Summary

The number of Klamath River fall Chinook salmon returning to the Klamath River Basin (Basin) in 2014 was estimated to be:

<table>
<thead>
<tr>
<th>Age</th>
<th>Number</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>22,348</td>
<td>0.12</td>
</tr>
<tr>
<td>3</td>
<td>57,837</td>
<td>0.32</td>
</tr>
<tr>
<td>4</td>
<td>98,710</td>
<td>0.54</td>
</tr>
<tr>
<td>5</td>
<td>3,897</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>182,792</strong></td>
<td><strong>1.00</strong></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Sector</th>
<th>Preseason Forecast</th>
<th>Postseason Estimate</th>
<th>Pre / Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run Size</td>
<td>92,800</td>
<td>160,400</td>
<td>0.58</td>
</tr>
<tr>
<td>Fishery Mortality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tribal Harvest</td>
<td>27,300</td>
<td>25,900</td>
<td>1.05</td>
</tr>
<tr>
<td>Recreational Harvest</td>
<td>4,100</td>
<td>5,300</td>
<td>0.77</td>
</tr>
<tr>
<td>Drop-off Mortality</td>
<td>2,500</td>
<td>2,400</td>
<td>1.04</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>33,900</td>
<td>33,600</td>
<td>1.01</td>
</tr>
<tr>
<td>Escapement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hatchery Spawners</td>
<td>18,200</td>
<td>31,300</td>
<td>0.58</td>
</tr>
<tr>
<td>Natural Area Spawners</td>
<td>40,700</td>
<td>95,300</td>
<td>0.43</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>58,900</td>
<td>126,600</td>
<td>0.47</td>
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</table>
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 2014. The estimates provided in this report are consistent with the Klamath Basin Megatable (CDFG 2015) and with the 2014 forecast of ocean stock abundance (KRTT 2015).

Age-specific escapement estimates for 2014 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 2015). 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 2015). 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 (Appendix B and C). Random and nonrandom sampling methods of various types were used throughout the Basin (Table 1) to estimate the numbers of fall Chinook salmon in the 2014 run 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 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 (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.

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 B for the Klamath River and Appendix C for the Trinity River.
Results

A total of 11,796 scales from 15 different sectors were aged for this analysis (Table 2). Of these, 941 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 D and E). Overall, the scale-based ages were generally accurate. Accuracy within the Trinity Basin was 100% for age-2 fish, 98% for age-3 fish, 99% for age-4 fish, and 100% for age-5 fish. Accuracy within the Klamath River Basin was 97% for age-2 fish, 96% for age-3 fish, 92% for age-4 fish, and 71% 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 2013 Klamath Basin age composition were slightly modified from the preliminary age composition. Final estimates are presented in Appendix G.

List of Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ad-clipped</td>
<td>adipose fin removed</td>
</tr>
<tr>
<td>CDFW</td>
<td>California Department of Fish and Wildlife</td>
</tr>
<tr>
<td>CWT</td>
<td>coded-wire tag</td>
</tr>
<tr>
<td>EST</td>
<td>Klamath River estuary</td>
</tr>
<tr>
<td>FL</td>
<td>fork length</td>
</tr>
<tr>
<td>HVT</td>
<td>Hoopa Valley Tribe</td>
</tr>
<tr>
<td>IGH</td>
<td>Iron Gate Hatchery</td>
</tr>
<tr>
<td>KRTAT</td>
<td>Klamath River Technical Advisory Team</td>
</tr>
<tr>
<td>KRTT</td>
<td>Klamath River Technical Team</td>
</tr>
<tr>
<td>KT</td>
<td>Karuk Tribe</td>
</tr>
<tr>
<td>LRC</td>
<td>Lower Klamath River Creel</td>
</tr>
<tr>
<td>MKWC</td>
<td>Mid-Klamath Watershed Council</td>
</tr>
<tr>
<td>M&amp;U</td>
<td>Klamath River below Weitchpec: “middle” section (Hwy 101–Surpur Cr.) and “upper” section (Surpur Cr.—Trinity River)</td>
</tr>
<tr>
<td>NCRC</td>
<td>Northern California Resource Center</td>
</tr>
<tr>
<td>QVIR</td>
<td>Quartz Valley Indian Reservation</td>
</tr>
<tr>
<td>SCS</td>
<td>Siskiyou County Schools</td>
</tr>
<tr>
<td>SRCD</td>
<td>Siskiyou Resource Conservation District</td>
</tr>
<tr>
<td>SRRC</td>
<td>Salmon River Restoration Council</td>
</tr>
<tr>
<td>TRH</td>
<td>Trinity River Hatchery</td>
</tr>
<tr>
<td>UR TRIBS</td>
<td>Upper Klamath River Tributaries</td>
</tr>
<tr>
<td>USFS</td>
<td>U.S. Forest Service</td>
</tr>
<tr>
<td>USFWS</td>
<td>U.S. Fish and Wildlife Service</td>
</tr>
<tr>
<td>WCW</td>
<td>Willow Creek Weir</td>
</tr>
<tr>
<td>YT</td>
<td>Yurok Tribe</td>
</tr>
<tr>
<td>YTFP</td>
<td>Yurok Tribal Fisheries Program</td>
</tr>
</tbody>
</table>
Literature Cited


Klamath River Technical Team Participants

California Department of Fish and Wildlife
  Brett Kormos
  Melodie Palmer-Zwahlen
  Morgan Knechtle
  Steve Cannata

Hoopa Valley Tribe
  George Kautsky
  Billy C. Matilton

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: Wade Sinnen, Sara Borok, Mary Claire Kier, Diana Chesney, Jennifer Simon, and Alex Letvin of the California Department of Fish and Wildlife; LeRoy Cyr of the U.S. Forest Service; 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. Scale collections were provided by the California Department of Fish and Wildlife, Hoopa Valley Tribe, U.S. Fish and Wildlife Service, U.S. Forest Service, and Yurok Tribe.
**Table 1. Estimation and sampling methods used for the 2014 Klamath River fall Chinook run assessment.**

