

**Downstream Migration Monitoring at Woodbridge Dam
on the Lower Mokelumne River, Ca.
December 2000 through July 2001**

July 2002

Michelle L. Workman
East Bay Municipal Utility District, 1 Winemasters Way, Lodi, Ca 95240

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SUMMARY

Two rotary screw traps were fished in tandem below Woodbridge Irrigation District Dam (WIDD) from December 18, 2000 through May 29, 2001. On April 23, 2001 an incline plane trap was positioned over the smolt bypass pipe in pool 9a of the low-stage fish ladder to capture smolts that were screened off at the Woodbridge diversion canal upstream of the dam. The traps were operated simultaneously until screw traps were taken out of operation on May 29th, in anticipation of flow reductions below WIDD to 20 cubic feet per second (cfs). From April 26, 2001 through July 23, 2001 all juvenile fall-run chinook salmon (*Oncorhynchus tshawytscha*) from the rotary screw traps and the smolt bypass trap were trucked to various locations below Wimpy's Marina.

The rotary screw traps captured 18,087 juvenile fall-run chinook salmon. The bypass trap captured 51,039 juvenile fall-run chinook salmon. The estimate of abundance for screw trap captures derived from calibrations was 68,294 (95% C.I.: 56,998 – 86,108). This number added to bypass catch data results in an estimate of 119,333 naturally produced juvenile fall-run chinook salmon passing WIDD from December 18, 2000 through July 23, 2001. As in years past (Marine 2000) emigration past WIDD was bimodal with a distinct peak of fry passing by mid-March, and a peak of smolts passing in May and June. Twenty-six age 1+ fall-run chinook salmon were captured between December and April.

The first steelhead (*O. mykiss*) young-of-year (YOY) were captured in mid-February. Screw trap captures for YOY steelhead totaled 50 fish. The bypass trap captured 295 YOY steelhead. Estimated abundance from screw trap captures was 244 fish (96% C.I.: 195-339). This number, when added to bypass catch, data results in an estimate of 539 YOY steelhead passing WIDD from February through July. In addition 596 age 1+ steelhead were captured between January and June. One hundred and one of these steelhead were not adipose clipped. The majority of subadult steelhead (495) had adipose clips and were captured between January and May. Of the total number, 31 age 1+ steelhead were captured in the bypass trap, and only one out of the 31 was adipose clipped. The rest were captured in the screw traps. Ninety-nine percent of the adipose clipped fish were captured in January, February and March. The Mokelumne River Fish Hatchery planted 124,729 brood year 1999 steelhead at Thornton on the Mokelumne River from December 12 through December 31, 2000. The large portion of adipose

clipped fish potentially came from fish in this group which moved upstream after planting.

Two adult steelhead were captured in the screw traps in February, and one spawned-out female steelhead was captured in the screw traps in June.

Twenty-nine species were recorded in rotary screw traps and the bypass trap. In order of abundance, these were fall-chinook salmon, black bass (*Micropterus sp.*), Pacific lamprey (*Lampetra tridentata*), and prickly sculpin (*Cottus asper*). This year the first yellowfin goby (*Acanthogobius flavimanus*), an invasive predatory fish, was recorded at the screw traps in January.

Lower Mokelumne River flows were released from Camanche Dam according to the normal and above JSA water year type through April 1, 2001 and according to the dry year flow schedule throughout the remainder of the monitoring period (JSA 1998). Camanche release was stable at approximately 330 cfs from December to April 2nd. As WIDD started the irrigation season, Camanche releases were driven by diversions to maintain minimum flows of 150 cfs downstream of WIDD through May and then 20 cfs downstream for June and July. Camanche releases ranged from 279 – 461 cfs from April through July.

INTRODUCTION

East Bay Municipal Utility District (EBMUD) has been monitoring the juvenile salmonid emigration on the lower Mokelumne River since 1990 (Bianchi et al 1992, Marine 2000). This report represents the results of monitoring from December 2000 through July 2001.

OBJECTIVES

The objectives of this study are to:

- 1) Monitor the abundance and emigration patterns of anadromous fish on the lower Mokelumne River past Woodbridge Irrigation District Dam
- 2) Monitor movement patterns and timing of all fish species utilizing the lower Mokelumne River from December through July
- 3) Coded-wire tag a portion of naturally produced juvenile fall-run chinook salmon
- 4) Conform data collection with the standards set out in the 1997 Comprehensive Assessment and Monitoring Program report on rotary screw trap protocols

METHODS

Rotary Screw traps

Two 8' diameter rotary screw traps (EG Solutions, Inc.) were fished in tandem below WIDD. Traps were checked twice daily, 5 days per week. Estimates were generated for the remaining days by averaging the catch for three days before and after the non-

trapping period. In periods of high abundance of fall-run chinook salmon traps were operated seven days per week. Traps were operated to maintain a rotational speed of two rotations per minute or greater (USFWS 1997). Morning checks were conducted within one hour of sunrise, and evening checks were conducted within one hour of sunset. During each check, weather, cone rotations since previous check, water velocity into cone, debris load, water temperature, and turbidity were recorded. Traps were cleared of debris and fish were offloaded into buckets. pontoons, cones, live boxes and decks were scrubbed each day to reduce algal build up and maintain trap rotation. All cables, pulleys, counters, and cones were inspected daily to ensure proper function. For rotary screw trap positioning see Marine (2000).

Bypass trap

On April 23, 2001 an incline plane trap was installed over the bypass pipe upstream of bay 9a in the low stage fish ladder. This pipe conveys fish that are screened off of the Woodbridge Irrigation Canal upstream. The trap was checked daily, until fish abundances were sufficiently high to warrant two checks per day. A fish crowder was placed at the entrance from the incline plane to the live box. Fish were netted with a long-handled dip net into buckets. Debris accumulation was cleared from the live box at each trap check.

Fish Handling

Fish were processed in a small trailer equipped with a flow-through water supply, and a recirculating anesthetic bath of Fiquel®MS-222 anesthetic. Concentration varied with temperature based on minimum required concentrations for chinook salmon (*Oncorhynchus tshawytscha*) (Fiquel® instructional leaflet). Electric aerators (air stones) were used to maintain oxygen concentrations. Fish were anesthetized and the first 50 fall-run chinook salmon, and the first 20 of any other species were weighed to the nearest 0.1 gram (with an Ohaus® Navigator scale) and measured to the nearest 1 mm. Life stage of each fish was recorded. Any observations of marks, injuries or anomalies were recorded. Fish were allowed to recover in oxygenated water and were then transported, via 5 gallon buckets equipped with battery operated aerators, to the lower Mokelumne River just downstream of the Lower Sacramento Road Bridge. Release locations varied to reduce predation on released fish.

Trapping and Trucking

The Lower Mokelumne River Joint Settlement Agreement (1998) recommends outmigrating smolts be trapped and transported around the Delta in critically dry years, when agreed upon by the California Department of Fish and Game (CDFG), the United States Fish and Wildlife Service (USFWS), and EBMUD. Trapping and trucking of juvenile fall-run chinook salmon began on April 26, 2001. A transport tank with two 75-gallon compartments equipped with mechanical aerators was used to haul fish. Tanks were filled from the high stage fish ladder using a submersible pump. Water was treated with Novaqua®, ice made from Mokelumne River water, pressurized O₂ and salt to minimize stress to fish. A recommended concentration of salt for fish transport of a 0.1 to

0.3% salt solution was used in transport (Piper et al 1992). Oxygen levels in transport tanks were initially set at 9.00 ppm to accommodate high oxygen consumption associated with stress. Transport levels were kept at > 7.00 ppm. Each tank was supplied with a 1-gallon container of frozen Mokelumne River water to maintain constant temperatures during transport.

Fish were released at Wimpy's Marina, Lighthouse Marina, B&W Resort and Korth's Pirates Lair (Figure 1). Release site determination was based on water temperatures, tides, predation activity and human activity at the site.

Fish were acclimated before release by adding release site water back into the tanks using a submersible pump. Once tank temperatures were within 1 degree of release water fish were released through a 4" diameter hose clamped to the drain of each tank, or transported in 5 gallon buckets and released via boat (B&W Resort location only).

Coded Wire Tagging

Coded wire tagging was conducted from 1/15/01 through 3/5/01. Chinook salmon >38mm fork length (FL), and completely buttoned-up were tagged. Two Northwest Marine Technologies Mark IV tagging machines with QC devices were used to implant CWT in juvenile fall chinook salmon.

Calibrations

Sixteen calibration tests for fall-run chinook salmon captures were conducted, consisting of 8 nighttime tests and 8 daytime tests. The first group of calibration fish was marked using upper and lower caudal clips. Subsequent groups were marked using a NewWest® photonic tagging gun. Caudal clips were used on fish that were too small to tag with the photonic gun. Calibration fish were marked and held overnight to assess mark retention and mortality. Fish were held in live-cars in bay 9a of the lower ladder. Releases were conducted after the morning trap check for the am release, and at full darkness for the pm release. Fish were released over the dam spill of WIDD.

Calibration experiments testing hatchery vs. wild fish catch rates and testing fish released over the dam spill vs. down the high stage ladder were conducted. Wild fish were captured upstream during seining surveys and transported in ice chests to WIDD. These fish were marked along with hatchery fish and released simultaneously. Ladder vs. spill tests were conducted with hatchery fish. Fish were released simultaneously over the spill of the dam and in bay 15 of the high stage ladder.

Diel Surveys

Three diel surveys were conducted to represent fry, parr and smolt sized fish. During diel surveys rotary screw traps were checked every hour during a 24-hour period to assess specific hourly movement patterns of fall-run chinook salmon.

