2001 Juvenile Chinook Salmon Capture and Production Indices Using Rotary-Screw Traps on the Lower Tuolumne River

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1. INTRODUCTION

Declines in salmon stocks along the Pacific Coast, and particularly in the San Joaquin Valley, California, during the latter years of the last century have led to a surge of conservation and protective measures. Historically, California boasted strong pacific salmon stocks with runs consisting of winter run, spring run, fall run, and late fall run chinook salmon (Yoshiyama, 2000). In the San Joaquin Basin those runs have declined appreciably. The Tuolumne River, a tributary to the San Joaquin River, has experienced similar declines in the various stocks. The Tuolumne River, California originates in the Sierra Nevada Mountains in Yosemite National Park. It runs down into the San Joaquin Valley and flows into the San Joaquin River (Figure 1.1). The Tuolumne River is reported as having spring and fall runs prior to the 1960's (as presented in Yoshiyama, 2000). However, overfishing, habitat loss, and water quality degradation have led to the decline of chinook salmon stocks on the Tuolumne River. The Lower Tuolumne River has been severely impacted by the construction of dams, which impede fish passage, large scale historical gold dredging, in-channel gravel mining, and water withdrawals. The National Marine Fisheries Service (NMFS) currently lists the fall run chinook salmon as a candidate species for federal ESU listing. It is also thought to be the only remaining viable run on the Tuolumne River.

The Central Valley Project Improvement Act (CVPIA) requires the USFWS to take measures to restore native anadromous fisheries stocks to sustainable levels. A monitoring and assessment program was implemented to evaluate success towards achieving this requirement. That program is called the Comprehensive Assessment and Monitoring Program (CAMP). The California Department of Fish and Game (CDFG) operates two rotary-screw traps on the Tuolumne River for CAMP, one of the traps is provided by TID and MID, as part of the juvenile salmon monitoring component to CAMP. The monitoring is also a component of the New Don Pedro FERC Settlement Agreement (Sections 13d,e,f,g).

Rotary-screw traps (RST's) are used in many studies of salmon along the Pacific Coast (Demko et al., 1999; Roper and Scarnecchia, 1996; Thedinga et al., 1994). RST's have been operated on the Tuolumne River near the confluence with the San Joaquin River since 1995 (Heyne and Loudermilk, 1997; 1998; Vasques and Kundargi, 2001) and in 2000, upstream in and below the primary spawning reach (Vick et al., 1998).

Several factors affect juvenile salmon migration rate and timing. Studies on the Columbia River indicate that the rate of migration (Giorgi et al., 1997; NMFS, 2000) and survival (NMFS, 2000)

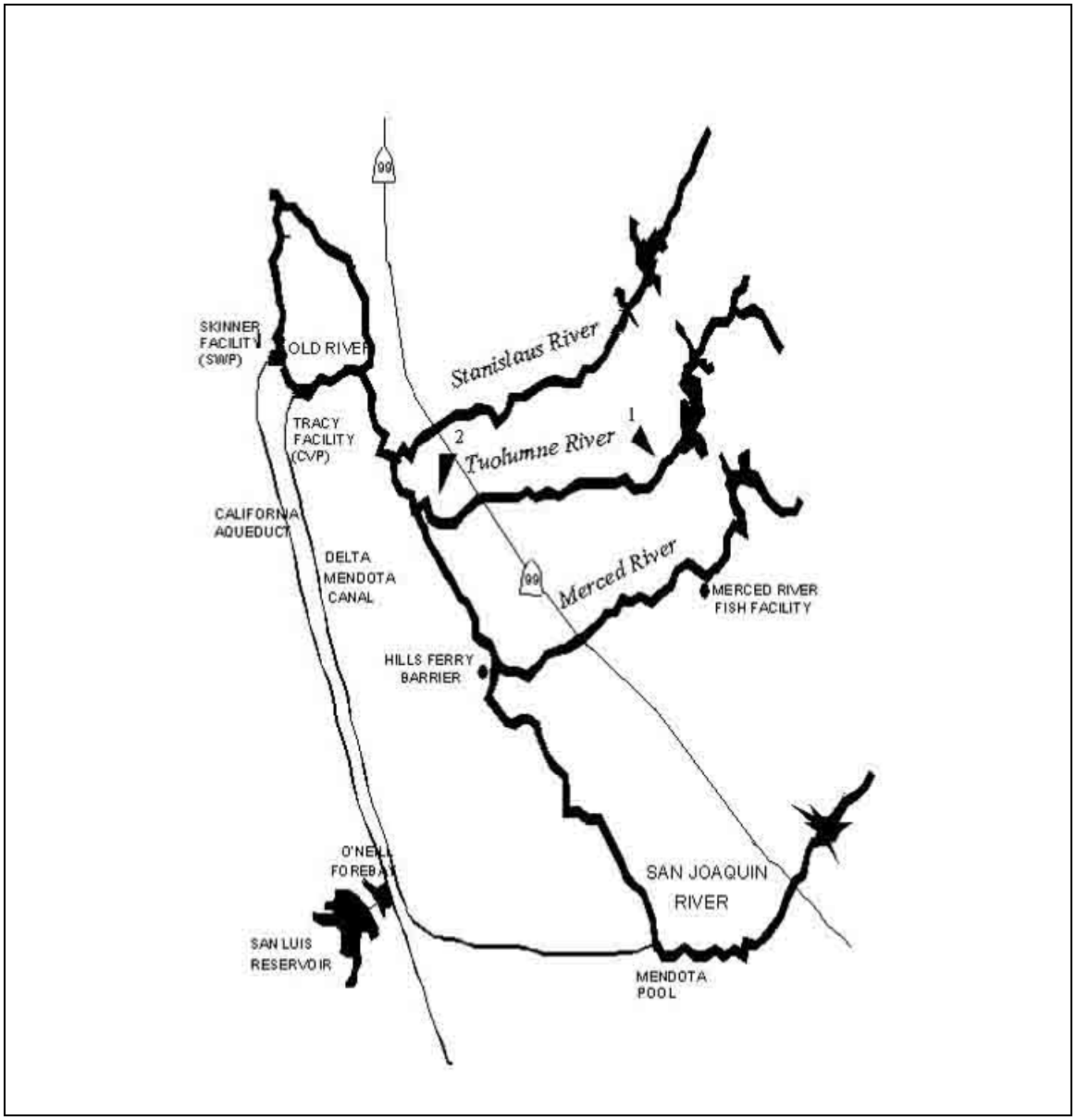

Figure 1.1 Map of San Joaquin River with 1. La Grange and 2. Shiloh referenced for orientation.

both increase with increasing flow. Previous studies on the Tuolumne River (Heyne and Loudermilk, 1997; 1998; Vasques and Kundargi, 2001) present preliminary assessments of smolt migration and production using rotary-screw traps. This paper attempts to expand the existing data by examining the 2001 juvenile outmigrant season using efficiency tests over three subsequent years of sampling. The objectives of this study are to: 1) estimate the production of juvenile chinook salmon and 2) assess the timing of migration during the 2001 sampling period.

2. METHODS

2.1. Site Description

Two rotary screw traps were operated side by side at the Grayson River Ranch, approximately 5.2 river miles from the confluence of the San Joaquin River and the Tuolumne River (Fig. 1.1). No attempt was made to enhance trap efficiency by altering the river channel. In the summer of 2000 some riparian restoration efforts began on the Grayson River Ranch, but there have been no alterations to the channel. The traps were located upstream of the Shiloh Bridge anchored by a cable crossing the river. The north bank of this section of river is a steep riprap bank. The south bank has a gentle slope with heavy riparian vegetation. The substrate through this area is dominated by sand. The thalweg generally runs near the north bank but may vary at low flows.

2.2. Rotary Screw Traps and Operations

The rotary screw traps are eight feet diameter across the mouth of the traps. Approximately half of the cone is immersed and 'fishing'. The structure of the traps is such that trap revolution increases with increasing velocity. Fish entering the mouth of the trap are directed towards a live well at the rear of the trap. One half revolution of the trap prevents any fish from exiting the mouth of the trap for one full revolution. The trapped fish are held in the live wells until a crew conducts a routine check.

Trap checks were performed on a daily basis, however, at the start and end of the 2001 season the traps were pulled (raised) so they did not sample on the weekends. Appendix I lists daily trap status. When the traps were pulled for the weekend they were raised after the Friday night check and lowered on Sunday afternoon. At the start of each season checks were performed twice a day; once salmon began appearing or flows increased the number of checks per day was increased to three checks a day. Near the end of the season frequency of trap checks was again reduced to two checks per day. The check schedule was designed to minimize the time between checks, particularly overnight, to reduce the likelihood of debris fouling the trap and increase effective 'fishing' time.

The traps were deployed on 03 January with two daily checks five days a week. The frequency of checks increased to seven days a week on 20 January. On 28 January a schedule of three checks a day began. The last check was conducted on the morning of May 29th. The traps were

raised after the last check and removed on May 30th. In previous years the traps sampled into early June; this season the flows were reduced to the FERC minimum on June 1st. The combination of low flows and high water temperatures reduced the chances detecting juvenile salmon and hindered the operation of the rotary-screw traps. They were therefore removed.

Each trap check consisted of fish capture data, environmental variable data, and trap operation data. Upon arrival at the traps the crew measured the revolutions per minute (RPM's) of the trap and recorded the total revolutions for the sample period. Air and water temperature (ºC) was recorded and conductivity (μs) was measured with a Cole-Palmer CON 5 conductivity meter. Turbidity (NTU) was measured with a Hach portable turbidity meter. The average of three velocity measurements (ms^{-1}) was recorded for each trap. The velocity was taken at a depth of 0.5 m at the mouth of each trap using a Global Water Flow Probe flow meter. After all fish were removed from the live wells and the trap was cleared of debris RPM's were again recorded.

All fish in the live wells were removed and recorded for each respective trap. Salmon were identified and checked for marks. Marks may include an adipose fin clip, indicating a coded wire tag (hereafter referred to as CWT), other fin clips, a dye mark on the caudal, dorsal, or anal fins, and freeze brands. All marked salmon were measured to the nearest millimeter fork length and the mark code was recorded. Unmarked (naturally produced) chinook salmon captures during peak periods of movement were often times in excess of 200 specimens. For this reason a representative sample of 100 juvenile salmon specimens per check were measured to the nearest millimeter (fork length) and the remainder were enumerated and recorded for each trap check. The number in excess of the 100 measured specimens will henceforth be referred to as a plus count. A smolt index code as specified in the Interagency Ecological Program Steelhead Project Work Team, Steelhead Life-stage Assessment Protocol was assessed for every measured salmon (marked and unmarked) and recorded. The smolt index criteria assigns a number from 1 to 5 for different stages of development: yolk sac fry; fry; parr; silvery parr; and smolt respectively.
All non-salmon fish captures were identified to species. The first 10 specimens of each species were measured to the nearest millimeter fork length and any additional specimens were enumerated and recorded as plus counts. Unidentifiable fish were labeled as unknown and preserved for later identification in the laboratory. Appendix II summarizes daily counts of all non-salmon catches.

2.3. Vulnerability Tests

Vulnerability tests were conducted almost weekly beginning on January 18th with the last test on May 16th. Vulnerability tests consist of releasing a known number of marked fish approximately 1 km upstream of the rotary-screw traps (Figure 2.1). Marked fish were held for 24 hours in live cars prior to release. This allowed the fish ample time to acclimate to the river conditions and account for handling mortality. Releases were conducted after sunset prior to the routine trap check. During the release the fish were distributed evenly across the river channel. Recaptures generally occurred the night of the test through the morning check the following day. The release groups ranged in number from approximately 1500 fish to approximately 3000 fish per test. All of the fish used in the vulnerability tests were of Merced River Fish Facility (MRFF) origin. The test fish were marked at the hatchery with subcutaneous dye. Marks consisted of either a yellow or blue mark on the dorsal, anal, upper, or lower lobes of the caudal fins or a combination of colors and locations.

