CALIFORNIA DEPARTMENT OF WATER RESOURCES

DSM2 Learning Series: Planning Studies Session 2: Output Post-Processing

Oct 27, 2023

Brad Tom

Modeling Support Office, Delta Modeling Section

DISCLAIMER

All DSM2 and CalSim simulations

in this training are

EXAMPLES AND SHOULD ONLY BE USED FOR TRAINING

DISCLAIMER

Water Year Types in Example Notebooks

*D1641 standards displayed in notebooks are applicable to water years for which all studies have the **same water year type**. Base and alternative studies with different hydrologies may have different water year types for some water years.

Hands-on exercises

Reminders

1. Raise your hand (on Teams) when you complete each step
2. If you have a question, enter it into the Teams chat, even if you are in the room

DSM2 Learning Series: Planning

DSM2 Learning Series

Skills Learned

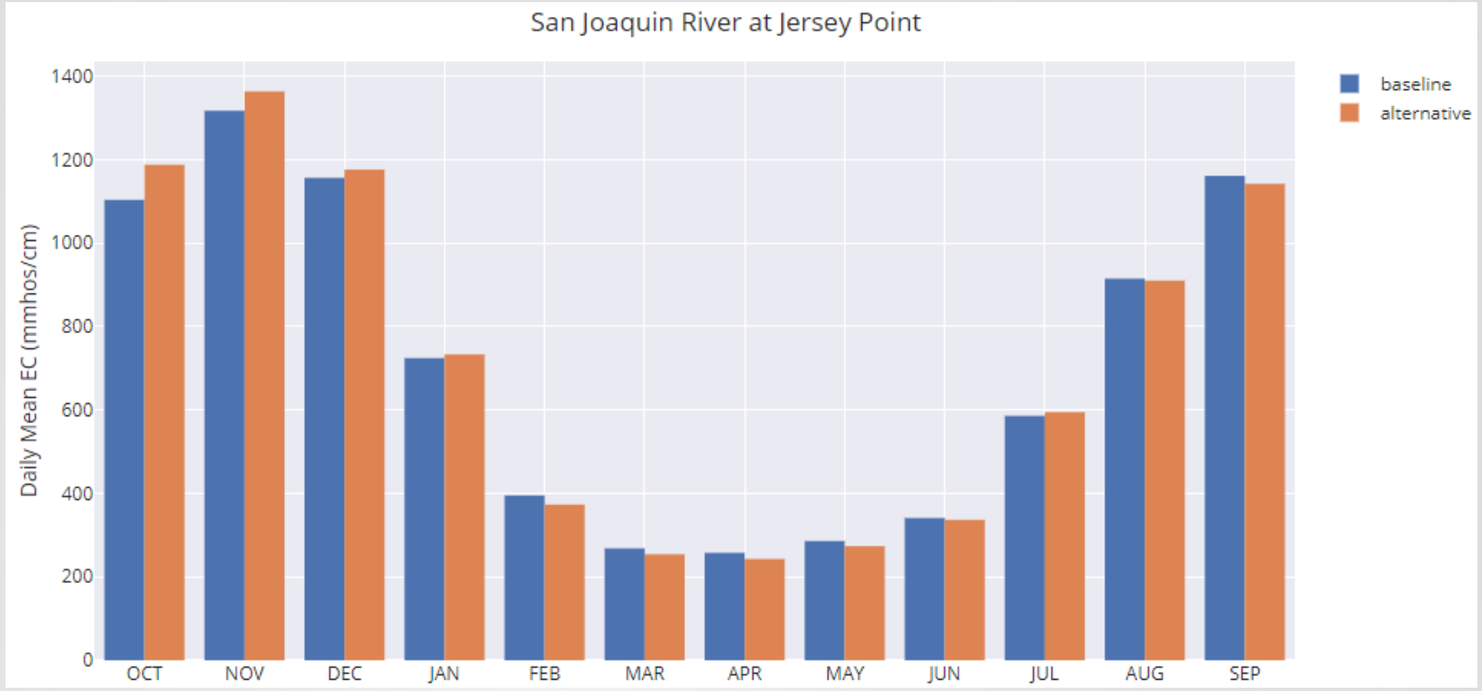
- Session 1: DSM2 Planning study setup
- Session 1 Hands-On Exercises:
  - Plotting DSM2 input with Jupyter notebooks
  - Running DSM2 planning studies
- **Session 2: Plotting DSM2 output with Jupyter notebooks**

