State Water Resources Control Board
Order 5/1/2013

Provision 10 – Fisheries Monitoring Tasks

April 1, 2014

Prepared by

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Introduction

The spring of 2013 was unusually dry and the Sonoma County Water Agency was concerned that storage in Lake Mendocino was insufficient to sustain the water demands of 2013. On April 25, 2013 the Water Agency submitted a petition to the State Water Board requesting a temporary urgency change to D1610 to address low storage concerns in Lake Mendocino. On May 1, 2013, the State Water Board issued an "Order Approving Temporary Urgency Change" for the following temporary changes to D1610:

In the upper Russian River (from the confluence with the East Fork of the Russian River to its Confluence with Dry Creek)

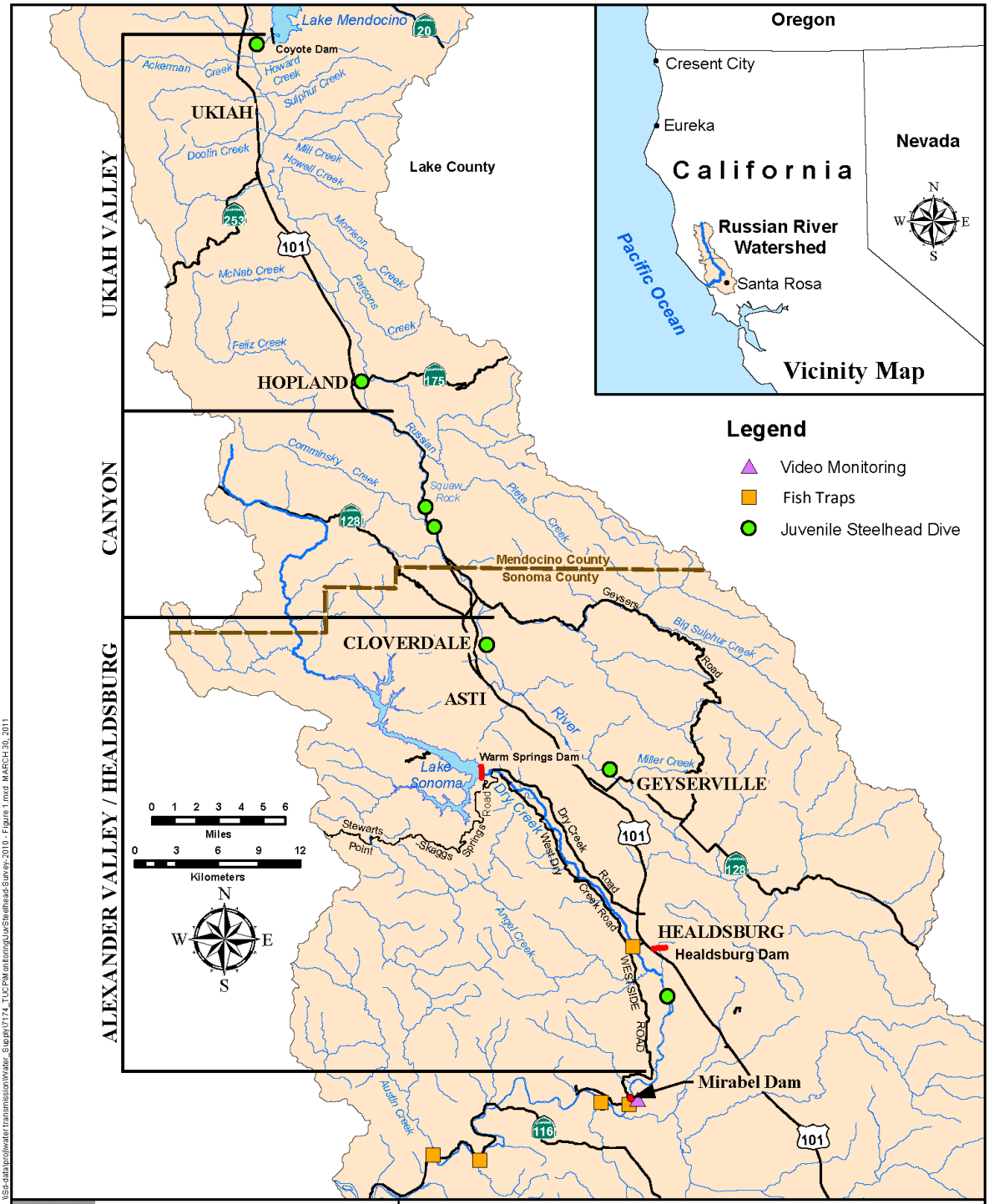
(1) From May 1 through June 15, 2013 minimum instream flow shall remain above 75 cfs
(2) From July 1 through October 28, 2013 minimum instream flows shall remain at or above 75 cfs, if during the period from July 1 through October 28 storage in Lake Mendocino remains above the Water Agency's calculated critical storage curve.
(3) From July 1, through October 28, 2013 instream flow shall remain at or above 25 cfs if storage in Lake Mendocino drops below the Water Agency's critical storage curve for 3 consecutive days.

In the lower Russian River (from the confluence with Dry Creek to the Pacific Ocean)

(1) From May 1 through June 30, 2013 minimum in-stream flow shall remain above 85 cfs
(2) From July 1 through October 28, 2013 minimum instream flows shall remain above 85 cfs, if during the period from July 1 through October 28 storage in Lake Mendocino remains above the Water Agency's calculated critical storage curve.
(3) From July 1, through October 28, 2013 instream flow shall remain at or above 50 cfs if storage in Lake Mendocino drops below the Water Agency's critical storage curve for 3 consecutive days.

Provisions 4 through 10 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 Wildlife (DFW) 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). If storage dropped below the critical storage curve in Lake Mendocino then the Water Agency was required to conduct an adult Chinook passage survey. Updates of fisheries monitoring data were sent to NMFS and DFG staff on a bi-weekly basis per provision 10 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 Mark West Creek (Figure 1). We present data collected at these sites in this report to supplement information required by the State Water Board Order. In 2014, the results of all Water Agency Biological Opinion monitoring will be presented in a comprehensive report to NMFS and DFG.



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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 chinook 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's 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 was 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 2013. 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, 2013, 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 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.

