California Department of Fish and Wildlife
Inland Fisheries Assessment and Monitoring Program

New Melones Reservoir
Kokanee Fishery Evaluation – 2021

by

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Abstract

New Melones Reservoir, located in the Central Sierra Nevada foothills, is a major hub for sport and recreational anglers alike. The reservoir has historically been stocked with Kokanee and Rainbow Trout. In order to evaluate adaptive management objectives for the Kokanee fishery of the reservoir, angler access point surveys were conducted by California Department of Fish and Wildlife (CDFW) during the summer season of 2021. A CDFW Scientific Aid interviewed anglers for information regarding the number of anglers fishing, number of rods used, total hours fished, species targeted, and number of fish kept and released (separated by species). Total lengths were taken from all kept Kokanee and Trout. Additionally, Kokanee were checked for the presence of an adipose fin and scales were collected. Currently, Kokanee measured from New Melones Reservoir meet the management goal of 330mm (13.0 in), with an average of 342.1mm (13.5 in). From the 102 Kokanee measured during the surveys, 52% (n=53) had been previously marked by having their adipose fin removed. Kokanee anglers were generally satisfied with their overall experience fishing and the size of Kokanee but prefer to catch more Kokanee in a day. Regular monitoring of the zooplankton community and abundance of the Kokanee population would provide additional information need to refine management objectives.

Introduction

New Melones Reservoir provides a variety of angling opportunities for anglers. Completed in 1978, the dam was originally owned by the US Army Corps of Engineers but in 1979 the Corps transferred the project to the US Bureau of Reclamation (US Bureau of Reclamation 2021a). New Melones contains a variety of sport fish species including Black Crappie *Pomoxis nigromaculatus*, Bluegill *Lepomis macrochirus*, Channel Catfish *Ictalurus punctatus*, Kokanee *Oncorhynchus nerka*, Largemouth Bass *Micropterus salmoides*, Smallmouth Bass *Micropterus dolomieu*, Spotted Bass *Micropterus punctulatus*, and Rainbow Trout *Oncorhynchus mykiss*. The California Department of Fish and Wildlife (CDFW) has a long history of stocking this reservoir with a variety of species, including Kokanee (Figure 1).

Angler access point surveys were conducted at New Melones to assess angler effort, catch, and satisfaction with the Kokanee sport fishery. In addition, the survey allowed for the recovery of marked Kokanee that had been planted in 2019. These marked Kokanee allow biologists to estimate the ratio of hatchery to naturally spawned fish to the fishery. The data provided by anglers is used to evaluate management objectives, fish stocking needs, and modifying harvest regulations. Additionally, scale samples collected from Kokanee give biologist important information pertaining to the age structure of the population.

Study Location

Located in the Central Sierra Nevada foothills and sitting at an elevation of 1,100 feet above sea level, New Melones Reservoir is the fourth largest reservoir in California. The reservoir is within Calaveras and Tuolumne counties and sits on Central Sierra Me-Wuk Land (Figure 2). New Melones dam was created as an embankment dam on the Stanislaus River and has three main tributaries: North Fork Stanislaus, Middle Fork Stanislaus, and South Fork Stanislaus. The reservoir has a maximum capacity of 2.4 million acre-feet of water and a surface area of 12,500 acres. The outflow of New Melones is impounded by Lake Tulloch before reaching the Stanislaus River which eventually flows into the San Joaquin River. The reservoir serves as a part of the Central Valley project and provides hydropower generation; the Central Valley Project aims to provide water to arid areas of California and to minimize downstream flooding (US Bureau of Reclamation 2021b). During the summer of 2021, California was declared to be in an extreme drought and saw record low reservoir levels across the state. In the 2021 water year New Melones Reservoir had an average storage level of 64% of capacity (California Department of Water Resources 2021). During the months that the angler survey were conducted (June to September), the reservoir had an average capacity of about 43% of total capacity (Figure 3).