Topics Not Covered

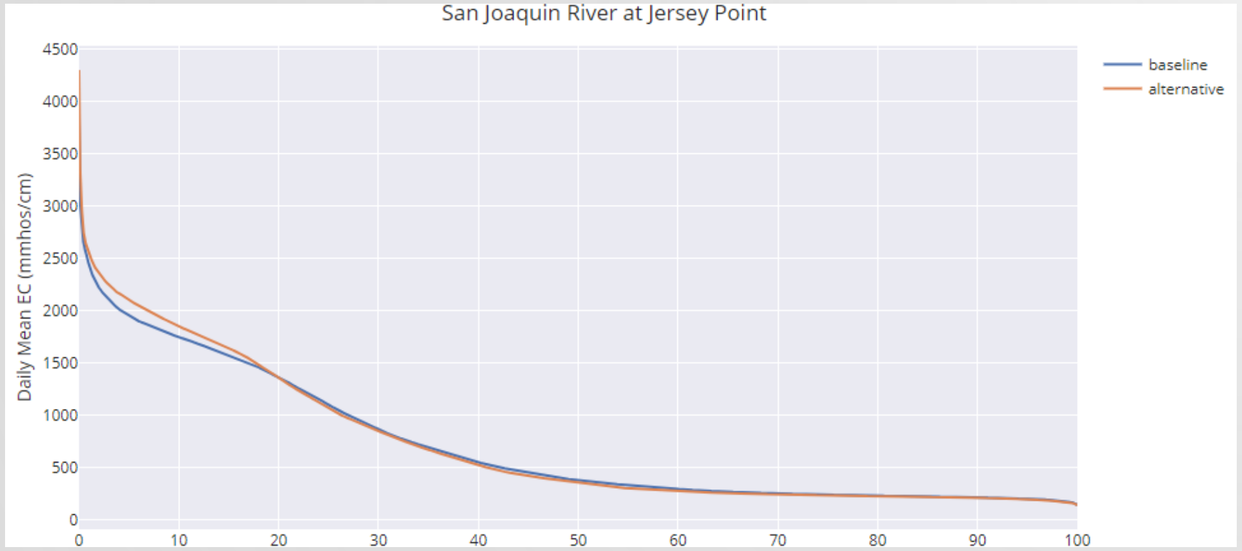
How to

- Run CalSim
- Change channel geometry
- Add/remove/change structures

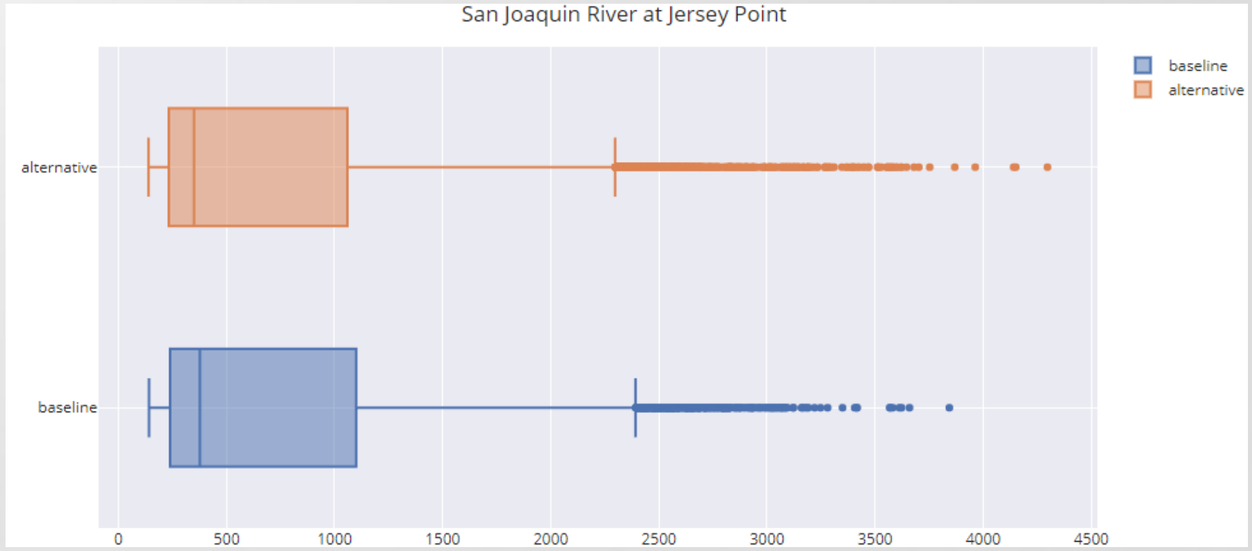
Output plot types created in notebook



Daily mean bar chart, aggregated by month

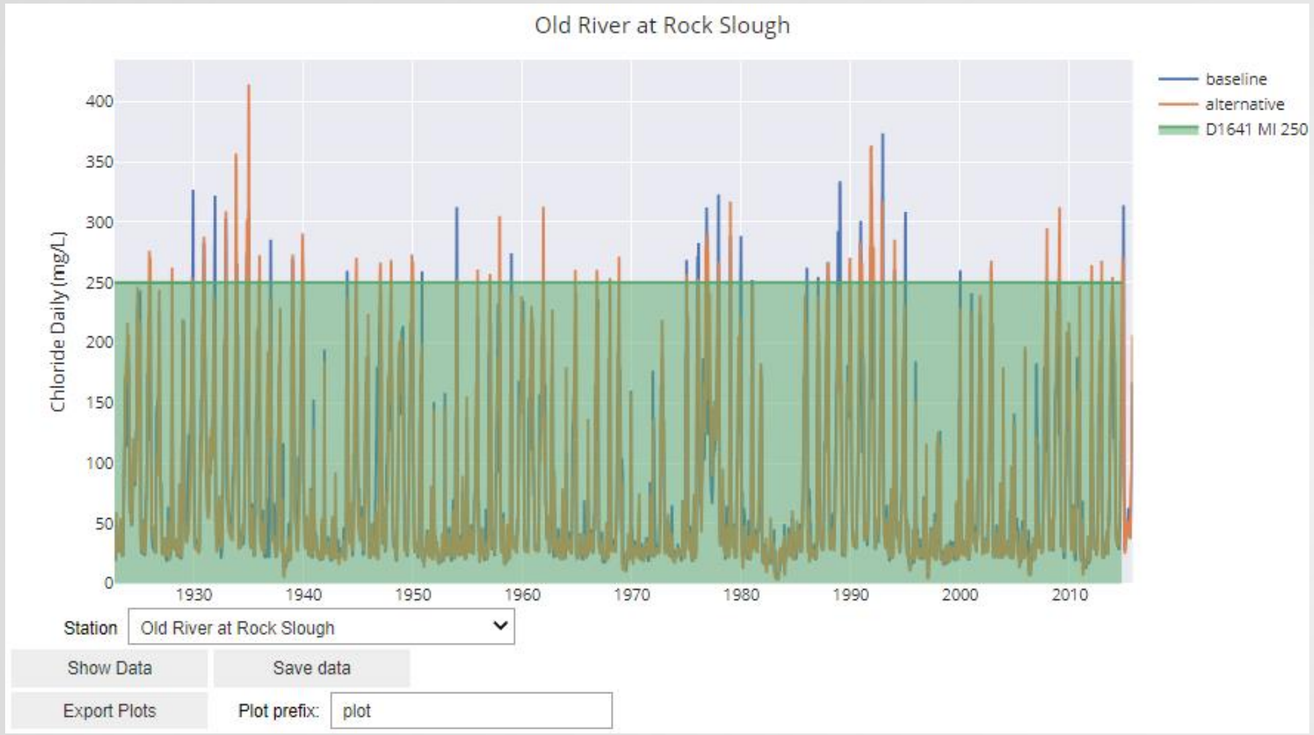


Exceedance probability

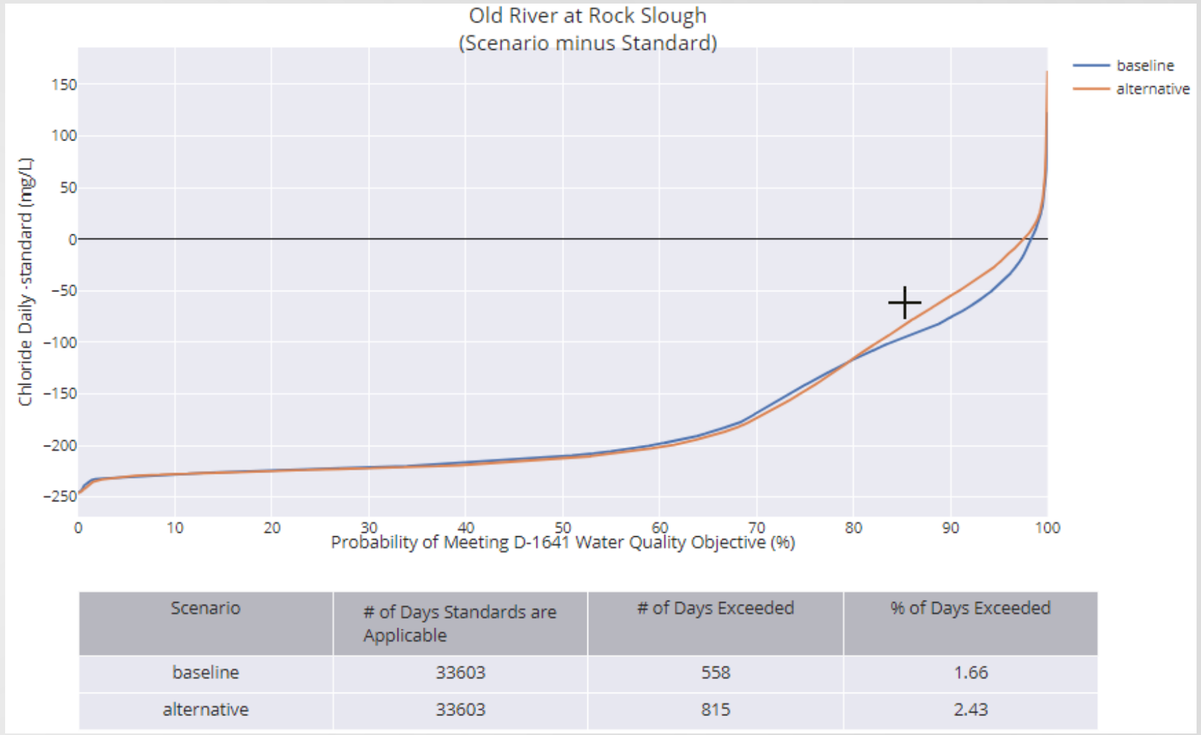


Box and whisker

Plots Types created in notebooks: Comparison to D1641 standards



Daily time series



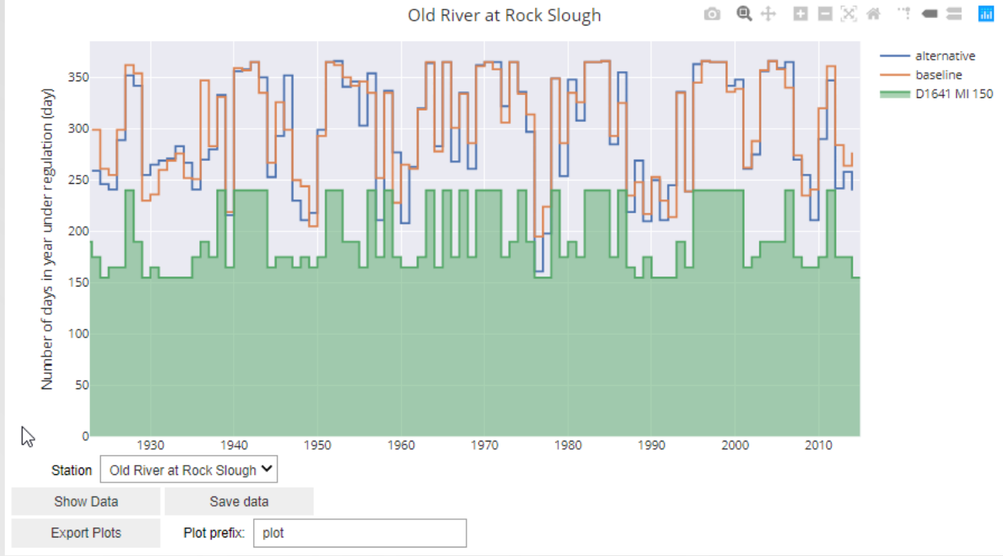
Scenario	# of Days Standards are Applicable	# of Days Exceeded	% of Days Exceeded
baseline	33603	558	1.66
alternative	33603	815	2.43

