

Juvenile Salmonid Monitoring on the Mainstem Trinity River, California, 2013

Paul Petros, Anthony D. Heacock and William D. Pinnix



HOOPA VALLEY
TRIBAL FISHERIES
DEPARTMENT
P.O. Box 417
Hoopa, CA 95546
(530) 625-4267

YUROK TRIBAL
FISHERIES PROGRAM
Box 36 Highway 96
Willow Creek, CA 95546
(530) 629-3333

U.S. FISH AND
WILDLIFE SERVICE
ARCATA FISH AND
WILDLIFE OFFICE
1655 Heindon Road
Arcata, CA 95521
(707) 822-7201



October 2014



Funding for this study was provided by the U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office and the Trinity River Restoration Program.

Disclaimer: The mention of trade names or commercial products in this report does not constitute endorsement or recommendation for use by the Federal government.

The Arcata Fish and Wildlife Office Fisheries Program reports its study findings through two publication series. The **Arcata Fisheries Data Series** was established to provide timely dissemination of data to local managers and for inclusion in agency databases. The **Arcata Fisheries Technical Reports** publishes scientific findings from single and multi-year studies that have undergone more extensive peer review and statistical testing. Additionally, some study results are published in a variety of professional fisheries journals.

Key words: Trinity River, salmon, downstream migrant trapping, Chinook salmon, coho salmon, steelhead, abundance index, juvenile salmon, rotary screw trap.

The correct citation for this report is:

Petros, P., A. D. Heacock, and W.D. Pinnix. 2014. Juvenile Salmonid Monitoring on the Mainstem Trinity River, California, 2013. Hoopa Valley Tribal Fisheries Department, Yurok Tribal Fisheries Program, and U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office. Arcata Fisheries Data Series Report Number DS 2014-38, Arcata, California.

Table of Contents

	page
List of Tables	iv
List of Figures	iv
List of Appendices	vi
Introduction.....	2
Methods.....	4
Results.....	4
Catch Totals	6
Abundance Indices.....	6
Hatchery/Natural Contribution	12
Chinook Salmon Population Estimation.....	12
Outmigrant Timing	12
Migration Rate	15
Fish Size.....	15
Fish Condition.....	19
References.....	23
Acknowledgements.....	23
Appendices.....	24

List of Tables

	page
Table 1. Week of the Year (WOY) and corresponding first calendar date.	4
Table 2. Period and duration of 2013 spring/summer monitoring and percent of time sampled at Pear Tree Rotary Screw Trap site (PTRST; rkm 118) and Willow Creek Rotary Screw Trap site (WCRST; rkm 34).	6
Table 3. Juvenile salmonid catch totals in 2013 for trapping at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34), on the Trinity River, California, operated by the Hoopa Valley Tribal Fisheries Department, U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office and the Yurok Tribal Fisheries Program. Hatchery fish totals are expanded catch based on adipose fin clip rate.....	7
Table 4. California Department of Fish and Game, Trinity River Hatchery juvenile salmonid releases, 2013.....	7
Table 5. Catch totals of non-target fish species captured at Pear Tree Rotary Screw Trap site (PTRST) and Willow Creek Rotary Screw Trap site (WCRST) on the mainstem Trinity River, California, 2013.	8
Table 6. Juvenile salmonid proportional discharge based abundance indices, at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013.	8
Table 7. Juvenile salmonid emigration duration and peak as inferred from proportional discharge based abundance indices, at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013.	14
Table 8. Juvenile salmonid maximum migration rate from Trinity River Hatchery to Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) sampling sites, operated by the Hoopa Valley Tribal Fisheries Department, U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, and the Yurok Tribal Fisheries Program, 2013.	15

List of Figures

Figure 1. Location of the Trinity River rotary screw trap sites near Willow Creek (rkm 34) and Pear Tree Gulch (rkm 118), California, operated by the Yurok Tribal Fisheries Program, U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, and the Hoopa Valley Tribal Fisheries Department.	3
Figure 2. Mean daily discharge (m^3/s) as recorded near Helena, California (U.S. Geological Survey Water Resource gage station #11-526400) and Hoopa (U.S. Geological Survey Water Resource gage station #11-530000), California and mean daily water temperatures ($^{\circ}C$) recorded at USGS gage #11-526400 and the Willow Creek Rotary Screw Trap (WCRST) in 2013.	5

Figure 3. Weekly proportional discharge based abundance indices for natural age-0 and hatchery age-0 Chinook salmon captured at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34) in 2013.	9
Figure 4. Weekly proportional discharge based abundance indices for natural age-0, natural age-1, and hatchery age-1 coho salmon captured at Pear Tree Rotary Screw Trap (PTRST, rkm 118) and Willow Creek Rotary Screw Trap (WCRST, rkm 34) in 2013.....	10
Figure 5. Weekly proportional discharge based abundance indices for natural age-0, natural age-1, natural age-2, and hatchery age-1 steelhead captured at Pear Tree Rotary Screw Trap (PTRST, rkm 118) and Willow Creek Rotary Screw Trap (WCRST, rkm 34) in 2013.	11
Figure 6. Weekly mark-recapture population estimates of natural age-0 and hatchery age-0 Chinook salmon captured at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34) in 2013.....	13
Figure 7. Weekly mean fork lengths of age-0 and age-1 Chinook salmon captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013.....	16
Figure 8. Weekly mean fork lengths for natural age-0, natural age-1, and hatchery coho salmon captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013.	17
Figure 9. Weekly mean fork lengths for natural age-0, age-1, age-2, and hatchery age-1 steelhead captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013.	18
Figure 10. Weekly mean K value for age-0 Chinook salmon (pooled natural and hatchery) captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013.	20
Figure 11. Weekly mean K value for natural age-1 coho salmon captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013.	21
Figure 12. Weekly mean K value for natural age-1 steelhead captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013.	22

List of Appendices

Appendix 1. Trinity River at Pear Tree rotary screw trap site weekly Chinook salmon catches and abundance indices, 2013.	25
Appendix 2. Trinity River at Willow Creek rotary screw trap site weekly Chinook salmon catches and abundance indices, 2013.....	26
Appendix 3. Trinity River at Pear Tree rotary screw trap site weekly coho salmon catches and abundance indices, 2013.....	27
Appendix 4. Trinity River at Willow Creek rotary screw trap site weekly coho salmon catches, and abundance indices, 2013.	28
Appendix 5. Trinity River at Pear Tree rotary screw trap site weekly steelhead catches and abundance indices, 2013.....	29
Appendix 6. Trinity River at Willow Creek rotary screw trap site weekly steelhead catches and abundance indices, 2013.	30
Appendix 7. Trinity River at Pear Tree rotary screw trap site weekly age-0 Chinook salmon population estimate input and results, 2013.....	31
Appendix 8. Trinity River at Willow Creek rotary screw trap site weekly age-0 Chinook salmon population estimate input and results, 2013.....	32
Appendix 9. Trinity River at Pear Tree rotary screw trap site weekly Chinook and coho salmon fork lengths, 2013.	33
Appendix 10. Trinity River at Willow Creek rotary screw trap site weekly Chinook and coho salmon fork lengths, 2013.....	34
Appendix 11: Trinity River at Pear Tree rotary screw trap site weekly steelhead fork lengths, 2013.....	35
Appendix 12: Trinity River at Willow Creek rotary screw trap site weekly steelhead fork lengths 2013.....	36
Appendix 13. Fulton's condition factor (K) for pooled natural and hatchery age-0 Chinook salmon with FL>50mm from the Pear Tree and Willow Creek rotary screw trap sites, 2013.	37
Appendix 14. Fulton's condition factor (K) for age-1 coho salmon from the Pear Tree and Willow Creek Rotary screw trap sites, 2013.....	38
Appendix 15. Fulton's condition factor (K) for natural age-1+ steelhead from the Pear Tree and Willow Creek rotary screw trap sites, 2013.	39

Juvenile Salmonid Monitoring on the Mainstem Trinity River, California, 2013

Paul Petros¹, Anthony D. Heacock², William D. Pinnix³

¹*Hoop Valley Tribal Fisheries Department
P.O. Box 417, Hoopa, CA 95546*

²*Yurok Tribal Fisheries Program
Box 36 Highway 96, Willow Creek, California 95573*

³*U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office
1655 Heindon Road, Arcata, California 95521*

Executive Summary.—This report presents juvenile salmonid emigration monitoring data collected in 2013 at both Pear Tree Bar (PTRST; river kilometer [rkm] 118) and Willow Creek (WCRST; rkm 34), California on the mainstem Trinity River. Monitoring at PTRST is conducted to estimate juvenile salmonid population size passing PTRST during the sampling season. Monitoring at WCRST is conducted to estimate juvenile salmonid population size and emigration timing during the monitoring period. In 2013, two rotary screw traps were operated at PTRST from January 15 through September 1, with successful sampling for 207 of the 230 day sampling period and at WCRST three rotary screw traps were operated from March 16 through August 30, with successful sampling for 143 days of the 169 day sampling period.

Age of salmonid outmigrants, mean length by week, migration rates, and hatchery contributions were estimated. Catch data were used to calculate proportional discharge based abundance indices for juvenile Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), and steelhead (*O. mykiss*). Catch data of other fishes are also presented.

Juvenile salmonid emigration target dates were developed by the Trinity River Restoration Program (TRRP) to assess at what date 80% of the juvenile salmonid population had reached Willow Creek and to help manage water temperatures in the mainstem Trinity River. The estimate of the week in which 80% of the juvenile Chinook salmon population passed WCRST, as inferred from the proportional discharge based abundance index was Week of the Year (WOY) 24 (June 5-June 11), which occurred before the TRRP management target date of July 9. The estimate of the week in which 80% of the natural coho salmon smolt population passed the WCRST was WOY 21 (May 15-May 21), which occurred prior to the TRRP management target date of June 4. The estimate of the week in which 80% of the steelhead smolt population passed the WCRST, as inferred from proportional discharge based abundance index, was WOY 20 (May 8 – May 14), which occurred prior to the TRRP management target date of May 22.

Weekly stratified mark-recapture population estimates of emigrating age-0 Chinook salmon were calculated for both naturally and hatchery-produced sub-populations. At PTRST an estimated 2,480,622 (SD=131,529; CV = 0.053) naturally-produced age-0 Chinook salmon and 677,188 (SD = 47,178, CV = 0.071) age-0 hatchery Chinook salmon passed the site between January 15 and September 1. At WCRST between March 16 and August 30, an estimated 4,828,842 (SD = 548,891; CV = 0.113) naturally-produced age-0 Chinook salmon and 384,512 (SD = 54,666; CV = 0.142) age-0 hatchery Chinook salmon passed the site.

Introduction

This report presents annual data collected to: (1) evaluate the production of juvenile Chinook salmon (*Oncorhynchus tshawytscha*), from the upper 65 kilometers of the mainstem Trinity River below Lewiston Dam, the primary restoration reach of the Trinity River Restoration Program (TRRP); and (2) provide data to enable evaluation of the production and outmigrant timing of juvenile salmonids through the lower Trinity River in response to managed flow releases, thermal regimes, and restoration efforts. Information collected by this project is needed to address TRRP Integrated Assessment Plan objective 3, and sub-objective 3.2 (TRRP and ESSA 2009):

Objective 3: Restore and maintain natural production of anadromous fish populations

Sub-objective 3.2: Increase freshwater production of anadromous fish.

Juvenile salmonid emigration from the mainstem Trinity River has been monitored since 1989 with rotary screw traps. This data series report summarizes the outmigrant monitoring data collected in 2013 cooperatively by the U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Hoopa Valley Tribal Fisheries Department, and Yurok Tribal Fisheries Program at Pear Tree Gulch (PTRST) and Willow Creek (WCRST) on the mainstem Trinity River (Figure 1). The intent of this data series report is to provide timely dissemination of data to local managers and for inclusion in agency databases, and provide basic biological information to evaluate the effectiveness of habitat restoration efforts, especially flow regimes recommended in the Record of Decision (USDOI 2000), in restoring the fishery resources of the Trinity River. In addition to quantifying salmonid outmigrant production and timing, fish condition and hatchery/natural composition of the outmigrants are assessed.

A technical report synthesizing multi-year datasets developed by this project will be periodically published to evaluate trends in outmigrant salmonid production, outmigrant timing, hatchery/natural contribution and condition/health. Monitoring emigrating juvenile salmonid populations in conjunction with habitat availability and suitability studies is expected to provide a direct evaluation of TRRP restoration efforts because these studies focus on the early freshwater life-history phase which is directly affected by instream conditions and management actions. In addition, it is intended that this basic information will be used by the TRRP to aid in development of a salmon production model for the Trinity River.

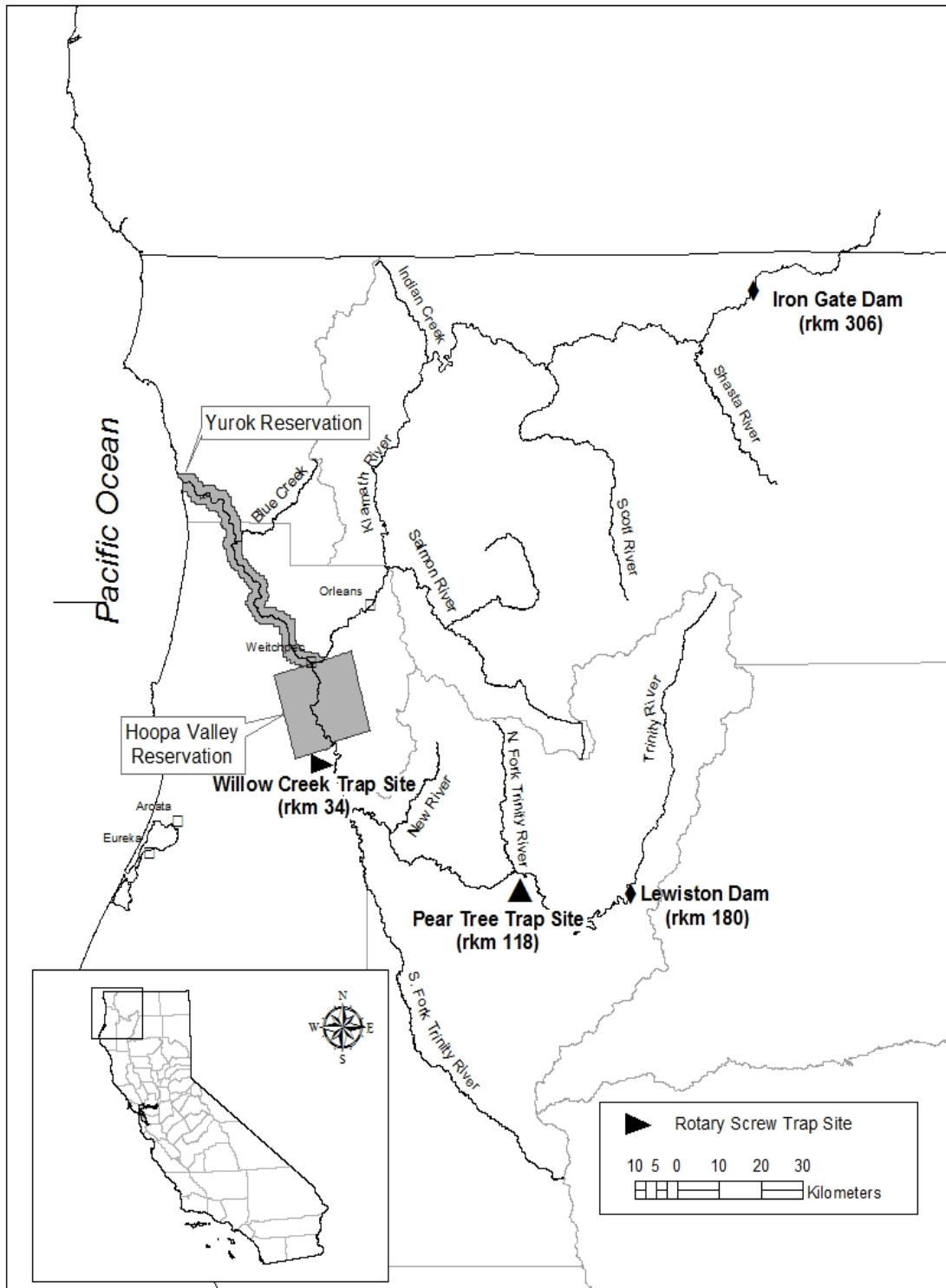


Figure 1. Location of the Trinity River rotary screw trap sites near Willow Creek (rkm 34) and Pear Tree Gulch (rkm 118), California, operated by the Yurok Tribal Fisheries Program, U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, and the Hoopa Valley Tribal Fisheries Department.

