AGREEMENT #Q2175064, -01
SANCTUARY FOREST, INC.

California Department of Fish and Wildlife
Environmental Enhancement Fund Grant Program
FINAL PROGRESS REPORT
Anderson Creek Instream & Riparian Habitat Restoration Project

Date: April 30,2024

Agreement No.: Q2175064 -01

Project Title: Anderson Creek Instream & Riparian Habitat Restoration Project

Grant Term: September 1, 2021 – June 30, 2024

Grantee: Sanctuary Forest, Inc.

FISCAL REPORT

Fund Source	Amount Awarded	Total Amount Reimbursed
CDFW EEF Grant Funds	$238,542.15	$238,524.57
NRCS Conservation Program	$41,713	$39,611.14
Sanctuary Forest in-kind	$4050	$4050
Agreement Totals	$284,305.15	$282,185.71

PROGRAM/TECHNICAL REPORT

Brief Summary of Work Performed September 9, 2021 to April 8, 2024

- **Task 1 – Project Management and Administration**
  Grantee will provide technical and administrative services associated with performing and completing the work for this Project, including managing this Agreement, assuring all permits are finalized, administering subcontracts, invoicing and payments, drafting and finalizing progress and final reports.

  During the first period of the grant term (October 2021), staff requested line-item budget changes as needed to add costs for biological and cultural surveys required for project permitting and permit fees which had been overlooked during the grant application. Funds were moved from implementation line items to cover these costs. An amendment to the grant was executed in December 2021 with the new budget.

  A new draft budget, with line-item changes needed to cover the higher-than-anticipated costs of permitting for both fees and staff time, was submitted and approved in June 2022. This was an

informal amendment.

In Spring 2023, SFI requested an increase in the scope of work for the remaining grant funds in order to install six additional instream structures. This request was granted. A budget line item change was also drafted with per communication with Cristina Perez in September 2023. This change was only between subcontractors and moved funds from planning, vegetation planting, and forestry consultant to instream HE& Labor as needed to cover the costs for the six structures.

- **Task 2 – Project Implementation**
  Instream habitat restoration will include placement of wood at 30 sites within a 3000 ft. reach of Anderson Creek. The riparian habitat restoration will include 22.5 acres of forest thinning focused on reducing tree density for improved forest health, increased riparian diversity, and reduced risk of stand replacing fire. Sanctuary Forest staff will execute all project subcontracts and perform final project planning and permitting with subcontractors. Biological and cultural assessments required for permitting will be completed by Stillwater Sciences and William and Rich and Associates. Planning of instream structures will be completed by the Mattole Salmon Group. Edwards Excavation will be the implementation subcontractor for both the instream and riparian restoration. Sanctuary Forest will plan for vegetation replanting where feasible following implementation and subcontract with the Mattole Restoration Council for replanting materials and labor.

  Implementation Timeline:

  2021:
  Subcontracts were executed with Stillwater Sciences and William Rich for preparation of the biological and cultural assessments and reports. The reports were completed and included in the 2022 permit applications discussed below.

  2022:
  SFI staff submitted permitting applications (401, 1600 and 404) in the first quarter. Permits were granted by the North Coast Regional Water Quality Control Board (SWRCB 401); California Department of Fish and Wildlife (1600), Army Corps of Engineers (404) and NOAA fisheries (Biological Opinion).

  To develop the forest thinning component, a field meeting was conducted with a team of foresters from the National Resource Conservation Service (NRCS) to discuss application of the standard practices with some modifications as needed to prioritize habitat over forest production. 22.5 acres of forest thinning was completed with final input from RPF Tim Metz (Restoration Forestry). As per the input from Tim and NRCS, the thinning was focused on removing all trees less than 8 inches in diameter in the first phase, then retuning in August 2022 to selectively cut trees to be used in the instream project, including some larger trees where thinning was needed.

  Planning of in-stream component structures with Campbell Thompson, Mattole Salmon Group and Tasha McKee, Sanctuary Forest, was completed in Summer 2022. Implementation of the instream component was completed in fall 2022 by Edwards Excavation according to the design plans.

2023:
In the first quarter of 2023 SFI and MSG conducted planning of additional instream wood.

In Summer of 2023, Edwards Excavation and the Mattole Salmon Group (MSG) completed installation of six additional large wood structures within a 550-ft reach of Anderson Creek downstream of the original project. This included moving approximately 25 fir trees with rootwads to the stream, per correspondence with Daniel Orr in May of that year. This phase of instream work was completed in late summer 2023.

NRCS certified the completed forest thinning work in the fall of 2023.

