CALIFORNIA DEPARTMENT OF WATER RESOURCES

West False River Emergency Drought Barrier and Drought Control

Insights from New Conditions 2021-2022

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Jon Burau, USGS

Acknowledgments

- Modeling team: Kijin Nam, Qiang Shu
- Environmental Monitoring Program
- Other Colleagues
  - Rosemary Hartman, Dave Bosworth (DISE)
  - Jared Frantzich (NCRO)
  - Keith Bouma-Gregson (USGS)
  - Kate Le (DWR)

BUREAU OF RECLAMATION

USGS
science for a changing world

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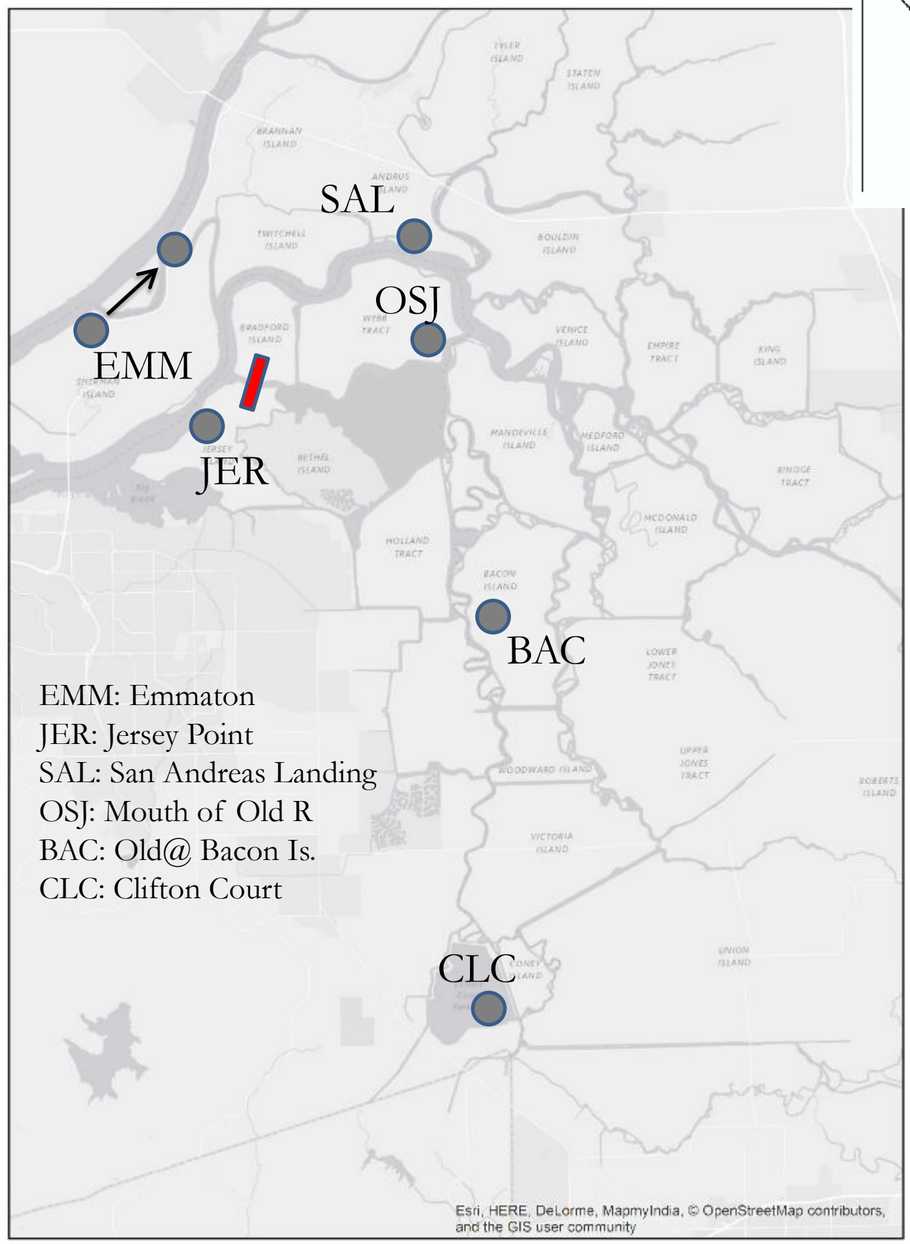
Plan for Talk

- Describe barrier and premise
- Review of 2021-2022 hydrology
- Barrier efficacy and its limiters
- Water management considerations

Barrier Location



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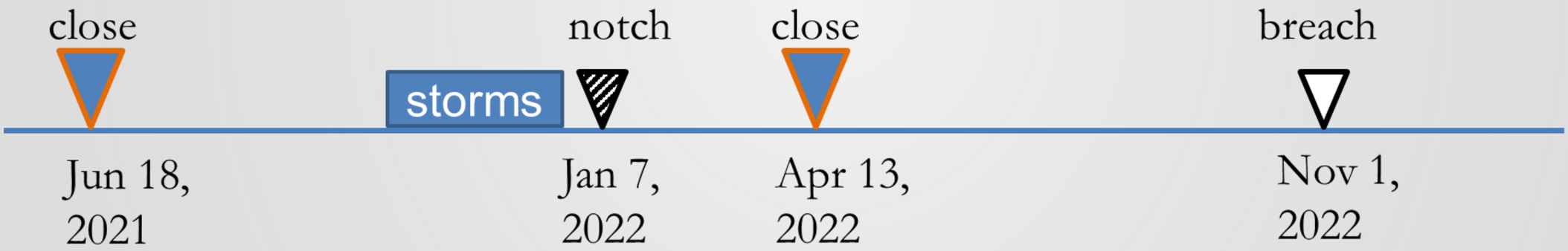
Installation Timeline



