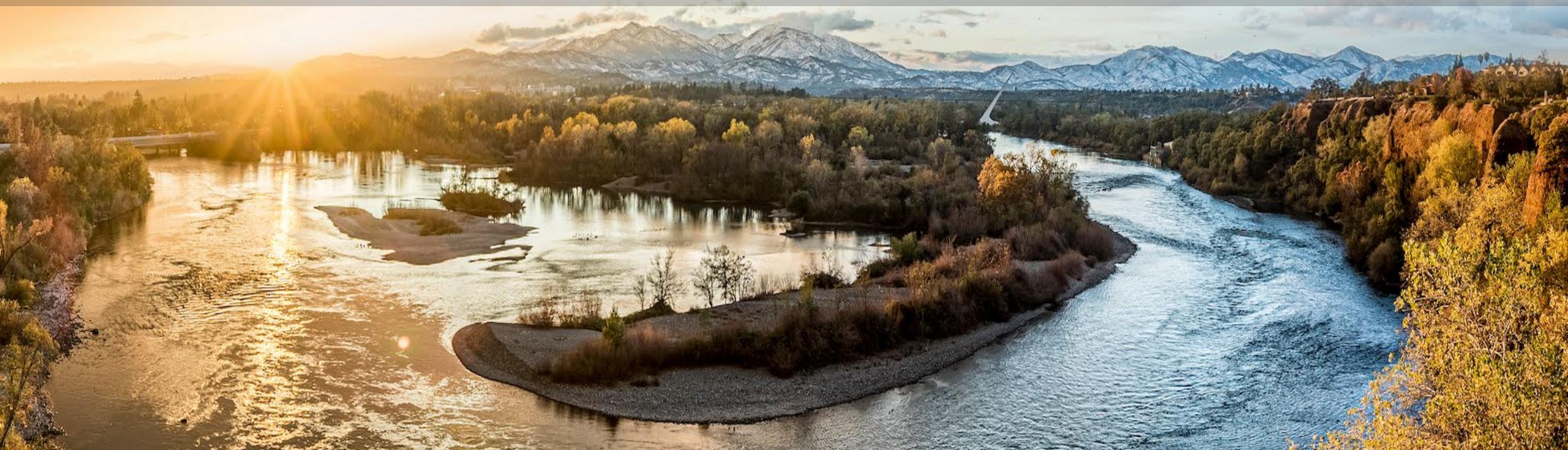




# Overview of SacPAS:

**Central Valley Prediction & Assessment of Salmon and other fishes**

[cbr.washington.edu/sacramento/](http://cbr.washington.edu/sacramento/)



**Susannah Iltis (presenter), Jennifer L. Gosselin, Matt Carter**



# Outline

## I. Background on SacPAS

History of CBR

Overview of tools & services

## II. Data & visualization considerations

Who, What, How

Example of our process to product

## III. SacPAS tools

Data Snapshot

Data Queries & Alerts

Work Groups & Teams



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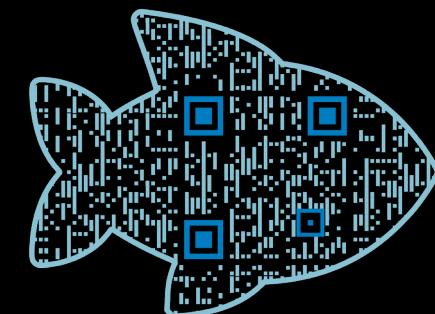
Data Queries & Alerts

Work Groups & Teams



# (Brief) History of CBR Columbia Basin Research

- 1994 CBR website with Columbia River DART (Data Access in Real Time)



[cbr.washington.edu](http://cbr.washington.edu)

- 2016 SacPAS

COLUMBIA BASIN RESEARCH

Data Predictions Trends Tools Publications About

Providing data and analytical tools for science-based decision making and management of regulated rivers and fishes

FACILITATING ACCESS CONDUCTING RESEARCH MAKING CONNECTIONS

Data on fishes and conditions, and tools for visualizations and predictions

Fish and river models, statistical packages, presentations and publications

Collaborators, practitioners, stakeholders, students, data, knowledge, and experiences

COLUMBIA RIVER DART COLUMBIA RIVER INSEASON FORECASTS

SACRAMENTO RIVER FISH MODEL CALIFORNIA CENTRAL VALLEY SACPAS

COLUMBIA RIVER DART PREDICTIONS TOOLS SACPAS

ESU/DPS Adult Passage Counts Snake River Smolt Passage ATLAS Basin TribPit Smelt Monitoring Team

Adult Passage Quick Look Chelan Smolt Passage Basin Overtopping Alert

Juvenile Passage Transportation Water Quality Temperature Thresholds

Transportation SAR Estimates Columbia Basin Conditions Juvenile Monitoring & Sampling

Water Quality Hourly River Conditions Juvenile Salvage & Loss

Pacific Ocean Coastal Upwelling Streamflow & Temperature Columbia Basin Annual Trends COMPASS Model

Ocean Moored Buoys Water Quality Trends SURPH Vitality Model

Overview DART News & Announcements ROSTER Results Dam Conditions

DART News & Announcements Reservoir Conditions

Questions? Requests? Contact: [web@cbr.washington.edu](mailto:web@cbr.washington.edu)

Search CBR...

Columbia Basin Research • School of Aquatic & Fishery Sciences • College of the Environment • University of Washington



# SACPAS: CENTRAL VALLEY PREDICTION AND ASSESSMENT OF SALMON

UNIVERSITY of WASHINGTON  
Columbia Basin Research

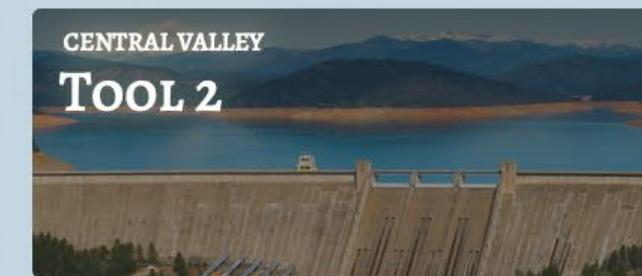
Data & Alerts ▾

Workgroups & Teams ▾

Tools & Models ▾

4th Dimension ▾

About ▾



# Overview of SacPAS Tools & Services

## Data Queries & Alerts

- Juvenile Monitoring & Sampling
- Juvenile Salvage & Loss
- Adult Escapement
- Temperature Thresholds
- River Conditions
- Exposure Index
- Weir Overtopping

## Work Groups & Teams

- Salmon Monitoring Team
- Smelt Monitoring Team
- Stanislaus Watershed Team
- More Team webpages in progress...

## Fish Model and Tools

- Fish Model, Egg-to-Fry Model  
(Anderson et al. 2022)
- Exploratory tools  
(Shiny apps)
- Loss & Salvage Predictor  
(Tillotson et al. 2022)
- Delta STARS (Survival, Travel Time, and Routing Simulation)  
(Perry et al. 2018; Hance et al. 2021)

# Overview of SacPAS Tools & Services

## Data Queries & Alerts

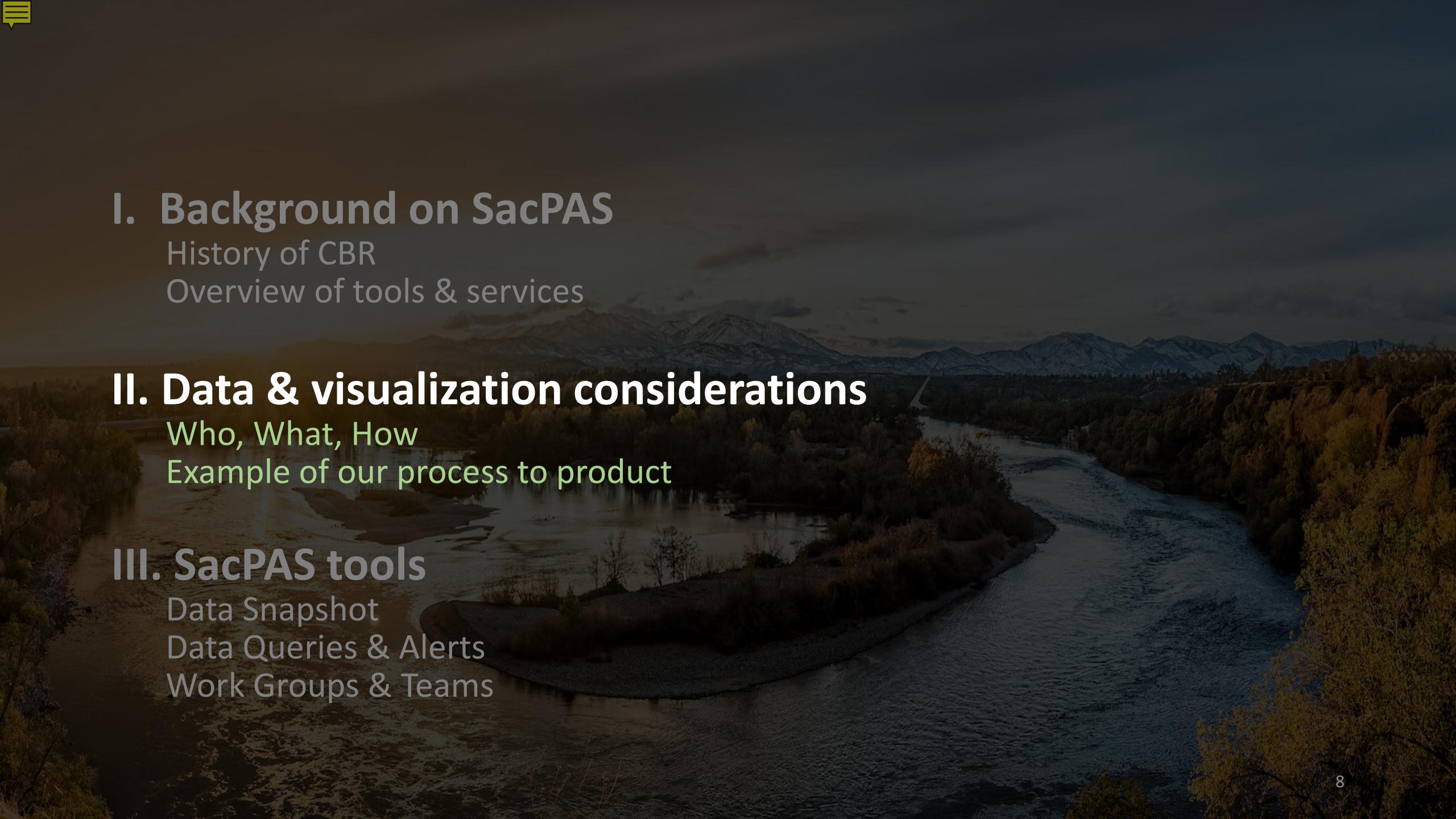
- Juvenile Monitoring & Sampling
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## Work Groups & Teams

- Salmon Monitoring Team
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- Stanislaus Watershed Team
- More Team webpages in progress...

## Modeling Tools

- Fish Model, Egg-to-Fry Model  
(Anderson et al. 2022)
- Loss & Salvage  
(Tillotson et al. 2022)
- STARS  
(Perry et al. 2018; Hance et al. 2021)
- Exploratory tools  
(Shiny apps)



## I. Background on SacPAS

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# SacPAS Data & Visualization Considerations

## What and for Whom

- **Human-centered design:**  
purpose of tool and type of users
  - Management teams
    - Specific, relevant metrics
    - Integrated data sets
  - Research scientists
    - Access to data downloads
  - Public
    - Equal access to data, visualizations, modeling tools
- **Temporal scale:**  
for pre-season & in-season management
  - Real-time, historical, forecast
  - Hourly, daily, seasonal, annually
- **Spatial scale:**  
including existing stations & survey locations
  - Sacramento River Basin
  - San Joaquin River Basin
  - Delta

# SacPAS Data & Visualization Considerations

How

- **Relevancy:**

- Create with collaboration
- Refine with user feedback

- **Usability:**

- Provide meaningful summaries
- Design for clear visualizations

- **Accessibility:**

- Create for audience with diverse abilities in mind
- Structure for quick, intuitive, online interactions

- **Transparency:**

- Include data attribution
- Describe/reference methods

# Process to Product: Stanislaus Watershed Team

## The Process



Stanislaus Watershed Team meeting with SacPAS

Initial team needs discussion.  
Additional needs and content discussions.



SacPAS reach out to PSMFC Caswell RST data contact

Possible to provide data publicly?  
Any data publishing requirements or concerns?



SacPAS reach out to CalFish

Request to coordinate with Caswell RST data contact to establish data upload process.