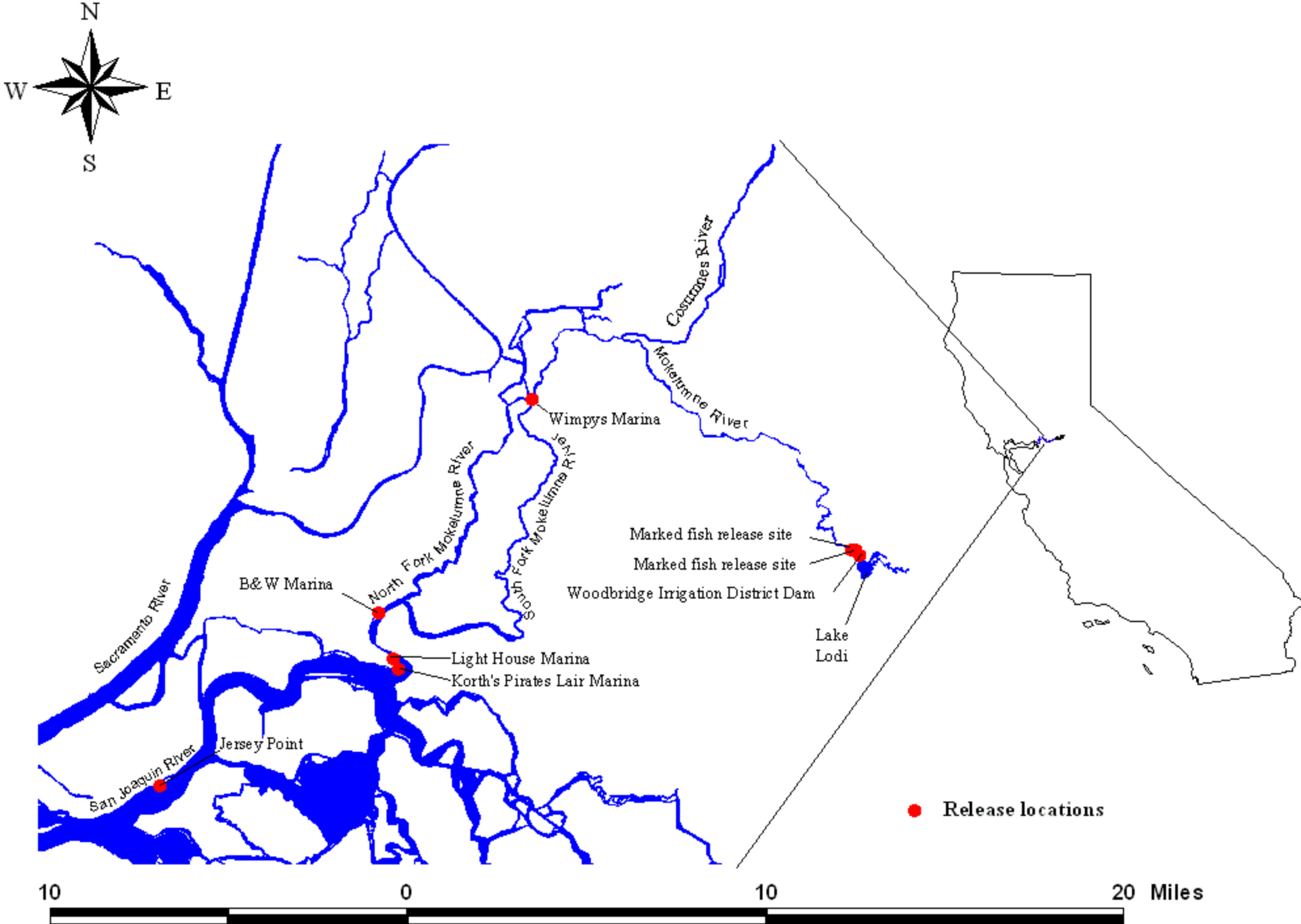


Figure 1. Release locations for juvenile fall-run chinook salmon trapped at Woodbridge Irrigation District Dam from April 26, 2001 through July 24, 2001.

RESULTS/DISCUSSION

Fall-run chinook salmon

During rotary screw trap monitoring, 18,087 juvenile fall chinook salmon were captured. Calibrations produced an estimate of 68,294 emigrants through the screw traps (95% C.I.: 56,998 – 86,108). The bypass trap captured 51,039 juvenile fall-run chinook salmon. The total estimate of outmigration juvenile fall-run chinook salmon was 119,333 (Figure 2). Data are in Appendix A.

Juvenile salmon were described to lifestage as fry, parr, silvery parr or smolt. Average fork lengths for fry were 32.4 - 41.0mm FL; parr were 49.9 - 61.4mm, silvery parr were 70.1 - 78.7mm and smolts were between 88.8 - 106.8mm. Average condition factor (K) ranged from 0.75 for fry in January to 1.07 for smolts in July (Figures 3 and 4).

Twenty-six age 1+ fall-run chinook salmon were recorded between December and April. Size range of these fish was 104mm - 219mm. This pattern of a small number of yearling smolts migrating out of the Mokelumne has been observed in past years (Marine and Vogel 2000).

Camanche release was stable at approximately 330 cfs from December to April 2nd. Flow below WIDD at this time was stable around 280 cfs with periodic small spikes associated with rainfall and runoff. As WIDD started the irrigation season, Camanche releases were managed to maintain minimum flows of 150 cfs downstream of WIDD through May and then 20 cfs for June and July. Camanche releases ranged from 279 – 461 cfs from April through July (Figures 5 and 6). Temperatures recorded at Camanche Dam were between 9.7-13.6 °C. Average temperature recorded at Woodbridge Dam rose steadily throughout the monitoring period from a low of 8.8 °C in January to a high of 21.2 °C in July (Figures 7 and 8).

Juvenile fall-run chinook emigration numbers were graphically compared to flow, temperature, barometric pressure, turbidity, and precipitation (Figures 5-11). No relationship between these factors and emigration patterns was apparent. Previous studies have shown no statistical relationship between these variables and emigration patterns for multiple year analyses (Workman 1999).

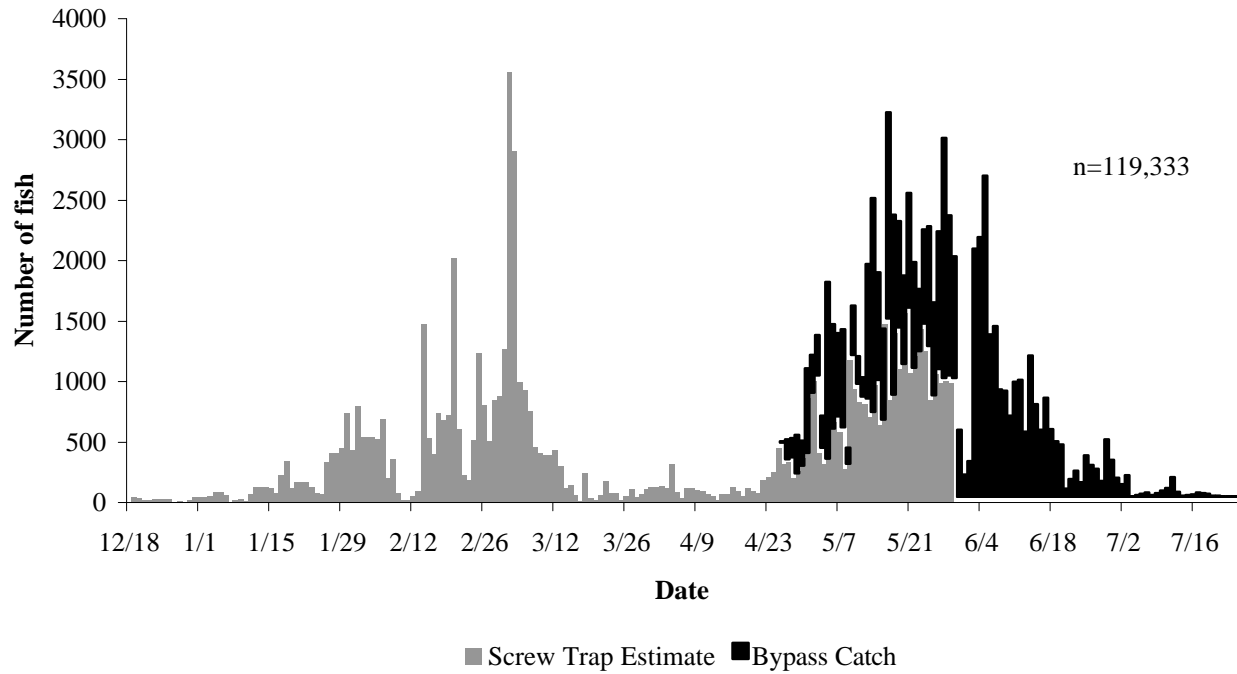


Figure 2. Estimated abundance of young of year fall-run chinook salmon passing Woodbridge Irrigation District Dam on the lower Mokelumne River from December 18, 2000 through July 24, 2001. (Screw trap estimate and bypass catch are summed for daily estimate where the two methods overlap)

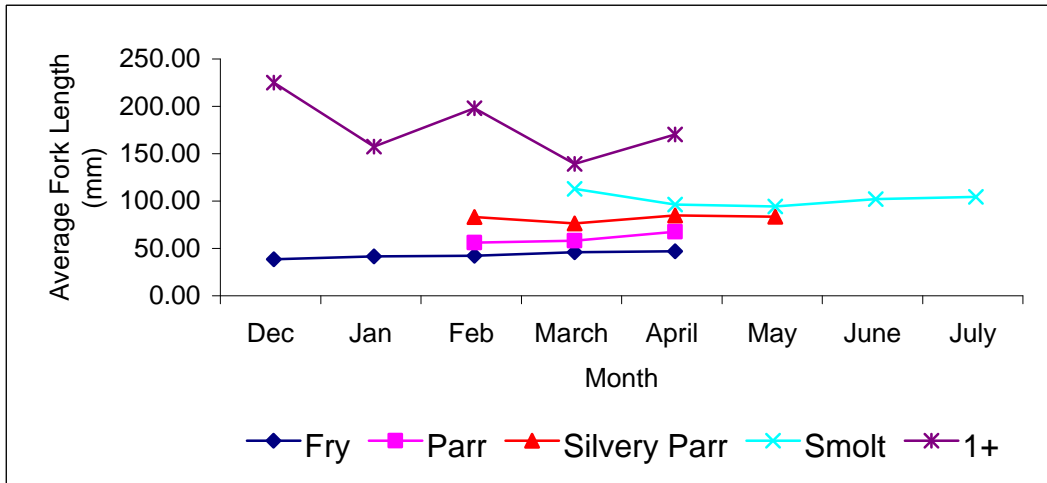


Figure 3. Average fork length (mm) of juvenile fall-run chinook salmon, by lifestage, on the lower Mokelumne River from December 17, 2000 through July 24, 2001.

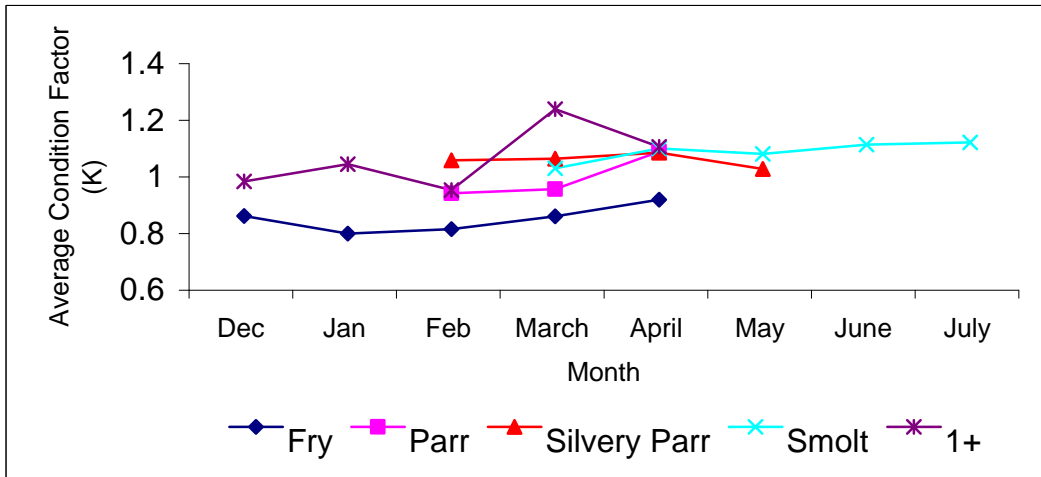


Figure 4. Average Condition Factor (K) of juvenile fall-run chinook salmon, by lifestage, on the lower Mokelumne River from December 17, 2000 through July 24, 2001.