Methods

Angler Survey

An access point angler survey, targeting Kokanee anglers, was conducted by CDFW from June 1 to September 12, 2021. A scientific aid was stationed at one of the two of the main boat ramps, Tuttletown or Gloryhole (Figure 2). Surveys were stratified into weekdays and weekends and conducted from 0800h to 1300h. This period was selected because of its relation to anglers that were targeting Kokanee (i.e., fishing in the early morning). Weather conditions and surface temperature of the water were taken at the beginning of each survey. The survey involved asking each angler or angler group a series of questions about their angling experience that day and fish caught; questions pertained to number of anglers, number of rods used, total hours fished, species targeted, county of residence and number of fish kept and released (by species). In addition, anglers were asked to rate their satisfaction about their overall experience fishing that day, number of fish caught, and size of fish caught. The satisfaction rating ranged from 1, very dissatisfied, to 5, very satisfied; if the angler rated the two latter of the parameters below neutral, they were asked to give a preferred number and/or size of fish caught. Fish kept by anglers were identified to species and total length was measured to the nearest millimeter; additionally, Kokanee were checked for the presence of an adipose fin. With permission from the angler, scale samples were taken from Kokanee kept. Samples were collected by scraping

from the posterior to anterior of the fish between the dorsal fin and lateral line. Each scale sample was placed in an envelope and labeled with identifying information.

Scale Analysis

Scales are rehydrated and then separated out to further clean the viable scales; scales that are viable are characterized by having a clear focus and minimal regeneration and degeneration (Minard and Dye 1998). Using a small, soft bristled paint brush, individual scales was cleaned of debris and placed into a separate dish (the process was repeated until six clean scales were obtained for each fish). The six scales were then mounted onto a slide and a drop of clear nail polish varnish was placed on each scale before situating the cover slide. After drying the slide under a weight, the slide was imaged using a Motic 10.0MP camera mounted on a compound microscope (Motic BA210) and Motic Imaging Software. The images were independently read by two separate biologists, ensuring that length of Kokanee and prior readings are hidden to reduce bias. For samples with an agreed upon age, annuli were measured and, in conjunction with ages, used in a Frasier-Lee equation to back calculate length-at-age estimates.

Results

Angler Survey

During the three months of surveying, 164 angler groups were interviewed, representing 298 individual anglers with a total of 1422 hours fished, and 391 rods used (Table 1). One hundred sixty-five Kokanee were caught, representing 136 fish kept and 29 released. One hundred seventy-one Rainbow Trout were caught with 96 being kept and 75 released. A total of 872 black bass were caught, representing 56 kept and 816 released. Anglers reported catching 27 Channel Catfish, representing 21 kept and 6 released. Six Black Crappie were caught with 3 kept and 3 released; one Brown Trout was caught and released (Table 2). About 54% (n=161) of anglers targeted black bass (including Largemouth, Smallmouth, and Spotted), while 28% (n=83) anglers targeted Kokanee, 8% (n=23) targeted Rainbow Trout, 3% (n=10) of anglers targeted Channel Catfish and 7% (n=21) did not have a target species (Figure 4). The majority of anglers surveyed were from either Tuolumne (21%) or Calaveras (21%) counties, 16% of anglers were from San Joaquin county, 11% from Stanislaus county, 7% from Amador county, 5% from Sacramento county, and 4% of Santa Clara county. The other 15% of anglers represent counties where five or less individual anglers identified they were from, including: Alameda, El Dorado, Kern, Monterey, Orange, Yuba, Fresno, Kings, San Luis Obispo, Santa Cruz, Solano, Sonoma, and Contra Costa county or were from the State of Nevada (Figure 5).

Kokanee anglers had an average satisfaction rating of 3.5 when rating their overall experience for the day of fishing, 2.8 for the number of fish caught, and 3.2 for the size of the fish caught. Rainbow Trout anglers rated their overall experience as 4.3, the number of fish caught was rated a 2.5, and the size of fish caught was rated a 3.0 (Figure 6).

