

2016 Monitoring Report



Photo by W. DeDobbeleer

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Siskiyou Resource Conservation District

For the
Scott River Water Trust

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Introduction

The purpose of the Scott River Water Trust (SRWT) Water Leasing Program is to improve conditions for salmon and steelhead in priority stream reaches by requesting landowners to forbear all or part of their decreed water right in exchange for fair financial compensation. Priority stream reaches for summer habitat were originally identified for the Water Trust in 2007 based on stream survey data (Quigley 2007a). The prioritization of reaches is tailored on an annual basis to the known presence of threatened coho salmon determined from direct observation spawning ground surveys and juvenile dive surveys (Magranet, 2016). In 2016, the Scott River Water Trust performed its tenth year of forbearance transactions with adjudicated water-users in Scott Valley.

Previous SRWT annual monitoring reports are available at the SRWT website:

www.scottwatertrust.org

Annual Monitoring Report Authors:

2008 – 2010 by E. Yokel

2011 by D. Quigley

2012 by P. Thamer

2014 by P. Thamer and S. Sommarstrom

2015 by L. Magranet

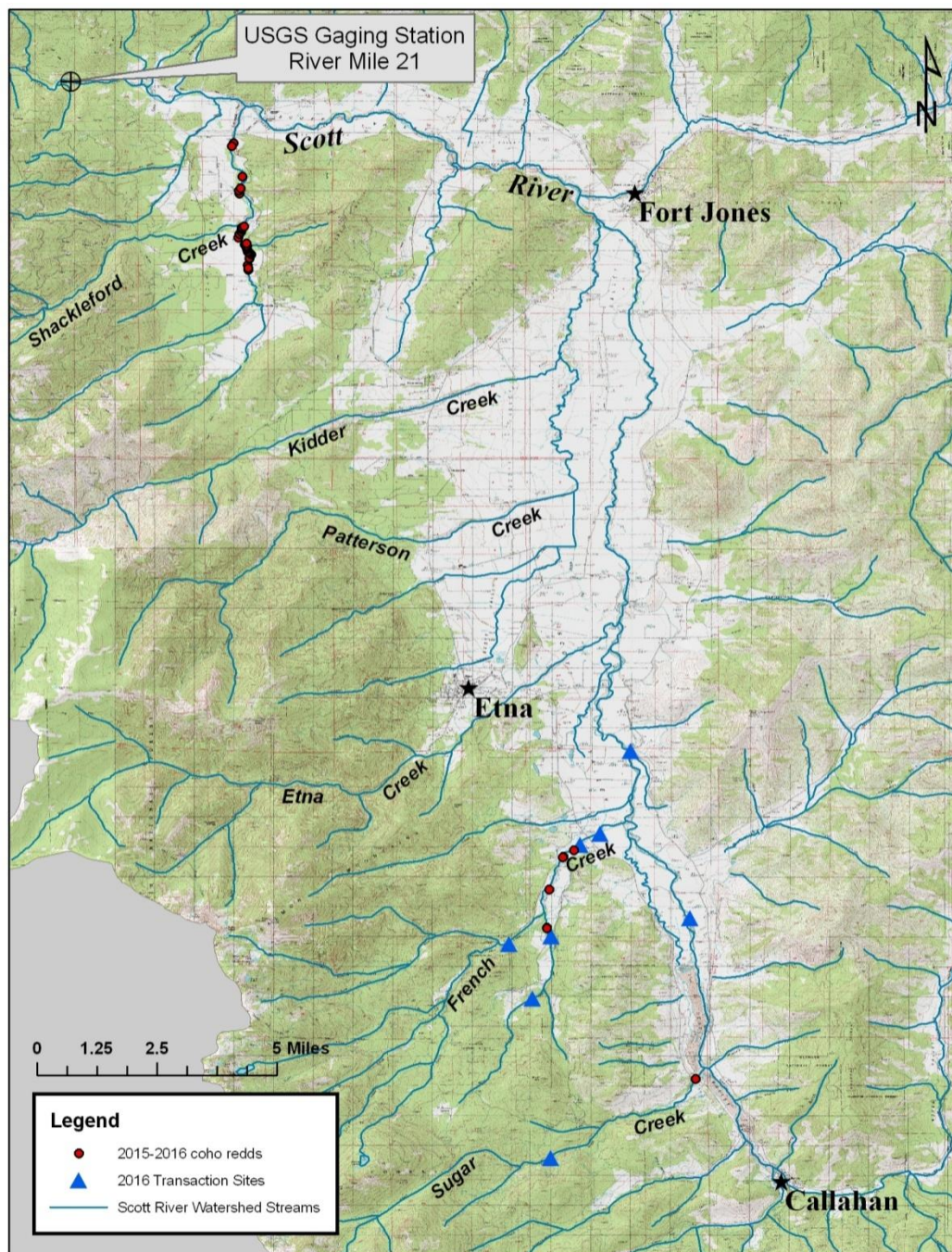
2016 Water Leasing Program Summary

Eight forbearance agreements were completed during the summer of 2016 – two from the mainstem Scott River, five from French Creek, and one from Sugar Creek (Table 1). Leases were not conducted in the fall of 2016 due to the curtailment of junior priority class rights by the State Water Resources Control Board (effective July 5th – October 24th 2016) and limited water supply.

Table 1. Summer 2016 Transaction Summary					
Stream / Tributary / Diversion No.	Date Began	Date Ended	Flow Leased min-max (cfs)	Est. Volume Leased (acre-feet)	Minimum Distance of benefit (ft)
French Creek					
#20	July 15	Oct. 1	0.58	88.6	9,650
#33 – Miners Ck	Aug. 10	Oct. 1	0.58-0.70	64.1	10,500
#36 – Miners Ck	Aug. 4	Oct. 1	0.25	28.3	3,500+
#47A	July 22	Oct. 1	0.10-0.90	60.0	5,000
#48	July 14	Oct. 1	0.45-0.76	104.7	3,200+
Sugar Creek					
#173B	Aug. 3	Oct. 1	0.19-0.72	48.6	10,000+
Scott River					
#196	July 15	Oct. 1	1.30	198.5	9,900
#223	Aug. 12	Oct. 1	1.50	145.8	18,400
TOTAL	8 leases	49 to 108 days	0.10 to 1.50 cfs	738.6 acre-feet	70,150 feet 13.3 miles

Lease Locations

All seasonal forbearance agreements were conducted within the valley of the Scott River sub-basin of the Klamath River (Map 1). Water leases primarily targeted summer rearing habitat for juvenile coho salmon and steelhead trout in priority tributaries. More detailed maps can be found in the Results section.



Map 1. Salmon spawning distribution and Scott River Water Trust 2016 transaction sites.

Note that Map 1 does not include Chinook redds because the Siskiyou Resource Conservation District did not conduct spawning ground surveys on the mainstem during the 2015-2016 salmon run; to the best of our knowledge adult Chinook did not enter Scott Valley.

Monitoring Objectives

The main objectives of the monitoring effort for the Scott River Water Trust are to answer the following questions:

- 1.) Was the amount of water paid for provided?
- 2.) Was there an instream effect on stream discharge and/or pool volume below the lease site?
- 3.) What was the extent (distance) of downstream impact on flows?
- 4.) Was instream water temperature affected by leases?

2016 Water Year Conditions – Normal

The Scott River drains a 520,184-acre (813 square mile) watershed with the quality of the water year being largely dependent upon fluctuations in snowpack. Following severe drought conditions from 2012 through 2015, precipitation during the winter of water year 2016 allowed for an average water supply. Precipitation in Fort Jones from October 1, 2015 to April 1, 2016 was documented at 120% of the average on record for that 5 month time period (Appendix A). Furthermore, snow surveys conducted by the U.S. Forest Service determined the equivalent water content of the snowpack on April 1, 2016 to be 97% of the historical average (Appendix A). However, unusually warm spring temperatures diminished the water content to 21% by May 1st (Appendix A). The relatively rapid snow melt caused the Scott River to prematurely decline towards base flow conditions (Appendix A). As such, discharge at the USGS Gaging Station (River Mile 21) remained below the historic daily median beginning in mid-May, the historic mining tailings in the southern portion of the watershed became disconnected in mid-June and base flow conditions hovered around or below 10 cfs (Appendix A). The 2016 water year ended up with 23.57” precipitation in Fort Jones, or 108% of average (Appendix A). A storm in mid-October of 2016 reconnected the mainstem of the Scott River from the valley through the confluence with the Klamath River.

Methods

The Monitoring Program for the Scott River Water Trust was first outlined by the Siskiyou Resource Conservation District (Siskiyou RCD) in 2007 (Quigley 2007b). Any refinements and updates made to the methods employed for the Monitoring Program are described in the annual Monitoring Report. In 2016, the Siskiyou RCD was subcontracted to complete all monitoring associated with the water-leasing program including water temperature, stream flow and direct observation dive surveys to evaluate fish presence.

Stream Flow

Instantaneous streamflow was measured using the FlowTracker Handheld - ADV (Acoustic Doppler Velocimeter) by SonTek/YSI. This flowmeter is the same model used by the California Dept. of Water Resources (CDWR) and is known for high precision in low flow ranges (down to 0.001 m/s). Flow measurements are conducted at hydrologic control points (e.g., pool tail out) with uniform laminar water velocities along a cross - section, following USGS standard methods (Rantz 1982, Yokel 2009.) Streamflow measurements were utilized for the SRWT Water Leasing Program to evaluate a transaction's affect on stream discharge and to monitor changes in available flow for an accurate payment schedule through the irrigation season. Streamflow records were also utilized from the gaging stations managed by CDWR on French Creek (FCC) and Sugar Creek (SGN).

Diversion Flow

In streams where the Watermaster does not measure diversion amounts, the Contractor validated the amount of flow being diverted before and after a transaction, in coordination with the SRWT Executive Director and water user. A fixed weir structure was the preferred method for verifying ditch flow. If a fixed weir structure was not present, flow measurements within the ditch were taken using the FlowTracker Handheld ADV by SonTek/YSI.

Stream Temperature

Onset HOBO Water Temperature Pro v2 Data Loggers were used to collect water temperature data at lease sites on 15-minute intervals. Data loggers were placed, on a site-specific basis, in targeted fish habitat within the transaction's zone-of-benefit. The water temperature loggers were calibrated in both an ice and air bath, and the calibration data was analyzed to ensure accuracy before being deployed. Attempts were made to place the devices instream a minimum of 24 hours prior to the initiation of a water lease in order to collect one full diurnal fluctuation; however, this was not possible at all sites. Microsoft Excel spreadsheets were used to develop daily minimum, maximum, and average water temperature records as needed.

Fish Observation Dives

Dive surveys are widely used to monitor salmonid populations, as they are a simple and cost effective method for estimating abundance, distribution, and species diversity with minimal disturbance. Siskiyou RCD field technicians trained in species identification and direct observation techniques snorkeled through habitat units within the zone-of-benefit of a transaction and enumerated fish by species and age class according to the methods employed by the California Department of Fish and Wildlife (CDFW) (Thurrow 1994). Despite efforts to standardize dive surveys, they have inherent limitations due to the complexity of the aquatic environment and individual bias; therefore it is important that biological data presented in this report is interpreted with that understanding. Dive surveys conducted by the Siskiyou RCD were usually coordinated in anticipation of specific water leases to inform the SRWT of habitat conditions within the reach that could potentially benefit from flow augmentation and justify the finalization of a particular forbearance agreement. Surveys were also conducted after water transactions were initiated to quantify populations benefitting from ongoing flow enhancement. It is important to point out that dive surveys did not cover the entirety of habitats influenced by the water leases.

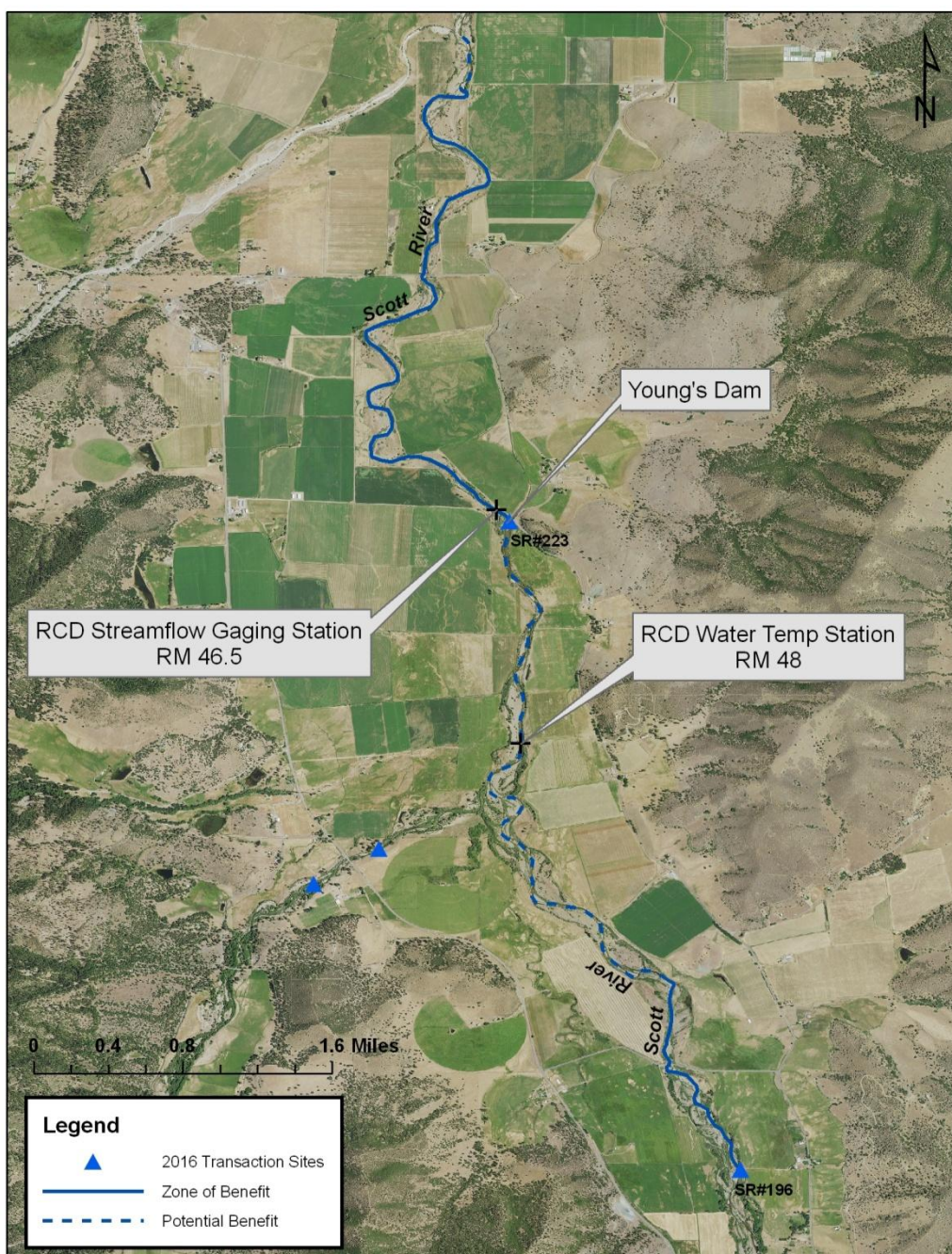
Juvenile coho surveys completed as part of this project were permitted through the NOAA Fisheries ESA Section 4(d) permit held by the Siskiyou RCD (File #19174). Liner densities were calculated from the data sheets by dividing the number of young-of-the-year salmonids observed (e.g., all age 0+ coho, Chinook and steelhead trout) by an estimate of the reach length determined from a path drawn between coordinates inputted into ArcGIS.

