

State of California  
The Resources Agency  
Department of Fish and Wildlife

Red Lake, Alpine County  
2013 Creel Survey



Ben Onanian  
Fish and Wildlife Scientific Aide  
High Elevation Fisheries

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## Introduction

During 2013, the California Department of Fish and Wildlife (CDFW) conducted a creel survey on Red Lake. The focus of the survey was to assess the health of the Lahontan cutthroat trout (LCT) (*Oncorhynchus clarki henshawi*) fishery and overall angler satisfaction with LCT in Red Lake. In 2011, CDFW moved from a brook trout (BK) (*Salvelinus fontinalis*) and LCT fishery, to a strictly LCT fishery at Red Lake. The LCT is the native game fish to the eastern slope of the Sierra Nevada mountain range, which was the motivating factor behind the switch in species. Red Lake also supports populations of Mountain suckers (*Catostomus platyrhynchus*) and tui chub (*Gila bicolor*).

Red Lake serves a unique purpose, functioning as a “put and take” fishery while concurrently serving as the emergency brood stock population for the CDFW LCT stocking program. Currently, CDFW maintains its brood stock LCT at Heenan Lake which is located approximately 30 miles from Red Lake. Red Lake has been receiving two plants a year of brood stock fish from Heenan Lake since 2009. Without the presence of Rainbow Trout, (RT) (*Oncorhynchus mykiss*) Red Lake’s LCT population should, theoretically, be of the same strain as Heenan Lake LCT.

Red Lake is an 85 acre lake located in Alpine County, and is situated approximately 7,800 feet above sea level. Red Lake is positioned directly off of Highway 88, roughly 25 miles south of Lake Tahoe and about one mile east of Carson Pass summit (Figure 1). Red Lake Creek is the outlet stream from Red Lake and flows for approximately 5 miles to its confluence with the West Fork Carson River near the Hope Valley Campground (Newton 2012). Red Lake is open to recreational activities all year. Popular activities include: fishing, hiking, hunting and wildlife viewing.

During the course of the survey, CDFW staff gathered data from anglers to determine angling method, catch per angler, catch per hour and angler satisfaction with the LCT fishery. This information, combined with historical stocking data, will assist the CDFW with future management decisions.

## Methods

Angler surveys were conducted at Red Lake (Figure 1) using a roving-roving sampling design (Pollock, Jones and Brown 1994). The sampling design was used to estimate daily angler effort (angler-hours) and daily catch. Instantaneous angler counts were taken every hour and a half and angler interviews were conducted between counts. The sampling days were first stratified into weekdays and weekends and holidays and secondly, into AM or PM sampling units. From the month of May 2013 through August 2013, a total of 20 days were randomly selected. Out of the 20 days, 14 days were weekdays (WD) and 6 days were weekend and/or holidays (WEH), furthermore, 11 of the survey days were PM units and 9 were AM units.

During interviews, the anglers were asked a series of questions: what time did they begin fishing, how many hours had they fished, how many people in the party, zip codes, whether or not the fishing trip was completed at the time of the interview and what gear was used. Anglers were asked the species, number, and sizes of landed trout. They were further asked if the landed trout was kept or released. In addition, all interviewed anglers were asked to rate their overall angling experience for the day and their