<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Estimation and Sampling Methods</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hatchery Spawners</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron Gate Hatchery (IGH)</td>
<td>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.</td>
<td>CDFW</td>
</tr>
<tr>
<td>Trinity River Hatchery (TRH)</td>
<td>Direct count. All fish examined for fin-clips, tags, and marks. Bio-data collected from a systematic random sample of 20% of the fish.</td>
<td>CDFW, HVT</td>
</tr>
<tr>
<td><strong>Natural Spawners</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmon River Basin</td>
<td>Carcass mark-recapture survey (Cormack-Jolly-Seber) within the mainstem combined with redd surveys of the lower mainstem and tributaries. Total run based on mark-recapture estimate and expanded redd count (2*total redd count)/(1-proportion of jacks) + live fish observed on last day surveyed. Jacks estimated from scale-age data for this area. Bio-data collected from all carcasses recovered.</td>
<td>CDFW, USFS, YT, KT, SRRC, SCS</td>
</tr>
<tr>
<td>Scott River Basin</td>
<td>Video count above weir at river mile 18 and carcass mark-recapture (Cormack-Jolly-Seber) below weir. Total run based on video count through the weir and mark-recapture estimate below the weir. Access was limited in a 0.5 mile section of the mark-recapture area which was surveyed once for a peak redd count. In this 0.5 mile section total was estimated using the following formula: Total run = (2*total redd count)/(1-proportion jacks). Bio-data collected from all carcasses recovered.</td>
<td>CDFW, SCS, OVR, USFS, KT, NCRC, SRCD</td>
</tr>
<tr>
<td>Shasta River Basin</td>
<td>Video count above weir. Bio-data collected from carcasses upstream of video weir site, a temporary trap, and mortalities stranded on weir.</td>
<td>CDFW</td>
</tr>
<tr>
<td>Bogus Creek Basin</td>
<td>Video count above weir and twice weekly direct carcass count below weir. Bio-data collected from a systematic random sample (1:4) of all carcasses observed during surveys above and below weir. Additionally, all ad-clipped fish were bio-sampled.</td>
<td>CDFW, SCS</td>
</tr>
<tr>
<td>Klamath River mainstem (IGH to Shasta R)</td>
<td>Area under the curve estimate from weekly carcass surveys. Bio-data collected from fresh carcasses.</td>
<td>USFS, YT</td>
</tr>
<tr>
<td>Klamath River mainstem (Ash Cr to Indian Cr)</td>
<td>Weekly redd survey. Total run = (2*total redd count)/(1-proportion jacks). Jacks estimated from the Klamath River mainstem area scale-age data.</td>
<td>USFS, KT</td>
</tr>
<tr>
<td>Klamath Tributaries above Trinity</td>
<td>Periodic redd surveys, the majority of which were performed weekly. Total run = (2*total redd count)/(1-proportion jacks) + live fish observed on last day surveyed. Jacks estimated from Klamath tributary scale-age data. Bio-data collected from all carcasses recovered.</td>
<td>USFS, CDFW, KT, YT, SRRC, MKWC, SCS</td>
</tr>
<tr>
<td>Blue Creek</td>
<td>Weekly snorkel surveys. Total estimated as the peak count during surveys. Bio-data collected from all fresh carcasses.</td>
<td>YT</td>
</tr>
<tr>
<td>Trinity River (mainstream above WCW)</td>
<td>Mark-recapture (Peterson); marks applied at WCW and recovered at TRH. All fish bio-sampled and scales collected in systematic random sample (1:2). Age composition of total run past WCW based on scale-age data from the weir. Natural spawning escapement estimated by subtracting age specific estimates of hatchery returns and recreational harvest above WCW from the total run.</td>
<td>CDFW, HVT</td>
</tr>
<tr>
<td>Trinity River (mainstream below WCW)</td>
<td>Bi-weekly redd survey. Total run = (2*total redd count)/(1-proportion jacks). Jacks estimated from the natural area above WCW. Bio-samples from all recovered carcasses.</td>
<td>HVT, USFWS</td>
</tr>
<tr>
<td>Trinity Tributaries (above Reservation; below WCW)</td>
<td>Periodic redd survey. Total run = (2*total redd count)/(1-proportion jacks) + live fish observed on last day surveyed. Jacks estimated from the Trinity tributaries and Hoopa Reservation tributaries combined. Bio-data collected from all recovered carcasses.</td>
<td>USFS</td>
</tr>
<tr>
<td>Hoopa Reservation Tributaries</td>
<td>Periodic redd survey. Total run = (2*total redd count)/(1-proportion jacks). Jacks estimated from the Trinity tributaries and Hoopa Reservation tributaries combined. Bio-data collected from all recovered carcasses.</td>
<td>HVT</td>
</tr>
<tr>
<td><strong>Recreational Harvest</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klamath River (below Hwy 101 bridge)</td>
<td>Jack and adult estimates based on access point creel survey during three randomly selected days per statistical week. Bio-data collected during angler interviews.</td>
<td>CDFW</td>
</tr>
<tr>
<td>Klamath River (Hwy 101 to Weitchpec)</td>
<td>Jack and adult estimates based on access point creel survey during three randomly selected days per statistical week. Bio-data collected during angler interviews.</td>
<td>CDFW</td>
</tr>
<tr>
<td>Klamath River (Weitchpec to IGH)</td>
<td>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). Upper river adult harvest = total adult harvest minus lower river adult harvest. Total harvest = adults/(1-proportion jacks). Jacks estimated from the weighted IGH, Klamath mainstem, Bogus Creek age composition data.</td>
<td>CDFW</td>
</tr>
<tr>
<td>Trinity River Basin (above WCW)</td>
<td>Jack and adult harvest estimates based on estimated harvest rates from angler return of reward tags applied at WCW.</td>
<td>CDFW</td>
</tr>
<tr>
<td>Trinity River Basin (below WCW)</td>
<td>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.</td>
<td>HVT</td>
</tr>
<tr>
<td><strong>Tribal Harvest</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klamath River (below Hwy 101)</td>
<td>Daily harvest estimates based on effort and catch-per-effort surveys. Bio-data collected during net harvest and buying station interviews.</td>
<td>YT</td>
</tr>
<tr>
<td>Klamath River (Hwy 101 to Trinity mouth)</td>
<td>Daily harvest estimates based on effort and catch-per-effort surveys. Bio-data collected during net harvest interviews.</td>
<td>YT</td>
</tr>
<tr>
<td>Trinity River (Hoopa Reservation)</td>
<td>Effort and catch-per-effort surveys during four randomly selected days per statistical week. Bio-data collected during net harvest interviews.</td>
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</tr>
<tr>
<td><strong>Fishery Dropoff Mortality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recreational Angling Dropoff Mortality 2.04%</td>
<td>Not directly estimated. Assumed rate relative to fishery impacts = .02; relative to fishery harvest = .02/(1-.02).</td>
<td>KRTAT</td>
</tr>
<tr>
<td>Tribal Net Dropoff Mortality 8.7%</td>
<td>Not directly estimated. Assumed rate relative to fishery impacts = .08; relative to fishery harvest = .08/(1-.08).</td>
<td>KRTAT</td>
</tr>
</tbody>
</table>

*a Bio-data 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 2014 Klamath Basin fall Chinook age-composition assessment.