Results

Scott River Mainstem Leases

The Siskiyou RCD conducted dive surveys through several key sections of the Scott River early in the summer of 2016 to assess the population of salmonids rearing in areas with potential for flow augmentation. Based on these observations, the SRWT determined that flow conditions in conjunction

with the relative abundance of coho salmon and steelhead trout warranted engaging with water users on the mainstem. The SRWT conducted two independent transactions located at diversions from river mile 46.7 and river mile 51.0 (Map 2). The thick blue line indicates the estimated length of habitat directly benefitted from the flow enhancement, which is shown extending to the next un-leased point of diversion or a location where there had been visible stream response. Both of these leases have the potential to influence habitat further downstream, as suggested by the dotted line, however, it was not documented in 2016.



Map 2. Mainstem Scott River summer transaction sites and zone of downstream benefit.

Scott River - SR196**Diversion Site:** Scott River Mile 51.0, Scott River Decree Diversion No. 196-D2 (SR196)**Lease Period:** July 16, 2016 – September 30, 2016**Duration:** 77 days**Water Right:** 1.30 cfs, 3rd Priority**Leased Amount:** 100% of available water right**Quantity Diverted at Initiation of Lease:** 1.86 cfs**Stream Discharge Before Lease was Initiated:** 23.59 cfs**Stream Discharge After Lease was Initiated:** 25.96 cfs **Net Gain:** 2.37 cfs**Downstream Benefit:** Extends a minimum of 9,900 feet (1.90 miles) to the next un-leased surface water diversion on the Scott River (Diversion No. 203-D2).***Transaction Event Summary***

On the morning of July 15, 2016 the Contractor measured the total quantity of water being diverted through the rectangular suppressed weir exiting the fish screen as 1.86 cfs (Photo 1). A discharge measurement was taken downstream of the bypass culvert along a cross-section at the inflow of a run and streamflow through this channel of the Scott River was measured to be 23.59 cfs. At 8:30 a.m., all ditch flow was released to the Scott River by fully opening the bypass culvert and setting flashboards to prevent water from being diverted (Photo 2). At this site, flow passes through a section of ditch (approximately 990 feet) before returning to the Scott River through the fish screen bypass because there is not a headgate to completely prevent water from entering the point of diversion. Furthermore, in 2014, CDFW biologists determined that there was suitable habitat – cover and cold water – provided by this length of ditch that would be especially valuable for rearing salmonids during drought years when the adjacent section of the Scott River channel is at risk of going subsurface. After the diverted water was returned instream, flow along the same cross-section of the Scott River channel was measured to be 25.96 cfs. Streamflow monitoring verified an instream benefit of 2.37 cfs on July 15th as a result of this transaction.

Streamflow Monitoring

All streamflow measurements were taken within a flatwater habitat unit along cross-sections 200 to 220 feet downstream of the bypass culvert. Follow-up streamflow measurements were taken on three different occasions after the initiation of the transaction (4 weeks, 7 weeks and 9 weeks) to verify that the leased water (1.3 cfs) remained instream (Table 2). The ditch was noted to be dry at the fish screen on September 1st when flow through the adjacent section of the Scott River reached a minimum of 2.76 cfs. Due to the substantial distance between the point-of-diversion and the fish screen bypass where flows were returned to the Scott River, the Contractor completed consecutive discharge measurements adjacent to these locations to confirm that monitoring was representative of conditions at either end of the site. The two measurements taken on the Scott River on September 16th indicate that flow above the point-of-diversion is nearly equivalent (within the instrument error margins) to flow below the fish screen bypass (Table 2). This means that even though the ditch at the fish screen went dry and the bypass culvert was no longer returning water, there was sufficient flow available to the water user at the point-of-diversion that they could have been diverting their full right if not under an

Table 2: Scott River Flow Summary at SR196

Date and Time	Flow (cfs)	Timing
July 15 08:22	23.59 (+/- 2.8%)	Pre-Lease
July 15 10:20	25.96 (+/- 2.7%)	Post-Lease
Aug 11 07:35	7.41 (+/- 3.2%)	Post-Lease, 4 weeks
Sept 1 07:42	2.76 (+/- 3.3%)	Post-Lease, 7 weeks
Sept 16 08:00	3.40 (+/- 3.3%)	Post-Lease, 9 weeks
Sept 16 09:50	3.32 (+/- 4.1%)	Post-Lease, 9 weeks (at point-of-diversion)

agreement. The understanding of these conditions prevented the water user from making modifications to the streambed in order to maintain flow down the ditch through the remainder of the season.



Photo 1. Flow being diverted through the fish screen (left of photo) before the lease was initiated.



Photo 2. Flow being bypassed into the Scott River (right of photo) after the lease was initiated.

Biological Monitoring

In early summer, the Siskiyou RCD completed a dive survey through the Scott River from Fay Lane upstream to SR196 bypass in order to gage the influence that a water transaction at this site might have on the fishery. Technicians identified juvenile salmonids rearing in every habitat unit through the 0.72 miles that were surveyed; densities of young-of-the-year fish were relatively low. Species encountered included coho salmon, rainbow trout as well as Klamath smallscale sucker and speckled dace. Six weeks into the lease, the dive survey was repeated and the abundance of salmonids rearing within this reach was found to have noticeably increased, with a population of mid-sized trout numbering over 500 fish. Note that the biological surveys discussed here only covered a portion of the length of stream influenced by this water transaction.

Temperature Monitoring

Prior to the initiation of a transaction at SR196, a water temperature logger was deployed off the river-right bank 140 feet downstream of where the diversion bypass flows re-enter the Scott River. Water temperature data was collected at this site from July 8th through October 12th. The logger was located on the stream margin at approximately 2 feet deep in a micro pool habitat underneath a willow cluster with southern exposure. Figure 1 shows water temperature data encompassing the duration of the SR196 water lease. The transaction began during a period where Scott River water temperatures were relatively high, but stable, before they inclined towards the seasonal maximum on July 29th. Analysis of water temperatures through the immediate days surrounding the initiation of the transaction confirm that the return of leased water did not affect the daily fluctuation of stream temperatures (Figure 2).

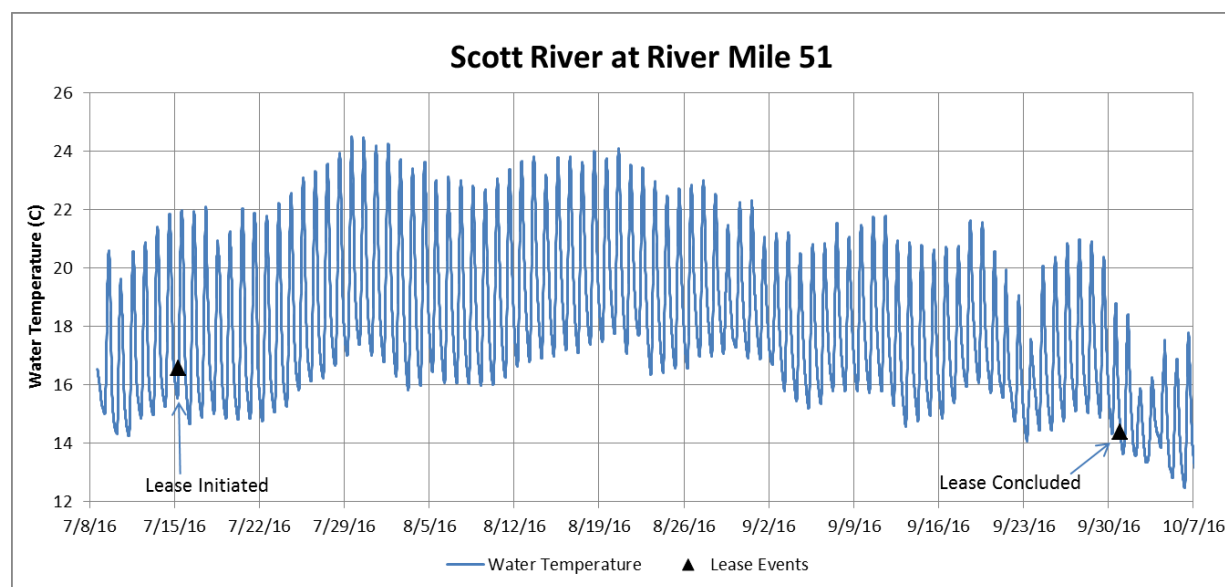


Figure 1. Water temperature data for the duration of the SR196 lease period.

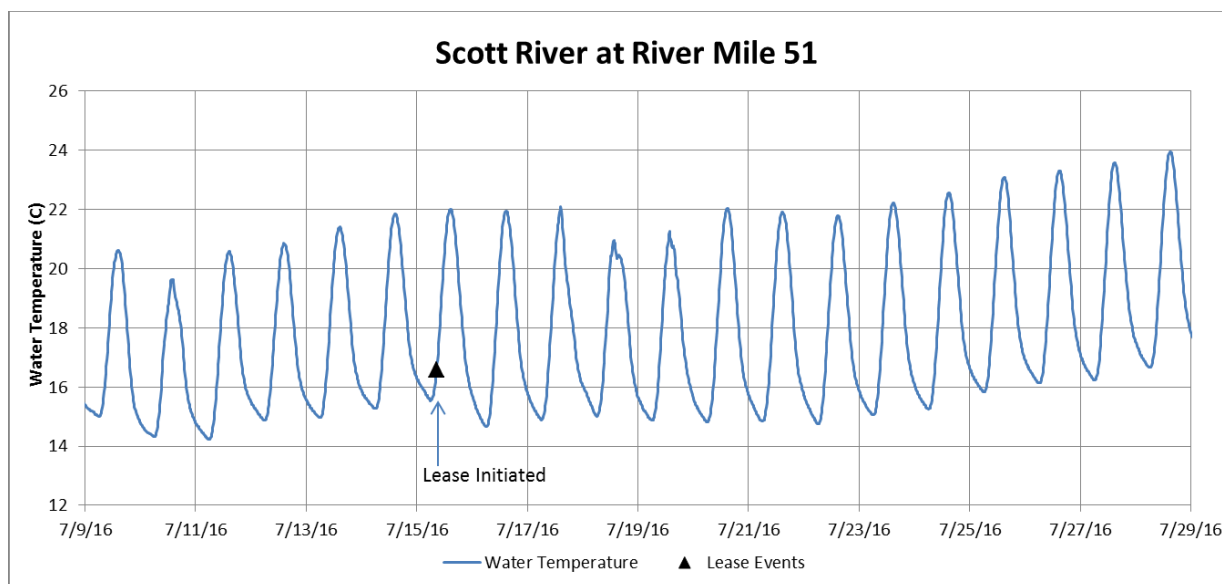


Figure 2. Water temperature data surrounding the initiation of the SR196 lease.

SR196 Conclusion:

1. Was the amount of water paid for provided? – Yes.
2. Was there an instream effect on stream discharge and/or pool volume below the lease site? – Yes, stream discharge increased.
3. What was the extent (distance) of downstream impact on flows? – Not monitored.
4. Was water temperature affected by the lease? – No.

Scott River – SR223

Diversion Site: Scott River Mile 46.7, Scott River Decree Diversion No. 223-D2 (SR223)

Water Right: 7.65 cfs, 5th Priority

Leased Amount: 1.5 cfs

Lease Period: August 13, 2016 – September 30, 2016

Duration: 49 days

Quantity Diverted Before Initiation of Lease: 6.18 cfs SVID canal + 1.89 cfs pumped = 8.07 cfs

Quantity Diverted After Initiation of Lease: 5.31 cfs SVID canal + 1.89 cfs pumped = 7.20 cfs

Net Diversion Reduction: 0.87 cfs

Stream Discharge Before Lease was Initiated: 3.66 cfs

Stream Discharge After Lease was Initiated: 4.67 cfs

Net Instream Gain: 1.01 cfs

Downstream Benefit: Extends a minimum of 18,400 feet (3.5 miles) as verified visually in 2013 but likely influences habitats past Etna Creek.