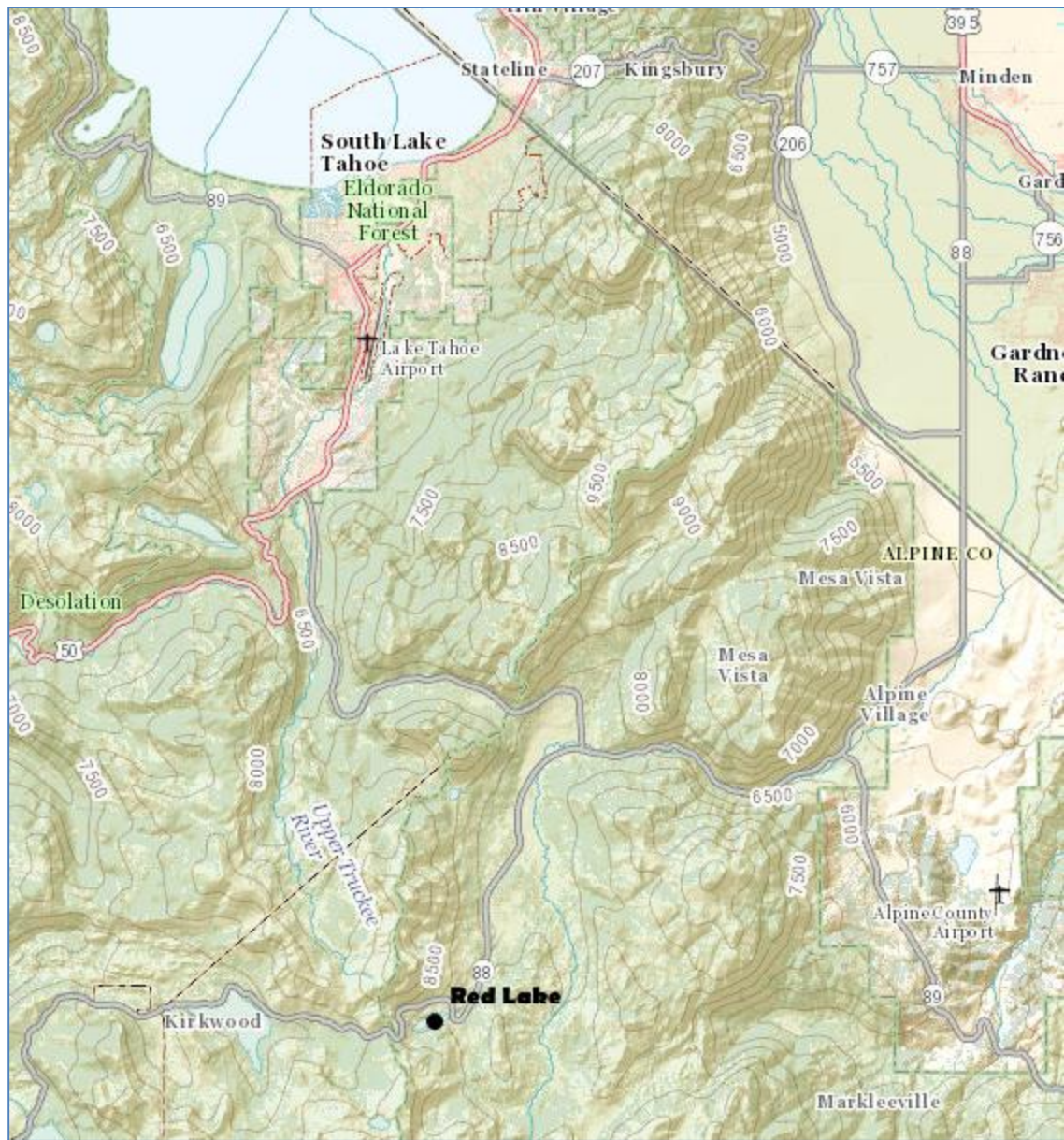


Figure 1. Topographic map of Red Lake and surrounding areas.

satisfaction with the number and size of trout caught. Anglers were asked to use a -2 (least satisfied) to 2 (most satisfied) scale when answering the above questions.

The daily angler effort ( $\hat{e}_i$ ) for each individual sampling day, during the months of May and June was estimated by

$$\hat{e}_i = \frac{(\hat{I}_i * t)}{P_i}$$

Where ( $\hat{I}_i$ ) represents the mean daily angler count, ( $t$ ) represents the length of the fishing period and ( $p_i$ ) represents the total probability that the fishing period is included in the sample. Due to the survey sample design there were only two periods to choose from (AM and PM), therefore, ( $p_i$ ) was always 0.5. The total angler effort (E) was then estimated by

$$E = \frac{\sum_{i=1}^n (\hat{e}_i)}{n} * N$$

Where ( $n$ ) is the total number of roving surveys completed and ( $N$ ) represents the number of days in the survey period.

## Results

The Red Lake creel survey began on May 9, 2013 and continued through August 20, 2013. During this 4 month period CDFW staff conducted a total of 20 surveys. However, due to scheduling conflicts, of those 20 surveys, 15 occurred during the months of May and June. During the month of July anglers were surveyed twice and during August anglers were surveyed three times. Due to the lack of survey days in July and August, statistical analysis of catch per unit effort (CPUE) has been broken down to reflect the months of May and June, the months of July and August and May through August.

Anglers came from four different states to fish Red Lake in 2013. Arizona and New Mexico were both represented by a single angler while Nevada produced 45 anglers (Table 1). Of the 45 Nevada residents, 22 (49.0%) reside in Douglas County which includes the cities of Gardnerville and Minden, two cities within close proximity to Red Lake (Table 2). However, the vast majority of anglers (77.4%) reside in California with El Dorado and Sacramento Counties providing the largest amount of anglers (Figure 2).

