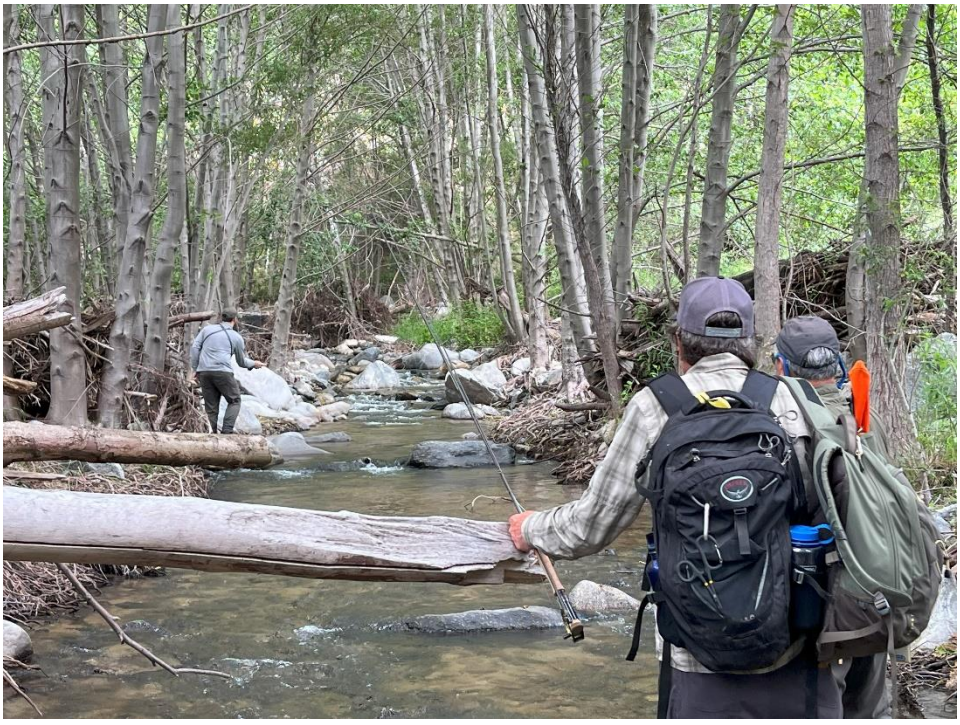
Arroyo Seco Summary Report
June 2024

California Department of Fish and Wildlife
Inland Fisheries Program

Prepared by Micah Palomino

For

Joseph Stanovich



Introduction:

This report is a follow up technical report to the 2023 Arroyo Seco Summary Report (O'Brien and Stanovich 2021) and is intended to continue to focus on the health of native coastal Rainbow Trout population (*Onchorhynchus mykiss*) within the Arroyo Seco. On November 24 and December 1, 2020, a total of 469 Rainbow Trout (RBT) were released into the Arroyo Seco and distributed over 2.5 miles of stream. Much of the population within Arroyo Seco is believed to be from the coastal rainbow trout translocation effort that was

undertaken by CDFW staff. This translocation occurred due to emergency actions related to the Bobcat Fire (Pareti, 2021 and 2020b).

Arroyo Seco Creek

The Arroyo Seco (AS), a tributary to the Los Angeles River, is comprised of two major components – the upper watershed above Devil's Gate Dam and lower watershed below the dam (Figure 1). The lower watershed has been highly impacted by anthropogenic disturbances including barriers and channelization for flood control and is therefore no longer suitable to support coastal RBT populations (O'Brien 2010; O'Brien & Stephens 2012; O'Brien & Stephens 2012b). The upper AS also has anthropogenic impacts, including Brown Mountain Dam (approximately 5.5 miles upstream of Devil's Gate), but was known to support a RBT population in recent years. However, the watershed burned extensively in the 2009 Station Fire which likely led to extirpation of the RBT population.

