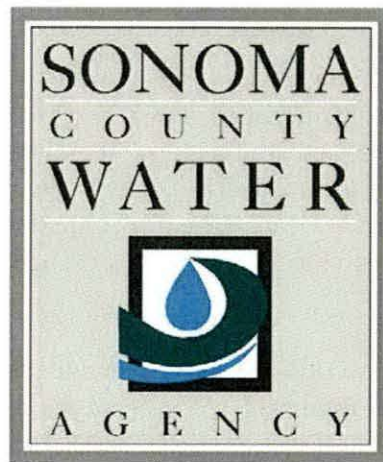


State Water Resources Control Board
Order 8/25/2014

Provision 6 - Fisheries Monitoring Tasks



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Prepared by

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Introduction

On August 14, 2014 the Water Agency submitted a petition to the State Water Board requesting a temporary urgency change to Decision 1610 (D1610), the water rights document that prescribes Sonoma County Water Agency (Water Agency) minimum instream flow requirements for the Russian River to address low storage concerns in Lake Mendocino due to drought conditions. On August 25, 2014, the State Water Board issued an “Order Approving Temporary Urgency Change” for the following temporary changes to D1610:

- a. Minimum instream flow in the Upper Russian River (from the confluence with the East Fork of the Russian River to its Confluence with Dry Creek) shall remain at or above 50 cubic feet per second (cfs).
- b. Minimum instream flow in the Lower Russian River (from its confluence with Dry Creek to the Pacific Ocean) shall remain at or above 60 cfs.
- c. For the purpose of compliance with this term, the minimum instream flow requirements shall be based on a 5-day running average of average daily stream flow measurements, provided that instantaneous flows on the upper Russian River shall be no less than 40 cfs and on the lower Russian River shall be no less than 50 cfs.

The State Water Board’s temporary urgency order included a number of provisions, 4 of which required fisheries monitoring and reporting. Provision 4 required that the Water Agency consult with the National Marine Fisheries Service (NMFS) and the California Department of Fish and Wildlife (DFW) to develop methodologies to monitor salmonids and other native fish during the term of the Order. Provision 5 required that the Water Agency monitor and record the daily number of adult salmonids moving upstream through the Russian river past Dry Creek. Provision 11 required that the Water Agency report the fish counts on a weekly basis. Provision 6 required that the Water Agency consult with the NMFS and the DFW at least every 2 weeks and that the Water Agency submit an annual report on the fisheries data collected for Terms 4 and 5. This report is intended to fulfill the reporting requirement in Provision 6.

Methods

The Water Agency consulted with NMFS and DFW on September 2, 2014 to develop methodologies to monitor salmonids and other native fish. The group came to the consensus that monitoring efforts would be focused on adult salmonids. In summary, the group agreed that SCWA would collect adult fish counts, conduct redd surveys, and conduct snorkel surveys.

Adult fish counts

The Water Agency used a combinations of passive integrated transponder (PIT) tag detections, underwater video, and dual-frequency identification sonar (DIDSON), to count adult salmonids at 3 different sites. At Duncans Mills, Wohler Bridge, and Dry Creek PIT tag antennas were used to detect adult salmonids that had been implanted with PIT tags as juveniles during

previous studies. The Duncans Mills site had 12 antennas and spanned the channel. The Wohler site used 1 antenna to detect fish moving up a temporary fish way associated with a construction project on the mainstem Russian River at Wohler. At Dry Creek a combination of PIT tag antennas, underwater video, and DIDSON were used to monitor adult salmonids. PIT tag antennas allowed us to detect salmonids previously marked with PIT tags, the DIDSON system allowed us to count adult salmonids as they returned to Dry Creek and the underwater video camera allowed us to prorate these counts when the camera could be operated. In addition to the Duncans Mills, Wohler Bridge, and Dry Creek monitoring sites the water Agency experimented with an underwater video camera at the Healdsburg fish ladder in order to count adult salmon migrating up the mainstem Russian River. Since this site is located on the main stem Russian River, upstream of Dry Creek we assume that fish counted at this station are different individuals for those counted at the Dry Creek station.

