California Department of Fish and Wildlife

North Central Region

Wallace Weir Fish Trapping and Relocation Efforts

2024 – 2025

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Purpose

The purpose of this document is to summarize the fish salvage efforts during the 2024-2025 trapping season in the Knights Landing Ridge Cut (KLRC) using the Wallace Weir Fish Collection Facility (Facility). The information in this document is intended to 1) provide historical context describing why a permanent fish collection facility was constructed, 2) document fish salvage efforts in the KLRC at the Facility, 3) show species composition observed in the Facility and 4) compare salvage efforts between the Facility and temporary trapping methods (i.e., fyke traps).

Introduction

Non-natal straying is a natural occurrence for adult salmonids and serves to increase genetic diversity among populations from different watersheds (Quinn, 1984). Anthropogenic impacts to natural waterways such as damming of rivers, water diversions, and the creation of artificial waterways have led to increased straying of adult salmonids in the California Central Valley. Adult salmonids can be attracted to the outflow from man-made canals and become entrained in them. These canals are usually not connected to a river upstream and oftentimes have poor habitat and water quality for adult salmonids and can make them vulnerable to predation and poaching. The entrainment of these fishes leads to a reduction in the adult spawning population. These losses are especially detrimental to Central Valley winter-run and spring-run Chinook Salmon *(Oncorhynchus tshawytscha)*. *S*outhern distinct population segment (sDPS) of Green Sturgeon **(***Acipenser medirostris*) and White Sturgeon (*Acipenser transmontanus*) have also been rescued as part of these efforts. These species are listed as threatened or endangered under the federal Endangered Species Act (ESA) and state of California Endangered Species Act (CESA). To reduce and prevent entrainment losses, the California Department of Fish and Wildlife (CDFW) has implemented salvage efforts in these man-made canals where salmonids have been observed. Beginning in 2013, CDFW has seasonally installed temporary traps in the Colusa Basin Drainage Canal (CBDC), KLRC, and the eastern toe drain of the Yolo Bypass (Toe drain) for salvaging ESA listed anadromous species (Figure 1). Although these efforts may reduce the impacts from artificially augmented straying, they are not a permanent solution.

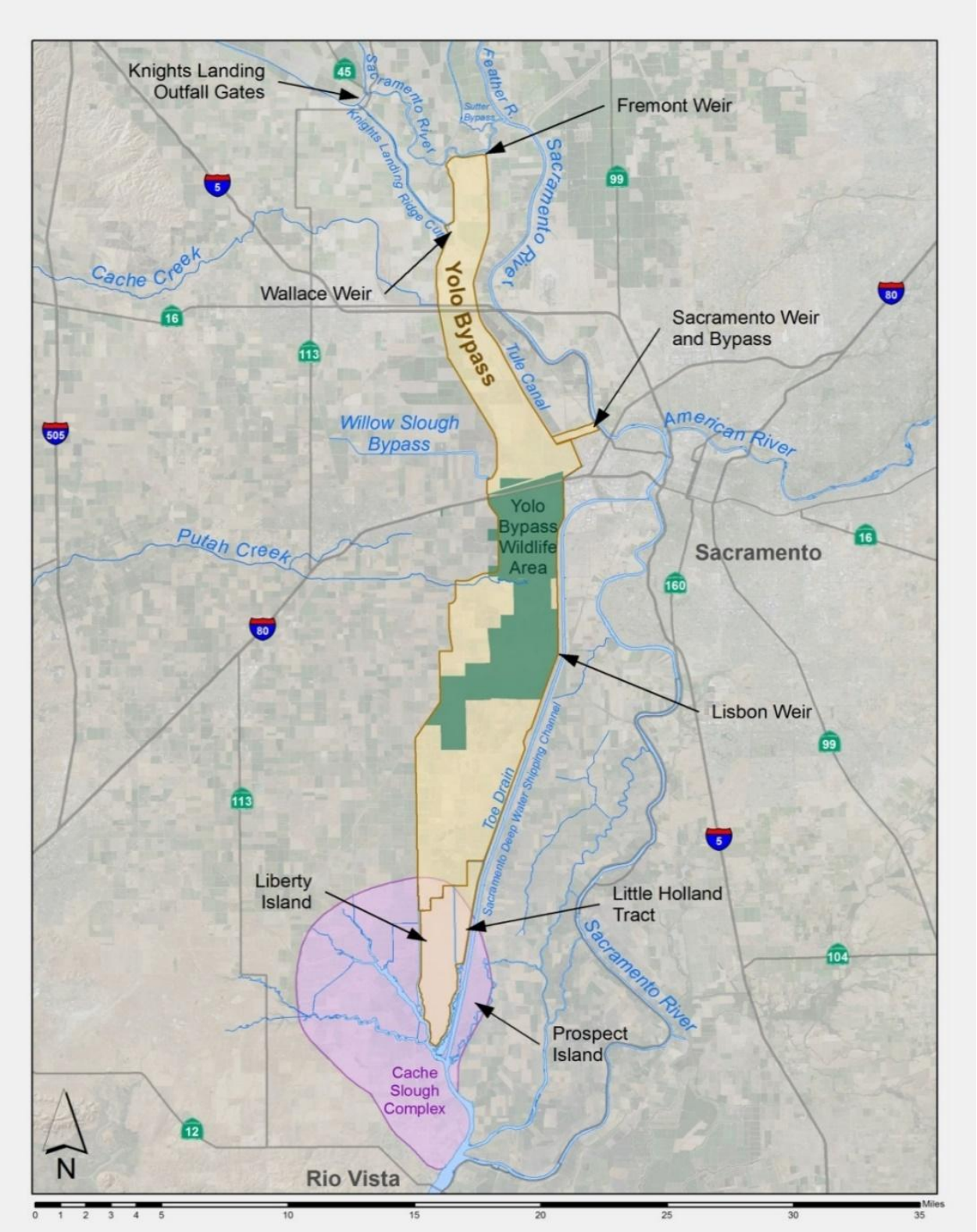

Figure 1. Map of the Yolo Bypass showing the Knights Landing Outfall Gates, Wallace Weir, and the Cache Slough Complex.

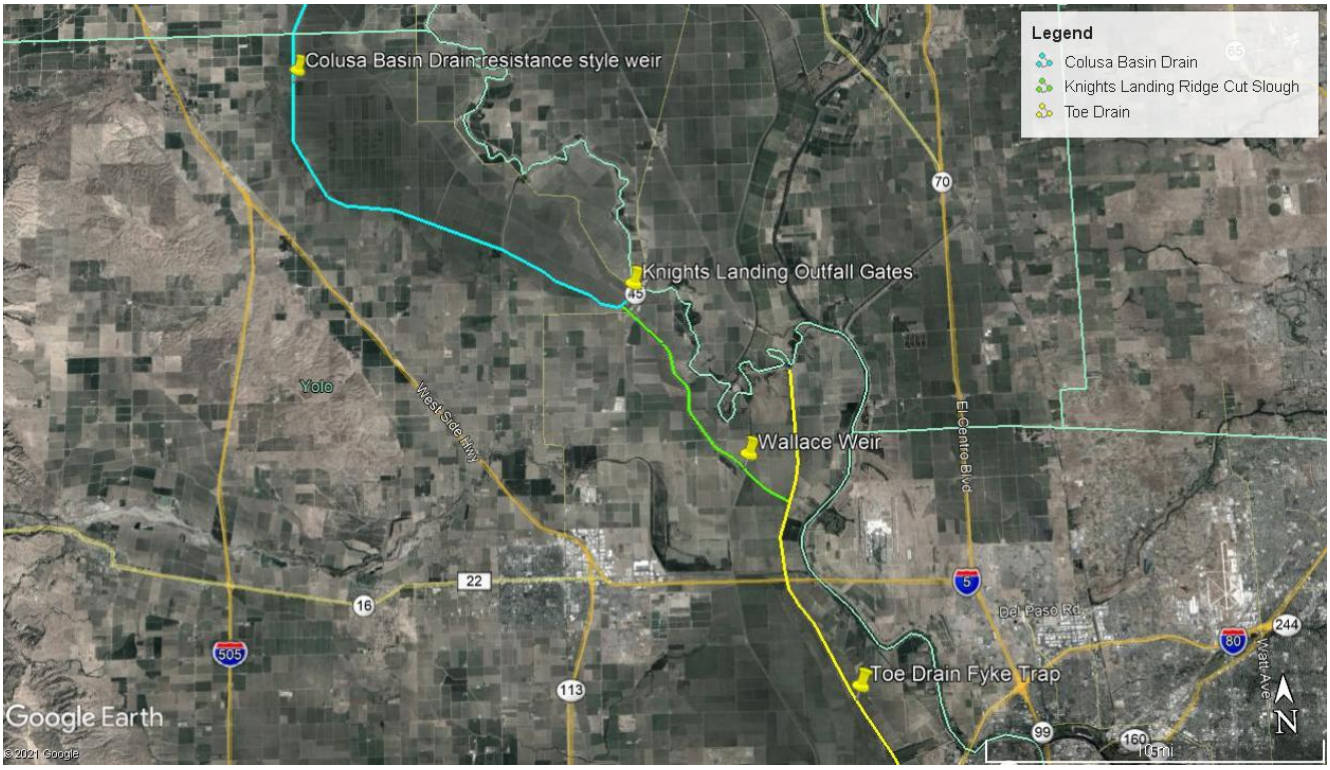

Figure 2. Map showing temporary trap site locations since 2013 in the Colusa Basin Drain (blue), Knights Landing Ridge Cut (green), and the eastern toe drain of the Yolo Bypass (yellow).

