

## Klamath River Fall Chinook Salmon Age-Specific Escapement, River Harvest, and Run Size Estimates, 2019 Run

Klamath River Technical Team  
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### Summary

The number of Klamath River fall Chinook Salmon returning to the Klamath River Basin (Basin) in 2019 was estimated to be:

<i>Age</i>	<i>Run Size</i>	
	<i>Number</i>	<i>Proportion</i>
2	9,991	0.21
3	30,304	0.64
4	6,867	0.15
5	99	0.00
<b>Total</b>	<b>47,261</b>	<b>1.00</b>

Preseason forecasts of the number of fall Chinook Salmon adults returning to the Basin and the corresponding post-season estimates are:

<i>Sector</i>	<i>Adults</i>		
	<i>Preseason Forecast</i>	<i>Postseason Estimate</i>	<i>Pre / Post</i>
<i>Run Size</i>	97,900	37,300	2.62
<i>Fishery Mortality</i>			
Tribal Harvest	32,400	6,000	5.40
Recreational Harvest	7,600	5,400	1.41
Drop-off Mortality	3,000	500	6.00
	43,000	11,900	3.61
<i>Escapement</i>			
Hatchery Spawners	14,200	5,200	2.73
Natural Area Spawners	40,700	20,200	2.01
	54,900	25,400	2.16

## Introduction

This report describes the data and methods used by the Klamath River Technical Team (KRTT) to estimate age-specific numbers of fall Chinook Salmon returning to the Basin in 2019. The estimates provided in this report are consistent with the Klamath Basin Megatable (CDFW 2020) and with the 2020 forecast of ocean stock abundance (KRTT 2020).

Age-specific escapement estimates for 2019 and previous years, coupled with the coded-wire tag (CWT) recovery data from Basin hatchery stocks, allow for a cohort reconstruction of the hatchery and natural components of Klamath River fall Chinook Salmon (Goldwasser et al. 2001, Mohr 2006a, KRTT 2020). Cohort reconstruction enables forecasts to be developed for the current year's ocean stock abundance, ocean fishery contact rates, and percent of spawners expected in natural areas (KRTT 2020). These forecasts are necessary inputs to the Klamath Ocean Harvest Model (Mohr 2006b), the model used by the Pacific Fishery Management Council to forecast the effect of fisheries on Klamath River fall Chinook Salmon.

## Methods

The KRTT obtained estimates of abundance and age composition separately for each sector of harvest and escapement. Random and nonrandom sampling methods of various types were used throughout the Basin (Table 1) to estimate the numbers of fall Chinook Salmon and to obtain the data from which the Klamath Basin Megatable totals and estimates of age composition were derived. The KRTT relied on surrogate data for estimating age composition where the sample of scales was insufficient, or altogether lacking, within a particular sector.

Estimates of age composition were based on random samples of scales (Table 2) whenever possible. Generally, each scale is aged independently by two trained readers. In cases of disagreement, a third read is used to arbitrate. Statistical methods (Cook and Lord 1978, Cook 1983, Kimura and Chikuni 1987) were used to correct the reader-assigned age composition estimates for potential bias based on the known-age vs. read-age validation matrices. The method used to combine the random sample's known ages (for CWT fish) and unknown read ages for estimation of the escapement or harvest age composition is described in Appendix A.

For cases in which scales were believed to be non-representative of the age-2 component, the KRTT relied on analysis of length-frequency histograms. In these cases, all fish less than or equal to a given fork-length "cutoff" were assumed to be age-2, and all fish greater than the cutoff length were assumed to be adults. The cutoff value varied by sector, and was based on location of the length-frequency nadir and, if appropriate, the length-frequency of known-age fish. As before, scales were used to estimate the age composition of adults (Appendix A).

An indirect method was used to estimate age composition for natural spawners in the Trinity River above the Willow Creek Weir (WCW). Age-specific numbers of fall Chinook Salmon that immigrated above WCW were estimated by applying the age composition from scales collected at the weir to the estimate of total abundance above the weir. Next, the age composition of returns to Trinity River Hatchery and the harvest above WCW were estimated. The age composition of natural spawners above the weir was then estimated as the age-specific abundances above the WCW, minus the age-specific hatchery and harvest totals.

In 2019, as in 2018, an opportunistic redd survey was performed on the mainstem Klamath River from Persido Bar to Big Bar, reaches where surveys generally do not occur. A total of 76 redds were identified in this survey in 2019. After substantial discussion, the KRTT decided to be

consistent with the decision made in 2018 to not include the results of this survey in the run size estimate. The KRTT noted that inclusion of this survey would not be consistent with the set of surveys that have contributed to the long term Klamath River fall Chinook dataset that has been used to inform the estimation of biological reference points and parameterize the Klamath Ocean Harvest Model. However, the KRTT appreciates the effort put forth to conduct this survey and is open to potentially including estimates from this area in the future.

The specific protocols used to develop estimates of age composition for each sector are provided in Table 3. A summary of the KRTT methods specific to each sector is given in Appendix B for the Klamath River and Appendix C for the Trinity River.

## Results

A total of 6,730 scales from 16 different sectors were aged for this analysis (Table 2). Of these, 537 were from known-age CWT fish. Known-age scales provide a direct check, or “validation”, of accuracy of the scale-based age estimates (Table 4, Appendices D and E). Overall, the scale-based ages were generally accurate. Accuracy within the Trinity Basin was 100% for age-2 fish, 97% for age-3 fish, and 90% for age-4 fish. Accuracy within the Klamath River Basin was 100% for age-2 fish, 94% for age-3 fish, and 81% for age-4 fish. The age-5 component of the run was very small in 2019 and no known-age-5 fish were available for the scale validation matrices (Table 4). As a result, accuracy could not be assessed for the age-5 component of the 2019 run. The statistical bias-adjustment methods employed are intended to correct for scale-reading bias, but the methods assume that the known-age versus read-age validation matrices are themselves well estimated (Kimura and Chikuni 1987).

Table 5 presents estimates of age-specific returns to Basin hatcheries and spawning grounds, as well as Basin harvest by tribal and recreational fisheries and the drop-off mortality associated with those fisheries. Table 6 displays the Table 5 estimates as proportions. Calculations underlying the results summarized in Table 5 are presented in Appendix F.

The final estimates of the 2018 Klamath Basin age composition are presented in Appendix G.

## List of Acronyms and Abbreviations

ad-clipped	adipose fin removed
CDFW	California Department of Fish and Wildlife
CWT	coded-wire tag
EST	Klamath River estuary
FL	fork length
HVT	Hoopa Valley Tribe
IGH	Iron Gate Hatchery
KRTAT	Klamath River Technical Advisory Team
KRTT	Klamath River Technical Team
KT	Karuk Tribe
LRC	Lower Klamath River Creel
MKWC	Mid-Klamath Watershed Council
M&U	Klamath River below Weitchpec: “middle” section (Hwy 101–Surpur Cr.) and “upper” section (Surpur Cr.—Trinity River)
NCRC	Northern California Resource Center
QVIR	Quartz Valley Indian Reservation
SCS	Siskiyou County Schools
SRCD	Siskiyou Resource Conservation District
SRRC	Salmon River Restoration Council
TRH	Trinity River Hatchery

UR TRIBS	Upper Klamath River Tributaries
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WCW	Willow Creek Weir
WSP	AmeriCorps Watershed Stewards Program
YT	Yurok Tribe
YTFP	Yurok Tribal Fisheries Program

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Table 1. Estimation and sampling methods used for the 2019 Klamath River fall Chinook run assessment.

