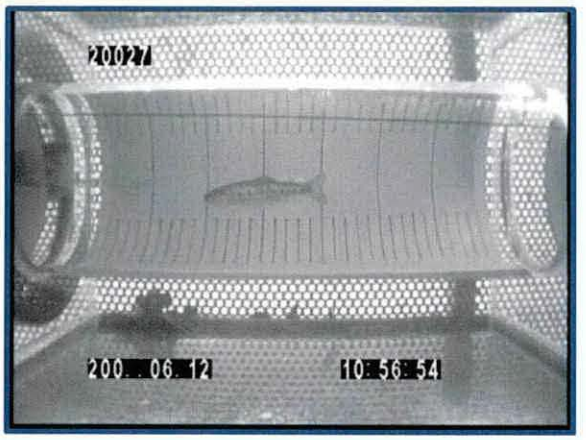
RESULTS OF THE FISHERIES MONITORING PLAN TO MEET STATE WATER RESOURCES CONTROL BOARD ORDER WR 2010 – 0018-DWR



April 1, 2011

Sonoma County Water Agency
404 Aviation Blvd.
Santa Rosa, CA 95403

SONOMA COUNTY WATER AGENCY

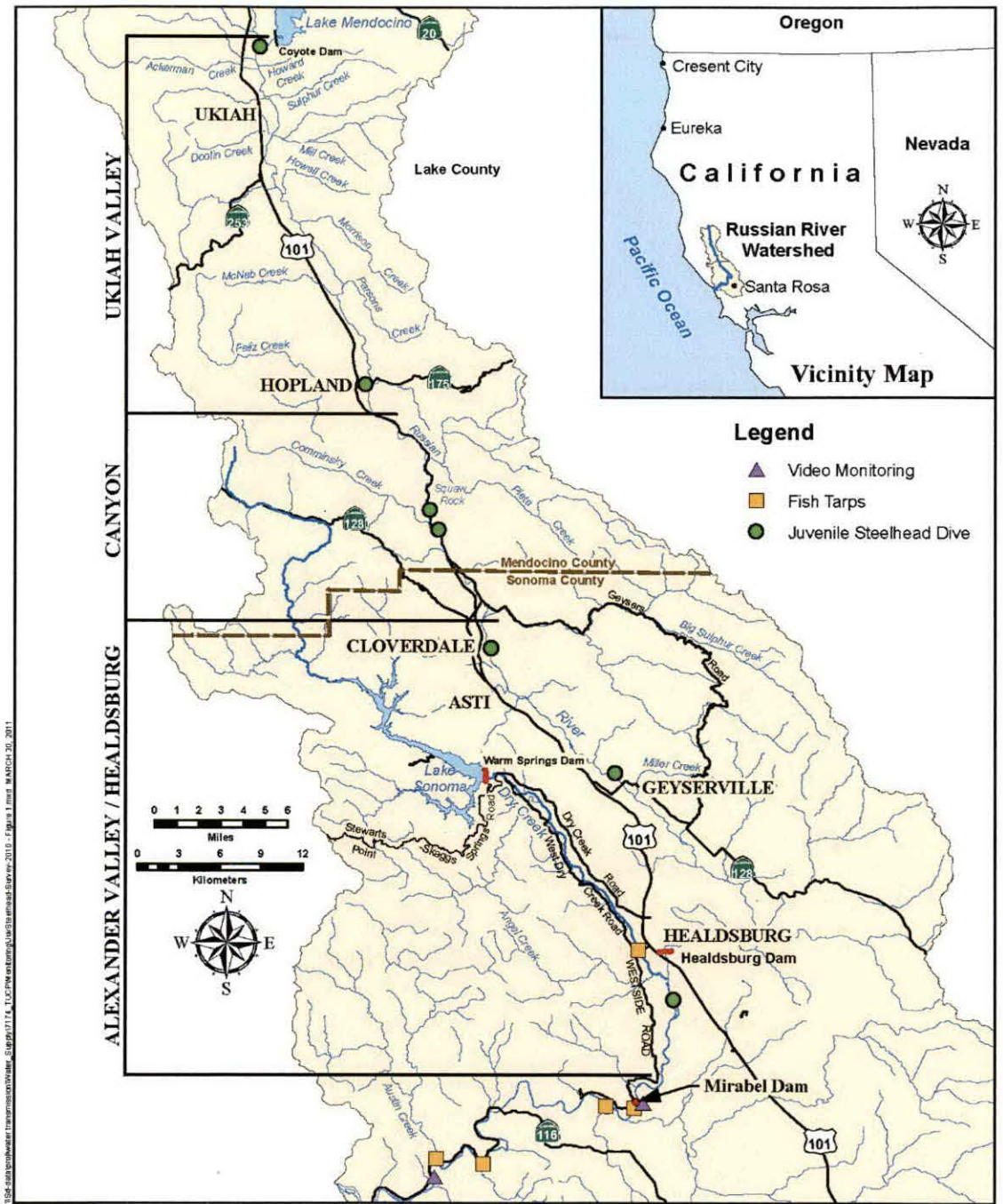
Introduction

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 6, 2010 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 May 25, 2010, the State Water Board issued Order WR 2010-0018-DWR (State Water Board Order) for the following temporary changes to D1610:

(1) From May 1 through October 15, 2010 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, 2010 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 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 May 2011, 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 the past 11 years. 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 in early September and ending when the dam is deflated due to high winter flows (typically in December). 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).

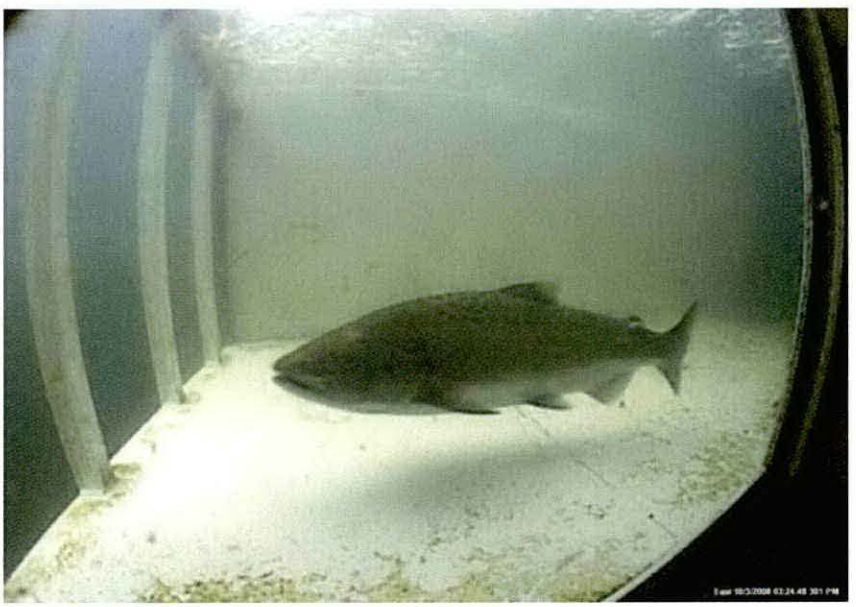

Figure 2. An image of an adult Chinook taken from the Mirabel Dam underwater video monitoring system located on the Russian River near Forestville, CA.

Adult Chinook Salmon Dive Surveys:

Weekly Chinook salmon dive surveys in the mainstem Russian River were performed from September 15 to November 15, 2010. 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 18, 2010 to August 25, 2010 the Agency conducted a dive survey for juvenile steelhead and native freshwater fish. A total of seven 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 corresponded to sites sampled in 2009 (Manning *et al.* 2009).

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. 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 traps can be found in Manning and Martin-Lamb (2011).

Fish traps located near the mouth of Green Valley Creek, Dutchbill 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, Dutchbill 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 Dutchbill 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 consists 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. The

video system alleviates the need to handle fish and minimizes fish stress in the relatively warm water conditions of the lower Russian River.

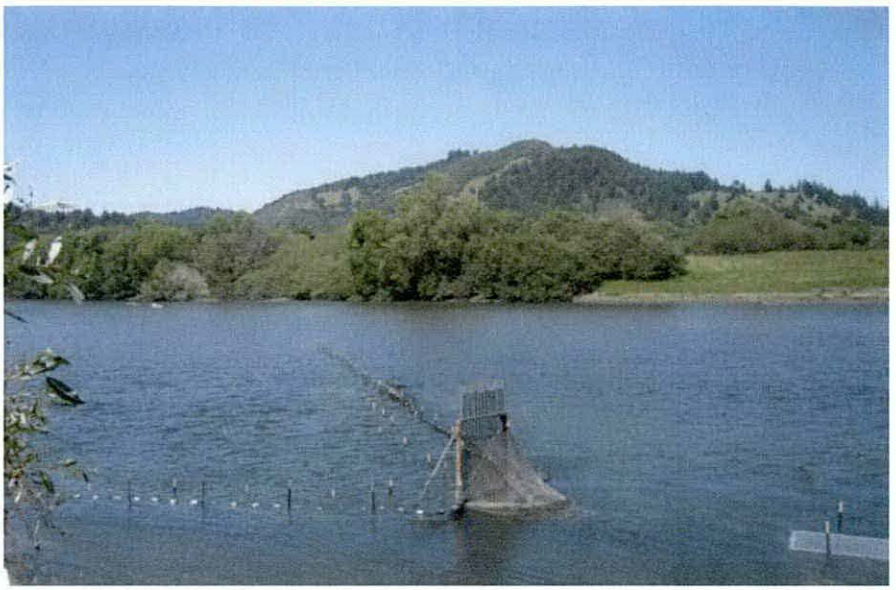

Figure 5. The Estuary fyke net juvenile salmonid video monitoring system located near the town of Duncans Mills.