SacPAS Database

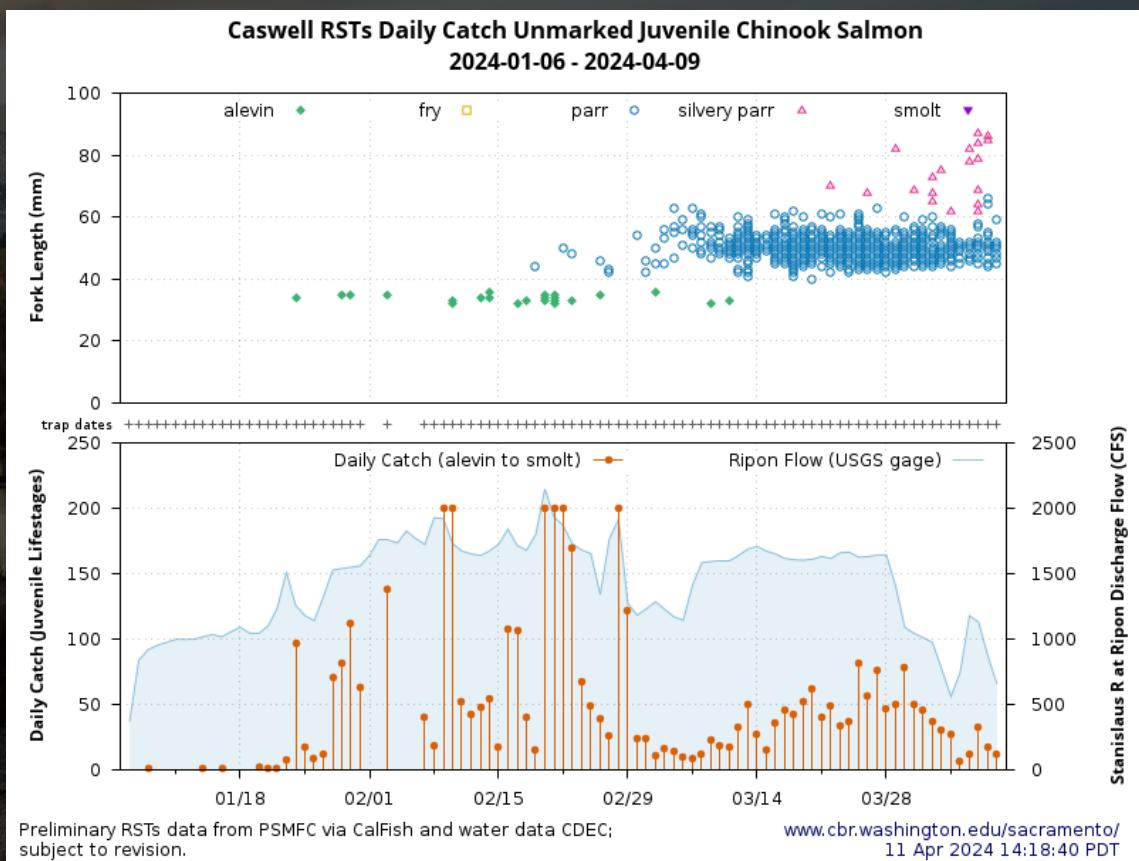
Design table structures for data.  
Develop retrieval, processing, and loading data procedures.  
Verify with primary source.  
Implement and update daily.



SacPAS Website

Design visualization based on existing figures.  
Develop query and visualization code.  
Implement publicly and update daily.

## The Product





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# Snapshot of data available on SacPAS

## ■ Environmental data

(selective list of CDEC and USGS)

- Reservoir Storage, Elevation, Outflow
- River Discharge, Stage
- Dissolved Oxygen
- Electrical Conductivity
- Turbidity
- Water Temperature
- And more

## ■ Delta Status & Operations

(CDWR)

## ■ Fish data (Salmon, smelt)

- **Juvenile Monitoring**  
(CDFW, USFWS Lodi, PSMFC)  
Counts and migration timing;  
RSTs, trawls, beach seines
- **Red Bluff Diversion Dam**  
(USFWS Red Bluff)  
Counts, migration timing
- **Salvage and Loss**  
(CDFW Bay Delta Region)  
Counts, timing, LAD, DNA race, CWT race
- **Adult escapement**  
(CDFW)  
GrandTab

- **Coded wire tag**  
(RMPC/RMIS, PSMFC)  
Smolt-to-adult survival

- **Redd and carcass survey**  
(CDFW)
- **Juvenile Production Estimate (JPE)**  
(NOAA)
- **Delta Smelt**  
(USFWS Lodi, CDFW)  
Current and historical surveys
- And more

