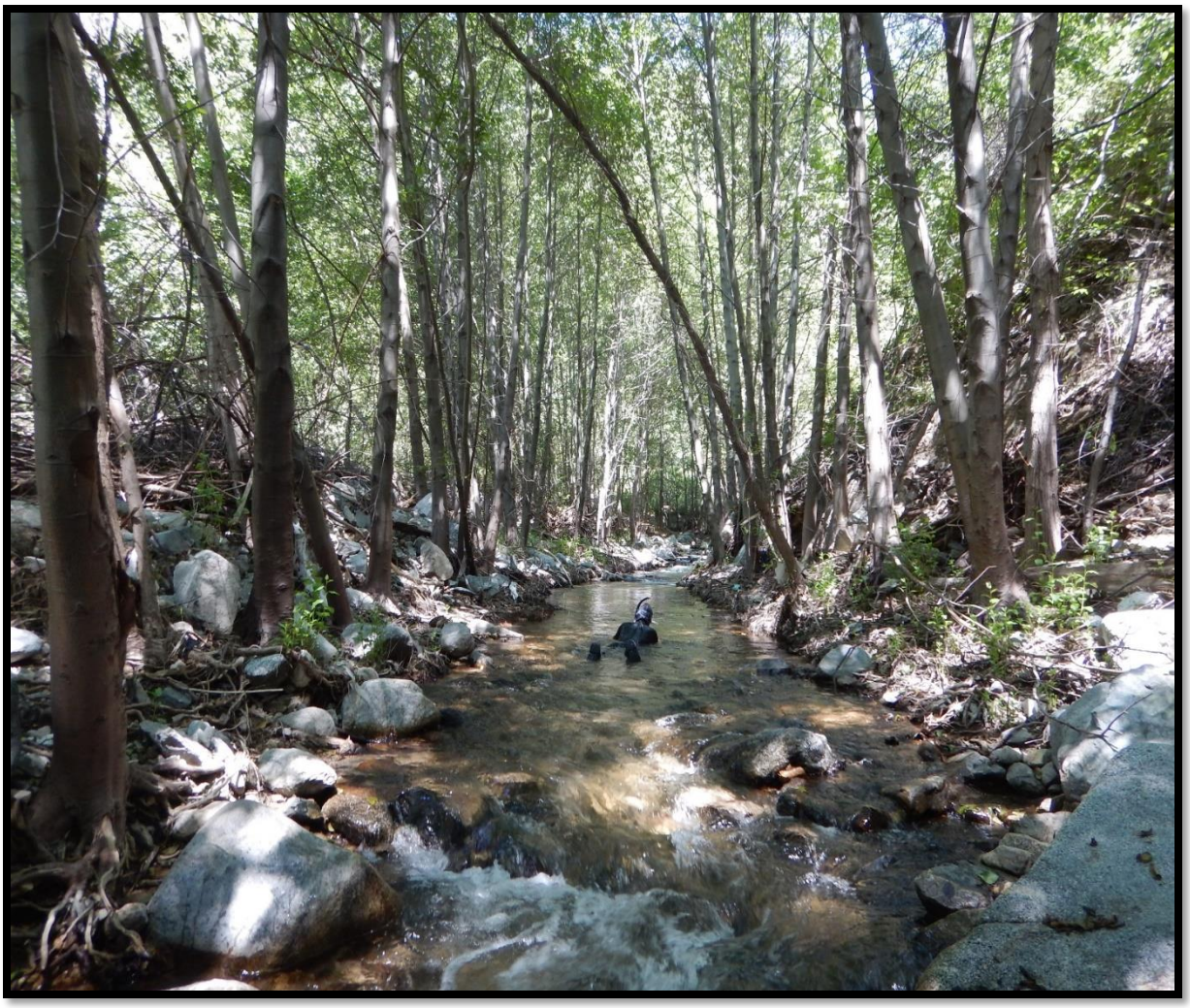
Arroyo Seco Summary Report
June 2023

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 2022 Arroyo Seco Summary Report (O'Brien and Stanovich 2021) and is intended to continue the focus on the health of native coastal rainbow trout population (*Onchorhynchus mykiss*) within the Arroyo Seco (AS). On November 24 and December 1, 2020, a total of 469 RBT were released into the AS 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 rainbow trout (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.