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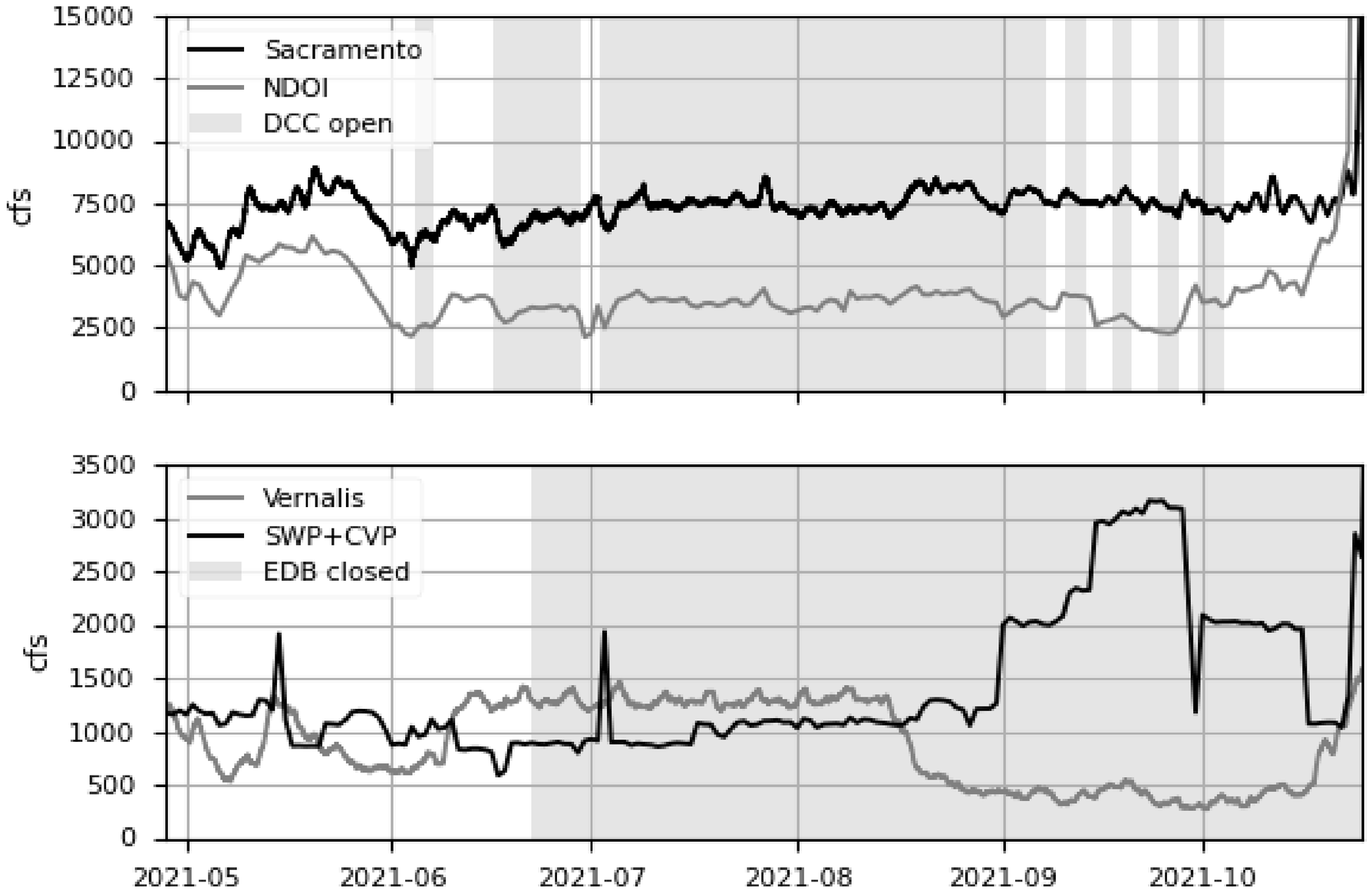
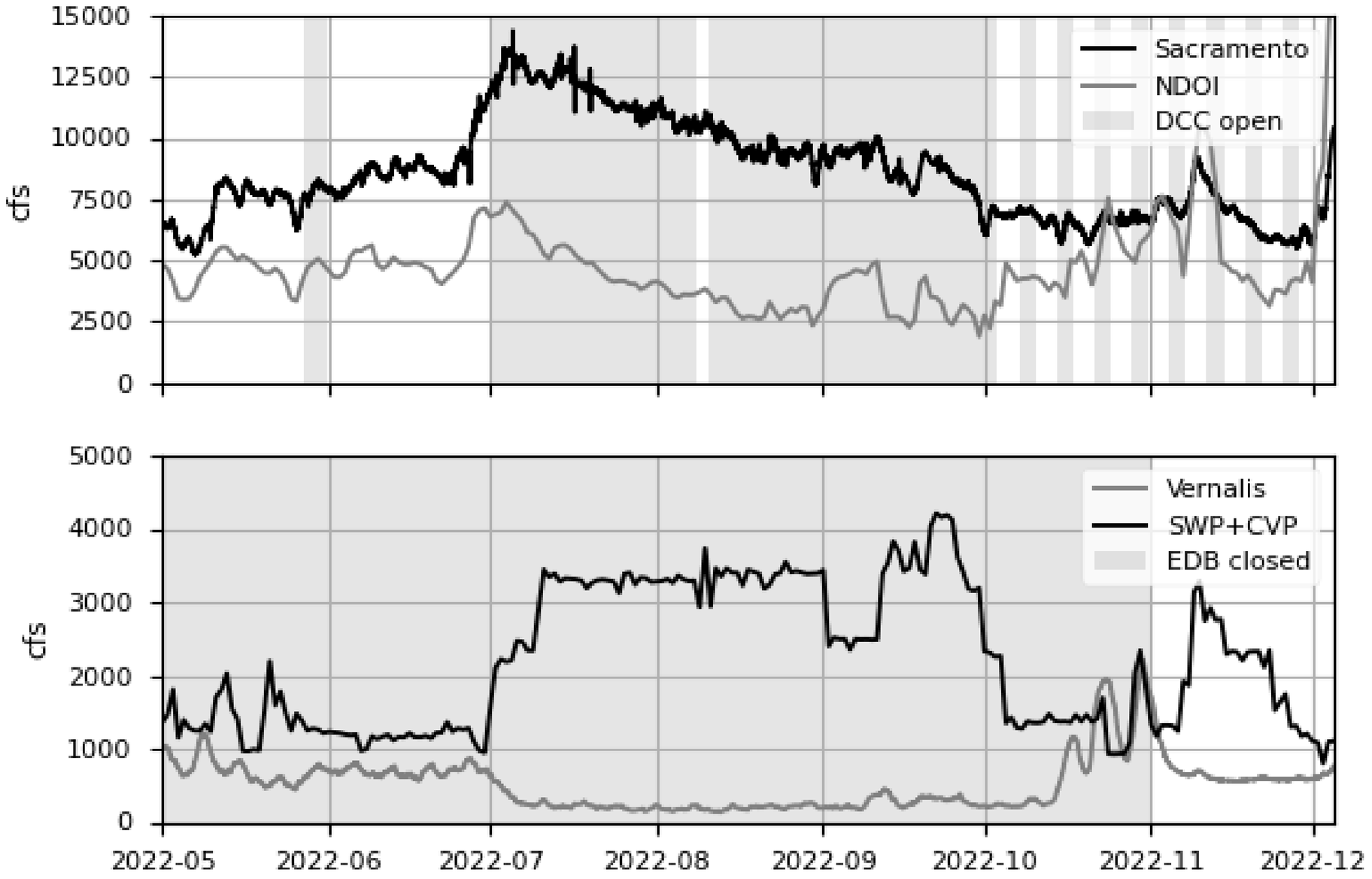
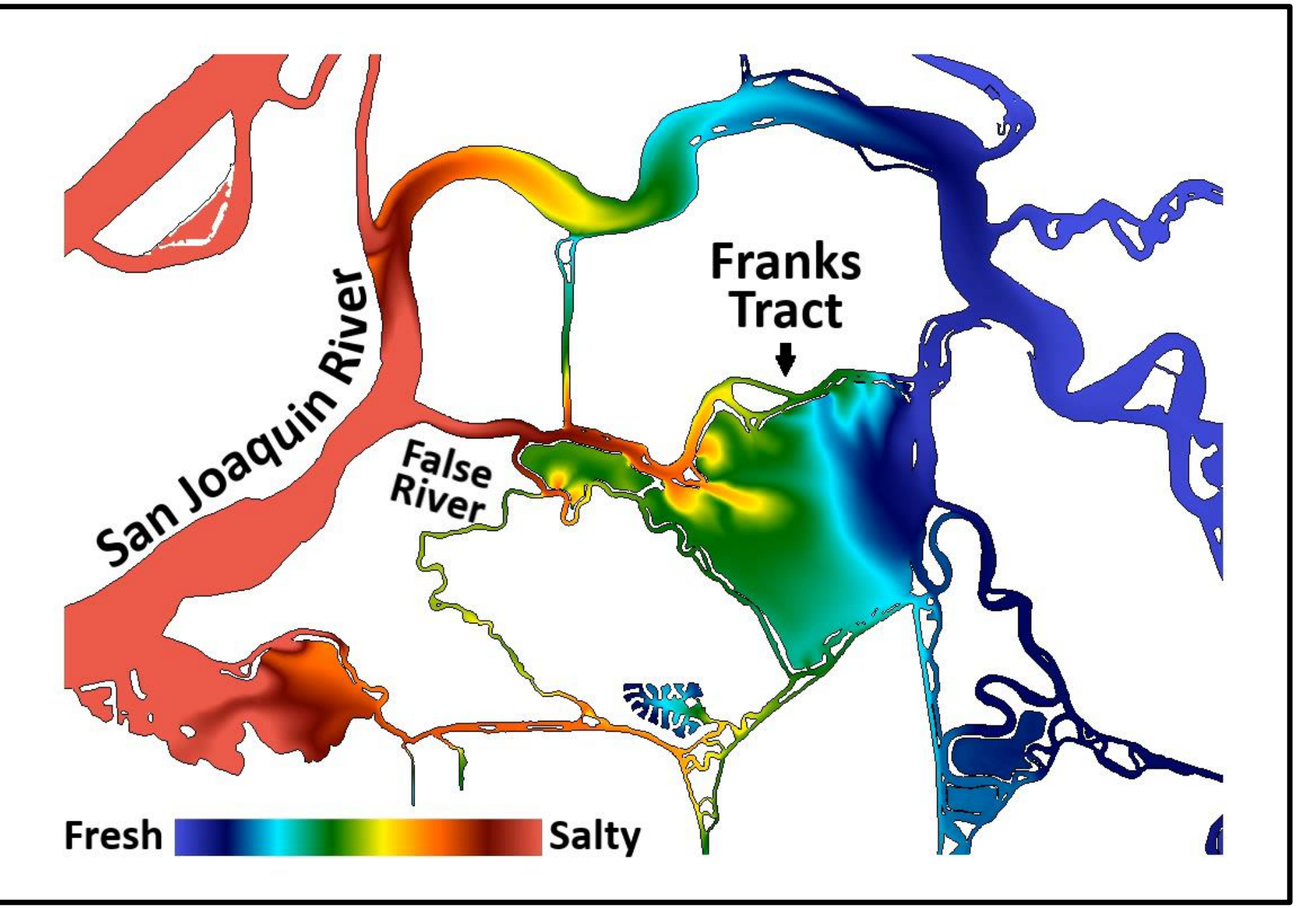
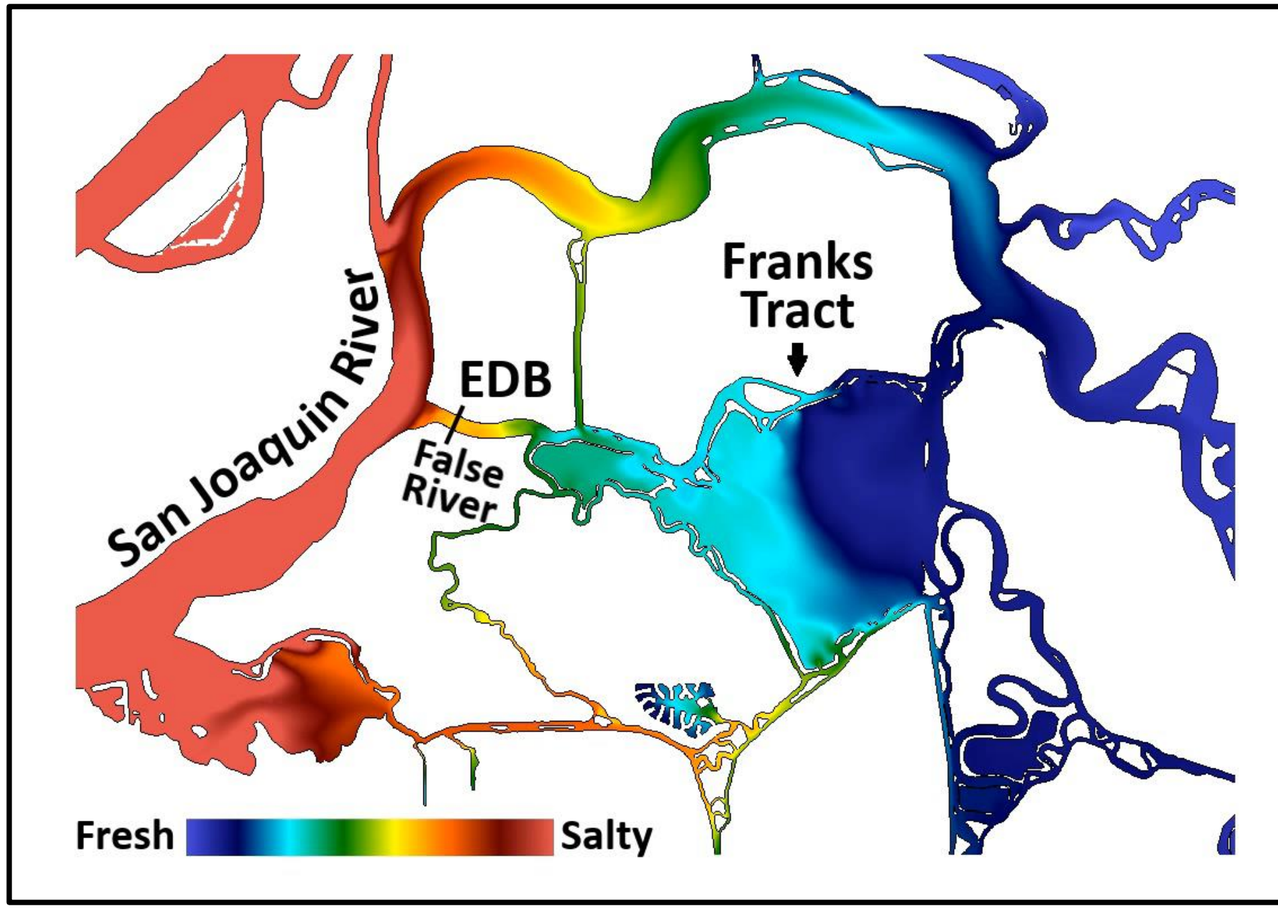

15000
12500
10000
7500
5000
2500
0
cfs
Sacramento
NDOI
DCC open
3500
3000
2500
2000
1500
1000
500
0
cfs
Vernalis
SWP+CVP
EDB closed
2021-05
2021-06
2021-07
2021-08
2021-09
2021-10


15000
12500
10000
7500
5000
2500
0
cfs
Sacramento
NDOI
DCC open
5000
4000
3000
2000
1000
0
cfs
Vernalis
SWP+CVP
EDB closed
2022-05
2022-06
2022-07
2022-08
2022-09
2022-10
2022-11
2022-12

