Klamath Falls National Fish Hatchery

Annual Report for Fiscal Year 2024

Prepared by:

U.S. Fish and Wildlife Service

Klamath Falls National Fish Hatchery

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The purpose of the U.S. Fish and Wildlife Service is to protect the natural world so current and future generations can live with, live from, and find awe in lands, waters, and wildlife.

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Executive Summary

The 2024 fiscal year (October 1, 2023 to September 30, 2024, hereafter FY24) saw a lot of important developments and improvements made at the Klamath Falls National Fish Hatchery ("KFNFH" or "Hatchery"). While this year's larval collection was lower than previous years, at approximately 30,150 Klamath sucker fry collected this past spring, it was much higher than the previous year's seeming collapse in larval drift. The larval drift season in FY24 resembled a more "normal" year in that the drift protracted for nearly a month and the numbers collected were enough to meet current production goals for the year, especially in view of the all-time record low availability of pond space due to ongoing facility construction activities. In addition, the staff also spawned and hatched an estimated 56,458 larval Lost River Suckers on station from gametes collected from the East Side Springs population in Upper Klamath Lake ("UKL").

To help support the dwindling populations of Klamath Basin Suckers, the staff reared and repatriated 11,831 production fish through the fiscal year, which included 1,317 fish raised successfully from the Gerber Reservoir net pen, which had a survival rate of over 96% this year. There were also 602 fish reared and transferred for telemetry research. This brings the total number of production sized fish repatriated or transferred to 12,433 overall for FY24. In addition, 4,632 fry were transferred to the Klamath Tribes Hatchery to aid in their production efforts and a total of 801 Klamath suckers were salvaged and repatriated from the Lower Klamath River dam removal effort, as well as the electrofishing efforts conducted by USBR staff over the winter in the local irrigation canals. This makes for a grand total of 17,866 fish released during FY24. While overall numbers are down from previous years, we were able to meet target production goals in FY24 in spite of severe space limitations at the Hatchery. It is hoped that during FY25, once the facility construction is nearing completion, we will begin to see steady increases in the amount and size of production sized suckers being produced from the facility on an annual basis from FY26 and onward.

To help the Klamath Basin move towards sucker recovery, the KFNFH staff continued to work hard to improve operational processes by conducting applied research, which focused on fish spawning and incubation techniques, long term intensive rearing to assess growth and survival compared to pond culture operations, and continued to expand monitoring efforts of Hatchery released fish. For example, by conducting incubation trials that assessed various water quality parameters, we increased our onsite hatching rates from around 20% to over 70%, a major development for the program. Also, the pilot work for PIT tag monitoring in areas that had clusters from previous radio telemetry monitoring work within our office, yielded the result of detecting 416 unique PIT tagged fish, 246 of which were either reared from the Hatchery (215) or rehabilitated and repatriated from salvage operations (31), which is more than half of the fish encountered having come through the hatchery at some point prior to repatriation into Upper Klamath Lake. These efforts will continue into the upcoming fiscal year so that we can refine our processes and get more Klamath suckers repatriated and thriving on the local landscape, as well as to better understand their habitat usage and persistence in the lake system post stocking.

Another major milestone for the hatchery was the commencement and progress of facility construction during the recent fiscal years. After a few years of environmental assessment and feasibility planning, conceptual design planning, securing the site through a long term lease, the designation of the Klamath Falls National Fish Hatchery, and bid solicitations and awards, both Phases 1 and 2 of construction were awarded within the fiscal year of 2022 and an appreciable amount of on the ground progress has been

made to date, especially on Phase 1 construction during FY24, which primarily related to pond construction and underground infrastructure installations, which will tentatively finish up during the spring of 2025, which is about 9 months behind the original timeline due to project modifications and new tasks awarded for completion. Progress on Phase 2 construction was more limited during most of FY24 but has hit the major milestone of beginning work on the first of four buildings, namely the maintenance/fleet building as the fiscal year closes out; this phase of construction is likely to be completed during the summer or fall of 2025, which will be about a year behind the original timeline due to project modifications and new tasks awarded for completion. Phases 3 and 4 of construction, namely additional pond construction and the new geothermal well respectively, were awarded in fiscal year 2023. The former will tentatively be completed in 2025 and the latter by the end of the 2024 calendar year, but both in FY25. Phase 5 of construction, namely the last of the planned ponds, is currently being planned for award early in fiscal year 2025 for tentative completion in 2026. Needless to say, this new hatchery infrastructure, which should expand our current production space of 0.66 acres to over 8.5 acres and greatly allowing us to expand our production capacity in the coming years. Our staff are eagerly looking forward to these important developments, especially in view of the fact that the construction efforts have reduced our original pond space to nearly a quarter of what we had before construction efforts commenced.

Although temporary space constraints will lead to reduced stocking numbers moving into FY25, the future of the hatchery's production capabilities is still very bright and will only improve as new pond space comes online. Already staff are planning to implement proposals for the new hatchery in FY25 that are geared towards improving our captive rearing and spawning techniques, expanding our population monitoring of hatchery stocks in the wild, refining our documentation of standard operating procedures, and better compiling and reporting on historical data from the program's inception. The staff at both the Hatchery and the Klamath Falls Fish and Wildlife Office (KFFWO) will continue to work closely with and learn from our vital partners within the Klamath Basin as we collective work towards fishery recovery goals.

With all of that said, please give your attention to the following annual report for more information on the activities briefly described above during fiscal year 2024 at the Hatchery.

Introduction

The Shortnose Sucker (*Chasmistes brevirostris*) and the Lost River Sucker (*Deltistes luxatus*) were listed by the US Fish and Wildlife Service (USFWS) as endangered in 1988. These species are long-lived freshwater fish endemic to select lakes and rivers in the upper Klamath Basin of southern Oregon and northern California, with lifespans of 30+ and 50+ years respectively. The Revised Recovery Plan for the Lost River Sucker (*Deltistes luxatus*, LRS) and Shortnose Sucker (*Chasmistes brevirostris*, SNS) called for the development of a controlled propagation program to prevent extinction. This was initially achieved in 2016 through a cooperative partnership with a local landowner of a fish rearing facility to use the existing geothermal water source, ponds, and infrastructure to growout wild caught sucker larvae and was then known as the Sucker Assisted Rearing Program (SARP). Due to the early success of the program at rearing Klamath suckers in ponds, the USFWS signed a 30-year lease with the landowner and designated the site as the Klamath Falls National Fish Hatchery ("KFNFH" or "Hatchery") in early 2022.

The Hatchery is currently under construction through 2026/2027 to expand the production capacity and infrastructure. Upon completion, the Hatchery will include a total of 33 production ponds, totaling approximately 8.5 acres of rearing space, a new influent retention pond, an effluent retention pond, a hatchery and administrative building, a maintenance shop, chemical and feed storage buildings, a primary well, and security, telecom, and supervisory control and data acquisition (SCADA) control systems. This new infrastructure will allow for the annual production of approximately 60,000 suckers to help support recovery goals and stabilize and rebuild existing sucker populations within Upper Klamath Lake (UKL) and its tributaries. For a conceptual image of the new hatchery infrastructure, please see **Figure 1**.

The current production target for the facility is to raise 8-10,000 fish annually to an average size of 200 mm total length and in fiscal year 2024, the KFNFH released or transferred 12,433 production fish, averaging approximately 221 mm total length. So far, approximately 74,620 production fish have been reared and released from the program since the first stockings in 2018. In addition, since 2022, the program has also released suckers into off-channel rearing locations or transferred fingerlings that were excess fish stocks (beyond our rearing capacity) as well as fry produced from experimental, wild-spawning activities on the lake and river side to other facilities. These have totaled approximately 20,269 fingerlings and 39,598 fry to date. There is also the ongoing development of an older refugia population that can act as a redundant captive broodstock should the need arise, with approximately 1,341 fish currently on station that range from the 2017-2022 collection years. In addition, suckers salvaged throughout the year from Klamath Project Operations are rehabilitated, tagged, and repatriated, with 801 total in FY24 and 7,224 salvaged suckers repatriated through the program to date. For more information on the collections and releases of suckers since the program's inception until the end of FY24, please see **Table 1**.

Figure 1 – Conceptual site plan for the new construction of the Klamath Falls National Fish Hatchery, which has a tentative completion date of 2026/2027.

Table 1 – Collections and releases from the Klamath Falls National Fish Hatchery since its inception in 2016, by federal fiscal years, running from October 1 through the following September 30. All total lengths (TL) reported are averages based on length-weight conversions from cumulative total weights of each type, production, fingerling, fry, and standard lengths (SL) of salvage fish are averages from measurements for each year.

Fiscal Year	Larvae Collected	SARP Release	TL (mm)	Fingerling Release	TL (mm)	Fry Release	TL (mm)	Salvage Release	SL or TL (mm)
2016	4,134	-	-	-	-	-	-	-	-
2017	8,730	-	-	-	-	-	-	-	-
2018	9,544	2,355	147	-	-	-	-	784	102 [SL]
2019	24,426	4,497	189	-	-	-	-	1,586	103 [SL]
2020	40,603	11,774	223	-	-	-	-	1,928	94 [SL]
2021	106,710	13,394	208	-	-	-	-	1,689	143 [SL]
2022	51,929	12,768	193	4,655	118	19,993	10	-	-
2023	6,036	17,399	194	15,604	89	14,973	10	436	129 [TL]
2024	30,150	12,433	221	-	-	4,632	10	801	126 [TL]
Total	**282,262**	**74,620**		**20,259**		**39,598**		**7,224**	

Fish Culture Operations Overview

The Klamath Falls National Fish Hatchery (KFNFH) uses a unique water supply sourced from a geothermal well, permitted to supply up to 399 gallons per minute (GPM) of water at approximately 88^{o}C. To make this supply suitable for fish culture operations, it is currently retained in three serial flow through head ponds, whereby it is allowed to cool to ambient temperatures for use in tanks and ponds. It can also be used in small quantities directly in ponds for exchange purposes year-round, or in larger quantities to artificially warm the ponds in the spring, fall, and winter months to alter or extend the growing season.

During FY24, the outdoor facility included 22 0.03-acre ponds in the P-series and four 0.25-acre ponds in the A-series. Early in FY24, the four 0.25-acre ponds in the A-series were also demolished so that the Phase 3 contract could continue to progress. In August and September of 2024, two new ponds each month in the Tier-1 series of ponds were used under beneficial occupancy to thin fish that were stocked in the P-series ponds, although these ponds are not complete and ready to be turned over completely to the staff, as there are still deficiencies in the kettles that need to be addressed at the end of the season, in the Fall/Winter. The remaining six Tier-1 series ponds will likely come online and be complete by the end of 2024 or in the spring of 2025. The 22 ponds in the P-series were used as the primary growout space of broodstock and juvenile suckers throughout most of FY24. For more information on the pond layout during FY24, please see **Figures 2 and 3.**

The indoor intensive facility, which is located in a 30'x100' greenhouse, includes five 1300-gallon and three 500-gallon green circular tanks for processing hatchery fish, 13 150-gallon dark blue rectangular tanks, 12 90-gallon green circular tanks, and eight 60-gallon light blue circular tanks for larval sucker rearing, three 175-gallon light blue circulars for salvage rehabilitation, and four Research Racks, recirculating aquaculture systems (RAS), each with a 180-gallon light blue rectangular sump which were used for egg incubation and/or wet lab space for research. For more information on the tank layout in the greenhouse in FY24, please see **Figure 4.**

The production cycle began with the collection of wild larval suckers drifting down the Williamson River from early May through June, and occasionally early July of each year. Larval suckers were collected, either with stationary drift nets in the middle of the river channel during the night and early morning dark hours and/or by active pursuit with dip nets in the marginal vegetation during early to noon daylight hours. The fish were transported back to the Hatchery and were tempered to the hatchery water supply, enumerated into isolation rearing tanks, and placed on a four-day prophylactic treatment protocol for removal of ectoparasites, namely a four-hour static bath of salt (0.5%) and an hour static bath of formalin (50ppm) prior to flushing the tank each day. Thereafter, mortality was monitored daily, and fish health was treated immediately to ensure that the wild caught fish do not pose a threat to established hatchery stocks.

Once the larval suckers were placed in the quarantine tanks, they were fed decapsulated and freshly hatched Artemia nauplii three to four times daily, usually at 7AM, 10AM, 1PM, and 4PM daily, and were later supplemented with commercially available dry feeds, such as Otohime and June Sucker diets in a fine mash after 14-21 days on station. All indoor culture units were cleaned each morning, monitored daily for adequate water quality, and fish mortalities were enumerated and removed from systems daily to monitor fish health and disease. After prophylactic treatments were completed and any observable mortality has subsided to normal levels, usually under 0.1-1.0% of the culture unit inventory, the larval fish were either stocked directly into fertilized ponds with high zooplankton blooms for natural forage

and/or feed trained during early rearing in tanks for up to four to six weeks prior to stocking in ponds, depending upon available space, manpower, and methodology needed.

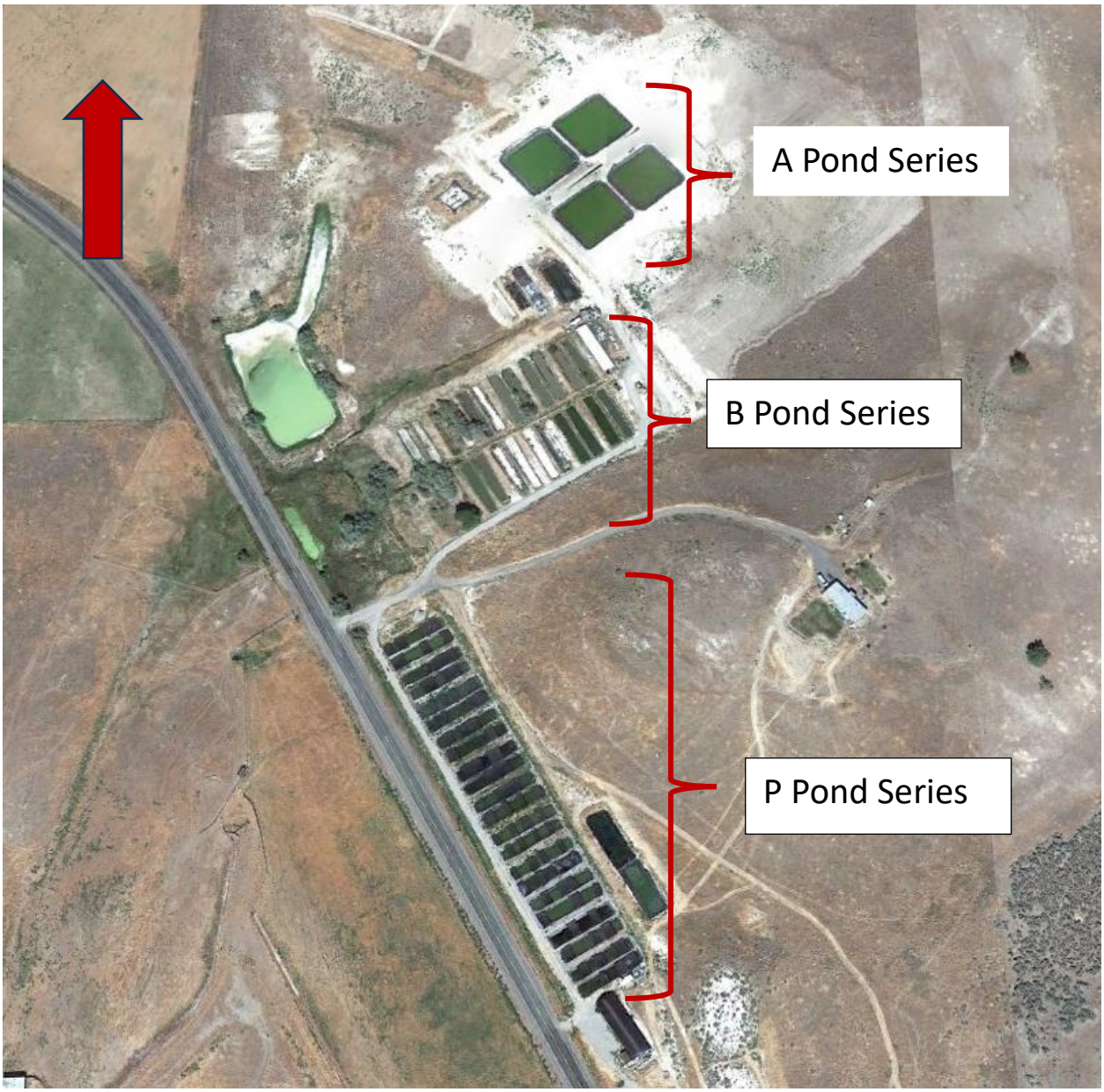

Figure 2 – An aerial view of the layout of ponds at the Klamath Falls National Fish Hatchery. During fiscal year 2023, the B Pond Series were demolished. Then early in FY24, the A Pond Series was demolished. During most of FY24, the P Pond series were the only ponds available for broodstock management and production purposes.