Transaction Event Summary

On the morning of August 12, 2016 the Contractor arrived on site to initiate a transaction at SR223. The total amount of flow being diverted was determined by summing the quantity being conveyed by the Scott Valley Irrigation District (SVID) canal and the quantity being extracted from the pumping bay. A cross-section was established on the SVID canal just down from the fish screen and a flow measurement

recorded 6.18 cfs. The amount of water being diverted through the pumping bay was measured on an inline flowmeter, which read 850 gallons per minute (1.89 cfs). Therefore the total flow being diverted prior to initiation of the transaction was determined to be 8.07 cfs. In order to divert this amount of water, flashboards were seated in all of the bays across Young's Dam and only residual seep was passing down the fish ladder (Photo 3). The transaction involved the release and maintenance of 1.5 cfs directly down the fish ladder to allow for fish passage through the low-flow period. As such, monitoring of this lease was conducted by establishing a rectangular weir between the concrete walls of the fish ladder (Photo 4). Between 8:45 and 10:30 a.m the Water Trust Executive Director and the Contractor incrementally adjusted the headgate until flow entering the fish ladder (as measured on the weir) reached 1.5 cfs. The fish screen infrastructure was not altered. Subsequent measurement of total diverted flow determined that there remained 5.31 cfs running down the SVID canal and 850 gallons per minute (1.89 cfs) being pumped into the irrigation system. Despite the lease target being met at the fish ladder, the Scott River downstream of Young's Dam recorded an increase of 0.75 to 1.01 cfs depending upon how it was measured (difference in RCD Streamflow Gaging Station records or direct difference in flow measurements). It is possible that the instream response is less because of a reduction in bypass at the fish screen or loss due to the diurnal fluctuation.



Photo 3. Flow passing into the fish ladder before the lease was initiated.



Photo 4. Flow passing into the fish ladder after the lease was initiated.

Streamflow Monitoring

Monitoring of this transaction consisted of checking flow over the rectangular weir within the fish ladder and adjusting the headgate as needed to maintain the targeted flow. Between the Water Trust Executive Director and the Contractor, the point-of-diversion was visited three times per week until September 2nd when the headgate had to be fully closed to maintain the terms of the transaction. Despite flow becoming available for diversion later in September, the water user decided to leave the headgate closed and forgo the remaining water without additional compensation.



Photo 5. The full 1.5 cfs of leased water passing through the fish ladder.

Biological Monitoring

In the early summer, the Siskiyou RCD completed a dive survey through the Scott River from Young's Dam to 0.82 miles downstream in order to determine whether juvenile salmonids were rearing within this region of the mainstem. Several schools of rainbow trout of various sizes and ages were observed, as well as a few individual coho salmon. Other species encountered included Klamath small-scale suckerfish, three-spined stickleback and speckled dace. Within a week of the initiation of a transaction at SR223 a more complete survey was conducted covering 2.0 miles from Young's Dam down to Horn Lane. Juvenile coho salmon were only encountered in four distinct habitat units, while rainbow trout were seen across the entire reach. Surveyors noted considerable numbers of mid-sized trout. Of these, 15-20 fish were recorded as mature adults; however, it was not clear whether they were ocean-run based on their untarnished condition. The abundance of this cohort prompted the Siskiyou RCD to conduct two consecutive days of capture and mark activities that collected scale samples for age analysis. Unfortunately, the sample size was not large enough to allow for conclusive results. Note that biological surveys discussed here only covered a portion of the length of stream influenced by this water transaction.



Photo 6. Rainbow trout captured above Horn Lane.

Temperature Monitoring

Water temperature monitoring in relation to the transaction at SR223 was performed at the River Mile 46.5 streamflow gaging station maintained by the Siskiyou RCD, which is situated on the river right margin of the run immediately below Young's Dam (Map 2). This station responds relatively quickly to alterations made at the diversion, however, it is subject to southern exposure. Water temperature data was recorded at this site for the SRWT from August 10th through October 25th. The Siskiyou RCD also collects well-mixed water temperatures on the Scott River at River Mile 48 (above Young's Dam) for trend monitoring purposes (Map 2). Figure 3 compares the water temperature data collected on the Scott River at River Mile 46.5 (below Young's Dam) and River Mile 48 (above Young's Dam) over the duration of the SR223 water lease. The River Mile 48 site identified peak water temperatures on July 29th, August 20th and August 13th. The transaction at SR223 was initiated on August 12th as water temperatures were on the rise. Closer analysis of this time period indicates that the augmentation of flow from the transaction noticeably stabilized water temperatures (Figure 4). From August 23rd onward, the water temperatures at RM 46.5 and RM 48 are nearly equal. Closing of the headgate on September 2nd did not appear to influence stream temperatures.

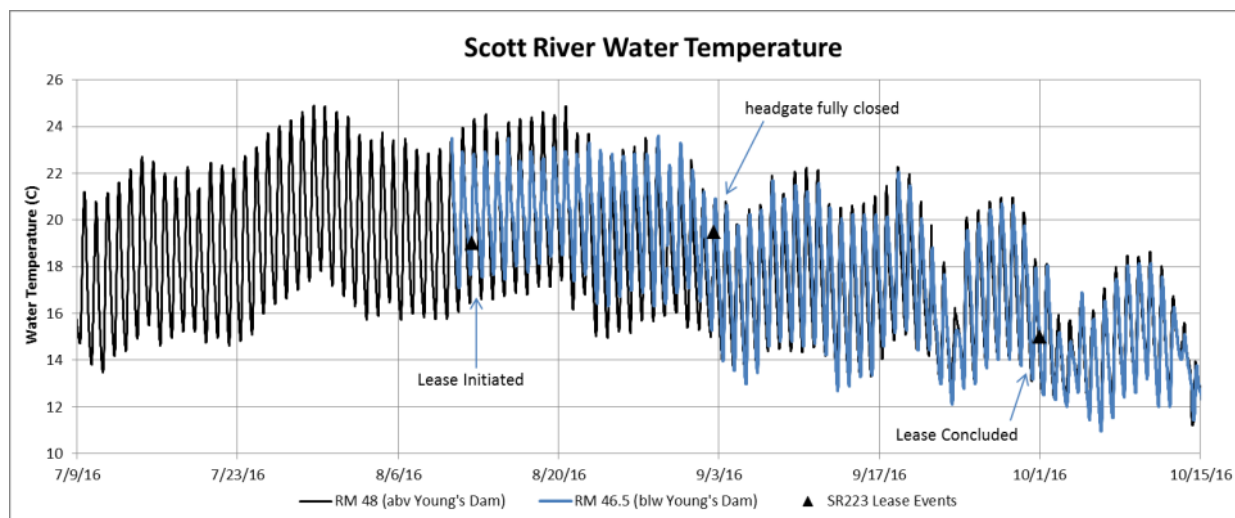


Figure 3. Water temperature data for the duration of the SR223 lease period (Siskiyou RCD).

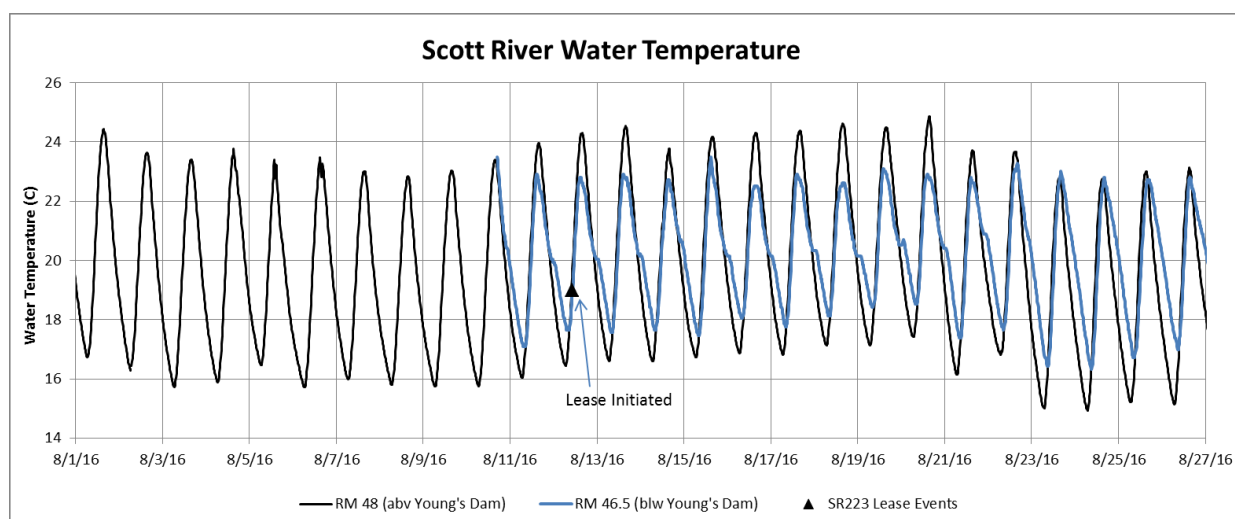


Figure 4. Water temperature data surrounding the initiation of the SR223 lease (Siskiyou RCD).

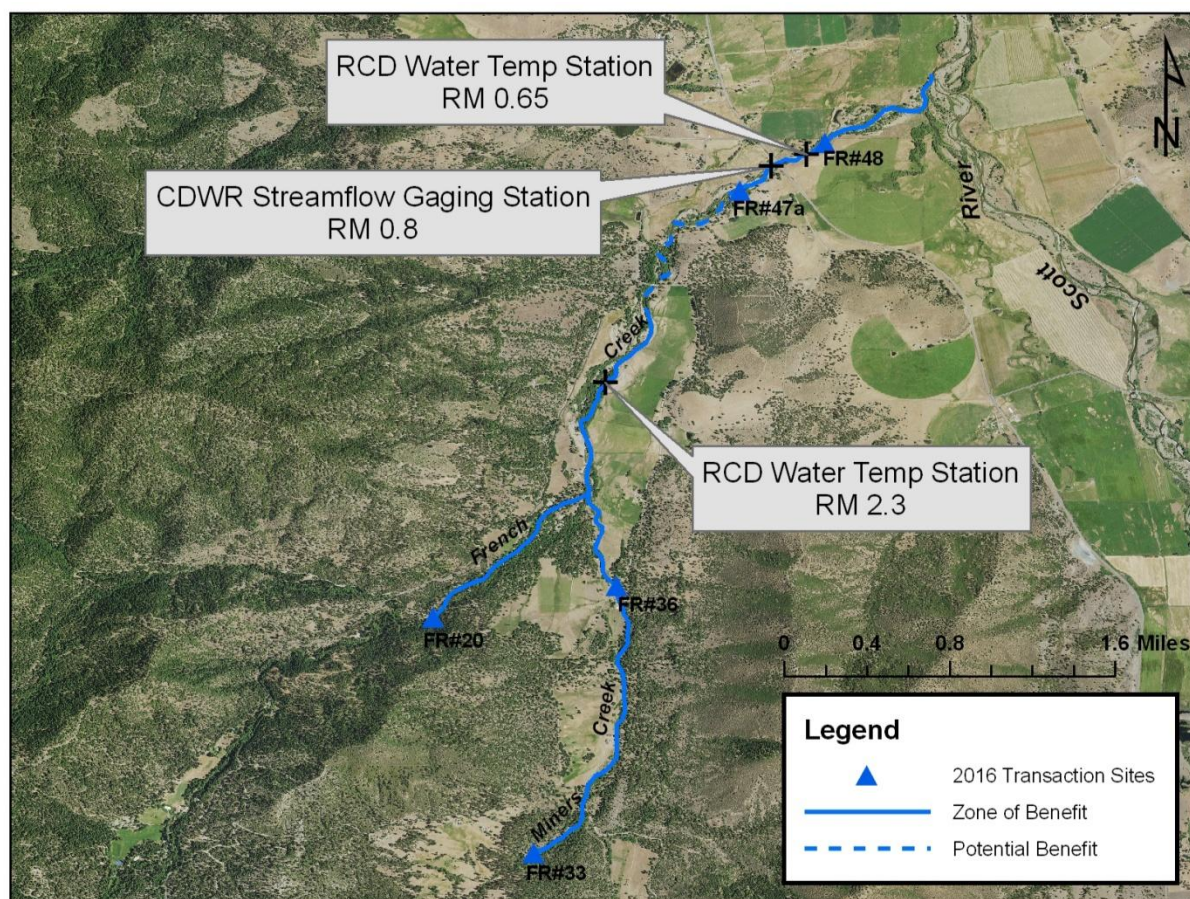
SR196 Conclusion:

5. Was the amount of water paid for provided? – Yes.
6. Was there an instream effect on stream discharge and/or pool volume below the lease site? – Yes, stream discharge increased.
7. What was the extent (distance) of downstream impact on flows? – Not monitored.
8. Was water temperature affected by leases? – Yes, flow augmentation stabilized water temperatures for nearly two weeks.

French Creek & Miners Creek Leases:

All water transactions conducted in the French Creek watershed are detailed on Map 3. Of the five total diversion sites, three have water rights on French Creek proper (FR48, FR47a and FR20) and two have rights on Miners Creek, a tributary to French Creek (FR36 and FR33). These leases augmented flow from water rights ranging from 0.25 to 0.90 cfs, for a total volume of 345.7 acre-feet returned instream

over the summer of 2016 (Table 1). The thick blue line displays the estimated length of habitat directly benefited from each of the individual transactions, which is shown to extend at minimum to the next un-leased point-of-diversion. For a portion of the irrigation season, when all of these leases were in effect, the full amount of leased water has the potential to augment the remaining length indicated by the dotted line. Therefore, the combination of these leases contributed water to 29,750 ft. or 5.6 miles of the French Creek system.



Map 3. French Creek and Miners Creek summer lease sites and downstream zone-of-benefit.

