Klamath Falls National Fish Hatchery

Annual Report for Fiscal Year 2021

Prepared by:

U.S. Fish and Wildlife Service

Klamath Falls National Fish Hatchery

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Executive Summary

There were many significant developments for the Sucker Assisted Rearing Program (SARP) during the fiscal year of 2021. Perhaps most important for the long-term operations and recovery of listed Klamath Suckers, was the designation by the US Fish and Wildlife Service as a new, official, National Fish Hatchery; now known as the Klamath Falls National Fish Hatchery. This was followed in the early part of fiscal year 2022 by the signing of a long term, 30-year, lease agreement with the current landowner, Mr. Ron Barnes, who has supported the SARP program from its pilot inception through a cooperative agreement with the Service. Years of coordination, planning, and environmental and engineering reviews and permitting have finally come to fruition. The fiscal year closed with the opportunity to start Phase 1 construction solicitation and award a contract in the spring of 2022 and with the strong potential to receive the full funding needed to complete Phase 2 construction in the coming three to five years.

Although there is still limited space and infrastructure to support the full-scale annual production goal of 60,000 suckers per year, the hard work and dedication of the Klamath Falls Fish and Wildlife Office staff allowed us to meet record production numbers in various ways. First, during the 2021 fiscal year, spanning from October 1, 2020 to September 30, 2021, we have never carried such a large inventory of fish on station at once, with a carryover of over 650 captive broodstock from collection years (CY) 2017-2019, 5,000 CY2019 fish, over 30,000 CY2020 for production purposes, and a new record high collection of larval suckers from the CY2021 of over 106,000 fish. While this created certain challenges, the staff worked diligently and intelligently to make things work as good as possible. With these fish, we were able to stock approximately 13,394 production fish, which were produced onsite from wild larval collections, back to Upper Klamath Lake and its tributaries for repatriation. An additional 1,689 salvage fish, which were salvaged from the A-Canal Forebay salvage efforts in the fall, were also repatriated to Upper Klamath Lake. We were also able to begin some applied research, funded through the Fish Technology Centers, to assess the effects of PIT tagging suckers earlier in the production cycle and to assess the effects of fish density in ponds on growth and survival. At the end of the fiscal year, we carried an inventory of approximately 74,000 fish, many of which would be harvested, tagged, restocked on station, and/or repatriated during the fall and spring of the 2022 fiscal year or the fall of fiscal year 2023.

To expand and improve our fish culture infrastructure, rearing units for raising fish, we used the winter of 2020/2021 to retrofit the current greenhouse tank room by moving tanks around to accommodate an additional 500 gallon tank, bringing the total to five now, to allow us to process more fish at once, and also two 60-gallon tanks and twelve 90-gallon tanks to allow for more larval rearing space; upgrades were also made to tank drains, lateral drain lines, and supply lines to accommodate more flow. In addition, after more than a year of planning and fabrication, we were able to get a new net pen aquaculture system installed for growout in Gerber Reservoir, that is similar in design to the existing net pen used in Upper Klamath Lake, but with new features that allow it to be completely submerged and stored underwater during winter ice formation. And as the fiscal year closed, we installed a new metal building that was purchased at the beginning of the fiscal year to improved building infrastructure and give us the capacity to have a separate quarantine space in the future for salvage operations, thus limiting biosecurity risks in the greenhouse.

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, 30+ and 50+ years respectively, freshwater fish that are endemic to very few lakes and rivers in the upper Klamath Basin of southern Oregon and northern California. The recovery plan for both species calls for the development of a controlled propagation program once the species reaches a population decline threshold to prevent extinction.

In 2016, a partnership was established between the USFWS and Mr. Ron Barnes, the landowner of a fish-rearing site (Gone Fishing Hatchery), to establish the current hatchery efforts on the property using the existing facility's water source, ponds, and some hatchery infrastructure. This partnership and effort became known as the Sucker Assisted Rearing Program (SARP). To date, Shortnose Suckers and Lost River Suckers have been successfully raised, and hatchery and rearing operations are determined to be an effective recovery tool. Since 2016, there have been many infrastructure improvements and additions. Due to the success of hatchery propagation, the USFWS has now established the Klamath Falls National Fish Hatchery (KFNFH) and is developing plans for an expanded hatchery facility to support the culture and release of these species in sufficient quantities to support existing wild populations at levels that are viable and self-sustaining. To reach these objectives, it has been estimated that approximately 60,000 fish need to be raised and repatriated annually. While the current infrastructure only allows staff to produce about one fifth of what is likely needed to stabilize sucker populations in Upper Klamath Lake, we have seen progressive increases in number of fish produced and/or overall fish size annually. And given the anticipated 4–6-year intermission of release of juveniles to the potential migration and detection of recruiting adults into the Williamson and Sprague Rivers, it is hoped that more of our SARP released fish will start to show up in population monitoring efforts in the coming years. Please note in **Table 1** the historical collections and releases of suckers since the program's inception in 2016.

Table 1 – Collection and release information for the Sucker Assisted Rearing Program since its inception in 2016 by fiscal years.

Fiscal Year	Larvae Collected	SARP Release	Total Length (mm)	Salvage Release	Salvage Standard Length (mm)
2016	4,134				
2017	8,730				
2018	9,544	2,355	147	784	102
2019	24,426	4,497	189	1,586	103
2020	40,603	11,774	223	1,928	94
2021	106,710	13,394	208	1,689	143
Total	**194,147**	**32,020**		**5,987**	

The Klamath Falls National Fish Hatchery has a unique water supply of 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 retained in three serial head ponds, whereby it is allowed to cool to ambient temperatures for use in tanks and ponds, however it can also be used directly in small quantities directly in ponds for exchange purposes year-round, or in larger quantities directly to artificially warm the ponds in the winter months to extend the growing season. The outdoor extensive facility currently includes 46 smaller 0.03-acre ponds and four larger 0.25-acre ponds used for growout of fish. The ponds are used primarily for growout of juvenile suckers through the 18-24 month growing cycle. Pond growout starts with juvenile fish being stocked after initial collections, prophylactic treatments, and/or early rearing efforts to feed train the fish are complete. Thereafter, aside from the limited time

spent in tanks during harvesting, tagging, and/or processing of fish, they spend the majority of the growing cycle in ponds prior to stocking and repatriation. The indoor intensive facility currently includes eight 500-gallon circular tanks, three 300-gallon circular tanks, (24) 150-gallon rectangular tanks, three 100-gallon circular tanks, (12) 90-gallon circular tanks, and eight 60-gallon circular tanks. These larger tanks serve to hold fish during harvest and tagging, as well as salvage, operations during the spring and fall, while the smaller tanks are used for larval rearing during the late spring and early summer before ponding fish. For more information on the pond and tank layout of the current facility, please see **Figures 1** and **2**.

Figure 1 – An aerial view of the current layout of ponds at the Klamath Falls National Fish Hatchery.

