State of California
Department of Fish and Wildlife

Upper Blue Lake General Fish Survey
Spring, 2014

By

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Summary

In an effort to evaluate the fishery of Upper Blue Lake (Upper Blue), a general fish survey was conducted on June 12 and 13, 2014. For the survey the entire shoreline was sampled with an electrofishing boat. Fish collected during the survey included common carp (CP) (*Cyprinus carpio*), bluegill (BG) (*Lepomis macrochirus)*, largemouth bass (LMB) (*Micropterus salmoides)*, rainbow trout (RBT) (*Oncorhynchus mykiss*), green sunfish (GSF) (*Lepomis cyanellus*), prickly sculpin (SCP-I) (*Cottus asper*) and brown bullhead (BB) (*Ameiurus nebulosus)*. Upper Blue was determined to have a diversified fishery based on observations from the survey. The low numbers of fish collected made drawing any conclusions about specific fish species unreliable. The high winds on the lake combined with the steep shoreline could have contributed to the fact that the Department did not see more fish which may have been present but out of range for the electrofishing boat. The data from this survey in conjunction with future efforts will be used to monitor the status of this fishery.

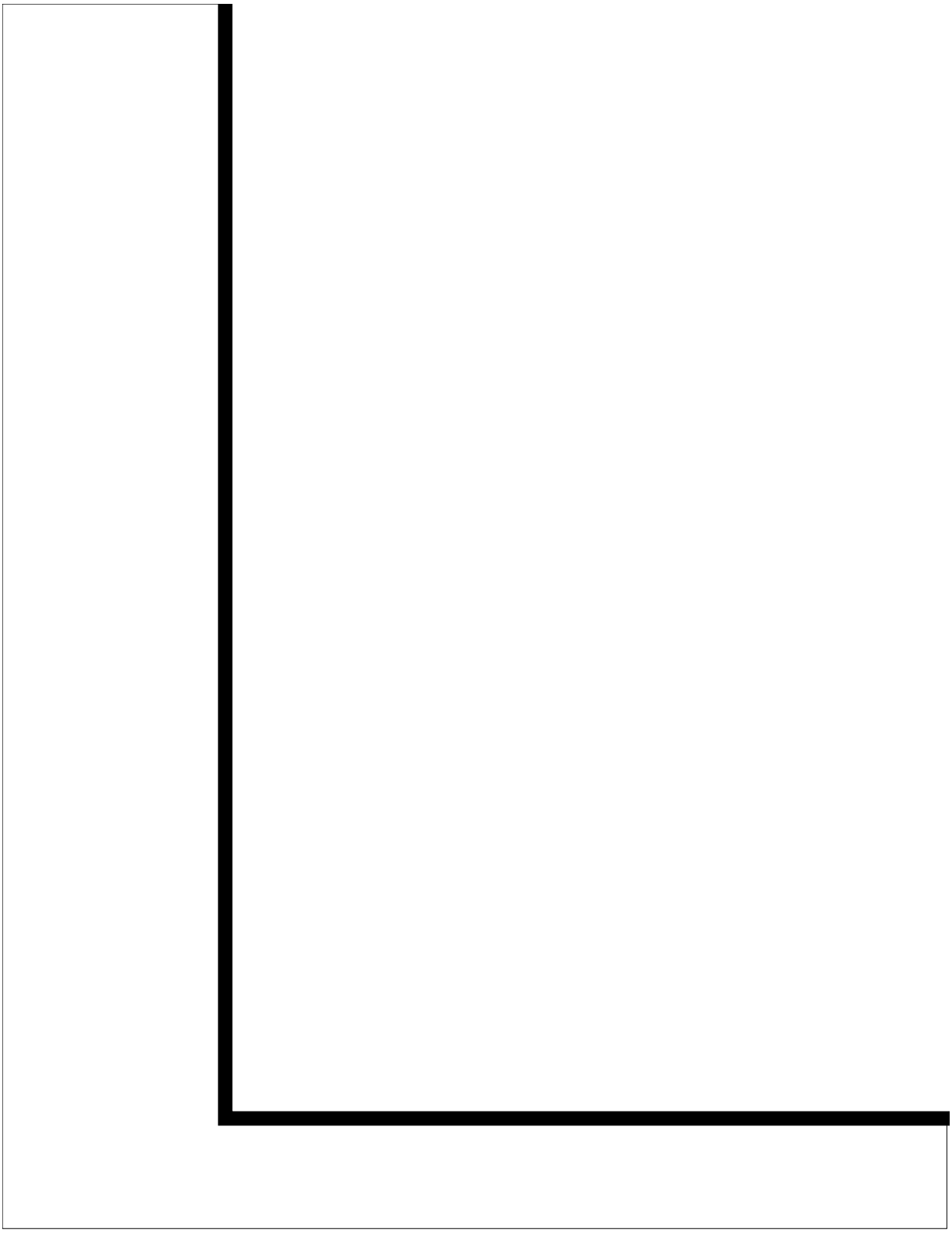
Introduction

The objectives of this survey were to:

- Determine fish species composition
- Determine fish age class distribution
- Create baseline indices with which to compare future surveys

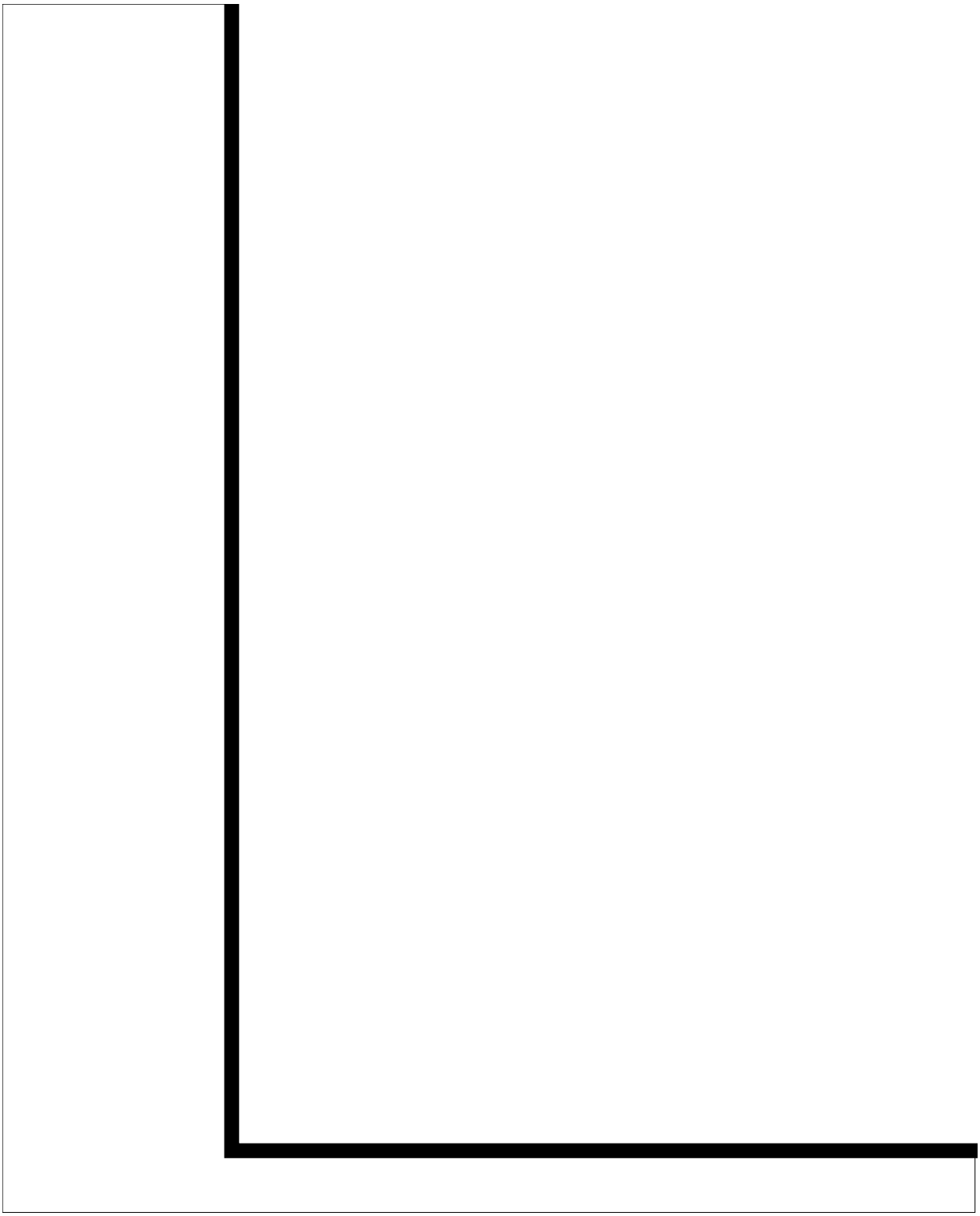
Upper Blue is a natural lake in the Cache Creek watershed in northwestern Lake County, California, approximately seven miles west of Upper Lake, CA on Highway 20 (Figure 1). The drainage basin comprises the upper northwest section of the Cache Creek basin with water leaving the lake and eventually draining into Clear Lake downstream.