Vulnerability, also referred to as trap efficiency, is the ratio recaptured marked fish to the total number of marked fish released during a vulnerability test. In this and other analyses the recapture of marked salmon was combined for both traps so that the two traps operating side by side were treated as a single sampling unit. The vulnerability tests were pooled for 1999-2001 to reduce variance. The data and prior information (Demko et al., 1999; Vasques and Kundargi, 2001) suggest that juvenile salmon exhibit varying degrees of vulnerability to capture by size. Therefore a multi-linear regression was performed with vulnerability as the dependant variable and flow and fork length of test fish as independent variables. SIGMASTAT was used in all statistical analyses. Daily vulnerability was then interpolated by using the resultant regression equation. In the regression equation mean daily flow was derived from the CDEC website and length was determined from the mean fork length (mm) of the daily catch.

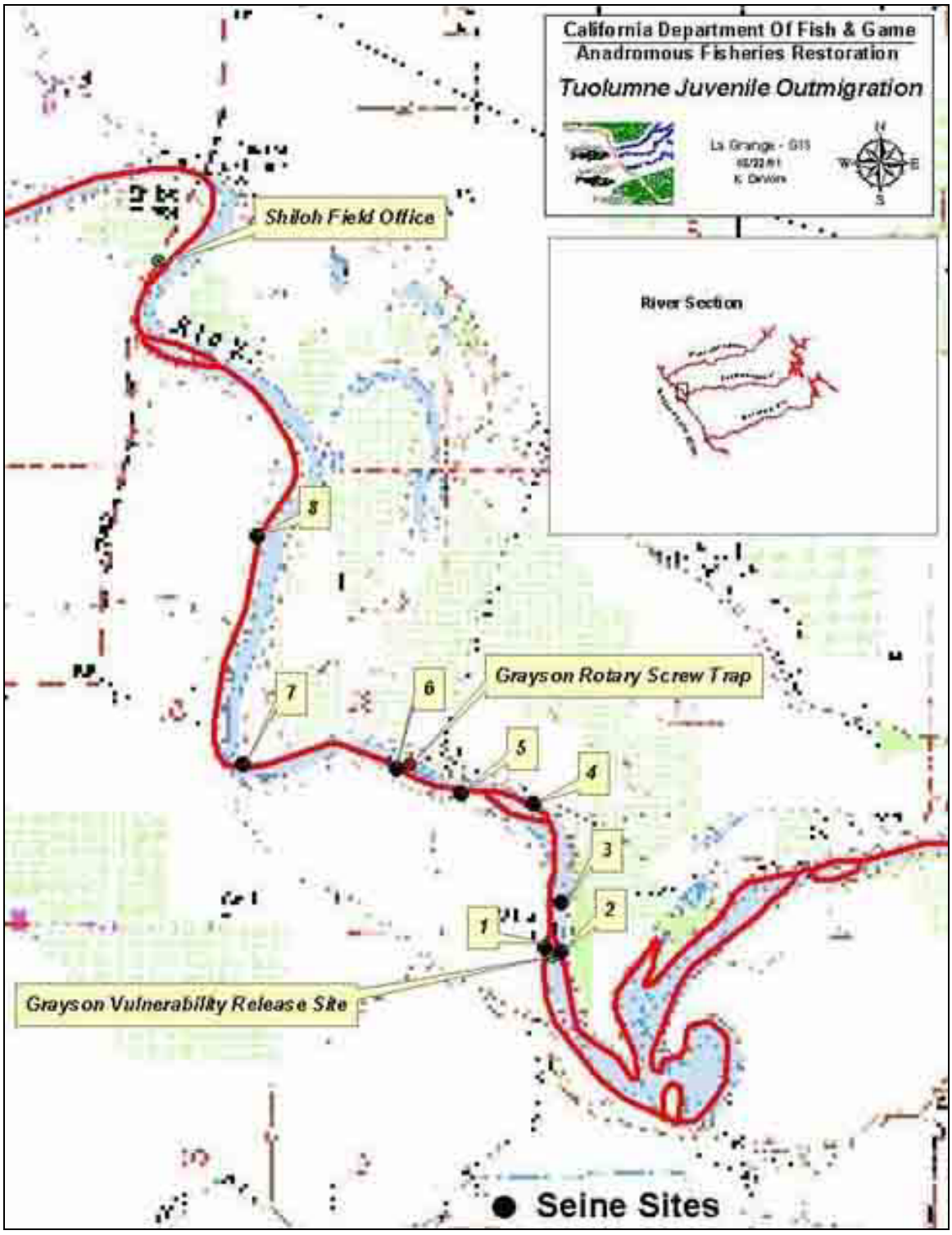

Figure 2.1. Map of Grayson site with screw-traps, vulnerability release site, and location of seining sites.

Expansion of the daily capture of naturally produced salmon was then determined by dividing the number of juveniles caught on a day by the estimated vulnerability for that day (see equation 2.2 in Vasques and Kundargi, 2001). The annual estimate of natural production is the sum of the daily estimates ΣT_i where T_i is the estimated number of naturally produced juveniles passing the traps on day i. Confidence intervals (95%) were calculated for the annual production estimates using equations 2.3 and 2.4 in Vasques and Kundargi, 2001 (as used in Roper and Scarnecchia, 2000).

In addition to the usual vulnerability tests, two tests were conducted that were designed to give an indication of how the test fish distribute across the river channel. Each test consisted of three separately marked groups. Rather than distributing the fish evenly across the channel, as done in usual vulnerability tests, each group was released near the left bank (facing downstream), right bank, or mid-channel. Recapture at the rotary-screw traps was conducted as usual. Again the results were combined for the two traps so that both traps were treated as one sampling unit.

In conjunction with the distribution tests seining was conducted to assist in the determination of test group distribution and assess the degree to which fish were "holding up" after release. Seining was conducted in a total of eight locations; upriver of the traps, opposite the traps, and down river (Figure 2.1). All chinook salmon captured in the seines were enumerated and measured to nearest mm fork length. All marked salmon were noted as such.

3. RESULTS

3.1. Catch and Timing of Outmigration

The total catch of naturally produced chinook salmon in 2001 was 6,478. Daily catches of naturally produced salmon are listed in Table 3.1. The peak fry migration period is from mid February to mid March (Figure 3.1). A second and less pronounced peak in smolt migration occurs in mid to late April (Figure 3.1). A total of 109 CWT's were recaptured from the smolt survival test releases of 68,795 (effective release number) at the Old La Grange Bridge. Daily CWT captures are presented in Figure 3.2 and Table 3.1.

The fork length of naturally produced salmon is displayed in Figure 3.3. This figure represents the fork lengths of fish caught but does not include the number of fish caught at each length. In

Table 3.1. Daily catch of naturally produced salmon with daily vulnerability estimate, expanded catch, daily CWT catch, and flow at Modesto

Sample Date	Naturally Produced Salmon			Daily CWT catch	Modesto Flow (cfs)
	Daily catch	Daily Vulnerability	Expanded Catch		
1/4/01	1	0.0351	29		439
1/5/01		0.1322			441
1/6/01		0.1322			445
1/7/01		0.1321			450
1/8/01		0.1306			562
1/9/01		0.1313			511
1/10/01		0.1305			573
1/11/01		0.1299			621
1/12/01		0.1284			733
1/13/01		0.1272			823
1/14/01		0.1271			829
1/15/01		0.1272			824
1/16/01	2	0.0882	23		653
1/17/01	1	0.0895	11		508
1/18/01	3	0.0908	33		496
1/19/01	3	0.0930	32		500
1/20/01	1	0.0908	11		495
1/21/01		0.1318			473
1/22/01	2	0.0947	21		461
1/23/01	1	0.0936	11		456
1/24/01		0.1318			477
1/25/01		0.1312			520
1/26/01		0.1299			620
1/27/01		0.1289			696
1/28/01	1	-0.0276	1		566
1/29/01	2	0.0874	23		501
1/30/01		0.1318			476
1/31/01	2	0.0912	22		464
2/1/01		0.1320			457
2/2/01	2	0.0925	22		457
2/3/01		0.1320			455
2/4/01	1	0.0937	11		451
2/5/01	2	0.0819	24		447
2/6/01	4	0.0444	90		442
2/7/01	1	0.0927	11		439
2/8/01	2	0.0910	22		438
2/9/01		0.1320			457
2/10/01	1	0.0139	72		587
2/11/01	2	0.0798	25		774
2/12/01	4	0.0851	47		869
2/13/01	77	0.0840	917		1004
2/14/01	305	0.0848	3595		949
2/15/01	169	0.0834	2025		1053

Table 3.1. Continued.

Sample Date	Naturally Produced Salmon			Daily CWT catch	Modesto Flow (cfs)
	Daily catch	Daily Vulnerability	Expanded Catch		
2/16/01	173	0.0828	2090		1093
2/17/01	308	0.0836	3682		1064
2/18/01	132	0.0831	1589		1080
2/19/01	77	0.0837	920		1062
2/20/01	97	0.0846	1146		988
2/21/01	98	0.0811	1208		1271
2/22/01	88	0.0710	1240		1864
2/23/01	358	0.0574	6233		3105
2/24/01	115	0.0516	2229		3451
2/25/01	362	0.0482	7518		3714
2/26/01	150	0.0504	2975		3547
2/27/01	177	0.0570	3105		2989
2/28/01	212	0.0616	3440		2601
3/1/01	164	0.0696	2355		2010
3/2/01	57	0.0764	746		1479
3/3/01	39	0.0773	505		1150
¾/01	15	0.0784	191		1057
3/5/01	42	0.0697	602		1380
3/6/01	32	0.0485	660		2624
3/7/01	167	0.0644	2592		1850
3/8/01	378	0.0653	5787		1836
3/9/01	351	0.0596	5887		2125
3/10/01	67	0.0660	1014		1741
3/11/01	60	0.0691	868		1343
3/12/01	109	0.0699	1560		1175
3/13/01	140	0.0679	2061		1069
3/14/01	133	0.0727	1828		807
3/15/01	64	0.0736	870		678
3/16/01	28	0.0739	379		634
3/17/01	18	0.0737	244		617
3/18/01	24	0.0706	340		608
3/19/01	35	0.0679	515		606
3/20/01	52	0.0683	762		615
3/21/01	45	0.0691	652		607
3/22/01	69	0.0649	1063		634
3/23/01	23	0.0609	377		614
3/24/01	10	0.0621	161		628
3/25/01	34	0.0605	562		639
3/26/01	22	0.0570	386		612
3/27/01	13	0.0561	232		611
3/28/01	19	0.0596	319		602
3/29/01	25	0.0614	407		600
3/30/01	30	0.0604	497		637
3/31/01	38	0.0568	669		641
4/1/01	64	0.0547	1170		668

Table 3.1. Continued.

