Monitoring Report

System: Lost Creek Reservoir
Sampling Dates: 4/20/2022
Target Species: Cutthroat Trout, Kokanee Salmon, Rainbow Trout, Splake, Tiger Trout, and Utah Chub

Monitoring Objectives:

1. Provide data for assessment of trends in species occurrence, relative abundance, biomass, and size structure of forage and sport fish assemblages.

2. Evaluate population indices to improve the effectiveness of stocking efforts of Cutthroat Trout, Kokanee Salmon (hereafter Kokanee), Rainbow Trout, Splake, and Tiger Trout.

3. Establish a naturally reproducing population of Kokanee.

4. Use top-down control to regulate Utah Chub population size.

Sampling Design and Methods:
A new sampling design was implemented in 2022 to improve the effectiveness of sampling methods in reservoirs that contain Kokanee and in deep reservoirs where benthic gillnets do not effectively quantify species that occupy pelagic habitats. The sampling design used experimental curtain gillnets suspended in the water column, thus giving managers the ability to sample benthic and pelagic habitats simultaneously or sample stratified portions of the pelagic fish community. Sampling occurred in the spring. Three gillnets were suspended in the pelagic zone at 6-m depth intervals ranging from 0 to 18-m depth and an additional gillnet was set nearshore with 6 m of water to sample the benthic and littoral habitats. All gillnets were 45.7 m long by 6.1 m deep with six 7.6-m panels that had bar mesh sizes of 13, 19, 25, 38, 51, and 64 mm. Nets were set overnight and retrieved at dawn. All fish caught were measured for total length (mm) and weight (g).

Prior to 2022, experimental benthic gillnets were used to conduct sampling. Benthic gillnets were 24.8 m long by 1.8 m deep with eight 3.1-m panels that had bar mesh sizes of 19, 25, 32, 38, 44, 51, 57, and 64 mm. Demographic data (*i.e.*, total length and weight) from benthic gillnets were used in this report for the size structure, weight-length, and relative weight analyses with the assumptions that catchability was constant between benthic and curtain gillnets and no size-based selectivity exists.

Summary:
The new sampling design appeared successful at sampling both the pelagic and benthic fish communities, but additional years of data are required before inferences can be drawn regarding sampling efficiency. Fish catches were comprised of Cutthroat Trout, Kokanee, Rainbow Trout, Splake, Tiger Trout, Utah Chub, and Mottled Sculpin (Table 2). Kokanee were the most abundant sport fish species in 2022 (Mean = 28.0; SD = 16.9) and had the highest relative abundance in the 6 to 12-m depth zone (Table 3; Figure 2). Cutthroat Trout mean relative abundance was 16.8 fish/net-night (SD = 11.1) and evenly dispersed among sampled depth zones and habitats (Table 3; Figures 1 & 2). Rainbow Trout mean relative abundances was 16.8 fish/net-night (SD = 23.8) and primarily found in littoral and benthic habitats. Splake and Tiger

Trout mean relative abundances were low (< 2 fish/net-night) and were only found in littoral and benthic habitats (Table 3; Figures 1 & 2). Temporal comparisons of relative abundance were precluded by changes in sampling gear. The size structure of Kokanee suggests two adult age classes were present in 2022 (*i.e.*, stocked individuals from 2020 and 2021). However, a strong decline exists between the 2021 to 2020 age classes suggesting survival to age-3, and subsequently survival to maturity, is low (Figures 3 & 4). Relative weights of all target species were low and remained low as fish progress through each proportional stock density length category (Figure 6). Utah Chub (*i.e.*, primary forage species) was abundant in littoral and benthic habitats. All other measurements and indices appear within normal bounds.

Management Actions:

1. Continue to perform the new sampling design with curtain gillnets. After an additional two years of data collection, a power analysis will be conducted to determine the effectiveness of the new sampling design. Sampling effort may need to increase to provide accurate and reliable population estimates.

2. Monitor fish assemblages as Lost Creek State Park continues to be developed and presumably fishing pressure on the reservoir increases. Stocking rates may need to be increased in future years.

3. Evaluate the stocking program of Kokanee. Three years of stocking Kokanee were performed in an attempt to establish a naturally reproducing population. No stocking will be performed in 2023 because of a low number of broodstock spawning, limiting the number of offspring available to be stocked throughout the state. Additional years of catch and creel data are required to determine if the current stocking program is effective and the amount of fishing mortality being induced on this population. Additionally, collecting aging structures (see Management Action #5) will allow for catch curve and mortality estimates to be calculated.

4. Observe Utah Chub populations to ensure salmonids in Lost Creek Reservoir are at a high enough density to apply sufficient top-down control over this forage species. Utah Chub and salmonid species can negatively interact when forage densities are high and compete for limited food resources. Increasing the number of stocked Cutthroat Trout would be recommended if Utah Chub abundances rise.