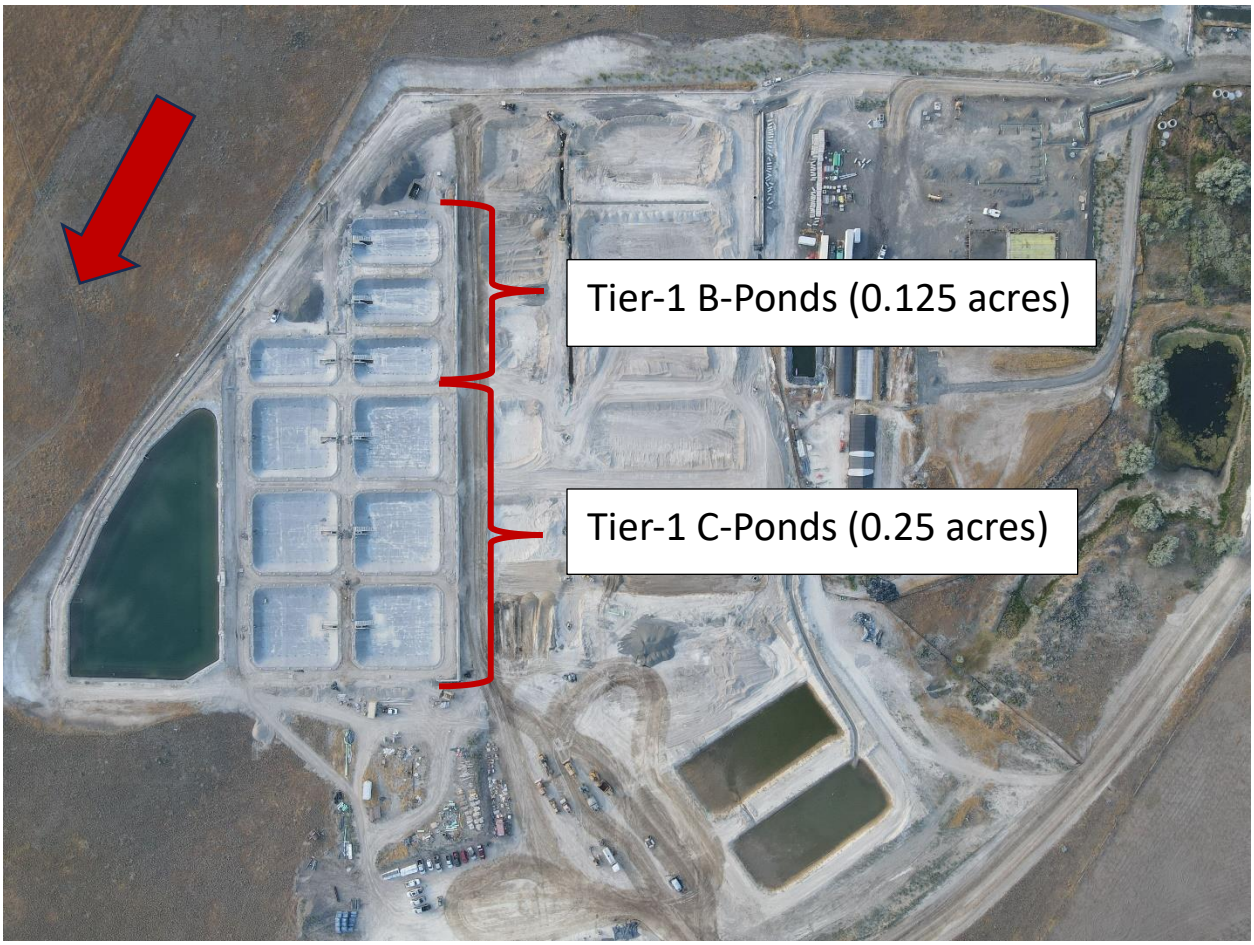

Figure 3 – An aerial view of the layout of the new Tier-1 ponds at the Klamath Falls National Fish Hatchery. This pond series includes six 0.25-acre C-Ponds (C1-C6) and four 0.125-acre B-Ponds (B1-B4). During fiscal year 2024, the Tier-1 pond series saw significant work accomplished and they are scheduled for completion moving into FY25.

Once fish were ponded, they are generally harvested, split, and restocked at least two or three times during the 18-24 month growing cycle, usually every 6-8 months, to check inventory, growth, and/or to tag them. During that time, water quality was monitored daily by staff to ensure that the fish had adequate dissolved oxygen (DO) concentrations to optimize growing conditions; this included ensuring morning DO measurements are above 5.0 mg/L. If the DO concentration was less than 5.0 mg/L, during morning DO measurements, fish were temporarily taken off feed for the day or given a reduced ration, and if DO was below 4.0 mg/L aerators were immediately deployed. The fish were fed commercially available diets in progressively larger sizes as they grew, at rates that began at 15-30% body weight (BW) daily and then were reduced progressively down to about 3-5% BW daily by the end of the first growing season; generally, the juvenile suckers have reached 100-125mm total length by November or December. During the cooler winter months, feed rates are usually reduced in quantity to 1-2% BW, and reduced in frequency to one to three times weekly, depending upon water temperature. During the second growing season, which starts in April or May, feed rates ranged between 2-3% BW daily as the fish get older and

their metabolism and growth slows. The fish were grown to the average target size of approximately 200mm total length by that second fall or the following spring and then they are strategically stocked and repatriated into various parts of Upper Klamath Lake and its tributaries. Prior to stocking out an entire year class, 300-500 fish total are randomly taken from multiple ponds to set aside as a refugia broodstock and incorporated into that captive population. After these refugia broodfish get larger and require thinning, a subset of suckers are randomly selected for repatriation as larger holdovers to stock at a larger size.

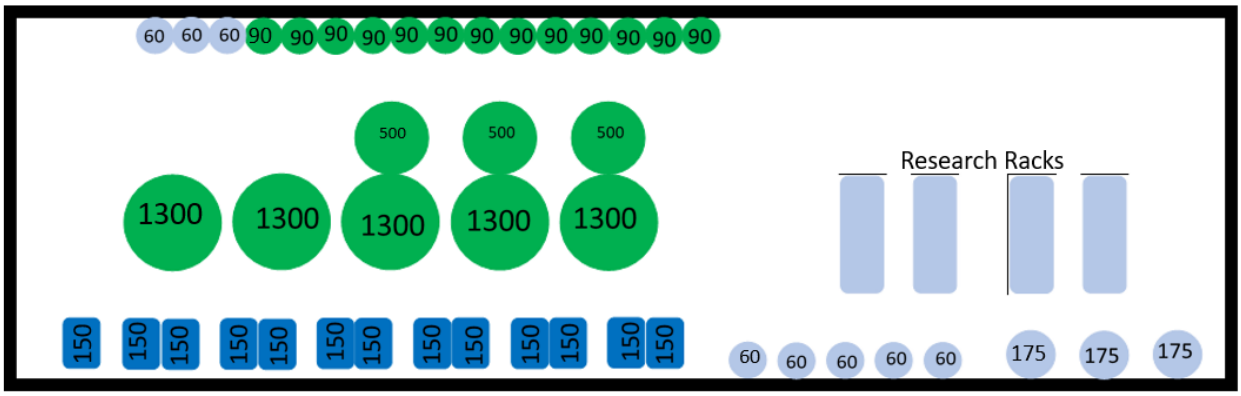

Figure 4 –Layout of tanks in the greenhouse at the Klamath Falls National Fish Hatchery in FY2024. Numbers indicate tank capacity in gallons.

One final component to the fish culture operations is seasonally rehabilitating salvaged suckers that were entrained in the forebay of the A-Canal headworks or unscreened diversions and canals of the Klamath Project. Reclamation salvaged suckers from these locations and fish were transported to the USFWS hatchery. Upon their arrival, USFWS placed suckers in temporary isolation, treated them using chemical therapeutants, scanned each fish for a PIT tag, PIT-tagged them if untagged, and measured to length and weight. These wild, salvaged suckers were repatriated back to Upper Klamath Lake by hatchery staff. Some years result in large numbers of suckers rehabilitated and repatriated and some years have none. This cooperative effort is important since these wild fish are some of the few suckers aged 0-2 years that have survived during their first few years of life. It may be that these fish have a greater likelihood of surviving into adulthood and rehabilitating them may represent an important sucker conservation measure.

Wild East Side Springs Lost River Sucker Spawning

Wild Lost River Sucker populations spawn in two different locations with strong site fidelity in the Upper Klamath Basin, so much so that they are considered two separate populations in the recovery plan due to the difference in reproductive behavior. The first and largest population, with approximately 24,000 fish, spawn in the Williamson and/or Sprague Rivers, near the town of Chiloquin, Oregon, during April and May (USFWS 2023 BiOp- based on estimates derived from 2021 USGS CJS data). The other smaller population, with approximately 4,000 (USFWS 2023 BiOp- based on estimates derived from 2021 USGS CJS data) individuals, spawn on the east side of Upper Klamath Lake, on a series of springs commonly referred to collectively as the East Side Springs, usually a little earlier in the spring than the river spawning population. During the peak of spawning activity in this area, US Geological Service (USGS) biologists conduct annual monitoring of river and spring populations using trammel nets at the East Side Springs, a weir located on the Williamson River, and PIT tag antenna arrays. The KFNFH staff, along with staff from the Klamath Tribes Hatchery (KTH), used some of these fish, from the springs spawning population, to collect and fertilize gametes for experimental incubation trials and to produce viable offspring for the hatchery broodstock population. In addition, were raised intensively and in ponds for production activities.

On April 17, April 24, May 1, and May 8, 2024, a total of twelve female Lost River Suckers were crossed with four males each, and one female was crossed with only two males, for a total of 50 family groups collected overall. In total, 43 wild adult Lost River Suckers were handled, 13 females and 30 males, with all 13 females and 24 of the males being spawned and returned safely to the water thereafter. Small batches of eggs were collected from each female during this effort so that these wild fish could still spawn naturally. After the collection of gametes, unfertilized eggs from each female were separated into four bowls, and each bowl of eggs was fertilized by one of four males, silted, and rinsed. Thereafter, the eggs were transported to the KFNFH and KTH facilities, counted, then placed in separate jars for incubation and hatching.

In total, 87,513 eggs were collected, including about 9,078 that were sampled for thiamine treatments and analysis, and leaving 78,435 eggs that were collected for production and 56,458 fry were hatched, an overall average 64.5% hatch rate with samples accounted for and 72.0% on the recirculating incubation systems in our new quarantine building. Approximately 2,875 fry were randomly selected from the 50 family groups stocked into a hatchery rearing pond to be used for broodstock from the CY2024 year class. In addition, approximately 14,000 additional fry were utilized for an extended intensive rearing trial in tanks within the greenhouse and salvage building through the summer months. And some of the excess milt from some males were used in some cryopreservation trials to assess post thaw motility and fertility rates using this milt. For more information on the male and female Lost River Suckers used in the spawning effort and the incubation results for each female, please see **Tables 2 and 3**.

The hatch rates overall were much better in FY24 than in previous years on the geothermal water supply. Having an average hatch rate over 70% is very significant for the hatchery, because in previous years we have generally experienced less than 20% due to water quality limitations in the hatchery water supply. Recent efforts to refine the augmentation of water quality parameters, primarily hardness and other vital minerals after stripping the water through a reverse osmosis filtration system, as well as installing chillers with heat pumps in the newly insulated salvage building seemed to greatly stabilize incubation

conditions and contributed to better hatching and early rearing results. The successful efforts of the Hatchery staff in FY24 solved a vital part of the incubation puzzle and have allowed us for the first time to hatch and rear larger numbers of captively produced sucker fry, even with limited infrastructure. Standardizing these methods will allow us to utilize the hatchery water supply into the future for successful captive spawning and incubation methods as well.

Table 2 – Summary of the wild East Side Springs Lost River Suckers handled during spawning activities from Upper Klamath Lake in the spring of 2024. In total, 50 family groups were collected and are represented in the CY2024 broodstock and production lot at the Klamath Falls National Fish Hatchery.

Date	Fin Clip ID#	PIT Tag Suffix	Sex	Gamete Use	Fork Length	Total Length	Spring Location	Family Groups
4/17/2024	3960-049	257C5DBC9C	Male	Spawned	690	732	CINDER	
4/17/2024	3960-050	003D6D4420	Male	Spawned	543	584	SUCKER	
4/17/2024	3960-051	003D485428	Male	Spawned	538	572	SUCKER	
4/17/2024	3960-052	003BBFCD43	Male	Spawned	615	661	SUCKER	
4/17/2024	3960-053	003D6B96AC	Female	Spawned	787	830	SUCKER	4
4/24/2024	3960-061	257C5DC4F7	Female	Spawned	743	784	CINDER	4
4/24/2024	3960-062	003D6D42B0	Female	Spawned	727	776	CINDER	4
4/24/2024	3960-066	003D6D42B9	Female	Spawned	730	772	CINDER	4
4/24/2024	3960-067	003C088836	Female	Spawned	762	808	SILVER	4
4/24/2024	3960-068	257C67C96D	Female	Spawned	707	749	SILVER	4
4/24/2024	3960-069	003D4855AE	Female	Spawned	727	768	SILVER	4
4/24/2024	3960-054	003D6D42A2	Male	Spawned	633	675	CINDER	
4/24/2024	3960-055	003C08DB3F	Male	Spawned	685	729	CINDER	
4/24/2024	3960-056	003D6B9717	Male	Spawned	730	773	CINDER	
4/24/2024	3960-057	003BC11270	Male	Spawned	649	689	CINDER	
4/24/2024	3960-058	003D485524	Male	Spawned	668	711	CINDER	
4/24/2024	3960-059	1C2D1D8129	Male	Not Spawned			CINDER	
4/24/2024	3960-060	003D485512	Male	Spawned	661	705	CINDER	
4/24/2024	NA	1C2DE0FABB	Male	Not Spawned/Cryo Preservation	712	750	CINDER	
4/24/2024	3960-063	003BC32588	Male	Not Spawned/Cryo Preservation	655	696	CINDER	
4/24/2024	3960-064	003C08883C	Male	Spawned/Cryopreservation	662	701	CINDER	
4/24/2024	3960-065	003D6D42F8	Male	Not Spawned/Cryo Preservation	679	724	CINDER	
5/1/2024	3960-080	003BC11294	Female	Spawned	735	786	CINDER	4
5/1/2024	3960-079	003BF7BCD9	Female	Spawned	656	695	CINDER	4
5/1/2024	3960-078	003C08EC99	Female	Spawned	761	812	CINDER	4
5/1/2024	3960-077	1C2DAE9E2A	Female	Spawned	785	830	CINDER	4
5/1/2024	3960-076	257C5D6ADA	Male	Spawned	646	682	CINDER	
5/1/2024	3960-075	1C2DE17403	Male	Spawned	644	682	CINDER	
5/1/2024	3960-074	003C08DB59	Male	Spawned	693	735	CINDER	
5/1/2024	3960-073	257C6CD07D	Male	Spawned	719	775	CINDER	
5/1/2024	3960-072	1C2DE2D2AD	Male	Spawned	706	746	CINDER	
5/1/2024	3960-071	003BC1127A	Male	Spawned	613	652	CINDER	
5/1/2024	NA	003D6D42E5	Male	Not Spawned	655	702	CINDER	
5/1/2024	3960-070	1C2D1E28AC	Male	Spawned	634	670	CINDER	
5/8/2024	3960-146	1C2DE33F30	Male	Spawned/Cryopreservation	665	705	CINDER	
5/8/2024	3960-145	003BC13B18	Male	Spawned/Cryopreservation	665	705	CINDER	
5/8/2024	3960-093	003D8B8428	Female	Spawned	745	765	CINDER	2
5/8/2024	3960-091	003D8B8427	Male	Spawned/Cryopreservation	770	818	CINDER	
5/8/2024	3960-090	003D6D42A9	Female	Spawned	710	755	CINDER	4
5/8/2024	3960-087	257C667FD0	Male	Spawned	665	710	CINDER	
5/8/2024	3960-086	257C67EC8A	Male	Spawned	660	705	CINDER	
5/8/2024	3960-083	003C08CEEA	Male	Spawned	685	730	CINDER	
5/8/2024	3960-095	A579	Male	Not Spawned/Cryo Preservation			CINDER	

Table 3 – Summary of the wild East Side Springs Lost River Suckers spawned from Upper Klamath Lake in the spring of 2024. In total, 50 family groups were collected and are represented in the CY2024 broodstock and production lot at the Klamath Falls National Fish Hatchery. While overall hatch rates were 64.5%, there were approximately 9,078 eggs sampled for thiamine analysis, leaving a total of 78,435 eggs for production and a hatch rate of 72.0% from what was used for production purposes. Please note that the total number of eggs reported are estimated based on an extrapolated count and volume; thus, hatch rate is an estimate, and therefore, can be greater than 100% at times.

Spawning Date	Female	Male	Male	Male	Male	Incubator	Egg Volume (mL)	# eggs/mL	Total Eggs	Total Fry	Hatch (%)	Hatch Date
4/17/2024	003D6B96AC	257C5DBC9C	003D6D4420	003D485428	003BBFCD43	aquaria	28.16	42.6	1200	483	40.3	4/24/2024
4/17/2024	003D6B96AC	257C5DBC9C	003D6D4420	003D485428	003BBFCD43	jars	192	42.6	8179	5258	64.3	4/22/2024
4/24/2024	257C5DC4F7	003D6D42A2	003C08DB3F	003D6B9717	003BC11270	jars	170	34.33	5836	4086	70.0	5/2/2024
4/24/2024	003D6D42B0	003D6B9717	003BC11270	003D485524	003D485512	jars	175	47	8225	2253	27.4	5/2/2024
4/24/2024	003D6D42B9	003C08883C	003BC11270	003D485512	003C08DB3F	jars	295	35	10325	11090	107.4	5/2/2024
4/24/2024	003C088836	003C08883C	003D485524	003D6B9717	003D6D42A2	jars	200	35	7000	3346	47.8	5/2/2024
4/24/2024	257C67C96D	003C08DB3F	003BC11270	003D485524	003D485512	jars	125	30.33	3791	517	13.6	5/2/2024
4/24/2024	003D4855AE	003D6D42A2	003D6B9717	003D485524	003C08883C	jars	160	34	5440	547	10.1	5/2/2024
5/1/2024	003BC11294	1C2DE2D2AD	003C08DB59	257C5D6ADA	257C6CD07D	jars	65	42	2730	2799	102.5	5/8/2024
5/1/2024	003BF7BCD9	1C2DE2D2AD	257C6CD07D	003C08DB59	257C5D6ADA	jars	165	41.65	6872	6457	94.0	5/8/2024
5/1/2024	003C08EC99	257C5D6ADA	1C2DE17403	003C08DB59	1C2D1E28AC	jars	105	64.65	6788	3420	50.4	5/8/2024
5/1/2024	1C2DAE9E2A	1C2D1E28AC	003BC1127A	1C2DE2D2AD	257C6CD07D	jars	315	42.5	13388	13137	98.1	5/8/2024
5/8/2024	003D6D42A9	1C2DE33F30	003D8B8427	003BC13B18	003C08CEEA	jars	85	66	5610	2025	36.1	5/14/2024
5/8/2024	003D8B8428	257C67EC8A	257C667FD0			jars	35	60.83	2129	1040	48.8	5/14/2024
									87513	**56458**	**64.5**	

Captive Shortnose Sucker Spawning

In recent years, the hatchery staff have sought to experimentally spawn older Shortnose Sucker (SNS) in the captive broodstock on station. Temperatures are monitored closely in late April and early May and when pond temperatures reach 14-16^{o}C consistently, then broodfish are seined or harvested from the ponds, checked for ripeness, sexed and sorted, and given hormone injections to assist with ovulation and increase milt volumes. The male SNS are given a single dose of human chorionic gonadotrophin (HCG) hormone, at a rate of 100 µl/kg injected intramuscularly in the dorsal area, before being placed into a separate "male" tank, or pond net pen, to ripen for three days. The female SNS are given the first of three doses of HCG, totaling a rate of 100 µl/kg injected intramuscularly in the dorsal area, before being placed into a separate "female" tank, or pond net pen, where they would get two additional doses, at 24-hour intervals. Then, after all the fish had three total days to ripen, staff checked for gravidity and ovulation rates of the females and milt volumes of the males. Once all of this handling is complete, and all the data is collected on each fish, such response to hormone, volume of eggs or milt collected, and/or partial versus full ovulation, then they are placed into a new pond for the growing season and any gametes collected and/or fertilized are incubated. This process is repeated each week at until fish are spent or eggs start to be reabsorbed and milt volumes diminish.

