

# Staff Workshop on Potential Changes to the Water Unavailability Methodology for the Delta Watershed

October 20, 2021



Division of Water Rights

# Workshop Logistics and Housekeeping

- Recording will be posted on the Delta Drought webpage at: [waterboards.ca.gov/drought/delta/](https://waterboards.ca.gov/drought/delta/)
- Webcast is available at: [video.calepa.ca.gov/](https://video.calepa.ca.gov/)
- How to participate:
  - Fill out virtual speaker card using online form provided in workshop notice
- Email us: [Bay-Delta@waterboards.ca.gov](mailto:Bay-Delta@waterboards.ca.gov)





# Agenda

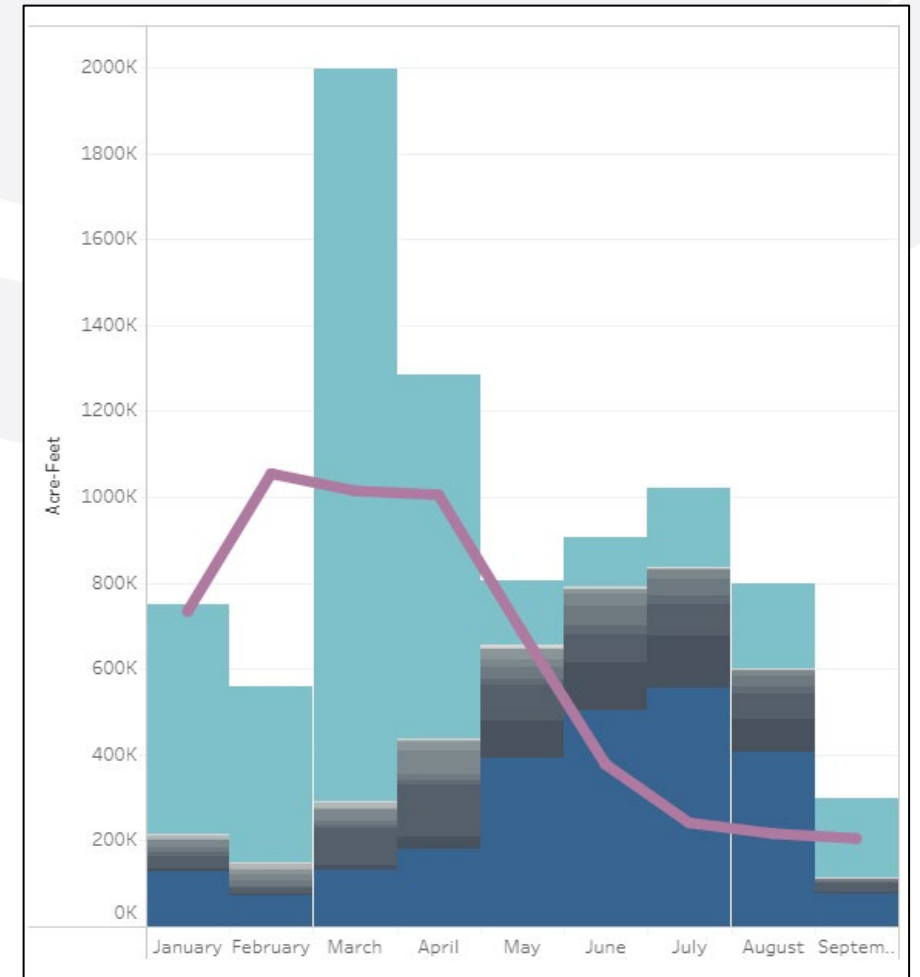
- Background
- Purpose for the workshop
- State Water Board staff overview of technical issues
- Agency and public presentations
- Agency and public comments

# Past and Upcoming Actions

- May 2021 – Draft Water Unavailability Methodology (methodology) released
- June 2021 – Released updated methodology and notices of water unavailability to junior water rights (post-1914 appropriative)
- July 2021 – Released updated methodology, draft emergency regulation, and notices of water unavailability to senior water rights
- August 2021 – Adopted emergency curtailment regulation, updated methodology, and issued curtailments to water right holders
- At least weekly – Updates to curtailments based on current data
- September 2021 – Released additional updates to methodology
- October 19/20 – Temporary suspension of curtailments/workshop
- November – Release any needed updates to methodology following workshop
- December 2021 – Workshop to consider alternate methods for curtailment, including water right Term 91 type approach
- Longer term – Further refinements and long-term measures

# Water Unavailability Methodology Overview

- Used to determine when natural and abandoned flows are not available for diversion by water right/claim priority date
- Does not apply to previously stored water delivered under a water right or contract
- Compares demand data against anticipated supply data
- Sub-watershed and watershed scale analyses - USGS HUC8, with some HUC8 combination
- Original development of methodology focused on dry season



# Wet Season and Other Possible Adjustments

- How to most effectively suspend curtailments in response to actual and projected precipitation and runoff events
- Return flow factors and methods for the wet season, including whether the U.S. Bureau of Reclamation and possibly other water users may retain residual control, dominion, or right to further use of return flows
- Assessments of water unavailability in the Legal Delta during the wet season, including freshwater residence time and related issues described in [Appendix D](#) of the Water Unavailability Methodology Report
- Possible incorporation of water supply/demand data submitted by water right holders and claimants larger than 5,000 acre-feet as part of enhanced reporting under the August 20, 2021 initial orders



# Curtailment Suspension Due to Forecasted Precipitation & Runoff

Jesse Jankowski



Division of Water Rights, Bay Delta & Hearings Branch

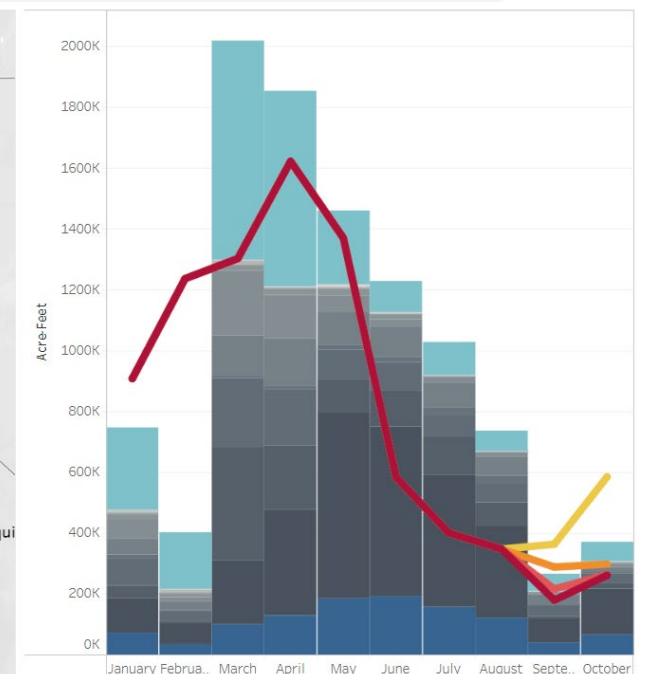
# Outline

- Water Unavailability Methodology
- Curtailment Status List and Weekly Updates
- Precipitation and Water Supply Forecasts
- October Curtailments To-Date
- Upcoming Actions



# Water Unavailability Methodology

- Compares water supply & demand at multiple scales
  - Supply = Unimpaired flow
  - Demand = 2018 reported diversions with QA/QC
- Includes adjustments to account for:
  - Supply data gaps for small streams
  - Headwater demands unmet by local supply
  - Return flows
  - Abandoned instream flows
  - Disconnected subwatersheds
  - Legal Delta demands
- Based on actual or claimed priority dates



# Curtailment Status List & Weekly Updates

- Determined by the Methodology
- Interactive searchable list at: [waterboards.ca.gov/drought/delta/](http://waterboards.ca.gov/drought/delta/)
- Updated at least weekly
- Describe curtailments by subwatershed and priority year
  - Recorded message: (916) 323-4643
  - Previous weeks' emails and Curtailment Status List spreadsheets available on website

The following priorities of water rights and claims are **curtailed at this time**, unless and until the State Water Board advises that this determination has been updated:

- Water rights and claims on the following San Joaquin River tributaries:
  - All post-1914 appropriative water rights, pre-1914 appropriative water right claims, and riparian water right claims in the Calaveras River subwatershed that are outside of the Legal Delta;
  - All post-1914 appropriative water rights and pre-1914 appropriative water right claims in the Merced River subwatershed;
  - Post-1914 appropriative water rights and pre-1914 appropriative water right claims in the Stanislaus River subwatershed with a priority date of 1850 or later that are outside of the Legal Delta;
  - Post-1914 appropriative water rights and pre-1914 appropriative water right claims in the Tuolumne River subwatershed with a priority date of 1900 or later;
- Post-1914 appropriative water rights and pre-1914 appropriative water right claims with a priority date of 1928 or later in all other tributaries of the San Joaquin River watershed that are outside of the Legal Delta;
- Water rights and claims on the following Sacramento River tributaries:
  - All post-1914 appropriative water rights and pre-1914 appropriative water right claims in the Yuba River subwatershed;
  - Post-1914 appropriative water rights and pre-1914 appropriative water right claims in the American River subwatershed above Folsom Reservoir with a priority date of 1852 or later;
  - Post-1914 appropriative water rights and pre-1914 appropriative water right claims in the Bear River subwatershed with a priority date of 1853 or later;
  - Post-1914 appropriative water rights and pre-1914 appropriative water right claims in the Cache Creek subwatershed with a priority date of 1859 or later;
  - Post-1914 appropriative water rights in the Stony Creek subwatershed with a priority date of 1977 or later; and
- Six post-1914 appropriative water rights associated with the Central Valley Project and State Water Project in the Sacramento River watershed and in the Legal Delta.

Search by Water Right ID

Search by Owner Name

Filter by Water Right Type (All) Filter by Subwatershed (All) Filter by Legal Delta (All)

(Updated 10/13/21)  
 Curtailment status should not be construed as a validation of a water right claim or an authorization to divert.

WR ID	Primary Owner	Claimed Priority Year	Current October Curtailment Status
A000018	GLENN-COLUSA IRRIGATION DISTRICT	1915	Not Curtailed
A000023	U.S. BUREAU OF RECLAMATION	Project	Curtailed
A000026	JAMES S PHELPS, TRUSTEE	1915	Curtailed
A000027	RECLAMATION DISTRICT #1004	1915	Not Curtailed
A000065	FRANK KIMP	1915	Not Curtailed
A000077A	Northern California Power Agency	1915	Curtailed
A000135	RICHARD L JENNINGS	1915	Not Curtailed

# Precipitation & Water Supply Forecasts

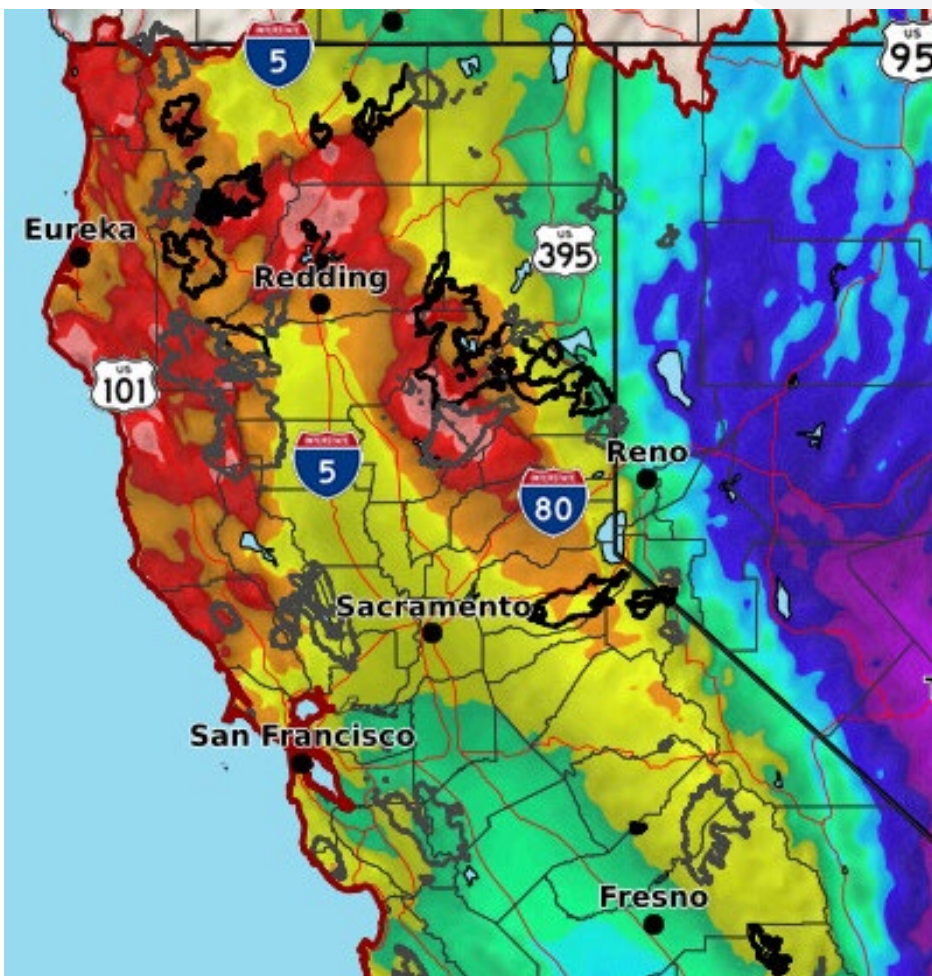
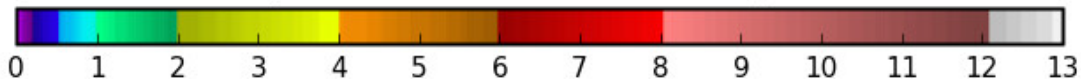
- August-early October based on monthly supply & demand
- Beginning October 13, based on weekly supply & demand
- Evaluating precipitation and water supply daily for potential changes to curtailments as a result of upcoming events
- California Nevada River Forecast Center (CNRFC) water supply forecasts update daily, high confidence in 7-day outlook
- Multiple forecasted supply values with probabilities of occurrence