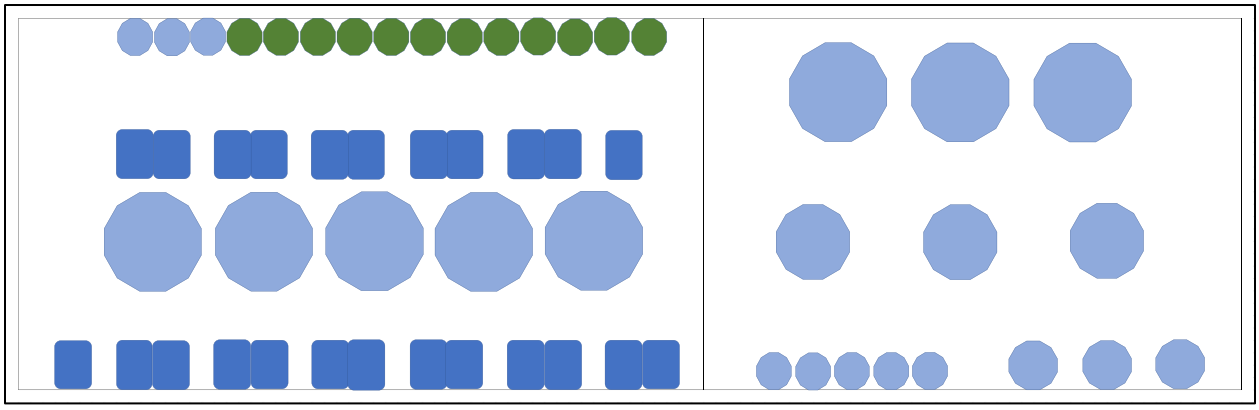

Figure 2 – A schematic view of the current layout of tanks in the greenhouse tank room at the Klamath Falls National Fish Hatchery. This indoor facility includes five 500-gallon circular tanks, (24) 150-gallon rectangular tanks, (12) 90-gallon circular tanks, and three 60-gallon circular tanks on the left side of the greenhouse for production and fish processing and on the right side of the greenhouse through an isolation screening are three 500-gallon, three 300-gallon, three 100-gallon circular tanks, and five 60-gallon circular tanks.

The production cycle begins with the collection of larval suckers drifting down the Williamson River from early May through late June or early July of each year. Once larval suckers are collected, either with stationary drift nets or by active pursuit with dip nets, the fish are transported back to the hatchery where they are tempered to the hatchery water supply temperature and water chemistry, enumerated into rearing tanks, and placed on a four-day prophylactic treatment protocol for removal of ectoparasites. They are fed freshly hatched Artemia nauplii multiple times daily and later supplemented with commercially available dry feeds in a fine mash. After early rearing in tanks for four to six weeks, the larval fish are stocked into recently fertilized larval ponds with high zooplankton blooms for natural forage. Pond water quality is monitored daily by staff to ensure that the fish have adequate dissolved oxygen levels above 4 mg/L and corrective actions are taken as necessary to improve water quality, either by increasing flows or using aeration. The fish are also fed commercially available diets in progressively larger sizes as they grow, at rates that start off at 15-30% body weight (BW) daily and then progressively down to about 3-5%BW daily by the end of the first growing season. Usually, by October or November, the juvenile suckers are nearing 100-125mm total length. During the cooler winter months, feed rates are usually reduced to 1-2%BW, one to three times weekly, depending upon water temperature. During the second growing season, which usually starts in April or May, once morning water temperatures exceed 15-18^{o}C, feed rates usually range between 2-3% BW daily as the fish get older and their metabolism and growth slows a little. The juvenile fish are rotated through ponds 3-4 times during the 18-24 month growing cycle, approximately on a six-month rotation, to enumerate and tag them prior to their reaching the target size of approximately 200mm total length. Thereafter, they are strategically stocked and repatriated into various parts of Upper Klamath Lake and its tributaries.

Production and Fish Distribution

From October 1, 2020, the fiscal year started off with the following inventory of fish on station: 325 fish from CY2017, 262 fish from CY2018, 14,014 fish from CY2019, and 30,664 fish from CY2020, totaling approximately 45,265 fish. During the previous month, we had begun harvesting ponds and stocking fish from the CY2018 and CY2019 lots for repatriation into Upper Klamath Basin. This work continued into October and November of 2020 and included tagging and release of 4,066 production fish from the CY2018 and CY2019 lots. There was also a total of 1,607 salvage fish rehabilitated and released during November and December of 2020. As we worked through the entire inventory of CY2019 fish, we selected broodstock from the lot; for the CY2019 fish, we selected 100 LRS and 200 SNS. We did not work through any of the CY2020 ponds, as we intended to inventory those fish in the spring of 2021. As far as pond survival goes, we had approximately 108.8% and 93.2% survival respectively for the CY2018 and CY2019 lots, with the former indicating that there were obvious inventory issues and errors when stocking the pond where those 2018 fish were held in the previous fiscal year. For more information on the fall 2020 fish distributions and pond production numbers, and for more information on other culture activities through the fiscal year, please see **Tables 2, 3,** and **4**.

Going into the winter of 2020/2021, there were still 7,664 fish from CY2019, not counting the 300 broodstock selected; this included 5,120 fish that were graded out as short fish that did not make the target 200 mm total length, as well as an additional 2,544 fish that were left ungraded for use in net pen operations, for telemetry work within our office, for potential mesocosm work for USGS, and for additional growout for the winter and spring. Something noteworthy from the winter production season was that with increased geothermal flows to the ponds, in an effort to extend the growing season by artificially raising pond temperatures over 15^{o}C, a marked increase in total ammonia levels and subsequently chronic low levels of fish mortality was observed. During the colder winter months, we streamlined operations to just having one or two staff onsite in rotation to care for basic husbandry activities each day, while the remainder of the staff cared for administrative duties and trainings and classes; with this lasting from late December of 2020 to late February 2021. During this time, one of the noteworthy accomplishments was that the staff collectively drafted and began initial editing of a comprehensive standard operating procedure document that addressed all the activities used to date with our current infrastructure.

During the spring of 2021, we commenced full scale operations in late February to harvest and stock excess fish from the CY2019 lot. Thereafter, we began harvesting and inventorying all our CY2020 fish in March and early April. The largest of these fish were set aside in temporary ponds to stock the net pen operations in Upper Klamath Lake and Gerber Reservoir in April and May and many of the remaining fish were stocked into the new B-series ponds, which were recently constructed during the previous summer for additional production space, but were also going to be used for a PIT tag effect and density study being conducted during growout through the summer. Then, as April progressed into early May, we stocked the remaining 2019 fish that were short the previous fall and began harvesting the temporary ponds to stock the net pen operations. In total, we stocked a total of 4,908 fish during the spring activities and transferred a total of 440 fish to the Klamath Tribes Hatchery for potential use for a mesocosm study conducted by USGS; this mesocosm study never materialized however and the Klamath Tribes ended up stocking surviving fish to the Sprague River during September 2021. Lastly, we also tried to experimentally spawn wild and captive Shortnose Sucker and were able to get one collection of eggs from one wild female, which resulted in sending developing gametes to the Southwest Native Aquatic Resources and Recovery Center for the development of a larval identification key, and we collected and fertilized eggs from one captive female and got milt from over 30 captive males for spawning and cryopreservation. We did incubate eggs from both spawns but had 0% hatch success and survival from both efforts, possibly indicating some limiting factor in the water supply, which will be investigated further during the spring of 2022.

