Electrofishing Survey Results at Finnon Reservoir, El Dorado County
Survey Conducted on April 26, 2016

INTRODUCTION

Finnon Reservoir is an off-channel, artificial impoundment located in western El Dorado County at an elevation of 2,425 feet above sea level. The property is open to the public for camping and day-use activities by donation. The lake itself is home to a variety of aquatic wildlife including largemouth bass (LMB; *Micropterus salmoides*), bluegill (BG; *Lepomis macrochirus*), sunfish (*Lepomis spp.*), bullfrogs (*Lithobates catesbeiana*), and red-eared sliders (*Trachemys scripta elegans*), to name a few. Additional information regarding the history, management, and habitats at Finnon Reservoir can be found at http://www.finnonrecreationarea.com.

The reservoir has undergone significant construction and augmentation in recent years. It was drained in mid- March 2011 to facilitate dam repairs. One hundred-seventy five largemouth bass, all in excess of 14 inches, were rescued from the resultant out-flow as the reservoir was drained and returned to the low pool that remained within the reservoir. Bluegill were observed in the low pool and likely survived the construction period. The new dam structure was completed in late 2011 and the reservoir began to slowly fill from precipitation and local runoff.

In March 2013, with the lake level still very low due to drought conditions, the littoral areas of the lake were easily accessible and 86 bass beds were constructed such that they would lie beneath 3 to 12 feet of water once the reservoir filled. The first beds were submerged in spring of 2016 - the first significant water year since the dam construction had been completed. In September 2013, approximately 1,000 pounds of crayfish were planted to provide forage for bass and bluegill. In addition, in October 2013, approximately 1,600 bluegill fry and 1,600 sunfish (*spp.*) fry were planted.

Due to the recent history of Finnon Reservoir, and that the reservoir has filled to the spillway only within the past year, it is reasonable to assume the aquatic resources, forage, invertebrate communities, and fish populations are in flux. As a result, electrofishing sampling was conducted to establish a baseline set of data against which future sampling efforts can be contrasted.

SAMPLING METHODS

On April 26, 2016, Finnon Reservoir in El Dorado County, was sampled with a 2007 Smith-Root electrofishing boat. The survey was conducted by California Department of Fish and Wildlife (CDFW) staff assisted by the lake manager, Mr. David Angelo. Mitch Lockhart operated the boat; Guy Easterling and Mr. David Angelo netted stunned fish; and Adam Koons collected and recorded data on each fish sampled. Sampling was conducted in the evening hours from 1930 to 2200 hours using a constant field while slowly maneuvering the boat from the boat launch (Figure 1), counter-clockwise along the shoreline of the lake. Sampling continued for 2 ½ hours until the entire shoreline was sampled.

Figure 1: Google Earth image of Finnon Reservoir, amenities, and surrounding habitat (retrieved May 2016). The yellow dot indicates the location of a gravel boat launch. The red dot indicates the location of the fee campground. The blue dot indicates the location of Mosquito General –Market and Kitchen.

In total, 120 LMB and 151 BG were captured. All fish captured were identified and total length measured to the nearest millimeter. Fish at least 100mm in length were weighed to the nearest gram. All fish were recovered in a circulating live well and released back into Finnon Reservoir alive. One BG was inadvertently killed before release. Approximately half way through the sampling effort, the batteries in the electronic scale failed and no replacements were on hand. As a result, weights were collected for only 64 LMB and 14 BG.

ANALYSIS METHODS

To analyze the fish sample, length and weight data were entered into a spreadsheet and analyzed separately for each species present in the sample.

Length Frequency Histogram Methods - Length frequency histograms are a visual descriptor of length data. The histograms were generated for each species by counting the number of fish sampled whose total lengths fell within specified length intervals. Twenty-millimeter length intervals were used for LMB and 10mm length intervals were used for BG (Anderson and Neumann 1996). Once the length-frequency relationship was plotted, the modal size class of the sample will be the size interval with the greatest frequency of fish. In addition, gaps between size intervals can indicate presence of multiple year classes or cohorts.

