LAKE CHELAN FISHERY FORUM
2017 ANNUAL WORK PLAN

LICENSE ARTICLE 404
SETTLEMENT AGREEMENT CHAPTER 6

FINAL

LAKE CHELAN HYDROELECTRIC PROJECT
FERC Project No. 637

February 27, 2017

Developed by the
National Park Service, USDA Forest Service, and
Washington Department of Fish and Wildlife
in coordination with, and adopted by, Chelan PUD

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SECTION 1: INTRODUCTION

On November 6, 2007, Public Utility District No. 1 of Chelan County (Chelan PUD) filed the Lake Chelan Fishery Plan (LCFP) pursuant to Article 404 of the Federal Energy Regulatory Commission Order on Offer of Settlement and Issuing New License dated November 6, 2006 for the Lake Chelan Hydroelectric Project. This report satisfies Article 404 requirements for annual reporting of activities associated with the following:

1. Tributary Barrier Removal
2. Fish Stocking
3. Entrainment Sampling
4. Monitoring and Evaluation Program

The Federal Energy Regulatory Commission (FERC) approved the LCFP on December 4, 2007. A component of the Lake Chelan Comprehensive Settlement Agreement (SA) and Lake Chelan Fishery Plan is for the National Park Service (NPS), USDA Forest Service (USFS), and Washington Department of Fish and Wildlife (WDFW) to develop and adopt an annual work plan describing monitoring and evaluation measures in Lake Chelan to be implemented in the upcoming year and a report on activities completed the previous year.

It is a requirement of Chelan PUD's Lake Chelan license to make available $20,000 each year, plus an additional $20,000 in matching funds, to be used for implementing measures contained in the annual Lake Chelan Fish Monitoring and Evaluation Plan.

This annual work plan, developed in coordination with Chelan PUD and adopted by the NPS, USDA Forest Service, and WDFW, describes the methods and schedule used to demonstrate compliance with efforts to restore and enhance, where feasible, native fisheries in Lake Chelan and its tributaries, and to support the lake's recreational fishery.

The goals of the LCFP are to: 1) provide guidance for the management of the fishery resources in Lake Chelan; 2) protect native fish populations while maintaining a healthy recreational sport fishery in Lake Chelan; and 3) develop a monitoring and evaluation program to assess the efficacy of management actions.

The primary Lake Chelan Fishery Forum (LCFF) management objectives are to:

1. Emphasize restoration/enhancement of native species, where feasible;
2. Support the recreational sport fishery;
3. Manage the lake elevation to enhance tributary production and recreation;
4. Determine compatibility of management actions with potential future bull trout re-introduction;
5. Develop a monitoring and evaluation program that provides flexibility for future changes in both implementation and the monitoring and evaluation program;
6. Monitor and address entrainment of fish from Lake Chelan into the Project intake.

SECTION 2: POTENTIAL AND PAST MONITORING AND EVALUATION MEASURES

The following list of monitoring and evaluation measures includes potential future monitoring projects, monitoring projects that have been implemented and completed, and monitoring projects that have been implemented and are ongoing. Result summaries are reported briefly for past implemented projects. All projects are evaluated annually by the LCFF. Specific measures to be implemented in 2016 are described in Section 3.

2.1 Comprehensive Creel Surveys

The Comprehensive Lake Chelan management plan was designed to alter the abundance and composition of fish species in Lake Chelan. The plan outlines many methods to accomplish this goal. The purpose of a creel survey on Lake Chelan is to collect the necessary information to evaluate the success of those methods. Of particular importance was the collection of data to evaluate westslope cutthroat trout (WCT) replacement of rainbow trout (RBT) in the sport harvest. Equally important was annual sampling of kokanee population abundance and age composition; information needed to guide implementation of kokanee management. In 2016, the kokanee survey was contained within the comprehensive creel survey.

Sampling of kokanee size by age, population composition by age and catch-per-unit-effort (CPUE) of the current population during the spring fishing season should provide an estimate of the up-coming fall spawning escapement. All of the fish that become spawners in the fall would have been available for harvest the spring of the same year. This information will be used to predict the upcoming fall spawner abundance and determine whether eggs should be collected from spawning kokanee, taken to Chelan Hatchery, reared to fry size, and released back into Lake Chelan or into other lakes around the state to supplement various fisheries. In addition, other information collected will assist with various fish management decisions.

The Lake Chelan Comprehensive Creel Survey is conducted on a tri-annual basis; the next scheduled survey will be conducted in 2019.

Creel survey methods:

To ensure results from creel surveys on Lake Chelan are useful and relevant, the methods used needed to be comparable to those used in the past by Duke Engineering Service (2000), Hagen (1997), and Brown (1984); the methods outlined here are designed with this in mind.

The main objectives are: 1) determine the relative composition of fish species and origin (naturally produced or hatchery released) contributing to the sport fishery; 2) determine what species of fish anglers prefer to catch and; 3) obtain effort and harvest information.

Periodic effort counts i.e. (boat counts), and roving on–lake angler interviews were used beginning in April and continuing until mid-October or until angler effort was so low that further surveys were deemed not cost effective. Both effort counts and the angler

interviews were scheduled on a stratified random basis. Strata included weekdays, weekends, A.M. (0700 –1400 hours) and P.M. (1400 – 2100 hours) time periods, upper-lake (up-lake from Twenty-Five Mile Creek) and lower-lake (down-lake from Twenty-Five Mile Creek). At least two randomly chosen weekdays and one non-random weekend day, alternating between Saturday and Sunday, were sampled per week. Effort counts consisted of counting the number of boats observed (independently for the upper and lower portions of the lake). Angler interviews were designed to collect information on individual angler effort (hours fished), fish caught and kept (or released) by species, fish length, weight, scales samples; (otoliths from burbot) for age analysis; all fin clips or other identifying marks were recorded. Stomach samples were obtained from Chinook by offering to clean angler's fish. Stomachs were preserved in a 10% solution of formalin for future analysis. A questionnaire designed to learn angler species preference and satisfaction was handed out during interviews with a self-addressed envelope. Anglers were asked to answer the questions when they have time and return the questionnaire by mail.

2016 survey results (lower lake); Twenty-Five Mile Creek down-lake to Chelan:
During April - October of 2016 we interviewed 802 anglers that fished for a total of 4,644 hours (Table 1). We estimated that 4,850 anglers fished for 25,108 hours and caught a total of 18,817 fish. The catch was comprised of 0.3% Chinook (100% naturally produced), 60.0% kokanee (100% naturally produced), 0.0% burbot, 9.3% lake trout, 0.7 % RBT, 9.4 % WCT and 20.4% smallmouth bass (Table 2-2, Figure 2-1).

Table 2-1: 2016 Lake Chelan creel survey angler data (lower lake).

Sample Data	Apr	May	June	July	Aug	Sept	Oct	Total
Angler Sample Rate:	20.8%	14.9%	18.8%	7.7%	2.8%	6.7%	34.0%	16.5%
Total Anglers Interviewed:	322	187	232	27	5	16	13	802
Total Fishing Hours Sampled:	2,129	1,008	1,262	102	19	79	46	4,644
Mean Hours per Trip:	6.6	5.4	5.4	3.8	3.8	4.9	3.6	4.8

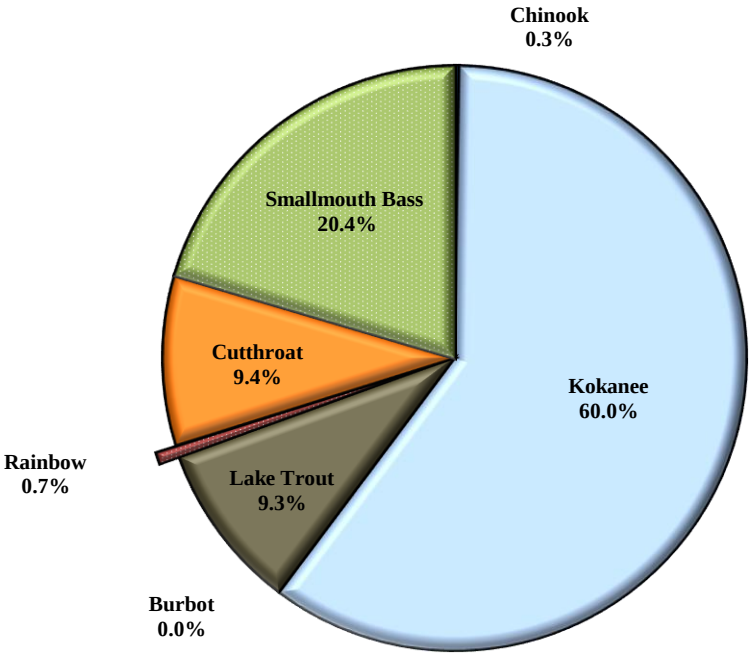


Figure 2-1: 2016 Lake Chelan species catch composition (lower lake).

Table 2-2: 2016 Lake Chelan creel survey results (lower lake).

Estimated Results	Apr	May	June	July	Aug	Sept	Oct	Total
Effort (hrs):	9,027	6,304	6,453	1,277	682	1,166	199	25,108
Angler Trips:	1,548	1,258	1,236	352	178	240	38	4,850
Chinook Harvest:	36	7	5	0	0	0	0	48
Chinook Released:	0	0	0	0	0	0	0	0
Chinook Total Catch:	***36***	***7***	***5***	***0***	***0***	***0***	***0***	***48***
Kokanee Harvest:	3,048	3,529	3,894	644	0	12	56	11,183
Kokanee Release:	52	0	13	39	0	0	0	104
Kokanee Total Catch:	***3,100***	***3,529***	***3,907***	***683***	***0***	***12***	***56***	***11,287***
Burbot Harvest:	0	0	0	0	0	0	0	0
Burbot Release:	0	0	0	0	0	0	0	0
Burbot Total Catch:	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Lake Trout Harvest:	314	497	524	289	0	12	90	1,726
Lake Trout Release:	8	7	0	0	0	0	0	15
Lake Trout Total Catch:	***322***	***504***	***524***	***289***	***0***	***12***	***90***	***1,741***
Rainbow Trout Harvest:	8	20	33	0	0	0	3	64
Rainbow Trout Release:	48	7	5	0	0	0	0	60
Rainbow Trout Total Catch:	***56***	***27***	***38***	***0***	***0***	***0***	***3***	***124***
Cutthroat Trout Harvest:	1,035	518	5	0	0	0	14	1,572
Cutthroat Trout Release:	141	40	0	0	0	0	20	201
Cutthroat Trout Total Catch:	***1,176***	***558***	***0***	***0***	***0***	***0***	***34***	***1,773***
SM Bass Harvest:	***36***	***0***	***11***	***0***	***114***	***0***	***0***	***161***
SM Bass Release:	580	1,109	1,511	0	284	199	0	3,683
SM Bass Total Catch:	***616***	***1,109***	***1,522***	***0***	***398***	***199***	***0***	***3,844***
Grand Total Catch:	***1,232***	***2,218***	***3,450***	***0***	***796***	***796***	***0***	***18,817***

2016 survey results (upper lake); Twenty-Five Mile Creek up-lake to Stehekin:
During April - October of 2016 we interviewed 153 anglers that fished for a total of 686 hours (Table 3). We estimated that 1,490 anglers fished for 7,392 hours and caught a total of 4,400 fish. The catch was comprised of 0.4% Chinook (100% naturally produced), 63.3% kokanee (100% naturally produced), 0.0% burbot, 6.0% lake trout, 1.3 % rainbow, 28.3 % cutthroat and 0.7% smallmouth bass (Table 2-4, Figure 2-2).

Table 2-3: 2016 Lake Chelan creel survey angler data (upper lake).