Sampling Location	Estimation and Sampling Methods	Agency
<b>Hatchery Spawners</b>		
Iron Gate Hatchery (IGH)	Direct count. All fish examined for fin-clips, tags, and marks. Bio-samples <sup>a</sup> collected from a systematic random sample of 10% of the fish. Additionally, all ad-clipped fish were bio-sampled.	CDFW, WSP
Trinity River Hatchery (TRH)	Direct count. All fish examined for fin-clips, tags, and marks. Bio-samples collected from a systematic random sample of 20% of the fish. Additional non-random ad-clipped fish were bio-sampled.	CDFW, HVT
<b>Natural Spawners</b>		
Salmon River Basin	Redd surveys of the upper and lower mainstem and tributaries, including Wooley Creek. Total redd count in Wooley Creek was adjusted to remove redds thought to be attributed to spring Chinook Salmon. Total run based on expanded redd count and last day live adults ( $2 \times \text{total redd count} + \text{last day live adults} / (1 - \text{proportion of jacks})$ ). Bio-samples collected from all carcasses recovered.	CDFW, USFS, USFWS, KT, SRRC, SCS, WSP, MKWC, NCRC
Scott River Basin	Combination SONAR and video count above weir at river mile 18 and redd survey below the weir. Total run based on ARIS acoustic and video count through the weir and redd survey (Total run below the weir = $(2 \times \text{total redd count}) / (1 - \text{proportion jacks})$ ). Bio-samples collected from all carcasses recovered.	CDFW, QVIR, USFS, KT, NCRC, SRCD, WSP
Shasta River Basin	Video count above weir. Bio-samples collected from all carcasses upstream of video weir site, a 20% systematic random sample of carcasses stranded on weir, and all fish captured in a trap immediately upstream of video chute. No ad-clipped fish were recovered.	CDFW, WSP
Bogus Creek Basin	Video count above weir and twice weekly direct carcass count below weir. Bio-samples collected from all carcasses observed during surveys above and below weir, including all ad-clipped fish.	CDFW, WSP
Klamath River mainstem (IGH to Shasta R.)	Hierarchical latent variable model from weekly mark-recapture carcass surveys. Bio-samples collected from all fresh carcasses encountered.	USFWS, YT
Klamath River mainstem (Shasta R. to Wingate Bar)	Weekly redd surveys. Total run = $(2 \times \text{total redd count}) / (1 - \text{proportion jacks})$ . Jacks estimated from Klamath River mainstem (IGH to Shasta R.) scale-age data.	USFWS, KT
Klamath Tributaries above Trinity	Periodic redd surveys. Total run = $(2 \times \text{total redd count} + \text{last day live adults}) / (1 - \text{proportion jacks})$ . Jacks estimated from Klamath tributary scale-age data. Bio-samples collected from all carcasses recovered.	USFS, CDFW, KT, YT, MKWC, WSP
Blue Creek	Total estimated using the maximum count from dive surveys conducted between 23 October and 11 December.	YT
Trinity River (mainstem above WCW)	Mark-recapture (unstratified Petersen); marks applied at WCW and recovered at TRH. All fish bio-sampled and scales collected from every other Chinook in good condition. Natural area spawning escapement estimated by subtracting age-specific estimates of hatchery returns and recreational harvest above WCW from age-specific estimates of the total run upstream of WCW.	CDFW, HVT
Trinity River (mainstem below WCW)	Bi-weekly redd surveys. Total run = $(2 \times \text{total redd count}) / (1 - \text{proportion jacks})$ using proportion of jacks in natural area spawning in Trinity River mainstem above WCW.	HVT, USFWS
Trinity Tributaries (above Reservation; below WCW)	Periodic redd surveys. Total run = $(2 \times \text{total redd count} + \text{last day live adults}) / (1 - \text{proportion jacks})$ using proportion of jacks in natural area spawning in Trinity River mainstem above WCW.	CDFW, USFS, WSP
Hoopa Reservation Tributaries	Periodic redd surveys. Total run = $(2 \times \text{total redd count}) / (1 - \text{proportion jacks})$ using proportion of jacks in natural area spawning in Trinity River mainstem above WCW.	HVT
<b>Recreational Harvest</b>		
Klamath River (below Hwy 101 bridge)	Jack and adult estimates based on access point and roving creel survey during 3 randomly selected days per Julian week through JW 40, then 2 days per week after JW 40. Bio-samples collected during angler interviews.	CDFW
Klamath River (Hwy 101 to Weitchpec)	Jack and adult estimates based on access point and roving creel survey during 3 randomly selected days per Julian week through JW 40, then 2 days per week after JW 40. Bio-samples collected during angler interviews.	CDFW
Klamath River (Weitchpec to IGH)	No survey. Upper Klamath adult harvest estimated using the ratio of lower river to total adult river harvest during the years 1999-2002 (Appendix B). Jacks estimated from IGH, Klamath mainstem, Shasta River, and Bogus Creek weighted average age compositions.	CDFW
Trinity River Basin (above WCW)	Jack and adult harvest estimates based on estimated harvest rates from angler return of reward and non-reward tags applied at WCW.	CDFW, HVT
Trinity River Basin (below WCW)	Roving access creel survey during three randomly selected days per statistical week stratified by weekdays (M-Th) and weekend (F-Su) days (1 weekday and 2 weekend). Bio-samples collected during angler interviews.	HVT
<b>Tribal Harvest</b>		
Klamath River (below Hwy 101)	Daily harvest estimates based on effort and catch-per-effort surveys. Bio-samples collected during harvest surveys.	YT
Klamath River (Hwy 101 to Trinity mouth)	Daily harvest estimates based on effort and catch-per-effort surveys. Bio-samples collected during harvest surveys.	YT
Trinity River (net and hook-and-line)	Roving effort and catch-per-effort surveys during four randomly selected days per statistical week for the net fishery, and three randomly selected days for the hook-and-line fishery, plus census count of hook-and-line and net fishery downstream of harvest weir to Tish Tang Creek. Bio-samples collected during harvest surveys.	HVT
Trinity River (harvest weir)	Direct count of all harvested fish. Bio-samples collected from all harvested fish.	HVT
<b>Fishery Dropoff Mortality</b>		
Recreational Angling Dropoff Mortality 2.04%	Not directly estimated. Assumed rate relative to fishery impacts = .02; relative to fishery harvest = $.02 / (1 - .02)$ .	KRTAT
Tribal Net Dropoff Mortality 8.7%	Not directly estimated. Assumed rate relative to fishery impacts = .08; relative to fishery harvest = $.08 / (1 - .08)$ .	KRTAT

<sup>a</sup> Bio-samples generally includes: fork length, scale, sex, tags or marks, and CWT recovery from dead ad-clipped fish.

Table 2. Scale sampling locations and numbers of scales collected for the 2019 Klamath Basin fall Chinook age-composition assessment.