Spawner surveys

The Water Agency used kayaks to conduct kayak surveys on Dry Creek. The entire length of Dry Creek was surveyed during each sampling event. Sampling events were spaced approximately 10-14 days apart. When redds were detected they were noted and the position was recorded with a global position device (GPS). A one-time peak redd count was planned for the Russian River from the confluence of the East and West forks of the Russian River to River Front Park near the town of Windsor.

Snorkel surveys

NMFS requested that the Water Agency conduct snorkel surveys on a weekly basis in the lower Russian River to detect adult salmonids. NMFS provided the Water Agency with 6 snorkel survey sites located at Duncans Mills, Vacation Beach, and Guerneville (Figure 1). However, it was noted, and agreed upon that it may not be possible to visit all 6 sites each week.

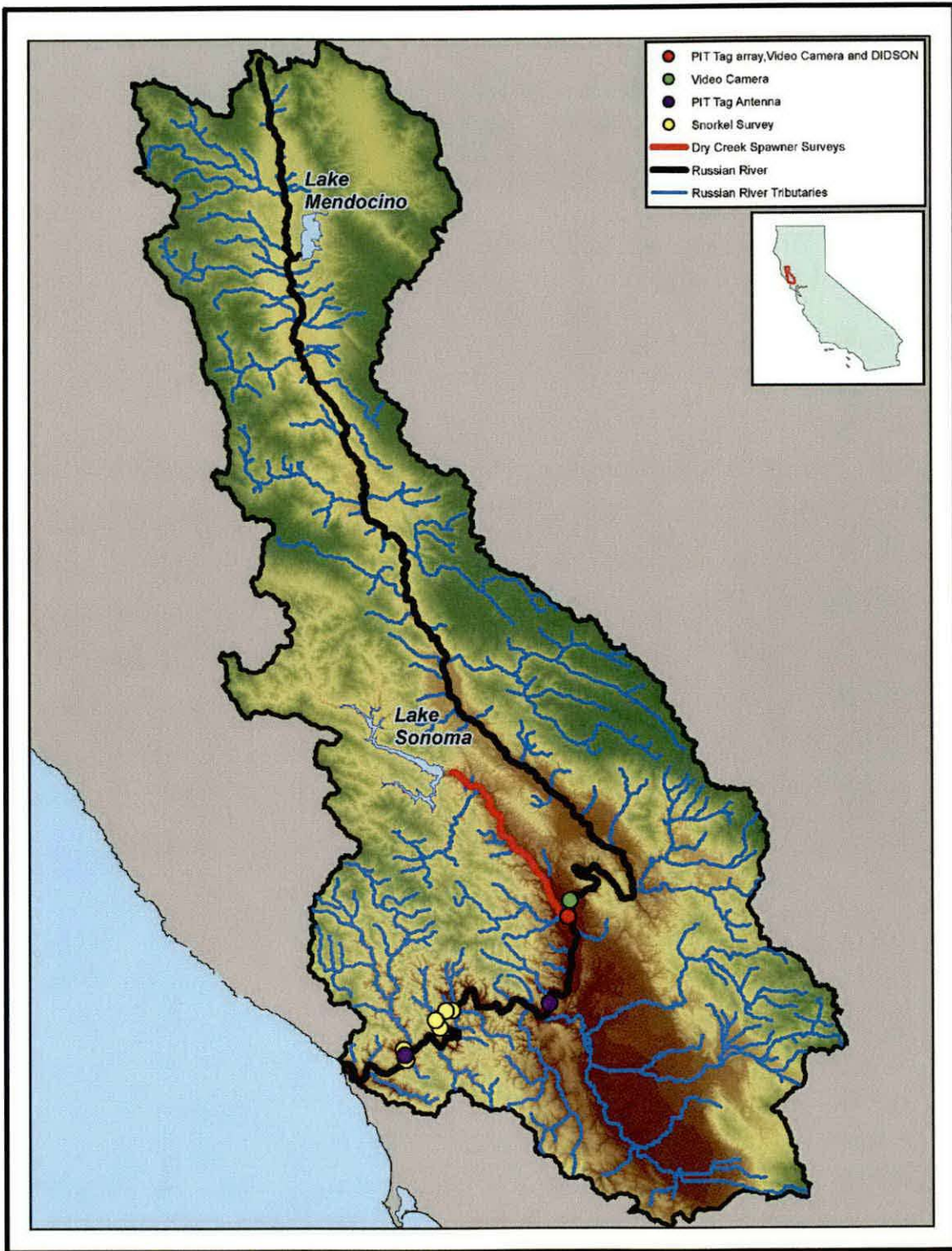


Figure 1. Russian River fisheries monitoring sites for the August, 2014 Temporary Urgency Change Order.

Results

Flow

Flow in the Russian River was generally controlled by reservoir releases from the beginning of the Order on August 24, 2014 to the first major storm event on November 20, 2014. Late fall and winter flows in the Russian River were mainly the result of natural runoff starting with the storm on November 20 through the end of the Order on February 20, 2015. From August 25, 2014 to late November flow in the Russian River at Hacienda ranged from approximately 60 cfs to approximately 150 cfs. A major storm event in early December elevated stream flows at Hacienda to 40,500 cfs (instantaneous maximum) on December 12, 2014 and a second major storm event in early February elevated stream flows to 25,000 cfs (instantaneous maximum) on February 7, 2015. These two storm events required us to remove our monitoring equipment from the stream.

