
113	S_FOLSM/STORAGE	S_FOLSMLEVEL5DV/STORAGE-LEVI			
218	C_OMR/FLOW-CHANNEL	C_INDNSL/FLOW-CHANNEL			
219	C_SJRVI/FLOW-CHANNEL	null			



PDF Report Template

```
# A template file to compare calsim with callite
SCALAR
NAME            VALUE
FILE_BASE       test/2020D09E_121510_DV.DSS #input file 1
NAME_BASE       CalSim
FILE_ALT        test/CL_2020D09E_BO_121510_DV.DSS # input file 2
NAME_ALT        CalLite
OUTFILE         test/Calsim_vs_Callite_021611.pdf
NOTE            "Notes: Corroboration Study with BO; CalSim: BO ver
ASSUMPTIONS     "Assumptions: Future Condition; Wheeling is On"
MODELER         "Nazrul Islam"
END

PATHNAME_MAPPING
VARIABLE                          VAR_CATEGORY    REPORT_TYPE
"Trinirty Storage"                S               Exceedance
"Shasta Storage"                  S               Exceedance
"FolSom Storage"                  S               Exceedance
"NOD Storage"                     S               Exceedance_
"Orovile Storage"                 S               Exceedance
"CVP SanLuis Storage"             S               Exceedance
"SWP SanLuis Storage"             S               Exceedance
"River Flow"                      RF              Average
"Trinity R blw Lewiston"          RF              Average
"Trinity Export"                  RF              Average
"Clear Cr blw Whiskeytown"        RF              Average
"Sacramento R @ Keswick"          RF              Average
"Sacramento R @ Wilkins Slough"   RF              Average
"Feather R blw Thermalito"        RF              Average
"American R blw Nimbus"           RF              Average
"Delta Inflow"                    DI              Average_post
"Sacramento R @ Hood"             DI              Average
"Yolo Bypass"                     DI              Average
"Mokelumne R"                     DI              Average
"San Joaquin R & Calaveras"       DI              Average
"Delta Outflow"                   DO              Average
"Delta Outflow for X2 and NDO"    DO              Average
"Delta Exports"                   DE              Average_post
"Banks SWP"                       DE              Average
"Banks CVP"                       DE              Average
"Jones"                           DE              Average
"SWP SOD Deliveries"              SWPSOD          Avg_Excd_post
"Table A (Incl. Article 56)"      SWPSOD          Average
"Article 21"                      SWPSOD          Average
"Article 56"                      SWPSOD          Average
"CVP SOD Deliveries"              CVPSOD          Avg_Excd
"SWP Table A Allocation"          ALLOC           Exceedance
                                                  //D100/FLOW-DELIVERY//1MON//
                                  //C3/FLOW-CHANNEL//1MON//
                                  //C5/FLOW-CHANNEL//1MON//
                                  //C129/FLOW-CHANNEL//1MON//
                                  //C203/FLOW-CHANNEL//1MON//
                                  //C9/FLOW-CHANNEL//1MON//
                                  //C400+C157+C504+C644/FLOW-CHANNEL//1MON//
                                  //C400/FLOW-CHANNEL//1MON//
                                  //C157/FLOW-CHANNEL//1MON//
                                  //C504/FLOW-CHANNEL//1MON//
                                  //C644/FLOW-CHANNEL//1MON//
                                  //C407/FLOW-CHANNEL//1MON//
                                  //D407/FLOW-DELIVERY//1MON//
                                  //D419+D419_CVP+D418/FLOW-DELIVERY//1MON//
                                  //D419/FLOW-DELIVERY//1MON//
                                  //D419_CVP/FLOW-DELIVERY//1MON//
                                  //D418/FLOW-DELIVERY//1MON//
                                  //SWP_TA_TOTAL+SWP_IN_TOTAL+SWP_CO_TOTAL///1MON//
                                  //SWP_TA_TOTAL/SWP_DELIVERY//1MON//
                                  //SWP_IN_TOTAL/SWP_DELIVERY//1MON//
                                  //SWP_CO_TOTAL/SWP_DELIVERY//1MON//
                                  //CVPTOTALDEL/FLOW-DELIVERY//1MON//
                                  //SWP_PERDELDV/SWP-DELIVERY//1MON//
```