Upper Blue sits at an elevation of approximately 1,361 feet above mean sea level. At maximum pool the lake occupies approximately 55 surface acres (Coulon 2009) and has 3,960 acre-feet of water storage (Brydon 1954). Upper Blue supports both a warmwater LMB, BG, BB, tule perch (TP) (*Hysterocarpus traski*), SCP-I and coldwater hatchery rainbow trout fishery.



Methods and Materials

The entire shoreline at Upper Blue (Figure 2) was sampled at night using an 18 ft. Smith-Root electrofishing boat. Pulsed DC current (8-12 amps) was used to "stun" the fish. When an electrical field was applied to the water it was measured on a counter and this time was recorded as generator seconds. Fish under electronarcosis were netted and placed in a holding tank. An effort was made to capture all shocked fish; however, very small fish sometimes eluded capture as did those fish on the outer edge of the electrical field. The crew consisted of two forward netters, one crewmember working the livewell, and one boat operator. The lake was sampled in a continuous line parallel to shore. The mean length and weight for each species was determined and an analysis of population indices were evaluated for selected species when appropriate. These indices include catch per unit of effort (CPUE) weight-length relationships, relative Weight (Wr), and proportional stock density (PSD) (Anderson, R.O. and R.M. Neumann 1996). Fish were identified to species and the first 100 of each species had measurements recorded for total length (TL) in millimeters (mm) and weights in grams (g) if minimum total lengths were attained for that specific specie (Murphy and Willis 1996). Weights were determined using digital or a Boga Grip ™ scale if the fish was over seven pounds. All fish collected after the first 100 of a species were tallied.



Catch Per Unit of Effort

Catch per unit effort (CPUE) is defined as the number of fish collected per minute of shocking time. The data was used to estimate (CPUE) for all species combined and for individual species.

CPUE = N/M

where:

N = total number of collected or the total number of a specie and

M = number of minutes that the electric field was active in the water

Relative Weight (Wr)

Relative Weights (Wr) are used to represent the overall condition of the species in Upper Blue. A fish's length is generally the primary determinant of its weight and increases in length will result in increases in weight. However, an increase in a fish's length is not always in direct proportion with an increase in its weight. These fish tend to change shape as they grow which is allometric growth. Relative Weight represents a modification of the Relative Condition Factor (Kn) that compensates for fish that exhibit these allometric growth patterns. The Wr is based on the assumption that the slope and intercept of the weight-length relationship are the same as in the "ideal" equation used in its calculation (Cone 1989). To determine the Wr for species sampled at Upper Blue the following equations were used:

$$\mathbf{Wr = (W/Ws) \times 100}$$

Where:

Wr = the condition of an individual fish.