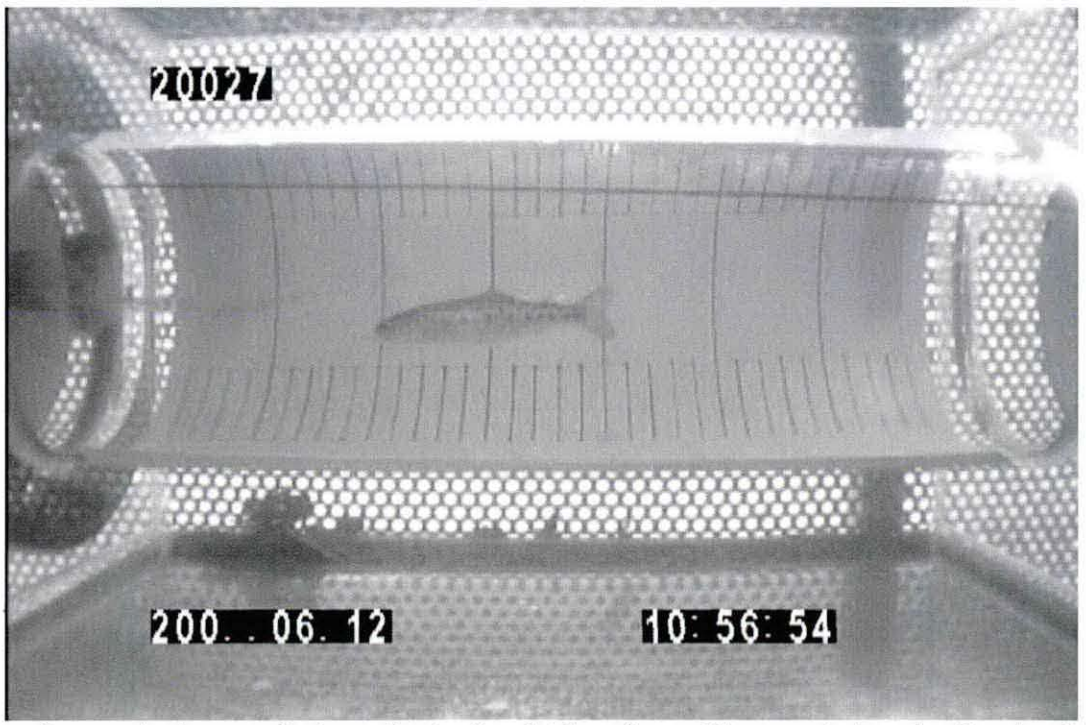

Figure 6. An image of a juvenile steelhead taken from video recoded on the Russian River Estuary fyke net juvenile salmonid video monitoring system.

Results:

Due to abundant rainfall, flows in the Russian River were higher than average in 2010. When compared to the average daily flow at the Hacienda Bridge Gaging Station from 2000 to 2009 flow in 2010 was higher in the late spring, early summer, and fall (Figure 7). Higher tributary inflow associated with a relatively wet spring necessitated that installation of traps later in 2010 than in previous years.

In October 2010, Lake Mendocino had the highest reservoir levels recorded in the last 51 years. High reservoir storage levels were due to a combination of the relatively wet spring and decreased releases to comply with the reduced in-stream flows required by the Biological Opinion. In October 2010, the US Army Corps of Engineers conducted a planned release from Coyote Valley Dam (Lake Mendocino) to evacuate water in the reservoir's flood control pool and stimulate the upstream movement of adult Chinook salmon.

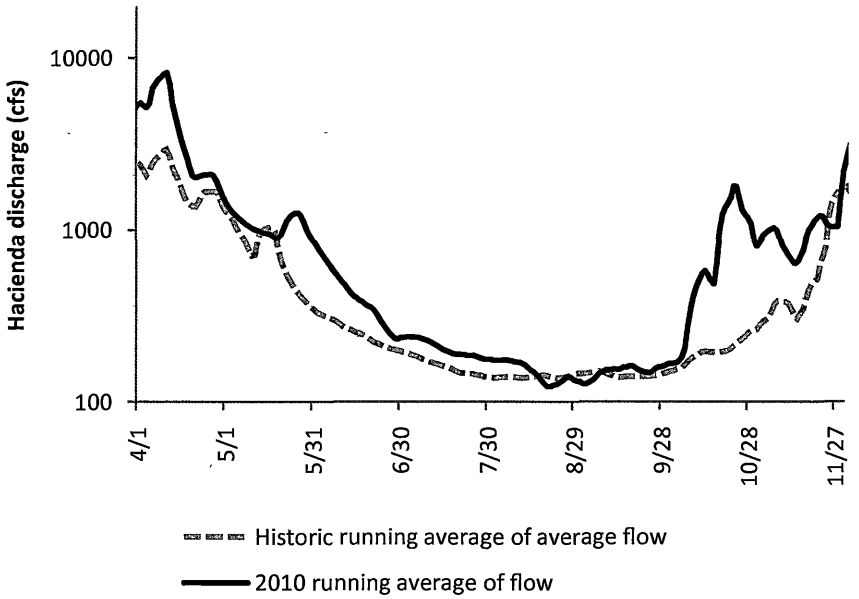

Figure 7. The weekly average of flow at Hacienda Bridge based on 10 years of data (2000-2009) shown with weekly average flow in 2010.

Early fall water conditions affected the monitoring of adult Chinook. A storm during the week of October 27, 2010 necessitated the deflation of Mirabel Dam as peak flow was forecast to rise above 5,000 cfs. When elevated storm flows subsided, the Water Agency re-inflated the dam in order to continue monitoring adult Chinook. The underwater camera system relies on counting fish as they move through fish ladders at the Mirabel inflatable dam. Unfortunately the Water Agency was not able to monitor the Chinook run while the dam was deflated and this led to a 5 day gap in the 2010 adult Chinook migration data. This storm also created river conditions that did not allow the Agency to conduct dive surveys to monitor adult Chinook salmon or to conduct Chinook redd surveys in the mainstem of the Russian River.

Video Monitoring of Adult Salmon Migration:

Video monitoring of the adult Chinook migration past the Mirabel inflatable dam began on September 1, 2010. The first Chinook for the season was observed on September 23, 2010. In total 2,515 adult Chinook salmon were observed at the Mirabel camera system (Table 1). Thirty eight Coho and 163 steelhead were also observed at the underwater camera system (Table 1). Fish could not be positively identified to the species level on October 25, 2010 due to high turbidity. The Dam was deflated for 5 days during the week of October 27, 2010, but operated continuously until it was deflated for the season on December 6, 2010. Because the video system only functions when the dam is inflated, counts at Mirabel dam represent minimum returns.

Table 1. The number of adult Chinook salmon, coho salmon, and steelhead observed on the Mirabel underwater camera system each week during the 2010. Please note that fish could not be positively identified to the species level on October 25, 2010 and October 26, 2010 due to high turbidity.

Date (Week)	Days fished	Chinook	Steelhead	Coho
1-Sep	7	0	0	0
8-Sep	7	0	0	0
15-Sep	7	0	0	0
22-Sep	7	3	0	0
29-Sep	7	654	0	1
6-Oct	7	62	0	2
13-Oct	7	954	11	8
20-Oct	7	307	5	9
27-Oct	2	33	2	1
3-Nov	7	199	2	5
10-Nov	7	93	8	4
17-Nov	7	47	41	3
24-Nov	7	124	36	1
1-Dec	5	40	58	4
Total	91	2516	163	38

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 2010. Because sustained flows at Hacienda Bridge stayed above 125 cfs, the Water Agency did not conduct lower river dive surveys in 2010.

Over 200 Chinook were observed at the Mirabel fish counting station by October 4, 2010 and upper river dive surveys were initiated the week of October 7. Survey sites included the pool immediately downstream from the Healdsburg Memorial Dam and the PG&E hole (approximately 200 m upstream of the Memorial Dam). Four apparently healthy adult Chinook were observed. The Water Agency planned on conducting upper river dive surveys to monitor adult Chinook on a weekly basis starting on October 7, 2010. However these surveys were not implemented because flows were too high to safely conduct dive surveys and turbidity was too high to detect fish.