# Precipitation & Water Supply Forecasts

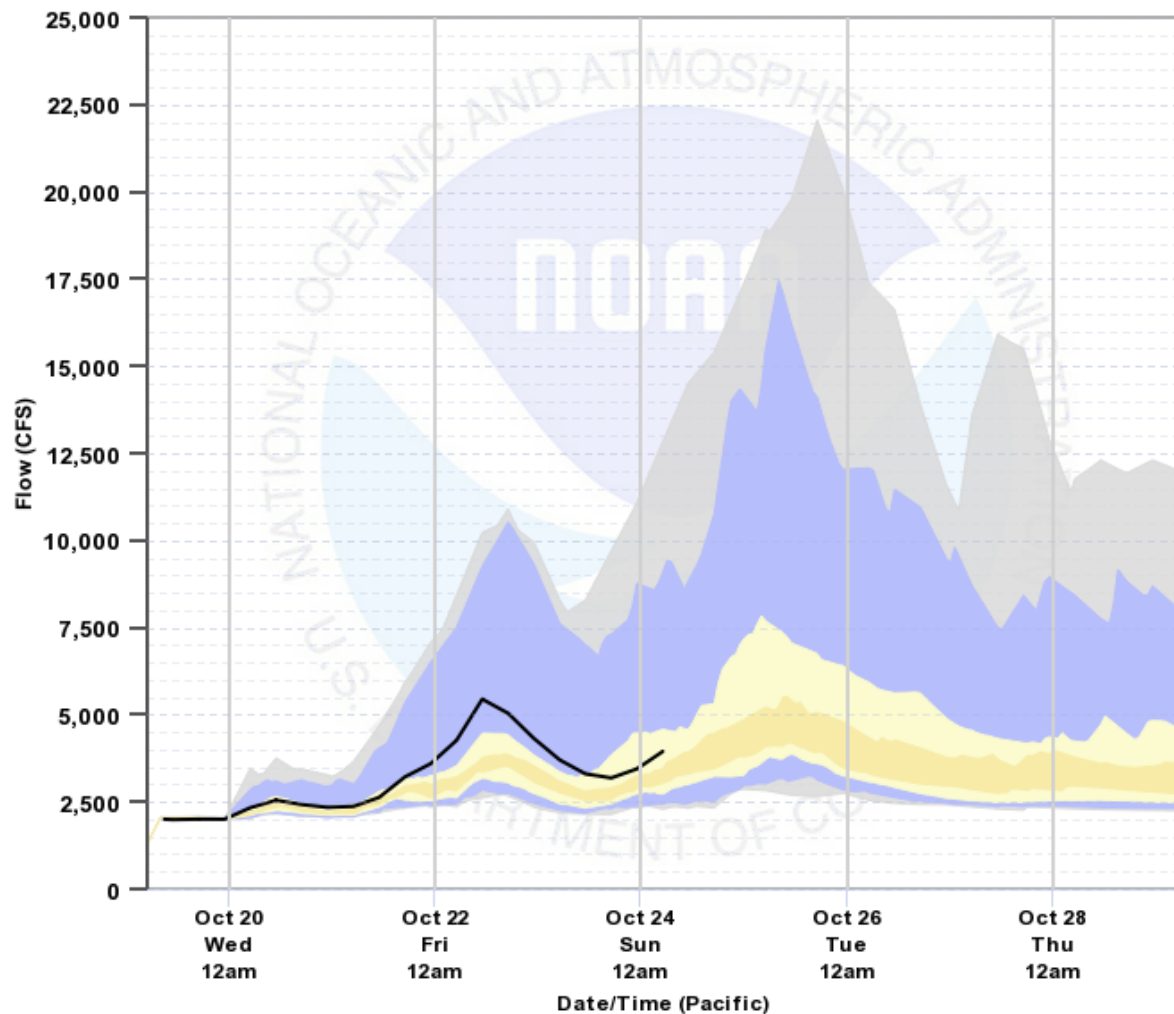
### 6-Day Forecast Precipitation (Inches)

Valid: Tue Oct 19, 2021 at 05 AM PDT to Mon Oct 25, 2021 at 05 AM PDT



### FEATHER RIVER - LAKE OROVILLE (ORDC1)

Created: 10/19/2021 at 8:55 AM PDT



National Weather Service  
CNRFC - Sacramento, CA

Created: 10/19/2021 07:24 AM PDT

Follow Us:



www.cnrfc.noaa.gov

# October Curtailments To-Date

- Weekly Updates issued on October 1<sup>st</sup>, 6<sup>th</sup>, 13<sup>th</sup>\*, and 19<sup>th</sup>\*  
\*Based on weekly datasets
- Major curtailments suspensions since October 1<sup>st</sup>:
  - Merced, Stanislaus: All Pre-14s → 1858 → None
  - Yuba: All Pre-14s → None
  - Upper American: 1851 → None
  - San Joaquin Watershed: 1873 → 1928 → None
- October 19<sup>th</sup> Update:
  - All curtailments temporarily suspended due to precipitation event

# Upcoming Actions

- Continue regularly evaluating water supply forecasts and updating curtailment changes in response to near-term precipitation events
- Assess accuracy of recent forecasts vs. observed runoff
- Designate some demands from Mokelumne, Chowchilla, and Fresno River as headwater subwatersheds
- Potential use of Bulletin 120 monthly forecasts in 2022



# Return Flow Assumptions

Matthew Holland



Division of Water Rights, Bay Delta & Hearings Branch

# Return Flow Assumptions

- Residual Control of Return Flows\*
- Review of Existing Assumptions
- Why are Updates Needed?
  - Direct Diversion vs. Diversion to Storage
  - Unmet Headwater Subwatershed Demands
- Proposed Updates for Wet Season

\*Not specifically a wet season issue

# Residual Control of Return Flows

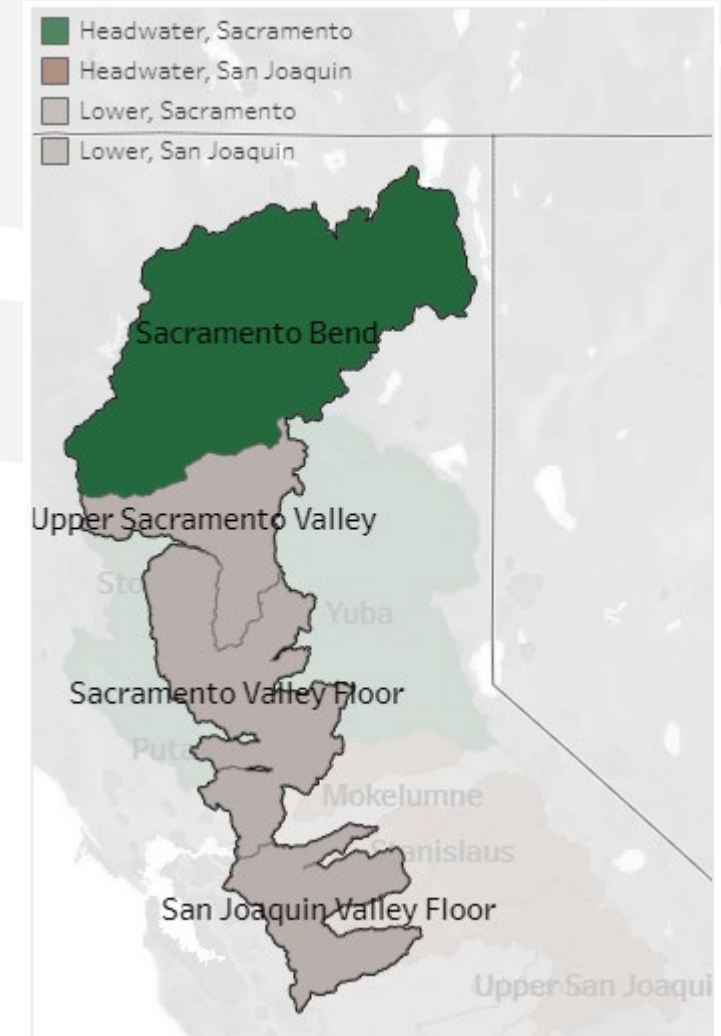
- Reclamation letter, September 16, 2021
  - Expressed concern that large modeled September return flows may have led to early lifting of curtailments\*
  - Claimed that Reclamation retains control of return flows, should not be included in supply
- Technical challenges: information needed to implement a change
  - Real-time return flow data very limited
  - Disaggregation of surface water diversions (Project vs. underlying right)
  - Disaggregation of surface water vs. groundwater to demands receiving Project water

\* See also Westlands, Sept 7, 2021, Reclamation, Sept 9, 2021



# Review of Existing Assumptions

- Demands in four subwatersheds scaled by demand factor to account for return flows from demands that are met
- Demand factors derived from ratio of modeled monthly return flows to modeled surface water deliveries (CalSim 3)
  - Demand factor =  $1 - \text{Returns/Diversions}$
  - Calculated at watershed scale (Sacramento, San Joaquin)

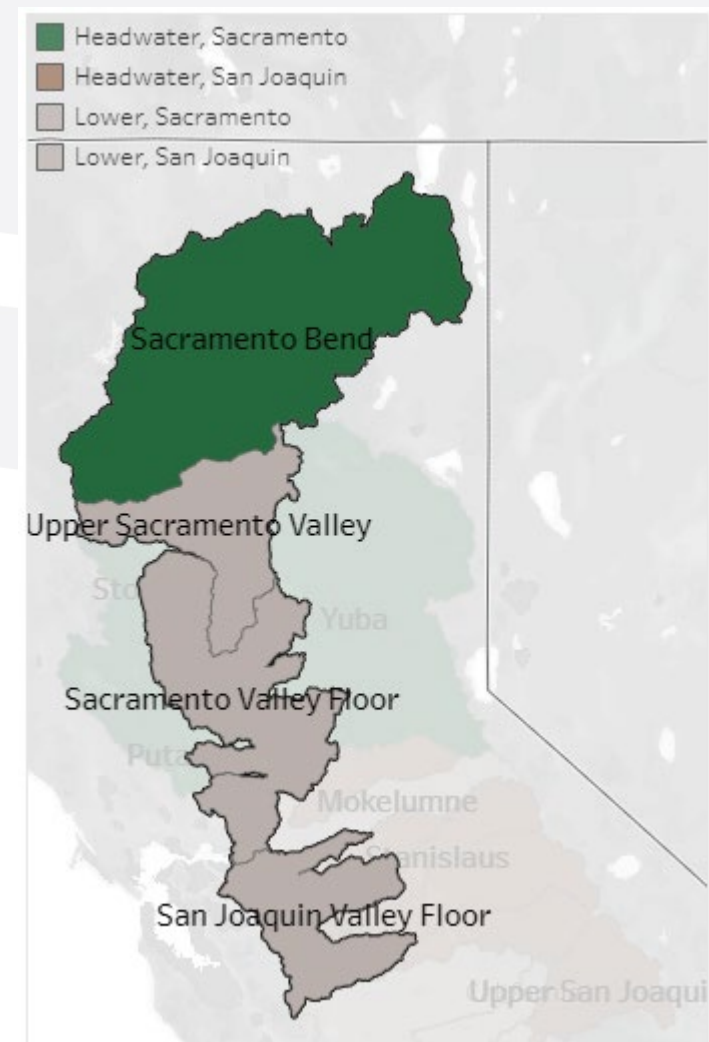


# Why are Updates Needed?

- Direct Diversion vs. Diversion to Storage
- Unmet Headwater Subwatershed Demands