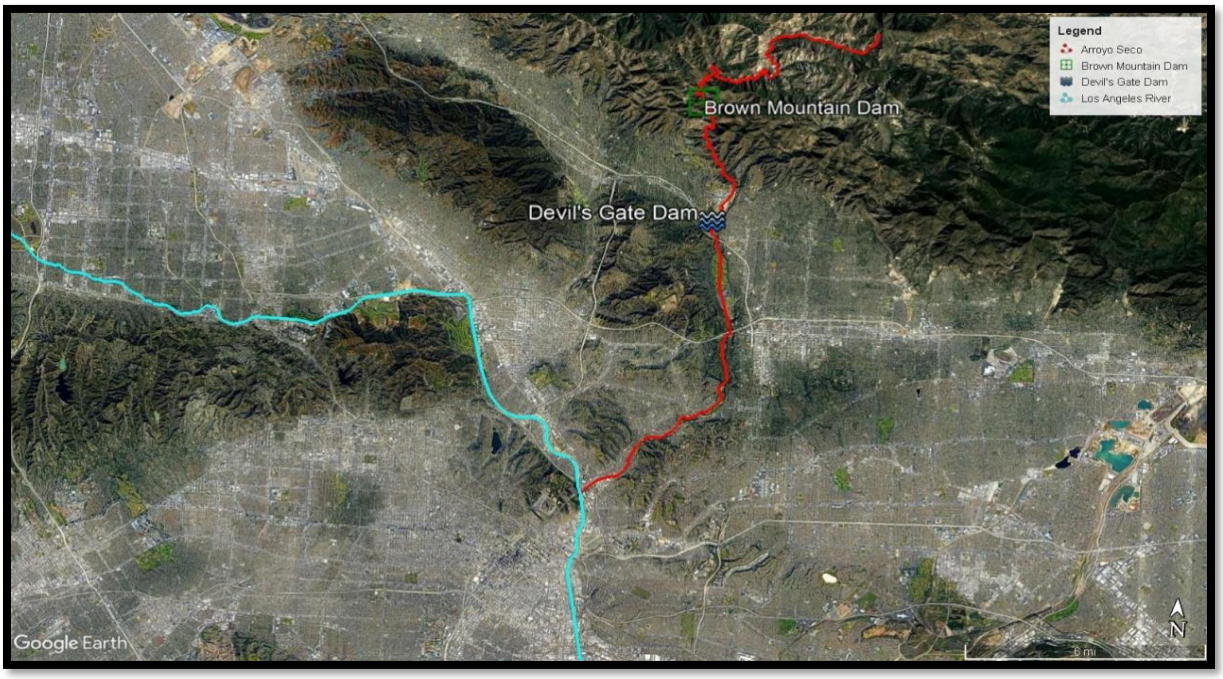


Figure 1. The Arroyo Seco (red), a tributary to the Los Angeles River (blue), is shown with the upper watershed located upstream of Devil's Gate Dam.

Methods:

Direct Observation Snorkel Survey

CDFW staff conducted a direct observation fisheries survey on AS. Direct observation snorkel surveys are an effective technique for assessing trout populations in southern California. One diver, equipped with a mask, snorkel, and wetsuit, entered a

habitat unit at the downstream end and swam or crawled to the upstream end, counting, identifying, and recording all the fish they saw. In small streams or habitat units, a single, experienced diver can effectively count and identify all fish in a single pass. In larger streams or complex habitat units, a combination of divers working together systematically may be necessary to determine fish numbers (Flosi et al. 2010).

Stream reaches that were dry or too shallow (< 4 inches) to snorkel were instead surveyed via streamside visual observations, as described in the *Stream Bank Observation* section of the California Salmonid Stream Habitat Restoration Manual. Visual counts from streambanks are a preferred method for assessing fish populations when shallow water depths preclude underwater observation or when alternative capture methods that generate mortality need to be avoided (Bozek and Rahel 1991). Depending on conditions, counts from stream banks may be superior to alternative methods such as electrofishing (Bonneau et al. 1995). Observation of fish from the stream bank or other vantage points is a commonly used technique to determine presence or absence of fish. It also provides "gross" estimates of fish numbers in sampled habitats (e.g., 10-20 young-of-year steelhead) (Flosi et al. 2010).