W = weight in grams

Ws = length-specific standard weight predicted by a length-weight regression for a species.

The equation to determine the Ws is:

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

Where:

a' = intercept value

b = slope of the log10 (weight) – log10 (length) regression equation

L = maximum total length

The intercept and slope parameters for standard weight (Ws) equations are taken from using the standard equations for that particular species found in Fisheries Techniques (1996). In concept, a mean Wr of 100 for a broad range of size-groups may reflect ecological and physiological optimality for populations (Murphy 1996). Utilizing these Ws equations, fish of all lengths, regardless of species are in good condition with a Wr of about 100. Distance from 100 above or below, indicates fatter or poorer condition.

If a minimum sample size of 30 of a given species is not collected or a minimum size is not met, no relative weights will be calculated.

Weight-Length Relationship

Linear regression values for the length-weight relationship were determined for selected species. The linear regression line slope and intercept values enabled us to estimate the weight of a fish if the total length is known. The regression equation is expressed as:

$y = a + bx$

Where:

y = estimated weight

a = intercept of the line

b = slope of the line

x = independent variable of total length

The intercept and slope values were generated using Microsoft Excel©.

Results and Discussion

A total of 7,736 electrofishing seconds (129 minutes) were used to sample the entire

Upper Blue shoreline. Table 1 summarizes the species composition, CPUE, mean total length and weight, and length ranges. A total of 376 fish representing seven species were collected during the survey (Table 1). Largemouth bass comprised 91 percent of the total fish sampled. Bluegill followed with 3.2 percent of the total fish sampled. Common carp and green sunfish each had 2.9 and 2.4 percent respectively. Brown bullhead, prickly sculpin, and rainbow trout finished with less than one percent of the total catch each. The total CPUE for this survey effort was 2.92 fish/min.

Table 1. Species composition from Upper Blue Lake, June 12 and 13, 2014.

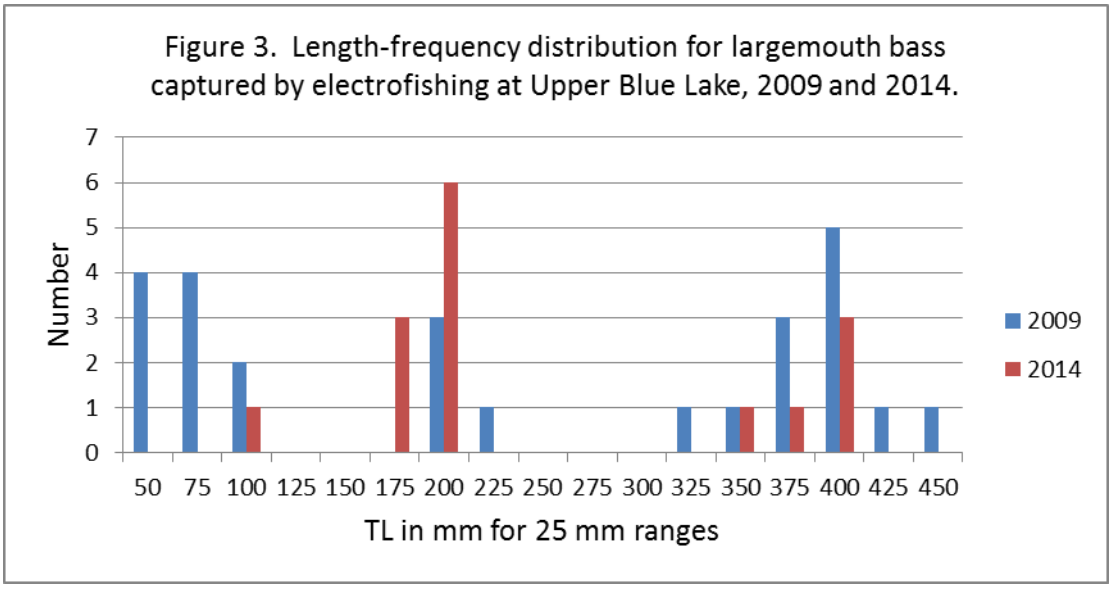
	Species	Number	Percent	CPUE	(TL) (mm)	Weight (g)	Length Ranges
1	Largemouth bass	342	91.0%	2.65	260.5	437.2	109 - 424
2	Bluegill	12	3.2%	0.09	50.3	NA	35 - 65
3	Common carp	11	2.9%	0.09	NA	NA	NA
4	Green sunfish	9	2.4%	0.07	116.4	71.4	61 - 172
5	Brown bullhead	1	0.3%	0.01	367	761	NA
6	Prickly sculpin	1	0.3%	0.01	117.0	22.0	NA
7	Rainbow trout	1	0.3%	0.09	210.0	NA	NA
	Total	376					
	Generator minutes:	128.9					
	CPUE (Fish/ gen. min)	2.92					
	Water Temperature	72º F					

