STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY **GAVIN NEWSOM**, *Governor*

DEPARTMENT OF WATER RESOURCES
DIVISION OF ENVIRONMENTAL SERVICES
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12/30/2020

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2019/2020 Salmonid and Green Sturgeon Incidental Take and Monitoring Report

Dear Ms. Rea:

Enclosed is the 2019/2020 *Salmonid and Green Sturgeon Incidental Take and Monitoring Annual Report*. This annual report is required under 2009 National Marine Fisheries Service (NMFS) Final Biological Opinion and Conference Opinion on the Proposed Long-Term Operations of the Central Valley Project and State Water Project (2009 NMFS Biological Opinion). This reporting period includes a transition from the 2009 Biological Opinions (BiOps) and CDFW Consistency Determination to the 2019 BiOps and 2020 Incidental Take Permit (ITP) for the SWP. The enclosed report includes the following:

1. A summary of the incidental take of natural and hatchery winter-run Chinook salmon (*Oncorhynchus tshawytscha*), spring-run Chinook salmon (*O. tshawytscha*) surrogates, Central Valley steelhead (*O. mykiss*), and green sturgeon (*Acipenser medirostris*) at the State Water Project's John E. Skinner Delta Fish Protective Facility and the Central Valley Project's Tracy Fish Collection Facility.
2. A summary of the data acquired through the salmonid monitoring program for the lower Sacramento River and the Delta, along with a summary of the Delta hydrologic conditions.

If you have any questions regarding the report, please contact me at (916) 376-9700 or your staff may contact Farida Islam of the Division of Environmental Services' Office of the Regulatory Compliance at (916) 376-9817.

Sincerely,

Dean F. Messer

Dean F. Messer, Chief
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2019/2020
SALMONID AND GREEN STURGEON
INCIDENTAL TAKE AND MONITORING REPORT

December 30, 2020

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2019/2020 SALMONID AND GREEN STURGEON INCIDENTAL TAKE AND MONITORING REPORT

This annual report is required under the Terms and Conditions of the 2009 National Marine Fisheries Service (NMFS) Biological Opinion and Conference Opinion on the Proposed Long-Term Operations of the Central Valley Project and State Water Project (2009 NMFS Biological Opinion). This report summarizes the incidental take of Winter-run Chinook Salmon (*Oncorhynchus tshawytscha*), Spring-run Chinook Salmon (*O. tshawytscha*) surrogates, Central Valley steelhead (*O. mykiss*), and green sturgeon (*Acipenser medirostris*) at the State Water Project's (SWP) John E. Skinner Delta Fish Protective Facility and the Central Valley Project's (CVP) Tracy Fish Collection Facility (Delta fish facilities) for 2019/2020. This report also includes data from a wide geographic area including the salmonid monitoring program for the lower Sacramento River and the Delta (Figure 1), and the hydrologic conditions in the Delta.

This reporting period includes a transition from the 2009 Biological Opinions (BiOps) and CDFW Consistency Determination to the 2019 BiOps and 2020 Incidental Take Permit (ITP) for the SWP. The United States Bureau of Reclamation (Reclamation) consulted under the Endangered Species Act (ESA) with the United States Fish and Wildlife Service (USFWS) and NMFS on potential effects of the Proposed Action (PA) of the Projects on threatened and endangered species. Reclamation submitted to these agencies a Biological Assessment (BA) on January 31, 2019, describing the proposed action that would be taken and the resulting effects. Reclamation updated the PA during consultation (two updates were provided on April 19, 2019 and July 30, 2019) and provided the final BA on October 21, 2019, which included the final PA description. In turn, the USFWS and NMFS issued their BiOps of the PA on October 21, 2019. Reclamation signed the Record of Decision (ROD), which included the 2019 BiOps from USFWS and NMFS, and began implementing the PA on February 18, 2020.

The Department of Water Resources (DWR) ITP from the California Department of Fish and Wildlife (CDFW) was signed on March 31, 2020 and resulted in a combination of operational requirements, both 2019 BiOps and the 2020 ITP, for the SWP. Information regarding Old and Middle River Flow can also be found in Reclamation's Water Year 2020 Seasonal Report for Old and Middle River (OMR) Flow Management (https://www.usbr.gov/mp/bdo/pro-activities-docs.html).

In addition to these annual reports, DWR also conducted Data Assessment Team (DAT) meetings and reported the relevant data updates to the Delta Operations for Salmon Monitoring Team (SaMT) during the 2019/2020 incidental take season. During the Water Year 2019/2020, DAT meeting notes were distributed to DAT members. Preliminary analysis of the weekly data reports for SaMT meeting notes are posted on the DOSS and SaMT Websites:
http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/doss.html
https://www.usbr.gov/mp/bdo/salmon-monitoring-team.html

Fish monitoring data were reviewed from the SacPAS website: http://www.cbr.washington.edu/sacramento

Data Acquisition

DWR acquired data from the CDFW, USFWS, and other internal DWR and Reclamation divisions. Fisheries monitoring and associated environmental field data collection was limited in 2019/2020 due to repeated and on-going sampling disruptions. These resulted primarily from air quality advisories and warnings from large scale forest fires, and mandatory COVID-19 restrictions and distancing protocols. Core sampling stations, ones critical to indices and operational triggers, were continued to the greatest degree possible. DWR will add an addendum to this report if analysis of the finalized data leads to substantial changes to the results.

Methods for Measuring Incidental Take

Similar to previous years, the CVP and SWP followed currently approved and agreed upon Loss Equations (CDFW 2013, https://wildlife.ca.gov/Conservation/Delta/Salvage-Monitoring). The loss equations followed at both fish facilities remained unchanged through the transition to 2019 BiOps from 2009 BiOps.

Observed Chinook Salmon Salvage

Figure 2 describes the observed Chinook Salmon salvage at the Delta fish facilities in 2019/2020 from normal salvage counts, special studies, and secondary flushes. Juvenile Chinook Salmon run type was determined using the Delta length-at-date criteria (LAD) (https://water.ca.gov/LegacyFiles/aes/docs/ValidatingLength-at-DateRunassignments.pdf). Fork lengths were obtained for all Chinook Salmon salvaged at the SWP Delta fish facilities that met the minimum size threshold for tissue collection of 35mm fork length. For the 2019/2020 water year, the total juvenile Chinook Salmon catch was 1,544 fish, expanded salvage was 4,876.87 fish, and an expanded combined loss of 7,730.95 fish. No sub-adults of an undetermined run of Chinook Salmon were observed that fell outside of the length-at-date criteria (greater than 300 mm fork length) at either facility. Therefore, no loss has occurred from sub-adult Chinook Salmon for the water year.

Based on clarifications in DOSS (2013), DWR and Reclamation defined naturally-produced older juvenile Chinook Salmon as all Chinook Salmon with non-clipped adipose fins (non-clipped) greater than or equal to the minimum Winter-run length-at-date criteria using the Delta Model, and less than the maximum length-at-date criteria in the Delta Model. The Delta Model length-at-date criteria categorizes two different brood years of Winter-run Chinook Salmon in July, and for that month DWR and Reclamation used the minimum Winter-run length-at-date criteria for the older brood year.

Overall, the number of observed non-clipped older juvenile Chinook Salmon in 2019/2020 was lower, a total of 57, compared to the number observed in 2018/2019, a total of 187. Interestingly, the observed number during 2018/2019 was higher than in 2017/2018. In 2019/2020, the observed non-clipped older juvenile Chinook Salmon were salvaged between December and April, with most of salvage occurring during late March 2020 (Figure 3). This was different than 2018/2019 year when salvage was observed between February and June with a peak in late March. The salvage trend of 2019/2020 year is comparable to multiple recent years, with the exception of the previous year. There was no noticeable correlation between the number of non-clipped older juvenile salvage and export levels.

The overall number of observed hatchery Chinook Salmon at the Delta fish facilities was lower in the 2019/2020 water year than the previous year. Similar to 2018/2019 the number of observed Spring-run Chinook Salmon from the San Joaquin River Restoration Program (SJRRP) comprised the highest proportion of hatchery fish observed in salvage among all of the hatchery release groups in 2019/2020. This was observed in both the 2017/2018 and 2016/2017 water years.

Rapid Genetic Testing

The Rapid Genetic Testing Protocol, which provides a genetic run assignment within 24 hours was in effect during the 2019-2020 water year, but no older juvenile fish density triggers were reached and it was not necessary to implement it. Nevertheless, genetic monitoring continued, and genetic results were reported to DOSS, and subsequently the Salmon Monitoring Team (SaMT), as they became available throughout the operational season. Additional information on rapid genetic protocol can be found on the NMFS website at:
https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/california-central-valley-water-operations-biological
The genetic results were included in the 6/22/20 meeting notes posted to:
https://www.usbr.gov/mp/bdo/docs/final-salmon-monitoring-team-weekly-meetingnotes-06-23-20.pdf

Observed Chinook Salmon Genetic Run Assignment

A total of 620 Chinook samples were salvaged from the CVP and 600 were delivered to the genetic laboratory during the 2019/2020 water year. Of those 600 CVP samples, all were assigned genotypes. A total of 530 non-clipped juvenile Chinook was salvaged from the SWP and 516 were sampled and delivered to the genetic laboratory during the 2019/2020 water year. Of those 516 SWP samples, all were assigned genotypes. Twelve confirmed juvenile Winter-run Chinook Salmon were observed at the CVP (n=7) and SWP (n=5) in 2019/2020 for an expanded salvage of 41 fish and total loss of 76.92

fish.

Winter-run Chinook Salmon

Winter-run Chinook Salmon Incidental Take

National Marine Fisheries Service (NMFS) provided the U.S. Bureau of Reclamation with the 2020 Juvenile Production Estimate (JPE) pursuant to the 2009 and 2019 Biological Opinion on the long-term operations of the Central Valley Project (CVP) and the State Water Project (SWP) (Rea, 2020). The JPE is calculated each year to determine the authorized level of incidental take for Winter-run Chinook Salmon, under section 7 of the Endangered Species Act (ESA), while operating the CVP/SWP Delta pumping facilities in each water year (NMFS 2009, 2019). In 2019, DFW estimated a total adult escapement of 7,852 Winter-run spawner's to the upper Sacramento River, which is significantly higher (219% increase) than the returns estimated in 2018 (2,458), it is also the highest number in last 10 years based on the data provided in JPE letter (Rea, 2020). The methodology used in 2019 to calculate the annual Winter-run escapement (Cormack-Jolly-Seber Model) was the same as was used in 2018. The Cormack-Jolly-Seber model allowed for an estimation of a 90% confidence interval, which ranged from 2,235 to 3,029 fish. Based on the point estimate of escapement, NMFS calculated the JPE of natural (non-clipped) Winter-run Chinook Salmon entering the Delta in 2019/2020. NMFS took into consideration the recommendations of the Independent Review Panel (IRP) and the advice of the Winter-run Project Work Team (WRPWT) in calculating the number from the Winter-run 2019 brood year. Similar to last year, the WRPWT identified several factors (more detail available in the JPE letter referenced below) in calculating the JPE. Using those factors, the WRPWT presented two different methods to calculate JPE for 2019/2020. They advised continuing or updating those factors also for BY 2020. Similar to previous years, the group preferred the JPI method as it gives a more accurate estimation of the egg-to-fry survival rate which is an important factor in calculating the JPE. It is noteworthy to mention that the team has used the updated value for "Fry-to-Smolt Survival" in both the JPI and JPE methods as the team agreed that the updated value reflects more recent studies done on the relevant factor (Rea, 2020). According to the 2020 JPE letter, NMFS recommended the continuation of funding for acoustic tag studies on Winter-run for BY 2020 and beyond to provide data on survival rates for various hydrologic condition types.

For Water Year 2020, NMFS estimated that 854,941 natural-origin juvenile Winter-run Chinook Salmon would enter the Delta. Based on this JPE, the incidental take level from October 1, 2019, through June 30, 2020, for the Delta fish facilities was 17,098 non-clipped Winter-run Chinook Salmon, which is equal to 2% of the natural Winter-run production entering the Delta. Under the 2009 NMFS BiOps, when rapid genetic protocol is implemented, incidental take of Winter-run Chinook salmon is set to 1% of the JPE and is estimated according to genetic run assignment. Take is initially based on the Delta Model length-at-date criteria until genetic results are obtained. Reclamation's

2019 Proposed Action currently does not include on option for Winter-run take estimates identified by their DNA. Winter-run Chinook Salmon is solely based on the Delta Length-at-Date Model. Under Reclamation's 2019 Proposed Action and the DWR Incidental Take Limit, Winter-run single year loss threshold is equal to the loss of 1.17% of the JPE any single year. 1.17% of the BY2019 winter-run Chinook Salmon is 10,003. Incidental take is based on loss using the current loss equation from DFW (2013).

More detailed information on rationales provided by NMFS for water year 2019/2020 JPE estimation can be found at: https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/california-central-valley-water-operations-biological

Loss of wild Winter-run Chinook Salmon, based on the Delta Model length-at-date criteria, occurred at both Delta fish facilities for a loss of 142.9 fish at the SWP and 53.9 fish at the CVP. The loss at the CVP declined by approximately 49% and 85% at the SWP for 2019/2020 when compared to the previous 2018/2019 season. The combined expanded loss of Winter-run sized Chinook Salmon was 197 for the 2019/2020 season, approximately 2.3% of the permitted incidental take based on the 2009 NMFS BiOp or 2.0% of the permitted incidental take based on Reclamation's 2019 Proposed Action. No mid-late season natural Winter-run Chinook Salmon daily loss thresholds identified in the 2020 ITP, nor the Consistency Determination for the 2009 NMFS BiOp were exceeded. Overall, the combined annual Winter-run sized Chinook Salmon loss, based on length-at-date criteria, was significantly lower compared to the total expanded loss of 537 estimated in the previous water year. The lowest percentage permitted take in the past nine water years occurred in Water Year 2014/2015 (Figures 4 and 5). In 2019/2020, the daily combined older juvenile Chinook Salmon loss density trigger (NMFS RPA Action IV.2.3) was never exceeded therefore no action regarding OMR flows was needed.

Under 4.10.5.10.2 of Reclamation's 2019 Proposed Action, DWR and Reclamation propose to avoid exceeding cumulative loss thresholds over the duration of the 2019 BiOps. Cumulative loss thresholds set based on cumulative historical loss (2010 - 2018). LAD loss of natural-origin Winter-run Chinook Salmon was 2.3% of the cumulative loss threshold set in the 2019 PA. LAD loss of natural-origin Winter-run Chinook Salmon was 1.97% of the single-year loss threshold set in the 2019 PA and 3.9% of 50% of the single-year loss threshold set in the 2019 PA. Between October 2019 and June 2020, less than 10% of the natural-origin juvenile Winter-run Chinook Salmon cumulative loss threshold occurred and the natural-origin juvenile Winter-run Chinook Salmon single-year loss threshold was not exceeded.