5. Conduct an age and growth study of both salmonids and Utah Chubs in the reservoir to characterize rates of growth and mortality of all species, and recruitment of Utah Chubs. This information would allow managers to determine how rates of Utah Chub growth and mortality respond to an increasing number of large piscivorous fishes in the reservoir.

6. Use newly designed surveys and creel reports to evaluate current stocking strategies of Splake and Tiger Trout. Under the previous sampling design, relative abundances of these species were low and showed weak returns to creel reports despite stocking efforts. Two alternative strategies could be: 1) to substitute these stocked species with a species that has better spatial overlap with Utah Chubs (*e.g.*, Rainbow Trout) and 2) to increase stocking numbers of Splake and Tiger Trout. However, additional years of survey data are needed under the new sampling design to support this proposed change.

Tables:

Table 1: Number of samples collected by sampling gear type, prescribed number samples by sampling gear type, and any additional data collected from Lost Creek Reservoir in 2022.

Gear Type	# of Samples	# of Prescribed Samples	Additional Data Collected
Curtain Gillnets	4	4	–

Table 2: Species composition from curtain gillnets as catch (# of fish) and biomass (kg) estimates from Lost Creek Reservoir in 2022.

Target Species	Catch	Catch (% Total)	Biomass	Biomass (% Total)
Cutthroat Trout	67	14.1	33.4	37.0
Kokanee	112	23.6	10.1	11.2
Rainbow Trout	67	14.1	26.3	29.1
Splake	2	0.4	1.2	1.4
Tiger Trout	8	1.7	2.9	3.3
Utah Chub	217	45.8	16.4	18.1
Mottled Sculpin	1	0.2	0.0	0.0

Table 3: Mean catch-per-unit-effort (CPUE; fish/net-night), mean total length (TL; mm), mean condition (Wr), and percentage of individuals within each traditional proportional size distribution (PSD) category for each target species from Lost Creek Reservoir in 2022. All values in parentheses indicate standard deviation.

Target Species	CPUE	Mean TL	Mean Wr	PSD-Quality	PSD-Preferred	PSD-Memorable	PSD-Trophy
Cutthroat Trout	16.8 (11.1)	392 (90)	78 (11)	62	17	3	0
Kokanee	28.0 (16.9)	206 (44)	84 (6)	10	10	0	0
Rainbow Trout	16.8 (23.8)	340 (33)	84 (9)	8	0	0	0
Splake	0.5 (1.0)	406 (30)	99 (18)	100	100	50	0
Tiger Trout	2.0 (4.0)	357 (33)	67 (5)	100	12	0	0
Utah Chub	54.2 (98.0)	211 (15)	93 (7)	89	0	0	0

Figures:

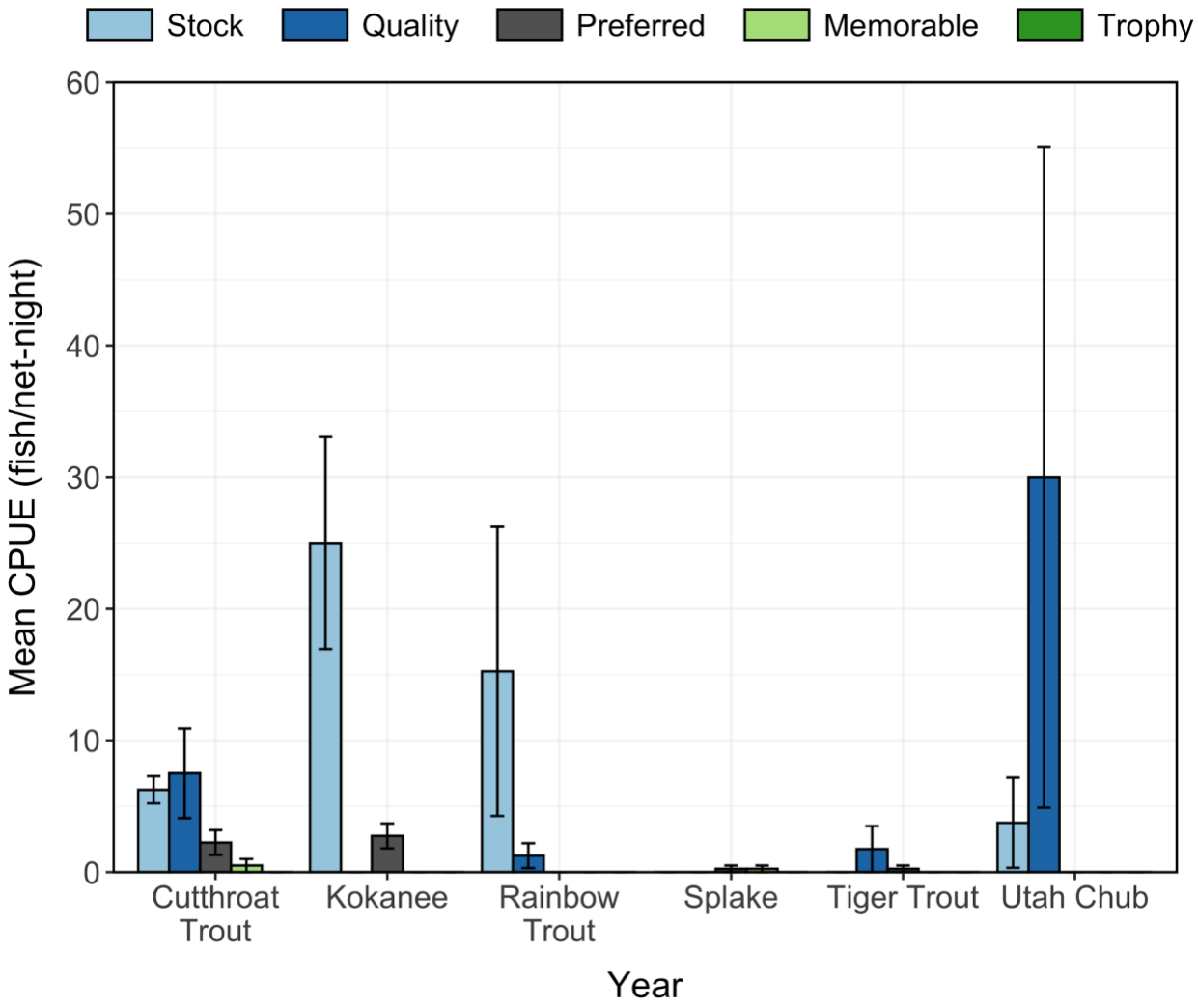

Figure 1: Mean catch-per-unit-effort (± standard error) of Cutthroat Trout, Kokanee Salmon, Rainbow Trout, Splake, Tiger Trout, and Utah Chub within each Gablehouse length category from Lost Creek Reservoir in 2022 as an index of relative abundance.

