

2024 RBDD RST Summary of Results



SRSP 2025 Fish Trends Meeting
Presented by Bill Poytress
and Tyler McCraney



RBDD RST Fish Monitoring 2024 Review

- Multiple activities conducted supporting research and the SRSP
 - Science Activities #11, 12, 13
- Acoustic tagging effort of wild Chinook limited, but conducted
 - Fall and spring smolts tagged in June of 2024 (n=62)
 - Many tags provided to enhance Spring Pulse Flow tagging studies
- Brood year 2022/2023 report incomplete due to loss of staff
 - data through November of 2024 (CHN, GST, Lamprey spp.)

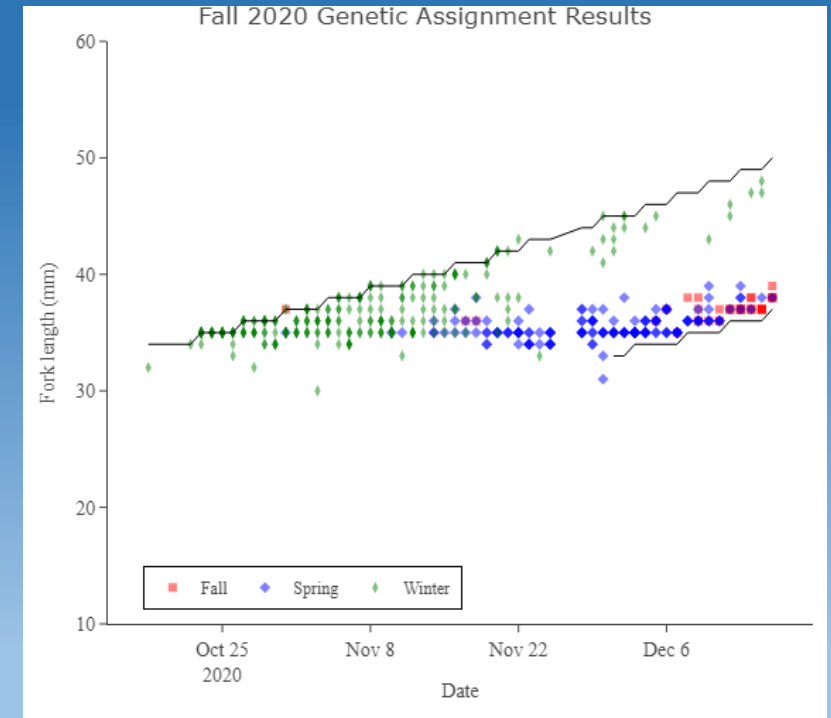


2024 RBDD RST Monitoring Support Activities

- Collect tissue samples for various research activities
 - Year 8 of Parentage based analyses (n=1,340; **SRSP Activity 13**)
 - WCS/SCS LAD corrections for JPE (n=153; rapid analyses)
 - WCS incidental morts for UCD-NMFS otolith habitat work (n=264)

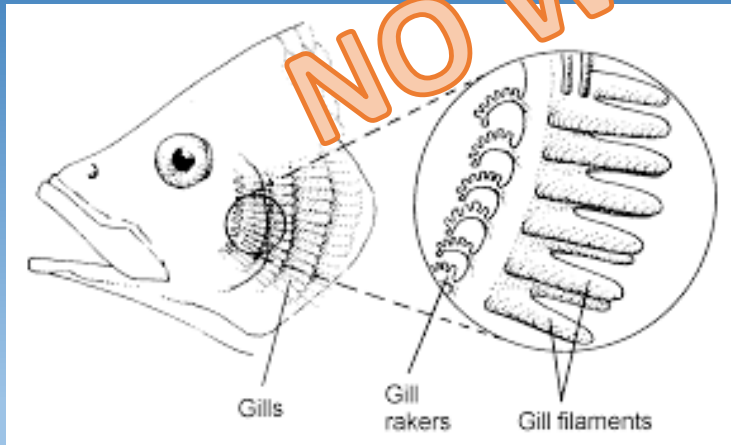


23-Sep	106-232	233-270	0-57	58-104	*	23
24-Sep	106-233	234-270	0-58	59-105	*	24
25-Sep	107-236	237-270	0-58	59-106	*	25
26-Sep	108-238	239-270	0-59	60-107	*	26
27-Sep	108-239	240-270	0-59	60-107	*	27
28-Sep	109-241	242-270	0-59	60-108	*	28
29-Sep	110-243	244-270	0-60	61-109	*	29
30-Sep	111-244	245-270	0-60	61-110	*	30
	FALL	SPRING	WINTER	LATE-FALL		
1-Oct	111-246	247-270	0-61	62-110	*	1-O
2-Oct	112-247	248-270	0-61	62-111	*	2-O
3-Oct	113-249	250-270	0-61	62-112	*	3-O
4-Oct	113-251	252-270	0-62	63-112	*	4-O
5-Oct	114-252	253-270	0-62	63-113	*	5-O
6-Oct	115-254	255-270	0-63	64-114	*	6-O
7-Oct	116-256	257-270	0-63	64-115	*	7-O
8-Oct	116-257	258-270	0-64	65-115	*	8-O
9-Oct	117-259	260-270	0-64	65-116	*	9-O
10-Oct	118-261	262-270	0-64	65-117	*	10-O
11-Oct	119-262	263-270	0-65	66-118	*	11-O
	FALL	SPRING	WINTER	LATE-FALL		
12-Oct	120-264	265-270	0-65	66-119	*	12-O
13-Oct	120-266	267-270	0-66	67-119	*	13-O
14-Oct	121-268	269-270	0-66	67-120	*	14-O
15-Oct	122-269	270-270	0-67	68-121	*	15-O
16-Oct	123-270	0-33	34-67	68-122	*	16-O
17-Oct	124-270	0-33	34-67	68-123	*	17-O
18-Oct	124-270	0-34	35-68	69-123	*	18-O
19-Oct	125-270	0-34	35-68	69-124	*	19-O
20-Oct	126-270	0-34	35-69	70-125	*	20-O
21-Oct	127-270	0-34	35-69	70-126	*	21-O
22-Oct	128-270	0-34	35-70	71-127	*	22-O
23-Oct	128-270	0-35	36-70	71-127	*	23-O
24-Oct	129-270	0-35	36-71	72-128	*	24-O
25-Oct	130-270	0-35	36-71	72-129	*	25-O
26-Oct	131-270	0-35	36-72	73-130	*	26-O
27-Oct	132-270	0-36	37-72	73-131	*	27-O
28-Oct	133-270	0-36	37-72	73-132	*	28-O
29-Oct	134-270	0-36	37-73	74-133	*	29-O