Relative Stock Density Methods – Relative stock density (RSD) is a numerical descriptor of length-frequency data that can provide insight into population dynamics and the quality of a fishery (Wege and Anderson 1978). The most commonly used comparison is relative stock density of quality-sized fish (RSD-Q) (Table 1) also known as proportional stock density (PSD). RSD-Q values range from 0-100 with values from 40-70 representative of balanced LMB populations and values of 20-60 representative of balanced BG populations. RSD-Q is calculated as follows:

RSD-Q = (number of fish ≥ minimum quality length)/(number of fish ≥ minimum stock length) *100

Individual LMB were considered sexually mature adult fish (stock-size) if total length was at least 200mm (7.9 inches) and were considered juvenile fish if total length was less than 200mm (Table 1). Individual BG were considered sexually mature adult fish (stock-size) if total length was at least 80mm (3.1 inches) and were considered juvenile fish if total length was less than 80mm (Table 1).

Table 1: Length categories in millimeters proposed for LMB and BG for the purposes of calculating RSD (Anderson and Neumann 1996).

Species	*Stock Length*	*Quality Length*	*Preferred Length*	*Memorable Length*	*Trophy Length*
LMB	200	300	380	510	630
BG	80	150	200	250	300

Relative Weight Methods – Relative weight (W_r) is a numerical descriptor of length-weight data that can provide insight into the condition and health of fish relative to other fish of the same species and size (Anderson and Neumann 1996). W_r values of 100 or higher indicate fish of "optimal" condition or health for a given size class. W_r is calculated as follows:

$W_r = (W/W_s) *100$

where W equals the weight of an individual fish, and where W_s is a predicted weight from a length specific regression constructed to represent the species.

RESULTS

In total, 271 fish were sampled, 120 LMB and 151 BG, during 2.5 hours of electrofishing. The water temperature was 18.3^0 C (65^0 F) as of 1930 hours at the boat ramp. The composition of the total sample is summarized in Table 2.

Table 2: Composition of the electrofishing sample conducted at Finnon Reservoir, El Dorado County, on April 26, 2016.

Species	*Number*	*Percent Catch*	*CPUE (catch/hour)*	*Mean Total Length (mm)*	*Mean Weight (g)*	*Number Weighed*	*Condition (Mean W_r)*
LMB	120	44%	48	197	228	64	88
BG	151	56%	60.4	108	90	14	99
Total	271	100%	108.4				

Largemouth Bass Results – Figure 2 summarizes length distributions for the LMB sample. Total lengths of LMB ranged from 90mm to 555mm (n=120; 3.5 to 21.85 inches) and weights ranged from 13 g to 2,830 g (n=64; 0.03 to 6.24 pounds). The modal size class, constituting 34% (n=41) of the LMB sampled, was 181mm to 200mm (7.1 to 7.9 inches).