As the late spring and early summer of 2021 progressed, the staff shifted their focus from basic pond culture operations through the summer and early fall and diverting much effort and attention to the busy wild larval collection and early rearing season, which ran from early May through mid-July once all the fry were ponded. In

total, 106,710 larval suckers were collected during the FY21 larval collection season. In addition to the hatchery operations, the staff also regularly diverted time throughout the summer assisting staff in our office and with partners outside our office with various field work activities, which included the Sump 1A salvage effort in Tule Lake, sucker population monitoring in Upper Klamath Lake, Gerber Reservoir, Tule Lake, and mussel surveys throughout the basin. In mid-July, staff initiated an emergency harvest of the Gerber Reservoir Net pen and stocked a total of 2,175 fish in refugia areas of Upper Klamath Lake, such as Odessa Springs or the Williamson River; this work commenced early due to low water levels and projections that forebode dry conditions within weeks at the net location. In early August, an emergency harvest of the Upper Klamath Lake net pen was warranted and only 606 fish were recovered and stocked at Odessa Springs, after anoxic conditions occurred for several consecutive nights and a large mortality event was documented thereafter during the normal weekly check. The summer and the fiscal year concluded with the stocking of 82 salvage fish taken and rehabilitated from the A-Canal Forebay salvage effort. Since fall harvest efforts were going to commence in October 2021, the results from these activities will be reported on in the next annual report for the that fiscal year

Table 2 – Summary of Lost River Sucker (LRS), Shortnose Sucker (SNS), and Klamath Largescale Sucker (KLS) stocked during the Fiscal Year 2020 (October 1, 2020 to September 30, 2021); during salvage stockings, the designation "Salvage," and during spring stockings, the designation "Suckers," were Klamath Suckers not identified to species and documented during tagging operations. Please note that weights and lengths were obtained from actual measurements and/or using length/weight estimators from #/lb, using C=0.000314 for LRS and C=0.000365 for SNS and C=0.000314 collectively; this was developed from a regression of historical length and weight data.

Date	Species	Lot	#	Weight (lb.)	#/lb.	TL (inches)	TL (mm)	From Ponds	Stocking Location
10/1/2020	LRS	2019	404	82.5	4.90	8.7	220	Pond 5, 14	Sprague River @ Beaty Gap
	SNS	2019	69	15.64	4.41	8.5	217	Pond 5, 14	Sprague River @ Beaty Gap
10/7/2020	LRS	2019	451	96.1	4.69	8.8	223	Pond 6, 21, B21	Rocky Point
	SNS	2019	158	39.45	4.01	8.8	224	Pond 6, 21, B21	Rocky Point
10/27/2020	LRS	2019	540	102.77	5.25	8.5	215	Pond 1, 10	Sprague River @ Beaty Gap
	SNS	2019	221	47.85	4.62	8.4	213	Pond 1, 10	Sprague River @ Beaty Gap
10/28/2020	LRS	2019	493	108.23	4.56	8.9	225	Pond 17, B15	Williamson River @ TNC
	SNS	2019	168	42.88	3.92	8.9	225	Pond 17, B15	Williamson River @ TNC
October	**LRS**	**2019**	**1888**	**389.60**	**4.85**	**8.7**	**221**		
	SNS	**2019**	**616**	**145.82**	**4.22**	**8.7**	**220**		
	Total		**2504**	**535.42**	**4.68**	**8.8**	**223**		
11/5/2020	LRS	2019	951	191.03	4.98	8.6	219	Pond 0, 16, 20	Sprague River Downstream Beaty Gap
	SNS	2019	231	46.5	4.97	8.2	208	Pond 0, 16, 20	Sprague River Downstream Beaty Gap
11/16/2020	Salvage	2020	1557	82.77	18.81	5.5	141	Forebay	Malone Springs
11/18/2020	LRS	2019	268	49.17	5.45	8.4	212	Pond 3	Rocky Point
	SNS	2019	112	24.69	4.54	8.5	215	Pond 3	Rocky Point
November	**LRS**	**2019**	**1219**	**240.20**	**5.07**	**8.6**	**217**		
	SNS	**2019**	**343**	**71.19**	**4.82**	**8.3**	**210**		
	Salvage	**2020**	**1557**	**82.77**	**18.81**	**5.5**	**141**		
	Total		**3119**	**394.16**	**7.91**	**7.4**	**188**		
12/21/2020	Salvage	2020	50	2.98	16.78	5.7	146	Forebay, A-Canal	Malone Springs
December	**Salvage**	**2020**	**50**	**2.98**	**16.78**	**5.7**	**146**		
	Total	**2020**	**50**	**2.98**	**16.8**	**5.7**	**146**		
2/26/2021	LRS	2019	935	224.95	4.16	9.2	232	Pond P11, 14, 15	Williamson River @ Sportsmans River Retreat
	SNS	2019	264	64.44	4.10	8.7	222	Pond P11, 14, 16	Williamson River @ Sportsmans River Retreat
February	**LRS**	**2019**	**935**	**224.95**	**4.16**	**9.2**	**232**		
	SNS	**2019**	**264**	**64.44**	**4.10**	**8.7**	**222**		
	Total	**2019**	**1199**	**289.39**	**4.14**	**9.2**	**233**		
4/12/2021	Suckers	2019	215	50	4.30	9.0	230		Transfer to Klamath Tribes for USGS Mesocosm
4/12/2021	Suckers	2020	225	6.5	34.62	4.5	115		Transfer to Klamath Tribes for USGS Mesocosm
4/26/2021	LRS	2019	490	77.24	6.34	7.9	202	Pond A3	Williamson River @ Sportsmans River Retreat
	SNS	2019	118	18.26	6.46	7.5	191	Pond A3	Williamson River @ Sportsmans River Retreat
4/27/2021	LRS	2019	987	152.83	6.46	7.9	201	Pond A3	Williamson River @ Sportsmans River Retreat
	SNS	2019	185	27.23	6.79	7.4	188	Pond A3	Williamson River @ Sportsmans River Retreat
4/28/2021	LRS	2019	1272	189.13	6.73	7.8	198	Pond A3	Williamson River @ Sportsmans River Retreat
	SNS	2019	231	35.02	6.60	7.5	190	Pond A3	Williamson River @ Sportsmans River Retreat
4/29/2021	LRS	2019	1270	194.33	6.54	7.9	200	Pond A3	Williamson River @ Sportsmans River Retreat
	SNS	2019	355	52.46	6.77	7.4	188	Pond A3	Williamson River @ Sportsmans River Retreat
April	**LRS**	**2019**	**4019**	**613.53**	**6.55**	**7.9**	**200**		
	SNS	**2019**	**889**	**132.97**	**6.69**	**7.4**	**189**		
	Total		**4908**	**746.5**	**6.57**	**7.9**	**199**		
7/14/2021	LRS	2019	51	17.78	2.87	10.8	274	GERW Netpen	Odessa Creek @ Odessa Campground
	SNS	2019	11	3.86	2.85	10.3	261	GERW Netpen	Odessa Creek @ Odessa Campground
	Suckers	2019	84	27.6	3.04	10.1	256	GERW Netpen	Odessa Creek @ Odessa Campground
7/14/2021	LRS	2020	312	28.6	10.91	6.9	175	GERW Netpen	Odessa Creek @ Odessa Campground
	SNS	2020	172	19.18	8.97	7	177	GERW Netpen	Odessa Creek @ Odessa Campground
	Suckers	2020	621	62.53	9.93	6.7	171	GERW Netpen	Odessa Creek @ Odessa Campground
7/15/2021	LRS	2019	32	11.79	2.71	11	280	GERE Netpen	Williamson River @ TNC
	SNS	2019	9	3.33	2.7	10.3	262	GERE Netpen	Williamson River @ TNC
	Suckers	2019	56	19.35	2.89	10.4	264	GERE Netpen	Williamson River @ TNC
7/15/2021	LRS	2020	196	21.75	9.01	7.3	186	GERE Netpen	Williamson River @ TNC
	SNS	2020	230	22.89	10.05	6.7	171	GERE Netpen	Williamson River @ TNC
	Suckers	2020	401	41.36	9.7	6.7	171	GERE Netpen	Williamson River @ TNC
July	**LRS**	**2019**	**83**	**29.57**	**2.81**	**10.9**	**276**		
	SNS	**2019**	**20**	**7.19**	**2.78**	**10.3**	**261**		
	Suckers	**2019**	**140**	**46.95**	**2.98**	**10.2**	**259**		
	LRS	**2020**	**508**	**50.35**	**10.09**	**7**	**179**		
	SNS	**2020**	**402**	**42.07**	**9.56**	**6.8**	**174**		
	Suckers	**2020**	**1022**	**103.89**	**9.84**	**6.7**	**171**		
	Total		**2175**	**280.02**	**7.77**	**7.2**	**184**		
8/12/2021	LRS	2019	58	26.59	2.18	11.2	286	UKLS Netpen	Odessa Creek @ Odessa Campground
	SNS	2019	25	10.93	2.29	10.5	266	UKLS Netpen	Odessa Creek @ Odessa Campground
	KLS (SNS)	2019	4	2.17	1.84	11.4	289	UKLS Netpen	Odessa Creek @ Odessa Campground
8/12/2021	LRS	2020	416	75.52	5.51	8.3	210	UKLS Netpen	Odessa Creek @ Odessa Campground
	SNS	2020	101	20.1	5.02	8.2	208	UKLS Netpen	Odessa Creek @ Odessa Campground
	KLS (SNS)	2020	2	0.32	6.26	7.6	194	UKLS Netpen	Odessa Creek @ Odessa Campground
August	**LRS**	**2019**	**58**	**26.59**	**2.18**	**11.2**	**286**		
	SNS	**2019**	**25**	**10.93**	**2.29**	**10.5**	**266**		
	KLS	**2019**	**4**	**2.17**	**1.84**	**11.4**	**289**		
	LRS	**2020**	**416**	**75.52**	**5.51**	**8.3**	**210**		
	SNS	**2020**	**101**	**20.1**	**5.02**	**8.2**	**208**		
	KLS	**2020**	**2**	**0.32**	**6.26**	**7.6**	**194**		
	Total		**606**	**135.63**	**4.47**	**8.7**	**220**		
9/27/2021	Salvage	2021	82	8.19	10.01	6.8	173	Forebay, A-Canal	Malone Springs
September	**Total**		**82**	**8.19**	**10.01**	**6.83**	**173**		
Grand Totals	**LRS**	**2019**	**8202**	**1524.44**	**5.38**	**8.40**	**213**		
	SNS	**2019**	**2157**	**432.54**	**4.99**	**8.19**	**208**		
	KLS	**2019**	**4**	**2.17**	**1.84**	**11.41**	**290**		
	Suckers	**2019**	**355**	**96.95**	**3.66**	**9.55**	**242**		
	LRS	**2020**	**924**	**125.87**	**7.34**	**7.57**	**192**		
	SNS	**2020**	**503**	**39.28**	**12.81**	**5.98**	**152**		
	KLS	**2020**	**2**	**0.32**	**6.25**	**7.60**	**193**		
	Suckers	**2020**	**1247**	**103.89**	**12.00**	**6.43**	**163**		
	Total LRS		**9126**	**1650.31**	**5.53**	**8.32**	**211**		
	Total SNS		**2660**	**471.82**	**5.64**	**7.86**	**200**		
	Total KLS		**6**	**2.49**	**2.41**	**10.44**	**265**		
	Total Suckers		**1602**	**200.84**	**7.98**	**7.36**	**187**		
	Production Total		**13394**	**2325.46**	**5.76**	**8.21**	**208**		
	Salvage	**2020**	**1607**	**85.75**	**18.74**	**5.54**	**141**		
	Salvage	**2021**	**82**	**8.19**	**10.01**	**6.83**	**173**		
	Salvage Total		**1689**	**93.94**	**17.98**	**5.62**	**143**		

