

State of California
The Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE

Lake Almanor General Fish Survey 2013

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TABLE OF CONTENTS

ACRONYMS	iv
I. INTRODUCTION.....	1
II. METHODS	1
Boat Electrofisher	1
Figure 1. Lake Almanor 2008	Error! Bookmark not defined.
Figure 2. Lake Almanor 2013	3
III. RESULTS.....	4
Lake Almanor 2013	4
Brown bullhead	4
Brown trout	4
Channel catfish	4
Carp	4
Largemouth bass	4
Pond smelt	4
Rainbow trout	5
Sacramento perch	5
Sacramento pikeminnow	5
Sacramento sucker	5
Sculpin	5
Smallmouth bass	5
Tui chub	5
Table 1. 2013 summary of fish captured in Lake Almanor	6

Figure 3. 2013 length-frequency histogram of Lake Almanor Centrarchids	6
Figure 4. 2013 length-frequency histogram of Lake Almanor fish (not including Centrarchids).....	7
Figure 5. 2013 Lake Almanor species composition.....	7
IV. DISCUSSION.....	8
2013 versus 2008	8
Table 2. 2008 summary of fish captured in Lake Almanor.... Error! Bookmark not defined.	
Figure 6. 2008 length-frequency histogram of Lake Almanor fish	9
Figure 7. 2008 Lake Almanor species composition.....	9
V. CONCLUSION	10
VI. REFERENCES	11

ACRONYMS

CDFW California Department of Fish and Wildlife
SR-18 Smith-Root electrofishing boat

Fish Species

BB	Brown bullhead <i>Ameiurus nebulosus</i>
BN	Brown trout <i>Salmo trutta</i>
CP	Carp <i>Cyprinus carpio</i>
CCF	Channel catfish <i>Ictalurus punctatus</i>
CHIN	Chinook salmon <i>Oncorhynchus tshawytscha</i>
GSH	Golden shiner <i>Notemigonus crysoleucas</i>
LMB	Largemouth bass <i>Micropterus salmoides</i>
PS	Pond smelt <i>Hypomesus nipponensis</i>
RT	Rainbow trout <i>Oncorhynchus mykiss</i> (4)
SP	Sacramento perch <i>Archoplites interruptus</i>
SPM	Sacramento pikeminnow (aka Squawfish) <i>Ptychocheilus grandis</i>
SCP	Sculpin <i>Cottus sp.</i>
SKR-S	Sacramento sucker <i>Catostomus occidentalis</i>
SMB	Smallmouth bass <i>Micropterus dolomieu</i>
TC	Tui chub <i>Siphateles bicolor</i>

Measurements

mm	millimeters
g	grams
TL	total length
CPUE	catch per unit effort

I. INTRODUCTION

Lake Almanor is located in Plumas County, near the town of Chester. The lake is a 25,000 surface acre reservoir created in 1927 that sits at an elevation of 4,501 feet and is part of the North Fork Feather River drainage. Currently, the dam is owned and operated by the Pacific Gas and Electric Company. The recreational fishery established at Lake Almanor is comprised of a variety of stocked and self-sustaining native and non-native fish populations including rainbow trout (RT) *Oncorhynchus mykiss*, brown trout (BN) *Salmo trutta*, Chinook salmon (CHIN) *Oncorhynchus tshawytscha*, smallmouth bass (SMB) *Micropterus dolomieu*, and largemouth bass (LMB) *Micropterus salmoides*.

In an effort to evaluate the fishery at Lake Almanor, a general fish survey was conducted on the nights of August 7-8, 2013 by California Department of Fish and Wildlife (CDFW). Prior to this, the lake was last surveyed in 2008 as part of the effort to monitor other waters nearby Lake Davis for northern pike (Figure 1). Results of this effort can be found in the *2008 monitoring of other waters of Plumas County* (LaCoss and Rossi 2011b) paper. Boat electrofishers were used to complete the 2013 survey. Fish species identified during this survey were brown bullhead (BB) *Ameiurus nebulosus*, brown trout, carp (CP) *Cyprinus carpio*, channel catfish (CCF) *Ictalurus punctatus*, largemouth bass, pond smelt (PS) *Hypomesus nipponensis*, rainbow trout, Sacramento perch (SP) *Archoplites interruptus*, Sacramento pikeminnow (SPM) *Ptychocheilus grandis*, Sacramento sucker (SKR-S) *Catostomus occidentalis*, sculpin (SCP) *Cottus sp.*, smallmouth bass, and tui chub (TC) *Siphateles bicolor*.