In some instances, a bank-side observer assisted the diver by counting fish in the areas too shallow to dive or at the upstream boundary of sections where the break in habitat or gradient was not distinct enough to limit fish movement out of the section. All observed trout were counted and categorized by the following size classes based on the following categories: young of the year (YOY), 0-2.9 in, 3-5.9 in, 6-8.9 in, 9-11.9 in, ≥12 inches.

YOY are defined by the Heritage and Wild Trout Program (HWTP) as emerging from the gravel in the same year as the survey effort. Depending on the species, date of emergence, relative growth rates, and habitat conditions, the size of the YOY's varies greatly, but are generally between zero and three inches in total length (Weaver and Mehalick 2008). If an individual was observed to be less than three inches but was difficult to determine whether it emerged from the gravel in the same year, by default it was classified in the small (0-2.9 inches) size class. When possible, the diver also categorized each trout by the presence or absence of the adipose fin when they had a clear visual on a particular fish and felt confident in the observation.

Each snorkeled habitat unit was measured (length, width, maximum depth) and categorized as riffle, pool, or flatwater (Flosi et al. 2010). The length of each habitat unit was measured along the thalweg of the creek and was determined by distinct breaks in habitat types or creek gradient. Data was also recorded for other aquatic species (amphibians, aquatic snakes) observed by snorkelers and as the surveyors walked upstream.

Hook and Line and Relative Weight

CDFW staff collected length and weight data of RBT captured via a hook and line survey. The team worked with the Pasadena Casting Club, within AS and calculated relative weight (Wr) to determine the well-being of the population. Furthermore, this allowed CDFW staff to examine all captured fish for external parasites or disease.

Working with members of the Pasadena Casting Club, each personnel of the CDFW team led 3-4 club members to conduct a hook and line survey through 5 separate reaches of AS. The reaches were split up into approximately the same distances of stream to attempt to cover equal amount of habitat. Once a RBT was caught a CDFW staff measured the length and weight of the fish. Each reach of stream was surveyed for 2 hours. The data collected from the hook and line survey was used to calculate relative weight of the RBT within AS.

Relative weights (W_r) were used to represent the overall condition describing how healthy a fish is at any given length. To determine the W_r for species sampled, the following equations were used:

$$\mathbf{W_r = (W / W_s) \times 100}$$

Where:
W_r = the condition of an individual fish.
W = weight in grams
W_s = length-specific standard weight predicted by a length-weight regression for a species.
The equation to determine the W_s is:

$$\mathbf{\log10 (W_s) = a' + b * \log10 (L)}$$

Where:
a' = intercept value
b = slope of the log10 (weight) – log10 (length) regression equation
L = maximum total length

The intercept & slope parameters for standard weight (W_s) equations were taken from the weight-length regression standard (Wege and Anderson 1978). Utilizing these W_r equations, fish of all lengths, regardless of species, are in good condition with a W_r of 100. Distance from 100, above or below, indicated a healthier or poorer condition relative to the standard.

Results:

Direct Observation Snorkel Survey

In June 2024 (6/4, 6/5, 6/6), CDFW staff conducted a direct observation snorkel survey on approximately 3.31 river miles of the AS between the Pasadena Water and Power

Diversion (N 34.202980, W -118.166475) and Brown Mountain Dam (N 34.237767, W -118.181503. CDFW staff snorkeled every location possible for RBT to use as refuge, totaling 3.5 miles.

One hundred and twenty-five habitat units were surveyed and categorized as flatwater, riffle, or pool. In previous surveys all habitat types dimensions were measured however in this year's survey only significant pools were measured for length, width, and depth (Table 1). There was still a substantial amount of flow due to significant storms early in the 2022/2023 rain year as well as above average rainfall in the 2023/2024 rain year, which allowed the stream to sustain flows from the previous year. In 2022, Devil's Gate Dam measured accumulated precipitation at 15.12 inches, whereas in 2023 the accumulated precipitation was measured at 42.95 inches and in 2024 the accumulated precipitation was 23.54 inches (Figure 2).