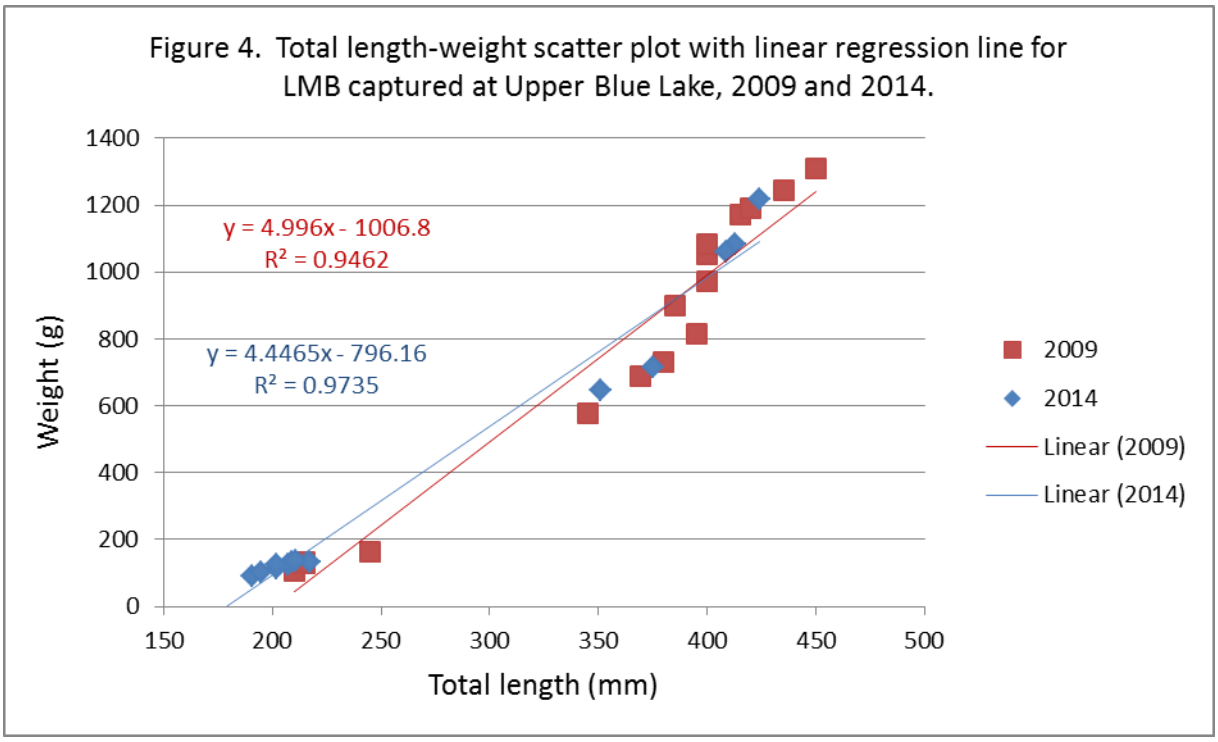
*Weights were only collected when the minimum total length for bluegill and green sunfish was 80 mm and 150 mm for largemouth bass. No weight for the rainbow trout was made due to not wanting to harm the fish. No lengths and weights for common carp were taken due to the damage they do to Department equipment.