During the unsuccessful spawning efforts in early FY23, we lowered pond densities going into that growing season to improve fish size and condition for the following FY24 spawning season and the fish condition was much better, with many plump SNS. However, pond temperatures did not hit our normal threshold of 14-16^{o}C until the week of May 13th, as it was a colder spring. During that week, we seined fish from the CY2017, CY2018, CY2019, and CY2020 broodstock lots, sexed and sorted fish that appeared ripe, and began administering hormone injections of HCG, leaving them in net pens in the ponds between each day's handling event. Early in the week, many males were already expressing milt and to a limited extent several females were expressing some eggs. In addition, even some Lost River Suckers (LRS) that we checked and did injections on as well were expressing milt and some limited eggs. Although initially promising, by the end of the week, the milt volume of most males had diminished greatly and the only eggs collected were starting to be reabsorbed. It was also apparent that pond temperatures increased quickly within the week, going from under 12^{o}C to over 18-19^{o}C by the close of the first spawning week. Staff decided to forgo further efforts with the warmer temperatures and to focus on care of the large amount of eggs and larvae on the incubation racks from the previous weeks work with the wild ESS LRS.

To prepare for next year's effort, USFWS will continue to prioritize broodstock management and lower pond densities, which may allow for better growth and condition moving into FY25, hopefully also improving ovulation and milt production. These broodstock year will also be another year older, and more likely to be sexually mature with hundreds of SNS being over six- and seven-year-olds. In addition, we plan on artificially warming the broodstock ponds in early to mid-April to control large temperature fluctuations. We may also try additional hormones or even implants so that we can limit daily handling of females to limit stress and the chance that they shut down during ovulation and start reabsorbing their eggs. While we hope that the spring of 2025 will be the year we have full blown success with these experimental efforts, especially in view of the fact that we have improved incubation success this year, we may not have reliable ovulation from the SNS broodstock until many of the fish are 8-10 years old, and perhaps even as late as 10-12 years old for the LRS broodstock on station.

Wild Larval Sucker Collections and Early Rearing

During the Spring of 2024, the Hatchery staff, along with assistance from the KFFWO staff, collected a total of 30,150 larval suckers from the lower Williamson River, near the town of Chiloquin, Oregon. Staff spent a total of 20 collections days on the river between the dates of May 8th and June 10th. The species composition of this catch was presumably a mix predominantly of Lost River Sucker and Shortnose Sucker, with some potential for limited numbers of Klamath Largescale Sucker. Collection methods included using a passive method of deploying drift nets in the river channel at night, as well as using active methods like long handled dip nets to actively collect larval suckers from a small flat-bottomed boat and/or by wading through marginal emergent vegetation where these fry collect during the early daylight hours. For more information on the daily collection trends, as well as overall comparisons of recent larval collection years, please see **Table 4** and **Figures 5, 6,** and **7**.

All collected sucker fry were transported back to the Hatchery daily, tempered into 90-gallon flow through circular rearing tanks with a 0.3% salt concentration, then given prophylactic treatments for four days, comprising of a three hour static bath 0.5% salt treatment immediately followed by a one hour static bath 50ppm formalin treatment each day before tanks are flushed and normal flow through is resumed. Fry were fed freshly hatched decapsulated Artemia nauplii three to four times daily until they are stocked to a fertilized fry pond. Tanks are siphoned and inspected daily to collect mortalities and to clean the tanks of debris and uneaten food. If fry are reared for more than 14-21-days, they are supplemented with dry commercial fish diets three to four times daily until stocked into a fertilized fry pond. Since larval pond space was limited, as we awaited new ponds to be finished, we ended up keeping nearly 5-6,000 fry inside the salvage building tanks until late July, so that these fish spent over two months inside before stocking into a fertilized fry pond.

Total observed mortality from all the tanks for an overall growing season that lasted nearly three months was 2,876 fish overall, which was approximately 9.5% of the entire stock. This included multiple fish health related mortalities as we constantly combatted Costia infections for the extended intensive rearing period all summer, and as we awaited more pond space to come online. A total of 20,344 fish were inventoried and stocked into fry ponds out of the total number of the 30,150 fish collected for an overall survival of 67.5% and with unobserved mortality at 23.0% of the entire collection stock. One observation that has been made over the recent years is that the longer the fish are raised intensively in tanks, the greater the unobserved losses become throughout that time frame, with the likely cause being cumulative human error the longer the fish are under care. This is one reason that we have tried to move towards stocking fry into ponds immediately after prophylactic treatments, provided we have adequate pond space available. The fish meet ideal growing conditions earlier in the season and hence grow larger and have better condition by the end of the growing season, with similar or slightly better returns on survival, for much less work and attention. Stocking fry into fertilized ponds immediately after collections and initial treatments are complete will become the standard method once the new hatchery infrastructure is completed, allowing us to stock and raise more fish with less effort. For more information on specific survival and mortality in each culture unit used during the early rearing season, please see **Table 5.**

Table 4 – Historical catches of larval suckers from the lower Williamson River, near Chiloquin, Oregon, used for production at the Klamath Falls National Fish Hatchery. (*) Note that 2023 was the first year when collections were limited in the number of fry available during the collection season.

Year (Spring)	# Collected	Primary Collection Method
2016	4,134	Drift Net (Passive Method)
2017	8,730	Drift Net (Passive Method)
2018	9,544	Drift Net (Passive Method)
2019	24,426	Drift Net (Passive Method)
2020	40,603	Drift Net (Passive Method)
2021	106,710	Drift Net (Passive Method) / Dip Net (Active Method)
2022	51,929	Dip Net (Active Method)
2023	6,036*	Dip Net (Active Method)
2024	30,150	Drift Net (Passive Method) / Dip Net (Active Method)
Total Collected to Date	**282,262**	

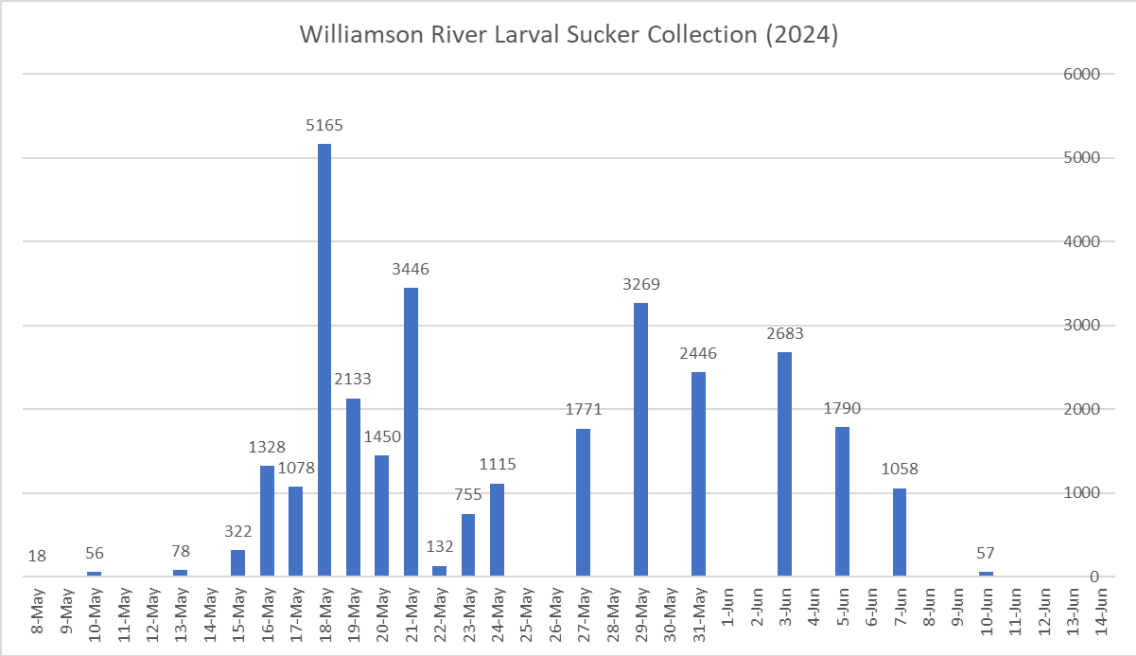

Figure 5 – Catches of larval Klamath suckers per day on the lower Williamson River, near Chiloquin, Oregon, during the Spring 2024 for the Klamath Falls National Fish Hatchery. The total catch from both drift nets and dip netting amounted to 30,150 larval suckers.

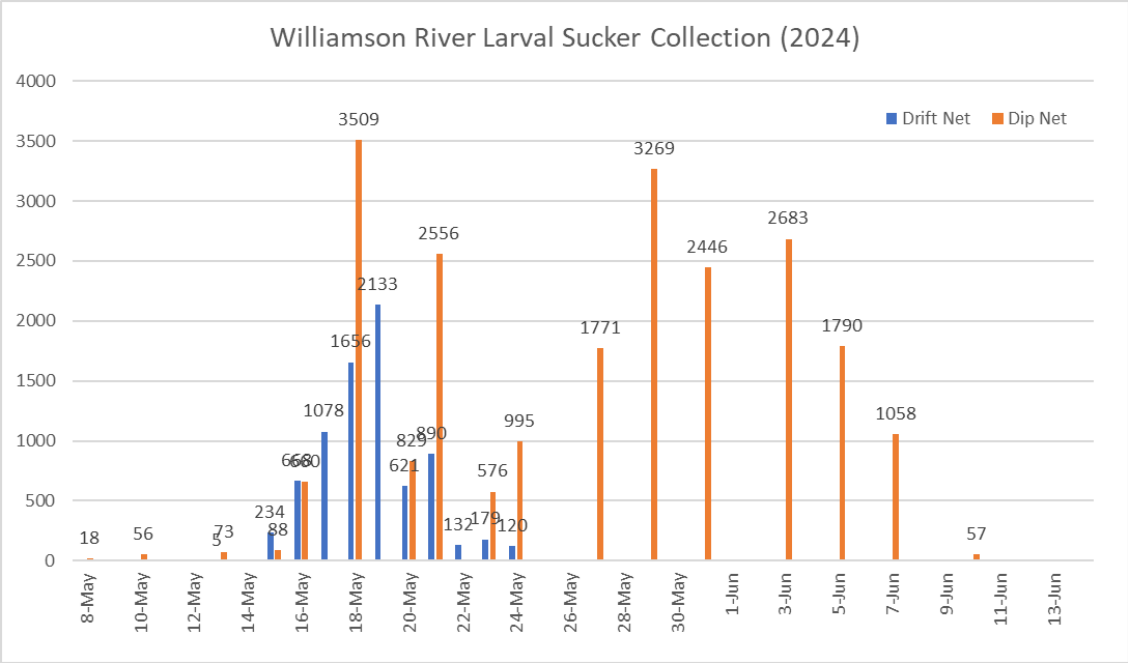

Figure 6 – Catches of larval Klamath suckers per day, drift net versus dip net, on the lower Williamson River, near Chiloquin, Oregon, during the Spring 2024 for the Klamath Falls National Fish Hatchery. The total catch from both drift nets and dip netting amounted to 30,150 larval suckers.

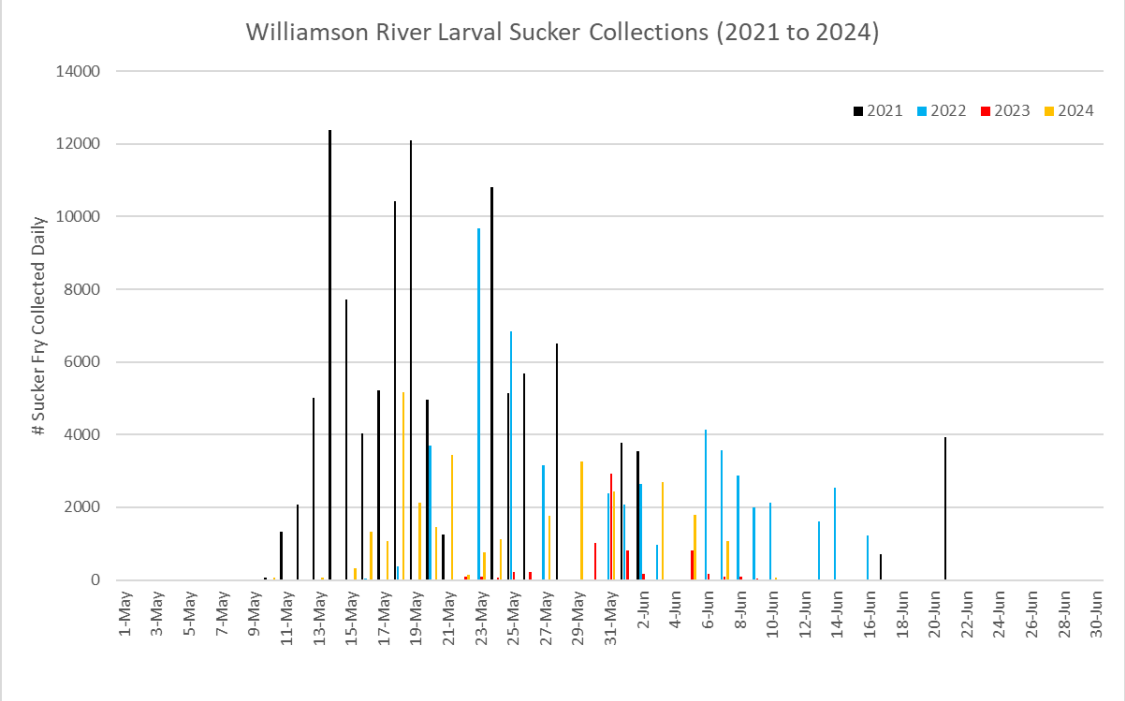

Figure 7 - Catches of larval suckers each day on the lower Williamson River, near Chiloquin, Oregon, during the Springs of 2021, 2022, 2023, and 2024 collection efforts for the Klamath Falls National Fish Hatchery.

Table 5 – This describes the initial collection and stocking numbers of larval suckers, total mortality, and survival of each culture tank, as well as overall summary information for early rearing in fiscal year 2024 at the Klamath Falls National Fish Hatchery.

Date	Culture Unit	Collected	Mortality	Stocked	Survival (%)	Observed Mortality (%)	Unobserved Mortality (%)
5/8/2024	C3 (Salvage Building)	18	0	18	100.0	0.0	0.0
5/10/2024	C4 (Salvage Building)	56	0	55	98.2	0.0	1.8
5/13/2024	C5 (Salvage Building)	78	0	58	74.4	0.0	25.6
5/15/2024	C3 (Salvage Building)	322	4	83	25.8	1.2	73.0
5/16/2024	C4 (Salvage Building)	1328	15	1211	91.2	1.1	7.7
5/17/2024	C6 (Salvage Building)	1078	77	765	71.0	7.1	21.9
5/18/2024	C9/C11 (Salvage Building)	5165	448	2566	49.7	8.7	41.6
5/19/2024	C12 (Salvage Building)	2133	20	1973	92.5	0.9	6.6
5/20/2024	C2 (Salvage Building)	1450	100	1238	85.4	6.9	7.7
5/21/2024	C3/C4 (Salvage Building	3446	707	2722	79.0	20.5	0.5
5/22/2024	C1 (Salvage Building)	132	6	125	94.7	4.5	0.8
5/23/2024	C7 (Salvage Building)	755	13	707	93.6	1.7	4.6
5/24/2024	C8 (Salvage Building)	1115	53	938	84.1	4.8	11.1
5/27/2024	C5 (Salvage Building)	1771	58	1170	66.1	3.3	30.7
5/28/2024	**Restock C1 (Salvage Building)**	**1629**	**348**	**1287**	**79.0**	**21.4**	**-0.4**
5/29/2024	C4/C6 (Salvage Building)	3269	103	2695	82.4	3.2	14.4
5/30/2024	**Restock C2 (Salvage Building)**	**1558**	**149**	**848**	**54.4**	**9.6**	**36.0**
5/31/2024	C7 (Salvage Building)	2446	53	2016	82.4	2.2	15.4
6/3/2024	C6 (Salvage Building)	2683	177	2229	83.1	6.6	10.3
6/5/2024	C8 (Salvage Building)	1790	155	1378	77.0	8.7	14.4
6/5/2024	**Restock C4 (Salvage Building)**	**1693**	**187**	**801**	**47.3**	**11.0**	**41.6**
6/5/2024	**Restock C11 (Salvage Building)**	**982**	**51**	**924**	**94.1**	**5.2**	**0.7**
6/7/2024	C7 (Salvage Building)	1058	26	802	75.8	2.5	21.7
6/10/2024	C5 (Salvage Building)	57	1	56	98.2	1.8	0.0
6/17/2024	**Restock C5 (Salvage Building)**	**1465**	**125**	**1071**	**73.1**	**8.5**	**18.4**
		30150	**2876**	**20344**	**67.5**	**9.5**	**23.0**

Pond Growout

Fish culture of Klamath Suckers is ideal in management ponds because the fish are in a natural and productive environment that hosts the production of natural forage of macroinvertebrates, such as cladocerans, copepods, and insect larvae, all of which serves as an excellent food source for the fish. The ability to forage naturally not only allows a hatchery reared fish to retain wild characteristics and helps to reduce domestication, while speeding up growth of the fish as their diets are supplemented by commercially available dry diets to meet their nutritional needs.