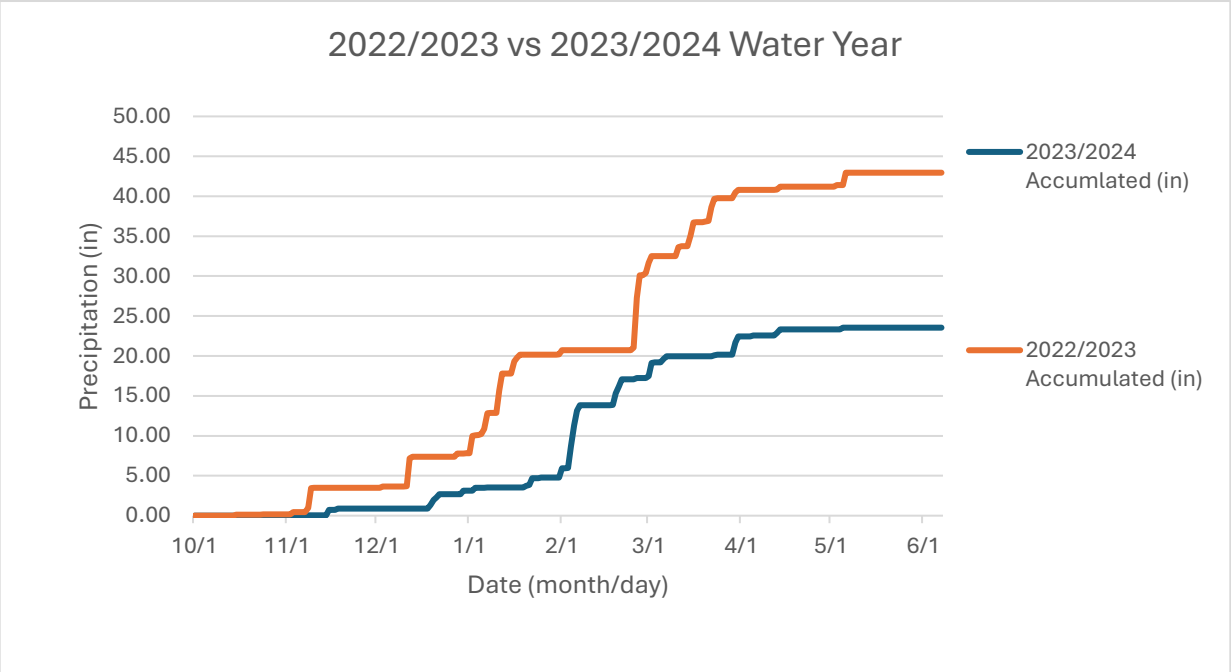


Figure 2. Accumulated Rain in inches throughout the 2022-2023 and 2023-2024 water year.

A total of 4,404 RBT were observed of varying size classes within the survey reach (Table 2). Most of the fish were categorized as 3-5.9 inches, with 1753 individuals (41.7%) observed in this size class. In 2023, most fish observed were in the 6-8.9 inches size class. The number of trout observed by approximate river mile and size class is shown in Figures 3-4.

Table 1. Total length, representative average width, and average maximum depth by habitat type per year. This year's survey only recorded dimensions of pool habitats.

Habitat Type	2024 Total Length (ft)	2023 Total Length (ft)	2022 Total Length (ft)	2024 Average Width (ft)	2023 Average Width (ft)	2022 Average Width (ft)	2024 Avereage Maximum Depth (ft)	2023 Average Maximum Depth (ft)	2022 Average Maximum Depth (ft)
Run	NA	3442.2	3837.0	NA	15.8	8.0	NA	1.7	0.9
Pool	1025.2	1768.2	1183.0	20.1	19.1	10.3	2.4	2.5	2.7
Riffle	NA	13294.8	12480.0	NA	16.5	8.6	NA	1.6	0.8
Not Recorded	~16475	0	0.0	NA	0.0	0	NA	0	0
Total	~17500	18505.2	17500.0		17.1	9.0		1.9	1.5

Table 2. June 2024, 2023, 2022, & 2021 AS RBT totals by size class.