# Why are Updates Needed?

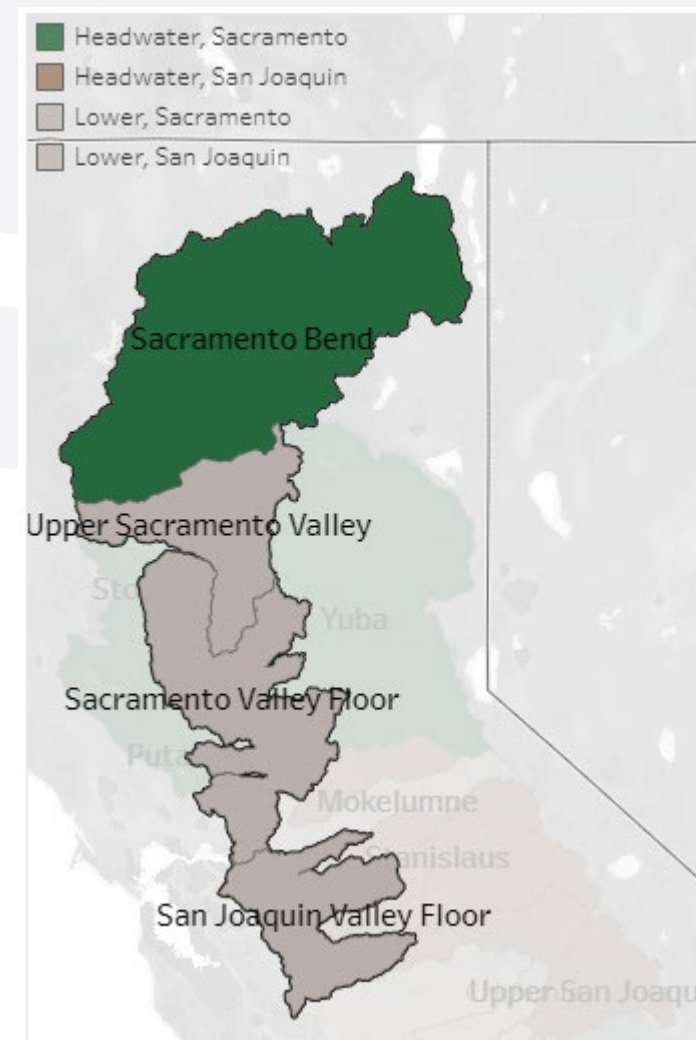
- Direct Diversion vs. Diversion to Storage
  - Diversion to storage does not produce return flow
  - Demand data set to date has aggregated direct diversion and diversion to storage
    - During irrigation season in a dry year, direct diversion far exceeds diversion to storage
    - During wet season, diversion to storage should dominate
  - Hydropower-only diversions excluded from demands during irrigation season





# Why are Updates Needed?

- Unmet Upper Watershed Demand
  - Some reservoirs mapped to subwatersheds that are assumed to receive return flows (e.g., Shasta Reservoir, in the Sacramento Bend subwatershed)
  - Some large Project rights split among points of diversion in different subwatersheds
  - Demands for storage may be very large
  - Unmet storage demands should not preclude diversion of available valley floor runoff
  - Existing methodology removes unmet headwater subwatershed demand



# Proposed Updates for Wet Season

- Disaggregate direct diversions and diversions to storage
- Assign demands for diversion to storage for complex rights to appropriate subwatersheds
- Include diversions to storage for non-consumptive rights that modify timing of flow
- Do not scale diversions to storage by a return flow factor, even if they are mapped to one of the four subwatersheds that receive return flows

# Proposed Updates for Wet Season

- Remove unmet storage demand from full watershed scale demand, even if mapped to one of the four subwatersheds that receive return flows
- Introduce headwater subwatersheds on Mokelumne, Chowchilla, and Fresno Rivers



# Freshwater Residence Time in the Legal Delta

Scott Ligare



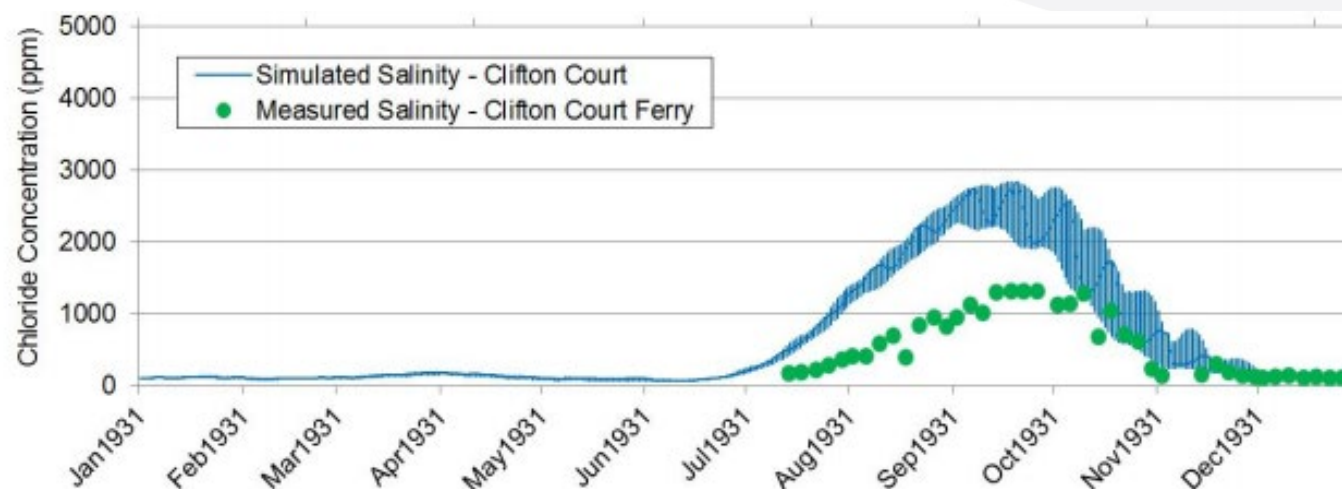
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# Delta Residence Time Considerations

- Proper use of Hydrodynamic Models such as DSM2
- Volume of Water in the Delta Channels
- Tidal Flux
- Delta Consumptive Use
- Delta Water Quality without Supplemental Project Water

# Appropriate Use of Delta Hydrodynamic Models

- DWR's DSM2 model has a difficult time representing low outflow – high salinity conditions such as observed in 2021
- If hydrodynamic models are used for drought planning, they need to be properly calibrated and validated for dry/salty conditions



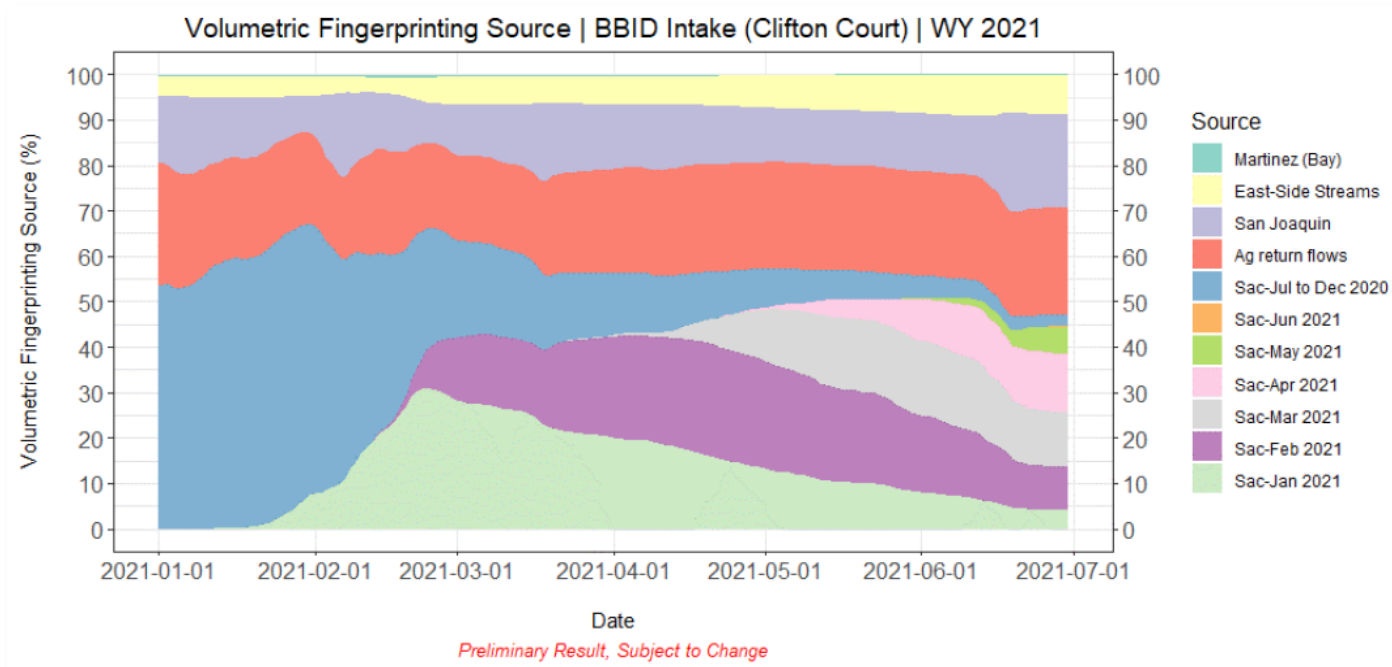
Comparison of Observed Salinity and Modeled Salinity in the Vicinity of Clifton Court Forebay, January–December 1931 (Paulsen, 2015)



# Appropriate Use of Delta Hydrodynamic Models (cont.)

- If an appropriate, validated version of DSM2 is to be used, assumptions regarding Delta inflow available for diversion should be used.

Figure 1. Preliminary Fingerprinting Results for WY 2021, Clifton Court Forebay.

