State of California Department of Fish and Wildlife

## Memorandum

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# Subject: 2018 Direct Observation Fisheries Survey of the Chili Bar Reach of the South Fork American River

#### Introduction

This report documents the findings of a monitoring survey conducted by California Department of Fish and Wildlife (CDFW) of the South Fork American River (SFAR). The purpose of the monitoring effort was to determine species distribution and relative abundance of native and non-native fresh water fishes in the "Chili Bar Reach"; the portion of the SFAR between Chili Bar dam and Coloma, California (**Figure 1**).

### Background

Flows in the Chili Bar Reach are determined by releases and spills from Chili Bar dam and Chili Bar Reservoir. The dam is owned and operated by Pacific Gas & Electric Company (PG&E) to generate electricity from a single seven megawatt turbine unit (FERC 2155). Most commonly, Chili Bar Reservoir stores releases during off-peak hours and generates electricity during peak hours (State of California 2013). As a result, Chili Bar Reach flows fluctuate daily (**Figure 2**). Extreme fluctuations in flow can



**Figure 1.** Overview map of the South Fork American River between Chili Bar Reservoir and Folsom Reservoir. The location of the 2018 direct observation fisheries survey is identified by the hash-marked box. The locations of Placerville, CA and Auburn, CA are included for reference.



**Figure 2.** Graph of representative daily mean discharge in cubic feet per second (y-axis) over time (x-axis) as recorded by U.S. Geologic Survey stream gauge at Chili Bar Dam. The time series covers February 2018 to October 2018 (source: <u>https://waterdata.usgs.gov/)</u>.

adversely impact riverine ecosystems, including resident fish populations and the benthic macroinvertebrate community on which they depend.

#### Methods

To characterize the fish assemblage and relative abundance of fish populations in the Chili Bar Reach, CDFW conducted direct observation surveys via snorkeling methods from October 30 to November 1, 2018. CDFW coordinated with PG&E to maintain Chili Bar dam releases at minimum flow (300 cfs) during the survey period. Five contiguous sections were surveyed (**Figures 3 & 4**) in an effort to capture all habitat within the Chili Bar Reach. River access is extremely limited along much of the reach. As a result, CDFW coordinated with American River Conservancy (ARC) to access the river via their property at Chili Bar Put-In.

CDFW crew entered the river each day at Chili Bar Put-In and used single-person, inflateable PVC kayaks to paddle downstream to the beginning of a survey reach. Once at a survey reach, five divers would begin the direct observation survey, proceeding downstream to the end of a survey reach. Additional crew were necessary to manage the unused kayaks and maintain a safety watch for the divers. At the end of the work



**Figure 3.** Detail topographic map of the Chili Bar Reach of the South Fork American River. The upstream boundary of each survey section is marked by a red triangle. The end point of SFAR-5 is marked with a purple triangle. The common names of features and rapids are noted with callout text for reference.



**Figure 4.** Aerial imagery of the Chili Bar Reach of the South Fork American River. The upstream boundary of each survey section is marked by a red triangle. The end point of SFAR-5 is marked with a purple triangle. The common names of features and rapids are noted with callout text for reference.

day, all crew paddled downstream to a designated takeout at American Whitewater Expeditions in Coloma, CA. All kayaks, paddles, and safety equipment were loaned to CDFW by American Whitewater Expeditions for the purposes of this survey.

The direct observation protocol followed the widely accepted guidelines as presented in the literature (O'Neal 2007; Murphy and Willis 1996; Hawkins and Reeves 1988). Five divers maintained an evenly spaced line perpendicular to the current, to the extent possible, and counted fish by species. All observed trout were further separated and counted by size class.

Size classes were divided into the following categories: young of year (YOY); small (< 6 inches); medium (6-11.9 inches); large (12-17.9 inches); and extra-large ( $\geq$  18 inches).

Divers were instructed in both visual size class estimation and proper snorkel survey techniques prior to starting the survey (e.g., dominant side, extent of visual survey area, safety considerations, etc.). For each section, a shore person used GPS to collect start and end coordinates and a track of the section.