French Creek Stream Flow

CDWR operates a streamflow gaging station on French Creek just upstream of State Highway 3 at river mile 0.8. Figure 5 shows daily mean discharge at the French Creek gaging station through the 2016 irrigation season, April 1st to September 30th. The season began with runoff from several rain events in April and May. A single precipitation event accumulated 0.34 to 0.71 inches between April 9th and April 14th, which accounted for the peak in runoff (CAL FIRE 2016, USFS 2016). The base flow period started in early August, with daily mean discharges reaching a minimum of 0.6 cfs (CDWR, 2016a). Rainfall finally came on October 13th and reconnected French Creek to the Scott River. It is important to note that FR48 is downstream of the CDWR gage, therefore, diversion and bypass of flows at this site do not contribute to the recordings made at that station.

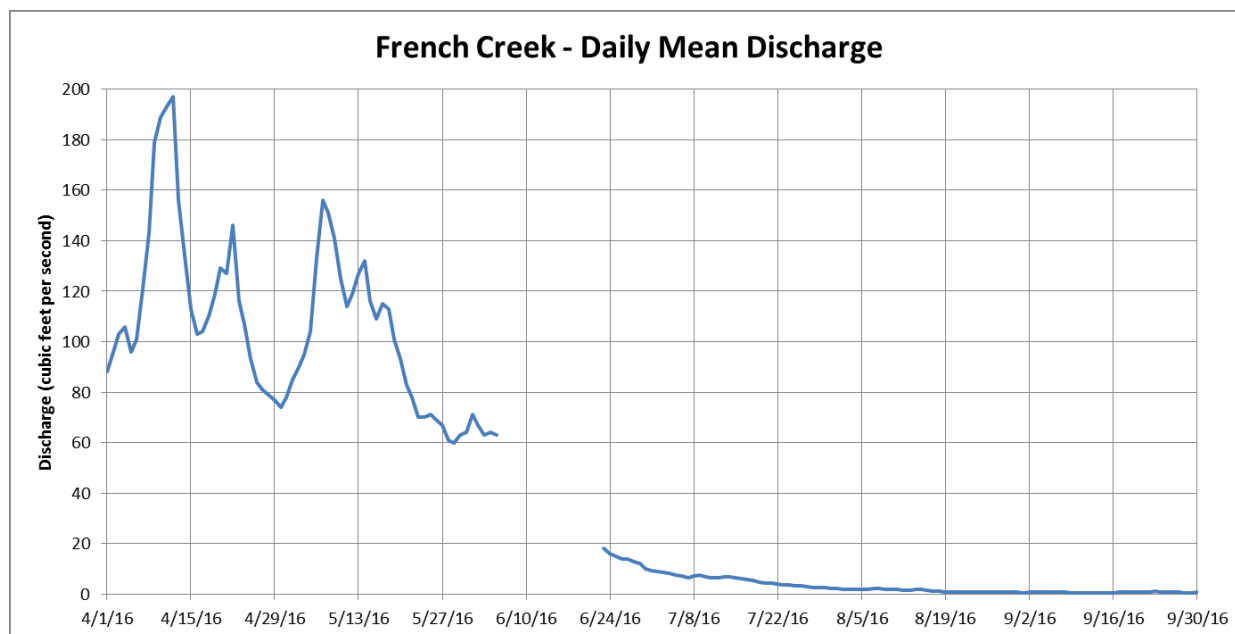


Figure 5. Daily mean discharge on French Creek at RM 0.8 through the 2016 irrigation season (CDWR 2016a).

*Note: This gage was not funded from June 6th through June 22nd and therefore the data recorded within that time period is not supported by CDWR.

Lower French Creek – FR48

Diversion Site: French Creek River Mile 0.60, French Creek Decree Diversion No. 48 (FR48)

Lease Period: July 15, 2016 – September 30, 2016

Lease Duration: 108 days

Water Right: 0.76 cfs, 7th Priority

Leased Amount: 100% of available water right

Quantity Diverted at Initiation of Lease: 0.74 cfs

Stream Discharge Before Lease was Initiated: 6.63 cfs *measured above the point of diversion

Stream Discharge After Lease was Initiated: Not Measured

Net Gain: Not Determined

Length of Downstream Benefit: Extends 3,200 feet (0.60 miles) down French Creek to its confluence

with the Scott River. When French Creek is connected at its confluence, this transaction has the potential to benefit an unknown length of the Scott River.

Transaction Event Summary:

A forbearance agreement was signed on July 14, 2016 and that afternoon the quantity of water being diverted measured 0.74 cfs through the rectangular suppressed weir exiting the fish screen (Photo 7). There is not a sufficient location to measure discharge on French Creek downstream of where the diversion bypass returns to the stream as a result of thick emergent aquatic vegetation and channel morphology. However, flow at that location could be estimated by measuring discharge above the point of diversion and subtracting the quantity being diverted. Utilizing this reasoning, a measurement taken in French Creek immediately above the point of diversion recorded 6.63 cfs, which suggests that 5.89 cfs remained instream below FR48 before the transaction. The amount of water entering the ditch at the point of diversion and being bypassed at the fish screen was not quantified. The headgate could not be closed because fish removal from the ditch had not yet been coordinated, so the transaction was initiated at this site by fully opening the screen bypass. Flashboards were installed to prevent water from being diverted and all remaining ditch flow was returned to the stream by way of the bypass pipe. Diversion bypass flows re-enter the stream 490 feet below the point-of-diversion. It was confirmed that no flow was

passing through the fish screen at 3:15 p.m (Photo 8). The SRWT Executive Director, in conjunction with CDFW personnel, returned to the site on August 3rd to relocate fish from the section of ditch between the point-of-diversion and fish screen, which allowed for the headgate to be closed.



Photo 7. Pre-lease diverted flow measured at 0.74 cfs.



Photo 8. Post-lease flow through the fish screen ceased.

Streamflow Monitoring

Streamflow monitoring for this lease is challenging due to the stream conditions in the immediate vicinity of the point of diversion. Since the leased water was initially returned to French Creek through the fish screen bypass pipe and there was not a suitable site for a flow measurement to be taken downstream, the net increase in streamflow on the day of the transaction could not be directly measured. It was

Table 3: French Creek Flow Summary at FR48		
Date	Flow (cfs)	Timing
July 14 13:51	6.63 (+/- 2.5%)	Pre-Lease
July 21 18:07	4.47 (+/- 2.3%)	Post-Lease, 1 week
Aug 5 15:06	1.97 (+/- 1.9%)	Post-Lease, 3 weeks
Aug 18 17:45	0.95 (+/- 2.4%)	Post-Lease, 5 weeks
Sept 1 11:17	0.66 (+/- 3.0%)	Post-Lease, 7 weeks
Sept 15 8:20	0.55 (+/- 4.3%)	Post-Lease, 9 weeks

decided that follow-up flow measurements would be taken at an existing stream gaging station managed by the Siskiyou RCD 375 feet upstream of the point-of-diversion. The site was sufficiently close to determine whether the full water right (0.76 cfs) was available for payment throughout the remainder of the irrigation season (Table 3). Utilization of the RCD stream gaging station also allowed flow measurements to contribute to a more robust dataset than would otherwise be collected for the Water Leasing Program alone. Juvenile salmonids were frequently encountered in this area during flow measurements, which were taken every other week as flows slowly declined and eventually dropped below the targeted water right.

Lower French Creek Connectivity: Correlating periodic observations with recordings made at the CDWR Streamflow Gaging Station, French Creek is suspected to have lost connectivity with the Scott River in mid to late August and to have remained so through the irrigation season. Flow on French Creek at the FR48 point-of-diversion and bypass return held through the entire summer, with a minimum of 0.43 cfs on September 12th according to the RCD stream gaging station. The lower 0.25 miles of French Creek consisted of disconnected pools during this time.

Biological Monitoring

Dive surveys were completed on two occasions through lower French Creek during the summer of 2016. The first occurred in mid-July, nearly one-month into the lease at FR48, and documented a substantial population of coho and rainbow trout rearing within lower French Creek (over 1,000 fish). This survey was repeated in early September, when the available streamflow was found to be completely reliant upon water provided by the Leasing Program, and some segregated habitats were identified near the confluence. The number of salmonids enumerated was found to be within the same order of magnitude as before, implying that densities had increased.

Temperature Monitoring

In preparation for this transaction a water temperature logger was deployed off of the river left bank of French Creek immediately below the fish screen bypass return of FR48. The logger was located on the south-facing margin of a glide at approximately 2 feet deep in a location shaded by riparian vegetation and instream brush. Water temperature data was collected at this site from May 3rd through October 11th (Figure 6). Juvenile salmonids were documented rearing in the vicinity of this device on several occasions during the low-flow period. As can be seen, the transaction at FR48 was initiated during a

stable period right before water temperatures peaked on July 31st. Comparison of these values with recordings made by the RCD water temperature station on French Creek at river mile 0.65 (above FR48, Map 3) shows a divergence across part of the dataset (Figure 7). The timing suggests that the water transaction resulted in higher daily maximum temperatures until the headgate was closed on August 3rd and leased water was no longer running through an open faced ditch (Figure 7). The variance is likely visible between these datasets because the SRWT device was located right below the bypass pipe and encountered water before it had become well-mixed with the stream. Therefore, it is possible that the transaction only influenced the water temperature of a microhabitat.

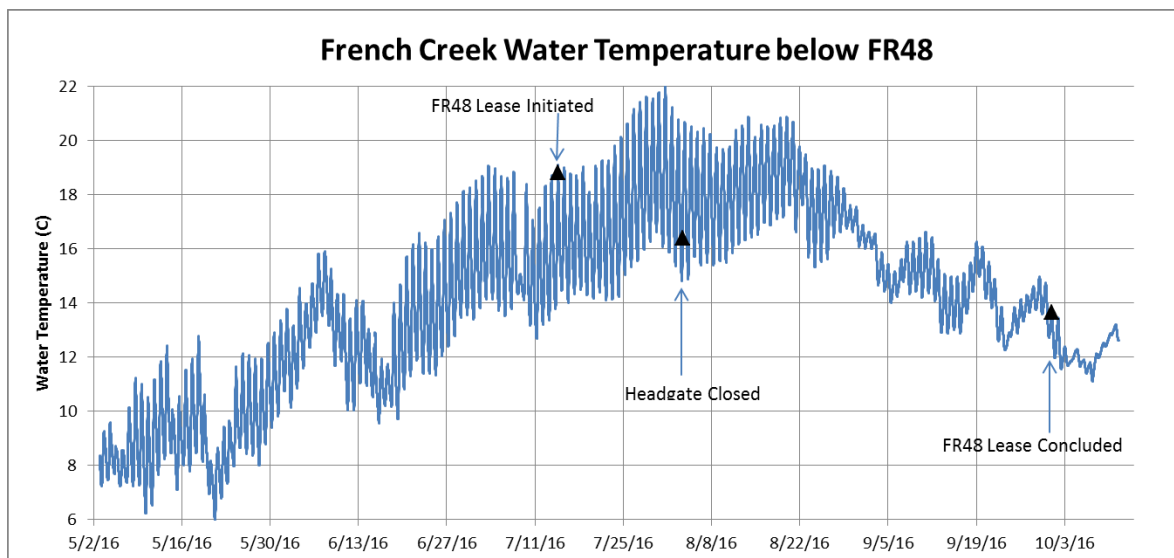


Figure 6. Water temperature data for the duration of the FR48 lease period.

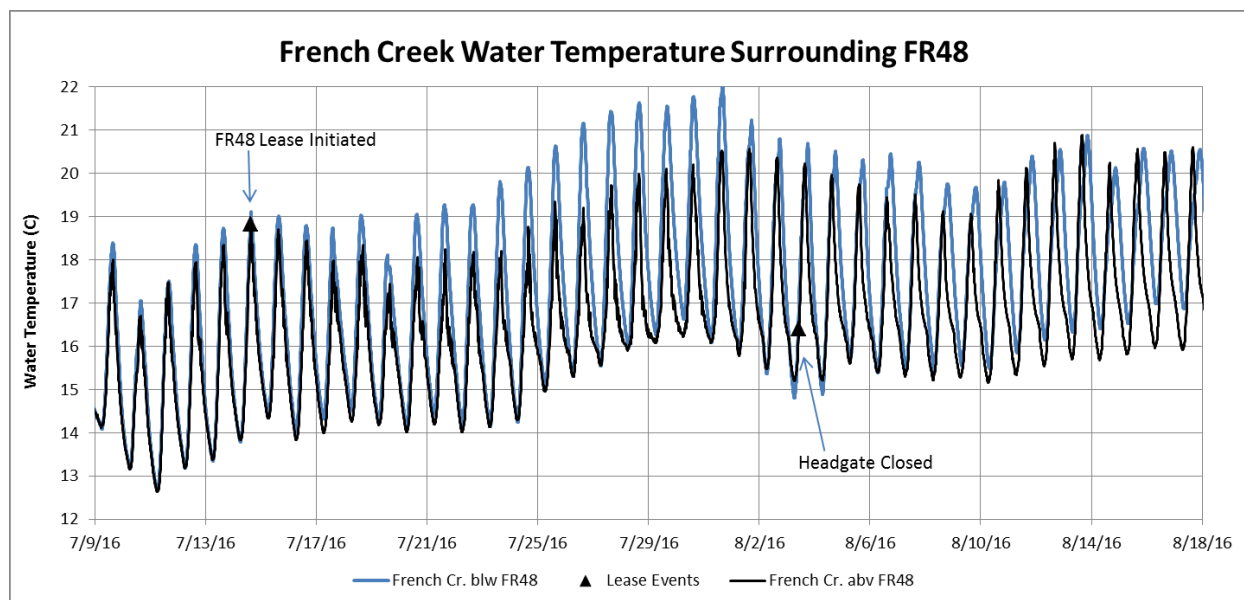


Figure 7. Water temperature data surrounding the initiation of the FR48 lease.

