RESULTS OF THE FISHERIES MONITORING PLAN FOR THE SONOMA COUNTY WATER AGENCY 2012 TEMPORARY URGENCY CHANGE (TUC)

April 1, 2013

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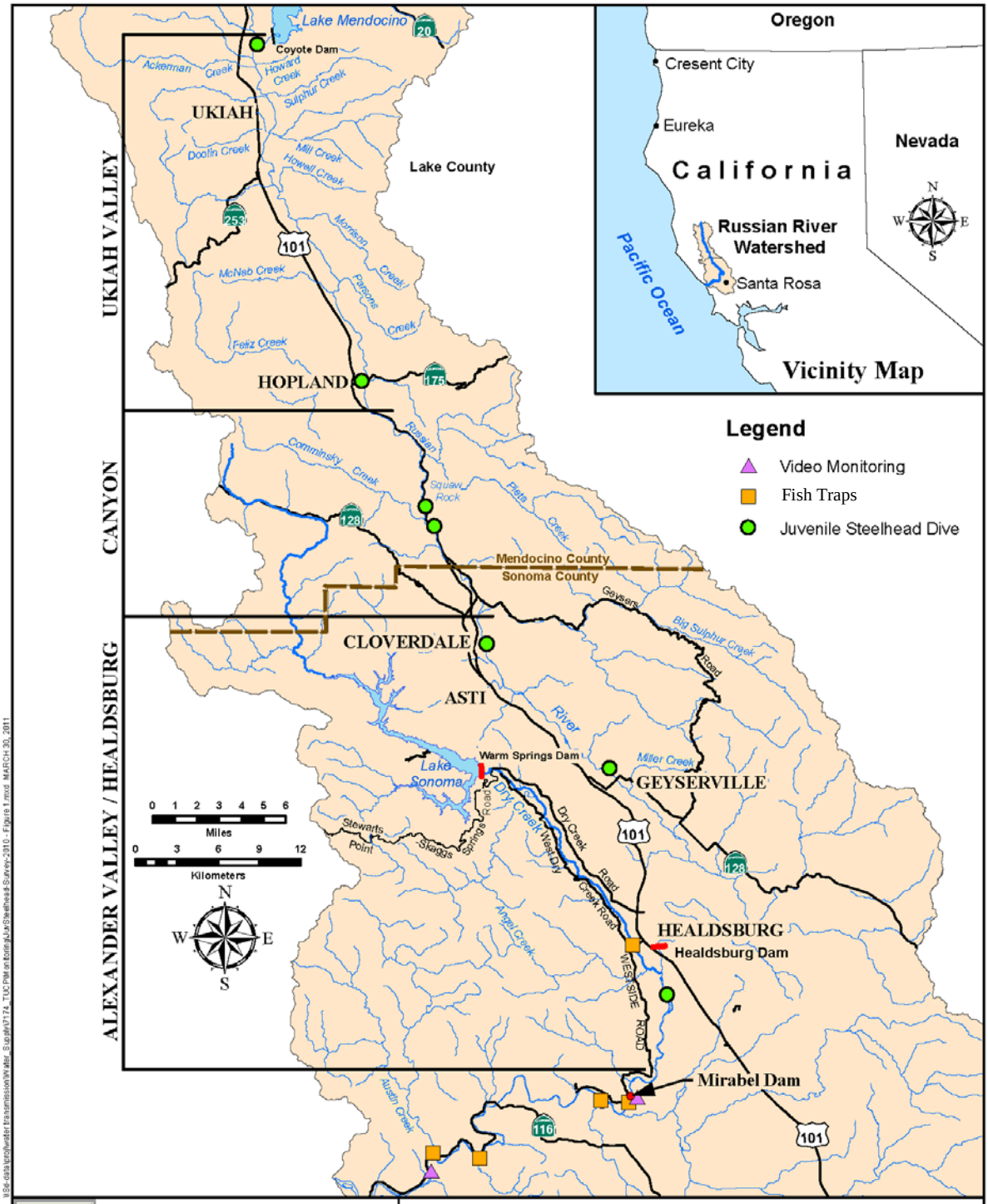
Introduction

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.

In April of 2012, 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 2, 2012, the State Water Board issued an "Order Approving Temporary Urgency Change" for the following temporary changes to D1610:

(1) From May 2 through October 15, 2012 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 2 through October 15, 2012 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, Dutch Bill 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). 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 coho (foreground) and an adult Chinook (background) taken from the Mirabel Dam underwater video monitoring system located on the mainstem Russian River near Forestville, CA.

Adult Chinook Salmon Dive Surveys:

The State Water Board Order requires dive surveys to be conducted in the lower mainstem provided 1.) adult Chinook are able to enter the Russian River (i.e. the river mouth was open), 2.) flows at the U.S. Geological Survey Hacienda Bridge Gage Station are below 125 cfs, and less than 200 Chinook have been observed on the Mirabel video system. Once 200 Chinook had been observed on the video system, the Water Agency is to conduct surveys at known spawning sites and relatively deep pools in the mainstem upstream of the Healdsburg memorial Dam when flows at Healdsburg are below 185 cfs.

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, multiple divers entered the river and visually searched the dive site in an attempt to detect adult Chinook (Figure 3). General appearance and number of Chinook in each pool was noted.

Figure 3. A photo of two adult Chinook in a pool near Healdsburg. The photo was taken during a dive survey conducted on October 11, 2012.

Juvenile Steelhead Dive Surveys:

From September 5 to September 11, 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 corresponded to sites sampled in 2011 (Smith 2011).

At each site, two divers entered the water at the downstream end of the sample site. The stream was divided into 2 lanes (left bank 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 4 and Figure 5). 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 Mark West Creek (near Trenton Healdsburg Road) , 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, Mark West 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 4. A rotary screw trap on Austin Creek.

Figure 5. 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 6). 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 7). 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 6. The Estuary fyke net juvenile salmonid video monitoring system located near the town of Duncans Mills.