<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Aged</th>
<th></th>
<th></th>
<th></th>
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<th>Agency</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Unknown-age</td>
<td>Known-age</td>
<td>Not aged</td>
<td>Total</td>
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<tr>
<td><strong>Hatchery Spawners</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron Gate Hatchery (IGH)</td>
<td>1,014</td>
<td>95</td>
<td>1,573</td>
<td>2,682</td>
<td>CDFW</td>
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<tr>
<td>Trinity River Hatchery (TRH)</td>
<td>993</td>
<td>301</td>
<td>24</td>
<td>1,318</td>
<td>HVT</td>
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<tr>
<td><strong>Natural Spawners</strong></td>
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<td></td>
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<tr>
<td>Salmon River Carcass Survey</td>
<td>449</td>
<td>0</td>
<td>15</td>
<td>464</td>
<td>CDFW</td>
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<tr>
<td>Scott River Carcass Survey</td>
<td>1,094</td>
<td>1</td>
<td>1,809</td>
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<td>CDFW</td>
<td></td>
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<tr>
<td>Shasta River Carcass</td>
<td>272</td>
<td>12</td>
<td>123</td>
<td>407</td>
<td>CDFW</td>
<td></td>
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<tr>
<td>Bogus Creek Weir</td>
<td>943</td>
<td>230</td>
<td>1,010</td>
<td>2,183</td>
<td>CDFW</td>
<td></td>
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<tr>
<td>Klamath River mainstem</td>
<td>677</td>
<td>61</td>
<td>20</td>
<td>758</td>
<td>USFWS</td>
<td></td>
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<tr>
<td>Upper Klamath River tributaries</td>
<td>504</td>
<td>0</td>
<td>12</td>
<td>516</td>
<td>USFS</td>
<td></td>
</tr>
<tr>
<td>Blue Creek Snorkle</td>
<td>63</td>
<td>0</td>
<td>4</td>
<td>67</td>
<td>YT</td>
<td></td>
</tr>
<tr>
<td>Willow Creek Weir</td>
<td>518</td>
<td>21</td>
<td>6</td>
<td>545</td>
<td>CDFW, HVT</td>
<td></td>
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<tr>
<td>Lower Trinity River Carcass</td>
<td>21</td>
<td>0</td>
<td>1</td>
<td>22</td>
<td>HVT</td>
<td></td>
</tr>
<tr>
<td>Lower Trinity River tributaries</td>
<td>36</td>
<td>0</td>
<td>0</td>
<td>36</td>
<td>HVT, USFS</td>
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<tr>
<td><strong>Recreational Harvest</strong></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Lower Klamath River Creel</td>
<td>1,448</td>
<td>15</td>
<td>73</td>
<td>1,536</td>
<td>CDFW</td>
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<tr>
<td>Lower Trinity River Creel</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>18</td>
<td>HVT</td>
<td></td>
</tr>
<tr>
<td><strong>Tribal Harvest</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klamath River (below Hwy 101)</td>
<td>1,490</td>
<td>141</td>
<td>336</td>
<td>1,967</td>
<td>YT</td>
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<tr>
<td>Klamath River (Hwy 101 to Trinity R)</td>
<td>535</td>
<td>16</td>
<td>29</td>
<td>580</td>
<td>YT</td>
<td></td>
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<tr>
<td>Trinity River (Hoopa Reservation)</td>
<td>684</td>
<td>51</td>
<td>15</td>
<td>750</td>
<td>HVT</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>10,759</td>
<td>944</td>
<td>5,050</td>
<td>16,753</td>
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</tbody>
</table>

a/ Scales from non-ad-clipped fish and ad-clipped fish without CWTs, mounted and aged.
b/ Scales from all mounted and aged ad-clipped CWT fish; non-random CWT fish used for validation but not age composition.
c/ Scales mounted and not aged or scales not mounted.
d/ Includes 12 scales collected from washbacks at Shasta weir that were aged but not used in scale analysis.
Table 3. Age-composition methods used for the 2014 Klamath Basin fall Chinook run assessment.

<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Age Composition Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hatchery Spawners</strong></td>
<td></td>
</tr>
<tr>
<td>Iron Gate Hatchery (IGH)</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>Trinity River Hatchery (TRH)</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td><strong>Natural Spawners</strong></td>
<td></td>
</tr>
<tr>
<td>Salmon River Basin</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>Scott River Basin</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>Shasta River Basin</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>Bogus Creek Basin</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>Klamath River mainstem (IGH to Shasta</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>R)</td>
<td></td>
</tr>
<tr>
<td>Klamath River mainstem (Ash Cr to</td>
<td>Surrogate: Klamath mainstem (IGH to Shasta R) age-structure.</td>
</tr>
<tr>
<td>Indian Cr)</td>
<td></td>
</tr>
<tr>
<td>Klamath tributaries (above Trinity</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>River)</td>
<td></td>
</tr>
<tr>
<td>Blue Creek</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>Trinity River (above WCW)</td>
<td>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.</td>
</tr>
<tr>
<td>Trinity River (mainstem below WCW)</td>
<td>Surrogate: Jack/adult structure from Trinity River (above WCW).</td>
</tr>
<tr>
<td>Trinity Tributaries (above Reservation to WCW )</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>Hoopa Reservation Tributaries</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td><strong>Recreational Harvest</strong></td>
<td></td>
</tr>
<tr>
<td>Klamath River (below Hwy 101 bridge)</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>Klamath River (Hwy 101 to Weitchpec)</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>Klamath River (Weitchpec to IGH)</td>
<td>Surrogate: IGH, Bogus Creek, and Klamath River mainstem (IGH to Shasta River) weighted age composition.</td>
</tr>
<tr>
<td>Trinity River Basin (above WCW)</td>
<td>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).</td>
</tr>
<tr>
<td>Trinity River Basin (below WCW)</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td><strong>Tribal Harvest</strong></td>
<td></td>
</tr>
<tr>
<td>Klamath River (below Hwy 101)</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>Klamath River (Hwy 101 to Trinity</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
<tr>
<td>mouth)</td>
<td></td>
</tr>
<tr>
<td>Trinity River (Hoopa Reservation)</td>
<td>Jack/adult structure from scale-age analysis.</td>
</tr>
</tbody>
</table>
Table 4a. 2014 Klamath River Basin scale validation matrices.