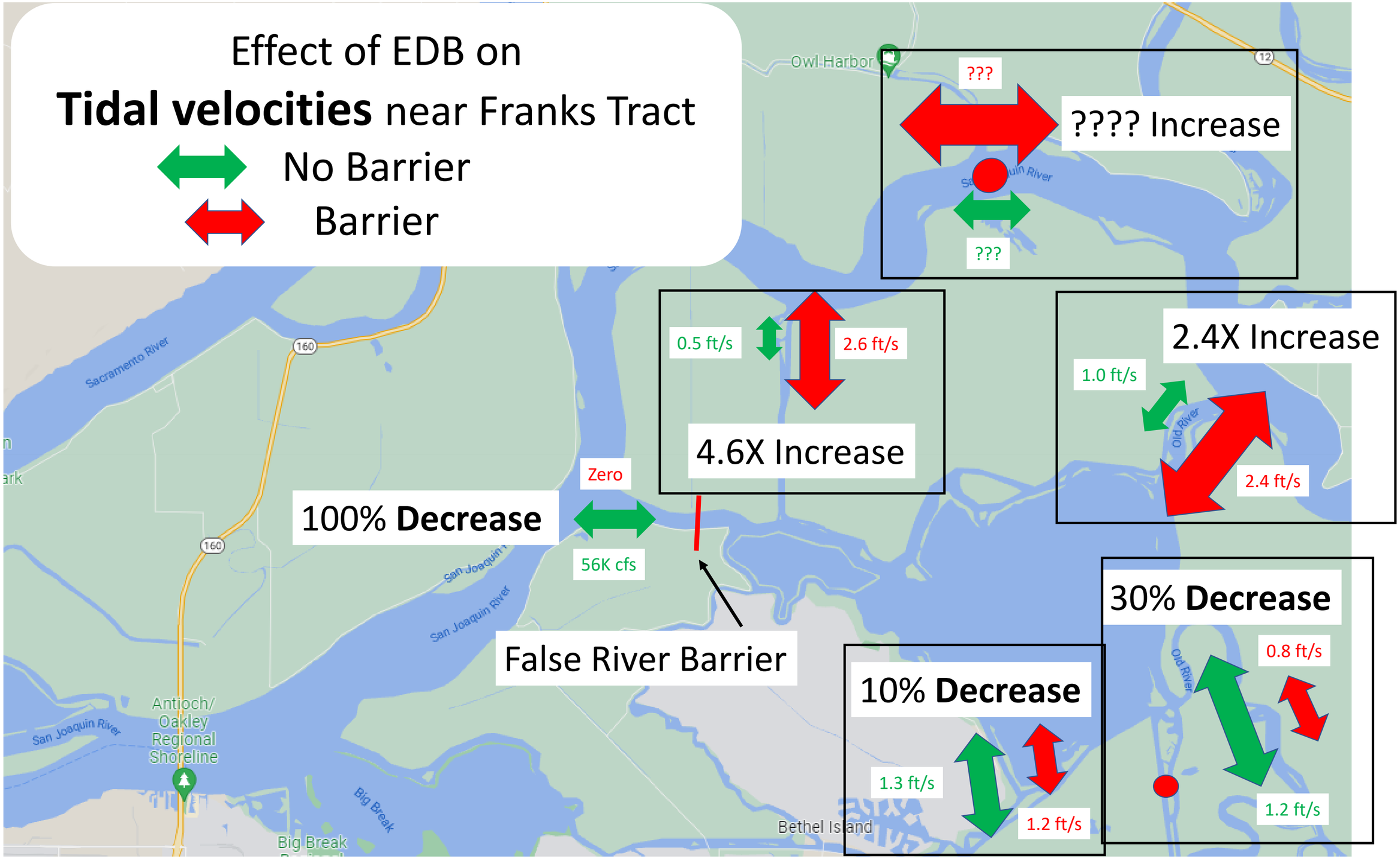
SCHISM 3D model simulation results



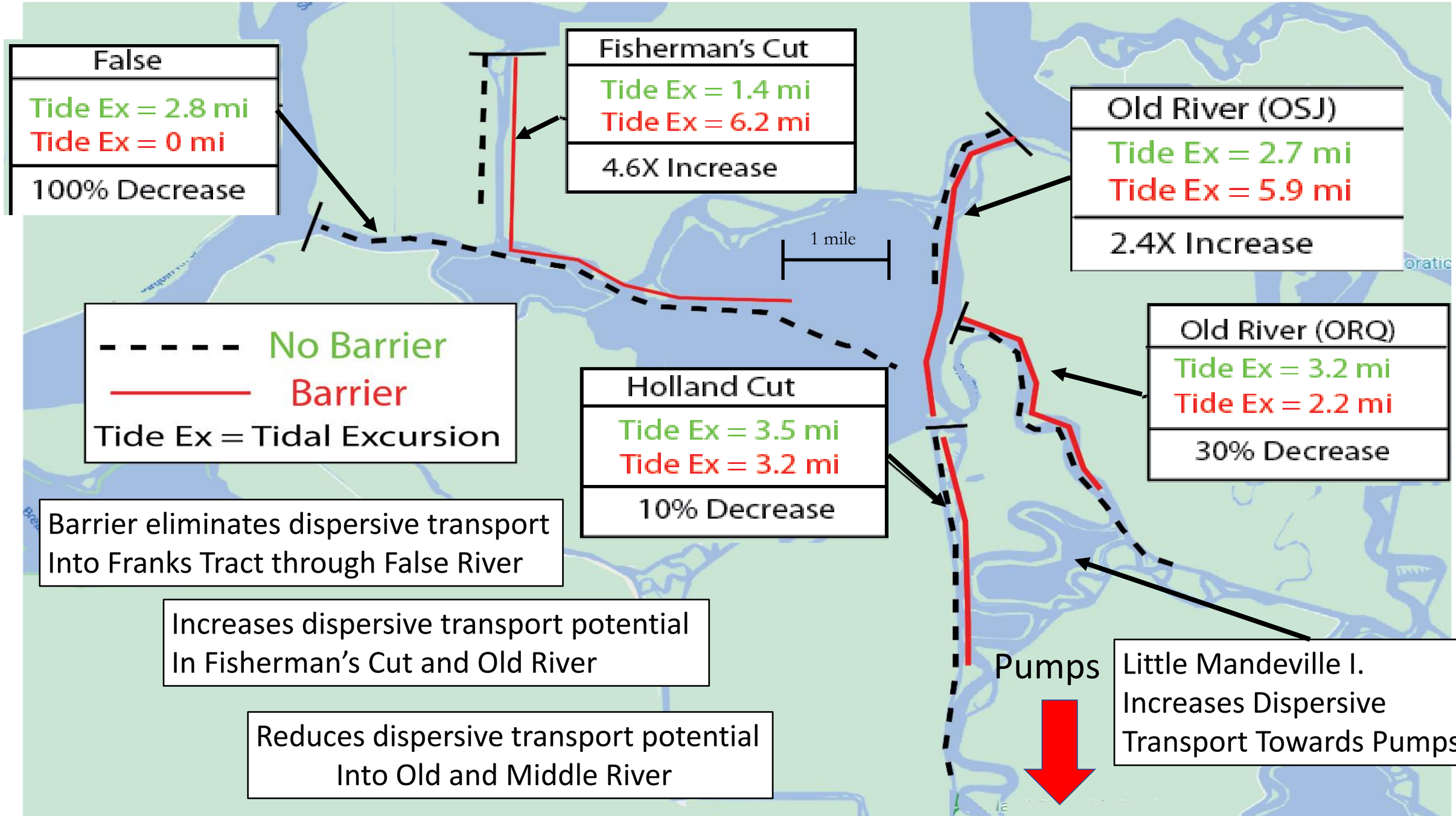
Without Barrier



With Barrier

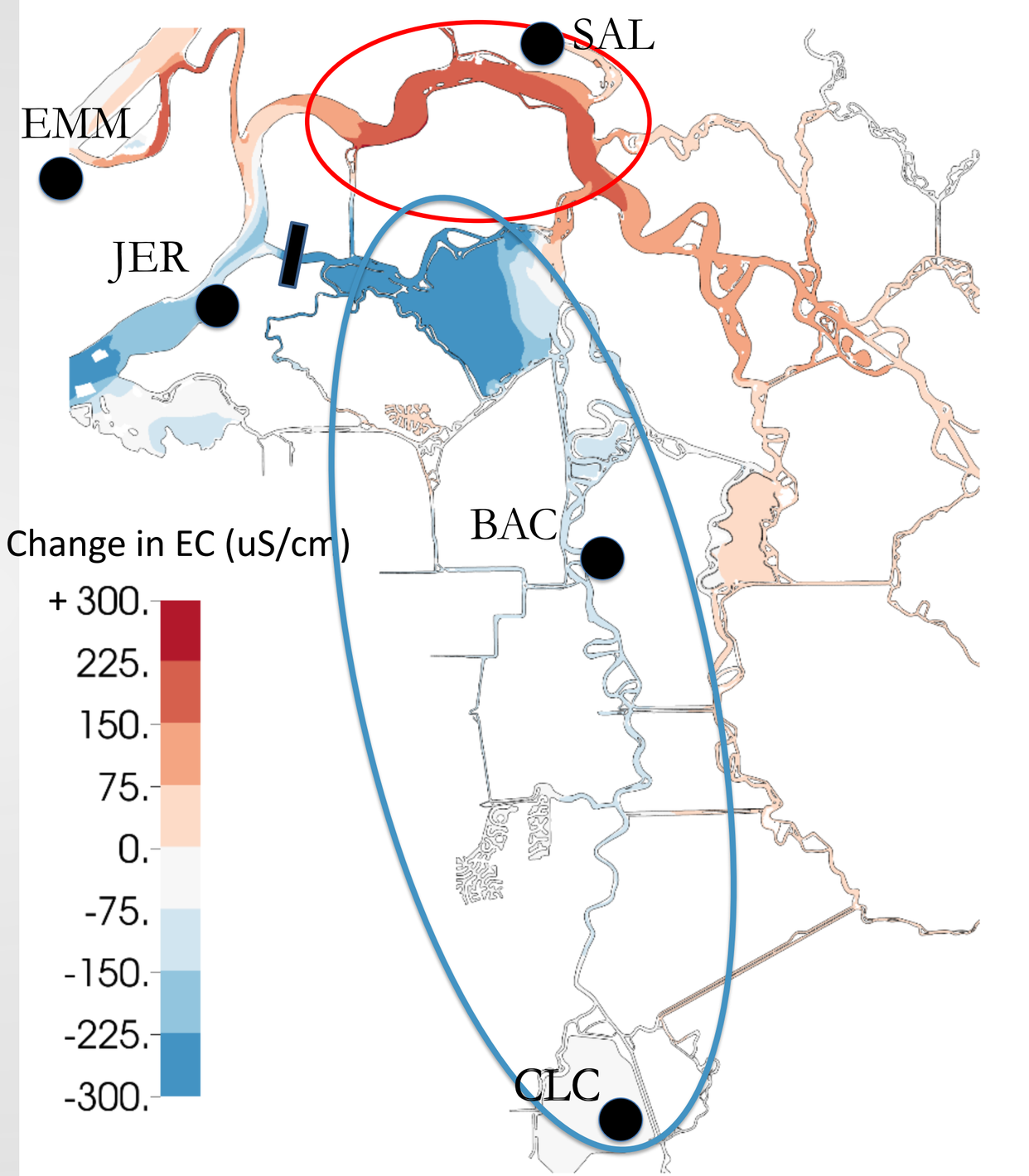

Effect of EDB on
Tidal velocities near Franks Tract
No Barrier
Barrier
Owl Harbor
???
???? Increase
???
0.5 ft/s
2.6 ft/s
4.6X Increase
2.4X Increase
1.0 ft/s
2.4 ft/s
Old River
Zero
100% Decrease
56K cfs
False River Barrier
30% Decrease
0.8 ft/s
1.2 ft/s
10% Decrease
1.3 ft/s
1.2 ft/s
Sacramento River
San Joaquin River
Antioch/
Oakley
Regional
Shoreline
Big Break
Bethel Island
160
12

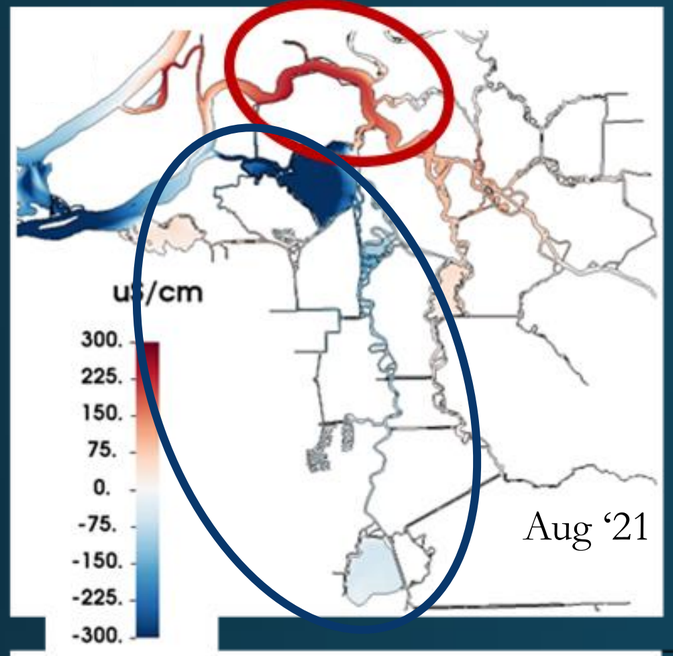
Effect of WFRDSB on tidal excursions Into Franks Track