Sample Data	Apr	May	June	July	Aug	Sept	Oct	Total
Angler Sample Rate:	11.3%	5.2%	13.2%	3.7%	0.0%	48.7%	40.4%	10.3%
Total Anglers Interviewed:	93	19	29	2	0	6	4	153
Total Fishing Hours Sampled:	441	84	102	3	0	34	22	686
Mean Hours per Trip:	4.7	4.4	3.5	1.5	0.0	5.6	5.5	5.0

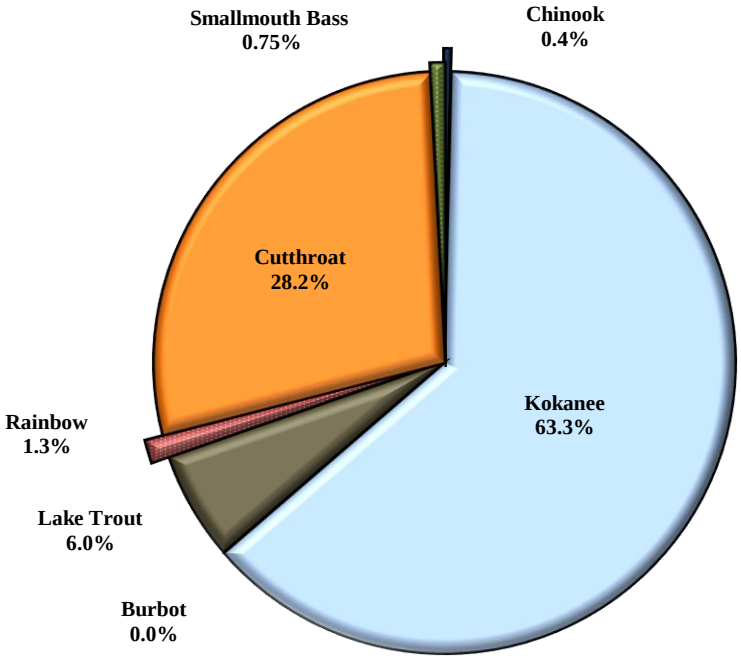
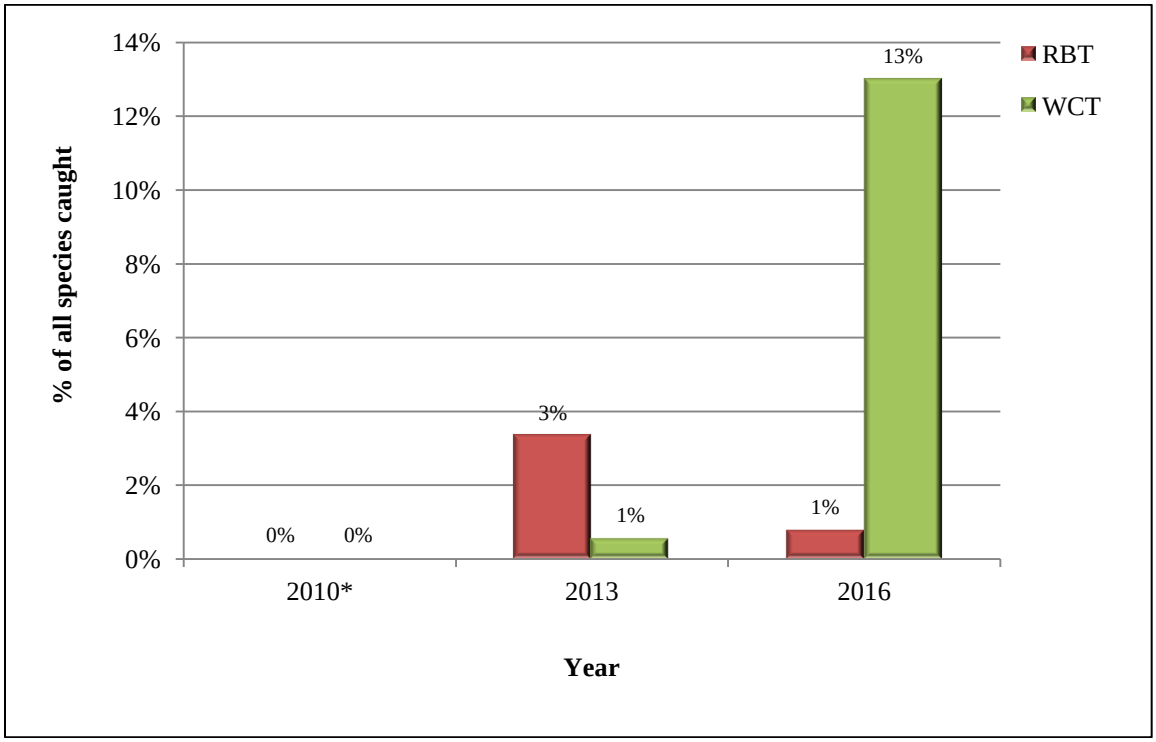


Figure 2-2: 2016 Lake Chelan species catch composition (upper lake).

Table 2-4: 2016 Lake Chelan creel survey results (upper lake).

Estimated Results	Apr	May	June	July	Aug	Sept	Oct	Total
Effort (hrs):	3,933	1,694	705	81	0	69	910	7,393
Angler Trips:	826	369	219	54	0	12	10	1,490
Chinook Harvest:	17	0	0	0	0	0	0	17
Chinook Released:	0	0	0	0	0	0	0	0
Chinook Total Catch:	***17***	***0***	***0***	***0***	***0***	***0***	***0***	***17***
Kokanee Harvest:	1,419	1,120	239	0	0	0	0	2,778
Kokanee Release:	0	0	7	0	0	0	0	7
Kokanee Total Catch:	***1,419***	***1,120***	***246***	***0***	***0***	***0***	***0***	***2,785***
Burbot Harvest:	0	0	0	0	0	0	0	0
Burbot Release:	0	0	0	0	0	0	0	0
Burbot Total Catch:	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Lake Trout Harvest:	145	115	0	0	0	0	0	260
Lake Trout Release:	6	0	0	0	0	0	0	6
Lake Trout Total Catch:	***150***	***115***	***0***	***0***	***0***	***0***	***0***	***266***
Rainbow Trout Harvest:	0	0	0	0	0	0	0	0
Rainbow Trout Release:	0	0	51	0	0	6	0	57
Rainbow Trout Total Catch:	***0***	***0***	***51***	***0***	***0***	***6***	***0***	***57***
Cutthroat Trout Harvest:	790	82	43	0	0	0	5	920
Cutthroat Trout Release:	217	33	72	0	0	0	0	322
Cutthroat Trout Total Catch:	***1,007***	***115***	***116***	***0***	***0***	***0***	***5***	***1,242***
SM Bass Harvest:	0	33	0	0	0	0	0	33
SM Bass Release:	0	0	0	0	0	0	0	0
SM Bass Total Catch:	***0***	***33***	***0***	***0***	***0***	***0***	***0***	***33***
Grand Total Catch:	***2,594***	***1,383***	***412***	***0***	***0***	***6***	***5***	***4,400***

Of significant note, WCT (13.0%) and RBT (0.8%) trout made up a significantly larger and smaller percentage of the overall catch composition respectively when compared to results of comprehensive creel surveys conducted in 2013 (Figure 2-3). This shift in species composition is a result of recent successes found in reaching the goals (33,000 lbs. of catchable trout) of the hatchery cutthroat program and subsequent lake plants since 2014. As WCT have met this program goal for two out of the last three years, RBT trout plants have been reduced or curtailed as per the Lake Chelan Comprehensive Fishery Management Plan (Viola 2002).

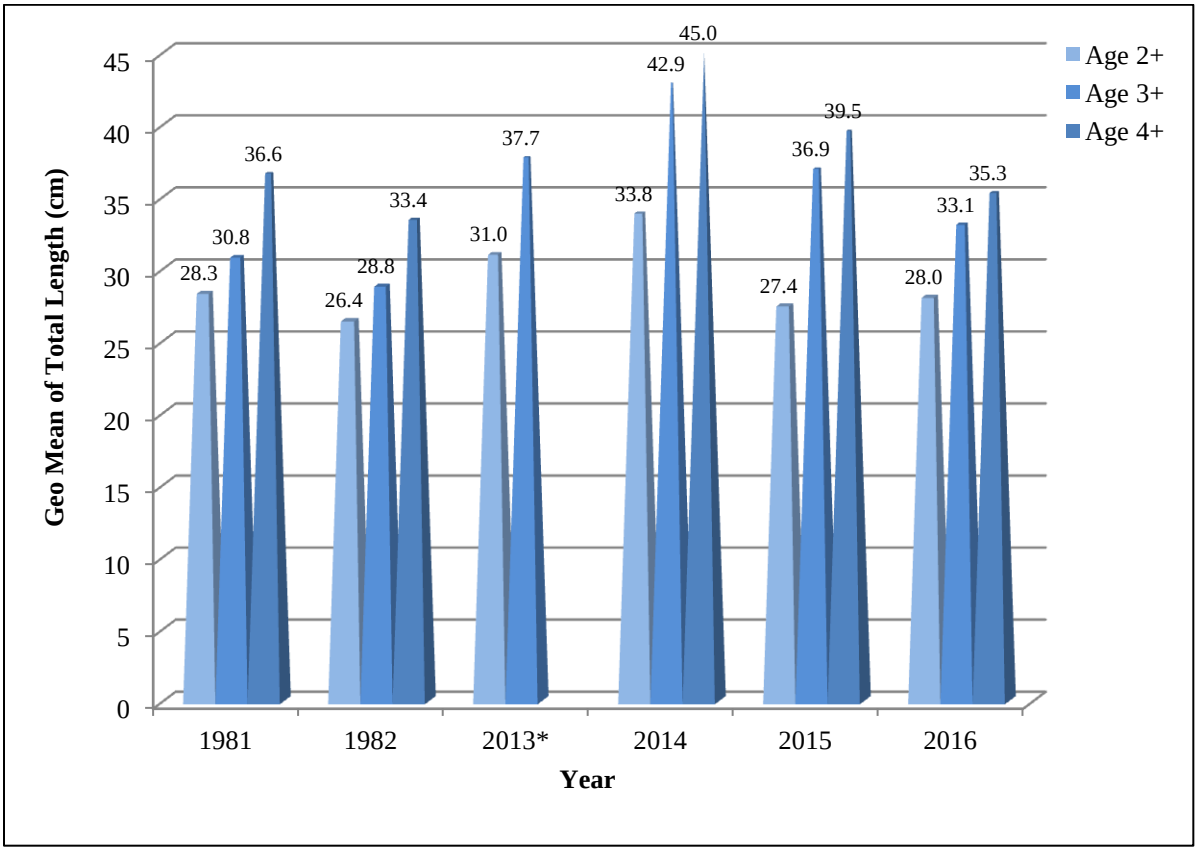


* RBT and WCT were not documented as being caught during the 2010 creel survey.

Figure 2-3: A comparison of rainbow and cutthroat trout catch percentages within the total estimated catch during the 2010, 2013, and 2016 Comprehensive Creel Surveys.

Specific to kokanee, the catch was comprised entirely of naturally produced fish (Tables 2-2 and.2-4). Overall kokanee catch per unit effort (CPUE) was 0.43, which was up considerably from that of 2015 (0.23) and 2014 (0.17). However, overall fish size was on average smaller in 2016 than the previous two years (Figure2-4).

Of all kokanee harvested (*N*=14,073), 55%, 27% and 18% were of age 2+, 3+ and 4+ respectively. Overall, length (Total Length in centimeters) at age was 28.0, 33.1 and 35.3 for age 2+, 3+ and 4+ respectively. Since 2014, this shows a decline of 17% (-5.8cm), 23% (-9.8cm) and 21% (-9.7cm) in age 2+, 3+ and 4+ fish respectively (Figure 2-4). Assuming the kokanee population has not recently been in a state of "crash", forage base and environmental conditions have remained relatively constant and given the smaller sizes with increased CPUE for all age classes in 2016, it is intuitive to think that the population may currently be trending upward.