Hatchery Winter-run Chinook Salmon Incidental Take

On March 10 and 23, 2020, an estimated 249,505 juvenile Winter-run (BY2019) from Livingston Stone National Fish Hatchery (LSNFH) were released into the Sacramento

River at Caldwell Park near Redding, California, which was higher than the release group of 225,017 hatchery Winter-run during the previous year (BY2018). Based on preliminary release information, data received from 500 acoustically-tagged (JSAT) from the release group, and an updated survival term, NMFS estimated that 92,291 hatchery fish would enter the Delta. Under the 2009 NMFS BiOp the incidental take level was set at 1% of the total hatchery production entering the Delta, or 923 hatchery Winter-run Chinook Salmon from October 1, 2019, through June 30, 2020. Additionally, an estimated total of 168,650 juvenile Winter-run Chinook Salmon were released into Battle Creek. NMFS estimated that 62,181 hatchery produced Winter-run Chinook Salmon from the additional Battle Creek release would survive to the Delta during WY 2020, with an incidental take level of 622 fish. The 2020 Incidental Take Permit limit was a loss no greater than 0.12% of the JPE, or 111 hatchery produced juvenile Winter-run Chinook Salmon; and the ITP does not include the additional Battle creek releases. The 2020 hatchery Winter-run take level was lower than in 2018/2019 (824 Winter-run), which was the second year of an additional Battle Creek release. There was no salvage from the LSNFH hatchery Winter-run Chinook Salmon at the Delta fish facilities and no loss occurred from the additional Battle Creek release group. Therefore, no loss triggers were exceeded for these groups.

As there was no LAD loss of hatchery Winter-run Chinook Salmon, loss represented 0% of the cumulative loss threshold set in the 2019 PA and 0% of the single-year loss threshold set in the 2019 PA. Between October 2019 and June 2020, less than 10% of the hatchery juvenile Winter-run Chinook Salmon cumulative loss threshold occurred and the hatchery juvenile Winter-run Chinook Salmon single-year loss threshold was not exceeded.

Coded Wire Tagged (CWT) fish have been used for many years for investigating the fish behavior and survival rate of Chinook Salmon following release from a hatchery. CWT fish that are identified during salvage at the Delta Fish Facilities (SWP and CVP) are carefully recovered and handled, in accordance with the Standard Operations Protocol, so that the tags can be removed and read. On occasion, tag loss or damage does occur, and some tags are unreadable due to tag imperfections. On these occasions, the fork lengths of the CWT fish are recorded, and the loss is calculated and recorded under the ‘Unknown’ category. For the 2019/2020 year, the Unknown loss of 14.69 fish was estimated at the CVP and reported as ‘Unknown CWT Loss’ (Table 1). At the SWP, the Unknown loss for 2019/2020 was estimated at 130.22 fish (Table 1). The combined 144.92 fish loss at both facilities for the 2019/2020 season is noted as total fish (Table 1).

Spring-Run Chinook Salmon

Under the 2009 and 2019 NMFS Biological Opinions, NMFS uses hatchery-produced subyearling Late Fall-run Chinook Salmon as surrogates for naturally produced yearling

Spring-run Chinook Salmon emigrating from the upper Sacramento River and tributaries into the Delta. According to NMFS, these late Fall-run Chinook Salmon are used as surrogates because they are generally released and begin their smoltification and emigration and passage through the Delta at approximately the same time, and at a similar size, as wild yearling Spring-run Chinook Salmon. The Coleman National Fish Hatchery (CNFH) releases a percentage of the total CNFH Late Fall-run Chinook Salmon production as these surrogate release groups.

In 2019/2020, CNFH released three groups of Late Fall-run Chinook Salmon marked with unique CWT codes as Spring-run Chinook Salmon surrogates into Battle Creek: 1) 84,869 on 12/09/19, 2) 77,672 on 12/18/19, and 3) 77,866 on 1/13/20. In addition to these surrogate releases, CNFH also released 77,866 Late Fall-run hatchery production fish into Battle Creek on 1/13/20. Prior to these releases, SAMT provided input to the CNFH on the release schedule of the surrogate Spring-run Chinook Salmon based on the information that the production release would occur concurrently with a precipitation event sometime between November and late December. However, SAMT also noted that the 1st surrogate release should occur about 3 days after the production release and should coincide with a rainfall event. SAMT provided the guidance to release the second surrogate group during late December, at least a week after the previous surrogate group and ideally preceding a precipitation event, and to release the third surrogate group after a similar number of days between the first and second releases.

Measuring Incidental Take

The incidental take level for the combined operation of the Delta pumping plants is equal to 1% of any individual CNFH Late-Fall Chinook Salmon surrogate release group. Measurement of incidental take for each surrogate release group is based on loss using the current loss equation from DFW (2013). However, there are occasions when the hatchery of origin for the CWT Chinook Salmon could not be confirmed due to lost, missing, or damaged tags, or due to the accidental release of CWT fish during salvage. For this reason, the actual loss could be higher than what is confirmed in Table 2. For the 2019/2020 season, the total Unknown loss due to Damaged Tags or Tags Not Found was 144.92 fish (Table 1). As mentioned previously, the Unknown loss is for the entire season and was not necessarily correlated with any one released group.

First Surrogate Release Group and Incidental Take

The first Spring-run Chinook Salmon surrogate hatchery group of 84,869 CNFH Late Fall-run Chinook Salmon was released on December 9, 2019. A total confirmed loss of 20.21 fish were estimated from this group from the fish salvaged at the Delta fish facilities (Table 2). The percent loss from the first release group was calculated to be 0.024%, which was below the exceedance level of 0.5% of the release group.

Second Surrogate Release Group and Incidental Take

On December 18, 2019, CNFH released the second Spring-run Chinook Salmon surrogate hatchery group of approximately 77,672 Late Fall-run Chinook Salmon into Battle Creek. The confirmed loss from this group was 25.03 fish. The percent loss was calculated to be 0.032%, which was below the exceedance level 0.5% of the release group.

Third Surrogate Release Group and Incidental Take

On January 13, 2020, CNFH released the third Spring-run Chinook Salmon surrogate hatchery group of approximately 77,866 Late Fall-run Chinook Salmon into Battle Creek (Table 2). No loss of occurred from this group at the Delta fish facilities (Table 2).

Fry/Smolt Chinook Salmon Loss

Most of the fry/smolt Chinook Salmon loss occurred during April and May, unlike in the previous few years when fry/smolt Chinook Salmon were salvaged a little earlier in the season, starting in early December (Figure 5). The annual loss in 2019/2020 was significantly lower than the previous year, approximately 69.2% less than was observed in the 2018/2019 water year.

The combined expanded loss of fry/smolt Chinook Salmon between October 2019 and July 2020 was approximately 5,724 fish, compared to the previous years' loss of 18,570 (Figure 6 and Figure 7). Using the Delta Model length-at-date criteria, DWR and Reclamation defined fry/smolts as all non-clipped Chinook Salmon smaller than the minimum Winter-run length-at-date criteria. The Delta Model length-at-date criteria categorizes two different brood years of Winter-run Chinook Salmon in July. For this month, DWR and Reclamation used the minimum Winter-run length-at-date criteria for the older brood year.

Chinook Salmon Monitoring in the Sacramento River and the Delta

The Delta Juvenile Fish Monitoring Program (DJFMP) conducted by USFWS operates under the auspices of the Interagency Ecological Program (IEP). The DJFMP has been conducting juvenile Salmon monitoring in the Delta since the early 1970s with the goals of gaining information on potential management actions that could improve the survival of juvenile salmon rearing and migrating through the Delta, and to document non-salmonid temporal and spatial distributions. For the USFWS Sacramento River and Delta surveys, DWR and Reclamation separated non-clipped older juvenile Chinook Salmon from fry/smolts using the Frank-Fisher Model (Fisher, F.W, CDFW) which categorizes two different brood years of Winter-run Chinook Salmon in July and August.

DWR and Reclamation used the minimum length of the dominant brood year of a reporting period for categorizing older juveniles and fry/smolts.

Spring-Run Chinook Salmon Surrogate Monitoring

The USFWS conducted a midwater and Kodiak trawl survey on the Sacramento River at Sherwood Harbor to gauge the relative abundance and timing of juvenile Chinook Salmon entering the Delta. Based on the preliminary data summary received in early September 2020, USFWS recovered four surrogate Spring-run Chinook Salmon from the first surrogate release, one Spring-run Chinook Salmon surrogate from the second release group, and none from the third release group (Figure 8 (a,b,c))). The number of recovered Spring-run Chinook Salmon surrogates are lower than a total of 23 fish reported for the previous year. The catch for the 2019/2020 water year occurred between late December and early April which was different than the trend observed in previous year, where the surrogate catch occurred between December 2018 and early January 2019, which coincided with the time period of catch of older juvenile Chinook Salmon at the Sacramento trawl location.

In addition, a midwater trawl survey was conducted at Chipps Island, the most downstream trawl survey location in the legal Delta. USFWS recovered surrogates at Chipps Island for a catch of 11 Spring-run Chinook Salmon surrogates from the first surrogate release, 4 fish in February from the second Spring-run Chinook Salmon surrogate release, and 4 Spring-run Chinook Salmon were observed from the third surrogate release. The total numbers of recovered surrogates were much lower in 2019/2020 compared to the total catch of 35 reported in the previous year. The timing of recoveries at Chipps Island for all three surrogate releases was consistent with the timing of older juvenile Chinook Salmon catch at Chipps Island.

It is noteworthy to mention that DJFMP could not sample in full capacity for a period of time during 2019/2020 due to COVID-19 restrictions. More details on the related topic can be obtained from USFWS Delta Juvenile Fish Monitoring Program. Due to the staff shortage and COVID-19 related issues at the USFWS, the catch data from WY 2020 was still awaiting the final QA/QC read at the time this report was being prepared. These results should be considered preliminary.

Hatchery Winter-Run Chinook Salmon Monitoring

Recoveries of hatchery Winter-run Chinook Salmon from LSNFH in the Delta monitoring trawls were significantly lower in 2019/2020 than in 2018/2019. Between late-March and mid-April of 2020 the USFWS recovered 28 hatchery Winter-run Chinook Salmon from LSNFH. All the hatchery Winter-run Chinook Salmon from LSNFH were recovered in the midwater trawls. 26 of the 28 fish were recovered in the Chipps Island midwater trawl (Figure 9) and 2 were recovered in the Sacramento midwater trawl.

Central Valley Steelhead

Steelhead Incidental Take

Reclamation's 2019 Proposed Action does not include daily loss thresholds for unclipped steelhead. As this report covers the time when the 2009 NMFS BiOps was still in effect, loss of steelhead for the period between October 1 and November 30, 2019 is included, and for this period was zero. CCV Steelhead loss in the Proposed Action loss is divided into two time periods to protect San Joaquin origin fish that historically appear in the Mossdale trawls later than the Sacramento origin fish: Period 1 (December 1 through March 31) and Period 2 (April 1 through June 15).

Loss of natural CCV steelhead for Period 1 (Dec 1 – Mar 31) was 6.7% of the cumulative loss threshold set for that period and loss for Period 2 (Apr 1 – June 15) was 5.6% of the cumulative loss threshold set for that period in the 2019 PA. Loss of natural CCV steelhead for Period 1 (Dec 1 – Mar 31) was 28.4% of the single-year loss threshold and 56.9% of 50% of the single-year loss threshold set for that period in the 2019 PA.

Loss of natural CCV steelhead for Period 2 (Apr 1 – June 15) was 20.9% of the single-year loss threshold and 41.8% of 50% of the single-year loss threshold set for that period in the 2019 PA.
Between October 2019 and June 2020, less than 10% of natural origin CCV steelhead cumulative loss thresholds in both periods occurred and neither natural-origin CCV steelhead single-year loss thresholds in either period was exceeded.

The SWP and CVP expanded salvage of non-clipped steelhead was approximately 143 fish and 157 fish respectively, for a total of 300 fish for the 2019/2020 year (Figure 10, Figure 11). In addition to no steelhead loss thresholds being exceeded for Reclamation's 2019 PA the expanded salvage was well below the 2009 BiOp incidental take level of 3,000 steelhead for the water year (Figure 10, Figure 11, Figure 12) as well. The annual expanded salvage of non-clipped steelhead for 2019/2020 decreased from 2018/2019, when it was 446 (Figure 12). For both 2018/2019 and 2019/2020, it was lower than the average number of salvage (767) for the previous twelve years (Figure 12).

The daily steelhead loss triggers for unclipped steelhead were calculated by multiplying combined exports in TAF on a given day by either 8 fish/TAF or 12 fish/TAF. During the 2019/2020 year, there was no occurrence of the exceedance of steelhead daily loss triggers based on the expanded salvage and calculated daily loss and therefore no action was needed for more restrictive Old and Middle River flow limits (Figure 10, Figure14).

The SWP and CVP salvage of hatchery (adipose fin clipped) steelhead significantly increased in 2018/2019 compared to the previous year (Figures 11 and 13). From October 2018 to July 2019, the CVP salvaged a total of 327 hatchery fish and the SWP

salvaged a total of 101 hatchery fish for a combined total annual salvage of 1,845 hatchery steelhead (Figures 11 and 13), which is significantly lower than the total of 1,239 in 2018/2019 (Figures 11 and 13).

Green Sturgeon Incidental Take

The incidental take level for Green Sturgeon remained at 74 fish for Water Year 2020 and is based on historical salvage per 2019 BiOps. In the 2019/2020 water year, an expanded salvage of four Green Sturgeon was observed at CVP Facility. Before that, the last Green Sturgeon was observed at the Federal Facility in the Water Year 2011/2012. No Green Sturgeon was observed at SWP in Water Year 2019/2020. The last Green Sturgeon was observed at SWP in Water Year 2015/2016 (Figure 15).

Delta Hydrology

For the 2019/2020 water year, Southern California received more than average precipitation while Northern California only received approximately 62% of the long term precipitation average (1966-2015). According to the California Data Exchange Center, Water Year 2019/2020 was classified as a “wet” water year type for both the Sacramento Valley the San Joaquin Valley. More Delta-specific information on current hydrology of California for the year 2019/2020 can be found at https://cdec.water.ca.gov.

Overall, average exports for Sacramento River and San Joaquin River were both higher during October to December 2019 and lower during January to July 2020 than they were in 2018/2019. Table 3 shows a monthly average summary of SWP and CVP exports, Sacramento and San Joaquin River flows, and Delta outflow. Figure 16 (a, b, c, d) shows the monthly averages of Delta hydrology for the Water Years 2014 through 2020.