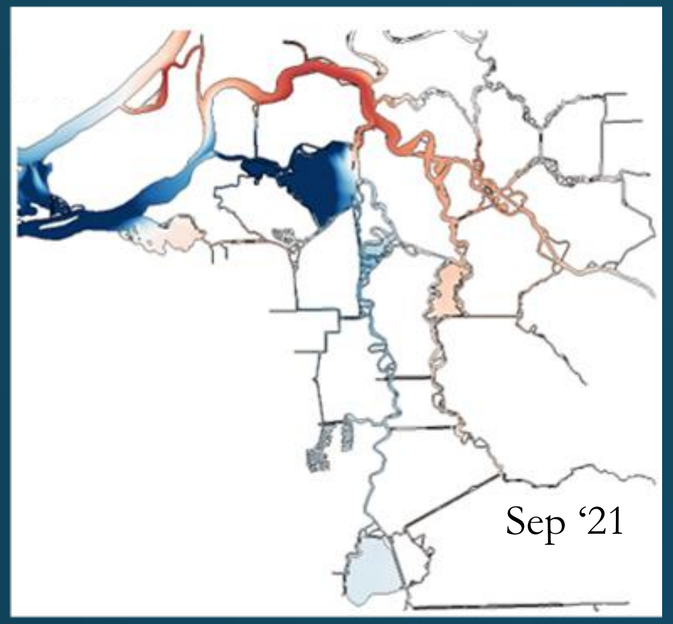


Bay-Delta SCHISM simulated change in salinity for August 1-14, 2021,

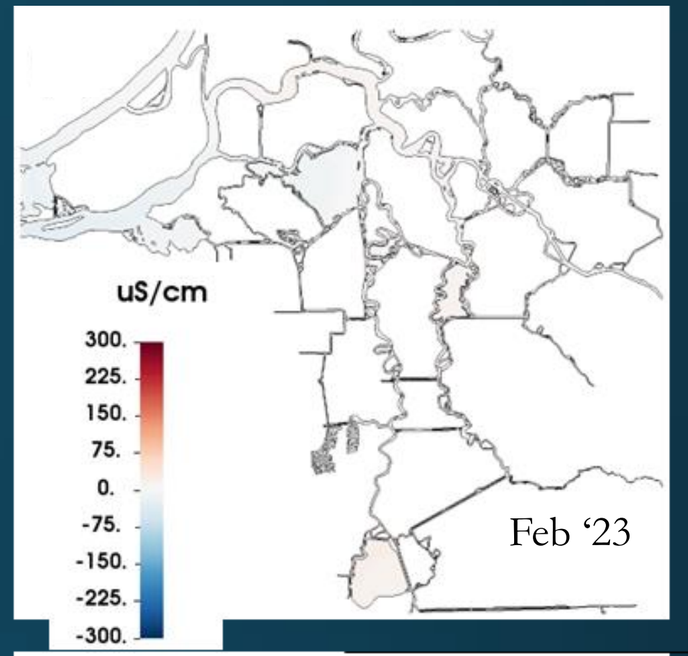
EDB minus **No EDB**

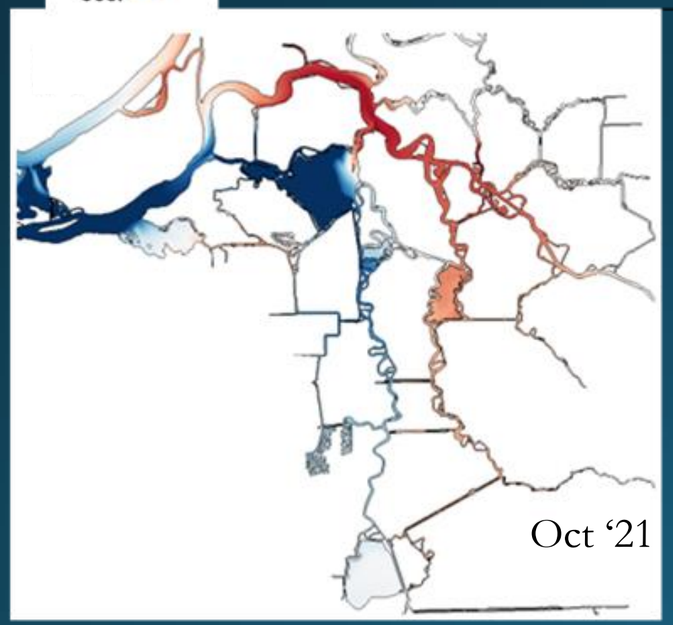


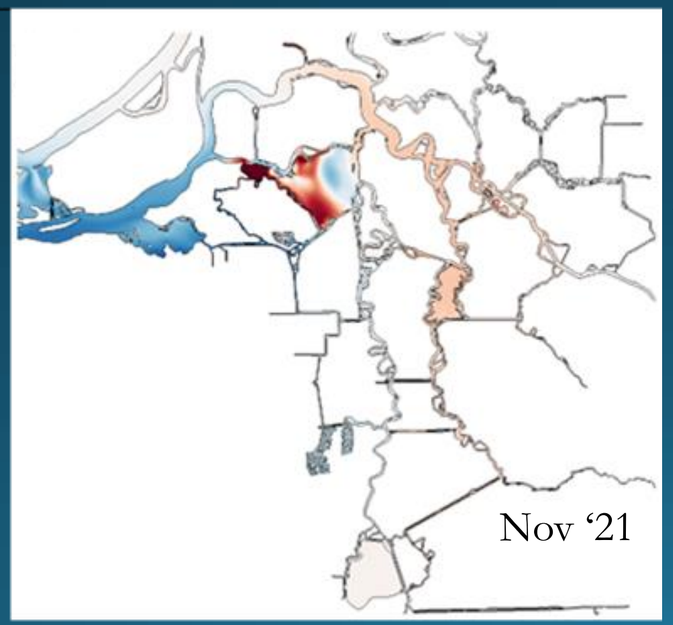




Notched





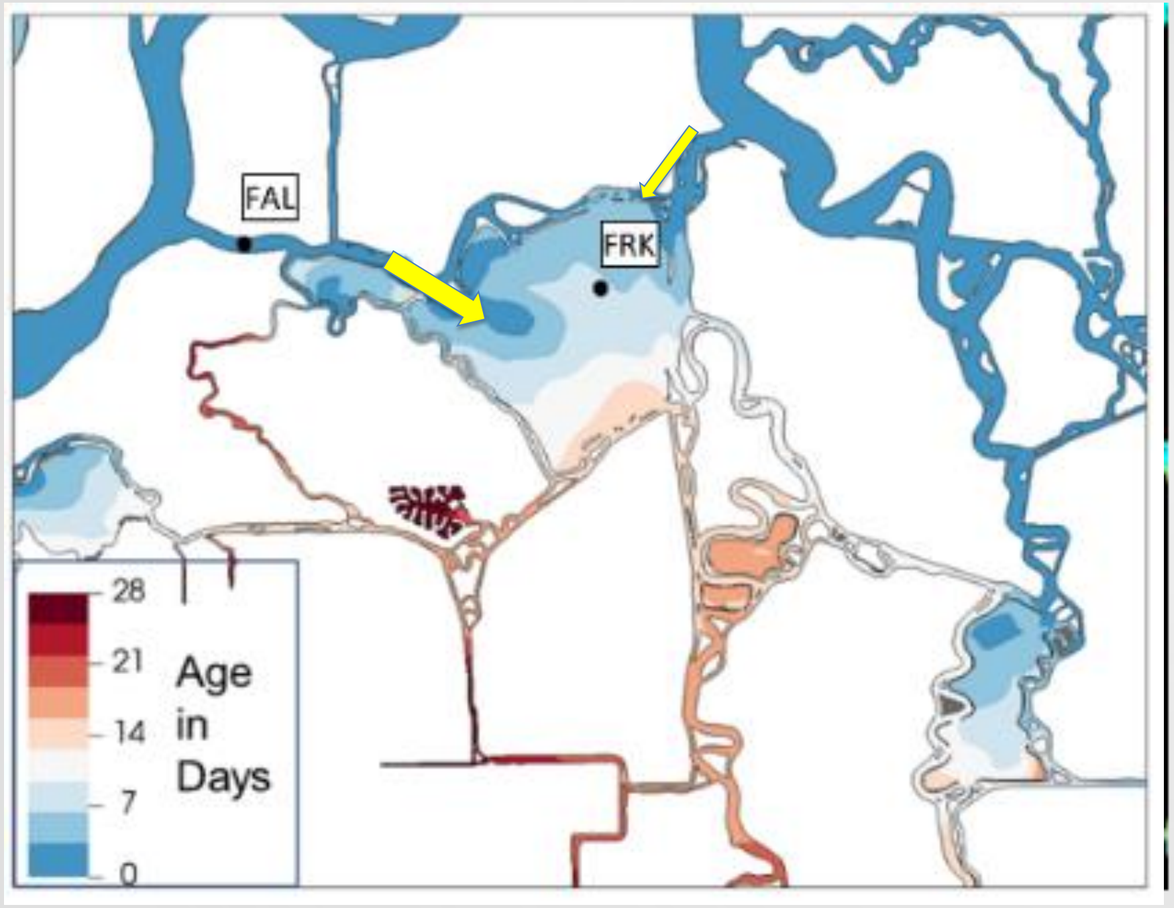


Freshet

Salinity change maps over first 14 days of each month from Bay-Delta SCHISM

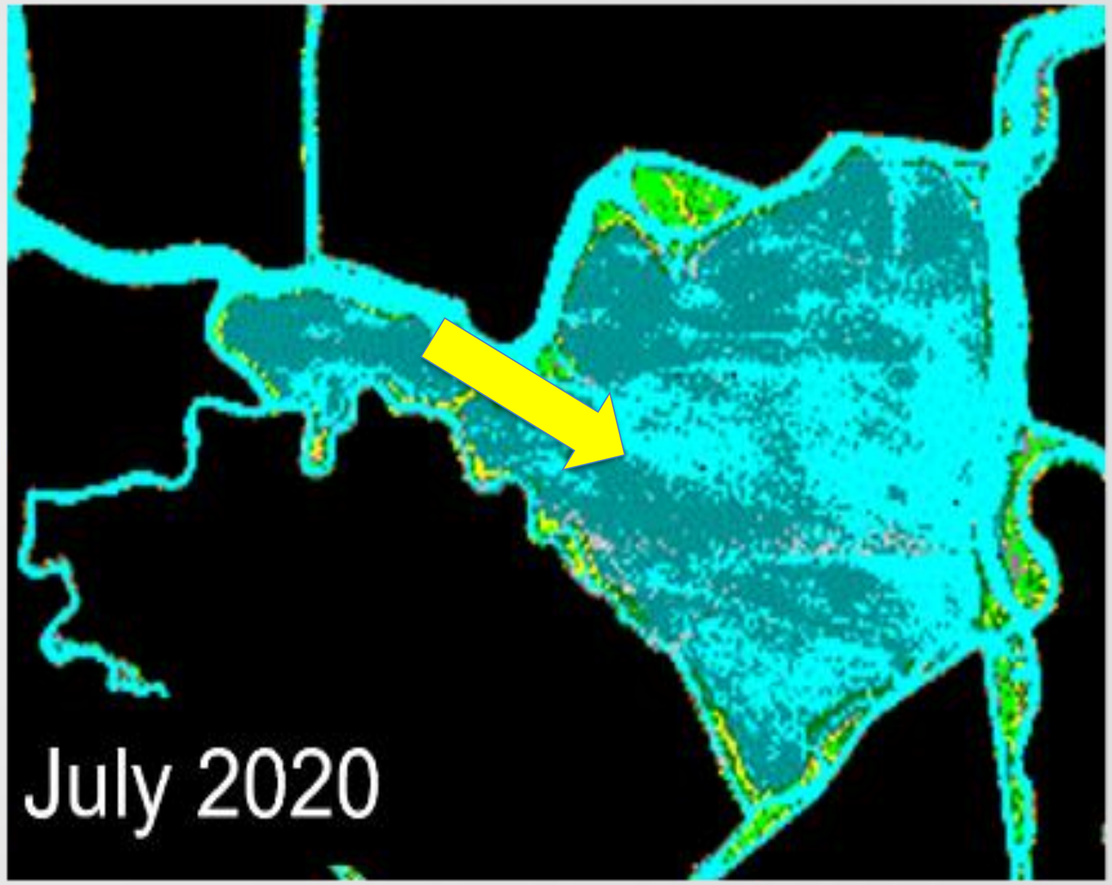
No Barrier/2020

Water Age*



SCHISM simulation result

Submerged Vegetation



Processed from NDVI
Ustin Lab, UCD

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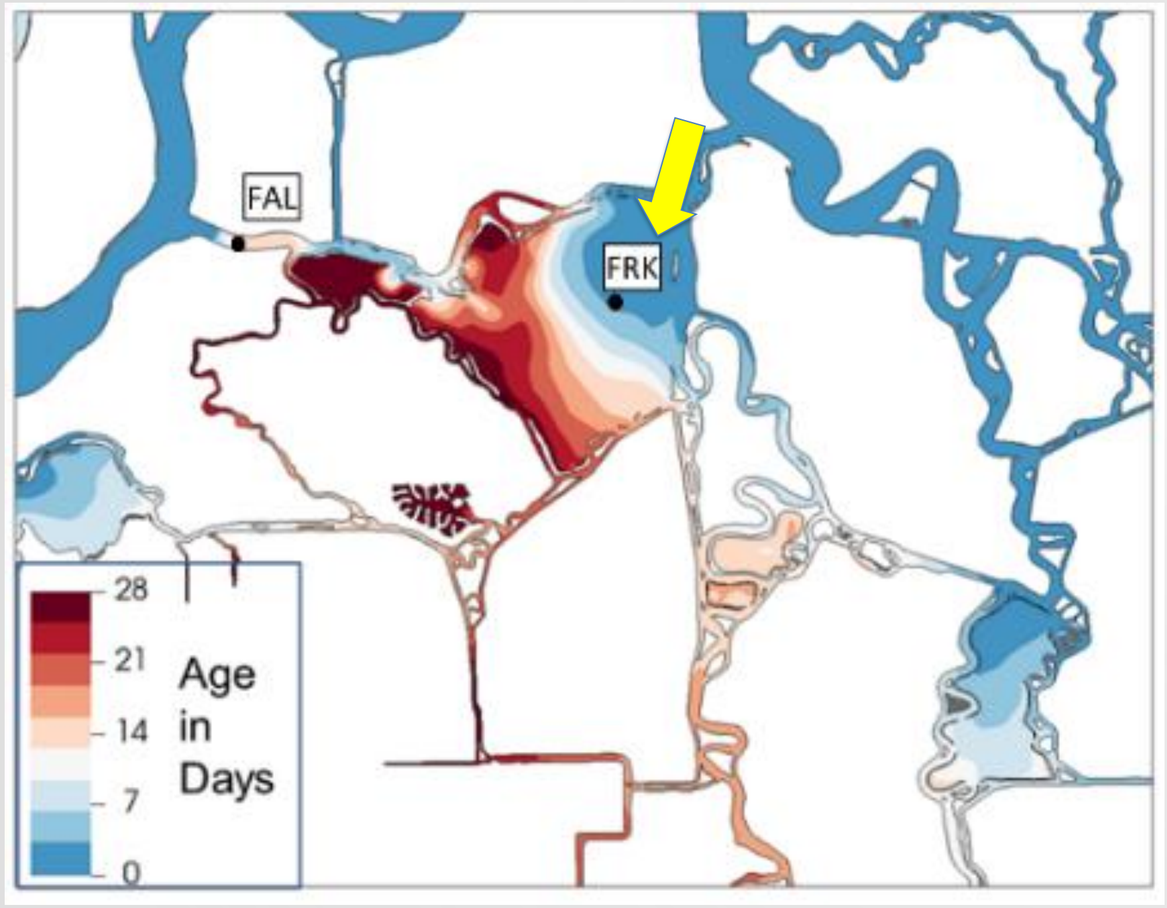
*Zero = Last contact with SJR