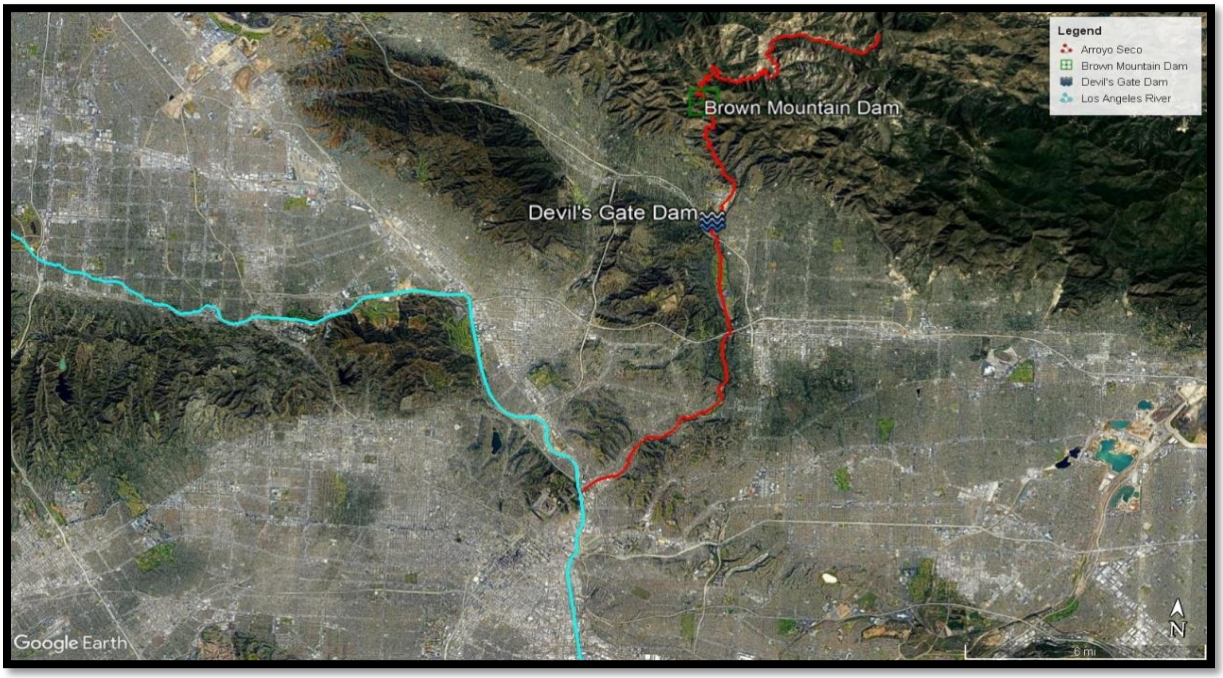


Figure 1. The Arroyo Seco (red), a tributary to the Los Angeles River (blue), is shown with the upper watershed located upstream of Devil's Gate Dam.

Methods:

Direct Observation Snorkel Survey

CDFW staff conducted a direct observation fisheries survey in 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: 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 such as amphibians and aquatic snakes observed by snorkelers and as the surveyors walked upstream.

Electrofishing and Relative Weight

CDFW staff collected length and weight data of RBT captured via electrofishing 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.

The equipment used to capture fish included one backpack electrofisher unit (Smith Root Model LR-20B) and two large dip nets. The backpack electrofisher settings were 150 Volts, 30 Hertz pulse frequency, and 15 duty cycle (DC). All captured fish were transferred to the 5-gallon buckets containing air pumps and stream water collected at the sample location. Captured fish were measured after each individual pass to the nearest mm (total length and fork length), weighed to the nearest gram, and placed in an additional bucket with a bubbler. Anesthetic was not used to measure and weigh fish. Once the pass was completed, fish were released over the entire length of the sampled habitat unit.