Methods

For details on background, study site, and monitoring methods for the data presented in this report, the reader is referred to the 2009 Trinity River Juvenile Salmonid Outmigrant Monitoring Report by Harris et al. (2012).

Results

Data are grouped by Week of the Year (WOY; Table 1). Graphs of water temperature and discharge through the sampling periods are presented in Figure 2.

Sampling Efforts

In 2013, trapping at PTRST began in the third week of January and trapping at WCRST was initiated the first week of March (Table 2). Sampling occurred at both sites in each sampling week, although occasionally traps were not run for complete sample weeks. To ensure that the greatest portion of the natural Chinook salmon emigration, as well as portions of the hatchery and natural coho salmon (*O. kisutch*) and steelhead (*O. mykiss*) smolt emigration were sampled, efforts were made to install the traps as early as possible and continue sampling throughout the summer. Sampling at Pear Tree Bar has occurred between early January and late August since 2007, and sampling at Willow Creek has occurred from March through August since 2005. It is important for readers to note that without sampling year-round, portions of annual production are excluded from estimates and indices presented in this report.

Table 1. Week of the Year (WOY) and corresponding first calendar date.

WOY	Week Beginning	WOY	Week Beginning	WOY	Week Beginning
1	01/01	18	04/30	35	08/27
2	01/08	19	05/07	36	09/03
3	01/15	20	05/14	37	09/10
4	01/22	21	05/21	38	09/17
5	01/29	22	05/28	39	09/24
6	02/05	23	06/04	40	10/01
7	02/12	24	06/11	41	10/08
8	02/19	25	06/18	42	10/15
9	02/26	26	06/25	43	10/22
10	03/05	27	07/02	44	10/29
11	03/12	28	07/09	45	11/05
12	03/19	29	07/16	46	11/12
13	03/26	30	07/23	47	11/19
14	04/02	31	07/30	48	11/26
15	04/09	32	08/06	49	12/03
16	04/16	33	08/13	50	12/10
17	04/23	34	08/20	51	12/17
				52	12/24

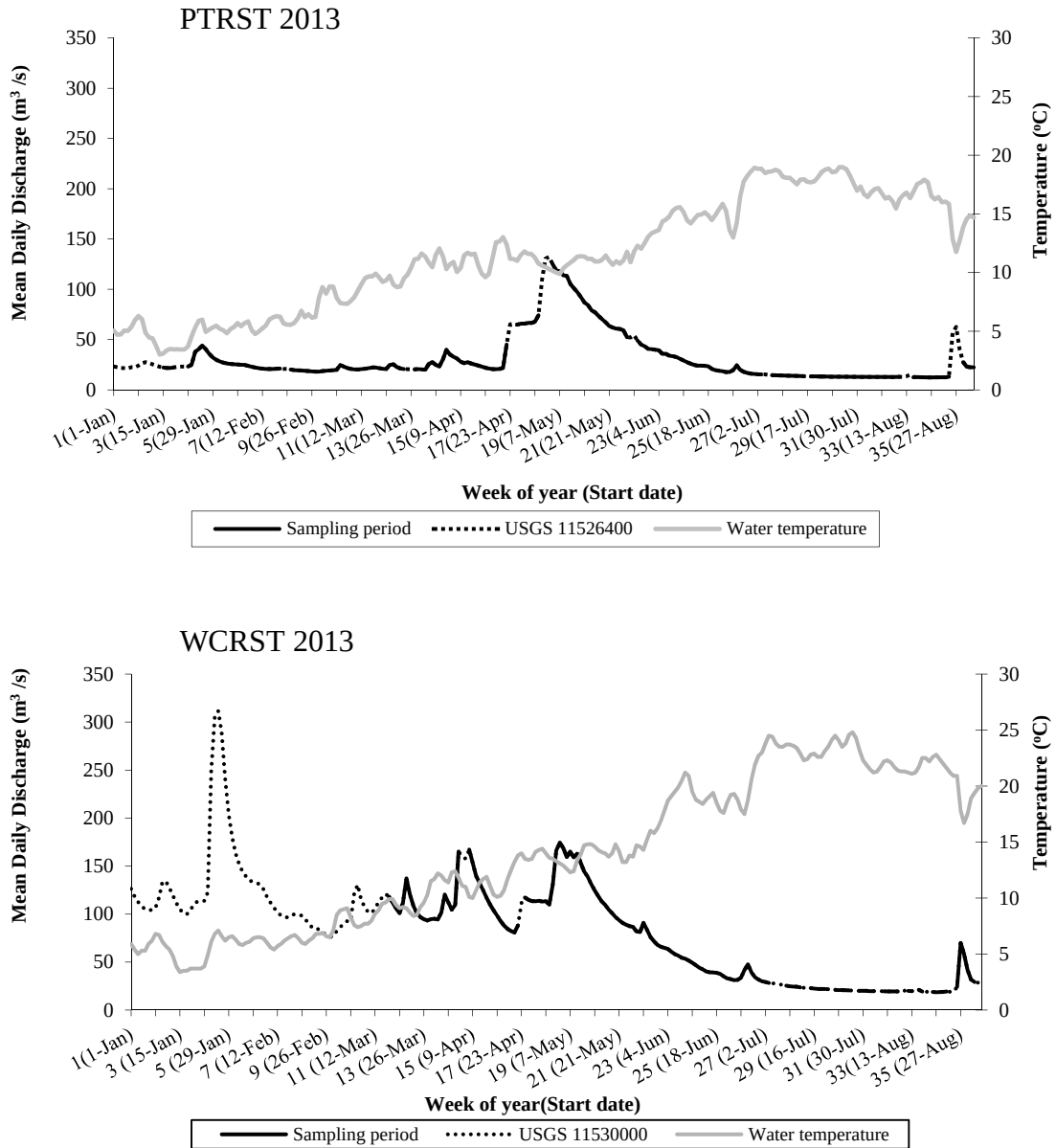


Figure 2. Mean daily discharge (m^3/s) as recorded near Helena, California (U.S. Geological Survey Water Resource gage station #11-526400) and Hoopa (U.S. Geological Survey Water Resource gage station #11-530000), California and mean daily water temperatures ($^{\circ}\text{C}$) recorded at USGS gage #11-526400 and the Willow Creek Rotary Screw Trap (WCRST) in 2013. USGS gage #11-526400 is located approximately 100m downstream of the Pear Tree Rotary Screw Trap (PTRST). Heavy line on discharge plot indicates sampling period, dashed line on discharge plot indicates no sampling.

Table 2. Period and duration of 2013 spring/summer monitoring and percent of time sampled at Pear Tree Rotary Screw Trap site (PTRST; rkm 118) and Willow Creek Rotary Screw Trap site (WCRST; rkm 34). Distinct days are total number of days sampled with at least one trap.

Site	Trap	Start-End dates	Days Trapped	Days possible	Trapping Rate
PTRST	1 (2.4m)	15-Jan - 1 Sep	206	230	89.6%
PTRST	2 (1.5m)	16-Jan - 1 Sep	159	229	69.4%
Distinct Days		15-Jan - 1 Sep	207	230	90.0%
WCRST	1 (2.4m)	10 Apr – 30 Jun	79	81	97.5%
WCRST	2 (2.4m)	28 Mar – 30 Aug	121	156	77.6%
WCRST	3 (2.4m)	16 Mar – 30 Aug	138	168	82.1%
Distinct Days		16 Mar – 30 Aug	143	168	85.1%

Catch Totals

Catch totals of the primary salmonids of interest (Chinook salmon, coho salmon and steelhead) are presented in Table 3. Chinook salmon were the most commonly captured salmonid at both sites, comprising approximately 97% and 95% of the total salmonid catch at PTRST and WCRST, respectively. Hatchery salmonid releases from Trinity River Hatchery (TRH) are presented in Table 4. Catch totals of other fish species are presented in Table 5.

Abundance Indices

The proportional discharge based abundance indices for natural age-0 Chinook salmon were 1,166,770 and 2,738,445 at PTRST and WCRST, respectively (Figure 3; Table 6; Appendix 1 and Appendix 2). The age-0 hatchery Chinook salmon abundance indices were 327,376 at PTRST and 149,464 at WCRST. Natural age-0 Chinook salmon were captured on the first day of trap operation at both sites, indicating that some age-0 Chinook salmon emigrated prior to trap installation.

The proportional discharge based abundance indices for age 1 naturally produced coho salmon were 1,468 and 5,070 fish at PTRST and WCRST, respectively (Figure 4; Table 6; Appendix 3 and Appendix 4). Age-0 naturally produced coho salmon abundance indices were 1,273 and 615 at PTRST and WCRST, respectively. Abundance indices of hatchery age-1 coho salmon were 7,556 and 46,698 at PTRST and WCRST, respectively.

Natural age-1 coho salmon were captured at the beginning of the sampling period at both trap sites, indicating that portions of each respective population emigrated prior to trap installation. At PTRST, proportional discharge based abundance indices of natural age-0 and age-1 steelhead were 18,967 and 8,832, respectively (Figure 5; Table 6; Appendix 5). Abundance indices of age-0 and age-1 steelhead at WCRST were 7,066 and 54,969, respectively (Figure 5; Table 6; Appendix 6). Abundance indices of hatchery age-1 steelhead were 10,550 at PTRST and 88,878 at WCRST. Sampling periods at both trap sites missed portions of each respective population that emigrated prior to or after trapping operations.

Table 3. Juvenile salmonid catch totals in 2013 for trapping at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34), on the Trinity River, California, operated by the Hoopa Valley Tribal Fisheries Department, U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office and the Yurok Tribal Fisheries Program. Hatchery fish totals are expanded catch based on adipose fin clip rate. NA = Not Applicable (i.e. no fish of a particular age class exist in the Trinity River).

Site	Species	Hatchery Age-0	Hatchery Age-1+	Natural Age-0	Natural Age-1+	Natural Age-2+	Total
PTRST	Chinook salmon	39,895	24	132,311	259	NA	172,489
PTRST	coho salmon	NA	917	169	138	NA	1,224
PTRST	steelhead	NA	1,218	1,627	1,042	29	3,916
WCRST	Chinook salmon	22,168	12	274,499	91	NA	296,770
WCRST	coho salmon	NA	2,609	53	386	NA	3,048
WCRST	steelhead	NA	6,155	705	4,666	8	11,534

Table 4. California Department of Fish and Game, Trinity River Hatchery juvenile salmonid releases, 2013. AD-clipped = adipose fin clipped fish.

Species ¹	Release Season	Number Released	Percentage AD-clipped or Marked	Release Dates
Chinook salmon	Spring	2,737,980	23.1	06/01 - 06/15
Chinook salmon	Fall	1,419,865	22.9	10/01 - 10/14
coho salmon ^{2,3}	Spring	511,618	100.0	03/15 - 03/20
steelhead	Spring	849,391	98.7	03/15 - 03/29

¹Chinook salmon releases include both spring-run and fall-run races released in the spring and fall release seasons.

²Coho salmon were marked with a right maxillary clip.

³The coho salmon mark rate was not available at the time of this report and is reported as the target rate.

Table 5. Catch totals of non-target fish species captured at Pear Tree Rotary Screw Trap site (PTRST) and Willow Creek Rotary Screw Trap site (WCRST) on the mainstem Trinity River, California, 2013.

Common name	Species	Life stage	PTRST Catch	WCRST Catch
Lamprey	<i>Entosphenus spp.</i>	Ammocete	1,574	1,155
		Eyed juvenile	60	121
		Adult	48	13
Sucker	<i>Catostomus spp</i>		156	2,350
Speckled dace	<i>Rhinichthys osculus</i>		185	812
Threespine stickleback	<i>Gasterosteus aculeatus</i>		42	529
Golden shiner	<i>Notemigonus crysoleucas</i>		1	5
Sculpin	<i>Cottus spp</i>		0	413
Green sturgeon	<i>Acipenser medirostris</i>	Juvenile	0	0
Brown trout	<i>Salmo trutta</i>	Juvenile	581	54
Sunfish	<i>Lepomis spp.</i>		0	45
Sockeye salmon	<i>Oncorhynchus nerka</i>	Juvenile	2	10
Season Total			2,649	5,507

Table 6. Juvenile salmonid proportional discharge based abundance indices, at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013. NA = Not Applicable (i.e. no fish of a particular age class exist in the Trinity River).

Site	Species	Hatchery Age-0	Hatchery Age-1	Natural Age-0	Natural Age-1	Natural Age-2+	Total
PTRST	Chinook salmon	327,376	290	1,166,770	2,028	NA	1,496,464
PTRST	coho salmon	NA	7,556	1,273	1,468	NA	10,297
PTRST	steelhead	NA	10,550	18,967	8,832	352	38,701
WCRST	Chinook salmon	149,464	744	2,738,445	2,119	NA	2,890,772
WCRST	coho salmon	NA	46,698	615	5,070	NA	52,383
WCRST	steelhead	NA	88,878	7,066	54,969	10,978	161,891

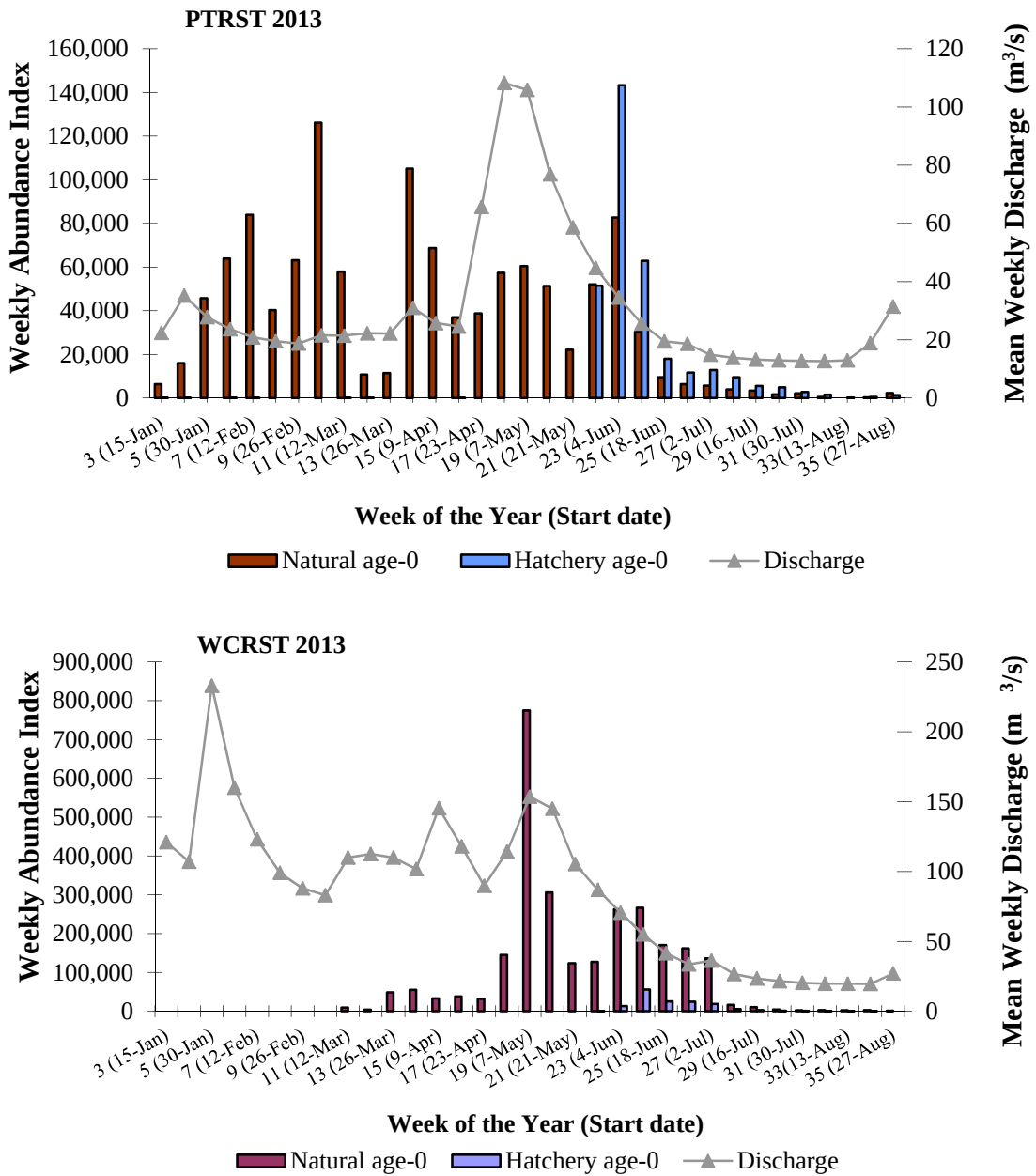


Figure 3. Weekly proportional discharge based abundance indices for natural age-0 and hatchery age-0 Chinook salmon captured at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34) in 2013.

