Outmigrant Trapping of Juvenile Salmonids in the Lower Tuolumne River, 2010

Submitted To:
Turlock Irrigation District
Modesto Irrigation District

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INTRODUCTION

Study Area Description

The Tuolumne River is the largest of three major tributaries (Tuolumne, Merced, and Stanislaus Rivers) to the San Joaquin River, originating in the central Sierra Nevada in Yosemite National Park and flowing west between the Merced River to the south and the Stanislaus River to the north (Figure 1). The San Joaquin River itself flows north and joins the Sacramento River in the Sacramento-San Joaquin Delta within California's Central Valley. The Tuolumne River is dammed at several locations for generation of power, water supply, and flood control – the largest impoundment is Don Pedro Reservoir.

The lower Tuolumne River corridor extends from its confluence with the San Joaquin River to La Grange Dam at river mile (RM) 52.2. The La Grange Dam site has been the upstream limit for anadromous fish migration since at least 1871.

Figure 1. Location map of study area on the Tuolumne River.

Purpose and History of Study

Rotary screw traps (RST) have been operated since 1995 at various locations in the Tuolumne River during the winter/spring period to meet several objectives, including monitoring the abundance and migration characteristics of juvenile salmonids and other fishes, and evaluating reach-specific survival relative to environmental conditions (Table 1). The Turlock Irrigation District and Modesto Irrigation District ('Districts'), and the City and County of San Francisco funded the entire RST program in 1995-97 and 2003-2010 and at 2-3 upstream sites in 1998-2000.

Current sampling locations include Grayson River Ranch (Grayson – RM 5.2) near the mouth of the Tuolumne River and a site downstream of the city of Waterford (RM 29.8). Rotary screw trap monitoring has been conducted annually near the mouth since 1995 (Shiloh in 1995-1998 and Grayson in 1999-2010) for the purpose of monitoring the abundance and migration characteristics of juvenile salmonids and other fishes. Since 2006, sampling has also been conducted annually near Waterford, about 25 miles upstream of the Grayson site, to provide comparative information on the size, migration timing, and production of juvenile fall-run Chinook salmon, as well as data on other fishes.

Table 1. Rotary screw trap monitoring in the Lower Tuolumne River, 1995-2010.

Year	*Site*	*Period Sampled*	*Proportion of Outmigration Period Sampled*	*Total Catch*	*Total Estimated Passage*	*Method of Passage Estimation*	*Results Reported In*
1995	Shiloh (RM 3.4)	Apr 25- Jun 01	24%	141	15,667[1]		Heyne and Loudermilk 1997
1996	Shiloh	Apr 18 - May 29	27%	610	40,385[1]		Heyne and Loudermilk 1997
1997	Shiloh	Apr 18 - May 24	24%	57	2,850[1]		Heyne and Loudermilk 1998
1998	Turlock Lake State Rec. (RM 42.0)	Feb 11- Apr 13	41%	7,125	259,581[1]	Mean efficiency	Vick and others 1998
	7/11 (RM 38.5)	Apr 15- May 31	31%	2,413			Vick and others 1998
	Charles Road (RM 25.0)	Mar 27- Jun 01	43%	981	66,848[1]	Mean efficiency	Vick and others 1998
	Shiloh	Feb 15- Jul 01	70%	2,546	1,615,673[1]	Regression	Blakeman 2004a
1999	7/11	Jan 19- May 17	79%	80,792	1,737,052[1]	%Flow sampled	Vick and others 2000
	Hughson (RM 23.7)	Apr 08- May 24	31%	449	7,175[1]	%Flow sampled	Vick and others 2000
	Grayson (RM 5.2)	Jan 12- Jun 06	93%	19,327	755,604[2]	Multiple regression	Vasques and Kundargi 2001
2000	7/11	Jan 10- Feb 27	32%	61,196	298,755[1]	%Flow sampled	Hume and others 2001
	Deardorff (RM 35.5)	Apr 09- May 25	31%	634	15,845[1]	%Flow sampled	Hume and others 2001
	Hughson	Apr 09- May 25	31%	264	2,942[1]	%Flow sampled	Hume and others 2001
	Grayson	Jan 09- Jun 12	95%	2,250	99,797[2]	Multiple regression	Vasques and Kundargi 2001

[1] Passage estimate reported in the annual report cited.
[2] Passage estimate derived from multiple regression equation based on data collected from 1999-2006 and 2008 as described in this report.

Year	*Site*	*Period Sampled*	*Proportion of Outmigration Period Sampled*	*Total Catch*	*Total Estimated Passage*	*Method of Passage Estimation*	*Results Reported In*
2001	Grayson	Jan 03-May 29	97%	6,478	99,584[2]	Multiple regression	Vasques and Kundargi 2002
2002	Grayson	Jan 15-Jun 06	91%	436	14,135[2]	Multiple regression	Blakeman 2004b
2003	Grayson	Apr 01-Jun 06	40%	359	9,091[2]	Multiple regression	Blakeman 2004c
2004	Grayson	Apr 01-Jun 09	40%	509	17,771[2]	Multiple regression	Fuller 2005
2005	Grayson	Apr 02-Jun 17	39%	1,317	255,710[2]	Multiple regression	Fuller and others 2006
2006	Waterford 1 (RM 29.8)	Jan 25-Apr 12	79%	8,648	178,034[1]	%Flow sampled	Fuller and others 2007
	Waterford 2 (RM 33.5)	Apr 21-Jun 21		458	178,034[1]		
	Grayson	Jan 25-Jun 22	84%	1,594	71,670[2]	Multiple regression	Fuller and others 2007
2007	Waterford (RM 29.8)	Jan 11-Jun 05	93%	3,312	57,801[1]	Average trap efficiency	Fuller 2008
	Grayson	Mar 23-May 29	45%	27	923[2]	Multiple regression	Fuller 2008
2008	Waterford	Jan 8-Jun 2	96%	3,350	24,894[1]	Average trap efficiency	Palmer and Sonke 2008
	Grayson	Jan 29-Jun 4	82%	193	3,283[2]	Multiple regression	Palmer and Sonke 2008
2009	Waterford	Jan 7-June 9	96%	3,725	37,174[1]	Average trap efficiency	Palmer and Sonke 2010
	Grayson	Jan 8-Jun 11	95%	155	4,677[2]	Multiple regression	Palmer and Sonke 2010
2010	Waterford	Jan 5-Jun 11	97%	2,281	29,294-55,941[3]	Average trap efficiency	This report
	Grayson	Jan 6-Jun 17	97%	52	4,443[2]	Multiple regression	This report

[1] Passage estimate reported in the annual report cited.
[2] Passage estimate derived from multiple regression equation based on data collected from 1999-2006 and 2008 as described in this report.

[3] Trap efficiency data not available for parr/smolt lifestage at high flows. A range of trap efficiencies from the 7/11 (RM 38) and Deardorff (RM 35.5) traps was used to obtain a range of passage estimates in 2010.

METHODS

Juvenile Outmigrant Monitoring

Sampling Gear and Trapping Site Locations

Rotary screw traps (E.G. Solutions, Eugene, OR) were installed and operated at the Waterford and Grayson sites. The traps consist of a funnel-shaped core suspended between two pontoons. Traps are positioned in the current so that water enters the 8 ft wide funnel mouth and strikes the internal screw core, causing the funnel to rotate. As the funnel rotates, fish are trapped in pockets of water and forced rearward into a livebox, where they remain until they are processed by technicians.

The single Waterford trap was located at RM 29.8, approximately two miles downstream of the Hickman Bridge. The trap was held in place by a 3/8-inch overhead cable strung between two large trees located on opposite banks. Cables fastened to the front of each pontoon were attached to the overhead cable. Warning signs, flashing safety lights and buoys marked the location of the trap and cables for public safety. Sufficient velocity at the trap during 2010 precluded the need for the “wings” used to increase catch efficiency during 2008 and a portion of 2009.

At Grayson two traps were fastened together, in a side-by-side configuration, with ½ inch Ultra High Molecular Weight (UHMW) plastic strips that were bolted to each inner-pontoon at the cross-bars. The traps were positioned and secured in place by two 50 lb plow-style anchors (Delta Fast-Set model, Lewmar, Havant, UK). The anchors were fastened to the outer-pontoons of the traps using 3/8-inch stainless steel leader cables (each outer-pontoon was attached to a separate in-line anchor) and the length of each leader cable was adjusted using a manual winch that was bolted to the outer-pontoon. The downstream force of the water on the traps kept the leader cables taut. Sufficient velocity at the traps during 2010 precluded the need for the “weir” structure used to increase catch efficiency during 2008 and 2009.

Trap Monitoring

Sampling at Waterford began on January 5, 2010. The trap was operated continuously (24 hours per day, 7 days per week) until June 11, 2010, when sampling was terminated due to consistently low catch.

Sampling at Grayson began on January 6, 2010. The traps were operated continuously (24 hours per day, 7 days per week) until sampling was terminated on June 17, 2010, due to consistently low catch.

Traps at both locations were checked at least every morning throughout the sampling period, with additional trap checks conducted as conditions required. During each trap check the contents of the liveboxes were removed, all fish were identified and counted, and any marked fish were noted. In addition, random samples of up to 50 salmon and 20 of each non-salmon species during each morning check, and up to 20 salmon and 10 of each non-salmon species during each evening check, were anesthetized, measured (fork lengths in millimeters), and recorded. Salmon were assigned to a lifestage category based on a fork length scale, where <50 mm = fry, 50-69 mm = parr, and $\geq$ 70 mm = smolt. In addition, the smolting appearance of all measured salmon and trout was rated based on a seven category scale, where 1 = yolk-sac fry, 2 = fry, 3 = parr, 4 = silvery parr, 5 = smolt, 6 = mature adult, and IAD = immature adult (Interagency Ecological Program, unpublished). Weights (to nearest tenth of a gram) were taken from up to 50 salmon each week (i.e., Monday through Sunday) and from all trout using a digital balance (Ohaus Corporation, Pine Brook, NJ). Fish were weighed in a small, plastic container partially filled with stream water, which was tared prior to measuring each individual fish. Fish were then placed in a container with freshwater and allowed to recover before release.

Daily salmon catch was equivalent to the number of salmon captured during a morning trap check plus the number of salmon captured during any trap check(s) that occurred within the period after the previous morning check. For example, the daily salmon catch for April 10 is the sum of salmon from the morning trap check on April 10 and the evening trap check conducted on April 9. Separate daily catch data were maintained for marked and unmarked salmon.

After all fish were measured and recorded, the traps were cleaned to prevent accumulation of debris that might impair trap rotation or cause fish mortality within the liveboxes. Trap cleaning included removal of debris from all trap surfaces and from within the liveboxes. The amount of debris load in the livebox was estimated and recorded whenever a trap was checked.

Trap Efficiency Releases

Trap efficiency tests using naturally produced juvenile salmon were conducted to estimate the proportion of migrating juvenile salmon sampled by the Waterford trap. Juvenile salmon captured in the Waterford trap were used to conduct tests whenever catches were sufficient to obtain a group of at least 30 fish over no more than two days. Eleven groups of naturally produced juvenile salmon (ranging in number from 29 to 116 fish) were marked and released at RM 30 (about 0.2 miles upstream of the trap) between January 21 and March 14. All marked fish were released after dark. Catches of naturally produced juvenile salmon at Waterford after March 14th were insufficient for trap efficiency tests. Likewise, catches of natural fish throughout the study period were insufficient for trap efficiency tests to be conducted at Grayson. Additionally, hatchery produced fish were not available for tests during 2010. Trap efficiency calculations for both sites are discussed in further detail below.

Holding Facility and Transport Method

Juvenile salmon were transferred from liveboxes into either 5-gallon buckets or 20-gallon insulated coolers depending on the number of fish, temperature, and distance traveled, and were transported by boat upstream to the release site.

At release sites, fish were held in livecars constructed of 15" diameter PVC pipe cut into 34" lengths (Figure 2). A rectangle approximately 6" wide by 23" long was cut longitudinally along the pipe and fitted with aluminum or stainless steel mesh. Livecars were tethered to vegetation or other structures and kept in areas of low water velocity to reduce fish stress.

Figure 2. Livecar used for holding trap efficiency test fish.

Marking Procedure

At the Waterford trapping site, naturally produced juvenile salmon were marked onshore immediately adjacent to the trap and were then transported to the release site where they were held until release. A photonic marking system was used for marking all of the release groups because of the high quality of marks and the ability to use the marking equipment in rapid succession. All fish were anesthetized with Tricaine-S before the appropriate mark was applied, and then a marker tip was placed against the caudal fin and orange photonic dye was injected into the fin rays. The photonic dye (DayGlo Color Corporation, Cleveland, OH) was chosen because of its known ability to provide a highly visible, long-lasting mark.

Pre-release Sampling

Prior to release, marked fish were sampled for length and mark retention. Fifty fish (or the entire release group if fewer than 50 fish) were randomly selected from each release group, anesthetized, and examined for marks; the remaining fish in each group were enumerated. Mark retention was rated as present or absent. A total of zero fish in 2010 were found to have no marks upon examination, consequently, all fish released were presumed to have visible marks.

Release Procedure

Livecars were located several feet away from the specific release point and fish were poured from the live cars into buckets for release. Fish were released by placing a dip net into the bucket, scooping up a "net-full" of fish and then emptying the fish into the river, allowing them to swim away. After releasing a "net-full" of fish, about 30 seconds to 3 minutes elapsed before another group of about a "net-full" was released. The amount of time between "net-full" releases varied depending on how fast fish swam away after their release. Total release time for marked groups ranged from ten minutes to 30 minutes depending on the group size.

Monitoring Environmental Factors

Flow Measurements and Trap Speed

Provisional daily average flow for the Tuolumne River at La Grange was obtained from USGS at http://waterdata.usgs.gov/ca/nwis/dv/?site_no=11265000&agency_cd=USGS. Provisional daily average flow for the Tuolumne River at Modesto was obtained from the USGS at http://waterdata.usgs.gov/ca/nwis/dv/?site_no=11290000&agency_cd=USGS. The Modesto flow station is below Dry Creek, the largest seasonal tributary entering the river downstream of La Grange Dam. As a result, that site includes flow associated with major winter runoff events. Velocity of water entering the traps was measured using two methods. First, the water velocity entering the traps was measured daily with a Global Flow Probe (Global Water, Fair Oaks, CA). Second, an average daily trap rotation speed was calculated for each trap, by recording the time (in seconds) for three continuous revolutions of the cone, once before and once after the morning trap cleaning. The average of the two times was considered the average daily trap rotation speed.

River Temperature, Relative Turbidity and Dissolved Oxygen

Instantaneous water temperature was measured daily with a mercury thermometer at the trap site. Data were also available from hourly recording thermographs maintained by the Districts at both trapping sites. To measure daily instantaneous turbidity, a water sample was collected each morning and later tested at the field station with a LaMotte turbidity meter (Model 2020e, LaMotte Company, Chestertown, MD). Turbidity was recorded in nephelometric turbidity units (NTU). Instantaneous dissolved oxygen was measured during trap checks with an ExStik® II D600 Dissolved Oxygen Meter (Extech Instruments Corporation, Waltham, MA) at the trapping sites and recorded in milligrams per liter (mg/L).

Estimating Trap Efficiency and Chinook Salmon Abundance

The estimated daily number of fish passing each site was generated by either expanding the catch data by the average estimated trap efficiency for the lifestage captured (Waterford) or by a trap efficiency predictor equation (Grayson).

There is a limited trap efficiency dataset for Waterford because sampling has only been conducted since 2006, and the data are currently inadequate for developing regression relationships between trap efficiency and explanatory variables such as river flow, fish size, or turbidity. In the future, when more tests have been conducted, a multiple regression may be developed similar to the one described below for the Grayson trap. In the interim, an estimate of salmon relative abundance for the sampling season was calculated by expanding the daily number of fish by the average observed trap efficiency for each lifestage using the best available data. Trap efficiency releases were only conducted for the fry lifestage in 2010 due to insufficient catch during the parr/smolt outmigration period. In some situations hatchery origin fish have also been used for trap efficiency tests, however, fish from the Merced River Hatchery were not available during 2010.

Salmon fry abundance estimates were generated based on trap efficiency tests conducted in 2010 at Waterford. Since no efficiency estimates were available for parr/smolt in 2010, the abundance of parr/smolt at Waterford was calculated as follows:

1. Abundance estimates during flows less than 1,000 cfs were calculated using all results from tests conducted during 2007 with parr/smolt at Waterford under similar flows.
2. Abundance estimates during flows greater than 1,000 cfs were calculated using all results from tests conducted at the 7/11 (RM 38) and Deardorff (RM 35.5) sites under similar flow conditions during 1998-2000 using fish approximately 60-95 mm (Stillwater Sciences 2001). Since these estimates were taken from different (but comparable) locations, a range of parr/smolt abundances were calculated to account for the uncertainty in trap efficiencies at Waterford during higher flows (i.e., greater than 1,000cfs).

At Grayson, daily trap efficiencies were estimated based on a multiple regression equation developed using flow and trap efficiency data collected from 1999 through 2008. Specifically, average daily river flow at Modesto, average fish size at release, and natural log transformed proportions of fish recovered from each release event were used to develop the following trap efficiency predictor equation (adjusted R^2 =0.64):

Daily Predicted Trap Efficiency= EXP(-0.29176+(-0.00042*Flow at MOD)+(-0.03410*Fish size))

where Flow at MOD= daily average river flow (cfs) at Modesto
Fish size= daily average fork length (mm) of fish captured at Grayson

These daily predicted trap efficiencies (DPTE) were then applied to the daily catch (DC) to estimate daily passage as follows:

Estimated Daily Passage= DC/DPTE

RESULTS AND DISCUSSION

Chinook Salmon

Number of Unmarked Chinook Salmon Captured

Juvenile salmon sampled in the 2010 RST operation were the progeny of an estimated 282 salmon (87 females) that spawned in the fall of 2009 (Cuthbert et al. 2010). The fall-run juvenile salmon outmigration in the San Joaquin Basin typically occurs during the winter and spring, extending mainly from January through May. The outmigration consists largely of fry in winter that are typically less than 50 mm fork length, and smolts in spring which are typically greater than 69 mm fork length. There are also some larger fish that migrate mostly in winter and some fry observed in late spring, which may be from salmon with different spawn timing than fall-run.

During 2010, catches of juvenile Chinook salmon at Waterford were highest in early to mid-March and primarily consisted of fry (<50 mm; Figure 5). Daily salmon catch peaked on January 22 (mainly fry <50 mm) following several days of rain, which began on January 18. Daily catches of juvenile salmon at Waterford between January 5 and June 11 ranged from zero to 128 fish, with a total catch of 2,281 salmon (Figure 3).

At Grayson, catches of juvenile salmon in 2010 were highest in late January and May during the fry and smolt outmigration periods, respectively. Daily catches of juvenile salmon at Grayson between January 6 and June 17 ranged from zero to six fish, with a total catch of 52 salmon (Figure 4). The total numbers captured by lifestage at each site are presented in Table 2.

Table 2. Catch by lifestage at Waterford and Grayson, 2010.

	Fry (<50 mm)	Parr (50-69 mm)	Smolt (≥ 70 mm)
Waterford	1,241	69	971
Grayson	13	0	39

Sampling at Waterford was considered comprehensive and covered January through May each year the trap was sampled. However, in 2006 the sampling was initiated a few weeks later than usual and there was an extended non-sampling period (April 12-21) due to high flows; therefore, outmigration was not fully sampled during the 2006 season. In 2010, the total annual catch of juvenile salmon at Waterford was approximately one-third less than the three previous years (i.e., 2007-2009) and only 25% of the number of Chinook captured in 2006, despite the abbreviated sampling during that year (Table 1; Figure 5). Total annual trap catch at Waterford from 2006-2010 ranged from a high of 9,106 in 2006 to a low of 2,281 in 2010, and averaged 4,346 juvenile salmon (Figure 5). The variation in catch during 2006 is likely due to environmental conditions, specifically high flows that averaged approximately 5,300 cfs during the juvenile migration season (i.e., January-May/June) and higher overall abundance. The lower catch in 2010 is likely due to environmental conditions during the smolt outmigration period when flows averaged approximately 2,400 cfs and lower overall abundance. Trap efficiency decreases at higher flows, specifically when flows are higher than approximately 1,000 cfs.

Total annual catch of juvenile salmon has varied substantially between years at Grayson/Shiloh (Table 1; Figure 6). This variation is likely due to differences in one or more factors including, the duration and timing of the sampling periods, environmental conditions, and overall fish abundance and survival (Table 1). Sampling periods have varied between years, with sampling initiated as early as January or as late as April and continuing through May/June.

During 1999-2002, 2006, and 2008-2010, sampling at Grayson encompassed the majority of the expected winter/spring outmigration season (i.e., January-May/June) and can be described as comprehensive (Table 1; Figure 6). In contrast, sampling was only conducted during the spring smolt outmigration period (i.e., April-May/June) in 1995-1997 at Shiloh and 2003-2005 and 2007 at Grayson, therefore sampling was incomplete for those years. Sampling during 1998 began in February but was limited to a single trap (Note: two traps were operated in all other years); thus, 1998 sampling covered an intermediate proportion of the entire outmigration period. The proportion of the Jan-May outmigration period monitored each year ranged from 82% to 98% during winter/spring sampling years, from 24% to 44% during spring-only sampling years, and was 70% in the intermediate sampling year (Table 1). The proportion of the outmigration period sampled may not be representative of the proportion of the juvenile population migrating during the sample period because the migration pattern is not uniform. Migration timing can be influenced by environmental factors such as flow and turbidity, which are often highly variable during the outmigration period.

Of the winter/spring sampling years, total annual trap catch at Grayson ranged from a high of 19,327 during 1999 to a low of 52 during 2010, and averaged 3,806 juvenile salmon (Figure 6). In all years of spring-only sampling, catches ranged from a high of 1,239 during 2001 to a low of 27 during 2007.