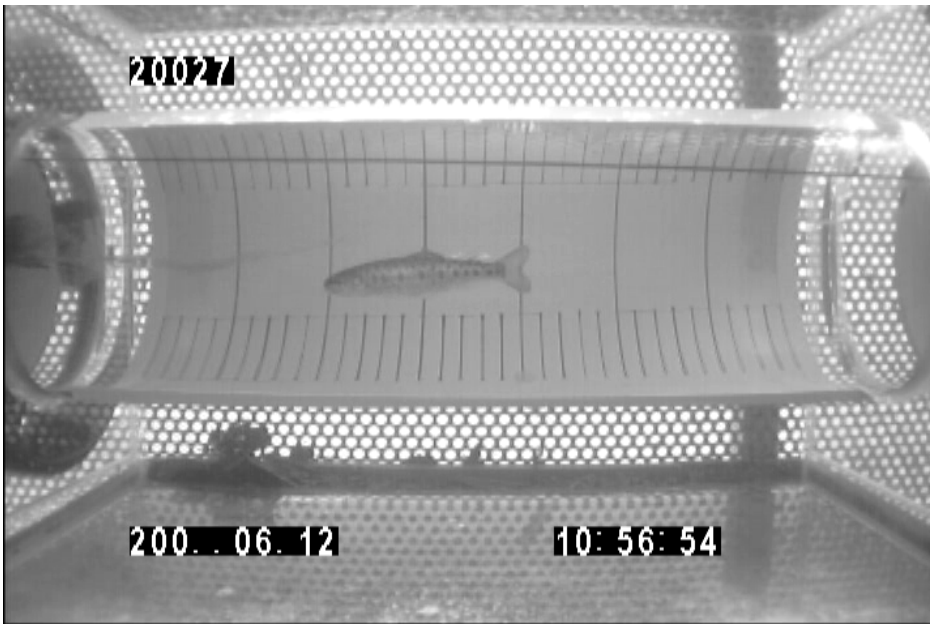

Figure 7. An image of a juvenile steelhead taken from video recoded on the Russian River Estuary fyke net juvenile salmonid video monitoring system.

Results:

Flows:

During the spring of 2012, Russian River flows were below the average stream flows for normal water years (2002, 2003, 2005, 2006). During the late summer flows in some reaches of the Russian River, such as near Hacienda and Healdsburg, were below D1610 minimum flows (Figure 8 and 9). When compared to the average daily flow at the Hacienda Bridge gaging station from 2000 to 2009 flow in 2012 was lower in the late spring and summer and slightly lower in the fall (Figure 9).

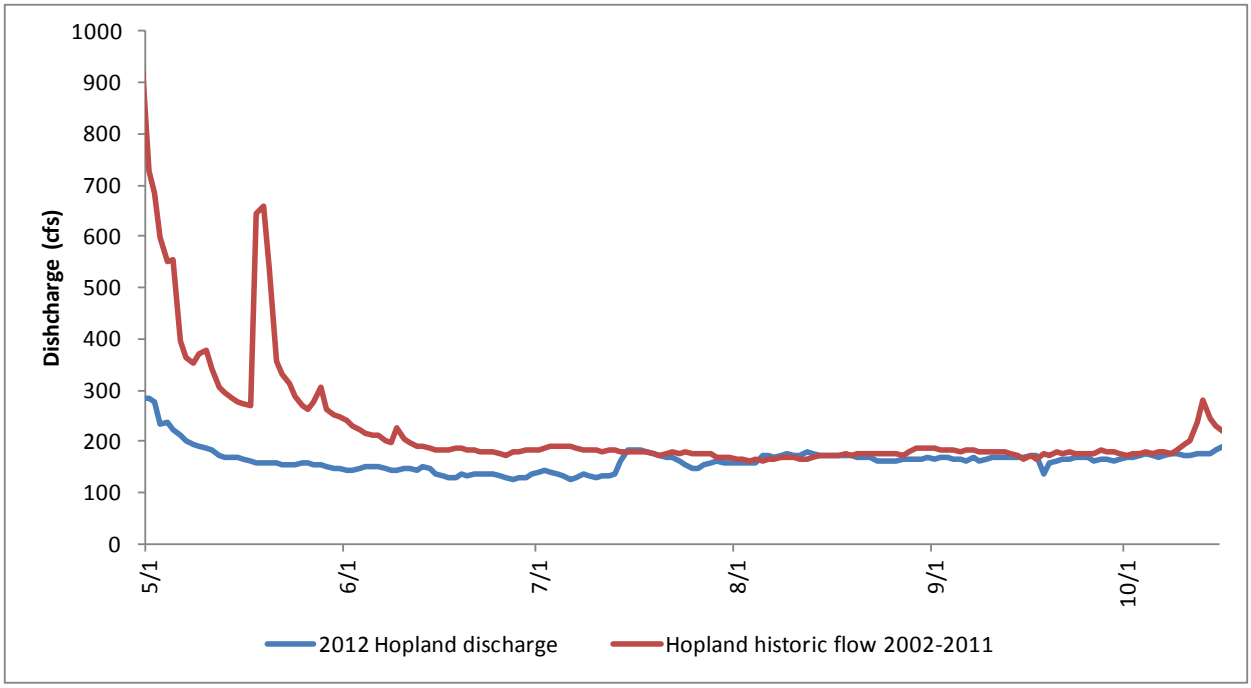

Figure 8. The average of flow of normal water years (2002, 2003, 2005, 2006) Hopland shown with weekly average flow in 2012.