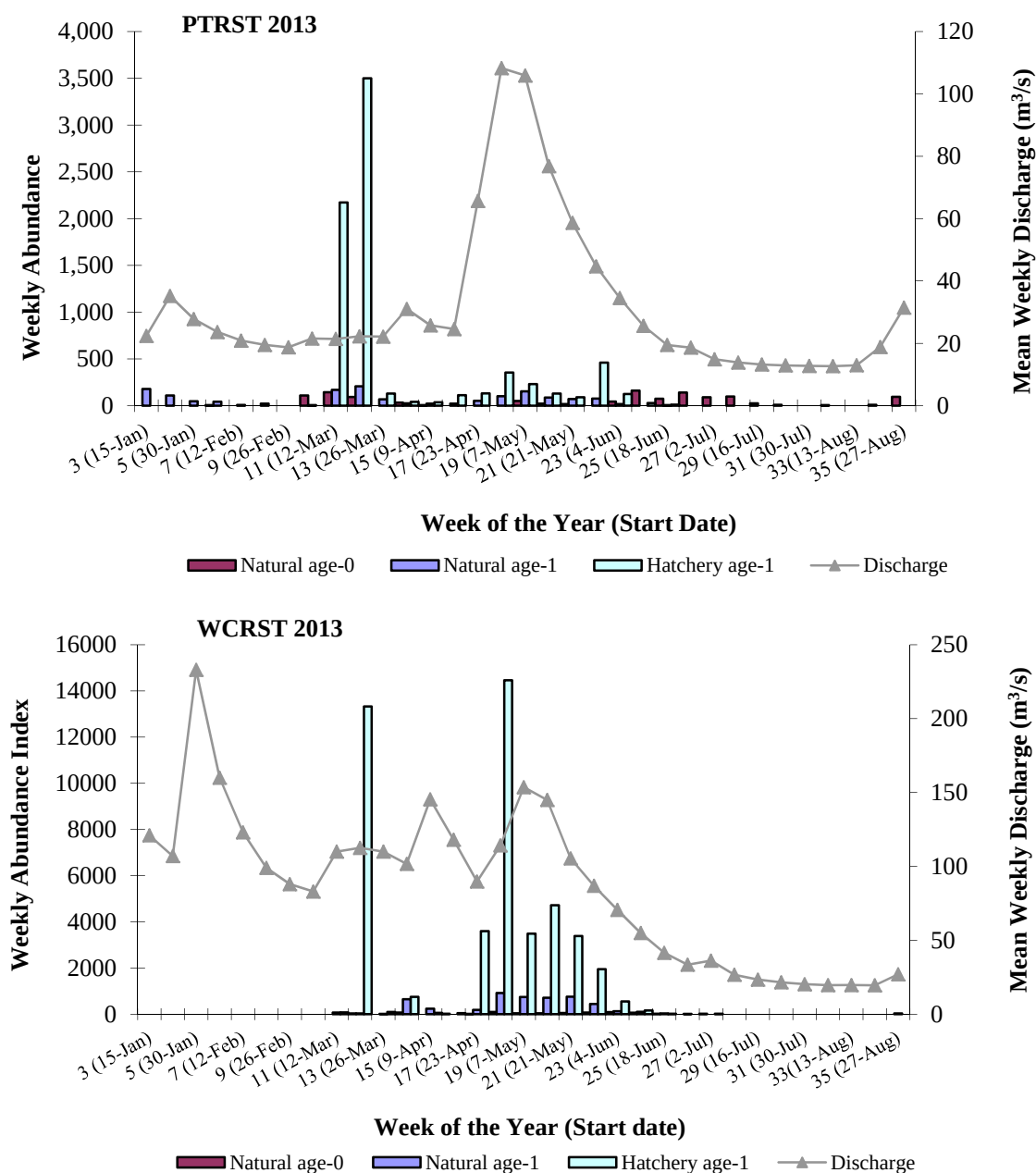


Figure 4. Weekly proportional discharge based abundance indices for natural age-0, natural age-1, and hatchery age-1 coho salmon captured at Pear Tree Rotary Screw Trap (PTRST, rkm 118) and Willow Creek Rotary Screw Trap (WCRST, rkm 34) in 2013.

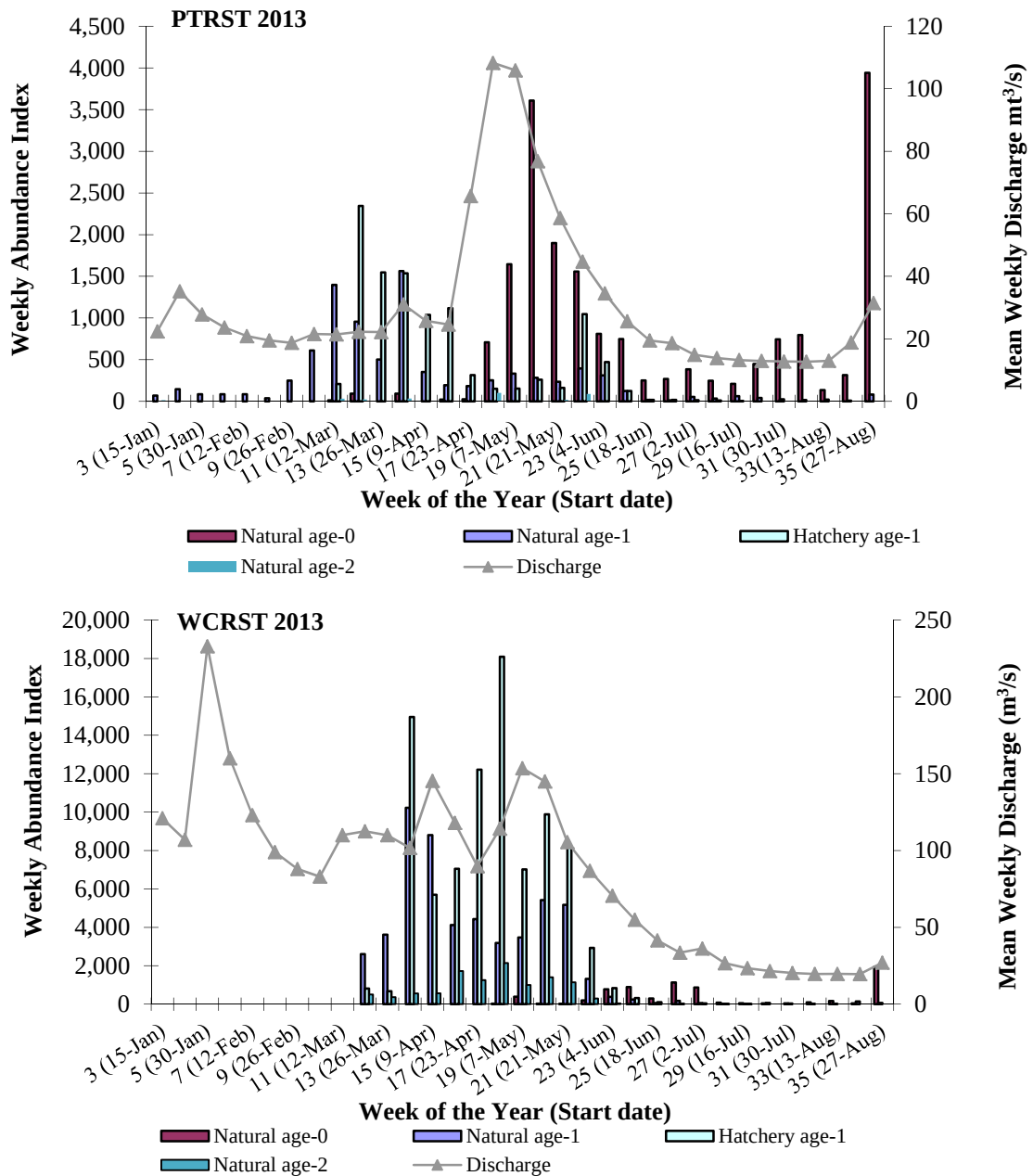


Figure 5. Weekly proportional discharge based abundance indices for natural age-0, natural age-1, natural age-2, and hatchery age-1 steelhead captured at Pear Tree Rotary Screw Trap (PTRST, rkm 118) and Willow Creek Rotary Screw Trap (WCRST, rkm 34) in 2013.

Hatchery/Natural Contribution

Chinook salmon were captured at PTRST and WCRST throughout the 2013 sampling season with the spring/summer emigration dominated by naturally-produced fish comprising 78% and 95%, respectively, of the total proportional discharge based abundance indices (Appendix 1 and Appendix 2).

Age-1 coho salmon smolts were predominantly hatchery origin at PTRST, which comprised 84% of the total age-1 proportional discharge based index in 2013 (Appendix 3). Age-1 coho salmon emigrants were predominantly hatchery origin at WCRST, comprising 89% of the total age-1 proportional discharge based index in 2013 (Appendix 4).

Based on proportional discharge based abundance indices at PTRST and WCRST, age-1 hatchery steelhead comprised 54% (Appendix 5) and 62% (Appendix 6), respectively, of the total age-1 abundance index.

Chinook Salmon Population Estimation

During the 2013 sampling season, freeze branded hatchery Chinook salmon marked at TRH and delivered to the trap sites were used to estimate trap efficiency for generating population estimates during the sampling period (Appendix 7 and Appendix 8). Weekly stratified mark-recapture population estimates of emigrating age-0 Chinook salmon were calculated for both naturally and hatchery-produced sub-populations (Figure 6). At PTRST an estimated 2,480,622 (SD=131,529; CV = 0.053) naturally-produced age-0 Chinook salmon and 677,188 (SD = 47,178, CV = 0.071) age-0 hatchery Chinook salmon passed the site between January 15 and September 1. At WCRST between March 16 and August 30, an estimated 4,828,842 (SD = 548,891; CV = 0.11) naturally-produced age-0 Chinook salmon and 384,512 (SD = 54,666; CV = 0.14) age-0 hatchery Chinook salmon passed the site.

Outmigrant Timing

The Chinook salmon population in the Trinity River is composed of both naturally-produced and hatchery-produced fish of both spring and fall races. The vast majority of juveniles during the spring/summer emigration period emigrate as age-0 fish, with the natural and hatchery emigration periods overlapping (Appendix 1 and Appendix 2). The week marking the cumulative passage of 80% of the natural juvenile Chinook salmon population at WCRST, as inferred from the proportional discharge based abundance index, was WOY 24 (June 11 – June 17), which occurred before the TRRP management target date of July 9 (TRRP and ESSA 2009). Based on proportional discharge based abundance indices, the natural age-0 Chinook salmon emigration peaked at PTRST in WOY 10, and peaked at WCRST in WOY 19. The hatchery age-0 Chinook salmon emigration peaked in WOY 23 at PTRST and WOY 24 at WCRST.

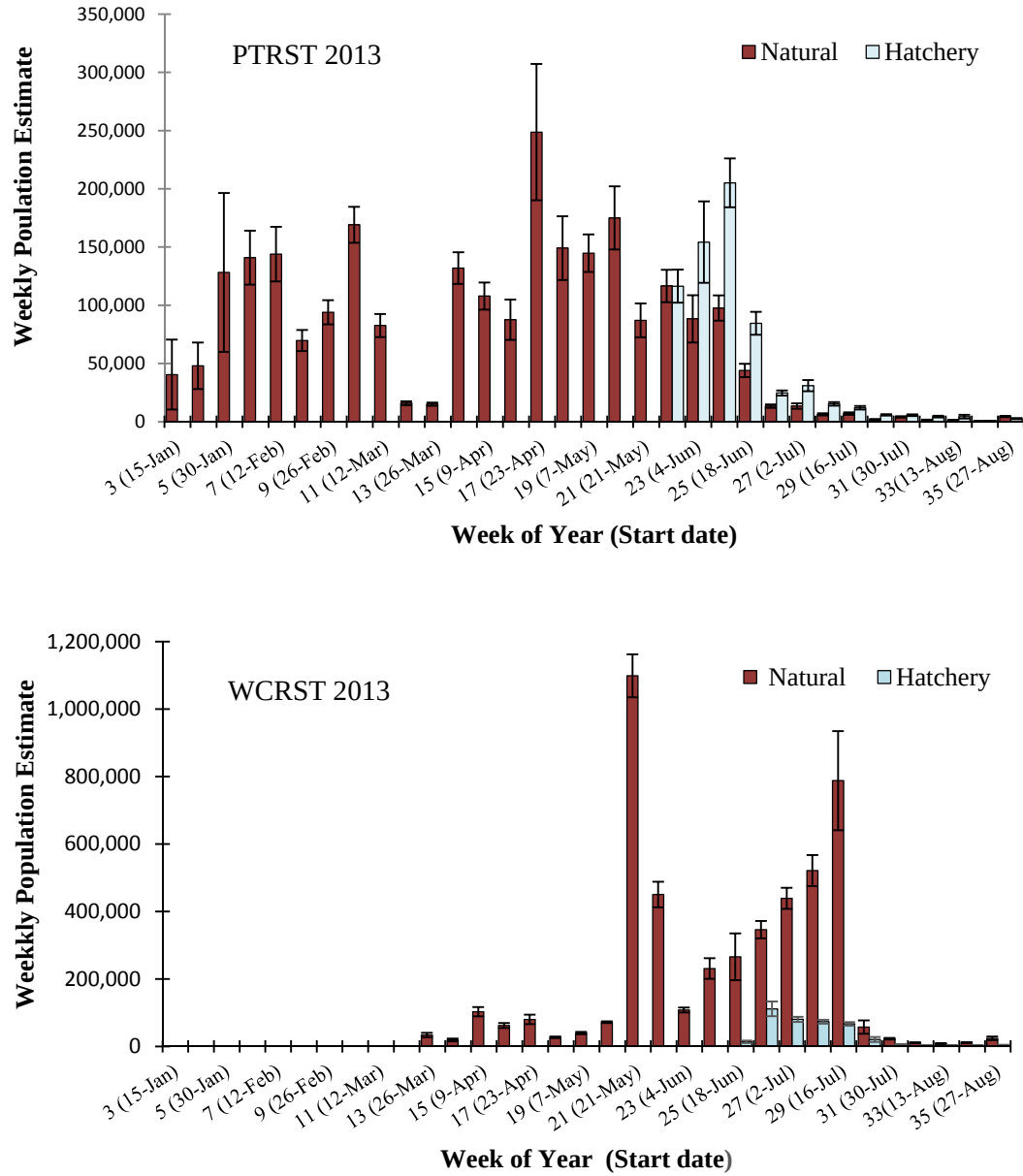


Figure 6. Weekly mark-recapture population estimates of natural age-0 and hatchery age-0 Chinook salmon captured at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34) in 2013. Error bars represent one standard deviation of the mean weekly estimate.

Table 7. Juvenile salmonid emigration duration and peak as inferred from proportional discharge based abundance indices, at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013. Values represent week of the year.