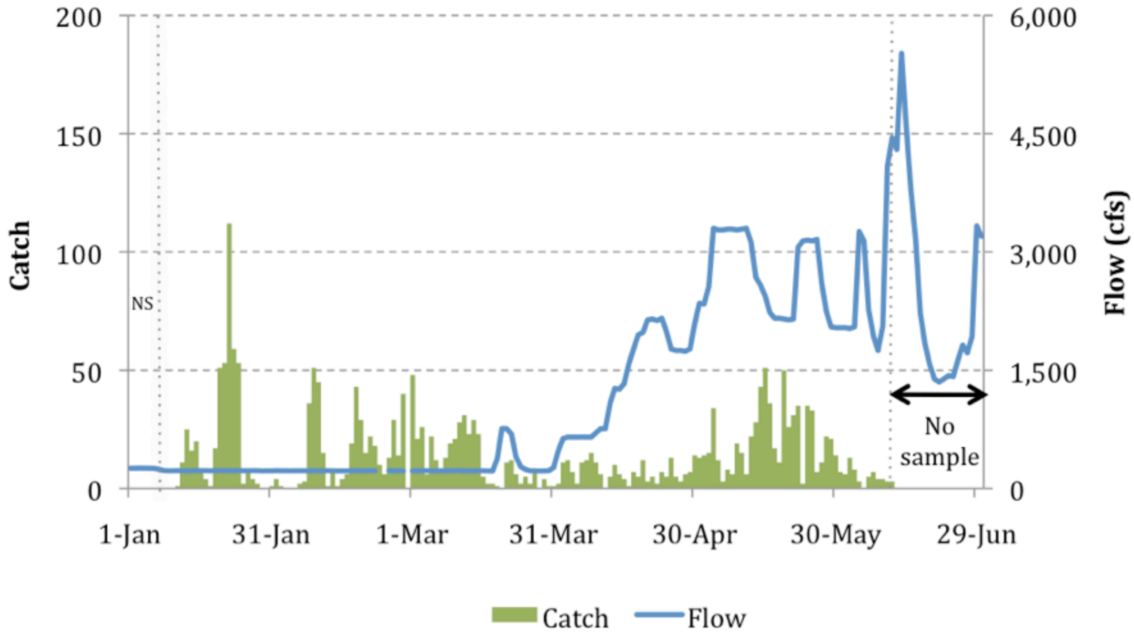

Figure 3. Daily catch of unmarked Chinook salmon at Waterford and river flow at La Grange (LGN) during 2010.

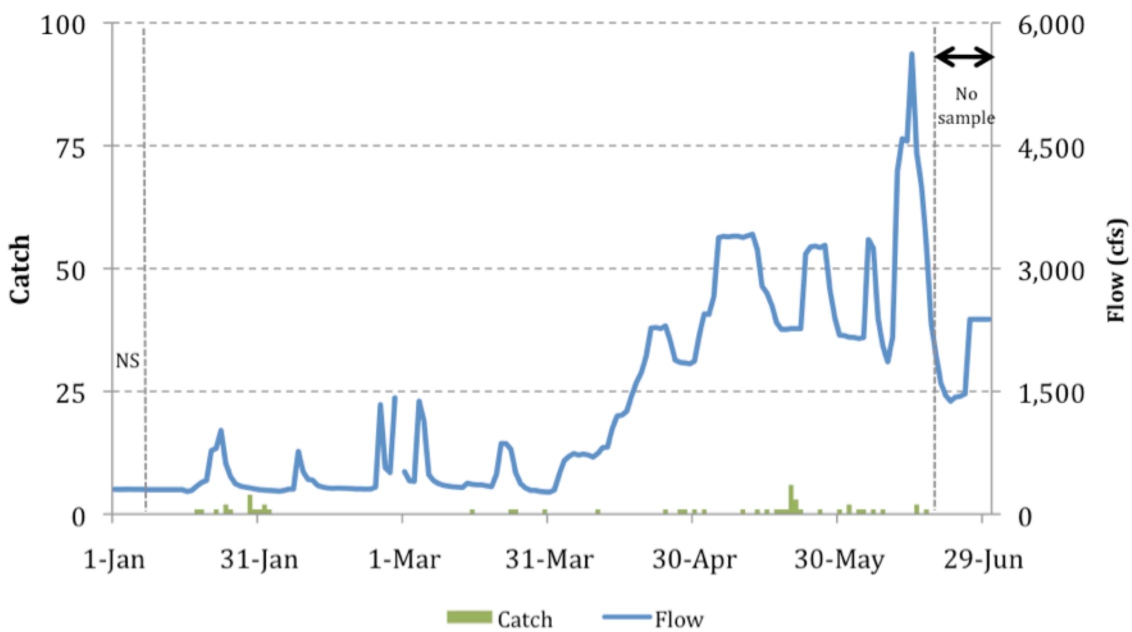

Figure 4. Daily catch of unmarked Chinook salmon at Grayson and river flow at Modesto (MOD) during 2010. Note: Flow at MOD is estimated on Jan. 8-Jan. 15; Jan. 21-Jan. 24; Feb. 11-Mar. 23; Apr. 21-Jun. 14; Jun. 16-Jun. 19; and Jun. 26-30 due to a malfunctioning gage.

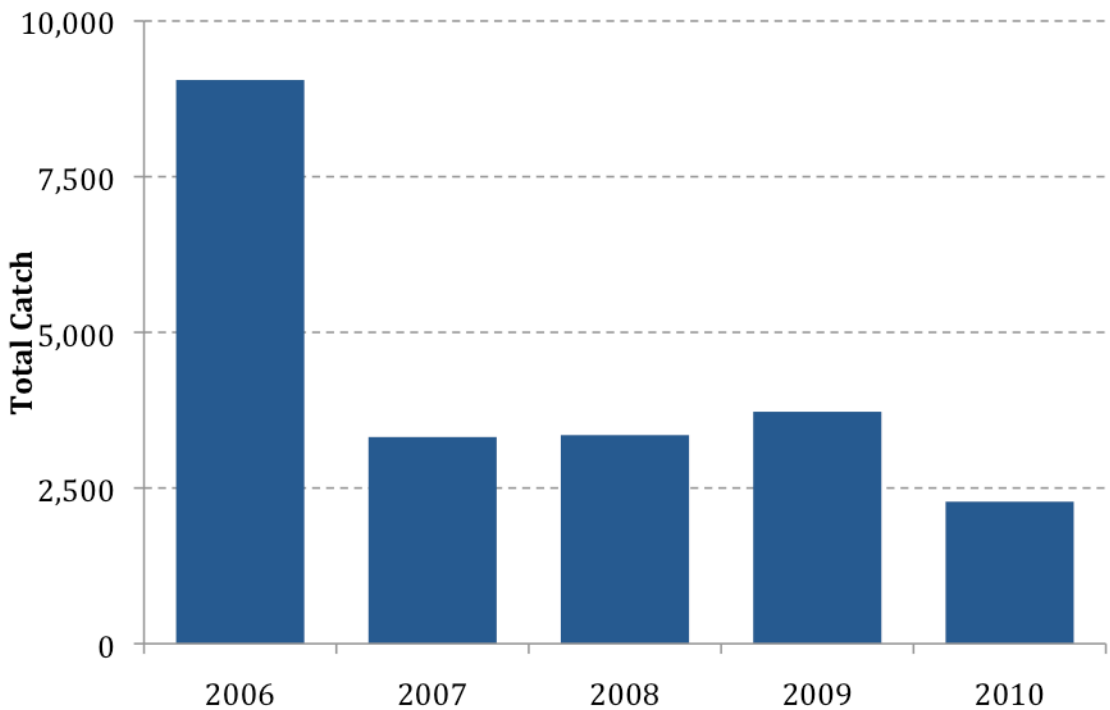

Figure 5. Total annual salmon catch at Waterford during 2006-2010.

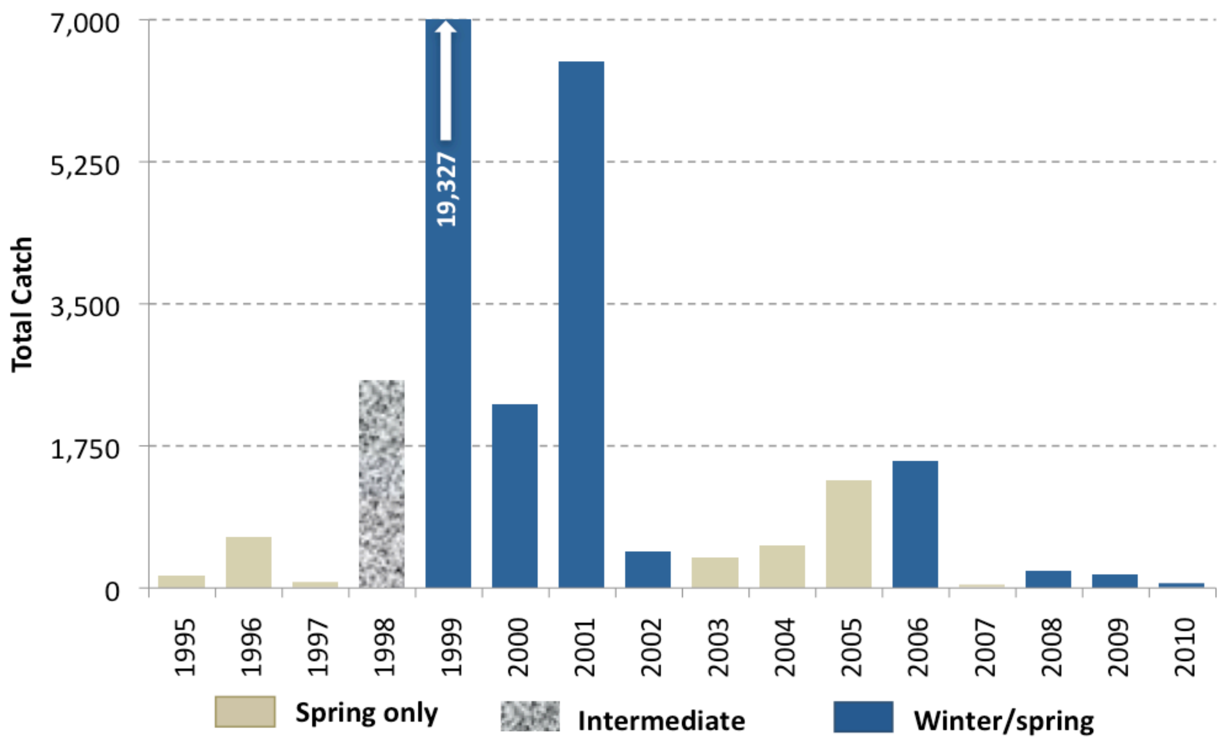

Figure 6. Total annual salmon catch at Shiloh/Grayson during 1995-2010.

Trap Efficiency

In 2010, eleven trap efficiency tests were conducted at Waterford using naturally produced salmon fry. Results from these tests ranged from 2.9% to 20.0% at flows (La Grange) between 223 cfs and 227 cfs (Table 3; Figure 7). No trap efficiency estimates were obtained during the parr/smolt outmigration period due to insufficient catch in the Waterford trap and the lack of hatchery fish available for releases. Average fork length at release for the trap efficiency test groups in 2010 ranged from 35 mm to 37 mm (n=11, Table 3). As mentioned previously, since flows were higher in 2010 than in recent years and there were no comparable trap efficiency data available for the Waterford trap at flows greater than 1,000 cfs, data were used from past test results conducted under similar flow conditions at the 7/11 (RM 38) and Deardorff (RM 35.5) traps (Table 3; Stillwater Sciences 2001). Consequently, in order to account for the uncertainty in trap efficiencies at higher flows at Waterford, a range of parr/smolt abundances were calculated from data collected in previous years during periods flows greater than 1,000 cfs.

Thus, salmon abundance estimate calculations at Waterford in 2010 were based on (Table 3):

Fry:

- trap efficiency tests conducted in 2010 at Waterford = 11.1%

Parr/Smolt:

- trap efficiency tests conducted in 2007 at Waterford at flows < 1,000cfs = 5.3%
- trap efficiency tests conducted in 1998-2000 at the 7/11 trap (RM 38; 1998 and 1999) and the Deardorff trap (RM 35.5; 2000) at flows > 1,000cfs = 2.0-5.6%

At Grayson, observed trap efficiency estimates from 1999-2008 ranged from zero to 21.2% at flows (Modesto) ranging between 280 cfs and 7,942 cfs (Table 4; Figure 8). No trap efficiency estimates were obtained at Grayson during 2010 due to insufficient catch in the traps and the lack of hatchery fish available for releases.

Daily predicted trap efficiency, and daily estimated passage at Waterford and Grayson in 2010 are provided in Appendices A and B, respectively.

Table 3. Trap efficiency results used to estimate daily trap efficiencies at Waterford. Note: Only releases for the fry lifestage were conducted in 2010. Results from 2007 were used for predicting daily trap efficiencies during the parr/smolt lifestages at flows less than 1,000 cfs. Historical trap efficiency data from the 7/11 (RM 38) and Deardorff (RM 35.5) traps were used during the parr/smolt lifestages at flows greater than 1,000 cfs.

Lifestage	Release Date	Location	Origin	Adjusted # Released	Number Recaptured	% Recaptured	Length at Release (mm)	Length at Recap. (mm)	Flow (cfs) at LGN	Turbidity
Fry	1/21/10	Waterford	Wild	110	22	20.0%	35	35	225	33.3
	1/22/10	Waterford	Wild	82	9	11.0%	35	35	225	21.2
	2/9/10	Waterford	Wild	34	1	2.9%	37	40	225	7.99
	2/10/10	Waterford	Wild	116	8	6.9%	37	37	225	1.16
	2/19/10	Waterford	Wild	42	3	7.1%	35	32	225	1.66
	2/20/10	Waterford	Wild	33	1	3.0%	36	35	225	1.14
	2/23/10	Waterford	Wild	29	2	6.9%	36	37	225	0.2
	3/1/10	Waterford	Wild	36	5	13.9%	35	36	224	15.5
	3/9/10	Waterford	Wild	44	8	18.2%	36	36	223	1.53
	3/11/10	Waterford	Wild	32	4	12.5%	36	35	227	1.68
	3/14/10	Waterford	Wild	35	3	8.6%	36	36	224	1.99
			TOTAL	593	66	11.1%				
Parr/smolt	3/5/07	Waterford	Wild	75	3	4.0%	56.2	59.7	341	0.62
	3/29/07	Waterford	Wild	48	3	6.3%	60.3	57.1	337	0.65
	3/31/07	Waterford	Wild	75	3	4.0%	58.4	47.3	337	0.43
	4/5/07	Waterford	Wild	50	2	4.0%	76.0	75.0	337	0.64
	4/11/07	Waterford	Wild	63	6	9.5%	80.6	80.2	343	1.07
	4/24/07	Waterford	Wild	63	3	4.8%	81.9	80.3	869	0.82
	4/26/07	Waterford	Wild	171	9	5.3%	80.2	79.1	646	0.88
	3/5/07	Waterford	Wild	75	3	4.0%	56.2	59.7	341	0.62
			TOTAL	545	29	5.3%				
Parr/smolt	4/26/98	7-Eleven	Hatchery	1504	54	3.6%	79.9	-	4051	3.5
	5/5/98	7-Eleven	Hatchery	4408	184	4.2%	88.1	-	2300	2.45
	5/11/98	7-Eleven	Hatchery	1560	88	5.6%	88.2	-	3244	2.3
	5/20/98	7-Eleven	Hatchery	877	21	2.4%	92.6	-	4768	1.95
	4/10/99	7-Eleven	Hatchery	295	6	2.0%	61.3	-	2721	1.3
	4/18/99	7-Eleven	Hatchery	2401	113	4.7%	70.8	-	2027	1.1
	4/30/99	7-Eleven	Hatchery	912	33	3.6%	78.3	-	3018	2.3
	4/27/00	Deardorff	Hatchery	1003	41	4.1%	np	-	1275	np
	5/4/00	Deardorff	Hatchery	1000	24	2.4%	np	-	2368	np
					Minimum TE	2.0%				
					Maximum TE	5.6%				

np=not provided

Table 4. Trap efficiency results from 1999-2008 used to derive the regression equation for predicting daily trap efficiencies at Grayson.

Release Date	Origin	Mark	Adjusted # Released	Number Recaptured	% Recaptured	Length at Release (mm)	Length at Recap. (mm)	Flow (cfs) at MOD
11-Mar-99	Hatchery	Anal fin blue	1946	28	1.4%	54	53	4620
24-Mar-99	Hatchery	Bottom caudal blue, ad-clip	1938	67	3.5%	61	61	3130
31-Mar-99	Hatchery	Top caudal blue, ad-clip	1885	73	3.9%	65	64	2250
7-Apr-99	Hatchery	Bottom caudal blue, ad-clip	1949	50	2.6%	68	68	2280
14-Apr-99	Hatchery	Anal fin blue, ad-clip	1953	34	1.7%	73	72	2000
20-Apr-99	Hatchery	Top caudal blue, ad-clip	2007	45	2.2%	73	75	1800
29-Apr-99	Hatchery	Bottom caudal blue, ad-clip	1959	14	0.7%	79	80	3220
4-May-99	Hatchery	Anal fin blue, ad-clip	2008	18	0.9%	83	82	3030
18-May-99	Hatchery	Top caudal blue, ad-clip	2001	29	1.4%	86	84	677
26-May-99	Hatchery	Bottom caudal blue, ad-clip	1984	75	3.8%	96	92	518
1-Mar-00	Hatchery	Top caudal blue	1964	30	1.5%	56	53	4690
16-Mar-00	Hatchery	Bottom caudal blue	1548	22	1.4%	56	56	5980
23-Mar-00	Hatchery	Anal fin blue	1913	55	2.9%	59	60	3190
30-Mar-00	Hatchery	Top caudal blue	1942	60	3.1%	62	63	2820
29-Apr-00	Hatchery	Top caudal blue, ad-clip	1931	22	1.1%	81	82	1470
6-May-00	Hatchery	Bottom caudal blue, ad-clip	1987	41	2.1%	85	85	2430
24-May-00	Hatchery	Top caudal blue, ad-clip	2010	24	1.2%	85	85	1010
18-Jan-01	Hatchery	Top caudal blue	1810	120	6.6%	37	np	487
8-Feb-01	Hatchery	Bottom caudal blue	1980	276	13.9%	47	np	434
1-Mar-01	Hatchery	Top caudal yellow	2017	57	2.8%	41	np	2130
14-Mar-01	Hatchery	Bottom caudal yellow	1487	75	5.0%	46	np	703
21-Mar-01	Hatchery	Bottom caudal blue, Dorsal fin blue, Top caudal yellow	3025	207	6.8%	61	np	519
28-Mar-01	Hatchery	Anal fin blue	1954	219	11.2%	51	np	515
11-Apr-01	Hatchery	Bottom caudal yellow, ad-clip	2021	141	7.0%	66	np	535
18-Apr-01	Hatchery	Top caudal blue, ad-clip	2060	95	4.6%	68	np	483
25-Apr-01	Hatchery	Ad-clip dorsal fin yellow, Bottom caudal blue, Dorsal fin blue	1515	34	2.2%	71	np	753
2-May-01	Hatchery	Anal fin blue, ad-	3053	163	5.3%	72	np	1460

Release Date	Origin	Mark	Adjusted # Released	Number Recaptured	% Recaptured	Length at Release (mm)	Length at Recap. (mm)	Flow (cfs) at MOD
		clip						
9-May-01	Hatchery	Bottom caudal yellow, ad-clip	3002	147	4.9%	75	np	1160
16-May-01	Hatchery	Top caudal blue, ad-clip	2942	93	3.2%	76	np	1020
20-Feb-02	Hatchery	Bottom caudal red	2094	444	21.2%	57	np	265
6-Mar-02	Hatchery	Anal fin red	2331	316	13.6%	68	np	278
13-Mar-02	Hatchery	Top caudal red	2042	324	15.9%	65	np	300
20-Mar-02	Hatchery	Dorsal fin red	2105	242	11.5%	68	np	328
27-Mar-02	Hatchery	Bottom caudal red	2121	147	6.9%	68	np	314
3-Apr-02	Hatchery	Anal fin red, ad-clip	1962	130	6.6%	76	np	312
9-Apr-02	Hatchery	Top caudal red, ad-clip	1995	56	2.8%	79	np	319
17-Apr-02	Hatchery	Dorsal fin red, ad-clip	2048	40	2.0%	84	np	889
25-Apr-02	Hatchery	Bottom caudal red, ad-clip	2001	22	1.1%	86	np	1210
1-May-02	Hatchery	Anal fin red, ad-clip	2033	14	0.7%	89	np	1250
8-May-02	Hatchery	Dorsal fin red, ad-clip	2021	31	1.5%	95	np	798
15-May-02	Hatchery	Top caudal red, ad-clip	2047	26	1.3%	97	np	653
22-May-02	Hatchery	Bottom caudal red, ad-clip	2043	10	0.5%	94	np	403
10-Apr-03	Hatchery	Top caudal green	1956	138	7.1%	77	np	297
17-Apr-03	Hatchery	Bottom caudal green	2047	65	3.2%	77	np	1350
24-Apr-03	Hatchery	Anal fin green	1979	31	1.6%	88	np	1210
1-May-03	Hatchery	Dorsal fin green	2044	113	5.5%	96	np	685
8-May-03	Hatchery	Top caudal green	2078	206	9.9%	83	np	726
15-May-03	Hatchery	Bottom caudal green	1996	125	6.3%	83	np	559
20-May-03	Hatchery	Anal fin green	1989	60	3.0%	89	np	317
28-May-03	Hatchery	Dorsal fin green	1950	125	6.4%	94	np	685
13-Apr-04	Hatchery	Dorsal fin green	1992	84	4.2%	79	74	1140
20-Apr-04	Hatchery	Anal fin green	1980	48	2.4%	81	79	1660
27-Apr-04	Hatchery	Top caudal green	1941	118	6.1%	86	85	826
4-May-04	Hatchery	Bottom caudal green	2008	50	2.5%	90	87	789
11-May-04	Hatchery	Anal fin green	1972	104	5.3%	86	79	815
18-May-04	Hatchery	Dorsal fin green	1996	178	8.9%	88	77	446
25-May-04	Hatchery	Top caudal green	2013	59	2.9%	92	90	337
9-Feb-06	Wild	Caudal fin pink	37	5	13.5%	34.6	35.2	3393
11-Feb-06	Wild	Caudal fin pink	26	4	15.4%	34.9	37.3	3437
12-Feb-06	Wild	Caudal fin pink	23	1	4.3%	36.1	37.0	3416
13-Feb-06	Wild	Caudal fin pink	28	1	3.6%	35.5	33.0	3418