Adult counts

PIT tag detections

Adult Chinook, steelhead, and coho were detected on the PIT tag antennas operated by the Water Agency during the period of the Order. Adult salmonids detected on PIT tag antennas during the Order included 2 Chinook, 3 Coho, and 4 steelhead. None of these fish were detected at more than one site so travel times cannot be calculated. However 3 of these fish were detected at one site multiple times which may indicate staging, spawning activity, or migrating to sea after spawning in the case of steelhead. One adult Chinook was first detected on December 30, 2014 at Duncans Mills and then detected many times at this site over the next 35 days. It is possible that this fish was staging in the estuary. It was last detected on February 3, 2015 a few days before a major storm event. Flow at Hacienda ranged from 397 cfs to 1600 cfs during this time period. The other Chinook detected by the Water Agency's antennas was detected near the mouth of Dry Creek on 3 different days from December 30, 2014 to February 15, 2015. This fish may have been staging or spawning near the mouth of Dry Creek. At the mouth of Dry Creek one adult steelhead was detected on two separate days over a 15 day period. The first day this steelhead was detected was on February 5 and the second day this fish was detected was on February 20, 2015 (Table 1). This fish may have been staging or spawning near the mouth of Dry Creek or it may have passes this antenna site en route to spawning grounds and then again while headed to sea.

Table 1. PIT tag detections of adult salmonids on antennas operated by the Water Agency during the period of the order. These data are preliminary and subject to change