II. METHODS

Sampling methods included the use of four boat electrofishers at night. The lake was divided into four sections (one per boat). Monitoring was conducted by sampling the lake at various locations within each of the four sections. Each crew was instructed to sample as many transects as possible in their designated area using 600 seconds of pedal shock time per transect. The electrofishing efforts varied based on distance from launch, accessibility of sampling area, weather conditions, and safety. A minimum of 30 fish per species captured during each sampling event were randomly sub-sampled and measured (total length (TL); millimeters (mm)) and weighed (grams (g)). Sampling events were defined as one monitoring period using a given area electrofished. If more than thirty fish per species per event were captured they were tallied by species. Capture rates for each method and species were calculated as catch per unit effort (CPUE), by dividing the number of fish captured by the hours sampled.

Boat Electrofisher

Four Smith-Root electrofishing boats (SR-18) were used during nighttime hours on the evenings of August 7 and August 8, 2013 to sample the shallow water around the perimeter of Lake Almanor (Figure 2). Due to the vast size of Lake Almanor, 21 different sites around the lake were sampled in approximately 600 seconds of pedal shock time intervals. Boat output was generally set to 40% DC Low at 120 pulses per second or DC High at 60 pulses per second producing plus or minus 6 amperes output.

Figure 1. Lake Almanor 2008. Green line around the perimeter of the lake denotes where electrofishing occurred (LaCoss and Rossi 2011b).