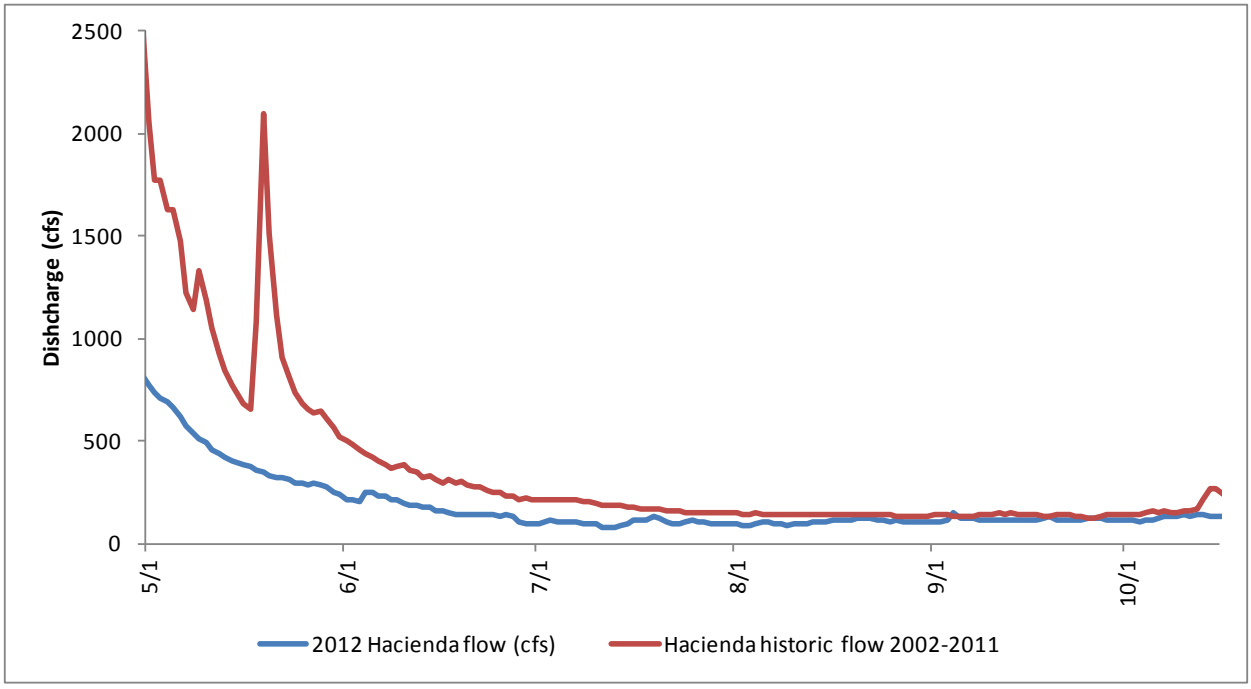

Figure 9. The average of flow of normal water years (2002, 2003, 2005, 2006) Hacienda Bridge shown with weekly average flow in 2012.

A relatively early winter storm forced the Water Agency to deflate the rubber dam at Mirabel in late November. The underwater camera system relies on counting fish as they move through fish ladders at the Mirabel inflatable dam. As a result the Water Agency was not able to monitor adult Chinook run as late into the year as is typically possible (Figure 10). Since the Mirabel dam was deflated in late November it is likely that some adult Chinook returned after the Water Agency was unable to monitor the Run. Therefore the numbers of Chinook reported here should be considered a minimum count and not the actual escapement of Chinook.

Video Monitoring of Adult Salmon Migration:

In 2012, video monitoring of adult Chinook migration past the Mirabel inflatable dam began on September 5 and continued until the dam was deflated for the season on November 21. The first Chinook of the season was observed on September 7 and the last Chinook was observed on November 21 for a total of 6,362 adult Chinook salmon. This number represents the highest count on record (Figure 11). In addition to Chinook, a total of 120 adult steelhead were also observed in 2012 (Table 1); however, because adult steelhead migration occurs relatively later than Chinook and the video system only functions when the dam is inflated, steelhead counts at Mirabel only represent minimum returns. Although coho salmon were also observed at Mirabel, their counts are preliminary at this time and are still undergoing review. Coho salmon populations in the Russian River are intensely monitored by the University of California Cooperative Extension Program/California Sea Grant.

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 2012 season. Note that the Chinook and steelhead counts may be adjusted slightly after some video is reviewed a second time by a panel of biologists.

Week start	**Chinook**	**steelhead**
1-Sep	1	0
8-Sep	1	1
15-Sep	0	1
22-Sep	14	3
29-Sep	69	3
6-Oct	61	7
13-Oct	1097	15
20-Oct	1946	5
27-Oct	1485	4
3-Nov	393	7
10-Nov	643	5
17-Nov	651	69
Total	**6362**	**120**

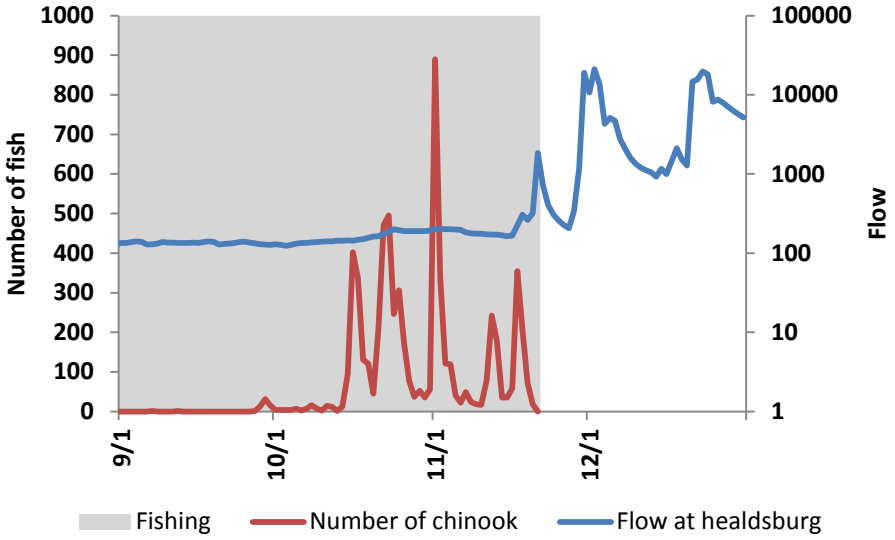

Figure 10. The number of Chinook salmon observed on the underwater camera system at Mirabel shown with the discharge at Hacienda. The days that the camera was operating is shown in grey.

