Salmon Monitoring Team Weekly Meeting
Conference call: 4/7/20 at 9:00 a.m.

- **Executive Summary:**
  - ESA-listed salmonids and southern DPS (sDPS) green sturgeon are currently present in the Delta as indicated by acoustic tagging and historical life history traits.
  - During 3/30/20 - 4/5/20, we observed salmonids at the Delta Fish Collection Facilities, particularly SJRRP spring-run Chinook salmon and steelhead.
  - Preliminary daily salvage estimate for 4/6/20 indicated a total of 40 unclipped and clipped steelhead were salvaged at the CVP.

Objective: Provide information to the Water Operations Management Team (WOMT), Reclamation and California Department of Water Resources on measures to reduce adverse effects from Delta operations of the Central Valley Project (CVP) and the State Water Project (SWP) on salmonids and green sturgeon. Salmon Monitoring Team (SaMT) notes will be posted to Reclamation's web page https://www.usbr.gov/mp/bdo/salmon-monitoring-team.html.

- **California Department of Fish and Wildlife (CDFW):** Geir Aasen, Adam Chorazyczewski, Kristal Davis-Fadtke, Kyle Griffiths, Jason Julienne, Morgan Kilgour, Duane Linander, Paige Uttley, Jonathan Williams
- **California Department of Water Resources (DWR):** Chris Cook, Brittany Davis, Mike Ford, Bryant Giorgi, Farida Islam, Tracy Pettit, Kevin Reece, Ian Uecker
- **Kearns & West:** Matt Marvin
- **National Marine Fisheries Service (NMFS):** Kristin Begun, Jeff Stuart, Garwin Yip
- **U.S. Bureau of Reclamation (Reclamation):** Elissa Buttermore, Suzanne Manugian, Ben Nelson
- **State Water Resources Control Board (SWRCB):** Chris Carr, Michael Macon, Craig Williams, Erin Foresman, Stanley Mubako
- **US Fish and Wildlife Service (USFWS):** Katherine Sun

Agenda Items:

1. Introductions (9:00-9:03)
   Purpose: Provide an accurate record of who is attending these calls

2. Relevant Actions and Triggers (9:04-9:08)
   Purpose: Review of relevant actions and triggers status and discuss any changes

3. Outlook, Current Operations, and Weather Forecast (9:09 – 9:17)
   Purpose: Review operations and weather sections on Weekly Outlook. Discuss Delta operations to consider context for evaluating Assessment questions about Delta operation effects

4. Review of Environmental Data (9:18-9:20).
   Purpose: Review environmental data to consider context for evaluating Assessment questions about Delta operations effects

5. Fish Abundance and Distribution (9:21-9:40)
   Purpose: Review fish monitoring data to inform fish distribution estimates, fish exposure, and behaviour cues that is part of the next section

a. Hatchery Releases
b. Historical Fish Monitoring Data
c. Fish Monitoring: RSTs/trawls/seines
d. Fish Monitoring: Salvage
e. Migration Status: Estimates of Fish Distribution

6. Fish Exposure and Behavioural Cues (9:41-9:56)
   Purpose: Assist in assessing entrainment risk of Delta operations on salmonids and sturgeon. Complete Evaluation section questions of the Assessment
   a. Historical Patterns (Comparison of abundance, timing, and loss to prior years)
   b. Current Conditions (Entrainment Models)
   c. Sensitivity to Operational Actions

7. Other Topics (9:57-9:58)
   Purpose: Identify additional topics that are not in the regular agenda

8. Additional Considerations for WOMT (9:58-10:00)
   Purpose: Highlight information that SaMT would like WOMT to consider related to changes to Delta water operations

9. Next SaMT Meeting (10:00)

Agenda Item 2.
Relevant Actions and Triggers Review

Delta Cross Channel (DCC) Gate Operations

- DCC gates are closed per operations described in the State Water Resource Control Board's D-1641, and Reclamation's Proposed Action 4.10.5.3 and are expected to remain closed until 5/20/20.

Old and Middle River (OMR) Flow Management

- Implementation of this action in water year (WY) 2020 began on 1/1/20 and requires that OMR flow be no more negative than -5,000 cfs (2019 ROC Proposed Action). OMR flows are reported weekly with the OMR index and the tidally filtered USGS gauges at the daily, 5-day and 14-day running averages.
- Revised JPE letter: On 3/27/20, NMFS provided a revised JPE letter to Reclamation reflecting updated information. The revised JPE letter provides the Reclamation with the revised JPE and ITL for hatchery origin juvenile Sacramento River winter-run Chinook salmon for water year (WY) 2020 based on the estimated number of hatchery fish released.
  - The revised incidental take for juveniles released from Livingston Stone National Fish Hatchery into the Sacramento River is **923 hatchery-produced (adipose fin clipped)** winter-run Chinook salmon
  - The revised incidental take of juveniles released into Battle Creek is **622 hatchery produced (adipose fin clipped and left ventral fin clipped)** winter-run Chinook salmon.
- Refer to weekly operations and fish outlook document for more triggers relevant to the California Department of Fish and Wildlife Incidental Take Permit (CDFW ITP) and the 2019 ROC Proposed Actions (see Agenda Item 3).
- DWR's ITP was signed on 3/31/20 and can be found online here: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/State-Water-Project/Files/ITP-for-Long-Term-SWP-Operations.pdf
- Rapid genetic analysis protocol discontinued for the season. Regular genetic reporting to continue.

Agenda Item 3.

Weekly Fish and Water Operations Outlook 4/7/20 – 4/13/20

Dry and milder weather returns today (04/07/20), at the start of this operations summary, and continues through the remainder of the week. Flows into the Delta will increase over the duration of the next week, due to the past wet weekend. The Long-Term ITP was issued by DFW for SWP operations last week (3/31/20). The maximum D-1641 export to Delta inflow (E/I) ratio of 0.35, Collinsville X2 compliance, OMR ≥ -5,000 cfs and the San Joaquin Inflow/Export (I:E) ratio are all mandatory compliance standards in effect this week. Beginning on 4/10/20, the D-1641 31 day "pulse flow" period for April-May begins for flows measured at Vernalis on the mainstem San Joaquin River. The CVP exports will be limited by D-1641 I:E constraints during the "pulse flow" period.

