

Klamath River Fall Chinook Salmon Age-Specific Escapement, River Harvest, and Run Size Estimates, 2011 Run

Klamath River Technical Team
21 February 2012

The 2012 KRTT reports are dedicated to our memory of Jerry Barnes, who recently passed away. Jerry was a member of the KRTT for more than 25 years, since its inception in the late 1980's, and was Team Chairman for much of the 1990's and early 2000's. Jerry's commitment to the Klamath Basin fishery resources and their rational management was unquestionable. His knowledge of the resources, the Basin's fisheries, and its management institutions was encyclopedic and incredibly valuable to the KRTT work and its members. He cared deeply about fishery resources, and devoted his professional life and much of his free time toward improving the scientific and biological basis of their management. His contribution to the KRTT cannot be replaced, and we will miss him greatly.

Summary

The number of Klamath River fall Chinook salmon returning to the Klamath River Basin (Basin) in 2011 was estimated to be:

<i>Age</i>	<i>Run Size</i>	
	<i>Number</i>	<i>Proportion</i>
2	85,860	0.45
3	59,713	0.32
4	41,286	0.22
5	1,986	0.01
Total	188,845	1.00

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>	101,500	103,000	0.99
<i>Fishery Mortality</i>			
Tribal Harvest	34,800	26,400	1.32
Recreational Harvest	7,900	4,200	1.88
Drop-off Mortality	3,200	2,400	1.33
	45,900	33,000	1.39
<i>Escapement</i>			
Hatchery Spawners	20,600	22,300	0.92
Natural Area Spawners	35,000	47,800	0.73
	55,600	70,100	0.79

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 2011. The estimates provided in this report are consistent with the Klamath Basin Megatable (CDFG 2012) and with the 2012 forecast of ocean stock abundance (KRTT 2012).

Age-specific escapement estimates for 2011 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 2012). Cohort reconstruction results enable 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 2012). 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 obtain the data from which the Klamath Basin Megatable totals and estimates of age composition were derived. The KRTT relied on surrogate data where the sample of scales was insufficient for estimation of age composition, or was altogether lacking, within a particular sector.

Estimates of age composition were based on random samples of scales (Table 2) whenever possible. Generally, each scale was aged independently by two trained readers. In cases of disagreement, a third read was 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 (CWT fish) and unknown read ages for estimation of the escapement or harvest age-composition is described in Appendix A.

In cases where scales were believed to be non-representative of the age-two 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-two, 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, known-age (CWT) length-frequencies. 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.

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

Results

A total of 17,667 scales from 17 different sectors were aged for this analysis (Table 2). Of these, 2,448 were from known-age (CWT) fish. Known-age scales provide a direct check, or "validation," of accuracy of the scale-based age estimates (Tables 4a and 4b, Appendices F and G). Overall, the scale-based ages were generally accurate. Accuracy within the Trinity Basin was 99% for age-2 fish, 99% for age-3 fish, 92% for age-4 fish, and 71% for age-5 fish. Accuracy within the Klamath River Basin was 98% for age-2 fish, 97% for age-3 fish, 84% age-4 fish, and 75% for age-5 fish. 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 2010 Klamath Basin age composition were slightly modified from the preliminary age composition. Final estimates are presented in Appendix G.

List of Acronyms and Abbreviations

ad-clipped	adipose fin removed
CDFG	California Department of Fish and Game
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
M&U	Klamath River below Weitchpec: “middle” section (Hwy 101–Surpur Ck) and “upper” section (Surpur Ck—Trinity River)
SCS	Siskiyou County Schools
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
YT	Yurok Tribe
YTFP	Yurok Tribal Fisheries Program

Literature Cited

- CDFG (California Department of Fish and Game). 2012. Klamath River basin fall Chinook salmon spawner escapement, in-river harvest and run-size estimates, 1978–2011. Available from W. Sinnen, CDFG, 5341 Ericson Way, Arcata, CA 95521.
- Cook, R.C. and G.E. Lord. 1978. Identification of stocks of Bristol Bay sockeye salmon, *Oncorhynchus nerka*, by evaluating scale patterns with a polynomial discriminant method. *Fishery Bulletin* 76:415–423.
- Cook, R.C. 1983. Simulation and application of stock composition estimators. *Canadian Journal of Fisheries and Aquatic Sciences* 40:2113–2118.
- Goldwasser, L., M.S. Mohr, A.M. Grover, and M.L. Palmer-Zwahlen. 2001. The supporting databases and biological analyses for the revision of the Klamath Ocean Harvest Model. Available from M.S. Mohr, National Marine Fisheries Service, 110 Shaffer Road, Santa Cruz, CA 95060.
- Kimura, D.K. and Chikuni, S. 1987. Mixtures of empirical distributions: an iterative application of the age-length key. *Biometrics* 43:23–35.

KRTT (Klamath River Technical Team). 2012. Ocean abundance projections and prospective harvest levels for Klamath River fall Chinook, 2011 season. Available from the Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 101, Portland, OR 97220-1384. <<http://www.pcouncil.org/salmon/salother.html>>

Mohr, M.S. 2006a. The cohort reconstruction model for Klamath River fall Chinook salmon. Unpublished report. National Marine Fisheries Service, Santa Cruz, CA.

Mohr, M.S. 2006b. The Klamath Ocean Harvest Model (KOHM): model specification. Unpublished report. National Marine Fisheries Service, Santa Cruz, CA.

Klamath River Technical Team Participants

California Department of Fish and Game

Jennifer Simon
Wade Sinnen

Hoopa Valley Tribe

George Kautsky
Billy C. Matilton
Bob Campbell

National Marine Fisheries Service

Michael O'Farrell

U.S. Fish and Wildlife Service

Stephen Gough

Yurok Tribe

Desma Williams

Acknowledgements

The Klamath River Technical Team thanks the following individuals for their expert assistance in compiling and reviewing the data for this report: Sara Borok, Mary Claire Kier, Melodie Palmer-Zwahlen, Brett Kormos, Diana Chesney, and Morgan Knechtle of the California Department of Fish and Game; and Joe Polos and Philip Colombano of the U.S. Fish and Wildlife Service. The Yurok Tribe and U.S. Fish and Wildlife Service performed the scale reading analysis for the Klamath River while the Hoopa Valley Tribe performed the scale reading analysis for the Trinity River. The U.S. Fish and Wildlife Service provided scale reading assistance to the Yurok Tribe. Scale collections were provided by the California Department of Fish and Game, Hoopa Valley Tribe, U.S. Fish and Wildlife Service, and Yurok Tribe.