Site	Species	Emigration Duration			Emigration Peak		
		Natural Age-0	Natural Age-1+	Hatchery	Natural Age-0	Natural Age-1+	Hatchery
PTRST	Chinook salmon	3-35	3-22	22-35	10	3	23
PTRST	coho salmon	6-35	3-25	11-25	24	12	12
PTRST	steelhead	11-35	3-35	11-35	35	14	12
WCRST	Chinook salmon	11-35	12-21	22-34	19	12	24
WCRST	coho salmon	12-27	11-26	11-27	18	18	18
WCRST	steelhead	18-35	11-35	12-29	26	14	18

The coho salmon population in the Trinity River is composed of both naturally-produced and hatchery populations. The vast majority of Trinity River coho salmon emigrate to the ocean as age-1 smolts while the emigration of age-0 fish is presumably a redistribution of rearing juveniles. Natural age-1 coho salmon were captured in the first week of sampling at both sites and emigration continued through early June (WOY 23) at PTRST and late June (WOY 26) at WCRST. Hatchery age-1 coho salmon abruptly emigrated from the upper river, with approximately 75% of the total flow based index passing PTRST within two weeks of release from TRH (Table 7, Appendix 3 and Appendix 4). Interpretation of the data suggests that the sampling period did not encompass the entire naturally-produced age-1 coho salmon emigration. The week marking the cumulative passage of 80% of the naturally produced age-1 coho population at WCRST, as inferred from the proportional discharge based index, was WOY 21 (May 21-May 27), which occurred prior to the TRRP management target date of June 4 (TRRP and ESSA 2009). Natural age-0 coho salmon emigration peaked in WOY 24 at PTRST and WOY 18 at WCRST. Natural age-1 coho salmon emigration peaked in WOY 12 at PTRST and WOY 18 at WCRST. Hatchery coho salmon emigration peaked in WOY 12 at PTRST and WOY 18 at WCRST.

The steelhead populations in the Trinity River are composed of both natural populations that exhibit highly variable juvenile life history patterns, as well as a hatchery-produced component. All juvenile age classes of steelhead were generally captured throughout the sampling season at PTRST and WCRST, with peaks in abundance occurring during the early portion of sampling for age-1, and in July for age-0 fish. Age-1 or older natural steelhead were present throughout the sampling period (Table 7; Appendix 5 and Appendix 6). The majority of hatchery-produced age-1 steelhead emigrated by the end of June. The week marking the cumulative passage of 80% of the natural steelhead smolt population at WCRST, as inferred from the proportional discharge based abundance index, was WOY 20 (May 14 – May 20), which occurred prior to the TRRP management target date of May 22 (TRRP and ESSA 2009). Natural age-0 steelhead emigration peaked in WOY 35 at PTRST and WOY 26 at WCRST. Natural age-1 steelhead emigration peaked in WOY 14 at PTRST and WOY 14 at WCRST. Hatchery steelhead emigration peaked in WOY 12 at PTRST and WOY 18 at WCRST.

Migration Rate

Maximum migration rates of salmonids released from TRH are presented in Table 8. These values should be considered maximums, as hatchery fish are released on a volitional basis.

Fish Size

Chinook salmon fork lengths generally increased through the season at both PTRST and WCRST (Figure 7; Appendix 9 and Appendix 10).

Natural age-0 coho salmon fork lengths generally increased through the sampling season at both PTRST and WCRST (Figure 8; Appendix 9 and Appendix 10). Hatchery and natural age-1 coho salmon fork lengths generally decreased through the sampling season at WCRST. Natural age-1 coho salmon fork lengths generally increased through the sampling season at PTRST, but fork lengths of age-1 hatchery coho salmon showed no consistent pattern.

Natural age 0 and age-1 steelhead fork lengths generally increased through the sampling season at both sites (Figure 9; Appendix 11 and Appendix 12). Hatchery and natural age-2 steelhead fork lengths remained relatively stable through the sampling season at both sites.

Table 8. Juvenile salmonid maximum migration rate from Trinity River Hatchery to Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) sampling sites, operated by the Hoopa Valley Tribal Fisheries Department, U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, and the Yurok Tribal Fisheries Program, 2013.

Site	Species	Date First Released	Date First Captured	# of Days	Maximum Migration Rate
PTRST	Chinook salmon	06/01/2013	6/02/2013	1	64 rkm/day
PTRST	coho salmon	03/15/2013	3/17/2013	2	32 rkm/day
PTRST	steelhead	03/15/2013	3/16/2013	3	21 rkm/day
WCRST	Chinook salmon	06/01/2013	06/04/2013	3	49 rkm/day
WCRST	coho salmon	03/15/2013	03/22/2013	7	21 rkm/day
WCRST	steelhead	03/15/2013	03/18/2013	3	49 rkm/day

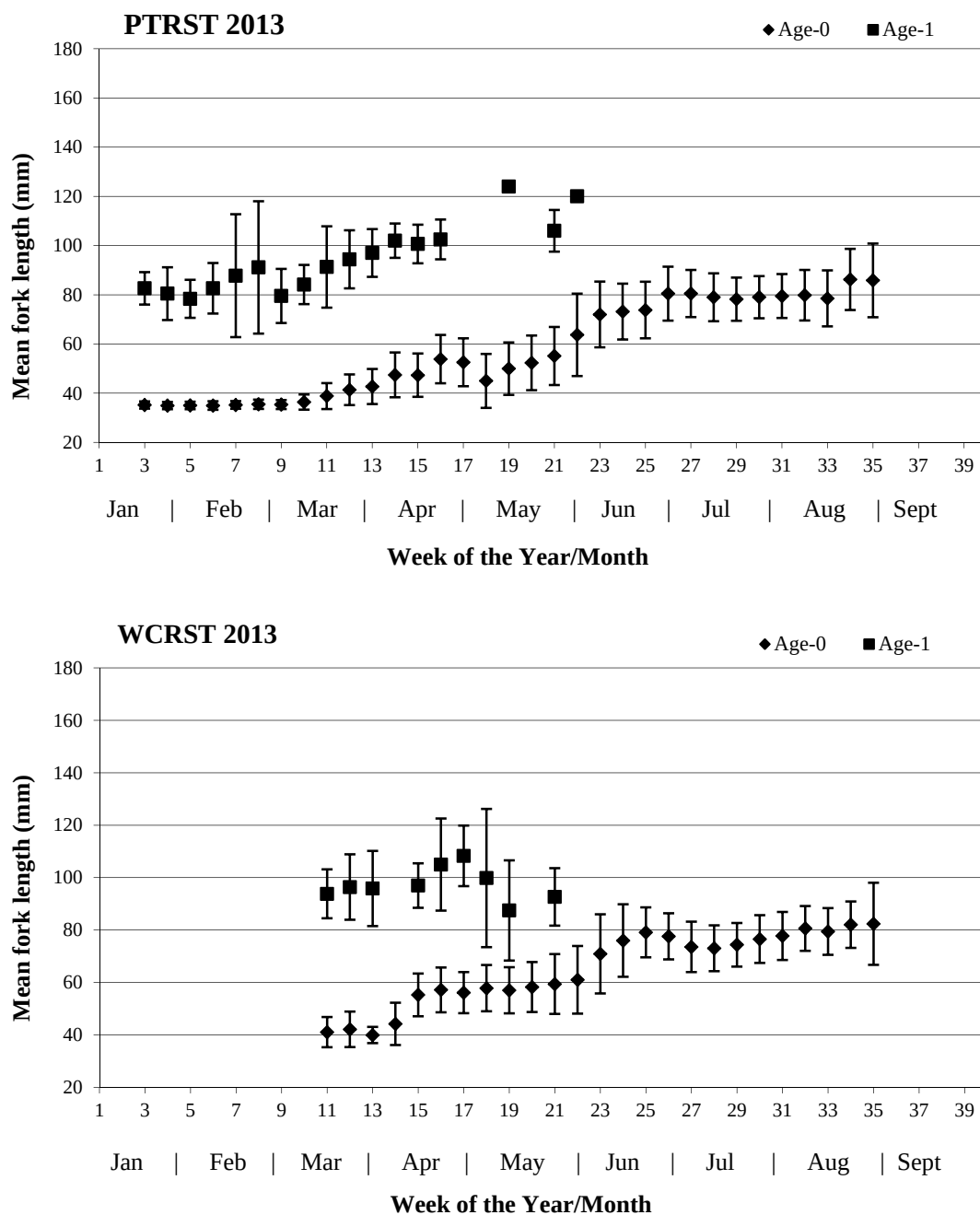


Figure 7. Weekly mean fork lengths of age-0 and age-1 Chinook salmon captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013. Error bars represent one standard deviation of the mean.

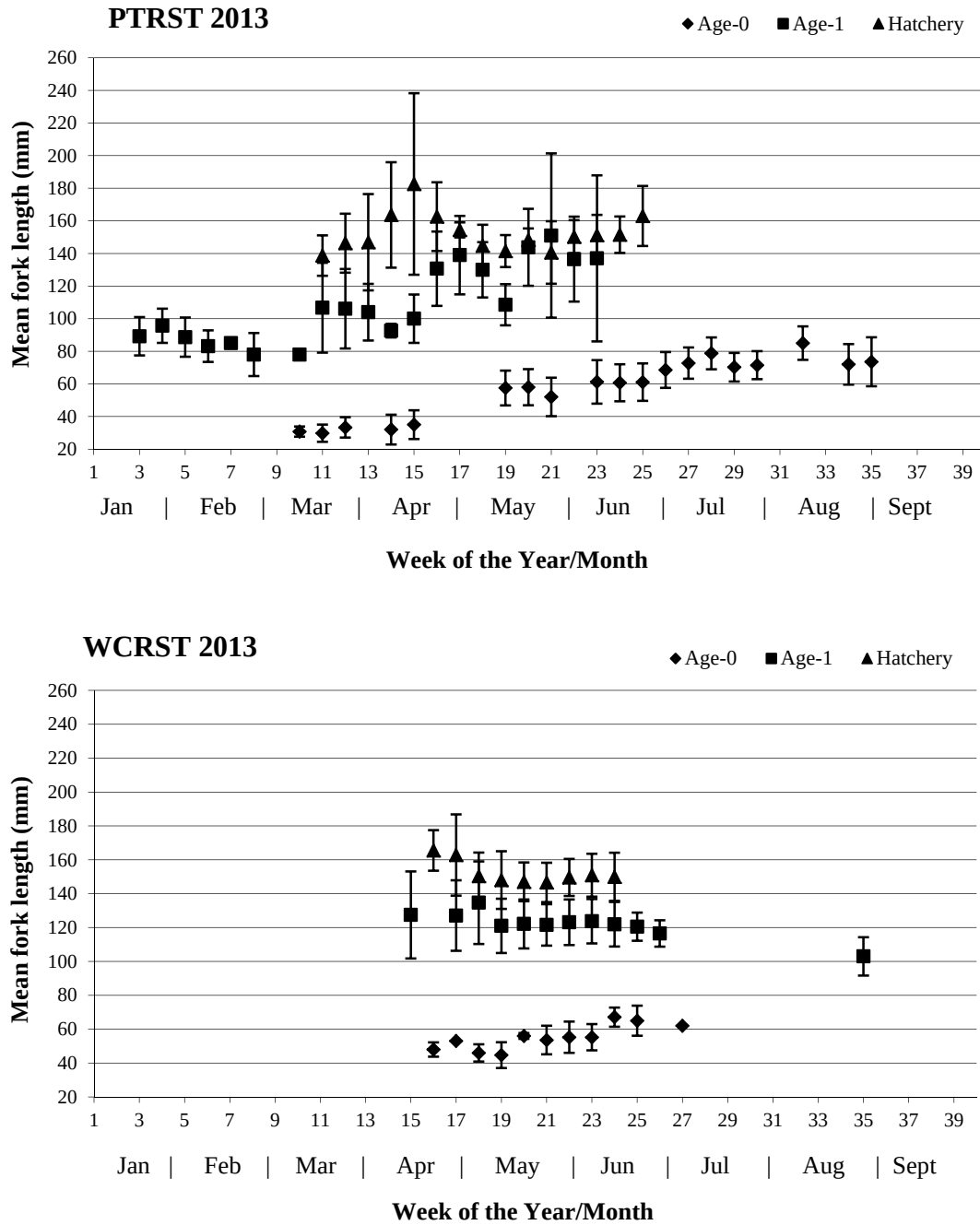


Figure 8. Weekly mean fork lengths for natural age-0, natural age-1, and hatchery coho salmon captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013. Error bars represent one standard deviation of the mean.

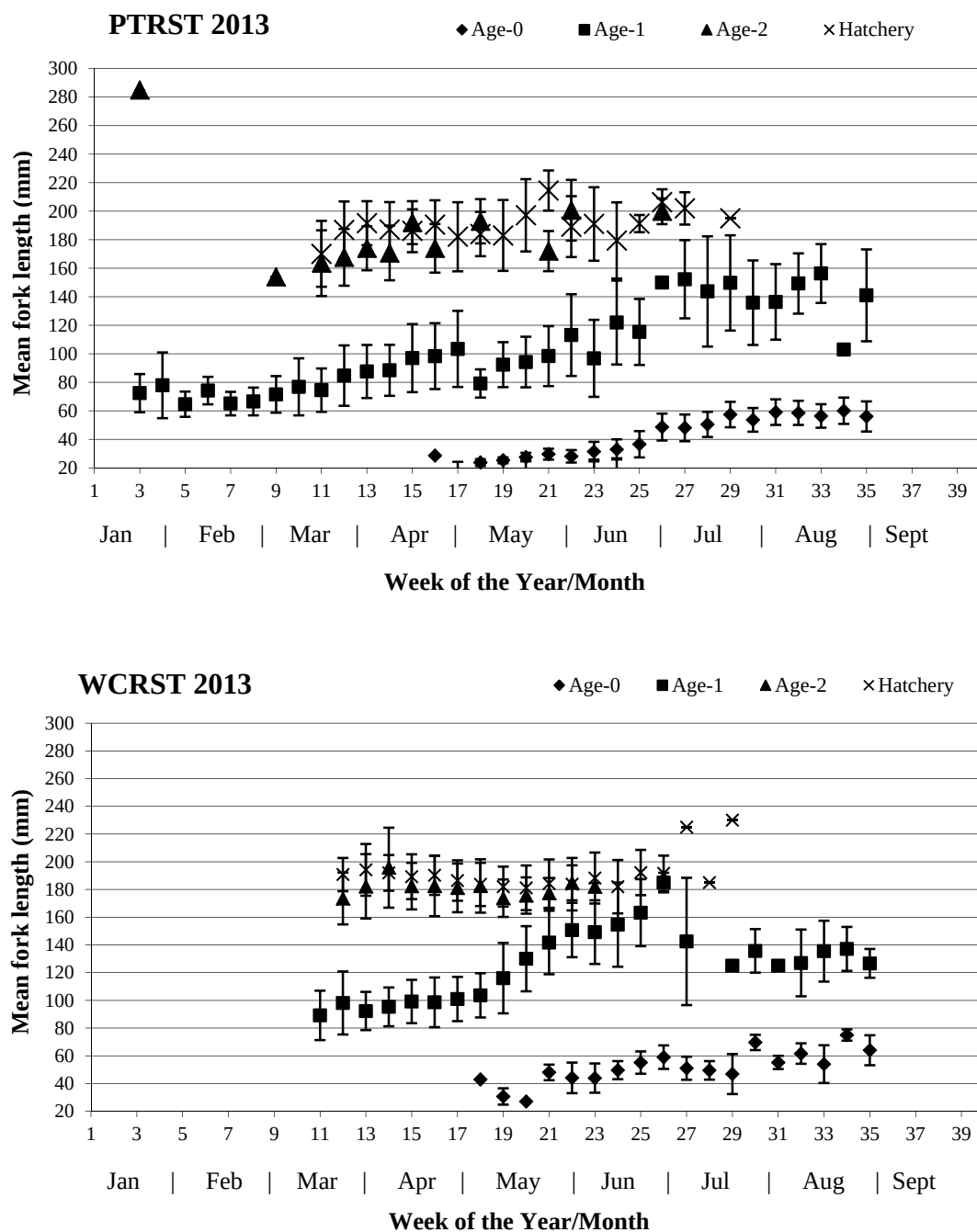


Figure 9. Weekly mean fork lengths for natural age-0, age-1, age-2, and hatchery age-1 steelhead captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013. Error bars represent one standard deviation of the mean.