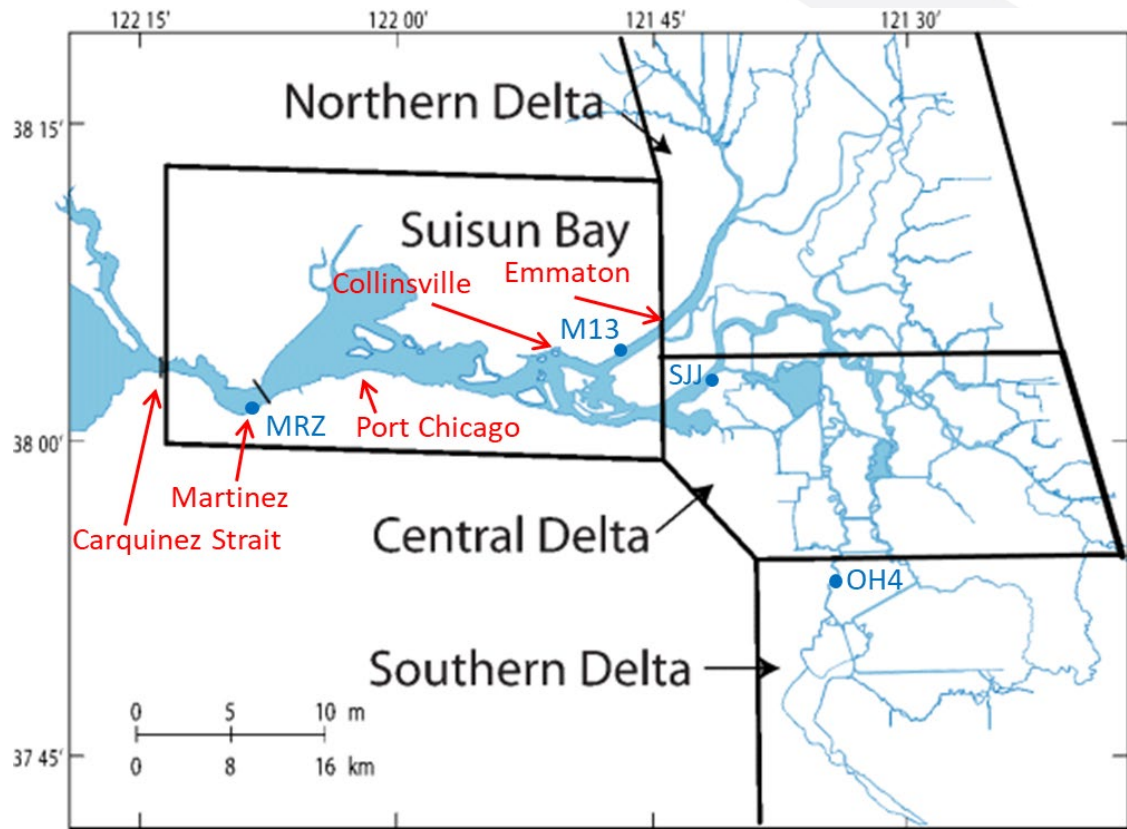


# Residence Time

- Delta residence time  $\neq$  volume / inflow
- Other factors that need to be considered
  - Tidal flux
  - In-Delta consumptive use
  - Water quality
  - Availability of Delta inflow

# Residence Time – Delta Regions/Tidal Flux

Legal Delta and Suisun Bay Channel Volumes and Tidal Flux, July 2021



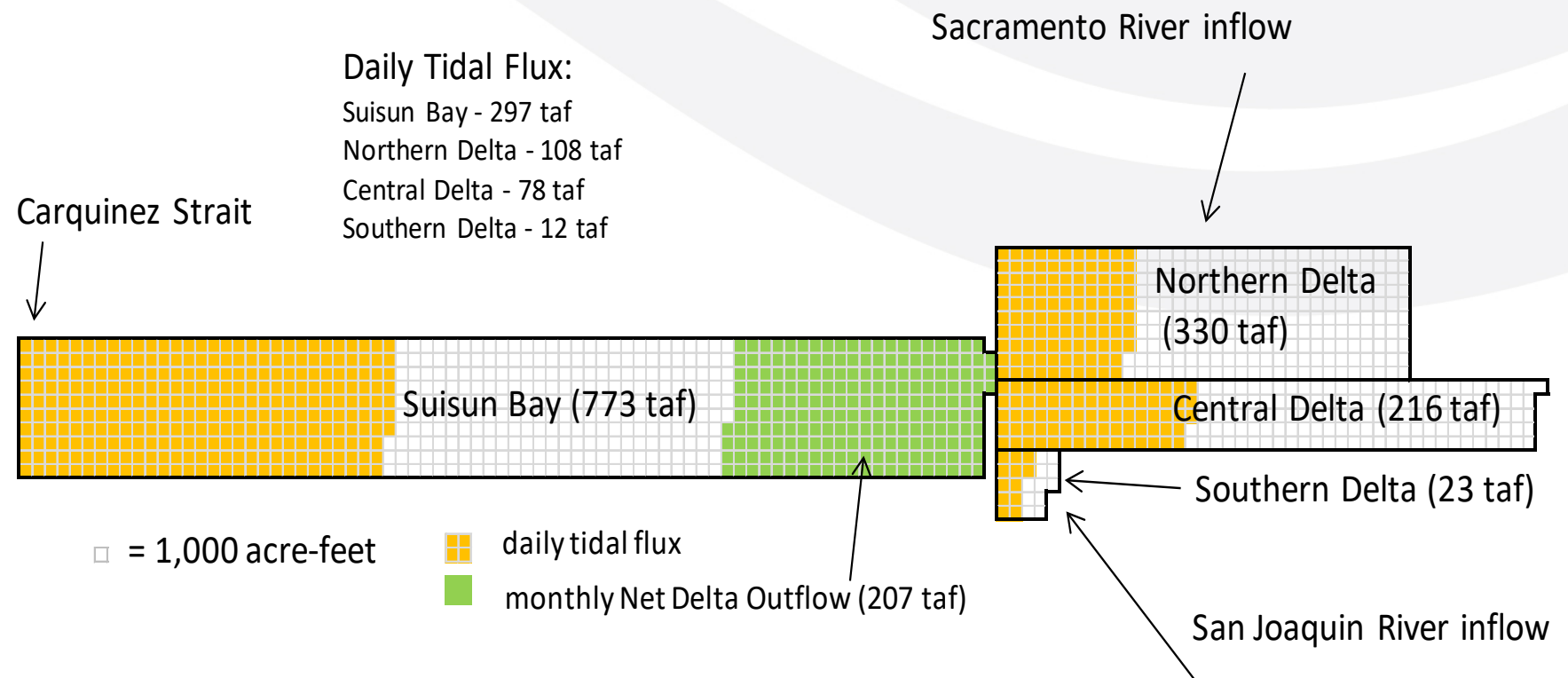
Map of Delta Regions and Suisun Bay (USGS 2007), with State Water Board Decision 1641 Delta Outflow Compliance Locations (red), Relevant CDEC Gages (blue), and Other Points of Interest Added

Region	Water Surface Area (million m <sup>2</sup> )	Channel Volume (million m <sup>3</sup> )	Water Surface Area (acres)	Channel Volume (TAF)	Tidal Range (feet)	Tidal Flux* (TAF/day)
Suisun Bay	165	954	40,772	773	3.6	297
Northern Delta	74	407	18,286	330	2.9	108
Central Delta	66	267	16,309	216	2.4	78
Southern Delta	10	28	2,471	23	2.4	12
<b>Total</b>	<b>316</b>	<b>1,656</b>	<b>78,085</b>	<b>1,343</b>		<b>494</b>
<b>Total without Suisun Bay</b>	<b>150</b>	<b>702</b>	<b>37,066</b>	<b>569</b>		<b>197</b>

Areas and volumes from USGS (2007).

Tidal ranges from CDEC river stage data for gages MRZ, M13, SJJ, and OH4

# Residence Time – Delta Regions/Tidal Flux





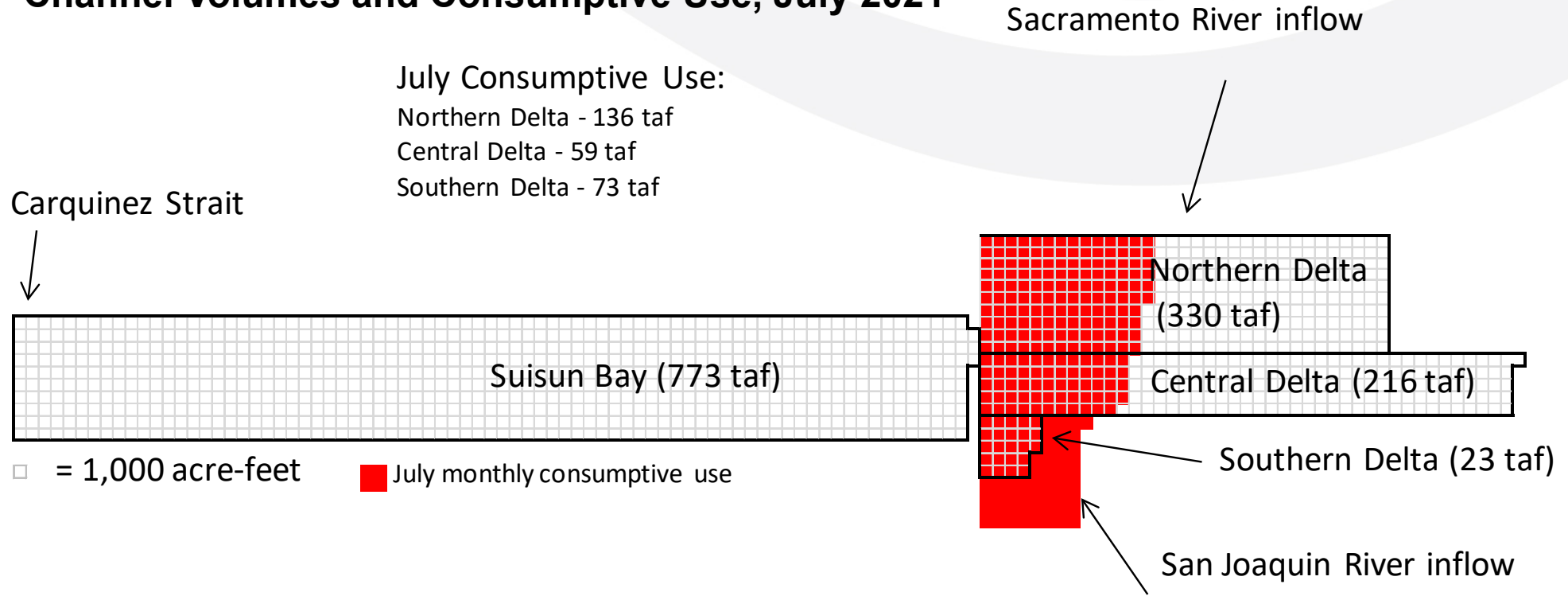
# Delta Residence Time – Delta Consumptive Use

Month	DAYFLOW Delta Gross Channel Depletions (TAF)	Northern Delta Depletions * (TAF)	Central Delta Depletions * (TAF)	Southern Delta Depletions* (TAF)	Northern Delta Depletions (% of Channel Vol)	Central Delta Depletions (% of Channel Vol)	Southern Delta Depletions( % of Channel Vol)
May	149	76	33	40	23%	15%	174%
June	223	114	49	60	35%	23%	261%
July	267	136	59	73	41%	27%	317%
August	232	118	51	63	36%	24%	274%
September	156	80	34	42	24%	16%	183%
October	114	58	25	31	18%	12%	135%
November	103	52	23	28	16%	11%	120%
December	128	65	29	34	20%	13%	149%

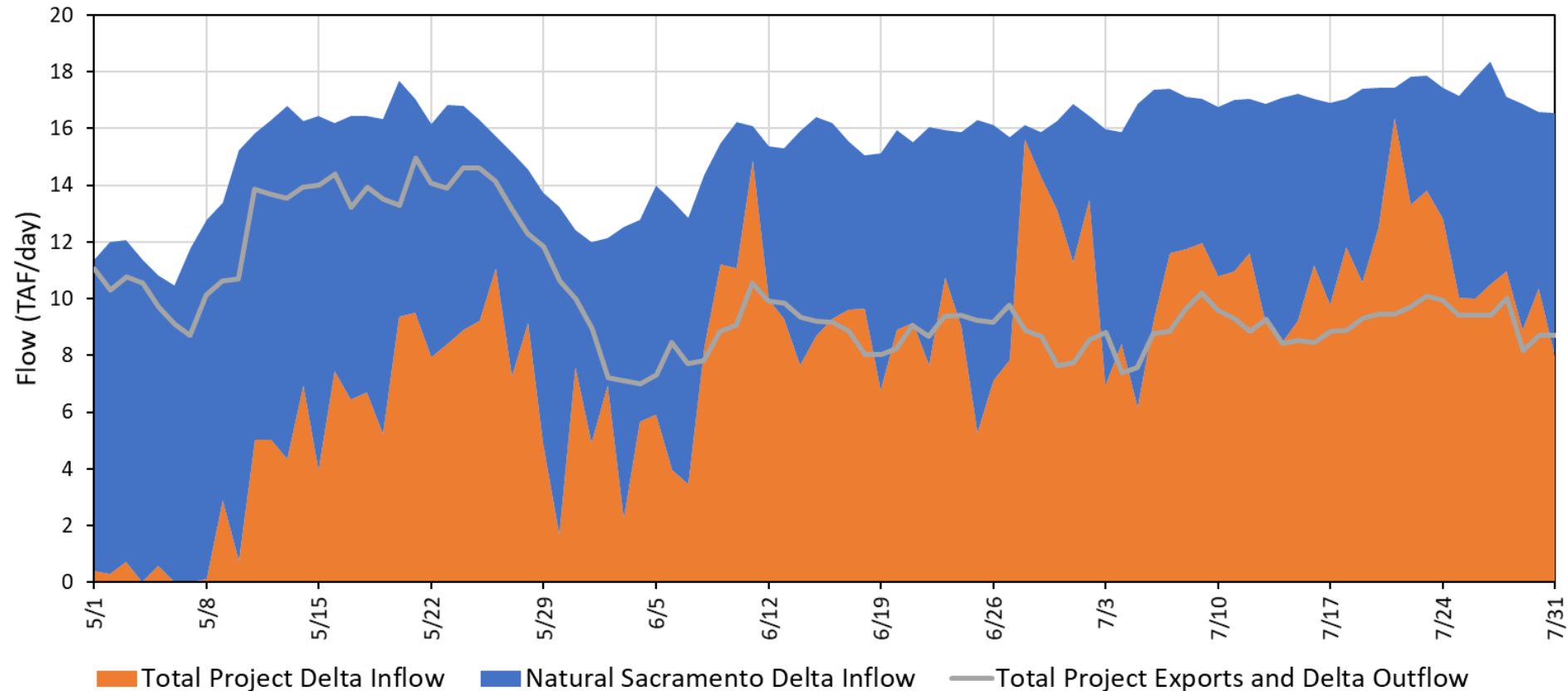
\* Depletions for the three regions are based on a proportional distribution of total DAYFLOW Delta gross channel depletions based on the service areas of the North, Central, and South Delta Water Agencies.

