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Long-Term Analyses of Estimates of Abundance of Juvenile Chinook Salmon on the Trinity River, 1989-2018

William D. Pinnix, Shannon P. Boyle, Tyler Wallin, Taylor Daley, and Nicholas A. Som

U.S. Fish and Wildlife Service
Arcata Fish and Wildlife Office
1655 Heindon Road
Arcata, CA 95521
(707) 822-7201

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This report is dedicated to the memory of Paul Petros, Fish Biologist for the Hoopa Valley Tribal Fisheries Department. Paul was a respected scientist, avid fisherman, and friend. He will be missed.

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Juvenile Chinook Salmon Estimates of Abundance on the Trinity River, 1989-2018

William D. Pinnix*, Shannon P. Boyle, Tyler Wallin, Tayler Daley, and Nicholas A. Som

U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office
1655 Heindon Road; Arcata, California

*Corresponding author
bill_pinnix@fws.gov

Abstract.—This report presents long-term analyses of smolt abundance data from two monitoring sites on the mainstem Trinity River, California near Pear Tree Gulch (2003-2018), and near Willow Creek (1989-2018), that were established by the Trinity River Restoration Program. We present trend analyses and production estimates (juveniles-per-spawner [JPS] and biomass-per-spawner [BPS]) for naturally produced juvenile Chinook Salmon (spring and fall-run combined), and trend analyses of hatchery produced juvenile Chinook Salmon. The relationship of these population parameters following implementation of spring hydrograph, or Record of Decision (ROD), discharges from Lewiston Dam is explored for pre-ROD (1989-2003) and post-ROD (2004-2018) time periods. Trend analyses from the Willow Creek site indicate a long-term positive trend in juvenile Chinook Salmon abundance. A model incorporating a change-point at 2004 fit the data better than a simple linear trend, which resulted in no evidence of trend (positive or negative) on either side of the change point, and similarly, no evidence of trend in abundance at the Pear Tree site was detected. Analyses of JPS at the Willow Creek and Pear Tree trap sites resulted in evidence for density dependent response at both sites and an increase in JPS following implementation of spring ROD discharge from Lewiston Dam. Although no evidence for trend in JPS was found at Willow Creek following 2004, evidence for positive trend in JPS was found at Pear Tree. We suggest that this increase in productivity is due to an increase in carrying capacity of the system due to increases in habitat available to juvenile Chinook Salmon during the spring emigration period. Analysis of biomass estimates of juvenile Chinook Salmon showed a weaker response post-ROD BPS, suggesting that although number of juveniles has increased, growth of juvenile Chinook Salmon may be muted after implementation of ROD flows, perhaps due to low water temperatures during critical growth periods (i.e. May-June). Weekly mean fork length of juvenile Chinook Salmon, both natural and hatchery origin, was smaller post-ROD. Apparent survival from Trinity River Hatchery to Willow Creek increased following ROD implementation, but no evidence of trend was apparent post-ROD at Pear Tree or Willow Creek.

Introduction

Restoration of natural production of anadromous fish populations is one of the fundamental objectives of the Trinity River Restoration Program (TRRP) and juvenile salmonid production has been identified as one of the key assessments to evaluate the effectiveness of cumulative restoration actions (TRRP and ESSA 2009). In this report we present results from a long-term analysis of data from two monitoring locations on the Trinity River, California to aid in assessment of how management actions have affected juvenile Chinook Salmon (Oncorhynchus tshawytscha) production in the Trinity River Basin. This report focuses on Chinook Salmon because of their primary importance to dependent fisheries and the availability of robust datasets. Information generated by this report is intended to inform the TRRP on the response of juvenile Chinook Salmon populations to collective and individual management actions. and will be used in an anticipated program-wide state of the river and fishery resources synthesis report.

In 2009 the partners of the TRRP completed the Integrated Assessment Plan (IAP; TRRP and ESSA 2009) that was intended to guide monitoring components of the Trinity River ecosystem. Objective 3 of the IAP, and sub-objective 3.2 specifically relate to natural production of anadromous fish populations:

> *Objective 3: Restore and maintain natural production of anadromous fish populations.*
> *Sub-objective 3.2: Increase freshwater production of anadromous fish.*

To achieve these objectives, the TRRP actions are expected to increase production of naturally spawned salmon populations. However, simply estimating the number of juvenile salmonids is not a complete picture of production, any measure of production must consider the size of the spawning population. The IAP further states that assessments of both adult spawners and the resulting juveniles produced are essential to inform annual and long-term management actions. This report will assess both linear trends in juvenile Chinook Salmon annual population estimates, as well as trends in juveniles-per spawner to assess the production potential of the habitats upon which juvenile Chinook Salmon rely. Habitat restoration and restoring a more natural streamflow is expected to increase both the amount and quality of rearing habitat for juvenile Chinook Salmon which in turn should lead to increased production.

In addition, Objective 4 of the IAP (TRRP and ESSA 2009) goes further in laying out that restoring natural production must be sustainable and support dependent fisheries and enhanced harvest opportunities:

> *Objective 4: Restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent tribal, commercial, and sport fisheries' full participation in the benefits of restoration via enhanced harvest opportunities.*

The IAP lays out how progress towards meeting the goals of the TRRP will be tracked by including annual quantitative population estimates of juveniles and adults of naturally and hatchery produced Chinook Salmon. Thus, estimates of juvenile Chinook Salmon must be apportioned to natural and hatchery components and are done so in this report. This report

attempts to describe yearly changes in juvenile Chinook Salmon (spring and fall-run combined) abundance and productivity (smolts per spawner) and potential influence of flow management. A companion document covering the relationship between flow management and juvenile Chinook Salmon outmigration timing has also been produced (Thomas Gast and Associates 2021). Together, the *Thomas Gast and Associates 2021 report* and *this report* are intended to assess impacts of TRRP management actions on juvenile Chinook Salmon production.

The objectives of this report are to:

1) Investigate trends in juvenile Chinook Salmon abundance, juveniles-per-spawner (JPS), biomass, and biomass-per-spawner (BPS) data at two monitoring sites, Pear Tree Gulch (Pear Tree) and Willow Creek.
2) Evaluate the effects of implementing Record of Decision (ROD) water management on juvenile Chinook Salmon metrics listed in #1.
3) Compare fork length and biomass of juvenile Chinook Salmon pre- and post-ROD implementation.
4) Utilize stock-recruit models to investigate both trends in *productivity* and density-dependent effects of spawning size on production of juvenile Chinook Salmon, to better understand any potential changes due to spawning population size. These stock recruit models are then employed both as a complete time series and broken down into pre- and post-ROD time series at the Willow Creek site to investigate potential impacts that water management had on Chinook Salmon productivity.
5) Calculate apparent survival of hatchery-reared juvenile Chinook Salmon.

Methods

Study Site / Background

The Bureau of Reclamation (BOR) completed the construction of the Trinity River Division (TRD) of the Central Valley Project to store 'surplus' Trinity River water for diversion to the Central Valley of California for agricultural, industrial and municipal use, and hydropower generation. The TRD blocked approximately 109 miles of salmon spawning and rearing habitat. Although some water (approximately 10% of natural flows) was reserved for release to the mainstem Trinity River below Lewiston Dam, salmon and steelhead populations rapidly declined after the project was completed. Major watershed erosion due to hydraulic mining and valley floor dredging led to major changes in the geomorphology of the Trinity River below Lewiston Dam. Lacking sufficient river discharge capable of transporting sediment downstream, riparian vegetation established along the riverbanks (Evans 1979) resulting in riparian berms, narrowing, and deepening of the river channel. By 1989 total acreage of riparian habitat had increased by 282%, gravel bars decreased by 95% and open water habitat decreased by 45% (USFWS 1994). Prior to 1989 based on an instream flow study conducted by the U.S. Fish and Wildlife Service (USFWS 1980), releases of water from Lewiston Dam would have needed to be less than 150 cubic feet per second (cfs) to maximize juvenile fish habitat. The same study also recommended mechanical river channel restoration to allow an increase in flow that would increase the

amount and quality of juvenile Chinook Salmon habitat (USFWS 1980), and monitoring was needed to assess the response of juvenile salmon to the proposed flow manipulations.

Rotary screw traps (RST) have been used as a monitoring device for emigrating juvenile salmonids on the Trinity River beginning in 1989 to characterize smolt emigration timing, inform development of instream flow recommendations, estimate population abundance and hatchery contribution, and to inform a salmon production computer model (SALMOD, Williamson et al. 1993). Early efforts of juvenile salmon monitoring were meant to inform development of instream flow recommendations that ultimately resulted in the Trinity River Flow Evaluation (USFWS and HVT 1999). Monitoring of juvenile Chinook Salmon had slightly different objectives over the first decade of sampling, largely due to the varying needs of SALMOD. In the first few years of monitoring (1989-1992), mark-recapture estimates of abundance at the Willow Creek site were calculated and compared to river discharge, laying the groundwork for a flow-based expansion estimate of abundance.

The flow-based expansion was explored to estimate juvenile Chinook Salmon abundance as it utilizes less effort than required in a mark-recapture study (Lang et al. 1998) and was needed because of too few fish captured in 1993 and 1994 due to high flows. In 2002 monitoring transitioned to utilizing mark-recapture to estimate weekly estimates of the number of juvenile Chinook Salmon passing the Willow Creek trap site. For a thorough documentation of the history of juvenile salmon monitoring on the mainstem Trinity River the reader is directed to Schwarz et al. (2009), and for background regarding the history of the TRRP and flow manipulation the reader is directed to the companion report (Thomas Gast and Associates 2021).

Data Sources

Abundance Estimates

Juvenile Chinook Salmon (spring and fall-run combined) mark-recapture abundance estimates have been calculated at two sites on the Trinity River: Pear Tree and Willow Creek (Figure 1; Craig 1989; Craig 1992; Goldsmith 1993; Lang et al. 1998; McCleod et al 1999; Scheiff et al 2001; Pinnix et al. 2007; Pinnix and Quinn 2009; Pinnix et al. 2011; Petros 2011; Harris et al. 2012; Petros et al. 2013; Pinnix et al. 2013; Davids et al. 2013; Petros et al. 2014; Petros et al. 2015; Harris et al. 2016; Petros et al. 2017; Green et al. 2004; Green and Petros 2004). Abundance estimates are generated from weekly stratified mark-recapture trials at both sites using an auto-regressive Bayesian population estimation model (Schwarz et al. 2009, Payton and Som 2021). Abundance estimates using intensive mark-recapture are available from 1989-1992, and 2003-2018 at Willow Creek and from 2003-2018 at Pear Tree.

Mark recapture efforts at Willow Creek prior to 2003 were insufficient to complete population estimates from 1993-2002. In a subset of years prior to 2003 (1989, 1990, 1991, and 2002), estimates were made that were utilized to reconstruct abundance estimates at Willow Creek from 1989-2002 drawing on the relationship between capture efficiency and river discharge (Quinn et al. in prep). These reconstructed estimates, and all other annual estimates were reanalyzed utilizing the methods described in Payton and Som (2021), which provide more reliable estimates than the Schwarz et al. (2009) model for study designs like those implemented at the Pear Tree and Willow Creek monitoring locations. Appendices A

and B, present the refined weekly and annual estimates and serve as an 'update' to the annual and weekly estimates presented in the above reports using a refined estimator.

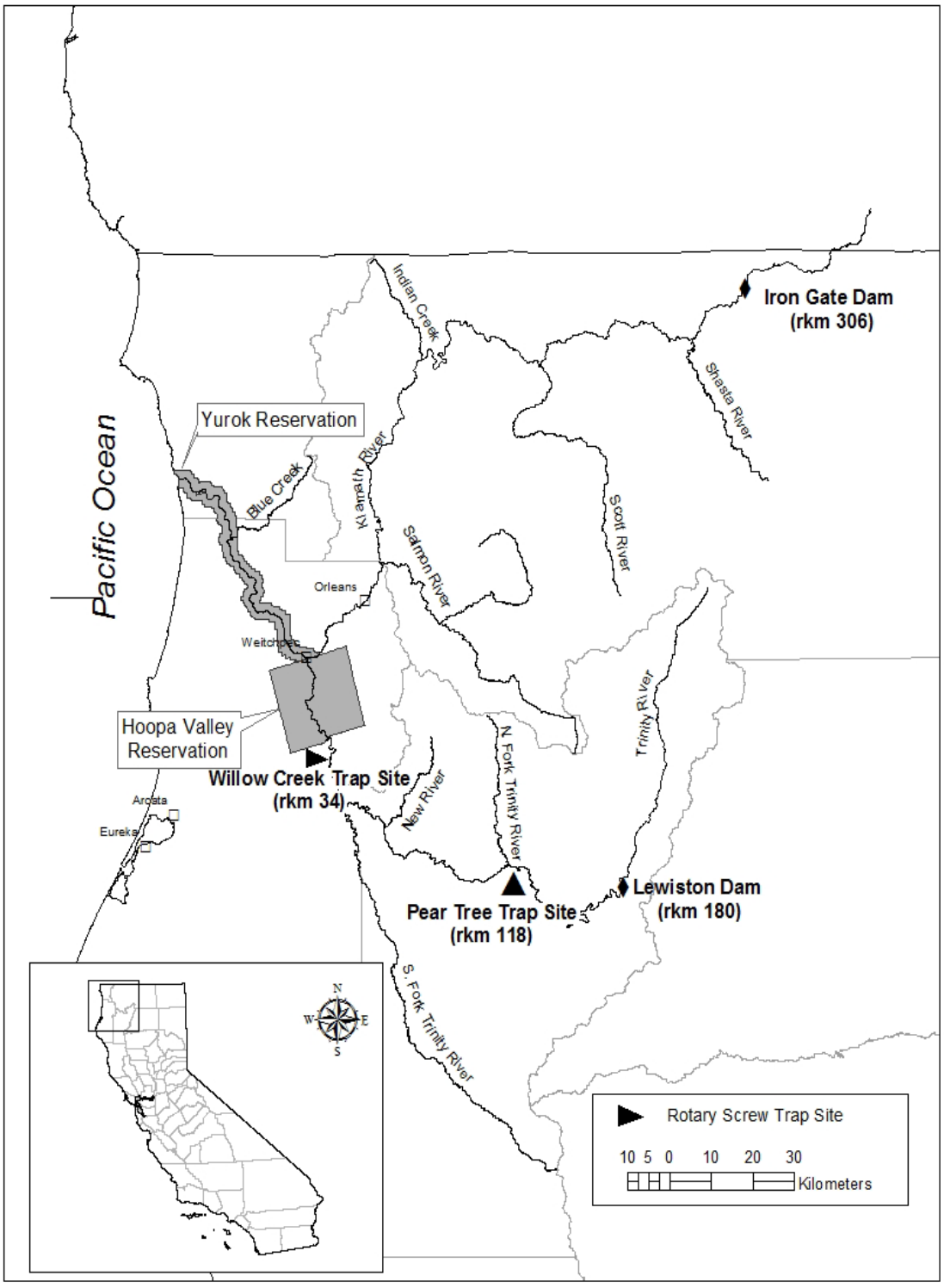

Figure 1. Map of Trinity River Basin and location of juvenile salmon monitoring (trap) sites near Willow Creek (rkm 34) and Pear Tree Gulch (rkm 118), California.

The years 1993 and 2000 were removed from analyses at the Willow Creek site, 2005 was removed from analyses at the Pear Tree site, and 2006 was removed from analysis at both the Willow Creek and Pear Tree sites. These years were removed from these analyses due to truncated sampling seasons or inaccurate trap efficiencies due to high flows and low to zero recaptures at those sites and years.

Adult Chinook Salmon Time Series

Adult Chinook Salmon abundance data was retrieved from the Trinity River spawning survey conducted (Gough et al. 2021) by the USFWS Arcata Fish and Wildlife Office, Yurok Tribal Fisheries Program, Hoopa Valley Tribal Fisheries Department, U.S. Forest Service, and California Department of Fish and Wildlife (CDFW). Adult abundance at Pear Tree is estimated to be a sum of redd counts in reaches 3-7 and the carcass mark-recapture estimate in reaches 1 and 2 (See Gough et al. 2021 for description/map of reaches). In the lower portion of the river at Willow Creek, the population estimate is a sum of adult Chinook Salmon at the Willow Creek weir and the spring-run estimate from the Junction City weir (Kier et al. 2020). The Time series of adults is presented in Appendix C.

Juveniles-Per-Spawner

To account for spawning population size, juveniles-per-spawner (JPS) was calculated from the juvenile abundance time series and the adult Chinook Salmon time series. JPS is calculated as:

$$juveniles - per - spawner_y = \frac{juvenile\ Chinook\ Salmon\ abundance\ estimate_y}{adult\ Chinook\ Salmon\ abundance\ estimate_{y-1}}$$

where y = year.

Fork Length and Weight Data

Fork length data (individual data and weekly mean) of Chinook Salmon captured at both the Pear Tree and Willow Creek trap were retrieved from yearly reports (see report list in Data Sources, ***Abundance Estimates*** section of this report).

Individual fork length values were pooled by week of the year across the pre-ROD and post-ROD periods for the Willow Creek trap site to create pre-ROD and post-ROD time series of mean weekly fork length. Only weeks 10-39 (approximately March-September) are used as this is prior to the October release of hatchery fish. Individual fork length data were collected but not available for analysis in years 1989-1991 and 1996. Only non-adipose fin clipped (unmarked) fish were used in this analysis. An unknown number of unmarked hatchery fish are present in the data set after week 22 in both ROD periods.

Trinity River Hatchery Release Data

Release of juvenile Chinook Salmon from TRH occurred every year covered by this report. Yearly release values were obtained directly from TRH (Darrick Muir, CDFW, *pers. comm.*)

and summarized in Appendix D along with yearly estimates of juvenile hatchery-reared Chinook Salmon captured at both Pear Tree and Willow Creek sites.

Analyses

Abundance Estimates

Annual trends in juvenile abundance at the Pear Tree and Willow Creek trap sites were assessed using linear regression in the statistical program R (R Core Team 2021).

Juvenile Abundance Change Point and Trend Analysis

Change point analyses identify abrupt changes within time series and can indicate a shift in either absolute abundance or rate of change in ecological data (Beckage et al. 2007). Evidence for changes in the juvenile abundance time series was assessed using the *changepoint* package (Killick et al. 2014) in the statistical program R (R Core Team 2021) and was performed on the Willow Creek time series only to test for effects of ROD flow implementation which started in 2004. Evidence for differences in mean abundance before and after change points was assessed using Student's t-test. Linear regression was used to assess trends in the juvenile abundance time series on either side of an identified change point.

Juvenile Abundance Trend Analysis with Flow Covariates

Comparison of various models calculating juvenile abundance as a function of river discharge at both trap sites were analyzed using linear regression in R, and small sample corrected Akaike's Information Criterion (AICc) available through the *AICcmodavg* package (Mazerolle 2020) was calculated. Models were assessed across the entire study period (2003-2018) at the Pear Creek site and were assessed during the pre-ROD and post-ROD years at the Willow Creek site. Monthly volume of water released from Lewiston Dam during April and May were chosen as key covariates because of the increase in juvenile salmonid habitat provided by higher discharge, and the ability of managers to control water released from Lewiston Dam. Mean daily discharge from Lewiston Dam was converted to volume in acre-feet for the Pear Tree site and from USGS gauging station 11530000 at Hoopa, CA for the Willow Creek site. In addition, adult abundance estimated from the Willow Creek and Junction City weirs were also considered as covariates.

Juveniles-Per-Spawner

Trends in annual estimates of JPS at the Pear Tree and Willow Creek trap sites were assessed using linear regression in the statistical program R (R Core Team 2021) over the complete time series for each site.

Juvenile-Per-Spawner Change Point

Evidence for changes in the JPS time series was evaluated using the *changepoint* (Killick et al. 2014) package. The binary segmentation penalty, one common approach to identifying multiple change points, was implemented to investigate the evidence of support for additional change points in the time series when only one was identified using the default settings. Evidence for differences in mean JPS before and after change points was assessed using Student's t-test.

Juvenile-Per-Spawner Change Point Trend Analysis

At the Willow Creek trap site, linear regression was used to assess temporal trends in JPS production on either side of identified change points.

Fork Length

Individual fork length data pooled by pre-ROD and post-ROD at the Willow Creek trap site were tested for evidence of differences by week using the *ANOVA* package in R (R Core Team 2021) to test for effects of flow management. Tests of differences in Willow Creek fork length by week were not included for weeks 10, 11, 37, 38, and 39 due to low samples sizes in those weeks. Juvenile Chinook Salmon with a complete adipose fin-clip can either be of natural origin, or the portion of un-clipped hatchery fish, hereafter referred to as No Clip, and adipose fin-clipped fish are referred to as Clip.

Biomass Estimates

Weekly mean fork length was used to calculate estimates of weekly biomass (kg) which was then multiplied by weekly abundance estimates (see Appendices A and B) to generate estimates of total biomass by week. Weekly estimates of biomass were then summed for each year to create annual estimates of biomass. Weekly mean fork length was converted to weight by the following formula:

$$Ln(Weight) = ((Ln(Fork\ Length)-3.857)/0.3216$$

This formula was derived from pooling all unmarked juvenile Chinook Salmon captured in the Pear Tree and Willow Creek traps in which both a length and weight were measured. Fork length and weight data of individual fish were collected but unavailable for analysis prior to 1994, therefore biomass data and analyses are limited to 1994-2018.

Biomass per spawner

Annual biomass estimates were divided by annual juvenile Chinook Salmon abundance estimates to generate estimates of biomass-per-spawner (BPS). Biomass-per-spawner data and analyses are limited to 1994-2018.

Stock Recruitment Analysis

Preliminary evidence for density dependent effects in Trinity River Chinook Salmon populations was evaluated using a likelihood ratio test. We compared a Ricker density dependent model (1), to a density independent function (2).

$$ln\ (Smolts) = Ln\ (aSe^{-bS}) \quad (1)$$

$$Ln\ (Smolts) = Ln\ (aS) \quad (2)$$

where: S = number of spawners.

Both models were fit using nonlinear least squares in R (R Core Team 2021). Initial values for model parameters were estimated using the srStarts function in the *FSA* package (Ogle et al. 2019); srStarts estimates starting values from linearized models of each specific parameterizations of stock-recruitment models. Confidence intervals for density dependent

models were estimated using bootstrap resampling in the *nlstools* package (Baty et al. 2015).

Hatchery Fish Apparent Survival

Apparent survival of hatchery-reared juvenile Chinook Salmon from the spring release period was estimated by dividing the annual abundance estimates from each trap site from the known number of hatchery fish from the spring release (May-June) and expressed as percentages; release of hatchery fish during the fall period are not included. The time series of annual estimates of hatchery origin juvenile Chinook Salmon at each site were compared to each other using a paired t-test. Estimates of hatchery origin juvenile Chinook Salmon from Willow Creek were compared pre- and post-ROD for evidence of differences using student's t-test.

Results

Juvenile Abundance

Pear Tree Juvenile Abundance Annual Trend

Juvenile abundance at the Pear Tree trap site has been estimated annually since 2003. Linear regression indicated no evidence of trend in juvenile abundance at Pear Tree across the study period 2003-2018 ($p = 0.963$; Table 1, Figure 2).

Table 1. Annual trend in Trinity River juvenile Chinook Salmon abundance at the Pear Tree trap site from 2003-2018.

	Estimate	**Standard Error**	**95% Confidence Interval**
(Intercept)	-5,058,140	148,169,315	[-32,789,1344, 317,775,063]
Year	3,493	73,671	[-157,023, 164,009]

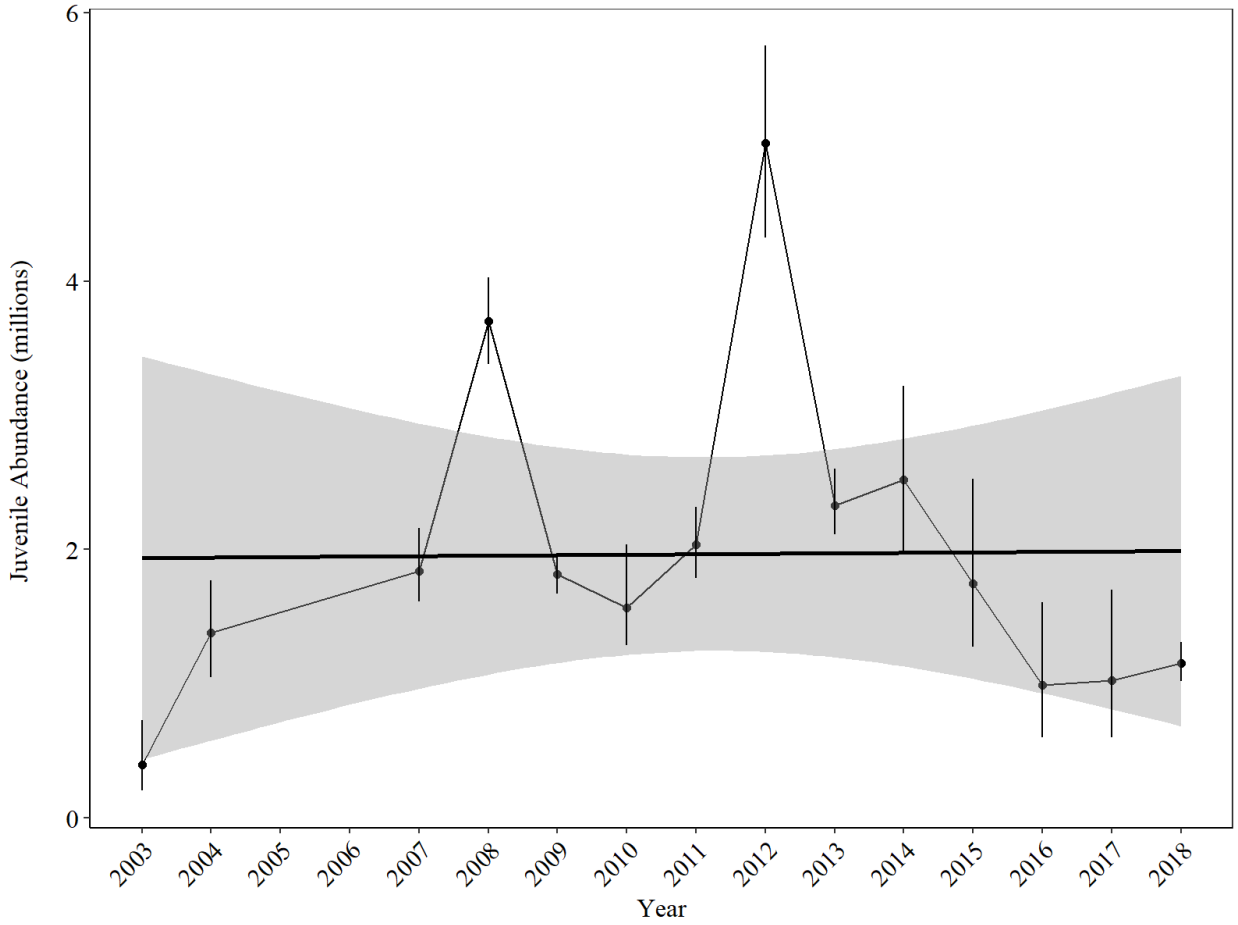

Figure 2. Estimated linear regression trend (thicker black line) of annual juvenile Chinook Salmon abundance (in millions) at the Pear Tree trap site on the Trinity River from 2003-2018. Grey bar indicates 95% confidence interval of regression line. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Willow Creek Juvenile Abundance Annual Trend

Despite considerable interannual variability, linear regression indicated strong evidence of increasing juvenile Chinook Salmon abundance at the Willow Creek trap site across the study period from 1989-2018 (p = 0.007; Table 2, Figure 3).

Table 2. Annual trend in Trinity River juvenile Chinook Salmon at the Willow Creek trap site from 1989-2018.