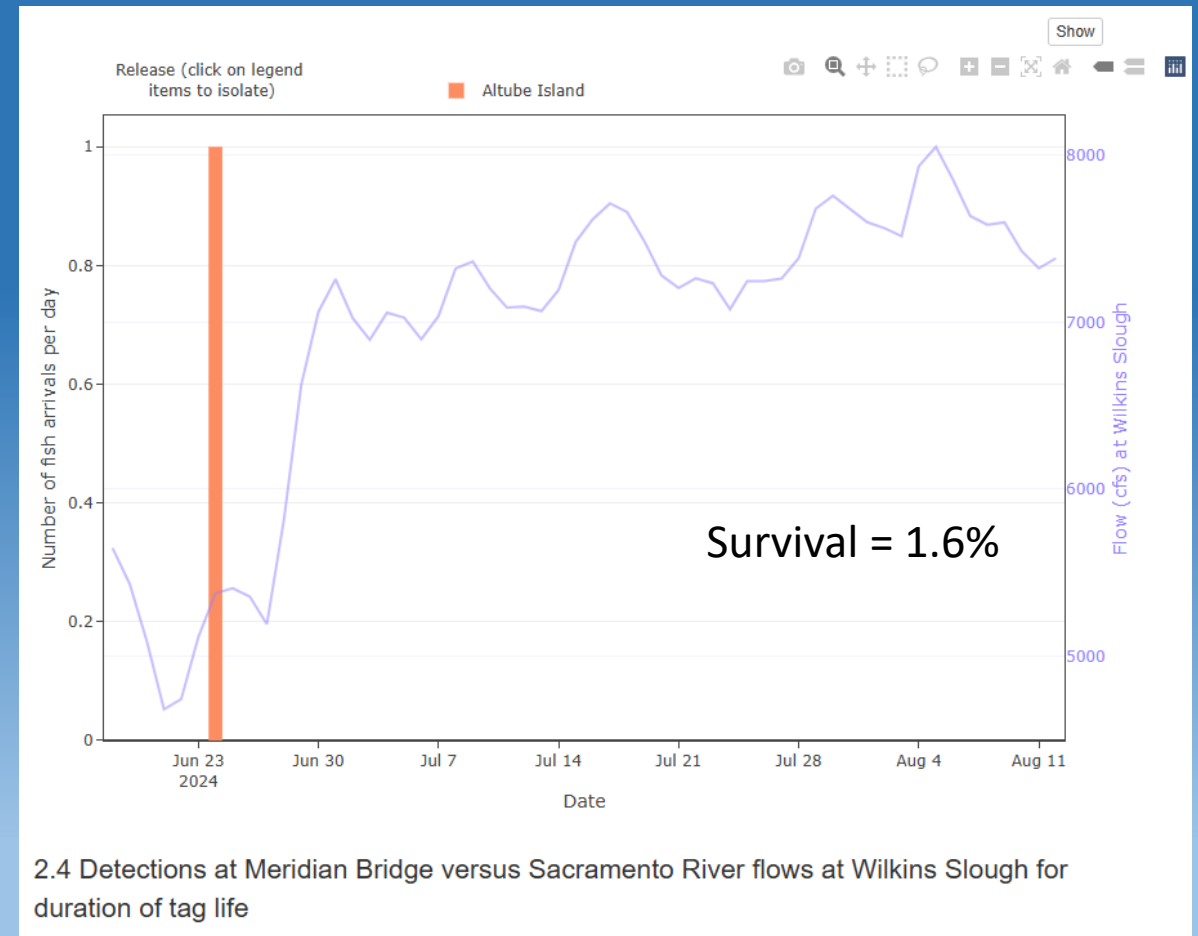
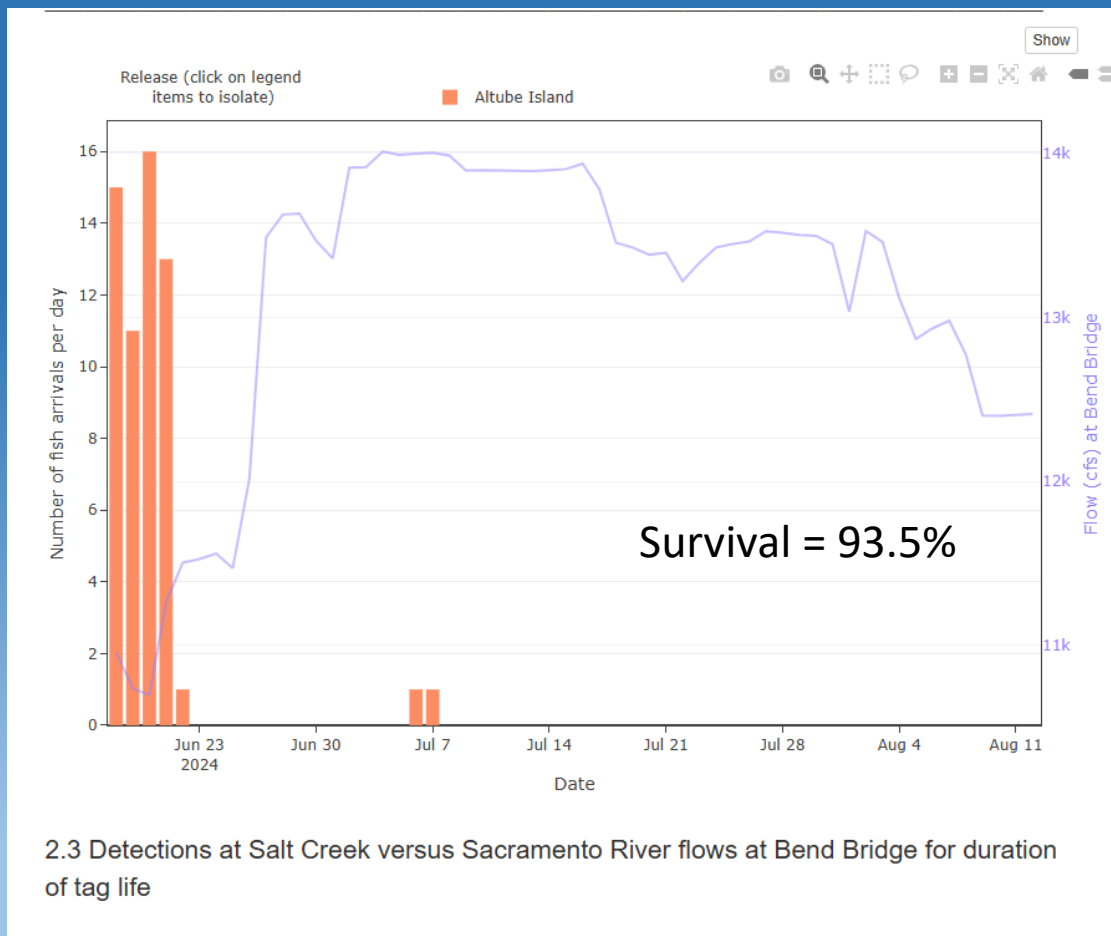
2024 RBDD RST SRSP Support Activities

- Collect Fish Health/Pathogen Data for others (SRSP Activity 28)
 - UCD/NMFS/USFWS-CNFH
 - Lethal Sampling of 80 wcs
 - Gill rakers for pathogen genomics (UCD)
 - Whole specimens for pathogen presence (USFWS/NMFS)
 - Monitor for *P. Mirabilis* and *C. Shasta*
 - Incidental mortality saved for NMFS-UCD
 - Use for healths for habitat use, year 2