Background

During the spring of 2013, CDFW rescued 312 adult Chinook Salmon from the CBDC, a man-made canal that drains approximately one million acres of agricultural land from Glenn, Colusa, and Yolo counties. Genetic and coded wire tag analyses revealed that many of the Chinook Salmon rescued were federally listed winter-run and spring-run origin fish. Following this rescue effort, CDFW implemented trapping efforts upstream of two possible entry points into the CBDC: The Knights Landing Outfall Gates (KLOG) and the Cache Slough Complex (CSC) (Figure 1). Multiple years of trapping in these locations have revealed that much of the salmonid entrainment occurs in the KLRC via the CSC. Conditions allowing for entrainment into the KLRC occur more frequently throughout the year and under a wider range of water years compared to the number of days KLOG is passable in a given year (Gahan et al., 2016). As such, it was deemed necessary to have a more permanent means of salvaging listed Salmon and Sturgeon from the KLRC. Trapping efforts in the KLRC historically took place approximately 200 meters downstream of an agricultural water control structure known as Wallace Weir (Figure 2). The weir consisted of an earthen berm and manually operated culvert with a wooden slide gate. During high flow events in the KLRC and Yolo Bypass, the weir was subjected to overtopping flows and erosion and needed to be repaired after such events. Similarly, the temporary fyke trap used for salvage operations was also subject to severe damage during these high flow

events and needed to be removed beforehand. In an effort between CDFW, California Department of Water Resources (CDWR), and Reclamation District 108 (RD108), the weir was modified to be more robust and include a fish collection facility. Construction on the improved weir and Facility began in the summer of 2016 and was finished in the summer of 2019.

Wallace Weir

Flow Control Structure – The current Wallace Weir flow control structure, or water control structure (WCS), consists of a built-up earthen berm armored with rip rap and six concrete box culverts through which water flows. Obermeyer dams are located on the upstream side of each culvert to regulate flow. On the downstream side of each culvert are bottom hinged metal fish screens that prevent fish from swimming upstream of the weir and further into the KLRC and CBDC. Each of the screens are raised and lowered via an overhead hoist and cable system mounted on the downstream end of the retaining walls. The Obermeyer dams and fish screens are controlled through a user interface housed in a control building on the top of the levee west of the weir. Air compressors that regulate the air pressure in each of the bladder dams are also stored in this control building. The fish screens can be programmed to raise and lower at different time intervals. Lowering of the fish screens can also be triggered by the amount of force being applied to the screens. This is to prevent debris build up which could cause a mechanical failure in the hoist system and result in an uncontrolled drop of the screens.

Fish Collection Facility - The Wallace Weir Fish Collection Facility (Facility) is a concrete structure adjacent to the improved Wallace Weir water control structure, located in the KLRC, approximately 9.7 kilometers southwest of the town of Knights Landing.

The Facility has four major components: the downstream entrance pool, holding pool, Facility intake pool, and energy dissipation basins (Figure 3). The entrance pool is where fish enter the Facility and leads to the holding pool, where fish are collected. The Facility intake pool is at the upstream end of the Facility, where water is diverted from the KLRC into the Facility. A mechanized trash rack is mounted at the intake of the Facility to block large debris from entering. The trash rack is driven by a Rotork actuator. After entering the Facility intake pool, water can be diverted into two energy dissipation basins: one at the upstream end of the holding pool and one running parallel to the west side of the holding pool. Water routed through the western energy dissipation basin drains out to the upstream end of the entrance pool to provide auxiliary attraction or maintenance flow when needed.

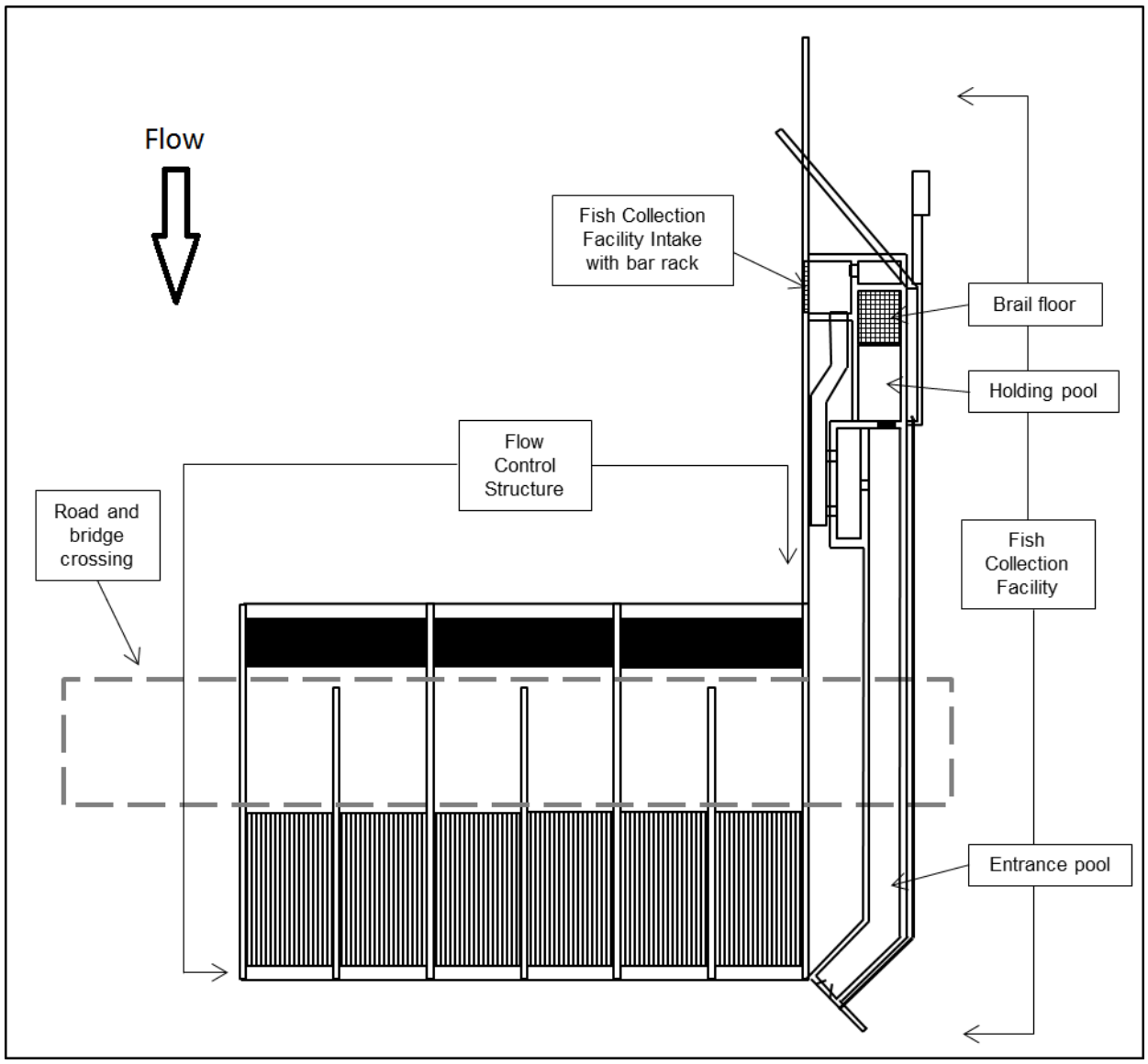

Figure 3. An overhead diagram of the Wallace Weir including the flow control structure and Facility.

