RESULTS OF THE FISHERIES MONITORING PLAN FOR THE SONOMA COUNTY WATER AGENCY 2011 TEMPORARY URGENCY CHANGE (TUC)

March 31, 2012

Sonoma County Water Agency
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SONOMA COUNTY WATER AGENCY

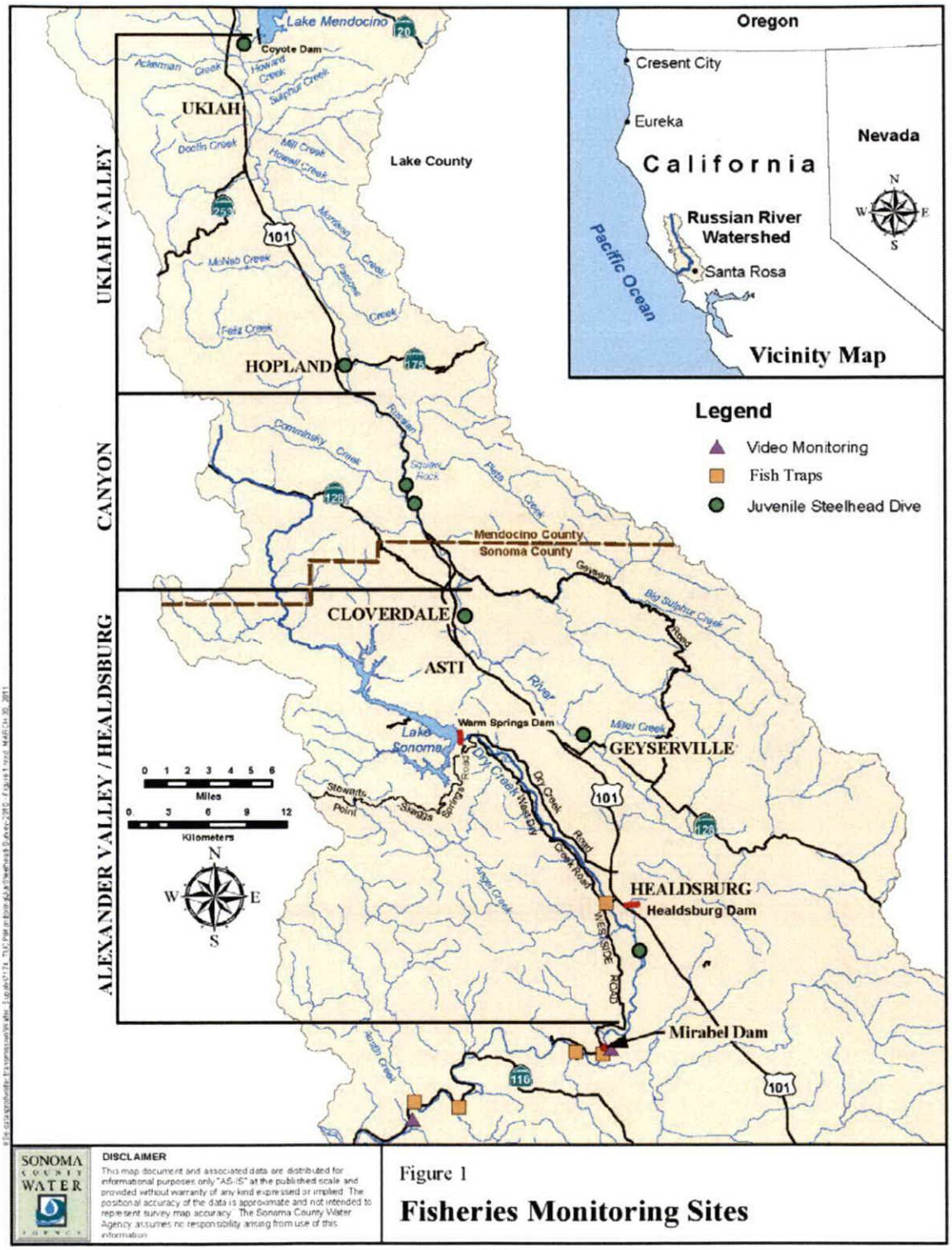
Introduction

On September 24, 2008 the National Marine Fisheries Service (NMFS) issued the Biological Opinion for Water Supply, Flood Control, and Channel Maintenance (Biological Opinion) to the U.S. Army Corps of Engineers, the Sonoma County Water Agency (Water Agency), and the Mendocino County Russian River Flood Control and Water Conservation Improvement District in the Russian River watershed (NMFS 2008). The Biological Opinion found that high summer time flow in the Russian River under the current State Water Resources Control Board (State Water Board) Decision 1610 (D1610) degraded steelhead and coho salmon habitat.

On April 18, 2011, the Water Agency submitted a petition to the State Water Board requesting a temporary urgency change to D1610 to meet lower in-stream flows required by the Biological Opinion. On June 1, 2011, the State Water Board issued "In the Matter of Permits 12947 A, 12949, 12950, and 16596 Order Approving Temporary Urgency Change" for the following temporary changes to D1610:

(1) From May 1 through October 15, 2011 in-stream flow requirements for the upper Russian River (from the confluence with the East Fork of the Russian River to its Confluence with Dry Creek) be reduced from 185 cubic feet per second (cfs) to 125 cfs.
(2) From May 1 through October 15, 2011 in-stream flow requirements for the lower Russian River (downstream of its confluence with Dry Creek) be reduced from 125 cfs to 70 cfs, with the understanding the Water Agency will typically maintain approximately 85 cfs at the Hacienda gauge as practicably feasible.

Provisions 2 through 7 of the State Water Board Order required the Water Agency to conduct and report on a number of fisheries monitoring projects. The Water Agency and State Water Board consulted with NMFS and the California Department of Fish and Game (DFG) regarding the fisheries monitoring objectives and methods. Projects included monitoring adult Chinook salmon returns at the Mirabel inflatable dam, dive surveys to monitor Chinook in the lower and upper Russian River, dive surveys to measure the relative abundance of juvenile steelhead and native freshwater fish in the upper Russian River, salmonid downstream migrant trapping operations in Dry Creek, the mainstem of the Russian River at Mirabel Dam and the Russian River estuary near Duncans Mills (Figure 1). Updates of fisheries monitoring data were sent to NMFS and DFG staff on a weekly basis per provision 7 of the State Water Board Order. While not a provision of the State Water Board Order, the Biological Opinion requires fish trap data collection in Austin Creek, Dutchbill Creek, and Green Valley Creek (Figure 1). We present data collected at these sites in this report to supplement information required by the State Water Board Order. In spring of 2012, the results of all Water Agency Biological Opinion monitoring will be presented in a comprehensive report to NMFS and DFG.



SONOMA COUNTY WATER AGENCY

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Figure 1

Fisheries Monitoring Sites

Methods

Video Monitoring of Adult Salmon Migration

The Water Agency has operated an underwater video camera system in fish ladders at the Mirabel inflatable dam to monitor the upstream migration of adult Chinook salmon for over a decade. As anadromous fish move upstream through the fish ladders on both sides of Mirabel Dam they are recorded by cameras (Figure 2). The cameras operate 24 hours a day, 7 days a week starting September 1, and ending when the dam is deflated due to high winter flows (typically in December, but the cameras were operated until January 17, 2012). Video is reviewed by Water Agency biologists on a daily basis. Fish detected on the video are identified to species and enumerated. For detailed methods see Chase (2005).

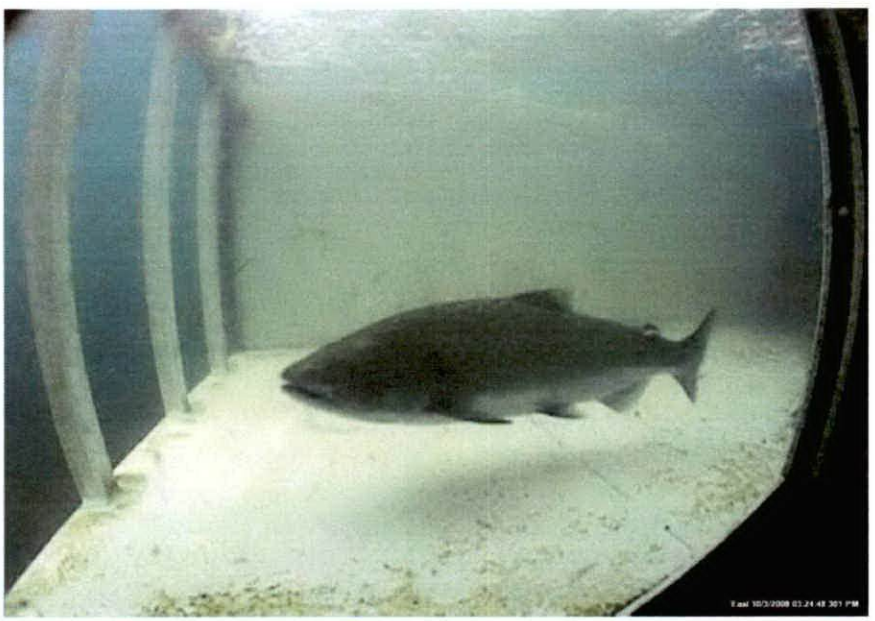

Figure 2. An image of an adult Chinook taken from the Mirabel Dam underwater video monitoring system located on the Russian River near Forestville, CA.

Adult Chinook Salmon Dive Surveys:

Weekly Chinook salmon dive surveys in the mainstem Russian River were performed from October 11 to November 10, 2011. Per the State Water Board Order, if Chinook were able to enter the Russian River (i.e. the river mouth was open), flows at U.S. Geological Survey Hacienda Bridge Gaging Station were below 125 cfs, and less than 200 Chinook had been observed on the Mirabel camera system, the Water Agency was to conduct surveys in the lower Russian River below the Mirabel Dam. Once 200 Chinook had been observed on the camera system, the Water Agency was to conduct dive surveys in the mainstem River upstream of the Mirabel Dam.

Dive sites were selected to provide the best water velocity, river depth, and water clarity conditions to observe fish. Where feasible, sites sampled during previous years of monitoring were selected for surveys in 2010. In previous years, dive surveys were conducted at 8 sites in 2 reaches along the Russian River. The Downstream reach extends from Brown's pool near Cassini's Ranch to the Mirabel Dam near the town of Forestville, CA. The Upstream reach extends from the Mirabel Dam to Diggers Bend near the Rio Linda Academy. In previous years surveys were conducted at Brown's pool near Cassini's Ranch, immediately downstream of the Vacation Beach Dam near Guerneville, immediately downstream of the Johnson Beach Dam near Guerneville, and at the pool immediately downstream of the Mirabel Dam. Upstream reach surveys were conducted at Redwood Hole approximately 3 km upstream of the Mirabel Dam, immediately downstream of the Healdsburg Memorial Dam, at the PG&E hole approximately 300 m upstream of the Healdsburg Memorial Dam, and at Diggers Bend near the Rio Linda Academy in Healdsburg. At each site, two divers entered the river and visually searched the dive site in an attempt to detect adult Chinook. General appearance and density of Chinook in the pool was noted.