Fish data retrieved from data owners, CalFish, and EDI Data Portal

# SacPAS Data Queries & Alerts

1. Juvenile Monitoring & Sampling



2. Juvenile Salvage & Loss



3. Adult Escapement



4. Temperature Thresholds



5. River Conditions



6. Exposure Index



# SacPAS Data Queries & Alerts

1. Juvenile Monitoring & Sampling



2. Juvenile Salvage & Loss



3. Adult Escapement



4. Temperature Thresholds



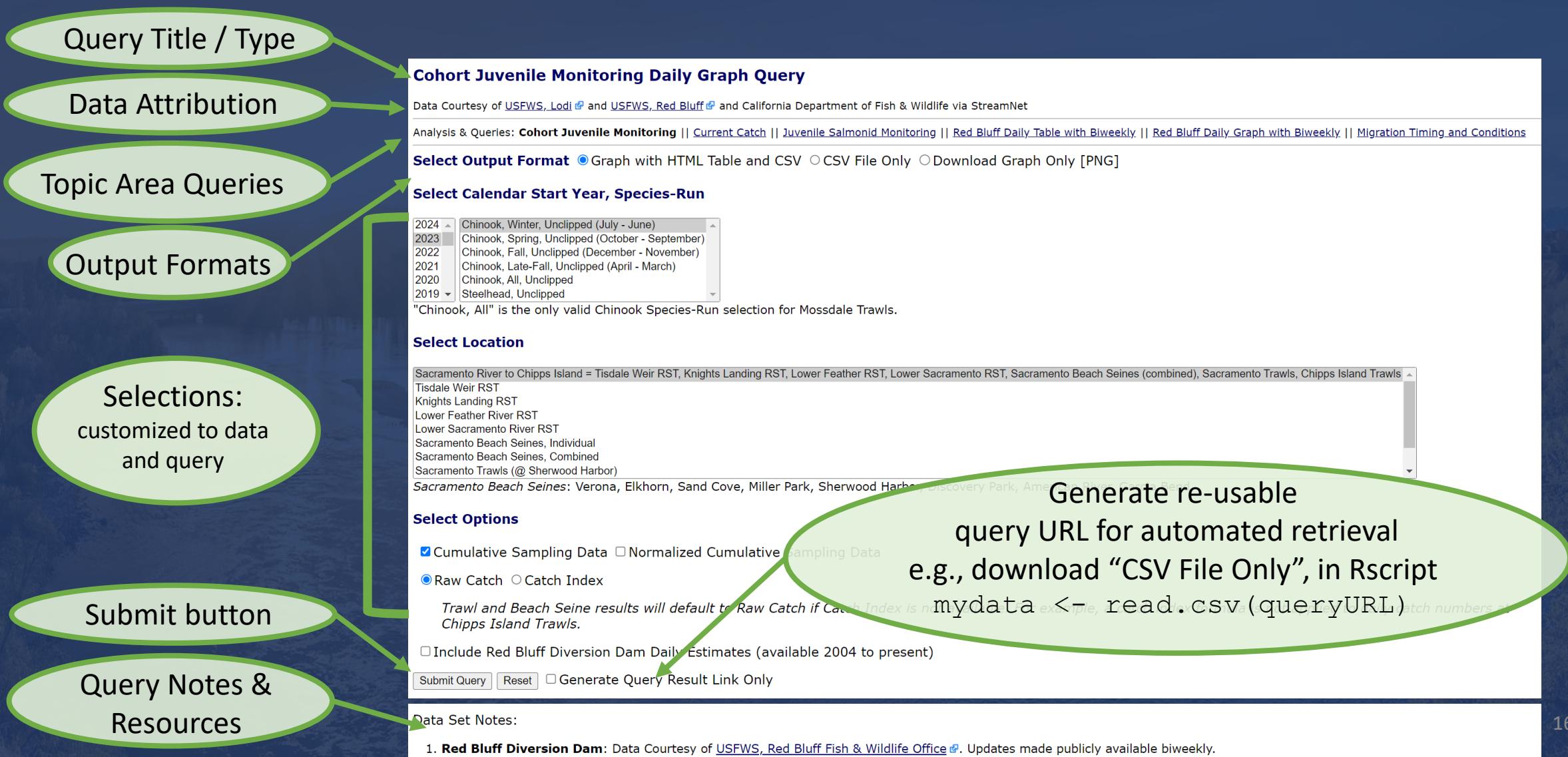
5. River Conditions



6. Exposure Index

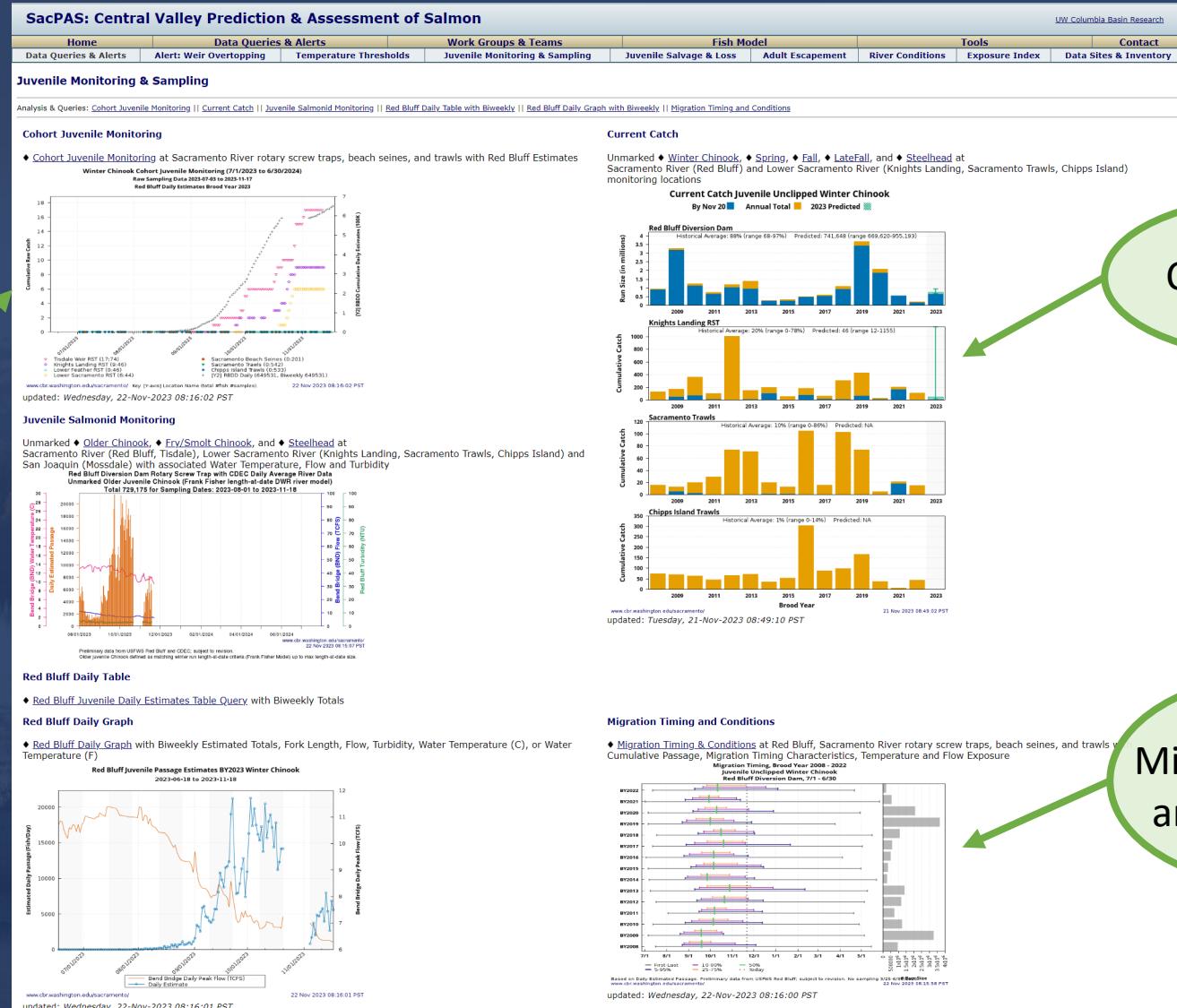


# Common Elements of SacPAS Query Interface



# 1. Juvenile Monitoring & Sampling

Cohort Juvenile Monitoring

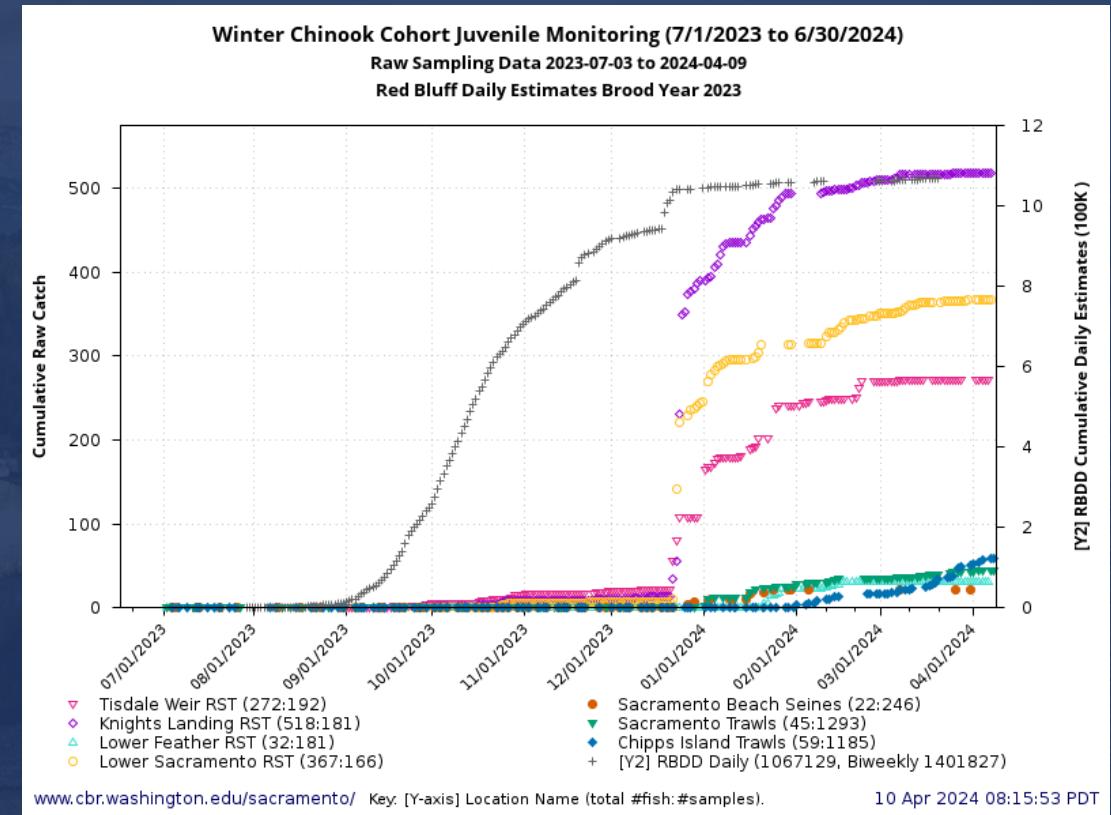


Current Catch

Migration Timing and Conditions

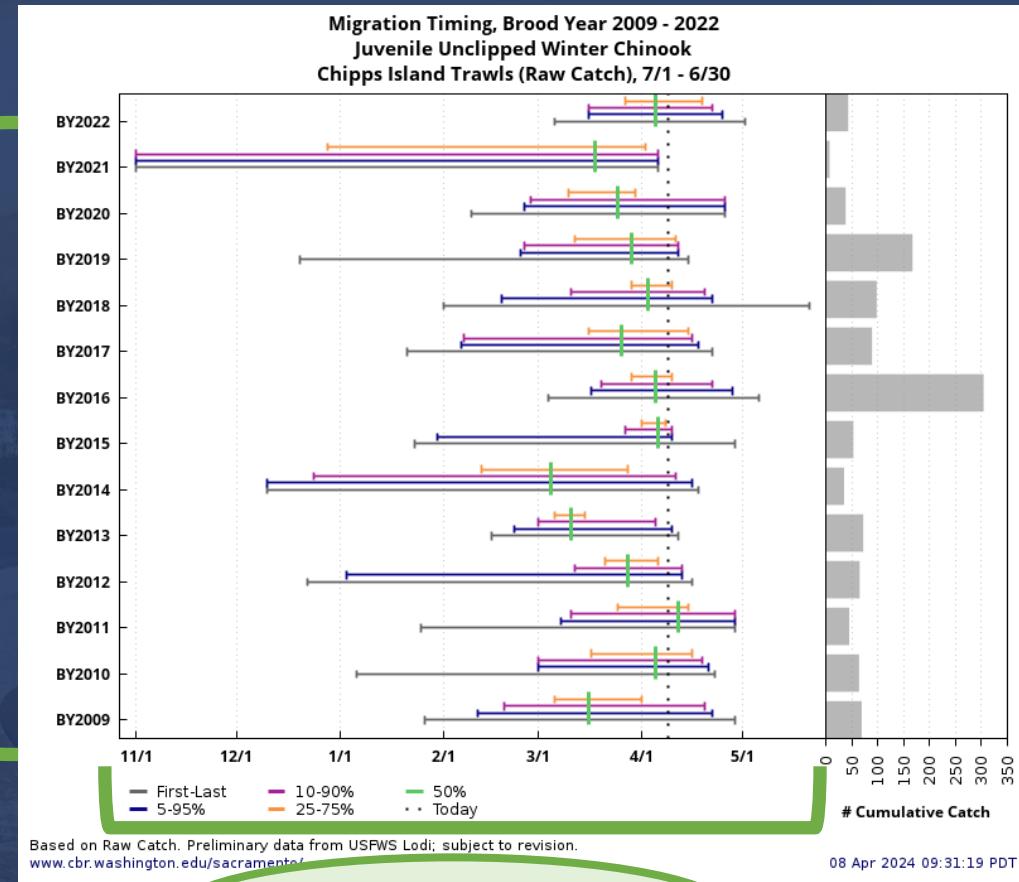
# Juvenile Monitoring & Sampling – Single Brood Year, Multiple Locations

- Rotary Screw Traps, Beach Seines, Trawls, and Red Bluff Diversion Dam catch
- Single point query access
- Brood Year cohorts
  - Red Bluff Diversion Dam
  - Length-at-Date model run assignments
- Tracking migration downstream



# Juvenile Monitoring & Sampling – Multiple Brood Years, Single Location

Brood Years

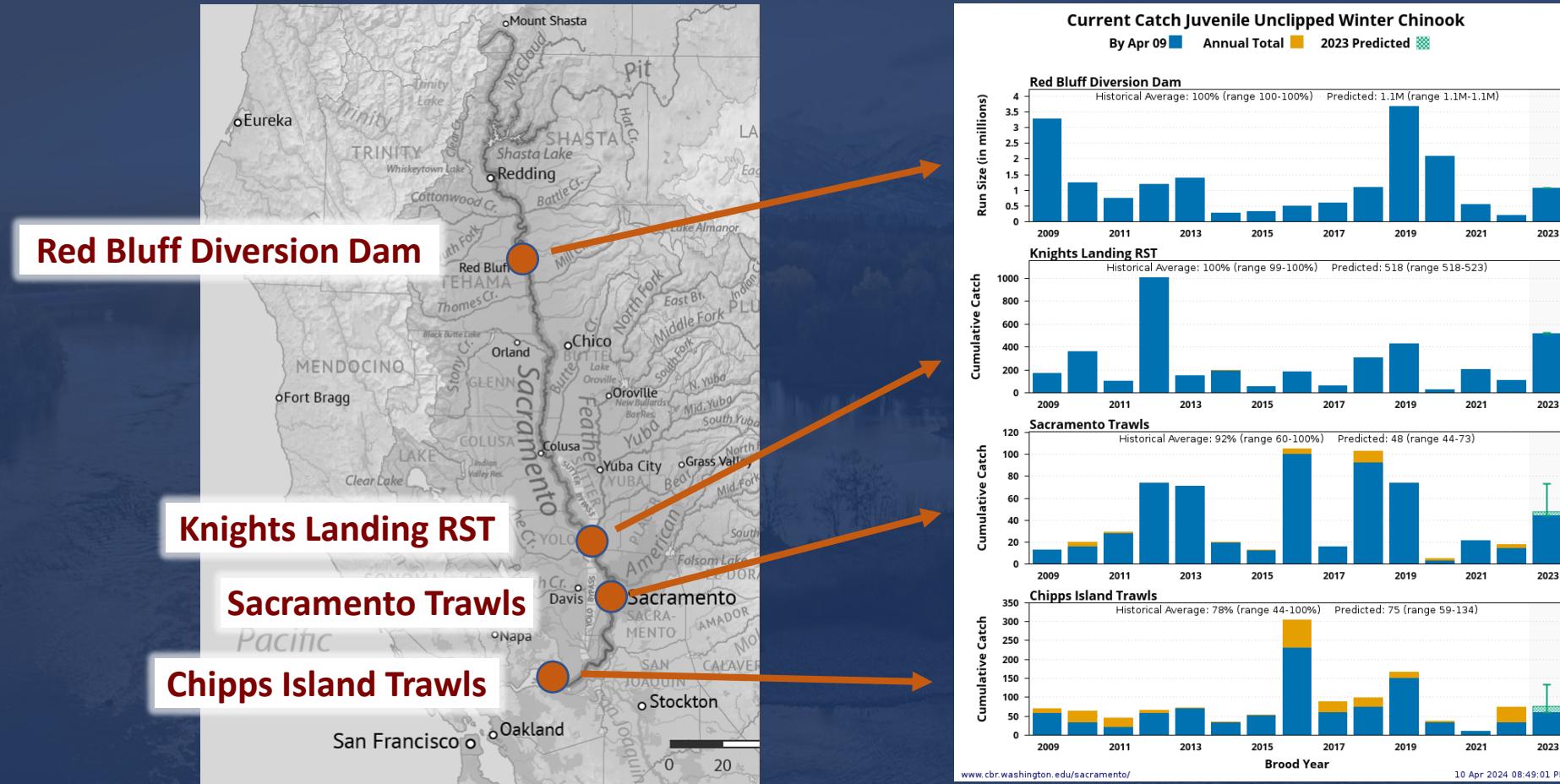


Total  
Passage Estimates  
or Catch

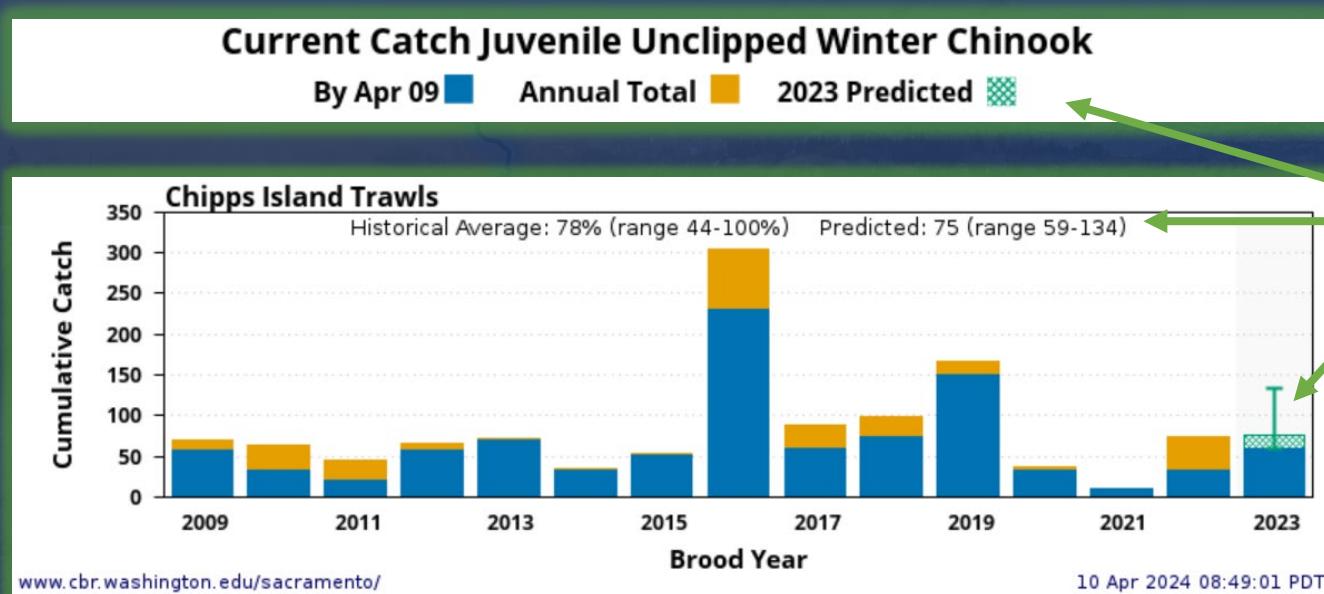
Date Range period

"Migration Timing and Conditions" [cbr.washington.edu/sacramento/data/query\\_hrt.html](http://cbr.washington.edu/sacramento/data/query_hrt.html)