	Estimate	**Standard Error**	**95% Confidence Interval**
(Intercept)	-152,477,551	52,418,016	[-260,434,475, -44,520,627]
Year	77,134	26,157	[23,262, 131,007]

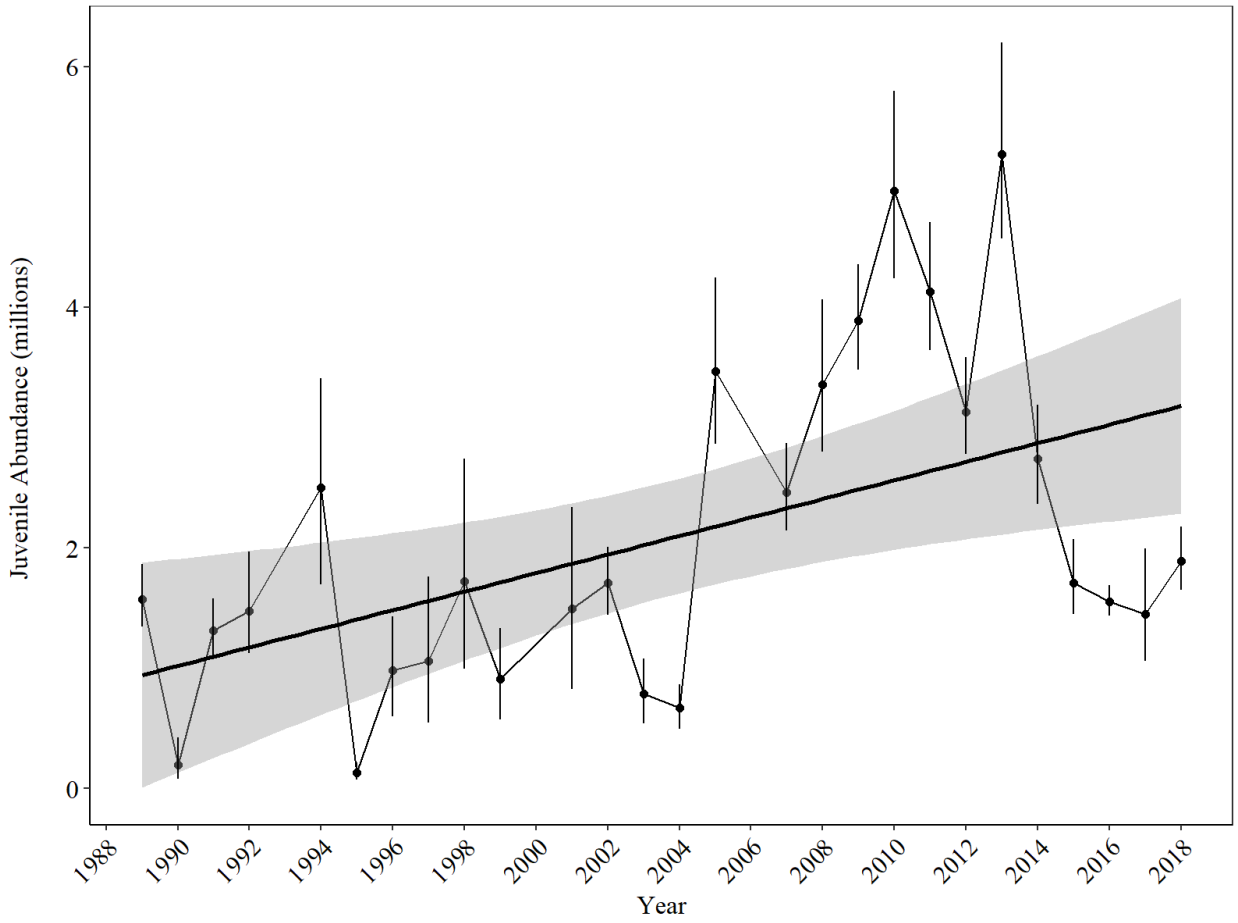

Figure 3. Estimated trend in annual juvenile Chinook Salmon abundance (in millions) at the Willow Creek trap site (thicker black line) on the Trinity River from 1989-2018. Grey bar indicates 95% confidence interval of regression line. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Juvenile Abundance Change Point

The first year of ROD implementation, 2004, was identified as the only potential change point in the Willow Creek juvenile abundance time series receiving evidence of support (Figure 4). Mean juvenile abundance between 1989 and 2003 was 1,219,444 and increased to 2,906,248 following ROD flow implementation in 2004, with overwhelming evidence of this difference representing an increase over the pre-ROD period ($p < 0.001$; Figure 4). It should be noted, however, that values from 2015-2018 are similar to the pre-ROD period.

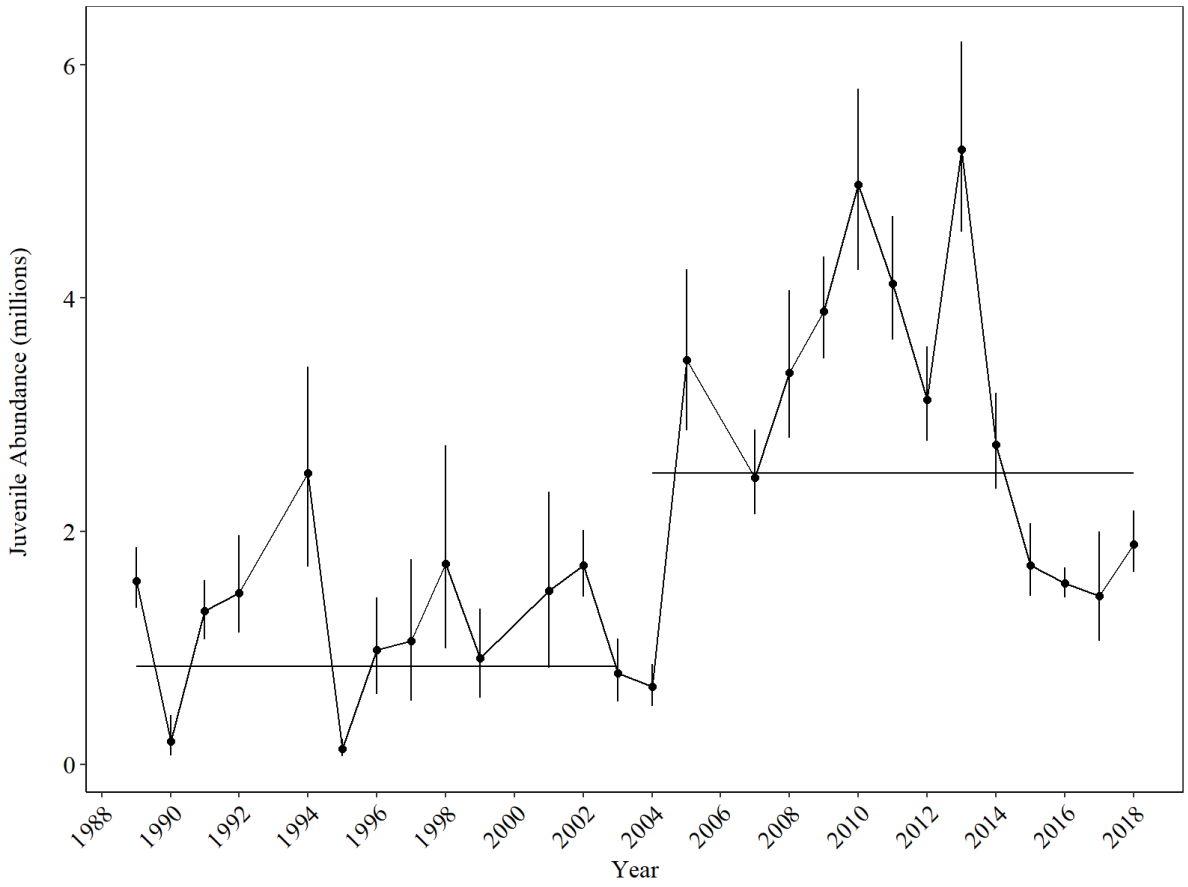

Figure 4. Juvenile Chinook Salmon abundance (in millions) at the Willow Creek trap site from 1989-2018. Horizontal lines indicate mean juvenile abundance (in millions) prior to and following the identified change point of 2004. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Juvenile Abundance Change Point Trend Analysis

After accounting for the strong evidence for a change point in Willow Creek juvenile abundance pre- and post-ROD flows, linear regression suggested there is no evidence of trends in juvenile abundance prior to or post implementation of ROD flows on the Trinity River (pre-ROD: $p = 0.868$; post-ROD:, $p = 0.536$; Table 3, Figure 5).

Table 3. Estimated trend in juvenile Chinook Salmon abundance prior to (1989-2003) and following (2004-2018) the implementation of the Record of Decision (ROD).

		Estimate	**Standard Error**	**95% Confidence Interval**
Pre-ROD	*(Intercept)*	-13,128,896	84,144,539	[-198,329,778, 172,071,985]
	Year	7,189	42,158	[-85,601, 99,978]
Post-ROD	*(Intercept)*	116,272,853	177,837,215	[-271,201,151, 503,746,857]
	Year	-56,363	88,416	[-249,006, 136,279]

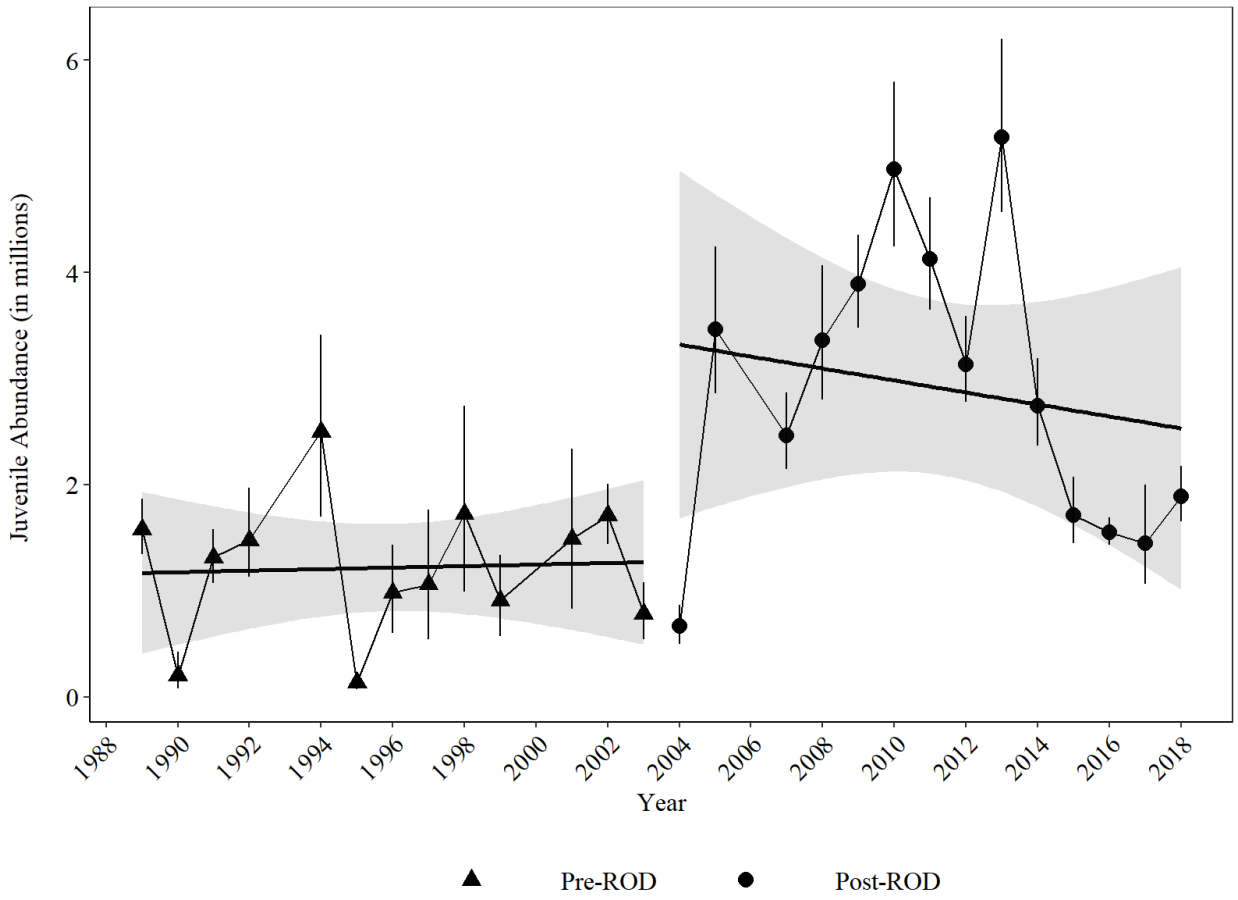

Figure 5. Juvenile Chinook Salmon abundance (in millions) at the Willow Creek trap site from 1989-2018 (triangles and filled circles). Pre- and post- Record of Decision (ROD) linear regression trendlines (thicker black lines) and 95% confidence intervals (grey shading) are shown. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Juvenile Abundance Trend Analysis with Flow Covariates

Pear Tree

The model of river discharge and adult covariates for the Pear Tree time series having the lowest AICc is the null model. The next lowest AICc was the model including April discharge plus adult abundance (Table 4) but there was not evidence these covariates improved model fit over a null model (p = 0.538).

Table 4. AICc model comparison of juvenile abundance at Pear Tree as a function of April and May discharge, and adult abundance covariates. Lowest AICc is bolded. "AprilMay" represents the sum of both months' discharge, an asterisk represents the full model with interaction terms, and a plus sign represents a simple model without interaction terms.

Model Covariates	AICc	Delta AICc
Null Model	**470**	0
April	474	4
May	474	4
AprilMay	475	5
April*May	480	10
April +May	477	7
April + Adults	473	3
May+ Adults	474	4
AprilMay+ Adults	475	5
April*May+ Adults	480	10
April +May+ Adults	476	6

Willow Creek

Due to the strong evidence for change point detection in the Willow Creek juvenile abundance time series in 2004, separate model selection routines were done for pre-ROD and post-ROD time periods.

The best model of river discharge and adult abundance covariates for the pre-ROD period according to AICc is the null model (Table 5). The model of May discharge had the same AICc as the null model, but there was not evidence this covariate improved model fit (p = 0.123). Two other models, April discharge and cumulative discharge during April-May have AICc values within 2 units of the best model.

Table 5. AICc model comparison of juvenile abundance at Willow Creek as a function of April and May discharge at Hoopa and adult abundance covariates pre- Record of Decision (1989-2003). Lowest AICc is bolded. "AprilMay" represents the sum of both months' discharge, an asterisk represents the full model with interaction terms, and a plus sign represents a simple model without interaction terms.

Covariates	**AICc**	**Delta AICc**
Null Model	**389**	0
April	391	2
May	**389**	0
AprilMay	390	1
April*May	398	9
April +May	393	4
April + Adults	395	6
May+ Adults	393	5
AprilMay+ Adults	394	5
April*May+ Adults	403	14
April +May+ Adults	398	9

Similarly, in post-ROD years (2004-2018), the best model of juvenile abundance was the null model (Table 6). The simple model of May discharge and cumulative April May discharge were within 2 AICc of the null model, but there was no evidence the covariates improved model fit ($p = 0.295$, and $p = 0.478$, respectively).

Table 6. AICc model comparison between juvenile abundance at Willow Creek, April and May discharge and adult abundance covariates post- Record of Decision (2004-2018). Lowest AICc is bolded. "AprilMay" represents the sum of both months' discharge, an asterisk represents the full model with interaction terms, and a plus sign represents a simple model without interaction terms.

Covariates	AICc	Delta AICc
Null Model	**440**	0
April	443	3
May	441	1
AprilMay	442	2
April*May	450	10
April +May	445	5
April + Adults	446	6
May+ Adults	444	4
AprilMay+ Adults	445	5
April*May+ Adults	456	16
April +May+ Adults	449	9

Juveniles-Per-Spawner

Pear Tree Annual Trend (Linear Model)

Production (JPS) at the Pear Tree trap site had moderate evidence for positive trend over the period 2003-2018 ($p = 0.015$; Table 7, Figure 6).

Table 7. Estimated annual trend in Trinity River Chinook Salmon production (juveniles-per-spawner) at the Pear Tree trap site from 2003-2018.

	Estimate	Standard Error	95% Confidence Interval
(Intercept)	-52,726	18,744	[-93,568, -11,885]
Year	26.39	9.32	[6.0820, 46.697]

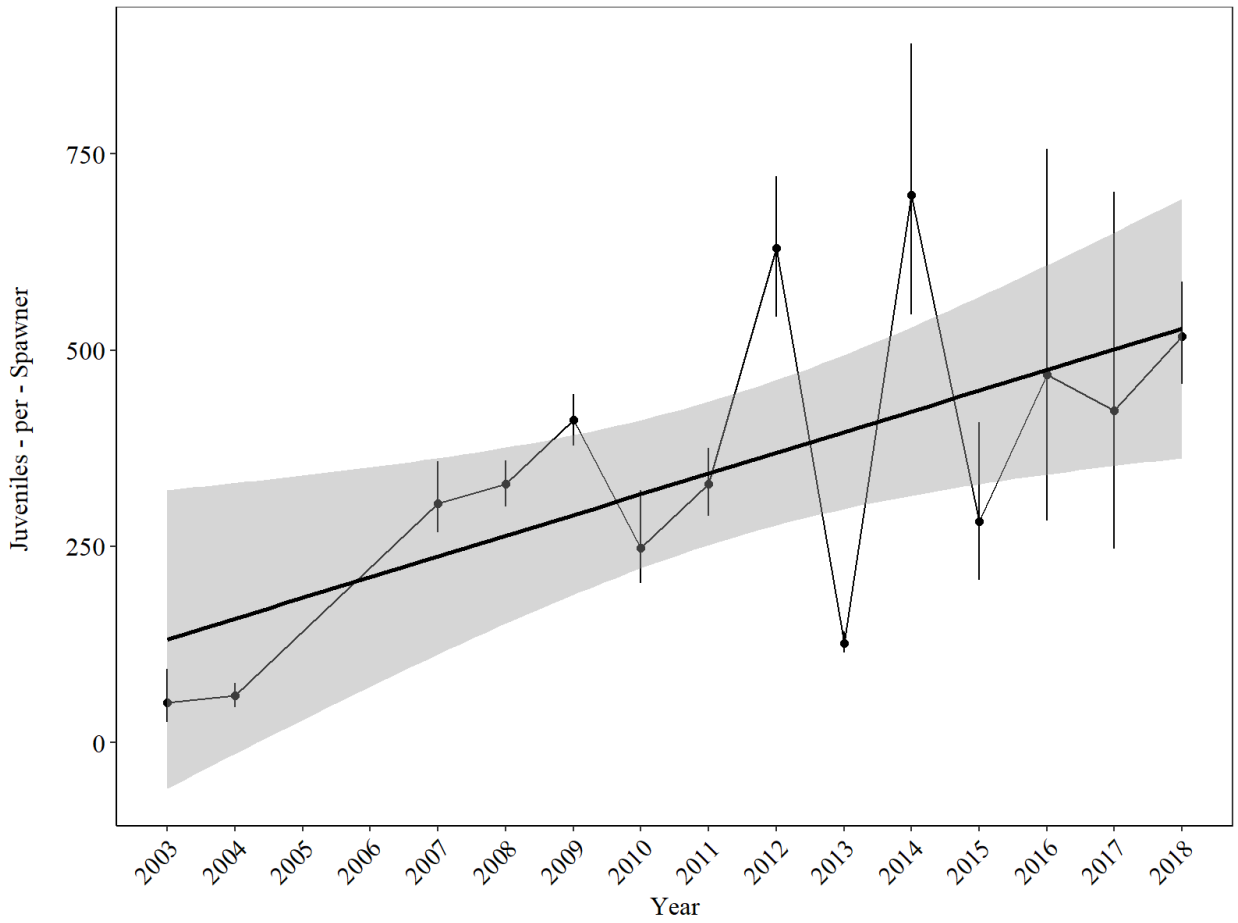

Figure 6. Estimated linear regression trend (thicker black line) of annual juvenile Chinook Salmon production (juveniles-per-spawner) at the Pear Tree trap site on the Trinity River from 2003-2018. Grey bar indicates 95% confidence interval of regression line. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Willow Creek Juveniles-Per-Spawner Annual Trend

At Willow Creek, there was also moderate evidence that JPS production increased across the study period from 1989-2018 (p = 0.045; Table 8, Figure 7).

Table 8. Estimated annual trend in Trinity River Chinook Salmon production (juveniles-per-spawner) at the Willow Creek trap site from 1989-2018.

	Estimate	**Standard Error**	**95% Confidence Interval**
(Intercept)	-8,678	4,175	[-17,276, -79.488]
Year	4.39	2.083	[0.0973, 8.682]

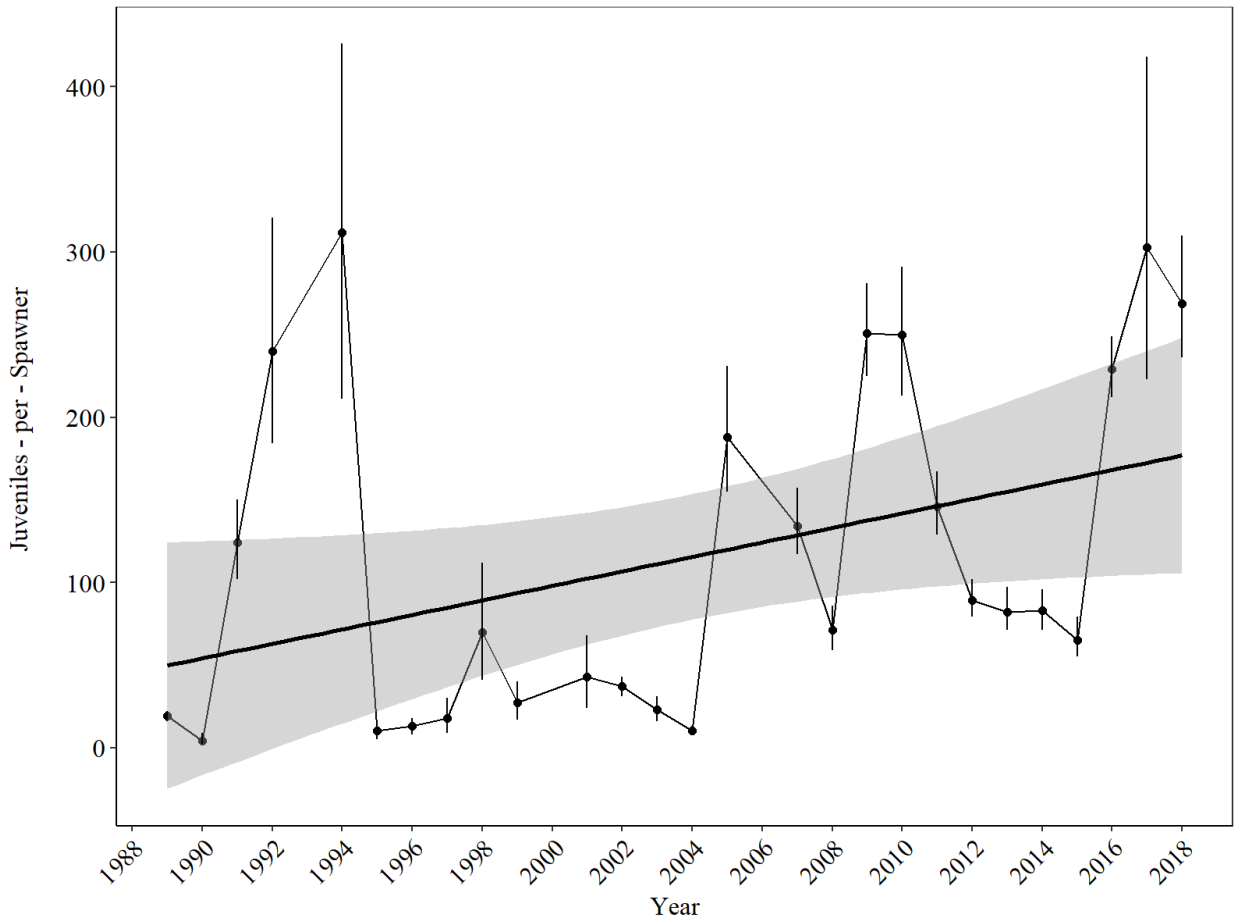

Figure 7. Estimated linear regression trend (thicker black line) on annual juvenile Chinook Salmon production (juveniles-per-spawner) at the Willow Creek trap site on the Trinity River from 1989-2018. Grey bar indicates 95% confidence interval of regression line. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Juveniles-Per-Spawner Change Point (Willow Creek)

In the JPS time series we assessed the difference in mean JPS pre- and post-ROD at the Willow Creek trap site. There was overwhelming evidence that mean JPS increased following ROD implementation, from a mean of 72 JPS from 1989-2003 to 155 JPS from 2004-2018 (p = 0.008; Figure 8).

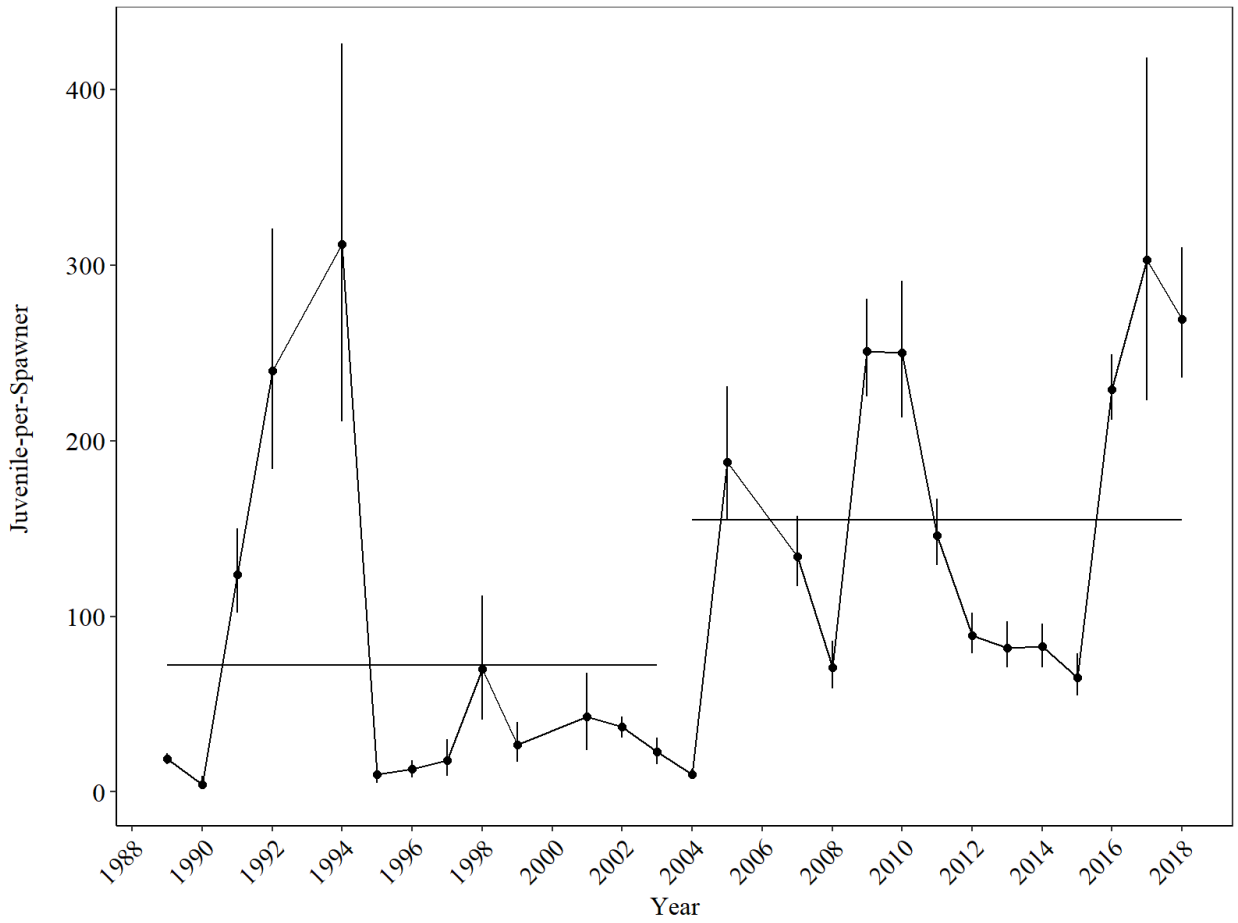

Figure 8. Juvenile Chinook Salmon production (juveniles-per-spawner) at the Willow Creek site from 1989-2018. Horizontal lines indicate mean juveniles-per-spawner pre- and post-Record of Decision (ROD) implementation in 2004. Error bars indicate 95% credible intervals around juvenile abundance estimates

Juvenile-per-Spawner Change Point Trend Analysis

There was no evidence of trend in production (JPS) at the Willow Creek trap site prior to 2004 ($p = 0.367$; Table 9, Figure 9) nor after ROD flow implementation in 2004 ($p = 0.154$; Table 9, Figure 9).

