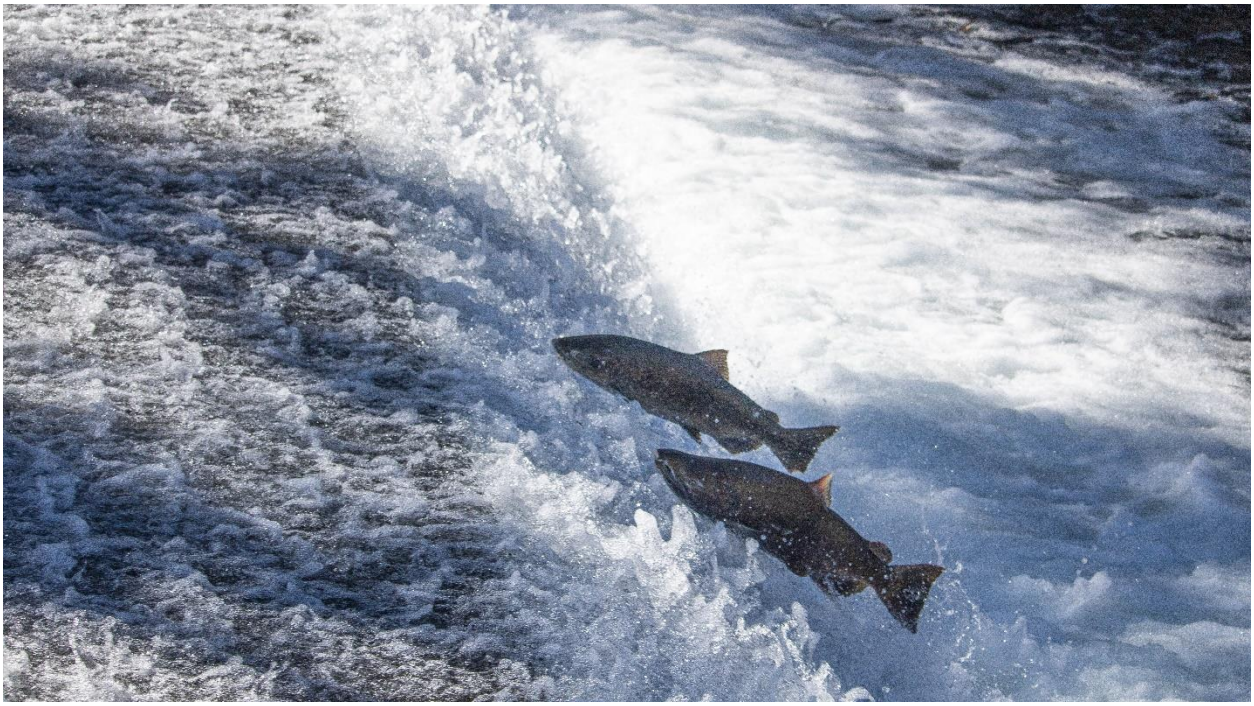
COLEMAN NATIONAL FISH HATCHERY

ANNUAL REPORT

FISCAL YEAR – 2021



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INTRODUCTION

Located in California's Central Valley, Coleman National Fish Hatchery (NFH) is situated on the north bank of Battle Creek, a tributary of the Sacramento River. Coleman NFH was established in 1942 to mitigate for the loss of salmonid spawning habitat that ensued following the construction of Shasta and Keswick Dams on the Sacramento River. The hatchery is operated by the U.S. Fish & Wildlife Service (Service) and funded by the U.S. Bureau of Reclamation (USBR). The hatchery propagates four distinct runs of fish: fall Chinook salmon, late fall Chinook salmon, winter Chinook salmon, and steelhead. Annual production goals for Coleman NFH are 12 million fall Chinook salmon, 1 million late fall Chinook salmon, and 600,000 steelhead. In addition to these mitigation production goals, Coleman NFH is rearing winter Chinook salmon on a provisional basis as part of an effort to reintroduce the endangered fish to the Battle Creek drainage.

The hatchery is situated on 75 acres of land, and an additional 63 acres exist in perpetual easements. The hatchery has three water intake structures on Battle Creek, allowing for uninterrupted delivery of rearing water to the facility. Water treatment at Coleman NFH is accomplished through a combination of settling, filtration, and ozonation. There are 2 settling ponds that are used to reduce suspended solids prior to filtration. A four bay Dual Media Filter system capable of filtering 45,000 gallons per minute further reduces levels of suspended solids. The Ozone Treatment Plant is capable of treating 30,000 gallons per minute and greatly reduces the risk of fish pathogens being introduced into the facility.

The hatchery operates a barrier weir spanning the entire width of Battle Creek, capable of diverting fish through a fish ladder and into several large broodstock holding ponds. The Spawning Building contains a cross-channel equipped with a hydraulic fish-crowder connecting the primary holding ponds. A tower containing a vertical fish lift and an anesthetizing tank connects the cross-channel with the sorting area in the spawning building.

The facility has a combination of 28-15x150ft raceways and 30-8x80ft raceways for juvenile rearing. The Incubation Building houses heath stack incubation trays and early-rearing tanks. Other buildings on the property include: The Administration Building, Shop Building, Vehicle Storage Building, Fabrication Shop/Maintenance Building, Feed Storage Building, 3 Residences, Chiller Building, and the Emergency Generator Building.

Also located on the facility is the CA/NV Fish Health Center (CA/NV FHC) that consists of two former residences converted into offices and lab spaces, and a Wet Lab located on the south side of the hatchery. Located on the hatchery grounds adjacent to the Wet Lab is the Anderson Field Office, which is a satellite workstation of the Red Bluff Fish and Wildlife Office (Red Bluff FWO).

STATION HIGHLIGHTS

Funding

Coleman National Fish Hatchery is fully funded by the USBR.

Personnel

At the end of the fiscal year Coleman NFH was staffed with: a Project Leader, a Deputy Project Leader, a Supervisory Facility Operations Specialist, an Administrative Officer, a Fisheries Program Assistant, a Supervisory Fish Biologist, 2 Fish Biologists, an Information and Education Specialist, a Motor Vehicle Operator, 5 Animal Caretakers, 2 Electronic Industrial Control Mechanics, an Electrician, 2 Maintenance Mechanics, and a Maintenance Worker.

Summary of significant staffing changes during fiscal year 2021: Hans Miller (Supervisory Facility Operations Specialist) was hired on 18 September 2021. Matt Peckham was promoted to Fish Biologist on 17 January 2021. Travis Webster and Kaitlin Gooding (Fish Biologists) were both promoted to GS-11. Jeff Freund (Motor Vehicle Operator) retired on 2 January 2021. Clay Hines and Patty Doolittle (Animal Caretakers) were promoted to Permanent. David Costas (Animal Caretaker) was hired on 1 August 2021. Jason Davis (Animal Caretaker) was hired on 15 August 2021. Spencer Gutenberger was promoted to Motor Vehicle Operator on 25 September 2021. See table in Appendix A for a complete list of station personnel.

FISH PRODUCTION SUMMARY

Fall Chinook Salmon Brood Year 2020 (CSA-FBW-20-COL)

Broodstock Collection and Spawning

The fish ladder was opened for collection of FCS broodstock on 1 October 2020. The first spawning take occurred on 6 October 2020; over 25% of female FCS handled were found to be ripe, green females and unpaired males were banked in Pond 4 for use on a future date. Spawning continued with sufficient but somewhat lower numbers of broodstock returning. Due to concerns regarding the somewhat low numbers of returning broodstock, green fish were continually banked in both Ponds 4 & 5 and incorporated into future spawning takes. The last take (13) occurred on 12 November 2020, a total of 4,083 crosses were made (Table 1) and 13,767 FCS were handled throughout the spawning season (Table 2).

Table 1. Fall Chinook salmon brood year 2020 number of female, male, and jack broodstock spawned at Coleman NFH by date and take

		Number Spawned			
Date	Take	Female	Male	Jack	Total
10/6/2020	1	176	178	2	356
10/8/2020	2	239	229	13	468
10/13/2020	3	427	408	30	865
10/14/2020	4	544	534	20	1,098
10/15/2020	5	282	283	3	568
10/20/2020	6	507	473	21	1,001
10/21/2020	7	405	392	18	815
10/22/2020	8	393	368	35	796
10/27/2020	9	374	227	57	658
10/29/2020	10	240	206	31	477
11/3/2020	11	118	112	6	236
11/5/2020	12	270	227	44	541
11/12/2020	13	108	101	8	217
	Total	4,083	3,738	288	8,109

Table 2. Fall Chinook salmon brood year 2020 disposition and number of fish collected at Coleman NFH from 6 October 2020 through 3 December 2020

Disposition	Female	Male	Jack	Total
Spawned	4,083	3,738	288	8,109
Excessed	1,463	498	490	2,451
DIPS[1]	1,732	1,172	303	3,207
Total	7,278	5,408	1,081	13,767

1. Dead in Pond Salmon (pre-spawn mortality)

Incubation

Each year the spawning plan is designed to harvest more eggs than are needed to meet production goals in order to hedge against a lack of ripe fish later in the spawning season and/or poor survival of earlier egg-takes. After inventory, eggs from each take are reduced to aggregates that will populate one or more ponds while attempting to both maintain a normal distribution (bell shaped curve) of eggs over time to mimic the run/spawn timing of the natural population and to retain enough eggs to achieve the production goal of releasing 12 million FCS smolts.

For the third consecutive year an increased number of eggs were retained to evaluate the practice of trucking and releasing FCS smolts offsite at the Scotty's Landing Boat Ramp on the Sacramento River. The study is in cooperation with the Red Bluff FWO, Golden Gate Salmon Association (GGSA) and the NorCal Guides Association. Due to the Covid-19 pandemic the offsite release was canceled during the previous year and all fish were released on station. A portion of the eggs from Takes 1 & 2 were allocated for the offsite release study (see *Juvenile Rearing* and *Release* sections for further information regarding this study).

Inventorying of FCS eggs began in late October and was completed during mid-December. Eggs were culled from several takes prior to inventorying (Table 3); this occurred either due to more than enough eggs being taken to meet the objectives for that take and/or the observation of trays with exceptionally low survival just prior to inventory.

Survival of harvested eggs to the 'eyed egg stage' was moderate (population mean = 84.4%). Volumetric sampling estimated the total number of eyed eggs at the time of inventory was 17,187,025. These eggs were further reduced to an estimated 13,954,158 eggs to meet production goals (Table 4).

Table 3. Fall Chinook salmon brood year 2020 crosses culled prior to inventory and estimated green eggs culled by take

Take	Number Of Crosses Culled	Estimated Green Eggs
2	2	10,000
4	48	240,000
5	30	150,000
6	30	150,000
7	30	150,000
10	2	10,000
Total	142	710,000

Table 4. Fall Chinook salmon brood year 2020 numbers of green eggs, eyed eggs, post-reduction eyed eggs, eggs per female, eggs per ounce, and percent survival to the eyed egg stage by date spawned and take

Date Spawned	Take	Green Eggs	Eyed Eggs	Post-Reduction Eyed Eggs	Eggs per Female	Eggs per oz	Percent Survival to Eyed Egg Stage
10/6/2020	1	831,563	694,625	686,817	4,725	78.25	83.5
10/8/2020	2	1,213,959	1,058,135	679,412	5,122	81.37	87.2
10/13/2020	3	2,129,689	1,847,519	1,452,150	4,988	79.15	86.8
10/14/2020	4	2,455,833	2,046,222	1,936,200	4,951	76.42	83.3
10/15/2020	5	1,299,270	1,067,640	968,100	5,156	79.19	82.2
10/20/2020	6	2,521,252	2,000,654	1,936,200	5,286	76.39	79.4
10/21/2020	7	1,913,213	1,526,994	1,454,150	5,102	78.42	79.8
10/22/2020	8	2,026,223	1,707,243	1,452,137	5,156	77.80	84.3
10/27/2020	9	2,012,289	1,835,138	968,100	5,380	74.59	91.2
10/29/2020	10	1,268,317	1,102,004	968,100	5,329	72.31	86.9
11/3/2020	11	666,816	590,272	484,050	5,651	73.60	88.5
11/5/2020	12	1,474,427	1,225,887	484,050	5,461	73.10	83.1
11/12/2020	13	545,996	484,692	484,692	5,056	71.70	88.8
Total/Avg.		20,358,847	17,187,025	13,954,158	5,166	76.33	84.4

Juvenile Rearing

Take 1 was transferred from the incubation stacks to the 15x150ft raceways (ponding, past: ponded) on 17 December 2020. Typically, FCS fry are ponded sequentially starting at raceway 1 (while leaving gaps for splitting of raceways); however, due to an unusually late release of BY20 LFCS juveniles, raceways 1-14 were still occupied during December when FCS ponding started. Therefore, ponding of BY20 FCS started at raceway 28 and continued in descending order. In-pond screens were used to increase the initial density of single pond takes and larger two pond takes were split with a pump and electronic fish counter prior to reaching a density index (DI) of 0.30.

A portion of fry (n = 405,534) from takes 1 and 2 were ponded in the 8x80ft raceways for use in an experimental offsite release study. The study is at the request of the Golden Gate Salmon Association (GGSA) and the NorCal Guides Association to evaluate the practice of trucking and releasing FCS smolts offsite at the Scotty's Landing Boat Ramp on the Sacramento River. The study was scheduled to have a 3 year duration and began with FCS BY18; however, due to the covid pandemic the offsite release of BY19 FCS fry was cancelled in the previous year.

FCS fry were fed the BioOregon BioVita line (high energy) of fish feeds after ponding. FCS were initially fed at 1% body weight per day for the first 1-2 days, then increased to 2% for 7 days, and finally increased again to 2.4%. Feed conversion and growth were good (Table 5) with fish reaching tagging and release targets earlier than normal.