Modeled volumetric water fingerprints derived from the Delta Simulation Model 2 (DSM2) at Clifton Court Forebay (SWP) and at the Jones Pumping Plant (CVP) are presented in Figures 17 and Figure 18. Overall, these fingerprints show similar trend observed in the year 2018/2019 when the majority of SWP water came from the San Joaquin River. Most of the water from the SWP during the 2017/2018 year was split between the San Joaquin River and the Sacramento River. In 2017/2018, water at CVP was split between the Sacramento and the San Joaquin Rivers (Figure 18) but in 2018/2019, and 2019/2020, the majority of CVP water came from the San Joaquin River.

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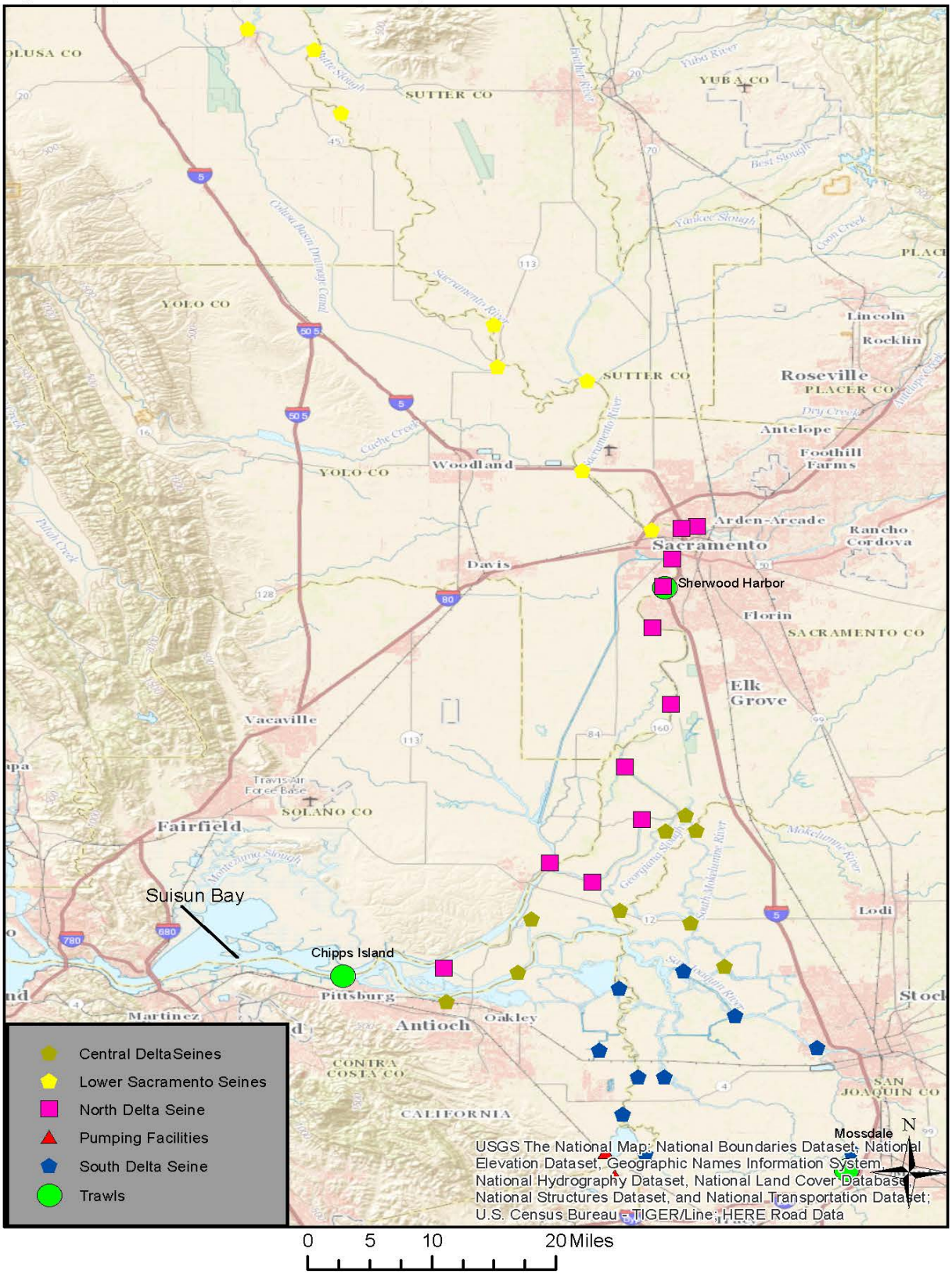
List of Figures

Figure 1. Map of monitoring sites used in this report.



Base map from ESRI and GPS coordinates provided by USFWS. Only seine sites that have been active since August 2004 are presented.

Figure 2. Observed Chinook Salmon salvage at the Delta fish facilities, with Delta hydrology, August 1, 2019, through July 31, 2020. Chinook Salmon race/run designation is based on Delta model length-at-date criteria and Coded Wire Tag recoveries.

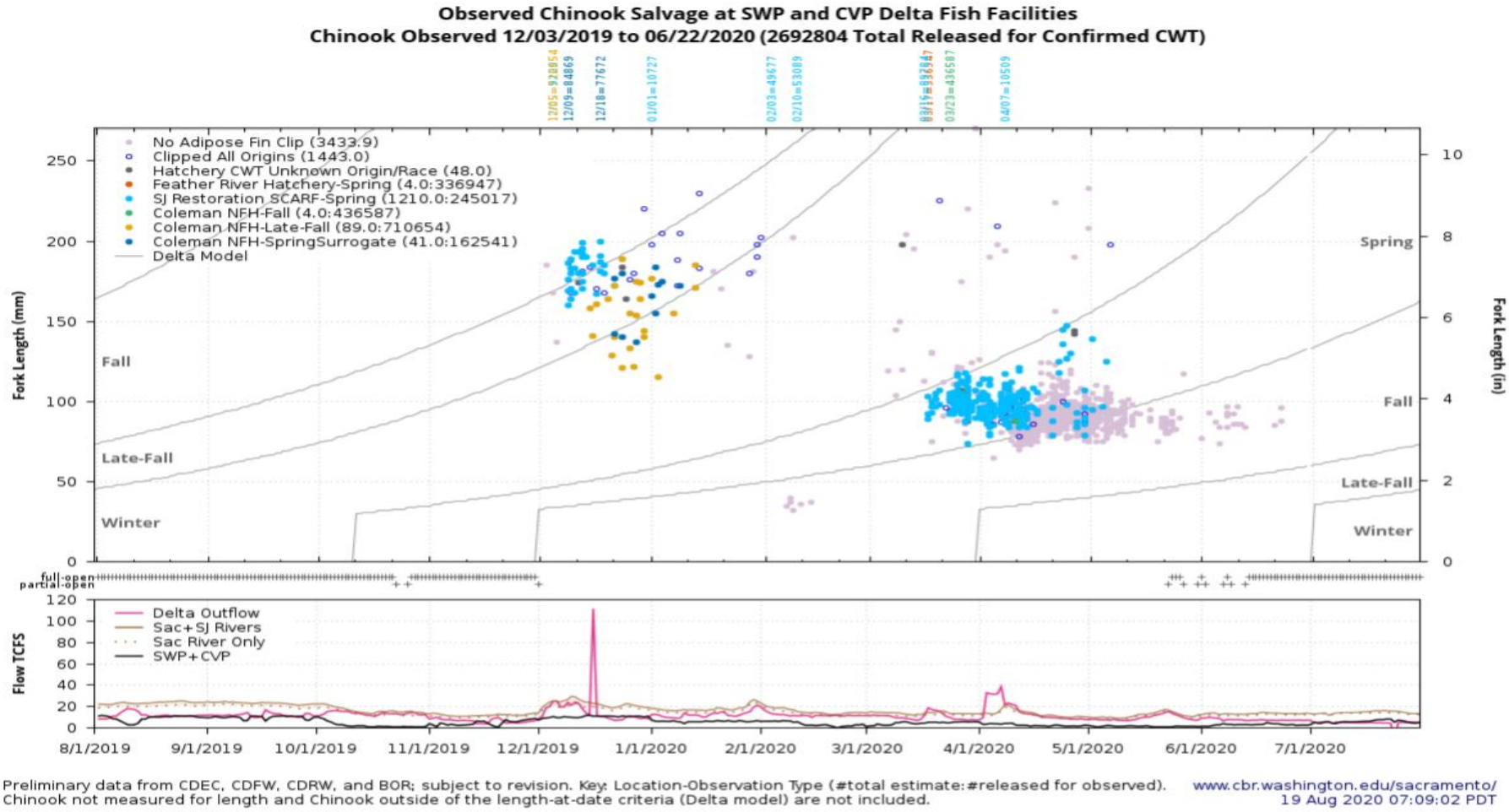
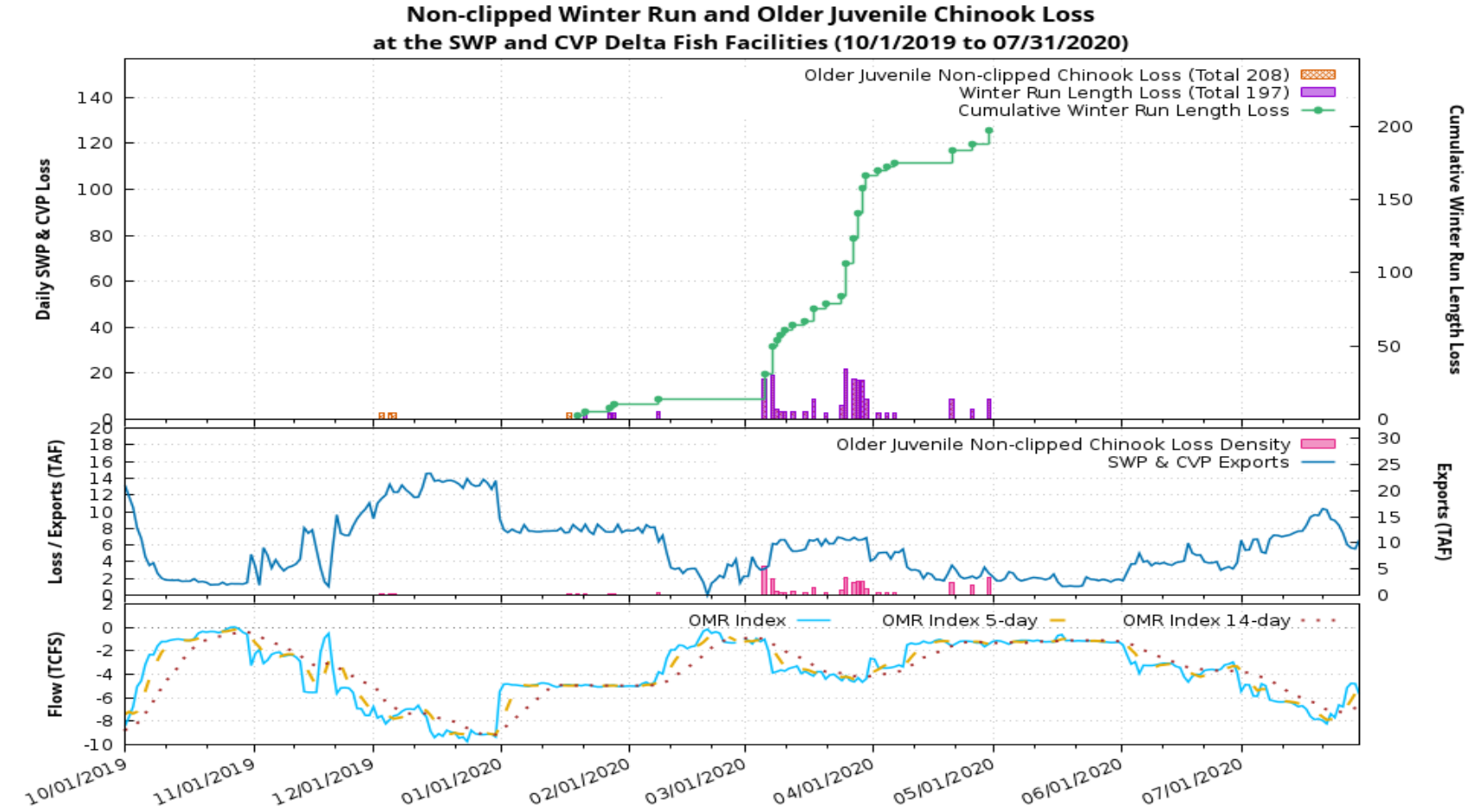


Figure 3. Daily loss and loss density of non-clipped Winter-run length and older juvenile Chinook Salmon at the Delta fish facilities using the current loss equation (DFW 2013), October 1, 2019, through July 31, 2020.



Preliminary data from CDFW; subject to revision. OMR Index calculated by SacPAS.
Older juvenile Chinook defined as matching winter run length-at-date criteria (Delta Model) up to max length-at-date size.

www.cbr.washington.edu/sacramento/
15 Dec 2020 13:19:27 PST

Figure 4. Non-clipped Winter-run length Chinook Salmon percent loss at the Delta fish facilities from October to June using the current loss equation (DFW 2013), Water Years 2010 through 2020.