Juvenile Steelhead Dive Surveys:

A total of 9,655 fish were detected during summer dive surveys consisting of 11 fish species (Table 3). However, only 11 juvenile steelhead were detected at the 7 survey sites (Table 2). Most fish consisted of native warm water species (99.5%). Two steelhead were found near a cold water seep near Geyserville and 9 steelhead downstream of the confluence with Dry Creek. 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 and 2010 there were 604 steelhead detected in 2002, 2 steelhead detected during 2009 and 2 steelhead during 2010 (Manning *et al.* 2009 and Table 2).

Water conditions during the 2010 survey were different than conditions present during the 2002 and 2009 surveys. Water visibility was relatively poor in 2010 when compared to the other 2 years sampled. The visibility in 2010 ranged from 0.5 m to over 2 m. 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 2010 water visibility was best (greater than 2 m) downstream of the confluence with Dry Creek. Water temperatures were colder in 2010 at most sites than during previous study years. Temperatures ranged from 12.5 °C in upper Ukiah Valley and gradually increased to 21 °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 (17 °C at the mouth of Dry Creek). The water temperature at this site was 21 °C 500 meters downstream of the confluence of Dry Creek (Table 2).

Table 2. Steelhead observations, water visibility, and temperature during summer dive surveys from 2002, 2009, and 2010 in the upper Russian River. Each site consisted of a 0.5 km river section. Note that dashes indicate locations that were not surveyed.

Reach	Location	2002						2009						2010					
		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				
	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, Feliz Creek confluence	-	-	-	-	-	-	1-2	17.2					0-1	15.5				
Canyon	Hopland, above Squaw Rock	1-2	20	57	56		113	-	-	-	-	-	-	-	-	-	-	-	-
	Hopland, below Squaw Rock	-	-	-	-	-	-	1-2	17.7					0-1	18				
	Cloverdale, above Comminski	1-2	18.9	411	24		435	1-2	17.7	1	1		2	0-1	19				
Alexander Valley/ Healdsburg	Cloverdale, below Crocker Bridge	1-2	22					1-2	21.1					0-1	21				
	Geyserville, above Hwy 128	1-2	23	1			1	>2	22.2					1-2	21	1	1		2
	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
	Healdsburg, above Riverfront Park	-	-	-	-	-	-	>2	16.7					-	-	-	-	-	-
		Total:		**551**	**235**	**2**	**788**	**Total:**		**4**	**14**	**0**	**18**	**Total:**		**2**	**9**	**0**	**9**

Table 3. Observations of non-salmonids during summer dive surveys from 2002, 2009, and 2010. Each site consisted of a 0.5 km section of the river.

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		83	0	0	0	0	66	10	0	0		0
Ukiah Valley, above Perkins Bridge	2		85	0	4	0	13	600	0	0	0		1
Ukiah Valley, Norgard Dam	1		511	61	1	0	0	578	300	0	0		2
Canyon, above Squaw Rock	0		298	119	10	1114	9	646	0	0	0		0
Canyon, above Comminski Station	2		1819	608	23	440	1	1297	0	0	0		0
Alexander Valley, below Crocker Bridge	37		1764	1212	40	4850	6	1454	0	0	0		0
Alexander Valley, above Geyserville Bridge (Hwy 128)	5		239	353	18	0	14	1200	0	0	0		1
Healdsburg, Healdsburg Dam	370		196	79	91	0	6	605	0	1	27		1
TOTAL	**417**	**0**	**4995**	**2432**	**187**	**6404**	**49**	**6446**	**310**	**1**	**27**	**0**	**5**
2009													
Ukiah Valley, below Forks													
Ukiah Valley, above Perkins Bridge													
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, Feliz 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 3. Continued from previous page. Observations of non-salmonids during summer dive surveys from 2002, 2009, and 2010. Each site consisted of a 0.5 km section of the river.

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	800	0	0	0	0	1
Canyon, above Comminski Station	0	0	146	254	3	47	0	1561	4	0	0	0	1
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		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**

Downstream Migrant Fish Trapping:

Downstream migrant trapping commenced on Austin Creek on April 15, 2010 and traps at 4 other Russian River Basin locations were installed between April 21 and May 5. Traps were operated until out-migrant fish were no longer detected, or lower flow prevented efficient trap operation (Table 4). The UC Cooperative Extension (UCCE) Coho Salmon Monitoring Program operated a fish trap on lower Green Valley Creek to estimate the outmigration of coho smolts. The Water Agency worked in conjunction with UCCE to PIT tag steelhead parr at the Green Valley Creek trap (Table 4).

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

Trap	Installed	Removed	Total days sampled
Austin	4/16/2010	7/19/2010	94
Dutchbill	4/21/2010	7/13/2010	82
Dry Creek	4/22/2010	8/31/2010	132
Mirabel	5/5/2010	7/16/2010	73
Green Valley	3/11/2010	6/3/2010	57

Steelhead:
In 2010, steelhead parr were most frequently encountered in Austin Creek. Over the course of the 2010 trapping season, 4,682 steelhead parr were captured at the Austin Creek trap (Figure 8). The Water Agency applied 997 PIT tags to steelhead (of which 963 were YOY steelhead) in Austin Creek. Dry Creek had the second highest catch of steelhead during the 2010 trapping season. In total 2,083 wild steelhead parr and 41 wild steelhead smolts were caught at the Dry Creek trap (Figure 8 and Figure 9).

In 2010, 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, 384 and 58 steelhead parr steelhead were caught at Mirabel and Dutchbill Creek respectively (Figure 8). While 44 and 5 steelhead smolts were caught at Mirabel and Dutchbill Creek respectively (Figure 9). The Green Valley Creek trap operated by the UCCE detected 5 steelhead parr and no steelhead smolts. 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 5,264 Chinook smolts were captured at the Dry Creek trap (Figure 10). A population estimate of 86,595 (95% CI: ± 8,890) at the Dry Creek fish trap was calculated using the Dry Creek catch data and trap efficiencies.

In 2010, Mirabel had the second highest catch of Chinook (2,501 smolts, Figure 10). Based on trap efficacies a population estimate of 101,976 ((95% CI: ± 41,916) was constructed for Mirabel in 2010. However trap efficacies were lower at Mirabel and the confidence interval is wider

when compared to Dry Creek. In 2010 relatively few Chinook smolts were captured in Austin Creek and Dutchbill Creek (24 and 4 respectively) (Figure 10). Green Valley Creek had similarly low catches of Chinook smolts as well. Fourteen Chinook were captured in the Green Valley Creek trap.

Coho:

The Green Valley Creek trap operated by the UCCE detected the most coho salmon smolts of the traps operated in conjunction with, or by the Water Agency in order to meet the requirements of the State Water Board's Order. In total 2,515 hatchery coho smolts and no wild coho salmon smolts (coho with adipose fins are presumed to be wild) were captured at the Green Valley Creek fish trap. At Dutchbill Creek 221 hatchery coho smolts and 1 wild coho smolt were detected at the trap as well (Figure 11). In Austin Creek 109 hatchery coho smolts were detected at the fish trap (Figure 11). An additional 2,419 hatchery coho parr were captured between June 25, 2010 and July 16, 2010 at the Austin fish trap. At Mirabel 189 hatchery coho smolts and 1 wild coho smolt were captured (Figure 11). The Dry Creek fish trap captured 21 hatchery coho smolts and 3 wild coho smolts (Figure 11). 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 2010.