* Age 4+ fish were not documented during the 2013 creel surveys presumably due to a relatively small sample size,
Figure 2-4: A comparison of kokanee average length at age data for fish harvested during Lake Chelan creel surveys.

Years of angling experience on Lake Chelan averaged 15.2 years but varied greatly. The mean number of days fished per year averaged 14.8 days but also varied greatly. Just 16.0% of those that responded said they did fish in tournaments. Ninety two percent of anglers indicated that the current fishery was excellent to good and 44.0% indicated that they felt the fishery was improving (Table 2-5).

Table 2-5: 2016 Angler questionnaire results summary.

# Years Fishing on Lake?	Avg. Days Fished Per Year?	Do You Fish Tournaments?	Current Fishery Status?	Last 5 to 10 Year Trend?
Mean = 15.2 Range (1-50) STD = 14.9	Mean = 14.8 Range (2-100) STD = 18.7	No = 84.0% Yes = 16.0%	Excellent = 28.0% Good = 64.0% Fair = 4.0% Poor = 0.0% Don't Know = 4.0%	Improving = 44.0% Unchanged = 20.0% Declining = 4.0% Don't Know = 32.0%

Forty four percent of anglers that responded were in favor of the lake having a trophy fishery. Chinook were favored as a trophy species 50.0% of the time, followed by kokanee at 33.3% (Table 2-6).

Table 2-6: Angler preference for a trophy fishery and the species preferred by those who indicated they were in favor of a trophy fishery.

Should there be a Trophy Fishery?	Kokanee (Yes)	Rainbow (Yes)	Lake Trout (Yes)	Chinook (Yes)	Cutthroat (Yes)	S.M. Bass (Yes)
Yes = 44.0%	33.3%	0.0%	8.3%	50.0%	8.3%	0.0%
No = 48.0%						
Unsure = 8.0%						

Anglers from Chelan (49%) and King (16%) counties made up the largest percentage of those surveyed. Other angler origins ranged from 0.1 - 10%, including multiple out of state anglers from Idaho, Oregon, Texas and New York (Figure 2-5).

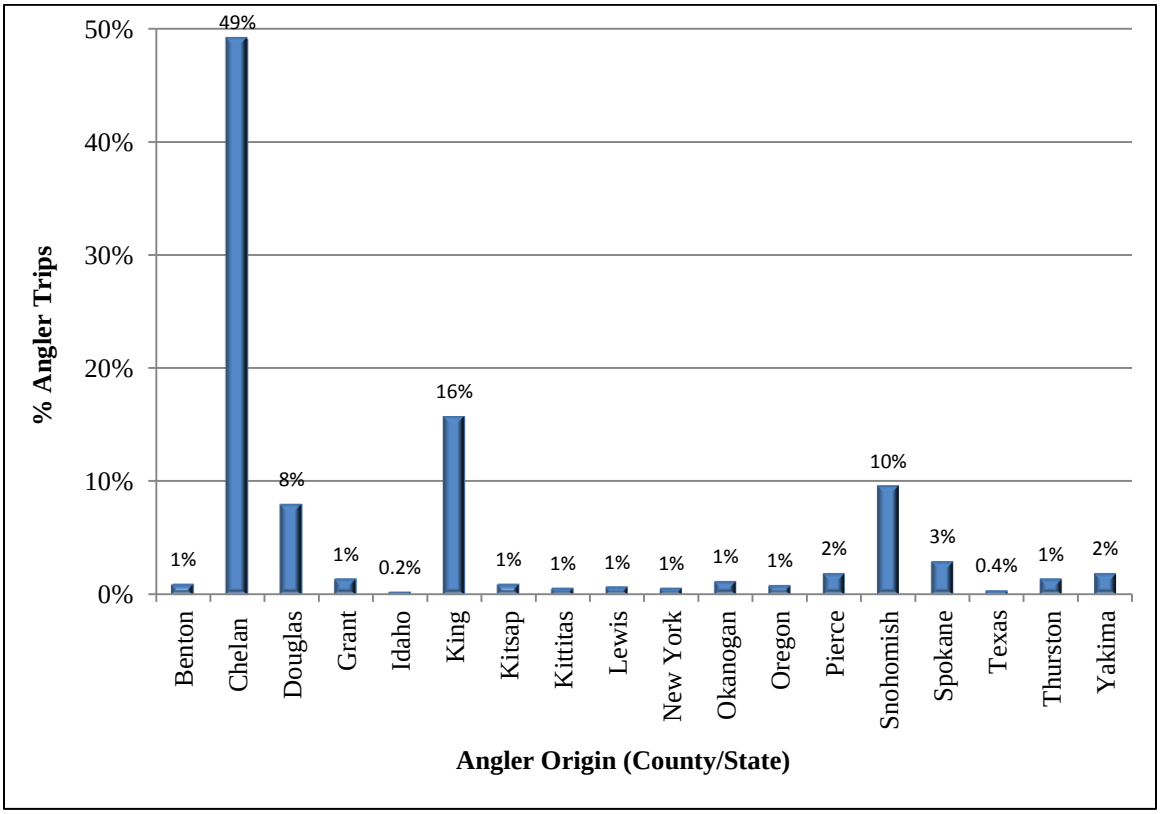


Figure 2-5: 2016 Angler County/State of Origin (%).

2.2 Westslope Cutthroat Trout

The current ongoing and planned future fish management goal for Lake Chelan is to beneficially alter the abundance and composition of fish species in the lake. Multiple methods are in progress or will be used in the future to accomplish this goal, such as altered fishing regulations, a change in stocking practices, and removal of lake tributary alluvial barriers to spring spawning fish (LCFP 2007). The monitoring and evaluation efforts listed below are needed to determine the success of these fish enhancement efforts and to signal the possible need of adaptive changes.

The goal for WCT is to increase significantly the abundance in lake tributaries and the lake itself, for these fish to eventually replace themselves naturally, and for fish to contribute to the sport fishery. To reach this goal the following objectives must be met:

1) WCT hatched from eyed-egg or fry stocking in lake tributaries must survive to maturity, spawn, and contribute to increased natural production.

2) A sufficient number of the catchable size WCT must escape harvest and recruit to the spawning run in order to substantially increase natural production.

3) The catchable size WCT must eventually replace the catchable size RBT in the sport fishery.

4) A majority of anglers fishing Lake Chelan need to accept the change in species.

Data from creel and spawning surveys will be evaluated to determine if efforts are meeting the above goal and objectives.

2.2.1 Lake Chelan Tributary Estimates of Cutthroat and Rainbow Trout Abundance, WDFW

During August, September and October of 2016, WDFW successfully sampled Big, Cascade, Fourmile and Pyramid Creeks (Tables 2-7 and 2-8). Information on adfluvial WCT and RBT population abundance, age class composition and other biological characteristics were collected. Due to inadequate lake transportation, opportunistic investigations, and surveys on Poison, Lightning, Little Big, Graham Harbor, Coyote, Deep Harbor, Lone Fir, Castle, Bear, and Riddle Creeks as mentioned in the 2016 annual work plan, were not feasible.

Electro fishing techniques used in 2016 were similar to those described in Brown (1984). All trout were identified as RBT or WCT. In 2016, 11 young of the year trout were lethally collected and sampled for future genetic analysis to provide some understanding of the current degree of hybridization between RBT and WCT.

Table 2-7: Estimated 2016 Lake Chelan tributary rainbow trout density and population abundance.

Tributary	Sample Site Est.		Site Area (M^2)	Rainbow Per (M^2)	Available[2] Area (M^2)	Estimate
	All RBT	YOY[1]				
Big	0[a]	0[a]	120.2	0.000	270	0
	NA	NA				
Cascade	2	1	65.7	0.030	315	10
	ENP	ENP				
Four Mile	51	45	52.9	0.964	672	648
	(44-58)[3]	(37-53)[3]				
Pyramid	58	22	87.7	0.661	1,092	722
	(29-67)	(13-31)				

[a]Mean number of fish estimated.
[1]YOY = young of the year, as a subset of all rainbow
[2]Estimated total accessible square meters of habitat in the entire stream; calculated as the minimal accessible stream length x average stream width (Brown 1984).
[3] (95% Confidence Interval)
ENP = Estimate not possible (all fish caught on first pass)

Table 2-8: Estimated 2016 Lake Chelan tributary cutthroat trout density and population abundance.

Tributary	Sample Site Est.		Site Area (M^2)	Cutthroat Per (M^2)	Available[2] Area (M^2)	Estimate
	All WCT	YOY[1]				
Big	33[a]	5[a]	120.2	0.275	270	74
	(30-36)[3]	(5-5)[3]				
Cascade	2	2	65.7	0.030	315	10
	ENP	ENP				
Four Mile	0	0	52.9	0.000	672	0
	NA	NA				
Pyramid	5	0	87.7	0.057	1,092	62
	(2-8)	NA				

[a]Mean number of fish estimated.
[1]YOY = young of the year, as a subset of all cutthroat
[2]Estimated total accessible square meters of habitat in the entire stream; calculated as the minimal accessible stream length x average stream width (Brown 1984).
[3] (95% Confidence Interval)
ENP = Estimate not possible (all fish caught on first pass)

Table 2-9: Estimated 2015 Lake Chelan tributary rainbow trout density and population abundance.

Tributary	Sample Site Est.		Site Area (M^2)	Rainbow Per (M^2)	Available[2] Area (M^2)	Estimate
	All RBT	YOY[1]				
Fish	52[a]	20[a]	132.5	0.392	1,920	753
	(49-55)[3]	(17-25)[3]				
Gold	3	1	27.3	0.110	390	43
	(3-6)	ENP				
Prince	26	8	232.8	0.112	1,464	164
	(25-27)	(6-10)				

[a]Mean number of fish estimated.
[1]YOY = young of the year, as a subset of all rainbow
[2]Estimated total accessible square meters of habitat in the entire stream; calculated as the minimal accessible stream length x average stream width (Brown 1984).
[3] (95% Confidence Interval)
ENP = Estimate not possible (all fish caught on first pass)

Table 2-10: Estimated 2015 Lake Chelan tributary cutthroat trout density and population abundance.

Tributary	Sample Site Est.		Site Area (M^2)	Cutthroat Per (M^2)	Available[2] Area (M^2)	Estimate
	All WCT	YOY[1]				
Fish	0[a]	0[a]	132.5	0.000	1,920	0
	NA	NA				
Gold	0	0	27.3	0.000	390	0
	NA	NA				
Prince	6	1	232.8	0.026	1,464	38
	(4-8)[3]	ENP				

[a]Mean number of fish estimated.
[1]YOY = young of the year, as a subset of all cutthroat
[2]Estimated total accessible square meters of habitat in the entire stream; calculated as the minimal accessible stream length x average stream width (Brown 1984).
[3] (95% Confidence Interval)
ENP = Estimate not possible (all fish caught on first pass)

Table 2-11: Estimated 2014 Lake Chelan tributary rainbow trout density and population abundance.

Tributary	Sample Site Est.		Site Area (M^2)	Rainbow Per (M^2)	Available[2] Area (M^2)	Estimate
	All RBT	YOY[1]				
First	20[a]	14[a]	73.2	0.273	6,208	1,696
	(16-24) [3]	(14-16)[3]				
Safety Harbor	60	39	201.3	0.298	1,356	404
	(50-70)	(33-51)				
Twenty-Five Mile	118	74	158.9	0.743	12,288	9,125
	(108-124)	(69-82)				
Grade	24	17	54.3	0.442	1,168	516
	(24-26)	(69-82)				
Mitchell	25	15	36.5	0.685	1,686	1,155
	(24-26)	(15-16)				

[1]YOY = young of the year, as a subset of all rainbow
[2]Estimated total accessible square meters of habitat in the entire stream; calculated as the minimal accessible stream length x average stream width (Brown 1984).
[3](95% Confidence Interval)
ENP = Estimate not possible (all fish caught on first pass)

Table 2-12: Estimated 2014 Lake Chelan tributary cutthroat trout density and population abundance.