Species	Life stage when tagged	PIT tagging site	Tagging date	Detection site	Date of first detection	Date of last detection	Number of detections
CHINOOK SALMON	SMOLT	Lower Dry Creek	5/14/2013	Duncans Mills	12/30/2014	2/3/2015	933
CHINOOK SALMON	SMOLT	Lower Dry Creek	6/13/2011	Mouth of Dry Creek	12/30/2014	2/15/2015	9
coho salmon	YOY	Warm Springs Hatchery	12/10/2013	Mouth of Dry Creek	1/14/2015	1/14/2015	4
coho salmon	YOY	Warm Springs Hatchery	11/27/2013	Mouth of Dry Creek	2/13/2015	2/13/2015	1
coho salmon	YOY	Warm Springs Hatchery	5/1/2013	Mouth of Dry Creek	2/13/2015	2/13/2015	1
steelhead	SMOLT	Jenner Gulch	9/24/2012	Duncans Mills	1/6/2015	1/6/2015	1
steelhead	Parr	Lower Dry Creek	7/25/2012	Mouth of Dry Creek	2/5/2015	2/20/2015	4
steelhead	Parr	Upper Dry Creek	7/29/2013	Mouth of Dry Creek	2/15/2015	2/15/2015	1
steelhead	Parr	Lower Dry Creek	7/9/2013	Mouth of Dry Creek	2/6/2015	2/6/2015	2

Video and DIDSON counts

The Water Agency installed a DIDSON and underwater video camera near the mouth of Dry Creek on September 1, 2014. During the time of operation there were two periods where DIDSON was not collecting images due to storms (December 10, 2014 to December 31, 2014 and from February 6, 2014 to February 18, 2015). A storm on December 10, 2014 increased turbidity to the point that the underwater camera was ineffective for the remainder of the monitoring season. In addition to the DIDSON and video camera at Dry Creek, the Water Agency experimented with an underwater video camera in the Healdsburg Fish ladder from September 29 to December 3, 2015. DIDSON images collected at Dry Creek have been reviewed through February 3 2015 (Figure 2 and Figure 3).

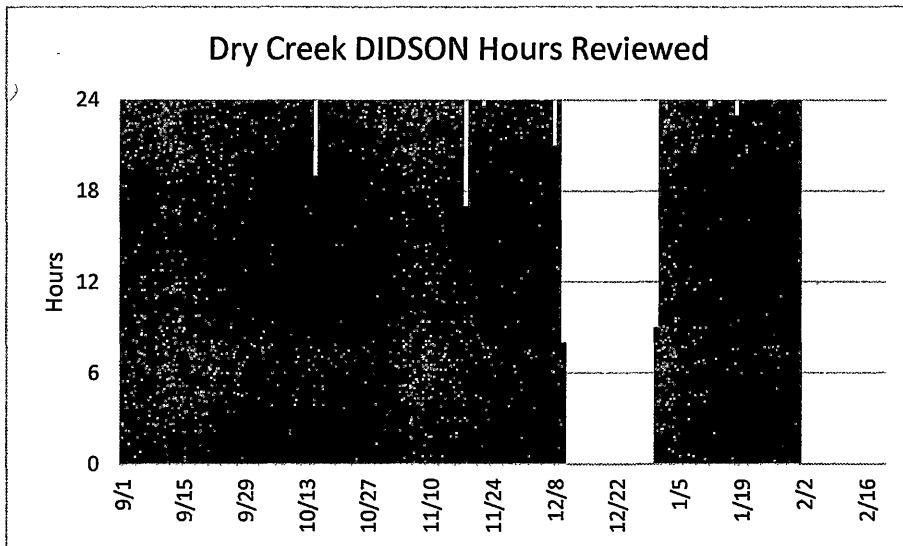


Figure 2. The number of hours of DIDSON that has been reviewed at the Dry Creek sampling site. Missing hours are due to data storage errors and storm events. DIDSON data has been reviewed through February 3, 2015.