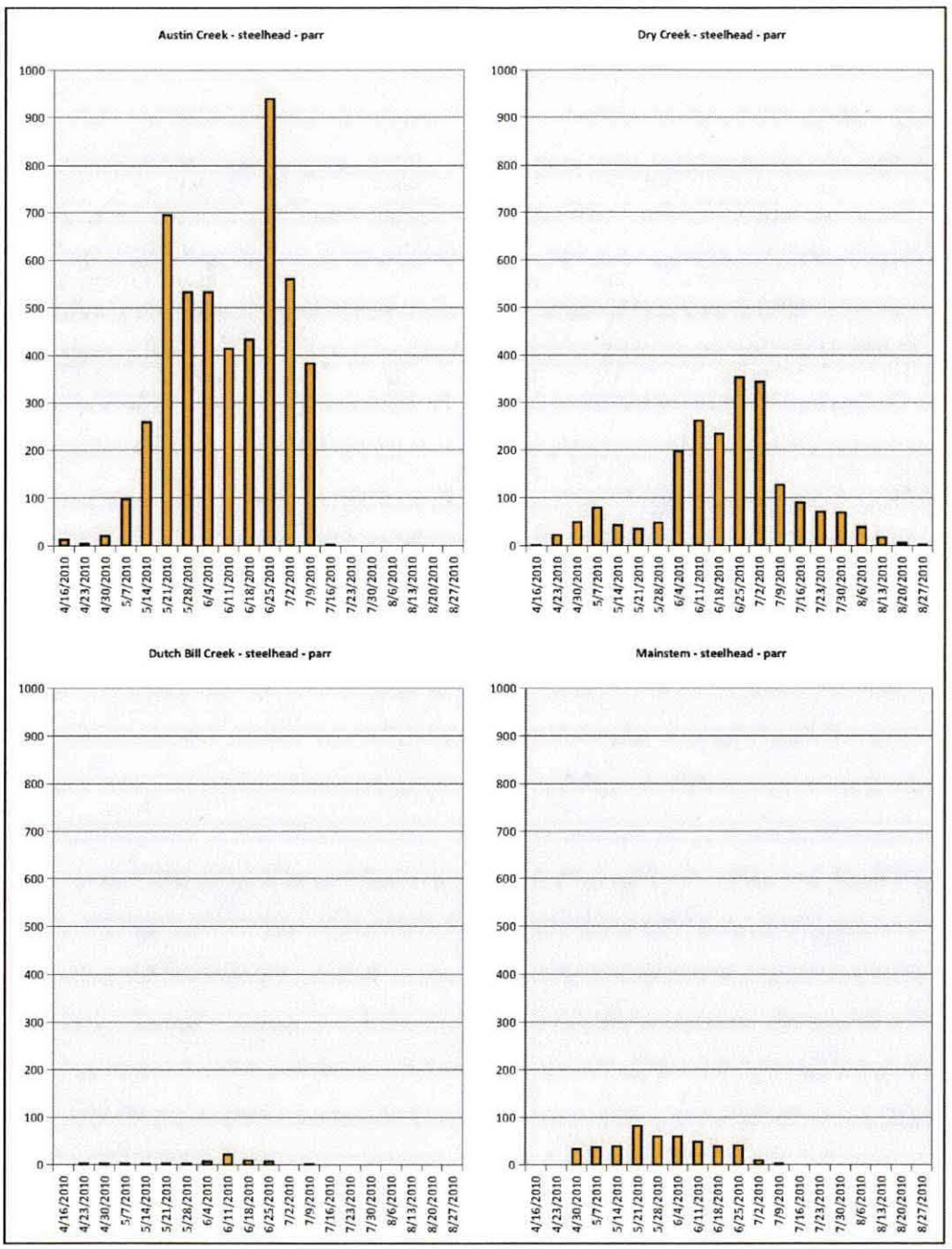

Figure 8. The weekly number of wild steelhead parr captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutchbill Creek, and Mainstem (Mirabel) trapping sites during the 2010. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

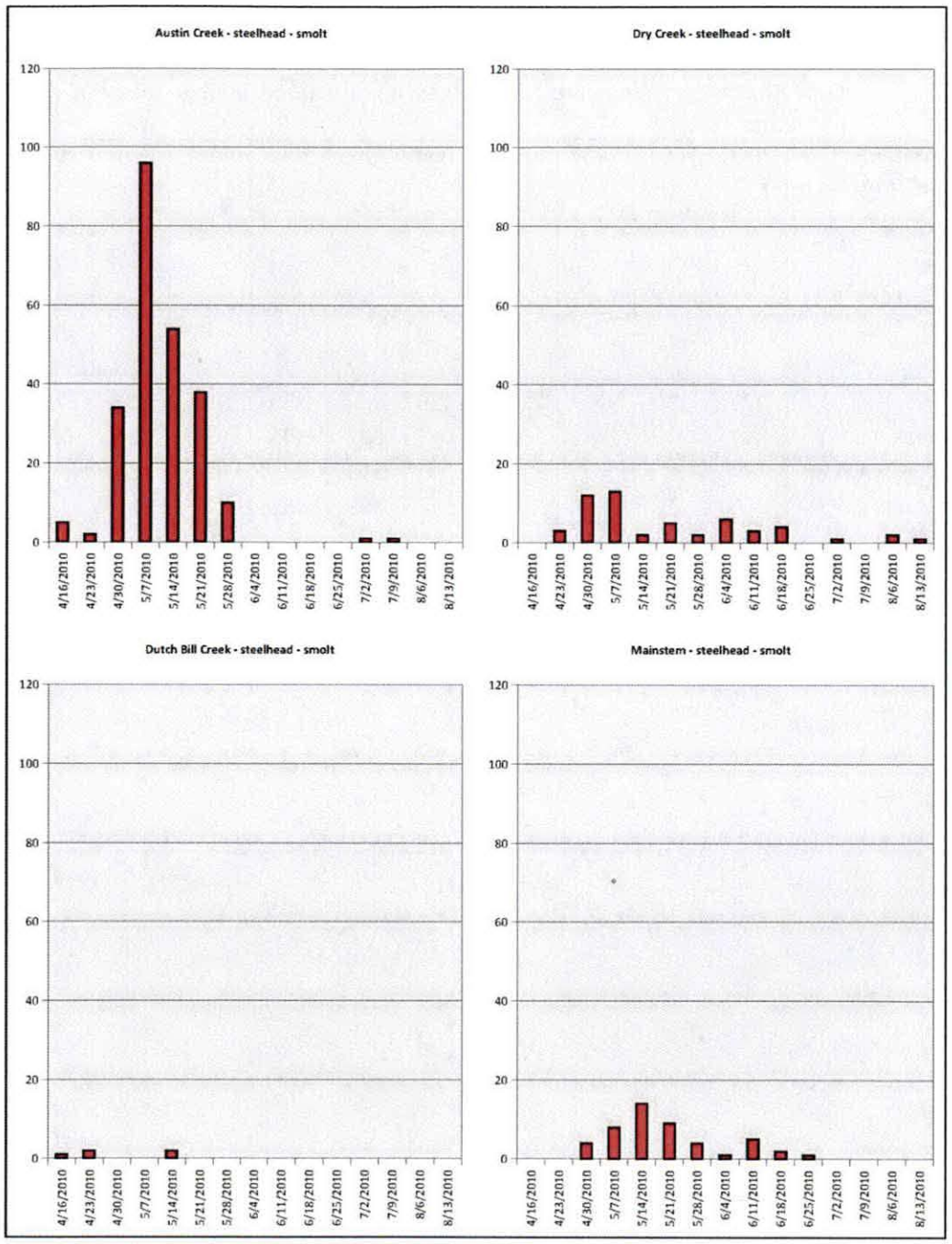

Figure 9. The weekly number of wild steelhead smolts captured in Russian River fish traps operated by the Water Agency at the Austin Creek, Dry Creek, Dutchbill Creek, and Mainstem (Mirabel) trapping sites during 2010. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

Table 5. The annual catch of non-smolt steelhead caught during the 2000 to 2010 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
Austin Creek	-	-	-	-	-	-	-	7,436	-	-	4774
Dry Creek	-	-	-	-	-	-	-	-	-	5290	2049
Dutch Bill Creek	-	-	-	-	-	-	-	-	-	-	58
Estuary	-	-	-	-	-	-	-	-	-	51	-
Green Valley Creek	-	-	-	-	-	417	-	27	304	1	67
Mainstem	773	156	5727	1115	1428	1594	230	1852	831	75	375
Mill Creek	-	-	-	-	-	627	393	931	725	438	352
Sheephouse Creek	-	-	-	-	-	113	59	49	17	-	-
Ward Creek	-	-	-	-	-	495	353	707	-	-	-