Prior to feeding commercial diets each feed day, pond water quality was monitored each morning to measure temperature and dissolved oxygen concentrations, using a handheld meter. These parameter measurements determine daily feed rations for each pond. Ponds were checked for mortality and dead fish were removed to reduce the spread of disease. Data is available in real-time to partners, such as the USFWS California Nevada Fish Health Unit, so staff can monitor our water quality and mortality records if problems are observed and reported. Close monitoring and observation are the first lines of defense to effectively culture Klamath Suckers and allow the staff to make daily management decisions and adjustments to help care for and protect these captive stocks.

During FY24, unusually cooler water temperatures, in mid to late August, caused some crashes in the blooms in several fingerling ponds, which resulted in lethal dissolved oxygen levels in the early mornings. There were two noteworthy crashes, one each in Ponds P12 and P13, which lead to the acute loss of several thousand fish between both instances, as well as some chronic losses shortly thereafter. Fish mortality was much higher in FY24 during the summer months than we have ever previously seen and was likely exacerbated due to crowding issues, as pond space was very limited during the early part of the production cycle, especially as we awaited new pond space into early to late August, before stocks could be fully split for the growing season. For more information on the average morning water temperature and dissolved oxygen trends, as well as monthly fish mortality, throughout the year, please see **Figures 8-10**.

Our staff also monitored other water quality parameters in ponds, such as pH, ammonia, adjusted water delivery of cooled and geothermal flows to regulate culture unit (pond or other holding space) temperatures, and sampled and monitored fish health, growth, and size; water quality and flow monitoring is done from daily and weekly to monthly, whereas the fish size monitoring is generally once every 1-3 months to recalibrate feed projection estimates. Suckers were harvested from ponds in the spring and fall to quantify fish, redistribute fish to new ponds and split to lower rearing densities, and to repatriate fish to locations within Upper Klamath Lake and its tributaries when fish reach target sizes. All of the suckers were PIT tagged at the end of the first growing season in late fall, when five to seven months old, so that the tag wound could heal in the winter when disease and water quality problems are less abundant. Tagging the production fish before they are stocked the following fall, about 10-12 months later, removes a vital stressor that can lead to post stocking mortality, with the goal of increasing wild survival in UKL.

Overall, fish at the hatchery had relatively high survival rates, generally over 80-90% for most age 1+ fish between harvest cycles, and consistent growth rates throughout the growing season, from March/April through October/November. Most of the losses incurred throughout the growing season occurred with fish less than a year old, with survival sometimes between 60-80%. For more information on pond

performance, growth, and survival in each of the ponds during the FY 2023, and even into the beginning of Fiscal Year 2024, please see **Tables 6-8**.

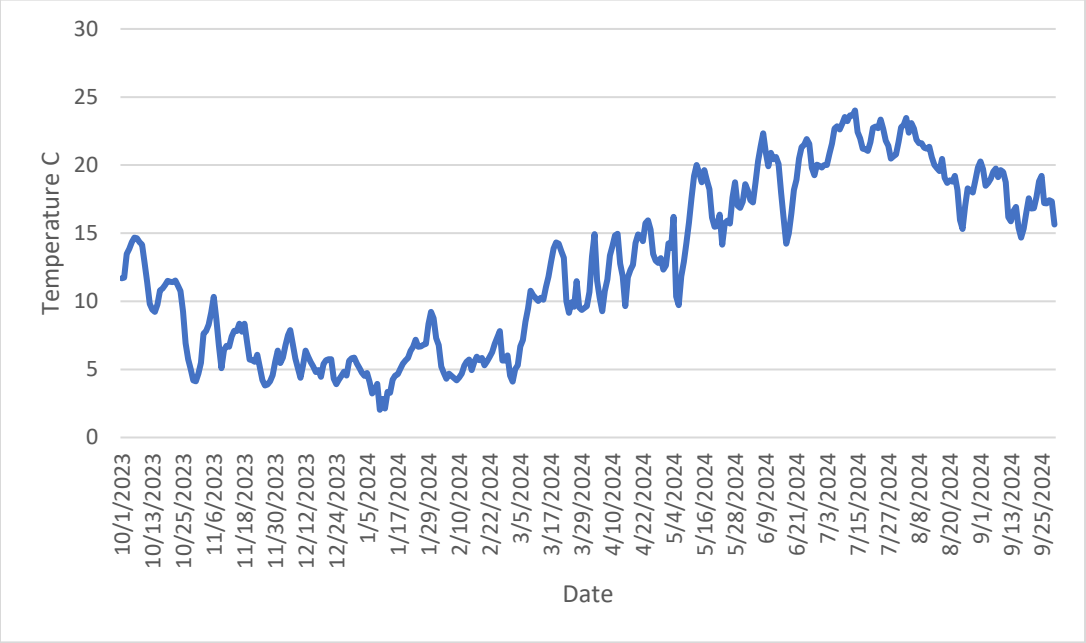

Figure 8 – Average morning temperature (°C) of all ponds located at the Hatchery, during the fiscal year of 2024; temperature is measured between 0600 and 0730 am each day.

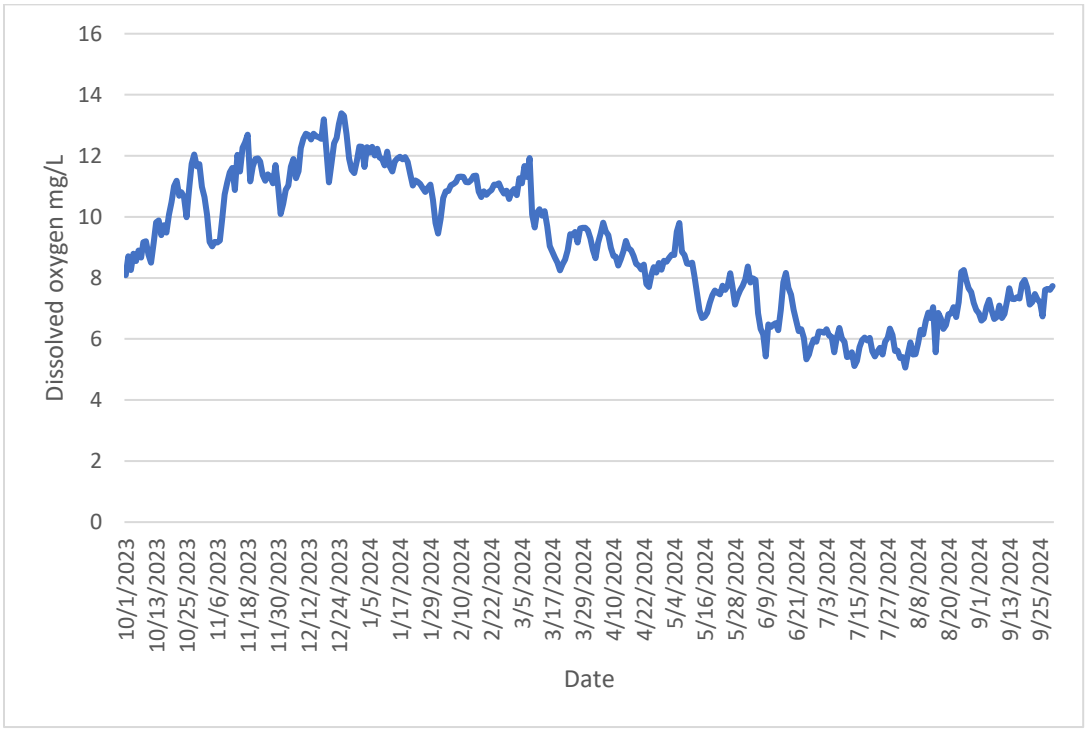

Figure 9 – Average morning dissolved oxygen concentration (mg/L), at the Klamath Falls National Fish Hatchery, in FY 2024; dissolved oxygen is measured each morning between 0600 and 0730 am each day.

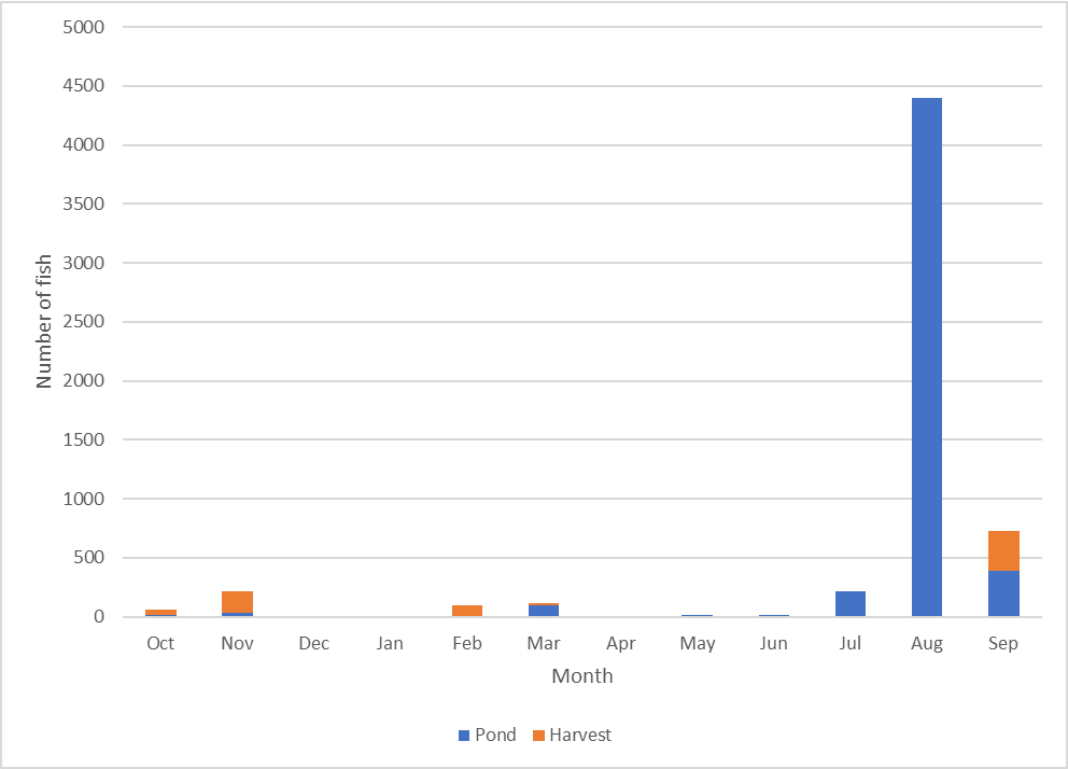

Figure 10 – Total monthly pond and harvest mortalities, at the Klamath Falls National Fish Hatchery, in FY 2024. Harvest mortalities result from handling and are recorded in orange.

Table 6 – Pond, collection year, stocking date, number of suckers on stocking date, average weight per fish, total weight of all fish in each pond (used to derive feeding amounts), average total length on stocking date (mm, measured or derived from length weight relationships, date harvested, number of suckers on harvest date, growth, and survival for ponds during the production cycle starting in the Spring of 2023 through the Fall of 2023 at the Klamath Falls National Fish Hatchery. The last ten rows in the table are summary numbers for each year class on station and the overall for the harvest season.

Pond	Lot	Stocked Date	Start #	Start g/fish	Start Wt (g)	Start WT (lb)	Start TL (mm)	Harvest Date	End #	End g/fish	End WT (g)	End WT (lb)	End TL (mm)	Days	Months	Growth (mm/day)	Weight Gain (lb)	Harvest Mortality #	Survival %
P1	2018	3/14/2023	103	309.20	31847.6	70.15	307	11/29/2023	89	461.76	41097	90.52	345	260	9	0.15	20.37	0	86.4
P2	2018	3/14/2023	100	294.20	29420	64.80	307	11/29/2023	86	426.07	36642	80.71	336	260	9	0.11	15.91	0	86.0
P3	2019	3/14/2023	102	303.70	30977.4	68.23	220	11/28/2023	91	426.51	38812	85.49	335	259	9	0.44	17.26	0	89.2
P4	2019	3/16/2023	100	303.70	30370	66.89	299	11/27/2023	91	458.22	41698	91.85	341	256	9	0.16	24.95	0	91.0
P5	2020	2/20/2023	302	125.20	37810	83.28	222	11/27/2023	263	233.65	61451	135.35	275	280	9	0.19	52.07	1	87.4
P6	2021	3/24/2023	311	64.60	20090.6	44.25	183	11/27/2023	266	175.03	46559	102.55	261	248	8	0.31	58.30	2	86.2
P7	ESS 2023	5/10/2023	3631	0.10	363.1	0.80	0.1	11/8/2023	2078	11.01	22884	50.41	108	182	6	0.59	49.61	59	58.9
P8	2017	5/22/2023	84	612.70	51466.7	113.36	370	11/27/2023	85	698.94	59410	130.86	395	189	6	0.13	17.50	0	101.2
P9	2022	2/24/2023	501	9.18	4599.2	10.13	96	10/23/2023	467	102.31	47781	105.24	217	241	8	0.50	95.11	1	93.4
P10	2022	2/24/2023	504	12.71	6405.8	14.11	107	10/24/2023	498	101.41	50504	111.24	216	242	8	0.45	97.13	0	98.8
P11	2022	2/24/2023	503	10.53	5296.6	11.67	102	10/23/2023	469	65.57	30753	67.74	189	241	8	0.36	56.07	2	93.6
P12	2022	2/24/2023	504	11.94	6017.8	13.26	106	10/25/2023	484	80.00	38718	85.28	205	243	8	0.41	72.03	3	96.6
P13	2022	2/24/2023	505	10.34	5221.7	11.50	101	10/23/2023	442	96.04	42449	93.50	216	241	8	0.48	82.00	0	87.5
P14	2022	2/24/2023	502	14.40	7228.8	15.92	113	10/24/2023	416	107.88	44876	98.85	221	242	8	0.45	82.92	2	83.3
P15	2022	2/24/2023	504	9.16	4616.6	10.17	99	10/23/2023	427	72.49	30953	68.18	196	241	8	0.40	58.01	3	85.3
P16	2022	2/24/2023	504	11.72	5906.9	13.01	105	10/25/2023	474	88.65	42018	92.55	208	243	8	0.42	79.54	2	94.4
P17	2022	3/3/2023	911	10.83	9866	21.73	103	10/16/2023	771	64.32	49590	109.23	185	227	8	0.36	87.50	20	86.8
P18	2023	6/5/2023	1500	0.02	27	0.06	0.1	11/7/2023	1297	10.36	13434	29.59	106	155	5	0.68	29.53	70	91.1
P19	2023	7/10/2023	628	0.18	111.5	0.25	0.1	11/7/2023	553	12.04	6658	14.67	111	120	4	0.92	14.42	17	90.8
P20	2023	6/9/2023	423	0.17	73	0.16	0.1	11/8/2023	262	21.16	5544	12.21	135	152	5	0.89	12.05	22	67.1
P21	2023	7/14/2023	342	0.23	79.5	0.18	0.1	11/8/2023	179	19.64	3516	7.74	131	117	4	1.12	7.57	6	54.1
A1	MIX	3/25/2023	1372	95.70	131300	289.21	MIX	10/16/2023	1068	240.53	256889	565.83	283	205	7	-	276.63	3	78.1
A2	2022	3/3/2023	4574	8.31	38008	83.72	96	10/17/2023	4020	67.27	270423	595.65	194	228	8	0.43	511.93	5	88.0
A3	2022	4/24/2023	4339	4.50	19525.5	43.01	80	10/30/2023	2986	31.02	92630	204.03	153	189	6	0.39	161.02	3	68.9
A4	2023	6/5/2023	1096	0.10	109.6	0.24	0.1	10/26/2023	897	24.34	21829	48.08	141	143	5	0.99	47.84	4	82.2
	2017		**84**						**85**									**0**	**101.2**
	2018		**203**						**175**									**0**	**86.2**
	2019		**202**						**182**									**0**	**90.1**
	2020		**302**						**263**									**1**	**87.4**
	2021		**311**						**266**									**2**	**86.2**
	2022		**13851**						**11454**									**41**	**83.0**
	2023		**3989**						**3188**									**119**	**82.9**
	ESS2023		**3631**						**2078**									**59**	**58.9**
	MIX		**1372**						**1068**									**3**	**78.1**
	Overall		**23945**						**18759**									**225**	**79.3**

Table 7 - Pond, collection year, stocking date, number of suckers on stocking date, average weight per fish, total weight of all fish in each pond (used to derive feeding amounts), average total length on stocking date (mm, measured or derived from length weight relationships, date harvested, number of suckers on harvest date, growth, and survival for ponds during the production cycle starting in the Fall of 2023 through the Spring of 2023 at the Klamath Falls National Fish Hatchery. The last nine rows in the table are summary numbers for each year class on station and the overall for the harvest season.