Juvenile Steelhead Dive Surveys:

From August 30 to September 7, 2011, the Water Agency conducted a dive survey for juvenile steelhead and native freshwater fish. A total of eight sites were sampled between Mirabel Dam and Lake Mendocino (Figure 1). Site photos are included in the Appendix. Each site was 500 m long and all but 1 corresponded to sites sampled in 2010 (Smith 2011).

At each site, three divers entered the water at the downstream end of the sample site. The stream was divided into 3 lanes (left bank, mid channel, and right bank). Divers were assigned to a lane and moved upstream visually searching for fish occupying their lane. Divers would employ a serpentine swimming pattern if they could not see their entire section when swimming in a straight line. In cases when velocity was too high to swim upstream divers would start at the upstream end of the site and drift downstream attempting to remain motionless so as not to disturb fish. All fish were identified to species when possible. Fish that could not be identified to species were identified to family. Fish were grouped into 3 size classes (<100 mm total length (TL), 101-300 mm TL, and >300 mm TL). In general, steelhead <100 mm TL are young-of-the-year (YOY), steelhead 101-300 mm in length are age 1-2, and steelhead greater than 300 mm are age 3+ (Moyle 2002). At the end of a survey, fish data from all divers was recorded on a data form for each site. In addition, water temperature and water visibility was recorded.

Downstream Migrant Fish Trapping:

The Water Agency operates three types of downstream migrant traps in the Russian River basin; rotary screw traps, funnel traps, and pipe traps (Figure 3 and Figure 4). Water Agency rotary screw trap methods are detailed in Chase (2005) and Manning and Martini-Lamb (2011). Methods for funnel net and pipe trap operation in the Russian River can be found in Manning and Martini-Lamb (2011).

Fish traps located near the mouths of Green Valley Creek, Dutch Bill Creek, Austin Creek, near West Side Road on Dry Creek, and near Mirabel Dam on the mainstem Russian River were

checked daily by Water Agency staff during the trapping season (typically from April through July). Captured fish were identified to species and enumerated. Fork length (to the nearest mm) and weight (to 0.1 g) were measured for a subset of individuals. Passive integrated transponder (PIT) tags were implanted into a subset of steelhead parr captured at the Mirabel, Dutch Bill Creek, Green Valley Creek, and Austin Creek fish traps. The recapture of PIT tagged steelhead on PIT tag antennas operated by the Water Agency, at other fish traps, or during Russian River Estuary seining surveys conducted by the Water Agency provided information on steelhead movement and growth. These data are not presented here but are available in Biological Opinion annual monitoring reports.

Figure 3. A rotary screw trap on Austin Creek.

Figure 4. A pipe trap on Dutch Bill Creek.

Estuary Fyke Net Juvenile Salmonid Video Monitoring System:

In addition to the aforementioned fish traps, the Water Agency also operates a video monitoring station that is comprised of a modified fyke net in the upper Estuary (Figure 5). The Estuary

video system allows fish to freely move through a viewing chamber where they are detected by the underwater video camera and PIT tag reader as they exit the downstream end of the weir (Figure 6). The video system alleviates the need to handle fish and minimizes fish stress in the relatively warm water conditions of the lower Russian River.

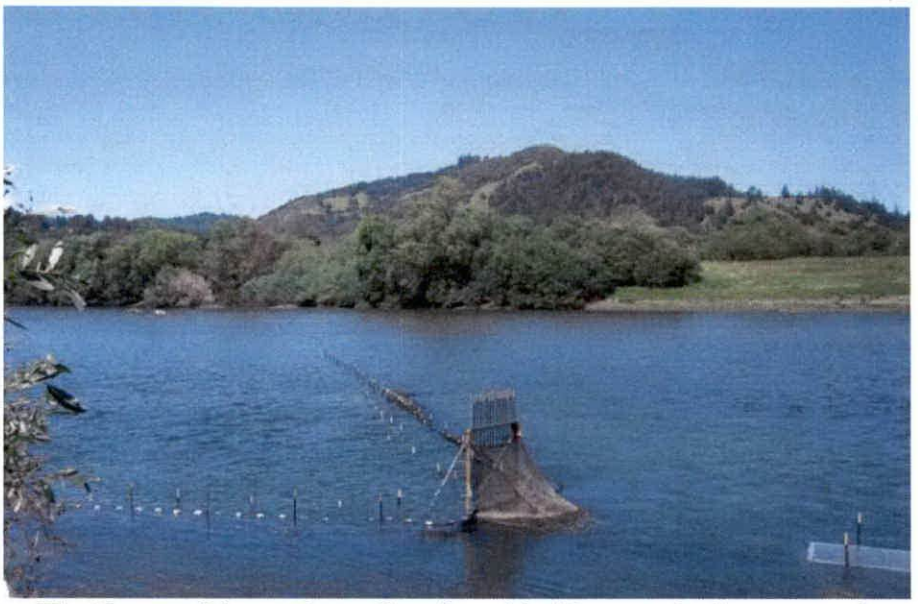

Figure 5. The Estuary fyke net juvenile salmonid video monitoring system located near the town of Duncans Mills.

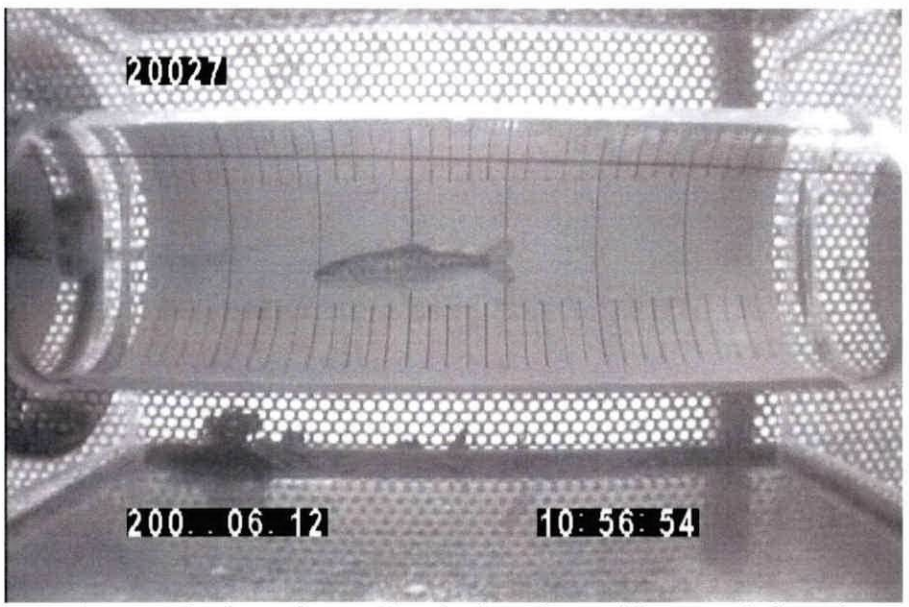

Figure 6. An image of a juvenile steelhead taken from video recoded on the Russian River Estuary fyke net juvenile salmonid video monitoring system.

Results:

Flows:

During the spring of 2011, Russian River flows were similar to average stream flows for normal water years (2002, 2003, 2005, 2006). However, flows in some reaches of the Russian River, such as near Hopland, were below D1610 minimum flows during late summer (Figure 7). When compared to the average daily flow at the Hacienda Bridge gauging station from 2000 to 2009 flow in 2011 was higher in the late spring, but similar to average flows in July and below average flows in August and September (Figure 8).

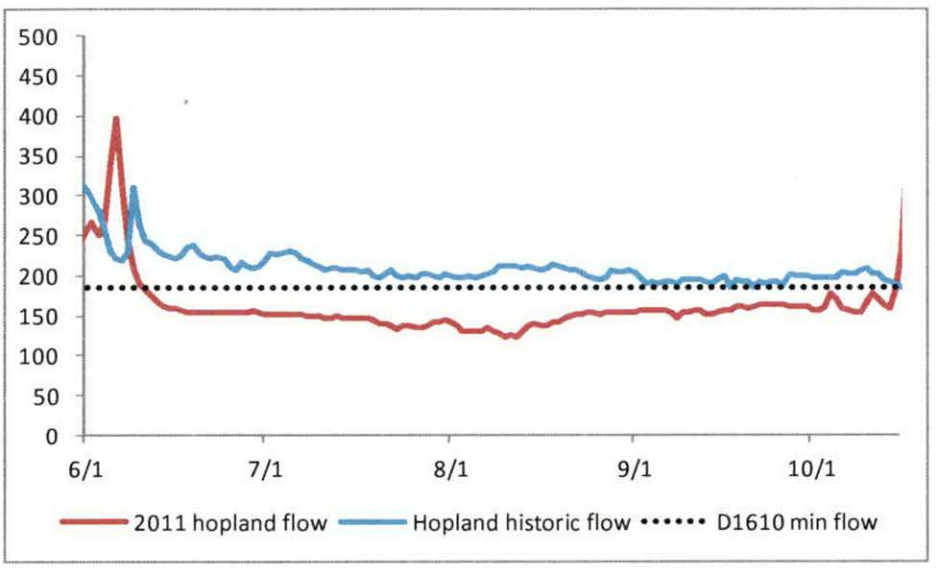

Figure 7. The average of flow of normal water years (2002, 2003, 2005, 2006) Hopland shown with weekly average flow in 2011.

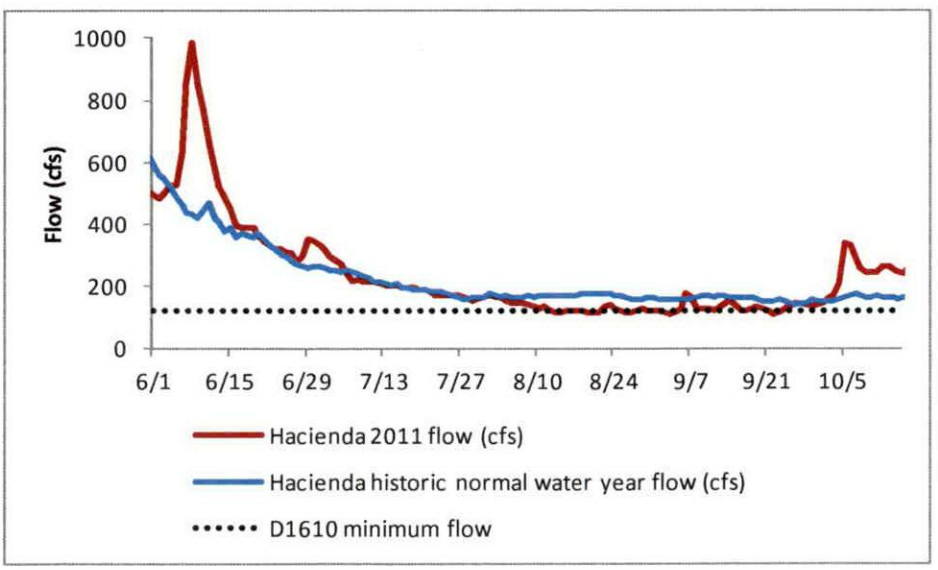

Figure 8. The average of flow of normal water years (2002, 2003, 2005, 2006) Hacienda Bridge shown with weekly average flow in 2011.