Results:

Flows:

During the spring of 2013, Russian River flows were below the average stream flows for normal water years (2002, 2003, 2005, 2006) due to low rainfall and the need to preserve storage in lake Mendocino. During the Order some reaches of the Russian River, such as near Hopland and Hacienda, were below D1610 minimum flows (Figure 6 and 7). When compared to the average daily flow at the Hacienda Bridge gaging station from normal water years between 2000 to 2009 flow in 2013 was lower in the spring, summer, and fall (Figure 7).

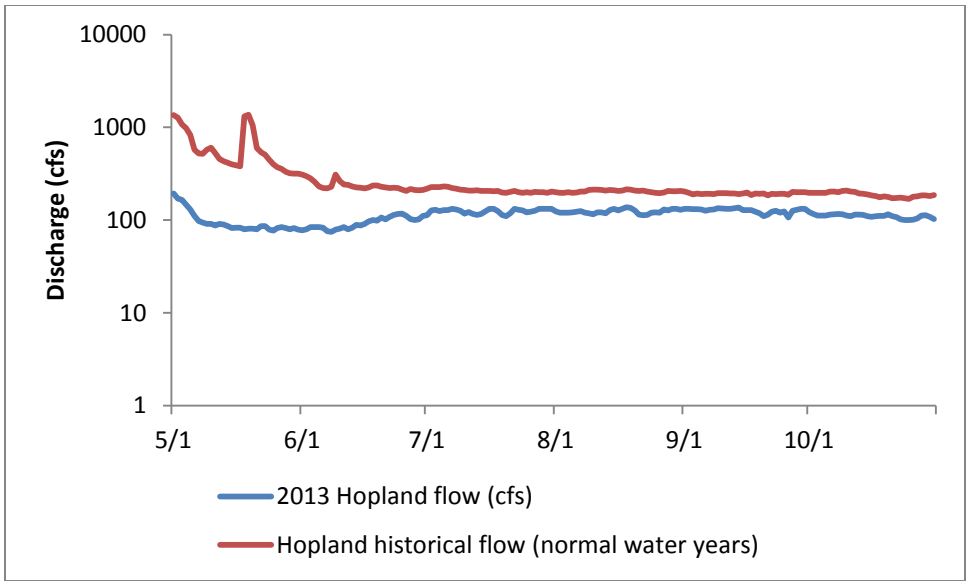

Figure 6. The average of flow of normal water years (2002, 2003, 2005, 2006) Hopland shown with weekly average flow in 2012.

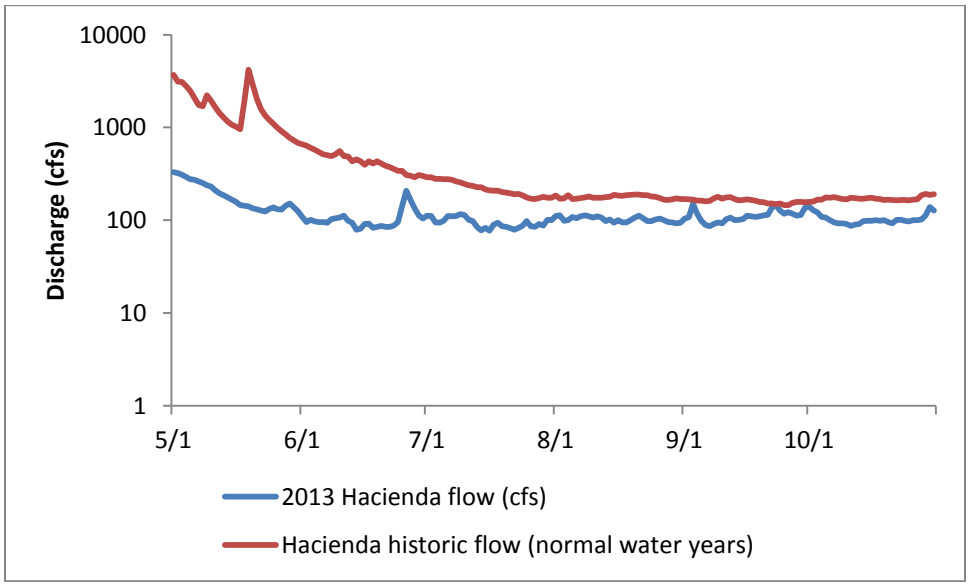

Figure 7. The average of flow of normal water years (2002, 2003, 2005, 2006) Hacienda Bridge shown with weekly average flow in 2012.

The lack of winter storms allowed the Water Agency to operate underwater camera system at the Mirabel inflatable dam until February 8, 2014. As a result the Water Agency was able to monitor adult Chinook run later into the year than is typically possible (Figure 8). Since the Mirabel dam was deflated in early February it is likely that most of the adult Chinook run was sampled.

Video Monitoring of Adult Salmon Migration:

In 2013, video monitoring of adult Chinook migration past the Mirabel inflatable dam began on September 2, and continued until the dam was deflated for the season on February 8, 2014. The first Chinook of the season was observed on September 2, 2013 and the last Chinook was observed on February 7, 2014 the day before the camera system was removed. A total of 3,142 adult Chinook salmon were observed in 2013-14 (Figure 8 and figure 10). The Chinook run did not start in earnest until October 29, 2013. It was at this point that flow increased from about 100 cfs to about 140 cfs. As in previous years river mouth closures had an effect on Chinook timing in 2013 (Figure 8). Water temperature also has a strong influence on adult Chinook run timing in addition to flow and river mouth closures. Before October water temperatures are typically warmer than preferred by Chinook (Figure 9). For a detailed analysis of water temperature and dissolved oxygen conditions for adult and juvenile salmonids in 2013 see the State Water Resources Control Board Order 5/1/2013: Provision 12 – Water Quality Monitoring Summary Report. In addition to Chinook, a total of 949 adult steelhead were also observed in 2013-14 (Figure 11); 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.

