UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Turlock Irrigation District	)	
	)	
and	)	Project No. 2299
	)	
Modesto Irrigation District	)	

2006 LOWER TUOLUMNE RIVER ANNUAL REPORT

Report 2006-5

Rotary Screw Trap Summary Update

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INTRODUCTION

Rotary screw traps have been operated at various locations in the Tuolumne River since 1995 to meet several objectives including monitoring the abundance and migration characteristics of juvenile salmonids and other fishes, and evaluation of reach-specific survival relative to environmental conditions. Rotary screw trap monitoring has been conducted annually near the mouth of the Tuolumne River since 1995 for the purpose of monitoring the abundance and migration characteristics of juvenile salmonids and other fishes. Trapping was conducted at the Shiloh Bridge (RM 3.4) from 1995 through 1998 by Turlock and Modesto Irrigation Districts (Districts) and California Department of Fish and Game (CDFG), at Grayson (RM 5.2) from 1999 through 2003 by CDFG, and from 2004 through 2006 by S.P. Cramer & Associates. The sampling periods have varied greatly between years with monitoring starting anywhere between January 3 and April 18, and ending anywhere between May 24 and July 1 (Table 1). Shorter sampling seasons from 1995 through 1998 were mainly associated with smolt survival studies using coded wire tagged Merced River Hatchery salmon under the Don Pedro Project fish study program. With funding provided by the CVPIA sampling periods were longer from 1999 through 2002. The Don Pedro Project fish study program ended smolt survival studies in 2002.

Sampling at other locations occurred between 1998 and 2000, and was generally associated with evaluation of reach-specific survival relative to environmental conditions. During 2006 sampling was initiated near the town of Waterford to estimate juvenile Chinook production. Waterford is downstream from most Chinook spawning and juvenile rearing activity and the primary and alternative sampling sites used during 2006 were the only locations in the area with suitable water velocity, depth, and anchoring opportunities.

This report summarizes results of the 1995 through 2006 trapping efforts (Table 1).

Available data for all years of sampling was compiled and summarized for this report, and a table noting the status of data availability from the lower trapping operations at Shiloh and Grayson was generated (Table 1). All 2004-2006 data from Grayson, 2006 data from Waterford, and data from 1998-2000 trapping operations at sites upstream was available from either a database or summary spreadsheets maintained by FISHBIO. Electronically accessible data from CDFG is incomplete for all years prior to 2004. The only data available electronically for all years and sites sampled is daily juvenile salmon catch, total estimated salmon passage, and turbidity.

Table 1. Rotary screw trap monitoring in the Lower Tuolumne River.

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	696,115[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	96,195[2]	Multiple regression	Vasques and Kundargi 2001

[1] Passage estimate reported in the annual report cited in the last column to the right.
[2] Passage estimate derived from multiple regression equation based on data collected from 1999-2006 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	94,752[2]	Multiple regression	Vasques and Kundargi 2002
2002	Grayson	Jan 15-Jun 06	91%	436	14,315[2]	Multiple regression	Blakeman 2004b
2003	Grayson	Apr 01-Jun 06	40%	359	9,104[2]	Multiple regression	Blakeman 2004c
2004	Grayson	Apr 01-Jun 09	40%	509	17,943[2]	Multiple regression	Fuller 2005
2005	Grayson	Apr 02-Jun 17	39%	1,317	209,431	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	178,034[2]	Multiple regression	Fuller and others 2007

Table 2. Data collected and presently available for rotary screw trap sampling at Shiloh (RM 3.4) and Grayson (RM 5.2), 1995-2006.

Data Type	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*
Chinook Salmon												
Daily catch	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Daily average length	NP	NP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual length	NP	NP	NP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Daily est. passage	NP	NP	Yes	NP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total est. passage	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Smolt index	NP	NP	NP	Yes	Yes	Yes	Yes	Yes	NP	Yes	Yes	Yes
Weight	?	?	?	?	?	?	?	?	?	X	Yes	Yes
Other Species												
Daily catch	Yes	Yes	NP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual length	NP	NP	NP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trap Efficiency												
Time of release	NP	NP	NP	NP	NP	NP	NP	NP	NP	Yes	Yes	Yes
Release location	NP	NP	NP	Yes	NP	NP	NP	NP	NP	Yes	Yes	Yes
Length at release	Yes	NP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Length at recapture	NP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NP	Yes	Yes	Yes
Trap Operation And Environmental Information												
Trap status	NP	NP	NP	Yes	Yes	Yes	Yes	Yes	NP	Yes	Yes	Yes
Trap condition	NP	NP	NP	Yes	Yes	Yes	Yes	Yes	NP	Yes	Yes	Yes
Velocity	NP	NP	NP	Yes	NP	Yes	Yes	Yes	NP	Yes	Yes	Yes
Turbidity	X	X	X	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Key to codes:

Yes= Data was collected and obtained from CDFG, S.P. Cramer & Associates, or FISHBIO

NP= Data was collected but not found in easily accessible sources (i.e., CDFG in annual reports, misc. spreadsheets, or on the Bay Delta and Tributaries website).

X= Data was not collected.

?= Not known if data was or was not collected.

SUMMARY UPDATE

Juvenile Chinook Salmon

Juvenile Salmon Catch

Juvenile saalmon outmigration in the San Joaquin Basin typically occurs during the winter and spring, extending from January through May (Vasques and Kundargi 2001; SRFG 2004). The winter migration period is dominated by fry migrants that are typically less than 50 mm forklength, and the spring period is dominated by smolts which are typically greater than 70 mm forklength.

Lower Traps at Shiloh/Grayson

At Shiloh/Grayson, total annual catch of juvenile salmon has varied substantially between years (Table 1, Figure 1); and this variation is likely due to differences in one or more factors including the duration and timing of the sampling periods, flow conditions, and overall fish abundance (Table 1, Figure 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 and 2006, sampling at Grayson encompassed the majority of the expected winter/spring outmigration season (i.e., January-May/June) and can be described as comprehensive (Figure 1 and Figure 2). 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 at Grayson, so sampling was incomplete for these 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 relative to all other years of monitoring.

Of the winter/spring sampling years, total trap catch at Grayson ranged from a high of 19,327 during 1999 to a low of 436 during 2002, and averaged 7,123 juvenile salmon (Figure 1). In all years of spring-only sampling, catches ranged from a high of 1,239 during 2001 to a low of 57 during 1997.