Table 9. Regression parameter estimates of juvenile Chinook Salmon production (juveniles-per-spawner) at the Willow Creek trap site prior to (1989-2003) and following (2004-2018) the implementation of the Record of Decision (ROD).

		Estimate	**Standard Error**	**95% Confidence Interval**
Pre-ROD	*(Intercept)*	11,517	12,173	[-15,277, 38,310]
	Year	-5.73	6.10	[-19.166, 7.692]
Post-ROD	*(Intercept)*	-16,796	11,145	[-41,079, 7,487]
	Year	8.43	5.54	[-3.65, 20.50]

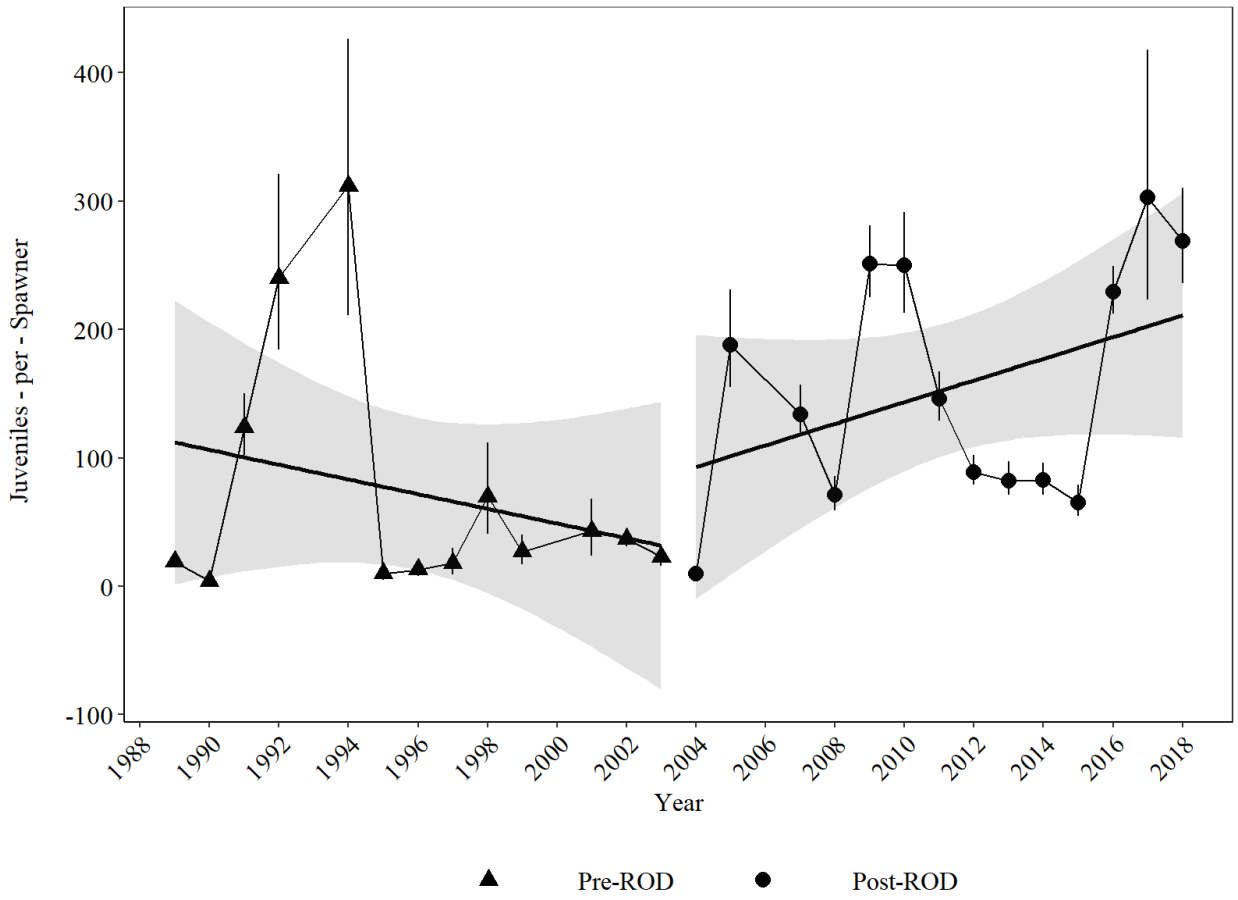

Figure 9. Juvenile Chinook Salmon production (juveniles-per-spawner) at the Willow Creek trap site from 1989-2018. Pre- and post- Record of Decision (ROD) linear regression trendlines (thicker black lines) and 95% confidence intervals (grey) are shown. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Fork Length

Comparisons of fork length at Willow Creek pre-ROD vs post-ROD revealed evidence of differences pre-ROD versus post-ROD in most weeks (Table 10, Figure 10). Post-ROD fork length was generally larger than pre-ROD in weeks 13, 15, 16, and 18. Pre-ROD fork length was generally larger than post-ROD starting in week 20.

Table 10. ANOVA test results of fork length (mm) by week and pre- Record of Decision (ROD) vs. post-ROD for juvenile Chinook Salmon captured at the Willow Creek trap site. *p*-values showing strong evidence for differences are bolded, and the period of 'larger' estimated fork lengths is indicated.

Week	Pre-ROD Mean Fork Length mm (SE)	Post-ROD Mean Fork Length mm (SE)	*p*-value	Larger
12	40.4 (0.23)	41.2 (0.22)	0.204	--
13	40.1 (0.23)	42.5 (0.19)	**<0.001**	**Post**
14	43.3 (0.31)	43.7 (0.18)	0.313	--
15	45.5 (0.36)	49.8 (0.23)	**<0.001**	**Post**
16	50.1 (0.32)	52.8 (0.21)	**<0.001**	**Post**
17	53.0 (0.41)	52.9 (0.22)	0.484	--
18	56.3 (0.39)	58.0 (0.26)	**0.005**	**Post**
19	57.3 (0.37)	57.5 (0.31)	0.814	--
20	61.0 (0.33)	59.9 (0.24)	**0.0139**	**Pre**
21	64.2 (0.39)	65.4 (0.26)	0.067	--
22	71.2 (0.44)	70.1 (0.25)	**0.0147**	**Pre**
23	79.5 (0.38)	74.9 (0.24)	**<0.001**	**Pre**
24	88.2 (0.33)	83.4 (0.19)	**<0.001**	**Pre**
25	88.1 (0.25)	85.0 (0.13)	**<0.001**	**Pre**
26	87.8 (0.22)	83.3 (0.11)	**<0.001**	**Pre**
27	85.8 (0.22)	82.2 (0.12)	**<0.001**	**Pre**
28	84.9 (0.18)	82.0 (0.11)	**<0.001**	**Pre**
29	86.1 (0.17)	82.9 (0.10)	**<0.001**	**Pre**
30	85.4 (0.16)	83.0 (0.10)	**<0.001**	**Pre**
31	86.9 (0.17)	84.5 (0.12)	**<0.001**	**Pre**
32	88.8 (0.18)	86.0 (0.13)	**<0.001**	**Pre**
33	90.9 (0.18)	88.2 (0.15)	**<0.001**	**Pre**
34	92.5 (0.19)	89.3 (0.21)	**<0.001**	**Pre**
35	94.7 (0.19)	89.8 (0.43)	**<0.001**	**Pre**
36	97.3 (0.21)	93.7 (0.81)	**<0.001**	**Pre**

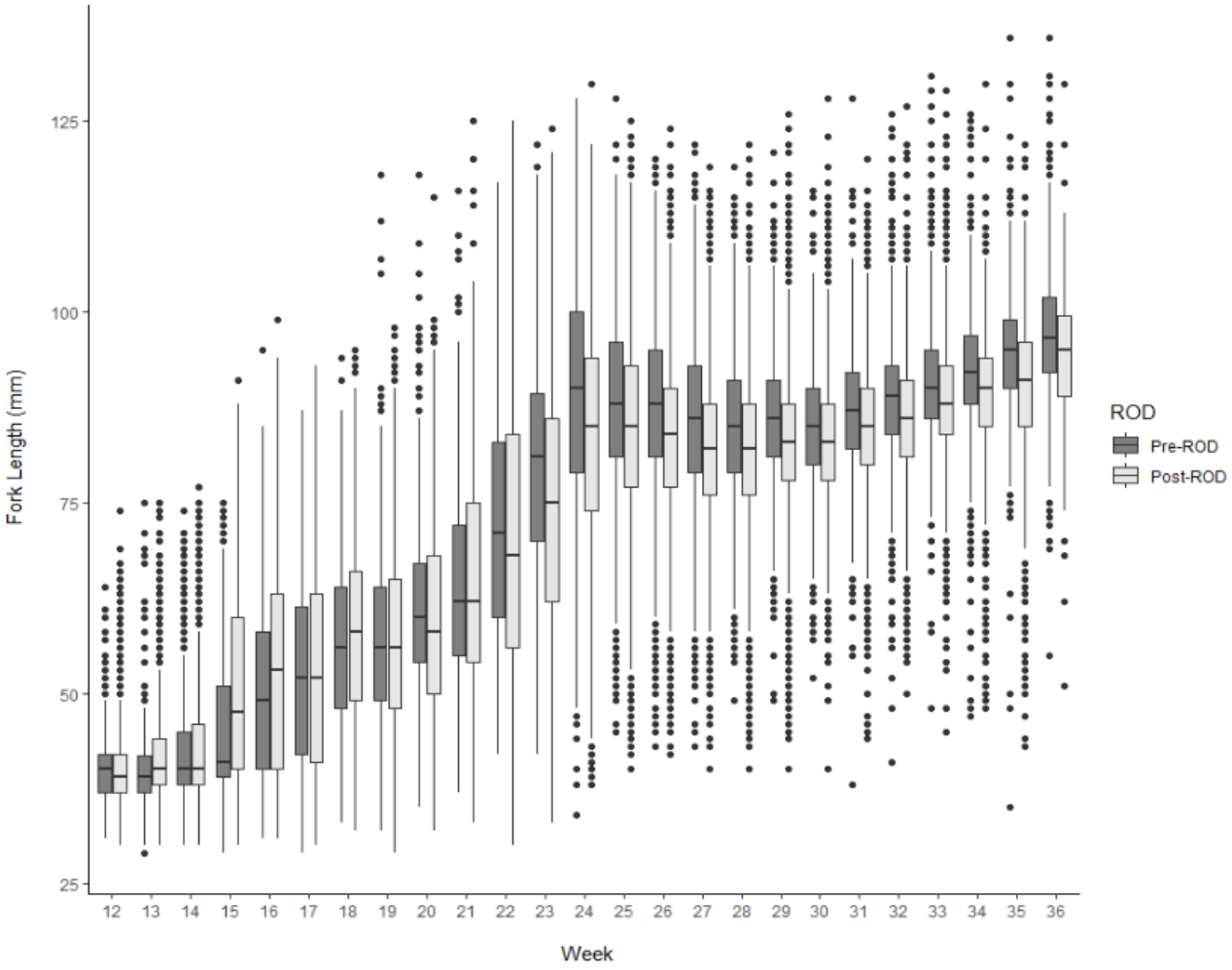

Figure 10. Box-plot of fork length for non-adipose fin-clipped age-0 Chinook Salmon captured at the Willow Creek trap site grouped by week and Record of Decision (ROD) period. Bars indicate standard error (SE) of the mean and points represent outliers beyond SE bars.

There was strong evidence (Figure 11) that both Clip and No-Clip fish were smaller during the post-ROD period (p-values < 0.0001 for each).

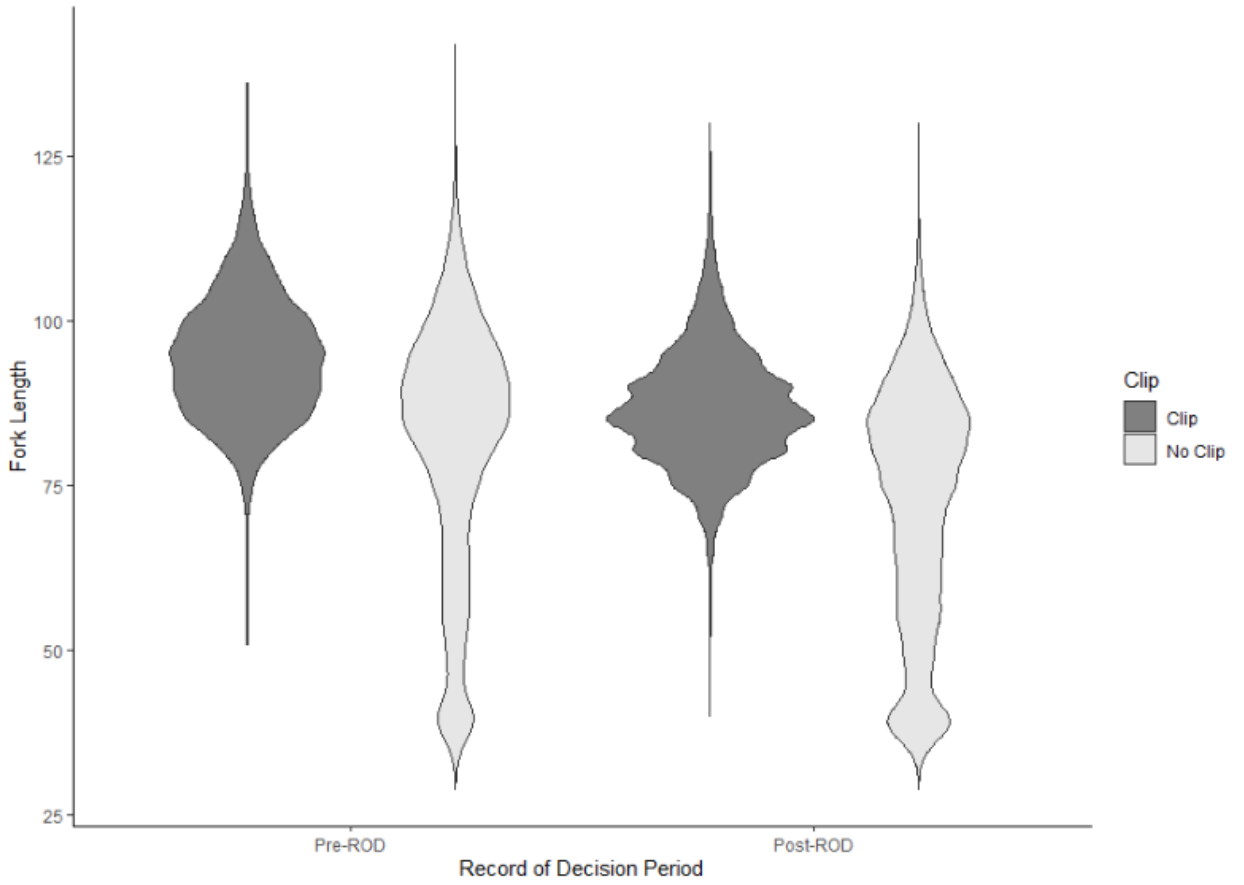

Figure 11. Violin plots of juvenile Chinook Salmon fork length (FL, mm) for adipose fin clipped hatchery fish (Clip) and non-adipose fin clipped fish (No Clip), which may be natural or hatchery origin, for both pre- Record of Decision (ROD, 1993-2003) and post-ROD (2004-2018) periods.

Biomass

Biomass Linear Trend

Annual estimates of biomass at the Pear Tree trap site did not exhibit evidence of trend (p = 0.785, Table 10, Figure 12) from 2003-2018.

Table 10. Regression parameter estimates of juvenile Chinook Salmon biomass at the Pear Tree trap site 2003-2018.

	Estimate	**Standard Error**	**95% Confidence Interval**
(Intercept)	69,841	232,269	[-436,230, 575,911]
Year	-32.92	115.49	[-284.543, 218.714]

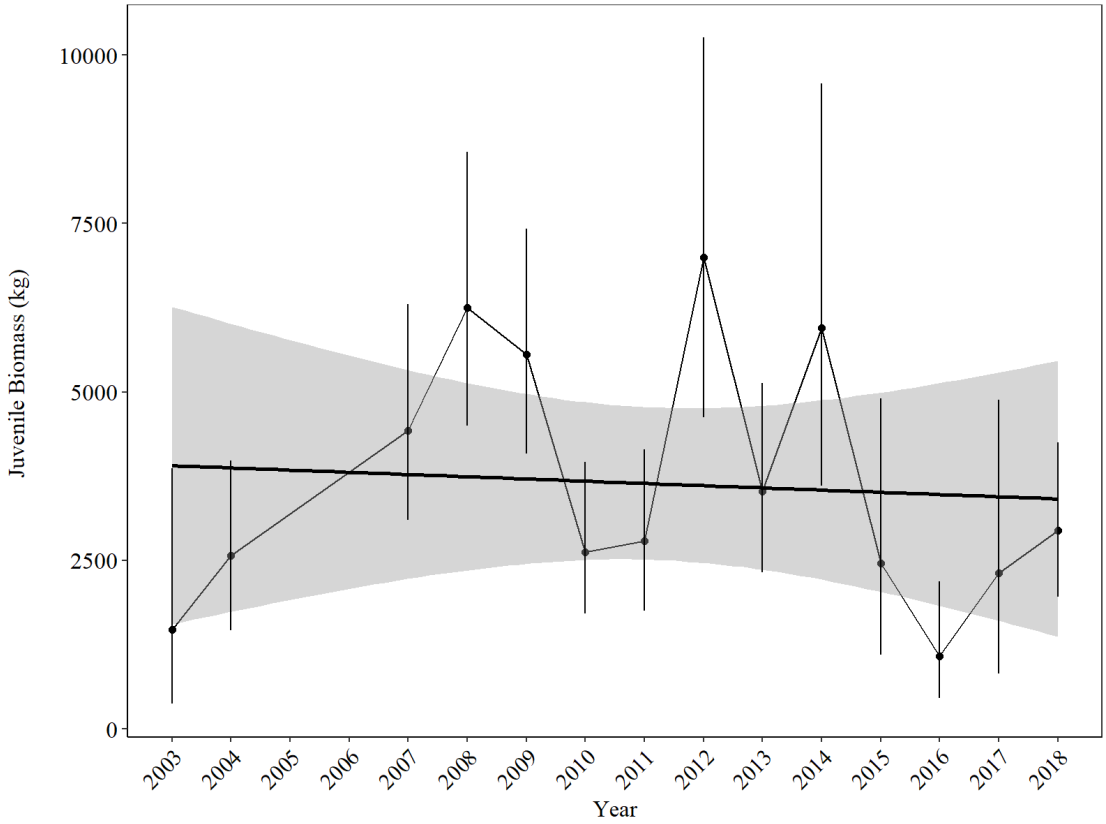

Figure 12. Juvenile Chinook Salmon annual biomass (kg) estimates at the Pear Tree trap site from 2003-2018. Linear regression trendline (thicker black line) is presented, grey bar indicates 95% confidence interval. Error bars indicate 95% credible intervals around juvenile abundance estimates.

At Willow Creek, estimates of total biomass did not suggest evidence for trend across the study period from 1994-2018 as indicated by linear regression (p = 0.079; Table 11, Figure 13).

Table 11. Estimated trend in Trinity River Chinook Salmon annual biomass (kg) estimates at the Willow Creek trap site from 1994-2018.

	Estimate	**Standard Error**	**95% Confidence Interval**
(Intercept)	-627,036	346,007	[-1.3e+06, 92,525]
Year	318	173	[-40, 677]

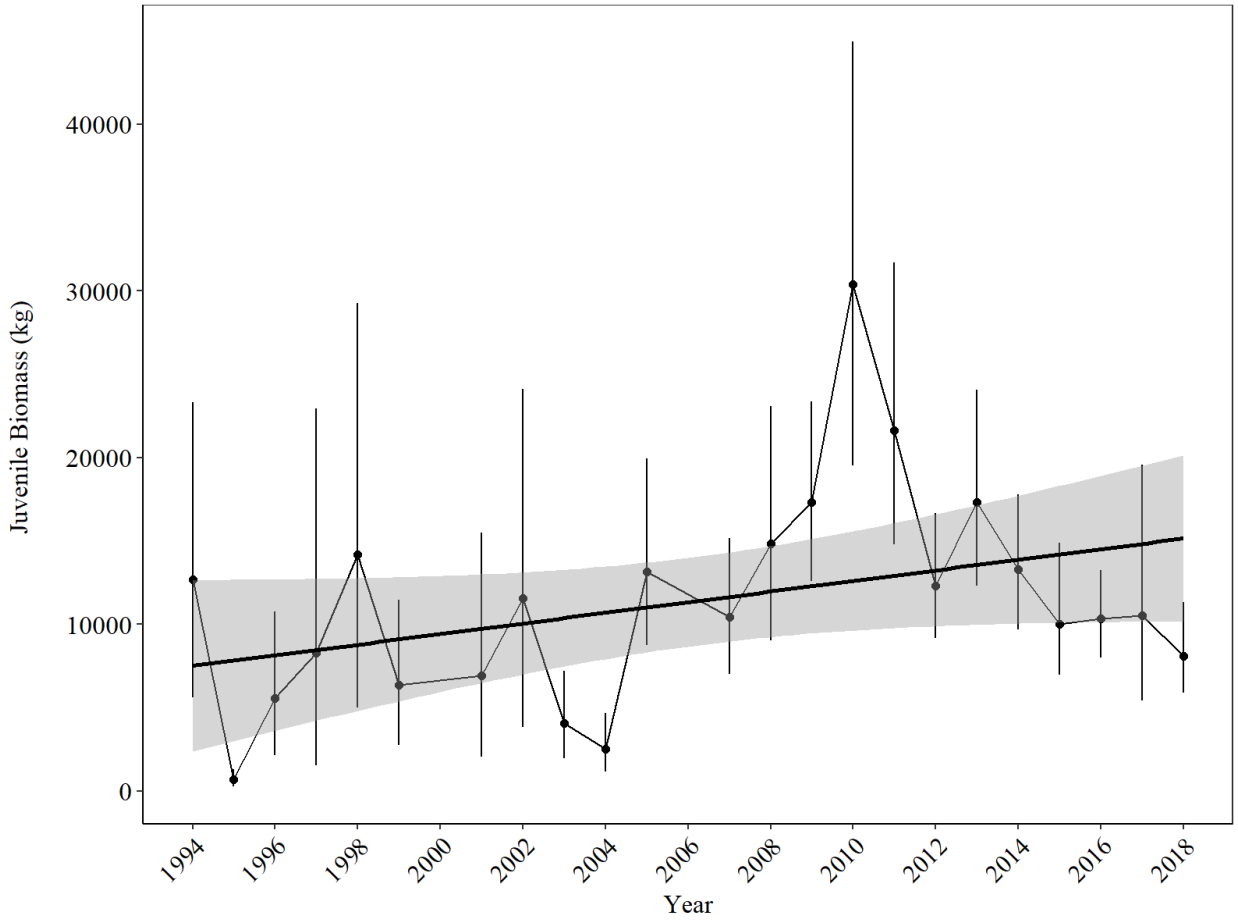

Figure 13. Juvenile Chinook Salmon annual biomass (kg) estimates at the Willow Creek trap site from 1994-2018. Linear regression trendline (thicker black line) is presented, grey bar indicates 95% confidence interval. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Biomass Change-Point (Willow Creek)

The year showing evidence as a change point in the Willow Creek biomass time series (Figure 14) was 2004. Mean annual juvenile Chinook Salmon biomass from 1994-2004 was 7,823 kg and increased to 13,735 kg from 2005-2018 providing strong evidence of difference ($p < 0.001$; Figure 14).

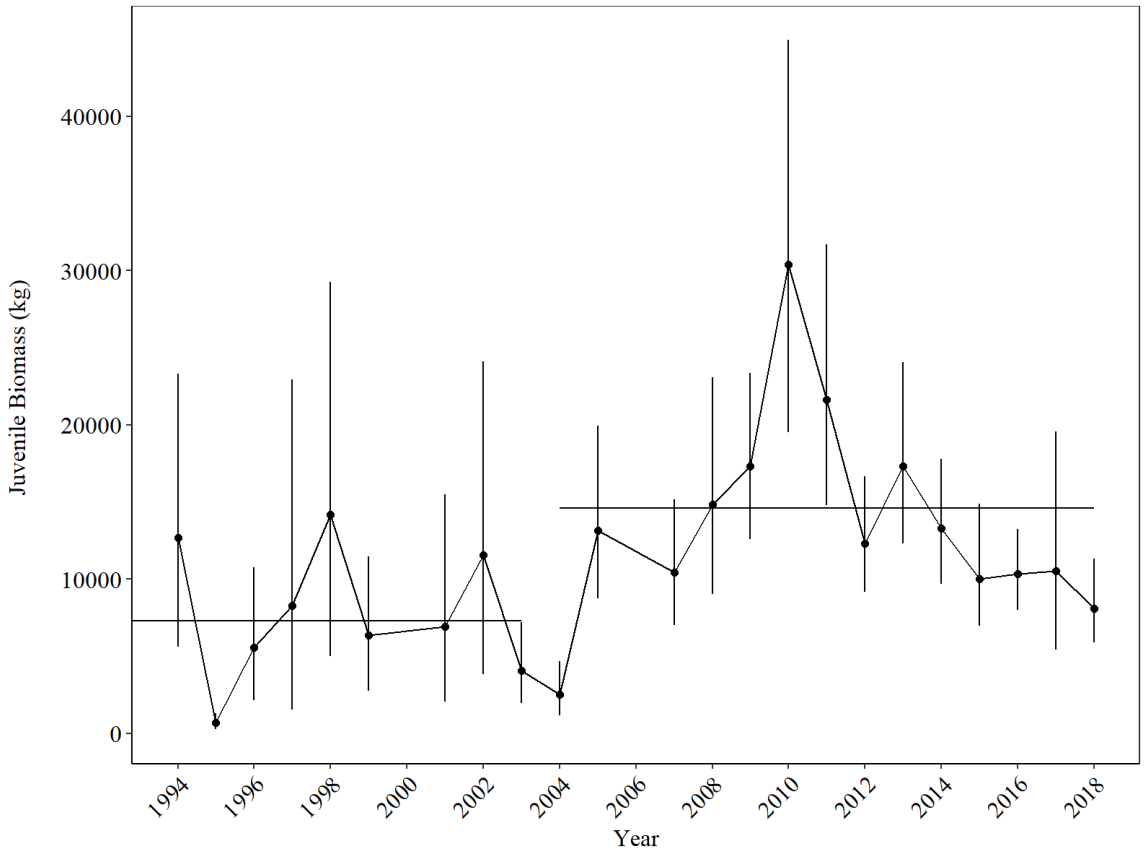

Figure 14. Juvenile Chinook Salmon annual biomass (kg) estimates at the Willow Creek site from 1989-2018. Horizontal lines indicate mean biomass (kg) pre- and post-ROD implementation in 2004. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Biomass Change-Point Trend (Willow Creek)

Biomass of juvenile Chinook Salmon production at the Willow Creek trap site was relatively stable prior to 2004 with no evidence of trend (p = 0.969; Table 12, Figure 15). Following ROD flow implementation in 2004, there was also no evidence of trend in biomass of juvenile Chinook Salmon (p = 0.869; Table 13, Figure 15).