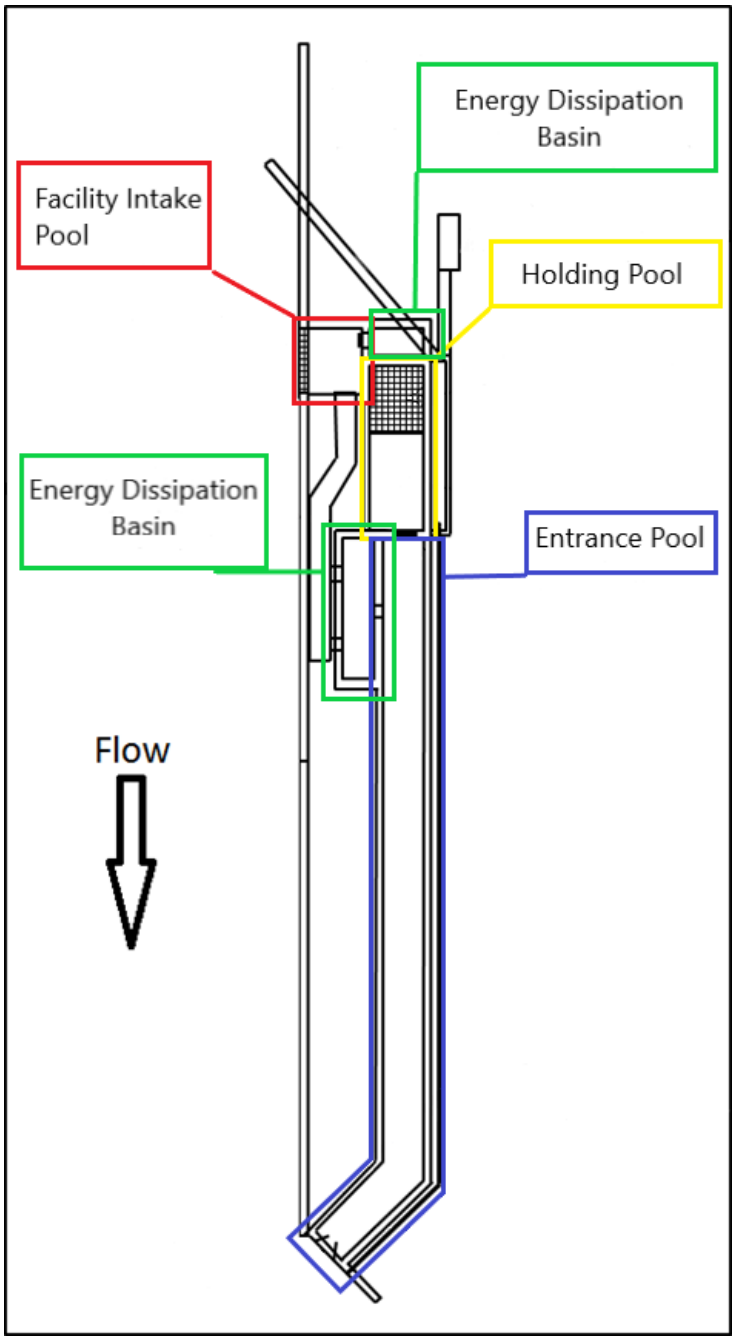

Figure 4. An overhead diagram of the Wallace Weir Fish Collection Facility with the four major components highlighted. The Facility intake pool (red), holding pool (yellow), entrance pool (blue) and the energy dissipation basins (green).

Five gates separate the major components of the Facility: the upstream Waterman gate, western auxiliary Waterman gate, slide gate, screened panel dual leaf holding pool LOPAC gate, and solid panel dual leaf entrance pool LOPAC gate (Figure 4). The upstream Waterman gate regulates flow from the KLRC to the Facility intake pool. The western auxiliary gate regulates flow from the Facility intake pool to the western energy dissipation bay. The slide gate is a stainless-steel plate used to hydraulically isolate the holding pool

from the entrance pool. The screened dual leaf panel LOPAC gate opens inwards into the holding pool and prevents fish from swimming back out into the entrance pool. These screened panels allow water to flow through even when closed, but block fish passage. The solid panel dual leaf LOPAC gates are used to adjust the head height of the water inside the Facility as well as to close the Facility.

The holding pool contains two components for collecting fish: a crowder rack and floor brail. The crowder rack is located at the downstream end of the holding pool. The top portion of the crowder rack consists of a platform with four wheels that ride along two metal rails that run lengthwise on the top of the holding pool walls. Metal handlebars mounted to either end of the crowder rack are used to manually push the crowder rack back and forth in the holding pool. The lower part of the crowder rack consists of two screen panels made of metal frames with 1" metal tubing running vertically within the frames. The metal tubes are spaced approximately 1" apart. The bottom of the two panels is raised and lowered mechanically via a chain driven by a Rotork actuator. This allows operators to control when fish pass through or to block them in when crowding in the holding pool occurs. The floor brail is a 10' by 8' metal basket consisting of 1" tubing spaced out approximately 1" apart. The floor brail sits in the upstream half of the holding pool and is raised and lowered by two steel threaded stems that are mechanically driven by a Rotork actuator. The floor brail is used to crowd fish towards the surface of the pool when staff are ready to collect fish and transfer them to a workup tub.

The mechanized components of the Facility are operated from a control panel mounted in a cabinet located on the northeast corner of the Facility. The controls are connected to the actuator of the crowder rack, floor brail, and traveling trash rack, providing power and a user interface. The two LOPAC gates and slide gate are operated via corded hand drills. Both LOPAC gates are operated via a drive nut and ball valves. The LOPAC gates open or close depending on which way the drive nut is spun, and which ball valves are opened or closed. The slide gate opens and closes via an operator nut that is rotated with a corded hand drill.

Although the Facility is intended to be operated during a wide range of river and bypass flow conditions, the area it is in is still subject to flooding when the Fremont Weir overtops during high Sacramento River flows. As such, several of the components of the Facility are removable, including: the Rotork actuators for the crowder rack, floor brail, traveling trash rack, and control cabinet. While these components need to be removed before overtopping events, the rest of the Facility can remain in place. This enables trapping to begin quickly after flooding recedes.

The Facility's flexibility and ability to be operated under a wide range of flow conditions, allow for safer and easier fish salvage operations than using temporary trapping methods.

Methods

Facility Procedures – Salvage operations at the Facility started on October 15, 2024. The dual leaf solid panel LOPAC gates, screened panel LOPAC gates, slide gate, and crowder rack gate were opened with the floor brail in the fully lowered position. While the Facility was fishing, the crowder rack was left on the downstream end of the holding pool with the gate open, allowing fish to swim into the holding pool and access the floor brail. The upstream Waterman gate at the intake pool was fully opened to allow flow through the Facility.

Environmental data were measured and recorded prior to checking the Facility. Water discharge (cubic feet per second) going into the Facility was measured using a Global Water flow probe. Water samples were taken upstream of the Facility for measuring turbidity in Nephelometric Turbidity Units (NTUs). Water temperature (degrees Celsius) and dissolved oxygen (milligrams per liter) were measured in the holding pool using a YSI temperature/dissolved oxygen meter.

Once environmental data were recorded, staff would close the gate on the crowder rack and push the crowder upstream in the holding pool until it became flush with the downstream edge of the floor brail. This concentrated fish in the holding pool above the floor brail. Once the crowder was pushed into position, the floor brail was lifted until the top of the brail was visible. If fish were present, the screened panel LOPAC gate and slide gate were closed, hydraulically sealing the holding pool from the entrance pool, and blocking any other fish from entering the holding pool. After closing the gates, the holding pool was filled with water using the upstream Waterman gate until the water level in the holding pool equalized with the water level in the KLRC. Then a diesel-powered water pump was used to fill the holding pool, and the floor brail was raised to the surface to allow for easy capture of fish. Fish were netted out using large D-ringed dip nets and salmonids were transferred to a 150-gallon (568 liter) workup tub to be processed. The workup tub was filled halfway with water from the KLRC and approximately 50 milliliters of API stress coat for every 3.8 liters of water. All bycatch were identified to species, enumerated, and returned to the KLRC, next to the Facility.

Salmonids were identified to species, examined for any external markings or tags (adipose fin clips, Floy tags, etc.), measured to fork length to the nearest 0.5 centimeter, and examined for sex. Two external T-bar anchor tags marked with individual four-digit ID numbers and a contact phone number were implanted into the muscle tissue behind the dorsal fin. A subset of Chinook Salmon was implanted with a HDX23 passive integrated transponder (PIT) tag. All salmonids were sampled for genetics via a fin clip from the upper lobe of the caudal fin. Genetic samples were stored on filter paper and placed inside individually labeled sample envelopes. After salmonids were measured, tagged, and sampled for genetics, they were evaluated for Reflex Action Mortality Predictors (RAMP)

(Davis, 2010). RAMP scoring has been used by other researchers as an indicator of stress and predictor of delayed mortality by testing five reflexes:

Tail grab – If the fish responds to handlers grabbing the tail by bursting forward. No response gives a score of 1.

Body flex – If fish attempts to struggle free of handler's grip when held out of the water with both hands around the center of the fish's body. No struggling gives a score of 1.

Vestibular-ocular response – If the fish's eye rolls to track the handler when rolled on its side out of the water. Eye not rolling to track handler gives a score of 1.

Head complex – If the fish exhibits a regular pattern of operculum ventilation when held above the surface of the water. If the fish is not ventilating or if ventilation is highly irregular, give a score of 1.

Orientation – If the fish rights itself within 3 seconds after being turned upside down in the water. Fish not rolling over within 3 seconds gives a score of 1.

One point for any of the five reflex tests indicated impairment of that reflex. The higher the score, the more impaired the fish was. Higher scores are also likely to lead to delayed mortality post release. If there was doubt as to whether a reflex was impaired or not, it was assumed that the reflex was impaired, and a point was given. If fish were vigorously struggling to the point where the handler could not control the fish, it was assumed that the fish's reflexes were not impaired and a total RAMP score of 0 was given.

After processing was complete, salmonids were transferred from the workup tub to a trailer mounted 400-gallon transport tank. The transport tank was equipped with two water recirculators and air stones hooked up to oxygen tanks to maintain dissolved oxygen levels while fish were in transit. The transport tanks were filled approximately 3/4 of the way full and API stress coat was added to the water in the same amount as the workup tub. A maximum of 12 fish were loaded into the transport tank at a time. Fish were transported to the Elkhorn Boat Launch on the Sacramento River, approximately 1.8 km downstream of the I-5 bridge. Dissolved oxygen inside the transport tank as well as in the river at the release point were measured and recorded. Temperatures between the transport tank water and river water needed to be within 2 degrees Celsius for fish to be released. If the difference in water temperature was greater than 2 degrees, the water in the transport tank was acclimated to the river water by slowly removing water from the tank and adding river water to the tank. Once the difference between the two water temperatures was less than 2 degrees, the transport tank was backed down the boat ramp into the water and fish were released out of the back of the tank via a slide gate.