Table 1. Estimation and sampling methods used for the 2011 Klamath River fall Chinook run assessment.

Sampling Location	Estimation and Sampling Methods	Agency
Hatchery Spawners		
Iron Gate Hatchery (IGH)	Direct count. All fish examined for fin-clips, tags, and marks. Bio-data collected from a systematic random sample of 10% of the fish. Additionally, all ad-clipped fish were bio-sampled.	CDFG
Trinity River Hatchery (TRH)	Direct count. All fish examined for fin-clips, tags, and marks. Bio-data collected from a systematic random sample of 20% of the fish.	CDFG, HVT
Natural Spawners		
Salmon River Basin	Carcass mark-recapture (Schafer) within the mainstem combined with redd surveys of the tributaries. Total run based on mark-recapture estimate and $(2 \times \text{total redd count}) / (1 - \text{proportion of jacks estimated for this area})$. Bio-data collected from all recovered carcasses though scales were obtained only from Path 1 carcasses (both eyes clear).	CDFG, USFS, YT, KT, SRRC, SCS
Scott River Basin	Video count above weir at river mile 17, and twice weekly redd/carcass survey above and below weir. Total run based on video count through the weir and the carcass survey (Schafer estimator) below the weir. Bio-data collected from all carcasses recovered.	CDFG, SCS, QVIR, USFS, KT, AC, SRCD
Shasta River Basin	Video count above weir. Bio-data collected from carcasses upstream of video weir site and mortalities stranded on weir.	CDFG, QVIR
Bogus Creek Basin	Video count above weir and twice weekly direct carcass count below weir. Bio-data collected from a systematic random sample (1:3) of all carcasses observed during surveys above and below weir. Additionally, all ad-clipped fish were bio-sampled.	CDFG, SCS
Klamath River mainstem (IGH to Shasta R)	Carcass mark-recapture (Peterson) estimates for jacks and adults, separately. River sections were surveyed weekly. Bio-data collected from fresh carcasses.	USFWS, YT
Klamath River mainstem (Ash Cr to Indian Cr)	Weekly redd survey. Total run = $(2 \times \text{total redd count}) / (1 - \text{proportion jacks from the Klamath River mainstem area})$.	USFWS, KT
Klamath Tributaries (above Trinity, including Pine Creek)	Periodic redd surveys, the majority of which were performed weekly. Total run = $(2 \times \text{total redd count}) / (1 - \text{proportion jacks estimated for this area}) + \text{live fish observed on last day surveyed}$. Bio data collected from all carcasses recovered.	USFS, CDFG, KT, YT, SRRC, MKWC, SCS
Blue Creek	Weekly snorkel surveys. Jacks and adults estimated as the peak count during surveys. Bio-data collected from all fresh carcasses and trapped live fish.	YT
Trinity River (mainstem above WCW)	Mark-recapture (Peterson); marks applied at WCW and recovered at TRH. All fish bio-sampled and scales collected in systematic random sample (1:2). Total natural area escapement calculated from WCW run size minus TRH return minus recreational harvest estimate.	CDFG, HVT
Trinity River (mainstem below WCW)	Bi-weekly redd survey attempted, however flows limited number of surveys to 4 for the season. Total run = $(2 \times \text{total redd count}) / (1 - \text{proportion jacks estimated for this area})$. Bio-samples from all recovered carcasses.	HVT
Trinity Tributaries (above Reservation; below WCW)	Weekly redd survey. Total run = $(2 \times \text{total redd count}) / (1 - \text{proportion jacks estimated for Trinity tributaries})$. Bio-data collected from all recovered carcasses.	CDFG
Hoopa Reservation Tributaries	Periodic redd survey. Total run = $(2 \times \text{total redd count}) / (1 - \text{proportion jacks estimated for Trinity tributaries})$. Bio-data collected from all recovered carcasses.	HVT
Recreational Harvest		
Klamath River (below Hwy 101 bridge)	Jack and adult estimates based on access point creel survey during three randomly selected days per statistical week. Bio-data collected during angler interviews.	CDFG
Klamath River (Hwy 101 to Weitchpec)	Jack and adult estimates based on access point creel survey during three randomly selected days per statistical week. Bio-data collected during angler interviews.	CDFG
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. Upper river adult harvest = total adult harvest minus lower river adult harvest. Total harvest = $\text{adults} / (1 - \text{proportion jacks estimated from the weighted IGH, Klamath mainstem and Bogus Creek age composition data})$.	CDFG
Trinity River Basin (above WCW)	Jack and adult harvest estimates based on estimated harvest rates from angler return of reward tags (applied at WCW) multiplied by estimates of jack and adult run sizes above WCW.	CDFG
Trinity River Basin (below WCW)	Roving access creel survey during three randomly selected days per statistical week stratified by weekdays and weekend days (1 weekday and 2 weekend). Bio-data collected during angler interviews.	HVT
Tribal Harvest		
Klamath River (below Hwy 101)	Daily harvest estimates based on effort and catch-per-effort surveys. Bio-data collected during net harvest and buying station interviews.	YT
Klamath River (Hwy 101 to Trinity mouth)	Daily harvest estimates based on effort and catch-per-effort surveys. Bio-data collected during net harvest interviews.	YT
Trinity River (Hoopa Reservation)	Effort and catch-per-effort surveys; four random days per statistical week. Bio-data collected during net harvest interviews.	HVT
Fishery Dropoff Mortality		
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

^a Biological samples ("bio-samples" or "bio-data") of live fish or carcasses generally include: sex, fork length, scales, tags or marks, and CWT recovery from ad-clipped fish.

Table 2. Scale sampling locations and numbers of scales collected for the 2011 Klamath Basin fall Chinook age-composition assessment.