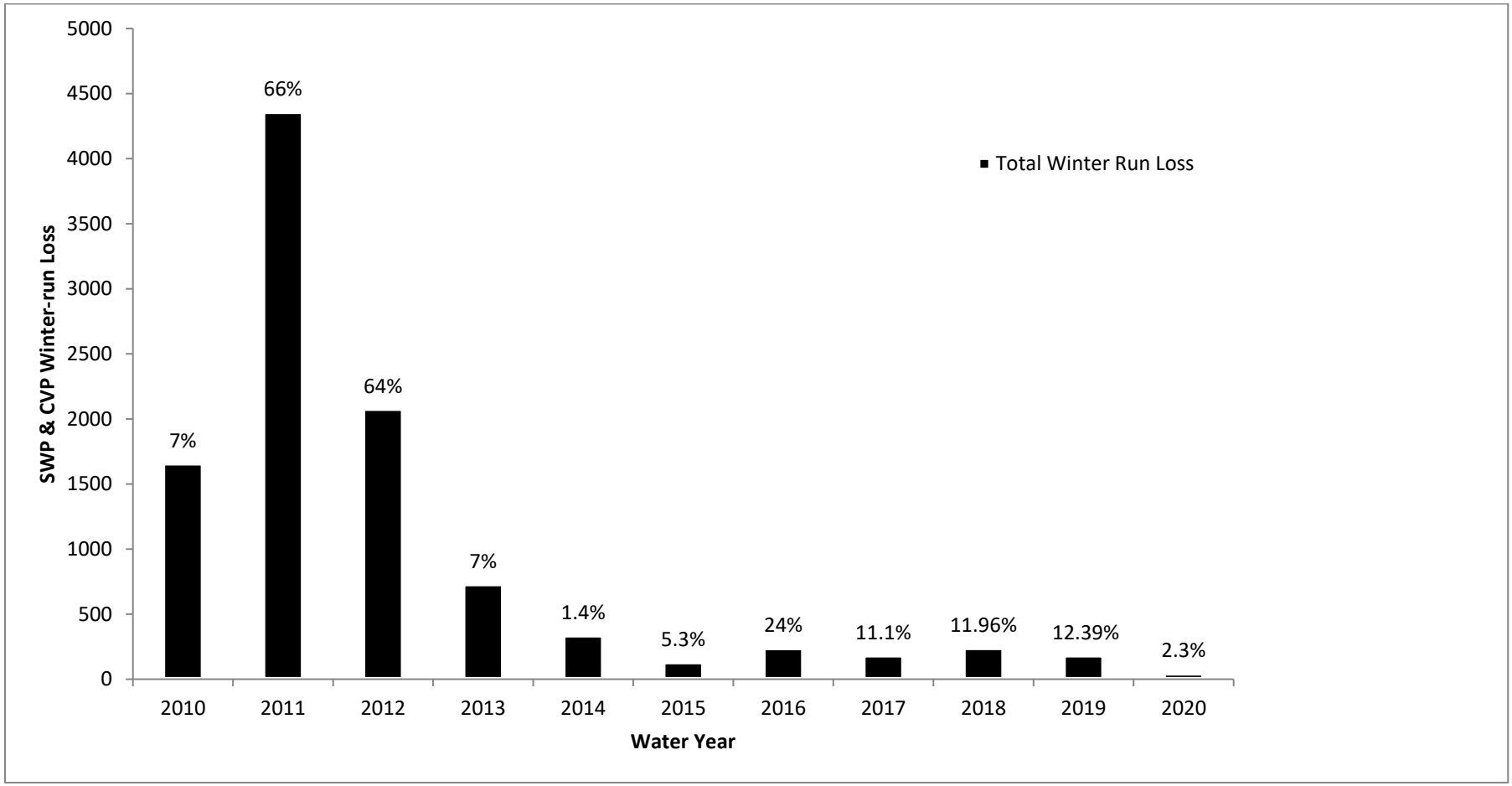


Figure 5. Unclipped Winter Chinook Expanded salvage number and timing at SWP and CVP, 2001-2019.

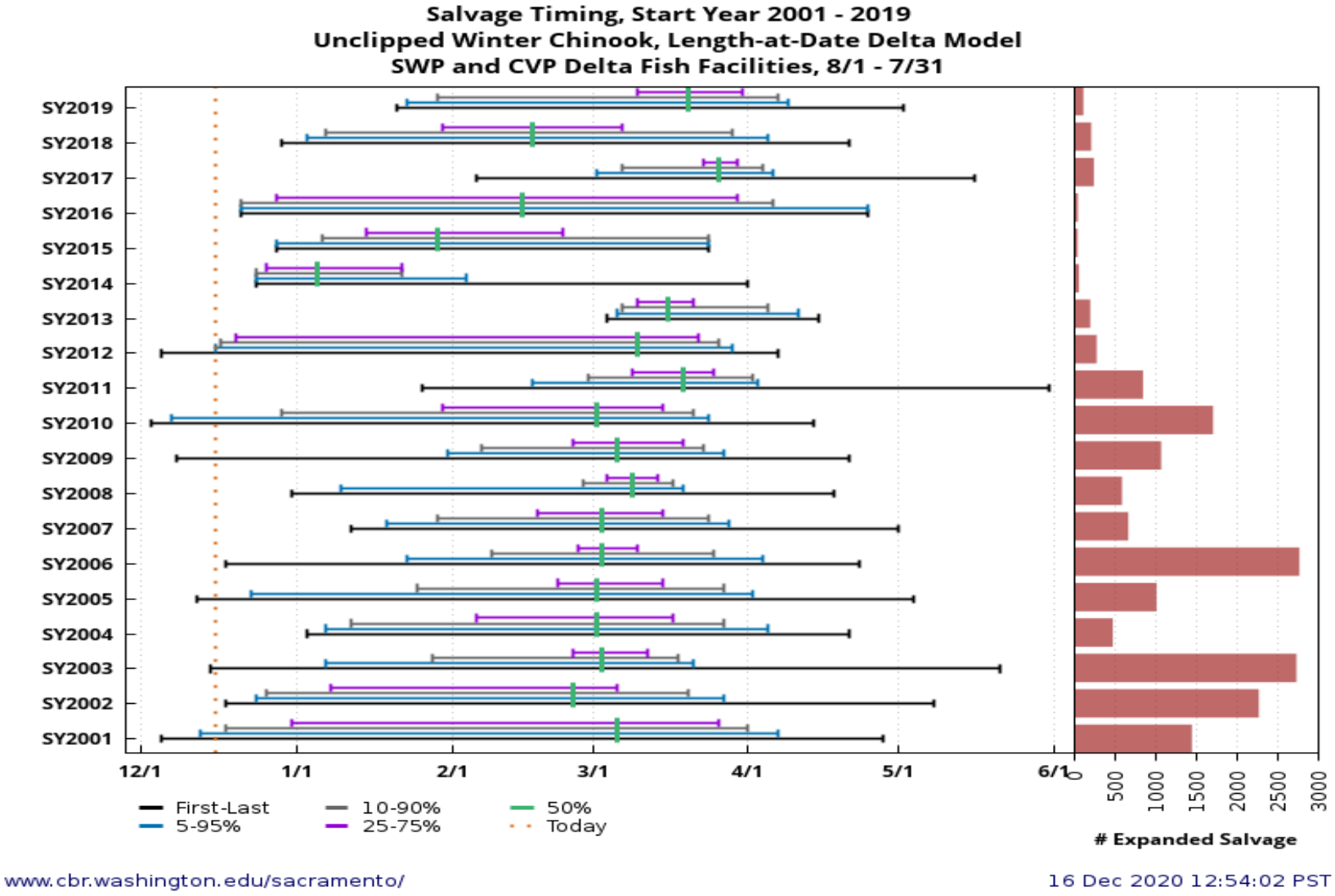


Figure 6. Daily loss and loss density of non-clipped fry/smolt Chinook Salmon at the Delta fish facilities using the current loss equation (DFW 2013), October 1, 2019 through July 31, 2020.

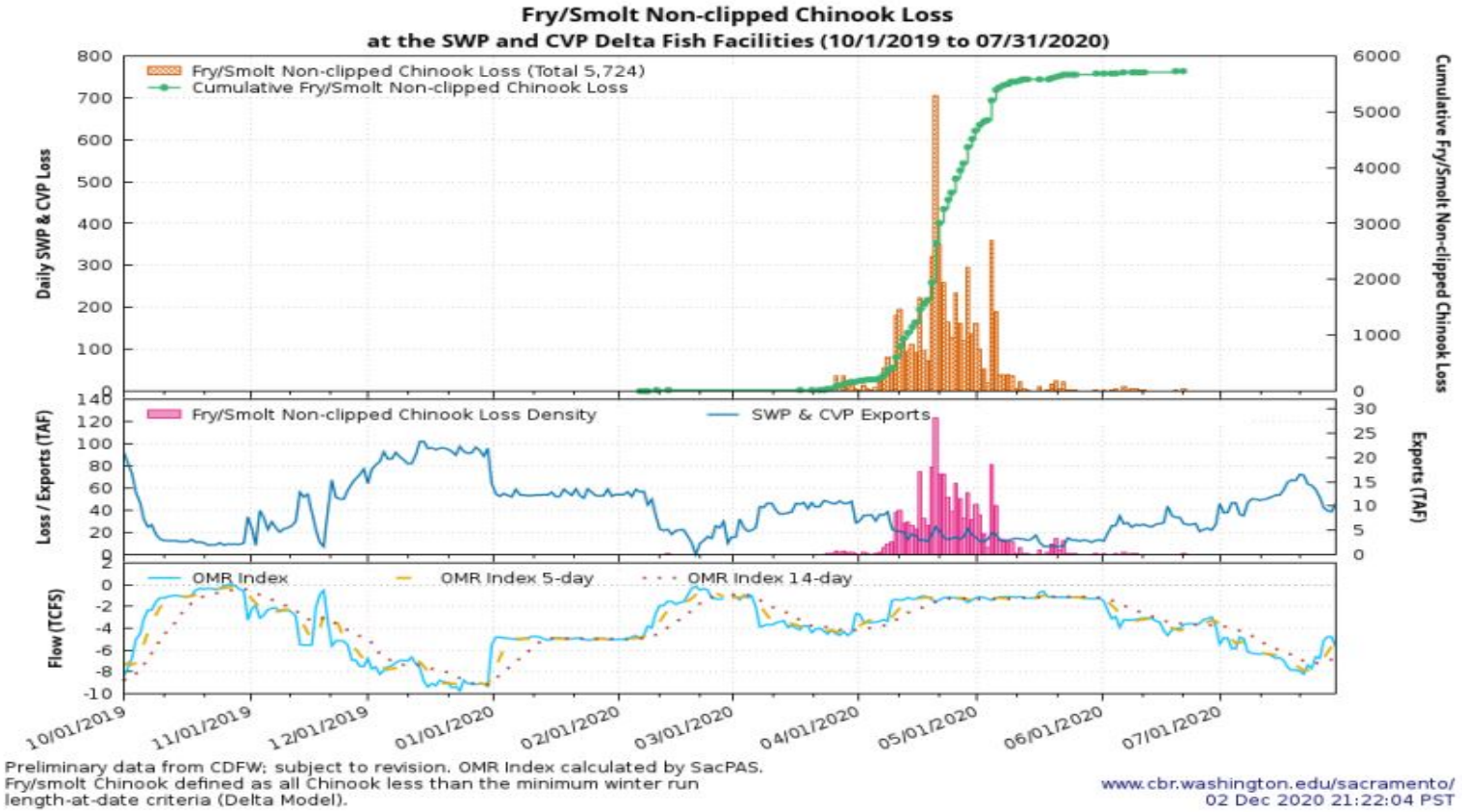
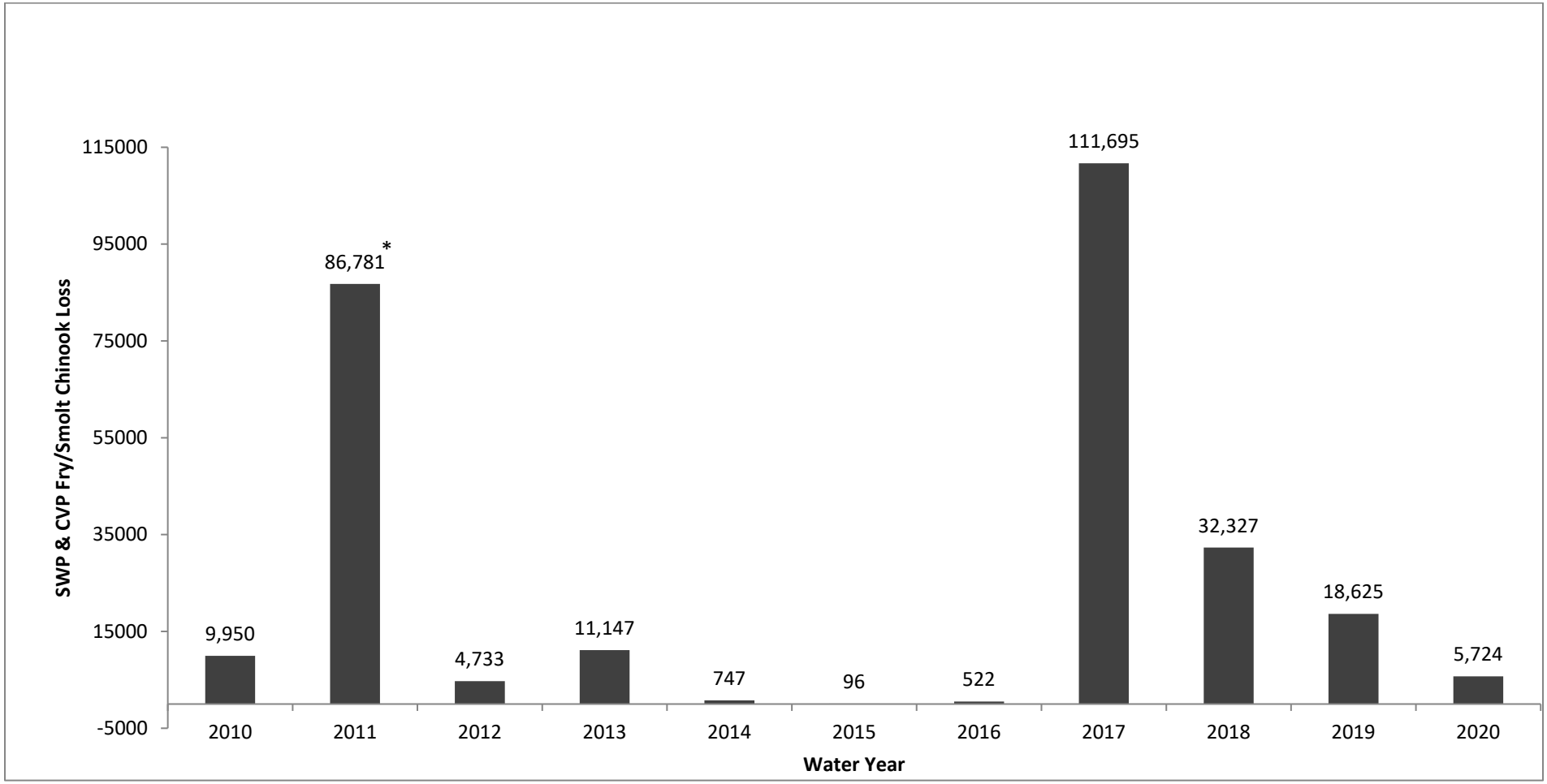
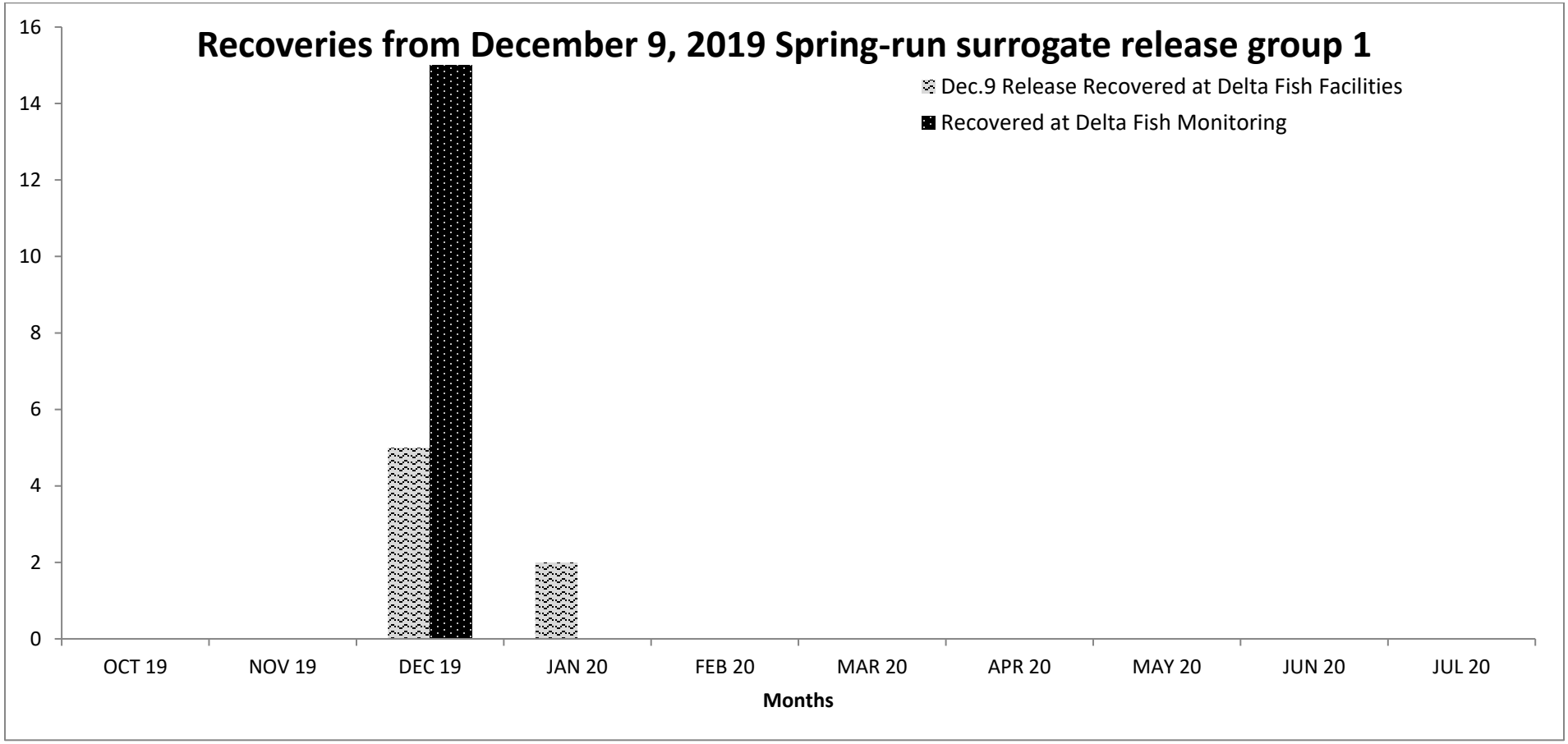