2024 RBDD RST Acoustic Tagging Activities

- Natural origin juvenile Chinook from traps (n=62)
- Salt Creek (rkm 457) to Meridian Bridge (rkm 291)



RBDD RST Monitoring 2024 Review

- Year #5 of RST Array using (4) 5' RST's and (1) 8' RST
 - Sampling effort was moderate (73%) through primary **fall run** outmigration period (1/1/-6/30/2024)
 - High flows precluded sampling; trap removed from river 3x (22 of 182 days)
 - Staffing limitations during high water / storm conditions (16/182 days)
 - Reduced sample effort around hatchery releases in March and April (12/182 days)
 - Sampling effort was moderately high (91%) through primary **winter run** outmigration period (7/1 – 12/31/2024)
 - (17) days not sampled due to: (3) holidays, (1) Park Fire AQI, (13) storm conditions
 - Tandem 5' RST's deployed in fall to attempt to capture more winter run for mark-recapture trials



2024 RBDD RST Monitoring Challenges & Effects:

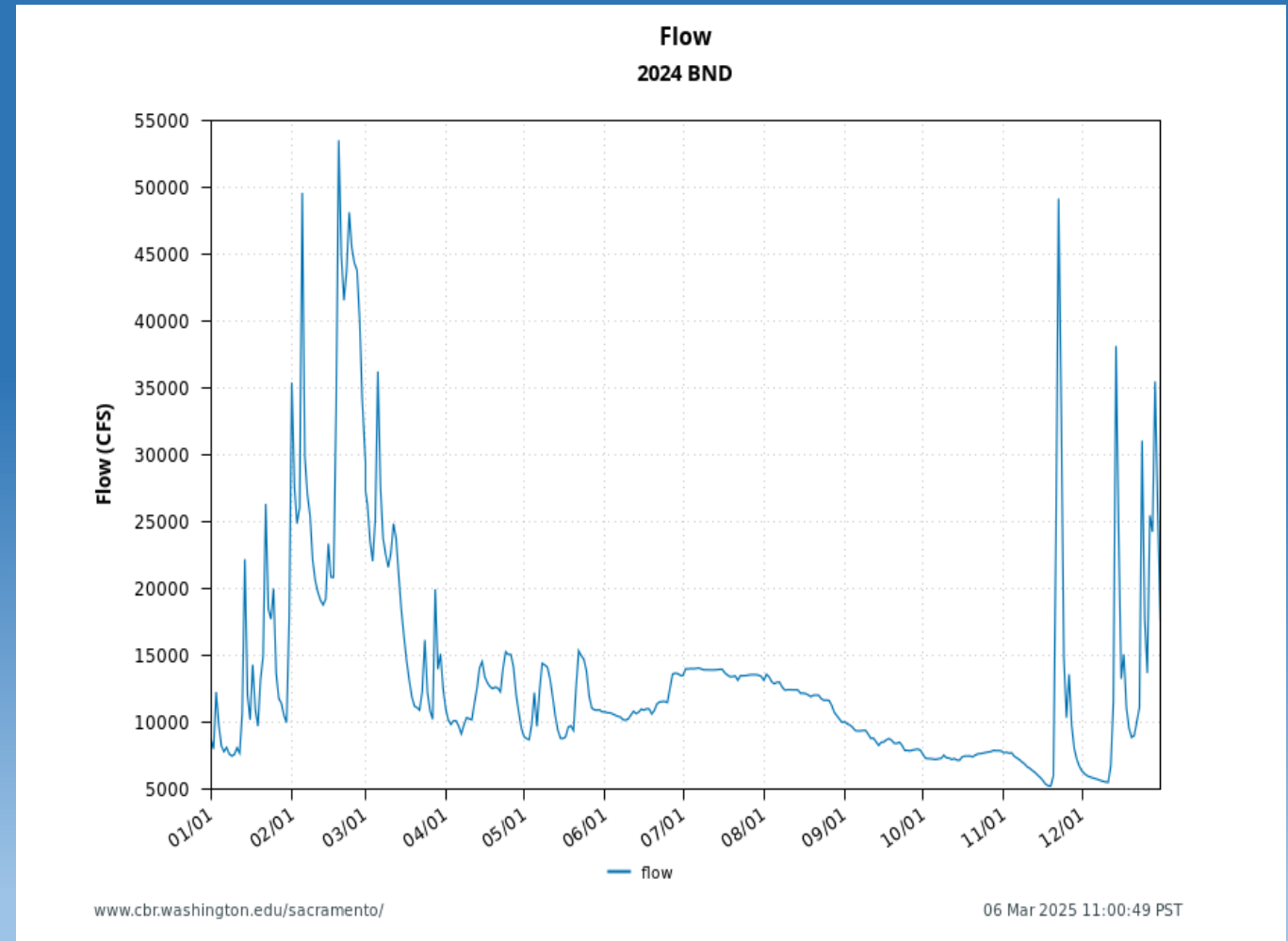
- **High flows Jan through March – excellent runoff**

- Unable to sample consistently
- Woody debris and safety issues
 - Less than full staffing
 - New field hires onboard by April
 - Loss of Data Manager/Sup in April
 - Less data online
 - Reports delayed

- **Passage Estimates**

- More imputation
 - Moderate Fall Run Estimate Impacts
 - Minor Winter Run Impacts