Results

Facility Operations - The Facility was fished for 3,562.75 hours between October 15, 2024, to June 2, 2025. The Facility was not fishing from February 2 to 18, 2025 due to flooding from a Fremont Weir overtopping event. Due to a failure of the thrust nut that drives the slide gate to open and close, the trap was closed from March 23 to April 15, 2025.

Environmental Conditions - Mean weekly flows in the KLRC ranged from -10 cfs (week 42) to 3,085 cfs (week 7). Mean weekly water temperatures at the Facility ranged from 8.2°C (week 4) to 22.8°C (week 22). Mean weekly dissolved oxygen levels in the Facility ranged from3.5 milligrams per liter (week 22) to 31.9 milligrams per liter (week 5). Mean weekly turbidity ranged from 22.7 NTUs (week 49) to 194.0 NTUs (week 51) (Table 1 and Figure 5).

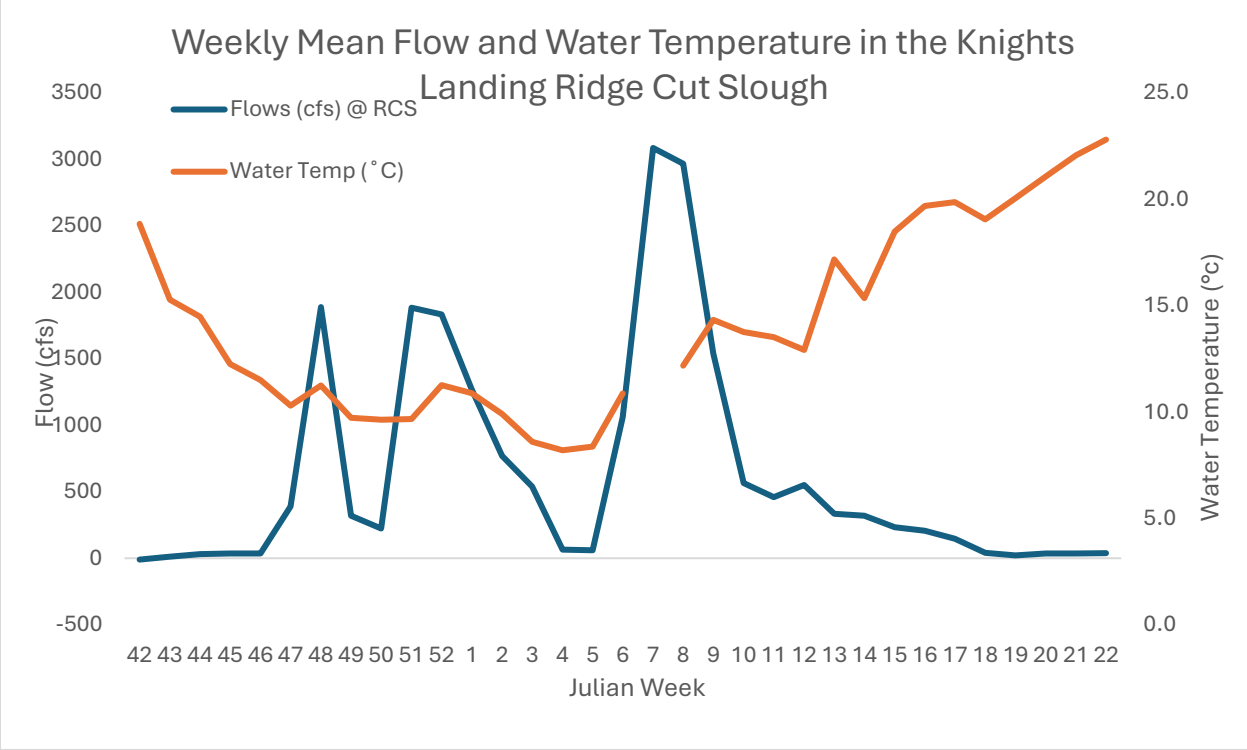

Figure 5. Mean weekly water temperatures (in degrees Celsius) and flow (in cubic feet per second) measured at the Wallace Weir Fish Collection Facility during the sampling season (Julian week). Water flow was reported by CDEC, Ridge Cut Slough (RCS) gauge in cubic feet per second.

Table 1. Weekly average turbidity, dissolved oxygen, flow in the KLRC, and water temperature, measured at the Facility.

Julian Week	Flows (cfs) @ RCS	Water Temp (˚C)	Turbidity (NTU)	D.O. (mg/L)
42	-10	18.8	84.97	n/a
43	13	15.3	43.53	7.8
44	32	14.5	91.30	8.0
45	37	12.3	30.70	11.3
46	36	11.5	48.15	10.8
47	390	10.3	61.30	8.9
48	1,890	11.3	70.80	7.9
49	320	9.7	22.69	8.0
50	225	9.6	99.31	11.6
51	1,884	9.7	194.01	11.4
52	1,832	11.3	61.2	11.9
1	1,272	10.9	49.9	16.4
2	769	9.9	50	19.2
3	539	8.6	47.14	21.2
4	65	8.2	33.49	25.7
5	60	8.4	27.37	31.9
6	1,061	10.9	61.45	22.5
7	3,085	n/a	n/a	n/a
8	2,967	12.2	89.72	11.4
9	1,541	14.3	58.31	10.3
10	566	13.8	74.77	10.4
11	459	13.5	56.11	11.3
12	552	12.9	52.86	13.0
13	334	17.2	52.6	10.1
14	319	15.4	48.1	12.4
15	233	18.5	47.2	8.5
16	206	19.7	56.2	8.3
17	146	19.9	58.0	8.7
18	41	19.1	62.0	7.1
19	21	20.0	56.8	7.4
20	36	21.1	38.5	5.1
21	36	22.1	51.4	4.9
22	38	22.8	43.7	3.5

Fish catch – During the 2024/2025 season, a total of 1,610 fish were captured in the Facility. The catch was comprised of 17 species, 5 of which were native (Table 2).

Table 2. Total catch of all fish species at the Wallace Weir fish collection Facility for the 2024/2025 season. *California native fish species.

Common Name	Scientific Name	Number Caught at WW
Black crappie	*Pomoxis nigromaculatus*	1
Brown bullhead	*Ameiurus nebulosus*	200
Common Carp	*Cyprinus carpio*	395
Channel catfish	*Ictalurus punctatus*	5
*Chinook salmon	*Oncorhynchus tshawytscha*	928
Goldfish	*Carassius auratus*	1
Largemouth Bass	*Micropterus salmoides*	20
*Sacramento Blackfish	*Orthodon microlepidotus*	13
*Sacramento Splittail	*Pogonichthys macrolepidotus*	1
*Sacramento sucker	*Catostomus occidentalis*	25
Smallmouth Bass	*Micropterus dolomieu*	4
Striped bass	*Morone saxatilis*	9
Threadfin Shad	*Dorosoma petenense*	1
*Tule Perch	*Hysterocarpus traskii*	1
Warmouth	*Lepomis gulosus*	1
White Catfish	*Ameiurus catus*	2
White Crappie	*Pomoxis annularis*	3

Picket weir fish – During the 2024/2025 trapping season, 381 fish were observed on the upstream side of the picket weirs of the WCS. The WCS was operated from November 2, 2024, to April 24, 2025. Whie the WCS passed flows, the picket weirs were flushed on a regular basis. The picket weirs were completely lowered between February 6 and 24, as water was flowing over the top of the pickets in their fully raised position. These flows over the pickets were due to both elevated CBDC flows and an overtopping event at Fremont Weir. The total count of confirmed fish species observed on the pickets was 13, five of which were native. One juvenile Green Sturgeon was observed on the upstream side of the picket weirs of the WCS on February 26, 2025 (Table 4). This Sturgeon was recovered alive, measured, implanted with a PIT tag and released on the Sacramento River, near the west end of Fremont Weir. No other Sturgeon were observed on the picket weirs or in the Facility during this season. Two Chinook Salmon were observed on the pickets, both of which were adipose fin clipped (Table 5). The first was recovered on December 28, 2024. The carcass was heavily predated upon and decayed. The head was taken for CWT extraction, but no tag was found. The second Chinook Salmon was recovered on April 10, 2025. This fish was also highly decayed, but a CWT was recovered. The tag code showed this fish was a winter-run from the Livingston Stone National Fish Hatchery, brood year 2022 (Table 9). One adipose fin clipped Steelhead was observed on the picket weirs as well (Table 5). The Steelhead was alive but in poor condition when recovered. Attempts were made to revive this fish and relocate it to the Sacramento River at Elkhorn Boat Launch. The Steelhead died in transit.

Table 3. Approximate counts of fish observed entrained on the upstream side of the picket weirs of the water control structure during the 2024/2025 season. *California native species.