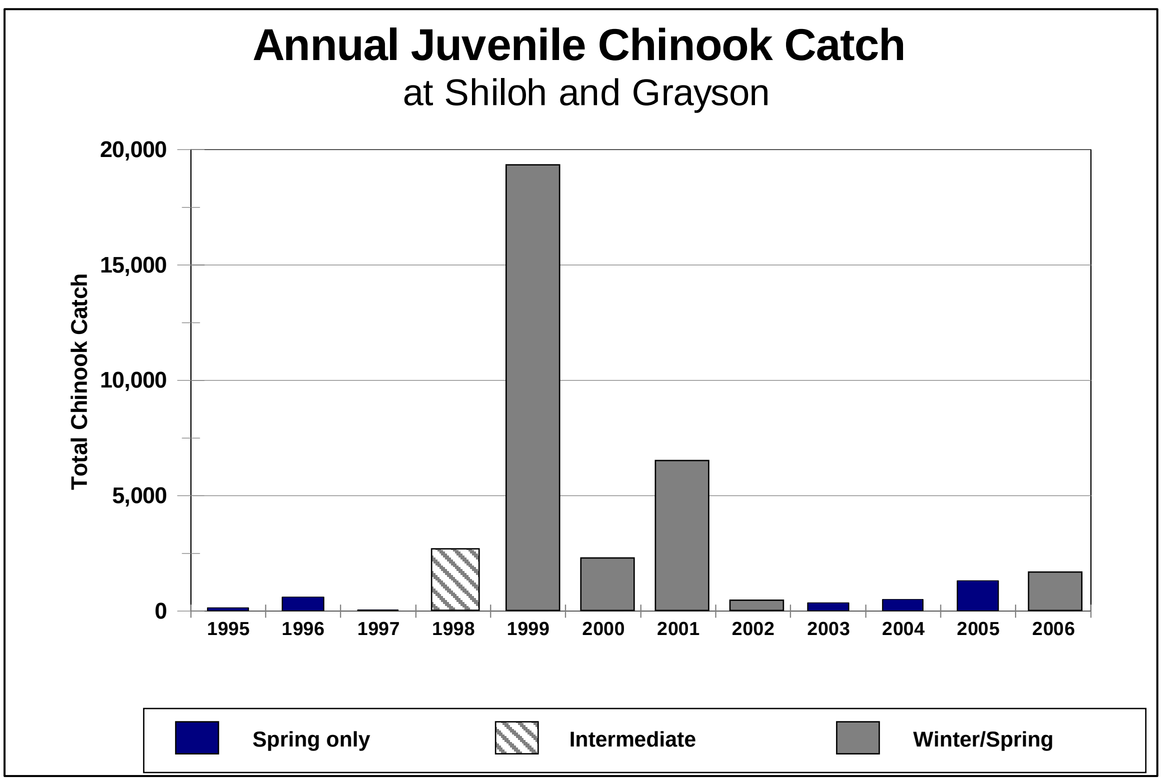


Figure 1. Annual number of juvenile Chinook salmon captured in the lower Tuolumne River at Shiloh (RM 3.4) and Grayson (RM 5.2) and sampling period type, 1995-2005.

The proportion of the typical outmigration period monitored each year ranged from 91% to 97% during winter/spring sampling years, from 24% to 40% during spring-only sampling years, and was 70% in the intermediate sampling year (Table 1). These proportions were calculated by taking the total number of sampling days in a given year and dividing by the total number of days for a typical complete outmigration period (i.e., January 1 through May 31).

The proportion of the outmigration period sampled may not be representative of the proportion of the juvenile population migrating during the sample period because migration timing can be influenced by environmental factors such as flow. For example, in years of low winter flows relatively few salmon reach the site prior to April (Figure 2). Under low flow conditions in 2002 (i.e., 265 cfs to 1,738 cfs) when sampling was conducted from January through early June, 94% of the juvenile Chinook catch occurred after April 1, yet this represented only 40% of the typical outmigration window. In contrast, most juveniles emigrated as fry from late January through early March during high flow years (i.e., flows exceeding 4,000 cfs at Modesto).

Changes in flow, particularly flow increases, were often associated with increased catches. Peak fry catches occurred at flows in excess of approximately 2,000 cfs. Fewer smolts appear to migrate after mid-May when flow often decreases to less than 1,000 cfs and water temperatures rise substantially. Smolts have been captured as late as June 17 (last day of sampling) during 2005 when flows remained relatively high through the late spring (i.e., greater than approximately 4,000 cfs), and water temperatures remained cooler than typical for that time of year.