System Flow Comparision: CalLite vs CalLite

Comparison of T2S1 and T2S2

Standard

	1922-2003				1929-1934				1987-1992			
	CalLite	CalLite	Diff	% Diff	CalLite	CalLite	Diff	% Diff	CalLite	CalLite	Diff	% Diff
River Flow												
Trinity R blw Lewiston	695	695	1	0	411	411	0	0	472	472	0	0
Trinity Export	538	537	2	0	384	431	-48	-11	431	479	-48	-10
Clear Cr blw Whiskeytown	122	122	0	0	85	85	0	0	102	102	0	0
Sacramento R @ Keswick	6262	6260	3	0	4090	4160	-69	-2	4481	4619	-137	-3
Sacramento R @ Wilkins Slough	6619	6625	-6	0	4066	4140	-73	-2	4724	4883	-159	-3
Feather R blw Thermalito	3167	3170	-3	0	1633	1614	19	1	1625	1567	57	4
American R blw Nimbus	2385	2386	-1	0	1268	1269	-1	0	1119	1135	-16	-1
Delta Inflow	**21574**	**21584**	**-10**	**0**	**9976**	**10031**	**-55**	**-1**	**10469**	**10588**	**-119**	**-1**
Sacramento R @ Hood	15596	15584	12	0	8324	8378	-55	-1	9102	9220	-118	-1
Yolo Bypass	2287	2309	-22	-1	101	101	0	0	141	142	-1	-1
Mokelumne R	666	666	0	0	206	206	0	0	155	155	0	0
San Joaquin R & Calaveras	3024	3024	0	0	1346	1346	0	0	1071	1071	0	0
Delta Outflow	**14587**	**15166**	**-579**	**-4**	**5124**	**5515**	**-390**	**-7**	**5415**	**6023**	**-608**	**-10**
Delta Outflow for X2 and NDO	4382	4337	45	1	4119	4025	94	2	3859	3924	-65	-2
Delta Exports	**6015**	**5449**	**566**	**10**	**3682**	**3347**	**336**	**10**	**3817**	**3330**	**487**	**15**
Banks SWP	3498	3039	459	15	2164	1844	320	17	2167	1787	379	21
Banks CVP	82	76	7	9	13	11	1	13	25	17	8	44
Jones	2435	2335	101	4	1506	1491	14	1	1625	1525	100	7
SWP SOD Deliveries	**3481**	**3016**	**465**	**15**	**2144**	**1809**	**336**	**19**	**2177**	**1769**	**409**	**23**
Table A (Incl. Article 56)	3095	2779	316	11	1735	1694	41	2	1970	1671	299	18
Article 21	264	110	154	139	373	82	291	357	156	21	135	656
Article 56	122	126	-4	-3	36	33	3	9	51	77	-26	-33
CVP SOD Deliveries	**2624**	**2518**	**106**	**4**	**1490**	**1465**	**25**	**2**	**1742**	**1633**	**109**	**7**

CalLite Model Use

- **Freely available:**
  - **Agencies supporting limited XA solver version**
  - **No FORTRAN compiler required**
- **Screening evaluations facilitated by:**
  - **Fast run-time (5 minutes)**
  - **Adjustable settings**

CalLite Model Use

- Experienced WRIMS modelers can go beyond GUI options in modifying settings
- Useful for:
  - Evaluating risk in meeting operational objectives, i.e. trade-offs between delivering water and environmental requirements
  - Quantifying operational flexibility through comparison of multiple scenarios

Anticipated Applications

- Water plan updates
- Reservoir and system reoperation studies
- O&M daily operation/forecasting tool
- Storage investigations (new facilities)
- Cost Allocation
- Delta alternative investigations
- Stakeholder education

CalLite 2.00 - The Central Valley Water Management Screening Model; Scenario - DEFAULT.cls

File Help

Run Settings | Hydroclimate | Demands | Facilities | Regulations | Operations | Quick Results | Custom Results | Map View | External PDF | Web Map

Load Scenario...

Save Scenario

Save As...

View Scenario Settings

Scenario Name: DEFAULT.cls

DSS File Name: DEFAULT_DV.DSS

Scenario Description

The default scenario contains Future Land Use, Base ANN Sea Level Rise, Historical Hydrology, SWP Full Table A, CVP Full Contract, D1641 regulation along with BO RPAs, Wheeling and Intertie.