Table 3 – Fall 2020 production summary. The paper # is the inventory during initial stocking, the actual # is the inventory at the time of harvest and processing, and the # brood is the number of fish that were designated as broodstock for each year class.

Harvest Date	Pond	Lot	Paper #	Actual #	Survival	TL (mm)	# Stocked	% Stocked	TL (mm)	# Short	% Short	TL (mm)	# Brood	Disposition
9/1/2020	A3	2018	2804	3052	108.8	224	2790	91.4	224				262	2790 Stocked; 262 Broodstock (2018 Lot) in Pond 8
9/15/2020	9	2019	899	860	95.7	213	598	69.5	221	179	20.8	184	83	598 Stocked; 83 SNS Broodstock (2019 Lot) in Pond 9; 179 Short Holdovers in Pond A3
9/15/2020	8	2019	896	863	96.3	219	642	74.4	231	154	17.8	183	67	642 Stocked; 17 SNS and 50 LRS Broodstock (2019 Lot) in Pond 9; 154 Short Holdovers in Pond A3
9/22/2020	15	2019	899	801	89.1	233	604	75.4	238	47	5.9	181	150	604 Stocked; 100 SNS and 50 LRS Broodstock (2019 Lot) in Pond 9; 47 Short Holdovers in Pond A3
9/23/2020	13	2019	900	843	93.7	216	681	80.8	224	162	19.2	183	0	681 Stocked; 162 Short Holdovers in Pond A3
9/28/2020	11	2019	594	550	92.6	210	371	67.5	221	179	32.5	188	0	371 Stocked; 179 Short Holdovers in Pond A3
9/28/2020	12	2019	600	519	86.5	184	121	23.3	209	398	76.7	176	0	121 Stocked; 398 Short Holdovers in Pond A3
9/30/2020	14	2019	584	529	90.6	202	286	54.1	217	243	45.9	186	0	286 Stocked; 243 Short Holdovers in Pond A3
9/30/2020	5	2019	1032	472	45.7	193	187	39.6	217	285	60.4	177	0	187 Stocked; 285 Short Holdovers in Pond A3
September Totals		**2018**	**2804**	**3052**	**108.8**		**2790**	**91.4**		**0**	**0.0**		**262**	
		2019	**6404**	**5437**	**84.9**		**3490**	**64.2**		**1647**	**30.3**		**300**	
10/6/2020	6	2019	584	517	88.5	217	372	72.0	223	145	28.0	185	0	372 Stocked; 145 Short Holdovers in Pond A3
10/6/2020	21	2019	306	294	96.1	191	87	29.6	214	207	70.4	181	0	87 Stocked; 207 Short Holdovers in Pond A3
10/6/2020	B21	2019	246	264	107.3	213	150	56.8	232	114	43.2	187	0	150 Stocked; 114 Short Holdovers in Pond A3
10/20/2020	A2	2019	2640	2544	96.4		0	0.0		2544	100.0		0	Larger Tag Effect Study Fish: 497 in P11, 499 in P12, 494 in P13, 496 in P14, 558 in P15
10/26/2020	1	2019	683	804	117.7	201	447	55.6	214	357	44.4	183	0	447 Stocked; 357 Short Holdovers in Pond A3
10/26/2020	10	2019	1125	863	76.7	192	314	36.4	214	549	63.6	180	0	314 Stocked; 549 Short Holdovers in Pond A3
10/27/2020	17	2019	851	743	87.3	215	560	75.4	225	183	24.6	185	0	560 Stocked; 183 Short Holdovers in Pond A3
10/27/2020	B15	2019	97	158	162.9	206	103	65.2	219	55	34.8	182	0	103 Stocked; 55 Short Holdovers in Pond A3
October Totals		**2019**	**6532**	**6187**	**94.7**		**2033**	**32.9**		**4154**	**67.1**		**0**	
11/3/2020	0	2019	852	938	110.1	194	369	39.3	213	569	60.7	182	0	369 Stocked; 569 Short Holdovers in Pond A3
11/3/2020	16	2019	738	937	127.0	195	235	25.1	213	702	74.9	179	0	235 Stocked; 702 Short Holdovers in Pond A3
11/3/2020	20	2019	857	841	98.1	208	578	68.7	219	263	31.3	185	0	578 Stocked; 263 Short Holdovers in Pond A3
11/16/2020	Forebay	Salvage	1569	1557	99.2	141	1557	100	141				0	1557 Stocked
11/17/2020	3	2019	761	709	93.2	200	380	53.6	215	329	46.4	182	0	380 Stocked; 329 Short Holdovers in Pond A3
November Totals		**2019**	**3208**	**3425**	**106.8**		**1562**	**45.6**		**1863**	**54.4**		**0**	
		Salvage	**1569**	**1557**	**99.2**		**1557**	**100**		**0**	**0**		**0**	
		Total	**4777**	**4982**	**104.3**		**3119**	**62.6**		**1863**	**37.4**		**0**	
12/21/2020	Forebay	Salvage	50	50	3.0	146	50	3.0	146					50 Stocked
December Totals		**Salvage**	**50**	**50**	**3.0**		**50**	**3.0**						
		Total	**50**	**50**	**3.0**		**50**	**3.0**						
Fall 2020 Overall		**2018**	**2804**	**3052**	**108.8**		**2790**	**91.4**		**0**	**0.0**		**262**	
		2019	**16144**	**15049**	**93.2**		**7085**	**47.1**		**7664**	**50.9**		**300**	
		Salvage	**1619**	**1607**	**102.2**		**1607**	**103.0**		**0**	**0.0**		**0**	
		Grand Total	**20567**	**19708**	**95.8**		**11482**	**58.3**		**7664**	**38.9**		**562**	