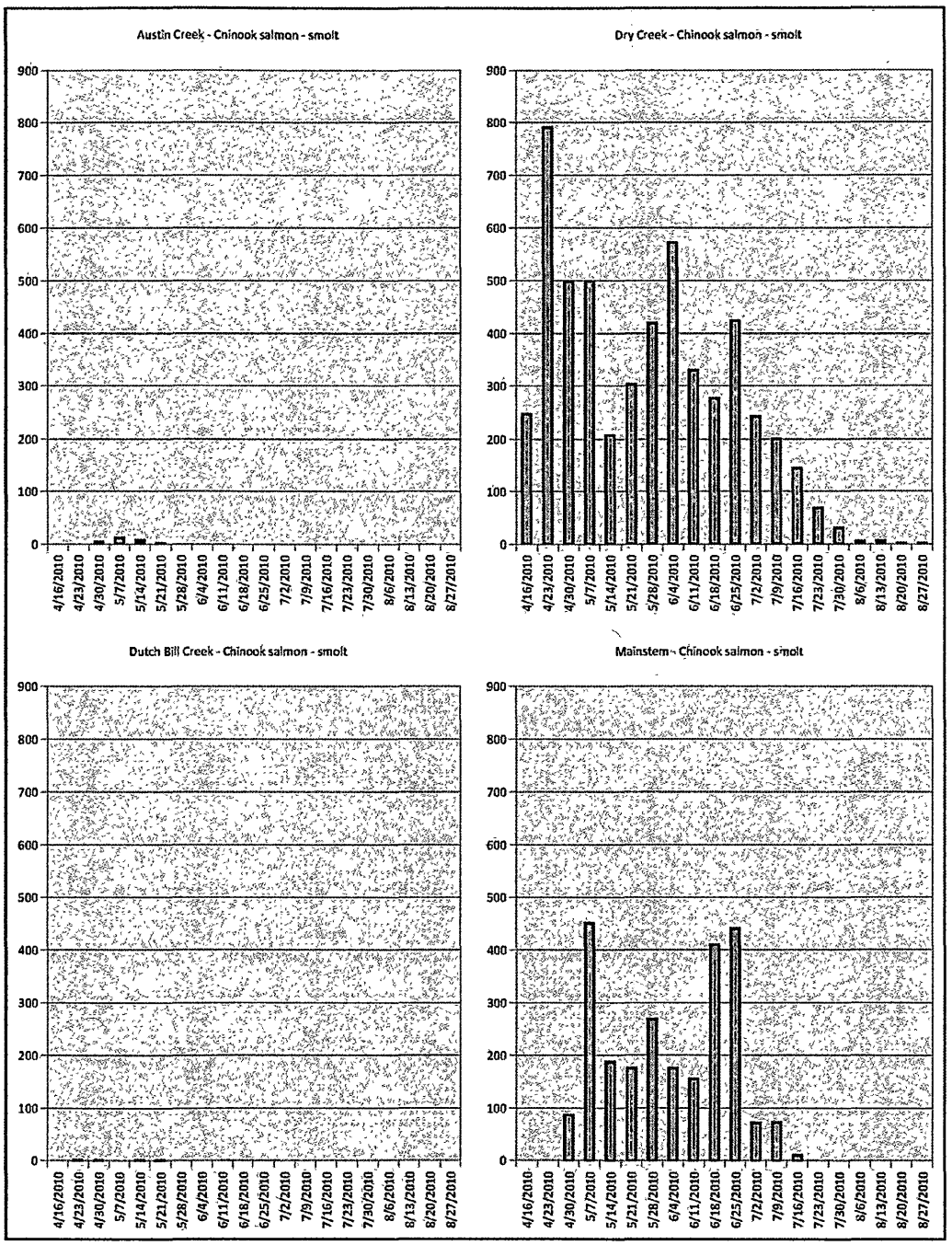

Figure 10. The weekly number of wild Chinook smolts captured in Russian River fish traps operated by the Water Agency at the Austin Creek, Dry Creek, Dutchbill Creek, and Mainstem (Mirabel) trapping sites during 2010. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

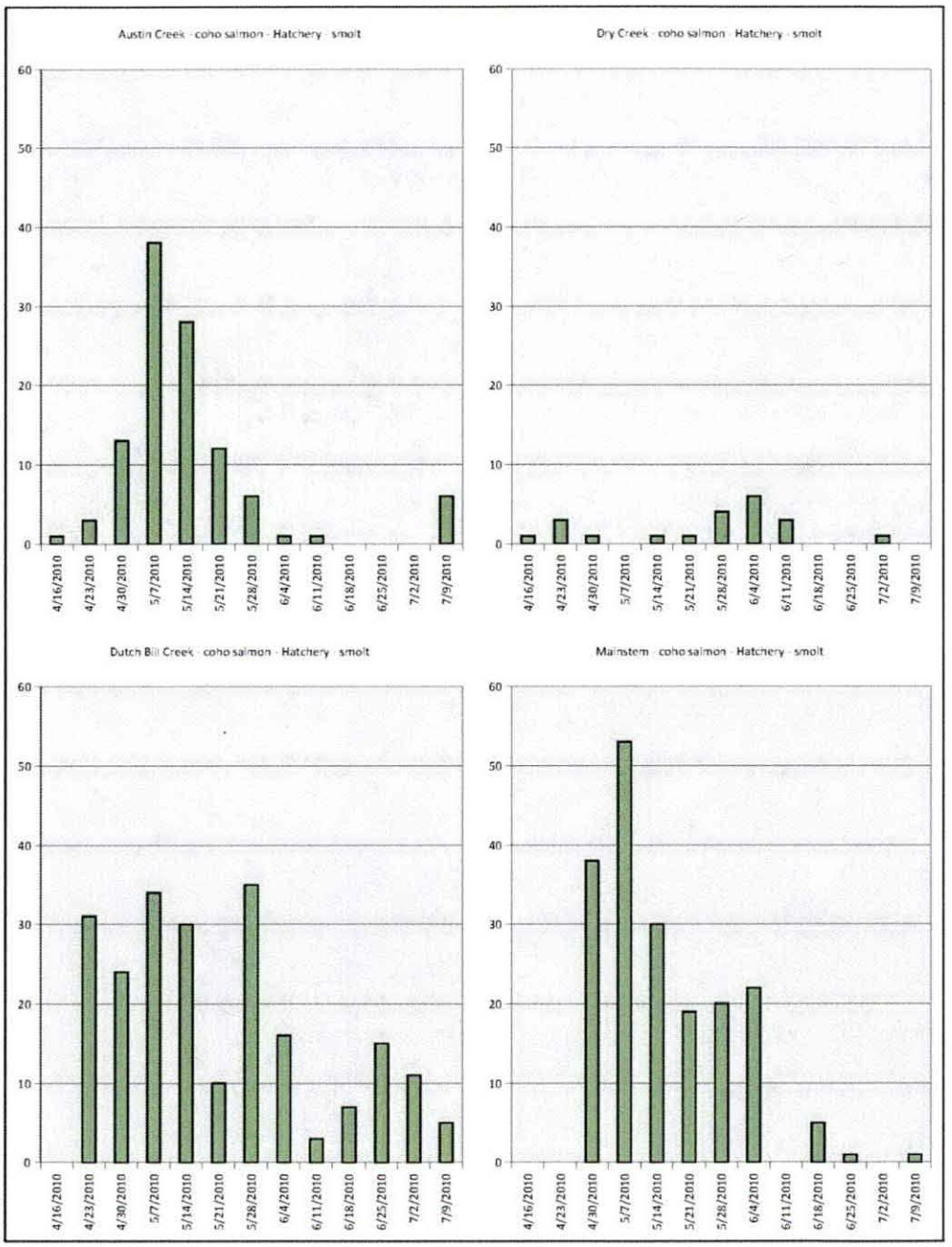

Figure 11. The weekly number of RRCCBP coho smolts captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutchbill Creek, and Mainstem (Mirabel) trapping sites during the 2010. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates. An additional 2,419 hatchery coho parr were captured between June 25, 2010 and July 16, 2010 at the Austin fish trap and are not shown in this figure.

Estuary Fyke Net Juvenile Salmonid Video Monitoring System:

On May 27, 2010 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 31 with the following exceptions; from May 29, 2010 through May 30, 2010 when turbidity was too high to detect fish and from June 2, 2010 through June 5, 2010 when the camera was damaged and out for repair.

The modifications to the fyke net in 2010 appear to have improved our ability to monitor juvenile salmonids. In 2009 the estuary fyke net was operated as a trap and 51 steelhead parr, 45 steelhead smolts, 162 Chinook, and 21 coho were captured. In comparison to 2010, when the fyke net was operated as a underwater video monitoring station 956 juvenile steelhead, 212 juvenile coho, and 404 Chinook smolts were observed (Figure 12-Figure 14). Technicians were highly confidant in the species identification of 79 % of juvenile steelhead, 65 % of juvenile coho, and to 57 % of the Chinook smolts observed on the video.

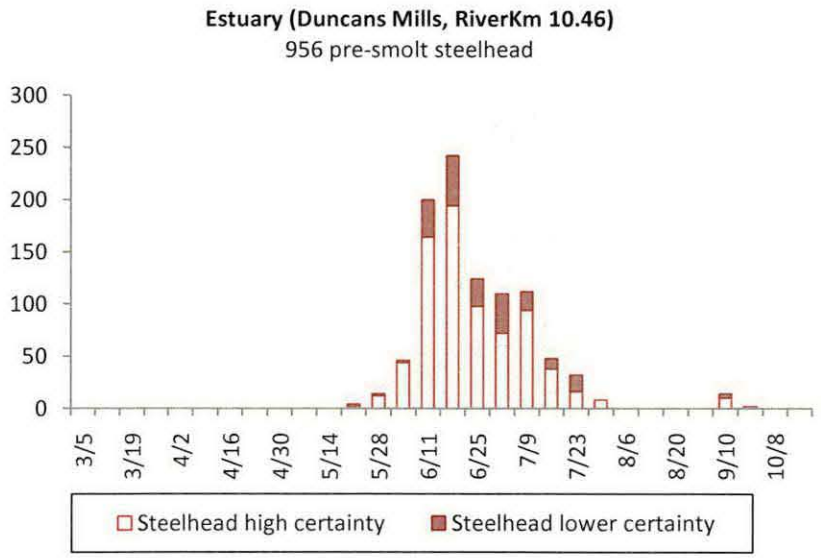

Figure 12. The number of steelhead observed on the Russian River Estuary fyke net video camera system in 2010. High/lower certainty indicates the confidence in the identification of individual fish to species level, based on image quality. The proportion of the week that the camera was operating is shown in light green. Note that these numbers represent total detections and have not been adjusted for camera efficiencies. These are not population estimates.