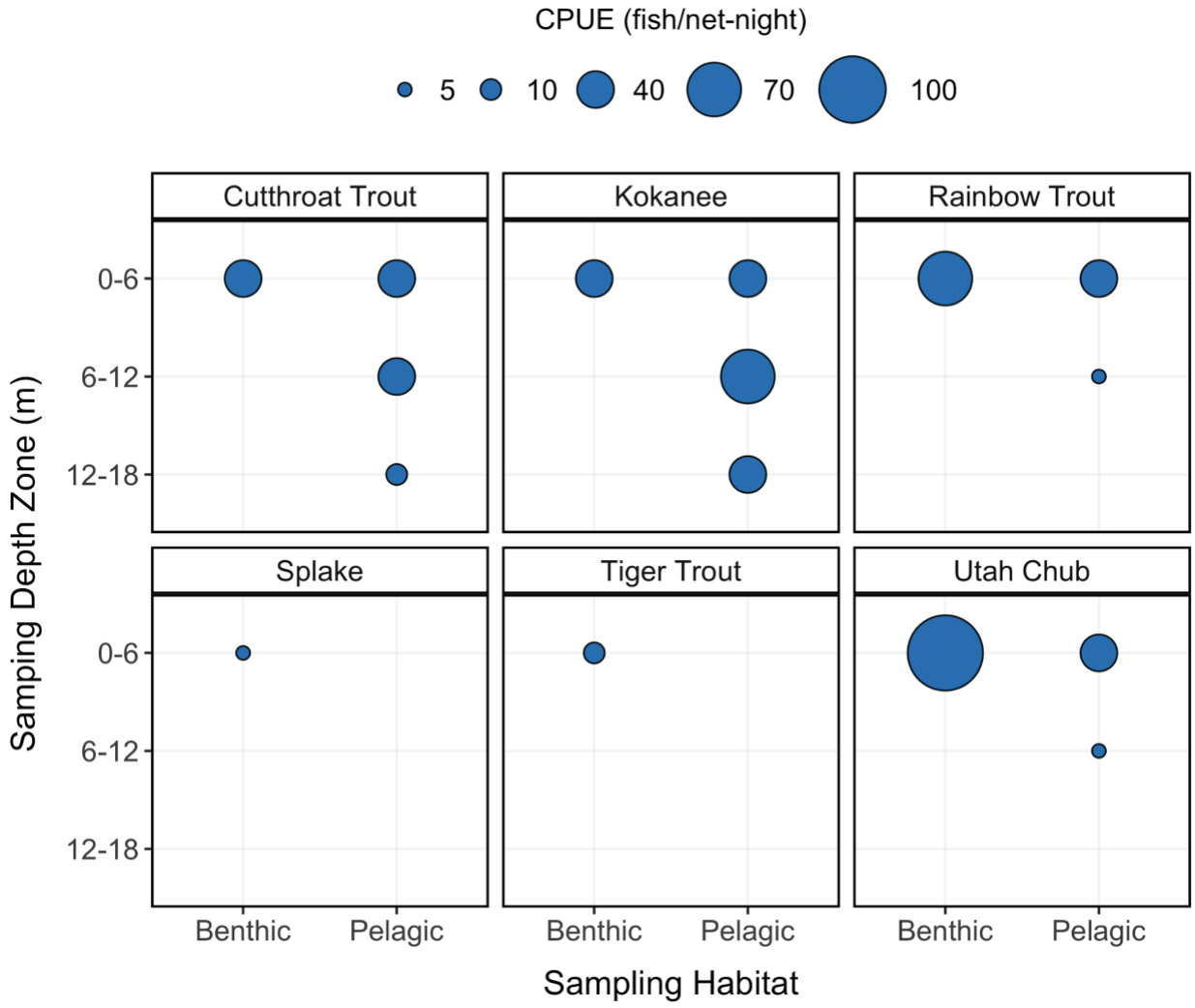

Figure 2: Catch-per-unit-effort (CPUE) of Cutthroat Trout, Kokanee Salmon, Rainbow Trout, Splake, Tiger Trout, and Utah Chub from each sampling location in Lost Creek Reservoir from 2022. CPUE is depicted with varying point size and the diameter of the point is directly proportional to CPUE. No sampling was conducted in the 6-12 and 12-18 m depth zones for benthic habitat.