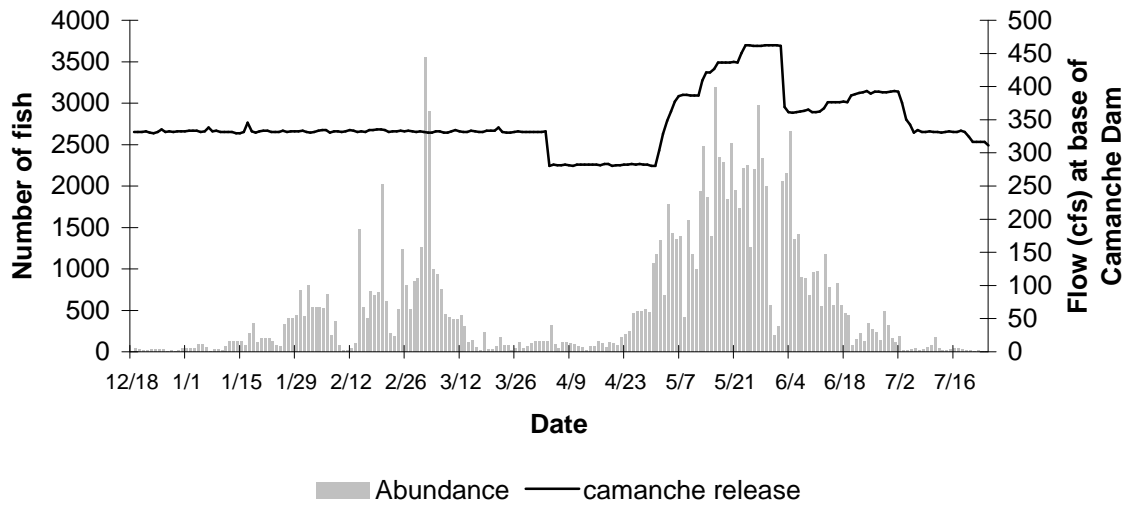


Figure 5. Juvenile fall-run chinook salmon emigration below Woodbridge Irrigation District Dam and Camanche release flows, December 18, 2000 through July 24, 2001.

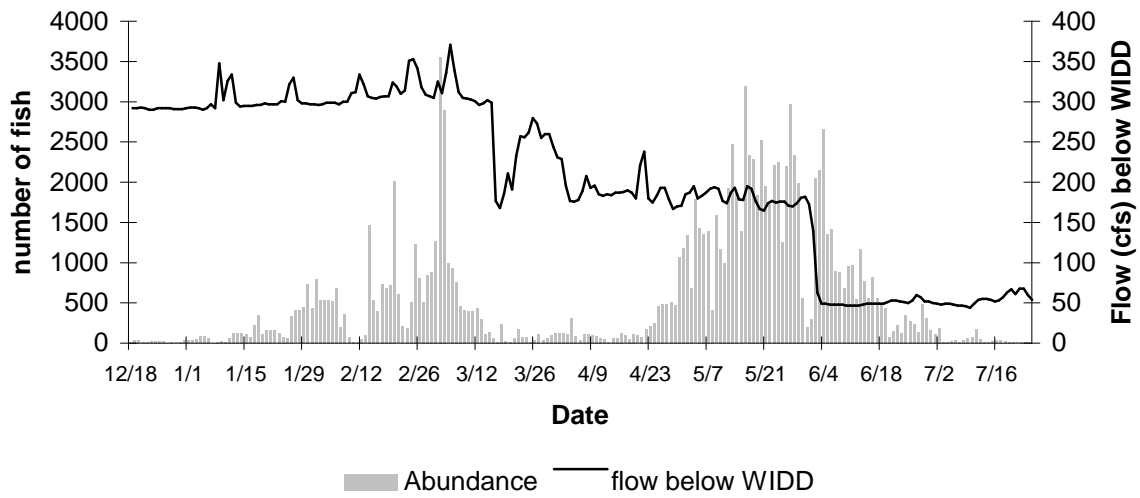


Figure 6. Juvenile fall-run chinook salmon emigration below Woodbridge Irrigation District Dam and flow below Woodbridge Irrigation District Dam, December 18, 2000 through July 24, 2001.

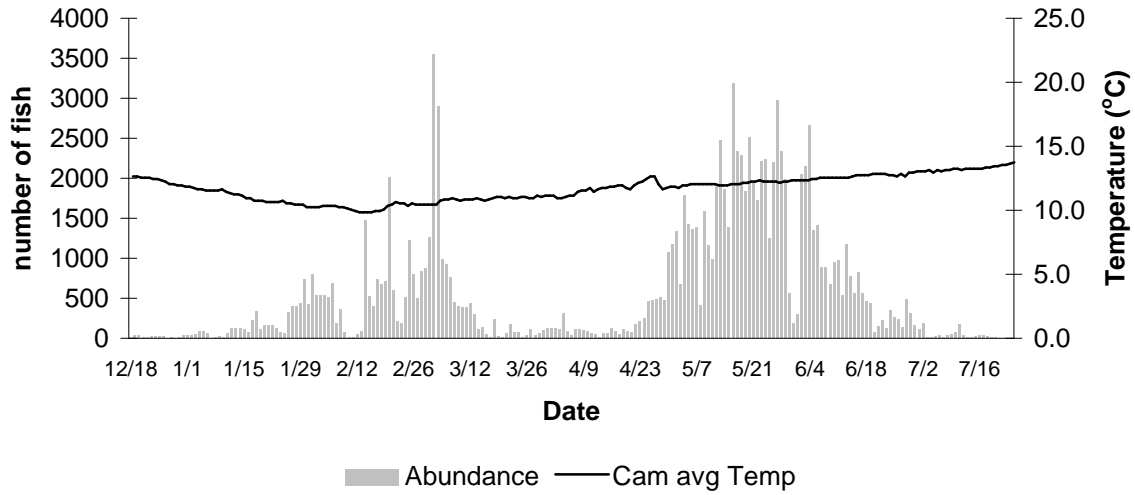


Figure 7. Juvenile fall-run chinook salmon emigration below Woodbridge Irrigation District Dam and water temperature at Camanche Dam, December 18, 2000 through July 24, 2001.

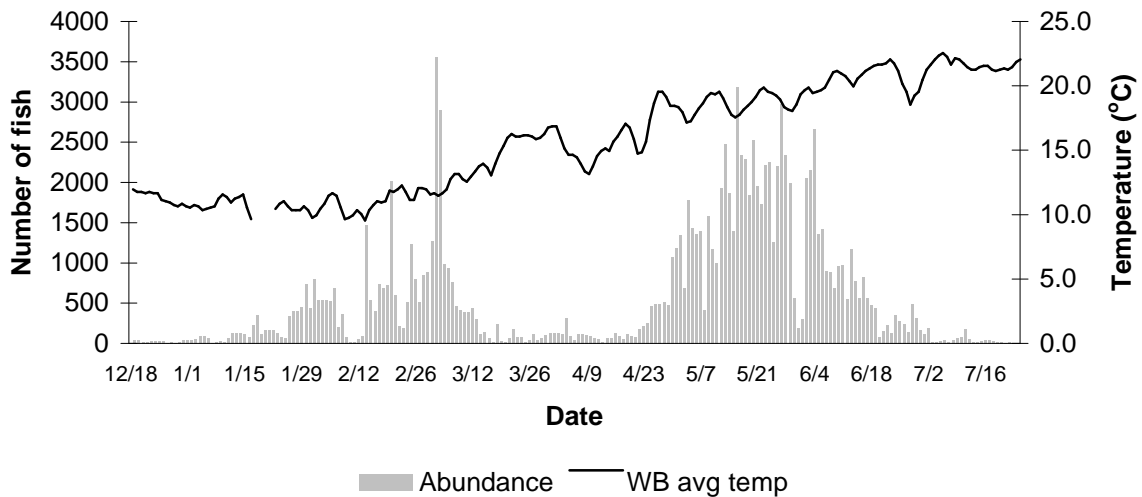


Figure 8. Juvenile fall-run chinook salmon emigration below Woodbridge Irrigation District Dam and water temperature at Woodbridge Dam, December 18, 2000 through July 24, 2001.

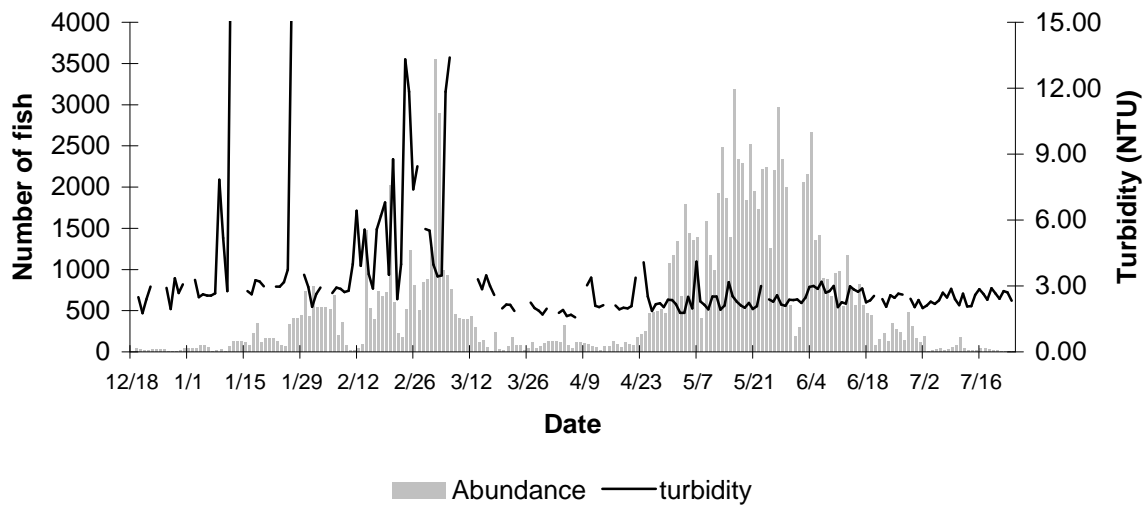


Figure 9. Juvenile fall-run chinook salmon emigration below Woodbridge Irrigation District Dam and turbidity, December 18, 2000 through July 24, 2001.

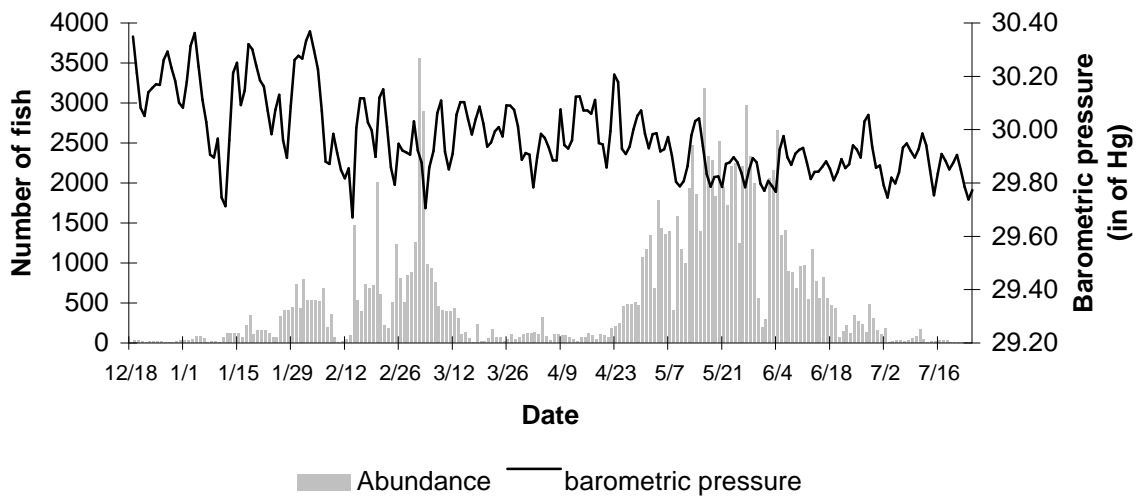


Figure 10. Juvenile fall-run chinook salmon emigration below Woodbridge Irrigation District Dam and barometric pressure, December 18, 2000 through July 24, 2001.