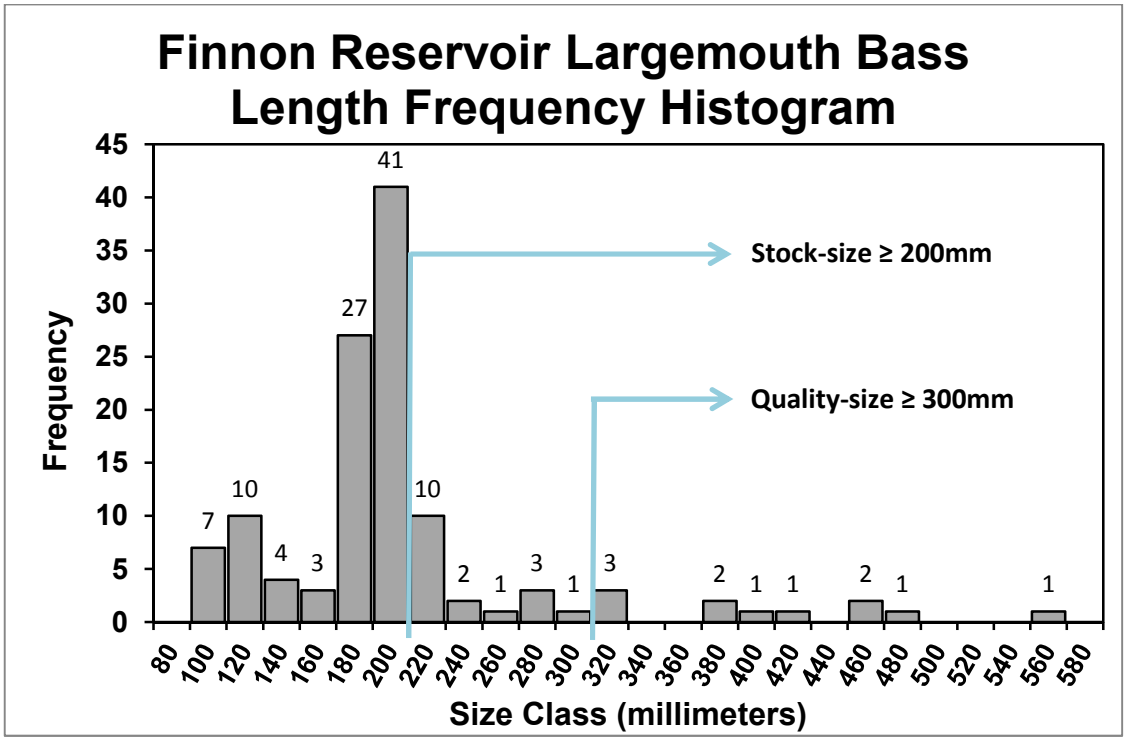

Figure 2: A length frequency histogram displaying the largemouth bass sample at Finnon Reservoir by size class. The X-axis displays a series of 20mm size classes. The X-axis labels are the upper boundary of each size class in millimeters. The Y-axis is the frequency or number of individual largemouth bass whose total length fell within a given size class. For example, 2 largemouth bass were caught whose total lengths were at least 441mm and less than or equal to 460mm.

Adult LMB comprised 25% (n=30) of the sample with a mean weight of 520g (1.14 lbs., n=23) (Table 3). Individuals were considered of quality-size if total length was at least 300mm (11.8 inches). Quality-sized fish comprised 9% of the sample (n=11) with a mean weight of 1,031g (2.27 lbs., n=10) (Table 3). Fish condition (W_r) was average or above average for all size classes. It is important to note that due to the aforementioned issues with the electronic scale, the number of fish weighed is very small for some size classes (Table 3) which likely skews the weight calculations.

Relative stock density of quality-size fish (RSD-Q) was 37 (Table 3), indicating that the sample contained a higher number of juvenile fish relative to adult fish than would be expected in a balanced population (40 ≤ RSD-Q ≤ 70). However, these results may be misleading since the sample of 30 stock-size, adult fish is considered too small to determine relative stock-density with confidence. A sample of at least 50 stock-size fish is preferred (Weithman et al. 1980).

Table 3: Table summarizing the composition of the LMB sample. Note, due to scale battery failures, the number of weighed fish was very small for some size classes, which had likely skewed the mean weight and mean W_r calculations.

	Length	*Number*	*Percent LMB catch*	*RSD*	*Mean Total Length (mm)*	*Mean Weight (g)*	*Number Weighed*	*Condition (Mean W_r)*
Juveniles	≤ 199mm	90	75%	-	165	64	41	89
Stock-size	≥ 200mm	30	25%	-	292	520	23	86
Quality-size	≥ 300mm	11	9%	37	404	1,031	10	87
Preferred-size	≥ 380mm	6	5%	20	459	1,586	5	93
Memorable-size	≥ 510mm	1	1%	3	555	2,830	1	103
Trophy-size	≥ 630mm	0	-	0	0	-	0	-

Bluegill Results – Figure 3 summarizes length distributions for the BG sample. One hundred-fifty one BG were captured, total lengths ranged from 13mm to 250mm (n=151; 0.5 to 9.8 inches) and weights ranged from 20g to 258g (n=14; 0.04 to 0.57 lbs.). The modal size class, constituting 20% (n=30) of the individuals sampled was 51mm to 60mm (2.0 to 2.4 inches).

Adult BG comprised 54% (n=81) of the sample. Individuals were considered of quality-size if total length was at least 150mm (5.9 inches). Quality-sized fish comprised 30% (n=45) of the sample. It is important to note that due to the aforementioned issues with the electronic scale, only 14 BG were weighed, too few to calculate mean weights and condition (W_r) for each size class. However, relative weight for the 14 BG weighed (mean W_r; N=14) suggests the BG at Finnon Reservoir are “optimum” condition and health. Although the sample of weighed BG was very small, the survey crew noted that BG captured were large and healthy.