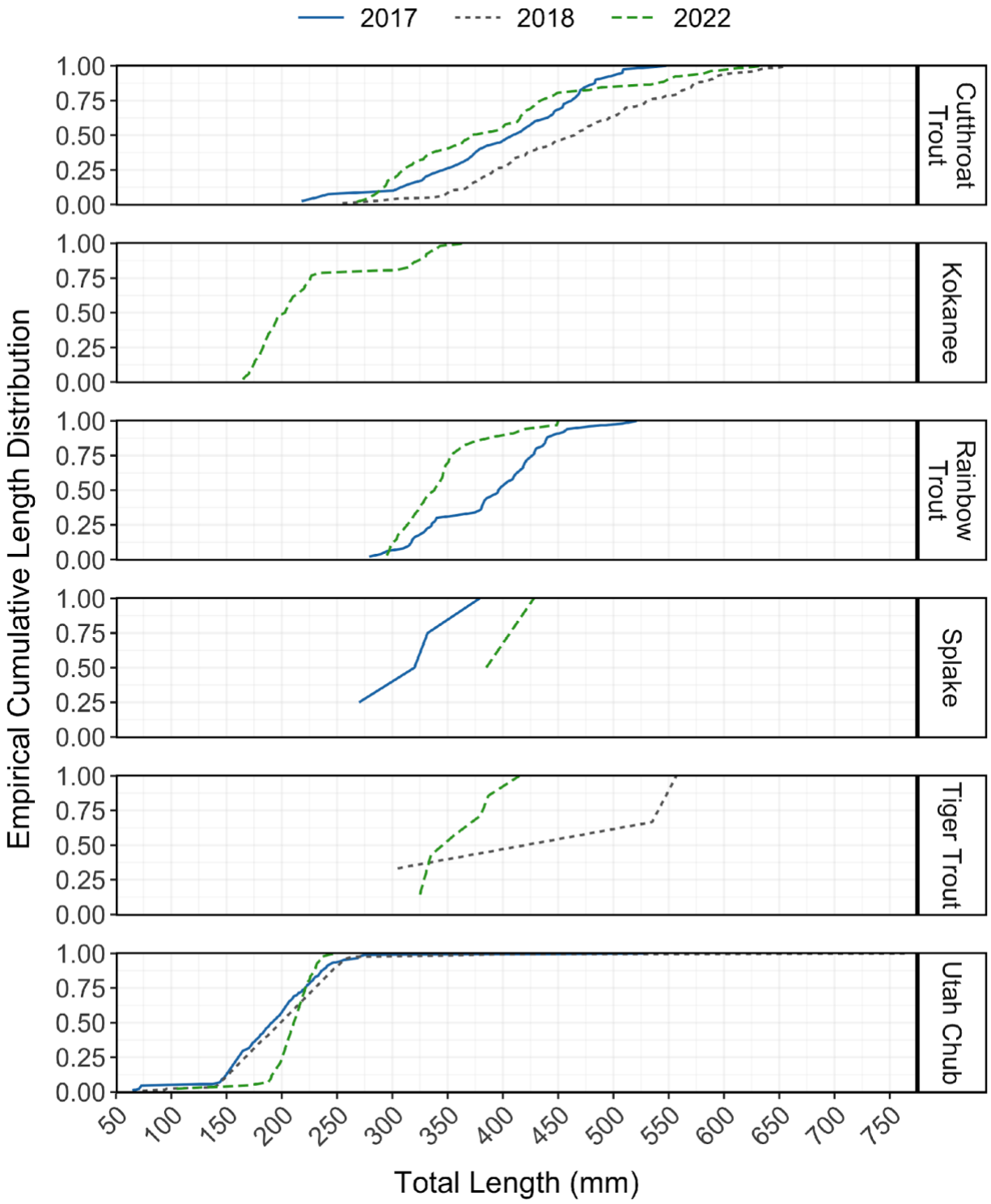

Figure 3: Empirical cumulative total length (mm) distribution of Cutthroat Trout, Kokanee Salmon, Rainbow Trout, Splake, Tiger Trout, and Utah Chub from Lost Creek Reservoir in 2017-2022. Data prior to 2022 was collected from benthic gillnets and no sampling was conducted in 2015 and 2019-2021.