Run Period

	Month	Year
Start	Oct	1921
End	Sep	2003

Run Type

- (•) Deterministic
- ( ) Probabilistic

Run Basis

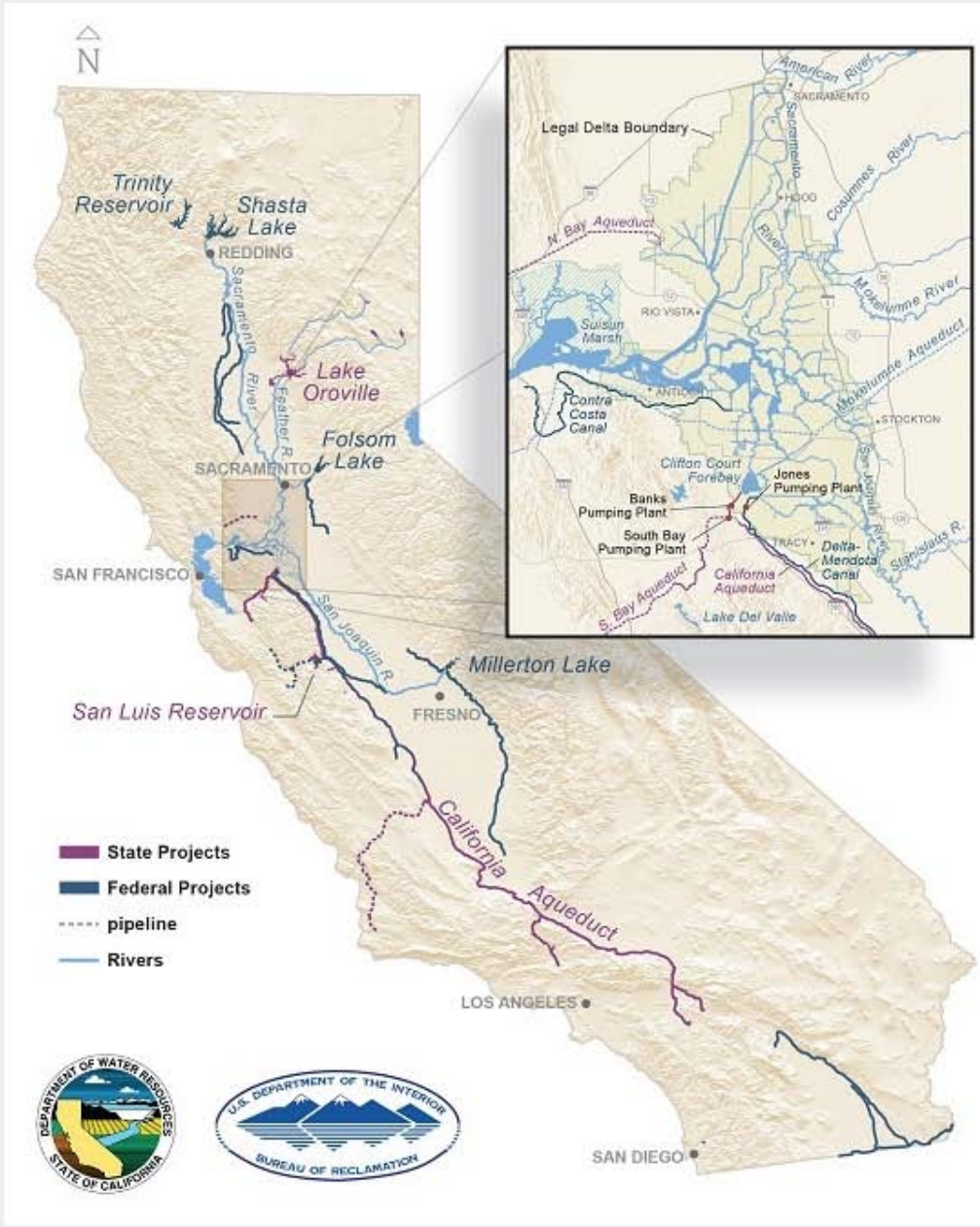
- ( ) Pre-Biological Opinion
- (•) Biological Opinions

