Water Quality Monitoring Summary for the Stitz Creek Watershed (1999-2018)

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Introduction

Long-term monitoring of fish-bearing (Class I) streams was initiated with adoption of the Habitat Conservation Plan (HCP) in 1999 with the goal to collect data to determine if salmonid habitat conditions across contemporary Humboldt Redwood Company (HRC) property meet, or are trending towards Aquatic Properly Functioning Condition (APFC). Current management activities by HRC are guided by the Aquatics Conservation Plan (ACP), part of the HCP, developed with state and federal agencies, and through various permits issued by the North Coast Regional Water Quality Control Board (NCRWQCB). Two Class I Aquatic Trends Monitoring (ATM) sites were established on HRC ownership in the Stitz Creek watershed in 1999. Both sites were selected with the advice and approval of HCP signatory agencies (NOAA Marine Fisheries and Department of Fish and Wildlife) and the NCRWQCB. The purpose of this document is to present methodology, summarize results, and discuss any trends observed in monitoring data collected since monitoring was instituted in the watershed.

Unlike *effectiveness* monitoring, *trend* monitoring is not specifically intended to evaluate specific management practices. Trend monitoring results may, over time, corroborate the findings of effectiveness monitoring, but are also strongly influenced and constrained by inherent watershed conditions and processes, apart from management, including drainage area, geology and geomorphology, topography, vegetation, and climate. Due to improvements in timber harvest practices required by the California Forest Practice Rules and HRC's HCP, recovery of aquatic habitat, where currently impaired, is expected to occur over time to the extent provided for by inherent watershed conditions. HRC's ATM program is designed to test this hypothesis as it tracks watershed trends over time.

Representative stream reaches included in the ATM program were chosen for a variety of factors that included access, distribution, gradient, percentage of HCP coverage in the watershed, and watershed interest. The basic design of this monitoring program is to repeatedly measure the habitat characteristics of stream reaches within the portion of watersheds most likely utilized by anadromous salmon (i.e. ≤ 4% gradient).

Stitz Creek is tributary to the Eel River south of Scotia, CA. The watershed (drainage area = ~10 km^2 [~4 mi^2]) is situated within the Lower Eel – Eel Delta (LEED) Watershed Analysis Unit (WAU). ATM habitat monitoring was conducted annually at two sites (ATM 171 and 172) within the watershed in 1999 and 2000 (Figure 1). Temperature monitoring was conducted at ATM-171 from 2004-2018 and at ATM-172 in 2016. Each monitoring reach is approximately 100 meters in length.