Table 4 – Spring 2021 production summary. Please note that the values highlighted in yellow were not calculated or recorded properly when the pond was harvested in the spring. The paper # is the inventory during initial stocking, the actual # is the inventory at the time of harvest and processing, and the # brood is the number of fish that were designated as broodstock.

Harvest Date	Pond	Lot	Paper #	Actual #	Harvest Morts	Survival	TL (mm)	# Stocked	% Stocked	TL (mm)	# Short	% Short	TL (mm)	# Brood	Disposition / Stocked To
2/23/2021	P19	2017	25	0	0	0.0		0							
2/23/2021	P11	2019	497	489	1	98.6	230	282	57.7						Willamson River (282), P17
2/23/2021	P13	2019	494	494	0	100.0	230	1	0.2						Williamson River (1), P16, P17
2/24/2021	P12	2019	499	479	0	96.0	221	0	0.0						P3
2/25/2021	P14	2019	496	493	1	99.6	228	372	75.5						Williamson River (372)
2/25/2021	P15	2019	558	544	2	97.8	230	544	100.0						Williamson River (544)
February 2021 Totals		**2017**	**25**	**0**	**0**	**0.0**									
		2019	**2544**	**2499**	**4**	**98.4**		**1199**	**48.0**						
3/8/2021	B3	202	677	611	18	92.9	128	0							P14, P21
3/8/2021	B5	2020	533	443	36	89.9	140	0							P15, P21
3/8/2021	B7	2020	528	421	47	88.6	134	0							P15, P21
3/10/2021	B9	2020	533	496	12	95.3	151	0							P13, P21
3/10/2021	B1	2020	529	449	8	86.4	134	0							P12, P13, P21
3/10/2021	B6	2020	533	472	9	90.2	160	0							P14, P13
3/11/2021	B8	2020	532	504	3	95.3	154	0							P13, P21
3/16/2021	B4	2020	531	470	11	90.6	133	0							P12, P21
3/16/2021	B10	2020	532	457	14	88.5	141	0							P12, P21
3/18/2021	B11	2020	531	485	16	94.4	139	0							P12, P21
3/16/2021	B2	2020	1646	1428	27	88.4	117	0							B2, B5, B1, B3
3/22/2021	B14	2020	533	510	8	97.2	114	0							B3
3/22/2021	B12	2020	533	290	5	55.3	134	0							B3, B6
3/22/2021	B16	2020	532	411	12	79.5	141	0							B6
3/22/2021	B13	2020	533	499	9	95.3	117	0							B6, B8
3/24/2021	B19	2020	533	455	28	90.6	153	0							B8
3/24/2021	B17	2020	532	510	3	96.4	150	0							B8, B7
3/24/2021	B20	2020	525	472	12	92.2	133	0							B7, B4
3/24/2021	B18	2020	532	452	13	87.4	149	0							B4
3/25/2021	B22	2020	530	476	30	95.5	135	0							B4, B13
3/29/2021	B23	2020	533	440	15	85.4	143	0							B13
3/29/2021	B24	2020	1,689	1,245	95	79.3	102	0							B14, B10, B13, B9
3/30/2021	A1	2020	6,995	6,162	41	88.7	125	0							B9, B12, B11, B15, B16, B23, B24, B22, B20
March 2021 Totals		**2020**	**21,105**	**18,158**	**472**	**88.3**									
4/6/2021	A4	2020	6,980	5,225	55	75.6	124	0							B20, B19, B21, B17, P21, P20, P19
4/12/2021	P3	2019	600	530	9	89.8	220	530							Williamson River (315), USGS/Klamath Tribes Transfer (215)
4/20/2022	P7	2020	800	593	28	77.6	142	0							P18
4/20/2021	P18	2020	833	706	32	88.6	137	0							P18, P19
4/22/2022	P12	2020	1,365	1,338	30	100.2	142	1338							Gerber Reservoir Net Pen
4/22/2021	P14	2020	916	898	0	98.0	134	898							Gerber Reservoir Net Pen
4/22/2021	P16	2019	350		0		230	250							Gerber Reservoir Net Pen, P0
4/26/2021	A3	2019	5120	4,908	16	96.2	195	4908							Williamson River (4908)
April 2021 Totals		**2019**	**6,070**	**5,438**	**25**	**90.0**									
		2020	**10,894**	**8,760**	**145**	**81.7**									
5/3/2021	P4	2020	800	609	8	77.1	151	268							P18, Upper Klamath Lake Net Pen
5/3/2021	P13	2020	1360	1267	31	95.4	153	1267							Upper Klamath Lake Net Pen
5/4/2021	P15	2020	894	836	4	94.0	141	836							Upper Klamath Lake Net Pen
5/4/2021	P17	2019	350		2		230	250							Upper Klamath Lake Net Pen, P0
May 2021 Totals		**2019**	**350**	**0**	**2**	**0.0**									
		2020	**3054**	**2712**	**43**	**88.8**									
Spring 2021 Overall		**2017**	**25**	**0**	**0**	**0.0**									
		2019	**8,964**	**7937**	**31**	**88.5**									
		2020	**35,053**	**29630**	**660**	**84.5**									
		Grand Total	**44042**	**37567**	**691**	**85.3**									