<table>
<thead>
<tr>
<th></th>
<th>Known Age</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>103</td>
</tr>
<tr>
<td>Read</td>
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<tr>
<td>Age</td>
<td>0</td>
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<tr>
<td>5</td>
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</tr>
<tr>
<td>Total</td>
<td>106</td>
</tr>
<tr>
<td></td>
<td>770</td>
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</table>

Table 4b. 2014 Trinity River Basin scale validation matrices.

<table>
<thead>
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<th>Known Age</th>
</tr>
</thead>
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<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Read</td>
<td>3</td>
</tr>
<tr>
<td>Age</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>373</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Known Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>1.00</td>
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<tr>
<td>Read</td>
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<tr>
<td>Age</td>
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<tr>
<td>5</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Table 5. Age composition of the 2014 Klamath Basin fall Chinook run.

<table>
<thead>
<tr>
<th>Escapement &amp; Harvest</th>
<th>AGE</th>
<th>Total</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>Hatchery Spawners</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron Gate Hatchery (IGH)</td>
<td>1,039</td>
<td>12,864</td>
<td>11,276</td>
</tr>
<tr>
<td>Trinity River Hatchery (TRH)</td>
<td>221</td>
<td>3,653</td>
<td>3,271</td>
</tr>
<tr>
<td><strong>Hatchery Spawner subtotal</strong></td>
<td>1,260</td>
<td>16,517</td>
<td>14,547</td>
</tr>
<tr>
<td><strong>Natural Spawners</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmon River Basin</td>
<td>527</td>
<td>865</td>
<td>1,674</td>
</tr>
<tr>
<td>Scott River Basin</td>
<td>2,051</td>
<td>2,977</td>
<td>7,159</td>
</tr>
<tr>
<td>Shasta River Basin</td>
<td>3,945</td>
<td>4,064</td>
<td>10,265</td>
</tr>
<tr>
<td>Bogus Creek Basin</td>
<td>323</td>
<td>6,119</td>
<td>6,448</td>
</tr>
<tr>
<td>Klamath River mainstem (IGH to Shasta R)</td>
<td>1269</td>
<td>6491</td>
<td>8847</td>
</tr>
<tr>
<td>Klamath River mainstem (Shasta R to Indian Cr)</td>
<td>575</td>
<td>2932</td>
<td>4010</td>
</tr>
<tr>
<td>Klamath Tributaries (above Trinity River)</td>
<td>1,498</td>
<td>1,649</td>
<td>4,987</td>
</tr>
<tr>
<td>Blue Creek</td>
<td>332</td>
<td>105</td>
<td>1,108</td>
</tr>
<tr>
<td><strong>Klamath Basin subtotal</strong></td>
<td>10,520</td>
<td>25,202</td>
<td>44,498</td>
</tr>
<tr>
<td>Trinity River (mainstem above WCW)</td>
<td>6,576</td>
<td>10,261</td>
<td>12,011</td>
</tr>
<tr>
<td>Trinity River (mainstem below WCW)</td>
<td>74</td>
<td>115</td>
<td>135</td>
</tr>
<tr>
<td>Trinity Tributaries (above Reservation; below WCW)</td>
<td>47</td>
<td>123</td>
<td>361</td>
</tr>
<tr>
<td>Hoopa Reservation tributaries</td>
<td>52</td>
<td>135</td>
<td>398</td>
</tr>
<tr>
<td><strong>Trinity Basin subtotal</strong></td>
<td>6,749</td>
<td>10,634</td>
<td>12,905</td>
</tr>
<tr>
<td><strong>Natural Spawners subtotal</strong></td>
<td>17,269</td>
<td>35,836</td>
<td>57,403</td>
</tr>
<tr>
<td><strong>Total Spawner Escapement</strong></td>
<td>18,529</td>
<td>52,353</td>
<td>71,950</td>
</tr>
<tr>
<td><strong>Recreational Harvest</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klamath River (below Hwy 101 bridge)</td>
<td>268</td>
<td>249</td>
<td>775</td>
</tr>
<tr>
<td>Klamath River (Hwy 101 to Weitchpec)</td>
<td>2,847</td>
<td>365</td>
<td>1,438</td>
</tr>
<tr>
<td>Klamath River (Weitchpec to IGH)</td>
<td>75</td>
<td>728</td>
<td>759</td>
</tr>
<tr>
<td>Trinity River Basin (above WCW)</td>
<td>168</td>
<td>358</td>
<td>355</td>
</tr>
<tr>
<td>Trinity River Basin (below WCW)</td>
<td>3</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td><strong>Subtotals</strong></td>
<td>3,361</td>
<td>1,726</td>
<td>3,353</td>
</tr>
<tr>
<td><strong>Tribal Harvest</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klamath River (below Hwy 101)</td>
<td>153</td>
<td>2,262</td>
<td>16,668</td>
</tr>
<tr>
<td>Klamath River (Hwy 101 to Trinity mouth)</td>
<td>130</td>
<td>593</td>
<td>2,785</td>
</tr>
<tr>
<td>Trinity River (Hoopa Reservation)</td>
<td>65</td>
<td>524</td>
<td>1,804</td>
</tr>
<tr>
<td><strong>Subtotals</strong></td>
<td>348</td>
<td>3,379</td>
<td>21,257</td>
</tr>
<tr>
<td><strong>Total Harvest</strong></td>
<td>3,709</td>
<td>5,105</td>
<td>24,610</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvest and Escapement</td>
<td>22,238</td>
<td>57,458</td>
<td>96,560</td>
</tr>
<tr>
<td>Recreational Angling Dropoff Mortality 2.04%</td>
<td>69</td>
<td>35</td>
<td>68</td>
</tr>
<tr>
<td>Tribal Net Dropoff Mortality 8.7%</td>
<td>30</td>
<td>294</td>
<td>1,848</td>
</tr>
<tr>
<td>Klamath River disease testing</td>
<td>11</td>
<td>50</td>
<td>234</td>
</tr>
<tr>
<td><strong>Total River Run</strong></td>
<td>22,348</td>
<td>57,837</td>
<td>98,710</td>
</tr>
</tbody>
</table>
Table 6. Age proportion of the 2014 Klamath Basin fall Chinook run.