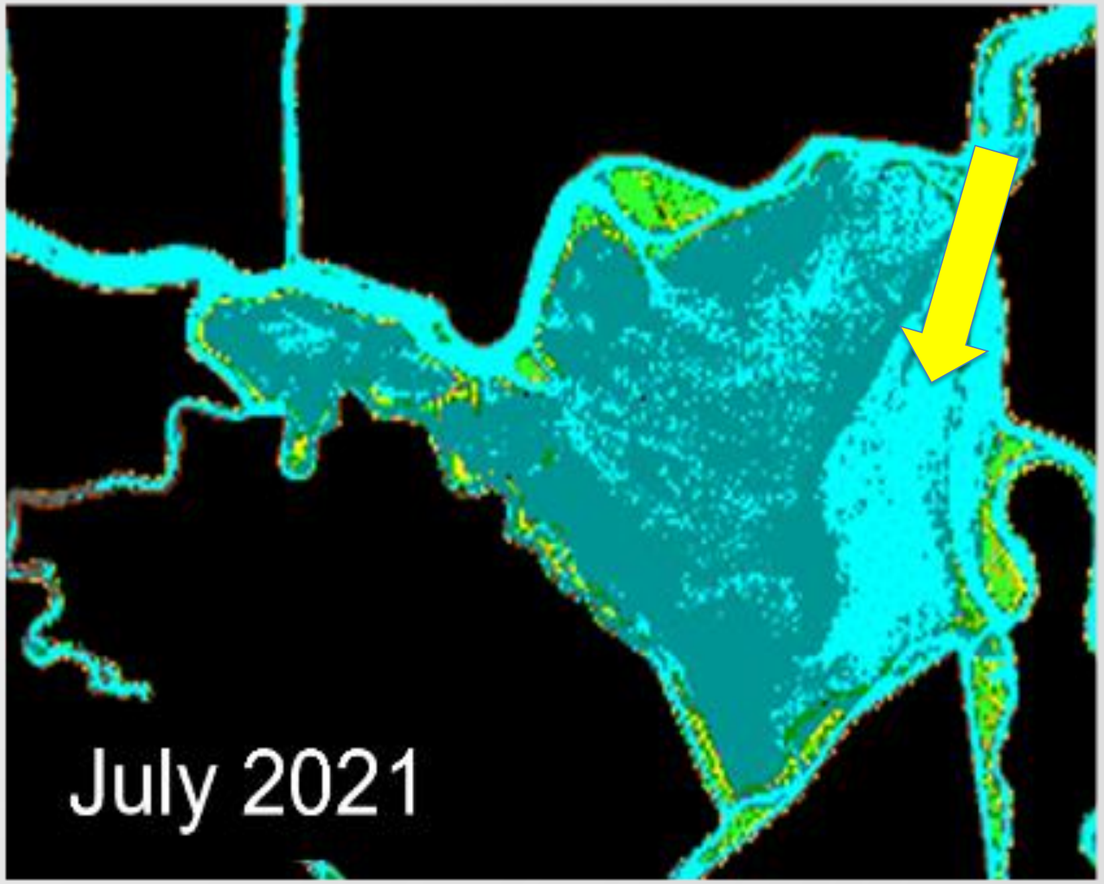
Barrier/2021

Water Age



SCHISM simulation result

Submerged Vegetation



Processed from NDVI
Ustin Lab, UCD

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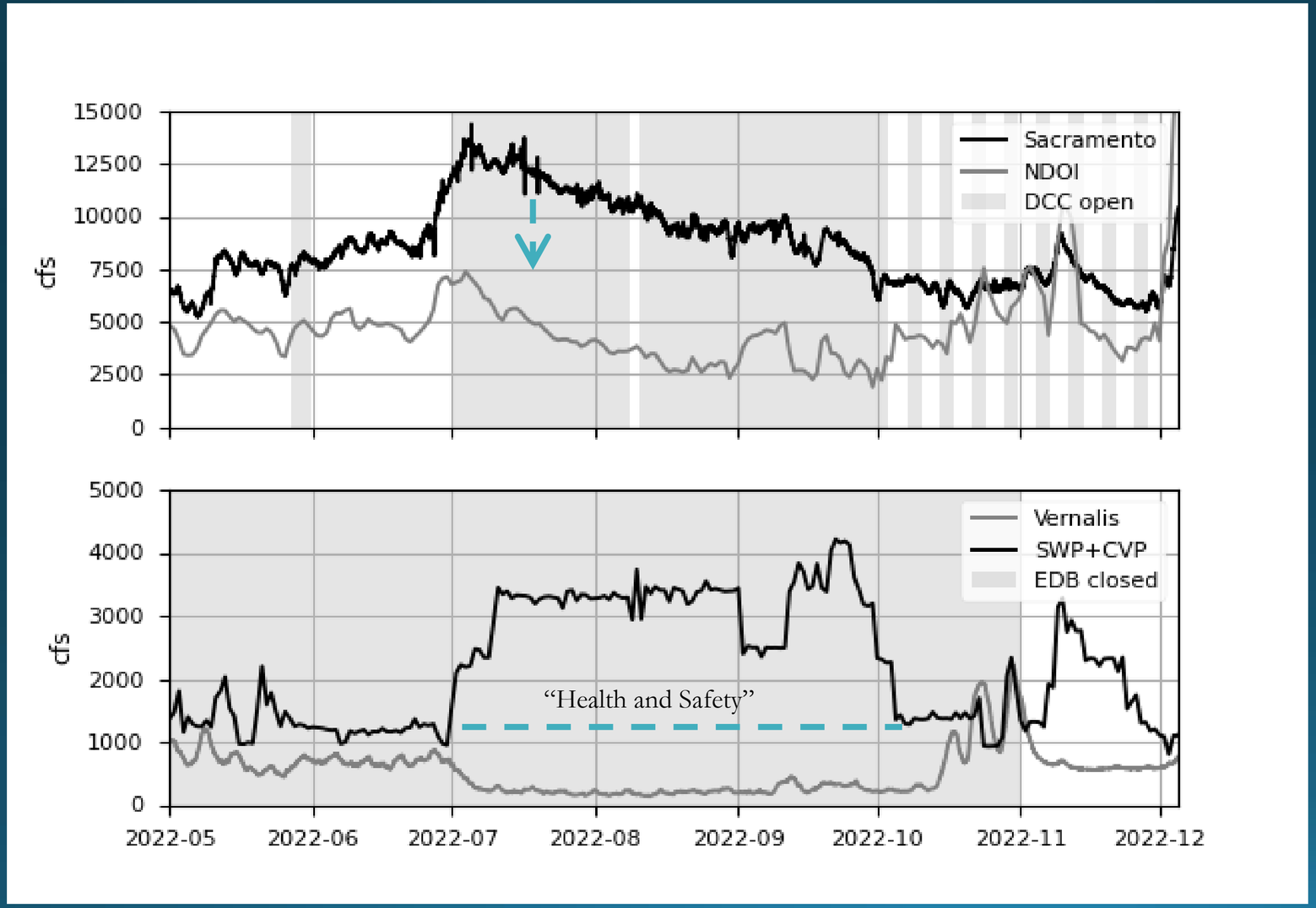
2022 Outflow, Through-Flow Effects

- Low vs Medium through-flow
  - Medium: Historical 2022 (3000+cfs exports)
  - Low: Reduce exports to Health and safety (CVP=900cfs), reduce Sac same
- Low vs Medium outflow
  - Low: Historical 2022 (2500-4000cfs)
  - Medium: Add 2000cfs June 1 – July 11, 600cfs Sep 1 – Oct 15
  - Achieved with Sac flow augmentation (hypothetical)

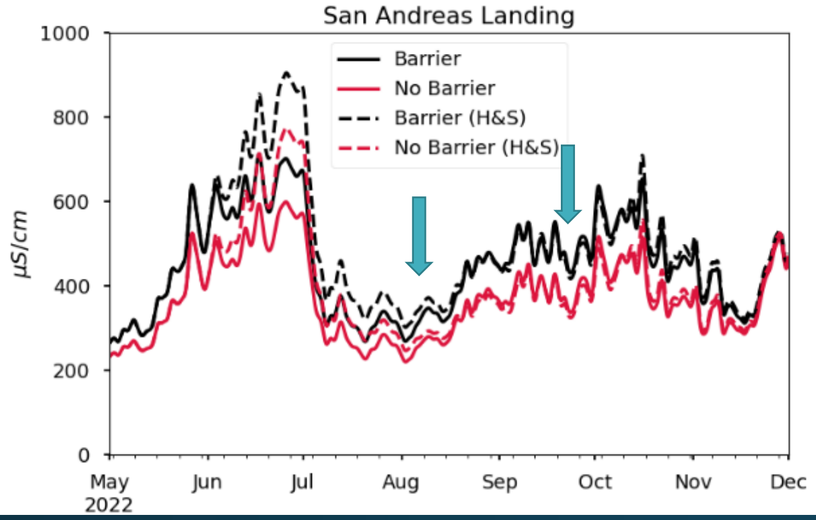
Through-flow/Carriage Water Test

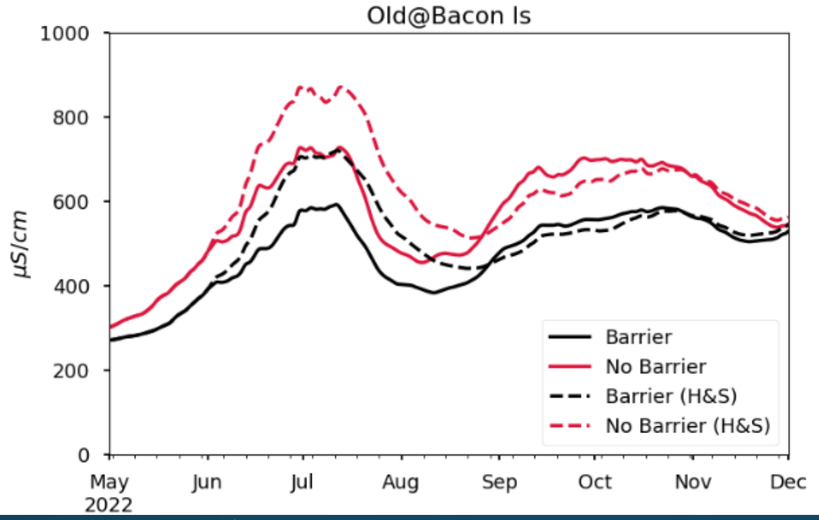


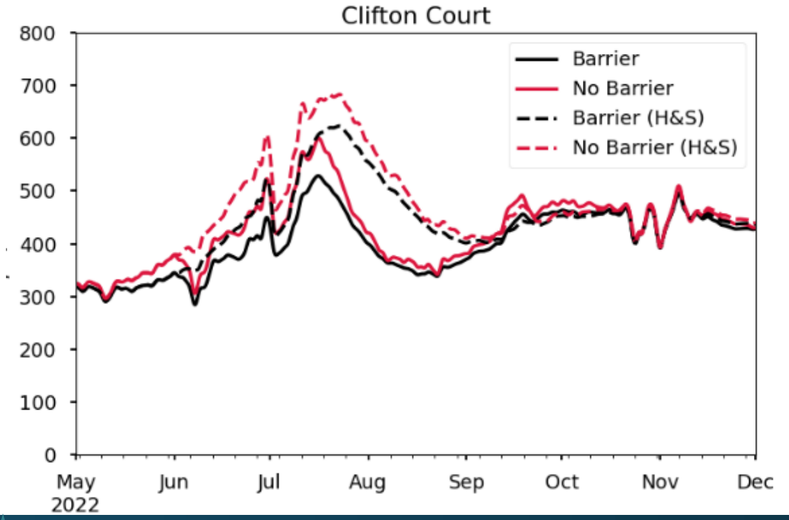
Low outflow:
Historical hydrology

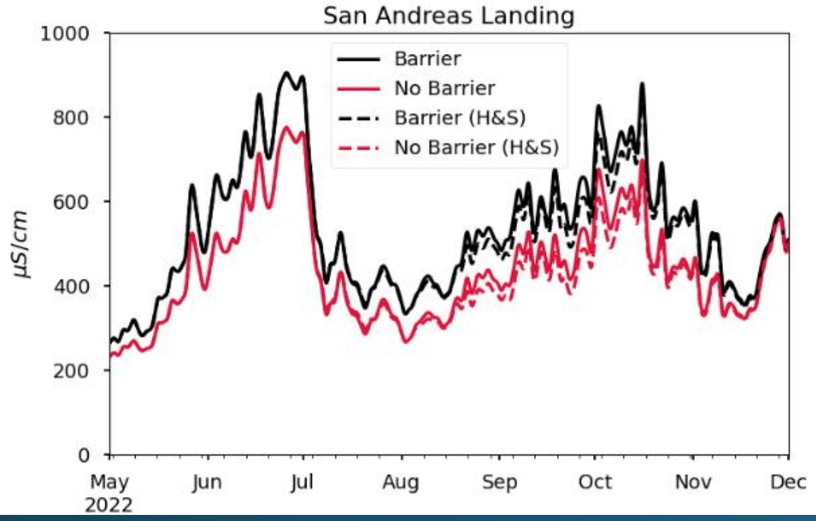
High outflow:
Add to Sac R.
+2000cfs 6/1 – 7/11
+ 600cfs 9/1 – 11/1