Fish Condition

Fulton's condition factor ($K = 100,000 * (\text{weight} / \text{length}^3)$) was calculated on a subsample of age-0 Chinook salmon larger than 50 mm (Figure 10, Appendix 13), age-1 coho salmon (Figure 11, Appendix 14), and age 1+ steelhead (Figure 12, Appendix 15). Due to the inability to determine the origin of unmarked individuals, clipped and non-clipped juvenile Chinook salmon are pooled in weekly mean calculations. Weekly mean condition factor of juvenile Chinook salmon showed no trend through the season at Pear Tree and generally decreased at Willow Creek. Age-1 coho salmon condition factor data presented are hatchery and natural combined due to the small sample size of natural origin coho salmon. Weekly mean condition factor of juvenile coho salmon generally decreased at both sites. Weekly mean condition factor of steelhead decreased slightly at both sites through the season.

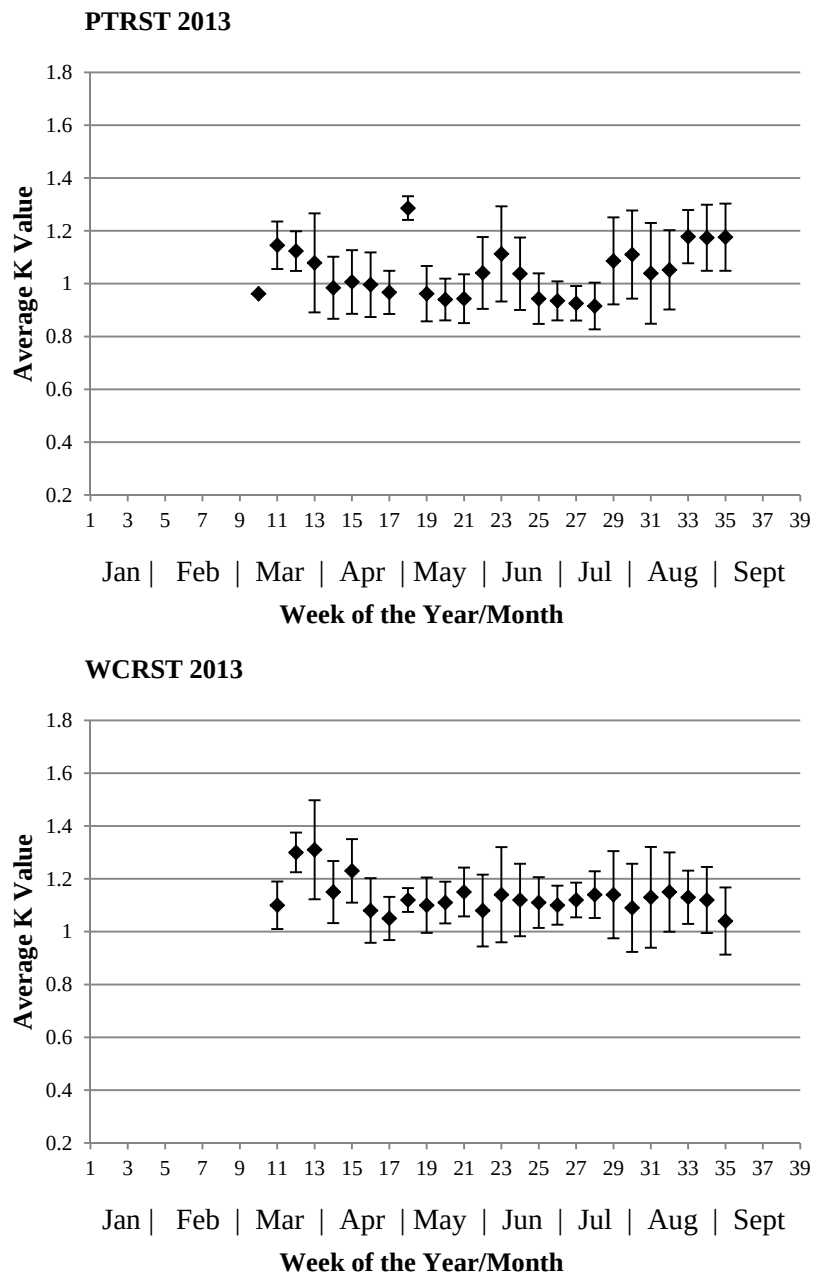


Figure 10. Weekly mean K value for age-0 Chinook salmon (pooled natural and hatchery) captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013. Error bars represent one standard deviation of the mean.

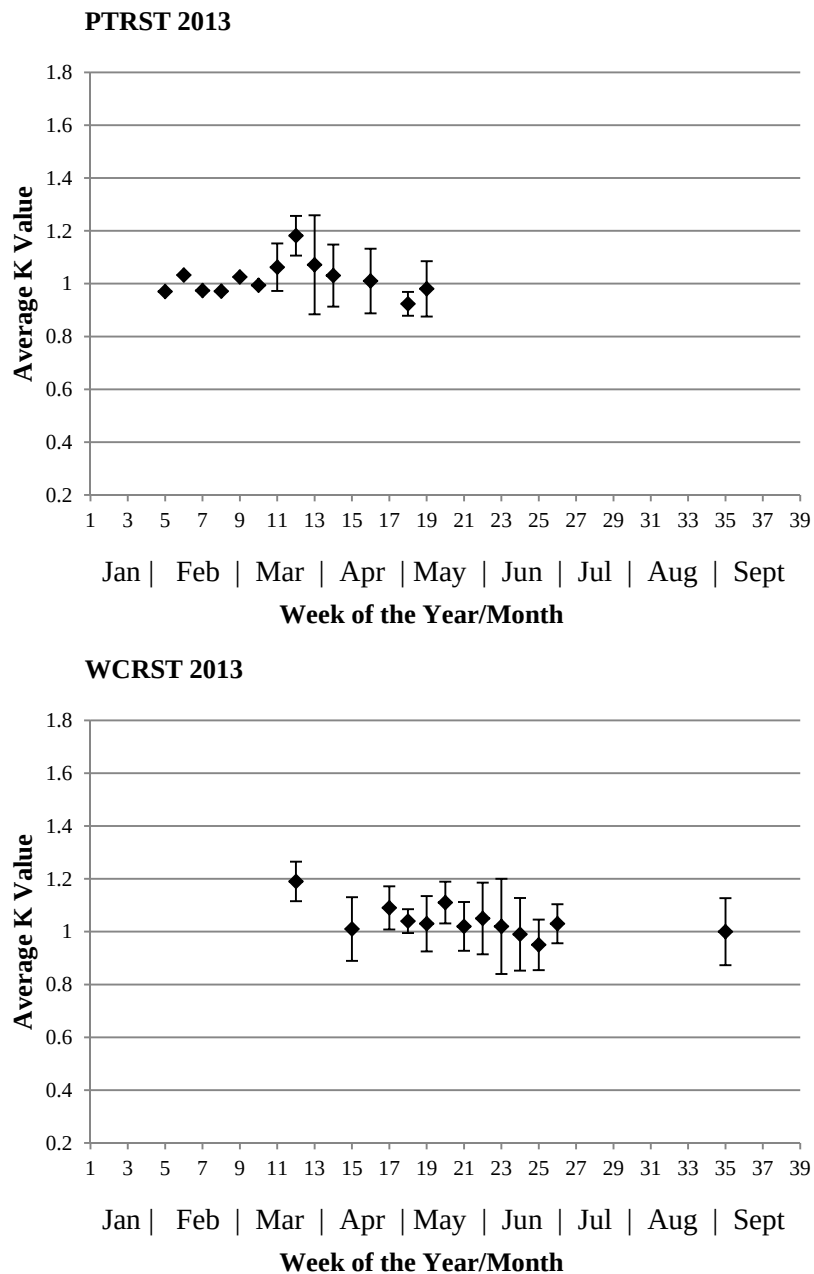


Figure 11. Weekly mean K value for natural age-1 coho salmon captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013. Error bars represent one standard deviation of the mean.

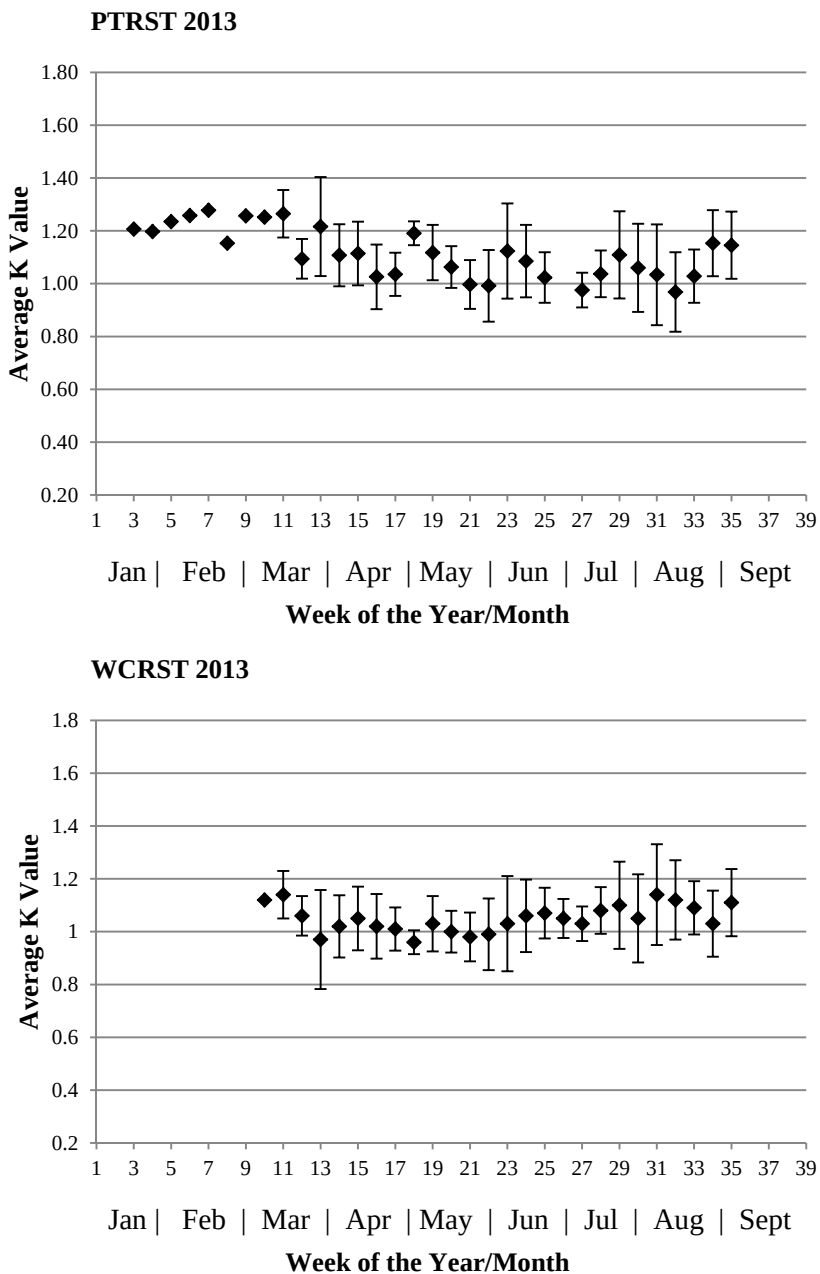


Figure 12. Weekly mean K value for natural age-1 steelhead captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2013. Error bars represent one standard deviation of the mean.

References

- Harris, N., P. Petros, and W.D. Pinnix. 2012. Juvenile Salmonid Monitoring on the Mainstem Trinity River, California, 2009. Yurok Tribal Fisheries Program, Hoopa Valley Tribal Fisheries Department, U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Data Series Report Number DS 2012-27, Arcata, California.
- Trinity River Restoration Program, ESSA Technologies Ltd. 2009. Integrated Assessment Plan, Version 1.0 – September 2009. Draft report prepared for the Trinity River Restoration Program, Weaverville, California 285 pp.
- United States Department of the Interior (USDOI). 2000. Record of Decision. Trinity River Mainstem Fishery Restoration Final Environmental Impact Statement/Environmental Impact Report. December 2000. 43 pp.

Acknowledgements

Special thanks to Al Andreoli, for allowing access through his property at the WCRST. In addition, the partners greatly appreciate the California Department of Fish and Wildlife and the Trinity River Hatchery staff for providing juvenile Chinook salmon and facilitating mark-recapture efforts.

Appendices

Appendix 1. Trinity River at Pear Tree rotary screw trap site weekly Chinook salmon catches and abundance indices, 2013. NC = no clip, AD = adipose fin clip.

Week Starting	Week of Year	Mean Daily Discharge (m ³ /s)	Trap Days Sampled	Weekly Chinook Salmon Catch							Weekly Chinook Salmon Indices					
				Hatchery			Natural		Total Catch		Hatchery			Natural		Index Total
				NC	AD	Age-1	Age-0	Age-1			NC	AD	Age-1	Age-0	Age-1	
1/15/2013	3	22	7	0	0	4	463	30	497		0	0	61	6,362	406	6,829
1/22/2013	4	35	14	0	0	4	1,745	22	1,771		0	0	39	15,978	199	16,216
1/30/2013	5	28	14	0	0	0	5,846	14	5,860		0	0	0	45,769	110	45,879
2/5/2013	6	24	14	0	0	4	9,005	11	9,020		0	0	30	63,935	76	64,041
2/12/2013	7	21	12	0	0	1	10,802	16	10,819		0	0	35	83,947	97	84,079
2/19/2013	8	20	12	0	0	0	5,432	8	5,440		0	0	0	40,291	59	40,350
2/26/2013	9	19	14	0	0	0	10,366	11	10,377		0	0	0	63,125	67	63,192
3/5/2013	10	22	14	0	0	0	18,403	36	18,439		0	0	0	126,107	247	126,354
3/12/2013	11	21	14	0	0	4	8,870	59	8,933		0	0	30	57,889	382	58,301
3/19/2013	12	22	12	0	0	6	1,394	26	1,426		0	0	65	10,746	181	10,992
3/26/2013	13	22	12	0	0	0	1,505	6	1,511		0	0	0	11,471	46	11,517
4/2/2013	14	31	14	0	0	0	12,504	3	12,507		0	0	0	105,043	25	105,068
4/9/2013	15	26	14	0	0	0	9,333	6	9,339		0	0	0	68,731	44	68,775
4/16/2013	16	25	14	0	0	1	4,963	5	4,969		0	0	30	36,995	14	37,039
4/23/2013	17	66	10	0	0	0	1,479	0	1,479		0	0	0	38,786	0	38,786
4/30/2013	18	108	8	0	0	0	1,134	0	1,134		0	0	0	57,340	0	57,340
5/7/2013	19	106	14	0	0	0	2,352	1	2,353		0	0	0	60,454	26	60,480
5/14/2013	20	77	13	0	0	0	2,362	0	2,362		0	0	0	51,331	0	51,331
5/21/2013	21	59	12	0	0	0	1,223	2	1,225		0	0	0	22,126	36	22,162
5/28/2013	22	45	12	3,108	933	0	4,069	1	8,111	39,676	11,913	0	0	51,967	13	103,569
6/4/2013	23	35	14	12,401	3,723	0	9,256	0	25,380	110,420	33,154	0	0	82,441	0	226,015
6/11/2013	24	26	14	6,608	1,984	0	4,111	0	12,703	48,482	14,557	0	0	30,167	0	93,206
6/18/2013	25	19	14	2,234	679	0	1,575	0	4,488	13,862	4,162	0	0	9,484	0	27,508
6/25/2013	26	19	14	1,537	461	0	1,080	0	3,078	8,992	2,700	0	0	6,334	0	18,026
7/2/2013	27	15	7	1,309	393	0	746	0	2,448	9,888	2,969	0	0	5,635	0	18,492
7/9/2013	28	14	7	1,276	383	0	684	0	2,343	7,327	2,200	0	0	3,929	0	13,456
7/16/2013	29	13	6	694	208	0	545	0	1,447	4,283	1,286	0	0	3,379	0	8,948
7/23/2013	30	13	7	741	222	0	322	0	1,285	3,773	1,133	0	0	1,654	0	6,560
7/30/2013	31	13	7	430	129	0	422	0	981	2,171	652	0	0	2,135	0	4,958
8/6/2013	32	13	6	206	64	0	100	0	370	1,222	367	0	0	533	0	2,122
8/13/2013	33	13	5	15	9	0	12	0	36	195	65	0	0	0	0	260
8/20/2013	34	19	6	35	13	0	39	0	87	393	118	0	0	281	0	792
8/27/2013	35	31	8	77	23	0	169	0	269	1,089	327	0	0	2,405	0	3,821
Totals			365	30,671	9,224	24	132,311	257	172,487	251,773	75,603	290	1,166,770	2,028	1,496,464	

Appendix 2. Trinity River at Willow Creek rotary screw trap site weekly Chinook salmon catches and abundance indices, 2013.
NC = no clip, AD = adipose fin clip.