With 61 possible fishing days in May and June, 15 (24.6%) of these days were surveyed. During weekends and/or holidays (WEH) CDFW clerks conducted surveys on 5 (27.8%) out of 18 possible fishing days. During weekdays (WD) clerks completed surveys on 10 (23.3%) out of 43 possible fishing days. Clerks conducted 8 (53.3%) PM surveys and 7 (46.7%) AM surveys. A total of 176 anglers were interviewed in May and June, 60 (34.1%) on WD and 116 (65.9%) on WEH. Furthermore, 95 (54%) anglers were interviewed during PM surveys, while 81 (46%) AM interviews were conducted. Fishing

pressure was highest in May with 93 (52.8%) angler interviews in comparison with June's 83 (47.2%) interviews.

Table 1. List of anglers fishing Red Lake in 2013 by county and state.

California County	Number of Anglers	State	Number of Anglers
El Dorado	37	California	168
Sacramento	27	Nevada	45
San Joaquin	15	Unknown	3
Alameda	11	Arizona	1
Contra Costa	11	New Mexico	1
Calaveras	9	Total	218
San Francisco	8		
Ventra	7		
San Mateo	6		
Solano	5		
Santa Clara	4		
Sonoma	4		
Los Angeles	3		
Stanislaus	3		
Unknown	3		
Amador	2		
Lassen	2		
Marin	2		
Placer	2		
Santa Cruz	2		
Yolo	2		
Mariposa	1		
San Benito	1		
San Diego	1		
Total	168		

Table 2. List of Nevada anglers by county.

Nevada County	Number of Anglers
Douglas	22
Washoe	13
Lyon	5
Carson City	4
Clark	1