<table>
<thead>
<tr>
<th>Escapement &amp; Harvest</th>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td><strong>Hatchery Spawners</strong></td>
<td></td>
</tr>
<tr>
<td>Iron Gate Hatchery (IGH)</td>
<td>0.04</td>
</tr>
<tr>
<td>Trinity River Hatchery (TRH)</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Hatchery Spawner subtotal</strong></td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Natural Spawners</strong></td>
<td></td>
</tr>
<tr>
<td>Salmon River Basin</td>
<td>0.16</td>
</tr>
<tr>
<td>Scott River Basin</td>
<td>0.16</td>
</tr>
<tr>
<td>Shasta River Basin</td>
<td>0.21</td>
</tr>
<tr>
<td>Bogus Creek Basin</td>
<td>0.02</td>
</tr>
<tr>
<td>Klamath River mainstem (IGH to Shasta R)</td>
<td>0.08</td>
</tr>
<tr>
<td>Klamath River mainstem (Shasta R to Indian Cr)</td>
<td>0.08</td>
</tr>
<tr>
<td>Klamath tributaries (above Reservation)</td>
<td>0.18</td>
</tr>
<tr>
<td>Yurok Reservation tributaries</td>
<td>0.21</td>
</tr>
<tr>
<td><strong>Klamath Basin subtotal</strong></td>
<td>0.13</td>
</tr>
<tr>
<td>Trinity River (mainstem above WCW)</td>
<td>0.22</td>
</tr>
<tr>
<td>Trinity River (mainstem below WCW)</td>
<td>0.22</td>
</tr>
<tr>
<td>Trinity tributaries (above Reservation)</td>
<td>0.08</td>
</tr>
<tr>
<td>Hoopa Reservation tributaries</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>Trinity Basin subtotal</strong></td>
<td>0.22</td>
</tr>
<tr>
<td><strong>Natural Spawners subtotal</strong></td>
<td>0.15</td>
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<tr>
<td><strong>Total Spawner Escapement</strong></td>
<td>0.13</td>
</tr>
<tr>
<td><strong>Recreational Harvest</strong></td>
<td></td>
</tr>
<tr>
<td>Klamath River (below Hwy 101 bridge)</td>
<td>0.20</td>
</tr>
<tr>
<td>Klamath River (Hwy 101 to Weitchpec)</td>
<td>0.60</td>
</tr>
<tr>
<td>Klamath River (Weitchpec to IGH)</td>
<td>0.05</td>
</tr>
<tr>
<td>Trinity River Basin (above WCW)</td>
<td>0.18</td>
</tr>
<tr>
<td>Trinity River Basin (below WCW)</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Subtotals</strong></td>
<td>0.39</td>
</tr>
<tr>
<td><strong>Tribal Harvest</strong></td>
<td></td>
</tr>
<tr>
<td>Klamath River (below Hwy 101)</td>
<td>0.01</td>
</tr>
<tr>
<td>Klamath River (Hwy 101 to Trinity mouth)</td>
<td>0.04</td>
</tr>
<tr>
<td>Trinity River (Hoopa Reservation)</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>Subtotals</strong></td>
<td>0.01</td>
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<td><strong>Total Harvest</strong></td>
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</tr>
<tr>
<td><strong>Totals</strong></td>
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</tr>
<tr>
<td>Harvest and Escapement</td>
<td>0.12</td>
</tr>
<tr>
<td>Recreational Angling Dropoff Mortality 2.04%</td>
<td>0.39</td>
</tr>
<tr>
<td>Tribal Net Dropoff Mortality 8.7%</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Total River Run</strong></td>
<td>0.12</td>
</tr>
</tbody>
</table>
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):
   \[
   N_a = n p_a + (N - n) r^*_a, \ a = 2,3,4,5.
   \]

2. Age-2 escapement by size-frequency; age 3–5 escapement by scales. Estimate \( N_a \) 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):
   \[
   N_a = \begin{cases} 
   N s_a, & a = 2 \\
   n p_a + [(N(1 - s_2) - n(1 - p_2))(r^*_3 / r^*_a), & a = 3,4,5
   \end{cases}
   \]

Iron Gate Hatchery (IGH)
A systematic random bio-sample\(^a\) was obtained from every tenth Chinook salmon returning to IGH in 2014. A total of 1,109 scale samples were aged, of which 95 were from known-age, CWT fish. 143 non-random scales were collected from known-age CWT fish <50 cm to assist in validation. 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 1:4 systematic random sample. Additionally, biological data, but no scale samples, were obtained from every (i.e., non-random) ad-clipped fish encountered. A total of 1,173 scale samples were aged, of which 230 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 during surveys in the lower seven river miles on public and private lands where access is granted. Bio-samples were also obtained from systematically sampled (1:10) carcasses that washed back onto the counting weir. Additionally, all ad-clipped fish not falling within the systematic sample were bio-sampled. A total of 284 scale samples were aged (258 from spawning ground surveys, 14 from a live trap and 12 from weir "wash-backs"). The 12 'wash-back' samples were from known-age, CWT fish. Scale-based age compositions 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 Cormack-Jolly-Seber estimator with data from twice weekly mark-recapture carcass surveys, with one exception. In a 0.5 mile reach, where access was granted for a single pass survey, a redd survey was conducted. Bio-samples were obtained from all non-deteriorated carcasses recovered above and below the weir. A total of 1,095 scale samples were aged of which one was of known-age. Scale-based age compositions were used to apportion all age classes.

Salmon River
Total escapement was estimated by combining the Cormack-Jolly-Seber estimate from the carcass survey within the main stem, upstream of Nordheimer campground, and a redd count expansion (redds X 2) from tributaries and the lowest three reaches of the main stem. Biological samples and scales were obtained from all recovered carcasses. A total of 449 scale samples were aged, 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 the number of live fish observed during the final survey in each tributary. A total of 504 scale samples were aged, none of which were from known-age CWT fish. Total escapement (including jacks) was estimated by expanding the adult estimate by the scale-based age-2 proportion. Scale-based age compositions were used to apportion all age classes.

Klamath River Mainstem
For the upper reach (IGH to Shasta River), weekly counts without removal were used to calculate an area-under-the-curve escapement estimate. Observation efficiency was derived from recapture histories of marked carcasses. Carcass 'life' (residence time) was derived from recapture histories and a 5-point

\(^a\) Biological samples ("bio-samples") of live fish or carcasses generally included: sex, fork length, tags or marks, a scale sample, and CWT recovery codes from adipose fin-clipped fish.
scale for appraisal of carcass condition. A total of 738 scales were aged, of which 61 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). Total escapement was estimated by expanding the adult estimate by the scale-based age-2 proportion from the upper reach. 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 the Highway 101 Bridge to Weitchpec and below the Highway 101 Bridge to the mouth). A total of 1,463 scale samples were aged, of which 15 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 2014. 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 to the average harvest in the lower Klamath River Creel area from these years was applied to the 2014 lower Klamath River Creel harvest estimate to estimate the total adult harvest in the Klamath River main stem. Adult harvest for the upper Klamath River recreational fishery was then estimated by subtracting the estimated lower Klamath River Creel estimate from the 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 Upper Klamath River main stem (IGH to Shasta River), Bogus Creek, and Iron Gate Hatchery. 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 largely subsistence and ceremonial with a four-day commercial fishery. A total of 1,631 scales were aged, of which 141 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. A total of 551 scale samples were aged, of which 16 came from known-age, CWT fish. Scale-based age compositions were used to apportion all age classes.