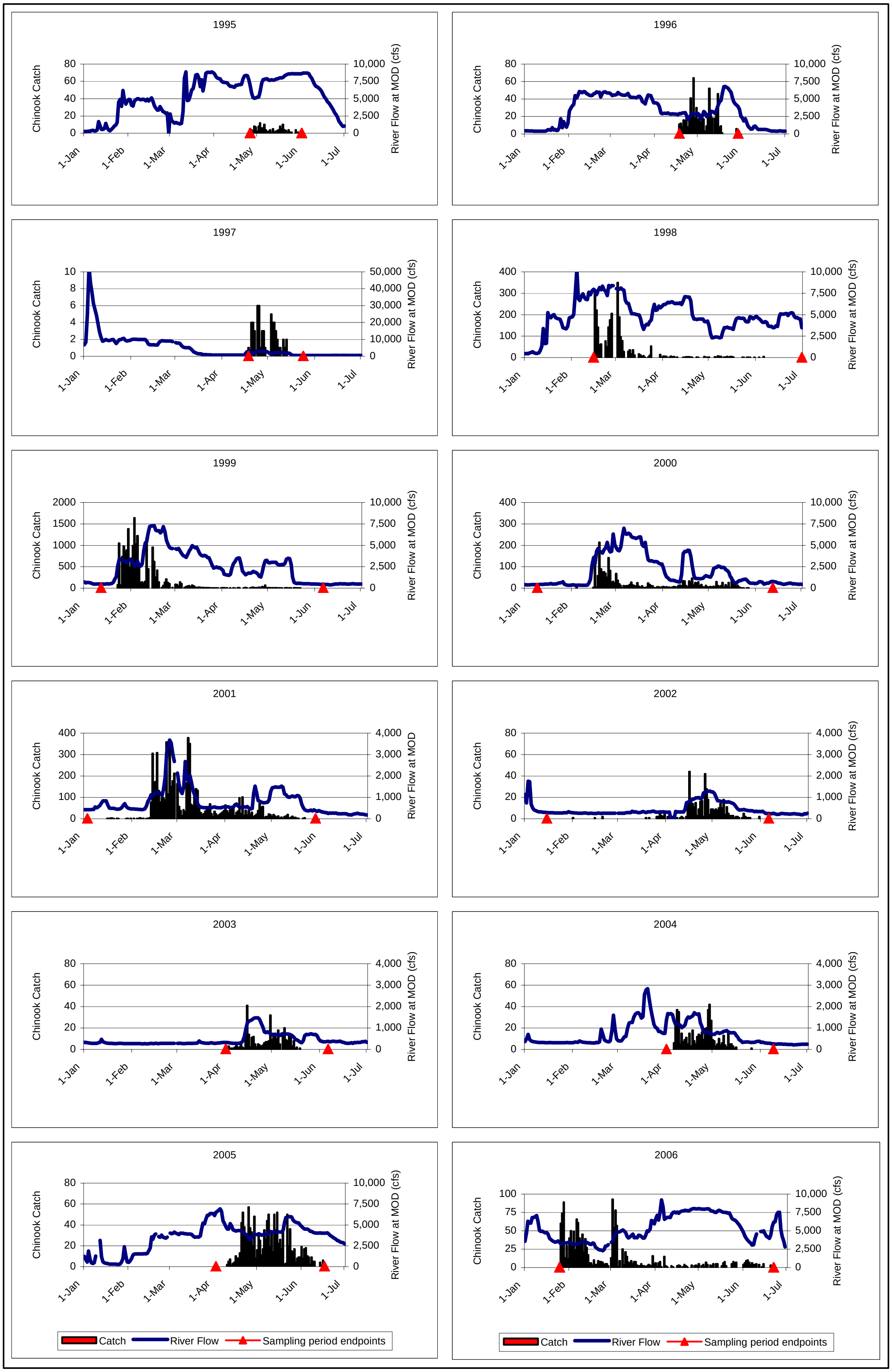


Figure 2. Daily Chinook catch at Shiloh/Grayson and river flow at Modesto, 1995-2006.

Upper Traps at Turlock Lake State Recreation Area, 7/11, Deardorff, Waterford, Charles Road, and Hughson

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

More information regarding upstream trapping operations will be included in future reports as data from future sampling efforts at Waterford come available.

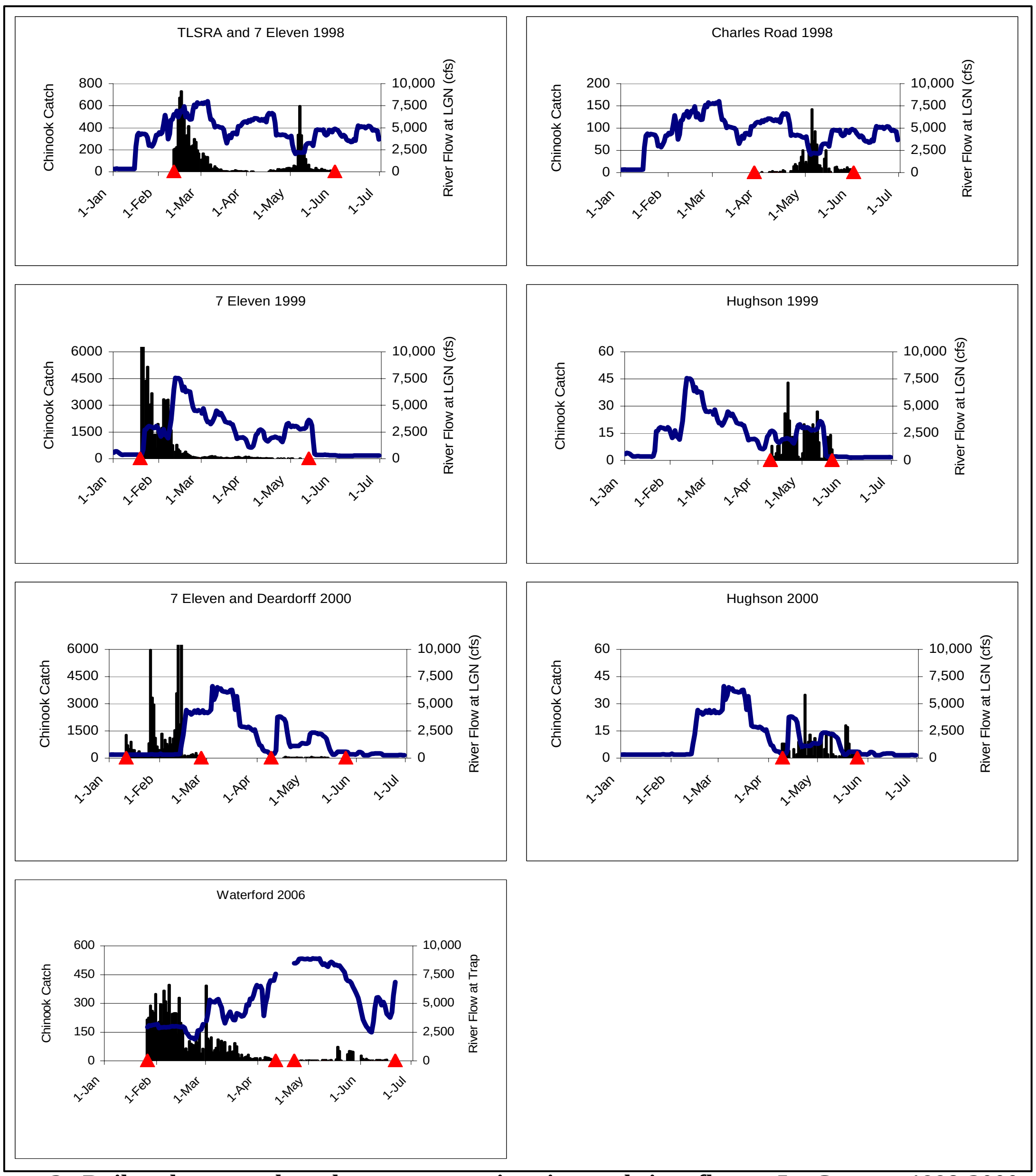


Figure 3. Daily salmon catch at the upper trapping sites and river flow at La Grange, 1998-2000 and 2006.