- **Task 3 – Project Monitoring**
  Grantee will be responsible for monitoring, evaluating, and reporting project effectiveness. Grantee staff will perform most of the monitoring tasks, and work with professional consultants (RDK Hydrology and Baldwin, Blomstrom, Wilkinson and Associates, Inc.) to analyze data and assess outcomes. The project will be assessed based on comparison of pre- and post-project parameters. Additionally, monitoring will be performed to determine if the project is performing as designed, and to identify adaptive management needs. Evaluation will also include assessments for project feasibility in other tributaries and watersheds. Quantitative monitoring will include dry season streamflow, water quality and pool habitat monitoring. Qualitative monitoring will include pre- and post-project photo documentation. An assessment report will be prepared and disseminated to all project funders. Additionally, project outcomes will be disseminated through conference presentations and workshops (including the Salmonid Restoration Federation conferences) such that the knowledge gained can be used to benefit other watersheds. Bella Vista Foundation will contribute funding for the subcontractor Baldwin, Blomstrom, Wilkinson and Associates, Inc for this task.

  Pre-project streamflow and water quality monitoring data was collected in 2015 and 2017. Post-project streamflow and water quality data was collected in 2023.

  Due to permit timing constraints, it was not feasible to perform pre and post forest monitoring with Baldwin, Blomstrom, Wilkinson and Associates. Most of the forest thinning needed to be completed by March 1 as part of a limited operating season under NEPA and therefore the work began in January 2022. Tasha Mckee, Sanctuary Forest Water Program Director notified CDFW EEF grant manager Daniel Orr about our inability to do the forest monitoring. A phone meeting was held and Daniel indicated that the project was funded primarily on its instream habitat value, and therefore the forest thinning monitoring was not critical, and we could go forward without doing it.

  Pre-project pool habitat surveys were conducted in July 2022 and post-project in 2023.

  Pre-project photo monitoring was completed in 2022. Post-project photo monitoring was completed in winter 2023 after implementation was complete.

  Mattole Salmon Group (MSG) completed a snorkel survey of 3000 feet of Anderson Creek over the summer of 2022.

- **Subcontractors**

Mattole Salmon Group – project planning, layout, implementation oversight of the instream habitat component; conducted juvenile dive surveys

Stillwater Sciences – botanical field surveys and biological report

Edwards Excavation – rocked access road to Anderson Creek, forest thinning contractor, instream implementation subcontractor

William Rich & Associates - cultural resources investigation

Restoration Forestry – on-the-ground planning and implementation of forest-thinning component, support with slash and brush management paid by cost share funds

RDK Hydrology – consulting on monitoring plan, providing analysis and assessment of outcomes

Deliverables

Task	Description	Deliverables	Expected Completion Dates	Completed (Yes/No) *	Date submitted to CDFW
1	Project Management and Administration	Quarterly Progress Reports	Due within 30 days following each calendar quarter (March, June, September, December) after grant execution	**Yes**	**Quarterly throughout term of grant**
		Quarterly Invoices	Due within 30 days following each calendar quarter (March, June, September, December) after grant execution	**Yes**	**Quarterly throughout term of grant**
		Copies of Executed Subcontracts	Due with next Quarterly Progress Reports upon completion of Subcontracts	**Yes**	
		Copies of Permits	Due with next Quarterly Progress Reports upon completion of Permits	**Yes**	
		Submit Project Data (to be included in monitoring report)	**Planned submit date May 8, 2024**		
		Final Progress	**April 7,2024**		

		Report			
		Final Invoice	**April 7,2024**		

Objectives

Project Objective (as stated in Grant Agreement)	**Objective met or exceeded? (Yes/No)***
The Anderson Creek Instream and Riparian Habitat Restoration Project ("the Project") aims to improve instream habitat for native salmonids (Coho, Chinook and Steelhead Trout) in Anderson Creek through the addition of large wood placed strategically for cover, scour, complexity and winter slow water refugia. The placement of large wood will help to restore natural processes of sediment sorting, aggradation and connection to floodplains that were lost with the widespread removal of wood.	Yes
Additionally, the Project aims to improve riparian habitat by reducing tree density and increasing species diversity along Anderson Creek. This reduction in tree density will also serve to reduce fuel loads during wildfires, thus helping reduce the severity of any burns which may occur.	Yes

*If No, please explain in Issues and Lessons Learned section below

Problems/Delays and Lessons Learned:

The permit process took much longer than expected and the permit cost was also higher. We were very fortunate that CDFW EEF could provide flexibility to move funds from other parts of the project to cover these costs. We are now including higher estimates in our grants to cover these costs. Part of the challenge included the combination of the two objectives – forest thinning and instream habitat. While CDFW and the State Water Board both encourage combining these two restoration practices for efficiency – wherein wood from the forest thinning is used for instream habitat structures and wood loading- the CEQA requirements are different. After consulting with the agencies we were able to "separate" the two projects with the instream project meeting the 5 acre CEQA exemption. CEQA for the upslope project was covered under the Humboldt County planning zoning for timberland and allowed activities. The CDFW 1600 was only required for the instream project activities.

Project Benefits and Results:

The project achieved the ecological benefits of improved rearing and spawning habitat for native salmonids as well as increased resilience to drought and water for birds, amphibians and wildlife. Prior to the project there was very little wood in the stream and very few pools. In the first post project winter, the high flows were not sufficient to form scour pools under the wood structures. After the 2nd post project winter we observed significant changes in channel morphology with the larger diameter wood structures catching smaller wood and sediment, building up the formerly incised streambed and reconnecting floodplains. This outcome gives us confidence that we will also achieve the long term ecological benefits of restoring natural hydrologic processes that support healthy forests and river

ecosystems.