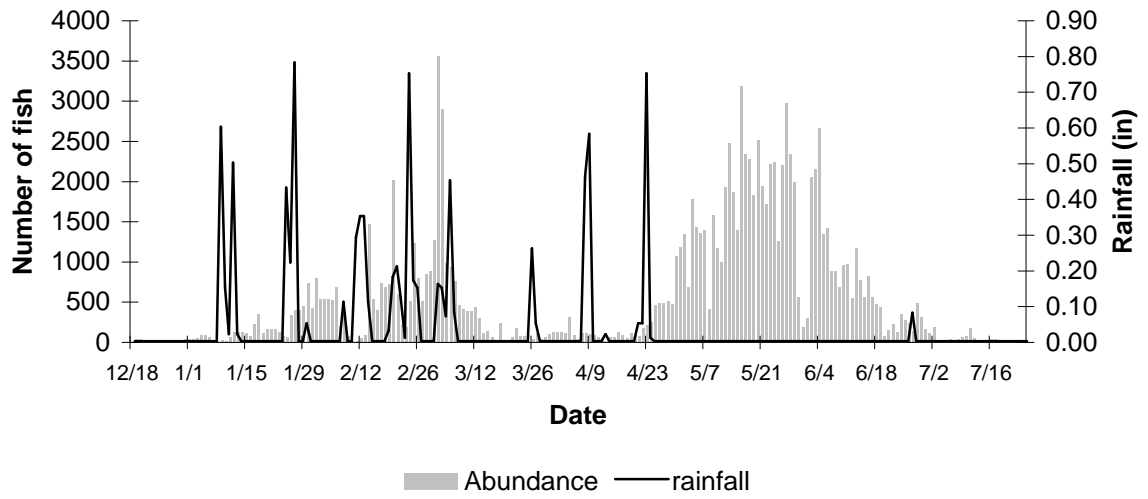


Figure 11. Juvenile fall-run chinook salmon emigration below Woodbridge Irrigation District Dam and rainfall, December 18, 2000 through July 24, 2001.

Diel Abundance

Smaller fish (< 60mm) dominated the catch from December through mid March. Movements at this time were predominantly during nighttime hours. On a weekly basis, from December through mid-March, nocturnal passage accounted for 71-97% of passage. From mid-March through May, when screw trapping ended, nocturnal passage accounted for 26-68% of passage. Weekly average fork length also increased to between 80-100mm during this period (Figures 12-13). Diel surveys conducted in February, March and May showed a crepuscular pattern of movement which is consistent with past surveys (Bianchi et al. 1992, Vogel and Marine 1999a,b) (Figure 14).

Calibrations

Calibration coefficients (trap efficiencies) are presented in Appendix A, for chinook salmon. The two experimental calibration releases, hatchery v. wild and ladder v. spill, did not appear significantly different. Further tests will need to be run to determine statistical significance.

Table 1. Trap efficiency test results for rotary screw traps fished at Woodbridge Irrigation District Dam, December 13, 2000 through May 29, 2001.

Date of Test	Species	Source	Release Site	Day Release		Night Release		Trap Efficiency	
				Marked	Recaptured	Marked	Recaptured	Day	Night
1/5/01	FCS	Hatchery	WIDD Spill			551	138		0.25
1/6/01	FCS	Hatchery	WIDD Spill	555	194			0.35	
1/23/01	FCS	Hatchery	WIDD Spill			553	165		0.30
1/24/01	FCS	Hatchery	WIDD Spill	227	72			0.32	
2/7/01	FCS	Hatchery	WIDD Spill			572	254		0.44
2/8/01	FCS	Hatchery	WIDD Spill	572	132			0.23	
2/18/01	FCS	Hatchery	WIDD Spill			298	69		0.23
2/18/01	FCS	Wild	WIDD Spill			71	25		0.35
2/19/01	FCS	Hatchery	WIDD Spill	423	122			0.29	
2/19/01	FCS	Wild	WIDD Spill	82	27			0.33	
2/27/01	FCS	Hatchery	WIDD Spill			377	156		0.41
2/28/01	FCS	Hatchery	WIDD Spill	362	124			0.34	
3/21/01	FCS	Hatchery	WIDD Spill			486	172		0.35
3/22/01	FCS	Hatchery	WIDD Spill	465	113			0.24	
4/10/01	FCS	Hatchery	WIDD Spill			520	255		0.49
4/11/01	FCS	Hatchery	WIDD Spill	443	55			0.12	
5/1/01	FCS	Hatchery	WIDD Spill			114	67		0.59
5/1/01	FCS	Hatchery	WIDD ladder			344	174		0.51
5/2/01	FCS	Hatchery	WIDD Spill	267	25			0.09	

Code Wire Tagging

Tagging began on January 15, 2001 and ended on March 7, 2001. Wild production

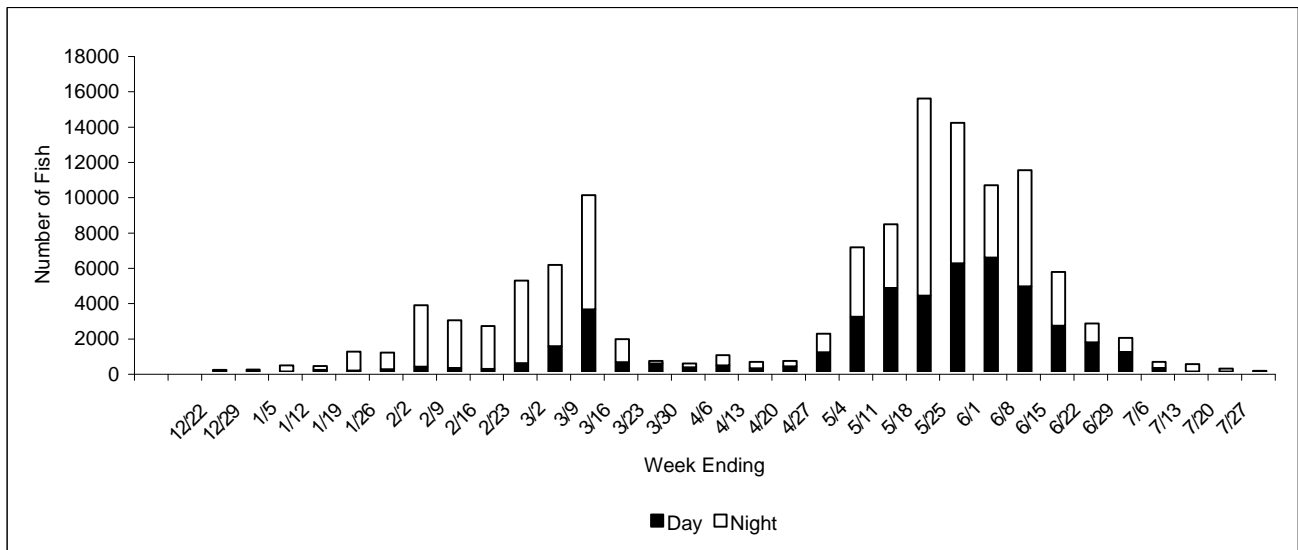


Figure 12. Weekly diel abundance of young of year fall-run chinook salmon emigrating past Woodbridge Dam from December 17, 2000 through July 24, 2001.

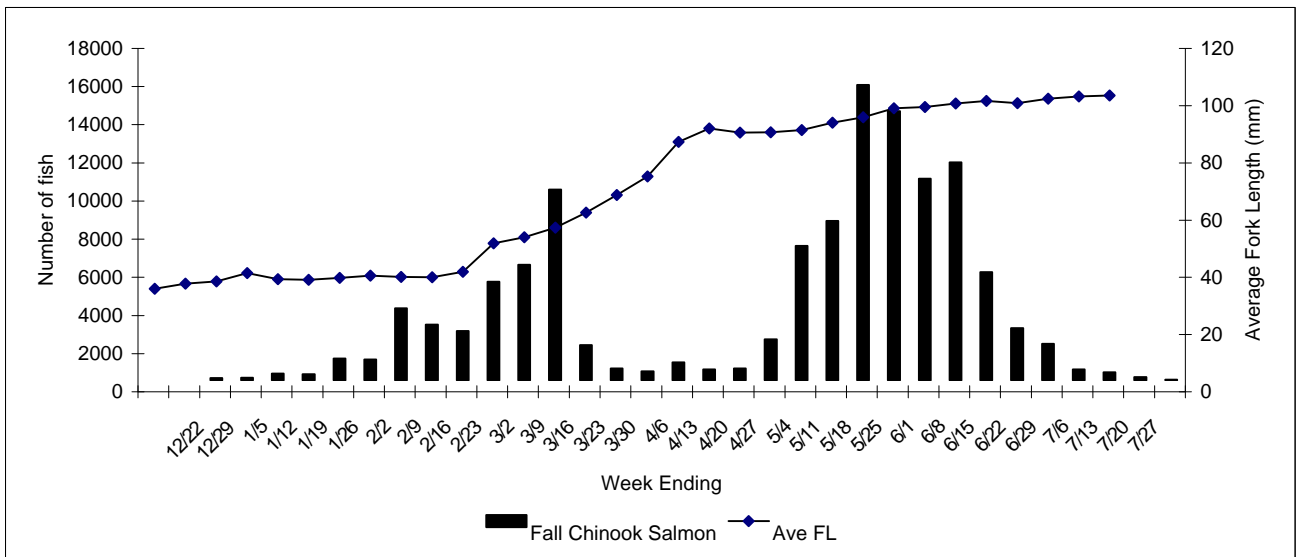


Figure 13. Average fork length (mm) and weekly abundance of young of year fall-run chinook salmon emigrating past Woodbridge Dam from December 17, 2000 through July 24, 2001.