Sampling Location	Scales collected			Total	Agency
	Read		Not read ^{c/}		
	Unknown-age ^{a/}	Known-age ^{b/}			
<u>Hatchery Spawners</u>					
Iron Gate Hatchery (IGH)	961	767	3,064	4,792	CDFG
Trinity River Hatchery (TRH)	2,248	621	53	2,922	HVT
<u>Natural Spawners</u>					
Salmon River Carcass Survey	423	0	10	433	CDFG
Scott River Carcass Survey	1,751	0	40	1,791	CDFG
Shasta River Carcass	280	0	1,458 ^{d/}	1,738	CDFG
Bogus Creek Weir	934	165	247	1,346	CDFG
Klamath River mainstem	590	0	153	743	USFWS
Upper Klamath River tributaries	144	0	2	146	USFS
Blue Creek Snorkle	134	0	18	152	YT
Willow Creek Weir	772	33	5	810	CDFG, HVT
Lower Trinity River Carcass	49	0	2	51	HVT
Lower Trinity River tributaries	100	0	5	105	HVT
<u>Recreational Harvest</u>					
Lower Klamath River Creel	1,742	96	22	1,860	CDFG
Lower Trinity River Creel	131	1	0	132	HVT
<u>Tribal Harvest</u>					
Klamath River (below Hwy 101)	2,047	488	320	2,855	YT
Klamath River (Hwy 101 to Trinity R)	1,249	54	236	1,539	YT
Trinity River (Hoopa Reservation)	1,664	223	35	1,922	HVT
TOTAL	15,219	2,448	5,670	23,337	

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

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

c/ Scales mounted and not read or scales not mounted.

d/ Includes scales collected from washbacks at Shasta weir that were read (n=122) but not used in scale analysis.

Table 3. Age-composition methods used for the 2011 Klamath Basin fall Chinook run

Sampling Location	Age Composition Method
<u>Hatchery Spawners</u>	
Iron Gate Hatchery (IGH)	Jack/adult structure from scale-age analysis.
Trinity River Hatchery (TRH)	Jack/adult structure from scale-age analysis.
<u>Natural Spawners</u>	
Salmon River Basin	Jack/adult structure from scale-age analysis.
Scott River Basin	Jack/adult structure from scale-age analysis.
Shasta River Basin	Jack/adult structure from scale-age analysis.
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 (Ash Cr to Indian Cr)	Surrogate: Klamath mainstem (IGH to Shasta R) age-structure.
Klamath tributaries (above Trinity River, including Pine Cr)	Jack/adult structure from scale-age analysis.
Blue Creek	Jacks estimated by direct observation. Adult age structure derived from scale-age analysis.
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)	Jack/adult structure from scale-age analysis.
Trinity Tributaries (above Reservation to WCW)	Jack/adult structure from scale-age analysis (all Trinity tributaries below WCW combined).
Hoopa Reservation Tributaries	Jack/adult structure from scale-age analysis (all Trinity tributaries below WCW combined).
<u>Recreational Harvest</u>	
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: IGH, Bogus Creek and Klamath River mainstem weighted age composition.
Trinity River Basin (above WCW)	Jack component based on estimated jack harvest rate and total jack run estimate. Adult Surrogate: adult age composition from Trinity River Basin Recreational Harvest (below WCW).
Trinity River Basin (below WCW)	Jack/adult structure from scale-age analysis.
<u>Tribal Harvest</u>	
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 (Hoopa Reservation)	Jack/adult structure from scale-age analysis.

Table 4a. 2011 Klamath River Basin scale validation matrices.

<u>Number</u>		Known Age				
		2	3	4	5	
Read Age	2	507	15	0	0	Total 1570
	3	9	886	19	0	
	4	0	16	109	2	
	5	0	0	1	6	
Total		516	917	129	8	

<u>Percentage</u>		Known Age				
		2	3	4	5	
Read Age	2	0.98	0.02	0.00	0.00	Total 1.00
	3	0.02	0.97	0.15	0.00	
	4	0.00	0.02	0.84	0.25	
	5	0.00	0.00	0.01	0.75	
Total		1.00	1.00	1.00	1.00	

Table 4b. 2011 Trinity River Basin scale validation matrices.

<u>Number</u>		Known Age				
		2	3	4	5	
Read Age	2	72	3	0	0	Total 882
	3	1	700	8	0	
	4	0	3	88	2	
	5	0	0	0	5	
Total		73	706	96	7	

<u>Percentage</u>		Known Age				
		2	3	4	5	
Read Age	2	0.99	0.00	0.00	0.00	Total 1.00
	3	0.01	0.99	0.08	0.00	
	4	0.00	0.00	0.92	0.29	
	5	0.00	0.00	0.00	0.71	
Total		1.00	1.00	1.00	1.00	

Table 5. Age composition of the 2011 Klamath Basin fall Chinook run.

Escapement & Harvest	AGE				Total Adults	Total Run
	2	3	4	5		
Hatchery Spawners						
Iron Gate Hatchery (IGH)	9,549	6,212	2,276	1	8,490	18,039
Trinity River Hatchery (TRH)	1,872	12,162	1,606	80	13,849	15,721
Hatchery Spawner subtotal	11,421	18,374	3,882	81	22,339	33,760
Natural Spawners						
Salmon River Basin	1,819	1,885	1,789	0	3,674	5,493
Scott River Basin	2,499	978	2,038	0	3,016	5,515
Shasta River Basin	11,187	23	190	0	213	11,400
Bogus Creek Basin	2,303	2,046	869	5	2,919	5,222
Klamath River mainstem (IGH to Shasta R)	2,247	1,224	1,486	6	2,716	4,963
Klamath River mainstem (Shasta R to Indian Cr)	1,059	539	718	3	1,260	2,319
Klamath Tributaries (above Trinity River)	3,259	458	2,583	32	3,072	6,331
Blue Creek	<u>418</u>	<u>11</u>	<u>1,067</u>	<u>65</u>	<u>1,143</u>	<u>1,561</u>
Klamath Basin subtotal	24,791	7,164	10,740	111	18,013	42,804
Trinity River (mainstem above WCW)	37,690	16,911	9,727	1,105	27,744	65,434
Trinity River (mainstem below WCW)	130	132	732	60	924	1,054
Trinity Tributaries (above Reservation; below WCW)	96	0	515	27	542	638
Hoopla Reservation tributaries	<u>94</u>	<u>0</u>	<u>503</u>	<u>27</u>	<u>530</u>	<u>624</u>
Trinity Basin subtotal	38,010	17,043	11,477	1,219	29,740	67,750
Natural Spawners subtotal	62,801	24,207	22,217	1,330	47,753	110,554
Total Spawner Escapement	74,222	42,581	26,099	1,411	70,092	144,314
Recreational Harvest						
Klamath River (below Hwy 101 bridge)	700	477	144	4	624	1,324
Klamath River (Hwy 101 to Weitchpec)	6,557	556	332	24	912	7,469
Klamath River (Weitchpec to IGH)	1,480	996	486	1	1,483	2,963
Trinity River Basin (above WCW)	826	401	311	14	726	1,552
Trinity River Basin (below WCW)	434	207	202	9	418	852
Subtotals	9,997	2,637	1,475	52	4,163	14,160
Tribal Harvest						
Klamath River (below Hwy 101)	429	7,629	9,251	338	17,218	17,647
Klamath River (Hwy 101 to Trinity mouth)	467	2,376	1,841	56	4,272	4,739
Trinity River (Hoopla Reservation)	426	3,281	1,495	87	4,863	5,289
Subtotals	1,322	13,286	12,587	481	26,353	27,675
Total Harvest	11,319	15,923	14,062	533	30,516	41,835
Totals						
Harvest and Escapement	85,541	58,504	40,161	1,944	100,608	186,149
Recreational Angling Dropoff Mortality 2.04%	204	54	30	1	85	289
Tribal Net Dropoff Mortality 8.7%	115	1,155	1,095	42	2,292	2,407
Total River Run	85,860	59,713	41,286	1,986	102,985	188,845

Table 6. Age proportion of the 2011 Klamath Basin fall Chinook run.