PIT Tag and Density Study

During the winter of the fiscal year, a brief proposal was submitted for funding to purchase PIT tags for tag effect study; this was part of a system wide proposal through the Fish Technology Centers whereby PIT tag related research was being conducted on a variety of species across the nation. While our proposal had just a modest request for funding, the scope of our proposed project was much larger than many of the projects with much larger budget requests, as we were just looking to cover the supply cost; therefore, we needed to dial back the scope of the project to look solely at one year class of sucker rather than two. Once we knew that our proposal was scoped correctly and approved for funding, we made plans to harvest CY2020 ponds and stock them accordingly during mid-March through early April. The overarching purpose of the study was aimed at assessing whether PIT tagging suckers earlier in the production cycle would have a deleterious effect on production metrics, like growth and survival. A secondary purpose of the study was to assess if growth and survival is significantly impacted by common rearing densities that ranged from 15-30,000 fish/acre. This was assessed by having fish stocked in triplicates between four different densities of both tagged and untagged fish stocked in a weekly block replicate for three weeks. The fish were kept in production for approximately 6 months and harvested in October 2021, over the course of three consecutive weeks for each of the respective replicate blocks. For more information, please see **Tables 5**, **6**, and **7**, that describes how each of the B-series ponds was stocked in a randomized order.

Table 5 – Summary of PIT Tag Study Pond stockings in Replicate Block 1 during week of March 22, 2021.

Pond	Start (#)	Av. TL (mm)	Av. W (g/fish)	Treatment (#/Acre)	Tagged vs. Untagged	Replicate Block
B2	450	117	16.4	15,000	Tagged	1
B5	750	116	15.8	25,000	Untagged	1
B1	450	118	15.7	15,000	Untagged	1
B6	750	135	23.7	25,000	Tagged	1
B3	600	117	15.4	20,000	Untagged	1
B8	900	138	25.3	30,000	Tagged	1
B7	900	141	27.2	30,000	Untagged	1
B4	600	149	31.1	20,000	Tagged	1
Total	**5,400**					

Table 6 – Summary of PIT Tag Study Pond stockings in Replicate Block 2 during week of March 29, 2021.

Pond	Start (#)	Av. TL (mm)	Av. W (g/fish)	Treatment (#/Acre)	Tagged vs. Untagged	Replicate Block
B14	750	102	11.7	25,000	Untagged	2
B10	450	102	11.8	15,000	Untagged	2
B13	750	139	24.8	25,000	Tagged	2
B9	450	122	18.7	15,000	Tagged	2
B12	600	124	19.3	20,000	Untagged	2
B11	600	125	18.8	20,000	Tagged	2
B15	900	126	19.6	30,000	Tagged	2
B16	900	125	19.3	30,000	Untagged	2
Total	**5,400**					

Table 7 – Summary of PIT Tag Study Pond stockings in Replicate Block 3 during week of April 5, 2021.

Pond	Start (#)	Av. TL (mm)	Av. W (g/fish)	Treatment (#/Acre)	Tagged vs. Untagged	Replicate Block
B23	900	126	18.7	30,000	Tagged	3
B24	900	124	18.4	30,000	Untagged	3
B22	750	124	18.7	25,000	Untagged	3
B20	600	116	15.6	20,000	Untagged	3
B19	600	113	14.8	20,000	Tagged	3
B21	750	113	14.7	25,000	Tagged	3
B17	450	113	14.4	15,000	Tagged	3
B18	450	113	14.8	15,000	Untagged	3
Total	**5,400**					

Wild and Captive Shortnose Sucker Spawning

Recent sample count data over the winter of 2021 showed that the CY2017 brood fish, and possibly the CY2018 lot as well, might be large enough to try to spawn experimentally during the spring. Water temperature profiles were monitored in the rearing ponds and shade cloth was placed on a couple of ponds to try to delay warming trends to identify if and when fish would ripen and produce viable gametes. Fish movement trends in the Williamson River, as well as water temperature data, both provided by the USGS, was also monitored with the goal to experimentally spawn wild Shortnose Sucker at the streamside of the Sprague River for gamete collection. The goal was to try to develop spawning and incubation protocols in the greenhouse, as well as to send fertilized Shortnose Sucker gametes to the Southwest Native Aquatic Resources and Recovery Center (SNARRC), in Dexter, New Mexico, to provide specimens for the development of a larval identification key for the species.

To reach the objective of collecting wild gametes, staff began doing night surveys in the Sprague River in late April and early May, assisted by the Klamath Tribes, to capture and hold ripe Shortnose Sucker for artificial spawning and collection of fertilized eggs the following morning. The Klamath Tribes staff collected these eggs for incubation and production purposes for their upcoming rearing season. On the night of May 5th and morning of the 6th, our staff collected one female and two male Shortnose Sucker in the lower Sprague River, spawned them with several crosses, gave most of the eggs to the Klamath Tribes staff, but sent some to the hatchery for disinfection and incubation and forwarded approximately 6,000 fertilized eggs to the SNARRC, via an overnight FedEx shipment. The shipment was successful, and the hatch rate was over 80% for the larval development identification work. The eggs incubated at the hatchery developed and eyed-up well, but unfortunately, all perished during the anticipated hatch. We concluded at the time that this may have been due to the unstable fluctuations in water temperature common in the building or complications with rolling eggs in hatching jars possibly having too much agitation for the fry.

To try and spawn the captively reared fish, staff were assisted by Javier Linares, the Fish and Aquatic Conservation Assistant Fisheries Supervisor, who has a strong background in reproductive physiology in fish. Javier assisted greatly in sampling the CY2017 and CY2018 stock periodically in April and May. Javier also took biopsies of eggs from the fish periodically and documented the growth and development of the sucker eggs over time. Then, on May 13th, after administering human chorionic gonadotrophin (hCG) doses to selected Shortnose Sucker from the CY2017 lot, staff were able to successfully spawn one female and fertilize the eggs for incubation and to document egg development. Milt was also collected from over 30 males to check motility rates and to send milt preserved in extender solutions to the Warm Springs National Fish Hatchery and Technology Center, in Warm Springs, Georgia, for cryopreservation and motility checks post thawing; some of this milt is still banked for future use if needed in the future.

With the total loss of the wild spawned eggs during hatch, Javier Linares and rearing staff, set up a small recirculation system to control wide thermal fluctuations while incubating the captively spawned eggs in borrowed heath trays from Coleman National Fish Hatchery, in Anderson, California. Even with tighter temperature control of the incubation water, we observed the same thing with the wild spawned eggs, proper development but a weak hatch success and total losses within days of hatch. We are not sure what the cause of mortality of the fry was in this case, as it was not likely temperature related. It should be noted that the Klamath Tribes staff successfully hatched their eggs in jars and have a much more stable water supply, in terms of temperature fluctuations, than we do. Also, the SNARRC staff have a stable water supply and successfully hatched their eggs in heath tray incubation stacks. However, there may be a strong possibility that our unique water chemistry from our geothermal supply may pose limiting factors on incubation success, such as low hardness and alkalinity. Also, perhaps some of the dissolved metals present in the supply could prohibit successful incubation and hatching. It has been suggested that we try augmentation of the water supply or to try another water source altogether solely for incubation. This will be further evaluated during the spring of 2022, perhaps incubating eggs in several different water supplies simultaneously, such as disinfected Sprague River water or augmenting the hatchery supply with

dissolved calcium chloride to increase the hardness. At the least, we are happy to see some of our captive broodstock maturing and showing promise to perform larger scale, experimental, spawning efforts in the upcoming years. The hope is that we will continue to have wild larval suckers to collect each year perpetually, but since a wide spread senescence event is anticipated in less than 5-10 years, as the wild adult Shortnose Sucker population is already at its known anticipated life expectancy, it is a strong possibility that we may need to utilize the captive broodstock for production purposes in the future, thus meriting experimental rigors now to fully understand what techniques may be needed.