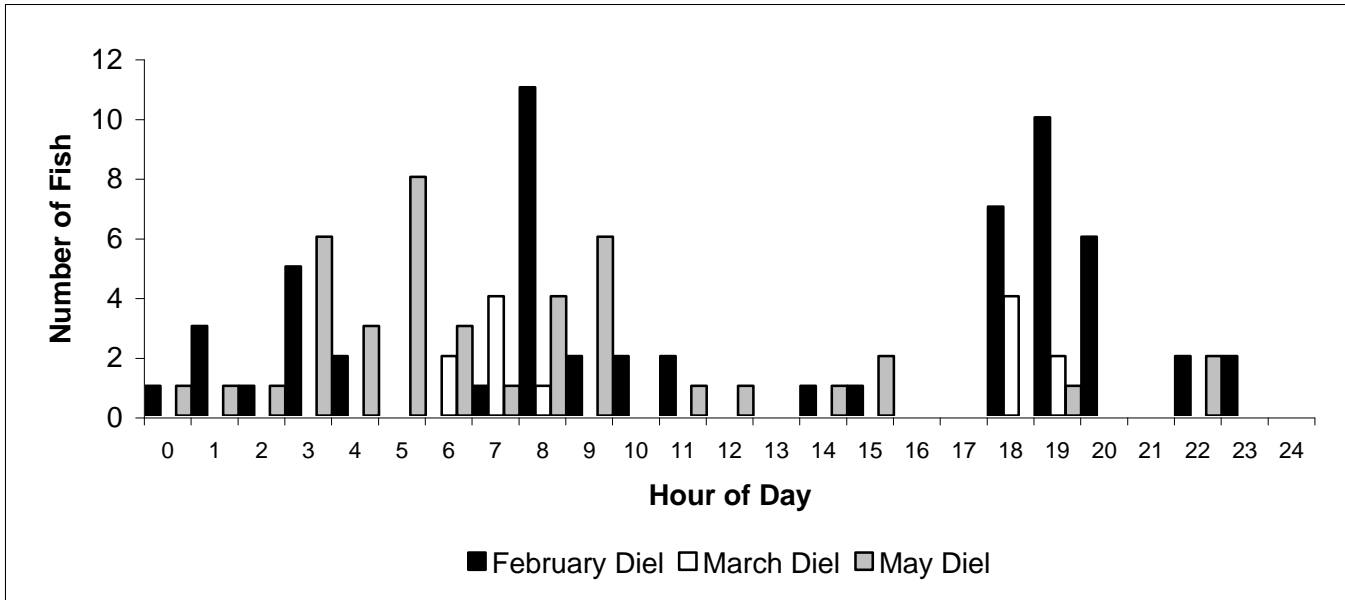


Figure 14. Diel movement pattern of juvenile fall-run chinook salmon on the lower Mokelumne River, Ca, December 13, 2000 through July 24, 2001.

tagging was compromised when 539,000 Mokelumne River Fish Hatchery reared fall chinook were released approximately four miles downstream of the rotary screw traps at Jahant Road between 2/28/01 and 3/1/01 (Rich Bryant pers. comm.). The next week, rotary screw trap captures increased and these hatchery fish may have moved upstream, been captured and tagged, compromising the integrity of the tag groups. Release reports were sent to CDFG reporting the mixed production and citing 3,089 fish tagged with code 06-01-13-02-08, and 238 fish tagged with code 06-01-13-02-09.

Table 2. Coded wire tag data for Mokelumne River fall-run chinook salmon tagged and released at Woodbridge Irrigation District Dam from January 15, 2001 through March 7, 2001.

Tag I.D.	Production	Brood Year	Release Location	Date Released		Total tagged
				First	Last	
06-01-13-02-08	Wild (Mixed)	2000	Woodbridge Dam	1/15/01	3/4/01	3,089
06-01-13-02-09	Wild (Mixed)	2000	Woodbridge Dam	1/30/01	3/5/01	238

Trapping and Trucking

Trapping and trucking occurred from April 26, 2001 through July 24, 2001 and was initiated when daily mean water temperatures at the Frandy gaging station (approximately 8 miles downstream of WIDD) exceeded 18 °C. During this period 56,933 were trapped, 56,413 fish were transported, and the number released alive was 56,229 (Table 3). The mortalities, 1.24%, can be attributed to handling and transport stress. Release location temperatures varied from within 0.1°C of trapping location to a high of 5.3°C of trapping location. Average difference in release v. trap temperatures was 3.0°C (Figure 15). All fish were acclimated to within 1.0°C of release water in the transport tanks by introducing release water into the tanks before release.

Steelhead

Fifty young-of-year steelhead were captured in rotary screw traps from February 16, 2001 through May 29, 2001. In previous years young steelhead have not been captured until March (Marine 2000). The estimate for young-of-year steelhead during this period, based on chinook calibrations, is 244 (95% C.I.: 195-339). Two hundred and ninety-five young-of-year steelhead were captured in the bypass trap from April 26, 2001 through July 24, 2001. Total estimate for 2001 young of year steelhead emigrating is 539 (Appendix B).

Juvenile steelhead were described to lifestage as fry, parr, silvery parr or smolt. Average fork length for fry was 45.6mm FL (range:22-70mm); parr averaged 67.5mm (range:38-111mm), silvery parr averaged 82.1mm (range:56-99mm) and smolts were 98.1mm (range:53-229mm) on average. The diel pattern of movement for steelhead appeared to be mostly nocturnal during screw trap captures. Bypass trap checks were not based on

Table 3. Trapping and Trucking of juvenile fall-run chinook salmon on the lower Mokelumne River, April 26, 2001 through July 24, 2001. Number transported, released alive, and temperatures at capture and release locations.

<u>Date</u>	<u>Capture</u>		<u>Release Site Temperatures (C)</u>				
	<u>Fall-run chinook</u> <u>Transported</u>	<u>Fall-run chinook</u> <u>Released Alive</u>	<u>WIDD</u>	<u>Lighthouse</u> <u>Marina</u>	<u>Wimpy's</u> <u>Marina</u>	<u>Korths</u> <u>Pirate's Lair</u>	<u>B&W</u> <u>Marina</u>
4/26/2001	159	159	17.2		19.0		
4/27/2001	247	246	18.1		19.3		
4/28/2001	155	155	18.0		18.6		
4/29/2001	479	479	18.2		18.3		
4/30/2001	679	678	17.6		18.6		
5/1/2001	628	628	17.7		19.1		
5/2/2001	603	601	17.8		18.8		
5/3/2001	393	393	16.9		17.7		
5/4/2001	1,185	1,183	17.2		18.8		
5/5/2001	948	946	16.7		18.7		
5/6/2001	757	755	17.5		19.1		
5/7/2001	1,173	1,161	18.7		20.8		
5/8/2001	553	552	18.6				20.1
5/9/2001	481	478	19.1				20.8
5/10/2001	419	418	18.8				21.0
5/11/2001	402	402	18.9	20.7			
5/12/2001	1,332	1,331	18.7	21.4			
5/13/2001	1,915	1,914	17.7	21.4			
5/14/2001	980	976	16.6	20.4			
5/15/2001	988	985	16.5	20.5			
5/16/2001	1,897	1,897	17.7	22.1			
5/17/2001	1,660	1,660	18.3	21.4			
5/18/2001	1,209	1,207	18.1	21.7			
5/19/2001	961	961	17.7	22.8			
5/20/2001	1,235	1,235	18.7	22.1			
5/21/2001	1,148	1,133	18.9	22.5			
5/22/2001	643	636	18.2	23.0			
5/23/2001	982	966	18.6	23.0			
5/24/2001	1,129	1,111	18.1	23.3			
5/25/2001	941	935	19.0	23.5			
5/26/2001	1,327	1,320	19.0	22.3			
5/27/2001	2,162	2,161	18.2	22.4			
5/28/2001	1,530	1,515	17.7	22.3			
5/29/2001	1,105	1,105	16.9	18.9			
5/30/2001	560	558	18.0	23.1			
5/31/2001	191	189	19.0	23.9			
6/1/2001	298	296	19.1	22.9			
6/2/2001	2,035	2,032	20.3	22.6			
6/3/2001	2,156	2,156	18.6	22.5			
6/4/2001	2,654	2,632	18.5	22.9			
6/5/2001	1,345	1,344	18.9	22.4			
6/6/2001	1,413	1,412	18.6	23.2			
6/7/2001	886	884	19.8	22.8			
6/8/2001	874	874	19.7	22.4			
6/9/2001	662	662	19.8	22.7			
6/10/2001	949	949	19.8	23.6			

Table 3 (Cont.). Trapping and Trucking of juvenile fall-run chinook salmon on the lower Mokelumne River, April 26, 2001 through July 24, 2001. Number transported, released alive, and temperatures at capture and release locations.

<u>Date</u>	<u>Capture</u>		<u>Release Site Temperatures (C)</u>				
	<u>Fall-run chinook</u> <u>Transported</u>	<u>Fall-run chinook</u> <u>Released Alive</u>	<u>WIDD</u>	<u>Lighthouse</u> <u>Marina</u>	<u>Wimpy's</u> <u>Marina</u>	<u>Korths</u> <u>Pirate's Lair</u>	<u>B&W</u> <u>Marina</u>
6/11/2001	965	955	19.7	22.7			
6/12/2001	546	544	19.8	23.1			
6/13/2001	1,168	1,168	19.4	22.2			
6/14/2001	770	770	20.4	23.2			
6/15/2001	560	560	21.7	23.4			
6/16/2001	819	812	21.8	24.4			
6/17/2001	562	562	20.7	23.8			
6/18/2001	465	465	22.0	23.8			
6/19/2001	417	417	22.4	24.4			
6/20/2001	243	242	22.2	25.1			
6/21/2001	152	152	22.1	25.7			
6/22/2001	221	221	22.2	25.4			
6/23/2001	126	126	21.6	25.0			
6/24/2001	344	344	20.2	24.1			
6/25/2001	268	268	19.1	23.0			
6/26/2001	240	240	19.0	23.3			
6/27/2001	137	137	18.4		21.4		
6/28/2001	483	482	18.2		22.0		
6/29/2001	312	312	18.7		21.3		
6/30/2001	163	163	20.0	22.8			
7/1/2001	112	112	20.5	22.6			
7/2/2001	185	185	21.2			24.5	
7/3/2001	11	10	21.2			23.2	
7/4/2001	19	19	21.3	23.1			
7/5/2001	30	30	21.2			23.4	
7/6/2001	41	40	21.1	24.5			
7/7/2001	19	19	20.8	23.9			
7/8/2001	35	34	20.8	24.1			
7/9/2001	58	58	20.5	23.5			
7/10/2001	80	80	20.1		21.8		
7/11/2001	170	169	19.9	22.0			
7/12/2001	46	46	19.5			21.2	
7/13/2001	18	18	19.6		22.1		
7/14/2001	21	21	20.2	22.3			
7/15/2001	23	22	19.9			21.7	
7/16/2001	41	41	20.1		21.6		
7/17/2001	34	34	19.5		22.3		
7/18/2001	31	31	19.8		21.0		
7/19/2001	13	13	20.1		21.1		
7/20/2001	16	16	19.9	22.7			
7/21/2001	5	5	19.6	22.0			
7/22/2001	9	9	19.9	22.6			
7/23/2001	7	7	20.3		21.8		
7/24/2001							
Total	56,413	56,229					