	2024 Total Fish	2023 Total Fish	2022 Total Fish	2021 Total Fish	2024 Percent of Total	2023 Percent of Total	2022 Percent of Total	2021 Percent of Total
YOY	0	51	21	90	0.00%	7.8%	1.0%	20.6%
0-2.9	1257	133	1549	177	29.91%	20.2%	74.0%	40.6%
3-5.9	1818	169	408	129	43.25%	25.7%	19.5%	29.6%
6-8.9	858	207	84	26	20.41%	31.5%	4.0%	6.0%
9-11.9	348	86	23	13	8.28%	13.1%	1.1%	3.0%
12+	123	11	7	1	2.93%	1.7%	0.3%	0.2%
Total	4404	657	2092	436	104.78%	100.0%	100.0%	100.0%

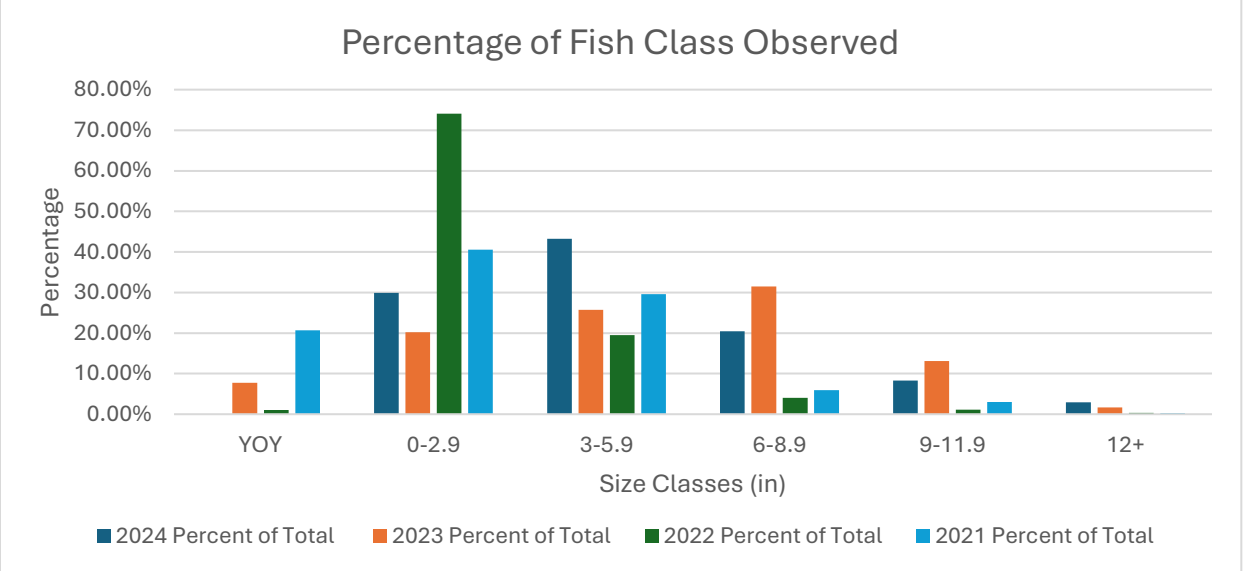


Figure 3. Percent of total RBT by size class observed in AS from 2021-2024.