In the previous year, BY19 FCS fry had increased levels of mortality after ponding and were diagnosed with thiamine deficiency syndrome. Adult salmon may develop a thiamine deficiency

if their diet composition is heavily comprised of prey fish containing high concentrations of the enzyme thiaminase (an enzyme that degrades thiamine). Furthermore, the ova developing within thiamine deficient adult female salmon may not contain adequate levels of the nutrient for early ontogeny of salmon fry prior to the start of exogenous feeding. Testing of eggs from BY20 FCS showed that a portion of the female broodstock had produced eggs deficient in thiamine. FCS fry had somewhat elevated levels of mortality after ponding and some fish exhibited symptoms consistent with thiamine deficiency syndrome (lethargic and corkscrew-swimming behavior). No thiamine treatments were done on BY20 FCS and fish appeared generally healthy after a few weeks of exogenous feeding.

Table 5. Summary by month of number brood year 2020 juvenile fall Chinook salmon in raceways, total mortality, mean weight, length, DI, FCR and total pounds of feed fed

			Mean				
Month	Number In Raceways	Mortality	(Fish/lb)	Length (in)	Density Index (DI)	Feed Conversion (FCR)	Feed Fed (lbs)
December	5,720,735	1,944	1,088.2	1.4	0.12	0.70	224
January	12,451,931	45,504	572.7	1.8	0.21	0.62	7,640
February	13,691,352	60,974	242.0	2.4	0.21	0.59	22,624
March	6,419,646	22,058	127.6	2.8	0.24	0.85	36,490
April	888,256	2,617	80.5	3.3	0.16	0.92	13,825
May[1]	-	0	59.6	3.6	-	-	2,548

1. Size at release

Marking and Tagging

Coded wire tagging (CWT; tagging) and adipose-fin clipping (marking) the fall Chinook salmon commenced during the last week of February and was completed on April 13. The production release group of FCS were marked and tagged at a 25% constant fractional rate, with each raceway receiving a unique CWT code. FCS reared for the paired onsite and Butte City release study were marked and tagged at a 100% rate. The AutoFish System™ used in the marking and tagging process provides an accurate census of the fish population in each raceway processed. The number generated by the tagging census was found to be 822,739 fish less than the hatchery inventory number (~6.0%). This difference represents the mortality between egg inventory and ponding (after-hatch loss) which would be very difficult to enumerate independently.

Release

Due to ongoing extreme drought conditions FCS growth was accelerated as much as possible to allow for earlier production releases to occur before environmental conditions in the migration corridor deteriorated further. There were 3 production releases into Battle Creek, totaling 11,670,791 (Table 6). Two of the production releases occurred in mid-March and one in early-April.

In addition to the production releases of BY20 FCS; a paired offsite (Butte City) and onsite experimental release occurred. This release was part of a 3-year study at the request of the GGSA and the NorCal Guides Association. The study began in 2019 with paired releases of BY18 FCS; however, the study was cancelled the following year in 2020 due to the covid pandemic. The aim of the study is to evaluate the relative survival and return of fish released onsite into Battle Creek

and those releases into a net pen at Scotty's Landing on the Sacramento River. At the time of release, it was determined that the water was too shallow at Scotty's Landing to accommodate the net pens and the fish were instead released directly into the Sacramento River at the Butte City Boat Ramp.

Table 6. Fall Chinook salmon brood year 2020 number released, location, fish/lb, and total weight by date and cwt

Date	CWT	Total Released	Release Location	(Fish/lb)	Total Weight (lbs)
3/10/2021	056546	454,311	Battle Creek	149.6	3,037
3/10/2021	056543	423,518	Battle Creek	99.7	4,248
3/10/2021	056542	411,202	Battle Creek	105.2	3,910
3/18/2022	056555	444,983	Battle Creek	164.0	2,713
3/18/2022	056554	447,637	Battle Creek	173.0	2,588
3/18/2022	056553	457,568	Battle Creek	167.8	2,727
3/18/2022	056552	460,315	Battle Creek	126.9	3,627
3/18/2022	056551	446,200	Battle Creek	121.0	3,688
3/18/2022	056550	466,177	Battle Creek	120.5	3,869
3/18/2022	056549	461,552	Battle Creek	114.6	4,028
3/18/2022	056548	442,960	Battle Creek	118.9	3,726
3/18/2022	056547	471,995	Battle Creek	112.6	4,192
3/18/2022	056545	465,421	Battle Creek	117.2	3,971
3/18/2022	056544	430,937	Battle Creek	119.4	3,609
3/24/2022	056570	92,718	Battle Creek	80.5	1,153
3/24/2022	056573	92,337	Battle Creek	85.3	1,082
3/26/2022	056571	92,156	Butte City	75.8	1,216
3/26/2022	056572	94,294	Butte City	84.6	1,115
4/8/2022	056567	437,407	Battle Creek	138.0	3,170
4/8/2022	056566	488,957	Battle Creek	119.1	4,105
4/8/2022	056565	421,713	Battle Creek	105.0	4,016
4/8/2022	056564	485,091	Battle Creek	109.1	4,446
4/8/2022	056563	415,179	Battle Creek	95.5	4,347
4/8/2022	056562	453,345	Battle Creek	89.5	5,065
4/8/2022	056561	471,901	Battle Creek	91.0	5,186
4/8/2022	056560	425,654	Battle Creek	94.3	4,514
4/8/2022	056559	453,716	Battle Creek	91.7	4,948
4/8/2022	056558	437,486	Battle Creek	94.3	4,639
4/8/2022	056557	439,217	Battle Creek	90.9	4,832
4/8/2022	056556	456,349	Battle Creek	85.3	5,350
5/3/2022-5/4/2022	056568	448,265	San Rafael Bay[1]	67.0	6,699
5/17/2022-5/18/2022	056569	440,616	San Rafael Bay[1]	52.2	8,439
Total/Avg.		12,931,177		104.1	124,255

1. Released at the Marin Rod and Gun Club boat ramp

By the time that the last two raceways were marked and tagged, environmental conditions in the river and delta had drastically deteriorated. An evaluation of in river temperature, flow, salinity, and Delta Cross Channel Gate Operations was made (trucking triggers) and it was determined that an onsite release of these fish would likely result in no or very low survival.

The two remaining raceways were split into four raceways to allow for the fish to be reared to a larger size prior to release. The larger size at release ensures that fish have fully smolted and will be able to osmoregulate in salt water. Each release occurred over a 2-day period. Trucking was accomplished using the 2002 Freightliner and Brown Ford fish-hauling trucks. Ice, no-foam, NovAqua (artificial slime), and salt were added to maintain water temperature and reduce fish stress during hauling. A chase vehicle followed the fish hauling trucks with additional ice which was used as needed. Fish were released at the Marin Rod and Gun Club boat ramp.

Late Fall Chinook Salmon Brood Year 2020 (CSA-LBW-20-COL)

Juvenile Rearing

At the beginning of the fiscal year there were 879,398 juvenile brood year 2020 LFCS on station with a mean size of 28.4 fish/lb. Feed conversion rate was exceptionally good for LFCS during October (mean FCR 0.66), before slowing (mean 1.62 FCR) during the month of December (Table 7). Very low rates of feed conversion in LFCS are often observed during the last months of rearing and may be attributable to changes in condition factor of fish undergoing the process of smoltification.

Table 7. Summary by month of number brood year 2020 juvenile late fall Chinook salmon in raceways, total mortality, mean weight, length, DI, FCR and total pounds of feed fed

			Mean				
Month	Number In Raceways	Mortality	(Fish/lb)	Length (in)	Density Index (DI)	Feed Conversion (FCR)	Feed Fed (lbs)
October	875,209	189	16.5	5.5	0.12	0.66	14,107
November	874,892	217	12.9	6.0	0.14	0.73	11,594
December	874,785	107	11.3	6.3	0.15	1.62	11,887
January[1]	0	14	11.1	6.3	-	-	2,004

1. Size at release

Release

Production releases of LFCS typically occur in November or December and are timed to coincide with storm events that increase flow and turbidity in the migratory corridor aiding rates of downstream migration and providing cover from predators. Due to ongoing drought conditions a suitable storm event did not occur until early January. The production release of brood year 2020 LFCS occurred on 4 & 5 January 2021 and was timed to coincide with a storm event (Table 8). Three additional ‘spring surrogate’ releases of LFCS also occurred during the month of January. Spring surrogate releases are used to estimate the take of ESA-listed spring Chinook salmon at fish salvage facilities associated with State and Federal water export conveyances.

Table 8. Late fall Chinook salmon brood year 2020 number released, location, fish/lb, and total weight by date and cwt

Date	CWT	Total Released	Release Location	(Fish/lb)	Total Weight (lbs)
1/4/2021	056350	62,954	Battle Creek	10.7	5,939
1/4/2021	056351	74,506	Battle Creek	11.0	6,835
1/4/2021	056352	67,162	Battle Creek	11.7	5,740
1/4/2021	056353	67,472	Battle Creek	12.5	5,398
1/4/2021	056354	58,821	Battle Creek	12.3	4,782
1/4/2021	056355	57,542	Battle Creek	12.0	4,795
1/4/2021	056356	52,656	Battle Creek	11.6	4,539
1/4/2021	056357	52,554	Battle Creek	11.6	4,546
1/5/2021	056347	67,930	Battle Creek	10.8	6,290
1/5/2021	056348	67,007	Battle Creek	9.1	7,404
1/5/2021	056349	57,099	Battle Creek	10.4	5,490
1/8/2021	056359	66,912	Battle Creek	9.3	7,198
1/22/2021	056360	61,351	Battle Creek	11.1	5,527
1/29/2021	056358	64,805	Battle Creek	11.5	5,635
Total/Avg.		878,771		11.0	80,118

Late Fall Chinook Salmon Brood Year 2021 (CSA-LBW-21-COL)

Broodstock Collection and Spawning

The Fish Ladder was opened intermittently between FCS broodstock collection and the beginning of LFCS spawning to allow for passage of natural-origin LFCS, natural-origin STT, and WCS. The first take of LFCS occurred on 22 December 2020. Spawning continued, and spawning targets were reached despite low numbers of broodstock returning. The last take (11) occurred on 2 March 2021, a total of 642 crosses were made (Table 9) and 1,827 LFCS were handled throughout the spawning season (Table 10).

LFCS spawning is managed as an integrated program; typically, natural-origin broodstock are collected weekly from the Keswick Dam Fish Trap and included in spawning crosses. The Keswick Dam Fish Trap was unavailable for use during LFCS spawning as the trap was undergoing inspection and maintenance; therefore, natural-broodstock from the Keswick Trap were not available for spawning during the BY21 run year. A single natural-origin male LFCS that returned to Coleman NFH was accidently euthanized on 22 December 2020 (Take 1) during sorting and was crossed with a hatchery-origin female.

Table 9. Late fall Chinook salmon brood year 2021 numbers of hatchery-origin and natural-origin, male, female, and jack broodstock spawned at Coleman NFH by date and take

		Hatchery-Origin			Natural-Origin			
			Male			Male		
Date	Take	Female	Adult	Jack	Female	Adult	Jack	Total
12/22/2020	1	14	13	0	0	1	0	28
12/29/2020	2	25	23	2	0	0	0	50
1/5/2021	3	105	99	6	0	0	0	210
1/12/2021	4	109	106	3	0	0	0	218
1/19/2021	5	132	132	0	0	0	0	264
1/26/2021	6	65	63	2	0	0	0	130
2/2/2021	7	115	114	1	0	0	0	230
2/9/2021	8	46	39	7	0	0	0	92
2/18/2021	9	29	28	1	0	0	0	58
2/23/2021	10	2	2	0	0	0	0	4
3/2/2021	11	0	0	0	0	0	0	0
	Total	642	619	22	0	1	0	1,284

Table 10. Late fall Chinook salmon brood year 2021 disposition and number of fish handled at Coleman NFH

Disposition	Female	Male	Jack	Total
Spawned	642	620	22	1,284
Excessed	191	35	7	233
DIPS	130	90	75	295
Passed Upstream	7	6	2	15
Total	970	751	106	1,827

Incubation

An estimated 3,233,461 green eggs were harvested over the course of the LFCS spawning season. Each year the spawning plan is designed to harvest more eggs than are needed to meet production goals in order to hedge against an early diminishing run of fish and, or poor survival of earlier egg takes. Excess eggs are later reduced if sufficient eggs are obtained in later takes to achieve production goals. A total of 1,314,024 eyed eggs were retained for production purposes. Overall survival to the eyed egg stage was 86.7% (Table 11).

Table 11. Late fall Chinook salmon brood year 2021 numbers of hatchery-origin green eggs, eyed eggs, post-reduction eyed eggs, eggs per female, eggs per ounce, and percent survival to the eyed egg stage by date spawned and take

Date Spawned	Take	Green Eggs	Eyed Eggs	Post-Reduction Eyed Eggs	Eggs per Female	Eggs per oz	Percent Survival to Eyed Egg Stage
12/22/2020	1	80,083	74,857	74,857	5,720	70.6	93.5
12/29/2020	2	126,752	108,858	108,858	5,070	74.6	85.9
1/5/2021	3	498,993	455,896	188,000	4,752	82.6	91.4
1/12/2021	4	546,992	460,767	188,000	5,018	79.5	84.2
1/19/2021	5	621,134	531,696	282,000	4,706	79.5	85.6
1/26/2021	6	347,952	285,088	94,000	5,353	78.6	81.9
2/2/2021	7	567,380	495,588	190,000	4,934	75.6	87.3
2/9/2021	8	262,546	233,162	94,000	5,708	735	88.8
2/18/2021	9	172,591	151,856	88,000	5,951	75.4	88.0
2/23/2021	10	9,038	6,309	6,309	4,519	85.3	69.8
	Total/Avg.	3,233,461	2,804,077	1,314,024	5,037	77.5	86.7

Juvenile Rearing

The first take of LFCS was ponded in the 8x80ft raceways on 21 March 2021**,** subsequent takes followed as they reached the "button-up" fry stage; the last take (10) was ponded on 30 April 2021. In-pond screens were used to maintain a desired minimum density of fish to promote uniform feeding.