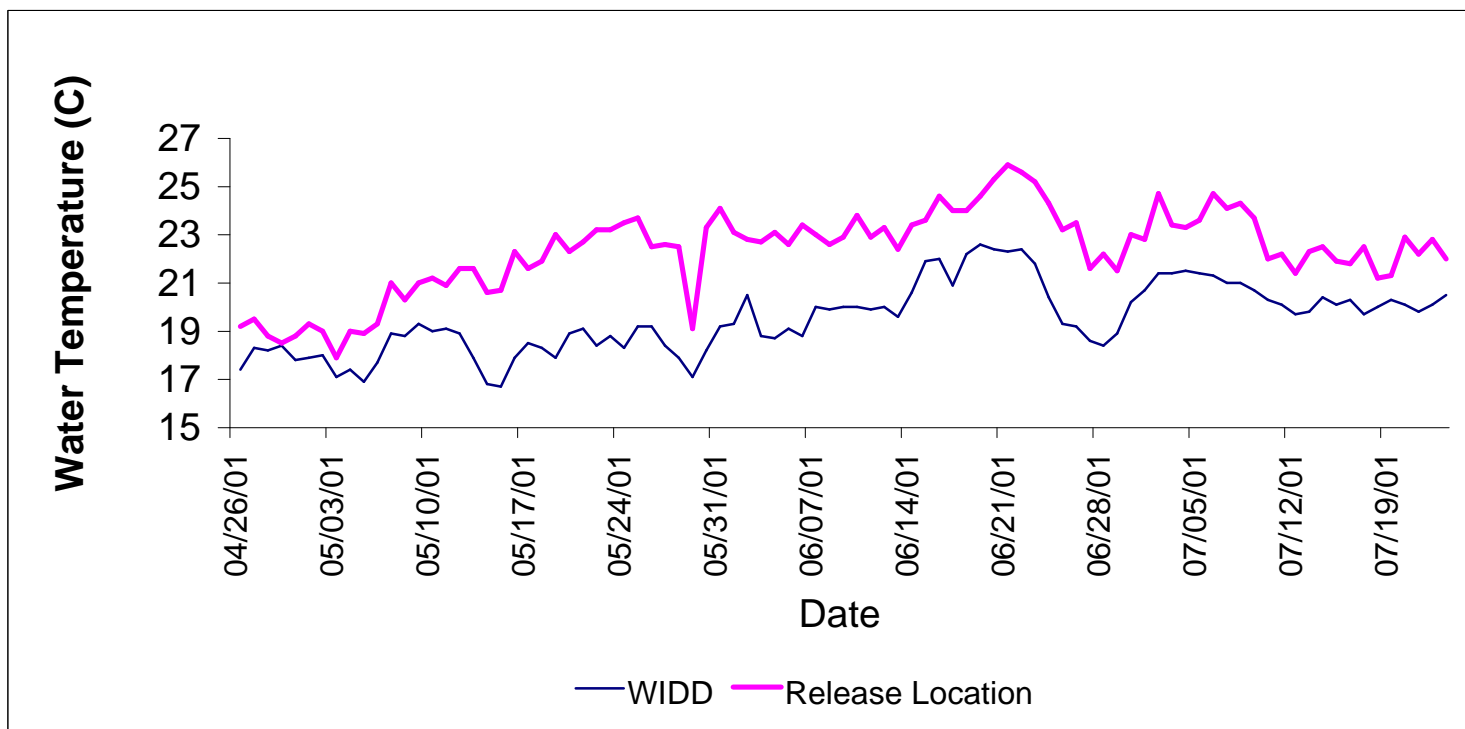


Figure 15. Water temperatures associated with trapping and trucking juvenile fall-run chinook salmon on the lower Mokelumne River, Ca. April 26, 2001 through July 24, 2001.

sunrise and sunset, so diel patterns for May through July can not be accurately determined (Figures 16 and 17).

Five hundred and ninety-six age 1+ steelhead also captured during monitoring. Of these, 495 had adipose fin clips. The majority of the ad-clipped hatchery origin fish were captured between January and May. Ninety-nine percent of the adipose clipped fish were captured in January, February and March.

Two unclipped adult steelhead were captured in the screw traps in February, and one spawned-out unclipped female steelhead was captured in the screw traps in June.

Incidental Species

Twenty-nine fish species were observed in rotary screw traps and bypass trap. The most abundant fish observed was fall-run chinook salmon followed by unknown juvenile black bass, Pacific lamprey and prickly sculpin, in order of abundance. Most of the Pacific lamprey observed were eyed juvenile (99%) with a small number of ammocoetes and adult lamprey appearing in the catch. Adult lampreys were observed in screw traps from January through May. (Table 4).

One adult yellowfin goby (*Acanthogobius flavimanus*) was observed in sampling in January. This represents the first occurrence of this invasive species this high in the Mokelumne River. Other observations have been made on the lower Mokelumne River at the confluence with the Cosumnes River. The yellowfin goby is an estuarine fish native to Japan that was first discovered in in the Sacramento-San Joaquin estuary in 1963 (Brittan et al 1963). It is thought to have been introduced through ballast water (Middleton 1982). In some coastal areas yellowfin goby have partially displaced staghorn sculpin (Brittan et al 1970) and may pose a threat to the locally abundant, native prickly sculpin.

In February and March, 24 smelt were captured in the screw traps and positively identified as Wakasagi (*Hypomesus nipponensis*) using the number of chromatophores on the chin as the key descriptor (Moyle 1976).

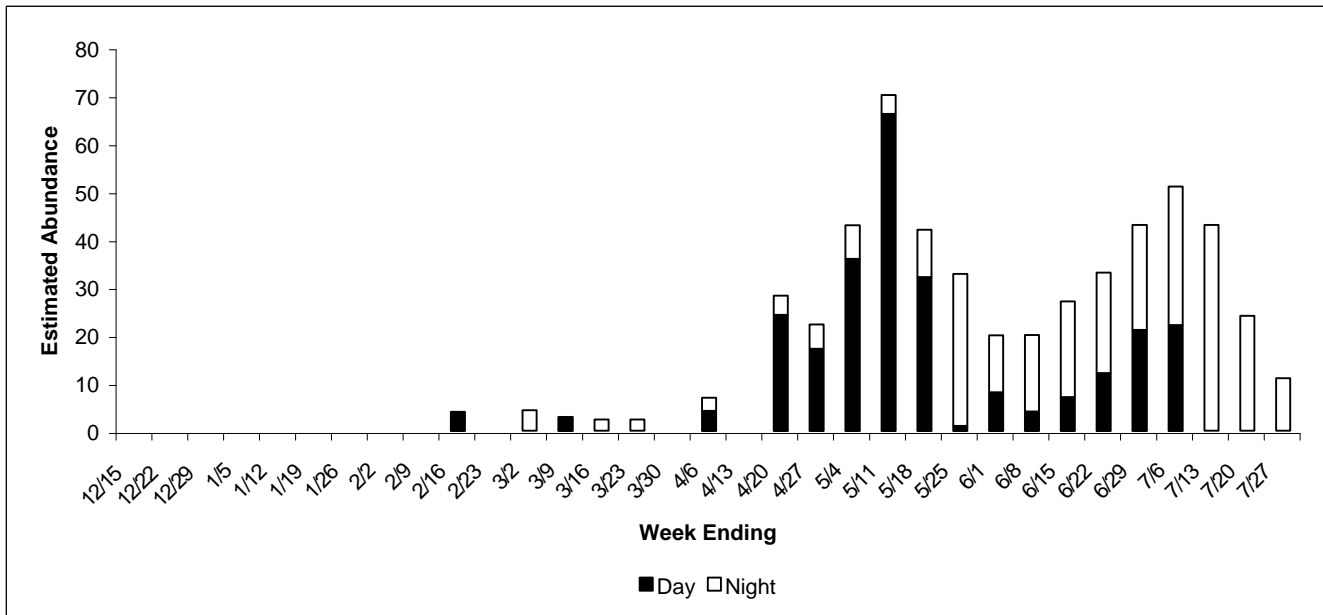


Figure 16. Weekly diel abundance of young of year steelhead emigrating past Woodbridge Dam from December 17, 2000 through July 24, 2001.

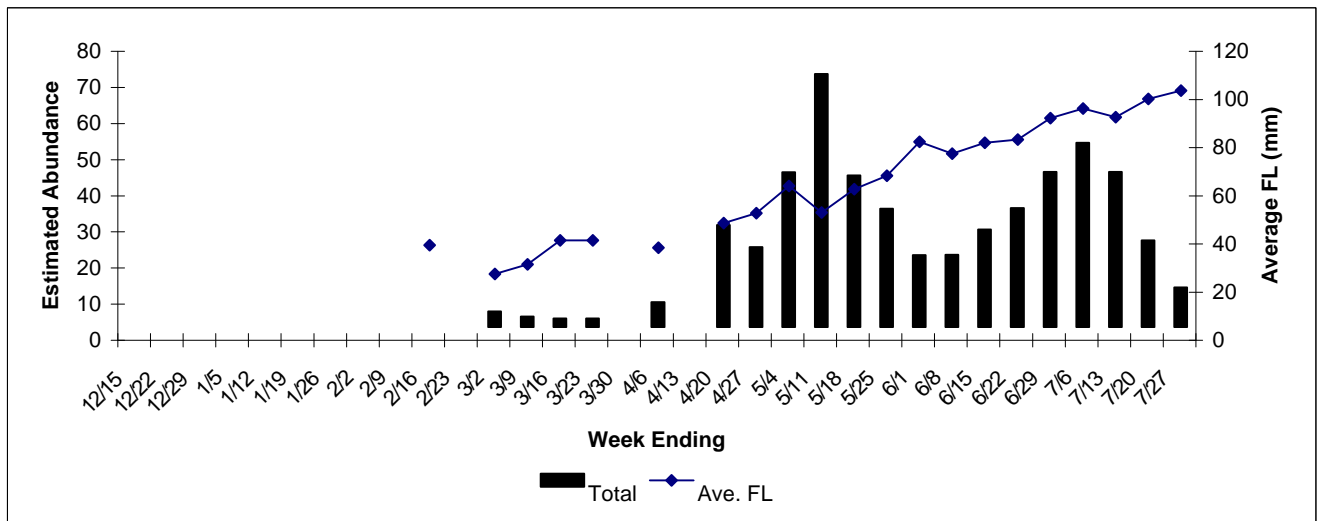


Figure 17. Weekly abundance of young of year steelhead and average fork length (mm) emigrating past Woodbridge Dam from December 17, 2000 through July 24, 2001.

Table 4. Fish species captured below Woodbridge Dam on the Lower Mokelumne River, San Joaquin County, Ca. from December 18, 2000 through July 31, 2001.