The forest thinning component benefits are also being achieved and include improved forest health, reduced fire hazard and increased forest stand diversity. We used lop and scatter and chipping of slash to help build up the mulch layer and to promote rainwater infiltration. The combined benefits of increased rainwater infiltration along with reduced evapotranspiration will help contribute to increased summer flows.

Public benefits include reduced fire risk associated with the forest thinning. Public benefits also include opportunities for learning and public interpretive hikes, and in the longer term, restoration of native Mattole River salmonid populations through improved freshwater rearing habitat.

Estimated Co-benefits achieved to date:
(Provide narrative description of any applicable Co-benefits achieved during the project, such as: water quality improvements; water storage; wildlife impacts; etc… here.)

The Project Co- benefits are included in the description above.

Summarize Benefits to Disadvantaged Communities (if applicable):
(Provide narrative description of benefits to disadvantaged communities, if applicable.)

This project occurred in the disadvantaged community of Whitethorn. The project provided local jobs with 100% of project work hours performed by residents of disadvantaged communities in Humboldt County. The project will also serve the community through education opportunities including tours and workshops at demonstration sites. Additionally, the project will increase resilience to climate change and drought for fish, wildlife, and human communities; reduce the threat of drought related fire impacts; increase stewardship and improved ecosystem health on conserved lands including lands in the Upper Mattole River and Forest Cooperative.

Lessons Learned
We learned that forest thinning requires significant slash treatment and were very glad that we had hired a contractor with heavy equipment and a masticator. On other smaller thinning projects where we had only used hand labor (chainsaws), the work went much more slowly and was twice the cost per acre. The slash build up on ground was also much thicker with a corresponding higher risk for fire on the projects with only hand crews. Another advantage of the heavy equipment was the ability to push trees over with their root wads attached. In some cases these logs with rootwads were used for instream habitat. For tanoak trees where we wanted to avoid resprouting of the stump, we were able to push over the trees and lay them on contour to help catch duff and form an infiltration sponge. Tanoak decays quickly when in contact with the ground and the decaying logs are great mushroom habitat. The use of hand crews was necessary for the steeper areas and the contractor's team was also very effective with chainsaw work.

For the instream component we learned that the approach of unanchored and non- engineered structures was very effective for a small stream like Anderson Creek. We were able to complete more structures and wood loading reaches within the budget than we had anticipated. For larger streams with more stream power, and where there is downstream infrastructure, anchoring is often necessary to avoid mobilization.

Sanctuary Forest

Anderson Creek Instream and Riparian Habitat Restoration Project

Monitoring Report

California Department of Fish and Wildlife
EEF Grant No. Q2175064, -01

Instream LWD installed in Anderson Creek in 2022, floodplain reconnection and plunge pool formation following 2023/2024 winter high flows

Riparian forest thinning in Anderson Creek, post-project photo shows lop and scatter mulch on the ground and wider spacing between trees in the foreground where thinning took place.

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Anderson Creek

Overview

The Anderson Creek Instream and Riparian Habitat Restoration Project was designed to address the impacted functions of water resources for the purpose of improving habitat for native salmonids in an important headwaters tributary to the Mattole River, Anderson Creek. The project aimed to measurably improve salmon rearing habitat and ecosystem function above baseline conditions in Anderson Creek within 1-2 years following implementation.

Project monitoring was conducted pre- and post-implementation to assess outcomes.

Implementation and monitoring timeline in Anderson Creek:

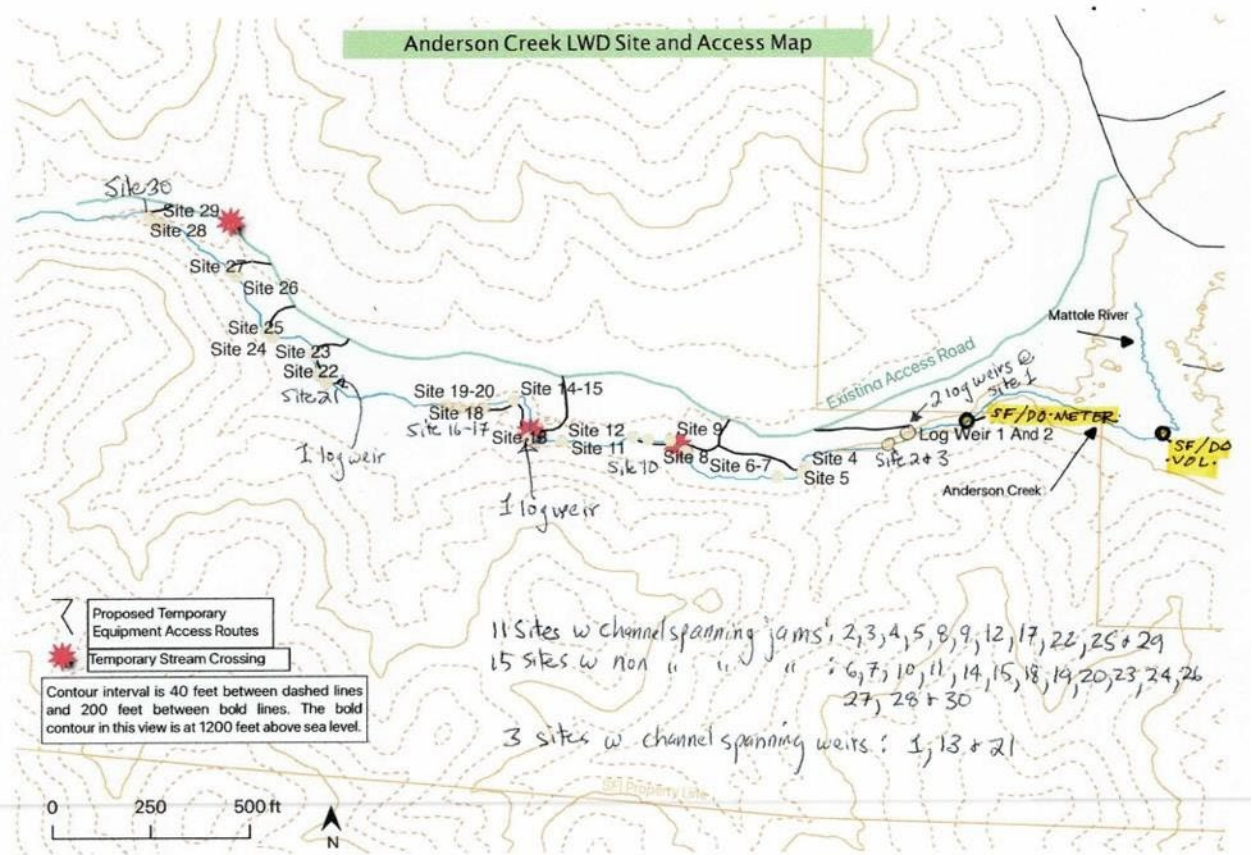
Implementation

- 2021: Grant was awarded and contracts were executed.
- 2022: Permits were obtained, forest thinning was completed. Instream component (3000 ft of instream wood placement) was planned and implemented.
- 2023: Six additional instream structures including 25 whole fir trees were installed in a 550' reach downstream of the previous instream installation. NRCS certified forest thinning component.
- 2024: Revegetation with native trees and plants.

Monitoring

- 2017: Pre-project streamflow data was measured. No water quality data was recorded pre-project.
- 2022: Pre-project botanical survey was completed in May, juvenile dive survey was conducted in June and pre-project habitat typing survey was conducted in July. Pre-project photo documentation was completed.
- 2023: Post-project habitat typing survey was conducted in June; post-project streamflow and water quality was monitored from June through the end of the dry season in November. Post-project photo monitoring was also completed.
- 2024: Project data analysis was conducted.

Figure 1. Project Site Map: Instream structures, streamflow monitoring sites and dissolved oxygen monitoring locations



Assessment questions include the following quantitative outcomes from the project:

What is the increase in summer streamflow? As per the outcomes discussed in this report, the rainfall differences between the pre-project and post-project year outweighed any benefits from the project. We are learning that streamflow monitoring is a difficult way to assess project performance because of the annual variations in rainfall, climate conditions and differences in stream morphology often resulting from the addition of instream wood.

What is the increase in summer pool habitat? As per the pre- and post-summary in this report, the length of pool habitat increased from 12.4% of the reach to 30% of the reach within one post-project year. The formation of pools in response to wood is largely dependent on the winter high flows and whether they convey enough power to scour around the wood. With the higher winter flows of 2023/2024, we observed formation of many more pools. We expect the project to continue evolving, with more complex habitat being created.

Are the structures performing as per design objectives? As of early spring 2024, most of the structures are performing as per design objectives, sometimes exceeding expectations. The four log-and-boulder weirs have persisted through two winters with their clay seal intact. Many of the

wood jams have captured other woody debris and stream bedload, reconnecting floodplains upstream of the jams and creating plunge pools on the downstream side. The structures that were built with both large and small wood appear to be the most effective (see cover photo). The structures with only large pieces did not capture as much material and did not significantly change stream morphology.

Streamflow Monitoring

Seasonal streamflow monitoring was performed at one established monitoring site downstream of the project reach for one pre- and one post-project dry seasons. The monitoring site is located ~8-10' feet downstream of the lowermost structure now installed within the project reach. The method of measuring discharge consisted of the following: installation of a cross section wherein sandbags are placed on both sides of the channel to square up the edges; a Marsh McBirney (pre-project) now using Hach (post-project) flow meter is used to measure depth and velocity when these are sufficient. When flows or depth are too low for the digital meter, a volumetric or "bucket and stopwatch" method is used at a location further downstream from the meter cross section, near the confluence with the mainstem of the Mattole River. This volumetric flow measurement site is within a bedrock cascade several feet above the confluence. *See images below.*

Anderson Creek streamflow measurement cross-section, post-project. Large wood installation is visible just upstream of the site.