Sample Date	Naturally Produced Salmon			Daily CWT catch	Modesto Flow (cfs)
	Daily catch	Daily Vulnerability	Expanded Catch		
4/2/01	37	0.0557	664		651
4/3/01	26	0.0545	477		641
4/4/01	47	0.0515	913		605
4/5/01	56	0.0514	1089		613
4/6/01	55	0.0520	1058		629
4/7/01	14	0.0459	305		750
4/8/01	29	0.0423	686		795
4/9/01	35	0.0446	785		685
4/10/01	98	0.0458	2138		640
4/11/01	24	0.0454	529		621
4/12/01	101	0.0439	2300		631
4/13/01	16	0.0461	347		636
4/14/01	40	0.0447	894		635
4/15/01	17	0.0444	383		663
4/16/01	37	0.0454	815		570
4/17/01	20	0.0446	448		535
4/18/01	30	0.0431	696		566
4/19/01	9	0.0354	254		1245
4/20/01	15	0.0304	494		1579
4/21/01	21	0.0289	726		1254
4/22/01	38	0.0346	1099		942
4/23/01	71	0.0363	1958		905
4/24/01	54	0.0387	1395		883
4/25/01	57	0.0338	1685	7	853
4/26/01	6	0.0368	163	10	852
4/27/01	10	0.0356	281	23	859
4/28/01	10	0.0354	282	20	877
4/29/01	22	0.0314	701	23	966
4/30/01	19	0.0280	679	13	1301
5/1/01	12	0.0223	539	6	1496
5/2/01	20	0.0244	819	1	1507
5/3/01	13	0.0292	446	3	1541
5/4/01	7	0.0224	313		1519
5/5/01	13	0.0393	331		
5/6/01	3	0.0416	72		
5/7/01	7	0.0216	324	2	1576
5/8/01	2	0.0262	76		1503
5/9/01	10	0.0237	421		1192
5/10/01	13	0.0240	541		1157
5/11/01	20	0.0223	898	1	1076
5/12/01	2	0.0190	105		1059
5/13/01	6	0.0215	279		1088
5/14/01	11	0.0195	563		1115
5/15/01	6	0.0233	258		1080
5/16/01	6	0.0237	253		1078
5/17/01	2	0.0288	70		1136

Table 3.1. Continued.

Sample Date	Naturally Produced Salmon			Daily CWT catch	Modesto Flow (cfs)
	Daily catch	Daily Vulnerability	Expanded Catch		
5/18/01	2	0.0168	119		1140
5/19/01		0.1243			1048
5/20/01		0.1278			780
5/21/01	2	0.0271	74		615
5/22/01	4	0.0215	186		502
5/23/01		0.1320			459
5/24/01		0.1322			446
5/25/01		0.1318			470
5/26/01		0.1314			501
5/27/01		0.1321			452
5/28/01		0.1311			526
5/29/01		0.1317			478

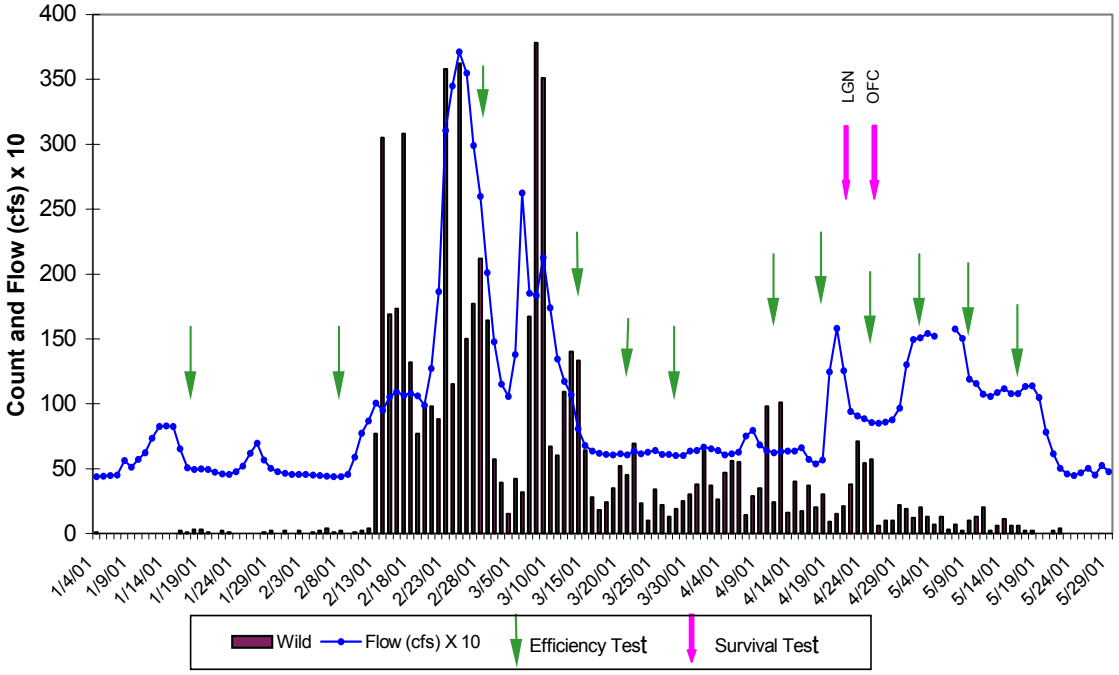

Figure 3.1. Daily catch of naturally produced juvenile chinook salmon with flow (cfs) at Modesto. Vulnerability tests and the start of survival test releases are indicated.

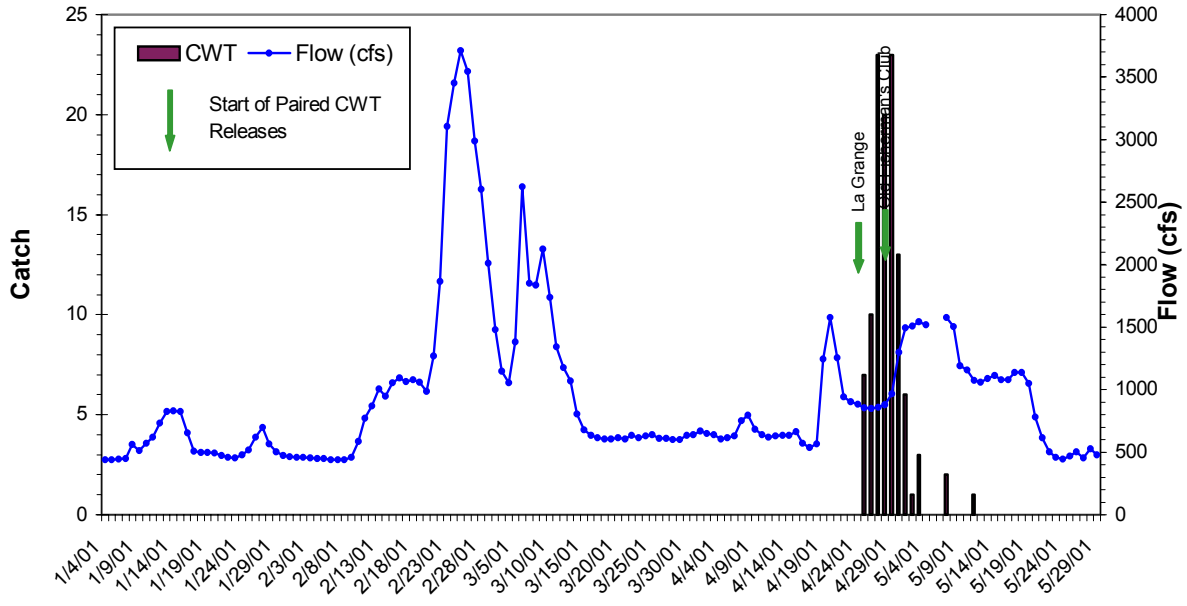

Figure 3.2. Daily catch of coded wire-tagged juvenile chinook salmon used in survival studies with flow at Modesto and the start of survival releases.

other words, each point is a length that was recorded for that day but may contain any number of fish at that given length. This graph is representative of the fish sizes passing the traps throughout the season. Figure 3.3 also displays the fork length of CWT's recaptured in the rotary-screw traps. This figure illustrates the pairing of lengths between hatchery and natural salmon for the test period.

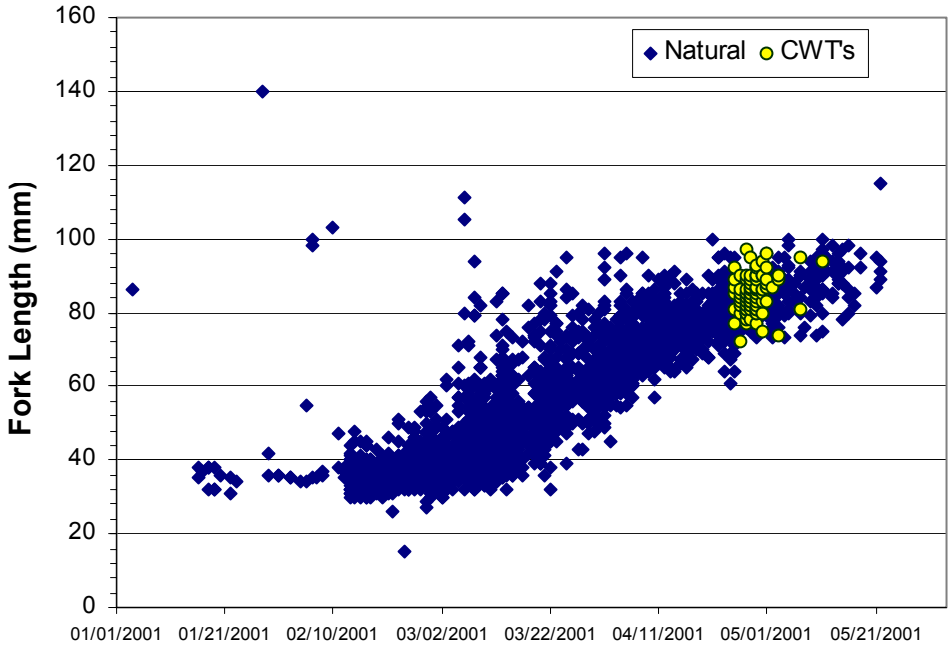

Figure 3.3. Fork lengths of naturally produced and CWT chinook salmon captured in 2001. Note the number of fish caught at each length is not represented in this figure.

3.2. Vulnerability Tests

In 2001 fifteen vulnerability tests were conducted, only 12 of these were used in the analysis. Three tests were unusable because of problems encountered either during the releases or during recapture. One vulnerability test conducted on 02 February 01 was discarded because a rapid increase in flows and heavy debris loads stopped the traps during the night of the test. Two other tests conducted on 22 May and 24 May 01 were thrown out of the analysis because extremely high temperatures, maximum during the period of May 22nd- May 24th = 26.97 degrees C, (CDFG data) were encountered and mortality during the holding period and release period was excessive. Following the release of the survivors fatalities were observed downriver. Survival during the

test was believed to be limited and thus the fish were not subject to similar conditions throughout the season. Table 3.2 lists the vulnerability tests and the size of salmon tested, tests not used in the analysis are not reported in Table 3.2. Vulnerability values were determined for the two traps combined. CWT fish were used in all vulnerability tests except the first six tests. The CWT code used in the vulnerability tests at Grayson was 06-44-45.

A multi-linear regression conducted on the non-transformed data for the vulnerability tests from 1999-2001 against flow and fork length yielded a line with an R-squared value of 0.59; n= 29; P< 0.001. The equation of the regression line, *vulnerability = 0.138-(0.0000131*flow)-(0.00113*length)*, was used to derive daily vulnerability estimates. The vulnerability estimates were used to expand the daily catch. Both the daily vulnerability estimates and expanded daily catch are listed in Table 3.1. Figure 3.4 illustrates the daily expanded catch and flow (cfs) at Modesto. An increase in the daily estimate of juvenile chinook salmon passing the traps is seen with a rise in flow. The large peaks (Figure 3.4) in February and early March correspond to the fry outmigration period. An annual estimate of natural production for 2001 was 111,644 juvenile chinook salmon (Table 3.3).

3.3. Distribution of Test Fish Within the Channel

Results of the distribution tests were highly variable and rather inconclusive. On 21-Mar-01 three groups of approximately 1000 marked fish were released. Recapture and vulnerability was highest for the group released on the right bank (Table 3.4). The mid-channel release group exhibited the next highest returns followed by the left bank release group. (Table 3.4). On 25-Apr-01 three groups of approximately 500 marked fish were released. Again recapture and vulnerability was highest on the right bank (Table 3.4) but vulnerability was much reduced from the previous test. The next greatest return was from the left bank release group and finally the mid-channel release group (Table 3.4).