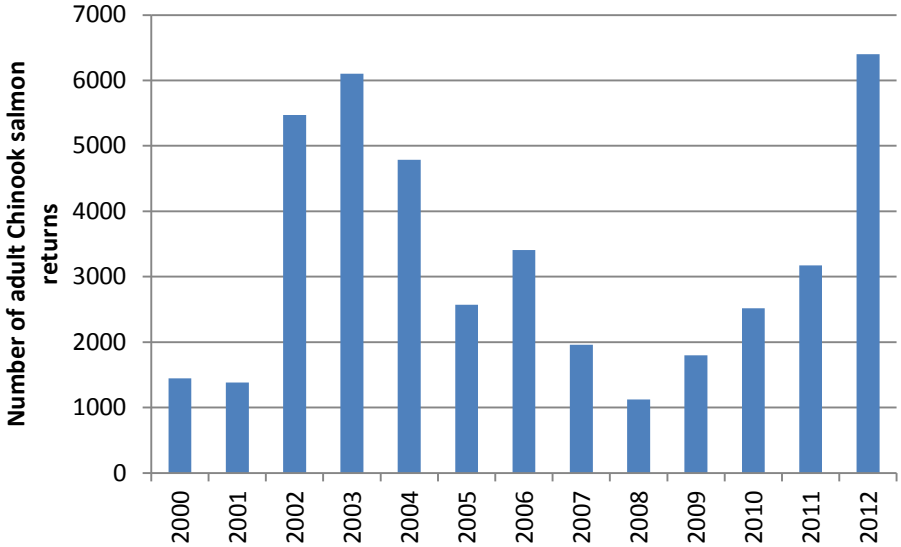

Figure 11. The number of adult Chinook observed on the underwater camera system at Mirabel from 2000 through 2012. Please note that sampling effort varied by year and direct comparisons should not be made.

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 in the lower Russian River in 2012. In 2012 over 200 Chinook were observed at the Mirabel fish counting station by October 15. Survey sites included pools near Duncans Mills, Vacation beach, Johnsons beach, Mirabel dam, immediately downstream from the Healdsburg Memorial Dam. In total approximately 70 large adult and 10

jack Chinook were observed during surveys that were conducted at these sites between October 11 and October 19, 2012. In addition to 1 adult coho, 3 adult, 5 juvenile, and 5 sub adult steelhead were also observed during these surveys.

Kayak based surveys to monitor adult salmon spawning activity by detecting salmon nests call redds were conducted in addition to dive surveys. In total 335 Chinook redds were observed during surveys conducted in the Russian River (Table 2). On November 14 and 15, 2012 a total of 236 chinook redds were observed in a 29 mile reach of the river between Crocker Road Bridge in Cloverdale and the Healdsburg Memorial Dam. On November 26, 2012 an additional 95 Chinook redds were observed between Lake Mendocino and Crocker Road Bridge. The section of river from the Healdsburg dam to the Wohler dam was surveyed on November 27, 2012 and 4 Chinook redds were observed. Four additional Surveys were conducted in Dry Creek from October 30, 2012 to November 27, 2012. In total 949 Chinook redds were observed in Dry Creek (Table 3). Since Dry Creek was surveyed multiple times there may be some double counting of redds between surveys. For detailed analysis of Chinook red surveys conducted in Dry Creek and the Russian River see Manning and Martini-Lamb (2013).

Table 2. The number of Chinook redds observed during kayak based redd surveys in the Russian River conducted in 2012.

	Date				
Reach	11/14	11/15	11/26	11/27	**Grand Total**
Forks of the Russian	-	-	3	-	**3**
Ukiah	-	-	90	-	**90**
Upper Alexander Valley	61	-	2	-	**63**
Middle Alexander Valley	94	-	-	-	**94**
Lower Alexander Valley	-	28	-	-	**28**
Upper Healdsburg	-	53	-	-	**53**
Lower Healdsburg	-	-	-	4	**4**
Total:	**155**	**81**	**95**	**4**	**335**

Table 3. The number of Chinook redds observed during kayak based redd surveys in Dry Creek conducted in 2012.

	Date				
Reach	10/30	11/6	11/13	11/27	**Grand Total**
Upper Dry Creek	67	178	200	298	**743**
Lower Dry Creek	24	44	74	64	**206**
Total:	**91**	**222**	**274**	**362**	**949**

Juvenile Steelhead Dive Surveys:

A total of 7,321 fish were detected during summer dive surveys consisting of 11 fish species however, only 15 juvenile steelhead were detected at the 8 survey sites (Table 4-6). Most fish consisted of native warm water species (99.7%). In 2011, 1 steelhead was found in a riffle located near a cold water seep upstream of the Highway 128 bridge crossing near Geyserville, 14

steelhead were found 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, 2010, 2011, and 2012 there were 604 steelhead detected in 2002, 2 steelhead detected during 2009, 2 steelhead during 2010, 0 in 2011, and 1 detected in 2012 (Table 4).

Water conditions during the 2012 survey were different then during 2002 and 2009 surveys, but similar to the 2010 and 2011 surveys. Water visibility was relatively poor in 2010, 2011 and 2012 when compared to 2002 and 2009. The visibility in 2012 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 2012 water visibility was greatest (greater than 2 m) downstream of the confluence with Dry Creek. Water temperatures in the upper sites were colder in 2012 than 2002 and 2009, but similar to 2010 and 2011. In 2012 water temperatures ranged from 12.7˚C in upper Ukiah Valley and gradually increased to 19 ˚C in the 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 (12.8 ˚C at the mouth of Dry Creek and 16.8 ˚C at the downstream boundary of the survey site). The water temperature at River Front Park was 19 ˚C (Table 4).

Table 4. Steelhead observations during summer dive surveys from 2002, 2009, 2010, 2011 and 2012 in the upper Russian River. Each site consisted of a 0.5 km river section.