Wild Larval Collection

The wild larval collection efforts began with close coordination with the Klamath Tribes Hatchery staff in March and April of 2021, working out a collaborative approach to collection efforts. The goal initially was to use smaller drift nets deployed from a boat, as well as larger drift nets suspended from the Williamson River bridge on Modoc Road to passively collect drifting larval suckers and then split the numbers between both hatcheries each day. However, early on, during the first week of May 2021, it was determined that the low water flows did not effectively capture larval suckers using these methods. After the first week's efforts amounting to less than 100 fish, it was decided that an active approach would be needed to effectively capture the numbers we had hoped to collect, which was going to be 80-100,000, as an exercise to see if our staff could successfully collect the numbers needed for the full hatchery build out production goals.

Thereafter, using active dip net techniques, both from wading the shoreline and from a small craft steered near shoreline vegetation, we began collecting thousands of fish each day until we started nearing our collection goal of 100,000 fish. Thereafter, larval fish were transported back to the hatchery twice each day, once at noon by a morning pickup runner, and then again at 2-3PM by the field crew returning with more fish from the afternoon effort. Fish were then subsequently hand counted into tanks and then given four days of prophylactic salt and formalin treatments to remove ectoparasites. During the early rearing activities, fish were fed a diet of Artemia nauplii four times daily and then transitioned onto dry diets of Otihime and Aquamax mash. Unfortunately, in mid-May, we started having significant gut impaction issues from the fish ingesting unhatched Artemia cysts, which resulted in significant mortalities of fry. We also had a Costia outbreak during the middle of June that resulted in a significant loss of fry as well. Of the 106,710 larval fish collected, we only ended up inventorying and ponding 53,518 fish, for an overall survival of approximately 50.2%. While the fish ranged in size from 20-25mm during initial stocking of ponds in July, sampling efforts conducted in August and September revealed that the CY2021 fish had reached sizes ranging from 80-100mm by the conclusion of the fiscal year. Please see **Figure 3** for more information on the larval collection numbers during May and June 2021.

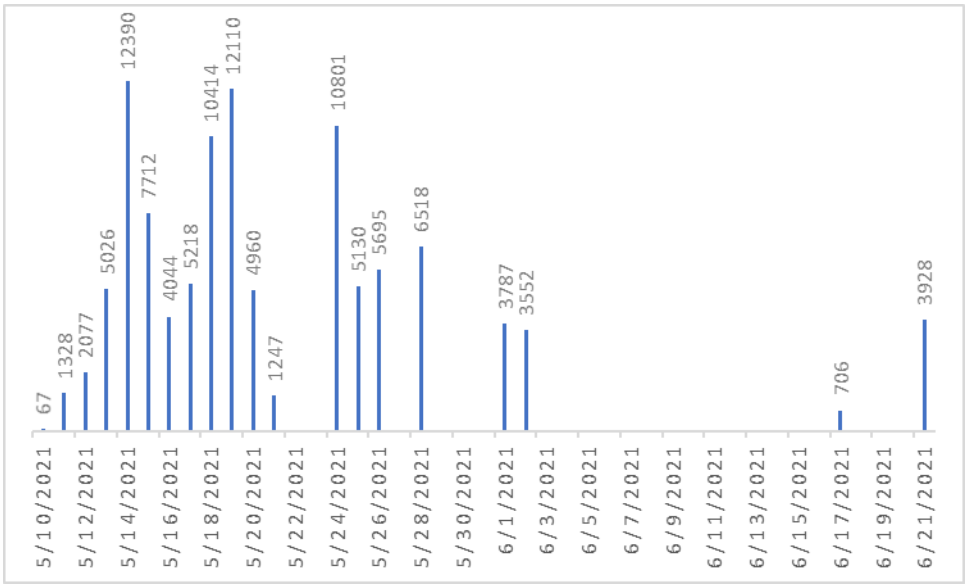

Figure 3 – Total number of larval suckers collected each day from the Williamson River in 2021. The total effort resulted in an overall collection of 106,720 larval suckers.

Net Pen Activities

Throughout the 2020 fiscal year and through nearly the first half of the 2021 fiscal year, staff worked with the contractor who built our first net pens system used in Upper Klamath Lake, Pacific Netting, to work through various delays and material shortages as suggested modifications in design be incorporated into the long awaited net pen system for Gerber Reservoir. As the spring of 2021 was well underway, it seemed promising that Pacific Netting would have the project completed and ready for use by April or May. In preparation for stocking the net pens, staff tagged over 5,000 of the largest CY2020 and approximately 700 larger CY2019 fish for use in extended rearing efforts in the two lakes for the summer. The initial plan was to stock each of the two nets at each lake with two different densities of fish, one net with 1,000 fish and the other with 1,500 fish, with each net being stocked with 10% CY2019 fish, so 100 in one net and 150 in the other respectively, and 90% CY2020 fish, with one net with 900 fish and 1350 in the other respectively. This would allow us to see if there was a difference in growth and/or survival among the two different pens and even year classes of fish at each lake.

In early April, Pacific Netting worked with our staff to get the new net pen delivered and put together onsite at Gerber Reservoir. Thereafter, the staff were trained on how to adjust the buoyancy to submerge the net pen for winter storage purposes. Then, in late April, staff got the net pen at Gerber Reservoir finalized and ready for use. Then, on April 22, staff began to harvest the three ponds that temporarily held fish tagged in early March, to stock the fish directly to the Gerber Reservoir net pen. Fish were scanned for the presence of a PIT tag, enumerated, and transported to the lake in two separate stocking tank runs, one for each net pen, and then loaded and boated across the lake to their respective net pen. The same basic operations ensued in early May for the Upper Klamath Lake net pen, the pens were transported to the summer location, anchored in place, netting set and secured; additionally, modifications were made to this net pen to extend the top netting off the water to help prevent bird predation. Thereafter, the staff harvested the temporary holding ponds with tagged fish and stocked these nets in a similar fashion as earlier described.

Monitoring of the net pens entailed either weekly or biweekly checks to the net pens to observe any odd fish behavior or mortalities present. There were also wagon wheel PIT tag array antennas in each net pen to monitor the population in each net and this data was downloaded periodically when batteries needed to be changed. And daily water quality was monitored at the Gerber Reservoir net pen by means of a sonde that was downloaded periodically when batteries needed changing; the water quality of the Upper Klamath Lake net pen was taken from the USGS monitoring station at Rattlesnake Point, just a few hundred meters north of the net pen.