Escapement & Harvest	AGE			
	2	3	4	5
<u>Hatchery Spawners</u>				
Iron Gate Hatchery (IGH)	0.53	0.34	0.13	0.00
Trinity River Hatchery (TRH)	0.12	0.77	0.10	0.01
Hatchery Spawner subtotal	0.34	0.54	0.11	0.00
<u>Natural Spawners</u>				
Salmon River Basin	0.33	0.34	0.33	0.00
Scott River Basin	0.45	0.18	0.37	0.00
Shasta River Basin	0.98	0.00	0.02	0.00
Bogus Creek Basin	0.44	0.39	0.17	0.00
Klamath River mainstem (IGH to Shasta R)	0.45	0.25	0.30	0.00
Klamath River mainstem (Shasta R to Indian Cr)	0.46	0.23	0.31	0.00
Klamath tributaries (above Reservation)	0.51	0.07	0.41	0.01
Yurok Reservation tributaries	<u>0.27</u>	<u>0.01</u>	<u>0.68</u>	<u>0.04</u>
Klamath Basin subtotal	0.58	0.17	0.25	0.00
Trinity River (mainstem above WCW)	0.58	0.26	0.15	0.02
Trinity River (mainstem below WCW)	0.12	0.13	0.69	0.06
Trinity tributaries (above Reservation)	0.15	0.00	0.81	0.04
Hoopla Reservation tributaries	<u>0.15</u>	<u>0.00</u>	<u>0.81</u>	<u>0.04</u>
Trinity Basin subtotal	0.56	0.25	0.17	0.02
Natural Spawners subtotal	0.57	0.22	0.20	0.01
Total Spawner Escapement	0.51	0.30	0.18	0.01
<u>Recreational Harvest</u>				
Klamath River (below Hwy 101 bridge)	0.53	0.36	0.11	0.00
Klamath River (Hwy 101 to Weitchpec)	0.88	0.07	0.04	0.00
Klamath River (Weitchpec to IGH)	0.50	0.34	0.16	0.00
Trinity River Basin (above WCW)	0.53	0.26	0.20	0.01
Trinity River Basin (below WCW)	<u>0.51</u>	<u>0.24</u>	<u>0.24</u>	<u>0.01</u>
Subtotals	0.71	0.19	0.10	0.00
<u>Tribal Harvest</u>				
Klamath River (below Hwy 101)	0.02	0.43	0.52	0.02
Klamath River (Hwy 101 to Trinity mouth)	0.10	0.50	0.39	0.01
Trinity River (Hoopla Reservation)	<u>0.08</u>	<u>0.62</u>	<u>0.28</u>	<u>0.02</u>
Subtotals	0.05	0.48	0.45	0.02
Total Harvest	0.27	0.38	0.34	0.01
<u>Totals</u>				
Harvest and Escapement	0.46	0.31	0.22	0.01
Recreational Angling Dropoff Mortality 2.04%	0.71	0.19	0.10	0.00
Tribal Net Dropoff Mortality 8.7%	0.05	0.48	0.45	0.02
Total River Run	0.45	0.32	0.22	0.01

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 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 – 2012 Details.

Iron Gate Hatchery (IGH)

A systematic random bio-sample^a was obtained from every tenth Chinook salmon returning to IGH in 2011. Additionally, every ad-clipped fish not occurring in the random sample was bio-sampled as nonrandom. Nonrandom sampled ad-clipped fish are used for age validation, but not used in scale-based age proportions. A total of 1,728 scale samples were collected and read, of which 767 were from known-age coded wire tagged (CWT) fish. Scale-based age compositions were used to apportion all age classes.

Bogus Creek

Escapement was estimated by summing carcasses encountered below the video weir and videography counts (since 2002) above the weir. Bio-samples were obtained using a 1:3 systematic random sample. Additionally, biological data were obtained from a non-random collection of every ad-clipped fish encountered. A total of 1,352 scale samples were collected and read, of which 418 were from known-age CWT fish. Scale-based age compositions were used to apportion all age classes.

Shasta River

Escapement was estimated by videography (since 1998) while bio-samples were collected from all recovered carcasses for surveys in the lower seven river miles on public and private lands where access is granted. An additional six river miles within the valley area were surveyed on Nature Conservancy property. Bio-samples were also obtained from all fish that washed back onto the counting weir. A total of 284 scale samples were collected from carcasses (excluding 'wash backs') and read, four of which were from known-age CWT fish. Scale-based age compositions from the carcass survey samples were used to apportion all age classes.

Scott River

Independent estimates from above and below the weir were combined to produce total escapement. Escapement above the weir was estimated using videography (since 2008). Escapement below the weir was calculated using the Schaefer estimator with data from twice weekly mark-recapture carcass surveys. Bio-samples were obtained from all non-deteriorated carcasses recovered above and below the weir. A total of 1,753 scale samples were collected and read, of which two were from known-age CWT fish. Scale-based age compositions were used to apportion all age classes.

Salmon River

Total escapement was calculated by combining a Schaefer carcass mark-recapture estimate within the main stem with a redd count expansion (redds X 2) from tributaries and the lowest three reaches of the main stem. Biological samples were obtained from all recovered carcasses though scales were obtained only from "Path 1" carcasses (both eyes clear). A total of 423 scale samples were collected and read, none of which were from known-age CWT fish. Scale-based age compositions were used to apportion all age classes.

Klamath River Tributaries

Adult escapement was estimated by expanding the total redd count (redds X 2) and adding in the number of live fish observed during the final survey in each tributary. A total of 144 scale samples were collected and read, none of which were of known-age CWT fish. Scale-based age compositions were used to apportion all age classes.