A relatively dry fall allowed the Water Agency to monitor adult Chinook later into the year than is typically possible. Since the Russian River basin received little rainfall in the fall of 2011, the Water Agency was able to keep the Mirabel dam inflated later into the year. The underwater camera system relies on counting fish as they move through fish ladders at the Mirabel inflatable dam. Since the Mirabel dam remained inflated for nearly the duration of the Chinook run it is likely the minimum count of Chinook in 2011 is close to the actual escapement of Chinook.

Video Monitoring of Adult Salmon Migration:

Video monitoring of the adult Chinook migration past the Mirabel inflatable dam began on September 1, 2011, and operated continuously until it was deflated for the season on January 17, 2012. The first Chinook for the season was observed on September 25, 2011. In total 3,173 adult Chinook salmon were observed at the Mirabel camera system. A total of 147 adult coho salmon were observed in 2011. In addition, 644 adult steelhead were also observed at the underwater camera system and in 2011 (Table 1). Because the video system only functions when the dam is inflated, counts at Mirabel dam represent minimum returns. The dam was inflated for almost the entire Chinook run and these minimum counts are likely close to the actual Chinook escapement. However this was not the case for returning steelhead. More steelhead likely passed Mirabel after the deflation of the dam since their natural run timing occurs later than Chinook. The return timing of coho in the Russian River is not as well documented as the return timing of Chinook and steelhead. However Russian River coho are intensely monitored in the tributaries by the UC San Diego California Sea Grant Extension program.

Table 1. The number of adult Chinook salmon, and steelhead (wild and hatchery origin) observed on the Mirabel underwater camera system each week during the 2011 season.

Week Start	Chinook	Steelhead
9/1/2011	0	0
9/8/2011	0	0
9/15/2011	0	0
9/22/2011	1	0
9/29/2011	377	1
10/6/2011	415	14
10/13/2011	888	7
10/20/2011	552	9
10/27/2011	328	3
11/3/2011	137	13
11/10/2011	96	9
11/17/2011	97	22
11/24/2011	236	115
12/1/2011	5	24
12/8/2011	0	36
12/15/2011	11	75
12/22/2011	3	79
12/29/2011	16	106
1/5/2012	1	44
1/12/2012	10	87
Total	**3,173**	**644**

Adult Chinook Salmon Dive Surveys:

Dive surveys to assess the general health and density of adult Chinook salmon were conducted by Water Agency staff in relatively deep holes along the middle and upper Russian River in 2011. Between September 15 and September 24 flows were occasionally, but were not sustained below 124 cfs. Because sustained flows at Hacienda Bridge stayed above 125 cfs, the Water Agency did not conduct lower river dive surveys in 2011.

In 2011 over 200 Chinook were observed at the Mirabel fish counting station by October 3, and upper river dive surveys were initiated the week of October 11. Survey sites included the pool immediately downstream from the Healdsburg Memorial Dam, the PG&E hole (approximately 200 m upstream of the Memorial Dam), and Redwood Hole near Riverfront Park. In total 51 apparently healthy adult Chinook were observed during 4 surveys that were conducted at these sites between October 10, 2011, and November 10, 2011.

Juvenile Steelhead Dive Surveys:

A total of 5,228 fish were detected during summer dive surveys consisting of 11 fish species (Table 3). However, only 21 juvenile steelhead were detected at the 8 survey sites (Table 2). Most fish consisted of native warm water species (99.6%). In 2011, 1 steelhead was found in the cascade downstream of Squaw Rock, 17 steelhead were found downstream of the confluence with Dry Creek and 3 steelhead were found on a run upstream of River Front Park. In comparison to the 4 sites (Ukiah below forks of the Russian River, Cloverdale above Comminski station, Cloverdale below Crocker road, and Geyserville, above hwy 128 bridge) sampled during 2002, 2009, 2010, and 2011 there were 604 steelhead detected in 2002, 2 steelhead detected during 2009, 2 steelhead during 2010, and 0 in 2011 (Table 2).

Water conditions during the 2011 survey were different then during 2002 and 2009 surveys, but similar to the 2010 survey. Water visibility was relatively poor in 2010 and 2011 when compared to 2002 and 2009. The visibility in 2011 ranged from less than 0.5 m to over 2 m. The visibility was the poorest near the confluence of the East and West Fork of the Russian River and gradually improved at downstream sample sites. During 2011 water visibility was greatest (greater than 2 m) downstream of the confluence with Dry Creek. Water temperatures in the upper sites were colder in 2011 than 2002 and 2009, but similar to 2010. In 2011 water temperatures ranged from 12°C in upper Ukiah Valley and gradually increased to 20 °C in the Alexander Valley / Healdsburg reach. Water temperatures at the Healdsburg dive site (downstream of the confluence of Dry Creek and the Russian River) was influenced by Dry Creek stream temperatures (13.8 °C at the mouth of Dry Creek and 18 °C at the downstream boundary of the survey site). The water temperature at River Front Park was 18.8 °C (Table 2).

Table 2. Steelhead observations during summer dive surveys from 2002, 2009, and 2010 in the upper Russian River. Each site consisted of a 0.5 km river section.

Reach	Location	2002						2009					2010					2011				
		Visibly (m)	Temp (C)	Steelhead (mm) 1-100	101-300	>300	Total	Visibly (m)	Temp (C)	Steelhead (mm) 1-100	101-300	>300 Total	Visibly (m)	Temp (C)	Steelhead (mm) 1-100	101-300	>300 Total	Visibly (m)	Temp (C)	Steelhead (mm) 1-100	101-300	>300 Total
Ukiah Valley	Ukiah below Forks	1-2	20	21	33	1	55	0-1	16				0-1	12 5				0-1	12			
	Ukiah above Perkins Bridge	1-2	20 5	6	1		7	0-1	18				-	-	-	-	- -					
	Ukiah Norgard Dam	1-2	20	51	109	1	161	0-1	16 7	3	2	5	-	-	-	-	- -					
	Hopland Felta Creek confluence	-	-	-	-	-	-	1-2	17.2				0-1	15 5				0-1	15			
Canyon	Hopland above Squaw Rock	1-2	20	57	56		113	-	-	-	-	-	-	-	-	-	- -	-	-	-	-	-
	Hopland below Squaw Rock	-	-	-	-	-	-	1-2	17.7				0-1	18				0-1	15	1		1
	Cloverdale above Communski	1-2	18 9	411	24		435	1-2	17.7	1	1	2	0-1	19				0-1	17.2			
Alexander Valley/Healdsburg	Cloverdale below Crocker Bridge	1-2	22					1-2	21.1				0-1	21				0-1				
	Geyserville above Hwy 128	1-2	23	1			1	>2	22 2				1-2	21	1	1	2	0-1	20			
	Healdsburg Healdsburg Dam	>2	24	4	12		16	>2	23 3		1	1	-	-	-	-	- -	-	-	-	-	-
	Healdsburg Diggers Bend	-	-	-	-	-	-	>2	21.7				-	-	-	-	- -					
	Healdsburg Dry Creek confluence	-	-	-	-	-	-	>2	15 5		10	10	>2	21	1	8	9	>2	13 8 18	6	9	2 17
	Healdsburg above Riverfront Park	-	-	-	-	-	-	>2	16 7				-	-	-	-	- -	>2	18 8		3	3
		Total:		551	235	2	788	Total:		4	14	0 18	Total:		2	9	0 9	Total:		6	13	2 21

Table 3. Observations of non-salmonids during summer dive surveys from 2002 and 2009. Each site consisted of a 0.5 km section of river. Coordinates and water conditions are shown in Table 1.

Location	Small Mouth Bass	Large Mouth Bass	Sac Sucker	Tule Perch	Hard-head	CA Roach	Sac Pike-minnow	Cyprinids	TS Stickle-back	Carp	Green Sunfish	Bluegill	Sculpin
2002													
Ukiah Valley, below Forks	0	0	83	0	0	0	0	66	10	0	0	0	0
Ukiah Valley, above Perkins Bridge	2	0	85	0	4	0	13	600	0	0	0	0	1
Ukiah Valley, Norgard Dam	1	0	511	61	1	0	0	578	300	0	0	0	2
Canyon, above Squaw Rock	0	0	298	119	10	1114	9	646	0	0	0	0	0
Canyon, above Comminski Station	2	0	1819	608	23	440	1	1297	0	0	0	0	0
Alexander Valley, below Crocker Bridge	37	0	1764	1212	40	4850	6	1454	0	0	0	0	0
Alexander Valley, above Geyserville Bridge (Hwy 128)	5	0	239	353	18	0	14	1200	0	0	0	0	1
Healdsburg, Healdsburg Dam	370	0	196	79	91	0	6	605	0	1	27	0	1
TOTAL	**417**	**0**	**4995**	**2432**	**187**	**6404**	**49**	**6446**	**310**	**1**	**27**	**0**	**5**
2009													
Ukiah Valley, below Forks	0	0	0	0	0	0	0	0	0	0	0	0	0
Ukiah Valley, above Perkins Bridge	0	0	0	0	0	0	0	0	0	0	0	0	0
Ukiah Valley, Norgard Dam	0	0	0	0	0	0	0	0	0	0	0	0	0
Canyon, below Squaw Rock	4	0	115	19	36	0	23	2060	10	1	0	0	1
Canyon, above Comminski Station	5	0	449	281	201	0	29	2589	0	0	0	0	0
Alexander Valley, below Crocker Bridge	3	1	196	116	90	0	53	1775	0	0	0	0	0
Alexander Valley, above Geyserville Bridge (Hwy 128)	14	0	222	40	102	0	33	1575	0	0	0	0	0
Healdsburg, Healdsburg Dam	309	0	160	53	1438	0	43	83	0	0	1	9	0
Ukiah Valley, Felix Creek confluence	5	0	47	85	17	7	1	0	5	0	0	0	0
Healdsburg, Diggers Bend	470	2	450	2	219	0	45	86	0	0	4	1	0
Lower Healdsburg, Dry Creek confluence	1	0	377	13	245	0	4	415	101	0	0	0	0
Lower Healdsburg, above Riverfront Park	4	0	241	124	26	0	27	1185	0	0	0	0	0
TOTAL	**480**	**2**	**1115**	**224**	**507**	**7**	**77**	**1686**	**106**	**0**	**4**	**1**	**0**

Table 4 . Observations of non-salmonids during summer dive surveys from 2010 and 2011. Each site consisted of a 0.5 km section of river. Coordinates and water conditions are shown in Table 1.