Pond	Lot	Stocked Date	Start #	Start g/fish	Start WT (g)	Start Wt (lb)	Start TL (mm)	Harvest Date	End #	End g/fish	End WT (g)	End WT (lb)	End TL (mm)	Days	Months	Growth (mm/day)	Weight Gain (lb)	Harvest Mortality #	Survival %
P0	2023	10/26/2023	818	24.51	20048	44.16	141	2/27/2024	805	17.8997	14105	31.07	-	124	10.33		-13.09	17	98.4
P1	2018	12/1/2023	86	477.87	41097	90.52	345		86										
P2	2018	12/4/2023	86	426.07	36642	80.71	336		86										
P3	2019	12/1/2023	91	426.51	38812	85.49	335		91										
P4	2019	11/28/2023	91	458.22	41698	91.85	341		91										
P5	2020	11/30/2023	262	234.55	61451	135.35	275	5/15/2024	259	237.01	61385.59	135.2106	306	167	5.56667	0.18562874	-0.14407489	0	98.9
P6	2021	12/28/2023	266	175.03	46559	102.55	261		266										
P7	2017	11/28/2023	85	698.94	59410	130.86	395	5/17/2024	85	673.55	57251.75	126.1052	426	171	5.7	0.18128655	-4.75385463	0	100.0
P9	2022	10/27/2023	401	89.90	36049	79.40	217		401										
P10	2022	11/1/2023	1052	30.88	32485	71.55	152	3/19/2024	1047	32.0973	33317	73.39	145	139	11.58	-0.6043165	1.83	9	99.5
P11	2022	11/1/2023	1052	31.93	33589	73.98	153	3/19/2024	1033	32.8709	33857	74.57	145	139	11.58	-0.6906475	0.59	3	98.2
P12	2022	11/1/2023	872	30.70	26770	58.96	152	3/19/2024	868	31.4742	26879	59.20	141	139	11.58	-0.9496403	0.24	14	99.5
P13	2023	11/9/2023	1036	15.58	16140	35.55	121	2/26/2024	961	17.1399	16300	35.90	-	109	9.08		0.35	10	92.8
P14	2023	11/8/2023	1255	10.36	13001	28.64	106	2/27/2024	1182	10.5599	12334	27.17	-	111	9.25		-1.47	14	94.2
P15	ESS 23	11/9/2023	1028	11.01	11318	24.93	108	2/26/2024	998	11.0884	10656	23.47	-	109	9.08		-1.46	37	97.1
P16	ESS 23	11/9/2023	1050	11.01	11560	25.46	108	2/26/2024	892	11.6834	10258	22.59	-	109	9.08		-2.87	14	85.0
	2017		**85**						**85**									**0**	**100.0**
	2018		**172**						**172**									**0**	**100.0**
	2019		**182**						**182**									**0**	**100.0**
	2020		**262**						**259**									**0**	**98.9**
	2021		**266**						**266**									**0**	**100.0**
	2022		**3377**						**3349**									**26**	**99.2**
	2023		**3109**						**2948**									**41**	**94.8**
	ESS2023		**2078**						**1890**									**51**	**91.0**
	Overall		**9531**						**9151**									**118**	**96.0**

Table 8 - Pond, collection year, stocking date, number of suckers on stocking date, average weight per fish, total weight of all fish in each pond (used to derive feeding amounts), average total length on stocking date (mm, measured or derived from length weight relationships, date harvested, number of suckers on harvest date, growth, and survival for ponds during the production cycle starting in the Fall of 2023 or Spring of 2024 through the Fall of 2024 at the Klamath Falls National Fish Hatchery. Please note that Fall inventory work was not completed for most ponds prior to the close of FY 2024.

Pond	Lot	Stocked Date	Start #	Start g/fish	Start WT (g)	Start Wt (lb)	Start TL (mm)	Harvest Date	End #	End g/fish	End WT (g)	End WT (lb)	End TL (mm)	Days	Months	Growth (mm/day)	Weight Gain (lb)	Harvest Mortality #	Survival %
P0	2020	5/15/2024	127	237.01	30100	66.3	306												
P1	2018	12/1/2023	86	477.87	41097	90.52	345												
P2	2018	12/4/2023	86	426.07	36642	80.71	336												
P3	2019	12/1/2023	91	426.51	38812	85.49	335												
P4	2019	11/28/2023	91	458.22	41698	91.85	341												
P5	2020	5/15/2024	132	237.01	31285	68.91	306												
P6	2021	12/28/2023	266	175.03	46559	102.55	261												
P7	2017	5/17/2024	53	673.55	35698	78.63	426												
P8	2017	5/17/2024	32	673.55	21568	47.51	426												
P9	2022	10/27/2023	401	89.90	36049	79.40	217												
P10	2024	6/10/2024	3000	4.653	13959	30.7467	81.2												
P11	2024	6/3/2024	3000	5.656	16968	37.37445	86.6												
P12	2024	5/28/2024	3027	0.05	151	0.33	17.9												
P13	2024	5/20/2024	3012	5.688	17132.26	37.73625	86.8												
P14	2024	5/23/2024	3031	8.213	24893.6	54.83172	98.1												
P15	ESS2024	5/29/2024	3000	5.771	17313	38.13436	87.2												
P16	ESS2023	2/28/2024	878	33.621	29519.24	65.02035	156.9												
P17	ESS2023	2/28/2024	961	38.712	37202.23	81.94324	164.5												
P18	2023	2/28/2024	957	47.243	45211.55	99.58491	175.8												
P19	2023	2/28/2024	957	44.483	42570.23	93.76703	172.3												
P20	2023	2/28/2024	957	49.458	47331.31	104.254	178.5												
P21	2022	3/20/2024	550	31.47	17309	38.12	154	9/25/2024	539	110.28	21614.94	47.61	220	189	6.3	0.352	9.49	343	98.0
C1	2024	8/2/2024	9510	0.36	22902	50.44	35												
C2	2023	8/19/2024	1345	47.05	63282	139.39	176												
C4	ESS2024	8/2/2024	14250	0.51	7268	16.01	39												
C5	ESS2023	8/19/2024	908	34.82	31612	69.63	159												

Net Pen Growout

Background

In 2019, the USFWS initiated the Net Pen Project in Upper Klamath Lake (UKL). Each spring, wild-caught (as larvae), hatchery-raised and PIT-tagged (age 1+), Lost River and Shortnose Suckers were introduced into two adjacent net pens for extended grow out prior to repatriating to UKL. The objective was to provide an in-situ rearing location, away from predation, to increase growth beyond what is experienced in the hatchery and to provide extended acclimation to wild conditions before release. Due to limited hatchery pond space, net pens allow for some suckers to grow and acclimate, and captive stocks that remain at the hatchery can be held at lower densities. Typical stocking of the net pens occurs in late spring to early summer depending on lake conditions and ice off for access and harvest occurs in the fall of that same year, before ice forms on the lakes. A net pen structure has two separate pens, with each pen having 1,500 sq/ft of surface area with ¼" net mesh.

After very poor survival was observed in 2019, modifications in 2020 raised the bird predation netting off of the water by installing an elevated railing, as we suspected avian predators may have infiltrated the netting in 2019. These modifications were not completed until the summer and reduced the 2020 season to a brief fall growout during September and into October, lasting about five or six weeks. In the summer of 2020, another net pen system was being developed for installation in Gerber Reservoir, as we hypothesized that poor water quality might be limiting sucker survival in UKL. Staff also started monitoring the net pens more frequently by checking the pens for mortalities every week to two weeks. The UKL and Gerber net pens were deployed in the spring of 2021 and the Gerber net pen required an early harvest in early July due to low surface elevations. Growth and survival were high in Gerber net pens, with survival between 83-97.3% and length gains ranging from about 30-45 mm during this short duration. The UKL net pens also required an emergency harvest in August of 2021, due to long term anoxic conditions forming and resulting in significant losses prior to harvest.

With all of the problems experienced and lessons learned to date, the UKL net pen was moved to a new location in Agency Lake in 2022, at the entrance of Four Mile Canal and staff deployed two Biomark 5' wagon wheel PIT tag antennas, and a Yellow Springs Instruments (YSI) EXO1 water quality sonde, to better monitor fish movement and water quality parameters throughout the growing season. This new location was selected because water quality data collected in the fall of 2021 indicated better water quality than in UKL. The Gerber net pens were not deployed in 2022, as the lake elevation was too low and the net pen structure was on dry land most of the growing season. As the 2022 net pen season closed, we observed the highest survival on record, nearly 48%, from the UKL net pens at Four Mile Canal, although the fish were in very poor condition due to competition and crowding from a large biomass of fathead minnows and blue chubs in the nets with the suckers. The fish in hatchery ponds have more space, generally measured in pounds per acre foot of water (generally less than 1,000 lbs./acre-foot). However, similar densities have been used at both UKL and Agency Lake as well, as at Gerber Reservoir, and the fish appear to be in poor condition in UKL, and even more so in Agency Lake, (4-Mile Canal), than at Rattlesnake Point. Subsequent net pen operations at Four Mile Canal in 2023 included biomass removal one or two times during the growing season. Net Pen and release locations are shown in **Figure 11** for UKL and **Figure 12** for Gerber Reservoir.

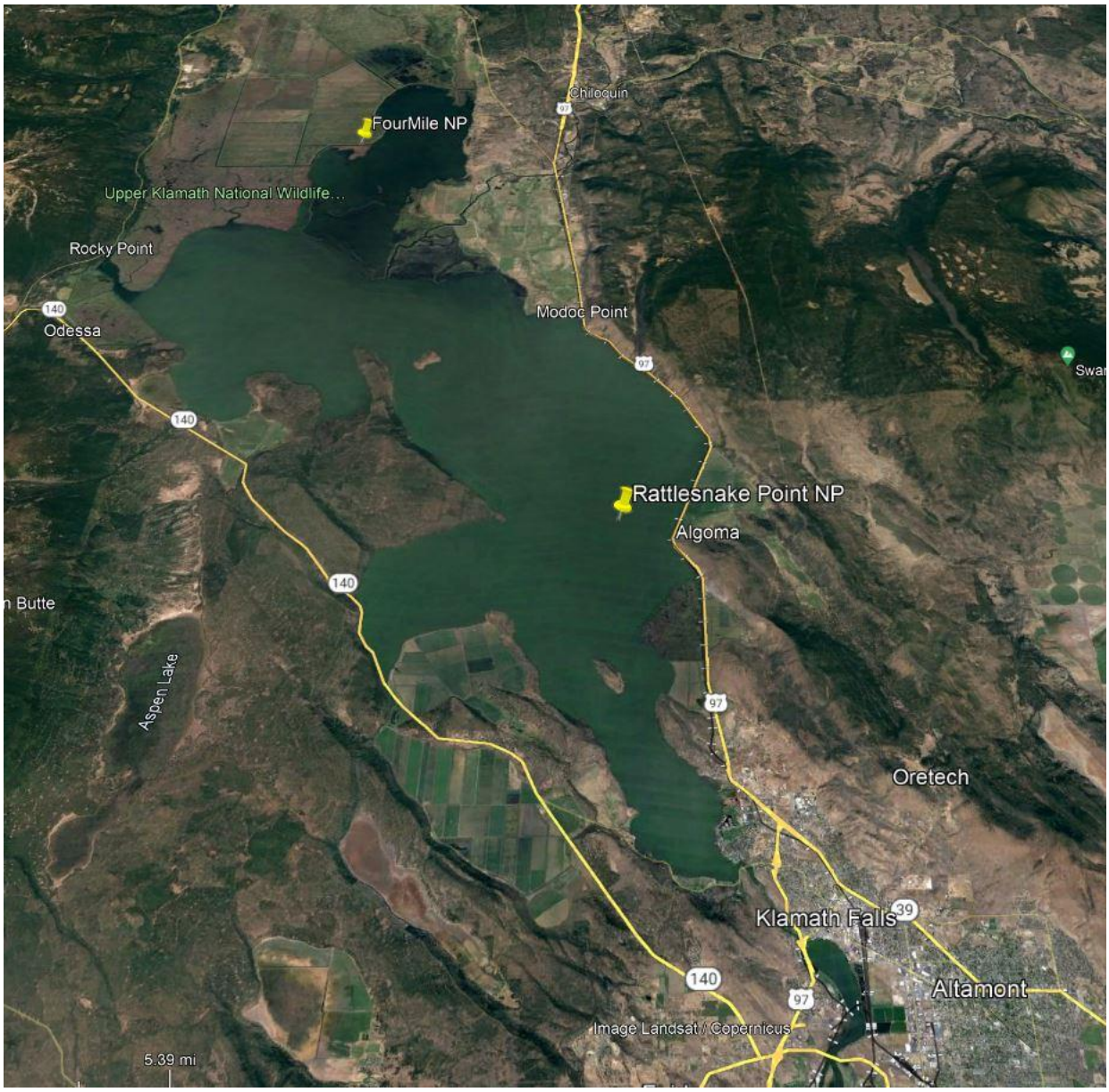

Figure 11 – Locations of the previous net pens location, Rattlesnake Point, in Upper Klamath Lake, and the current net pen location, Four Mile Canal, in Agency Lake, near Chiloquin, Oregon.

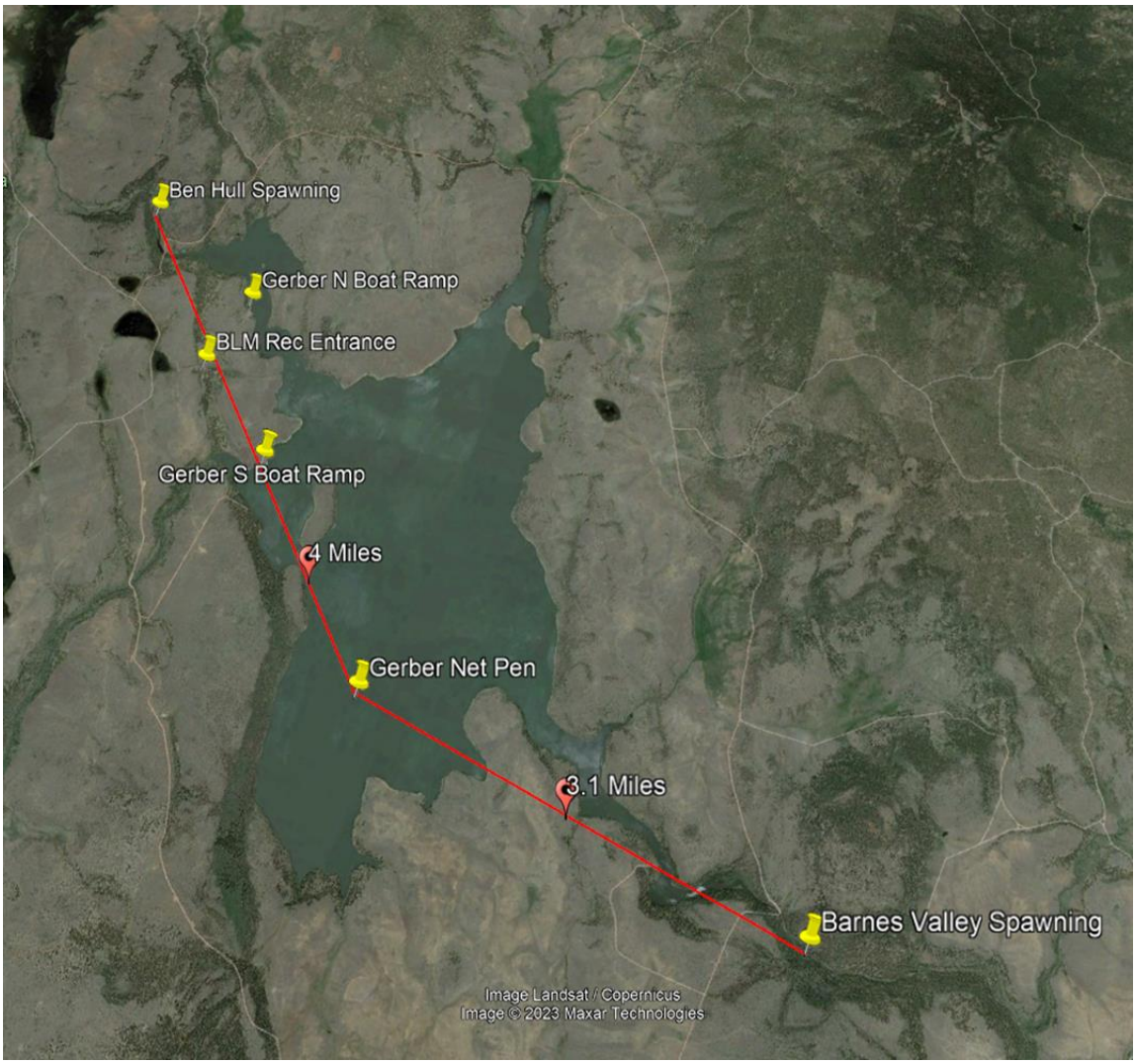

Figure 12 – Location of the net pens in Gerber Reservoir (see yellow pin in the middle of the lake, near Bonanza, Oregon.

UKL Net Pen 2024

Due to multiple years of low survival of the UKL net pen operation, KFNFH production fish were not added to the net pen for grow out and acclimation in the summer of 2024. The net pen was used to hold two different groups of fish for studies as the future of the UKL net pen is uncertain. The net pen was used in early spring of 2024 to hold 10 wild adult SNS captured in Modoc Bay by USGS at USFWS's request, and transported to the net pen by KFNFH staff. Adult SNS were held from 02/14/2024 and released on 5/29/2024. No fish mortality was observed during this time and no adverse water quality was observed. The purpose of the study was to observe the response and survival of wild adults held in the net pen for possible gametes retrieval for future KFNFH incubation. Staff observed that the fish were healthy looking when harvested after being stocked into the net pen. SNS were handled two times over

the six weeks they were held and all suckers felt firm, ripening did not occur, and no gametes were expressed.

The second use of this net pen in FY24 was mid-September through early-November of 2024, as a holding area for a joint USGS/USFWS acoustic study assessing the relationship of survival of various sizes of juvenile suckers. The suckers came from being held the previous year at the Lower Klamath Refuge ponds, along with a supplemental stocking from KFNFH in late September 2024; with the latter being held for one week before fish were tagged by USGS for acoustic telemetry. Fish were held for another 5 weeks before release the first week of November. The overall sucker survival during this second holding period was 45 percent. A bacterial infection spread early in the holding period causing multiple mortality events during their tagging efforts. For more information on historical net pen performance, survival, and growth, please see **Table 9**.