Tributary/Division	Projected Intended Operations and Ranges for week	Related Environmental and Fish Conditions
Clear Creek	Whiskeytown Release: 200 cfs	• Adult Spring-run Chinook immigration March – June. • Late-fall run Chinook emergence from redds through May. • Steelhead emergence from redds through May. *(updated 4/3/20)*
Sacramento River	Shasta Storage: 3.59 million acre-feet (MAF) Keswick Dam Release: 4,500 cfs (a decrease to 4,000 cfs is possible)	• End of winter-run Chinook juvenile migration, adults migrating and holding. • Spring-run Chinook juveniles rearing and emigrating. • Fall-run Chinook fry in gravel with continued emergence, juveniles rearing and emigrating. • End of Late-fall Chinook spawning, eggs and fry in gravel. • Steelhead spawning at peak. • Green Sturgeon adults present. *(updated 4/6/20)*
Feather River	Oroville Storage: 2.29 MAF Oroville Dam Release to Feather: 1,750 cfs	• Fall-run Chinook salmon eggs still in gravel, hatching, and emergence is ongoing. Peak emergence of fall-run was expected to have occurred in mid-March but is more likely to occur through mid-April. • Steelhead spawning is minimal. Steelhead eggs are in gravel, hatching and emergence is ongoing. • Spring-run and Fall-run juvenile Chinook salmon continue to emigrate out of the Lower Feather River. • Late-fall Chinook salmon eggs in gravel, hatching, and emergence has started. *(updated 4/3/20)*

American River	Folsom Storage: 0.47 MAF Nimbus Dam Release to American: 1,500 cfs (a decrease to 1,250 cfs is possible)	• Fall-run Chinook salmon eggs still in gravel, hatching and emergence is ongoing. Peak emergence of fall-run estimated to have occurred mid-March. Preliminary carcass survey results indicate the majority of fall-run Chinook salmon have emerged from the gravel and emergence will occur through mid-April. Fall-run Chinook that have emerged are currently rearing and emigrating out of the lower American River. • Steelhead spawning continues, eggs are in the gravel, hatching and emergence is ongoing. Juvenile passage at Watt Ave. has increased over the past week • Spring-run and winter-run Chinook salmon juveniles present (non-natal rearing). • Fall-run Chinook and steelhead redds at potential risk of dewatering due to reductions in releases. • Fall-run Chinook and steelhead juveniles at risk of stranding due to reductions in releases. • *(updated 4/3/20)*
Stanislaus River	New Melones Storage: 1.89 MAF Goodwin Dam Release to Stanislaus: Operating between 300 cfs to 1,350 cfs throughout the course of April as a result of the spring pulse flow pursuant to the Stepped Release Plan	• Majority of fall-run Chinook salmon have emerged. Preliminary carcass survey data estimated peak emergence to have occurred mid-February. • Steelhead are spawning based on historical timing and eggs are currently in the gravel. No empirical data on steelhead spawning is available. Historical data indicates steelhead may be emerging now. *(updated 4/3/20)*
Delta	Freeport: 10,000 to 18,000 cfs Vernalis: 1,500 to 3,000 cfs Delta Outflow index: 9,000 to 20,000 cfs Exports Jones Pumping Plant: 800 to 3,600 cfs Clifton Court Forebay inflows: 500 to 1,500 cfs Expected OMR Index Values: -1,000 to -3,500 cfs Maximum Allowable OMR: -5,000 cfs X2 position: 74 to >81 km QWEST: +1,000 cfs to +5,000 cfs DCC: Closed	• 31-33% Winter-run Chinook juveniles present and 65% past Chipps Island. • 53-68% Spring-run Chinook juveniles present and 7% past Chipps Island. • Fall-run Chinook juveniles rearing. • Steelhead juvenile migration occurring. • Green Sturgeon adult and juveniles present. • Adult Delta Smelt likely spawning and Larval Delta smelt present • Spawning adult and larval Longfin Smelt present. *(updated 4/7/20)*

Table 2. Relevant WY 2020 Fish and Environmental Criteria and Status in 2019 Reclamation LTO Action and NMFS and USFWS Biological Opinions.

Species/run	Threshold	Current Status	Weekly Trend	Updated through
Natural Winter-run Chinook Loss	WY2020 JPE: 854,941 fish Single –year threshold equal to 1.17% of JPE: 0.0117 * 854,941 = 10,003 fish 50% Single-year loss threshold = **5,001** fish.	Loss (LAD) = **172.2** fish (3.4% of the 50% single-year loss threshold)	Decreasing	4/6/20
Hatchery Winter-run Chinook salmon loss	JPE of Sac. R hatchery winter-run Chinook salmon releases: 92,291 fish 152,000 fish (~60%) released on 3/10/20 97,505 fish (~40%) released on 3/23/20 Single-year loss threshold: 0.0012 * 92,291 = 110.75 fish 50% of single year threshold = **55.4** fish	Loss = **0** fish	Possible change expected; hatchery winter-run Chinook salmon are in the Delta.	4/6/20
Steelhead, non-clipped	1. December 1 – March 31 = Loss not to exceed 707 fish. This is 50% of 1,414 fish from December – March single year loss threshold. 2. April 1- June 15: Loss not to exceed **776** fish. This is 50% of 1,552 fish from April 1 – June 15 single year loss threshold	1. Cumulative loss of non-clipped steelhead December 1 through March 31 = 402 fish 2. Cumulative loss of non-clipped steelhead April 1 through June 15= **12.5** fish (1.6% of 50% loss threshold)	Increasing	4/6/20
Hatchery Spring-run Chinook salmon surrogates	Loss > 0.5% of each release group: 1. 12/9/19: 84,869 = **424.3** fish 2. 12/18/19: 77,672 = **388.4** fish 3. 1/13/20: 77,866 = **389.3** fish	<u>Loss</u> 1. **20.2** fish 2. **25.0** fish 3. **0** fish	No change expected	4/6/20
SDPS Green sturgeon	Cumulative salvage = **74** fish	Salvage = **0** fish	No change expected	4/6/20
Delta Smelt	No First Flush identified. Daily Avg. < 12 NTU at OBI Ripe Female Observed March-June: OMR no more negative than -5000 cfs Clifton Court 3 consecutive Daily Average Temps >= 77 °F	Turbidity = 3.67 NTU at OBI Daily Avg QWEST: Positive >= 77 °F Days =0	Expected to remain stable	4/6/20

Table 3: Relevant Water Year 2020 Fish Criteria and Status for Listed Fish under the SWP Long-Term Incidental Take Permit. This table is draft and under revision by DWR.