Typically, LFCS are vaccinated against enteric red mouth disease (*Yersinia ruckeri*) as they reach a minimum size of 250 fish/lb; however, this year as part of a trial, only half of the raceways received the enteric redmouth vaccine, whereas the other half were scheduled to receive 2 consecutive vaccinations for columnaris (*Flavobacterium columnare*) at 150 fish/lb, and again at 100 fish/lb. The aim of this trial was to evaluate the efficacy of the columnaris vaccine at reducing mortality from columnaris in juvenile LFCS.

In the past, LFCS have been pumped from the 8x80ft raceways into the tagging trailer and discharged into the 15x150ft raceways. This year, fish were marked and tagged into empty adjacent 8x80ft raceways. Rearing the LFCS in the 8x80ft raceways longer was an attempt to grow these fish more rapidly to meet size thresholds required for the columnaris vaccine trial. Crowding fish and administering the vaccine is also more easily accomplished in the smaller raceways.

Coded wire tagging and marking of late fall Chinook salmon commenced on 11 May 2021. After the first 3 raceways were marked, the remaining fish were deemed too small to continue and therefore tagging and marking was paused from 14-24 May 2021. Tagging had to be paused several more times during June due to extremely warm water temperatures. Tagging of the last raceway was completed on 25 June 2021. The tagging census number was found to be 42,470 fewer fish (~3.8%) than the hatchery inventory projected. This difference represents the mortality between egg inventory and ponding (after-hatch loss) which would be very difficult to enumerate independently.

Despite the more rapid growth of the LFCS in the 8x80ft raceways, warm water temperatures in June also led to an early cessation of the columnaris vaccine trial; 7 raceways received the enteric red mouth vaccine (control), 4 raceways received 2 vaccinations for columnaris, and 3 raceways received only a single vaccination for columnaris. LFCS were pumped from the 8x80ft raceways to the 15x150ft raceways using the 4 inch fish pump, flex hose, and a roll of 4 inch hose. The first 12 raceways were moved over the course of 3 days the week of 14 June 2021. The remaining 2 raceways were moved on 25 June 2021 when tagging was completed.

Starting in early June, columnaris and *Ichthyophthirius multifiliis* (Ich) led to elevated rates of LFCS mortality. Despite repeated oxytetracycline (OTC), chloramine-T (CHL-T) and salt treatments (Table 12), high levels of mortality continued to occur throughout the summer. There did not appear to be a noticeable difference in mortality between groups of fish that received the experimental columnaris vaccine and controls. By the end of the fiscal year, temperatures had become more suitable, and rates of mortality had decreased to acceptable levels.

Table 12. Summary by date of brood year 2021 late fall chinook salmon treatments, dosage, and rearing units/groups treated

Dates	Treatment	Dosage	Rearing Units/ Group Treated
6/5/2021-6/18/2021	OTC	10g/100lbs	RW 29
6/9/2021-6/18/2021	OTC	3.75g/100lbs	RW's 31, 33-39
6/9/2021-6/11/2021	CHL-T	20mg/L	RW's 31, 33-39
6/10/2021-6/12/2021	CHL-T	20mg/L	RW 43
6/24/2021-6/26/2021	CHL-T	20mg/L	RW's 9-11
6/24/2021-7/3/2021	OTC	3.75g/100lbs	RW's 9-11
6/30/2021-7/9/2021	OTC	3.75g/100lbs	RW's 1-8 & 12-14
7/1/2021-7/7/2021	Salt	1000ppm	RW's 1-14
7/8/2021-7/10/2021	CHL-T	20mg/L	RW's 1-14
7/10/2021-7/19/2021	OTC	3.75g/100lbs	RW's 1-14
8/5/2021-8/18/2021	OTC	10g/100lbs	RW 4

At the end of the fiscal year there were 1,039,639 LFCS on station with a mean size of 24.0 fish/lb (Table 13).

Table 13. Summary by month of number brood year 2021 juvenile late fall Chinook salmon in raceways, total mortality, mean weight, length, DI, FCR and total pounds of feed fed

	Number In Tanks/		Mean				
Month	Raceways	Mortality	(Fish/lb)	Length (in)	Density Index (DI)	Feed Conversion (FCR)	Feed Fed (lbs)
March	371,212	503	1160.3	1.4	0.08	0.75	26
April	1,295,313	18,982	572.8	1.9	0.15	0.60	1,105
May	1,173,064	9,985	125.7	2.9	0.18	0.70	4,733
June	1,111,254	32,037	86.6	3.3	0.05	1.18	4,410
July	1,049,003	62,251	55.3	3.8	0.07	0.81	5,575
August	1,043,107	5,896	36.9	4.4	0.09	0.99	8,567
September	1,039,639	3,468	24.0	5.0	0.12	1.26	11,072

Steelhead Brood Year 2020 (CVS-WBW-20-COL)

Juvenile Rearing

Brood year 2020 juvenile steelhead (STT) converted feed at good rates until December when water cooled and slowed growth rates (mean FCR 2.17). There were no fish health issues with the STT from the beginning of the fiscal year through release and rates of mortality were low (Table 14).

Table 14. Summary by month of number brood year 2020 juvenile steelhead in raceways, total mortality, mean weight, length, DI, FCR and total pounds of feed fed

			Mean				
Month	Number In Raceways	Mortality	(Fish/lb)	Length (in)	Density Index (DI)	Feed Conversion (FCR)	Feed Fed (lbs)
October	633,246	305	7.4	7.4	0.15	0.91	21,580
November	632,862	140	4.8	8.5	0.20	0.63	28,615
December[1]	632,731	106	4.5	8.7	0.21	2.17	15,645

1. Size at release

Release

Table 15. Steelhead brood year 2020 number released, location, fish/lb, and total weight by date and raceway

Date	Total Released	Raceway	Release Location	(Fish/lb)	Total Weight (lbs)
12/11/2020	45,227	28	Red Bluff Diversion Dam	4.3	10,518
12/11/2020	49,827	27		4.3	11,588
12/11/2020	45,099	26		4.9	9,204
12/12/2020	47,399	25		4.8	9,875
12/12/2020	45,344	24		5.1	8,891
12/12/2020	42,912	23		4.7	9,130
12/16/2020	47,667	22		4.3	11,085
12/16/2020	46,771	21		4.7	9,951
12/16/2020	46,004	20		4.5	10,223
12/28/2020	50,727	19		4.1	12,372
12/28/2020	42,085	18		4.2	10,020
12/29/2020	41,901	17		4.2	9,976
12/29/2020	40,351	16		4.5	8,967
12/29/2020	41,437	15		4.2	8,866
Total/Average	632,751			4.5	140,666

Typically, juvenile STT are released the first week in January or earlier in December if good environmental conditions occur (*i.e.*, a storm event with increased flow and high turbidity). This year, STT needed to be released in December despite poor environmental conditions to make space for FCS to be ponded in the 15x150ft raceways. Typically LFCS would be released prior to STT to allow for ponding of FCS; however, it was decided that STT would likely fair better in the poor in-river conditions than the LFCS and thus they were released first.

The release site was also moved to the Sycamore Grove boat ramp (Red Bluff, Ca), due to the low river flows and unsuitable condition of the Bend Boat Ramp (Bend, Ca). There were three separate production releases of STT during the month of December. The first release occurred from 11-12 December 2020, the second release occurred on 16 December 2020, and the third release occurred from 28-29 December 2020. STT were crowded to the front of each raceway and loaded onto distribution trucks using a fish pump and dewatering tower. A total of 632,731 juvenile STT were released into the Sacramento River at the Sycamore Grove Boat Ramp in December (Table 15).

Steelhead Brood Year 2021 (CVS-WBW-21-COL)

Broodstock Collection and Spawning

Steelhead broodstock collection began in early-October with relatively few fish being collected until numbers started to increase somewhat when the ladder was re-opened in late-December. Early returning steelhead broodstock (October through mid-December) and late returning steelhead (Late-December through February) are typically held separately in Ponds 5 and 4 respectively. Separation of these STT allows for targeted spawning of either group with the goal of incorporating a relatively equal number of both early and late returning STT into the spawning plan. For the third consecutive year, due to low numbers of returning fall Chinook salmon, Ponds 4 and 5 were used for holding non-ripe fall Chinook salmon that would typically be euthanized without spawning (excessed); consequently, steelhead broodstock that returned during fall Chinook spawning were transferred to the Pre-Release Pond instead of Pond 5. Transferring steelhead to the prerelease pond also allows for better feeding of broodstock and enumeration and removal of pre-spawn mortalities.

In mid-December, the Pre-Release Pond was seined, and all of the surviving 449 early-returning steelhead were transferred to Pond 5. A total of 2,002 late-returning steelhead were collected and transferred to Pond 4 during LFCS sorting and spawning. The first steelhead egg take occurred on 23 December 2020 and consisted of 29 pairs of fish (Table 16). Steelhead are classified as shorts or longs based upon their fork-length. Shorts have lengths that are greater than 16in and less than 21.75in; longs are fish greater than or equal to 21.75in. The ratio of short to long broodstock was approximately 1:1. The last take occurred on 23 February 2021, a total of 553 pairs of steelhead were spawned throughout the spawning season.

Table 16. Steelhead brood year 2021 numbers of female and male, short, and long broodstock spawned at Coleman NFH by date and take

		Hatchery-Origin				
		Female		Male		
Date	Take	Short	Long	Short	Long	Total
12/23/2020	1	0	29	9	20	58
12/29/2020	2	8	24	12	20	64
1/7/2021	3	20	39	40	19	118
1/14/2021	4	25	82	62	45	214
1/21/2021	5	22	52	48	26	148
1/28/2021	6	26	34	37	23	120
2/4/2021	7	17	48	41	24	130
2/11/2021	8	12	23	27	8	70
2/18/2021	9	14	24	31	7	76
2/23/2021	10	30	24	46	8	108
	Total	174	379	353	200	1,106

Broodstock Reconditioning

The STT kelt release occurred on 1 March 2021, water was lowered in the Pre-release Pond and a seine net was used release fish through the wastewater canal into Battle Creek. Two staff members independently attempted to enumerate fish as they transited the canal. The two counts were: 1,028 and 1,054.

Incubation

At inventory there were an estimated 278,217 eyed eggs from crosses of short females and 932,967 eyed eggs from long females (Tables 17 & 18). In order to increase the genetic diversity of hatchery-origin STT, the spawning plan incorporates twice as many broodstock as is needed to meet egg-take goals. Eyed eggs from short and long crosses were proportional to the ratio at which they were collected. A total of 687,458 eyed eggs were and retained for production (Table 19).

Table 17. Steelhead brood year 2021 numbers of green eggs, eyed eggs, post-reduction eyed eggs, eggs per female, eggs per ounce, and percent survival to the eyed egg stage by date spawned and take from short females

Date Spawned	Take	Green Eggs	Eyed Eggs	Post-Reduction Eyed Eggs	Eggs per Female	Eggs per oz	Percent Survival to Eyed Egg Stage
12/23/2020	1	0	0	0	NA	NA	NA
12/29/2020	2	13,189	11,031	8,958	1,649	239.8	83.6
1/7/2021	3	49,991	45,402	23,696	2,631	241.5	90.8
1/14/2021	4	58,655	45,531	26,731	2,346	267.8	77.6
1/21/2021	5	44,322	31,227	9,278	2,607	251.8	70.5
1/28/2021	6	69,915	52,658	31,900	2,797	221.3	75.3
2/4/2021	7	59,027	28,309	13,148	3,935	301.2	48.0
2/11/2021	8	37,456	24,206	12,185	3,121	254.8	64.6
2/18/2021	9	19,847	14,434	14,434	2,481	257.8	72.7
2/23/2021	10	39,284	25,419	25,419	3,274	288.9	64.7
	Total/Avg.	391,686	278,217	165,749	2,778	258.3	71.0

Table 18. Steelhead brood year 2021 numbers of green eggs, eyed eggs, post-reduction eyed eggs, eggs per female, eggs per ounce, and percent survival to the eyed egg stage by date spawned and take from long females

Date Spawned	Take	Green Eggs	Eyed Eggs	Post-Reduction Eyed Eggs	Eggs per Female	Eggs per oz	Percent Survival to Eyed Egg Stage
12/23/2020	1	130,887	92,964	48,163	4,513	216.7	71.0
12/29/2020	2	69,401	48,409	39,205	2,892	214.2	69.8
1/7/2021	3	162,104	138,097	72,630	4,381	220.3	85.2
1/14/2021	4	301,824	199,994	117,758	3,971	203.7	66.3
1/21/2021	5	172,563	130,881	38,885	4,930	208.4	75.8
1/28/2021	6	145,666	106,350	64,426	4,856	196.6	73.0
2/4/2021	7	135,116	75,242	35,015	4,359	199.6	55.7
2/11/2021	8	92,691	71,381	35,978	4,878	206.9	77.0
2/18/2021	9	59,024	44,476	44,476	3,279	207.8	75.4
2/23/2021	10	34,252	25,173	25,173	1,317	206.3	73.5
	Total/Avg.	1,303,528	932,967	521,709	4,011	208.1	71.6

Table 19. Steelhead brood year 2021 numbers of green eggs, eyed eggs, eggs per female, eggs per ounce, and percent survival to the eyed egg stage from short and long females

Broodstock Origin	Green Eggs	Eyed Eggs	Post-Reduction Eyed Eggs	Eggs per Female	Eggs per oz	Percent Survival to Eyed Egg Stage
Short	391,686	278,217	165,749	2,778	258.3	71.0
Long	1,303,528	932,967	521,709	4,011	208.1	71.6
Total/Avg	1,695,214	1,211,184	687,458	3,638	231.9	71.4

Juvenile Rearing

The first take of STT was transferred from the incubation stacks to the early-rearing tanks on 24 February 2021, tanking of STT continued until the last take was tanked on 14 April 2021. Fish were started on a high percent body weight diet, and feed conversion rates (FCR) were very good (Table 20) while in tanks. Fish were closely monitored, and tanks were split as needed to maintain acceptable density indices.