Trap Efficiency and Juvenile Salmon Abundance

Trap Efficiency at Shiloh and Grayson

During all years except 2005, trap efficiency was estimated at Shiloh or Grayson by releasing known numbers of marked Chinook salmon from the Merced River Hatchery a short distance upstream of the trap (i.e., approximately one mile). The number of trap efficiency tests conducted annually ranged from 4 to 13 tests (Appendix B), with the number of tests generally dependent upon the number of weeks sampled. The proportion of marked fish recaptured from each group serves as an estimate of trap efficiency and these estimates were used to estimate juvenile Chinook abundance from daily trap catches at Grayson from 1999-2006 as described in Fuller and others 2007.

In general, estimated efficiency at Shiloh and Grayson declined as river flow increased and was low and relatively consistent at flows greater than 1,000 cfs at Modesto (Figure 4 and Figure 5). Trap efficiency was consistently low at Shiloh from 1995 through 1998 (i.e., less than 4%) and this was one of the primary factors that contributed to the decision to move the trapping location to Grayson in 1999 (Figure 5). However, low trap efficiency at Shiloh may have been the result of high flows rather than the influence of the bridge piers upstream of the trap since results were similar between the two sites for tests conducted at comparable flows (i.e., greater than 1,000 cfs). Trap efficiency was more variable at Grayson, ranging from 0.1% to 21.2% from 1999 through 2006 (Figure 5), and this likely reflects differences in the range of flows and fish sizes evaluated at each site.

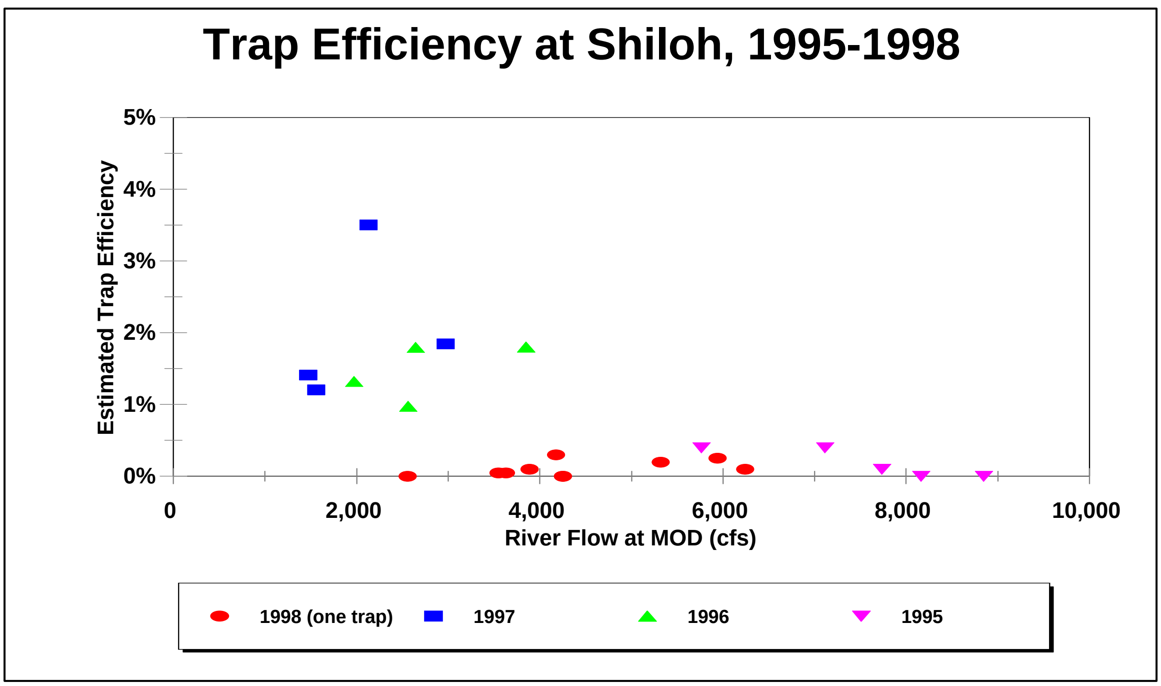


Figure 4. Estimated trap efficiency at Shiloh from 1995 through 1998.

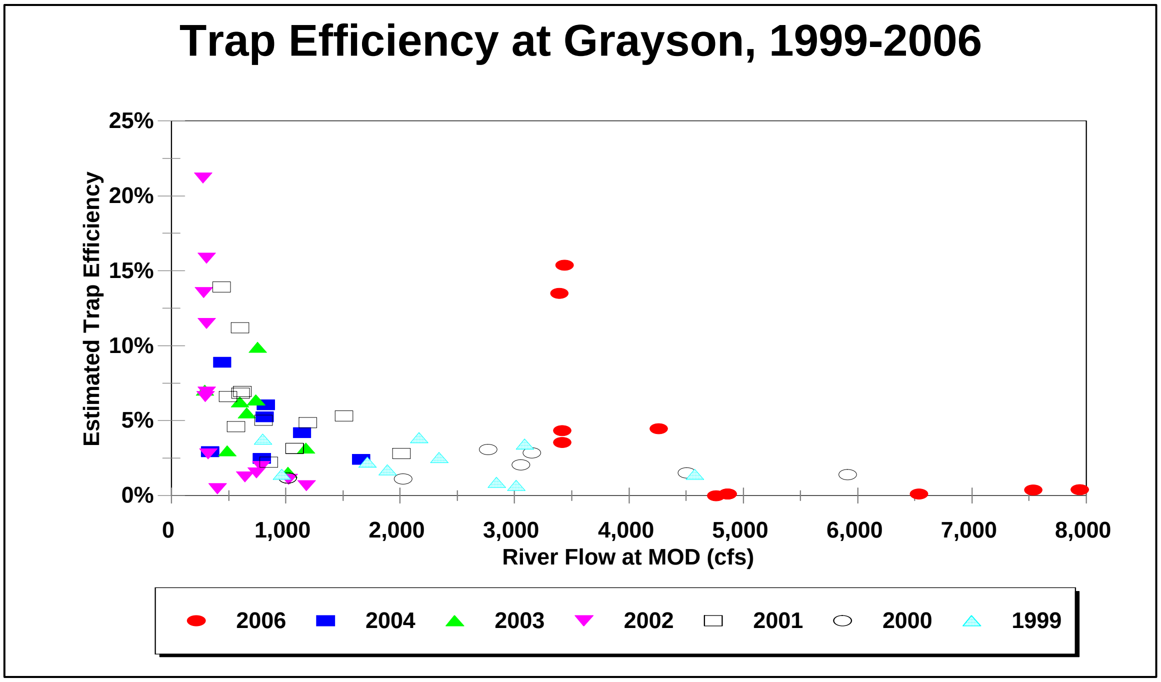


Figure 5. Estimated trap efficiency at Grayson from 1999 through 2006.