Exceedance probability

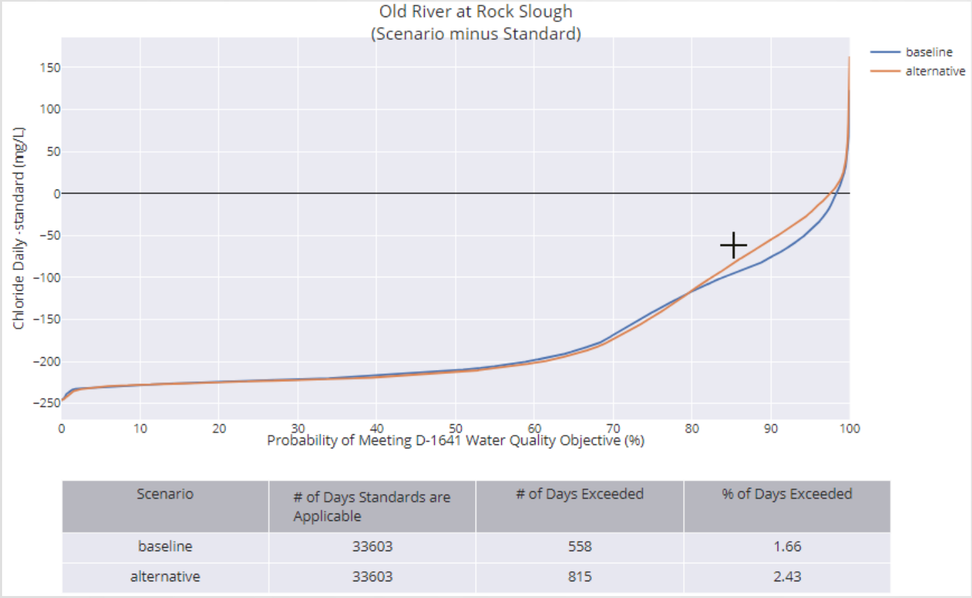
*D1641 standards displayed in notebooks are applicable to water years for which all studies have the **same water year type**. Base and alternative studies with different hydrologies may have different water year types for some water years.

Plots Types created in notebooks: Comparison to D1641 standards

Daily time series

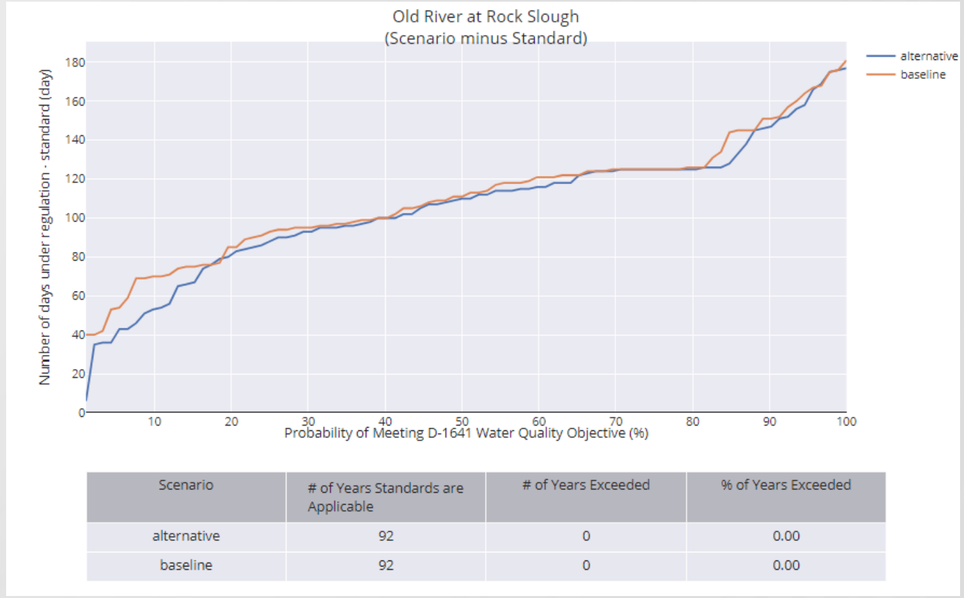


Daily or monthly mean bar chart, aggregated by month



Scenario	# of Days Standards are Applicable	# of Days Exceeded	% of Days Exceeded
baseline	33603	558	1.66
alternative	33603	815	2.43

Exceedance probability



Scenario	# of Years Standards are Applicable	# of Years Exceeded	% of Years Exceeded
alternative	92	0	0.00
baseline	92	0	0.00

Box and whisker

Jupyter notebooks for plotting model output

Notebook filename	Purpose
2021_example_EC.ipynb	Compare EC outputs from multiple scenarios, many stations throughout the system • Bar charts aggregated by month • Exceedance probability • Box & Whisker
2021_example_EC_stds.ipynb	Compare EC outputs from multiple scenarios to D1641 stds • Time series • Exceedance probability
2021_example_stage.ipynb	Compare Stage outputs from multiple scenarios • All four plot types

Post-processing model output

baseline study: running the post-processor

Run post-processor

Creates new flow, stage, and velocity DSS files, containing

- daily max & min
- daily & monthly mean

Command Prompt - postpro.bat

```
D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>postpro.bat
```

Successful run

```
/HYDROV8.2.2/TRNR_CUT/VEL/01SEP2010 - 01SEP2014/15MIN/2021EX/
/HYDROV8.2.2/VENICE162/VEL/01SEP2010 - 01SEP2014/15MIN/2021EX/
/HYDROV8.2.2/VENICE163/VEL/01SEP2010 - 01SEP2014/15MIN/2021EX/
all process done

(pydelmod_plan) D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline
ctivate.bat

D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>endlocal

D:\DSM2_Planning_2023\delta\DSM2_v822plan\studies_planning\baseline>
```