Kokanee

The average total length of Kokanee measured was 342mm (13.5 in), with a range from 252mm (9.9 in) to 449mm (17.7 in) (Figure 7). 47% of Kokanee measured had their adipose fin clipped (marked) and 53% were not clipped (un-marked), representing the hatchery and naturally spawned Kokanee in New Melones respectively. The marked Kokanee had an average total length of 356mm (14.0 in), compared to un-marked Kokanee which had a total length average of 328mm (12.9 in). Pairwise comparisons were run to test for differences in the total lengths of marked and non-marked Kokanee. A Shapiro-Wilks normality test was run to test the normality of each data set and showed the marked and non-marked data sets were normally distributed (p-value = 0.5823, 0.596 respectively). Because the data was normally distributed, a Welch's two sample t-test was run to test significance and revealed that the total length of marked Kokanee is significantly greater than the total length of un-marked Kokanee at New Melones Reservoir (t = -3.3794, df = 88.224, p-value =0.001083).

Rainbow Trout

The average total length of Rainbow Trout measured was 371.3 mm (14.6 in), ranging from 259 mm (10.2 in) to 562 mm (22.1 in). The majority of Rainbow Trout measured were between 381–404 mm (15-15.9 inches) (n=18) (Figure 8).

Scale Analysis

The scale analysis determined that a majority of Kokanee measured (n=30, 79%) were two year old fish. Eight kokanee (21%) were determined to be one year old fish and zero fish were aged at 3 years or older. A Frasier-Lee back-calculation was used to determine length-at-age data. From this back calculation we found that the average length of a fish at one year old is 157 mm (6.3 in) and the average length of a fish at year two was 259 mm (10.2 in) (Table 3). Kokanee aged to be one year old ranged from 229-302 mm (9 -11.9 in) with an average of 272 mm (10.7 in) at the time of capture. Kokanee aged to be a year two fish ranged from 302-411 mm (11.9-16.2 in) with an average of 350mm (13.8 in) at the time of capture (Figure 9). One 449 mm (17.7 in) Kokanee was measured but could not be aged due to poor scale quality.

Discussion

The Kokanee sport fishery at New Melones Reservoir is supplemented with an annual stocking of fingerling sized Kokanee by the CDFW. The observed Kokanee size in a reservoir fishery can be density dependent – and overabundance of fish, while providing for increased catch rates, could reduce the average fish size thus decreasing angler satisfaction. Therefore, gaining an understanding of the percentage of naturally produced Kokanee in the fishery assists biologists in determining hatchery supplementation levels that meet management goals while still maintaining angler satisfaction.

The ration of marked to un-marked Kokanee observed during this survey had a ratio of 1:1. What was previously thought to be a one inch difference between the marked and un-marked Kokanee, aging data can now confirm is the result of the two year classes that make up the un-marked Kokanee population. The total lengths of the one year old un-marked Kokanee decreased the average length being observed. When comparing length-at-age data, there was no biologically significant difference found between the two groups; un-marked Kokanee were only 0.2 inches larger at age two than marked Kokanee. The 1:1 ratio coupled with the length-at-age data indicates that the two groups (i.e., marked and un-marked fish) are equally abundant in the fishery and that they are growing at similar rates to each other.

The Kokanee fishery at New Melones Reservoir is managed as a quality fishery with an average target length of 330 mm (13.0 in); the Kokanee measured throughout the survey met this management objective indicating that the current stocking allotment is meeting the management goals and satisfaction of anglers at the reservoir.

References

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Tables

Table 1. Number of anglers, hours fished, and total rods used by anglers separated by anglers targeting Kokanee (KOK), Rainbow Trout (RT), Black Bass (BB), Channel Catfish (CCF) or no preference.

	Anglers	Hours Fished	Total Rods
KOK	83	441	130
RT	23	101.5	33
BB	161	712	175
CCF	10	56	20
Any	21	111.5	33
Total	298	1422	391

Table 2. Number of Kokanee (KOK), Rainbow Trout (RT), Black Bass (BB), and Other (i.e., Crappie, Brown Trout and Channel Catfish) kept and released by anglers at New Melones, separated by species targeted.