Species	Action	Current Status	Weekly Trend	Last Updated
Salmonids	• OMR Mgmt. triggered (8.3.2) • Winter-run protection (8.6.1) • Early winter-run protection (8.6.2) • Daily Loss winter-run (8.6.3) • Spring-run surrogate protection (8.6.4)	• In effect • In effect • N.A. • In effect • In effect	• Ongoing • No advice, annual salvage < 50% threshold • N.A. • April Daily Loss threshold is 0.00507% JPE • No change – salvage below "trigger" levels	• 4/6/20 • 4/6/20 • N.A. • 4/6/20 • 4/6/20
Delta smelt	• First Flush (8.3.1) • Turbidity Bridge Avoidance (8.5.1) • Larval and Juvenile (8.5.2)	• N.A. • N.A. • In effect	• N.A • N.A. • No change	• N.A. • N.A. • 4/6/20
Longfin smelt	• Early Adult Protection (8.3.3) • OMR Mgmt. for Adults (8.4.1) • Larval and Juvenile (8.4.2) • High Flow Offramp (8.4.3)	• N.A. • N.A. • In effect • In effect	• N.A. • N.A. • No change – no recommendation • No change	• N.A • N.A. • 4/6/20 • 4/6/20

Operations

Operations Category	Location	Operations on 4/1/20	Operations on 4/7/20
Clifton Court Inflow	Clifton Court Forebay	600 cfs (meeting the proportional flow allotment for the SWP based on the Vernalis I:E requirement of the CDFW ITP)	600 cfs, will increase by 100-200 cfs on 4/10/20 in response to anticipated increasing flows at Vernalis (VNS) due to spring pulse flows on the Stanislaus River. Operating to I:E ratio of 1:1
SWP Reservoir Releases	Feather – Oroville	1,750 cfs	1,750 cfs, potentially decreasing a couple of hundred cfs over the next week
SWP Reservoir Storage	San Luis (SWP)	975 TAF	965 TAF
SWP Reservoir Storage	Oroville	2,294 TAF	2,329 TAF
Environmental Parameters	Sacramento River at Freeport	11,700 cfs	16,100 cfs
Environmental Parameters	San Joaquin River at Vernalis	1,480 cfs	1,730 cfs
Environmental Parameters	Delta Outflow Index	7,517 cfs	16,000 cfs, increasing to approximately 22,000 today (4/7)
Environmental Parameters	E:I (14-day)	34% (14-day avg.)	26% (14-day avg.)
Environmental Parameters	X2	79 Km	79 Km

Operations Category	Location	Operations on 4/1/20	Operations on 4/7/20
CVP Exports	Jones Pumping Plant	Targeting 2,700 cfs, change order submitted on 3/27/20 for 3,500 cfs on Friday (4/3/20)	3,500 cfs, anticipate decreasing on 4/10 to 1,600 cfs due to 1:1 ratio
CVP Reservoir Releases	American - Nimbus	1,500 cfs, incoming storm this weekend may result in reductions to Nimbus releases.	1,500 cfs
CVP Reservoir Releases	Sacramento - Keswick	5,000 cfs (increased on 3/27/20), incoming storm this weekend may result in reductions to Keswick releases.	4,600 cfs today (4/7/20). In the process of ramping down from 5,000 cfs to 4,500 cfs (on 4/8/20) due to storm precipitation over the weekend. Potential to increase next week in order to offset expected warmer air temperatures and demand for increased agricultural diversions historically seen in mid-April from the Sacramento River.
CVP Reservoir Releases	Stanislaus - Goodwin	200 cfs, releases potentially increasing for spring pulse flow later this week. 31-day pulse period scheduled for the period between 4/10/20 – 5/10/20	200 cfs, change order for increases starting 4/8/20 for the next week. Increase releases to 1,250 cfs by 4/8/20, decrease to 400 cfs by 4/11/20, then increase releases to 1,350 cfs by 4/13/20.
CVP Reservoir Releases	Trinity - Lewiston	300 cfs	300 cfs. Snow melt pulse flow to start on Trinity during the week of 4/12/20

Operations Category	Location	Operations on 4/1/20	Operations on 4/7/20
CVP Reservoir Storage	San Luis (CVP)	536 TAF	563 TAF
CVP Reservoir Storage	Shasta	3,600 TAF	3,662 TAF
CVP Reservoir Storage	Folsom	476 TAF	526 TAF
CVP Reservoir Storage	New Melones	1,892 TAF	1,899 TAF
CVP	DCC Gates	Closed	Closed

cfs = cubic feet per second
MAF = million acre feet
TAF = thousand acre feet
Km = kilometer
Location of X2 measured from the Golden Gate

Factors controlling Delta exports: EI, CVP EC, SWP IE: San Joaquin River inflow to export ratio. Export restrictions are a limiting factor. The SWRCB's D-1641 San Joaquin River Pulse Flow requirements will begin on 4/10/20 and continue for 30 days controlling both the CVP and SWP exports.

Agenda Item 4.
Review of Environmental Data
OMR Demonstration Project: OMR Index and USGS Tidally Filtered Values are displayed on SacPAS. http://www.cbr.washington.edu/sacramento/data/delta_loss.html

Approximate OMR gage data as of 4/4/20

	USGS gauges (cfs)	**Index (cfs)**
Daily	-3,800	-3,500
5-day	-2,900	-3,300
14-day	-3,800	-4,000

Approximate OMRs as of 4/6/20:

	Index (cfs)
Daily	-3,400 cfs
5-day	-3,300 cfs
14-day	-3,900 cfs

Agenda Item 5.
Fish Abundance and Distribution

Hatchery Releases
On 4/3/20, USFWS released approximately 2.5 million brood year (BY) 2019 fall Chinook salmon from the Coleman National Fish Hatchery into Battle Creek. This release included 25% marked (adipose fin clip and CWT) and 75% unmarked fish.

On 4/7/20, CDFW released approximately 707,776 brood year 2019 Chinook salmon from Feather River Hatchery into the Feather River at Live Oak and Boyd's pump. This release included 100% marked (adipose fin clip) and Coded Wire Tagged (CWT) fish. 252 acoustically tagged fish were released at the Boyds release location and 256 acoustically tagged fish were released at the Gridley release location

On 4/6/20, CDFW released approximately 395,000 brood year 2019 fall-run Chinook salmon from the Merced River Hatchery into the San Joaquin River at Sherman Island Net Pen site. This release included 25% marked (adipose fin clip and CWT) fish and 75% unmarked fish

Fish Monitoring

Historical Fish Monitoring Data

Because of challenges with limited data and interpretation of real-time steelhead catch data, SaMT reviews historical catch data on SacPAS's Migration Timing and Conditions page and the Salvage Timing page.

Migration Timing: http://www.cbr.washington.edu/sacramento/data/query_hrt.html
Average percent of annual emigrating population for each species of interest (based on LAD) captured at the following locations by 4/5/20 for the years 2005 to 2018.