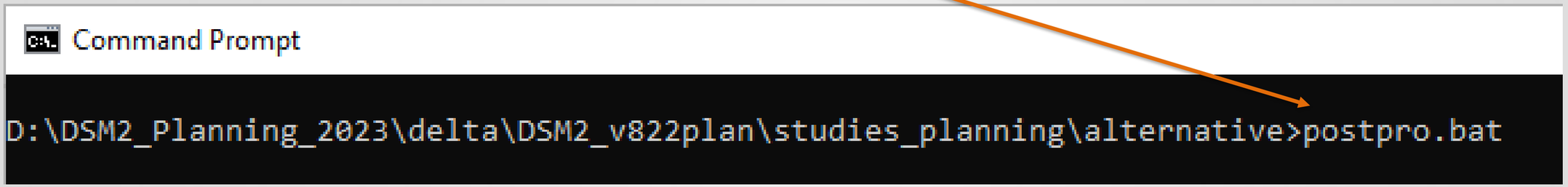
Post-processing model output

alternative study: running the post-processor

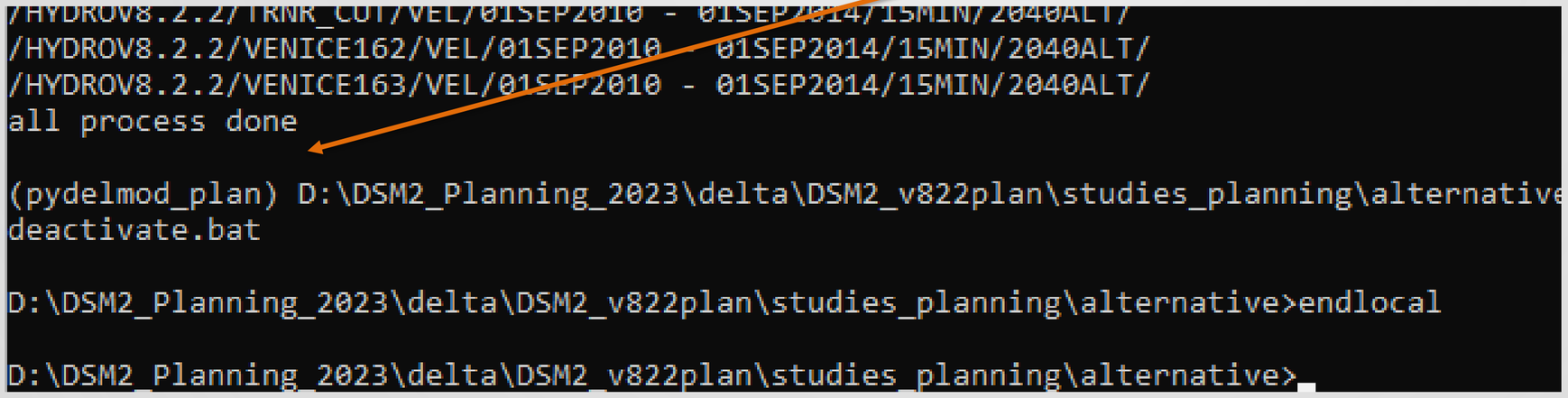
Run post-processor

Creates new flow, stage, and velocity DSS files, containing

- daily max & min
- daily & monthly mean

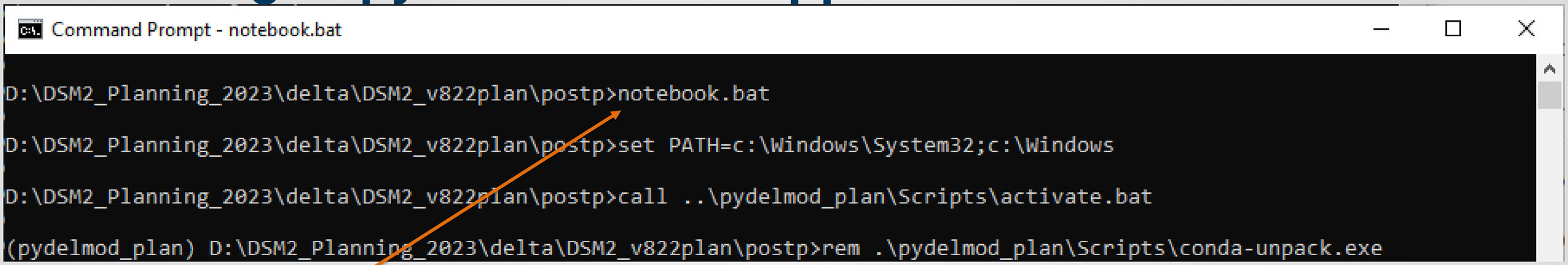


Successful run



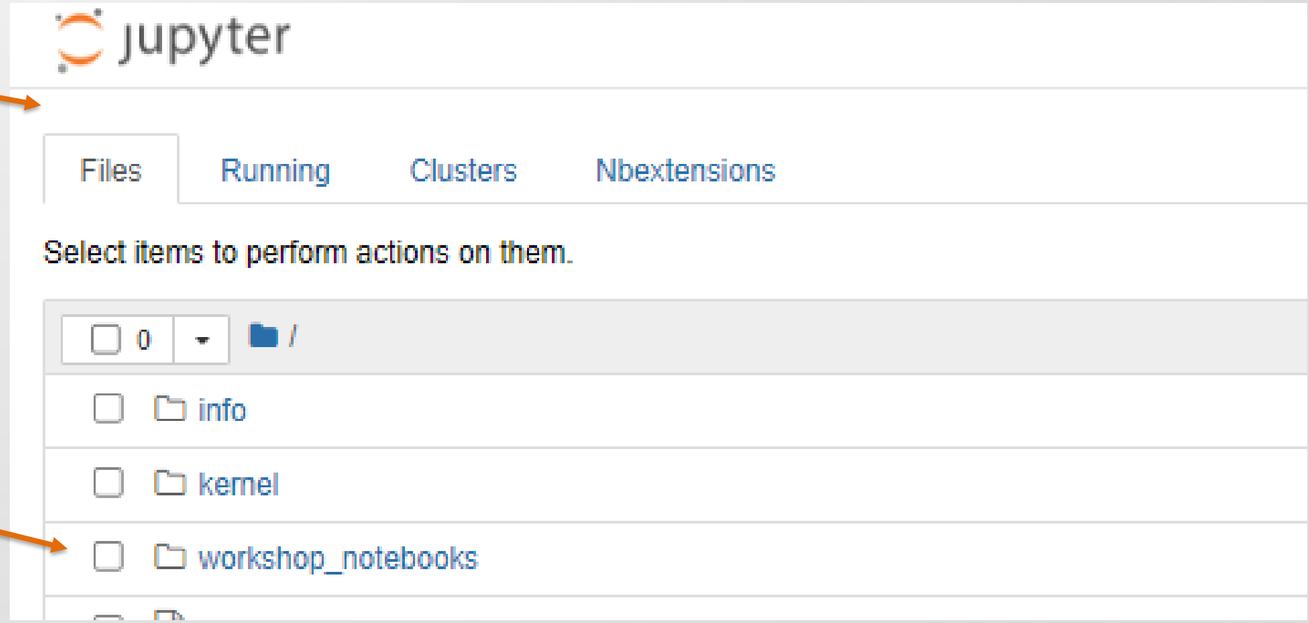
Post-processing model output

starting Jupyter notebook application



1. noteook.bat starts the jupyter notebook application

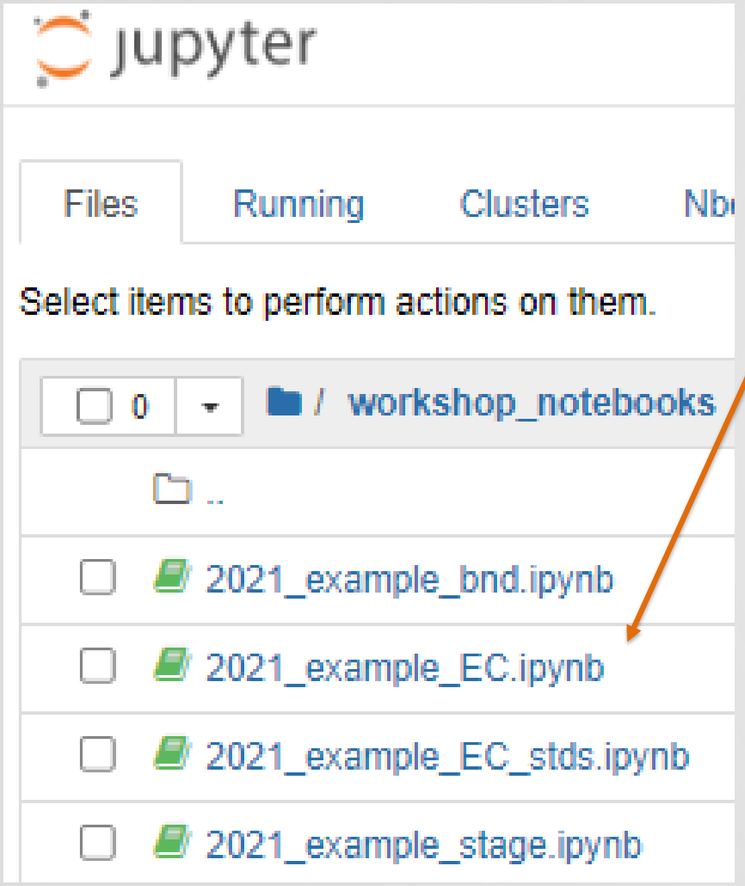
2. Jupyter notebook opens in web browser