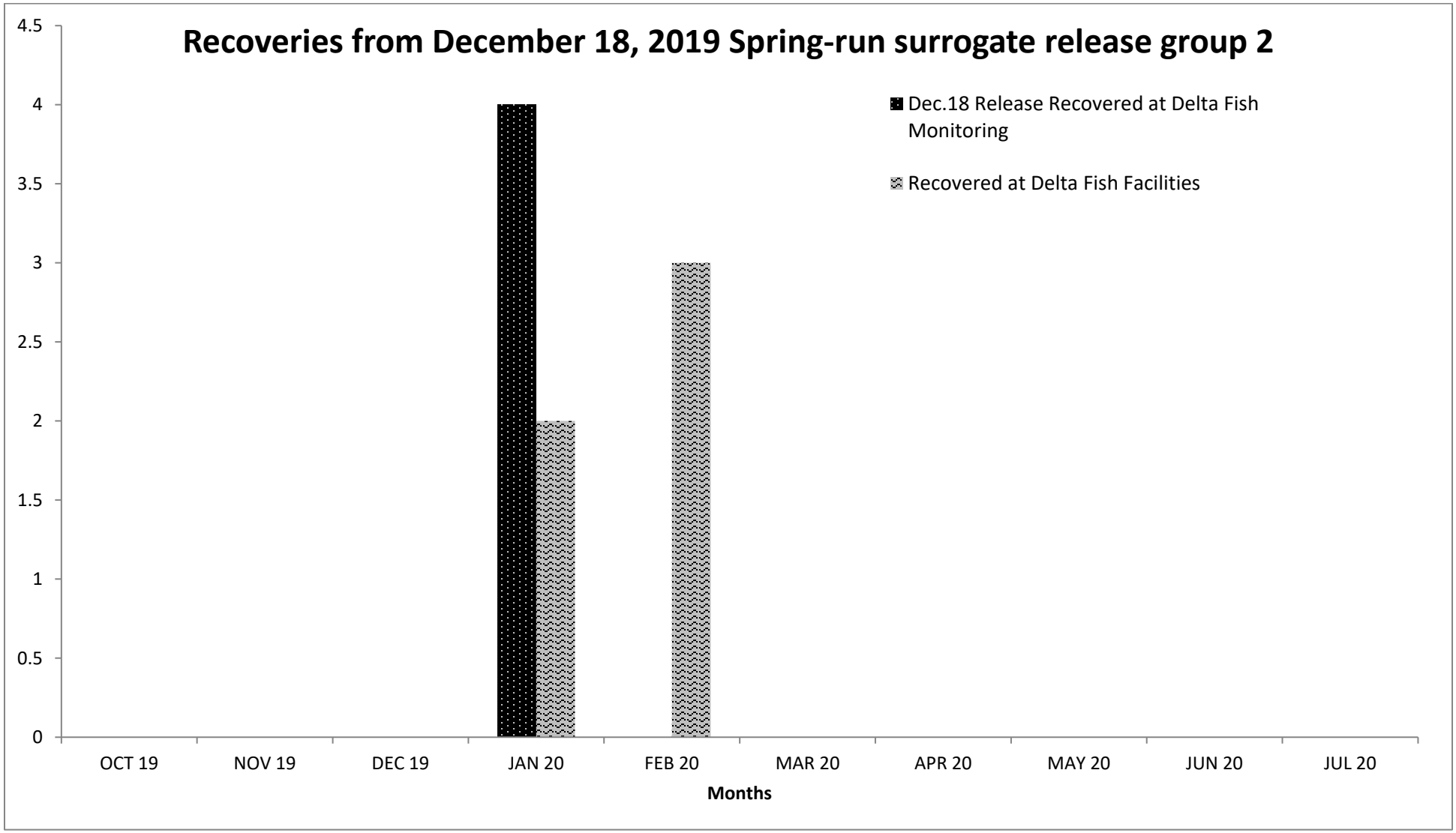
Figure 7. Non-clipped fry/smolt Chinook Salmon loss at the Delta fish facilities from October to July using the current loss equation (DFW 2013), Water Years 2010 through 2020



* in Water Year 2011, an additional loss of 2 fish occurred outside of the October to July period, which brings the annual loss total to 86,783 fish

Figures 8 (a,b,c). Older juvenile Chinook Salmon and CNFH late-fall Chinook Salmon (Spring-run surrogate) recoveries from the Delta monitoring program and loss at the Delta fish facilities, October 1, 2019 through June 30, 2020.




Recoveries from December 18, 2019 Spring-run surrogate release group 2
Dec.18 Release Recovered at Delta Fish Monitoring
Recovered at Delta Fish Facilities
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
OCT 19
NOV 19
DEC 19
JAN 20
FEB 20
MAR 20
APR 20
MAY 20
JUN 20
JUL 20
Months

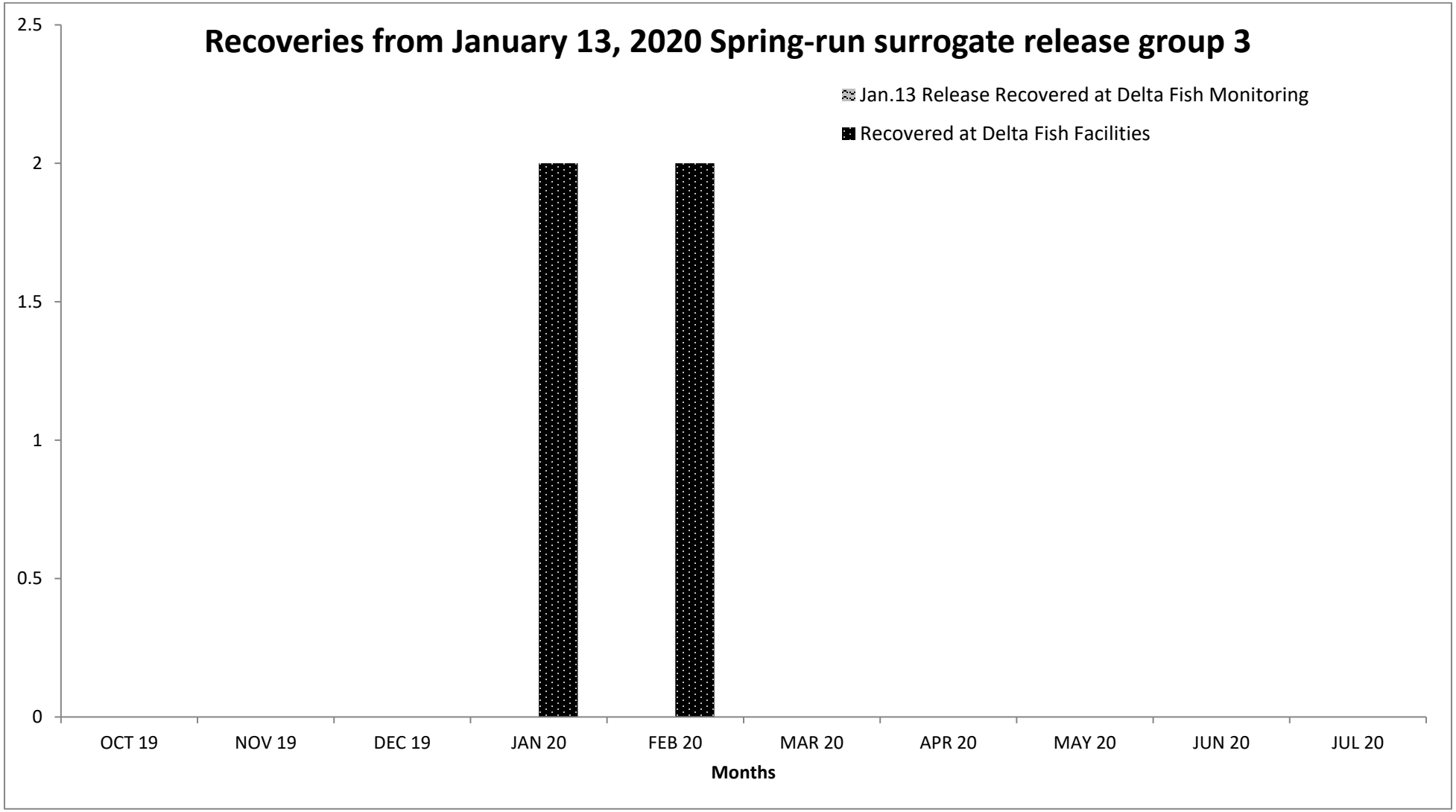

Recoveries from January 13, 2020 Spring-run surrogate release group 3
Jan.13 Release Recovered at Delta Fish Monitoring
Recovered at Delta Fish Facilities
2.5
2
1.5
1
0.5
0
OCT 19
NOV 19
DEC 19
JAN 20
FEB 20
MAR 20
APR 20
MAY 20
JUN 20
JUL 20
Months

Figure 9. LSNFH Winter-run Chinook Salmon recoveries from the Delta monitoring program and loss at the Delta fish facilities, October 1, 2019 through July 31, 2020.

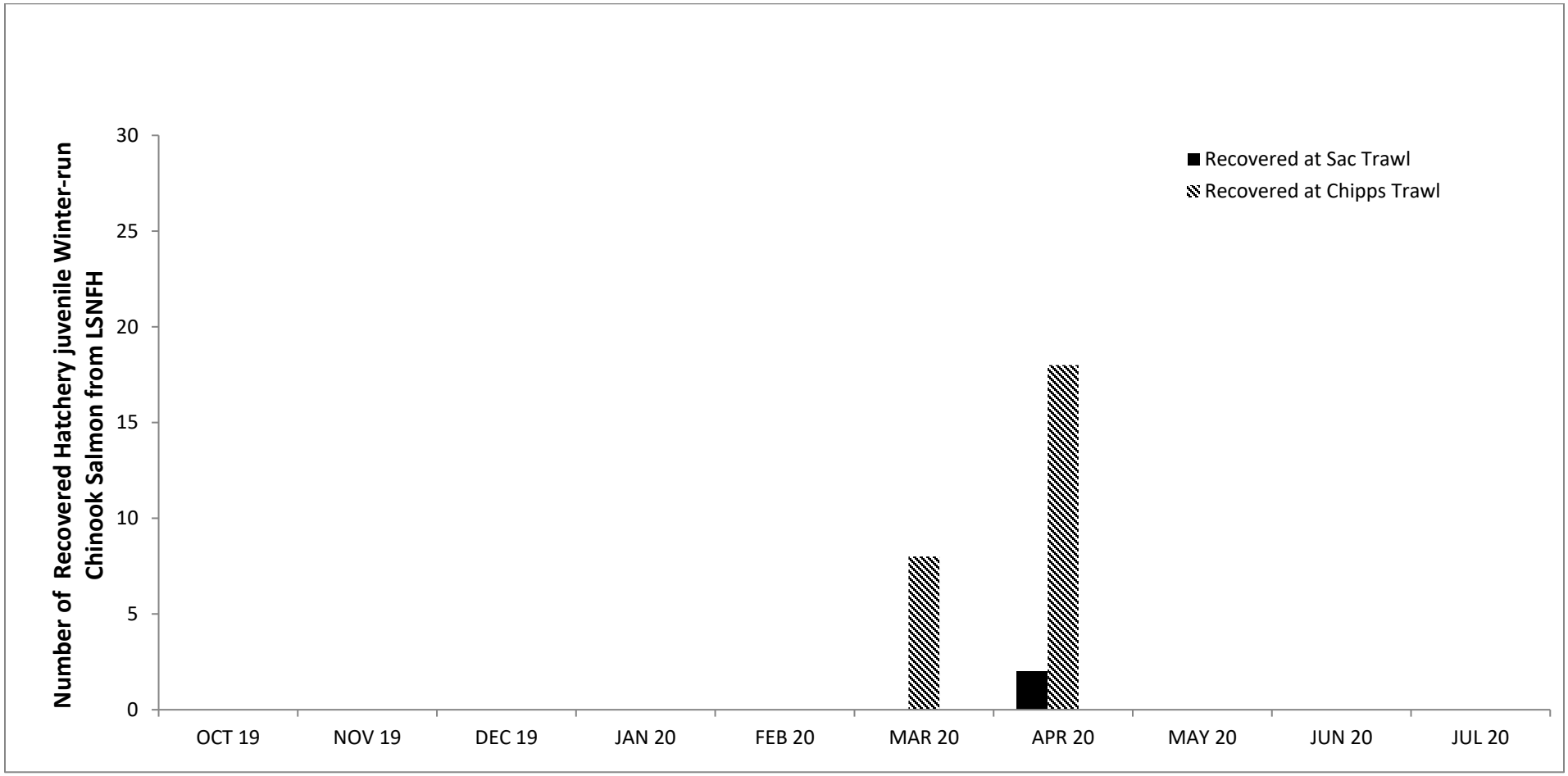


Figure 10. Non-clipped steelhead salvage at the Delta fish facilities, October 2019 through July 2020.