# Juvenile Monitoring & Sampling – Multiple Brood Years, Multiple Locations Simple “Prediction” based on Historical & Current Years



# Juvenile Monitoring & Sampling – Multiple Brood Years, Multiple Locations Simple “Prediction” based on Historical & Current Years

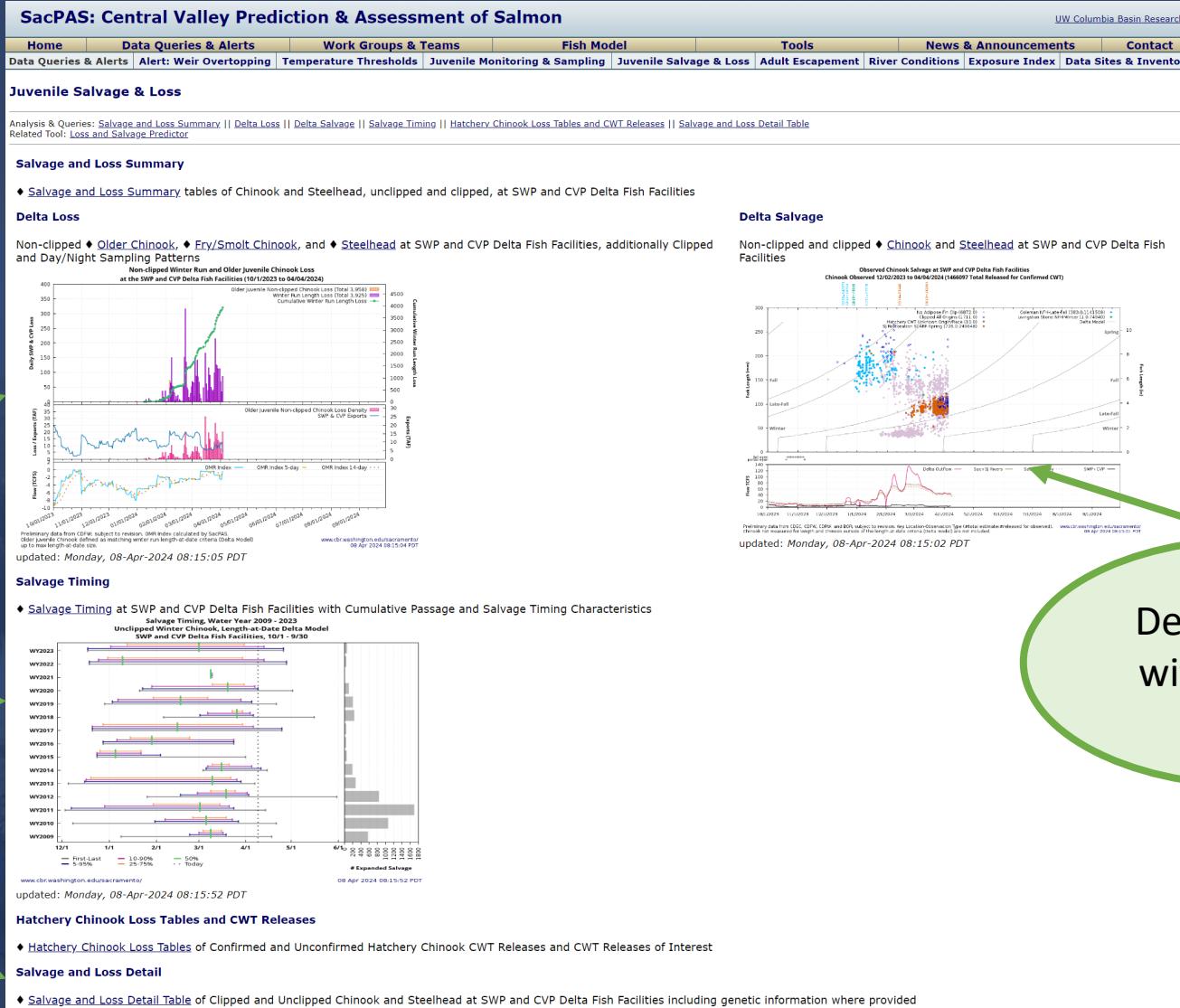


April 9<sup>th</sup>  
Winter Chinook  
Chipps Island  
BY2023 Prediction

## 2. Juvenile Salvage & Loss



Delta Loss  
with Exports & OMRI



Historical  
Salvage Timing

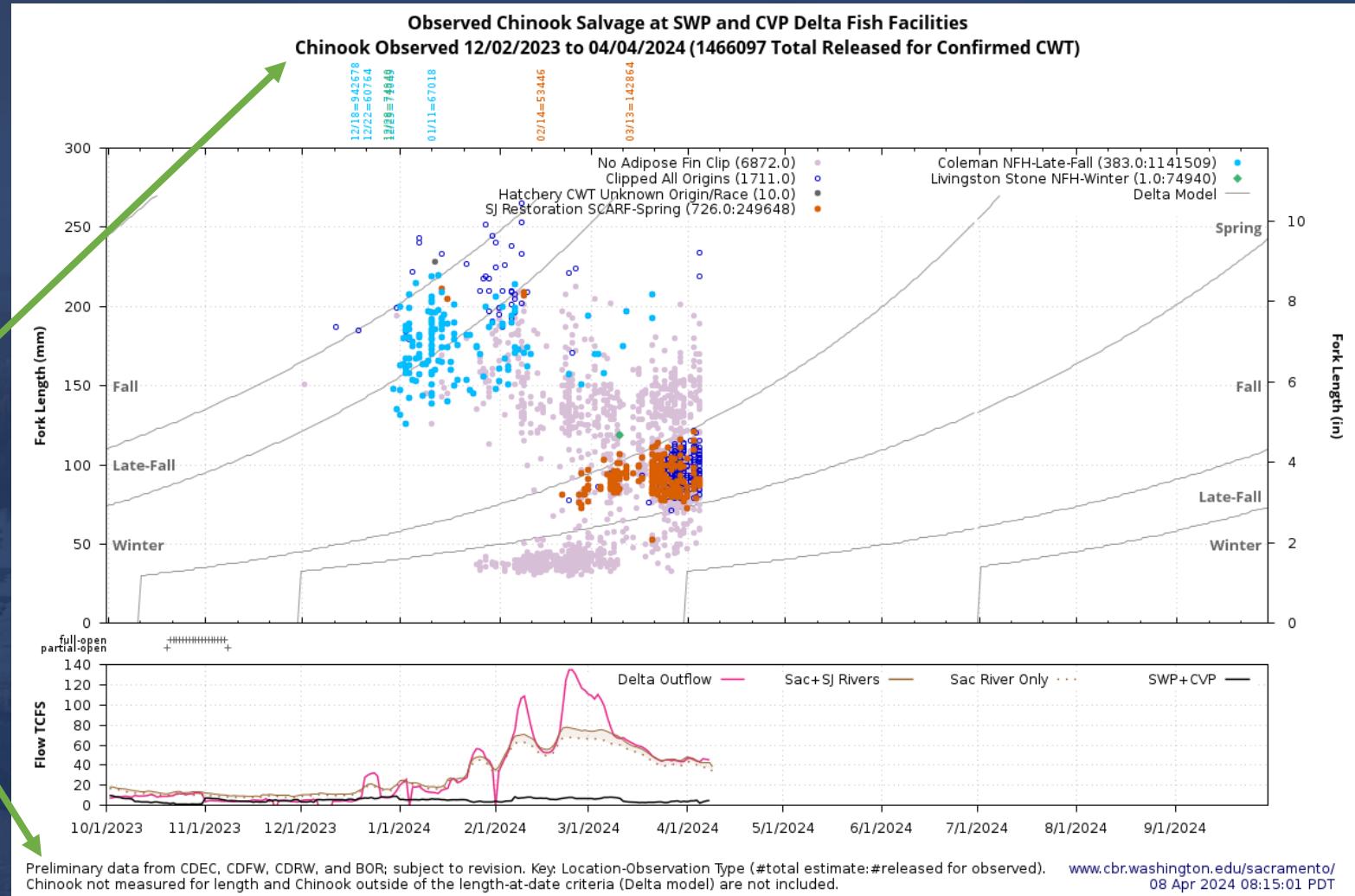
Salvage & Loss Detail  
with Length-at-Date,  
CWT, and DNA Races

Delta Salvage  
with Flows &  
Exports

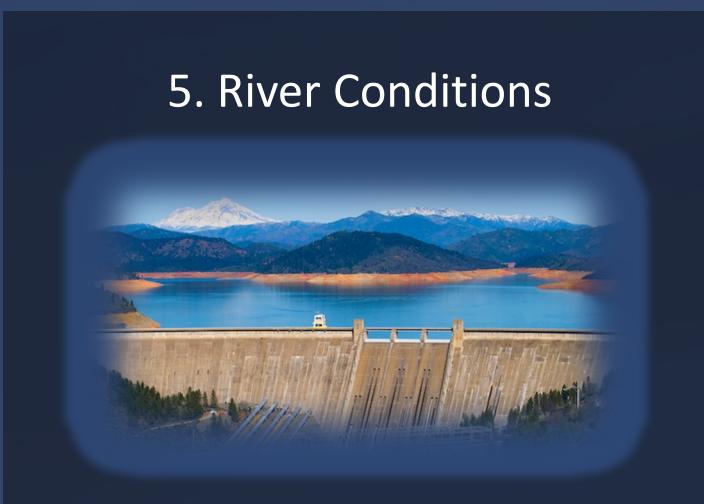
## 2. Juvenile Salvage & Loss



Detailed title and data notes included in the figure for transparency



## 5. River Conditions



Multiple Selections allowed:  
Year, Location, and Data Parameter

Date Range

10 Year Averages

Graph Options

**SacPAS: Central Valley Prediction & Assessment of Salmon** UW Columbia Basin Research

**Home** **Data Queries & Alerts** **Work Groups & Teams** **Fish Model** **Tools** **Contact**

[Data Queries & Alerts](#) [Alert: Weir Overtopping](#) [Temperature Thresholds](#) [Juvenile Monitoring & Sampling](#) [Juvenile Salvage & Loss](#) [Adult Escapement](#) [River Conditions](#) [Exposure Index](#) [Data Sites & Inventory](#)

**River Conditions Graph & Text Query**

Data Courtesy of [CDEC](#)

Queries: [River Graph&Text](#) || [River Graph&Text Map](#) || [Daily River Table](#) || [All Years River Graph](#) || [Basin Conditions](#)

**Select Output Format**

Graph  Day of Year [DOY] Data Table  Calendar Date [mm/dd] Data Table  
 Download CSV Only [mm/dd]  Download CSV Only [single data pt/row]  Download Graph Only [PNG]

**Limit Locations by Hydrologic Area or Explore by Map**

All Locations  Sacramento River Basin  San Joaquin River Basin  Delta

**Select Calendar Year, Location, River Data**

2023 ▾ Sacramento R blw Georgiana Slough (GES)  
2022 Sacramento R at Hamilton City-Main Ch (HMC)  
2021 Sacramento R upstream of Hwy 44 (SAC)  
2020 Sacramento R at Jellys Ferry (JLF)  
2019 Sacramento R, Keswick Reservoir (KES)  
2018 ▾ Sacramento R, Keswick, WQ (KWK)

Reservoir Storage (AF)  
River Flow (CFS)  
River Stage (ft)  
Spillway Discharge (CFS)  
Turbidity (NTU/FNU)  
Water Temperature

Water Temperature Unit  °F  °C

Multiple selections allowed for each (hold Ctrl key and click individual items to select multiple in a list).  
Query is calendar year based, not water year.  
Maximum 2 y-axes for graph output.  
Please refer to the [River Parameters](#) inventory below to look up location-parameter availability.

**Set Date Range**

Start  End  mm/dd Remove dates to automatically scale graph.

**Select 10 Year Averages**

Reservoir Outflow (CFS)  Reservoir Storage (AF)  River Flow (CFS)  
 River Stage (ft)  Spillway Discharge (CFS)  Water Temperature

Multiple selections for 10 Year River Data Parameters allowed.