As the summer growing season progressed, it became evident that the water levels of the Gerber net pen would not be maintained throughout the summer months and that the selected site would likely be dry by about early August. Armed with this information, staff made plans to do an emergency early harvest in mid-July and then stock these fish into refuge areas of Upper Klamath Lake, namely Odessa Creek. While all the fish showed signs of good growth, adding nearly 30-40mm in size, the CY2020 fish did not reach the anticipated target size due to the short amount of time in the net pens . However, the overall survival in Gerber net pens ranged between 97.2% and 86.7% for the CY2019 and CY2020 year classes, respectively. An early harvest was also needed in the Upper Klamath Lake net pen. A largescale mortality event was noted in early August during a normal weekly check by staff and this was traced back to several consecutive water quality events that led to anoxic conditions in the early morning hours near that USGS monitoring station. Thereafter, the staff mobilized for another early, emergency, harvest of these net pens and stocking fish to Odessa Creek, anticipating that at least two more months of poor water quality seemed imminent and that we might lose all the fish if left throughout the growing season. While survival was 0.0% in the north pen for both year classes, the survival was between 34.8% and 23.1% for the CY2019 and CY2020 year classes respectively in the south pen. The growth was very good among the fish that survived and most of the CY2020 fish were able to hit the target size, despite the shortened growing season. For more information on the size of the fish stocked from each net pen and the survival in each net pen, please see **Table 2** and **8**.

While USFWS net pen operations in the past have had very poor success, with nearly total losses during summer rearing in Upper Klamath Lake, we believe that these operations show promise by taking advantage of the good growing conditions present in both Gerber Reservoir and Upper Klamath Lake, provided that the nets are placed in locations that will not go dry or have serious water quality issues. With ongoing drought conditions present in the basin, the former may continue to be an issue for the Gerber Reservoir net pen in the coming years. Staff are investigating potential new locations in either Upper Klamath Lake or Agency Lake that might have better water quality conditions through the summer months for use in fiscal year 2022.

Table 8 – Net pen summary of fish stocked and recovered from extended growout in Gerber Reservoir and Upper Klamath Lake. GERW and GERE refers to the net pens oriented west and east respectively in Gerber Reservoir. UKLS and UKLN refers to the net pens oriented south and north respectively in Upper Klamath Lake. CY refers to the collection year class.

Gerber Reservoir Net Pen				**Upper Klamath Lake Net Pen**			
Net / CY	**# Stocked**	**# Harvested**	**% Survival**	**Net / CY**	**# Stocked**	**# Harvested**	**% Survival**
GERW 2019	150	146	97.3	UKLS 2019	150	87	58.0
GERW 2020	1331	1105	83.0	UKLS 2020	1350	519	38.4
GERW Total	1481	1251	84.5	UKLS Total	1500	606	40.4
GERE 2019	100	97	97.0	UKLN 2019	100	0	0.0
GERE 2020	898	827	92.1	UKLN 2020	900	0	0.0
GERE Total	998	924	92.6	UKLN Total	1000	0	0.0
Overall 2019	**250**	**243**	**97.2**	**Overall 2019**	**250**	**87**	**34.8**
Overall 2020	**2229**	**1932**	**86.7**	**Overall 2020**	**2250**	**519**	**23.1**
Overall Total	**2479**	**2175**	**87.7**	**Overall Total**	**2500**	**606**	**24.2**

Infrastructure and Equipment Updates

During the summer of 2020, we made larger contract purchases to procure a Bobcat skid steer with various implements and two new electric Carryall 700 carts for use on the hatchery. We also made some smaller micro purchases of various gear, such as four large 600 GPM trash pumps and hoses, smaller 40GPM submersible pumps, new dip nets and brooms, and some new seines for harvesting ponds more efficiently. In addition, we purchased twelve new fiberglass circular tanks to expand greenhouse larval rearing capacity and a metal. Later in the summer/fall, we purchased a 24'x40' metal building kit to improve the storage capacity onsite in the near future. While many of the micro purchases made arrived for use before the end of the 2020 fiscal year, many of the larger contract items did not show up until much later during the 2021 fiscal year.

Once we completed pond harvest, tagging, and stocking operations for the fall/winter of 2020, we started modifying some of the plumbing and tank configurations within the greenhouse. This entailed upgrading the size of supply lines running in the middle of the building to accommodate more flow, including larger supply and drain lines. Staff also moved the older 30-gallon aquaria out of the greenhouse, rearranged eleven of the current 150-gallon fiberglass tanks, and made space to install two additional 60-gallon and twelve additional 90-gallon circular tanks. This work was essentially complete by the end of the 2020 calendar year. Thereafter, we began making individual siphon wands, tank brushes, and nets for each tank system to help improve biosecurity measures throughout the spring in preparation for the 2022 larval rearing season.

In December 2020, we received the two electric Carryall 700 carts, which we began to use immediately around the hatchery for feeding, moving equipment around, and towing transfer tank trailers when harvesting ponds and moving fish on station. Later in April, we received our Bobcat T-770 tracked skid steer with a light materials bucket and a smaller digging bucket; however, none of the other implements arrived at this time. Then, in August, we finally got most of the other implements for our skid steer, including a hydraulic broom, a mower deck, a roller compacter, an auger with several different sized bits, and a backhoe attachment; unfortunately, we did not get the forks attachment that we have needed, nor a digging bucket with the backhoe attachment, rendering it useless to date, and these items still have not arrived due to supply chain delays.

In February 2020, the staff purchased and installed two carport structures behind the greenhouse to keep our hatchery gear out of the elements for safe keeping. Shortly thereafter, we received the metal building kit that we ordered the previous fall, and it was deemed appropriate to wait on the installation of this until we got closer to the signing of the lease for the property acquisition for the hatchery site, as this had been delayed to an unknown timeframe. Later in August, there were strong indications that the 30-year lease would be signed in the coming month or two, so staff got busy prepping the site of the new metal building installation. Following site grading and layout, the staff excavated the footer trench, built and installed concrete forms, poured a 12"x 24" concrete footer and driveway pad, installed drain lines on the inside of the footer perimeter and through a preinstalled footer penetration outside, installed geotech lining and gravel inside the entire building footprint, and erected the metal structure and paneling. This initial work was completed in early September. Shortly thereafter, we contracted the installation of an insulated 8' x 10' roll up garage door to close in the structure. This building's first use would be to store all of the new equipment we had purchased to date, the skid steer, the electric carts, and our mower out of the elements and secured in our first enclosed, hard-walled, building. The ultimate purpose of this new building will be to develop it into a dedicated quarantine building for rehabilitating salvaged suckers within the basin, with the goal to have power and water installations complete by July or August of 2022 to use for potential salvage operations with suckers from USBR.

Lastly, as was mentioned before, there were delays during the fiscal year in the signing of the lease agreement with Mr. Ron Barnes to build the new hatchery. While the lease was tentatively to be signed in January 2021, it did not actually get signed until the early part of fiscal year 2022. While we did not know that it would take this long at the time, we went ahead with Phase 1 construction planning to the point of getting the 100% design package finished with contracted engineers, as well as a solicitation package ready to advertise and award in early 2022.

We also worked concurrently on completing the Phase 2 construction package to the point of completing the 35% design concept. However, both efforts were placed on hold once it was apparent that we could not hit contracting deadlines in May and June of 2021. It was determined that we would resume work on the Phase 1 solicitation package and completing the Phase 2 conceptual plans sometime after the lease agreement was signed and finalized, with the anticipated staring time sometime in the winter of 2021/2022.