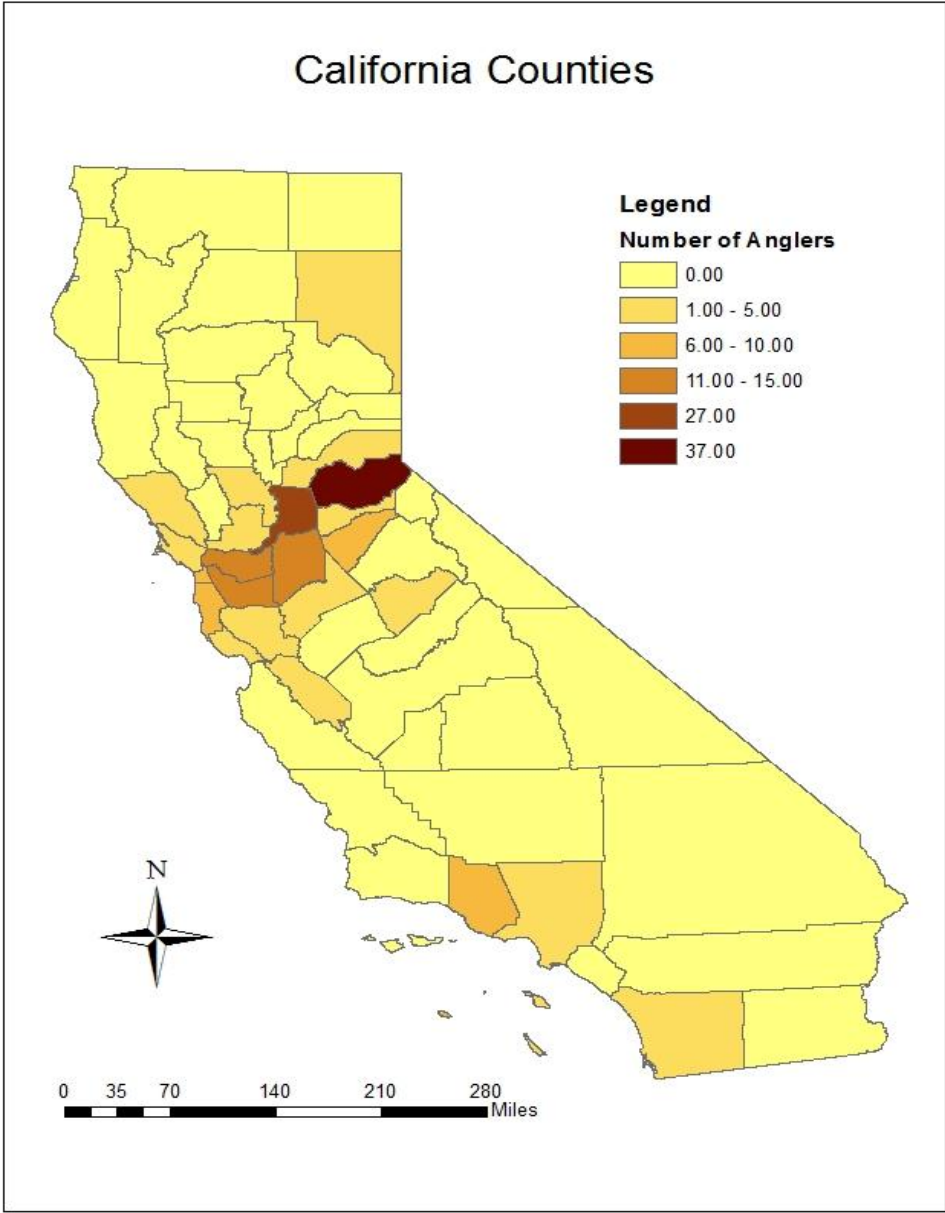


Figure 2. Number of anglers by California counties

Between the months of May and August there were a total of 123 possible fishing days, of these, 20 (16.3%) days were surveyed. During WEH 6 (16.2%) surveys were conducted out of the 37 possible fishing days. Clerks completed surveys on 14 (16.3%) of the 86 possible WD. Of the 20 surveys, 9 (45.0%) were AM surveys, while 11 (55.0%) were PM surveys.

During the 2013 Red Lake survey, anglers reported landing three different salmonid species while fishing Red Lake. While LCT accounted for 442 (99.5%) of 444 total fish landed, a single rainbow trout (*Oncorhynchus mykiss*, RT) and a single mountain whitefish (*Prosopium williamsoni*, WF) were present in the survey. CDFW Scientific Aide Kevin Langham also reported seeing spawning mountain suckers (*Castostomus platyrhynchus*) around the Red Lake dam. Of the 442 LCT landed, anglers reported releasing 348 (78.7%) and keeping 93 (21.3%)(Table 3). Anglers reported catching LCT up to 19.9" although 324 (73.3%) of the 442 LCT landed were under 8" in length. Furthermore, 431(97.5%) of the landed LCT were under 10" in length. The modal size class of landed LCT (247) was the 6-7.9" class. The closest size class to the mode was the 8-9.9" class with 107 landed LCT (Figure 3).

Table 3. Numbers and sizes of LCT and RT landed in 2013.

Species	Kept	Released	Total Caught	Percent of total catch	Percent Released	Modal Size Class
LCT	93	348	442	99.5	78.7	6-7.9"
RT	0	1	1	0.25	100	10-11.9"
WF	1	0	1	0.25	0	10-11.9"
Totals	94	349	444	100		

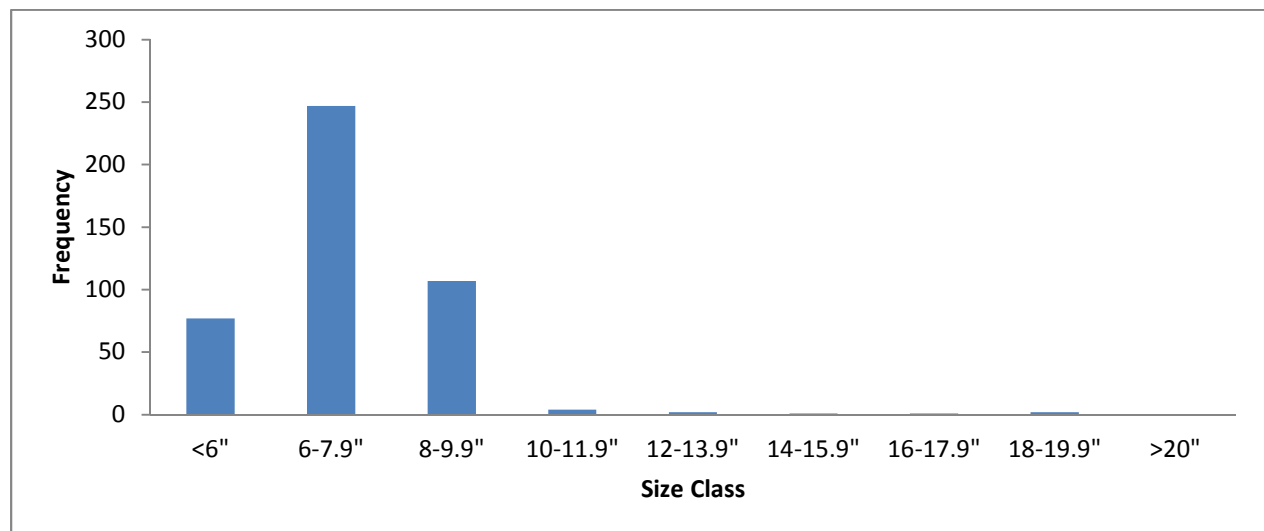


Figure 3. Number of LCT landed by size class during 2013 survey at Red Lake.