Week Starting	Week of Year	Mean Daily Discharge (m ³ /s)	Trap Days Sampled	Weekly Chinook Salmon Catch						Weekly Chinook Salmon Indices					
				Hatchery			Natural		Total Catch	Hatchery			Natural		Index Total
				NC	AD	Age-1	Age-0	Age-1		NC	AD	Age-1	Age-0	Age-1	
3/12/2013	11	112	3	0	0	0	135	6	141	0	0	0	9,569	420	9,989
3/19/2013	12	113	7	0	0	3	125	46	174	0	0	371	3,984	1,180	5,535
3/26/2013	13	110	11	0	0	2	3,075	14	3,091	0	0	147	48,534	293	48,974
4/2/2013	14	102	10	0	0	0	2,440	0	2,440	0	0	0	55,188	0	55,188
4/9/2013	15	145	17	0	0	0	2,245	2	2,247	0	0	0	33,163	22	33,185
4/16/2013	16	118	21	0	0	0	3,640	5	3,645	0	0	0	38,282	48	38,330
4/23/2013	17	90	15	0	0	1	2,332	9	2,342	0	0	26	32,026	97	32,149
4/30/2013	18	114	13	0	0	3	6,014	4	6,021	0	0	144	144,823	22	144,989
5/7/2013	19	154	21	0	0	2	53,983	1	53,986	0	0	46	775,098	0	775,144
5/14/2013	20	145	21	0	0	0	26,433	0	26,433	0	0	0	305,866	0	305,866
5/21/2013	21	105	21	0	0	1	12,563	2	12,566	0	0	10	123,731	20	123,761
5/28/2013	22	87	21	0	0	0	14,869	1	14,870	26	8	0	127,293	9	127,336
6/4/2013	23	71	21	1,306	392	0	33,062	1	34,761	10,149	3,047	0	262,795	8	275,999
6/11/2013	24	55	21	7,017	2,107	0	43,014	0	52,138	42,878	12,873	0	266,364	0	322,115
6/18/2013	25	42	21	4,260	1,279	0	36,403	0	41,942	19,567	5,874	0	170,449	0	195,890
6/25/2013	26	33	15	2,864	860	0	24,283	0	28,007	18,795	5,643	0	161,895	0	186,333
7/2/2013	27	36	6	543	163	0	5,011	0	5,717	14,368	4,313	0	135,984	0	154,665
7/9/2013	28	27	10	503	151	0	1,818	0	2,472	4,378	1,314	0	16,247	0	21,939
7/16/2013	29	23	10	246	74	0	1,254	0	1,574	2,143	644	0	10,629	0	13,416
7/23/2013	30	22	10	110	33	0	510	0	653	931	279	0	4,336	0	5,546
7/30/2013	31	20	10	73	22	0	307	0	402	601	180	0	2,535	0	3,316
8/6/2013	32	20	10	60	18	0	364	0	442	485	146	0	2,880	0	3,511
8/13/2013	33	20	7	30	9	0	218	0	257	310	93	0	2,611	0	3,014
8/20/2013	34	20	10	37	11	0	328	0	376	322	97	0	2,828	0	3,247
8/27/2013	35	27	6	0	0	0	73	0	73	0	0	0	1,335	0	1,335
Totals			338	17,049	5,119	12	274,499	91	296,770	114,953	34,511	744	2,738,445	2,119	2,890,772

Appendix 3. Trinity River at Pear Tree rotary screw trap site weekly coho salmon catches and abundance indices, 2013.
R-MAX = right maxillary clip.

Week Starting	Week of Year	Mean Daily Discharge m3/s	Trap Days Sampled	Weekly Coho Salmon Catch				Weekly Coho Salmon Indices			
				Hatchery	Natural		Total Catch	Hatchery	Natural		Index Total
				R-MAX	Age-0	Age-1		R-MAX	Age-0	Age-1	
1/15/2013	3	22	7	0	0	13	13	0	0	179	179
1/22/2013	4	35	14	0	0	12	12	0	0	110	110
1/30/2013	5	28	14	0	0	6	6	0	0	47	47
2/5/2013	6	24	14	0	1	6	7	0	7	43	50
2/12/2013	7	21	12	0	0	1	1	0	0	8	8
2/19/2013	8	20	12	0	0	3	3	0	0	22	22
2/26/2013	9	19	14	0	0	0	0	0	0	0	0
3/5/2013	10	22	14	0	16	1	17	0	110	7	117
3/12/2013	11	21	14	333	22	26	381	2,173	144	170	2,487
3/19/2013	12	22	12	454	12	27	493	3,500	93	208	3,801
3/26/2013	13	22	12	17	0	9	26	130	0	69	199
4/2/2013	14	31	14	5	4	3	12	42	34	25	101
4/9/2013	15	26	14	5	1	3	9	37	7	22	66
4/16/2013	16	25	14	15	0	3	18	112	0	22	134
4/23/2013	17	66	10	5	0	2	7	131	0	52	183
4/30/2013	18	108	8	7	0	2	9	354	0	101	455
5/7/2013	19	106	14	9	2	6	17	231	51	154	436
5/14/2013	20	77	13	6	1	4	11	130	22	87	239
5/21/2013	21	59	12	5	1	4	10	90	18	72	180
5/28/2013	22	45	12	36	0	6	42	460	0	77	537
6/4/2013	23	35	14	14	5	2	21	125	45	18	188
6/11/2013	24	26	14	4	22	0	26	29	161	0	190
6/18/2013	25	19	14	2	12	1	15	12	74	6	92
6/25/2013	26	19	14	0	24	0	24	0	141	0	141
7/2/2013	27	15	7	0	12	0	12	0	91	0	91
7/9/2013	28	14	7	0	17	0	17	0	98	0	98
7/16/2013	29	13	6	0	4	0	4	0	25	0	25
7/23/2013	30	13	7	0	2	0	2	0	10	0	10
7/30/2013	31	13	7	0	0	0	0	0	0	0	0
8/6/2013	32	13	6	0	1	0	1	0	6	0	6
8/13/2013	33	13	5	0	0	0	0	0	0	0	0
8/20/2013	34	19	6	0	1	0	1	0	9	0	9
8/27/2013	35	31	8	0	7	0	7	0	95	0	95
Total			365	917	169	138	1,224	7,556	1,273	1,468	10,297

Appendix 4. Trinity River at Willow Creek rotary screw trap site weekly coho salmon catches, and abundance indices, 2013.
R-MAX = right maxillary clip.

Week Starting	Week of Year	Mean Daily Discharge m ³ /s	Trap Days Sampled	Weekly Coho Salmon Catch				Weekly Coho Salmon Indices			
				Hatchery	Natural		Total Catch	Hatchery	Natural		Index Total
				R-MAX	Age-0	Age-1		R-MAX	Age-0	Age-1	
3/12/2013	11	112	3	1	0	1	2	75	0	70	145
3/19/2013	12	113	7	425	1	1	427	13,328	32	32	13,392
3/26/2013	13	110	11	4	0	1	5	95	0	15	110
4/2/2013	14	102	10	30	3	26	59	749	69	648	1,466
4/9/2013	15	145	17	4	0	15	19	59	0	236	295
4/16/2013	16	118	21	4	2	0	6	44	20	0	64
4/23/2013	17	90	15	264	1	14	279	3,593	14	184	3,791
4/30/2013	18	114	13	545	5	40	590	14,461	94	916	15,471
5/7/2013	19	154	21	242	3	53	298	3,487	41	745	4,273
5/14/2013	20	145	21	418	3	62	483	4,720	37	710	5,467
5/21/2013	21	105	21	345	5	78	428	3,383	49	758	4,190
5/28/2013	22	87	21	225	8	50	283	1,951	71	445	2,467
6/4/2013	23	71	21	69	11	16	96	554	87	128	769
6/11/2013	24	55	21	25	9	18	52	160	63	103	326
6/18/2013	25	42	21	4	4	7	15	20	19	34	73
6/25/2013	26	33	15	0	0	2	2	0	0	13	13
7/2/2013	27	36	6	1	1	0	2	19	19	0	38
7/9/2013	28	27	10	0	0	0	0	0	0	0	0
7/16/2013	29	23	10	0	0	0	0	0	0	0	0
7/23/2013	30	22	10	0	0	0	0	0	0	0	0
7/30/2013	31	20	10	0	0	0	0	0	0	0	0
8/6/2013	32	20	10	0	0	0	0	0	0	0	0
8/13/2013	33	20	7	0	0	0	0	0	0	0	0
8/20/2013	34	20	10	0	0	0	0	0	0	0	0
8/27/2013	35	27	6	0	0	2	2	0	0	33	33
Totals			338	2,606	56	386	3,048	46,698	615	5,070	52,383

Appendix 5. Trinity River at Pear Tree rotary screw trap site weekly steelhead catches and abundance indices, 2013. AD = adipose fin clip.

Week Starting	Week of Year	Mean Daily Discharge m3/s	Trap Days Sampled	Weekly Steelhead Catch					Weekly Steelhead Abundance Indices						
				Hatchery	Natural				Catch Total	Hatchery	Natural				Index Total
				AD	Age-0	Age-1	Age-2+	AD		Age-0	Age-1	Age-2+			
1/15/2013	3	22	7	0	0	5	1	6	0	0	69	14	83		
1/22/2013	4	35	14	0	0	16	0	16	0	0	147	0	147		
1/30/2013	5	28	14	0	0	11	0	11	0	0	86	0	86		
2/5/2013	6	24	14	0	0	12	0	12	0	0	85	0	85		
2/12/2013	7	21	12	0	0	11	0	11	0	0	85	0	85		
2/19/2013	8	20	12	0	0	5	0	5	0	0	37	0	37		
2/26/2013	9	19	14	0	0	41	1	42	0	0	250	6	256		
3/5/2013	10	22	14	0	0	89	0	89	0	0	610	0	610		
3/12/2013	11	21	14	32	2	214	5	253	209	13	1,397	33	1,652		
3/19/2013	12	22	12	304	12	124	3	443	2,344	93	956	23	3,416		
3/26/2013	13	22	12	203	0	66	1	270	1,547	0	503	8	2,058		
4/2/2013	14	31	14	183	11	186	4	384	1,537	92	1,563	34	3,226		
4/9/2013	15	26	14	141	0	48	1	190	1,038	0	353	7	1,398		
4/16/2013	16	25	14	150	3	26	1	180	1,118	22	194	7	1,341		
4/23/2013	17	66	10	12	1	7	0	20	315	26	184	0	525		
4/30/2013	18	108	8	3	14	5	2	24	152	708	253	101	1,214		
5/7/2013	19	106	14	6	64	13	0	83	154	1,645	334	0	2,133		
5/14/2013	20	77	13	12	166	13	0	191	261	3,608	283	0	4,152		
5/21/2013	21	59	12	9	105	13	1	128	163	1,900	235	18	2,316		
5/28/2013	22	45	12	82	122	31	7	242	1,047	1,558	396	89	3,090		
6/4/2013	23	35	14	53	91	35	0	179	472	810	312	0	1,594		
6/11/2013	24	26	14	17	102	17	0	136	125	748	125	0	998		
6/18/2013	25	19	14	3	41	3	0	47	18	251	18	0	287		
6/25/2013	26	19	14	3	46	2	1	52	18	269	12	6	305		
7/2/2013	27	15	7	2	51	7	0	60	15	385	53	0	453		
7/9/2013	28	14	7	2	43	6	1	52	11	247	34	6	298		
7/16/2013	29	13	6	1	34	10	0	45	6	210	62	0	278		
7/23/2013	30	13	7	0	88	8	0	96	0	449	41	0	490		
7/30/2013	31	13	7	0	148	5	0	153	0	745	25	0	770		
8/6/2013	32	13	6	0	140	3	0	143	0	796	17	0	813		
8/13/2013	33	13	5	0	19	3	0	22	0	136	22	0	158		
8/20/2013	34	19	6	0	35	1	0	36	0	315	9	0	324		
8/27/2013	35	31	8	0	289	6	0	295	0	3,941	82	0	4,023		
Total			365	1,218	1,627	1,042	29	3,916	10,550	18,967	8,832	352	38,701		

Appendix 6. Trinity River at Willow Creek rotary screw trap site weekly steelhead catches and abundance indices, 2013.
AD = adipose fin clip.

Week Starting	Week of Year	Mean Daily Discharge m3/s	Trap Days Sampled	Weekly Steelhead Catch					Weekly Steelhead Abundance Indices				
				Hatchery	Natural			Catch	Hatchery	Natural			Index
				AD	Age-0	Age-1	Age-2+	Total	AD	Age-0	Age-1	Age-2+	Total
3/12/2013	11	112	3	0	0	19	0	19	0	0	1,337	0	1,337
3/19/2013	12	113	7	26	0	82	16	124	817	0	2,607	505	3,929
3/26/2013	13	110	11	37	0	230	18	285	678	0	3,620	368	4,666
4/2/2013	14	102	10	611	0	440	23	1,074	14,956	0	10,227	556	25,739
4/9/2013	15	145	17	408	0	664	45	1,117	5,697	0	8,804	563	15,064
4/16/2013	16	118	21	679	0	395	162	1,236	7,049	0	4,117	1,726	12,892
4/23/2013	17	90	15	892	0	327	88	1,307	12,208	0	4,428	1,255	17,891
4/30/2013	18	114	13	776	1	161	87	1,025	18,091	22	3,187	2,139	23,439
5/7/2013	19	154	21	491	25	235	70	821	7,019	390	3,472	997	11,878
5/14/2013	20	145	21	879	2	486	125	1,492	9,888	24	5,417	1,398	16,727
5/21/2013	21	105	21	834	2	529	115	1,480	8,204	20	5,170	1,137	14,531
5/28/2013	22	87	21	336	23	152	33	544	2,933	192	1,319	293	4,737
6/4/2013	23	71	21	104	97	47	5	253	838	773	379	41	2,031
6/11/2013	24	55	21	50	138	41	0	229	318	891	240	0	1,449
6/18/2013	25	42	21	23	64	12	0	99	105	295	57	0	457
6/25/2013	26	33	15	3	170	26	0	199	20	1,128	171	0	1,319
7/2/2013	27	36	6	1	30	2	0	33	40	868	58	0	966
7/9/2013	28	27	10	1	9	2	0	12	10	83	18	0	111
7/16/2013	29	23	10	1	6	1	0	8	7	52	7	0	66
7/23/2013	30	22	10	0	5	7	0	12	0	41	60	0	101
7/30/2013	31	20	10	0	5	4	0	9	0	43	32	0	75
8/6/2013	32	20	10	0	12	2	0	14	0	97	17	0	114
8/13/2013	33	20	7	0	15	2	0	17	0	161	21	0	182
8/20/2013	34	20	10	0	4	17	0	21	0	38	139	0	177
8/27/2013	35	27	6	0	97	3	0	100	0	1,948	65	0	2,013
Total			338	6,152	705	3,886	787	11,530	88,878	7,066	54,969	10,978	161,891

Appendix 7. Trinity River at Pear Tree rotary screw trap site weekly age-0 Chinook salmon population estimate input and results, 2013. NC = no clip, AD = adipose fin clip.