Table 12. Regression parameter estimates of juvenile Chinook Salmon biomass (kg) at the Willow Creek trap site prior to (1989-2003) and following (2004-2018) the implementation of the Record of Decision (ROD).

		Estimate	**Standard Error**	**95% Confidence Interval**
Pre-ROD	*(Intercept)*	49,430	1,039,148	[-15,277, 38,311]
	Year	-20.82	520	[-1,250, 1,208]
Post-ROD	*(Intercept)*	160 346	872,705	[-1,741,115, 2,061,807]
	Year	-72.89	434	[-1,018, 872]

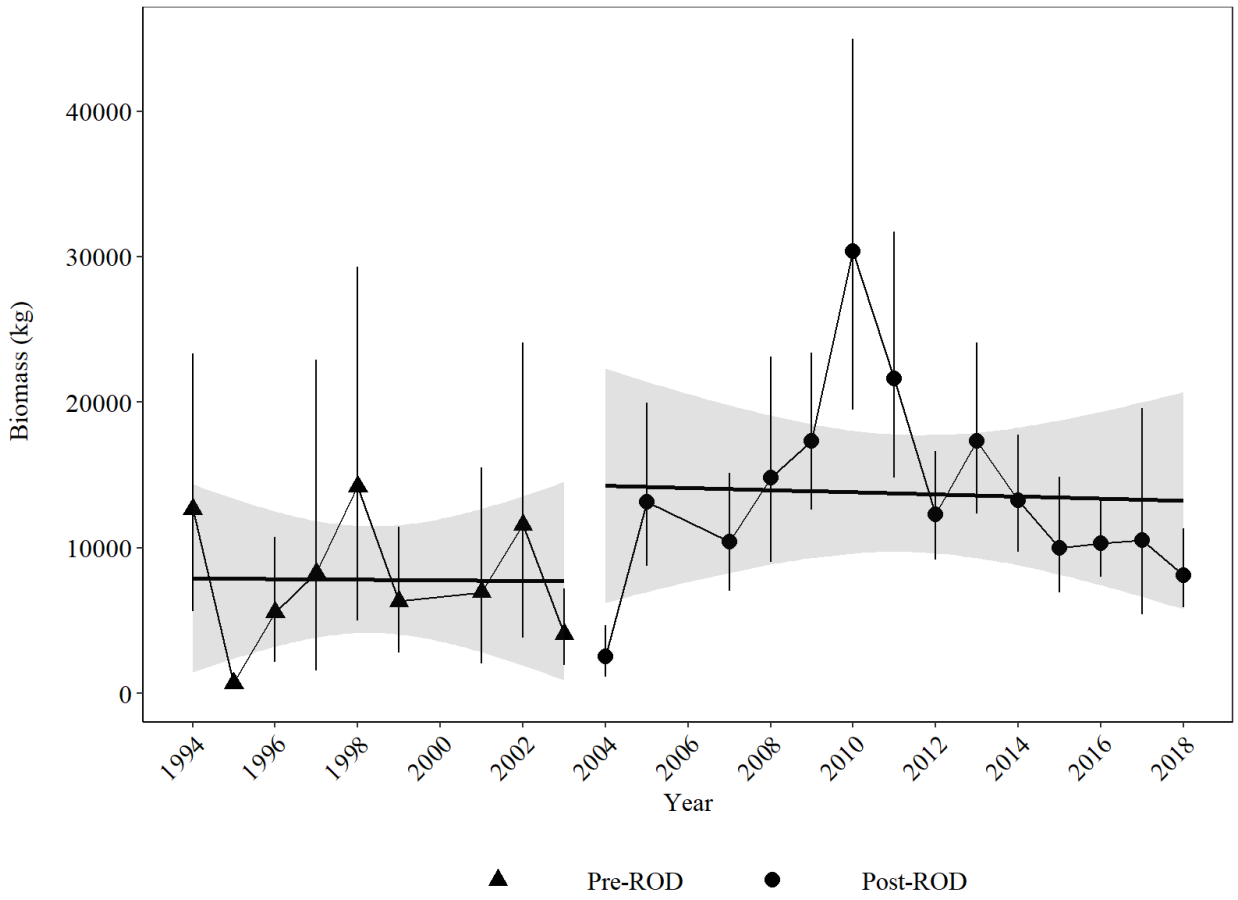

Figure 15. Juvenile Chinook Salmon biomass (kg) at the Willow Creek trap site from 1994-2018. Pre- and post-ROD linear regression trendlines (thicker black lines) and 95% confidence intervals (grey) are shown. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Biomass per Spawner

Annual estimates of BPS at the Pear Tree site revealed weak or moderate evidence of trend (p = 0.055, Table 13, Figure 16).

Table 13. Regression parameter estimates of juvenile Chinook Salmon biomass-per-spawner at the Pear Tree trap site 2003-2018.

	Estimate	**Standard Error**	**95% Confidence Interval**
(Intercept)	-31.58	14.964	[-64.180, 1.0241]
Year	0.0158	0.00744	[-0.000416, 0.0320]

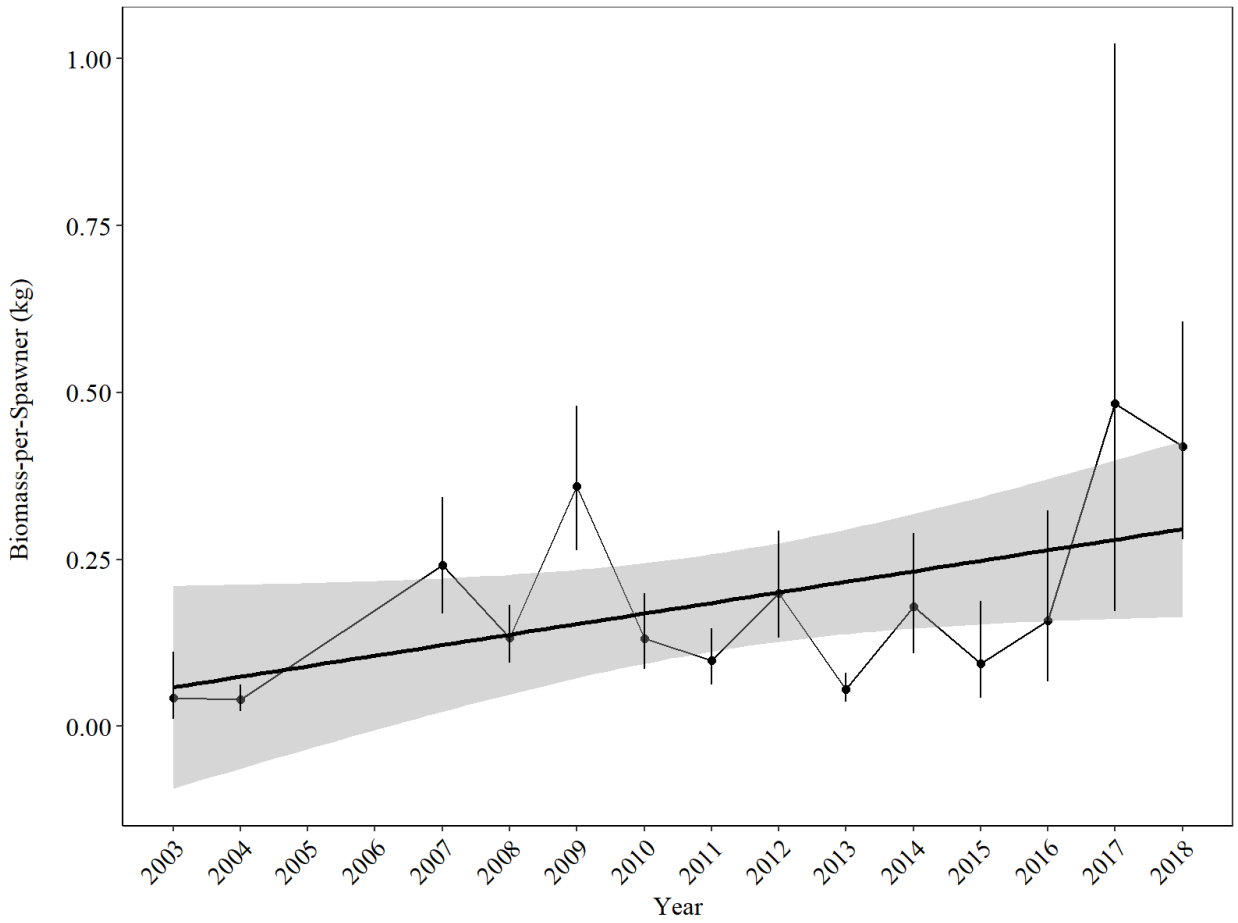

Figure 16. Juvenile Chinook Salmon annual biomass-per-spawner (kg) estimates at the Pear Tree trap site from 2003-2018. Linear regression trendline (thicker black line) is presented, grey bar indicates 95% confidence interval. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Annual estimates of BPS at the Willow Creek site exhibited moderate evidence of positive trend (p = 0.0.036 Table 14, Figure 17) from 1994-2018.

Table 14. Regression parameter estimates of juvenile Chinook Salmon biomass-per-spawner at the Willow Creek trap site 1994-2018.

	Estimate	**Standard Error**	**95% Confidence Interval**
(Intercept)	-69.457	31.258	[-134.462, -44.519]
Year	0.0349	0.0156	[0.00253, 0.0673]

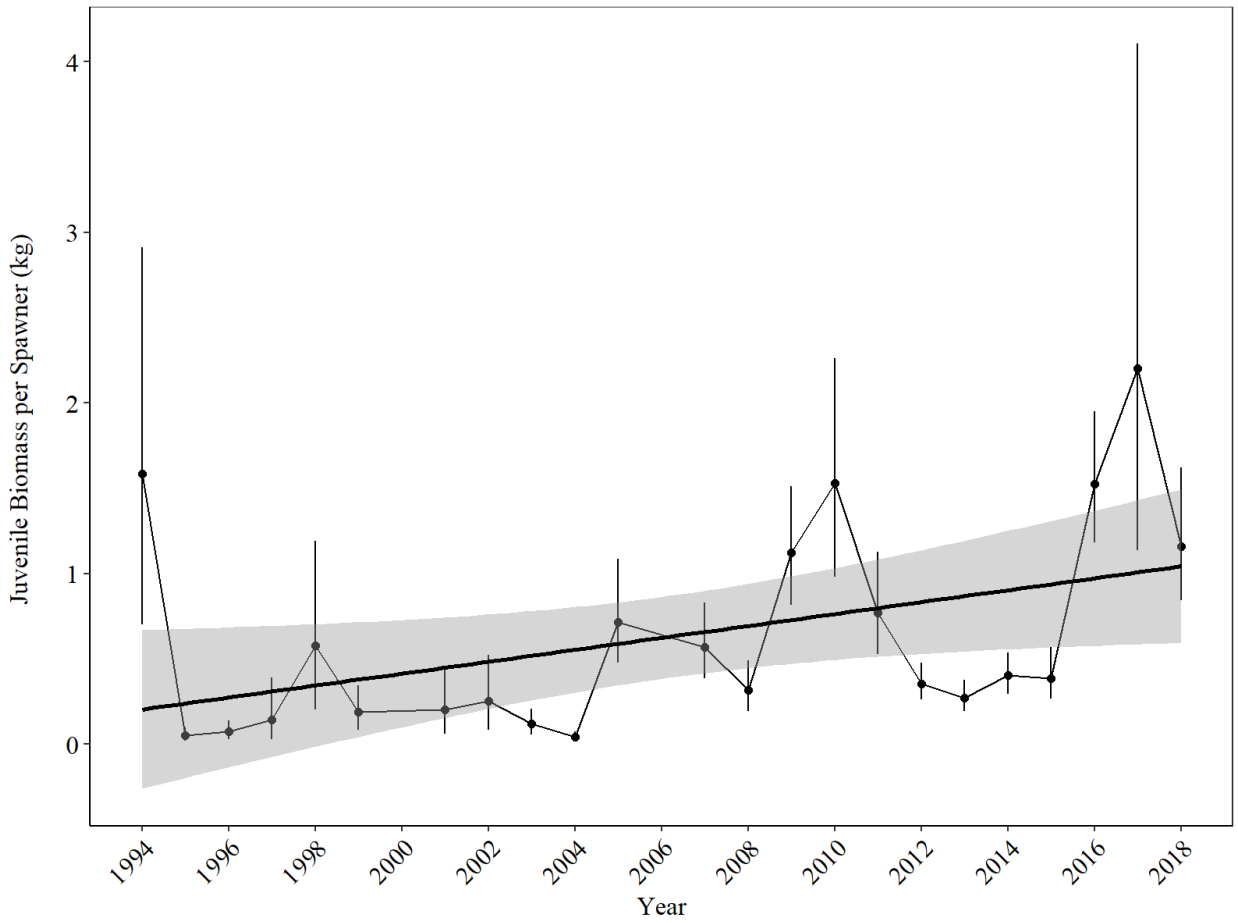

Figure 17. Juvenile Chinook Salmon annual biomass-per-spawner (kg) estimates at the Willow Creek trap site from 1994-2018. Linear regression trendline (thicker black line) is presented, grey bar indicates 95% confidence interval. Error bars indicate 95% credible intervals around juvenile abundance estimates.

There was strong evidence of differences in Willow Creek BPS on either side of the 2004 change-point ($p < 0.001$, Figure 18) from 0.354 kg/spawner (1994-2003) to 0.810 kg/spawner (2004-2018). Biomass-per-Spawner of juvenile Chinook Salmon at the Willow Creek trap site was relatively stable prior to 2004 with no evidence of trend ($p = 0.234$; Table 15, Figure 19). Following ROD flow implementation in 2004, there was weak or no evidence of trend in BPS of juvenile Chinook Salmon ($p = 0.083$; Table 15, Figure 19).

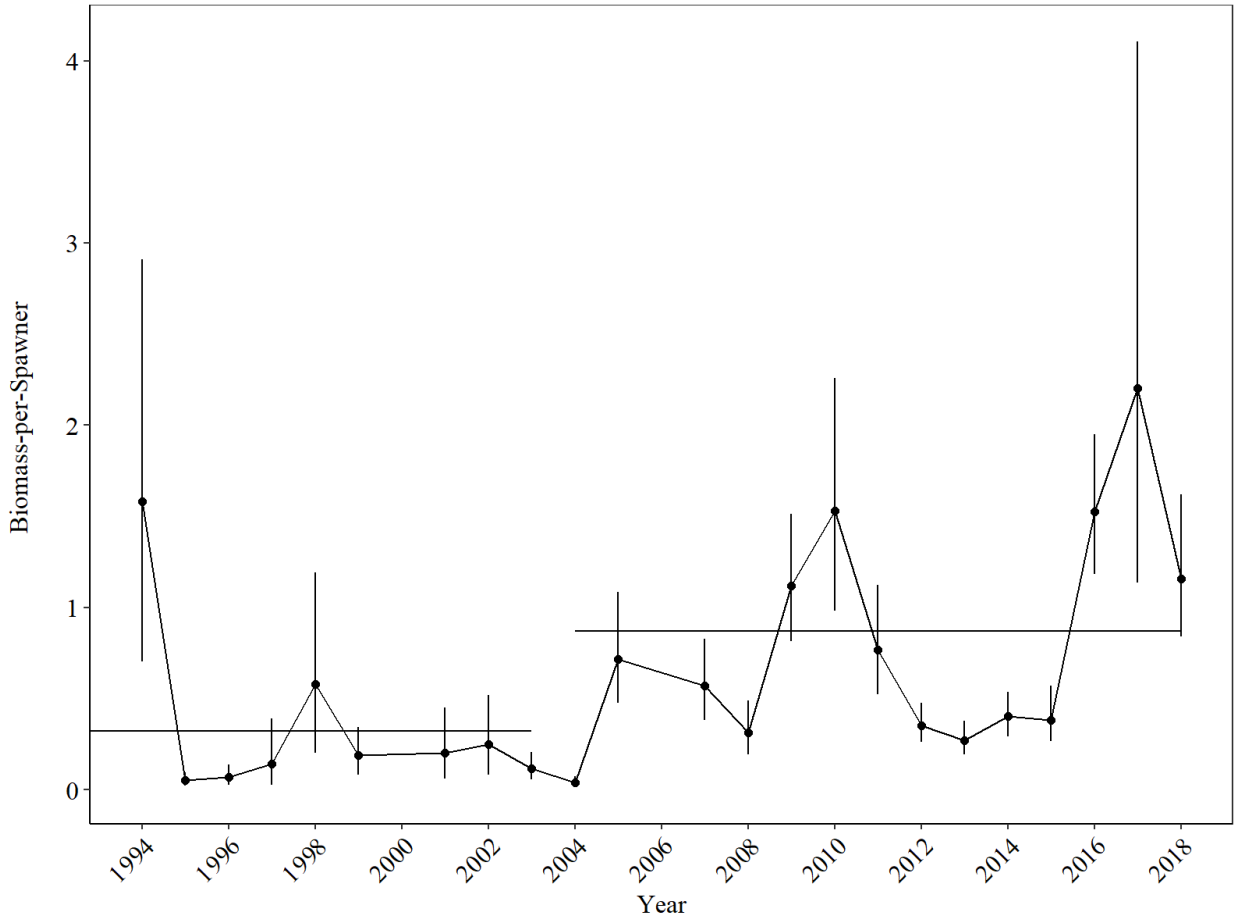

Figure 18. Juvenile Chinook Salmon annual biomass-per-spawner (kg) estimates at the Willow Creek site from 1989-2018. Horizontal lines indicate mean biomass (kg) pre- and post-ROD implementation in 2004. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Table 15. Regression parameter estimates of juvenile Chinook Salmon biomass-per-spawner (kg) at the Willow Creek trap site prior to (1989-2003) and following (2004-2018) the implementation of the Record of Decision (ROD).

		Estimate	**Standard Error**	**95% Confidence Interval**
Pre-ROD	*(Intercept)*	136.06	104.25	[-110.44, 382.57]
	Year	-0.0679	0.0522	[-0.191, 0.0554]
Post-ROD	*(Intercept)*	-133.85	71.18	[-288.94, 21.24]
	Year	0.0670	0.03544	[-0.0102, 0.144]

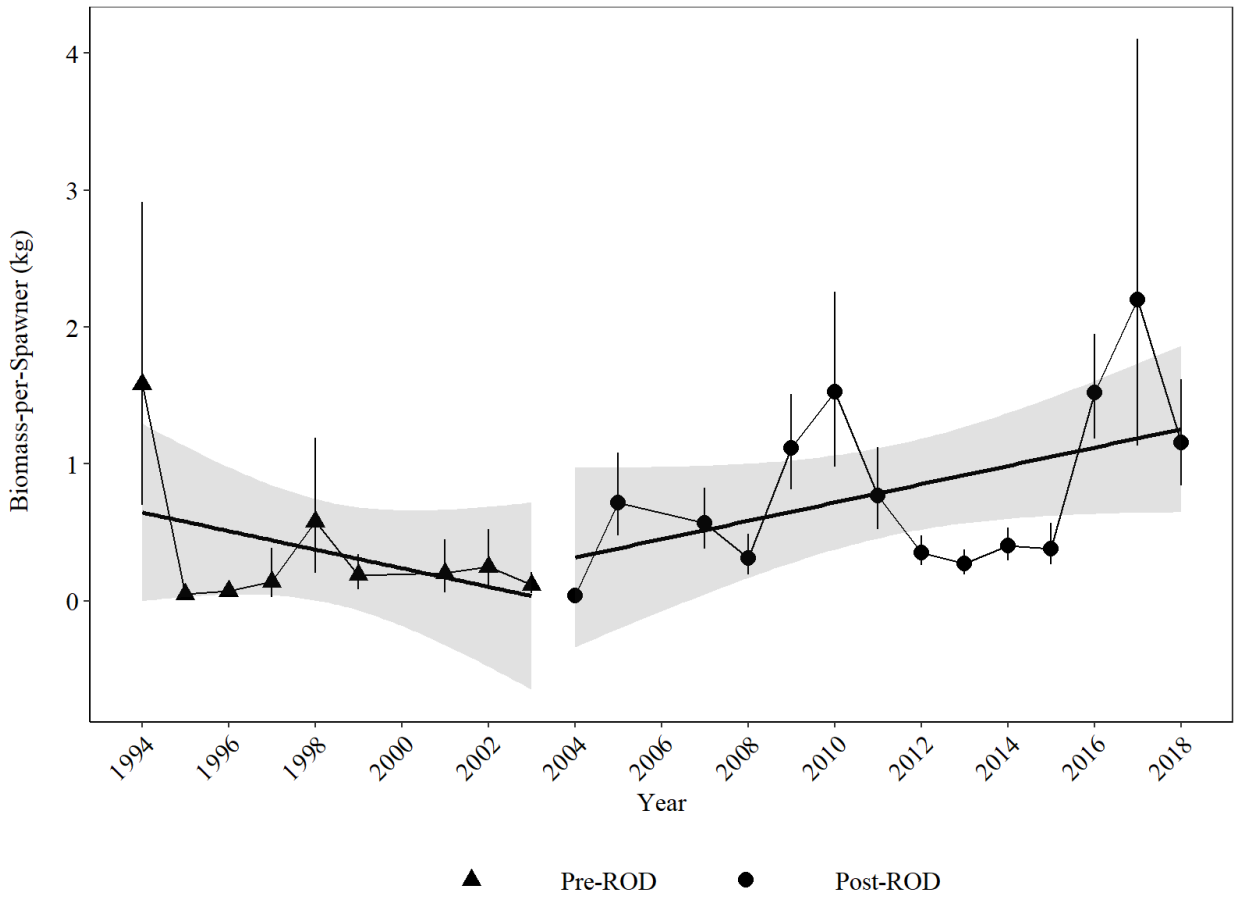

Figure 19. Juvenile Chinook Salmon biomass-per-spawner (kg) at the Willow Creek trap site from 1994-2018. Pre- and post- Record of Decision (ROD) linear regression trendlines (thicker black lines) and 95% confidence intervals (grey) are shown. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Stock Recruitment Analysis

Pear Tree

Comparison of a density independent linear model, and a Ricker density dependent model provide evidence for density dependent effects at the Pear Tree trap site (Table 16, Figure 20). The density-dependent Ricker function fit the data better than the density independent function (p = 0.005) and had a lower AICc value.

Table 16. Comparison of density independent and dependent models at the Pear Tree trap site, 2003-2018.

Model	Parameters		Residual df	RSS	df	SS	F	Pr(>F)	AICc
	a	***b***							
Density Independent	6.340	-	13	8.4284					37
95% *CI*	[274.01, 571.32]	-							
Ricker	566.7	9.223e-5	12	4.2519	1	4.1765	11.787	0.005	**29**
95% *CI*	[244.01, 889.35]	[3.37e-5, 1.51e-4]							

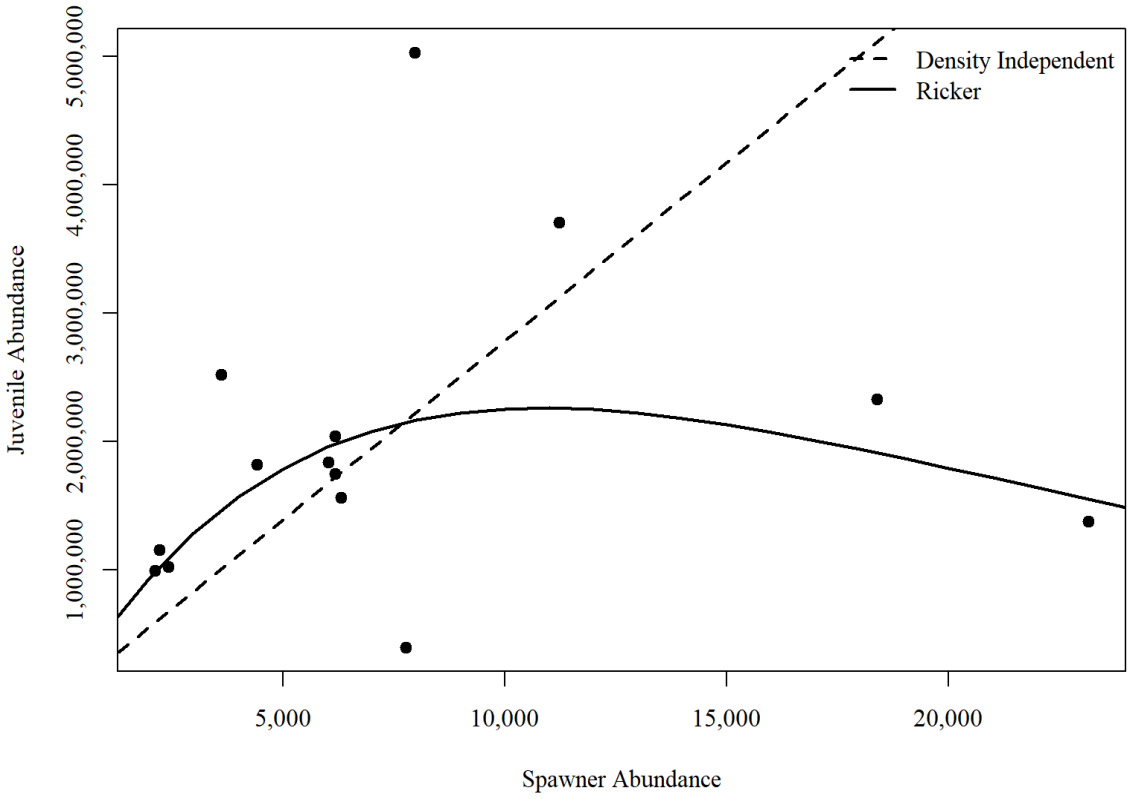

Figure 20. Juvenile Chinook Salmon abundance as a function of spawner abundance (total adults) at the Pear Tree trap site (2003-2018). Density-independent (dashed line) and Ricker density-dependent (solid line) functions are shown.

Willow Creek

Both pre-ROD and post-ROD Ricker models performed better than the respective density independent models (Table 17, Figure 21). The production of JPS in the post-ROD period is substantially higher compared to pre-ROD years (Figure 21) and can be seen in the values of the Ricker *a*-parameter (329.94 vs. 109.79, respectively). Both the pre-ROD and post-ROD Ricker models revealed evidence of improved fit (p = 0.021 and p = <0.001 respectively).

Table 17. Comparison of density independent and dependent stock recruit models for the Willow Creek trap site, pre-Record of Decision (ROD, 1989-2003) and post-ROD (2004-2018).