Sampling Location	Aged			Total Collected <sup>c/</sup>	Agency
	Unknown-age <sup>a/</sup>	Known-age <sup>b/</sup>	Total		
<b><u>Hatchery Spawners</u></b>					
Iron Gate Hatchery (IGH)	307	35	342	397	CDFW
Trinity River Hatchery (TRH)	227	114	341	345	HVT
<b><u>Natural Spawners</u></b>					
Salmon River	144	0	144	148	CDFW/USFS
Scott River Carcass Survey <sup>d/</sup>	325	0	325	329	CDFW
Shasta River Carcass Survey <sup>e/</sup>	233	0	233	273	CDFW
Bogus Creek	484	26	510	525	CDFW
Klamath River mainstem	325	15	340	348	USFWS
Upper Klamath River tributaries	27	0	27	29	USFS
Blue Creek Dive Survey	0	0	0	2	YT
Willow Creek Weir	732	21	753	766	HVT
Lower Trinity River Carcass Survey	0	0	0	0	HVT/USFWS
Lower Trinity River tributaries	0	0	0	2	HVT/USFS
<b><u>Recreational Harvest</u></b>					
Lower Klamath River Creel	1,146	71	1,217	1,213	CDFW
Lower Trinity River Creel	79	15	94	95	HVT
<b><u>Tribal Harvest</u></b>					
Klamath River (below Hwy 101)	731	60	791	826	YT
Klamath River (Hwy 101 to Trinity R)	213	8	221	232	YT
Trinity River (Hoopa Reservation)	1,004	172	1,176	1,200	HVT
<b>TOTAL</b>	<b>5,977</b>	<b>537</b>	<b>6,514</b>	<b>6,730</b>	

a/ Scales from non-ad-clipped fish and ad-clipped fish without CWTs, mounted and read.

b/ Scales from all mounted and aged ad-clipped CWT fish; non-random CWT fish used for validation but not age composition.

c/ Scales collected from the area.

d/ Weir washback collected scales were read but not used.

e/ Spawning ground survey and weir washback collected scales were read but not used. Scales from the trap were used.

Table 3. Age-composition methods used for the 2019 Klamath Basin fall Chinook run assessment.

Sampling Location	Age Composition Method
<b><u>Hatchery Spawners</u></b>	
Iron Gate Hatchery (IGH)	Jack/adult structure from scale-age analysis.
Trinity River Hatchery (TRH)	Jack/adult structure from scale-age analysis.
<b><u>Natural Spawners</u></b>	
Salmon River Basin	Jack/adult structure from scale-age analysis.
Scott River Basin	Jack/adult structure from scale-age analysis.
Shasta River Basin	Jacks estimated from length-frequency analysis, adult proportions based on scale-age analysis from trap data.
Bogus Creek Basin	Jack/adult structure from scale-age analysis.
Klamath River mainstem (IGH to Shasta R.)	Jack/adult structure from scale-age analysis.
Klamath River mainstem (Shasta R. to Wingate Bar)	Surrogate: Klamath mainstem (IGH to Shasta R.) age structure.
Klamath tributaries (above Trinity R.)	Jack/adult structure from scale-age analysis.
Blue Creek	Jacks estimated through direct observation. Unweighted average of scale-based adult age structure from Blue Ck. in 2007-2009, 2011-2015, and 2017.
Trinity River (above WCW)	Jack/adult structure derived from subtracting age-specific TRH counts and recreational harvest estimate above WCW from the age-specific total run estimate above WCW derived from scale-age analysis.
Trinity River (mainstem below WCW)	Surrogate: jack/adult structure from Trinity River (above WCW).
Trinity Tributaries (above Reservation to WCW )	Surrogate: jack/adult structure from Trinity River (above WCW).
Hoopa Reservation Tributaries	Surrogate: jack/adult structure from Trinity River (above WCW).
<b><u>Recreational Harvest</u></b>	
Klamath River (below Hwy 101 bridge)	Jack/adult structure from scale-age analysis.
Klamath River (Hwy 101 to Weitchpec)	Jack/adult structure from scale-age analysis.
Klamath River (Weitchpec to IGH)	Surrogate: jack/adult weighted average age proportions from Shasta River, IGH, Bogus Creek, and mainstem Klamath (IGH to Shasta R.).
Trinity River Basin (above WCW)	Jack component based on estimated jack harvest rate and total jack run estimate. Adult age structure surrogate from Trinity River recreational harvest below WCW.
Trinity River Basin (below WCW)	Jack/adult structure from scale-age analysis.
<b><u>Tribal Harvest</u></b>	
Klamath River (below Hwy 101)	Jack/adult structure from scale-age analysis.
Klamath River (Hwy 101 to Trinity mouth)	Jack/adult structure from scale-age analysis.
Trinity River (net and hook-and-line)	Jack/adult structure from scale-age analysis.
Trinity River (harvest weir)	Jack/adult structure from scale-age analysis.
<b><u>Ich Disease Monitoring</u></b>	
Klamath-Trinity Basin	No additional fish harvested for disease monitoring.



**Table 4a. 2019 Klamath River Basin scale validation matrices**

<u>Number</u>		Known Age				
		2	3	4	5	
Read Age	2	10	12	0	0	Total 380
	3	0	273	15	0	
	4	0	5	64	0	
	5	0	1	0	0	
Total	10	291	79	0		

  

<u>Percentage</u>		Known Age				
		2	3	4	5	
Read Age	2	1.00	0.04	0.00	0.00	Total 1.00
	3	0.00	0.94	0.19	0.00	
	4	0.00	0.02	0.81	0.00	
	5	0.00	0.00	0.00	1.00	
Total	1.00	1.00	1.00	1.00		

**Table 4b. 2019 Trinity River Basin scale validation matrices.**

<u>Number</u>		Known Age				
		2	3	4	5	
Read Age	2	26	4	0	0	Total 338
	3	0	253	5	0	
	4	0	3	47	0	
	5	0	0	0	0	
Total	26	260	52	0		

  

<u>Percentage</u>		Known Age				
		2	3	4	5	
Read Age	2	1.00	0.02	0.00	0.00	Total 1.00
	3	0.00	0.97	0.10	0.00	
	4	0.00	0.01	0.90	0.00	
	5	0.00	0.00	0.00	1.00	
Total	1.00	1.00	1.00	1.00		

Table 5. Age composition of the 2019 Klamath Basin fall Chinook run.