**10 Year Range**

**Customize Graph**

Combine like Data Types on Axis  Graph Nulls  Grid  Monochrome w/Symbols  Plot Symbols

Min  Max  First Y-Axis

Min  Max  Second Y-Axis

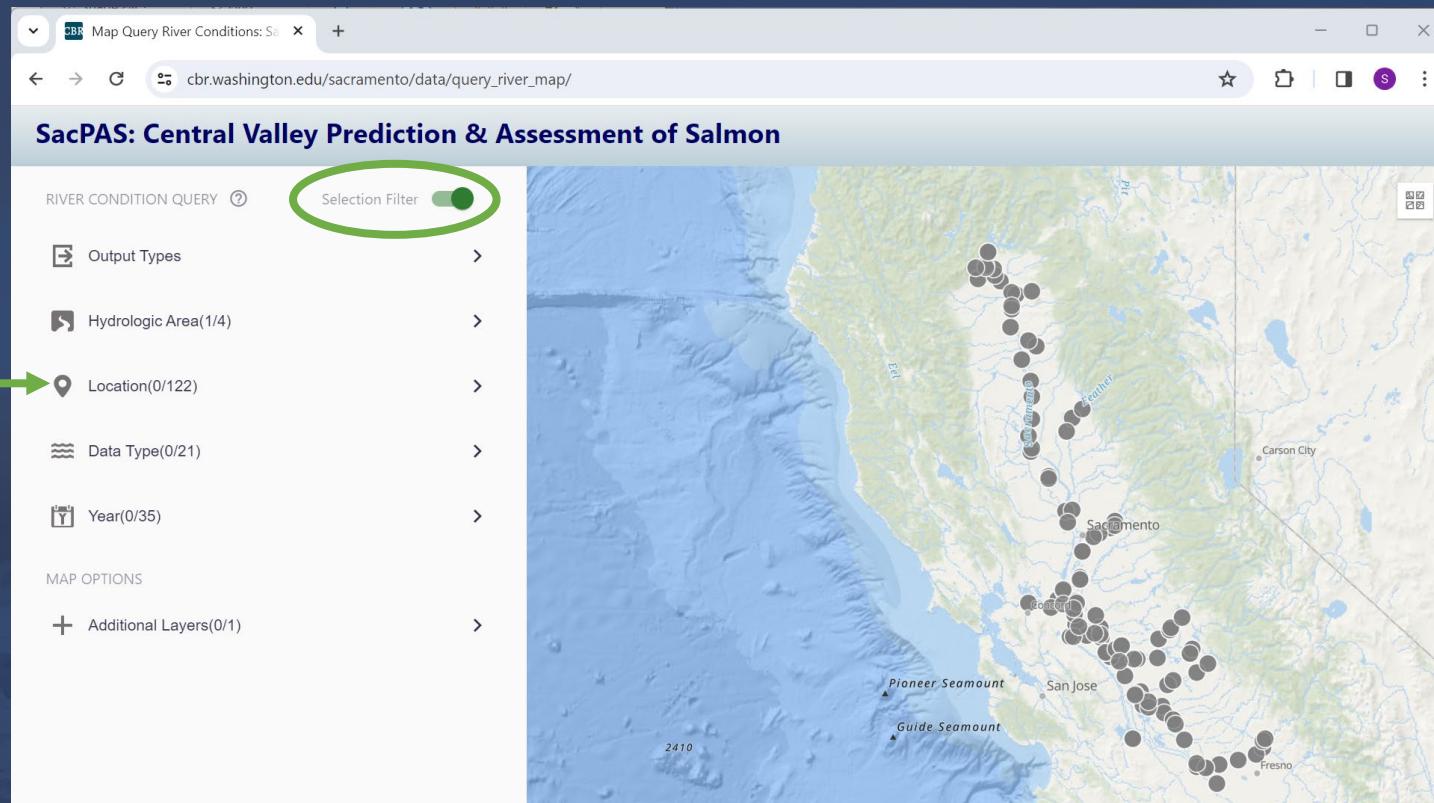
Medium (640 x 480)

Generate Query Result Link Only

# Map Interface for River Conditions Query



Location(0/122):  
0 selected  
122 possible



Data Type “Tidally Filtered Flow” Exploration Question:  
at which locations and for which years is Tidally Filtered Flow available?

# Map Interface for River Conditions Query

Location(0/2):  
0 selected  
2 possible

SacPAS: Central Valley Prediction & Assessment of Salmon

Hydrologic Area(1/2)

Location(0/2)

Data Type(1/21)

- Air Temperature (F)
- Air Temperature Max (F)
- Air Temperature Min (F)
- Control Regulating Discharge (CFS)
- Dissolved Chloride (mg/L)
- Dissolved Oxygen (mg/L)
- Electrical Conductivity (uS/cm)
- Flow (CFS)
- Full Natural Flow (CFS)
- Pumping Discharge (CFS)
- Res Above Top of Conserv Stor (AF)
- Reservoir Elevation (ft)
- Reservoir Flow (CFS)
- Reservoir Inflow (CFS)
- Reservoir Storage (AF)
- Spillway Discharge (CFS)
- Stage (ft)
- Tidally Filtered Flow (CFS)

Submit Get Url Reset

cbr.washington.edu/sacramento/data/query\_river\_map/

# Map Interface for River Conditions Query

SacPAS: Central Valley Prediction & Assessment of Salmon

RIVER CONDITION QUERY (2/2) Selection Filter

- Output Types
- Hydrologic Area(1/2)
- Location(2/2)
  - Sacramento R at Freeport (USGS 11447650)
  - Sacramento R at Rio Vista (USGS 11455420)
- Data Type(1/1)
- Year(0/10)

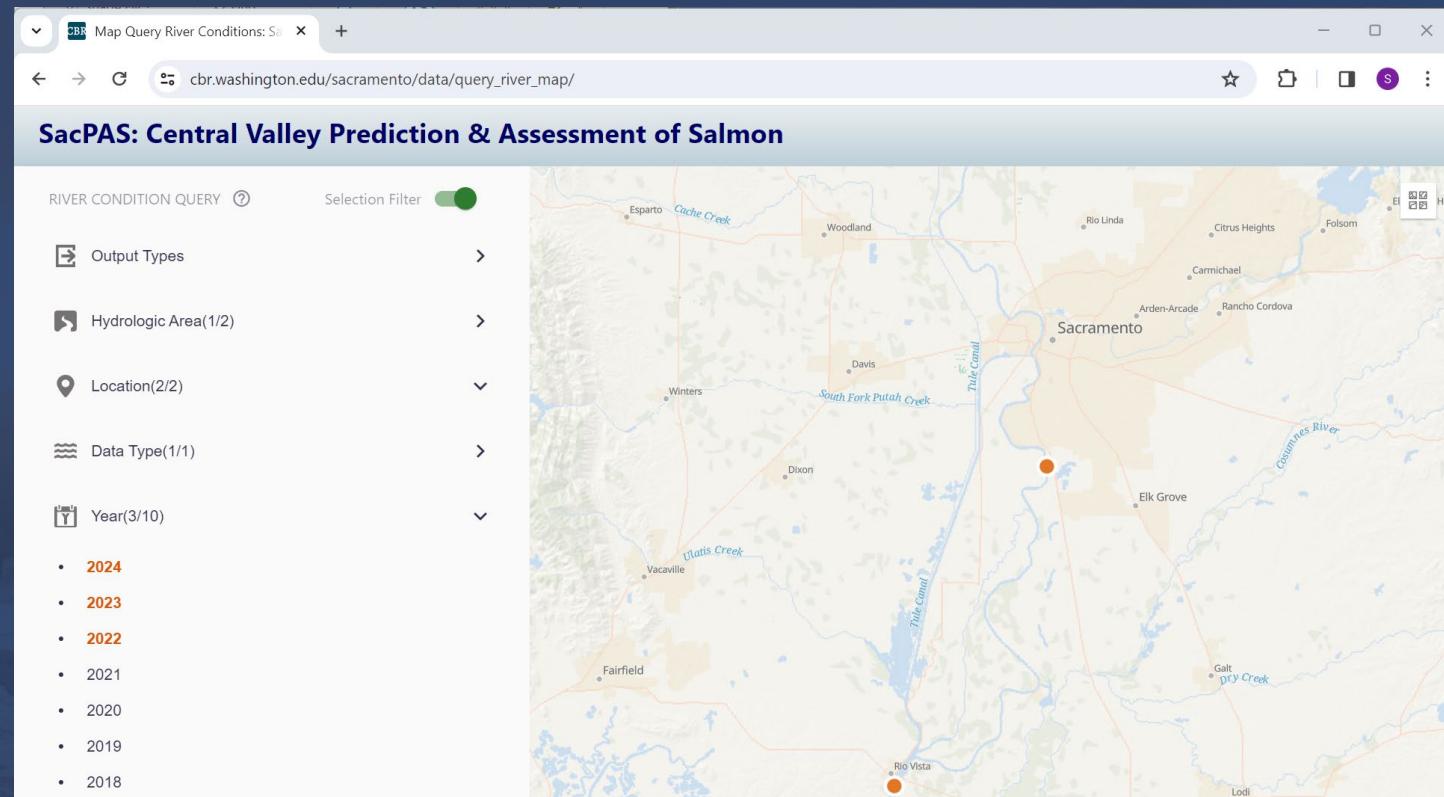
MAP OPTIONS

- Additional Layers(0/1)

**Submit**

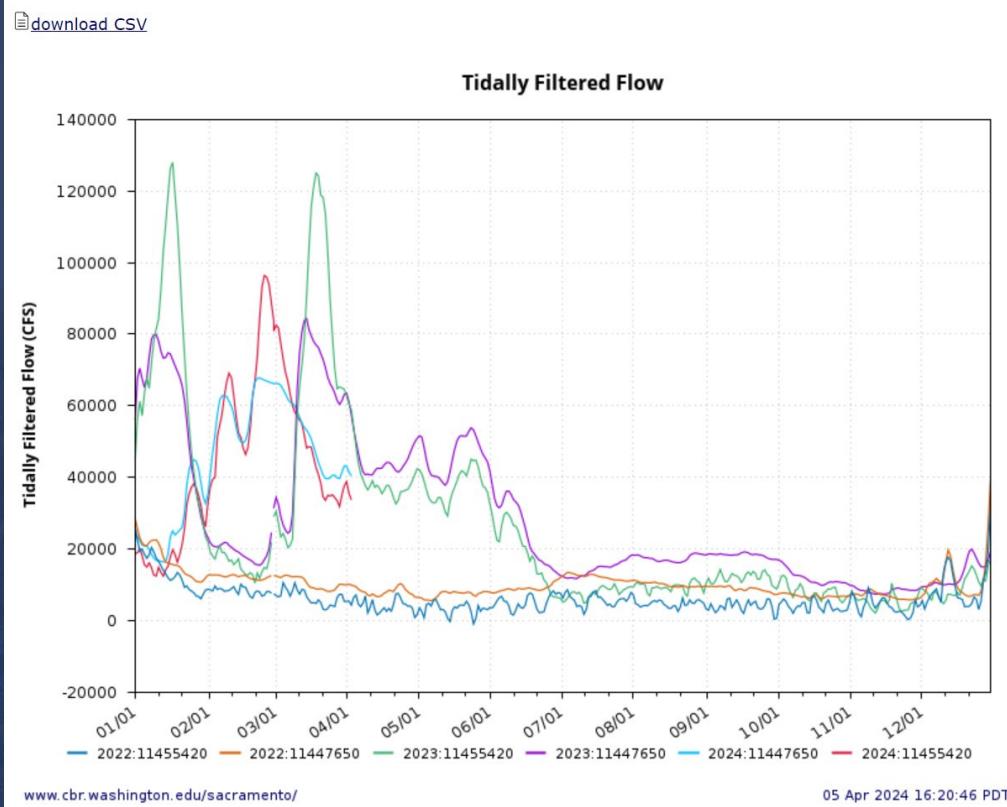
cbr.washington.edu/sacramento/data/query\_river\_map/

# Map Interface for River Conditions Query



Data Type “Tidally Filtered Flow” Exploration Question:  
at which locations and for which years is Tidally Filtered Flow available?