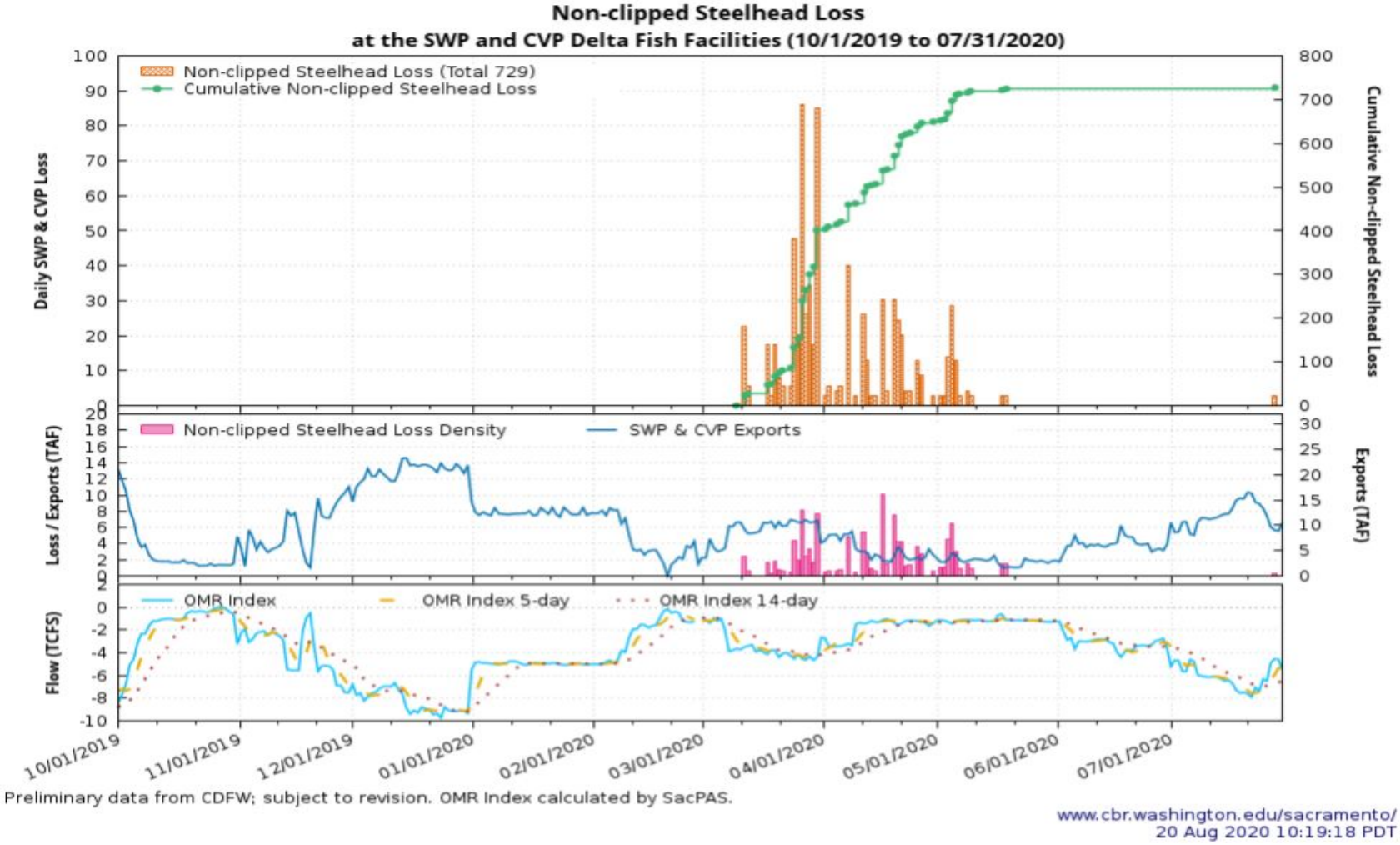


Figure 11. Total steelhead salvage (adipose fin clipped & non-clipped) at the Delta fish facilities, October 2019 through July 2020.

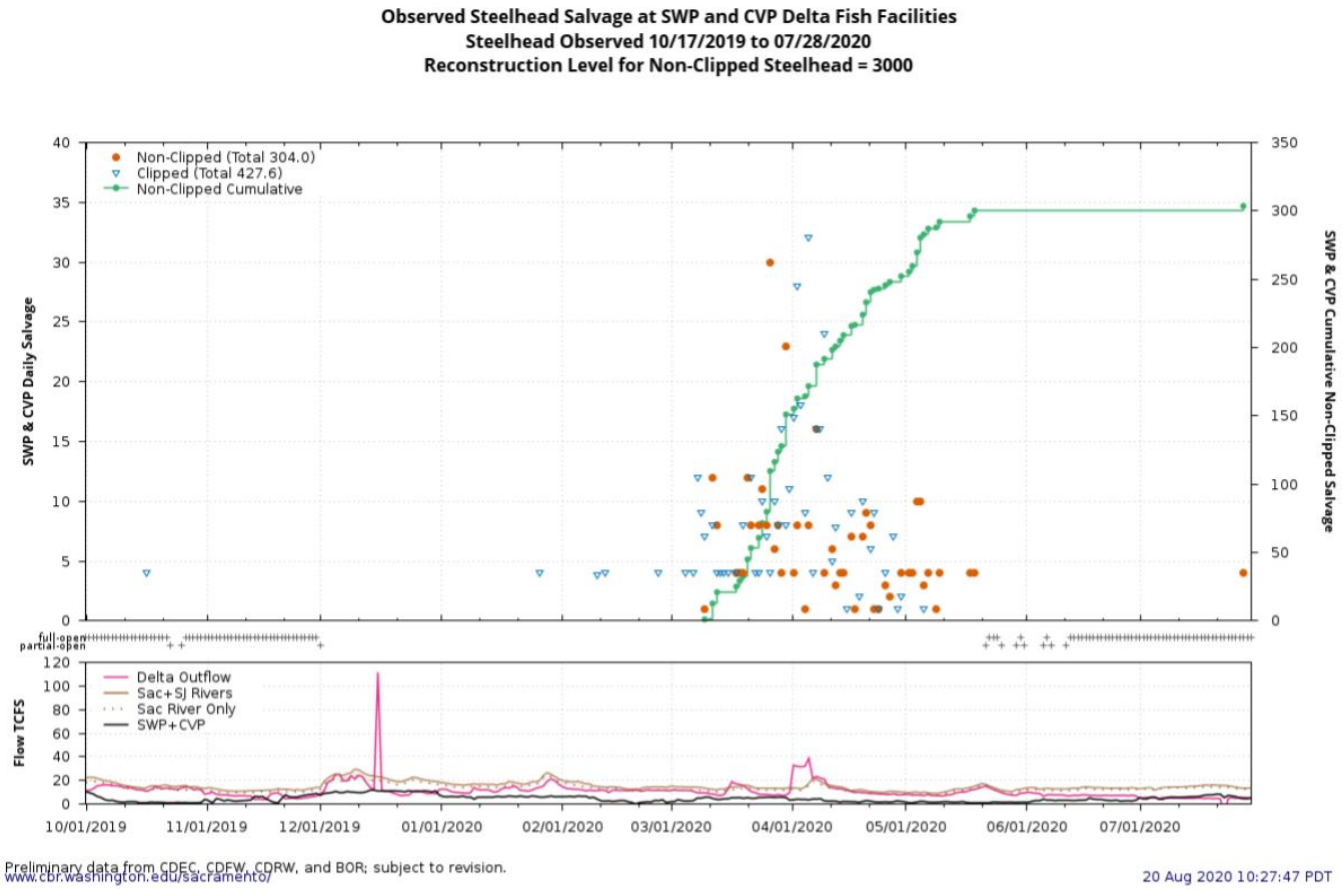


Figure 12. Non-clipped steelhead salvage at the Delta fish facilities from October to July, Water Years 2007 through 2020.

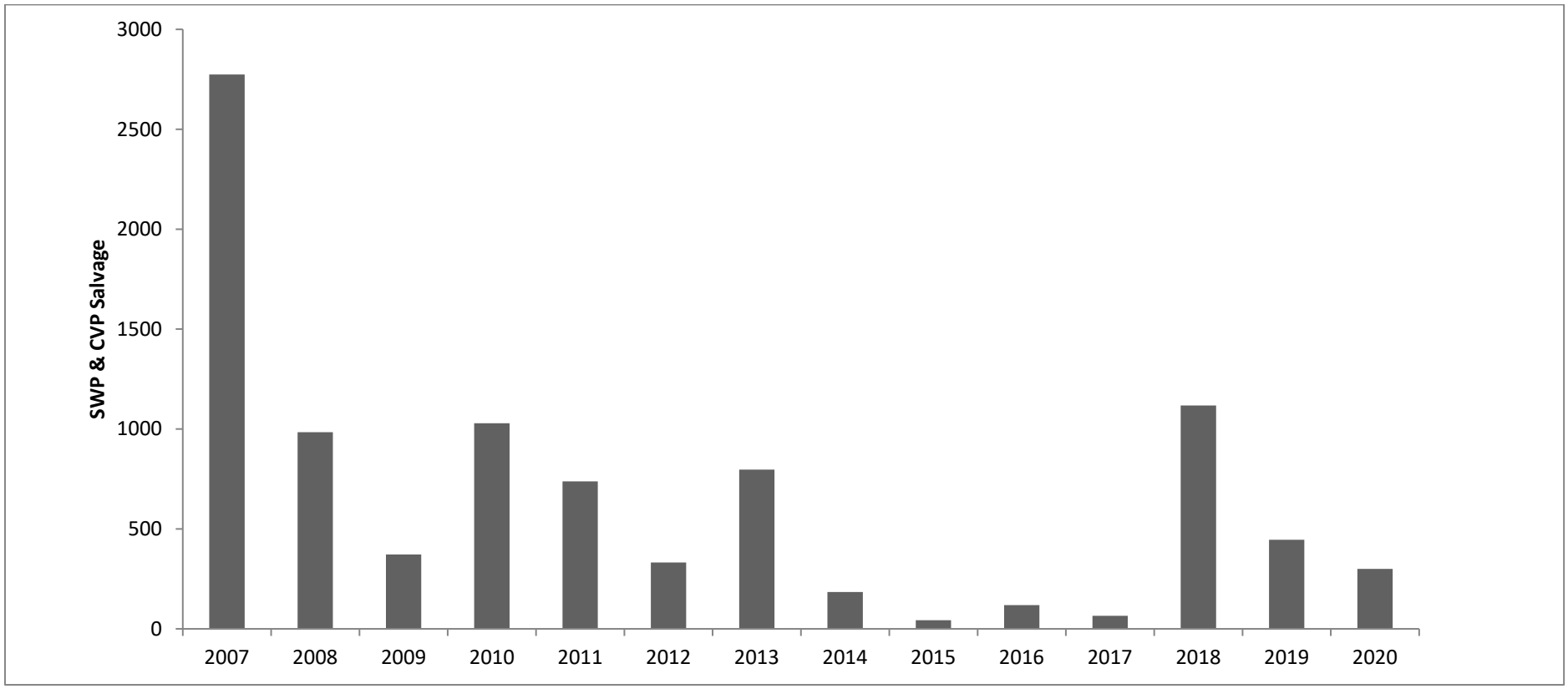


Figure 13. Hatchery (adipose fin clipped) steelhead salvage at the Delta fish facilities from October to July, Water Years 2007 through 2020.

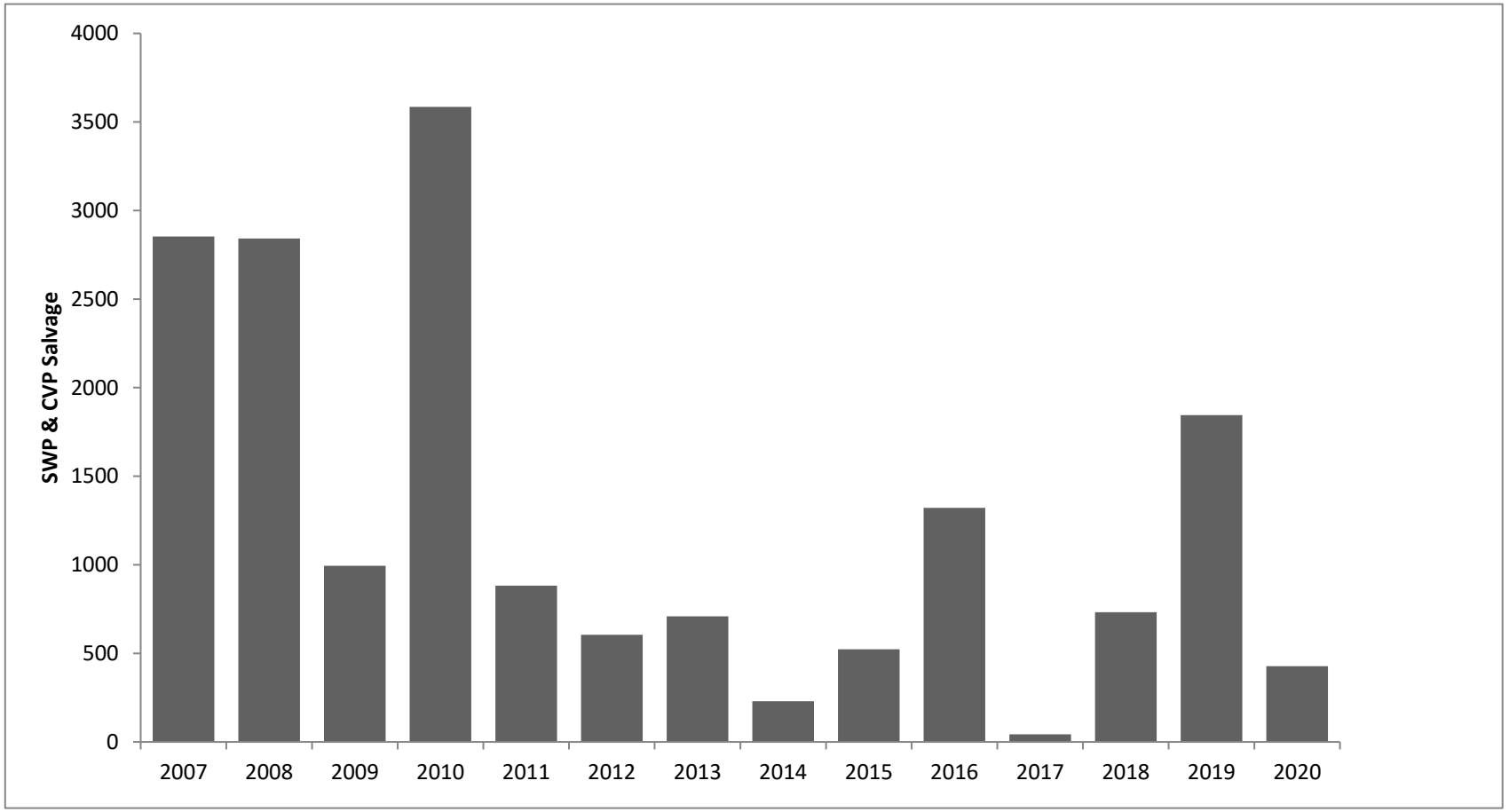


Figure 14. Daily loss and loss density of non-clipped steelhead at the Delta fish facilities using the current loss equation (DFW 2013), October 1, 2019 through July 31, 2020.