Release Date	Origin	Mark	Adjusted # Released	Number Recaptured	% Recaptured	Length at Release (mm)	Length at Recap. (mm)	Flow (cfs) at MOD
3-Mar-06	Wild	Caudal fin green	89	4	4.5%	34.8	35.3	4261
5-May-06	Hatchery	Caudal fin yellow	949	4	0.4%	73.2	74.3	7942
12-May-06	Hatchery	Caudal fin yellow	1,286	5	0.4%	81.8	76.6	7534
25-May-06	Hatchery	Top caudal yellow	1,532	2	0.1%	83.7	69.5	6537
1-Jun-06	Hatchery	Top caudal yellow	1,694	0	0.0%	91.9	-	
14-Jun-06	Hatchery	Top caudal yellow	1,507	2	0.1%	85.4	83.0	4864
3/1/08	Wild	Caudal fin yellow	73	5	6.9%	38	38	342
4/15/08	Hatchery	Caudal fin orange	1131	109	9.6%	77	76	300
4/25/08	Hatchery	Dorsal fin orange	1005	17	1.7%	86	84	1290
5/7/08	Hatchery	Anal fin orange	526	8	1.5%	96	96	1310
5/14/08	Hatchery	Caudal fin orange	519	13	2.5%	93	91	941
5/21/08	Hatchery	Lower caudal orange, anal fin orange	515	19	3.7%	92	91	678

np= not provided

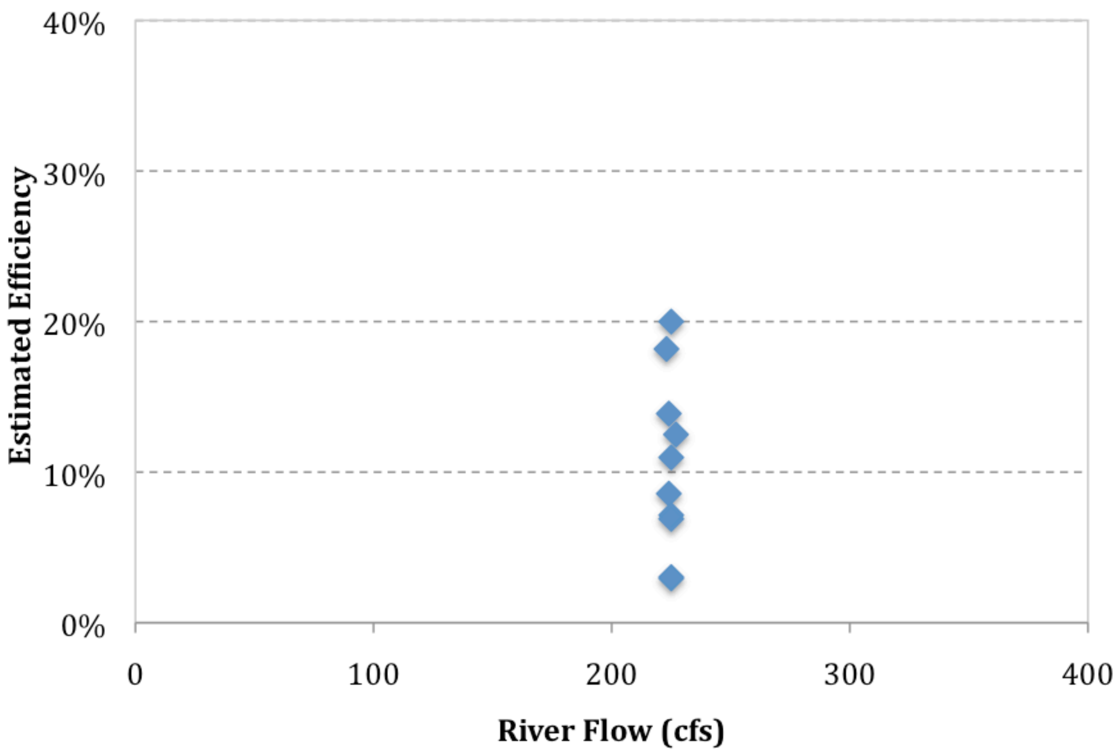

Figure 7. Trap efficiency estimates at Waterford relative to river flow at La Grange (LGN) during 2010.

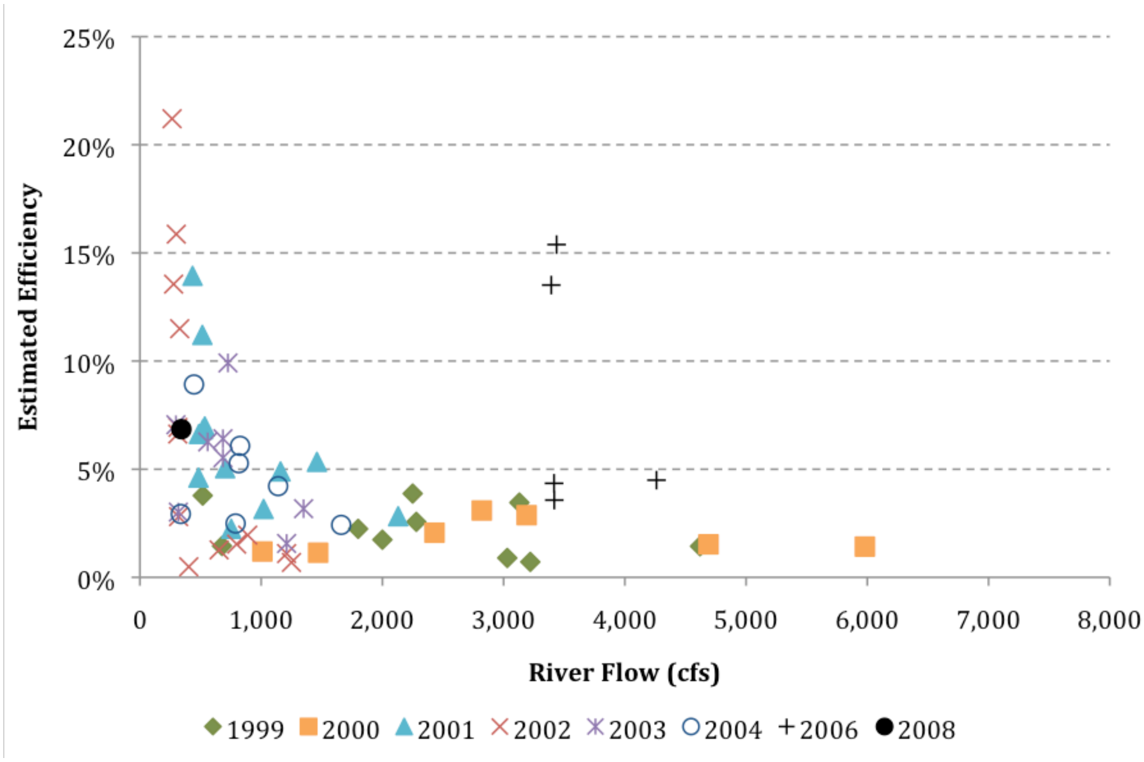

Figure 8. Trap efficiency observations at Grayson relative to river flow at Modesto (MOD), 1999-2008.

<u>*Estimated Chinook Salmon Abundance*</u>

As mentioned previously, in order to account for the uncertainty in trap efficiencies at Waterford during periods of parr/smolt outmigration (April 11-June 10), a range of abundances were calculated using trap efficiency data from previous study years. In this section, for ease of explanation, the population estimate was calculated using the median historical efficiency with the range in parentheses (Figure 9). Based on calculated daily passage estimates, an estimated 42,600 (29,300-55,900) Chinook salmon passed Waterford during 2010, of which 70.7% (58.2%-77.2%) were smolts (Table 5). In comparison, the percentage of fish passing Waterford as smolts was 51.7% in 2009, 34.3% in 2008, and 51.1% in 2007. In 2006, sampling efforts were affected by high spring flows resulting in passage estimates that were likely underestimated (particularly for smolts). Similar to the pattern observed for catch in 2010, and in previous years, it is estimated that a majority of the salmon passing Waterford in 2010 prior to mid-March were fry and passage was then dominated by smolts from late-March through May (Table 5; Figure 10). Daily estimated salmon passage at Waterford ranged from zero to 1,730 (max. range = 1,153-2,550). The peak in daily passage for fry occurred on January 21 and smolt passage peaked on May 15 (Figure 11).

During the 2009-2010 spawning season, approximately 490 (337-643) juveniles were produced per female spawner relative to the estimated 87[3] female spawners; compared to 175 juveniles in 2009, 311 in 2008, and 205 in 2007 (Table 6). Beginning in 2010 the number of female spawners was estimated using counts from a Vaki Riverwatcher used in conjunction with a resistance board weir, rather than using the traditional carcass surveys. This estimate of spawner abundance is believed to be more accurate than carcass surveys, especially during years of lower abundance (Cuthbert et al. 2010).

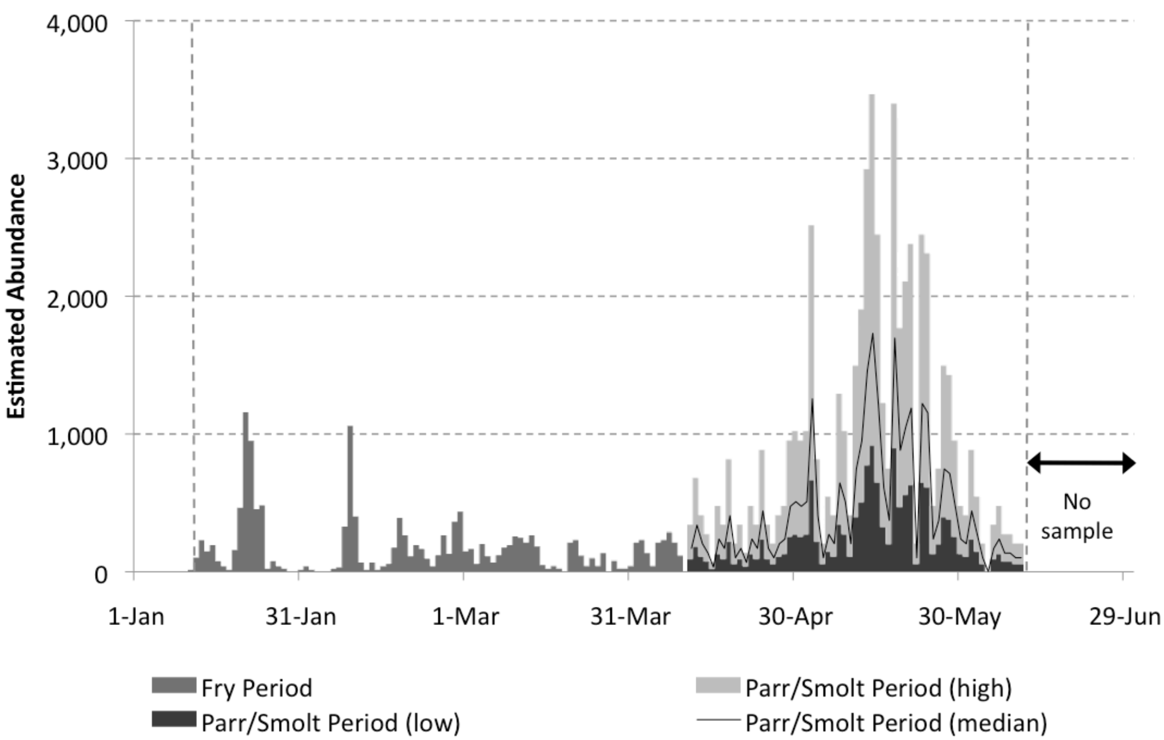

Figure 9. Daily estimated abundance of Chinook salmon at Waterford based on trap efficiencies conducted in 2010 at Waterford during the fry period, and trap efficiencies conducted in 2007 at Waterford (at flows < 1,000cfs) and at the 7/11 and Deardorff traps in 1998-2000 (at flows > 1,000cfs) for the parr/smolt period. A range of abundances were calculated for the parr/smolt period and the median and range are presented in this graph.

[3] Excludes 18 adult salmon of unknown gender.

Table 5. Estimated passage by lifestage at Waterford and Grayson during 1995-2010. *For 2010 the estimated passage values used in this table for Waterford are the median values of the estimated ranges.

		Sampling Period	Fry		Parr		Smolts		Total
			Number	%	Number	%	Number	%	
Waterford	2006	w/s	163,805	54.0%	6,550	2.2%	133,127	43.9%	303,482
	2007	w/s	20,633	35.7%	7,614	13.2%	29,554	51.1%	57,801
	2008	w/s	15,259	61.3%	1,102	4.4%	8,534	34.3%	24,894
	2009	w/s	13,399	36.0%	4,562	12.3%	19,213	51.7%	37,174
	2010*	w/s	10,735	25.9%	1,030	2.5%	29,728	71.6%	41,493
Grayson	1995	spring	-	-	-	-	22,067	100%	22,067
	1996	spring	-	-	-	-	16,533	100%	16,533
	1997	spring	-	-	-	-	1,280	100%	1,280
	1998	intermediate	1,196,625	74.1%	327,422	20.3%	91,626	5.7%	1,615,673
	1999	w/s	716,858	94.9%	8,452	1.1%	30,293	4.0%	755,604
	2000	w/s	48,338	48.4%	8,431	8.4%	43,028	43.1%	99,797
	2001	w/s	59,153	59.4%	12,480	12.5%	27,951	28.1%	99,584
	2002	w/s	75	0.5%	696	4.9%	13,364	94.5%	14,135
	2003	spring	27	0.3%	0	0%	9,064	99.7%	9,091
	2004	spring	155	0.9%	732	4.1%	16,884	95.0%	17,771
	2005	spring	-	-	416	0.2%	255,294	99.8%	255,710
	2006	w/s	62,901	87.8%	1,536	2.1%	7,233	10.1%	71,670
	2007	spring	-	-	-	-	937	100%	937
	2008	w/s	917	27.9%	14	0.4%	2,352	71.6%	3,283
	2009	w/s	145	3.1%	200	4.3%	4,332	92.6%	4,677
	2010	w/s	183	4.1%	-	-	4260	95.9%	4,443

Table 6. Estimated number of juvenile salmon produced per female spawner, 2006-2010.

	Females	Juveniles/female spawner
2006	478	635
2007	282	205
2008	80	311
2009	212	175
2010	87	337 to 643

An estimated 4,443 unmarked Chinook salmon passed Grayson during 2010 and 95.9% of these were smolts (Table 5). Daily estimated passage at Grayson ranged from 0 to 718 salmon. Peak daily passage for smolts occurred on May 20 (Figure 12). During comparable seasonal sampling in previous years at Grayson (i.e., winter/spring sampling in 1999-2002, 2006, and 2008-2009), total estimated passage ranged from a high of 755,604 in 1999 to a low of 3,283 in 2008 (Table 1; Figure 14); the proportion of passage as smolts was the highest in 2010 (95.9%) and the lowest in 1999 (4.0%). In spring-only sampling years at Grayson/Shiloh (i.e., 2003-2005 and 2007 at Grayson and 1995-1997 at Shiloh), total estimated passage ranged from a high of

255,710 in 2005 to a low of 937 in 2007 (Table 1; Figure 14); the vast majority of migrants in all spring-only years were smolts (>95.0%; Table 5). Among all years, estimated passage was the highest during 1998 (Table 1; Figure 14), when sampling effort was intermediate and the proportion passing as smolts was low (5.7%). However, the 1998 passage estimate of 1,615,673 fish may be inflated and the proportion passing as smolts may be underestimated because no trap efficiency tests were conducted with fry.

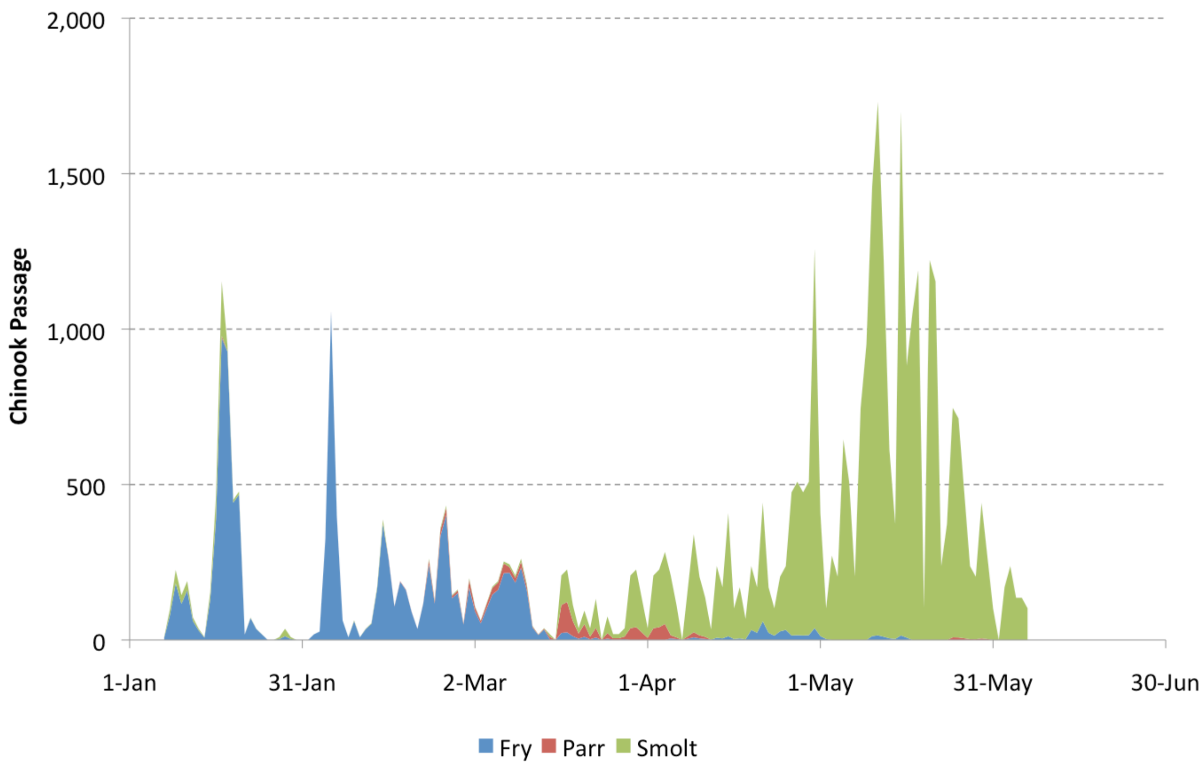

Figure 10. Juvenile salmon passage by lifestage at Waterford during 2010.

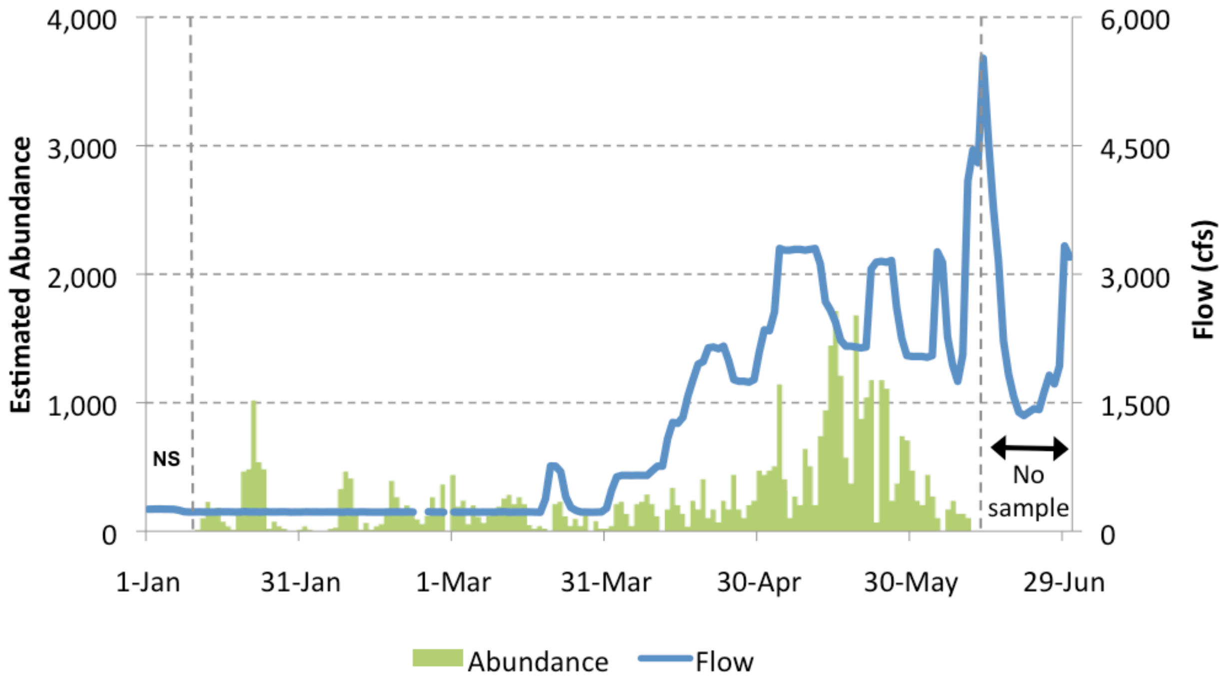

Figure 11. Daily estimated passage of unmarked Chinook salmon at Waterford and river flow at La Grange (LGN) during 2010.