# River Conditions Results



mm/dd	2024:11447650:tidallyfilteredflow (CFS)	2024:11455420:tidallyfilteredflow (CFS)	2023:11455420:tidallyfilteredflow (CFS)	2023:11447650:tidallyfilteredflow (CFS)	2022:11455420:tidallyfilteredflow (CFS)	2022:11447650:tidallyfilteredflow (CFS)
1/1	22491.667	18595.833		44941.667	55995.833	26104.167
1/2	23441.667	18904.167		56304.167	67587.500	22441.667
1/3	22250.000	19941.667		61220.833	70470.833	19216.667
1/4	21025.000	18045.833		57195.833	67529.167	19925.000
1/5	20900.000	15491.667		63541.667	65041.667	18462.500
1/6	20837.500	14870.833		67833.333	67779.167	17312.500
1/7	19741.667	16054.167		64837.500	73641.667	18345.833
1/8	18366.667	14675.000		72000.000	78612.500	20362.500
1/9	17375.000	12629.167		78112.500	79812.500	19058.333
1/10	16712.500	12375.000		81541.667	79883.333	17412.500
1/11	16658.333	14812.500		84254.167	78037.500	16500.000
1/12	16504.167	13379.167		92241.667	75229.167	15287.500
1/13	16283.333	12350.000		103079.167	73295.833	13958.333
1/14	16450.000	14037.500		110458.333	73466.667	13033.333
1/15	18437.500	15095.833		118666.667	74754.167	11908.333
1/16	23295.833	17670.833		126333.333	74479.167	11158.333
1/17	25012.500	19729.167		128000.000	72825.000	11520.833
1/18	23870.833	18408.333		119208.333	71183.333	12187.500
1/19	24475.000	16212.500		110583.333	69575.000	13362.500
1/20	25291.667	18383.333		98862.500	67937.500	12670.833
1/21	25879.167	21054.167		85941.667	65637.500	11270.833
1/22	29991.667	25416.667		74316.667	61541.667	9229.167
1/23	37754.167	32208.333		63491.667	55695.833	9592.500
1/24	42183.333	35391.667		54600.000	48741.667	8625.833
1/25	44020.833	37187.500		46950.000	43112.500	8168.750
1/26	44895.833	38200.000		41462.500	39416.667	7675.000
1/27	44466.667	37112.500		36554.167	36020.833	6807.083
1/28	42425.000	34979.167		32516.667	32520.833	6679.167
1/29	38454.167	32216.667		30475.000	29129.167	5982.500
1/30	34475.000	28162.500		26591.667	26445.833	7296.667
1/31	32658.333	26154.167		23270.833	24537.500	8452.917
2/1	35270.833	32854.167		21820.833	23029.167	8714.167
2/2	41066.667	37329.167		19104.167	21658.333	8528.750
2/3	46779.167	39370.833		17995.833	20891.667	8195.000
2/4	51908.333	39950.000		17125.000	20566.667	9586.250
2/5	57458.333	51283.333		19395.833	20487.500	8602.917
2/6	61520.833	54487.500		20891.667	20900.000	8912.083

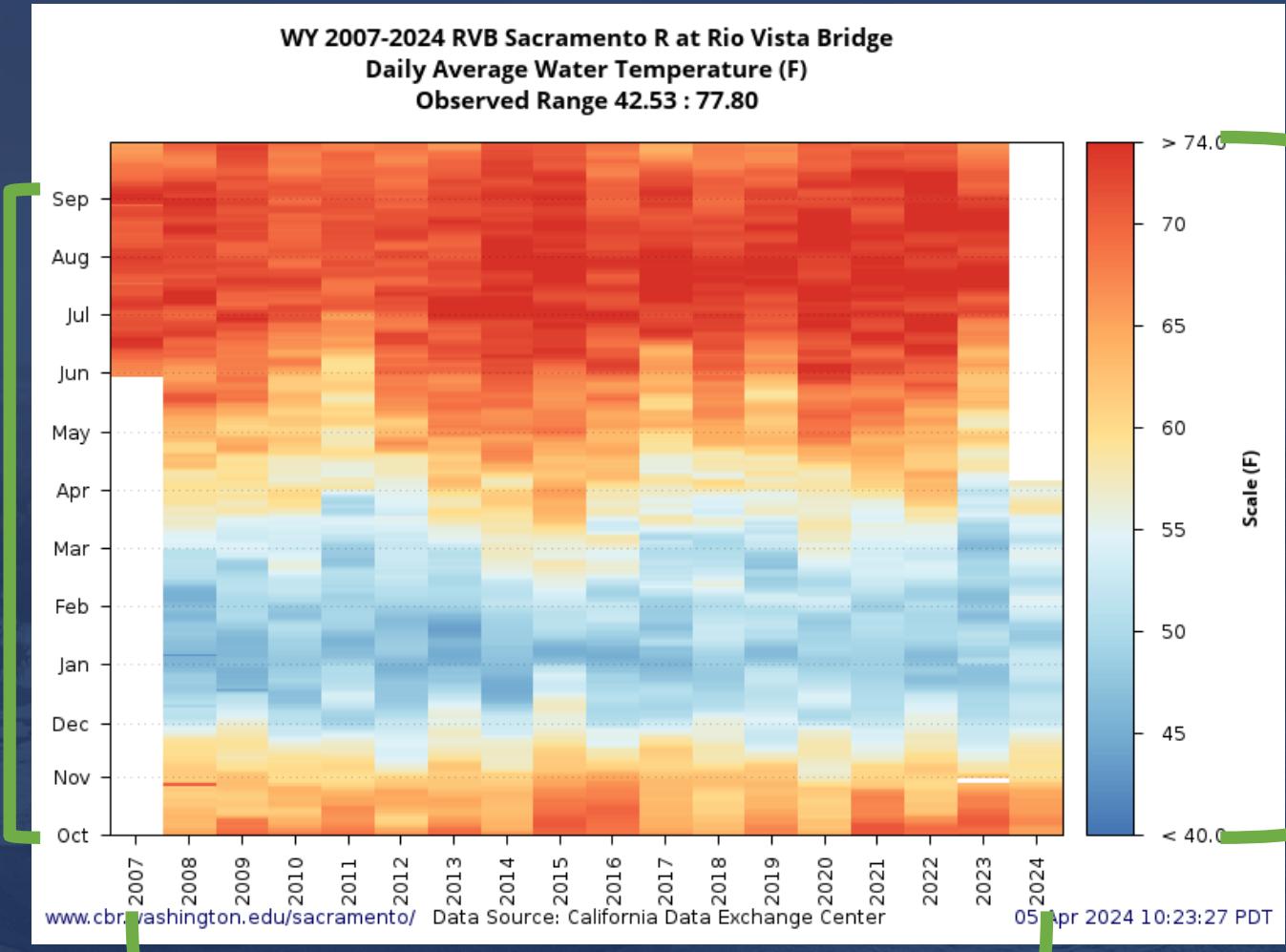
"River Conditions Graph & Text" [cbr.washington.edu/sacramento/data/query\\_river\\_graph.html](http://cbr.washington.edu/sacramento/data/query_river_graph.html)

"Map Interface River Conditions" [cbr.washington.edu/sacramento/data/query\\_river\\_map/](http://cbr.washington.edu/sacramento/data/query_river_map/)

## 5. River Conditions



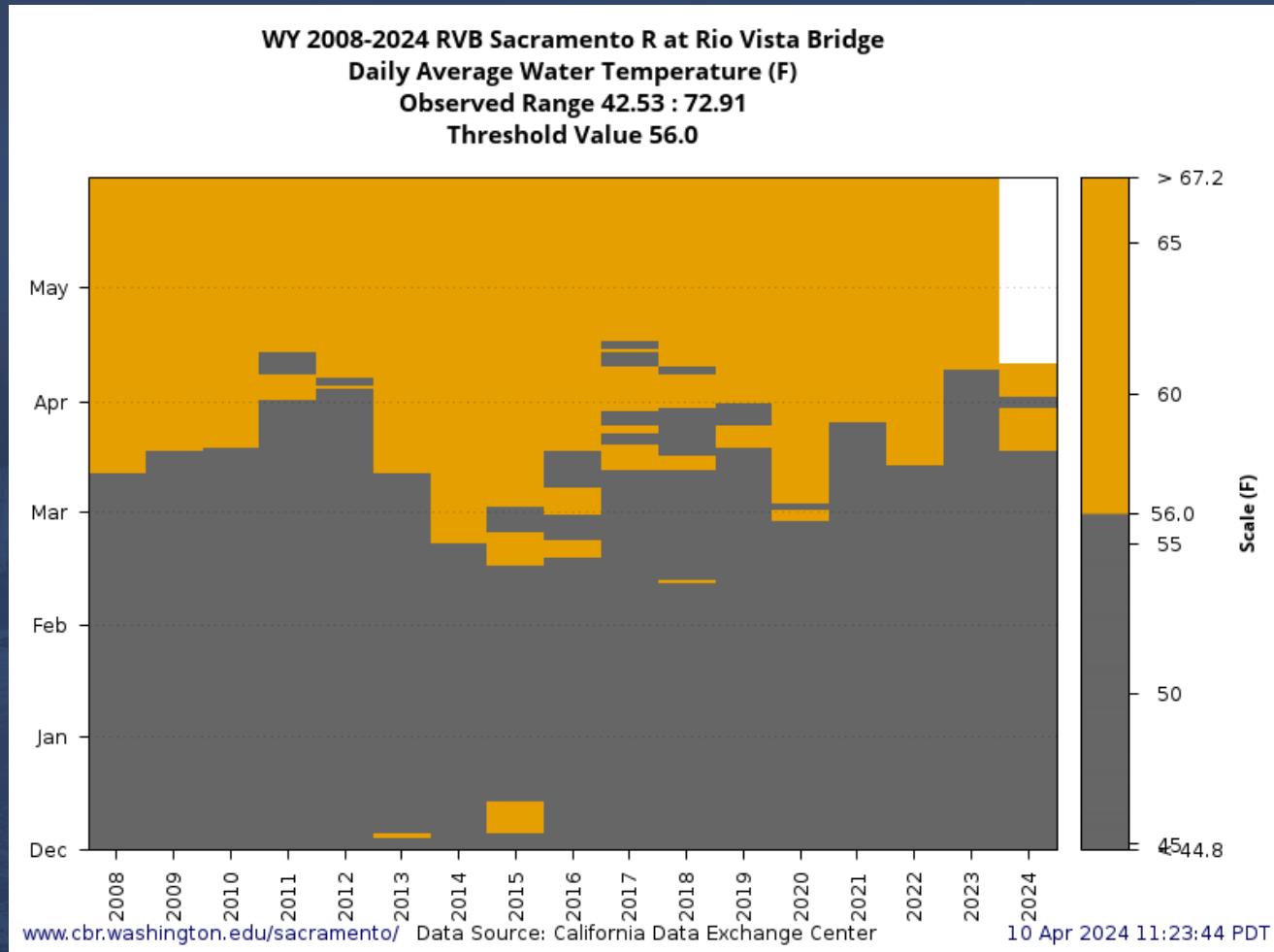
Months through the Water Year



Color Legend (°F)

# All Years River Graph

## Threshold Value

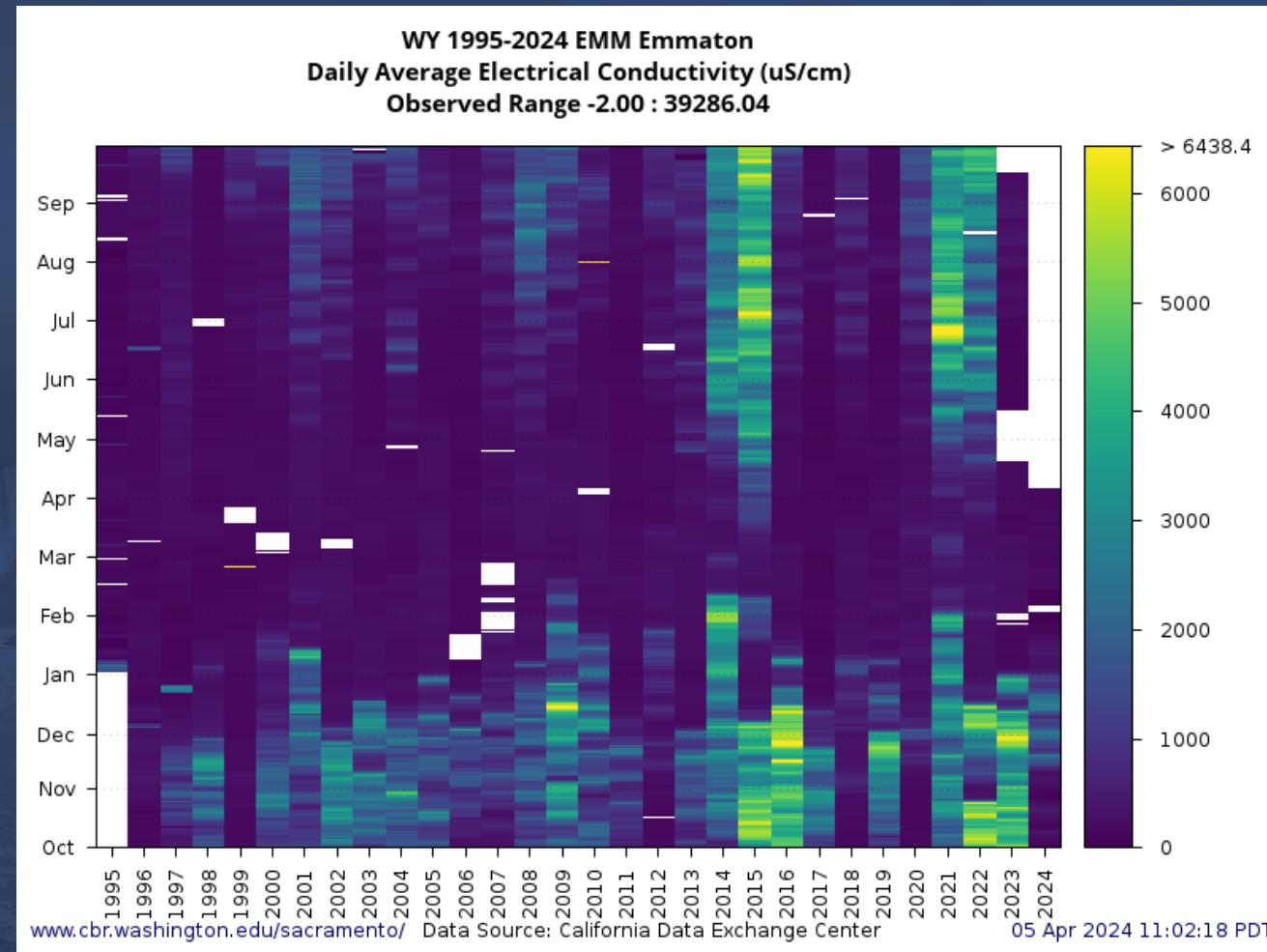


“Color Blindness Simulator” [color-blindness.com/coblis-color-blindness-simulator/](http://color-blindness.com/coblis-color-blindness-simulator/)