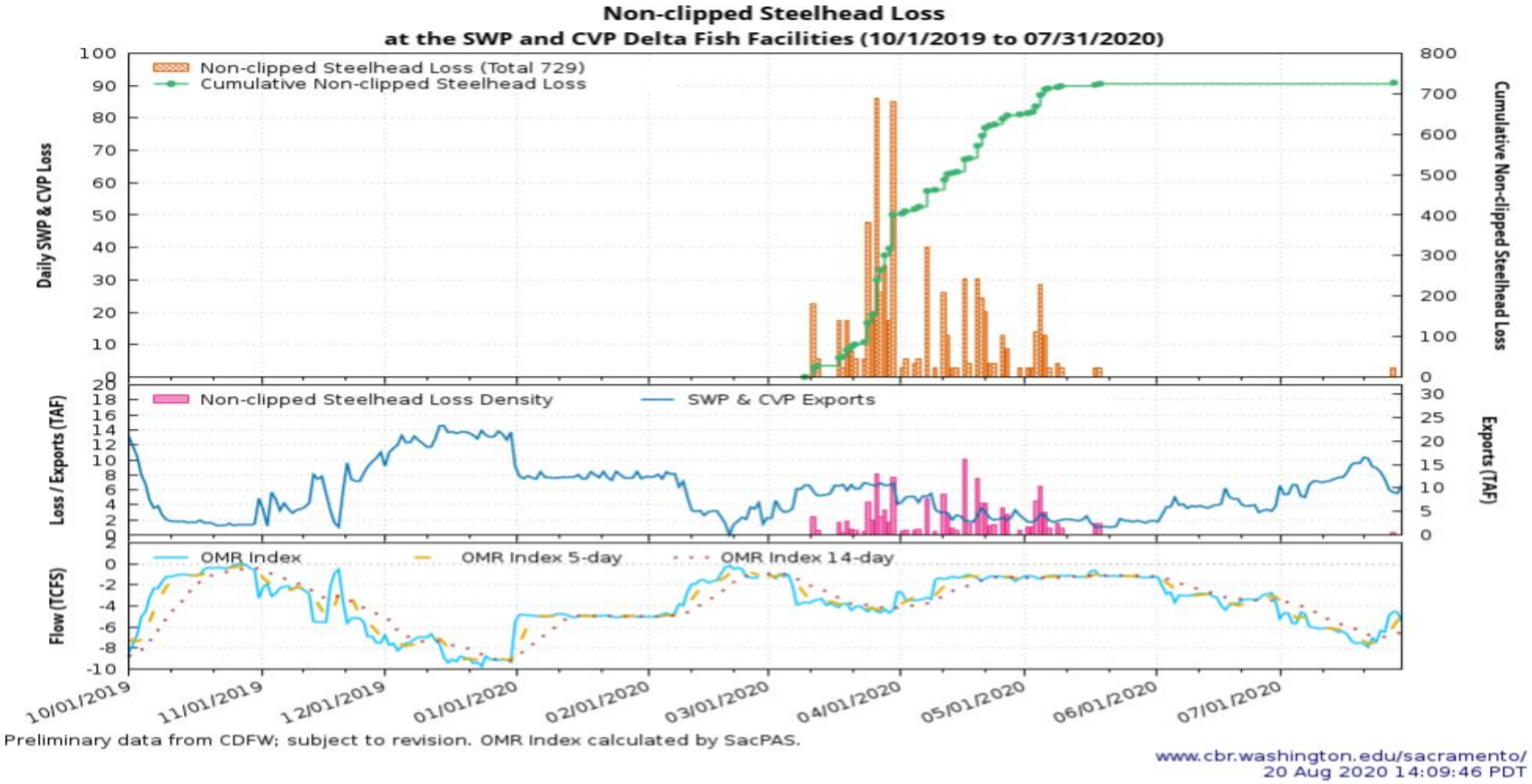


Figure 15. Green sturgeon salvage at the Delta fish facilities from October to July, Water Years 2008 through 2020.

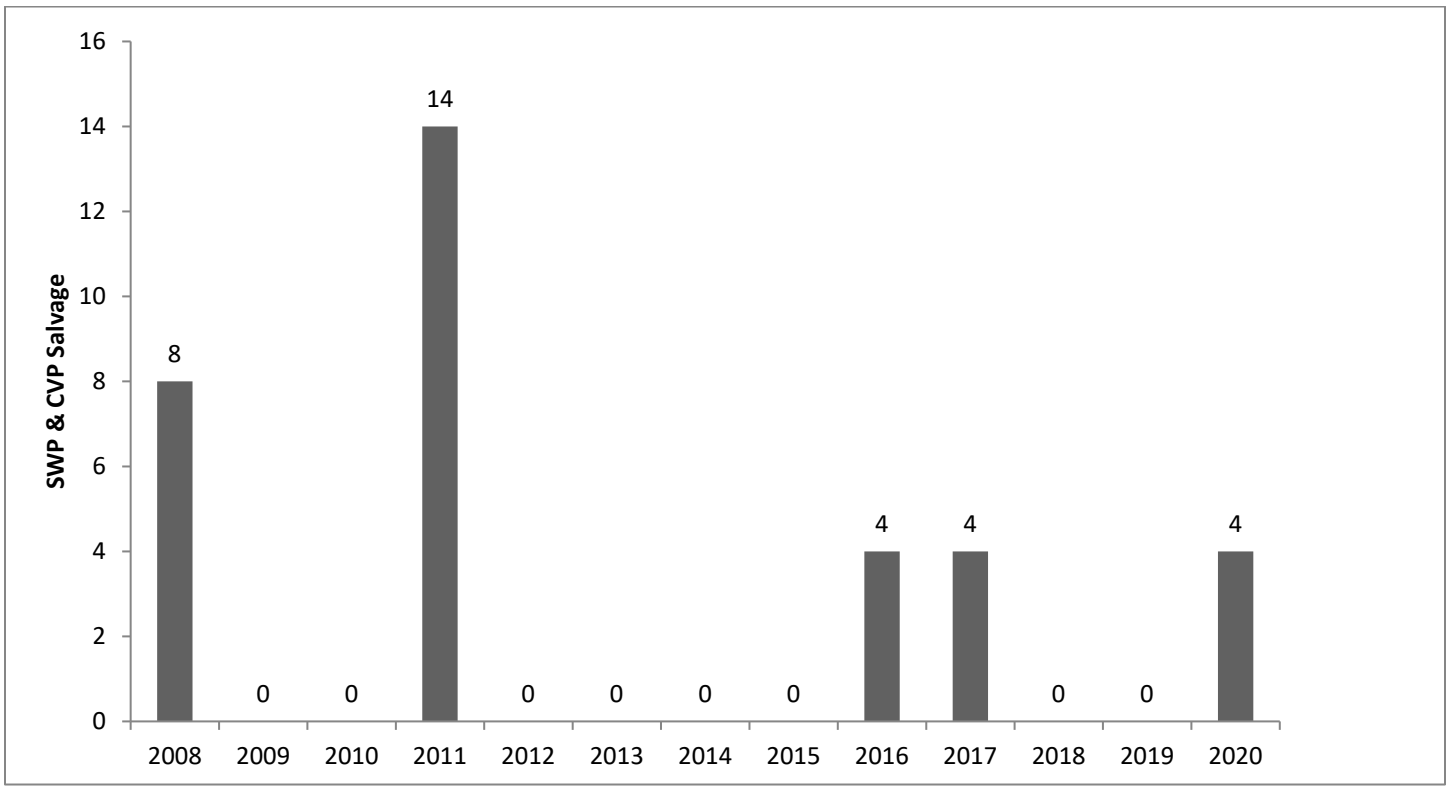


Figure 16a. Monthly averages of Delta Outflow(cfs) from October to July, Water Years 2015 through 2020.

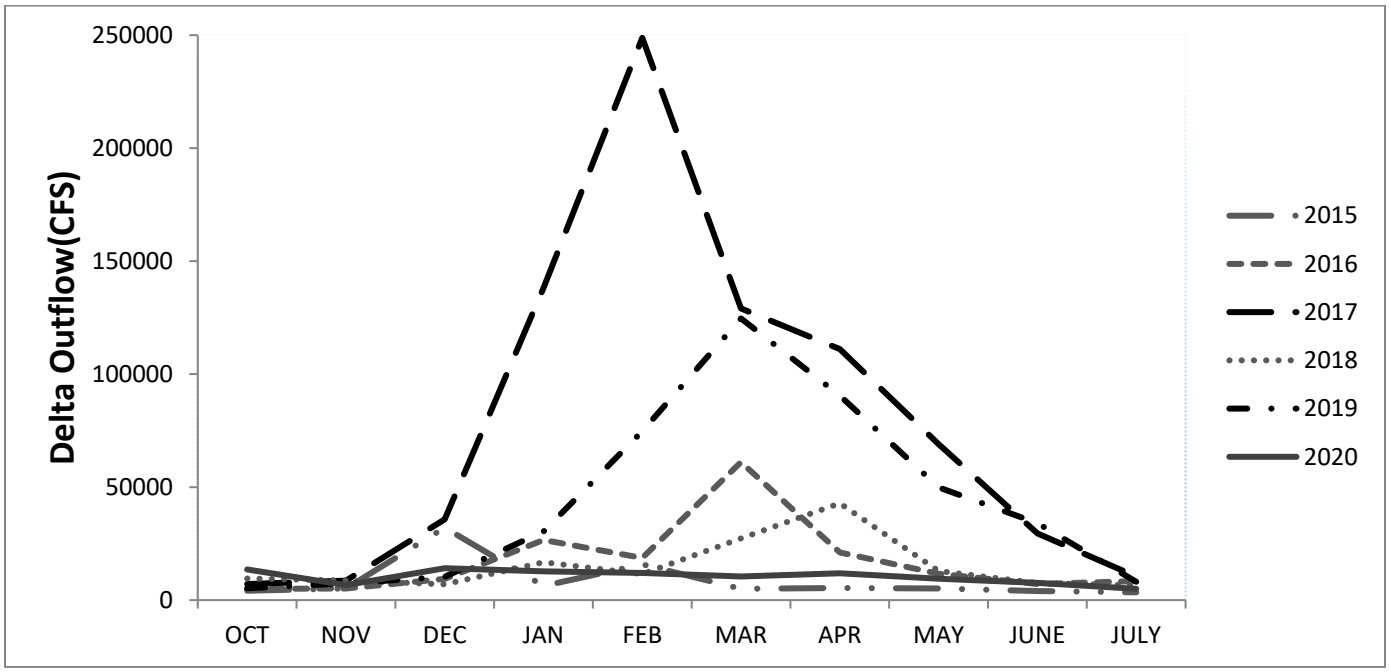


Figure 16b. Monthly averages of SWP and CVP Exports(cfs) from October to July, Water Years 2015 through 2020.

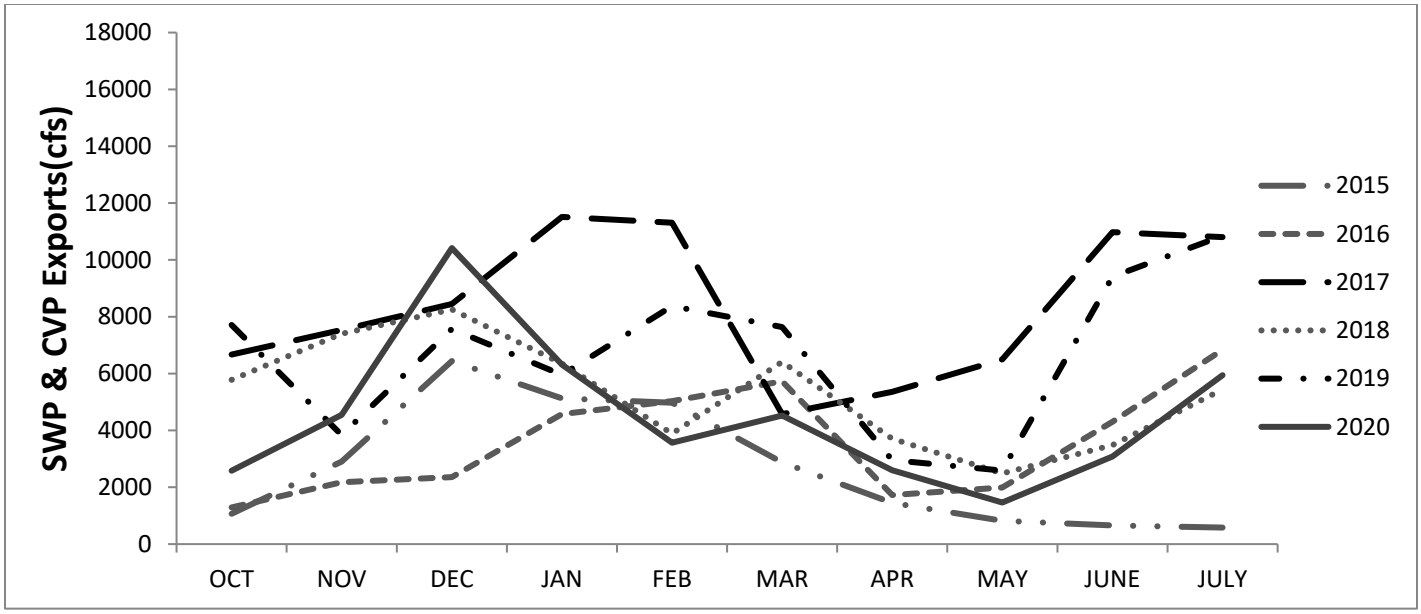


Figure 16c. Monthly averages of the Sacramento River at Freeport from October to July, Water Years 2015 through 2020.