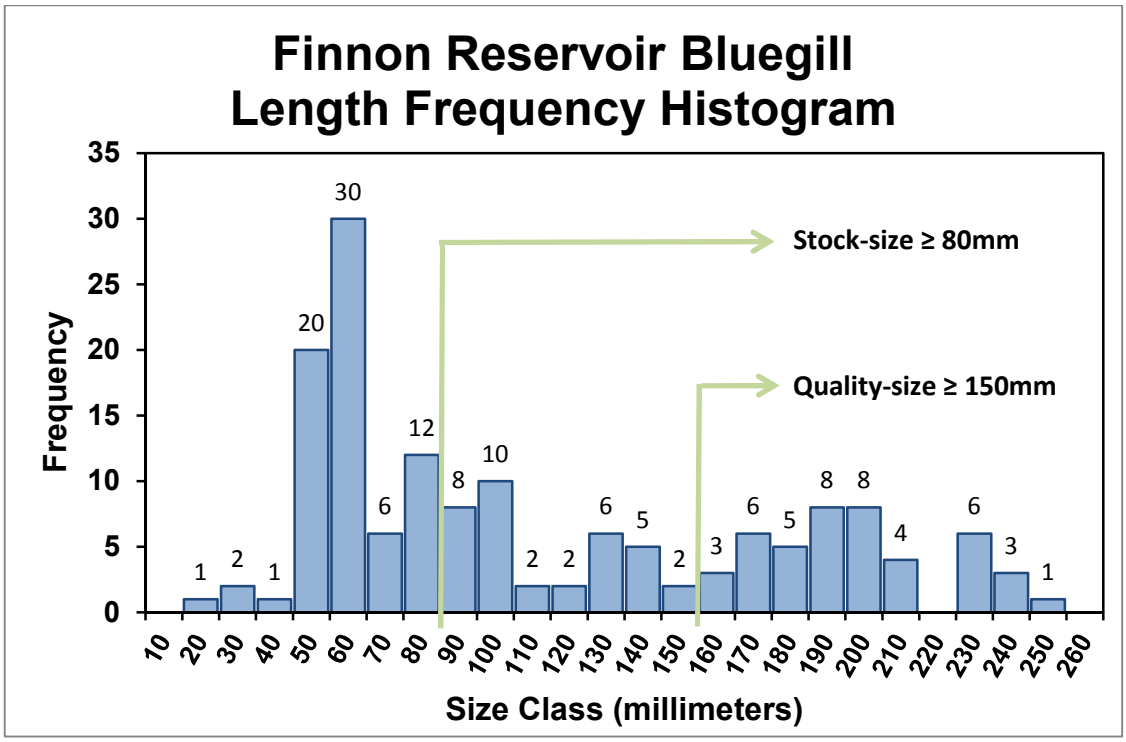

Figure 3: A length frequency histogram displaying the bluegill sample at Finnon Reservoir by size class. The X-axis displays a series of 10mm size classes. The X-axis labels are the upper boundary of each size class in millimeters. The Y-axis is the frequency or number of individual bluegill whose total length fell within a given size class. For example, six bluegill were caught whose total lengths were at least 121mm and less than or equal to 130mm.

Relative stock density of quality-size fish (RSD-Q) was 56 (Table 4), indicating that the sample is representative of a balanced population (20 ≤ RSD-Q ≤ 60). In contrast to LMB, the sample of stock-size BG (n=81) was large enough to meet to calculate an RSD-Q of 56 with confidence as recommended by Weithman et al. (1980).

Table 4: Table summarizing the composition of the BG sample. Note, due to scale battery failures, the number of weighed fish is very small which precludes the use of weight-based parameters for some size classes.

	Length	*Number*	*Percent BG catch*	*RSD*	*Mean Total Length (mm)*	*Mean Weight (g)*	*Number Weighed*	*Condition (Mean W_r)*
Juvenile size	≤ 80mm	70	58%	-	55	-	0	-
Stock size	≥ 80mm	81	68%	-	154	90	14	99
Quality size	≥ 150mm	45	38%	56	193	179	5	100
Preferred size	≥ 200mm	15	13%	19	221	229	2	99
Memorable size	≥ 250mm	1	1%	1	250	-	0	-
Trophy size	≥ 300mm	0	-	0	0	-	0	-

DISCUSSION

Our sample captured LMG and BG across a broad range of size and age classes. Young of year, juvenile, and adult fish were captured. Adult fish of both species appeared healthy, in good condition, and of quality size. These observations suggest that water quality (temperature), habitat, and availability of prey items are sufficient for both LMB and BG. This is further supported by RSD-Q values of 37 and 56, respectively, which are near or within expected values for balanced populations (LMB = 40 ≤ RSD-Q ≤ 70; BG = 20 ≤ RSD-Q ≤ 60). Furthermore, fish condition (mean W_r) was above average, 88 for LMB and 99 for BG.