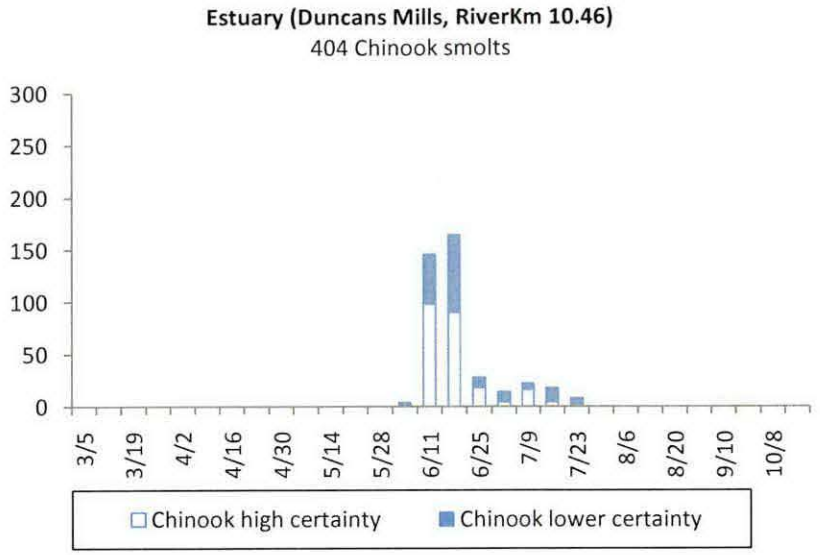

Figure 13. The number of Chinook observed on the Russian River Estuary fyke net video camera system in 2010. High/lower certainty indicates the confidence in the identification of individual fish to species level, based on image quality. The proportion of the week that the camera was operating is shown in light green. Note that these numbers represent total detections and have not been adjusted for camera efficiencies. These are not population estimates.

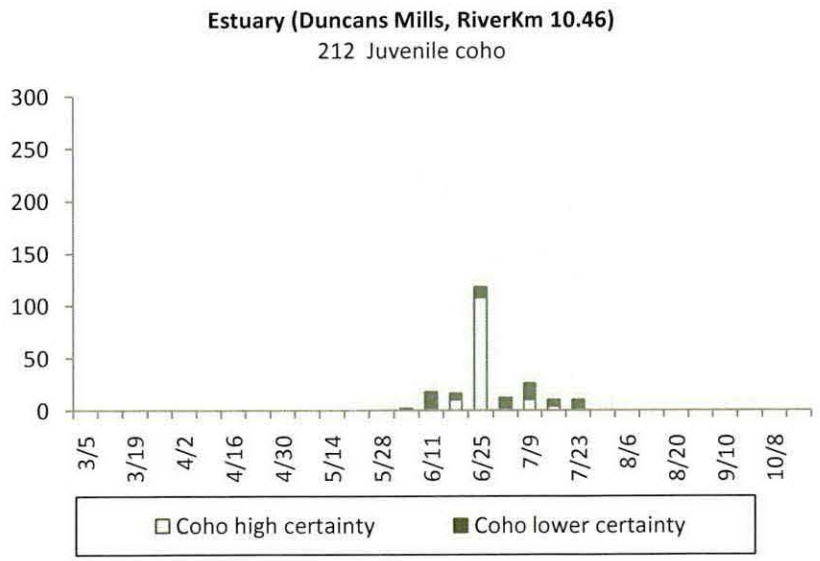

Figure 14. The number of Coho observed on the Russian River Estuary fyke net video camera system in 2010. High/lower certainty indicates the confidence in the identification of individual fish to species level, based on image quality. The proportion of the week that the camera was operating is shown in light green. 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 size of the 2010 run ranked approximately 6th in the last 11 years even with the 5 day period in late October where no data was collected due to the dam being lowered. The count of hatchery coho was higher in 2010 than any other year. This is likely due to increased releases of coho smolts by the hatchery program and possibly to improved ocean conditions.

Adult Chinook Salmon Dive Surveys:

Little data was collected during the adult Chinook dives due to high water velocity and high turbidity associated with relatively early storms. Because of the lack of data no conclusions can be drawn.

Juvenile Steelhead Dive Surveys:

Overall, steelhead abundance appeared to be lower during summer 2010 than 2002 but counts were similar to 2009. Water visibility likely played a role in the low detection rate of juvenile steelhead during the 2010 survey. Of the 3 years surveyed, water visibility was the lowest during 2010. Water visibility was less than 1 meter at the forks of the Russian River, Hopland, Squaw Rock, Comminski Station Road, and Alexander Valley near Crocker Road. However, if large numbers of steelhead were present at these sites it is likely that more individuals would have been detected.

The discrepancy between juvenile steelhead counts from 2002 and steelhead counts from 2009 and 2010 dive surveys could also be explained by differences in adult steelhead returns and spawning from previous years. In the 4 sample sites that were repeatedly surveyed in 2002, 2009, and 2010 the Water Agency detected 604, 2, and 2 steelhead, respectively. Some of the lowest steelhead adult hatchery returns at Warm Springs and Coyote Valley hatcheries in the last 10 years occurred in 2008-2009 and 2009-2010. However the 2001-2002 adult returns were relatively strong (Figure 15). While steelhead observed during the dive surveys are wild, it is likely that both hatchery and wild steelhead smolts experienced similar ocean conditions and that trends in the number of returning adults would be similar between the hatchery and wild populations. It is also 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 than the surveys conducted in 2009 and 2010.

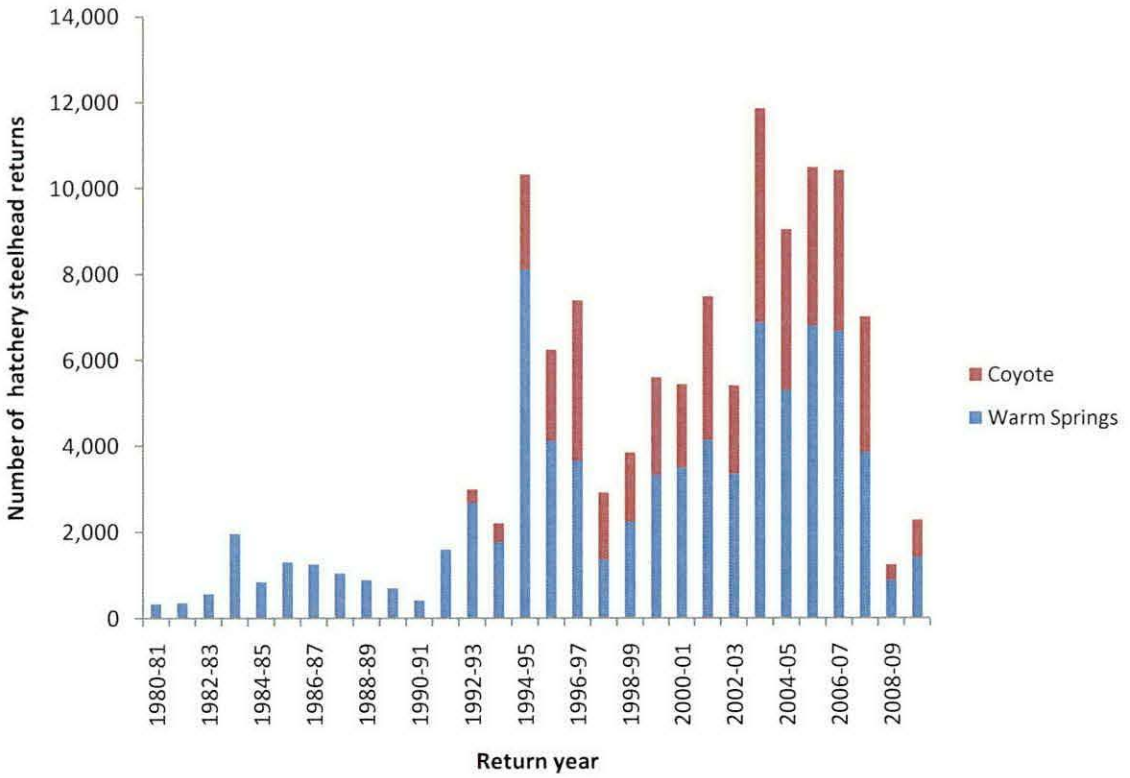

Figure 15. Hatchery returns of adult steelhead at the Coyote Valley Dam and Warm Springs Dam fish hatcheries for 1980-81 to 2010-2011 return years.

Downstream Migrant Fish Trapping:

Steelhead:
Much of the 2010 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 and 2010 and spawner survey data (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). The relatively low number of Chinook detected at Mirabel during 2010 when compared to other years may be partially due to lower trap efficiency in 2010. We found that trap efficacies for catching hatchery steelhead parr at Mirabel Dam decreased when the rubber dam was deflated (Water Agency unpublished data). The Dam was deflated for much of the 2010 trapping season.