A total of 218 anglers were interviewed between May 9, 2013 and August 20, 2013. These anglers reported angling a total of 459.75 hours and landing 444 total fish. Overall average catch rates were 2.05 trout per angler and 0.97 trout per hour (Table 4). Anglers spent an estimated average of 2.12 hours per trip, although, this number is significantly low when one accounts for the fact that 103 anglers (47.5%) reported an incomplete fishing effort at the time of interview. One hundred and fourteen anglers (52.5%) reported a complete fishing effort at time of contact with CDFW clerks (Table 5). Between the months of May and June a total of 176 anglers were surveyed, these anglers put in a combined 381.25 angler hours and landed a total of 410 fish. Overall catch rates for May and June were 2.33 trout per angler and an average of 1.08 trout per hour per angler. On average, anglers spent 2.17 hours fishing per trip.

Table 4. Catch per hour for anglers fishing Red Lake between May and August 2013.

	# of Anglers	# of Hours	Total Catch	Catch Per		Hours per
				Angler	Hour	Angler
<u>May/June</u>	176	381.25	410	2.33	1.08	2.17
<u>July/Aug</u>	42	78.5	34	0.81	0.43	1.87
<u>Total</u>	218	459.75	444	2.05	0.97	2.11

Table 5. Comparison of anglers reporting a complete trip to anglers reporting an incomplete trip.

	<u>Complete Effort</u>	<u>Incomplete Effort</u>	<u>Unknown</u>
<u>May/June</u>	83	93	0
<u>July/August</u>	31	10	1
<u>Total</u>	114	103	1

Average daily angler effort, average daily catch rates and catch per unit effort (CPUE) were estimated for the months of May and June using the four instantaneous angler counts recorded during each survey. The overall fishing effort for Red Lake during the month of May was 1398 estimated angler hours. Effort was further broken down to WD PM (6 estimated angler hours), WD AM (18 estimated angler hours), WD (24 estimated angler hours), WEH PM (28.5 estimated angler hours), WEH AM (48 estimated angler hours) and WE (76.5 estimated angler hours). The estimated overall catch for May was 1836.00 fish. Further breakdown of daily catch rates can be found in Tables 6 and 7. The overall CPUE for the month of May was estimated at 1.31 fish per hour. The overall fishing effort for the month of June was 977.5 estimated angler hours. This was further stratified into WD PM (7.5 estimated angler hours), WD AM (11 estimated angler hours), WD (18.5 estimated angler hours), WEH PM (33.75 estimated angler hours) and WE (33.75 estimated angler hours). The estimated overall catch for the month of June was 3303.92



fish. The overall CPUE for June was estimated at 3.38 fish per hour per angler (Tables 8 and 9). The overall fishing effort for the months of July and August was estimated at 711 angler hours. The total catch for July and August was estimated at 438 trout with a CPUE of 0.62 (Table 10 and 11). The overall CPUE for the months of May and June combined was estimated at 2.16 fish per hour per angler (Table 12).

Table 6. Daily effort and daily catch numbers during the month of May 2013.

Date	Secondary Sampling Unit	Period Effort (Angler Hours)	Daily Effort (Angler Hours)
<b>Weekdays</b>			
5/9/2013	PM	12	24
5/13/2013	AM	13.5	27
5/17/2013	PM	0	0
5/20/2013	AM	22.5	45
Mean			24
<b>Weekends</b>			
5/19/2013	AM	49.5	99
5/25/2013	PM	57	114
5/26/2013	AM	46.5	93
Mean			102

Date	Daily Effort (Angler Hours)	Daily Catch Rate	Daily Catch (Fish per Day)
<b>Weekdays</b>			
5/9/2013	24	0.5	12
5/13/2013	27	1.71	46.17
5/17/2013	0	0	0
5/20/2013	45	0.43	19.35
Mean			19.38
<b>Weekends</b>			
5/19/2013	99	1.92	190.08
5/25/2013	114	1.31	149.34
5/26/2013	93	1.65	153.45
Mean			164.29

Table 7. Catch per unit effort breakdowns for the month of May in fish per hour.

<b>Stratum</b>	<b>Daily Catch (Fish Per Day)</b>	<b>Daily Effort (Angler Hours)</b>	<b>CPUE</b>
Weekdays (AM)	16.38	18	0.91
Weekdays (PM)	3	6	0.5
Weekdays	19.38	24	0.81
Weekend (AM)	85.89	48	1.79
Weekend (PM)	37.34	28.5	1.31
Weekends	123.23	76.5	1.61
May Overall	1836.21	1398	1.31

Table 8. Daily effort and daily catch numbers during the month of June 2013.