# Delta Residence Time – Delta Consumptive Use

**Schematic of Suisun Bay and Delta Regions with Scaled Channel Volumes and Consumptive Use, July 2021**

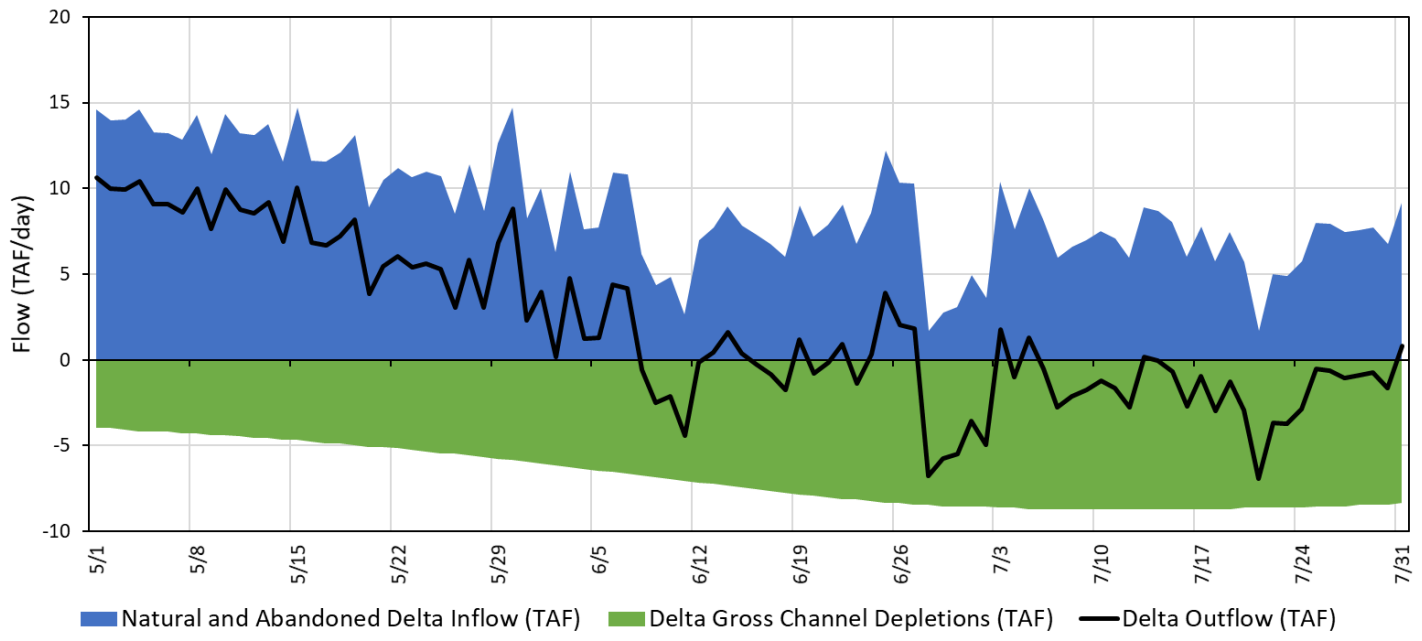


# Previously Stored Project and Natural and Abandoned Delta Inflow



- From July 2021 onward, Project Delta inflow is nearly always greater than exports and Delta outflow

# Delta Inflows and Outflows without SWP and CVP Storage Release and Exports

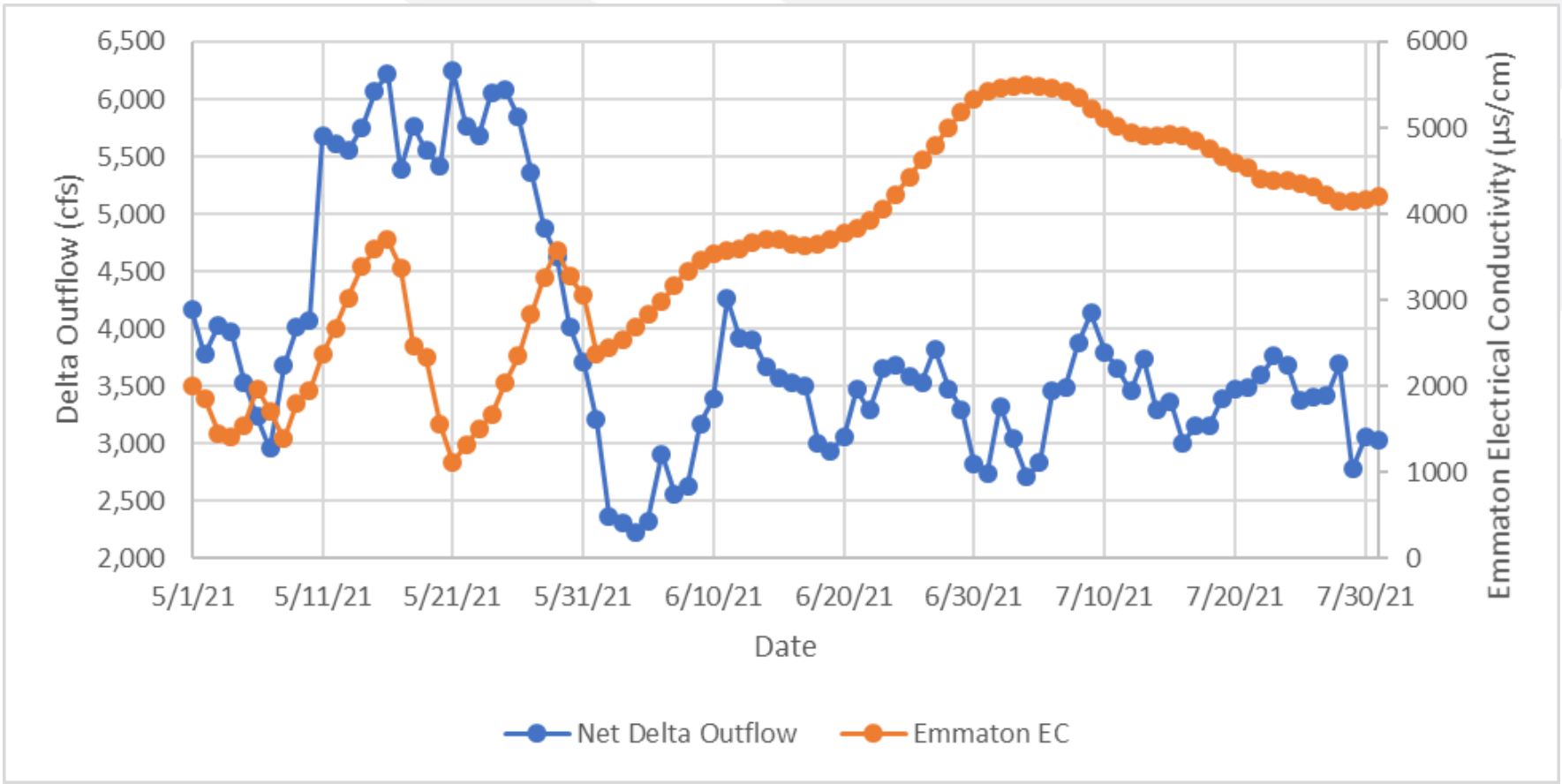


- From July onward, Delta outflow would be negative without Project releases from storage

Month	Natural and Abandoned Legal Delta Inflow (TAF)	Net Delta Consumptive Use (TAF)	Calculated Net Delta Outflow (TAF)	Calculated Net Delta Outflow (cfs)
May 2021	302	148	155	2,514
June 2021	194	220	-26	-437
July 2021	198	268	-70	-1,138



# Observed EC at Emmaton 2021



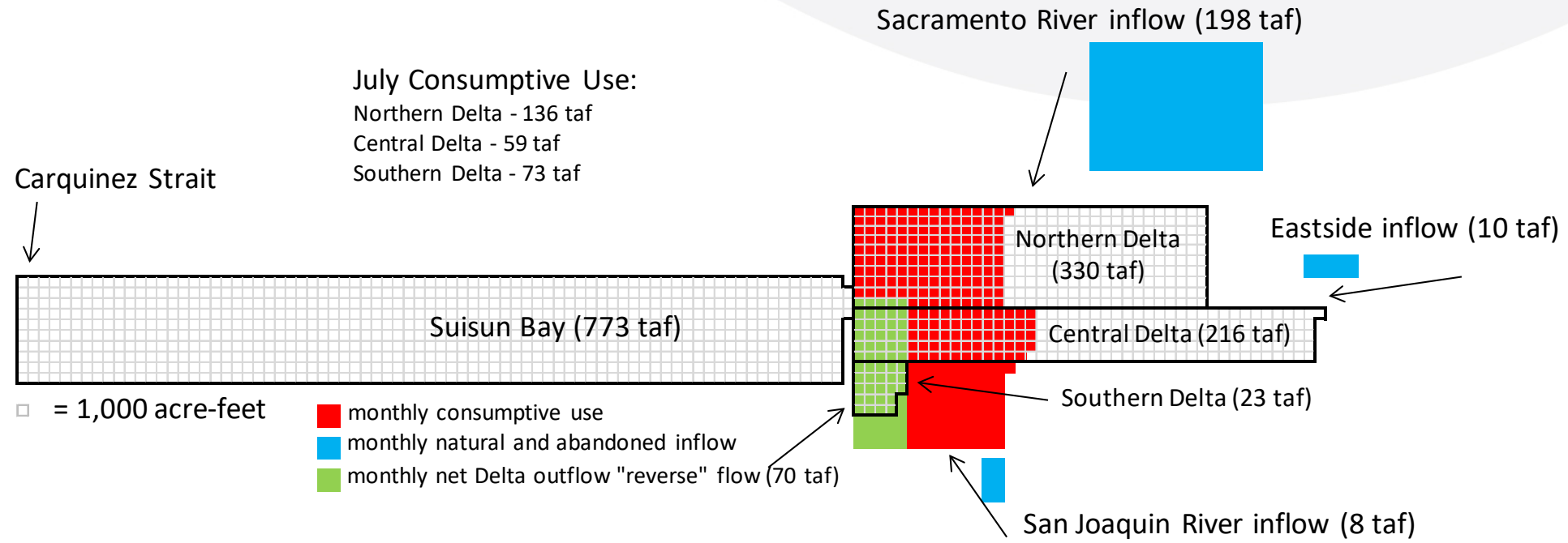
# Replacement Inflow to Southern Delta

Calculated Southern Delta Replacement Water with No Delta Inflow from San Joaquin River Project Releases, May-July 2021

Month	Natural and Abandoned San Joaquin River Inflow to Legal Delta (TAF)	Southern Delta Consumptive Use (TAF)	"Replacement" Inflow to Southern Delta (TAF)
May 2021	37	40	3
June 2021	13	60	47
July 2021	8	72	64
Sum	57	172	115

# Replacement Inflow to Southern Delta

**Schematic of Suisun Bay and Delta Regions with Scaled Channel Volumes, Consumptive Use, Natural and Abandoned Legal Delta Inflow, and Net Delta Outflow Reverse Flow, July 2021**