- **Less than optimal sampling year**



WCS 2024 FEQ2 JPI: 472,295*

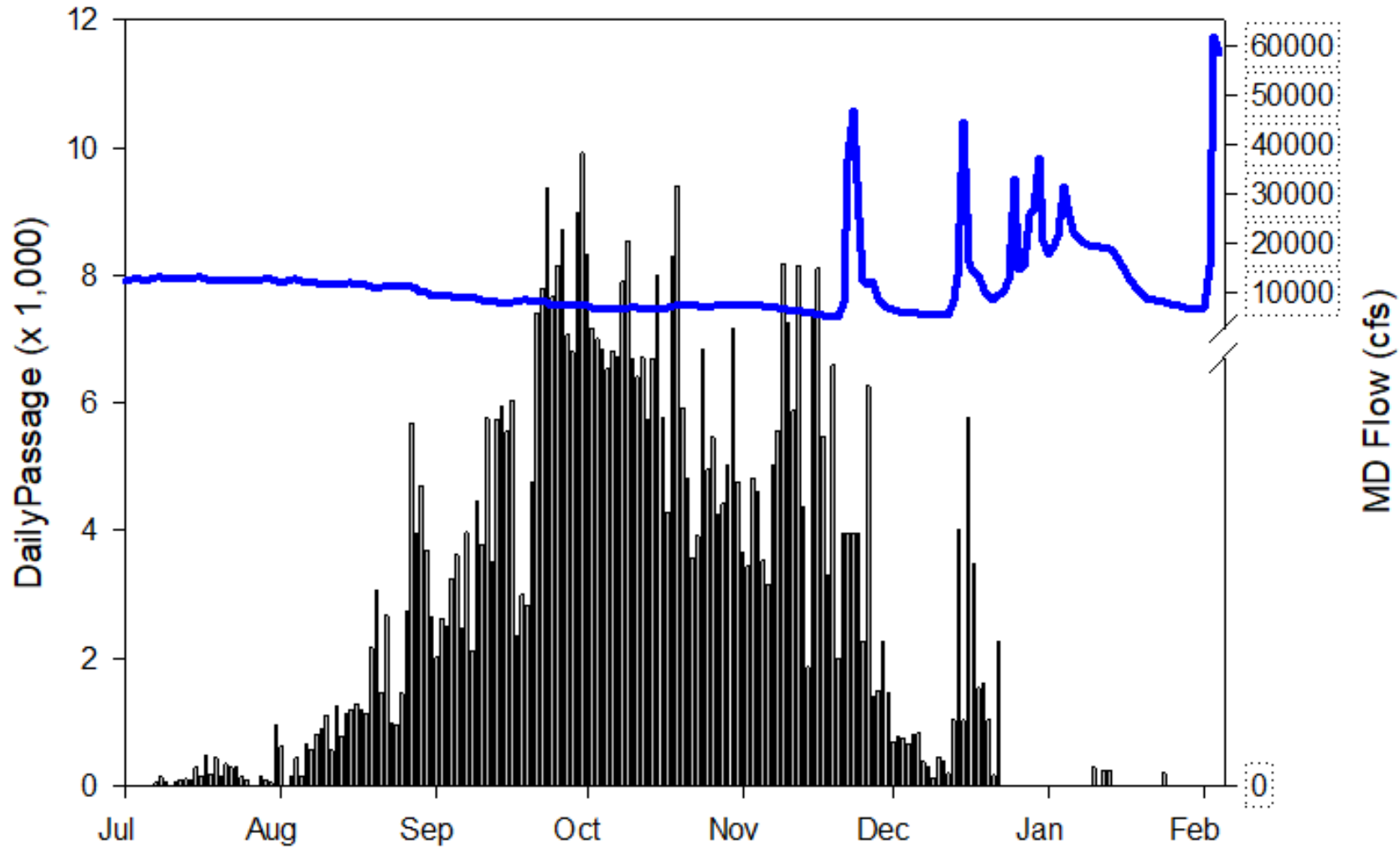
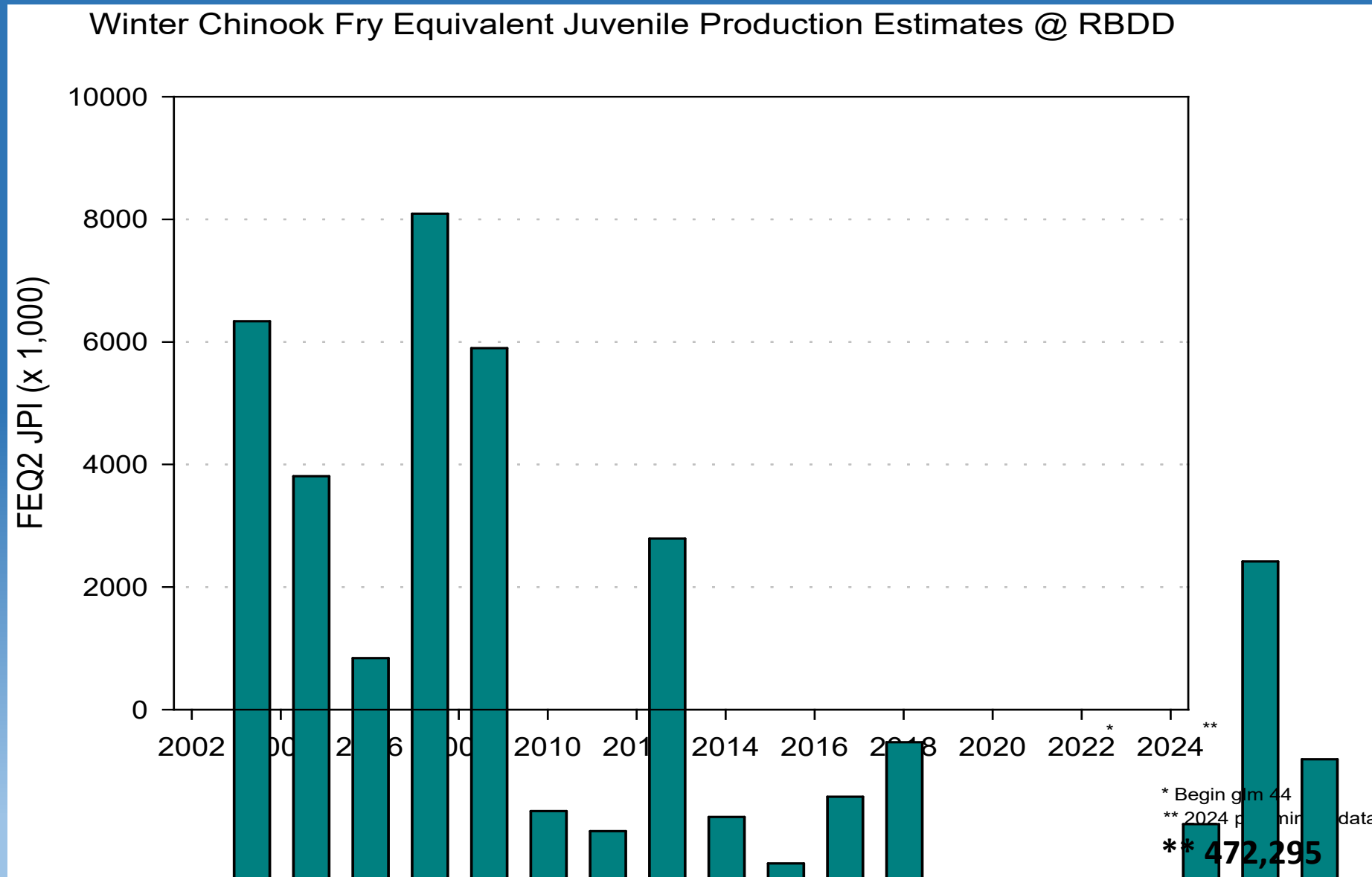