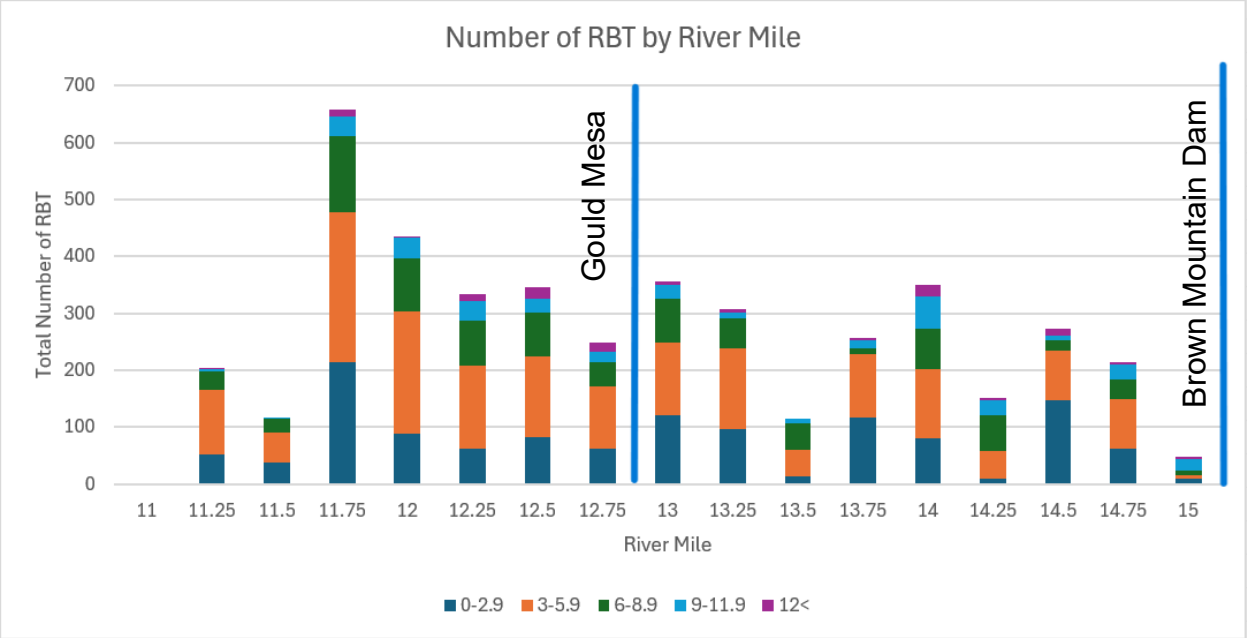


Figure 4. Total number of RBT observed by river mile.

Relative Weight

Twenty-five (25) fish were captured via hook and line and were measured and weighed. 17 RBT captured were >120 mm, allowing for calculation of Wr (Figure 5). RBT <120 mm are not typically used for relative weight calculations because they provide unreliable weights (Simpkins and Hubert 2023). Average Wr for RBT captured was 101. Total lengths of all RBT caught ranged from 95mm to 271mm. The average length of RBT >120mm was 202 mm.

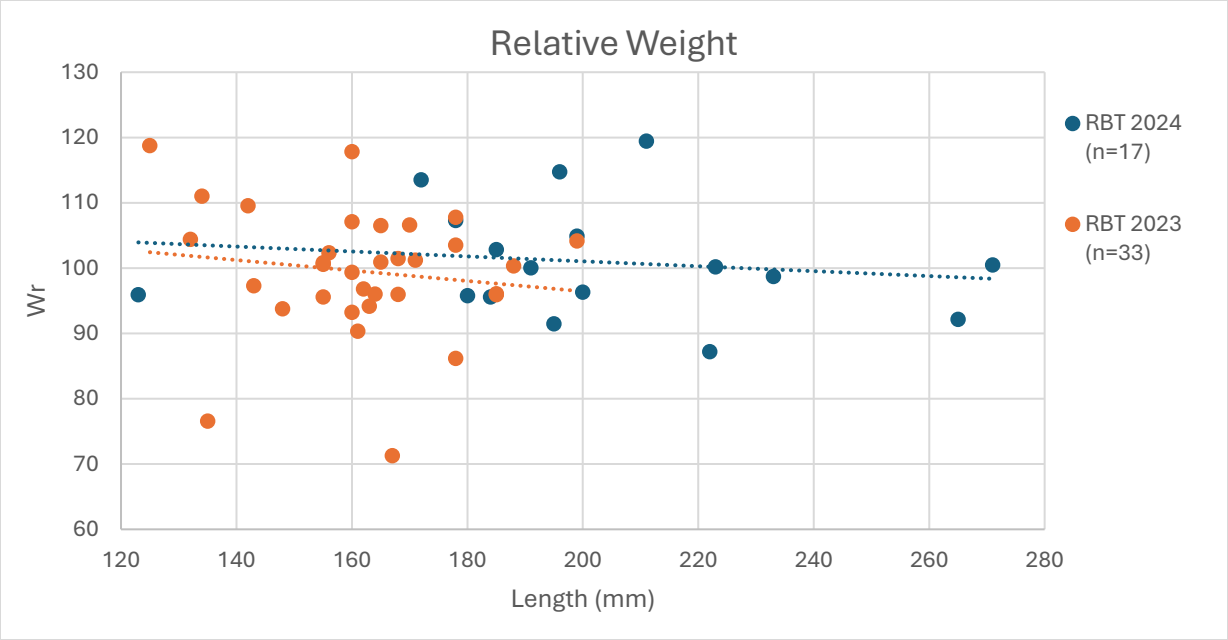


Figure 5. Relative Weight of RBT >120 mm caught during the hook and line survey.