^a Biological samples ("bio-samples") of live fish or carcasses generally included: sex, fork length, tags or marks, and CWT recovery from ad-clipped fish.

Klamath River Mainstem

For the upper reach (IGH to Shasta River), escapement was calculated by combining two independent size-stratified Petersen carcass mark-recapture estimates for “small” (<64 cm FL) and “large” (≥64 cm FL) fish. A total of 756 scale samples from carcasses were collected and read, of which 166 were from known-age CWT fish. Scale-based age proportions were used to assign all age classes.

For the lower reach (Ash Creek to Indian Creek), adult escapement was estimated by expanding the total redd count (redds X 2). The total was estimated by expansion of the adult estimate using scale-based age proportions from the upper reach [adult/(1-proportion jacks)]. Scale-based age proportions from the upper reach were used as surrogate to assign all age classes from total estimate.

Lower Klamath River Creel

Total harvest was estimated by combining creel census estimates from the two sub-areas (above Highway 101 Bridge to Weitchpec and below Highway 101 Bridge to mouth). A total of 1,918 scale samples were collected and read, of which 176 were taken from known-age CWT fish. Scale-based age proportions for each sub area were used to apportion all age classes in their respective sub-area.

Upper Klamath River Recreational Fishery

A creel census in this sub-area was not conducted in 2011. Creel census data were available for the lower and upper river fisheries in 1999 through 2002. The ratio of average adult harvest in the entire Klamath main stem for these years to the average harvest in the lower Klamath River Creel area was applied to the Lower Klamath River Creel harvest estimate to estimate the total 2011 adult harvest in the Klamath River main stem. Adult harvest for the Upper Klamath River Recreational Fishery was estimated by subtracting the estimated Lower Klamath River Creel from Klamath main stem 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 main stem, Bogus Creek, and Iron Gate Hatchery combined. These weighted scale-based age compositions were used to apportion all age classes in this fishery.

Yurok Tribal Estuary Fishery (Klamath mouth to Hwy 101)

Yurok harvest in the estuary was estimated by hourly stratified effort and catch-per-effort methods. The fishery was closed on Wednesdays and Thursdays and between the hours of 10 PM and 7 AM on fishing days. A total of 2,598 scale samples were collected and read, of which 551 were from known-age CWT fish. Scale-based age compositions were used to apportion all age classes.

Yurok Tribal Fishery Above 101

Yurok harvest in this sub area was estimated by daily effort and catch-per-effort analyses. The fishery was closed on Wednesdays and Thursdays. Yurok harvest in the mid- and upper-Klamath area was segregated into jacks and adults based on scale ages. A total of 1,310 scale samples were collected and read, of which 61 came from known-age CWT fish. Scale-based age compositions were used to apportion all age classes.

Blue Creek

Escapement was estimated from the peak dive count of live fish. Jacks were estimated by direct diver count. A total of 135 scale samples from carcasses and netted live fish were read. Scale-based age compositions were used to apportion adult age classes

Appendix C. Trinity River – 2011 Details.

Trinity River Hatchery (TRH)

Sampling for scales was conducted in a systematic (1:5) random manner. Ad-clipped and non-ad-clipped fish were selected with equal probability. A total of 2,869 scales were aged of which 621 scales came from CWT fish. Scale samples were used to apportion the hatchery return into age classes.

Upper Trinity River Recreational Harvest

The general method for estimating the upper Trinity recreational harvest depends on the application of reward/non-reward program tags at the Willow Creek Weir (WCW) and subsequently returned by anglers. CDFG estimated a 1.559% harvest rate on adult Chinook based on return of 7 program reward-tags of the 449 applied at WCW. The jack harvest rate of 2.286% was based on return of 8 reward program tags of the 350 tags applied, yielding an estimated harvest of 826 age-2 Chinook. There were no scales recovered from this fishery as no creel census was implemented in 2011. The adult age-proportions estimated for the Lower Trinity River Creel were used to apportion the Upper Trinity River Recreational Harvest adult component.

Lower Trinity River Creel

A roving creel census was implemented in Trinity River below the location of the WCW. A total of 132 scales were aged of which 1 were from known-age fish. Total harvest was apportioned by age using the scale-age proportions.

Upper Trinity River Natural Escapement

Total run estimated using a Petersen mark-recapture estimator. The methods used for ageing the Trinity River run above WCW are similar to those used in the estimation of the population, apportioned to three general recovery areas: Trinity River Hatchery, Trinity upper-basin natural spawning escapement, and recreational harvest. At WCW a systematic random sampling (1:2) of all fish examined produces a collection of scales for program marked fish, some of which are ad-clipped (Trinity River Hatchery origin). Validation of WCW scales is accomplished with known-age fish later recovered at either TRH or natural spawning areas which are also referenced to WCW by a unique "program tag" (spaghetti tag applied at WCW with unique identifying number). A total of 809 scales were used in estimation of the WCW run of which 33 CWT records were subsequently recovered at TRH.

The age-structure for fish passing above WCW was estimated using these scales and known-age fish recovered at Trinity River Hatchery which are linked to the scale samples. Next, specific age structures are estimated for fish returning to TRH and the recreational fishery. These proportions are applied to the total hatchery escapement and estimated fishery harvest respectively providing totals by age within area. These totals are next deducted from the WCW run apportioned by age resulting in an age-structure for the natural escapement in the upper Trinity River.

Lower Trinity River Natural Escapement:

The lower Trinity River natural escapement estimation area included total spawners estimated in both mainstem and tributary sub-areas (redds X 2). Sufficient scale samples were recovered to generate independent age proportions for both the mainstem and tributary sub-areas. In the tributaries, a total of 100 scales were aged, none of which were from known-age fish. In the mainstem, a total of 49 scales were aged, none of which were from known-age fish.

Hoopa Valley Tribal Harvest

Hoopa Valley Tribal harvest is a composite of the gillnet and hook-and-line fisheries prosecuted by Tribal members. A total of 1,887 scales were aged of which 223 were from known-age fish. The total harvest was apportioned by age using these scale-age proportions.