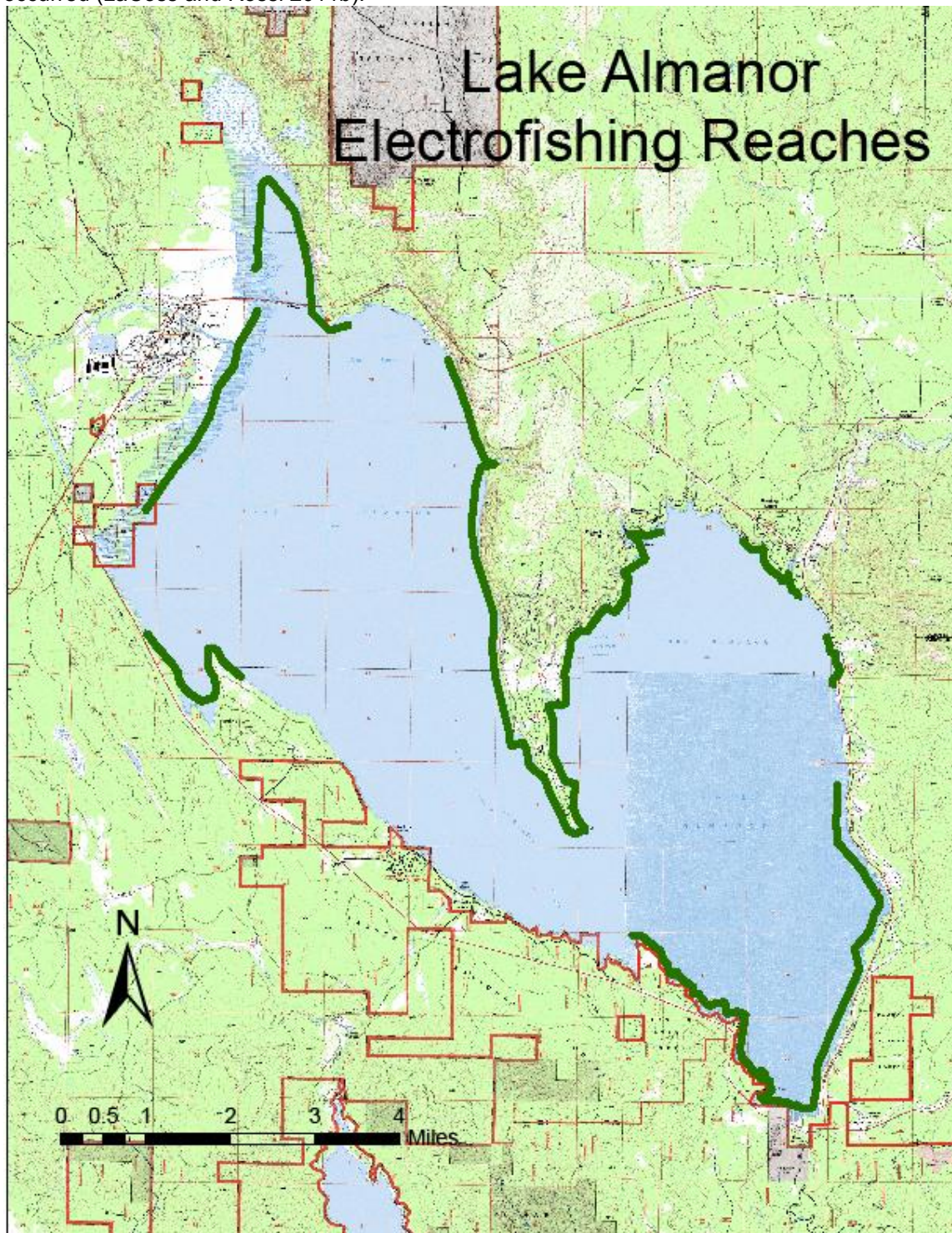
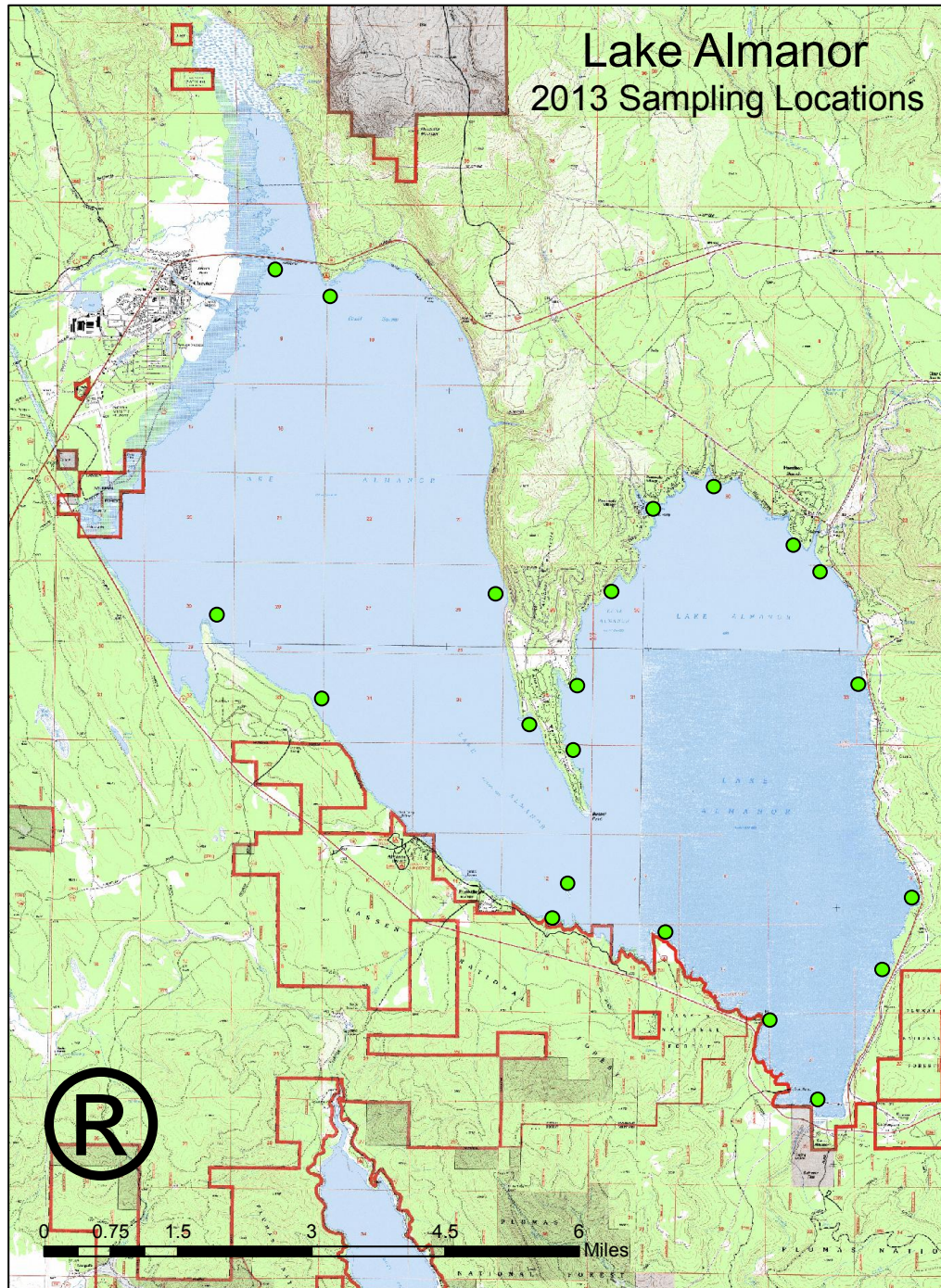