Photo 1. Pasadena Casting Club participated in the hook and line survey to collect fish for CDFW staff.

Photo 2. RBT captured in AS, June 2024.

Discussion:

The 2024 survey observed over six times the (amount or number) of RBT than last year's survey. Based on the number of RBT observed and the conditions of the watershed during the June 2024 survey, it appears that the established population within AS is still healthy. This could be attributed to the fact that better conditions i.e., thermal stability, suitable dissolved oxygen, and greater water availability, may have attributed to good health in fish. During the 2022-2023 water year, AS experienced sustained high flow events due to above average amounts of precipitation and snow melt. As a result, during sustained high flow events there was a decline in habitat quality for spawning trout (Yao et. al 2017) and may have also had a displacement effect on RBT, moving fish downstream (Hilwig and MaKinster 2008) which led to a decrease in the number of RBT observed in the June 2023 survey. However, high flow events from 2022/2023 water year combined with the 2023/2024 water accumulation, may have led to continued beneficial discharge within AS, increasing potential habitat and spawning grounds.

All size classes of RBT were observed during this survey, except for young of the year (YOY). However, fish less than 2.9 inches observed during the survey, included observed YOY. Presence of YOY RBT and RBT less than 2.9 inches indicates that successful reproduction continues to occur within the population. Most fish observed were in the size class 3-5.9 in compared to 2023 where most fish observed were in 6-8.9 in size class. However, it is to be noted that the total number of fish observed in 2023 was 657 and during this year's survey 4,404 fish were observed. It should also be recognized that all

size classes of RBT had more fish observed during this year's survey than any size class count in the 2023 survey. Based on the results of size class distribution there appears to be successful recruitment across all size classes (Table 2).

Mean Wr for RBT (greater than 120mm) sampled was 101, indicative of a population with slightly above average health. Using the relative weight equation, it is known that a Wr of 100 shows the population to be in good condition, and the distance from 100 above or below determines healthier or poorer condition respectively. Although the Wr mean results of this survey were higher than the 2023 survey, a plot of relative weight displays a linear negative relationship (Figure 5). This indicates that the Wr of RBT decreases as the total length of individual fish increases, which is also reflective of last years survey results. This linear negative relationship shows that larger fish in the system remain slightly poorer in health. Some assumptions for this may be due to prolonged effects of more energy expended from larger trout over a long period of time during the previous two winters (Figure 2) consequently leading to a decrease in relative weight.

High flows experienced in water years 2022-2023 and 2023-2024 may lead to greater spawning success of RBT through flushing of fine particulate organic material built up over the prolonged drought and exposing interstitial spaces within the substrate. Additionally, flows continued to provide favorable pools, similar to the amount of pool habitat type found in the previous two years of surveying (Table 1).

Conclusion and Recommendation:

South Coast Region 5 fisheries staff recommends continuing spring, summer, and fall evaluations of RBT population to observe fluctuating limitations of habitat and health of population structure, distribution, and abundance. With the substantial water availability, drought conditions have decreased, however drought conditions likely will continue to fluctuate in the coming years. It is necessary to continue the frequency of survey techniques and locations as drought conditions are expected to return.

Lastly, CDFW should explore creating a put and take fishery within the lower section of the Arroyo Seco and keeping a wild trout fishery within the upper section of the Arroyo Seco to Brown Mountain Dam. It may also be beneficial for CDFW to explore logistics to survey potential fisheries or habitat above Brown Mountain Dam.

Acknowledgements:

Thank you to CDFW staff Micah Palomino, Abram Tucker, Isabella Fusco, Allison Linskey, Cara Munro, Zoie Jones, and Cassie Bretz, and the Pasadena Casting Club and CalTrout's Russell Marlow for participating in the 2024 AS assessment survey.

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