Appendix D. 2011 Klamath age analysis

Unknown scales age composition as read					
	AGE 2	AGE 3	AGE 4	AGE 5	TOTAL
BOGUS	416	370	146	2	934
IGH	502	335	123	1	961
SALMON	140	163	119	1	423
SCOTT	785	409	553	4	1,751
SHASTA	270	6	4	0	280
MAINSTEM	267	164	157	2	590
UR TRIBS	73	20	50	1	144
LRC EST	175	123	33	1	332
LRC UP	1,223	127	56	4	1,410
YTFP EST	64	992	953	38	2,047
YTFP M&U	132	675	427	15	1,249
BLUE CRK	13	18	97	6	134
	4060	3402	2718	75	10255
Unknown scales corrected age proportions (Kimura method)					
	AGE 2	AGE 3	AGE 4	AGE 5	TOTAL
BOGUS	0.4471	0.3750	0.1770	0.0010	1.0
IGH	0.5262	0.3293	0.1446	0.0000	1.0
SALMON	0.3311	0.3432	0.3257	0.0000	1.0
SCOTT	0.4533	0.1773	0.3694	0.0000	1.0
SHASTA	0.9814	0.0019	0.0167	0.0000	1.0
MAINSTEM	0.4567	0.2322	0.3097	0.0013	1.0
UR TRIBS	0.5147	0.0723	0.4079	0.0050	1.0
LRC EST	0.5305	0.3572	0.1094	0.0029	1.0
LRC UP	0.8816	0.0705	0.0446	0.0033	1.0
YTFP EST	0.0248	0.4193	0.5366	0.0192	1.0
YTFP M&U	0.0993	0.4980	0.3908	0.0120	1.0
BLUE CRK	0.0986	0.0090	0.8414	0.0510	1.0
Known CWT ages ^{/a}					
	AGE 2	AGE 3	AGE 4	AGE 5	TOTAL
BOGUS	156	245	19	0	420
IGH	1854	1397	162	1	3414
SALMON	0	0	0	0	0
SCOTT	0	1	1	0	2
SHASTA	3	1	0	0	4
MAINSTEM	56	110	0	0	166
UR TRIBS	0	0	0	0	0
LRC	108	53	7	0	168
YTFP EST	4	460	76	10	550
YTFP M&U	2	44	11	0	57
BLUE CRK	0	0	0	0	0
	2183	2311	276	11	4781
<u>Breakout within strata</u>					
Bogus1	30	67	6	0	103
Bogus2	126	178	13	0	317
LRC - lo	12	14	2	0	28
LRC - mid	96	39	5	0	140
YTFP MID	1	29	6	0	36
YTFP UP	1	15	5	0	21

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

Appendix E. 2011 Trinity age analysis

WCW = Willow Ck. Weir

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable		5	0	0	0	0	5
2	373	5	0	0	0	0	378
3	287	0	30	0	0	0	317
4	104	0	1	1	0	0	106
5	8	0	0	0	0	0	8
37							
772		777	5	31	1	0	814

LOWTRINREC = Lower Trinity Recreational

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable		0	0	0	0	0	0
2	66	0	0	0	0	0	66
3	35	0	1	0	0	0	36
4	29	0	0	0	0	0	29
5	1	0	0	0	0	0	1
131		131	0	1	0	0	132

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

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable		31	0	4	0	0	35
2	142	1	1	0	0	0	144
3	1047	0	192	3	0	0	1242
4	455	0	1	23	0	0	479
5	20	0	0	0	0	2	22
227							
1664		1695	1	198	26	2	1922

TRH = Trinity River Hatchery

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable		44	0	8	1	0	53
2	271	66	2	0	0	0	339
3	1749	1	477	5	0	0	2232
4	220	0	1	64	2	0	287
5	8	0	0	0	3	0	11
630							
2248		2292	67	488	70	5	2922

LOWTRINTRIBS = Lower Trinity Tribs - Includes samples taken by I Cwt Age

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable		5	0	0	0	0	5
2	15	0	0	0	0	0	15
3	3	0	0	0	0	0	3
4	79	0	0	0	0	0	79
5	3	0	0	0	0	0	3
100		105	0	0	0	0	105

UPKLAMREC Upper Klamath Recreational

NO DATA

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

LOWTRINMAINSTEM = Lower Trinity Mainstem

		Cwt Age					
		no cwt age	2	3	4	5	Total
Scale unreadable		2	0	0	0	0	2
2	6	0	0	0	0	0	6
3	9	0	0	0	0	0	9
4	32	0	0	0	0	0	32
5	2	0	0	0	0	0	2
49		51	0	0	0	0	51

NO DATA

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

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

		Cwt Age					
		2	3	4	5		
2		72	3	0	0	0	
3		1	700	8	0	0	
4		0	3	88	2	0	
5		0	0	0	5	0	
4x4						0.98	

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

		Cwt Age				
		2	3	4	5	
2		0.9863	0.0042	0.0000	0.0000	
3		0.0137	0.9915	0.0833	0.0000	
4		0.0000	0.0042	0.9167	0.2857	
5		0.0000	0.0000	0.0000	0.7143	

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

# known scales	37	227	1	630	0	895
unknown scales	772	1664	131	2248	100	4964

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

		Cwt Age			
		2	3	4	5
2		1.0139	-0.0043	0.0004	-0.0002
3		-0.0140	1.0090	-0.0917	0.0367
4		0.0001	-0.0047	1.0913	-0.4365
5		0.0000	0.0000	0.0000	1.4000

UNKNOWN CWTS

		Cwt Age					
		2	3	4	5	Total	
30		14	0	0	0	14	

WCW scales

Age	WCW no cwts	known age cwts scales	Total age all scales	WCW age proportions
2	377	0	377	0.4883
3	275	0	275	0.3564
4	109	0	109	0.1408
5	11	0	11	0.0145
	772	0	772	1.0000

CWTS Age	Cwt Age					(Estimated)		(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	1	0	410.96	0	28	765	0	
3	0	198	1	2641.3	0	97	3458	0	
4	0	26	0	357.04	0	13	467	0	
5	0	2	0	19	0	1	25	0	
	0	227	1	3429	0	138	4715	0	

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

	Total Run	WCW		TRH + Rec above WCW+Natural	Apportioned Natural Escapement	
		Age	proportions	Escapement	Escapement	Proportions
Rec above WCW	1552	2	0.4883	40389	37690	0.5760
TRH	15721	3	0.3564	29474	16911	0.2584
Naturals	65434	4	0.1408	11644	9727	0.1487
Total	82707	5	0.0145	1200	1105	0.0169
				82707		

Appendix F. 2011 Klamath Basin fall Chinook age-composition calculation worksheet.