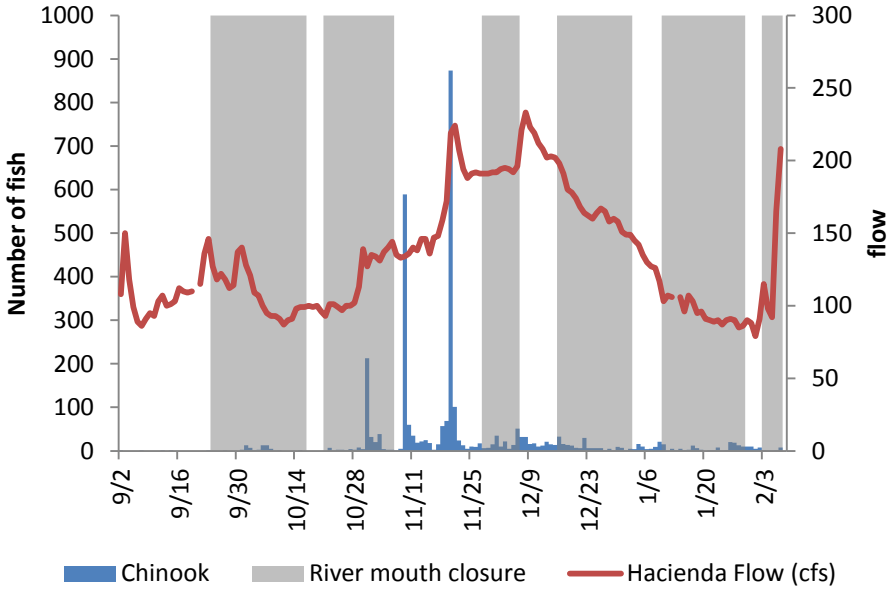

Figure 8. The number of Chinook salmon observed on the underwater camera system at Mirabel shown with the discharge at Hacienda and the periods of time that the river mouth was closed.

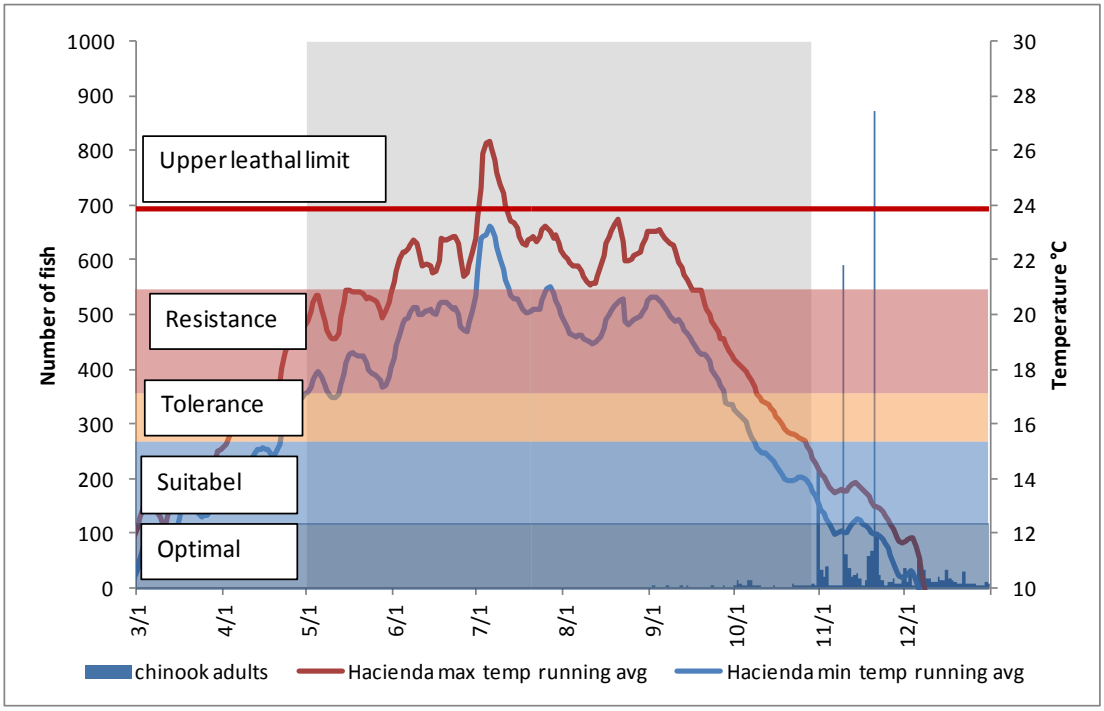

Figure 9. The number of Chinook adults detected at Mirabel shown with the maximum daily water temperature 7-day running average collected at Hacienda. Also shown are the temperature zones of optimal (<12.2 °C), suitable (12.2-15.5 °C), tolerance (15.5-16.9 °C), resistance (16.9-21.1 °C), and the upper critical lethal limit (>23.9) for Chinook adults. The period of the Order is shaded in grey.

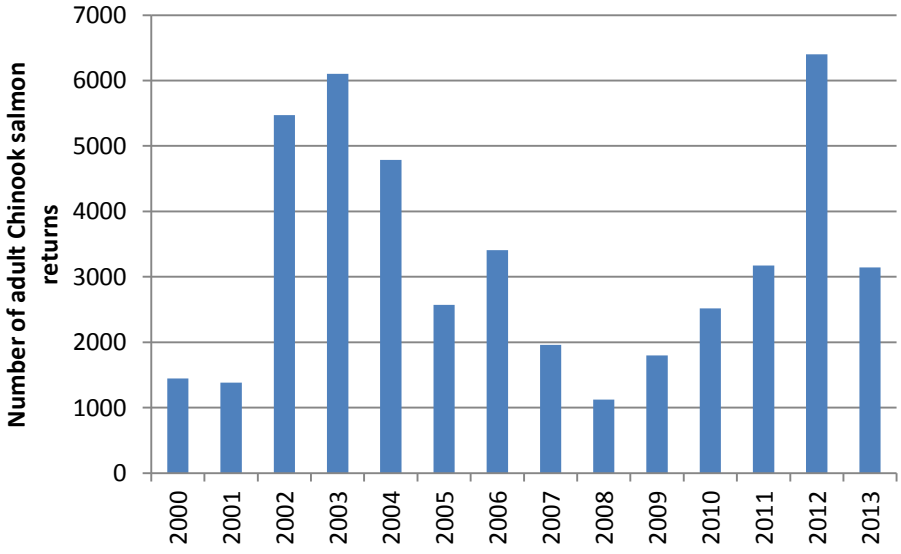

Figure 10. The number of adult Chinook observed on the underwater camera system at Mirabel from 2000 through 2013. Please note that sampling effort varied by year and direct comparisons should not be made.