Figure 2. Lake Almanor General Fish Survey 2013. Green dots indicate electrofishing sampling locations.



III. RESULTS

Lake Almanor 2013

Lake Almanor was sampled by boat electrofisher with a total of 21 sampling events. Water temperatures ranged from 71-74 degrees Fahrenheit. A total of 5.08 hours of electrofishing occurred during these sampling events, resulting in the capture of a total of 855 fish, of which 642 were measured. The effort resulted in a CPUE of 168.3 fish per hour. Thirteen species of fish were captured: brown bullhead, brown trout, carp, channel catfish, largemouth bass, pond smelt, rainbow trout, sculpin, Sacramento perch, Sacramento pikeminnow, Sacramento sucker, smallmouth bass, and tui chub (Table 1). Length frequency for fish measured during electrofishing events is displayed in a length frequency histogram in Figures 3 and 4. Species composition is displayed in Figure 5.

Brown bullhead

Six BB were collected ranging from 151-360 mm; mean TL = 280 mm (Table 1). Length range data shows the BB sampled are in the third year (140-200 mm), fourth year (190-280 mm), and above age classes (Moyle 2002).

Brown trout

Three BN were collected ranging from 140-232 mm; mean TL = 184 mm (Table 1). Length range data shows the BN sampled are in the second (70-220 mm) to third (130-360 mm) year age class (Moyle 2002).

Channel catfish

Two CCF were collected ranging from 38-46 mm; mean TL = 42 mm (Table 1). Length range data shows the CCF sampled are in the young of the year age class (Moyle 2002).

Carp

Three CP were collected, only one length was recorded (681 mm) (Table 1).

Largemouth bass

Sixteen LMB were collected ranging from 72-433 mm; mean TL = 210 mm (Table 1). Length range data shows the LMB sampled are in the one year to four year age classes. Identifying individual age classes by growth rate in LMB is difficult due to the variability of genetic background, food availability, competition, temperature, and other limnological factors (Moyle 2002).

Pond Smelt

Thirty PS (aka Wakasagi) were collected ranging from 40-74 mm; mean TL = 58 mm (Table 1). Adult fish typically range from 70-90 mm (standard length). These fish provide an important food source for catchable sized salmonids. However, they have the potential to negatively affect other fishes with life stages that depend on zooplankton such as largemouth bass (Moyle 2002).

Rainbow trout

Seventeen RT were collected ranging from 145-431 mm; mean TL = 288 mm (Table 1). Length range data shows the RT sampled are in the one year of age class and above (Moyle 2002).

Sacramento perch

The SP is the only member of the Centrarchidae family that naturally occurs west of the Rocky Mountains (Moyle 2002). Thirty-four SP were collected ranging from 29-113 mm; mean TL = 41 mm (Table 1). Length range data shows the majority of the SP sampled are young of the year (<60 mm). Only one fish sampled was in the one year of age class (60-130 mm) (Figure 3) (Moyle 2002).

Sacramento pikeminnow

Thirteen SPM were collected ranging from 471-730 mm; mean TL = 634 mm (Table 1). Length range data shows the SPM sampled are older than five years (Moyle 2002).