**Blue Creek**

The peak dive count of live fish was used as the estimate of escapement. A total of 63 scale samples were aged. Bio-samples were obtained from all carcasses recovered. Scale-based age compositions were used to apportion all age classes.

**Trinity River Hatchery (TRH)**
Sampling for scales was conducted in a systematic (1:5) random manner including ad-clipped and non-ad-clipped fish (no non-random ad-clipped fish scales were collected). A total of 1,294 scales were aged, of which 301 scales came from known-age CWT fish. Scale samples were used to apportion the hatchery return into age classes.

**Upper Trinity River Recreational Harvest**
The method for estimating the upper Trinity recreational harvest depends on the application of reward and non-reward program tags at the Willow Creek Weir (WCW) and subsequent returns by anglers. In 2014, only reward tags were used to estimate harvest. CDFW estimated a 2.44% harvest rate on adult Chinook salmon based on the return of program reward tags (14 of 573) applied at WCW. The jack harvest rate of 2.42% was based on return of program reward tags (3 of 124 applied), yielding an estimated harvest of 168 age-2 Chinook. There were no scales recovered from this fishery as no creel survey was implemented in 2014. The age-2 recreational harvest was determined by multiplying the jack harvest rate by the age-2 run size estimated from scales aged at WCW. The adult age proportions estimated for the Lower Trinity River Creel were used to apportion the adult component.

**Lower Trinity River Creel**
A roving creel survey was implemented in Trinity River below the location of the WCW. A total of 18 scales were aged, of which none were from known-age, CWT fish. Total harvest was apportioned by age using the scale age proportions.

**Upper Trinity River Natural Escapement**
Total run was estimated using a non-stratified 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 to three general recovery areas: Trinity River Hatchery, Trinity upper basin natural spawning escapement, and recreational harvest. At WCW a systematic random sample (1:2) of all Chinook 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 recovered throughout all sectors of the Trinity River. A total of 539 scales were aged of which 21 were from known-age, CWT fish subsequently recovered at TRH.

The age structure for fish passing above WCW was estimated using scales collected at WCW minus those from known-age fish later recovered at TRH. Next, specific age structures were estimated for fish returning to TRH and the recreational fishery. These proportions were applied to the total hatchery escapement and estimated fishery harvest, respectively, providing totals by age within area. These totals were then 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 estimate included total spawners estimated in both main stem and tributary sub-areas (redds X 2). In the tributaries, a total of 36 scales were aged, none of which were from known-age fish. In the main stem, a total of 21 scales were aged, none of which were from known-age fish. Scale based age proportions were used to apportion all age classes in tributaries while the upper Trinity River natural age structure was used to apportion all age classes in the main stem below WCW.

**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 735 scales were aged, of which 51 were from known-age fish. The total harvest was apportioned by age using these scale age proportions.
### Unknown scales age composition as read

<table>
<thead>
<tr>
<th></th>
<th>AGE 2</th>
<th>AGE 3</th>
<th>AGE 4</th>
<th>AGE 5</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOGUS</td>
<td>32</td>
<td>463</td>
<td>437</td>
<td>3</td>
<td>935</td>
</tr>
<tr>
<td>IGH</td>
<td>50</td>
<td>516</td>
<td>441</td>
<td>5</td>
<td>1,012</td>
</tr>
<tr>
<td>SALMON</td>
<td>74</td>
<td>136</td>
<td>222</td>
<td>17</td>
<td>449</td>
</tr>
<tr>
<td>SCOTT</td>
<td>181</td>
<td>306</td>
<td>587</td>
<td>19</td>
<td>1,093</td>
</tr>
<tr>
<td>SHASTA</td>
<td>48</td>
<td>59</td>
<td>116</td>
<td>1</td>
<td>224</td>
</tr>
<tr>
<td>MAINSTEM</td>
<td>56</td>
<td>280</td>
<td>333</td>
<td>4</td>
<td>673</td>
</tr>
<tr>
<td>UR TRIBS</td>
<td>90</td>
<td>122</td>
<td>281</td>
<td>11</td>
<td>504</td>
</tr>
<tr>
<td>LRC EST</td>
<td>74</td>
<td>85</td>
<td>203</td>
<td>14</td>
<td>376</td>
</tr>
<tr>
<td>LRC UP</td>
<td>633</td>
<td>123</td>
<td>304</td>
<td>12</td>
<td>1,072</td>
</tr>
<tr>
<td>YTFP EST</td>
<td>15</td>
<td>259</td>
<td>1,155</td>
<td>61</td>
<td>1,490</td>
</tr>
<tr>
<td>YTFP M&amp;U</td>
<td>21</td>
<td>120</td>
<td>387</td>
<td>7</td>
<td>535</td>
</tr>
<tr>
<td>BLUE CRK</td>
<td>13</td>
<td>8</td>
<td>41</td>
<td>1</td>
<td>63</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,287</td>
<td>2,477</td>
<td>4,507</td>
<td>155</td>
<td>8,426</td>
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</tbody>
</table>