Batch runs

Under Construction

Run Scenario

Help



CalLite 2.00 - The Central Valley Water Management Screening Model; Scenario - DEFAULT.cls

File Help

Run Settings | Hydroclimate | Demands | Facilities | Regulations | Operations | Quick Results | Custom Results | Map View | External PDF

D-1641 | Biological Opinion RPAs | Others

Interior Delta Flows
- [x] Delta Cross Channel - Default

River Flows
- [x] Sacramento River at Rio Vista Minimum Flow - Default
- [ ] San Joaquin River at Vernalis

Delta Outflows
- [x] Minimum Net Delta Outflow - Default
- [x] X2 Requirements - Default
  - [x] Roe Trigger

Export Restrictions
- [x] Export-Inflow Ratio - Default
- [x] Vernalis (Vernalis D-1641 Criteria)

Salinity Standards
- [x] Agricultural (at Emmaton)
- [x] Agricultural (at Jersey Point)
- [x] Municipal and Industrial (at Rock Slough)
- [x] Fish and Wildlife (at Collinsville)

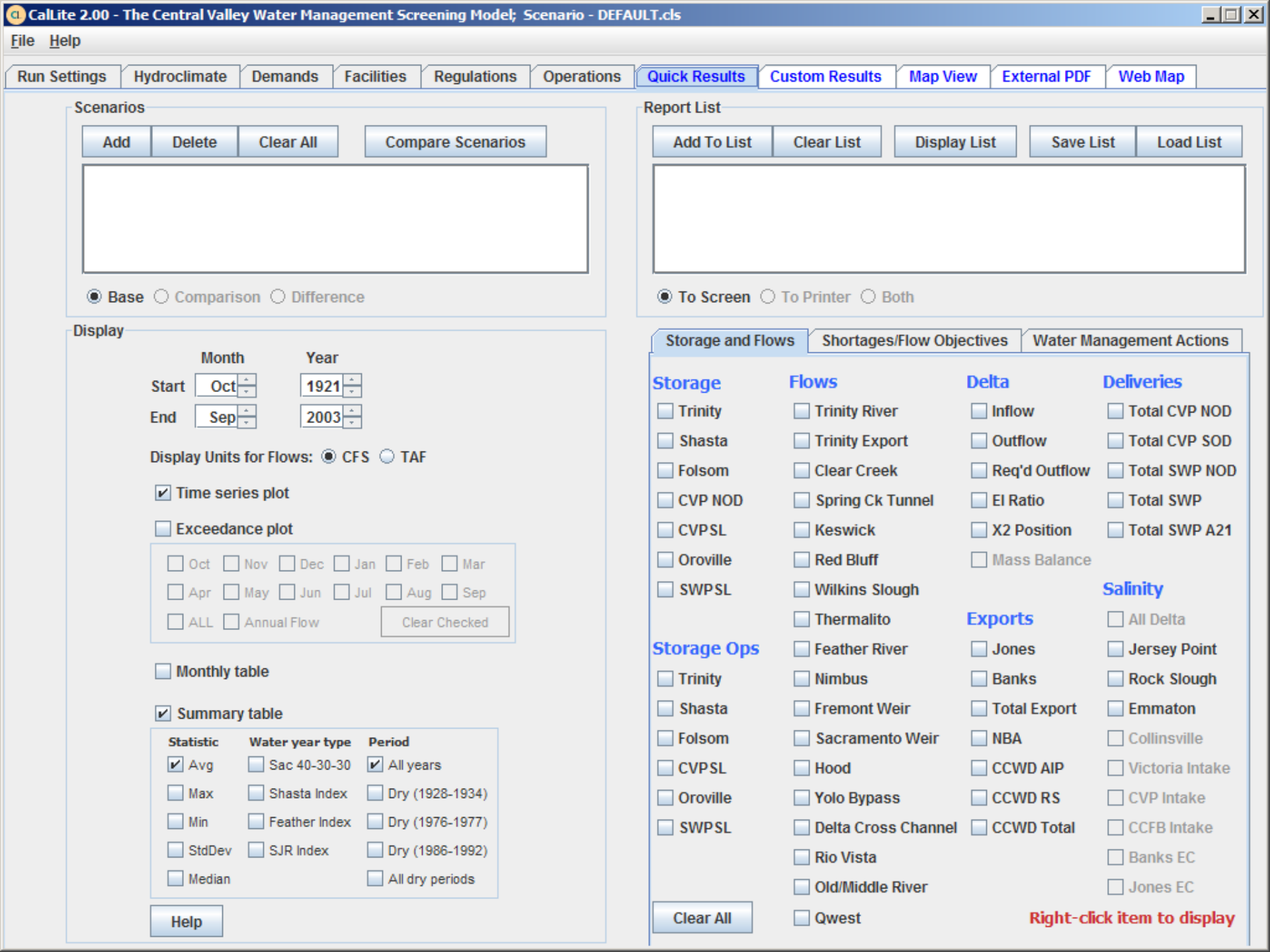
Help

Sacramento River at Rio Vista Minimum Flow

Copy | Paste | (•) D-1641 | ( ) User defined

month	Wet	Above Nor...	Below Nor...	Dry	Critical
1	4000	4000	4000	4000	3000
2	4500	4500	4500	4500	3500
3	4500	4500	4500	4500	3500
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	3000	3000	3000	3000	3000

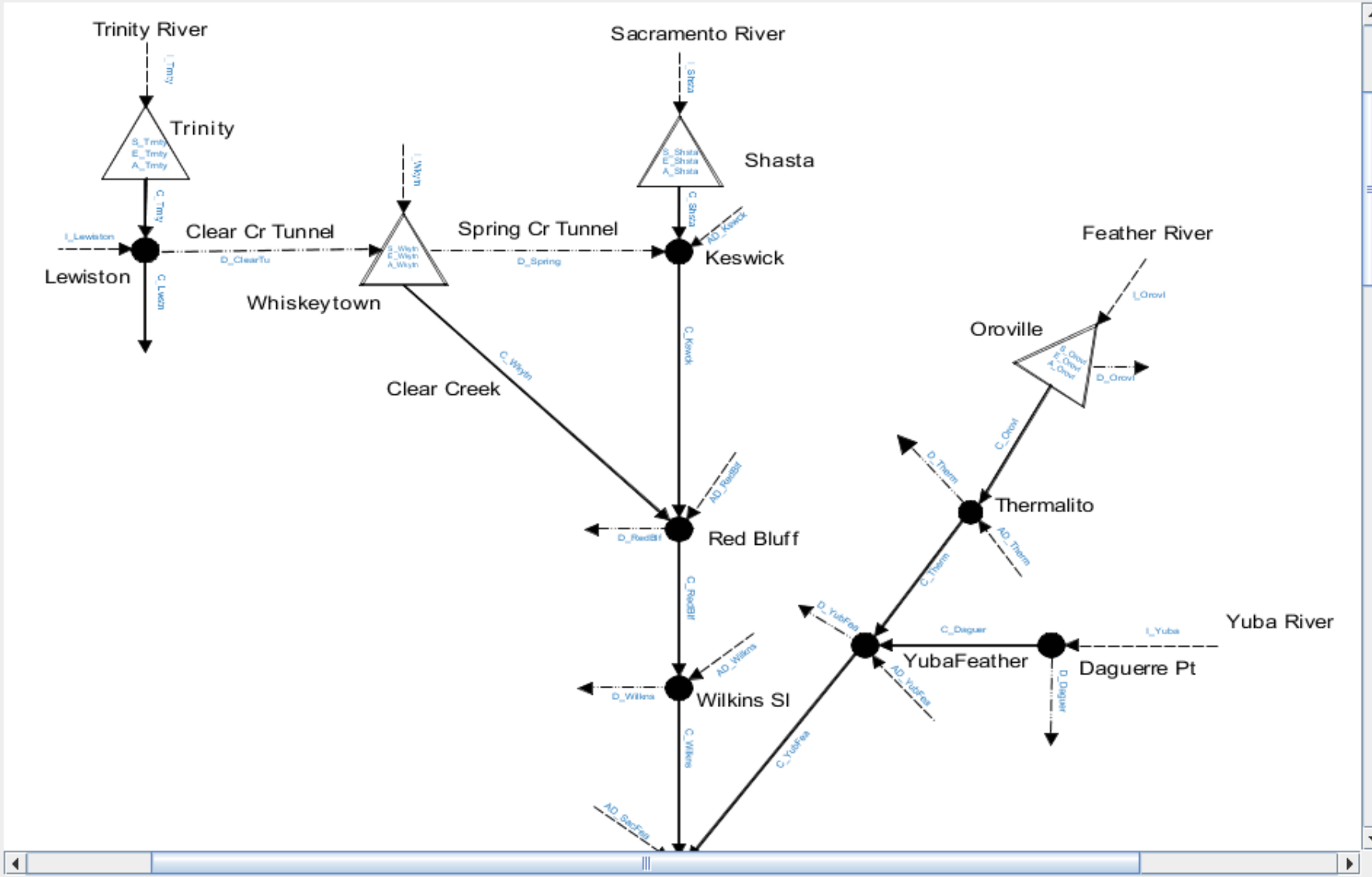
Access regulation table by selecting or right-clicking on item at left