Sacramento sucker

Twenty-nine SKR-S were collected ranging from 40-595 mm; mean TL = 383 mm (Table 1). Length range data shows the SKR-S sampled are in the young of the year and above age classes (Moyle 2002). Identifying individual age classes by growth rate in SKR-S is difficult due to variability. SKR-S less than 47 mm (standard length) are likely to be under a year old, while many suckers over 400 mm are older than ten years (Moyle 2002).

Sculpin

Eighteen SCP were collected ranging from 25-101 mm; mean TL = 72 mm (Table 1). The SCP collected were not keyed to individual species (Moyle 2002).

Smallmouth bass

Six hundred and eighty-one SMB were collected ranging from 14-415 mm; mean TL = 157 mm (Table 1). Length range data shows the SMB sampled are in the young of the year to four year age classes (Moyle 2002). The majority of SMB collected were in the one year of age class (60-180 mm), the second year age class (140-270 mm), and the third year age class (190-270 mm) (Figure 3) (Moyle 2002).

Tui chub

Three TC were collected ranging from 56-335 mm; mean TL = 155 mm (Table 1). Length range data shows the TC sampled are in the one year age class (50-100 mm standard length) to upwards of six to seven years old (Moyle 2002).

Table 1. 2013 summary of fish captured in Lake Almanor using boat electrofishing.

Species	Number Captured	TL Range	TL Mean	Percent of Capture	CPUE
Brown bullhead	6	151-360	280	0.7%	1.181
Brown trout	3	140-232	184	0.4%	0.591
Channel catfish	2	38-46	42	0.2%	0.394
Carp	3	681	681	0.4%	0.591
Largemouth bass	16	72-433	210	1.9%	3.15
Pond smelt	30	40-74	58	3.5%	5.906
Rainbow trout	17	145-431	288	2.0%	3.346
Sacramento perch	34	29-113	41	4.0%	6.693
Sacramento pikeminnow	13	471-730	634	1.5%	2.559
Sacramento sucker	29	40-595	383	3.4%	5.709
Sculpin	18	25-101	72	2.1%	3.543
Smallmouth bass	681	14-415	157	79.6%	134.1
Tui chub	3	56-335	155	0.4%	0.591

Figure 3. 2013 length-frequency histogram of Lake Almanor centrachids captured using boat electrofishing.

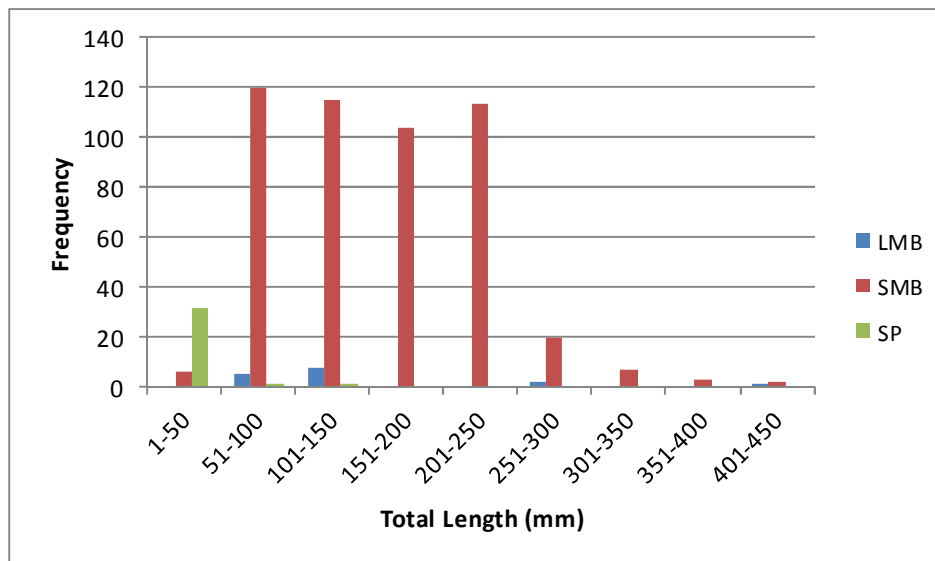


Figure 4. 2013 length-frequency histogram of Lake Almanor fish (not including centrachids) captured using boat electrofishing.