2/14/12

Hatchery spawners	# Grise	# Adults	Total Run	CALCULATED AGE					Total	SCALE AGE PROPORTIONS (unknowns)					Unk. Age Scales Read	Length Freq or Redds Live	
				2	3	4	5	6		2	3	4	5	Total			
Iron Gate Hatchery (IGH)	9549	8490	18039	9549	6212	2276	1	18039	scales	0.5262	0.3293	0.1446	0.0000	1.0	961		
Trinity River Hatchery (TRH)	1872	13849	15721	1872	12162	1606	80	15721	IGH cwt	1854	1397	162	1	3414			
<i>Hatchery spawner subtotal:</i>	<i>11421</i>	<i>22339</i>	<i>33760</i>	<i>11421</i>	<i>18374</i>	<i>3882</i>	<i>81</i>	<i>33760</i>	scales	0.11889	0.7745	0.1016	0.0050	1.0	2248		
		prop. hatchery grise	0.338						TRH cwt	411	2641	357	19	3429			
									proportion hatchery	0.179							
Natural Spawners																	
Trinity River mainstem above WCW	37690	27744	65434	37690	16911	9727	1105	65434	scales	0.57601	0.25844	0.14866	0.01689	1.0	772		
Trinity River mainstem below WCW	130	924	1054	130	132	732	60	1054	scales	0.12361	0.12521	0.69404	0.05714	1.0	49	462	
Salmon River Basin (includes Wooley Cr)	1819	3674	5493	1819	1885	1789	0	5493	scales	0.33113	0.34321	0.32566	0.00000	1.0	423	326	
Scott River	2499	3016	5515	2499	978	2038	0	5515	scales	0.45332	0.17726	0.36941	0.00000	1.0	1,751		
Shasta River	11187	213	11400	11187	23	190	0	11400	Scott CWT	0	1	1	0	2			
Bogus Creek	2303	2919	5222	2303	2046	869	5	5222	scales	0.98137	0.00192	0.01671	0.00000	1.0	280		
Mainstem Klamath (IGH to Shasta R)	2247	2716	4963	2247	1224	1486	6	4963	Shasta CWT	3	1	0	0	4			
Mainstem Klamath (Ash Cr to Indian Cr)	1059	1260	2319	1059	539	718	3	2319	scales	0.44706	0.37496	0.17695	0.00103	1.0	934		
<i>Main basin natural subtotals:</i>	<i>58,934</i>	<i>42,466</i>	<i>101,400</i>	<i>58,934</i>	<i>23,738</i>	<i>17,549</i>	<i>1,179</i>	<i>101,400</i>	Bogus CWT	156	245	19	0	420			
									scales	0.45671	0.23223	0.30974	0.00132	1.0	590	<64 cm	
									KR main CWT	56	110	0	0	166			
									Upper Main	0.45671	0.23223	0.30974	0.00132	1.0	IGH to Shasta	630	
Klamath Tributaries																	
Aiken Cr	32	30	62	32	4	25	0	62	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	15	
Beaver Cr	117	110	227	117	16	92	1	227	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	55	
Bluff Cr	166	157	323	166	23	132	2	323	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	57 88	
Boise Cr	5	4	9	5	1	4	0	9	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	2 1	
Camp Cr	969	914	1883	969	136	768	9	1883	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	452 20	
Clear Cr	226	213	439	226	32	179	2	439	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	92 60	
Dillon Cr	73	69	143	73	10	58	1	143	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	21 56	
Elk Cr	205	193	398	205	29	162	2	398	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	80 68	
Grider Cr	139	131	271	139	20	111	1	271	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	65 3	
Horse Cr	17	16	33	17	2	13	0	33	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	6 8	
Independence Cr	0	0	0	0	0	0	0	0	scales	0.51474	0.07227	0.40795	0.00504	1.0	144		
Indian Cr	253	238	491	253	36	200	2	491	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	76 178	
Irving Cr	0	0	0	0	0	0	0	0	scales	0.51474	0.07227	0.40795	0.00504	1.0	144		
Perch Cr	0	0	0	0	0	0	0	0	scales	0.51474	0.07227	0.40795	0.00504	1.0	144		
Red Cap Cr	774	729	1503	774	109	613	8	1503	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	363 7	
Rock Cr	26	25	51	26	4	21	0	51	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	10 10	
Slate Cr	150	141	291	150	21	119	1	291	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	70 2	
Seiad Cr	0	0	0	0	0	0	0	0	scales	0.51474	0.07227	0.40795	0.00504	1.0	144		
Thompson Cr	56	53	109	56	8	44	1	109	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	8 76	
TI Cr	0	0	0	0	0	0	0	0	scales	0.51474	0.07227	0.40795	0.00504	1.0	144		
Pine Cr (previously in Trin Tribs)	51	48	99	51	7	40	0	99	scales	0.51474	0.07227	0.40795	0.00504	1.0	144	24	
<i>Klamath trib subtotal:</i>	<i>3259</i>	<i>3072</i>	<i>6331</i>	<i>3259</i>	<i>458</i>	<i>2583</i>	<i>32</i>	<i>6331</i>								1396 577	
Trinity Tributaries																	
Horse Linto Cr	58	324	382	58	0	308	16	382	scales	0.15091	0.00000	0.80621	0.04288	1.0	100	162	
Cedar Cr (trib to Horse Linto)	39	218	257	39	0	207	11	257	scales	0.15091	0.00000	0.80621	0.04288	1.0	100	109	
<i>Trinity trib subtotal:</i>	<i>96</i>	<i>542</i>	<i>638</i>	<i>96</i>	<i>0</i>	<i>515</i>	<i>27</i>	<i>638</i>								271	
<i>Non-reservation trib subtotal:</i>	<i>3355</i>	<i>3614</i>	<i>6969</i>	<i>3355</i>	<i>458</i>	<i>3098</i>	<i>59</i>	<i>6969</i>									
Reservation Tributaries-Hoopa Valley																	
Campbell Cr	3	16	19	3	0	15	1	19	scales	0.15091	0.00000	0.80621	0.04288	1.0	100	8	
Hostler Cr	2	12	14	2	0	11	1	14	scales	0.15091	0.00000	0.80621	0.04288	1.0	100	6	
Mill Cr	43	240	283	43	0	228	12	283	scales	0.15091	0.00000	0.80621	0.04288	1.0	100	120	
Pine Cr. (moved in 2007 to Klam trib)																	
Soctish Cr	3	18	21	3	0	17	1	21	scales	0.15091	0.00000	0.80621	0.04288	1.0	100	9	
Supply Cr	23	130	153	23	0	123	7	153	scales	0.15091	0.00000	0.80621	0.04288	1.0	100	65	
Tish Tang Cr	20	114	134	20	0	108	6	134	scales	0.15091	0.00000	0.80621	0.04288	1.0	100	57	
Other (Hospital Cr.)	0	0	0	0	0	0	0	0	scales	0.15091	0.00000	0.80621	0.04288	1.0	100		
<i>HVT reservation trib subtotal:</i>	<i>94</i>	<i>530</i>	<i>624</i>	<i>94</i>	<i>0</i>	<i>503</i>	<i>27</i>	<i>624</i>	scales	0.15091	0.00000	0.80621	0.04288	1.0	100	265	
Reservation Tributaries-Yurok																	
Blue Cr	418	1143	1561	418	11	1067	65	1561	scales	count	0.00996	0.93345	0.05658	1.0	134		
<i>Reservation tributaries subtotal:</i>	<i>512</i>	<i>1673</i>	<i>2185</i>	<i>512</i>	<i>11</i>	<i>1570</i>	<i>92</i>	<i>2185</i>									
<i>Natural spawner subtotal:</i>	<i>62801</i>	<i>47753</i>	<i>110554</i>	<i>62801</i>	<i>24207</i>	<i>22217</i>	<i>1330</i>	<i>110554</i>									
<i>Total spawners:</i>	<i>74222</i>	<i>70092</i>	<i>144314</i>	<i>74222</i>	<i>42581</i>	<i>26099</i>	<i>1411</i>	<i>144314</i>									
Angler Harvest																	
Klamath River (below Hwy 101)	700	624	1324	700	477	144	4	1324	scales	0.53052	0.35719	0.10941	0.00289	1.0	332		
Klamath River (Hwy 101 to Weitchpec)	6557	912	7469	6557	556	332	24	7469	est-LRC CWT	12	14	2	0	28			
									scales	0.88160	0.07051	0.04456	0.00332	1.0	1,410		
									mid-LRC CWT	96	39	5	0	140			
									SURROGATE - Iron Gate+Bogus+Klamath Mainstem Weighted Totals								
										14099	9482	4631	12	28224			
										IGH+Bog+Klam	0.49953	0.33595	0.16408	0.00043	1.0		
										SURROGATE - Trinity Rec. Harvest below WCW - adults only							
										TR LRC	count	0.49466	0.48354	0.02180	1.0		
										TR-up CWT	28	97	13	1	110	Paper CWTs	
										scales	0.50977	0.24250	0.23704	0.01069	1.0	131	<58cm
										TR-low CWT	0	1	0	0	1		
<i>Angler harvest subtotal:</i>	<i>9,997</i>	<i>4,163</i>	<i>14,160</i>	<i>9,997</i>	<i>2,637</i>	<i>1,475</i>	<i>52</i>	<i>14,160</i>									
Tribal Harvest																	
Klamath River (Estuary)	429	17218	17647	429	7629	9251	338	17647	scales	0.0248	0.4193	0.5366	0.0192	1.0	2,047		
Klamath River (101 to Trinity R)	467	4272	4739	467	2376	1841	56	4739	YTFP EST CWT	4	460	76	10	550			
Trinity River	426	4863	5289	426	3281	1495	87	5289	scales	0.0993	0.4980</						