NOTE: From April 11-June 10 the graph depicts median daily passage estimates - See Figure 9.

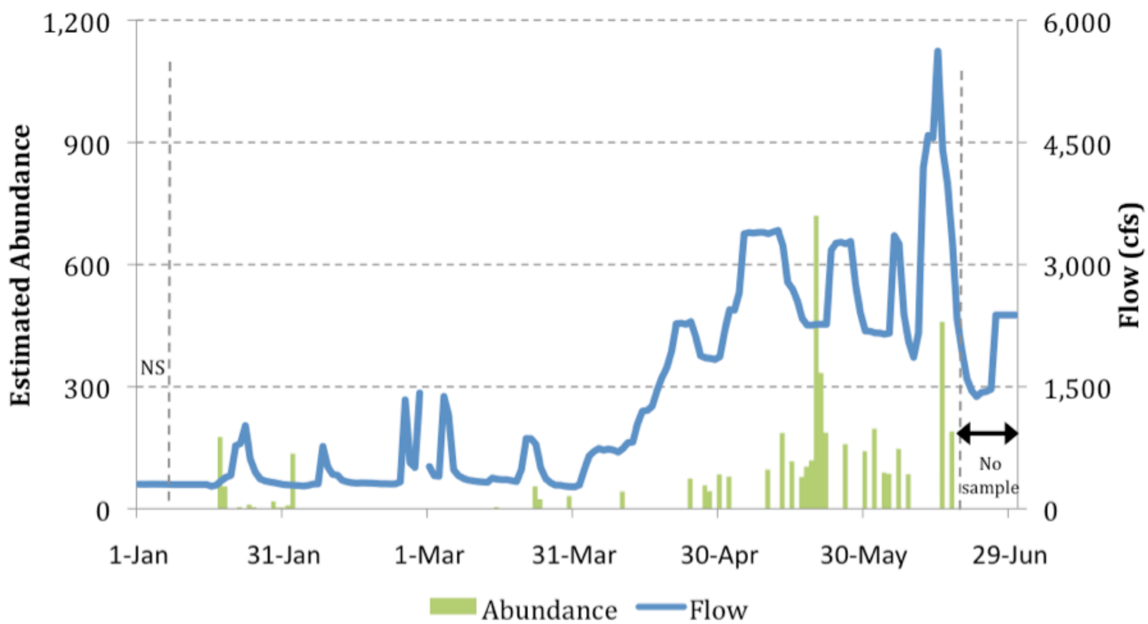

Figure 12. Daily estimated passage of unmarked Chinook salmon at Grayson and river flow at Modesto (MOD) during 2010.

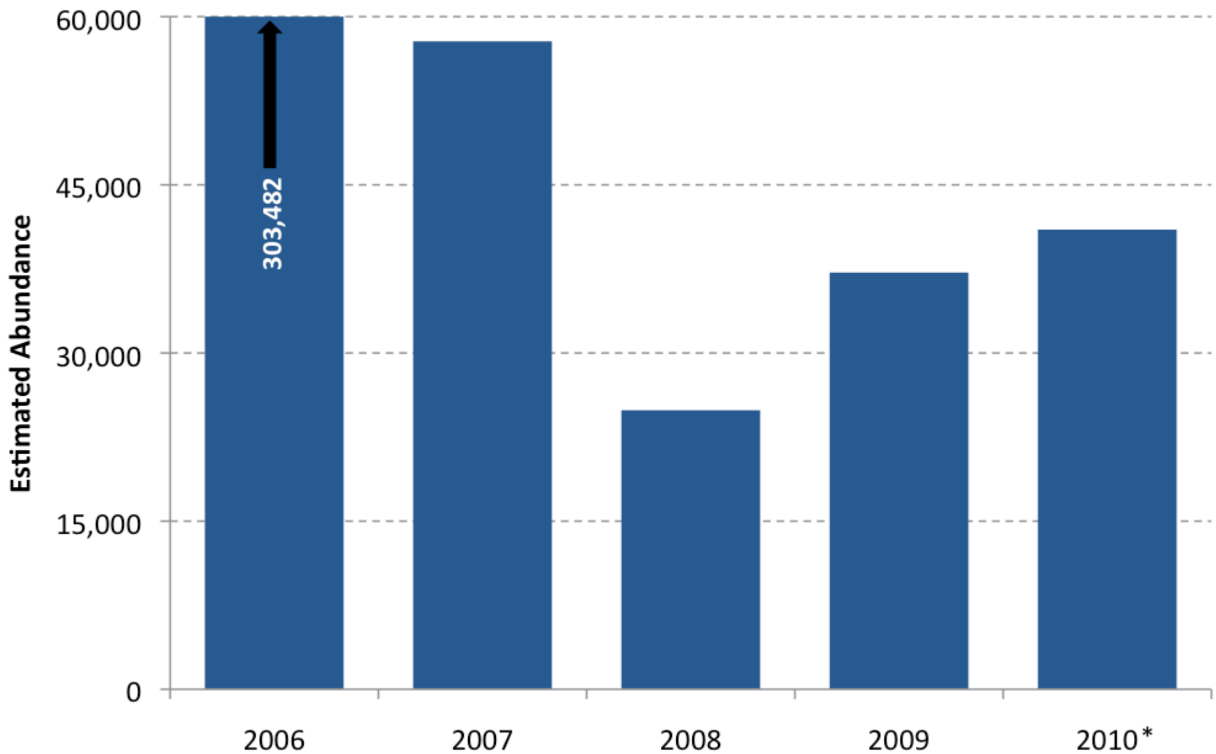

Figure 13. Total estimated Chinook passage at Waterford (2006-2010).

**Note that 2010 estimates are based upon the median of historical trap efficiency. (*range = 29,300–55,900).*

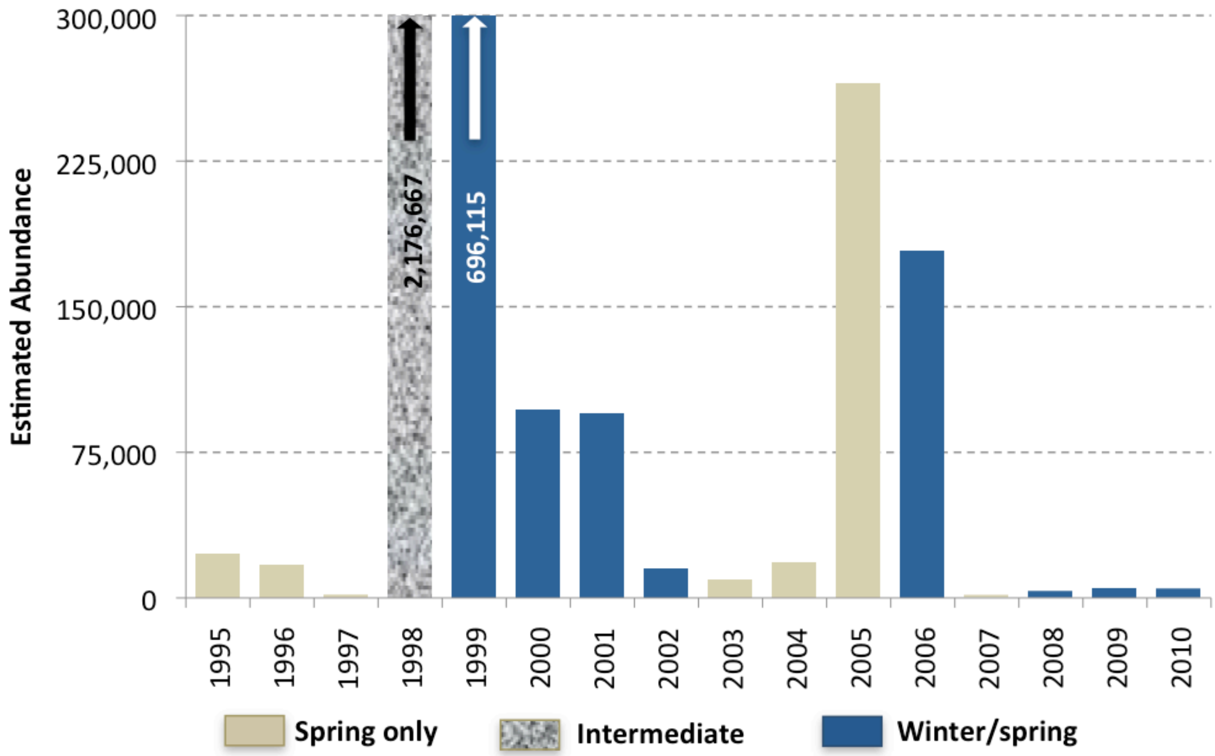

Figure 14. Total estimated Chinook passage at Shiloh and Grayson during 1995-2010.

Estimated Chinook Salmon Abundance and Environmental Factors

Peaks in salmon fry passage at Waterford in the winter were generally associated with peaks in turbidity conditions. River releases were relatively stable during this period (January-mid-March) and ranged from 222 cfs to 259 cfs. River flow near Grayson during the winter period was more variable as a result of storm run-off, particularly from Dry Creek entering at Modesto, and ranged from 279 cfs to 1,423 cfs. During the spring (mid-March through June), higher pulse flows produced several peaks in flow at both traps (Figure 11 and Figure 12).

During 2010 monitoring, daily average water temperatures ranged from 49.6°F to 60.4°F at the Waterford trap (Figure 15) and from 47.7°F to 64.2°F at the Grayson traps (Figure 16). Water temperatures generally increased through the outmigration season, with two peaks in mid- and late-March. There were no obvious correlations between trends in passage and water temperature during 2010.

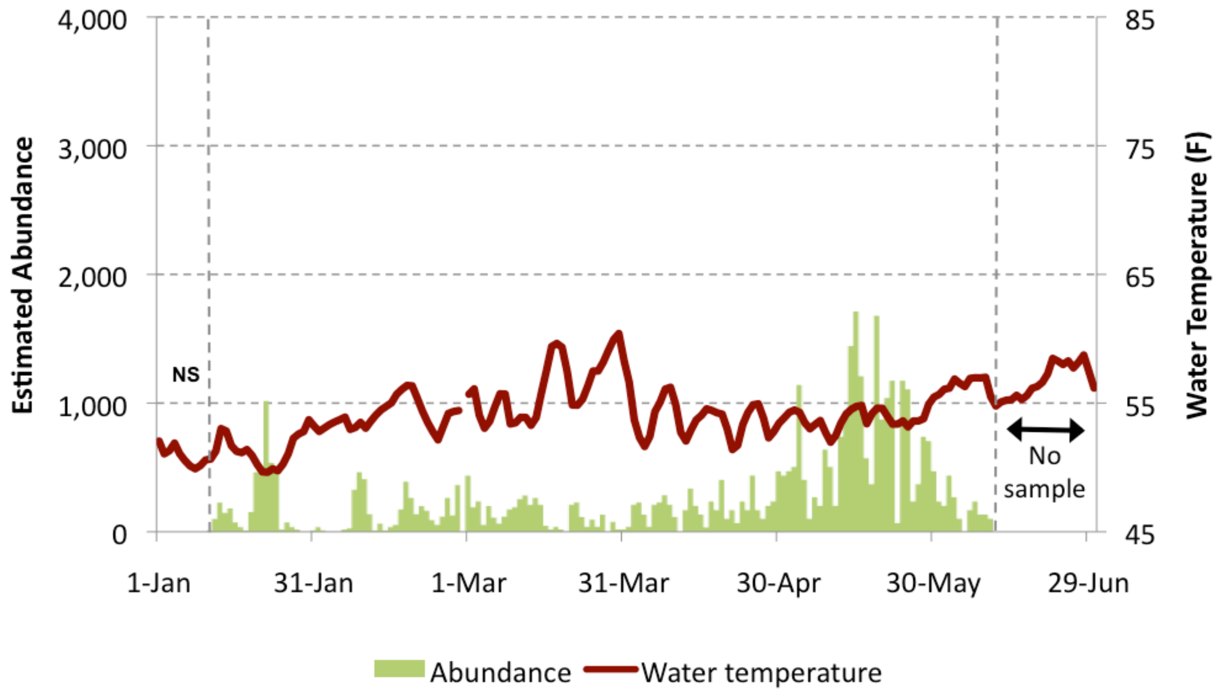

Figure 15. Daily estimated passage of unmarked Chinook salmon and daily average water temperature at the Waterford trap during 2010. NOTE: From April 11-June 10 the graph depicts median daily passage estimates - See Figure 9.

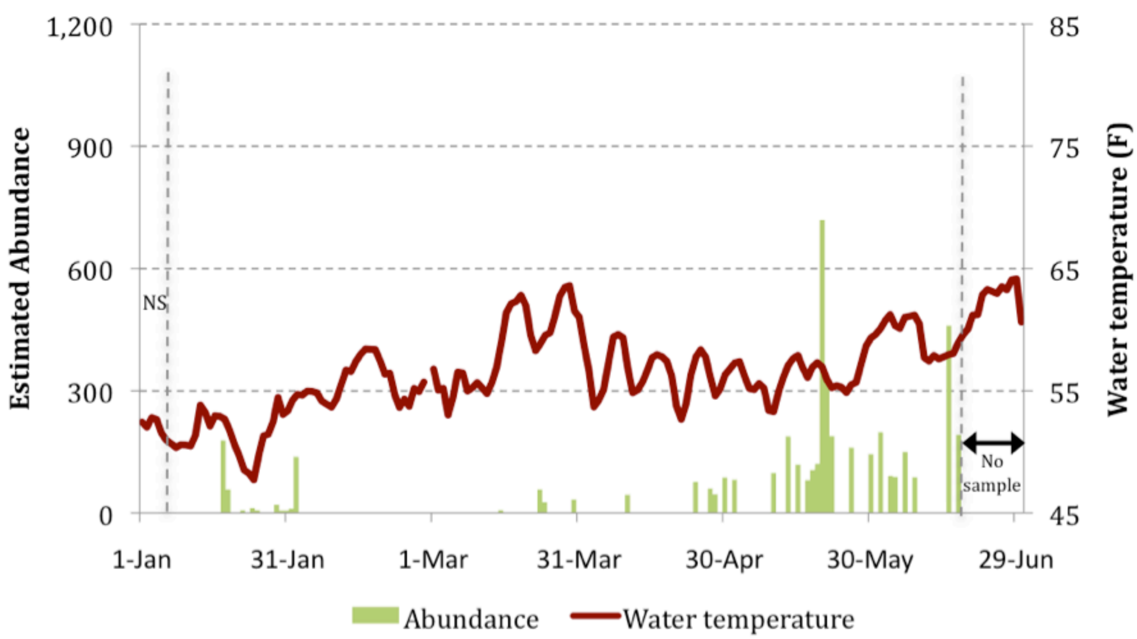

Figure 16. Daily estimated passage of unmarked Chinook salmon and daily average water temperature at the Grayson trap during 2010.

Background turbidity was generally less than 4 NTU at Waterford (Figure 17) and less than 6 NTU at Grayson (Figure 18) during the 2010 monitoring period. During several storm events (Figure 19), spikes in turbidity were observed ranging as high as 33 NTU at Waterford, and ranging as high as 81 NTU at Grayson. Peaks in passage on January 21st and February 9th at Waterford coincided with periods of elevated turbidity.

The ratio of estimated total passage at Grayson relative to the estimated total passage at Waterford provides an index of survival through the river between the sites (24.6 miles) during years when the majority of the outmigration period is sampled. The survival index for 2010, 10.4%, should be interpreted with caution, since there is substantial uncertainty in the total passage estimate for Waterford. This value was calculated using the median estimated total passage for Waterford, and ranges from 7.9% to 15.2% based upon the range of estimated passages. Survival indices of 23.6%, 13.2% and 11.9% were calculated for 2006, 2008 and 2009, respectively. A survival index was not calculated for 2007 because sampling did not begin until mid-March.

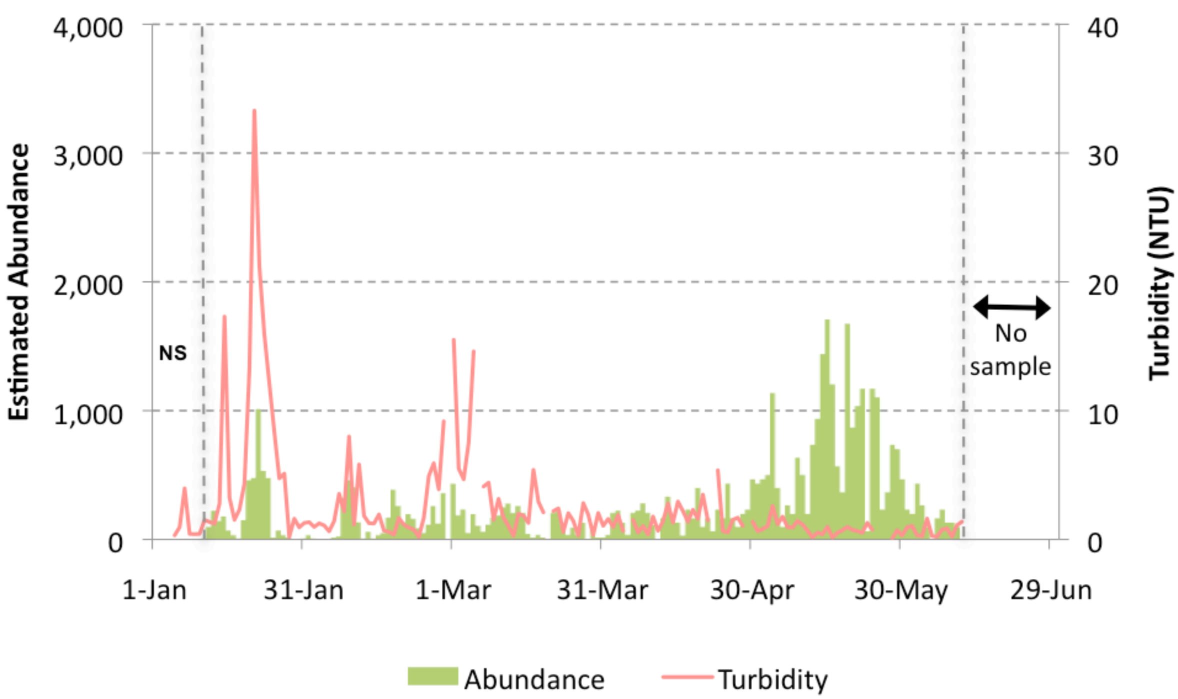

Figure 17. Daily estimated passage of unmarked Chinook salmon and instantaneous turbidity at Waterford during 2010. NOTE: From April 11-June 10 the graph depicts median daily passage estimates - See Figure 9.

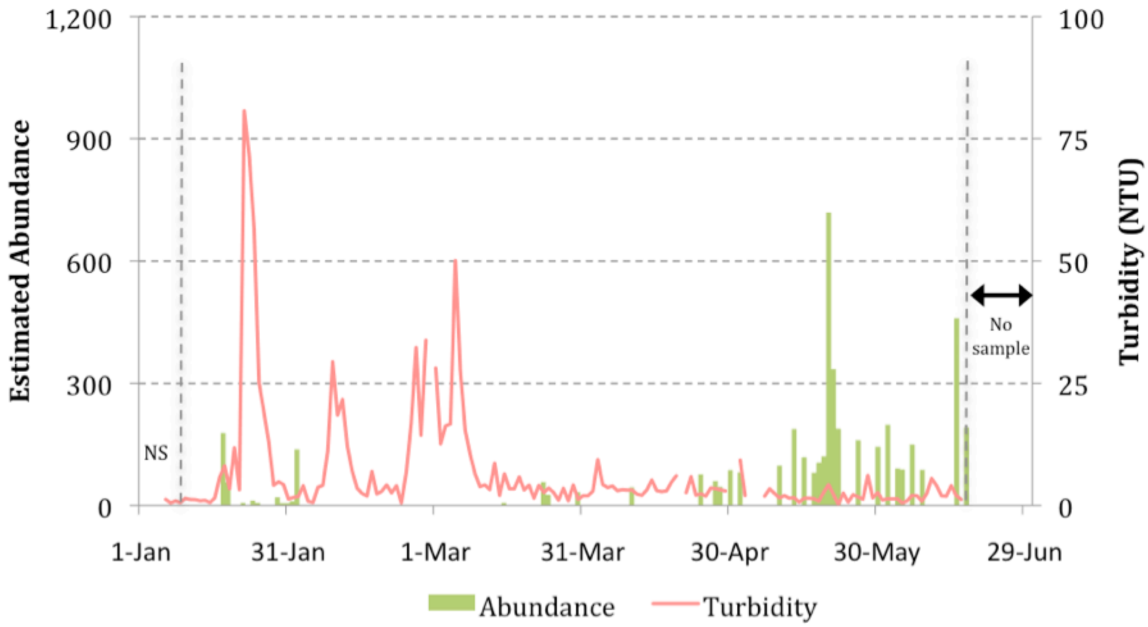

Figure 18. Daily estimated passage of unmarked Chinook salmon and instantaneous turbidity at Grayson during 2010.