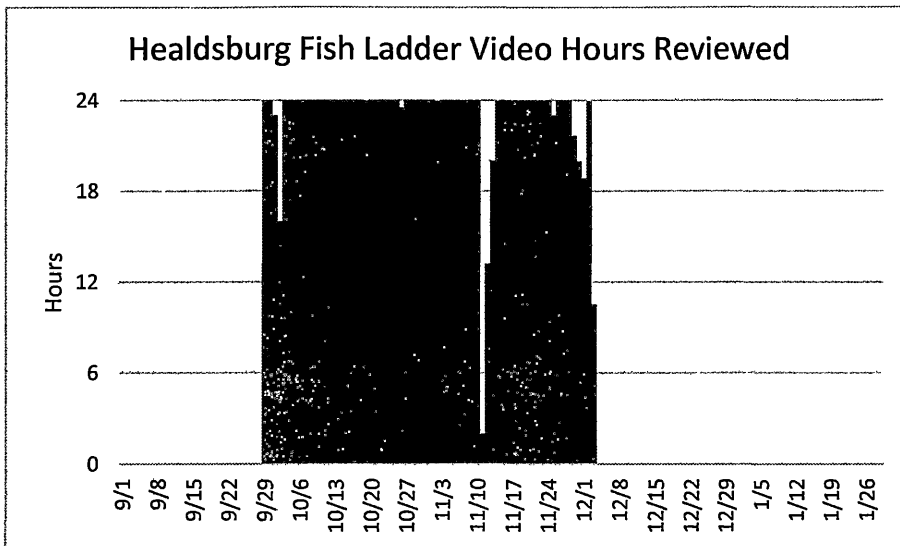


Figure 3. The number of hours of underwater video that has been reviewed per day at the Healdsburg Fish ladder on the mainstem Russian River. Missing hours are due corrupt data, and storm events.

As of February 3, 2015 a total of 2,269 salmonids were observed on the DIDSON during the period of the order. The camera at Dry Creek allowed us to prorate DIDSON counts base on the species ratio until December 10, 2014 when the camera was removed. The prorated counts from Dry Creek are 937 Chinook, 9 coho, and 18 steelhead. An additional 1,578 salmonids and 106 unknown fish species were observed on the DIDSON after the video camera was removed. At Healdsburg, from the time the camera was installed on September 28, 2014 to the day the camera was removed on December 3, 2014 396 Chinook, 9 coho, 7 steelhead were observed. In total between the two sites 1,333 chinook, 18 coho, 25 steelhead, 1,578 unidentified salmonids and 106 unknown fish species have been observed (Table 2).

Table 2. The number of adult salmonids observed on the Dry Creek DIDSON, and Healdsburg fish ladder from September 1, 2014 to February 3, 2015. DIDSON counts made prior to December 10, 2014 were prorated using the species ratio from the underwater camera at Dry Creek and combined with Healdsburg counts. **These counts are from Dry Creek, occurred after December 10, 2014, and have not been prorated. *These fish have coho traits.

Mouth of Dry Creek and Healdsburg fish ladder (09/01/2014-02/03/2015)					
	**Salmonid Species	**Unknown fish species	Chinook	*Coho	Steelhead
Total	1578	106	1333	18	25

Spawner Surveys

Spawner surveys were conducted in Dry Creek beginning in October on an approximately 7 to 14 day frequency. On December 3, 2014 a storm caused turbidity to become too high in Dry Creek for spawner surveys to be effective. The last spawner survey was conducted on November 25, 2015. A total 129 redds and 11 fish were observed over the course of 5 surveys (Table 3). No spawner surveys were conducted in the mainstem Russian River because storm events in December created conditions that were not favorable for spawner surveys.

Table 3. The number of redds and fish observed during Dry Creek spawner surveys shown by date and reach. The upper reach extends from the Warm Springs Dam at late Sonoma to Lambert Bridge, while the lower reach extends from Lambert Bridge to the mouth of Dry Creek.