Anderson Creek volumetric streamflow measurement site. Dissolved oxygen is measured in the pool above the cascade.

Pre- and Post-Project Discharge Measurements:

Figures 2.0, 2.1 and 2.2 *(below)* show streamflow data measured during pre- and post-project dry seasons for Anderson Creek and the mainstem of the Mattole River. Data show that in 2023 (post-project) there was less surface flow measured in both Anderson Creek and the Mattole River during the early months of the dry season than in 2017 (pre-project). In October, this trend shifts in both streams, with greater flow measured post-project than before. This could be in part due to a rain event (see Figure 3) or other weather-related factors (temperature, winds, humidity, smoke, etc.). One of the challenges in making determinations based on streamflow measurements alone is the presence of uncontrolled variables associated with weather and natural changes in streambed morphology from year to year. In this way, the weather can ultimately obscure or override project outcomes.

It should also be noted that, depending on local circumstances (valley width, soil/gravel depth, porosity, etc.) it could take several years to build up a depleted aquifer, so there could be more definitive conclusions after another year or two of monitoring.

Figure 2.0 Selected Anderson Creek and Mattole River Streamflow Measurements (from each month pre-project (2017) and post-project (2023) for comparison)

Anderson Creek Streamflow Measurements Pre-Project (2017) and Post-Project (2023)

	June				July		August	
	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date
2017 (pre-project)	0.265	6/21/2017	NM	NM	0.063	7/26/2017	0.033	8/22/2017
2023 (post-project)	0.259	6/14/2023	0.150	6/28/2023	0.045	7/26/2023	0.024	8/23/2023
Difference (2023-2017)	-0.006		--		-0.018		-0.009	

	September		October				November	
	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date
2017 (pre-project)	0.008	9/7/2017	0.002	10/5/2017	0.001	10/18/2017	0.037	11/2/2017
2023 (post-project)	0.004	9/6/2023	0.042	10/4/2023	0.116	10/18/2023	0.056	11/2/2023
Difference (2023-2017)	-0.003		0.041		0.116		0.018	

NM=Not Measured on this date

Mattole Mainstem Streamflow Measurements Pre-Project (2017) and Post-Project (2023)

	June				July		August	
	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date
MS6 2017	10.988	6/21/2017	9.694	6/28/2017	3.117	7/26/2017	0.714	8/22/2017
MS6 2023	10.242	6/14/2023	7.357	6/28/2023	1.531	7/27/2023	0.520	8/23/2023
Difference (2023-2017)	-0.747		-2.337		-1.586		-0.194	

	September		October				November	
	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date
MS6 2017	0.142	9/7/2017	0.091	10/5/2017	0.056	10/18/2017	0.754	11/2/2017
MS6 2023	0.185	9/6/2023	0.950	10/4/2023	3.895	10/18/2023	1.740	11/1/2023
Difference (2023-2017)	0.043		0.859		3.839		0.986	

Figure 2.1 Anderson Creek Pre- and Post-Project Streamflow Measurements (full data set represented)