	Model	**Parameters**		**Residual**	**RSS**	**df**	**SS**	**F**	**Pr(>F)**	**AICc**
		a	***b***	***df***						
Pre-ROD	**Linear**	34.79	-	12	18.98					35
	95% *CI*	[8.35, 61.23]	-							
	Ricker	109.79	3.11e-05	11	11.44	1	7.536	7.244	0.021	**32**
	95% *CI*	[109.79, 233.56]	[5.66e-06, 5.65e-05]							
Post-Rod	**Linear**	117.5	-	13	10.27					31
	95% *CI*	[58.35, 176.73]	-							
	Ricker	329.94	3.71e-05	12	3.04	1	7.231	28.529	<0.001	**26**
	95% *CI*	[155.23, 504.64]	[2.13e-05, 5.29e-05]							

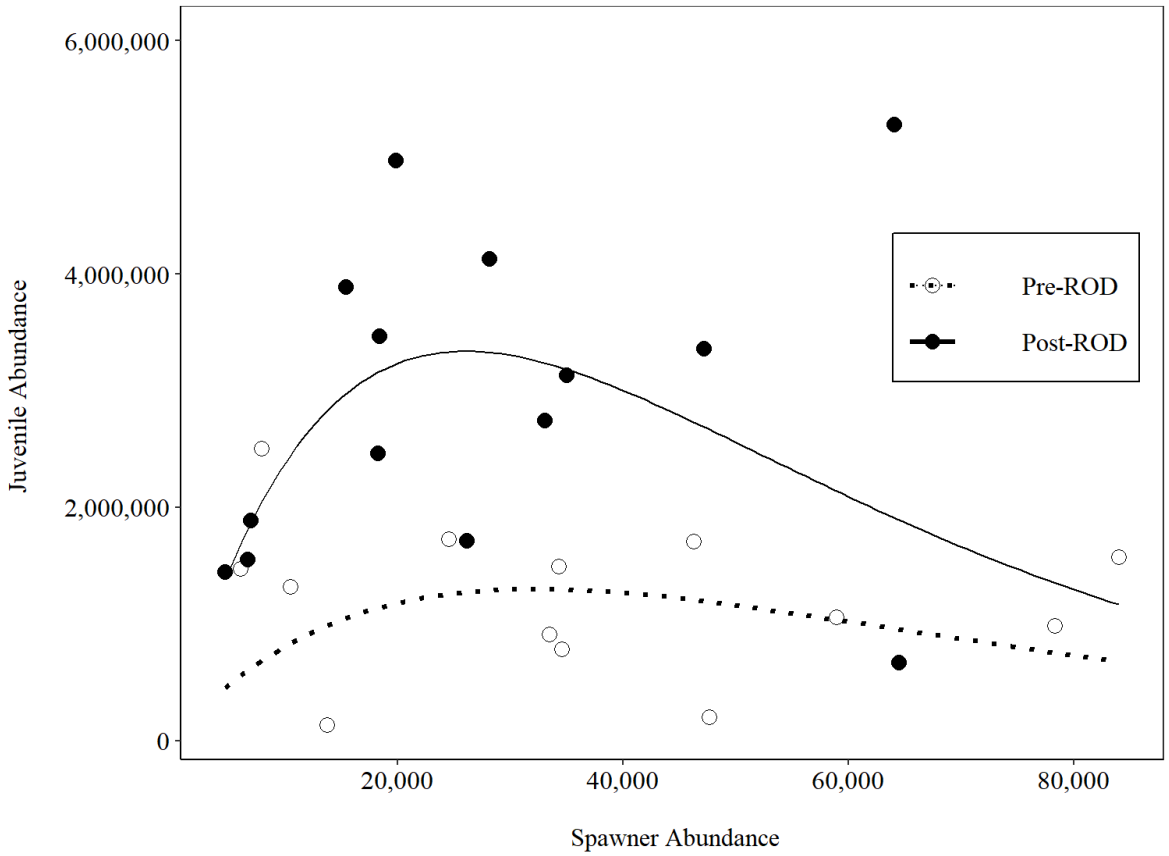

Figure 21. Juvenile Chinook Salmon abundance as a function of spawner abundance for pre-Record of Decision (ROD, 1989-2003) and post-ROD (2004-2018) time periods at the Willow Creek trap site.

Hatchery Fish Apparent Survival

Estimates of hatchery origin juvenile Chinook Salmon and the releases from TRH are presented in Figure 22 and including the estimated apparent survival, or 'Precent of Release' in Appendix D. No evidence of difference ($p = 0.148$, paired t-test) was found between the Pear Tree and Willow Creek estimates of hatchery-origin juvenile Chinook Salmon abundance. Nor was there evidence of difference ($p = 0.238$) found between the pre-ROD and post-ROD Willow Creek estimates of hatchery-origin juvenile Chinook Salmon abundance.

There was no or weak evidence of trend in estimates of abundance of hatchery origin juvenile Chinook Salmon at the Pear Tree site ($p = 0.099$). Similarly, there was no evidence of trend in estimates of abundance of hatchery origin juvenile Chinook Salmon at the Willow Creek site over the entire time series ($p = 0.267$), over the pre-ROD time period ($p = 0.595$), or over the post-ROD time period ($p = 0.663$)

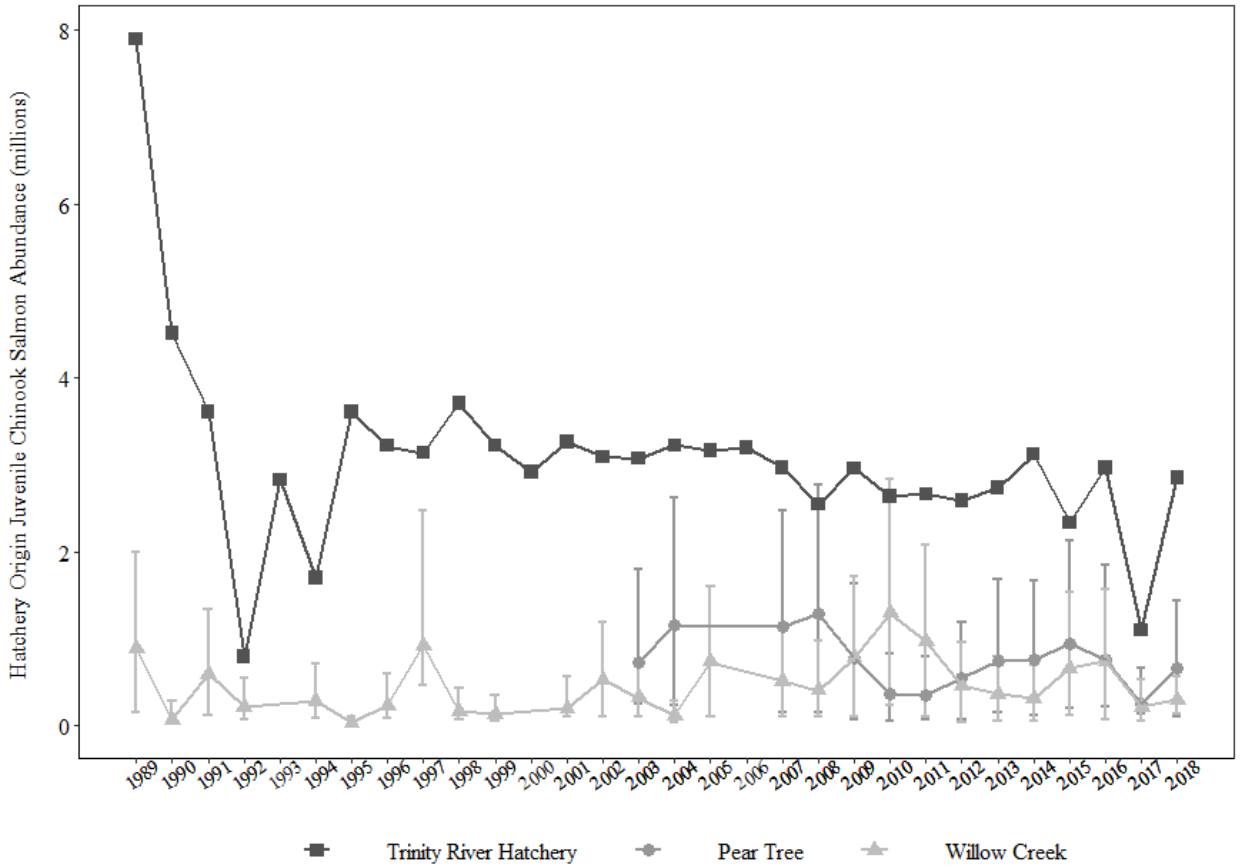

Figure 22. Trinity River Hatchery spring release of juvenile Chinook Salmon with abundance estimates of hatchery-origin juvenile Chinook Salmon abundance at the Pear Tree and Willow Creek trap sites, 1989-2018. Error bars indicate 95% credible intervals around juvenile abundance estimates.

Apparent survival from TRH to the Pear Tree site ranged from 13.5-50.5%, and from TRH to the Willow Creek site ranged from 1.1-49.2% and shows no evidence of differing between the sites (p = 0.165).

There was weak or no evidence of trend in apparent survival from TRH to the Pear Tree site (p = 0.099). There was weak or moderate evidence of trend in apparent survival from TRH to the Willow Creek site over the entire time series (p = 0.076), but not within either of the pre-ROD time period (p = 0.777), or over the post-ROD time period (p = 0.972)

There was some evidence of increase (p = 0.030) in apparent survival from TRH to the Willow Creek site in the post-ROD (mean 21.3%) time period compared to the pre-ROD (mean 11.9%) time period.

Discussion

Analyses of the long-term juvenile salmon dataset on the Trinity River, in concert with spawning adult data, shows a distinct response to water management as part of the TRRP implementation of the Record of Decision (ROD, USDOI 2000) and the annual prescriptive releases of water from Lewiston Dam since 2004. Annual estimates of juvenile abundance, JPS, biomass, and BPS at the Willow Creek Trap site show a marked increase with a significant state-shift occurring after implementation of the ROD. These results suggest that the increase in volume of water released to the Trinity River during the spring and summer months (April-July) incurred some advantage to juvenile Chinook Salmon, likely in the form of increase in habitat availability leading to increased capacity to support higher abundance of juvenile Chinook Salmon. However, following implementation of the ROD, no trend in abundance of juvenile Chinook Salmon is apparent at the Willow Creek and Pear Tree sites. It is possible that the lack of detectable trend could be due to the relatively small increase in habitat capacity (Beechie et al. 2015), although our analyses cannot determine the causal effects.

Tempering this increase in numbers of juvenile Chinook Salmon produced in the upper Trinity River, fish were generally smaller after implementation of spring ROD hydrographs. This is reflected in the magnitude of change in mean values from pre-ROD condition to post-ROD conditions. When juvenile Chinook Salmon estimates are compared to the number of adult spawners (JPS), the change in values pre- and post-ROD (2.35 x increase) are smaller compared to juvenile abundance estimates. (2.63 x increase). Likewise, the increase in BPS was a 2.29 x increase. Although more fish are being produced post-ROD, juvenile Chinook Salmon are smaller than pre-ROD conditions reflecting the cooler water temperature during the spring ROD hydrograph releases which is presumably leading to smaller fish size. Hatchery origin juvenile Chinook Salmon show the same decrease in mean size post-ROD even though size of fish released in the spring season have remained relatively constant (Darrick Muir, CDFW, *pers. comm*. 2021) over the reporting period (1989-2018). It is difficult to tease out the effect of density dependance and temperature, but due to the strong signal in mean fork length by week, temperature likely plays a large role in growth in juvenile Chinook Salmon and therefore influencing biomass estimates. Larger juveniles at ocean entry have been shown to have higher marine survival (Pearcy 1992, Beamish and Malmken 2001), and it is possible that lower ocean survival of juvenile Chinook Salmon in post-ROD years could be impacting returning spawning population size in subsequent years.

The response of hatchery-reared Chinook Salmon similarly showed a shift in mean annual estimates at the Willow Creek trap site, with a nearly doubling of abundance post implementation of the ROD. Estimates at the Willow Creek trap site indicate that apparent survival of hatchery-reared Chinook Salmon increased post-ROD, the mean annual estimates post rod (approximately 600,000 fish per year) indicate that mean apparent survival from release at TRH to Willow Creek in the pre-ROD period was 11.9% and increased to 21.3% in the post-ROD period. It appears that increase in habitat due to increase in water volume during the hatchery release, plays a role in survival of hatchery-reared juvenile Chinook Salmon in the upper Trinity River. The fact that the Pear Tree and Willow Creek estimates of hatchery-reared juvenile Chinook Salmon were not significantly different, implies that mortality of these fish is initially high and the majority of fish die in

the upper Trinity River reach above the Pear Tree site. This is consistent with findings of Beeman et al. (2009) that found a marked mortality of tagged Coho Salmon in the upper reaches of the Trinity River just downstream of TRH. However, it should also be noted that the variability in abundance (and hence, apparent survival) estimates is relatively high, and this complicates our ability to detect differences via statistical tests.

Although there wasn't evidence for trends in abundance and biomass in post-ROD years at both Pear Tree and Willow Creek sites, it is possible the lack of a trend is due to unusually low abundance in the three most recent years of sampling (2016-2018). These low annual estimates reflect the low spawning population sizes for their respective brood years (Gough et al. 2021). The trend in JPS at the Pear Tree site is likely due to a density dependent effect leading to higher survival of juveniles when abundance is low due to decreases in competition for habitat and food. In addition, caution must be used in interpreting the JPS trend at the Pear Tree site as the years 2005 and 2006 were removed from the analyses. Som and Pinnix (2014) showed that approximately 15 years of data are required to detect a trend at the Pear Tree site by sampling 5 days a week (current sampling effort) and a 'true' population trend of 1.5% annual increase. Since the Pear Tree time series analyzed here is 16 years of data with 2 years missing, we recommend reanalyzing the Pear Tree time series with an additional 2-3 years of data to see if the positive trend in JPS is present.

We recommend that the TRRP adopt either total biomass or BPS as the primary metric for tracking juvenile Chinook Salmon response to TRRP management actions. These metrics track abundance well and are sensitive to both fish density (habitat availability) and growth, which is in part a function of water temperature, as well as food quality and availability. In addition, we recommend using the refined abundance estimator in future analyses of juvenile Chinook Salmon abundance estimates to ensure compatibility with the data and results presented here.

Summary

- There was a long-term positive trend in abundance and JPS at the Willow Creek trap site, but not biomass, but this long-term trend is not continual over time, but instead results from a phase shift occurring with implementation of the ROD flows. No trend in abundance was detected at the Pear Tree site. A positive trend in JPS was detected at the Pear Tree site, but no trend was apparent in the BPS time series.
- A change point at 2004 was found in time series of abundance, juveniles-per-spawner, and annual estimates of biomass at the Willow Creek trap site. However, trends on either side of the change point were not detected.
- Although the trend in abundance, juveniles-per- spawner, and annual estimates of biomass did not trend on either side of the change point, mean values of these metrics increased post-ROD compared to pre-ROD.
- Tempering the increase in abundance of juvenile Chinook Salmon post-ROD, pooled weekly mean fork length decreased in most weeks in the post-ROD time period. In addition, pooled fork length post-ROD was smaller compared to pre-ROD for both adipose fin clipped (hatchery origin) and unclipped juvenile Chinook Salmon.

- Analyses of the Ricker Stock-Recruit relationship showed that the density dependent relationship was a better fit to the data than density independent model. An increase in 'carrying capacity' in the post-ROD compared to pre-ROD SR model was detected.
- No relation between abundance was found with monthly discharge volumes. Although no significant models were found, models incorporating May discharge volume performed better than other models but did not improve the fit over the null models.

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Appendices

Appendix A.1. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2003.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
1/5/2003	2	14,157	11,234	17,691	0	0	0
1/12/2003	3	27,611	8,511	62,937	0	0	0
1/19/2003	4	26,803	6,478	66,410	0	0	0
1/26/2003	5	23,287	5,966	61,005	0	0	0
2/2/2003	6	24,213	4,464	63,610	0	0	0
2/9/2003	7	27,516	4,905	80,310	0	0	0
2/16/2003	8	30,921	6,442	80,369	0	0	0
2/23/2003	9	31,784	6,926	78,334	0	0	0
3/2/2003	10	15,135	3,478	41,541	0	0	0
3/9/2003	11	13,054	2,576	35,727	0	0	0
3/16/2003	12	12,928	2,400	33,594	0	0	0
3/23/2003	13	15,469	3,547	38,169	0	0	0
3/30/2003	14	16,160	4,222	36,424	0	0	0
4/6/2003	15	16,782	6,112	32,923	151,916	63,026	283,524
4/13/2003	16	27,023	12,630	45,954	252,130	152,210	392,354
4/20/2003	17	30,226	12,290	54,969	133,263	58,373	246,814
4/27/2003	18	31,221	17,609	49,452	94,912	55,815	147,263
5/4/2003	19	26,779	9,636	52,754	55,697	18,724	108,377
5/11/2003	20	24,325	7,235	51,706	41,390	13,435	90,142
5/18/2003	21	20,774	6,149	47,963	42,829	11,985	95,825
5/25/2003	22	18,206	4,821	42,966	36,593	9,641	85,978
6/1/2003	23	16,045	3,691	38,055	21,424	5,748	51,164
6/8/2003	24	12,364	3,296	30,753	10,362	2,845	25,954
6/15/2003	25	7,234	1,366	17,626	6,588	1,576	16,458
6/22/2003	26	4,759	963	12,555	3,661	745	9,376
6/29/2003	27	4,254	773	11,925	1,445	232	4,303
7/6/2003	28	2,027	355	6,755	1,211	140	4,041
7/13/2003	29	1,048	107	3,793	1,323	189	4,578
7/20/2003	30	1,186	105	4,794	824	45	3,432
Totals		567,104	310,327	930,257	892,934	570,212	1,287,251

Appendix A.2. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2004.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/14/2004	12	198,434	89,894	343,358	0	0	0
3/21/2004	13	117,897	51,771	218,866	0	0	0
3/28/2004	14	59,888	24,624	121,584	61	0	351
4/4/2004	15	91,805	45,095	178,815	24	0	159
4/11/2004	16	85,038	40,742	158,361	15	0	115
4/18/2004	17	65,222	43,255	98,176	12	0	94
4/25/2004	18	52,447	37,209	73,179	13	0	86
5/2/2004	19	15,719	6,466	28,144	18	0	120
5/9/2004	20	1,974	677	4,580	34	0	191
5/16/2004	21	4,568	1,876	8,660	89	0	372
5/23/2004	22	7,810	3,496	15,987	613	83	1,573
5/30/2004	23	23,828	9,665	41,246	35,461	14,030	60,392
6/6/2004	24	15,776	3,932	30,829	217,639	96,282	377,959
6/13/2004	25	82,930	36,650	140,928	243,153	100,110	396,604
6/20/2004	26	54,867	37,603	74,671	192,643	147,063	247,832
6/27/2004	27	5,232	493	12,685	80,314	37,866	170,373
7/4/2004	28	10,895	5,248	18,125	36,302	24,165	54,738
7/11/2004	29	16,005	9,391	23,923	30,989	19,988	44,537
7/18/2004	30	20,075	8,602	35,134	26,282	12,242	46,532
7/25/2004	31	18,589	11,848	26,324	20,517	13,663	29,004
8/1/2004	32	13,669	6,994	25,010	13,480	7,164	24,822
8/8/2004	33	1,114	128	2,736	8,200	3,028	16,844
8/15/2004	34	2,657	784	5,115	1,975	662	4,200
Totals		996,398	744,953	1,350,218	927,918	677,567	1,248,366

Appendix A.3. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2005. Data from this year are not included in analyses but presented here for reference.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
12/26/2004	1	36,099	12,241	85,633	0	0	0
1/2/2005	2	49,089	15,018	114,136	0	0	0
1/9/2005	3	78,692	25,939	177,544	0	0	0
1/16/2005	4	142,378	48,018	302,587	0	0	0
1/23/2005	5	185,635	59,921	394,441	0	0	0
1/30/2005	6	197,836	139,143	276,549	0	0	0
2/6/2005	7	262,288	167,262	381,776	0	0	0
2/13/2005	8	197,923	121,824	292,998	0	0	0
2/20/2005	9	169,861	102,048	261,598	0	0	0
2/27/2005	10	85,761	45,869	139,762	0	0	0
3/6/2005	11	202,533	134,609	289,188	0	0	0
3/13/2005	12	97,975	36,626	221,865	0	0	0
3/20/2005	13	94,600	27,283	217,237	0	0	0
3/27/2005	14	179,932	101,026	284,173	0	0	0
4/3/2005	15	382,486	228,670	581,081	0	0	0
4/10/2005	16	127,783	78,416	197,870	0	0	0
4/17/2005	17	197,932	126,042	295,056	0	0	0
4/24/2005	18	125,874	77,529	197,342	0	0	0
5/1/2005	19	6,092	984	28,130	0	0	0
5/8/2005	20	17,074	5,042	42,523	0	0	0
5/15/2005	21	54,549	26,766	96,085	0	0	0
5/22/2005	22	77,597	36,815	140,502	153,409	72,578	274,811
5/29/2005	23	58,791	20,339	123,843	778,475	295,704	1,499,474
6/5/2005	24	167,018	77,936	288,506	712,454	395,479	1,218,590
6/12/2005	25	64,062	18,274	160,792	117,793	38,192	291,726
6/19/2005	26	47,294	14,305	124,527	47,720	14,541	122,230
6/26/2005	27	39,710	6,684	116,671	49,057	11,465	138,779
Totals		3,506,394	2,886,877	4,388,152	1,921,769	1,184,562	3,096,964

Appendix A.4. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2006. Data from this year are not included in analyses but presented here for reference.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
2/19/2006	8	15,546	8,731	28,114	0	0	0
2/26/2006	9	29,640	17,599	43,330	0	0	0
3/5/2006	10	21,997	13,968	34,211	0	0	0
3/12/2006	11	25,854	17,245	36,473	0	0	0
3/19/2006	12	29,858	21,572	38,571	0	0	0
3/26/2006	13	24,864	17,983	34,126	0	0	0
4/2/2006	14	23,118	16,986	31,536	0	0	0
4/9/2006	15	10,833	6,856	18,167	0	0	0
4/16/2006	16	13,299	8,731	18,268	0	0	0
4/23/2006	17	5,035	3,225	7,212	0	0	0
4/30/2006	18	1,574	887	2,700	0	0	0
5/7/2006	19	913	494	1,583	0	0	0
5/14/2006	20	624	286	1,213	0	0	0
5/21/2006	21	989	204	2,526	0	0	0
5/28/2006	22	1,531	259	3,861	0	0	0
6/4/2006	23	2,396	668	5,073	10,676	5,543	18,755
6/11/2006	24	3,317	1,397	5,658	15,290	9,588	23,462
6/18/2006	25	6,315	3,190	9,687	12,387	6,968	18,205
6/25/2006	26	6,767	3,742	10,367	11,787	7,079	17,556
7/2/2006	27	7,219	4,381	11,662	7,212	4,376	11,606
7/9/2006	28	5,859	2,909	10,459	6,496	3,551	11,348
7/16/2006	29	12,110	7,947	18,454	10,554	6,807	15,986
7/23/2006	30	15,752	10,575	21,703	13,598	9,106	19,014
7/30/2006	31	9,888	6,625	13,846	9,649	6,540	13,743
8/6/2006	32	6,282	3,676	9,079	8,692	5,597	12,561
8/13/2006	33	8,215	4,978	11,966	7,725	4,636	11,296
Totals		296,118	248,200	361,876	116,334	92,904	144,008

Appendix A.5. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2007.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
12/31/2006	1	1,577	96	6,471	0	0	0
1/7/2007	2	3,857	655	11,722	0	0	0
1/14/2007	3	3,154	481	9,884	0	0	0
1/21/2007	4	4,009	472	12,766	0	0	0
1/28/2007	5	5,555	771	17,648	0	0	0
2/4/2007	6	22,300	3,373	61,986	0	0	0
2/11/2007	7	47,588	29,074	73,736	0	0	0
2/18/2007	8	74,347	54,296	96,664	0	0	0
2/25/2007	9	48,402	30,884	71,343	0	0	0
3/4/2007	10	38,392	24,660	58,860	0	0	0
3/11/2007	11	46,294	31,014	64,127	0	0	0
3/18/2007	12	46,180	35,087	60,303	0	0	0
3/25/2007	13	12,870	9,401	17,129	0	0	0
4/1/2007	14	36,629	30,433	44,110	0	0	0
4/8/2007	15	294,815	264,268	325,020	0	0	0
4/15/2007	16	222,053	194,401	250,499	0	0	0
4/22/2007	17	79,349	69,254	90,088	0	0	0
4/29/2007	18	81,585	31,194	168,165	0	0	0
5/6/2007	19	170,603	68,291	333,347	0	0	0
5/13/2007	20	147,291	65,635	290,043	0	0	0
5/20/2007	21	67,417	30,059	143,417	0	0	0
5/27/2007	22	51,429	37,132	65,214	4,319	2,652	6,264
6/3/2007	23	131,729	93,176	174,695	652,550	499,821	833,410
6/10/2007	24	37,016	23,712	51,982	243,204	192,211	299,103
6/17/2007	25	38,661	29,305	48,700	96,063	77,380	116,707
6/24/2007	26	17,494	14,590	20,726	29,536	25,473	34,073
7/1/2007	27	17,940	14,148	22,125	34,110	28,235	40,697
7/8/2007	28	16,756	10,942	23,242	33,081	23,488	43,532
7/15/2007	29	8,197	5,521	11,272	15,743	11,633	20,556
7/22/2007	30	4,210	2,246	6,539	6,614	4,126	9,971
7/29/2007	31	7,860	4,836	11,723	9,459	6,083	14,266
8/5/2007	32	3,721	518	9,341	10,265	3,110	23,673
Totals		1,840,396	1,615,059	2,160,885	1,140,459	977,650	1,334,508

Appendix A.6. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2008.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
1/13/2008	3	13,915	1,558	41,735	0	0	0
1/20/2008	4	19,857	3,077	54,080	0	0	0
1/27/2008	5	27,441	5,590	75,215	0	0	0
2/3/2008	6	49,895	9,635	123,663	0	0	0
2/10/2008	7	113,568	71,608	165,542	0	0	0
2/17/2008	8	141,111	103,344	183,241	0	0	0
2/24/2008	9	172,738	133,034	214,710	0	0	0
3/2/2008	10	347,700	281,595	416,158	0	0	0
3/9/2008	11	335,406	261,973	414,391	0	0	0
3/16/2008	12	20,874	13,181	32,011	0	0	0
3/23/2008	13	52,153	31,197	79,833	0	0	0
3/30/2008	14	111,667	77,766	155,610	0	0	0
4/6/2008	15	84,268	70,771	100,847	0	0	0
4/13/2008	16	51,864	46,927	57,200	0	0	0
4/20/2008	17	874,109	739,013	1,017,199	0	0	0
4/27/2008	18	270,764	152,840	416,273	0	0	0
5/4/2008	19	75,689	16,761	192,175	0	0	0
5/11/2008	20	82,223	61,687	109,372	0	0	0
5/18/2008	21	45,849	25,937	73,434	0	0	0
5/25/2008	22	80,737	43,658	137,707	0	0	0
6/1/2008	23	150,399	101,592	206,414	406,812	298,168	553,446
6/8/2008	24	127,299	103,683	153,031	317,167	264,447	375,978
6/15/2008	25	64,648	48,428	81,726	127,472	99,256	160,569
6/22/2008	26	99,123	64,684	143,343	113,474	74,169	164,938
6/29/2008	27	44,086	15,114	89,606	45,870	16,471	92,828
7/6/2008	28	17,001	13,853	20,367	14,859	12,107	17,978
7/13/2008	29	17,672	14,852	20,874	11,487	9,346	13,771
7/20/2008	30	25,611	21,448	29,986	32,187	27,454	37,458
7/27/2008	31	19,159	15,507	23,368	46,187	38,546	54,525
8/3/2008	32	28,489	21,853	35,912	60,024	47,478	74,483
8/10/2008	33	21,122	16,023	26,324	23,093	17,753	29,171
8/17/2008	34	11,066	8,798	13,199	13,250	10,937	15,675
8/24/2008	35	10,661	3,109	23,984	15,841	5,081	35,115
8/31/2008	36	7,122	930	18,898	11,532	2,311	30,973
9/7/2008	37	5,371	537	15,139	8,618	1,501	24,092
9/14/2008	38	1,647	71	6,209	16,201	2,272	51,410
Totals		3,704,175	3,379,838	4,026,986	1,288,266	1,124,660	1,479,183