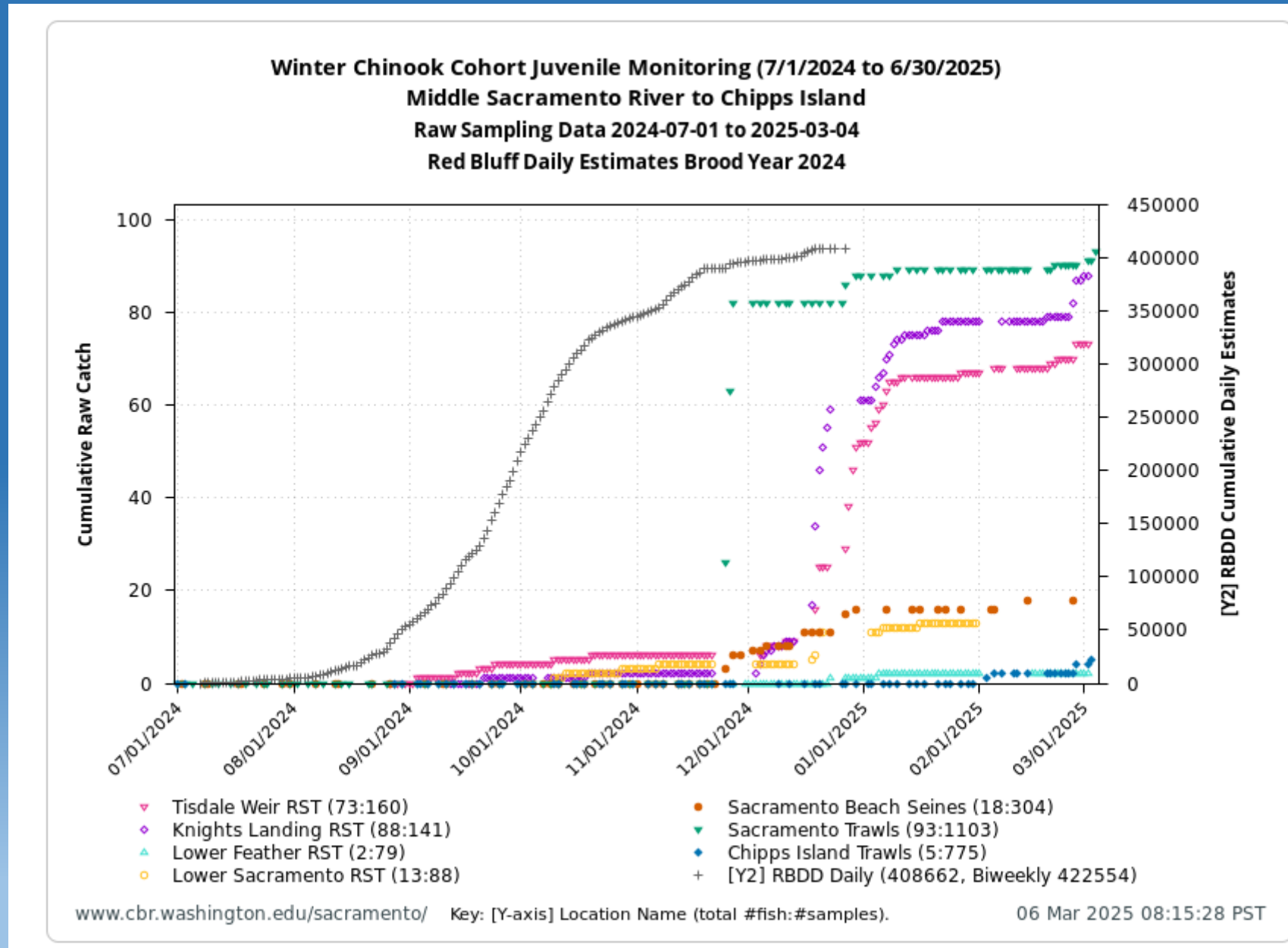
Figure 1. Daily juvenile winter Chinook passage measured at RBDD with flow (right Y-axis) estimated at RBDD, minus diversions where applicable.

* Preliminary glm 44

2024 Fish Trends, RBDD RST Winter Run Monitoring



Lower Sac River saw fish pass in late Nov/December...