Trap Efficiency at the Upper Trap Sites

During 1999-2000 and 2006 few trap efficiency releases were conducted at each of the sampling sites and the data are insufficient to relate trap efficiency to variables such as flow, fish size, and turbidity. Lacking this relationship, estimates for sampling at all sites at which monitoring occurred during 1999, 2000, and 2006 were calculated based on the percentage of river flow estimated to be sampled by the traps (Table 1).

Juvenile Salmon Abundance at Grayson

Since sampling effort did not encompass the entire outmigration period in all years (Table 1, Figure 6), it is appropriate to describe expanded catches as estimated passage during the specific period sampled. Total estimated passage at Grayson during winter/spring sampling years ranged from a high of 696,115 during 1999 to a low of 14,315 during 2002 (Table 1, Figure 6). During spring-only sampling years at Grayson and Shiloh, estimated passage ranged from a high of 264,376 in 2005 to a low of 9,104 during 2003 (Table 1, Figure 6). Estimated passage was highest during 1998 (Table 1, Figure 6) when sampling effort was intermediate (i.e., February-July). However, the 1998 passage estimate may be inflated because no trap efficiency tests were conducted with fry. The regression equation for predicting daily trap efficiency during 1998 was based on tests conducted with larger fish which are generally less vulnerable to capture than fry. Therefore, the application of efficiencies predicted by this equation to fry captured during February could inflate estimated passage.

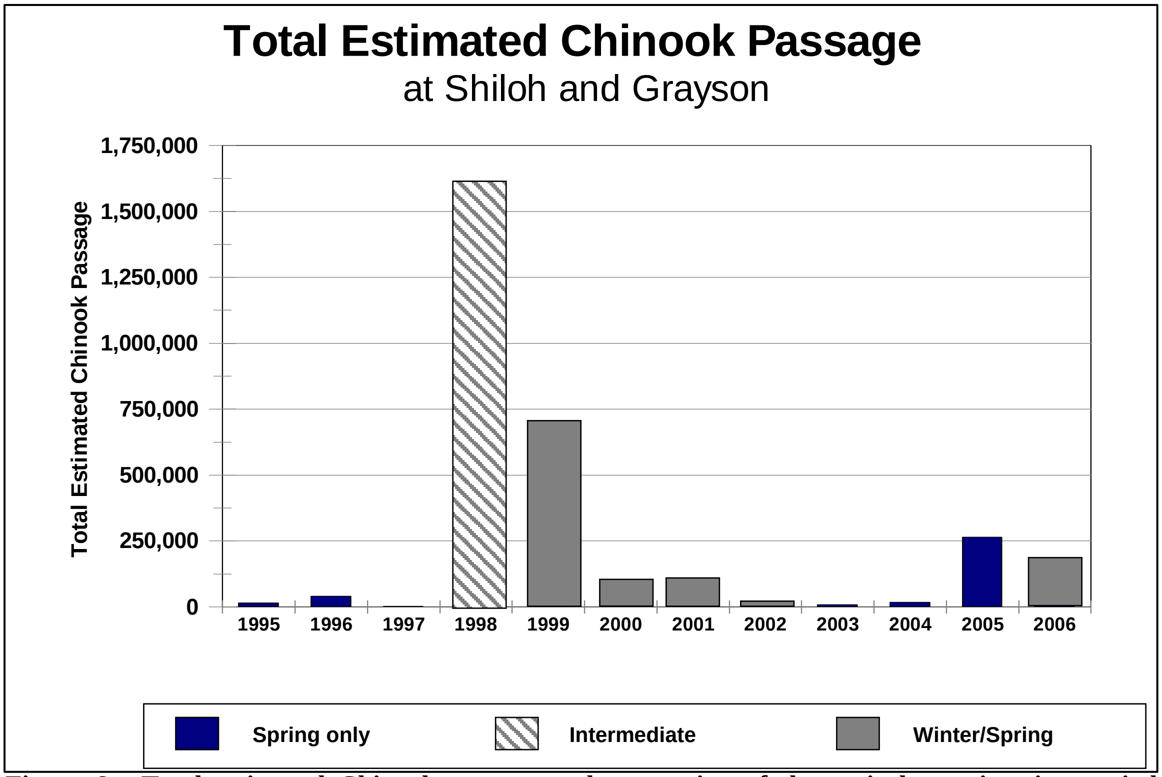


Figure 6. Total estimated Chinook passage and proportion of the typical outmigration period sampled annually at Shiloh and Grayson from 1995 through 2006.