During May several takes of STT had slightly elevated levels of mortality and were observed to be flashing. The CA/NV FHC diagnosed the symptomatic fish with Costia. Standing bath formalin treatments (110 mg/L) were used to control mortality and deemed successful (Table 21).

On May 19 2021, there was a power outage that affected the facility after normal working hours. Many different pieces of equipment were affected including water delivery pumps. As a result, staff turned raw water (untreated gravity-fed surface water) on to the hatchery building. Juvenile STT (Takes 8-10) being reared inside received raw water for approximately 20 minutes until the treated water supply could be restored. On the morning of May 21 2021, at approximately 1040, it was discovered that the raw water valve had remained in the open position even after treated water was restored. It was estimated that raw water was supplied to the STT tanks for over 40

hours. Hatchery staff and California/Nevada Fish Health Center staff closely monitored fish for signs of disease throughout the rest of the month.

Starting on 15 April 2021 STT were vaccinated for enteric redmouth disease, and transferred to the 8x80ft raceways when they reached a size of approximately 250 fish/lb. The last take was transferred to the 8x80ft raceways on 27 May 2021.

Marking of STT commenced on 4 May 2021. In addition to marking, the AutoFish System™ used by PFMFC provides an accurate count of fish populations in each raceway processed. Marking was completed on 9 June 2021 and the final difference between the hatchery inventory number and the census taken from the marking trailer was -16,184 fish (~ 2.6 %). This difference represents the mortality between egg inventory and ponding (after-hatch loss) which would be very difficult to enumerate independently. STT were pumped from the 8x80ft raceways to the 15x150ft raceways on 15 & 16 June 2021.

In early June all STT raceways were diagnosed with columnaris infection. On 5 June 2021, a 14 day OTC treatment was started on all STT raceways that had already been marked (Table 21). The treatment was paused for a day when fish were pumped from the 8x80ft raceways to the 15x150ft raceways. Raceway 45 (Take 9) was experiencing elevated mortality due to columnaris infection and was given a 3 day Chloramine-T treatment prior to marking (Table 21). All treatment were successful at temporarily decreasing rates of mortality; however, columnaris infections continued throughout the summer rearing period and all raceways were given a 14 day treatment from 18 August – 1 September 2021 (Table 21). Further treatments were not needed to control columnaris.

Table 20. Summary by month of numbers of brood year 2021 juvenile steelhead in tanks and raceways, total mortality, mean weight, length, DI, FCR and total pounds of feed fed

			Mean				
Month	Number In Tanks/ Raceways	Mortality	(Fish/lb)	Length (in)	Density Index (DI)	Feed Conversion (FCR)	Feed Fed (lbs)
February	47,553	610	2,906.8	1.0	0.18	-	2
March	485,734	5,278	1,453.9	1.4	0.22	0.53	1,601
April	690,253	14,710	403.4	2.2	0.19	0.63	1,408
May	655,390	2,061	88.8	3.3	0.13	0.64	3,531
June	628,672	16,694	55.4	3.8	0.04	1.40	5,121
July	619,222	9,450	29.1	4.7	0.06	0.96	9,594
August	611,829	7,393	17.3	5.6	0.09	0.88	11,874
September	611,189	640	9.6	6.7	0.13	0.65	17,491

Table 21. Summary by date of brood year 2021 steelhead treatments, dosage, and rearing units/groups treated

Dates	Treatment	Dosage	Rearing Units/ Group Treated
4/13/2021-4/14/2021	Formalin	110ppm	Tanks 1-8
4/24/2021-4/25/2021	Formalin	110ppm	Tanks 17-28
5/13/2021	Formalin	110ppm	Tanks 36-39
6/5/2021-6/18/2021	OTC	10g/100lbs	RWs 15-25
6/7/2021-6/9/2021	CHL-T	20mg/L	RW 45
8/18/2021-9/1/2021	OTC	10g/100lbs	RW's 15-28

Winter Chinook Salmon Brood Year 2020 (WCS-WBD-20-LIV)

Egg and Fry Transfers (To Coleman NFH and Mount Lassen Trout Farm)
Spawning of winter Chinook salmon (WCS) for the Battle Creek Reintroduction Program at Livingston Stone NFH concluded in September 2020 (Fiscal year 2020). Brood year 2020 is composed of both progeny of captive broodstock, and for the first time anadromous broodstock returning to Battle Creek (2 year-old male 'jack' salmon from Battle Creek and cryopreserved milt from WCS collected at the Keswick Dam Fish Trap have been used in previous years). Captive broodstock and anadromous broodstock were spawned separately and were not combined within takes or lots.

A portion of the captive broodstock progeny were transferred to Mount Lassen Trout Farm (MLTF) on the North Fork of Battle Creek. MLTF was selected as a provisional rearing facility to aid in the reintroduction of WCS to Battle Creek. On 1 September 2020 the first group of eyed eggs (Take 14) were transferred to MLTF (Table 22). On 7 October 2020, the second group of eyed eggs (Take 15) was transferred from Livingston Stone NFH to MLTF. Eggs were loaded into laundry bags and hauled in a tank mounted on a pickup truck.

On 14 October 2020, 3 trucks equipped with fish tanks were used to transport Takes 1-12 to Coleman NFH. Later, button-up fry from takes 13 and 14a were transferred to Coleman NFH on 21 & 28 October 2020 respectively.

Table 22. Lot, take, date spawned, numbers of eyed eggs, life stage at transfer, number transferred, transfer dates, and rearing facility for progeny of winter Chinook captive brood stock spawned at the Livingston Stone NFH and transferred to the Coleman NFH and Mount Lassen Trout Farm

Lot	Take	Date Spawned	Eyed Eggs	Life Stage At Transfer	Number Transferred	Date Transferred	Rearing Facility
1	1	5/18/2020	2,853	Fed-fry	55,977	10/14/2020	CNFH
	2	6/3/2020	5,383				
	3	6/10/2020	6,030				
	4	6/17/2020	22,052				
	5a	6/24/2020	23,553				
2	5b	6/24/2020	16,527	Fed-fry	86,442	10/14/2020	CNFH
	6	7/1/2020	20,571				
	7	7/2/2020	31,908				
	8	7/8/2020	16,236				
	9	7/15/2020	4,391				
	10	7/20/2020	5,818				
3	11	8/4/2020	2,381	Fed-Fry	41,669	10/14/2020	CNFH
	12	8/12/2020	16,974	Fry		10/14/2020	
	13	8/18/2020	15,847	Fry		10/21/2020	
	14a	8/25/2020	17,181	Fry		10/28/2020	
4	14b	8/25/2020	15,140	Eyed Eggs	15,140	9/29/2020	MLTF
	15	9/1/2020	39,660		39,660	10/7/2020	
		Totals	257,425		238,888		

Juvenile Rearing (Coleman NFH)

The WCS fry were fed BioOregon BioVita Fish Feed (High Energy Diet). Growth was manipulated by feed rate to combine the 14 takes into 3 lots that each received a unique CWT. Takes 2-10 were started in the 8x 80ft raceways, and Takes 1, 13, and 14 were started in early-rearing tanks inside the incubation building. On 28 October 2020, Take 1 was combined with Takes 2-5a in Raceway 43 to form Lot 1. On 13 November 2020, fish in Raceways 39 & 40 (Takes 5b-10) were moved and consolidated in Raceway 41 to form Lot 2.

WCS fry are marked at a 100% rate with an adipose and left-pelvic fin clip so that upon return to Coleman NFH, adults can be differentiated from LFCS. During December, the first 2 lots of WCS tagged and marked. On 5 February 2001, fin clipping and CWT tagging of Lot 3 was completed.

Table 23. Summary by month of number brood year 2020 winter Chinook salmon reared at Coleman National Fish Hatchery in tanks and raceways, total mortality, mean weight, length, DI, FCR and total pounds of feed fed

			Mean				
Month	Number In Tanks/ Raceways	Mortality	(Fish/lb)	Length (in)	Density Index (DI)	Feed Conversion (FCR)	Feed Fed (lbs)
October	183,410	1,798	849.4	1.8	0.20	0.71	185.9
November	182,099	645	343.6	2.2	0.20	0.84	451.8
December	173,220	671	193.3	2.6	0.24	1.08	500.7
January	172,346	874	125.7	2.9	0.25	1.49	716.7
February	116,727	713	80.1	3.4	0.23	0.73	311
March[1]	0	66	65.8	3.6	-	-	207

1. Size at release

Juvenile Rearing (Mount Lassen Trout Farm)

Eggs were incubated in hatching baskets contained within early-rearing tanks. Fry reared in the tanks after hatching and were later moved to a larger concrete raceway. Marking (adipose and left-pelvic fin clipping) and tagging (CWT) of WCS at Mt. Lassen Trout Farms (MLTF) was accomplished during February 2021. Renovations and repairs were made to the manual tagging trailer and a generator was utilized to power the tagging trailer at MLTF.

Release (Coleman NFH and Mount Lassen Trout Farm)

Lot 1 was released on 1 February 2021 into the North Fork of Battle Creek. Smolts were loaded onto a fish distribution truck with a fish pump and dewatering tower. Fish were hauled to Wildcat Bridge and several pieces of flexible irrigation hosing were attached to the fish distribution truck to release WCS directly into the creek. Lots 2 and 3 were released in the same manner on 8 & 16 March 2021. Lot 4 (MLTF) were released by Coleman NFH staff on 10 March 2021 at the same location and manner on the North Fork Battle Creek (Table 24).

Table 24. Winter Chinook salmon brood year 2020 reared at CNFH and MLTF, number released, CWT, fish/lb, weight, and release location by date and lot

Date	Lot/(Take)	Number Released	CWT	Size (Fish/lb)	Weight (lbs)	Release Location
Production Releases of Winter Chinook Salmon reared at CNFH						
2/1/2021	1 (1-5a)	53,604	055890	69.3	773.5	Wildcat Bridge North Fork Battle Creek
3/8/2021	2 (5b-10)	78,388	055779	59.2	1,324.1	
3/16/2021	3 (11-14a)	37,291	056538	72.3	515.8	
Production Releases of Winter Chinook Salmon Reared at MLTF						
3/10/2021	4 (14b-15)	44,095	056539	60.7	726.4	Wildcat Bridge North Fork Battle Creek
Miscellaneous Releases						
11/6/2021	3 (11-14a)	333	None	858.3	0.4	Battle Creek at Intake 3 (Rotary Screw Trap Efficiency Trials)
11/12/2021	3 (11-14a)	333	None	640.3	0.5	
3/7/2021	2 (5b-10)	450	055779	59.2	7.6	
3/16/2021	3 (11-14a)	449	056538	72.3	6.2	
	Total/Mean	214,943		64.1	3,354.5	

Winter Chinook Salmon Brood Year 2021 (WCS-WBD-21-LIV)

Broodstock Collection and Spawning

The first adult WCS collected at Coleman NFH was on 20 November 2020. The fish was bio-sampled and passed upstream. Adult WCS continued returning and were passed upstream until broodstock collection began on 18 February 2021. A quota system was developed to determine numbers of fish to be collected for broodstock and passed upstream. Fish that presented with any wounds or potential fish health issues were not retained for broodstock. WCS broodstock were transferred from Coleman NFH to Livingston Stone NFH on a weekly basis. Depending on the number of broodstock a tank mounted on a truck bed, or a fish distribution truck were used to haul broodstock. On 24 May 2021, broodstock collection ceased due to warm water temperatures in Battle Creek. The fish ladder was configured to allow for upstream passage with video monitoring of any additional WCS returning. In all, 88 WCS were handled during the collection period and 54 were retained for broodstock. Numbers of WCS broodstock returning to the Coleman NFH were not included in previous Annual Reports and have been included in Appendix C.

Table 25. Winter Chinook salmon brood year 2021 disposition and number of fish passed and collected for broodstock at Coleman NFH from 20 November 2020 through 20 May 2021

Disposition	Female	Male	Jack	Total
Passed	13	17	0	30
Broodstock	26	21	7	54
DIPS[1]	1	2	1	4
Total	40	40	8	88

1. Dead in Pond Salmon (pre-spawn mortality)

WCS broodstock collected at Coleman NFH were spawned at Livingston Stone NFH from May through July. Eggs were fertilized from 22 females over the course of 9 takes. Starting in August, captive broodstock were spawned at Livingston Stone NFH for the Battle Creek Jumpstart Project. During August and September, 128 females were spawned during 6 separate egg takes.

This year a portion of both the BC Broodstock and captive broodstock progeny were transferred to Mt Lassen Trout Farm (MLTF) on the North Fork of Battle Creek. On 3 August 2021, an estimated 4,925 eyed eggs from Take 6 were transferred to MLTF. On 5 August 2021, an estimated 13,452 eyed eggs from Takes 7 & 8 were transferred to MTLF. All eggs were transferred in cloth laundry bags suspended in a tank mounted on a pickup truck. Additional eggs from crosses of captive broodstock will be transferred to MLTF as they reach the eyed egg stage and are inventoried starting in early October.

When water temperatures are suitable, fry will begin to be transferred to Coleman NFH. Eggs and fry are transferred at the earliest opportunity to aid in the imprinting of fish to Battle Creek.