2/11/2020

Escapement & Harvest	AGE				Total Adults	Total Run
	2	3	4	5		
<b>Hatchery Spawners</b>						
Iron Gate Hatchery (IGH)	249	2,825	972	0	3,797	4,046
Trinity River Hatchery (TRH)	205	1,182	199	0	1,381	1,586
<b>Hatchery Spawner subtotal</b>	<b>454</b>	<b>4,007</b>	<b>1,171</b>	<b>0</b>	<b>5,178</b>	<b>5,632</b>
<b>Natural Spawners</b>						
Salmon River Basin	686	790	167	0	957	1,643
Scott River Basin	409	1,596	85	0	1,681	2,090
Shasta River Basin	78	5,341	585	0	5,926	6,004
Bogus Creek Basin	148	872	118	0	990	1,138
Klamath River mainstem (IGH to Shasta R.)	169	879	262	8	1,149	1,318
Klamath River mainstem (Ash Cr. to Wingate Bar)	310	1,591	475	16	2,082	2,392
Klamath Tributaries (above Trinity River)	488	510	148	0	658	1,146
Blue Creek	<u>26</u>	<u>24</u>	<u>61</u>	<u>6</u>	<u>91</u>	<u>117</u>
<b>Klamath Basin subtotal</b>	<b>2,314</b>	<b>11,603</b>	<b>1,901</b>	<b>30</b>	<b>13,534</b>	<b>15,848</b>
Trinity River (mainstem above WCW)	3,765	5,545	996	17	6,558	10,323
Trinity River (mainstem below WCW)	22	32	6	0	38	60
Trinity Tributaries (above Reservation; below WCW)	15	22	4	1	27	42
Hoopla Reservation tributaries	<u>51</u>	<u>74</u>	<u>14</u>	<u>0</u>	<u>88</u>	<u>139</u>
<b>Trinity Basin subtotal</b>	<b>3,853</b>	<b>5,673</b>	<b>1,020</b>	<b>18</b>	<b>6,711</b>	<b>10,564</b>
<b>Natural Spawners subtotal</b>	<b>6,167</b>	<b>17,276</b>	<b>2,921</b>	<b>48</b>	<b>20,245</b>	<b>26,412</b>
<b>Total Spawner Escapement</b>	<b>6,621</b>	<b>21,283</b>	<b>4,092</b>	<b>48</b>	<b>25,423</b>	<b>32,044</b>
<b>Recreational Harvest</b>						
Klamath River (below Hwy 101 bridge)	246	617	144	3	764	1,010
Klamath River (Hwy 101 to Weitchpec)	2,239	2,261	318	0	2,579	4,818
Klamath River (Weitchpec to IGH)	91	1,408	275	2	1,685	1,776
Trinity River Basin (above WCW)	54	178	2	0	180	234
Trinity River Basin (below WCW)	78	155	2	0	157	235
<b>Subtotals</b>	<b>2,708</b>	<b>4,619</b>	<b>741</b>	<b>5</b>	<b>5,365</b>	<b>8,073</b>
<b>Tribal Harvest</b>						
Klamath River (below Hwy 101)	41	2,002	1,282	38	3,322	3,363
Klamath River (Hwy 101 to Trinity mouth)	51	331	254	2	587	638
Trinity River (net and hook-and-line)	94	518	158	0	676	770
Trinity River (harvest weir)	405	1,209	178	2	1,389	1,794
<b>Subtotals</b>	<b>591</b>	<b>4,060</b>	<b>1,872</b>	<b>42</b>	<b>5,974</b>	<b>6,565</b>
<b>Total Harvest</b>	<b>3,299</b>	<b>8,679</b>	<b>2,613</b>	<b>47</b>	<b>11,339</b>	<b>14,638</b>
<b>Totals</b>						
Harvest and Escapement	9,920	29,962	6,705	95	36,762	46,682
Recreational Angling Dropoff Mortality 2.04%	55	94	15	0	109	164
Tribal Net Dropoff Mortality 8.7%	16	248	147	4	399	415
Klamath-Trinity Basin Ich disease testing	0	0	0	0	0	0
<b>Total River Run</b>	<b>9,991</b>	<b>30,304</b>	<b>6,867</b>	<b>99</b>	<b>37,270</b>	<b>47,261</b>

Table 6. Age proportion of the 2019 Klamath Basin fall Chinook run.

Escapement & Harvest	AGE			
	2	3	4	5
<b>Hatchery Spawners</b>				
Iron Gate Hatchery (IGH)	0.06	0.70	0.24	0.00
Trinity River Hatchery (TRH)	0.13	0.75	0.13	0.00
<b>Hatchery Spawner subtotal</b>	0.08	0.71	0.21	0.00
<b>Natural Spawners</b>				
Salmon River Basin	0.42	0.48	0.10	0.00
Scott River Basin	0.20	0.76	0.04	0.00
Shasta River Basin	0.01	0.89	0.10	0.00
Bogus Creek Basin	0.13	0.77	0.10	0.00
Klamath River mainstem (IGH to Shasta R.)	0.13	0.67	0.20	0.01
Klamath River mainstem (Ash Cr. to Wingate Bar)	0.13	0.67	0.20	0.01
Klamath tributaries (above Trinity River)	0.43	0.45	0.13	0.00
Yurok Reservation tributaries	<u>0.22</u>	<u>0.21</u>	<u>0.52</u>	<u>0.05</u>
<b>Klamath Basin subtotal</b>	0.15	0.73	0.12	0.00
Trinity River (mainstem above WCW)	0.36	0.54	0.10	0.00
Trinity River (mainstem below WCW)	0.37	0.53	0.10	0.00
Trinity tributaries (above Reservation)	0.36	0.52	0.10	0.02
Hoopa Reservation tributaries	<u>0.37</u>	<u>0.53</u>	<u>0.10</u>	<u>0.00</u>
<b>Trinity Basin subtotal</b>	0.36	0.54	0.10	0.00
<b>Natural Spawners subtotal</b>	0.23	0.65	0.11	0.00
<b>Total Spawner Escapement</b>	0.21	0.66	0.13	0.00
<b>Recreational Harvest</b>				
Klamath River (below Hwy 101 bridge)	0.24	0.61	0.14	0.00
Klamath River (Hwy 101 to Weitchpec)	0.46	0.47	0.07	0.00
Klamath River (Weitchpec to IGH)	0.05	0.79	0.15	0.00
Trinity River Basin (above WCW)	0.23	0.76	0.01	0.00
Trinity River Basin (below WCW)	<u>0.33</u>	<u>0.66</u>	<u>0.01</u>	<u>0.00</u>
<b>Subtotals</b>	0.34	0.57	0.09	0.00
<b>Tribal Harvest</b>				
Klamath River (below Hwy 101)	0.01	0.60	0.38	0.01
Klamath River (Hwy 101 to Trinity mouth)	0.08	0.52	0.40	0.00
Trinity River (net and hook-and-line)	0.12	0.67	0.21	0.00
Trinity River (harvest weir)	<u>0.23</u>	<u>0.67</u>	<u>0.10</u>	<u>0.00</u>
<b>Subtotals</b>	0.09	0.62	0.29	0.01
<b>Total Harvest</b>	0.23	0.59	0.18	0.00
<b>Totals</b>				
Harvest and Escapement	0.21	0.64	0.14	0.00
Recreational Angling Dropoff Mortality 2.04%	0.34	0.57	0.09	0.00
Tribal Net Dropoff Mortality 8.7%	0.04	0.60	0.35	0.01
<b>Total River Run</b>	0.21	0.64	0.15	0.00

Appendix A: Estimation of escapement age-composition from a random sample containing known-age (CWT) and unknown read-age fish.

Denote the escapement at age as  $\{N_a, a = 2, 3, 4, 5\}$ ,  $N = \sum N_a$ , and for the random sample of size  $(n + m)$  fish, denote the following quantities:

- known-age fish: number at age  $\{n_a, a = 2, 3, 4, 5\}$ ,  $n = \sum n_a$ ,  $p_a = n_a / n$ .
- unknown read-age fish: number at age  $\{m_a, a = 2, 3, 4, 5\}$ ,  $m = \sum m_a$ ,  $r_a = m_a / m$ .
- bias-corrected unknown read-age proportions:  $\{r_a^*, a = 2, 3, 4, 5\}$ ,  $r_A^* = r_3^* + r_4^* + r_5^*$ .
- age-2 proportion as estimated by size-frequency:  $s_2$ .

1. Age 2–5 escapement by scales. Estimate  $N_a$  as the sample of known-age  $a$  fish plus the unknown age portion of the escapement times the estimated age  $a$  proportion (bias-corrected):

$$N_a = np_a + (N - n)r_a^*, \quad a = 2, 3, 4, 5.$$

2. Age-2 escapement by size-frequency; age 3–5 escapement by scales. Estimate  $N_2$  as the total escapement times the size-frequency based estimated age-2 proportion. Estimate  $N_a$  for  $a = 3, 4, 5$  as the sample known-age  $a$  fish plus the unknown age portion of the adult escapement times the age  $a$  proportion among adults (bias-corrected):

$$N_a = \begin{cases} Ns_2, & a = 2 \\ np_a + [N(1 - s_2) - n(1 - p_2)](r_a^* / r_A^*), & a = 3, 4, 5 \end{cases}$$

## Appendix B. Klamath River – 2019 methodology details.

### Iron Gate Hatchery (IGH)

Escapement to IGH is a direct count of the number of fall Chinook Salmon entering the hatchery over the duration of the spawning season. A systematic random bio-sample was obtained from every tenth Chinook Salmon returning to IGH. Heads were also collected for CWT analysis from all ad-clipped fish not included in the systematic sample. Scale-based age compositions were used to apportion all age classes.