Week Starting	Week of Year	Sampling Fraction ¹	Catch NC	Catch AC	Marks Released	Marks Recaptured	Recapture Rate	Estimated Natural	SD Natural	Estimated Hatchery	SD Hatchery
1/15/2013	3	0.57	463	0	0	----	----	40,502	30,022	0	0
1/22/2013	4	1	1,745	0	0	----	----	47,992	19,973	0	0
1/30/2013	5	1	5,846	0	0	----	----	128,239	68,160	0	0
2/5/2013	6	1	9,005	0	494	30	0.06	140,871	23,163	0	0
2/12/2013	7	0.86	10,802	0	482	42	0.09	143,927	23,462	0	0
2/19/2013	8	0.86	5,432	0	508	48	0.09	69,754	8,995	0	0
2/26/2013	9	1	10,366	0	504	57	0.11	94,004	10,424	0	0
3/5/2013	10	1	18,403	0	927	100	0.11	169,093	15,436	0	0
3/12/2013	11	1	8,870	0	449	50	0.11	82,614	9,982	0	0
3/19/2013	12	0.86	1,394	0	865	93	0.11	15,933	1,661	0	0
3/26/2013	13	0.86	1,505	0	961	117	0.12	15,127	1,403	0	0
4/2/2013	14	1	12,504	0	892	85	0.1	131,948	13,640	0	0
4/9/2013	15	1	9,333	0	923	81	0.09	107,919	11,658	0	0
4/16/2013	16	1	4,963	0	460	27	0.06	87,584	17,357	0	0
4/23/2013	17	0.71	1,479	0	1,986	13	0.01	248,662	58,570	0	0
4/30/2013	18	0.57	1,134	0	2,241	28	0.01	149,093	27,348	0	0
5/7/2013	19	1	2,352	0	4,720	76	0.02	144,718	16,132	0	0
5/14/2013	20	1	2,362	0	2,447	32	0.01	174,986	27,096	0	0
5/21/2013	21	0.86	1,223	0	1,962	32	0.02	87,121	14,528	0	0
5/28/2013	22	0.86	7,177	933	1,780	74	0.04	116,605	13,939	116,374	14,186
6/4/2013	23	1	21,657	3,723	1,843	12	0.01	88,376	20,284	154,203	34,960
6/11/2013	24	1	10,719	1,984	1,924	78	0.04	97,651	10,905	205,105	20,979
6/18/2013	25	1	3,809	679	1,978	68	0.03	44,027	5,724	84,555	9,841
6/25/2013	26	1	2,617	461	1,941	160	0.08	13,381	1,476	24,689	2,185
7/2/2013	27	0.71	2,055	393	545	42	0.08	13,521	2,351	31,008	4,837
7/9/2013	28	1	1,960	383	1,001	110	0.11	6,364	896	15,408	1,546
7/16/2013	29	0.86	1,239	208	825	74	0.09	7,078	1,047	12,026	1,517
7/23/2013	30	1	1,063	222	962	161	0.17	1,998	369	5,885	570
7/30/2013	31	1	852	129	998	100	0.1	4,113	608	5,680	733
8/6/2013	32	0.86	306	64	807	61	0.08	1,417	460	4,467	736
8/13/2013	33	0.71	27	9	843	6	0.01	1,051	602	4,402	1,588
8/20/2013	34	0.86	74	13	2,489	235	0.09	441	132	709	147
8/27/2013	35	0.57	246	23	4,946	319	0.06	4,512	511	2,677	458
Total			162,982	9,224	43,703	2,411	0.06	2,480,622	131,529	667,188	47,178

¹Sampling Fraction is the proportion of week days sampled.

Appendix 8. Trinity River at Willow Creek rotary screw trap site weekly age-0 Chinook salmon population estimate input and results, 2013. NC = no clip, AD = adipose fin clip.

Week Starting	Week of Year	Sampling Fraction ¹	Catch NC	Catch AC	Marks Released	Marks Recaptured	Recapture Rate	Estimated Natural	SD Natural	Estimated Hatchery	SD Hatchery
3/12/2013	11	0.43	135	0	872	23	0.026	33,941	6,476	---	---
3/19/2013	12	0.50	125	0	1,035	19	0.018	19,325	4,190	---	---
3/26/2013	13	0.79	3,075	0	953	53	0.056	102,814	13,614	---	---
4/2/2013	14	0.71	2,440	0	729	62	0.085	61,894	7,415	---	---
4/9/2013	15	0.81	2,245	0	791	26	0.033	80,026	14,177	---	---
4/16/2013	16	1.00	3,640	0	956	133	0.139	26,947	2,265	---	---
4/23/2013	17	0.71	2,332	0	1,393	117	0.084	39,592	3,543	---	---
4/30/2013	18	0.93	6,014	0	4,723	642	0.136	71,771	2,692	---	---
5/7/2013	19	1.00	53,983	0	4,771	230	0.048	1,098,875	63,746	---	---
5/14/2013	20	1.00	26,433	0	1,820	106	0.058	450,297	38,038	---	---
5/21/2013	21	1.00	12,563	0	1,792	213	0.119	108,078	7,306	---	---
5/28/2013	22	1.00	14,869	0	903	59	0.065	230,876	30,477	---	---
6/4/2013	23	1.00	34,368	392	396	10	0.025	265,560	69,448	13,633	3,693
6/11/2013	24	1.00	50,031	2,107	1,084	137	0.126	345,929	25,723	111,328	21,846
6/18/2013	25	1.00	40,663	1,279	939	75	0.08	438,930	31,185	80,118	7,511
6/25/2013	26	0.71	27,147	860	961	60	0.062	521,386	45,909	73,314	5,661
7/2/2013	27	0.43	5,554	163	992	22	0.022	787,963	146,880	66,824	5,158
7/9/2013	28	0.71	2,321	151	---	---	---	57,250	19,812	20,630	7,280
7/16/2013	29	0.71	1,500	74	910	108	0.119	22,919	2,263	5,875	739
7/23/2013	30	0.71	620	33	713	72	0.101	11,072	1,347	3,165	522
7/30/2013	31	0.71	380	22	738	67	0.091	8,218	1,052	2,581	454
8/6/2013	32	0.71	424	18	873	60	0.069	11,215	1,435	2,434	490
8/13/2013	33	0.50	248	9	717	15	0.021	23,907	5,138	3,996	1,113
8/20/2013	34	0.71	365	11	946	172	0.182	3,881	317	556	121
8/27/2013	35	0.43	73	0	---	---	---	6,178	4,444	60	80
Total			291,548	5,119	30,007	2,481	0.077	4,828,842	548,891	384,512	54,666

¹Sampling Fraction is the proportion of trap days sampled during the week.

Appendix 9. Trinity River at Pear Tree rotary screw trap site weekly Chinook and coho salmon fork lengths, 2013.

Week Starting	Week of Year	Chinook Salmon*										Natural Coho Salmon										Hatchery Coho Salmon				
		Age-0					Age-1					Age-0					Age-1					Age-1				
		n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD
1/15/2013	3	133	35.2	32	39	1.46	34	82.6	72	99	6.59	0	---	---	---	---	13	89.2	64	105	11.74	0	---	---	---	---
1/22/2013	4	385	35	30	39	1.49	26	80.5	64	103	10.7	0	---	---	---	---	9	95.7	81	108	10.46	0	---	---	---	---
1/30/2013	5	420	35	31	40	1.51	14	78.4	70	98	7.71	0	---	---	---	---	6	88.7	73	109	12.04	0	---	---	---	---
2/5/2013	6	421	35	30	44	1.72	15	82.7	67	104	10.27	0	---	---	---	---	6	83.2	73	98	9.66	0	---	---	---	---
2/12/2013	7	360	35.2	30	40	1.56	17	87.8	72	155	24.98	0	---	---	---	---	1	85	85	85	---	0	---	---	---	---
2/19/2013	8	360	35.5	26	47	1.87	8	91.1	72	154	26.91	0	---	---	---	---	3	78	63	88	13.23	0	---	---	---	---
2/26/2013	9	420	35.4	27	42	1.81	11	79.5	67	102	11	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
3/5/2013	10	420	36.4	30	55	3.09	36	84.2	68	101	7.95	16	30.8	28	33	1.39	1	78	78	78	---	0	---	---	---	---
3/12/2013	11	420	38.8	32	58	5.28	63	91.3	69	149	16.52	22	29.8	27	32	1.66	26	106.7	70	160	27.56	79	138.7	110	180	12.4
3/19/2013	12	335	41.4	30	60	6.26	32	94.4	73	117	11.82	12	33.3	29	53	6.39	27	106.1	73	168	24.37	133	147.7	120	220	15.13
3/26/2013	13	310	42.7	33	65	7.11	6	97	82	110	9.7	0	---	---	---	---	8	104	93	145	17.35	17	146.9	116	250	29.55
4/2/2013	14	409	47.4	33	75	9.11	3	102	95	109	7	1	32	32	32	---	3	92.7	88	96	4.16	5	163.6	138	218	32.35
4/9/2013	15	434	47.3	32	82	8.82	6	100.7	90	110	7.84	1	35	35	35	---	3	100	83	110	14.8	5	182.6	148	280	55.68
4/16/2013	16	363	53.9	32	77	9.83	6	102.5	93	111	8.09	0	---	---	---	---	3	130.7	117	157	22.81	15	162.6	134	198	21.08
4/23/2013	17	281	52.6	32	79	9.73	0	---	---	---	---	0	---	---	---	---	2	139	122	156	24.04	5	154.4	150	162	4.62
4/30/2013	18	248	45	27	93	11	0	---	---	---	---	0	---	---	---	---	2	130	118	142	16.97	7	144.7	125	163	12.92
5/7/2013	19	434	50	32	89	10.7	1	124	124	124	---	2	57.5	54	61	4.95	6	108.5	88	120	12.61	9	141.4	125	159	9.84
5/14/2013	20	449	52.3	34	95	11.1	0	---	---	---	---	1	58	58	58	---	4	143.8	109	160	23.63	6	148.3	140	161	6.98
5/21/2013	21	357	55.1	32	94	11.8	2	106	100	112	8.49	1	52	52	52	---	4	151	103	196	50.38	5	140.6	109	157	19.2
5/28/2013	22	466	63.7	34	103	16.7	1	120	120	120	---	0	---	---	---	---	6	136.5	115	188	26.04	36	150.3	130	170	10.13
6/4/2013	23	948	72	30	104	13.3	0	---	---	---	---	4	61.3	55	70	6.29	2	137	101	173	50.91	14	151.2	130	175	12.45
6/11/2013	24	768	73.2	39	104	11.4	0	---	---	---	---	22	60.7	45	75	8.45	0	---	---	---	---	4	151.5	138	165	11.21
6/18/2013	25	726	73.8	44	105	11.5	0	---	---	---	---	12	61.1	50	73	7.14	1	---	---	---	---	2	163	150	176	18.38
6/25/2013	26	684	80.4	43	105	10.8	1	128	128	128	---	24	68.6	40	90	10	0	---	---	---	---	0	---	---	---	---
7/2/2013	27	401	80.5	48	110	9.6	0	---	---	---	---	12	72.8	63	82	6.85	0	---	---	---	---	0	---	---	---	---
7/9/2013	28	257	79	50	105	9.73	0	---	---	---	---	12	78.8	72	90	6.38	0	---	---	---	---	0	---	---	---	---
7/16/2013	29	335	78.2	54	113	8.78	0	---	---	---	---	4	70.3	62	75	5.91	0	---	---	---	---	0	---	---	---	---
7/23/2013	30	394	79	55	107	8.55	0	---	---	---	---	2	71.5	70	73	2.12	0	---	---	---	---	0	---	---	---	---
7/30/2013	31	325	79.5	46	118	8.93	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
8/6/2013	32	244	79.8	55	128	10.3	0	---	---	---	---	1	85	85	85	---	0	---	---	---	---	0	---	---	---	---
8/13/2013	33	36	78.5	58	120	11.4	0	---	---	---	---	0	0	0	0	0	0	---	---	---	---	0	---	---	---	---
8/20/2013	34	86	86.2	66	128	12.4	0	---	---	---	---	1	72	72	72	---	0	---	---	---	---	0	---	---	---	---
8/27/2013	35	181	85.9	52	120	15	0	---	---	---	---	7	73.6	49	85	11.5	0	---	---	---	---	0	---	---	---	---

*Natural and Hatchery combined

Appendix 10. Trinity River at Willow Creek rotary screw trap site weekly Chinook and coho salmon fork lengths, 2013.

Week Starting	Week of Year	Chinook Salmon*										Natural Coho Salmon										Hatchery Coho Salmon				
		Age-0					Age-1					Age-0					Age-1					Age-1				
		n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD
3/12/2013	11	84	41.1	34	60	5.75	6	93.8	82	105	9.33	0	0	0	0	----	1	103	103	103	----	1	161	161	161	----
3/19/2013	12	106	42.2	30	62	6.76	49	96.4	76	134	12.48	1	35	35	35	----	1	148	148	148	----	156	148.8	120	257	17.69
3/26/2013	13	267	40	35	65	3.07	16	95.9	62	120	14.34	0	0	0	0	----	1	123	123	123	----	4	143.3	134	158	10.31
4/2/2013	14	256	44.2	35	74	8.05	0	0	0	0	----	3	33.3	32	35	1.53	1	80	80	80	----	4	158.3	125	187	25.84
4/9/2013	15	404	55.3	36	75	8.15	2	97	91	103	8.49	0	0	0	0	----	15	127.5	66	159	25.67	4	139	128	152	10.17
4/16/2013	16	562	57.2	36	78	8.54	5	105	86	130	17.55	2	48	45	51	4.24	0	0	0	0	----	4	165.5	150	179	11.96
4/23/2013	17	471	56.2	35	79	7.85	10	108.3	83	120	11.54	1	53	53	53	----	14	127.1	110	184	20.82	216	162.8	102	250	23.99
4/30/2013	18	356	57.9	36	80	8.83	7	99.9	72	133	26.35	5	46	40	52	5.1	40	134.7	93	210	24.39	212	150.3	113	210	13.94
5/7/2013	19	508	57	36	91	8.79	2	87.5	74	101	19.09	3	44.7	38	53	7.64	44	121	90	168	16.03	189	148	109	262	17.02
5/14/2013	20	600	58.3	40	95	9.51	0	0	0	0	----	3	56	55	58	1.73	51	122.1	90	152	14.44	323	147	113	200	11.46
5/21/2013	21	601	59.4	37	101	11.4	3	92.7	80	99	10.97	5	53.6	44	64	8.44	78	121.6	102	186	12.22	295	146.6	120	187	11.62
5/28/2013	22	568	61	34	95	12.89	0	---	---	---	----	8	55.3	40	70	9.22	46	123.1	92	155	13.45	186	149.6	113	184	10.93
6/4/2013	23	640	70.9	39	102	15.08	0	---	---	---	----	8	55.3	45	68	7.74	15	123.7	103	148	13.13	56	150.9	125	195	12.64
6/11/2013	24	625	76	40	110	13.82	0	---	---	---	----	8	67.1	60	75	5.64	17	121.9	100	145	13.15	20	150	135	190	14.2
6/18/2013	25	766	79.2	46	100	9.53	0	---	---	---	----	3	65	58	75	8.89	6	120.5	108	130	8.31	4	151.3	145	155	4.79
6/25/2013	26	533	77.6	45	100	8.79	0	---	---	---	----	0	0	0	0	----	2	116.5	111	122	7.78	0	0	0	0	----
7/2/2013	27	295	73.6	44	100	9.61	0	---	---	---	----	1	62	62	62	----	0	---	---	---	----	1	135	135	135	----
7/9/2013	28	451	73.1	40	104	8.73	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----
7/16/2013	29	320	74.4	45	95	8.31	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----
7/23/2013	30	200	76.6	40	110	9.12	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----
7/30/2013	31	192	77.8	44	101	9.17	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----
8/6/2013	32	179	80.6	48	105	8.54	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----
8/13/2013	33	142	79.5	45	100	8.89	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----
8/20/2013	34	197	82.1	48	108	8.85	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----	0	---	---	---	----
8/27/2013	35	73	82.4	44	115	15.64	0	---	---	---	----	0	---	---	---	----	2	103	95	111	11.31	0	---	---	---	----

*Natural and Hatchery combined.