# Delta Salinity and Crop Sensitivity

- 50/50 mix of 20,000  $\mu\text{s}/\text{cm}$  water from central Suisun Bay would result in a mixed water quality of over 10,000  $\mu\text{s}/\text{cm}$ , assuming there was no salt in the other components of the mix
- **A 90/10 mix of Martinez and San Joaquin River water could approach 18,000  $\mu\text{s}/\text{cm}$ .**

Crop Sensitivity	Salinity where declines in productivity are observed*	Salinity where 100% decline in productivity are observed*
Sensitive	2,000 $\mu\text{s}/\text{cm}$	8,000 $\mu\text{s}/\text{cm}$
Moderately Sensitive	3,000 $\mu\text{s}/\text{cm}$	16,000 $\mu\text{s}/\text{cm}$
Moderately Tolerant	7,000 $\mu\text{s}/\text{cm}$	24,000 $\mu\text{s}/\text{cm}$
Tolerant	10,000 $\mu\text{s}/\text{cm}$	32,000 $\mu\text{s}/\text{cm}$

\*Crop Sensitivity from Hoffman (2010)



# Conclusions

- Estimates of residence time that only rely on one simple volume of the entire Delta and Delta inflow overestimate the residence time
- When tidal flux and consumptive use are considered the residence time of water in the South and Central Delta is on the order of weeks by August 2021
- Without release of previously stored Project water, by August 2021 the water quality in the Delta would be too salty for agricultural or municipal beneficial uses

# Water Demand Dataset and Enhanced Reporting Data

Nicole Williamson & Lauren Adams



Division of Water Rights, Bay Delta & Hearings Branch

# Water Unavailability Methodology: Current Water Demand Dataset

- The Water Unavailability Methodology evaluates demands for natural and abandoned flows by basis of water right.
- To date, the analysis has relied on reported water diversion data from the State Water Board's Electronic Water Rights Information Management System (eWRIMS) database.
- Currently, the Water Unavailability Methodology estimates water demand based on the total monthly diversion amount reported for each consumptive use water right record in 2018, including direct diversions and diversions to storage.



# Water Unavailability Methodology: Current Water Demand Dataset (Cont.)

- Projections of demands during the wet season may be a better reflection of demands than historical diversion data.
  - Current reservoir storage is lower compared to reservoir storage at this time during 2018
  - 2018 wet season diversion data is a reflection of precipitation and runoff events and prior reservoir storage capacities instead of actual demands that exist this year
- Current demand dataset may not fully account for demands for storage under non-consumptive hydropower rights that may make water unavailable for a period of time.

# Enhanced Reporting Requirements

- August 20 Initial Orders Imposing Water Right Curtailment and Reporting Requirements (August 20 Orders) were issued to all water right holders and claimants in the Delta watershed.
- The August 20 Orders require enhanced reporting for water rights and claims with a face value or recent reported annual diversion amount of 5,000 acre-feet or greater.
  - First and second forms were due by September 17 and October 10
  - Subsequent forms due by 10th of each month through July 2022
- Approximately 88% of Enhanced Reporting Forms have been submitted for September 2021 and 61% of Enhanced Reporting Forms have been submitted for October 2021.



# Enhanced Reporting Requirements (Cont.)

- Past Diversions and Projected Demands, in units of acre-feet per month
  - First form (due September 17): past diversions January-July 2021, projected diversions September-November 2021
  - Second form (due October 10): past diversions August-September 2021, projected diversions October-December 2021
  - Subsequent forms: currently planned to include prior month's diversions, rolling 3-month projections
- Projected Demands are NOT anticipated diversions
  - Amount that would be used if water is available
  - Best estimate at time of submission
- Avoid duplication of diversions or demands between multiple rights or claims

# Enhanced Reporting Requirements (Cont.)

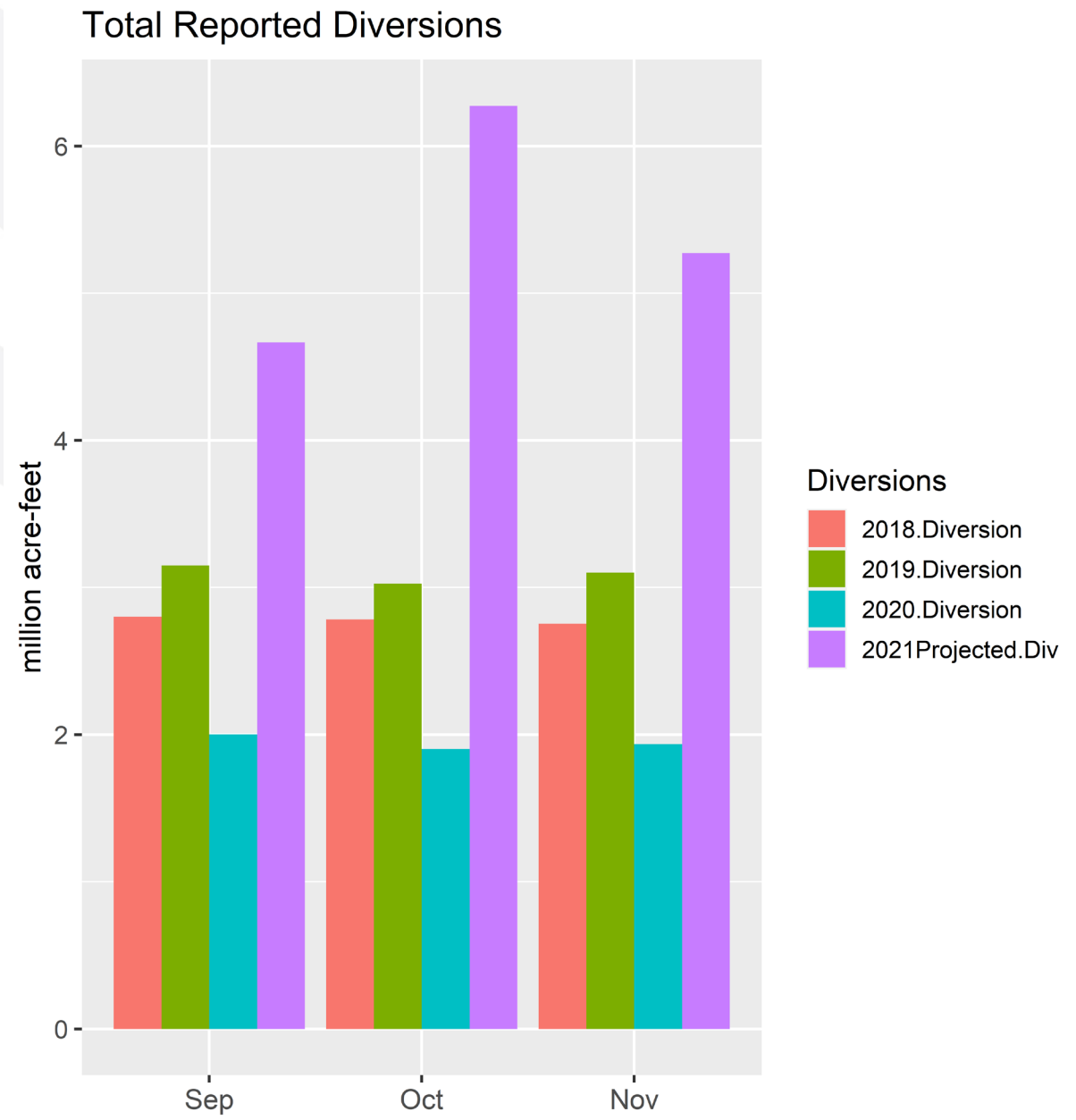
- Enhanced Reporting Form reporting categories:
  - Direct Diversion for Consumptive Use
  - Direct Diversion for Non-Consumptive Use
  - Diversion to Storage for Any Purpose
  - Releases from Storage for Consumptive Use
  - Releases from Storage that are Abandoned

# Enhanced Reporting Data: Opportunities

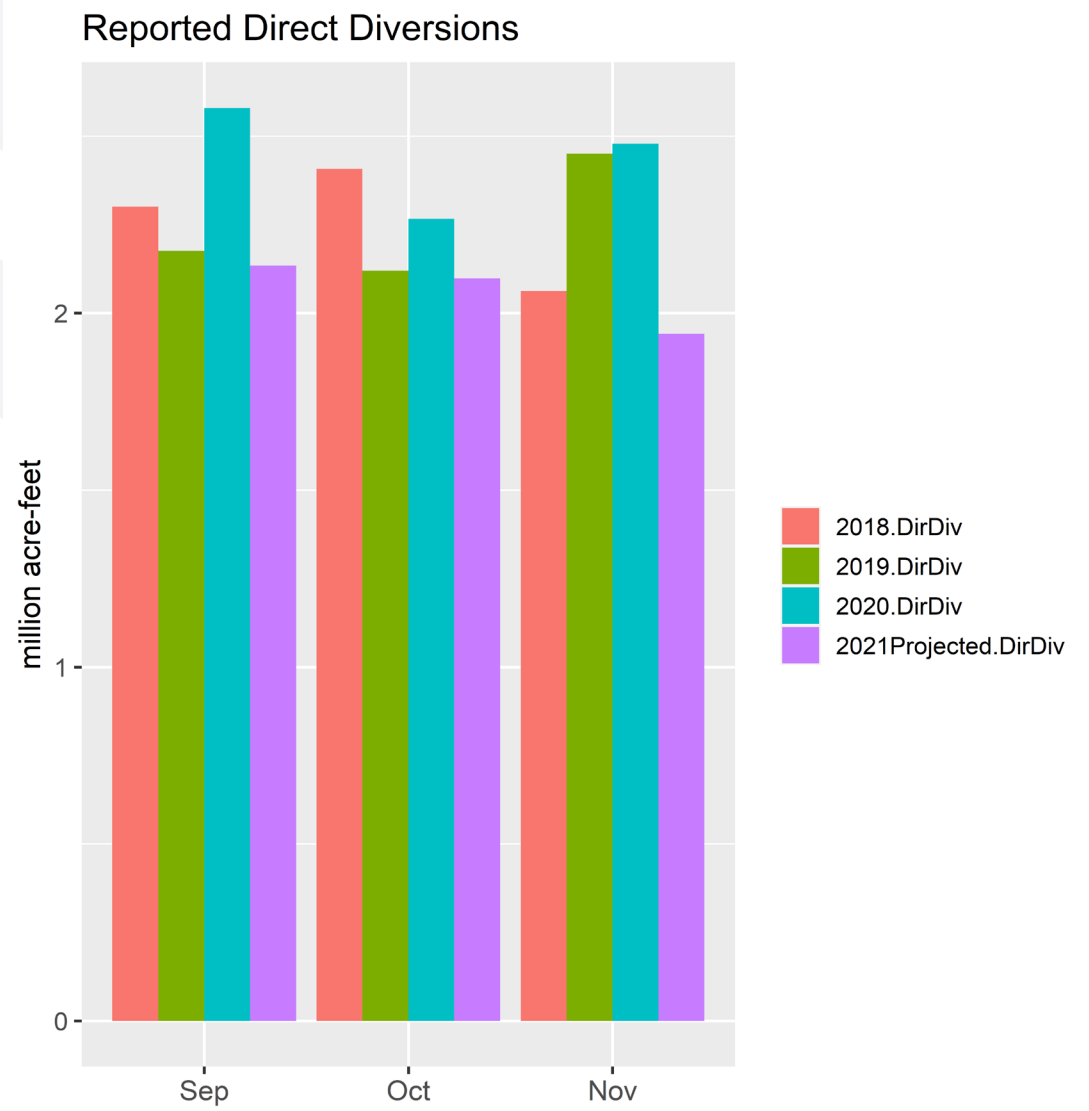
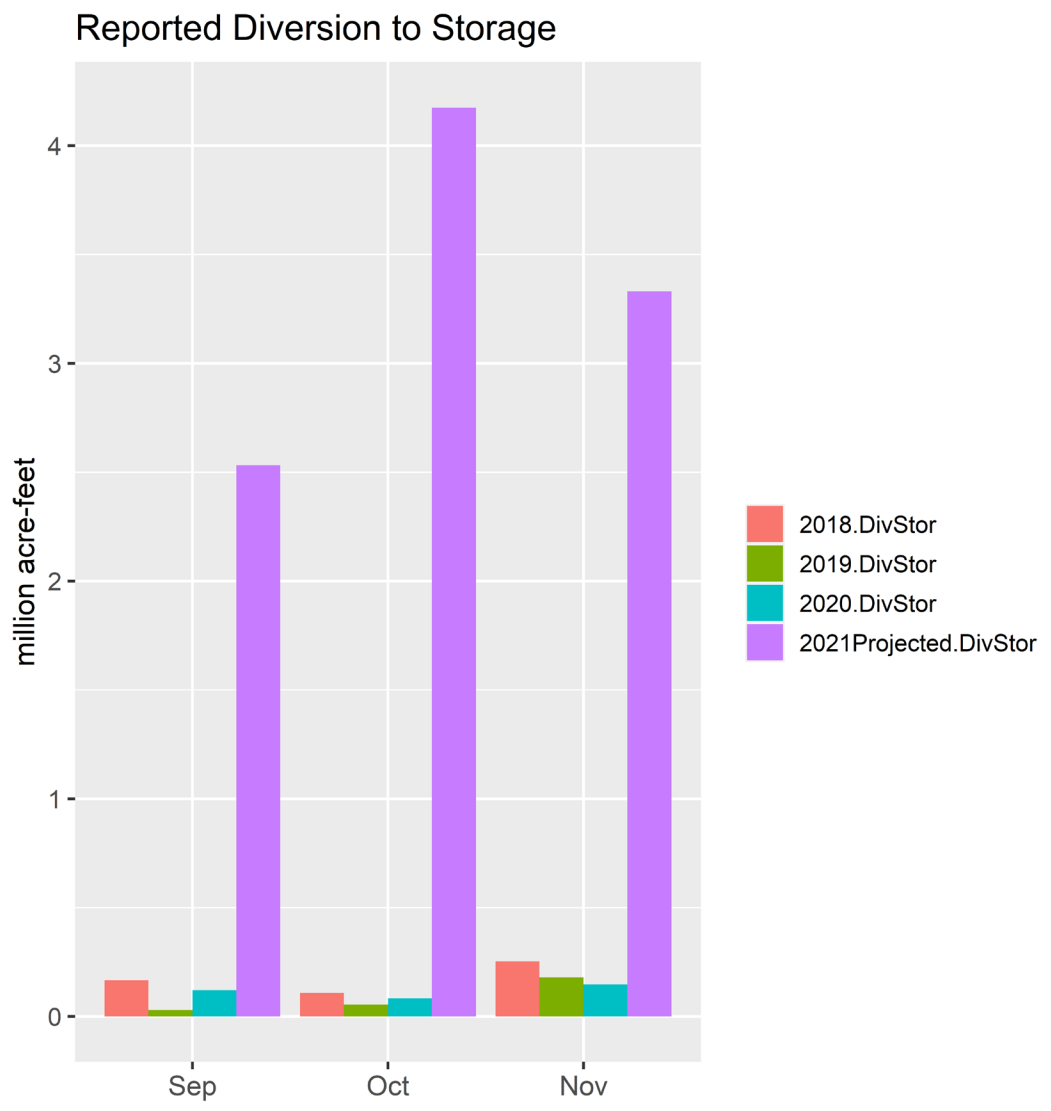
- State Water Board staff are currently reviewing enhanced reporting data submitted by water right holders and claimants.
- Multiple ways in which this data may be used:
  - Identification of duplicative water demand data reported under multiple water right records
  - Comparison of enhanced reporting data with diversion data submitted in previous years
  - Evaluation to assess abandoned flow assumptions
- State Water Board staff are considering possible changes to the Enhanced Reporting Form for future months.