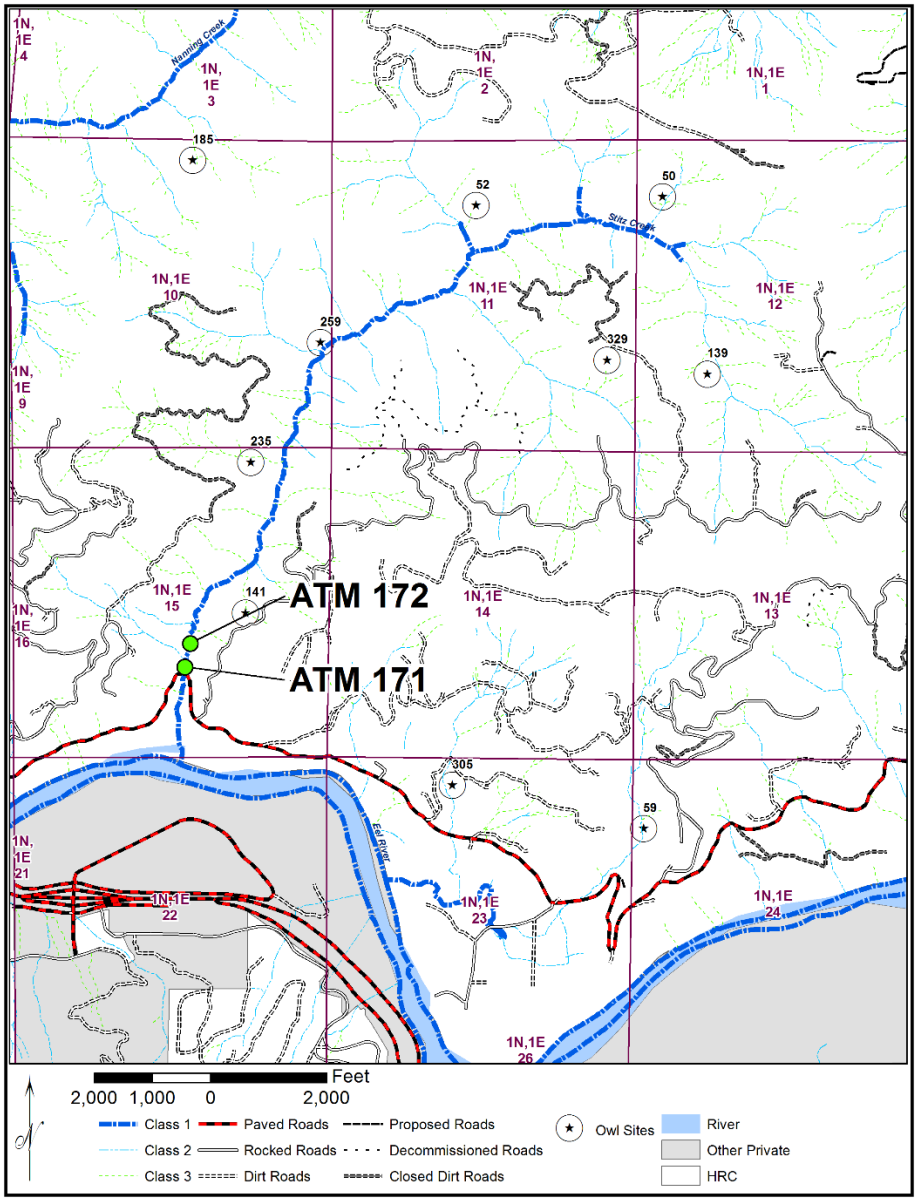


Figure 1. ATM stations 171 and 172, Stitz Creek, California

Methods and Result Summaries

Aquatic Trends Monitoring

Habitat parameters were measured in the summer of 2000 at both Stitz Creek ATM stations and stream temperature was monitored at ATM-171 from 2004-2018 (Tables 1 and 2). Data from these habitat surveys were compiled into simplified summary "report card" style tables used in the ATM reports submitted annually to all HCP signatory agencies. Habitat values are measured against Aquatic Properly Functioning Conditions (APFC) targets for stream and riparian characteristics, established by both state and federal agencies in 1997. HRC simplifies the presentation of habitat status by color-coding the values within the report cards into four categories:

- **Blue:** Habitat conditions meet APFC target criteria
- **White:** Habitat conditions do not meet APFC target criteria
- **Green:** There are currently no established APFC criteria to measure against
- **Grey:** There were no data collected for this parameter

Bed surface sampling data were utilized to construct a cumulative frequency plot with the corresponding relative frequency distribution of streambed particle sizes within each ATM station (See HRC SOP-13, *Surface and subsurface stream sediment sampling*, for detailed methodology). These analyses assess patterns of coarsening or fining in streambed substrate and are considered the current baseline for future comparison (Figure 2).

Physical measurements of pools were conducted to assess dimensions, abundance (i.e. the percentage of channel length comprised of pools), and association with large woody debris (LWD) (See HRC SOP-14, *Stream habitat typing and measurement*, for detailed methodology). Stream temperature is the longest continuously-monitored habitat parameter on record in Stitz Creek (See HRC SOP-09, *Temperature instrumentation and deployment*, for detailed methodology), with ten years of data at ATM-171 and one year at ATM-172 (Figure 3). Stream temperature (˚C) is recorded during the warmest part of the year (typically June through September) using continuous recording data loggers (Onset HOBO® Water Temp Pro v2).