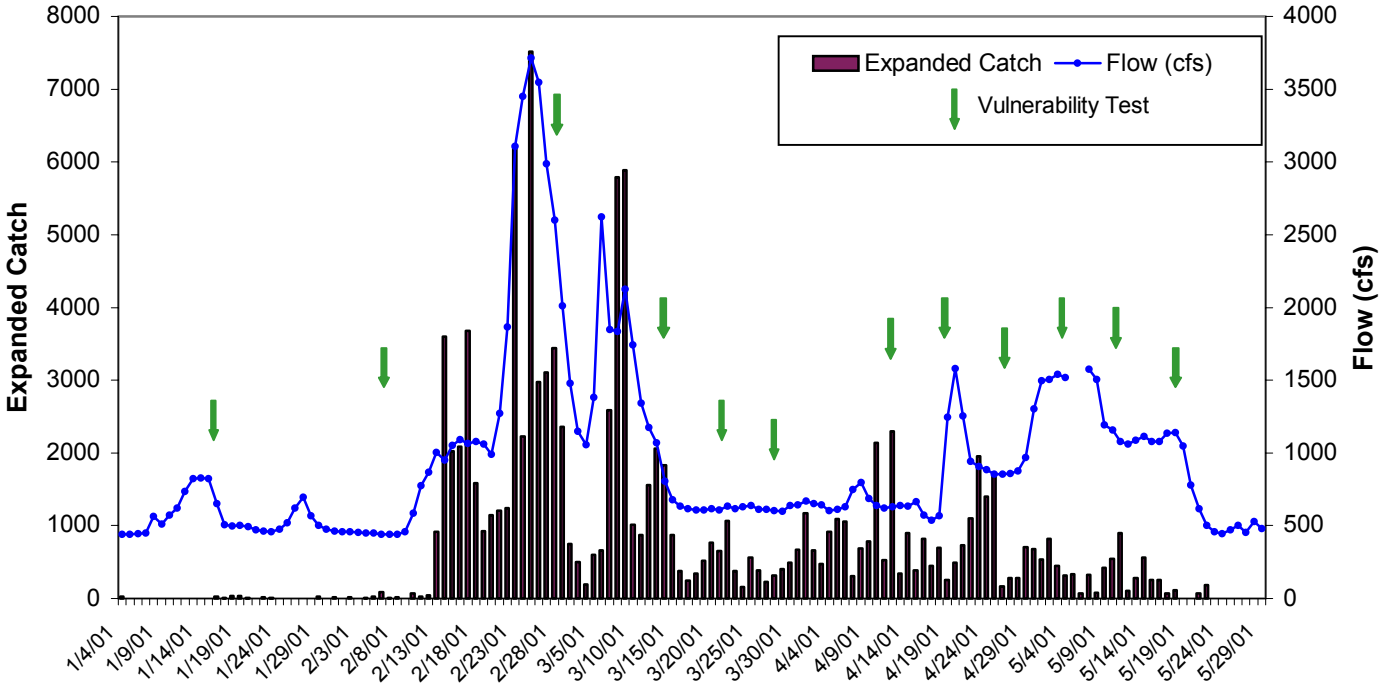

Figure 3.4 Expanded daily catch of naturally produced chinook salmon juveniles with flow at Modesto. Arrows indicate vulnerability tests.

Table 3.3. Annual production estimate of naturally produced chinook salmon and the number released and recaptured in vulnerability tests

Number of wild salmon captured	Number of vulnerability test fish released	Number of vulnerability test fish recaptured	Production estimate ± 95% C.I.
6,478	26,866	1,627	111,644 (± 4691)

Table 3.2. Vulnerability tests for 2001 Grayson rotary screw traps with release numbers and number recaptured for each test. Vulnerability values represent both traps combined.

Date	Mark[1]	Effective no. Released	Mean FL (range)	No. Recaptured	Vulnerability u_j	Flow (cfs) @ Modesto
1/18/2001	BLUC	1810	37 (30-41)	120	0.07	496
2/8/2001	BLLC	1980	46.9 (40-53)	276	0.14	438
3/1/2001	YLUC	2017	41.4 (37-49)	57	0.03	2010
3/14/2001	YLLC	1487	46.3 (40-54)	75	0.05	807
3/21/2001*	BLLC, BLDO, YLUC	3025	61, 61, 61.5 (48-70)**	207	0.07	607
3/28/2001	BLAN	1954	50.9 (40-59)	219	0.11	602
4/11/2001	acYLLC	2021	66.1 (57-75)	141	0.07	621
4/18/2001	acBLUC	2060	68.0 (55-78)	95	0.05	566
4/25/2001*	acYLDO, BLLC, BLDO	1515	70.6, 70.2, 70.6 (62-82)**	34	0.02	853
5/2/2001	acBLAN	3053	72.3 (61-84)	163	0.05	1507
5/9/2001	acYLLC	3002	75 (62-88)	147	0.05	1192
5/16/2001	acBLUC	2942	76.4 (65-90)	93	0.03	1078

*Indicates bank to bank vulnerability test containing three mark groups released. For all analyses the three groups were pooled and treated as one release.

**Fork lengths for each mark group respectively.

[1] ac indicates adipose fin clip and CWT, BL indicates blue panjet mark, YL indicates yellow panjet mark. UC indicates upper caudal, LC indicates lower caudal, DO indicates dorsal, and AN indicates anal fin.

[2]Flow data are from California Data Exchange Center website.

Table 3.4. Releases and recaptures for in-channel distribution of vulnerability test fish with mark group specific vulnerability indices and mean fork length at time of release.

Test Date	Release Location	Mark	Effective no. Released	No. Recaptured	Vulnerability u_j	Mean FL (range)
3/21/01	Left Bank	BLDO	1005	53	0.05	61 (48-68)
	Mid-Channel	YLUC	1016	64	0.06	61.5 (49-68)
	Right Bank	BLLC	1004	90	0.09	61 (50-70)
4/25/01	Left Bank	BLLC	502	12	0.02	70.2 (63-80)
	Mid-Channel	YLDO+YLDOUC	503	9	0.02	70.6 (62-82)
	Right Bank	BLDO	510	13	0.03	70.6 (62-80)

Note: the two rotary screw traps were treated as one sampling unit and recaptures were combined for both traps. Also note that the combined vulnerability for each group was used in the regression.

Seining was conducted once, 22-Mar-01, at eight sites working downstream from the release site. Seining was not conducted during the second distribution test because of lack of personnel and time constraints. Two sites were seined below the rotary-screw traps to compare to capture above the traps. The left bank was seined at four locations and the right bank at four locations (Figure 2.1). Table 3.5 contains the results of the seining. A total of 75 naturally produced salmon were caught. Captures of test fish released on the banks yielded slightly higher catches than the mid-channel release group (Table 3.5). Interestingly, higher captures were recorded for a group that was not part of the test but was released the previous week during a routine vulnerability test. This indicates the fish held up in the river above the traps. One fish from the non-test group was recaptured below the traps. A total of seven other species were captured during the seining operations (Table 3.5).

Table 3.5. Results of seining following the 21-March-2001 vulnerability test. Sites 1-5 were above the traps, Site 6 was on the south bank opposite the traps and sites 7-8 were below the traps.

Seine Site/Bank	Naturally Produced Salmon	Marked Salmon				Other Species						
		BLDO[1]	YLUC[2]	BLLC[3]	YLLC[4]	LMB	BGS	RES	MQF	WHC	RSN	MSS
1Left						1	3	3	10			
2Right	6					1						
3Right	12			3	3		1	1				
4Right	25	1			3					1		
5Left	19	3	2		11				1		19	2
6Left									1			
7Right	2			1	1	1	1				4	
8Left	11											
Totals	**75**	**4**	**2**	**4**	**18**	**3**	**5**	**4**	**12**	**1**	**23**	**2**
Left bank	32	3	2	0	12	2	4	3	12	0	23	2
Right bank	43	1	0	4	6	1	1	1	0	1	0	0

1 Left bank release.
2 Mid-channel release.
3 Right bank release
4 this test release was conducted the previous week indicating that the fish may have held up during the test
Note: See Table 3.2 for mark code descriptions and Appendix II for species codes

4. DISCUSSION

4.1. Catch and Timing of Outmigration

As observed in previous studies at Shiloh and Grayson (Heyne and Loudermilk, 1998; Vasques and Kundargi, 2001) catches of juvenile salmon appear to correlate to changes in river flow. Additionally, peaks in capture occur temporally with an early peak of fry capture and a later smaller peak of smolts (Vick et al., 1998; Heyne and Loudermilk, 1999; Vasques and Kundargi, 2001). In previous years at Grayson these peaks occurred From January to February for fry and from mid-April to May for smolts (Vasques and Kundargi, 2001). In 1999 a flow increase occurred in late January and corresponded with a very large fry capture (Vasques and Kundargi, 2001). In 2000 the peak fry capture occurred in mid to late February and also corresponded with an increase in flow (Vasques and Kundargi, 2001). In 2001 the timing of the fry outmigration was similar to that of 2000. The peak fry migration period in 2001 occurred from mid-February to mid-March (Figure 3.1). This data suggests that on the Tuolumne River chinook salmon fry migrate from January to March and respond to changes in flow during this period. The catch of fry was considerably low in 2001. This was likely due to the fact that a 3-fold increase in flow occurred in a short time and the traps had to be moved out of the thalweg to avoid heavy debris loads. It is believed that large proportions of fry were missed due to the move and trap downtime and therefore unaccounted for in the analysis. Other factors that may result in a decreased fry catch may include variations in horizontal distribution across the river channel and natural variations in the population.

Low flows during the majority of the season may have resulted in highly variable catches. The results of the seining indicate that a number of fry may have held up in the river and thus avoided detection by the RST's. Low flows may have facilitated this behavior. Smolts are less susceptible to capture by the rotary-screw traps. Their ability to avoid/escape capture may be enhanced by flows lower than seen in previous years. Additionally, lower captures of smolts may reflect earlier fry outmigration.

4.2. Vulnerability Tests and Estimates

There are inherent problems with using the rotary-screw traps to estimate vulnerability of chinook juveniles. Accurately estimating vulnerability requires numerous test releases, which can not be met over the time scale this study spans. Also, accurate vulnerability estimates and expanded

daily estimates assume the trap operated 100% of the sample period. This was not the case and it is often difficult to estimate the actual amount of time sampled. The inability to monitor the trap operation the entire time it is sampling resulted in periods of unknown 'downtime'. The most common problem was that revolution counters would break resulting in uncertainties with regard to actual time sampled. Even though some inaccuracy exists the estimates presented here assume the traps operated 100% of the sample period.

Although it is clear from the data that each trap has a different efficiency one value was used because the traps are operated side by side. The true efficiency of each trap differs because of its position in the channel and orientation to the thalweg. However, since the two traps actually fish as a single unit it is acceptable to treat the vulnerability/efficiency as such. Additionally, the data indicates that the traps exhibit different efficiency values when they are moved horizontally across the channel. Ideally, vulnerability estimates would be made on each trap and for each trap location. This requires vulnerability tests for each trap position. However, in urgent cases tests were not conducted before the traps were moved. Hence, it is impractical to evaluate vulnerability in all trap positions. Therefore, for the purposes of this report trap vulnerability/efficiency was pooled for all trap positions.

The use of vulnerability indices is paramount in the rotary-screw trap use to estimate juvenile production. Unfortunately, a high degree of variability exists in the data. For this reason vulnerability was pooled over 1999-2001, yet a high level of variability still exists. Roper and Scarnechia (2000) state that the use of a single fish trap can be an accurate means of estimating population size if the trap efficiency exceeds 10%. Between 1999 and 2001 vulnerability exceeded 10% only once, February 8, 2001 (Table 3.2). Therefore, for this reason and reasons mentioned earlier regarding fry capture the estimates produced here should be treated cautiously.

In addition to the production estimates the confidence intervals should be treated with caution The method used to create the confidence intervals was to pool vulnerability tests over both years. However, when determining the confidence intervals the captures and recaptures of only the year in question were used. This may reduce the confidence intervals artificially and inappropriately. A more appropriate method of determining confidence intervals may be to set daily confidence limits. Unfortunately, this would require daily test releases and recaptures. Since it was not possible to conduct daily tests confidence limits were only placed on the final estimate and the entire season was treated as one period.