Table 26. Take, date spawned, numbers of eyed eggs, life stage at transfer, transfer dates, and rearing facility for progeny of winter Chinook salmon captive brood stock spawned at the Livingston Stone NFH and transferred to the Coleman NFH and Mount Lassen Trout Farm

Take	Date Spawned	Number Of Females	Eyed Eggs	Life Stage At Transfer	Date Transferred	Rearing Facility
Progeny of Anadromous Broodstock						
1	5/20/2021	1	7,038	Fed-fry	10/4/2021	CNFH
2	6/3/2021	3	14,856	Fed-fry	10/4/2021	CNFH
3	6/10/2021	1	5,112	Fed-fry	10/4/2021	CNFH
4	6/21/2021	3	12,568	Fed-fry	10/4/2021	CNFH
5	6/28/2021	3	13,305	Fed-fry	10/4/2021	CNFH
6a	7/6/2021	3	14,516	Fed-fry	10/4/2021	CNFH
6b	7/6/2021	1	4,925	Eyed Eggs	8/3/2021	MLTF
7a	7/12/2021	1	1,812	Fed-fry	10/4/2021	CNFH
7b	7/12/2021	2	7,948	Eyed Eggs	8/5/2021	MLTF
8a	7/15/2021	1	4,893	Fed-fry	10/4/2021	CNFH
8b	7/15/2021	1	5,494	Eyed Eggs	8/5/2021	MLTF
9	7/26/2021	2	9,306	Fed-fry	10/4/2021	CNFH
Progeny of Captive Broodstock						
10	8/18/2021	12	9,626	Button-up Fry	10/27/2021	CNFH
11	8/25 & 8/26/2021	32	29,200	Button-up Fry	11/2/2021	CNFH
12	9/1 & 9/2/2021	39	20,713	Button-up Fry	11/10/2021	CNFH
13	9/8/2021	20	13,648	Eyed Eggs	10/6/2021	MLTF
14	9/15/2021	19	11,099	Eyed Eggs	10/14/2021	MLTF
15	9/22/2021	6	2,897	Eyed Eggs	10/19/2021	MLTF
	Totals	150	188,956			

CYCLICAL MAINTENANCE AND CONSTRUCTION

Maintenance Activities

Water Treatment and Delivery

On 3 November 2020, a new actuator was installed at the orifice of the pipe that allows for shunting of water from raceways 1-14 to the abatement pond.

During November Randy Busjahn (Electronic Control Mechanic) and Norm Daniels (Electronic Control Mechanic) performed maintenance on filter bay 4.

On 8 December 2020, Randy Busjahn chlorinated and fixed the bridge on filter 4.

Two new Ozone Chiller modules and 4 new pumps for the lower pump station arrived during the month of November and were installed.

Beginning on 9 December 2020, multiple alarms were addressed at ozone over a 2.5-week period. The alarms were due to a bad cell in the new ozone generator preventing 100 percent production. There is a communication issue within the system, and the contractor was contacted to correct the issue.

In January, Lonnie Sullivan (Maintenance Mechanic), Ralph Winstead (Maintenance Mechanic), and Jason Fookes (Maintenance Worker) worked on the lower pump station assembly.

In January, Randy Busjahn and Norm Daniels serviced filter bays 2 & 4 and replaced analyzer #4.

Joe Livesay changed the UV bulbs in the domestic water system in January.

On 8 February 2021, Randy Busjahn brought filter bay 1 online. Randy Busjahn and Norm Daniels worked on filter bay 2.

Lonnie Sullivan and Jason Fookes removed the old pumps and set new pumps at the raw water pump station on 23 February 2021. On 25 February 2021, Randy Busjahn and Norm Daniels set up the electrical for the new raw water pumps. On 16 March 2021, Lonnie Sullivan, Jason Fookes, Randy Busjahn, and Norm Daniels installed the new pumps at the lower pump station. On 8 April 2021, Randy Busjahn and Norm Daniels worked on the wiring of the raw water pumps.

On 14 March 2021, Norm Daniels and Randy Busjahn, replaced the water sensor in the sump located before the 54 inch line to the hatchery building.

On 22 March 2021, Randy Busjahn performed maintenance on filter bays 2 & 4.

From 6 – 8 April 2021, Johnson Controls was onsite for their quarterly site visit.

On 28 April 2021 the Coleman Canal was shut down for annual cleaning and maintenance. Starting on 3 May 2021, Fischer Excavating cleaned out the Coleman Canal. Spencer Gutenberger (Motor

Vehicle Operator) and Beau Hopkins (Animal Caretaker) drove dump trucks (one of which was provided by the Sacramento Wildlife Refuge) to remove material from the canal. On 6 May 2021, Lonnie Sullivan and Ralph Winstead returned the dump truck to the Sacramento National Wildlife Refuge. On 10 May 2021, the canal was re-watered, and the spawning building was turned on.

On 19 May 2021, multiple power outages occurred which caused failure of the electrical backup and alarm systems. Water delivery to the incubation tanks and outside raceways was disrupted and raw water was manually diverted to the rearing sites. Norm Daniels and Randy Busjahn were called back to restore normal water delivery.

On 26 May 2021, an after action review meeting was held with hatchery management and the Electronic Industrial Control mechanics to discuss the power outage that occurred on 19 May 2021.

On 8 June 2021, Randy Busjahn performed maintenance on filter bay 2.

On 8 July 2021, Randy Busjahn performed maintenance on filter bay 2.

On 27 July 2021, Randy Busjahn performed maintenance on filter bay 4.

On 2 September 2021, Lonnie Sullivan and Ralph Winstead removed water pumps #4 and #5 at the raw water station and installed new pumps.

Beginning on 8 September 2021, Cody Thomas (Animal Caretaker), Spencer Gutenberger, Ralph Winstead, Lonnie Sullivan, and Norm Daniels dredged the area in front of the spawning building water intake on Nevis Creek.

On 21 September 2021, water lines were flushed in the incubation building in preparation for the upcoming fall Chinook spawning season and transfer of WCS fry to the Coleman NFH from the Livingston Stone NFH.

Fish Ladder and Spawning Building
During October, Lonnie Sullivan, Jason Fookes, and Norm Daniels made emergency repairs to the Pond 4 crowder during spawning operations.

On 23 February 2021, Lonnie Sullivan and Jason Fookes assisted A1 Crane Service install the fish guidance structure for the video monitoring station in the fish ladder.

On 17 March 2021, Jason Fookes, Norm Daniels, and Ralph Winstead performed maintenance on the job water pump in the spawning building.

On 1 April 2021, Lonnie Sullivan and Ralph Winstead assisted A-1 Crane Service with the removal of the bulkhead on the primary river ladder. On 2 April 2021, A-1 Crane service returned to reinsert the bulkhead on the primary river ladder with the assistance of Ralph Winstead.

On 10 May 2021, Anderson Crane Service reinserted the primary river ladder bulkhead.

On 24 May 2021, A1 Crane Service inserted the bulkhead to shut down the spawning building.

On 22 June 2021, Jason Fookes, Lonnie Sullivan, and Ralph Winstead cleaned out the vault in the fish ladder.

Joe Livesay completed renovation of the pond 5 fish crowder during August.

On 3 September 2021, Lonnie Sullivan and Ralph Winstead pulled the bulk heads at the fish ladder.

On 22 September 2021, Joe Livesay installed the V-trap fish counter in pond 3.

On 27 September 2021, Randy Busjahn, Jason Fookes, and Lonnie Sullivan watered-up the spawning building in preparation for the upcoming FCS spawning season.

Fish Distribution Trucks
On 9 December 2020, Lonnie Sullivan and Ralph Winstead prepped the fish distribution trucks for release.

Lonnie Sullivan, Ralph Winstead, and Jeff Freund (Motor Vehicle Operator) drove fish transport trucks for release (STT BY20) on 11,12,16,28,29 December 2020.

Lonnie Sullivan and Ralph Winstead prepared the fish distribution trucks for WCS release.

On 9 February 2021, Ralph Winstead drove the fish distribution truck to Keswick, and worked on the transport tank for the Chevrolet truck for WCS transport.

Lonnie Sullivan began taking bids on the modifications of the distribution tank currently on the brown transfer truck. The modified tank will be used for the distribution tractor. On 10 February 2021, Lonnie Sullivan submitted a purchase request modification for the brown fish truck tank, so it can also be used on the new fish distribution truck.

On 3 March 2021, Ralph Winstead drove the fish distribution truck to Keswick.

On 8 March 2021, Maintenance staff performed road control for the WCS release at the Wildcat Bridge. Lonnie Sullivan drove the fish distribution truck.

On 10 March 2021, Maintenance staff performed road control for Mount Lassen Trout Farm Winter Chinook release at the Wildcat Bridge. Lonnie Sullivan drove the fish distribution truck.

On 18 March 2021, Maintenance staff performed road control for the WCS release at Wildcat Bridge. Lonnie Sullivan drove the fish distribution truck.

On 23 March 2021, Ralph Winstead and Lonnie Sullivan made a site visit to Scotty's Landing for the upcoming experimental release.

On 26 March 2021, Ralph Winstead and Lonnie Sullivan drove the fish distribution trucks to Scotty's Landing for the experimental fall Chinook release. Due to concerns regarding low water

at the boat ramp, the fall Chinook experimental release was moved downstream to the Butte City boat ramp.

On 21 April 2021, Maintenance met with the Biologists to discuss the upcoming trucking of FCS to Marin, California.

Lonnie Sullivan serviced the brown distribution truck in preparation for the FCS release in Marin, California.

On 28 April 2021, Lonnie Sullivan and Ralph Winstead ran temperature checks on the distribution trucks to prepare for the FCS release in Marin, Califonria.

On 29 April 2021, Spencer Gutenberger, Ralph Winstead, and Lonnie Sullivan took the blue hatchery van to the Marin Rod and Gun Club to see the release location.

On 12 May 2021, Lonnie Sullivan and Joe Livesay performed maintenance on the green fish distribution truck.

On 22 July 2021, Lonnie Sullivan (Maintenance Mechanic) and Ralph Winstead took the white fish distribution truck to Ceres, CA to have the transfer tank installed.

Other Government Vehicles
Lonnie Sullivan began the process of diagnosing and repairing the Yamaha electric golf cart.

On 25 February 2021, Joe Livesay completed the wiring of the pesticide applicator in the new side by side all-terrain vehicle.

On 12 April 2021, Lonnie Sullivan performed maintenance on the bobcat.

On 13 April 2021, Ralph Winstead performed maintenance on the agriculture tractor.

Lonnie Sullivan serviced the blue hatchery van in April.

On 5 July 2021, GSA vehicles were serviced.

On 14 July 2021, routine maintenance was performed on the John Deere tractor.

On 19 July 2021, Jason Fookes performed maintenance on the spray buggy.

Electrical
On 1 February 2021, Lonnie Sullivan exercised the backup generators

On 4 May 2021, a diesel fuel delivery was made to prepare for the upcoming scheduled power outage.

Permits and Reporting
Joe Livesay submitted quarterly NPDES reports.

Joe Livesay sent water samples in for basic laboratory testing 23 February 2021.

On 5 March 2021, Joe Livesay worked on the domestic water 2020 consumer confidence report.

Also on 7 March 2021, Joe Livesay posted the 2020 OSHA 300/300A accident report, and the 2020 confidence report in hatchery buildings.

Also on 18 March 2021, Randy Busjahn and Norm Daniels met with the California State Water Resources Control Board (SWCRB) to perform a hatchery water measurement. They posted their results on the California Data Exchange Center. (CDEC)
On 14 April 2021, Ralph Winstead and Lonnie Sullivan provided vehicle data to Brett Galyean (Project Leader) for the government vehicle report for the state of California.

On 15 April 2021, Lonnie Sullivan and Jason Fookes submitted property inventory forms to Brett Galyean.

On 9 June 2021, Joe Livesay submitted a salinity report to the State Water Resource Board.

On 11 June 2021, Joe Livesay sampled the hatchery's domestic water supply and submitted results to the lab.

Joe Livesay completed the Pesticide Use Permit (PUP), allowing Jason Fookes to spray the grounds this coming spring and summer.

Renovations
Starting in October, maintenance staff planned and arranged for the arrival of new equipment and an electrical upgrade of the maintenance shop. In November maintenance staff completed the electrical upgrade and placed and installed all new equipment in the maintenance shop. A new metal storage rack was also fabricated.

On 6 July 2021, Ralph Winstead and Jason Fookes prepped the boneyard for the construction of a barrier fence. On 27 August 2021, Lonnie Sullivan, Ralph Winstead, and Jason Fookes installed fencing along northeast side of the boneyard lot.

Telecommunications
Norm Daniels monitored and repaired Coleman National Fish Hatchery phones in January.

On 16 June 2021, Joe Livesay verified the Ethernet switch was the cause of the internet and phone outage in the crew building.

Mount Lassen Trout Farm (MLTF)
On 2 November 2020, Joe Livesay, and staff from the Red Bluff FWO made a site visit to Mt Lassen Trout Farm to evaluate the electrical needs for operation of a CWT tagging trailer on site.

Ralph Winstead and Joe Livesay performed maintenance and repairs on the manual tagging trailer (wheel bearings, thermostat). Joe Livesay worked on and tested the manual tagging trailer prior to being used at MLTF.

On 8 February 2021, Joe Livesay went to MLTF to give the tagging trailer crew a walk through on tagging trailer operations and generator use.

On 11 February 2021, Lonnie Sullivan and Ralph Winstead picked up the generator and pipes from MLTF.

Livingston Stone NFH
Joe Livesay performed maintenance work on fish feeders and the electrical infrastructure at Livingston Stone NFH.

On 4 February 2021, Ralph Winstead transported tanks to Livingston Stone National Fish Hatchery for their water recirculation system which supplies their heath trays.

During April, Ralph Winstead and Jason Fookes performed maintenance on the chilled water system for the WCS egg stacks. New pumps, a filter system, tanks, and plumbing were installed.

On 22 April 2021, Joe Livesay wired the new water pumps and flow switches for the chiller rehabilitation project at Livingston Stone NFH

On 24 August 2021, Joe Livesay traveled to Livingston Stone National Fish Hatchery to replace the aeration system on a forklift fish distribution tank. A gasoline engine circulation pump was replaced with a 12 voltage direct current Fresh-flow aerators and battery system.