Common name	Scientific name	Total
Black Crappie	*Pomoxis nigromaculatus*	6
Channel Catfish	*Ictalurus punctatus*	1
*Chinook salmon	*Oncorhynchus tshawytscha*	2
Common Carp	*Cyprinus carpio*	329
Goldfish	*Carassius auratus*	1
*Green Sturgeon	*Acipenser medirostris*	1
Largemouth Bass	*Micropterus salmoides*	5
*Sacramento Hitch	*Lavinia exilicauda*	2
*Sacramento Splittail	*Pogonichthys macrolepidotus*	1
*Sacramento Sucker	*Catostomus occidentalis*	13
Smallmouth Bass	*Micropterus dolomieu*	1
*Steelhead	*Oncorhynchus mykiss*	1
Striped Bass	*Morone saxatilis*	1
UNID Bullhead	*Ameiurus sp.*	1
UNID Catfish	*Ictalurus sp.*	9
UNID Crappie	*Pomoxis sp.*	2
UNID Sunfish	*Lepomis sp.*	1
Unknown	*???*	4

Table 4. Sturgeon recovered alive from the upstream side of one of the picket weirs of the water control structure.

Date	Species	Fork length (cm)	PIT Tag #	Release location	Mortality (Y/N)	Comments
2/26/2025	Green Sturgeon	40	982091076317247	Sac R., near Fremont Weir West side	No	Recovered alive from upstream side of picket weir 3A. Held in transport tank for recovery during Fremont Weir fish rescue.

Table 5. Salmonid mortalities recovered from the upstream side of the picket weirs of the water control structure.

Date	Capture time	Species	Fork length (cm)	Ad clip? (Y/N)	Sex (M/F/U)	Mortality (Y/N)	Comments
12/28/2024	8:30	Chinook salmon	84.5	Yes	Male	Yes	Found on the upstream side of picket weir 2A while being eaten by otter. Head taken for CWT extraction, no tag found.
4/4/2025	8:40	Steelhead	45	Yes	Unknown	Yes	Found on the upstream side of picket weir 3A. Barely alive when recovered. Died in transit to the Elkhorn Boat Launch.
4/10/2025	8:35	Chinook salmon	~92	Yes	Unknown	Yes	Found on the upstream side of picket weir 3A, highly decayed. Head was brought back to the office for CWT extraction

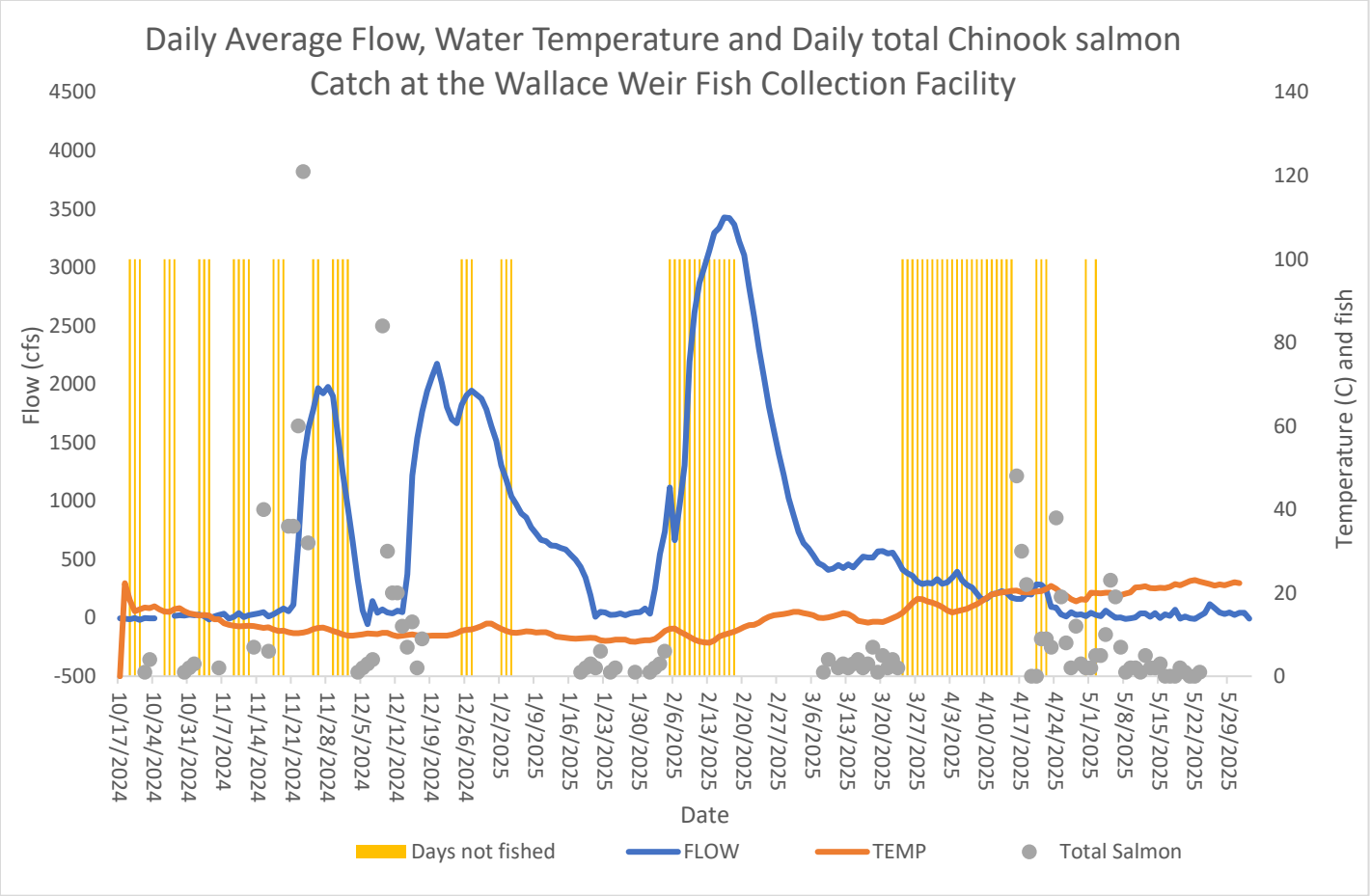

Figure 6. Daily total Chinook Salmon catch for trapping below Wallace Weir and daily average water temperatures and flows recorded on CDEC on the Ridge Cut Slough at Knights Landing gauge for water year 2024-2025. The days that the Facility was not trapping are indicated by yellow vertical bars. River flows reported by CDEC, Ridge Cut Slough at Knights Landing (RCS) and reported in cubic feet per second (cfs).

Salmonids – A total of 923 live Chinook Salmon were captured in the Facility during the 2024/2025 season. An additional 17 mortalities occurred in the Facility, 9 of which were sacrificed for CWT extraction and the rest were incidental mortalities (Table 6). Catch was bimodally distributed through the season. The first group of fish was captured between October 22, 2024, and February 4, 2025 (n=574), and the second group between March 8 and May 28, 2025 (n=349). The break in catch occurred during a Fremont Weir overtopping event that inundated much of the bypass, including the Facility, which was not fishing during that time (Figure 6). Adipose fin clipped fish made up 34% (n=320) of the total Chinook Salmon catch in the Facility. The first group of fish caught between October and February was comprised of 19.0% adipose fin clipped fish, and 58.9% for the second group between March and May (Table 7). The fork length range for the first group of fish was 45.5 cm to 102 cm, with an average of 69.7 cm. The size range of the second group of fish was 47.0 cm to 91.0 cm with an average of 79.2 cm. It should be noted that only 92 of the 349 live fish in the second group were measured. The rest were not measured or tagged to

reduce handling stress. There were 12 Chinook Salmon mortalities observed immediately downstream of the Facility in late May, 10 of which were adipose fin clipped (Table 8). Heads were taken from the adipose fin clipped fish for CWT extraction and reading, eight of which had CWTs found and read (Table 9). No Steelhead were caught in the Facility this season.

Table 6. Total catch of live and dead adipose fin intact, clipped and unknown status Chinook Salmon in the Facility between October 22, 2024, and May 28, 2025. Mortalities include fish sacrificed for CWT extraction. This table does not include downstream mortalities or Chinook Salmon recovered from the picket weirs.

	Chinook Salmon Total	Chinook Salmon (Adipose Fin Intact)	Chinook Salmon (Adipose Fin Clipped)	Chinook salmon (Adipose fin unknown)
Alive	923	613	309	1
Mortalities	17	6	11	0
Grand Total	**940**	**619**	**320**	**1**

Table 7. Catch per Julian week of Chinook Salmon and mortalities in the Facility based on adipose fin clip status.

Julian Week	Chinook Salmon (Ad +)	Chinook Salmon (Ad +) MORT	Chinook Salmon (Ad -)	Chinook Salmon (Ad - Sac)	Chinook Salmon (Ad -) MORT	Chinook Salmon (Ad ?)	Chinook Salmon (Ad ?) MORT	Total
42	0	0	0	0	0	0	0	0
43	5	0	0	0	0	0	0	5
44	6	0	0	0	0	0	0	6
45	2	0	0	0	0	0	0	2
46	46	0	2	5	0	0	0	53
47	242	1	39	3	0	0	0	285
48	0	0	0	0	0	0	0	0
49	113	4	27	0	0	0	0	144
50	54	0	8	1	0	0	0	63
51	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	2	0	1	0	0	0	0	3
4	0	0	14	0	0	0	0	14
5	1	0	3	0	0	0	0	4
6	0	0	9	0	0	0	0	9
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	2	0	3	0	0	0	0	5
11	7	0	9	0	0	0	0	16
12	9	0	13	0	2	0	0	24
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	44	0	57	0	0	1	0	102
17	34	1	58	0	0	0	0	93
18	18	0	21	0	0	0	0	39
19	21	0	34	0	0	0	0	55
20	5	0	7	0	0	0	0	12
21	2	0	3	0	0	0	0	5
22	1	0	1	0	0	0	0	2

Table 8. Chinook Salmon carcasses found downstream of the Facility during the 2024-2025 season.