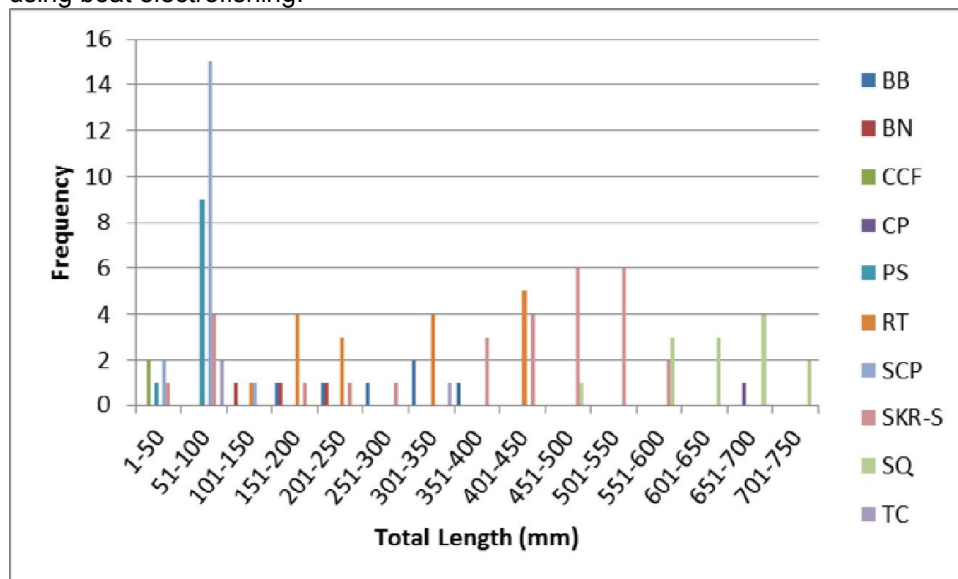
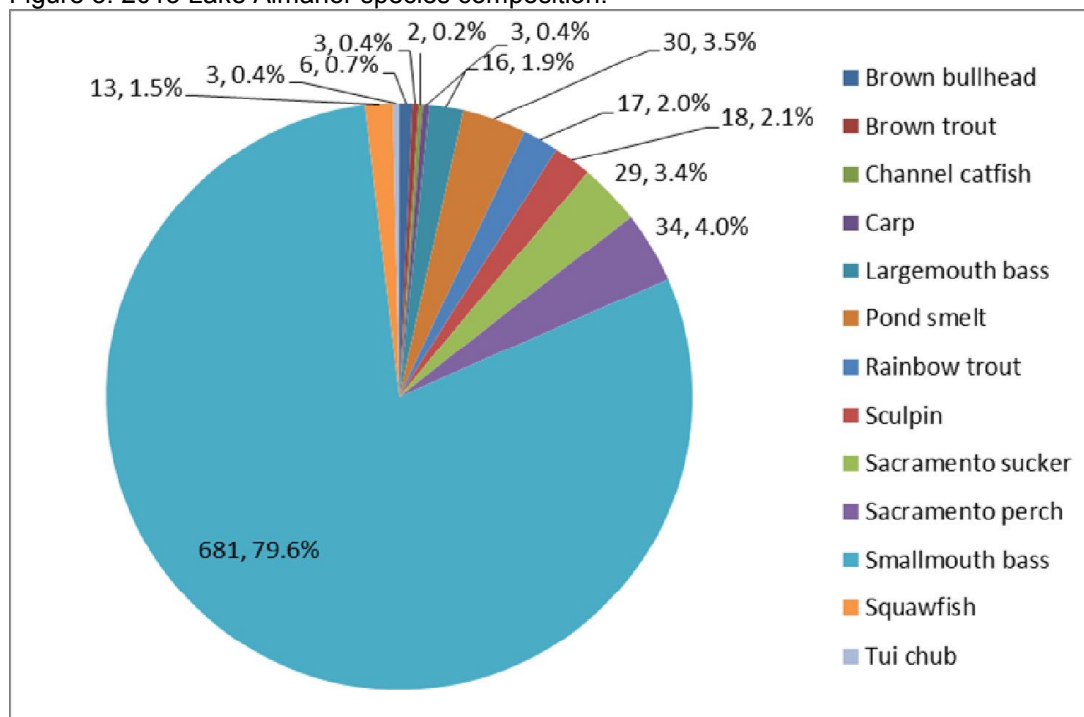


Figure 5. 2013 Lake Almanor species composition.