Juvenile Salmon Abundance at the Upper Trap Sites

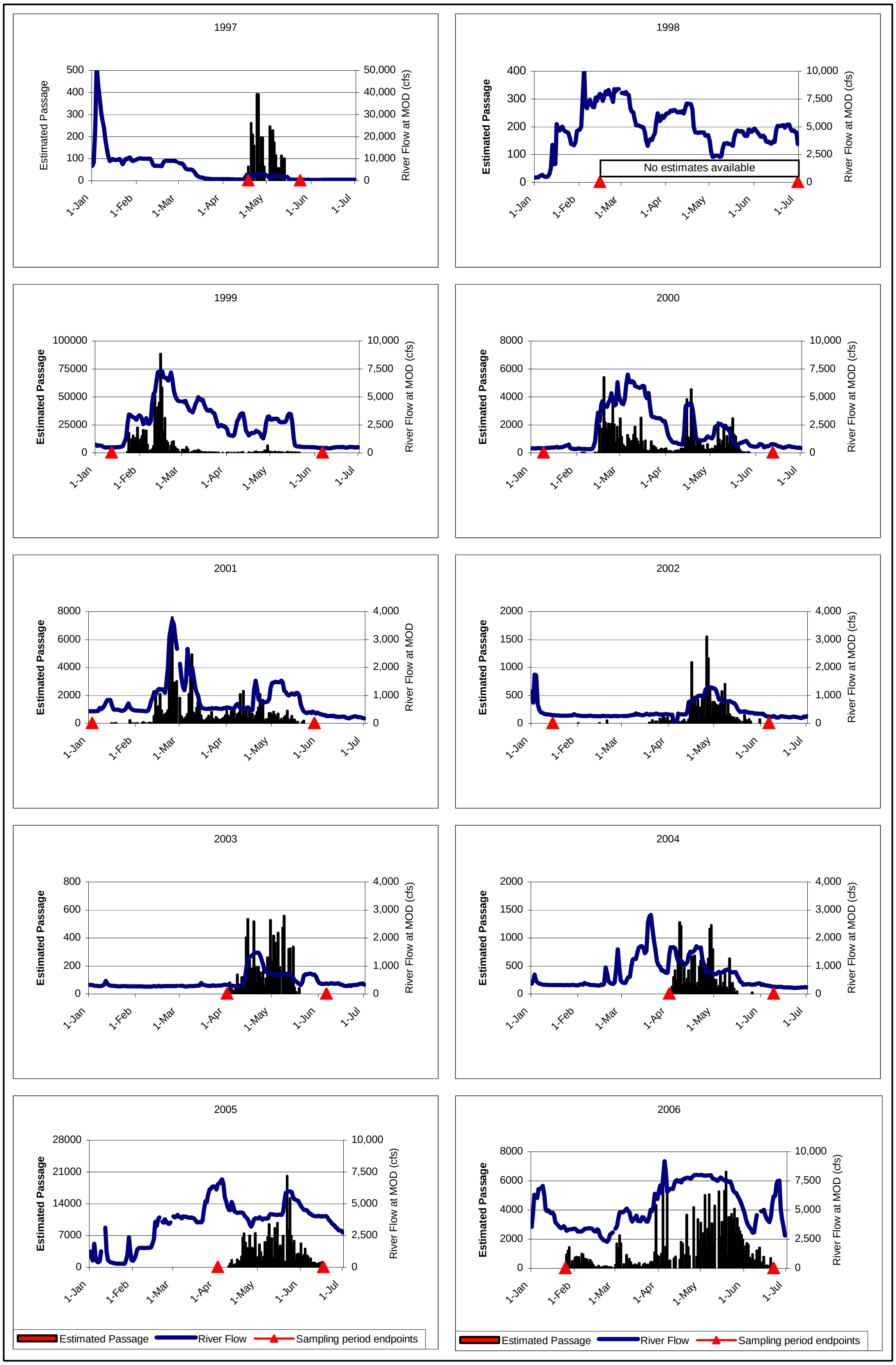
Comparisons of juvenile salmon abundance at the upper sites will be discussed in future reports as more information comes available form the new monitoring effort initiated at Waterford.

Relative Salmon Survival between Rotary Screw Trap Sites

During years in which monitoring occurred during both the winter and spring at both an upper site and at Shiloh or Grayson, total passage estimates from the sites can be compared to provide an index of survival between the sites. Such comparisons can only be conducted with data collected during 1999 and 2006, and these survival indices ranged from 40% to 70%, respectively.

Juvenile Salmon Emigration Timing

As described previously, juvenile salmon outmigration in the San Joaquin Basin typically extends from January through May (Vasques and Kundargi 2001; SRFG 2004) and sampling effort was incomplete in many years. As such, timing of juvenile emigration can be compared among only the years when sampling occurred during both winter and spring. Comparison of cumulative passage at Grayson during 1999-2002 and during 2006 indicates that most migration activity occurs from February through May (Figure 7).


1997
1998
No estimates available
1999
2000
2001
2002
2003
2004
2005
2006
Estimated Passage
River Flow at MOD (cfs)
River Flow at MOD
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
Estimated Passage
River Flow
Sampling period endpoints

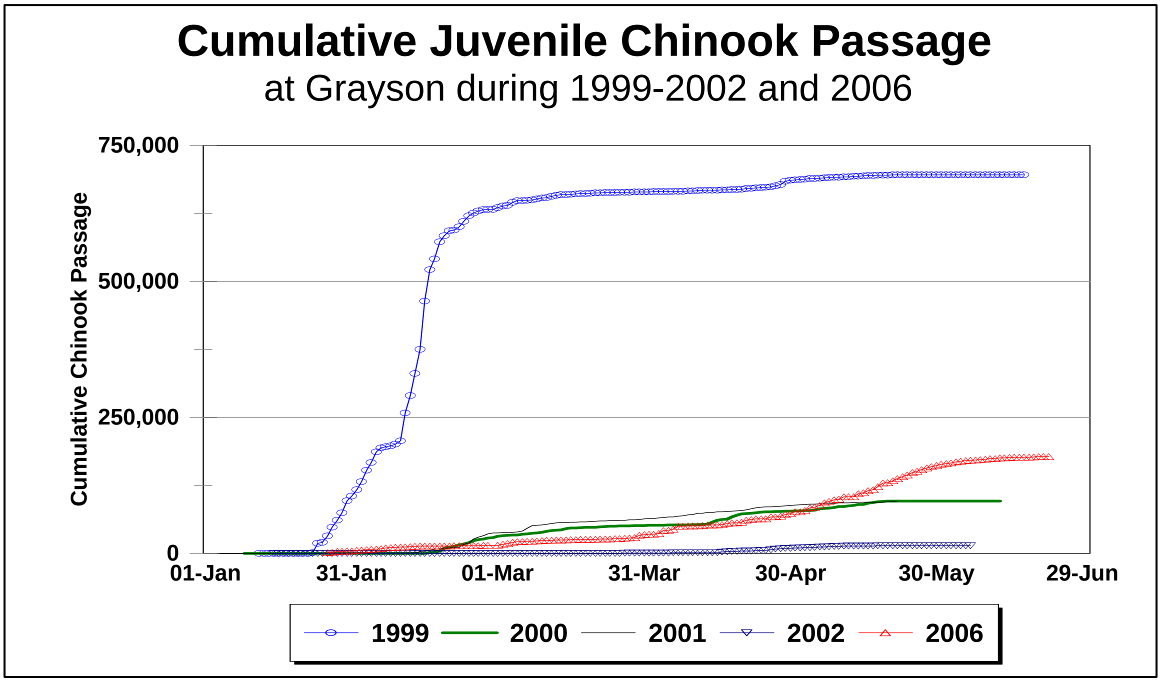


Figure 7. Cumulative estimated passage of juvenile Chinook salmon at Grayson (RM 5.2) during comprehensive sampling, 1999-2002 and 2006.

Size of Juvenile Chinook Outmigrants

Daily mean lengths of juvenile Chinook salmon captured at Shiloh/Grayson are presently available for 1997-2006 (Table 1). To simplify interannual comparison of how average Chinook length changes through the typical outmigration period, daily mean lengths were averaged per Julian week. The averages for some weeks were excluded due to low sample size.