“All Years River Graph” [cbr.washington.edu/sacramento/data/query\\_river\\_allyears.html](http://cbr.washington.edu/sacramento/data/query_river_allyears.html)

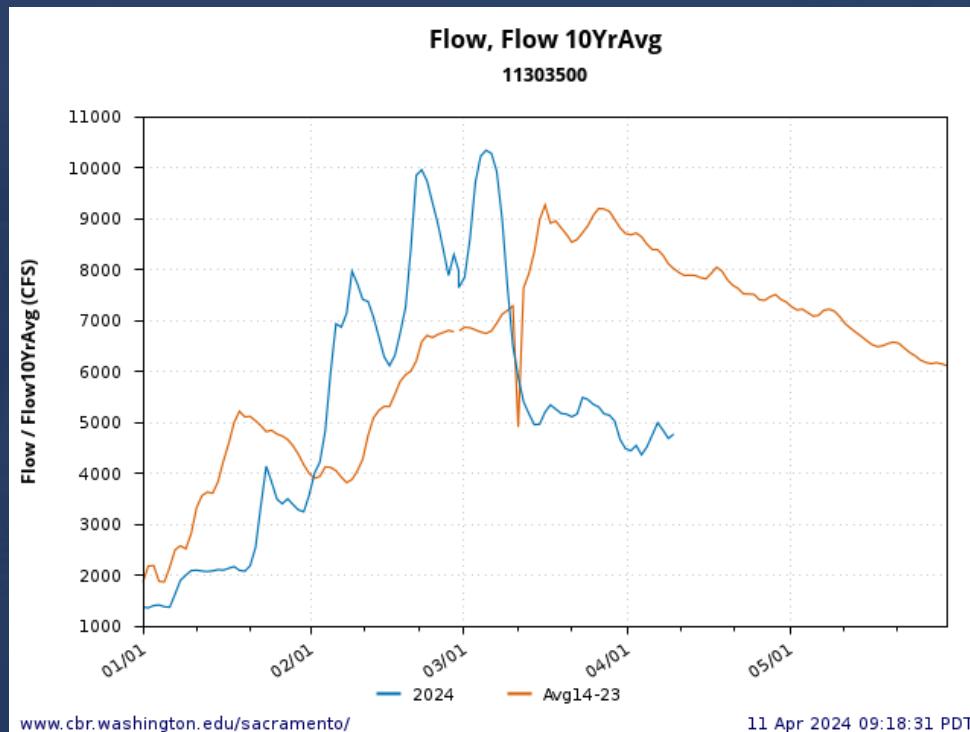
# All Years River Graph

## Electrical Conductivity at Emmaton

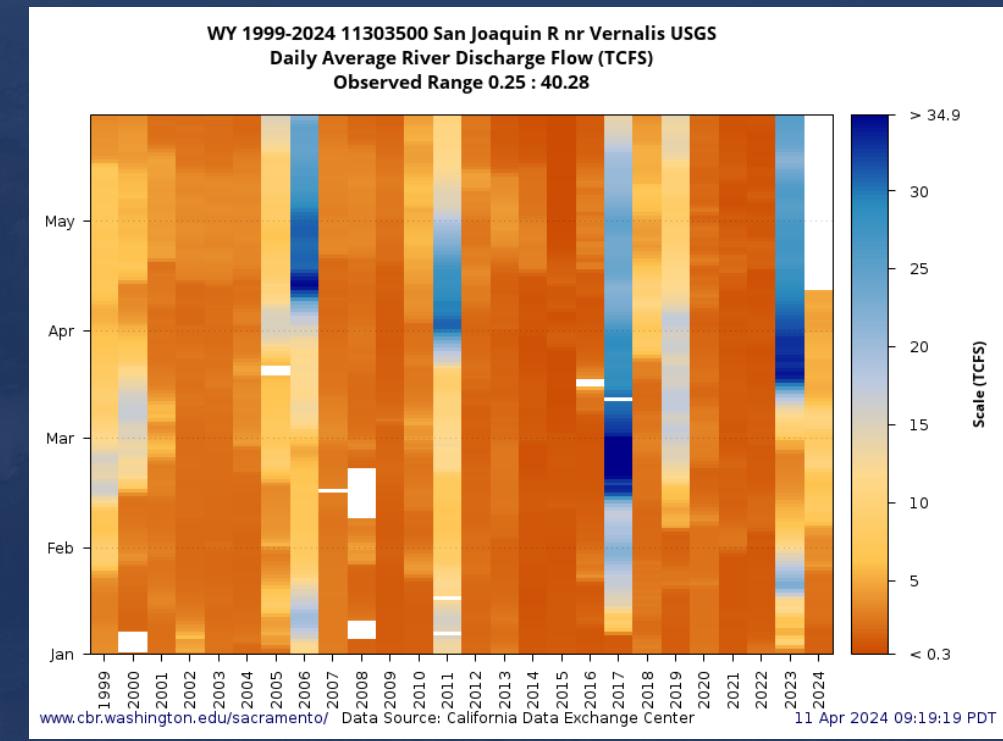


# USGS Flow near Vernalis– Current Year with 10 Year Average, All Historical Years

## River Conditions Graph & Text



## All Years River Graph



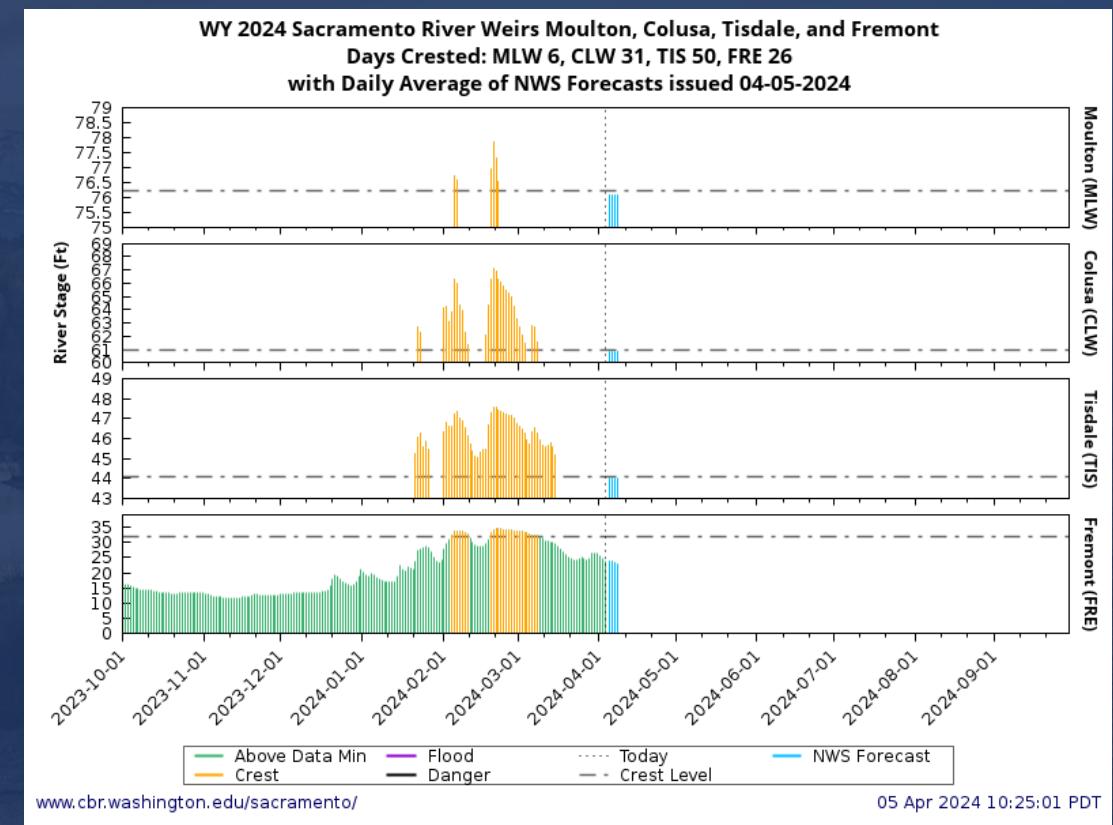
“River Conditions Graph & Text” [cbr.washington.edu/sacramento/data/query\\_river\\_graph.html](http://cbr.washington.edu/sacramento/data/query_river_graph.html)

“All Years River Graph” [cbr.washington.edu/sacramento/data/query\\_river\\_allyears.html](http://cbr.washington.edu/sacramento/data/query_river_allyears.html)

# Customized Tools from Requests

Example:

- Weir Overtopping Alert tool
  - Customized web page
  - Email alert service



# SacPAS Work Groups & Teams

On SacPAS website:

- Salmon Monitoring Team
- Smelt Monitoring Team
- Stanislaus Watershed Team

In development:

- San Joaquin River Restoration Program

When requests are made:

We aim to provide process/product

- Automated
- Repeatable
- Public
- Consistent
- Current

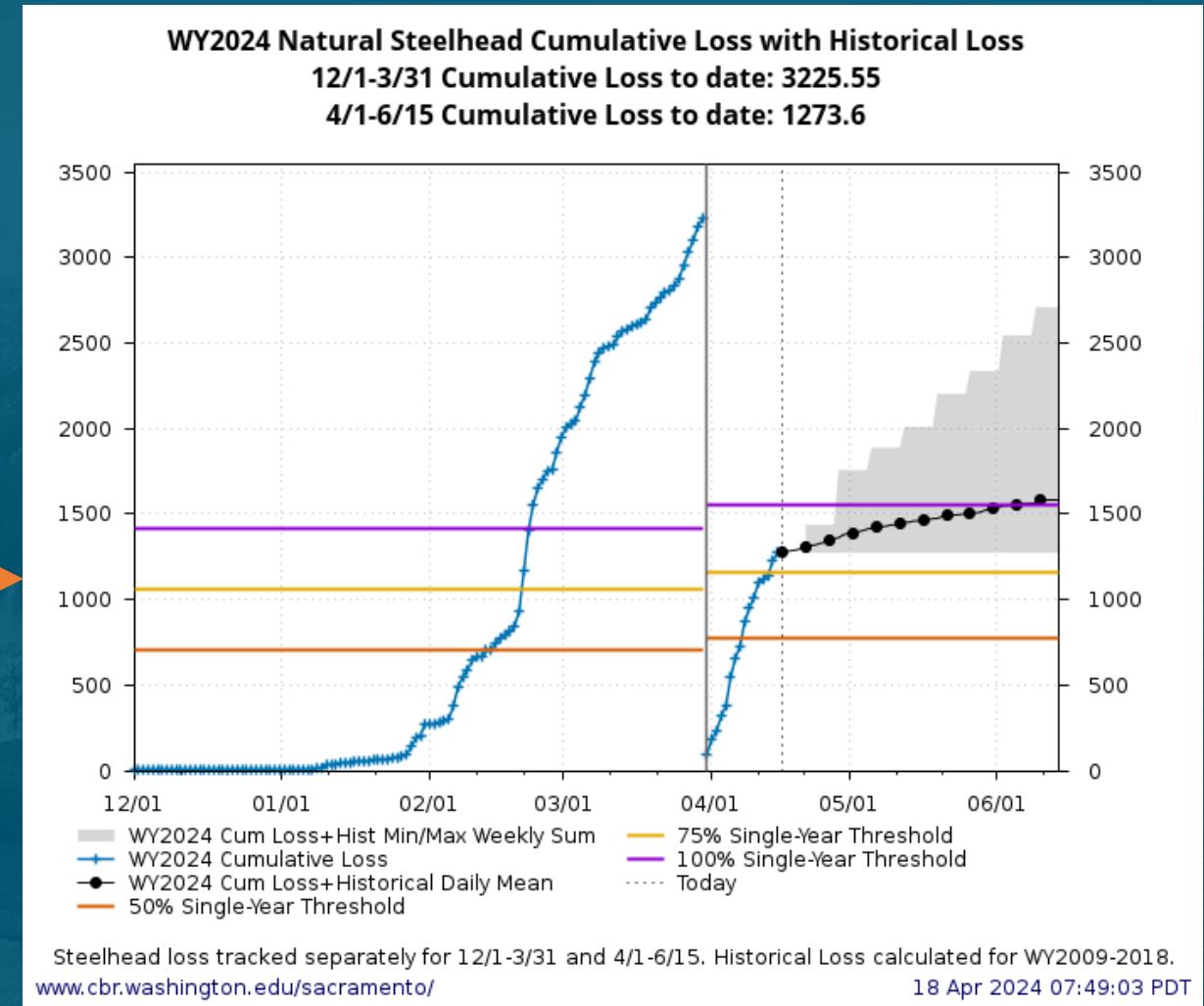
**All products and services are designed, developed, and refined in collaboration with team members and liaisons.**