Appendix A.7. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2009.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
1/4/2009	2	5,776	818	17,928	0	0	0
1/11/2009	3	6,314	1,377	16,596	0	0	0
1/18/2009	4	8,223	6,220	10,593	0	0	0
1/25/2009	5	16,757	13,221	21,066	0	0	0
2/1/2009	6	13,893	10,821	17,163	0	0	0
2/8/2009	7	28,834	7,721	70,573	0	0	0
2/15/2009	8	36,431	30,786	42,541	0	0	0
2/22/2009	9	46,653	37,656	57,142	0	0	0
3/1/2009	10	66,716	50,817	85,314	0	0	0
3/8/2009	11	43,840	38,468	49,514	0	0	0
3/15/2009	12	31,563	26,611	36,623	0	0	0
3/22/2009	13	39,861	24,691	61,579	0	0	0
3/29/2009	14	19,954	14,847	26,106	0	0	0
4/5/2009	15	38,739	33,795	43,896	0	0	0
4/12/2009	16	241,886	188,267	308,227	0	0	0
4/19/2009	17	371,528	308,944	443,380	0	0	0
4/26/2009	18	26,212	18,121	35,481	0	0	0
5/3/2009	19	121,818	73,328	190,170	0	0	0
5/10/2009	20	114,166	86,115	151,695	0	0	0
5/17/2009	21	43,324	32,908	56,788	0	0	0
5/24/2009	22	109,994	67,541	163,848	0	0	0
5/31/2009	23	125,331	91,026	168,713	191,374	140,562	255,534
6/7/2009	24	38,220	29,501	47,317	106,963	90,436	126,840
6/14/2009	25	57,113	45,500	68,704	112,676	93,882	134,510
6/21/2009	26	46,111	33,608	60,969	80,037	57,782	103,128
6/28/2009	27	23,368	16,170	31,851	73,110	54,700	94,633
7/5/2009	28	22,888	17,600	28,449	94,147	80,512	109,268
7/12/2009	29	13,071	10,143	16,497	30,842	25,488	37,399
7/19/2009	30	12,171	4,504	24,097	21,652	8,009	42,798
7/26/2009	31	4,650	2,812	6,404	15,194	11,915	19,174
8/2/2009	32	1,656	1,026	2,306	3,532	2,770	4,338
8/9/2009	33	3,519	1,307	5,844	14,611	10,233	19,620
8/16/2009	34	5,529	1,440	13,055	8,352	2,689	19,360
8/23/2009	35	3,053	229	9,557	10,880	1,685	32,233
Totals		1,818,510	1,673,121	1,965,050	773,211	695,965	861,625

Appendix A.8. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2010.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
1/17/2010	3	44,837	6,660	125,298	0	0	0
1/24/2010	4	46,135	9,654	130,231	0	0	0
1/31/2010	5	51,480	8,419	150,744	0	0	0
2/7/2010	6	96,398	18,371	276,017	0	0	0
2/14/2010	7	131,654	28,045	371,600	0	0	0
2/21/2010	8	196,889	128,437	297,357	0	0	0
2/28/2010	9	47,805	40,482	56,995	0	0	0
3/7/2010	10	63,015	53,542	73,552	0	0	0
3/14/2010	11	46,061	40,658	52,309	0	0	0
3/21/2010	12	5,271	4,466	6,169	0	0	0
3/28/2010	13	2,491	2,047	2,984	0	0	0
4/4/2010	14	29,638	22,117	38,547	0	0	0
4/11/2010	15	35,548	31,863	39,328	0	0	0
4/18/2010	16	160,151	128,347	199,856	0	0	0
4/25/2010	17	55,850	45,979	67,097	0	0	0
5/2/2010	18	93,085	66,373	129,692	0	0	0
5/9/2010	19	80,544	58,786	110,904	0	0	0
5/16/2010	20	24,466	19,814	29,617	0	0	0
5/23/2010	21	37,372	26,276	49,892	0	0	0
5/30/2010	22	21,234	13,598	29,210	20,282	13,391	28,678
6/6/2010	23	16,947	4,105	37,425	47,493	13,328	105,007
6/13/2010	24	51,452	36,263	69,872	70,269	50,832	92,855
6/20/2010	25	40,288	22,270	66,193	36,715	20,696	61,342
6/27/2010	26	17,243	11,630	24,212	6,426	3,750	9,660
7/4/2010	27	27,509	17,918	39,353	13,450	7,780	20,091
7/11/2010	28	12,928	10,374	15,675	17,303	14,227	20,707
7/18/2010	29	37,458	27,757	48,938	74,291	57,431	95,836
7/25/2010	30	7,693	5,018	10,420	25,622	20,142	32,249
8/1/2010	31	5,745	3,064	8,536	22,322	16,740	28,942
8/8/2010	32	5,593	3,515	7,970	13,094	9,546	17,797
8/15/2010	33	7,401	3,046	12,949	16,234	8,660	27,765
8/22/2010	34	1,251	519	2,178	3,062	1,797	4,638
Totals		1,564,952	1,285,276	2,037,266	374,733	318,644	450,558

Appendix A.9. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2011.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
1/9/2011	2	51,499	12,169	114,281	0	0	0
1/16/2011	3	57,010	13,887	125,574	0	0	0
1/23/2011	4	82,007	30,587	161,642	0	0	0
1/30/2011	5	109,228	80,627	143,310	0	0	0
2/6/2011	6	103,468	85,525	124,348	0	0	0
2/13/2011	7	52,447	46,749	58,651	0	0	0
2/20/2011	8	63,897	51,585	76,692	0	0	0
2/27/2011	9	107,048	92,037	123,561	0	0	0
3/6/2011	10	52,222	45,627	59,076	0	0	0
3/13/2011	11	53,042	42,897	65,779	0	0	0
3/20/2011	12	47,145	36,179	61,159	0	0	0
3/27/2011	13	70,888	51,652	94,971	0	0	0
4/3/2011	14	73,880	57,865	93,268	0	0	0
4/10/2011	15	117,408	75,626	170,326	0	0	0
4/17/2011	16	70,363	57,020	86,433	0	0	0
4/24/2011	17	176,255	126,031	231,865	0	0	0
5/1/2011	18	137,259	57,945	250,023	0	0	0
5/8/2011	19	115,536	77,764	167,116	0	0	0
5/15/2011	20	125,333	75,860	188,356	0	0	0
5/22/2011	21	72,857	26,070	136,971	0	0	0
5/29/2011	22	55,091	33,432	83,889	71,486	44,891	107,820
6/5/2011	23	49,791	33,539	70,264	57,422	38,211	80,423
6/12/2011	24	39,253	24,651	57,976	63,142	41,019	91,094
6/19/2011	25	25,413	14,275	41,117	66,698	40,207	104,240
6/26/2011	26	26,369	18,052	34,980	23,480	16,721	32,269
7/3/2011	27	19,364	12,783	27,182	13,032	8,338	19,084
7/10/2011	28	13,401	8,910	19,236	10,494	6,624	15,228
7/17/2011	29	6,981	4,097	10,962	8,314	4,744	12,518
7/24/2011	30	6,585	3,519	10,327	12,115	7,281	18,335
7/31/2011	31	5,128	2,963	7,514	7,756	5,212	11,148
8/7/2011	32	2,684	1,527	3,953	6,243	4,322	8,444
8/14/2011	33	2,776	1,523	4,361	6,632	4,595	9,270
8/21/2011	34	3,121	936	6,237	5,738	2,229	11,509
Totals		2,040,157	1,784,989	2,316,659	359,068	291,247	434,330

Appendix A.10. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2012

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
1/8/2012	2	5,296	883	15,969	0	0	0
1/15/2012	3	7,911	1,929	20,364	0	0	0
1/22/2012	4	14,297	3,509	33,708	0	0	0
1/29/2012	5	30,826	7,318	74,298	0	0	0
2/5/2012	6	54,997	13,287	124,582	0	0	0
2/12/2012	7	125,102	34,362	280,153	0	0	0
2/19/2012	8	177,185	50,999	388,954	0	0	0
2/26/2012	9	114,591	89,138	142,645	0	0	0
3/4/2012	10	144,031	110,443	183,933	0	0	0
3/11/2012	11	289,147	230,685	361,277	0	0	0
3/18/2012	12	209,132	162,408	271,020	0	0	0
3/25/2012	13	90,644	51,431	140,357	0	0	0
4/1/2012	14	227,587	164,866	301,432	0	0	0
4/8/2012	15	358,863	108,190	735,949	0	0	0
4/15/2012	16	641,694	491,798	841,869	0	0	0
4/22/2012	17	508,327	378,240	670,921	0	0	0
4/29/2012	18	570,059	343,521	881,006	0	0	0
5/6/2012	19	172,097	49,211	406,172	0	0	0
5/13/2012	20	205,448	158,994	262,632	0	0	0
5/20/2012	21	198,958	152,245	255,215	0	0	0
5/27/2012	22	99,892	75,845	129,058	0	0	0
6/3/2012	23	204,301	148,560	275,508	169,735	121,766	229,989
6/10/2012	24	163,997	115,496	222,329	130,920	91,701	176,889
6/17/2012	25	81,783	59,035	110,263	60,249	41,326	80,647
6/24/2012	26	63,195	40,472	91,518	51,376	31,667	75,182
7/1/2012	27	16,647	10,933	22,954	15,937	10,871	22,690
7/8/2012	28	28,163	21,531	35,715	27,425	20,226	34,652
7/15/2012	29	21,945	17,754	26,645	19,689	15,499	24,017
7/22/2012	30	15,623	11,326	20,649	20,146	15,392	26,063
7/29/2012	31	19,685	13,381	27,771	30,989	22,091	41,947
8/5/2012	32	8,545	4,775	12,986	15,169	9,684	22,007
8/12/2012	33	4,543	1,795	9,102	4,411	1,596	9,148
8/19/2012	34	2,516	1,489	3,773	639	180	1,258
8/26/2012	35	1,037	500	1,635	375	77	825
Totals		5,028,549	4,322,107	5,752,383	552,853	472,793	645,663

Appendix A.11. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2013.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
1/13/2013	3	31,470	6,455	78,328	0	0	0
1/20/2013	4	45,930	9,373	107,696	0	0	0
1/27/2013	5	90,215	31,881	200,264	0	0	0
2/3/2013	6	146,415	102,808	199,602	0	0	0
2/10/2013	7	144,366	112,073	189,489	0	0	0
2/17/2013	8	71,403	53,357	91,195	0	0	0
2/24/2013	9	95,215	75,122	120,214	0	0	0
3/3/2013	10	169,080	138,078	200,164	0	0	0
3/10/2013	11	79,562	61,818	102,069	0	0	0
3/17/2013	12	15,929	12,980	19,402	0	0	0
3/24/2013	13	15,205	12,399	17,877	0	0	0
3/31/2013	14	127,106	105,904	153,900	0	0	0
4/7/2013	15	107,778	87,373	131,343	0	0	0
4/14/2013	16	87,069	59,725	118,275	0	0	0
4/21/2013	17	82,453	27,725	173,460	0	0	0
4/28/2013	18	142,376	97,463	194,360	0	0	0
5/5/2013	19	142,632	114,264	176,686	0	0	0
5/12/2013	20	163,520	116,057	217,607	0	0	0
5/19/2013	21	87,421	61,272	117,686	0	0	0
5/26/2013	22	113,081	88,365	139,040	112,448	88,528	138,280
6/2/2013	23	109,436	48,481	196,741	189,197	83,361	340,418
6/9/2013	24	97,443	76,729	120,202	203,255	162,048	247,630
6/16/2013	25	45,416	34,626	57,868	86,083	68,771	108,190
6/23/2013	26	25,061	10,937	44,388	46,634	21,134	82,009
6/30/2013	27	14,181	9,676	19,413	32,313	23,196	42,297
7/7/2013	28	11,042	4,721	22,175	27,053	9,905	51,057
7/14/2013	29	9,747	3,295	19,757	16,688	6,366	34,809
7/21/2013	30	5,064	1,624	10,593	14,669	4,350	30,355
7/28/2013	31	4,496	1,654	8,640	6,427	2,356	12,290
8/4/2013	32	1,518	625	2,492	4,353	3,042	5,870
8/11/2013	33	778	106	2,104	2,795	638	6,806
Totals		2,331,228	2,110,838	2,603,412	753,735	600,537	932,628

Appendix A.12. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2014.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
1/12/2014	3	343	58	1,022	0	0	0
1/19/2014	4	1,896	532	4,743	0	0	0
1/26/2014	5	12,034	2,631	27,770	0	0	0
2/2/2014	6	27,943	6,465	62,544	0	0	0
2/9/2014	7	13,087	3,591	31,049	0	0	0
2/16/2014	8	26,855	22,924	31,096	0	0	0
2/23/2014	9	120,620	31,676	270,846	0	0	0
3/2/2014	10	45,784	36,465	56,324	0	0	0
3/9/2014	11	50,319	42,925	58,604	0	0	0
3/16/2014	12	23,959	19,842	28,850	0	0	0
3/23/2014	13	90,589	27,194	209,336	0	0	0
3/30/2014	14	40,611	34,772	47,260	0	0	0
4/6/2014	15	123,204	31,242	282,305	0	0	0
4/13/2014	16	381,590	97,200	902,526	0	0	0
4/20/2014	17	894,375	645,914	1,242,381	0	0	0
4/27/2014	18	68,198	53,298	84,497	0	0	0
5/4/2014	19	53,547	41,524	66,542	0	0	0
5/11/2014	20	29,406	24,665	34,605	0	0	0
5/18/2014	21	45,935	37,686	54,856	0	0	0
5/25/2014	22	168,386	134,756	203,722	1,300	607	2,137
6/1/2014	23	76,435	52,411	106,002	423,534	305,762	551,060
6/8/2014	24	22,089	17,116	28,067	39,374	31,409	47,722
6/15/2014	25	45,326	33,389	59,451	85,035	62,595	109,298
6/22/2014	26	33,838	26,102	42,596	67,447	53,203	83,255
6/29/2014	27	16,320	8,689	25,624	72,785	51,892	98,328
7/6/2014	28	9,196	2,541	20,297	24,223	7,624	52,708
7/13/2014	29	2,223	1,079	3,531	7,161	5,322	9,127
7/20/2014	30	2,704	230	5,350	14,604	9,346	21,325
7/27/2014	31	863	27	2,312	9,345	5,984	13,524
8/3/2014	32	1,307	17	2,625	3,111	1,504	5,007
8/10/2014	33	345	1	837	1,699	1,057	2,395
8/17/2014	34	310	0	1,154	1,778	709	2,934
Totals		2,519,677	1,970,117	3,219,805	759,188	634,781	903,833

Appendix A.13. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2015.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
1/4/2015	2	124,005	20,162	375,106	0	0	0
1/11/2015	3	179,199	26,663	556,176	0	0	0
1/18/2015	4	199,286	34,380	577,420	0	0	0
1/25/2015	5	128,490	109,928	147,671	0	0	0
2/1/2015	6	134,806	100,715	173,830	0	0	0
2/8/2015	7	283,650	212,458	364,354	0	0	0
2/15/2015	8	83,335	53,978	122,791	0	0	0
2/22/2015	9	38,971	26,387	53,487	0	0	0
3/1/2015	10	8,186	6,828	9,710	0	0	0
3/8/2015	11	7,523	5,901	9,435	0	0	0
3/15/2015	12	5,821	4,621	7,076	0	0	0
3/22/2015	13	8,659	7,194	10,226	0	0	0
3/29/2015	14	21,272	17,962	25,178	0	0	0
4/5/2015	15	29,164	24,218	35,199	0	0	0
4/12/2015	16	23,757	18,940	28,875	0	0	0
4/19/2015	17	23,051	19,711	26,724	0	0	0
4/26/2015	18	38,277	4,346	134,624	0	0	0
5/3/2015	19	61,745	40,012	90,233	0	0	0
5/10/2015	20	140,164	63,248	255,260	0	0	0
5/17/2015	21	25,878	2,787	85,363	0	0	0
5/24/2015	22	24,547	5,143	61,633	63,956	12,487	156,208
5/31/2015	23	17,270	1,878	37,136	328,982	205,088	480,920
6/7/2015	24	5,498	672	12,979	175,012	112,659	262,636
6/14/2015	25	8,401	259	20,910	162,829	99,913	245,655
6/21/2015	26	4,549	566	11,321	156,323	98,703	236,650
6/28/2015	27	6,260	3,845	8,639	14,088	10,754	17,906
7/5/2015	28	787	121	1,664	7,892	5,718	10,211
7/12/2015	29	297	13	878	3,982	2,943	5,285
7/19/2015	30	100	1	303	789	493	1,093
7/26/2015	31	35	0	112	334	202	485
8/2/2015	32	20	0	87	253	44	722
8/9/2015	33	16	0	77	114	38	220
8/16/2015	34	16	0	121	71	2	302
Totals		1,745,032	1,278,363	2,526,792	939,332	729,400	1,181,927

Appendix A.14. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2016.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
1/10/2016	2	91,949	23,306	219,544	0	0	0
1/17/2016	3	133,177	31,164	353,999	0	0	0
1/24/2016	4	109,988	16,097	340,337	0	0	0
1/31/2016	5	90,848	19,253	238,057	0	0	0
2/7/2016	6	87,724	19,235	210,651	0	0	0
2/14/2016	7	54,930	16,641	124,397	0	0	0
2/21/2016	8	22,933	16,079	30,560	0	0	0
2/28/2016	9	27,085	22,590	32,912	0	0	0
3/6/2016	10	29,224	23,679	35,663	0	0	0
3/13/2016	11	27,853	21,301	35,502	0	0	0
3/20/2016	12	32,425	25,318	40,258	0	0	0
3/27/2016	13	9,524	7,362	12,005	0	0	0
4/3/2016	14	19,903	16,133	24,564	0	0	0
4/10/2016	15	49,797	31,930	71,798	0	0	0
4/17/2016	16	33,605	28,131	39,410	0	0	0
4/24/2016	17	23,896	8,376	49,737	0	0	0
5/1/2016	18	14,458	11,344	18,420	0	0	0
5/8/2016	19	4,341	3,059	5,809	0	0	0
5/15/2016	21	10,136	6,767	14,209	0	0	0
5/22/2016	22	7,850	5,363	11,012	0	0	0
5/29/2016	23	6,580	1,674	15,148	155,258	113,144	210,810
6/5/2016	24	4,348	935	9,286	53,182	33,216	76,882
6/12/2016	25	4,077	802	9,688	43,690	24,473	71,417
6/19/2016	26	4,784	494	12,540	65,143	29,793	117,806
6/26/2016	27	5,452	581	14,829	43,484	20,005	81,228
7/3/2016	28	3,302	931	6,349	25,842	16,761	37,484
7/10/2016	29	5,039	2,210	8,312	26,174	18,772	35,127
7/17/2016	30	4,570	1,889	7,805	20,666	13,531	28,572
7/24/2016	31	2,929	642	6,751	65,237	18,823	145,010
7/31/2016	32	2,599	291	6,940	88,836	22,118	215,343
8/7/2016	33	2,420	139	7,080	69,502	17,625	166,838
8/14/2016	34	2,182	48	7,322	41,040	7,073	101,607
8/21/2016	35	1,706	11	6,641	33,280	5,310	95,831
Totals		991,618	601,068	1,606,796	770,493	546,558	1,084,848

Appendix A.15. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2017.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
1/22/2017	4	109,422	23,825	252,380	0	0	0
1/29/2017	5	136,973	26,796	364,208	0	0	0
2/5/2017	6	94,639	11,902	313,005	0	0	0
2/12/2017	7	67,908	13,852	172,137	0	0	0
2/19/2017	8	59,062	13,792	144,836	0	0	0
2/26/2017	9	44,196	10,301	107,481	0	0	0
3/5/2017	10	20,160	4,825	48,073	0	0	0
3/12/2017	11	10,897	2,901	24,184	0	0	0
3/19/2017	12	6,602	4,231	9,702	0	0	0
3/26/2017	13	9,624	2,810	21,644	0	0	0
4/2/2017	14	11,992	3,414	26,259	0	0	0
4/9/2017	15	11,756	6,991	17,488	0	0	0
4/16/2017	16	21,287	15,741	28,077	0	0	0
4/23/2017	17	21,001	4,661	55,503	0	0	0
4/30/2017	18	20,949	6,027	46,889	0	0	0
5/7/2017	19	26,964	12,745	47,898	0	0	0
5/14/2017	20	5,450	2,773	8,777	0	0	0
5/21/2017	21	4,976	1,806	9,380	0	0	0
5/28/2017	22	7,917	3,043	16,022	0	0	0
6/4/2017	23	12,209	6,011	20,719	0	0	0
6/11/2017	24	21,750	15,364	29,172	0	0	0
6/18/2017	25	57,439	41,417	75,690	0	0	0
6/25/2017	26	17,319	8,538	28,179	20,843	11,761	32,879
7/2/2017	27	14,358	5,131	27,028	18,273	5,161	33,304
7/9/2017	28	26,684	7,619	56,449	34,816	10,387	74,414
7/16/2017	29	33,401	8,419	79,948	46,079	10,777	107,077
7/23/2017	30	26,637	6,819	63,959	41,423	11,075	95,993
7/30/2017	31	16,196	4,087	36,551	31,016	6,566	67,889
8/6/2017	32	11,188	2,206	26,705	18,422	5,134	45,175
8/13/2017	33	7,142	816	18,764	13,262	2,731	35,450
8/20/2017	34	7,393	342	22,550	10,917	1,784	32,828
Totals		1,024,260	598,557	1,698,668	252,570	118,661	421,047

Appendix A.16. Weekly population estimates (with confidence limits) for natural and hatchery-reared juvenile Chinook Salmon at the Pear Tree trap site on the Trinity River in 2018.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
1/8/2018	2	2,431	427	7,274	0	0	0
1/15/2018	3	3,895	927	9,808	0	0	0
1/22/2018	4	4,609	914	11,963	0	0	0
1/29/2018	5	5,572	1,125	14,272	0	0	0
2/5/2018	6	14,282	4,190	35,111	0	0	0
2/12/2018	7	19,383	4,501	48,498	0	0	0
2/19/2018	8	23,325	5,137	58,337	0	0	0
2/26/2018	9	16,119	4,289	39,988	0	0	0
3/5/2018	10	25,804	19,608	33,115	0	0	0
3/12/2018	11	79,529	52,474	116,550	0	0	0
3/19/2018	12	34,889	26,561	44,308	0	0	0
3/26/2018	13	13,938	10,981	17,636	0	0	0
4/2/2018	14	47,592	37,994	60,226	0	0	0
4/9/2018	15	118,840	88,770	155,419	0	0	0
4/16/2018	16	156,062	99,191	237,865	0	0	0
4/23/2018	17	8,387	6,554	10,668	0	0	0
4/30/2018	18	42,690	31,582	56,458	0	0	0
5/7/2018	19	88,951	62,147	123,118	0	0	0
5/14/2018	20	120,495	79,603	175,008	0	0	0
5/21/2018	21	49,827	36,757	65,688	0	0	0
5/28/2018	22	96,599	69,559	130,018	0	0	0
6/4/2018	23	46,601	37,131	56,161	0	0	0
6/11/2018	24	21,924	9,593	34,728	328,475	267,203	404,182
6/18/2018	25	38,491	29,476	47,426	105,339	87,503	126,400
6/25/2018	26	13,238	10,346	16,538	43,709	36,869	50,497
7/2/2018	27	9,967	2,400	22,634	51,804	15,353	110,511
7/9/2018	28	5,446	1,200	12,385	45,913	12,982	100,047
7/16/2018	29	4,911	1,617	8,134	30,423	24,389	36,808
7/23/2018	30	1,335	504	2,421	8,240	6,152	10,501
7/30/2018	31	2,043	319	4,779	10,488	2,869	23,451
8/6/2018	32	1,246	166	3,384	9,931	2,835	24,121
8/13/2018	33	1,235	153	3,276	4,555	1,147	10,890
8/20/2018	34	798	178	1,600	3,221	2,056	4,498
8/27/2018	35	848	280	1,435	1,208	715	1,911
Totals		1,152,897	1,019,736	1,309,809	658,006	553,056	777,552

Appendix B.1 Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 1989.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
4/2/1989	14	2,019	947	3,646	0	0	0
4/9/1989	15	1,642	811	2,744	0	0	0
4/16/1989	16	495	150	1,036	0	0	0
4/23/1989	17	2,654	1,042	3,984	0	0	0
4/30/1989	18	392	148	742	0	0	0
5/7/1989	19	317	104	666	0	0	0
5/14/1989	20	466	164	991	0	0	0
5/21/1989	21	3,071	1,448	4,925	0	0	0
5/28/1989	22	13,661	2,415	26,109	44,415	21,881	75,085
6/4/1989	23	20,171	3,582	40,585	190,756	81,847	274,029
6/11/1989	24	20,080	7,220	45,117	49,915	25,567	122,213
6/18/1989	25	79,954	49,168	120,990	352,423	269,316	500,869
6/25/1989	26	132,200	97,269	167,078	107,618	78,397	137,428
7/2/1989	27	119,015	86,714	165,550	62,954	44,674	89,854
7/9/1989	28	112,908	78,150	145,457	34,739	22,846	47,870
7/16/1989	29	83,416	60,948	109,348	25,073	16,340	35,833
7/23/1989	30	40,909	25,836	56,119	8,042	3,764	13,091
7/30/1989	31	36,610	19,168	61,133	3,428	979	7,368
Totals		682,295	584,638	795,816	891,669	729,492	1,104,504

Appendix B.2. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 1990.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
2/25/1990	9	678	5	4,458	0	0	0
3/4/1990	10	977	43	4,604	0	0	0
3/11/1990	11	1,041	31	4,821	0	0	0
3/18/1990	12	2,500	233	8,842	0	0	0
3/25/1990	13	3,070	247	10,953	0	0	0
4/1/1990	14	4,650	441	14,578	0	0	0
4/8/1990	15	4,027	590	11,890	0	0	0
4/15/1990	16	3,895	1,839	7,132	0	0	0
4/22/1990	17	14,755	2,687	43,482	0	0	0
4/29/1990	18	21,277	9,798	41,415	0	0	0
5/6/1990	19	10,878	2,743	26,404	0	0	0
5/13/1990	20	11,620	1,320	36,860	0	0	0
5/20/1990	21	5,337	179	20,745	15,242	758	57,613
5/27/1990	22	3,896	14	18,527	15,001	630	60,630
6/3/1990	23	3,370	4	16,821	11,529	546	49,003
6/10/1990	24	3,599	0	15,672	5,788	449	24,125
6/17/1990	25	2,387	0	10,488	6,381	636	23,485
6/24/1990	26	2,057	0	10,428	3,623	142	15,490
7/1/1990	27	724	0	3,952	2,191	88	9,114
7/8/1990	28	346	0	2,054	2,011	182	8,079
7/15/1990	29	157	0	1,005	1,772	118	6,424
7/22/1990	30	95	0	684	433	5	2,218
7/29/1990	31	63	0	510	167	1	1,079
8/5/1990	32	59	0	598	143	0	1,156
Totals		118,277	51,795	232,314	75,203	13,588	213,075

Appendix B.3. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 1991.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
2/3/1991	6	842	268	1,710	0	0	0
2/10/1991	7	1,665	852	2,773	0	0	0
2/17/1991	8	1,384	734	2,152	0	0	0
2/24/1991	9	463	153	895	0	0	0
3/3/1991	10	328	104	704	0	0	0
3/10/1991	11	272	94	552	0	0	0
3/17/1991	12	214	62	445	0	0	0
3/24/1991	13	260	73	512	0	0	0
3/31/1991	14	414	166	772	0	0	0
4/7/1991	15	929	419	1,576	0	0	0
4/14/1991	16	725	356	1,184	0	0	0
4/21/1991	17	853	365	1,434	0	0	0
4/28/1991	18	856	397	1,496	0	0	0
5/5/1991	19	1,590	840	2,674	0	0	0
5/12/1991	20	4,810	2,707	7,228	0	0	0
5/19/1991	21	3,722	2,069	6,736	0	0	0
5/26/1991	22	13,986	6,475	25,311	34,611	20,899	58,128
6/2/1991	23	44,321	24,586	65,893	104,458	65,110	148,844
6/9/1991	24	123,336	83,844	161,725	142,101	101,054	189,055
6/16/1991	25	127,674	84,118	186,916	107,160	68,849	154,606
6/23/1991	26	159,508	103,500	210,468	90,943	59,523	123,819
6/30/1991	27	80,029	54,928	127,018	23,777	13,369	38,188
7/7/1991	28	49,855	31,114	73,868	25,404	14,757	39,390
7/14/1991	29	31,143	17,981	47,230	22,848	12,199	34,945
7/21/1991	30	22,323	12,299	33,173	19,290	10,557	30,518
7/28/1991	31	12,034	5,892	20,471	7,819	3,694	14,004
8/4/1991	32	8,087	3,801	14,275	6,686	2,893	11,898
8/11/1991	33	10,375	4,237	17,128	7,819	3,106	14,058
Totals		712,313	570,077	864,357	600,281	484,538	735,620