Date	Subreach	Number of new redds	Number of fish observed
10/22/2014	Upper	1	
	Lower	1	
11/5/2014	Upper	5	
	Lower	5	
11/19/2014	Upper	34	11
	Lower	22	
11/25/2014	Upper	39	
	Lower	23	
Grand Total		130	11

Snorkel Surveys

Few adult salmonids were observed during snorkel surveys conducted by the Water Agency. The mouth of the Russian River remained closed for much of the fall and limited salmonids entering the river from the ocean. The Water Agency conducted the first snorkel survey on October 27, 2014 following a breach of the Russian River October 22, 2014. Snorkel surveys were conducted on a weekly basis until November 26, 2014 when storm events elevated the turbidity in the river. Snorkel survey sites recommended by NMFS and CDFW were located at: Moscow Road Bridge and Browns Pool near Duncans Mills, upstream and downstream of Vacation Beach near Monte Rio; and Neeley's Hole and Johnson's beach near Guerneville. In addition to these sites, the Water Agency surveyed the PG&E Hole near Healdsburg. Visibility was generally less than 6 feet at all sites. The total counts when combining all surveys and survey sites were approximately 30 to 40 Chinook, 0 coho, 5 steelhead, and 10 unidentified salmonids (Table 4). The steelhead observed were likely half-pounders or small adults and made up of a combination of wild and hatchery origin fish.

Table 4. Dates when Snorkel surveys were conducted by the Water Agency, locations of survey sites, and the number of salmonids observed.

Date	Site	Chinook	Coho	Steelhead	Salmonids
10/27	Moscow Road Bridge	0	0	0	0
	Vacation Beach (D.S.)	0	0	5	0
	Vacation Beach (U.S.)	0	0	0	0
	Neeley's Hole	0	0	0	0
	Johnson's Beach	0	0	0	0
11/6	Moscow Road Bridge	0	0	0	0
	Vacation Beach (D.S.)	0	0	0	0
	Vacation Beach (U.S.)	0	0	0	0
	Neeley's Hole	0	0	0	0
	Johnson's Beach	0	0	0	0
	Healdsburg	20-30	0	0	0
11/13	Moscow Road Bridge	0	0	0	0
	Vacation Beach (D.S.)	0	0	0	0
	Neeley's Hole	0	0	0	0
	Johnson's Beach	0	0	0	0
11/20	Moscow Road Bridge	0	0	0	0
	Brown's pool	0	0	0	0
	Vacation Beach (D.S.)	0	0	0	0
	Vacation Beach (U.S.)	0	0	0	0
	Healdsburg	10	0	0	10
11/26	Moscow Road Bridge	0	0	0	0
	Vacation Beach (D.S.)	0	0	0	0
	Vacation Beach (U.S.)	2	0	0	0
	Neeley's Hole	0	0	0	0
	Johnson's Beach	0	0	0	0
	Healdsburg	0	0	0	0

Discussion

Flow

Flow in the Russian River was mainly controlled by reservoir releases during the beginning of the Order and by natural runoff towards the end of the Order. Storm events in November, December, and February affected our ability to monitor adult salmonids. The turbidity related to these storm events made spawner and snorkel surveys ineffective and limited our use of underwater video and DIDSON. A sand bar formed at the mouth of the Russian River on September 17, 2014 and limited salmonid access to the river until October 23, 2014. Our

monitoring indicates that flow was generally adequate to allow for salmonid passages during the period of time that salmonids had access to the river (Figure 4).