	Kept	Released	Total
KOK	136	29	165
RT	96	75	171
BB	56	816	872
Other	24	10	34

Table 3. Mean back calculated length at age in inches of Kokanee caught. Data separated by age and marked status

			Mean Back calculated lengths at age (in)	
Age	Year-class	Number in sample	Age 1	Age 2
1	2019	8	6.3	
2	2018	30	6.2	10.2
2 (un-marked)	2018	13	6.1	10.3
2 (marked)	2018	17	6.2	10.1

Figures

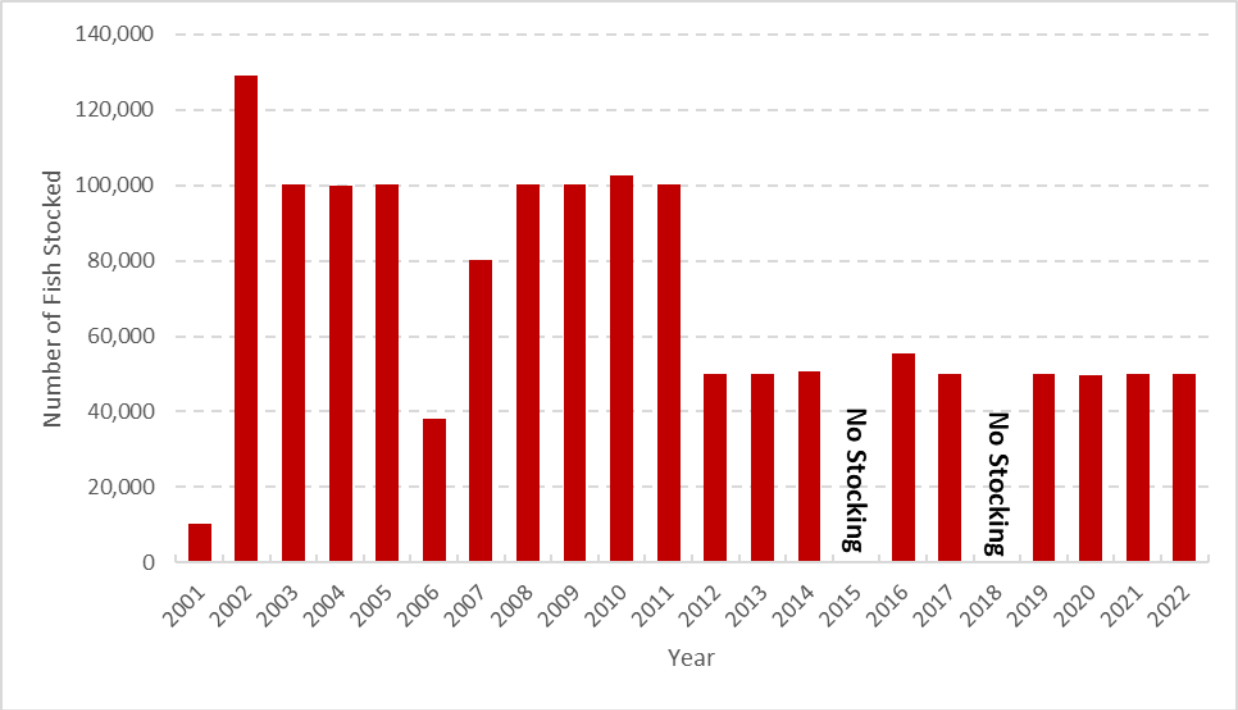

Figure 1. Stocking history of Kokanee at New Melones from 2001-2021

Figure 2. Map showing the location of New Melones. Markers indicate location of Gloryhole boat ramp (GH) and Tuttletown boat ramp (TT).