Tributary	Sample Site Est.		Site Area (M^2)	Cutthroat Per (M^2)	Available[2] Area (M^2)	Estimate
	All WCT	YOY[1]				
First	2[a]	0[a]	73.2	0.027	6,208	170
	(2-15)[3]	ENP				
Safety Harbor	3	0	201.3	0.015	1,356	20
	ENP	ENP				
Twenty-Five Mile	3	1	158.9	0.019	12,288	232
	(3-6.1)	ENP				
Grade	0	0	54.3	0.000	1,168	0
	ENP	ENP				
Mitchell	1	1	36.5	0.027	1,686	46
	ENP	ENP				

[1]YOY = young of the year, as a subset of all rainbow
[2]Estimated total accessible square meters of habitat in the entire stream; calculated as the minimal accessible stream length x average stream width (Brown 1984).
[3](95% Confidence Interval)
ENP = Estimate not possible (all fish caught on first pass)

Results from data gathered for Big, Cascade, Fourmile and Pyramid Creeks in 2013 and 2016 are compared to those conducted in 1982 by Brown (1984) in Table 13. Of the tributaries sampled in 2016, Big Creek showed a significant increase in the percentage of cutthroat compared to that of 1982 and 2013, while a slight increase was detected on Pyramid Creek. Fourmile Creek continues to show consistently low percentages or no Cutthroat present. Unfortunately, the very low sample size for Cascade Creek in 2016 (*N*=4, all collected on the first pass) prevents us from making a statistically valid comparison across years.

Table 2-13: Comparison of species abundance and composition 1982 vs. 2013 vs. 2016.

Tributary	1982			2013			2016		
	All	%RBT	%WCT	All	%RBT	%WCT	All	%RBT	%WCT
Big	236	99%	1%	18	22%	78%	74	0%	100%
Cascade	453	85%	15%	168	13%	87%	20	50%	50%
Fourmile	431	90%	10%	106	100%	0%	648	100%	0%
Pyramid	522	98%	2%	250	100%	0%	784	92%	8

Results from data gathered in 2015, 2014, 2013, 2012, and 2011 are compared to those conducted in 1982 by Brown (1984) Tables 2-14, 2-15, 2-16, 2-17, and 2-18 respectively. The intent is to evaluate the effectiveness of recent management actions to increase WCT abundance.

Table 2-14: Comparison of species abundance and composition 1982 vs. 2015.

Tributary	1982			2015		
	All Trout	%RBT	%WCT	All Trout	%RBT	%WCT
Fish	773	80%	20%	753	100%	0%
Gold	1,478	00%	0%	43	100%	0%
Prince	1,146	86%	14%	202	81%	19%

Table 2-15: Comparison of species abundance and composition 1982 vs. 2014.

Tributary	1982			2014		
	All Trout	% RBT	%WCT	All Trout	%RBT	%WCT
First	2,483	100%	0%	1,866	91%	9%
Safety Harbor	1,032	99%	1%	424	95%	5%
25 Mile	7,776	100%	0%	9,357	98%	2%
Grade	824	100%	0%	516	100%	0%
Mitchell	480	100%	0%	1,201	96%	4%

Table 2-16: Comparison of species abundance and composition 1982 vs 2013.

Tributary	1982			2013		
	All Trout	% RBT	%WCT	All Trout	%RBT	%WCT
Pyramid	522	98%	2%	250	100%	0%
Cascade	453	85%	15%	168	13%	87%
Big	236	99%	1%	18	22%	78%
Four Mile	431	90%	10%	106	100%	0%

Table 2-17: Comparison of species abundance and composition 1982 vs. 2012.

Tributary	1982			2012		
	All Trout	%RBT	%WCT	All Trout	%RBT	%WCT
Fish	773	80%	0.20%	358	100%	0%
Gold	1,478	100%	0.00%	422	84%	16%
Prince	1,146	86%	0.14%	347	98%	2%

Table 2-18: Comparison of species abundance and composition 1982 vs. 2011.

Tributary	1982			2011		
	All Trout	%RBT	%WCT	All Trout	%RBT	%WCT
First	2,483	100%	0%	1,949	62%	38%
25-Mile	7,776	100%	0%	2,580	100%	0%
Mitchell	480	100%	0%	455	93%	7%
Grade	824	100%	0%	292	80%	20%
Safety Harbor	1,032	99%	1%	231	71%	29%

Hybridization between RBT and cutthroat has occurred and is still occurring. Genetics results from 2012 indicate that an average of 44% (21 - 71%) of the fish sampled were cutthroat/RBT hybrids. Therefore, young of the year trout identified during 2016 sampling as either RBT or cutthroat may have actually been hybrids. However, most likely many of the fish sampled in 1982 were also hybrids. It is intuitive that this would be the case given the long period of time that both species have coexisted in the lake. Because of RBT presence we may never completely reestablish pure strain cutthroat as the dominate species. Nevertheless, based on 2016 sampling we can now say that we have significant and modest increases in the proportion of cutthroat in Big and Pyramid Creeks respectively when compared to that of 1982 and 2013. The intent is to evaluate the effectiveness of recent management actions to increase WCT abundance.

2.2.2 Stehekin River Side Channel Trout Spawning and Abundance Surveys, NPS

As part of the effort to reestablish native WCT in the Lake Chelan System, a series of monitoring surveys were implemented in the Stehekin River. These surveys included: 1) side channel spawning and abundance surveys, 2) mainstem spawning and abundance surveys, and 3) genetic analysis of newly emerged trout fry to determine parental lineage.

Spawning surveys for RBT and WCT were conducted by NPS staff from 2009-2011 in selected Stehekin River side channel and tributary index reaches to evaluate progress towards restoration of adfluvial WCT. Another three-year sequence of spawning surveys was initiated in 2015 and will continue through 2017. This second round of spawning surveys is intended to assess the results of supplemental Stehekin River tributary stocking which began in 2012 and/or natural recruitment (Figure 2-6).

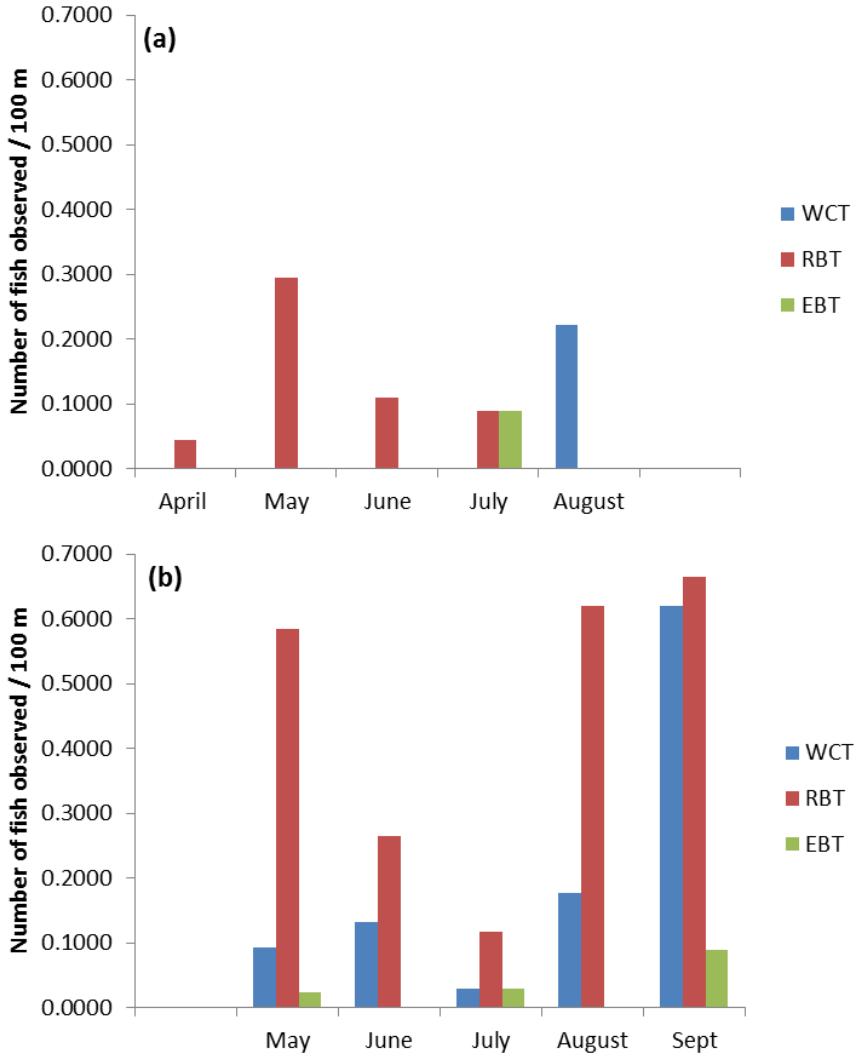


Figure 2-6: Density of fish observed in core index sites by month for surveys conducted during a) 2009-2011 and b) 2015-2016.

A summary report of 2009-2011 results can be found in Anthony and Glesne 2012. In the 2009 to 2011 surveys actively spawning RBT trout were routinely observed during the spring though no WCT were observed. Surveys conducted in 2015 and 2016 have documented a number of large adfluvial WCT in index sites during the spring spawning period. While no WCT have been observed actively digging or spawning, one individual was observed on 5/23/2016 holding on a newly constructed redd. Large adfluvial WCT were frequently observed in established index sites in August and September, though these fish were only observed holding and feeding, and were not exhibiting spawning behavior.

2.2.3 Genetic analysis of newly emerged trout fry, NPS

From 2011 to 2016, a sample of newly emerged fry was collected from each of four index reaches annually for genetic analysis to provide information on RBT and WCT reproduction within the index reaches, and the prevalence of hybridization.

Analysis of samples collected from 2011 to 2015 was completed by the USGS Western Fisheries Research Center following methods outlined in Ostberg and Rodriguez (2006). Results from sampling efforts indicated that the vast majority of the newly emerged fry were RBT, and the percent of hybridized fish ranged from 0% to 72% in the channels surveyed. In 2013, eleven fry samples from index site i5 were identified as genetically pure WCT. However, this collection was inadvertently made just days after WDFW stocked WCT fry into the subject reach, so it is highly likely that the sampled fish were WCT of hatchery origin. In 2015, fry with WCT genotypes were detected at index sites 13 (n=1) and 18 (n=2) (Figure 2-7), indicating successful WCT spawning had occurred at or near these sample locations.