### Bogus Creek

Escapement was estimated by summing carcasses encountered during spawning ground surveys below the video weir and videography counts above the weir. Spawning ground surveys were also conducted upstream of the weir and bio-samples were collected from every carcass encountered. Scale-based age compositions were used to apportion all age classes.

### Shasta River

Escapement was estimated by videography as the net count of fish moving upstream (total observed moving upstream minus total moving downstream). Bio-samples were collected from all carcasses encountered during surveys in the lower seven miles of the Shasta River, five reaches in the upper mainstem Shasta River, Big Springs Creek, Little Springs Creek, and Parks Creek. Bio-samples were also obtained from a 1:5 systematic sample of carcasses that washed back onto the counting weir. A trap was also installed on the upstream end of the video flume to bolster scale sample collection for a total of 68 hours of effort between September 24 and October 23. Every fish was bio-sampled from the video flume trap. No ad-clipped fish were recovered. Scale-based age compositions from samples collected from the trap were used to apportion adult age classes. The age-2 proportion was estimated based on a length-frequency cut-off for jacks (<50 cm FL) because the corrected scale-age proportion produced an unrealistic result of no fish at age-2.

### Scott River

Independent estimates from above and below the weir were combined to estimate total escapement. Escapement above the weir was estimated using videography and SONAR as the net count of fish moving upstream. During periods when the video monitoring station was inoperable (6.25 hours in total), fish passage was interpolated by averaging the two days prior and two days following the outage. Adult escapement below the weir was estimated by expanding the total redd count (redds X 2). Total escapement below the weir was then estimated by applying the scale-based age-2 proportion to adult escapement. Bio-samples were obtained from all non-deteriorated carcasses recovered above and below the weir. Scale-based age compositions were used to apportion all age classes.

### Salmon River

Adult escapement was estimated by expanding the total redd count (redds X 2) and then adding the number of live adult fish observed on the last survey. Total escapement was then estimated by expanding adult escapement by the scale-based age-2 proportion. Bio-samples

were obtained from recovered carcasses. Scale-based age compositions were used to apportion all age classes. Total redd count in Wooley Creek was adjusted to remove redds thought to be attributed to spring-run Chinook Salmon.

#### Klamath River Tributaries

Adult escapement was estimated by expanding the total redd count (redds X 2) and then adding the number of live adult fish observed on the last survey. Total escapement was then estimated by expanding adult escapement by the scale-based age-2 proportion. Scale-based age compositions were used to apportion all age classes.

#### Klamath River Mainstem (IGH to Shasta River)

A hierarchical latent variable model based on weekly carcass counts and mark-recapture data was used to estimate escapement. All surveyed fresh carcasses were bio-sampled. Scale-based age proportions were used to assign all age classes.

#### Klamath River Mainstem (Ash Creek to Wingate Bar)

Adult escapement was estimated by expanding total redd counts (redds X 2) from weekly surveys. Total escapement was then estimated by expanding adult escapement by the scale-based age-2 proportion from the upper reach. Age assignments were based on age proportions from scales collected in the IGH-Shasta reach.

#### Lower Klamath River Creel

Total harvest was estimated by combining creel estimates from the two sub-areas (above the Highway 101 Bridge to Weitchpec and below the Highway 101 Bridge to the mouth). In each sub-area, jack and adult estimates were based on access point and roving creel surveys during three randomly selected days per Julian week (JW) through JW 40, then during two days per week after JW 40. Bio-samples were collected from every fish possible during angler interviews. Scale-based age proportions from scale samples were used to apportion all age classes in each sub-area.

#### Upper Klamath River Recreational Fishery

A creel survey in this sub-area was not conducted in 2019. Creel data were available for the lower and upper river fisheries from 1999 to 2002. The ratio of average adult harvest in the entire Klamath mainstem to average harvest in the lower Klamath River creel area from these years was applied to the 2019 lower Klamath River creel harvest to estimate total adult harvest in the Klamath River mainstem. Adult harvest for the upper Klamath River recreational fishery was then estimated by subtracting the estimated lower Klamath River creel estimate from the Klamath mainstem total harvest. Finally, the combined adult and jack harvest was obtained by dividing the adult harvest by the proportion of adults from the weighted average scale-age composition of the upper Klamath River mainstem (IGH to Shasta River), Shasta River, Bogus Creek, and IGH. This weighted scale-based age composition was used to apportion all age classes in this fishery.

Yurok Tribal Estuary Fishery (Klamath mouth to Hwy 101)

Subsistence Yurok harvest in this sub-area was estimated by hourly net-fishing effort and catch-per-effort (fish per net-hour) analyses, stratified by day and night. The commercial harvest period was not diurnally stratified. Scale-based age composition was used to apportion all age classes.

Yurok Tribal Fishery Above Hwy 101

Yurok harvest in this sub-area was estimated by daily net-fishing effort and catch-per-effort (fish per net-day) analyses. Scale-based age composition was used to apportion all age classes.

Blue Creek

Total escapement was estimated using the maximum single-day count from dive surveys conducted between October 23 and December 11. Bio-samples were collected from two recovered carcasses. Jacks were identified by visual determination during dive surveys and apportioned from the total count. Adult age proportions were estimated as the unweighted average of age-specific proportions in Blue Creek from years when scales were used to apportion adult age classes (2007-2009, 2011-2015, and 2017).

## Appendix C. Trinity River – 2019 methodology details.

### Trinity River Natural Escapement (above WCW)

Escapement was estimated using a Petersen mark-recapture estimator. The methods used for estimating age structure within the Trinity River run above WCW were similar to those used in the population estimate, apportioned into three general recovery areas: TRH, Trinity basin natural spawning escapement above WCW, and recreational harvest. Scales were collected from every other Chinook Salmon (1:2 systematic sample) at WCW. Validation of WCW scales was accomplished with known-age fish recovered throughout all sectors of the Trinity River.

The age structure for fish passing above WCW was estimated using scales collected at WCW and TRH. Age-specific abundances for all fish passing above WCW were estimated from scales collected at WCW. Next, age-specific abundances of fish returning to TRH and fish harvested in the recreational fishery were estimated. Finally, age-specific abundances from TRH and the recreational fishery were subtracted from age-specific abundances of fish passing above WCW to yield age-specific abundances of fish returning to natural spawning areas above WCW.

### Trinity River Hatchery (TRH)

Escapement to TRH is a direct count of the number of fall Chinook Salmon entering the hatchery over the duration of the spawning season. Scales were sampled systematically (1:5), ad-clipped and non-ad-clipped fish included. Additionally, a non-random sample of ad-clipped fish was drawn during the latter three weeks of spawning to further validate scale ages. Scale samples were used to apportion the hatchery return into age classes.

### Upper Trinity River Recreational Harvest

The method for estimating the upper Trinity River recreational harvest depends on the application of program tags at WCW and subsequent returns by anglers. In 2019 CDFW estimated a 2.213% harvest rate on adult Chinook Salmon based on the return of program reward and non-reward tags (22 of 994) applied at WCW. The jack harvest rate of 1.344% was based on return of program reward tags (7 of 521). No scales were recovered from this fishery since no creel survey was implemented in 2019. Adult age proportions were determined using surrogate scales aged from recreational harvest below WCW.