On 10 September 2021, Joe Livesay made a temporary connection tying in all three chillers to the alarm dialer at the East Incubation chiller pump control center for Livingston Stone National Fish Hatchery.

On 17 September 2021, Joe Livesay completed installation of a water alarm system in the broodstock tanks at LSNFH.

Other Maintenance
Joe Livesay setup a new fish pump and counter in October

Randy Busjahn and Norm Daniels repaired the freezer room door.

On 1 March 2021, Lonnie Sullivan, Jason Fookes, and Randy Busjahn set up wastewater canal release pipes for the steelhead kelt release into Battle Creek.

On 7 March 2021, Joe Livesay troubleshot air compressor issues in the old shop building and replaced pulleys and the motor.

On 24 March 2021, Coleman Maintenance staff assisted Red Bluff Fish and Wildlife Office maintenance staff in pouring a concrete pad at the Anderson Field Office.

On 17 May 2021, Joe Livesay repaired the six-inch fish pump.

On 11 May 2021, Joe Livesay worked on the sump pump for the pre-release pond.

During May and June, Jason Fookes, Ralph Winstead, and Lonnie Sullivan replaced the expansion joint caulking in raceways 1 – 14. The concrete roadway along the raceways also had seal joints replaced at the same time.

On 27 July 2021, an excavator arrived from the Bureau of Land Management (BLM). The excavator was used to remove the car that was set on fire below intake 3, and to reinforce the rock barrier to avoid similar issues in the future. On 3 August 2021, the cleanup and reconstruction of the rock barrier was completed on the Bureau of Land Management (BLM) property adjacent to the hatchery.
On 4 August 2021, Mikes Heating and Air was called in to repair and service the administration HVAC system. On 20 August 2021, Mikes Heating and Air installed a new HVAC system in the Incubation building and replaced part of the Administration building's HVAC system.

On 5 August 2021, Shasta Overhead door repaired multiple garage bay doors.

On 6 August 2021, the administration section of the incubation building was added to the Big Time pest control contract.

Ralph Winstead fabricated a second cart for the Jensorter machine.

OUTREACH, INFORMATION, AND EDUCATION

There was no Return of the Salmon Festival in October this year due to COVID-19 and the hatchery was opened on a limited basis to visitors. During October the hatchery also reopened to the public for the first time since the COVID-19 pandemic began in March; the hatchery was opened on weekends only. In November, the hatchery increased the number of days it was open to the public (Saturday-Monday). In December, this was further expanded to Friday through Monday.

On 1 October. U.S. Fish and Wildlife Service Director Aurelia Skipwith and Regional Director Paul Souza visited Coleman NFH. Director Skipwith toured the hatchery, met with staff and opened the fish ladder for the 2020 spawning season (photo in Appendix D).

A new educational GPS based virtual reality game, "Agents of Discovery" computer app, was started in October and play continued through November. The app averaged 4 downloads per week. A group of homeschool students came for a self-guided tour. The students had previously completed the "Junior Angler" books and they received their certificates and badges while at the hatchery.

During December, Laura Mahoney (Information and Education Specialist) participated in a zoom "Career Day" presentation for 8th graders at Lassen View School. Laura also wrote a short article for the employee newsletter about Jeff Freund's retirement, participated in the national planning call for the fisheries 150th anniversary, and sent out an email and made contact with the volunteer group (inactive since the start of COVID-19).

During January, Laura Mahoney provided video footage for a YouTube video created by a U.C. Davis Aquaculture professor, coordinated with the TITC program for Shasta County, and met with

the TITC representatives from Legacy Regions 1, 2 and 8 to discuss ways to bring TITC to schools during the current challenges.

During February, The Article "Unheard of" by Laura Mahoney was released and was picked up by the website Mavens Notebook and was printed in the Red Bluff Daily News.

During February and March, Eyed eggs were provided to Bella Vista and Montgomery Creek Schools for use in a Trout in the Classroom program.

On 25 February, Laura Mahoney provided a zoom presentation on careers in the FWS for the students at Northern Summit Academy. Junior Angler and Biologist in Training activity books were also distributed to students for use during a unit discussing stream ecology.

On 26 February, FCS fry were picked up by Turtle Bay Museum for an aquarium display in the museum. These fish will be kept on display for a year at the museum and then released into the Sacramento River. In March, Laura Mahoney hosted a zoom presentation with Turtle Bay Exploration Park focusing on educating their staff about the biology and rearing of the FCS that are on display at the museum.

During March, a story walk featuring the book Pout Pout Fish and the Bully Bully Shark was installed along "picnic row" at the hatchery.

In May, Laura Mahoney provided certificates to a group of 6-8th graders at a local charter school that completed the activity book "Biologist in Training."

In September, a new story walk was installed featuring the book, Red Tag Comes Back. Laura Mahoney spent a lot of time communicating with teachers regarding field trips (or alternatives) and working on website updates for Coleman NFH and the Ca/Nv Fish Health Center.

MEETINGS, TRAINING, AND OTHER EVENTS

On 1 October 2020, Aurelia Skipwith (Director of the US Fish and Wildlife Service), and Paul Souza (Regional Director) visited Coleman NFH. Director Skipwith opened the fish ladder for collection of fall Chinook salmon and participated in a photo shoot while riding an e-bike to mark the announcement of new regulations expanding the use of electric bicycles on US Fish and Wildlife Service properties.

Brett Galyean (Project Leader) met with Derrick Rupert (Bureau of Reclamation) to discuss hatchery projects and funding including ongoing renovations of the Ozone Treatment Plant.

Avery Currier (Seasonal Fish Culturist) started on 11 October 2020.

On 14 & 15 October 2020, there was a Public Safety Power Shutoff that required taking the Coleman Powerhouse offline. As a result, the hatchery switched from Intake 1 to backup Intake 2 and Intake 3 for water delivery.

On 19 October 2020, Brett Galyean and Robert Null (Deputy Project Leader) attended a Battle Creek winter Chinook reintroduction meeting (virtually).

On 5 November 2020, Mike Mangus (Reporter KRCR Redding) visited the hatchery to film a public interest segment on salmon spawning operations.

Also, on 5 November 2020, Martha Maciel (Assistant Regional Director External Affairs) was on station and given a tour by Laura Mahoney.

On 6 November 2020, water was turned off to the downstream user at their request; water was restored on 13 November 2020.

On 10 November 2020, Brett Galyean met with staff from the Bureau of Reclamation to discuss Long Term Operations in the Central Valley.

On 18 November 2020, Mike Jeletic (Hydrologist, Portland Regional Office) took measurements in the Coleman Canal and at the downstream water user's property.

On 8 December 2020, Brett Gaylean, Robert Null, and Marc Provencher (Fish Biologist) held a Hatchery Data Standardization meeting with Alexander Jones (Fish Biologist) from our Regional Office.

On 9 December 2020, Brett Gaylean held a meeting with John Ridilla (Budget Analyst) from the Regional Office concerning the first payment of the new 5-year agreement with the Bureau of Reclamation.

A senior staff (supervisors) meeting was held on 14 December 2020.

On 22 December 2020, a socially distanced retirement party was held for Jeff Freund (Motor Vehicle Operator). Jeff started as a volunteer at the hatchery in 1990. Jeff's retirement was effective 31 December 2020.

Also on 22 December 2020, a Safety Committee meeting was held

Amy Kart (Seasonal Fish Culturist) started on 4 January 2021.

On 12 January 2021, Brett Galyean (Project Leader) and Laura Mahoney (Information and Education Specialist) visited Mt. Lassen Trout Farm.

Brett Galyean had a quarterly meeting on 15 January 2021 with Derrick Rupert (Bureau of Reclamation) regarding funding.

Matt Peckham (Fish Biologist) was promoted from Animal Caretaker to Fish Biologist on 17 January 2021.

On 21 January 2021, Brett Galyean attended a Lower Battle Creek project presentation.

During the month of January Brett Galyean participated in an internal U.S. Fish and Wildlife call regarding a restoration project on lower Battle Creek. (Rancho Brescquia)

Due to inclement weather on 22 January 2021, Brett Galyean did not have employees come in to the hatchery for safety issues. WG employees took administrative leave and GS employees teleworked that day.

On 1 February 2021, Brett Galyean, Taylor Lipscomb (Supervisory Fish Biologist), Kaylee Allen (Assistant Regional Director), and Bob Clarke (Fisheries Program Supervisor) participated in a Livingston Stone National Fish Hatchery operations meeting.

On 2 February 2021 Brett Galyean, Bob Null, Bob Clarke, and Kaylee Allen participated in a Coleman National Fish Hatchery operations meeting.

On 3 February 2021, Coleman management and the Red Bluff office discussed options for Fall Chinook Salmon release.

On 9 February 2021, a Coleman interagency meeting was held with U.S. Fish and Wildlife employees and The Bureau of Land Reclamation (USBR) discussing the budget. Brett Galyean presented funding information for the 2020 fiscal year, and the potential need of additional funding in the future.

On 10 February 2021, Brett Galyean and Bob Null attended a meeting discussing the Battle Creek jumpstart program, and grants with the California Department of Fish and Game.

On 11 February 2021, multiple agencies met to discuss increasing the WCS broodstock collection at Livingston Stone due to drought concerns.

On 19 February 2021, Brett Galyean and Taylor Lipscomb had a meeting with the USBR to discuss the use of chillers at Livingston Stone for this summer and fall.

On 24 February 2021, there was a hatchery supervisory meeting.

On 25 February 2021, Brett Galyean attended a Wage Grade committee meeting. He also met with the California Department of Fish and Game to discuss ocean harvest quotas for salmon.

The STT Kelt release occurred on 1 March 2021. The fish counters recorded 1028 and 1054 fish released into Battle Creek.

Jody Holzworth and Paul Souza held an all hands meeting with the Coleman and Livingston Stone hatchery staff on 2 April 2021.

The region 8 town hall meeting was held on 16 March 2021.

Hiring managers reviewed applicants that were referred for the Facilities Operation Specialist position on 22 March 2021.

Ralph Winstead held a forklift training class at Coleman NFH for Clay Hines, Amy Kart, and Patty Doolittle on 23 March 2021.

On 1 April 2021, Brett Galyean and Bob Null participated in a call with Mount Lassen Trout Farm to discuss the WCS rearing season for 2020.

April 6 – 7 2021, Brett Galyean participated in a virtual project leader meeting.

On 8 April 2021, Coleman National Fish Hatchery released 12 raceways of Fall Chinook Salmon onsite into Battle Creek. A total of 5,386,148 fish were released.

Brett Galyean had a Microsoft Teams call with the United States Bureau of Reclamation (USBR) evaluating the trap sorter on 12 April 2021.

Also, on April 12 2021, Brett Galyean met with a contractor to go over the security at Coleman NFH.

On 23 April 2021, Brett Galyean met with Derrick Rupert (Bureau of Reclamation) for their quarterly meeting.

On 26 April 2021, Brett Galyean participated in a call with the California Department of Fish and Wildlife to discuss the trigger/release plan for trucking juvenile FCS.

On 27 April 2021, Robert Null led a Battle Creek tour for River Partners.

On 30 April 2021, a social distant retirement party was held for long time seasonal Brad Carter (Seasonal Animal Caretaker).

A planned power outage occurred from 4 - 6 May 2021 and a week-long scheduled power outage occurred starting on 24 May 2021.

On 7 June 2021, there was a Senior Staff Meeting

On 16 June 2021, staff participated in fire extinguisher training.

On 23 June 2021, a report was made to the Shasta County Sherriff's Department regarding vandalism at Intake 3.

On 24 June 2021, there was a Wage Grade Committee meeting.

On the evening of 3 July 2021, a vehicle was set on fire downstream from intake 3 on the Bureau of Land Management (BLM) property. Hatchery residents assisted CAL Fire locate the fire.

On 9 July 2021, Ralph Winstead and Brett Galyean met with John Ribinsky of the BLM to discuss the removal of the burned vehicle and creating a new boulder barrier for the property.

Alex Jones (Fish Biologist) was at Coleman NFH for a work detail from 13 – 17 July 2021 to assist Marc Provencher evaluate a database solution for hatchery data needs.

On 16 July 2021, the air conditioning in incubation building offices stopped working.

Hans Miller (Supervisory Facilities Operations Specialist) reported for duty on 19 July 2021.

Joe Livesay was elected chair of the Wage Grade Committee for Legacy Region 1/8 on 29 July 2021.

On 1 August 2021, Matt Peckham (Fish Biologist) closed the fish ladder.

Also on 1 August 2021, a reporter from KRCR interviewed Brett Gaylean (Project Leader) about Winter Chinook Salmon.

On 2 August 2021, there was an unscheduled loss of ozone from 6 a.m. to 10 a.m..

Also, on August 2 2021, the water supply for the hatchery switched to intakes 2 and 3 for a month long planned power outage from PG&E.

David Costas (Animal Caretaker) reported for duty on 2 August 2021.

Hatchery senior staff had a meeting on 5 August 2021.

Brett Galyean and Bob Null attended a meeting with the Red Bluff FWO to discuss Battle Creek priorities on 6 August 2021.

On 8 August 2021, motor vehicle operators and biologist met to discuss trucking of Fall Chinook Salmon fry.

Brett Galyean was interviewed by KRCR reporter Mike Mangas regarding WCS on 10 August 2021.

On 16 August 2021, Jason Davis (Animal Caretaker) reported for duty.

On 17 August 2021, Laura Mahoney attended a Greater Battle Creek working group meeting and gave an update on Livingston Stone NFH and Coleman NFH operations.

On 19 August 2021, Coleman turned in the fiscal year 2021 real property inventory for the complex.

On 23 August 2021, Brett Galyean signed off the Fisheries Information System (FIS) accomplishments for the complex.