FR48 Conclusion:

1. Was the amount of water paid for provided? – Yes.

2. Was there an instream effect on stream discharge and/or pool volume below the lease site? – Not Monitored.
3. What was the extent (distance) of downstream impact on flows? – Not Monitored.
4. Was water temperature affected by leases? – Temporarily, until the headgate was closed on August 3rd.

Lower French Creek - FR47A

Diversion Site: French Creek River Mile 0.95, French Creek Decree Diversion No. 47a (FR47A)

Lease Period: July 23, 2016 – September 30, 2016

Duration: 70 days

Water Right: 0.9 cfs combined 5th and 6th priority (single water user)

Leased Amount: 100% of available water rights

Quantity Diverted at Initiation of Lease: 0.90 cfs

Stream Discharge Before Lease was Initiated: 4.32 cfs

Stream Discharge After Lease was Initiated: 5.71 cfs

Net Gain: 1.39 cfs

Downstream Benefit: Extends 5,000 feet (0.95 miles) down French Creek to its confluence with the Scott River because the only diversion downstream (FR48) was already being leased as of July 15, 2016.

Transaction Event Summary:

A forbearance agreement was signed by the user of both water rights and on the morning of July 22nd the Contractor measured 0.90 cfs being diverted through the rectangular contracted weir below the fish screen (Photo 9). Due to the fact that fish removal from the ditch had not yet been coordinated, the transaction was planned to be initiated at this site by fully opening the screen bypass. It is important to note that this diversion has a relatively long length of ditch from the point-of-diversion to the fish screen, approximately 980 feet. As a result, water that is bypassed as part of normal operation of the fish screen returns to French Creek just below State Highway 3, which bypasses the CDWR Streamflow Gaging Station. In order to accurately quantify the instream benefit of this transaction, streamflow was measured at the tail-out of the glide where bypass flows are returned, about 90 feet downstream of the pipe. A pre-lease discharge measurement taken along this cross-section documented 4.32 cfs in French Creek. The total diverted amount of water was returned instream at 8:00 a.m. by adding flashboards to the ditch and fully opening the screen bypass (Photo 10). A streamflow measurement completed after the transaction verified that flow had increased to 5.71 cfs across the same cross-section. The net gain was found to be



Photo 9. Pre-Lease diverted flow 0.9 cfs.



Photo 10. Post-lease diverted flow 0 cfs.

slightly larger than the amount of water measured in the ditch, presumably because the ditch amount was affected by transmission loss. CDFW removed juvenile fish from the ditch on August 9th after which the headgate was closed by the SRWT Executive Director. Within an hour, the CDWR gage registered a 0.04 foot increase in river stage, which correlates to a 0.48 cfs gain according to the rating table provided by CDWR (RT7).

Streamflow Monitoring

Similar to FR48, it was decided that follow-up flow measurements for FR47a would be taken at an existing stream gaging station managed by the Siskiyou RCD in the habitat unit above the point-of-diversion. The site was sufficiently close to determine how much of the water right was available for payment throughout the remainder of the irrigation season (Table 4). Utilization of the RCD stream gaging station also allowed flow measurements to contribute to a more robust dataset than would otherwise be collected for the Water Leasing Program alone. River stage was evaluated weekly at the CDWR gage (825 feet downstream of the point-of-diversion) and flow measurements were taken at the RCD stream gaging station as conditions changed – generally every other week (Table 4). Streamflow steadily declined at this site through most of the lease period, reaching a minimum daily average of 0.21 cfs on September 14th, according to the RCD stream gaging station. Flow measurements taken near the point-of-diversion are not comparable to the pre-lease and post-lease measurements taken below the bypass return pipe because this section of stream is known to be a gaining reach.

Table 4: French Creek Flow Summary at FR47A		
Date	Flow (cfs)	Timing
July 22 7:48	4.32 (+/- 1.8%)*	Pre-Lease
July 22 9:41	5.71 (+/- 2.4%)*	Post-Lease
July 29 8:23	3.26 (+/- 3.5%)	Post-Lease, 1 week
Aug 5 13:45	1.40 (+/- 2.6%)	Post-Lease, 2 weeks
Aug 19 7:18	0.48 (+/- 2.3%)	Post-Lease, 4 weeks
Sept 1 9:32	0.25 (+/- 2.7%)	Post-Lease, 6 weeks
Sept 15 10:00	0.20 (+/- 2.8%)	Post-Lease, 8 weeks
Sept 30 8:30	0.30 (+/- 3.1%)	Post-Lease, 10 weeks

*flow measured below screen bypass return and therefore not directly comparable to the other measurements

Biological Monitoring

The downstream benefit of this water transaction extends from the point-of-diversion to the mouth of French Creek and includes the zone-of-benefit of the FR48 lease. Therefore, fisheries monitoring completed in lower French Creek for the FR48 water lease is applicable for this site as well. No additional biological monitoring was completed specific to this water lease because property access could not be acquired. The Contractor did observe juvenile salmonids during nearly all of the post-lease flow measurements.

Temperature Monitoring

Prior to this lease a water temperature device was deployed off of the river-left bank about 15 feet below the point of diversion. The logger was positioned in the pool created by the diversion boulder weir such that it was shaded by riparian vegetation. Water temperature data was collected at this site from July 10th through October 11th (Figure 8). Note that the temperature logger did not see the leased water until the head gate was closed on August 9th because flow was bypassed through the fish screen for the first 17 days of the agreement. Therefore, the only way that we can determine if the leased water influenced the stream is by comparing water temperatures above and below the point of diversion surrounding the time

when the headgate was closed (Figure 9). The water temperature data above FR47a is from the RCD stream gaging station located approximately 160 feet above the point-of-diversion. The fact that these datasets track so closely demonstrates that the water temperature of French Creek was not affected by the transaction at FR47a. With the existing monitoring network there is no way to determine if the return of leased water through the fish screen bypass influenced water temperatures on French Creek.

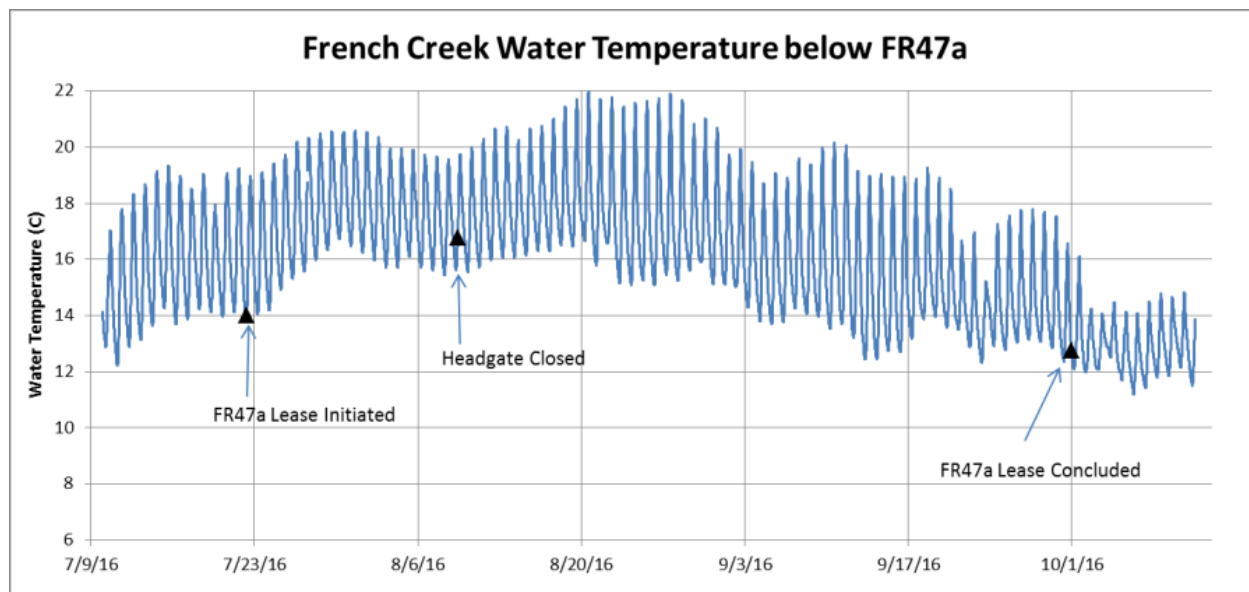


Figure 8. Water temperature data for the duration of the FR47A lease period.

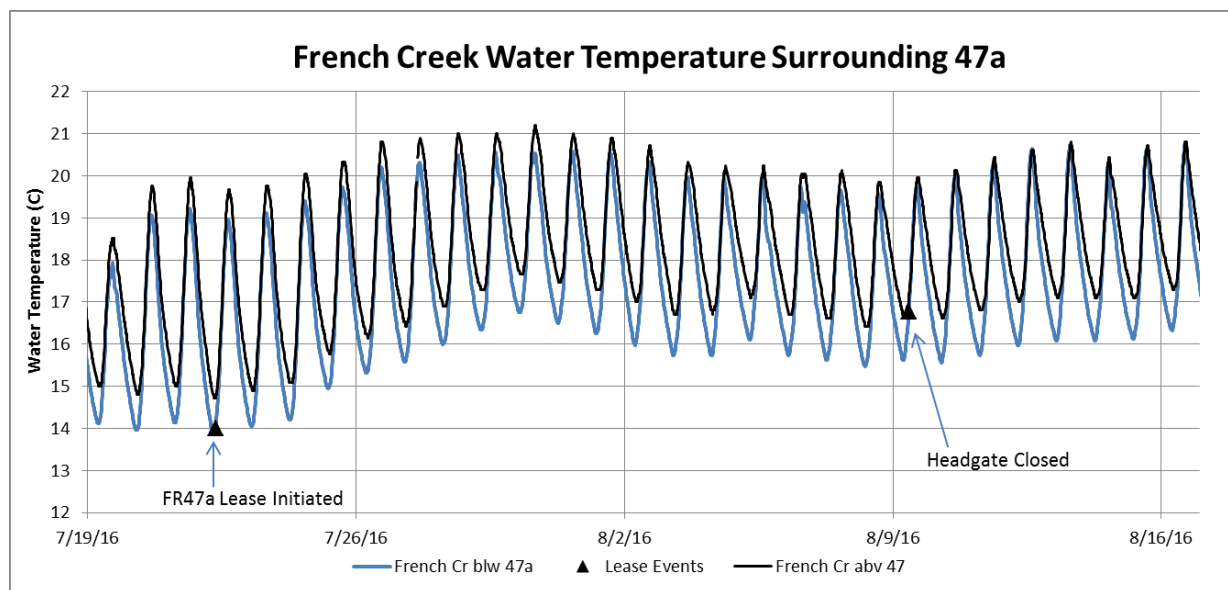


Figure 9. Water temperature data surrounding the closing of the headgate at FR47a.

FR47A Conclusion:

1. Was the amount of water paid for provided? – Yes.
2. Was there an instream effect on stream discharge and/or pool volume below the lease site? – Yes, stream discharge increased.

3. What was the extent (distance) of downstream impact on flows? – Not monitored.
4. Was water temperature affected by leases? – No.

Lower Miners Creek – FR36

Diversion Site: Lower Miners Creek River Mile 0.5 –French Creek Decree Diversion No. 36 (FR36)

Lease Period: August 5, 2016 – September 30, 2016

Lease Duration: 57 days

Water Right: 0.25 cfs, 1st Priority

Leased Amount: 100%

Quantity Diverted at Initiation of Lease: 0.265 cfs

Stream Discharge Before Lease was Initiated: 0.06 cfs

Stream Discharge After Lease was Initiated: Not measured

Net Instream Gain: Not determined

Downstream Benefit: Extends at a minimum 3,500 feet (0.7 miles) to the mouth of Miners Creek and likely into French Creek as long as there is sufficient connectivity.

Transaction Event Summary

On August 4, 2016, the Contractor met the water user at the point-of-diversion and assisted in optimizing the fish screen. The Contractor subsequently measured the diverted flow to be 0.265 cfs using the rectangular contracted weir within the ditch, immediately below the fish screen. A cross-section for streamflow measurements was selected on Miners Creek, 120 feet downstream from the point-of-diversion along a small flatwater habitat unit and below where fish screen bypass flows re-enter the stream. A discharge measurement recorded 0.06 cfs in Miners Creek; however, the error margin could not be maintained within USGS standards due to extremely low water depths and velocities along the established cross-section (Table 5). Furthermore, diversion volume was found to have declined to 0.15 cfs because the fish screen paddle wheel had stopped spinning. As a result of these limitations, the Contractor suggests that flow in Miners Creek is understood to be approximately 0.1 cfs prior to the lease. Fish removal activities were privately coordinated and the headgate was closed (Photo 11 and 12). The Contractor returned to the site on August 11th to complete a streamflow measurement along the same cross-section and recorded 1.02 cfs in Miners Creek (Table 5).

Table 5: Miners Creek Flow Summary at FR36

Date	Flow (cfs)	Timing
Aug. 4 8:22	0.06 (+/- 10.9%)	Pre-Lease
Aug. 11 10:41	1.02 (+/- 4.8%)	Post-Lease

Streamflow Monitoring

The leased right at Diversion No. 36 holds a 1st priority on water from Miners Creek meaning other diverters are regulated to ensure that it is available throughout the entire irrigation season. Therefore, follow-up flow measurements are not necessary at this site.

Biological Monitoring

During the 2015-2016 winter salmon runs, the Siskiyou RCD documented two coho redds on Miners Creek. By April 25th 2016, the Scott River Watershed Council (SRWC) found fry rearing in the vicinity of those redd sites. It wasn't until September 8th that dive surveys were repeated on Miners Creek to enumerate young-of-the-year fish benefitting from the flow enhancement that was initiated in mid-August. Miners Creek was surveyed from its confluence with French Creek upstream approximately 0.35 miles through a reach characterized by meandering riffle-glide morphology. Although the mouth of Miners Creek was connected and flowing into French Creek at the time of the survey, it was found to lose surface connectivity at a point where the floodplain widens and the channel disperses into several braids.