Brood Years	Species, species run	Red Bluff Diversion Dam	Tisdale RST	Knights Landing RST	Beach Seines	Sac Trawl (Sherwood)	Chipps Island Trawl
2005 – 2018	Winter-run Chinook salmon	99.9%	99.8%	99.8%	100%	88%	72.1%
2005 – 2018	Spring-run Chinook salmon	63.1%	56.2%	67%	92.7%	34.1%	8.3%
2005 – 2018	Steelhead	3.5%	74.9%	68.3%	78.7%	92.3%	86.1%

Salvage timing: http://www.cbr.washington.edu/sacramento/data/query_salvage_hrt.html
Average percent for each species (based on LAD) of interest salvaged at the SWP and CVP Delta Fish Facilities by 4/5/20 in previous years. Average sampled represents historic data spanning years 2005 – 2018.

Brood Year	Species, species run	Average Percent Salvaged at SWP and CVP Delta Facilities
Average 2005 - 2018	Winter-run Chinook salmon (unclipped)	97.4%
Average 2005 – 2018	Spring-run Chinook salmon (unclipped)	20.7%
Average 2005 – 2018	Steelhead (unclipped)	66.5%

Current Fish Monitoring Data

Fish monitoring data summarized over the past week are found on Bay Delta Live. Unless otherwise noted, reported races are based on fork length (LAD).

Location	Feather River RST Eye Channel[A]	Feather River RST Herringer[B]	GCID RST[C]	Tisdale RST[D]	Knights Landing RST[E]	Beach Seines [F]	EDSM [F]	LAR RST[G]	Sacramento Trawl [F]	Chipps Island Midwater Trawl [F]	Mossdale Kodiak Trawl [F]	Caswell RST[H]
Sample Dates	3/31-4/3 *	3/31-4/5	4/1-4/4	3/30-4/5	3/30-4/5			3/31	3/29-3/31, 4/3	3/29-3/31, 4/2-4/3		3/31-4/3
Chinook					2							43 juv
FR Chinook	6,958	2,146	244 juv 891 smolt	9	167			444	7			
SR Chinook	36	20		103*	1,137*			52	81*	11*		
WR Chinook			2 smolt		2			1		19		
LFR Chinook	63	4										
Chinook (ad-clip)		4 SR	116 FR juv 3 FR smolt 11 WR smolt	54 SR	38 FR 453 SR 2 WR			18,659	34	11		
Steelhead (natural)	4							10 fry		**2**		
Steelhead (ad-clip)					3			2	2	1		
Green Sturgeon												
Flows (avg. cfs)	1,059	1,750	1,172	6,900	7,135							
W. Temp. (avg. °F)	53	54.2	54.5	55.9	56.4							
Turbidity (avg. NTU)	1.2	2.3	7.73	6.8	9.1							

[A] Feather River RST data from Eye Channel sampling period was from 3/31/20 at 9:56 to 4/3/20 at 9:27 for biological data. * Environmental data (flow) recorded through 4/7/20.

[B] Feather River RST data at Herringer sampling period was from 3/31/20 at 13:37 to 4/5/20 at 9:38.

[C] GCID RST cone was raised 3/31/20 to allow the remainder of hatchery released chinook to move through the system. Sampling resumed 4/1/20. GCID RST sampling period was from 4/1/20 9:00 to 4/4/20 9:00. RST operating at full cone.
[D] Tisdale RST sampling period was from 3/30/20 at 9:30 to 4/5/20 at 11:00. RST operating at full cone 3/30/20 at 9:30 to 4/4/20 at 9:45 and 50% 4/4/20 at 9:45 to 4/5/20 at 11:00.
[E] Knights Landing RST sampling period was from 3/30/20 at 1030 to 4/5/20 at 10:30. RST operating at full cone 3/30/20 at 10:30 to 4/4/20 at 10:30 and 50% 4/4/20 at 10:30 to 4/5/20 at 10:30.
[F] DatCall sampling data period for 3/29/20 to 4/4/20. Beach Seines, EDSM, and Mossdale Trawl not sampled the past week.
[G] Lower American River RST sampling period was only for 3/31/20, no additional data after that date.
[H] Caswell RST sampling period was from 3/31/2020 to 4/3/20.

- A team member noted that the number of natural spring-run sized Chinook salmon observed in monitoring should be viewed with caution given the recent releases of 6.6 million hatchery fall-run Chinook salmon in the upper Sacramento River with sizes that overlap with spring-run sized Chinook salmon.

Fish Monitoring Gear Efficiency/Disruptions:

Monitoring Survey	Status (as of 4/6/20; this seems to be evolving weekly)
Delta	
SWP regular counts, CWT reading, and larval sampling	Ongoing through modified staffing
CVP regular counts, CWT reading, and larval sampling	Ongoing through modified staffing
Smelt Larval Survey	On hold until further notice (after 4/1/20)
20mm Survey	On hold until further notice (after 4/1/20)
Bay Study	On hold until further notice (after 4/1/20)
DJFMP- Chipps and Sacrament Trawls	USFWS Prioritized with reduced effort
DJFMP- Seines	Not sampling due to COVID-19
EDSM	USFWS Prioritized with reduced effort
EMP	Discrete sampling will not occur in April, Continuous sampling continues
Mossdale	Not sampling due to COVID-19
USGS Flow monitoring	Continuous monitoring continues
Sacramento River	
Acoustic tagging- Battle Creek hatchery	Ended tagging early. Tagged ~250 fish
Acoustic tagging- Fall run Chinook	Will not occur this March and April
Acoustic tagging-Spring run Chinook	Tagging occurred 4/2-4/4. Hatchery release occurred 4/7.
Acoustic tagging-Pulse Flow experiment	Unlikely to occur
Red Bluff Diversion Dam screw trap	USFWS Prioritized with modified staffing
Knights Landing screw trap	Ongoing through modified staffing
Tisdale screw trap	Ongoing through modified staffing
Sacramento River	
Redd dewatering and stranding surveys	Suspended
Sacramento Carcass and Redd Surveys	Continuing
San Joaquin River	
SJRRP CDFW Field Monitoring	On hold until further notice
SJRRP USFWS and USBR Field Monitoring	Ongoing with modified staffing

- Members noted that FishBio will resume monitoring on the Stanislaus River near Oakdale this week.

Green Sturgeon
No new tags deployed.

Summary of sturgeon detections in the Sacramento River north of Sherman Lake; approximate coordinates 38.06024° N and -121.08015° W; 19 March and April 2020.