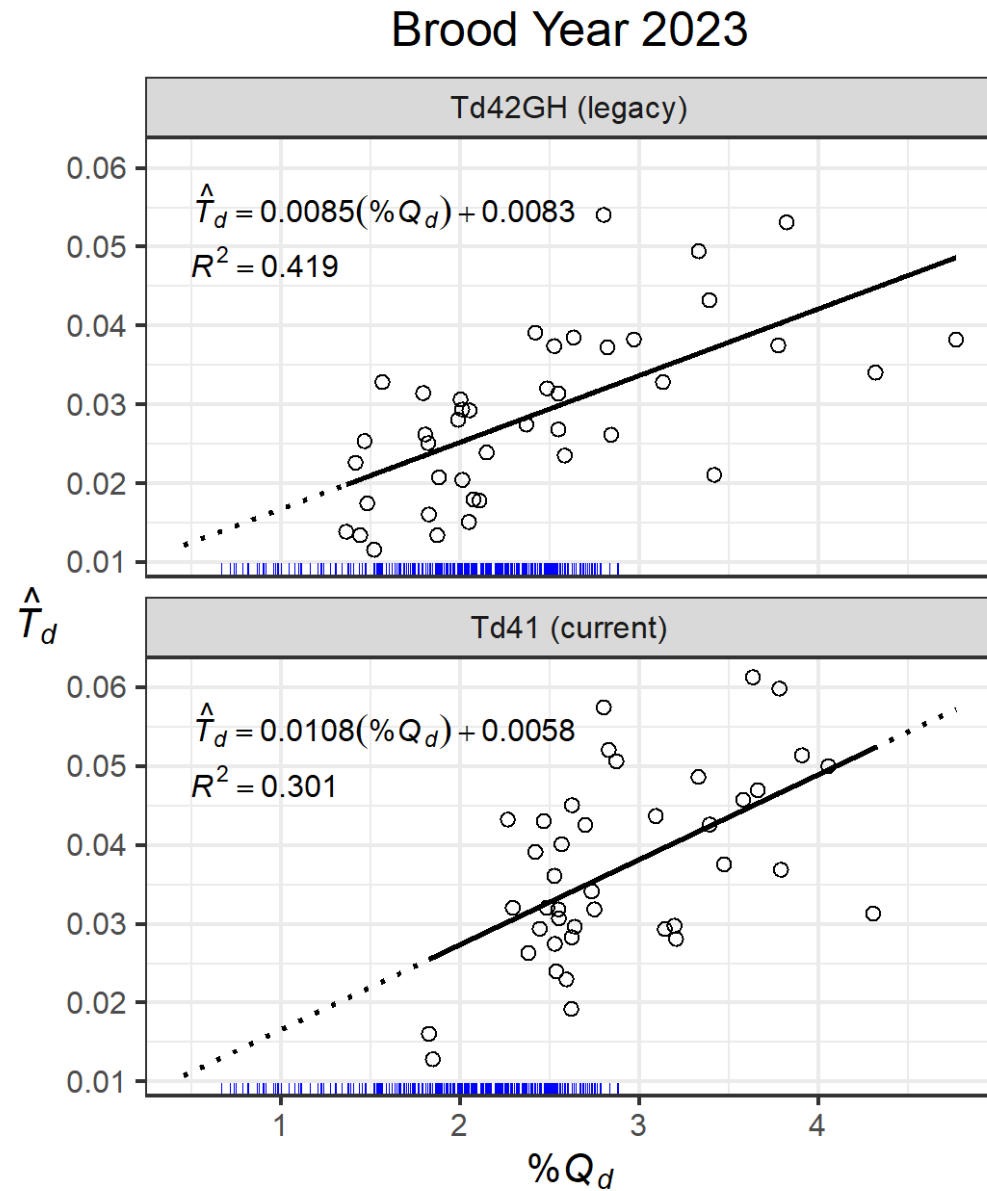
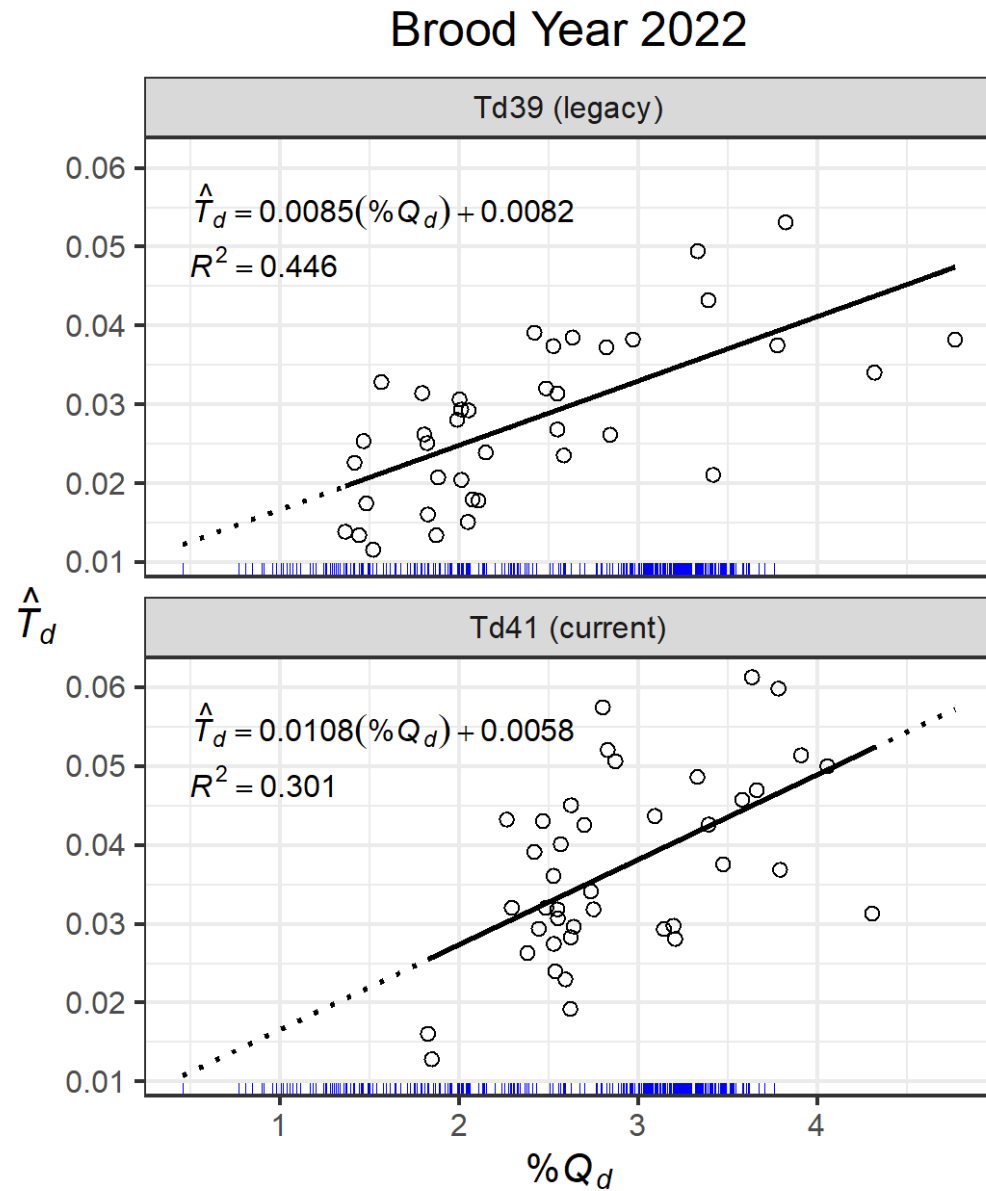


RBDD RST Statistical Methods Review and Update

- Coincides with **SRSP Activity (11) and (12)**
- **(11)** Plan, support, and implement a structured approach for efficiency tests at RBDD RST across run/size, flow conditions, etc.
- **(12)** Analyze existing RBDD juvenile monitoring data to assess the relationship between flow and environmental conditions and fish passage
- Introducing Tyler McCraney:
 - Trap Efficiency Model comparisons
 - Confidence Interval methods comparisons

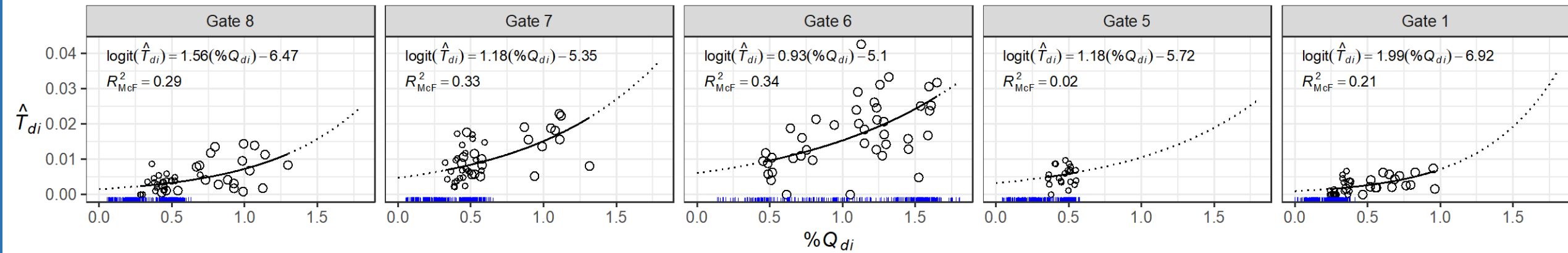


Linear Models of Trap Efficiency (2018–2023)

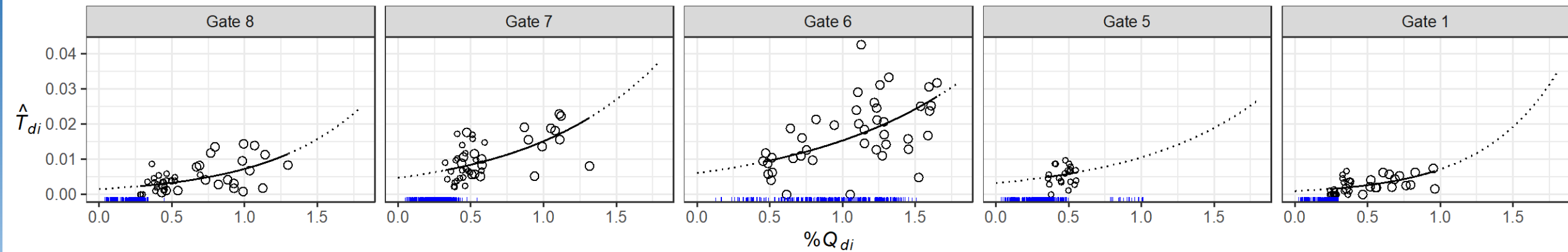


Binomial Generalized Linear Models of Trap Efficiency: New method for use with 5' and/or 8' RST's*