Temperature data are used to calculate the maximum weekly average temperature (MWAT), or the average of the daily mean temperature measured during the warmest seven consecutive days each year. The APFC target value for MWAT is ≤16.8 ˚C.

Table 1. Habitat parameters measured at Stitz Creek ATM-171 (2000-2018)

ATM 171 Stitz Creek	Parameter	Target Value (# no target)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Bed Surface	D_{84} (mm)	#	79																		
	D_{50} (mm)	65-95	22																		
	D_{16} (mm)	#	<1																		
	D_5 (mm)	#	<1																		
Pool Characteristics	Pool Area (%)	≥25	64																		
	Pool Spacing (CW/pool)	≤6	3																		
	Residual Pool Depth (m)	≥.91	0.47																		
	Pools Assoc. w/wood (%)	≥50	86																		
Large Woody Debris	Total Piece Frequency (#/100 ft)	≥5.1																			
	Total Piece Count	#																			
Water Temperature	MWAT (°C)	≤16.8					17.9	16.6	17.1	17.3	16.3	16.0	14.8	15.3						16.8	15.8
Riparian Overstory	Canopy Over Stream (%)	≥90																			
	Canopy of Rip Forest (%)	≥85																			

Table 2. Habitat parameters measured at Stitz Creek ATM-172 (2000)

ATM 172 Stitz Creek	Parameter	Target Value (# no target)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Bed Surface	D_{84} (mm)	#	14																
	D_{50} (mm)	65-95	5																
	D_{16} (mm)	#	<1																
	D_5 (mm)	#	<1																
Pool Characteristics	Pool Area (%)	≥25	31																
	Pool Spacing (CW/pool)	≤6	2																
	Residual Pool Depth (m)	≥.91	0.25																
	Pools Assoc. w/wood (%)	≥50	75																
Large Woody Debris	Total Piece Frequency (#/100 ft)	≥5.1	1.9																
	Total Piece Count	#	169																
Water Temperature	MWAT (°C)	≤16.8																	15.80
Riparian Overstory	Canopy Over Stream (%)	≥90																	
	Canopy of Rip Forest (%)	≥85																	