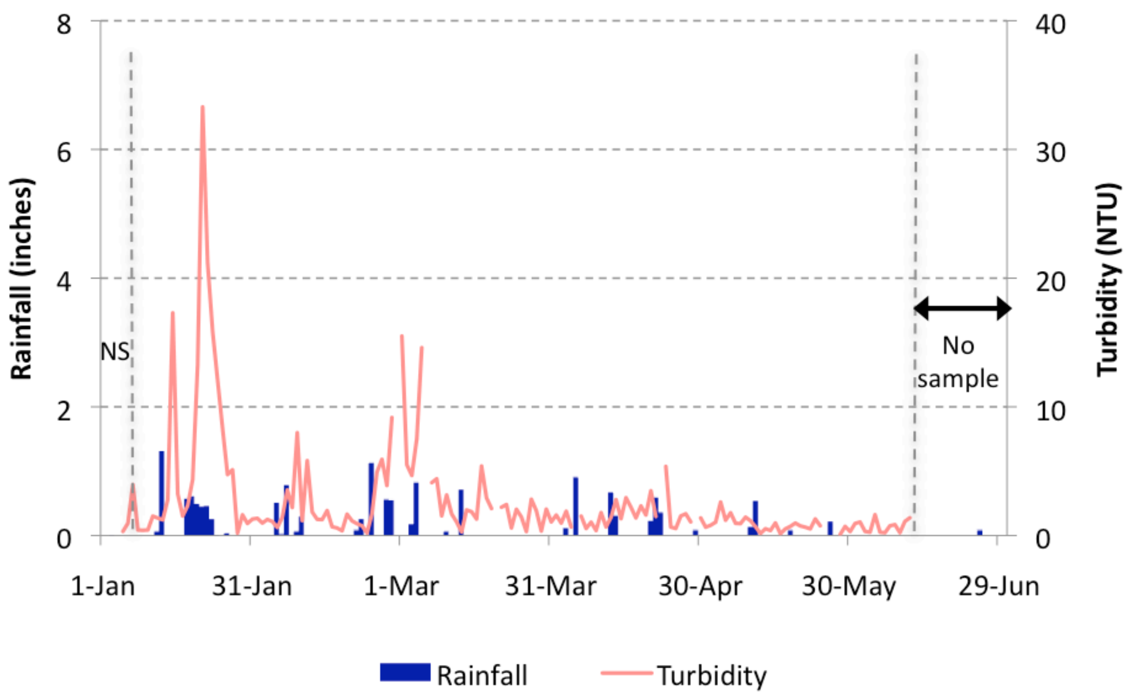

Figure 19. Daily rainfall measured at Don Pedro Reservoir and instantaneous turbidity at Waterford during 2010.

Chinook Salmon Length at Migration

Individual fork lengths of unmarked salmon captured at Waterford during 2010 ranged from 30 mm to 140 mm (Figure 20), and daily average length gradually increased from approximately 36 mm to over 90 mm during the course of the sampling period (Figure 21 and Figure 22). Most of the juvenile salmon passing Waterford during 2010 were smolts measuring 80-109 mm, followed by fry measuring 30-39 mm (Figure 23). In total, it is estimated that 11,471 fry (<50 mm), 1,023 parr (50-69 mm), and 30,124 smolts (≥70 mm) passed Waterford during 2010 (Table 5). There were also a number of fish captured throughout the season that were atypical sizes for fall-run Chinook salmon production (Figure 20). For instance, during January through mid-March there were 47 fish much larger than the majority of juvenile salmon captured during that period (average size of larger fish was over 60 mm larger than majority of juvenile salmon captured) and 10 fish in the spring that were much smaller than other juvenile salmon captured during that period (34-38 mm versus 45-125 mm).

Individual fork lengths of unmarked Chinook salmon captured at Grayson during 2010 ranged from 31 mm to 139 mm (Figure 24), and daily average length ranged between 31 mm and 110 mm during the sampling period (Figure 25 and Figure 26). Nearly 78% of the salmon estimated to have passed Grayson during 2010 were smolts measuring 90-109 mm (Figure 26). In total, it is estimated that 183 fry (<50 mm), zero parr (50-69 mm), and 4,260 smolts (≥70 mm) passed Grayson during 2010 (Table 5). Similar to Waterford, three much larger sized Chinook were also captured during January through early March (Figure 24).

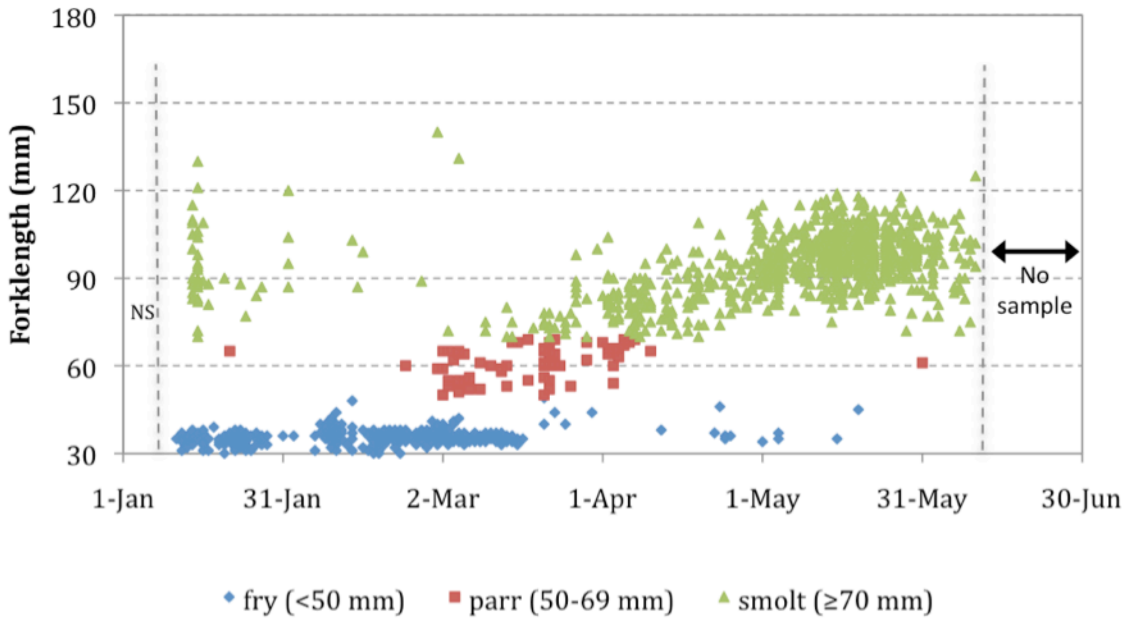

Figure 20. Individual fork lengths of juvenile salmon captured at Waterford during 2010.

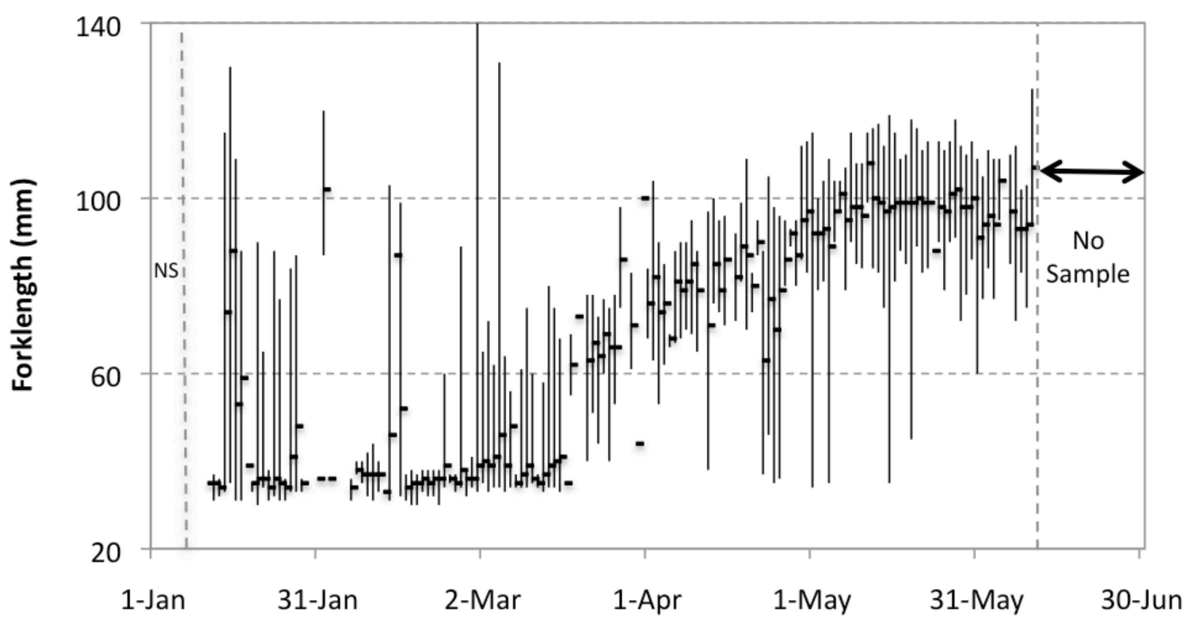

Figure 21. Daily minimum, average, and maximum fork lengths of unmarked Chinook salmon captured at Waterford during 2010.

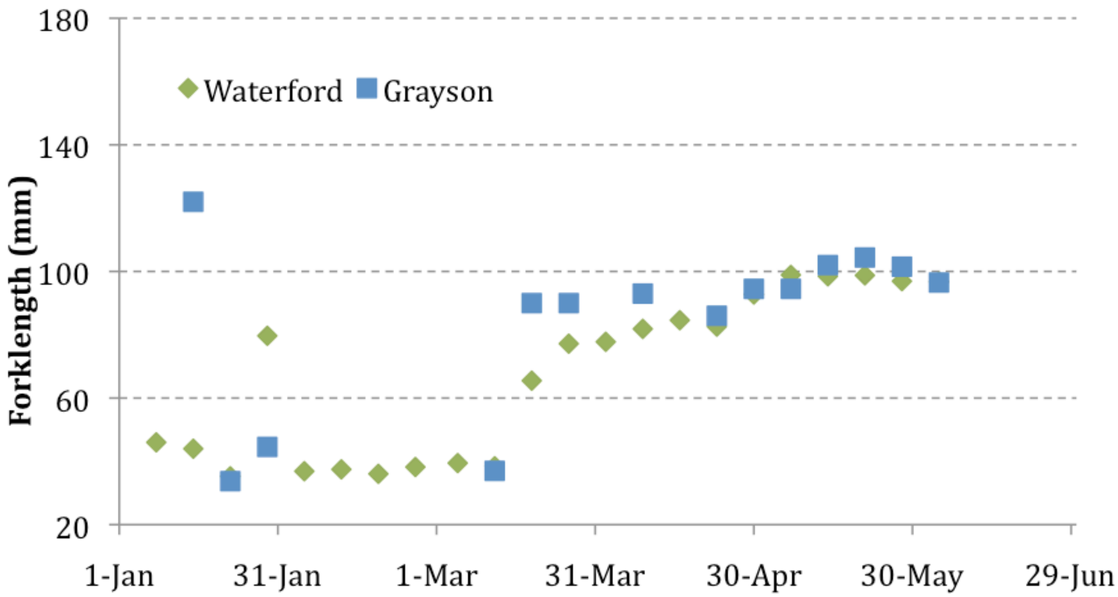

Figure 22. Average fork length of juvenile Chinook salmon captured at Waterford and Grayson by Julian week during 2010.

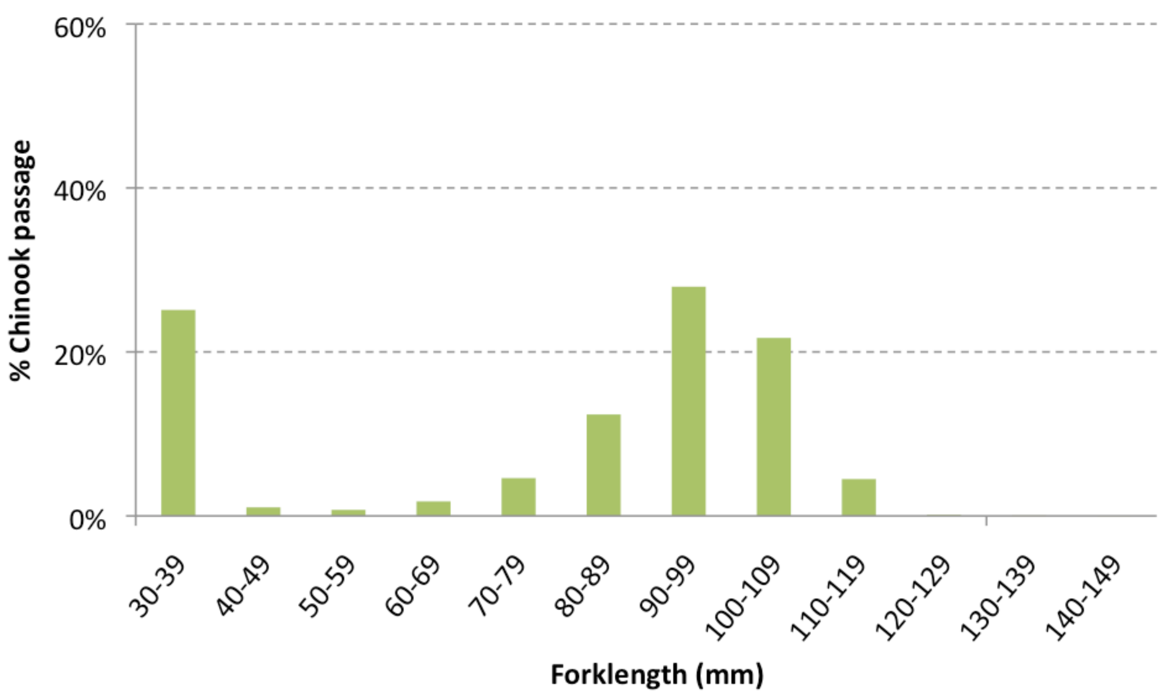

Figure 23. Estimated Chinook passage by 10 mm fork length intervals at Waterford during 2010.

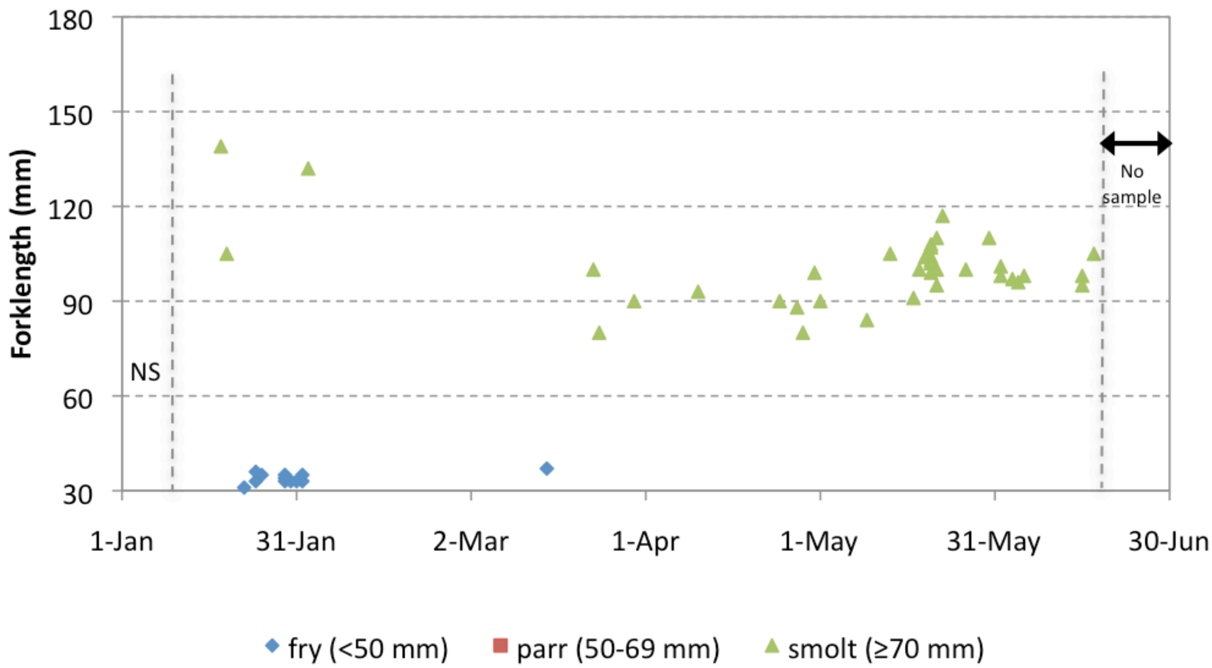

Figure 24. Individual fork lengths of juvenile salmon captured at Grayson during 2010.

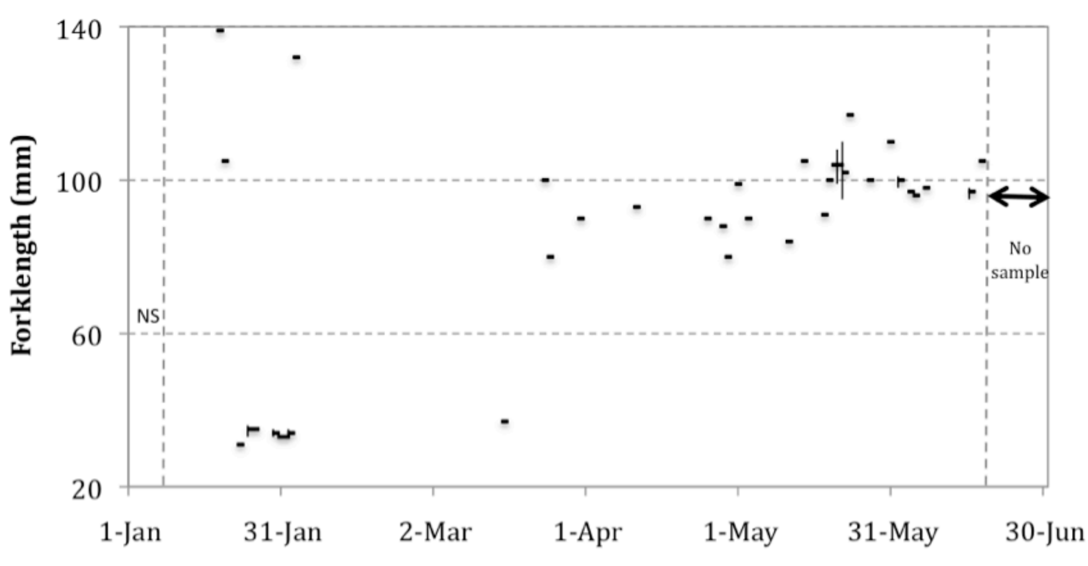

Figure 25. Daily minimum, average, and maximum fork lengths of unmarked Chinook salmon captured at Grayson during 2010.

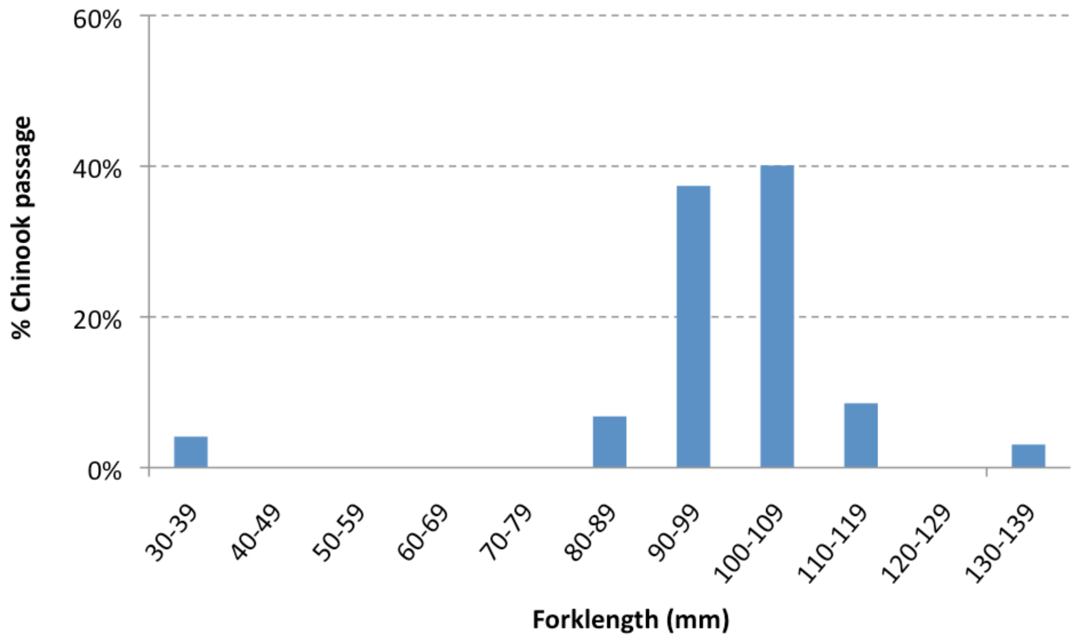

Figure 26. Estimated Chinook passage by 10 mm fork length intervals at Grayson during 2010.

Chinook Salmon Condition at Migration

Juveniles captured at both Waterford and Grayson during 2010 were generally healthy with no apparent signs of disease or stress. The relationship between individual salmon fork length and weight showed a very similar trend between Waterford and Grayson (Figure 27).