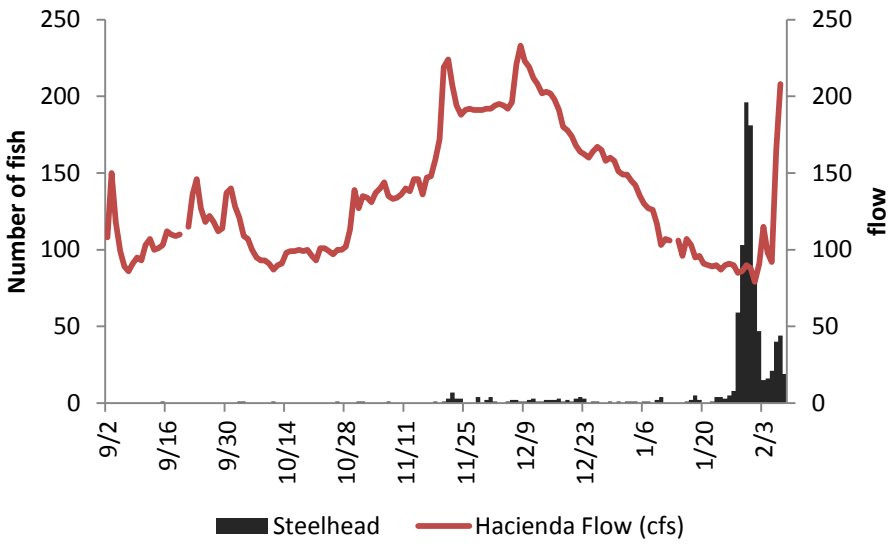

Figure 11. The number of steelhead observed on the underwater camera system at Mirabel shown with the discharge at Hacienda.

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 2013. In 2013 only 105 Chinook were observed at the Mirabel fish counting station by October 28. Survey sites included pools near Duncans Mills, Monte Rio, Vacation beach, Summer Crossing Road, Johnsons beach, and Hacienda. In total approximately 44 large adult Chinook were observed during these surveys. All the Chinook were observed on the October 14, 2013 survey (34 at Browns pool near Duncans Mills, 9 at Vacation Beach, and 1 at Hacienda, Table 1).

Table 1. The dates and location of dive surveys, the number of divers, and the number of Chinook observed.

Date	Dive site	Number of divers	Number of Chinook observed
9/24	Brown's Pool	2	
	Monte Rio	2	
	Vacation Beach	2	
10/2	Brown's Pool	2	
	Monte Rio	2	
	Vacation Beach	2	
10/10	Brown's Pool	2	
	Monte Rio	2	
	Hacienda	2	
10/16	Brown's Pool	2	
	Monte Rio	2	
	Hacienda	2	
10/24	Brown's Pool	5	34
	Monte Rio	5	
	Vacation Beach	5	9
	Summer Crossing Rd.	5	
	Johnson's Beach	5	
	Hacienda	5	1

Kayak based surveys to monitor adult salmon spawning activity by detecting salmon nests called redds were conducted in addition to dive surveys. In total 266 unique Chinook redds (not including duplicates in areas surveyed twice) were observed during kayak based redd surveys between Ukiah and Mirabel (Table 2). These surveys were conducted between December 2 and December 5, 2013. Additional preliminary surveys were conducted in Alexander valley. The earliest of these preliminary surveys began on November 14, 2013 and both Chinook and Chinook redds were observed. Additional Surveys were conducted on about a weekly basis in Dry Creek starting October 23, 2013. In total 1059 “new” Chinook redds were observed in Dry Creek (Table 3). New redds are redds that appear fresh and less than 1 week old. However it is difficult to determine the exact age of a redd therefore it is likely that there is a degree of double counting between weekly surveys. For detailed analysis of Chinook redd surveys conducted in Dry Creek and the Russian River see Martini-Lamb and Manning (2014).

Table 2. The number of new and old Chinook redds as well as adult Chinook observed during kayak based redd surveys in the Russian River conducted in 2013.

Reach	Date	New Redds	Old Redds	Fish Observed
Ukiah	11/14	3		
	12/5	39		28
Canyon	12/5	4		7
Alexander Valley	11/12	12		21
	11/14	12		13
	11/26	27		24
	12/2	125	1	70
	12/3	32	5	21
Upper Healdsburg	12/3	55	2	24
Total:		258	8	208

Table 3. The number of Chinook redds observed during kayak based redd surveys and the dates the surveys conducted in Dry Creek during 2013. These surveys are still ongoing.

Date	New Redds	Old redds	Fish observed
10/23/2013	4		3
10/30/2013	16	5	3
11/7/2013	55	5	17
11/13/2013	90	3	71
11/21/2013	185	6	118
11/27/2013	189	24	165
12/4/2013	211	42	144
12/11/2013	271	41	208
1/14/2014	26	54	30
1/27/2014	12	40	6

Juvenile Steelhead Dive Surveys:

A total of 5,928 fish were detected during summer dive surveys consisting of 8 fish species. In total 311 juvenile steelhead were detected at 8 survey sites (Table 4 and 5). In comparison 780, 18, 11, 21, and 15 were steelhead were observed in 2002, 2009, 2010, 2011, and 2012 respectively. In 2013 most fish consisted of native warm water species (94.8%). Dive surveys were conducted at Ukiah near the confluence of the east and west forks of the Russian River, at Hopland near the confluence of the Russian River and Feliz Creek, at Squaw Rock near Hopland,