Yet, these results are not definitive. There are problems with the dataset when attempting to characterize the fish populations of Finnon Reservoir. The electronic scale failed approximately half-way through the sample and only 64 LMB and 14 BG were weighed. The small number of weighed fish (small sample size) creates an issue when calculating weight-based parameters. In addition, because the lake was sampled in a counter-clockwise direction, all of the weights are collected from fish that occupy the western portion of the lake. The western portion of the lake hosts habitat that is quite different than the shallower, warmer, more vegetated eastern portion of the lake. This may explain why so few BG were captured and weighed before the scale failed. Moreover, the sample of stock-size (adult) LMB was too small to confidently calculate the relative stock density of quality-size LMB. In contrast, the BG stock-size sample was more than sufficient to lend confidence to the results.

That being stated, it is important to understand that population metrics are most useful for making comparisons between survey efforts to gain insight into how a given fish population has changed over time. Therefore, sampling efforts should continue at Finnon Reservoir on an annual basis for two to five years, or more.

Largemouth Bass Discussion – Analyzing the length frequency histogram for largemouth bass (Figure 2), a number of inferences can be made. Subjectively, the LMB population at Finnon Reservoir provides a nice fishery with a broad range of fish sizes in good numbers with a few fish growing sufficiently large to please any angler.

Young-of-year fish (year-0), hatched in spring of 2015, sample demonstrated good growth (90 to 190mm) indicating sufficient benthic macroinvertebrate forage for young bass. The abundance of year 1+ fish (180 to 230mm) indicate high survival of young-of-year and significant recruitment of young fish to adult-size. Adult fish (≥ 200mm) are of good quality (mean W_r = 86) with a mean length of 292mm (11.5 inches) and mean weight of 520g (1.15 lbs.).

However, the relative stock density of quality-size fish (RSD-Q=37) is at the low end of what one might expect in a balanced population of LMB. It is likely the LMB population is still recovering from low water levels associated with dam construction activities the population structure remains in flux. However, in some instances, low RSD-Q values can indicate LMB growth slows significantly once a fish reaches adult-size. A possible explanation is that the reservoir is not supporting sufficient prey items for the

population of adult-size LMB. For instance, if BG grow very quickly, cohorts of BG may grow beyond the preferred size of prey items for a given cohort of LMB resulting in low recruitment of adult-size fish to larger size classes. It is also possible that the aforementioned small sample size of adult-size LMB is biasing the results. In any case, to gain further insight into the population dynamics of the LMB at Finnon Reservoir, additional sampling efforts are necessary.

Bluegill Discussion – Subjectively, the BG population at Finnon Reservoir is doing very well with a broad distribution of size classes and individual fish growing quite large and fat. Unfortunately, due to the incredibly low number of BG weighed, none of the weight-based parameters lend much insight. However, the length-based parameters can still be evaluated. For instance, the relative stock density of quality-size fish (RSD-Q = 56) is near the upper limit of the range suggested for a balanced population. This may indicate an abundance of prey items and rapid growth for adult-size fish. Perhaps the crayfish present in Finnon Reservoir become available once the BG is of sufficient size. Further sampling efforts should be conducted to determine if the BG population is trending towards a top-heavy distribution of larger, adult fish. Such a situation could be detrimental to the growth of adult LMB.

RECOMMENDATIONS

It is important to stress the uncertainty and preliminary nature of the results of a single sample. What is clear is that an abundance of quality- size LMB and BG are present in the lake and would be a pleasure to pursue with rod and reel. As such, I discourage any fishery enhancement projects and recommend continued sampling on an annual basis for the next 2 to 5 years.

In addition, I recommend a voluntary survey form be distributed to the anglers of Finnon Reservoir. Perhaps such a form could be included within the fee envelope. A collection box or receptacle will need to be provided, as well, preferably in a visible and highly visited location. The purpose would be to collect information about the fishery from the perspective of a hook and line angler. Such insight is invaluable when managing fish populations for good fishing. The CDFW regional District Biologist could provide assistance in the development and implementation of such a survey should one be implemented at Finnon Reservoir.

LITERATURE CITED

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