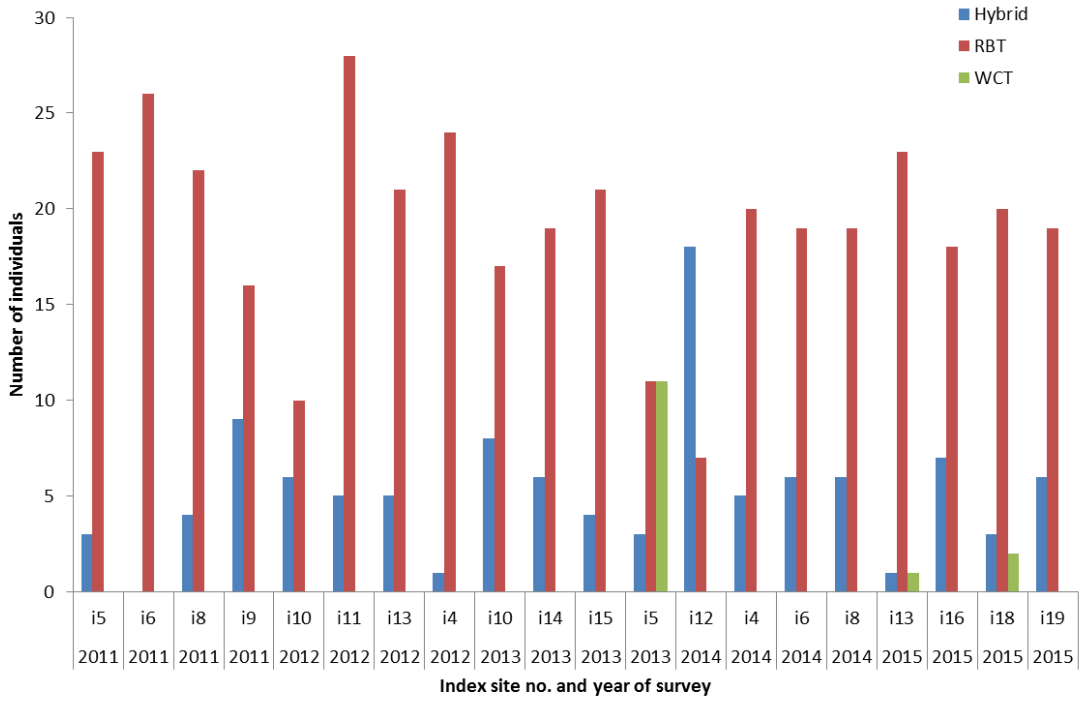


Figure 2-7: Genetic assignment of newly emerged fry collected from Stehekin River side channel index sites from 2011 to 2015.

2.3 Kokanee

Kokanee are the most sought after fish in Lake Chelan (Brown 1984; DES 2000a) and maintaining this fishery is a high priority for the LCFF.

Goals and objectives for Lake Chelan are to: 1) produce consistently good fishing; and 2) maintain an abundance of kokanee at a level that does not substantially hinder our efforts to restore native species.

2.3.1 Lake Chelan Tributary Kokanee Escapement, NPS, WDFW and CPUD

Chelan PUD has conducted annual Lake Chelan spawning surveys for kokanee and land-locked Chinook salmon since 1984. The purpose of these surveys is to document the annual trends of kokanee spawning populations within the Lake Chelan drainage (Stone and Fielder 2004). A majority of the natural production for kokanee in the Lake Chelan basin occurs in two-side channel complexes of the Stehekin River associated with

Company and Blackberry creeks. Given the high amounts of spawning activity, these areas have been used as index reaches since 1984. Additional tributaries to Lake Chelan that have been included in the annual kokanee spawning ground surveys are: Mitchell, Gold, Grade, Safety Harbor, Prince, Fish, First, and Twenty-five Mile creeks.

Prior to 2013, kokanee spawning surveys were conducted approximately twice monthly between August 31 and October 31 by CPUD based on the availability of survey crews. These surveys were conducted by walking in or along the streams and counting all live kokanee with tally counters. Large masses of kokanee were occasionally estimated when individual fish enumeration was not feasible (Stone and Fielder 2004). Due to a lack of CPUD staff, WDFW and NPS assumed responsibility for these surveys in 2016.

Results of kokanee spawning ground surveys prior to 2013 can be found in Keesee and Keller (2013). Preliminary results of the 2016 kokanee spawning ground surveys are outlined in Table 2-19 below.

Table 2-19: Lake Chelan tributary kokanee escapement estimates, peak counts and peak count dates, 2016.

Stream	Peak Count	Date	Escapement Estimate
25-Mile	33	10/5/16	40
First	12	10/5/16	12
Mitchell	0	N/A	0
Gold	0	N/A	0
Grade	0	N/A	0
Safety Harbor	0	N/A	0
Prince	13	10/5/16	23
Fish	2	10/5/16	2
Blackberry	3,559	09/30/16	7,298
Company	24,725	09/22/16	48,782

2.3.2 Stehekin River Mainstem and Side Channel Kokanee Escapement Surveys, NPS

Significant kokanee production emanating from mainstem and side channel habitat of the Stehekin River exists that is not being assessed using current survey methods (DES 2000a). To help augment the kokanee index reach surveys, North Cascades National Park Service (NOCA) personnel conducted expanded kokanee spawning surveys in 2000, 2010, and 2015 on all fish accessible side channels in the lower 16 km of the Stehekin River including segments of the Company and Blackberry creek side channel complexes (Table 2-20).

Table 2-20: Amount of side channel habitat assessed, habitat suitable for kokanee spawning and migration, and number of fish sample segments in the Stehekin River expanded kokanee spawning surveys; 2000, 2010 and 2015.

Year of Survey	Habitat Assessed (km)	Suitable Habitat (km)	Habitat Selected for Survey (km)	Percent of Suitable Habitat Surveyed (%)	Number of Fish Sample Segments
2000	22.8	19.8	7.2	36.4	17
2010	14.9	9.6	3.4	35.4	16
2015	19.4	16.9	3.8	22.5	15

In 2010 and 2015, the mainstem of the Stehekin River was also surveyed for spawning kokanee. The sample design for these surveys was based on partitioning the river into 32 500-meter reaches and assessing each of these reaches for their capacity to support kokanee spawning. Based on this assessment, 24 reaches were included in the sample frame and eight reaches were eliminated due to deeply incised channels consisting primarily of large cobbles and boulders. These reaches were identified in a 2007 large woody debris survey as "transport zones" (Riedel 2008). Of the remaining 24 reaches, in 2010 12 were randomly selected for sampling, and seven were selected in 2015. All randomly selected mainstem and side channel reaches were sampled four times between August 30 and October 15 in 2010 and five times between September 1 and October 28 in 2015.

Daily counts of adult kokanee were used to calculate escapement using Area-Under-the-Curve methodology as outlined by Hillborn et al. (1999) and the escapement estimate was expanded from surveyed habitat to all available habitat. The 2015 escapement estimate was 32,926 kokanee, only 17.5% of the 2010 escapement estimate of 187,475 fish (Figure 2-8 and 2-9).

Figure 2-8: Kokanee escapement estimates for side channel and mainstem habitats in the Stehekin River; 2000, 2010 and 2015.

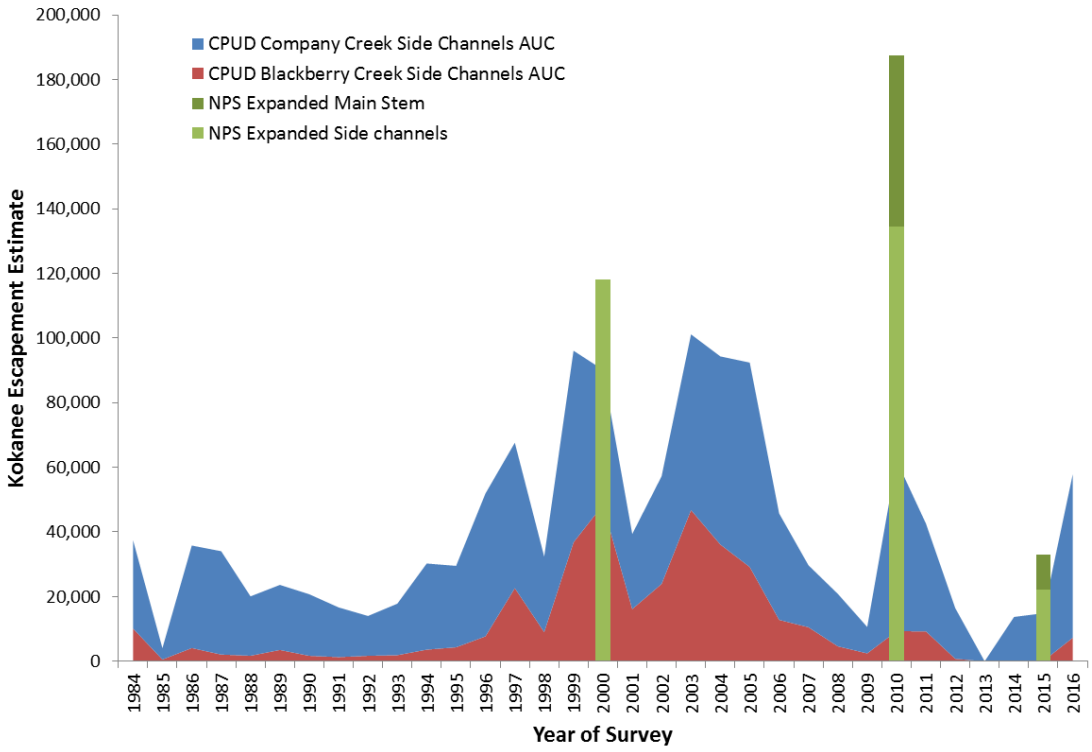


Figure 2-9: Annual kokanee escapement to the Blackberry and Company Creek side channels, from 1984 to 2016, as estimated by CPUD index reach surveys. Overlaid in green are the 2000, 2010, and 2015 expanded kokanee escapement estimates.

A detailed report detailing the methods and results from the 2000 and 2010 expanded kokanee escapement surveys is contained in Anthony and Glesne 2013. A report incorporating the 2015 results is currently in progress and will be available in spring 2017. Replication of this survey is recommended at five-year intervals, with the next survey planned for 2020. Results will be used to calibrate estimates of annual Chelan PUD index reach escapement to total basin escapement and to evaluate changes in habitat and spawning kokanee distribution in the study area.

2.3.3 Kokanee Stocking Monitoring and Evaluation, WDFW

WDFW will clip adipose fins on all kokanee reared and released into Lake Chelan as part of the fish stocking program. Fin clipped kokanee will provide important information regarding the contribution of hatchery-reared kokanee to the sport fishery (especially their survival) as identified through creel surveys versus natural production. The cost of fin-clipping hatchery produced kokanee is estimated to be $6,200 annually.

2.4 Burbot

The LCFF believes that monitoring burbot population dynamics should be an important component to the monitoring and evaluation program. However, methods for assessing the burbot population in Lake Chelan need to be developed. Developing these methods will be a future task for the LCFF.

2.5 Smallmouth and Largemouth Bass

The LCFF believes that monitoring smallmouth and largemouth bass population dynamics should be an important component to the monitoring and evaluation program. However, methods for assessing the bass population in Lake Chelan need to be developed. Developing these methods will be a future task for the LCFF. In 2013, the NPS documented the presence of largemouth bass in the Lucerne Basin of Lake Chelan with photographic evidence of a specimen caught off Purple Point dock. In 2014, WDFW staff observed one adult largemouth bass swimming near one of the public docks at Stehekin.

2.6 Bull Trout

The LCFF believes that the monitoring of any future population and/or individual occurrences of bull trout in Lake Chelan should be an important component to the monitoring and evaluation program. Monitoring of this species at this time should include documentation of incidental occurrences during associated fish monitoring and evaluation program activities. Standard metric measurements, physical condition, photographs, and location of fish within Lake Chelan during these occurrences should be documented and provided to the LCFF for review.

The USFWS prepared the paper entitled "What Happened to Bull Trout in Lake Chelan? An Examination of the Historical Evidence" (Nelson 2012). The intent of the document was to conduct a "…rigorous examination of the factors that may have led to the demise of bull trout" prior to considering any reintroduction of bull trout into the Lake Chelan basin. This is a very important management document that should be included by reference into the AWP.