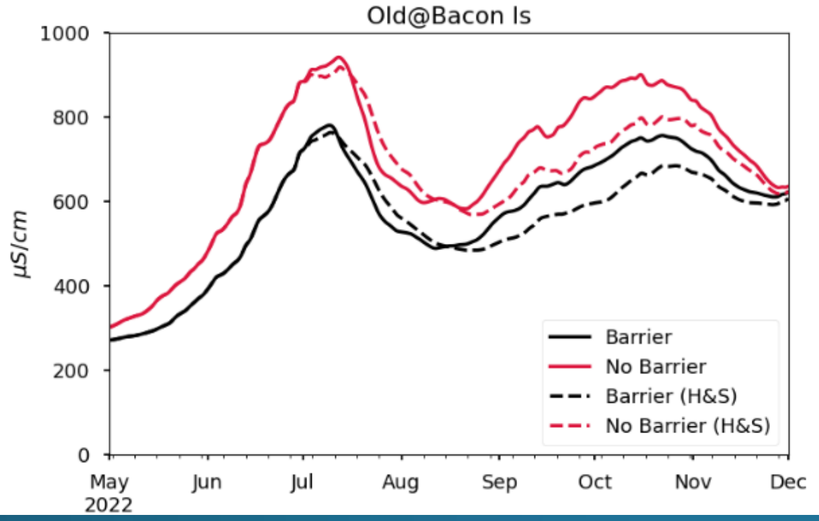
Medium (augmented) outflow

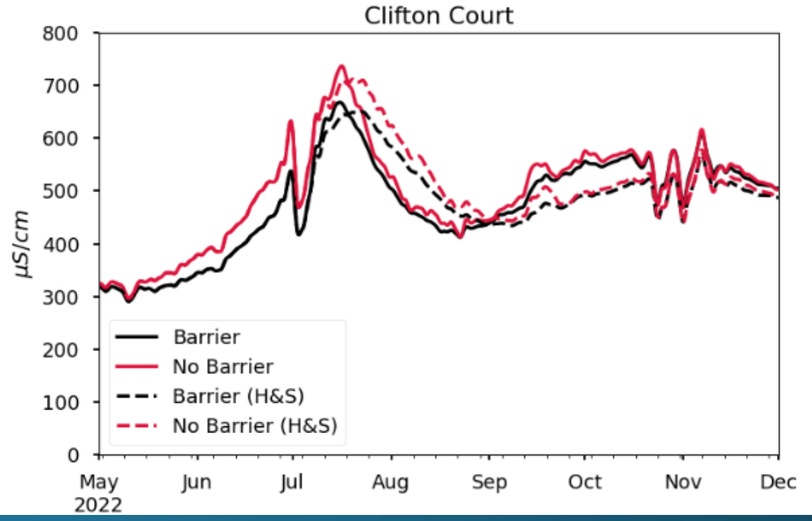












Lower (historical) outflow

Modeled salinity converted to EC

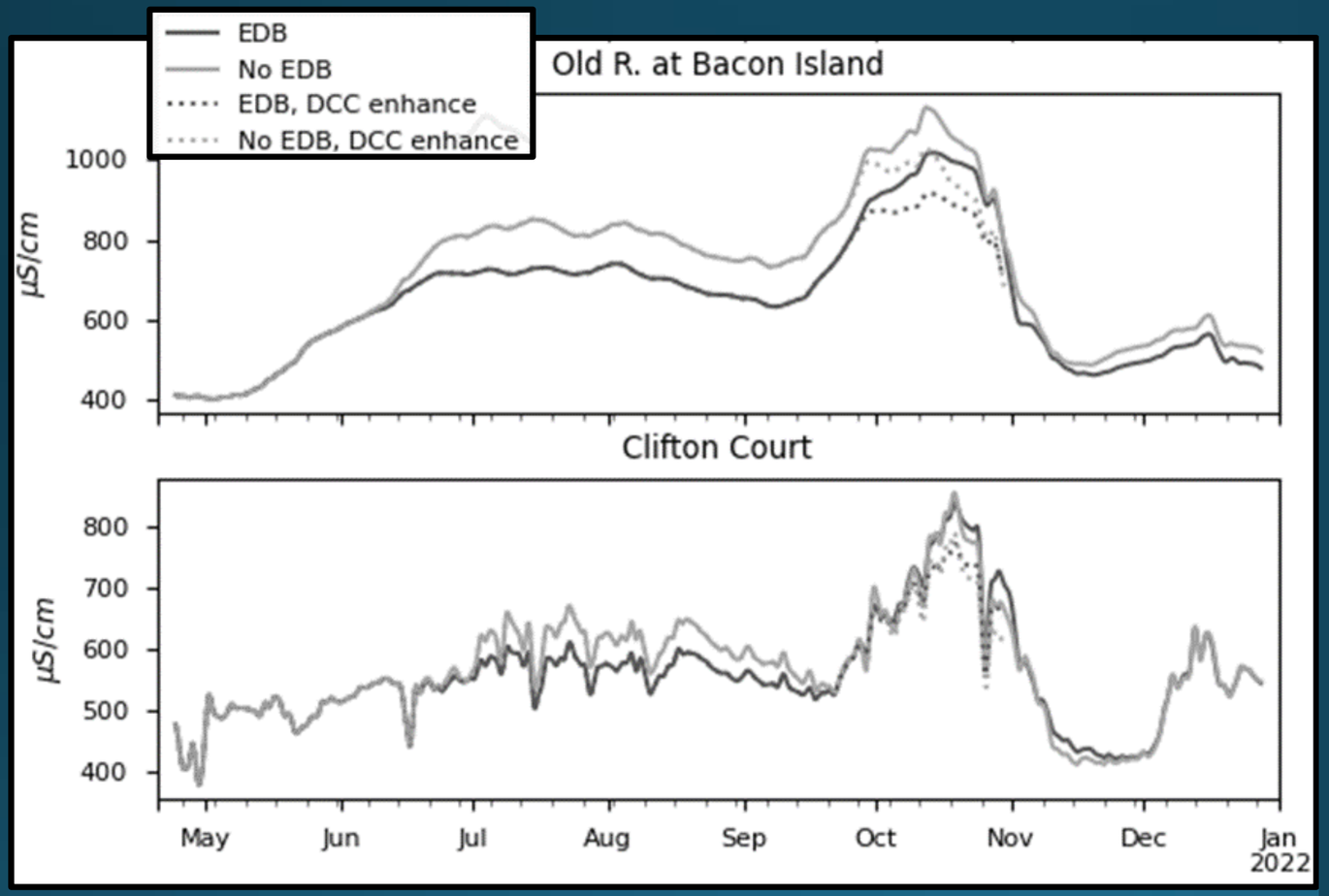
Conclusions

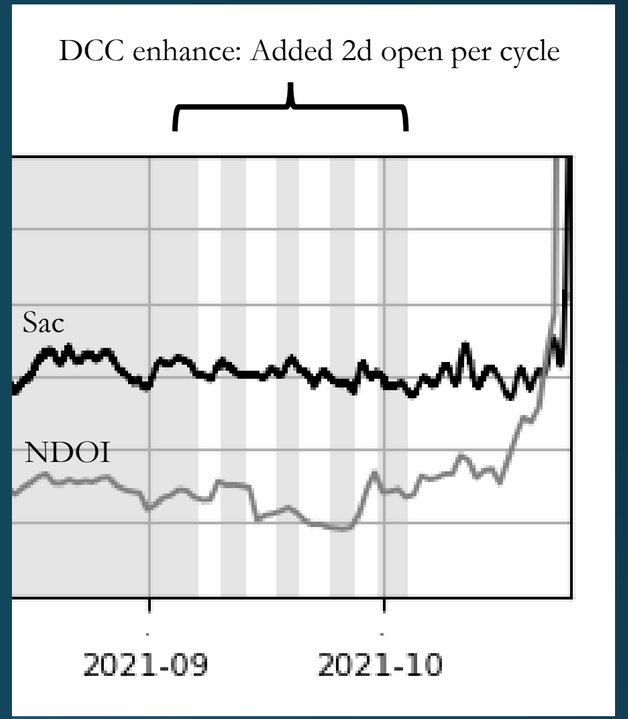
- Barrier slows salinity intrusion from the west
- “Activating” the full benefit requires salinity be present
- San Andreas Landing: controls outcome
  - Through-flow helpful if SAL sufficiently fresh
- Delta Cross Channel:
  - Closed: favors Emmaton
    - Barrier: allow this without Jersey Point salinity overrunning Delta
  - Open: favors SAL and Jersey Point water quality.
    - Best Protection, shores up barriers weak spot
- Complements mean-flow solutions like North Delta Barriers

Questions?

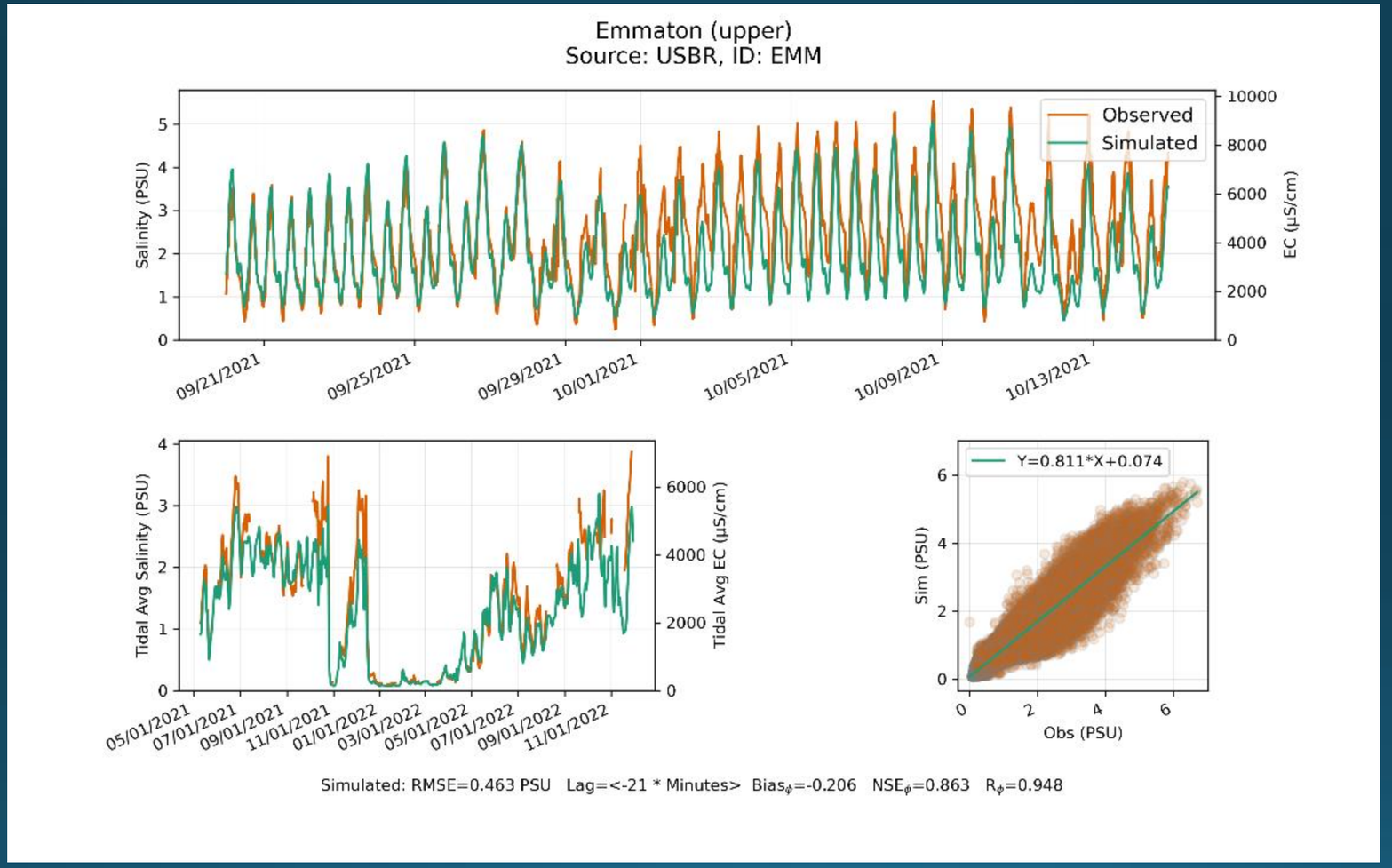
- Eli.Ateljevich@water.ca.gov
- jrburau@usgs.gov