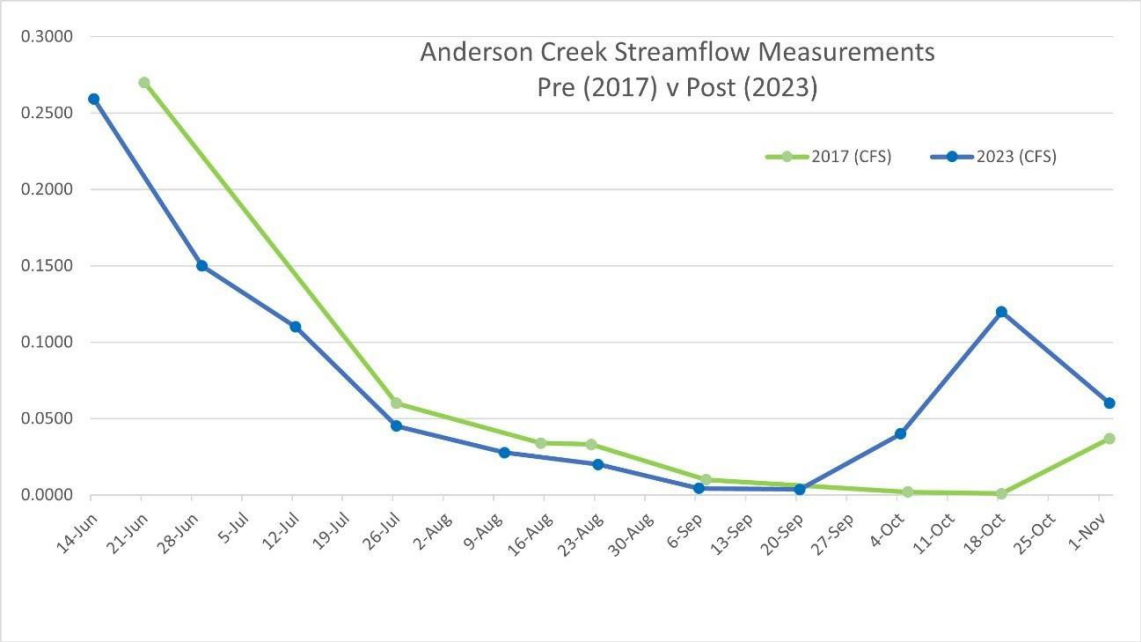
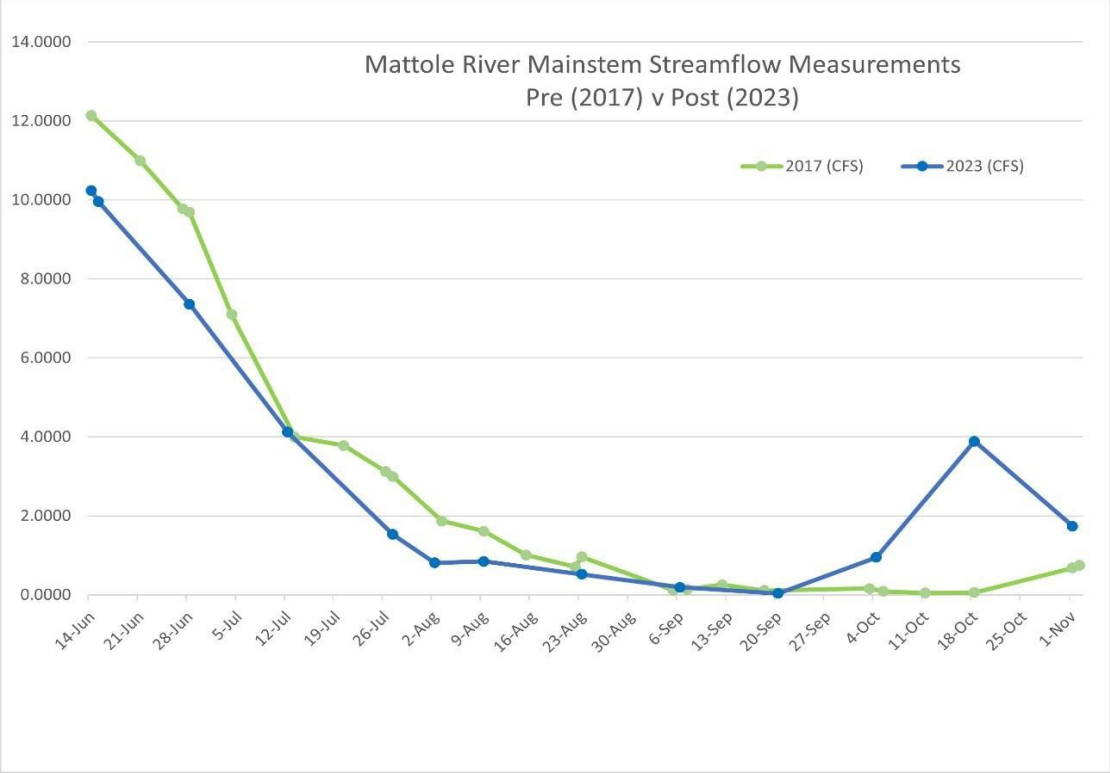


Figure 2.2 Mattole Mainstem (MS6 Site) Pre- and Post-Project Streamflow Measurements (full data set represented)