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 2023 (6/20, 6/21, 6/22), CDFW staff conducted a direct observation snorkel survey on the AS between the Pasadena Water and Power Diversion (N 34.202980, W -118.166475 upstream approximately 3.5 river miles to Brown Mountain Dam (N 34.237767, W -118.181503). CDFW staff snorkeled all locations RBT might use as refuge, totaling 3.5 miles.

One hundred and sixty habitat units were surveyed and categorized as flatwater, riffle, or pool. Riffles dominated all habitat types in the AS (Table 1). There was considerably more water this year compared to 2022, due to storms and increased rainfall in the previous winter/spring. In 2022, Devil's Gate Dam measured accumulated precipitation at 15.12 inches, whereas in 2023 accumulated precipitation was measured at 42.95 inches (Figure 2).

Table 1. Total length, representative average width, and average maximum depth by habitat type per year

Habitat Type	2023 Total Length (ft)	2022 Total Length (ft)	2023 Average Width (ft)	2022 Average Width (ft)	2023 Average Maximum Depth (ft)	2022 Average Maximum Depth (ft)	2023 Percent Habitat Type	2022 Percent Habitat Type
Run	3442.2	3837.0	15.8	8.0	1.7	0.9	18.6%	21.9%
Pool	1768.2	1183.0	19.1	10.3	2.5	2.7	9.6%	6.8%
Riffle	13294.8	12480.0	16.5	8.6	1.6	0.8	71.8%	71.3%
Not Recorded	0	0.0	0.0	0	0	0	0%	0%
Total	18505.2	17500.0	17.1	9.0	1.9	1.5	100.0%	100%

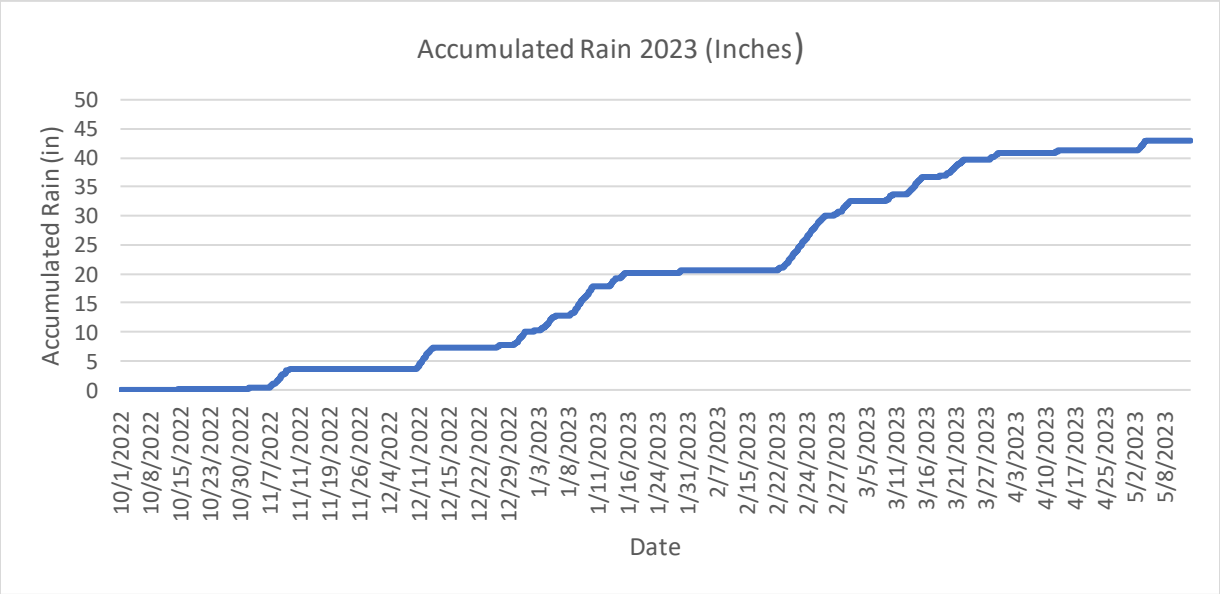


Figure 2: Accumulated Rain in inches during 2022-2023 .