In 2016, the NPS conducted environmental DNA (eDNA) sampling of a large part of the Stehekin River watershed to determine presence or absence of Bull Trout. This survey was conducted as part of the USFS Rocky Mountain Research Station Columbia Basin Bull Trout Initiative. The Stehekin River and its major tributaries were sampled according to protocols established by Carim et al, (2015), with sample sites located every 1 km throughout sample streams. A total of 152 sites in the Stehekin Basin were targeted by the NPS for sampling, and in 2016, 124 sites were surveyed. In 2017, the NPS intends to complete sampling of the remaining 28 sample sites. This survey will provide another piece of evidence in determining if Bull Trout have indeed been extirpated from the Stehekin River basin.

2.7 Tributary Barrier Confirmation and Removal Planning

Tributary barriers identified in the Tributary Barrier Analysis report (DES 2000b) will be reassessed for depth, velocity, and gradient and re-prioritized if necessary. Two methodologies that may be used are: 1) using the Forest Practices Board Emergency Rule and "Oregon Method" used in the 2000 report; or 2) developing a more simplistic method based on the principles of the 2000 methodology to use as a more rapid assessment tool. The USDA Forest Service supports the latter option.

As tributary barriers are documented as either remaining or eliminated, the LCFF will update the tributary barrier removal priority list included in the 2000 report. Once the

tributary barrier removal priority list is updated, the LCFF will work with Chelan PUD to implement Lake Chelan Settlement Agreement License Article 6(c) for tributary barrier removal work, such as investigating barrier removal methods, stream channel rehabilitation design at tributary mouths, contractor selection to conduct work, etc. Actual on-the-ground tributary barrier removal efforts will commence in early 2011, depending upon runoff volume and associated lake elevation.

Tributary barrier removal efforts were scheduled originally to begin in 2009. However, the schedule was revised due to delay in selecting a design contractor; need by the design contractor to view tributary mouths in 2009 to observe barriers present and discuss with the consulting team and LCFF potential preliminary design features; time required to secure necessary permits; and time required to secure a construction contractor.

The LCFF conducted a boat tour of tributary mouths in March 2008, touring both the north and south shores from Twenty-five Mile Creek up lake to Fish Creek. During the tour, LCFF members took numerous photographs of the tributary mouths to initiate photo-documentation of existing tributary mouth conditions and barriers to upstream fish passage. Photographs were posted on the Chelan PUD Lake Chelan Implementation Website. After the conclusion of the tour, Forum members reached consensus that virtually all tributaries observed had barriers, either water depth, water velocity, or gradient, to upstream fish passage at the lake elevation of approximately 1083.0 feet that occurred during the site visit.

The LCFF met again on June 17, 2008 to review Statements of Qualifications (SOQs) submitted by potential tributary barrier removal design consultants, select a consultant, and proceed with implementing the Tributary Barrier Removal Project (TBRP). A design consultant, the Fairbanks Environmental Team, was selected by consensus of the LCFF.

The LCFF reviewed pertinent information regarding watershed conditions of tributaries to Lake Chelan, such as the USDA Forest Service Regional Assistance Teams (RATs) assessment report, USDA Forest Service Lake Chelan Basin fire map of areas burned since 1998, and tributary mouth photographs taken in March 2008. Based on this information, the priority tributaries selected by the LCFF at the June 17, 2008 meeting were Safety Harbor, Mitchell, Grade, and Gold creeks.

However, even with the selection of priority tributaries, the LCFF members discussed proceeding cautiously with tributary barrier removal efforts due to the following considerations:

1. Based on the data illustrated by the Lake Chelan basin fire map and recommendations from the RATs, significant watershed instability has been documented in most tributaries to Lake Chelan due to recent fires. The instability of the upper watersheds will likely result in high bed load movements for a number of years during high runoff events, which may thwart barrier removal and stream reconfiguration efforts until the watersheds have time to stabilize to a greater extent;

2. The RATs also recommended giving the new lake level operating regime more time to be in affect that may allow tributaries to carve out alluvial deposits on their own due to high flow events occurring when the lake level will lower than historical elevations during major high runoff events, particularly in the fall and winter; and
3. Allow the WDFW WCT restoration program additional time to increase tributary WCT populations, thereby producing more spawning age adults that could contribute to natural reproduction in the tributaries.

Efforts to implement barrier removal in Lake Chelan tributaries in 2011 included the following:

1. Chelan PUD staff planned to have the Lake Chelan elevation in 2011 at or below 1086 feet (MSL) by no later than mid-February and remain below 1086 feet through March and, potentially, into early April in order to conduct construction activities in-the-dry.
2. Barrier removal and stream reconstruction activities were conducted in Mitchell and Gold creeks, simultaneously, beginning the week of February 7, 2011 and completed on February 24, 2011.
3. Photographs were taken of Prince, Fish, and Safety Harbor creek mouths on May 25, 2011 at Lake Chelan elevation 1087.48. The intent of the photographs was to document that no barriers to upstream fish passage were present. Presence of barriers to upstream fish passage in these creeks had been documented in previous years. The plausible explanation for these creeks ability to "repair themselves" is that the lake level operation contained in the new license draws the lake down sooner in the fall. The drawdown allowed the energy of the streams during winter freshets to scour out sediment at the tributary mouths to prevent formation of barriers to upstream adult fish passage, No further mechanical treatment is planned for any Lake Chelan tributary at this time. Monitoring will continue in future years to document passage ability for trout between elevations 1086 ft. and 1100 ft.

Efforts to monitor the presence of barriers to upstream fish passage in Lake Chelan tributaries in 2016 included photo-documentation of existing conditions at the mouths of First, Twenty-five Mile, Gold, Safety Harbor, Fish, and Prince creeks in March during lake drawdown. Photographs of Mitchell Creek were not taken in 2016 due to inclement weather conditions. Mechanical treatment of upstream passage barriers was employed at Gold and Mitchell creeks in 2011. Monitoring trips in 2014, 2015, and 2016 verified that access from Lake Chelan to spawning habitat was maintained in all creeks surveyed. Photographs of tributary mouths can be found in Tributary Barriers Photographs, 2008-2017 (Chelan PUD 2017).

2.8 Entrainment Investigation

License Article 404 *Lake Chelan Fishery Plan* of the Lake Chelan license requires Chelan PUD to conduct entrainment sampling "…to determine the potential for entrainment of adult WCT at the project intakes." Specific elements for the Entrainment Investigation are described in the Lake Chelan Comprehensive Plan, section 4.6.4 of

Chapter 6 Lake Chelan Comprehensive Fishery Management Plan. An excerpt from section 4.6.4 *Entrainment* is as follows:

> Chelan PUD shall conduct no more than 140 days of entrainment sampling over 4 sampling years, using the same methodology used during the 2000 and 2001 field seasons, or another methodology of comparable cost recommended by the LCFF, and approved by WDFW, USFWS, and WDOE. Upon request of WDFW, Chelan PUD shall develop a sampling plan in consultation with USFWS, WDOE, and the LCFF, subject to approval by WDFW. The plan shall specify the sampling years and the allocation of sampling days among such years. The first sampling year shall be not be prior to year seven of the effective date of the New License, and the last sampling year shall be no later than year 35 of the effective date of the New License. The purpose of the sampling is to determine if significant numbers of adult spawnable age/size adfluvial WCT are entering the power tunnel entrance.

Article 404 of the license includes a requirement for Chelan PUD to develop and file for approval with FERC within one year of issuance of the license a Lake Chelan Fishery Plan that includes measures to address Tributary Barrier Removal, a Fish Stocking Plan, and an Entrainment Sampling Plan. The Lake Chelan Fishery Plan, developed in consultation with the LCFF, was approved by FERC on December 4, 2007. The Entrainment Sampling plan is section 4.2.5 of the Lake Chelan Fishery Plan. Study methods used to investigate entrainment during relicensing baseline studies (DES 2001) were hook-and-line, Oneida trap, gillnet, and video. These same methods, or other methods recommended by the LCFF will be employed for future entrainment investigations. Stated in Article 404 of the license is the following reporting requirement:

> Annual results of any entrainment sampling shall be compiled in a final report and filed with the commission no later than March 1 of the subsequent year. The report shall also contain any recommendations for continued sampling, or other studies to evaluate entrainment of cutthroat trout.

Year 7 of the effective date of the license was 2013. However, discussions for conducting an Entrainment Investigation have not occurred yet within the LCFF, primarily due to monitoring and evaluation results indicating that actions taken to date, such as altering fishing regulations, changing fish stocking practices, and removing lake tributary barriers to spring spawning fish (see section 2.2), have not demonstrated a significant increase in the WCT abundance in the lake. Likely, the LCFF will continue discussions in 2017 regarding when entrainment sampling may occur and preferred methodologies to be used for the investigation.

The LCFF met on December 10, 2015. An item that was not on the agenda but was brought up during the meeting was the entrainment investigation. After some discussion, Forum members agreed to postpone the entrainment investigation until such time as more WCT were documented to be present in the area near the penstock intake to provide a more representative investigation. At the meeting, Forum members requested that the entrainment investigation be included on future agendas for further discussion.

The LCFF met on December 15, 2016 to begin developing the 2017 Annual Work Plan (AWP). The entrainment investigation was discussed during that meeting. The LCFF discussed the importance of establishing a timeline regarding the development and implementation of an entrainment study plan. It was noted that a sampling plan would need to be submitted to FERC and receive approval before implementation could occur. Annual results of any entrainment-sampling plan would need to be compiled in a final report and filed with FERC no later than March 1 of the subsequent year. The report would need to contain any recommendations for continued sampling, or other studies to evaluate entrainment of WCT.

Snorkel surveys in Reach 1 of the Chelan River have identified some emigration of adult WCT and RBT from Lake Chelan into the upper reaches of the Chelan River, likely during spring spill operations. These trout are large enough (9-20+ inches) to have originated in the lake rather than having been spawned and reared in the Chelan River. No trout fry have been observed in the upper Chelan River during snorkel surveys to date. However, the number of fish observed is still relatively low: less than 120 WCT and RBT, combined, were observed in the entire length of Reach 1 of the Chelan River during the October 2016 snorkel survey. This low number of fish in the river indicates that a low number of trout are likely near the dam during spill operations, which occurred from later February through early July, and, therefore, a low number of fish were likely in the vicinity of the power tunnel intake with the potential to become entrained.

Due to the data indicating an apparent low number of WCT in the vicinity of the power tunnel intake, the LCFF did not support conducting an Entrainment Investigation in 2017. However, the LCFF did support developing an Entrainment Investigation Plan to have available when the Forum decided that implementing an investigation would be appropriate.

SECTION 3: MEASURES TO BE IMPLEMENTED IN 2017

The following addresses Tributary Barriers, Fish Stocking, and the Monitoring and Evaluation Program measures that will be implemented in 2017.

3.1 Fish Stocking

Article 6(d) and Section 4.6.3 of Chapter 6 of the Comprehensive Plan requires Chelan PUD to make available to the WDFW sufficient funding to rear annually the following resident fish at the Chelan Hatchery for stocking in Lake Chelan:

1. Approximately 5,000 pounds of salmonid fingerlings (for example: 500,000 fish at 100 fish/lb, presently kokanee).
2. Approximately 33,000 pounds of catchable-sized salmonids (for example: approximately 100,000 fish at 3 fish/lb, presently WCT and triploid RBT, if necessary.

Planned and actual fish stocking rates for 2014-2016 are shown in Tables 3-1 and 3-6 below (Cory Morrison, WDFW, pers. com.). Planned fish stocking for 2017 is outlined in Table 3-7 (Cory Morrison, WDFW, pers. com.).

Table 3-1: 2014 Fish Stocking Plan.