4.3. Distribution of Test Fish within the River Channel

The results of the horizontal distribution tests indicate the fish may re-distribute rather evenly across the channel before they reach the traps. However, only two tests were conducted and the results are provisional at best. The results of the seining indicate that many vulnerability test fish, particularly fry, may have "held up" in the river following release. This is a violation of the fundamental assumption that marked fish will be recaptured shortly after release. Compounding the issue of recapture during a short temporal scale if fry reared in the river after release they may have been more able to avoid the traps at a larger size. Similarly if fry reared to a larger size before passing the traps detection would further be reduced once the traps were moved out of the thalweg to avoid debris. Low flows in 2001 may have contributed to the ability of fish to hold in the river to rear. In 1999 and 2000 the data suggests that most of the fry migrated past the traps in a relatively short period. Higher flows during 1999 and 2000 likely flushed the entrained fry. Recapture data of vulnerability tests conducted in 2001 indicate that in some cases the fish held over more than 20 days before being detected by the rotary-screw traps. This effect may affect the estimates of annual production by artificially lowering the estimate.

5. CONCLUDING REMARKS

A clear relationship can be demonstrated between the timing of fish migration and changes in flow, particularly with an increase in flow. A shift in the annual timing of fry migration to later in the year from 1999 to 2001 is likely due to flow increases later in the season. In addition the data indicates a relationship between vulnerability and flow as well as vulnerability and fish size.

The annual production estimate this year may be artificially low due to trap position and down time during critical fry outmigration periods. Additionally, it appears that juveniles may have "held up" to a size more capable of avoiding capture by the traps. It appears from previous years that the fry component of the estimate is a key element in accurately assessing juvenile production. The contribution of smolts to the estimate is more difficult to represent due to the high degree of variability in vulnerability. Low flows throughout most of the 2001 season may have contributed to low captures and highly variable vulnerability tests. Furthermore, high temperatures at the end of the season may have limited survivability in the lower reaches of the river.

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Appendix IA. Operation log for the Tuolumne River north trap at (trap code = TU005N) at Grayson Ranch 2001. Minutes sampled does not reflect trap down time.

Sample Date	Sample Time	Trap Status	Minutes Sampled	Anomaly
03-Jan-01	7:19	Set		Set without pull
03-Jan-01	16:43	Check	564	
04-Jan-01	7:55	Check	912	
04-Jan-01	16:41	Check	526	
05-Jan-01	7:53	Check	912	
05-Jan-01	17:01	Pull	548	
07-Jan-01	13:23	Set	N/A	
08-Jan-01	8:00	Check	1117	
08-Jan-01	16:44	Check	524	
09-Jan-01	7:55	Check	911	
09-Jan-01	16:37	Check	522	
10-Jan-01	8:10	Check	933	
10-Jan-01	16:30	Check	500	
11-Jan-01	8:22	Check	952	
11-Jan-01	18:14	Check	592	
12-Jan-01	7:45	Check	811	
12-Jan-01	16:39	Pull	534	
14-Jan-01	13:27	Set	N/A	
15-Jan-01	7:48	Check	1101	
15-Jan-01	17:29	Check	581	
16-Jan-01	8:40	Check	911	
16-Jan-01	16:57	Check	497	
17-Jan-01	8:20	Check	923	
17-Jan-01	17:20	Check	540	
18-Jan-01	8:16	Check	896	
18-Jan-01	19:00	Check	644	
19-Jan-01	8:42	Check	822	
19-Jan-01	17:12	Check	510	
20-Jan-01	7:35	Check	863	
20-Jan-01	16:33	Check	538	
21-Jan-01	7:27	Check	894	
21-Jan-01	16:45	Check	558	
22-Jan-01	7:05	Check	860	
22-Jan-01	16:52	Check	587	
23-Jan-01	7:40	Check	888	
23-Jan-01	16:50	Check	550	
24-Jan-01	7:45	Check	895	
24-Jan-01	16:13	Check	508	
25-Jan-01	8:10	Check	957	
25-Jan-01	16:45	Check	515	
26-Jan-01	7:38	Check	893	

26-Jan-01	16:45	Check	547	
27-Jan-01	7:10	Check	865	
27-Jan-01	17:00	Check	590	
28-Jan-01	7:55	Check	895	
28-Jan-01	14:00	Check	365	
28-Jan-01	19:31	Check	331	
29-Jan-01	8:02	Check	751	
29-Jan-01	13:20	Check	318	
29-Jan-01	19:10	Check	350	
30-Jan-01	7:54	Check	764	
30-Jan-01	18:43	Check	649	
31-Jan-01	7:48	Check	785	
31-Jan-01	13:48	Check	360	
31-Jan-01	19:01	Check	313	
01-Feb-01	7:35	Check	754	
01-Feb-01	13:15	Check	340	
01-Feb-01	18:59	Check	344	
02-Feb-01	7:28	Check	749	
02-Feb-01	12:20	Check	292	
02-Feb-01	18:45	Check	385	
03-Feb-01	8:24	Check	819	
03-Feb-01	13:22	Check	298	
03-Feb-01	18:54	Check	332	
04-Feb-01	7:30	Check	756	
04-Feb-01	13:37	Check	367	
04-Feb-01	19:25	Check	348	
05-Feb-01	8:37	Check	792	
05-Feb-01	13:17	Check	280	
05-Feb-01	19:11	Check	354	
06-Feb-01	7:17	Check	726	
06-Feb-01	18:49	Check	692	
07-Feb-01	7:26	Check	757	
07-Feb-01	13:56	Check	390	
07-Feb-01	19:11	Check	315	
08-Feb-01	7:02	Check	711	
08-Feb-01	13:03	Check	361	
08-Feb-01	19:52	Check	409	
09-Feb-01	7:49	Check	717	
09-Feb-01	12:40	Check	291	
09-Feb-01	18:53	Check	373	
10-Feb-01	7:55	Check	782	
10-Feb-01	13:46	Check	351	
10-Feb-01	20:30	Check	404	
11-Feb-01	7:20	Check	650	
11-Feb-01	13:43	Check	383	

11-Feb-01	19:26	Check	343	
12-Feb-01	7:37	Check	731	
12-Feb-01	12:51	Check	314	
12-Feb-01	19:09	Check	378	
13-Feb-01	9:04	Check	835	
13-Feb-01	15:45	Check	401	
13-Feb-01	22:37	Check	412	
14-Feb-01	7:39	Check	542	
14-Feb-01	14:23	Check	404	
14-Feb-01	19:40	Check	317	
15-Feb-01	6:53	Check	673	
15-Feb-01	13:36	Check	403	
15-Feb-01	19:05	Check	329	
16-Feb-01	7:25	Check	740	
16-Feb-01	13:16	Check	351	
16-Feb-01	18:39	Check	323	
17-Feb-01	8:36	Check	837	
17-Feb-01	13:02	Check	266	
17-Feb-01	18:37	Check	335	
18-Feb-01	7:21	Check	764	
18-Feb-01	13:18	Check	357	
18-Feb-01	18:35	Check	317	
19-Feb-01	7:33	Check	778	
19-Feb-01	13:39	Check	366	
19-Feb-01	19:03	Check	324	
20-Feb-01	7:20	Check	737	
20-Feb-01	13:50	Check	390	
20-Feb-01	19:11	Check	321	
21-Feb-01	7:37	Check	746	
21-Feb-01	16:06	Check	509	
21-Feb-01	19:23	Check	197	
22-Feb-01	8:13	Check	770	
22-Feb-01	15:20	Check	427	
22-Feb-01	20:25	Check	305	
23-Feb-01	9:57	Check	812	
23-Feb-01	16:32	Check	395	
23-Feb-01	19:32	Check	180	
24-Feb-01	9:03	Check	811	
24-Feb-01	14:23	Check	320	
24-Feb-01	19:34	Check	311	
25-Feb-01	7:38	Check	724	
25-Feb-01	14:37	Check	419	
25-Feb-01	19:39	Check	302	
26-Feb-01	8:11	Check	752	
26-Feb-01	13:26	Check	315	

26-Feb-01	19:47	Check	381	
27-Feb-01	7:07	Check	680	
27-Feb-01	13:35	Check	388	
27-Feb-01	18:47	Check	312	
28-Feb-01	7:40	Check	773	
28-Feb-01	15:19	Check	459	
28-Feb-01	20:05	Check	286	
01-Mar-01	7:34	Check	689	
01-Mar-01	14:46	Check	432	
01-Mar-01	20:50	Check	364	
02-Mar-01	7:26	Check	636	
02-Mar-01	14:25	Check	419	
02-Mar-01	19:16	Check	291	
03-Mar-01	7:43	Check	747	
03-Mar-01	13:29	Check	346	
03-Mar-01	19:41	Check	372	
04-Mar-01	8:15	Check	754	
04-Mar-01	13:33	Check	318	
04-Mar-01	19:50	Check	377	
05-Mar-01	7:59	Check	729	
05-Mar-01	13:29	Check	330	
05-Mar-01	19:23	Check	354	
06-Mar-01	7:23	Check	720	
06-Mar-01	14:25	Check	422	
06-Mar-01	20:30	Check	365	
07-Mar-01	7:11	Check	641	
07-Mar-01	14:26	Check	435	
07-Mar-01	19:05	Check	279	
08-Mar-01	7:44	Check	759	
08-Mar-01	15:43	Check	479	
08-Mar-01	21:23	Check	340	
09-Mar-01	7:37	Check	614	
09-Mar-01	14:10	Check	393	
09-Mar-01	19:07	Check	297	
10-Mar-01	7:07	Check	720	
10-Mar-01	14:22	Check	435	
10-Mar-01	19:54	Check	332	
11-Mar-01	7:39	Check	705	
11-Mar-01	13:56	Check	377	
11-Mar-01	20:07	Check	371	
12-Mar-01	7:11	Check	664	
12-Mar-01	14:41	Check	450	
12-Mar-01	19:04	Check	263	
13-Mar-01	7:36	Check	752	
13-Mar-01	13:16	Check	340	

13-Mar-01	19:08	Check	352	
14-Mar-01	7:49	Check	761	
14-Mar-01	13:55	Check	366	
14-Mar-01	20:02	Check	367	
15-Mar-01	7:42	Check	700	
15-Mar-01	14:07	Check	385	
15-Mar-01	18:44	Check	277	
16-Mar-01	7:27	Check	763	
16-Mar-01	13:55	Check	388	
16-Mar-01	19:02	Check	307	
17-Mar-01	7:21	Check	739	
17-Mar-01	14:05	Check	404	
17-Mar-01	19:40	Check	335	
18-Mar-01	7:05	Check	685	
18-Mar-01	13:41	Check	396	
18-Mar-01	20:06	Check	385	
19-Mar-01	7:53	Check	707	
19-Mar-01	14:07	Check	374	
19-Mar-01	19:08	Check	301	
20-Mar-01	7:11	Check	723	
20-Mar-01	13:05	Check	354	
20-Mar-01	19:03	Check	358	
21-Mar-01	7:22	Check	739	
21-Mar-01	13:25	Check	363	
21-Mar-01	19:12	Check	347	
22-Mar-01	7:26	Check	734	
22-Mar-01	14:30	Check	424	
22-Mar-01	19:02	Check	272	
23-Mar-01	7:17	Check	735	
23-Mar-01	13:46	Check	389	
23-Mar-01	19:40	Check	354	
24-Mar-01	7:21	Check	701	
24-Mar-01	13:25	Check	364	
24-Mar-01	18:41	Check	316	
25-Mar-01	7:15	Check	754	
25-Mar-01	14:01	Check	406	
25-Mar-01	20:12	Check	371	
26-Mar-01	7:18	Check	666	
26-Mar-01	13:20	Check	362	
26-Mar-01	18:50	Check	330	
27-Mar-01	7:29	Check	759	
27-Mar-01	12:54	Check	325	
27-Mar-01	19:12	Check	378	
28-Mar-01	7:17	Check	725	
28-Mar-01	13:26	Check	369	