Table 9. Upper Klamath Lake sucker net pen survival thru each operation year since deployed in 2019. Each operation year is divided by the different fish pens (UKLN, UKLS, UKLW, UKLE) and the year the fish were captured as larval fish from the Williamson River (CY). The average total length (TL) in millimeters (mm) stocked into the pen and harvested out of the pen that same year to show growth and numbers stocked into the pen and harvested out of the pen to show survival of each operation year. Operation year 2020 is an outlier year as fish were not stocked until fall and only held for two months, and no production fish were stocked in 2024 as the future of using the UKL net pen to grow suckers is being assessed by USFWS.

Operation Year	Fish CY	Pen ID	Stock TL (mm)	# Stocked	Harvest TL (mm)	# Harvested	Survival (%)
2019	2018	UKLN	160	534	0	0	**0.0**
2019	2017	UKLS	236	480	263	10	**2.1**
2020	2019	UKLN	224	220	233	180	**81.8**
2021	2019	UKLN	228	100	0	0	**0.0**
2021	2020	UKLN	134	900	0	0	**0.0**
2021	2019	UKLS	233	150	280	87	**58.0**
2021	2020	UKLS	150	1350	210	519	**38.4**
2022	2021	UKLW	96	1999	142	947	**47.4**
2022	2021	UKLE	105	1852	155	897	**48.4**
2023	2021	UKLW	170	1005	221	29	**2.9**
2023	2021	UKLE	171	1001	220	31	**3.1**
2024	experimental use only no production fish stocked						
Overall				**9591**		**2700**	**28.2**

Gerber Net Pen 2024

Gerber net pen was stocked on 03/21/24 with 1378 Shortnose Suckers (730 in GERW pen and 648 GERE pen) and no fish mortalities were observed throughout the entire time fish were stocked in the pens. Only Shortnose Suckers were stocked due to fish escaping the previous year, in 2023, due to several small holes that developed in one of the nets, and caused up to 437 Lost River Suckers to be added to a body of water that they are not currently found in. Up to 114 Shortnose Suckers, originally collected from UKL as larvae, likely escaped also during this timeframe. We are awaiting permitting and permission from USFWS leadership to decide if Lost River Suckers can be stocked in the Gerber net pen again. Holes were located and mended on both nets before stocking fish, and no holes were found when nets were stored prior to winter. One submersible 5' diameter PIT antenna was deployed in each pen, about mid water column, and multiple issues were observed with the GERE antenna logger, as it needed to be re-formatted and data was lost in parts of June and August. No sucker mortality was observed but three small (~30 mm) perch were found dead in GERE on July 27th, with no obvious signs of disease and no mortality was observed thereafter. The pens were harvested on 09/10/2024 and 1,317 fish were processed (96% survival) with total length, weight, and observed afflictions recorded for each PIT scanned fish, and with 6 fish mortalities resulting from handling during harvest and transport to the processing site onshore. Thereafter, the suckers were transported and stocked at Williamson River Sportsman River Retreat boat ramp the same day as processing. Then, later in the fall, the net pens and floating docks were secured for the winter once the reservoir reached the lowest water level for the season. For more information on historical net pen performance, survival, and growth, please see **Table 10**.

Table 10. Gerber net pen sucker survival and growth data since the first use of the Gerber net pen in 2021, each operation year is divided by the different fish pens and by the Fish CY (Capture year from the Williamson River as larval fish). The average total length (TL) is in millimeters (mm) of fish stocked in and harvested out of the pen the same year, also shown is number of fish stocked and harvested in the same year for survival of that grow out year. In 2021 fish were pulled out of the net pen early (July) due to low lake levels, and GERE in 2023 show low survival however suckers likely escaped out of multiple holes that were found in net.

Operation Year	Fish CY	Pen ID	Stock TL (mm)	# Stocked	Harvest TL (mm)	# Harvested	Survival (%)
2021	2019	GERE	235	100	269	97	**97.0**
2021	2020	GERE	140	898	174	827	**92.1**
2021	2019	GERW	230	150	265	146	**97.3**
2021	2020	GERW	138	1331	173	1105	**83.0**
2022	Low Water - Not Operational						
2023	2021	GERE	170	1005	225	454	**45.2**
2023	2021	GERW	171	1036	214	1000	**96.5**
2024	2022	GERE	149	648	205	624	**96.3**
2024	2022	GERW	148	730	201	693	**94.9**
Overall				**5898**		**4946**	**83.9**

Gerber Net Pen WQ 2024

Various water quality parameters were recorded hourly using a Eureka Manta continuous sonde set mid-column in the water, with a depth range of 3-10 feet, based on the reservoir water surface elevation. The sonde records water temperature, dissolved oxygen, specific conductivity, and pH readings. Using a cable and rope set up, the sonde was deployed in the corner of the west net pen. Sonde deployment ranged from 4/30/2024 to 9/10/2024, when suckers were harvested from the net pens. The sonde was calibrated once a month. Overall Gerber water quality parameters stayed in ranges beneficial for sucker rearing and survival for most of the year. However, there is a gap in data collection from a sonde malfunction, which occurred from June 25 through the morning of August 14, and there could have been unfavorable conditions during that time without monitoring. What is known for sure is that in late August, the dissolved oxygen levels dropped below the threshold of 4 mg/L for short periods of time, with the lowest dissolved oxygen reading at 2.99 mg/L. Fortunately, no sucker mortalities were observed during the entire growout period and fish survival and growth was good. For more information on the water temperature and dissolved oxygen readings collected from the Gerber Net Pen sonde, please see **Figures 13 and 14**.

In addition to water quality parameter sampling, a water sample was collected at the net pen on July 23, 2024 and sent for toxin and taxa ID analysis, due to observers noting that the water was a light brown color, which was something not observed in years past. The sample results indicated that a cyanobacteria bloom was detected but no toxins were found. An increase in turbidity and this brown water color continued into August and through the harvest in mid-September. During this time, the sonde also detected a substantial increase in specific conductivity.

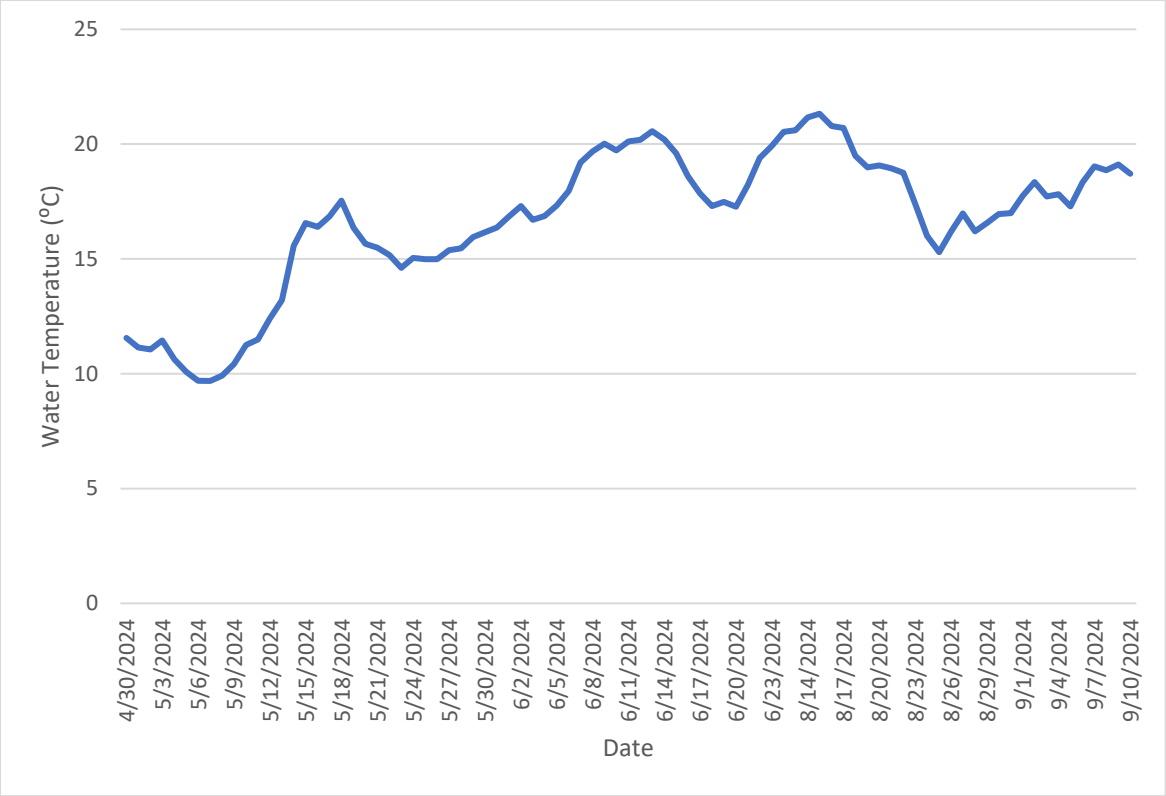

Figure 13 – Average daily water temperature (degrees C) in the west net pen in Gerber Reservoir, Oregon, from 4/30/2024 to 9/10/2024, except data was not collected from June 25-August 14 due to sonde malfunction.

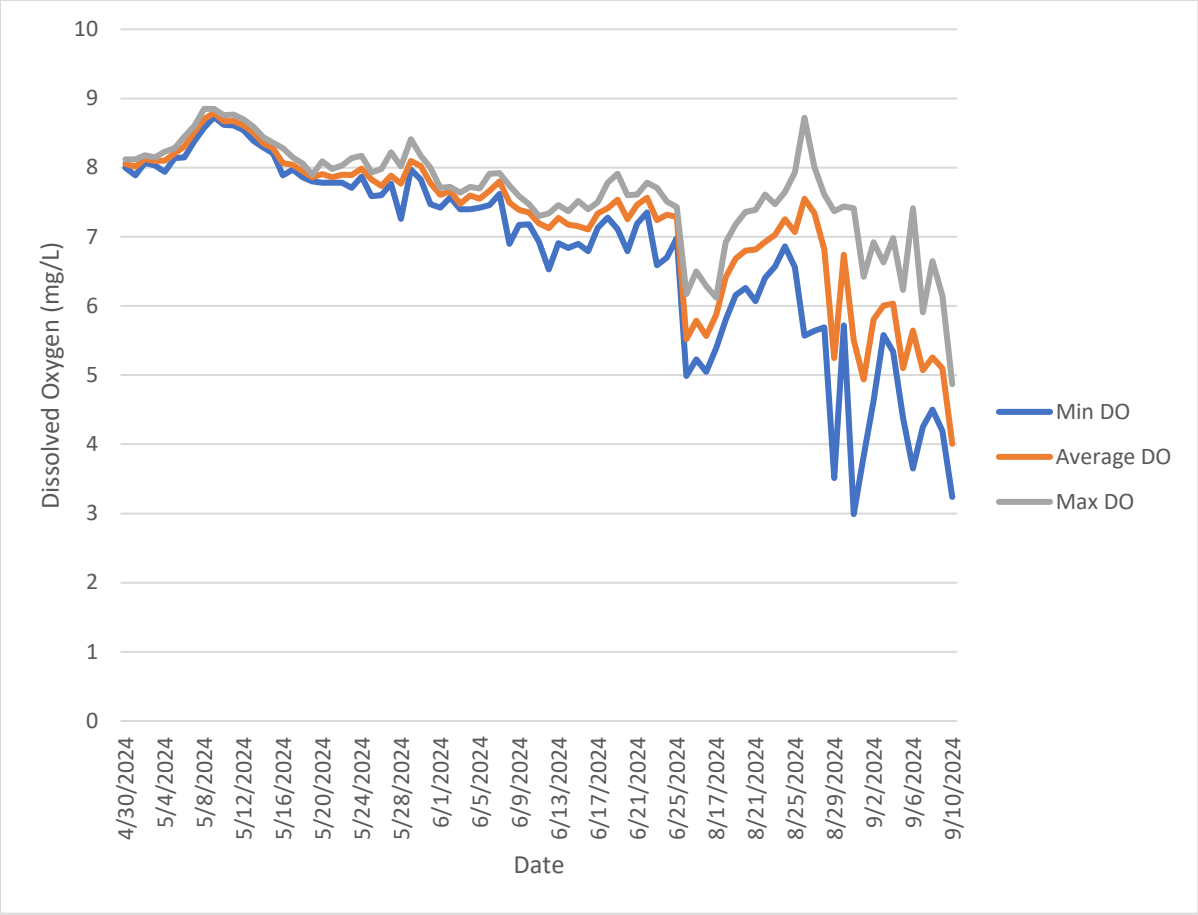

Figure 14 – Average, minimum, and maximum daily dissolved oxygen readings in the west net pen in Gerber Reservoir, Oregon, from 4/30/2024 to 9/10/2024, except data was not collected from June 25-August 14 due to sonde malfunction.

Fish Distribution

Since the inception of the SARP program, suckers have been released in the spring of each year, when fish are 22-24 months old. Starting in 2020, there have also been fall releases of fish that grew faster and had gotten to the production target size of 200 mm total length by as early as 17-18 months old, with the smaller fish being graded out for growout during a second winter before release the following spring. However, during the fall of 2022, after ponding approximately 7,100 of such smaller fish, winter rearing space was exhausted, due to vacating the B-series ponds for demolition and construction of the new hatchery building, and we began releasing production fish regardless of size, without grading, in mid-November 2022. As pond space would also diminish in the fall of 2023, with the vacating of the A-series ponds for demolition for Phases 3 and 4 of construction to continue, all production fish were released without grading the fish. Hence, the average size of fish released declined during both of these years (**Table 1**).

In total, for FY24, dating from October 1, 2023 through September 30, 2024, approximately 12,433 production fish were released or transferred, both from the rearing ponds, the fish stocked from net pen operations, and the fish transferred for telemetry operations, namely 10,514, 1,317, and 602 respectively. In addition, there were approximately 4,632 fry transferred to the Klamath Tribes to aid in their production. And there were also 801 fish repatriated from salvage operations, both from the dam removal effort in the Lower Klamath River and the local canal and forebay salvage efforts. This brings the total number of suckers released and/or transferred to approximately 17,866 for the entire fiscal year of 2024. For more information on historic and current fish distributions, please see **Tables 1** and **11**.

The production sized fish released during FY24 were larger, 219 mm total length, compared to the average total length in FY23 at 194 mm, due to reducing densities back in FY23 prior to the start of the stocking season in the fall of 2024 for FY24. Fiscal year 2024 also had reduced stocking numbers compared to FY23, due to scaled back production, as many of our ponds had to be vacated and demolished for new construction to progress. Since the beginning of FY23, fall of 2022, we had to vacate 24 of our 0.03-acre B-series ponds for demolition, resulting in a net loss of 0.72 acres of rearing space from the 2.38 acres we started with. Additionally, during the start of FY24, fall of 2023, we had to vacate four of our 0.25-acre A-series ponds for demolition, resulting in a net loss of 1.0 acres of rearing space. The only space currently left moving into FY25 are 22 of our 0.03-acre P-series ponds, with a total pond space of 0.66 acres, which is only 27.7% of the original space we started with in FY2020. There is also tentatively 2.0 additional acres of pond space coming online towards the end of the calendar year of 2024 or spring/summer of 2025, pending the contractors performing Phase 1 construction finish this work soon. This remaining pond space requires 10 ponds for broodstock management, leaving only 12 ponds for production growout and larval collection rearing; which made things very tight in FY24. With the continual loss of pond space without new replacement ponds, we will see an all-time low in FY25 before steady increases in pond space are realized as each phase of construction is completed.

In addition to the normal stocking of PIT tags in our production fish, larger fish were graded and set aside for the Recovery Team to do their first release of a multi-year acoustic and radio telemetry study in the spring of 2022. Thereafter, a second cohort of fish with only radio telemetry tags were released in the fall of 2022. Telemetry stockings also occurred again during the spring and fall of 2023 to continue a multiyear monitoring effort. Moving into the fall of FY24, the Hatchery transferred 731 larger fish to the Lower Klamath Refuge Ponds to hold fish for the spring releases of telemetry fish. However, in the

spring, the Recovery Team decided to forego the remainder of years of radio telemetry surgeries and monitoring in favor of a new acoustic telemetry study that would be collaborated with USGS to answer other questions related to survival of fish stocked in different size categories. Following this decision, 388 fish were harvested, sorted, and released in March and an additional 304 fish from the hatchery were later added to the 325 that were harvested and kept, to set aside a total of 629 fish that were restocked into these ponds for this effort in the fall of 2024. Towards the end of FY24, only 406 fish were harvested from the Lower Klamath Refuge Ponds on 9/17/2024 and transferred to the net pen at 4 Mile Canal in Agency Lake to hold into October 2024 for subsequent surgeries and repatriation for monitoring in November 2024. These fish will be counted just once at the beginning of FY24 as a fish distribution for repatriation and longer term holding to the Klamath Refuge ponds, then fish later added from the hatchery were counted as a fish transfer to add to this number, since we knew then that they would later be restocked, and subsequent fish that survived this process will be counted again as a new distribution for FY25 during the USGS tagging and stocking event in the Fall. The difference between a fish distribution and transfer is that distributions are often considered the end of the road for the fish and a stocking or repatriation event, whereas a transfer is more like moving fish from a facility or for temporary holding, to later be stocked and repatriated to the wild. Over the years, the Klamath Refuge Ponds have generally been considered a distribution, since fish were supposed to stay there a long time. But if there is a discreet goal to only hold fish temporarily to restock them later, a transfer designation is generally more appropriate.

Table 11 – Summary of all fish distributions for repatriation or transfer from the Klamath Falls National Fish Hatchery during the fiscal year of 2024, dating from October 1, 2023 through September 30, 2024.