at Cominsky Station Road, at Crocker Road near Cloverdale, at the Highway 128 bridge near Geyserville, at the confluence of Dry Creek and the Russian River, and at River Front Park near Windsor. Of the 311 juvenile steelhead observed in 2013 282 were observed at Squaw Rock, 9 at Cominsky Station Road, 2 in a disconnected off-channel pool that had cold water seep at Geyserville, 13 at the confluence of Dry Creek and the Russian River, and 5 at River Front Park. Visibility was better in 2002 than in 2013 at most sample sites. Visibility in 2013 was better than in 2009-2012 at most sample sites. The difference in visibility during sampling events may partially explain the differences between the number of steelhead observed during each year (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			2013		
		Visibly (m)	Temp (C)	Steelhead	Visibly (m)	Temp (C)	Steelhead	Visibly (m)	Temp (C)	Steelhead	Visibly (m)	Temp (C)	Steelhead	Visibly (m)	Temp (C)	Steelhead	Visibly (m)	Temp (C)	Steelhead
Ukiah Valley	Ukiah below Forks	1-2	20	55	0-1	16		0-1	12.5		0-1	12		0-1	12.7		0-1	12.7	
	Ukiah above Perkins Bridge	1-2	20.5	7	0-1	18		-	-	-	-	-	-	-	-	-	-	-	-
	Ukiah Norgard Dam	1-2	20	161	0-1	16.7	5	-	-	-	-	-	-	-	-	-	-	-	-
	Hopland Feliz Creek confluence	-	-	-	1-2	17.2		0-1	15.5		0-1	15		0-1	13.8		0-1	13.8	
Canyon	Hopland above Squaw Rock	1-2	20	113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hopland below Squaw Rock	-	-	-	1-2	17.7		0-1	18		0-1	15	1	0-1	13.9		0-1	13.9	282
	Cloverdale above Comminski	1-2	18.9	435	1-2	17.7	2	0-1	19		0-1	17.2		1-2	13.8		1-2	13.8	9
Alexander Valley/ Healdsburg	Cloverdale below Crocker Bridge	1-2	22		1-2	21.1		0-1	21		0-1			1-2	15		1-2	15	0
	Geyserville above Hwy 128	1-2	23	1	>2	22.2		1-2	21	2	0-1	20		>2	17.8	1	>2	17.8	2
	Healdsburg Healdsburg Dam	>2	24	16	>2	23.3	1	-	-	-	-	-	-	-	-	-	-	-	-
	Healdsburg Diggers Bend	-	-	-	>2	21.7		-	-	-	-	-	-	-	-	-	-	-	-
	Healdsburg Dry Creek confluence	-	-	-	>2	15.5	10	>2	21	9	>2	13.8 - 18	17	>2	12.8 to 17.8	14	>2	12.8 to 17.8	13
	Healdsburg above Riverfront Park	-	-	-	>2	16.7		-	-	-	>2	18.8	3	>2	19		>2	19	5
		Total:		**788**	**Total:**		**18**	**Total:**		**9**	**Total:**		**21**	**Total:**		**15**	**Total:**		**311**

Table 5. Observations of non-salmonids during summer dive surveys in 2013. Each site consisted of a 0.5 km section of river. Coordinates and water conditions are shown in Table 1.

2013	Small Mouth Bass	Large Mouth Bass	Sacramento Sucker	Tule Perch	Hardhead	CA Roach	Sacramento Pike-minnow	Cyprinids	Stickle-back	Carp	Green Sunfish	Bluegill
Ukiah Valley, below Forks	0	0	0	0	0	0	0	0	0	0	0	0
Ukiah Valley, Feliz Creek confluence	0	0	1	70	0	0	1	50	0	0	0	0
Canyon, below Squaw Rock	0	0	107	20	201	0	0	200	0	0	0	0
Canyon, above Comminski Station	0	0	0	200	0	0	0	550	0	0	0	0
Alexander Valley, below Crocker Bridge	7	0	178	184	130	0	21	928	0	1	0	0
Alexander Valley, above Geyserville Bridge (Hwy 128)	19	0	597	151	414	0	19	300	0	0	0	0
Lower Healdsburg, Dry Creek confluence	0	0	20	0	0	0	0	417	0	0	0	0
Lower Healdsburg, above Riverfront Park	1	0	80	100	0	0	0	650	0	0	0	0
TOTAL	**27**	**0**	**983**	**725**	**745**	**0**	**41**	**3095**	**0**	**1**	**0**	**0**

Downstream Migrant Fish Trapping:

Between March 28 and April 17, 2013, 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 March 26 and March 27, 2013, respectively. Traps were operated until out-migrant fish were no longer detected, or lower flow prevented efficient trap operation (Table 6).

Table 6. The installation and removal date and total number of days fished for the downstream migrant traps operated by the Water Agency.

Site	Installed	Removed	Days Fished
Austin Creek	4/17/2013	6/18/2013	63
Dry Creek	3/26/2013	7/31/2013	147
Dutch Bill Creek	4/18/2013	5/24/2013	32
Mirabel	3/27/2013	7/31/2013	130
Mark West Creek	3/28/2013	6/23/2013	81

Steelhead:

In 2013, steelhead parr were frequently encountered in Austin Creek. Over the course of the 2013 trapping season, 7,397 steelhead parr were captured at the Austin Creek trap (Figure 11 and Table 7). The Water Agency applied 1,749 PIT tags to steelhead in Austin Creek. In total 3,619 wild steelhead parr and 281 wild steelhead smolts were caught at the Dry Creek trap (Figure 12 and Figure 13).

In 2013, 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, 1658, 79, and 316 steelhead parr steelhead were caught at Mirabel, Dutch Bill Creek, and Mark West Creek respectively (Figure 12). While 195, 18, and 454 steelhead smolts were caught at Mirabel, Dutch Bill Creek, and Mark West Creek respectively (Figure 13). 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 9,410 Chinook smolts were captured at the Dry Creek trap. In 2013, Mirabel had the second highest catch of Chinook (6,350 smolts). In 2013 relatively few Chinook smolts were captured in Austin Creek, Dutch Bill Creek, and Mark West Creek (135, 0, and 157 respectively) (Figure 14).

Coho:

The Mark West 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. At Mark West Creek 2,258 hatchery coho smolts, 32 wild coho smolt, and 66 wild coho parr were detected at the trap. In total 717 hatchery coho smolts, and 19 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 1,059 hatchery coho smolts, 20 wild coho smolt, and 137 wild coho parr were captured. In Austin Creek 74 hatchery coho smolts, 12 wild coho smolt were detected at the trap. In addition to coho smolts 38 wild coho parr were detected at the Austin Creek fish trap. The Dry Creek fish trap captured 760 hatchery coho smolts, 19 wild coho smolts, and 1 wild coho parr (Figure 15 and 16). 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), the UCCE coho Salmon Monitoring Program results for 2011, and UCCE and CSG (2012).