Species	Life Stage	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
American Shad <i>Alosa sapidissima</i>	Juvenile	0	0	0	0	0	0	0	0	0
	Adult	0	0	0	0	0	3	0	0	3
Brown Bullhead <i>Ameiurus nebulosus</i>	Juvenile	0	0	0	0	1	0	0	0	1
Black Crappie <i>Pomoxis nigromaculatus</i>	Juvenile	0	0	0	0	2	8	0	0	10
	Adult	0	0	0	0	0	0	0	0	0
Bluegill <i>Lepomis macrochirus</i>	Juvenile	7	14	7	48	16	11	1	0	104
	Adult	1	3	14	25	60	53	0	0	156
Carp <i>Cyprinus carpio</i>	Juvenile	0	0	1	0	2	276	143	19	441
	Adult	0	0	0	0	0	0	0	0	0
Channel Catfish <i>Ictalurus punctatus</i>	Juvenile	0	0	0	2	0	1	0	0	3
	Adult	0	0	0	0	0	0	0	1	1
Fall-chinook salmon <i>Oncorhynchus tshawytscha</i>	Juvenile	39	861	4,526	5,296	2,646	32,378	22,316	1,040	69,102
	1+	1	10	2	1	13	0	0	0	27
Goldfish <i>Carassius auratus</i>	Juvenile	4	8	2	2	0	1	1	5	23
	Adult	0	2	0	0	0	0	0	0	2
Golden Shiner <i>Notemigonus crysoleucas</i>	Juvenile	0	1	0	2	0	0	0	0	3
	Adult	3	13	4	14	5	3	0	2	44
Green Sunfish <i>Lepomis cyanellus</i>	Juvenile	1	1	0	1	3	9	1	1	17
	Adult	0	0	0	0	1	1	0	0	2
Hitch <i>Lavinia exilicauda</i>	Juvenile	2	1	0	2	2	36	4	2	49
	Adult	0	0	2	2	3	6	1	0	14
Inland Silverside <i>Menidia beryllina</i>	Juvenile	0	0	0	0	0	2	0	0	2
	Adult	1	2	18	0	5	2	0	0	28
Lepomis hybrid <i>Lepomis sp.</i>	Juvenile	0	0	0	0	0	1	0	0	1
	Adult	0	0	0	0	0	0	0	0	0
Largemouth Bass <i>Micropterus salmoides</i>	Juvenile	1	2	0	1	3	4	0	0	11
	Adult	0	0	0	0	0	0	0	0	0
Mosquitofish <i>Gambusia affinis</i>	Juvenile	0	0	0	0	1	0	0	0	1
	Adult	0	0	0	0	0	0	0	0	0
Pacific Lamprey <i>Lampetra tridentata</i>	Ammocete	1	0	0	0	2	0	0	0	3
	Juvenile	3	7,756	1,863	467	412	500	113	22	11,136
	Adult	0	1	0	3	1	1	0	0	6

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Appendix A. Daily abundance of juvenile fall-run chinook migrating past Woodbridge Irrigation District Dam, December 17, 2000 through May 29, 2001. Data estimated from screw trap captures and bypass trap captures

	YOY Day	YOY Night	Trap Efficiency Day	Trap Efficiency Night	Estimated YOY Day	Estimated YOY Night	Estimated YOY Total	95% Confidence Interval		Bypass Catch Total
								High	Low	
12/18/00	0	0	0.350	0.250	0	0	0	0	0	0
12/19/00	0	10	0.350	0.250	0	40	40	32	26	
12/20/00	1	8	0.350	0.250	3	32	35	30	24	
12/21/00	0	5	0.350	0.250	0	20	20	16	13	
12/22/00	0	4	0.350	0.250	0	16	16	13	10	
12/23/00	0	7	0.350	0.250	0	28	28	23	18	
12/24/00	0	7	0.350	0.250	0	28	28	23	18	
12/25/00	0	7	0.350	0.250	0	28	28	23	18	
12/26/00	0	7	0.350	0.250	0	28	28	23	18	
12/27/00	0	1	0.350	0.250	0	4	4	3	3	
12/28/00	1	2	0.350	0.250	3	8	11	11	9	
12/29/00	1	1	0.350	0.250	3	4	7	8	6	
12/30/00	0	5	0.350	0.250	0	20	20	16	13	
12/31/00	0	10	0.350	0.250	0	40	40	32	26	
01/01/01	0	10	0.350	0.250	0	40	40	32	26	
01/02/01	0	10	0.350	0.250	0	40	40	32	26	
01/03/01	0	12	0.350	0.250	0	48	48	39	31	
01/04/01	1	21	0.350	0.250	3	84	87	72	57	
01/05/01	2	20	0.350	0.250	6	80	86	74	58	
01/06/01	5	11	0.350	0.250	14	44	58	59	46	
01/07/01	0	1	0.350	0.250	0	4	4	3	3	
01/08/01	2	4	0.350	0.250	6	16	22	22	17	
01/09/01	0	7	0.350	0.250	0	28	28	23	18	
01/10/01	1	2	0.350	0.250	3	8	11	11	9	
01/11/01	17	5	0.350	0.250	49	20	69	95	72	
01/12/01	4	29	0.350	0.250	11	116	127	112	88	
01/13/01	4	29	0.350	0.250	11	116	127	112	88	
01/14/01	4	29	0.350	0.250	11	116	127	112	88	
01/15/01	1	29	0.350	0.250	3	116	119	98	78	

Appendix A. Daily abundance of juvenile fall-run chinook migrating past Woodbridge Irrigation District Dam, December 17, 2000 through May 29, 2001. Data estimated from screw trap captures and bypass captures

	YOY Day	YOY Night	Trap Efficiency Day	Trap Efficiency Night	Estimated YOY Day	Estimated YOY Night	Estimated YOY Total	95% Confidence Interval		Bypass Catch Total
								High	Low	
01/16/01	0	19	0.350	0.250	0	76	76	61	49	
01/17/01	3	54	0.350	0.250	9	216	224	188	149	
01/18/01	2	85	0.350	0.250	6	339	345	284	225	
01/19/01	2	28	0.350	0.250	6	112	118	100	79	
01/20/01	2	40	0.350	0.250	6	160	165	138	110	
01/21/01	2	40	0.350	0.250	6	160	165	138	110	
01/22/01	1	40	0.350	0.250	3	160	163	134	106	
01/23/01	1	37	0.317	0.298	3	124	127	146	113	
01/24/01	2	21	0.317	0.298	6	70	77	88	68	
01/25/01	0	20	0.317	0.298	0	67	67	77	59	
01/26/01	31	70	0.317	0.298	98	235	332	390	290	
01/27/01	11	111	0.317	0.298	35	372	407	469	359	
01/28/01	11	111	0.317	0.298	35	372	407	469	359	
01/29/01	23	111	0.317	0.298	73	372	445	516	391	
01/30/01	5	216	0.317	0.298	16	724	740	849	655	
01/31/01	4	125	0.317	0.298	13	419	432	496	382	
02/01/01	26	214	0.317	0.298	82	717	799	924	705	
02/02/01	6	155	0.317	0.298	19	519	538	619	476	
02/03/01	11	151	0.317	0.298	35	506	541	623	478	
02/04/01	11	151	0.317	0.298	35	506	541	623	478	
02/05/01	5	151	0.317	0.298	16	506	522	600	462	
02/06/01	12	194	0.317	0.298	38	650	688	792	608	
02/07/01	15	59	0.231	0.444	65	133	198	223	178	
02/08/01	1	159	0.231	0.444	4	358	362	399	332	
02/09/01	0	33	0.231	0.444	0	74	74	82	68	
02/10/01	1	5	0.231	0.444	4	11	16	17	14	
02/11/01	1	7	0.231	0.444	4	16	20	22	18	
02/12/01	0	21	0.231	0.444	0	47	47	52	43	

Appendix A. Daily abundance of juvenile fall-run chinook migrating past Woodbridge Irrigation District Dam, December 17, 2000 through May 29, 2001. Data estimated from screw trap captures and bypass captures

	YOY Day	YOY Night	Trap Efficiency Day	Trap Efficiency Night	Estimated YOY Day	Estimated YOY Night	Estimated YOY Total	95% Confidence Interval		Bypass Catch Total
								High	Low	
02/13/01	3	37	0.231	0.444	13	83	96	107	88	
02/14/01	13	629	0.231	0.444	56	1,416	1,473	1,626	1,347	
02/15/01	6	225	0.231	0.444	26	507	533	588	487	
02/16/01	10	158	0.231	0.444	43	356	399	443	364	
02/17/01	8	311	0.231	0.444	35	700	735	812	672	
02/18/01	8	151	0.288	0.232	28	652	680	855	564	
02/19/01	15	155	0.288	0.232	52	669	721	905	579	
02/20/01	49	427	0.288	0.232	170	1,844	2,014	2,525	1,573	
02/21/01	14	129	0.288	0.232	49	557	606	760	609	
02/22/01	5	47	0.288	0.232	17	203	220	276	210	
02/23/01	34	15	0.288	0.232	118	65	183	220	69	
02/24/01	45	83	0.288	0.232	156	358	514	635	400	
02/25/01	28	263	0.288	0.232	97	1,136	1,233	1,546	1,077	
02/26/01	8	180	0.288	0.232	28	777	805	1,013	729	
02/27/01	17	190	0.343	0.414	50	459	509	580	453	
02/28/01	5	344	0.343	0.414	15	831	846	962	755	
03/01/01	18	342	0.343	0.414	53	827	879	1,001	784	
03/02/01	352	98	0.343	0.414	1,028	237	1,264	1,468	1,111	
03/03/01	572	780	0.343	0.414	1,670	1,885	3,555	4,090	3,144	
03/04/01	165	1,001	0.343	0.414	482	2,419	2,901	3,311	2,581	
03/05/01	116	269	0.343	0.414	339	650	989	1,134	877	
03/06/01	146	210	0.343	0.414	426	508	934	1,074	826	
03/07/01	115	175	0.343	0.414	336	423	759	872	671	
03/08/01	48	131	0.343	0.414	140	317	457	523	405	
03/09/01	45	115	0.343	0.414	131	278	409	469	363	
03/10/01	48	105	0.343	0.414	140	254	394	452	349	
03/11/01	48	105	0.343	0.414	140	254	394	452	349	
03/12/01	62	105	0.343	0.414	181	254	435	500	385	

Appendix A. Daily abundance of juvenile fall-run chinook migrating past Woodbridge Irrigation District Dam, December 17, 2000 through May 29, 2001. Data estimated from screw trap captures and bypass captures

	YOY Day	YOY Night	Trap Efficiency Day	Trap Efficiency Night	Estimated YOY Day	Estimated YOY Night	Estimated YOY Total	95% Confidence Interval		Bypass Catch Total
								High	Low	
03/13/01	8	116	0.343	0.414	23	280	304	346	271	
03/14/01	9	37	0.343	0.414	26	89	116	132	103	
03/15/01	5	52	0.343	0.414	15	126	140	160	125	
03/16/01	0	24	0.343	0.414	0	58	58	66	52	
03/17/01	4	0	0.343	0.414	12	0	12	14	10	
03/18/01	62	24	0.343	0.414	181	58	239	277	210	
03/19/01	1	11	0.343	0.414	3	27	30	34	26	
03/20/01	0	9	0.343	0.414	0	22	22	25	19	
03/21/01	14	1	0.243	0.354	58	3	60	72	52	
03/22/01	34	13	0.243	0.354	140	37	177	208	153	
03/23/01	14	7	0.243	0.354	58	20	77	91	67	
03/24/01	14	7	0.243	0.354	58	20	77	91	67	
03/25/01	0	7	0.243	0.354	0	20	20	22	18	
03/26/01	11	0	0.243	0.354	45	0	45	54	39	
03/27/01	23	6	0.243	0.354	95	17	112	132	97	
03/28/01	2	13	0.243	0.354	8	37	45	52	40	
03/29/01	2	21	0.243	0.354	8	59	68	77	60	
03/30/01	7	27	0.243	0.354	29	76	105	121	93	
03/31/01	11	29	0.243	0.354	45	82	127	147	112	
04/01/01	11	29	0.243	0.354	45	82	127	147	112	
04/02/01	12	29	0.243	0.354	49	82	131	152	116	
04/03/01	6	33	0.243	0.354	25	93	118	135	105	
04/04/01	37	59	0.243	0.354	152	167	319	371	280	
04/05/01	6	21	0.243	0.354	25	59	84	97	74	
04/06/01	0	14	0.243	0.354	0	40	40	45	35	
04/07/01	10	27	0.243	0.354	41	76	117	136	104	
04/08/01	10	27	0.243	0.354	41	76	117	136	104	
04/09/01	6	27	0.243	0.354	25	76	101	116	89	

Appendix A. Daily abundance of juvenile fall-run chinook migrating past Woodbridge Irrigation District Dam, December 17, 2000 through May 29, 2001. Data estimated from screw trap captures and bypass captures