Largemouth bass

Largemouth bass captured and measured ranged from 109 - 424 mm (4.3 and 16.7

inches) (Table 1). Multiple large pods of young of the year LMB were seen but only one pod was collected with the nets and tallied. In addition to the LMB collected and measured, a total of 327 young of the year LMB were collected and tallied. These fish were tallied since the Department was looking to get more lengths and weights of LMB of greater size for the first 100 LMB collected and the risk of injury to the small/young fish. Also, gathering length-weight data on young of the year LMB is unreliable. It is not recommended to collect a weight for LMB under 150 mm in total length due to the fact that a small weight miscalculation can inhibit gathering a reliable R^2 value as well as Wr value (Gablehouse 1984a). LMB collected ranged from young of the year to five plus years of age at the time of sampling (Moyle 2002) in 2014. The large amount of LMB young of the year collected in relation to other sizes collected indicates a significant amount of recruitment for this year. The mean total length for LMB 109 mm and greater was 260.5 mm (10.3 inches) in 2014. A comparison of LMB collected in the 2009 survey (Thomas 2009) and the 2014 survey indicate a gap in LMB collected from 250 – 324 mm (9.8 – 12.8 in.) (Figure 3). It is possible that the smaller bass are having a difficult time growing to the larger size classes because of competition for resources with other fish and/or being predated on by the LMB in the larger size classes. Using the linear regression equation present in Figure 4, a reliable estimated weight can be determined from the length of a LMB for both 2009 and 2014. Both the 2009 and 2014 slopes are similar which suggests the LMB fishery has remained consistent between the two years surveyed.





No PSD, RSD-P, RSD-M, and relative weight values were calculated due to the lack of quality size and greater LMB collected.

Conclusions

The high winds during the survey as well as the steep gradient of the lake shoreline made sampling fish difficult. This could have contributed to low numbers of fish greater than 100 mm in total length since they might have been occupying greater depths that the boat could not sample. Due to the lack of suitable sample sizes for the majority of species collected during the survey, no summaries were made since the results would be inconclusive.

The large number of LMB collected and different age classes present in relation to other species collected suggests that LMB are surviving well in Upper Blue. A larger diversity of fish were collected during this survey, with seven different species collected compared to two surveys made in 2009. A survey in January of 2009 yielded only two species (Largemouth bass and bluegill) (Coulon 2009) and another survey in April yielded only four species (Largemouth bass, tule perch, bluegill, and green sunfish). A couple of reasons that might explain the difference in diversity could be the time of year and amount of shoreline covered. The surveys in 2009 were earlier in the year when the surface water temperature was likely cooler than the June, 2014 survey. This might have had more fish occupying warmer temperatures at greater

depths. Also, with less shoreline covered in the 2009 surveys, there was likely less of a chance to gather more fish. One species that was collected from the April, 2009 electrofishing survey that was not seen in this survey was tule perch (Thomas 2009). Tule perch may be petitioned to be a listed species under the California Endangered Species Act (CESA) and/or the Endangered Species Act (ESA) which would govern federal protection. Monitoring the population of this fish in Upper Blue Lake is an important managing strategy for the Department for gathering information. Future spring surveys at Upper Blue will be conducted at the same time of the season and same locations to maximize consistency.

References

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