Appendix B.4. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 1992.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
2/16/1992	8	777	43	3,910	0	0	0
2/23/1992	9	1,160	152	4,356	0	0	0
3/1/1992	10	1,736	211	5,693	0	0	0
3/8/1992	11	1,933	240	6,726	0	0	0
3/15/1992	12	2,679	321	8,888	0	0	0
3/22/1992	13	4,370	366	13,648	0	0	0
3/29/1992	14	6,061	892	19,116	0	0	0
4/5/1992	15	5,883	688	20,805	0	0	0
4/12/1992	16	12,909	2,049	40,426	0	0	0
4/19/1992	17	9,529	1,314	32,855	0	0	0
4/26/1992	18	14,223	1,729	50,286	0	0	0
5/3/1992	19	41,635	6,163	130,775	0	0	0
5/10/1992	20	81,887	11,331	244,458	0	0	0
5/17/1992	21	241,214	129,132	416,140	0	0	0
5/24/1992	22	378,925	253,177	553,137	0	0	0
5/31/1992	23	126,422	95,366	169,271	0	0	0
6/7/1992	24	11,115	3,826	25,105	0	0	0
6/14/1992	25	81,429	64,805	98,348	50,997	40,995	62,812
6/21/1992	26	32,011	25,026	39,485	16,761	13,077	21,079
6/28/1992	27	61,564	17,116	146,936	42,014	11,503	99,563
7/5/1992	28	44,206	30,001	62,172	24,955	16,615	35,548
7/12/1992	29	10,843	1,584	30,289	7,418	1,085	21,780
7/19/1992	30	1,026	28	3,905	21,635	3,042	67,901
7/26/1992	31	647	1	2,768	17,361	2,251	54,967
8/2/1992	32	967	0	4,093	11,608	1,689	35,963
8/9/1992	33	1,177	0	4,277	6,880	1,005	22,051
8/16/1992	34	1,771	0	7,511	2,756	272	11,625
Totals		1,247,052	948,873	1,668,868	218,770	138,728	339,750

Appendix B.5. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 1993. Data from this year are no included in analyses but presented here for reference.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/28/1993	13	1,444	185	4,602	0	0	0
4/4/1993	14	2,076	351	5,256	0	0	0
4/11/1993	15	3,785	837	9,196	0	0	0
4/18/1993	16	5,267	1,367	13,072	0	0	0
4/25/1993	17	5,344	1,143	12,535	0	0	0
5/2/1993	18	5,191	1,341	12,442	0	0	0
5/9/1993	19	4,755	1,241	11,193	0	0	0
5/16/1993	20	4,066	884	9,728	0	0	0
5/23/1993	21	4,550	971	11,111	0	0	0
5/30/1993	22	9,343	2,009	22,805	0	0	0
6/6/1993	23	28,687	8,091	65,479	0	0	0
6/13/1993	24	64,064	21,884	146,018	6,180	1,657	14,311
6/20/1993	25	36,718	11,757	75,809	16,844	6,489	36,647
6/27/1993	26	21,623	8,787	41,011	21,596	8,323	42,145
7/4/1993	27	22,586	8,571	45,827	8,353	2,796	16,886
7/11/1993	28	24,994	8,546	50,040	4,594	1,458	9,835
7/18/1993	29	19,327	6,887	39,085	3,956	1,192	8,201
7/25/1993	30	21,663	7,415	43,884	2,093	599	4,435
8/1/1993	31	20,140	5,537	41,322	1,355	324	3,099
8/8/1993	32	17,907	5,881	38,429	1,010	191	2,487
8/15/1993	33	15,101	4,878	32,697	904	179	2,155
8/22/1993	34	15,899	5,404	34,623	1,010	215	2,358
8/29/1993	35	14,096	3,642	32,873	1,261	248	3,286
Totals		398,028	233,608	596,907	73,720	39,529	121,057

Appendix B.6. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 1994

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
2/20/1994	8	1,230	134	3,322	0	0	0
2/27/1994	9	1,422	338	3,352	0	0	0
3/6/1994	10	1,539	377	3,394	0	0	0
3/13/1994	11	1,633	424	3,598	0	0	0
3/20/1994	12	2,487	787	5,399	0	0	0
3/27/1994	13	4,547	1,436	9,838	0	0	0
4/3/1994	14	11,239	4,086	24,302	0	0	0
4/10/1994	15	18,712	5,478	39,323	0	0	0
4/17/1994	16	21,644	7,018	46,578	0	0	0
4/24/1994	17	22,755	6,535	47,423	0	0	0
5/1/1994	18	23,753	6,182	50,989	0	0	0
5/8/1994	19	33,373	11,516	72,489	0	0	0
5/15/1994	20	54,058	18,316	110,583	0	0	0
5/22/1994	21	74,433	25,258	158,903	0	0	0
5/29/1994	22	173,427	53,870	348,592	0	0	0
6/5/1994	23	365,202	136,906	726,940	4,271	1,147	8,795
6/12/1994	24	203,777	89,114	399,236	19,588	7,680	37,582
6/19/1994	25	226,246	97,408	407,231	37,683	17,294	68,753
6/26/1994	26	339,030	234,677	473,223	30,706	20,621	43,676
7/3/1994	27	186,684	82,609	343,504	15,887	6,699	28,612
7/10/1994	28	120,116	44,722	229,796	11,326	4,372	22,301
7/17/1994	29	71,462	28,922	136,870	15,307	6,068	29,517
7/24/1994	30	48,182	18,024	93,159	16,961	6,406	32,860
7/31/1994	31	33,370	13,279	66,111	17,579	6,805	35,116
8/7/1994	32	25,256	9,978	50,531	16,901	6,091	33,666
8/14/1994	33	13,962	5,210	26,330	28,873	11,424	55,709
8/21/1994	34	9,202	3,043	18,741	36,381	12,848	73,859
8/28/1994	35	10,718	3,065	24,848	25,183	7,452	56,193
Totals		2,204,044	1,472,407	3,027,271	289,822	195,179	426,331

Appendix B.7. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 1995.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
2/19/1995	8	2,376	373	6,045	0	0	0
2/26/1995	9	2,344	474	5,623	0	0	0
3/5/1995	10	2,450	566	5,792	0	0	0
3/12/1995	11	2,486	511	5,874	0	0	0
3/19/1995	12	2,547	550	5,871	0	0	0
3/26/1995	13	2,622	687	5,863	0	0	0
4/2/1995	14	2,810	739	6,011	0	0	0
4/9/1995	15	2,934	918	6,512	0	0	0
4/16/1995	16	3,132	879	6,536	0	0	0
4/23/1995	17	3,048	991	6,230	0	0	0
4/30/1995	18	3,180	1,093	6,347	0	0	0
5/7/1995	19	3,358	1,001	6,580	0	0	0
5/14/1995	20	3,256	1,085	6,390	0	0	0
5/21/1995	21	3,150	1,148	6,180	0	0	0
5/28/1995	22	3,113	1,026	6,144	0	0	0
6/4/1995	23	3,428	1,007	6,597	3,014	605	6,705
6/11/1995	24	4,025	1,353	7,748	3,100	830	6,606
6/18/1995	25	5,065	1,928	10,098	3,313	1,093	6,746
6/25/1995	26	5,287	2,021	10,213	4,312	1,777	8,603
7/2/1995	27	5,327	2,042	10,226	5,087	2,179	10,444
7/9/1995	28	5,108	2,066	9,713	5,447	1,960	11,030
7/16/1995	29	5,421	1,900	10,620	5,232	2,089	10,746
7/23/1995	30	5,348	1,862	10,981	5,132	1,766	10,653
7/30/1995	31	5,080	1,566	10,669	5,243	1,561	11,688
Totals		90,556	43,264	147,878	41,487	17,469	73,010

Appendix B.8. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 1996.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/17/1996	12	31,943	7,953	70,720	0	0	0
3/24/1996	13	26,355	7,941	55,835	0	0	0
3/31/1996	14	17,616	5,523	37,265	0	0	0
4/7/1996	15	10,051	3,161	21,979	0	0	0
4/14/1996	16	8,206	2,366	18,564	0	0	0
4/21/1996	17	7,569	2,255	16,221	0	0	0
4/28/1996	18	5,810	1,697	13,219	0	0	0
5/5/1996	19	5,213	1,231	12,130	0	0	0
5/12/1996	20	6,508	1,512	14,388	0	0	0
5/19/1996	21	12,466	3,454	26,613	0	0	0
5/26/1996	22	19,967	6,828	42,859	0	0	0
6/2/1996	23	43,407	15,851	87,733	10,541	3,053	21,777
6/9/1996	24	27,835	9,605	54,423	32,212	12,375	63,350
6/16/1996	25	32,179	13,309	63,278	29,887	11,467	59,287
6/23/1996	26	31,302	13,392	61,536	27,853	10,601	54,142
6/30/1996	27	43,812	18,596	86,235	20,104	8,510	39,504
7/7/1996	28	49,106	21,354	95,641	19,744	7,868	38,396
7/14/1996	29	41,144	15,283	76,628	22,926	9,257	43,943
7/21/1996	30	60,127	26,147	114,297	13,764	5,812	26,321
7/28/1996	31	46,652	20,134	89,281	13,291	5,137	25,142
8/4/1996	32	47,871	18,708	90,881	11,503	4,497	21,676
8/11/1996	33	42,802	16,290	83,042	9,869	3,337	18,899
8/18/1996	34	39,252	14,082	75,727	8,549	2,738	16,973
8/25/1996	35	40,629	12,626	88,509	6,544	1,764	14,423
Totals		741,627	478,577	1,089,649	237,945	141,145	369,099

Appendix B.9. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 1997.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/23/1997	13	860	108	2,840	0	0	0
3/30/1997	14	196	13	690	0	0	0
4/6/1997	15	218	19	746	0	0	0
4/13/1997	16	364	13	1,421	0	0	0
4/20/1997	17	1,710	185	6,261	0	0	0
4/27/1997	18	1,061	138	3,402	0	0	0
5/4/1997	19	1,121	159	3,410	0	0	0
5/11/1997	20	1,673	268	4,954	0	0	0
5/18/1997	21	1,657	254	4,934	0	0	0
5/25/1997	22	807	68	2,609	0	0	0
6/1/1997	23	388	0	2,730	2,788	34	11,393
6/8/1997	24	73	0	431	14,182	2,404	41,684
6/15/1997	25	46	0	256	54,322	10,238	151,728
6/22/1997	26	87	0	454	111,470	22,033	324,124
6/29/1997	27	609	5	2,540	164,374	27,975	457,653
7/6/1997	28	27,885	6,436	76,553	83,965	14,815	223,130
7/13/1997	29	11,832	1,561	37,201	117,169	18,460	322,316
7/20/1997	30	26,242	5,180	69,979	74,032	17,346	192,071
7/27/1997	31	17,363	3,352	47,038	58,260	10,291	153,206
8/3/1997	32	13,139	1,993	35,214	29,282	4,573	77,978
8/10/1997	33	633	8	2,733	35,189	6,236	98,706
8/17/1997	34	239	0	1,642	33,544	6,569	99,209
8/24/1997	35	197	0	2,218	27,164	4,444	86,608
Totals		123,948	55,232	224,097	930,126	458,557	1,545,727

Appendix B.10. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 1998.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
4/12/1998	16	2,869	503	7,937	0	0	0
4/19/1998	17	2,107	430	5,426	0	0	0
4/26/1998	18	1,668	352	4,274	0	0	0
5/3/1998	19	1,067	194	2,937	0	0	0
5/10/1998	20	1,084	161	2,918	0	0	0
5/17/1998	21	1,656	315	4,161	0	0	0
5/24/1998	22	2,349	512	5,986	0	0	0
5/31/1998	23	2,992	631	7,856	2,363	137	8,093
6/7/1998	24	6,228	1,340	15,113	2,735	290	8,677
6/14/1998	25	13,488	3,788	32,576	4,337	724	11,135
6/21/1998	26	25,357	8,462	57,777	8,584	2,352	19,560
6/28/1998	27	30,991	9,649	65,100	13,933	4,405	30,595
7/5/1998	28	49,469	16,580	101,815	14,787	4,512	31,373
7/12/1998	29	85,384	28,952	172,391	14,036	4,629	29,365
7/19/1998	30	187,650	68,312	397,222	10,010	3,403	20,995
7/26/1998	31	240,411	81,205	487,887	9,005	2,912	18,442
8/2/1998	32	188,646	69,978	383,275	10,651	4,051	22,341
8/9/1998	33	147,622	55,413	297,545	11,014	3,874	22,585
8/16/1998	34	114,281	43,881	230,819	9,862	3,635	20,002
8/23/1998	35	82,139	29,596	167,222	9,539	3,548	19,694
8/30/1998	36	57,449	22,888	118,087	11,277	3,660	23,001
9/6/1998	37	81,318	27,252	161,385	8,110	3,009	16,707
9/13/1998	38	77,653	24,207	161,494	8,099	2,503	16,983
9/20/1998	39	66,537	18,923	152,443	8,666	2,336	20,101
Totals		1,555,612	888,742	2,476,250	168,987	93,041	261,702

Appendix B.11. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 1999.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/14/1999	11	3,408	642	9,022	0	0	0
3/21/1999	12	3,436	953	8,676	0	0	0
3/28/1999	13	4,142	1,274	9,455	0	0	0
4/4/1999	14	4,808	1,728	10,290	0	0	0
4/11/1999	15	5,122	1,722	10,752	0	0	0
4/18/1999	16	6,252	2,016	12,585	0	0	0
4/25/1999	17	7,044	2,305	14,520	0	0	0
5/2/1999	18	7,124	2,142	14,315	0	0	0
5/9/1999	19	7,487	2,732	15,388	0	0	0
5/16/1999	20	7,325	1,928	14,662	0	0	0
5/23/1999	21	7,213	1,935	15,167	0	0	0
5/30/1999	22	9,301	2,681	18,794	0	0	0
6/6/1999	23	15,917	6,093	30,666	5,810	1,635	12,591
6/13/1999	24	22,088	9,301	41,149	7,512	2,393	14,277
6/20/1999	25	34,929	14,759	64,405	8,184	3,280	14,950
6/27/1999	26	31,711	12,946	57,626	11,795	4,855	22,542
7/4/1999	27	42,130	17,545	76,618	10,886	4,553	20,217
7/11/1999	28	57,266	25,855	105,397	9,285	3,860	16,964
7/18/1999	29	63,265	27,332	113,242	8,953	3,974	16,390
7/25/1999	30	71,094	32,249	125,602	7,752	3,586	14,043
8/1/1999	31	61,321	26,022	109,408	8,047	3,702	14,575
8/8/1999	32	43,715	20,821	75,630	9,499	4,222	16,892
8/15/1999	33	43,908	20,385	78,393	8,075	3,673	14,392
8/22/1999	34	43,445	18,773	75,246	6,952	3,026	12,261
8/29/1999	35	34,077	15,558	60,230	6,897	2,923	12,150
9/5/1999	36	29,724	13,022	53,082	6,360	2,871	12,068
9/12/1999	37	24,078	10,041	44,416	6,835	2,942	12,975
9/19/1999	38	22,951	9,212	44,562	6,405	2,279	12,155
9/26/1999	39	22,505	7,554	45,236	5,645	1,826	11,834
Totals		768,634	475,963	1,121,467	140,737	80,612	206,438

Appendix B.12. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2000. Data from this year are not included in analyses but presented here for reference.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
5/14/2000	20	17,927	5,297	40,930	0	0	0
5/21/2000	21	18,667	6,005	38,667	0	0	0
5/28/2000	22	24,514	9,730	46,370	0	0	0
6/4/2000	23	33,603	14,354	61,156	11,178	4,317	21,594
6/11/2000	24	37,965	16,467	67,570	12,526	5,545	22,869
6/18/2000	25	46,236	21,571	84,383	11,662	5,269	21,711
6/25/2000	26	46,431	21,471	83,793	12,131	5,332	22,079
7/2/2000	27	41,791	19,493	73,426	13,135	5,902	23,706
7/9/2000	28	54,450	24,814	98,948	10,098	4,932	18,426
7/16/2000	29	66,048	29,702	120,350	8,027	3,461	14,621
7/23/2000	30	66,355	31,852	119,665	7,040	3,408	12,546
7/30/2000	31	48,450	22,481	83,834	7,366	3,552	12,870
8/6/2000	32	31,134	15,808	55,076	8,034	3,903	14,406
8/13/2000	33	22,202	9,301	37,086	7,886	3,623	13,965
8/20/2000	34	23,539	11,460	41,613	5,373	2,495	9,547
8/27/2000	35	15,944	6,776	28,496	5,461	2,643	9,937
9/3/2000	36	14,818	6,944	27,773	4,158	1,535	7,782
9/10/2000	37	9,547	3,821	18,355	4,670	1,763	8,880
9/17/2000	38	7,839	3,004	15,341	4,869	1,908	9,500
9/24/2000	39	7,978	2,677	17,052	4,046	1,227	8,573
Totals		657,672	406,507	990,920	142,228	82,432	209,878

Appendix B.13. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2001.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
4/8/2001	15	16,916	4,140	42,374	0	0	0
4/15/2001	16	19,700	5,129	46,586	0	0	0
4/22/2001	17	25,052	6,361	62,759	0	0	0
4/29/2001	18	23,787	5,396	56,450	0	0	0
5/6/2001	19	20,339	4,132	50,760	0	0	0
5/13/2001	20	50,548	10,289	120,597	0	0	0
5/20/2001	21	80,182	19,347	191,842	0	0	0
5/27/2001	22	141,394	34,132	325,562	0	0	0
6/3/2001	23	286,029	84,409	657,055	4,274	1,068	10,532
6/10/2001	24	130,415	39,853	295,113	37,965	10,732	85,452
6/17/2001	25	95,053	25,311	201,867	73,406	21,904	158,273
6/24/2001	26	78,447	24,040	169,113	49,862	14,409	106,785
7/1/2001	27	71,625	20,661	156,342	15,773	5,012	34,950
7/8/2001	28	51,094	17,506	108,075	5,438	1,521	11,704
7/15/2001	29	28,974	8,687	59,059	3,343	1,145	7,374
7/22/2001	30	18,727	6,486	40,796	1,692	462	3,819
7/29/2001	31	8,297	2,146	18,924	1,043	211	2,510
8/5/2001	32	6,730	2,061	15,157	558	133	1,363
8/12/2001	33	3,425	1,046	8,466	375	56	1,040
8/19/2001	34	4,470	1,131	10,434	130	8	406
8/26/2001	35	2,740	691	6,464	107	4	380
9/2/2001	36	1,377	346	3,368	125	5	414
9/9/2001	37	2,079	538	4,850	58	2	242
9/16/2001	38	1,974	463	4,883	40	1	204
9/23/2001	39	2,772	516	7,177	33	0	191
Totals		1,276,056	698,769	1,986,161	204,868	90,400	360,322

Appendix B.14. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2002.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/10/2002	11	6,525	1,911	15,534	0	0	0
3/17/2002	12	7,122	2,324	15,688	0	0	0
3/24/2002	13	7,721	2,578	16,587	0	0	0
3/31/2002	14	9,635	3,063	20,958	0	0	0
4/7/2002	15	13,535	4,107	29,863	0	0	0
4/14/2002	16	36,415	13,005	74,460	0	0	0
4/21/2002	17	36,165	16,327	68,061	0	0	0
4/28/2002	18	57,611	35,989	87,269	0	0	0
5/5/2002	19	61,474	27,670	115,854	0	0	0
5/12/2002	20	131,634	80,320	201,321	0	0	0
5/19/2002	21	42,643	27,460	60,726	0	0	0
5/26/2002	22	39,076	16,161	70,668	0	0	0
6/2/2002	23	110,459	76,418	147,509	18,537	12,947	25,980
6/9/2002	24	133,179	100,312	172,929	159,418	120,627	207,087
6/16/2002	25	114,481	73,315	162,748	205,276	136,180	296,004
6/23/2002	26	78,938	51,198	114,227	57,734	37,579	84,091
6/30/2002	27	77,415	58,303	100,085	30,048	22,419	39,110
7/7/2002	28	79,924	33,313	145,372	23,562	10,266	43,357
7/14/2002	29	36,013	15,751	69,658	12,867	5,113	25,052
7/21/2002	30	18,585	7,658	36,543	5,260	2,017	10,575
7/28/2002	31	6,383	2,042	14,149	2,678	777	6,061
8/4/2002	32	3,381	1,022	7,730	2,346	627	5,353
8/11/2002	33	4,588	1,638	9,829	1,592	478	3,617
8/18/2002	34	6,613	2,382	13,255	1,082	311	2,326
8/25/2002	35	4,538	1,517	8,756	1,419	443	3,127
9/1/2002	36	2,432	834	5,134	920	276	2,227
9/8/2002	37	1,196	360	2,607	814	187	1,873
9/15/2002	38	751	173	1,837	464	89	1,199
9/22/2002	39	326	34	1,022	287	30	913
Totals		1,169,962	974,467	1,393,452	532,973	429,191	654,239

Appendix B.15. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2003.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/2/2003	10	31,998	8,346	71,105	0	0	0
3/9/2003	11	36,229	9,155	79,884	0	0	0
3/16/2003	12	15,728	3,689	36,024	0	0	0
3/23/2003	13	13,235	3,167	31,230	0	0	0
3/30/2003	14	13,678	3,716	33,487	0	0	0
4/6/2003	15	20,568	5,585	48,629	0	0	0
4/13/2003	16	21,330	5,687	48,011	0	0	0
4/20/2003	17	19,984	4,721	46,902	0	0	0
4/27/2003	18	23,305	3,111	67,691	0	0	0
5/4/2003	19	26,611	6,497	63,903	0	0	0
5/11/2003	20	18,336	4,692	41,223	0	0	0
5/18/2003	21	7,697	1,649	17,483	0	0	0
5/25/2003	22	5,567	1,409	13,402	0	0	0
6/1/2003	23	8,389	2,374	18,171	0	0	0
6/8/2003	24	16,632	6,226	30,739	40,187	16,223	72,515
6/15/2003	25	24,660	12,843	42,843	81,184	42,358	131,098
6/22/2003	26	26,478	12,073	49,257	66,828	29,708	122,937
6/29/2003	27	20,936	11,629	34,311	61,121	36,068	95,413
7/6/2003	28	19,016	10,096	30,598	34,351	19,270	54,101
7/13/2003	29	20,470	9,939	34,266	16,536	8,276	28,035
7/20/2003	30	12,824	5,772	23,019	7,110	3,140	12,794
7/27/2003	31	6,547	2,211	12,748	3,538	1,269	7,026
8/3/2003	32	3,894	1,276	7,880	1,654	511	3,608
8/10/2003	33	2,527	768	5,419	852	201	2,025
8/17/2003	34	1,866	521	3,964	506	97	1,283
8/24/2003	35	1,023	218	2,322	389	68	1,023
8/31/2003	36	594	132	1,415	435	98	1,104
9/7/2003	37	748	174	1,752	250	38	689
9/14/2003	38	964	163	2,348	162	10	549
Totals		452,759	298,446	687,756	325,875	227,451	443,467

Appendix B.16. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2004.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/14/2004	12	32,605	9,127	74,262	0	0	0
3/21/2004	13	21,700	6,471	46,690	0	0	0
3/28/2004	14	24,806	6,994	57,512	0	0	0
4/4/2004	15	24,834	8,849	55,116	0	0	0
4/11/2004	16	26,434	9,620	54,745	0	0	0
4/18/2004	17	17,193	4,517	39,343	0	0	0
4/25/2004	18	9,675	2,539	22,139	0	0	0
5/2/2004	19	8,517	2,607	17,756	0	0	0
5/9/2004	20	8,096	1,903	17,995	0	0	0
5/16/2004	21	17,712	6,299	37,292	0	0	0
5/23/2004	22	29,913	12,460	58,290	0	0	0
5/30/2004	23	48,600	24,706	84,640	0	0	0
6/6/2004	24	49,935	23,759	95,227	6,368	2,228	12,843
6/13/2004	25	19,519	8,264	38,015	10,567	3,996	20,539
6/20/2004	26	13,816	6,069	26,995	18,314	7,871	34,148
6/27/2004	27	17,325	7,830	31,437	18,296	7,169	32,196
7/4/2004	28	28,083	12,762	49,083	16,320	7,423	29,414
7/11/2004	29	37,570	19,816	63,626	19,476	9,320	33,449
7/18/2004	30	37,048	19,104	65,943	19,664	9,252	34,618
7/25/2004	31	20,724	7,718	40,981	4,087	1,342	8,090
8/1/2004	32	6,251	2,065	13,115	2,445	850	5,307
8/8/2004	33	2,740	821	6,121	1,017	249	2,379
8/15/2004	34	2,078	549	4,921	343	39	1,012
8/22/2004	35	900	215	2,321	233	16	770
8/29/2004	36	920	167	2,572	157	4	651
Totals		543,537	404,726	720,014	122,964	85,938	170,315

Appendix B.17. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2005.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
2/27/2005	10	42,346	11,883	103,162	0	0	0
3/6/2005	11	64,801	17,680	154,703	0	0	0
3/13/2005	12	82,656	18,945	208,172	0	0	0
3/20/2005	13	166,284	20,898	566,344	0	0	0
3/27/2005	14	344,227	208,574	535,370	0	0	0
4/3/2005	15	140,302	45,535	318,632	0	0	0
4/10/2005	16	75,064	56,242	102,278	0	0	0
4/17/2005	17	43,619	22,576	71,580	0	0	0
4/24/2005	18	22,139	5,639	52,130	0	0	0
5/1/2005	19	9,672	1,413	27,124	0	0	0
5/8/2005	20	22,508	4,950	59,389	0	0	0
5/15/2005	21	76,731	19,472	182,274	0	0	0
5/22/2005	22	316,190	232,250	405,752	0	0	0
5/29/2005	23	427,313	366,542	504,162	67,216	54,975	81,749
6/5/2005	24	132,537	101,300	169,626	193,084	150,986	247,306
6/12/2005	25	131,178	100,397	166,875	278,683	219,099	348,348
6/19/2005	26	63,240	48,442	80,558	70,988	53,908	89,536
6/26/2005	27	107,338	42,920	221,578	47,667	17,105	96,892
7/3/2005	28	89,425	29,254	190,658	36,023	11,619	76,413
7/10/2005	29	121,185	42,240	263,928	18,164	5,964	39,321
7/17/2005	30	59,378	18,217	130,296	10,269	2,877	22,448
7/24/2005	31	24,321	7,690	53,818	2,124	631	5,051
7/31/2005	32	7,413	2,129	16,559	647	106	1,659
8/7/2005	33	2,204	562	4,903	293	28	845
8/14/2005	34	823	145	2,200	116	5	421
8/21/2005	35	777	149	2,016	77	0	388
8/28/2005	36	1,128	81	3,187	73	0	534
Totals		2,718,348	2,165,082	3,440,189	739,468	630,093	859,434