The SRWC has implemented two beaver dam analogue (BDA) structures within this section of stream, which were enhanced by the flow augmentation provided by the Water Trust. There were only four habitat units within lower Miners Creek that were suitable for snorkeling and over 200 young-of-the-year salmonids were observed within this limited area. An unknown portion of the population within this reach went undocumented as a result of the survey conditions.



Photo 11. Pre-lease headgate open.



Photo 12. Post-lease headgate fully closed.

Water Temperature

A water temperature device was placed in the deepest part of the plunge pool created by the vortex boulder weir, 25 feet below the point-of-diversion (same pool as previous years). Although the device was deployed into the lower portion of the water column, it likely received some well-mixed water dispersed from the boulder spillway. Water temperature data was collected at this site from July 14th through October 11th (Figure 10). The FR36 lease was initiated on the downward limb from the seasonal maximum temperature, which was recorded on July 30th as 20.9 C. Comparison of water temperatures from Miners Creek with the adjacent reach of French Creek reveal that the two track closely and demonstrates that there was not a visible influence on water temperature as a result of this transaction (Figure 11).

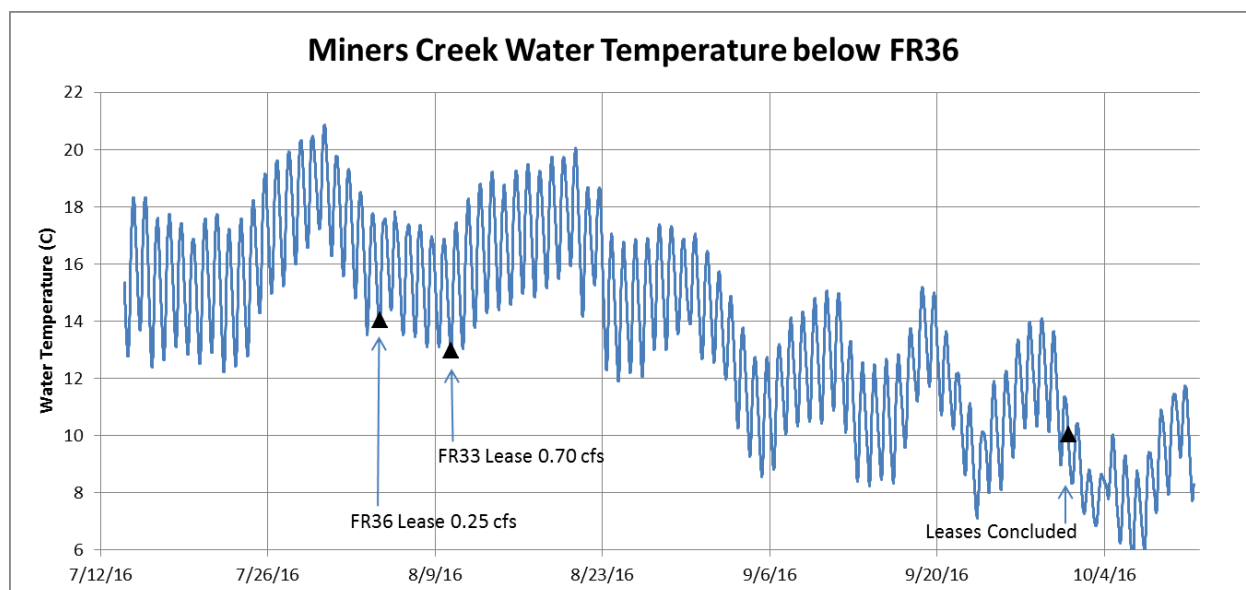


Figure 10. Water temperature data from Miners Creek for the duration of the FR36 and FR33 lease periods.

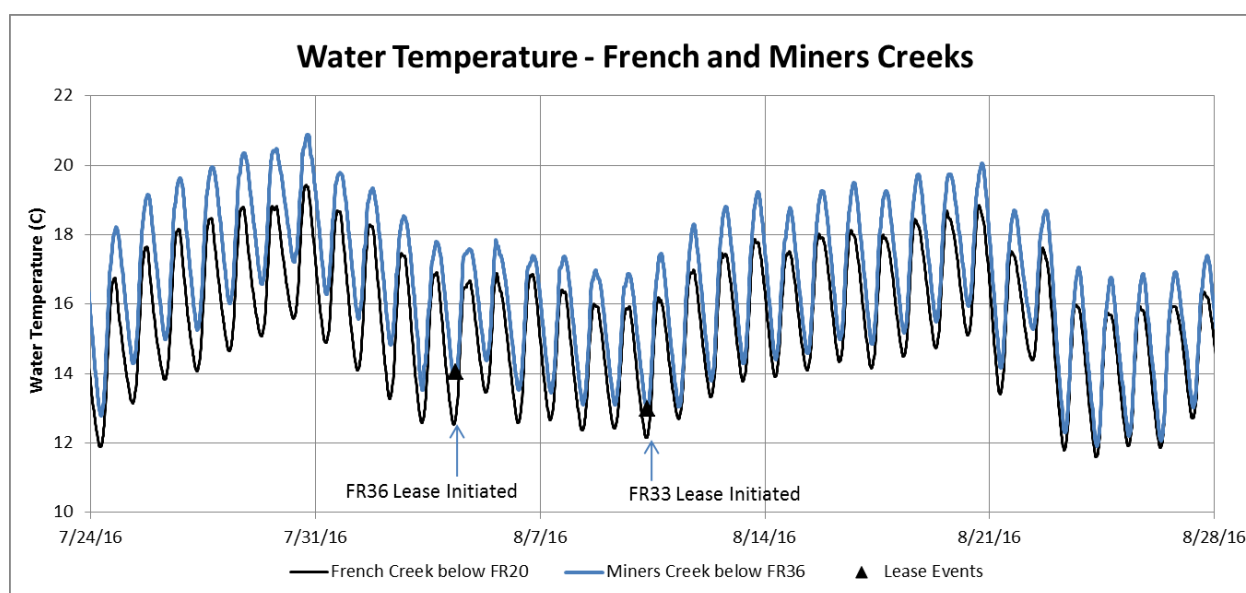


Figure 11. Comparison of water temperature on French Creek (above Miners Creek) and Miners Creek.

FR36 Conclusion:

1. Was the amount of water paid for provided? – Yes.
2. Was there an instream effect on stream discharge and/or pool volume below the lease site? – Yes, stream discharge increased.
3. What was the extent (distance) of downstream impact on flows? – Not monitored.
4. Was water temperature affected by leases? – No.

Upper Miners Creek – FR33

Diversion Site: Miners Creek River Mile 2.0 – French Creek Decree Diversion No. 33 (FR33)

Lease Period: August 11, 2016 – September 30, 2016

Lease Duration: 51 days

Water Right: 1.22 cfs, 2nd priority

Leased Amount: 100% of available water right

Quantity Diverted at Initiation of Lease: 0.70 cfs

Stream Discharge Before Lease was Initiated: 0.12 cfs

Stream Discharge After Lease was Initiated: 0.86 cfs

Net Instream Gain: 0.74 cfs

Downstream Benefit: Extends 10,500 feet (2.0 miles) downstream to the confluence with French Creek because the Water Trust had already secured a transaction with the remaining downstream water user.

Transaction Event Summary

A forbearance agreement was signed on August 10, 2016, and that morning the Contractor measured the diverted flow to be 0.70 cfs on the rectangular contracted weir situated within the ditch, immediately below the fish screen. A cross-section was established on Miners Creek, 265 ft. below the point-of-diversion and downstream of the screen bypass return pipe, where a flow measurement was conducted recording 0.12 cfs. The Water Trust Executive Director, in coordination with the water user, lowered the headgate in several intervals and fish relocated was coordinated privately. The headgate was fully closed at 8:10 a.m. and the hand-stacked dam at the point-of-diversion was adjusted to allow flow to access the stream channel (Photo 13 and 14). A follow-up stream flow measurement recorded 0.86 cfs in Miners Creek. This transaction resulted in a measureable net instream benefit of 0.74 cfs after the initiation of the lease.



Photo 13. Miners Creek at the FR33 POD before the lease, headgate open.



Photo 14. Miners Creek at the FR33 POD after the lease, headgate closed.

Streamflow Monitoring

As the full 1.22 cfs water right was not available on Miners Creek at the initiation of this transaction, streamflow measurements were conducted weekly along the established cross-section to ensure accurate payment as flow changed throughout the irrigation season (Table 6). Streamflow on Miners Creek remained relatively steady through the period of this water lease, reaching a minimum of 0.68 cfs as recorded on August 24th.

Biological Monitoring

The zone-of-benefit of the leased water from the FR33 diversion extends at least 7,750 feet to the next downstream diversion on Miners Creek at RM 0.5 (FR36). However, because the water right off of FR36 was leased prior to the initiation of this transaction, the water returned instream from FR33 has the ability to benefit habitat quality all the way to French Creek. Therefore, fisheries monitoring completed in lower Miners Creek during the FR36 water lease is applicable for this site as well. As previously stated, over 200 young-of-the-year coho and trout were documented in 4 habitats on lower Miners Creek under summer base-flow conditions. Flow augmentation from these two water leases probably contributed to the survival of these juveniles. No

Table 6: Miners Creek Flow Summary at FR33

Date	Flow (cfs)	Timing
Aug 10 7:40	0.12 (+/- 3.0%)	Pre-Lease
Aug 10 9:41	0.86 (+/- 1.8%)	Post-Lease
Aug 17 7:17	0.72 (+/- 2.2%)	Post-Lease, 2 weeks
Aug 24 7:33	0.68 (+/- 3.6%)	Post-Lease, 3 weeks
Aug 31 7:33	0.71 (+/- 2.2%)	Post-Lease, 4 weeks
Sept 7 7:33	0.77 (+/- 1.9%)	Post-Lease, 5 weeks
Sept 14 7:37	0.73 (+/- 1.8%)	Post-Lease, 6 weeks
Sept 21 7:56	0.76 (+/- 1.8%)	Post-Lease, 7 weeks
Sept 28 7:48	0.73 (+/- 1.7%)	Post-Lease, 8 weeks

additional biological monitoring was completed specific to the FR33 water lease because property access could not be acquired.

Temperature Monitoring

Water temperature monitoring was not performed in association with the transaction at FR33 because the initiation of a lease concluded the diversion of surface water from Miners Creek for the remainder of the irrigation season, therefore returning the stream to unimpaired flow conditions. Review of the water temperature data collected at FR36 is sufficient for evaluating the potential influence of water returned at FR33. Figure 10 and 11 indicate that the transaction at FR33 was initiated at the beginning of an upward trend in water temperatures throughout the French Creek stream system, therefore the increase from August 10th through August 13th cannot be specifically attributed to leased water being returned instream.

FR33 Conclusion:

1. Was the amount of water paid for provided? – Yes.
2. Was there an instream effect on stream discharge and/or pool volume below the lease site? – Yes, stream discharge increased.
3. What was the extent (distance) of downstream impact on flows? – On August 11th the water leased at FR33 was measured below FR36 (7,870 feet downstream). The water transaction likely impacted flows further downstream, however, it was not documented.
4. Was water temperature affected by leases? – No.

Upper French Creek - FR20

Diversion Site: Upper French Creek River Mile 3.7 –French Creek Decree Diversion No. 20 (FR20)

Lease Period: July 16th – September 30th 2016

Duration: 77 days

Water Right: 0.58 cfs 1st priority

Leased Amount: 100%

Quantity Diverted at Initiation of Lease: 0.76 cfs

Stream Discharge Before Lease was Initiated: 8.74 cfs

Stream Discharge After Lease was Initiated: 9.00 cfs

Net Instream Gain: 0.26 cfs

Downstream Benefit: Extends 9,650 feet (1.8 miles) past the next active diversion on French Creek (Diversion No. 23) because the leased water is from a 1st priority right.

Transaction Event Summary:

A forbearance agreement was signed on July 15, 2016. Due to the fact that there is no infrastructure for flow control at the point-of-diversion, water is freely bypassed through fish screen box and diverted flow is managed at a

Table 7: French Creek Flow Summary at FR20			
Date		Flow (cfs)	Timing
July 15	13:00	8.74 (+/- 3.8%)	Pre-Lease
July 15	15:13	9.00 (+/- 3.2%)	Post-Lease

headgate further down the ditch (below the fish screen). On the morning of July 15th, the Contractor, in coordination with the water user, measured diverted flow to be 0.76 cfs through a parshall flume located 40 feet below the headgate. A streamflow cross-section was established on French Creek 90 feet downstream from the fish screen bypass pipe. A measurement completed in the early afternoon recorded 8.74 cfs (Photo 15). At 1:10 p.m., the headgate was closed and flashboards were set so that all ditch flow re-entered the stream by way of either the fish screen bypass pipe or a secondary spillway. A follow-up stream flow measurement recorded 9.00 cfs in French Creek (Photo 16). Despite the parshall flume

verifying the release of 0.76 cfs at the headgate, the French Creek cross-section only responded with an increase of 0.26 cfs on the afternoon of July 15th. The discrepancy between these measurement sites may be due to the daily fluctuation of flow on French Creek (natural afternoon decline) or the loss of water during the temporary rehydration of the secondary spillway.



Photo 15. Pre-lease streamflow measurement on French Creek recorded 8.74 cfs.



Photo 16. Post-lease streamflow measurement on French Creek recorded 9.00 cfs.

Streamflow Monitoring

Diversion No. 20 holds a 1st priority on water from French Creek meaning other diverters are regulated to ensure that it is available throughout the entire irrigation season. Therefore, follow-up flow measurements are not necessary at this site. The water lease is estimated to benefit 9,650 feet of habitat on French Creek, past Diversion No 23 and up to Diversion No. 43. Due to the flow stability within this reach, and the first priority status of the returned water, surface diversion at FR23 is unable to impact the flow enhancements from FR20. This cannot be said for activity at FR43 because it is considerably further downstream.