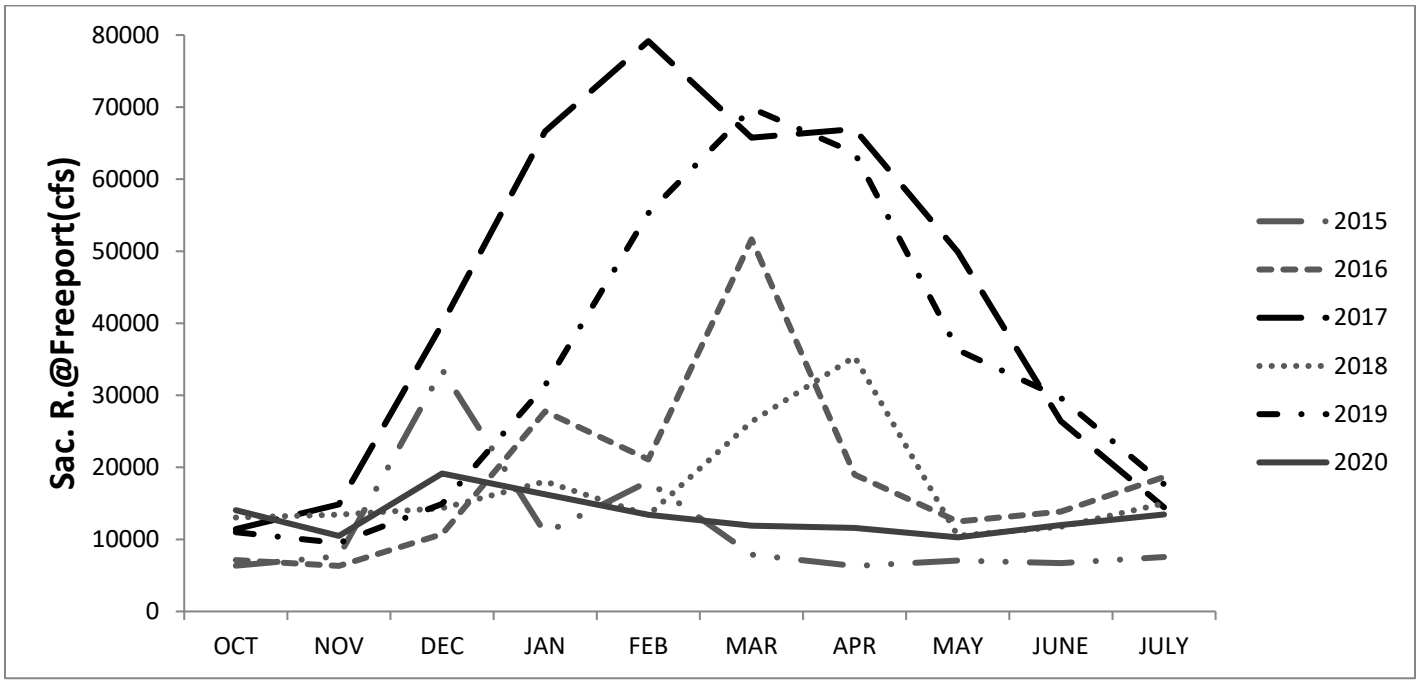


Figure 16d. Monthly averages of the San Joaquin River at Vernalis from October to July, Water Years 2015 through 2020.

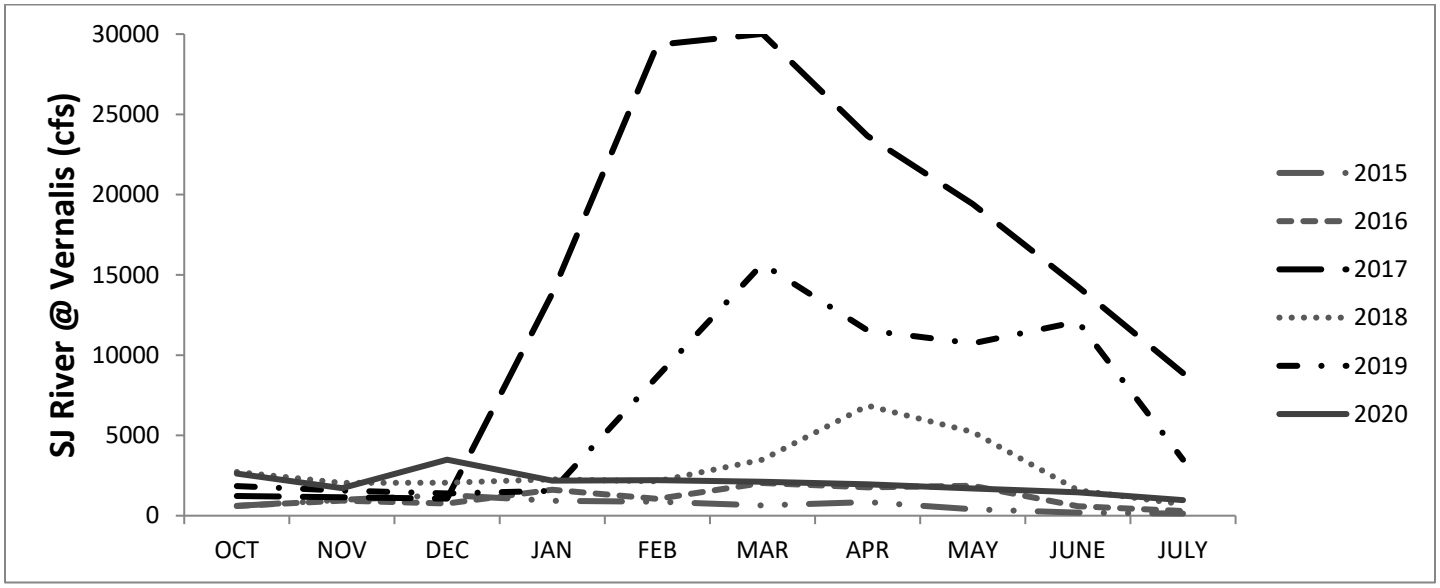
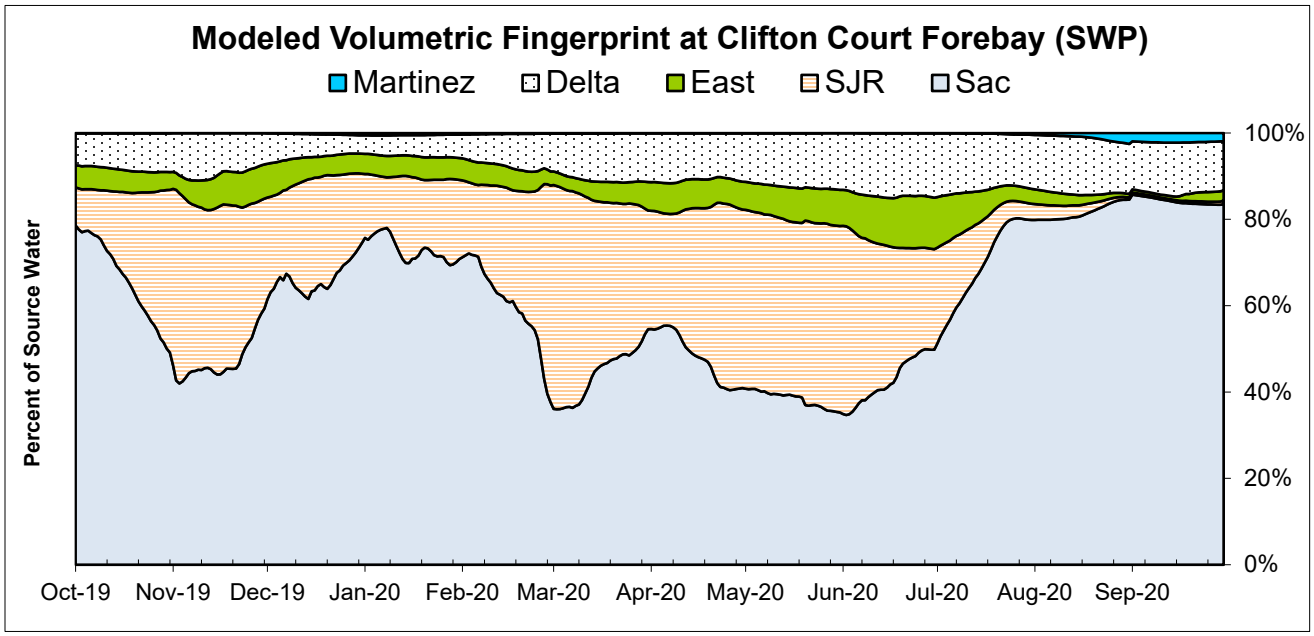
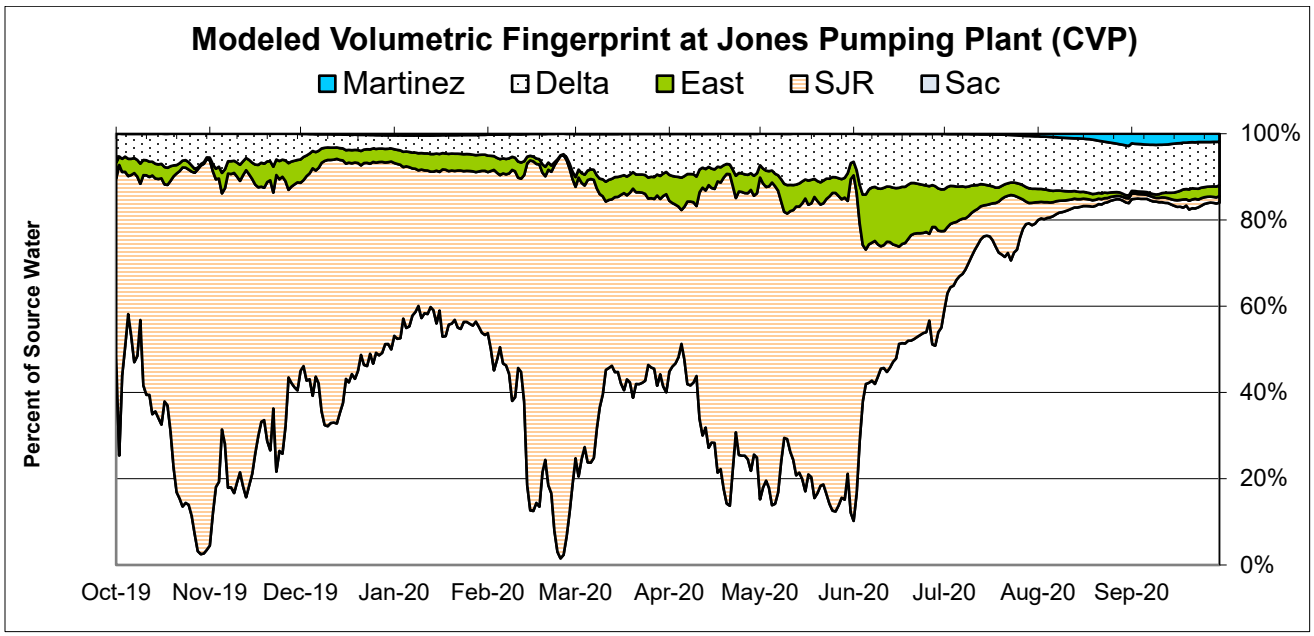


Figure 17. Modeled volumetric water fingerprint for the Clifton Court Forebay (SWP) as derived from DSM2, October 2019 through September 2020.



Sacramento-San Joaquin 2019/2020 Delta fingerprint figure from DWR-Operations Control Office

Figure 18. Modeled volumetric water fingerprint for the Jones Pumping Plant (CVP) as derived from DSM2, October 2019 through September 2020.



Sacramento-San Joaquin 2019/2020 Delta fingerprint figure from DWR-Operations Control Office

Table 1. Unknown hatchery (adipose fin clipped) Chinook Salmon loss at the Delta fish facilities using the current loss equation (DFW 2014), October 2019 through June 2020.

Facility	Unknown CWT Loss[5]	Unread CWT Loss[6]	Unknown Hatchery Loss[7]	Acoustic Tag Loss[8]	Number of Unassigned CWTs[9]
SWP	130.22				
CVP	14.70				
TOTAL	**144.92**				

[5]Adipose-fin clipped Chinook was observed during fish count, but tag code could not be determined (e.g., damaged tag, lost tag, no tag, or Chinook released).

[6]Adipose-fin clipped Chinook was collected during fish count and has not been processed yet.

[7]CWT has been read, but hatchery release information not yet available.

[8]Adipose-fin clipped Chinook released due to presence of sutures.

[9]CWT cannot currently be assigned to a salvage record with certainty since the CWT was lost and then found. CWT may be assigned to a salvage record if new information is available.

Table 2. Hatchery (adipose fin clipped) Chinook Salmon loss at the Delta fish facilities using the current loss equation (DFW 2014), October 2019 through June 2020.

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]
12/9/2019	LF	Coleman NFH	Battle Creek	Spring Surrogate	20.21	84,869	n/a	0.024	n/a	0.5%	12/22/2019	1/9/2020
12/18/2019	LF	Coleman NFH	Battle Creek	Spring Surrogate	25.03	77,672	n/a	0.032	n/a	0.5%	1/1/2020	1/4/2020
1/13/2020	LF	Coleman NFH	Battle Creek	Spring Surrogate		77,866	n/a		n/a	0.5%		

[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.

Table 3. Monthly averages of hydrologic parameters in the Sacramento-San Joaquin River Delta, October 2019 through July 2020.

	SWP (Banks) Average Exports		CVP (Jones) Average Exports		Sacramento River Average Flow	San Joaquin River Average Flow	Delta Outflow Average Flow
Month	TAF	cfs	TAF	cfs	cfs	cfs	cfs
Oct	71	1149	88	1435	14058	2626	13559
Nov	193	3139	86	1405	10484	1720	6648
Dec	421	6847	219	3569	19145	3488	14116
Jan	132	2148	256	4167	16258	2182	12712
Feb	117	1902	102	1667	13408	2216	12028
Mar	116	1882	162	2641	11900	2115	10489
Apr	42	677	118	1924	11600	1959	11854
May	33	531	57	932	10283	1695	9442
Jun	31	496	159	2584	11983	1461	7596
Jul	120	1952	245	3990	13449	969	5004