Reach	Location	2002						2009						2010						2011						2012					
		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	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					0-1	12.7				
	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					0-1	15					0-1	13.8				
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	0-1	13.9				
	Cloverdale above Comminski	1-2	18.9	411	24		435	1-2	17.7	1	1		2	0-1	19					0-1	17.2					1-2	13.8				
Alexander Valley/ Healdsburg	Cloverdale below Crocker Bridge	1-2	22					1-2	21.1					0-1	21					0-1						1-2	15				
	Geyserville above Hwy 128	1-2	23	1			1	>2	22.2					1-2	21	1	1		2	0-1	20					>2	17.8	1			1
	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	>2	12.8 to 17.8		13	1	14
	Healdsburg above Riverfront Park	-	-	-	-	-	-	>2	16.7					-	-	-	-	-	-	>2	18.8		3		3	>2	19				
		Total:		**551**	**235**	**2**	**788**	**Total:**		**4**	**14**	**0**	**18**	**Total:**		**2**	**9**	**0**	**9**	**Total:**		**6**	**13**	**2**	**21**	**Total:**		**1**	**13**	**1**	**15**

Table 5. 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, 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 6 . Observations of non-salmonids during summer dive surveys from 2010, 2011 and 2012. Each site consisted of a 0.5 km section of 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	0	800	0	0	0	0	1
Canyon, above Comminski 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 Comminski 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**
2012													
Ukiah Valley, below Forks	0	0	0	0	0	0	0	0	0	0	0	0	0
Ukiah Valley, Feliz Creek confluence	0	0	0	0	0	0	0	0	0	0	0	0	0
Canyon, below Squaw Rock	0	0	39	0	0	278	0	66	0	0	0	0	0
Canyon, above Comminski Station	0	0	76	151	0	180	0	430	0	0	0	0	1
Alexander Valley, below Crocker Bridge	0	4	12	20	0	150	1	0	0	0	0	0	0
Alexander Valley, above Geyserville Bridge (Hwy 128)	13	0	865	435	88	0	64	480	0	0	0	0	0
Lower Healdsburg, Dry Creek confluence	0	0	79	23	45	18	105	1275	3	0	0	0	3
Lower Healdsburg, above Riverfront Park	1	0	380	162	115	20	84	1655	0	0	0	0	0
TOTAL	**14**	**4**	**1451**	**791**	**248**	**646**	**254**	**3906**	**3**	**0**	**0**	**0**	**4**

Downstream Migrant Fish Trapping:

Between April 6 and April 17, 2012, the Water Agency installed downstream migrant fish traps on 3 lower river tributaries (Dutch Bill Creek, Austin Creek, and Mark West Creek). The Water Agency installed rotary screw traps at Dry Creek and Mirabel April 5 and April 27, 2011, respectively. Traps were operated until out-migrant fish were no longer detected, or lower flow prevented efficient trap operation (Table 7).

Table 7. The installation and removal date and total number of days fished for the downstream migrant traps operated by the Water Agency.

Site	Installation date	Removal date	Days fished
Austin Creek	4/17	7/2	76
Dry Creek	4/5	7/31	117
Dutch Bill Creek	4/6	6/9	64
Mainstem	4/27	7/3	67
Mark West Creek	5/7	7/2	56

Steelhead:
In 2012, steelhead parr were frequently encountered in Austin Creek. Over the course of the 2012 trapping season, 3,666 steelhead parr were captured at the Austin Creek trap (Figure 12 and Table 8). The Water Agency applied 1,639 PIT tags to steelhead in Austin Creek. Dry Creek had a higher catch of steelhead during the 2012 trapping season. In total 4,705 wild steelhead parr and 57 wild steelhead smolts were caught at the Dry Creek trap (Figure 12 and Figure 13).

In 2012, relatively few steelhead were caught at Mirabel, Dutch Bill Creek, and Mark West Creek fish traps when compared to catches at Austin Creek and Dry Creek. In total, 983, 33, and 95 steelhead parr steelhead were caught at Mirabel, Dutch Bill Creek, and Mark West Creek respectively (Figure 9). While 79, 11, and 44 steelhead smolts were caught at Mirabel, Dutch Bill Creek, and Mark West Creek respectively (Figure 10). 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 7,803 Chinook smolts were captured at the Dry Creek trap (Figure 14). A population estimate of 117,930 Chinook smolts (95% CI: ± 20,956) at the Dry Creek fish trap was calculated using the Dry Creek catch data and trap efficiencies.

In 2012, Mirabel had the second highest catch of Chinook (2,307 smolts, Figure 14). When adjusted for trap efficiencies Mirabel had a lower population estimate than Dry Creek. Based on trap efficacies a population estimate of 57,004 (95% CI: ± 20,560) was constructed for Mirabel in 2012 (Figure 15). In 2012 relatively few Chinook smolts were captured in Austin Creek, Dutch Bill Creek, and Mark West Creek (377, 13, and 376 respectively) (Figure 14).

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 1,982 hatchery coho smolts, and 35 wild coho salmon smolts (coho with adipose fins are presumed to be wild), and 2 wild coho parr were captured at the Dutch Bill Creek fish trap. At Mirabel 270 hatchery coho smolts, 26 wild coho smolt, and 45 wild coho parr were captured (Figure 16 and 17). In Austin Creek 570 hatchery coho smolts, 37 wild coho smolt were detected at the trap (figure 16 and 17). In addition to coho smolts 584 hatchery coho parr and 372 wild coho parr were detected at the Austin Creek fish trap. At Mark West Creek 357 hatchery coho smolts, 28 wild coho smolt, and 7 wild coho parr were detected at the trap. The Dry Creek fish trap captured 127 hatchery coho smolts, 117 wild coho smolts, and 35 wild coho parr (Figure 16 and 17). 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.