A total of 657 RBT were observed of varying size classes within the survey reach (Table 2). Most of the fish were categorized as 6 to 8.9 inches, with 207 individuals (31.7%) observed in this size class. In 2022, the previous year, most fish observed were in the 0-to-2.9-inch size class. The number of trout observed by approximate river mile and size class is shown in Figures 6 & 7.

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

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

Figures 3 & 4. Typical habitat snorkeled on AS in June 2023

Figure 5. RBT observed underwater during the 2023 AS assessment.

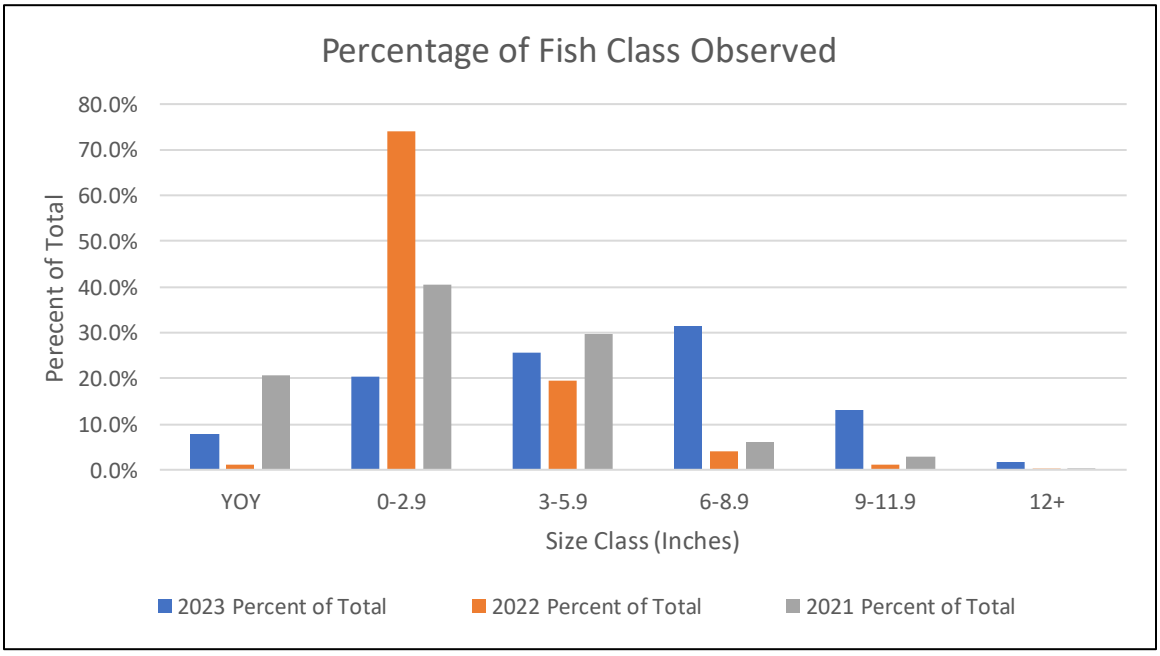


Figure 6. Percent of total RBT by size class observed from AS 2021-2023

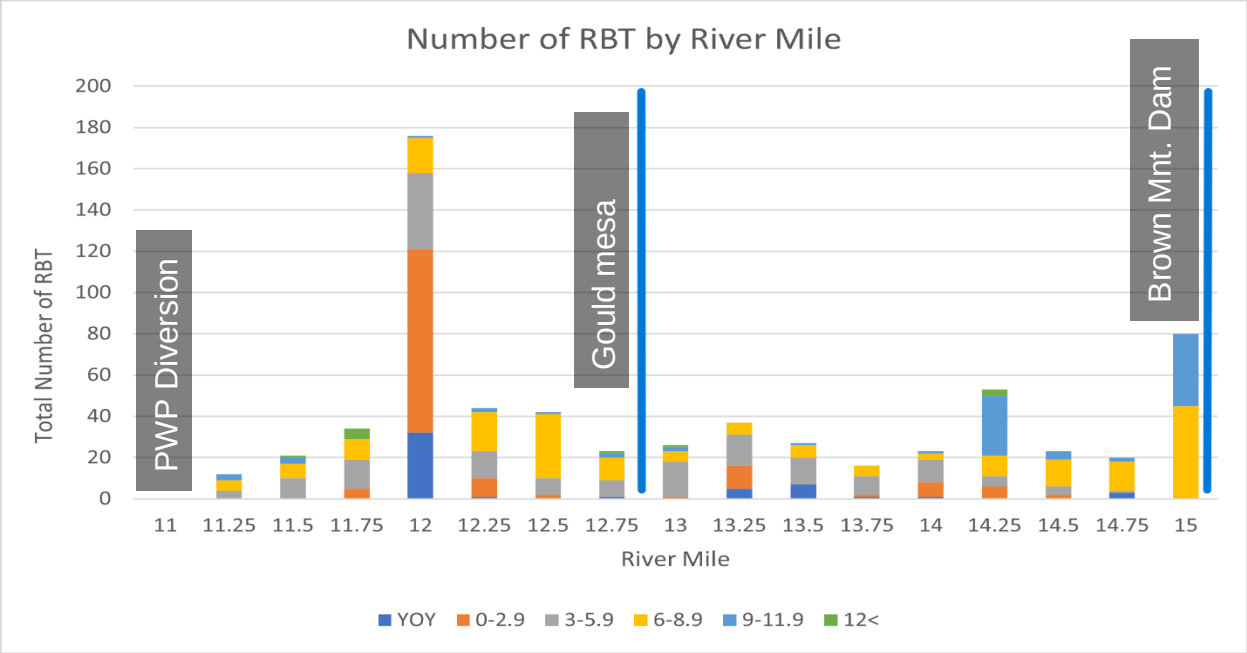


Figure 7. Total number of RBT observed by river mile.

Relative Weight

Thirty-three (33) fish were captured via electrofishing and were measured, weighed, and clipped for genetics. All 33 RBT captured were >120 mm, allowing for calculation of Wr (Figure 8). 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 100. Total lengths of all RBT caught ranged from 125mm to 199mm. The average length of RBT >120mm was 162mm.