# Salmon Monitoring Team: Products Example

## WY2024 Salmon Monitoring Current Conditions

- DCC Operations (10/1 - 11/30)
- Alerts: Deer Creek, Mill Creek, Wilkins Slough, Knights Landing
- Juvenile Sampling (14 days)
- Historical Migration Pattern for "Today"
- Species Distribution Estimates
- Loss&Salvage Predictor Estimates
- Delta STARS Estimates
- Single-Year Loss Thresholds

Visualizations to support  
OMR management season  
and ITL



# Smelt Monitoring Team: Products Example

## Smelt Monitoring Current Conditions

Includes data for Delta and Longfin smelt in Enhanced Delta Smelt Monitoring (EDSM), Chipps Island Trawl, and Salvage, and monitoring of current conditions.

- Water Temperature
- Onset of OMR Management
- Turbidity Bridge Avoidance
- Larval and Juvenile Delta Smelt Protection
- End of OMR Management
- Operations and Hydrology

Data Source  
with Data  
Quality  
attribute

## **EDSM WY 2024 (10/01/2023 - 09/30/2024)**

Delta Smelt and Longfin Smelt caught in Enhanced Delta Smelt Monitoring (EDSM)

Sample Date Time	Species	Mark Code	nfish	Fork Length (mm)	Subregion	Stratum	Region	Method	Source
2023-10-05 10:24:00	Delta Smelt	None	1	60	Sacramento River near Rio Vista	Lower Sacramento	North	Kodiak Trawl	EDSM Provisional, USFWS Lodi
2023-10-24 12:24:00	Delta Smelt	None	1	53	Lower Sacramento River	Lower Sacramento	West	Kodiak Trawl	EDSM Provisional, USFWS Lodi
2023-11-15 09:17:00	Delta Smelt	None	1	57	Lower Sacramento River	Lower Sacramento	West	Kodiak Trawl	EDSM Provisional, USFWS Lodi
2023-10-02 09:12:00	Longfin Smelt	None	1	48	Suisun Marsh	Suisun Marsh	West	Kodiak Trawl	EDSM Provisional, USFWS Lodi
2023-10-03 11:16:00	Longfin Smelt	None	1	60	West Suisun Bay	Suisun Bay	Far West	Kodiak Trawl	EDSM Provisional, USFWS Lodi
2023-10-03 11:16:00	Longfin Smelt	None	1	61	West Suisun Bay	Suisun Bay	Far West	Kodiak Trawl	EDSM Provisional, USFWS Lodi
2023-10-03 11:33:00	Longfin Smelt	None	1	69	West Suisun Bay	Suisun Bay	Far West	Kodiak Trawl	EDSM Provisional, USFWS Lodi
2023-10-04 08:45:00	Longfin Smelt	None	1	53	Grizzly Bay	Suisun Marsh	West	Kodiak Trawl	EDSM Provisional, USFWS Lodi
2023-10-04 08:45:00	Longfin Smelt	None	1	54	Grizzly Bay	Suisun Marsh	West	Kodiak Trawl	EDSM Provisional, USFWS Lodi
2023-10-05 10:41:00	Longfin Smelt	None	1	49	Grizzly Bay	Suisun Marsh	West	Kodiak Trawl	EDSM Provisional, USFWS Lodi

# Current & Historical Delta Smelt Query

## Current and Historical Delta Smelt Surveys Query -- in Development

Data Courtesy of California Department of Fish & Wildlife and USFWS Lodi Office

### Select Output Format

- HTML Table and CSV  CSV File Only

### Select Species, Stratum, Survey

Delta Smelt Longfin Smelt All	All Strata Cache Slough and Liberty Island Cross Channel Area Deep Water Shipping Channel, Sacramento Sacramento River, Lower Sacramento River, Upper	All Surveys Delta Juvenile Fish Monitoring Program, USFWS [1976] Delta Smelt Larval Survey, CDFW [2005-2006] Enhanced Delta Smelt Monitoring, USFWS [2016] Fall Midwater Trawl Survey, CDFW [1967] North Bay Aquaduct Survey, CDFW [1993-2004]
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*Single year in brackets indicates the earliest year of data. Year range in brackets indicates the available data range for a non-active survey. Most surveys are updated annually and do not conduct sampling year-round.*

### Set Date Range

Start Date

End Date

### Set Forklength Type

- Batch Forklengths  Individual Forklengths

*Batch forklength reports min, max, and average lengths (where available) of fish measured in sample.  
Individual forklengths is a subset of Batch and only report individual fish measured in sample.*

# Current & Historical Delta Smelt Query

**Smelt Current and Historical Sampling Dates in SacPAS Database**

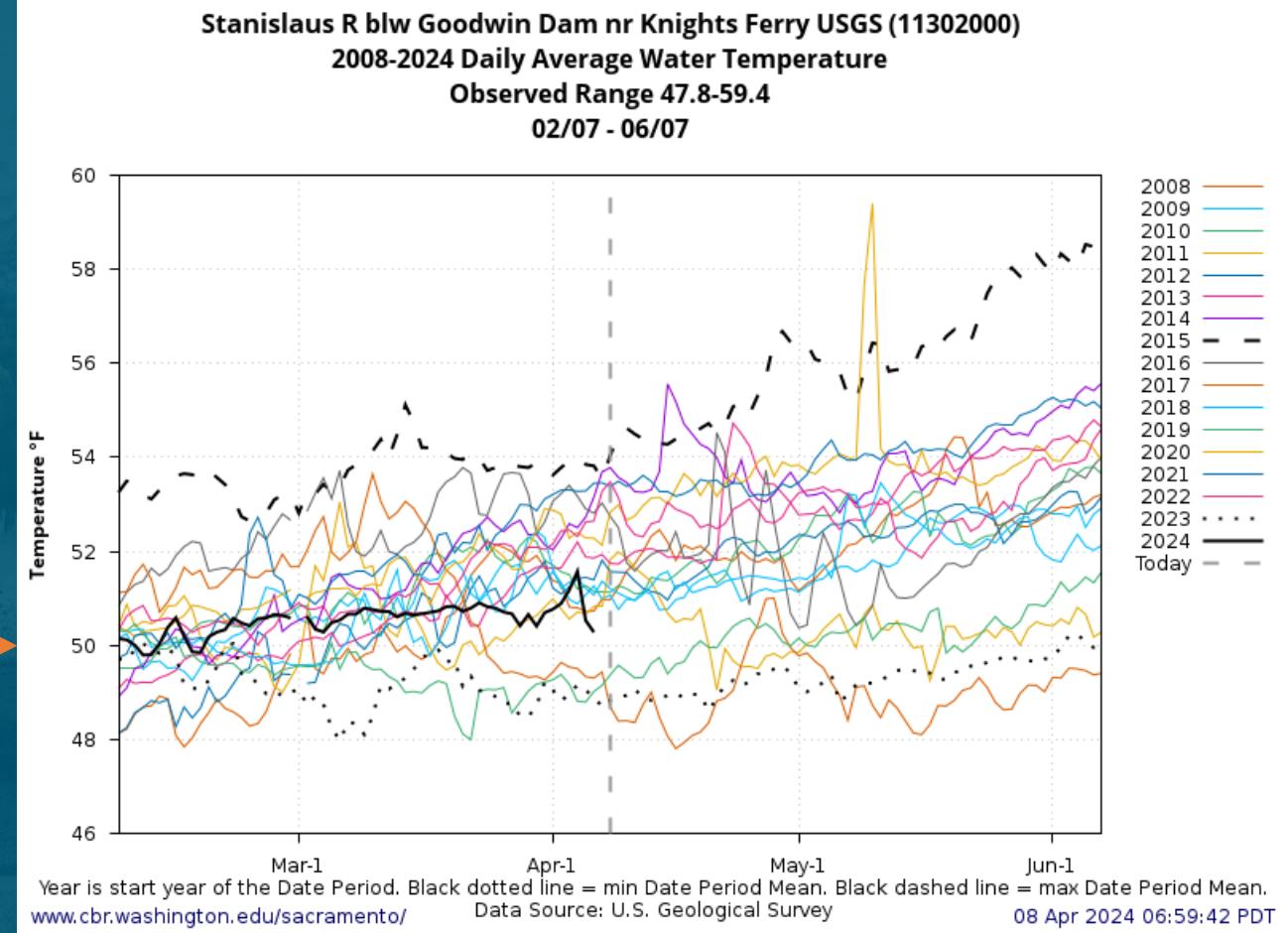
<b>Survey</b>	<b>Min Date</b>	<b>Max Date</b>
Salvage, CDFW	1993-01-03	2024-04-10
Enhanced Delta Smelt Monitoring, USFWS (preliminary)	2022-12-07	2024-03-28
Delta Juvenile Fish Monitoring Program, USFWS	1976-03-09	2024-03-20
Spring Kodiak Trawl, CDFW (discontinued in 2023)	2002-01-07	2023-05-04
San Francisco Estuary Smelt Larva Survey, CDFW	2009-01-05	2023-03-17
Fall Midwater Trawl Survey, CDFW	1967-09-12	2022-12-15
Enhanced Delta Smelt Monitoring, USFWS (EDI final)	2016-12-15	2022-11-29
20-mm Survey, CDFW	1995-04-27	2022-06-30
Larval Salvage, CDFW (subset of Salvage)	2018-03-31	2022-04-12
San Francisco Bay Study, CDFW	1980-01-23	2021-12-15
Townet Survey, CDFW	1959-06-16	2021-06-10
Delta Smelt Larval Survey, CDFW	2005-01-31	2006-07-15
North Bay Aquaduct Survey,CDFW	1993-03-07	2004-06-30

# Stanislaus Watershed Team: Products Example

## WY2024 Stanislaus Watershed Monitoring Current Conditions -- In Development

- Stanislaus Temperature and Flow
- Current River Conditions
- Water Temperature Min, Max, Average
- Water Temperature Historical
- Hourly Dissolved Oxygen
- Stanislaus River Flows
- Goodwin Dam Spillway Discharge
- Unimpaired Flow
- Data Locations Map

Visual prediction of near-term conditions : moving 60-day windows on either side of "today" for current and historical Water Temperature



# Summary

Real-time tools, in context of historical / forecasted  
Data summaries & metrics to support decisions

## Data & Visualizaions Considerations

- Purpose of tools and type of users:
  - Decision support tools
  - Research
  - Public
- Usability
- Relevancy
- Accessibility
- Transparency

## Data Queries & Alerts

- Juvenile Monitoring & Sampling
- Juvenile Salvage & Loss
- Adult Escapement
- Temperature Thresholds
- River Conditions
- Exposure Index
- Weir Overtopping

## Work Groups & Teams

- Salmon Monitoring Team
- Smelt Monitoring Team
- Stanislaus Watershed Team
- More team pages in progress...



# Hello !

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- We seek your feedback
  - Errors/bugs
  - Refinement of tools
  - New customized tools
- We look forward to new collaborations

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