### Lower Trinity River Creel

A roving creel survey was implemented in the Trinity River downstream of WCW. Sampling was temporally stratified by weekend (Friday-Sunday) and weekday, with sampling occurring on 2 and 1 randomly selected days per stratum, respectively. Scale samples were used to apportion all age classes.

### Trinity Mainstem Natural Escapement (below WCW)

Total escapement was estimated by expanding total redd counts (redds X 2) from surveys conducted biweekly as conditions allowed and applying the jack proportion from the upper Trinity River natural escapement. No scales were collected in this sector. The upper Trinity River natural escapement age structure was used as a surrogate to apportion all ages.



Trinity Tributaries (above Reservation; below WCW)

Total escapement was estimated by expanding total redd counts (redds X 2) and applying the jack proportion from the upper Trinity River natural escapement. Only one scale sample was collected in this sector, therefore age proportions from the upper Trinity River natural escapement sector were used to apportion all age classes.

Hoopa Reservation Tributaries

Total escapement was estimated by expanding total redd counts (redds X 2) and applying the jack proportion from the upper Trinity River natural escapement. Only one scale sample was collected in this sector, therefore age proportions from the upper Trinity River natural escapement sector were used to apportion all age classes.

Hoopa Valley Tribal Harvest (net and hook-and-line)

Hoopa Valley Tribal member gill net and hook-and-line harvest is monitored by estimating effort and catch from three (hook-and-line) or four (gill net) randomly selected days per week. Total harvest was estimated by expanding randomly selected days and effort to weekly totals. A census of the Tribal net and hook-and-line fisheries was also implemented in the area immediately downstream of the Hoopa selective harvest weir to Tish Tang Creek. Scale-age proportions were used to apportion all ages.

Hoopa Valley Tribal Harvest (harvest weir)

Total harvest was a direct count of all Chinook Salmon taken at the weir. Scale samples were attempted to be taken from every other harvested fish. Scale-age proportions were used to apportion all ages.

Appendix D. 2019 Klamath age analysis.

<b>Unknown scales age composition as read</b>					
	AGE 2	AGE 3	AGE 4	AGE 5	TOTAL
BOGUS	68	13	0	144	225
IGH	237	15	0	326	578
SALMON	128	14	0	147	289
SCOTT	215	56	3	325	599
SHASTA	12	3	0	27	42
MAINSTEM	214	46	2	363	625
UR TRIBS	333	42	0	742	1,117
LRC EST	447	217	9	699	1,372
LRC UP	119	70	1	212	402
YTFP EST	0	0	0	0	0
YTFP M&U	128	14	0	147	289
BLUE CRK	0	0	0	0	0
	1,901	490	15	3,132	5,538

  

<b>Unknown scales corrected age proportions (Kimura method)</b>					
	AGE 2	AGE 3	AGE 4	AGE 5	TOTAL
BOGUS	0.1337	0.7651	0.1012	0.0000	1.0
IGH	0.0695	0.6834	0.2471	0.0000	1.0
SALMON	0.4177	0.4810	0.1013	0.0000	1.0
SCOTT	0.1955	0.7639	0.0406	0.0000	1.0
SHASTA	0.0000	0.9014	0.0986	0.0000	1.0
MAINSTEM	0.1295	0.6650	0.1986	0.0069	1.0
UR TRIBS	0.4260	0.4461	0.1278	0.0000	1.0
LRC EST	0.2480	0.6062	0.1427	0.0032	1.0
LRC UP	0.4697	0.4642	0.0661	0.0000	1.0
YTFP EST	0.0123	0.5970	0.3791	0.0116	1.0
YTFP M&U	0.0818	0.5207	0.3946	0.0029	1.0
BLUE CRK	0.2077	0.2068	0.5286	0.0569	1.0

  

<b>Known CWT ages <sup>a/</sup></b>					
	AGE 2	AGE 3	AGE 4	AGE 5	TOTAL
BOGUS	1	29	6	0	36
IGH	20	573	158	0	751
SALMON	0	0	0	0	0
SCOTT	0	0	0	0	0
SHASTA	0	0	0	0	0
MAINSTEM	0	13	3	0	16
UR TRIBS	0	0	0	0	0
LRC	6	70	6	0	82
YTFP EST	0	36	33	0	69
YTFP M&U	0	6	7	0	13
BLUE CRK	0	0	0	0	0
	27	727	213	0	967

  

<b>Breakout within strata</b>					
Bogus1	1	19	5	0	25
Bogus2	0	10	1	0	11
LRC - lo	0	16	2	0	18
LRC - mid	6	54	4	0	64
YTFP MID	0	0	0	0	0
YTFP UP	0	6	7	0	13

a/ Table includes known-age fish whose scales were not mounted / read.

Appendix E. 2019 Trinity age analysis.

WCW = Willow Ck. Weir

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable		13	0	0	0	0	13
2		249	4	0	0	0	253
3		412	0	15	1	0	428
4		70	0	0	1	0	71
5		1	0	0	0	0	1
21							
732		745	4	15	2	0	766

LOWTRINREC = Lower Trinity Recreational

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable		1	0	0	0	0	1
2		28	2	0	0	0	30
3		50	0	11	0	0	61
4		1	0	1	1	0	3
5		0	0	0	0	0	0
15							
79		80	2	12	1	0	95

HUPAHARV = Hoopa Tribal Net Harvest plus Tribal Hook-and-Line

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable		12	0	0	1	0	13
2		50	3	1	0	0	54
3		242	0	41	1	0	284
4		68	0	0	14	0	82
5		0	0	0	0	0	0
61							
360		372	3	42	16	0	433

TRH = Trinity River Hatchery

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable		4	0	1	1	0	6
2		33	7	2	0	0	42
3		166	0	86	0	0	252
4		28	0	2	17	0	47
5		0	0	0	0	0	0
116							
227		231	7	91	18	0	347

LOWTRINTRIBS = Lower Trinity Tribs - Includes samples taken by U

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable		0	0	0	0	0	0
2		1	0	0	0	0	1
3		0	0	0	0	0	0
4		1	0	0	0	0	1
5		0	0	0	0	0	0
0							
2		2	0	0	0	0	2

NO DATA

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable							
2							
3							
4							
5							
0							
0		0	0	0	0	0	0

HVTSELECTHARV = Hoopa Tribal Weir Harvest

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable		8	0	0	0	0	8
2		196	10	1	0	0	207
3		501	0	100	3	0	604
4		71	0	0	14	0	85
5		1	0	0	0	0	1
128							
769		777	10	101	17	0	905

NO DATA

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable							
2							
3							
4							
5							
0							
0		0	0	0	0	0	0

POOLED data from all areas: Scale age-CWT age matrix.  
(Includes only fish with both scale age and CWT known age.)

VALIDATION MATRIX		2	3	4	5	
2		26	4	0	0	
3		0	253	5	0	
4		0	3	47	0	
5		0	0	0	1E-10	0.96

(B)  
Scale-CWT age matrix of proportions of column sums.

	2	3	4	5
2	1.0000	0.0154	0.0000	0.0000
3	0.0000	0.9731	0.0962	0.0000
4	0.0000	0.0115	0.9038	0.0000
5	0.0000	0.0000	0.0000	1.0000

Corrected Scale age proportion vectors for scale-aged 2 - 5 fish.

# known scales	21	61	15	116	0	128
# unknown scales	732	360	79	227	2	769

Correction Matrix for ages 2,3,4,5.  
(Inverse of Scale-CWT age proportion matrix.)