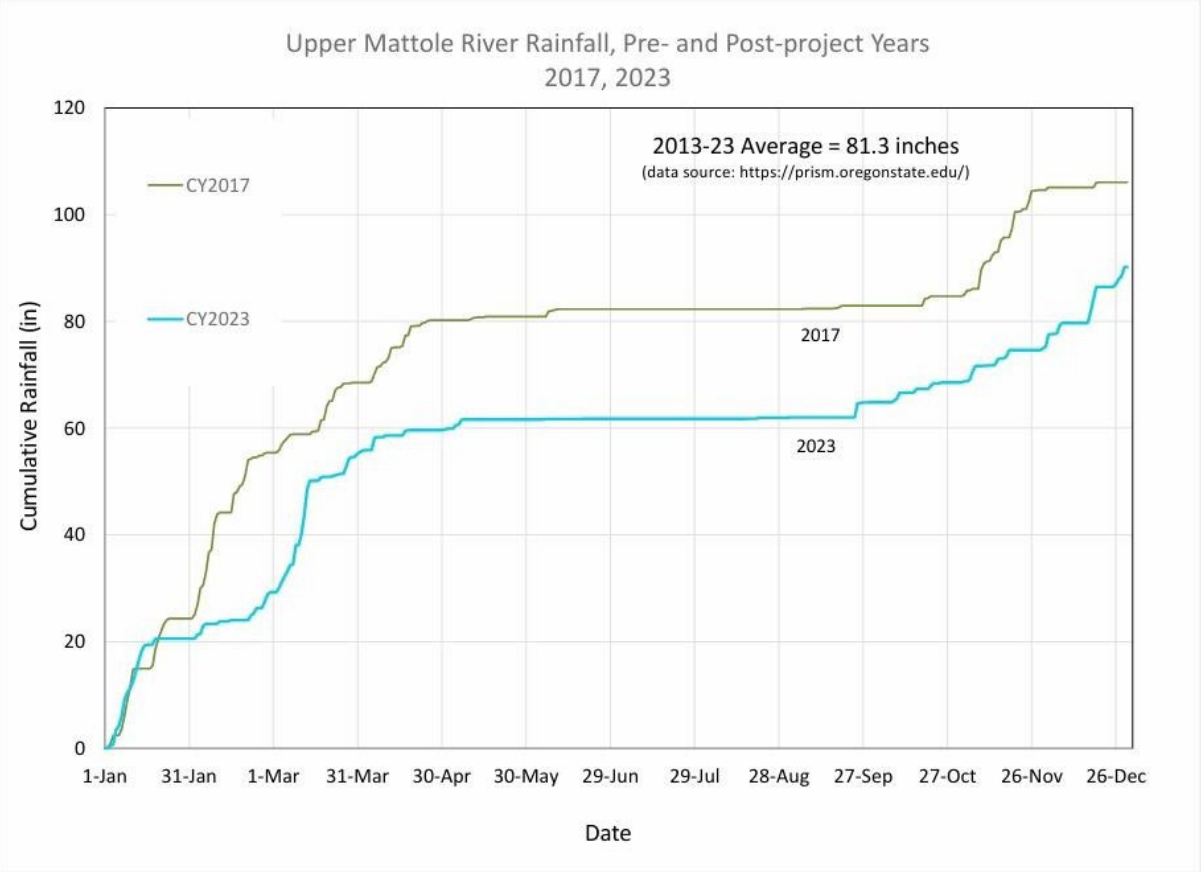


The graph below (*Figure 3*) shows cumulative rainfall for the same years, in order to put the discharge data into perspective.

Pre- and Post-project Rainfall:

Figure 3 plots cumulative rainfall for the Upper Mattole River for the pre- and post-project years consistent with Figures 2, above. There was significantly more rainfall in the pre-project year (2017) than post-project (2023). The timing of rainfall is also important as we have learned that late spring rains are critical for maintaining summer flows and late summer rains are critical for fall streamflows. The 2017 cumulative rainfall shows a "bump/rain event" in early June which would contribute to higher flows being sustained longer into the dry season than post-project. The 2023 cumulative rainfall shows a rain event in late-September, when the pre- versus post streamflow trend is reversed.

Figure 3. 2017 versus 2023 Rainfall Totals



Water Quality

Water quality was only measured post-project for the main instream LWD placement in 2022. Therefore, this is a general discussion about post-project water quality. The following chart (*Figure 4*) represents water quality measurements taken during the 2023-24 water year near the established streamflow monitoring site related to the Anderson Creek project reach (see *Fig. 1*). Prior to LWD installation in 2023, dissolved oxygen was measured in the first pool upstream of the cross section (referred to as US ~20'). This was a relatively deep, persistent pool along the left bank where stage measurements were also taken. After instream LWD installation, DO was measured either immediately upstream of the cross section where there was sufficient depth in the channel (a shallow run with sufficient depth for the DO probe, referred to as US ~5) or in a smaller pool just downstream of the streamflow cross section (DS ~15). Because there were no pre-project water quality measurements recorded in Anderson Creek, we can't draw any conclusions about the effect of the instream work. However, we can discuss whether the post-project water quality is adequate for aquatic species.

Figure 4 *(below)* shows water quality measurements taken in Anderson Creek during the dry months of the 2023-24 water year. Table 4.5 explains water quality thresholds adequate for juvenile salmonids (Baier, Mattole Salmon Group, 2008).

Figure 4. Dissolved Oxygen, Temperature & Streamflow WY2023

Anderson Creek Dissolved Oxygen Measurements

Timestamp	Baro	DO ppm	Temp C	Flow (cfs)	Site	Comments
6/6/2023 16:12	97.51	9.37	11.8	0.31	HU 1	Habitat Survey
6/14/2023 17:04	97.51	10.54	13	0.26	US ~20'	WY2023
6/28/2023 16:10	97.53	10.47	13.5	0.15	US ~20'	
7/12/2023 16:11	97.89	8.69	14.8	0.11	US ~20'	
7/26/2023 16:49	97.72	10.27	16.5	0.05	US ~20'	
8/10/2023 14:01	97.6	8.69	16	0.03	US ~20'	
8/23/2023 14:10	97.76	8.02	14.3	0.02	US ~20'	
10/18/2023 16:15	98.15	10.53	12.6	0.12	US ~5'	WY2024
11/2/2023 14:04	98.85	10.05	8	0.06	DS ~15'	

Table 4.5. Water Quality Thresholds used to Evaluate Suitability of Juvenile Salmonid Habitat in the Upper Mattole River - Mattole Headwaters Water Quality Monitoring Report (Baier, Mattole Salmon Group, 2008)