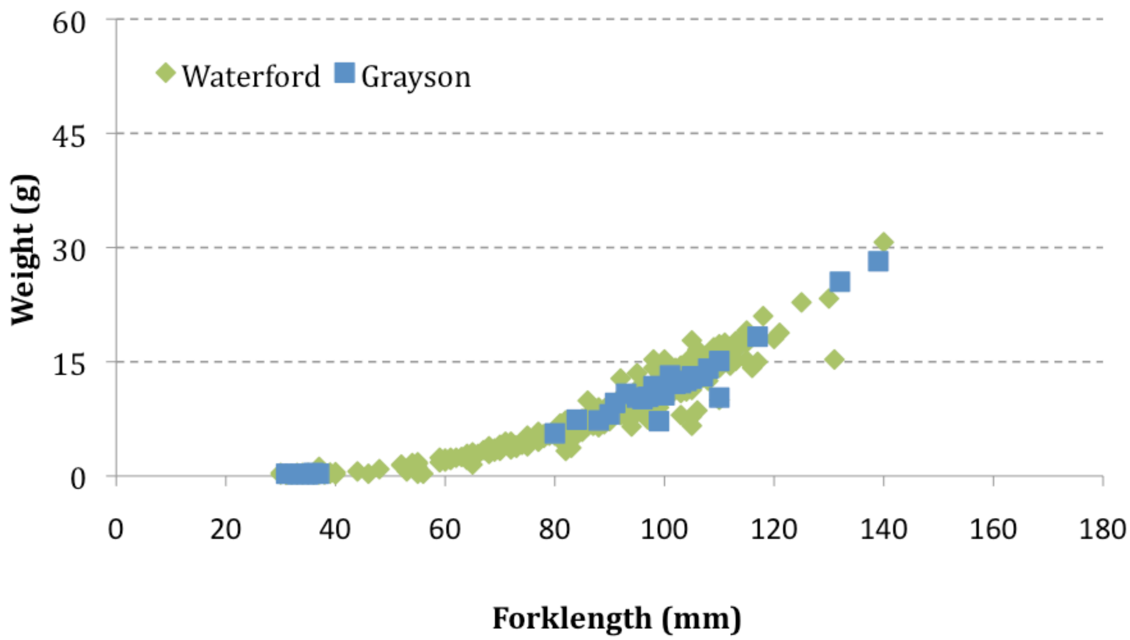

Figure 27. Fork length and weight of individual juvenile Chinook salmon measured at Waterford and Grayson during 2010.

Oncorhynchus mykiss (Rainbow Trout/Steelhead)

No *O. mykiss* were captured at Waterford or Grayson in 2010. Total annual *O. mykiss* catch at the Grayson and Waterford traps between 2007 and 2010 ranged from zero to eleven (Figure 28).

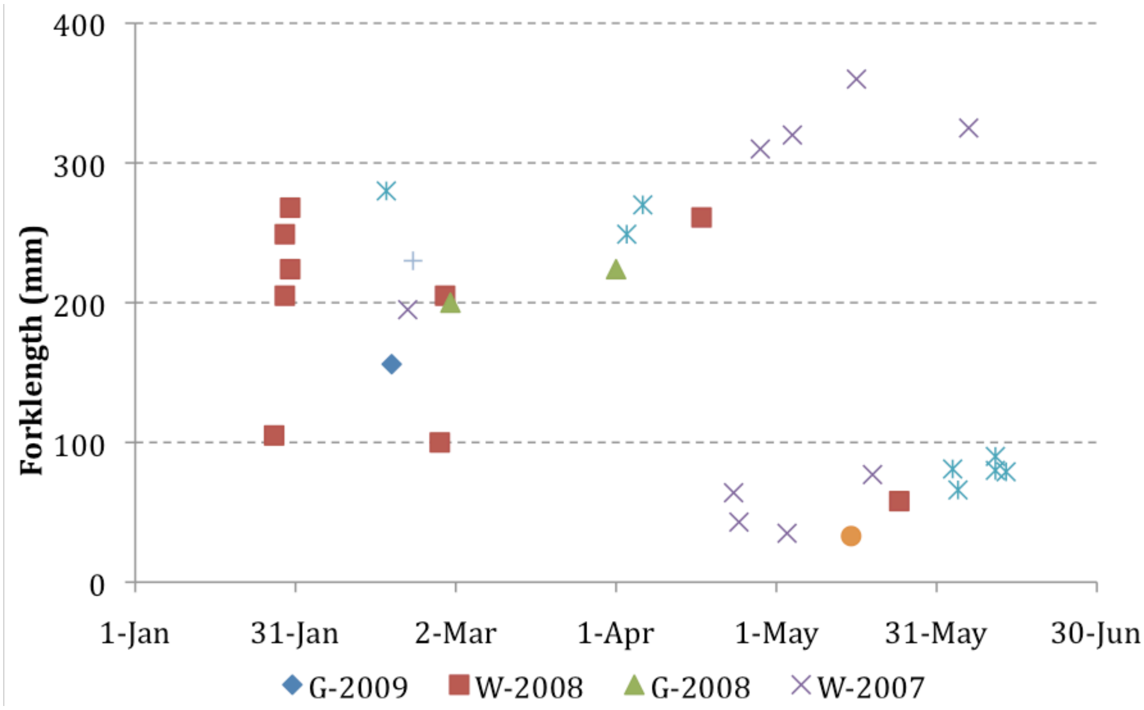

Figure 28. Date, size and location of *O. mykiss* captured at Waterford (W) and Grayson (G).

Other Fish Species Captured

A total of 4,467 non-salmonids representing at least 22 species (5 native, 17 introduced) were captured during operation of the Waterford and Grayson traps in 2010 (Table 7; Appendices C and D). Native species comprised 56.7% of the total non-salmonid catch, consisting primarily of lamprey (n=1,952). Most species captured at Waterford were also recorded at Grayson. Additional species only recorded at Waterford were green sunfish and tule perch. Species only recorded at Grayson were bigscale logperch, black bullhead, brown bullhead, black crappie, goldfish, and inland silverside. Lampreys captured in the traps were primarily ammocoetes and were not identified to species or measured. No adult lamprey were captured at either trapping location.

Table 7. Non-salmonid species captured at Waterford and Grayson during 2010. Native species are indicated in bold.

		Waterford				Grayson			
Common Name	Scientific Name	Total Catch	Minimum Length (mm)	Average Length (mm)	Maximum Length (mm)	Total Catch	Minimum Length (mm)	Average Length (mm)	Maximum Length (mm)
Catfish Family									
Black bullhead	*Ameiurus melas*	0	-	-	-	1	180	180	180
Brown bullhead	*Ameiurus nebulosus*	0	-	-	-	20	156	184	206
Channel catfish	*Ictalurus punctatus*	57	38	58	80	12	43	64	120
White catfish	*Ictalurus catus*	367	36	58	160	550	36	57	272
Lamprey Family									
Lamprey - unidentified	Not applicable	1,916	-	-	-	36	-	-	-
Livebearer Family									
Mosquitofish	*Gambusia affinis*	14	28	32	47	88	46	47	47
Minnow Family									
Golden shiner	*Notemigonus crysoleucas*	4	31	40	49	56	35	71	172
Goldfish	*Carassius auratus*	0	-	-	-	2	-	-	-
Red shiner	*Cyprinella lutrennsis*	1	54	54	54	88	25	57	155
Sacramento pikeminnow	*Ptychochelius grandis*	401	33	82	169	93	25	80	180
Perch Family									
Bigscale logperch	*Percina macrolepida*	0	-	-	-	1	107	107	107
Sculpin Family									
Prickly Sculpin	*Cottus asper*	14	72	85	140	3	90	108	125
Silverside Family									
Inland silverside	*Menidia beryllina*	0	-	-	-	5	34	54	72

Common Name	Scientific Name	Waterford Total Catch	Waterford Minimum Length (mm)	Waterford Average Length (mm)	Waterford Maximum Length (mm)	Grayson Total Catch	Grayson Minimum Length (mm)	Grayson Average Length (mm)	Grayson Maximum Length (mm)
Sucker Family									
Sacramento sucker	*Catostomus occidentalis*	50	34	63	430	21	25	46	193
Sunfish Family									
Bluegill	*Lepomis macrochirus*	177	34	66	174	119	23	75.4	168
Black crappie	*Pomoxis annularis*	0	-	-	-	7	32	93.6	227
Green sunfish	*Lepomis cyanellus*	8	64	129	175	0	-	-	-
Largemouth bass	*Micropterus salmoides*	17	48	68	90	51	33	112	305
Redear sunfish	*Lepomis microlophus*	67	34	87	182	164	30	73	188
Smallmouth bass	*Micropterus dolomieu*	9	52	79	155	34	64	121	285
Warmouth	*Lepomis gulosus*	12	69	123	194	1	33	33	33
Unidentified bass	Not applicable	0	-	-	-	10	34	43.7	67
Surfperch Family									
Tule perch	*Hysterocarpus traskii*	1	89	89	89	0	-	-	-
Unidentified species	Not applicable	0	-	-	-	2	-	-	-

Total Species Captured = 22 (17 introduced, 5 native)

Total Native Individuals Captured = 2,535 (2,382 at Waterford, 153 at Grayson)

Total Introduced Individuals Captured = 1,932 (733 at Waterford, 1,199 at Grayson)

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Appendix A. Daily Chinook catch, length, and estimated passage at Waterford and environmental data from 2010.

	Unmarked Chinook Salmon																*Environmental Conditions*			
		Fork Length (mm)			High Range	Estimated Passage - High				Low Range	Estimated Passage - Low				Median	Flow (cfs)			
Date	Catch	Min	Avg	Max	Est. Efficiency	Fry	Parr	Smolt	Total	Est. Efficiency	Fry	Parr	Smolt	Total	Passage	La Grange	Velocity (ft/s)	Temp at Trap	Turbidity
1/5/10	0	-	-	-	0.111	0	0	0	0	0.111	0	0	0	0	0	255	1.8	50.3	0.32
1/6/10	0	-	-	-	0.111	0	0	0	0	0.111	0	0	0	0	0	254	1.7	49.6	0.96
1/7/10	0	-	-	-	0.111	0	0	0	0	0.111	0	0	0	0	0	244	1.8	50.0	3.96
1/8/10	0	-	-	-	0.111	0	0	0	0	0.111	0	0	0	0	0	228	1.9	50.7	0.43
1/9/10	0	-	-	-	0.111	0	0	0	0	0.111	0	0	0	0	0	231	1.7	49.6	0.41
1/10/10	0	-	-	-	0.111	0	0	0	0	0.111	0	0	0	0	0	225	1.9	48.5	0.43
1/11/10	1	35	35	35	0.111	7	0	2	9	0.111	7	0	2	9	9	227	1.5	50.1	1.51
1/12/10	11	31	34	37	0.111	80	0	19	99	0.111	80	0	19	99	99	225	1.7	52.5	1.36
1/13/10	25	32	34	36	0.111	182	0	43	225	0.111	182	0	43	225	225	224	1.8	53.4	1.22
1/14/10	16	33	77	115	0.111	116	0	28	144	0.111	116	0	28	144	144	224	2.2	54.5	2.79
1/15/10	20	35	88	130	0.111	159	1	29	189	0.111	159	1	29	189	189	226	1.7	50.7	17.30
1/16/10	8	31	53	109	0.111	61	0	11	72	0.111	61	0	11	72	72	226	1.5	50.5	3.24
1/17/10	4	31	59	88	0.111	30	0	5	36	0.111	30	0	5	36	36	226	1.7	50.9	1.52
1/18/10	1	39	39	39	0.111	8	0	1	9	0.111	8	0	1	9	9	224	2.1	51.2	2.32
1/19/10	17	33	34	35	0.111	129	1	23	153	0.111	129	1	23	153	153	225	1.7	50.3	4.34
1/20/10	51	30	38	90	0.111	387	3	70	459	0.111	387	3	70	459	459	225	1.8	46.0	13.20
1/21/10	53	34	38	65	0.111	971	8	174	1153	0.111	971	8	174	1153	1153	225	1.8	48.5	33.30
1/22/10	112	31	34	38	0.111	927	0	18	946	0.111	927	0	18	946	946	225	1.9	48.0	21.20
1/23/10	59	32	37	88	0.111	442	0	9	450	0.111	442	0	9	450	450	225	2.4	48.7	15.90
1/24/10	53	31	36	77	0.111	468	0	9	477	0.111	468	0	9	477	477	225	1.7	48.7	12.10
1/25/10	2	31	34	36	0.111	18	0	0	18	0.111	18	0	0	18	18	225	1.9	50.1	8.34
1/26/10	8	33	42	84	0.111	71	0	1	72	0.111	71	0	1	72	72	225	2.1	50.3	4.74
1/27/10	4	33	48	87	0.111	35	0	1	36	0.111	35	0	1	36	36	225	1.8	50.1	5.11
1/28/10	2	33	35	36	0.111	18	0	0	18	0.111	18	0	0	18	18	225	1.8	51.6	0.19
1/29/10	0	-	-	-	0.111	0	0	0	0	0.111	0	0	0	0	0	225	1.8	51.9	1.61
1/30/10	0	-	-	-	0.111	0	0	0	0	0.111	0	0	0	0	0	225	1.5	53.0	0.94
1/31/10	1	36	36	36	0.111	3	0	6	9	0.111	3	0	6	9	9	225	1.8	52.1	1.28
2/1/10	4	87	102	120	0.111	12	0	24	36	0.111	12	0	24	36	36	225	1.7	51.8	1.34
2/2/10	1	36	36	36	0.111	3	0	6	9	0.111	3	0	6	9	9	225	1.1	52.1	0.97
2/3/10	0	-	-	-	0.111	0	0	0	0	0.111	0	0	0	0	0	225	1.7	51.4	1.25
2/4/10	0	-	-	-	0.111	0	0	0	0	0.111	0	0	0	0	0	225	1.4	53.0	1.09
2/5/10	0	-	-	-	0.111	0	0	0	0	0.111	0	0	0	0	0	225	1.5	54.6	0.63

	Unmarked Chinook Salmon															*Environmental Conditions*			
		Fork Length (mm)			High Range	Estimated Passage - High				Low Range	Estimated Passage - Low				Median	Flow (cfs)			
Date	Catch	Min	Avg	Max	Est. Efficiency	Fry	Parr	Smolt	Total	Est. Efficiency	Fry	Parr	Smolt	Total	Passage	La Grange	Velocity (ft/s)	Temp at Trap	Turbidity
2/6/10	2	31	34	36	0.111	18	0	0	18	0.111	18	0	0	18	18	225	1.8	53.9	1.42
2/7/10	3	37	39	40	0.111	27	0	0	27	0.111	27	0	0	27	27	225	2.2	52.5	3.54
2/8/10	36	35	37	40	0.111	324	0	0	324	0.111	324	0	0	324	324	225	1.9	51.9	2.18
2/9/10	51	32	38	42	0.111	1054	0	0	1054	0.111	1054	0	0	1054	1054	225	1.8	52.6	7.99
2/10/10	45	31	36	44	0.111	396	0	0	396	0.111	396	0	0	396	396	225	2.1	51.6	1.16
2/11/10	15	35	38	40	0.111	63	0	0	63	0.111	63	0	0	63	63	225	1.7	53.7	5.82
2/12/10	1	33	33	33	0.111	9	0	0	9	0.111	9	0	0	9	9	225	1.5	52.7	1.83
2/13/10	7	31	46	103	0.111	61	0	2	63	0.111	61	0	2	63	63	225	1.6	53.2	1.26
2/14/10	1	87	87	87	0.111	9	0	0	9	0.111	9	0	0	9	9	225	1.4	53.6	1.24
2/15/10	4	32	52	99	0.111	35	0	1	36	0.111	35	0	1	36	36	225	1.5	53.7	1.94
2/16/10	6	31	34	37	0.111	52	0	2	54	0.111	52	0	2	54	54	225	1.9	54.5	0.68
2/17/10	19	30	35	38	0.111	165	0	6	171	0.111	165	0	6	171	171	225	1.8	54.8	0.59
2/18/10	43	30	35	37	0.111	373	0	14	387	0.111	373	0	14	387	387	225	2.0	55.2	0.37
2/19/10	29	33	36	38	0.111	259	2	0	261	0.111	259	2	0	261	261	225	2.2	56.1	1.66
2/20/10	15	35	36	38	0.111	107	1	0	108	0.111	107	1	0	108	108	225	1.5	54.2	1.14
2/21/10	22	32	36	38	0.111	187	2	0	189	0.111	187	2	0	189	189	225	1.8	53.9	0.92
2/22/10	18	30	35	38	0.111	161	2	0	162	0.111	161	2	0	162	162	225	1.6	51.9	0.76
2/23/10	10	34	39	60	0.111	89	1	0	90	0.111	89	1	0	90	90	225	2.1	52.5	0.20
2/24/10	6	35	36	36	0.111	36	0	0	36	0.111	36	0	0	36	36	225	2.0	51.0	1.68
2/25/10	13	33	35	37	0.111	116	1	0	117	0.111	116	1	0	117	117	227	1.8	51.2	4.93
2/26/10	29	34	42	89	0.111	243	14	5	261	0.111	243	14	5	261	261	224	1.7	53.5	5.92
2/27/10	14	32	36	38	0.111	117	7	2	126	0.111	117	7	2	126	126	225	1.9	53.4	3.89
2/28/10	40	34	36	41	0.111	335	19	6	360	0.111	335	19	6	360	360	222	1.9	52.2	9.17
3/1/10	48	33	46	140	0.111	402	23	8	432	0.111	402	23	8	432	432	224	1.4	54.6	15.50
3/2/10	21	35	42	65	0.111	134	8	3	144	0.111	134	8	3	144	144	223	-	54.0	5.50
3/3/10	26	33	46	72	0.111	151	9	3	162	0.111	151	9	3	162	162	224	-	54.1	4.67
3/4/10	6	34	41	62	0.111	50	3	1	54	0.111	50	3	1	54	54	225	-	51.0	7.52
3/5/10	22	34	51	131	0.111	169	25	5	198	0.111	169	25	5	198	198	224	2.1	52.1	14.60
3/6/10	12	33	42	64	0.111	92	13	3	108	0.111	92	13	3	108	108	223	-	53.6	-
3/7/10	7	34	48	56	0.111	54	8	2	63	0.111	54	8	2	63	63	224	2.0	53.0	4.11
3/8/10	13	34	35	37	0.111	100	15	3	117	0.111	100	15	3	117	117	224	2.0	55.0	4.41
3/9/10	19	34	42	61	0.111	146	21	4	171	0.111	146	21	4	171	171	223	2.2	50.0	1.53
3/10/10	21	34	44	75	0.111	161	23	5	189	0.111	161	23	5	189	189	226	2.0	52.1	3.15

	Unmarked Chinook Salmon															Environmental Conditions			
		Fork Length (mm)			High Range	Estimated Passage - High				Low Range	Estimated Passage - Low				Median	Flow (cfs)			
Date	Catch	Min	Avg	Max	Est. Efficiency	Fry	Parr	Smolt	Total	Est. Efficiency	Fry	Parr	Smolt	Total	Passage	La Grange	Velocity (ft/s)	Temp at Trap	Turbidity
3/11/10	28	35	40	60	0.111	215	31	6	252	0.111	215	31	6	252	252	227	1.9	51.8	1.68
3/12/10	31	34	35	37	0.111	216	18	9	243	0.111	216	18	9	243	243	222	1.9	53.4	1.05
3/13/10	23	33	41	58	0.111	184	15	8	207	0.111	184	15	8	207	207	224	1.9	51.2	0.28
3/14/10	29	34	50	80	0.111	232	19	10	261	0.111	232	19	10	261	261	224	2.2	51.6	1.99
3/15/10	23	34	43	75	0.111	160	13	7	180	0.111	160	13	7	180	180	225	1.7	53.7	1.85
3/16/10	5	33	41	68	0.111	40	3	2	45	0.111	40	3	2	45	45	225	1.9	55.7	1.28
3/17/10	2	35	35	35	0.111	16	1	1	18	0.111	16	1	1	18	18	223	2.1	57.9	5.40
3/18/10	2	55	62	69	0.053	34	3	1	38	0.053	34	3	1	38	38	221	1.8	57.9	2.92
3/19/10	1	73	73	73	0.053	2	8	9	19	0.053	2	8	9	19	19	376	1.6	57.0	2.10
3/20/10	0	-	-	-	0.053	0	0	0	0	0.053	0	0	0	0	0	761	2.2	60.9	-
3/21/10	11	40	63	78	0.053	22	90	95	208	0.053	22	90	95	208	208	759	3.6	53.9	2.20
3/22/10	12	51	66	78	0.053	24	98	104	226	0.053	24	98	104	226	226	694	3.3	53.0	2.41
3/23/10	6	44	64	73	0.053	12	49	52	113	0.053	12	49	52	113	113	400	3.2	53.0	0.59
3/24/10	2	60	69	77	0.053	4	16	17	38	0.053	4	16	17	38	38	277	2.5	53.9	2.04
3/25/10	5	40	66	75	0.053	10	41	43	94	0.053	10	41	43	94	94	242	-	56.3	1.44
3/26/10	2	53	66	78	0.053	2	9	27	38	0.053	2	9	27	38	38	224	-	57.3	0.31
3/27/10	7	75	86	98	0.053	8	31	93	132	0.053	8	31	93	132	132	224	-	56.0	2.82
3/28/10	0	-	-	-	0.053	0	0	0	0	0.053	0	0	0	0	0	222	-	57.3	1.93
3/29/10	4	61	71	83	0.053	4	18	53	75	0.053	4	18	53	75	75	223	-	58.2	0.35
3/30/10	1	44	44	44	0.053	1	4	13	19	0.053	1	4	13	19	19	225	-	60.2	2.05
3/31/10	1	100	100	100	0.053	1	4	13	19	0.053	1	4	13	19	19	268	-	57.0	1.06
4/1/10	2	68	76	84	0.053	2	9	27	38	0.053	2	9	27	38	38	480	-	55.4	1.59
4/2/10	11	63	82	104	0.053	0	38	170	208	0.053	0	38	170	208	208	634	-	52.8	0.97
4/3/10	12	53	74	90	0.053	0	41	185	226	0.053	0	41	185	226	226	652	-	51.0	1.89
4/4/10	7	62	76	85	0.053	0	24	108	132	0.053	0	24	108	132	132	652	-	50.5	0.66
4/5/10	2	66	68	69	0.053	0	7	31	38	0.053	0	7	31	38	38	651	-	50.3	-
4/6/10	11	67	81	88	0.053	0	38	170	208	0.053	0	38	170	208	208	653	-	52.0	1.51
4/7/10	12	68	79	90	0.053	0	41	185	226	0.053	0	41	185	226	226	652	-	52.7	0.55
4/8/10	15	70	80	90	0.053	0	51	232	283	0.053	0	51	232	283	283	652	-	54.3	1.04
4/9/10	11	69	85	95	0.053	5	10	192	208	0.053	5	10	192	208	208	707	-	54.3	0.39
4/10/10	6	65	79	88	0.053	3	6	105	113	0.053	3	6	105	113	113	759	-	55.2	1.78
4/11/10	0	-	-	-	0.053	0	0	0	0	0.053	0	0	0	0	0	760	-	52.8	0.67
4/12/10	5	38	71	97	0.02	6	12	232	250	0.056	2	4	83	89	170	1080	-	50.1	1.42