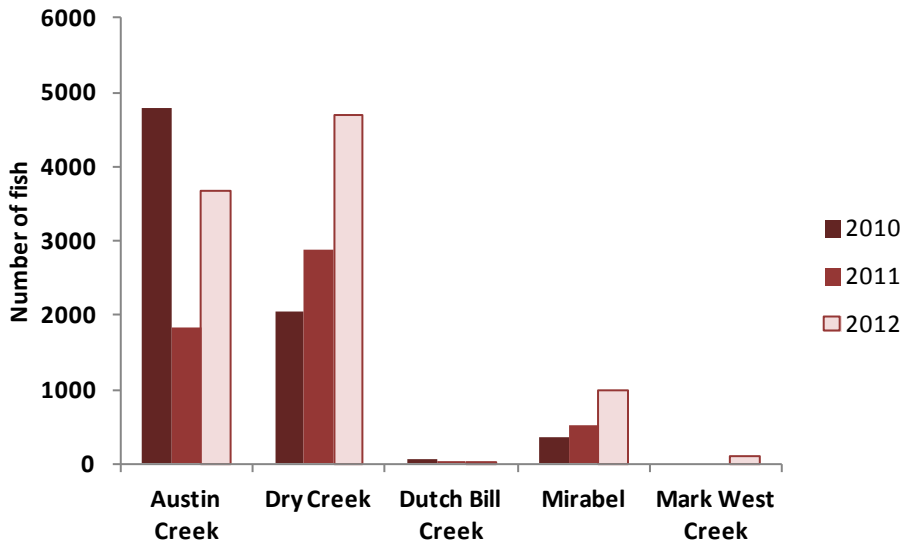

Figure 12. The number of wild steelhead parr captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-12. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

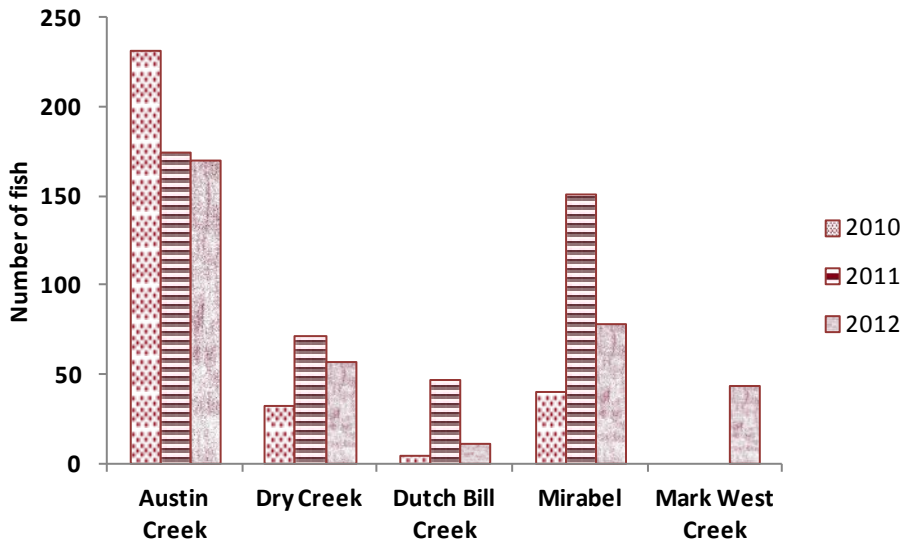

Figure 13. The number of wild steelhead smolts captured in Russian River fish traps operated by the Water Agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-12. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

Table 8. 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. The asterisk denotes that the Green Valley Creek trap was removed unusually early in 2011 due to trapping complications. The Mill Creek data for 2012 is not available (NA) at the time of this writing.

Tributary	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Austin Creek	-	-	-	-	-	-	-	-	-	-	4,774	1,829	3,666
DRY CREEK	-	-	-	-	-	-	-	-	-	5,207	2,049	2,879	4,704
Dutch Bill Creek	-	-	-	-	-	-	-	-	-	-	58	31	21
Estuary	-	-	-	-	-	-	-	-	-	51	-	-	-
Green Valley Creek	-	-	-	-	-	417	-	35	304	1	67	3	-
Mainstem	773	156	5,727	1,115	1,428	1,594	230	1,852	831	75	370	528	983
MARK WEST CREEK	-	-	-	-	-	-	-	-	-	-	-	-	95
Mill Creek	-	-	-	-	-	573	414	931	686	438	353	520	-
Sheephouse Creek	-	-	-	-	-	113	57	50	17	-	-	-	-
Ward Creek	-	-	-	-	-	498	351	707	-	-	-	-	-

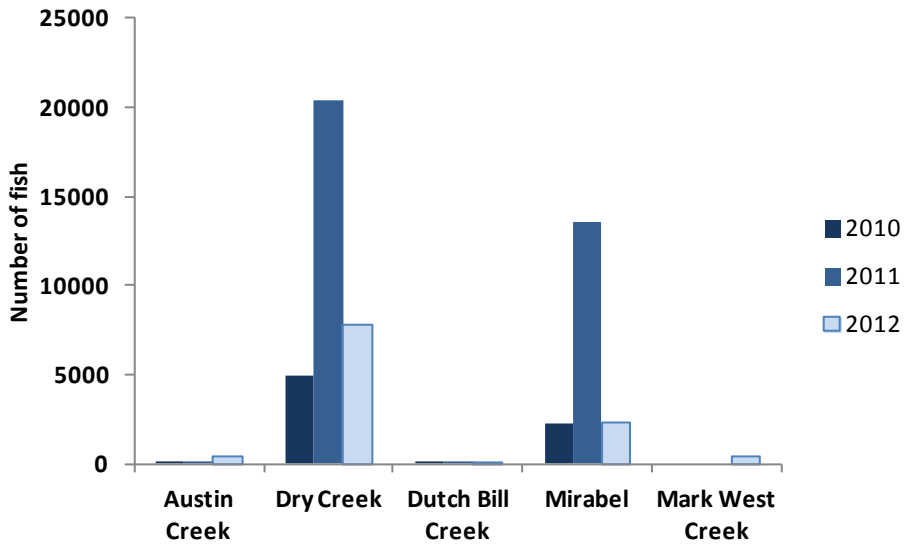

Figure 14. The number of wild Chinook smolts captured in Russian River fish traps operated by the Water Agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-12. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