Location	Small Mouth Bass	Large Mouth Bass	Sac Sucker	Tule Perch	Hard-head	CA Roach	Sac Pike-minnow	Cyprinids	TS Stickle-back	Carp	Green Sunfish	Bluegill	Sculpin
2010													
Ukiah Valley, below Forks	0	0	3	0	0	0	0	0	0	0	0	0	0
Ukiah Valley, Feliz Creek confluence	0	0	2	0	0	0	0	20	0	0	0	0	0
Canyon, below Squaw Rock	0	0	17	1	0	0	0	800	0	0	0	0	1
Canyon, above Commnski Station	0	0	146	254	3	47	0	1561	4	0	0	0	1
Alexander Valley, below Crocker Bridge	2	0	1095	45	0	82	22	685	0	0	0	0	0
Alexander Valley, above Geyserville Bridge (Hwy 128)	26	0	564	342	0	15	64	1985	1	0	0	0	0
Lower Healdsburg, Dry Creek confluence	6	0	48	82	220	718	53	705	0	0	3	0	0
TOTAL	**34**	**0**	**1875**	**724**	**223**	**862**	**139**	**5756**	**5**	**0**	**3**	**0**	**2**
2011													
Ukiah Valley, below Forks	0	0	0	0	0	0	0	0	0	0	0	0	0
Ukiah Valley, Feliz Creek confluence	0	0	8	0	0	0	0	10	2	0	0	0	0
Canyon, below Squaw Rock	0	0	1	1	2	0	6	15	0	0	0	0	1
Canyon, above Commnski Station	0	0	167	231	0	49	12	630	18	0	0	0	0
Alexander Valley, below Crocker Bridge	0	0	6	0	7	18	0	34	0	0	0	0	0
Alexander Valley, above Geyserville Bridge (Hwy 128)	15	0	215	324	138	8	76	444	400	0	0	0	5
Lower Healdsburg, Dry Creek confluence	0	0	55	24	0	0	48	95	0	0	0	0	0
Lower Healdsburg, above Riverfront Park	8	2	213	263	283	1115	167	90	0	0	0	0	1
TOTAL	**23**	**2**	**665**	**843**	**430**	**1190**	**309**	**1318**	**420**	**0**	**0**	**0**	**7**

Downstream Migrant Fish Trapping:

Between April 6 and April 14, 2011, the Water Agency installed downstream migrant fish traps on 3 lower river tributaries (Dutch Bill Creek, Austin Creek, and Green Valley Creek). The Water Agency installed rotary screw traps at Dry Creek and Mirabel April 13 and April 14, 2011, respectively. Traps were operated until out-migrant fish were no longer detected, or lower flow prevented efficient trap operation (Table 4). Trapping on Green Valley Creek was suspended on May 5, 2011, due to concerns about the capture of California freshwater shrimp, an endangered species. The Water Agency is working with NMFS and DFG to resolve this issue.

Table 4. The installation and removal date and total number of days fished for the downstream migrant traps operated by the Water Agency.

Trap	Installed	Removed	Total days sampled
Austin	4/14/2011	7/5/2011	72
Dutchbill	4/6/2011	7/5/2011	87
Dry Creek	4/13/2011	8/10/2011	118
Mirabel	4/15/2011	7/16/2011	93
Green Valley	4/12/2011	5/5/2011	24

Steelhead:
In 2011, steelhead parr were frequently encountered in Austin Creek. Over the course of the 2011 trapping season, 1,827 steelhead parr were captured at the Austin Creek trap (Figure 9). The Water Agency applied 500 PIT tags to steelhead in Austin Creek. Dry Creek had a higher catch of steelhead during the 2011 trapping season. In total 2,922 wild steelhead parr and 72 wild steelhead smolts were caught at the Dry Creek trap (Figure 9 and Figure 10).

In 2011, relatively few steelhead were caught at Mirabel, Dutchbill Creek, and Green Valley Creek fish traps when compared to catches at Austin Creek and Dry Creek. In total, 427 and 33 steelhead parr steelhead were caught at Mirabel and Dutchbill Creek respectively (Figure 9). While 150 and 43 steelhead smolts were caught at Mirabel and Dutchbill Creek respectively (Figure 10). The Green Valley Creek trap operated detected 3 steelhead parr and 1 steelhead smolt before being removed. Please note that the above numbers reported for steelhead have not been adjusted for trap efficiencies and are not population estimates.

Chinook:
Chinook were most frequently encountered at the Dry Creek fish trap. In total 21,897 Chinook smolts were captured at the Dry Creek trap (Figure 11). A population estimate of 170,826 Chinook smolts (95% CI: ± 21,792) at the Dry Creek fish trap was calculated using the Dry Creek catch data and trap efficiencies.

In 2011, Mirabel had the second highest catch of Chinook (13,753 smolts, Figure 11), but when adjusted for trap efficiencies had a higher population estimate than Dry Creek. Based on trap efficacies a population estimate of 191,839 (95% CI: ± 91,152) was constructed for Mirabel in

2011. However trap efficacies were lower at Mirabel and the confidence interval is wider when compared to Dry Creek. In 2011 relatively few Chinook smolts were captured in Austin Creek and Dutchbill Creek (48 and 33 respectively) (Figure 11). Green Valley Creek had similarly low catches of Chinook smolts as well. Sixteen Chinook were captured in the Green Valley Creek trap.

Coho:

The Dutch Bill Creek trap detected the most coho salmon of the traps operated by the Water Agency to meet the requirements of the State Water Board's Order. In total 3,213 hatchery coho smolts, no wild coho salmon smolts (coho with adipose fins are presumed to be wild), and 5 wild coho parr were captured at the Dutch Bill Creek fish trap. At Mirabel 618 hatchery coho smolts, 14 wild coho smolt, and 10 wild coho parr were captured (Figure 12). In Austin Creek 371 hatchery coho smolts, 1 wild coho smolt, and 13 wild coho parr were detected at the fish trap (Figure 12). At Green Valley Creek 265 hatchery coho smolts, 2 wild coho smolt, and 1 wild coho parr were detected at the trap (Figure 12). The Dry Creek fish trap captured 113 hatchery coho smolts, 86 wild coho smolts, and 15 wild coho parr (Figure 12). Please note that the above numbers reported for Coho smolts have not been adjusted for trap efficiencies and are not population estimates. For detailed analysis of downstream migrant trapping catches for coho smolts in the Russian River see Conrad (2005), Obedzinski *et al.* (2006), Obedzinski *et al.* (2007), Obedzinski *et al.* (2008) and the UCCE Coho Salmon Monitoring Program results for 2011.

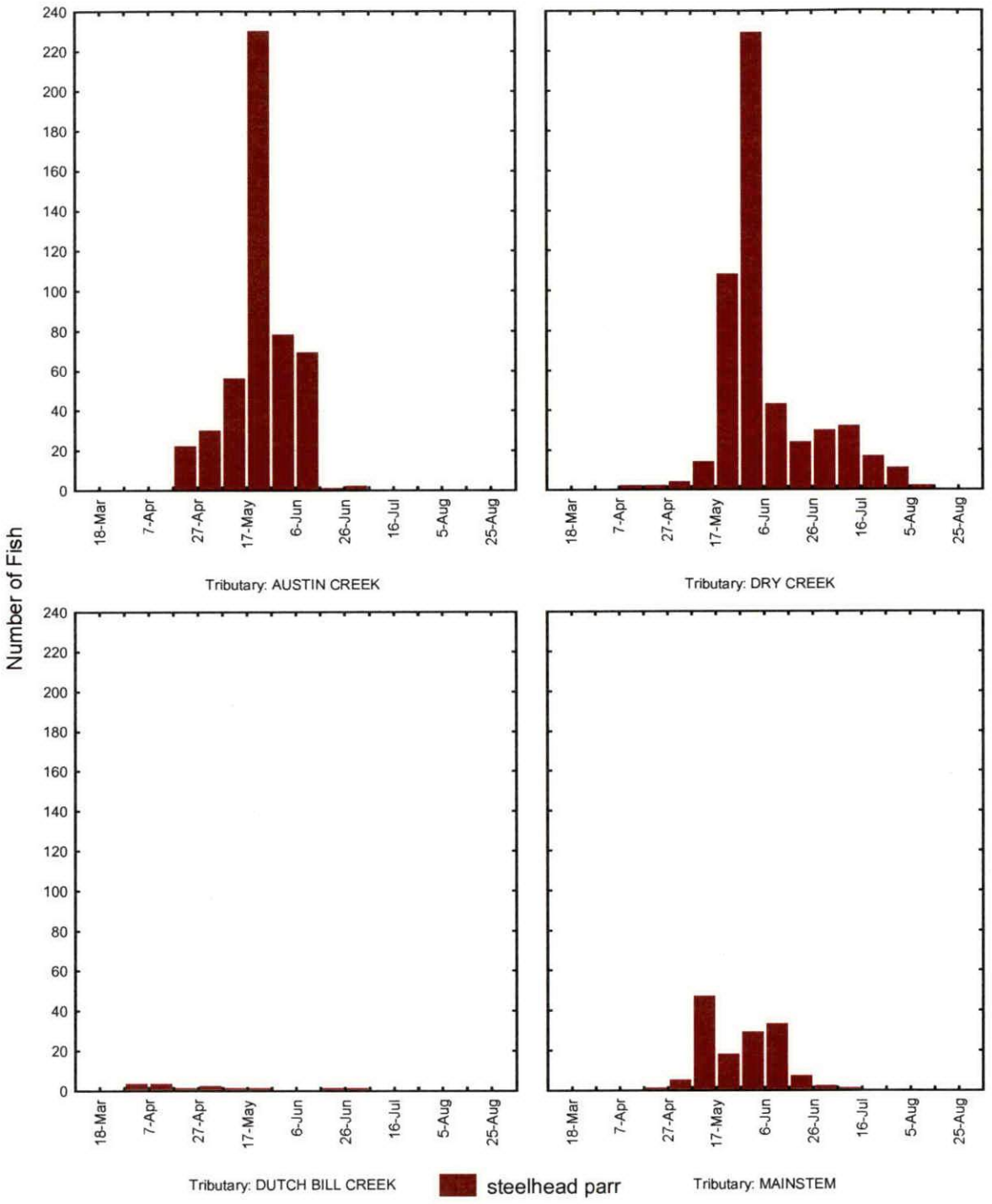

Figure 9. The weekly number of wild steelhead parr captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutchbill Creek, and Mainstem (Mirabel) trapping sites during the 2011. Note that these numbers

represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

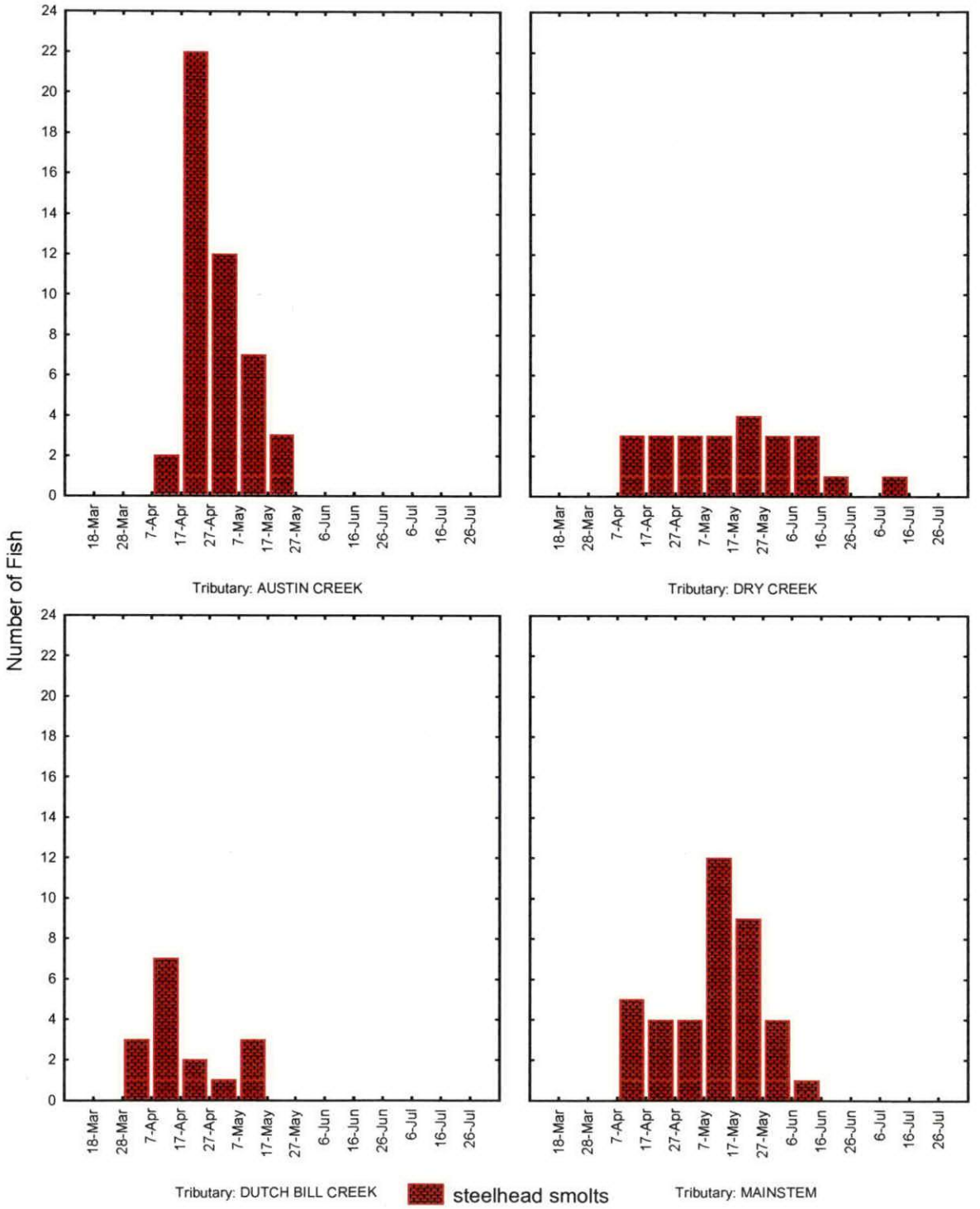

Figure 10. The weekly number of wild steelhead smolts captured in Russian River fish traps operated by the Water Agency at the Austin Creek, Dry Creek, Dutchbill Creek, and Mainstem (Mirabel) trapping sites during 2011. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

Table 5. The annual catch of non-smolt steelhead caught during the 2000 to 2011 trapping seasons at downstream migrant traps operated by the Water Agency and UCCE. Note that dashes indicate a trap was not operated at that location during that particular year.

Downstream migrant Trap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austin Creek	-	-	-	-	-	-	-	7,436	-	-	4,774	1,827
Dry Creek	-	-	-	-	-	-	-	-	-	5,290	2,049	2,922
Dutch Bill Creek	-	-	-	-	-	-	-	-	-	-	58	27
Estuary fyke net	-	-	-	-	-	-	-	-	-	51	-	-
Green Valley Creek	-	-	-	-	-	417	-	27	304	1	67	3
Mainstem	773	156	5,727	1,115	1,428	1,594	230	1,852	831	75	375	427
Mill Creek	-	-	-	-	-	627	393	931	725	438	352	521
Sheephouse Creek	-	-	-	-	-	113	59	49	17	-	-	-
Ward Creek	-	-	-	-	-	495	353	707	-	-	-	-

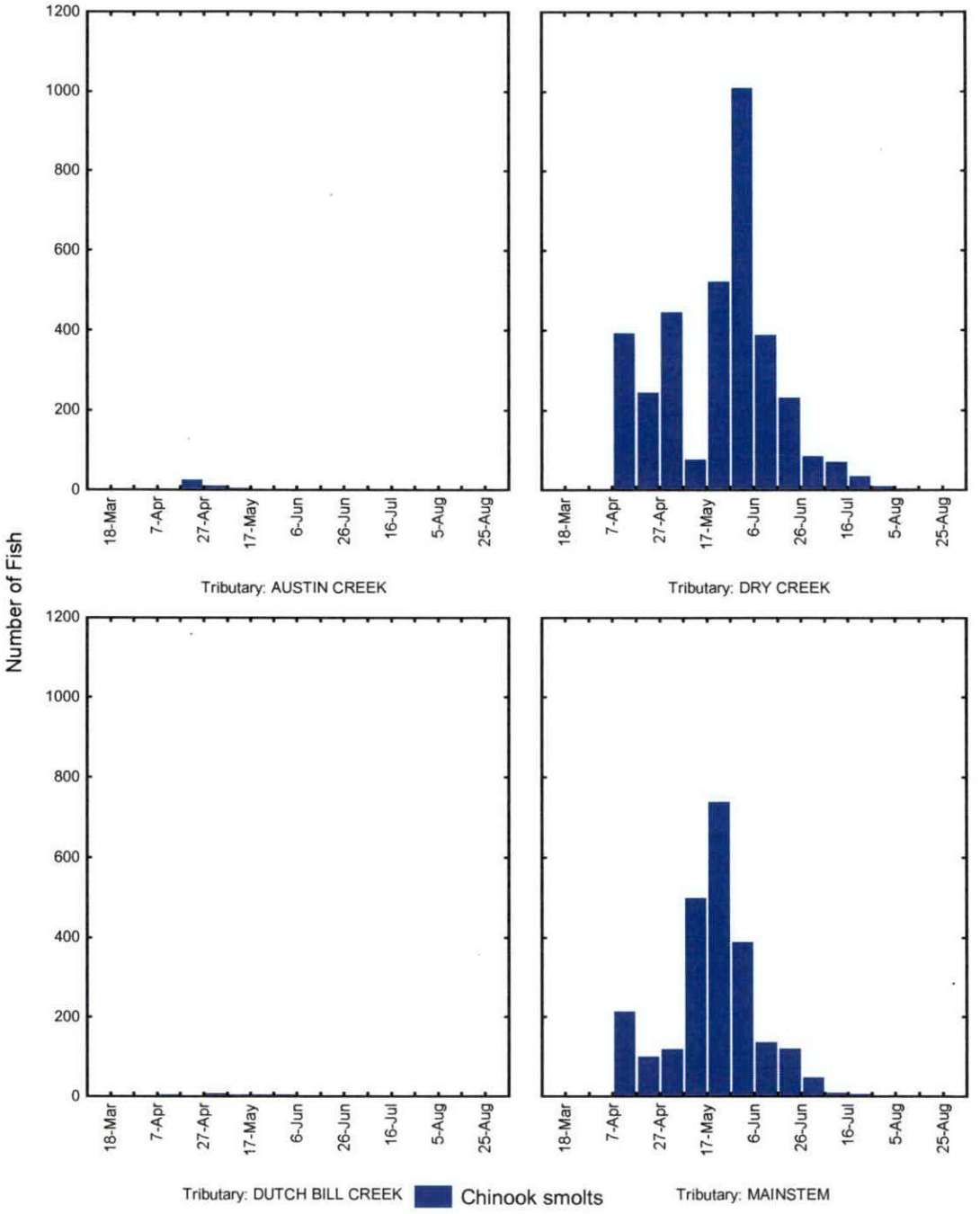

Figure 11. The weekly number of wild Chinook smolts captured in Russian River fish traps operated by the Water Agency at the Austin Creek, Dry Creek, Dutchbill Creek, and Mainstem (Mirabel) trapping sites during 2011. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

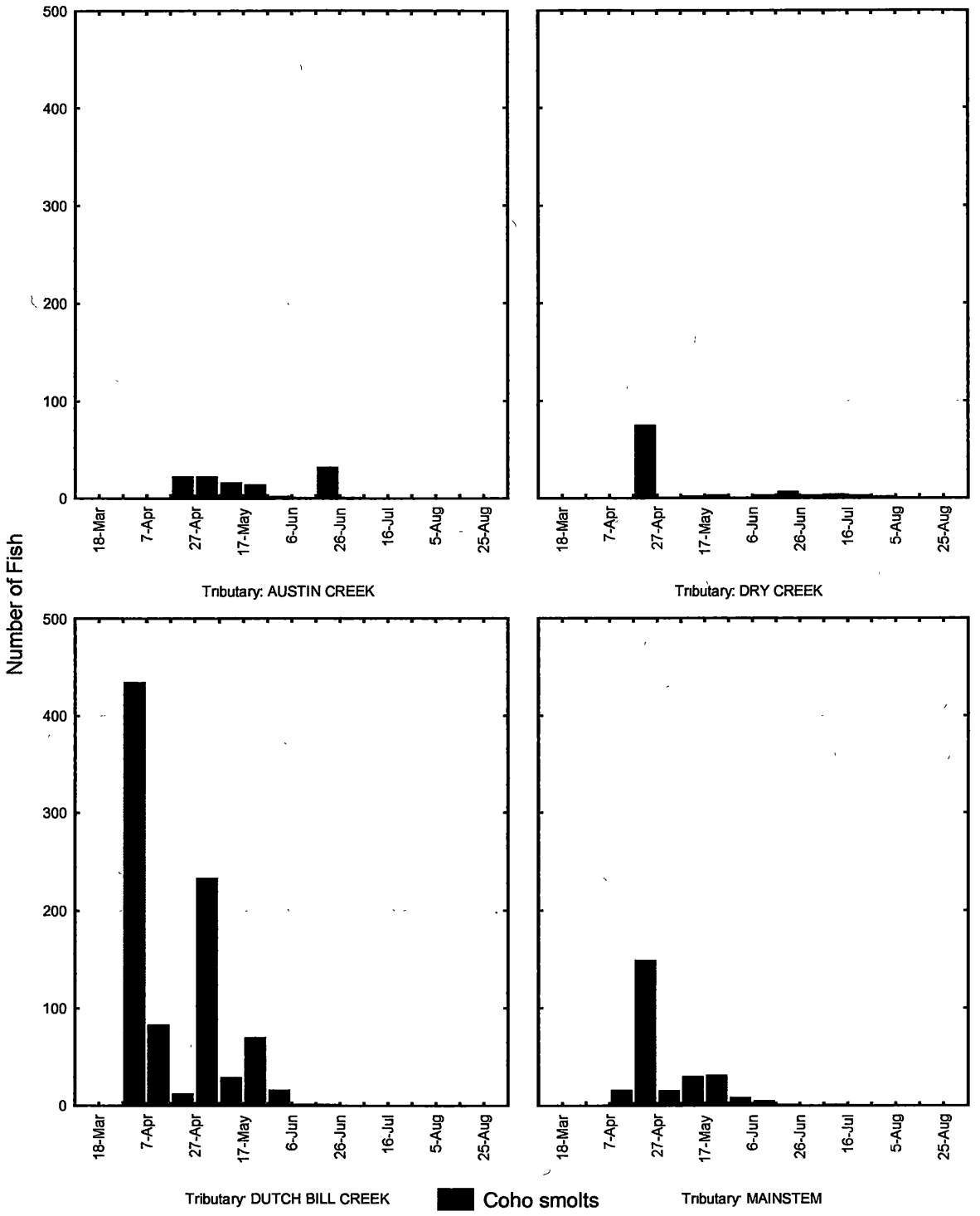

Figure 12. The weekly number of RRCCBP coho smolts captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutchbill Creek, and Mainstem (Mirabel) trapping sites during the 2011. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

Estuary Fyke Net Juvenile Salmonid Video Monitoring System:

On April 28, 2011, the Water Agency began operating an underwater video camera near the upstream end of the Russian River Estuary between Austin Creek and Moscow Road Bridge (10.5 km upstream of the mouth of the River) to monitor YOY steelhead as they made their way downstream into the Estuary. The video camera recorded footage 24 hours per day through July 19. During this time 81 fish were identified as steelhead juveniles, 115 fish were identified as Chinook smolts, and 43 fish were identified as coho smolts (Figure 13-15).