3. Click on "workshop_notebooks" folder

Post-processing model output

Opening and configuring a notebook



1. Open the file 2021_example_EC.ipynb

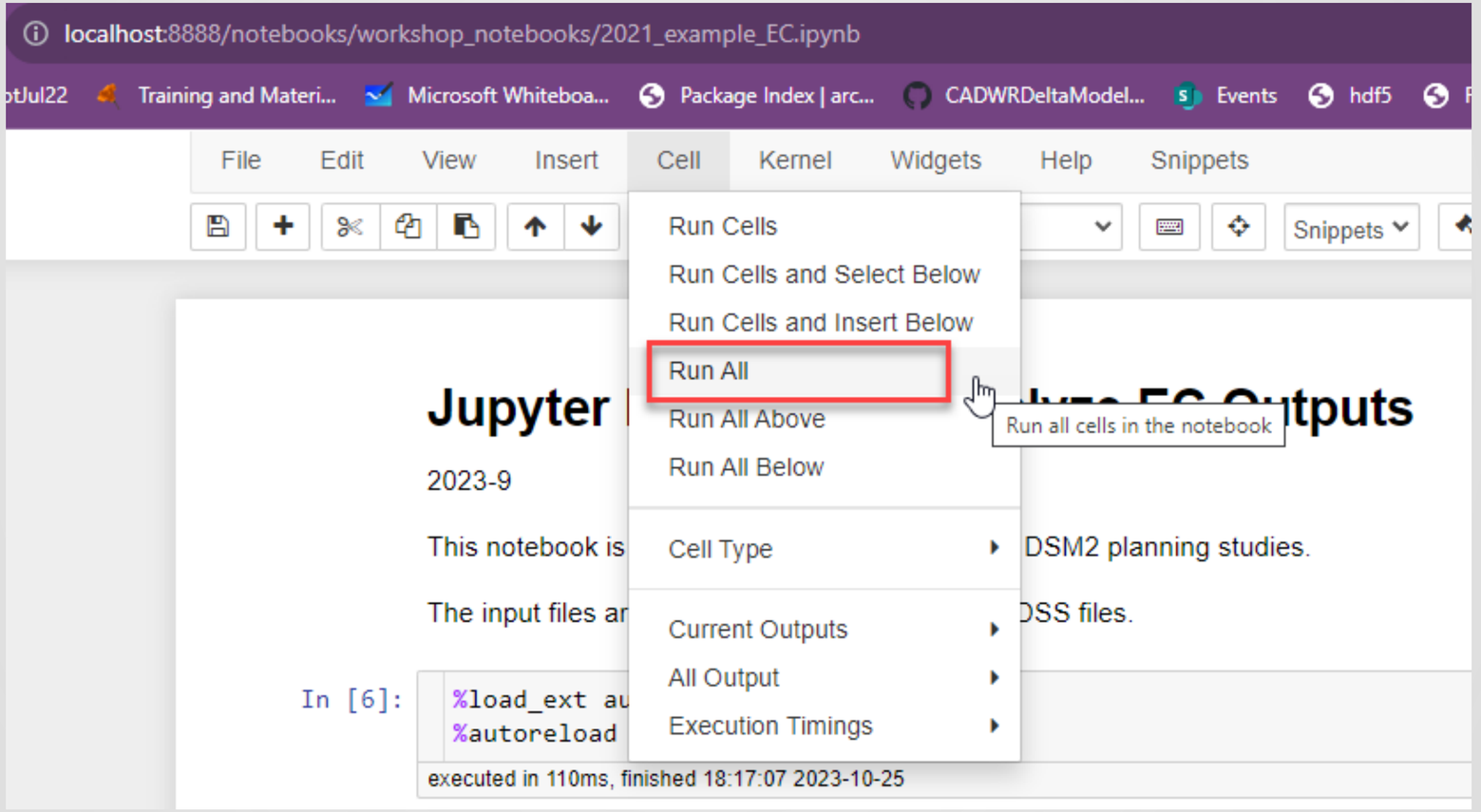
2. Make sure these lines point to your study folders

```
# Read in scenarios
dir_plan = '../../studies_planning/'
dir2021base = dir_plan+'baseline/'
dir2040alt = dir_plan+'alternative/'

scenarios = [
            {'name': 'baseline',        'fpath': dir2021base+"timeseries/2021ex
            {'name': 'alternative',     'fpath': dir2040alt+"timeseries/2040alt
]

# Add a wateryear type column
wyt_c3f2020 = dir_plan+"baseline/timeseries/CALSIM/calsim_2021ex.DSS"
df_wyt2020 = pdmu.read_calsim3_wateryear_types(wyt_c3f2020)

# period93 = ['1922-10-1','2015-9-30']
period93 = ['2010-10-1','2014-9-30']
```

3. Modify for 4 year time period

Post-processing model output

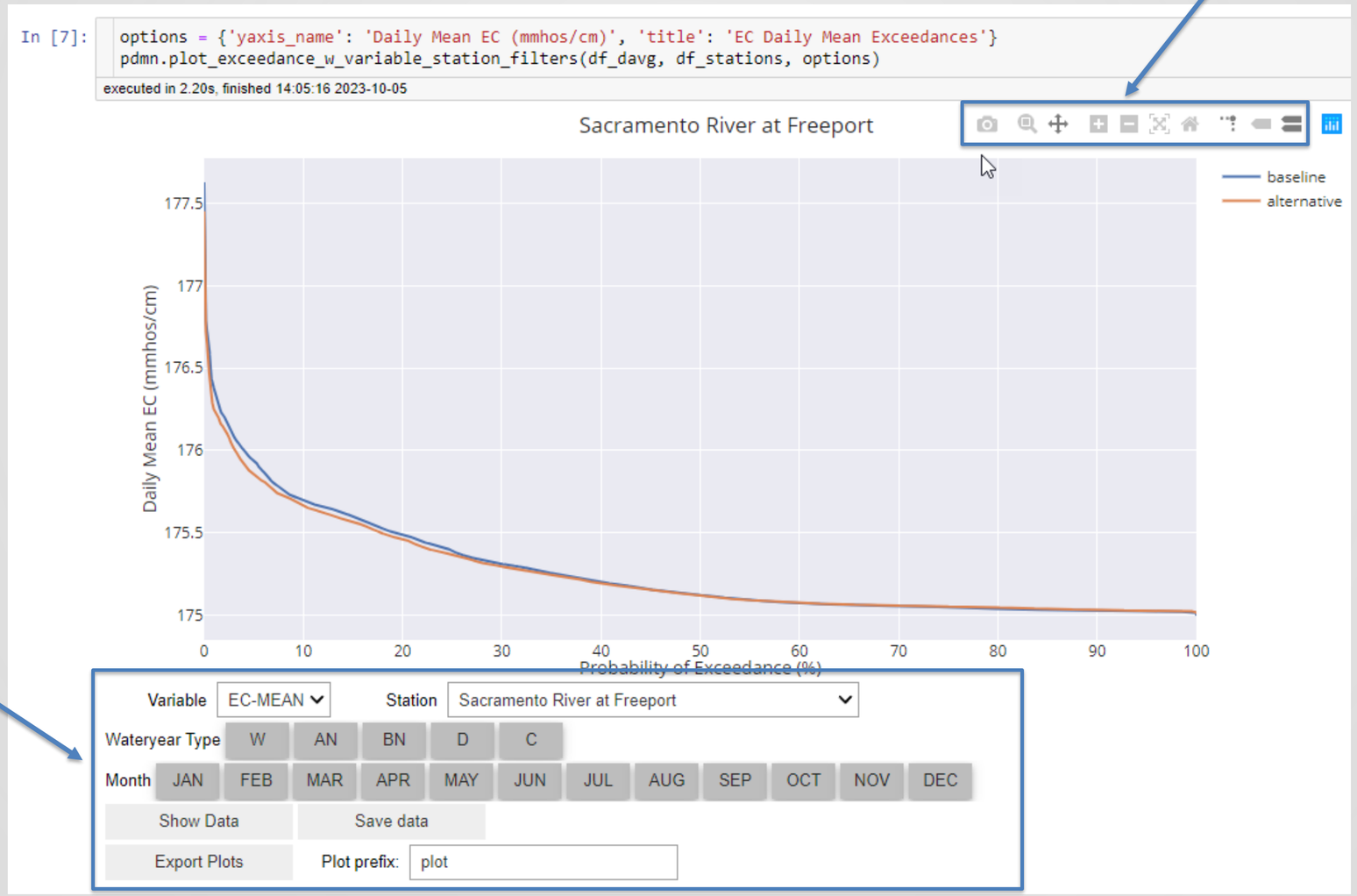
Running all cells in a notebook



Post-processing model output

Working with plots in Jupyter notebook

Toolbar
- Download plot as a png
- Zoom
- Pan
- Zoom in
- Zoom out
- Autoscale
- Reset axes
- Toggle spike lines
- Show closest data on hover
- Compare data on hover



- Change variable, station
- Filter by water year type, month, etc.
- Display or save data
- Export Plots/change plot filename prefix

Working with plots in Jupyter notebook

– Run any of the output plotting notebooks
– Try various plot features

Post-Training Excercise

- Do full 100 year runs and post-process

Questions?

Please enter questions into the chat

Brad Tom (Bradley.Tom@water.ca.gov)

Thank You!