Brood Year 2022



Brood Year 2023

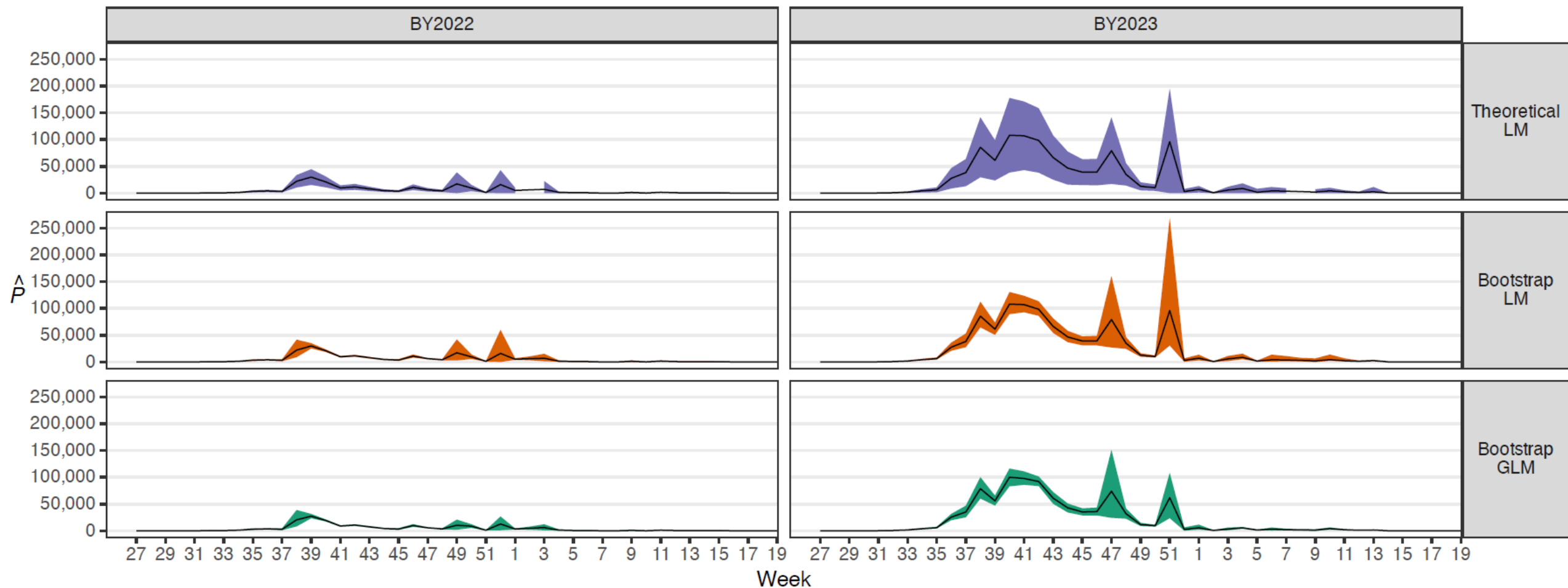


Rotary screw trap ◦ 5' ◦ 8'

* Gate 6 missing trials with 5' RST and Gate 5 missing trials with 8' RST; $n = 5$ trials will be added from this winter.

Bootstrap vs. Theoretical Confidence Intervals

Weekly Passage Estimates (\hat{P}) of Unmarked Winter-Run Chinook Salmon



95% CI ■ Theoretical (Student t) ■ Bootstrap (semiparametric LM, nonparametric \hat{P}_d) ■ Bootstrap (parametric GLM, nonparametric \hat{P}_d)

RBDD RST Statistical Methods Review and Update

- New binomial GLM: gate-stratified trap efficiency
- New methods for Confidence Intervals
 - 2-step bootstrap algorithms:
 1. Sampling variance of trap efficiency model(s):
 - Semiparametric (residuals) bootstrap of LM
 - Parametric (binomial response) bootstrap of GLMs
 2. Sampling variance of weekly passage estimates:
 - Nonparametric bootstrap daily passage
 - Bootstrap percentile 95% CI's
 - Weekly for weekly reports
 - Annual for annual reports
 - Generally greater precision (e.g., +/- 15% bootstrap CI vs. 40% theoretical CI)
 - New code for automated/reproducible data analysis pipeline in R

```
# import data from MS Access
importMsAccessDb <-
function(
  .beginIDDate, ## YYYY-MM-DD
  .endIDDate, ## YYYY-MM-DD
  .path="S:/MSJM/NEW_DATABASE/DoubleEntry_Database_be.accdb" ## default backend since 2011
){
  require(tidyverse)
  require(RODBC)
  require(hms)
  beginIDDate <-
    format(date(.beginIDDate), format="%m/%d/%Y")
  endIDDate <-
    format(date(.endIDDate), format="%m/%d/%Y")
  Database <-
    odbcConnectAccess2007(access.file=.path)
  Sample_SampleID_TrapEffort <-
    sqlQuery(
      channel=Database,
      query=paste0(
        "SELECT Sample.GearID, Sample.LunarPhase, Sample.MethodCode, Sample.Q_SID, Sample.QaDone, Sam
        FROM (Sample INNER JOIN SampleID ON Sample.SampleID = SampleID.SampleID) INNER JOIN Trapeffor
        GROUP BY Sample.GearID, Sample.LunarPhase, Sample.MethodCode, Sample.Q_SID, Sample.QaDone, Sa
        HAVING (((SampleID.IDDate)>=#", beginIDDate, "# And (SampleID.IDDate)<=#", endIDDate, "#))
        ORDER BY Sample.SampleDate, Sample.SampleID;"),
      rows_at_time=1) |>
    select(-SampleID.1, -SampleRowID.1) |>
    as_tibble()
  Catch_Sample_SampleID_TrapEffort <-
    sqlQuery(
      channel=Database,
      query=paste0(
        "SELECT Catch.CatchRowID, Catch.CatchSampNum, Catch.Count, Catch.CountRef, Catch.Death, Catch
        FROM ((Catch INNER JOIN Sample ON Catch.SamplerowID = Sample.SampleRowID) INNER JOIN SampleID
        GROUP BY Catch.CatchRowID, Catch.CatchSampNum, Catch.Count, Catch.CountRef, Catch.Death, Catch
        HAVING (((SampleID.IDDate)>=#", beginIDDate, "# And (SampleID.IDDate)<=#", endIDDate, "#))
        ORDER BY Sample.SampleDate, Sample.SampleTime;"),
      rows_at_time=1) |>
    select(-SampleID.1, -SampleRowID.1, -SampleRowID.2) |>
    as_tibble()
  dat <-
```