Date	Fork length (cm)	Ad clip? (Y/N)	Sex (M/F/U)	Mortality (Y/N)	Comments
5/17/2025	93	Yes	Male	Yes	Carcass found approximately 30 feet downstream of the weir. Head taken for CWT extraction.
5/18/2025	86	Yes	Male	Yes	Carcass found approximately 30 feet downstream of the weir. Head taken for CWT extraction.
5/18/2025	83	Yes	Female	Yes	Carcass found approximately 30-40 feet downstream of the weir. Head taken for CWT extraction.
5/18/2025	96	Yes	Male	Yes	Carcass found approximately 30-40 feet downstream of the weir. Head taken for CWT extraction.
5/18/2025	75	No	Female	Yes	Carcass found approximately 30-40 feet downstream of the weir.
5/19/2025	82	Yes	Male	Yes	Carcass found approximately 40 feet downstream of the weir. Head taken for CWT extraction.
5/21/2025	79	Yes	Female	Yes	Carcass found immediately downstream of water control structure, bay 1. Head taken for CWT extraction.
5/21/2025	79.5	Yes	Male	Yes	Carcass found immediately downstream of water control structure, bay 2. Head taken for CWT extraction.
5/21/2025	80	Yes	Female	Yes	Carcass found immediately downstream of water control structure, bay 2. Head taken for CWT extraction. No CWT detected.
5/23/2025	75	No	Male	Yes	Carcass found approximately 70 yards downstream of the weir on right bank. Mid-section of body heavily predated upon by vultures.
5/23/2025	68	Yes	Male	Yes	Carcass found approximately 100 yards downstream of weir, floating in the middle of the channel. Head taken for CWT extraction.
5/26/2025	79	Yes	Unknown	Yes	Found floating in downstream end of bay 1A/B of water control structure. Head taken for CWT extraction.

Table 9. Coded Wire Tag (CWT) information from sacrificed Chinook Salmon, mortalities found in the Facility, on the upstream side of the picket weir of the WCS and downstream of the Facility. *Sacrifice, **In Facility mortality, ***Picket Weir mortality, ****Downstream mortality.

CWT #	Recovery date	Hatchery of Origin	Run	Brood Year	Release Year
063004*	11/12/2024	Mokelumne River Hatchery	Fall	2022	2023
063005*	11/14/2024	Mokelumne River Hatchery	Fall	2022	2023
063003*	11/14/2024	Mokelumne River Hatchery	Fall	2022	2023
060019*	11/14/2024	Feather River Hatchery	Fall	2022	2023
063004*	11/14/2024	Mokelumne River Hatchery	Fall	2022	2023
063008*	11/19/2024	Mokelumne River Hatchery	Fall	2022	2023
063004*	11/19/2024	Mokelumne River Hatchery	Fall	2022	2023
063004*	11/19/2024	Mokelumne River Hatchery	Fall	2022	2023
063005*	12/13/2024	Mokelumne River Hatchery	Fall	2022	2023
056586**	3/20/2025	Livingston Stone NFH	Winter	2022	2023
056521**	3/20/2025	Livingston Stone NFH	Winter	2022	2023
056587***	4/10/2025	Livingston Stone NFH	Winter	2022	2023
056523****	5/17/2025	Livingston Stone NFH	Winter	2022	2023
056523****	5/18/2025	Livingston Stone NFH	Winter	2022	2023
056585****	5/18/2025	Livingston Stone NFH	Winter	2022	2023
056521****	5/18/2025	Livingston Stone NFH	Winter	2022	2023
056588****	5/19/2025	Livingston Stone NFH	Winter	2022	2023
056522****	5/21/2025	Livingston Stone NFH	Winter	2022	2023
056588****	5/21/2025	Livingston Stone NFH	Winter	2022	2023
056586****	5/23/2025	Livingston Stone NFH	Winter	2022	2023

Post release recoveries – During the 2024/2025 season, 532 Chinook Salmon were Floy tagged, of which, 184 were also PIT tagged. Not all Chinook Salmon were tagged due to elevated stress levels caused by high water temperatures and low dissolved oxygen levels. As of drafting this report, Floy tags from 14 fish have been recovered and reported post release. Eleven of the 14 recovered Floy tags were from fish captured between November 2024 and February 2025, and the other three between April and May 2025. Recovery locations included the Sacramento River, the Feather River and associated hatchery, and the Yuba River (Table 10). Most of the recovered Chinook Salmon were found on the Upper Sacramento River during the winter-run carcass survey. Sightings of live Chinook Salmon with Floy tags were reported from Butte Creek on June 3 and Clear Creek on July 15. These fish were not captured, so the tag numbers were not read or reported.

Table 10. Recovery date and location of Floy tagged Chinook Salmon released on the Sacramento River from the Facility during the 2024/2025 season.

Tag & Release Date	Recovery Date	Recovery time (days)	Tag color/#	Recovery condition	Recovery location	Disposition	RUN ID	RAMP score
11/12/2024	11/13/2024	1	Grey/4519, 4520	Alive	Sacramento River, KL fyke trap, RM 9148, 38°49'29.23"N, 121°43'23.86"W	Not spawned	…	0
11/14/2024	11/22/2024	8	Grey/5906, 5907	Alive	Feather River Hatchery	Culled	…	0
11/22/2024	12/3/2024	11	Grey/5522, 5523	Alive	Yuba River, upstream of hwy 20 bridge	Released alive	…	0
12/6/2024	12/20/2024	14	Grey/2187, 2188	Dead	Feather River carcass survey, River mile 61	Unknown	…	3
1/22/2025	7/20/2025	179	Green/2753, 2754	Dead	Upper Sac River carcass survey, River mile 296.5	Spawned	…	0
1/22/2025	7/26/2025	185	Green/2759, 2760	Dead	Upper Sac River carcass survey, River mile 300	Spawned	…	0
1/22/2025	8/3/2025	193	Green/2763, 2764	Dead	Upper Sac River carcass survey, River mile 295	Spawned	…	0
1/25/2025	7/26/2025	182	Green 2767, 2768	Dead	Upper Sac River carcass survey, River mile 296.5	Spawned	…	0
2/3/2025	7/20/2025	167	Green/2787, 2788	Dead	Upper Sac River carcass survey, River mile 297	Spawned	…	0
2/4/2025	7/29/2025	175	Green/2799, 2800	Dead	Upper Sac River carcass survey, River mile 300	Spawned	…	0
2/4/2025	8/10/2025	187	Green/2795, 2796	Dead	Upper Sac River carcass survey, River mile 301	Spawned	…	0
3/22/2025	8/13/2025	144	Green/8034	Dead	Upper Sac River carcass survey, River mile 300	Spawned	…	0
4/26/2025	6/3/2025	38	Grey/6533	Alive	Keswick Dam Fish Trap	Returned to Sac. R.	…	N/A
5/5/2025	6/3/2025	28	Grey/6987	Alive	Keswick Dam Fish Trap	Returned to Sac. R.	…	N/A

Genetics – Fin clips from the upper caudal lobe were taken from all Chinook Salmon captured in the Facility for genetic analysis. Results for samples taken from 952 Chinook Salmon encountered at or below the Facility between October 2024 and May of 2025 showed that there were 528 fall-run, one late fall-run, 258 winter run, 81 spring-run and 83 samples that yielded no results (Table 11). Most of the fall-run were encountered at the Facility between October and December, 2024 (Table 12), while winter and spring-run were mostly seen between January and May, 2025 (Table 13). One Chinook Salmon captured on April 16, 2025 was not sampled for genetics.

Table 11. Summary of run-assignments based on genetic analysis of Chinook Salmon encountered at and below the Facility.

Run	Number of Fish
Fall	528
Late Fall	1
Winter	262
Spring	81
No Result	79

Based on the CWT readings from the downstream mortalities, four of the 83 Chinook Salmon that yielded no results from genetic analysis were Livingston Stone Hatchery winter-run, bringing the total number of winter-run observed at or below the Facility to 262, and unidentified or “no result” fish to 79.

Table 12. Number of each run (based on genetic analysis and CWT readings) observed at or below the Facility and their capture dates, from October to December, 2024.