### Unknown scales corrected age proportions (Kimura method)

<table>
<thead>
<tr>
<th></th>
<th>AGE 2</th>
<th>AGE 3</th>
<th>AGE 4</th>
<th>AGE 5</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOGUS</td>
<td>0.0234</td>
<td>0.4743</td>
<td>0.4994</td>
<td>0.0028</td>
<td>1.0</td>
</tr>
<tr>
<td>IGH</td>
<td>0.0386</td>
<td>0.4923</td>
<td>0.4637</td>
<td>0.0054</td>
<td>1.0</td>
</tr>
<tr>
<td>SALMON</td>
<td>0.1630</td>
<td>0.2676</td>
<td>0.5177</td>
<td>0.0518</td>
<td>1.0</td>
</tr>
<tr>
<td>SCOTT</td>
<td>0.1645</td>
<td>0.2388</td>
<td>0.5741</td>
<td>0.0226</td>
<td>1.0</td>
</tr>
<tr>
<td>SHASTA</td>
<td>0.2150</td>
<td>0.2212</td>
<td>0.5594</td>
<td>0.0044</td>
<td>1.0</td>
</tr>
<tr>
<td>MAINSTEM</td>
<td>0.0760</td>
<td>0.3874</td>
<td>0.5300</td>
<td>0.0066</td>
<td>1.0</td>
</tr>
<tr>
<td>UR TRIBS</td>
<td>0.1789</td>
<td>0.1969</td>
<td>0.5954</td>
<td>0.0288</td>
<td>1.0</td>
</tr>
<tr>
<td>LRC EST</td>
<td>0.1980</td>
<td>0.1818</td>
<td>0.5694</td>
<td>0.0507</td>
<td>1.0</td>
</tr>
<tr>
<td>LRC UP</td>
<td>0.6058</td>
<td>0.0761</td>
<td>0.3033</td>
<td>0.0148</td>
<td>1.0</td>
</tr>
<tr>
<td>YTFP EST</td>
<td>0.0076</td>
<td>0.1109</td>
<td>0.8264</td>
<td>0.0551</td>
<td>1.0</td>
</tr>
<tr>
<td>YTFP M&amp;U</td>
<td>0.0363</td>
<td>0.1667</td>
<td>0.7812</td>
<td>0.0158</td>
<td>1.0</td>
</tr>
<tr>
<td>BLUE CRK</td>
<td>0.2107</td>
<td>0.0665</td>
<td>0.7028</td>
<td>0.0201</td>
<td>1.0</td>
</tr>
</tbody>
</table>

### Known CWT ages

<table>
<thead>
<tr>
<th></th>
<th>AGE 2</th>
<th>AGE 3</th>
<th>AGE 4</th>
<th>AGE 5</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOGUS</td>
<td>34</td>
<td>263</td>
<td>283</td>
<td>5</td>
<td>585</td>
</tr>
<tr>
<td>IGH</td>
<td>224</td>
<td>2478</td>
<td>1493</td>
<td>46</td>
<td>4241</td>
</tr>
<tr>
<td>SALMON</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SCOTT</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>SHASTA</td>
<td>0</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>MAINSTEM</td>
<td>7</td>
<td>60</td>
<td>50</td>
<td>4</td>
<td>121</td>
</tr>
<tr>
<td>UR TRIBS</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LRC</td>
<td>15</td>
<td>14</td>
<td>29</td>
<td>3</td>
<td>61</td>
</tr>
<tr>
<td>YTFP EST</td>
<td>1</td>
<td>41</td>
<td>113</td>
<td>5</td>
<td>160</td>
</tr>
<tr>
<td>YTFP M&amp;U</td>
<td>1</td>
<td>2</td>
<td>13</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>BLUE CRK</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>282</td>
<td>2864</td>
<td>1985</td>
<td>66</td>
<td>5197</td>
</tr>
</tbody>
</table>

#### Breakout within strata

<table>
<thead>
<tr>
<th></th>
<th>Bogus1</th>
<th>Bogus2</th>
<th>LRC - lo</th>
<th>LRC - mid</th>
<th>YTFP MID-UP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bogus1</td>
<td>14</td>
<td>20</td>
<td>2</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Bogus2</td>
<td>92</td>
<td>171</td>
<td>5</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>LRC - lo</td>
<td>114</td>
<td>169</td>
<td>10</td>
<td>19</td>
<td>0</td>
</tr>
<tr>
<td>LRC - mid</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>16</td>
</tr>
</tbody>
</table>

/a Table includes known-age fish whose scales were not mounted / read.
### Appendix E. 2014 Trinity age analysis.

<table>
<thead>
<tr>
<th>CWT Age</th>
<th>Scale unreadable</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willow Creek Weir (WCW)</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Hoopa Tribal Harvest (HUPAHARV)</td>
<td>18</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Trinity River Hatchery (TRH)</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Lower Trinity Recreational CWT (LOWTRINREC)</td>
<td>30</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>Hoopa Tribal Mainstem (HUPAMAIN)</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>51</td>
</tr>
</tbody>
</table>

### POOLED data from all areas: Scale age-CWT age matrix.

- **Validation Matrix:**
  - Scale age proportions for scale-aged 2 - 5 fish.
  - Known scales: 23, 53, 0, 305, 0, 381
  - Unknown scales: 518, 684, 0, 2270

<table>
<thead>
<tr>
<th>Scale age</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willow Creek Weir</td>
<td>0.1934</td>
<td>0.0296</td>
<td>0.0398</td>
<td>0.0082</td>
<td>0.2293</td>
</tr>
<tr>
<td>Hoopa Tribal</td>
<td>0.2070</td>
<td>0.4466</td>
<td>0.0523</td>
<td>0.0889</td>
<td>0.4728</td>
</tr>
<tr>
<td>Lower Trinity</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>TRH</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Lower Trinity Hatchery (LOWTRINHATCH)</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Lower Trinity HATCHERY</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Upper Trinity</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Upper Trinit</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Natural</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Age</th>
<th>Total Run</th>
<th>WCV</th>
<th>WCV + Natural</th>
<th>TRH</th>
<th>TRH + Natural</th>
<th>Apportioned Natural Escapement</th>
<th>WCV + WCV Natural</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>926</td>
<td>0.1834</td>
<td>6694</td>
<td>0.1278</td>
<td>0.1834</td>
<td>6694</td>
<td>0.1278</td>
</tr>
<tr>
<td>3</td>
<td>7196</td>
<td>0.3758</td>
<td>14272</td>
<td>0.1021</td>
<td>0.3758</td>
<td>14272</td>
<td>0.1021</td>
</tr>
<tr>
<td>4</td>
<td>29552</td>
<td>0.4118</td>
<td>15638</td>
<td>0.1201</td>
<td>0.4118</td>
<td>15638</td>
<td>0.1201</td>
</tr>
<tr>
<td>5</td>
<td>37974</td>
<td>0.0290</td>
<td>1100</td>
<td>0.0040</td>
<td>0.0290</td>
<td>1100</td>
<td>0.0040</td>
</tr>
<tr>
<td>Total</td>
<td>37974</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