	2	3	4	5
2	1.0000	-0.0158	0.0017	0.0000
3	0.0000	1.0290	-0.1095	0.0000
4	0.0000	-0.0131	1.1078	0.0000
5	0.0000	0.0000	0.0000	1.0000

Age	Willow Creek Weir WCW	Hoopa Tribal NET HARV	Lower Trinity REC HARV	TRH HATCHERY	Lower Trinity Mainstem CARCASS	Upper Trinity REC HARV	Upper Trin NATURAL	Lower Trin Tribs
2	0.3314	0.1286	0.3444	0.1340	0.0000	-	0.3648	0.5000
3	0.5687	0.6710	0.6499	0.7390	0.0000	0.9913	0.5372	0.0000
4	0.0985	0.2004	0.0057	0.1270	0.0000	0.0087	0.0964	0.5000
5	0.0014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0016	0.0000
	1.00000	1.00000	1.00000	1.00000	0.00000	1.00000	1.00000	1.00000

CWTS Age	(Estimated)							
	Willow Creek Weir WCW	Hoopa Tribal NET HARV	Lower Trinity REC HARV	TRH HATCHERY	Lower Trinity CARCASS	Upper Trinity REC HARV	Upper Trinity NATURAL	Hoopa Hook&Line
2	0	3	2	42	0	2	109	0
3	0	42	12	284	0	21	641	0
4	0	16	1	45	0	3	102	0
5	0	0	0	0	0	0	0	0
# unknown ads	0	61	15	371	0	26	851	0
# total ads	0	66	17	377	0	0	0	0

WCW scales				
Age	WCW no cwts	known age cwts scales	Total age all scales	WCW age proportions
2	243	0	243	0.3314
3	416	0	416	0.5687
4	72	0	72	0.0985
5	1	0	1	0.0014
	732	0	732	1.0000

Natural Escapement, Trinity basin above WCW: Apportioned to age structure.

Rec above WCW	Total Run	Apportioned Natural Escapement minus TRH #s minus above WCW creel #s		
		Age	WCW proportions	TRH + Rec above WCW+Natural Escapement
Rec above WCW	234	2	0.3314	4024
TRH	1586	3	0.5687	6905
Naturals	10323	4	0.0985	1197
Total	12143	5	0.0014	17

12143

**Appendix F. 2019 Klamath Basin fall Chinook age-composition calculation worksheet.**

2/11/2020

Hatchery spawners	# Grilse	# Adults	Total Run	CALCULATED AGE				Total	SCALE AGE PROPORTIONS (unknowns)					Unk. Age Scales Read	Redd Surveys				
				2	3	4	5		2	3	4	5	Total		Redds	Live	Video	Carcass	
Iron Gate Hatchery (IGH)	249	3797	4046	249	2825	972	0	4046	scales	0.06954	0.68338	0.24708	0.00000	1.0	578				
Trinity River Hatchery (TRH)	205	1381	1586	205	1182	199	0	1586	IGH cwt	0.41786	0.48100	0.10133	0.00000	1.0	227				
<i>Hatchery spawner subtotal:</i>	<i>454</i>	<i>5178</i>	<i>5632</i>	<i>454</i>	<i>4007</i>	<i>1171</i>	<i>0</i>	<i>5632</i>	TRH cwt	0.13401	0.73896	0.12704	0.00000	1.0					
		prop. hatchery grilse	0.081			proportion hatchery	0												
<b>Natural Spawners</b>																			
Trinity River mainstem above WCW	3765	6558	10323	3765	5545	996	17	10323	scales	0.36476	0.53719	0.09644	0.00161	1.0	732				
Trinity River mainstem below WCW	22	38	60	22	32	6	0	60	Up T main	0.36476	0.53719	0.09644	0.00161	1.0	0				
Salmon River Basin (includes Wooley Cr)	686	957	1643	686	790	167	0	1643	scales	0.41786	0.48100	0.10133	0.00000	1.0	289				
Scott River	409	1681	2090	409	1596	85	0	2090	scales	0.19549	0.76386	0.04064	0.00000	1.0	599				
Shasta River	78	5926	6004	78	5341	585	0	6004	Scott CWT	0	0	0	0	0	0				
Bogus Creek	148	990	1138	148	872	118	0	1138	Adult scales only	0.90135	0.09865	0.00000	0.00000	1.0	42				
Mainstem Klamath (IGH to Shasta R)	169	1149	1318	169	879	262	8	1318	Shasta CWT	0	0	0	0	0	0				
Mainstem Klamath (Ash Cr to Wingate Bar)	310	2082	2392	310	1591	475	16	2392	scales	0.13374	0.76507	0.10119	0.00000	1.0	225				
Mainstem Klamath (Persido Bar to Big Bar)	113	152	265	113	118	34	0	265	Bogus CWT	1	29	6	0	36					
<i>Main basin subtotal:</i>	<i>5,587</i>	<i>19,381</i>	<i>24,968</i>	<i>5,587</i>	<i>16,646</i>	<i>2,694</i>	<i>41</i>	<i>24,968</i>	scales	0.12950	0.66496	0.19859	0.00695	1.0	625				
									Up K main	0.12950	0.66496	0.19859	0.00695	1.0	IGH to Shasta	1041			
									Klam trib	0.42605	0.44614	0.12781	0.00000	1.0	Klam trib	76			
<b>Klamath Tributaries</b>																			
Aiken Cr	0	0	0	0	0	0	0	0	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Beaver Cr	48	65	113	48	50	15	0	113	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Bluff Cr	13	17	30	13	13	4	0	30	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Boise Cr	0	0	0	0	0	0	0	0	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Camp Cr	79	107	186	79	83	24	0	186	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Clear Cr	53	72	125	53	56	16	0	125	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Dillon Cr	37	50	87	37	39	11	0	87	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Elk Cr	30	40	70	30	31	9	0	70	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Ft. Goff Cr	0	0	0	0	0	0	0	0	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Grider Cr	45	61	106	45	47	14	0	106	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Horse Cr	28	38	66	28	30	8	0	66	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Independence Cr	0	0	0	0	0	0	0	0	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Indian Cr	62	83	145	62	64	19	0	145	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Irving Cr	0	0	0	0	0	0	0	0	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Pearch Cr	0	0	0	0	0	0	0	0	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Red Cap Cr	53	71	124	53	55	16	0	124	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Rock Cr	3	4	7	3	3	1	0	7	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Slate Cr	0	0	0	0	0	0	0	0	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Swilup Cr	0	0	0	0	0	0	0	0	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Thompson Cr	31	42	73	31	33	9	0	73	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Ti Cr	0	0	0	0	0	0	0	0	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Ukonom Cr	6	8	14	6	6	2	0	14	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Other	0	0	0	0	0	0	0	0	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
Pine Cr (formerly in Hoopa trib)	0	0	0	0	0	0	0	0	scales	0.42605	0.44614	0.12781	0.00000	1.0	1,117				
<i>Klamath trib subtotal:</i>	<i>488</i>	<i>658</i>	<i>1146</i>	<i>488</i>	<i>510</i>	<i>148</i>	<i>0</i>	<i>1146</i>											
<b>Trinity Tributaries</b>																			
Horse Linto Cr	13	23	36	13	19	3	1	36	Up T main	0.36476	0.53719	0.09644	0.00161	1.0	2				
Cedar Cr (trib to Horse Linto)	2	4	6	2	3	1	0	6	Up T main	0.36476	0.53719	0.09644	0.00161	1.0	2				
Other (Willow & Madden creeks in Up TR nat estim)	0	0	0	0	0	0	0	0	Up T main	0.36476	0.53719	0.09644	0.00161	1.0	2				
<i>Trinity trib subtotal:</i>	<i>15</i>	<i>27</i>	<i>42</i>	<i>15</i>	<i>22</i>	<i>4</i>	<i>1</i>	<i>42</i>											
<i>Non-reservation trib subtotal:</i>	<i>503</i>	<i>685</i>	<i>1188</i>	<i>503</i>	<i>532</i>	<i>152</i>	<i>1</i>	<i>1188</i>											
<b>Reservation Tributaries-Hoopa Valley</b>																			
Campbell Cr	0	0	0	0	0	0	0	0	Up T main	0.36476	0.53719	0.09644	0.00161	1.0	2				
Hostler Cr	0	0	0	0	0	0	0	0	Up T main	0.36476	0.53719	0.09644	0.00161	1.0	2				
Mill Cr	14	24	38	14	20	4	0	38	Up T main	0.36476	0.53719	0.09644	0.00161	1.0	2				
Pine Cr. (moved in 2007 to Klam trib)																			
Soctish Cr	0	0	0	0	0	0	0	0	Up T main	0.36476	0.53719	0.09644	0.00161	1.0	2				
Supply Cr	30	52	82	30	44	8	0	82	Up T main	0.36476	0.53719	0.09644	0.00161	1.0	2				
Tish Tang Cr	7	12	19	7	10	2	0	19	Up T main	0.36476	0.53719	0.09644	0.00161	1.0	2				
Other (Hospital Cr.)	0	0	0	0	0	0	0	0	Up T main	0.36476	0.53719	0.09644	0.00161	1.0	2				
<i>HVT reservation trib subtotal:</i>	<i>51</i>	<i>88</i>	<i>139</i>	<i>51</i>	<i>74</i>	<i>14</i>	<i>0</i>	<i>139</i>											
<b>Reservation Tributaries-Yurok</b>																			
Blue Cr	26	91	117	26	24	61	6	117	SURROGATE - Unweighted avg of Blue Cr adults from 2007-09, 11-15, 17 (years w/ surrogates omitted)										
<i>Reservation tributaries subtotal:</i>	<i>77</i>	<i>179</i>	<i>256</i>	<i>77</i>	<i>98</i>	<i>75</i>	<i>6</i>	<i>256</i>	count	0.26099	0.66715	0.07186	1.0	0					
<i>Natural spawner subtotal:</i>	<i>6167</i>	<i>20245</i>	<i>26412</i>	<i>6167</i>	<i>17276</i>	<i>2921</i>	<i>48</i>	<i>26412</i>	0.222										
<i>Total spawners:</i>	<i>6621</i>	<i>25423</i>	<i>32044</i>	<i>6621</i>	<i>21283</i>	<i>4092</i>	<i>48</i>	<i>32044</i>											
<b>Angler Harvest</b>																			
Klamath River (below Hwy 101)	246	764	1010	246	617	144	3	1010	scales	0.24797	0.60621	0.14265	0.00317	1.0	1372				
Klamath River (Hwy 101 to Weitchpec)	2239	2579	4818	2239	2261	318	0	4818	est-LRC CWT	0	16	2	0	18					
									scales	0.46975	0.46420	0.06606	0.00000	1.0	402				
									mid-LRC CWT	6	54	4	0	64					
									SURROGATE - IGH+Bogus+Klamath Mainstem+Shasta Weighted Totals										
									IGH+Bog+Klam+Sha	644	9917	1937	8	12506					