Generally, average fish length was around 35-40 mm (forklength) during January and February then gradually increased to 90-100 mm by late May (Figure 8). From late March through early May, average size for a given week ranged widely between years. For example, during the week of April 2, average size differed by 25 mm from a low of 69 mm in 2000 to a high of 84 mm in 2002.

Length frequency distributions weighted for estimated passage were calculated for years in which necessary data (i.e., individual forklength and estimated daily passage) were available and sampling occurred during winter and spring. These length frequency distributions (Figure 9) illustrate that with the exception of 2002, juvenile salmon migration past Grayson was consistently dominated by fry (i.e., less than 50 mm). During 1999, only 6% of the salmon estimated to pass Grayson were greater than 50 mm. In contrast, fish greater than 50 mm represented 99% of the catch during 2002.

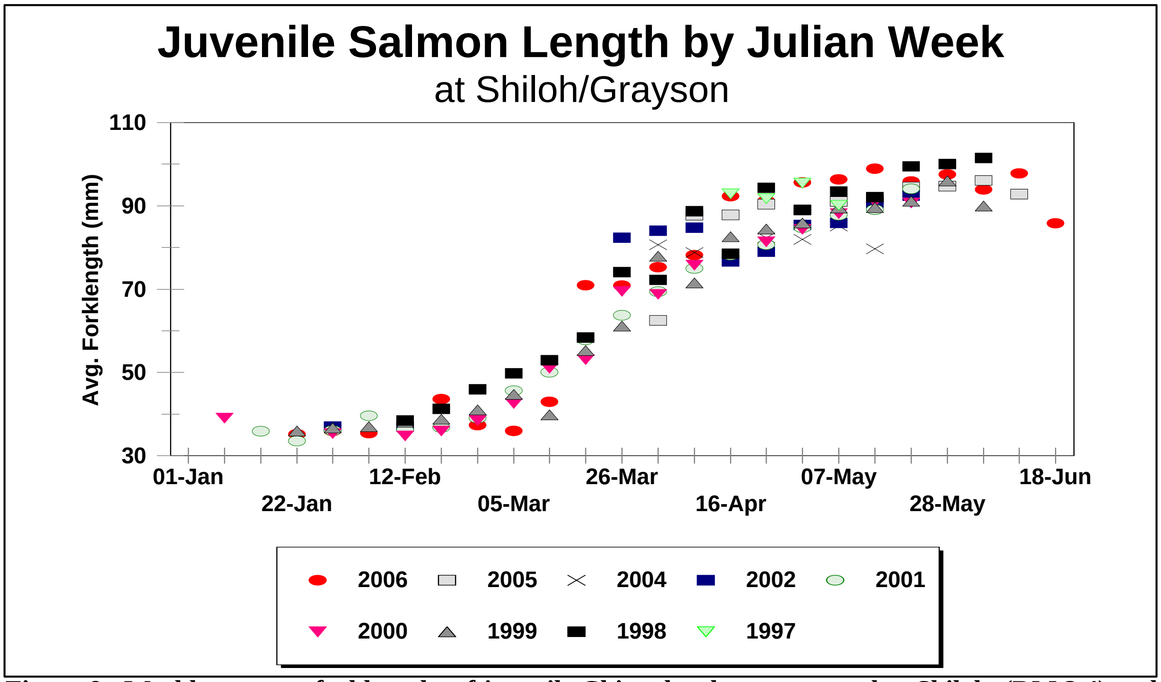


Figure 8. Weekly average forklengths of juvenile Chinook salmon captured at Shiloh (RM 3.4) and Grayson (RM 5.2), 1997-2006. Data is not available for 1995 and 1996.

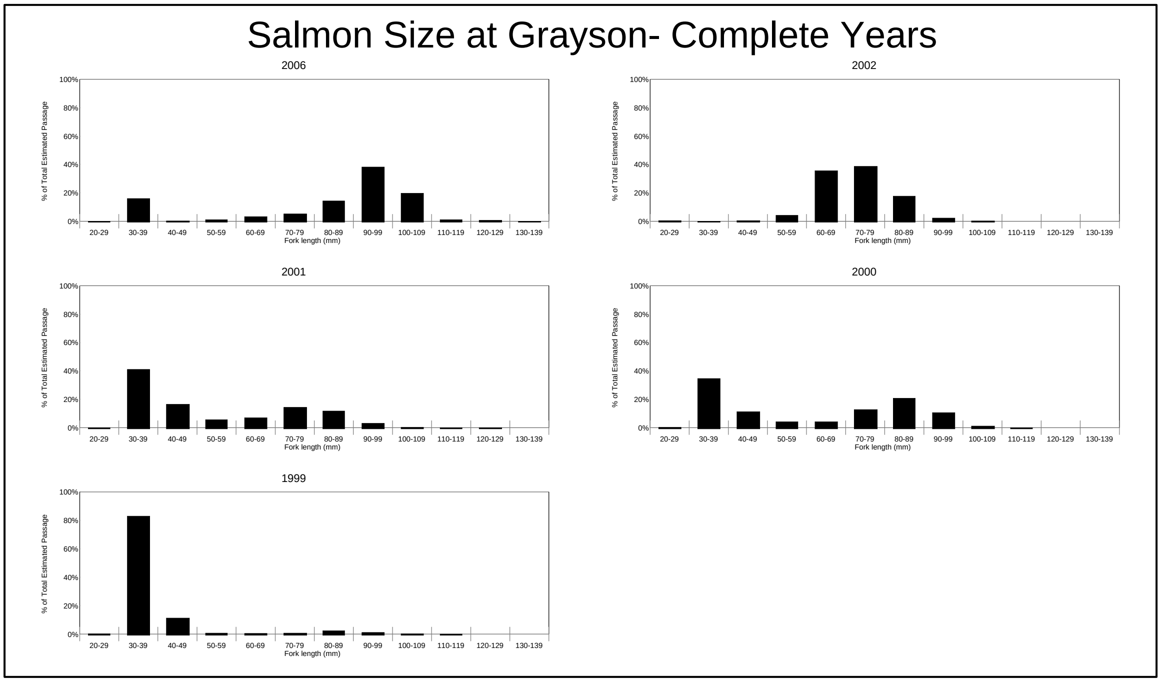


Figure 9. Length frequency distribution of estimated salmon passage at Grayson during 1999-2002 and 2006 when sampling was complete.