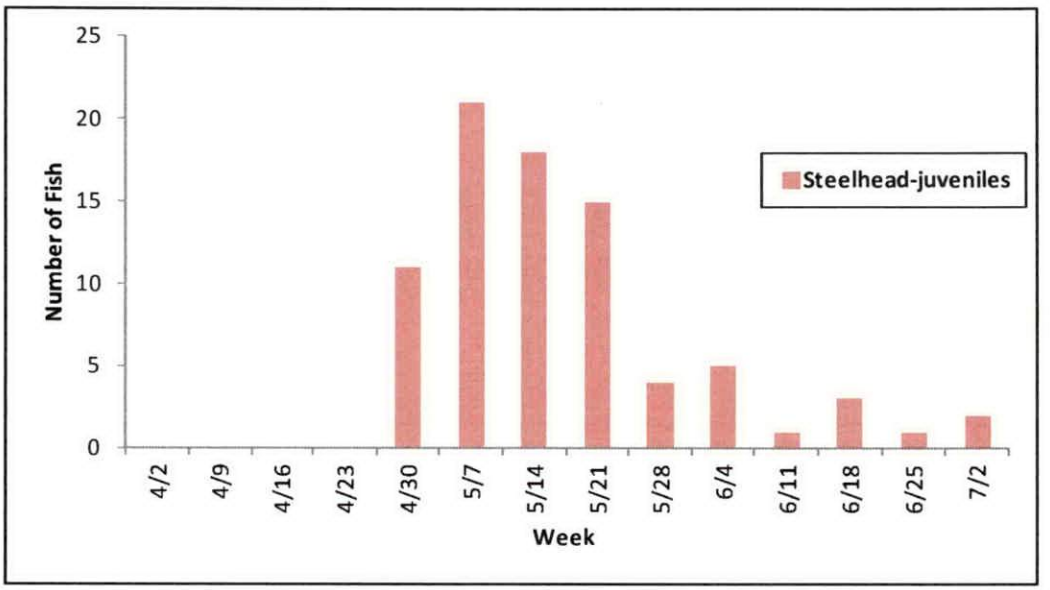

Figure 13. The number of steelhead observed on the Russian River Estuary fyke net video camera system in 2010. Note that these numbers represent total detections and have not been adjusted for camera efficiencies. These are not population estimates.

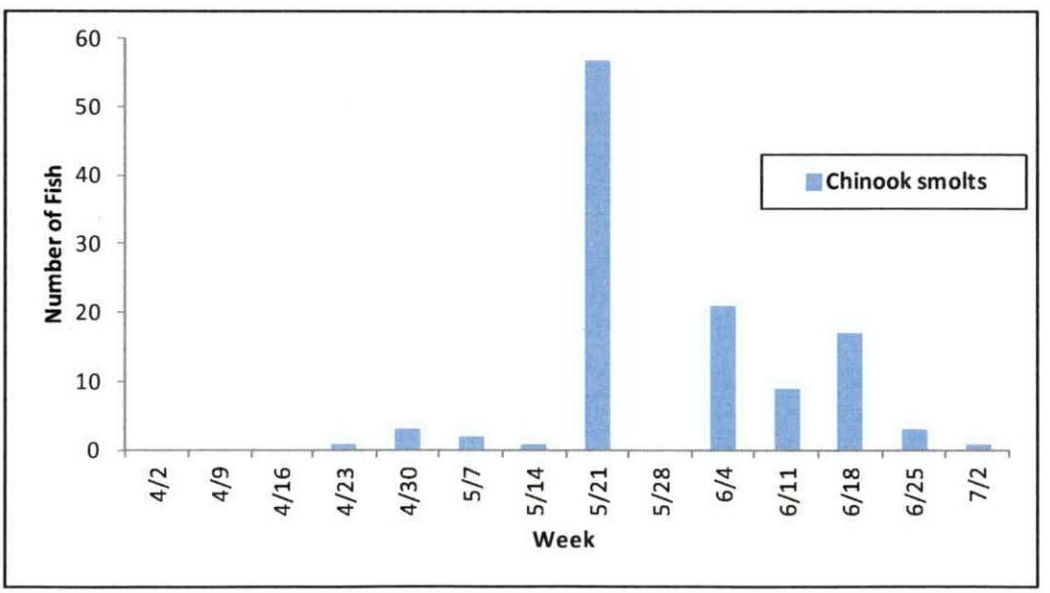

Figure 14. The number of Chinook observed on the Russian River Estuary fyke net video camera system in 2010. Note that these numbers represent total detections and have not been adjusted for camera efficiencies. These are not population estimates.

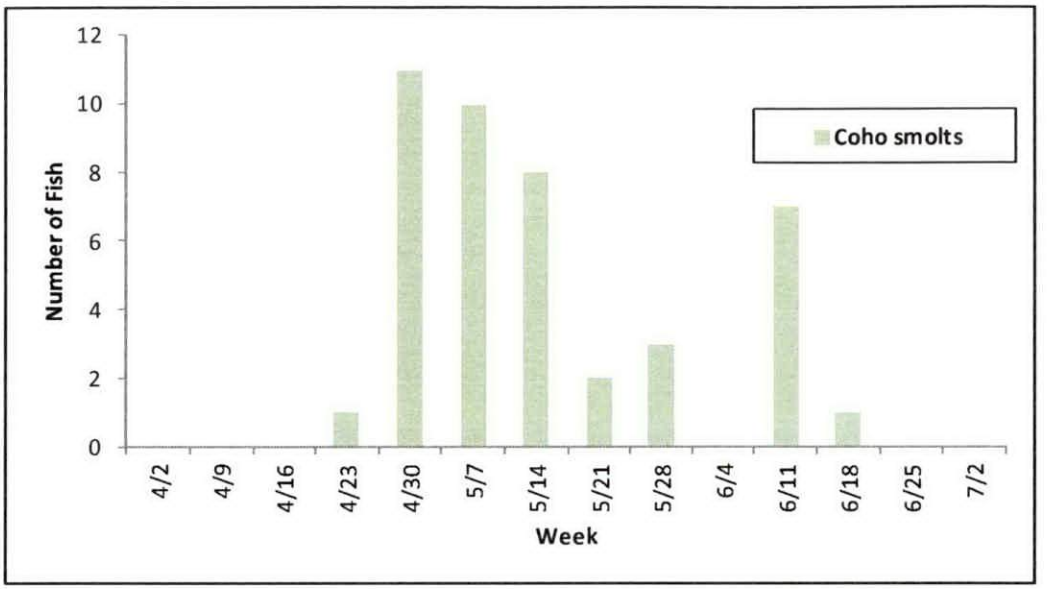

Figure 15. The number of Chinook observed on the Russian River Estuary fyke net video camera system in 2010. Note that these numbers represent total detections and have not been adjusted for camera efficiencies. These are not population estimates.

Conclusions:

Video Monitoring of Adult Salmon Migration:

Direct comparisons between years of Chinook counts at Mirabel cannot be made due to the difference in sampling periods. However relative differences in run size can be observed. The number of adult Chinook salmon observed in 2011 was the 5th highest in the last 12 years. It is important to note that the 2011 sampling season was longer than during typical years due the presence of favorable sampling conditions in 2011. The count of hatchery coho was higher in 2011 than any other year. This is likely due to increased releases of coho smolts by the hatchery program, the favorable sampling conditions experienced this year, and possibly to improved ocean conditions.

Adult Chinook Salmon Dive Surveys:

Adult Chinook observed during 2011 appeared healthy and not over crowded.

Juvenile Steelhead Dive Surveys:

Overall, steelhead abundance appeared to be lower during summer 2011 then 2002 and similar to 2009 and 2010. In the 4 sample sites that were repeatedly surveyed in 2002, 2009, 2010, and 2011, the Water Agency detected 604, 2, 2, and 0 steelhead respectively. Water visibility likely played a role in the low detection rate of juvenile steelhead during the 2010 and 2011 surveys. Of the 4 years surveyed water visibility was the poorest

during 2011. Water visibility was greatest in 2002 (at least 1-2 meters of visibility all sites). In 2009, 2010 and 2011 the number of sites with 0-1 meters of visibility was 3, 5, and 6 respectively (Table 2). Thurow 1994 suggests minimum water visibilities of between 1.5 and 4 meters depending on the target species and the nature of the habitat being sampled. He further suggests that surveyors should be able to see the stream bottom from the surface in the deepest portion of the sample site. These conditions were not met in many of the sample sites surveyed in 2009, 2010, and 2011. Therefore fish may have been present at these sites, but avoided detection. However, if large numbers of steelhead were present at these sites it is likely that some individuals would have been detected.

While visibility was likely a factor in the low number of steelhead detected in 2009, 2010, and 2011 the actual number of steelhead present may have been different between years. The discrepancy between juvenile steelhead counts from 2002 and steelhead counts from 2009, 2010, and 2011 could be explained by differences in adult steelhead returns and spawning from previous years. Some of the lowest steelhead adult hatchery returns at Warm Springs and Coyote Valley Hatcheries in the last 10 years occurred in 2008-2009, 2009-2010, and 2010-2011. However the 2001-2002 adult returns were relatively strong (Figure 2). While these are not wild steelhead it is likely that both hatchery and wild steelhead smolts experienced similar ocean conditions and that the relative number of returning adults would be similar between the hatchery and wild populations. It is likely that there would be a larger population of juvenile steelhead following one or two years of strong adult returns and vice versa. This may help explain why the survey conducted during 2002 detected more steelhead then the surveys conducted in 2009, 2010 and 2011.