Species; life stage	Date tagged	Tag ID	Tagging Location	Tagging Entity	Detection Date(s)
Green sturgeon; juvenile	10/03/19	A69-1602-12237	Sacramento River north of Sherman Lake	CDFW	3/19/20
Green sturgeon; juvenile	12/12/20	A69-1602-12220	Sacramento River north of Sherman Lake	CDFW	3/19/20, 4/2/20
Green sturgeon; juvenile	2/18/20	A69-1602-11435	Sacramento River north of Sherman Lake	CDFW	4/2/20
Green sturgeon; juvenile	3/19/20	A69-1602-12233	Sacramento River north of Sherman Lake	CDFW	4/2/20
White sturgeon; adult	3/31/15	A69-9001-19560	San Joaquin River	USFWS – Lodi	3/19/20

Red Bluff Diversion Dam Biweekly Report
There was no USFWS biweekly report for this week (3/30/20 – 4/6/20) prior to the call.

Fish Monitoring: Salvage

This report covers the period from 3/30/20 to 4/5/20.

CHINOOK SALMON
Spring-run sized Chinook salmon (adipose clipped) were salvaged at the federal (weekly salvage= 252 fish) and state (weekly salvage= 19 fish) facilities for the period of reporting.

Spring run sized Chinook salmon (NON adipose clipped) were salvaged at the federal (weekly salvage= 44 fish) and state (weekly salvage= 8 fish) facilities for the period of reporting.

Winter run sized Chinook salmon (NON adipose clipped) were salvaged at the federal (weekly salvage= 8 fish) and state (weekly salvage= 6 fish) facilities for the period of reporting.

Winter run sized Chinook salmon (adipose clipped) were salvaged at the federal facility (weekly salvage= 4 fish) but not at the state facility for the period of reporting.

Fall run sized Chinook salmon (NON adipose clipped) were salvaged at the federal facility (weekly salvage= 4 fish) but not at the state facility for the period of reporting.

The seasonal (10/1/19 to present) salvage totals of all Chinook salmon at the federal facility are 791.0 adipose clipped fish (loss= 540.71) and 185.8 NON adipose clipped fish (loss= 129.18).

The seasonal (10/1/19 to present) salvage totals of all Chinook salmon at the state facility are 171.0 adipose clipped fish (loss= 718.50) and 60.0 NON adipose clipped fish (loss= 255.90).

STEELHEAD
Steelhead (adipose clipped) were salvaged at the federal (weekly salvage= 72 fish) and state (weekly salvage= 35 fish) facilities for the period of reporting.

Steelhead (NON adipose clipped) were salvaged at the federal (weekly salvage= 16 fish) and state (weekly salvage= 24 fish) facilities for the period of reporting.

The seasonal (10/1/19 to present) salvage totals of all steelhead at the federal facility are 190.87 adipose clipped fish (loss= 129.79 fish) and 81.0 NON adipose clipped fish (loss= 55.08 fish).

The seasonal (10/1/19 to present) salvage totals of all Steelhead at the state facility are 67.0 adipose clipped fish (loss= 290.11 fish) and 83.0 NON adipose clipped fish (loss= 359.39 fish).

DOSS Weekly Salvage Update

Reporting Period: March 30-April 5, 2020

Prepared by Kyle Griffiths on April 6, 2020 14:56

Preliminary Results -Subject to Revision

Criteria	30-Mar	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	Trend	
Loss Densities									
Wild older juvenile CS	1.61	0.79	0	0	0.36	0	0.35	↘	0.44
Wild steelhead	1.63	7.73	0	0.39	0.67	0	0.53	↘	1.56
Exports									
SWP daily export	6,972	5,663	1,214	1,638	1,176	1,239	1,244	↘	2,735
CVP daily export	3,657	5,337	5,361	5,338	6,903	6,925	6,934	→	5,779
SWP reduced counts	0	0	0	0	0	0	0		
CVP reduced counts	0	0	0	0	0	0	0		

Loss Density = fish lost/TAF; water export = AF; Trend = compared to previous week; wild = adipose fin present
Loss = estimated number of fish lost at the CVP and SWP Delta export facilities based on estimated salvage (see below)
Reduced counts = percentage of time that routine salvage sample time were less than 30 min per 2 hours of salvage and export operations
Yellow highlighted dates indicate TFCF salvage outage occurred

Chinook Salmon Weekly/Season Salvage and Loss

Combined salvage and loss for both CVP and SWP fish facilities

Race determined by size at date of capture; hatchery = adipose fin missing;

		Weekly Total			Season Total		Season Total LAD	
Category		Salvage	Loss	Trend	Salvage	Loss	Salvage	Loss
Wild								
	Winter Run	14	32	↘	63	129	98	172
	Spring Run	52	63	↘	100	180	104	183
	Late Fall Run	0	0	→	12	8	12	8
	Fall Run	4	3	↗	71	68	32	22
	Unclassified	0	0	→	0	0	0	0
	Total	**70**	**97**		**246**	**385**	**246**	**385**
Hatchery								
	Winter Run	4	3	↗	17	12	77	81
	Spring Run	271	252	↘	729	1,081	594	962
	Late Fall Run	0	0	→	195	153	186	144
	Fall Run	0	0	→	21	14	105	72
	Unclassified	0	0	→	0	0	0	0
	Total	**275**	**255**		**962**	**1,259**	**962**	**1,259**

Trend = weekly loss per race; Salvage = estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time
NC = cannot be calculated; hatchery salmon salvage and loss estimates have been corrected using CWT readings when available

Steelhead Weekly/Season Salvage and Loss

Combined salvage and loss for both CVP and SWP fish facilities

	Weekly Total			Season Total	
Category	Salvage	Loss	Trend	Salvage	Loss
Wild	40	115	↘	164	414
Hatchery	107	201	↗	258	420
Total	**147**	**315**		**422**	**834**

State Water Project loss = salvage x 4.33; Central Valley Project loss = salvage x 0.68

Preliminary Genetic Data for CVP/SWP Salvage – Data subject to revision.
04-06-2020

Caution should be exercised when interpreting population assignment results, as the nuances of the statistical analysis used to generate the results may not be apparent. The mathematical error regarding the broad determination of winter run versus non-winter run is essentially zero. There is high confidence in the "Assignment" and probability shown in "PosProb1", so that information could be viewed as "certain". Regarding finer sub-divisions of population assignment, error can increase. The "Group" label is categorized by run type (or race); however, there is little genetic difference between fall and late-fall. It is more appropriate to collapse the information into the National Marine Fisheries Service's designated Evolutionary Significant Units (ESU): 1) fall/late fall; 2) spring; and 3) winter. Regarding the probabilities themselves, a value greater than 0.80 is viewed as highly likely and is interpreted as the observed assignment to the "group" shown was statistically greater than to any other possible group. Similarly, values lower than 0.80 are statistically less uncertain. The "Assignment" and "Group" categories represent genetic identification using markers and methods that have been NMFS-approved.