# Data Overview

- Total Diversions (2018-2020)
  - From Annual Reports
    - Direct Diversion
    - Diversion to Storage
- Projected Demands
  - From Enhanced Reporting
    - Direct Diversion
    - Diversion to Storage



# Data Overview



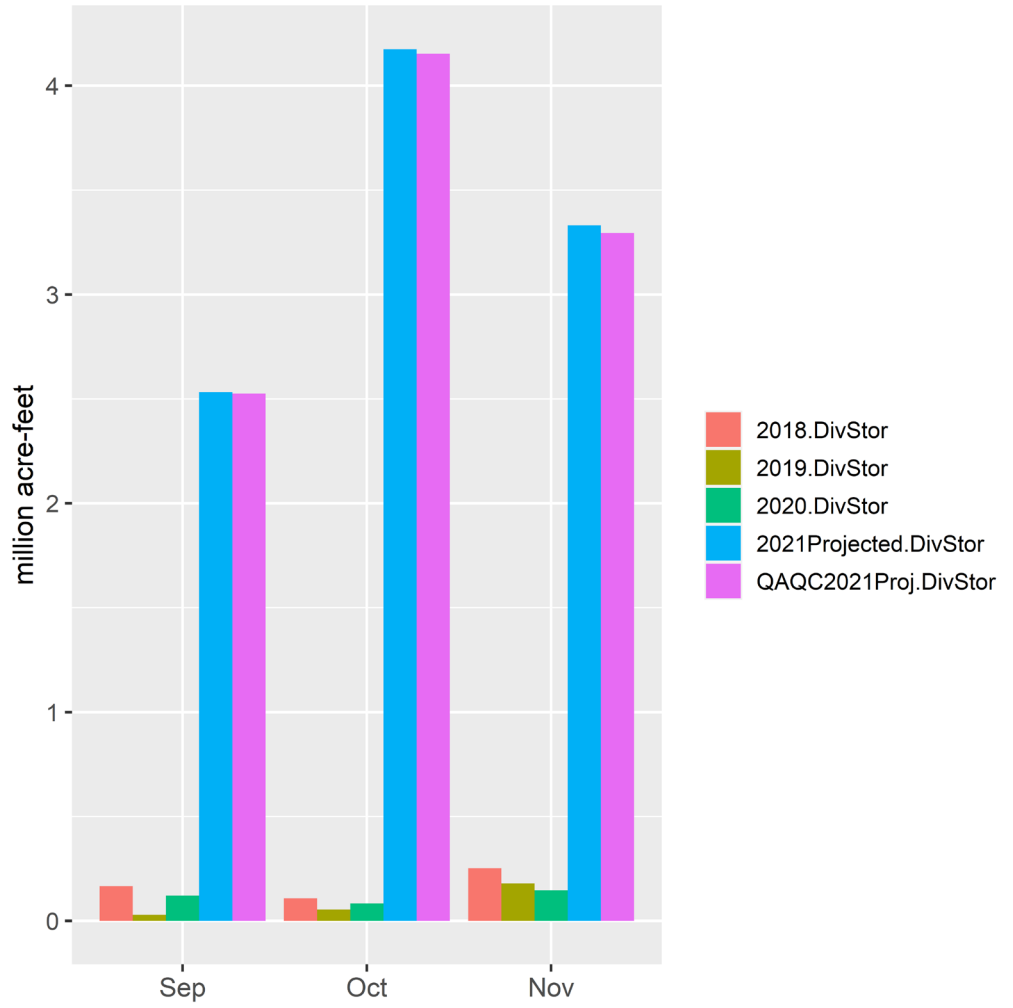


# Reporting and Accounting

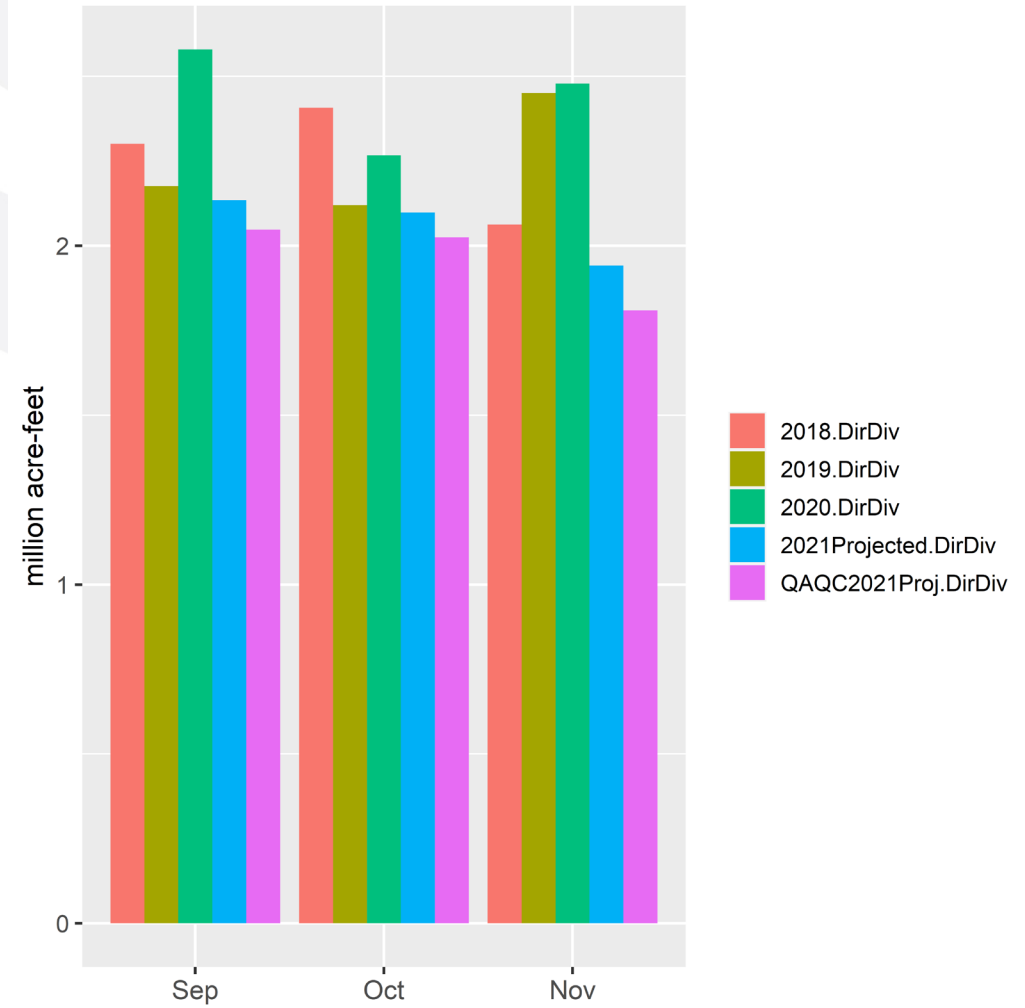
- **Benefits**
  - Operational clarification
  - Reporting clarification
- **Issues**
  - Unclear who reports what
  - Unclear how much to report
  - Unclear in which month to report
  - Unclear about unauthorized activity
  - Unsubmitted forms
- **Clarification**
  - Report the projected estimate each month under each water right or claim