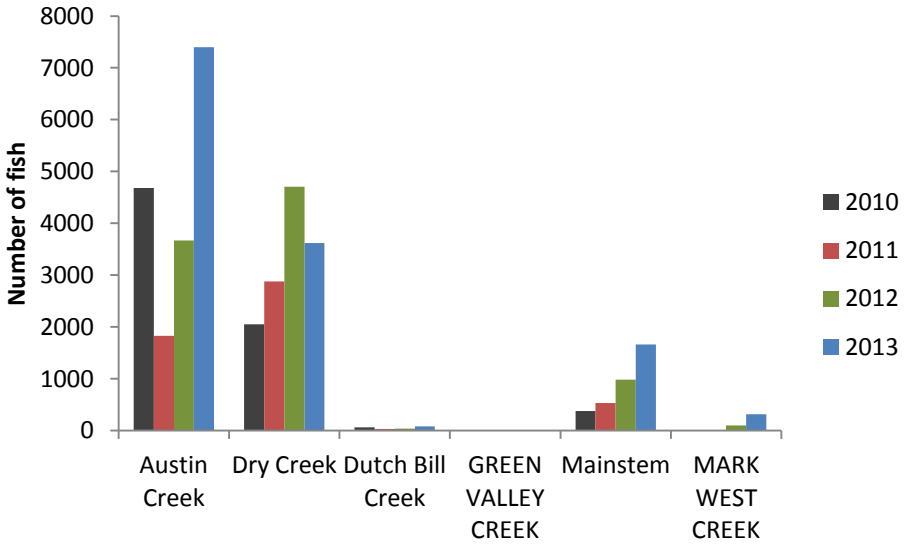

Figure 12. The number of wild steelhead parr captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-13. Note that these numbers represent total catch and have not been adjusted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

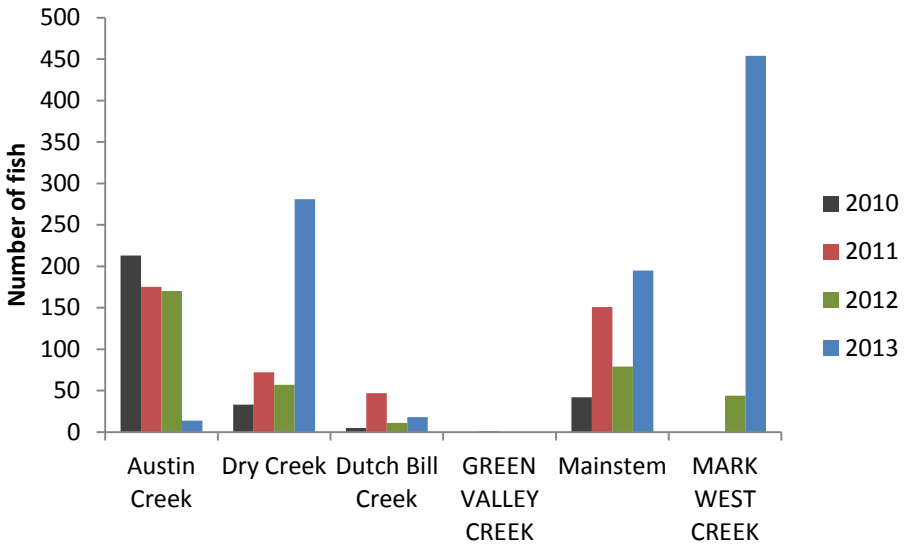

Figure 13. The number of wild steelhead smolts captured in Russian River fish traps operated by the Water Agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-13. Note that these numbers represent total catch and have not been adjusted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

Table 7. The annual catch of non-smolt steelhead caught during the 2000 to 2013 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 2012-13 is not available (NA) at the time of this writing.

Downstream migrant Trap	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Austin Creek	-	-	-	-	-	-	-	7,436	-	-	4,774	1,827	3,666	7,397
Dry Creek	-	-	-	-	-	-	-	-	-	5,290	2,049	2,922	4,705	3,619
Dutch Bill Creek	-	-	-	-	-	-	-	-	-	-	58	27	33	79
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	983	1,658
Sheephouse Creek	-	-	-	-	-	113	59	49	17	-	-	-	-	-
Ward Creek	-	-	-	-	-	495	353	707	-	-	-	-	-	-
Mill Creek	-	-	-	-	-	573	414	931	685	438	353	520	NA	NA
Mark West Creek	-	-	-	-	-	-	-	-	-	-	-	-	95	454

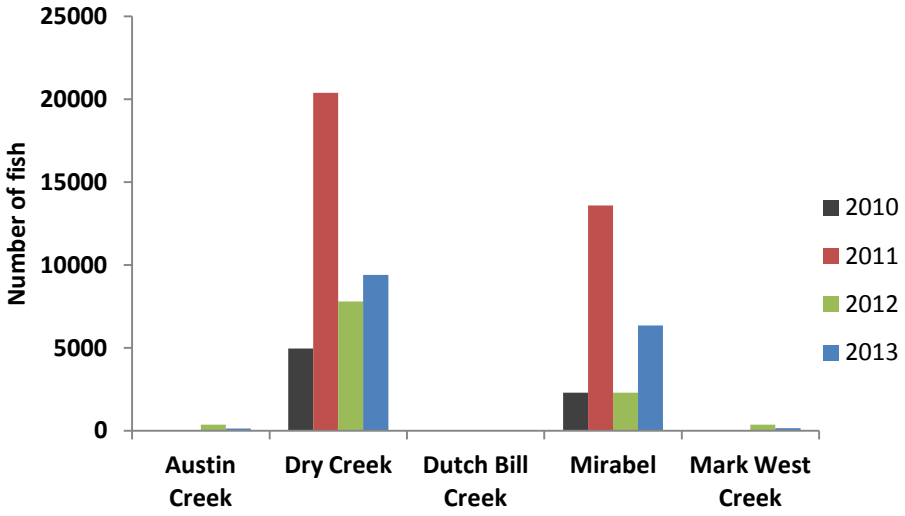

Figure 14. The number of wild Chinook smolts captured in Russian River fish traps operated by the Water Agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-13. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