CalLite 2.00 - The Central Valley Water Management Screening Model; Scenario - DEFAULT.cls
File
Help
Run Settings
Hydroclimate
Demands
Facilities
Regulations
Operations
Quick Results
Custom Results
Map View
External PDF
Web Map
Scenarios
Add
Delete
Clear All
Compare Scenarios
Base
Comparison
Difference
Report List
Add To List
Clear List
Display List
Save List
Load List
To Screen
To Printer
Both
Display
Month
Year
Start
Oct
1921
End
Sep
2003
Display Units for Flows:
CFS
TAF
Time series plot
Exceedance plot
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
ALL
Annual Flow
Clear Checked
Monthly table
Summary table
Statistic
Avg
Max
Min
StdDev
Median
Water year type
Sac 40-30-30
Shasta Index
Feather Index
SJR Index
Period
All years
Dry (1928-1934)
Dry (1976-1977)
Dry (1986-1992)
All dry periods
Help
Storage and Flows
Shortages/Flow Objectives
Water Management Actions
Storage
Trinity
Shasta
Folsom
CVP NOD
CVPSL
Oroville
SWPSL
Storage Ops
Trinity
Shasta
Folsom
CVPSL
Oroville
SWPSL
Flows
Trinity River
Trinity Export
Clear Creek
Spring Ck Tunnel
Keswick
Red Bluff
Wilkins Slough
Thermalito
Feather River
Nimbus
Fremont Weir
Sacramento Weir
Hood
Yolo Bypass
Delta Cross Channel
Rio Vista
Old/Middle River
Qwest
Delta
Inflow
Outflow
Req'd Outflow
EI Ratio
X2 Position
Mass Balance
Exports
Jones
Banks
Total Export
NBA
CCWD AIP
CCWD RS
CCWD Total
Deliveries
Total CVP NOD
Total CVP SOD
Total SWP NOD
Total SWP
Total SWP A21
Salinity
All Delta
Jersey Point
Rock Slough
Emmaton
Collinsville
Victoria Intake
CVP Intake
CCFB Intake
Banks EC
Jones EC
Clear All
Right-click item to display

CalLite 2.00 - The Central Valley Water Management Screening Model; Scenario - DEFAULT.cls

File Help

Run Settings | Hydroclimate | Demands | Facilities | Regulations | Operations | Quick Results | Custom Results | Map View | External PDF | Web Map



Click: on an element for data; shift+click: then drag to pan; ctrl+click: then drag to zoom in
Shift+right click: then move mouse up and down to zoom in/out; ctrl+right click: to rotate schematic

Help

CalLite 2.0 Development Team

- DWR
  - Richard Chen
  - Hao Xie
  - Kevin Fung and Kevin Kao
  - Nicky Sandhu
  - Erik Reyes
  - Nazrul Islam
- WRIMS Consultants
  - Dan Easton
  - Andy Draper
- SWRCB
  - Lucas Sharkey
  - Mark Gowdy
- Reclamation
  - Nancy Parker
  - Tom FitzHugh
  - Claire Hsu / Junaid As-Salek
- FWS
  - Derek Hilts
  - Craig Anderson
- GUI Consultants
  - Tad Slawecki
  - Daniel Rucinski
  - Nadia Kabir

RECLAMATION