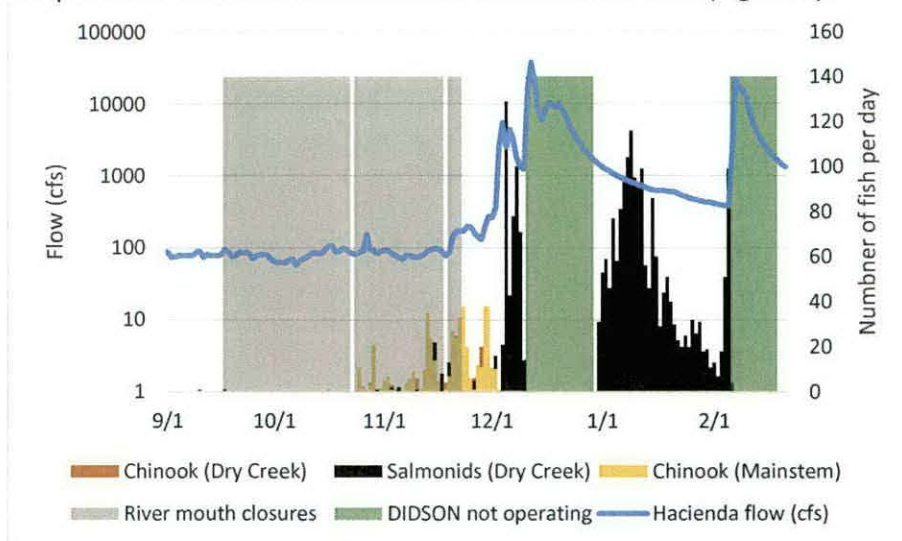


Figure 4. The period of time that the mouth of the Russian River was closed, the flow in the Russian River from the USGS Hacienda gage, the period of time that the DIDSON was not operated during to storm events and the number of adult salmonids observed at the Dry Creek DIDSON and Healdsburg underwater video during the period of the Order.

Adult Counts

PIT tag detections

PIT tag detections of salmonids can be useful for many purposes, but when detection numbers are low it is difficult to separate migration from other patterns of fish behavior. During the Order only a few adult salmonids were detected. Some of these fish exhibited unusual movement patterns. While these observations are interesting it is difficult to draw meaningful conclusions from the detection of only 9 fish.

Video and DIDSON counts

Adult salmonid counts collected in 2014-15 should be considered a minimum count and the magnitude of the 2014-15 salmonid run should not be compared to other years. The Water Agency has been operating an underwater video camera system at Mirabel to collect adult salmonid counts for over a decade. This counting station could not be operated in 2014-15 due to a fish passage project. Alternate sites were used to collect adult salmonid counts in 2014-15, but storm events in December and February limited our ability to collect these counts. While storms during the December-February time period have occurred in previous monitoring years, the 2014-15 adult chinook migration likely took place later in 2014-15 than in previous years. The later run timing is related to the formation of a sand bar at the mouth of the Russian River that limited fish access to the river. Since the chinook run took place later in the year than in

previous years, the storm events that occurred in early December 2014 encouraged many fish to enter the river at a time when our monitoring equipment was not operating. Therefore we likely undercounted chinook in 2014-15.

The Healdsburg Memorial Dam and fish ladder used as a monitoring site in 2014-15 allowed us to count salmonids returning to the upper Russian River. We may continue to refine video monitoring at this site while Mirabel is under construction. However the current camera arrangement at Healdsburg needs further testing and development.

Spawner Surveys

While a few spawner surveys were conducted on Dry Creek no surveys were conducted on the mainstem Russian River in 2014-15. Storms created high flow and turbidity in December 2014. The high flow made for unsafe conditions to conduct spawner surveys. High turbidity rendered spawner surveys ineffective once flow returned to safe levels.

Snorkel Surveys

Due to generally poor water visibility in the lower river during the term of the Order, snorkel surveys failed to account for many fish likely present during the surveys. Water visibility was typically less than 6 feet at all sample sites. The sample sites were often at least 10-15 feet deep and over 100 feet wide. These conditions allow for adult salmonids to easily avoid divers. When combining all sites and surveys only 45 to 55 salmonids were observed during snorkel surveys. During the same time period (October 27, 2014 through November 26, 2014) a total of 685 salmonids were observed on the DIDSON at Dry Creek and under water video at Healdsburg. Snorkel surveys in the mainstem Russian River may detect the presence of fish but limited water quality restricts the use of these data.

References

State Water Board, Order approving Sonoma County Water Agency's Petition for temporary urgency change permits 12947A, 12949, 12950, and 16596 (applications 12919A, 15736, 15737, 19351). August 25, 2014. State Water Resource Control Board. Sacramento Ca.