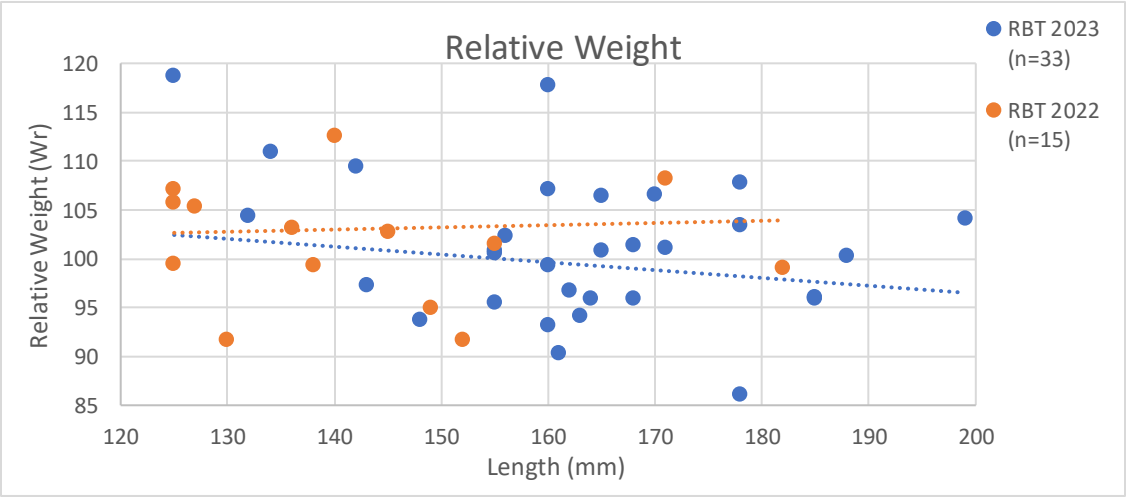


Figure 8. Relative weight (Wr) versus total length of individual RBT sampled from AS 2023 & 2022.

Figures 9 & 10. RBT captured in AS, June 2023.

Discussion:

The 2023 survey observed less numbers of RBT than last year's survey. This may be due to the increase in the amount of water and flow caused by storms and snow melt in the previous winter and water temperature has been colder. Sustained high flow events can decline habitat quality for spawning trout (Yao et. al 2017) and can have a displacement effect on RBT, moving fish downstream (Hilwig and MaKinster 2008). This may explain the decrease in the number of RBT observed during this year's survey, especially in the size class 0-3 inches when comparing numbers from 2022 to 2023.

All size classes of RBT were observed during this survey. Fish that emerged from gravel in the survey year and fish less than 2.9 inches were observed during the survey, which indicates successful reproduction continues to occur within the population. Most fish observed were in the size class 6-8.9 in compared to in 2022 most fish observed were in 0-2.9 in size class. The total number of fish observed in 2022 was 2092 and during this year's survey 657 fish were observed. Based on the results of size class distribution there appears to be successful recruitment across all size classes.

High flows experienced in water year 2022-2023 created more pool habitat during the survey in 2023 as seen in the slight increase from 2022. Precipitation data shows a major increase in precipitation, as the 2021-2022 water year received only 15.12 inches and the 2022-2023 water year received 42.95 inches (LACPW). The success of larger fish could be due to their resiliency and ability to move in higher flows, where smaller fish may have been swept downstream to Devil's Gate Reservoir.

We can assume some of the population was lost due to stranding in the reservoir, based on CDFW's site visit July 10, 2023, and interaction with Los Angeles County Public Works mention of fish mortalities. RBT may be expressing their anadromous life stage and using the reservoir as a makeshift ocean. These RBT were originally taken from the WFSGR, as a translocation effort after the Bobcat Fire, where they were also likely expressing their anadromous life stage using the San Gabriel Reservoir as a makeshift ocean.

Based on the number of RBT observed and conditions of the watershed during the June 2023 survey, it still appears that the established population within the AS remains healthy. The mean Wr for RBT greater than 120 mm sampled during 2023 is 100 in comparison to Wr in 2022 which was 103. 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. The population remains to be in good condition though a slight decrease in condition is seen from 2022 to 2023. This decrease could be attributed to the fact that water conditions i.e., thermal shifts, dissolved oxygen, prey availability, and water availability, may have influenced the health of RBT.

Conclusion and Recommendation:

South Coast Region 5 fisheries staff recommends continuing spring, summer, and fall evaluations of population and habitat conditions to observe fluctuating limitations of habitat

and health of population structure, distribution, and abundance. Although water availability in streams has increased this past water year due to storms and high precipitation, these events caused high flow events that may have negatively affected the health of the population. With the high flow events from the winter storms, 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.

Also recommended is to begin a dialogue with Los Angeles County Public Works to discuss best management practices for maintaining Devils Gate Reservoir and avoid stranding RBT. Lastly, CDFW should explore submitting a petition for regulation change within the AS to establish a put and take fishery within a delineated reach of the lower AS and keeping a delineated reach for wild trout regulations within the upper section of the AS. Removal of low flow barriers should also be pursued.

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