Date	Fall-run	Late Fall-run	Winter-run	Spring-run	No Result
10/22/2024	1	0	0	0	0
10/23/2024	4	0	0	0	0
10/30/2024	1	0	0	0	0
10/31/2024	2	0	0	0	0
11/1/2024	3	0	0	0	0
11/6/2024	2	0	0	0	0
11/12/2024	7	0	0	0	0
11/14/2024	40	0	0	0	0
11/15/2024	6	0	0	0	0
11/19/2024	34	0	0	0	2
11/20/2024	33	0	0	0	3
11/21/2024	55	1	0	0	4
11/22/2024	116	0	0	1	4
11/23/2024	31	0	0	0	1
12/2/2024	1	0	0	0	0
12/3/2024	2	0	0	0	0
12/4/2024	7	0	0	0	0
12/6/2024	79	0	0	0	5
12/7/2024	22	0	0	0	8
12/8/2024	12	0	0	0	8
12/9/2024	11	0	0	0	9
12/10/2024	6	0	0	0	6
12/11/2024	7	0	0	0	0
12/12/2024	13	0	0	0	0
12/13/2024	2	0	0	0	0
12/14/2024	7	0	0	0	2

Table 13. Number of each run (based on genetic analysis and CWT readings) observed at or below the Facility and their capture dates, from January to May, 2025.

Date	Fall-run	Late Fall-run	Winter-run	Spring-run	No Result	Date	Fall-run	Late Fall-run	Winter-run	Spring-run	No Result
1/18/2025	0	0	1	0	0	4/23/2025	1	0	5	1	0
1/19/2025	0	0	2	0	0	4/24/2025	1	0	33	4	0
1/20/2025	1	0	2	0	0	4/25/2025	2	0	15	2	0
1/21/2025	0	0	2	0	0	4/26/2025	1	0	4	3	0
1/22/2025	0	0	6	0	0	4/27/2025	0	0	2	0	0
1/24/2025	0	0	1	0	0	4/28/2025	0	0	9	3	0
1/25/2025	0	0	2	0	0	4/29/2025	1	0	2	0	0
1/29/2025	1	0	0	0	0	4/30/2025	0	0	2	0	0
2/1/2025	0	0	1	0	0	5/1/2025	0	0	2	0	0
2/2/2025	0	0	2	0	0	5/2/2025	1	0	1	2	1
2/3/2025	0	0	3	0	0	5/3/2025	2	0	0	2	1
2/4/2025	0	0	6	0	0	5/4/2025	0	0	5	4	1
3/8/2025	0	0	1	0	0	5/5/2025	1	0	14	2	6
3/9/2025	0	0	2	2	0	5/6/2025	3	0	14	1	1
3/11/2025	0	0	2	0	0	5/7/2025	0	0	7	0	0
3/12/2025	0	0	1	2	0	5/8/2025	0	0	1	0	0
3/13/2025	0	0	1	1	0	5/9/2025	1	0	1	0	0
3/14/2025	0	0	3	0	0	5/10/2025	0	0	2	0	0
3/15/2025	0	0	1	3	0	5/11/2025	0	0	0	0	1
3/16/2025	0	0	2	0	0	5/12/2025	2	0	0	2	1
3/17/2025	0	0	1	2	0	5/13/2025	0	0	1	1	0
3/18/2025	0	0	5	1	1	5/14/2025	0	0	2	0	0
3/19/2025	0	0	1	0	0	5/15/2025	1	0	1	1	0
3/20/2025	0	0	5	0	0	5/17/2025	0	0	1	0	0
3/21/2025	0	0	1	1	0	5/18/2025	0	0	3	0	1
3/22/2025	0	0	2	2	0	5/19/2025	1	0	1	1	0
3/23/2025	0	0	1	1	0	5/20/2025	0	0	0	1	0
4/16/2025	0	0	29	11	8	5/21/2025	0	0	2	0	1
4/17/2025	1	0	21	8	0	5/23/2025	1	0	1	1	0
4/18/2025	2	0	12	8	1	5/25/2025	0	0	1	0	0
4/21/2025	0	0	6	3	0	5/26/2025	0	0	0	0	1
4/22/2025	0	0	5	4	0	5/27/2025	0	0	0	0	1
						5/28/2025	0	0	0	0	1

RAMP Scores – A total of 554 Chinook Salmon captured at the Facility were evaluated for a RAMP score. The most frequently observed RAMP score was 0 (Table 11). Tail grab was the most frequently impacted reflex among tested individuals (Table 12). Between October 2024 and February 2025, RAMP scores varied between zero and three, with zero being the most common score. From March to May, scores only varied between zero and one, with zero being the most comm score (Table 13).

Table 14. Total count of Reflex Action Mortality Predictor (RAMP) scores of Chinook Salmon caught at the Facility.

Total RAMP Score	Number of Fish
0	400
1	75
2	56
3	23
4	0
5	0

Table 15. Total number of times each reflex was scored during a RAMP test.

Tail Grab	Body Flex	VOR	Head Complex	Orientation
248	182	0	0	82

Table 16. Percentage of each RAMP score during the October 2024 to February 2025 month range, and March to May 2025 month range.

	RAMP Scores					
Month Range	0	1	2	3	4	5
Oct. - Feb.	0.70	0.15	0.11	0.05	0.00	0.00
Mar. - May	0.96	0.04	0.00	0.00	0.00	0.00

Discussion

This season's quantity and timing of Chinook Salmon catch was similar to last season. While most of the Chinook Salmon catch occurred during the first half of the season between November and January, there was a relatively large number observed between March and May. There were more and larger fish in the later half of this season than last season. Like last season, most of the later fish were adipose fin clipped. Both seasons saw similar flow patterns, with high flow events starting in the winter and lasting through early spring. With the Facility able to remain trapping through a wide range of high flow conditions and start trapping soon after overtopping events, more fish are likely to be encountered as opposed to trapping with temporary equipment such as fyke traps. While the Facility provides more opportunities to capture these fish and collect data during and after high flow events, this is also an overall delay to migration and a source of additional stress. Projects such as the Adult Fish Passage and Big Notch Projects may help minimize this issue by providing volitional passage out of the Bypass, back to the Sacramento River. High canal flows usually lead to large numbers of fish being flushed downstream in the CBDC, along with attraction of adults upstream through the Bypass. While the WCS has pickets to minimize upstream adult passage, there is an operational balance to manage debris and fish moving downstream as well. Adjustments to the picket flushing cycles were made this season to minimize possible entrainment of juvenile Sturgeon by increasing flushing cycles. While this adjustment may minimize downstream entrainment of fish, this may also provide more upstream passage opportunities for adult fish. Facility maintenance and repairs continued to interrupt trapping operations during this season. While a stockpile of spare parts has been amassed over previous seasons, a shortage of one part led to a long delay in operations. Salvage efforts continue to shed light on the magnitude of fish straying and stranding in the Bypass, but it should be considered a temporary fix to a long-term issue. More data on RAMP scoring was gathered this season, with some correlation shown between low scores and increased likelihood of post release survival. However, very few post release recoveries have been reported this season, as in previous years. It is still uncertain whether there are relatively few post release recoveries reported due to high post release mortality rates, few detections, or poor tag retention, which warrants further study.

The Chinook Salmon catch at Wallace Weir during the 2024-25 season was the highest recorded since monitoring at Wallace Weir began in 2013. Like most years, more fish were seen during the fall-run migration timing than the rest of the season, indicative of the run sizes and hatchery production of fall-run in the Central Valley. While most of the fall-run catch occurred between October and December, 2024, there were 22 observed between April and May (Table 13), well outside of the adult migration timing (Yoshiyama et al., 1998). One spring-run Chinook Salmon was also observed well outside of the normal adult spring-

run migration window, being captured on November 22, 2024 (Table 12). The exact cause of these unusual observations is unknown, but could be due to actual early/late migration timing of individuals, a mixing of genetics between different runs, or corrupted genetic samples.

A substantial number of fish were also observed from January to May, 2025, as seen in the previous trapping season (Kubo, 2025). Based on genetic analysis and CWT data pulled from Chinook Salmon mortalities downstream of the Facility and in surrounding areas of the Bypass, most of these fish were winter-run. The CWT readings from mortalities recovered in the second half of the season showed the winter-run fish to be from brood year 2022. Based on the average fork lengths of last season's winter-run, it is likely that those were also brood year 2022 fish that came in as two year olds. The hatchery releases for juveniles from brood year 2022 occurred between 2023 Fremont Weir overtopping events. The timing of these releases may have routed some of these fish through the Bypass, which they may have imprinted on, leading to increased straying of this cohort into the Bypass as adults.

Both seasons were the only years the Facility operated during relatively wet winters, high flows and Fremont Weir overtopping events (Kubo and Kilgour, 2022; Kubo, Ponte and Seabert, 2023; Kubo and Diep, 2023; Kubo, 2023; Kubo, 2025). The duration of the Fremont Weir overtopping events this season was similar to last season. However, in this season overtopping occurred mostly during one event, whereas last season the overtopping occurred during two events. High flows in the Sacramento River and KLRC started earlier this season, with flows reaching over 2000 cfs by the end of November in the KLRC. In the previous season, flows did not start ramping up until later into January. Flows began decreasing in late March through early April of both seasons, just as Chinook Salmon catch increased at the Facility. Though timing and duration of Fremont Weir overtopping was similar in both seasons, elevated flows throughout the canals and river started earlier this season. This longer duration of flows may have provided more attraction flow for Chinook Salmon, which may explain the increase Chinook Salmon catch for the second half of this season compared to the previous season.