<b>Date</b>	<b>Secondary Sampling Unit</b>	<b>Period Effort (Angler Hours)</b>	<b>Daily Effort (Angler Hours)</b>
<b>Weekdays</b>			
6/6/2013	PM	10.5	21
6/10/2013	PM	4.5	9
6/12/2013	AM	7.5	15
6/17/2013	AM	25.5	51
6/21/2013	PM	7.5	15
6/25/2013	AM	0	0
Mean			18.5
<b>Weekends</b>			
6/1/2013	PM	37.5	75
6/9/2013	PM	30	60
Mean			67.5

<b>Date</b>	<b>Daily Effort (Angler Hours)</b>	<b>Daily Catch Rate</b>	<b>Daily Catch (Fish Per Day)</b>
<b>Weekdays</b>			
6/6/2013	21	1	21
6/10/2013	9	0.8	7.2
6/12/2013	15	2.43	36.45
6/17/2013	51	1.27	64.77
6/21/2013	15	2.14	32.1
6/25/2013	0	0	0
Mean			26.92
<b>Weekends</b>			
6/1/2013	75	5.13	384.75
6/9/2013	60	3.83	229.8
Mean			307.28

Table 9. Catch per unit effort breakdowns for the month of June in fish per hour.

<b>Stratum</b>	<b>Daily Catch (Fish Per Day)</b>	<b>Daily Effort (Angler Hours)</b>	<b>CPUE</b>
Weekday (AM)	16.87	11	1.53
Weekday (PM)	10.05	7.5	1.34
Weekdays	26.92	18.5	1.46
Weekend (AM)	N/A	N/A	N/A
Weekend (PM)	153.64	33.75	4.55
Weekends	153.64	33.75	4.55
June Overall	3303.92	977.5	3.38

Table 10. Daily effort and daily catch numbers during the months of July and August 2013.

<b>Date</b>	<b>Secondary Sampling Unit</b>	<b>Period Effort (Angler Hours)</b>	<b>Daily Effort (Angler Hours)</b>
<b>Weekdays</b>			
7/12/2013	PM	6	12
8/9/2013	AM	36	72
8/15/2013	PM	1.5	3
8/20/2013	PM	6	12
Mean			24.75
<b>Weekends</b>			
7/20/2013	AM	12	24
Mean			24

<b>Date</b>	<b>Daily Effort (Angler Hours)</b>	<b>Daily Catch Rate</b>	<b>Daily Catch (Fish Per Day)</b>
<b>Weekdays</b>			
7/12/2013	12	2.33	27.96
8/9/2013	72	0.41	29.52
8/15/2013	3	0	0
8/20/2013	12	1	12
Mean			17.37
<b>Weekends</b>			
7/20/2013	24	0.42	10.08
Mean			10.08

Table 11. Catch per unit effort breakdowns for the months of July and August in fish per hour.

<b>Stratum</b>	<b>Daily Catch (Fish Per Day)</b>	<b>Daily Effort (Anglers Hours)</b>	<b>CPUE</b>
Weekday (AM)	14.76	36	0.41
Weekday (PM)	6.66	4.5	1.48
Weekdays	21.42	40.5	0.53
Weekend (AM)	5.04	12	0.42
Weekend (PM)	N/A	N/A	N/A
Weekends	5.04	12	0.42
Overall	438.12	711	0.62

Table 12. Combined catch per unit effort for the months of May and June and May through August 2013.

<b>Stratum</b>	<b>Daily Catch (Fish Per Day)</b>	<b>Daily Effort (Angler Hours)</b>	<b>CPUE</b>
May	1836.21	1398	1.31
June	3303.92	977.5	3.38
May and June	5140.13	2375.5	2.16
May-August	5578.25	3086.5	1.81

During 2013, CDFW was responsible for three stocking events at Red Lake. On May 13 Red Lake received a plant of 5,014 (460 lbs) sub-catchable LCT, 180 (360 lbs) LCT on May 21, and 152 (304 lbs) on May 22 (Table 13). The sub-catchable LCT averaged 4-6 inches in length while the following plants consisted of brood stock fish from Heenan Lake averaging 2lbs per trout. Data analysis and CPUE comparison with stocking dates revealed no correlation.

Anglers surveyed covered a broad spectrum when it came to gear use while fishing Red Lake. By far, the majority of anglers preferred bait fishing. A total of 93 anglers (43%) reported using bait as their sole method of fishing and 169 (78%) of the anglers surveyed reported using bait in combination with another method during their fishing effort. Fly fishing was the least popular method on Red Lake, with only 10 (5%) anglers claiming fly fishing as their sole method. Lure angling was statistically the second most popular method with 35 (16%) anglers reporting it as their sole method of angling. Further breakdown of gear combinations and use can be found in Figure 4.