Appendix 11: Trinity River at Pear Tree rotary screw trap site weekly steelhead fork lengths, 2013.

Week Starting	Week of Year	Natural Steelhead															Hatchery Steelhead				
		Age-0					Age-1					Age-2					Age-1				
		n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD
1/15/2013	3	0	---	---	---	---	5	72.4	56	93	13.35	1	285	285	285	---	0	---	---	---	---
1/22/2013	4	0	---	---	---	---	15	77.9	50	133	23.07	0	---	---	---	---	0	---	---	---	---
1/30/2013	5	0	---	---	---	---	11	64.6	51	76	8.88	0	---	---	---	---	0	---	---	---	---
2/5/2013	6	0	---	---	---	---	12	74.2	61	88	9.63	0	---	---	---	---	0	---	---	---	---
2/12/2013	7	0	---	---	---	---	10	65.1	54	78	8.24	0	---	---	---	---	0	---	---	---	---
2/19/2013	8	0	---	---	---	---	5	66.6	51	75	9.76	0	---	---	---	---	0	---	---	---	---
2/26/2013	9	0	---	---	---	---	41	71.5	50	96	12.8	1	154	154	154	---	0	---	---	---	---
3/5/2013	10	0	---	---	---	---	89	76.8	44	137	19.97	0	---	---	---	---	0	---	---	---	---
3/12/2013	11	0	---	---	---	---	201	74.5	47	138	15.18	5	163.6	153	180	10.55	32	170.1	90	200	23.07
3/19/2013	12	0	---	---	---	---	124	84.7	48	152	21.19	3	167.7	158	180	11.24	132	186.9	121	237	19.9
3/26/2013	13	0	---	---	---	---	65	87.6	57	147	18.6	1	174	174	174	---	97	191.6	130	225	15.39
4/2/2013	14	0	---	---	---	---	115	88.4	50	150	17.86	4	170.8	164	178	7.27	102	187.2	130	235	19.19
4/9/2013	15	0	---	---	---	---	48	97	65	165	23.9	1	192	192	192	---	96	186.3	125	221	15.05
4/16/2013	16	3	28.7	28	29	0.58	26	98.3	66	142	23.11	1	174	174	174	---	115	190.6	122	241	17.03
4/23/2013	17	0	---	---	---	---	7	103.4	68	140	26.72	0	---	---	---	---	10	182.1	120	210	24.22
4/30/2013	18	12	23.8	20	27	2.38	5	79.2	67	94	9.93	2	193	180	206	18.38	3	184	169	200	15.52
5/7/2013	19	64	25.3	22	30	2.08	13	92.4	72	130	15.79	0	---	---	---	---	5	183	155	217	24.82
5/14/2013	20	133	27.5	19	38	2.99	13	94.2	65	122	17.75	0	---	---	---	---	12	197.2	140	227	25.36
5/21/2013	21	62	29.6	22	45	3.83	13	98.4	68	146	21.07	1	172	172	172	---	9	214.6	189	230	14.07
5/28/2013	22	107	28.1	22	54	4.34	31	113.1	65	170	28.63	7	200.7	180	228	19.3	69	189.2	125	235	21.32
6/4/2013	23	88	31.4	23	60	6.86	35	96.8	62	175	26.98	0	---	---	---	---	53	191.1	94	234	25.78
6/11/2013	24	102	32.9	22	63	7.07	17	121.9	67	173	29.46	0	---	---	---	---	17	179.5	125	215	26.7
6/18/2013	25	41	36.6	24	64	9.23	3	115.3	94	140	23.18	0	---	---	---	---	3	191.3	185	197	6.03
6/25/2013	26	46	48.7	31	76	9.46	1	150	150	150	---	1	200	200	200	---	3	206.3	197	215	9.02
7/2/2013	27	50	48.1	31	68	9.35	7	152.3	114	190	27.4	0	---	---	---	---	2	202	194	210	11.31
7/9/2013	28	29	50.5	30	68	8.85	4	143.8	100	189	38.62	0	---	---	---	---	0	---	---	---	---
7/16/2013	29	34	57.4	43	77	8.93	8	149.8	107	195	33.4	0	---	---	---	---	1	195	195	195	---
7/23/2013	30	82	53.7	33	77	8.31	7	135.9	105	181	29.68	0	---	---	---	---	0	---	---	---	---
7/30/2013	31	148	59.1	40	85	8.97	5	136.4	109	179	26.48	0	---	---	---	---	0	---	---	---	---
8/6/2013	32	135	58.6	41	85	8.47	3	149.3	125	163	21.13	0	---	---	---	---	0	---	---	---	---
8/13/2013	33	17	56.4	48	82	8.25	3	156.3	133	172	20.6	0	---	---	---	---	0	---	---	---	---
8/20/2013	34	35	60	42	87	9.23	1	103	103	103	---	0	---	---	---	---	0	---	---	---	---
8/27/2013	35	134	56.1	34	93	10.52	6	141	105	193	32.22	0	---	---	---	---	0	---	---	---	---

Appendix 12: Trinity River at Willow Creek rotary screw trap site weekly steelhead fork lengths 2013.

Week Starting	Week of Year	Natural Steelhead															Hatchery Steelhead				
		Age-0					Age-1					Age-2					Age-1				
		n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD
3/12/2013	11	0	---	---	---	----	18	89.2	49	118	17.82	0	0	0	0	----	0	0	0	0	----
3/19/2013	12	0	---	---	---	----	79	98.1	60	148	22.75	16	173.5	150	205	18.69	26	190.8	170	217	11.98
3/26/2013	13	0	---	---	---	----	165	92.3	56	149	13.77	18	182.2	150	220	23.23	37	194.2	152	247	18.68
4/2/2013	14	0	---	---	---	----	207	95.3	68	147	14.04	23	195.7	152	230	28.86	155	192	152	220	12.91
4/9/2013	15	0	---	---	---	----	271	99.2	62	148	15.65	45	182.4	151	225	16.81	225	189.2	122	230	16.21
4/16/2013	16	0	---	---	---	----	218	98.6	65	149	17.93	162	182.5	150	249	21.83	457	190.3	105	247	14.16
4/23/2013	17	0	---	---	---	----	166	101	64	147	15.96	88	181.2	150	220	17.53	397	186.5	140	235	14.6
4/30/2013	18	1	43	43	43	----	46	103.6	75	145	15.98	87	182.5	150	240	19.26	279	183.7	120	228	15.6
5/7/2013	19	16	30.7	21	42	5.88	147	116	66	169	25.36	70	173.7	150	212	13.56	346	182.1	150	236	14.47
5/14/2013	20	2	27	27	27	----	159	130	76	165	23.47	125	175.7	160	250	13.12	475	181.2	140	229	16.12
5/21/2013	21	2	48	44	52	5.66	162	141.7	87	177	22.91	115	177.3	160	218	11.01	397	184.3	132	240	17.45
5/28/2013	22	19	44.1	27	63	11.02	103	150.8	95	178	19.61	33	184.8	170	225	12.59	275	183.8	124	231	18.93
6/4/2013	23	85	43.9	24	72	10.56	37	149.2	110	185	22.99	5	182	180	185	2.74	72	188.3	127	237	18.43
6/11/2013	24	106	49.6	30	67	6.49	11	154.6	98	186	30.38	0	---	---	---	----	41	182	120	215	19.22
6/18/2013	25	56	55.1	44	88	8.04	4	163.3	132	188	24.19	0	---	---	---	----	22	192.2	170	222	16.29
6/25/2013	26	158	59	30	100	8.52	2	185	180	190	7.07	0	---	---	---	----	3	191.7	177	200	12.74
7/2/2013	27	30	51	32	64	8.33	2	142.5	110	175	45.96	0	---	---	---	----	1	225	225	225	----
7/9/2013	28	8	49.5	39	58	6.68	0	0	0	0	----	0	---	---	---	----	1	185	185	185	----
7/16/2013	29	6	46.8	28	66	14.46	1	125	125	125	----	0	---	---	---	----	1	230	230	230	----
7/23/2013	30	3	69.7	64	75	5.51	3	135.7	118	148	15.7	0	---	---	---	----	0	---	---	---	----
7/30/2013	31	5	55.2	49	60	4.76	1	125	125	125	----	0	---	---	---	----	0	---	---	---	----
8/6/2013	32	11	61.6	49	70	7.38	2	127	110	144	24.04	0	---	---	---	----	0	---	---	---	----
8/13/2013	33	13	54	40	90	13.62	2	135.5	120	151	21.92	0	---	---	---	----	0	---	---	---	----
8/20/2013	34	4	75	70	80	4.08	10	137.1	115	160	15.87	0	---	---	---	----	0	---	---	---	----
8/27/2013	35	97	64.1	35	90	10.82	3	126.7	115	135	10.41	0	---	---	---	----	0	---	---	---	----

Appendix 13. Fulton's condition factor (K) for pooled natural and hatchery age-0 Chinook salmon with FL>50mm from the Pear Tree and Willow Creek rotary screw trap sites, 2013.

Week Starting	Week of Year	Pear Tree Trap Site			Willow Creek Trap Site		
		n	Average K	Standard Deviation of K	n	Average K	Standard Deviation of K
1/15/2013	3	0	---	---	---	---	---
1/22/2013	4	0	---	---	---	---	---
1/30/2013	5	0	---	---	---	---	---
2/5/2013	6	0	---	---	---	---	---
2/12/2013	7	0	---	---	---	---	---
2/19/2013	8	0	---	---	---	---	---
2/26/2013	9	0	---	---	---	---	---
3/5/2013	10	1	0.96	---	0	---	---
3/12/2013	11	2	1.15	0.09	2	1.10	0.19
3/19/2013	12	6	1.12	0.08	19	1.30	0.42
3/26/2013	13	18	1.08	0.19	4	1.31	0.13
4/2/2013	14	90	0.98	0.12	30	1.65	0.91
4/9/2013	15	36	1.01	0.12	103	1.23	0.42
4/16/2013	16	128	1.00	0.12	251	1.08	0.22
4/23/2013	17	50	0.97	0.08	314	1.05	0.20
4/30/2013	18	6	1.29	0.05	230	1.12	0.21
5/7/2013	19	77	0.96	0.11	343	1.10	0.26
5/14/2013	20	109	0.94	0.08	408	1.11	0.24
5/21/2013	21	48	0.94	0.09	343	1.15	0.21
5/28/2013	22	135	1.04	0.14	398	1.08	0.18
6/4/2013	23	145	1.11	0.18	240	1.14	0.17
6/11/2013	24	422	1.04	0.14	208	1.12	0.18
6/18/2013	25	606	0.94	0.10	327	1.11	0.14
6/25/2013	26	365	0.93	0.07	210	1.10	0.12
7/2/2013	27	287	0.93	0.07	150	1.12	0.17
7/9/2013	28	197	0.92	0.09	262	1.14	0.17
7/16/2013	29	335	1.09	0.17	219	1.14	0.16
7/23/2013	30	394	1.11	0.17	131	1.09	0.13
7/30/2013	31	280	1.04	0.19	163	1.13	0.16
8/6/2013	32	211	1.05	0.15	153	1.15	0.26
8/13/2013	33	36	1.18	0.10	127	1.13	0.20
8/20/2013	34	73	1.17	0.13	143	1.12	0.13
8/27/2013	35	126	1.18	0.13	70	1.04	0.21

Appendix 14. Fulton's condition factor (K) for age-1 coho salmon from the Pear Tree and Willow Creek Rotary screw trap sites, 2013.

Week Starting	Week of Year	Pear Tree Trap Site			Willow Creek Trap Site		
		n	Average K	Standard Deviation of K	n	Average K	Standard Deviation of K
1/15/2013	3	8	1.13	0.09	---	---	---
1/22/2013	4	5	1.14	0.06	---	---	---
1/30/2013	5	5	1.14	0.05	---	---	---
2/5/2013	6	6	1.10	0.10	---	---	---
2/12/2013	7	1	1.01	---	0	---	---
2/19/2013	8	3	1.12	0.08	0	---	---
2/26/2013	9	0	---	---	0	---	---
3/5/2013	10	1	1.22	---	0	---	---
3/12/2013	11	101	1.24	0.12	0	---	---
3/19/2013	12	125	1.01	0.14	1	1.19	---
3/26/2013	13	22	1.05	0.11	0	---	---
4/2/2013	14	7	0.95	0.16	1	3.38	---
4/9/2013	15	3	1.05	0.19	2	1.01	0.09
4/16/2013	16	17	0.96	0.09	0	---	---
4/23/2013	17	3	0.94	0.16	14	1.09	0.23
4/30/2013	18	8	1.00	0.10	39	1.04	0.13
5/7/2013	19	14	1.02	0.03	44	1.03	0.13
5/14/2013	20	6	0.85	0.15	50	1.11	0.20
5/21/2013	21	5	0.83	0.15	75	1.02	0.13
5/28/2013	22	11	0.95	0.11	46	1.05	0.13
6/4/2013	23	0	---	---	11	1.02	0.17
6/11/2013	24	2	0.90	0.17	15	0.99	0.16
6/18/2013	25	0	---	---	5	0.95	0.05
6/25/2013	26	0	---	---	2	1.03	0.05
7/2/2013	27	0	---	---	0	---	---
7/9/2013	28	0	---	---	0	---	---
7/16/2013	29	0	---	---	0	---	---
7/23/2013	30	0	---	---	0	---	---
7/30/2013	31	0	---	---	0	---	---
8/6/2013	32	0	---	---	0	---	---
8/13/2013	33	0	---	---	0	---	---
8/20/2013	34	0	---	---	0	---	---
8/27/2013	35	0	---	---	2	1.00	0.25

Appendix 15. Fulton's condition factor (K) for natural age-1+ steelhead from the Pear Tree and Willow Creek rotary screw trap sites, 2013.

Week Starting	Week of Year	Pear Tree Trap Site			Willow Creek Trap Site		
		n	Average K	Standard Deviation of K	n	Average K	Standard Deviation of K
1/15/2013	3	4	1.21	0.10	---	---	---
1/22/2013	4	13	1.20	0.11	---	---	---
1/30/2013	5	6	1.24	0.15	---	---	---
2/5/2013	6	9	1.26	0.07	---	---	---
2/12/2013	7	5	1.28	0.13	---	---	---
2/19/2013	8	4	1.15	0.05	---	---	---
2/26/2013	9	38	1.26	0.11	---	---	---
3/5/2013	10	82	1.25	0.18	---	---	---
3/12/2013	11	199	1.26	0.13	11	0.96	0.22
3/19/2013	12	75	1.09	0.16	78	1.22	0.36
3/26/2013	13	61	1.22	0.15	105	1.19	0.16
4/2/2013	14	110	1.11	0.16	127	1.83	0.85
4/9/2013	15	31	1.11	0.17	99	1.11	0.26
4/16/2013	16	27	1.03	0.11	147	1.11	0.23
4/23/2013	17	4	1.04	0.14	165	1.08	0.30
4/30/2013	18	4	1.19	0.07	46	1.14	0.18
5/7/2013	19	5	1.12	0.19	147	1.17	0.22
5/14/2013	20	11	1.06	0.09	158	1.11	0.19
5/21/2013	21	4	1.00	0.06	146	1.02	0.18
5/28/2013	22	12	0.99	0.19	102	0.99	0.12
6/4/2013	23	5	1.12	0.04	30	1.01	0.16
6/11/2013	24	6	1.09	0.09	6	0.95	0.22
6/18/2013	25	3	1.02	0.06	4	0.95	0.14
6/25/2013	26	---	---	---	2	0.86	0.06
7/2/2013	27	7	0.98	0.05	1	1.19	0.00
7/9/2013	28	4	1.04	0.09	0	---	---
7/16/2013	29	8	1.11	0.15	1	1.08	0.00
7/23/2013	30	7	1.06	0.12	1	1.05	0.00
7/30/2013	31	3	1.03	0.10	1	1.04	0.00
8/6/2013	32	3	0.97	0.09	2	1.14	0.19
8/13/2013	33	3	1.03	0.02	2	1.09	0.10
8/20/2013	34	1	1.15	---	10	0.99	0.10
8/27/2013	35	4	1.15	0.05	3	1.02	0.09