Due to the size of the river and the extreme fluctuations in flow and stage, traditional habitat typing has little relevance. The category (e.g., flatwater, riffle, or pool) of a section of the river would change the same day as river stage increased or decreased. Instead, representative photographs were collected during the survey at minimum flow (300 cfs) and the photos were analyzed for the presence of pool, riffle, and flatwater habitats. All habitat types present within a survey reach were noted.

Fish abundance was estimated for each species and survey section by dividing the total number of fish observed by the total length of stream habitat surveyed to calculate fish per mile (fish/mi).

#### Results

**Figure 5** summarizes the observations from the total survey of Chili Bar Reach. **Table 1** provides summary details for each of the five survey sections. In total, CDFW surveyed 5.41 river miles and observed 532 individual fish encompassing five species.

Rainbow Trout (RT; *Oncorhynchus mykiss*) was the most abundant species, accounting for 62% (n=330) of the fish observed with an estimated abundance of 61 fish/mi. Sacramento Sucker (SKR-S; *Castostomus occidentalis*) was the next most frequent species observed (23%; n=124) with an estimated abundance of 23 fish/mi. Sacramento Pikeminnow (SPK; *Ptychocheilus grandis*), Brown Trout (BN; *Salmo trutta*), and

Chinook Salmon (CHIN; *Oncorhynchus tshawytscha*) were much rarer encompassing 8% (n=41), 7% (n=35), and 0% (n=2) of the total catch, respectively.

Other species known to occur within Chili Bar Reach include Riffle Sculpin (*Cottus gulosus*) and Hardhead Minnow (*Mylophardoon conocephalus*). Neither species was observed by CDFW during the 2018 survey. However, divers were not able to distinguish between Hardhead Minnow and Sacramento Pikeminnow. As a result, some portion of the observed Sacramento Pikeminnow may be Hardhead Minnow.



**Figure 5.** Summary details of all fish observed during the 2018 direct observation fisheries survey of Chili Bar Reach SFAR.

**Figure 6** summarizes the length frequency of three sportfish species observed during the 2018 survey. Four size classes of Rainbow Trout and Brown Trout were observed. Only two adult Chinook Salmon were observed. Medium-sized Rainbow Trout was the most frequently observed size class of any species, accounting for 36% (n=193) of all observations with an estimated density of 36 fish/mi. Rainbow Trout were abundant in survey sections containing riffle habitats (**Table 1**). Large-size was the most abundant

Reach	Reach Length (ft)	Habitat Types	Species	Number of Fish Observed					Estimated
				Small < 6"	Medium 6" - 11.9"	Large 12 - 17.9"	Extra Large > 18"	Total	Density (fish/mi)
SFAR-1	6,086	Run Pool	Brown Trout	0	1	5	0	6	5
			Chinook Salmon	0	0	1	0	1	1
			Pikeminnow	0	1	6	2	9	8
			Rainbow Trout	9	26	19	4	58	50
			Sacramento Sucker	0	1	34	1	36	31
SFAR-2	2,969	Riffle	Pikeminnow	0	2	2	0	4	7
			Rainbow Trout	18	26	11	0	55	98
SFAR-3	2,756	Pool Riffle	Brown Trout	0	1	2	1	4	8
			Pikeminnow	0	1	0	0	1	2
			Rainbow Trout	0	8	10	1	19	36
			Sacramento Sucker	0	3	42	6	51	98
SFAR-4	5,938	Run Pool Riffle	Brown Trout	3	3	3	2	11	10
			Pikeminnow	5	0	6	0	11	10
			Rainbow Trout	19	52	14	0	85	76
			Sacramento Sucker	0	3	8	0	11	10
SFAR-5	10,827	Run Pool	Brown Trout	0	3	11	0	14	7
			Chinook Salmon	0	0	0	1	1	0
			Pikeminnow	3	7	4	2	16	8
			Rainbow Trout	21	81	29	2	133	65
			Sacramento Sucker	0	7	19	0	26	13

 Table 1. Reach, size class, and species specific summary details of the 2018 direct observation survey at Chili Bar

 Reach SFAR.





size class of Brown Trout observed with an estimated density of 21 fish/mi. Brown Trout were more abundant in survey sections containing pool or run habitats. No YOY of any species were seen, therefore the YOY size class was excluded from the figure.