Location	Species	Stock	Number	No. Fish/lb	Stocking Date
Lake Chelan Tributaries					
Fish Creek	Cutthroat	Twin LK	6,000	Fry	July – August
Gold Creek	Cutthroat	Twin LK	1,300	Fry	July – August
Prince Creek	Cutthroat	Twin LK	4,700	Fry	July – August
Cascade Creek	Cutthroat	Twin LK	600	Fry	July – August
Four Mile Creek	Cutthroat	Twin LK	2,100	Fry	July – August
Big Creek	Cutthroat	Twin LK	700	Fry	July – August
Pyramid Creek	Cutthroat	Twin LK	2,300	Fry	July – August
Company Creek	Cutthroat	Twin LK	30,000	Fry	July – August
Blackberry Creek	Cutthroat	Twin LK	30,000	Fry	July – August
Lake Chelan	Cutthroat	Twin LK	50,000+	2.5	July - August
		Ad-Clipped (80%)			
	Kokanee	Lake Chelan	70,000	<100	May
	Triploid Rainbow	Spokane	50,000	2.5	August - September
	Triploid Rainbow	Spokane	2,000	0.5	May - September

Table 3-2: 2014 Actual Fish Stocking.

Location	Species	Stock	Number	No. Fish/lb	Stocking Date
Lake Chelan Tributaries					
Fish Creek	Cutthroat	Twin LK	6,000	426	August
Gold Creek	Cutthroat	Twin LK	1,300	557	August
Prince Creek	Cutthroat	Twin LK	4,700	557	August
Cascade Creek	Cutthroat	Twin LK	600	426	August
Four Mile Creek	Cutthroat	Twin LK	2,100	426	August
Big Creek	Cutthroat	Twin LK	700	557	August
Pyramid Creek	Cutthroat	Twin LK	2,300	557	August
Company Creek	Cutthroat	Twin LK	30,000	402	August
Blackberry Creek	Cutthroat	Twin LK	30,000	426	August
Chelan River			2,000	242	October
Lake Chelan	Cutthroat	Twin LK	47,483	3.5	June
		Ad-Clipped (80%)			
	Kokanee	Lake Chelan	70,177	85	May
	Triploid Rainbow	Spokane	728	0.2-0.25	June
	Triploid Rainbow	Spokane	38,846	~2.5	October - November

Table 3-3: 2015 Fish Stocking Plan.

Location	Species	Stock	Number	No. Fish/lb	Stocking Date
Lake Chelan Tributaries					
Twenty Five Mile Creek	Cutthroat	Twin LK	29,000	Fry	July - August
First Creek	Cutthroat	Twin LK	14,700	Fry	July - August
Mitchel Creek	Cutthroat	Twin LK	4,000	Fry	July - August
Grade Creek	Cutthroat	Twin LK	2,700	Fry	July - August
Safety Harbor Creek	Cutthroat	Twin LK	3,200	Fry	July - August
Cascade Creek	Cutthroat	Twin LK	600	Fry	July - August
Four Mile Creek	Cutthroat	Twin LK	2,100	Fry	July - August
Big Creek	Cutthroat	Twin LK	700	Fry	July - August
Pyramid Creek	Cutthroat	Twin LK	2,300	Fry	July - August
Company Creek	Cutthroat	Twin LK	30,000	Fry	July - August
Blackberry Creek	Cutthroat	Twin LK	30,000	Fry	July - August
Lake Chelan	Cutthroat	Twin LK	100,000	3.0	July - August
		Ad-clipped (80%)			
	Kokanee	Lake Chelan	80,000	<100	May
	Triploid Rainbow	Spokane	TBD	2.5	August - September
	Triploid Rainbow	Spokane	1,000	0.5	May - September

Table 3-4: 2015 Actual Fish Stocking.

Location	Species	Stock	Number	No. Fish/lb	Stocking Date
Lake Chelan Tributaries					
Twenty Five Mile Creek[1]	Cutthroat	Twin LK	20,000	Fry	July - August
First Creek[1]	Cutthroat	Twin LK	14,000	Fry	July - August
Mitchell Creek	Cutthroat	Twin LK	4,000	Fry	July - August
Grade Creek[1]	Cutthroat	Twin LK	2,000	Fry	July - August
Safety Harbor Creek[1]	Cutthroat	Twin LK	3,000	Fry	July - August
Cascade Creek	Cutthroat	Twin LK	6,00	Fry	July - August
Four Mile Creek[1]	Cutthroat	Twin LK	2,000	Fry	July - August
Big Creek	Cutthroat	Twin LK	700	Fry	July - August
Pyramid Creek[2]	Cutthroat	Twin LK	0	Fry	July - August
Company Creek	Cutthroat	Twin LK	30,000	Fry	July - August
Blackberry Creek[2]	Cutthroat	Twin LK	0	Fry	July - August
Lake Chelan	Cutthroat	Twin LK	103,310	2.9	July - August
		Ad-clipped (80%)			
	Kokanee	Lake Chelan	80,227	<100	May
	Triploid Rainbow	Spokane	0	2.5	August - September
	Triploid Rainbow	Spokane	0	0.5	May - September

[1] Original planned numbers to be stocked were reduced due to a shortage in the overall WCT program.
[2] Fish stocking did not occur for select tributaries due to fire or drought conditions.

Table 3-5: 2016 Fish Stocking Plan.

Location	Species	Stock	Number	No. Fish/lb	Stocking Date
Lake Chelan Tributaries					
Twenty Five Mile Creek	Cutthroat	Twin LK	29,000	Fry	July - August
First Creek	Cutthroat	Twin LK	14,700	Fry	July - August
Mitchell Creek	Cutthroat	Twin LK	4,000	Fry	July - August
Grade Creek	Cutthroat	Twin LK	2,700	Fry	July - August
Safety Harbor Creek	Cutthroat	Twin LK	3,200	Fry	July - August
Fish Creek	Cutthroat	Twin LK	6,000	Fry	July - August
Gold Creek	Cutthroat	Twin LK	1,300	Fry	July - August
Prince Creek	Cutthroat	Twin LK	4,700	Fry	July - August
Company Creek	Cutthroat	Twin LK	30,000	Fry	July - August
Blackberry Creek	Cutthroat	Twin LK	30,000	Fry	July - August
Lake Chelan	Cutthroat	Twin LK	105,000	3.0	July - August
		Ad-clipped (80%)			
	Kokanee	Lake Chelan	38,000	<100	May
	Triploid Rainbow[1]	Spokane	TBD	2.5	August - September
	Triploid Rainbow[1]	Spokane	TBD	0.5	May - September

1 – Triploid rainbow trout will be stocked only if the full requirement of 33,000 pounds cannot be met by Westslope cutthroat trout only.

Table 3-6: 2016 Actual Fish Stocking.

Location	Species	Stock	Number	No. Fish/lb	Stocking Date
Lake Chelan Tributaries					
Twenty Five Mile Creek	Cutthroat	Twin LK	29,010	557	August
First Creek	Cutthroat	Twin LK	14,700	539	August
Mitchell Creek	Cutthroat	Twin LK	4,000	230	September
Grade Creek	Cutthroat	Twin LK	2,700	539	August
Safety Harbor Creek	Cutthroat	Twin LK	3,200	551	August
Fish Creek	Cutthroat	Twin LK	6,000	200	September
Gold Creek	Cutthroat	Twin LK	1,300	230	September
Prince Creek	Cutthroat	Twin LK	4,700	551	August
Company Creek	Cutthroat	Twin LK	30,000	461	August
Blackberry Creek	Cutthroat	Twin LK	30,016	461	August
Lake Chelan	Cutthroat	Twin LK	122,367	3.9	June - July
		Ad-clipped (80%)			
	Kokanee	Lake Chelan	34,297	56	June
	Triploid Rainbow	Spokane	0	NA	NA

Table 3-7: 2017 Fish Stocking Plan.

Location	Species	Stock	Number	No. Fish/lb	Stocking Date
Lake Chelan Tributaries					
Fish Creek	Cutthroat	Twin LK	6,000	Fry	August-September
Gold Creek	Cutthroat	Twin LK	1,300	Fry	August-September
Prince Creek	Cutthroat	Twin LK	4,700	Fry	August-September
Cascade Creek	Cutthroat	Twin LK	600	Fry	August-September
Four Mile Creek	Cutthroat	Twin LK	2,100	Fry	August-September
Big Creek	Cutthroat	Twin LK	700	Fry	August-September
Pyramid Creek	Cutthroat	Twin LK	2,300	Fry	August-September
Company Creek	Cutthroat	Twin LK	30,000	Fry	August-September
Blackberry Creek	Cutthroat	Twin LK	30,000	Fry	August-September
Lake Chelan	Cutthroat	Twin LK	105,000	3.0+	June -July
		Ad-clipped (80%)			
	Kokanee	Lake Chelan	0	<100	May - June
	Triploid Rainbow[1]	Spokane	TBD	2.5	August - September
	Triploid Rainbow[1]	Spokane	TBD	0.5	May - September

1 – Triploid rainbow trout will be stocked only if the full requirement of 33,000 pounds cannot be met in full by Westslope cutthroat trout.

A significant note for 2016 for actual fish stocked into Lake Chelan was 122,367 WCT at 3.9 fish per pound (FPP). This was just the third time in as many consecutive years that WCT of approximate catchable size were stocked successfully into the lake for recreational fishing. As outlined previously in this document, WCT have been very difficult to rear to catchable size due to eggs originating from wild stock and being much more difficult to culture (more susceptible to disease, reduced growth rates, avoidance/fright behavior, etc.) than more domesticated stocks, such as RBT. However, WDFW and Chelan PUD coordinated alternative rearing practices and facilities for WCT, and were able to produce WCT to catchable size and stock them into Lake Chelan for the first time in 2014. As a result of this success, the programmatic shift was once

again pursued and successfully implemented with an even larger group of fish in 2016. This program, in addition to refinements as more is learned regarding the culturing of wild-origin WCT, will be continued into the future with the goal of producing the entire license stocking production requirement of trout to be WCT and reducing the stocking of triploid RBT, to the greatest extent practicable.

The plan for 2017 is to meet the catchable-sized trout license requirement (33,000 lbs. at 3 fpp) through stocking all WCT. However, as shown in Table 3-7, some triploid RBT are being reared at the Chelan Hatchery as "back-up" in the event that the full requirement cannot be met by stocking all WCT. The triploid RBT will be stocked only if the full requirement cannot be met by WCT. Otherwise, these RBT will be stocked in other local area lakes.

3.2 Monitoring and Evaluation Program

3.2.1 Fish Creek Westslope Cutthroat Trout Distribution Survey using eDNA, USFS

Working with the USFS Rocky Mountain Research Station and National Genomics Center for Wildlife and Fish Conservation to survey the potential westslope cutthroat trout habitat in the Fish Creek sub-watershed using eDNA.

Approximatly 45 water samples will be collected within Fish Creek during low flow periods from July to August, 2017 by USFS staff following protocols developed by the USFS Rocky Mountain Research Station (Carim et al, 2015). Equipment and supplies for collecting the samples will be provided by the Rocky Mountain Research Station and the genetic analysis and reporting will be completed by the National Genomics Center. Each sample will cost $100; $75 for the first species and $25 for each additional species. Due to the stocking history of Fish Creek and the lakes that drain into Fish Creek, analysis for both RBT and WCT would be conducted. In addition to collecting water samples for eDNA analysis at each site, the FS will also collect tissue samples using hook and line for genetic analysis at a later date.

Table 3-8: Estimated USFS budget and schedule for Fish Creek eDNA survey.

Schedule	Task	Requested PUD Matching $ (LC06b2)	USFS Matching $
July-August 2017	Coordination and collection of water samples for eDNA analysis from 45 sites along Fish Creek (GS-11 and GS-9 for 10 days). Per diem and USFS Boat and Operator expenses (2 trips).	$7,000	 $500
September-November 2017	USFS Rocky Mountain Research Station; National Genomic Center eDNA Sample Analysis (n=45)		$4,500
November-December 2017	USFS coordination with RMRS, data management and report writing		$2,000
	Total	$7,000	7,000

3.2.2 Lake Chelan Tributary Estimates of Juvenile Westslope Cutthroat and Rainbow Trout Abundance, WDFW

Since 2011, WDFW has conducted annual fish abundance surveys on select lake tributaries on a three-year rotational basis. These surveys are conducted to obtain information on adfluvial WCT and RBT population abundance, age class composition and other biological characteristics.