Stock Date	Species	Lot	#	Weight (lb.)	Actual TL (mm)	#/lb.	Projected TL (inches)	Projected TL (mm)	From Ponds	Stocking Location
10/17/2023	LRS	Mixed	238	98.69	270	2.41	10.97	279	A1	North Refuge Pond
	SNS	Mixed	169	91.77	279	1.84	11.42	290	A1	North Refuge Pond
10/18/2023	LRS	2022	208	25.82	185	8.06	7.34	186	P17	ODOT Pond
	SNS	2022	296	46.04	184	6.43	7.53	191	P17	ODOT Pond
10/18/2023	LRS	Mixed	163	65.41	269	2.49	10.85	276	A1	South Refuge Pond
	SNS	Mixed	161	67.41	254	2.39	10.47	266	A1	South Refuge Pond
10/18/2023	LRS	2022	918	117.66	185	7.80	7.42	188	P17, A2	Sprague River @ Beatty Gap
	SNS	2022	1039	166.92	192	6.22	7.61	193	P17, A2	Sprague River @ Beatty Gap
10/19/2023	LRS	2022	837	107.74	186	7.77	7.43	189	A2	Odessa Springs
	SNS	2022	1492	241.10	192	6.19	7.62	194	A2	Odessa Springs
10/24/2023	LRS	2022	556	85.10	195	6.53	7.87	200	P9, P11, P13, P15	Henzel Boat Ramp
	SNS	2022	1049	213.10	209	4.92	8.23	209	P9, P11, P13, P15	Henzel Boat Ramp
10/26/2023	LRS	2022	625	120.17	213	5.20	8.49	216	P10, P12, P14, P16	Williamson River @ TNC
	SNS	2022	1046	224.52	212	4.66	8.38	213	P10, P12, P14, P16	Williamson River @ TNC
10/27/2023	LRS	Mixed	100	59.48	307	1.68	12.37	314	A1	Bare Island - Telemetry Fish
	SNS	Mixed	237	183.58	317	1.29	12.85	326	A1	Bare Island - Telemetry Fish
10/3/2023	LRS	Salvage	5	27.05	631.2	0.18	25.83	656	LKNWR Salvage (Dams Out)	Williamson River @ TNC
	SNS	Salvage	178	323.83	446.5	0.55	17.08	434	LKNWR Salvage (Dams Out)	Williamson River @ TNC
October Total	**LRS**	**Mixed**	**501**	**223.58**		**2.24**	**11.24**	**286**		
	SNS	**Mixed**	**567**	**342.76**		**1.65**	**11.83**	**301**		
	LRS	**2022**	**3144**	**456.49**		**6.89**	**7.73**	**196**		
	SNS	**2022**	**4922**	**891.68**		**5.52**	**7.92**	**201**		
	LRS	**Salvage**	**5**	**27.05**		**0.18**	**25.83**	**656**		
	SNS	**Salvage**	**178**	**323.83**		**0.55**	**17.08**	**434**		
11/22/2023	Unknown	Salvage	5	0.19		26.32	4.95	126	J-Canal Salvage	Malone Springs
November Total	**Unknown**	**Salvage**	**5**	**0.19**		**26.32**	**4.95**	**126**		
2/20/2024	Unknown	Salvage	452	15.23	116.15	29.68	4.75	121	J-Canal Salvage	Malone Springs
2/26/2024	Unknown	Salvage	59	1.57	108.12	37.58	4.39	112	J-Canal Salvage	Mouth of Four Mile Canal
February Total	**Unknown**	**Salvage**	**511**	**16.8**		**30.42**	**4.71**	**120**		
3/12/2024	LRS	Mixed	220	98.77	265.39	2.23	10.71	272	LKNWR	Williamson River @ Sportsmans
	SNS	Mixed	168	81.65	262.54	2.06	11.00	279	LKNWR	Williamson River @ Sportsmans
3/18/2024	Unknown	Salvage	102	2.82	113.9	36.17	4.45	113	J-Canal Salvage	Agency Lake @ Henzel Boat Ramp
3/21/2024	LRS	2022	688	42.78	140.74	16.08	5.54	141	P10, P11	Lakeside Farms
3/21/2024	LRS	2022	135	7.97	136.61	16.94	5.45	138	P12	Lower Klamath Lake National Wildlife Refuge
	SNS	2022	169	12.15	143.63	13.91	5.82	148	P12	Lower Klamath Lake National Wildlife Refuge
March Total	**LRS**	**Mixed**	**220**	**98.77**		**2.23**	**11.27**	**286**		
	SNS	**Mixed**	**168**	**81.65**		**2.06**	**11.00**	**279**		
	LRS	**2022**	**823**	**50.75**		**27.32**	**4.88**	**124**		
	SNS	**2022**	**169**	**12.15**		**13.91**	**5.82**	**148**		
	Unknown	**Salvage**	**102**	**2.82**		**36.17**	**4.45**	**113**		
6/6/2024	ESS LRS	2024	4632	0.077	10	60155.84	0.38	10	Salvage Building Recirc Racks	Transfer - Klamath Tribes Hatchery
June Total	**ESS LRS**	**2024**	**4632**	**0.077**		**60155.84**	**0.38**	**10**		
9/10/2024	LRS	2023	17	2.60	198	6.54	7.87	200	Gerber Net Pens - GERE and GERW	Williamson River @ Sportsmans
	SNS	2023	1300	229.40	203	5.67	7.85	199	Gerber Net Pens - GERE and GERW	Williamson River @ Sportsmans
9/17/2024	LRS	Mixed	156	65.63	287	2.38	11.02	280	Refuge Ponds	Transfer - Agency Lake, 4 Mile Canal Net Pen - Telemetry Study
	SNS	Mixed	250	83.15	246	3.01	9.69	246	Refuge Ponds	Transfer - Agency Lake, 4 Mile Canal Net Pen - Telemetry Study
9/27/2024	LRS	2022	14	3.09	222	4.53	8.89	226	P21	Transfer - Agency Lake, 4 Mile Canal Net Pen - Telemetry Study
	SNS	2022	182	44.52	220	4.09	8.75	222	P21	Transfer - Agency Lake, 4 Mile Canal Net Pen - Telemetry Study
September Total	**LRS**	**2022**	**14**	**3.09**		**4.53**	**8.89**	**226**		
	SNS	**2022**	**182**	**44.52**		**4.09**	**8.75**	**222**		
	LRS	**2023**	**17**	**2.6**		**6.54**	**7.87**	**200**		
	SNS	**2023**	**1300**	**229.4**		**5.67**	**7.85**	**199**		
	ESS LRS	**2024**	**4632**	**0.077**		**60155.84**	**0.38**	**10**		
	LRS	**Mixed**	**156**	**65.63**		**2.38**	**11.02**	**280**		
	SNS	**Mixed**	**250**	**83.15**		**3.01**	**9.69**	**246**		
FY24 Spp. Total	**LRS**	**Total**	**4875**	**900.91**		**5.41**	**8.38**	**213**		
	SNS	**Total**	**7558**	**1685.31**		**4.48**	**8.49**	**216**		
	ESS LRS	**Total**	**4632**	**0.077**		**60155.84**	**0.38**	**10**		
	Unknown	**Total**	**801**	**370.69**		**26.32**	**4.95**	**126**		
Stocking Total	**Production**		**11831**	**2389.83**		**4.95**	**8.63**	**219**		
	Salvage		**801**	**370.69**		**2.16**	**11.38**	**289**		
Transfer Total	**Fry**		**4632**	**0.077**		**60155.84**	**0.38**	**10**		
	Production		**602**	**196.39**		**3.07**	**10.13**	**257**		
Overall Distribution Total	**Production**		**12433**	**2586.22**		**4.81**	**8.72**	**221**		
	Fry		**4632**	**0.077**		**60155.84**	**0.38**	**10**		
	Salvage		**801**	**370.69**		**2.16**	**11.38**	**289**		
	Overall		**17866**	**2956.99**		**6.04**	**8.08**	**205**		

Field Monitoring for Hatchery Fish

During the winter of FY24, the Hatchery staff started to make plans to install PIT tag arrays in locations within UKL and away from the spawning areas that are monitored by USGS staff. The purpose of this pilot effort was to see if we could detect hatchery reared fish in other areas that are not being monitored, perhaps that would give some clues to the habitat usage of juvenile fish seasonally throughout the spring, summer and fall months. The sites considered were based on data that showed clusters of detections from the earlier radio telemetry study conducted in 2022 to the present, as well as those that had some natural pinch points or were adjacent to wetland habitat. From some of the sites that seemed promising, and after consulting with fisheries modelers at the Abernathy Fish and Technology Center, several locations were selected initially, namely Hanks Marsh and Odessa Spring. At Hanks Marsh, six submersible 5' diameter Biomark PIT antenna were deployed on 4/3/2024. At Odessa Springs, six submersible 5' diameter Biomark PIT antennas were deployed on 4/4/2024. Then later in the early summer, two additional sites were selected and six antennas were placed at each, namely at Thomason Creek and in the oxbow loop in the lower Williamson River, just downstream of the Nature Center boat ramp, on 6/18/2024 and 6/26/2024 respectively. It was planned to keep these 24 antennas, six at each of four sites, deployed until the fall or early winter months prior to pulling them out of the lake before major ice formation occurs. Each antenna was checked monthly and downloads of the available data was collected during each visit, with only slight adjustments to locations made at each site upon retrieval.

There were no major issues to note except that one of the antennas deployed at Hanks Marsh was damaged by an animal chewing through the antenna node cord in early July. The Hanks Marsh and Odessa Springs arrays had the majority of the detections from the initial deployment until mid-June. Detections decreased during the summer months, with less than 20 unique detections in the months of July, August, and September; however detections increased in October and November, during the start of the FY25 fiscal year. In total, there were 176 unique detection at Hanks Marsh; 147 hatchery reared suckers and 5 salvaged suckers. At Odessa Springs, there were 222 unique detections; 54 hatchery reared suckers and 25 salvage suckers. The Thomason Creek and Williamson River arrays had few detections during the summer months but had the majority noted in September. At Thomason Creek, there were 14 unique detections, with 10 being hatchery reared fish and 1 being a salvage fish. At the Williamson River Oxbow, there were four unique detections and all of these were hatchery reared suckers. As for the remaining 170 unique tags of unknown fish, 24 were from Hanks, 143 were from Odessa, and 3 were from Thomason. These unknown fish could be a combination of adult suckers, Redband Rainbow Trout, or possibly experimentally released juvenile Chinook Salmon. Overall, there were 416 unique detections across all the arrays, with more than half of these, a total of 246 or 59.1%, being either raised at the hatchery (215) or passing through the hatchery for rehabilitation as salvage fish (31). For more information on the total number of unique fish detections, please see **Table 12**.

The majority of the fish detected in FY24 were stocked in 2023, with only 9 of the 215 (4%) hatchery fish stocked prior to 2023. Of the 215 hatchery reared suckers detected, 27 (12.6%) were fish stocked from the Gerber or UKL net pens. Once the data is complete for the year, after retrieving all of the antennas, our staff will do more analysis to look at overall trends for the year at each array location. Also, our staff will collaborate with the USGS to identify the species of the 170 unique tags from unknown fish. And, once this data is summarized, our staff will draft a technical report on the work and report out during the Sucker Science Symposium in January 2025. But initially, the work conducted this year seems promising

in our ability to detect juvenile suckers from the hatchery before they are large enough to be sexually mature and get detected on the antenna arrays in the spawning areas in the Williamson and Sprague Rivers and on the East Side Springs in UKL. Interestingly, the USGS submersible antenna arrays in Pelican Bay, picked up 68 unique hatchery reared suckers during the summer until 10/1/2024. And the detection of an additional 246 fish that were stocked by the hatchery at these other four array sites, shows that hatchery fish are present in other parts of the lake that are not normally monitored. Taking all of this into consideration and working closely with our partners, we will further evaluate current and additional monitoring locations and equipment deployment during the spring of 2025.

Table 12 – Summary of all unique fish detected at four different sites where submersible antennas detected PIT tags in Upper Klamath Lake and its tributaries during the spring, summer, and early fall to October 1, 2024. The unique tags that are listed as unknown, are either adult wild suckers or other species that are PIT tagged in the system.

Monitor Location	Deployment Date	Retrevial Date	Unique tags	SARP tags	Salvage	Unknown
Hanks Marsh	4/3/2024	12/2/2024	176	147	5	24
Odessa Springs	4/4/2024	12/2/2024	222	54	25	143
Thomason Creek	6/18/2024	10/25/2024	14	10	1	3
Williamson Oxbow	6/26/2024	12/2/2024	4	4	0	0
Total			**416**	**215**	**31**	**170**

Facility Construction

After several years of planning, environmental compliance, permitting, finalizing conceptual designs for various phases of construction, and developing bid packages, the first two phases of construction were awarded to contractors in fiscal year 2022 to do initial site grading, build 11 ponds, add underground infrastructure, and build a hatchery and maintenance building. Phases 3 and 4 of construction were awarded to contractors in fiscal year 2023 and will entail doing more site grading, building 21 additional ponds, adding more underground infrastructure, and drilling a new primary geothermal well. In addition to these contracts being awarded, numerous modifications have also been made and awarded to date, with nearly $34 million obligated so far from both Fisheries and Aquatic Conservation funding (1311) for hatchery operations and Bipartisan Infrastructure Law funding (BIL). It is also anticipated that Phase 5 of construction will be awarded in the early part of FY25, as the solicitation period closes on October 23, 2024. This phase of construction will include site work, underground infrastructure, and construction of the last four ponds needed. At least one additional phases of construction may be needed to complete the hatchery infrastructure, perhaps with a performance period running from 2025 and/or 2026 to 2027 and/or 2028.

The new hatchery will consist of a one-acre head pond water supply influent retention pond (IRP), a bank of Tier-1 ponds (C1-C6 and B1-B4) consisting of six quarter-acre and four eighth-acre production ponds for fry and fingerling production, a lower bank of Tier-2 ponds (C9-C14 and D1-8), capable of serial reuse of water from Tier-1 ponds, consisting of six quarter-acre and eight half-acre production ponds for juvenile production, another lower bank of broodstock ponds (A1-A6) consisting of six twelfth-acre ponds, a hatchery and maintenance building, a half-acre effluent retention pond (D10), an additional bank of lease area 2 ponds (D11 and A7 and A8) consisting of one half-acre and two twelfth-acre isolation/production ponds, as well as an additional third-acre head pond water supply for lease area 2. In addition to this, the facility will have a hatchery and administrative building, a maintenance shop and storage garage, feed and chemical storage buildings, a wide array of underground utilities and water works running to all the infrastructure, including power to each pond kettle, cooled and geothermal water supply and a drain line from each pond, telecommunication and SCADA conduit for internet and remote monitoring, and fencing around the entire site. For more information on the different phases of construction, please see **Figure 15**.

Phase 1 Construction, which is 1311 funded and awarded to Morello Construction in the summer of 2022, is well underway, with tentative completion by the spring of 2025. All major site grading and below ground piping and conduit is complete and the above ground geothermal water supply piping from the well is also complete and operational. The IRP head pond has been completed. Kettles have been poured in all the Tier-1 ponds and the linings installed. The large retaining wall separating Tier-1 and Tier-2 ponds is nearing completion. Electrical service has not been completed yet but should be done by the spring of 2025, along with the installation of metal cabling and bird netting to wrap up the remaining parts of this contract. The completion dates will be weather dependent and there are still several modifications to the contract that will be processed in the early part of FY25 that may extend the current contract from the spring to the summer of 2025.

Phase 2 Construction, which is BIL funded and awarded to RJS Construction in the fall of 2022, is slow out of the gate but now underway, with tentative completion of the hatchery buildings likely being delayed until the spring of 2025 due to changes in the soil designation conditions onsite, requiring major

engineering delays on the building foundation requirements; these engineering issues are almost resolved as FY24 ends and should be resolved within the first month of FY25. The original contract performance period was to complete all work by the fall of 2024, within 24 months for the performance period. All major site grading to the utility elevations are done and the septic sanitation system is complete and signed off on by county inspectors. The slab for the maintenance building is complete and the erection of the building just started a couple weeks before the close of FY24. Once the engineering checks are complete, contractors should be ordering the hatchery building with the goal to erect it before winter. Once the buildings are complete, then the site will be brought to finish grade and the parking lot will be paved with asphalt. There will also be the installation of a feed storage building and a chemical storage building once the parking lot is paved. Then crews will be able to complete the finish work inside the maintenance and hatchery building through the winter indoors for completion by the spring of 2025. However, this may be delayed into the summer or fall of 2025 by the time all the inside finish work is complete and the prepurchased modular furniture within the office and laboratory space is installed.

Phase 3 Construction, which is BIL funded and awarded to Diversified Contractors in the summer of 2023, is well underway, with tentative completion by the summer or fall of 2025. Already, the basic forming of many of the fourteen Tier-2 ponds (C9-C14 and D1-8) is underway and the demolition of the old A-pond series from the old infrastructure, is complete to make way for the remaining pond construction to progress. The formation of these fourteen ponds are close to finish grading, and they will begin pouring concrete kettles and getting the bedding materials ready to line all fourteen of the ponds starting in the spring of 2025. In addition, the effluent retention pond (D10) will be constructed after the demolition of eight of our old P-series ponds occurs, which will tentatively emptied by November of 2024. Work will likely commence on forming the six broodstock ponds in the spring of 2025, for completion by the summer or fall of 2025, which will wrap up the last of the contract tasks.

Phase 4 Construction, which is BIL funded and awarded to KLR Inc. in the summer of 2023, includes the drilling of a new primary geothermal well. Currently, the 6” test well was drilled to 400’ and they have hit the correct aquifer on the first try, which was confirmed with electronic logging of data. Thereafter, they installed the 18” production well with a stainless steel casing since the water is corrosive with the salt in it. The remaining parts of the contract entail pouring a small concrete pad around the well casing and then installing the pump and building a small, covered structure over the well to protect the equipment from the elements. Finally, we will continue to await the necessary permitting with the state of Oregon to operate this new well, making it the primary point of diversion, rather than the well that is just outside the lease boundary that we currently operate off of. This permit paperwork has already been in the queue for approval for over two years but will hopefully be complete by the time the new well is operational by the end of 2024. Also, while the current contract also had an option to drill a second well within the lease boundary, it does not appear that we will get permission to move forward on this goal anytime soon so this task will likely be deobligated and the money used for other contracts.