	Unmarked Chinook Salmon															*Environmental Conditions*			
		Fork Length (mm)			High Range	Estimated Passage - High				Low Range	Estimated Passage - Low				Median	Flow (cfs)			
Date	Catch	Min	Avg	Max	Est. Efficiency	Fry	Parr	Smolt	Total	Est. Efficiency	Fry	Parr	Smolt	Total	Passage	La Grange	Velocity (ft/s)	Temp at Trap	Turbidity
4/13/10	10	76	85	100	0.02	12	24	463	500	0.056	4	9	166	179	339	1270	-	50.2	2.79
4/14/10	6	74	79	95	0.02	7	15	278	300	0.056	3	5	99	107	204	1260	-	52.1	1.31
4/15/10	4	71	86	96	0.02	5	10	185	200	0.056	2	3	66	71	136	1330	-	-	2.94
4/16/10	1	-	-	-	0.02	1	0	49	50	0.056	1	0	17	18	34	1580	-	54.2	2.20
4/17/10	7	72	82	92	0.02	10	0	340	350	0.056	4	0	121	125	238	1770	-	53.9	1.37
4/18/10	5	81	89	99	0.02	7	0	243	250	0.056	3	0	87	89	170	1950	-	52.8	2.30
4/19/10	12	70	87	109	0.02	18	0	582	600	0.056	6	0	208	214	407	1980	-	53.4	1.60
4/20/10	3	74	80	83	0.02	4	0	146	150	0.056	2	0	52	54	102	2140	-	52.1	3.48
4/21/10	5	87	90	95	0.02	7	0	243	250	0.056	3	0	87	89	170	2150	-	50.9	1.48
4/22/10	2	37	63	88	0.02	3	0	97	100	0.056	1	0	35	36	68	2130	-	50.1	-
4/23/10	7	46	82	105	0.02	48	0	302	350	0.056	17	0	108	125	238	2160	-	51.9	5.37
4/24/10	5	35	70	98	0.02	34	0	216	250	0.056	12	0	77	89	170	1990	-	51.8	0.66
4/25/10	13	36	83	96	0.02	89	0	561	650	0.056	32	0	200	232	441	1770	-	52.7	0.55
4/26/10	5	80	86	95	0.02	34	0	216	250	0.056	12	0	77	89	170	1750	-	52.8	1.52
4/27/10	3	89	92	93	0.02	20	0	130	150	0.056	7	0	46	54	102	1750	-	53.0	1.69
4/28/10	6	80	87	95	0.02	41	0	259	300	0.056	15	0	93	107	204	1740	-	51.6	1.06
4/29/10	7	86	95	112	0.02	48	0	302	350	0.056	17	0	108	125	238	1770	-	50.3	-
4/30/10	14	83	97	113	0.02	21	0	679	700	0.056	8	0	242	250	475	2090	-	51.0	1.37
5/1/10	13	34	92	115	0.02	23	0	727	750	0.056	8	0	260	268	509	2350	-	52.0	0.65
5/2/10	14	79	92	100	0.02	21	0	679	700	0.056	8	0	242	250	475	2340	-	52.2	0.80
5/3/10	15	81	93	104	0.02	23	0	727	750	0.056	8	0	260	268	509	2560	-	54.1	1.04
5/4/10	34	35	88	109	0.02	57	0	1793	1850	0.056	20	0	640	661	1255	-	-	52.3	2.60
5/5/10	12	90	97	104	0.02	18	0	582	600	0.056	7	0	208	214	407	3280	-	48.0	1.19
5/6/10	3	97	101	104	0.02	5	0	145	150	0.056	2	0	52	54	102	3280	-	51.2	1.77
5/7/10	8	79	96	107	0.02	0	0	400	400	0.056	0	0	143	143	271	3290	-	52.3	0.95
5/8/10	6	90	98	115	0.02	0	0	300	300	0.056	0	0	107	107	204	3290	-	50.9	0.93
5/9/10	19	85	98	108	0.02	0	0	950	950	0.056	0	0	339	339	645	3280	-	51.0	1.43
5/10/10	15	84	96	108	0.02	0	0	750	750	0.056	0	0	268	268	509	3290	-	52.5	1.15
5/11/10	6	99	108	115	0.02	0	0	300	300	0.056	0	0	107	107	204	3300	4.7	50.0	0.69
5/12/10	22	84	100	116	0.02	0	0	1100	1100	0.056	0	0	393	393	746	3120	5.2	51.6	0.16
5/13/10	28	83	99	117	0.02	0	0	1400	1400	0.056	0	0	500	500	950	2680	-	57.4	0.53
5/14/10	43	75	97	112	0.02	18	0	2132	2150	0.056	7	0	761	768	1459	2580	-	50.8	0.39
5/15/10	51	35	98	119	0.02	22	0	2528	2550	0.056	8	0	903	911	1730	2440	5.1	54.5	0.98

	Unmarked Chinook Salmon															***Environmental Conditions***			
		Fork Length (mm)			**High Range**	**Estimated Passage - High**				**Low Range**	**Estimated Passage - Low**				**Median**	**Flow (cfs)**			
Date	**Catch**	**Min**	**Avg**	**Max**	**Est. Efficiency**	**Fry**	**Parr**	**Smolt**	**Total**	**Est. Efficiency**	**Fry**	**Parr**	**Smolt**	**Total**	**Passage**	**La Grange**	**Velocity (ft/s)**	**Temp at Trap**	**Turbidity**
5/16/10	36	81	99	115	0.02	15	0	1785	1800	0.056	6	0	637	643	1221	2230	4.6	53.4	0.14
5/17/10	17	88	99	109	0.02	8	0	892	900	0.056	3	0	319	321	611	2160	4.2	53.2	0.52
5/18/10	11	85	99	110	0.02	5	0	545	550	0.056	2	0	195	196	373	2160	5.0	52.3	0.71
5/19/10	50	45	99	118	0.02	21	0	2479	2500	0.056	8	0	885	893	1696	2150	4.7	53.9	0.97
5/20/10	26	89	101	116	0.02	11	0	1289	1300	0.056	4	0	460	464	882	2140	4.6	52.7	0.75
5/21/10	31	83	98	111	0.02	0	0	1550	1550	0.056	0	0	554	554	1052	2150	4.6	53.2	0.65
5/22/10	35	84	100	113	0.02	0	0	1750	1750	0.056	0	0	625	625	1188	3060	4.9	51.0	0.52
5/23/10	2	88	88	88	0.02	0	0	150	150	0.056	0	0	54	54	102	3140	5.3	51.0	1.29
5/24/10	35	90	98	113	0.02	0	0	1800	1800	0.056	0	0	643	643	1221	3150	5.2	51.2	0.76
5/25/10	33	79	97	111	0.02	0	0	1700	1700	0.056	0	0	607	607	1154	3140	5.3	53.2	-
5/26/10	7	90	101	113	0.02	0	0	350	350	0.056	0	0	125	125	238	3160	4.2	52.7	2.05
5/27/10	11	91	102	118	0.02	0	0	550	550	0.056	0	0	196	196	373	2610	5.3	52.8	-
5/28/10	22	72	98	112	0.02	0	12	1088	1100	0.056	0	4	388	393	746	2250	5.1	53.0	0.08
5/29/10	21	78	98	110	0.02	0	12	1038	1050	0.056	0	4	371	375	713	2050	5.0	51.9	0.71
5/30/10	14	86	100	113	0.02	0	8	692	700	0.056	0	3	247	250	475	2040	5.0	53.0	0.31
5/31/10	7	60	91	109	0.02	0	4	346	350	0.056	0	1	124	125	238	2040	4.6	54.5	0.94
6/1/10	6	77	94	105	0.02	0	3	297	300	0.056	0	1	106	107	204	2040	4.5	56.1	1.05
6/2/10	13	84	96	111	0.02	0	7	643	650	0.056	0	3	230	232	441	2030	4.6	54.6	0.32
6/3/10	8	77	94	109	0.02	0	4	396	400	0.056	0	2	141	143	271	2050	3.7	56.1	0.26
6/4/10	3	95	104	109	0.02	0	0	150	150	0.056	0	0	54	54	102	3260	5.1	56.3	1.62
6/5/10	0	-	-	-	0.02	0	0	0	0	0.056	0	0	0	0	0	3140	4.9	55.0	0.26
6/6/10	5	85	97	110	0.02	0	0	250	250	0.056	0	0	89	89	170	2270	5.3	54.3	0.22
6/7/10	7	72	93	112	0.02	0	0	350	350	0.056	0	0	125	125	238	1940	4.8	55.9	0.76
6/8/10	4	83	93	102	0.02	0	0	200	200	0.056	0	0	71	71	136	1750	4.3	55.4	0.85
6/9/10	4	75	94	103	0.02	0	0	200	200	0.056	0	0	71	71	136	2060	4.4	56.3	0.22
6/10/10	3	94	107	125	0.02	0	0	150	150	0.056	0	0	54	54	102	4090	5.1	53.0	1.10
6/11/10	0	-	-	-	0.02	0	0	0	0	0.056	0	0	0	0	0	4450	-	52.7	1.38

Appendix B. Daily Chinook catch, length, predicted trap efficiency, and estimated passage at Grayson and environmental data from 2010.

	Unmarked Chinook Salmon									*Environmental Conditions*				
		Fork Length (mm)				Estimated Passage				Flow (cfs)	Velocity (ft/s)			
Date	Catch	Min	Avg	Max	Est. Efficiency	Fry	Parr	Smolt	Total	Modesto Flow	North	South	Temp at the traps	Turbidity
1/6/10	0	-	-	-	-	0	0	0	0	311	2.0	1.9	51.0	1.27
1/7/10	0	-	-	-	-	0	0	0	0	310	1.9	1.8	50.7	0.53
1/8/10	0	-	-	-	-	0	0	0	0	300	1.9	2.0	50.4	0.96
1/9/10	0	-	-	-	-	0	0	0	0	300	1.8	1.9	50.6	0.62
1/10/10	0	-	-	-	-	0	0	0	0	300	2.0	1.9	50.6	1.48
1/11/10	0	-	-	-	-	0	0	0	0	300	1.9	1.8	50.5	1.25
1/12/10	0	-	-	-	-	0	0	0	0	300	1.8	1.8	51.4	1.22
1/13/10	0	-	-	-	-	0	0	0	0	300	1.8	1.9	53.8	0.98
1/14/10	0	-	-	-	-	0	0	0	0	300	1.6	2.0	53.2	1.07
1/15/10	0	-	-	-	-	0	0	0	0	300	1.8	1.9	52.1	0.62
1/16/10	0	-	-	-	-	0	0	0	0	279	1.8	1.8	53.0	1.57
1/17/10	0	-	-	-	-	0	0	0	0	293	1.9	1.6	52.9	5.82
1/18/10	1	139	139	139	0.006	0	0	177	177	345	2.1	2.1	52.7	8.15
1/19/10	1	105	105	105	0.018	0	0	57	57	389	1.8	1.8	51.8	3.46
1/20/10	0	-	-	-	-	0	0	0	0	413	1.8	1.8	50.6	11.80
1/21/10	0	-	-	-	-	0	0	0	0	777	2.1	1.8	49.7	3.27
1/22/10	1	31	31	31	0.185	5	0	0	5	804	3.0	2.9	48.5	80.70
1/23/10	0	-	-	-	-	0	0	0	0	1023	2.9	2.6	48.3	71.60
1/24/10	2	33	35	36	0.178	11	0	0	11	616	2.6	2.9	47.7	56.60
1/25/10	1	35	35	35	0.187	5	0	0	5	457	2.5	2.1	49.7	25.20
1/26/10	0	-	-	-	-	0	0	0	0	372	2.3	2.3	51.3	19.10
1/27/10	0	-	-	-	-	0	0	0	0	344	2.1	2.0	51.5	12.90
1/28/10	0	-	-	-	-	0	0	0	0	332	2.1	2.0	52.5	4.18
1/29/10	4	33	34	35	0.206	17	0	2	19	322	2.0	1.9	54.4	4.87
1/30/10	1	33	33	33	0.213	4	0	1	5	310	1.8	1.8	53.1	4.30
1/31/10	1	33	33	33	0.214	4	0	1	5	299	1.8	1.9	53.4	1.34
2/1/10	2	33	34	35	0.207	9	0	1	10	295	-	-	54.2	1.66
2/2/10	1	132	132	132	0.007	121	0	15	136	291	2.0	1.4	54.7	1.88
2/3/10	0	-	-	-	-	0	0	0	0	288	1.8	1.8	54.6	4.06
2/4/10	0	-	-	-	-	0	0	0	0	282	1.6	1.8	55.0	0.89
2/5/10	0	-	-	-	-	0	0	0	0	290	1.7	1.7	55.0	0.62
2/6/10	0	-	-	-	-	0	0	0	0	306	-	1.8	54.8	3.74
2/7/10	0	-	-	-	-	0	0	0	0	308	1.8	1.8	54.2	4.16
2/8/10	0	-	-	-	-	0	0	0	0	767	1.7	2.4	53.9	11.10
2/9/10	0	-	-	-	-	0	0	0	0	519	2.4	2.4	53.7	29.40
2/10/10	0	-	-	-	-	0	0	0	0	426	2.3	2.3	54.3	18.50
2/11/10	0	-	-	-	-	0	0	0	0	415	2.3	2.2	55.5	21.70
2/12/10	0	-	-	-	-	0	0	0	0	352	1.7	1.6	56.7	12.10
2/13/10	0	-	-	-	-	0	0	0	0	333	2.0	2.0	56.6	6.98
2/14/10	0	-	-	-	-	0	0	0	0	322	1.7	1.9	57.4	3.54
2/15/10	0	-	-	-	-	0	0	0	0	317	1.8	1.9	58.0	2.48
2/16/10	0	-	-	-	-	0	0	0	0	320	2.1	2.1	58.4	1.98

	Unmarked Chinook Salmon									*Environmental Conditions*				
		Fork Length (mm)				Estimated Passage				Flow (cfs)	Velocity (ft/s)			
Date	Catch	Min	Avg	Max	Est. Efficiency	Fry	Parr	Smolt	Total	Modesto Flow	North	South	Temp at the traps	Turbidity
2/17/10	0	-	-	-	-	0	0	0	0	318	2.0	2.0	58.4	6.99
2/18/10	0	-	-	-	-	0	0	0	0	317	2.0	2.1	58.4	2.39
2/19/10	0	-	-	-	-	0	0	0	0	314	2.1	2.0	57.5	2.93
2/20/10	0	-	-	-	-	0	0	0	0	309	1.8	1.9	56.4	4.22
2/21/10	0	-	-	-	-	0	0	0	0	309	1.5	1.9	56.4	2.60
2/22/10	0	-	-	-	-	0	0	0	0	307	1.8	1.8	54.7	4.05
2/23/10	0	-	-	-	-	0	0	0	0	308	1.7	2.0	53.6	0.51
2/24/10	0	-	-	-	-	0	0	0	0	332	2.0	2.1	54.3	6.81
2/25/10	0	-	-	-	-	0	0	0	0	1338	2.3	2.1	53.7	16.80
2/26/10	0	-	-	-	-	0	0	0	0	568	2.4	2.1	55.2	32.30
2/27/10	0	-	-	-	-	0	0	0	0	510	2.2	2.1	54.9	14.40
2/28/10	0	-	-	-	-	0	0	0	0	1423	2.3	2.6	55.7	33.80
3/1/10	0	-	-	-	-	0	0	0	0	520	-	-	56.8	28.10
3/2/10	0	-	-	-	-	0	0	0	0	409	-	-	55.1	12.60
3/3/10	0	-	-	-	-	0	0	0	0	403	-	-	55.2	16.30
3/4/10	0	-	-	-	-	0	0	0	0	1380	-	-	53.0	16.70
3/5/10	0	-	-	-	-	0	0	0	0	1140	1.5	1.8	54.5	50.10
3/6/10	0	-	-	-	-	0	0	0	0	482	1.0	2.2	56.5	27.70
3/7/10	0	-	-	-	-	0	0	0	0	410	2.2	2.1	56.5	15.40
3/8/10	0	-	-	-	-	0	0	0	0	376	-	-	55.0	10.48
3/9/10	0	-	-	-	-	0	0	0	0	354	1.8	2.1	55.3	6.53
3/10/10	0	-	-	-	-	0	0	0	0	344	1.8	1.8	55.7	3.89
3/11/10	0	-	-	-	-	0	0	0	0	336	1.8	1.8	55.2	4.24
3/12/10	0	-	-	-	-	0	0	0	0	332	1.4	1.8	54.8	3.28
3/13/10	0	-	-	-	-	0	0	0	0	328	2.0	1.8	55.7	8.65
3/14/10	0	-	-	-	-	0	0	0	0	379	1.9	1.8	56.9	2.11
3/15/10	1	37	37	37	0.181	6	0	0	6	365	1.8	1.7	59.0	6.48
3/16/10	0	-	-	-	-	0	0	0	0	359	1.9	1.6	61.4	3.45
3/17/10	0	-	-	-	-	0	0	0	0	359	1.7	1.7	62.1	3.45
3/18/10	0	-	-	-	-	0	0	0	0	347	1.7	1.6	62.3	5.85
3/19/10	0	-	-	-	-	0	0	0	0	337	1.6	1.8	62.8	3.21
3/20/10	0	-	-	-	-	0	0	0	0	483	1.7	1.5	62.0	4.18
3/21/10	0	-	-	-	-	0	0	0	0	864	2.4	1.9	59.5	1.52
3/22/10	0	-	-	-	-	0	0	0	0	862	2.4	2.2	58.3	4.14
3/23/10	1	100	100	100	0.018	0	0	57	57	793	2.4	2.4	58.9	2.69
3/24/10	1	80	80	80	0.039	0	0	25	25	505	-	-	59.6	3.58
3/25/10	0	-	-	-	-	0	0	0	0	374	-	-	59.7	2.69
3/26/10	0	-	-	-	-	0	0	0	0	323	-	-	61.1	1.12
3/27/10	0	-	-	-	-	0	0	0	0	293	-	-	62.7	3.54
3/28/10	0	-	-	-	-	0	0	0	0	292	-	-	63.4	0.99
3/29/10	0	-	-	-	-	0	0	0	0	280	-	-	63.6	4.22
3/30/10	1	90	90	90	0.031	0	0	32	32	274	-	-	61.5	1.29
3/31/10	0	-	-	-	-	0	0	0	0	271	-	-	61.0	-
4/1/10	0	-	-	-	-	0	0	0	0	296	-	-	58.7	2.02
4/2/10	0	-	-	-	-	0	0	0	0	486	-	-	56.6	2.02

	Unmarked Chinook Salmon									*Environmental Conditions*				
		Fork Length (mm)				Estimated Passage				Flow (cfs)	Velocity (ft/s)			
Date	Catch	Min	Avg	Max	Est. Efficiency	Fry	Parr	Smolt	Total	Modesto Flow	North	South	Temp at the traps	Turbidity
4/3/10	0	-	-	-	-	0	0	0	0	651	-	-	53.7	2.96
4/4/10	0	-	-	-	-	0	0	0	0	706	-	-	54.2	9.39
4/5/10	0	-	-	-	-	0	0	0	0	741	-	-	55.1	4.33
4/6/10	0	-	-	-	-	0	0	0	0	722	-	-	57.2	3.69
4/7/10	0	-	-	-	-	0	0	0	0	735	-	-	59.4	4.00
4/8/10	0	-	-	-	-	0	0	0	0	723	-	-	59.6	3.06
4/9/10	0	-	-	-	-	0	0	0	0	698	-	-	59.3	3.26
4/10/10	1	93	93	93	0.023	0	0	44	44	743	-	-	56.8	3.18
4/11/10	0	-	-	-	-	0	0	0	0	813	-	-	54.8	3.18
4/12/10	0	-	-	-	-	0	0	0	0	820	-	-	55.1	2.34
4/13/10	0	-	-	-	-	0	0	0	0	1050	-	-	55.7	2.12
4/14/10	0	-	-	-	-	0	0	0	0	1200	-	-	56.7	3.23
4/15/10	0	-	-	-	-	0	0	0	0	1210	-	-	57.7	5.23
4/16/10	0	-	-	-	-	0	0	0	0	1260	-	-	58.0	3.08
4/17/10	0	-	-	-	-	0	0	0	0	1450	-	-	57.8	2.87
4/18/10	0	-	-	-	-	0	0	0	0	1610	-	-	57.4	3.02
4/19/10	0	-	-	-	-	0	0	0	0	1730	-	-	56.3	4.79
4/20/10	0	-	-	-	-	0	0	0	0	1930	-	-	53.8	6.11
4/21/10	0	-	-	-	-	0	0	0	0	2274	-	-	52.7	-
4/22/10	0	-	-	-	-	0	0	0	0	2280	-	-	54.0	2.66
4/23/10	0	-	-	-	-	0	0	0	0	2267	-	-	56.3	5.92
4/24/10	1	90	90	90	0.013	0	0	76	76	2298	-	-	57.8	2.14
4/25/10	0	-	-	-	-	0	0	0	0	2114	-	-	58.4	2.43
4/26/10	0	-	-	-	-	0	0	0	0	1881	-	-	57.8	1.95
4/27/10	1	88	88	88	0.017	0	0	59	59	1855	-	-	56.1	3.59
4/28/10	1	80	80	80	0.022	0	0	45	45	1848	-	-	54.6	3.48
4/29/10	0	-	-	-	-	0	0	0	0	1836	-	-	55.2	3.23
4/30/10	1	99	99	99	0.012	0	0	86	86	1869	-	-	56.3	3.00
5/1/10	0	-	-	-	-	0	0	0	0	2188	-	-	56.8	-
5/2/10	1	90	90	90	0.012	0	0	80	80	2445	-	-	57.3	-
5/3/10	0	-	-	-	-	0	0	0	0	2441	-	-	57.4	9.29
5/4/10	0	-	-	-	-	0	0	0	0	2659	-	-	56.2	2.07
5/5/10	0	-	-	-	-	0	0	0	0	3378	-	-	55.2	2.46
5/6/10	0	-	-	-	-	0	0	0	0	3392	-	-	55.1	-
5/7/10	0	-	-	-	-	0	0	0	0	3387	-	-	55.6	-
5/8/10	0	-	-	-	-	0	0	0	0	3395	-	-	55.2	1.95
5/9/10	0	-	-	-	-	0	0	0	0	3395	-	-	53.4	3.43
5/10/10	1	84	84	84	0.010	0	0	97	97	3379	-	-	53.3	2.50
5/11/10	0	-	-	-	-	0	0	0	0	3399	4.0	4.3	54.9	1.58
5/12/10	0	-	-	-	-	0	0	0	0	3419	3.0	3.0	56.1	2.05
5/13/10	1	105	105	105	0.005	0	0	187	187	3233	-	-	57.1	1.52
5/14/10	0	-	-	-	-	0	0	0	0	2782	-	-	57.6	1.63
5/15/10	1	-	-	-	0.009	0	0	118	118	2700	3.1	3.2	57.9	0.69
5/16/10	0	-	-	-	-	0	0	0	0	2553	2.8	3.1	56.9	1.51
5/17/10	1	91	91	91	0.013	0	0	80	80	2337	2.8	2.5	56.1	1.52