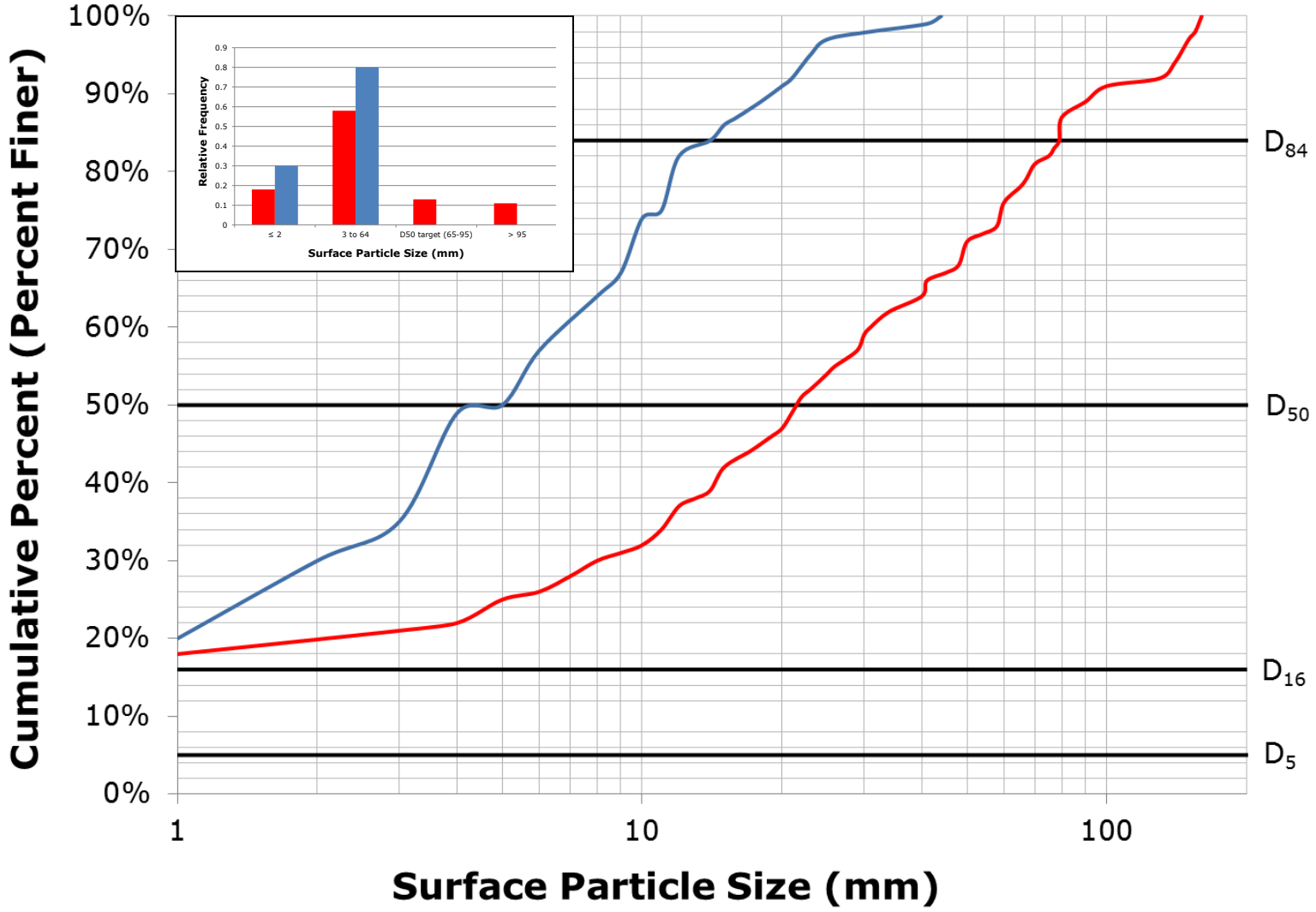


Figure 2. Cumulative percent (percent finer) and corresponding relative frequency distribution (insert) of surface substrate particle sizes at ATM-171 (red) and ATM-172 (blue) in Stitz Creek, 2000