Additional analyses have been included in the population assignments results table. The "ots28" column represents the outcome of an analysis using 18 markers spanning two genes associated with migration timing (i.e. greb1L and rock1). Early migrating stocks (e.g. winter Chinook Salmon, spring Chinook Salmon) have different genetic information at markers than late migrating stocks (e.g. fall Chinook Salmon). Currently, ots28 data are not included in genetic assignment process (i.e. "Assignment, "Group"). Ots28 information has been included in reporting table to enhance characterization of fall-run versus spring-run ambiguity and provide a useful supplement to population assignments. The "sexid" column represents the genotype at a Y-Chromosome sex determination marker that is highly correlated with phenotypic sex. Accurately documenting sex visually is quite challenging for juvenile or immature Salmon.

For the results provided, assignment probabilities were high for winter/non-winter (shown; PosProb1) and ESU level (i.e., fall and late fall combined)(not shown). In addition, known introgression between Feather River spring-run and Feather River fall-run Chinook salmon may result in low assignment probabilities when those individuals are present.

All Chinook salvaged during this water year that have been analyzed were fall/late fall-run except for 6 winter-run salvaged on 3/6/2020, 3/10/2020, 3/16/2020, and 3/18/2020.

Sample Date	*Fork Length*	*ots28*	*sexid*	*Assignment*	*PosProb1*	*Group*	*PosProb2*	*DeltaModel*	*Facility*
12/3/2019	185	late	female	Non-winter	1.000	Late Fall	0.500	Fall	CVP
12/5/2019	168	late	female	Non-winter	1.000	Fall	0.987	Late Fall	CVP
12/6/2019	137	late	female	Non-winter	1.000	Fall	1.000	Late Fall	CVP
1/18/2020	181	late	female	Non-winter	1.000	Fall	0.903	Late Fall	CVP
1/20/2020	170	late	male	Non-winter	1.000	Fall	0.985	Winter	CVP
1/22/2020	135	late	male	Non-winter	1.000	Fall	0.997	Winter	CVP
1/28/2020	128	late	female	Non-winter	1.000	Fall	0.978	Winter	CVP
1/29/2020	181	late	female	Non-winter	1.000	Fall	0.996	Winter	CVP
2/7/2020	35	late	female	Non-winter	1.000	Fall	0.992	Fall	CVP
2/8/2020	37	late	male	Non-winter	1.000	Fall	0.920	Fall	CVP
2/8/2020	40	late	female	Non-winter	1.000	Fall	0.983	Fall	CVP
2/9/2020	202	late	female	Non-winter	1.000	Fall	0.981	Winter	CVP
2/9/2020	32	late	male	Non-winter	1.000	Fall	0.981	Fall	CVP
2/11/2020	36	late	male	Non-winter	1.000	Fall	1.000	Fall	CVP
2/14/2020	37	late	male	Non-winter	1.000	Fall	1.000	Fall	CVP
3/6/2020	119	early	female	Winter	1.000	Winter	1.000	Winter	SWP
3/8/2020	104	early	male	Non-winter	1.000	Fall	0.999	Winter	SWP
3/8/2020	145	late	female	Non-winter	1.000	Fall	1.000	Winter	CVP
3/9/2020	150	late	female	Non-winter	1.000	Fall	1.000	Winter	SWP
3/10/2020	198	early	male	Non-winter	1.000	Fall	0.999	Winter	CVP
3/10/2020	120	early	male	Winter	0.994	Winter	0.994	Winter	CVP
3/11/2020	204	late	female	Non-winter	1.000	Fall	0.882	Winter	CVP
3/13/2020	195	early	male	Non-winter	1.000	Fall	1.000	Winter	CVP
3/16/2020	113	early	female	Winter	0.988	Winter	0.988	Winter	CVP
3/18/2020	130	early	male	Winter	1.000	Winter	1.000	Winter	CVP
3/18/2020	131	early	male	Winter	1.000	Winter	1.000	Winter	CVP
3/18/2020	130	early	male	Winter	1.000	Winter	1.000	Winter	CVP
3/18/2020	75	late	male	Non-winter	1.000	Fall	0.998	Spring	CVP

For more information on new science related to these markers:

Blankenship, S. 2020. Genetic Data Report Guidance – Premature Migration. Technical Memorandum.

Narum, S. R., A. Di Genova, S. J. Micheletti, and A. Maass. 2018. Genomic variation underlying complex life-history traits revealed by genome sequencing in Chinook salmon. Proceedings of the Royal Society B: Biological Sciences 285(1883):20180935.

Prince, D. J., S. M. O'Rourke, T. Q. Thompson, O. A. Ali, H. S. Lyman, I. K. Saglam, T. J. Hotaling, A. P. Spidle, and M. R. Miller. 2017. The evolutionary basis of premature migration in Pacific salmon highlights the utility of genomics for informing conservation. Science Advances 3(8):e1603198.

Quinn, T. P., P. McGinnity, and T. E. Reed. 2015. The paradox of "premature migration" by adult anadromous salmonid fishes: patterns and hypotheses. Canadian Journal of Fisheries and Aquatic Sciences 73(7):1015–1030.

Thompson, T. Q., M. R. Bellinger, S. M. O'Rourke, D. J. Prince, A. E. Stevenson, A. T. Rodrigues, M. R. Sloat, C. F. Speller, D. Y. Yang, V. L. Butler, M. A. Banks, and M. R. Miller. 2019. Anthropogenic habitat alteration leads to rapid loss of adaptive variation and restoration potential in wild salmon populations. Proceedings of the National Academy of Sciences 116(1):177.

CONFIRMED HATCHERY (ADIPOSE-FIN CLIPPED) CHINOOK SALMON LOSS AT THE SWP & CVP DELTA FISH FACILITIES as of 4/6/20 for spring-run Chinook salmon surrogate releases

Release Date	CWT Race	Hatchery	Release Site	Release Type	Confirmed Loss	Number Released[1]	Total Entering Delta	% Loss of Number Released[2]	% Loss of Total Entering Delta[3]	First Stage Trigger	Date of First Loss[4]	Date of Last Loss[4]
12/9/19	LF	Coleman NFH	Battle Creek	Spring Surrogate	20.21	84,869	n/a	0.024	n/a	0.5%	12/22/19	1/9/20
12/18/19	LF	Coleman NFH	Battle Creek	Spring Surrogate	25.03	77,672	n/a	0.032	n/a	0.5%	1/1/20	1/4/20
1/13/20	LF	Coleman NFH	Battle Creek	Spring Surrogate		77,866	n/a		n/a	0.5%		

SWP and CVP adipose-fin clipped Chinook lost from 10/1/19 through 4/6/20.

[1]Number released with the adipose-fin clipped and a coded-wire tag (CWT).