Please suggest topics for future learning sessions on the survey

Follow-up Survey

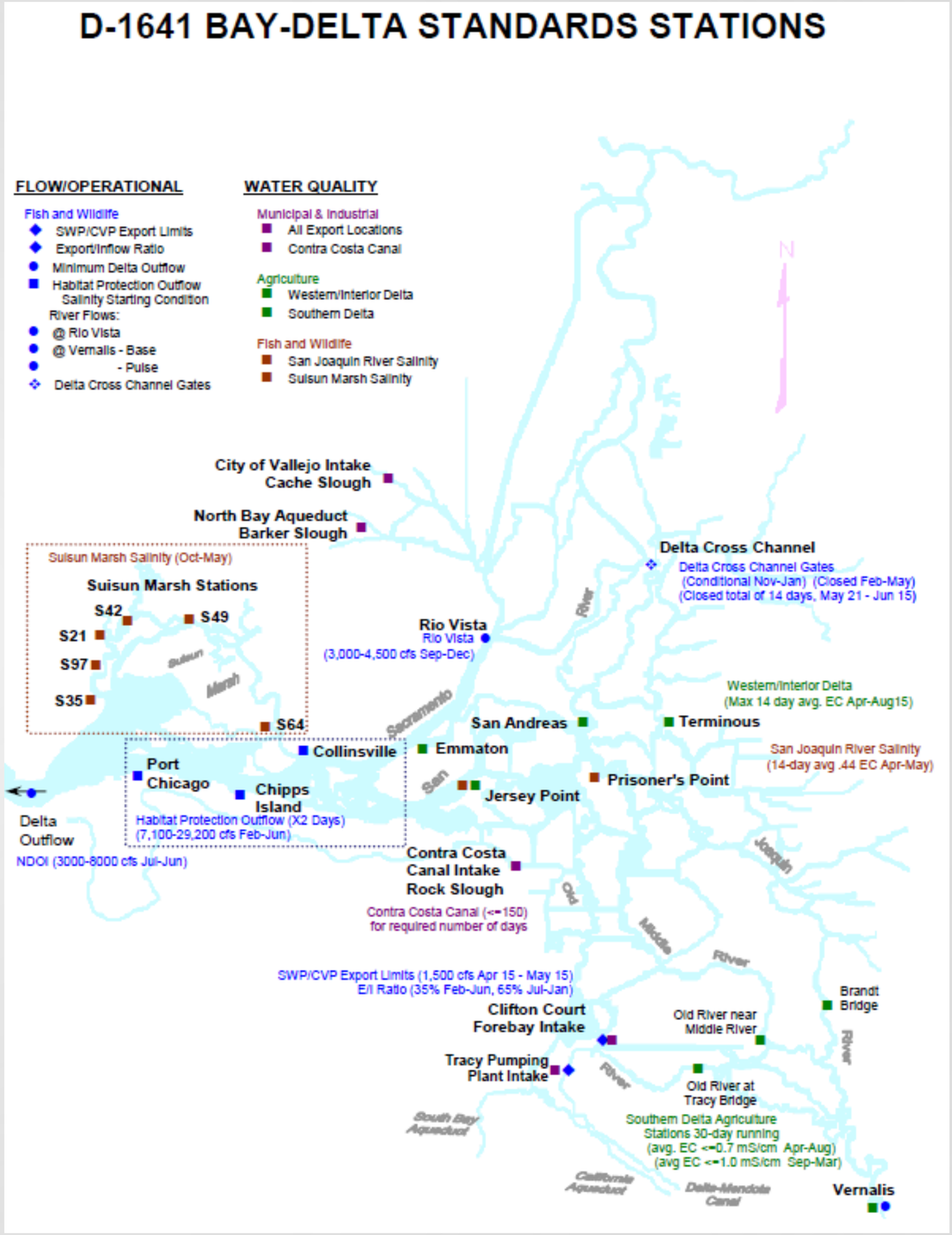
https://forms.gle/RpfTrULhep4fwqh67

Extra Slides

D1641 Bay-Delta

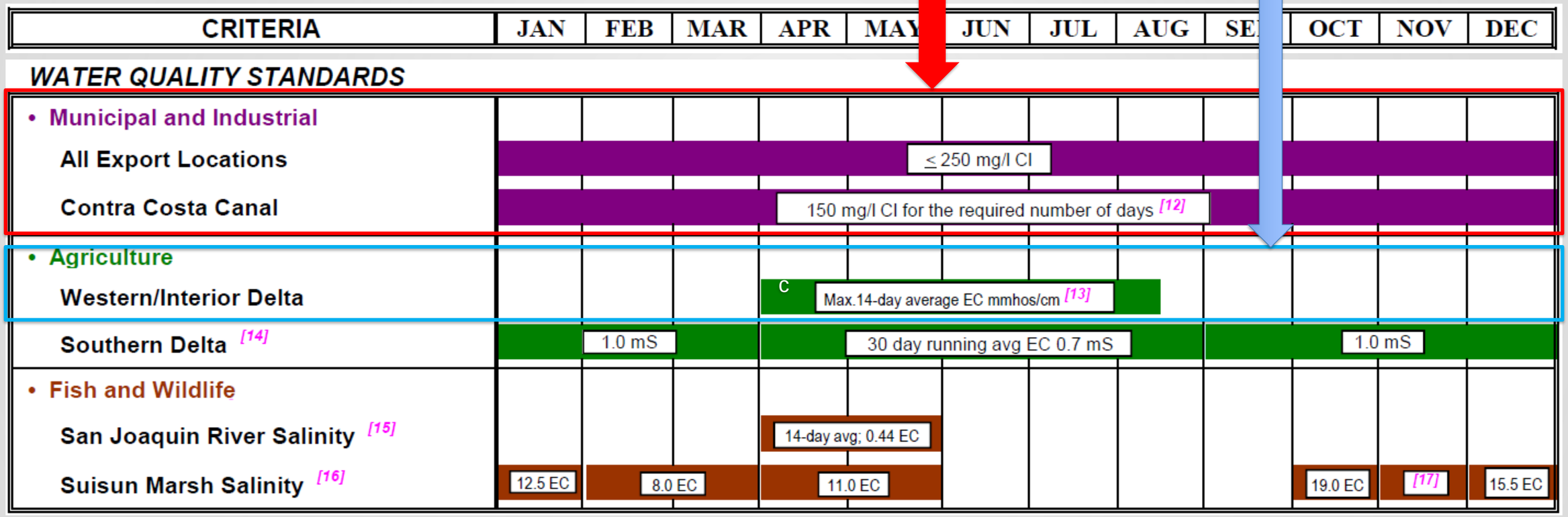
Three most important Salinity Control Stations