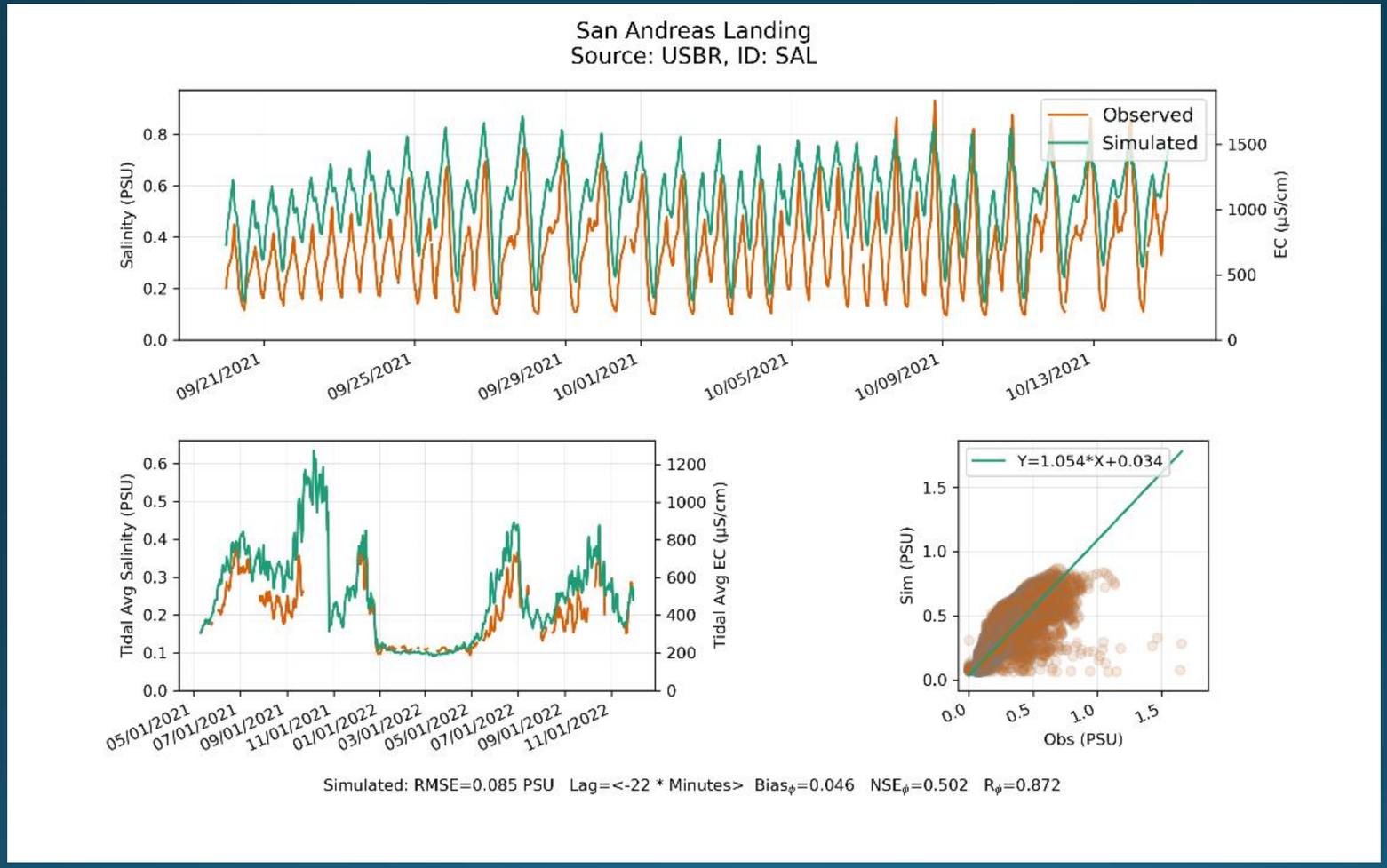
Delta Cross Channel Results

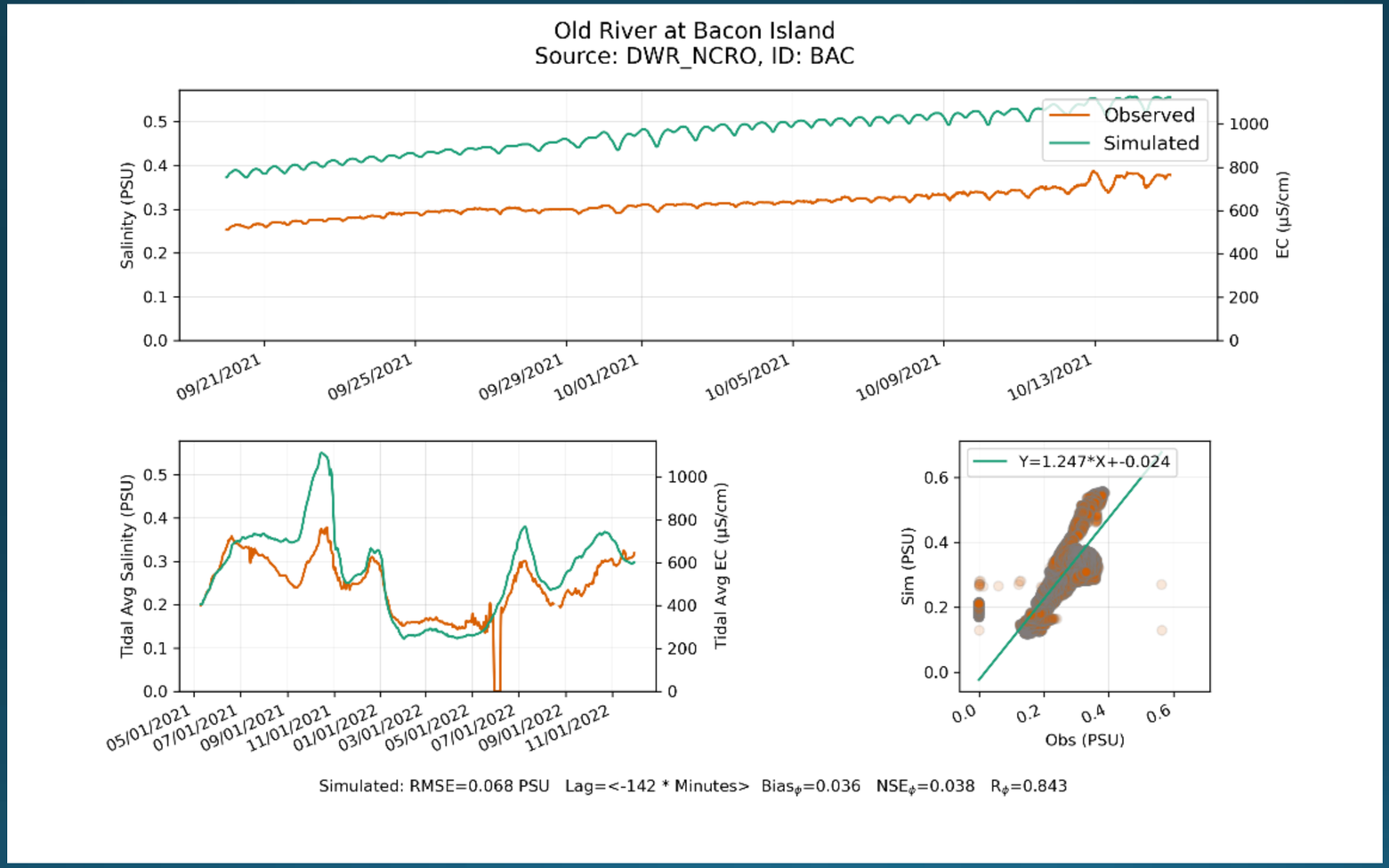


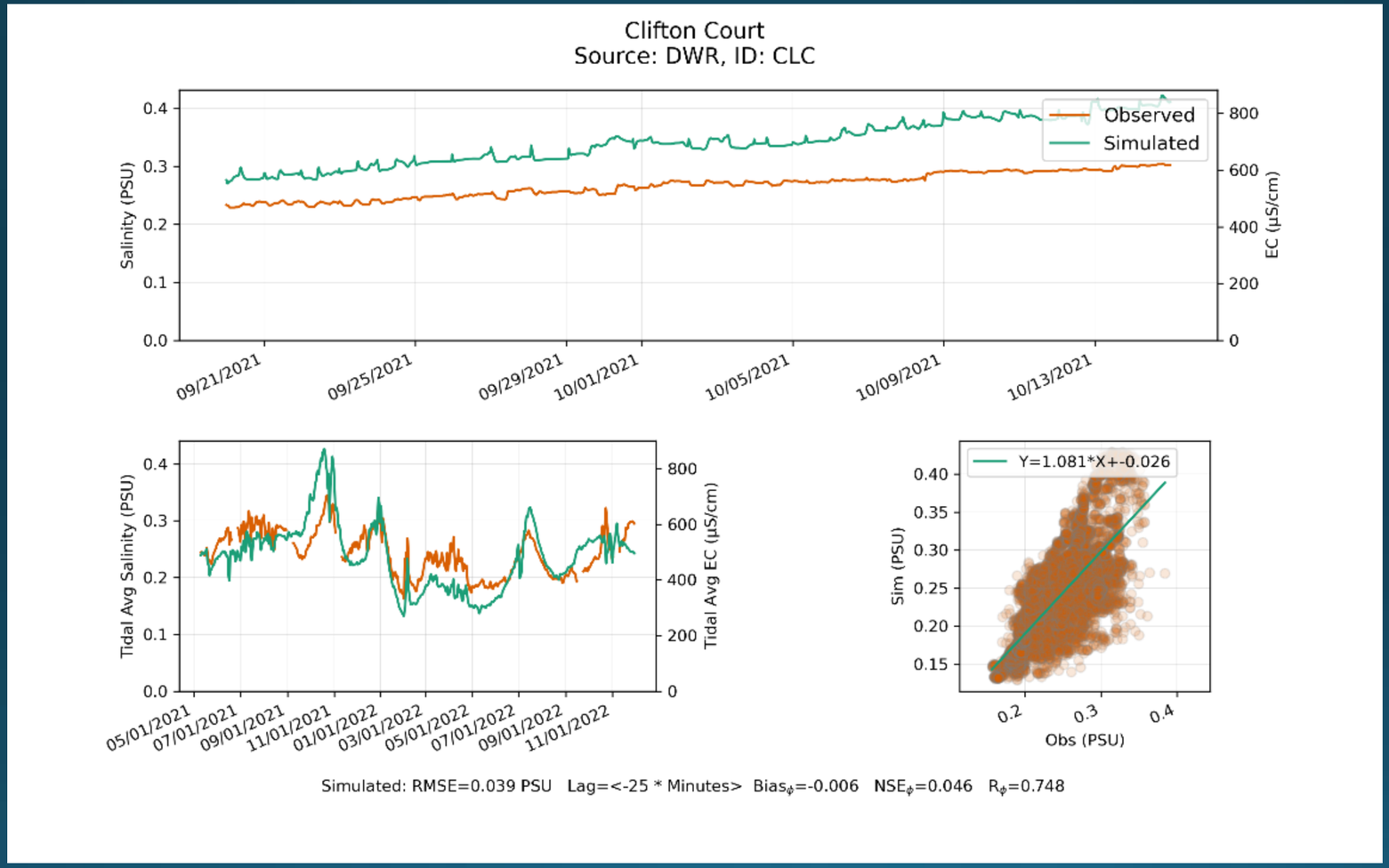


SCHISM simulation in 2021 based on 99% exceedance forecast (saltier than historical)