Biological Monitoring

The Siskiyou RCD performed several snorkel surveys of French Creek in early September, covering two separate stream sections totaling 0.55 miles within the zone-of-benefit of FR20. The section of French Creek in the immediate vicinity of FR20 is characterized by a relatively straight channel with step-pool morphology after which the stream transforms into a meandering riffle-pool regime below the confluence of Miners Creek. Juvenile salmonids were observed in all surveyed habitat units including pools, glides and low gradient riffles (Photo 17). Coho were predominantly found in the deeper habitats, residing in the lower half of the water column and utilizing elements of cover such as overhanging banks or woody debris/roots. Trout were found throughout the stream reach, even frequently in riffles with moderate water velocities. Observers documented nearly three times as many trout as there were coho in the section immediately below FR20 but a nearly equal distribution between salmonid species in the section surrounding the confluence of Miners Creek. The combination of these surveys identified over 2,000 salmonids residing within this limited section of French Creek during base-flow period. It is worth emphasizing that the transaction at FR20 resulted in the furthest upstream source of voluntary flow enhancement on French Creek during the summer of 2016. The location where this water was returned instream, river mile 3.7, neatly encompasses the upper extent of documented coho spawning during the 2015-2016 run (river mile 2.3) thus fulfilling the objective of the SRWT to deliver water within priority reaches for rearing juveniles.



Photo 17. Young-of-the-year trout and coho salmon observed by surveyors, indicating the similarity in condition.

Temperature Monitoring

A water temperature logger was deployed off the river right bank of French Creek into the deepest portion of a pool habitat downstream of where FR20 bypass flows return to the stream. Juvenile salmonids were verified to be rearing in this habitat over the summer. Water temperature data was collected below FR20 from July 14th through October 11th (Figure 12). Comparison to water temperature data collected by the Siskiyou RCD at River Mile 2.3 on French Creek (below Miners Creek, Map 3) can be used to verify that the return of leased water did not impact local temperature conditions at FR20 (Figure 13). Although water temperatures were on an incline coming into this transaction, the datasets track very closely and the diurnal fluctuation was not altered, indicating that the returned water was not impacting the temperature regime of French Creek.

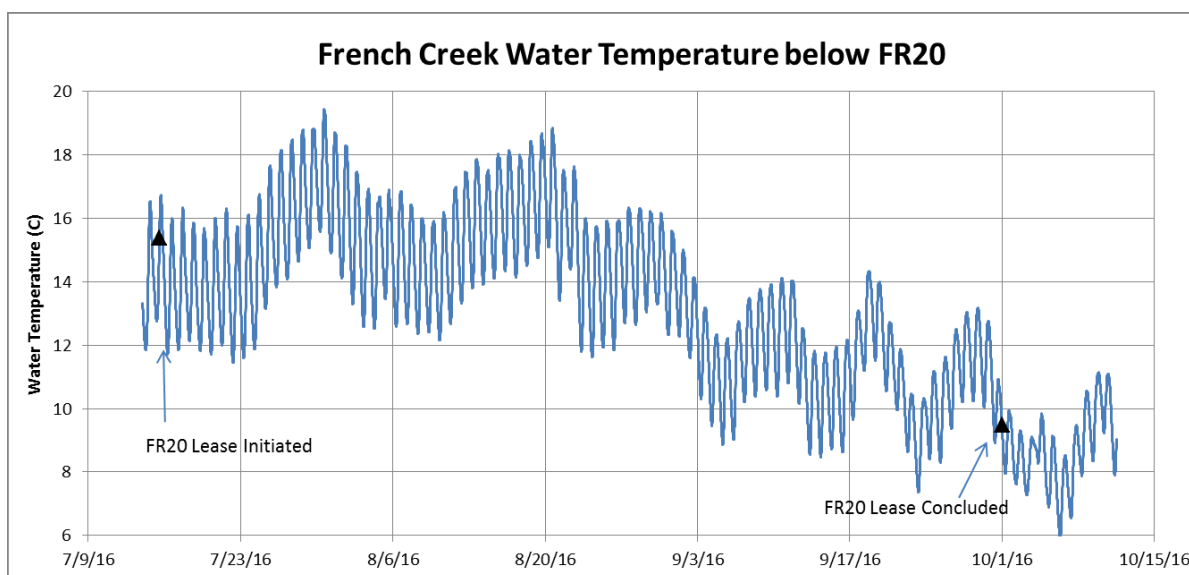


Figure 12. Water temperature data for the duration of the FR20 lease period.

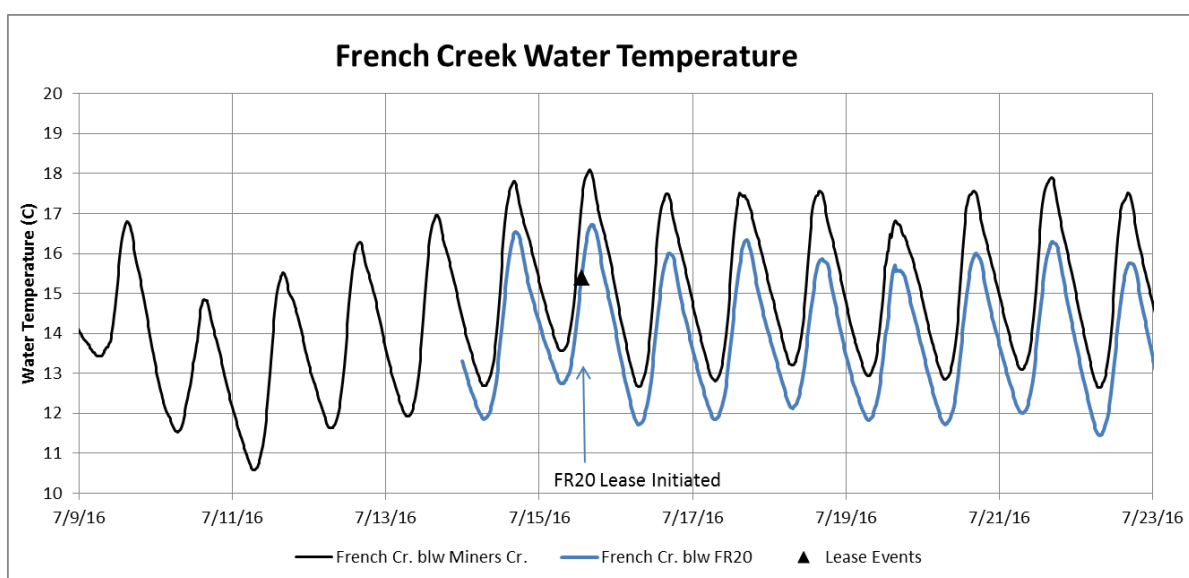


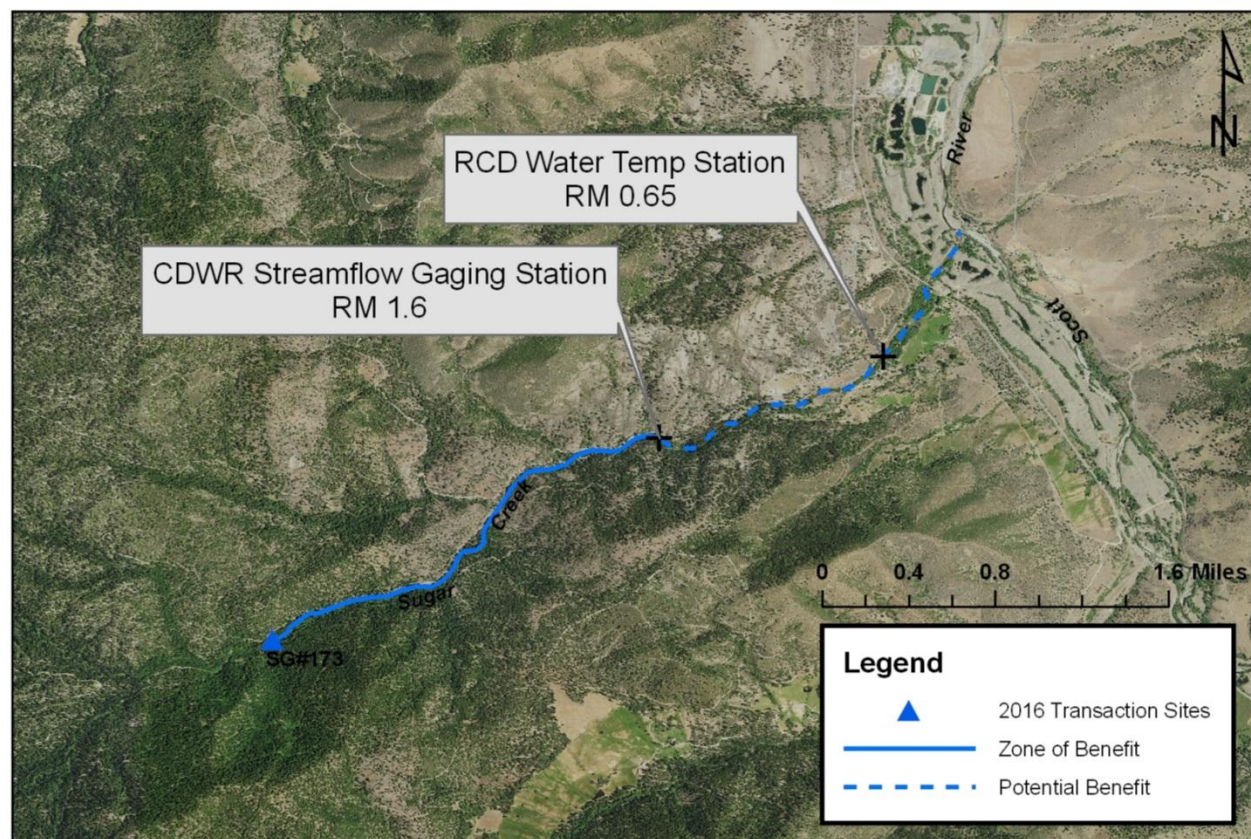
Figure 13. Water temperature data surrounding the initiation of the FR20 lease.

FR20 Conclusion:

1. Was the amount of water paid for provided? – Yes.
2. Was there an instream effect on stream discharge and/or pool volume below the lease site? – Yes, stream discharge increased.
3. What was the extent (distance) of downstream impact on flows? Not Monitored.
4. Was water temperature affected by leases? – No.

Sugar Creek Lease

Sugar Creek meets the Scott River in the upper end of the historic mining tailings reach at river mile 54.4. In 2010, all of the water rights from Sugar Creek were modified to allow for the dedication of adjudicated water to instream beneficial use pursuant to Water Code Section 1707. Through that process, the first priority water right of 1.2 cfs was permanently committed for instream purposes when Sugar Creek at the CDWR gage station (RM 1.6) is measured at 10 cfs or less. This instream dedication leaves only one active point-of-diversion on Sugar Creek, Darbee Ditch (SR173), which now serves multiple priority water rights. Water users on Darbee Ditch held combined rights of 9.8 cfs, 4.8 cfs of which was conserved through the piping of the ditch and relocation of other diversions in 2004 and subsequently allocated towards instream beneficial use in 2010. The Water Trust annually engages with the diverters at this site in order to lease a portion of the remaining 5.0 cfs (based on priority) that can be used through the irrigation season so long as flow at the CDWR gage is above 1.2 cfs. The single water transaction conducted in the Sugar Creek watershed is detailed on Map 4.



Map 4. Sugar Creek lease location, monitoring network and zone of downstream benefit.

The thick blue line traces the 1.9 miles of stream documented to have been benefited by the transaction at SG173. The leased water likely influenced habitats all the way to the mouth of Sugar Creek because there are no other active points of diversion through this reach; however, it was not verified in 2016. When the mouth of Sugar Creek is connected, leased water potentially contributes to the Scott River as well.

Sugar Creek Streamflow

CDWR operates a streamflow gaging station on Sugar Creek at River Mile 1.6. Figure 14 shows daily average discharge at the Sugar Creek station through the irrigation season as defined by the Scott River Decree, April 1st to October 1st. Spring runoff is characterized by an oscillating stream response from precipitation events that accumulated 0.71 to 0.99 inches at nearly consistent intervals from April through May (USFS 2016). The base flow period started in late-July and extended through the remainder of the irrigation season, with daily average discharges hovering right around 2 cfs (CDWR 2016b). Sugar Creek sustained surface flow from the SG173 point of diversion to its confluence with the Scott River for the duration of the 2016 summer, although the river was disconnected through multiple reaches of the tailings.