Red Lake anglers were asked the level of satisfaction with their overall angling experience and with the size and numbers of trout landed. Anglers were also asked their level of satisfaction with the switch to a primarily LCT fishery, although, approximately halfway through the survey CDFW clerks modified the

question to reflect angler satisfaction with the current LCT fishery. Anglers surveyed during 2013 were satisfied with their overall angling experience at Red Lake, with the average response being 1.36 and 182 (87%) anglers reporting a positive response. Anglers were positive when it came to the numbers of fish landed, with an average response of 0.94 with 128 (89%) anglers responding positively. Anglers were dissatisfied with the size of trout landed in Red Lake. The average response for satisfaction with the size of trout in Red Lake was -0.22. Overall, anglers responded positively when questioned about a LCT fishery with an average response of 0.51 (Table 14).

Table 13. CDFW stocking events at Red Lake from 2011-2013.

Month	Number	Weight (lbs.)	Size	Species
7/18/2011	3,015	201	sub-catchable	LCT
5/18/2012	189	378	super-catchable	LCT
5/22/2012	161	322	super-catchable	LCT
6/4/2012	6,672	785	sub-catchable	LCT
6/5/2012	13,328	1,532	sub-catchable	LCT
5/13/2013	5,014	460	sub-catchable	LCT
5/21/2013	180	360	super-catchable	LCT
5/22/2013	152	304	super-catchable	LCT

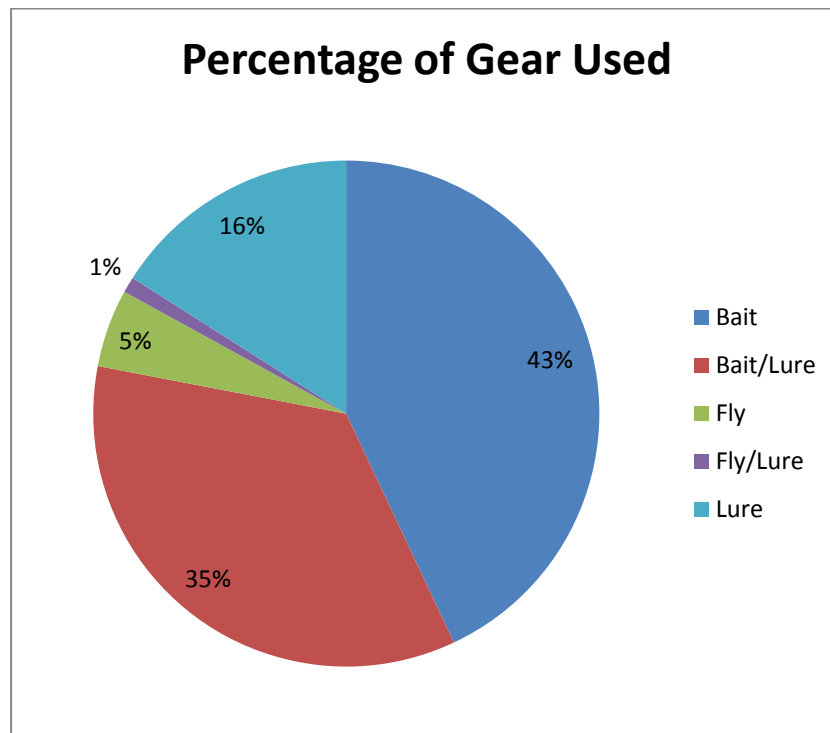


Figure 4. Gear use at Red Lake during 2013.

Table 14. Angler satisfaction at Red Lake 2013.

Question	-2	-1	0	1	2	DNA	Average
Overall Angling Experience	9	19	7	32	150	0	1.36
Size of Fish	47	48	46	32	31	13	-0.22
Number of Fish	8	15	44	22	106	22	0.94
Change/Satisfaction with LCT Fishery	7	9	65	18	37	0	0.51

### Discussion

Strictly adhering to the design of a roving-roving creel was difficult for CDFW survey clerks on Red Lake. Under the assumptions of the method, survey days and times were to be randomly selected. Due to scheduling conflicts not all survey dates were random. Furthermore, during the months of July and August an insufficient amount of surveys were conducted to pull accurate statistical data. The fact that data from these two months was omitted from calculations may cause significant underestimations in angler effort, catch rates and CPUE.