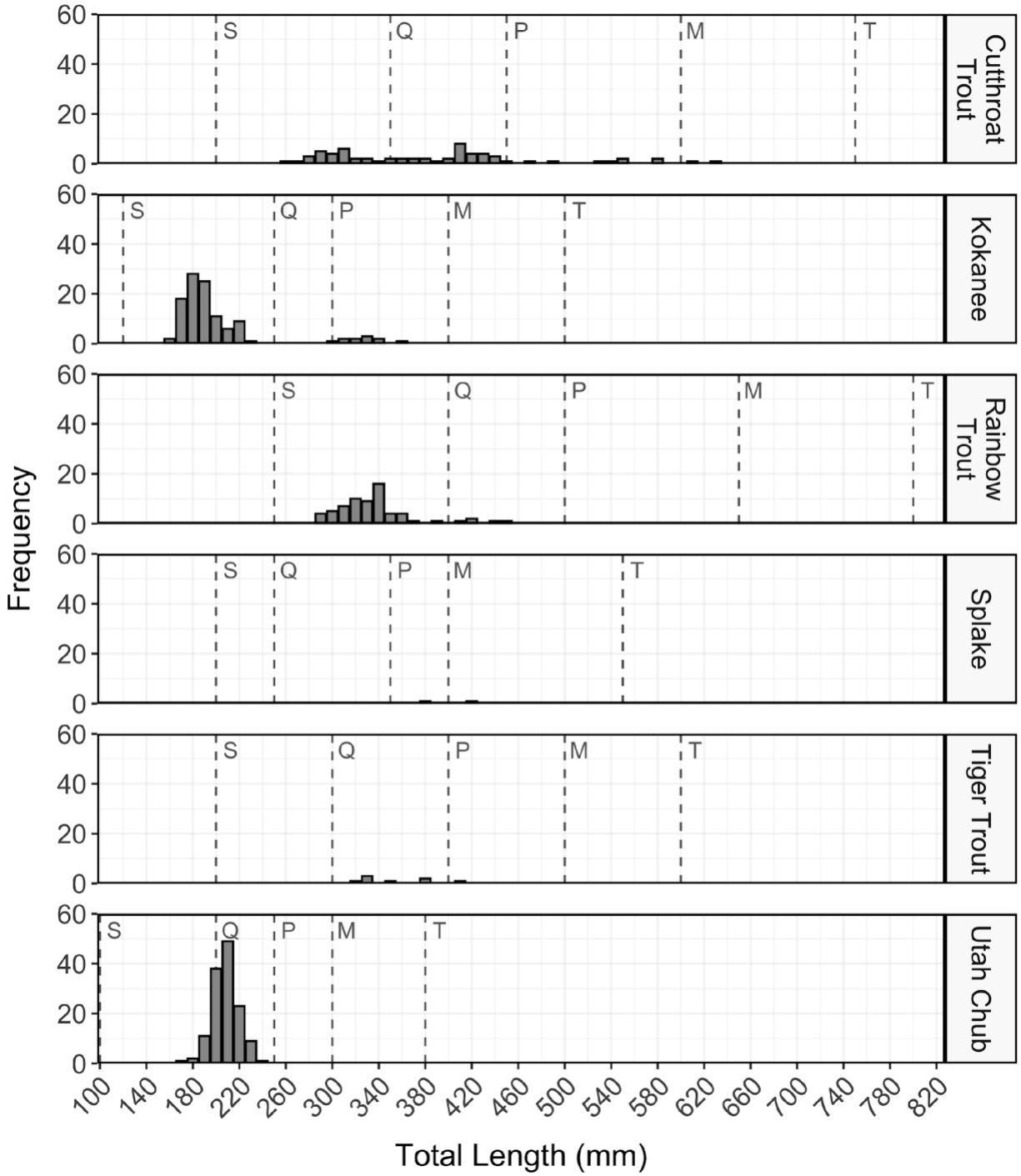

Figure 4: Total length (mm) frequency of Cutthroat Trout, Kokanee Salmon, Rainbow Trout, Splake, Tiger Trout, and Utah Chub from Lost Creek Reservoir in 2022. The length intervals are left-inclusive and right-exclusive, and the x-axis labels represent the start of the length interval (i.e., left side). The start of each Gablehouse length category is identified by the vertical dashed lines and the category name (i.e., stock, quality, preferred, memorable, and trophy) is indicated by the first letter of each category on the right side of the dashed line.