### Correction Matrix for ages 2, 3, 4, 5.

<table>
<thead>
<tr>
<th>Scale age</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willow Creek Weir</td>
<td>0.10000</td>
<td>0.00000</td>
<td>0.00000</td>
<td>0.00000</td>
<td>0.10000</td>
</tr>
<tr>
<td>Hoopa Tribal</td>
<td>0.9839</td>
<td>0.9839</td>
<td>0.9839</td>
<td>0.9839</td>
<td>0.9839</td>
</tr>
<tr>
<td>Lower Trinity</td>
<td>0.0115</td>
<td>0.0115</td>
<td>0.0115</td>
<td>0.0115</td>
<td>0.0115</td>
</tr>
<tr>
<td>TRH</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Lower Trinity Hatchery (LOWTRINHATCH)</td>
<td>0.9900</td>
<td>0.9900</td>
<td>0.9900</td>
<td>0.9900</td>
<td>0.9900</td>
</tr>
<tr>
<td>Lower Trinity HATCHERY</td>
<td>0.0100</td>
<td>0.0100</td>
<td>0.0100</td>
<td>0.0100</td>
<td>0.0100</td>
</tr>
<tr>
<td>Upper Trinity</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Upper Trinit</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Natural</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

### WCW scales

<table>
<thead>
<tr>
<th>Age</th>
<th>WCV no cwts</th>
<th>Total age</th>
<th>WCV age proportions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>95</td>
<td>2</td>
<td>0.1793</td>
</tr>
<tr>
<td>3</td>
<td>195</td>
<td>4</td>
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</tr>
<tr>
<td>4</td>
<td>213</td>
<td>7</td>
<td>0.4072</td>
</tr>
<tr>
<td>5</td>
<td>35</td>
<td>15</td>
<td>0.0277</td>
</tr>
<tr>
<td>Total</td>
<td>5818</td>
<td>23</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
### Hatchery spawners

<table>
<thead>
<tr>
<th>Hatchery spawners</th>
<th>Grisle</th>
<th>Adults</th>
<th>Run</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
<th>SCALE AGE PROPORTIONS (unknowns)</th>
<th>Unk. Age Read</th>
<th>Length Pop or Live</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron Gate Hatchery (IGH)</td>
<td>1039</td>
<td>24300</td>
<td>25339</td>
<td>1039</td>
<td>12864</td>
<td>11276</td>
<td>160</td>
<td>25339</td>
<td>0.16296</td>
<td>0.26761</td>
<td>0.51766</td>
</tr>
<tr>
<td>Trinity River Hatchery (TR)</td>
<td>221</td>
<td>6795</td>
<td>7196</td>
<td>221</td>
<td>3853</td>
<td>3271</td>
<td>51</td>
<td>7196</td>
<td>0.12726</td>
<td>0.1517</td>
<td>0.14577</td>
</tr>
</tbody>
</table>

### Natural Spawners

<table>
<thead>
<tr>
<th>Natural Spawners</th>
<th>Main basin spawners:</th>
<th>Total in-river run</th>
<th>Total spawners:</th>
<th>Total harvest:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trinity River mainstem above WCV</td>
<td>6576</td>
<td>2326</td>
<td>365</td>
<td>449</td>
</tr>
<tr>
<td>Trinity River tributaries</td>
<td>3945</td>
<td>1425</td>
<td>93</td>
<td>185</td>
</tr>
<tr>
<td>Bogus Creek</td>
<td>323</td>
<td>1260</td>
<td>16</td>
<td>124</td>
</tr>
</tbody>
</table>

### Mainstream Klamath (IGH to Shasta R)

- Angler Harvest
- Tribe Harvest

### Mainstream Klamath (tr. to Indian Cr)

- Angler Harvest
- Tribe Harvest

### Klamath Tributaries

- Alcan Cr
- Beaver Cr
- Bluff Cr
- Boise Cr
- Camp Cr
- Clear Cr
- Dillon Cr
- Elk Cr
- Ft. Golf Cr
- Horse Cr
- Independence Cr
- Indian Cr
- Irving Cr
- Poison Cr
- Red Cap Cr
- Rock Cr
- Slave Cr
- Setup Cr
- Siskiyou Cr
- Thompson Cr
- Ti Cr
- Unknown Cr
- Other (China Cr.

### Reservation Tributaries-Hoopa Valley

- Campbell Cr
- Hoskit Cr
- Mill Cr
- Scott Cr (moved in 2007 to Klam tribs)
- Smith Cr
- Supply Cr
- Tuh Tung Ch Cr
- Tuh Tung Ch (Hoopa Valley)
- Other (Hospital Cr.

### Reservation Tributaries-Yurok

- Blue Cr
- B frontal Commons tribs- (Willow & Madden creeks in Up TR nat estim)
- Cedar Cr (trib to Horse Linto)
- Pine Cr (formerly in Hoopa tribs)
- Other (Hospital Cr.

### Non-reservation tributaries

- Martmain Klamath (IGH to Shasta R)

### Total harvest:

- 22348 | 160444 | 128792 |

### Angler Harvest

- Klamath River (below Hwy 101)
- Klamath River (Hwy 101 to Weitchpec)
- Salmon River Basin (includes Wooley Cr)
- Klamath River disease testing |

### Tribe Harvest

- Klamath River (below Willow Cr. Weir)

### Total spawners:

- Klamath River Hatchery (IGH) 1039 | 7196 |
- Trinity River Hatchery (TR) 221 |

### Totals

- In-river run and escapement
- Angling drop-off mortality (2.04%)
- Non-angling drop-off mortality (8.7%)
Appendix G. Age composition of the 2013 Klamath Basin fall Chinook run.

<table>
<thead>
<tr>
<th>Escapement &amp; Harvest</th>
<th>AGE</th>
<th>Total Adults</th>
<th>Total Run</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**Hatchery Spawners**

| Hatchery Spawner Subtotal | 1,458 | 7,775 | 9,352 | 21 | 17,148 | 18,606 |

**Natural Spawners**

| Natural Spawners Subtotal | 10,310 | 18,897 | 39,696 | 562 | 59,156 | 69,466 |

| Total Spawner Escapement  | 11,768 | 26,672 | 49,048 | 583 | 76,304 | 88,072 |

**Recreational Harvest**

| Tribal Harvest Subtotals | 2,260 | 7,675 | 12,043 | 82 | 19,800 | 22,060 |

| Total Harvest | 2,519 | 26,671 | 55,714 | 450 | 82,836 | 85,355 |

| Totals | 14,287 | 53,343 | 104,762 | 1,033 | 159,140 | 173,427 |

| Harvest and Escapement | 14,287 | 53,343 | 104,762 | 1,033 | 159,140 | 173,427 |

| Recreational Angling Dropoff Mortality 2.04% | 46 | 157 | 246 | 2 | 404 | 450 |

| Tribal Net Dropoff Mortality 8.7% | 23 | 1,652 | 3,797 | 32 | 5,481 | 5,504 |

| Total River Run | 14,356 | 55,152 | 108,805 | 1,068 | 165,025 | 179,381 |