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 it is unusual to encounter hatchery coho parr especially in large numbers since coho typically outmigrate as age 1+ smolts. The 2,419 hatchery coho parr encountered at the Austin Creek fish trap was likely an anomaly. These coho parr had been stocked in tributaries at least 10.9 km upstream of the Austin Creek trap a few days before they were captured. These fish were expected to rear throughout the summer in tributaries and their rapid downstream movement was not anticipated. 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 2010 Estuary fyke net video monitoring system 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. The increase in the number of steelhead detected at the Estuary fyke net is likely due to the increase in the length of the 2010 trapping season and an increase in trap efficiency. However without the ability to measure trap efficiencies it is not possible to determine if the difference between the number of steelhead detected during the 2009 and 2010 monitoring seasons are related to the increased sampling season, a change in the number of steelhead entering the estuary, or to an increased detection rate due to modifications made to the trap.

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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.

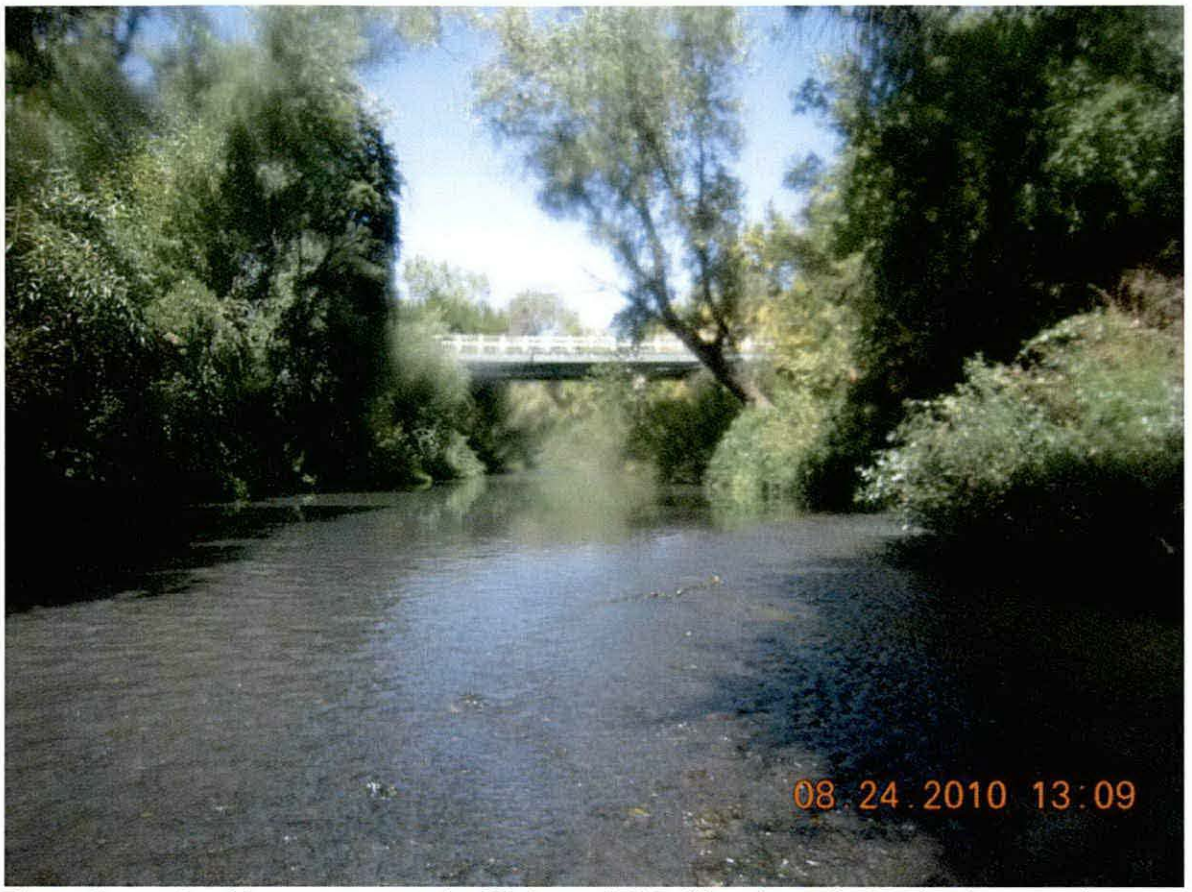

Figure C Looking upstream at the Highway 175 Bridge above the Hopland survey site.

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

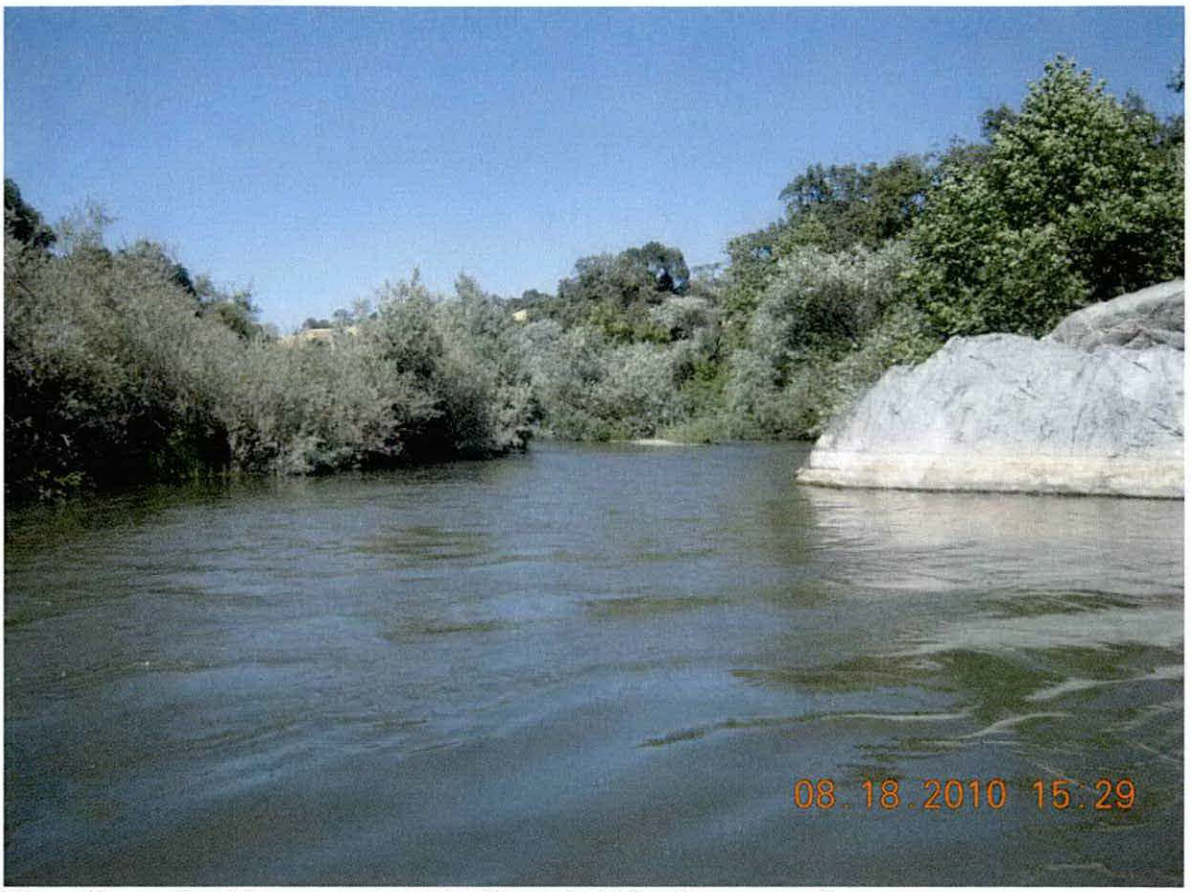

Figure E. Looking upstream at the Comminski Station survey site.