The main tributaries to be surveyed include First, Twenty-five Mile, Railroad, Mitchell, Fish, Grade, Gold, Prince, Big, Four Mile, Cascade Pyramid, and Safety Harbor Creeks.

WDFW surveyed Twenty-Five Mile, First, Safety Harbor, Grade and Mitchell Creeks beginning in 2014, thus these tributaries will once again be sampled in 2017 as per the three-year rotating schedule. In addition to and as time, reliable lake transportation, and personnel availability allows, the following creeks may also be investigated and surveyed if feasible: Poison, Lightning, Little Big, Graham Harbor, Coyote, Deep Harbor, Lone Fir, Castle, Bear, and Riddle Creeks. If surveys are successful for any of the aforementioned tributaries, they will then fall into the three-year rotation. Surveys on these creeks have not been conducted since 1982 and so may serve as additional comparative information.

Table 3-9: Estimated WDFW budget and schedule for tributary trout abundance.

Year	Task	Total $	Requested $ (LC06b1)	Requested PUD Matching $ (LC06b2)	WDFW Matching $
2017	Conduct tributary surveys in September & October	$20,800		$10,400	$10,400
	Data Mtg. and Reporting.	$3,800		$1,900	$1,900
	Boat and Vehicle Operating Costs	$1,650	$1,650		
	Supplies and Equipment	$650	$650		
	Estimated Totals	$26,900	$2,300	$12,300	$12,300

3.2.3 Stehekin River Cutthroat Trout Spawning, Abundance and Genetic Surveys, NPS

North Cascades National Park personnel will conduct five to six trout spawning surveys in the spring and early summer of 2016, and will conduct two additional snorkel surveys of index sites in late summer/early fall to monitor trout abundance. Fry DNA will be collected from four index reaches to examine parental lineage and hybrid status.

Table 3-10: Estimated 2017 NPS budget and schedule for westslope cutthroat trout surveys.

Schedule	Task	Total $	NPS Requested (LC06b1)	Requested PUD Matching (LC06b2)	NPS/USFS Matching
May-Aug	Conduct four to five trout spawning surveys at 8 side channel index sites (1-GS/9 Ecologist and 1-GS/6 Bio Tech for a total of 30 person-days)	$8,339	$3,939	$2,200	$2,200
Aug-Oct	Conduct two snorkel surveys in 8 side-channel/trib. index reaches (1–GS/9 Ecologist and 1-GS/6 Bio Tech for total of 8 person-days)	$1,940	$940	$500	$500
Aug-Oct	Collect cutthroat/rainbow young-of-year for genetic analysis in four side channel reaches (1–GS/9 Ecologist and 1-GS/6 Bio Tech for total of 2 person-days)	$517	$117	$200	$200
Oct-Dec	USGS WFRC Lab analyses, Data Mgt. and Reporting (100 samples @ $55/sample including Overhead)	$5,500	$2,500	$1,500	$1,500
Nov-Dec	Data Mgt. and Reporting (1-GS/6 Bio Tech for 8 days, 1-GS/9 Ecol. for 8 days)	$4,668		$2,334	$2,334
May-Oct	Travel (Ferry and per diem)	$1,912	$1,912		
	Vehicle (1.75 months @ $900/month)	$1,575	$1,575		
	Supplies	$450	$450		
	2017 Estimated Totals:	$24,901	$11,433	$6,734	$6,734

3.2.4 Lake Chelan Tributary Kokanee Escapement, WDFW

Annual escapement of kokanee spawning in Lake Chelan tributaries has been estimated by the Chelan County PUD from 1983 to 2015 through surveying of index reaches. This long-term data set of kokanee escapement has been used to evaluate trends in the Lake Chelan kokanee abundance and spawner distribution (see Section 2.3). Estimates of natural recruitment can also be used in determining stocking rates of kokanee fry conducted by WDFW.

Due to reduced personnel availability within the CPUD, WDFW proposes to conduct kokanee spawning surveys in 2017 on the following index sites: Fish, Prince, Safety Harbor, 25-Mile, First, Grade, Gold, and Mitchell creeks. The NPS will survey the remaining two index sites outlined in Section 3.2.5.

Table 3-11: Estimated 2017 WDFW budget and schedule for CPUD down-lake tributary index sites.

Year	Task	Total $	Requested $ (LC06b1)	Requested $ LC06b2	WDFW Matching $
2017	Conduct Kokanee Creel Surveys On Eight Tributaries, Sep-Oct.	$6,000		$3,000	$3,000
	Vehicle/Boat Operating Costs	$1,800	$1,800		
	Sampling Supplies	$200	$200		
	Estimated Totals	$8,000	$2,000	$3,000	$3,000

3.2.5 Lake Chelan Tributary Kokanee Escapement, NPS

Due to reduced personnel availability within the CPUD, the NPS proposes to conduct kokanee spawning surveys in 2017 on the Company and Blackberry creek index sites as outlined below.

Table 3-12: Estimated 2017 NPS budget and schedule for CPUD Stehekin River index sites.

Schedule	Task	Total $	NPS Requested (LC06b1)	Requested PUD Matching (LC06b2)	NPS/USFS Matching
Aug-Oct	Conduct four kokanee spawning surveys at CPUD Stehekin River index sites (1-GS/9 Ecologist and 1-GS/6 Bio Tech for 8 person-days)	$1,877	$1,877		
Nov-Dec	Data Mgt. and Reporting (1-GS/6 Biotech for 4 days, 1-GS/9 Ecol. for 4 days)	$1,267	$1,267		
May-Oct	Travel (Ferry and per diem)	$373	$373		
	Vehicle (0.5 months @ $900/month)	$450	$450		
	Supplies	$0	$0		
	2017 Estimated Totals:	$3,967	$3,967	$0	$0

3.2.6 Kokanee Creel Survey, WDFW

WDFW will conduct annual kokanee creel surveys designed to monitor and determine the contribution of kokanee to the sport fishery. The main purpose of the survey is to: 1) determine the relative composition of kokanee as it relates to age and origin (naturally produced or hatchery released) contributing to the sport fishery; and 2) determine if kokanee continue to be a preferred species to pursue and catch. WDFW plans to begin conducting these surveys in April and will conclude sometime in June.

Table 3-13: Estimated WDFW Budget and Schedule for kokanee creel survey.

Year	Task	Total $	Requested $ (LC06b1)	Requested $ LC06b2	WDFW Matching $
2017	Conduct Kokanee Creel Surveys	$20,000		$10,000	$10,000
	Data Management	$2,000		$1,000	$1,000
	Vehicle Operating Costs	$1,300	$1,300		
	Sampling Supplies	$200	$200		
	Estimated Totals	$23,500	$1,500	$11,000	$11,000

3.2.7 Kokanee Stocking Monitoring and Evaluation, WDFW

When it is determined that kokanee should be stocked back into Lake Chelan, WDFW will clip adipose fins on all kokanee reared and released into the lake as part of the fish stocking program. Fin clipped kokanee will provide important information regarding the contribution of hatchery-reared kokanee to the sport fishery (especially their survival) as identified through creel surveys versus natural production. The cost of fin-clipping hatchery produced kokanee is estimated to be $6,200 annually.

Estimated Budget and Schedule: $6,200 for fin clipping kokanee in 2016.

3.2.8 Collection and analysis of eDNA samples, NPS

North Cascades National park will collect eDNA samples from 28 sites which were not sampled in 2016. Additional funding is requested for sample analysis and collection. In addition to screening samples for Bull Trout presence, each sample (n=152) will be screened for the presence of WCT, RBT and EBT. This data will lead to a broad understanding of fish species distribution in the Stehekin River watershed, including potential locations of genetically pure WCT populations, and the extent of invasive species colonization.

Table 3-14: Estimated 2017 NPS budget and schedule for eDNA sampling and analysis.

Schedule	Task	Total $	NPS Requested (LC06b1)	Requested PUD Matching (LC06b2)	NPS/USFS Matching
Aug-Oct	Collect Field Samples from n=28 sites (NPS, GS-09 & GS-06, 20 person-days)	$4,536	$2,536	$1,000	$1,000
Nov-Apr	USFS National Genomic Center. eDNA Sample Analysis, Data Mgt. and Reporting; run eDNA samples for WCT, RBT and EBT presence	$11,400	$5,800	$2,800	$2,800
Nov-Dec	Data Mgt. and Reporting (1-GS/6 Biotech for 2 days, 1-GS/9 Ecol. for 2 days)	$1,130	$0	$565	$565
Aug-Oct	Travel (Ferry and per diem)	$575	$575		
Sept-Oct	Vehicle (1 month @ $900/month)	$900	$900		
Sept-Oct	Equipment &Supplies	$0			
	2017 Estimated Totals:	$18,541	$9,811	$4,365	$4,365

3.2.8 *Tributary Barrier Confirmation and Removal*

Tributaries to Lake Chelan will be monitored by site visits and photo documentation in 2017 by the Chelan PUD to ensure that connectivity to the lake and upstream migration access to spring spawning WCT is maintained. Photographs of tributary mouths (First, Fish, Gold, Grade, Mitchell, Prince, Railroad, Safety Harbor, and 25-Mile creeks) will be taken in late March when the lake elevation is near its' lowest point to document tributary mouth upstream passage conditions. On-the-ground reconnaissance may be conducted to ascertain the type and extent of the passage barrier if photo monitoring indicates the presence of a passage barrier (water depth, water velocity, gradient). Photo documentation of tributary mouth conditions for 2017 will be included in the Tributary Barriers Photographs, 2008-2017 report (Chelan PUD 2017).

3.2.9 *Entrainment Investigation*

Chelan PUD will develop an Entrainment Investigation Study Plan in 2017 for review by the LCFF. Upon approval of the study plan by the LCFF, Chelan PUD will submit the plan with the Federal Energy Regulatory Commission (FERC) for approval. Once approved, the plan will be available to implement when the LCFF deems it appropriate to do so.

Table 3-15:. Summary of 2016 LCFP Expenditures.

Measure	Estimated M&E Cost	Amount to be provided by Chelan PUD	Agency Cost-share	Task
Fish Creek Westslope Cutthroat Trout Distribution Survey using eDNA (USFS)	$14,000	$7,000	$7,000	Section 3.2.1
Lake Chelan Tributary Estimates of Juvenile Westslope Cutthroat and Rainbow Trout Abundance (WDFW)	$26,900	$14,600	$12,300	Section 3.2.2
Stehekin River Cutthroat Trout Spawning, Abundance and Genetic Surveys (NPS)	$24,901	$18,167	$6,734	Section 3.2.3
Lake Chelan Tributary Kokanee Spawning Escapement, Down-Lake Tributaries, WDFW	$8,000	$5,000	$3,000	Section 3.2.4
Lake Chelan Tributary Kokanee Spawning Escapement, Stehekin Basin, NPS	$3,967	$3,967	$0	Section 3.2.5
Kokanee Creel Survey (WDFW)	$23,500	$12,500	$11,000	Section 3.2.6
Kokanee Stocking Monitoring and Evaluation – Fin Clipping (WDFW)	$0	$0	$0	Section 3.2.7
Collection and Analysis of eDNA Samples, NPS	$18,541	$14,176	$4,365	Section 3.2.8
Total M&E Survey Costs	$119,809	$75,410	$44,399	
Tributary Barriers			N/A	Section 3.2.9
Fish Stocking	$30,000	$30,000	N/A	Section 3.1
TOTAL	$149,809	$105,410	$44,399	

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