IV. DISCUSSION

Lake Almanor boat electrofishing surveys indicate that the predominate species is smallmouth bass (Figures 5 & 7). However, this result is not representative of the entire lake since electrofishing boats are better suited for sampling the littoral zone where bass and other warmwater species are generally more prevalent. Electrofishing boats are not designed to sample the limnetic zone where cold water pelagic species predominate. Coldwater species are mostly incidental catches, thus most of the deeper water remains unsampled. Possible options for sampling coldwater species include angling surveys, creel surveys, angler survey boxes, gill nets, or electrofishing during colder times of the year when coldwater species are more likely to find the shallow water tolerable.

2013 versus 2008

Lake Almanor was surveyed in early August during the 2013 sampling and in late July during the 2008 sampling. The time of year in which the surveys were conducted is comparable. The overall CPUE was much greater in 2013 (168.3 fish per hour) than the previous sampling effort in 2008 (52.7 fish per hour). Smallmouth bass comprised the vast majority of the catch in both 2013 (79.6%) and 2008 (91.1%). More species of fish were observed in 2013 than 2008. However, two species that were recorded during the 2008 sampling (Chinook salmon and golden shiner (GSH) *Notemigonus crysoleucas*) were not present in the 2013 sampling (Tables 1 and 2). This may have been a result of the different sampling techniques used (running the shoreline versus specific transects). In 2008, sampling involved following the shoreline to cover as much of the perimeter of the lake as possible (Figure 1). Approximately 75 percent of the shoreline was surveyed in 2008 compared to less than half in 2013. In 2013, sampling occurred in 600 seconds of pedal shock time transects at 21 different locations chosen by each crew (Figure 2). This type of electrofishing allowed the crews to target specific locations and habitat that may be more conducive to fish capture. The change in electrofishing technique was made due the immense size of Lake Almanor.

Table 2. 2008 summary of fish captured in Lake Almanor using boat electrofishing (LaCoss and Rossi 2011b).

Species	Number Captured	Number Measured	TL Range (mm)	Mean TL (mm)	Percent of Capture (%)	CPUE (fish per hour)
Brown trout	1	1	-	-	0.6	0.3
Carp	1	1	-	-	0.6	0.3
Chinook salmon	1	1	-	-	0.6	0.3
Golden shiner	3	3	59-91	70	1.9	1
Largemouth bass	1	1	-	-	0.6	0.3
Rainbow trout	2	2	130-405	268	1.3	0.7
Sacramento sucker	4	4	289-325	472	2.5	1.3
Smallmouth bass	144	60	41-309	169	91.1	48
Tui chub	1	1	-	-	0.6	0.3
Total	158	74	-	-	~100	52.7

Figure 6. 2008 length-frequency histogram of Lake Almanor fish captured using boat electrofishing (LaCoss and Rossi 2011b).