Adequate attraction flows into the Bypass for winter and spring-run Chinook Salmon started early this season compared to last. The magnitude of straying during Fremont Weir overtopping remains unknown. While the Facility was operable during the high flows, trap efficiency was low as there were larger attraction flows from different sources outside of the Facility outflow. Figure 6 shows the daily Chinook Salmon catch compared to KLRC flows along with days the Facility was not fishing. There was no Chinook Salmon catch once the flows reached above 500 cfs and the Facility was not fishing from February 2 to 18. Chinook Salmon were not captured at the Facility again until flows dropped below 500 cfs in early March. The flow going through the WCS of the weir was orders of magnitude higher than the Facility, as was the flow in the Tule Canal. Any Chinook Salmon present in

the Bypass were likely drawn to the greater volume of water flowing through the Tule canal and WCS, rather than the Facility.

Genetic analysis of fin clips and CWT readings from downstream carcasses showed 262 of the 394 Chinook Salmon observed at and downstream of the Facility between January and May were winter-run. Only 81 of these were identified as spring-run and another 24 as fall-run. The number of spring-run observed at the facility this season was far greater than what was observed in the previous season (n=5). This is likely indicative of the larger adult returns seen in the Central Valley for the 2024 spawning season compared to 2023 (Azat and Killam, 2025). The number of winter-run observed at the Facility for the 2023/2024 season (n=224) and 2024/2025 season is somewhat comparable. There were additional nearby observations of winter-run in the Bypass during the 2024/2025 season that, combined with Facility observations, better reflect the difference in Central Valley returns and the difference in returns between 2024 and 2025. The Valley wide estimate for winter-run for 2024 was only 1,367 (Azat and Killam, 2025) while the 2025 estimate, as of publishing this report, is expected to be approximately 14,885 (CDFW, 2025).

On April 29, 2025, several live and dead adult Chinook Salmon were observed in a pool below a culvert that drains water from the Cache Creek Settling Basin. A rescue effort and carcass recovery was carried out the following two days. While 72 live Chinook Salmon were relocated, another 72 carcasses were recovered, from which 36 CWTs were extracted and read, showing each fish was a winter-run from the Livingston Stone National Fish Hatchery, with one brood year 2023 fish, and the rest from brood year 2022 (Hideaki, 2025). Most of the live and dead fish from these efforts were adipose fin clipped, with only six unclipped fish. This site is inside of the western levee of the Bypass, approximately 3 miles south of Wallace Weir, and drains in the Tule canal, approximately 2 miles downstream of the confluence with the KLRC. Genetic analysis of fin clips and CWT readings from carcasses showed that there were 103 winter-run, three spring-run and the other 65 were unidentified.

Over half of the Chinook Salmon captured at the Facility between March and May this season were adipose fin clipped. The percentage of clipped fish for this period is lower than last season for the same time period but was still overall dominated by clipped fish (Kubo, 2025). Considering the nearby observation of mostly adipose fin clipped fish at the Cache Creek Settling Basin stranding, most of the fish that strayed into the Bypass following the Fremont Weir overtopping were likely mostly adipose fin clipped, and therefore, hatchery origin. Poor in-river conditions such as high temperatures or low flows during spawning, coupled with basin wide thiamine deficiency (NOAA, 2021) may have led to low numbers of natural origin survival and subsequent returns of adults.

Timing of winter-run observations at the Facility seems to run somewhat late into their historic run timing (Yoshiyama, et al., 1998). The peak of the adult returns would typically occur during March, yet peak numbers of winter run both this season and last occurred in

late April and May, respectively (Table 12) (Kubo, 2025). The peak observations of winter-run at the Facility may not be representative of the entire run for the Central Valley. These fish could also be starting their migration into the Bypass closer to the normal timing for winter-run but not showing up at the Facility until later. This may be due to adult fish holding in deeper pool areas or obstructions in the channel impeding passage. However, the latter explanation appears unlikely, given that canal flows between March and April were sufficient to support ample passage.

Due to the high flows in the canal, more picket flushes had to occur to mitigate for the debris build up. During the Fremont Weir overtopping in February, the pickets were completely lowered. The flows from Fremont Weir overtopping and high canal flows elevated the stage height at the WCS above the tops of the pickets, and for a brief period, over the surface of the Facility. Having the pickets raised during this time would not have been effective at blocking upstream passage and would have been more damaging to the WCS itself with the increased debris load and water pressure. Once the stage height fell below the height of the pickets, they were immediately raised. The pickets do serve as a positive fish barrier upstream of the weir at times but still need to be lowered when flows are high and fish attraction up the Bypass and into the CBDC is at its peak. The WCS and Facility may be an improvement from the previous designs of the weir but are not 100% effective under all conditions at blocking upstream passage.

Less fish were observed on the pickets this season compared to last (Kubo, 2025). After several observations of juvenile Green and White Sturgeon on the pickets last season, operations were adjusted to increase flushing cycles to reduce the time fish spend stranded on the pickets. The flushes were also adjusted so that the pickets do not have to completely lower to the bottom elevation of the culverts but instead lower a few inches to a foot below the surface of the water to minimize the time the pickets are down and limit upstream passage for adults. As a result, only one juvenile Green Sturgeon was observed on the pickets this season. This fish was recovered alive and released into the Sacramento River near Fremont Weir. The adjustment in picket operations may have minimized the number of fish overall observed on the pickets. The reduction in stranded fish may also be due to higher flows in the area overtopping the pickets for a longer period, allowing for increased upstream and downstream passage opportunities.

Post release recoveries followed similar trends to last season in that most of the fish that were reported also had low RAMP scores (Table 10). All post release recoveries except for one fish had a RAMP score of 0, though the sample size is small (n=9). Two of these fish were also not tested for a RAMP score. Though the trend between the two seasons seems to lean towards a direct correlation between low RAMP scores and likelihood of post release recovery, it is still too small of a sample size to draw any meaningful conclusions. Many of the fish captured in the later half of this season were not scored for RAMP, so the averaged scores between March and May are not fully representative of the condition of

Chinook Salmon at the Facility, post handling and processing. Most of the recovered Floy tags were from fish that were captured between November and February, while water temperatures were relatively low (Figure 6 and Table 1), and likely less stressful for Chinook Salmon, relative to conditions on site during the beginning and end of the trapping season. Conditions on site are very likely a large contributing factor to increased likelihood of long-term post release survival and subsequent recovery or post release mortality. While RAMP scoring may provide some useful information for the likelihood of post release survival, further study is needed to examine the cause of the low post release recovery rates. Post release tracking is done to some extent via PIT tagging, but there is not enough coverage from detection arrays to give meaningful data on movement, behavior and mortality. More extensive coverage, acoustic tagging, and other studies on these fish post release would be helpful to shed more light onto the low tag recovery rates.

Between May 17 and 26, twelve Chinook Salmon mortalities were observed downstream of the Facility in the KLRC. Environmental conditions began to deteriorate to suboptimal levels during this time, with dissolved oxygen dropping below 7 mg/L and water temperatures above 20 degrees Celsius (Richter and Kolmes, 2005). Prolonged exposure to these conditions was the likely cause of these mortalities. Due to a mechanical failure of part of the slide gate, the Facility was not operable from March 23 to April 15. This downtime in trapping likely led to Chinook Salmon downstream of Facility being stranded for an extended period and prolonged their exposure to poor water quality conditions. This prolonged stranding downstream may have contributed to the mortalities seen later in May.

Water surface elevation in the KLRC and CBDC upstream of the Facility dropped significantly later in May. This drop in water levels was likely a contributing factor to the declining environmental conditions at the Facility, as well as the warming weather, leading to downstream mortalities. There was also an incident between May 20 and 21, where the water intake for the Facility was tampered with sometime after the last trap check on May 20. The intake was completely closed, shutting off flow through the Facility. As a result, three adipose fin clipped winter-run Chinook Salmon carcasses were found downstream of the Facility on the morning of May 21. The decreased upstream stage height and start of the growing season for rice farms upstream of the Facility was thought to be a driver for someone to tamper with the Facility. A chain and lock were installed on the intake gate to deter future tampering. This incident highlighted the need to have an onsite surveillance system installed, as well as establishing communications with surrounding stakeholders to ensure all needs are met for both water users and trapping operations.

This season's operations also provided insight into potential species composition and abundance following high flow and flooding events in the Central Valley. The increased catch of winter and spring-run at the Facility, mortalities downstream in the KLRC, and stranding events in surrounding areas further highlights the need for volitional passage of

adult fish out of the bypass during and after high flow events. Despite the increased catch of Chinook Salmon in the later half of this season, there were still ample opportunities for fish to pass upstream during the Fremont Weir overtopping event and following inundation of the Facility. These situations lead to gaps in data and trapping efforts and continued loss of listed fish species. Temporally extended attraction flows into the Bypass have led to stranding of winter-run Chinook Salmon in the KLRC when water quality conditions are deteriorating and suboptimal for salmonids. This timing also coincides with increased agricultural water operations, which conflict with needs for trapping operations at the Facility. Increased communication with surrounding stakeholders and added security measures will hopefully minimize future vandalization and conflict with upstream landowners. Post release recapture data continues to be relatively low compared to the numbers of fish caught. RAMP scoring may provide some insight as to the likelihood of post release mortality in these fish, but additional study and post release tracking is needed to better understand the reason behind the low post-release recovery rates. These issues further highlight how trapping and salvage efforts should be viewed as temporary solutions to a chronic issue. Projects such as the Big Notch Project at Fremont Weir may be helpful for minimizing such straying and stranding events, given the right timing and duration of operations.

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