# Over-reporting

Diversion to Storage

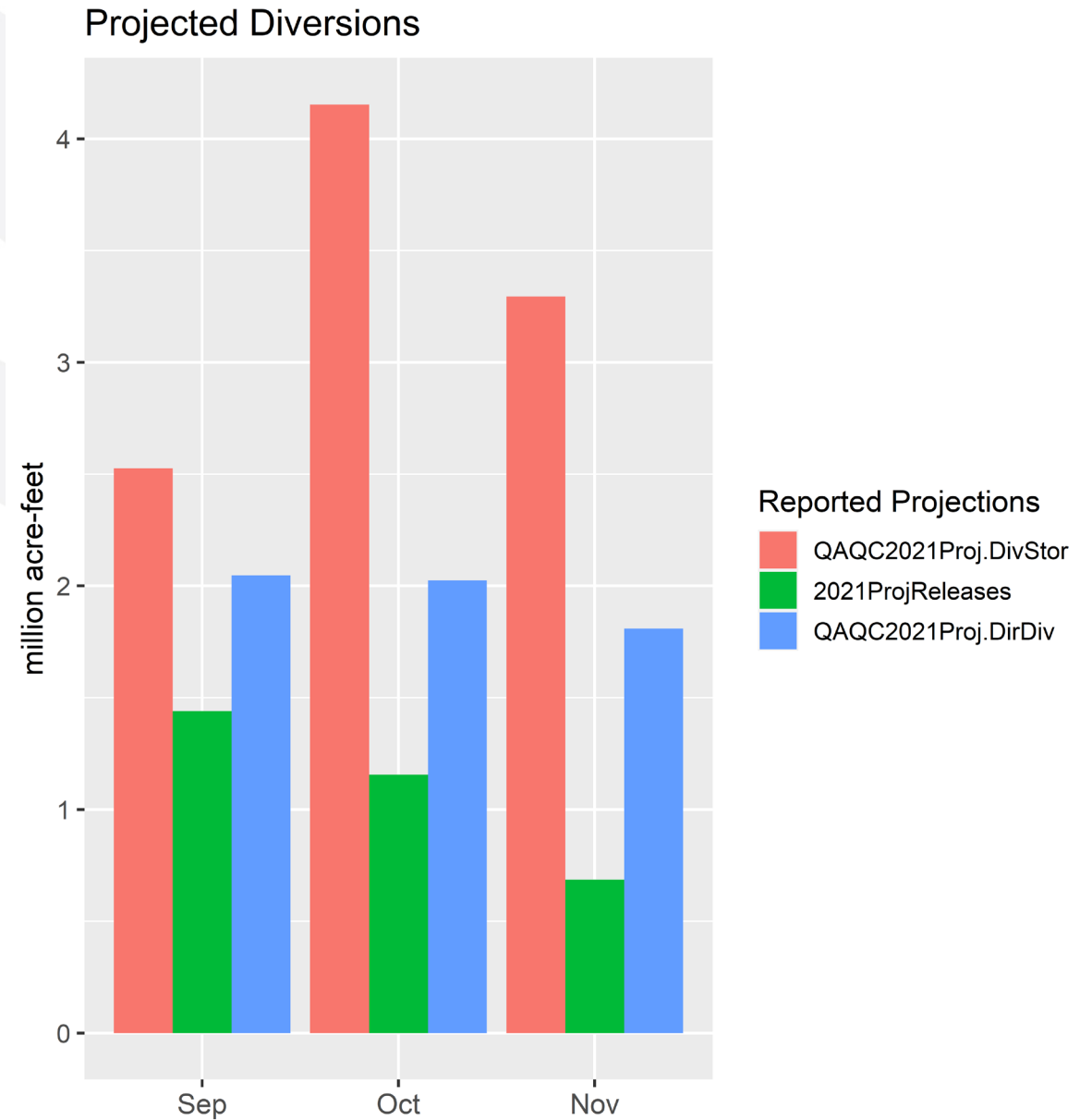


Direct Diversions



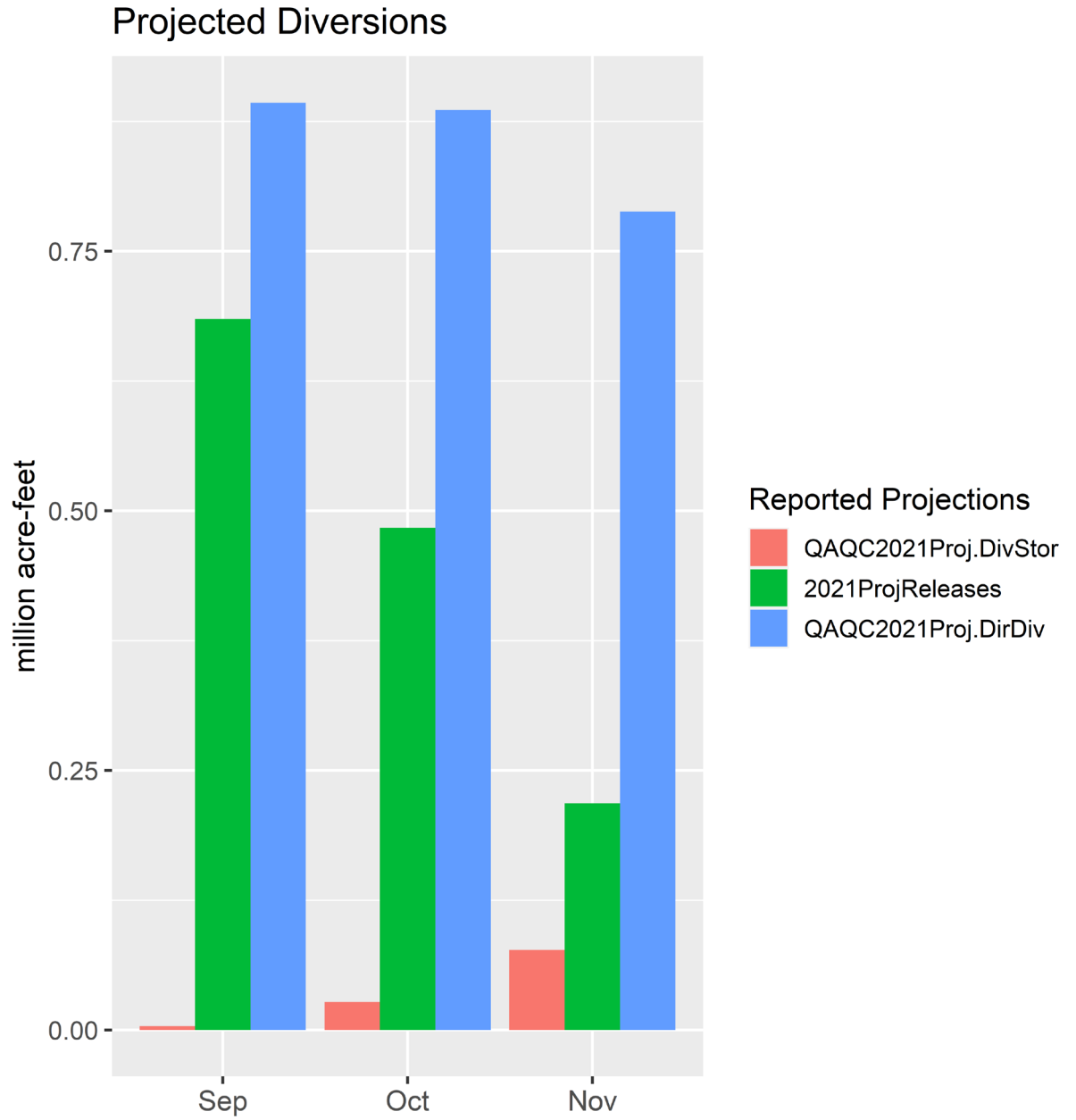
# Under-reporting

- 47% of those that did Report did not project any authorized diversions and did not indicate that projected diversion were reported under a different record
- Assumed water scarcity or curtailment
- Storage tracking



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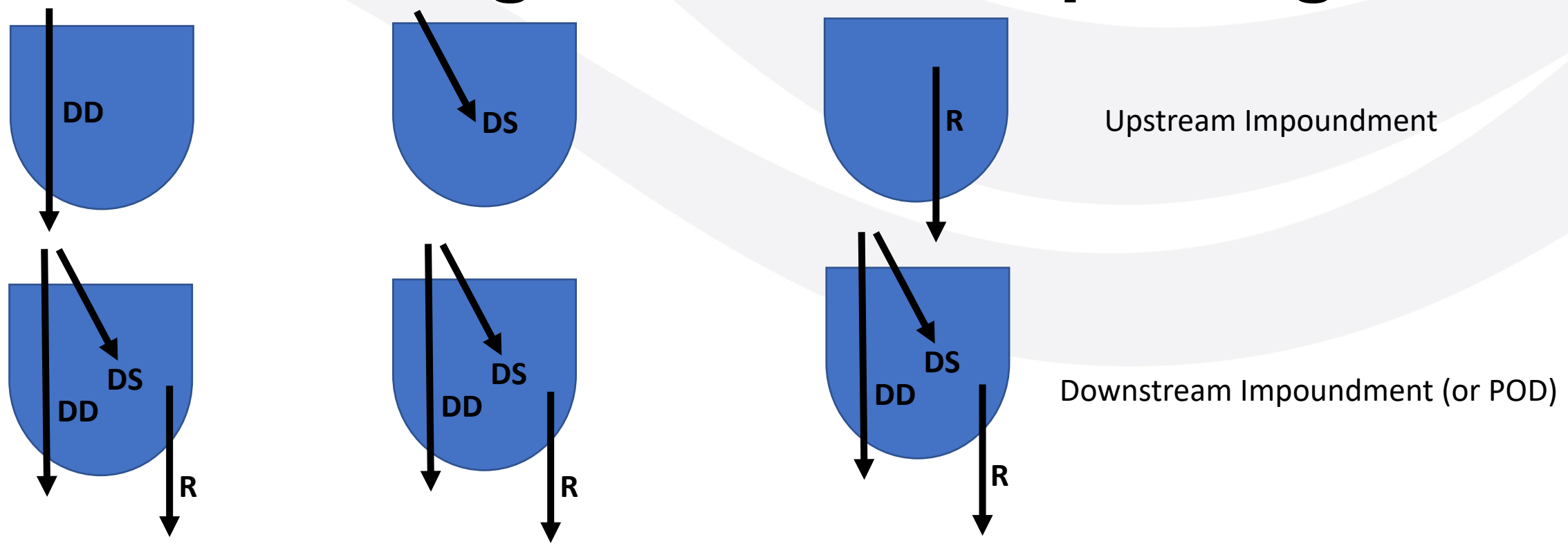
# Summarized reporting

- Different levels of data aggregation
  - Same Primary Owner
  - Shared Place of Use
  - Shared Point of Diversion
  - Shared Powerhouse
  - Shared Impoundment
  - Cascading Reservoirs
  - One Water Right or Water Claim





# Cascading Reservoir Reporting



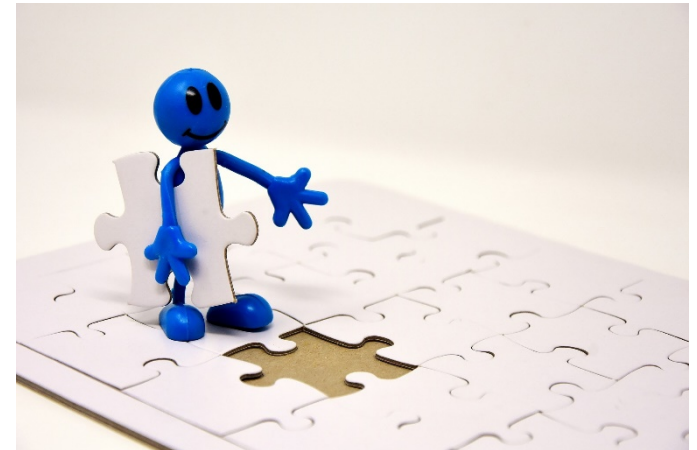
DD = Direct Diversion

DS = Diversion to Storage

R = Releases

# Summarized reporting

- Different levels of data aggregation
  - Same Primary Owner
  - Shared Place of Use
  - Shared Point of Diversion
  - Shared Powerhouse
  - Shared Impoundment
  - Cascading Reservoirs
  - One Water Right or Water Claim



# Reporting Support



- For over-reporting
  - Diversions should not be projected beyond the authorized season of diversion or use, or in excess of authorized rate of direct diversion
- For under-reporting
  - Projections should represent the amount of water anticipated to be used under a right or claim if water is available at its priority
  - Report diversion to storage each month
  - Submit the forms
- For summary-reporting
  - Report the projected demand estimate each month under each water right or claim

# Follow-up

- State Water Board staff are considering potential updates to Enhanced Reporting Forms for future months
- State Water Board staff anticipate contacting specific diverters to request additional clarification regarding information submitted in Enhanced Reporting Forms



# Changes to Address Reporting Issues

- Possible changes to reporting form
  - Reporting by point of diversion
  - Reporting of maximum demands by month
  - Clarification of questions
  - Other changes
- Incorporation of land based demand data, real time reservoir storage conditions
- Use of more refined modeling tools



# Public Comments & Clarifying Questions



# Resources – Contact the State Water Board

**Email:** [Bay-Delta@waterboards.ca.gov](mailto:Bay-Delta@waterboards.ca.gov)

**Delta Drought Phone Line:**

Call (916) 319-0960 and leave a message and staff will return your call as soon as possible

**Webpages:**

Delta Drought Webpage:  
[waterboards.ca.gov/drought/delta/](http://waterboards.ca.gov/drought/delta/)

Water Unavailability Methodology Webpage:  
[waterboards.ca.gov/drought/drought\\_tools\\_methods/delta\\_method.html](http://waterboards.ca.gov/drought/drought_tools_methods/delta_method.html)

**Delta Drought Email Subscription List:**  
[waterboards.ca.gov/resources/email\\_subscriptions/](http://waterboards.ca.gov/resources/email_subscriptions/)

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