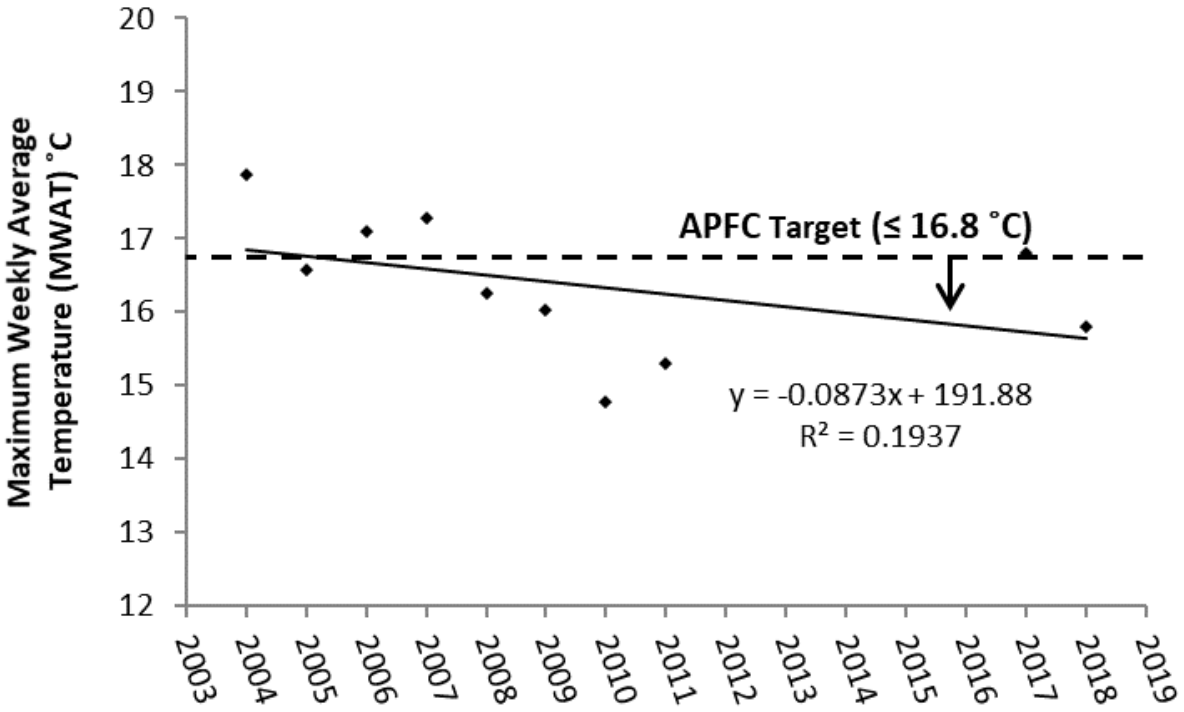


Figure 3. MWAT records at ATM-171 suggest a trend towards the APFC target for stream temperature in Stitz Creek (2004-2018)

Biological Sampling and Habitat Inventory

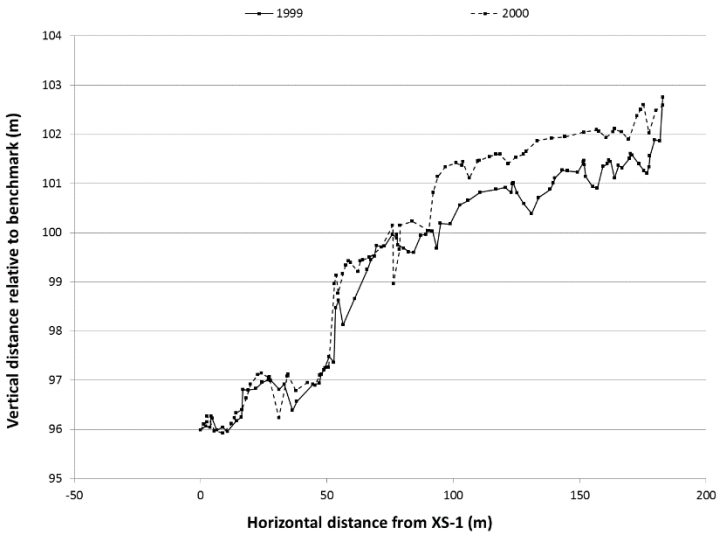
Three surveys were conducted in Stitz Creek to document fish presence and/or quantify available salmonid habitat. The first survey, conducted in 1992 by the California Department of Fish and Game (DFG) as part of the North Coast Basin Planning Project (BPP), documented the presence of steelhead (*Oncorhynchus mykiss*), quantified available fish habitat, and identified a number of "problem sites" within the channel including road crossing(s) and log jams. The second survey, conducted in 2000 by Pacific Lumber Company (PALCO) field technicians, documented cutthroat trout (*Oncorhynchus clarki clarki*) and steelhead presence by electrofishing upstream of the 11 foot falls formed by the culvert crossing Shively Road. The third survey, conducted in 2010 by members of the Americorps Watershed Stewards Project (WSP) under the guidance of DFG, documented current habitat conditions and recommend potential habitat enhancement options for anadromous salmonids. The WSP survey also

documented salmonid presence throughout the surveyed reach which extended approximately 3,300 feet upstream from the Eel River confluence.