Effects: Winter Chinook Egg-to-Fry estimates

Lm 90%CI

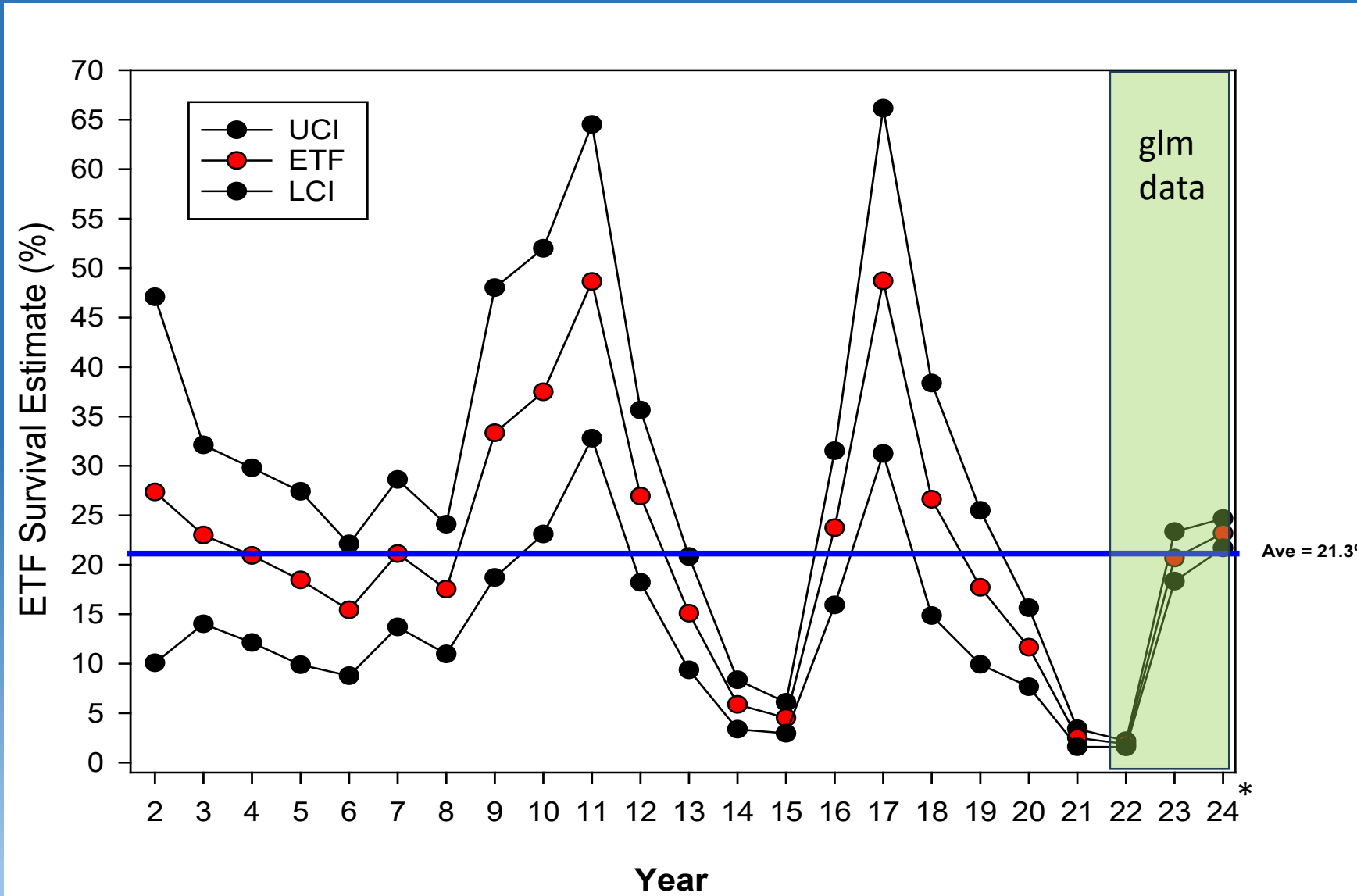
Year	L 90 CI	ETF	Hi 90 CI
2	10.07%	27.35%	47.09%
3	14.02%	23.00%	32.11%
4	12.12%	20.94%	29.79%
5	9.89%	18.46%	27.41%
6	8.77%	15.43%	22.10%
7	13.70%	21.12%	28.61%
8	10.97%	17.53%	24.09%
9	18.71%	33.35%	48.01%
10	23.09%	37.48%	51.99%
11	32.79%	48.64%	64.51%
12	18.22%	26.93%	35.64%
13	9.36%	15.09%	20.82%
14	3.38%	5.87%	8.37%
15	2.97%	4.53%	6.09%
16	15.94%	23.73%	31.53%
17	31.25%	48.70%	66.16%
18	14.85%	26.61%	38.37%
19	9.93%	17.71%	25.49%
20	7.66%	11.66%	15.65%
21	1.60%	2.50%	3.41%
22	1.38%	2.47%	3.56%
23	15.53%	25.56%	35.60%
24*	23.77%	25.33%	27.43%

glm 95%CI

Year	L 95 CI	ETF	Hi 95 CI
2	10.07%	27.35%	47.09%
3	14.02%	23.00%	32.11%
4	12.12%	20.94%	29.79%
5	9.89%	18.46%	27.41%
6	8.77%	15.43%	22.10%
7	13.70%	21.12%	28.61%
8	10.97%	17.53%	24.09%
9	18.71%	33.35%	48.01%
10	23.09%	37.48%	51.99%
11	32.79%	48.64%	64.51%
12	18.22%	26.93%	35.64%
13	9.36%	15.09%	20.82%
14	3.38%	5.87%	8.37%
15	2.97%	4.53%	6.09%
16	15.94%	23.73%	31.53%
17	31.25%	48.70%	66.16%
18	14.85%	26.61%	38.37%
19	9.93%	17.71%	25.49%
20	7.66%	11.66%	15.65%
21	1.60%	2.50%	3.41%
22	1.59%	1.88%	2.19%
23	18.33%	20.68%	23.35%
24*	21.70%	23.19%	24.66%



Effects: Winter Chinook Egg-to-Fry estimates



* Thru 12/31/24



Enter 2025.

Hold Everything...

RBDD RST Statistical Methods Update

- Current Status of re-coding using new methods: **ON HOLD.**
 - Incomplete due to mass terminations of probationary employees
 - 40% of project staff removed
 - Fish Bio/Data Manager/Statistician/Coder
 - Field Staff declines by 4, so far...
 - Automated data pipeline to SacPas: Incomplete
 - No real-time updates to SacPas
 - Automated monthly updates of raw data to EDI: Incomplete
 - Periodic, at best
 - Reporting stalled and/or delayed indefinitely
 - Updated methods need additional coding and write-ups
 - Peer Review recommended



Looking for data or reports?

Raw data accessible from EDI:

<https://portal.edirepository.org/nis/mapbrowse?packageid=edi.1365.12>

SacPas: http://www.cbr.washington.edu/sacramento/data/juv_monitoring.html

Acoustics data (2021, 2022 and 2024 reach level survival data):

<https://oceanview.pfeg.noaa.gov/shiny/FED/telemetry/>

Reports available on RBFWO website or ResearchGate :

<https://www.fws.gov/project/red-bluff-diversion-dam-juvenile-fish-monitoring>

<https://www.researchgate.net/>

Email: bill_poytress@fws.gov



Time for questions or discussion???