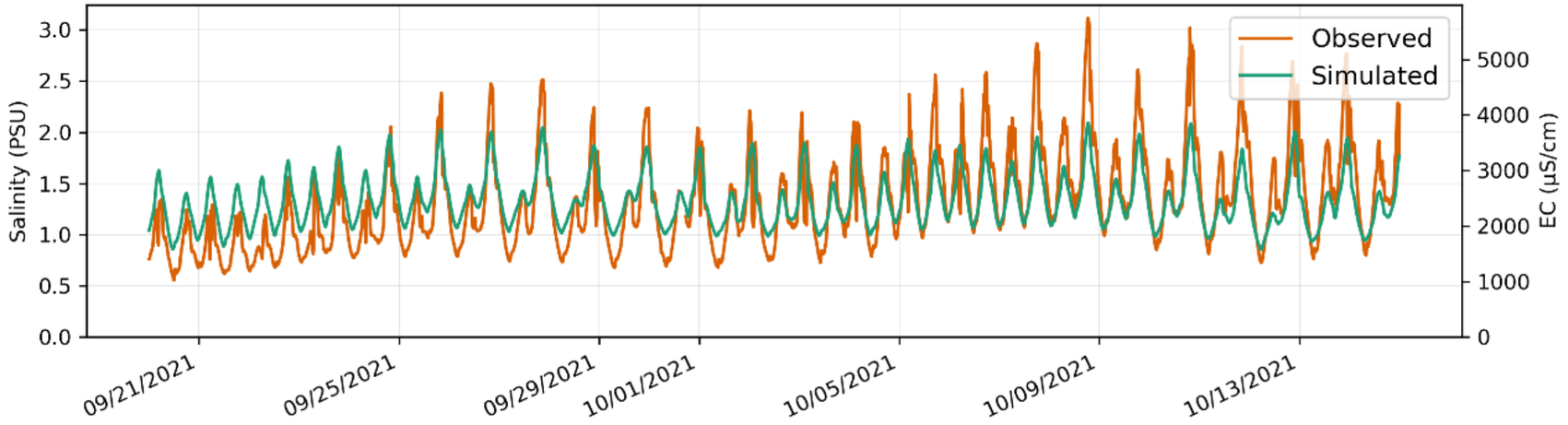

Emmaton (upper)
Source: USBR, ID: EMM
Observed
Simulated
Salinity (PSU)
EC (µS/cm)
09/21/2021
09/25/2021
09/29/2021
10/01/2021
10/05/2021
10/09/2021
10/13/2021
Tidal Avg Salinity (PSU)
Tidal Avg EC (µS/cm)
05/01/2021
07/01/2021
09/01/2021
11/01/2021
01/01/2022
03/01/2022
05/01/2022
07/01/2022
09/01/2022
11/01/2022
Y=0.811*X+0.074
Sim (PSU)
Obs (PSU)
Simulated: RMSE=0.463 PSU Lag=<-21 * Minutes> Bias$_\phi$=-0.206 NSE$_\phi$=0.863 R$_\phi$=0.948

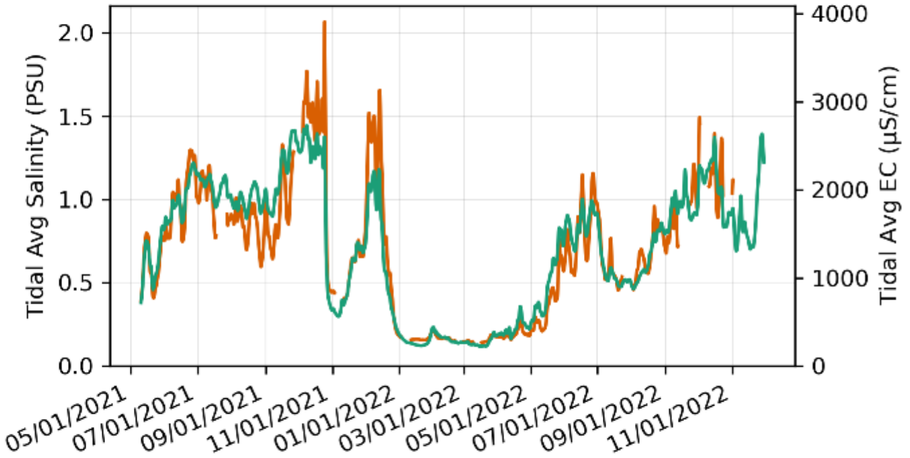

San Andreas Landing
Source: USBR, ID: SAL
Observed
Simulated
Salinity (PSU)
EC (µS/cm)
09/21/2021
09/25/2021
09/29/2021
10/01/2021
10/05/2021
10/09/2021
10/13/2021
Tidal Avg Salinity (PSU)
Tidal Avg EC (µS/cm)
05/01/2021
07/01/2021
09/01/2021
11/01/2021
01/01/2022
03/01/2022
05/01/2022
07/01/2022
09/01/2022
11/01/2022
Y=1.054*X+0.034
Sim (PSU)
Obs (PSU)
Simulated: RMSE=0.085 PSU Lag=<-22 * Minutes> Bias$_\phi$=0.046 NSE$_\phi$=0.502 R$_\phi$=0.872

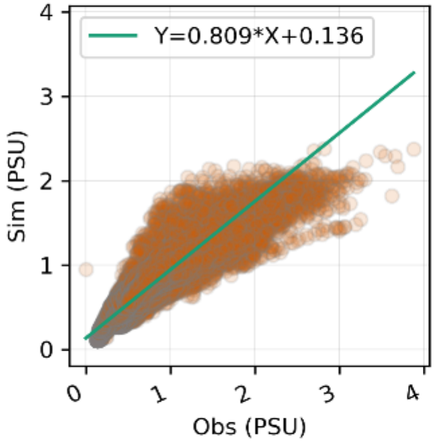

Old River at Bacon Island
Source: DWR_NCRO, ID: BAC
Observed
Simulated
Salinity (PSU)
EC (µS/cm)
09/21/2021
09/25/2021
09/29/2021
10/01/2021
10/05/2021
10/09/2021
10/13/2021
Tidal Avg Salinity (PSU)
Tidal Avg EC (µS/cm)
05/01/2021
07/01/2021
09/01/2021
11/01/2021
01/01/2022
03/01/2022
05/01/2022
07/01/2022
09/01/2022
11/01/2022
Y=1.247*X+-0.024
Sim (PSU)
Obs (PSU)
Simulated: RMSE=0.068 PSU Lag=<-142 * Minutes> Bias$_\phi$=0.036 NSE$_\phi$=0.038 R$_\phi$=0.843


Clifton Court
Source: DWR, ID: CLC
Observed
Simulated
Salinity (PSU)
EC (µS/cm)
09/21/2021
09/25/2021
09/29/2021
10/01/2021
10/05/2021
10/09/2021
10/13/2021
Tidal Avg Salinity (PSU)
Tidal Avg EC (µS/cm)
05/01/2021
07/01/2021
09/01/2021
11/01/2021
01/01/2022
03/01/2022
05/01/2022
07/01/2022
09/01/2022
11/01/2022
Y=1.081*X+-0.026
Sim (PSU)
Obs (PSU)
Simulated: RMSE=0.039 PSU Lag=<-25 * Minutes> Bias$_\phi$=-0.006 NSE$_\phi$=0.046 R$_\phi$=0.748

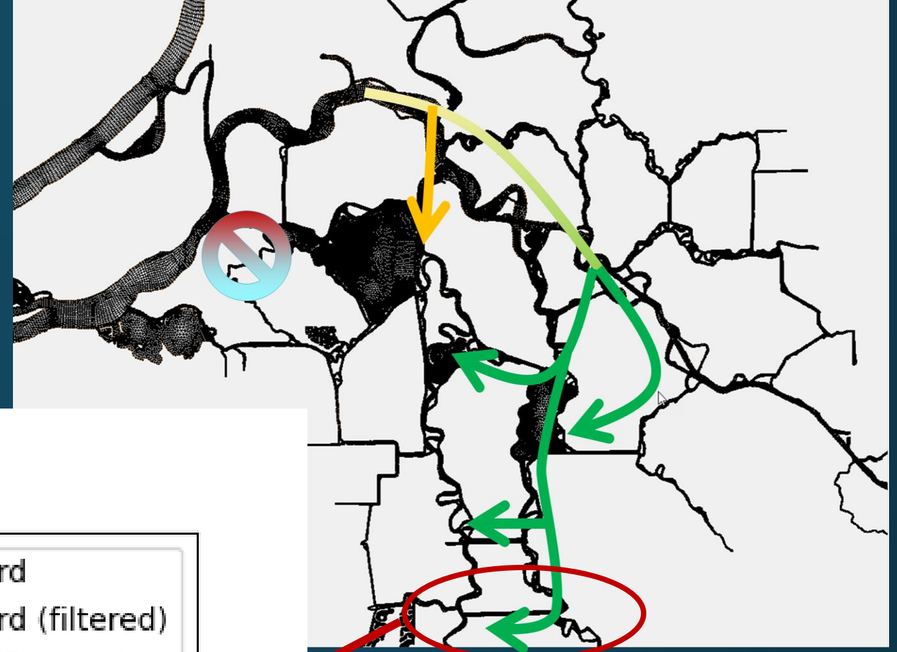
Jersey Point
Source: USBR, ID: JER

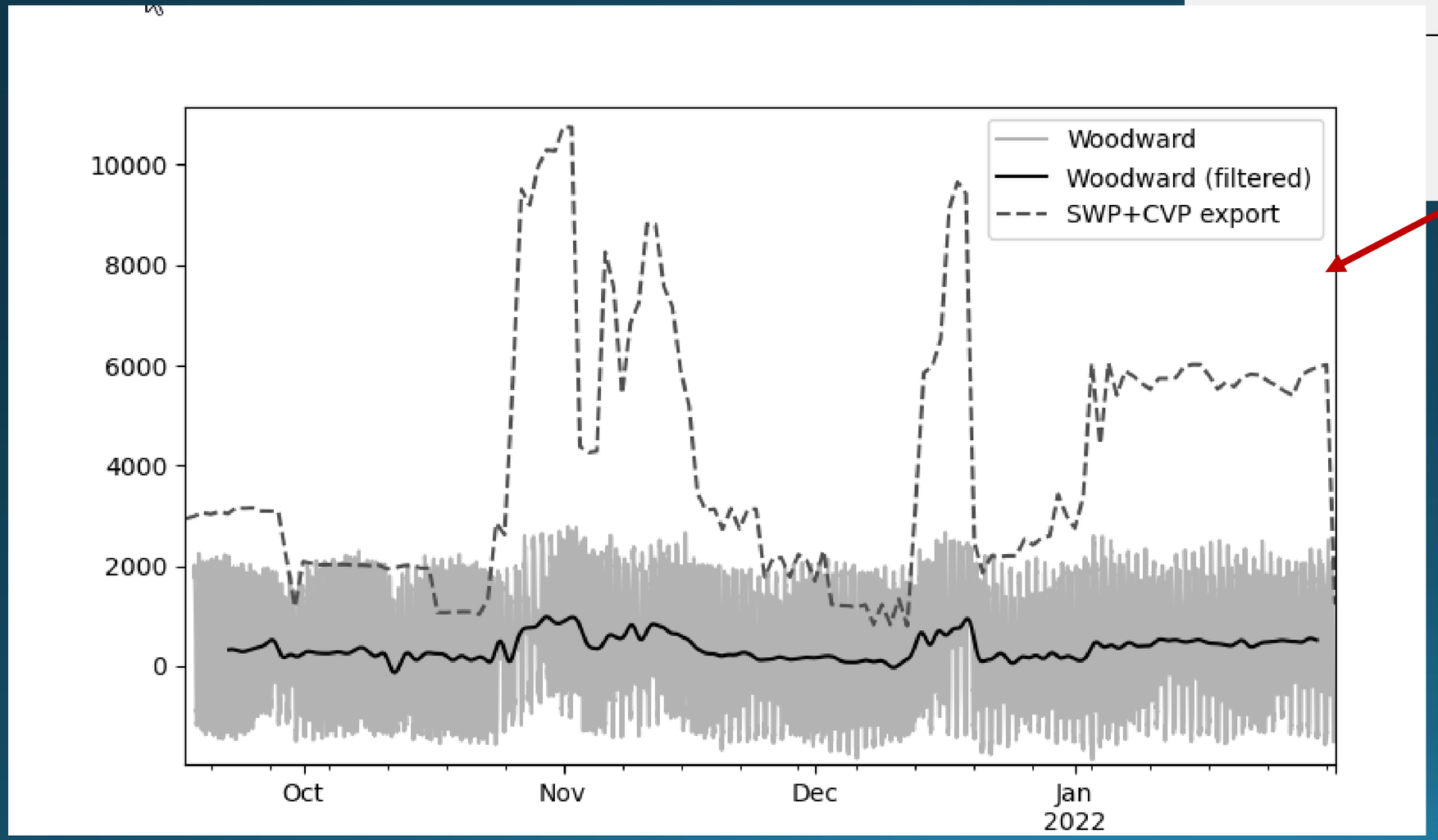






Simulated: RMSE=0.181 PSU Lag=<-18 * Minutes> $Bias_{\phi}$=0.004 NSE_{ϕ}=0.861 R_{ϕ}=0.930




Woodward
Woodward (filtered)
SWP+CVP export
10000
8000
6000
4000
2000
0
Oct
Nov
Dec
Jan
2022