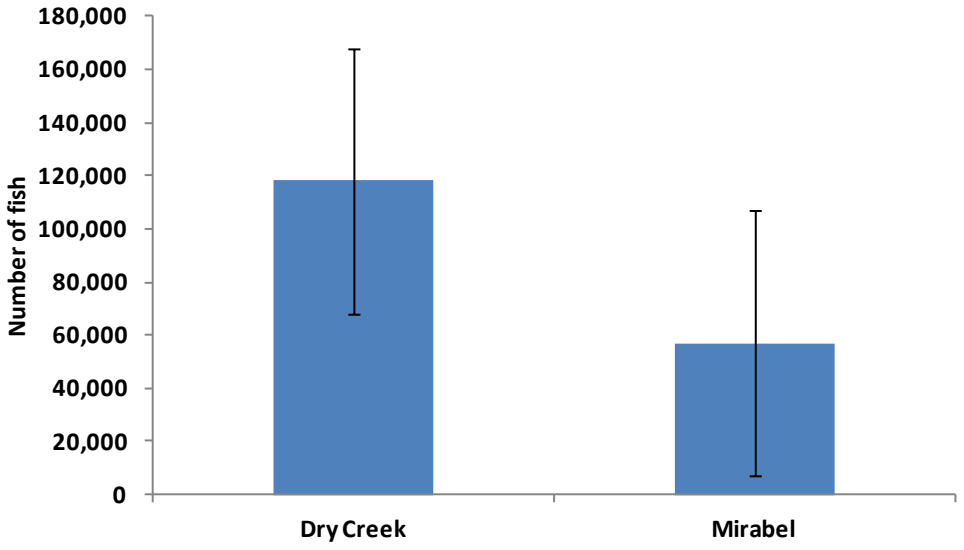

Figure 15. The population estimates for Chinook smolts at Mirabel and Dry Creek during the 2012 sampling season show with 95% confidence interval error bars.

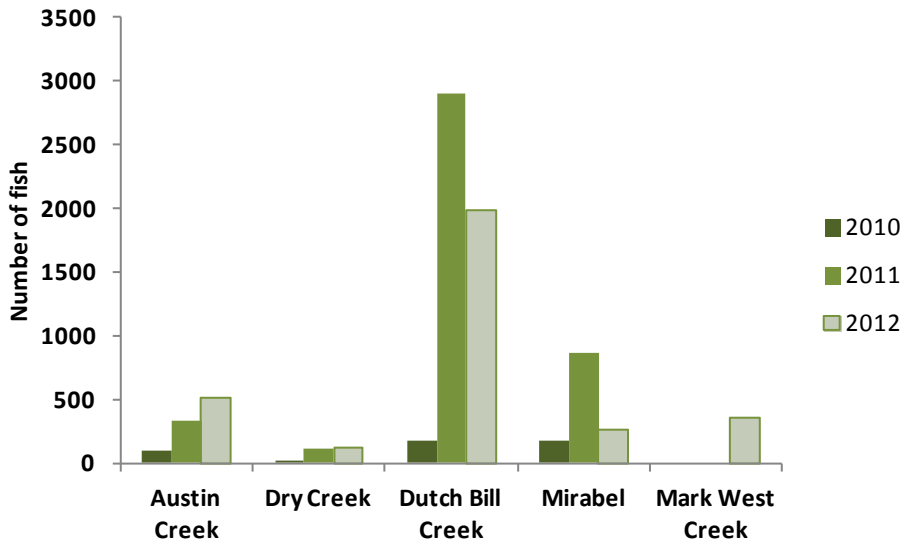

Figure 16. The number of RRCCBP coho smolts captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-12. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

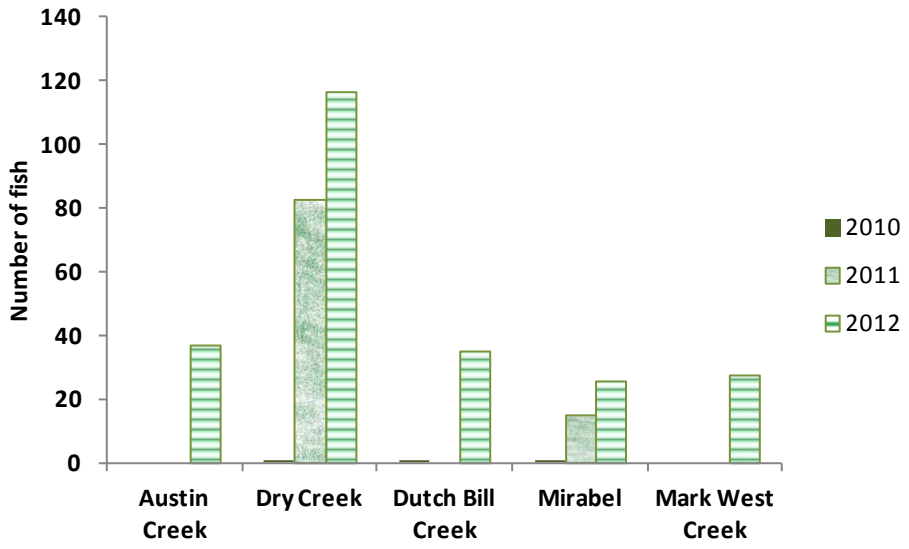

Figure 17. The number of wild coho smolts captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-12. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

Estuary Fyke Net Juvenile Salmonid Video Monitoring System:

On June 13, 2012, 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. Attempts to install the camera were made as early as May 14, 2012, but the camera was damaged and was sent out for repair. Once installed the video camera recorded footage 24 hours per day through July 18. During this time 23 fish were

identified as steelhead juveniles, 6 fish were identified as Chinook smolts, 3 fish were identified as coho smolts, 15 fish were identified to the family salmonidae, and 31 fish were unidentifiable (Table 9).

A PIT tag antenna array was operated at Duncans Mills during 2012 in order to detect PIT tagged steelhead as they entered the estuary. The first antenna in the array (a 4 foot by 4 foot swim through antenna) was installed on May 10, 2012. Five flat plate antennas were installed from June 7 through June 26, 2012. In total 346 steelhead parr that were PIT tagged at Austin Creek were detected at the Duncans Mills antenna. Steelhead PIT tagged at trap sites other than Austin Creek were not detected at the Duncans Mills antenna array. During the same time period that the camera was operated 78 steelhead were detected on the PIT tag antenna array. Travel time from the Austin Creek trap site to the Duncans Mills antenna array ranged from 0 to 155 days with the media travel time of 2 days. A total of 125 Chinook smolts tagged at the Dry Creek screw trap were detected at the Duncans Mills antenna array. During the period of time that the camera was operated 36 Chinook smolts were detected on the antenna array. The travel time from Dry Creek to ranged from 0 to 29 days with a median travel time of 2 days. In addition to juvenile salmonids 11 adult Chinook and 42 adult coho were detected on the antenna array.