28-Mar-01	18:55	Check	329	
29-Mar-01	7:50	Check	775	
29-Mar-01	14:17	Check	387	
29-Mar-01	19:08	Check	291	
30-Mar-01	8:41	Check	813	
30-Mar-01	14:00	Check	319	
30-Mar-01	19:00	Check	300	
31-Mar-01	7:42	Check	762	
31-Mar-01	13:57	Check	375	
31-Mar-01	18:49	Check	292	
01-Apr-01	8:07	Check	798	
01-Apr-01	14:04	Check	357	
01-Apr-01	20:20	Check	376	
02-Apr-01	7:32	Check	672	
02-Apr-01	13:29	Check	357	
02-Apr-01	18:55	Check	326	
03-Apr-01	7:20	Check	745	
03-Apr-01	14:12	Check	412	
03-Apr-01	19:26	Check	314	
04-Apr-01	7:21	Check	715	
04-Apr-01	13:50	Check	389	
04-Apr-01	19:30	Check	340	
05-Apr-01	7:20	Check	710	
05-Apr-01	13:32	Check	372	
05-Apr-01	19:03	Check	331	
06-Apr-01	7:32	Check	749	
06-Apr-01	13:39	Check	367	
06-Apr-01	19:23	Check	344	
07-Apr-01	7:35	Check	732	
07-Apr-01	14:13	Check	398	
07-Apr-01	19:22	Check	309	
08-Apr-01	7:20	Check	718	
08-Apr-01	13:35	Check	375	
08-Apr-01	19:03	Check	328	
09-Apr-01	7:39	Check	756	
09-Apr-01	13:16	Check	337	
09-Apr-01	18:59	Check	343	
10-Apr-01	8:04	Check	785	
10-Apr-01	14:11	Check	367	
10-Apr-01	18:34	Check	263	
11-Apr-01	7:53	Check	799	
11-Apr-01	13:50	Check	357	
11-Apr-01	19:29	Check	339	
12-Apr-01	8:06	Check	757	
12-Apr-01	13:33	Check	327	

12-Apr-01	19:08	Check	335	
13-Apr-01	7:31	Check	743	
13-Apr-01	13:41	Check	370	
13-Apr-01	18:56	Check	315	
14-Apr-01	8:10	Check	794	
14-Apr-01	12:55	Check	285	
14-Apr-01	18:54	Check	359	
15-Apr-01	7:08	Check	734	
15-Apr-01	13:33	Check	385	
15-Apr-01	18:37	Check	304	
16-Apr-01	8:12	Check	815	
16-Apr-01	14:13	Check	361	
16-Apr-01	18:57	Check	284	
17-Apr-01	6:51	Check	714	
17-Apr-01	14:22	Check	451	
17-Apr-01	18:42	Check	260	
18-Apr-01	7:25	Check	763	
18-Apr-01	13:33	Check	368	
18-Apr-01	19:34	Check	361	
19-Apr-01	7:26	Check	712	
19-Apr-01	13:00	Check	334	
19-Apr-01	18:40	Check	340	
20-Apr-01	7:00	Check	740	
20-Apr-01	14:32	Check	452	
20-Apr-01	19:09	Check	277	
21-Apr-01	7:25	Check	736	
21-Apr-01	14:25	Check	420	
21-Apr-01	18:55	Check	270	
22-Apr-01	6:56	Check	721	
22-Apr-01	14:32	Check	456	
22-Apr-01	18:47	Check	255	
23-Apr-01	7:54	Check	787	
23-Apr-01	14:34	Check	400	
23-Apr-01	19:13	Check	279	
24-Apr-01	7:25	Check	732	
24-Apr-01	15:14	Check	469	
24-Apr-01	19:12	Check	238	
25-Apr-01	7:32	Check	740	
25-Apr-01	13:52	Check	380	
25-Apr-01	18:50	Check	298	
26-Apr-01	7:05	Check	735	
26-Apr-01	13:19	Check	374	
26-Apr-01	19:04	Check	345	
27-Apr-01	7:04	Check	720	
27-Apr-01	13:54	Check	410	

27-Apr-01	18:35	Check	281	
28-Apr-01	7:35	Check	780	
28-Apr-01	13:54	Check	379	
28-Apr-01	18:40	Check	286	
29-Apr-01	8:05	Check	805	
29-Apr-01	13:24	Check	319	
29-Apr-01	20:00	Check	396	
30-Apr-01	6:58	Check	658	
30-Apr-01	19:07	Check	729	
01-May-01	7:46	Check	759	
01-May-01	14:13	Check	387	
01-May-01	18:57	Check	284	
02-May-01	7:14	Check	737	
02-May-01	14:09	Check	415	
02-May-01	19:32	Check	323	
03-May-01	6:42	Check	670	
03-May-01	13:33	Check	411	
03-May-01	19:29	Check	356	
04-May-01	7:46	Check	737	
04-May-01	13:50	Check	364	
04-May-01	18:48	Check	298	
05-May-01	7:33	Check	765	
05-May-01	12:34	Check	301	
05-May-01	18:51	Check	377	
06-May-01	7:45	Check	774	
06-May-01	12:41	Check	296	
06-May-01	19:14	Check	393	
07-May-01	8:18	Check	784	
07-May-01	19:24	Check	666	
08-May-01	7:17	Check	713	
08-May-01	13:53	Check	396	
08-May-01	19:18	Check	325	
09-May-01	6:54	Check	696	
09-May-01	19:27	Check	753	
10-May-01	6:50	Check	683	
10-May-01	13:08	Check	378	
10-May-01	19:33	Check	385	
11-May-01	7:07	Check	694	
11-May-01	14:46	Check	459	
11-May-01	18:47	Check	241	
12-May-01	7:30	Check	763	
12-May-01	19:00	Check	690	
13-May-01	7:32	Check	752	
13-May-01	13:12	Check	340	
13-May-01	19:01	Check	349	

14-May-01	7:26	Check	745	
14-May-01	14:00	Check	394	
14-May-01	18:46	Check	286	
15-May-01	7:47	Check	781	
15-May-01	13:40	Check	353	
15-May-01	18:37	Check	297	
16-May-01	7:31	Check	774	
16-May-01	14:29	Check	418	
16-May-01	19:07	Check	278	
17-May-01	7:26	Check	739	
17-May-01	15:58	Check	512	
17-May-01	18:53	Check	175	
18-May-01	7:55	Check	782	
18-May-01	14:27	Check	392	
18-May-01	20:07	Check	340	
19-May-01	7:30	Check	683	
19-May-01	13:50	Check	380	
19-May-01	18:20	Check	270	
20-May-01	7:13	Check	773	
20-May-01	12:50	Check	337	
21-May-01	7:39	Check	1129	
22-May-01	7:38	Check	1439	
22-May-01	19:08	Check	690	
23-May-01	8:03	Check	775	
23-May-01	19:44	Check	701	
24-May-01	7:21	Check	697	
24-May-01	20:19	Check	778	
25-May-01	7:33	Check	674	
25-May-01	19:36	Check	723	
26-May-01	7:00	Check	684	
26-May-01	12:52	Check	352	
26-May-01	18:35	Check	343	
27-May-01	7:47	Check	792	
27-May-01	12:23	Check	276	
27-May-01	19:14	Check	411	
28-May-01	6:49	Check	695	
28-May-01	13:07	Check	378	
28-May-01	19:07	Check	360	
29-May-01	7:00	Check	713	Check and pull

Appendix I B. Operation log for the Tuolumne River south trap at (trap code = TU005S) at Grayson Ranch 2001. Minutes sampled does not reflect trap down time.

Sample Date	Sample Time	Trap Status	Minutes Sampled	Anomaly
03-Jan-01	7:06	Set		set without pull
03-Jan-01	16:38	Check	572	
04-Jan-01	7:27	Check	889	
04-Jan-01	16:48	Check	561	
05-Jan-01	7:53	Check	905	
05-Jan-01	16:55	Pull	542	
07-Jan-01	13:20	Set	N/A	
08-Jan-01	7:35	Check	1095	
08-Jan-01	16:55	Check	560	
09-Jan-01	8:09	Check	914	
09-Jan-01	16:46	Check	517	
10-Jan-01	7:28	Check	882	
10-Jan-01	16:39	Check	551	
11-Jan-01	7:00	Check	861	
11-Jan-01	17:47	Check	647	
12-Jan-01	7:53	Check	846	
12-Jan-01	17:03	Pull	550	
14-Jan-01	13:24	Set	N/A	
15-Jan-01	8:28	Check	1144	
15-Jan-01	17:19	Check	531	
16-Jan-01	7:35	Check	856	
16-Jan-01	17:04	Check	569	
17-Jan-01	8:00	Check	896	
17-Jan-01	17:47	Check	587	
18-Jan-01	7:55	Check	848	
18-Jan-01	18:38	Check	643	
19-Jan-01	8:15	Check	817	
19-Jan-01	16:55	Check	520	
20-Jan-01	7:13	Check	858	
20-Jan-01	16:47	Check	574	
21-Jan-01	7:09	Check	862	
21-Jan-01	16:30	Check	561	
22-Jan-01	9:24	Check	1014	
22-Jan-01	16:58	Check	454	
23-Jan-01	7:11	Check	853	
23-Jan-01	15:04	Check	473	
24-Jan-01	7:05	Check	961	
24-Jan-01	16:25	Check	560	
25-Jan-01	7:18	Check	893	
25-Jan-01	16:48	Check	570	
26-Jan-01	7:18	Check	870	
26-Jan-01	16:58	Check	580	
27-Jan-01	7:22	Check	864	
27-Jan-01	16:39	Check	557	

28-Jan-01	7:20	Check	881	
28-Jan-01	13:50	Check	390	
28-Jan-01	19:50	Check	360	
29-Jan-01	7:37	Check	707	
29-Jan-01	13:03	Check	326	
29-Jan-01	18:54	Check	351	
30-Jan-01	7:18	Check	744	
30-Jan-01	18:50	Check	692	
31-Jan-01	7:25	Check	755	
31-Jan-01	13:39	Check	374	
31-Jan-01	19:10	Check	331	
01-Feb-01	7:13	Check	723	
01-Feb-01	12:50	Check	337	
01-Feb-01	19:08	Check	378	
02-Feb-01	7:10	Check	722	
02-Feb-01	12:25	Check	315	
02-Feb-01	18:30	Check	365	
03-Feb-01	8:03	Check	813	
03-Feb-01	13:10	Check	307	
03-Feb-01	19:08	Check	358	
04-Feb-01	7:16	Check	728	
04-Feb-01	13:14	Check	358	
04-Feb-01	18:07	Check	293	
05-Feb-01	8:21	Check	854	
05-Feb-01	13:05	Check	284	
05-Feb-01	19:00	Check	355	
06-Feb-01	7:10	Check	730	
06-Feb-01	18:57	Check	707	
07-Feb-01	7:05	Check	728	
07-Feb-01	13:49	Check	404	
07-Feb-01	19:02	Check	313	
08-Feb-01	6:45	Check	703	
08-Feb-01	12:42	Check	357	
08-Feb-01	19:45	Check	423	
09-Feb-01	7:11	Check	686	
09-Feb-01	12:30	Check	319	
09-Feb-01	18:43	Check	373	
10-Feb-01	7:30	Check	767	
10-Feb-01	13:50	Check	380	
10-Feb-01	20:15	Check	385	
11-Feb-01	7:30	Check	675	
11-Feb-01	13:06	Check	336	
11-Feb-01	19:01	Check	355	
12-Feb-01	7:15	Check	734	
12-Feb-01	12:33	Check	318	
12-Feb-01	18:57	Check	384	
13-Feb-01	8:08	Check	791	
13-Feb-01	17:05	Check	537	