- Emmaton
- Jersey Point
- Rock Slough



D1641 Bay-Delta

- Emmaton
- Jersey Point
- Rock Slough

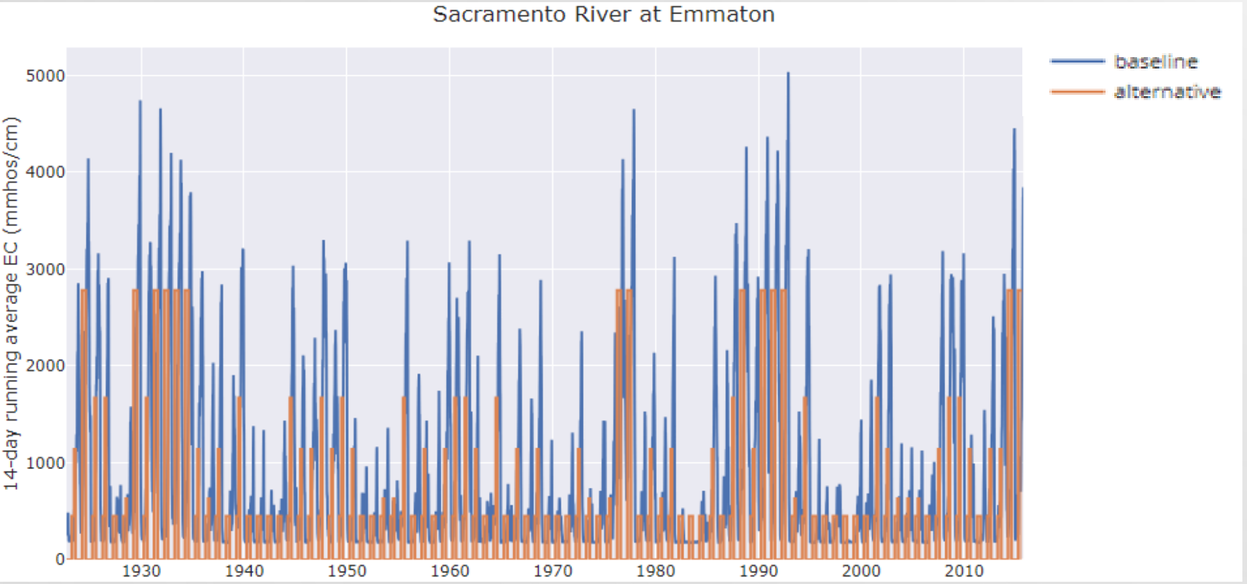


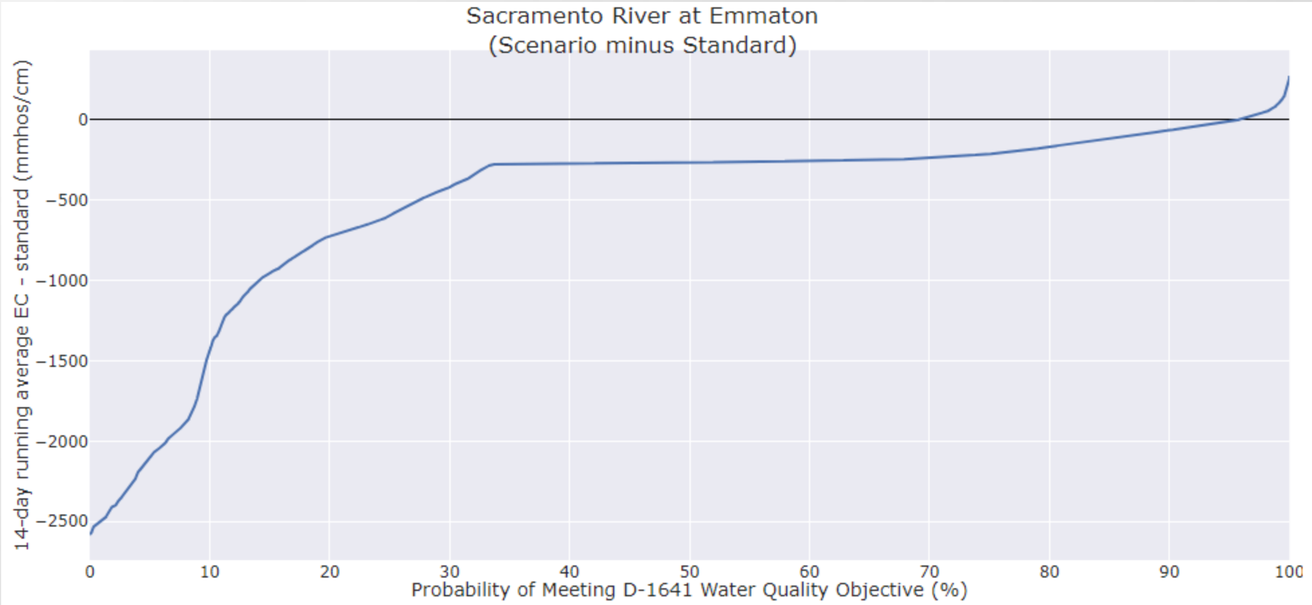
Emmaton Compliance

[13] The maximum14-day running average of mean daily EC (mmhos/cm) depends on water year type.

	WESTERN DELTA				INTERIOR DELTA			
	Sac River @ Emmaton		SJR @ Jersey Point		Mokelumne R @ Terminous		SJR @ San Andreas	
Year Type	0.45 EC from April 1 to date shown	EC value from date shown to Aug15 *	0.45 EC from April 1 to date shown	EC value from date shown to Aug15 *	0.45 EC from April 1 to date shown	EC value from date shown to Aug15 *	0.45 EC from April 1 to date shown	EC value from date shown to Aug15 *
W	Aug 15		Aug 15		Aug 15		Aug 15	
AN	Jul 1	0.63	Aug 15		Aug 15		Aug 15	
BN	Jun 20	1.14	Jun 20	0.74	Aug 15		Aug 15	
D	Jun 15	1.67	Jun 15	1.35	Aug 15		Jun 25	0.58
C		2.78		2.20		0.54		0.87

* When no date is shown, EC limit continues from April 1.





Scenario	# of Days Standards are Applicable	# of Days Exceeded	% of Days Exceeded
DCR2021_EX2020	12741	552	4.33

Jersey Point Compliance

[13] The maximum14-day running average of mean daily EC (mmhos/cm) depends on water year type.

	WESTERN DELTA				INTERIOR DELTA			
	Sac River @ Emmaton		SJR @ Jersey Point		Mokelumne R @ Terminous		SJR @ San Andreas	
Year Type	0.45 EC from April 1 to date shown	EC value from date shown to Aug15 *	0.45 EC from April 1 to date shown	EC value from date shown to Aug15 *	0.45 EC from April 1 to date shown	EC value from date shown to Aug15 *	0.45 EC from April 1 to date shown	EC value from date shown to Aug15 *
W	Aug 15		Aug 15		Aug 15		Aug 15	
AN	Jul 1	0.63	Aug 15		Aug 15		Aug 15	
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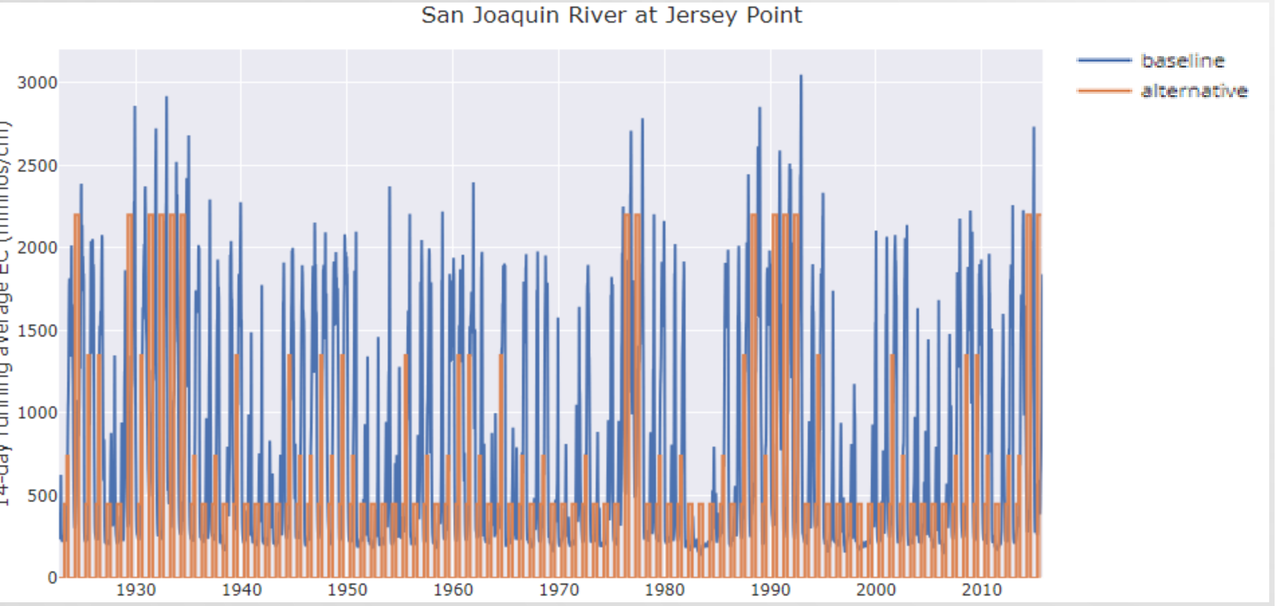
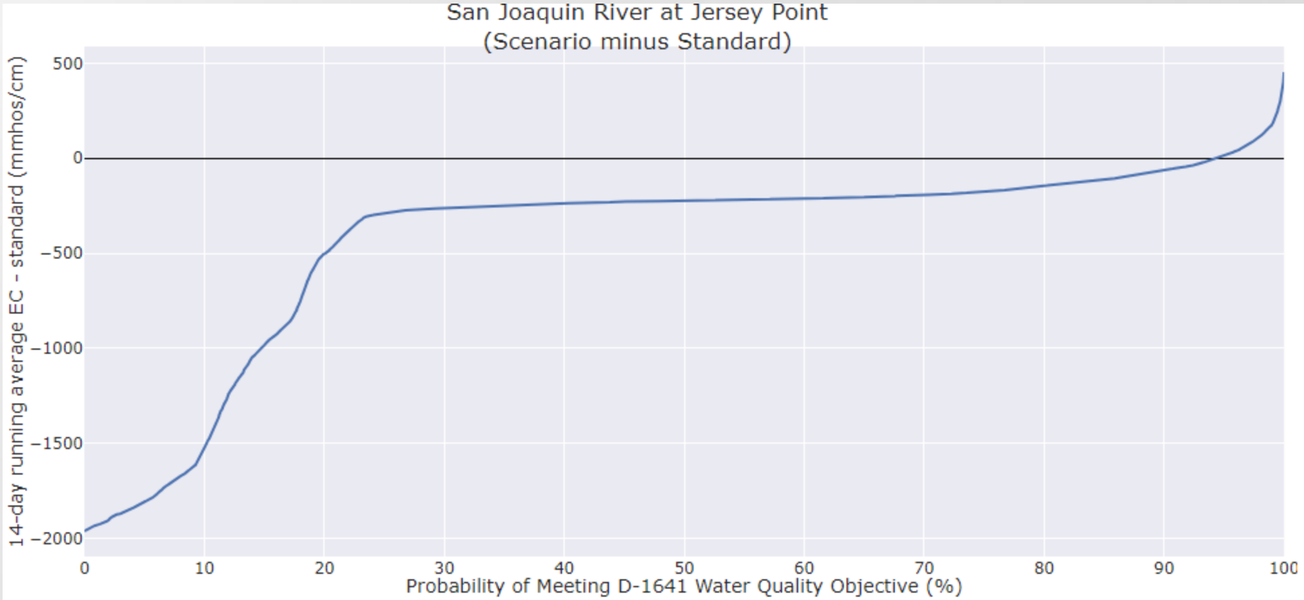