All three surveys verified fish presence upstream of the Shively Road crossing. The culvert structure was identified as a candidate for modification in order to improve fish passage and is currently considered an anadromous barrier, though there remains a viable resident population of trout successfully reproducing upstream. Although the available fish habitat upstream of Shively Road is currently limited to resident salmonids, it was recommended that Stitz Creek be managed as an anadromous, natural production stream. Other fish species documented in Stitz Creek in 2010 included three-spined stickleback (*Gasterosteus aculeatus*), California roach (*Lavinia symmetrics*), and Sacramento pike minnow (*Ptychocheilus grandis*).

Streambed Elevation Surveys

A long profile thalweg survey was conducted within ATM-171 in 1999 and 2000 (Figure 4). The survey follows standard HRC operating procedures (see HRC SOP-31, *Survey with a total station*, for detailed methodology) extended approximately 180 meters beginning at the downstream extent of the ATM reach. Proceeding upstream, the position of the thalweg was established at each break between riffles and pools and within the deepest part of each pool. One cross-section (XS-1) was measured at the lowest point of the thalweg profile during each of the two survey years (Figure 5). Cross-sectional area was determined below a reference elevation typically set at a channel feature associated with bankfull depth.



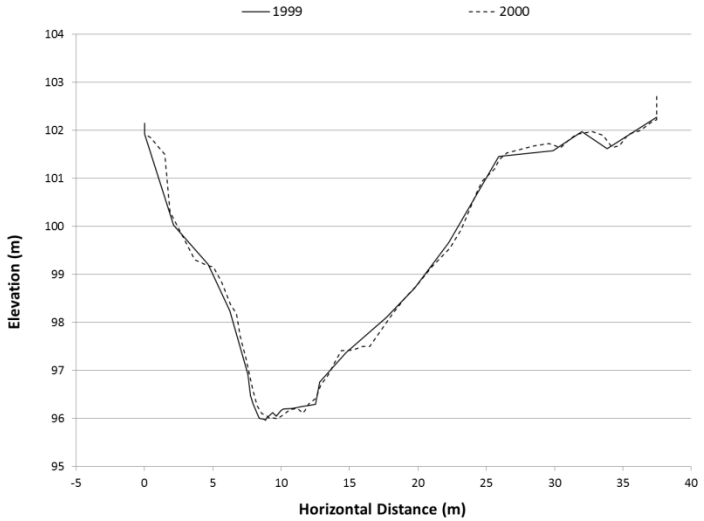


Figure 5. Long profile thalweg survey (above) and cross-section survey (below) data for Stitz Creek ATM-171, 1999-2000

Discussion

Given the limited scope of data collection, trends in habitat and stream morphology are difficult to assess in Stitz Creek. Pool area and pool wood association appeared to be sufficient in 2000 while other habitat parameters did not meet APFC targets that were established at that time. More data are available regarding water temperature and these measurements suggest favorable conditions in the watershed.

From 1999-2000 streambed elevations in lower portions of Stitz Creek aggraded towards the upper extent of the survey profile and remained fairly stable in the lower extent. Data from cross-section 1 reinforces the latter observation as very little change was measured during the same period. Thalweg and cross-sectional profiles were discontinued in 2000 due to access issues and the high abundance of large wood in the channel.

Based on the physical and biological data collected since 1992, the Stitz Creek watershed appears to provide sufficient habitat conditions which support a viable population of resident steelhead and cutthroat trout. Anadromy is currently limited to the lower stream reaches downstream of the Shively Road crossing. However, anadromy may be restored to the upper watershed through proper design and modification of the current road crossing. The extent to which anadromous fish might utilize the upper watershed is unknown due to relatively small surface substrate particle sizes, gradient limitations, and the presence of multiple LDAs (large woody accumulations).

References

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