On 25 August 2021, a flyer was sent to the Bureau of Indian Affairs (BIA) for upcoming FCS spawning dates, so local native tribes can coordinate fish pick up.

On 30 August 2021, Brett Galyean and Bob Null participated in a conference call regarding the experimental FCS fry release project.

Also on 30 August 2021, Brett Galyean and Bob Null participated in a conference call with the Reb Bluff FWO discussing Battle Creek priorities.

On 31 August 2021, Brett Galyean and Bob Null participated in a conference call discussing Battle Creek priorities with the regional office.

On 1 September 2021, the hatchery went back on water Intakes 1 and 3.

On 7 September 2021, Bob Null participated in an alternative release site meeting with stakeholders and other U.S. Fish and Wildlife Service staff. The purpose of the meeting was to discuss current results from and future plans for the experimental offsite release of fall Chinook salmon at downstream locations (i.e. Butte City, Scotty's Landing, etc.).

On 14 September 2021, hatchery maintenance, water treatment, and biology staff met to discuss watering up the spawn building.

On 15 September 2021, the fall Hatchery Evaluation Team (HET) meeting took place with the Red Bluff Fish and Wildlife Office, Ca/Nv Fish Health Center, and Coleman NFH staff.

On 17 September 2021, a meeting took place discussing the future of the Delta Smelt program with Livingston Stone National Fish Hatchery, Brett Galyean, and the Regional Office.

On 20 September 2021, Brett Galyean and Bob Null participated in a meeting with National Marine Fisheries Service (NMFS) and Ca/Nv Fish Health Center staff to discuss sampling of fall Chinook Salmon to look for thiamine deficiency.

On 21 September 2021, federal contractors inspected the roads and pathways throughout the hatchery grounds.

On 22 September 2021, Brett Galyean participated in a phone call with PG&E, U.S. Fish and Wildlife Service staff, California Department of Fish and Wildlife Staff, Bureau of Reclamation, and National Marine Fisheries Service staff.

On 23 September 2021 Joe Livesay (Electrician) and Brett Galyean participated in a Wage Grade Committee call.

On 25 September 2021, Coleman National Fish Hatchery celebrated its 79th year.

On 26 September 2021, Spencer Gutenberger (Animal Caretaker) was promoted to motor vehicle operator.

On 27 September 2021, Brett Galyean visited LSNFH.

Also on 27 September 2021, the spawning building was watered up.

On 28 September 2021, Brett Galyean, Kaylee Allen (Assistant Regional Director), and Robert Clarke (Fisheries Program Supervisor) held a meeting discussing hatchery operations.

APPENDIX A
COLEMAN NFHC STATION PERSONNEL

NAME	FUNCTIONAL TITLE	GRADE	PERIOD WORKED	REMARKS
Brett Galyean	Project Leader	GS-0482-14	10/01/2020–09/30/2021	
Robert Null	Deputy Project Leader	GS-0482-13	10/01/2020-09/30/2021	
Hans Miller	Supervisory Facility Op Sec	GS-1640-12	09/18/2021-09/30/2021	Hired
Taylor Lipscomb	Supervisory Fishery Biologist	GS-0482-12	10/01/2020-09/30/2021	
Sonia Thomas	Administrative Officer	GS-0341-11	10/01/2020-09/30/2021	
Terrera Hopkins	Fisheries Program Assistant	GS-0303-06	10/01/2020-09/30/2021	
Ron Stone	Supervisory Fishery Biologist	GS-0482-12	10/01/2020-09/30/2021	
Marc Provencher	Fishery Biologist	GS-0482-11	10/01/2020-09/30/2021	
Matt Peckham	Animal Caretaker	WG-5408-05	10/01/2020-01/16/2021	
Matt Peckham	Fish Biologist	GS-0482-07	01/17/2021-09/30/2021	Promoted
Laura Mahoney	Information & Ed. Specialist	GS-1001-11	10/01/2020-09/30/2021	
Travis Webster	Fishery Biologist	GS-0482-09	10/01/2020-11/07/2020	
Travis Webster	Fishery Biologist	GS-0482-11	11/08/2020-09/30/2021	Promoted
Kaitlin Gooding	Fishery Biologist	GS-0482-09	10/01/2020-01/02/2021	
Kaitlin Gooding	Fishery Biologist	GS-0482-11	01/03/2021-09/30/2021	Promoted
Joe Livesay	Electrician	WG-2805-10	10/01/2020-09/30/2021	
Lonnie Sulivan	Maintenance Mechanic	WG-4749-10	10/01/2020-09/30/2021	
Ralph Winstead	Maintenance Mechanic	WG-4749-10	10/01/2020-09/30/2021	
Jason Fookes	Maintenance Worker	WG-4749-08	10/01/2020-09/30/2021	
Randy Busjahn	Electronic Control Mechanic	WG-2606-10	10/01/2020-09/30/2021	
Norm Daniels	Electronic Control Mechanic	WG-2606-10	10/01/2020-09/30/2021	
Jeffrey S. Freund	Motor Vehicle Operator	WG-5703-08	10/01/2020-01/02/2021	Retired
William Hopkins	Animal Caretaker	WG-5048-05	10/01/2020-09/30/2021	
Spencer Gutenberger	Animal Caretaker	WG-5408-05	10/01/2020-09/25/2021	
Spencer Gutenberger	Motor Vehicle Operator	WG-5703-08	09/26/2021-09/30/2021	Promoted
Brandt Becnel	Animal Caretaker	WG-5048-05	10/01/2020-11/07/2020	Resigned
Cody Thomas	Animal Caretaker	WG-5408-05	10/01/2020-09/30/2021	
Clay Hines	Animal Caretaker	WG-5408-05	10/01/2020-09/30/2021	Converted to PERM
Patty Doolittle	Animal Caretaker	WG-5408-05	10/01/2020-09/30/2021	Converted to PERM
Amy Kart	Animal Caretaker	WG-5408-05	01/17/2021-07/03/2021	Seasonal
Brad Carter	Animal Caretaker	WG-5048-05	11/02/2020-05/08/2021	Seasonal
Avery Currier	Animal Caretaker	WG-5408-05	10/11/2020-04/10/2021	Seasonal
David Costas	Animal Caretaker	WG-5048-05	08/01/2021-09/30/2021	Hired
Jason Davis	Animal Caretaker	WG-5048-05	08/15/2021-09/30/2021	Hired

APPENDIX B
LOT DESIGNATOR CODES

RUN NAME	SPECIES CODE	STRAIN CODE	STATION CODE	SAMPLE DESIGNATOR CODE	LEGACY
Fall Chinook salmon - Battle Creek	CSA	FBW	COL	CSA-FBW-19-COL	FCS-BCW-19
Late Fall Chinook salmon - Battle Creek	CSA	LBW	COL	CSA-LBW-19-COL	LFS-BCW-19
Central Valley Steelhead - Battle Creek	CVS	WBW	COL	CVS-WBW-19-COL	STT-BCW-19
Winter Chinook salmon - Battle Creek (Captive broodstock)	WCS	WBD	LIV	WCS-WBD-19-LIV	WCS-BCW-19
Winter Chinook salmon - Sacramento River	WCS	WSW	LIV	WCS-WSW-19-LIV	WCS-SRW-19
Winter Chinook salmon - Battle Creek (Anadromous broodstock)	WCS	WBW	LIV	WSR-WBW-20-LIV	NA

APPENDIX C
NUMBER AND DISPOSITION OF WINTER CHINOOK SALMON RETURNING TO THE COLEMAN NFH IN 2019 AND 2020

Winter Chinook salmon brood year 2019 disposition and number of fish passed and collected for broodstock at Coleman NFH from

Disposition	Female	Male	Jack	Total
Passed	0	0	0	0
Broodstock	0	0	74	74
DIPS[1]	0	0	0	0
Total	0	0	74	74

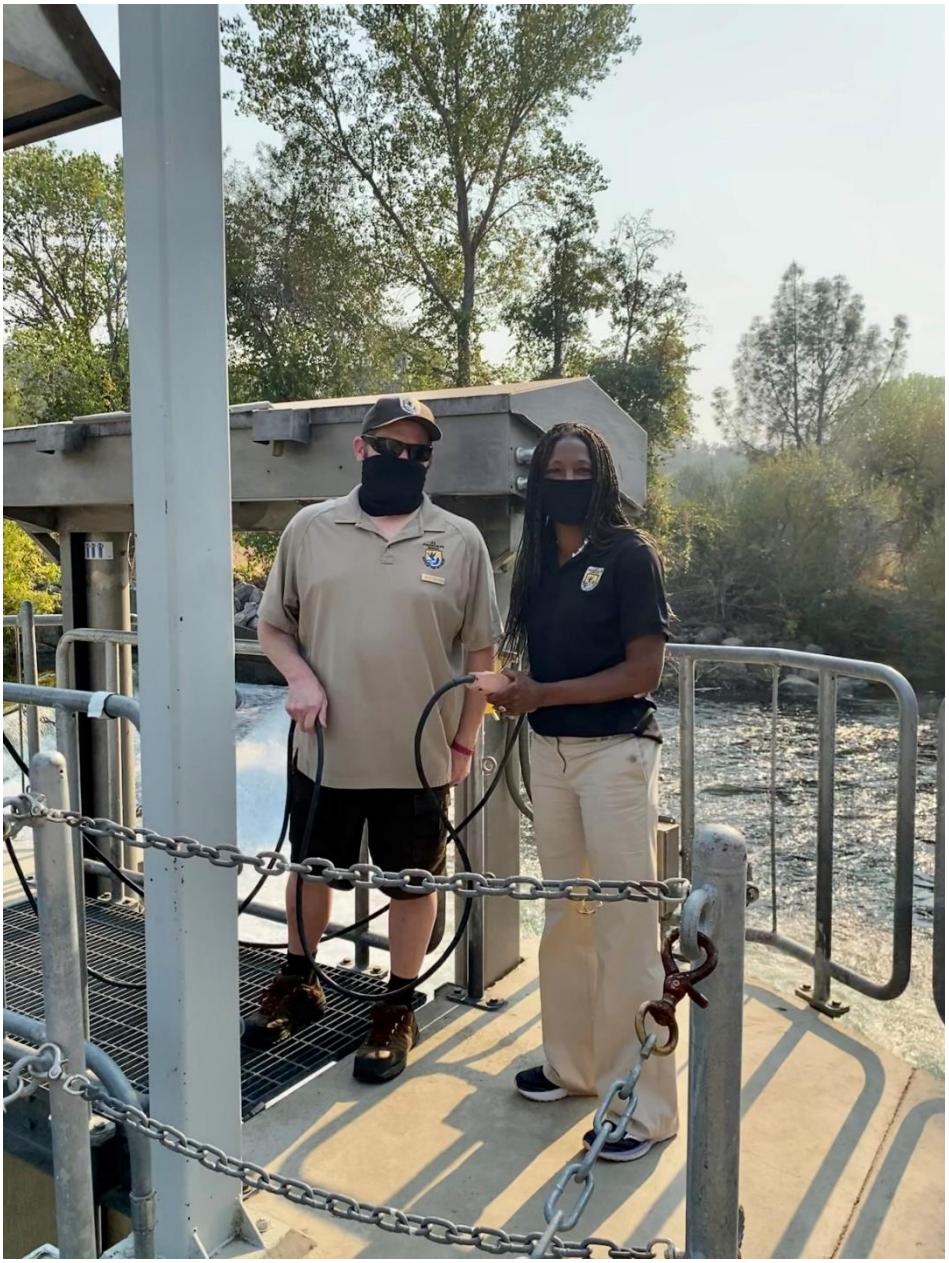
1. Dead in Pond Salmon (pre-spawn mortality)

Winter Chinook salmon brood year 2020 disposition and number of fish passed and collected for broodstock at Coleman NFH from 8 January 2020 to 16 April 2020

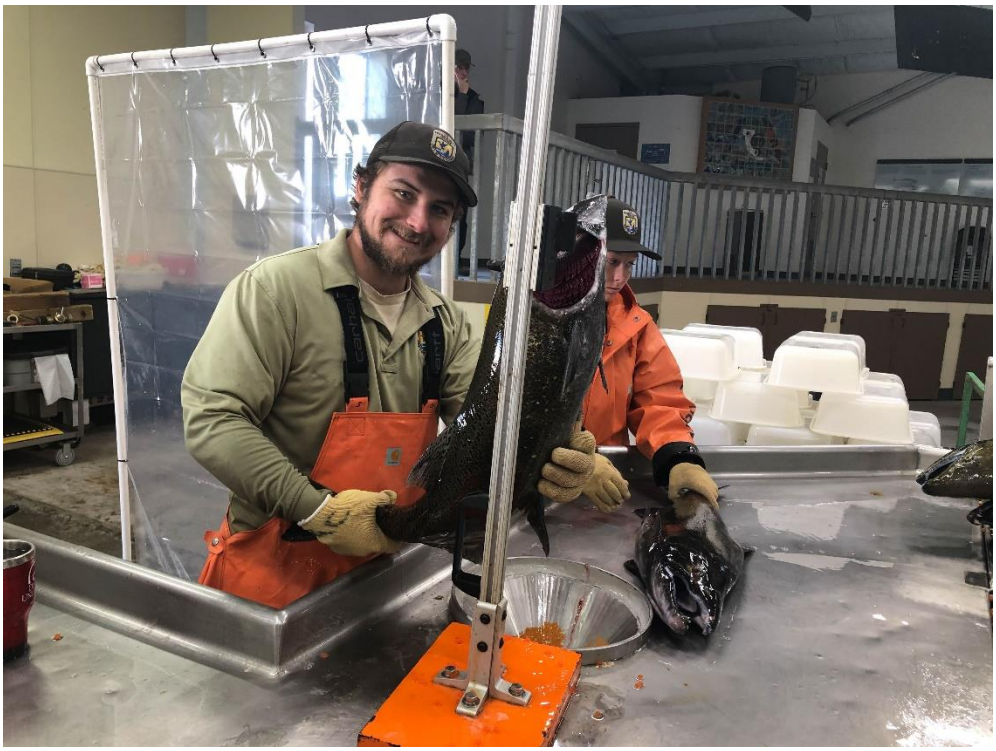
Disposition	Female	Male[2]	Jack	Total
Passed	250	16	3	269
Broodstock	34	66	0	100
DIPS[1]	5	1	0	6
Total	289	83	3	375