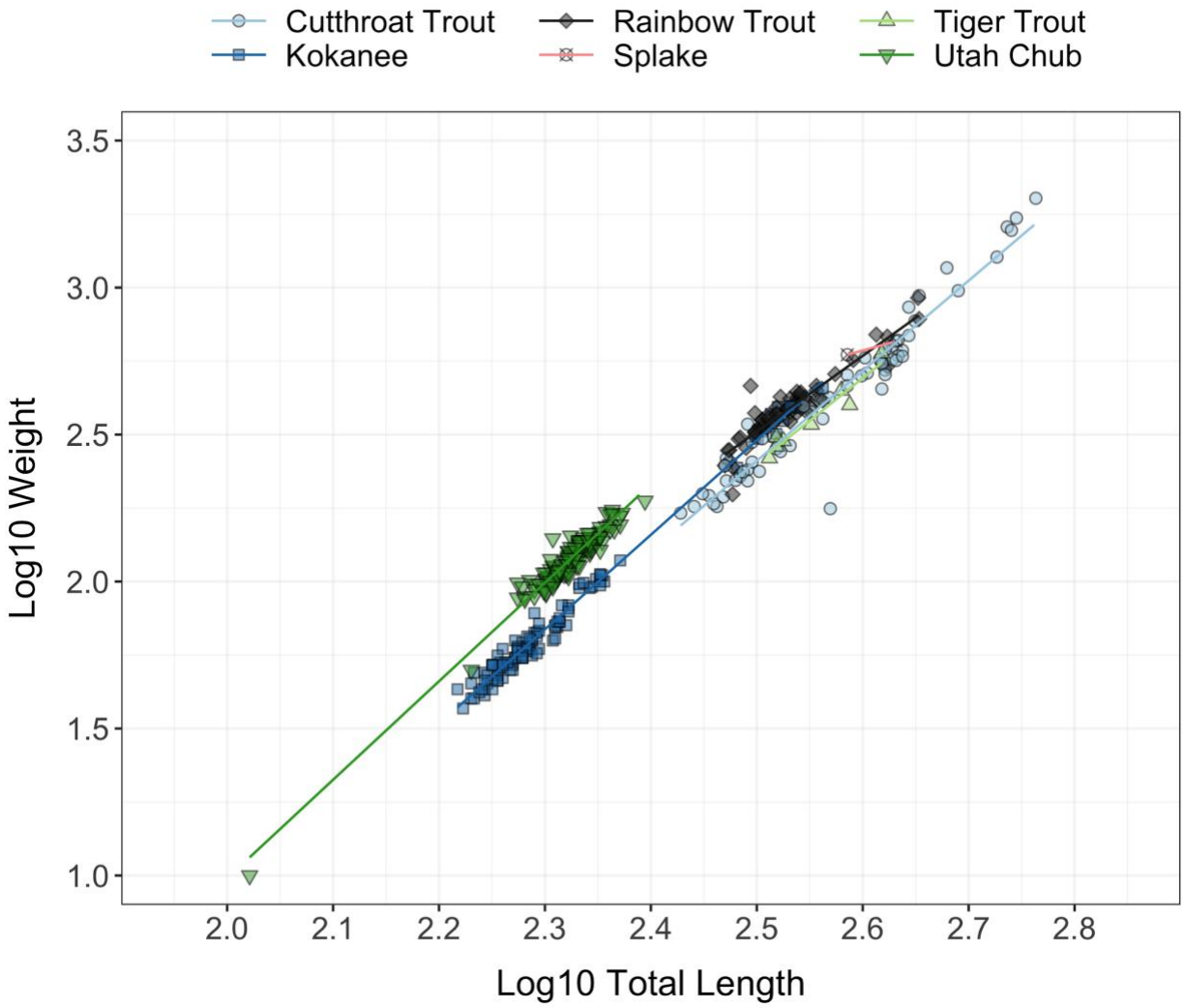

Figure 5: Fitted line plot for the regression of log10 weight on log10 total length for Cutthroat Trout, Kokanee Salmon, Rainbow Trout, Splake, Tiger Trout, and Utah Chub from Lost Creek Reservoir in 2019-2022. Data prior to 2022 was collected from benthic gillnets and no sampling was conducted in 2015 and 2019-2021.

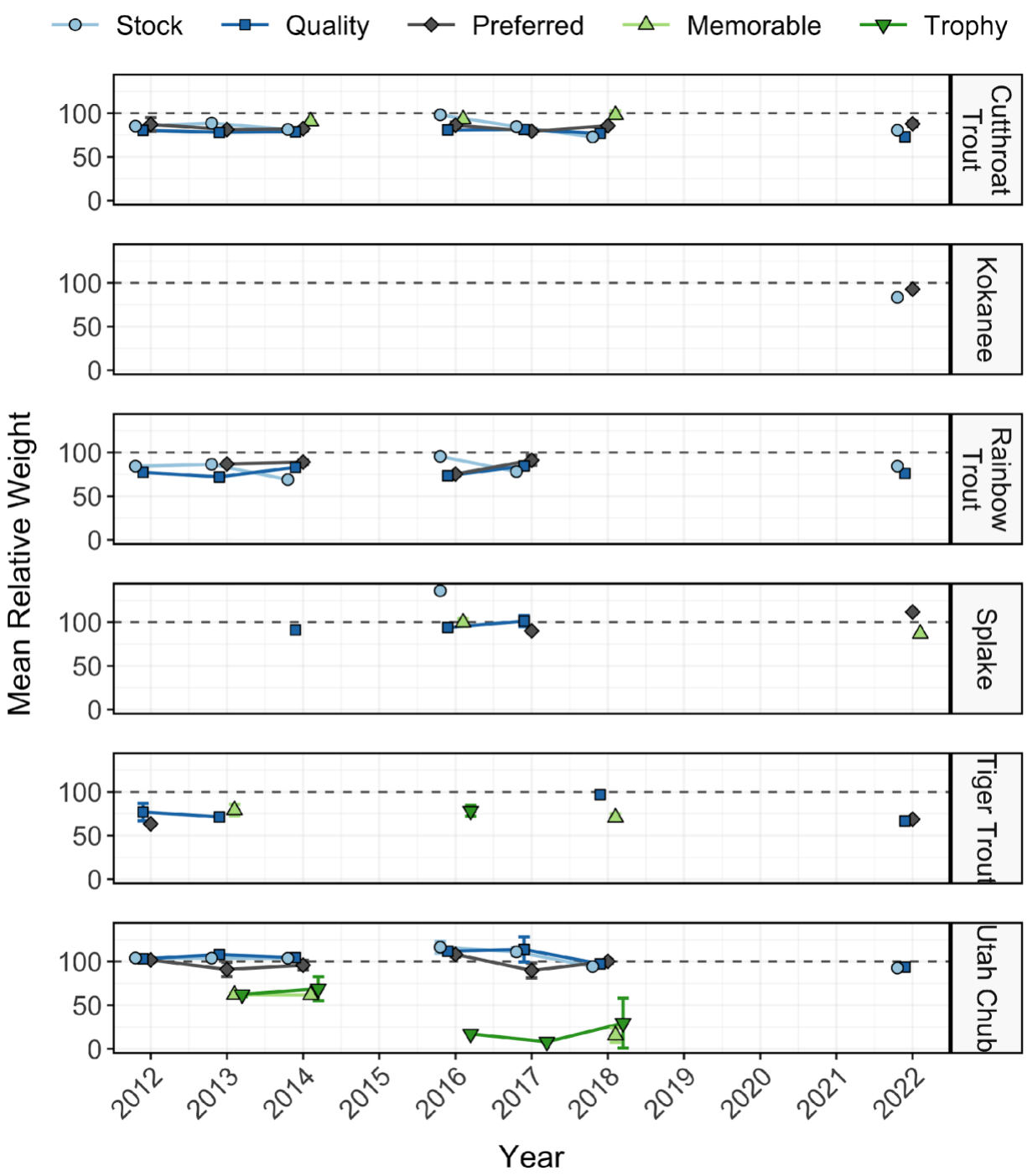

Figure 6: Relative weight (± standard error) of Cutthroat Trout, Kokanee Salmon, Rainbow Trout, Splake, Tiger Trout, and Utah Chub within each Gablehouse length category from Lost Creek Reservoir in 2012-2022 as an index of condition. The horizontal dashed line indicates a 1:1 relationship between standard weight and relative weight. Points and lines are jittered to minimize overplotting. Data prior to 2022 was collected from benthic gillnets and no sampling was conducted in 2015 and 2019-2021.