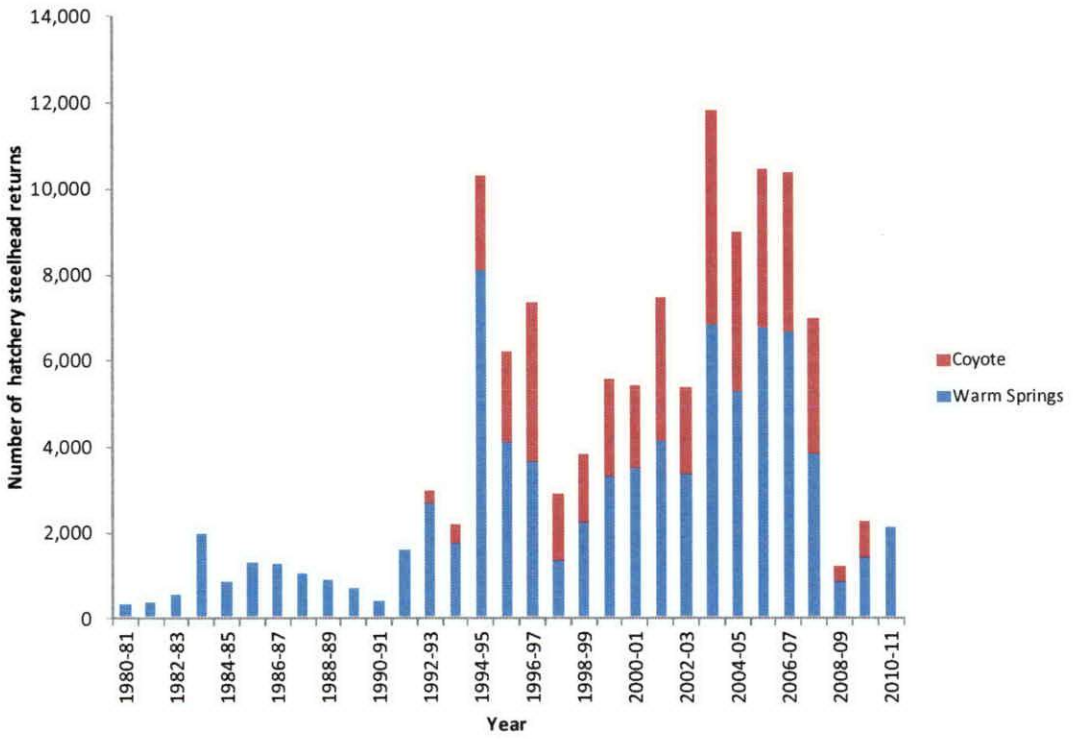

Figure 15. Hatchery returns of steelhead at Warm Springs and Coyote Hatcheries on the Russian River from 1980 to 2011.

Downstream Migrant Fish Trapping:

Steelhead:
Much of the 2011 steelhead smolt migration likely took place before the fish traps were installed. However, the traps were likely operating during the majority of time that juvenile steelhead could have moved out of Austin Creek and Dutch Bill Creek because low streamflow in these tributaries prevents fish from emigrating to the mainstem during summer.

Chinook:
Based on the population estimates of Chinook salmon passing the Dry Creek trap site in 2009, 2010, and 2011, as well as spawner survey data collected in the last 10 years (Manning and Martini-Lamb 2011), Dry Creek is an important resource for Chinook salmon in the Russian River basin. Chinook redd surveys conducted in the Russian River basin that found 22% to 44 % of Chinook redds, detected annually, in Dry Creek (Manning and Martini-Lamb 2011).

As concluded by Chase et al. (2007) and confirmed by our recent trapping data, Austin Creek, Dutchbill Creek, and Green Valley Creek are less important resources for Chinook salmon.

Coho:
Since all of the Water Agency's fish traps are downstream of streams stocked with hatchery coho it is not unusual to encounter hatchery coho smolts at these traps. However wild coho have become quite rare in the Russian River basin in the last 10 years. In 2011 wild coho were encountered at all of the Water Agency's traps which is likely due to the efforts of the Russian River Captive Broodstock Program. For a more detailed analysis of coho trapping data in the Russian River basin see the UCCE Coho Salmon Monitoring Program results for the 2010 season.

Russian River Estuary fyke net video camera system:

When compared to the 2009 estuary fyke net trapping operations the Estuary fyke net video monitoring system operated in 2010 and 2011 improved our ability to monitor juvenile steelhead. Modifications to the fyke net increased the period of time we could monitor fish. Approximately 20 times more juvenile steelhead were detected in the 2010 sampling season than in the 2009 sampling season (Smith 2011). However fewer steelhead were detected in 2011 than in 2010. This is likely a combination of poor conditions for sampling (decreased visibility) and a smaller number of juvenile steelhead entering the estuary (as reflected in the Austin creek trap catches) in 2011 when compared to 2010. However without the ability to measure trap efficiencies it is not possible to determine if the difference between the number of steelhead detected between years is related to a change in the number of steelhead entering the estuary, or to a change in detection rate due to modifications made to the trap or changing environmental conditions (flow, visibility).

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Appendix

Figure A Looking downstream at the confluence of the East and West fork of the Russian River. Note the high turbidity.

Figure B An underwater photo taken at the confluence of the East and West Forks of the Russian River of a divers hand from 0.5 m away illustrating the high turbidity.

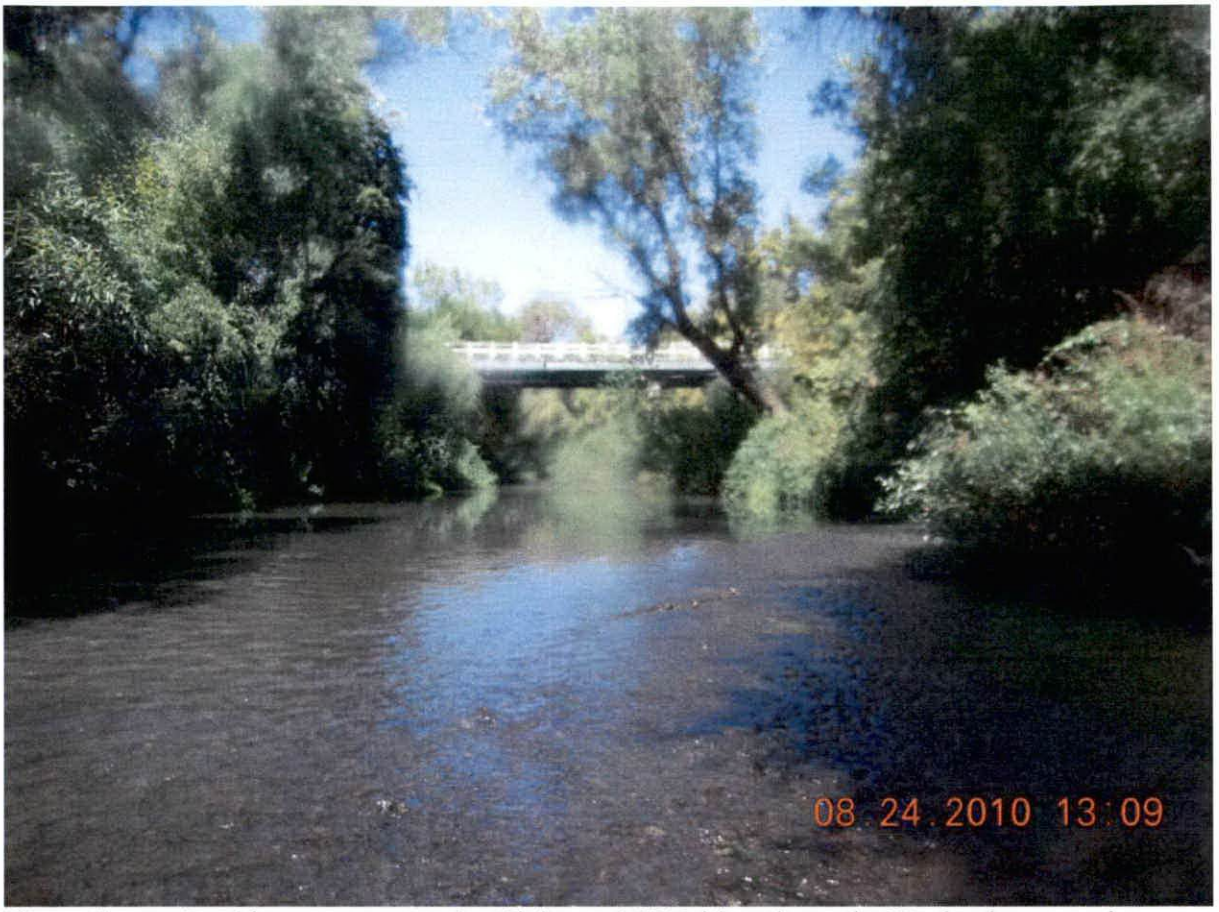

Figure C Looking upstream at the Highway 175 Bridge above the Hopland survey site.

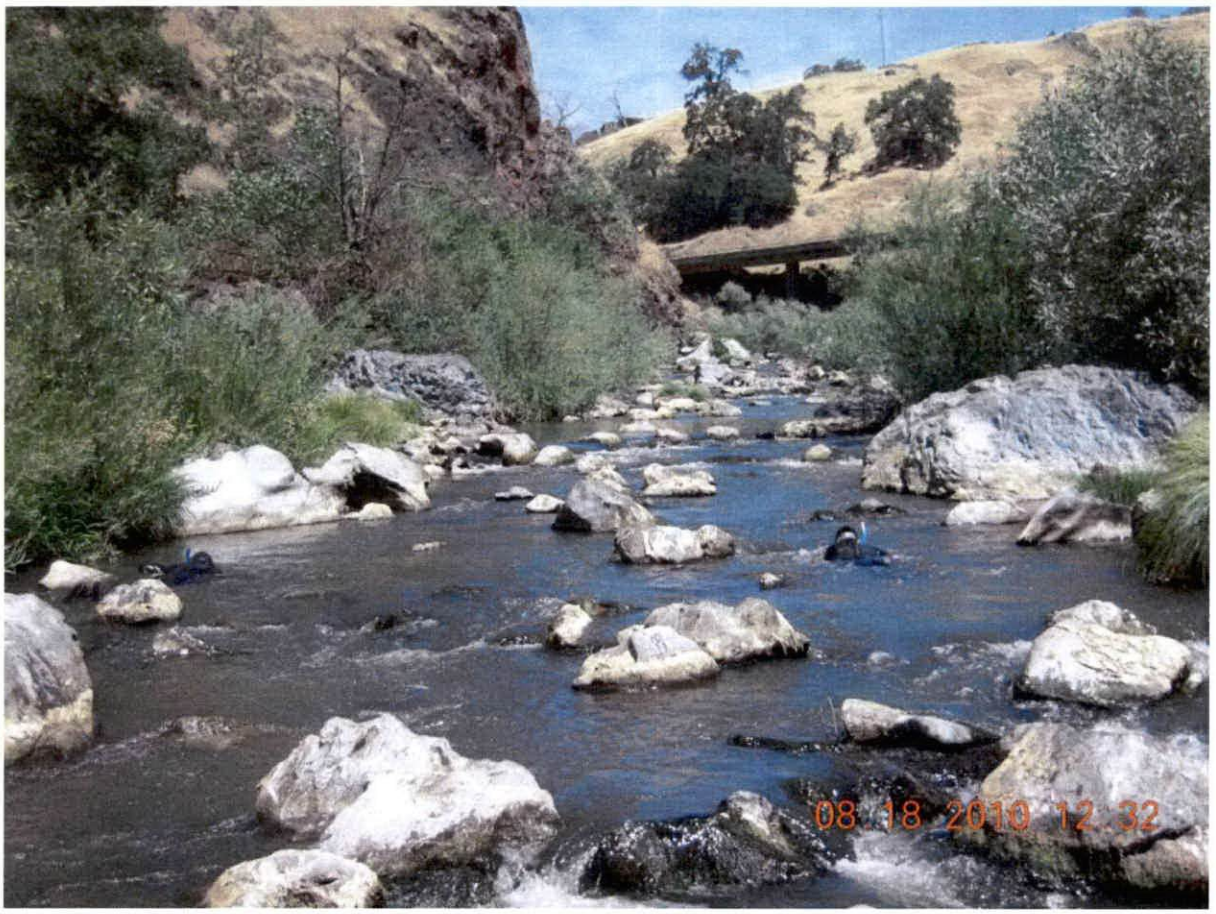

Figure D Looking upstream near the top of the Squaw Rock survey site.