The presence of small and medium sized trout suggests natural reproduction and rearing is occurring within the Chili Bar Reach. It is unclear if Chinook Salmon naturally reproduce within the reach. Recent stocking of salmon in Folsom Reservoir use sterile triploid fish. However, historic stocking of Chinook Salmon used diploid fish that may have been able to establish a naturalized population in the SFAR.

#### Discussion

Results from the 2018 CDFW direct observation survey of Chili Bar Reach demonstrate a very low fish abundance for all observed species and size classes (<100 fish/mi). Trout spawning and rearing does occur in situ, but with relatively low recruitment to adult size classes. These results are consistent with other heavily fluctuating tail water systems. As of the writing of this report, flows within this reach fluctuate daily between minimum flow (300 cfs) during low demand hours to 1,500 cfs during peak power demand (**Figure 7**). Severe fluctuations over short temporal spans impair physical habitats and water quality; and increase risk of stranding and decrease survival of eggs, fry, and juvenile fish.



**Figure 7.** Graph of representative daily discharge fluctuations in cubic feet per second (y-axis) over time (x-axis) as recorded by US Geologic Survey stream gauge at Chili Bar Dam. The time series covers 19 Dec. 2019 to 15 Jan. 2020 (source: www.dreamflows.com).

Brown Trout observations suggest that the resident population is very small and perhaps not self-sustaining. It is more likely this fishery is supported by upstream migrations from higher quality spawning and rearing habitats downstream. There are too few Chinook Salmon observations to draw meaningful conclusions. However, it is most likely this fishery is supported by migrations from plants at Folsom Reservoir and/or higher quality downstream spawning and rearing habitats.

Detection probability of small and juvenile fish was low due to several issues, some of which could be ameliorated with changes to the survey design. Surveying downstream, rather than the preferred upstream direction, can be problematic. The principle issue is that downstream divers are approaching most fishes head on, who will scatter before the diver can see them. In addition, downstream divers often become concentrated in the thalweg, or other river sections with swift current, and are swept past slow current microhabitats where small fish may congregate. While surveying the entire reach

upstream is not possible, it may be possible to survey microhabitats where the water velocity and river morphology permit upstream swimming. To increase detection probability of small fishes, future surveys of the Chili Bar Reach will utilize smaller and finer scale survey sections, some of which will be surveyed upstream.

The timing of the survey may also have contributed to the low densities of fish observed. Assuming Chinook Salmon and Brown Trout are migrating into Chili Bar Reach from downstream habitats, identifying the timing of those movements and planning surveys around that timing may increase the detection of adult fish. Angler surveys may be useful in identifying timing of movements.

## Future Needs

Additional surveys are necessary to better understand salmonid spawning and rearing locations and success, especially for Brown Trout and Chinook Salmon. The findings of this survey result in several recommendations for future surveys.

- 1. Conduct a direct observation survey along the SFAR from Coloma, CA to Salmon Falls.
- 2. Conduct backpack electrofishing surveys on select perennial tributaries to the SFAR to identify spawning and rearing habitat.
- 3. Resurvey Chili Bar Reach with smaller and finer scale survey reaches, and survey upstream within microhabitats as flow and conditions allow.
- 4. Seasonal data on adult migration is necessary to determine if the current fishing regulation schema is appropriate to protect spawning adults.

## References

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**Photos 1 & 2.** Upstream (top) and downstream (bottom) photos of the start of SFAR-1.



**Photos 3 & 4.** Upstream (top) and downstream (bottom) photos of SFAR-2 taken near the mid-point of the survey reach. The upstream (top) photo features Meatgrinder rapid.



**Photos 5 & 6.** Upstream (top) and downstream (bottom) photos of the start of SFAR-3.



Photo 7. SFAR-4 near the mid-point of the survey reach.



**Photo 8.** Upstream photo of SFAR-5 at Threat #3 of Triple Threat rapid.