[2]% Loss of Number Released = (Confirmed Loss/Number Released)*100.

[3]% Loss of Total Entering Delta= (Confirmed Loss/Total Entering Delta)*100.

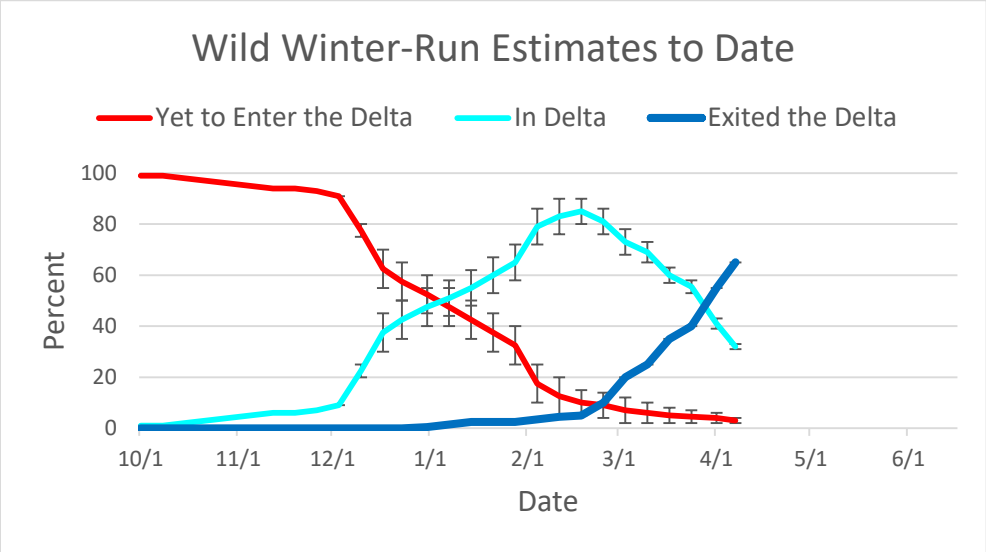
[4]Date of first and last loss accounts for all CWT loss even those from special studies where salvage and loss=0.

DWR-DES Revised 2/7/20. Preliminary data from DFW, DWR, USFWS, and Reclamation; subject to revision.

SaMT Estimates of Fish Distribution
SaMT estimates of the current distribution of listed Chinook salmon, as a percentage of the population, are based on recent monitoring data and historical migration timing patterns.

Location	Yet to Enter Delta (Upstream of Knights Landing)	In the Delta	Exited the Delta (Past Chipps Island)
Young-of-year (YOY) winter-run Chinook salmon	2-4% Last week: 2-6%	31-33% Last week: 39-43%	65% Last week: 55%
YOY spring-run Chinook salmon	25-40% Last week: 30-45%	53-68% Last week: 53-68%	7% Last week: 2%
YOY hatchery winter-run Chinook salmon	35-45% Last week: 45-55%	40-45% Last week: 35-40%	15-20% Last week: 10-15%
Steelhead	30-45% Last week: 40-65%	40-60% Last week: 30-50%	10-15% Last week: 5-10%

Rationale for changes in distribution
Natural winter-run Chinook salmon:
Over 3.8 million BY 2019 winter-run Chinook salmon have passed RBDD so far in WY 2020. In the last week, 19 winter-run were captured in Chipps Island Trawl and 2 at Knights Landing. SaMT estimates that the percentage of winter-run Chinook salmon population within the Delta changed from 39-43% to 31-33%. SaMT also estimates an additional 10% exited past Chipps Island equating to an estimated sum total of 65% exiting the Delta. Based on the time of year, the majority of winter-run Chinook salmon juveniles are migrating out of the Delta.

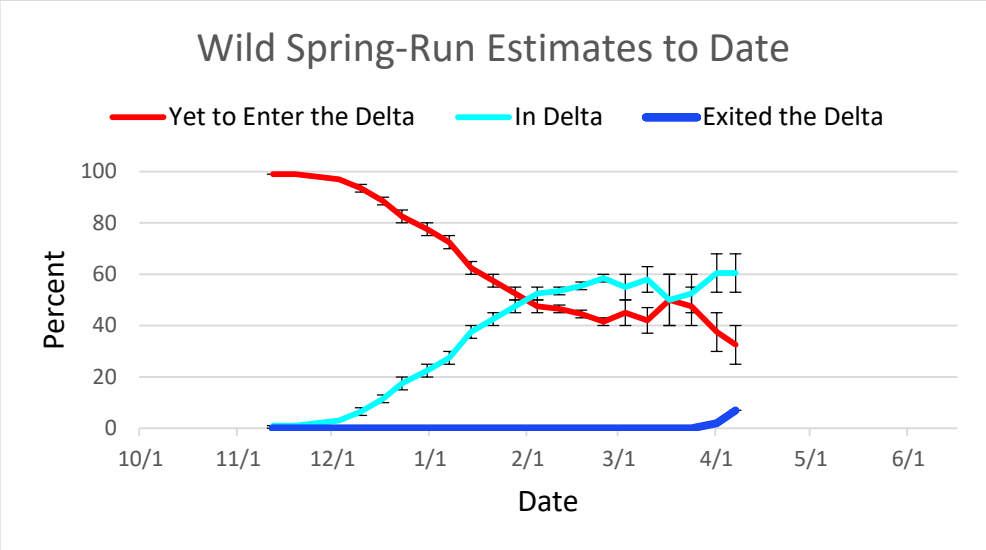


WY 2020 natural winter-run Chinook salmon distribution

Hatchery winter-run Chinook salmon: Hatchery winter-run Chinook salmon were released recently into Sacramento River and Battle Creek (3/10/20, 3/23/20). Acoustic tagged fish have been detected at several locations including: Butte City, Wilkens Slough, I-80/I-50, Tower Bridge, Georgiana Slough, and Benicia (western Suisun Bay), indicating that at least some of these fish have moved into the Delta and beyond.
https://calfishtrack.github.io/real-time/pageLSWR_2020.html

Natural spring-run Chinook salmon:
In the last week 81 juvenile spring-run Chinook salmon were observed at Sacramento Trawl, 1,137 at Knights Landing, 103 at Tisdale, and 11 at Chipps Island. Beach seine sites were not sampled. Historical timing based on passage at Knights Landing indicate that 67% of the natural young-of-year spring-run Chinook salmon are considered to be in the Delta by this time of year, but excludes Butte Creek and Feather River spring-run. Chinook salmon that typically emigrate into the Delta later in the season and are not captured at the Knights Landing monitoring station. In previous years with similar hydrological conditions (i.e., low flows and limited environmental cues), juvenile Chinook salmon have been observed to hold and rear in the upper river later than years with consistent winter storms and elevated flows. SaMT estimates 25-40% of the spring-run Chinook salmon population are upstream of the Delta and 53-68% are in the Delta. SaMT also estimates an additional 7% have exited past Chipps Island.