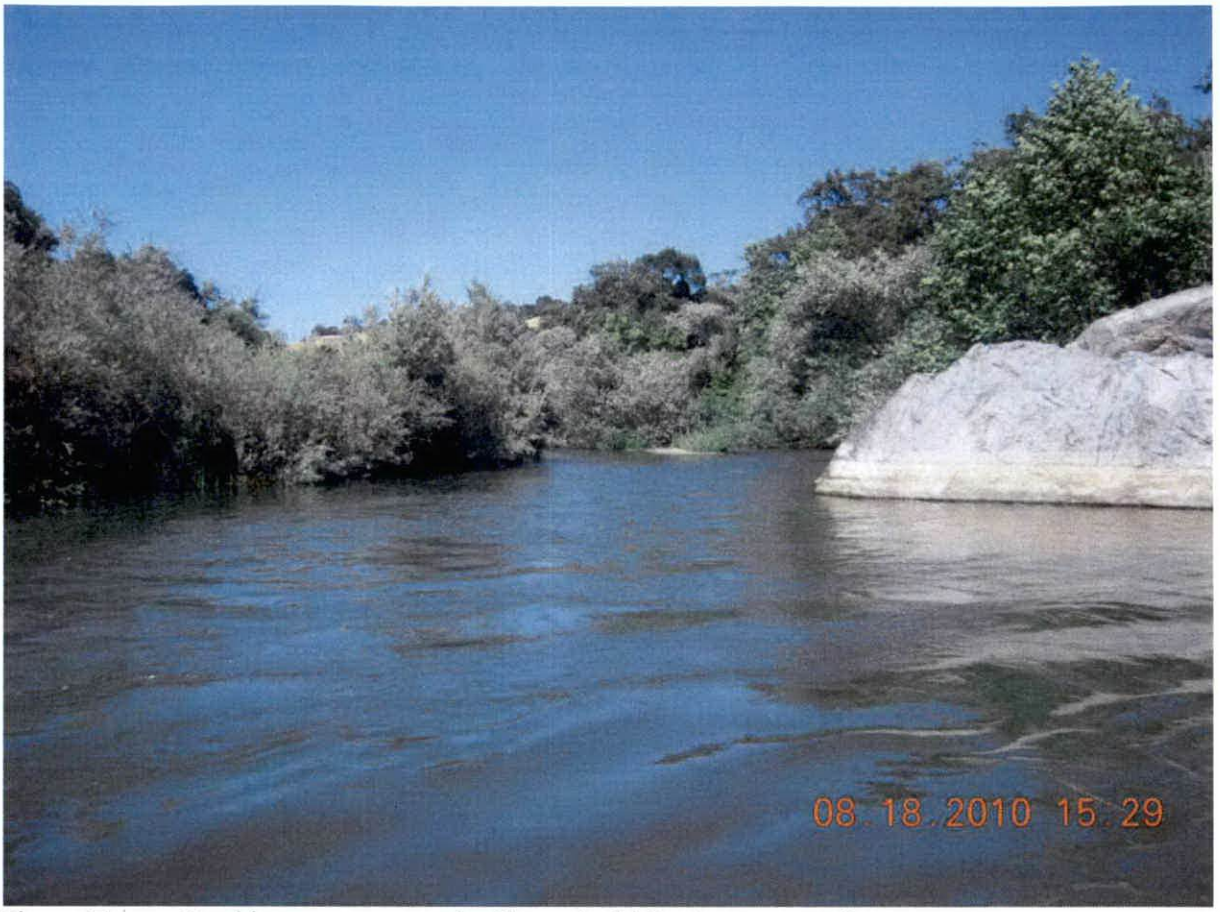

Figure E. Looking upstream at the Comminski Station survey site.

Figure F Looking upstream at the Geyserville survey site.

Figure G A photo of Russian River Tule perch taken in the Geyserville survey site.

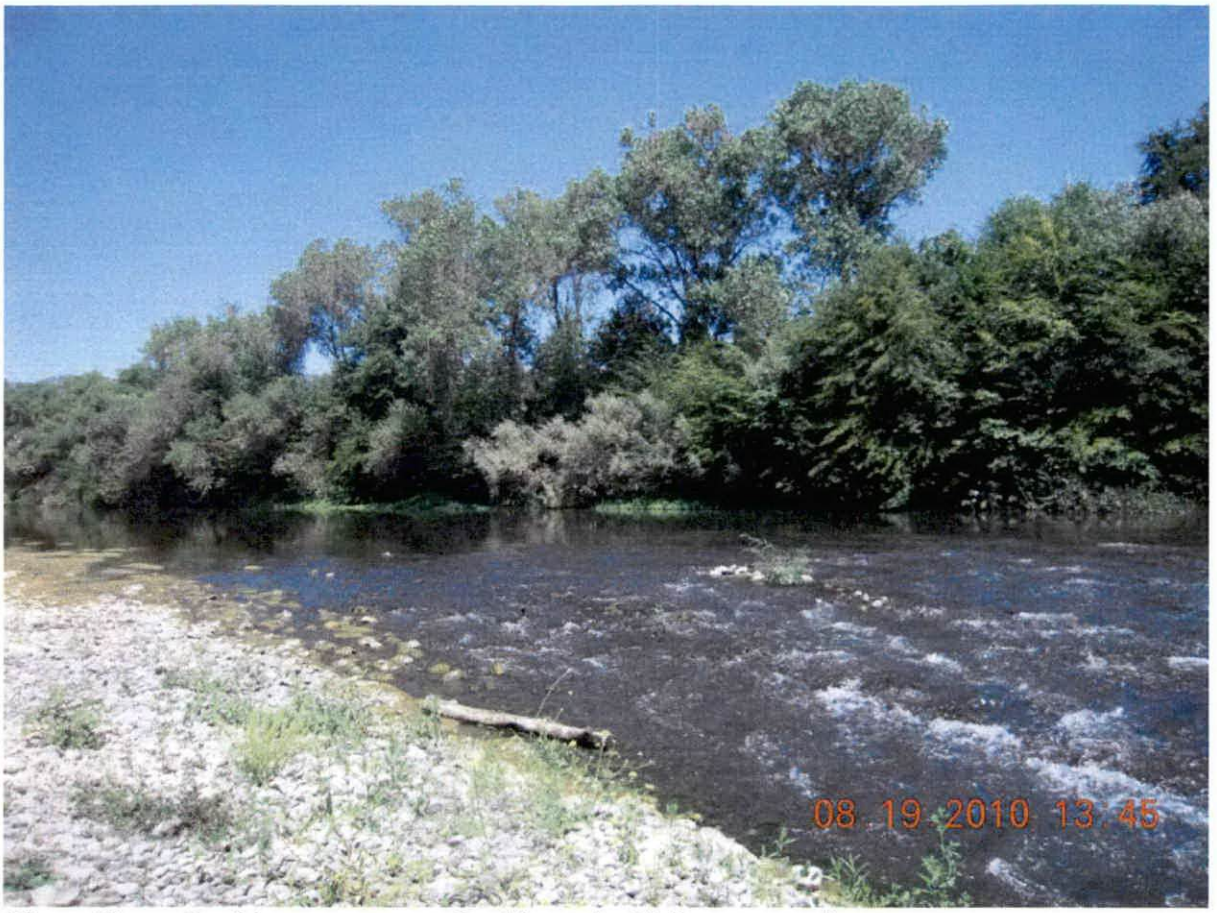

Figure H Looking upstream at the Alexander Valley survey site.

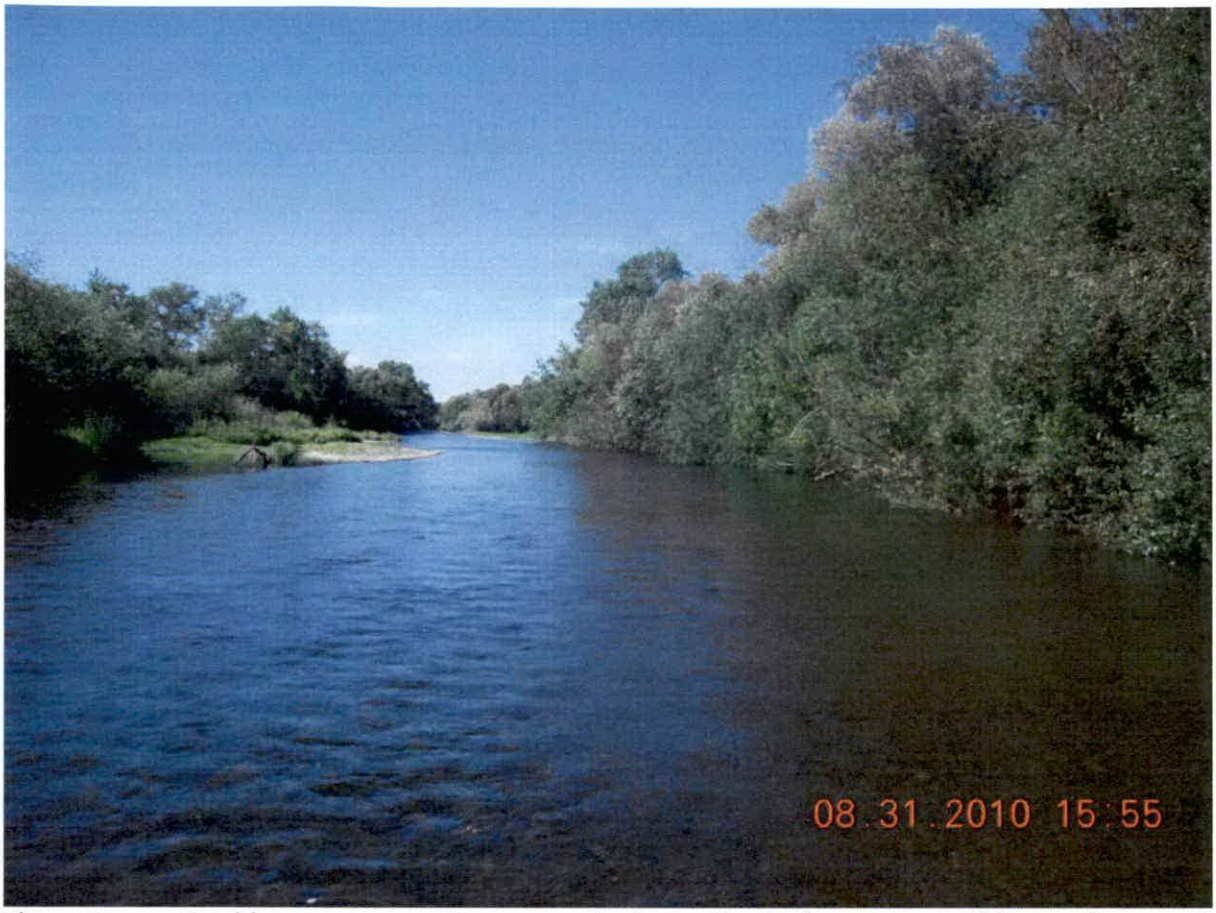

Figure I. Looking upstream at the survey site immediately downstream of the confluence of Dry Creek and the Russian River.