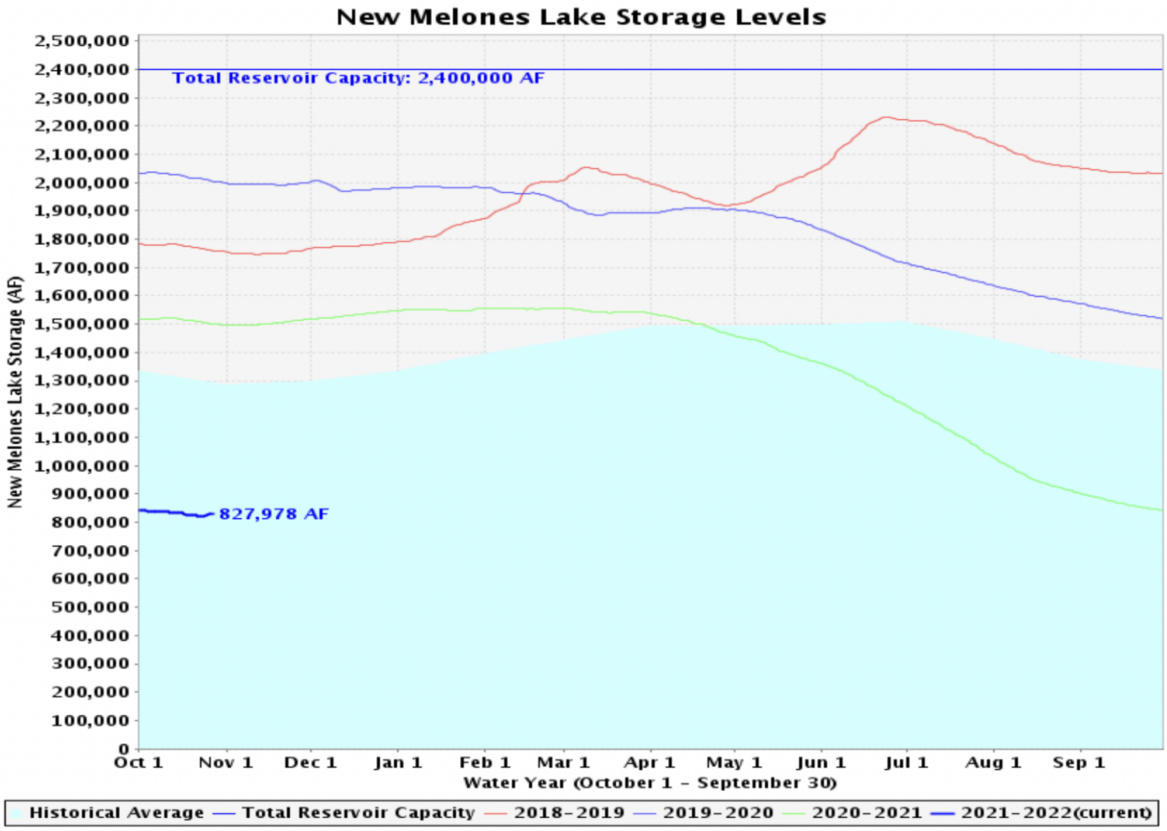

Figure 3. Water levels of New Melones from the 2018 – 2021 water years. (California Department of Water Resources 2021)