## Appendix G. Final age composition of the 2018 Klamath Basin fall Chinook run.

2/3/2020

Escapement & Harvest	AGE				Total Adults	Total Run
	2	3	4	5		
<b>Hatchery Spawners</b>						
Iron Gate Hatchery (IGH)	435	10,666	759	0	11,425	11,860
Trinity River Hatchery (TRH)	171	7,057	85	0	7,142	7,313
<b>Hatchery Spawner subtotal</b>	<b>606</b>	<b>17,723</b>	<b>844</b>	<b>0</b>	<b>18,567</b>	<b>19,173</b>
<b>Natural Spawners</b>						
Salmon River Basin	285	1,169	59	0	1,228	1,513
Scott River Basin	71	1,085	115	8	1,208	1,279
Shasta River Basin	2,017	17,715	960	0	18,675	20,692
Bogus Creek Basin	196	3,379	103	0	3,482	3,678
Klamath River mainstem (IGH to Shasta R)	453	6,973	736	0	7,709	8,162
Klamath River mainstem (Ash Cr to Wingate Bar)	220	3,381	357	0	3,738	3,958
Klamath Tributaries (above Trinity River)	131	1,202	67	0	1,269	1,400
Blue Creek	<u>118</u>	<u>181</u>	<u>14</u>	<u>1</u>	<u>196</u>	<u>314</u>
<b>Klamath Basin subtotal</b>	<b>3,491</b>	<b>35,085</b>	<b>2,411</b>	<b>9</b>	<b>37,505</b>	<b>40,996</b>
Trinity River (mainstem above WCW)	4,075	14,355	144	0	14,499	18,574
Trinity River (mainstem below WCW)	58	206	2	0	208	266
Trinity Tributaries (above Reservation; below WCW)	21	75	1	0	76	97
Hoopla Reservation tributaries	<u>18</u>	<u>64</u>	<u>0</u>	<u>0</u>	<u>64</u>	<u>82</u>
<b>Trinity Basin subtotal</b>	<b>4,172</b>	<b>14,700</b>	<b>147</b>	<b>0</b>	<b>14,847</b>	<b>19,019</b>
<b>Natural Spawners subtotal</b>	<b>7,663</b>	<b>49,785</b>	<b>2,558</b>	<b>9</b>	<b>52,352</b>	<b>60,015</b>
<b>Total Spawner Escapement</b>	<b>8,269</b>	<b>67,508</b>	<b>3,402</b>	<b>9</b>	<b>70,919</b>	<b>79,188</b>
<b>Recreational Harvest</b>						
Klamath River (below Hwy 101 bridge)	121	380	55	0	435	556
Klamath River (Hwy 101 to Weitchpec)	1,780	1,543	60	0	1,603	3,383
Klamath River (Weitchpec to IGH)	77	963	64	0	1,027	1,104
Trinity River Basin (above WCW)	200	761	0	0	761	961
Trinity River Basin (below WCW)	59	284	0	0	284	343
<b>Subtotals</b>	<b>2,237</b>	<b>3,931</b>	<b>179</b>	<b>0</b>	<b>4,110</b>	<b>6,347</b>
<b>Tribal Harvest</b>						
Klamath River (below Hwy 101)	86	7,637	1,028	0	8,665	8,751
Klamath River (Hwy 101 to Trinity mouth)	42	3,084	695	0	3,779	3,821
Trinity River (net and hook-and-line)	7	1,035	66	0	1,101	1,108
Trinity River (harvest weir)	173	1,198	26	0	1,224	1,397
<b>Subtotals</b>	<b>308</b>	<b>12,954</b>	<b>1,815</b>	<b>0</b>	<b>14,769</b>	<b>15,077</b>
<b>Total Harvest</b>	<b>2,545</b>	<b>16,885</b>	<b>1,994</b>	<b>0</b>	<b>18,879</b>	<b>21,424</b>
<b>Totals</b>						
Harvest and Escapement	10,814	84,393	5,396	9	89,798	100,612
Recreational Angling Dropoff Mortality 2.04%	46	80	4	0	84	130
Tribal Net Dropoff Mortality 8.7%	12	1,023	155	0	1,178	1,190
Klamath-Trinity Basin Ich disease testing	0	0	0	0	0	0
<b>Total River Run</b>	<b>10,872</b>	<b>85,496</b>	<b>5,555</b>	<b>9</b>	<b>91,060</b>	<b>101,932</b>