Water Quality Parameter	Range	Juvenile Salmonid Suitability
Water Temperature (Downie et al. 2002, RWQCB 2003)		
Long Term Averages	≥ 19°C	Unsuitable
	17 to 19°C	Marginal
	<17°C	Suitable
Short-Term Critical Thermal Maximum	≥ 24°C	Unsuitable (Death is usually imminent)
Dissolved Oxygen (EPA 1986)		
Daily Minimum	6 mg/L	Marginal (Slight Production Impairment)
Daily Minimum	≤ 4 mg/L	Unsuitable (Severe Production Impairment)
PH (RWQCB 1994)		
Daily Range	6,5 to 8,5 pH units	Suitable

According to the Mattole Headwaters Water Quality Monitoring Report (Baier, Mattole Salmon Group, 2008), water temperatures generally remain suitable to marginal for juvenile salmonids in Mattole headwaters streams. It is chronic summertime low flows which present the greatest threat to their survival. As flow drops, pools begin to disconnect and water quality drops in the isolated pools. Low dissolved oxygen levels can cause metabolic stress and make juveniles more susceptible to disease. Salmonid growth is reduced at 5 mg/L, and D.O. levels of 3.3 mg/L or below, if sustained for more than three days, can be lethal. Fortunately, monitoring of Anderson Creek in 2023 shows that water temperatures in the reach surveyed remain suitable, though they come very close to marginal in July and August. Dissolved oxygen levels also remained within the suitable range It should be noted that no water quality surveys were conducted in isolated pools (lacking inflow) in 2023.

Summer Pool Habitat

Pool habitat monitoring was performed throughout the entire Anderson Creek Project reach in order to measure changes in width, length and depth of pools during the summer of pre- and post-project years. Surveying habitat post-project was challenging because of the amount of large wood obscuring the stream. Where surveyors were unable to assess (either visually or to physically measure) lengths of the channel, the hidden reaches were coded as *runs*. This likely skewed the percentages of other types of features recorded. Indeed, the better the habitat for fish, the harder it is for habitat-typing humans due to an abundance of wood.

The chart below summarizes the data from the pre- and post-project years. Even with more rainfall in the pre-project year than post-project, the analysis indicates a substantial increase in pool habitat, both in total area and number of pools. ***Percentages in columns showing pre- verses post- dates refer to the percentage of total reach measured***.

Figure 5. Pool Habitat Survey Pre- (2022) vs. Post-Project (2023)

	Pre - Project vs. Post - Project (Early-Summer)			
	Wet Season(Pre) 7/28-29/2022	Wet Season(Post) 6/2, 6/6/2023	Difference (post-pre)	
Total Length of Reach	2651.60	2597.87	-53.73	
Total Length of Dry Reach	17.50	0	-17.50	
Total Length of Pool Habitat:	327.60	771	443.40	
Total Length of Flatwater Habitat:	1622.50	1377.37	-245.13	
Total Length of Riffle Habitat:	604.50	358	-246.50	
Total Length Not Surveyed:	0.00	0	0.00	
Total Length Cascade Habitat:	79.5	54	25.50	
Percent Dry Reach:	0.66%	0.00%	-0.66%	
Percent Pool Habitat	12.35%	29.68%	17.32%	
Percent Flatwater:	61.19%	53.02%	-8.17%	
Percent Riffle:	22.80%	13.78%	-9.02%	
Percent Not Surveyed:	0.00%	0.00%	0.00%	
Percent Cascade:	3.00%	2.08%	0.92%	
# of Pools	21	37.0	16.0	
# of Runs	30	36	6	
# of Riffles	22	26	4	
Average Pool Max Depth	1.55	1.74	0.19	
Average Pool Area	127.76	160.04	32.28	
Average Canopy Cover	0.00%	0.00%	0.00	NR
Average Bank Full Width:	15.36	21.38	6.02	
# of Side Channels:	0	0	0	
% of dry reach	0.66%	0.00%	-0.66%	
Estimated pool area in reach (wet)				
# of pools x average area (wet)	2683	5921	3239	

Snorkle Survey

The Mattole Salmon Group dove 32 pools in Anderson Creek (any pool with a maximum depth >30 cm) in June of 2022. Surveyors saw 10 total "rainbow trout" *O. mykiss* (at least 15 cm or without parr marks) distributed throughout the reach from pool #2 to pool #31. No smaller fish were found, perhaps indicating that steelhead have not spawned in Anderson Creek the last two dry winters. The initial jump from the mainstem Mattole to Anderson Creek -a significant bedrock cascade- is pretty large and we didn't have substantial flows during prime steelhead season. The presence of these larger resident fish does seem to indicate that, even in summer 2021 (an extreme low flow year), some pools in Anderson maintained sufficient water throughout the dry season to sustain fish.

Photo Point Documentation

A photo report was submitted with the final report. Pre- and post-project photos illustrate the

lack of instream wood and pool habitat prior to project implementation versus after. For example, Site 1, a run at the downstream end of the reach which lacked any wood or complexity, now has two log weirs upstream of an installed log jam. Site 6 had been a cobble and bedrock run with no LWD, now has sufficient wood to retain gravel.