Appendix B.18. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2006.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/19/2006	12	3,297	314	11,461	0	0	0
3/26/2006	13	4,653	673	14,323	0	0	0
4/2/2006	14	6,329	834	18,816	0	0	0
4/9/2006	15	4,782	608	14,333	0	0	0
4/16/2006	16	1,436	85	5,023	0	0	0
4/23/2006	17	1,458	132	4,609	0	0	0
4/30/2006	18	555	17	1,986	0	0	0
5/7/2006	19	369	24	1,319	0	0	0
5/14/2006	20	253	8	978	0	0	0
5/21/2006	21	257	13	1,049	0	0	0
5/28/2006	22	430	11	1,709	0	0	0
6/4/2006	23	1,593	22	6,434	6,973	388	25,603
6/11/2006	24	13,803	1,844	35,358	36,641	8,021	92,504
6/18/2006	25	37,344	17,519	60,806	200,170	132,597	292,781
6/25/2006	26	46,013	30,601	61,932	199,849	154,581	251,187
7/2/2006	27	31,809	20,070	46,906	132,971	96,358	172,865
7/9/2006	28	3,828	1,284	7,013	35,005	26,073	46,882
7/16/2006	29	3,872	1,735	6,243	11,646	7,606	17,021
7/23/2006	30	10,746	4,831	17,825	29,784	17,751	46,670
7/30/2006	31	2,213	820	4,348	5,545	2,581	9,727
8/6/2006	32	3,206	565	7,952	9,589	2,471	22,675
8/13/2006	33	6,044	1,467	15,639	4,732	971	12,073
8/20/2006	34	4,643	1,102	12,151	2,129	459	5,572
8/27/2006	35	2,999	649	7,707	480	59	1,503
9/3/2006	36	1,492	154	5,047	168	0	869
Totals		206,689	157,056	265,904	692,773	580,685	831,821

Appendix B.19. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2007.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/4/2007	10	7,344	1,194	23,525	0	0	0
3/11/2007	11	12,053	1,607	34,690	0	0	0
3/18/2007	12	14,695	2,211	39,948	0	0	0
3/25/2007	13	13,271	2,724	36,394	0	0	0
4/1/2007	14	18,246	3,002	51,870	0	0	0
4/8/2007	15	52,022	11,767	137,291	0	0	0
4/15/2007	16	53,943	46,270	61,342	0	0	0
4/22/2007	17	60,095	37,785	94,584	0	0	0
4/29/2007	18	82,585	17,723	217,904	0	0	0
5/6/2007	19	134,396	110,495	161,066	0	0	0
5/13/2007	20	128,008	104,464	155,043	0	0	0
5/20/2007	21	91,686	64,811	122,036	0	0	0
5/27/2007	22	162,460	117,355	219,650	0	0	0
6/3/2007	23	190,419	146,914	238,965	5,272	3,476	7,706
6/10/2007	24	373,405	256,368	514,728	203,411	140,611	283,520
6/17/2007	25	233,770	168,837	323,939	189,152	131,599	259,642
6/24/2007	26	156,076	109,334	210,086	88,778	64,089	123,598
7/1/2007	27	66,800	19,783	159,344	16,330	5,047	39,824
7/8/2007	28	17,019	3,667	40,964	5,241	1,179	12,596
7/15/2007	29	3,056	534	8,052	2,353	414	6,310
7/22/2007	30	1,705	368	4,317	970	175	2,703
7/29/2007	31	1,355	221	3,832	210	13	740
8/5/2007	32	542	67	1,545	230	16	776
8/12/2007	33	287	16	884	81	1	373
8/19/2007	34	223	0	842	53	0	357
Totals		1,941,921	1,687,352	2,253,855	520,587	417,013	637,131

Appendix B.20. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2008.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/9/2008	11	3,587	486	9,977	0	0	0
3/16/2008	12	3,858	967	10,433	0	0	0
3/23/2008	13	10,089	2,964	24,593	0	0	0
3/30/2008	14	24,849	7,106	58,427	0	0	0
4/6/2008	15	41,567	11,888	99,470	0	0	0
4/13/2008	16	50,256	12,755	112,361	0	0	0
4/20/2008	17	41,665	11,759	96,937	0	0	0
4/27/2008	18	26,533	6,687	58,980	0	0	0
5/4/2008	19	26,334	17,066	37,694	0	0	0
5/11/2008	20	67,205	42,902	96,688	0	0	0
5/18/2008	21	99,409	29,144	212,246	0	0	0
5/25/2008	22	120,716	99,915	145,574	0	0	0
6/1/2008	23	215,819	169,174	265,220	1,194	465	2,081
6/8/2008	24	339,590	262,557	429,163	12,777	9,309	17,309
6/15/2008	25	526,088	405,066	662,545	66,022	50,860	85,420
6/22/2008	26	372,315	263,874	500,656	52,426	37,765	71,944
6/29/2008	27	235,186	180,039	306,866	52,212	38,863	68,566
7/6/2008	28	208,931	85,367	418,177	50,582	18,942	99,445
7/13/2008	29	176,690	59,165	355,507	47,238	16,195	96,061
7/20/2008	30	124,278	43,502	256,822	53,223	19,494	110,588
7/27/2008	31	72,460	23,733	151,946	29,706	11,021	64,065
8/3/2008	32	31,040	11,276	64,627	16,120	5,155	33,225
8/10/2008	33	11,368	3,133	24,981	7,649	2,213	17,069
8/17/2008	34	7,779	2,333	18,760	3,440	946	8,209
8/24/2008	35	5,840	1,312	16,107	2,509	342	6,984
Totals		2,946,895	2,462,439	3,504,893	410,204	302,443	559,886

Appendix B.21. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2009.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/8/2009	11	12,533	8,636	17,209	0	0	0
3/15/2009	12	4,299	3,410	5,229	0	0	0
3/22/2009	13	12,981	8,753	17,844	0	0	0
3/29/2009	14	30,363	7,469	76,019	0	0	0
4/5/2009	15	16,781	4,535	39,935	0	0	0
4/12/2009	16	9,747	8,135	11,582	0	0	0
4/19/2009	17	48,518	39,099	58,106	0	0	0
4/26/2009	18	171,274	104,190	258,615	0	0	0
5/3/2009	19	106,324	62,617	159,581	0	0	0
5/10/2009	20	114,464	30,703	278,530	0	0	0
5/17/2009	21	89,427	66,534	116,831	0	0	0
5/24/2009	22	235,030	195,283	277,319	0	0	0
5/31/2009	23	248,864	199,847	306,960	26,586	20,323	33,570
6/7/2009	24	299,323	214,334	390,788	88,967	64,833	117,872
6/14/2009	25	452,690	317,058	619,330	239,934	169,396	333,394
6/21/2009	26	598,195	444,237	775,265	264,381	198,922	346,687
6/28/2009	27	255,564	205,737	324,898	85,298	66,371	106,204
7/5/2009	28	151,302	116,468	194,074	36,772	28,324	47,529
7/12/2009	29	116,110	88,526	152,542	23,487	17,073	30,747
7/19/2009	30	34,618	11,758	72,243	10,472	3,172	21,531
7/26/2009	31	17,134	5,627	36,231	2,079	632	4,576
8/2/2009	32	6,351	4,223	9,353	429	104	1,010
8/9/2009	33	3,217	1,728	5,245	322	55	798
8/16/2009	34	757	433	1,134	197	49	431
8/23/2009	35	2,569	723	6,243	110	10	344
Totals		3,100,531	2,783,510	3,460,723	788,077	680,071	924,781

Appendix B.22. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2010.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/7/2010	10	11,584	8,281	15,119	0	0	0
3/14/2010	11	9,907	6,623	13,741	0	0	0
3/21/2010	12	8,835	6,751	11,405	0	0	0
3/28/2010	13	11,418	8,755	14,695	0	0	0
4/4/2010	14	92,611	52,556	165,444	0	0	0
4/11/2010	15	253,115	161,376	381,899	0	0	0
4/18/2010	16	88,935	67,672	113,870	0	0	0
4/25/2010	17	39,886	31,295	50,210	0	0	0
5/2/2010	18	40,774	13,712	85,284	0	0	0
5/9/2010	19	87,337	57,906	126,381	0	0	0
5/16/2010	20	48,433	37,042	60,008	0	0	0
5/23/2010	21	43,708	12,607	90,978	0	0	0
5/30/2010	22	47,042	15,456	102,972	0	0	0
6/6/2010	23	71,701	48,119	99,904	30,516	19,125	44,766
6/13/2010	24	127,914	92,673	168,702	55,711	40,386	74,931
6/20/2010	25	166,099	121,435	225,150	76,305	54,598	103,432
6/27/2010	26	252,716	167,266	357,622	140,460	93,932	202,188
7/4/2010	27	482,062	355,814	650,866	179,916	132,379	244,913
7/11/2010	28	620,110	487,722	770,089	280,575	220,300	350,380
7/18/2010	29	450,453	329,662	596,773	228,130	168,839	306,841
7/25/2010	30	288,434	102,721	517,684	144,531	55,206	262,210
8/1/2010	31	178,397	62,613	356,182	68,294	22,098	135,495
8/8/2010	32	93,183	29,596	197,370	32,417	10,561	69,490
8/15/2010	33	40,177	10,334	92,810	20,950	5,828	49,112
8/22/2010	34	22,760	3,703	62,078	11,801	1,592	31,827
Totals		3,669,660	3,160,620	4,265,991	1,298,153	1,061,895	1,544,345

Appendix B.23. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2011.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/6/2011	10	6,977	3,928	11,353	0	0	0
3/13/2011	11	2,725	1,687	4,024	0	0	0
3/20/2011	12	7,169	1,669	17,833	0	0	0
3/27/2011	13	12,236	3,286	30,830	0	0	0
4/3/2011	14	40,957	22,988	66,906	0	0	0
4/10/2011	15	38,420	9,902	96,570	0	0	0
4/17/2011	16	68,464	38,958	105,903	0	0	0
4/24/2011	17	33,582	18,917	55,252	0	0	0
5/1/2011	18	31,712	18,951	48,731	0	0	0
5/8/2011	19	34,762	22,048	50,797	0	0	0
5/15/2011	20	80,968	53,265	120,074	0	0	0
5/22/2011	21	54,450	35,978	77,792	0	0	0
5/29/2011	22	54,534	13,399	131,451	0	0	0
6/5/2011	23	18,919	15,495	22,649	915	491	1,435
6/12/2011	24	68,712	49,891	91,763	29,822	20,597	39,908
6/19/2011	25	306,734	235,617	386,080	107,403	82,252	136,858
6/26/2011	26	556,223	449,905	687,691	215,694	170,512	263,581
7/3/2011	27	224,814	182,022	269,107	62,590	50,974	76,677
7/10/2011	28	161,389	118,095	217,929	70,782	50,109	94,684
7/17/2011	29	189,957	148,956	240,113	120,011	91,653	150,904
7/24/2011	30	365,143	285,601	460,319	159,377	122,855	201,349
7/31/2011	31	220,230	179,756	263,688	73,058	59,609	89,039
8/7/2011	32	194,511	56,593	415,396	44,452	14,450	97,454
8/14/2011	33	138,475	38,558	310,187	27,562	8,427	62,152
8/21/2011	34	66,102	17,757	149,907	19,696	5,373	45,842
8/28/2011	35	28,770	7,435	68,420	11,148	2,510	26,395
9/4/2011	36	24,609	6,131	60,267	8,900	2,299	21,772
9/11/2011	37	33,288	7,427	91,164	3,702	777	10,198
Totals		3,153,360	2,777,581	3,630,353	973,541	865,457	1,101,399

Appendix B.24. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2012.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/4/2012	10	1,219	680	1,910	0	0	0
3/11/2012	11	873	510	1,292	0	0	0
3/18/2012	12	3,577	758	8,982	0	0	0
3/25/2012	13	11,619	2,290	31,114	0	0	0
4/1/2012	14	20,942	3,916	51,870	0	0	0
4/8/2012	15	38,845	6,861	102,527	0	0	0
4/15/2012	16	68,628	13,725	183,771	0	0	0
4/22/2012	17	95,790	22,275	244,721	0	0	0
4/29/2012	18	120,813	63,995	206,697	0	0	0
5/6/2012	19	81,722	18,260	202,452	0	0	0
5/13/2012	20	79,969	22,183	198,373	0	0	0
5/20/2012	21	102,610	61,503	156,269	0	0	0
5/27/2012	22	145,062	81,923	237,206	0	0	0
6/3/2012	23	52,937	44,737	62,089	929	424	1,541
6/10/2012	24	163,914	143,321	185,588	7,965	6,386	9,736
6/17/2012	25	296,311	251,248	345,268	50,545	42,428	59,915
6/24/2012	26	215,479	181,093	256,205	53,612	44,040	64,307
7/1/2012	27	183,139	144,261	225,497	56,335	43,216	70,526
7/8/2012	28	336,699	272,748	410,535	105,466	84,401	130,272
7/15/2012	29	193,816	158,479	231,641	67,998	56,093	83,468
7/22/2012	30	164,139	134,103	196,291	38,028	30,459	46,015
7/29/2012	31	64,218	54,923	74,496	16,838	14,003	19,999
8/5/2012	32	44,658	29,375	61,627	14,755	9,551	21,290
8/12/2012	33	38,033	21,747	59,926	21,439	12,649	34,833
8/19/2012	34	28,919	10,046	63,245	13,746	4,068	29,793
8/26/2012	35	31,484	6,524	83,106	6,841	1,085	18,016
Totals		2,669,380	2,346,285	3,114,538	460,219	416,961	503,617

Appendix B.25. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2013.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/10/2013	11	12,479	7,910	18,297	0	0	0
3/17/2013	12	14,338	8,490	21,601	0	0	0
3/24/2013	13	69,872	53,103	88,722	0	0	0
3/31/2013	14	41,934	32,759	52,762	0	0	0
4/7/2013	15	81,634	53,642	115,046	0	0	0
4/14/2013	16	26,886	22,997	31,632	0	0	0
4/21/2013	17	39,448	32,147	46,364	0	0	0
4/28/2013	18	47,999	44,473	51,610	0	0	0
5/5/2013	19	1,110,265	973,993	1,254,395	0	0	0
5/12/2013	20	457,790	382,359	546,033	0	0	0
5/19/2013	21	107,707	94,035	122,255	0	0	0
5/26/2013	22	232,673	182,191	291,524	0	0	0
6/2/2013	23	675,414	189,243	1,482,978	34,543	8,459	75,211
6/9/2013	24	346,280	293,877	402,021	73,250	61,441	85,795
6/16/2013	25	464,184	367,889	569,937	70,597	56,903	88,357
6/23/2013	26	545,039	424,001	682,691	83,623	63,159	105,207
6/30/2013	27	468,440	313,991	657,934	65,563	43,512	95,104
7/7/2013	28	59,165	17,498	131,301	21,091	6,216	47,203
7/14/2013	29	15,116	12,443	18,311	3,915	2,914	5,151
7/21/2013	30	7,210	5,505	9,140	2,052	1,302	2,906
7/28/2013	31	4,858	3,578	6,228	1,514	866	2,294
8/4/2013	32	7,538	5,760	9,872	1,617	937	2,528
8/11/2013	33	16,066	9,628	23,969	2,264	850	4,351
8/18/2013	34	2,594	2,105	3,104	385	182	623
8/25/2013	35	4,328	565	12,391	161	5	660
Totals		4,908,534	4,286,852	5,813,946	367,821	314,235	437,329

Appendix B.26. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2014.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/16/2014	12	8,382	6,521	10,652	0	0	0
3/23/2014	13	4,161	3,288	5,059	0	0	0
3/30/2014	14	49,820	36,325	66,425	0	0	0
4/6/2014	15	60,736	49,387	73,335	0	0	0
4/13/2014	16	53,112	41,986	65,317	0	0	0
4/20/2014	17	170,189	137,562	205,227	0	0	0
4/27/2014	18	50,079	41,591	58,531	0	0	0
5/4/2014	19	82,768	72,745	93,939	0	0	0
5/11/2014	20	67,362	60,840	74,723	0	0	0
5/18/2014	21	113,930	98,432	131,489	0	0	0
5/25/2014	22	591,595	401,093	846,532	644	108	1,455
6/1/2014	23	804,501	558,031	1,102,346	160,470	112,750	222,200
6/8/2014	24	126,377	97,939	156,289	53,997	41,978	68,323
6/15/2014	25	36,756	30,582	44,319	28,063	22,718	33,556
6/22/2014	26	103,450	78,332	135,017	42,553	31,135	55,339
6/29/2014	27	21,284	17,388	25,623	8,481	6,588	10,648
7/6/2014	28	10,410	7,866	13,213	5,594	4,012	7,387
7/13/2014	29	17,736	11,045	25,609	10,530	6,242	15,855
7/20/2014	30	5,198	3,421	7,027	2,134	1,227	3,408
7/27/2014	31	768	262	1,267	1,272	768	1,912
8/3/2014	32	17,137	7,072	34,978	348	4	1,518
8/10/2014	33	688	417	996	296	91	546
8/17/2014	34	1,156	205	2,172	509	29	1,491
Totals		2,424,900	2,079,899	2,810,689	317,494	267,356	385,711

Appendix B.27. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2015.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/8/2015	11	9,999	1,212	32,789	0	0	0
3/15/2015	12	17,133	2,401	51,945	0	0	0
3/22/2015	13	29,250	4,274	88,502	0	0	0
3/29/2015	14	35,687	6,907	108,538	0	0	0
4/5/2015	15	53,269	7,705	151,219	0	0	0
4/12/2015	16	54,787	10,292	160,456	0	0	0
4/19/2015	17	41,718	8,189	121,384	0	0	0
4/26/2015	18	8,815	7,623	10,046	0	0	0
5/3/2015	19	178,015	152,963	203,423	0	0	0
5/10/2015	20	108,454	85,436	133,041	0	0	0
5/17/2015	21	153,266	99,279	224,786	0	0	0
5/24/2015	22	53,700	31,993	85,254	0	0	0
5/31/2015	23	71,608	54,052	90,699	140,227	109,433	176,608
6/7/2015	24	65,614	53,583	78,100	173,780	147,127	204,575
6/14/2015	25	66,742	54,686	80,638	190,019	158,507	224,419
6/21/2015	26	19,556	4,728	49,312	112,202	26,233	281,367
6/28/2015	27	4,936	880	12,937	33,158	7,102	82,989
7/5/2015	28	1,647	1,037	2,252	3,077	2,416	3,877
7/12/2015	29	664	59	1,887	3,597	840	9,757
7/19/2015	30	1,120	174	3,040	234	23	722
7/26/2015	31	207	48	363	117	16	272
8/2/2015	32	53	4	120	45	5	116
8/9/2015	33	96	0	416	37	0	262
8/16/2015	34	202	0	881	35	0	410
Totals		1,029,902	849,866	1,299,905	667,572	536,928	863,527

Appendix B.30. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2016.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/27/2016	13	5,969	2,341	10,938	0	0	0
4/3/2016	14	3,781	2,716	5,170	0	0	0
4/10/2016	15	1,696	1,258	2,222	0	0	0
4/17/2016	16	1,036	776	1,336	0	0	0
4/24/2016	17	1,091	864	1,344	0	0	0
5/1/2016	18	3,199	2,099	4,396	0	0	0
5/8/2016	19	2,657	1,224	4,513	0	0	0
5/15/2016	20	15,171	9,733	21,486	0	0	0
5/22/2016	21	98,460	73,135	132,647	0	0	0
5/29/2016	22	79,398	63,581	97,037	0	0	0
6/5/2016	23	200,479	152,875	258,488	22,872	16,380	31,607
6/12/2016	24	50,732	38,268	63,359	45,589	34,454	56,308
6/19/2016	25	58,569	44,365	76,799	76,621	57,619	99,378
6/26/2016	26	44,214	33,956	55,115	62,344	48,973	78,473
7/3/2016	27	51,181	42,434	61,882	117,528	99,272	138,616
7/10/2016	28	65,435	49,364	80,957	201,078	161,226	246,471
7/17/2016	29	16,635	12,527	21,199	91,717	77,783	108,066
7/24/2016	30	75,062	62,278	90,209	67,132	55,157	79,881
7/31/2016	31	12,693	4,093	29,171	41,422	12,850	91,596
8/7/2016	32	6,494	4,861	8,381	7,036	5,223	8,777
8/14/2016	33	2,474	1,332	3,663	1,568	772	2,649
8/21/2016	34	543	59	1,648	3,500	663	10,265
Totals		804,811	734,250	884,557	747,717	681,202	830,572

Appendix B.31. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2017.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
4/9/2017	15	1,345	284	2,797	0	0	0
4/16/2017	16	3,566	1,372	6,352	0	0	0
4/23/2017	17	2,374	103	9,337	0	0	0
4/30/2017	18	1,598	421	3,469	0	0	0
5/7/2017	19	1,809	866	3,049	0	0	0
5/14/2017	20	9,419	4,885	15,304	0	0	0
5/21/2017	21	4,211	1,855	7,619	0	0	0
5/28/2017	22	12,160	6,801	18,772	0	0	0
6/4/2017	23	31,859	23,529	41,466	963	119	2,406
6/11/2017	24	128,344	103,063	159,612	975	239	1,917
6/18/2017	25	167,343	126,725	217,683	20,615	14,588	28,233
6/25/2017	26	49,720	39,149	61,744	41,376	32,544	52,349
7/2/2017	27	32,541	22,718	45,528	38,023	26,559	52,960
7/9/2017	28	30,281	21,372	40,278	55,385	40,859	71,946
7/16/2017	29	63,909	17,180	147,111	93,326	25,607	216,126
7/23/2017	30	87,684	55,156	129,438	102,438	66,756	153,136
7/30/2017	31	51,603	10,336	127,407	121,184	24,998	298,633
8/6/2017	32	45,686	8,103	129,469	60,506	10,542	171,482
8/13/2017	33	20,327	4,224	55,159	48,989	8,537	125,465
8/20/2017	34	17,488	3,824	44,142	8,663	2,211	23,651
8/27/2017	35	10,278	941	40,259	4,138	107	17,697
Totals		807,106	637,137	1,021,849	636,108	388,945	969,415

Appendix B.32. Weekly population estimates (with confidence limits) for age-0 Chinook Salmon at the Willow Creek trap site on the Trinity River in 2018.

Week Starting	Week of Year	Estimated Natural	LCI	UCI	Estimated Hatchery	LCI	UCI
3/12/2018	11	21,602	3,081	63,847	0	0	0
3/19/2018	12	23,468	8,955	47,219	0	0	0
3/26/2018	13	48,975	20,619	102,408	0	0	0
4/2/2018	14	68,878	24,605	143,257	0	0	0
4/9/2018	15	148,523	58,467	318,193	0	0	0
4/16/2018	16	85,766	55,705	124,612	0	0	0
4/23/2018	17	28,177	17,692	41,529	0	0	0
4/30/2018	18	11,429	9,324	13,557	0	0	0
5/7/2018	19	26,233	21,539	31,025	0	0	0
5/14/2018	20	120,095	100,868	138,856	0	0	0
5/21/2018	21	209,002	170,868	250,584	0	0	0
5/28/2018	22	220,185	184,372	255,463	0	0	0
6/4/2018	23	202,508	169,608	242,363	0	0	0
6/11/2018	24	195,750	166,263	233,013	4,962	3,121	6,865
6/18/2018	25	74,571	62,371	87,549	35,055	28,591	42,390
6/25/2018	26	52,143	42,489	61,641	29,848	24,015	36,394
7/2/2018	27	74,970	59,818	92,976	11,650	7,631	16,890
7/9/2018	28	97,284	33,470	199,701	19,664	6,405	40,616
7/16/2018	29	55,365	32,285	88,066	52,346	29,098	81,535
7/23/2018	30	33,882	15,200	58,796	48,816	23,950	84,653
7/30/2018	31	23,038	3,128	67,193	14,114	1,937	42,756
8/6/2018	32	6,169	189	25,183	22,021	2,479	78,922
8/13/2018	33	4,170	28	21,700	23,037	684	102,660
Totals		1,887,343	1,652,510	2,175,888	298,720	250,086	360,085

Appendix C. Estimates of number of adult Chinook Salmon spawners used in comparison to juvenile Chinook Salmon abundance estimates at Pear Tree and Willow Creek trap sites in the Trinity River.

Brood Year	Pear Tree	Willow Creek
1988	--	83,945
1989	--	47,686
1990	--	10,562
1991	--	6,135
1992	--	8,081
1993	--	8,016
1994	--	13,803
1995	--	78,323
1996	--	58,929
1997	--	24,556
1998	--	33,517
1999	--	12,721
2000	--	34,314
2001	--	46,275
2002	7,772	34,625
2003	23,148	64,474
2004	6,910	18,417
2005	6,031	20,071
2006	6,455	18,330
2007	11,220	47,192
2008	4,421	15,476
2009	6,318	19,892
2010	6,185	28,196
2011	7,980	35,027
2012	18,389	64,038
2013	3,617	33,083
2014	6,188	26,145
2015	2,124	6,779
2016	2,422	4,775
2017	2,230	7,017

Appendix D. Summary of number of juvenile age-0 Chinook Salmon (Spring-Run and Fall-Run combined) released from Trinity River Hatchery during the spring release (June) and annual estimates of hatchery-reared juvenile Chinook Salmon at the Pear Tree and Willow Creek trap sites, 1989-2018. Also presented are the percent of original Trinity River Hatchery release estimated at each trapping site.

	Trinity River Hatchery	Pear Tree Yearly Estimate				Willow Creek Yearly Estimate			
Year	**Spring (June) Hatchery Release**	**Hatchery Estimate**	**95% Credible Interval** *Lower*	*Upper*	**Percent of Release**	**Hatchery Estimate**	**95% Credible Interval** *Lower*	*Upper*	**Percent of Release**
1989	7,888,799	--	--	--	--	891,669	729,492	1,104,504	11.3
1990	4,515,429	--	--	--	--	75,203	13,588	213,075	1.7
1991	3,605,816	--	--	--	--	600,281	484,538	735,620	16.6
1992	796,620	--	--	--	--	218,770	138,728	339,750	27.5
1993	2,830,256	--	--	--	--	N/A	--	--	--
1994	1,702,897	--	--	--	--	289,822	195,179	426,331	17.0
1995	3,612,898	--	--	--	--	41,487	17,469	73,010	1.1
1996	3,219,148	--	--	--	--	237,945	141,145	369,099	7.4
1997	3,138,062	--	--	--	--	930,126	458,557	1,545,727	29.6
1998	3,707,818	--	--	--	--	168,987	93,041	261,702	4.6
1999	3,218,475	--	--	--	--	140,737	80,612	206,438	4.4
2000	2,920,569	--	--	--	--	N/A	--	--	--
2001	3,261,876	--	--	--	--	204,868	90,400	360,322	6.3
2002	3,092,287	--	--	--	--	532,973	429,191	654,239	17.2
2003	3,072,825	737,490	490,905	1,061,859	24.0	325,875	227,451	443,467	10.6
2004	3,224,972	1,159,770	921,027	1,462,199	36.0	122,964	85,938	170,315	3.8
2005	3,165,519	N/A	--	--	--	739,468	630,093	859,434	23.4
2006	3,199,954	N/A	--	--	--	N/A	--	--	--
2007	2,968,557	1,140,459	977,650	1,334,508	38.4	520,587	417,013	637,131	17.5
2008	2,546,833	1,288,266	1,124,660	1,479,183	50.6	410,204	302,443	559,886	16.1
2009	2,959,517	773,211	695,965	861,625	26.1	788,077	680,071	924,781	26.6
2010	2,637,317	374,733	318,644	450,558	14.2	1,298,153	1,061,895	1,544,345	49.2
2011	2,664,455	359,068	291,247	434,330	13.5	973,541	865,457	1,101,399	36.5
2012	2,593,001	552,853	472,793	645,663	21.3	460,219	416,961	503,617	17.7
2013	2,737,980	753,735	600,537	932,628	27.5	367,821	314,235	437,329	13.4
2014	3,123,466	759,188	634,781	903,833	24.3	317,494	267,356	385,711	10.2
2015	2,337,891	939,332	729,400	1,181,927	40.2	667,572	536,928	863,527	28.6
2016	2,964,069	770,493	546,558	1,084,848	26.0	747,717	681,202	830,572	25.2
2017	1,102,711	252,570	118,661	421,047	22.9	216,779	164,538	320,995	19.7
2018	2,852,305	658,006	553,056	777,552	23.1	275,661	183,138	431,232	9.7