Appendix G. Age composition of the 2010 Klamath Basin fall Chinook run (finalized 2/6/2012).

Escapement & Harvest	AGE				Total Adults	Total Run
	2	3	4	5		
Hatchery Spawners						
Iron Gate Hatchery (IGH)	1,069	6,908	3,369	1	10,278	11,347
Trinity River Hatchery (TRH)	1,432	3,958	3,810	6	7,774	9,206
Hatchery Spawner subtotal	2,501	10,866	7,179	7	18,052	20,553
Natural Spawners						
Salmon River Basin	356	1,610	868	0	2,478	2,834
Scott River Basin	394	400	1,714	0	2,114	2,508
Shasta River Basin	87	239	1,022	0	1,261	1,348
Bogus Creek Basin	291	2,243	932	4	3,180	3,471
Klamath River mainstem (IGH to Shasta R)	180	1088	1293	12	2,392	2,572
Klamath River mainstem (Shasta R to Indian Cr)	95	588	698	6	1,292	1,387
Klamath Tributaries (above Trinity River)	274	704	959	0	1,663	1,937
Blue Creek	<u>134</u>	<u>335</u>	<u>455</u>	<u>0</u>	<u>790</u>	<u>924</u>
Klamath Basin subtotal	1,811	7,207	7,941	22	15,170	16,981
Trinity River (mainstem above WCW)	9,764	11,587	9,765	195	21,547	31,311
Trinity River (mainstem below WCW)	15	17	15	0	32	47
Trinity Tributaries (above Reservation; below WCW)	69	82	69	1	152	221
Hoopla Reservation tributaries	<u>147</u>	<u>174</u>	<u>147</u>	<u>3</u>	<u>324</u>	<u>471</u>
Trinity Basin subtotal	9,995	11,860	9,996	199	22,055	32,050
Natural Spawners subtotal	11,806	19,067	17,937	221	37,225	49,031
Total Spawner Escapement	14,307	29,933	25,116	228	55,277	69,584
Recreational Harvest						
Klamath River (below Hwy 101 bridge)	162	198	306	6	510	672
Klamath River (Hwy 101 to Weitchpec)	1,320	838	384	3	1,225	2,545
Klamath River (Weitchpec to IGH)	88	595	280	0	875	963
Trinity River Basin (above WCW)	127	112	74	3	190	317
Trinity River Basin (below WCW)	134	141	90	4	235	369
Subtotals	1,831	1,884	1,134	16	3,035	4,866
Tribal Harvest						
Klamath River (below Hwy 101)	20	8,584	13,052	89	21,725	21,745
Klamath River (Hwy 101 to Trinity mouth)	156	2,616	1,823	22	4,461	4,617
Trinity River (Hoopla Reservation)	252	1,932	1,755	13	3,701	3,953
Subtotals	428	13,132	16,630	124	29,887	30,315
Total Harvest	2,259	15,016	17,764	140	32,922	35,181
Totals						
Harvest and Escapement	16,566	44,949	42,880	368	88,199	104,765
Recreational Angling Dropoff Mortality 2.04%	37	38	23	0	62	99
Tribal Net Dropoff Mortality 8.7%	37	1,142	1,446	11	2,599	2,636
Total River Run	16,640	46,129	44,349	382	90,860	107,500