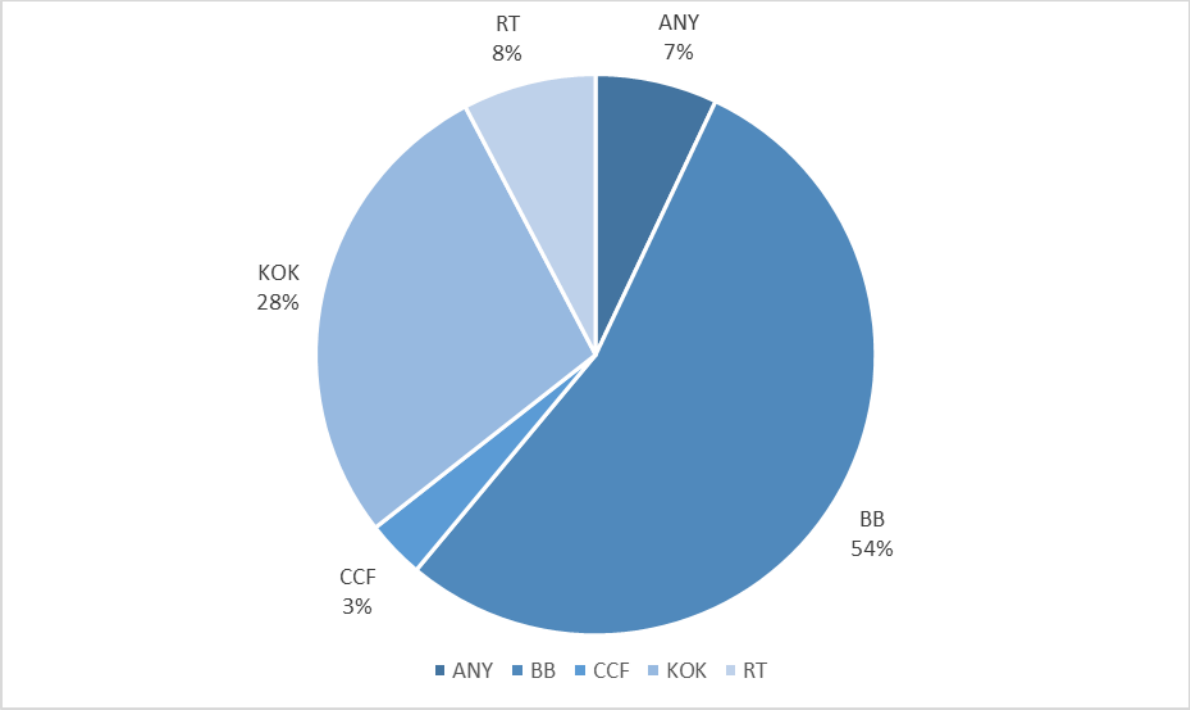

Figure 4. Species targeted by anglers at New Melones. Species include Kokanee (KOK), Rainbow Trout (RT), Black Bass (BB), Channel Catfish (CCF), and unspecified target species (ANY)

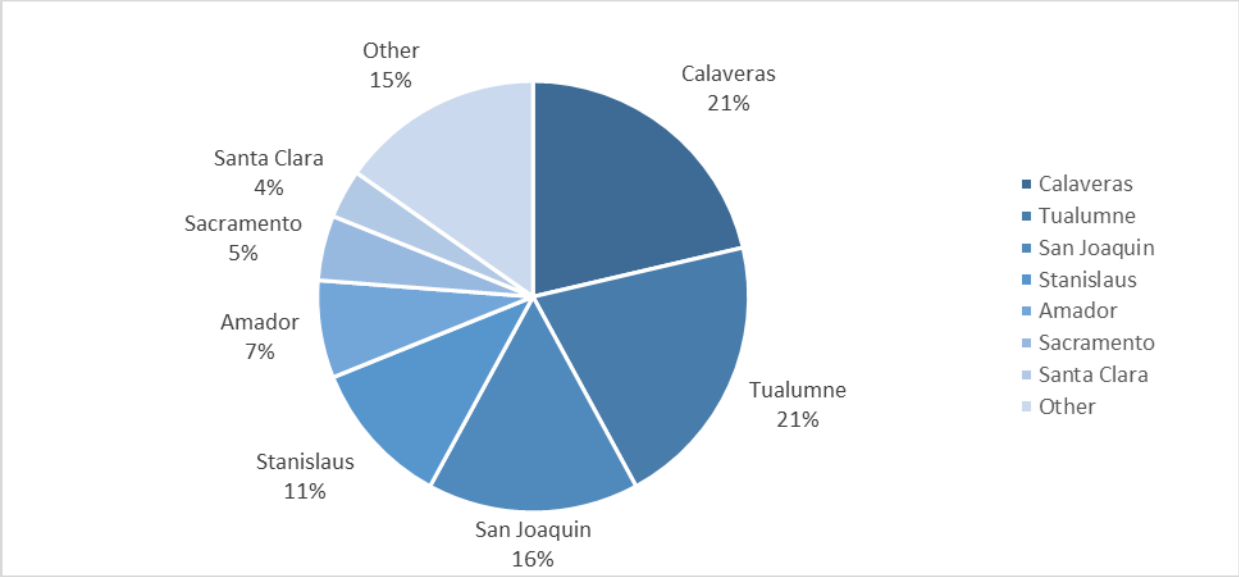

Figure 5. Counties of anglers fishing at New Melones.