Rainbow/steelhead trout

Catches of rainbow/steelhead trout have occurred infrequently at all trapping sites, with a total of 12 individuals observed (Table 3). No rainbow/steelhead trout were captured at Charles Road or Hughson, and over all years of outmigrant monitoring at Shiloh/Grayson, two rainbow/steelhead trout have been captured (Table 3).

Table 3. Rainbow/steelhead trout captured from 1995 through 2006.

Date	*Number*	*Fork Length (mm)*	*Smolt Index*	*Sampling Location*
16-Feb-06	1	280	5	Waterford
02-Apr-06	1	249	5	Waterford
05-Apr-06	1	270	5	Waterford
02-Jun-06	1	81	3	Waterford
03-Jun-06	1	66	3	Waterford
10-Jun-06	1	90	3	Waterford
10-Jun-06	1	80	3	Waterford
12-Jun-06	1	79	3	Waterford
14-May-05	1	33	2	Grayson
21-Feb-00	1	230	5	Grayson
21-Jan-99	1	198	5	7 Eleven
01-Apr-99	1	45	3	7 Eleven

Other Fish Species

Lower Traps at Shiloh/Grayson

Daily catch of species other than Chinook salmon is presently available for all years of monitoring at Shiloh and Grayson, with the exception of 1997. A total of 38 species have been represented in the catch (Table 4), including Chinook salmon. Of these, 29% are native to the Tuolumne River drainage and 71% are introduced species.

Over all years combined, white catfish were the most commonly captured species, followed by Pacific lamprey, largemouth bass, smallmouth bass, and bluegill (Table 4). Species rarely captured (i.e., fewer than 10 individuals captured) at Shiloh and Grayson include rainbow trout, brown bullhead, yellow bullhead, American shad, fathead minnow, hitch, hardhead, bigscale logperch, riffle sculpin, and striped bass.

Upper Traps at Turlock Lake State Recreation Area, 7/11, Deardorff, Waterford, Charles Road, and Hughson

Daily catch of species other than Chinook salmon is presently available for all years of monitoring at the upper trapping sites and will be summarized in future reports.

Table 4. Species other than salmon captured at Shiloh 1995-1998 and at Grayson 1999-2005.

Common Name	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	TOTAL
Catfish Family													
Bullhead catfish	0	2		0	0	0	0	0	0	0	0	0	**2**
Black bullhead	1	0		3	5	0	0	0	2	0	0	1	**12**
Brown bullhead	0	0		1	2	0	0	0	0	0	0	0	**3**
Channel catfish	1	1		8	15	61	28	12	12	12	3	6	**159**
White catfish	14	2		64	198	616	890	2,141	1,196	625	51	55	**5,852**
Yellow bullhead	0	0		1	0	0	0	0	0	0	0	0	**1**
Unidentified catfish	0	40		0	1	82	5	0	12	29	0	0	**169**
Herring Family													
American shad	0	0		1	0	4	0	2	0	1	0	0	**8**
Threadfin shad	0	1		46	4	312	85	43	13	3	0	20	**527**
Lamprey Family													
Pacific lamprey*	0	0		3	755	442	393	215	788	4	0	0	**2,600**
Unid. lamprey	0	0		0	0	0	172	76	0	4	13	72	**337**
Livebearer Family													
Mosquitofish	21	22		35	1	71	42	60	53	68	10	9	**392**
Minnow Family													
Carp	1	0		0	4	10	3	0	1	1	0	39286	**39306**
Fathead minnow	0	0		0	0	0	1	1	0	3	1	0	**6**
Hitch*	0	1		0	1	3	0	0	0	1	1	3	**10**
Golden shiner	2	11		0	6	144	105	5	14	5	10	42	**344**
Goldfish	32	12		75	5	6	1	3	0	0	2	2	**138**
Hardhead*	0	1		0	0	6	0	0	1	0	2	66	**76**
Red shiner	12	2		19	2	73	97	225	140	56	5	17	**648**
Sac. blackfish*	0	1		0	1	12	7	2	0	2	0	58	**83**
Sac. pikeminnow*	11	2		46	1	342	20	23	3	2	42	149	**641**
Sac. splittail*	0	0		0	2	12	1	3	2	0	0	0	**20**
Unid. minnow	570	0		0	7	93	26	10	4	0	0	0	**710**
Perch Family													
Bigscale logperch	0	0		0	0	0	1	3	0	0	0	2	**6**
Salmonid Family													
Rainbow trout*	0	0		0	0	1	0	0	0	0	1	0	**2**
Sculpin Family													
Prickly sculpin*	0	0		4	135	14	6	3	1	0	0	6	**169**
Riffle sculpin*	0	0		0	4	0	0	0	0	0	0	0	**4**
Unidentified sculpin	0	3		0	0	0	0	0	0	0	0	0	**3**
Silverside Family													
Inland silverside	3	102		18	7	92	55	48	19	15	5	8	**372**
Smelt Family													
Wakasagi	0	0		19	0	0	0	0	0	0	0	0	**19**
Sucker Family													
Sacramento sucker*	39	12		2	94	114	126	58	12	17	4	99	**577**
Sunfish Family													
Bass- unid. species	0	0		0	0	0	0	0	0	29	0	0	**29**
Black crappie	0	0		0	41	1	2	66	0	0	0	329	**439**
Bluegill	1	26		8	80	431	446	168	16	37	19	33	**1,265**
Green sunfish	2	2		0	7	8	5	8	10	2	0	1	**45**
Largemouth bass	2	56		2	26	264	137	474	0	638	15	889	**2,503**
Redear sunfish	0	0		1	1	4	2	3	1	0	1	5	**18**
Red-eye bass	0	0		0	0	1	0	0	0	0	0	0	**1**
Smallmouth bass	0	0		1	2	58	40	510	17	785	6	39	**1,458**
Spotted bass	0	0		0	0	33	0	125	2	0	0	0	**160**
Warmouth	0	1		15	2	8	1	9	2	0	1	5	**44**
White crappie	0	3		0	21	10	5	1	1	0	0	0	**41**
Unidentified sunfish	3	2		8	4	42	17	30	306	8	0	0	**420**
Surfperch Family													
Tule Perch	0	0		0	0	0	0	0	0	0	1	0	**1**
Temperate Bass Family													
Striped bass	0	0		0	2	4	0	1	0	0	0	0	**7**

* Indicates species native to the Tuolumne River.

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