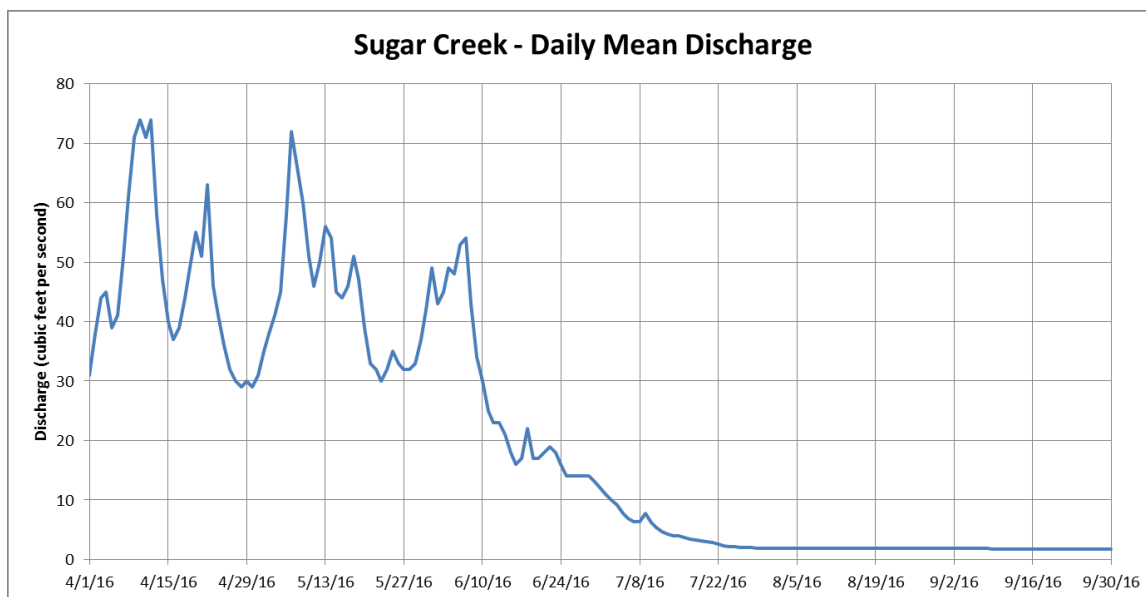


Figure 14. Sugar Creek daily average flow at RM 1.6 through the 2016 irrigation season (CDWR 2016b).

Upper Sugar Creek - SG173

Diversion Site: Upper Sugar Creek River Mile 3.5, Scott River Decree Diversion No. 173-B11 (SG173).

Lease Period: August 4, 2016 – September 30, 2016

Duration: 58 days

Water Right: 1.52 cfs 3rd priority

Leased Amount: 100% of available water right

Diversion Amount Before Lease Initiated: 1.84 cfs

Diversion Amount After Lease Initiated: 1.1 cfs

Net Diversion Reduction: 0.74 cfs

Stream Discharge Before Lease Initiated: 1.61 cfs

Stream Discharge After Lease Initiated: 2.00 cfs

Net Instream Gain: 0.39 cfs

Downstream Benefit: Extends a minimum of 10,000 feet (1.9 miles) to the CDWR gage but likely all the way to the confluence with the Scott River (3.5 miles) because there are no other surface water diversions on Sugar Creek.

Transaction Event Summary

On the morning of August 3, 2016, the Contractor met with the Darbee Ditch water users to initiate a lease of the 3rd priority water right. Diverted flow was measured at 1.84 cfs across the rectangular contracted weir entering the pipeline, with 0.74 cfs belonging to the 3rd priority. A cross-section for discharge measurements was established on Sugar Creek 280 feet downstream of the point-of-diversion (below the fish screen bypass return pipe) to monitor the change in discharge as a result of this transaction. A flow measurement recorded 1.61 cfs in Sugar Creek (Photo 11). The Contractor, in coordination with the Darbee Ditch water users, then adjusted the headgate and fish screen infrastructure to reduce the diverted flow by 0.74 cfs, thereby returning the 3rd priority water right instream at the point-of-diversion. The lease target was met at 10:30 a.m. when flow entering the diversion pipeline was measured to be 1.1 cfs across the rectangular weir. A post-lease flow measurement taken along the same cross-section revealed 2.00 cfs in Sugar Creek (Photo 12). Despite the rectangular weir verifying the release of 0.74 cfs as a result of this transaction, the Sugar Creek cross-section only responded with an increase of 0.39 cfs on the afternoon of August 3rd. The discrepancy between these values is understood to be due to the fact that the pre- and post- streamflow measurements were taken several hours apart, which allows for the diurnal decline in flow to work against the augmentation provided by the lease. This is evidenced by the CDWR streamflow gage, which registered the quantity of water leased on August 3rd over a one hour time period in the middle of the afternoon when stage was naturally declining (Figure 15).



Photo 3. Pre-lease streamflow measurement on Sugar Creek at RM 3.5.



Photo 4. Post-lease streamflow measurement on Sugar Creek at RM 3.5.

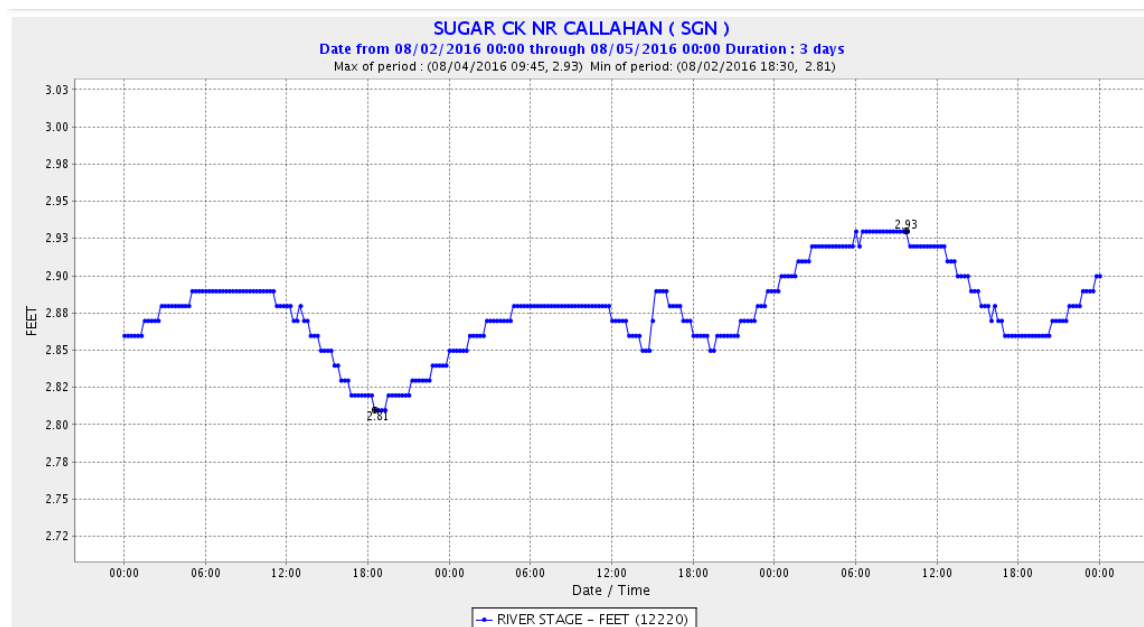


Figure 15. Sugar Creek Stage surrounding initiation of the SG173 lease, as recorded by CDWR gage at RM 1.6 (CDWR 2016b).

Streamflow Monitoring

The Darbee Ditch water users who continued to exercise their rights were responsible for managing the infrastructure at the point-of-diversion and diverting water in accordance with the adjudication. The Contractor completed weekly streamflow measurements at the established cross-section on Sugar Creek to determine the magnitude of the leased 3rd priority right through the season (Table 8). Flow in Sugar Creek beyond the 1.2 cfs minimum instream flow requirement that would have been available for diversion by the 3rd priority right was leased by the Water Trust. A portion of the 3rd priority water right was available through the remainder of the irrigation season but reached a minimum of 0.19 cfs on the final three days of the lease (Sept 29th -30th).

Date	Flow (cfs)	Timing
Aug 3 9:20	1.61 (+/- 2.6%)	Pre-Lease
Aug 3 12:52	2.00 (+/- 2.3%)	Post-Lease
Aug 4 11:40	1.92 (+/- 2.6%)	Post-Lease
Aug 10 12:34	1.75 (+/- 3.5%)	Post-Lease
Aug 17 10:40	1.71 (+/- 3.1%)	Post-Lease
Aug 25 9:36	1.65 (+/- 3.4%)	Post-Lease
Aug 30 12:19	1.58 (+/- 3.4%)	Post-Lease
Sept 7 9:36	1.68 (+/- 2.8%)	Post-Lease
Sept 14 9:28	1.49 (+/- 2.8%)	Post-Lease
Sept 21 9:42	1.54 (+/- 2.7%)	Post-Lease
Sept 28 10:53	1.39 (+/- 3.3%)	Post-Lease

Biological Monitoring

Over the summer of 2016, direct observation dive surveys on Sugar Creek were only completed below Highway 3 through a section of stream augmented by multiple habitat enhancement projects. In the early summer, the Contractor verified that a decent population of juvenile salmonids were rearing within this 0.2 mile reach of the tributary (slightly over 1,000 fish), with coho salmon vastly outnumbering rainbow trout. By late August, three weeks into the water lease at Darbee Ditch, repeat dive surveys found that the juvenile salmonid population had increased, with the abundance of trout having considerably expanded to include individuals ranging from 50 mm to mature natives. Other species encountered included Klamath small-scale sucker, three-spined stickleback and speckled dace. Note that the biological surveys discussed here only covered the lowest portion of stream influenced by the water transaction at SG173.

Water Temperature

A water temperature device was not deployed on Sugar Creek below SG173 prior to initiation of a water lease because access to the site could not be coordinated. However, the Siskiyou RCD maintains a water temperature trend monitoring site in a shaded riffle at river mile 0.65 (Map 4), which is representative of conditions on the tributary (Figure 16). Because this site is located several miles downstream from the point-of-diversion, the dataset cannot be used to determine if leased water impacted the temperature regime of Sugar Creek, but it is clear that the transaction at SG173 occurred on the downward limb from summer peak temperatures.

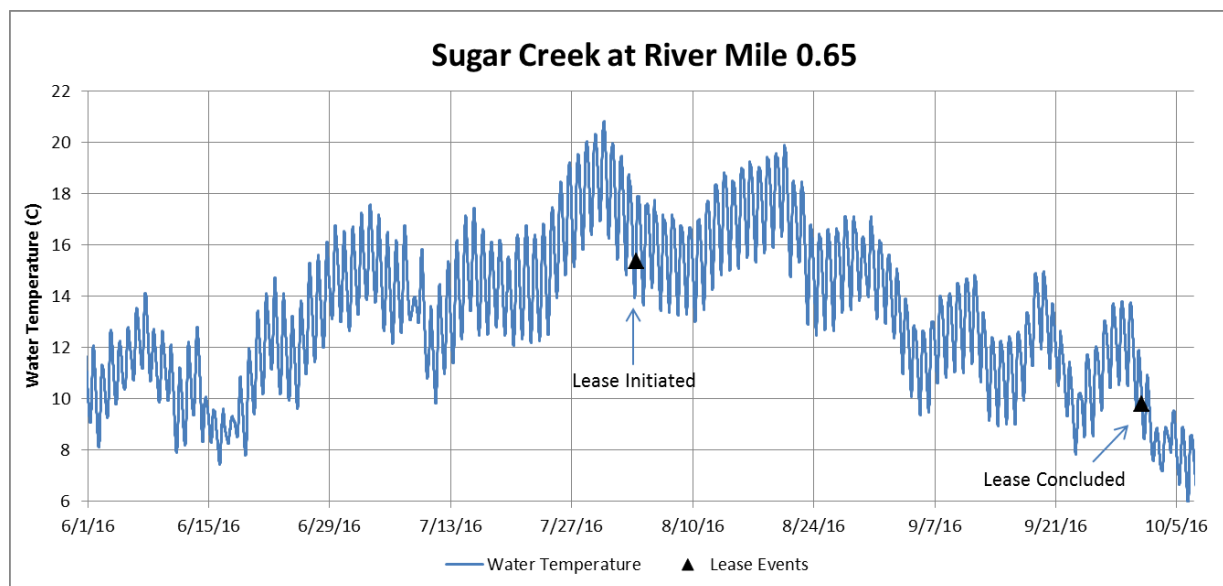


Figure 16. Sugar Creek water temperatures during the 2016 irrigation season.

SG173 Conclusion:

1. Was the amount of water paid for provided? – Yes.
2. Was there an instream effect on stream discharge and/or pool volume below the lease site? – Yes, stream discharge increased.
3. What was the extent (distance) of downstream impact on flows? – The CDWR Streamflow Gage, 1.9 miles downstream from Diversion No. 173, registered an increase in stage as a result of the transaction. The lease likely impacted flows further downstream, however, it was not documented.
4. Was water temperature affected by leases? – Not Determined.

Conclusions & Recommendations

Conclusions

The eight forbearance agreements negotiated by the Scott River Water Trust during the 2016 irrigation season improved surface water flows through priority stream reaches for rearing salmonids within the Scott River Watershed. Leased water was measurable instream at all sites and documented benefitting juvenile coho salmon and steelhead trout. At sites where stream temperature was monitored, there was no significant change in water temperature directly attributable to the transaction.

Recommendations

Recommendations made by the Siskiyou RCD for improved implementation of the Water Leasing Program include the following:

- A. The SRWT should reconsider whether it is necessary to collect water temperature data at all transaction sites. Some annual leases have been monitored across various water year types without a detectable impact on the stream and may not require further justification. The Contractor recommends that any leases where water is returned (even temporarily) through the fish screen bypass pipe continue to be monitored.

- B. Support the Siskiyou RCD in maintaining a network of water temperature trend monitoring sites because they provide a clear baseline that is useful for comparing with SRWT devices deployed in the immediate zone-of-benefit of a transaction.
- C. The SRWT should reconsider if it wants to completely answer its third monitoring objective - *What was the extent (distance) of downstream impact on flows?* In order to determine the extent to which there is a measureable impact on river stage, continuous recording pressure transducers would need to be deployed periodically downstream. The Siskiyou RCD is willing to establish a monitoring network for this purpose if the SRWT wants to determine the zone-of-benefit with better resolution.
- D. Continue to offer assistance to participants preparing for a forbearance agreement. It is imperative that diversion infrastructure is operating correctly before the SRWT Contractor arrives to initiate a lease. In order to ensure clear and accurate monitoring of a transaction, the leased quantity is based off of the total diverted flow as determined by the ditch measuring device and confirmed by pre- and post-lease instream flow measurements. Therefore, if the total diverted flow at the ditch measuring device is less than the maximum legal water right, but the full right is available, it must be diverted at the initiation of the lease for accurate utilization of SRWT reporting methods.

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