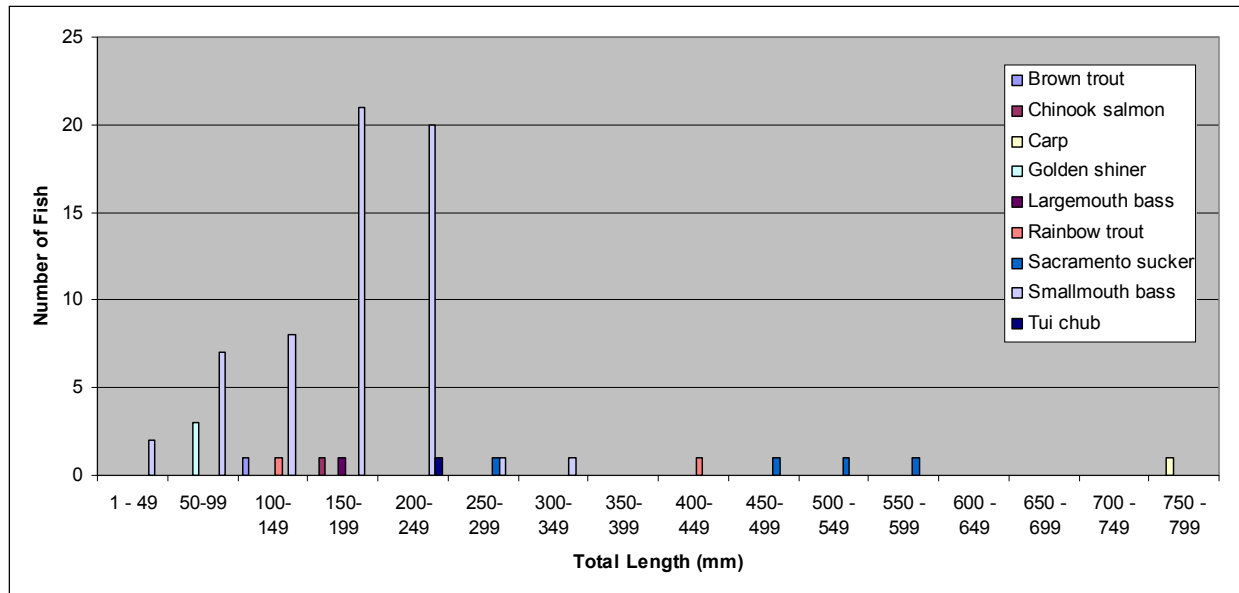
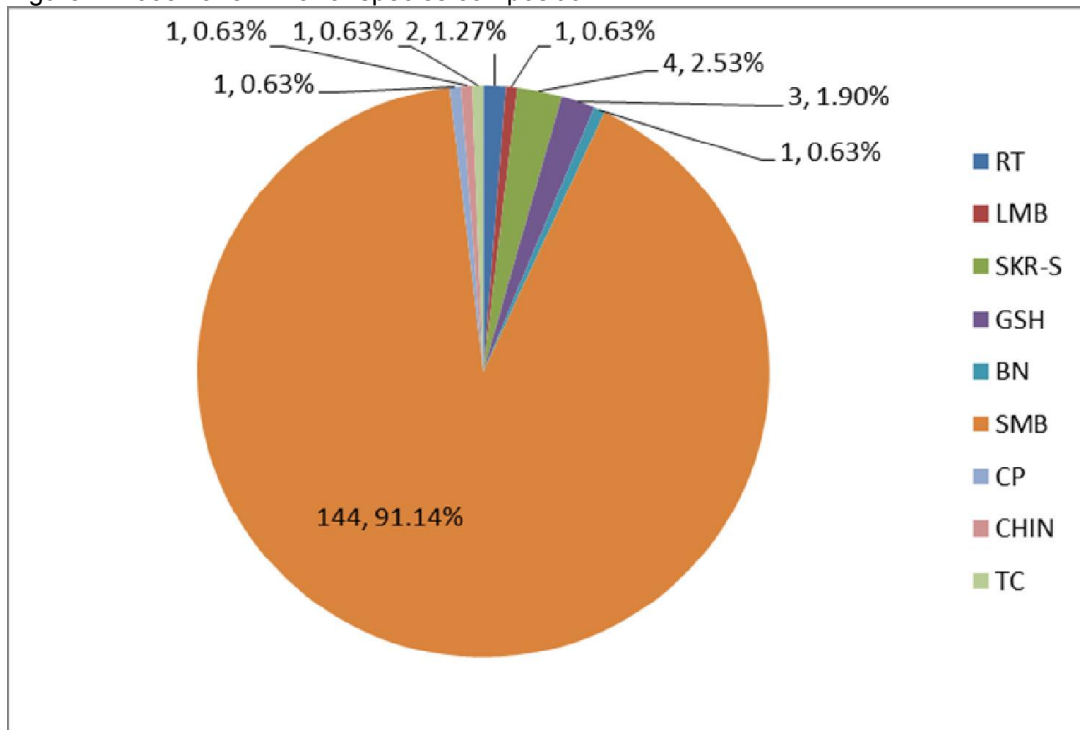


Figure 7. 2008 Lake Almanor species composition.



V. CONCLUSION

Monitoring will be continued in subsequent years. A springtime sampling may prove to find more life stages present in shallow water as some species come in to breed. Also, other species that prefer cooler temperatures may find the shallows more tolerable in the early season. Angling surveys, creel surveys, angler survey boxes, or gill netting may help to obtain more information on the salmonid populations inhabiting the lake. These timeframes and methods will be applied to future evaluations of the Lake Almanor fishery.

VI. REFERENCES

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