Figure 6. Average satisfaction ratings of size of fish, number of fish, and overall experience rating separated by species targeted.

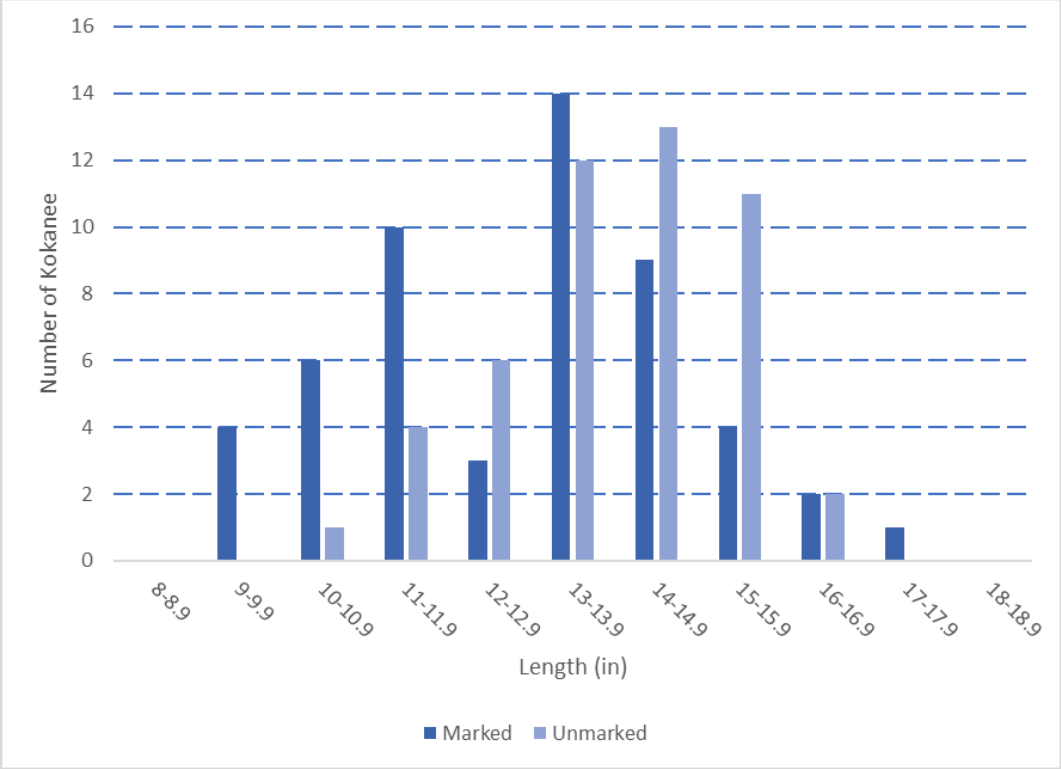

Figure 7. Total lengths of Kokanee measured at New Melones comparing marked and un-marked fish.