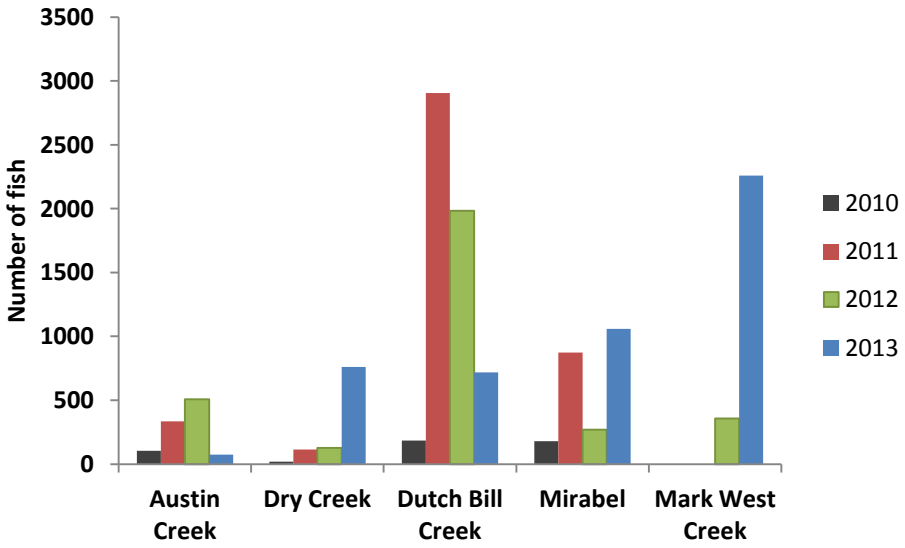

Figure 15. The number of RRCCBP coho smolts captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-13. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

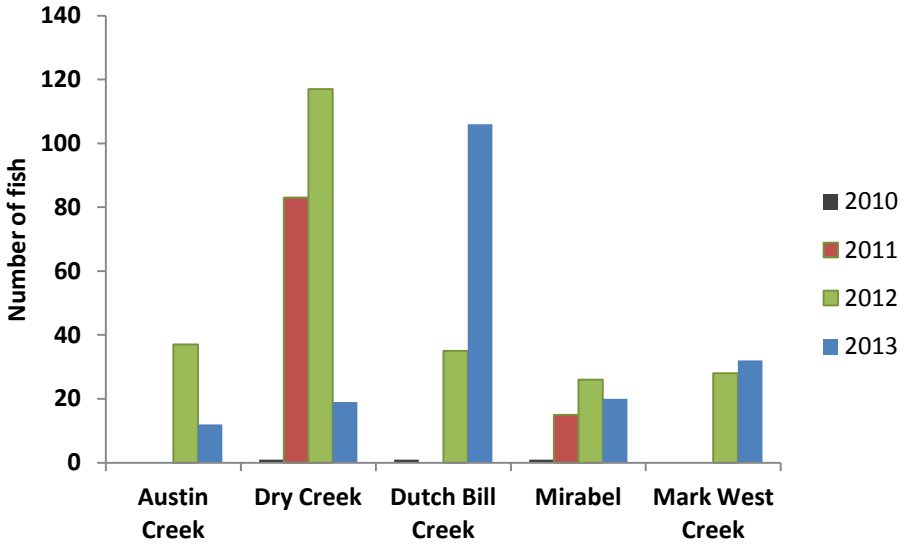

Figure 16. The number of wild coho smolts captured in Russian River fish traps operated by the Water agency at the Austin Creek, Dry Creek, Dutch Bill Creek, Mainstem (Mirabel), and Mark West Creek trapping sites during 2010-13. Note that these numbers represent total catch and have not been adjusted for trap efficiencies. These are not population estimates.

Discussion:

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 2013 was very close to the long term average. The 2013 sampling season was much longer than other sampling seasons and probably approaches the actual escapement of Chinook in 2013.

Adult Chinook Salmon Dive Surveys:

Despite the low flows in the fall and winter adult Chinook observed during 2013 appeared healthy and not over crowded. Chinook redd surveys found Chinook redds throughout the upper Russian River and Dry Creek in a distribution and quantity similar to other years.

Juvenile Steelhead Dive Surveys:

Overall, steelhead abundance appeared to be higher in the summer of 2013 than in 2009, 2010 and 2011, but lower than 2002. Water visibility likely plays a role in the low detection rate of juvenile steelhead during these surveys. Water visibility was the poorest during the 2010, 2011, 2012, and 2013 surveys. Water visibility was greatest in 2002 (at least 1-2 meters of visibility all sites). In 2009, 2010, 2011, 2012, and 2013 the number of sites with 0-1 meters of visibility was 3, 5, 6, 3, and 3 respectively (Table 4). 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, 2012, and 2013. 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 as was likely the case in 2013.

While visibility was likely a factor in the low number of steelhead detected in 2009, 2010, 2011, and 2012 the actual number of steelhead present may have been different between years. The discrepancy between juvenile steelhead counts from 2002 and steelhead counts from 2009-2013 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 and 2012-2013 adult returns were relatively strong (Figure 17). 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 and 2013 detected more steelhead than the surveys conducted in 2009-2012.