	Unmarked Chinook Salmon										*Environmental Conditions*				
		Fork Length (mm)				Estimated Passage				Flow (cfs)	Velocity (ft/s)			
Date	Catch	Min	Avg	Max	Est. Efficiency	Fry	Parr	Smolt	Total	Modesto Flow	North	South	Temp at the traps	Turbidity
5/18/10	1	100	100	100	0.010	0	0	105	105	2257	3.1	3.5	56.9	1.43
5/19/10	1	104	104	104	0.008	0	0	120	120	2256	3.0	3.2	57.3	0.92
5/20/10	6	99	104	108	0.008	0	0	718	718	2266	3.0	3.3	57.0	2.68
5/21/10	3	95	102	110	0.009	0	0	333	333	2267	3.0	3.2	55.9	4.28
5/22/10	1	117	117	117	0.005	0	0	187	187	2266	2.1	3.4	55.3	2.28
5/23/10	0	-	-	-	-	0	0	0	0	3178	3.3	3.6	55.4	0.24
5/24/10	0	-	-	-	-	0	0	0	0	3264	3.7	3.1	55.3	2.56
5/25/10	0	-	-	-	-	0	0	0	0	3274	3.7	3.8	54.9	0.70
5/26/10	1	100	100	100	0.006	0	0	159	159	3255	3.6	3.7	55.5	2.25
5/27/10	0	-	-	-	-	0	0	0	0	3284	-	-	55.7	1.77
5/28/10	0	-	-	-	-	0	0	0	0	2757	3.7	3.5	57.2	1.30
5/29/10	0	-	-	-	-	0	0	0	0	2410	3.0	3.2	58.6	6.18
5/30/10	1	110	110	110	0.007	0	0	143	143	2186	2.8	3.0	59.3	1.58
5/31/10	0	-	-	-	-	0	0	0	0	2180	1.7	2.9	59.6	2.66
6/1/10	2	98	100	101	0.010	0	0	197	197	2161	2.4	1.9	60.1	1.13
6/2/10	0	-	-	-	-	0	0	0	0	2159	2.8	3.0	60.7	1.40
6/3/10	1	97	97	97	0.011	0	0	90	90	2146	2.8	3.2	61.2	1.38
6/4/10	1	96	96	96	0.011	0	0	87	87	2157	2.9	3.1	60.3	1.41
6/5/10	0	-	-	-	-	0	0	0	0	3355	3.5	3.6	60.1	0.52
6/6/10	1	98	98	98	0.007	0	0	148	148	3251	3.4	3.2	61.0	0.97
6/7/10	0	-	-	-	-	0	0	0	0	2387	3.1	3.2	61.1	2.10
6/8/10	1	-	-	-	0.012	0	0	86	86	2048	2.7	3.2	61.2	2.03
6/9/10	0	-	-	-	-	0	0	0	0	1862	2.3	2.7	60.5	0.92
6/10/10	0	-	-	-	-	0	0	0	0	2157	2.7	2.8	57.7	2.46
6/11/10	0	-	-	-	-	0	0	0	0	4192	3.4	3.6	57.4	5.56
6/12/10	0	-	-	-	-	0	0	0	0	4585	3.8	4.0	57.9	4.09
6/13/10	0	-	-	-	-	0	0	0	0	4555	3.6	3.8	57.6	2.02
6/14/10	0	-	-	-	-	0	0	0	0	5620	4.1	4.1	57.8	1.94
6/15/10	2	95	97	98	0.004	0	0	458	458	4410	4.5	4.0	58.0	2.26
6/16/10	0	-	-	-	-	0	0	0	0	3997	3.8	3.6	58.1	2.06
6/17/10	1	105	105	105	0.005	0	0	191	191	3283	2.1	2.4	58.9	1.25

Appendix C. Daily counts of non-salmonids captured at Waterford during 2010.

Batch Date	BGS	BRB	CHC	GSF	GSN	LAM	LMB	MQK	PRS	RES	RSN	SASQ	SASU	SMB	TP	W	WHC
1/4/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/5/10	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1/6/10	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
1/7/10	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
1/8/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/9/10	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1/10/10	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/11/10	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	1
1/12/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/13/10	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
1/14/10	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1/15/10	3	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
1/16/10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
1/17/10	2	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0
1/18/10	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1
1/19/10	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1/20/10	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/21/10	3	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2
1/22/10	2	0	0	0	0	4	0	0	0	1	0	0	0	1	0	0	3
1/23/10	3	0	0	0	1	4	0	0	1	0	0	0	1	0	0	0	2
1/24/10	2	0	0	0		1	0	0	0	1	0	0	0	0	0	0	0
1/25/10	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1/26/10	0	0	0	0	0	1	0	1	0	2	0	0	0	0	0	0	2
1/27/10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1/28/10	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/29/10	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
1/30/10	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1/31/10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/1/10	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
2/2/10	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1
2/3/10	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
2/4/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/5/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/6/10	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
2/7/10	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2
2/8/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/9/10	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2/10/10	2	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2
2/11/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
2/12/10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Batch Date	BGS	BRB	CHC	GSF	GSN	LAM	LMB	MQK	PRS	RES	RSN	SASQ	SASU	SMB	TP	W	WHC
2/13/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2/14/10	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
2/15/10	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/16/10	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
2/17/10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/18/10	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
2/19/10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2/20/10	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
2/21/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/22/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/23/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/24/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2/25/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/26/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/27/10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
2/28/10	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
3/1/10	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
3/2/10	2	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0
3/3/10	2	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0	4
3/4/10	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2
3/5/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
3/6/10	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	2
3/7/10	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1
3/8/10	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3
3/9/10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
3/10/10	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4
3/11/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3/12/10	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0
3/13/10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/14/10	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
3/15/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3/16/10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3/17/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/18/10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
3/19/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
3/20/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/21/10	1	0	1	0	0	1	1	0	0	8	0	0	0	0	0	0	16
3/22/10	11	0	0	0	0	1	2	0	0	1	0	0	0	0	0	0	4
3/23/10	6	0	3	0	0	1	1	0	0	1	0	1	0	0	0	0	18
3/24/10	6	0	3	0	0	1	0	0	0	0	0	1	0	0	0	0	6
3/25/10	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	2
3/26/10	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Batch Date	BGS	BRB	CHC	GSF	GSN	LAM	LMB	MQK	PRS	RES	RSN	SASQ	SASU	SMB	TP	W	WHC
3/27/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/28/10	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3
3/29/10	5	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	1
3/30/10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
3/31/10	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4/1/10	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
4/2/10	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
4/3/10	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	6
4/4/10	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	5
4/5/10	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	4
4/6/10	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	17
4/7/10	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	9
4/8/10	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	11
4/9/10	3	0	2	0	0	0	0	0	0	0	0	0	2	0	1		8
4/10/10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
4/11/10	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	11
4/12/10	1	0	2	0	0	1	0	1	0	0	0	0	0	0	0	0	7
4/13/10	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4/14/10	4	0	2	1	0	1	0	0	0	0	0	5	4	1	0	0	13
4/15/10	0	0	1	0	0	1	0	0	0	0	0	3	0	0	0	0	13
4/16/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4/17/10	4	0	1	0	0	0	0	1	0	0	0	1	3	0	0	0	18
4/18/10	5	0	2	0	0	1	1	2	0	1	0	21	2	0	0	1	10
4/19/10	0	0	3	0	0	2	0	2	0	1	0	24	2	0	0	0	19
4/20/10	3	0	1	0	0	2	0	0	0	1	0	18	0	0	0	0	6
4/21/10	0	0	1	0	0	2	0	0	0	0	0	15	1	0	0	1	2
4/22/10	3	0	0	0	0	0	1	0	0	0	0	19	1	0	0	0	2
4/23/10	1	0	1	0	0	1	0	0	0	4	0	22	3	0	0	0	4
4/24/10	5	0	2	2	0	1	1	0	0	1	0	21	0	0	0	0	2
4/25/10	8	0	6	0	0	1	1	0	0	0	0	22	5	0	0	0	5
4/26/10	3	0	3	0	0	1	0	1	0	0	0	9	3	0	0	0	1
4/27/10	2	0	0	0	0	0	0	0	0	1	0	5	3	0	0	0	1
4/28/10	1	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	3
4/29/10	0	0	0	0	0	1	0	0	0	0	0	3	2	0	0	0	2
4/30/10	1	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	1
5/1/10	0	0	1	0	0	1	0	0	0	0	0	4	1	0	0	0	2
5/2/10	0	0	0	2	0	1	0	0	0	0	0	12	1	0	0	0	1
5/3/10	1	0	1	0	0	1	1	0	0	7	0	8	2	0	0	0	2
5/4/10	2	0	0	0	0	1	1	0	0	4	0	12	1	0	0	0	0
5/5/10	1	0	0	0	0	2	1	0	0	0	0	15	0	0	0	0	2
5/6/10	1	1	0	0	0	2	0	0	0	0	0	19	1	0	0	1	1
5/7/10	0	0	0	0	0	2	0	0	0	0	0	18	0	0	0	0	1

Batch Date	BGS	BRB	CHC	GSF	GSN	LAM	LMB	MQK	PRS	RES	RSN	SASQ	SASU	SMB	TP	W	WHC
5/8/10	2	0	0	0	0	1	0	0	0	0	0	9	0	0	0	0	1
5/9/10	0	0	0	0	0	0	1	0	0	2	0	5	1	0	0	0	0
5/10/10	0	0	1	0	0	1	0	0	0	1	0	5	0	0	0	1	1
5/11/10	1	0	0	0	0	0	0	0	0	0	0	4	1	0	0	1	0
5/12/10	2	0	0	0	0	1	2	0	0	0	0	6	0	0	0	0	0
5/13/10	0	0	0	0	0	1	0	0	0	0	0	5	2	0	0	0	0
5/14/10	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1
5/15/10	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
5/16/10	0	0	1	0	0	0	0	0	0	0	0	2	1	0	0	0	3
5/17/10	0	0	2	0	0	1	0	0	0	0	0	2	0	0	0	0	0
5/18/10	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
5/19/10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3
5/20/10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/21/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/22/10	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0
5/23/10	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
5/24/10	1	0	0	0	0	1	1	0	0	1	0	3	0	0	0	0	0
5/25/10	0	0	0	0	0	1	0	0	0	1	0	5	1	0	0	1	0
5/26/10	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
5/27/10	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
5/28/10	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
5/29/10	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0
5/30/10	2	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1
5/31/10	0	0	0	0	0	1	1	0	0	1	0	1	0	0	0	0	1
6/1/10	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	3
6/2/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/3/10	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4
6/4/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/5/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6/6/10	1	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0
6/7/10	1	0	0	0	0	2	0	0	0	4	0	0	0	1	0	0	1
6/8/10	0	0	0	0	0	0	0	1	0	2	0	1	0	1	0	0	0
6/9/10	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1
6/10/10	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	3
6/11/10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

Appendix D. Daily counts of non-salmonids captured at Grayson during 2010.

Batch Date	BAS	BGS	BKB	BKS	BRB	CHC	GF	GSN	LAM	LMB	LP	MQK	MSS	PRS	RES	RSN	SASQ	SASU	SMB	UNID	W	WHC
1/5/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1/6/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
1/7/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
1/8/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
1/9/10	0	1	0	0	0	0	0	0	0	1	0	1	0	0	4	5	0	0	1	0	0	5
1/10/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
1/11/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
1/12/10	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	3
1/13/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
1/14/10	0	2	0	0	0	0	0	0	0	0	0	5	0	0	1	0	0	0	0	0	0	13
1/15/10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0	0	0	0	0	0	7
1/16/10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	1
1/17/10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
1/18/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
1/19/10	0	0	1	0	0	0	0	0	0	0	0	0	0	0	8	2	0	0	0	0	0	5
1/20/10	0	2	0	0	0	0	0	0	1	0	0	2	0	0	1	0	0	0	0	0	0	5
1/21/10	0	0	0	0	1	0	0	0	1	0	0	0	0	0	9	0	0	0	1	0	0	5
1/22/10	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
1/23/10	0	4	0	0	0	1	0	0	3	2	0	2	2	0	2	1	0	0	3	0	0	2
1/24/10	0	2	0	0	1	0	0	2	1	2	0	4	0	0	5	0	0	0	0	0	0	3
1/25/10	0	8	0	0	0	0	0	1	0	0	0	1	0	0	3	0	0	0	1	0	0	0
1/26/10	0	7	0	0	2	0	0	1	2	0	0	1	0	0	12	0	0	1	2	0	0	5
1/27/10	0	6	0	1	1	0	0	3	0	1	0	3	0	0	9	0	0	1	0	0	0	5
1/28/10	0	7	0	0	1	0	0	3	0	2	1	5	0	0	7	0	0	0	1	0	0	16
1/29/10	0	2	0	0	0	2	0	1	0	1	0	1	0	0	7	2	0	0	1	0	0	5
1/30/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	7
1/31/10	0	1	0	0	0	1	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0	1
2/1/10	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	4
2/2/10	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	5
2/3/10	0	0	0	0	1	0	0	2	0	0	0	0	0	0	3	0	0	0	0	0	1	3
2/4/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
2/5/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	1
2/6/10	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
2/7/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
2/8/10	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	4
2/9/10	0	1	0	0	0	0	0	4	0	2	0	2	0	1	6	4	0	0	2	0	0	15
2/10/10	0	3	0	0	1	0	0	0	0	6	0	3	0	1	14	10	0	0	0	0	0	27
2/11/10	0	0	0	0	0	0	0	5	0	0	0	1	0	0	4	0	0	0	0	0	0	5
2/12/10	0	0	0	0	0	0	0	2	0	0	0	0	0	0	5	0	0	0	0	0	0	6
2/13/10	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	1	0	0	16
2/14/10	0	4	0	0	0	0	0	2	1	0	0	0	0	0	1	0	0	0	0	1	0	28

Batch Date	BAS	BGS	BKB	BKS	BRB	CHC	GF	GSN	LAM	LMB	LP	MQK	MSS	PRS	RES	RSN	SASQ	SASU	SMB	UNID	W	WHC
2/15/10	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	7
2/16/10	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
2/17/10	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	5	0	0	0	0	0	14
2/18/10	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	5
2/19/10	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	8
2/20/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
2/21/10	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	3
2/22/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	8
2/23/10	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2
2/24/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	4
2/25/10	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4
2/26/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
2/27/10	0	3	0	0	0	0	0	1	0	8	0	0	0	0	1	0	0	0	0	0	0	4
2/28/10	0	0	0	0	0	0	0	5	1	2	0	1	0	0	1	0	0	0	0	0	0	26
3/1/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/2/10	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0
3/3/10	0	1	0	0	0	0	0	1	0	1	0	3	0	0	5	2	0	0	0	0	0	7
3/4/10	0	2	0	1	0	0	0	0	0	0	0	1	0	0	3	4	0	0	0	0	0	12
3/5/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/6/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0	0	0
3/7/10	0	2	0	0	1	0	0	0	0	0	0	0	0	0	1	3	0	0	2	0	0	0
3/8/10	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	7
3/9/10	0	2	0	0	1	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	3
3/10/10	0	0	0	0	2	0	0	4	0	0	0	0	0	0	1	2	0	0	0	0	0	2
3/11/10	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	2
3/12/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	4
3/13/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
3/14/10	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	3
3/15/10	0	1	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	5
3/16/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
3/17/10	0	2	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	7
3/18/10	0	2	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3
3/19/10	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	4
3/20/10	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
3/21/10	0	3	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	4
3/22/10	0	2	0	0	0	0	0	0	0	3	0	2	0	0	0	0	0	0	0	0	0	7
3/23/10	0	0	0	0	0	0	0	1	0	0	0	2	0	0	2	2	0	0	2	0	0	9
3/24/10	0	2	0	0	0	1	0	0	0	0	0	2	1	0	5	1	0	0	0	0	0	8
3/25/10	0	4	0	0	0	0	0	6	0	0	0	1	0	0	0	0	0	0	0	0	0	6
3/26/10	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
3/27/10	0	2	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	0	0	0	0	3
3/28/10	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Batch Date	BAS	BGS	BKB	BKS	BRB	CHC	GF	GSN	LAM	LMB	LP	MQK	MSS	PRS	RES	RSN	SASQ	SASU	SMB	UNID	W	WHC
3/29/10	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4
3/30/10	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/31/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4/1/10	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1
4/2/10	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
4/3/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4/4/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/5/10	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3
4/6/10	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	5
4/7/10	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	10
4/8/10	0	0	0	0	0	0	0	0	1	2	0	3	0	0	0	0	0	0	0	0	0	9
4/9/10	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	0	0	2
4/10/10	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2
4/11/10	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1
4/12/10	0	1	0	0	0	2	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	5
4/13/10	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	7
4/14/10	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4
4/15/10	0	0	0	0	0	0	0	0	1	1	0	2	0	0	0	1	0	0	0	0	0	2
4/16/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	1	0	0	7
4/17/10	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	1	0	0	0	0	0	2
4/18/10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1
4/19/10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
4/20/10	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	3	0	0	0	0	4
4/21/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/22/10	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	4	0	0	0	0	0
4/23/10	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	13	0	0	0	0	1
4/24/10	0	2	0	0	0	0	0	0	2	1	0	1	0	0	0	1	18	0	0	0	0	0
4/25/10	0	1	0	0	0	0	0	0	2	0	0	1	0	0	0	0	20	0	0	0	0	3
4/26/10	0	1	0	0	0	1	0	0	0	1	0	3	0	0	0	0	9	0	0	0	0	3
4/27/10	0	1	0	0	1	0	0	0	0	1	0	4	0	0	0	0	7	0	0	0	0	2
4/28/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
4/29/10	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	3	0	0	0	0	1
4/30/10	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/1/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
5/2/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/3/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
5/4/10	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1
5/5/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/6/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/7/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/8/10	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
5/9/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Batch Date	BAS	BGS	BKB	BKS	BRB	CHC	GF	GSN	LAM	LMB	LP	MQK	MSS	PRS	RES	RSN	SASQ	SASU	SMB	UNID	W	WHC
5/10/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
5/11/10	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/12/10	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	1
5/13/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/14/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
5/15/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
5/16/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
5/17/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/18/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/19/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
5/20/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/21/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
5/22/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5/23/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/24/10	0	0	0	0	0	0	0	0	2	0	0	1	0	0	2	6	1	1	0	0	0	2
5/25/10	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	2
5/26/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1	0	0	0	0	0
5/27/10	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
5/28/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5/29/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
5/30/10	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	0	0	0	1
5/31/10	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2	0	0	0	3
6/1/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0
6/2/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1
6/3/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/4/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
6/5/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/6/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/7/10	1	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1
6/8/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	3
6/9/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6/10/10	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
6/11/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/12/10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/13/10	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
6/14/10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/15/10	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
6/16/10	4	0	0	3	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	1
6/17/10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Key to species codes

BAS	Unidentified bass
BGS	Bluegill
BKB	Black bullhead
BKS	Black crappie
BRB	Brown bullhead
CHC	Channel catfish
CHN	Chinook
GF	Goldfish
GSF	Green sunfish
GSN	Golden shiner
LAM	Lamprey, unidentified species
LMB	Largemouth bass
LP	Bigscale logperch
MQK	Mosquitofish
MSS	Inland silverside
PRS	Prickly sculpin
RES	Redear sunfish
RSN	Red shiner
SASQ	Sacramento pikeminnow
SASU	Sacramento sucker
SMB	Smallmouth bass
TP	Tule perch
UNID	Unidentified species
W	Warmouth
WHC	White catfish