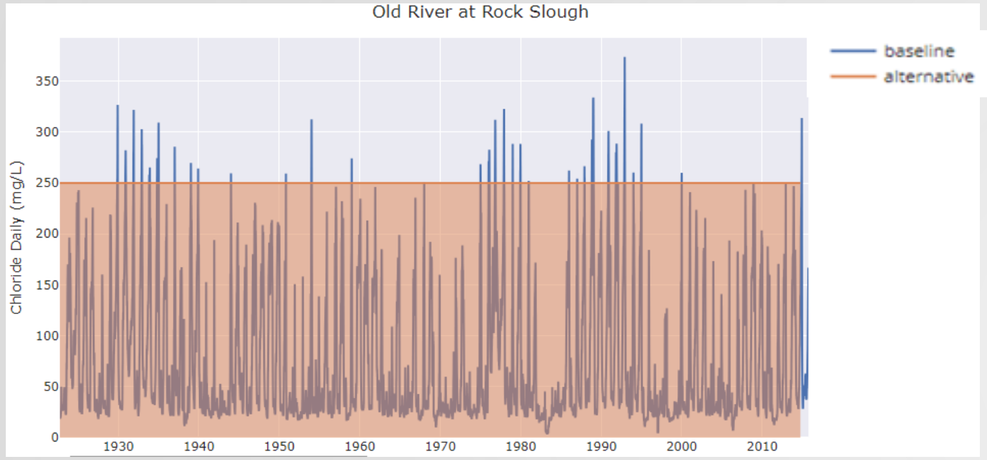


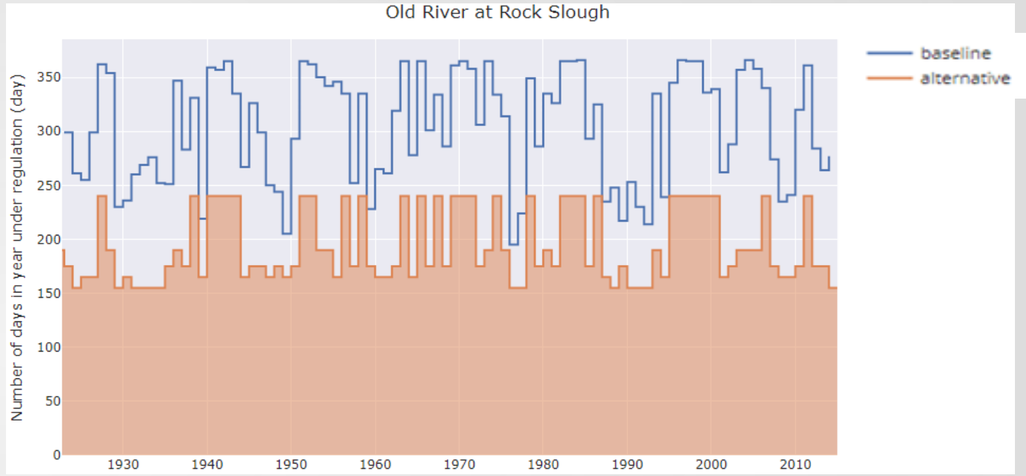
Scenario	# of Days Standards are Applicable	# of Days Exceeded	% of Days Exceeded
baseline	12741	714	5.60

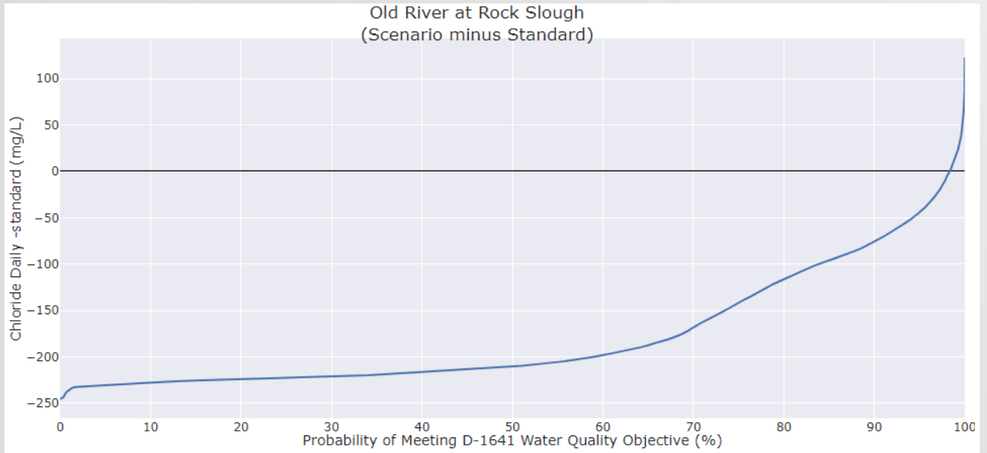
Rock Slough Compliance

[12] Minimum # of days that the mean daily chlorides ≤ 150 mg/l must be provided in intervals of not less than 2 weeks duration. Standard applies at Contra Costa Canal Intake or Antioch Water Works Intake.

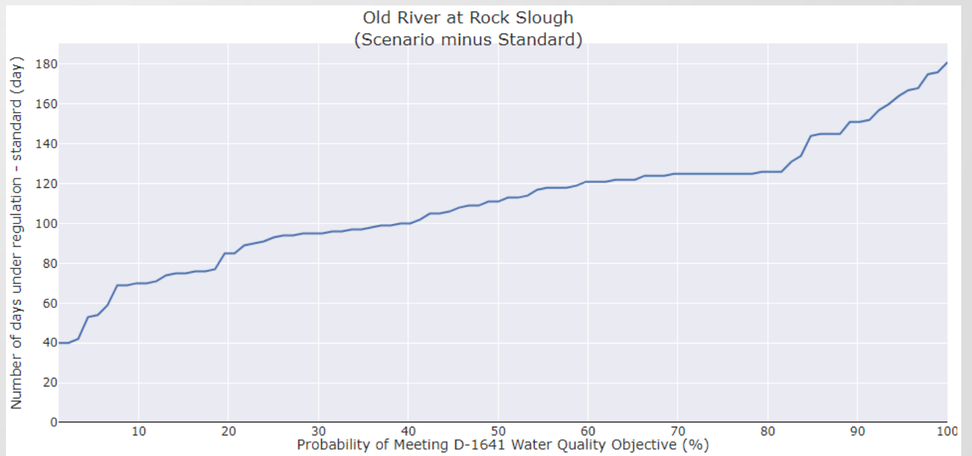
Year Type	W	AN	BN	D	C
# Days	240	190	175	165	155







Scenario	# of Days Standards are Applicable	# of Days Exceeded	% of Days Exceeded
DCR2021_EX2020	33603	558	1.66



Scenario	# of Years Standards are Applicable	# of Years Exceeded	% of Years Exceeded
DCR2021_EX2020	92	0	0.00