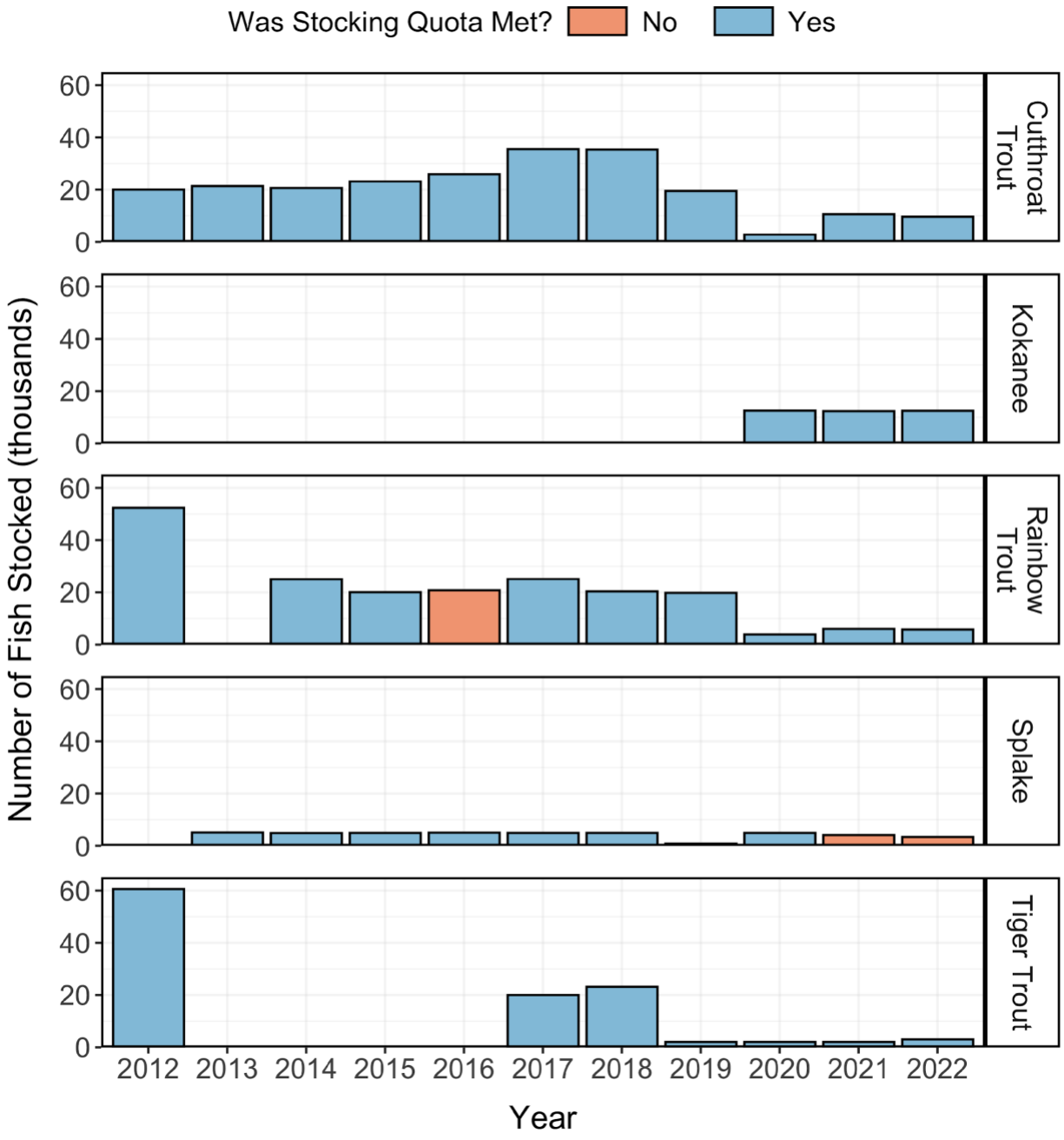

Figure 7: Number of individuals stocked in Lost Creek Reservoir from 2012-2022. Length-at-stocking and stocking quota varies among years. A stocking quota was determined to be met if the number of stocked individuals was at least 90% of the stocking quota.