13-Feb-01	22:16	Check	311	
14-Feb-01	7:12	Check	536	
14-Feb-01	14:58	Check	466	
14-Feb-01	19:59	Check	301	
15-Feb-01	8:06	Check	727	
15-Feb-01	13:06	Check	300	
15-Feb-01	19:24	Check	378	
16-Feb-01	7:37	Check	733	
16-Feb-01	13:42	Check	365	
16-Feb-01	18:25	Check	283	
17-Feb-01	7:50	Check	805	
17-Feb-01	13:02	Check	312	
17-Feb-01	18:19	Check	317	
18-Feb-01	7:34	Check	795	
18-Feb-01	13:26	Check	352	
18-Feb-01	18:46	Check	320	
19-Feb-01	7:02	Check	736	
19-Feb-01	13:21	Check	379	
19-Feb-01	18:52	Check	331	
20-Feb-01	7:35	Check	763	
20-Feb-01	13:42	Check	367	
20-Feb-01	19:03	Check	321	
21-Feb-01	7:07	Check	724	
21-Feb-01	15:43	Check	516	
21-Feb-01	18:54	Check	191	
22-Feb-01	7:15	Check	741	
22-Feb-01	16:17	Check	542	
22-Feb-01	20:41	Check	264	
23-Feb-01	7:17	Check	636	
23-Feb-01	15:32	Check	495	
23-Feb-01	20:05	Check	273	
24-Feb-01	8:10	Check	725	
24-Feb-01	14:07	Check	357	
24-Feb-01	19:20	Check	313	
25-Feb-01	7:09	Check	709	
25-Feb-01	14:21	Check	432	
25-Feb-01	20:24	Check	363	
26-Feb-01	7:25	Check	661	
26-Feb-01	12:57	Check	332	
26-Feb-01	19:28	Check	391	
27-Feb-01	7:47	Check	739	
27-Feb-01	14:22	Check	395	
27-Feb-01	18:57	Check	275	
28-Feb-01	7:23	Check	746	
28-Feb-01	14:47	Check	444	
28-Feb-01	20:33	Check	346	
01-Mar-01	7:04	Check	631	
01-Mar-01	14:27	Check	443	

01-Mar-01	20:21	Check	354	
02-Mar-01	7:04	Check	643	
02-Mar-01	14:01	Check	417	
02-Mar-01	19:11	Check	310	
03-Mar-01	7:23	Check	732	
03-Mar-01	13:11	Check	348	
03-Mar-01	19:19	Check	368	
04-Mar-01	8:03	Check	764	
04-Mar-01	13:17	Check	314	
04-Mar-01	19:34	Check	377	
05-Mar-01	7:34	Check	720	
05-Mar-01	13:08	Check	334	
05-Mar-01	19:05	Check	357	
06-Mar-01	7:42	Check	757	
06-Mar-01	15:02	Check	440	
06-Mar-01	20:48	Check	346	
07-Mar-01	7:30	Check	642	
07-Mar-01	15:06	Check	456	
07-Mar-01	19:29	Check	263	
08-Mar-01	7:16	Check	707	
08-Mar-01	15:18	Check	482	
08-Mar-01	20:59	Check	341	
09-Mar-01	6:55	Check	596	
09-Mar-01	13:58	Check	423	
09-Mar-01	18:54	Check	296	
10-Mar-01	7:28	Check	754	
10-Mar-01	13:46	Check	378	
10-Mar-01	19:34	Check	348	
11-Mar-01	7:16	Check	702	
11-Mar-01	13:36	Check	380	
11-Mar-01	20:30	Check	414	
12-Mar-01	6:59	Check	629	
12-Mar-01	14:02	Check	423	
12-Mar-01	18:49	Check	287	
13-Mar-01	7:52	Check	783	
13-Mar-01	13:39	Check	347	
13-Mar-01	19:19	Check	340	
14-Mar-01	7:28	Check	729	
14-Mar-01	14:17	Check	409	
14-Mar-01	20:15	Check	358	
15-Mar-01	7:00	Check	645	
15-Mar-01	14:06	Check	426	
15-Mar-01	18:52	Check	286	
16-Mar-01	7:08	Check	736	
16-Mar-01	14:08	Check	420	
16-Mar-01	18:45	Check	277	
17-Mar-01	7:03	Check	738	
17-Mar-01	13:54	Check	411	

17-Mar-01	19:33	Check	339	
18-Mar-01	6:50	Check	677	
18-Mar-01	13:50	Check	420	
18-Mar-01	20:23	Check	393	
19-Mar-01	7:25	Check	662	
19-Mar-01	14:22	Check	417	
19-Mar-01	19:15	Check	293	
20-Mar-01	6:57	Check	702	
20-Mar-01	13:12	Check	375	
20-Mar-01	18:49	Check	337	
21-Mar-01	7:00	Check	731	
21-Mar-01	13:38	Check	398	
21-Mar-01	18:54	Check	316	
22-Mar-01	6:58	Check	724	
22-Mar-01	14:08	Check	430	
22-Mar-01	18:46	Check	278	
23-Mar-01	7:01	Check	735	
23-Mar-01	13:56	Check	415	
23-Mar-01	19:55	Check	359	
24-Mar-01	6:57	Check	662	
24-Mar-01	13:09	Check	372	
24-Mar-01	18:56	Check	347	
25-Mar-01	6:56	Check	720	
25-Mar-01	14:07	Check	431	
25-Mar-01	19:53	Check	346	
26-Mar-01	7:00	Check	667	
26-Mar-01	13:40	Check	400	
26-Mar-01	18:46	Check	306	
27-Mar-01	7:05	Check	739	
27-Mar-01	12:49	Check	344	
27-Mar-01	19:04	Check	375	
28-Mar-01	6:52	Check	708	
28-Mar-01	13:39	Check	407	
28-Mar-01	19:15	Check	336	
29-Mar-01	7:07	Check	712	
29-Mar-01	14:41	Check	454	
29-Mar-01	18:59	Check	258	
30-Mar-01	8:03	Check	784	
30-Mar-01	14:11	Check	368	
30-Mar-01	19:10	Check	299	
31-Mar-01	7:12	Check	722	
31-Mar-01	13:50	Check	398	
31-Mar-01	18:40	Check	290	
01-Apr-01	6:40	Check	720	
01-Apr-01	13:33	Check	413	
01-Apr-01	20:01	Check	388	
02-Apr-01	6:51	Check	650	
02-Apr-01	13:41	Check	410	

02-Apr-01	18:42	Check	301	
03-Apr-01	6:56	Check	734	
03-Apr-01	13:56	Check	420	
03-Apr-01	19:44	Check	348	
04-Apr-01	6:57	Check	673	
04-Apr-01	13:38	Check	401	
04-Apr-01	19:47	Check	369	
05-Apr-01	6:58	Check	671	
05-Apr-01	13:07	Check	369	
05-Apr-01	19:14	Check	367	
06-Apr-01	6:57	Check	703	
06-Apr-01	13:53	Check	416	
06-Apr-01	19:06	Check	313	
07-Apr-01	7:50	Check	764	
07-Apr-01	14:00	Check	370	
07-Apr-01	19:33	Check	333	
08-Apr-01	7:38	Check	725	
08-Apr-01	13:25	Check	347	
08-Apr-01	19:14	Check	349	
09-Apr-01	7:12	Check	718	
09-Apr-01	13:46	Check	394	
09-Apr-01	18:44	Check	298	
10-Apr-01	8:27	Check	823	
10-Apr-01	13:56	Check	329	
10-Apr-01	18:40	Check	284	
11-Apr-01	7:12	Check	752	
11-Apr-01	13:41	Check	389	
11-Apr-01	19:08	Check	327	
12-Apr-01	7:16	Check	728	
12-Apr-01	13:06	Check	350	
12-Apr-01	19:15	Check	369	
13-Apr-01	7:45	Check	750	
13-Apr-01	13:36	Check	351	
13-Apr-01	18:53	Check	317	
14-Apr-01	7:36	Check	763	
14-Apr-01	13:09	Check	333	
14-Apr-01	19:00	Check	351	
15-Apr-01	6:48	Check	708	
15-Apr-01	13:17	Check	389	
15-Apr-01	18:42	Check	325	
16-Apr-01	7:35	Check	773	
16-Apr-01	14:32	Check	417	
16-Apr-01	18:37	Check	245	
17-Apr-01	7:05	Check	748	
17-Apr-01	14:02	Check	417	
17-Apr-01	18:51	Check	289	
18-Apr-01	7:05	Check	734	
18-Apr-01	13:39	Check	394	

18-Apr-01	19:13	Check	334	
19-Apr-01	6:56	Check	703	
19-Apr-01	13:43	Check	407	
19-Apr-01	19:04	Check	321	
20-Apr-01	8:01	Check	777	
20-Apr-01	14:17	Check	376	
20-Apr-01	19:44	Check	327	
21-Apr-01	8:04	Check	740	
21-Apr-01	14:00	Check	356	
21-Apr-01	19:06	Check	306	
22-Apr-01	7:29	Check	743	
22-Apr-01	14:37	Check	428	
22-Apr-01	18:35	Check	238	
23-Apr-01	7:18	Check	763	
23-Apr-01	14:17	Check	419	
23-Apr-01	19:34	Check	317	
24-Apr-01	7:02	Check	688	
24-Apr-01	14:54	Check	472	
24-Apr-01	19:30	Check	276	
25-Apr-01	7:11	Check	701	
25-Apr-01	13:42	Check	391	
25-Apr-01	18:39	Check	297	
26-Apr-01	7:17	Check	758	
26-Apr-01	12:58	Check	341	
26-Apr-01	18:54	Check	356	
27-Apr-01	7:32	Check	758	
27-Apr-01	14:03	Check	391	
27-Apr-01	18:37	Check	274	
28-Apr-01	7:56	Check	799	
28-Apr-01	14:05	Check	369	
28-Apr-01	19:06	Check	301	
29-Apr-01	8:21	Check	795	
29-Apr-01	13:31	Check	310	
29-Apr-01	20:08	Check	397	
30-Apr-01	7:35	Check	687	
30-Apr-01	18:37	Check	662	
01-May-01	8:30	Check	833	
01-May-01	14:49	Check	379	
01-May-01	18:31	Check	222	
02-May-01	8:06	Check	815	
02-May-01	13:59	Check	353	
02-May-01	19:22	Check	323	
03-May-01	7:31	Check	729	
03-May-01	13:07	Check	336	
03-May-01	18:53	Check	346	
04-May-01	8:11	Check	798	
04-May-01	14:00	Check	349	
04-May-01	18:38	Check	278	

05-May-01	6:54	Check	736	
05-May-01	13:01	Check	367	
05-May-01	18:30	Check	329	
06-May-01	8:07	Check	817	
06-May-01	12:44	Check	277	
06-May-01	19:05	Check	381	
07-May-01	8:49	Check	824	
07-May-01	18:57	Check	608	
08-May-01	7:40	Check	763	
08-May-01	13:59	Check	379	
08-May-01	19:25	Check	326	
09-May-01	7:13	Check	708	
09-May-01	19:41	Check	748	
10-May-01	7:36	Check	715	
10-May-01	13:32	Check	356	
10-May-01	19:49	Check	377	
11-May-01	7:45	Check	716	
11-May-01	15:05	Check	440	
11-May-01	19:08	Check	243	
12-May-01	7:18	Check	730	
12-May-01	18:45	Check	687	
13-May-01	7:23	Check	758	
13-May-01	13:20	Check	357	
13-May-01	18:47	Check	327	
14-May-01	7:07	Check	740	
14-May-01	13:47	Check	400	
14-May-01	18:51	Check	304	
15-May-01	8:19	Check	808	
15-May-01	13:33	Check	314	
15-May-01	18:48	Check	315	
16-May-01	7:14	Check	746	
16-May-01	14:18	Check	424	
16-May-01	19:18	Check	300	
17-May-01	7:00	Check	702	
17-May-01	16:13	Check	553	
17-May-01	18:58	Check	165	
18-May-01	8:20	Check	802	
18-May-01	14:09	Check	349	
18-May-01	19:41	Check	332	
19-May-01	7:36	Check	715	
19-May-01	14:07	Check	391	
19-May-01	18:36	Check	269	
20-May-01	7:28	Check	772	
20-May-01	12:39	Check	311	
21-May-01	8:16	Check	1177	
22-May-01	7:07	Check	1371	
22-May-01	19:21	Check	734	
23-May-01	8:20	Check	779	

23-May-01	19:49	Check	689	
24-May-01	7:34	Check	705	
24-May-01	19:54	Check	740	
25-May-01	7:52	Check	718	
25-May-01	20:00	Check	728	
26-May-01	7:07	Check	667	
26-May-01	13:01	Check	354	
26-May-01	18:20	Check	319	
27-May-01	7:56	Check	816	
27-May-01	12:36	Check	280	
27-May-01	19:03	Check	387	
28-May-01	7:13	Check	730	
28-May-01	12:47	Check	334	
28-May-01	18:58	Check	371	
29-May-01	7:46	Check	768	Check and pull

Appendix II A. Total number of native fish captured per day by species. Does not include chinook salmon or species with season totals less than two specimens.