	YOY Day	YOY Night	Trap Efficiency Day	Trap Efficiency Night	Estimated YOY Day	Estimated YOY Night	Estimated YOY Total	95% Confidence Interval		Bypass Catch Total
								High	Low	
04/10/01	5	25	0.124	0.490	40	51	91	109	79	
04/11/01	2	25	0.124	0.490	16	51	67	77	60	
04/12/01	2	18	0.124	0.490	16	37	53	62	47	
04/13/01	0	10	0.124	0.490	0	20	20	22	19	
04/14/01	3	22	0.124	0.490	24	45	69	81	61	
04/15/01	3	22	0.124	0.490	24	45	69	81	61	
04/16/01	10	22	0.124	0.490	81	45	125	156	106	
04/17/01	5	28	0.124	0.490	40	57	97	116	85	
04/18/01	1	22	0.124	0.490	8	45	53	60	48	
04/19/01	7	29	0.124	0.490	56	59	116	140	100	
04/20/01	6	23	0.124	0.490	48	47	95	116	82	
04/21/01	0	37	0.124	0.490	0	75	75	83	69	
04/22/01	9	52	0.124	0.490	72	106	179	213	156	
04/23/01	13	52	0.124	0.490	105	106	211	255	181	
04/24/01	16	59	0.124	0.490	129	120	249	303	214	
04/25/01	34	86	0.124	0.490	274	175	449	556	381	15
04/26/01	20	73	0.124	0.490	161	149	310	377	266	172
04/27/01	24	67	0.124	0.490	193	137	330	407	281	160
04/28/01	14	41	0.124	0.490	113	84	196	241	167	320
04/29/01	22	39	0.124	0.490	177	80	257	323	215	214
04/30/01	21	96	0.124	0.490	169	196	365	439	316	706
05/01/01	59	118	0.094	0.506	630	233	863	1,266	670	315
05/02/01	45	266	0.094	0.506	481	526	1,006	1,354	826	338
05/03/01	15	125	0.094	0.506	160	247	407	532	340	272
05/04/01	1	155	0.094	0.506	11	306	317	359	285	1468
05/05/01	34	102	0.094	0.506	363	202	565	804	447	867
05/06/01	43	104	0.094	0.506	459	206	665	962	521	696
05/07/01	29	134	0.094	0.506	310	265	575	790	465	817

Appendix A. Daily abundance of juvenile fall-run chinook migrating past Woodbridge Irrigation District Dam, December 17, 2000 through May 29, 2001. Data estimated from screw trap captures and bypass trap captures

	YOY Day	YOY Night	Trap Efficiency Day	Trap Efficiency Night	Estimated YOY Day	Estimated YOY Night	Estimated YOY Total	95% Confidence Interval		Bypass Catch Total
								High	Low	
07/03/01										11
07/04/01										19
07/05/01										31
07/06/01										41
07/07/01										19
07/08/01										35
07/09/01										58
07/10/01										80
07/11/01										171
07/12/01										46
07/13/01										18
07/14/01										21
07/15/01										24
07/16/01										41
07/17/01										38
07/18/01										31
07/19/01										3
07/20/01										17
07/21/01										5
07/22/01										10
07/23/01										7
07/24/01										5
Total	4,426	15,722			27,375	40,919	68,294	86,108	56,998	51,039

Appendix B. Daily abundance of juvenile steelhead migrating past Woodbridge Irrigation District Dam, February 16,2001 through July 24, 2001. Data estimated from screw trap captures and bypass trap captures

Date	YOY Day	YOY Night	Trap Efficiency Day	Trap Efficiency Night	Estimated YOY Day	Estimated YOY Night	Estimated YOY Total	95% Confidence Interval		Bypass Catch Total
								High	Low	
02/16/01	1	0	0.231	0.444	4	0	4	5	4	
02/17/01	0	0	0.231	0.444	0	0	0	0	0	
02/18/01	0	0	0.288	0.232	0	0	0	0	0	
02/19/01	0	0	0.288	0.232	0	0	0	0	0	
02/20/01	0	0	0.288	0.232	0	0	0	0	0	
02/21/01	0	0	0.288	0.232	0	0	0	0	0	
02/22/01	0	0	0.288	0.232	0	0	0	0	0	
02/23/01	0	0	0.288	0.232	0	0	0	0	0	
02/24/01	0	0	0.288	0.232	0	0	0	0	0	
02/25/01	0	0	0.288	0.232	0	0	0	0	0	
02/26/01	0	1	0.288	0.232	0	4	4	5	4	
02/27/01	0	0	0.343	0.414	0	0	0	0	0	
02/28/01	0	0	0.343	0.414	0	0	0	0	0	
03/01/01	0	0	0.343	0.414	0	0	0	0	0	
03/02/01	0	0	0.343	0.414	0	0	0	0	0	
03/03/01	0	0	0.343	0.414	0	0	0	0	0	
03/04/01	0	0	0.343	0.414	0	0	0	0	0	
03/05/01	0	0	0.343	0.414	0	0	0	0	0	
03/06/01	0	0	0.343	0.414	0	0	0	0	0	
03/07/01	0	0	0.343	0.414	0	0	0	0	0	
03/08/01	1	0	0.343	0.414	3	0	3	3	3	
03/09/01	0	0	0.343	0.414	0	0	0	0	0	
03/10/01	0	0	0.343	0.414	0	0	0	0	0	
03/11/01	0	0	0.343	0.414	0	0	0	0	0	
03/12/01	0	0	0.343	0.414	0	0	0	0	0	
03/13/01	0	0	0.343	0.414	0	0	0	0	0	
03/14/01	0	0	0.343	0.414	0	0	0	0	0	

Appendix B. Daily abundance of juvenile steelhead migrating past Woodbridge Irrigation District Dam, February 16,2001 through July 24, 2001. Data estimated from screw trap captures and bypass trap captures

Date	YOY Day	YOY Night	Trap Efficiency Day	Trap Efficiency Night	Estimated YOY Day	Estimated YOY Night	Estimated YOY Total	95% Confidence Interval		Bypass Catch Total
								High	Low	
03/15/01	0	1	0.343	0.414	0	2	2	3	2	
03/16/01	0	0	0.343	0.414	0	0	0	0	0	
03/17/01	0	0	0.343	0.414	0	0	0	0	0	
03/18/01	0	0	0.343	0.414	0	0	0	0	0	
03/19/01	0	0	0.343	0.414	0	0	0	0	0	
03/20/01	0	1	0.343	0.414	0	2	2	3	2	
03/21/01	0	0	0.243	0.354	0	0	0	0	0	
03/22/01	0	0	0.243	0.354	0	0	0	0	0	
03/23/01	0	0	0.243	0.354	0	0	0	0	0	
03/24/01	0	0	0.243	0.354	0	0	0	0	0	
03/25/01	0	0	0.243	0.354	0	0	0	0	0	
03/26/01	0	0	0.243	0.354	0	0	0	0	0	
03/27/01	0	0	0.243	0.354	0	0	0	0	0	
03/28/01	0	0	0.243	0.354	0	0	0	0	0	
03/29/01	0	0	0.243	0.354	0	0	0	0	0	
03/30/01	0	0	0.243	0.354	0	0	0	0	0	
03/31/01	0	0	0.243	0.354	0	0	0	0	0	
04/01/01	0	0	0.243	0.354	0	0	0	0	0	
04/02/01	1	0	0.243	0.354	4	0	4	5	4	
04/03/01	0	0	0.243	0.354	0	0	0	0	0	
04/04/01	0	0	0.243	0.354	0	0	0	0	0	
04/05/01	0	0	0.243	0.354	0	0	0	0	0	
04/06/01	0	1	0.243	0.354	0	3	3	3	3	
04/07/01	0	0	0.243	0.354	0	0	0	0	0	
04/08/01	0	0	0.243	0.354	0	0	0	0	0	
04/09/01	0	0	0.243	0.354	0	0	0	0	0	
04/10/01	0	0	0.124	0.490	0	0	0	0	0	
04/11/01	0	0	0.124	0.490	0	0	0	0	0	

Appendix B. Daily abundance of juvenile steelhead migrating past Woodbridge Irrigation District Dam, February 16,2001 through July 24, 2001. Data estimated from screw trap captures and bypass trap captures

Date	YOY Day	YOY Night	Trap Efficiency Day	Trap Efficiency Night	Estimated YOY Day	Estimated YOY Night	Estimated YOY Total	95% Confidence Interval		Bypass Catch Total
								High	Low	
04/12/01	0	0	0.124	0.490	0	0	0	0	0	0
04/13/01	0	0	0.124	0.490	0	0	0	0	0	0
04/14/01	0	0	0.124	0.490	0	0	0	0	0	0
04/15/01	0	0	0.124	0.490	0	0	0	0	0	0
04/16/01	0	0	0.124	0.490	0	0	0	0	0	0
04/17/01	1	0	0.124	0.490	8	0	8	11	6	0
04/18/01	1	1	0.124	0.490	8	2	10	13	8	0
04/19/01	0	0	0.124	0.490	0	0	0	0	0	0
04/20/01	1	1	0.124	0.490	8	2	10	13	8	0
04/21/01	0	1	0.124	0.490	0	2	2	2	2	0
04/22/01	0	0	0.124	0.490	0	0	0	0	0	0
04/23/01	0	0	0.124	0.490	0	0	0	0	0	0
04/24/01	1	1	0.124	0.490	8	2	10	13	8	0
04/25/01	0	0	0.124	0.490	0	0	0	0	0	0
04/26/01	1	0	0.124	0.490	8	0	8	11	6	2
04/27/01	0	0	0.124	0.490	0	0	0	0	0	0
04/28/01	1	1	0.124	0.490	8	2	10	13	8	1
04/29/01	1	0	0.124	0.490	8	0	8	11	6	0
04/30/01	1	0	0.124	0.490	8	0	8	11	6	0
05/01/01	0	0	0.094	0.506	0	0	0	0	0	1
05/02/01	0	0	0.094	0.506	0	0	0	0	0	2
05/03/01	0	0	0.094	0.506	0	0	0	0	0	0
05/04/01	1	0	0.094	0.506	11	0	11	17	8	2
05/05/01	0	0	0.094	0.506	0	0	0	0	0	1
05/06/01	0	0	0.094	0.506	0	0	0	0	0	1
05/07/01	2	1	0.094	0.506	21	2	23	36	17	0
05/08/01	0	0	0.094	0.506	0	0	0	0	0	1
05/09/01	0	0	0.094	0.506	0	0	0	0	0	1

Appendix B. Daily abundance of juvenile steelhead migrating past Woodbridge Irrigation District Dam, February 16,2001 through July 24, 2001. Data estimated from screw trap captures and bypass trap captures

Date	YOY Day	YOY Night	Trap Efficiency Day	Trap Efficiency Night	Estimated YOY Day	Estimated YOY Night	Estimated YOY Total	95% Confidence Interval		Bypass Catch Total
								High	Low	
07/05/01										3
07/06/01										8
07/07/01										0
07/08/01										5
07/09/01										3
07/10/01										7
07/11/01										12
07/12/01										7
07/13/01										9
07/14/01										4
07/15/01										4
07/16/01										1
07/17/01										1
07/18/01										7
07/19/01										4
07/20/01										3
07/21/01										3
07/22/01										6
07/23/01										1
07/24/01										1
Total	21	29			183	62	244	339	195	292