Phase 5 Construction, which will be BIL funded, is currently out for solicitation and bids, which was scheduled to close on October 23, 2024, with a subsequent award sometime in November of 2024 after the FBMS blackout period is over. Phase 5 will include the last of the pond construction on the second lease area to include site grading on this parcel, including the demolition of the remaining 14 P-ponds and the greenhouse building, and the construction of three additional production ponds and

rehabilitation of the existing head pond supply on this parcel. During this phase, a reroute of a portion of the geothermal water supply piping will also be included to match the new site elevations.

Additional tasks on another future phase of construction may also include the installation of a SCADA system for the entire facility, as well as additional installations of security systems across the facility. There may also be the construction of an additional pole barn building to hold larger tanks for holding feral broodstock in isolation on lease parcel 2. This future phase of construction will likely be funded with 1311 money and awarded in FY25 and completed by the end of 2027.

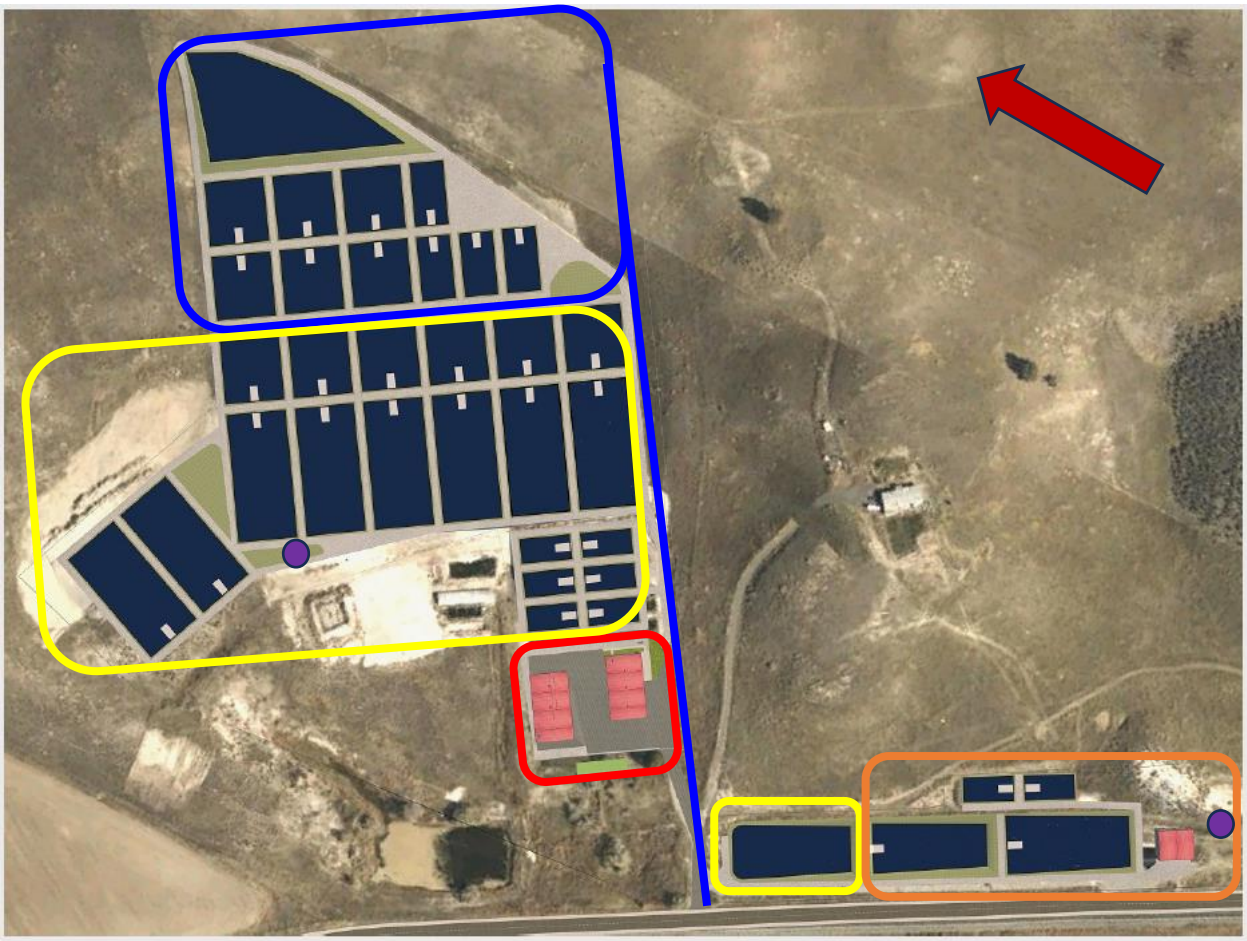

Figure 15 – Conceptual aerial overlay of the full buildout of the Klamath Falls National Fish Hatchery. Phase 1 construction (blue) will include a 1.0-acre influent retention pond at the top, followed by six 0.25-acre and four 0.12-acre fry and fingerling ponds in the Tier-1 series of juvenile ponds below. Phase 2 construction (red) will include the maintenance building, the hatchery building and office, and a feed and chemical storage building. Phase 3 construction (yellow) will include six 0.25-acre and eight 0.5-acre juvenile production ponds in the Tier-2 series below the Tier-1 series, followed by six 0.08-acre broodstock ponds below that, and lastly the 0.5-acre effluent retention pond. Phase 4 construction (purple dots) will include a new primary geothermal well by the Tier-2 series of ponds and possibly a new backup geothermal well on the lower lease parcel by the road. Phase 5 construction (orange) is currently being planned and will also include two 0.08-acre and one or two 0.5-acre quarantine ponds on the lower lease parcel by the road.

Future Work

The following is a list of various priority activities that will be carried out by the Hatchery staff during FY25. While not all things may be fully achieved, this outlines our normal planned hatchery operations, special projects, and potential outcomes for each project.

Hatchery Construction Management (All Year) – Lead: Mark Yost

- Monitor progress of the existing five phases of construction currently awarded and underway.
    - Phase 1 – Completion of the new head ponds, ten tier-1 production ponds, utility and plumbing installations, and bird predation cabling and netting on ponds, tentative by spring of 2025.
    - Phase 2 – Completion of the hatchery and maintenance buildings and associated structures utilities, and plumbing installations around the building sites, tentative by summer of 2025.
    - Phase 3 – Completion of fourteen tier-2 production ponds, six broodstock ponds, and one effluent retention pond, along with utility and plumbing installations, tentative by fall of 2025.
    - Phase 4 – Completion of a test well and connections to a functional production well from the geothermal aquifer under the site, along with the potential for an additional backup production well, tentative by end of 2024.
    - Phase 5 – Currently out for bid until October 23, 2024 prior to award selection before the end of 2024 calendar year. Completion of major site grading, three production ponds, and one new influent retention pond on lease area 2, along with utility and plumbing installations to the existing salvage building, tentative by fall of 2026
- Assisting with the development of a 100% design package and solicitation contract to award for Phase 6 construction, which may include a mop up effort to finish unfunded work needed in earlier phases, as well as a large pole barn building for large circular and trough installation on lease area 2, and SCADA and security installations across the entire site, with a tentative award in either FY25 or FY26.

PIT Tag Array Construction and Deployment in UKL (All Year) – Lead: Josh Gondek

- Monitor fixed and portable arrays for detections of suckers.
- Assemble and set up three litz array systems purchased in FY24 and deploy in the spring of 2025 and monitor through the fall of 2025 prior to removal before ice forms.
- Prepare a proposal for upscaling fixed array construction/assembly, installation, and monitoring for FY25 and FY26.

Fall 2024 Telemetry Surgery of Refuge Pond Fish / Telemetry Monitoring for USGS/USFWS Acoustic Study (All Year) – Lead: McKenzie Wasley

- Assist with surgeries to implant acoustic tags into LRS and SNS in early October 2024 and hold in the Agency Lake net pen to release in November 2024.

- Assist USGS with monitoring efforts and acoustic receiver installation and maintenance as needed.
- Receive regular updates on preliminary results and management lessons, at least quarterly.

Harvest, Process, Stock Production Lots for Repatriation and Winter Storage (October/November 2024) – Lead: Michelle Jackson

- Perform normal fall pond harvest and inventory work to include redistributing broodstock and production lots to new ponds for the winter season.
- Stock the production lots that are to the average target size for repatriation.
- Select some of the excess CY2020, CY2021, and CY2022 broodstock fish and combine for winter holding into production ponds and repatriation in the spring of 2025, to allow further room for broodstock growth in FY25.
- PIT tag all fingerlings that will be carried over for the CY24 production lot and stock into new ponds for the winter season.
- Prepare pond space, buildings, tanks, and incubation systems for winter.
- Assist the Klamath Tribes with pond harvest and fish processing work for the fall season as needed.

Draft, Edit, and Finalize the FY24 Annual Report (Fall 2024) – Lead: Mark Yost

- Compile hatchery data and staff accomplishments from the previous fiscal year and rearing cycles and draft a report that documents our practices and activities.

Prepare Presentations for the Sucker Science Symposium and Other Conferences (Fall/Winter 2024) – Lead: Michelle Jackson / Josh Gondek / Javier Linares

- Compile hatchery data and draft a presentation for conferences. (Michelle Jackson)
- Compile data from the net pen rearing and draft presentation for conferences (Desert Fish Council in November). (Josh Gondek)
- Compile data from the spring spawning activities, namely SNS egg thiamine and ESS LRS cryopreservation efforts and draft a report and presentation for conferences. (Javier Linares)
- Compile data from the USGS PIT tag detection release from August 2024 and draft a report and presentation for conferences. (Javier Linares)

Process PIT Tag Array SARP Detections (Winter 2025) – Lead: Javier Linares / Josh Gondek

- Develop code to extract SARP PIT tag detections from the USGS data file released in August 2024.
- Correlate SARP PIT tag detections to the Klamath Falls NFH master release file to determine the total number of unique detections and a length frequency plot for all unique detections to date of August 2024.

- Correlate SARP PIT tag detections to the Klamath Falls NFH master release file to compile a table of unique detections by year for each release year of fish to look at persistence in the system over time.
- Correlate SARP PIT tag detections to the Klamath Falls NFH master release file to compile a table or matrix of unique detections by stocking season (spring versus fall releases), stocking locations, release type (soft vs. hard), and by release year.

Draft, Edit, and Finalize a Five Year Program Review for KFNFH, FY2020-2024 (Winter 2025) – Lead: Mark Yost

- Compiling a five year program review report draft from FY20-24 for review internally before finalizing.

Review and Edit the Comprehensive SOPs for the Klamath Falls NFH (Winter 2025) – Lead: Mark Yost

- Review, edit, and refine the various SOPs currently drafted for the Klamath Falls NFH, so that the documents represent the operation of the current and/or new infrastructure used to date.
- Include in these SOP documents ample amounts of pictures of infrastructure and staff performing various tasks to allow continuity of operations and to help prevent loss of institutional knowledge about methodologies used in the event of staff turnover.
- Finalize a copy of the comprehensive SOPs by individual chapters and print for a binder so sections can be updated, created, and/or included as needed. Include redundant copies of this document to be kept at the hatchery, the office, and by local and RO leadership.

Draft Feed Study Summary (Winter 2025) – Lead: Michelle Jackson

- Compile study data from the previous two years of production and draft a technical report.
- From the final technical report, draft a manuscript for peer review and journal submission.
- Prepare a poster/presentation of study results for use at a conference.

Harvest, Process, Stock Production Lots for Grow Out (February/March 2025) – Lead: Michelle Jackson

- Perform normal spring harvest and inventory work to include redistributing broodstock and production lots to new ponds for the growing season.
- Stock the production lots that are to the average target size for repatriation.
- Possibly cull out some of the CY2020, CY2021, and CY2022 broodstock to production ponds to allow further room for broodstock growth.
- Prepare pond space, tanks, and incubation systems for larval rearing season.
- Assist the Klamath Tribes with pond harvest and fish processing work for the spring season as needed.

Gerber Reservoir Net Pen Operations (March/April-September/October 2025) – Josh Gondek

- Pending adequate water levels and conditions for net pen rearing at the sites selected, stocking excess CY2024 year class holdover fish into the Gerber Reservoir net pens in April for growout through September or October.
- Possibly disassemble and move the net pen from Agency Lake to Gerber Reservoir for additional growout space in the future.
- Harvest net pens in September or October, process fish, and repatriate fish to Upper Klamath Lake and/or its tributaries.

Spawning East Side Springs LRS / Incubation (April 2025) – Lead: Michelle Jackson

- Collect and fertilize wild LRS gametes from the East Side Springs of Upper Klamath Lake, utilizing at least four males to every female, to produce a minimum of 48 family groups across at least two weeks of the spawn.
- Transport, disinfect, enumerate, and incubate eggs from each family group in a separate hatching jar, which will be pooled by each weekly collection for hatching into a common trough, circular tank, and/or production pond after individual jars are inventoried upon hatch.
- Excess eggs may be used for research.
- Viable larval fish will be ponded from each family group cross for broodstock and possibly limited production rearing. Excess fish may be used for research during the spring or stocked to off channel growout locations.

Spawning Captive Broodstock SNS / Incubation (April 2025) – Lead: Javier Linares / Mark Yost

- Artificially warm the broodstock ponds in late March or early April to expedite maturation and to attempt to better control water temperature fluctuations common in the spring.
- Collect and fertilize SNS gametes from the captive broodstock at Klamath Fall NFH, utilizing at least four males to every female, to produce as many family groups as possible across at least two weeks of the spawn.
    - This will likely require the use of HGC hormone injections to help ovulation but ripeness checks will occur at least once each week or every other week if handling needs to be limited.
    - Most gravid fish from the 2017, 2018, and 2019 year classes will be pooled into a clean pond in several large floating net pen structures for ease of handling for hormone injections and ripeness checks.
    - Some gravid fish from the 2017, 2018, and 2019 year classes may be put in tanks to administer hormone injections and ripeness checks.
- Transport, disinfect, enumerate, and incubate eggs from each family group in a separate hatching jar, which will be pooled by each weekly collection for hatching into a common trough after individual jars are inventoried upon hatch.
- Excess eggs may be used for research.

- Viable larval fish may be used for larval feed trials during the spring but no fish are planned for production or release unless decided appropriate by Abernathy geneticists and management.

Spawning Williamson/Sprague Rivers SNS / Incubation (April/May 2025) – Lead: Josh Gondek

- Collect and fertilize wild SNS gametes from the Williamson/Sprague Rivers, utilizing at least four males to every female, to produce as many family groups as possible across at least two weeks of the spawn.
- Transport, disinfect, enumerate, and incubate eggs from each family group in a separate hatching jar, which will be pooled by each weekly collection for hatching into a common trough after individual jars are inventoried upon hatch.
- Excess eggs may be used for research.
- Viable larval fish may be ponded from each family group cross for limited production rearing. Excess fish may be used for research during the spring or stocked to off channel growout locations.

Extending and Cryopreservation of Milt (April/May 2025) – Lead: Javier Linares

- Collect milt from the various spawning efforts from both LRS and SNS.
- Perform motility checks over time using milt extender solutions for both LRS and SNS.
- Cryopreserve milt from both LRS and SNS for post thaw motility checks.
- Fertilize SNS eggs with thawed SNS milt and incubate to assess fertilization, development, and hatch rates.
- Cryopreserve milt from both LRS and SNS for banking.

Thiamine Treatments and Sample Analysis (April/May 2025) – Lead: Javier Linares

- Utilizing gametes collected in other efforts, performing egg treatments, incubation, and early rearing, and sample collection and analysis to compare baseline thiamine levels and dose responses.

Wild Larval Collection of LRS and SNS in Williamson River (May/June 2025) – Lead: Josh Gondek

- Collect at least 60,000 wild caught larval suckers from the Williamson River in May/June for production purposes using active methods, such as dip netting, as well as passive methods, such as drift netting.
- Transporting and enumerating larval suckers to the Klamath Falls NFH isolation building for disease treatment and monitoring, as well as early rearing.

Early Rearing LRS and SNS to Ponding (May/June 2025) – Lead: Michelle Jackson

- Perform initial prophylactic treatments and early rearing techniques to pond at least 30-45,000 wild caught larval suckers from the Williamson River in May/June for production purposes.
- Possibly stock excess larval suckers directly into backwater locations upon collection.

Development and Implementation of an Integrated Pest Management (IPM) (July-September 2025) – Lead: Mark Yost

- Have key staff attend trainings and/or study for testing and certification for public pesticide applicators license, to include at minimum aquatic and general use endorsements.
- Perform an Intra-Service Section 7 Consultation to identify and approve best management practices and SOPs for work around the hatchery and listed species.
- Perform bioassays on desired aquatic and terrestrial chemicals needed to control fish diseases and noxious weeds on station.

Definitions and Acronyms

The following definitions are/or acronyms being added to address questions from some of the external partners who reviewed this report and gave feedback. These are not dictionary or policy definitions but rather laymen explanations for clarity in the report.

Definitions

Production Fish – These are the fish raised to a target size of 200 mm total length, generally being 18-24 months old.

Production Goal – This is the target goal of the number of fish the hatchery would like to produce, raise, and/or release in a given year, based on staffing and space limitations.

Beneficial Occupancy – Where the government starts to use newly constructed infrastructure before the contractor has completed the entire construction project and turned everything over for use to close out the contract.

Acronyms

LRS – Lost River Sucker

SNS – Shortnose Sucker

ESS – East Side Springs

USFWS – US Fish and Wildlife Service

KFNFH – Klamath Falls National Fish Hatchery