Table 9. The number of Chinook, coho, steelhead, unknown salmonids, and unknown fish species that were observed per week on the fyke net video during the 2012 trapping season.

Week start	Chinook	Coho	Steelhead	Unknown salmonid	Unknown fish
6/13	2	0	2	2	6
6/20	2	1	4	0	1
6/27	0	2	12	4	12
7/4	0	0	0	2	5
7/11	1	0	1	0	4
7/18	1	0	4	7	3
Total	**6**	**3**	**23**	**15**	**31**

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 2012 was the highest in the last 12 years. It is important to note that the 2012 sampling season was slightly truncated by relatively early rain storms and that more Chinook may have returned to the Russian River in 2012 than was observed on the camera system.

Adult Chinook Salmon Dive Surveys:

Adult Chinook observed during 2012 appeared healthy and not over crowded. Chinook redd surveys found Chinook redds throughout the upper Russian River and Dry Creek.

Juvenile Steelhead Dive Surveys:

Overall, steelhead abundance appeared to be lower during summer 2012 then 2002 and similar to 2009, 2010 and 2011. In the 4 sample sites that were repeatedly surveyed in 2002, 2009, 2010, 2011 and 2012, the Water Agency detected 604, 2, 2, 0, and 1 steelhead respectively. Water visibility likely played a role in the low detection rate of juvenile steelhead during the 2010 2011 and 2012 surveys. Water visibility was the poorest during the 2010, 2011, and 2012 surveys. Water visibility was greatest in 2002 (at least 1-2 meters of visibility all sites). In 2009, 2010, 2011, and 2012 the number of sites with 0-1 meters of visibility was 3, 5, 6, and 3 respectively (Table 4). However it is important to note that two of the remaining 5 sites sampled in 2012 had approximately 1.5 meters of visibility. 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, 2011, and 2012. 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 2009-2012 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, 2010-2011, and 2011-2012. However the 2001-2002 adult returns were relatively strong (Figure 18). 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 a smaller population of juvenile steelhead following weak adult returns. This may help explain why the survey conducted during 2002 detected more steelhead then the surveys conducted in 2009-2012.

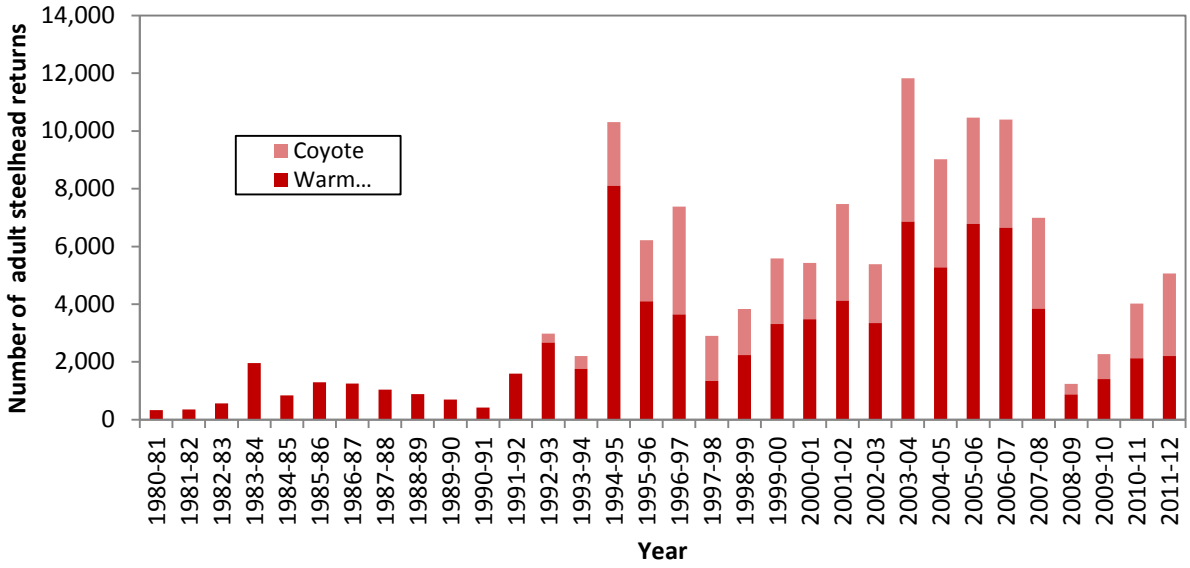

Figure 18. Hatchery returns of steelhead at Warm Springs and Coyote Hatcheries on the Russian River from 1980 to 2012.

Downstream Migrant Fish Trapping:

Steelhead:
Much of the 2012 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, 2011, and 2012 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 and Dutch Bill 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 2012 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. However the number of salmonids observed in 2012 was similar to the number captured in the trap in 2009 (Manning and martini-Lamb 2011). Faulty equipment prevented us from installing the fyke net video system before Mid June. A change in environmental conditions (increase in drifting filamentous algae and a decrease in visibility) limited our ability to operate the fyke net effectively. Furthermore 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, debris). Based on trap detections at Austin Creek and PIT tag detection at the fyke net it is likely that many steelhead passed the fyke net and were not detected. As a result the Water Agency in conjunction with NMFS and the California Department of Fish and Wildlife are exploring alternatives to detecting salmonids as they enter the estuary.

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

Figure D A diver near the bottom of the Squaw Rock survey site.

Figure E. A sculpin in the Canyon reach.

Figure F A photo of a divers hand taken in the canyon reach. Note the high turbidity.

Figure G A photo of a juvenile steelhead taken downstream of the Russian River and Dry Creek confluence.