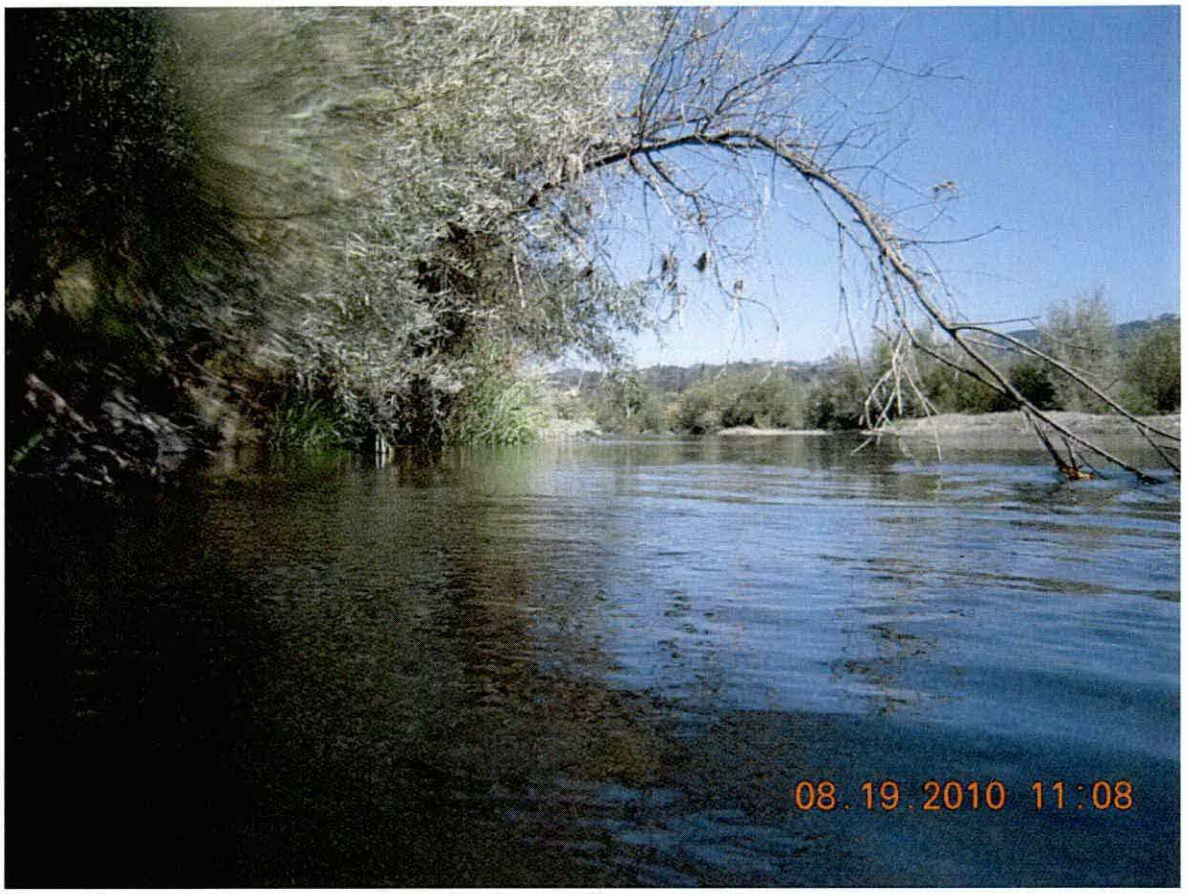

Figure F Looking upstream at the Geyserville survey site.

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

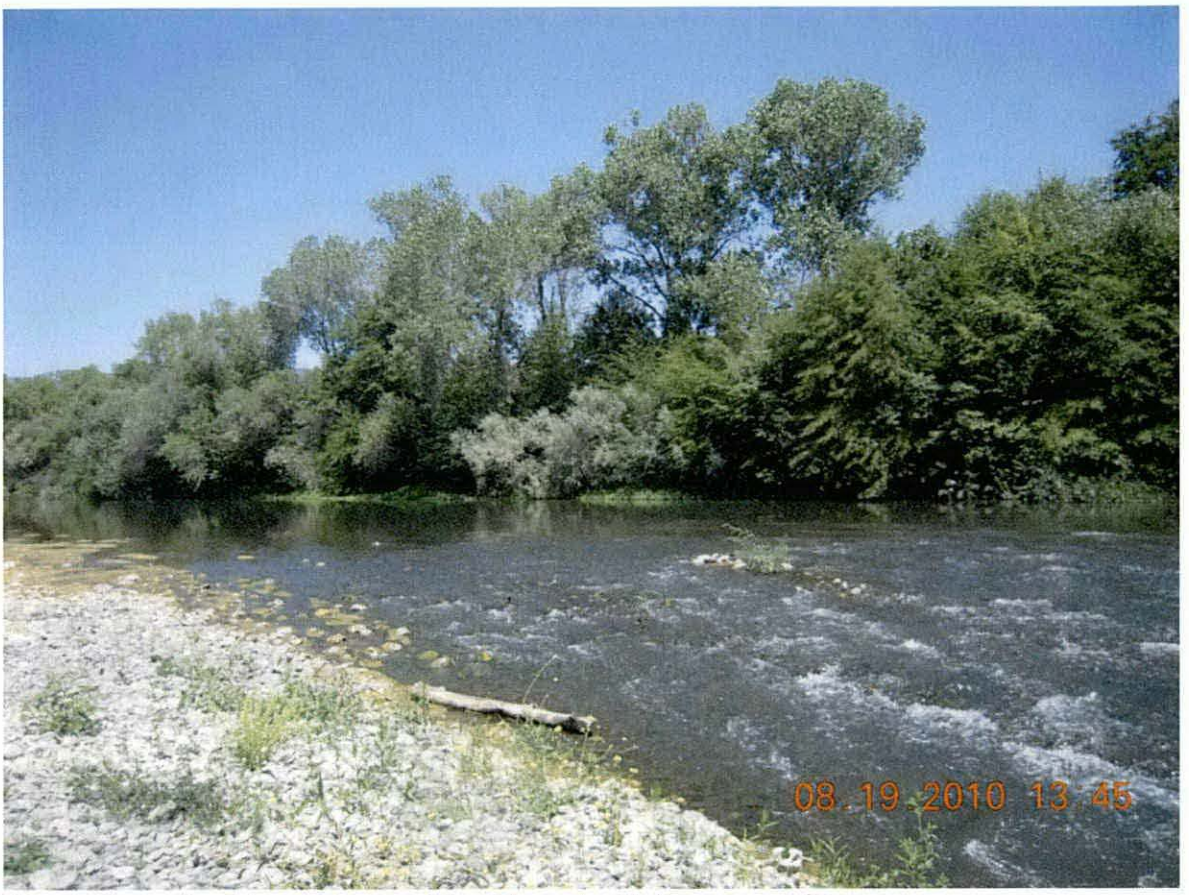

Figure H Looking upstream at the Alexander Valley survey site.

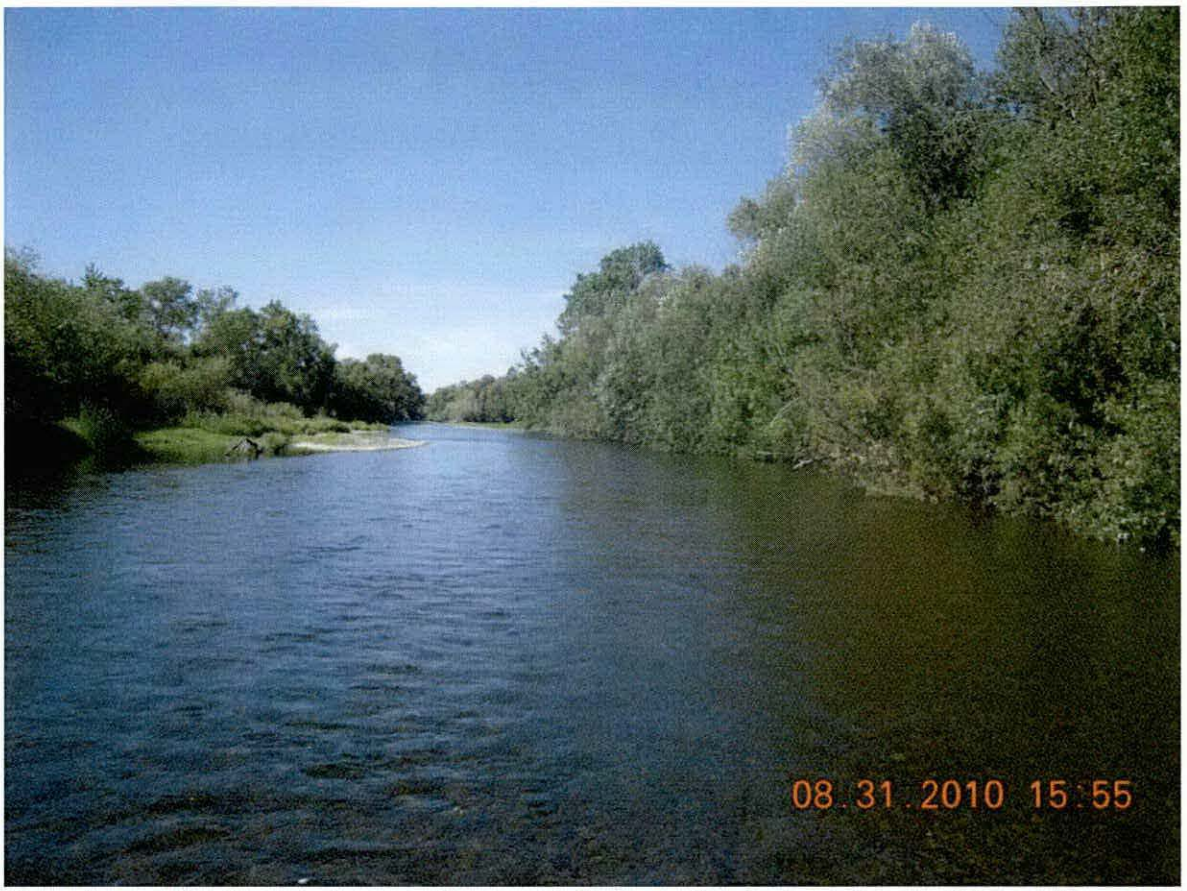

Figure I. Looking upstream at the survey site immediately downstream of the confluence of Dry Creek and the Russian River.