In the month of June, catch per unit effort increased by 158% while estimated daily effort decreased in comparison to May. Water conditions and seasonal weather could be factors which contributed to such a dramatic increase in CPUE. Warmer weather in June opens up many other outdoors activities such as: hiking, camping, boating and swimming. June also marks the end of the school year and many families use this time for family vacations, all these factors may be associated with the decrease in estimated daily effort.

The overall CPUE for the months of July and August was estimated at 0.62 trout per hour, which is significantly lower than the CPUE values for May, June and May through August. May's CPUE value was estimated at 1.31, June's at 3.38 and May through August at 1.81. The poor CPUE value for July and August can most likely be attributed to the lack of surveying days during those months. Poor fishing conditions such as increased algae and decreased water clarity could also be associated with the low CPUE. While CDFW clerks surveyed Red Lake seven and eight times during May and June, July and August received a combined total of only five surveying dates. The lack of data is the major factor behind statistical inaccuracies for the months of July and August.

The roving-roving survey conducted at Red Lake likely underestimated angler hours due to the fact that 47% of interviews were performed on anglers who had yet to complete their angling trip. This would also impact calculations for total effort, catch rate and CPUE. Although CDFW clerks made an effort to re-interview anglers after complete fishing efforts, catching one-hundred percent of anglers at time of completion was not a realistic outcome. Angler survey boxes (ASB) are located on the southeast corner of the dam and the southwest part of the lake. While the southeast ASB is in good location, it is located under large trees and is situated slightly off of the parking area. It would be beneficial to move the ASB

box approximately 20 yards closer to the parking locations for increased visibility and angler convenience.

Anglers at Red Lake were generally pleased with their overall fishing experience and with the number of trout being landed but were not satisfied with the size of trout landed. The lack of size can be attributed to the fact that 94% (5,014 LCT) of the LCT stocked in 2013 averaged 0.1 lbs in weight. A total of 682 trophy LCT were stocked into Red Lake between 2012-2013 but account for only two percent of the LCT planted in Red Lake.

Red Lake is managed as a “put and take” fishery. These bodies of water are defined as lakes or streams which receive heavy fishing pressure and are unable to support self-sustaining trout populations. These waters are commonly referred to as catchable fisheries and provide the public with the opportunity to harvest their catch. Due to the small sizes, anglers were releasing the majority (78.7%) of landed LCT. Consequently, there were higher numbers of sub catchable LCT in Red Lake than one would expect in a common “put and take” fishery. It may be beneficial for CDFW to cease or cut back on LCT plants in 2014 allowing for possible growth of current LCT in Red Lake. A reduction in stocking events may thin out the current LCT population through natural mortalities and angler harvest; this may reduce the amount of competition for food resources and thus lead to increased growth rates in LCT. CDFW should consider conducting a general fish survey implementing the use of gillnets to gather evidence on size classes, growth rates and fish density in Red Lake.

CDFW staff noticed many of the (trophy) brood stock LCT congregating at the outlet to Red Lake Creek. Despite the fact that these trout were spawned by CDFW staff at Heenan Lake prior to stocking into Red Lake, they may still exhibit the urge to spawn in the creek. Backpack electrofishing expeditions conducted by CDFW staff on Red Lake Creek confirmed the fact that brood stock LCT were exiting the lake and becoming stranded in the creek. Low water levels and natural fish barriers, such as a steep gradient, make it impossible for the LCT to return to Red Lake. With such a low number of trophy size fish stocked into Red Lake, it is extremely important that those fish remain in the lake and provide anglers with a chance to land a quality trout. Red Lake receives much higher fishing pressure in comparison to Red Lake Creek. In the interest of maintaining and increasing angler satisfaction CDFW should consider installing a fish barrier to prevent the escape of trophy LCT into Red Lake Creek during the springtime when water levels are high enough to allow LCT to move into the creek.

### **Recommendations**

- Relocating the angler survey box located in the southeast corner of the dam for increased visibility and angler convenience.
- CDFW clerks should conduct a minimum of 8 random creels per month to ensure statistical accuracy.
- Reduction in CDFW stocking allotments for Red Lake in 2014 and possibly future years.
- Fish barrier could be implemented to stop brood stock trout from moving into Red Lake creek.
- Gillnetting should be conducted for a size structure evaluation on LCT in Red Lake.

## References

Newton, S. 2012. 2011 Creel Census and Trout Evaluation Study. California Department of Fish and Wildlife, Heritage and Wild Trout Program. CDFW Files.

Pollock, K.H., C.M. Jones, and T.L. Brown. 1994. Angler survey methods and their application in fisheries management. American Fisheries Society Special Publication 25.