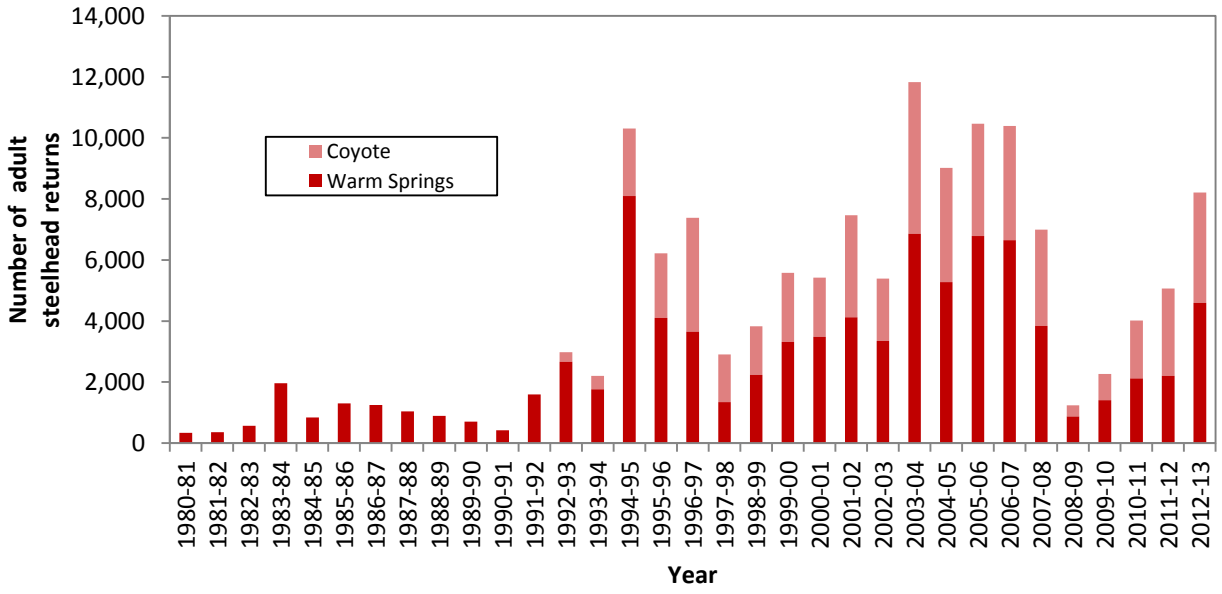

Figure 17. Hatchery returns of steelhead at Warm Springs and Coyote Hatcheries on the Russian River from 1980 to 2013.

Downstream Migrant Fish Trapping:

Steelhead:

Much of the 2013 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 trapping efforts 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. 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 2013 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.

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Appendix

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

Figure B. An underwater photo illustrating the high turbidity near Ukiah and that visibility is limited to just beyond arms reach.

Figure C. Looking downstream at the Hopland survey site.

Figure D. Looking upstream at the Geyserville reach.

Figure E. The confluence of the Dry Creek and the Russian River.

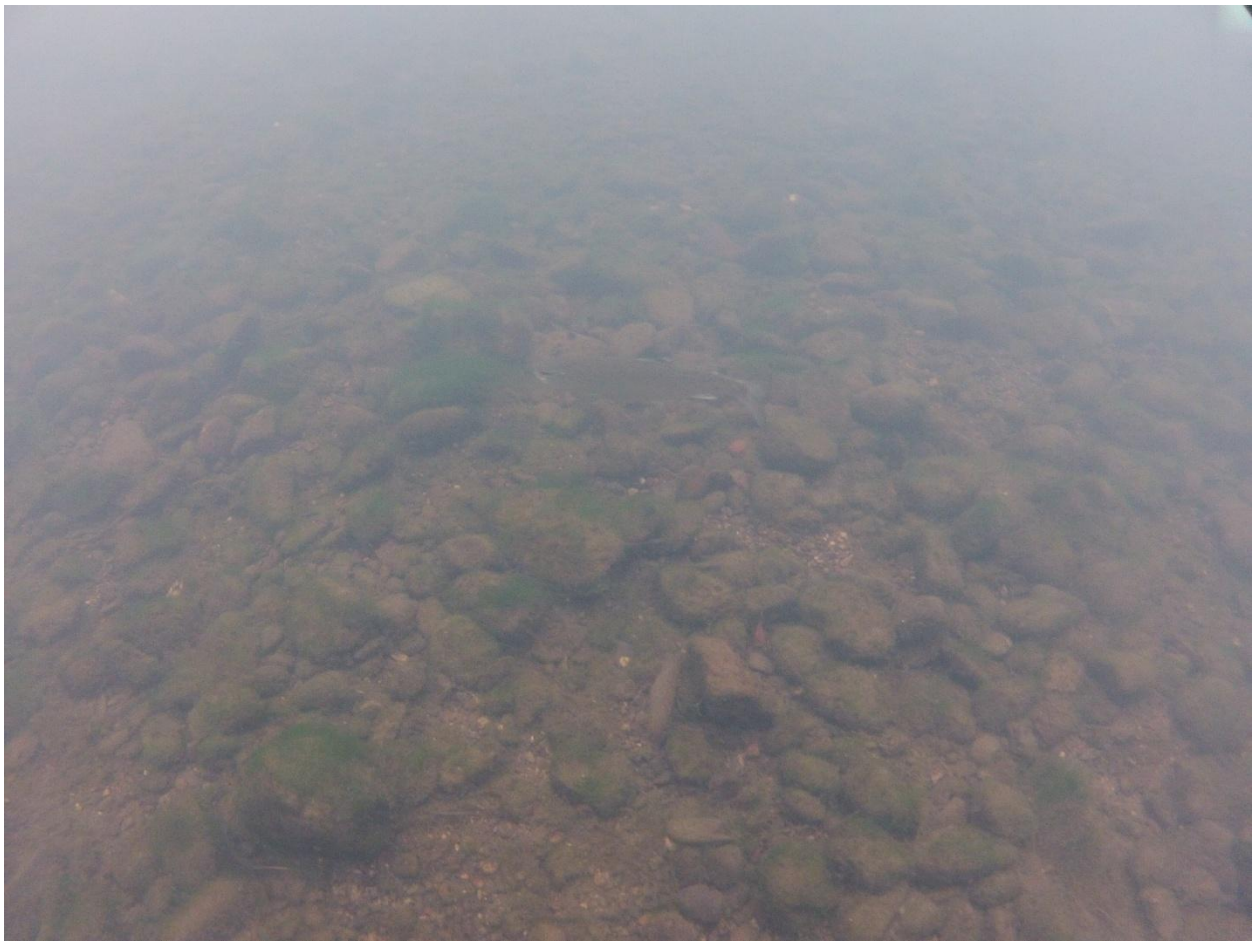

Figure F. A photo of a juvenile steelhead taken downstream of the Russian River and Dry Creek confluence.

Figure G. Looking downstream near River Front Park.