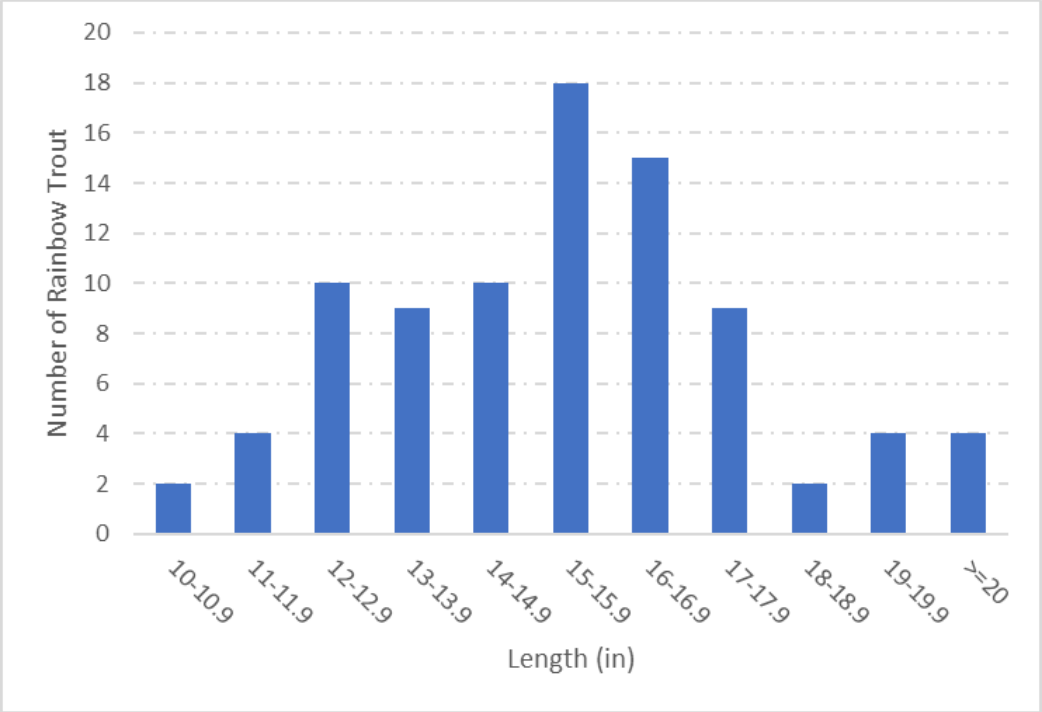

Figure 8. Total lengths of Rainbow Trout measured from New Melones

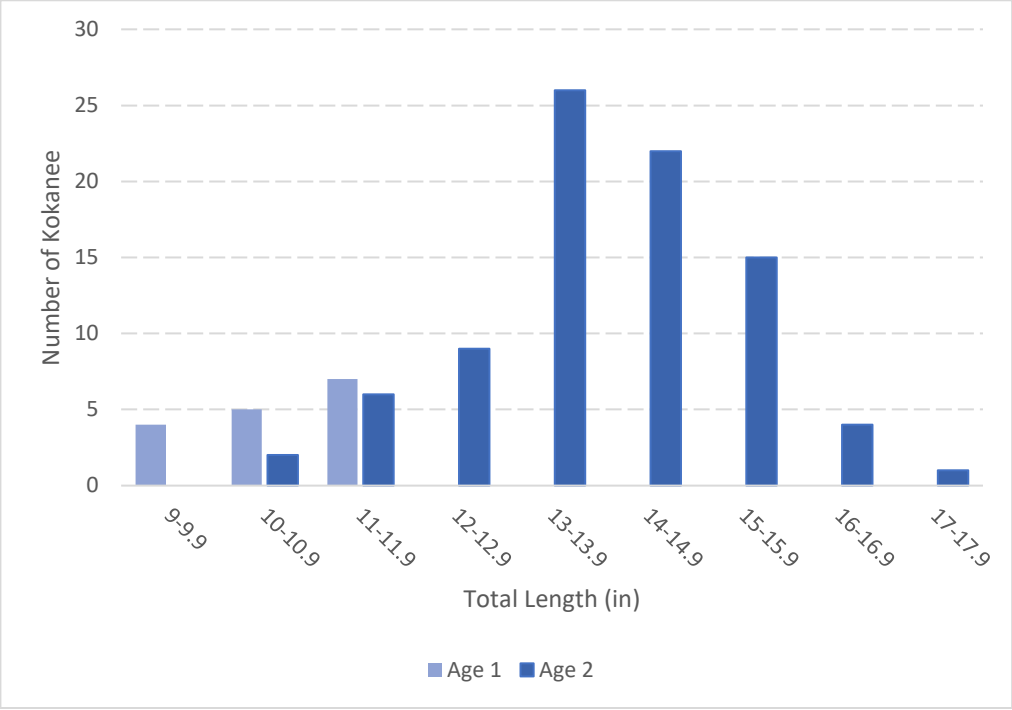

Figure 9. Distribution of Age 1 and Age 2 Kokanee total lengths. Data was extrapolated from the aging of a subsample (n=38) of Kokanee and applied to entire sample of measured Kokanee from the survey (n = 101).