1. Dead in Pond Salmon (pre-spawn mortality) and Incidental Mortality
2. Disposition not recorded for one male but assumed to have been passed upstream

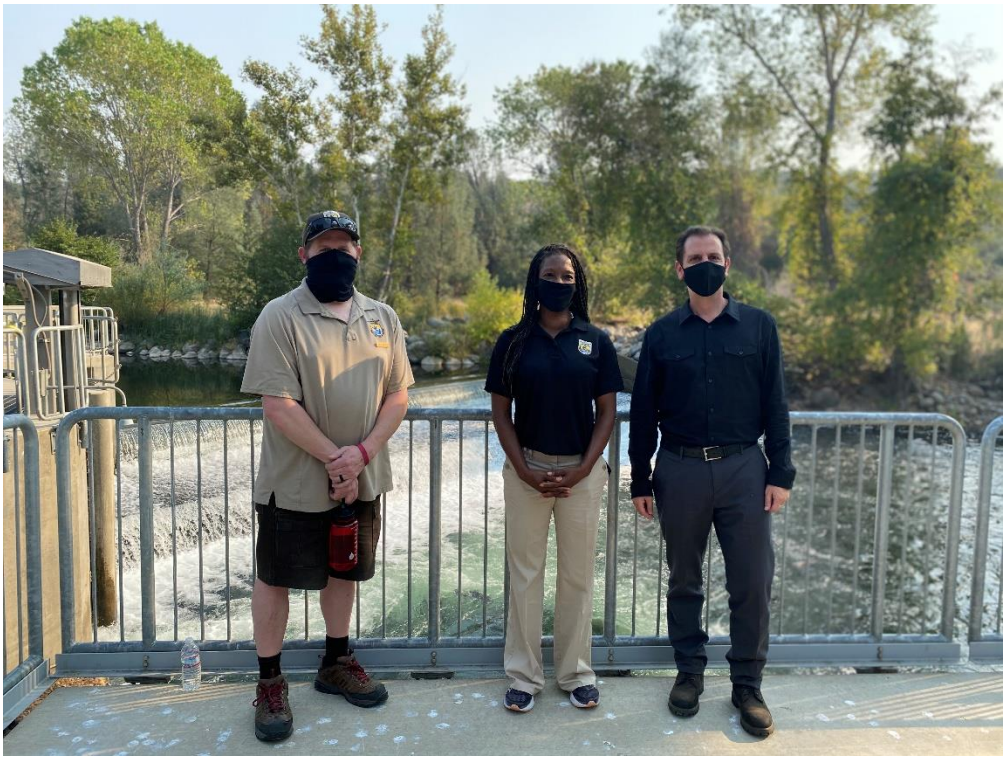
APPENDIX D
STATION PHOTOS



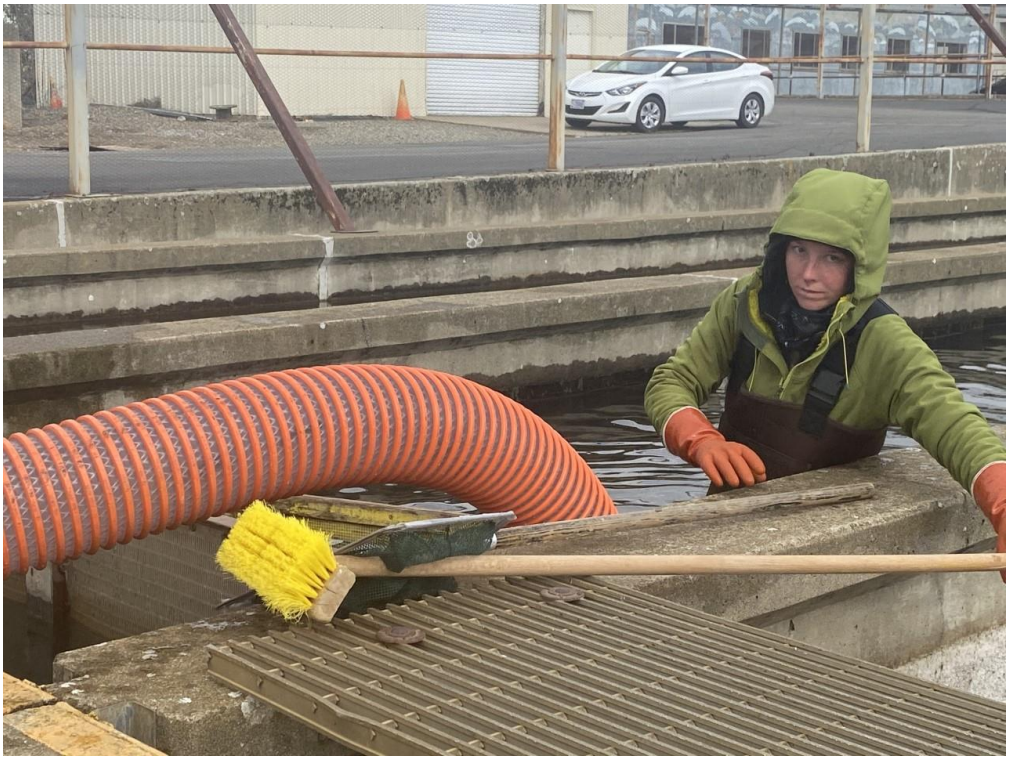
Aurelia Skipwith opens the Fish Ladder for the FCS spawning season



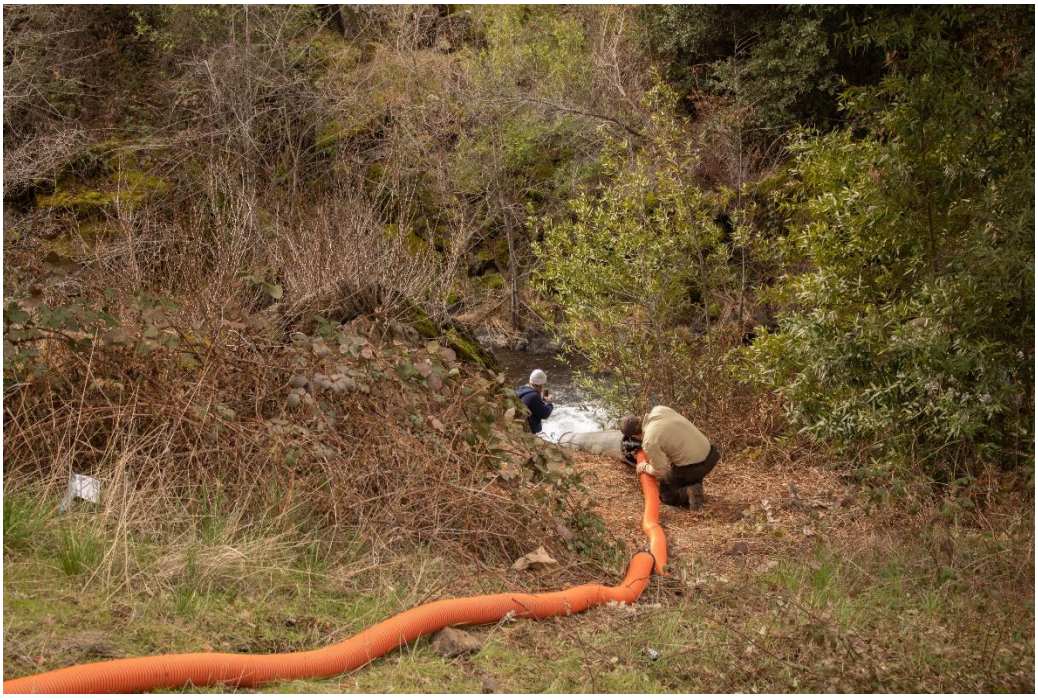
Spencer Gutenberger spawning FCS



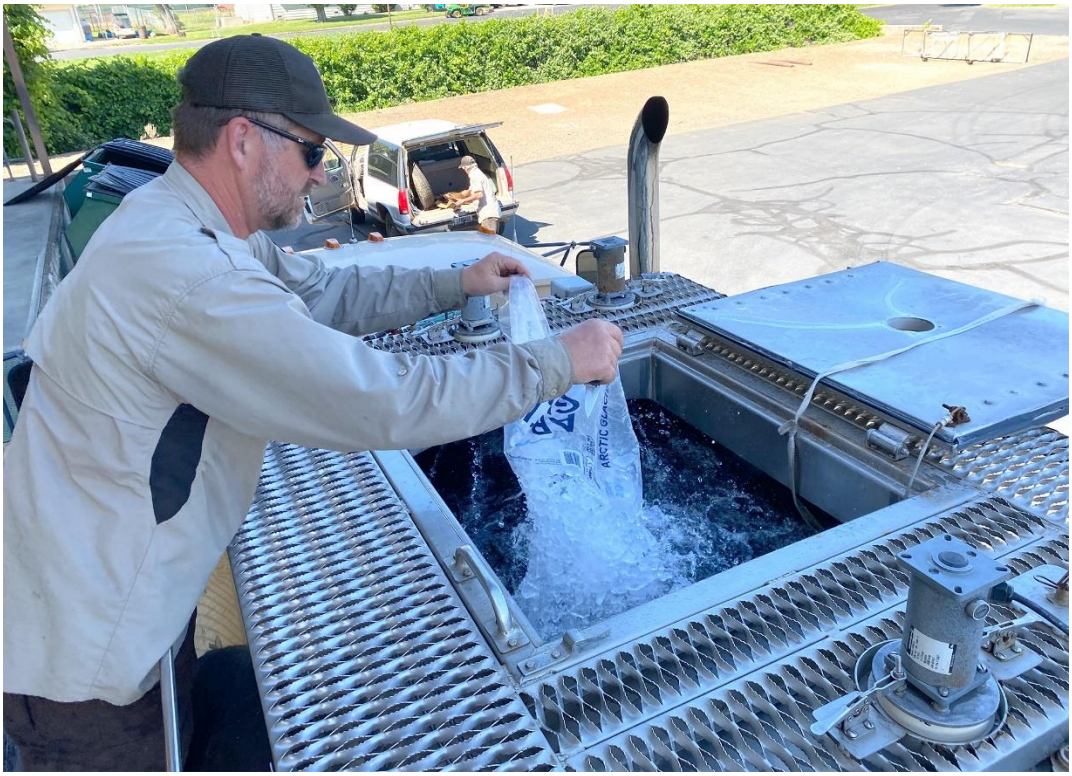
Brett Galyean with Aurelia Skipwith (Director) and Paul Souza (Regional Director)



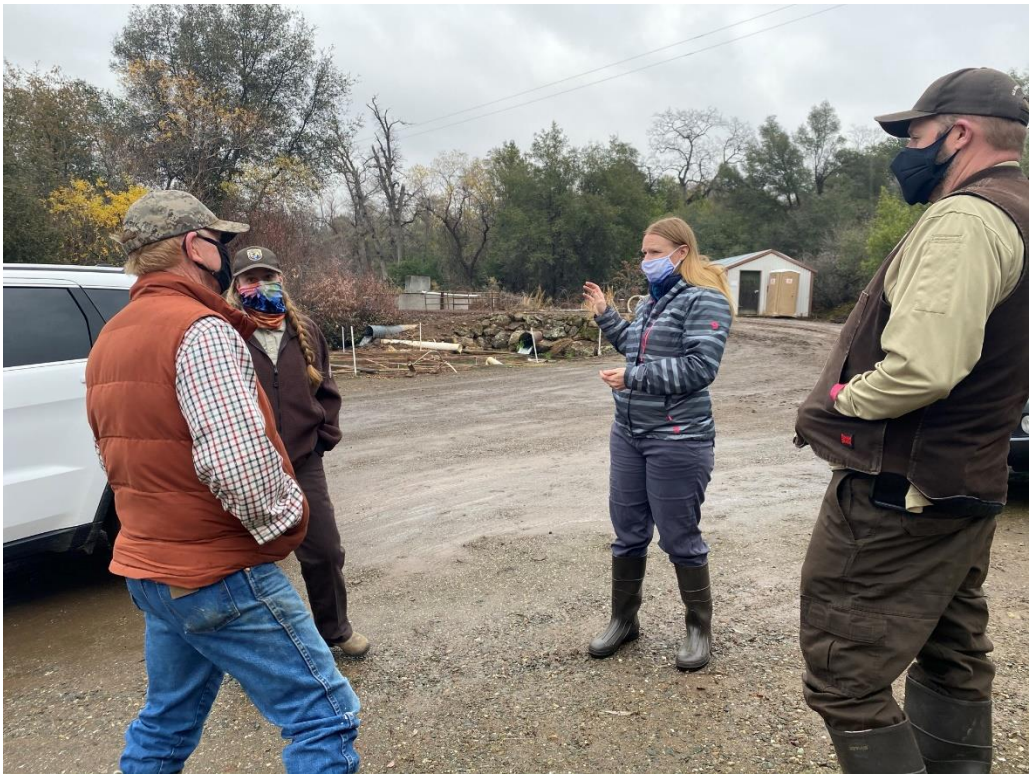
Patty Doolittle pumping WCS into a fish distribution truck for release



Releasing WCS at Wildcat Bridge



Lonnie Sullivan preparing a fish distribution truck for transport to Marin, CA to release FCS



Brett Galyean and Laurie Early (RB FWO) meet with staff from MLTF