It is important to note that this week's large numbers of spring-run Chinook salmon were observed at downstream monitoring sites following the fall-run Chinook salmon production releases from Coleman NFH which include 75% unmarked fish. Natural spring-run Chinook salmon are indistinguishable from larger, unmarked hatchery origin fall-run Chinook salmon and the average FL of this year's releases suggest a large portion of the fall-run Chinook salmon would be counted as spring-run Chinook salmon where monitoring sites assign run using LAD criteria.



WY 2020 natural spring-run Chinook salmon distribution estimates to date.

Natural Steelhead:
Several factors increase uncertainty of measuring downstream movements of steelhead including varying life history and residency times, as well as monitoring gear avoidance. To provide an estimate of steelhead presence in the Delta, the SaMT discussed historical catch and emigration timing data. Natural-origin steelhead were observed in salvage (loss = 115) and at Chipps Island (n = 32) during this past week. Historically, 66% of steelhead are salvaged by this time of the year. SaMT estimates that 40-60% of steelhead are in the Delta this week and that 10-15% have exited past Chipps Island.

Agenda Item 6.
Fish Exposure and Behavioral Cues

Historical Patterns
This section is a placeholder to discuss plots of historical loss to current loss and loss tool predictions in future meetings. These figures were included in the Assessment document for this week. Additional figures, tables, and online tools are being developed to inform this discussion.

Current Conditions
Entrainment into the Interior Delta:
https://oceanview.pfeg.noaa.gov/shiny/FED/CalFishTrack/
The Delta STARS Model is an individual-based simulation model that estimates survival, travel time, and routing of juvenile salmon migrating through the Delta. The model's structure and parameters are based on a recent analysis (Perry et al. in press) that relates individual survival, travel time, and routing of late-fall-run Chinook salmon to daily Sacramento River flows at Freeport and Delta Cross Channel operations. SaMT reviewed the STARS model for route-specific survival and routing probabilities.

Routing probabilities into the interior Delta from the Sacramento River appeared to be similar to last week based on minute changes in Sacramento River flows. The STARS model estimates the following proportion of entrainment: 0% DCC, 19% Georgiana Slough, 54% Sacramento River, and 41% Sutter and Steamboat Slough (Last updated on 4/3/20).

Routing probabilities at Three Mile Slough and Broad Slough (junction of the Sacramento and San Joaquin rivers) are not estimated by the STARS model. However, QWEST is expected to be positive this week.

DSM2
DSM2 – Results are provided in the Assessment documents weekly on Tuesday and Fridays.

Sensitivity to Operational Actions - SaMT Feedback on Entrainment Risk

The questions from OMR Flow Management Guidance Document (page 20) are provide below.

1) After January 1, are more than 5% of the juveniles from one or more salmonid species present in the Delta?
    - Yes.
        - Currently 31-33% natural winter-run Chinook salmon, 53-68% spring-run Chinook salmon, 40-45% of hatchery winter-run Chinook salmon, and 40-60% of steelhead are estimated to be in the Delta.
2) Does the action (Delta exports, OMR flows, DCC gate operations) impact fish movement and change the potential distribution of fish?
    - Yes.
        - Winter-run Chinook salmon, spring-run Chinook salmon, and steelhead are shifting from a rearing phase (where they are closer to river banks) to migration phase (where they are moving in the river channel). This behavior makes them more vulnerable to exports.
        - Storms events will also cue fish movement. Precipitation events occurred over the past week.
        - Considering historical timing of outmigration for winter-run Chinook salmon, spring-run Chinook salmon, and steelhead as well as monitoring data (in salvage and Chipps Island Trawl), we believe that the distribution of Sacramento-origin fish are likely to be affected by Delta exports as they are migrating through the Delta to be observed at these locations.
        - Under conditions similar to those being experienced currently in past years, fish have been routed through the Head of Old River from the San Joaquin River. The Mossdale trawl is not sampling currently due to COVID-19 restrictions, but we have observed San Joaquin River Restoration Project (SJRRP) spring-run Chinook salmon in salvage at the Delta Fish Collection Facilities during the past week (total estimated loss > 906).
        - The Salmon Monitoring Team expects to see more San Joaquin River origin fish at CVP.
3) How much loss has occurred in the past week (3/30/20 - 4/5/20)?
    - Increased losses of salmonids in both clipped and natural fish have been observed at the SWP and CVP facilities (particularly Chinook salmon released pursuant to the SJRRP, and steelhead). Fish salvage began to increase recently on the State side, however, this may decrease in the upcoming week as the SWP decreases exports due to ITP criteria. An increase in salvage at the CVP of San Joaquin-origin salmonids is expected over the upcoming weeks.
    - In the past week, natural-origin winter-run sized Chinook salmon were salvaged at the Delta fish collection facilities (weekly loss = 32 fish).
    - Natural-origin spring-run sized Chinook salmon were salvaged last week at the Delta fish collection facilities (weekly loss = 63 fish)
    - Hatchery-origin spring-run Chinook salmon were salvaged at both facilities (weekly loss = 252 fish)

- Hatchery-origin steelhead were observed in salvage at both facilities (weekly loss = 201 fish).
- Natural-origin steelhead were observed in salvage at both facilities (weekly loss = 115).
- On 4/6/20 unclipped and clipped steelhead salvage = 40.

4) What is the likelihood of increased loss exceeding the next single year loss threshold based on the population distribution, abundance, and behavior of fish in Delta?
   - Unlikely. Annual cumulative loss is not approaching any of the Delta Performance Thresholds. Please refer to operations outlook for details.
5) If a single-year loss threshold has been exceeded, do continued OMR restrictions benefit fish movement based on real-time information?
   - Not applicable. No thresholds have been exceeded during this water year.
6) If OMR is more negative than -5,000 cfs, are there changes in spawning, rearing, foraging, sheltering, or migration behavior beyond those anticipated to occur under OMR management at -5,000 cfs?
   - Not applicable. Current OMR flows more positive than -5,000 cfs.

Agenda Item 7.
Other Topics

- Assessment will be finalized on 4/7/20

Agenda Item 8.
Additional Considerations for WOMT

- Operating according to the finalized CDFW ITP. It will take time to align operations under the State ITP and ROC on LTO between the two Projects.
- Revising water ops and fish outlook document to include ITL to help track relevant actions and triggers.

Agenda Item 9.
Next SaMT Meeting is scheduled for Tuesday, 4/14/20 at 9:00 a.m.