Sample Date	Organism Codes								
	PL	PRS	RFS	SASQ	SASU	SCB	SPLT	UNLP	UNLPA
01/03/2001									2
01/04/2001		1							
01/05/2001	1								
01/07/2001									
01/08/2001	1								
01/09/2001	15								
01/10/2001	1								
01/11/2001	12							70	11
01/12/2001	4								1
01/14/2001									
01/15/2001	1	1							
01/16/2001								4	
01/17/2001	1			1					
01/18/2001	3	1							
01/19/2001									
01/20/2001	2								
01/21/2001	2								
01/22/2001	2		1						
01/23/2001	2								1
01/24/2001									1
01/25/2001	6								
01/26/2001	13								3
01/27/2001	19								8
01/28/2001	41								11
01/29/2001	6								4
01/30/2001	8								2
01/31/2001	1								1
02/01/2001	3								
02/02/2001	2								
02/03/2001	1	1							1
02/04/2001	4								
02/05/2001	1								
02/06/2001									
02/07/2001	1								
02/08/2001	3								
02/09/2001									
02/10/2001	2	1							
02/11/2001									
02/12/2001	2								
02/13/2001	14								1
02/14/2001	10		1						2
02/15/2001	3								
02/16/2001	4								
02/17/2001	3								
02/18/2001	3								

02/19/2001	3								
02/20/2001	8								1
02/21/2001	7								
02/22/2001	5								
02/23/2001	13								
02/24/2001	5								
02/25/2001	42								
02/26/2001	6								
02/27/2001	3								
02/28/2001	9								
03/01/2001	3								
03/02/2001	2								
03/03/2001	3		1					1	
03/04/2001									
03/05/2001	4								1
03/06/2001	32								2
03/07/2001	7								
03/08/2001	8								
03/09/2001	2								
03/10/2001	2								
03/11/2001	3								
03/12/2001	2								
03/13/2001	1								
03/14/2001	2								
03/15/2001									
03/16/2001									
03/17/2001									
03/18/2001									
03/19/2001	1								
03/20/2001									
03/21/2001									
03/22/2001									
03/23/2001								1	1
03/24/2001									
03/25/2001	1								
03/26/2001		1							
03/27/2001									
03/28/2001									1
03/29/2001				1					1
03/30/2001									1
03/31/2001									3
04/01/2001								2	
04/02/2001								1	
04/03/2001									
04/04/2001								1	
04/05/2001	1								
04/06/2001									1
04/07/2001									
04/08/2001	13								
04/09/2001									5
04/10/2001									3
04/11/2001									

04/12/2001									1
04/13/2001									
04/14/2001									1
04/15/2001									1
04/16/2001						1			1
04/17/2001									1
04/18/2001									1
04/19/2001								1	
04/20/2001	1								
04/21/2001	1								2
04/22/2001					5				2
04/23/2001						1			
04/24/2001	1				3				1
04/25/2001					3				
04/26/2001									
04/27/2001									1
04/28/2001				1	2				
04/29/2001					3				1
04/30/2001									
05/01/2001					16				
05/02/2001	1				8				
05/03/2001	1				1				
05/04/2001					2				1
05/05/2001				1	22				
05/06/2001	1				1				
05/07/2001					3	1			
05/08/2001				1	5				
05/09/2001					3				
05/10/2001				1	15				
05/11/2001	2				7				1
05/12/2001				2	1				
05/13/2001									
05/14/2001					3				1
05/15/2001				3	1				
05/16/2001					2	1			
05/17/2001	1			1	4				
05/18/2001					1				1
05/19/2001					6				
05/20/2001					2	1			
05/21/2001					4				
05/22/2001									2
05/23/2001									1
05/24/2001				1	3				
05/25/2001									
05/26/2001				1					1
05/27/2001				5		1			
05/28/2001				1		1			1
05/29/2001							1		
Season Total	393	6	3	20	126	7	1	81	91

Appendix II B. Total number of non-native fish captured per day by species. Does not include species with season totals less than two specimens.

Sample Date	Organism Codes														
	BGS	BKS	C	CHC	GSF	GSN	LMB	MQF	MSS	RES	RSN	SMB	TFS	WHC	WHS
01/02/2001															
01/03/2001	2													3	
01/04/2001	4													5	
01/05/2001	7								1					1	
01/07/2001															
01/08/2001	4										1			2	
01/09/2001	19										3			1	
01/10/2001	22										5			1	
01/11/2001	34						5	1	1		1			5	
01/12/2001	23						1				4			14	
01/14/2001															
01/15/2001	15							1	2		1			5	
01/16/2001	13						1		1					6	
01/17/2001	7			1		3	1		1					2	
01/18/2001	45								1		2			6	
01/19/2001	16						1		1		2			3	
01/20/2001	11							1						10	
01/21/2001	9					4			1		2			9	
01/22/2001	11						1				5	1		3	
01/23/2001	9										1			11	
01/24/2001	16					2			1		2			8	
01/25/2001	11								1		1			9	
01/26/2001	17			1			1							12	
01/27/2001	9					1		2						11	
01/28/2001	7								2		1		2	16	
01/29/2001	6						1				2			18	
01/30/2001	6						1				1			5	
01/31/2001	8								1					6	
02/01/2001	3			1										8	
02/02/2001	4					2								3	
02/03/2001	3				1									3	
02/04/2001	2					1								6	
02/05/2001	4			1		1								9	
02/06/2001	1													9	
02/07/2001	10			1										2	
02/08/2001	4														
02/09/2001	3													3	
02/10/2001	2													2	
02/11/2001	1								1					1	
02/12/2001	9						1							2	
02/13/2001	6					2		1	4					16	
02/14/2001	1			2		5			2					4	
02/15/2001	6					1			3					9	
02/16/2001						1	1		2					11	
02/17/2001	2								1					13	
02/18/2001							1				2			5	
02/19/2001	5													9	
02/20/2001	2							2			3			8	
02/21/2001	4					2		2						10	
02/22/2001								1	2					13	
02/23/2001									2					6	
02/24/2001														2	
02/25/2001								2	1					2	
02/26/2001	1							1	1				1	4	
02/27/2001	1					1			1					3	
02/28/2001									1					7	
03/01/2001						1			2						
03/02/2001								1						2	
03/03/2001				1		2								2	

03/04/2001														1	
03/05/2001														1	
03/06/2001									2				1	4	
03/07/2001									6					3	
03/08/2001				3				1	1					30	
03/09/2001				1			1		1					23	
03/10/2001	1					1			2				2	12	
03/11/2001														10	
03/12/2001	1													6	
03/13/2001											2			11	
03/14/2001	1										2	1	1	10	
03/15/2001	4										1			24	
03/16/2001	4										2			7	
03/17/2001	4			2										3	
03/18/2001	1										2			1	
03/19/2001	1											1		18	
03/20/2001	2						1	1						7	
03/21/2001			1					1			1			14	
03/22/2001							2	1			1			14	
03/23/2001												1		12	
03/24/2001														7	
03/25/2001						2		1	1		1			7	
03/26/2001												1		8	
03/27/2001								1						12	
03/28/2001						1		1						7	
03/29/2001	1										3			13	
03/30/2001	1							1						9	
03/31/2001	1				1			1			1			10	
04/01/2001	2			1										12	
04/02/2001						3		1					1	9	
04/03/2001						1					1			3	
04/04/2001						1								4	
04/05/2001								2						3	
04/06/2001											2		25	3	
04/07/2001													13		
04/08/2001														3	
04/09/2001													8	11	
04/10/2001											1		15	8	
04/11/2001						1							6	2	
04/12/2001													5		
04/13/2001			1										1	4	
04/14/2001														2	
04/15/2001	1			2							1			5	
04/16/2001	1			1		1			1		1			6	
04/17/2001	1		1			1								9	
04/18/2001								1						6	
04/19/2001	2													5	
04/20/2001						1		1						4	
04/21/2001											1		1	1	
04/22/2001						2		2			1		1	8	2
04/23/2001	1										3			5	
04/24/2001											3			4	
04/25/2001						1					2			3	
04/26/2001											2			2	
04/27/2001						1		1						5	
04/28/2001	2					1								5	
04/29/2001														7	
04/30/2001								2			1			3	
05/01/2001								1						9	
05/02/2001									1					2	
05/03/2001														1	
05/04/2001						1		1			1			1	
05/05/2001									1	1	1			7	
05/06/2001						1					1			3	
05/07/2001						9								3	1

05/08/2001						1								4	
05/09/2001									1		1			1	
05/10/2001	3					1					1	1		1	
05/11/2001						3	1		1		2			4	
05/12/2001							1							4	
05/13/2001	2						4						1	2	
05/14/2001				1	1									1	
05/15/2001					1	2								2	
05/16/2001						1	3					1			1
05/17/2001						1					1			2	
05/18/2001	1						1							6	
05/19/2001							5				1			2	
05/20/2001														1	
05/21/2001						16	41	2			4			10	
05/22/2001				2		6	26	2			5			5	1
05/23/2001	1			2		4	16				1			6	
05/24/2001		2		2		2	3	1					1	2	
05/25/2001				3	1	4	8							5	
05/26/2001							1					10		6	
05/27/2001							5				1	14		3	
05/28/2001	1					4	2	1		1	2	7		22	
05/29/2001	1					2					1	2		3	
Grand Total	446	2	3	28	5	105	137	42	55	2	97	40	85	890	5

List of species codes

AMS	American shad
BGS	Bluegill sunfish
BKB	Black bullhead
BRB	Brown bullhead
BKS	Black crappie
C	Common carp
CHC	Channel catfish
FHM	Fathead minnow
GF	Goldfish
GSF	Green sunfish
GSN	Golden shiner
HCH	Hitch
HH	Hardhead
KBL	Kern brook lamprey
LMB	Largemouth bass
MQF	Mosquito fish
MSS	Inland silverside
PL	Pacific lamprey
PRS	Prickly sculpin
RBT	Rainbow trout
RES	Redear sunfish
RFS	Riffle sculpin
RSN	Red shiner
SASQ	Sacramento squawfish
SASU	Sacramento sucker
SCB	Sacramento blackfish
SMB	Smallmouth bass
SPLT	Splittail
STB	Striped bass
TFS	Threadfin shad
TP	Tule perch
UNCF	Unknown ictalurid
UNCN	Unknown centrarchid
UNCP	Unknown cyprinid
UNLP	Unknown lamprey
INLPA	Unknown lamprey ammoceote
UNK	Unknown
W	Warmouth
WHC	White catfish
WHS	White crappied